e-Front runners

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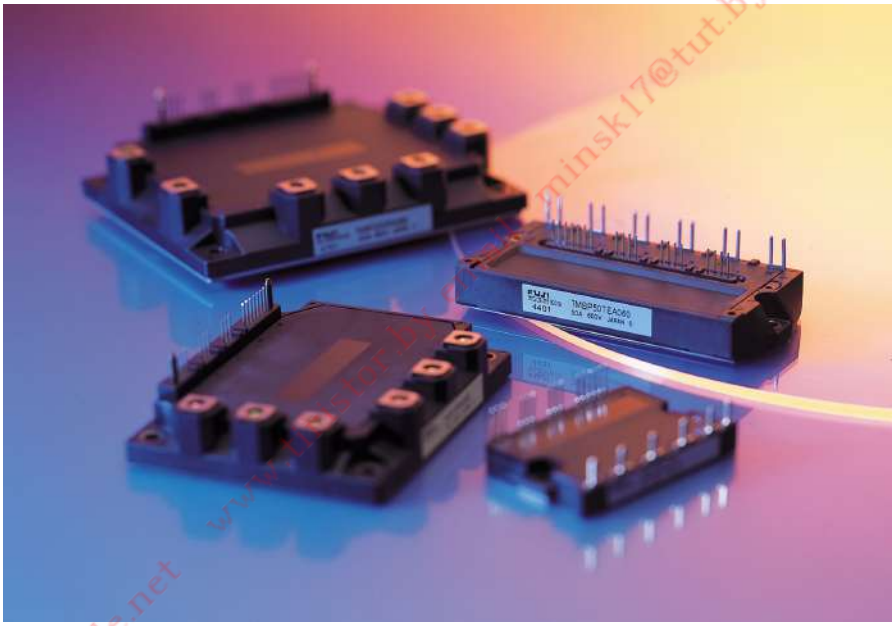
FUJI IGBT–IPM
APPLICATION MANUAL



Fuji Electric Device Technology Co., Ltd.

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Features

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1 GBT-IPMs Characteristics

An intelligent power module (IPM) has the following characteristics when compared with a combination of IGBT modules and drive circuits.

1.1 Built-in drive circuit

- IGBT gate drives operate under optimal conditions.
- Since the wiring length between the internal drive circuit and IGBT is short and the impedance of the drive circuit is low, no reverse bias DC source is required.
- The R-series IPM (R-IPM) devices require four control power sources, one source on the lower arm side, and three individual sources on the upper arm side with proper circuit isolation.

1.2 Built-in protection circuits

- The following built-in protection circuits are included in the R-IPM devices:
  (OC): Overcurrent protection
  (SC): Short-circuit protection
  (UV): Undervoltage protection for control power source
  (OH): Overheating protection
  (ALM): External alarm output

- The OC and SC protection circuits provide protection against IGBT damage caused by overcurrent or load short-circuits. These circuits monitor the collector current using detection elements incorporated in each IGBT and thus can minimize the possibility of severe damage to the IGBT. They also protect against arm short-circuits.[*1]

- The UV protection circuit is in all of the IGBT drive circuits. This circuit monitors the Vcc supply voltage level against the IGBT drive Vin.

- The OH protection circuit protects the IGBT and FWD from overheating. It also monitors the insulating substrate's temperature with temperature detection elements installed on the insulating substrates inside the IPM.
  (Case temperature overheating protection: TcOH)[*2]

- Additionally, each IGBT chip contains a temperature detection element on the IGBT die, which allows the OH to act rapidly when abnormally high chip temperatures are detected. (Junction temperature overheating protection: TjOH)
- The ALM circuit outputs an alarm signal to outside of the IPM, making it possible to shutdown the system reliably by outputting the alarm signal to the microcontroller which controls IPM when the circuit detects an abnormal condition (specified above). *2

*1 The N-line shunt resistance method is used for overcurrent detection of small-capacity types.

*2 Refer to Chapter 3 “Description of Functions” for the protective functions of each IPM.

1.3 Built-in brake circuit (7 in 1 IPM)

- For a motor control inverter application, a brake circuit can be built to protect bus overvoltage by just adding a power dissipating resistor.
- The drive circuits and protection circuits are included in the brake IGBT in the same way as inverter IGBTs.

2 IPM Characteristics by Series

2.1 R-IPM, R-IPM3 series

2.1.1 Small-capacity types

A lineup of small-capacity types with 15 to 30 A for 600 V systems and 15 A for 1200 V systems is available. (P617, P619 package)

- P617 package products are a type without a copper base, while P619 package products are a type with a copper base, which further improves the heat radiation ability.
- The control input terminals have a standard pitch of 2.54 mm.
- The shape of the main terminals is the Faston shape, and as the height is the same as that of the control input terminals, connection by the same printed boards is possible with the soldering method as well as with the connector method.
- By improvement of the trade-off between Vce(sat) and switching loss, the total loss has been improved.
- The chip is protected from abnormal heating by IGBT chip overheating protection.

2.1.2 Medium-capacity types (alarm output only for the lower arm)

A lineup of medium-capacity types with 50 to 150 A for 600 V systems and 25 to 75 A for 1200 V systems is available. (P610, P611 package)

- The control input terminals have a standard pitch of 2.54 mm, they are arranged in one line, and connection is possible with one connector for general use. A guide pin makes insertion of the connector for the printed board easy.
- The main power source inputs (P, N), the brake output (B), and the output terminals (U, V, W) are arranged close to each other, and the main wiring is a simple package construction.
- As the main terminals are M5 screws, large currents can be connected securely.
- The screw diameter for connection to the heat sink is M5, the same as for the main terminals.
- As all electrical connections are made by screws or connectors, soldering is not required and removal is easy.
- By improvement of the trade-off between Vce(sat) and switching loss, the total loss has been improved.
- The chip is protected from abnormal heating by IGBT chip overheating protection.[*3]

[*3] There is no alarm output from the upper arm side.

2.1.3 Medium-capacity types (with upper arm alarm output function)

A lineup of medium-capacity types with 50 to 150 A for 600 V systems and 25 to 75 A for 1200 V systems is available. (P621 package)

- OC, SC, UV, and TjOH alarm signals can be output from the upper arm. This allows secure protection against trouble from ground faults, etc.[*4]
- As the main terminals are M5 screws, large currents can be connected securely.
- The screw diameter for connection to the heat sink is M5, the same as for the main terminals.

- As all electrical connections are made by screws or connectors, soldering is not required and removal is easy.
- By improvement of the trade-off between Vce(sat) and switching loss, the total loss has been improved.
- The chip is protected from abnormal heating by IGBT chip overheating protection.

*4 The TcOH alarm is output only from the lower arm.

2.1.4 Large-capacity types (alarm output only for the lower arm)

A lineup of large-capacity types with 200 to 300 A for 600 V systems and 100 to 150 A for 1200 V systems is available. (P612 package)

- The layout of the control input terminals is the same as for the medium-capacity standard package, and correspondence is possible with one connector type.
- The main power source inputs (P, N), the brake output (B), and the output terminals (U, V, W) are arranged close to each other, and the main wiring is a simple package construction.
- As the main terminals are M5 screws, large currents can be connected securely.
- The screw diameter for connection to the heat sink is M5, the same as for the main terminals.
- As all electrical connections are made by screws or connectors, soldering is not required and removal is easy.
- By improvement of the trade-off between Vce(sat) and switching loss, the total loss has been improved.
- The chip is protected from abnormal heating by IGBT chip overheating protection.*5

*5 There is no alarm output from the upper arm side.

2.2 Econo IPM series

The Econo IPM series is a lineup with 50 to 150 A for 600 V systems and 25 to 75 A for 1200 V systems. (P622 package)

- In comparison with the medium-capacity types, the mounting area has been reduced by approximately 30% and the mass has been reduced by approximately 40%, contributing to reduction of the device size.
- As the height is the same as that of Econo DIMs (Econo Diode Modules), connection is possible with the same printed circuit boards.
- OC, SC, UV, and TjOH alarm signals can be output from the upper arm. This makes secure protection against trouble from ground faults etc. possible.
- The chip is protected from abnormal heating by IGBT chip overheating protection.

3 Definition of Type Name and Lot No.

• Type name

7 MBP 50 RT A 060 -01

- -01: Additional model number (if necessary)
- 060: Voltage rating
  - 060: 600 V
  - 120: 1200 V
- A: Additional number of series
- RT: Series name
  - R: R-IPM
  - RT: R-IPM3
  - TE: Econo IPM
- 50: Inverter IGBT current rating
  - 50: 50 A
- MBP: Indicates IGBT-IPM
- 7: Number of main elements
  - 7-chip circuit with built-in brake
  - 6-chip circuit without dynamic brake

• Lot No.

4 1 01

- 01: Additional number (01 to 99)
- 1: Month of production
  - 1: Jan.
  - 9: Sep.
  - 0: Oct.
  - N: Nov.
  - D: Dec.
- 4: Year of production
  - 4: 2004

4 Lineup

600 V system, 15 to 75 A

	15A	20A	30A	50A	75A
R-IPM	6MBP15RH060	6MBP20RH060	6MBP30RH060	6MBP50RA060 7MBP50RA060	6MBP75RA060 7MBP75RA060
R-IPM3	–	6MBP20RTA060	–	6MBP50RTB060 7MBP50RTB060 6MBP50RTJ060 7MBP50RTJ060	6MBP75RTB060 7MBP75RTB060 6MBP75RTJ060 7MBP75RTJ060
Econo IPM	–	–	–	6MBP50TEA060 7MBP50TEA060	6MBP75TEA060 7MBP75TEA060

600 V system, 100 to 300 A

	100A	150A	200A	300A
R-IPM	6MBP100RA060 7MBP100RA060	6MBP150RA060 7MBP150RA060	6MBP200RA060 7MBP200RA060	6MBP300RA060 7MBP300RA060
R-IPM3	6MBP100RTB060 7MBP100RTB060 6MBP100RTJ060 7MBP100RTJ060	6MBP150RTB060 7MBP150RTB060 6MBP150RTJ060 7MBP150RTJ060	–	–
Econo IPM	6MBP100TEA060 7MBP100TEA060	6MBP150TEA060 7MBP150TEA060	–	–

1200 V system

	15A	25A	50A	75A	100A	150A
R-IPM	6MBP15RA120	6MBP25RA120 7MBP25RA120 6MBP25RJ120 7MBP25RJ120	6MBP50RA120 7MBP50RA120 6MBP50RJ120 7MBP50RJ120	6MBP75RA120 7MBP75RA120 6MBP75RJ120 7MBP75RJ120	6MBP100RA120 7MBP100RA120	6MBP150RA120 7MBP150RA120
Econo IPM	–	6MBP25TEA120 7MBP25TEA120	6MBP50TEA120 7 MBP50TEA120	6MBP75TEA120 7MBP75TEA120	–	–

5 Outline Drawings

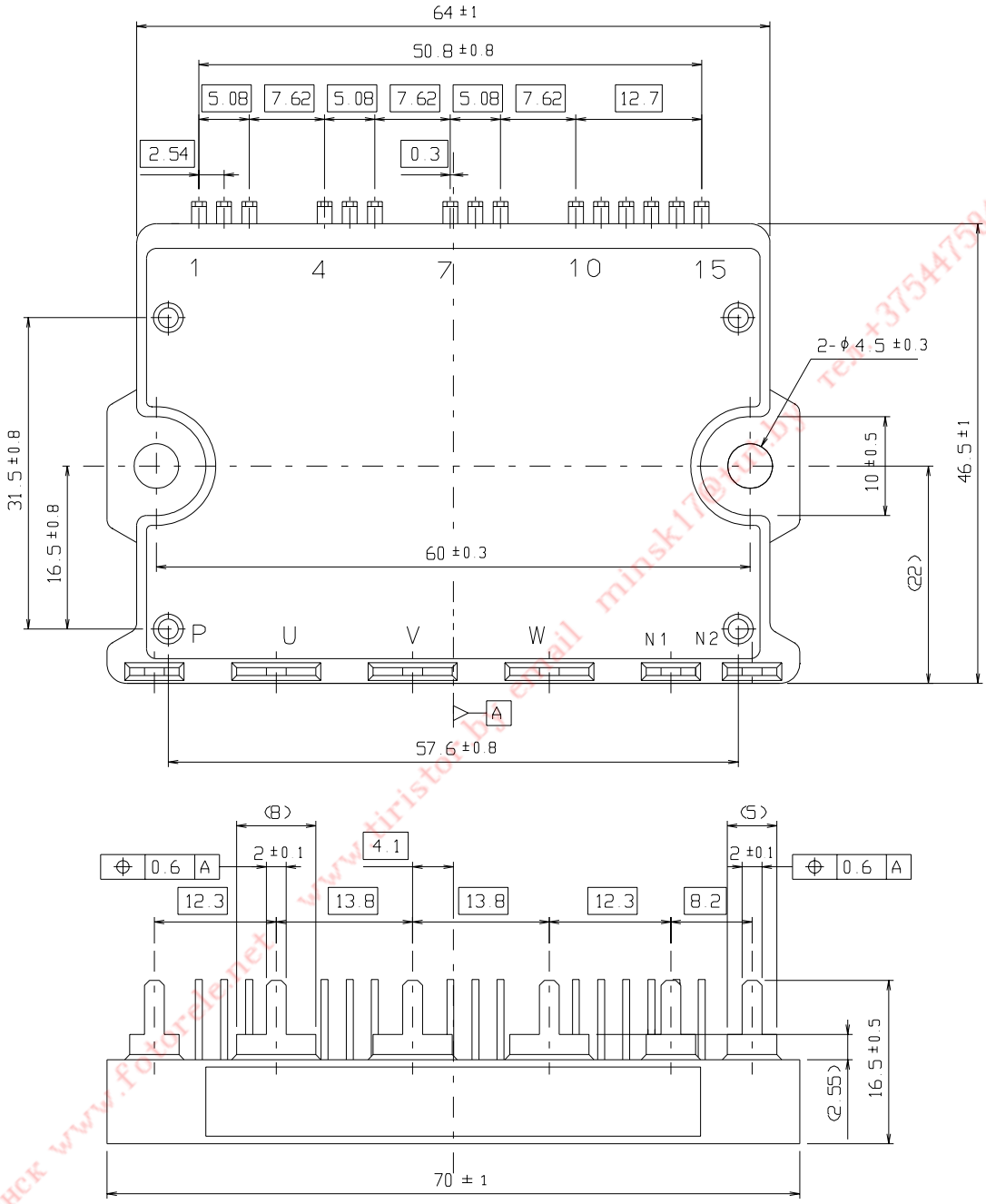

Fig. 1-1 Outline Drawing (P617)

Type name: 6MBP15RH060, 6MBP20RH060, 6MBP30RH060

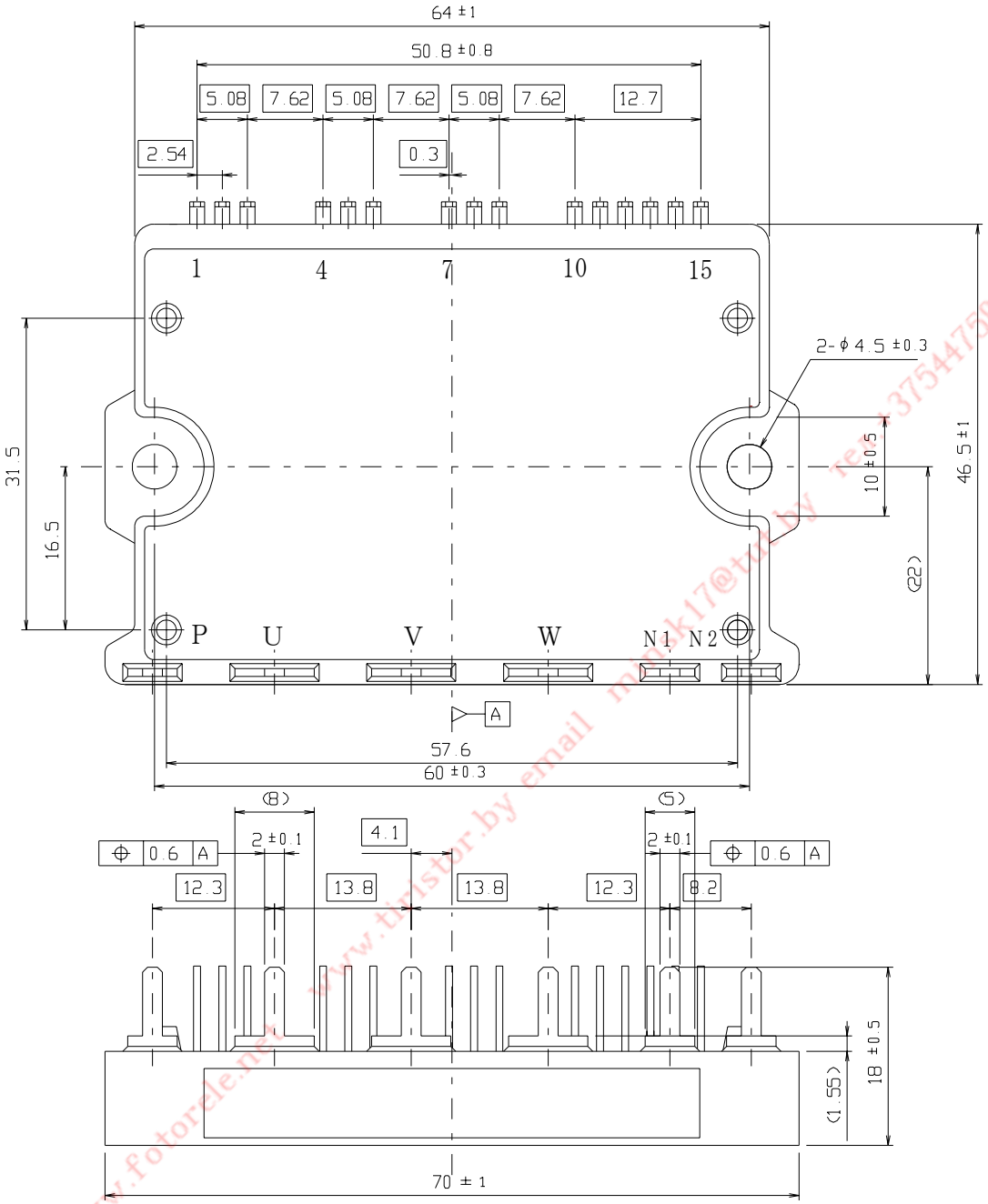

Fig. 1-2 Outline Drawing (P619)

Type name: 6MBP20RTA060, 6MBP15RA120

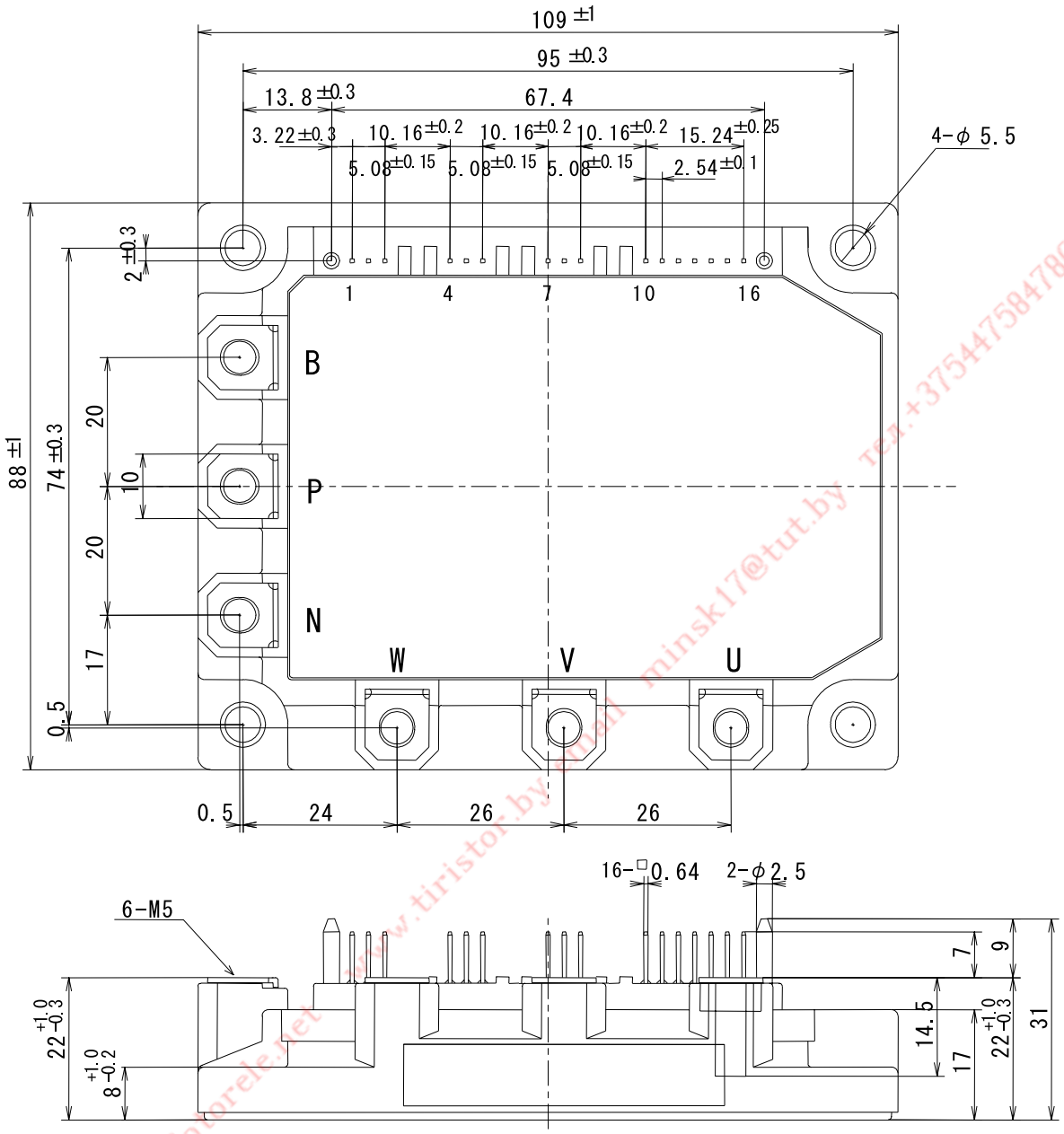

Fig. 1-3 Outline Drawing (P610)

Type name: 6MBP50RA060, 6MBP75RA060, 6MBP50RTB060, 6MBP75RTB060, 6MBP25RA120

7MBP50RA060, 7MBP75RA060, 7MBP50RTB060, 7 MBP75RTB060, 7MBP25RA120

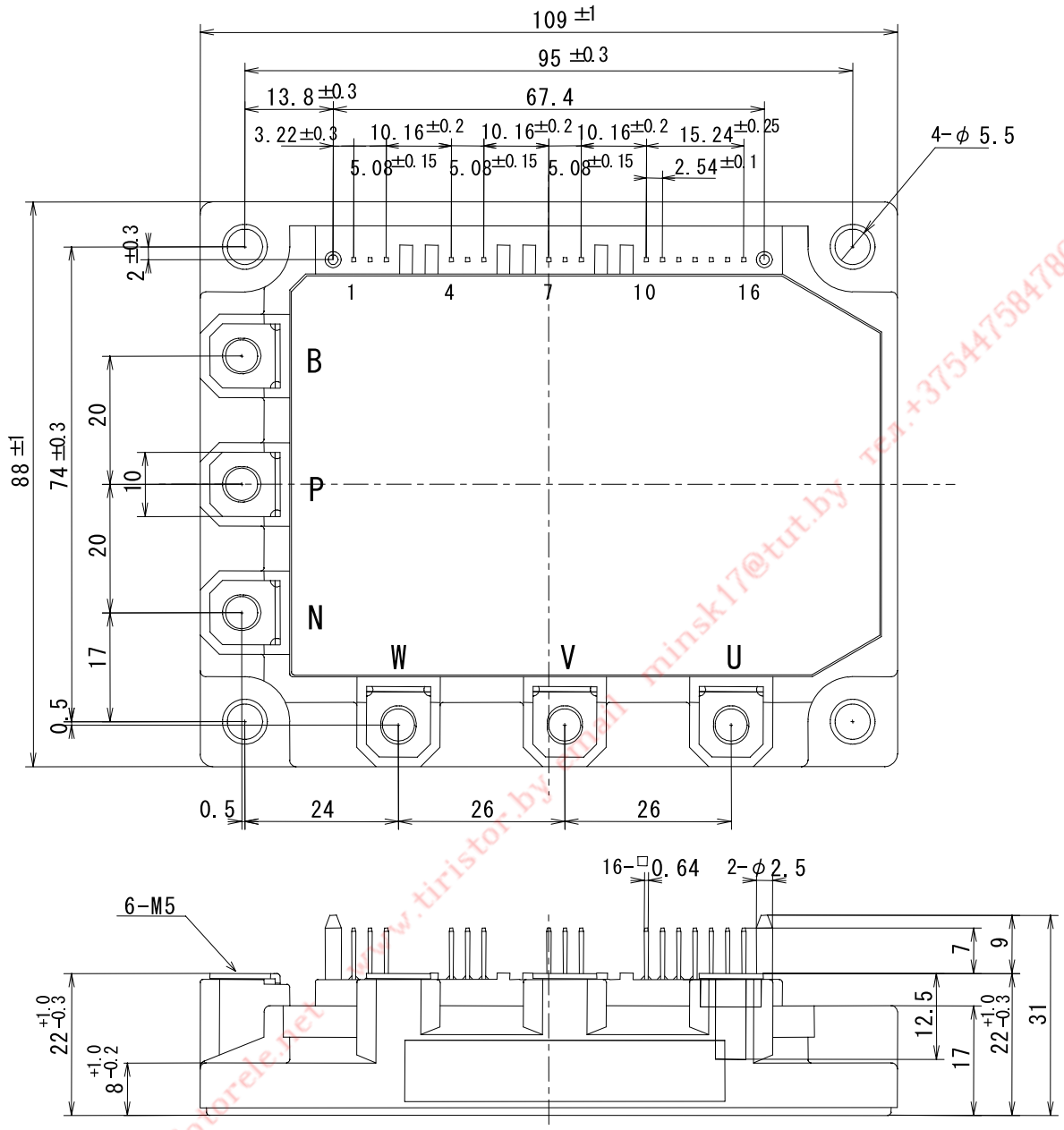

Fig. 1-4 Outline Drawing (P611)

Type name: 6MBP100RA060, 6MBP150RA060, 6MBP100RTB060, 6MBP150RTB060, 6MBP50RA120, 6MBP75RA120
7MBP100RA060, 7MBP150RA060, 7MBP100RTB060, 7MBP150RTB060, 7MBP50RA120, 7MBP75RA120

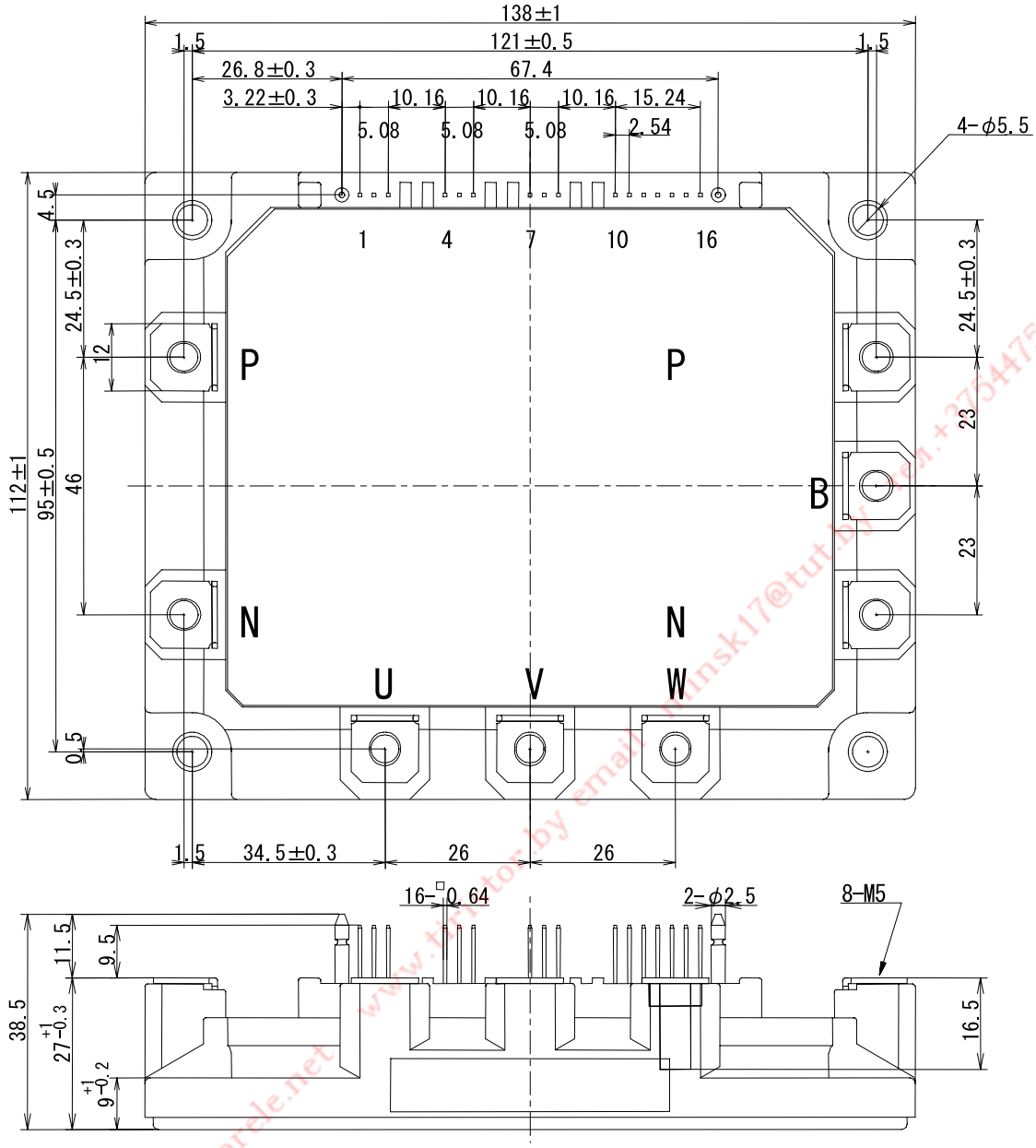

Fig. 1-5 Outline Drawing (P612)

Type name: 6MBP200RA060, 6MBP300RA060, 6MBP100RA120, 6MBP150RA120

7MBP200RA060, 7MBP300RA060, 7MBP100RA120, 7MBP150RA120

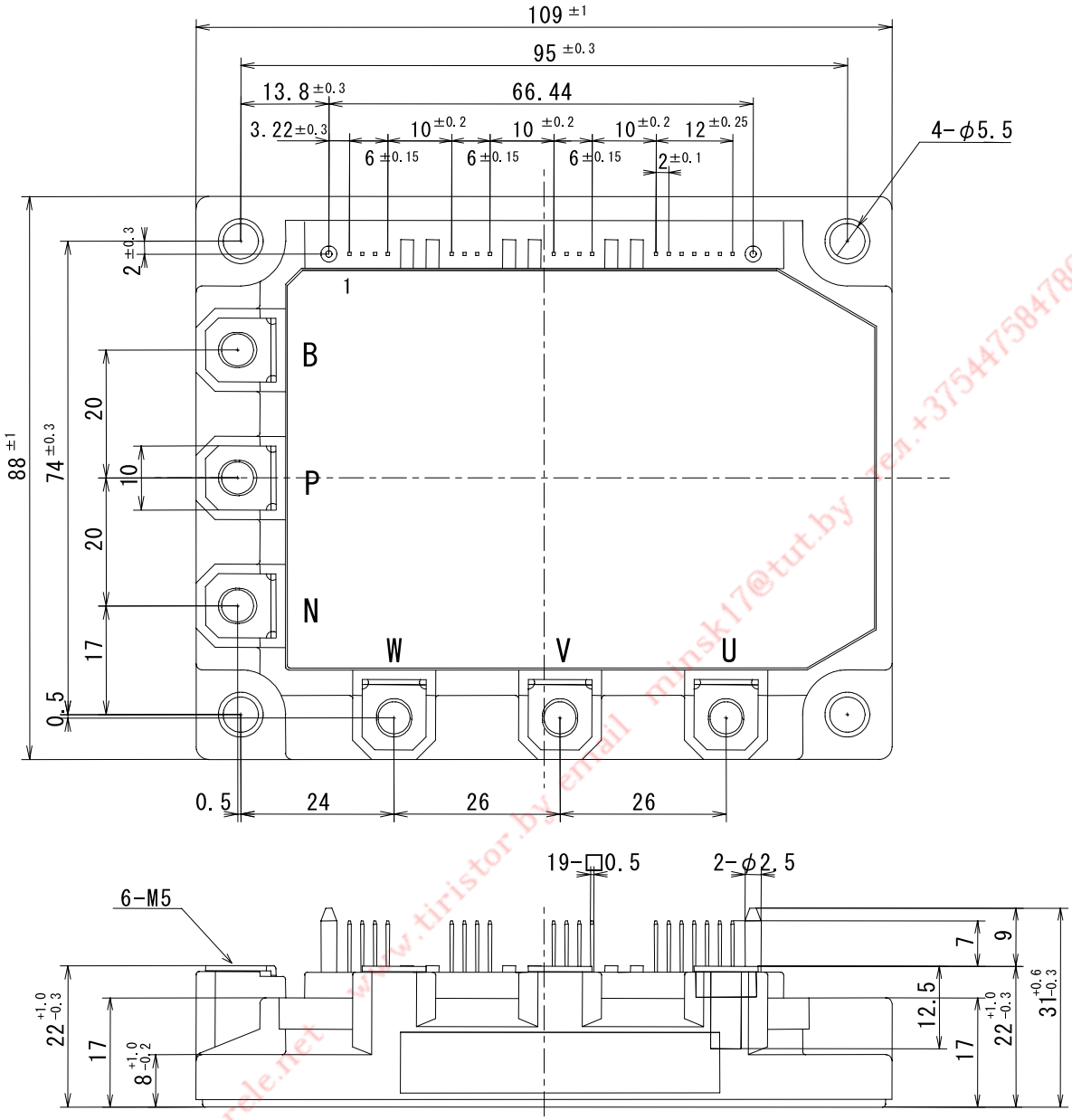

Fig. 1-6 Outline Drawing (P621)

Type name: 6MBP50RTJ060, 6MBP75RTJ060, 6MBP100RTJ060, 6MBP150RTJ060, 6MBP25RJ120, 6MBP50RJ120, 6MBP75RJ120

7MBP50RTJ060, 7MBP75RTJ060, 7MBP100RTJ060, 7MBP150RTJ060, 7MBP25RJ120, 7MBP50RJ120, 7MBP75RJ120

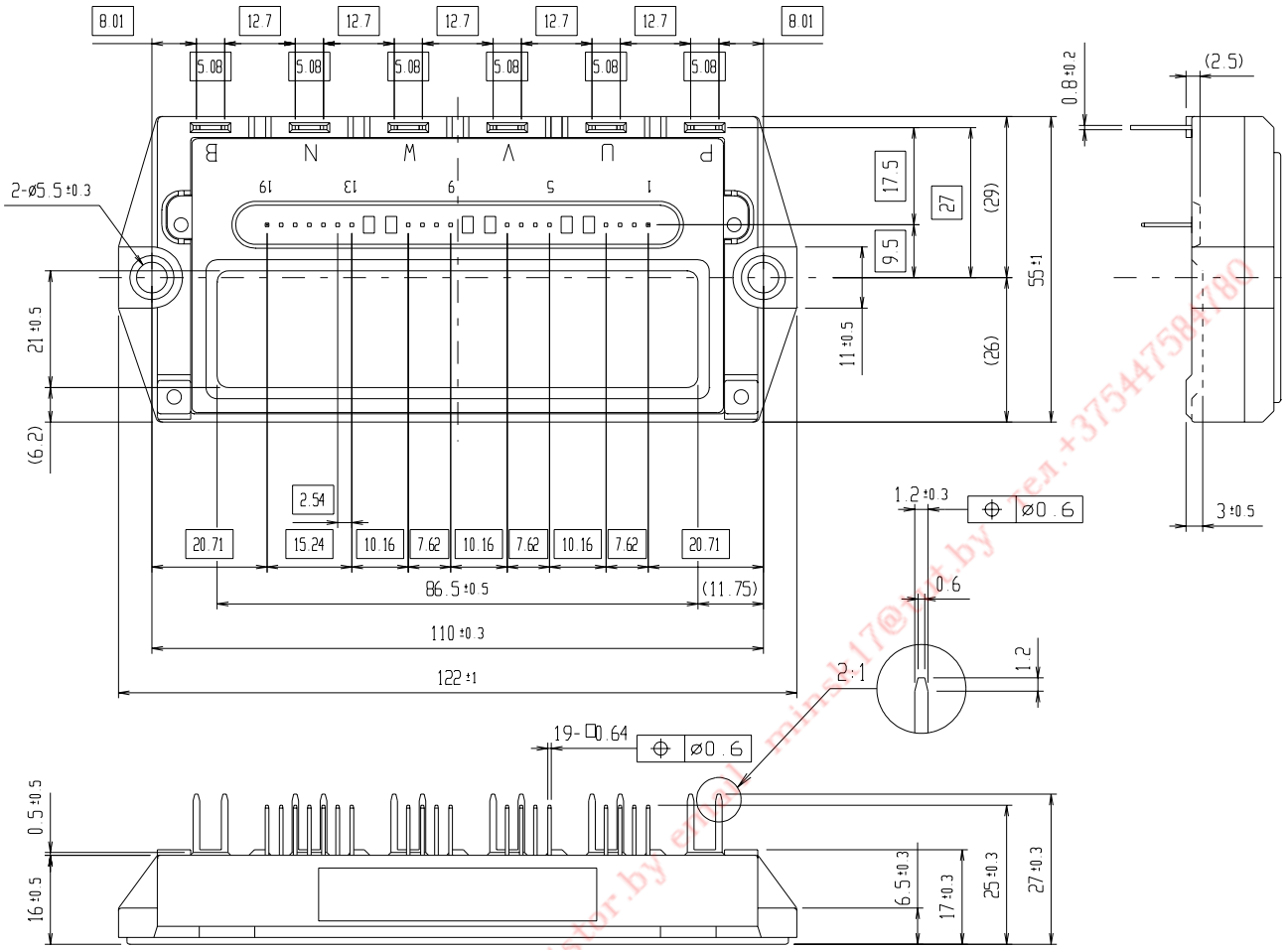

Fig. 1-7 Outline Drawing (P622)

Type name: 6MBP50TEA060, 6MBP75TEA060, 6MBP100TEA060, 6MBP150TEA060
6MBP25TEA120, 6MBP50TEA120, 6MBP75TEA120

7MBP50TEA060, 7MBP75TEA060, 7MBP100TEA060, 7MBP150TEA060
7MBP25TEA120, 7MBP50TEA120, 7MBP75TEA120

Chapter 2
Description of Terminal Symbols and Terminology

Contents Page

1 Description of Terminal Symbols

Main terminals

Terminal Symbol	Description
P N	Main power source Vd input terminal for the inverter bridge. P: + side, N: – side
B	Brake output terminal: terminal to connect the resistor for regenerative operation declaration
U V W	3-phase inverter output terminal
N2	Main power source Vd "negative(-)" input terminal after rectification converter smoothing of the inverter unit (P617, 619)
N1	Terminal for external connection of resistance when the OC level is to be changed (P617, 619)

Control terminals

Terminal Symbol	P610, P611 P612	P617 P619	P621 P622	Description
GND U Vcc U	<1> <3>	<1> <3>	<1> <4>	Control power source Vcc input in the upper arm U phase Vcc U: + side, GND U: – side
Vin U	<2>	<2>	<3>	Control signal input in the upper arm U phase
ALM U	–	–	<2>	Upper arm U-phase alarm output when the protection circuits are operating
GND V Vcc V	<4> <6>	<4> <6>	<5> <8>	Control power source Vcc input in the upper arm V phase Vcc V: + side, GND V: – side
Vin V	<5>	<5>	<7>	Control signal input in the upper arm V phase
ALM V	–	–	<6>	Upper arm V-phase alarm output when the protection circuits are operating
GND W Vcc W	<7> <9>	<7> <9>	<9> <12>	Control power source Vcc input in the upper arm W phase Vcc W : + side, GND W: – side
Vin W	<8>	<8>	<11>	Control signal input in the upper arm W phase
ALM W	–	–	<10>	Upper arm W-phase alarm output when the protection circuits are operating
GND Vcc	<10> <11>	<10> <11>	<13> <14>	Control power source Vcc input in the lower arm common Vcc: + side, GND: – side
Vin X	<13>	<12>	<16>	Control signal input in the lower arm X phase
Vin Y	<14>	<13>	<17>	Control signal input in the lower arm Y phase
Vin Z	<15>	<14>	<18>	Control signal input in the lower arm Z phase
Vin DB	<12>	–	<15>	Control signal input in the lower arm brake phase
ALM	<16>	<15>	<19>	Lower arm alarm output when the protection circuits are operating

2 Description of Terminology

1. Absolute Maximum Ratings

Term	Symbol	Description
Bus voltage	V_{DC}	DC voltage that can be applied between PN terminals
DC Bus voltage (surge)	V_{DC} (surge)	Peak value of the surge voltage that can be applied between PN terminals in switching
DC Bus voltage (short circuit)	V_{SC}	DC source voltage between PN terminals that can be protected from short circuits/overcurrent
Collector-emitter Voltage	V_{CES}	Maximum collector-emitter voltage of the built-in IGBT chip and repeated peak reverse voltage of the FWD chip (only the IGBT for the brake)
Reverse voltage	V_R	Repeated peak reverse voltage of the FWD chip in the brake section
Collector current	I_C	Maximum DC collector current for the IGBT chip
	I_{CP}	Maximum DC pulse collector current for the IGBT chip
	$-I_C$	Maximum DC forward current for the FWD chip
FRD forward Current	I_F	Maximum DC forward current for the FWD chip in the brake section
Collector power Dissipation	P_C	Maximum power dissipation for one IGBT element Power dissipation for Tj to become 150°C at Tc = 25°C or power dissipated in collector so that Tj becomes 150°C at Tc = 25°C
Control power source voltage	V_{CC}	Voltage that can be applied between GND and each Vcc terminal
Input voltage	Vin	Voltage that can be applied between GND and each Vin terminal
Input current	Iin	Current that flows between GND and each Vin terminal
Alarm signal voltage	V_{ALM}	Voltage that can be applied between GND and ALM terminal
Alarm signal current	I_{ALM}	Current that flows between GND and ALM terminal
Chip junction Temperature	Tj	Maximum junction temperature of the IGBT and FWD chips during continuous operation
Operating case temperature	Topr	Range of case temperature for electrical operation (Fig. 1 shows the measuring point of the case temperature Tc)
Storage temperature	T_{stg}	Range of ambient temperature for storage or transportation, when there is no electrical load
Isolating voltage	Viso	Maximum effective value of the sine-wave voltage between the terminals and the heat sink, when all terminals are shorted simultaneously
Screw torque — Terminal	–	Max. torque for connection of terminal and external wire with the specified screw
Screw torque — Mounting	–	Max. torque when mounting the element to the heat sink with the specified screw

2. Electrical Characteristics

2.1 Main Circuit

Term	Symbol	Description
Collector-emitter cutoff current	I_{CES}	Collector current when a specified voltage is applied between the collector and emitter of an IGBT with all input signals H (= Vz)
Collector-emitter saturation voltage	V_{CE} (sat)	Collector-emitter voltage at a specified collector current when the input signal of only the elements to be measured is L (= 0V) and the inputs of all other elements are H (= Vz)
Diode forward voltage	V_F	Forward voltage at a specified forward current with all input signals H (= Vz)
Turn-on time	ton	The time from the input signal dropping below the threshold value until the collector current becomes 90% of the rating. See Fig. 2-3.
Turn-off time	toff	The time from the input signal rising above the threshold value until the collector current becomes 10% of the rating. See Fig. 2-3.
Fall time	tf	The time from the collector current becoming 90% at the time of IGBT turn-off until the tangent to the decreasing current becomes 10%. See Fig. 2-3.
Reverse recovery time	trr	The time required for the reverse recovery current of the built-in diode to disappear. See Fig. 2-3.

2.2 Control Circuits

Term	Symbol	Description
Control power source consumption current	Iccp	Current flowing between control power source Vcc and GND on the P-side (upper arm side)
	Iccn	Current flowing between control power source Vcc and GND on the N-side (lower arm side)
Input signal threshold voltage	Vinth (on)	Control signal voltage when IGBT changes from OFF to ON
	Vinth (off)	Control signal voltage when IGBT changes from ON to OFF
Input zenor voltage	Vz	Voltage clamped by zener diode connected between GND and each Vin when the control signal is OFF
Signal hold time	t_{ALM}	Period in which an alarm continues to be output (ALM) from the ALM terminal after the N-side protection function is actuated
Limiting resistor for alarm	R_{ALM}	Built-in resistance limiting the primary current of the photocoupler for ALM output
Current detection shunt resistance	R1	Resistance value of the IPM built-in shunt resistor (P617, P619)

2.3 Protection Circuits

Term	Symbol	Description
Overcurrent protective operation current	I_{OC}	IGBT collector current at which the overcurrent protection (OC) works
Overcurrent cut off time	t_{DOC}	Shown in Fig. 2-1
Short-circuit protection delay time	tsc	Shown in Fig. 2-2
Chip overheating protection temperature	TjoH	Tripping temperature at which the IGBT chip junction temperature Tj overheats and IGBT soft shutdown is performed
Chip overheating protection hysteresis	TjH	Drop temperature required for output stop resetting after protection operation
Case overheating protection temperature	TcOH	Tripping temperature at which the IGBT performs soft shutdown when the case temperature Tc shows overheating
Case overheating protection hysteresis	TcH	Drop temperature required for output stop resetting after protection operation
Under voltage protection level	V_{UV}	Tripping voltage at which the IGBT performs soft shutdown when the control power source voltage Vcc drops
Control power source undervoltage protection hysteresis	V_H	Recovery voltage required for output stop resetting after protection operation

3. Thermal Characteristics

Term	Symbol	Description
Chip-case thermal resistance	Rth (j-c)	Chip-case thermal resistance of IGBT or diode
Chip-fin thermal resistance	Rth (c-f)	Thermal resistance between the case and heat sink, when mounted on a heat sink at the recommended torque using the thermal compound
Case temperature	Tc	IPM case temperature (temperature of the copper plate directly under the IGBT or the diode)

4. Noise Tolerance

Term	Symbol	Description
Common mode noise	–	Common mode noise tolerance in our test circuit
Electric surge	–	Electric surge tolerance in our test circuit

5. Other

Term	Symbol	Description
Weight	Wt	Weight of IPM
Switching frequency	fsw	Range of control signal frequencies for input to the control signal input terminal
Reverse recovery current	Irr	Shown in Fig. 2-3
Reverse bias safe operation area	RBSOA	Area of the current and voltage in which IGBT can be cut off under specified conditions during turn-off
Switching loss	Eon	IGBT switching loss during turn-on
	Eoff	IGBT switching loss during turn-off
	Err	FWD switching loss during reverse recovery

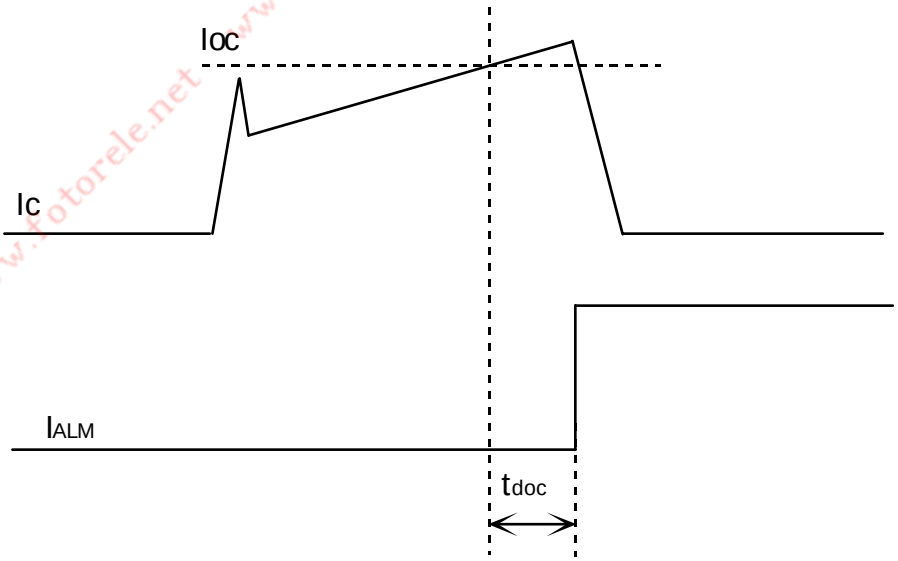

Fig. 2-1 Overcurrent Protection Delay Time (tdoc)

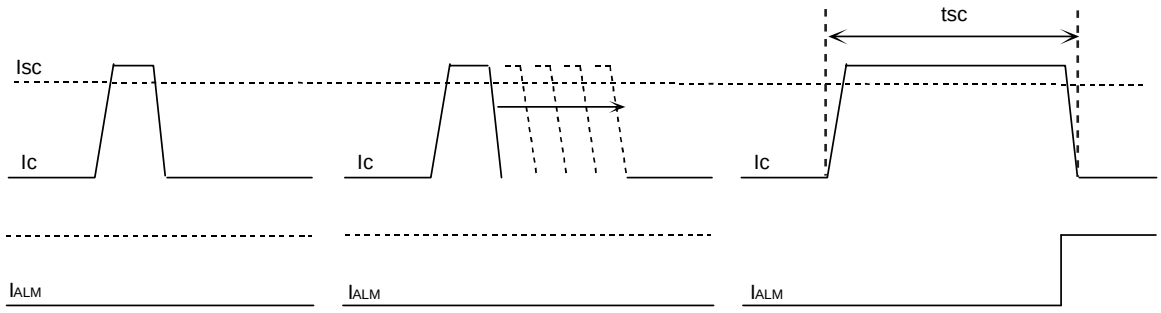

Fig. 2-2 Short-circuit Protection Delay Time (tsc)

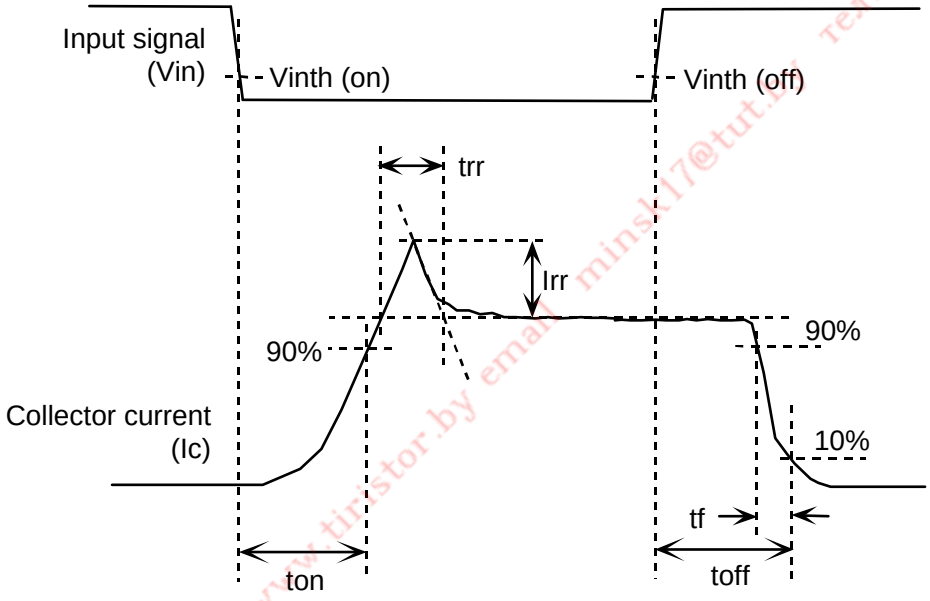

Fig. 2-3 Switching Time

Chapter 3
Description of Functions

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1 Function Tables

The functions built into the IPM are shown in Tables 3-1 to 3-3.

Table 3-1 IPM Built-in Functions (R-IPM)

600 V system

Element Number	Model	Built-in Functions								Package
		Common for Upper and Lower Arm			Upper Arm		Lower Arm			
		Dr	UV	TjOH	OC	ALM	OC	ALM	TcOH	
6 in 1	6MBP15RH060	√	√	√	–	–	√	√	–	P617
	6MBP20RH060	√	√	√	–	–	√	√	–	P617
	6MBP30RH060	√	√	√	–	–	√	√	–	P617
	6MBP50RA060	√	√	√	√	–	√	√	√	P610
	6MBP75RA060	√	√	√	√	–	√	√	√	P610
	6MBP100RA060	√	√	√	√	–	√	√	√	P611
	6MBP150RA060	√	√	√	√	–	√	√	√	P611
	6MBP200RA060	√	√	√	√	–	√	√	√	P612
	6MBP300RA060	√	√	√	√	–	√	√	√	P612
7 in 1	7MBP50RA060	√	√	√	√	–	√	√	√	P610
	7MBP75RA060	√	√	√	√	–	√	√	√	P610
	7MBP100RA060	√	√	√	√	–	√	√	√	P611
	7MBP150RA060	√	√	√	√	–	√	√	√	P611
	7MBP200RA060	√	√	√	√	–	√	√	√	P612
	7MBP300RA060	√	√	√	√	–	√	√	√	P612

1200 V system

Element Number	Model	Built-in Functions								Package
		Common for Upper and Lower Arm			Upper Arm		Lower Arm			
		Dr	UV	TjOH	OC	ALM	OC	ALM	TcOH	
6 in 1	6MBP15RA120	√	√	√	–	–	√	√	–	P619
	6MBP25RA120	√	√	√	√	–	√	√	√	P610
	6MBP50RA120	√	√	√	√	–	√	√	√	P611
	6MBP75RA120	√	√	√	√	–	√	√	√	P611
	6MBP100RA120	√	√	√	√	–	√	√	√	P612
	6MBP150RA120	√	√	√	√	–	√	√	√	P612
7 in 1	7MBP25RA120	√	√	√	√	–	√	√	√	P610
	7MBP50RA120	√	√	√	√	–	√	√	√	P611
	7MBP75RA120	√	√	√	√	–	√	√	√	P611
	7MBP100RA120	√	√	√	√	–	√	√	√	P612
	7MBP150RA120	√	√	√	√	–	√	√	√	P612
6 in 1	6MBP25RJ120	√	√	√	√	√	√	√	√	P621
	6MBP50RJ120	√	√	√	√	√	√	√	√	P621
	6MBP75RJ120	√	√	√	√	√	√	√	√	P621
7 in 1	7MBP25RJ120	√	√	√	√	√	√	√	√	P621
	7MBP50RJ120	√	√	√	√	√	√	√	√	P621
	7MBP75RJ120	√	√	√	√	√	√	√	√	P621

Dr: IGBT drive circuit, UV: Control power source undervoltage protection, TjOH: Element overheating protection, OC: Overcurrent protection, ALM: Alarm output, TcOH: Case overheating protection

Table 3-2 IPM Built-in Functions (R-IPM3)

600 V system

Element Number	Model	Built-in Functions								Package
		Common for Upper and Lower Arm			Upper Arm		Lower Arm			
		Dr	UV	TjOH	OC	ALM	OC	ALM	TcOH	
6 in 1	6MBP20RTA060	√	√	√	–	–	√	√	–	P619
	6MBP50RTB060	√	√	√	√	–	√	√	√	P610
	6MBP75RTB060	√	√	√	√	–	√	√	√	P610
	6MBP100RTB060	√	√	√	√	–	√	√	√	P611
	6MBP150RTB060	√	√	√	√	–	√	√	√	P611
7 in 1	7MBP50RTB060	√	√	√	√	–	√	√	√	P610
	7MBP75RTB060	√	√	√	√	–	√	√	√	P610
	7MBP100RTB060	√	√	√	√	–	√	√	√	P611
	7MBP150RTB060	√	√	√	√	–	√	√	√	P611
6 in 1	6MBP50RTJ060	√	√	√	√	√	√	√	√	P621
	6MBP75RTJ060	√	√	√	√	√	√	√	√	P621
	6MBP100RTJ060	√	√	√	√	√	√	√	√	P621
	6MBP150RTJ060	√	√	√	√	√	√	√	√	P621
7 in 1	7MBP50RTJ060	√	√	√	√	√	√	√	√	P621
	7MBP75RTJ060	√	√	√	√	√	√	√	√	P621
	7MBP100RTJ060	√	√	√	√	√	√	√	√	P621
	7MBP150RTJ060	√	√	√	√	√	√	√	√	P621

Dr: IGBT drive circuit, UV: Control power source undervoltage protection, TjOH: Element overheating protection, OC: Overcurrent protection, LM: Alarm output, TcOH: Case overheating protection

Table 3-3 IPM Built-in Functions (Econo IPM)

600 V system

Element Number	Model	Built-in Functions								Package
		Common for Upper and Lower Arm			Upper Arm		Lower Arm			
		Dr	UV	TjOH	OC	ALM	OC	ALM	TcOH	
6 in 1	6MBP50TEA060	√	√	√	√	√	√	√	–	P622
	6MBP75TEA060	√	√	√	√	√	√	√	–	P622
	6MBP100TEA060	√	√	√	√	√	√	√	–	P622
	6MBP150TEA060	√	√	√	√	√	√	√	–	P622
7 in 1	7MBP50TEA060	√	√	√	√	√	√	√	–	P622
	7MBP75TEA060	√	√	√	√	√	√	√	–	P622
	7MBP100TEA060	√	√	√	√	√	√	√	–	P622
	7MBP150TEA060	√	√	√	√	√	√	√	–	P622

1200 V system

Element Number	Model	Built-in Functions								Package
		Common for Upper and Lower Arm			Upper Arm		Lower Arm			
		Dr	UV	TjOH	OC	ALM	OC	ALM	TcOH	
6 in 1	6MBP25TEA120	√	√	√	√	√	√	√	–	P622
	6MBP50TEA120	√	√	√	√	√	√	√	–	P622
	6MBP75TEA120	√	√	√	√	√	√	√	–	P622
7 in 1	7MBP25TEA120	√	√	√	√	√	√	√	–	P622
	7MBP50TEA120	√	√	√	√	√	√	√	–	P622
	7MBP75TEA120	√	√	√	√	√	√	√	–	P622

Dr: IGBT drive circuit, UV: Control power source undervoltage protection, TjOH: Element overheating protection, OC: Overcurrent protection, ALM: Alarm output, TcOH: Case overheating protection

2 Function Descriptions

2.1 IGBT, FWD for 3-phase inverters

As shown in Fig. 3-1, IGBT and FWD for 3-phase inverters are built in, and a 3-phase bridge circuit is formed inside the IPM. The main circuit is completed by connecting the main power source to the P and N terminals and the 3-phase output lines to the U, V, and W terminals. Connect a snubber circuit to suppress the surge voltages.

2.2 IGBT, FWD for brake

As shown in Fig. 3-1, IGBT and FWD for brake are built in, and an IGBT collector is connected internally to the B terminal. By controlling the brake IGBT through connection of brake resistance between the terminals P and B, the regeneration energy can be dissipated while decelerating to suppress the rise of voltage between the P and N terminals.

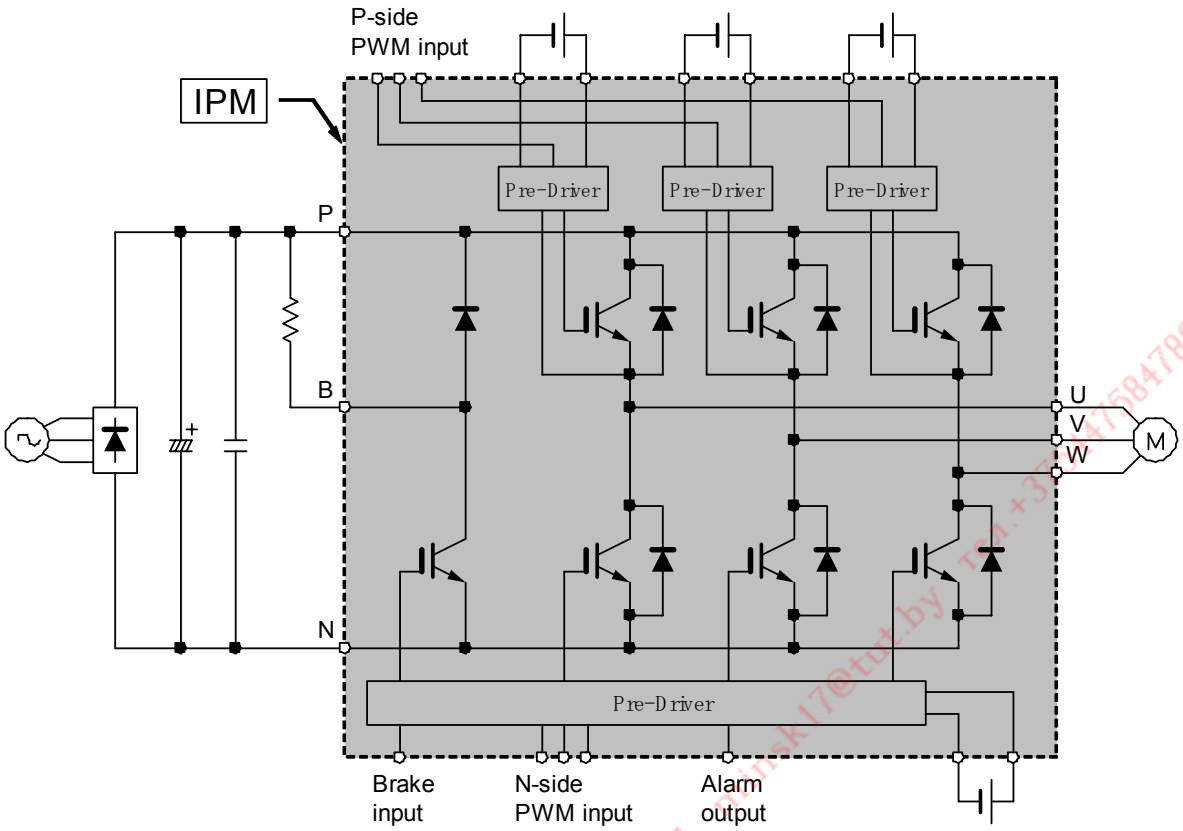


Fig. 3-1 3-Phase Inverter Application Model (in Case of 7MBP150RTB060)

2.3 IGBT drive function

Fig. 3-2 shows the pre-driver block diagram. As the IPM incorporates an IGBT drive function, the IGBT can be driven without designing a gate resistance value by connecting the photocoupler output to the IPM. The features of this drive function are introduced below.

- Independent gate resistance control

  A special turn-on/turn-off Rg not using any exclusive gate resistance Rg is built in. With this, the dv/dt of turn-on and turn-off can be controlled individually, so that the merits of the element are fully demonstrated (Turn on/Normal Shutdown).

- Soft shutdown

  During an overcurrent or other abnormality, the gate voltage is lowered softly and gently to prevent element destruction by surge voltage (Soft Shutdown).

- Errorneous ON prevention

  Since a circuit is set up to ground the gate electrode with low impedance while OFF, erroneous ON caused by the rise of VGE due to noise can be prevented (Off Hold).

- A reverse bias power source is not required.
  As the IPM has a short wiring between the drive circuit and the IGBT, the wiring impedance is small, making driving without reverse bias possible.

- Alarm latch
  Alarms have a latch period of approximately 2 ms, and the IGBT does not operate even when an On-signal enters during the latch period. In addition, as the alarms for each phase, including brake, on the lower arm side are connected mutually, all IGBTs on the lower arm side are stopped for the latch period when a protection operation is performed on the lower arm side.

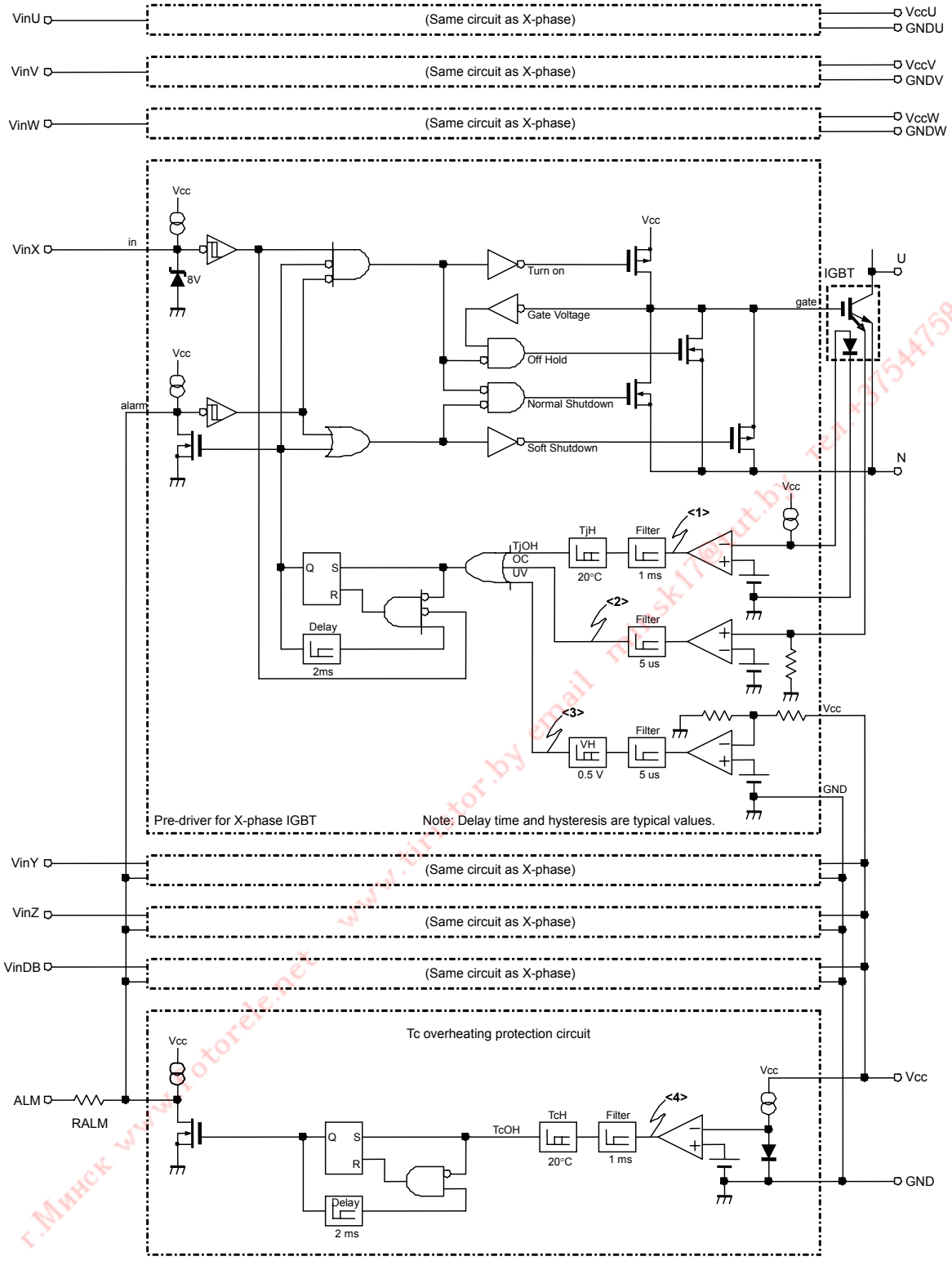


Fig. 3-2 IPM Function Block (Representative Model: 7MBP150RTB060)

2.4 Overcurrent protection function (OC)

Two detection methods are used, the sense IGBT method and the shunt resistance method.

(1) Sense IGBT method

Models: P610/P611/P612/P621/P622

- The main current flowing in the IGBT is detected by taking the sense current flowing in the current sense IGBT inside the IGBT chip into the control circuit. The sense current is extremely small in comparison with the main current, so that the detection loss can be kept minimal in comparison with the shunt resistance method.
- When the overcurrent protection Ioc level is exceeded for a duration of approximately 5 μs (tdoc), the IGBT goes through a soft shutdown. As a detection filter is installed, faulty operations caused by instantaneous overcurrents or noise can be prevented.
- When after approximately 2 ms the level drops below Ioc and the input signal is OFF, the alarm is released.

(2) Shunt resistance method

Models: P617/P619

- Overcurrent protection is performed by detecting the voltage at both ends of the current detection shunt resistance R1, connected to the DC bus bar line N. When the overcurrent detection level Ioc is exceeded for a duration of approximately 5 μs (tdoc), the IGBT goes through a soft shutdown. As a detection filter is installed, faulty operations caused by instantaneous overcurrents or noise can be prevented.
- When after approximately 2 ms the level drops below Ioc and if the input signal is OFF, the alarm is released.

2.5 Short-circuit protection function (SC)

The SC protection function always operates with the OC protection function to suppress the peak current when a load or arm is shorted.

2.6 Undervoltage protection (UV)

- The UV protection function performs soft shutdown of the IGBT when the control source voltage (Vcc) continuously drops below VUV for approximately 5 μs.
- As the hysteresis VH is provided, the alarm is released if Vcc recovers to VUV + VH or more after approximately 2 ms and the input signal is OFF.

2.7 Case temperature overheating protection function (TcOH)

- The TcOH protection function detects the insulating substrate temperature with the temperature detection elements set up on the same ceramic substrate as that on which the power chips (IGBT, FWD) are set up and performs soft shutdown of the IGBT when the detected temperature exceeds the protection level TcOH continuously for approximately 1 ms.
- As the hysteresis TcH is provided, the alarm is released if Tc drops below TcOH-TcH after approximately 2 ms.
- The TcOH detection positions are shown in Fig.3-3 to Fig.3-6.

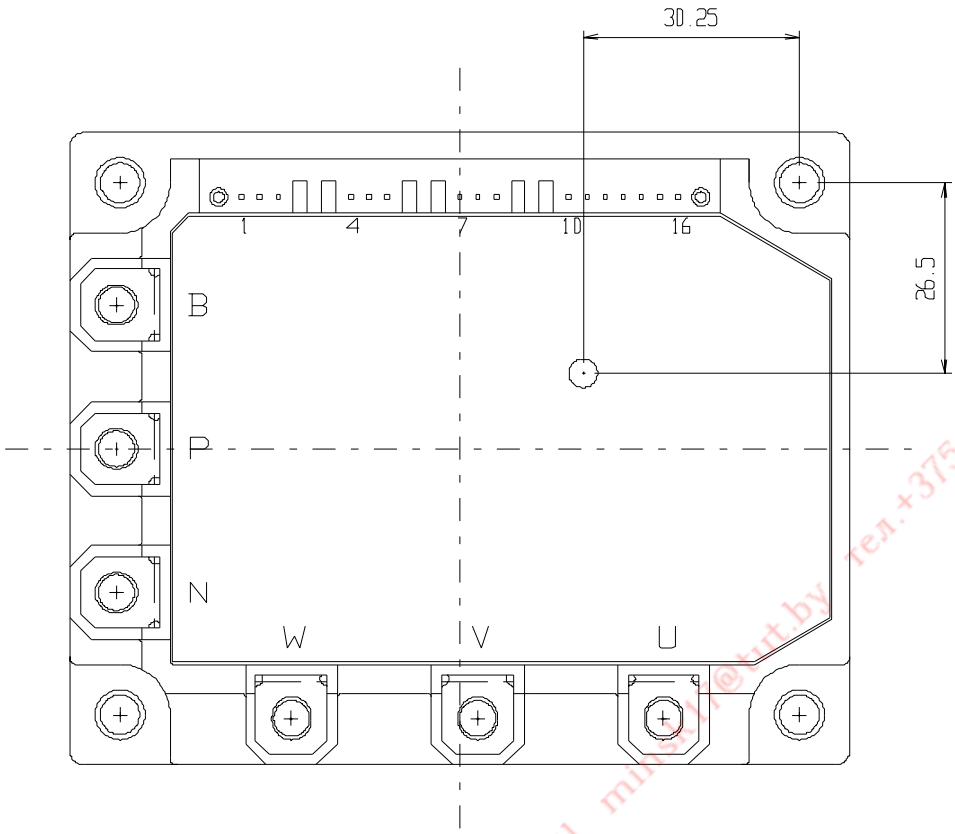


Fig. 3-3 TcOH Detection Position (P610)

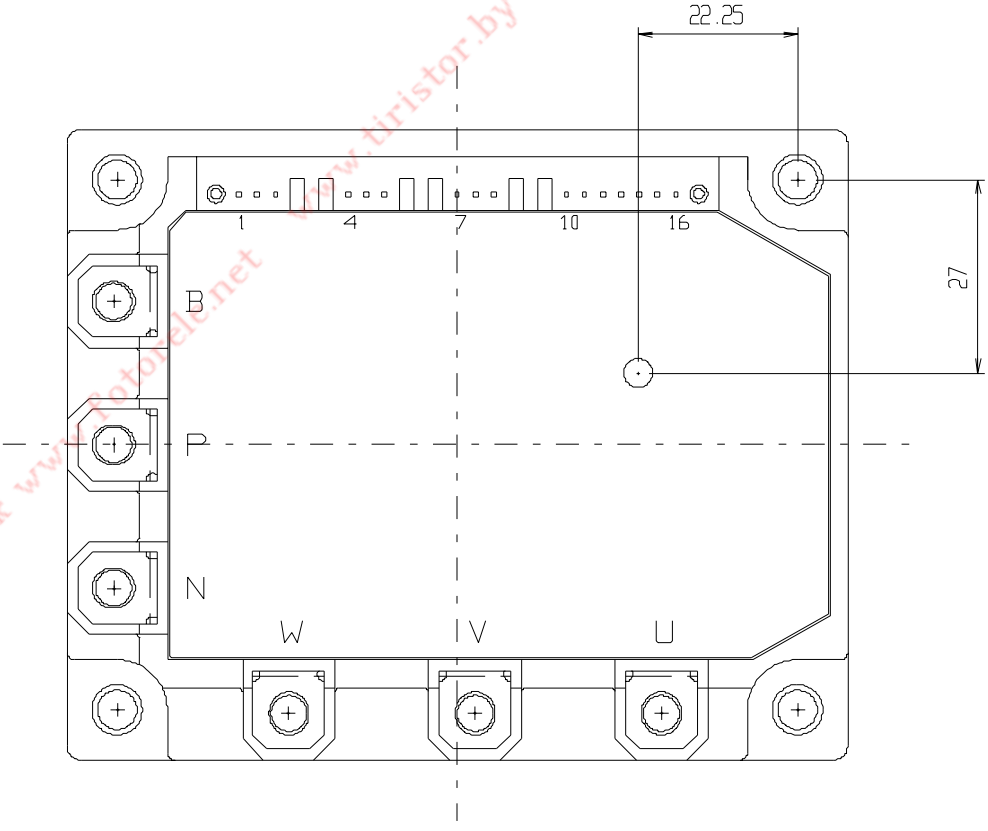


Fig. 3-4 TcOH Detection Position (P611)

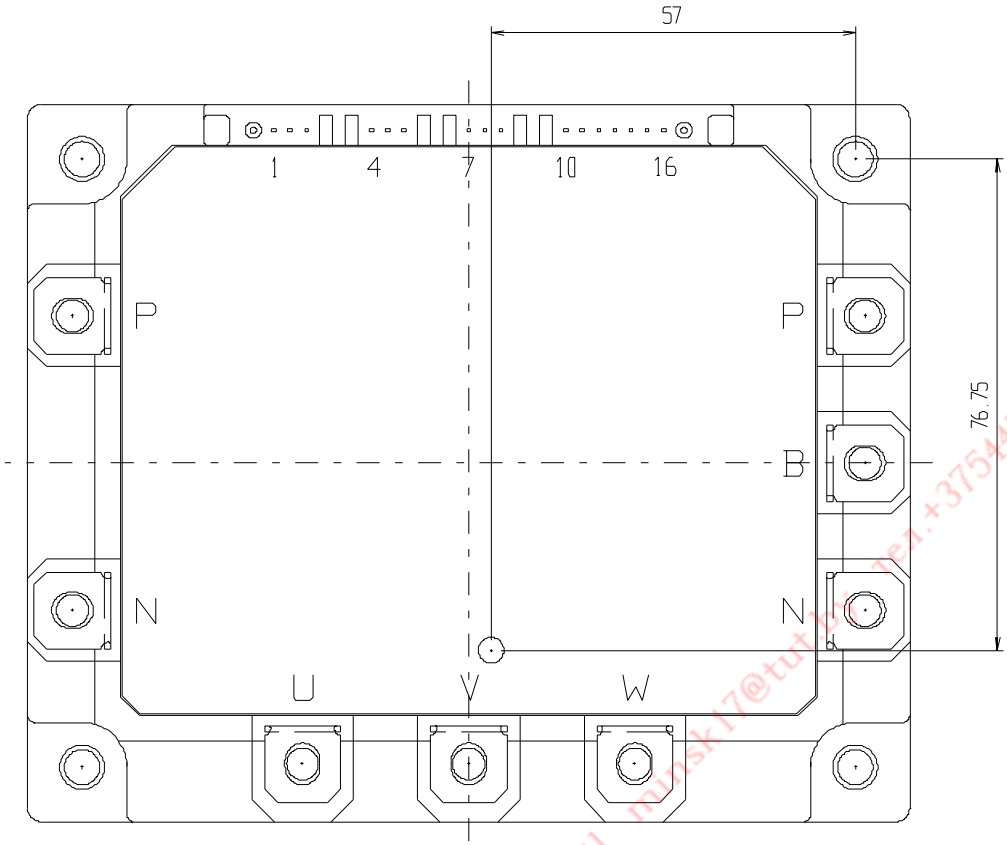


Fig. 3-5 TcOH Detection Position (P612)

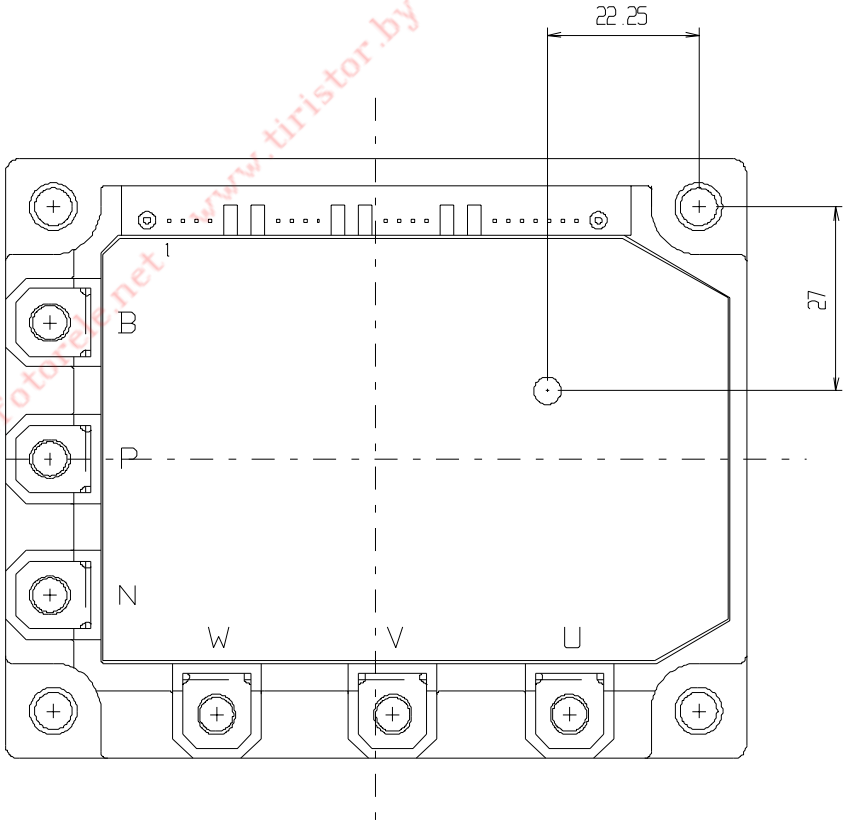


Fig. 3-6 TcOH Detection Position (P621)

2.8 Chip temperature overheating protection function (TjOH)

- The TjOH protection function detects the IGBT chip temperature with the temperature detection elements set up on all IGBT chips and performs soft shutdown of the IGBT when the detected temperature exceeds the protection level (TjOH) continuously for approximately 1 ms or more.
- As the hysteresis TjH is provided, the alarm is released if Tj drops below TjOH-TjH after approximately 2 ms and the input signal is OFF.

2.9 Alarm output function (ALM)

- When a protection function operates, the alarm output terminal becomes conductive against each reference potential GND. With open collector output, a function for direct drive of the photocoupler is provided, and a 1.5 kΩ series resistor is built in.
- When a protection function operates, the alarm signal is output continuously for approximately 2 ms (tALM). The alarm is released when the alarm cause has been removed, tALM has elapsed, and the input signal is OFF. When the cause is TcOH, the alarm is released regardless of the input signal.
- As the alarm terminals of the drive circuit on the lower arm side are connected mutually, all IGBTs on the lower arm side, including the brake, are stopped when any one of the IGBTs outputs an alarm.

3 Truth Tables

The truth tables when a fault occurs are shown in Tables 3-4 to 3-7.

Table 3-4 Truth Table (P617, P619)

	Cause of Fault	IGBT				Alarm Output Low Side
		U-phase	V-phase	W-phase	Low Side	
High side U-phase	UV	OFF	*	*	*	High
	TjOH	OFF	*	*	*	High
High side V-phase	UV	*	OFF	*	*	High
	TjOH	*	OFF	*	*	High
High side W-phase	UV	*	*	OFF	*	High
	TjOH	*	*	OFF	*	High
Low side	OC	*	*	*	OFF	Low
	UV	*	*	*	OFF	Low
	TjOH	*	*	*	OFF	Low

* Depends on input logic

Table 3-5 Truth Table (P610, P611, P612)

	Cause of Fault	IGBT				Alarm Output Low Side
		U-phase	V-phase	W-phase	Low Side	
High side U-phase	OC	OFF	*	*	*	High
	UV	OFF	*	*	*	High
	TjOH	OFF	*	*	*	High
High side V-phase	OC	*	OFF	*	*	High
	UV	*	OFF	*	*	High
	TjOH	*	OFF	*	*	High
High side W-phase	OC	*	*	OFF	*	High
	UV	*	*	OFF	*	High
	TjOH	*	*	OFF	*	High
Low side	OC	*	*	*	OFF	Low
	UV	*	*	*	OFF	Low
	TjOH	*	*	*	OFF	Low
	TcOH	*	*	*	OFF	Low

* Depends on input logic

Table 3-6 Truth Table (P621)

	Cause of Fault	IGBT				Alarm Output			
		U-phase	V-phase	W-phase	Low Side	ALMU	ALMV	ALMW	ALM
High side U-phase	OC	OFF	*	*	*	Low	High	High	High
	UV	OFF	*	*	*	Low	High	High	High
	TjOH	OFF	*	*	*	Low	High	High	High
High side V-phase	OC	*	OFF	*	*	High	Low	High	High
	UV	*	OFF	*	*	High	Low	High	High
	TjOH	*	OFF	*	*	High	Low	High	High
High side W-phase	OC	*	*	OFF	*	High	High	Low	High
	UV	*	*	OFF	*	High	High	Low	High
	TjOH	*	*	OFF	*	High	High	Low	High
Low side	OC	*	*	*	OFF	High	High	High	Low
	UV	*	*	*	OFF	High	High	High	Low
	TjOH	*	*	*	OFF	High	High	High	Low
	TcOH	*	*	*	OFF	High	High	High	Low

* Depends on input logic

Table 3-7 Truth Table (P622)

	Cause of Fault	IGBT				Alarm Output			
		U-phase	V-phase	W-phase	Low Side	ALMU	ALMV	ALMW	ALM
High side U-phase	OC	OFF	*	*	*	Low	High	High	High
	UV	OFF	*	*	*	Low	High	High	High
	TjOH	OFF	*	*	*	Low	High	High	High
High side V-phase	OC	*	OFF	*	*	High	Low	High	High
	UV	*	OFF	*	*	High	Low	High	High
	TjOH	*	OFF	*	*	High	Low	High	High
High side W-phase	OC	*	*	OFF	*	High	High	Low	High
	UV	*	*	OFF	*	High	High	Low	High
	TjOH	*	*	OFF	*	High	High	Low	High
Low side	OC	*	*	*	OFF	High	High	High	Low
	UV	*	*	*	OFF	High	High	High	Low
	TjOH	*	*	*	OFF	High	High	High	Low

* Depends on input logic

4 IPM Block Diagrams

The IPM block diagrams are shown in Fig. 3-7 to Fig. 3-14.

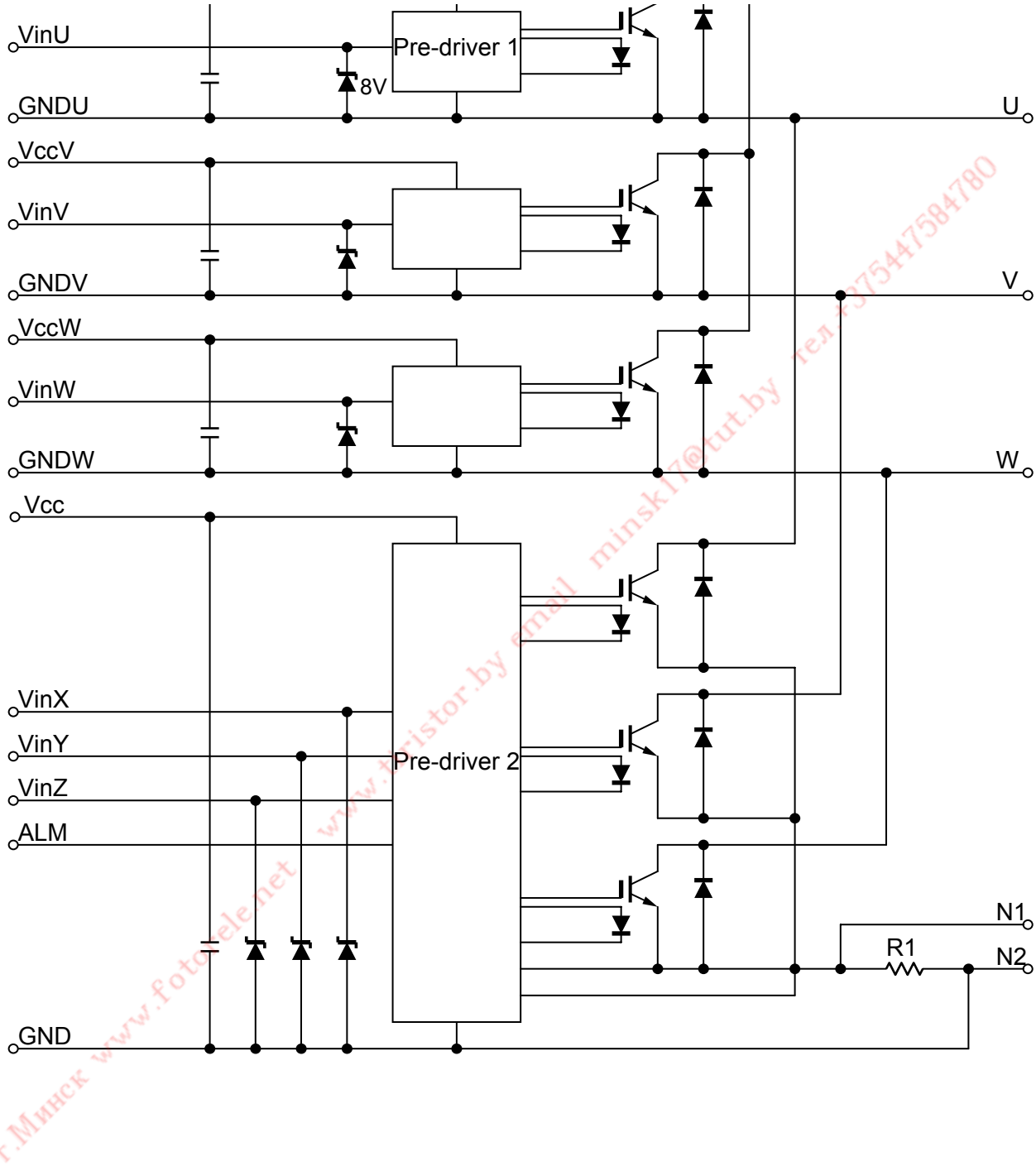


Fig. 3-7 IPM Block Diagram (P617)

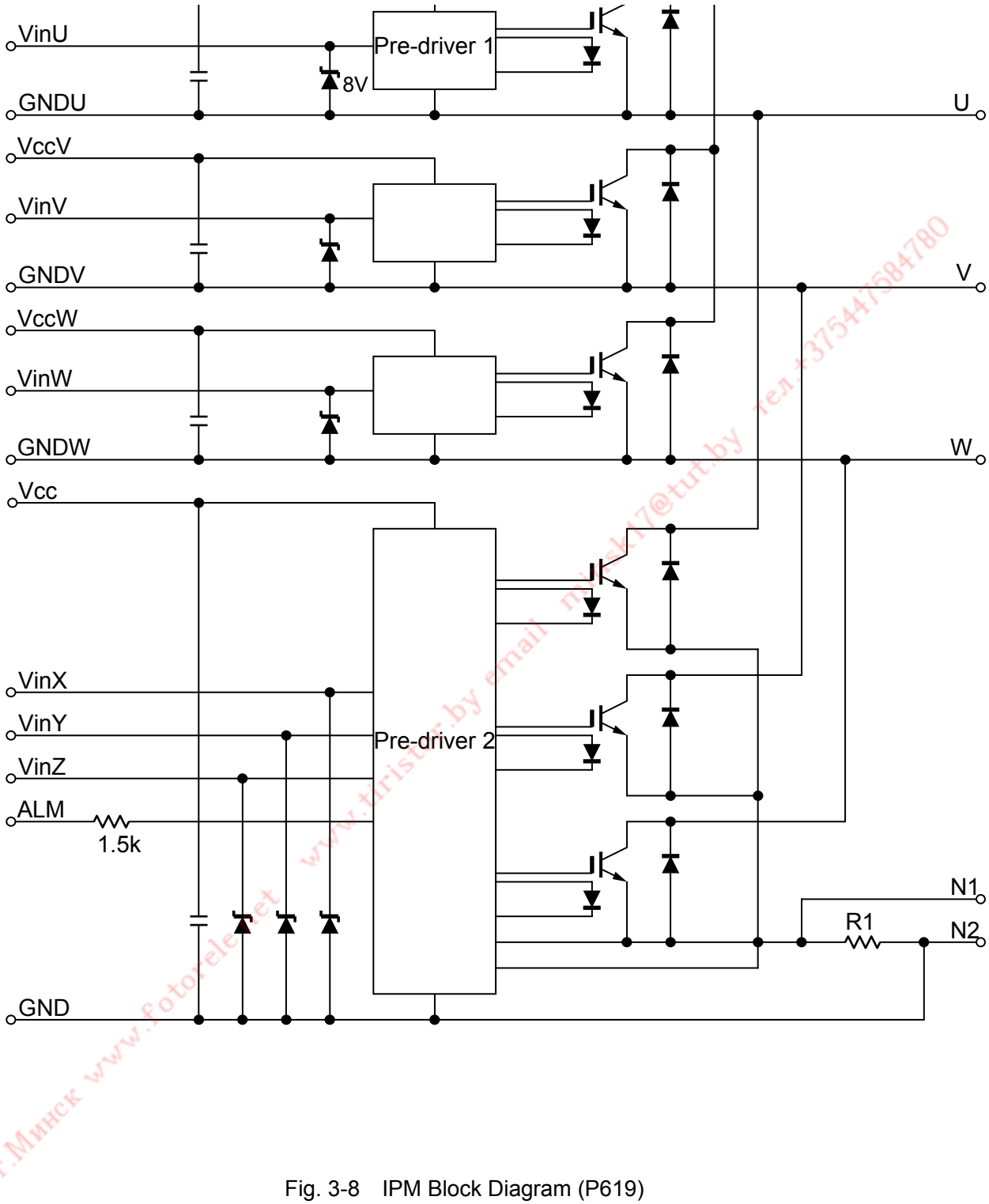


Fig. 3-8 IPM Block Diagram (P619)

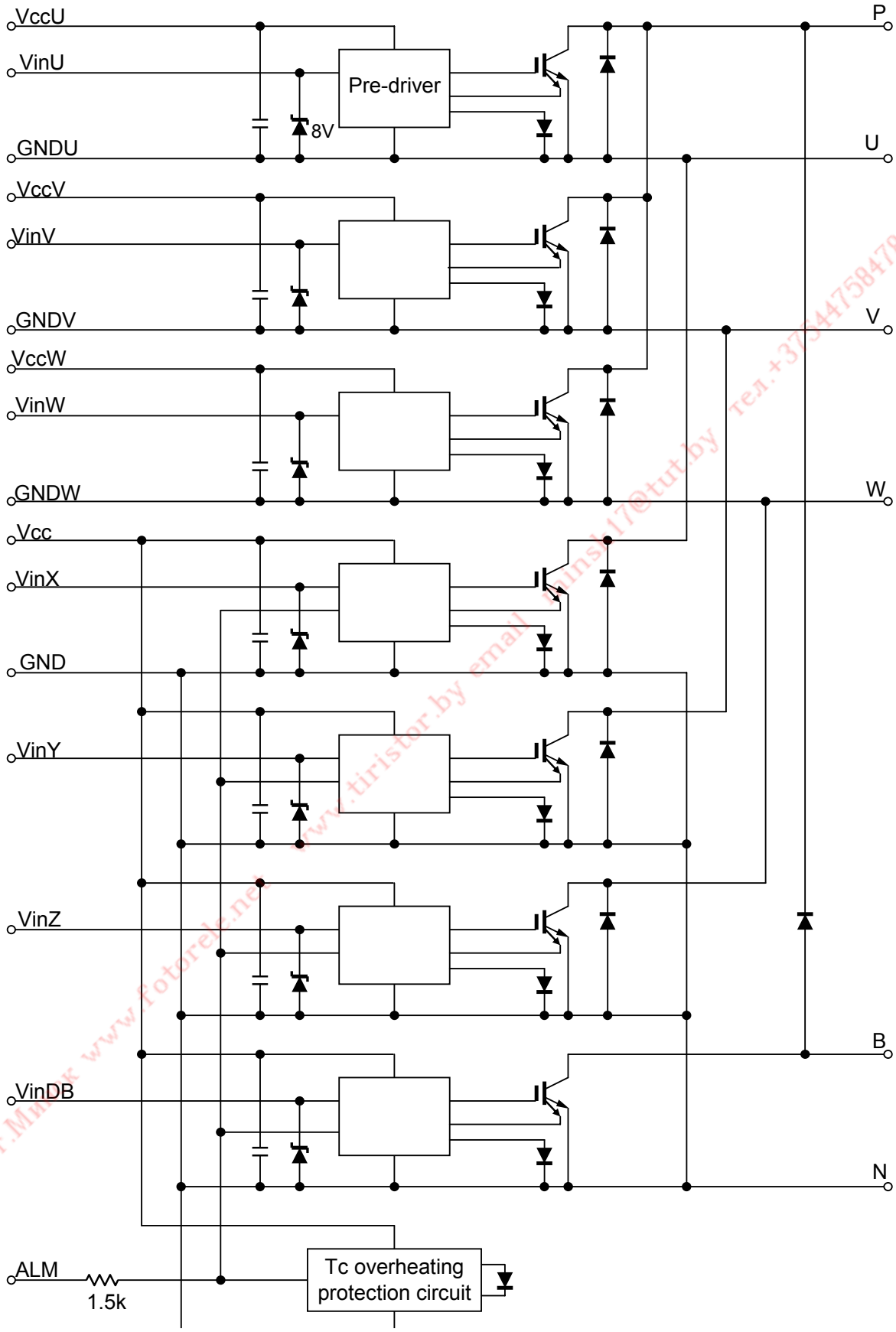


Fig. 3-9 IPM Block Diagram (P610, P611, P612 with Built-in Brake)

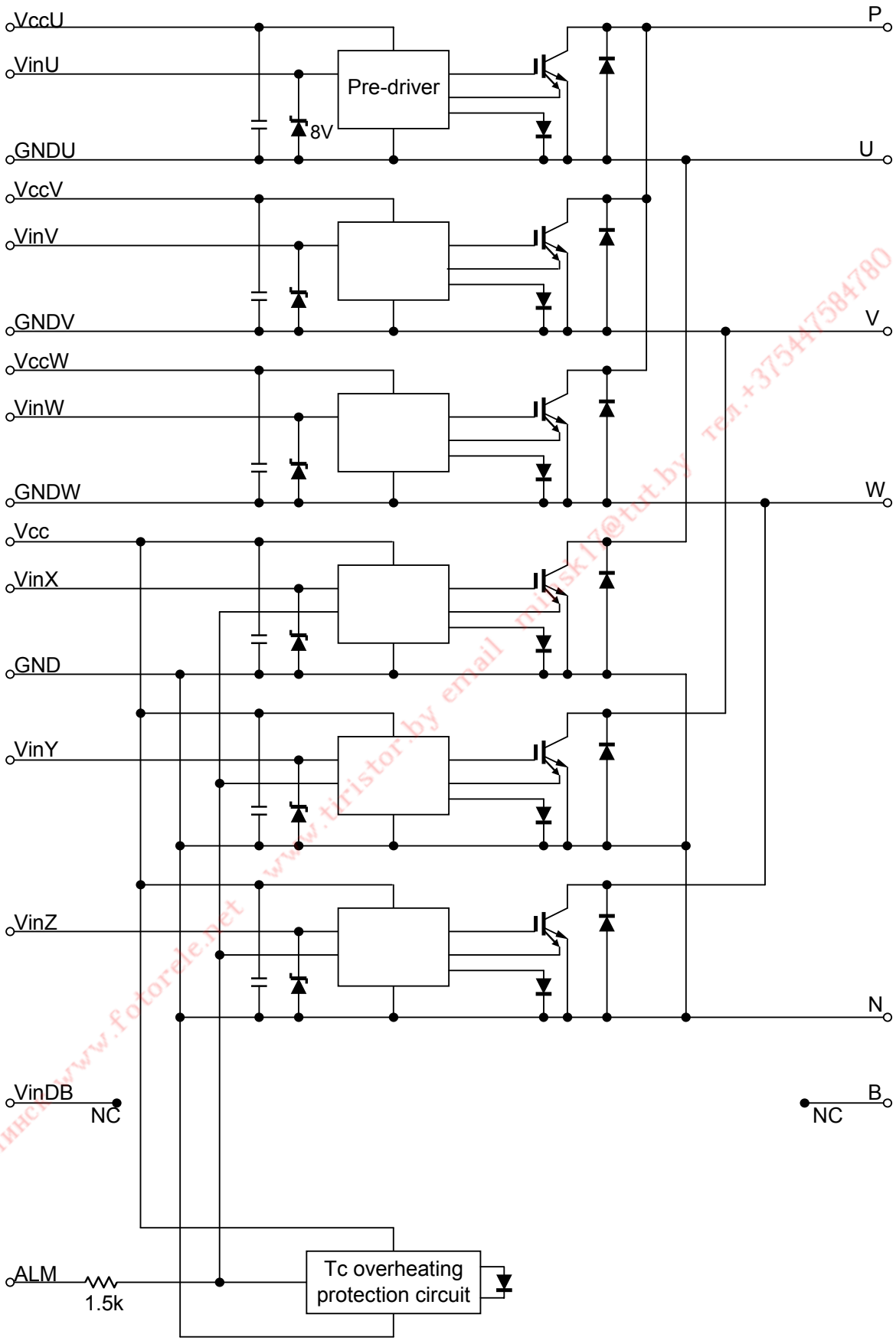


Fig. 3-10 IPM Block Diagram (P610, P611, P612 Without Brake)

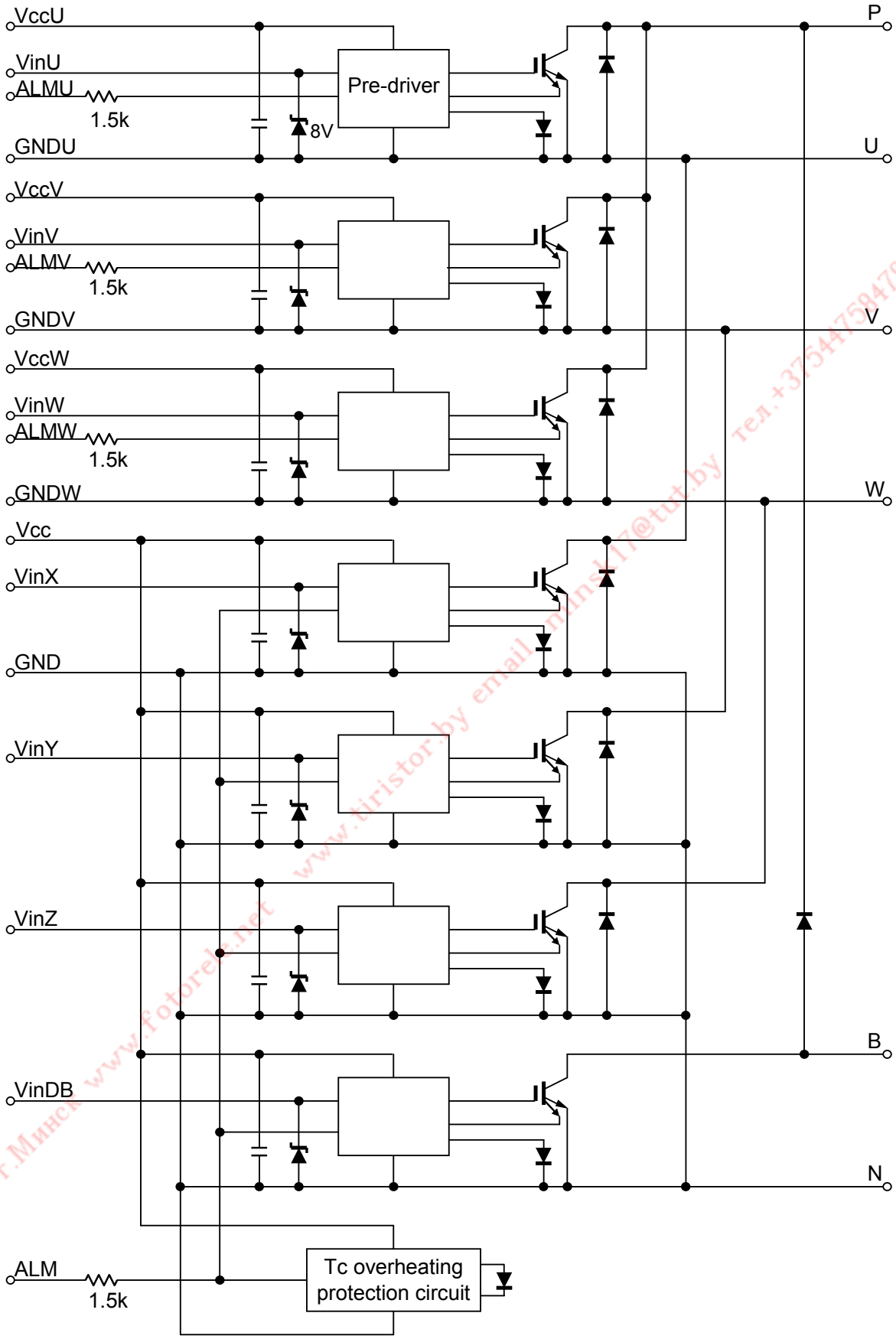


Fig. 3-11 IPM Block Diagram (P621 with Built-in Brake)

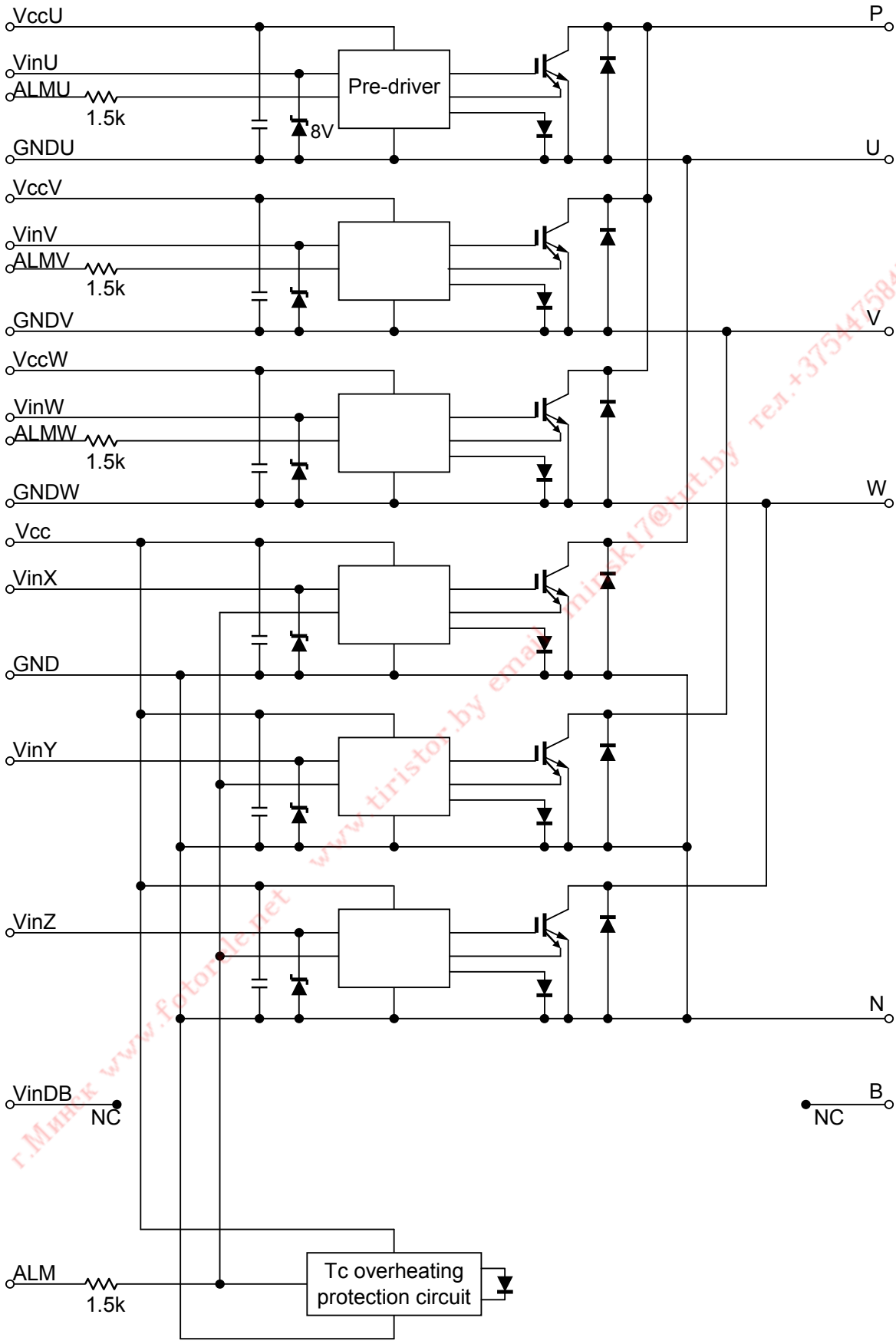


Fig. 3-12 IPM Block Diagram (P621 Without Brake)

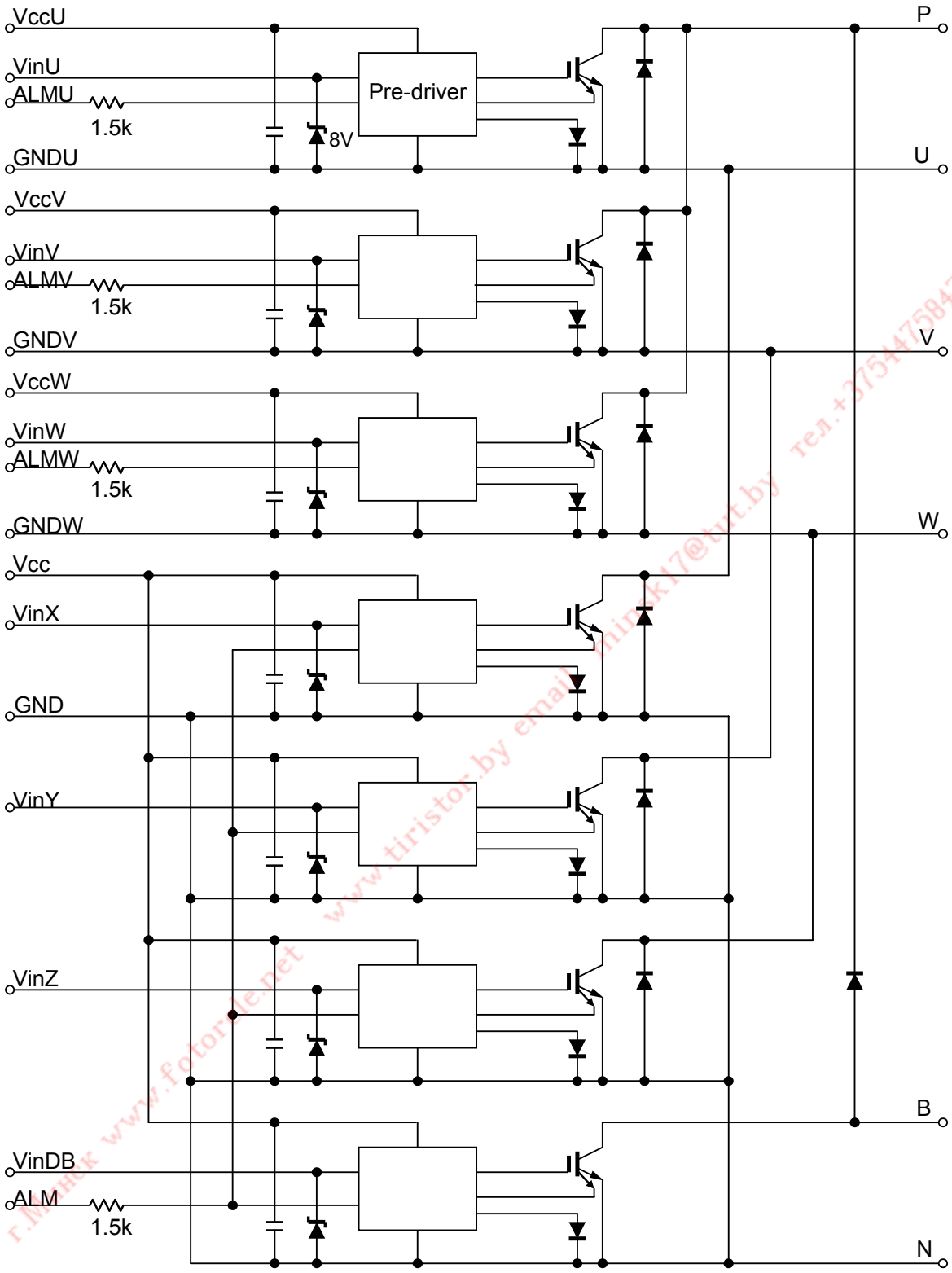


Fig. 3-13 IPM Block Diagram (P622 with Built-in Brake)

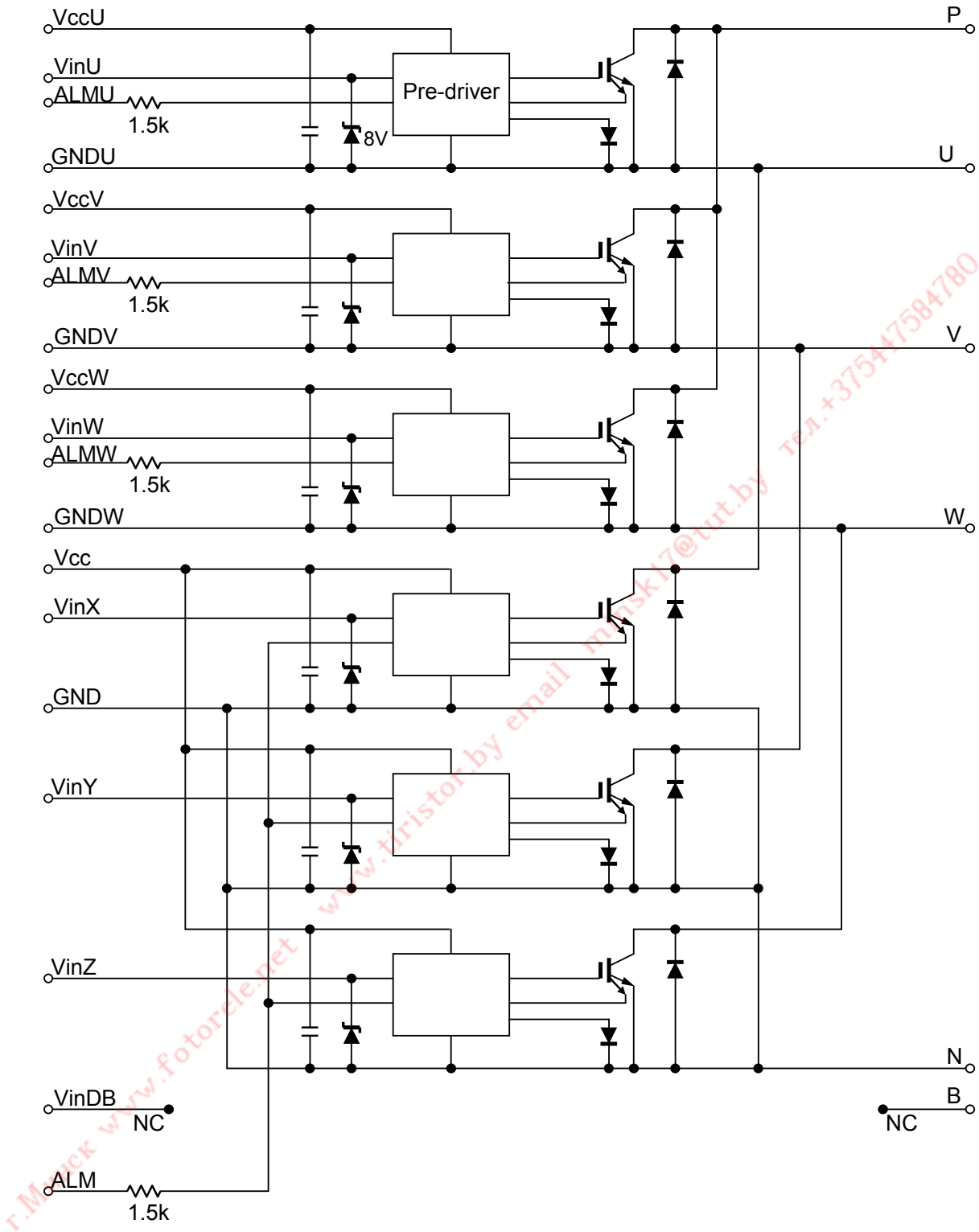


Fig. 3-14 IPM Block Diagram (P622 Without Brake)

5 Timing Charts

The timing charts for the protection functions are shown in Fig. 3-15 to Fig. 3-21.

Undervoltage protection (UV) (1)

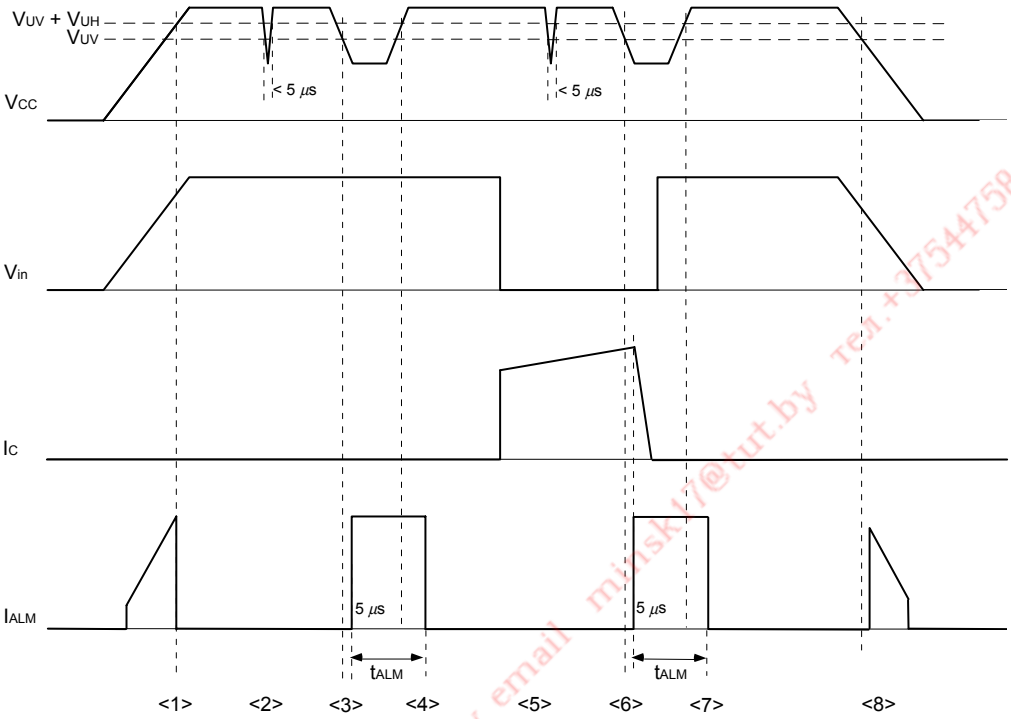


Fig. 3-15 Timing Chart UV (1)

Refer to Fig. 3-2 <3>.

<1> If Vcc is below V_{UV} + V_H while V_{CC} is ON, an alarm is output.

<2> If the period in which V_{CC} falls below V_{UV} is shorter than 5 μs, the protection function does not work (while Vin is OFF).

<3> An alarm is output when a period of about 5 μs elapses after V_{CC} falls below V_{UV} if Vin is OFF, and IGBT remains OFF.

<4> If V_{CC} returns to V_{UV} + V_H after t_{ALM} elapses, UV is reset after t_{ALM} elapses if Vin is OFF and the alarm is also reset simultaneously.

<5> If the period in which V_{CC} falls below V_{UV} is shorter than 5 μs, the protection function does not work (while Vin is ON).

<6> An alarm is output when a period of about 5 μs elapses after V_{CC} falls below V_{UV} if Vin is ON, and a soft IGBT shutdown occurs.

<7> If V_{CC} returns to V_{UV} + V_H after t_{ALM} elapses, UV is reset after t_{ALM} elapses if Vin is OFF and the alarm is also reset simultaneously.

<8> An alarm is output if V_{CC} falls below VUV while V_{CC} c is OFF.

Undervoltage protection (UV) (2)

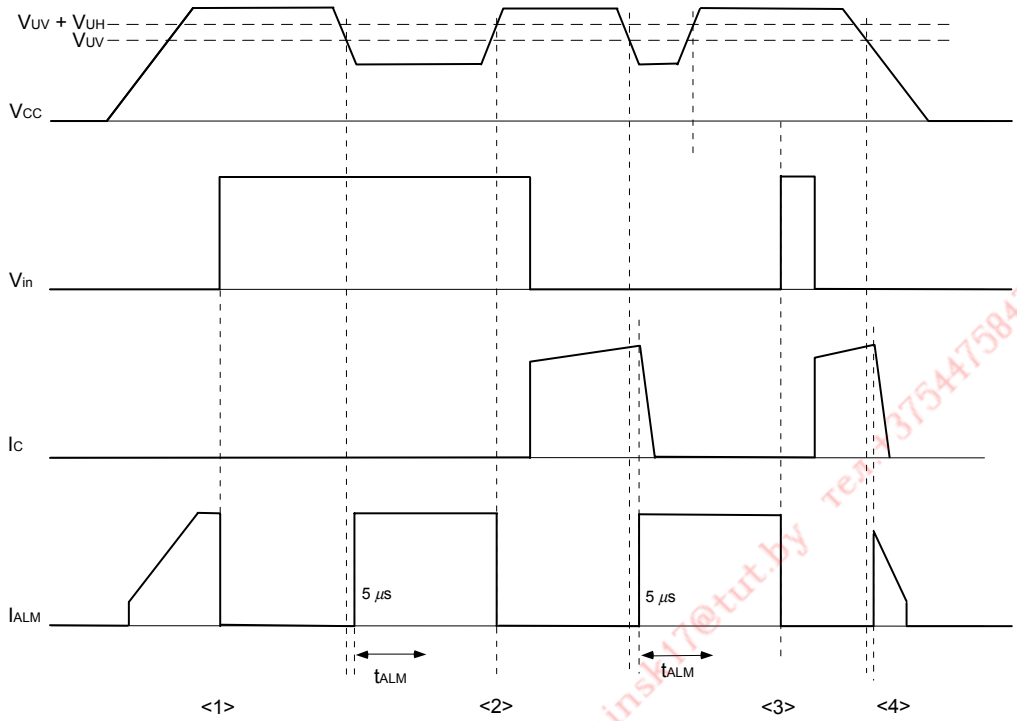


Fig. 3-16 Timing Chart UV (2)

Refer to Fig. 3-2 <3>.

<1> If Vcc is below $V_{UV} + V_H$ while V_{CC} is ON, an alarm is output. (Until Vin changes to OFF)

<2> If Vcc returns to $V_{UV} + V_H$ after t_{ALM} elapses, UV and the alarm are reset simultaneously with the return of $V_{UV} + V_H$ if Vin is OFF.

<3> Even if V_{CC} returns to $V_{UV} + V_H$ after t_{ALM} elapses, UV is not reset after t_{ALM} elapses if Vin is ON. UV and the alarm are reset simultaneously with Vin OFF.

<4> If Vin is ON while V_{CC} is OFF, the alarm is output, and a soft IGBT shutdown is executed while V_{CC} is below V_{UV}.

Overcurrent protection (OC)

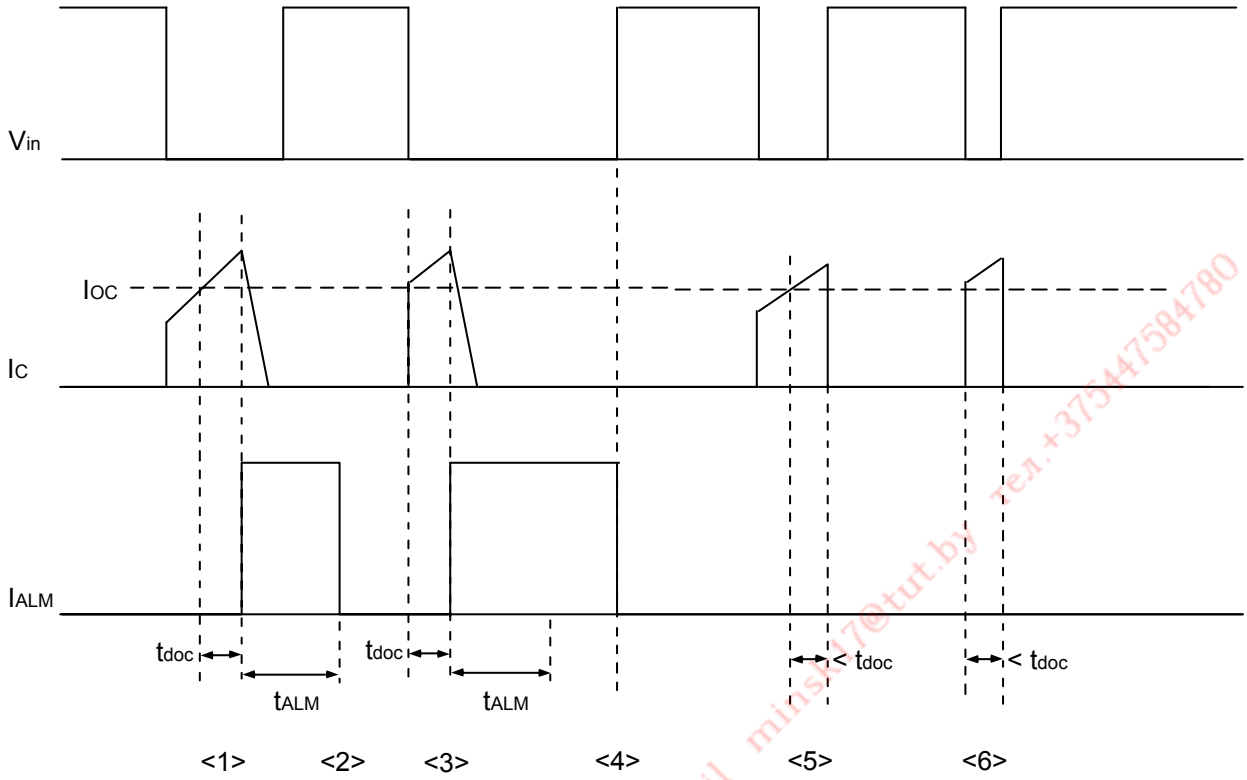


Fig. 3-17 Timing Chart OC

Refer to Fig. 3-2 <3>.

<1> An alarm is output and a soft IGBT shutdown is executed when t_{DOC} elapses after Ic rises above Ioc.

<2> OC and the alarm are reset simultaneously if Vin is OFF when t_{ALM} elapses.

<3> An alarm is output and a soft IGBT shutdown is executed when t_{DOC} elapses after Ic rises above Ioc.

<4> If Vin is ON when t_{ALM} elapses, OC is not reset. OC and the alarm are reset simultaneously when Vin is OFF.

<5> If Vin changes to OFF before t_{DOC} elapses after Ic rises above Ioc, the protection function is not activated and a normal IGBT shutdown is executed.

<6> If Vin changes to OFF before t_{DOC} elapses after Ic rises above Ioc, the protection function is not activated and a normal IGBT shutdown is executed.

Short-circuit protection

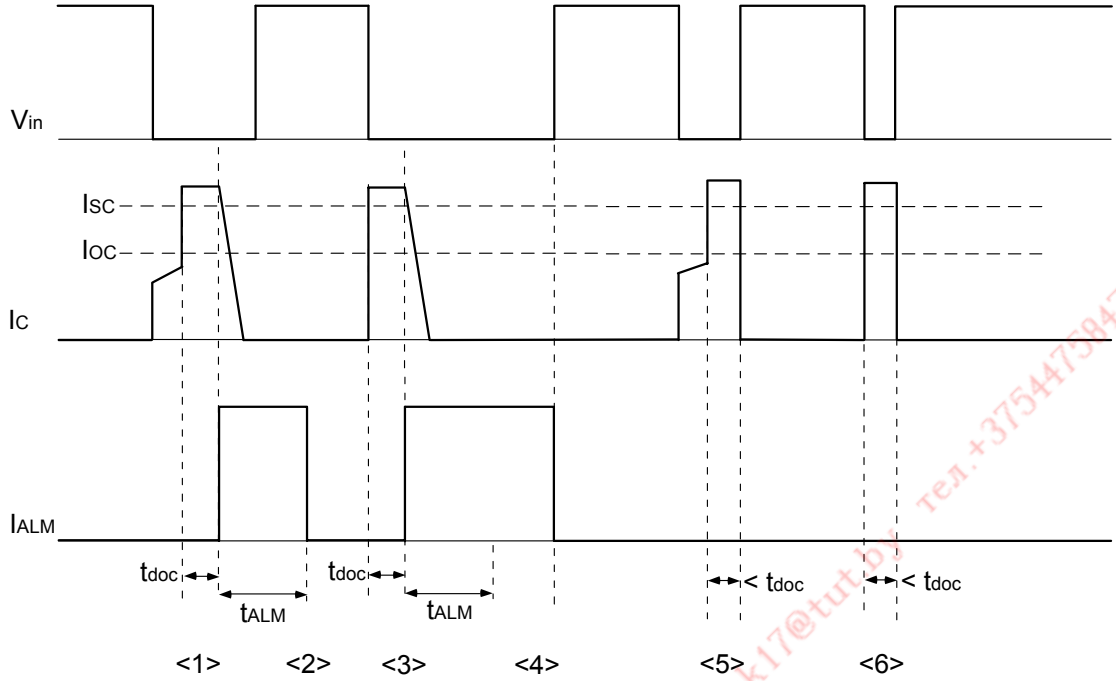


Fig. 3-18 Timing Chart SC

Refer to Fig. 3-2 <2>.

<1> If the load shorts after Ic has started flowing and Ic exceeds Isc, the Ic peak is suppressed instantly. An alarm is output and a soft IGBT shutdown is executed when t_{DOC} elapses.

<2> OC and the alarm are reset simultaneously if Vin is OFF when t_{ALM} elapses.

<3> If the load shorts and Isc is exceeded simultaneously with the start of flow of Ic, the Ic peak is instantly suppressed. An alarm is output and a soft IGBT shutdown is executed after t_{DOC} elapses.

<4> If Vin is ON when t_{ALM} elapses, OC is not reset. OC and the alarm are reset simultaneously when Vin is OFF.

<5> If the load shorts after Ic has started flowing and Ic exceeds Isc, the Ic peak is suppressed instantly. Then, if Vin changes to OFF before t_{DOC} elapses, the protection function is not activated and a normal IGBT shutdown occurs.

<6> If the load shorts simultaneously with the start of flow of Ic and Ic exceeds Isc, the Ic peak is suppressed instantly. Then, if Vin changes to OFF before t_{DOC} elapses, the protection function is not activated and a normal IGBT shutdown is executed.

Case temperature overheating protection (TcOH)

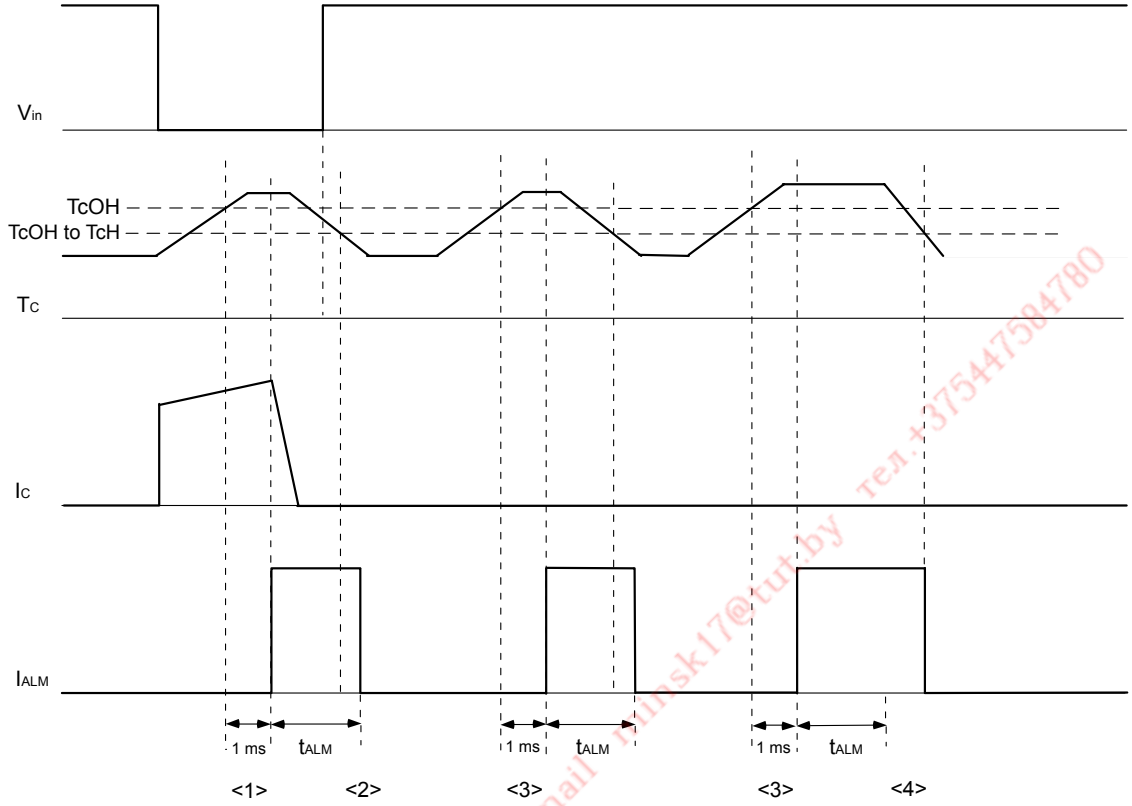


Fig. 3-19 Timing Chart TcOH

Refer to Fig. 3-2 <4>.

<1> An alarm is output if the case temperature Tc continuously exceeds T_{COH} for a period of about 1 ms, and if Vin is ON, a soft shutdown of all IGBTs on the lower arm side is executed.

<2> If Tc falls below T_{COH}-T_{CH} before t_{ALM} elapses, the alarm is reset when t_{ALM} elapses.

<3> If Tc exceeds continuously T_{COH} for a period of about 1 ms, an alarm is output. (While Vin is OFF)

<4> If Tc has not fallen below T_{COH}-T_{CH} when t_{ALM} elapses, the alarm is not reset. When Tc falls below T_{COH}-T_{CH} after t_{ALM} elapses, the alarm is reset.

IGBT chip overheating protection (TjOH) (1)

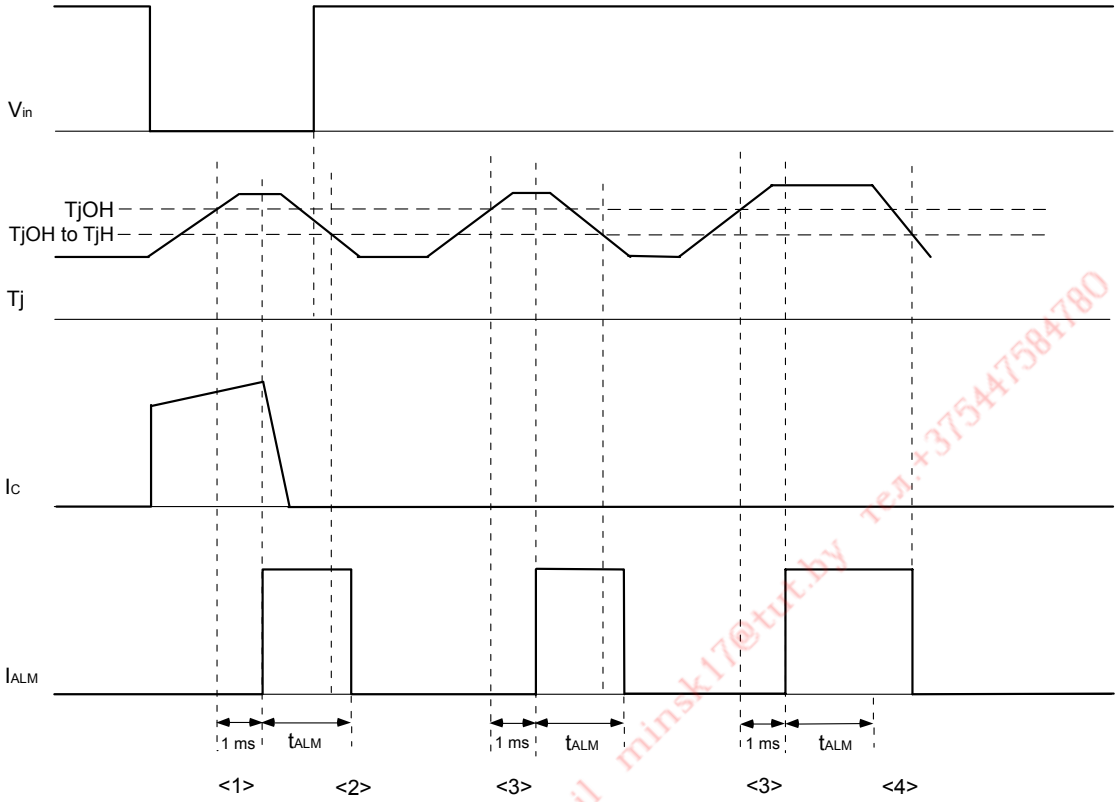


Fig. 3-20 Timing chart TjOH (1)

Refer to Fig. 3-2 <4>.

<1> An alarm is output and a soft IGBT shutdown is executed if the IGBT chip temperature Tj continuously exceeds T_{jOH} for a period of about 1 ms.

<2> If Tj falls below Tj_{OH}-Tj_H before t_{ALM} elapses, OH and the alarm are simultaneously reset if Vin is OFF when t_{ALM} elapses.

<3> An alarm is output if Tj continuously exceeds Tj_{OH} for a period of about 1 ms, and if Vin is OFF, the protection function is not activated.

<4> When Tj falls below Tj_{OH}-Tj_H after t_{ALM} elapses, OH and the alarm are reset simultaneously if Vin is OFF.

IGBT chip overheating protection (TjOH) (2)

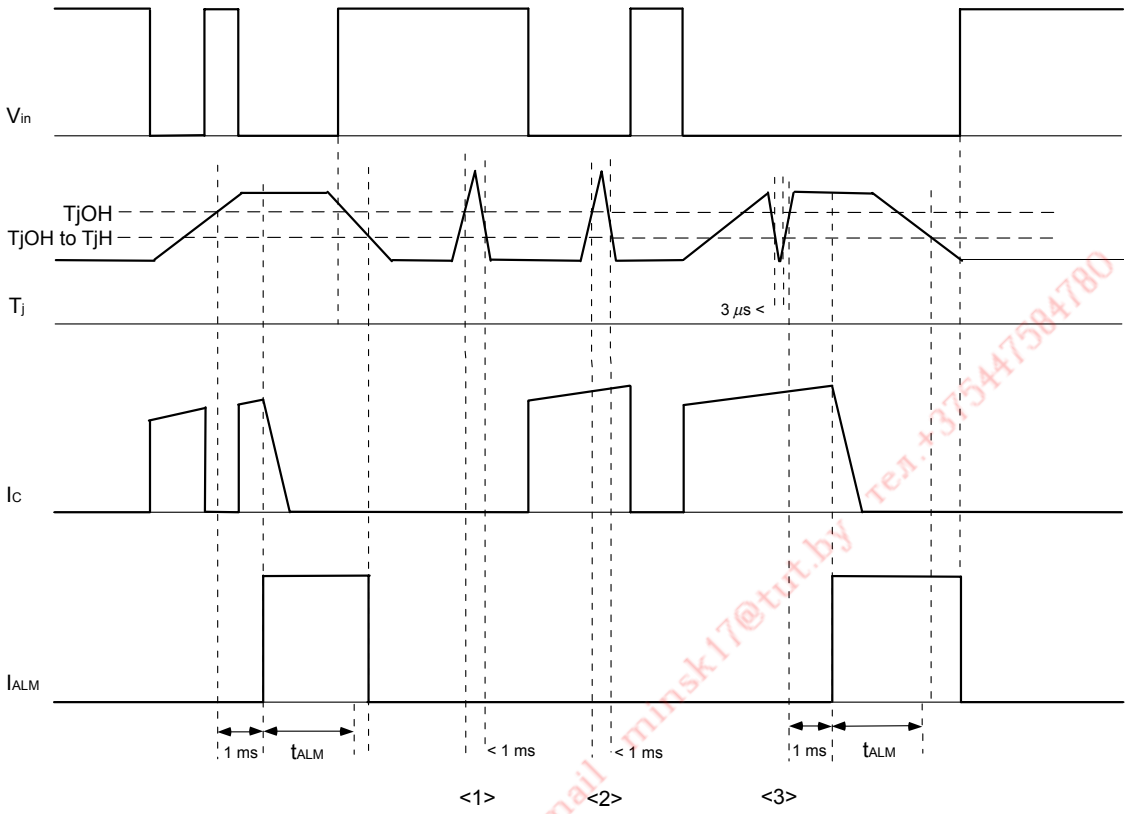


Fig. 3-21 Timing Chart TjOH (2)

Refer to Fig. 3-2.

<1> If Tj exceeds Tj_{OH} and then falls below Tj_{OH} within about 1 ms, OH does not operate regardless of whether Vin is ON or OFF.

<2> If Tj exceeds Tj_{OH} and then falls below Tj_{OH} within about 1 ms, OH does not operate regardless of whether Vin is ON or OFF.

<3> If Tj exceeds Tj_{OH} and then falls below Tj_{OH} for a period of about 3 μs or longer, the 1 ms detection timer is reset.

Chapter 4
Examples of Application Circuits

Contents Page

1 Examples of Application Circuits

Fig. 4-1 shows an example of an application circuit for P610, P611, and P612 (types with built-in brake).

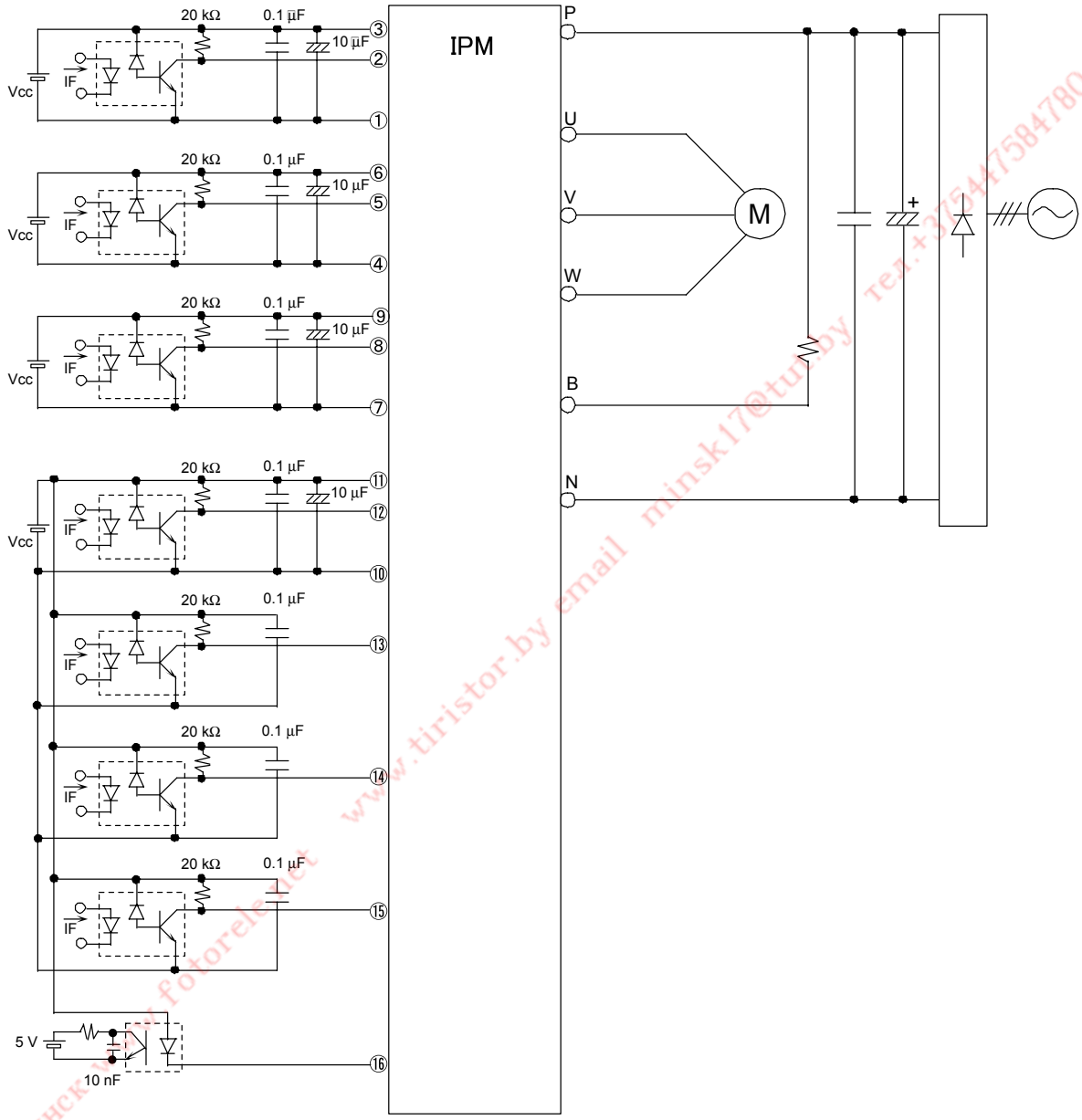


Fig. 4-1 Example of Application Circuit for P610, P611, and P612 (Types with Built-in Brake)

Fig. 4-2 shows an example of an application circuit for P610, P611, and P612 (types without brake).

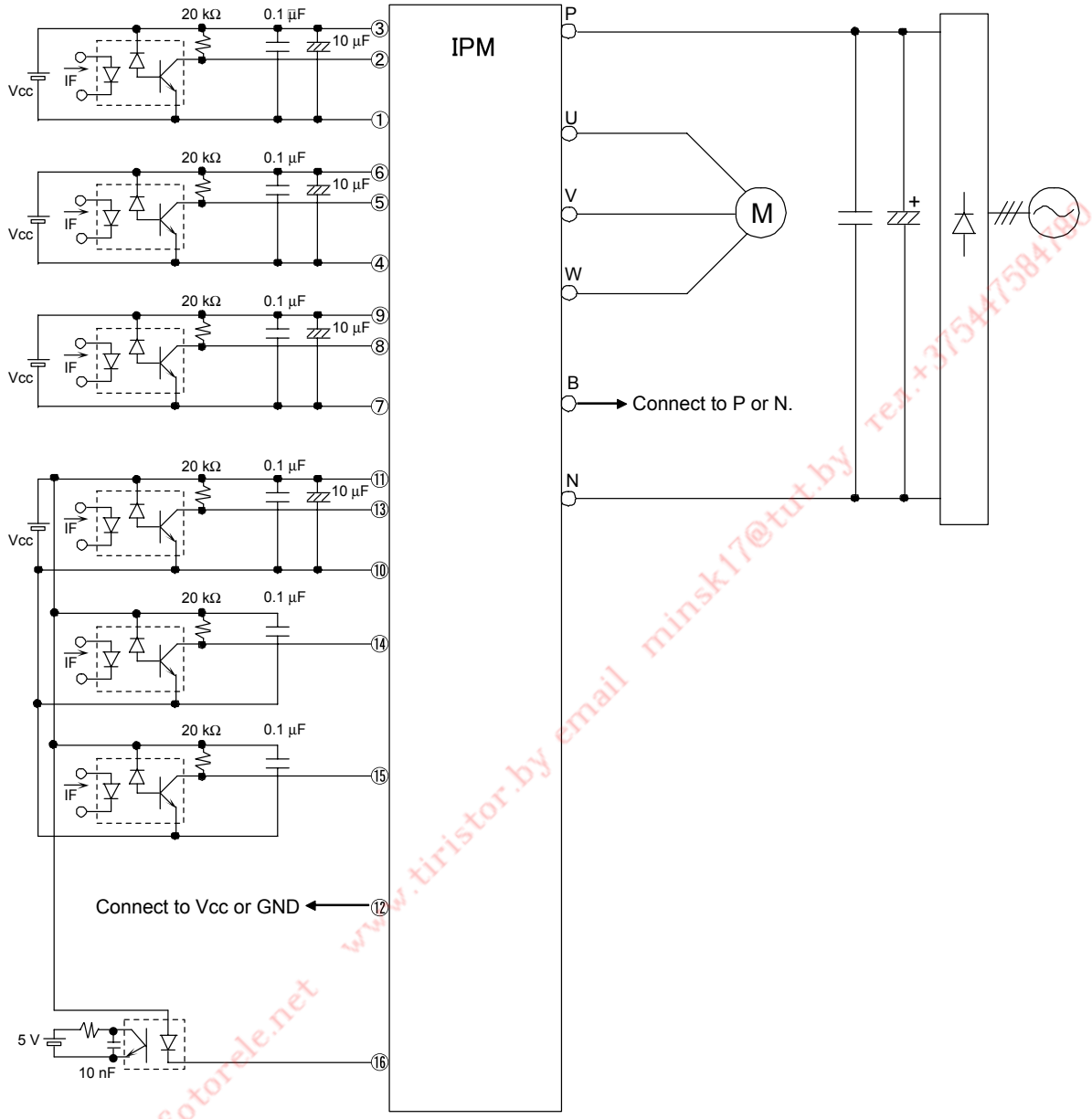


Fig. 4-2 Example of Application Circuit for P610, P611, and P612 (Types Without Brake)

Fig. 4-3 shows an example of an application circuit for P621 and P622 (types with built-in brake).

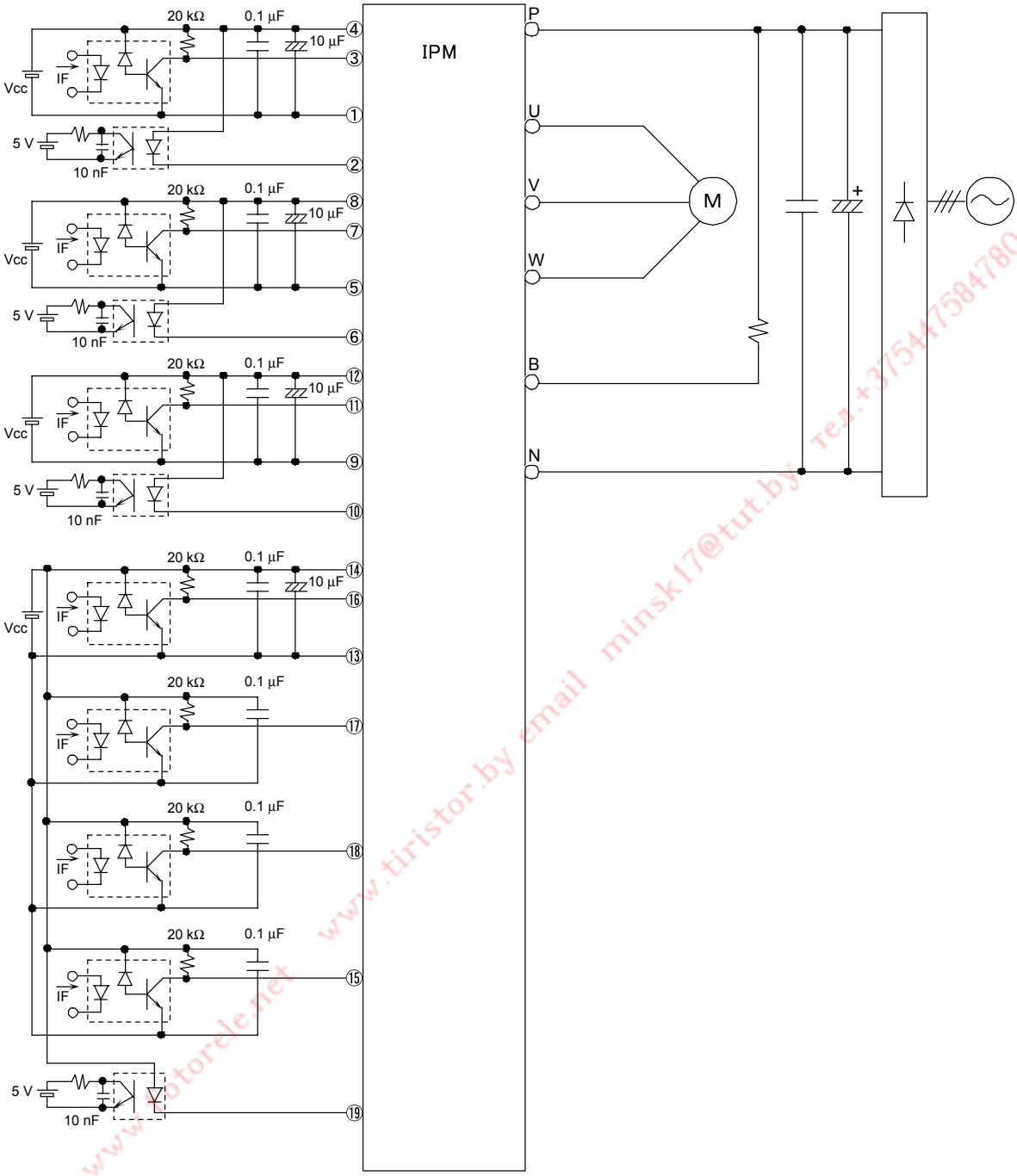


Fig. 4-3 Example of Application Circuit for P621, P622 (with Upper Arm Alarm)
(Types with Built-in Brake)

Fig. 4-4 shows an example of an application circuit for P621 and P622 (types without brake).

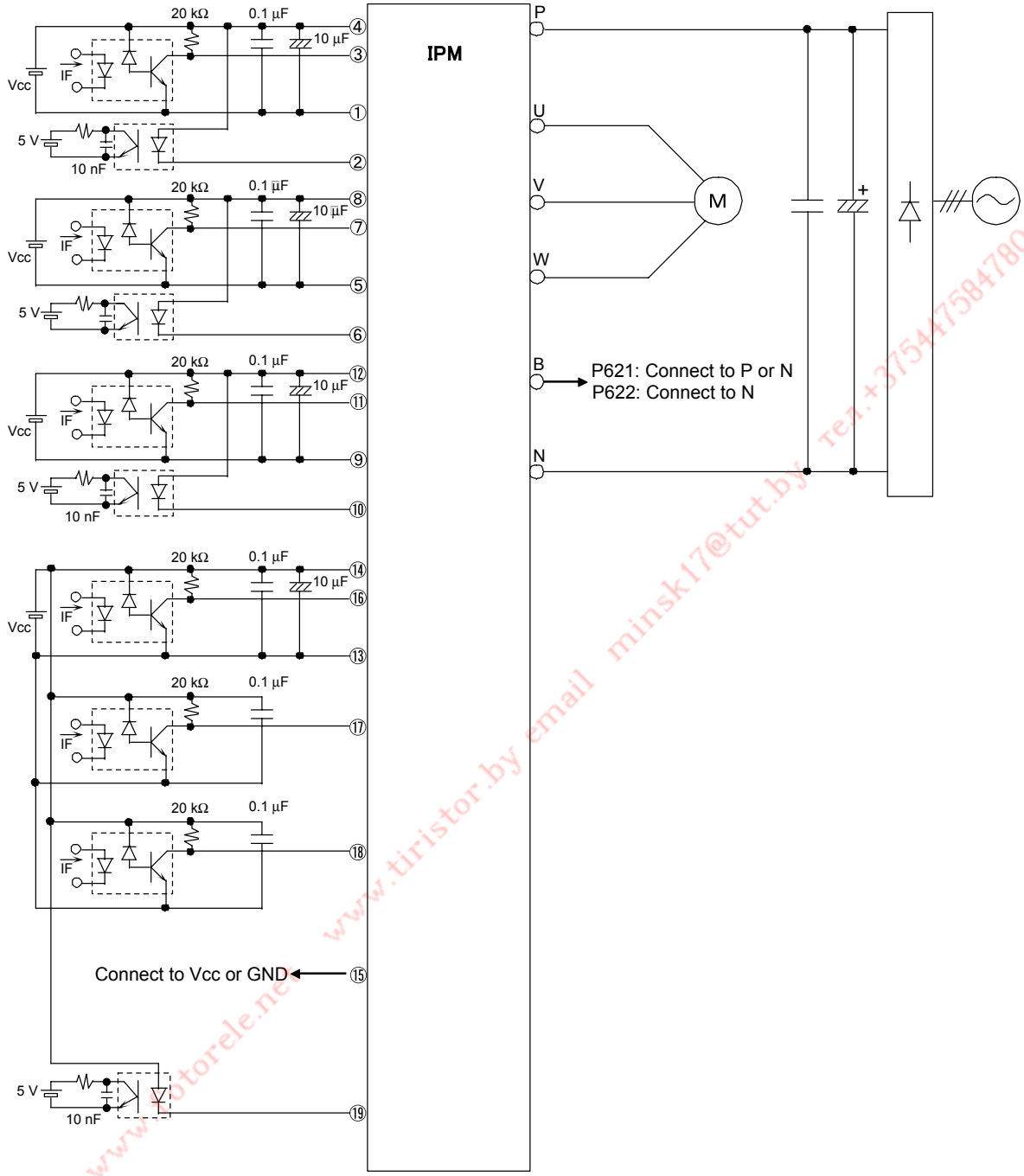


Fig. 4-4 Example of Application Circuit for P621, P622 (with Upper Arm Alarm) (Types Without Brake)

Fig. 4-5 shows an example of an application circuit for P617.

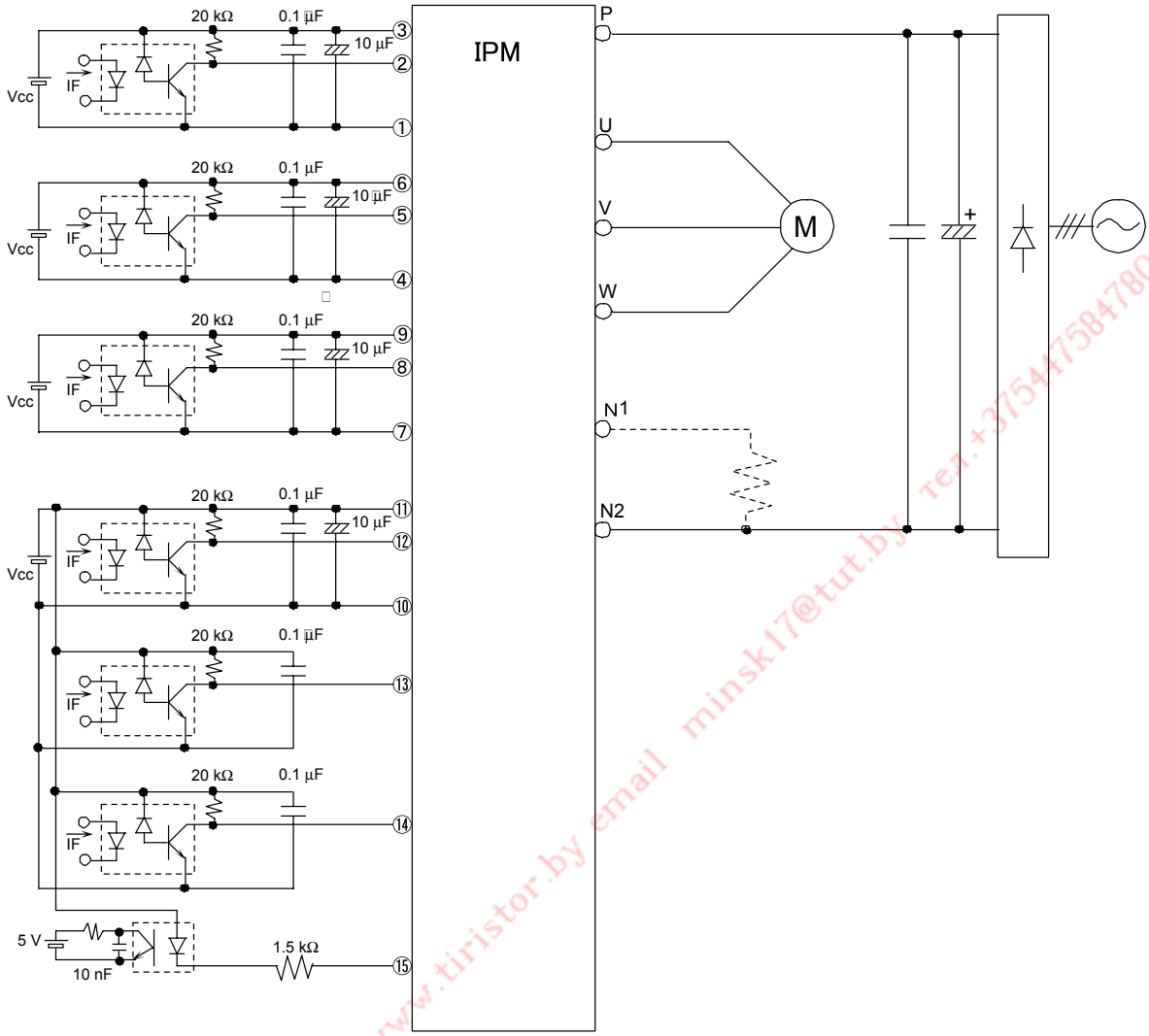


Fig. 4-5 Example of Application Circuit for Small-capacity IPM P617

Fig. 4-6 shows an example of an application circuit for P619.

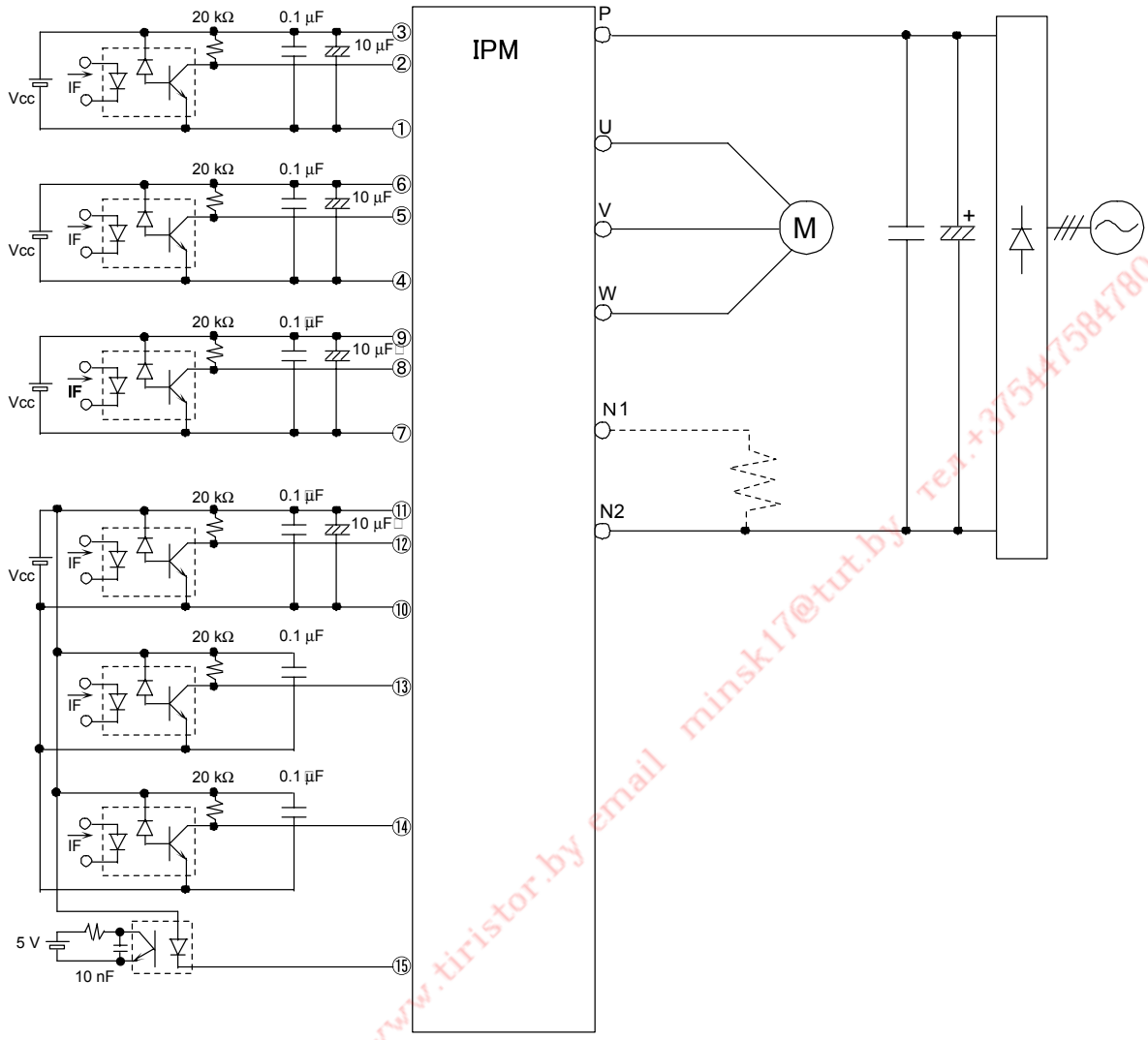


Fig. 4-6 Example of Application Circuit for Small-capacity IPM P619

2 Precautions

2.1 Control power source

As shown in the application circuit examples, a total of four isolation power sources are required for the control power sources, 3 on the upper arm side and 1 on the lower arm side.

If you are using commercial power source units, do not connect the GND terminal on the side of the power source output.

When the GND on the output side is connected to + or -, faulty operation occurs because each power source is connected to the ground on the side of power source input. Stray capacity between each power source and ground should be reduced to a minimum.

2.2 Structural isolation among four power sources (input connectors and PC boards)

Isolation is needed between each of the four power sources and the main power source.

Since a large amount of dv/dt is applied to this isolation during IGBT switching, keep sufficient clearance between the components and the isolation. (2 mm or more is recommended.)

2.3 GND connection

The control power source GND on the lower arm side and the main power source GND are connected inside the IPM. Never connect them outside the IPM. If you connect them outside the IPM, loop currents generated inside and outside the IPM flow to the lower arm due to di/dt and cause malfunctioning of the photocoupler and the IPM. The input circuit of the IPM may also be damaged.

2.4 Control power source capacitor

The 10 μF and 0.1 μF capacitors connected to each control power source as shown in the application circuit examples are not intended for smoothing the control power sources, but for compensating the wiring impedance up to the IPM. Capacitors for smoothing are needed separately.

Since transient variations may be caused in the wiring impedance from the capacitor to the control circuit, connect the capacitor as close to the IPM control terminal and photocoupler pin as possible.

Select capacitors with lower impedance and better frequency characteristics for the electrolytic capacitors. In addition, connect capacitors with better frequency characteristics, such as film capacitors, in parallel.

2.5 Alarm circuits

- The potential on the secondary side of the alarm photocoupler may vary due to dv/dt. It is recommended to stabilize the potential by connecting a capacitor of approximately 10 nF.
- As P617 does not have a built-in alarm resistor, a resistor of 1.5 kΩ must be connected on the outside of the IPM.

2.6 Pull-up of the signal input terminal

Pull up the control signal input terminal to Vcc with a resistor of 20 kΩ. Even if you do not use the brake in the built-in brake IPM, still pull up the DB input terminal. If you do not pull up the terminal, a malfunction may be caused by dv/dt.

2.7 Snubber

Connect the snubber to the PN terminals directly. For the P612 package set up the snubber for each PN terminal on both sides.

2.8 B terminal

In the case of the 6 in 1 package (without brake) type, connecting the B terminal to the N or P terminal as described below is recommended.

P610, P611, P612, P621 ·····N or P terminal

P622(Econo-IPM) ·····N terminal (connection to the P terminal causes an internal short-circuit)

2.9 Upper arm alarm

When the upper arm alarm of an IPM with upper arm alarm output is not used, connect the alarm terminal to Vcc to stabilize the potential.

2.10 Overcurrent protection for small-capacity IPMs

The limit level for overcurrent protection can be adjusted to a high level by adding a resistor between the N1 and N2 terminals of small-capacity IPMs (P617, 619). The resistor added at that time must be mounted close to the N1 and N2 terminals. A long distance from the N1 and N2 terminals can cause faulty operation of the IPM.

2.11 IPM input circuit

The constant-current circuit shown in Fig. 4-7 is provided in the input section of our IPMs, and outflow from the IPM takes place at the timing shown in the figure. For this reason, the IF on the primary side of the photocoupler must be determined so that a current of IR + 1 mA flows through the pull-up resistor on the secondary side of the photocoupler. If the IF is not sufficient, faulty operation on the secondary side is possible.

Also, the pull-up resistor must be selected so that a current of IR + 1 mA flows on the secondary side of the photocoupler when the photocoupler is ON and that the current flowing into the IPM at the time of OFF does not exceed the Iin MAX listed in the specifications.

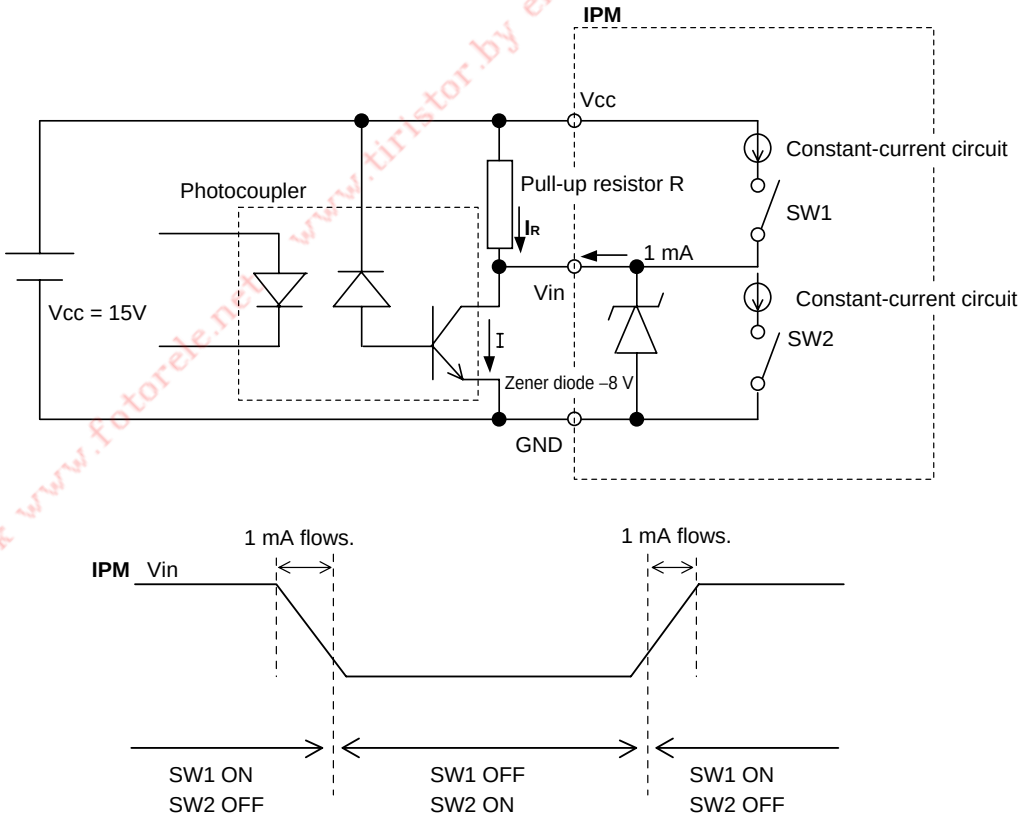


Fig. 4-7 IPM Input Circuit and Rated Current Operation Timing

3 Photocoupler and Peripheral Circuits

3.1 Photocoupler for control input

● Photocoupler rating

Use a photocoupler satisfying the following characteristics.

- CMH = CML > 15 kV/μs or 10 kV/μs
- tpHL = tpLH < 0.8 μs
- tpLH-tpHL = –0.4 to 0.9 μs
- CTR > 15%

Example: Product of Agilent: HCPL-4504
Product of Toshiba: TLP759 (IGM)

Note: Safety standards such as UL and VDE should also be applied.

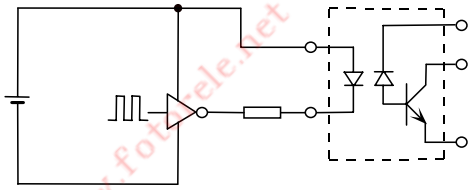
● Wiring between photocoupler and IPM

Make the wiring between the photocoupler and the IPM as short as possible to reduce the wiring impedance between the photocoupler and the IPM control terminal. Separate each wire between the primary and secondary circuits so that floating capacitance does not become large, since a strong dv/dt is applied between the primary and secondary circuits.

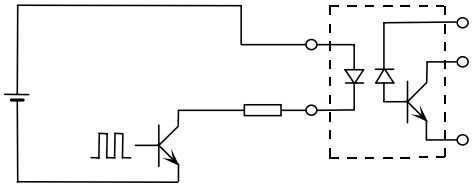
● Light emitting diode driving circuit

The dv/dt withstand capability of the photocoupler is also affected by the input light emitting diode driving circuit. A driving circuit example is shown in Fig. 4-8.

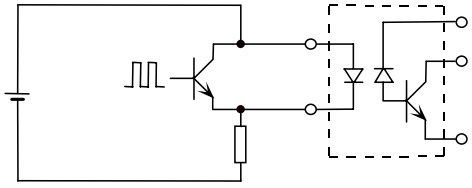
Good example: Totempole output IC
Current limiting resistor on the cathode side of the photo diode



Bad example: Open collector



Good example: Photo diode A-K is shorted by transistors C-E
(example which is particularly fit for photocoupler OFF)



Bad example: Current limiting resistor on the anode side of the photo diode

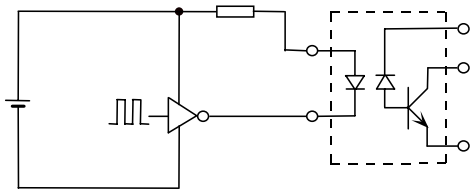


Fig. 4-8 Photocoupler Input Circuits

3.2 Photocoupler for alarm output

● Photocoupler rating

General-purpose photocouplers can be used, but photocouplers satisfying the following characteristics are recommended.

- 100%< CTR< 300%
- Single-element type

Example: TLP521-1-GR rank

Note: Safety standards such as UL and VDE should also be applied.

● Input current limiting resistor

A current limiting resistor for the light emitting diode in the photocoupler input is included in the IPM.

R_{ALM} = 1.5 kΩ and if connected directly to Vcc, about 10 mA of I_F flows with Vcc = 15 V.

Therefore, there is no need to connect any current limiting resistor.

However, if a large amount of current, i.e., Iout > 10 mA, is needed on the photocoupler output, increase the CTR value of the photocoupler to the required value.

● Wiring between the photocoupler and the IPM

Since a large amount of dv/dt is also applied on the photocoupler for the alarm, the same precautions as described in 3.1 should be taken.

4 Connectors

Connectors suitable for the shape of the R-IPM control terminals are commercially available.

16-pin connector for P610, 611, 612: MDF7-25S-2.54DSA made by Hirose Electric

For P621: DF10-31S-2DSA made by Hirose Electric

Please confirm the reliability and the specifications of the above connectors with the manufacturer.

Chapter 5
Cooling Design

Contents Page

1 Cooler (Heat Sink) Selection Method

- To safeguard operation of the IGBT, make sure the junction temperature Tj does not exceed Tjmax. Cooling should be designed in such a way that ensures that Tj is always below Tjmax even in abnormal states such as overload operation as well as under the rated load.
- Operation of IGBT at temperatures higher than Tjmax could result in damage to the chips.
  In the IPM, the TjOH protection function operates when the chip temperature of IGBT exceeds Tjmax. However, if the temperature rises too quickly, the chip may not be protected.
- Likewise, note that the chip temperature of FWD should not exceed Tjmax.
- When selecting the cooler (heat sink), always measure the temperature directly under the center of the chip. The Econo IPM series in particular is designed with operational preconditions for servo applications, etc., in which the temperature increases/decreases in a short time, so care is required in regard to heat accumulation when using under other conditions. As the structure and design place special importance upon compactness, there is a tendency for heat to accumulate in the power chip located at the center. For the chip layout, refer to the IPM internal structure drawing: MT6M5313. For the concrete design, refer to the following document.

  "IGBT MODULE APPLICATION MANUAL REH984"
  Contents: • Power dissipation loss calculation
  • Selecting heat sinks
  • Heat sink mounting precautions
  • Troubleshooting

2 Notes on Heat Sink Selection

How to select heat sinks is described in the manual REH982. Note also the following points.

- Flatness of the heat sink surface
  Flatness between mounting screw pitches: 0 to +100 μm, roughness: 10 μm or less

If the heat sink surface is concave, a gap occurs between the heat sink and the IPM, leading to deterioration of cooling efficiency.

If the flatness is +100 μm or more, the copper base of the IPM is deformed and cracks could occur in the internal isolating substrates.

Chapter 6
Cautions on Use

Contents Page

1 Main Power Source

1.1 Voltage range

1.1.1 600 V system IPMs

- The main power source should not exceed 500 V (= V_{DC}(surge)) between the P and N main terminals. The voltage between the collector and emitter main terminals (= VCES) should not exceed 600 V (= absolute max. rated voltage).
- Surge voltage occurs in the wiring inductance inside the IPM due to di/dt during switching, but the product is designed so that 600 V is not exceeded between the collector and emitter main terminals when the main power source is used at V_{DC}(surge) or lower between the P and N main terminals.
- In order for the maximum surge voltage at the time of switching not to exceed the rated voltage, keep the connecting wires between the IPM and the embedded product short and install a snubber close to the P and N terminals.

1.1.2 1200 V system IPMs

- The main power source should not exceed 1000 V (= V_{DC}(surge)) between the P and N main terminals. The voltage between the collector and emitter main terminals (= VCES) should not exceed 1200 V (= absolute max. rated voltage).
- Surge voltage occurs in the wiring inductance inside the IPM due to di/dt during switching, but the product is designed so that 1200 V is not exceeded close to the chip when the main power source is used at V_{DC}(surge) or lower between the P and N main terminals.
- In order for the maximum surge voltage at the time of switching not to exceed the rated voltage, keep the connecting wires between the IPM and the embedded product short and install a snubber close to the P and N terminals.

1.2 External noise

Countermeasures have been taken against external noise within the IPM, but faulty operation may possibly occur depending on the type and intensity of the noise.

Please take sufficient countermeasures against noise entering the IPM.

1.2.1 Noise from outside the equipment

- Apply a noise filter on the AC line, isolate the ground and so on.
- When required, add capacitors of 100 pF or less between all phase signal inputs and signal GND.
- Install arresters against lightning surges, etc.

1.2.2 Noise from within the equipment

- Outside the rectifier: Implement the same countermeasures as the above.
- Inside the rectifier: Apply snubber circuits on the PN lines.
  (In case of multiple inverters connected to one rectifier converter, etc.)

1.2.3 Noise from the output terminals

- Take external countermeasures so that contactor switching surges and so on do not enter.

2 Control Power Source

2.1 Voltage range

- The drive circuit shows stable operation when the control power source voltage is in the range of 13.5 to 16.5 V.
  Operation with a value as close to 15 V as possible is recommended.
- When the control power source voltage is below 13.5 V, the loss will increase and noise will show a tendency to decrease.
  Also, the protection performance will shift, so that the protection functions may not be sufficient and chip damage may occur.
- When the control power source voltage drops below 13.5 V, dropping down to VUV or lower, the undervoltage protection function (UV) operates.
  When the control power source voltage recovers to VUV + VH, UV is automatically released.
- When the control power source voltage exceeds 16.5 V, the loss decreases and noise shows a tendency to increase.
  Also, the protection performance will shift, so that the protection functions may not be sufficient and chip damage may occur.
- When the control power source voltage is below 0 V (reverse bias) or exceeds 20 V, the drive circuit and/or the main chip may be damaged. Never apply these voltages.

2.2 Voltage ripple

- The recommended voltage range of 13.5 to 16.5 V includes the voltage ripple of Vcc.
  During the manufacture of the control power source, be sure to keep the voltage ripple sufficiently low.
  Also be sure to keep noise superimposed on the power source sufficiently low.
- Design the control power source so as to keep dv/dt at 5 V/μs or lower.

2.3 Power source start-up sequence

- Apply the main power source after confirming that Vcc is in the recommended voltage range.
  If the main power source is applied before the recommended voltage is reached, the chip may be destroyed (worst-case scenario).

2.4 Alarm at the time of power source start-up and shutdown

- At the time of power source start-up, an alarm is output at the UV protection function operation level voltage.

  Recovery is made when the protection release level voltage is reached, but as the alarm will not be released as long as an ON signal is input, appropriate measures must be taken on the drive circuit side.
- As there is also alarm output at the time of power source shutdown, similar measures are required.

2.5 Precautions upon control circuit design

- Design with sufficient margin, taking the current consumption specification (Icc) for the drive circuit into consideration.
- Make the wiring between the input terminals of the IPM and the photocoupler as short as possible, and use a pattern layout with a small stray capacitance for the primary side and the secondary side of the photocoupler.
- Install a capacitor as close as possible between Vcc and GND in the case of a high-speed photocoupler.
- For a high-speed photocoupler, use a high CMR type in which tpHL, tpLH $\leq$ 0.8 μs.
- For the alarm output circuit, use a low-speed photocoupler type in which CTR $\geq$ 100%.
- Use four isolated power sources for the control power source Vcc. Also use a design with suppressed voltage fluctuations.
- When a capacitor is connected between the input terminals and GND, note that the response time in regard to an input signal on the primary side of the photocoupler becomes longer.
- Design the primary-side current of the photocoupler with sufficient margin taking the CTR of the photocoupler being used into consideration.

3 Protection Functions

As the built-in protection functions and the presence or absence of alarm output differ according to the package and the model, confirm the protection functions of your IPM referring to the "List of IPM built-in functions" in chapter 3.

3.1 Protection operations in general

3.1.1 Range of protection

- The protection functions included in the IPM are designed for non-repetitive abnormal phenomena.
- Do not apply constant stress that exceeds the rating.

3.1.2 Countermeasures for alarm output

- If an alarm is output, stop the input signal into the IPM immediately to stop the equipment.
- The IPM protection functions protect against abnormal phenomena, but they cannot remove the causes of the abnormalities. After stopping the equipment, restart it after you have removed the cause of the abnormality.

3.2 Precautions for the protection functions

3.2.1 Overcurrent

- The overcurrent protection function (OC) executes a soft shutdown of the IGBT and outputs an alarm when the overcurrent continues in excess of the insensitive time (tdoc).
  Accordingly, OC does not operate when the overcurrent is removed within the tdoc period.
- In P619, the current is detected on the N-line, so there is no OC for the upper arm.

3.2.2 Starting with load short-circuit

- The OC has an insensitive time (tdoc) of approximately 5 to 10 μs. If the input signal pulse width is shorter than this, the OC does not operate.
- If an input signal pulse width of tdoc or less continues when starting with the load shorted, short circuits occur continuously and the chip temperature of the IGBT rises rapidly.
  In such a case, the rise of the case temperature does not follow the rise of the chip temperature and the case temperature overheating protection function (TcOH) does not operate. Normally the chip temperature overheating protection function (TjOH) operates and provides protection, but as TjOH also has a delay of approximately 1 ms, depending on the state of the chip temperature rise, the protection operation may not occur in time, possibly causing damage to the chip.

3.2.3 Ground short

- If a ground short occurs and an overcurrent flows through the lower arm of the IGBT, overcurrent protection by OC occurs for all IPMs.
- If a ground short occurs and an overcurrent flows through the upper arm of the IGBT, the protection operation differs according to the package and the model.

  P621, P622

  Overcurrent protection is provided by the OC of the upper arm. Alarm output also is provided.

  P610, P611, P612

  Overcurrent protection is provided by the OC of the upper arm, but there is no alarm output.
  For details, refer to the related document MT6M3046 "Protection in R-IPM Earth Fault Mode".

  P619, P617

  As there is no OC for the upper arm, there is no overcurrent protection and no alarm output.

3.3 FWD overcurrent protection

- FWD current is not detected. Accordingly, there is no protection when overcurrent flows only for FWD.

3.4 Case temperature protection

- TcOH is the protection function used when the temperature of the entire insulation substrate rises. Accordingly, the chip temperature protection function (TjOH) operates when the heating is concentrated on one chip.

3.5 Chip temperature protection

- A chip temperature protection function (TjOH) is built into all IGBTs, including the brake part.

4 Power Cycling Capability

The lifetime of semiconductor products is not eternal. Accumulated fatigue by thermal stress resulting from rising and falling temperatures generated within the device may shorten the lifetime of the components. Narrow the range of temperature variations as much as possible.

5 Other

5.1 Precautions for usage and installation into equipment

(1) Also read the IPM delivery specifications for IPM use and installation into the device.

(2) Always prevent secondary damage by installing a fuse or a circuit breaker with a suitable capacity between the commercial power source and this product, keeping in mind the possibility of chip damage caused by unexpected accidents.

(3) When investigating the chip duty at the time of a normal turn-off operation, make sure that the operation track for the turn-off voltage and current is within the RBSOA specifications.
When investigating the chip duty with non-repetitive short-circuit interruption, make sure that it is within the SCSOA specifications.

(4) Use this product upon full understanding of the product usage environment and upon investigation of whether the product reliability life is satisfactory or not. In case of use in excess of the reliability life of the product, the chip may be destroyed before the target life of the device.

(5) Apply a thermal compound or the like between the IPM and the heat sink to make the contact heat resistance as small as possible.

(6) Use the IPM within the range specified in the specifications for the screw torque and the heat sink flatness.
Incorrect handling can cause insulation failure.

(7) Take care so that no load is placed on the IPM. Particularly, the control terminal should not be bent.

(8) Do not perform soldering by reflow on the main terminal and control terminal. Take care to prevent any effect on the IPM by heat, flux, and washing solutions used for soldering other components.

(9) Avoid locations where corrosive gases are generated or dust is present.

(10) Take care to prevent high-voltage static electricity entering the main terminal and control terminal.

(11) When removing and attaching the control circuit and the IPM, first confirm that Vcc is 0 V.

Chapter 7
Trouble Shooting

Contents Page

1 Trouble Shooting

In comparison to standard modules, IPMs have various protection functions (overcurrent, overheating, etc.) built in, so that their devices are not easily destroyed by abnormal conditions. However, destruction may occur depending on the abnormality, so that countermeasures are required once the cause and state of occurrence have been clarified. An analysis diagram indicating the cause of destruction is shown on page 2 and should be used to investigate the causes of destruction.

(For element fault judgment, refer to the Module Application Manual, chapter 4, item 2 "Fault Judgment Method".)

Also, in the case of alarm output from the IPM, use the alarm cause analysis diagrams of Fig. 7-2 to investigate the cause.

2 Fault Analysis Diagrams

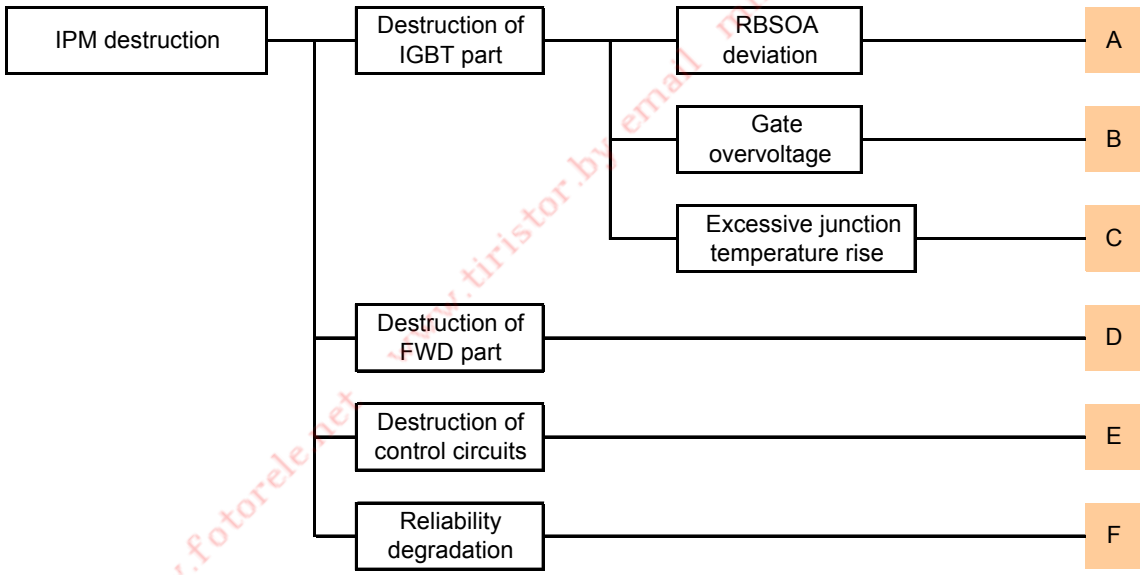


Fig. 7-1 (a.) IPM Fault Analysis Diagram (The letters A to F connect to the following diagrams.)

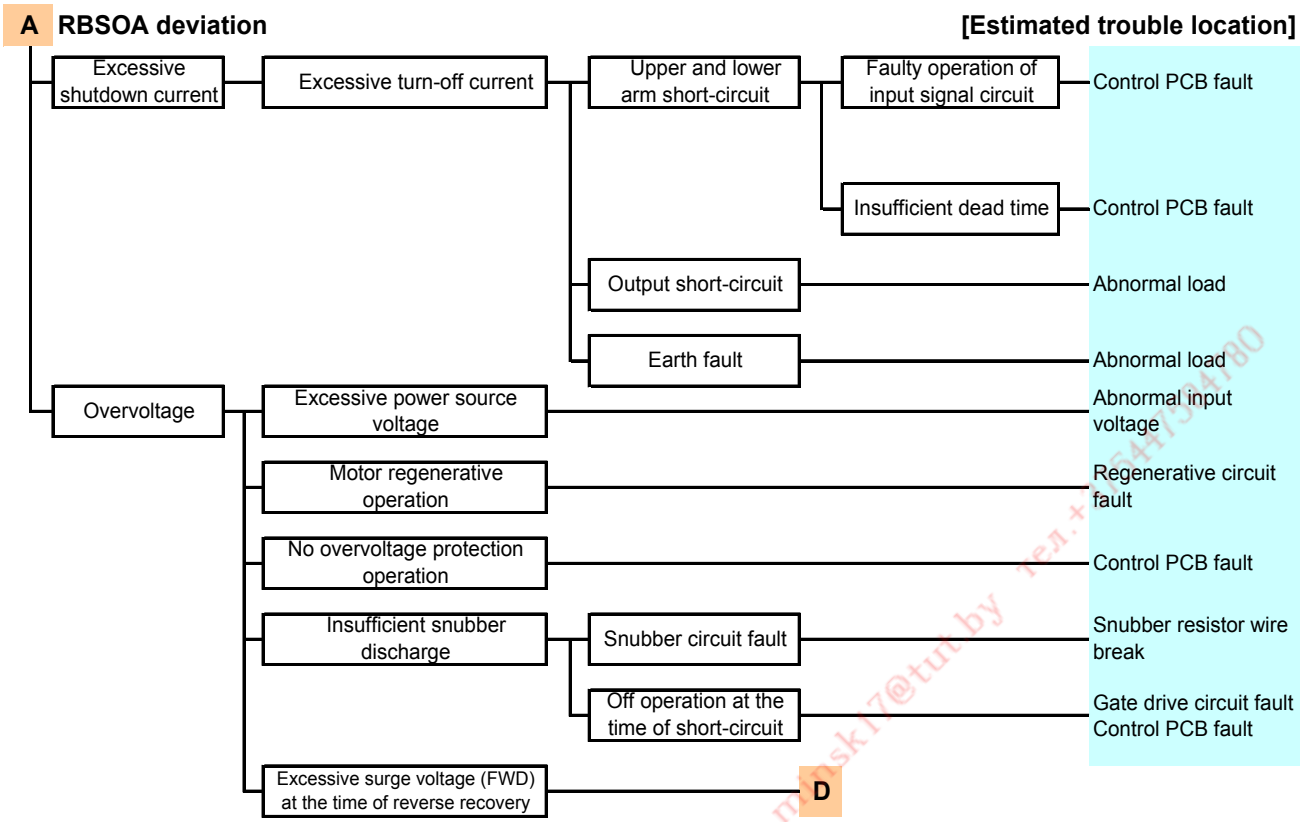


Fig. 7-1 (b) Mode A: RBSOA Deviation

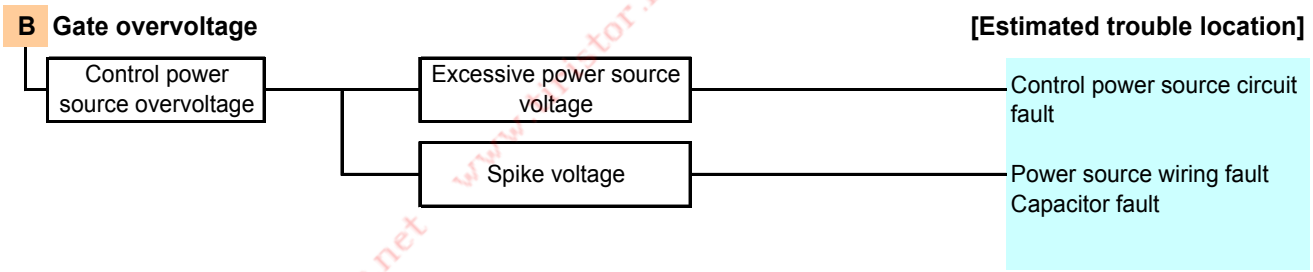


Fig. 7-1 (c) Mode B: Gate Overvoltage

C **Excessive junction temperature rise (rapid temperature rise)**

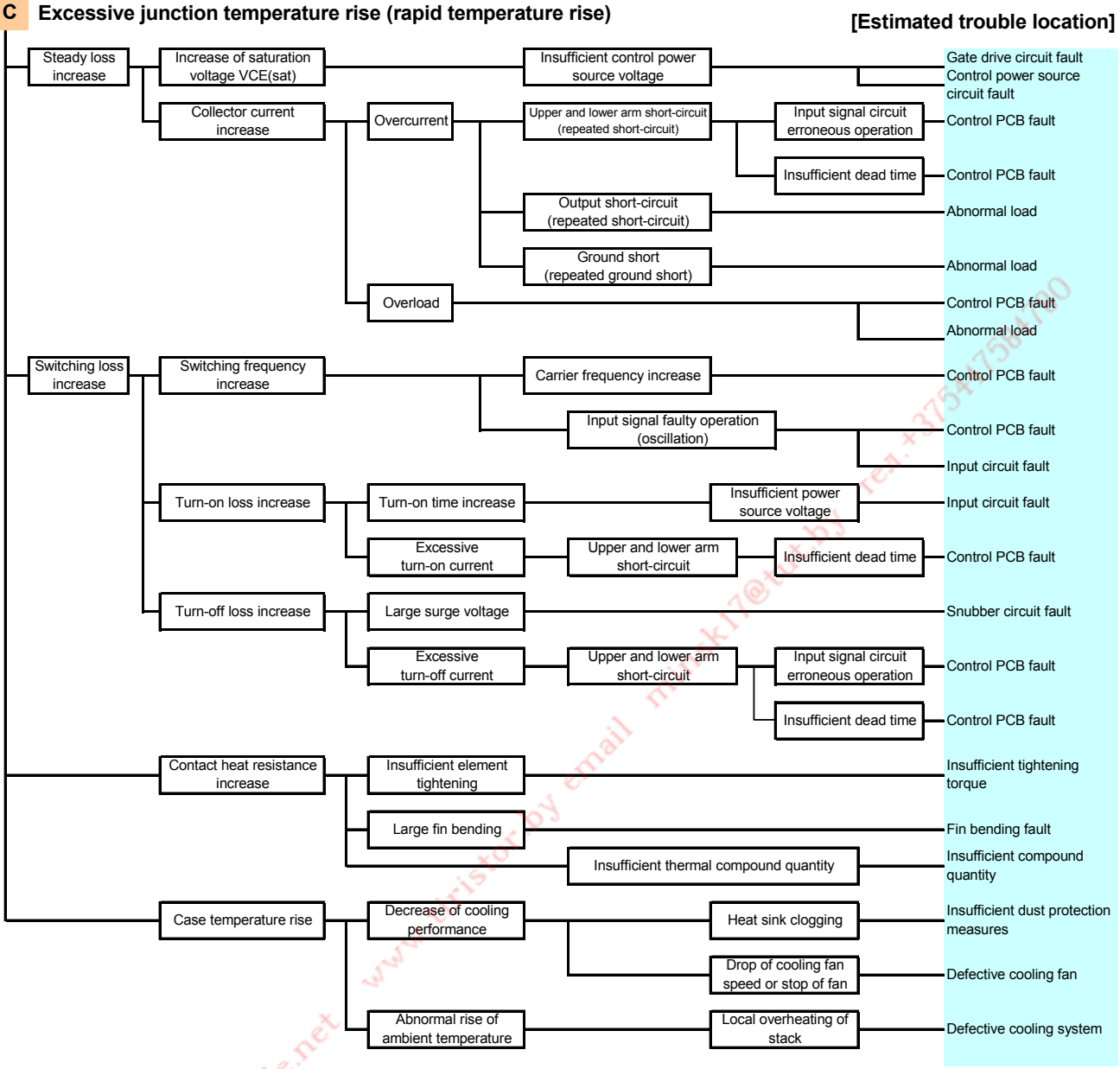


Fig. 7-1 (d) Mode C: Excessive Rise in Junction Temperature

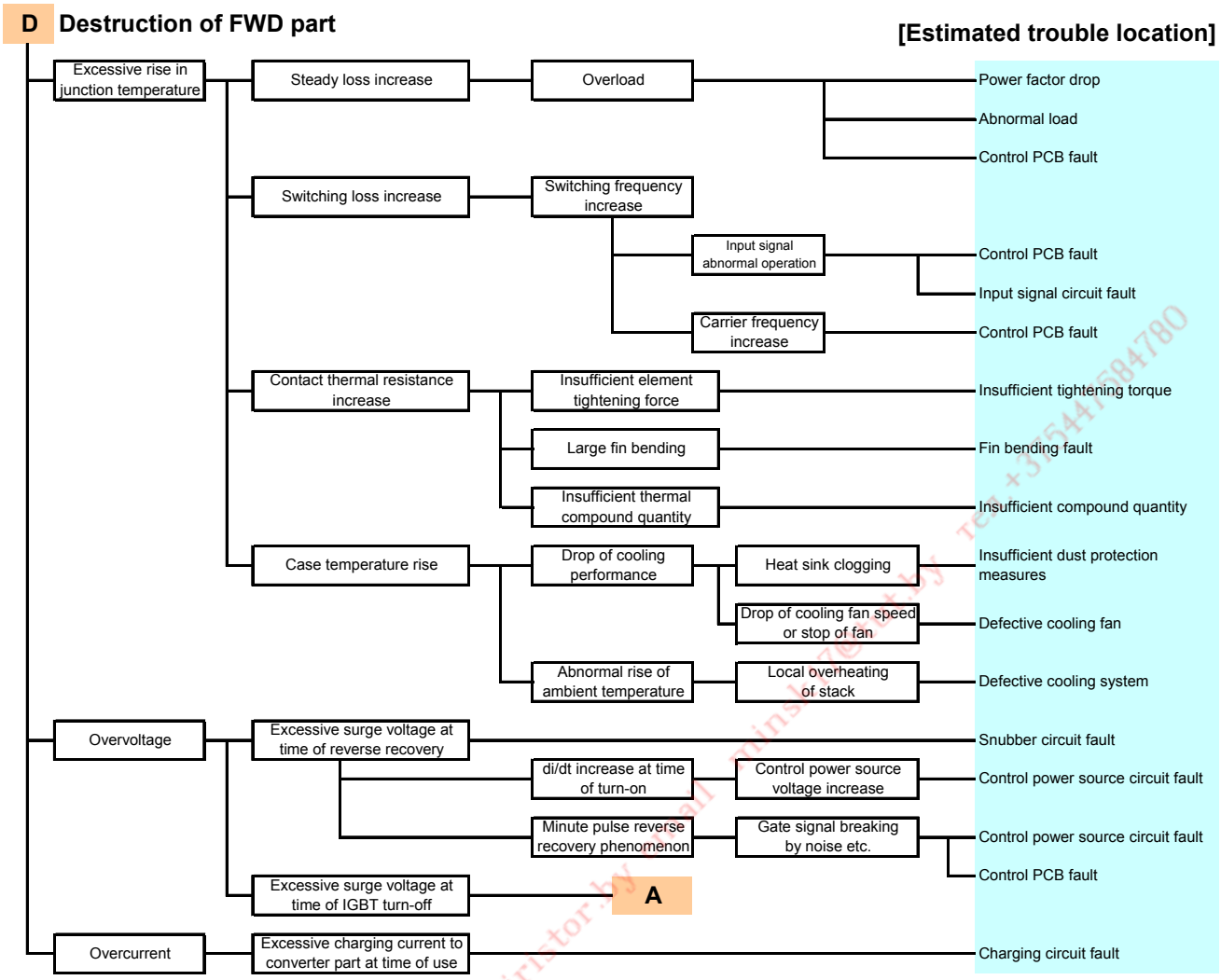


Fig. 7-1 (e) Mode D: Destruction of FWD Part

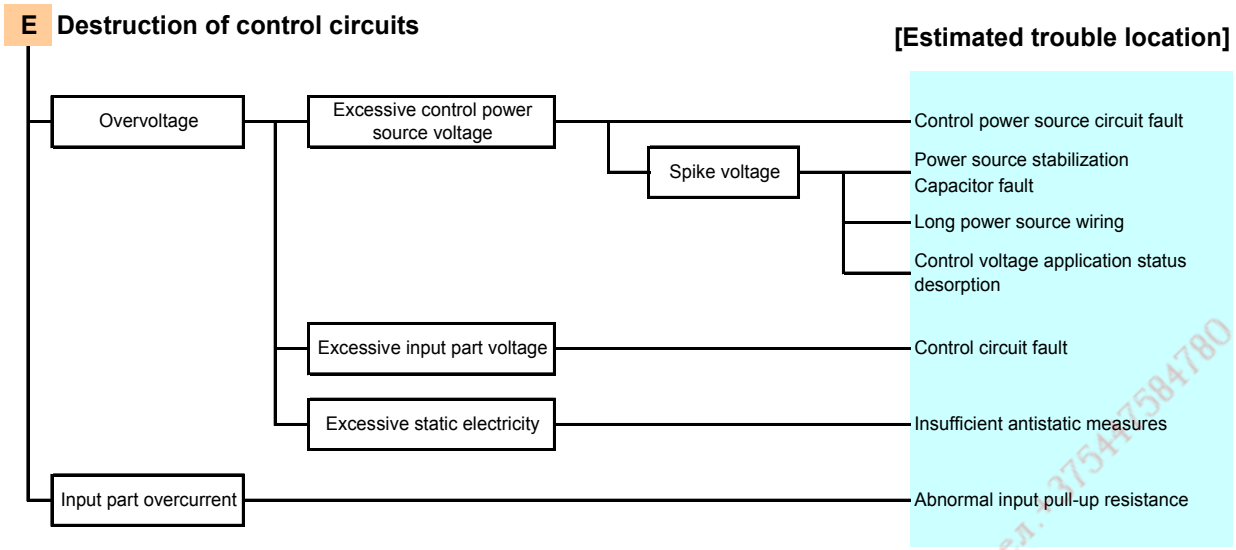


Fig. 7-1 (f) Mode E: Destruction of Control Circuit

F Damage related to reliability and product handling

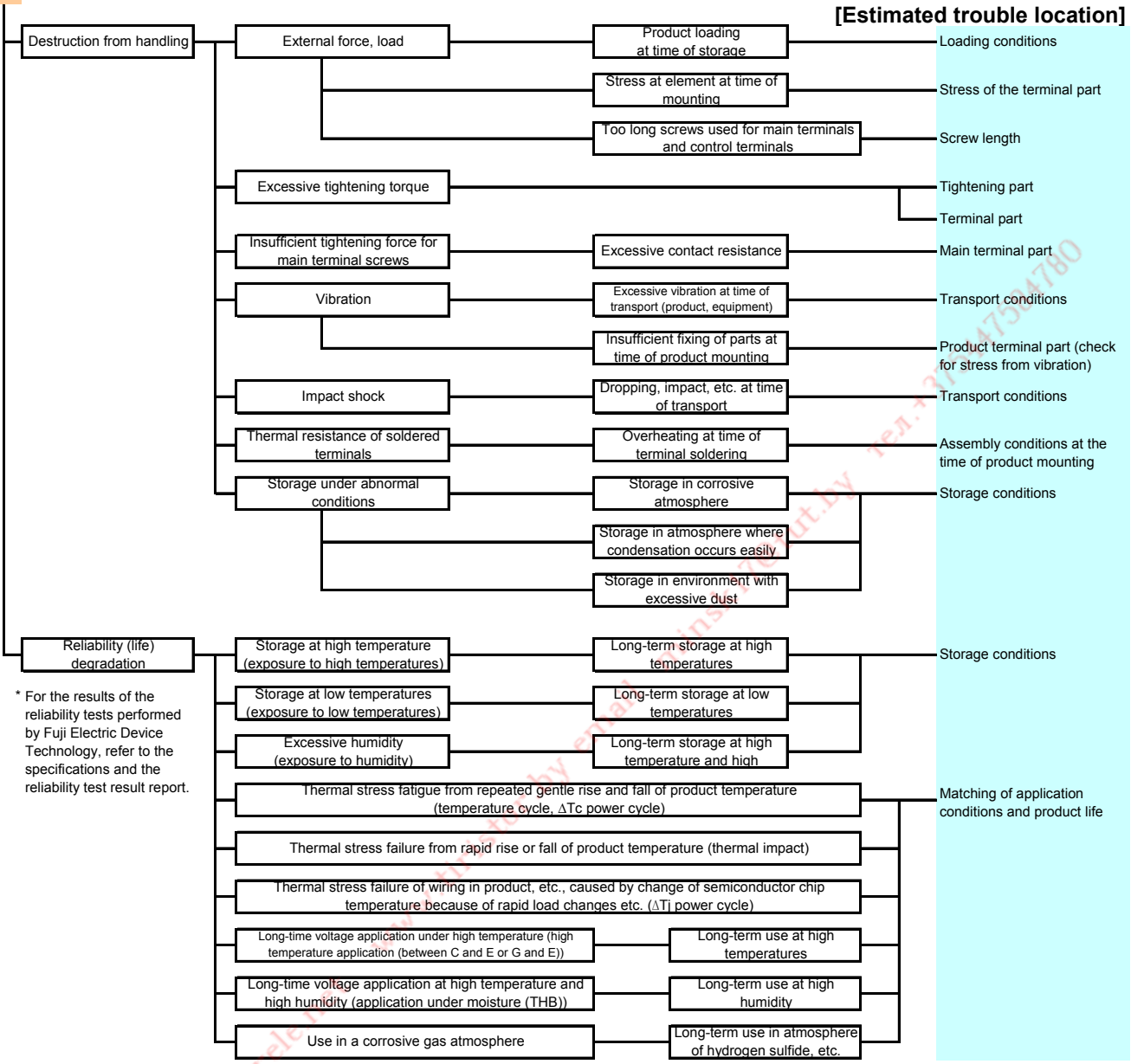


Fig. 7-1 (g) Mode F: Damage Related to Reliability and Product Handling

3 Alarm Cause Analysis Diagram

3.1 Cause analysis in the event an IPM alarm occurs

When an inverter using an IPM comes to an alarm stop, a survey must first be done to find out whether the alarm was output from the IPM or from a device control circuit (other than the IPM).

If the alarm was output by the IPM, determine the cause according to the following cause analysis diagram.

For observation of whether there is an IPM alarm or not via the alarm output voltage, the presence or absence of an alarm output can be confirmed easily by inserting a 1.5 kΩ resistor between the IPM alarm terminal and the cathode of the alarm photodiode and measuring the IPM alarm terminal voltage.

Phenomenon		Explanation of alarm cause	How to determine alarm cause
IPM alarm occurrence			
Normal alarm	TjOH	The chip temperature Tj is detected by the temperature detection element (diode) built into all IGBTs. When TjOH exceeds the trip level continuously for 1 ms or longer, the IGBT is switched off for protection.	• Measure the control power source voltage Vcc, the DC input voltage d, the output current Io. • Measure the case temperature Tc directly under the chip, calculate ΔTj-c, and estimate Tj. • Confirm the IPM installation method. (Fin flatness, thermal compound, etc.) • The alarm holding time in many cases is longer than 2 ms.
	OC	The collector current is detected by the current flowing through the current sensing IGBT built into all IGBT chips. When the overcurrent trip level is exceeded continuously for approximately 5 μs or longer, the IGBT is switched off for protection.	• Observe the alarm and the output current (U, V, W) with an oscilloscope. • Observe the alarm and the DC input current (P, N) with an oscilloscope. • Observe the current change 5 μs before alarm output. • Confirm the trip level and the detection location in case of current detection with CT, etc. • The alarm holding time in many cases is 2 ms.
	UV	When the control power source voltage Vcc drops below the undervoltage trip level continuously for 5 μs or longer, the IGBT is switched off for protection.	• Observe the alarm and Vcc with an oscilloscope. • Observe the power source voltage change 5 μs before alarm output • In case of instantaneous voltage drops, the alarm holding time in many cases is 2 ms.
	TcOH	The insulation substrate temperature is detected by the temperature detection element (IC) installed on the same ceramic substrate as the power device. When the TcOH trip level is exceeded continuously for 1 ms or longer, the IGBT is switched off for protection.	• Measure the temperature at the side of the copper base with a thermocouple. • Observe the alarm output period with an oscilloscope. • The possibility that the alarm is TcOH is large when output is made for a longer period than the 2 ms of the alarm holding time.
Faulty alarm		• When the control power source voltage Vcc exceeds the absolute max. rating of 20 V or when an excessive dv/dt or ripple is applied, the drive IC may be damaged or a faulty alarm output. • When noise current flows in the IPM control circuit, the IC voltage may become unstable and a faulty alarm output.	• A short pulse alarm in the order of μs is output. • Observe the Vcc waveform during motor operation with an oscilloscope, preferably in the vicinity of the IPM control terminals. • Vcc < 20 V, dv/dt ≤ 5 V/μs, and Vripple ≤ 2 Vp-p shall apply (all four power supplies). • Confirm that there is no external wiring between IPM control GND and main terminal GND. In case of wiring, noise current flows into the IPM control circuit. • When the drive IC is damaged, there is a high possibility of abnormal increase of Icc. Ex.: If Iccp ≥ 10 mA @Vin = "High", confirm the abnormality of IPM peripheral circuits. Refer to "Cautions for Design and Application" and "Application Circuit Examples" in the delivery specifications.

Fig. 7-2 Alarm Cause Analysis Diagram

WARNING

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of February 2004.
   The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.

2. All applications described in this Catalog exemplify the use of Fuji's products for your reference only. No right or license, either express or implied, under any patent, copyright, trade secret or other intellectual property right owned by Fuji Electric Device Technology Co., Ltd. is (or shall be deemed) granted. Fuji Electric Device Technology Co., Ltd. makes no representation or warranty, whether express or implied, relating to the infringement or alleged infringement of other's intellectual property rights which may arise from the use of the applications described herein.

3. Although Fuji Electric Device Technology Co., Ltd. is enhancing product quality and reliability, a small percentage of semiconductor products may become faulty. When using Fuji Electric semiconductor products in your equipment, you are requested to take adequate safety measures to prevent the equipment from causing a physical injury, fire, or other problem if any of the products become faulty. It is recommended to make your design fail-safe, flame retardant, and free of malfunction.

4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
   • Computers • OA equipment • Communications equipment (terminal devices) • Measurement equipment
   • Machine tools • Audiovisual equipment • Electrical home appliances • Personal equipment • Industrial robots etc.

5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Device Technology Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
   • Transportation equipment (mounted on cars and ships) • Trunk communications equipment
   • Traffic-signal control equipment • Gas leakage detectors with an auto-shut-off feature
   • Emergency equipment for responding to disasters and anti-burglary devices • Safety devices

6. Do not use products in this Catalog for the equipment requiring strict reliability such as (without limitation)
   • Space equipment • Aeronautic equipment • Nuclear control equipment
   • Submarine repeater equipment • Medical equipment

7.

8. If you have any question about any portion in this Catalog, ask Fuji Electric Device Technology Co., Ltd. or its sales agents before using the product.
   Neither Fuji Electric Device Technology Co., Ltd. nor its agents shall be liable for any injury caused by any use of the products not in accordance with instructions set forth herein.

Модуль igbt fuji каталог, характеристики, datasheet

Fuji Electric

Innovating Energy Technology

FUJI SEMICONDUCTORS

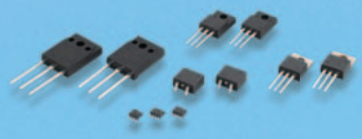
富士電機半導体

25A2-W-0004



あらゆるシーンでエネルギーマネジメントに貢献する富士電機のパワー半導体

Fuji Electric Power Semiconductors contibuting Energy Management in various fields



富士電機は、低炭素社会の実現に向け、産業機械、鉄道、自動車、社会インフラ、再生可能エネルギー、家電製品、情報機器など様々な場面で、高いエネルギー利用効率を可能にするパワー半導体を提供します。
パワーエレクトロニクス技術のキーデバイスであるパワー半導体の技術革新と製品開発を続け、安全・安心で持続可能な社会の実現に貢献していきます。

Fuji Electric provides Power Semiconductors enabling high-efficiency energy usage in various fields such as industrial machinery,automobile, railroad, social infrastructure, renewable energy, consumer electronics and information equipment in order to achieve low-carbon society.
Fuji Electric contributes to realization of safe and secure sustainable society through continuous technology inovation and product development of Power Semiconductors as key devices in Power Electronics technology.

※ 掲載の写真は当社パワー半導体が使われる様々な用途の一例を示すものであり、写真の製品に必ずしも使用されていることではありません。
The pictures on this page show examples of various applications which may use Fuji Electric Power Semiconductors, they aren't necessarily used in the products in these pictures.



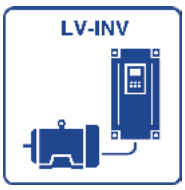
INDEX

富士電機は、各種用途に適したパワー半導体を供給しています。
下に示す各用途の製品情報については以下の弊社パワー半導体Webサイトをご覧ください。

www.fujielectric.co.jp/products/semiconductor/usage/

Fuji Electric provides Power Semiconductors well suited for various applications. You will find more information on products for each application shown below at our Web site.
www.fujielectric.com/products/semiconductor/usage/

インバータ／Inverters



ベルトコンベヤ、ファン、ポンプなどにおいてモータを可変速運転する汎用インバータに最適な半導体製品。

Semiconductor products best suited for general-purpose inverters that carry out variable-speed operation of motors in products such as belt conveyors, fans and pumps

高圧インバータ／Medium-Voltage Inverters

鉄鋼・繊維・製紙プラントなどに使われる3相交流3k/6k/6.6kVの高圧電動機を駆動する高圧インバータに最適な半導体製品。

Semiconductor products suitable for medium-voltage inverters that drive 3-phase AC 3k/6k/6.6kV high-voltage motors used in iron and steel plants, textile plants and paper mills

NC・サーボ／NC / Servos

工作機械の位置決めや速度制御を行うNC・サーボと組立・溶接・搬送などに使われ多軸制御機能を持つロボットに最適な半導体製品。

Semiconductor products best suited to NC and servos that carry out speed control and positioning of machine tools, as well as robots that have multi-spindle control features used in assembly, welding and conveyance

鉄道／Railroads

鉄道車両の主電動機駆動、補助電源装置など車両用パワーエレクトロニクスに適した半導体製品。

Semiconductor products suited for the power electronics of railroad cars such as the main motor drive and auxiliary power supply equipment of rolling stock

風力発電／Wind Power Generation

風力発電機から出力される交流電力を直流電力に変換するAC/DCコンバータと直流電力を商用周波数の交流電力に変換するインバータに最適な半導体製品。

Semiconductor products suitable for AC/DC converters that convert the AC power output from wind turbine generators to DC power, as well as for inverters that convert DC power to the AC power of commercial frequencies

太陽光／Solar

太陽光パネルで発電された直流の電力を家庭で消費したり、電力会社の電源系統に戻すために交流の電力に変換するパワーコンディショナに最適な半導体製品。

Semiconductor products best suited for power conditioners that convert solar-panel generated DC power into AC power to enable the residential consumption, as well as to facilitate the recovery of the power to the power systems of power companies

溶接機／Welding Machines

2つ以上の金属部材に熱または圧力を加え溶融・一体化する溶接機において抵抗熱を発生させるスイッチング回路に最適な半導体製品。

Semiconductor products suitable for switching circuits that generate resistance heat in welding machines to melt and integrate by adding heat or pressure to two or more metallic members

UPS／UPS

停電や瞬停からシステムダウンを防ぐUPS（無停電電源装置）の電力変換回路に最適な半導体製品。

Semiconductor products ideal for the power conversion circuits of UPS (uninterruptible power supply) that prevent system shutdown during power outages and instantaneous power failures

スイッチング電源／Switching Power Supplies

民生・OA・通信機器など幅広い用途に使用されている汎用スイッチング電源に最適な半導体製品。

Semiconductor products best suited for general-purpose switching power supplies used in a wide variety of applications such as equipment for general consumers and OA and communication devices

PC・サーバ／PC / Servers

小型・軽量化が進むノートPCと高性能化が進むデスクトップPC、サーバの電源に最適な半導体製品。

Semiconductor products suitable for the power supplies of increasingly high-performance desktop PCs and servers, as well as of increasingly compact and lightweight notebook PCs

薄型TV／Flat-screen TVs

薄型・軽量・大画面化が進む一方、低消費電力化が求められるTVセットの電源に最適な半導体製品。

Semiconductor products ideal for the power supplies of TV sets that require low power consumption and large screens that are increasingly thinner and more lightweight

自動車／Automobiles

「Car Electronics Solution ～環境・安全・快適性に貢献～」をテーマとした、IGBTモジュール、パワーIC、MOSFET、圧力センサの自動車用半導体製品。

IGBT modules, power ICs, MOSFETs and pressure sensors as semiconductor products for automobiles developed with the theme "Car Electronics Solutions - Contributing to the Environment, Safety and Comfort"

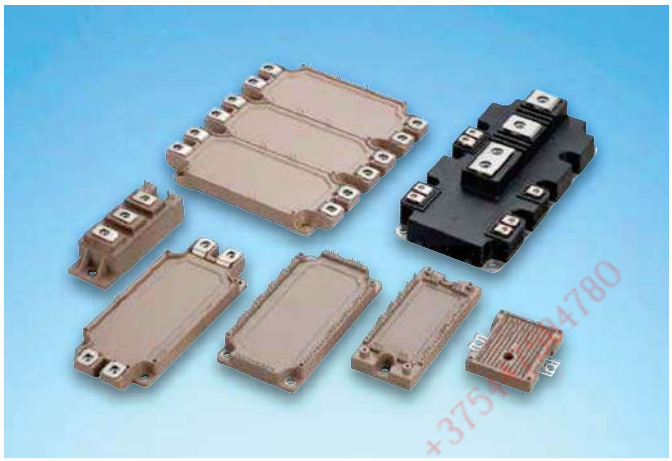
CONTENTS

IGBT モジュール
IGBT Module

RoHS

富士電機の IGBT モジュールはモータの可変速駆動装置や無停電電源装置等の電力変換器のスイッチング素子として開発されてきました。IGBT はパワー MOSFET の高速スイッチング性能とバイポーラトランジスタの高電圧・大電流処理能力とを合わせ持った半導体素子です。

Fuji Electric has been developing IGBT modules designed to be used as switching elements for power converters of variable-speed drives for motors, uninterruptable power supplies, and more. IGBT has superior characteristics combining the high-speed switching performance of a power MOSFET with the high-voltage/high-current handling capabilities of a bipolar transistor.



■ IGBTモジュール Xシリーズの特長

●電力損失を低減し省エネに貢献

当社第 7 世代「X シリーズ」は、本モジュールを構成する IGBT 素子およびダイオード素子の厚みをさらに薄くし微細化することで、素子構造を最適化。これにより、従来製品（当社第 6 世代「V シリーズ」）に比べてインバータ動作時の電力損失を低減しました。搭載機器の省エネと電力コスト削減に貢献します。

●機器の小型化を実現

新たに開発した絶縁基板を適用し、モジュールの放熱性を向上。上記（電力損失低減）と併せて発熱を抑制することで、従来製品に比べ約 36％の小型化※１を実現しました。さらに連続動作時の最大保証ﾁｯﾌﾟ温度を従来の 150℃から 175℃にすることで、搭載機器のサイズを維持しながら出力電流を最大 35％※２増やすことが可能となります。これらにより機器の小型化およびトータルコスト削減に寄与します。

※１：1200V 75A PIM 製品における実装面積比

※２：当社試算値

●機器の信頼性向上に寄与

モジュールの構造や使用部材を見直し、高温動作時の安定性や耐久性を高めました。搭載機器の信頼性向上に寄与します。

Features of the IGBT Module X Series

● Reduces power dissipation to contribute to energy saving

The IGBT and diode devices of Fuji electric's 7th-generation X series that constitute these modules have been made thinner and miniaturized, thereby optimizing the device structure. This has successfully reduced power dissipation in inverter operation compared with conventional products (Fuji Electric's 6th-generation V Series), contributing to energy saving and power cost reduction of the equipment on which the module is installed.

● Achieves equipment size reduction

A newly developed insulating substrate has been applied in order to improve the module's heat dissipation. Combined with the feature described above (reduced power dissipation) to suppress heat generation, an approximately 36%*1 reduction has been achieved in comparison to the conventional module. In addition, the maximum temperature guaranteed in continuous operation has been increased from the conventional 150°C to 175°C, which allows the output current to be increased by up to 35%*2 while maintaining the size of the equipment on which the module is installed. This contributes to reducing the size and total cost of the equipment.

*1: Mounting area ratio with 1200 V 75A PIM models

*2: Value estimated from simulation results

● Contributes to improving equipment reliability

Newly developed structures and materials of the module have realized to increase its stability and durability in high-temperature operation. This contributes to improving the stability and reliability of the equipment on which the module is installed.

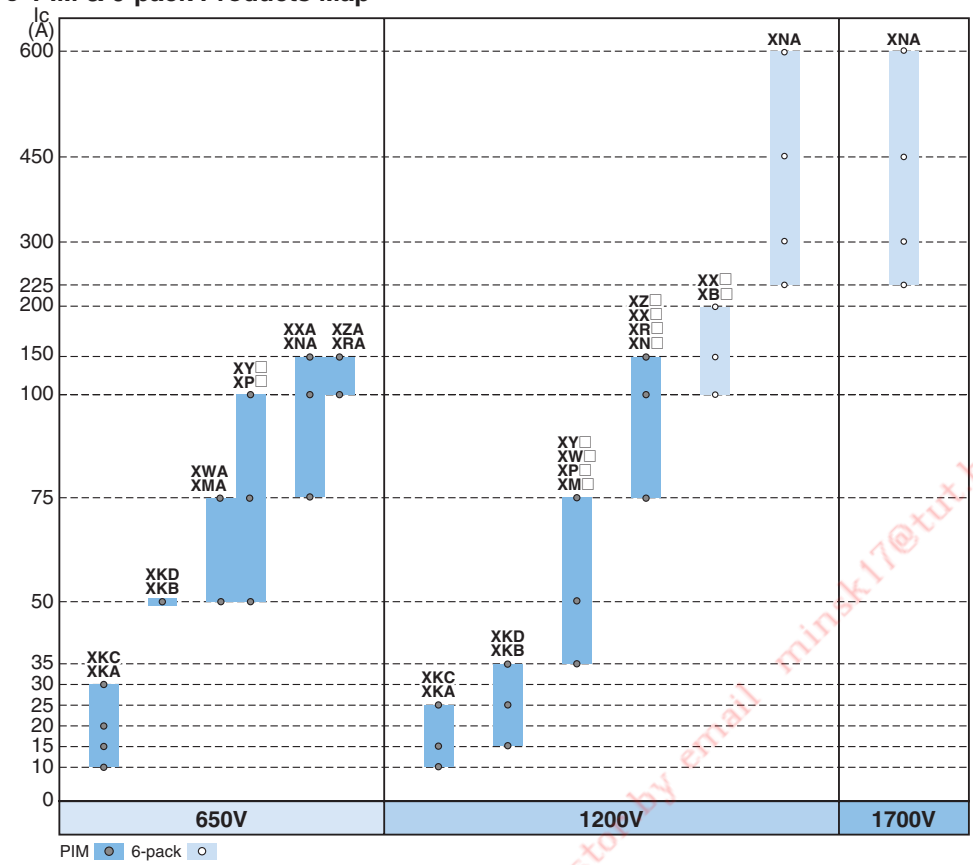
■製品系列　Product lineup

Number of IGBT Switches	Products Category	Page	Internal Configuration				Max V_{CE}			Rated Current					
			IGBT Module			Discrete IGBT	650V	1200V	1700V	≤50A	>50A ≤150A	>150A ≤300A	>300A ≤600A	>600A ≤1200A	>1200A
			Standard Module	Power Integrated Module	Intelligent Power Module										
2	**Standard 2-pack**	14	✓				✓	✓	✓		✓	✓	✓	✓	
		15						✓	✓			✓	✓	✓	
2	**PrimePACK™**	16	✓					✓	✓					✓	✓
6	**6-pack**	12	✓					✓			✓	✓			
		13						✓	✓			✓	✓		
	IPM	17			✓		✓			✓					
7	**PIM**	9		✓			✓	✓		✓					
		10					✓	✓		✓	✓				

注: PrimePACK™はInfineon Technologies社の登録商標です。
Note: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.

■ 製品系列マップ　Products Map ＜X series＞

● PIM & 6-pack Products Map



Power Integrated Module

7MBR Ic

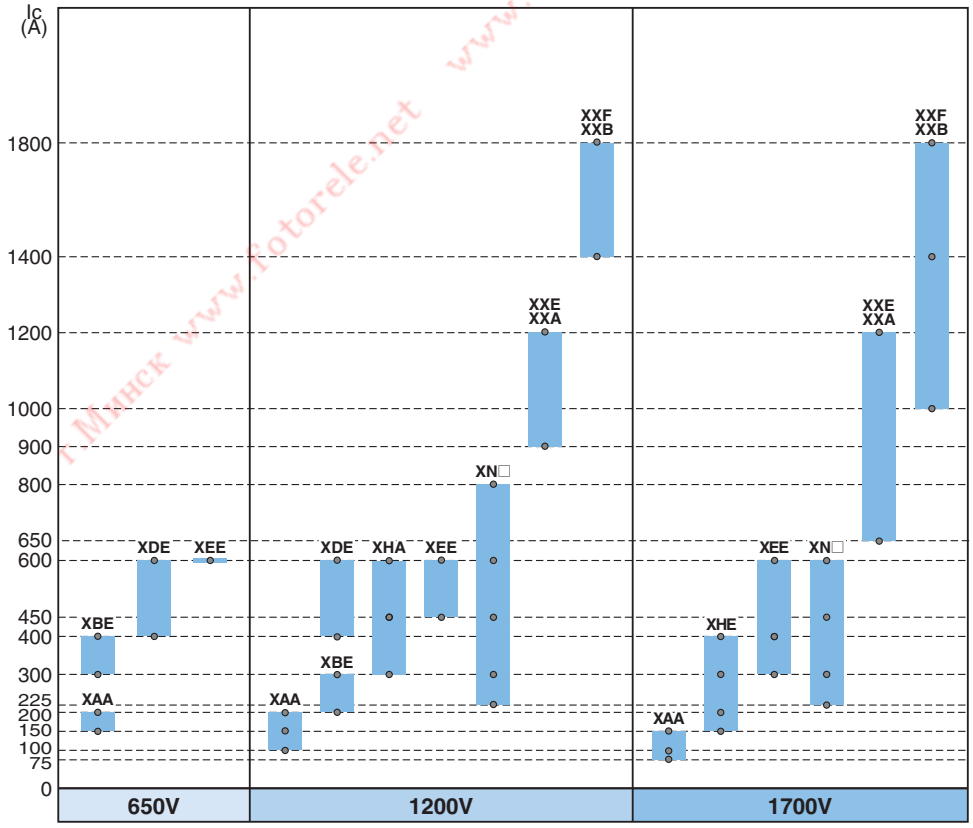
IGBT series & Package type	Vces
XKA, XKC	33.8× 62.8mm
XKB, XKD	56.7× 62.8mm
XM□, XP□, XW□, XY□	45×107.5mm
XN□, XR□, XX□, XZ□	62× 122mm

6-pack

6MBI Ic

IGBT series & Package type	Vces
XB□, XX□	62× 122mm
XNA	150× 162mm

● 2-pack Products Map



2-pack

2MBI Ic

IGBT series & Package type	Vces	
XAA	34× 94 mm	Standard Pack
XBE	45× 92 mm	
XDE	62×108 mm	
XEE	80×110 mm	
XHA	62×108 mm	
XN□	62×150 mm	
XXA, XXE	89×172 mm	PrimePACK™
XXB, XXF	89×250 mm	

PrimePACK™はInfineon Technologies社の登録商標です。
PrimePACK™ is registered trademark of Infineon Technologies AG, Germany

■ 型式の見方　Part numbers ＜X series＞

6MBI100XBA120-50 (example)

6	MB	I	100	X	B	A	120	50
IGBT スイッチ数 Number of IGBT Switches	IGBT モジュール IGBT Module	内部構成 Internal Configuration	定格電流 Rated Current	IGBT デバイス IGBT Device Technology	パッケージ Package Type		最大電圧 Max. VCE	RoHS Compliant
		I: Standard Modules	× 1	X: X series (7th Generation)	See the Products map	A ～ D：Standard Type	065: 650V	50 to 99 RoHS Compliant
		R: Power Integrated Modules				E ～ H：Premium Type*	120: 1200V	
		P: Intelligent Power Modules					170: 1700V	

* Premium Type：Low Thermal Impedance Version

■ 記号　Letter symbols

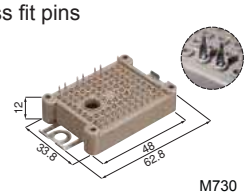
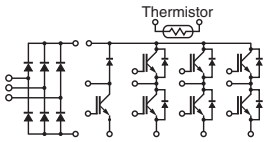
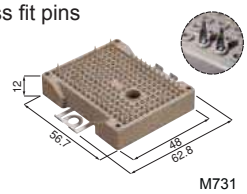
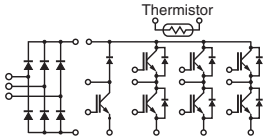
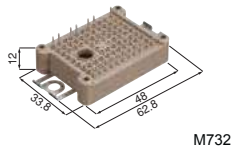
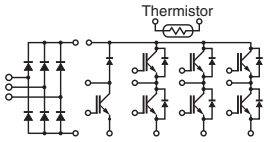
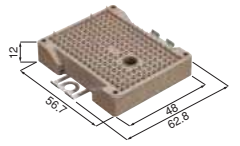
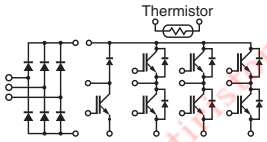
記号　Letter symbols

V_{CES}:	コレクタ・エミッタ間電圧	Collector-to-emitter rated voltage (Gate-to-emitter short-circuited)	$V_{CE(sat)}$:	コレクタ・エミッタ飽和電圧	Collector-to-emitter saturation voltage
V_{GES}:	ゲート・エミッタ間電圧	Gate-to-emitter rated voltage (Collector-to-emitter short-circuited)	t_{on}:	ターンオン時間	Turn-on time
			t_{off}:	ターンオフ時間	Turn-off time
			t_f:	立下り時間	Fall time
I_C:	コレクタ電流	Rated collector current	$t_{d(on)}$:	ターンオン遅延時間	Turn-on time
P_C:	最大損失	Maximum power dissipation	$t_{d(off)}$:	ターンオフ遅延時間	Turn-off time

IGBT モジュール PIM ＜X series＞

■小容量PIM（コンバータ部、ブレーキ部内蔵）650V, 1200Vクラス

Small PIM/Built-in converter and brake 650, 1200 volts class

	Ic	650V X series	1200V X series
Press fit pins  M730 	10A	7MBR10XKA065-50	7MBR10XKA120-50
	15A	7MBR15XKA065-50	7MBR15XKA120-50
	20A	7MBR20XKA065-50	
	25A		7MBR25XKA120-50
	30A	7MBR30XKA065-50	
Press fit pins  M731 	15A		7MBR15XKB120-50
	25A		7MBR25XKB120-50
	35A		7MBR35XKB120-50
	50A	7MBR50XKB065-50	
Solder pins  M732 	10A	7MBR10XKC065-50	7MBR10XKC120-50
	15A	7MBR15XKC065-50	7MBR15XKC120-50
	20A	7MBR20XKC065-50	
	25A		7MBR25XKC120-50
	30A	7MBR30XKC065-50	
Solder pins  M733 	15A		7MBR15XKD120-50
	25A		7MBR25XKD120-50
	35A		7MBR35XKD120-50
	50A	7MBR50XKD065-50	

Dimension [mm]

型式 Device type	インバータ部 Inverter [IGBT]				ブレーキ部 Brake [IGBT+FWD]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass Grams
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		
● 7MBR10XKA065-50	650	10	90	1.30	650	10	650	800	10	0.90	360	M730	25
● 7MBR15XKA065-50	650	15	110	1.30	650	15	650	800	15	0.95	360	M730	25
● 7MBR20XKA065-50	650	20	135	1.30	650	20	650	800	20	1.00	360	M730	25
● 7MBR30XKA065-50	650	30	180	1.30	650	30	650	800	30	1.05	360	M730	25
● 7MBR50XKB065-50	650	50	270	1.30	650	50	650	800	50	1.10	580	M731	45
● 7MBR10XKC065-50	650	10	90	1.30	650	10	650	800	10	0.90	360	M732	25
● 7MBR15XKC065-50	650	15	110	1.30	650	15	650	800	15	0.95	360	M732	25
● 7MBR20XKC065-50	650	20	135	1.30	650	20	650	800	20	1.00	360	M732	25
● 7MBR30XKC065-50	650	30	180	1.30	650	30	650	800	30	1.05	360	M732	25
● 7MBR50XKD065-50	650	50	270	1.30	650	50	650	800	50	1.10	580	M733	45
● 7MBR10XKA120-50	1200	10	105	1.50	1200	10	1200	1600	10	0.95	295	M730	25
● 7MBR15XKA120-50	1200	15	135	1.50	1200	15	1200	1600	15	1.00	295	M730	25
● 7MBR25XKA120-50	1200	25	160	1.70	1200	25	1200	1600	25	1.05	295	M730	25
● 7MBR15XKB120-50	1200	15	135	1.50	1200	15	1200	1600	15	0.95	470	M731	45
● 7MBR25XKB120-50	1200	25	200	1.50	1200	25	1200	1600	25	1.00	470	M731	45
● 7MBR35XKB120-50	1200	35	255	1.50	1200	35	1200	1600	35	1.05	470	M731	45
● 7MBR10XKC120-50	1200	10	105	1.50	1200	10	1200	1600	10	0.95	295	M732	25
● 7MBR15XKC120-50	1200	15	135	1.50	1200	15	1200	1600	15	1.00	295	M732	25
● 7MBR25XKC120-50	1200	25	160	1.70	1200	25	1200	1600	25	1.05	295	M732	25
● 7MBR15XKD120-50	1200	15	135	1.50	1200	15	1200	1600	15	0.95	470	M733	45
● 7MBR25XKD120-50	1200	25	200	1.50	1200	25	1200	1600	25	1.00	470	M733	45
● 7MBR35XKD120-50	1200	35	255	1.50	1200	35	1200	1600	35	1.05	470	M733	45

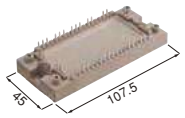
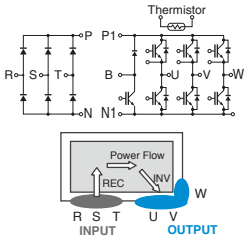
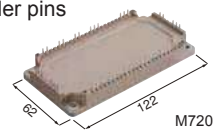
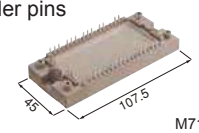
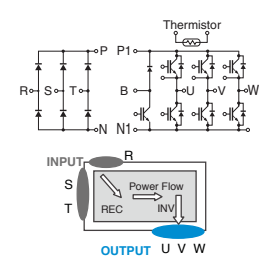
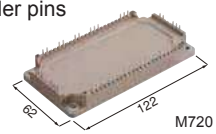
● : 新製品　New products

$V_{CE(sat)}$, V_{FM} : at T_j=25℃, Chip

IGBT モジュール PIM ＜X series＞

■ PIM（コンバータ部、ブレーキ部内蔵）EconoPIM™ 650V, 1200Vクラス

PIM/Built-in converter and brake EconoPIM™ 650, 1200 volts class

		Ic	650V X series	1200V X series
Solder pins  M719		25A		
		35A		7MBR35XMA120-50
		50A	7MBR50XMA065-50	7MBR50XMA120-50
		75A	7MBR75XMA065-50	7MBR75XME120-50
Solder pins  M720		50A		
		75A	7MBR75XNA065-50	7MBR75XNA120-50
		100A	7MBR100XNA065-50	7MBR100XNA120-50
		150A	7MBR150XNA065-50	7MBR150XNE120-50
Solder pins  M719		25A		
		35A		7MBR35XPA120-50
		50A	7MBR50XPA065-50	7MBR50XPA120-50
		75A	7MBR75XPA065-50	7MBR75XPE120-50
		100A	7MBR100XPE065-50	
Solder pins  M720		50A		
		75A		7MBR75XRA120-50
		100A	7MBR100XRA065-50	7MBR100XRA120-50
		150A	7MBR150XRA065-50	7MBR150XRE120-50

Dimension [mm]

型式 Device type	インバータ部 Inverter [IGBT]				ブレーキ部 Brake [IGBT+FWD]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		Grams
● 7MBR50XMA065-50	650	50	210	1.3	650	30	650	800	50	1.05	545	M719	200
● 7MBR75XMA065-50	650	75	270	1.3	650	50	650	800	75	1.25	545	M719	200
● 7MBR75XNA065-50	650	75	270	1.3	650	50	650	800	75	1.25	545	M720	310
● 7MBR100XNA065-50	650	100	330	1.3	650	50	650	800	100	1.1	770	M720	310
● 7MBR150XNA065-50	650	150	450	1.3	650	75	650	800	150	1.1	1260	M720	310
● 7MBR50XPA065-50	650	50	210	1.3	650	30	650	800	50	1.05	545	M719	200
● 7MBR75XPA065-50	650	75	270	1.3	650	50	650	800	75	1.25	545	M719	200
● 7MBR100XPE065-50	650	100	480	1.3	650	50	650	800	100	1.1	745	M719	200
● 7MBR100XRA065-50	650	100	330	1.3	650	50	650	800	100	1.1	770	M720	310
● 7MBR150XRA065-50	650	150	450	1.3	650	75	650	800	150	1.1	1260	M720	310
● 7MBR35XMA120-50	1200	35	200	1.5	1200	25	1200	1600	35	1.05	450	M719	200
● 7MBR50XMA120-50	1200	50	250	1.5	1200	35	1200	1600	50	1.05	690	M719	200
● 7MBR75XME120-50	1200	75	455	1.55	1200	35	1200	1600	75	1.15	690	M719	200
● 7MBR75XNA120-50	1200	75	335	1.5	1200	50	1200	1600	75	1.15	690	M720	310
● 7MBR100XNA120-50	1200	100	445	1.45	1200	75	1200	1600	100	1.05	970	M720	310
● 7MBR150XNE120-50	1200	150	880	1.5	1200	75	1200	1600	150	1.05	1650	M720	310
● 7MBR35XPA120-50	1200	35	200	1.5	1200	25	1200	1600	35	1.05	450	M719	200
● 7MBR50XPA120-50	1200	50	250	1.5	1200	35	1200	1600	50	1.05	690	M719	200
● 7MBR75XPE120-50	1200	75	455	1.55	1200	35	1200	1600	75	1.15	690	M719	200
● 7MBR75XRA120-50	1200	75	335	1.5	1200	50	1200	1600	75	1.15	690	M720	310
● 7MBR100XRA120-50	1200	100	445	1.45	1200	75	1200	1600	100	1.05	970	M720	310
● 7MBR150XRE120-50	1200	150	880	1.5	1200	75	1200	1600	150	1.05	1650	M720	310

●：新製品　New products

$V_{CE(sat)}$, V_{FM}: at T_j=25℃ , Chip

注: EconoPIM™はInfineon Technologies社の登録商標です。

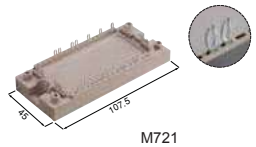
Note: EconoPIM™ is registered trademarks of Infineon Technologies AG, Germany.

IGBT モジュール PIM ＜X series＞

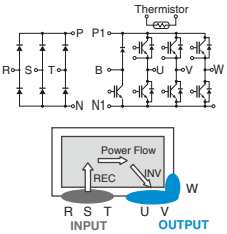
■ PIM（コンバータ部、ブレーキ部内蔵） EconoPIM™ 650V, 1200Vクラス

PIM/Built-in converter and brake EconoPIM™ 650, 1200 volts class

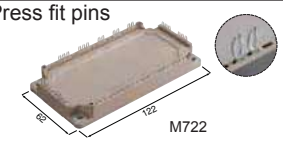
Press fit pins



M721

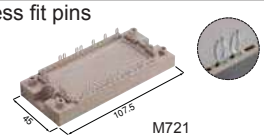


Press fit pins

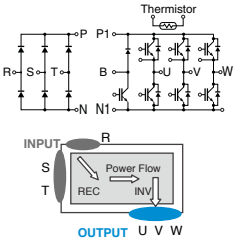


M722

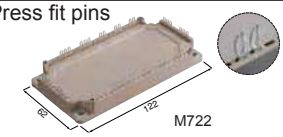
Press fit pins



M721



Press fit pins



M722

Ic	650V X series	1200V X series
25A		
35A		**7MBR35XWA120-50**
50A	**7MBR50XWA065-50**	**7MBR50XWA120-50**
75A	**7MBR75XWA065-50**	**7MBR75XWE120-50**
50A		
75A	**7MBR75XXA065-50**	**7MBR75XXA120-50**
100A	**7MBR100XXA065-50**	**7MBR100XXA120-50**
150A	**7MBR150XXA065-50**	**7MBR150XXE120-50**
25A		
35A		**7MBR35XYA120-50**
50A	**7MBR50XYA065-50**	**7MBR50XYA120-50**
75A	**7MBR75XYA065-50**	**7MBR75XYE120-50**
100A	**7MBR100XYE065-50**	
50A		
75A		**7MBR75XZA120-50**
100A	**7MBR100XZA065-50**	**7MBR100XZA120-50**
150A	**7MBR150XZA065-50**	**7MBR150XZE120-50**

Dimension [mm]

型式 Device type	インバータ部 Inverter [IGBT]				ブレーキ部 Brake [IGBT+FWD]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		Grams
○ **7MBR50XWA065-50**	650	50	210	1.3	650	30	650	800	50	1.05	545	M721	200
○ **7MBR75XWA065-50**	650	75	270	1.3	650	50	650	800	75	1.25	545	M721	200
○ **7MBR75XXA065-50**	650	75	270	1.3	650	50	650	800	75	1.25	545	M722	310
○ **7MBR100XXA065-50**	650	100	330	1.3	650	50	650	800	100	1.1	770	M722	310
○ **7MBR150XXA065-50**	650	150	450	1.3	650	75	650	800	150	1.1	1260	M722	310
○ **7MBR50XYA065-50**	650	50	210	1.3	650	30	650	800	50	1.05	545	M721	200
○ **7MBR75XYA065-50**	650	75	270	1.3	650	50	650	800	75	1.25	545	M721	200
○ **7MBR100XYE065-50**	650	100	480	1.3	650	50	650	800	100	1.1	745	M721	200
○ **7MBR100XZA065-50**	650	100	330	1.3	650	50	650	800	100	1.1	770	M722	310
○ **7MBR150XZA065-50**	650	150	450	1.3	650	75	650	800	150	1.1	1260	M722	310
○ **7MBR35XWA120-50**	1200	35	200	1.5	1200	25	1200	1600	35	1.05	450	M721	200
○ **7MBR50XWA120-50**	1200	50	250	1.5	1200	35	1200	1600	50	1.05	690	M721	200
○ **7MBR75XWE120-50**	1200	75	455	1.55	1200	35	1200	1600	75	1.15	690	M721	200
○ **7MBR75XXA120-50**	1200	75	335	1.5	1200	50	1200	1600	75	1.15	690	M722	310
○ **7MBR100XXA120-50**	1200	100	445	1.45	1200	75	1200	1600	100	1.05	970	M722	310
○ **7MBR150XXE120-50**	1200	150	880	1.5	1200	75	1200	1600	150	1.05	1650	M722	310
○ **7MBR35XYA120-50**	1200	35	200	1.5	1200	25	1200	1600	35	1.05	450	M721	200
○ **7MBR50XYA120-50**	1200	50	250	1.5	1200	35	1200	1600	50	1.05	690	M721	200
○ **7MBR75XYE120-50**	1200	75	455	1.55	1200	35	1200	1600	75	1.15	690	M721	200
○ **7MBR75XZA120-50**	1200	75	335	1.5	1200	50	1200	1600	75	1.15	690	M722	310
○ **7MBR100XZA120-50**	1200	100	445	1.45	1200	75	1200	1600	100	1.05	970	M722	310
○ **7MBR150XZE120-50**	1200	150	880	1.5	1200	75	1200	1600	150	1.05	1650	M722	310

○：開発中　Under development

$V_{CE(sat)}$, V_{FM}: at T_j=25℃ , Chip

注：EconoPIM ™は Infineon Technologies 社の登録商標です。

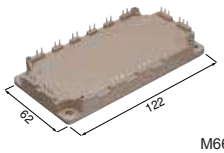
Note: EconoPIM™ is registered trademarks of Infineon Technologies AG, Germany.

IGBT モジュール 6-Pack ＜X series＞

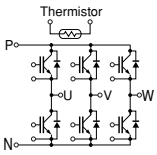
■6個組　EconoPACK™　1200Vクラス

6-Pack EconoPACK™ 1200 volts class

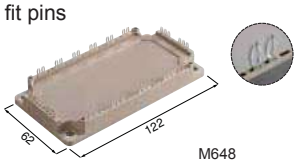
Solder pins



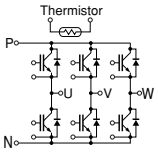
M668



Press fit pins



M648



Ic	1200V X series
100A	**6MBI100XBA120-50**
150A	**6MBI150XBA120-50**
200A	**6MBI200XBA120-50**
	6MBI200XBE120-50
100A	**6MBI100XXA120-50**
150A	**6MBI150XXA120-50**
200A	**6MBI200XXA120-50**
	6MBI200XXE120-50

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
● **6MBI100XBA120-50**	1200	±20	100	445	1.45	100	TBD	TBD	TBD	M668	300
● **6MBI150XBA120-50**	1200	±20	150	625	1.45	150	TBD	TBD	TBD	M668	300
● **6MBI200XBA120-50**	1200	±20	TBD	750	1.55	200	TBD	TBD	TBD	M668	300
● **6MBI200XBE120-50**	1200	±20	TBD	1000	1.55	200	TBD	TBD	TBD	M668	300
● **6MBI100XXA120-50**	1200	±20	100	445	1.45	100	TBD	TBD	TBD	M648	300
● **6MBI150XXA120-50**	1200	±20	150	625	1.45	150	TBD	TBD	TBD	M648	300
● **6MBI200XXA120-50**	1200	±20	TBD	750	1.55	200	TBD	TBD	TBD	M648	300
● **6MBI200XXE120-50**	1200	±20	TBD	1000	1.55	200	TBD	TBD	TBD	M648	300

●：新製品　New products

$V_{CE(sat)}$: at T_j=25℃, Chip

注: EconoPACK™はInfineon Technologies社の登録商標です。
6MBI200XBE120-50、6MBI200XXE120-50は低熱抵抗パッケージ適用

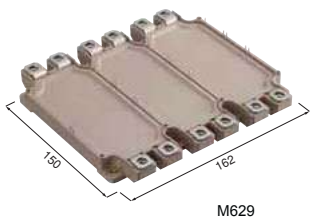
Note: EconoPACK™ is registered trademarks of Infineon Technologies AG, Germany.
6MBI200XBE120-50、6MBI200XXE120-50; Premium type (Low Thermal Impedance Version)

IGBT モジュール 6-Pack ＜X series＞

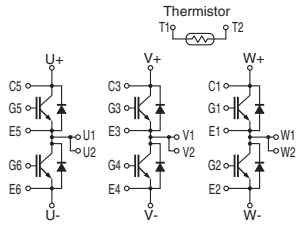
■6個組　EconoPACK™+　1200V, 1700Vクラス

6-Pack EconoPACK™+ 1200, 1700 volts class

Solder pins, High power 6-pack



M629



Ic	1200V X series	1700V X series
225A	**6MBI225XNA120-50**	**6MBI225XNA170-50**
300A	**6MBI300XNA120-50**	**6MBI300XNA170-50**
450A	**6MBI450XNA120-50**	**6MBI450XNA170-50**
600A	**6MBI600XNA120-50**	**6MBI600XNA170-50**

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time $t_{d(on)}$ Typ. μsec.	$t_{d(off)}$ Typ. μsec.	t_f Typ. μsec.	パッケージ Package	質量 Net mass Grams
○ **6MBI225XNA120-50**	1200	±20	225	TBD	TBD	225	TBD	TBD	TBD	M629	TBD
○ **6MBI300XNA120-50**	1200	±20	300	TBD	TBD	300	TBD	TBD	TBD	M629	TBD
○ **6MBI450XNA120-50**	1200	±20	450	TBD	TBD	450	TBD	TBD	TBD	M629	TBD
○ **6MBI600XNA120-50**	1200	±20	600	TBD	TBD	600	TBD	TBD	TBD	M629	TBD
○ **6MBI225XNA170-50**	1700	±20	225	TBD	TBD	225	TBD	TBD	TBD	M629	TBD
○ **6MBI300XNA170-50**	1700	±20	300	TBD	TBD	300	TBD	TBD	TBD	M629	TBD
○ **6MBI450XNA170-50**	1700	±20	450	TBD	TBD	450	TBD	TBD	TBD	M629	TBD
○ **6MBI600XNA170-50**	1700	±20	600	TBD	TBD	600	TBD	TBD	TBD	M629	TBD

○:開発中　Under development

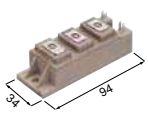
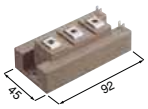
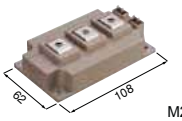
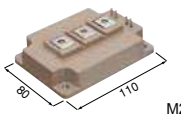
$V_{CE(sat)}$: at T_j=25℃, Chip

注: EconoPACK™+はInfineon Technologies社の登録商標です。

Note: EconoPACK™+ is registered trademarks of Infineon Technologies AG, Germany.

IGBT モジュール 2-Pack ＜X series＞

■2個組 650V, 1200V, 1700Vクラス Standard 2-Pack 650, 1200, 1700 volts class

	Ic	650V X series	1200V X series	1700V X series
 M263	75A			2MBI75XAA170-50
	100A		2MBI100XAA120-50	2MBI100XAA170-50
	150A	2MBI150XAA065-50	2MBI150XAA120-50	2MBI150XAA170-50
	200A	2MBI200XAA065-50	2MBI200XAA120-50	
 M274	150A			
	200A		2MBI200XBE120-50	
	300A	2MBI300XBE065-50	2MBI300XBE120-50	
	400A	2MBI400XBE065-50		
 M275	300A			
	400A	2MBI400XDE065-50	2MBI400XDE120-50	
	600A	2MBI600XDE065-50	2MBI600XDE120-50	
 M276	150A			2MBI150XHA170-50
	200A			2MBI200XHA170-50
	300A		2MBI300XHA120-50	2MBI300XHA170-50
	400A			2MBI400XHA170-50
	450A		2MBI450XHA120-50	
	600A		2MBI600XHA120-50	
 M277	300A			2MBI300XEE170-50
	400A			2MBI400XEE170-50
	450A		2MBI450XEE120-50	
	600A	2MBI600XEE065-50	2MBI600XEE120-50	2MBI600XEE170-50

Dimension [mm]

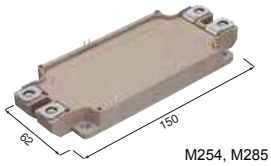
型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time $t_{d(on)}$ Typ. µsec.	$t_{d(off)}$ Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
○ 2MBI150XAA065-50	650	±20	150	TBD	TBD	150	TBD	TBD	TBD	M263	TBD
○ 2MBI200XAA065-50	650	±20	200	TBD	TBD	200	TBD	TBD	TBD	M263	TBD
○ 2MBI300XBE065-50	650	±20	300	TBD	TBD	300	TBD	TBD	TBD	M274	TBD
○ 2MBI400XBE065-50	650	±20	400	TBD	TBD	400	TBD	TBD	TBD	M274	TBD
○ 2MBI400XDE065-50	650	±20	400	TBD	TBD	400	TBD	TBD	TBD	M275	TBD
○ 2MBI600XDE065-50	650	±20	600	TBD	TBD	600	TBD	TBD	TBD	M275	TBD
○ 2MBI600XEE065-50	650	±20	600	TBD	TBD	600	TBD	TBD	TBD	M277	TBD
○ 2MBI100XAA120-50	1200	±20	100	TBD	TBD	100	TBD	TBD	TBD	M263	TBD
○ 2MBI150XAA120-50	1200	±20	150	TBD	TBD	150	TBD	TBD	TBD	M263	TBD
○ 2MBI200XAA120-50	1200	±20	200	TBD	TBD	200	TBD	TBD	TBD	M263	TBD
○ 2MBI200XBE120-50	1200	±20	200	TBD	TBD	200	TBD	TBD	TBD	M274	TBD
○ 2MBI300XBE120-50	1200	±20	300	TBD	TBD	300	TBD	TBD	TBD	M274	TBD
○ 2MBI400XDE120-50	1200	±20	400	TBD	TBD	400	TBD	TBD	TBD	M275	TBD
○ 2MBI600XDE120-50	1200	±20	600	TBD	TBD	600	TBD	TBD	TBD	M275	TBD
○ 2MBI300XHA120-50	1200	±20	300	TBD	TBD	300	TBD	TBD	TBD	M276	TBD
○ 2MBI450XHA120-50	1200	±20	450	TBD	TBD	450	TBD	TBD	TBD	M276	TBD
○ 2MBI600XHA120-50	1200	±20	600	TBD	TBD	600	TBD	TBD	TBD	M276	TBD
○ 2MBI450XEE120-50	1200	±20	450	TBD	TBD	450	TBD	TBD	TBD	M277	TBD
○ 2MBI600XEE120-50	1200	±20	600	TBD	TBD	600	TBD	TBD	TBD	M277	TBD
○ 2MBI75XAA170-50	1700	±20	75	TBD	TBD	75	TBD	TBD	TBD	M263	TBD
○ 2MBI100XAA170-50	1700	±20	100	TBD	TBD	100	TBD	TBD	TBD	M263	TBD
○ 2MBI150XAA170-50	1700	±20	150	TBD	TBD	150	TBD	TBD	TBD	M263	TBD
○ 2MBI150XHA170-50	1700	±20	150	TBD	TBD	150	TBD	TBD	TBD	M276	TBD
○ 2MBI200XHA170-50	1700	±20	200	TBD	TBD	200	TBD	TBD	TBD	M276	TBD
○ 2MBI300XHA170-50	1700	±20	300	TBD	TBD	300	TBD	TBD	TBD	M276	TBD
○ 2MBI400XHA170-50	1700	±20	400	TBD	TBD	400	TBD	TBD	TBD	M276	TBD
○ 2MBI300XEE170-50	1700	±20	300	TBD	TBD	300	TBD	TBD	TBD	M277	TBD
○ 2MBI400XEE170-50	1700	±20	400	TBD	TBD	400	TBD	TBD	TBD	M277	TBD
○ 2MBI600XEE170-50	1700	±20	600	TBD	TBD	600	TBD	TBD	TBD	M277	TBD

○：開発中 Under development

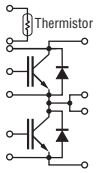
IGBT モジュール 2-Pack ＜X series＞

■2個組　1200V, 1700Vクラス　Standard 2-Pack 1200, 1700 volts class

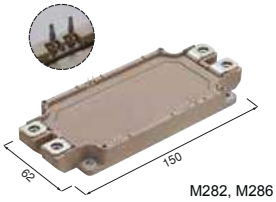
Solder pins



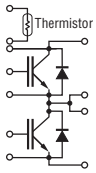
M254, M285



Press fit pins



M282, M286



Ic	1200V X series	1700V X series
225A	**2MBI225XNA120-50**	**2MBI225XNA170-50**
300A	**2MBI300XNA120-50**	**2MBI300XNA170-50**
450A	**2MBI450XNA120-50**	**2MBI450XNA170-50**
600A	**2MBI600XNE120-50**	**2MBI600XNE170-50**
800A	**2MBI800XNE120-50**	
225A	**2MBI225XNB120-50**	**2MBI225XNB170-50**
300A	**2MBI300XNB120-50**	**2MBI300XNB170-50**
450A	**2MBI450XNB120-50**	**2MBI450XNB170-50**
600A	**2MBI600XNF120-50**	**2MBI600XNF170-50**
800A	**2MBI800XNF120-50**	

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time $t_{d(on)}$ Typ. µsec.	$t_{d(off)}$ Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
○ **2MBI225XNA120-50**	1200	±20	225	TBD	TBD	225	TBD	TBD	TBD	M254	350
○ **2MBI300XNA120-50**	1200	±20	300	TBD	TBD	300	TBD	TBD	TBD	M254	350
○ **2MBI450XNA120-50**	1200	±20	450	TBD	TBD	450	TBD	TBD	TBD	M254	350
○ **2MBI600XNE120-50**	1200	±20	600	TBD	TBD	600	TBD	TBD	TBD	M285	350
○ **2MBI800XNE120-50**	1200	±20	800	TBD	TBD	800	TBD	TBD	TBD	M285	350
○ **2MBI225XNB120-50**	1200	±20	225	TBD	TBD	225	TBD	TBD	TBD	M282	350
○ **2MBI300XNB120-50**	1200	±20	300	TBD	TBD	300	TBD	TBD	TBD	M282	350
○ **2MBI450XNB120-50**	1200	±20	450	TBD	TBD	450	TBD	TBD	TBD	M282	350
○ **2MBI600XNF120-50**	1200	±20	600	TBD	TBD	600	TBD	TBD	TBD	M286	350
○ **2MBI800XNF120-50**	1200	±20	800	TBD	TBD	800	TBD	TBD	TBD	M286	350
○ **2MBI225XNA170-50**	1700	±20	225	TBD	TBD	225	TBD	TBD	TBD	M254	350
○ **2MBI300XNA170-50**	1700	±20	300	TBD	TBD	300	TBD	TBD	TBD	M254	350
○ **2MBI450XNA170-50**	1700	±20	450	TBD	TBD	450	TBD	TBD	TBD	M254	350
○ **2MBI600XNE170-50**	1700	±20	600	TBD	TBD	600	TBD	TBD	TBD	M285	350
○ **2MBI225XNB170-50**	1700	±20	225	TBD	TBD	225	TBD	TBD	TBD	M282	350
○ **2MBI300XNB170-50**	1700	±20	300	TBD	TBD	300	TBD	TBD	TBD	M282	350
○ **2MBI450XNB170-50**	1700	±20	450	TBD	TBD	450	TBD	TBD	TBD	M282	350
○ **2MBI600XNF170-50**	1700	±20	600	TBD	TBD	600	TBD	TBD	TBD	M286	350

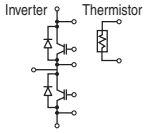
○：開発中　Under development

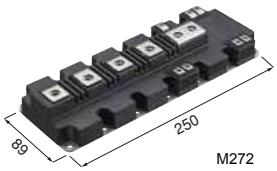
$V_{CE(sat)}$: at T_j=25°C, Chip

IGBT モジュール 2-Pack ＜X series＞

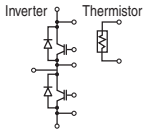
■PrimePACK™ 1200V, 1700Vクラス　PrimePACK™ 1200, 1700 volts class

M271





M272



Ic	1200V X series Low switching loss	1200V X series Soft turn off	1700V X series Low switching loss	1700V X series Soft turn off
650A			**2MBI650XXA170E-50**	
900A	**2MBI900XXA120E-50**	**2MBI900XXA120P-50**		
1200A	**2MBI1200XXE120E-50**	**2MBI1200XXE120P-50**		**2MBI1200XXE170P-50**
1000A			**2MBI1000XXB170E-50**	
1400A		**2MBI1400XXB120P-50**		**2MBI1400XXB170P-50**
1800A		**2MBI1800XXF120P-50**		**2MBI1800XXF170P-50**

Dimension [mm]

型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time $t_{d(on)}$ Typ. μsec.	$t_{d(off)}$ Typ. μsec.	t_f Typ. μsec.	パッケージ Package	質量 Net mass Grams
○ **2MBI900XXA120E-50**	1200	±20	900	TBD	TBD	900	TBD	TBD	TBD	M271	850
○ **2MBI900XXA120P-50**	1200	±20	900	TBD	TBD	900	TBD	TBD	TBD	M271	850
○ **2MBI1200XXE120E-50**	1200	±20	1200	TBD	TBD	1200	TBD	TBD	TBD	M271	850
○ **2MBI1200XXE120P-50**	1200	±20	1200	TBD	TBD	1200	TBD	TBD	TBD	M271	850
○ **2MBI1400XXB120P-50**	1200	±20	1400	TBD	TBD	1400	TBD	TBD	TBD	M272	1250
○ **2MBI1800XXF120P-50**	1200	±20	1800	TBD	TBD	1800	TBD	TBD	TBD	M272	1250
○ **2MBI650XXA170E-50**	1700	±20	650	TBD	TBD	650	TBD	TBD	TBD	M271	850
○ **2MBI1200XXE170P-50**	1700	±20	1200	TBD	TBD	1200	TBD	TBD	TBD	M271	850
○ **2MBI1000XXB170E-50**	1700	±20	1000	TBD	TBD	1000	TBD	TBD	TBD	M272	1250
○ **2MBI1400XXB170P-50**	1700	±20	1400	TBD	TBD	1400	TBD	TBD	TBD	M272	1250
○ **2MBI1800XXF170P-50**	1700	±20	1800	TBD	TBD	1800	TBD	TBD	TBD	M272	1250

○:開発中　Under development

$V_{CE(sat)}$: at T_j=25°C, Chip

注: PrimePACK™はInfineon Technologies社の登録商標です。
Note: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.

IGBT モジュール IPM ＜X series＞

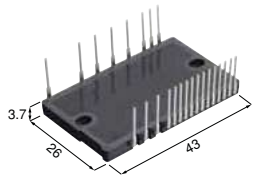
■小容量IPM（Intelligent Power Module）600Vクラス

Small IPM (Intelligent Power Module) 600 volts class

Built-in protection functions

P-side fault status output (Alarm)
N-side fault status output (Alarm)
Under voltage protection (self shutdown)
Over current protection (External current detection and shutdown)
Overheating protection (self shutdown)
Temperature sensor output (Vtemp, out)

Small IPM with High Voltage Driver-IC
without Brake-Chopper



P633A

						Ic	600V X series
✓		✓	✓	✓		15A	**6MBP15XSD060-50**
						20A	**6MBP20XSD060-50**
						30A	**6MBP30XSD060-50**
						35A	**6MBP35XSD060-50**
✓	✓	✓	✓	✓		15A	**6MBP15XSF060-50**
						20A	**6MBP20XSF060-50**
						30A	**6MBP30XSF060-50**
						35A	**6MBP35XSF060-50**

Dimension [mm]

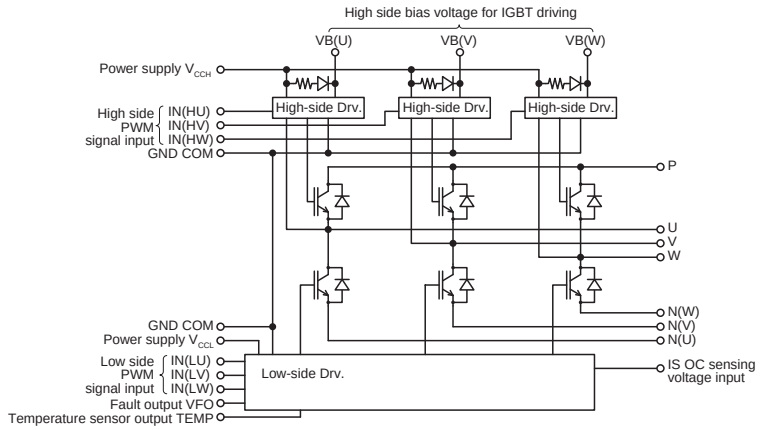
型式 Device type	インバータ部 Inverter			制御部 Control									パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	$V_{CE(sat)}$ Typ. Volts	V_{CCL} V_{CCH} VB Typ. Volts	Boot-strap Diode	Input signal Acive logic and Voltage level	保護機能 Protection function UV V_{CCL} V_{CCH} VB	OC ※1	Vtemp ※2	TOH ※2	Alarm出力 VFO fault output			
● **6MBP15XSD060-50**	600	15	1.60	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	-	N-side(UV,OC)		P633A	9.3
● **6MBP20XSD060-50**	600	20	1.60	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	-	N-side(UV,OC)		P633A	9.3
● **6MBP30XSD060-50**	600	30	1.60	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	-	N-side(UV,OC)		P633A	9.3
● **6MBP35XSD060-50**	600	35	1.40	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	-	N-side(UV,OC)		P633A	9.3
● **6MBP15XSF060-50**	600	15	1.60	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	N-side(143±7℃)	N-side(UV,OC,TOH)		P633A	9.3
● **6MBP20XSF060-50**	600	20	1.60	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	N-side(143±7℃)	N-side(UV,OC,TOH)		P633A	9.3
● **6MBP30XSF060-50**	600	30	1.60	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	N-side(143±7℃)	N-side(UV,OC,TOH)		P633A	9.3
● **6MBP35XSF060-50**	600	35	1.40	15	Built-in	High(3.3/5V)	P&N-side	N-side	N-side	N-side(143±7℃)	N-side(UV,OC,TOH)		P633A	9.3

●:新製品　New Products

※1 外部電流検出方式
※1 External current ditection

※2 LVIC内での温度検出
※2 Temperature detection in LVIC

●ブロック図　Block Diagram



IGBT モジュール
IGBT Module

富士電機の IGBT モジュールはモータの可変速駆動装置や無停電電源装置等の電力変換器のスイッチング素子として開発されてきました。IGBT はパワー MOSFET の高速スイッチング性能とバイポーラトランジスタの高電圧・大電流処理能力とを合わせ持った半導体素子です。

Fuji Electric has been developing IGBT modules designed to be used as switching elements for power converters of variable-speed drives for motors, uninterruptable power supplies, and more. IGBT has superior characteristics combining the high-speed switching performance of a power MOSFET with the high-voltage/high-current handling capabilities of a bipolar transistor.

■ IGBTモジュール Vシリーズの特長

●パッケージ小型化と出力のパワー UP を実現！
・高性能、低損失な第 6 世代 V シリーズ IGBT チップ・FWD を使用
・Tj max175℃、連続動作保証 150℃
●環境に優しいモジュール
・豊富な組立性、ハンダレス組立への対応
・RoHS 対応（一部非対応）
●ターンオン特性
・ノイズー損失トレードオフの改善
・dv/dt, dic/dt 低減によるノイズ・振動の抑制
●ターンオフ特性
・ソフトスイッチング特性・ターンオフ振動の抑制

Features of the IGBT Module V Series

- **A compact design allows for greater power output**
  - High performance 6th-generation V series IGBT/FWD chipset
  - T_j(max.)=175°C, $T_{j(op)}$=150°C
- **Environmentally friendly modules**
  - Easy assemblage, solder free options
  - RoHS compliant (Some parts are Non RoHS.)
- **Turn-on switching characteristics**
  - Improved noise-loss trade-off
  - Reduced turn-on dv/dt, excellent turn-on dic/dt
- **Turn-off switching characteristic**
  - Soft switching behavior, turn-off oscillation free

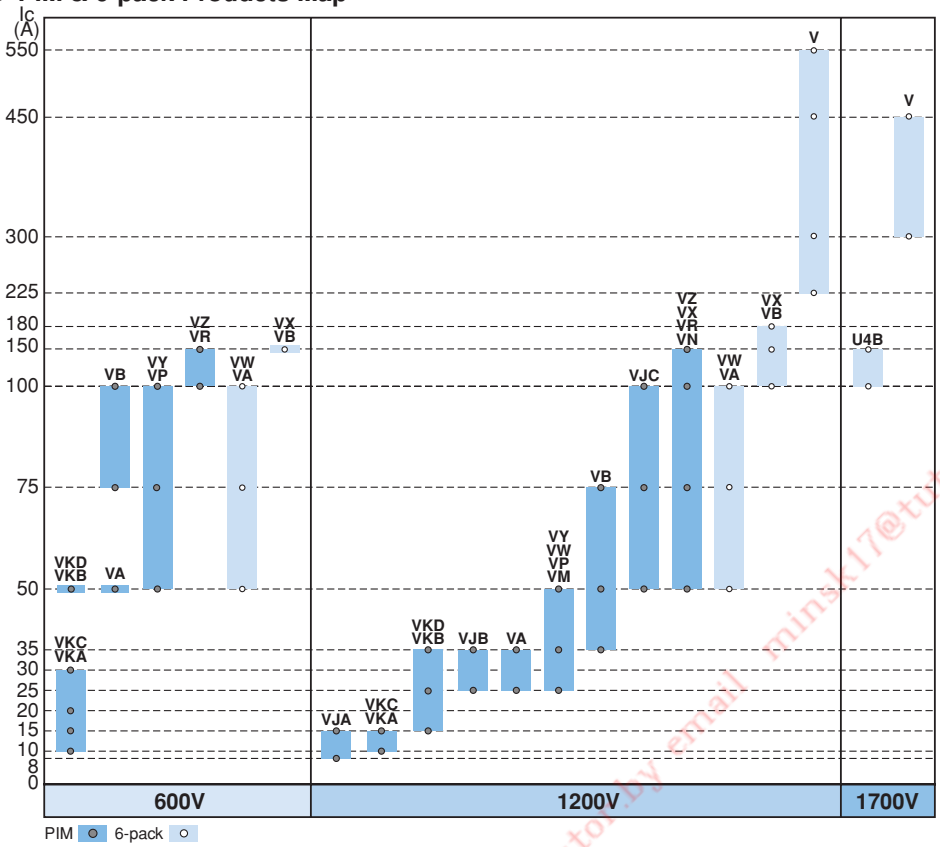
■製品系列　Product lineup

Number of IGBT Switches	Products Category	Page	Internal Configuration: IGBT Module: Standard Module	Internal Configuration: IGBT Module: Power Integrated Module	Internal Configuration: IGBT Module: Intelligent Power Module	Internal Configuration: Discrete IGBT	Max V_{CE}: 600V	Max V_{CE}: 1200V	Max V_{CE}: 1700V	Max V_{CE}: 3300V	Rated Current: ≤50A	Rated Current: >50A ≤150A	Rated Current: >150A ≤300A	Rated Current: >300A ≤600A	Rated Current: >600A ≤1200A	Rated Current: >1200A
1	**Standard 1-pack**	32	✓					✓	✓					✓	✓	
	Chopper	34	✓				✓	✓			✓	✓	✓			
2	**Standard 2-pack**	28	✓				✓	✓	✓			✓	✓	✓		
		29						✓	✓				✓	✓		
1,2	**High Speed Module**	36	✓					✓				✓	✓	✓		
	High Power Module	30,33	✓					✓	✓	✓				✓	✓	✓
	PrimePACK™	31,35	✓					✓	✓					✓	✓	✓
6	**6-pack**	25						✓				✓				
		26	✓				✓	✓	✓		✓	✓				
		27						✓	✓				✓	✓		
4,12	**AT-NPC 3 level**	37	Reverse-Blocking IGBTs are integrated.				✓	✓	✓		✓	✓	✓	✓	✓	
1	**Discrete RB-IGBT**	42				✓	✓					✓				
7	**PIM**	21					✓	✓			✓					
		22		✓				✓			✓	✓				
		23					✓	✓			✓	✓				
6,7	**IPM**	39					✓	✓			✓	✓	✓	✓		
1	**Discrete IGBT**	42				✓	✓	✓			✓	✓				
2	**IPM for EV/HEV**	45			✓			✓						✓		
6	**6-pack for EV/HEV**	45	✓				✓							✓	✓	

注: PrimePACK™はInfineon Technologies社の登録商標です。
Note: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.

■ 製品系列マップ　Products Map ＜V series＞

● PIM & 6-pack Products Map



Power Integrated Module

7MBR Ic – Vces

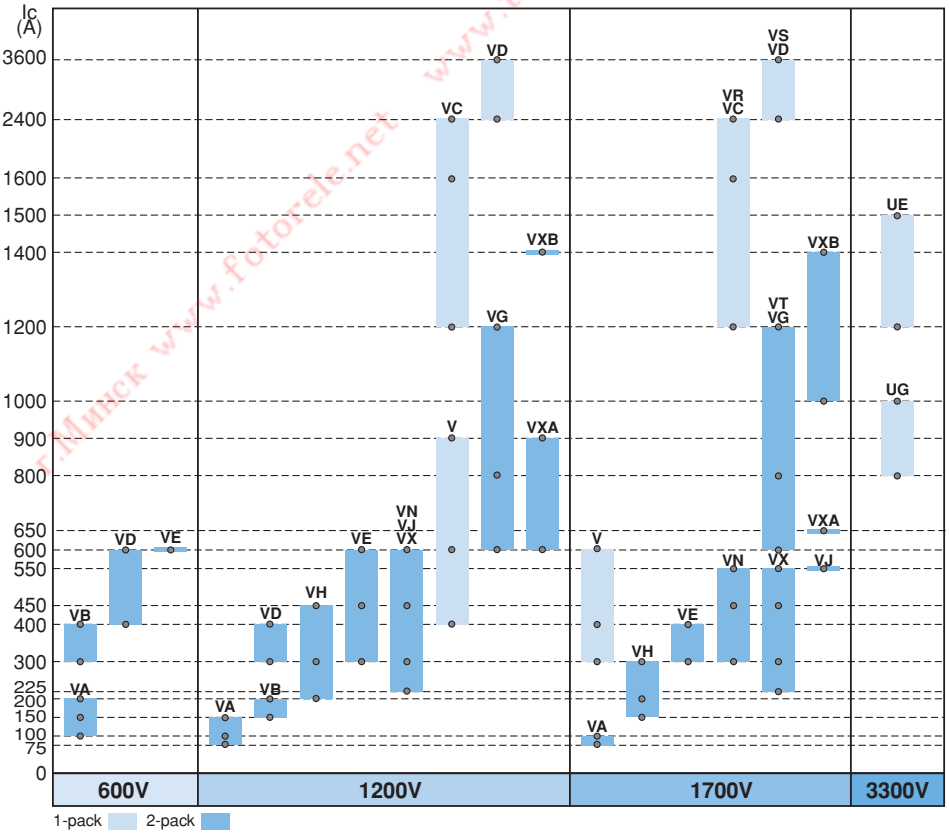
IGBT series & Package type	
VJA	40 × 42 mm
VJB	52 × 59 mm
VJC	59 × 82 mm
VKA, VKC	33.8 × 62.8 mm
VKB, VKD	56.7 × 62.8 mm
VA, VM, VP, VW, VY	45 × 107.5 mm
VB, VN, VR, VX, VZ	62 × 122 mm

6-pack

6MBI Ic – Vces

IGBT series & Package type	
VA, VW	45 × 107.5 mm
VB, VX, U4B	62 × 122 mm
V	150 × 162 mm

● 1-pack / 2-pack Products Map



1-pack

1MBI Ic – Vces

IGBT series & Package type		
V	62×108 mm	Standard Pack
VC, VR, UG	140×130 mm	High Power Module
VD, VS, UE	140×190 mm	

2-pack

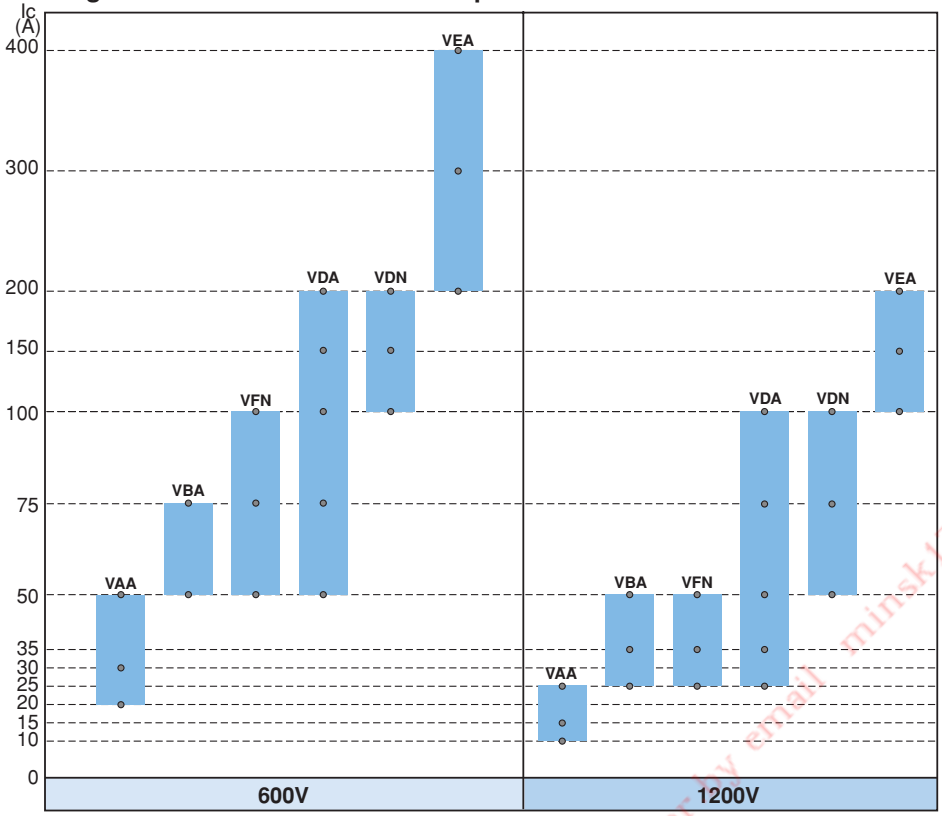
2MBI Ic – Vces

IGBT series & Package type		
VA	34 × 94 mm	Standard Pack
VB	45 × 92 mm	
VD	62×108 mm	
VE	80×110 mm	
VH	62×108 mm	
VJ, VN, VX	62×150 mm	
VG, VT	140×130 mm	High Power Module
VXA	89×172 mm	PrimePACK™
VXB	89×250 mm	

PrimePACK™はInfineon Technologies 社の登録商標です。
PrimePACK™ is registered trademark of Infineon Technologies AG, Germany

■ 製品系列マップ　Products Map ＜V series＞

● Intelligent Power Module Products Map



6/7MBP Ic | IGBT series & Package type | – Vces

		7 in 1	6 in 1
VAA	49.5 × 70 mm	–	○
VBA	50.2 × 87 mm	–	○
VDA, VDN	84 × 128.5 mm	○	○
VEA	110 × 142 mm	○	○
VFN*	55 × 90 mm	○	○

Thermal impedance of VDN type is lower than VDA type.

■ 型式の見方　Part numbers

2MBI300VH-120-50 (example)

2	MB	I	300	V	H	120	50
IGBT スイッチ数 Number of IGBT Switches	IGBT モジュール IGBT Module	内部構成 Internal Configuration	定格電流 Rated Current	IGBT デバイス IGBT Device Technology	パッケージ Package Type	最大電圧 Max. VCE	RoHS Compliant
		I: Standard Modules	× 1	V: V series (6th Generation)	See the Products Map on the next pages	060: 600V	None, 01 to 49 Non RoHS Compliant
		R: Power Integrated Modules		U: U series (5th Generation)		120: 1200V	50 to 99 RoHS Compliant
		P: Intelligent Power Modules				170: 1700V	
						330: 3300V	

■ 記号　Letter symbols

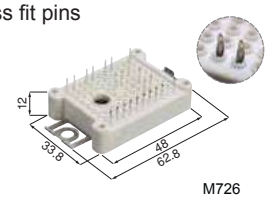
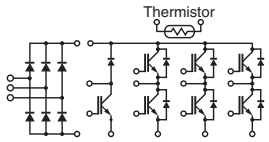
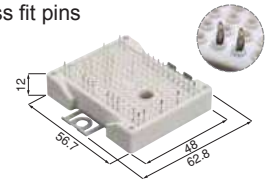
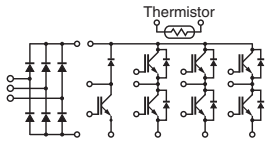
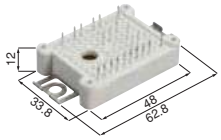
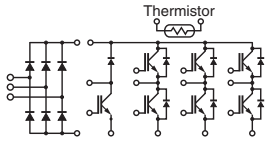
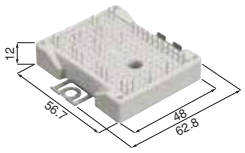
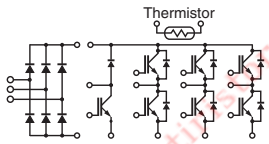
記号　Letter symbols

V_{CES}:	コレクタ・エミッタ間電圧	Collector-to-emitter rated voltage (Gate-to-emitter short-circuited)	$V_{CE(sat)}$:	コレクタ・エミッタ飽和電圧	Collector-to-emitter saturation voltage
V_{GES}:	ゲート・エミッタ間電圧	Gate-to-emitter rated voltage (Collector-to-emitter short-circuited)	t_{on}:	ターンオン時間	Turn-on time
			t_{off}:	ターンオフ時間	Turn-off time
I_C:	コレクタ電流	Rated collector current	t_f:	立下り時間	Fall time
P_C:	最大損失	Maximum power dissipation	$t_{d(on)}$:	ターンオン遅延時間	Turn-on time
			$t_{d(off)}$:	ターンオフ遅延時間	Turn-off time

IGBT モジュール PIM ＜V series＞

■小容量PIM（コンバータ部、ブレーキ部内蔵）600V, 1200Vクラス

Small PIM/Built-in converter and brake 600, 1200 volts class

	Ic	600V V series	1200V V series
Press fit pins  M726 	10A	**7MBR10VKA060-50**	**7MBR10VKA120-50**
	15A	**7MBR15VKA060-50**	**7MBR15VKA120-50**
	20A	**7MBR20VKA060-50**	
	30A	**7MBR30VKA060-50**	
Press fit pins  M727 	15A		**7MBR15VKB120-50**
	25A		**7MBR25VKB120-50**
	35A		**7MBR35VKB120-50**
	50A	**7MBR50VKB060-50**	
Solder pins  M728 	10A	**7MBR10VKC060-50**	**7MBR10VKC120-50**
	15A	**7MBR15VKC060-50**	**7MBR15VKC120-50**
	20A	**7MBR20VKC060-50**	
	30A	**7MBR30VKC060-50**	
Solder pins  M729 	15A		**7MBR15VKD120-50**
	25A		**7MBR25VKD120-50**
	35A		**7MBR35VKD120-50**
	50A	**7MBR50VKD060-50**	

Dimension [mm]

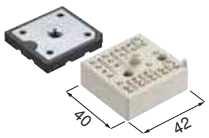
型式 Device type	インバータ部 Inverter [IGBT] V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	ブレーキ部 Brake [IGBT+FWD] V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	コンバータ部 Converter [Diode] V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.	パッケージ Package	質量 Net mass Grams
7MBR10VKA060-50	600	10	70	1.70	600	10	600	800	10	0.95	360	M726	25
7MBR15VKA060-50	600	15	85	1.75	600	15	600	800	15	1.00	360	M726	25
7MBR20VKA060-50	600	20	100	1.70	600	20	600	800	20	1.05	360	M726	25
7MBR30VKA060-50	600	30	125	1.70	600	30	600	800	30	1.15	360	M726	25
7MBR50VKB060-50	600	50	180	1.60	600	50	600	800	50	1.25	580	M727	45
7MBR10VKC060-50	600	10	70	1.70	600	10	600	800	10	0.95	360	M728	25
7MBR15VKC060-50	600	15	85	1.75	600	15	600	800	15	1.00	360	M728	25
7MBR20VKC060-50	600	20	100	1.70	600	20	600	800	20	1.05	360	M728	25
7MBR30VKC060-50	600	30	125	1.70	600	30	600	800	30	1.15	360	M728	25
7MBR50VKD060-50	600	50	180	1.60	600	50	600	800	50	1.25	580	M729	45
7MBR10VKA120-50	1200	10	110	1.85	1200	10	1200	1600	10	0.95	245	M726	25
7MBR15VKA120-50	1200	15	135	1.90	1200	15	1200	1600	15	1.00	245	M726	25
7MBR15VKB120-50	1200	15	135	1.90	1200	15	1200	1600	15	1.00	245	M727	45
7MBR25VKB120-50	1200	25	180	1.85	1200	25	1200	1600	25	1.00	370	M727	45
7MBR35VKB120-50	1200	35	215	1.85	1200	35	1200	1600	35	1.05	370	M727	45
7MBR10VKC120-50	1200	10	110	1.85	1200	10	1200	1600	10	0.95	245	M728	25
7MBR15VKC120-50	1200	15	135	1.90	1200	15	1200	1600	15	1.00	245	M728	25
7MBR15VKD120-50	1200	15	135	1.90	1200	15	1200	1600	15	1.00	245	M729	45
7MBR25VKD120-50	1200	25	180	1.85	1200	25	1200	1600	25	1.00	370	M729	45
7MBR35VKD120-50	1200	35	215	1.85	1200	35	1200	1600	35	1.05	370	M729	45

$V_{CE(sat)}$, V_{FM} : at T_j=25℃, Chip

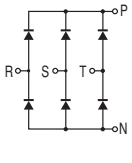
IGBT モジュール PIM ＜V series＞

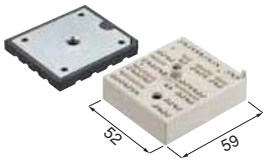
■MiniSKiiP®（コンバータ部、ブレーキ部内蔵）1200Vクラス

MiniSKiiP®/Built-in converter and brake 1200 volts class

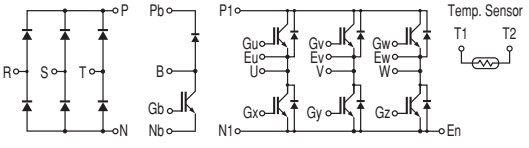


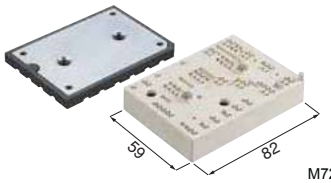
M723





M724





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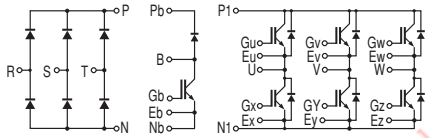


Ic	1200V V series
8A	**7MBR8VJA120-50**
	7MBR8VJA120-53
15A	**7MBR15VJA120-50**
	7MBR15VJA120-53
25A	**7MBR25VJB120-50**
	7MBR25VJB120-53
35A	**7MBR35VJB120-50**
	7MBR35VJB120-53
	7MBR35VJB120A-50
	7MBR35VJB120A-53
50A	**7MBR50VJC120-50**
	7MBR50VJC120-53
75A	**7MBR75VJC120-50**
	7MBR75VJC120-53
100A	**7MBR100VJC120-50**
	7MBR100VJC120-53

Dimension [mm]

型式 Device type	インバータ部 Inverter [IGBT]			ブレーキ部 Brake [IGBT+FWD]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		Grams
● **7MBR8VJA120-50**	1200	8	1.80	1200	8	1200	1600	8	1.00	220	M723	40
● **7MBR8VJA120-53**	1200	8	1.80	1200	8	1200	1600	8	1.00	220	M723	40
● **7MBR15VJA120-50**	1200	15	1.85	1200	15	1200	1600	15	1.10	220	M723	40
● **7MBR15VJA120-53**	1200	15	1.85	1200	15	1200	1600	15	1.10	220	M723	40
● **7MBR25VJB120-50**	1200	25	1.85	1200	25	1200	1600	25	1.10	370	M724	65
● **7MBR25VJB120-53**	1200	25	1.85	1200	25	1200	1600	25	1.10	370	M724	65
● **7MBR35VJB120-50**	1200	35	1.85	1200	35	1200	1600	35	1.20	370	M724	65
● **7MBR35VJB120-53**	1200	35	1.85	1200	35	1200	1600	35	1.20	370	M724	65
● **7MBR35VJB120A-50**	1200	35	1.85	1200	35	1200	1600	35	1.05	700	M724	65
● **7MBR35VJB120A-53**	1200	35	1.85	1200	35	1200	1600	35	1.05	700	M724	65
● **7MBR50VJC120-50**	1200	50	1.85	1200	50	1200	1600	50	1.10	700	M725	95
● **7MBR50VJC120-53**	1200	50	1.85	1200	50	1200	1600	50	1.10	700	M725	95
● **7MBR75VJC120-50**	1200	75	1.85	1200	75	1200	1600	75	1.25	700	M725	95
● **7MBR75VJC120-53**	1200	75	1.85	1200	75	1200	1600	75	1.25	700	M725	95
● **7MBR100VJC120-50**	1200	100	1.75	1200	100	1200	1600	100	1.15	1000	M725	95
● **7MBR100VJC120-53**	1200	100	1.75	1200	100	1200	1600	100	1.15	1000	M725	95

●：新製品　New Products

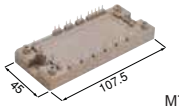
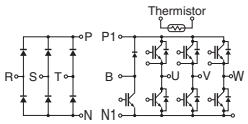
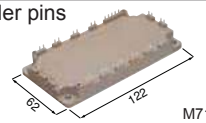
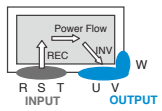
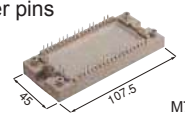
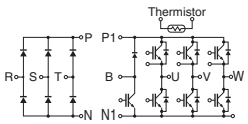
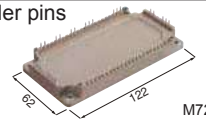
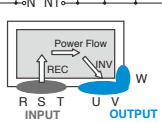
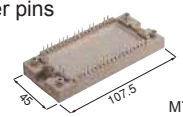
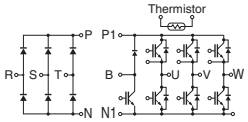
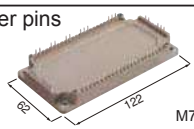
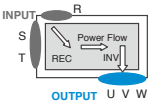
$V_{CE(sat)}$, V_{FM}: at T_j=25℃, Chip

注1：MiniSKiiP®はSEMIKRON INTERNATIONAL 社の登録商標です。
注2："-50"はStandard Lid使用タイプ、"-53"はSlim Lid使用タイプです。
Note1: MiniSKiiP® is a registered trademark of SEMIKRON INTERNATIONAL GmbH.
Note2: "-50" indicates Standard Lid types and "-53" indicates Slim Lid types.

IGBT モジュール PIM ＜V series＞

■ PIM（コンバータ部、ブレーキ部内蔵） EconoPIM™ 600V, 1200Vクラス

PIM/Built-in converter and brake EconoPIM™ 600, 1200 volts class

		Ic	600V V series	1200V V series
Solder pins  M711		25A		7MBR25VA120-50
		35A		7MBR35VA120-50
		50A	7MBR50VA060-50	
Solder pins  M712		35A		7MBR35VB120-50
		50A		7MBR50VB120-50
		75A	7MBR75VB060-50	7MBR75VB120-50
		100A	7MBR100VB060-50	
Solder pins  M719		25A		7MBR25VM120-50
		35A		7MBR35VM120-50
		50A		7MBR50VM120-50
Solder pins  M720		50A		7MBR50VN120-50
		75A		7MBR75VN120-50
		100A		7MBR100VN120-50
		150A		7MBR150VN120-50
Solder pins  M719		25A		7MBR25VP120-50
		35A		7MBR35VP120-50
		50A	7MBR50VP060-50	7MBR50VP120-50
		75A	7MBR75VP060-50	
		100A	7MBR100VP060-50	
Solder pins  M720		50A		7MBR50VR120-50
		75A		7MBR75VR120-50
		100A	7MBR100VR060-50	7MBR100VR120-50
		150A	7MBR150VR060-50	7MBR150VR120-50

Dimension [mm]

型式 Device type	インバータ部 Inverter [IGBT]				ブレーキ部 Brake [IGBT+FWD]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		Grams
7MBR50VA060-50	600	50	200	1.6	600	50	600	800	50	1.3	210	M711	180
7MBR75VB060-50	600	75	300	1.6	600	50	600	800	75	1.25	500	M712	300
7MBR100VB060-50	600	100	335	1.6	600	50	600	800	100	1.25	700	M712	300
7MBR50VP060-50	600	50	200	1.6	600	50	600	800	50	1.3	210	M719	200
7MBR75VP060-50	600	75	300	1.6	600	50	600	800	75	1.25	500	M719	200
7MBR100VP060-50	600	100	430	1.85	600	50	600	800	100	1.25	700	M719	200
7MBR100VR060-50	600	100	335	1.6	600	50	600	800	100	1.25	700	M720	310
7MBR150VR060-50	600	150	485	1.6	600	75	600	800	150	1.25	700	M720	310
7MBR25VA120-50	1200	25	170	1.85	1200	25	1200	1600	25	1.4	155	M711	180
7MBR35VA120-50	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M711	180
7MBR35VB120-50	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M712	300
7MBR50VB120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M712	300
7MBR75VB120-50	1200	75	385	1.85	1200	50	1200	1600	75	1.4	520	M712	300
7MBR25VM120-50	1200	25	170	1.85	1200	25	1200	1600	25	1.4	155	M719	200
7MBR35VM120-50	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M719	200
7MBR50VM120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M719	200
7MBR50VN120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M720	310
7MBR75VN120-50	1200	75	385	1.85	1200	50	1200	1600	75	1.4	520	M720	310
7MBR100VN120-50	1200	100	520	1.75	1200	75	1200	1600	100	1.5	520	M720	310
7MBR150VN120-50	1200	150	885	1.85	1200	100	1200	1600	150	1.4	780	M720	310
7MBR25VP120-50	1200	25	170	1.85	1200	25	1200	1600	25	1.4	155	M719	200
7MBR35VP120-50	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M719	200
7MBR50VP120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M719	200
7MBR50VR120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M720	310
7MBR75VR120-50	1200	75	385	1.85	1200	50	1200	1600	75	1.4	520	M720	310
7MBR100VR120-50	1200	100	520	1.75	1200	75	1200	1600	100	1.5	520	M720	310
7MBR150VR120-50	1200	150	885	1.85	1200	100	1200	1600	150	1.4	780	M720	310

注: EconoPIM™はInfineon Technologies社の登録商標です。
Note: EconoPIM™ is registered trademarks of Infineon Technologies AG, Germany.

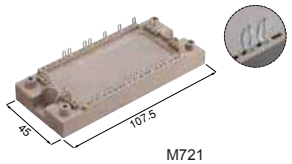
$V_{CE(sat)}$, V_{FM}: at Tj=25℃, Chip

IGBT モジュール PIM ＜V series＞

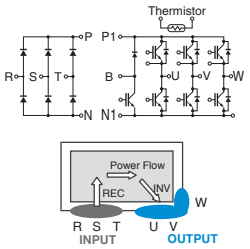
■ PIM（コンバータ部、ブレーキ部内蔵） EconoPIM™ 600V, 1200Vクラス

PIM/Built-in converter and brake EconoPIM™ 600, 1200 volts class

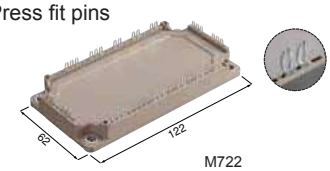
Press fit pins



M721

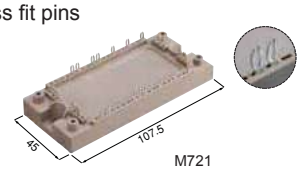


Press fit pins

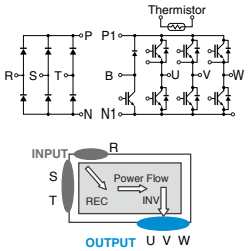


M722

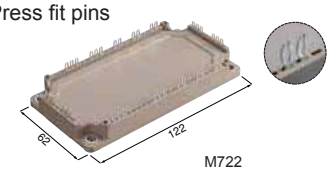
Press fit pins



M721



Press fit pins



M722

Ic	600V V series	1200V V series
25A		**7MBR25VW120-50**
35A		**7MBR35VW120-50**
50A		**7MBR50VW120-50**
50A		**7MBR50VX120-50**
75A		**7MBR75VX120-50**
100A		**7MBR100VX120-50**
150A		**7MBR150VX120-50**
25A		**7MBR25VY120-50**
35A		**7MBR35VY120-50**
50A	**7MBR50VY060-50**	**7MBR50VY120-50**
75A	**7MBR75VY060-50**	
100A	**7MBR100VY060-50**	
50A		**7MBR50VZ120-50**
75A		**7MBR75VZ120-50**
100A	**7MBR100VZ060-50**	**7MBR100VZ120-50**
150A	**7MBR150VZ060-50**	**7MBR150VZ120-50**

Dimension [mm]

型式 Device type	インバータ部 Inverter [IGBT]				ブレーキ部 Brake [IGBT+FWD]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		Grams
7MBR50VY060-50	600	50	215	1.6	600	50	600	800	50	1.3	210	M721	200
7MBR75VY060-50	600	75	300	1.6	600	50	600	800	75	1.25	500	M721	200
7MBR100VY060-50	600	100	430	1.85	600	50	600	800	100	1.25	700	M721	200
7MBR100VZ060-50	600	100	335	1.6	600	50	600	800	100	1.25	700	M722	310
7MBR150VZ060-50	600	150	485	1.6	600	75	600	800	150	1.25	700	M722	310
7MBR25VW120-50	1200	25	170	1.85	1200	25	1200	1600	25	1.4	155	M721	200
7MBR35VW120-50	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M721	200
7MBR50VW120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M721	200
7MBR50VX120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M722	310
7MBR75VX120-50	1200	75	385	1.85	1200	50	1200	1600	75	1.4	520	M722	310
7MBR100VX120-50	1200	100	520	1.75	1200	75	1200	1600	100	1.5	520	M722	310
7MBR150VX120-50	1200	150	885	1.85	1200	100	1200	1600	150	1.4	780	M722	310
7MBR25VY120-50	1200	25	170	1.85	1200	25	1200	1600	25	1.4	155	M721	200
7MBR35VY120-50	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M721	200
7MBR50VY120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M721	200
7MBR50VZ120-50	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M722	310
7MBR75VZ120-50	1200	75	385	1.85	1200	50	1200	1600	75	1.4	520	M722	310
7MBR100VZ120-50	1200	100	520	1.75	1200	75	1200	1600	100	1.5	520	M722	310
7MBR150VZ120-50	1200	150	885	1.85	1200	100	1200	1600	150	1.4	780	M722	310

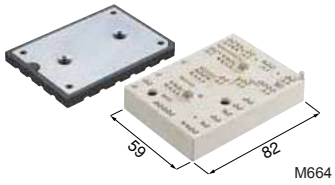
注: EconoPIM™はInfineon Technologies社の登録商標です。
Note: EconoPIM™ is registered trademarks of Infineon Technologies AG, Germany.

$V_{CE(sat)}$, V_{FM}: at T_j=25℃, Chip

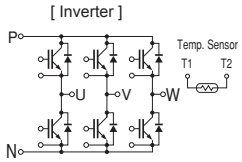
IGBT モジュール 6-Pack ＜V series＞

■6個組MiniSKiiP® 1200Vクラス

6-Pack, MiniSKiiP® 1200 volts class



M664



Ic	1200V V series
100A	**6MBI100VJC-120-50**
	6MBI100VJC-120-53
150A	**6MBI150VJC-120-50**
	6MBI150VJC-120-53
	6MBI150VJC-120-55
	6MBI150VJC-120-58

Dimension [mm]

型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
○ **6MBI100VJC-120-50**	1200	±20	100	310	1.75	100	0.44	0.43	0.05	M664	95
○ **6MBI100VJC-120-53**	1200	±20	100	310	1.75	100	0.44	0.43	0.05	M664	95
○ **6MBI150VJC-120-50**	1200	±20	150	450	1.85	150	0.45	0.43	0.06	M664	95
○ **6MBI150VJC-120-53**	1200	±20	150	450	1.85	150	0.45	0.43	0.06	M664	95
○ **6MBI150VJC-120-55**	1200	±20	150	710	1.85	150	0.45	0.43	0.06	M664	95
○ **6MBI150VJC-120-58**	1200	±20	150	710	1.85	150	0.45	0.43	0.06	M664	95

○：開発中　Under development

$V_{CE(sat)}$: at T_j=25℃, Chip

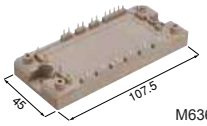
注1：MiniSKiiP®はSEMIKRON INTERNATIONAL 社の登録商標です。
注2：6MBI150VJC-120-55、6MBI150VJC-120-58は低熱抵抗パッケージ適用
注3："-50/-55"はStandard Lid使用タイプ、"-53/-58"はSlim Lid使用タイプです。
Note1: MiniSKiiP® is a resistered trademark of SEMIKRON INTERNATIONAL GmbH.
Note2: 6MBI150VJC-120-55, 6MBI150VJC-120-58; Premium type (Low Thermal Impedance Version)
Note3: "-50/-55" indicates Standard Lid types and "-53/-58" indicates Slim Lid types.

IGBT モジュール 6-Pack ＜V series / U series＞

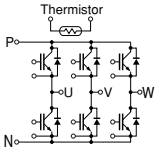
■6個組　EconoPACK™　600V, 1200V, 1700Vクラス

6-Pack EconoPACK™ 600, 1200, 1700 volts class

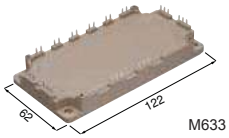
Solder pins



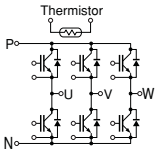
M636



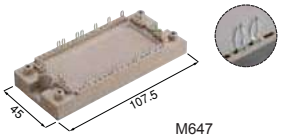
Solder pins



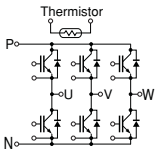
M633



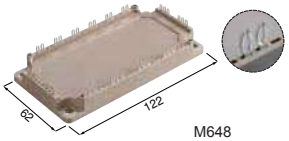
Press fit pins



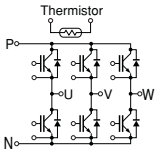
M647



Press fit pins



M648



Ic	600V V series	1200V V series	1700V V / U series
50A	**6MBI50VA-060-50**	**6MBI50VA-120-50**	
75A	**6MBI75VA-060-50**	**6MBI75VA-120-50**	
100A	**6MBI100VA-060-50**	**6MBI100VA-120-50**	
100A		**6MBI100VB-120-50**	**6MBI100U4B-170-50**
150A	**6MBI150VB-060-50**	**6MBI150VB-120-50**	**6MBI150U4B-170-50**
		6MBI180VB-120-50	
		6MBI180VB-120-55	
50A	**6MBI50VW-060-50**	**6MBI50VW-120-50**	
75A	**6MBI75VW-060-50**	**6MBI75VW-120-50**	
100A	**6MBI100VW-060-50**	**6MBI100VW-120-50**	
100A		**6MBI100VX-120-50**	**6MBI100VX-170-50**
150A	**6MBI150VX-060-50**	**6MBI150VX-120-50**	
		6MBI180VX-120-50	
		6MBI180VX-120-55	

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
6MBI50VA-060-50	600	±20	50	200	1.6	50	0.36	0.52	0.03	M636	180
6MBI75VA-060-50	600	±20	75	275	1.6	75	0.36	0.52	0.03	M636	180
6MBI100VA-060-50	600	±20	100	335	1.6	100	0.36	0.52	0.03	M636	180
6MBI150VB-060-50	600	±20	150	485	1.6	150	0.36	0.52	0.03	M633	300
6MBI50VW-060-50	600	±20	50	215	1.6	50	0.36	0.52	0.03	M647	200
6MBI75VW-060-50	600	±20	75	300	1.6	75	0.36	0.52	0.03	M647	200
6MBI100VW-060-50	600	±20	100	335	1.6	100	0.36	0.52	0.03	M647	200
6MBI150VX-060-50	600	±20	150	485	1.6	150	0.36	0.52	0.03	M648	300
6MBI50VA-120-50	1200	±20	50	280	1.85	50	0.39	0.53	0.06	M636	180
6MBI75VA-120-50	1200	±20	75	385	1.85	75	0.39	0.53	0.06	M636	180
6MBI100VA-120-50	1200	±20	100	520	1.75	100	0.39	0.53	0.06	M636	180
6MBI100VB-120-50	1200	±20	100	520	1.75	100	0.39	0.53	0.06	M633	300
6MBI150VB-120-50	1200	±20	150	770	1.75	150	0.39	0.53	0.06	M633	300
6MBI180VB-120-50	1200	±20	150	835	1.85	200	0.39	0.53	0.06	M633	300
6MBI180VB-120-55	1200	±20	150	1075	1.85	200	0.39	0.53	0.06	M633	300
6MBI50VW-120-50	1200	±20	50	280	1.85	50	0.39	0.53	0.06	M647	200
6MBI75VW-120-50	1200	±20	75	385	1.85	75	0.39	0.53	0.06	M647	200
6MBI100VW-120-50	1200	±20	100	520	1.75	100	0.39	0.53	0.06	M647	200
6MBI100VX-120-50	1200	±20	100	520	1.75	100	0.39	0.53	0.06	M648	300
6MBI150VX-120-50	1200	±20	150	770	1.75	150	0.39	0.53	0.06	M648	300
6MBI180VX-120-50	1200	±20	150	835	1.85	200	0.39	0.53	0.06	M648	300
6MBI180VX-120-55	1200	±20	150	1075	1.85	200	0.39	0.53	0.06	M648	300
6MBI100VX-170-50	1700	±20	100	665	2.00	100	0.63	0.70	0.10	M648	300
6MBI100U4B-170-50	1700	±20	100	520	2.25	100	0.62	0.55	0.09	M633	300
6MBI150U4B-170-50	1700	±20	150	735	2.25	150	0.62	0.55	0.09	M633	300

注: EconoPACK™はInfineon Technologies社の登録商標です。
6MBI180VB-120-55、6MBI180VX-120-55は低熱抵抗パッケージ適用
Note: EconoPACK™ is registered trademarks of Infineon Technologies AG, Germany.
6MBI180VB-120-55, 6MBI180VX-120-55; Premium type (Low Thermal Impedance Version)

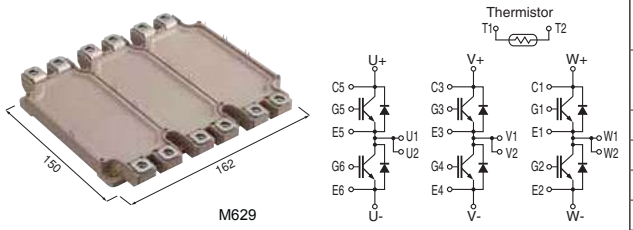
$V_{CE(sat)}$: at T_j=25℃, Chip

IGBT モジュール 6-Pack ＜V series＞

■6個組　EconoPACK™+　1200V, 1700Vクラス

6-Pack EconoPACK™+ 1200, 1700 volts class

High power 6-pack



Ic	1200V V series	1700V V series
225A	**6MBI225V-120-50**	
	6MBI225V-120-80	
300A	**6MBI300V-120-50**	**6MBI300V-170-50**
	6MBI300V-120-80	
450A	**6MBI450V-120-50**	**6MBI450V-170-50**
550A	**6MBI550V-120-50**	

Dimension [mm]

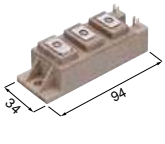
型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
6MBI225V-120-50	1200	±20	225	1070	1.85	225	0.55	1.05	0.11	M629	950
6MBI225V-120-80	1200	±20	225	1070	1.85	225	0.55	1.05	0.11	M629	950
6MBI300V-120-50	1200	±20	300	1600	1.75	300	0.55	1.05	0.11	M629	950
6MBI300V-120-80	1200	±20	300	1600	1.75	300	0.55	1.05	0.11	M629	950
6MBI450V-120-50	1200	±20	450	2250	1.75	450	0.55	1.05	0.11	M629	950
6MBI550V-120-50	1200	±20	550	2500	1.85	600	0.55	1.05	0.11	M629	950
6MBI300V-170-50	1700	±20	300	1665	2.00	300	0.90	1.30	0.10	M629	950
6MBI450V-170-50	1700	±20	450	2500	2.00	450	0.90	1.30	0.10	M629	950

注: EconoPACK™+はInfineon Technologies社の登録商標です。
　-80 : 高熱伝導体のTIM（Thermal-Interface-Material）をモジュールベース面に塗布。
Note: EconoPACK™+ is registered trademarks of Infineon Technologies AG, Germany.
　-80 : Pre-Applied Thermal-Interface-Material

$V_{CE(sat)}$: at T_j=25℃, Chip

IGBT モジュール 2-Pack ＜V series＞

■2個組　600V, 1200V, 1700Vクラス　Standard 2-Pack 600, 1200, 1700 volts class



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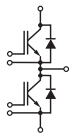

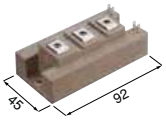

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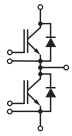

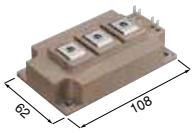

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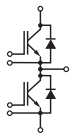

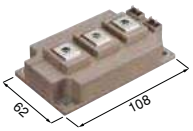

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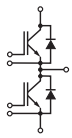
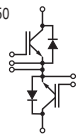
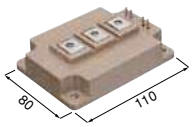


* 2MBI450VH-120F-50





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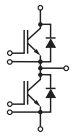


Ic	600V V series	1200V V series	1700V V series
75A		2MBI75VA-120-50	2MBI75VA-170-50
100A	2MBI100VA-060-50	2MBI100VA-120-50	2MBI100VA-170-50
150A	2MBI150VA-060-50	2MBI150VA-120-50	
200A	2MBI200VA-060-50		
150A		2MBI150VB-120-50	
200A		2MBI200VB-120-50	
300A	2MBI300VB-060-50		
400A	2MBI400VB-060-50		
300A		2MBI300VD-120-50	
400A	2MBI400VD-060-50	2MBI400VD-120-50	
600A	2MBI600VD-060-50		
150A			2MBI150VH-170-50
200A		2MBI200VH-120-50	2MBI200VH-170-50
300A		2MBI300VH-120-50	2MBI300VH-170-50
450A		2MBI450VH-120-50	
		2MBI450VH-120F-50	
300A		2MBI300VE-120-50	2MBI300VE-170-50
400A			2MBI400VE-170-50
450A		2MBI450VE-120-50	
600A	2MBI600VE-060-50	2MBI600VE-120-50	

Dimension [mm]

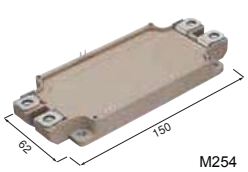
型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
2MBI100VA-060-50	600	±20	100	330	1.60	100	0.65	0.60	0.04	M263	180
2MBI150VA-060-50	600	±20	150	480	1.60	150	0.65	0.60	0.04	M263	180
2MBI200VA-060-50	600	±20	200	640	1.60	200	0.65	0.60	0.04	M263	180
2MBI300VB-060-50	600	±20	300	1360	1.60	300	0.65	0.60	0.07	M274	240
2MBI400VB-060-50	600	±20	400	1970	1.60	400	0.65	0.60	0.07	M274	240
2MBI400VD-060-50	600	±20	400	1970	1.60	400	0.65	0.60	0.07	M275	370
2MBI600VD-060-50	600	±20	600	2940	1.60	600	0.75	0.75	0.07	M275	370
2MBI600VE-060-50	600	±20	600	2940	1.60	600	0.75	0.75	0.07	M277	470
2MBI75VA-120-50	1200	±20	75	390	1.85	75	0.60	0.60	0.04	M263	180
2MBI100VA-120-50	1200	±20	100	555	1.85	100	0.60	0.60	0.04	M263	180
2MBI150VA-120-50	1200	±20	150	785	1.85	150	0.60	0.60	0.04	M263	180
2MBI150VB-120-50	1200	±20	150	1070	1.85	150	0.60	0.80	0.08	M274	240
2MBI200VB-120-50	1200	±20	200	1500	1.75	200	0.60	0.80	0.08	M274	240
2MBI300VD-120-50	1200	±20	300	2200	1.85	300	0.60	0.80	0.08	M275	370
2MBI400VD-120-50	1200	±20	400	3330	1.75	400	0.60	0.80	0.08	M275	370
2MBI200VH-120-50	1200	±20	200	1110	1.75	200	0.60	0.80	0.08	M276	370
2MBI300VH-120-50	1200	±20	300	1600	1.75	300	0.60	0.80	0.08	M276	370
2MBI450VH-120-50	1200	±20	450	2400	1.80	450	0.60	0.80	0.08	M276	370
2MBI450VH-120F-50	1200	±20	450	2400	1.80	450	0.60	0.80	0.08	M276	370
2MBI300VE-120-50	1200	±20	300	2200	1.85	300	0.60	0.80	0.08	M277	470
2MBI450VE-120-50	1200	±20	450	3350	1.80	450	0.60	0.80	0.08	M277	470
2MBI600VE-120-50	1200	±20	600	4800	1.75	600	0.60	0.80	0.08	M277	470
2MBI75VA-170-50	1700	±20	75	555	2.00	75	1.25	1.30	0.15	M263	180
2MBI100VA-170-50	1700	±20	100	665	2.00	100	1.25	1.30	0.15	M263	180
2MBI150VH-170-50	1700	±20	150	1110	2.00	150	0.95	1.05	0.14	M276	370
2MBI200VH-170-50	1700	±20	200	1250	2.00	200	1.15	1.05	0.14	M276	370
2MBI300VH-170-50	1700	±20	300	1805	2.00	300	1.15	1.05	0.14	M276	370
2MBI300VE-170-50	1700	±20	300	2830	2.00	300	1.15	1.05	0.14	M277	470
2MBI400VE-170-50	1700	±20	400	3840	2.00	400	1.15	1.05	0.14	M277	470

$V_{CE(sat)}$: at T_j=25°C, Chip

IGBT モジュール 2-Pack ＜V series＞

■2個組　1200V, 1700Vクラス　Standard 2-Pack 1200, 1700 volts class

Solder pins



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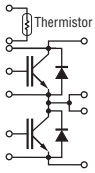
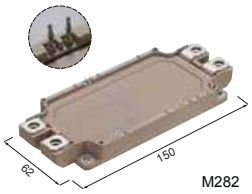
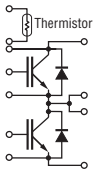


Press fit pins

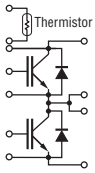


M282



Spring contacts

M260



Ic	1200V V series	1700V V series
225A	**2MBI225VN-120-50**	
	2MBI225VN-120-80	
	2MBI225VN-120S-50	
300A	**2MBI300VN-120-50**	**2MBI300VN-170-50**
	2MBI300VN-120S-50	
450A	**2MBI450VN-120-50**	**2MBI450VN-170-50**
	2MBI450VN-120-80	
	2MBI450VN-120S-50	
550A		**2MBI550VN-170-50**
600A	**2MBI600VN-120-50**	
	2MBI600VN-120-80	
225A	**2MBI225VX-120-50**	**2MBI225VX-170-50**
300A	**2MBI300VX-120-50**	**2MBI300VX-170-50**
450A	**2MBI450VX-120-50**	**2MBI450VX-170-50**
550A		**2MBI550VX-170-50**
600A	**2MBI600VX-120-50**	
225A	**2MBI225VJ-120-50**	
300A	**2MBI300VJ-120-50**	
450A	**2MBI450VJ-120-50**	
	2MBI450VJ-120-80	
550A		**2MBI550VJ-170-50**
600A	**2MBI600VJ-120-50**	
	2MBI600VJ-120-80	

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
2MBI225VN-120-50	1200	±20	225	1070	1.85	225	0.55	1.05	0.11	M254	300
2MBI225VN-120-80	1200	±20	225	1070	1.85	225	0.55	1.05	0.11	M254	350
2MBI225VN-120S-50	1200	±20	225	1360	1.85	225	0.40	0.55	0.05	M254	300
2MBI300VN-120-50	1200	±20	300	1595	1.75	300	0.55	1.05	0.11	M254	300
2MBI300VN-120S-50	1200	±20	300	2000	1.75	300	0.45	0.65	0.06	M254	300
2MBI450VN-120-50	1200	±20	450	2270	1.75	450	0.55	1.05	0.11	M254	300
2MBI450VN-120-80	1200	±20	450	2270	1.75	450	0.55	1.05	0.11	M254	350
2MBI450VN-120S-50	1200	±20	450	3000	1.75	450	0.47	0.70	0.07	M254	300
2MBI600VN-120-50	1200	±20	600	3750	1.85	600	0.55	1.05	0.11	M254	300
2MBI600VN-120-80	1200	±20	600	3750	1.85	600	0.55	1.05	0.11	M254	350
2MBI225VX-120-50	1200	±20	225	1070	1.85	225	0.55	1.05	0.11	M282	350
2MBI300VX-120-50	1200	±20	300	1595	1.75	300	0.55	1.05	0.11	M282	350
2MBI450VX-120-50	1200	±20	450	2270	1.75	450	0.55	1.05	0.11	M282	350
2MBI600VX-120-50	1200	±20	600	3750	1.85	600	0.55	1.05	0.11	M282	350
2MBI225VJ-120-50	1200	±20	225	1070	1.85	225	0.55	1.05	0.11	M260	300
2MBI300VJ-120-50	1200	±20	300	1595	1.75	300	0.55	1.05	0.11	M260	300
2MBI450VJ-120-50	1200	±20	450	2270	1.75	450	0.55	1.05	0.11	M260	300
2MBI450VJ-120-80	1200	±20	450	2270	1.75	450	0.55	1.05	0.11	M260	360
2MBI600VJ-120-50	1200	±20	600	3750	1.85	600	0.55	1.05	0.11	M260	300
2MBI600VJ-120-80	1200	±20	600	3750	1.85	600	0.55	1.05	0.11	M260	360
2MBI300VN-170-50	1700	±20	300	1665	2.00	300	0.90	1.30	0.10	M254	350
2MBI450VN-170-50	1700	±20	450	2500	2.00	450	0.90	1.30	0.10	M254	350
2MBI550VN-170-50	1700	±20	550	3750	2.15	550	1.00	1.30	0.10	M254	350
2MBI225VX-170-50	1700	±20	225	1500	2.00	225	0.90	1.05	0.08	M282	350
2MBI300VX-170-50	1700	±20	300	1665	2.00	300	0.90	1.30	0.10	M282	350
2MBI450VX-170-50	1700	±20	450	2500	2.00	450	0.90	1.30	0.10	M282	350
2MBI550VX-170-50	1700	±20	550	3750	2.15	550	1.00	1.30	0.10	M282	350
2MBI550VJ-170-50	1700	±20	550	3750	2.15	550	1.00	1.30	0.10	M260	360

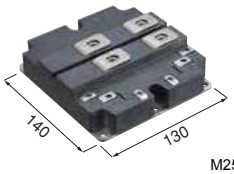
注 : -80 : 高熱伝導体の TIM（Thermal-Interface-Material）をモジュールベース面に塗布。
Note: -80 : Pre-Applied Thermal-Interface-Material

$V_{CE(sat)}$: at T_j=25°C, Chip

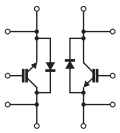
IGBT モジュール 2-Pack ＜V series＞

■ハイパワーモジュール　1200V, 1700Vクラス

High Power Module 1200, 1700 volts class



M256, M278



Ic	1200V V series Cu-baseplate	1700V V series Cu-baseplate	1700V V series AlSiC-baseplate
600A	**2MBI600VG-120P**	**2MBI600VG-170E**	**2MBI600VT-170E**
800A	**2MBI800VG-120P**	**2MBI800VG-170E**	**2MBI800VT-170E**
1200A	**2MBI1200VG-120P**	**2MBI1200VG-170E**	**2MBI1200VT-170E**

Dimension [mm]

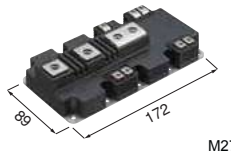
型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
2MBI600VG-120P	1200	±20	600	3940	1.70	600	1.86	1.25	0.12	M256	1500
2MBI800VG-120P	1200	±20	800	5170	1.70	800	1.97	1.33	0.15	M256	1500
2MBI1200VG-120P	1200	±20	1200	6810	1.70	1200	2.55	1.67	0.16	M256	1500
2MBI600VG-170E	1700	±20	600	4410	2.00	600	2.28	2.07	0.58	M256	1500
2MBI800VG-170E	1700	±20	800	5760	2.00	800	2.41	2.13	0.55	M256	1500
2MBI1200VG-170E	1700	±20	1200	7500	2.00	1200	2.76	2.29	0.33	M256	1500
2MBI600VT-170E	1700	±20	600	4280	2.00	600	1.51	2.07	0.58	M278	900
2MBI800VT-170E	1700	±20	800	5370	2.00	800	2.00	2.13	0.55	M278	900
2MBI1200VT-170E	1700	±20	1200	7040	2.00	1200	2.14	2.29	0.33	M278	900

Note: M256: Cu-baseplate M278: AlSiC-baseplate

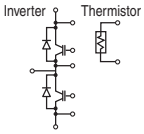
$V_{CE(sat)}$: at T_j=25°C, Chip　Switching time: at T_j=125°C

IGBT モジュール 2-Pack ＜V series＞

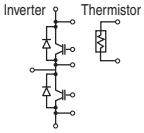
■PrimePACK™ 1200V, 1700Vクラス　PrimePACK™ 1200, 1700 volts class



M271



M272



Ic	1200V V series Low switching loss	1200V V series Soft turn off	1700V V series Low switching loss	1700V V series Soft turn off
600A	2MBI600VXA-120E-50			
	2MBI600VXA-120E-54			
650A			2MBI650VXA-170E-50	
			2MBI650VXA-170E-54	
			2MBI650VXA-170EA-50	
			2MBI650VXA-170EA-54	
900A	2MBI900VXA-120E-50	2MBI900VXA-120P-50		
	2MBI900VXA-120E-54	2MBI900VXA-120P-54		
1000A			2MBI1000VXB-170E-50	
			2MBI1000VXB-170E-54	
			2MBI1000VXB-170EA-50	
			2MBI1000VXB-170EA-54	
1400A	2MBI1400VXB-120E-50	2MBI1400VXB-120P-50	2MBI1400VXB-170E-50	2MBI1400VXB-170P-50
	2MBI1400VXB-120E-54	2MBI1400VXB-120P-54	2MBI1400VXB-170E-54	2MBI1400VXB-170P-54

Dimension [mm]

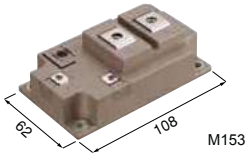
型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. μsec.	t_{off} Typ. μsec.	t_f Typ. μsec.	パッケージ Package	質量 Net mass Grams
2MBI600VXA-120E-50	1200	±20	600	3350	1.75	600	1.00	1.20	0.15	M271	850
2MBI600VXA-120E-54	1200	±20	600	3350	1.75	600	1.00	1.20	0.15	M271	850
2MBI900VXA-120E-50	1200	±20	900	5100	1.75	900	1.00	1.20	0.15	M271	850
2MBI900VXA-120E-54	1200	±20	900	5100	1.75	900	1.00	1.20	0.15	M271	850
2MBI1400VXB-120E-50	1200	±20	1400	7650	1.75	1400	1.00	1.20	0.15	M272	1250
2MBI1400VXB-120E-54	1200	±20	1400	7650	1.75	1400	1.00	1.20	0.15	M272	1250
2MBI900VXA-120P-50	1200	±20	900	5100	1.65	900	1.00	1.20	0.15	M271	850
2MBI900VXA-120P-54	1200	±20	900	5100	1.65	900	1.00	1.20	0.15	M271	850
2MBI1400VXB-120P-50	1200	±20	1400	7650	1.65	1400	1.00	1.20	0.15	M272	1250
2MBI1400VXB-120P-54	1200	±20	1400	7650	1.65	1400	1.00	1.20	0.15	M272	1250
2MBI650VXA-170E-50	1700	±20	650	4150	2.00	650	1.25	1.55	0.15	M271	850
2MBI650VXA-170E-54	1700	±20	650	4150	2.00	650	1.25	1.55	0.15	M271	850
2MBI650VXA-170EA-50	1700	±20	650	4150	2.00	650	1.70	1.60	0.11	M271	850
2MBI650VXA-170EA-54	1700	±20	650	4150	2.00	650	1.70	1.60	0.11	M271	850
2MBI1000VXB-170E-50	1700	±20	1000	6250	2.00	1000	1.25	1.55	0.15	M272	1250
2MBI1000VXB-170E-54	1700	±20	1000	6250	2.00	1000	1.25	1.55	0.15	M272	1250
2MBI1000VXB-170EA-50	1700	±20	1000	6250	2.00	1000	1.70	1.60	0.11	M272	1250
2MBI1000VXB-170EA-54	1700	±20	1000	6250	2.00	1000	1.70	1.60	0.11	M272	1250
2MBI1400VXB-170E-50	1700	±20	1400	8820	2.15	1400	1.25	1.55	0.15	M272	1250
2MBI1400VXB-170E-54	1700	±20	1400	8820	2.15	1400	1.25	1.55	0.15	M272	1250
2MBI1400VXB-170P-50	1700	±20	1400	8820	1.90	1400	1.35	1.80	0.20	M272	1250
2MBI1400VXB-170P-54	1700	±20	1400	8820	1.90	1400	1.35	1.80	0.20	M272	1250

注: PrimePACK™はInfineon Technologies社の登録商標です。
-54…$V_{CE(sat)}$及びV_Fのランクをラベルに表示
本ページでEAの付く型式は、ダイオードの負荷が厳しいアプリケーションに対応し、FWDを最適化したことにより、V_Fおよび熱抵抗を低減。

Note: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.
The products with suffix '-54' on this page are labeled to specify the rank of $V_{CE(sat)}$ and V_F.
The products with 'EA' on this page have optimized FWD for the application causing heavy load through FWD. The optimized FWD reduces V_F and thermal resistance.

IGBT モジュール 1-Pack ＜V series＞

■ 1個組　1200V, 1700Vクラス　　Standard 1-Pack 1200, 1700V volts class



Ic	1200V V series Aluminium oxide DCB	1200V V series Aluminium nitride DCB	1700V V series Aluminium oxide DCB
300A			**1MBI300V-170-50**
400A	**1MBI400V-120-50**	**1MBI400VF-120-50**	**1MBI400V-170-50**
600A	**1MBI600V-120-50**	**1MBI600VF-120-50**	**1MBI600V-170-50**
900A	**1MBI900V-120-50**		

Dimension [mm]

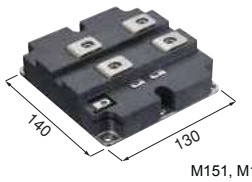
型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
1MBI400V-120-50	1200	±20	400	2410	1.75	400	0.60	1.10	0.14	M153	380
1MBI600V-120-50	1200	±20	600	3000	1.75	600	0.70	0.90	0.10	M153	380
1MBI900V-120-50	1200	±20	900	4280	1.90	900	0.70	0.85	0.10	M153	380
1MBI400VF-120-50	1200	±20	400	3330	1.75	400	0.60	1.10	0.14	M153	380
1MBI600VF-120-50	1200	±20	600	4680	1.75	600	0.70	0.90	0.10	M153	380
1MBI300V-170-50	1700	±20	300	1705	2.00	300	0.70	0.80	0.14	M153	380
1MBI400V-170-50	1700	±20	400	2500	2.00	400	0.70	0.80	0.14	M153	380
1MBI600V-170-50	1700	±20	600	3610	2.00	600	0.70	0.80	0.14	M153	380

$V_{CE(sat)}$: at T_j=25°C, Chip

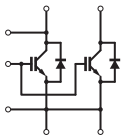
IGBT モジュール 1-Pack ＜V series / U series＞

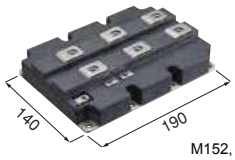
■ハイパワーモジュール　1200V, 1700V, 3300Vクラス

High Power Module 1200, 1700, 3300 volts class

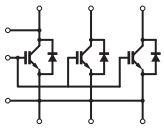


M151, M155





M152, M156



Ic	1200V V series Cu-baseplate	1700V V series Cu-baseplate	1700V V series AlSiC-baseplate	3300V U Series AlSiC-baseplate
800A				**1MBI800UG-330**
1000A				**1MBI1000UG-330**
				1MBI1000UG-330B
1200A	**1MBI1200VC-120P**	**1MBI1200VC-170E**	**1MBI1200VR-170E**	
1600A	**1MBI1600VC-120P**	**1MBI1600VC-170E**	**1MBI1600VR-170E**	
2400A	**1MBI2400VC-120P**	**1MBI2400VC-170E**	**1MBI2400VR-170E**	
1200A				**1MBI1200UE-330**
1500A				**1MBI1500UE-330**
				1MBI1500UE-330B
2400A	**1MBI2400VD-120P**	**1MBI2400VD-170E**	**1MBI2400VS-170E**	
3600A	**1MBI3600VD-120P**	**1MBI3600VD-170E**	**1MBI3600VS-170E**	

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
1MBI1200VC-120P	1200	±20	1200	7890	1.70	1200	1.73	1.52	0.15	M151	1500
1MBI1600VC-120P	1200	±20	1600	10340	1.70	1600	2.22	1.47	0.19	M151	1500
1MBI2400VC-120P	1200	±20	2400	13630	1.70	2400	3.15	1.93	0.24	M151	1500
1MBI2400VD-120P	1200	±20	2400	15780	1.70	2400	2.38	1.64	0.21	M152	2300
1MBI3600VD-120P	1200	±20	3600	20540	1.70	3600	2.98	2.15	0.27	M152	2300
1MBI1200VC-170E	1700	±20	1200	8820	2.00	1200	2.18	2.20	0.45	M151	1500
1MBI1600VC-170E	1700	±20	1600	11700	2.00	1600	2.28	2.17	0.40	M151	1500
1MBI2400VC-170E	1700	±20	2400	15000	2.00	2400	2.63	2.41	0.38	M151	1500
1MBI2400VD-170E	1700	±20	2400	17640	2.00	2400	2.30	2.22	0.43	M152	2300
1MBI3600VD-170E	1700	±20	3600	22380	2.00	3600	2.27	2.67	0.31	M152	2300
1MBI1200VR-170E	1700	±20	1200	8570	2.00	1200	1.51	2.20	0.45	M155	900
1MBI1600VR-170E	1700	±20	1600	10710	2.00	1600	1.83	2.17	0.40	M155	900
1MBI2400VR-170E	1700	±20	2400	14010	2.00	2400	2.51	2.41	0.38	M155	900
1MBI2400VS-170E	1700	±20	2400	16120	2.00	2400	2.09	2.22	0.43	M156	1300
1MBI3600VS-170E	1700	±20	3600	21120	2.00	3600	2.70	2.66	0.32	M156	1300
1MBI800UG-330	3300	±20	800	9600	2.28	800	3.40	2.40	0.40	M155	900
1MBI1000UG-330	3300	±20	1000	10400	2.46	1000	2.50	2.00	0.50	M155	900
● **1MBI1000UG-330B**	3300	±20	1000	10400	2.75	1000	3.10	2.35	0.45	M155	900
1MBI1200UE-330	3300	±20	1200	14700	2.28	1200	3.40	2.40	0.40	M156	1300
1MBI1500UE-330	3300	±20	1500	15600	2.46	1500	3.10	2.60	0.50	M156	1300
● **1MBI1500UE-330B**	3300	±20	1500	15600	2.75	1500	3.10	2.35	0.45	M156	1300

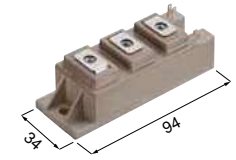
●:新製品　New Products

Note1: M151, M152: Cu-baseplate　M155, M156: AlSiC-baseplate　　$V_{CE(sat)}$: at T_j=25°C, Chip　Switching time: at T_j=125°C, at T_j=150°C (3300V-1000A, 1500A only)

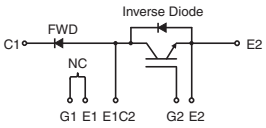
Note2: -330B type: 低スイッチング損失　Low switching losses

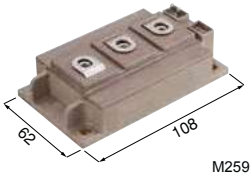
IGBT モジュール チョッパ ＜V series / U series＞

■ チョッパ 600V, 1200Vクラス Chopper 600, 1200 volts class

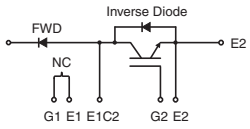


M262





M259



Ic	600V U series	1200V U series	1200V V series
50A		**1MBI50U4F-120L-50**	
75A		**1MBI75U4F-120L-50**	
100A		**1MBI100U4F-120L-50**	
150A			**1MBI150VA-120L-50**
200A			**1MBI200VA-120L-50**
200A		**1MBI200U4H-120L-50**	
300A	**1MBI300U2H-060L-50**		

Dimension [mm]

型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
1MBI300U2H-060L-50	600	±20	300	1000	2.45	300	0.40	0.48	0.07	M259	360
1MBI50U4F-120L-50	1200	±20	50	400	2.15	50	0.32	0.41	0.07	M262	180
1MBI75U4F-120L-50	1200	±20	75	400	2.20	75	0.32	0.41	0.07	M262	180
1MBI100U4F-120L-50	1200	±20	100	540	2.20	100	0.32	0.41	0.07	M262	180
1MBI200U4H-120L-50	1200	±20	200	1040	2.25	200	0.32	0.41	0.07	M259	360
1MBI150VA-120L-50	1200	±20	150	785	1.85	150	0.60	0.60	0.04	M262	180
1MBI200VA-120L-50	1200	±20	200	880	1.80	200	0.60	0.60	0.04	M262	180

$V_{CE(sat)}$: at T_j=25°C, Chip

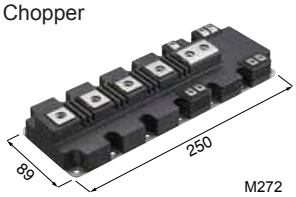
IGBT モジュール チョッパ ＜V series＞

■PrimePACK™ 1200V, 1700Vクラス PrimePACK™ 1200, 1700 volts class

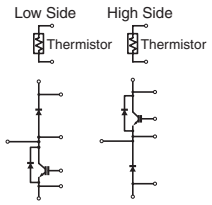
Chopper

M271

Chopper



M272



Ic	1200V V series Soft turn off Low side configuration	1200V V series Soft turn off High side configuration	1700V V series Low switching loss Low side configuration	1700V V series Low switching loss High side configuration
650A			1MBI650VXA-170EL-50	1MBI650VXA-170EH-50
			1MBI650VXA-170EL-54	1MBI650VXA-170EH-54
1000A			1MBI1000VXB-170EL-50	1MBI1000VXB-170EH-50
			1MBI1000VXB-170EL-54	1MBI1000VXB-170EH-54
1400A	1MBI1400VXB-120PL-54	1MBI1400VXB-120PH-54	1MBI1400VXB-170PL-50	1MBI1400VXB-170PH-50
			1MBI1400VXB-170PL-54	1MBI1400VXB-170PH-54

Dimension [mm]

型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. μsec.	t_{off} Typ. μsec.	t_f Typ. μsec.	パッケージ Package	質量 Net mass Grams
1MBI1400VXB-120PL-54	1200	±20	1400	7650	1.65	1400	1.00	1.20	0.15	M272	1250
1MBI1400VXB-120PH-54	1200	±20	1400	7650	1.65	1400	1.00	1.20	0.15	M272	1250
1MBI650VXA-170EL-50	1700	±20	650	4150	2.00	650	1.25	1.55	0.15	M271	850
1MBI650VXA-170EL-54	1700	±20	650	4150	2.00	650	1.25	1.55	0.15	M271	850
1MBI1000VXB-170EL-50	1700	±20	1000	6250	2.00	1000	1.25	1.55	0.15	M272	1250
1MBI1000VXB-170EL-54	1700	±20	1000	6250	2.00	1000	1.25	1.55	0.15	M272	1250
● 1MBI1400VXB-170PL-50	1700	±20	1400	8820	2.15	1400	1.25	1.55	0.15	M272	1250
● 1MBI1400VXB-170PL-54	1700	±20	1400	8820	2.15	1400	1.25	1.55	0.15	M272	1250
1MBI650VXA-170EH-50	1700	±20	650	4150	2.00	650	1.25	1.55	0.15	M271	850
1MBI650VXA-170EH-54	1700	±20	650	4150	2.00	650	1.25	1.55	0.15	M271	850
1MBI1000VXB-170EH-50	1700	±20	1000	6250	2.00	1000	1.25	1.55	0.15	M272	1250
1MBI1000VXB-170EH-54	1700	±20	1000	6250	2.00	1000	1.25	1.55	0.15	M272	1250
● 1MBI1400VXB-170PH-50	1700	±20	1400	8820	2.15	1400	1.25	1.55	0.15	M272	1250
● 1MBI1400VXB-170PH-54	1700	±20	1400	8820	2.15	1400	1.25	1.55	0.15	M272	1250

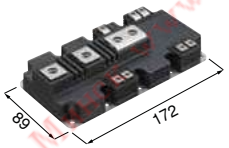
●:新製品 New products

$V_{CE(sat)}$: at T_j=25℃, Chip

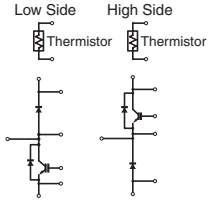
注: PrimePACK™はInfineon Technologies社の登録商標です。
-54…$V_{CE(sat)}$及びV_Fのランクをラベルに表示

Note: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.
The products with suffix '-54' on this page are labeled to specify the rank of $V_{CE(sat)}$ and V_F.

Chopper



M271



Ic	1200V V series Boost (Low side) Chopper	1200V V series Buck (High side) Chopper	1700V V series Boost (Low side) Chopper	1700V V series Buck (High side) Chopper
900A	1MBI900VXA-120PD-50	1MBI900VXA-120PC-50		
	1MBI900VXA-120PD-54	1MBI900VXA-120PC-54		

Dimension [mm]

型式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. μsec.	t_{off} Typ. μsec.	t_f Typ. μsec.	パッケージ Package	質量 Net mass Grams
1MBI900VXA-120PC-50	1200	±20	900	5100	1.65	900	1.10	1.20	0.15	M271	850
1MBI900VXA-120PC-54	1200	±20	900	5100	1.65	900	1.10	1.20	0.15	M271	850
1MBI900VXA-120PD-50	1200	±20	900	5100	1.65	900	1.10	1.20	0.15	M271	850
1MBI900VXA-120PD-54	1200	±20	900	5100	1.65	900	1.10	1.20	0.15	M271	850

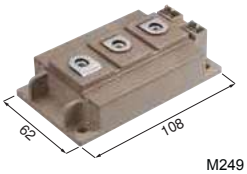
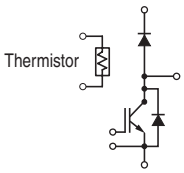
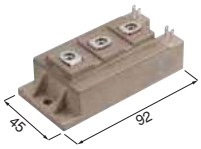
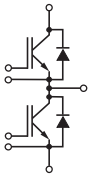
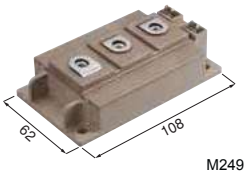
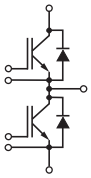
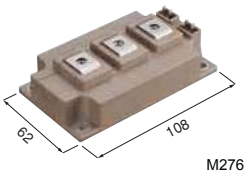
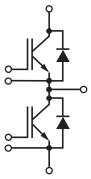
$V_{CE(sat)}$: at T_j=25℃, Chip

注: PrimePACK™はInfineon Technologies社の登録商標です。
-54…$V_{CE(sat)}$及びV_Fのランクをラベルに表示
逆並列接続ダイオードの電流定格は120Aです。Boost/Buck chopper回路にのみ適用願います。

Note: PrimePACK™ is registered trademark of Infineon Technologies AG, Germany.
The products with suffix '-54' on this page are labeled to specify the rank of $V_{CE(sat)}$ and V_F.
Antiparallel diode current rating is 120A. Application circuit is Boost/Buck chopper only.

IGBT モジュール 高速タイプ

■高速IGBTモジュール　1200Vクラス　　High Speed 1200 volts class

		Ic	1200V High Speed IGBT
Chopper	 M249 	200A	**1MBI200HH-120L-50**
		300A	**1MBI300HH-120L-50**
		400A	**1MBI400HH-120L-50**
2-pack	 M233 	100A	**2MBI100HB-120-50**
2-pack	 M249 	150A	**2MBI150HH-120-50**
		200A	**2MBI200HH-120-50**
2-pack	 M276 	100A	**2MBI100HJ-120-50**
		150A	**2MBI150HJ-120-50**
		200A	**2MBI200HJ-120-50**
		300A	**2MBI300HJ-120-50**

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. µsec.	t_{off} Typ. µsec.	t_f Typ. µsec.	パッケージ Package	質量 Net mass Grams
1MBI200HH-120L-50	1200	±20	200	1390	3.10	200	0.2	0.3	0.05	M249	370
1MBI300HH-120L-50	1200	±20	300	2090	3.20	300	0.2	0.3	0.05	M249	370
1MBI400HH-120L-50	1200	±20	400	2500	3.10	400	0.2	0.4	0.05	M249	370
2MBI100HB-120-50	1200	±20	100	1040	3.10	100	-	0.30	0.05	M233	240
2MBI150HH-120-50	1200	±20	150	1390	3.20	150	-	0.30	0.05	M249	370
2MBI200HH-120-50	1200	±20	200	1790	3.10	200	-	0.30	0.05	M249	370
2MBI100HJ-120-50	1200	±20	100	655	3.20	100	0.25	0.30	0.05	M276	370
2MBI150HJ-120-50	1200	±20	150	925	3.20	150	0.25	0.30	0.05	M276	370
2MBI200HJ-120-50	1200	±20	200	1385	3.20	200	0.25	0.30	0.05	M276	370
2MBI300HJ-120-50	1200	±20	300	1950	3.20	300	0.25	0.30	0.05	M276	370

$V_{CE(sat)}$: at T_j=25°C, Chip

IGBT モジュール ３レベル ＜V series＞

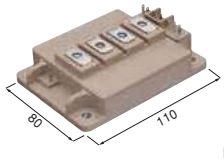
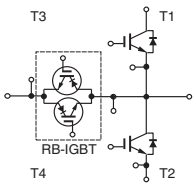
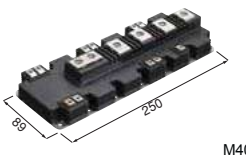
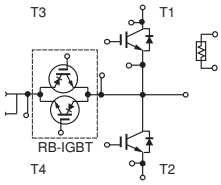
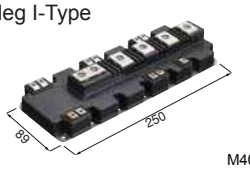
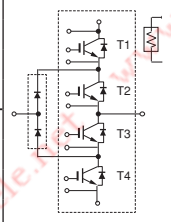
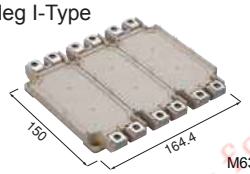
■T/Iタイプ NPC３レベル回路　600V, 1200V, 1700Vクラス

T/I-type NPC 3-level Circuits 600, 1200, 1700 volts class

■特長　　Features

- ●電力変換効率に優れた T/I タイプ NPC3 レベル回路に対応
- ● 1 レッグまたは 3 レッグ（3 相分）を 1 パッケージに搭載、またモジュールの外部配線が容易
- ●低パッケージ内部インダクタンスにより低サージ電圧を実現
- ● T-Type AC-SW 部には RB-IGBT を採用、低損失を実現
- ●メイン SW 部には第 6 世代 IGBT, FWD を採用し低損失を実現

- Applicable to T/I-type NPC 3-level circuit, for high power conversion efficiency.
- There are 1-leg or 3-leg (3 phase) circuits in one package and it is easier to makes external wiring of module.
- Lower surge voltage by smaller internal package stray inductance.
- Lower power loss can be achieved by using RB-IGBT as for T-type AC-SW device.
- Lowest power loss can be achieved by using 6th Gen. IGBT and FWD as for Main-SW device.

	Ic \ T1, T2 / T3, T4	600V / 600V	1200V / 600V	1200V / 900V	1200V / 1200V	1700V / 1200V
1-leg T-Type  M403 	220A					4MBI220VF-170R2-50
	300A		4MBI300VG-120R-50	4MBI300VG-120R1-50		
	340A		4MBI340VF-120R-50			
	400A	4MBI400VG-060R-50	4MBI400VF-120R-50 ※1			
	450A		4MBI450VF-120RD-50 ※2			
1-leg T-Type  M404 	450A			4MBI450VB-120R1-50		4MBI450VB-170R2-50
	600A					4MBI600VB-170R2-50
	650A			4MBI650VB-120R1-50		
	900A			4MBI900VB-120R1-50		
1-leg I-Type  M404 	600A				4MBI600VC-120-50	
1-leg I-Type  M639	600A				4MBI600VM-120-50	

Dimension [mm]

型　式 Device type	T1, T2 V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	T3, T4 V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	パッケージ Package	質量 Net mass Grams
4MBI400VG-060R-50	600	400	1135	1.60	400	600	400	1560	2.45	400	M403	460
4MBI300VG-120R-50	1200	300	1250	1.85	300	600	300	1250	2.45	300	M403	460
4MBI300VG-120R1-50	1200	300	1500	1.85	300	900	300	1550	2.30	300	M403	460
● **4MBI340VF-120R-50**	1200	340	1500	1.85	300	600	340	1500	2.45	300	M403	460
4MBI400VF-120R-50 ※1	1200	400	1835	2.00	400	600	450	2230	2.45	400	M403	460
○ **4MBI450VF-120RD-50** ※2	1200	-	-	1.75	200	600	450	2230	2.45	400	M403	460
4MBI450VB-120R1-50	1200	450	2205	1.85	450	900	450	1980	2.30	450	M404	1300
4MBI650VB-120R1-50	1200	650	3060	1.80	650	900	650	2660	2.25	650	M404	1300
4MBI900VB-120R1-50	1200	900	3950	1.85	900	900	900	3675	2.30	900	M404	1300
○ **4MBI600VC-120-50**	1200	600	2865	1.85	600	1200	600	2865	1.85	600	M404	1300
○ **4MBI600VM-120-50**	1200	600	TBD	TBD	600	1200	600	TBD	TBD	600	M639	950
● **4MBI220VF-170R2-50**	1700	200	1500	2.00	200	1200	200	1865	2.70	200	M403	460
○ **4MBI450VB-170R2-50**	1700	450	2830	2.00	450	1200	450	2660	2.70	450	M404	1300
○ **4MBI600VB-170R2-50**	1700	600	3410	2.00	600	1200	600	3680	2.70	600	M404	1300

●:新製品　New Products,　○:開発中　Under development

$V_{CE(sat)}$: at T_j=25°C, Chip

注: 製品名にVFが含まれる型式は低熱抵抗パッケージ適用　Note: VF type is lower thermal impedance version.

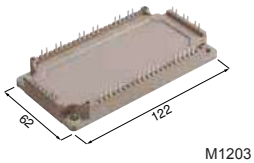
※1:インバータ専用　Particular for Inverter　　※2:コンバータ専用　Particular for Converter

IGBT モジュール ３レベル ＜V series＞

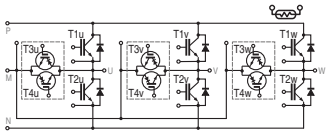
■T/IタイプNPC３レベル回路　1200Vクラス

T/I-type NPC 3-level Circuits 1200 volts class

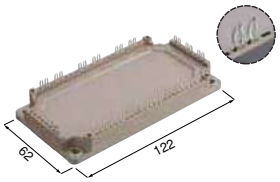
3-leg Solder pins



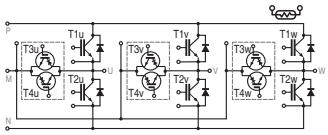
M1203



3-leg Press fit pins



M1202



Ic \ T1, T2 / T3, T4	1200V / 600V
50A	**12MBI50VN-120-50**
75A	**12MBI75VN-120-50**
100A	**12MBI100VN-120-50**
50A	**12MBI50VX-120-50**
75A	**12MBI75VX-120-50**
100A	**12MBI100VX-120-50**

Dimension [mm]

型　式 Device type	T1, T2					T3, T4					パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.		Grams
12MBI50VN-120-50	1200	50	230	1.85	50	600	50	235	2.45	50	M1203	302
12MBI75VN-120-50	1200	75	320	1.85	75	600	75	305	2.45	75	M1203	302
12MBI100VN-120-50	1200	100	430	1.75	100	600	100	400	2.45	100	M1203	302
12MBI50VX-120-50	1200	50	230	1.85	50	600	50	235	2.45	50	M1202	302
12MBI75VX-120-50	1200	75	320	1.85	75	600	75	305	2.45	75	M1202	302
12MBI100VX-120-50	1200	100	430	1.75	100	600	100	400	2.45	100	M1202	302

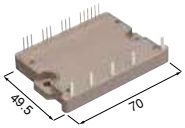
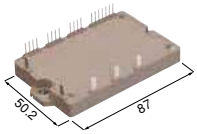
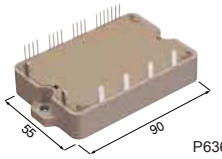
$V_{CE(sat)}$: at T_j=25°C, Chip

IGBT モジュール IPM ＜V series＞

■ IPM（Intelligent Power Module）600V, 1200Vクラス
IPM (Intelligent Power Module) 600, 1200 volts class

Built-in protection functions

P-side fault status output (Alarm)
N-side fault status output (Alarm)
Under voltage protection (self shutdown)
Over current protection (self shutdown)
Overheating protection (self shutdown)

						Ic	600V V series		1200V V series	
							Without Brake-Chopper	With Brake-Chopper	Without Brake-Chopper	With Brake-Chopper
 P629	✓	✓	✓	✓		10A			**6MBP10VAA120-50**	
						15A			**6MBP15VAA120-50**	
						20A	**6MBP20VAA060-50**			
						25A			**6MBP25VAA120-50**	
						30A	**6MBP30VAA060-50**			
						50A	**6MBP50VAA060-50**			
 P626	✓	✓	✓	✓	✓	25A			**6MBP25VBA120-50**	
						35A			**6MBP35VBA120-50**	
						50A	**6MBP50VBA060-50**		**6MBP50VBA120-50**	
						75A	**6MBP75VBA060-50**			
 P636	✓	✓	✓	✓	✓	25A			**6MBP25VFN120-50**	**7MBP25VFN120-50**
						35A			**6MBP35VFN120-50**	**7MBP35VFN120-50**
						50A	**6MBP50VFN060-50**	**7MBP50VFN060-50**	**6MBP50VFN120-50**	**7MBP50VFN120-50**
						75A	**6MBP75VFN060-50**	**7MBP75VFN060-50**		
						100A	**6MBP100VFN060-50**	**7MBP100VFN060-50**		

Dimension [mm]

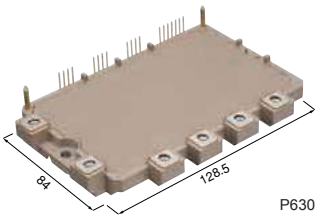
型式 Device type	インバータ部 Inverter			ブレーキ部 Brake		制御部 Control							パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{CC} Typ. Volts	I_{OC}[INV] Min. Amps.	V_{UV} Volts	T_{jOH} Min. ℃	Alarm OC(typ.) ms	UV(typ.) ms	T_{jOH}(typ.) ms		Grams
6MBP20VAA060-50	600	20	1.4	-	-	15	30	11.0 to 12.5	150	2	4	8	P629	80
6MBP30VAA060-50	600	30	1.4	-	-	15	45	11.0 to 12.5	150	2	4	8	P629	80
6MBP50VAA060-50	600	50	1.4	-	-	15	75	11.0 to 12.5	150	2	4	8	P629	80
6MBP50VBA060-50	600	50	1.4	-	-	15	75	11.0 to 12.5	150	2	4	8	P626	100
6MBP75VBA060-50	600	75	1.4	-	-	15	113	11.0 to 12.5	150	2	4	8	P626	100
6MBP50VFN060-50	600	50	1.25	-	-	15	100	11.0 to 12.5	150	2	4	8	P636	190
6MBP75VFN060-50	600	75	1.25	-	-	15	150	11.0 to 12.5	150	2	4	8	P636	190
6MBP100VFN060-50	600	100	1.25	-	-	15	200	11.0 to 12.5	150	2	4	8	P636	190
7MBP50VFN060-50	600	50	1.25	600	30	15	100	11.0 to 12.5	150	2	4	8	P636	190
7MBP75VFN060-50	600	75	1.25	600	50	15	150	11.0 to 12.5	150	2	4	8	P636	190
7MBP100VFN060-50	600	100	1.25	600	50	15	200	11.0 to 12.5	150	2	4	8	P636	190
6MBP10VAA120-50	1200	10	1.7	-	-	15	15	11.0 to 12.5	150	2	4	8	P629	80
6MBP15VAA120-50	1200	15	1.7	-	-	15	23	11.0 to 12.5	150	2	4	8	P629	80
6MBP25VAA120-50	1200	25	1.7	-	-	15	38	11.0 to 12.5	150	2	4	8	P629	80
6MBP25VBA120-50	1200	25	1.7	-	-	15	38	11.0 to 12.5	150	2	4	8	P626	100
6MBP35VBA120-50	1200	35	1.7	-	-	15	53	11.0 to 12.5	150	2	4	8	P626	100
6MBP50VBA120-50	1200	50	1.7	-	-	15	75	11.0 to 12.5	150	2	4	8	P626	100
6MBP25VFN120-50	1200	25	1.7	-	-	15	50	11.0 to 12.5	150	2	4	8	P636	190
6MBP35VFN120-50	1200	35	1.7	-	-	15	70	11.0 to 12.5	150	2	4	8	P636	190
6MBP50VFN120-50	1200	50	1.7	-	-	15	100	11.0 to 12.5	150	2	4	8	P636	190
7MBP25VFN120-50	1200	25	1.7	1200	15	15	50	11.0 to 12.5	150	2	4	8	P636	190
7MBP35VFN120-50	1200	35	1.7	1200	25	15	70	11.0 to 12.5	150	2	4	8	P636	190
7MBP50VFN120-50	1200	50	1.7	1200	25	15	100	11.0 to 12.5	150	2	4	8	P636	190

IGBT モジュール IPM ＜V series＞

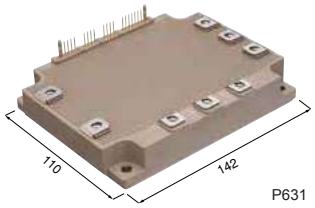
■ IPM（Intelligent Power Module）600V, 1200Vクラス
IPM (Intelligent Power Module) 600, 1200 volts class

Built-in protection functions

P-side fault status output (Alarm)
N-side fault status output (Alarm)
Under voltage protection (self shutdown)
Over current protection (self shutdown)
Overheating protection (self shutdown)



P630



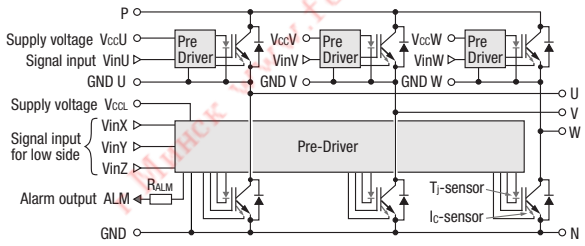
P631

						Ic	600V V series		1200V V series	
							Without Brake-Chopper	With Brake-Chopper	Without Brake-Chopper	With Brake-Chopper
						25A			6MBP25VDA120-50	7MBP25VDA120-50
						35A			6MBP35VDA120-50	7MBP35VDA120-50
						50A	6MBP50VDA060-50	7MBP50VDA060-50	6MBP50VDA120-50	7MBP50VDA120-50
									6MBP50VDN120-50	7MBP50VDN120-50
						75A	6MBP75VDA060-50	7MBP75VDA060-50	6MBP75VDA120-50	7MBP75VDA120-50
									6MBP75VDN120-50	7MBP75VDN120-50
✓	✓	✓	✓	✓		100A	6MBP100VDA060-50	7MBP100VDA060-50	6MBP100VDA120-50	7MBP100VDA120-50
							6MBP100VDN060-50	7MBP100VDN060-50	6MBP100VDN120-50	7MBP100VDN120-50
						150A	6MBP150VDA060-50	7MBP150VDA060-50		
							6MBP150VDN060-50	7MBP150VDN060-50		
						200A	6MBP200VDA060-50	7MBP200VDA060-50		
							6MBP200VDN060-50	7MBP200VDN060-50		
						100A			6MBP100VEA120-50	7MBP100VEA120-50
						150A			6MBP150VEA120-50	7MBP150VEA120-50
						200A	6MBP200VEA060-50	7MBP200VEA060-50	6MBP200VEA120-50	7MBP200VEA120-50
						300A	6MBP300VEA060-50	7MBP300VEA060-50		
✓	✓	✓	✓	✓		400A	6MBP400VEA060-50	7MBP400VEA060-50		

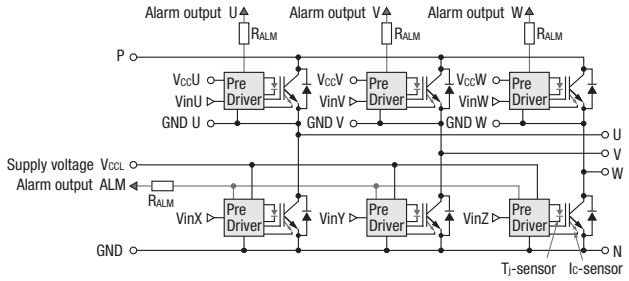
Dimension [mm]

●ブロック図　Block Diagram

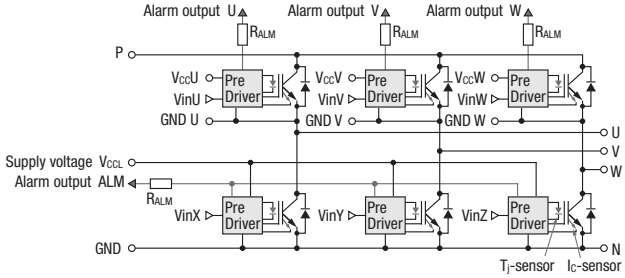
・6MBP□VAA060-50
・6MBP□VAA120-50



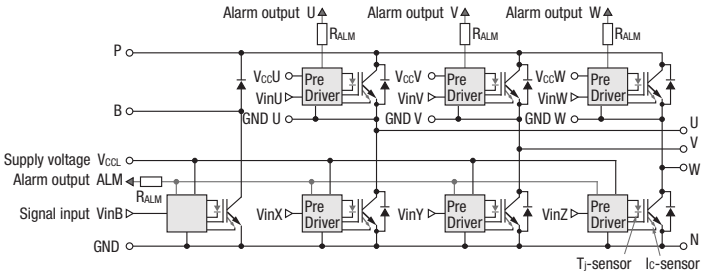
・6MBP□VBA060-50
・6MBP□VBA120-50



・6MBP□VFN□-50
・6MBP□VDA□-50
・6MBP□VDN□-50
・6MBP□VEA□-50



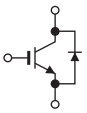
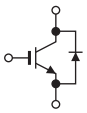
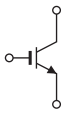
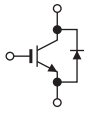
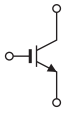
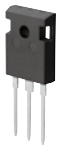
・7MBP□VFN□-50
・7MBP□VDA□-50
・7MBP□VDN□-50
・7MBP□VEA□-50



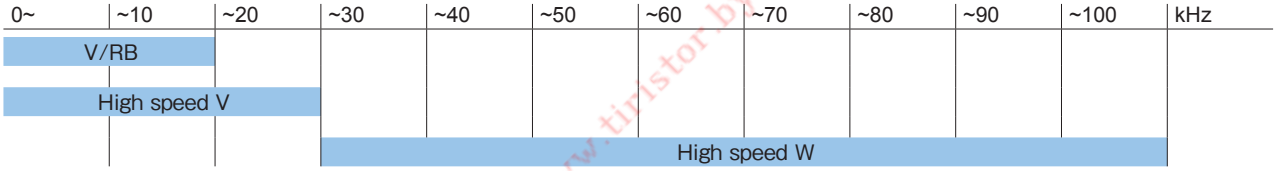
型式 Device type	インバータ部 Inverter			ブレーキ部 Brake		制御部 Control							パッケージ Package	質量 Net mass Grams
	V_{CES} Volts	I_C Cont. Amps.	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{CC} Typ. Volts	I_{OC}[INV] Min. Amps.	V_{UV} Volts	T_{jOH} Min. ℃	Alarm OC(typ.) ms	UV(typ.) ms	T_{jOH}(typ.) ms		
6MBP50VDA060-50	600	50	1.4	-	-	15	75	11.0 to 12.5	150	2	4	8	P630	290
6MBP75VDA060-50	600	75	1.4	-	-	15	113	11.0 to 12.5	150	2	4	8	P630	290
6MBP100VDA060-50	600	100	1.4	-	-	15	150	11.0 to 12.5	150	2	4	8	P630	290
6MBP100VDN060-50	600	100	1.4	-	-	15	150	11.0 to 12.5	150	2	4	8	P630	290
6MBP150VDA060-50	600	150	1.4	-	-	15	225	11.0 to 12.5	150	2	4	8	P630	290
6MBP150VDN060-50	600	150	1.4	-	-	15	225	11.0 to 12.5	150	2	4	8	P630	290
6MBP200VDA060-50	600	200	1.4	-	-	15	300	11.0 to 12.5	150	2	4	8	P630	290
6MBP200VDN060-50	600	200	1.4	-	-	15	300	11.0 to 12.5	150	2	4	8	P630	290
7MBP50VDA060-50	600	50	1.4	600	30	15	75	11.0 to 12.5	150	2	4	8	P630	290
7MBP75VDA060-50	600	75	1.4	600	50	15	113	11.0 to 12.5	150	2	4	8	P630	290
7MBP100VDA060-50	600	100	1.4	600	50	15	150	11.0 to 12.5	150	2	4	8	P630	290
7MBP100VDN060-50	600	100	1.4	600	50	15	150	11.0 to 12.5	150	2	4	8	P630	290
7MBP150VDA060-50	600	150	1.4	600	75	15	225	11.0 to 12.5	150	2	4	8	P630	290
7MBP150VDN060-50	600	150	1.4	600	75	15	225	11.0 to 12.5	150	2	4	8	P630	290
7MBP200VDA060-50	600	200	1.4	600	100	15	300	11.0 to 12.5	150	2	4	8	P630	290
7MBP200VDN060-50	600	200	1.4	600	100	15	300	11.0 to 12.5	150	2	4	8	P630	290
6MBP200VEA060-50	600	200	1.25	-	-	15	300	11.0 to 12.5	150	2	4	8	P631	940
6MBP300VEA060-50	600	300	1.25	-	-	15	450	11.0 to 12.5	150	2	4	8	P631	940
6MBP400VEA060-50	600	400	1.25	-	-	15	600	11.0 to 12.5	150	2	4	8	P631	940
7MBP200VEA060-50	600	200	1.25	600	100	15	300	11.0 to 12.5	150	2	4	8	P631	940
7MBP300VEA060-50	600	300	1.25	600	150	15	450	11.0 to 12.5	150	2	4	8	P631	940
7MBP400VEA060-50	600	400	1.25	600	200	15	600	11.0 to 12.5	150	2	4	8	P631	940
6MBP25VDA120-50	1200	25	1.7	-	-	15	38	11.0 to 12.5	150	2	4	8	P630	290
6MBP35VDA120-50	1200	35	1.7	-	-	15	53	11.0 to 12.5	150	2	4	8	P630	290
6MBP50VDA120-50	1200	50	1.7	-	-	15	75	11.0 to 12.5	150	2	4	8	P630	290
6MBP50VDN120-50	1200	50	1.7	-	-	15	75	11.0 to 12.5	150	2	4	8	P630	290
6MBP75VDA120-50	1200	75	1.7	-	-	15	113	11.0 to 12.5	150	2	4	8	P630	290
6MBP75VDN120-50	1200	75	1.7	-	-	15	113	11.0 to 12.5	150	2	4	8	P630	290
6MBP100VDA120-50	1200	100	1.7	-	-	15	150	11.0 to 12.5	150	2	4	8	P630	290
6MBP100VDN120-50	1200	100	1.7	-	-	15	150	11.0 to 12.5	150	2	4	8	P630	290
7MBP25VDA120-50	1200	25	1.7	1200	15	15	38	11.0 to 12.5	150	2	4	8	P630	290
7MBP35VDA120-50	1200	35	1.7	1200	15	15	53	11.0 to 12.5	150	2	4	8	P630	290
7MBP50VDA120-50	1200	50	1.7	1200	25	15	75	11.0 to 12.5	150	2	4	8	P630	290
7MBP50VDN120-50	1200	50	1.7	1200	25	15	75	11.0 to 12.5	150	2	4	8	P630	290
7MBP75VDA120-50	1200	75	1.7	1200	35	15	113	11.0 to 12.5	150	2	4	8	P630	290
7MBP75VDN120-50	1200	75	1.7	1200	35	15	113	11.0 to 12.5	150	2	4	8	P630	290
7MBP100VDA120-50	1200	100	1.7	1200	50	15	150	11.0 to 12.5	150	2	4	8	P630	290
7MBP100VDN120-50	1200	100	1.7	1200	50	15	150	11.0 to 12.5	150	2	4	8	P630	290
6MBP100VEA120-50	1200	100	1.7	-	-	15	150	11.0 to 12.5	150	2	4	8	P631	940
6MBP150VEA120-50	1200	150	1.7	-	-	15	225	11.0 to 12.5	150	2	4	8	P631	940
6MBP200VEA120-50	1200	200	1.7	-	-	15	300	11.0 to 12.5	150	2	4	8	P631	940
7MBP100VEA120-50	1200	100	1.7	1200	50	15	150	11.0 to 12.5	150	2	4	8	P631	940
7MBP150VEA120-50	1200	150	1.7	1200	75	15	225	11.0 to 12.5	150	2	4	8	P631	940
7MBP200VEA120-50	1200	200	1.7	1200	100	15	300	11.0 to 12.5	150	2	4	8	P631	940

注：本ページでVDNの付く型式は高放熱特性。
Note：The products with “VDN” on this page have high heat dissipation characteristics.

ディスクリート IGBT　Discrete IGBT

Package	V_{CES} (V)	I_C (A)	Trench-FS					RB-IGBT
			V Series	High-Speed V Series		High-Speed W Series		
								
 TO-247-P2	600/650	30	FGW30N60VD					
		35		FGW35N60HD FGW35N60HC	FGW35N60H			
		40				FGW40N65WD FGW40N65WE	FGW40N65W	
		50	FGW50N60VD	FGW50N60HD FGW50N60HC	FGW50N60H	FGW50N65WD FGW50N65WE	FGW50N65W	
		60				FGW60N65WD FGW60N65WE	FGW60N65W	
		75		FGW75N60HD FGW75N60HC	FGW75N60H	FGW75N65WD FGW75N65WE	FGW75N65W	
		85						FGW85N60RB
	1200	15	FGW15N120VD	FGW15N120HD	FGW15N120H			
		25	FGW25N120VD			FGW25N120WD FGW25N120WE	FGW25N120W	
		30		FGW30N120HD	FGW30N120H			
		40	FGW40N120VD	FGW40N120HD	FGW40N120H	FGW40N120WD FGW40N120WE	FGW40N120W	

■シリーズ別推奨動作周波数　Recommended operating frequency



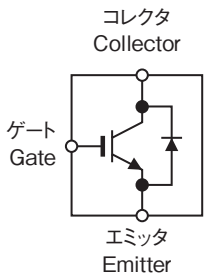
■ 型式の見方　Part numbers

FGW35N60HD (example)

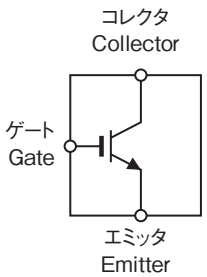
F	G		W		40	N		65		W		D	
社名 Company	機種コード Device code		パッケージコード Package type		定格電流 Current	極性 Polarity		定格電圧 Voltage		シリーズ Series		ダイオードタイプ Diode Type	
Fuji	G	IGBT	W	TO-247	×1	N	N-ch	60	600V	W	High Speed W series	C,E	w/ Diode (Full rated)
								65	650V	H	High Speed V series		
								120	1200V	V	V series	D	w/ Diode
										RB	RB-IGBT	Blank	w/o Diode

■ 等価回路　Equivalent circuit

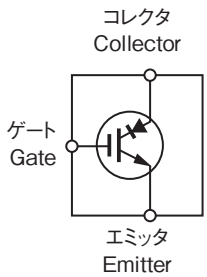
(a) ダイオード内蔵 with Diode



(b) ダイオードなし without Diode



(c) ディスクリート RB-IGBT



■ ディスクリートIGBT High Speed Wシリーズ　650V,1200Vクラス
Discrete IGBT High Speed W series 650V,1200V class

■特長　　Features

- トレンチゲート、フィールドストップ IGBT
- 低 VCE(sat)、低スイッチング Loss
- 高周波対応 (～100kHz)

- IGBT in Trench-gate structure and Field-stop technology
- Low VCE(sat) and low switching Loss
- High switching frequency (～100kHz)

IGBT in field-stop technology and trench-gate structure with Ultra fast FWD
650V,1200Vクラス　650,1200 volts class

型　式 Device type	絶対最大定格 Maximum Ratings				$V_{CE(sat)}$	E_{on} E_{off}		Q_G	V_F		Qrr	パッケージ	質量
	V_{CES}	I_C Tc=100°C	I_{CP}	P_D	(V_{GE}=15V)	(r_g=10Ω)				I_F Tc=100°C		Package	Net mass
	Volts	Amps.	Amps.	IGBT Watts	Typ. Volts	typ. mJ		typ. nC	typ. Volts	Amps.	typ. μC		Grams
● **FGW40N65W**	650	40	160	155	1.8	0.29	0.29	180	-	-	-	TO-247-P2	6.0
● **FGW40N65WD**	650	40	160	155	1.8	0.29	0.29	180	2.5	20	0.26	TO-247-P2	6.0
● **FGW40N65WE**	650	40	160	155	1.8	0.29	0.29	180	2.5	40	0.29	TO-247-P2	6.0
● **FGW50N65W**	650	50	200	190	1.8	0.42	0.46	215	-	-	-	TO-247-P2	6.0
● **FGW50N65WD**	650	50	200	190	1.8	0.42	0.46	215	2.5	25	0.32	TO-247-P2	6.0
● **FGW50N65WE**	650	50	200	190	1.8	0.42	0.46	215	2.5	50	0.35	TO-247-P2	6.0
● **FGW60N65W**	650	60	240	230	1.8	0.6	0.67	250	-	-	-	TO-247-P2	6.0
● **FGW60N65WD**	650	60	240	230	1.8	0.6	0.67	250	2.5	30	0.3	TO-247-P2	6.0
● **FGW60N65WE**	650	60	240	230	1.8	0.6	0.67	250	2.5	60	0.33	TO-247-P2	6.0
● **FGW25N120W**	1200	25	100	220	2.0	0.9	1.3	80	-	-	-	TO-247-P2	6.0
● **FGW25N120WD**	1200	25	100	220	2.0	0.9	1.3	80	2.2	12	0.6	TO-247-P2	6.0
○ **FGW25N120WE**	1200	25	100	220	2.0	0.9	1.3	80	2.2	25	0.6	TO-247-P2	6.0
● **FGW40N120W**	1200	40	160	360	2.0	2.8	1.6	120	-	-	-	TO-247-P2	6.0
● **FGW40N120WD**	1200	40	160	360	2.0	2.8	1.6	120	2.2	20	0.95	TO-247-P2	6.0
○ **FGW40N120WE**	1200	40	160	360	2.0	2.8	1.6	120	2.2	40	0.95	TO-247-P2	6.0

●：新製品　New Products,　○：開発中　Under development

■ ディスクリートIGBT V/High Speed Vシリーズ　600V, 1200Vクラス
Discrete IGBT V/High Speed V series 600V, 1200V class

■特長　Features

- トレンチゲート、フィールドストップ IGBT
- 低 VCE(sat)、低スイッチング Loss (High Speed V シリーズ)
- 短絡保証時間 tsc=10μs (V シリーズ)
- IGBT in Trench-gate structure and Field-stop technology
- Low VCE(sat) and low switching Loss (High Speed V series)
- Short circuit withstand time; tsc=10μs (V series)

IGBT in field-stop technology and trench-gate structure with Ultra fast FWD
600Vクラス　600 volts class

型式 Device type	絶対最大定格 Maximum Ratings				$V_{CE(sat)}$	E_{on}	E_{off}	Q_G	V_F		Qrr	パッケージ	質量
	V_{CES}	I_C Tc=100°C	I_{CP}	P_D IGBT	(V_{GE}=15V) Typ.	(r_g=10Ω) typ.		typ.	typ.	I_F	typ.	Package	Net mass
	Volts	Amps.	Amps.	Watts	Volts	mJ	mJ	nC	Volts	Amps.	μC		Grams
FGW30N60VD	600	30	60	230	1.6	1.2	0.7	225	1.5	25	0.7	TO-247-P2	6.0
FGW35N60H	600	35	105	230	1.5	0.9	0.85	210	-	-	-	TO-247-P2	6.0
FGW35N60HD	600	35	105	230	1.5	0.9	0.85	210	2.0	15	0.06	TO-247-P2	6.0
FGW35N60HC	600	35	105	230	1.5	0.95	0.85	210	2.35	35	0.13	TO-247-P2	6.0
FGW50N60H	600	50	150	360	1.5	1.4	1.7	305	-	-	-	TO-247-P2	6.0
FGW50N60HD	600	50	150	360	1.5	1.4	1.7	305	2.0	25	0.08	TO-247-P2	6.0
FGW50N60HC	600	50	150	360	1.5	1.5	1.7	305	2.3	50	0.07	TO-247-P2	6.0
FGW50N60VD	600	50	100	360	1.6	2.4	1.4	360	1.5	35	0.75	TO-247-P2	6.0
FGW75N60H	600	75	225	500	1.5	3.0	4.2	460	-	-	0.12	TO-247-P2	6.0
FGW75N60HD	600	75	225	500	1.5	3.0	4.2	460	2.0	35	0.13	TO-247-P2	6.0
FGW75N60HC	600	75	225	500	1.5	3.8	4.2	460	2.3	75	0.3	TO-247-P2	6.0

1200Vクラス　1200 volts class

型式 Device type	絶対最大定格 Maximum Ratings				$V_{CE(sat)}$	E_{on}	E_{off}	Q_G	V_F		Qrr	パッケージ	質量
	V_{CES}	I_C Tc=100°C	I_{CP}	P_D IGBT	(V_{GE}=15V) Typ.	(r_g=10Ω) typ.		typ.	typ.	I_F	typ.	Package	Net mass
	Volts	Amps.	Amps.	Watts	Volts	mJ	mJ	nC	Volts	Amps.	μC		Grams
FGW15N120H	1200	15	45	155	1.8	0.6	0.8	140	-	-	-	TO-247-P2	6.0
FGW15N120HD	1200	15	45	155	1.8	0.6	0.8	140	2.2	12	0.6	TO-247-P2	6.0
FGW15N120VD	1200	15	30	155	1.85	1.1	0.8	150	1.7	15	0.85	TO-247-P2	6.0
FGW25N120VD	1200	25	50	260	1.85	2.2	1.4	235	1.7	25	1.2	TO-247-P2	6.0
FGW30N120H	1200	30	90	260	1.8	1.6	1.5	230	-	-	-	TO-247-P2	6.0
FGW30N120HD	1200	30	90	260	1.8	1.6	1.5	230	2.2	20	0.95	TO-247-P2	6.0
FGW40N120H	1200	40	120	340	1.8	2.8	1.8	300	-	-	-	TO-247-P2	6.0
FGW40N120HD	1200	40	120	340	1.8	2.8	1.8	300	2.2	30	1.35	TO-247-P2	6.0
FGW40N120VD	1200	40	80	340	1.85	4.3	2.2	320	1.7	30	1.45	TO-247-P2	6.0

■ディスクリートRB-IGBT　Discrete RB-IGBT

■特長　Features

- 富士電機の独自技術により逆電圧特性を有する IGBT を 1 チップで実現
- 3 レベルインバータ (T タイプ) への適用で高効率を実現
- Reverse blocking character is realized for 1 chip by Fuji's original technology.
- High efficiency by applying to T-type 3 level inverter circuit.

■特性　Characteristics

型式 Device type	絶対最大定格 Maximum Ratings					$V_{CE(sat)}$	E_{on}	E_{off}	Q_G	t_{rr}	パッケージ	質量
	V_{CES}	I_C Tc=100°C	I_{CP}	tsc	P_D IGBT	(V_{GE}=15V) Typ.	(r_g=10Ω) typ.		typ.	typ.	Package	Net mass
	Volts	Amps.	Amps.	μsec.	Watts	Volts	mJ	mJ	nC	n sec		Grams
FGW85N60RB	600	85	170	10	600	2.45	4.7	2.4	300	165	TO-247-P2	6.0

EV, HEV 用 IGBT モジュール

■ EV, HEV用IGBT IPMの特長

Features of IGBT IPM for Electric Vehicle and Hybrid Electric Vehicle

■特長　Features

- ドライブ回路、保護機能内蔵
- ・光絶縁
  （信号入力、IGBT チップ温度モニター、異常検出時アラーム出力）
- ・短絡保護、過熱保護、制御電圧低下保護
- ・鉛フリー

- Including circuit board whitch has IGBT drive and protection fanction
- ・Optical isolated
  (signal input, IGBT's temperature monitor, alarm output)
- ・Detection and protection
  (short-circuit, over-temperature, under-voltage)
- ・Lead Free Package

■ 特性　Characteristics

(T_j=25°C)

型　式 Device type	V_{CES} Volts	$I_{C(Cont)}$ Amps.	$V_{CE(sat)}$ Typ. Volts	V_F Typ. Volts	パッケージ Package	質量 Net mass Grams
2MBP600UN120V	1200	600	2.00	2.20	P401	680g

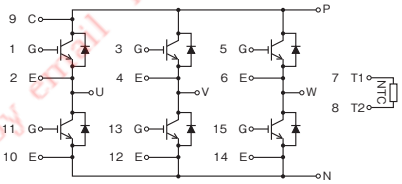
■ EV, HEV用IGBTモジュールの特長

Features of IGBT Module for Electric Vehicle and Hybrid Electric Vehicle

■特長　Features

- ●第６世代“V シリーズ” 650V-IGBT
- ●直接水冷銅フィンベース
- ●高パワー密度および小型パッケージ
- ● RoHS 対応

- 6th Generation “V-series“ 650V-IGBT
- Direct liquid Cooling Fin-base with copper
- High power density and small package size
- RoHS compliant



■ 特性　Characteristics

$V_{CE\ (sat)}$: at T_j=25°C, Chip

型　式 Device type	V_{CES} Volts	$I_{C(Cont)}$ Amps.	$I_{C(Peak)}$ Amps.	$V_{CE(sat)}$ Typ. Volts	V_F Typ. Volts	パッケージ Package	質量 Net mass Grams
6MBI600VW-065V	650	300	600	2.00（I_C=600A）	1.70（I_F=600A）	M652	900g

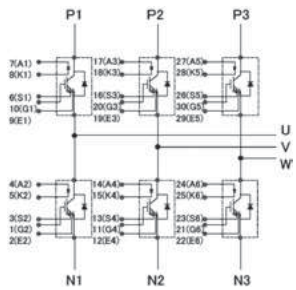
■ EV, HEV用IGBTモジュールの特長

Features of IGBT Module for Electric Vehicle and Hybrid Electric Vehicle

■特長　Features

- ●第７世代“RC IGBT”750V-IGBT
- ●直接水冷アルミウォータージャケット
- ●高パワー密度および小型・軽量パッケージ
- ●高信頼性：Tjmax 175℃保証
- ● RoHS 対応

- 7th Generation “RC-IGBT“ 750V-IGBT
- Direct liquid Cooling AL Water jacket
- High power density ,small and light weight package
- High reliability：Tjmax 175℃ guaranteed
- RoHS compliant



■ 特性　Characteristics

$V_{CE\ (sat)}$: at T_j=25°C, Chip

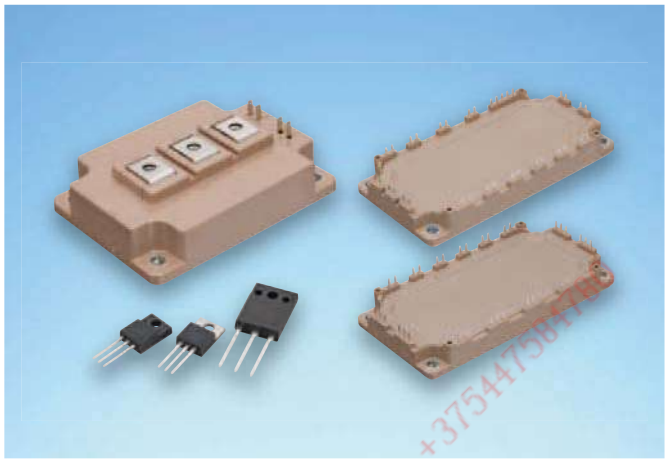
型　式 Device type	V_{CES} Volts	$I_{C(Cont)}$ Amps.	$I_{C(Peak)}$ Amps.	$V_{CE(sat)}$ Typ. Volts	V_F Typ. Volts	パッケージ Package	質量 Net mass Grams
○ **6MBI800XV-075V-01**	750	720	1600	1.45（I_C=800A）	1.50（I_F=800A）	M653	572g

○：開発中　Under development

SiCデバイス
SiC Devices

SiC デバイスは、高耐圧、低損失、高周波動作および高温動作を実現する優れた特性を持っています。SiC を適用したパワー半導体は、大幅な省エネと搭載製品の小型・軽量化を実現することができます。

SiC devices have excellent characteristics that realize high blocking voltage, low power dissipation, high-frequency operation and high-temperature operation.
Power semiconductors that make use of SiC achieve significant reduction in energy consumption, and can be used to develop smaller and lighter products.



■ SiC-SBD搭載IGBTハイブリッドモジュールVシリーズ
IGBT Hybrid Modules with SiC-SBD V series

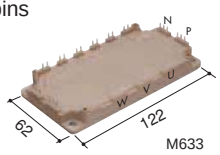
■特長　Features

●高性能チップ適用
・低損失の V シリーズ IGBT
・低損失の SiC-SBD
●従来の Si-IGBT モジュール製品とパッケージ互換

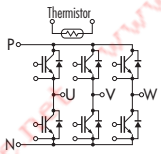
- High performance chips
  · V series IGBT for low loss operation
  · SiC-SBD for low loss operation
- The same package lineup as the conventional Si-IGBT modules

■6個組　EconoPACK™　1200V クラス　6-pack EconoPACK™ 1200 volts class

Solder pins



M633



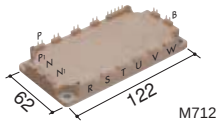
Ic	1200V IGBT Hybrid Modules with SiC-SBD V series
100A	**6MSI100VB-120-50**

Dimension [mm]

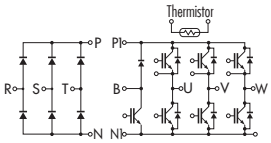
型　式 Device type	V_{CES}	V_{GES}	I_C Cont.	P_C	$V_{CE(sat)}$ (V_{GE}=15V) Typ.	I_C	スイッチングタイム Switching time t_{on} Typ.	t_{off} Typ.	t_f Typ.	パッケージ Package	質量 Net mass
	Volts	Volts	Amps.	Watts	Volts	Amps.	μsec.	μsec.	μsec.		Grams
● **6MSI100VB-120-50**	1200	±20	100	520	1.75	100	0.39	0.42	0.05	M633	300

●：新製品　New Products
注: EconoPACK™はInfineon Technologies社の登録商標です。
Note: EconoPACK™ is registered trademarks of Infineon Technologies AG, Germany.

■ PIM（コンバータ部、ブレーキ部内蔵）EconoPIM™　600, 1200V クラス
PIM/Built-in converter and brake EconoPIM™ 600, 1200 volts class



M712



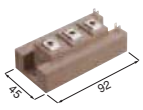
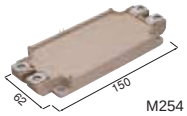
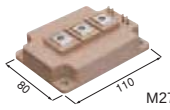
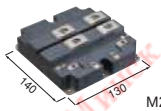
Ic	600V	1200V
	IGBT Hybrid Modules with SiC-SBD V series	
35A		**7MSR35VB120-50**
50A	**7MSR50VB060-50**	**7MSR50VB120-50**
75A	**7MSR75VB060-50**	
100A	**7MSR100VB060-50**	

Dimension [mm]

型　式 Device type	インバータ部 Inverter [IGBT]				ブレーキ部 Brake [IGBT+FED]			コンバータ部 Converter [Diode]				パッケージ Package	質量 Net mass
	V_{CES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ Typ. Volts	V_{CES} Volts	I_C Cont. Amps.	V_{RRM} Volts	V_{RRM} Volts	I_O Cont. Amps.	V_{FM} Typ. Volts	I_{FSM} Amps.		Grams
● **7MSR50VB060-50**	600	50	215	1.6	600	50	600	800	50	1.3	210	M712	330
● **7MSR75VB060-50**	600	75	300	1.6	600	50	600	800	75	1.25	500	M712	330
● **7MSR100VB060-50**	600	100	335	1.6	600	50	600	800	100	1.25	700	M712	330
● **7MSR35VB120-50**	1200	35	210	1.85	1200	25	1200	1600	35	1.35	260	M712	330
● **7MSR50VB120-50**	1200	50	280	1.85	1200	35	1200	1600	50	1.35	360	M712	330

●：新製品　New Products
注: EconoPIM™はInfineon Technologies社の登録商標です。
Note: EconoPIM™ is registered trademarks of Infineon Technologies AG, Germany.

■２個組　1200, 1700V クラス　Standard 2-pack 1200, 1700 volts class

	Ic	1200V	1700V
		IGBT Hybrid Modules with SiC-SBD V series	
 M274	200	**2MSI200VAB-120-53**	
 M276	300	**2MSI300VAH-120C-53**	
 M254	300	**2MSI300VAN-120-53**	
	450	**2MSI450VAN-120-53**	**2MSI450VAN-170-53**
	550		**2MSI550VAN-170-53**
	600	**2MSI600VAN-120-53**	
 M277	400		**2MSI400VE-170E-53**
 M256	1200		**2MSI1200VAT-170PC**
			2MSI1200VAT-170EC

Dimension [mm]

型　式 Device type	V_{CES} Volts	V_{GES} Volts	I_C Cont. Amps.	P_C Watts	$V_{CE(sat)}$ (V_{GE}=15V) Typ. Volts	I_C Amps.	スイッチングタイム Switching time t_{on} Typ. μsec.	t_{off} Typ. μsec.	t_f Typ. μsec.	パッケージ Package	質量 Net mass Grams
○ **2MSI200VAB-120-53**	1200	±20	200	1500	1.75	200	T.B.D	T.B.D	T.B.D	M274	270
● **2MSI300VAH-120C-53**	1200	±20	300	1600	1.75	300	0.82	0.84	0.09	M276	370
○ **2MSI300VAN-120-53**	1200	±20	300	1595	1.75	300	T.B.D	T.B.D	T.B.D	M254	300
○ **2MSI450VAN-120-53**	1200	±20	450	2270	1.75	450	T.B.D	T.B.D	T.B.D	M254	300
○ **2MSI600VAN-120-53**	1200	±20	600	3750	1.85	600	T.B.D	T.B.D	T.B.D	M254	300
○ **2MSI450VAN-170-53**	1700	±20	450	2500	2.00	450	T.B.D	T.B.D	T.B.D	M254	300
○ **2MSI550VAN-170-53**	1700	±20	550	3750	2.15	550	T.B.D	T.B.D	T.B.D	M254	300
● **2MSI400VE-170-53**	1700	±20	400	4540	2.00	400	1.05	1.95	0.09	M277	470
○ **2MSI1200VAT-170PC**	1700	±20	1200	7040	1.80	1200	T.B.D	T.B.D	T.B.D	M256	900
○ **2MSI1200VAT-170EC**	1700	±20	1200	7040	2.00	1200	T.B.D	T.B.D	T.B.D	M256	900

●：新製品　New Products　○：開発中　Under development

■ SiC ショットキーバリアダイオード　SiC Schottky-Barrier Diodes (SBD)

■特長　Features

- ●高速スイッチング特性
- ・電源の高周波動作、システムの小型軽量化
- ●低 VF 特性
- ●低 IR 特性
- ・Tj=175℃保証、電源の高温動作、低損失化、高効率化
- ●高逆サージ耐量

- ● High speed switching
- · High-frequency operation,miniaturization,weight saving
- ● Low-VF
- ● Low-IR
- · Tj=175°C Guaranteed, High-temperature operation, Low-Loss, High efficiency
- ● High avalanche capability

■ SiC-SBD シリーズ　SiC-SBD Series

SiC-SBD Series			TO-220	TO-220F	TO-247	T-Pack(s)
						
結線	V_{RRM} (V)	Io (A)				
シングル Single	650	6	✓	✓		
		8	✓	✓		
		10	✓	✓	✓	✓
		25	✓	✓	✓	✓
	1200	18		✓	✓	
デュアル Dual	650	20	✓	✓	✓	✓
		50			✓	
	1200	36			✓	

型　式 Device type	絶対最大定格 Maximaum rating V_{RRM} Volts	I_O *1 Amps.	I_{FSM} *2 Amps.	接合温度 Thermal rating T_j (°C) MAX	電気的特性 (Ta=25°C) Characteristics V_{FM} MAX. Volts	I_{RRM} *3 MAX. μA	パッケージ Package
○ **FDCP06S65**	650	6	34	175	1.8	10	TO-220
○ **FDCP08S65**	650	8	40	175	1.8	10	TO-220
FDCP10S65	650	10	50	175	1.8	10	TO-220
FDCP20C65	650	20	50	175	1.8	10	TO-220
FDCP25S65	650	25	100	175	1.6	10	TO-220
FDCA10S65	650	10	50	175	1.8	10	TO-220F
FDCA20C65	650	20	50	175	1.8	10	TO-220F
FDCA25S65	650	25	100	175	1.6	10	TO-220F
○ **FDCA06S65**	650	6	34	175	1.8	10	TO-220F
○ **FDCA08S65**	650	8	40	175	1.8	10	TO-220F
FDCY10S65	650	10	50	175	1.8	10	TO-247
FDCY20C65	650	20	50	175	1.8	10	TO-247
FDCY25S65	650	25	100	175	1.6	10	TO-247
FDCY50C65	650	50	100	175	1.6	10	TO-247
○ **FDCC10S65**	650	10	50	175	1.8	10	T-Pack(S)
○ **FDCC20C65**	650	20	50	175	1.8	10	T-Pack(S)
○ **FDCC25S65**	650	25	100	175	1.6	10	T-Pack(S)
FDCA18S120	1200	18	90	175	1.7	10	TO-220F
FDCY18S120	1200	18	90	175	1.7	10	TO-247
FDCY36C120	1200	36	90	175	1.7	10	TO-247

○：開発中　Under development

*1　50Hz 方形波 duty=1/2
*2　正弦波 10ms
*3　V_R=V_{RRM}

*1　50Hz Square wave duty=1/2
*2　Sine half wave, 10ms
*3　V_R=V_{RRM}

■自動車用 SiC ショットキーバリアダイオード　Automotive SiC Schottky-Barrier Diodes

SiC-SBD Series			TO-220	TO-247	T-Pack(s)
					
結線	V_{RRM} (V)	Io (A)			
ｼﾝｸﾞﾙ Single	650	10	✓	✓	✓
		25	✓	✓	✓
	1200	18		✓	
デュアル Dual	650	20	✓	✓	✓
		50		✓	
	1200	36		✓	

型　　式 Device type	V_{RRM} Volts	I_o Amps.	I_{FSM} Amps.	V_F max. Volts	I_{RRM} max. mA	rating T_j and T_{stg} °C	パッケージ Package	質量 Net mass Grams
FDCP10S65A	650	10	100	1.8	0.005	-55 to +175	TO-220	2.0
FDCY10S65A	650	10	100	1.8	0.005	-55 to +175	TO-247	6.4
FDCC10S65A	650	10	100	1.8	0.005	-55 to +175	T-Pack(S)	1.6
FDCP20C65A	650	20 *1	100	1.8	0.005	-55 to +175	TO-220	2.0
FDCY20C65A	650	20 *1	100	1.8	0.005	-55 to +175	TO-247	6.4
FDCC20C65A	650	20 *1	100	1.8	0.005	-55 to +175	T-pack	1.6
FDCP25S65A	650	25	190	1.7	0.01	-55 to +175	TO-220	2.0
FDCY25S65A	650	25	190	1.7	0.01	-55 to +175	TO-247	6.4
FDCC25S65A	650	25	190	1.7	0.01	-55 to +175	T-pack	1.6
FDCY50C65A	650	50 *1	190	1.7	0.01	-55 to +175	TO-247	6.4
FDCY18C120A	1200	18	180	1.8	0.01	-55 to +175	TO-247	6.4
FDCY36C120A	1200	36 *1	180	1.8	0.01	-55 to +175	TO-247	6.4

*1 : 2 in 1 package, IF=0.5Io

電源制御用IC
Integrated Circuits

富士電機の電源制御用 IC は AC/DC、DC/DC それぞれにラインアップを揃えており様々な電源回路に対応が可能です。高効率、低待機電力、低ノイズを実現し、各種環境関連の規制に対応。更に、多くの保護機能を IC に内蔵しており、電源回路の小型化も実現できます。

Fuji Electric offers a lineup of AC/DC and DC/DC power supply control ICs that support a variety of power circuits. These highly efficient, low-noise products with low standby power consumption are compatible with environmental regulations. Furthermore, the many protection functions are built into the ICs themselves, allowing for smaller power circuits.

■ 電源制御用 IC の特長　Features of Power Supply control ICs

低待機電力対応 PWM制御IC　Green Mode PWM-ICs

■特長　Features

- 500V / 650V 耐圧起動回路内蔵
- 軽負荷時 スイッチング周波数低減
- 各種保護機能（過電圧 / ブラウンアウト /2 段階過電力）
- 周波数拡散機能による低 EMI ノイズ

- Built-in 500/650V withstand voltage start up circuit
- Reduct switching frequency at light load
- Protect functions (Over voltage/Brown out/2 stage Over power)
- Low EMI noise

低待機電力対応 擬似共振制御IC　Green Mode Quasi-resonant ICs

■特長　Features

- 500V 耐圧起動回路内蔵
- 低待機電力対応（間欠動作 / 周波数低減）
- 各種保護機能（過電圧 / 過負荷など）

- Built-in 500V withstand voltage start up circuit
- Green mode functions (Intermittent Switching/Linerary reduced switching frequency)
- Protect functions (Over voltage/Over load etc.)

力率改善制御IC　Power Factor Correction ICs

■特長　Features

- 幅広い電力範囲（75W ～ 1kW）
- 力率 0.99 以上
- 各種保護機能（FB ピンオープンショート / 過電圧など）

- Wide electric power range(From 75W to 1kW)
- Power factor ≧ 0.99
- Protect functions (FB Pin open short/Over voltage etc.)

電流共振IC　Current Resonant ICs

■特長　Features

- ワールドワイド入力にて、1 コンバータの回路構成が可能
- ハイサイド駆動回路内蔵
- 共振はずれ防止機能
- 各種保護機能
  （過電流 / 過電圧 / 過負荷 / 過熱 / ブラウンアウト）
- 低待機電力対応（間欠動作）

- Realize 1 convertor circuit structure at world wide input power
- Built-in High side driver
- Priventing capacitive region operation
- Protect functions
  (Over current/Over voltage/Over load/Over heat/Brown out)
- Green mode function (Intermittent switching)

ハイサイド・ローサイド ドライバIC　High and Low side driver IC

■特長

- VS 端子の高負電圧耐量
- 30V までの広範囲電源電圧（FA5650/5651）
- 3.3V 論理入力に対応
- 電源電圧低下保護を内蔵
- dVs/dt 耐量 50kV/us の高ノイズ耐量
- 高速応答：入出力遅延時間 125ns（Typ）
（FA5650/5651/5751）

■ Features

- High negative transient voltage on VS terminal
- Wide range supply voltage up to 30V (FA5650/5651)
- 3.3V logic compatible
- Built-in under voltage lockout
- Allowable offset supply voltage transient dVs/dt up to 50kV/us
- High speed response: Turn on/off delay time 125ns (Typ)
(FA5650/5651/5751)

■型式の見方　Part numbers

FA8A00N (example)

F	A	8	A	00	N
社名 Company Symbol	制御方式 Control System	製品シリーズ Series	世代 Generation	系列番号 Number	パッケージコード Package code
F Fuji	A Analog	1 CRMPFC	A 1G	2 桁の整数 Two-digit integer	N SOP
		6 LLC	B 2G		P DIP
		8 PWM	C 3G		
			… …		

FA5590N (example)

F	A	55	90	N
社名 Company Symbol	制御方式 Control System	製品シリーズ Series	系列番号 Number	パッケージコード Package code
F Fuji	A Analog	3X AC/DC	2 桁の整数 Two-digit integer	N/S SOP
		5X AC/DC		P DIP
		7X DC/DC		
		13X AC/DC		

■ AC/DC 電源制御用 IC　AC/DC Power Supply control ICs

●低待機電力対応 PWM制御IC（電流モード）　Green mode PWM-ICs (Current mode)

型式 Type Name	デューティ Duty (%)	入力電圧 Input voltage (V)	動作周波数 Frequency (kHz) 65	動作周波数 Frequency (kHz) 100	電流検出 Current sense	過負荷保護 Over load protection	過電力保護 Over power protection	過電圧保護 Over voltage protection	起動回路 Start up circuit	低待機電力機能 Green mode function	X-Cap 放電機能 X-Cap discharge function
ブラウンアウト機能 内蔵 Within Brown out function											
FA8A00N	83%	12 - 24V	✓		プラス Positive	自動復帰 Auto-Recovery	2段階 2Stage (OPP ratio 1:1.4)	ラッチ Latch	500V	リニア周波数低減 Linerary frequency reduction 間欠動作 Intermittent opration	✓
FA8A40N				✓							
FA8A01N			✓			タイマーラッチ Timer-latch					
FA8A41N				✓							
FA8A27N		10 - 28V	✓				2段階 2Stage (OPP ratio 1:1.8)				
FA8A37N											
FA8A39N											
ブラウンアウト機能 非内蔵 Without Brown out function											
FA5680N	85%	11 - 24V	✓		マイナス Negative	自動復帰 Auto-Recovery	1段階 1Stage	ラッチ Latch	500V	リニア周波数低減 Linerary frequency reduction 間欠動作 Intermittent opration	✓
FA5681N			✓			タイマーラッチ Timer-latch					
FA8A60N	83%	10 - 24V	✓		プラス Positive	自動復帰 Auto-Recovery					
FA8A64N				✓							
FA8A61N			✓			タイマーラッチ Timer-latch					
FA8A65N				✓							
FA8A70N			✓			自動復帰 Auto-Recovery					
FA8A74N				✓							
FA8A71N			✓			タイマーラッチ Timer-latch					
FA8A75N				✓							
FA8A12N			✓			自動復帰 Auto-Recovery	2段階 2Stage				
FA8A80N●			✓			自動復帰 Auto-Recovery	1段階 1Stage		650V		
FA8A84N●				✓							
FA8A81N●			✓			タイマーラッチ Timer-latch					
FA8A85N●				✓							
FA8A90N●			✓			自動復帰 Auto-Recovery					
FA8A94N●				✓							
FA8A91N●			✓			タイマーラッチ Timer-latch					✓
FA8A95N●				✓							

●:新製品　New Product

●低待機電力対応 PWM-IC系列（ブラウンアウトあり）　Green mode PWM-ICs with Brown Out function

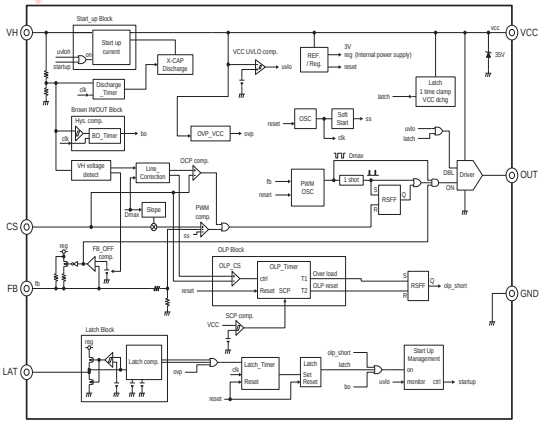
低待機電力PWM IC Green Mode PWM IC							
ブラウンアウト機能 Brown Out function	内蔵 Within						
電流検出 Current senes	プラス Positive						
過電力保護 Over power protection	2段階 2 Stage OPP ratio 1:1.4				2段階 2 Stage OPP ratio 1:1.8		
動作周波数 Frequency (kHz)	65		100		65		
過負荷保護 Over load protecition	自動復帰 Auto-recovery	タイマーラッチ Timer-latch	自動復帰 Auto-recovery	タイマーラッチ Timer-latch	タイマーラッチ Timer-latch		
OLP遅延時間 OLP Delay time (ms)	70	70	70	70	860	1600	2400
X-Cap放電機能 X-Cap discharge	内蔵 Within	内蔵 Within	内蔵 Within	内蔵 Within	内蔵 Within	内蔵 Within	内蔵 Within
型式 Product type	FA8A00N	FA8A01N	FA8A40N	FA8A41N	FA8A27N	FA8A37N	FA8A39N

●低待機電力対応 PWM-IC系列（ブラウンアウトなし）　Green mode PWM-ICs without Brown Out function

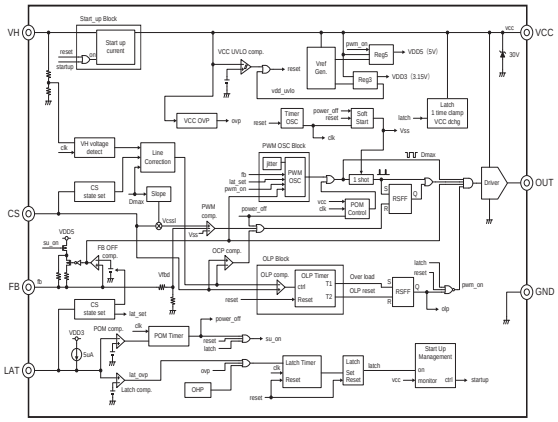
低待機電力PWM IC Green Mode PWM IC											
ブラウンアウト機能 Brown Out function	非内蔵 Without										
過電力保護 Over power protection	1段階 1 Stage										2段階 2 Stage
電流検出 Current senes	マイナス Negative		プラス Positive								プラス Positive
過負荷保護 Over load protecition	自動復帰 Auto-recovery	タイマーラッチ Timer-latch	自動復帰 Auto-recovery		タイマーラッチ Timer-latch						自動復帰 Auto-recovery
動作周波数 Frequency (kHz)	65	65	65	100	65		100				65
X-Cap放電機能 X-Cap discharge			内蔵 Within	内蔵 Within		内蔵 Within		内蔵 Within	内蔵 Within	内蔵 Within	内蔵 Within
型式Product type 起動素子500V	FA5680N	FA5681N	FA8A60N	FA8A70N	FA8A64N	FA8A74N	FA8A61N	FA8A71N	FA8A65N	FA8A75N	FA8A12N
型式Product type 起動素子650V			FA8A80N	FA8A90N	FA8A84N	FA8A94N	FA8A81N	FA8A91N	FA8A85N	FA8A95N	

●代表型式ブロック図　Block diagram(Main product)

FA8A00N（With-in Brown out)



FA8A61N（Without Brown out)

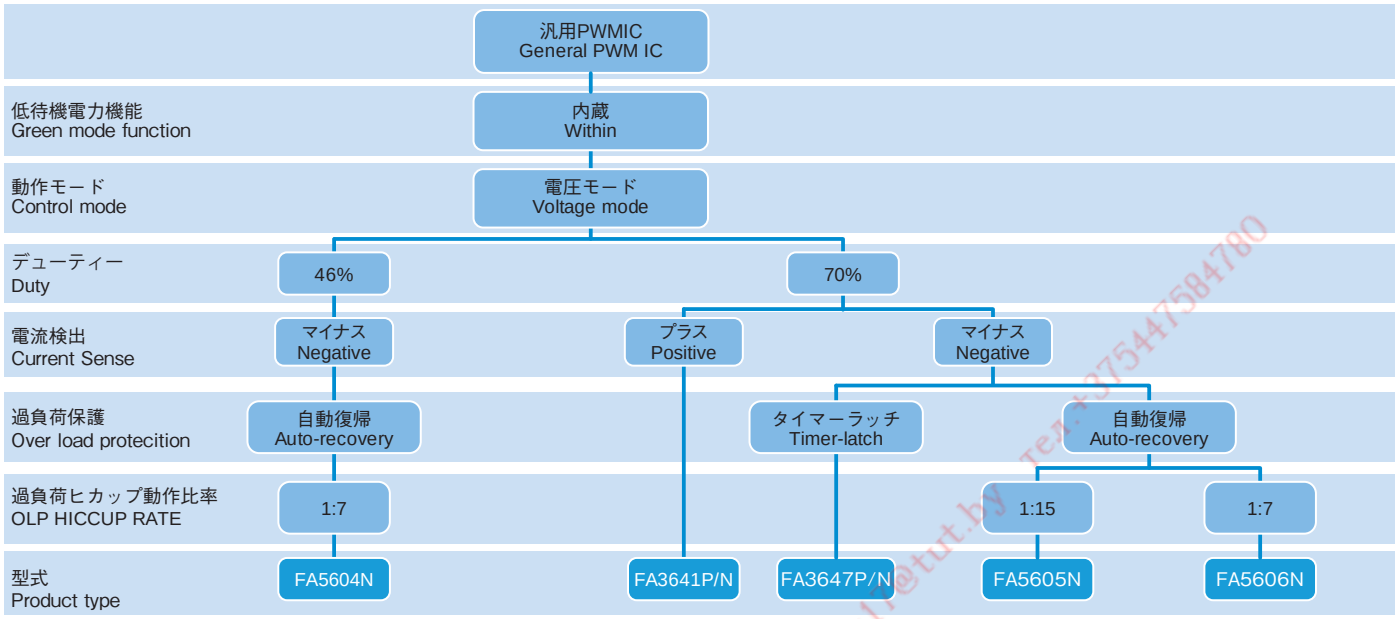


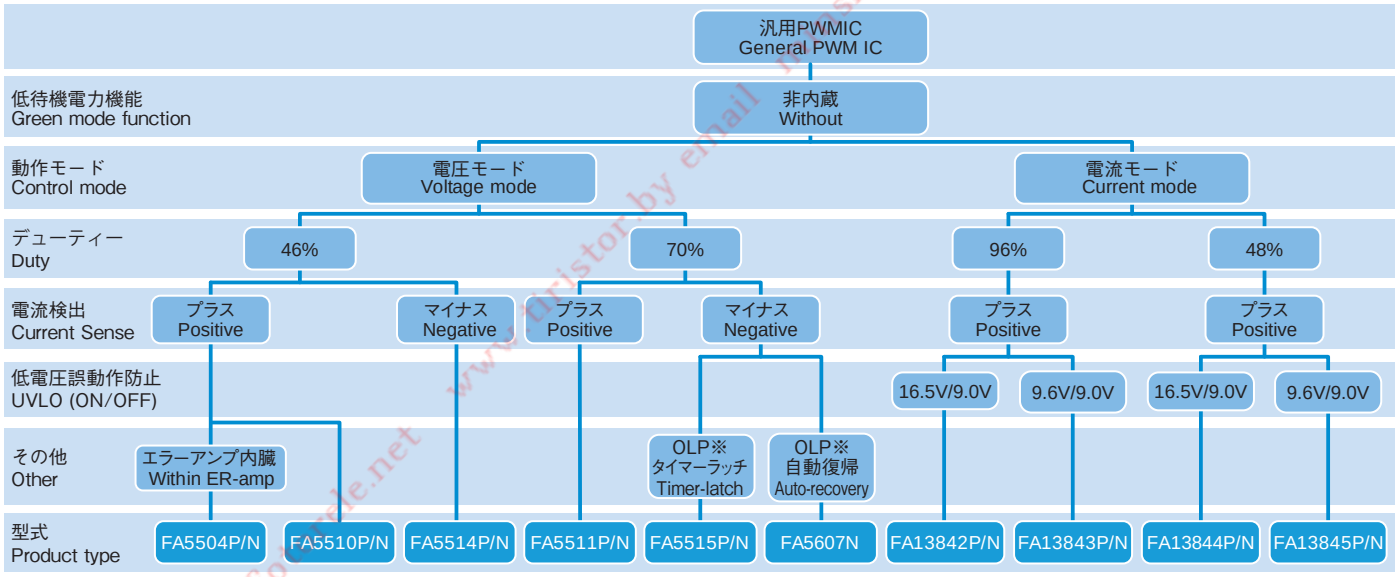
●汎用PWM制御IC　General PWM-ICs

型式 Type Name	制御方式 Control mode	デューティ Duty (%)	入力電圧 Input voltage (V)	電流検出 Current sense	過負荷保護 Over load protection	過電圧保護 Over voltage protection	UVLO Under-voltage lockout (ON/OFF)	備考 Remarks
低待機電力機能 内蔵　Within Green mode function								
FA3641P/N	電圧モード Voltage mode	70	10 - 28	プラス Positive	タイマーラッチ Timer-latch	ラッチ Latch	–	
FA3647P/N				マイナス Negative			–	
FA5604N		46	10 - 30	マイナス Negative	自動復帰 Auto-Recovery		17.5V/9.7V	軽負荷時周波数低減開始 / 復帰 FB 電圧 1.8V/1.95V Frequency reduction start/stop FB voltage under light load 1.8V/1.95V
FA5605N		70						
FA5606N								軽負荷時周波数低減開始 / 復帰 FB 電圧 1.55V/1.65V Frequency reduction start/stop FB voltage under light load 1.55V/1.65V
低待機電力機能 非内蔵　Without Green mode function								
FA13842P/N	電流モード Current mode	96	10 - 25	プラス Positive	–	–	16.5V/9.0V	
FA13843P/N								
FA13844P/N		48						
FA13845P/N								
FA5504P/N	電圧モード Voltage mode	46	10 - 28		タイマーラッチ Timer-latch	ラッチ Latch	–	エラーアンプ内蔵 Within error amplifier
FA5510P/N								
FA5511P/N		70						
FA5514P/N		46		マイナス Negative				
FA5515P/N		70						
FA5607N			10 - 30		自動復帰 Auto-Recovery		17.5V/9.7V	

PKG: 全て8pin　All 8pin
動作周波数:外部調整　Frequency: Adjustable

●汎用PWM制御IC系列　General PWM-ICs

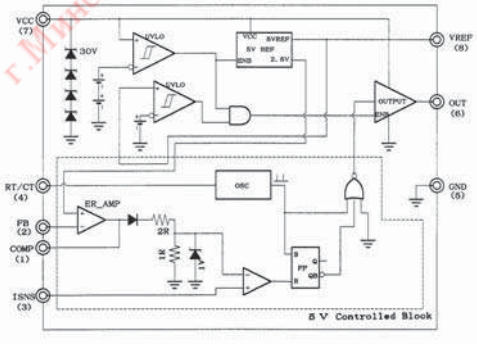




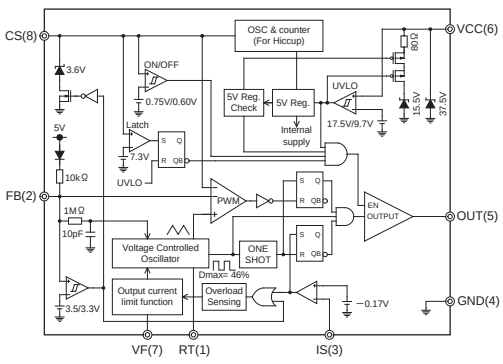
※OLP：Over Load Protection 過負荷保護

●代表型式ブロック図　Block diagram (Main model)

FA13842P/N



FA5604N

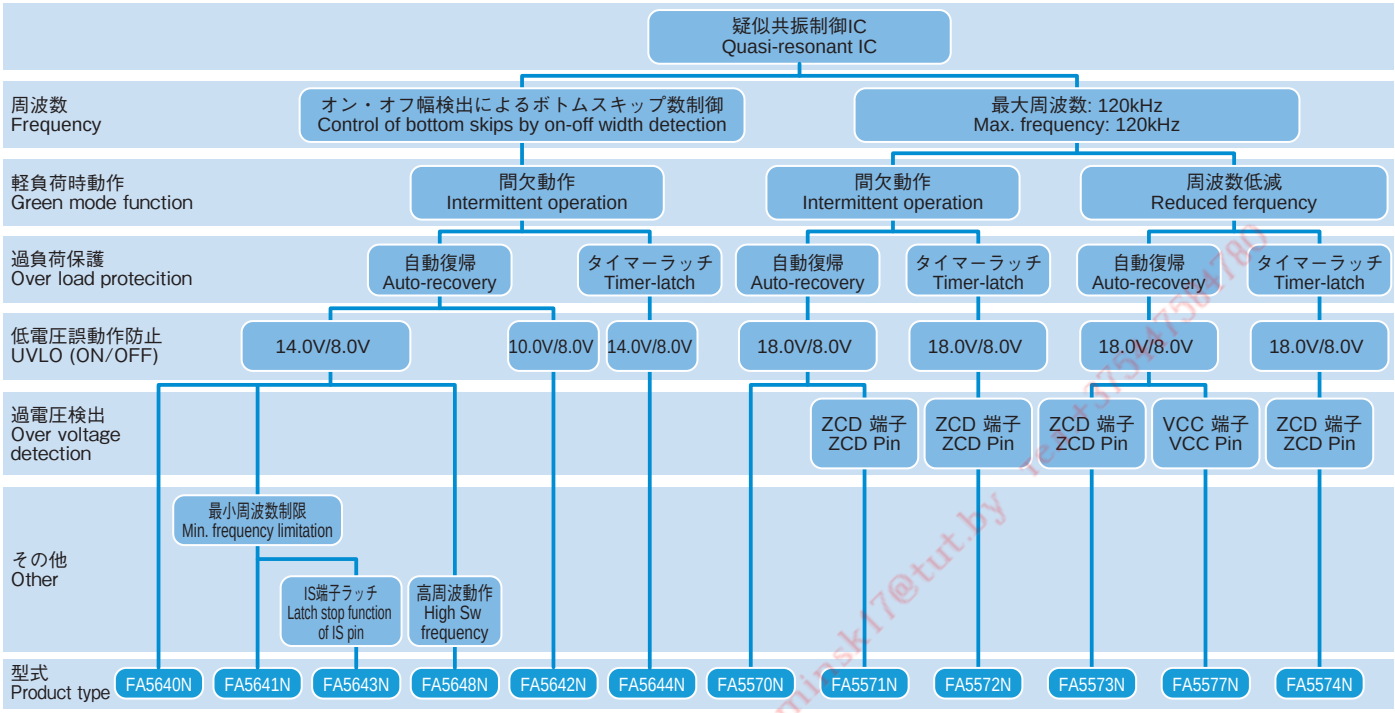


●低待機電力対応 擬似共振制御IC（電流モード） Green mode Quasi-resonant ICs（Current mode）

型式 Type Name	入力電圧 Input voltage (V)	最大周波数 Maximum frequency	過負荷保護 Over load protection	過電圧検出 Over voltage sense	起動回路 Start up circuit	低待機電力機能 Green mode function	UVLO Under-voltage lockout (ON/OFF)	備考 Remarks
FA5570N	10 - 28	120kHz	自動復帰 Auto-Recovery	–	500V	間欠動作 Intermittent operation	18V/8V	
FA5571N				ZCD 端子 ZCD Pin				過電圧保護ラッチ Over voltage protection Latch
FA5572N			タイマーラッチ Timer-latch					
FA5573N			自動復帰 Auto-Recovery			リニア周波数低減 Linerary frequency reduction		
FA5574N			タイマーラッチ Timer-latch					
FA5577N			自動復帰 Auto-Recovery	VCC 端子 VCC Pin				
FA5640N	11 - 26	オンーオフ幅検出によるボトムスキップ数制御 Bottom skip control by on-off width detection	自動復帰 Auto-Recovery	ZCD 端子 ZCD Pin		間欠動作 Intermittent operation	14V/8V	
FA5641N								最小周波数制限 Min. frequency limitation
FA5642N							10V/8V	
FA5643N							14V/8V	最小周波数制限 Min. frequency limitation IS 端子ラッチ停止 Latch stop function (IS pin)
FA5644N			タイマーラッチ Timer-latch					
FA5648N			自動復帰 Auto-Recovery					高周波動作向け For High SW frequency

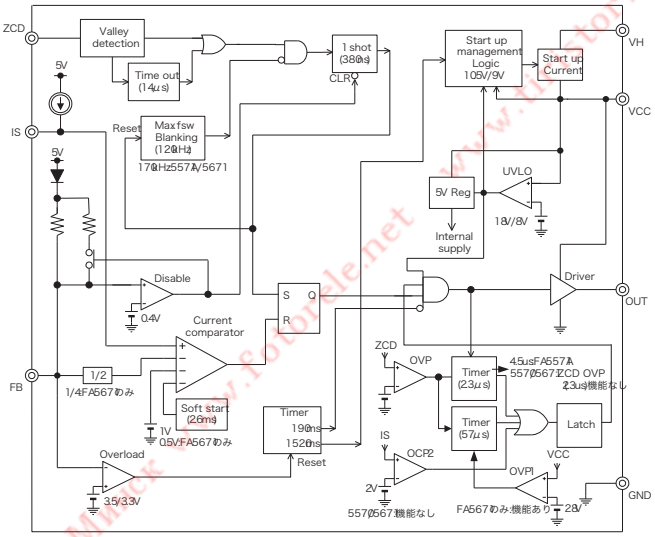
PKG: 全て8pin All 8pin

●低待機電力対応 擬似共振制御IC系列　Green mode Quasi-resonant ICs

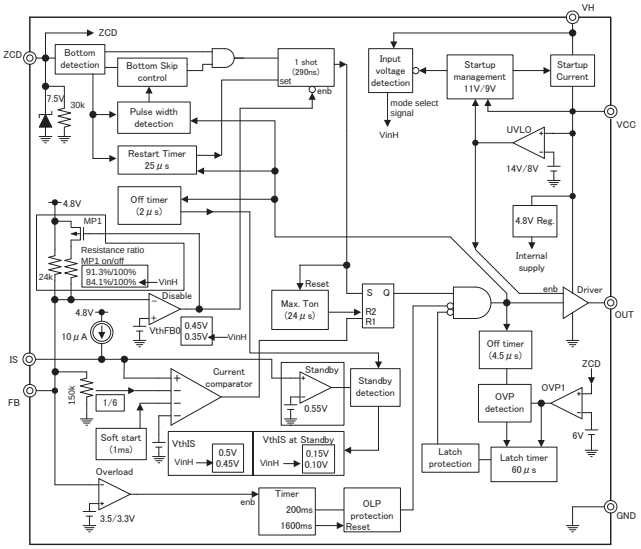


●代表型式ブロック図　Block diagram (Main model)

FA5570N



FA5640N

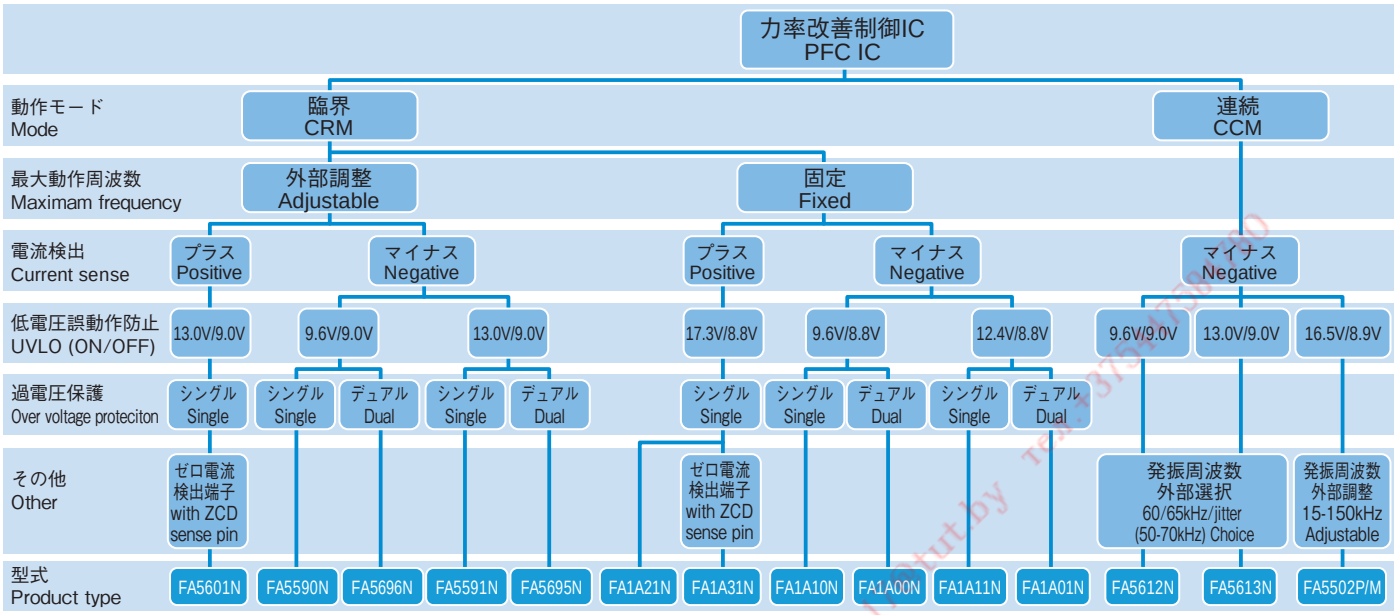


●力率改善制御IC　Power factor correction ICs

型式 Type Name	入力電圧 Input voltage (V)	最大デューティ Duty (%)	電流検出 Current sense	UVLO Under-voltage lockout (ON/OFF)	動作周波数 Frequency	最大周波数 Maximum frequency	ゼロ電流検出 Zero Current Detection	FBオープンショート保護 FB open short protection	過電圧保護 Over voltage protection	備考 Remarks
臨界モード PFC CRMPFC										
FA5590N	10 - 26	–	マイナス Negative	9.6V/9.0V	自励方式 Self-oscillation	外部調整 Adjustable	電流検出 Current sence	✓	パルス幅制御電圧制限 Voltage-Limit by Pulse width	
FA5591N				13.0V/9.0V						
FA1A10N				9.6V/8.8V		固定 Fixed				
FA1A11N				12.4V/8.8V						
FA5695N				13.0V/9.0V		外部調整 Adjustable			パルス幅制御電圧制限＋電圧制限 Voltage-Limit by Pulse width and Voltage-Limit	
FA5696N				9.6V/9.0V						
FA1A00N				9.6V/8.8V		固定 Fixed				
FA1A01N				12.4V/8.8V						
FA5601N			プラス Positive	13.0V/9.0V		外部調整 Adjustable	補助巻線 Auxiliary-winding		パルス幅制御電圧制限 Voltage-Limit by Pulse width	
FA1A21N				17.3V/8.8V		固定 Fixed		–		過負荷保護 Over load protection
FA1A31N○				17.3V/8.8V						
連続モード PFC　CCMPFC										
FA5502P/M	10 - 28	94	マイナス Negative	16.5V/8.9V	外部調整 Adjustable	150kHz	–	–	電圧制限 Voltage-Limit	
FA5612N	10 - 26			9.6V/9.0V	外部選択 Choice 65/60kHz/jitter (50-70kHz)	–		✓	パルス幅制御電圧制限 Voltage-Limit by Pulse width	
FA5613N				13.0V/9.0V						

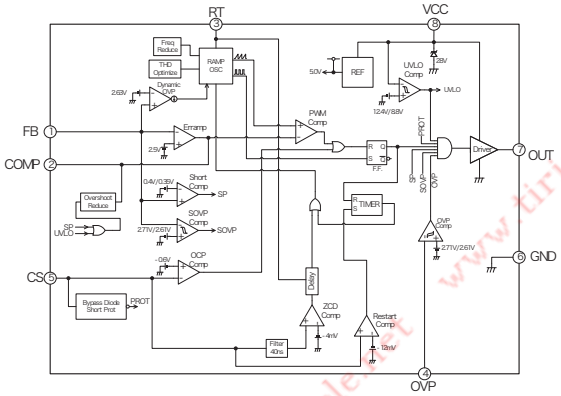
○:開発中　Under development
PKG: FA5502のみ16pin 他は全て8pin　FA5502 is 16pin, others are 8pin

●力率改善制御IC系列　Power factor correction ICs

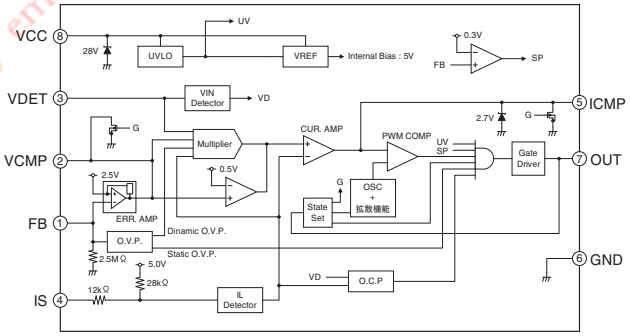


●代表型式ブロック図　Block diagram (Main model)

FA5591N



FA5613N



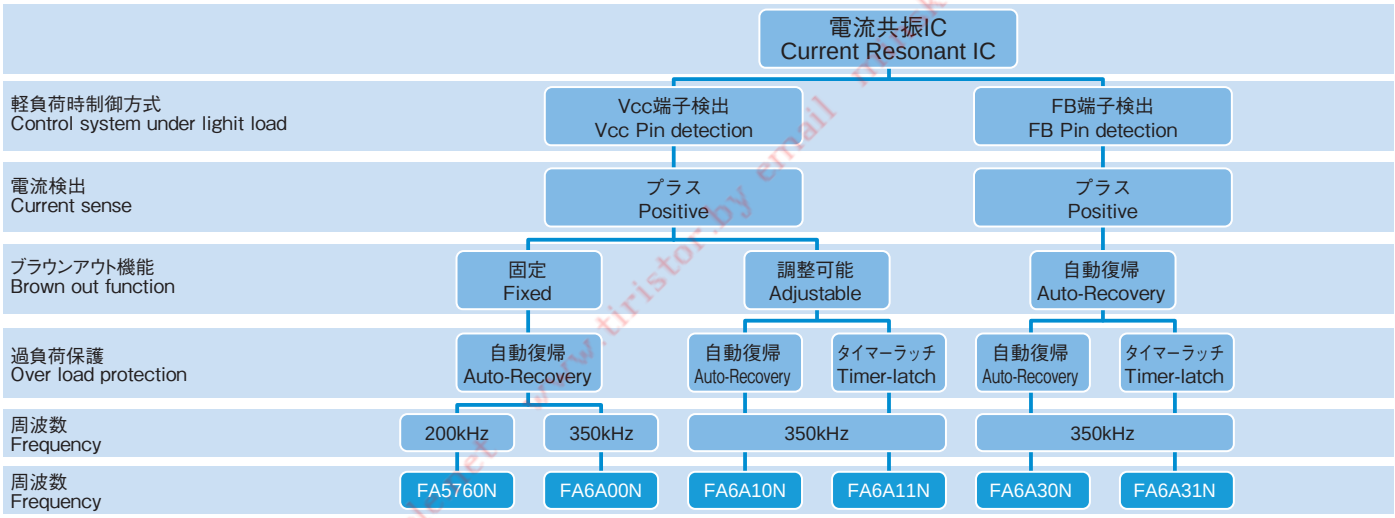
●電流共振IC　Current Resonant ICs

型式 Type Name	制御方式 Control mode	入力電圧 Input voltage (V)	UVLO Under-voltage lockout (ON/OFF)	電流検出 Current sense	動作周波数 Frequency	最大周波数 Maximum frequency (kHz)	過負荷保護 Over load protection	過電圧保護 Over voltage protection	起動回路 Start up circuit	ブラウンアウト機能 Brown out function
FA5760N	電圧モード Voltage mode	10 - 24	12.0V/8.9V	プラス Positive	自励方式 Self-oscillation	200	自動復帰 Auto-Recovery	タイマーラッチ Timer-latch	500V	固定 Fixed
FA6A00N		14 - 27	12.0V/9.0V			350				
FA6A10N						350				調整可能 Adjustable
FA6A11N						350	タイマーラッチ Timer-latch			
FA6A30N●							自動復帰 Auto-Recovery			
FA6A31N●							タイマーラッチ Timer-latch			

●: 新製品　New Product　　PKG: 全て16pin　All 16pin

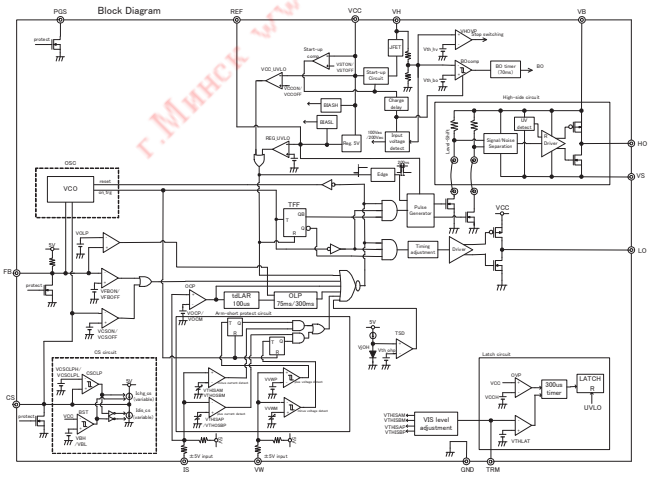
IC

●電流共振IC　Current Resonant ICs

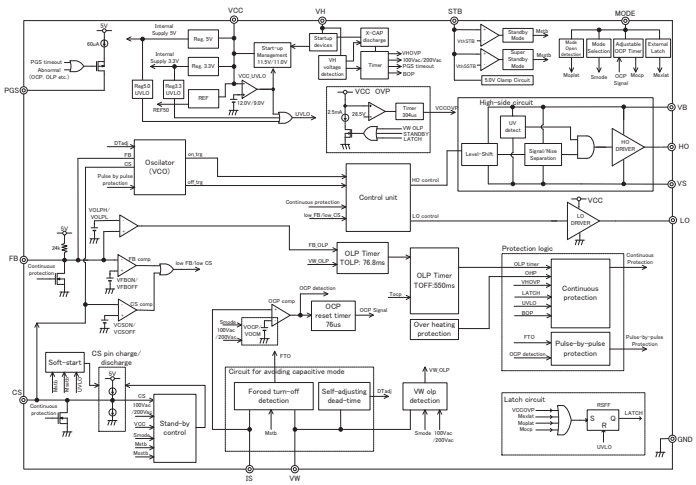


●代表型式ブロック図　Block diagram (Main model)

FA5760N



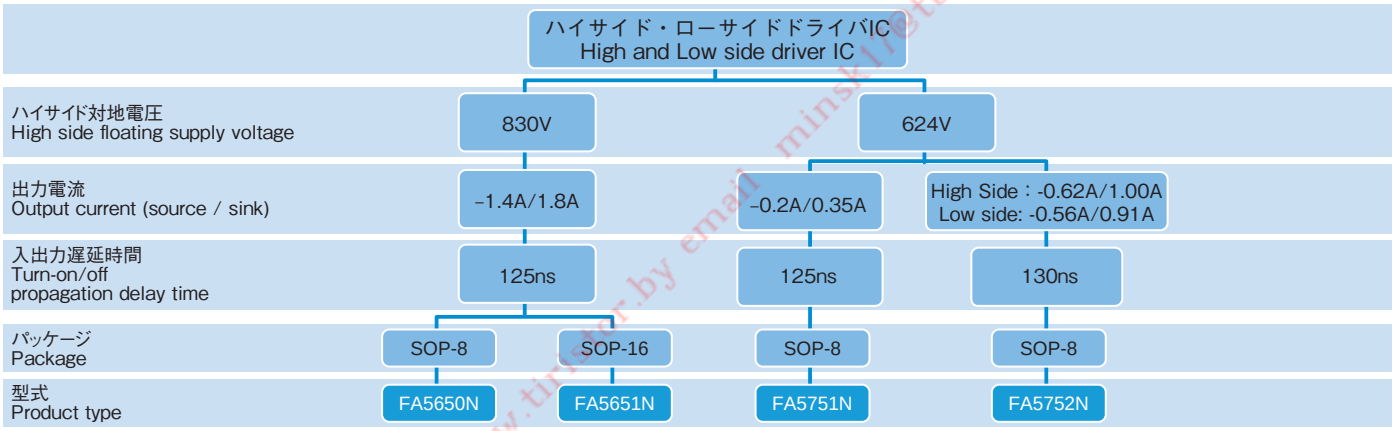
FA6A00N



■ ハイサイド・ローサイド ドライバ IC　High and Low side driver ICs

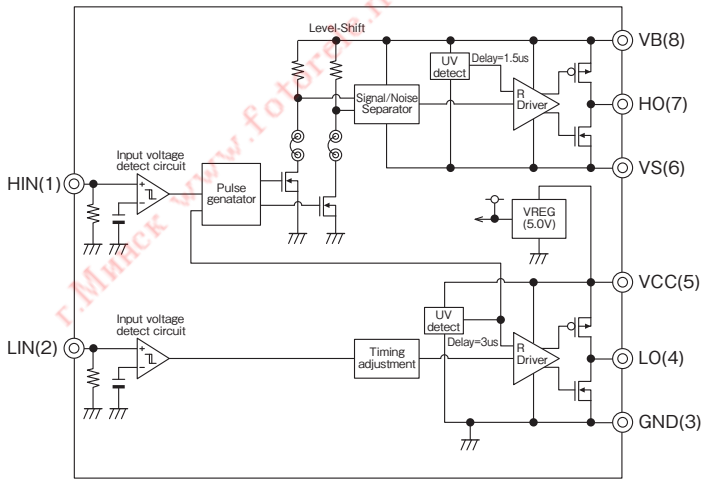
型式 Type name	絶対最大定格 Absolute maximum ratings				電気的特性 Electrical characteristics				
	ハイサイド対地電圧 High side floating supply voltage	入力電圧 Maximum supply voltage	出力電流 Output current source / sink	最大動作周波数 Maximum input frequency	論理入力電圧 Logic"1" / "0" Input voltage level (typ.)	入出力遅延時間 Turn-on/off propagation delay time (typ.)	電源電圧低下保護 VCC and VBS supply under-voltage threshold (typ.)	入力系統数 Number of Input terminal	パッケージ Package
FA5650N	830V	30V	-1.4A/1.8A	500kHz	Logic"1" 2.1V Logic"0" 1.1V	125ns	positive going 8.9V negative going 8.2V	2	SOP-8
FA5651N									SOP-16
FA5751N	624V	24V	-0.2A/0.35A		Logic"1" 2.1V Logic"0" 1.3V	125ns			SOP-8
FA5752N			High side IHO: -0.62A/1.00A Low side ILO: -0.56A/0.91A			130ns			

●ハイサイド・ローサイド ドライバIC系列　High and Low side driver IC

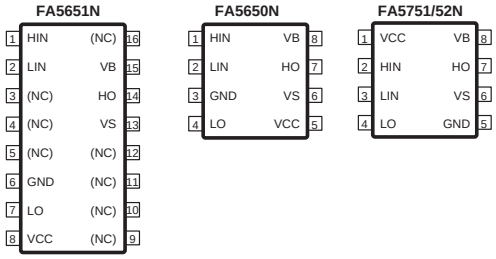


●代表型式ブロック図　Block diagram (Main model)

FA5650N



■端子配置　Pin Layout

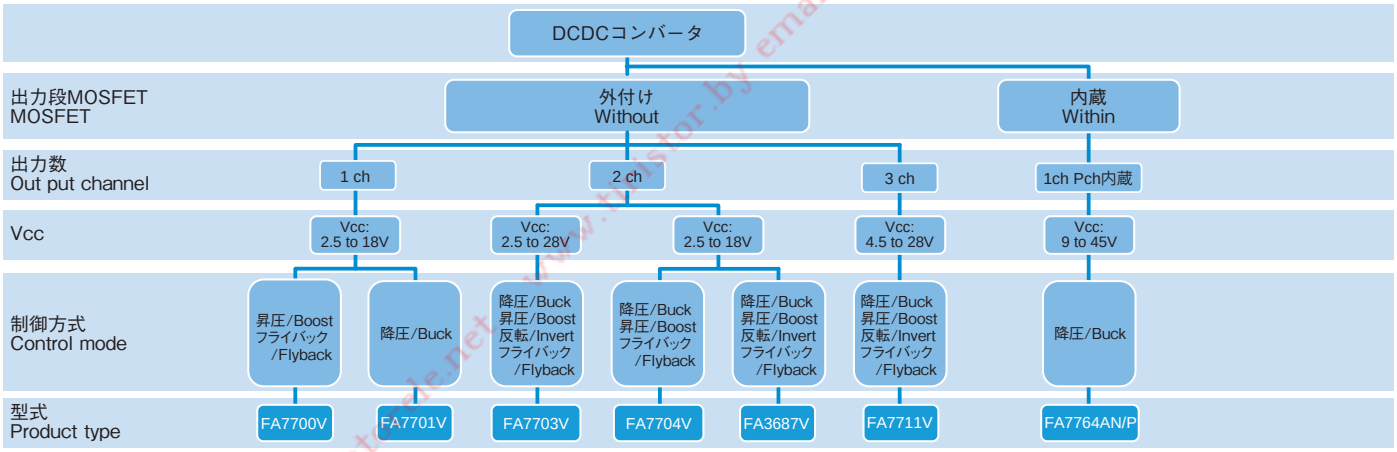


■ DC/DC 電源制御用 IC　DC/DC Power Supply control ICs

●DC/DC制御IC　DC/DC Power Supply control ICs

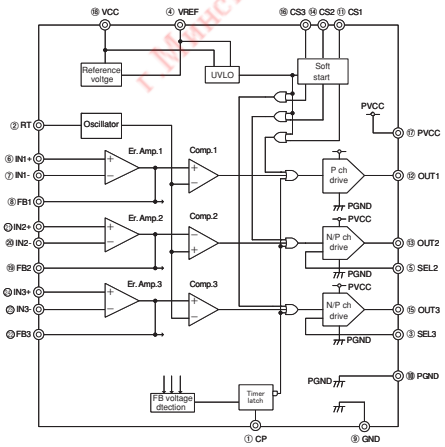
型式 Type Name	制御方式 Control mode				出力数 Output channel	入力電圧 Input voltage	動作周波数 Frequency	基準電圧 Reference Voltage	動作周囲温度 Operating Ambient Temperature	出力電流 Output Current	出力段 MOSFET Output MOSFET	パッケージ Package
	昇圧 Boost	フライバック Fly back	降圧 Buck	反転 Inverting								
FA7700V	✓	✓			1	2.5 - 18V	50k - 1MHz	0.88V	-30 ― +85℃	―	―	TSSOP-8
FA7701V			✓		1	2.5 - 18V	50k - 1MHz	0.88V	-30 ― +85℃	―	―	TSSOP-8
FA7703V	✓	✓	✓	✓	2	2.5 - 28V	50k - 1MHz	1.0V	-30 ― +85℃	―	―	TSSOP-16 SOP-16
FA7704V	✓	✓	✓		2	2.5 - 18V	50k - 1MHz	1.0V	-30 ― +85℃	―	―	TSSOP-16
FA3687V	✓	✓	✓	✓	2	2.5 - 18V	300k - 1.5MHz	1.0V	-40 ― +85℃	―	―	TSSOP-16
FA7711V	✓	✓	✓	✓	3	4.5 - 28V	200k - 800kHz	Adjustable	-20 ― +85℃	―	―	TSSOP-24
FA7764AN/P			✓		1	9 - 45V	30k - 400kHz	1.0V	-20 ― +85℃	1.5A	内蔵 Within	SOP-8E

●DC/DC制御IC　DC/DC Power Supply control ICs

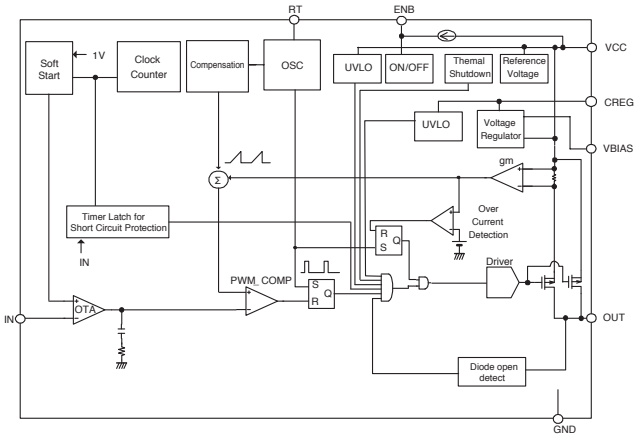


●代表型式ブロック図　Block diagram (Main model)

FA7711V



FA7764AN/P



パワーMOSFET
Power MOSFETs

富士電機のパワー MOSFET は、低損失、低ノイズ、低オン抵抗などの特長を有し、中耐圧から高耐圧品までラインアップしています。
スーパージャンクション技術を適用した『Super J MOS®』シリーズでは 600V 耐圧品を中心に展開しています。

Fuji Electric has a lineup of power MOSFETs ranging from medium to high-voltage types with features such as low power loss, low noise, and low on-resistance.
The “Super J-MOS®” Series uses superjunction technology, and was developed primarily for models with a withstand voltage of 600 V.

■ 第2世代スーパージャンクション　MOSFET Super J MOS®S2シリーズ

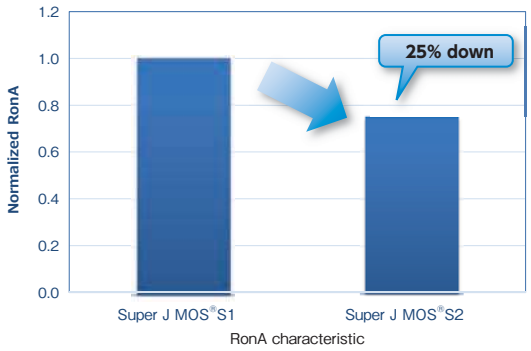
■コンセプト　Concept

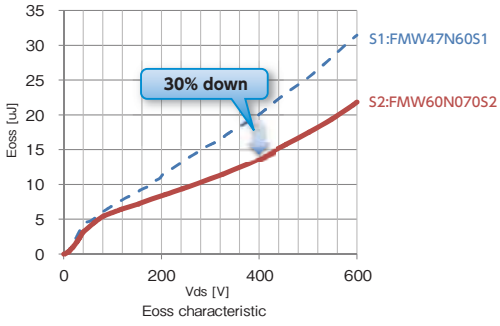
スーパージャンクション構造の不純物拡散プロセスの改善により、従来製品 (Super J MOS®S1 シリーズ) に比べ、素子耐圧とオン抵抗 (Ron・A) のトレードオフを大幅に改善し、ターンオフ損失とターンオフ dV/dt とのトレードオフ特性を従来製品と同等レベルにする事で、低損失と低ノイズ特性を両立し電源の高効率化、小型化をサポートします。

Superjunction technology has much improved trade-off charactarisity between On-resistance and Breakdown voltage. Super J MOS has the same turn-off loss and turn-off dv/dt capabilities at conventional MOS-FET. As a result, It contributs to high efficiency and miniaturization of power supply.

■ Super J MOS®S2 シリーズの特長
Features of the Super J MOS® S2series

- ●低オン抵抗　RonA を従来比(対 Super J MOS®S1)約 25% 低減
- ●低充放電容量　Eoss を従来比(対 Super J MOS®S1)約 30% 低減
- ●低ゲートチャージ　QG を従来比(対 Super J MOS®S1)約 30% 低減
- ●低ターンオフ損失と低ノイズを両立
- ●アバランシェ耐量保証
- ●ゲートしきい値電圧 typ.±0.5V 保証
- ●低オン抵抗化によりパッケージ小型化が可能
  ex) 600V/0.07Ω/TO-3P → 600V/0.07Ω/TO-220F
- Low RonA　25% lower than our conventional MOSFET
- Low Eoss　30% lower than our conventional MOSFET
- Low QG　30% lower than our conventional MOSFET
- Coping with both low turn-off loss and low noise
- Guaranteed avalanche robustness
- Narrow band of the gate threshold voltage (typ.±0.5V)
- Due to low RDS (on), Selectable smaller package
  ex) 600V/0.07Ω/TO-3P → 600V/0.07Ω/TO-220F





■用途　Applications

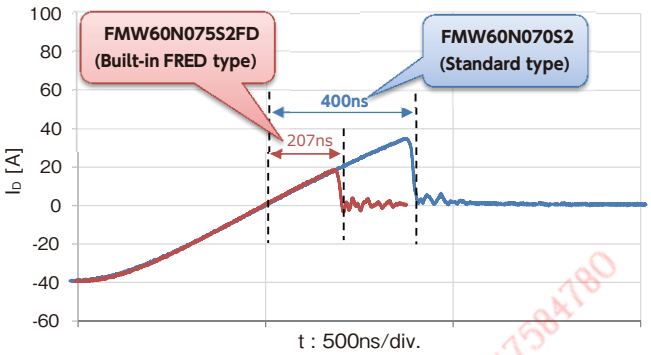
サーバ、PC、パワーコンディショナー、UPS、液晶テレビ、照明、標準電源、基地局電源などの PFC 回路・PWM コンバータ

PFC or PWM converter for Server, PC, PCS, UPS, LCD-TV, Lighting and Standard power supply

■ Super J MOS®S2FD シリーズ (Built-in FRED type) の特長

Features of the Super J MOS® S2FD series (Built-in FRED type)

- ●内蔵ダイオードの Trr を Super J MOS®S2 比、約 50%低減
- ●高リカバリー耐量 (高 -di/dt 耐量)
- ●アバランシェ耐量保証
- Fast-recovery body diode 50% lower than Super J MOS®S2
- High diode recovery ruggedness (High -di/dt ruggedness)
- Guaranteed avalanche robustness



Conditions : V_{DD}=400V, I_{sd}=39.4A, -di/dt=100A/us, T_{ch}=25℃

Built-in diode recovery wave form

■用途　Applications

UPS、サーバー、通信電源、LED 照明、PCS 等の LLC、フェーズシフトフルブリッジ回路等の共振回路部、インバータ回路部

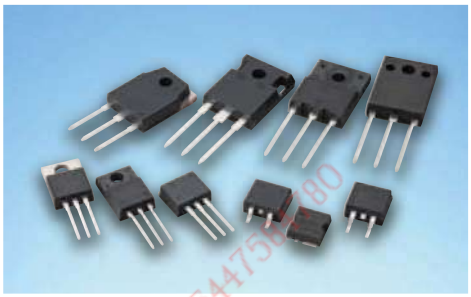
for resonant switching topologies in applications like UPS, Server,Telecom, LED lighting, Power conditioner system and Power supply.

■ SuperFAP-E^3, E^{3S}シリーズの特長　Features of the SuperFAP-E^3, E^{3S} series

■コンセプト　Concept

第二世代擬平面接合技術により、“低損失、低ノイズ特性”と“使い易さ”を両立し、電源セットの設計から製品までのトータル性能向上をサポートします。

The second generation Quasi-Planer Junction technology copes with both low loss/noise and usability.
And this technology lets us achive high performance for power supply's circuit desine.

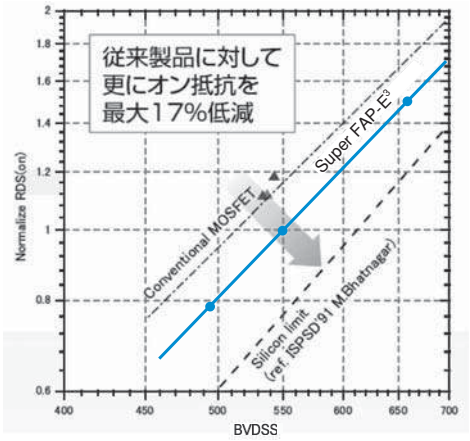


■特長　Features

- ●低損失特性と低ノイズ特性の両立
- ●低オン抵抗特性
- ●スイッチング時 dv/dt のゲート抵抗制御性が良い
- ●スイッチング時の VGS のリンギングが小さい
- ●ゲートしきい値電圧幅 ±0.5V
- ●高アバランシェ耐量

- Coping with both low loss and low noise
- Low RDS(on)
- High controlability of gate recistance during switching
- Low VGS ringing waveform during switching
- Narrow band of the gate threshold voltage(3.0±0.5V)
- High avalanche durability

E^{3}コンセプト概念図
Concept



■ SuperFAP-Gシリーズの特長　Features of the SuperFAP-G series

擬平面接合技術により、低 Qgd によるスイッチング損失と低オン抵抗特性を実現しました。

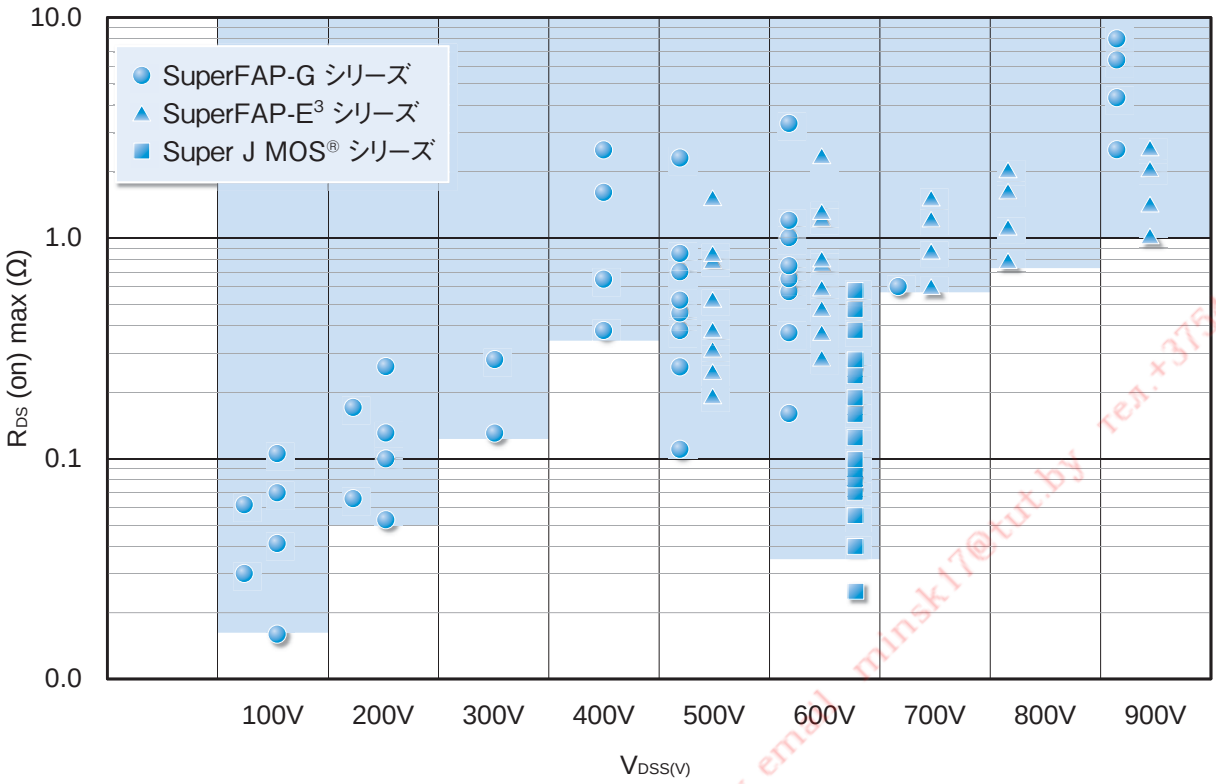
The Quasi-Planer Junction technology achieve low RDS(on) and low witching loss(low Qgd).

■特長　Features

- ●ターンオフ損失の低減　従来比で約 75%低減
- ●低ゲートチャージ　従来比で約 60%低減
- ●高アバランシェ耐量
- ●低オン抵抗化によりパッケージ小型化が可能
  ex）500V/0.4Ω/TO-3P → 500V/0.38Ω/TO-220

- Low turn off loss　75% lower than our conventional type
- Low Gate charge　60% lower than our conventional type
- High avalanche durability
- Due to low RDS(on), Selectable smaller package
  ex) 500V/0.4Ω/TO-3P → 500V/0.38Ω/TO-220

■系列マップ　Series map



■型式の見方　Part numbers

FMV20N60S1 (example)

F	M		V		20	N		60	S1	
社名 Company Symbol	機種コード Device code		パッケージコード Package code		定格電流 Current	極性 Polarity		定格電圧 Voltage	製品シリーズ Series	
Fuji	M	MOSFET	A	TO-220F	×1	N	N-ch	×1/10	S1	Super J MOS®
			C	T-pack (S)					S1FD	Super J MOS® (FRED)
			H	TO-3P					S1A	Super J MOS® for Automotive
			I	T-pack (L)					S1FDA	Super J MOS® (FRED) for Automotive
			P	TO-220					E	SuperFAP-E3
			R	TO-3PF					ES	SuperFAP-E3S
			V	TO-220F (SLS)					G	SuperFAP-G
			W	TO-247					GF	SuperFAP-G (FRED)
									T2	Trench
									R	3G-Trench

FMV60N190S2 (example)

F	M		V		60	N		190	S2	
社名 Company Symbol	機種コード Device code		パッケージコード Package code		定格電圧 Voltage	極性 Polarity		オン抵抗 Ron(mΩ)	製品シリーズ Series	
Fuji	M	MOSFET	D	TO-252	×1/10	N	N-ch	×1	S2	Super J MOS®
			H	TO-3P					S2FD	Super J MOS® (FRED)
			P	TO-220					S2A	Super J MOS® for Automotive
			V	TO-220F (SLS)					S2FDA	Super J MOS® (FRED) for Automotive
			W	TO-247						

■ Super J MOS® S2シリーズ　Super J MOS® S2 series

低オン抵抗、低ノイズ、低スイッチング損失　Low-on resistance, low switching noise and low switching loss

Super J MOS® S2 series			TO-220	TO-220F (SLS)	TO-3P(Q)	TO-247-P2	TO-252
							
Vds (V)	Ron (Ω)	Id (A)					
600	0.3800	8.1	✓	✓			✓
	0.2800	10.4	✓	✓	✓		✓
	0.1900	15.5	✓	✓	✓	✓	
	0.1600	17.9	✓	✓		✓	
	0.1250	22.7	✓	✓		✓	
	0.0990	29.2	✓	✓		✓	
	0.0880	32.8	✓	✓		✓	
	0.0790	37.1	✓	✓		✓	
	0.0700	39.4		✓		✓	
	0.0550	49.9				✓	
	0.0400	66.2				✓	
	0.0254	95.5				✓	
650V	(0.1010)	(30.6)	✓	✓		✓	
	(0.0790)	(37.1)		✓		✓	
	(0.0450)	(62.4)				✓	
	(0.0287)	(89.8)				✓	

■ 600Vクラス　600V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	I_D (pulse) Amps.	R_{DS} (on) Max. Ohms (Ω)	P_D Watts	V_{GS} Volts	V_{GS} (th) Volts	Qg typ. nC	パッケージ Package	質　量 Net mass Grams
● **FMP60N380S2**	600	8.1	24.3	0.3800	62	30	3.0±0.5	27.5	TO-220	2.0
● **FMV60N380S2**	600	8.1	24.3	0.3800	20	30	3.0±0.5	27.5	TO-220F(SLS)	2.0
○ **FMD60N380S2**	600	8.1	24.3	0.3800	58	30	3.0±0.5	27.5	TO-252	(0.3)
● **FMP60N280S2**	600	10.4	31.2	0.2800	75	30	3.0±0.5	33	TO-220	2.0
● **FMV60N280S2**	600	10.4	31.2	0.2800	26	30	3.0±0.5	33	TO-220F(SLS)	2.0
● **FMH60N280S2**	600	10.4	31.2	0.2800	65	30	3.0±0.5	33	TO-3P(Q)	5.0
○ **FMD60N280S2**	600	10.4	31.2	0.2800	75	30	3.0±0.5	33	TO-252	(0.3)
● **FMP60N190S2**	600	15.5	46.5	0.1900	113	30	3.0±0.5	46	TO-220	2.0
● **FMV60N190S2**	600	15.5	46.5	0.1900	38	30	3.0±0.5	46	TO-220F(SLS)	2.0
● **FMW60N190S2**	600	15.5	46.5	0.1900	94	30	3.0±0.5	46	TO-247-P2	6.0
● **FMP60N160S2**	600	17.9	53.7	0.1600	127	30	4.0±0.5	43	TO-220	2.0
● **FMV60N160S2**	600	17.9	53.7	0.1600	45	30	4.0±0.5	43	TO-220F(SLS)	2.0
● **FMW60N160S2**	600	17.9	53.7	0.1600	110	30	4.0±0.5	43	TO-247-P2	6.0
● **FMP60N125S2**	600	22.7	68.1	0.1250	160	30	4.0±0.5	53	TO-220	2.0
● **FMV60N125S2**	600	22.7	68.1	0.1250	57	30	4.0±0.5	53	TO-220F(SLS)	2.0
● **FMW60N125S2**	600	22.7	68.1	0.1250	140	30	4.0±0.5	53	TO-247-P2	6.0
● **FMP60N099S2**	600	29.2	87.6	0.0990	210	30	4.0±0.5	65	TO-220	2.0
● **FMV60N099S2**	600	29.2	87.6	0.0990	75	30	4.0±0.5	65	TO-220F(SLS)	2.0
● **FMW60N099S2**	600	29.2	87.6	0.0990	185	30	4.0±0.5	65	TO-247-P2	6.0

●：新製品　New Products　○：開発中　Under development

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■ 600Vクラス　600V class(continued)

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. Ohms (Ω)	P_D Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G typ. nC	パッケージ Package	質　量 Net mass Grams
● **FMP60N088S2**	600	32.8	98.4	0.0880	235	30	4.0±0.5	72	TO-220	2.0
● **FMV60N088S2**	600	32.8	98.4	0.0880	85	30	4.0±0.5	72	TO-220F(SLS)	2.0
● **FMW60N088S2**	600	32.8	98.4	0.0880	205	30	4.0±0.5	72	TO-247-P2	6.0
● **FMP60N079S2**	600	37.1	111.3	0.0790	270	30	4.0±0.5	80	TO-220	2.0
● **FMV60N079S2**	600	37.1	111.3	0.0790	95	30	4.0±0.5	80	TO-220F(SLS)	2.0
● **FMW60N079S2**	600	37.1	111.3	0.0790	235	30	4.0±0.5	80	TO-247-P2	6.0
● **FMV60N070S2**	600	39.4	118.2	0.0700	110	30	4.0±0.5	90	TO-220F(SLS)	2.0
● **FMW60N070S2**	600	39.4	118.2	0.0700	270	30	4.0±0.5	90	TO-247-P2	6.0
● **FMW60N055S2**	600	49.9	149.7	0.0550	340	30	4.0±0.5	110	TO-247-P2	6.0
● **FMW60N040S2**	600	66.2	198.6	0.0400	435	30	4.0±0.5	147	TO-247-P2	6.0
● **FMW60N025S2**	600	95.5	286.5	0.0254	575	30	4.0±0.5	222	TO-247-P2	6.0

●:新製品　New Product

■ 650Vクラス　650V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. Ohms (Ω)	P_D Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G typ. nC	パッケージ Package	質　量 Net mass Grams
○ **(FMP65N101S2)**	650	(30.6)	(91.8)	(0.1010)	TBD	(30)	TBD	TBD	TO-220	2.0
○ **(FMV65N101S2)**	650	(30.6)	(91.8)	(0.1010)	TBD	(30)	TBD	TBD	TO-220F(SLS)	2.0
○ **(FMW65N101S2)**	650	(30.6)	(91.8)	(0.1010)	TBD	(30)	TBD	TBD	TO-247-P2	6.0
○ **(FMV65N079S2)**	650	(37.1)	(111.3)	(0.079)	TBD	(30)	TBD	TBD	TO-220F(SLS)	2.0
○ **(FMW65N079S2)**	650	(37.1)	(111.3)	(0.079)	TBD	(30)	TBD	TBD	TO-247-P2	6.0
○ **(FMW65N045S2)**	650	(62.4)	(187.2)	(0.0450)	TBD	(30)	TBD	TBD	TO-247-P2	6.0
○ **(FMW65N029S2)**	650	(89.8)	(269.4)	(0.0287)	TBD	(30)	TBD	TBD	TO-247-P2	6.0

○:開発中　Under development

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■ Super J MOS® S2FDシリーズ　高速ダイオード内蔵シリーズ
Super J MOS® S2FD Series (Built-in FRED type)

低オン抵抗、低ノイズ、低スイッチング損失　Low-on resistance, low switching noise and low switching loss

Super J MOS® S2FD Series (Built-in FRED type)			TO-220	TO-220F (SLS)	TO-247-P2
Vds (V)	Ron (Ω)	Id (A)			
600	0.1700	17.9	✓	✓	✓
	0.1330	22.7	✓	✓	✓
	0.1050	29.2	✓	✓	✓
	0.0940	32.8	✓	✓	✓
	0.0840	37.1	✓	✓	✓
	0.0750	39.4		✓	✓
	0.0590	49.9			✓
	0.0430	66.2			✓
	0.0270	95.5			✓

■ 600Vクラス　600V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. Ohms (Ω)	P_D Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G typ. nC	Trr typ. ns	パッケージ Package	質　量 Net mass Grams
● **FMP60N170S2FD**	600	17.9	53.7	0.170	127	30	4.0±1.0	(47)	150	TO-220	2.0
● **FMV60N170S2FD**	600	17.9	53.7	0.170	45	30	4.0±1.0	(47)	150	TO-220F(SLS)	2.0
● **FMW60N170S2FD**	600	17.9	53.7	0.170	110	30	4.0±1.0	(47)	150	TO-247-P2	6.0
● **FMP60N133S2FD**	600	22.7	68.1	0.133	160	30	4.0±1.0	(59)	160	TO-220	2.0
● **FMV60N133S2FD**	600	22.7	68.1	0.133	57	30	4.0±1.0	(59)	160	TO-220F(SLS)	2.0
● **FMW60N133S2FD**	600	22.7	68.1	0.133	140	30	4.0±1.0	(59)	160	TO-247-P2	6.0
● **FMP60N105S2FD**	600	29.2	87.6	0.105	210	30	4.0±1.0	75	174	TO-220	2.0
● **FMV60N105S2FD**	600	29.2	87.6	0.105	75	30	4.0±1.0	75	174	TO-220F(SLS)	2.0
● **FMW60N105S2FD**	600	29.2	87.6	0.105	185	30	4.0±1.0	75	174	TO-247-P2	6.0
● **FMP60N094S2FD**	600	32.8	98.4	0.094	235	30	4.0±1.0	83	185	TO-220	2.0
● **FMV60N094S2FD**	600	32.8	98.4	0.094	85	30	4.0±1.0	83	185	TO-220F(SLS)	2.0
● **FMW60N094S2FD**	600	32.8	98.4	0.094	205	30	4.0±1.0	83	185	TO-247-P2	6.0
● **FMP60N084S2FD**	600	37.1	111.3	0.084	270	30	4.0±1.0	(91)	190	TO-220	2.0
● **FMV60N084S2FD**	600	37.1	111.3	0.084	95	30	4.0±1.0	(91)	190	TO-220F(SLS)	2.0
● **FMW60N084S2FD**	600	37.1	111.3	0.084	235	30	4.0±1.0	(91)	190	TO-247-P2	6.0
● **FMV60N075S2FD**	600	39.4	118.2	0.075	110	30	4.0±1.0	97	207	TO-220F(SLS)	2.0
● **FMW60N075S2FD**	600	39.4	118.2	0.075	270	30	4.0±1.0	97	207	TO-247-P2	6.0
● **FMW60N059S2FD**	600	49.9	149.7	0.059	340	30	4.0±1.0	(127)	215	TO-247-P2	6.0
● **FMW60N043S2FD**	600	66.2	198.6	0.043	435	30	4.0±1.0	177	250	TO-247-P2	6.0
● **FMW60N027S2FD**	600	95.5	286.5	0.027	575	30	4.0±1.0	(274)	288	TO-247-P2	6.0

●:新製品　New Product

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■ Super J MOS® S1シリーズ Super J MOS® S1 series

低オン抵抗、低ノイズ、低スイッチング損失 Low-on resistance, low switching noise and low switching loss

Super J MOS® S1 series			TO-220	TO-220F (SLS)	TO-3P(Q)	TO-247-P2
						
Vds (V)	Ron (Ω)	Id (A)				
600	0.580	6.5	✓	✓		
	0.470	8	✓	✓		
	0.380	10	✓	✓		
	0.280	13	✓	✓	✓	
	0.230	15	✓	✓	✓	✓
	0.190	20	✓	✓	✓	✓
	0.160	22	✓	✓	✓	✓
	0.125	30	✓	✓	✓	✓
	0.099	35		✓	✓	✓
	0.088	40		✓	✓	✓
	0.070	47			✓	✓
	0.055	57				✓
	0.040	68				✓

■ 600Vクラス 600V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. Ohms (Ω)	P_D Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G typ. nC	パッケージ Package	質量 Net mass Grams
FMP07N60S1	600	6.5	19.5	0.580	60	30	3±0.5	21	TO-220	2.0
FMV07N60S1	600	6.5	19.5	0.580	21	30	3±0.5	21	TO-220F(SLS)	2.0
FMP08N60S1	600	8	24	0.470	70	30	3±0.5	25	TO-220	2.0
FMV08N60S1	600	8	24	0.470	25	30	3±0.5	25	TO-220F(SLS)	2.0
FMP10N60S1	600	10	30	0.380	90	30	3±0.5	28	TO-220	2.0
FMV10N60S1	600	10	30	0.380	32	30	3±0.5	28	TO-220F(SLS)	2.0
FMP13N60S1	600	13	39	0.280	120	30	3±0.5	35	TO-220	2.0
FMV13N60S1	600	13	39	0.280	43	30	3±0.5	35	TO-220F(SLS)	2.0
FMH13N60S1	600	13	39	0.280	105	30	3±0.5	35	TO-3P(Q)	5.0
FMP15N60S1	600	15	45	0.230	135	30	3±0.5	43	TO-220	2.0
FMV15N60S1	600	15	45	0.230	48	30	3±0.5	43	TO-220F(SLS)	2.0
FMH15N60S1	600	15	45	0.230	115	30	3±0.5	43	TO-3P(Q)	5.0
FMW15N60S1	600	15	45	0.230	115	30	3±0.5	43	TO-247-P2	6.0
FMP20N60S1	600	20	60	0.190	150	30	3±0.5	48	TO-220	2.0
FMV20N60S1	600	20	60	0.190	60	30	3±0.5	48	TO-220F(SLS)	2.0
FMH20N60S1	600	20	60	0.190	130	30	3±0.5	48	TO-3P(Q)	5.0
FMW20N60S1	600	20	60	0.190	130	30	3±0.5	48	TO-247-P2	6.0
FMP22N60S1	600	22	66	0.160	195	30	3±0.5	57	TO-220	2.0
FMV22N60S1	600	22	66	0.160	70	30	3±0.5	57	TO-220F(SLS)	2.0
FMH22N60S1	600	22	66	0.160	170	30	3±0.5	57	TO-3P(Q)	5.0
FMW22N60S1	600	22	66	0.160	170	30	3±0.5	57	TO-247-P2	6.0
FMP30N60S1	600	30	90	0.125	250	30	3±0.5	73	TO-220	2.0
FMV30N60S1	600	30	90	0.125	90	30	3±0.5	73	TO-220F(SLS)	2.0
FMH30N60S1	600	30	90	0.125	220	30	3±0.5	73	TO-3P(Q)	5.0
FMW30N60S1	600	30	90	0.125	220	30	3±0.5	73	TO-247-P2	6.0
FMV35N60S1	600	35	105	0.099	110	30	3±0.5	87	TO-220F(SLS)	2.0
FMH35N60S1	600	35	105	0.099	270	30	3±0.5	87	TO-3P(Q)	5.0
FMW35N60S1	600	35	105	0.099	270	30	3±0.5	87	TO-247-P2	6.0
FMV40N60S1	600	40	120	0.088	130	30	3±0.5	100	TO-220F(SLS)	2.0
FMH40N60S1	600	40	120	0.088	315	30	3±0.5	100	TO-3P(Q)	5.0
FMW40N60S1	600	40	120	0.088	315	30	3±0.5	100	TO-247-P2	6.0
FMH47N60S1	600	47	141	0.070	390	30	3±0.5	125	TO-3P(Q)	5.0
FMW47N60S1	600	47	141	0.070	390	30	3±0.5	125	TO-247-P2	6.0
FMW57N60S1	600	57	171	0.055	445	30	3±0.5	153	TO-247-P2	6.0
FMW79N60S1	600	68	204	0.040	545	30	3±0.5	203	TO-247-P2	6.0

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■ Super J MOS® S1FDシリーズ　高速ダイオード内蔵シリーズ
Super J MOS® S1FD Series (Built-in FRED type)

低オン抵抗、低ノイズ、低スイッチング損失　Low-on resistance, low switching noise and low switching loss

Super J MOS® S1FD series (Built-in FRED type)			TO-220	TO-220F (SLS)	TO-3P(Q)	TO-247-P2
						
Vds (V)	Ron (Ω)	Id (A)				
600	0.200	20	✓	✓	✓	✓
	0.170	22	✓	✓	✓	✓
	0.132	30	✓	✓	✓	✓
	0.105	35		✓	✓	✓
	0.093	40			✓	✓
	0.074	47			✓	✓
	0.058	57				✓
	0.042	68				✓

■ 600Vクラス　600V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. Ohms (Ω)	P_D Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G typ. nC	Trr typ. ns	パッケージ Package	質　量 Net mass Grams
FMP20N60S1FD	600	20	60	0.200	150	30	4.0±1.0	52	150	TO-220	2.0
FMV20N60S1FD	600	20	60	0.200	60	30	4.0±1.0	52	150	TO-220F(SLS)	2.0
FMH20N60S1FD	600	20	60	0.200	130	30	4.0±1.0	52	150	TO-3P(Q)	5.0
FMW20N60S1FD	600	20	60	0.200	130	30	4.0±1.0	52	150	TO-247-P2	6.0
FMP22N60S1FD	600	22	66	0.170	195	30	4.0±1.0	58	165	TO-220	2.0
FMV22N60S1FD	600	22	66	0.170	70	30	4.0±1.0	58	165	TO-220F(SLS)	2.0
FMH22N60S1FD	600	22	66	0.170	170	30	4.0±1.0	58	165	TO-3P(Q)	5.0
FMW22N60S1FD	600	22	66	0.170	170	30	4.0±1.0	58	165	TO-247-P2	6.0
FMP30N60S1FD	600	30	90	0.132	250	30	4.0±1.0	73	180	TO-220	2.0
FMV30N60S1FD	600	30	90	0.132	90	30	4.0±1.0	73	180	TO-220F(SLS)	2.0
FMH30N60S1FD	600	30	90	0.132	220	30	4.0±1.0	73	180	TO-3P(Q)	5.0
FMW30N60S1FD	600	30	90	0.132	220	30	4.0±1.0	73	180	TO-247-P2	6.0
FMV35N60S1FD	600	35	105	0.105	110	30	4.0±1.0	92	185	TO-220F(SLS)	2.0
FMH35N60S1FD	600	35	105	0.105	270	30	4.0±1.0	92	185	TO-3P(Q)	5.0
FMW35N60S1FD	600	35	105	0.105	270	30	4.0±1.0	92	185	TO-247-P2	6.0
FMH40N60S1FD	600	40	120	0.093	315	30	4.0±1.0	104	200	TO-3P(Q)	5.0
FMW40N60S1FD	600	40	120	0.093	315	30	4.0±1.0	104	200	TO-247-P2	6.0
FMH47N60S1FD	600	47	141	0.074	390	30	4.0±1.0	127	210	TO-3P(Q)	5.0
FMW47N60S1FD	600	47	141	0.074	390	30	4.0±1.0	127	210	TO-247-P2	6.0
FMW57N60S1FD	600	68	171	0.058	445	30	4.0±1.0	158	220	TO-247-P2	6.0
FMW79N60S1FD	600	68	204	0.042	545	30	4.0±1.0	209	230	TO-247-P2	6.0

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■ SuperFAP-E^{3}シリーズ SuperFAP-E^3 series

低オン抵抗、低ノイズ Low-on resistance and low switching noise

SuperFAP-E^3 series			TO-220	TO-220 (SLS)	TO-3P (Q)	TO-3PF	T-Pack(L)	T-Pack(S)
								
Vds (V)	Ron (Ω)	Id (A)						
500	1.5	5	✓	✓			✓	✓
	0.85	6.5	✓	✓			✓	✓
	0.79	7.5	✓	✓				
	0.52	12	✓	✓			✓	✓
	0.38	16	✓	✓	✓		✓	✓
	0.31	20	✓	✓	✓		✓	✓
	0.245	23		✓	✓	✓		
	0.19	28			✓	✓		
600	2.3	3	✓	✓			✓	✓
	1.3	6	✓	✓			✓	✓
	1.2	6	✓	✓				
	0.79	10	✓	✓			✓	✓
	0.75	11	✓	✓			✓	✓
	0.58	13	✓	✓			✓	✓
	0.47	16	✓	✓			✓	✓
	0.365	19		✓	✓	✓		
	0.28	23			✓	✓		
650	1.47	7		✓				
	0.97	9		✓				
700	1.5	7		✓	✓			
	1.2	9		✓	✓			
	0.85	11		✓	✓			
	0.59	15		✓				
800	2	6		✓	✓		✓	✓
	1.6	8		✓	✓		✓	✓
	1.1	10		✓	✓			
	0.78	13		✓	✓			
900	2.5	6		✓	✓		✓	✓
	2	7		✓	✓		✓	✓
	1.4	9		✓	✓	✓		
	1	11		✓	✓	✓		

■ SuperFAP-E^{3}シリーズ SuperFAP-E^3 series

■ 500V クラス 500V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
FMP05N50E	500	5	20	1.5	60	30	3±0.5	21	TO-220	2.0
FMV05N50E	500	5	20	1.5	21	30	3±0.5	21	TO-220F(SLS)	1.7
FMI05N50E	500	5	20	1.5	60	30	3±0.5	21	T-Pack(L)	1.6
FMC05N50E	500	5	20	1.5	60	30	3±0.5	21	T-Pack(S)	1.6
FMP07N50E	500	6.5	26	0.85	90	30	3±0.5	32	TO-220	2.0
FMV07N50E	500	6.5	26	0.85	32	30	3±0.5	32	TO-220F(SLS)	1.7
FMI07N50E	500	6.5	26	0.85	90	30	3±0.5	32	T-Pack(L)	1.6
FMC07N50E	500	6.5	26	0.85	90	30	3±0.5	32	T-Pack(S)	1.6
FMP08N50E	500	7.5	30	0.79	105	30	3±0.5	35	TO-220	2.0
FMV08N50E	500	7.5	30	0.79	37	30	3±0.5	35	TO-220F(SLS)	1.7
FMP12N50E	500	12	48	0.52	165	30	3±0.5	60	TO-220	2.0
FMV12N50E	500	12	48	0.52	60	30	3±0.5	60	TO-220F(SLS)	1.7
FMI12N50E	500	12	48	0.52	165	30	3±0.5	60	T-Pack(L)	1.6
FMC12N50E	500	12	48	0.52	165	30	3±0.5	60	T-Pack(S)	1.6
FMP16N50E	500	16	64	0.38	225	30	3±0.5	60	TO-220	2.0
FMV16N50E	500	16	64	0.38	80	30	3±0.5	60	TO-220F(SLS)	1.7
FMI16N50E	500	16	64	0.38	225	30	3±0.5	60	T-Pack(L)	1.6
FMC16N50E	500	16	64	0.38	225	30	3±0.5	60	T-Pack(S)	1.6
FMH16N50E	500	16	64	0.38	195	30	3±0.5	60	TO-3P(Q)	5.1
FMP20N50E	500	20	80	0.31	270	30	3±0.5	77	TO-220	2.0
FMV20N50E	500	20	80	0.31	95	30	3±0.5	77	TO-220F(SLS)	1.7
FMI20N50E	500	20	80	0.31	270	30	3±0.5	77	T-Pack(L)	1.6
FMC20N50E	500	20	80	0.31	270	30	3±0.5	77	T-Pack(S)	1.6
FMH20N50E	500	20	80	0.31	235	30	3±0.5	77	TO-3P(Q)	5.1
FMV23N50E	500	23	92	0.245	130	30	3±0.5	93	TO-220F(SLS)	1.7
FMH23N50E	500	23	92	0.245	315	30	3±0.5	93	TO-3P(Q)	5.1
FMR23N50E	500	23	92	0.245	150	30	3±0.5	93	TO-3PF	6.0
FMH28N50E	500	28	112	0.19	400	30	3±0.5	130	TO-3P(Q)	5.1
FMR28N50E	500	28	112	0.19	200	30	3±0.5	130	TO-3PF	6.0

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

記号 Letter symbols

V_{DSS}:	ドレイン・ソース電圧	Drain-source voltage	P_D:	許容損失電力	Maximum power dissipation
I_D :	ドレイン電流	Continuous drain current	V_{GS}:	ゲート・ソース電圧	Gate-source voltage
$I_{D(pulse)}$:	パルスドレイン電流	Pulsed drain current	$V_{GS(th)}$:	ゲートしきい値電圧	Gate threshold voltage
$R_{DS(on)}$:	ドレイン・ソース オン抵抗	Drain-source on-state resistance	Q_G:	トータルゲートチャージ量	Total gate charge

SuperFAP-E^3 シリーズは、一般民生用向けの品質保証製品であります。車載用、医療機器など高度な信頼性を要求される機器へ適用される場合には、弊社にお問い合わせください。また、航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。

The SuperFAP-E^3 series products satisfies the quality assurance level of general consumer use.
If you intend to use the products for equipment requiring higher reliability, such as equipment for automobiles and medical equipment, please contact Fuji Electric.
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ SuperFAP-E^{3}シリーズ SuperFAP-E^3 series

■ 600 ー 800V クラス 600 - 800V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
FMP03N60E	600	3	12	2.3	60	30	3±0.5	21.5	TO-220	2.0
FMV03N60E	600	3	12	2.3	21	30	3±0.5	21.5	TO-220F(SLS)	1.7
FMI03N60E	600	3	12	2.3	60	30	3±0.5	21.5	T-Pack(L)	1.6
FMC03N60E	600	3	12	2.3	60	30	3±0.5	21.5	T-Pack(S)	1.6
FMP05N60E	600	5.5	22	1.3	90	30	3±0.5	33	TO-220	2.0
FMV05N60E	600	5.5	22	1.3	32	30	3±0.5	33	TO-220F(SLS)	1.7
FMI05N60E	600	5.5	22	1.3	90	30	3±0.5	33	T-Pack(L)	1.6
FMC05N60E	600	5.5	22	1.3	90	30	3±0.5	33	T-Pack(S)	1.6
FMP06N60E	600	6	24	1.2	105	30	3±0.5	35	TO-220	2.0
FMV06N60E	600	6	24	1.2	37	30	3±0.5	35	TO-220F(SLS)	1.7
FMP10N60E	600	10	40	0.79	165	30	3±0.5	47	TO-220	2.0
FMV10N60E	600	10	40	0.79	60	30	3±0.5	47	TO-220F(SLS)	1.7
FMI10N60E	600	10	40	0.79	165	30	3±0.5	47	T-Pack(L)	1.6
FMC10N60E	600	10	40	0.79	165	30	3±0.5	47	T-Pack(S)	1.6
FMP11N60E	600	11	44	0.75	180	30	3±0.5	48.5	TO-220	2.0
FMV11N60E	600	11	44	0.75	65	30	3±0.5	48.5	TO-220F(SLS)	1.7
FMI11N60E	600	11	44	0.75	180	30	3±0.5	48.5	T-Pack(L)	1.6
FMC11N60E	600	11	44	0.75	180	30	3±0.5	48.5	T-Pack(S)	1.6
FMP13N60E	600	13	52	0.58	225	30	3±0.5	60	TO-220	2.0
FMV13N60E	600	13	52	0.58	80	30	3±0.5	60	TO-220F(SLS)	1.7
FMI13N60E	600	13	52	0.58	225	30	3±0.5	60	T-Pack(L)	1.6
FMC13N60E	600	13	52	0.58	225	30	3±0.5	60	T-Pack(S)	1.6
FMP16N60E	600	16	64	0.47	270	30	3±0.5	76	TO-220	2.0
FMV16N60E	600	16	64	0.47	95	30	3±0.5	76	TO-220F(SLS)	1.7
FMI16N60E	600	16	64	0.47	270	30	3±0.5	76	T-Pack(L)	1.6
FMC16N60E	600	16	64	0.47	270	30	3±0.5	76	T-Pack(S)	1.6
FMV19N60E	600	19	76	0.365	130	30	3±0.5	105	TO-220F(SLS)	1.7
FMH19N60E	600	19	76	0.365	315	30	3±0.5	105	TO-3P(Q)	5.1
FMR19N60E	600	19	76	0.365	150	30	3±0.5	105	TO-3PF	6.0
FMH23N60E	600	23	92	0.28	400	30	3±0.5	130	TO-3P(Q)	5.1
FMR23N60E	600	23	92	0.28	200	30	3±0.5	130	TO-3PF	6.0
FMV07N65E	650	7	28	1.47	37	30	3±0.5	35	TO-220F(SLS)	1.7
FMV09N65E	650	9	36	0.97	60	30	3±0.5	47	TO-220F(SLS)	1.7
FMV07N70E	700	7	28	1.5	48	30	4±0.5	32	TO-220F(SLS)	1.7
FMH07N70E	700	7	28	1.5	115	30	4±0.5	32	TO-3P(Q)	5.1
FMV09N70E	700	9	36	1.2	60	30	4±0.5	38	TO-220F(SLS)	1.7
FMH09N70E	700	9	36	1.2	145	30	4±0.5	38	TO-3P(Q)	5.1
FMV11N70E	700	11	44	0.85	85	30	4±0.5	50	TO-220F(SLS)	1.7
FMH11N70E	700	11	44	0.85	205	30	4±0.5	50	TO-3P(Q)	5.1
FMV15N70E	700	15	60	0.59	120	30	4±0.5	66	TO-220F(SLS)	1.7
FMV06N80E	800	6	24	2.0	48	30	4±0.5	32	TO-220F(SLS)	1.7
FMH06N80E	800	6	24	2.0	115	30	4±0.5	32	TO-3P(Q)	5.1
FMI06N80E	800	6	24	2.0	135	30	4±0.5	32	T-Pack(L)	1.6
FMC06N80E	800	6	24	2.0	135	30	4±0.5	32	T-Pack(S)	1.6
FMV08N80E	800	8	32	1.6	60	30	4±0.5	38	TO-220F(SLS)	1.7
FMH08N80E	800	8	32	1.6	145	30	4±0.5	38	TO-3P(Q)	5.1
FMI08N80E	800	8	32	1.6	165	30	4±0.5	38	T-Pack(L)	1.6
FMC08N80E	800	8	32	1.6	165	30	4±0.5	38	T-Pack(S)	1.6
FMV10N80E	800	10	40	1.1	85	30	4±0.5	50	TO-220F(SLS)	1.7
FMH10N80E	800	10	40	1.1	205	30	4±0.5	50	TO-3P(Q)	5.1
FMV13N80E	800	13	52	0.78	120	30	4±0.5	66	TO-220F(SLS)	1.7
FMH13N80E	800	13	52	0.78	285	30	4±0.5	66	TO-3P(Q)	5.1

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

■ SuperFAP-E^3 シリーズ SuperFAP-E^3 series

■ 900V クラス 900V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
FMH06N90E	900	6	24	2.5	115	30	4±0.5	33	TO-3P(Q)	5.1
FMV06N90E	900	6	24	2.5	48	30	4±0.5	33	TO-220F(SLS)	1.7
FMI06N90E	900	6	24	2.5	135	30	4±0.5	33	T-Pack(L)	1.6
FMC06N90E	900	6	24	2.5	135	30	4±0.5	33	T-Pack(S)	1.6
FMH07N90E	900	7	28	2.0	145	30	4±0.5	39	TO-3P(Q)	5.1
FMV07N90E	900	7	28	2.0	60	30	4±0.5	39	TO-220F(SLS)	1.7
FMI07N90E	900	7	28	2.0	165	30	4±0.5	39	T-Pack(L)	1.6
FMC07N90E	900	7	28	2.0	165	30	4±0.5	39	T-Pack(S)	1.6
FMH09N90E	900	9	36	1.4	205	30	4±0.5	50	TO-3P(Q)	5.1
FMV09N90E	900	9	36	1.4	85	30	4±0.5	50	TO-220F(SLS)	1.7
FMR09N90E	900	9	36	1.4	100	30	4±0.5	50	TO-3PF	6.0
FMH11N90E	900	11	44	1.0	285	30	4±0.5	60	TO-3P(Q)	5.1
FMV11N90E	900	11	44	1.0	120	30	4±0.5	60	TO-220F(SLS)	1.7
FMR11N90E	900	11	44	1.0	135	30	4±0.5	60	TO-3PF	6.0

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

■ SuperFAP-E^{3S} 低Qgシリーズ SuperFAP-E^{3S} Low Qg series

低オン抵抗、低ノイズ、低スイッチング損失 Low-on resistance, low switching noise and low switching loss

SuperFAP-E^{3S} Low Qg series			TO-220	TO-220 (SLS)	TO-3P (Q)	TO-3PF	T-Pack(L)	T-Pack(S)	TFP
									
Vds (V)	Ron (Ω)	Id (A)							
500	0.5	12	✓	✓			✓	✓	✓
	0.38	16	✓	✓	✓		✓	✓	✓
	0.31	20	✓	✓	✓		✓	✓	✓
	0.27	21		✓	✓	✓			
	0.245	23		✓	✓	✓			
	0.19	28			✓	✓			
600	1.2	6	✓	✓			✓	✓	
	0.75	12	✓	✓			✓	✓	✓
	0.58	13	✓		✓		✓	✓	✓
	0.47	16	✓	✓	✓		✓	✓	✓
	0.4	17		✓	✓	✓			
	0.365	19		✓	✓	✓			
	0.28	23			✓	✓			

■ 500V クラス 500V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
FMP12N50ES	500	12	48	0.5	180	30	3.7±0.5	41	TO-220	2.0
FMV12N50ES	500	12	48	0.5	65	30	3.7±0.5	41	TO-220F(SLS)	1.7
FMI12N50ES	500	12	48	0.5	180	30	3.7±0.5	41	T-Pack(L)	1.6
FMC12N50ES	500	12	48	0.5	180	30	3.7±0.5	41	T-Pack(S)	1.6
FML12N50ES	500	12	48	0.5	180	30	3.7±0.5	41	TFP	1.6
FMP16N50ES	500	16	64	0.38	225	30	3.7±0.5	52	TO-220	2.0
FMV16N50ES	500	16	64	0.38	80	30	3.7±0.5	52	TO-220F(SLS)	1.7
FMI16N50ES	500	16	64	0.38	225	30	3.7±0.5	52	T-Pack(L)	1.6
FMC16N50ES	500	16	64	0.38	225	30	3.7±0.5	52	T-Pack(S)	1.6
FMH16N50ES	500	16	64	0.38	195	30	3.7±0.5	52	TO-3P(Q)	5.1
FML16N50ES	500	16	64	0.38	225	30	3.7±0.5	52	TFP	1.6
FMP20N50ES	500	20	80	0.31	270	30	4.2±0.5	57	TO-220	2.0
FMV20N50ES	500	20	80	0.31	95	30	4.2±0.5	57	TO-220F(SLS)	1.7
FMI20N50ES	500	20	80	0.31	270	30	4.2±0.5	57	T-Pack(L)	1.6
FMC20N50ES	500	20	80	0.31	270	30	4.2±0.5	57	T-Pack(S)	1.6
FMH20N50ES	500	20	80	0.31	235	30	4.2±0.5	57	TO-3P(Q)	5.1
FML20N50ES	500	20	80	0.31	270	30	4.2±0.5	57	TFP	1.6
FMV21N50ES	500	21	84	0.27	120	30	4.2±0.5	67	TO-220F(SLS)	1.7
FMR21N50ES	500	21	84	0.27	135	30	4.2±0.5	67	TO-3PF	6.0
FMH21N50ES	500	21	84	0.27	285	30	4.2±0.5	67	TO-3P(Q)	5.1
FMV23N50ES	500	23	92	0.245	130	30	4.2±0.5	74	TO-220F(SLS)	1.7
FMR23N50ES	500	23	92	0.245	150	30	4.2±0.5	74	TO-3PF	6.0
FMH23N50ES	500	23	92	0.245	315	30	4.2±0.5	74	TO-3P(Q)	5.1
FMR28N50ES	500	28	112	0.19	200	30	4.2±0.5	92	TO-3PF	6.0
FMH28N50ES	500	28	112	0.19	400	30	4.2±0.5	92	TO-3P(Q)	5.1

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

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The SuperFAP-E^{3S}series products satisfies the quality assurance level of general consumer use.
If you intend to use the products for equipment requiring higher reliability, such as equipment for automobiles and medical equipment, please contact Fuji Electric.
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ SuperFAP-E^{3S} 低Qgシリーズ SuperFAP-E^{3S} Low Qg series

■ 600V クラス 600V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
FMP06N60ES	600	6	24	1.2	105	30	3.7±0.5	31	TO-220	2.0
FMV06N60ES	600	6	24	1.2	37	30	3.7±0.5	31	TO-220F(SLS)	1.7
FMI06N60ES	600	6	24	1.2	105	30	3.7±0.5	31	T-Pack(L)	1.6
FMC06N60ES	600	6	24	1.2	105	30	3.7±0.5	31	T-Pack(S)	1.6
FMP12N60ES	600	12	48	0.75	180	30	4.2±0.5	37	TO-220	2.0
FMV12N60ES	600	12	48	0.75	65	30	4.2±0.5	37	TO-220F(SLS)	1.7
FMI12N60ES	600	12	48	0.75	180	30	4.2±0.5	37	T-Pack(L)	1.6
FMC12N60ES	600	12	48	0.75	180	30	4.2±0.5	37	T-Pack(S)	1.6
FML12N60ES	600	12	48	0.75	180	30	4.2±0.5	37	TFP	1.6
FMP13N60ES	600	13	48	0.58	225	30	4.2±0.5	48	TO-220	2.0
FMV13N60ES	600	13	48	0.58	225	30	4.2±0.5	48	TO-220F(SLS)	1.7
FMI13N60ES	600	13	48	0.58	225	30	4.2±0.5	48	T-Pack(L)	1.6
FMC13N60ES	600	13	48	0.58	225	30	4.2±0.5	48	T-Pack(S)	1.6
FMH13N60ES	600	13	48	0.58	195	30	4.2±0.5	48	TO-3P(Q)	5.1
FML13N60ES	600	13	48	1.58	225	30	4.2±0.5	48	TFP	1.6
FMP16N60ES	600	16	64	0.47	270	30	4.2±0.5	56	TO-220	2.0
FMV16N60ES	600	16	64	0.47	95	30	4.2±0.5	56	TO-220F(SLS)	1.7
FMI16N60ES	600	16	64	0.47	270	30	4.2±0.5	56	T-Pack(L)	1.6
FMC16N60ES	600	16	64	0.47	270	30	4.2±0.5	56	T-Pack(S)	1.6
FMH16N60ES	600	16	64	0.47	235	30	4.2±0.5	56	TO-3P(Q)	5.1
FML16N60ES	600	16	64	0.47	270	30	4.2±0.5	56	TFP	1.6
FMV17N60ES	600	17	68	0.4	120	30	4.2±0.5	68	TO-220F(SLS)	1.7
FMR17N60ES	600	17	68	0.4	135	30	4.2±0.5	68	TO-3PF	6.0
FMH17N60ES	600	17	68	0.4	285	30	4.2±0.5	68	TO-3P(Q)	5.1
FMV19N60ES	600	19	76	0.365	130	30	4.2±0.5	74	TO-220F(SLS)	1.7
FMR19N60ES	600	19	76	0.365	150	30	4.2±0.5	74	TO-3PF	6.0
FMH19N60ES	600	19	76	0.365	315	30	4.2±0.5	74	TO-3P(Q)	5.1
FMR23N60ES	600	23	92	0.28	200	30	4.2±0.5	92	TO-3PF	6.0
FMH23N60ES	600	23	92	0.28	400	30	4.2±0.5	92	TO-3P(Q)	5.1

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

SuperFAP-E^{3S} シリーズは、一般民生用向けの品質保証製品であります。車載用、医療機器など高度な信頼性を要求される機器へ適用される場合には、弊社にお問い合わせください。また、航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。

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Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ SuperFAP-Gシリーズ SuperFAP-G series

低オン抵抗、低ゲート容量 Low-on resistance and low gate charge

SuperFAP-G series			TO-220	TO-220F	TO-220 (SLS)	TO-3PF	TO-247	T-Pack(L)	T-Pack(S)	TFP
Vds (V)	Ron (Ω)	Id (A)								
100	0.062	29	✓	✓				✓	✓	
120	0.03	67	✓	✓				✓	✓	✓
150	0.105	23	✓	✓				✓	✓	
	0.1	23								
	0.07	33	✓	✓				✓	✓	✓
	0.041	57	✓	✓				✓	✓	✓
	0.016	100					✓			
200	0.17	18	✓	✓				✓	✓	✓
	0.066	45	✓	✓				✓	✓	✓
250	0.26	14	✓	✓				✓	✓	
	0.13	24			✓					
	0.1	37	✓	✓		✓		✓	✓	✓
	0.053	59				✓	✓			
280	0.061	56				✓	✓			
300	0.28	15		✓						
	0.13	32	✓	✓				✓	✓	✓
450	2.5	3	✓	✓						
	1.6	4	✓	✓						
	0.65	10	✓	✓				✓	✓	
	0.38	17	✓	✓				✓	✓	✓
500	2.3	4	✓	✓				✓	✓	
	0.85	9	✓	✓				✓	✓	
	0.7	11	✓	✓				✓	✓	
	0.52	14	✓	✓				✓	✓	
	0.46	16	✓	✓				✓	✓	
	0.38	19	✓	✓			✓	✓	✓	✓
	0.26	25				✓	✓			
	0.11	51					✓			
600	3.3	3	✓	✓				✓	✓	
	1.2	8	✓	✓				✓	✓	
	1	9	✓	✓				✓	✓	
	0.75	12	✓	✓				✓	✓	
	0.65	13	✓	✓		✓				
	0.57	16	✓	✓			✓	✓	✓	
	0.37	21				✓	✓			
700	0.6	17				✓				
900	8	2.2	✓	✓						
	6.4	2.6	✓	✓				✓	✓	
	4.3	3.7	✓	✓						
	2.5	6.0						✓	✓	

■ SuperFAP-Gシリーズ SuperFAP-G series

■ 100 ー 250V クラス 100 - 250V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
2SK3598-01	100	29	116	0.062	105	±30	3 to 5	22	TO-220	2.0
2SK3599-01MR	100	29	116	0.062	37	±30	3 to 5	22	TO-220F	1.7
2SK3600-01L, S	100	29	116	0.062	105	±30	3 to 5	22	T-pack	1.6
2SK3920-01	120	67	268	0.03	270	±30	3 to 5	52	TO-220	2.0
2SK3886-01MR	120	67	268	0.03	95	±30	3 to 5	52	TO-220F	1.7
2SK3921-01L, S	120	67	268	0.03	270	±30	3 to 5	52	T-pack	1.6
2SK3922-01	120	67	268	0.03	270	±30	3 to 5	52	TFP	0.8
2SK3602-01	150	23	92	0.105	105	±30	3 to 5	21	TO-220	2.0
2SK3603-01MR	150	23	92	0.105	37	±30	3 to 5	21	TO-220F	1.7
2SK3604-01L, S	150	23	92	0.105	105	±30	3 to 5	21	T-pack	1.6
2SK3648-01	150	33	132	0.07	150	±30	3 to 5	34	TO-220	2.0
2SK3649-01MR	150	33	132	0.07	53	±30	3 to 5	34	TO-220F	1.7
2SK3650-01L, S	150	33	132	0.07	150	±30	3 to 5	34	T-pack	1.6
2SK3474-01	150	33	132	0.07	150	±30	3 to 5	34	TFP	0.8
2SK3537-01MR	150	33	132	0.07	53	±20	1 to 2.5	46	TO-220F	1.7
2SK3590-01	150	57	228	0.041	270	±30	3 to 5	52	TO-220	2.0
2SK3591-01MR	150	57	228	0.041	95	±30	3 to 5	52	TO-220F	1.7
2SK3592-01L, S	150	57	228	0.041	270	±30	3 to 5	52	T-pack	1.6
2SK3593-01	150	57	228	0.041	270	±30	3 to 5	52	TFP	0.8
2SK3882-01	150	100	400	0.016	600	±30	3 to 5	140	TO-247	4.9
2SK3606-01	200	18	72	0.17	105	±30	3 to 5	21	TO-220	2.0
2SK3607-01MR	200	18	72	0.17	37	±30	3 to 5	21	TO-220F	1.7
2SK3608-01L, S	200	18	72	0.17	105	±30	3 to 5	21	T-pack	1.6
2SK3609-01	200	18	72	0.17	105	±30	3 to 5	21	TFP	0.8
2SK3594-01	200	45	180	0.066	270	±30	3 to 5	51	TO-220	2.0
2SK3595-01MR	200	45	180	0.066	95	±30	3 to 5	51	TO-220F	1.7
2SK3596-01L, S	200	45	180	0.066	270	±30	3 to 5	51	T-pack	1.6
2SK3597-01	200	45	180	0.066	270	±30	3 to 5	51	TFP	0.8
2SK3610-01	250	14	56	0.26	105	±30	3 to 5	21	TO-220	2.0
2SK3611-01MR	250	14	56	0.26	37	±30	3 to 5	21	TO-220F	1.7
2SK3612-01L, S	250	14	56	0.26	105	±30	3 to 5	21	T-pack	1.6
FMV24N25G	250	24	96	0.13	65	±30	3 to 5	36	TO-220F(SLS)	1.7
2SK3554-01	250	37	148	0.1	270	±30	3 to 5	44	TO-220	2.0
2SK3555-01MR	250	37	148	0.1	95	±30	3 to 5	44	TO-220F	1.7
2SK3556-01L, S	250	37	148	0.1	270	±30	3 to 5	44	T-pack	1.6
2SK3535-01	250	37	148	0.1	270	±30	3 to 5	44	TFP	0.8
2SK3651-01R	250	37	148	0.1	115	±30	3 to 5	44	TO-3PF	6.0
2SK3778-01	250	59	236	0.053	410	±30	3 to 5	80	TO-247	4.9
2SK3779-01R	250	59	236	0.053	210	±30	3 to 5	80	TO-3PF	6.0

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

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■ SuperFAP-Gシリーズ SuperFAP-G series

■ 300 ー 500V クラス 300 – 500V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
2SK3580-01MR	300	15	60	0.28	48	±30	3.5 to 4.5	23	TO-220F	1.7
2SK3772-01	300	32	128	0.13	270	±30	3 to 5	44.5	TO-220	2.0
2SK3773-01MR	300	32	128	0.13	95	±30	3 to 5	44.5	TO-220F	1.7
2SK3774-01L, S	300	32	128	0.13	270	±30	3 to 5	44.5	T-pack	1.6
2SK3775-01	300	32	128	0.13	270	±30	3 to 5	44.5	TFP	0.8
2SK3725-01	450	3	12	2.5	50	±30	3 to 5	10.5	TO-220	2.0
2SK3726-01MR	450	3	12	2.5	17	±30	3 to 5	10.5	TO-220F	1.7
2SK3916-01	450	4.3	17.2	1.6	21	±30	3 to 5	13	TO-220	2.0
2SK3917-01MR	450	4.3	17.2	1.6	21	±30	3 to 5	13	TO-220F	1.7
2SK3514-01	450	10	40	0.65	135	±30	3 to 5	22	TO-220	2.0
2SK3515-01MR	450	10	40	0.65	48	±30	3 to 5	22	TO-220F	1.7
2SK3516-01L, S	450	10	40	0.65	135	±30	3 to 5	22	T-pack	1.6
2SK3692-01	450	17	68	0.38	225	±30	3 to 5	33	TO-220	2.0
2SK3693-01MR	450	17	68	0.38	80	±30	3 to 5	33	TO-220F	1.7
2SK3694-01L, S	450	17	68	0.38	225	±30	3 to 5	33	T-pack	1.6
2SK4040-01	450	17	68	0.38	225	±30	3 to 5	33	TFP	0.8
2SK3985-01	500	3.6	14.4	2.3	60	±30	3 to 5	13	TO-220	2.0
2SK3986-01MR	500	3.6	14.4	2.3	21	±30	3 to 5	13	TO-220F	1.7
2SK3987-01L, S	500	3.6	14.4	2.3	60	±30	3 to 5	13	T-pack	1.6
2SK3519-01	500	9	36	0.85	135	±30	3 to 5	20	TO-220	2.0
2SK3520-01MR	500	9	36	0.85	48	±30	3 to 5	20	TO-220F	1.7
2SK4004-01MR	500	9	36	0.85	48	±30	2.5 to 3.5	24	TO-220F	1.7
2SK3521-01L, S	500	9	36	0.85	135	±30	3 to 5	20	T-pack	1.6
2SK3931-01	500	11	44	0.70	165	±30	3 to 5	25	TO-220	2.0
2SK3932-01MR	500	11	44	0.70	60	±30	3 to 5	25	TO-220F	1.7
2SK3933-01L, S	500	11	44	0.70	165	±30	3 to 5	25	T-pack	1.6
2SK3468-01	500	14	56	0.52	195	±30	3 to 5	30	TO-220	2.0
2SK3469-01MR	500	14	56	0.52	70	±30	3 to 5	30	TO-220F	1.7
2SK3512-01L, S	500	14	56	0.52	195	±30	3 to 5	30	T-pack	1.6
2SK3504-01	500	16	64	0.46	225	±30	3 to 5	33	TO-220	2.0
2SK3505-01MR	500	16	64	0.46	80	±30	3 to 5	33	TO-220F	1.7
2SK3581-01L, S	500	16	64	0.46	225	±30	3 to 5	33	T-pack	1.6
2SK3682-01	500	19	76	0.38	270	±30	3 to 5	32	TO-220	2.0
2SK3683-01MR	500	19	76	0.38	95	±30	3 to 5	32	TO-220F	1.7
2SK3684-01L, S	500	19	76	0.38	270	±30	3 to 5	32	T-pack	1.6
2SK3685-01	500	19	76	0.38	235	±30	3 to 5	32	TO-247	4.9
FML19N50G	500	19	76	0.38	270	±30	3 to 5	32	TFP	0.8
2SK3522-01	500	25	100	0.26	335	±30	3 to 5	54	TO-247	4.9
2SK3523-01R	500	25	100	0.26	160	±30	3 to 5	54	TO-3PF	6.0
2SK3680-01	500	51	208	0.11	600	±30	3 to 5	118	TO-247	4.9

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

■ SuperFAP-Gシリーズ SuperFAP-G series

■ 600 ー 900V クラス 600 - 900V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
2SK3988-01	600	3	12	3.3	60	±30	3 to 5	13	TO-220	2.0
2SK3989-01MR	600	3	12	3.3	21	±30	3 to 5	13	TO-220F	1.7
2SK3990-01L, S	600	3	12	3.3	60	±30	3 to 5	13	T-pack	1.6
2SK3524-01	600	8	32	1.2	135	±30	3 to 5	20	TO-220	2.0
2SK3525-01MR	600	8	32	1.2	48	±30	3 to 5	20	TO-220F	1.7
2SK3526-01L, S	600	8	32	1.2	135	±30	3 to 5	20	T-pack	1.6
2SK3887-01	600	9	36	1.0	165	±30	3 to 5	25	TO-220	2.0
2SK3888-01MR	600	9	36	1.0	60	±30	3 to 5	25	TO-220F	1.7
2SK3889-01L, S	600	9	36	1.0	165	±30	3 to 5	25	T-pack	1.6
2SK3501-01	600	12	48	0.75	195	±30	3 to 5	30	TO-220	2.0
2SK3502-01MR	600	12	48	0.75	70	±30	3 to 5	30	TO-220F	1.7
2SK3513-01L, S	600	12	48	0.75	195	±30	3 to 5	30	T-pack	1.6
2SK3450-01	600	13	52	0.65	225	±30	3 to 5	34	TO-220	2.0
2SK3451-01MR	600	13	52	0.65	80	±30	3 to 5	34	TO-220F	1.7
2SK3753-01R	600	13	52	0.65	95	±30	3 to 5	34	TO-3PF	6.0
2SK3686-01	600	16	64	0.57	270	±30	3 to 5	33	TO-220	2.0
2SK3687-01MR	600	16	64	0.57	97	±30	3 to 5	33	TO-220F	1.7
2SK3688-01L, S	600	16	64	0.57	270	±30	3 to 5	33	T-pack	1.6
2SK3689-01	600	16	64	0.57	235	±30	3 to 5	33	TO-247	4.9
2SK3527-01	600	21	84	0.37	335	±30	3 to 5	54	TO-247	4.9
2SK3528-01R	600	21	84	0.37	160	±30	3 to 5	54	TO-3PF	6.0
2SK3681-01	600	43	172	0.16	600	±30	3 to 5	118	TO-247	4.9
2SK3891-01R	700	17	68	0.6	170	±30	3 to 5	46	TO-3PF	6.0
2SK3727-01	900	2.2	8.8	8.0	75	±30	3.5 to 4.5	8.3	TO-220	2.0
2SK3728-01MR	900	2.2	8.8	8.0	26	±30	3.5 to 4.5	8	TO-220F	1.7
2SK3981-01	900	2.6	10.4	6.4	90	±30	3 to 5	13	TO-220	2.0
2SK3982-01MR	900	2.6	10.4	6.4	32	±30	3 to 5	13	TO-220F	1.7
2SK3983-01L, S	900	2.6	10.4	6.4	90	±30	3 to 5	13	T-pack	1.6
2SK3698-01	900	3.7	14.8	4.3	120	±30	3.5 to 4.5	13	TO-220	2.0
2SK3699-01MR	900	3.7	14.8	4.3	43	±30	3.5 to 4.5	13	TO-220F	1.7
2SK3676-01L, S	900	6	24	2.5	195	±30	3 to 5	21.5	T-pack	1.6

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

■ SuperFAP-Gシリーズ　高速ダイオード内蔵シリーズ
SuperFAP-G Built-in FRED series

SuperFAP-G Built-in FRED series			TO-220	TO-220F	TO-247	T-Pack (L)	T-Pack (S)
							
Vds (V)	Ron (Ω)	Id (A)					
500	0.55	13	✓	✓			
600	0.8	11	✓	✓		✓	✓
	0.17	42			✓		

■ 500 ー 600V クラス　500 - 600V class

型　　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ Volts	Q_G Typ. nC	パッケージ Package	質　量 Net mass Grams
2SK3695-01	500	13	52	0.55	195	±30	3 to 5	28	TO-220	2.0
2SK3696-01MR	500	13	52	0.55	70	±30	3 to 5	28	TO-220F	1.7
2SK3928-01	600	11	44	0.8	195	±30	3 to 5	30	TO-220	2.0
2SK3929-01MR	600	11	44	0.8	70	±30	3 to 5	30	TO-220F	1.7
2SK3930-01L, S	600	11	44	0.8	195	±30	3 to 5	30	T-pack	1.6
2SK3697-01	600	42	168	0.17	600	±30	3 to 5	105	TO-247	4.9

*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

■ 低・中耐圧トレンチ シリーズ Trench Power MOSFET

低オン抵抗、高ゲート耐圧 Low-on resistance and high gate capability

Trench Power MOSFET			TO-220	TO-220F	TO-3P (Q)	TO-247	T-Pack(L)	T-Pack(S)	D2-pack
									
Vds (V)	Ron (Ω)	Id (A)							
40	0.060	70				✓			
60	0.0065	70		✓					
		80	✓				✓	✓	✓
	0.0065	100			✓				
75	0.0079	70		✓					
	0.0085	70						✓	
100	0.0067	80						✓	
	0.0067	100				✓			
	0.0128	80	✓	✓			✓	✓	
150	0.0245	65	✓	✓			✓	✓	
200	0.0470	49	✓	✓			✓	✓	

■ 60 – 100V クラス 60 – 100V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	パッケージ Package	質量 Net mass Grams
2SK4068-01	40	70	280	0.006	115	+30/-20	3.0	TO-247	4.9
2SK3273-01MR	60	70	280	0.0065	70	+30/-20	3.0	TO-220F	1.7
2SK3270-01	60	80	320	0.0065	135	+30/-20	3.0	TO-220	2.0
2SK3272-01L, S	60	80	320	0.0065	135	+30/-20	3.0	T-pack (L, S)	1.6
2SK3272-01SJ	60	80	320	0.0065	135	+30/-20	3.0	D2-pack	1.6
2SK4047-01S	60	80	320	0.0065	195	+30/-20	3.0	T-pack (S)	1.6
2SK3271-01	60	100	400	0.0065	155	+30/-20	3.0	TO-3P	5.5
2SK3730-01MR	75	70	280	0.0079	70	±20	3.0	TO-220F	1.7
2SK3804-01S	75	70	280	0.0085	162	±20	3.0	T-pack (S)	1.6
FMC80N10R6	100	80	320	0.0067	180	+30/-20	3.0	T-pack (S)	1.6
FMY100N10R6	100	100	400	0.0067	280	+30/-20	3.0	TO-247	6.3

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

■ 100 – 200V クラス 100 – 200V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	パッケージ Package	質量 Net mass Grams
FMP80N10T2	100	80	320	0.0128	270	+30/-20	2 to 4	TO-220	2.0
FMA80N10T2	100	80	320	0.0128	95	+30/-20	2 to 4	TO-220F	1.7
FMI80N10T2	100	80	320	0.0128	270	+30/-20	2 to 4	T-pack(L)	1.6
FMC80N10T2	100	80	320	0.0128	270	+30/-20	2 to 4	T-pack(S)	1.6
FMP65N15T2	150	65	260	0.0245	270	+30/-20	2 to 4	TO-220	2.0
FMA65N15T2	150	65	260	0.0245	95	+30/-20	2 to 4	TO-220F	1.7
FMI65N15T2	150	65	260	0.0245	270	+30/-20	2 to 4	T-pack(L)	1.6
FMC65N15T2	150	65	260	0.0245	270	+30/-20	2 to 4	T-pack(S)	1.6
FMP49N20T2	200	49	196	0.047	270	+30/-20	2 to 4	TO-220	2.0
FMA49N20T2	200	49	196	0.047	95	+30/-20	2 to 4	TO-220F	1.7
FMI49N20T2	200	49	196	0.047	270	+30/-20	2 to 4	T-pack(L)	1.6
FMC49N20T2	200	49	196	0.047	270	+30/-20	2 to 4	T-pack(S)	1.6

*1 $R_{DS\ (on)}$: V_{GS}=10V, *2 P_D: T_C=25°C

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The Trench Power MOSFET series products satisfies the quality assurance level of general consumer use.
If you intend to use the products for equipment requiring higher reliability, such as equipment for automobiles and medical equipment, please contact Fuji Electric.
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用Super J MOS® S1シリーズ
Automotive Super J MOS® S1 series

AEC Q101

低オン抵抗、低ノイズ、低スイッチング損失　Low-on resistance, low switching noise and low switching loss

Automotive Super J MOS® S1 Series			TO-247	T-Pack(S)
				
Vds (V)	Ron (Ω)	Id (A)		
600	0.145	29	✓	✓
	0.082	46	✓	
	0.070	47	✓	
	0.071	52	✓	
	0.062	53	✓	
	0.046	67	✓	
	0.040	68	✓	

■ 600V クラス　600V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
FMY47N60S1A	600	47	141	0.070	390	30	3.0±0.5	125	TO-247	6.4
FMY53N60S1A	600	53	159	0.062	480	30	3.0±0.5	164	TO-247	6.4
FMY68N60S1A	600	68	204	0.040	545	30	3.0±0.5	203	TO-247	6.4

*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

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航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。

Automotive Super J MOS® S1 series of products satisfies the quality assurance level of general automobile use (conforms to AEC-Q101).
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用Super J MOS® S1FDシリーズ（高速ダイオード内蔵タイプ）
Automotive Super J MOS® S1FD series (Built-in FRED type)

AEC Q101

■ 600V クラス　600V class

型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	Q_G Typ. nC	trr Typ. nsec	パッケージ Package	質量 Net mass Grams
FMC29N60S1FDA	600	29	87	0.145	220	30	4.0±1	73	170	T-Pack	1.6
FMY29N60S1FDA	600	29	87	0.145	220	30	4.0±1	73	170	TO-247	6.4
FMY46N60S1FDA	600	46	138	0.082	390	30	4.0±1	125	210	TO-247	6.4
FMY52N60S1FDA	600	52	156	0.071	480	30	4.0±1	164	280	TO-247	6.4
FMY67N60S1FDA	600	67	201	0.046	545	30	4.0±1	203	280	TO-247	6.4
FMY52N65S1FDA	650	52	156	0.071	480	30	4.0±1	164	280	TO-247	6.4

*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

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The Automotive Super J MOS® S1FD series of products satisfies the quality assurance level of general automobile use (conforms to AEC-Q101).
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用Super J MOS® S2シリーズ
Automotive Super J MOS® S2 series

AEC Q101

低オン抵抗、低ノイズ、低スイッチング損失　Low-on resistance, low switching noise and low switching loss

■ 600V クラス　600V class

	型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
○	**FMY60N160S2A**	600	18	54	0.160	110	30	4.0±0.5	42	TO-247	6.4
○	**FMC60N160S2A**	600	18	54	0.160	127	30	4.0±0.5	42	T-Pack	1.6
○	**FMY60N125S2A**	600	23	68	0.125	140	30	4.0±0.5	52	TO-247	6.4
○	**FMC60N125S2A**	600	23	68	0.125	160	30	4.0±0.5	52	T-Pack	1.6
○	**FMY60N099S2A**	600	29	88	0.099	185	30	4.0±0.5	64	TO-247	6.4
○	**FMC60N099S2A**	600	29	88	0.099	210	30	4.0±0.5	64	T-Pack	1.6
○	**FMY60N088S2A**	600	33	98	0.088	205	30	4.0±0.5	71	TO-247	6.4
○	**FMC60N088S2A**	600	33	98	0.088	235	30	4.0±0.5	71	T-Pack	1.6
○	**FMY60N079S2A**	600	37	111	0.079	235	30	4.0±0.5	80	TO-247	6.4
○	**FMC60N079S2A**	600	37	111	0.079	270	30	4.0±0.5	80	T-Pack	1.6
○	**FMY60N070S2A**	600	39	118	0.070	270	30	4.0±0.5	89	TO-247	6.4
○	**FMY60N040S2A**	600	66	199	0.040	435	30	4.0±0.5	150	TO-247	6.4
○	**FMY60N025S2A**	600	96	287	0.025	575	30	4.0±0.5	232	TO-247	6.4

○：開発中　*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

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航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。

The Automotive Super J MOS® S1FD series of products satisfies the quality assurance level of general automobile use (conforms to AEC-Q101).
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用Super J MOS® S2FDシリーズ（高速ダイオード内蔵タイプ）
Automotive Super J MOS® S2FD series (Built-in FRED type)

AEC Q101

	型式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	Q_G Typ. nC	パッケージ Package	質量 Net mass Grams
○	**FMY60N105S2FDA**	600	28	84	0.105	185	30	4.0±1	64	TO-247	6.4
○	**FMC60N105S2FDA**	600	28	84	0.105	210	30	4.0±1	64	T-Pack	1.6
○	**FMY60N081S2FDA**	600	37	111	0.081	235	30	4.0±1	100	TO-247	6.4
○	**FMC60N081S2FDA**	600	37	111	0.081	270	30	4.0±1	100	T-Pack	1.6

○：開発中　*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

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Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用MOSFET（Trench Power MOS、SuperFAP-E^{3S}）
Automotive MOSFET

Automotive Trench Power MOSFET SuperFAP-E^{3S} Low Qg series			TO-220	TO-220F	TO-3P (Q)	TO-247	T-Pack(L)	T-Pack(S)	D2-pack
									
Vds (V)	Ron (Ω)	Id (A)							
40	0.006	70				✓			
60	0.0065	70		✓					
		80	✓				✓	✓	✓
								✓	
	0.0065	100			✓	✓			
75	0.0079	70		✓					
	0.0085	70						✓	
100	0.0067	80					✓		
	0.0128	80							
	0.0067	100				✓			
150	0.0245	65							
200	0.047	49							
300	0.085	47				✓			
	0.072	50				✓			
	0.053	67				✓			
	0.045	72				✓			
600	0.29	22				✓			
	0.28	24				✓			
	0.21	30				✓			
	0.20	31				✓			
	0.17	35				✓			
	0.16	36				✓			

■ 自動車用SuperFAP-E^{3S} 低Qgシリーズ
Automotive SuperFAP-E^{3S} Low Qg series

AEC Q101

■ 300 − 600V クラス　300 - 600V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	Q_G Typ. nC	パッケージ Package	質　量 Net mass Grams
FMY50N30ES	300	50	200	0.072	400	+30/-30	4.2±0.5	97	TO-247	6.4
FMY72N30ES	300	72	288	0.045	570	+30/-30	4.2±0.5	155	TO-247	6.4
FMY24N60ES	600	24	96	0.280	400	+30/-30	4.2±0.5	95	TO-247	6.4
FMY31N60ES	600	31	124	0.200	495	+30/-30	4.2±0.5	125	TO-247	6.4
FMY36N60ES	600	36	144	0.160	570	+30/-30	4.2±0.5	155	TO-247	6.4

*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

自動車用SuperFAP-E^{3S} 低Qgシリーズは、一般車載用向けの品質保証(AEC-Q101準拠)製品であります。
航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。

The Automotive SuperFAP-E^{3S} Low Qg series of products satisfies the quality assurance level of general automobile use (conforms to AEC-Q101).
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用SuperFAP-E^{3S} 低Qg 高速ダイオード内蔵シリーズ
Automotive SuperFAP-E^{3S} Low Qg Built-in FRED series

AEC Q101

低オン抵抗、低ノイズ、低スイッチング損失　Low-on resistance, low switching noise and low switching loss

■ 300 ー 600V クラス　300 – 600V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	Q_G Typ. nC	t_{rr} Typ. nsec	パッケージ Package	質　量 Net mass Grams
FMY47N30ESF	300	47	188	0.085	400	+30/-30	4.2±1.0	96	130	TO-247	6.4
FMY67N30ESF	300	67	268	0.053	570	+30/-30	4.2±1.0	155	150	TO-247	6.4
FMY22N60ESF	600	22	88	0.290	400	+30/-30	4.2±1.0	95	150	TO-247	6.4
FMY30N60ESF	600	30	120	0.210	495	+30/-30	4.2±1.0	125	160	TO-247	6.4
FMY35N60ESF	600	35	140	0.170	570	+30/-30	4.2±1.0	155	160	TO-247	6.4

*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

自動車用SuperFAP-E^{3S} 低Qg 高速ダイオード内蔵シリーズは、一般車載用向けの品質保証(AEC-Q101準拠)製品であります。
航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。

Automotive SuperFAP-E^{3S} Low Qg Built-in FRED series of products satisfies the quality assurance level of general automobile use (conforms to AEC-Q101).
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用 トレンチMOSFET　Automotive Trench Power MOSFET

■ 40 ー 100V クラス　40 – 100V class

型　式 Device type	V_{DSS} Volts	I_D Amps.	$I_{D\ (pulse)}$ Amps.	$R_{DS\ (on)}$ Max. *1 Ohms (Ω)	P_D *2 Watts	V_{GS} Volts	$V_{GS\ (th)}$ typ. Volts	パッケージ Package	質　量 Net mass Grams
2SK4068-01	40	70	280	0.006	115	+30/-20	3.0	TO-247	4.9
2SK3273-01MR	60	70	280	0.0065	70	+30/-20	3.0	TO-220F	1.7
2SK3270-01	60	80	320	0.0065	135	+30/-20	3.0	TO-220	2.0
2SK3272-01L, S	60	80	320	0.0065	135	+30/-20	3.0	T-pack	1.6
2SK3272-01SJ	60	80	320	0.0065	135	+30/-20	3.0	D2-pack	1.6
2SK4047-01S	60	80	320	0.0065	195	+30/-20	3.0	T-pack	1.6
FMY100N06T ※1	60	100	400	0.0065	135	+30/-20	3.0	TO-247	6.3
2SK3271-01	60	100	400	0.0065	155	+30/-20	3.0	TO-3P	5.5
2SK3730-01MR	75	70	280	0.0079	70	±20	3.0	TO-220F	1.7
2SK3804-01S	75	70	280	0.0085	135	±20	3.0	T-pack	1.6
FMC80N10R6	100	80	320	0.0067	324	+30/-20	3.0	T-Pack	1.6
FMY100N10R6 ※1	100	100	400	0.0067	280	+30/-20	3.0	TO-247	6.3

*1 $R_{DS\ (on)}$: V_{GS}=10V,　*2 P_D: T_C=25°C

※1　FMY100N06T、FMY100N10R6は一般車載用向けの品質保証(AEC-Q101準拠)製品であります。
FMY100N06T and FMY100N10R6 satisfies the quality assurance level of general automobile use (conforms to AEC-Q101).

航空宇宙用など高度な信頼性を要求される機器への適用は行わないでください。
Do not use the products for equipment requiring strict reliability such as aerospace equipment.

■ 自動車用 IPS シリーズ（インテリジェントパワースイッチ）
Automotive IPS series (Intelligent Power Switches)
自己保護機能　Self protection

型式 Device type	Type	Channels	V_{GS} Volts	I_D Amps.	$R_{DS\ (on)}$ Max. Ohms (Ω)	P_D Watts	パッケージ Package	質量 Net mass Grams	備考 Remarks
F5044H	High side	1	50	2.5	0.12 ※1	1.5	SOP-8	0.2	
F5045P	High side	1	50	1	0.60 ※1	1.5	SOP-8	0.2	
● **F5106H**	High side	1	50	2	0.12 ※1	1.5	SOP-8	0.2	
● **F5112H** ※3	High side	1	50	2	0.12 ※1	2	SOP-8	0.2	
F5062H	High side	1	35	50	0.008 ※1	114	PSOP-12	0.4	
F5072H	High side	1	35	80	0.005 ※1	114	PSOP-12	0.4	
F5018	Low side	1	40	8	0.14 ※2	15	K-pack	0.6	
F5019	Low side	1	40	12	0.14 ※2	30	T-pack	1.6	
F5020	Low side	1	40	3	0.40 ※2	10	K-pack	0.6	
F5033	Low side	2	40	1	0.60 ※2	1.5	SOP-8	0.2	
F5041	Low side	2	40	1	0.60 ※2	1.5	SOP-8	0.2	
F5042	Low side	1	40	8	0.14 ※2	15	K-pack	0.6	
F5043	Low side	1	40	12	0.14 ※2	30	T-pack	1.6	
F5048	Low side	1	80	15	0.125 ※2	43	T-pack	1.6	
F5055	Low side	2	40	5.9	0.14 ※2	7.8	SSOP-20	0.3	
F5063L	Low side	2	40	1.9	0.14 ※2	1.75	SOP-8	0.2	

●：新製品　New Product　　※1 $R_{DS\ (on)}$: V_{DS}=13V　※2 $R_{DS\ (on)}$: V_{IN}/V_{GS}=5V　※3 低待機電流品

整流ダイオード
Rectifier Diodes

富士電機の整流ダイオードは、低 VF 特性、低 IR などの特長を有し、電源の PFC 回路や二次側整流回路に対応が可能です。

Fuji Electric's rectifier diodes have features such as low VF characteristics and low IR, and are compatible with PFC circuits of power supplies and secondary-side rectification circuits.

■ SBD, LLD の特長　Features of the SBD, LLD

超低IR-SBD (Schottky-Barrier Diode)　Ultra Low-IR SBD

■特長　Features

- ●接合部温度（Tj）175℃保証
- ●従来品に対し VF は同等で、IR を 1/10 以下に低減

- ● Guaranteed Tj=175°C
- ● VF is same level and IR is reduced by less than 1/10.

LLD (Low Loss Diode)　Super LLD series for PFC circuit

■特長　Features

Super LLD-3（電流連続モード PFC 用）
- ●従来品に対し高速化と低 VF 化を実現。

Super LLD-2（臨界モード PFC 用）
- ●低 VF 特性による低損失化
- ●ソフトリカバリーによる低ノイズ化

Super LLD-3 for CCM-PFC
- ● Realize acceleration and low VF compaired with existing model.

Super LLD-2 for DCM-PFC
- ● Achieved low power loss by low VF
- ● Achieved low noise by soft recovery

■型式の見方　Part numbers

FDRW50C60L (example)

F	DR		W		50	C		60		L	
社名 Company code	機種コード Device code		パッケージコード Package code		定格電流 Current	極性 Polarity		定格電圧 Voltage		製品シリーズ Series	
Fuji	DR	FWD	P	TO-220	×1	S	Single	60	600V	L	Ultra Fast Recovery
			W	TO-247		C	Cathode Common	120	1200V	J	Sort/Fast Recovery

5 整流ダイオード/Rectifier Diodes

■型式の見方　Part numbers

YA875C10R (example)

YA		87		5		C		10						R
パッケージコード Package code		シリーズ Series		定格電流 Current		極性 Polarity		定格電圧 Voltage						付加コード Additional code
KP	K-Pack (L)	8x	SBD	1	5A	S	Single	SBD	02	20V	LLD	2	200V	R or RR
KS	K-Pack (S)	9x	LLD	2	10A	C	Cathode Common		03	30V		3	300V	
MS	TFP			3	15A				04	40V		4	400V	
PA	TO-3P			4	15A				06	60V		6	600V	
PG	TO-3PF			5	20A				08	80V		8	800V	
PH	TO-247			6	30A				09	90V		10	1000V	
TP	T-Pack (L)			8	30A				10	100V		12	1200V	
TS	T-Pack (S)			9	40A				12	120V		15	1500V	
YA	TO-220			0	40A				15	150V				
YG	TO-220F								20	200V				

■型式の見方　Part numbers

ESAD92M02R (example)

ESA		D			92		M		02					R
チップ構成 Chip		定格電流 Current			シリーズ Series		パッケージコード Package code		電圧定格 Voltage					付加コード Additional code
ESA	ツインチップ	リード	ERA	≦1A	8x	SBD	無し	フィン	SBD	004	40V	LLD	02	200V	R or RR
ER	シングルチップ		ERB	≦2A	9x	LLD	M	フルモールド		006	60V		03	300V	
			ERC	≦3A						009	90V				
			ERD	-											
		TOPKG	ERC	≦5A											
			ESAB	5A-10A											
			ESAC	10A-20A											
			ESAD	20A-30A											

■ ショットキーバリアダイオード　Schottky-Barrier Diodes(SBD)

Schottky-Barrier Diodes(SBD)					TO-220F	K-Pack(L)	K-Pack(S)	TFP
								
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R (mA)				
シングル	40	5	0.55	5	✓		✓	
	45	10	0.60	2	✓			
	60	5	0.59	5	✓			
		15	0.63	20	✓			
デュアル	20	7	0.39	10		✓	✓	
	30	5	0.47	5			✓	
	40	5	0.55	5	✓		✓	
		10	0.55	5	✓			
		20	0.6	15	✓			
		30	0.53	8	✓			✓
	60	5	0.58	5	✓			
		10	0.58	5	✓			
		15	0.58	5	✓			
		20	0.58	15	✓			
		30	0.58	3				✓
	90	5	0.9	5			✓	
	100	5	0.8	0.7	✓			
		10	0.8	1.2	✓			
		20	0.8	2.5	✓			
		30	0.8	20	✓			

シングル　1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	 I_O*1 Amps.	 I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM} Max. Volts	 I_{RRM}*3 Max.mA	 $R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
KS826S04	40	5.0 (Tc=110℃)	80	-40 to +150	0.55 (I_F=5.0A)	5	10	K-pack(S)	0.6
YG811S04R	40	5.0 (Tc=122℃)	120	-40 to +150	0.55 (I_F=5.0A)	5	5.0	TO-220F	1.7
YG812S04R	45	10 (Tc=124℃)	120	-40 to +150	0.6 (I_F=10A)	2	2.5	TO-220F	1.7
YG811S06R	60	5.0 (Tc=127℃)	80	-40 to +150	0.59 (I_F=5.0A)	5	5.0	TO-220F	1.7
YG804S06R	60	15 (Tc=99℃)	120	-40 to +150	0.63 (I_F=15A)	20	2.2	TO-220F	1.7

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms.　　*3 V_R=V_{RRM}

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms　*3 V_R=V_{RRM}

記号　Letter symbols

V_{RRM}	ピーク繰返し逆電圧	Repetitive peak reverse voltage	T_{stg}	保存温度	Storage temperature
V_{RSM}	ピーク非繰返し逆電圧	Non-repetitive peak reverse voltage	V_{FM}	順電圧	Forward voltage
I_O	平均出力電流	Average output current	I_{RRM}	逆電流	Reverse current
I_{FSM}	サージ電流	Surge current	t_{rr}	逆回復時間	Reverse recovery time
T_j	接合温度	Junction temperature	$R_{th\ (j\text{-}c)}$	熱抵抗 (接合ケース間)	Thermal resistance (Junction to case)
T_a	周囲温度	Ambient temperature	T_l	リード温度	Lead temperature
T_c	ケース温度	Case temperature	$I_{F(AV)}$	平均順電流	Average forward current

■ ショットキーバリアダイオード　Schottky-Barrier Diodes(SBD)

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	 I_O*1 Amps.	 I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	 I_{RRM}*4 Max.mA	 $R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
KP883C02	20	7.0 (Tc=89℃)	60	-40 to +125	0.39 (I_F=2.5A)	10	10.0	K-Pack(L)	0.6
KS883C02	20	7.0 (Tc=89℃)	60	-40 to +125	0.39 (I_F=2.5A)	10	10.0	K-pack(S)	0.6
KS823C03	30	5.0 (Tc=117℃)	60	-40 to +150	0.47 (I_F=2.5A)	5	10.0	K-pack(S)	0.6
KS823C04	40	5.0 (Tc=107℃)	60	-40 to +150	0.55 (I_F=2.5A)	5	10.0	K-pack(S)	0.6
YG801C04R	40	5.0 (Tc=125℃)	100	-40 to +150	0.55 (I_F=2.0A)	5	5.0	TO-220F	1.7
YG802C04R	40	10 (Tc=110℃)	120	-40 to +150	0.55 (I_F=4.0A)	5	3.5	TO-220F	1.7
YG805C04R	40	20 (Tc=100℃)	120	-40 to +150	0.6 (I_F=10A)	15	2.5	TO-220F	1.7
YG838C04R	40	30 (Tc=85℃)	180	-40 to +150	0.53 (I_F=12.5A)	8	2.0	TO-220F	1.7
MS838C04	40	30 (Tc=111℃)	180	-40 to +150	0.53 (I_F=12.5A)	8	1.2	TFP	0.8
YG801C06R	60	5.0 (Tc=125℃)	60	-40 to +150	0.58 (I_F=2.0A)	5	5.0	TO-220F	1.7
YG802C06R	60	10 (Tc=118℃)	80	-40 to +150	0.58 (I_F=4.0A)	5	3.5	TO-220F	1.7
YG803C06R	60	15 (Tc=94℃)	100	-40 to +150	0.58 (I_F=6.0A)	5	3.0	TO-220F	1.7
YG805C06R	60	20 (Tc=108℃)	80	-40 to +150	0.58 (I_F=8.0A)	15	2.5	TO-220F	1.7
MS808C06	60	30 (Tc=118℃)	150	-40 to +150	0.58 (I_F=12.5A)	3	1.2	TFP	0.8
KS823C09	90	5.0 (Tc=100℃)	60	-40 to +150	0.9 (I_F=2.5A)	5	10.0	K-pack(S)	0.6
YG801C10R	100	5.0 (Tc=117℃)	60	-40 to +150	0.8 (I_F=1.5A)	0.7	5.0	TO-220F	1.7
YG802C10R	100	10 (Tc=102℃)	80	-40 to +150	0.8 (I_F=3.0A)	1.2	3.5	TO-220F	1.7
YG805C10R	100	20 (Tc=91℃)	100	-40 to +150	0.8 (I_F=5.0A)	2.5	2.5	TO-220F	1.7
YG808C10R	100	30 (Tc=80℃)	180	-40 to +150	0.8 (I_F=10A)	20	2.0	TO-220F	1.7

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　　*3 I_F=0.5Io 1チップあたり
*4 V_R=V_{RRM} 1チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　　*3 I_F=0.5Io per element
*4 V_R=V_{RRM} per element

■ 超低 IR ショットキーバリアダイオード　Ultra Low IR Schottky-Barrier Diodes

Ultra Low IR Schottky-Barrier Diodes					TO-220	TO-220F
						
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R (mA)		
デュアル	100	10	0.82	0.015	✓	✓
		20	0.86	0.02	✓	✓
		30	0.86	0.03	✓	✓
	120	10	0.84	0.015	✓	✓
		20	0.88	0.02	✓	✓
		30	0.88	0.03	✓	✓
	150	10	0.86	0.015	✓	✓
		20	0.89	0.02	✓	✓
		30	0.89	0.03	✓	✓
	200	10	0.89	0.015	✓	✓
		20	0.93	0.02	✓	✓
		30	0.93	0.03	✓	✓

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max.mA	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
YG872C10R	100	10 (Tc=146℃)	125	-40 to +175	0.82	0.015	3.5	TO-220F	1.7
YA872C10R	100	10 (Tc=158℃)	125	-40 to +175	0.82	0.015	2.0	TO-220	2.0
YG875C10R	100	20 (Tc=131℃)	145	-40 to +175	0.86	0.020	2.5	TO-220F	1.7
YA875C10R	100	20 (Tc=144℃)	145	-40 to +175	0.86	0.020	1.75	TO-220	2.0
YG878C10R	100	30 (Tc=122℃)	160	-40 to +175	0.86	0.030	2.0	TO-220F	1.7
YA878C10R	100	30 (Tc=142℃)	160	-40 to +175	0.86	0.030	1.25	TO-220	2.0
YG872C12R	120	10 (Tc=143℃)	125	-40 to +175	0.84	0.015	3.5	TO-220F	1.7
YA872C12R	120	10 (Tc=158℃)	125	-40 to +175	0.84	0.015	2.0	TO-220	2.0
YG875C12R	120	20 (Tc=127℃)	145	-40 to +175	0.88	0.020	2.5	TO-220F	1.7
YA875C12R	120	20 (Tc=144℃)	145	-40 to +175	0.88	0.020	1.75	TO-220	2.0
YG878C12R	120	30 (Tc=116℃)	160	-40 to +175	0.88	0.030	2.0	TO-220F	1.7
YA878C12R	120	30 (Tc=141℃)	160	-40 to +175	0.88	0.030	1.25	TO-220	2.0
YG872C15R	150	10 (Tc=144℃)	125	-40 to +175	0.86	0.015	3.5	TO-220F	1.7
YA872C15R	150	10 (Tc=157℃)	125	-40 to +175	0.86	0.015	2.0	TO-220	2.0
YG875C15R	150	20 (Tc=130℃)	145	-40 to +175	0.89	0.020	2.5	TO-220F	1.7
YA875C15R	150	20 (Tc=143℃)	145	-40 to +175	0.89	0.020	1.75	TO-220	2.0
YG878C15R	150	30 (Tc=120℃)	160	-40 to +175	0.89	0.030	2.0	TO-220F	1.7
YA878C15R	150	30 (Tc=140℃)	160	-40 to +175	0.89	0.030	1.25	TO-220	2.0
YG872C20R	200	10 (Tc=143℃)	125	-40 to +175	0.89	0.015	3.5	TO-220F	1.7
YA872C20R	200	10 (Tc=157℃)	125	-40 to +175	0.89	0.015	2.0	TO-220	2.0
YG875C20R	200	20 (Tc=127℃)	145	-40 to +175	0.93	0.020	2.5	TO-220F	1.7
YA875C20R	200	20 (Tc=141℃)	145	-40 to +175	0.93	0.020	1.75	TO-220	2.0
YG878C20R	200	30 (Tc=116℃)	160	-40 to +175	0.93	0.030	2.0	TO-220F	1.7
YA878C20R	200	30 (Tc=138℃)	160	-40 to +175	0.93	0.030	1.25	TO-220	2.0

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　　*3 I_F=0.5Io 1チップあたり
*4 V_R=V_{RRM} 1チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　　*3 I_F=0.5Io per element
*4 V_R=V_{RRM} per element

■ 低 IR ショットキーバリアダイオード　Low IR Schottky-Barrier Diodes

Low IR Schottky-Barrier Diodes					TO-220	TO-220F	TO-3P (Q)	TO-3PF	TO-247	T-Pack(L)	T-Pack(S)	TFP
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R (mA)								
シングル	120	5	0.88	0.15		✓						
	150	5	0.9	0.15		✓						
デュアル	45	20	0.63	0.175	✓	✓					✓	✓
		30	0.63	0.2	✓	✓					✓	✓
	60	10	0.68	0.15	✓	✓					✓	
		20	0.74	0.175	✓	✓					✓	
		30	0.74	0.2	✓	✓					✓	
		40	0.7	0.2	✓	✓				✓		
	80	10	0.76	0.15	✓	✓					✓	✓
		20	0.76	0.175	✓	✓					✓	✓
		30	0.76	0.2	✓	✓					✓	
		40	0.71	0.2	✓	✓				✓		
	100	10	0.86	0.15	✓	✓					✓	
		20	0.86	0.175	✓	✓					✓	✓
		30	0.86	0.2	✓	✓	✓			✓	✓	✓
		40	0.82	0.2	✓	✓				✓		
	120	10	0.88	0.15	✓	✓				✓	✓	
		20	0.88	0.15	✓	✓			✓	✓	✓	✓
		30	0.88	0.2	✓	✓			✓		✓	✓
		30	1.01	0.2								
		40	0.95	0.2	✓	✓						
	150	10	0.9	0.15	✓	✓				✓	✓	
		20	0.9	0.15	✓	✓		✓	✓	✓	✓	✓
		30	0.9	0.2	✓	✓	✓		✓		✓	✓
		40	0.97	0.2	✓	✓						

シングル　1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max.mA	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
YG861S12R	120	5 (Tc=104℃)	75	-40 to +150	0.88	0.15	5.0	TO-220F	1.7
YG861S15R	150	5 (Tc=94℃)	75	-40 to +150	0.90	0.15	5.0	TO-220F	1.7

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms.　*3 I_F=Io　*4 V_R=V_{RRM}

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms　*3 I_F=Io　*4 V_R=V_{RRM}

■ 低 IR ショットキーバリアダイオード　Low IR Schottky-Barrier Diodes

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max.mA	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
YG865C04R	45	20 (Tc=115℃)	145	-40 to +150	0.63	0.175	2.5	TO-220F	1.7
YA865C04R	45	20 (Tc=126℃)	145	-40 to +150	0.63	0.175	1.75	TO-220	2.0
TS865C04R	45	20 (Tc=126℃)	145	-40 to +150	0.63	0.175	1.75	T-pack(S)	1.6
MS865C04	45	20 (Tc=125℃)	145	-40 to +150	0.63	0.175	1.75	TFP	0.8
YG868C04R	45	30 (Tc=105℃)	160	-40 to +150	0.63	0.20	2.0	TO-220F	1.7
YA868C04R	45	30 (Tc=122℃)	160	-40 to +150	0.63	0.20	1.25	TO-220	2.0
TS868C04R	45	30 (Tc=122℃)	160	-40 to +150	0.63	0.20	1.25	T-pack(S)	1.6
MS868C04	45	30 (Tc=122℃)	160	-40 to +150	0.63	0.20	1.25	TFP	0.8
YG862C06R	60	10 (Tc=124℃)	125	-40 to +150	0.68	0.15	3.5	TO-220F	1.7
YA862C06R	60	10 (Tc=136℃)	125	-40 to +150	0.68	0.15	2.0	TO-220	2.0
TS862C06R	60	10 (Tc=136℃)	125	-40 to +150	0.68	0.15	2.0	T-pack(S)	1.6
YG865C06R	60	20 (Tc=109℃)	145	-40 to +150	0.74	0.175	2.5	TO-220F	1.7
YA865C06R	60	20 (Tc=122℃)	145	-40 to +150	0.74	0.175	1.75	TO-220	2.0
TS865C06R	60	20 (Tc=122℃)	145	-40 to +150	0.74	0.175	1.75	T-pack(S)	1.6
YG868C06R	60	30 (Tc=101℃)	160	-40 to +150	0.74	0.20	2.0	TO-220F	1.7
YA868C06R	60	30 (Tc=119℃)	160	-40 to +150	0.74	0.20	1.25	TO-220	2.0
TS868C06R	60	30 (Tc=119℃)	160	-40 to +150	0.74	0.20	1.25	T-pack(S)	1.6
YG869C06R	60	40 (Tc=105℃)	190	-40 to +150	0.70	0.20	1.2	TO-220F	1.7
YA869C06R	60	40 (Tc=114℃)	190	-40 to +150	0.70	0.20	1.0	TO-220	2.0
TP869C06R	60	40 (Tc=114℃)	190	-40 to +150	0.70	0.20	1.0	T-Pack(L)	1.6
YG862C08R	80	10 (Tc=109℃)	125	-40 to +150	0.76	0.15	3.5	TO-220F	1.7
YA862C08R	80	10 (Tc=126℃)	125	-40 to +150	0.76	0.15	2.0	TO-220	2.0
TS862C08R	80	10 (Tc=126℃)	125	-40 to +150	0.76	0.15	2.0	T-pack(S)	1.6
MS862C08	80	10 (Tc=115℃)	125	-40 to +150	0.76	0.15	3.0	TFP	0.8
YG865C08R	80	20 (Tc=89℃)	145	-40 to +150	0.76	0.175	2.5	TO-220F	1.7
YA865C08R	80	20 (Tc=107℃)	145	-40 to +150	0.76	0.175	1.75	TO-220	2.0
TS865C08R	80	20 (Tc=107℃)	145	-40 to +150	0.76	0.175	1.75	T-pack(S)	1.6
MS865C08	80	20 (Tc=108℃)	145	-40 to +150	0.76	0.175	1.75	TFP	0.8
YG868C08R	80	30 (Tc=72℃)	160	-40 to +150	0.76	0.20	2.0	TO-220F	1.7
YA868C08R	80	30 (Tc=105℃)	160	-40 to +150	0.76	0.20	1.25	TO-220	2.0
TS868C08R	80	30 (Tc=105℃)	160	-40 to +150	0.76	0.20	1.25	T-pack(S)	1.6
YG869C08R	80	40 (Tc=86℃)	190	-40 to +150	0.71	0.20	1.2	TO-220F	1.7
YA869C08R	80	40 (Tc=98℃)	190	-40 to +150	0.71	0.20	1.0	TO-220	2.0
TP869C08R	80	40 (Tc=98℃)	190	-40 to +150	0.71	0.20	1.0	T-Pack(L)	1.6

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　*3 I_F=0.5Io 1チップあたり
*4 V_R=V_{RRM} 1チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　*3 I_F=0.5Io per element
*4 V_R=V_{RRM} per element

■ 低 IR ショットキーバリアダイオード　Low IR Schottky-Barrier Diodes

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	 I_O*1 Amps.	 I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	 I_{RRM}*4 Max.mA	 $R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
YG862C10R	100	10 (Tc=118℃)	125	-40 to +150	0.86	0.15	3.5	TO-220F	1.7
YA862C10R	100	10 (Tc=132℃)	125	-40 to +150	0.86	0.15	2.0	TO-220	2.0
TS862C10R	100	10 (Tc=132℃)	125	-40 to +150	0.86	0.15	2.0	T-pack(S)	1.6
YG865C10R	100	20 (Tc=103℃)	145	-40 to +150	0.86	0.175	2.5	TO-220F	1.7
YA865C10R	100	20 (Tc=117℃)	145	-40 to +150	0.86	0.175	1.75	TO-220	2.0
TS865C10R	100	20 (Tc=117℃)	145	-40 to +150	0.86	0.175	1.75	T-pack(S)	1.6
MS865C10	100	20 (Tc=117℃)	145	-40 to +150	0.86	0.175	1.75	TFP	0.8
YG868C10R	100	30 (Tc=91℃)	160	-40 to +150	0.86	0.20	2.0	TO-220F	1.7
YA868C10R	100	30 (Tc=113℃)	160	-40 to +150	0.86	0.20	1.25	TO-220	2.0
TS868C10R	100	30 (Tc=113℃)	160	-40 to +150	0.86	0.20	1.25	T-pack(S)	1.6
TP868C10R	100	30 (Tc=113℃)	160	-40 to +150	0.86	0.20	1.25	T-Pack(L)	1.6
MS868C10	100	30 (Tc=114℃)	160	-40 to +150	0.86	0.20	1.2	TFP	0.8
PA868C10R	100	30 (Tc=107℃)	160	-40 to +150	0.86	0.20	1.5	TO-3P(Q)	5.1
YG869C10R	100	40 (Tc=94℃)	190	-40 to +150	0.82	0.20	1.2	TO-220F	1.7
YA869C10R	100	40 (Tc=105℃)	190	-40 to +150	0.82	0.20	1.0	TO-220	2.0
TP869C10R	100	40 (Tc=105℃)	190	-40 to +150	0.82	0.20	1.0	T-Pack(L)	1.6
YG862C12R	120	10 (Tc=122℃)	75	-40 to +150	0.88	0.15	3.00	TO-220F	1.7
YA862C12R	120	10 (Tc=137℃)	75	-40 to +150	0.88	0.15	1.20	TO-220	2.0
TP862C12R	120	10 (Tc=137℃)	75	-40 to +150	0.88	0.15	1.50	T-Pack(L)	1.6
TS862C12R	120	10 (Tc=137℃)	75	-40 to +150	0.88	0.15	1.50	T-pack(S)	1.6
YG865C12R	120	20 (Tc=116℃)	150	-40 to +150	0.88	0.15	1.75	TO-220F	1.7
YA865C12R	120	20 (Tc=126℃)	150	-40 to +150	0.88	0.15	1.25	TO-220	2.0
PH865C12	120	20 (Tc=126℃)	150	-40 to +150	0.88	0.15	1.50	TO-247	4.9
TP865C12R	120	20 (Tc=126℃)	150	-40 to +150	0.88	0.15	1.25	T-Pack(L)	1.6
TS865C12R	120	20 (Tc=126℃)	150	-40 to +150	0.88	0.15	1.25	T-pack(S)	1.6
MS865C12	120	20 (Tc=126℃)	150	-40 to +150	0.88	0.15	1.25	TFP	0.8
YG868C12R	120	30 (Tc=116℃)	190	-40 to +150	0.88	0.20	1.20	TO-220F	1.7
YA868C12R	120	30 (Tc=122℃)	190	-40 to +150	0.88	0.20	1.00	TO-220	2.0
PH868C12	120	30 (Tc=122℃)	190	-40 to +150	0.88	0.20	1.20	TO-247	4.9
TS868C12R	120	30 (Tc=122℃)	190	-40 to +150	0.88	0.20	1.00	T-pack(S)	1.6
MS868C12	120	30 (Tc=115℃)	190	-40 to +150	0.88	0.20	1.20	TFP	0.8
YG869C12R	120	40 (Tc=95℃)	190	-40 to +150	0.95	0.20	1.20	TO-220F	1.7
YA869C12R	120	40 (Tc=104℃)	190	-40 to +150	0.95	0.20	1.00	TO-220	2.0
YG862C15R	150	10 (Tc=117℃)	75	-40 to +150	0.90	0.15	3.00	TO-220F	1.7
YA862C15R	150	10 (Tc=134℃)	75	-40 to +150	0.90	0.15	1.50	TO-220	2.0
TP862C15R	150	10 (Tc=134℃)	75	-40 to +150	0.90	0.15	1.50	T-Pack(L)	1.6
TS862C15R	150	10 (Tc=134℃)	75	-40 to +150	0.90	0.15	1.50	T-pack(S)	1.6
YG865C15R	150	20 (Tc=101℃)	150	-40 to +150	0.90	0.15	1.75	TO-220F	1.7
PH865C15	150	20 (Tc=109℃)	150	-40 to +150	0.90	0.15	1.50	TO-247	4.9
PG865C15R	150	20 (Tc=80℃)	150	-40 to +150	0.90	0.15	2.50	TO-3PF	6.0
YA865C15R	150	20 (Tc=115℃)	150	-40 to +150	0.90	0.15	1.25	TO-220	2.0
TP865C15R	150	20 (Tc=115℃)	150	-40 to +150	0.90	0.15	1.25	T-Pack(L)	1.6
TS865C15R	150	20 (Tc=115℃)	150	-40 to +150	0.90	0.15	1.25	T-pack(S)	1.6
MS865C15	150	20 (Tc=115℃)	150	-40 to +150	0.90	0.15	1.25	TFP	0.8
YG868C15R	150	30 (Tc=113℃)	190	-40 to +150	0.90	0.20	1.20	TO-220F	1.7
YA868C15R	150	30 (Tc=119℃)	190	-40 to +150	0.90	0.20	1.00	TO-220	2.0
TS868C15R	150	30 (Tc=119℃)	190	-40 to +150	0.90	0.20	1.00	T-pack(S)	1.6
MS868C15	150	30 (Tc=113℃)	190	-40 to +150	0.90	0.20	1.20	TFP	0.8
PA868C15R	150	30 (Tc=129℃)	190	-40 to +150	0.90	0.20	1.20	TO-3P	5.5
PH868C15	150	30 (Tc=129℃)	190	-40 to +150	0.90	0.20	1.20	TO-247	4.9
YG869C15R	150	40 (Tc=90℃)	190	-40 to +150	0.97	0.20	1.20	TO-220F	1.7
YA869C15R	150	40 (Tc=100℃)	190	-40 to +150	0.97	0.20	1.00	TO-220	2.0

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　*3 I_F=0.5Io 1チップあたり
*4 V_R=V_{RRM} 1チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　*3 I_F=0.5Io per element
*4 V_R=V_{RRM} per element

■ スーパー LLD 2 (臨界モード PFC 回路用) Super LLD 2 (Critical mode PFC)

Super LLD 2 (Critical mode PFC)						TO-220	TO-220F	TO-247
								
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)			
シングル	600	8	1.55	10	0.05	✓	✓	
		10	1.55	10	0.05	✓	✓	
	800	5	2.2	10	0.05		✓	
デュアル	600	10	1.55	10	0.05	✓	✓	✓

シングル 1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM} Max. Volts	I_{RRM}*3 Max. μA	t_{rr}*4 μsec.	$R_{th(j-c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
YA971S6R	600	8 (Tc=116℃)	70	-40 to +150	1.55 (I_F=8A)	10	0.05	2.5	TO-220	2.0
YG971S6R	600	8 (Tc=89℃)	70	-40 to +150	1.55 (I_F=8A)	10	0.05	4.5	TO-220F	1.7
YA972S6R	600	10 (Tc=115℃)	100	-40 to +150	1.55 (I_F=10A)	10	0.05	2.0	TO-220	2.0
YG972S6R	600	10 (Tc=89℃)	100	-40 to +150	1.55 (I_F=10A)	10	0.05	3.5	TO-220F	1.7
YG971S8R	800	5 (Tc=93℃)	60	-40 to +150	2.2 (I_F=5A)	10	0.05	4.5	TO-220F	1.7

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms. *3 V_R=V_{RRM}
*4 I_F=0.1A, IR=0.2A, Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms *3 V_R=V_{RRM}
*4 I_F=0.1A, IR=0.2A, Irec=0.05A

デュアル 2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM} Max. Volts	I_{RRM}*3 Max. μA	t_{rr}*4 μsec.	$R_{th(j-c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
YA975C6R	600	20 (Tc=106℃)	100	-40 to +150	1.55 (I_F=10A)	10	0.05	1.25	TO-220	2.0
YG975C6R	600	20 (Tc=89℃)	100	-40 to +150	1.55 (I_F=10A)	10	0.05	1.75	TO-220F	1.7
PH975C6	600	20 (Tc=97℃)	100	-40 to +150	1.55 (I_F=10A)	10	0.05	1.5	TO-247	4.9

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり *3 V_R=V_{RRM} 1チップあたり
*4 I_F=0.1A, IR=0.2A, Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element *3 V_R=V_{RRM} per element
*4 I_F=0.1A, IR=0.2A, Irec=0.05A

■ スーパー LLD 3 (連続モード PFC 回路用) Super LLD 3 (Continuous mode PFC)

Super LLD 3 (Continuous mode PFC)						TO-220	TO-220F	TO-247	T-Pack (S)
									
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)				
シングル	600	8	3	25	0.026	✓	✓		
		10	3	30	0.028	✓	✓		
デュアル	600	16	3	25	0.026	✓	✓		✓
		20	3	30	0.028	✓	✓	✓	✓

シングル 1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM} Max. Volts	I_{RRM}*3 Max. μA	t_{rr}*4 μsec.	$R_{th(j-c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
YA981S6R	600	8 (Tc=99℃)	40	-40 to +150	3.0 (I_F=8A)	25	0.026	2.5	TO-220	2.0
YG981S6R	600	8 (Tc=58℃)	40	-40 to +150	3.0 (I_F=8A)	25	0.026	4.5	TO-220F	1.7
YA982S6R	600	10 (Tc=99℃)	50	-40 to +150	3.0 (I_F=10A)	30	0.028	2.0	TO-220	2.0
YG982S6R	600	10 (Tc=60℃)	50	-40 to +150	3.0 (I_F=10A)	30	0.028	3.5	TO-220F	1.7

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms. *3 V_R=V_{RRM}
*4 I_F=0.1A, IR=0.2A, Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms *3 V_R=V_{RRM}
*4 I_F=0.1A, IR=0.2A, Irec=0.05A

デュアル 2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM} Max. Volts	I_{RRM}*3 Max. μA	t_{rr}*4 μsec.	$R_{th(j-c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
YA982C6R	600	16 (Tc=88℃)	40	-40 to +150	3.0 (I_F=8A)	25	0.026	1.5	TO-220	2.0
TS982C6R	600	16 (Tc=88℃)	40	-40 to +150	3.0 (I_F=8A)	25	0.026	1.5	T-pack(S)	1.6
YG982C6R	600	16 (Tc=68℃)	40	-40 to +150	3.0 (I_F=8A)	25	0.026	2	TO-220F	1.7
YA985C6R	600	20 (Tc=86℃)	50	-40 to +150	3.0 (I_F=10A)	30	0.028	1.25	TO-220	2.0
TS985C6R	600	20 (Tc=86℃)	50	-40 to +150	3.0 (I_F=10A)	30	0.028	1.25	T-pack(S)	1.6
YG985C6R	600	20 (Tc=60℃)	50	-40 to +150	3.0 (I_F=10A)	30	0.028	1.75	TO-220F	1.7
PH985C6	600	20 (Tc=73℃)	50	-40 to +150	3.0 (I_F=10A)	30	0.028	1.5	TO-247	4.9

( ) 条件
*1 50Hz方形波 duty=1/2(センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり *3 V_R=V_{RRM} 1チップあたり
*4 I_F=0.1A. IR=0.2A. Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty 1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element *3 V_R=V_{RRM} per element
*4 I_F=0.1A. IR=0.2A. Irec=0.05A

■ 低損失超高速ダイオード　Low-Loss Fast Recovery Diodes (LLD)

Low-Loss Fast Recovery Diodes (LLD)						TO-220F	K-Pack(L)	K-Pack(S)	TFP
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)				
シングル	200	5	0.95	100	0.035	✓	✓	✓	
		10	0.98	200	0.035	✓			
	300	5	1.2	100	0.035	✓			
デュアル	200	5	0.95	100	0.035	✓	✓	✓	
		10	0.95	100	0.035	✓			
		20	0.98	200	0.035	✓			✓
	300	5	1.2	100	0.035	✓			
		10	1.2	100	0.035	✓			
		20	1.2	200	0.035				✓

シングル　1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
KP926S2	200	5 (Tc=106℃)	70	-40 to +150	0.95	100	0.035	10.0	K-Pack(L)	0.6
KS926S2	200	5 (Tc=106℃)	70	-40 to +150	0.95	100	0.035	10.0	K-pack(S)	0.6
YG911S2R	200	5 (Tc=134℃)	50	-40 to +150	0.95	100	0.035	3.5	TO-220F	1.7
YG912S2R	200	10 (Tc=116℃)	80	-40 to +150	0.98	200	0.035	3.5	TO-220F	1.7
YG911S3R	300	5 (Tc=128℃)	40	-40 to +150	1.2	100	0.035	3.5	TO-220F	1.7

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms.　*3 I_F=Io　*4 V_R=V_{RRM}
*5 I_F=0.1A. IR=0.2A. Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty 1/2
*2 Sine wave, 10ms　*3 I_F=Io　*4 V_R=V_{RRM}
*5 I_F=0.1A. IR=0.2A. Irec=0.05A

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
KP923C2	200	5 (Tc=103℃)	50	-40 to +150	0.95	100	0.035	10.0	K-Pack(L)	0.6
KS923C2	200	5 (Tc=103℃)	50	-40 to +150	0.95	100	0.035	10.0	K-pack(S)	0.6
YG901C2R	200	5 (Tc=120℃)	25	-40 to +150	0.95	100	0.035	5.0	TO-220F	1.7
YG902C2R	200	10 (Tc=115℃)	50	-40 to +150	0.95	100	0.035	3.5	TO-220F	1.7
YG906C2R	200	20 (Tc=102℃)	80	-40 to +150	0.98	200	0.035	2.5	TO-220F	1.7
MS906C2	200	20 (Tc=105℃)	80	-40 to +150	0.98	200	0.035	2.0	TFP	0.8
YG901C3R	300	5 (Tc=105℃)	25	-40 to +150	1.2	100	0.035	5.0	TO-220F	1.7
YG902C3R	300	10 (Tc=101℃)	40	-40 to +150	1.2	100	0.035	3.5	TO-220F	1.7
MS906C3	300	20 (Tc=95℃)	80	-40 to +150	1.2	200	0.035	2.0	TFP	0.8

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　*3 I_F=0.5Io 1チップあたり
*4 V_R=V_{RRM} 1チップあたり
*5 I_F=0.1A, IR=0.2A, Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　*3 I_F=0.5Io per element
*4 V_R=V_{RRM} per element
*5 I_F=0.1A, IR=0.2A, Irec=0.05A

■ 低損失超高速低ノイズダイオード　Low-Loss Fast Soft Recovery Diodes (LLD)

Low-Loss Fast Soft Recovery Diodes (LLD)						TO-220	TO-220F	TO-3PF	T-Pack (S)	K-Pack (S)	TFP
											
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)						
シングル	300	5	1.3	20	0.04					✓	
	400	5	1.45	20	0.05					✓	
デュアル	300	10	1.3	20	0.04	✓	✓		✓		
		20	1.3	35	0.04	✓	✓	✓	✓		✓
	400	10	1.45	20	0.05	✓	✓		✓		
		20	1.45	35	0.05	✓	✓	✓	✓		✓

シングル　1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
KS986S3	300	5 (Tc=128℃)	90	-40 to +150	1.3	20	0.04	3.5	K-pack(S)	0.6
KS986S4	400	5 (Tc=125℃)	80	-40 to +150	1.45	20	0.05	3.5	K-pack(S)	0.6

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms.　*3 I_F=Io　*4 V_R=V_{RRM}
*5 I_F=0.1A, IR=0.2A, Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms　*3 I_F=Io per element　*4 V_R=V_{RRM}
*5 I_F=0.1A, IR=0.2A, Irec=0.05A

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
YG982C3R	300	10 (Tc=112℃)	90	-40 to +150	1.3	20	0.04	3	TO-220F	1.7
YA982C3R	300	10 (Tc=128℃)	90	-40 to +150	1.3	20	0.04	1.75	TO-220	2.0
TS982C3R	300	10 (Tc=128℃)	90	-40 to +150	1.3	20	0.04	1.75	T-pack(S)	1.6
YG985C3R	300	20 (Tc=105℃)	110	-40 to +150	1.3	35	0.04	1.75	TO-220F	1.7
YA985C3R	300	20 (Tc=118℃)	110	-40 to +150	1.3	35	0.04	1.25	TO-220	2.0
TS985C3R	300	20 (Tc=118℃)	110	-40 to +150	1.3	35	0.04	1.25	T-pack(S)	1.6
MS985C3	300	20 (Tc=118℃)	110	-40 to +150	1.3	35	0.04	1.25	TFP	0.8
PG985C3R	300	20 (Tc=73℃)	110	-40 to +150	1.3	35	0.04	3	TO-3PF	6.0
YG982C4R	400	10 (Tc=107℃)	80	-40 to +150	1.45	20	0.05	3	TO-220F	1.7
YA982C4R	400	10 (Tc=125℃)	80	-40 to +150	1.45	20	0.05	1.75	TO-220	2.0
TS982C4R	400	10 (Tc=125℃)	80	-40 to +150	1.45	20	0.05	1.75	T-pack(S)	1.6
YG985C4R	400	20 (Tc=100℃)	100	-40 to +150	1.45	35	0.05	1.75	TO-220F	1.7
YA985C4R	400	20 (Tc=114℃)	100	-40 to +150	1.45	35	0.05	1.25	TO-220	2.0
TS985C4R	400	20 (Tc=114℃)	100	-40 to +150	1.45	35	0.05	1.25	T-pack(S)	1.6
MS985C4	400	20 (Tc=114℃)	100	-40 to +150	1.45	35	0.05	1.25	TFP	0.8
PG985C4R	400	20 (Tc=64℃)	100	-40 to +150	1.45	35	0.05	3	TO-3PF	6.0

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　*3 I_F=0.5Io 1チップあたり
*4 V_R=V_{RRM} 1チップあたり
*5 I_F=0.1A, IR=0.2A, Irec=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　*3 I_F=0.5Io per element
*4 V_R=V_{RRM} per element
*5 I_F=0.1A, IR=0.2A, Irec=0.05A

■ ショットキーバリアダイオード　Schottky-Barrier Diodes (SBD)

Schottky-Barrier Diodes (SBD)					TO-3P(Q)	TO-3PF	T-Pack (S)	T-Pack (L)
								
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)				
シングル / デュアル	40	10	0.55	5			✓	✓
		20	0.6	15			✓	
		30	0.55	20	✓	✓		
	60	30	0.58	20	✓	✓	✓	

シングル / デュアル　1 in one-package/2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max.mA	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
TP802C04R	40	10 (Tc=116℃)	120	-40 to +150	0.55 (I_F=4.0A)	5	3.0	T-Pack(L)	1.6
TS802C04R	40	10 (Tc=116℃)	120	-40 to +150	0.55 (I_F=4.0A)	5	3.0	T-pack(S)	1.6
TS805C04R	40	20 (Tc=110℃)	120	-40 to +150	0.6 (I_F=10A)	15	2.0	T-pack(S)	1.6
ESAD83M-004RR	40	30 (Tc=105℃)	150	-40 to +150	0.55 (I_F=12.5A)	20	1.7	TO-3PF	6.0
ESAD83-004R	40	30 (Tc=118℃)	150	-40 to +150	0.55 (I_F=12.5A)	20	1.2	TO-3P	5.5
ESAD83M-006RR	60	30 (Tc=106℃)	120	-40 to +150	0.58 (I_F=12.5A)	20	1.7	TO-3PF	6.0
TS808C06R	60	30 (Tc=115℃)	120	-40 to +150	0.58 ($_{IF}$=12.5A)	20	1.2	T-pack(S)	1.6
ESAD83-006R	60	30 (Tc=119℃)	120	-40 to +150	0.58 (I_F=12.5A)	20	1.2	TO-3P	5.5

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　*3 1チップあたり
*4 V_R=V_{RRM} 1チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　*3 per element
*4 V_R=V_{RRM} per element

■ 低損失超高速ダイオード　Low-Loss Fast Recovery Diodes (LLD)

Low-Loss Fast Recovery Diodes (LLD)						TO-3P(Q)	TO-3PF	T-Pack (S)	T-Pack (L)
									
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)				
シングル / デュアル	200	5	0.95	100	0.035				✓
		10	0.95	100	0.035			✓	✓
		20	0.95	200	0.04	✓	✓		
		20	0.98	200	0.035			✓	✓
	300	10	1.2	100	0.035			✓	✓
		20	1.2	200	0.04	✓	✓		
	400	20	1.5	500	0.05	✓			

シングル / デュアル　1 in one-package/2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μ sec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質 量 Net mass Grams
TP901C2R	200	5 (Tc=120℃)	25	-40 to +150	0.95 (I_F=2.5A)	100	0.035	5.0	T-Pack(L)	1.6
TP902C2R	200	10 (Tc=125℃)	50	-40 to +150	0.95 (I_F=5A)	100	0.035	2.5	T-Pack(L)	1.6
TS902C2R	200	10 (Tc=125℃)	50	-40 to +150	0.95 (I_F=5A)	100	0.035	2.5	T-pack(S)	1.6
ESAD92M-02RR	200	20 (Tc=108℃)	100	-40 to +150	0.95 (I_F=10A)	200	0.04	2.0	TO-3PF	6.0
TP906C2R	200	20 (Tc=110℃)	80	-40 to +150	0.98 (I_F=10A)	200	0.035	2.0	T-Pack(L)	1.6
TS906C2R	200	20 (Tc=110℃)	80	-40 to +150	0.98 (I_F=10A)	200	0.035	2.0	T-pack(S)	1.6
ESAD92-02R	200	20 (Tc=115℃)	100	-40 to +150	0.95 (I_F=10A)	200	0.04	1.5	TO-3P	5.5
TP902C3R	300	10 (Tc=115℃)	40	-40 to +150	1.2 (I_F=5A)	100	0.035	2.5	T-Pack(L)	1.6
TS902C3R	300	10 (Tc=115℃)	40	-40 to +150	1.2 (I_F=5A)	100	0.035	2.5	T-pack(S)	1.6
ESAD92-03R	300	20 (Tc=110℃)	80	-40 to +150	1.2 (I_F=10A)	200	0.04	1.5	TO-3P	5.5
ESAD92M-03RR	300	20 (Tc=96℃)	80	-40 to +150	1.2 (I_F=10A)	200	0.04	2.0	TO-3PF	6.0
PA905C4R	400	20 (Tc=107℃)	70	-40 to +150	1.5 (I_F=10A)	500	0.05	1.5	TO-3P	5.5

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms. 1チップあたり　*3 1チップあたり
*4 V_R=V_{RRM} 1チップあたり　*5 I_F=0.1A, IR=0.2A, Irec.=0.05A

( ) Conditions
*1 50Hz Square wave duty=1/2 (Average forward current of centertap full wave connection)
*2 Sine wave, 10ms per element　*3 per element
*4 V_R=V_{RRM} per element　*5 I_F=0.1A, IR=0.2A, Irec.=0.05A

■ 600V 超高速ダイオード　Ultra Fast Recovery Diodes

Ultra Fast Recovery Diodes						TO-220	TO-247-P2
							
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)		
シングル	600	15	2.6	250	0.031	✓	✓
		25	2.6	250	0.033	✓	✓
		35	2.6	250	0.036		✓
デュアル	600	50	2.6	250	0.033		✓
		70	2.6	250	0.036		✓

シングル　1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
FDRP15S60L	600	15 (Tc=98°C)	110	-40 to +150	2.6	250	0.031	1.6	TO-220	2.0
FDRW15S60L	600	15 (Tc=85°C)	110	-40 to +150	2.6	250	0.031	2.0	TO-247-P2	4.9
FDRP25S60L	600	25 (Tc=86°C)	125	-40 to +150	2.6	250	0.033	1.2	TO-220	2.0
FDRW25S60L	600	25 (Tc=86°C)	125	-40 to +150	2.6	250	0.033	1.2	TO-247-P2	4.9
FDRW35S60L	600	35 (Tc=91°C)	140	-40 to +150	2.6	250	0.036	0.8	TO-247-P2	4.9

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms. 1 パルス　　*3 I_F=Io
*4 V_R=V_{RRM}　　*5 V_R=30V, I_F=0.1 Io, -di/dt=200A/us

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms 1shot　　*3 I_F=Io
*4 V_R=V_{RRM}　　*5 V_R=30V, I_F=0.1 Io, -di/dt=200A/us

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
FDRW50C60L	600	50 (Tc=86°C)	125	-40 to +150	2.6	250	0.033	0.6	TO-247-P2	4.9
FDRW70C60L	600	70 (Tc=91°C)	140	-40 to +150	2.6	250	0.036	0.4	TO-247-P2	4.9

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms.　1チップあたり　　*3 I_F=0.5 Io,　1チップあたり
*4 V_R=V_{RRM}　1チップあたり
*5 V_R=30V, I_F=0.05 Io, -di/dt=200A/us, 1 チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2, Output Current of center tap full wave connection
*2 Sine wave, 10ms 1shot, Rating per element　　*3 I_F=0.5 Io, Rating per element
*4 V_R=V_{RRM}, Rating per element
*5 V_R=30V, I_F=0.05 Io, -di/dt=200A/us, Rating per element

■ 1200V 低ノイズ高速ダイオード　Soft Recovery Fast Recovery Diodes

Soft Recovery Fast Recovery Diodes						TO-247-P2
結線	V_{RRM} (V)	Io (A)	V_F (V)	I_R(μA)	Trr (μsec)	
シングル	1200	12	2.8	250	0.042	✓
		20	2.8	250	0.055	✓
		30	2.8	250	0.063	✓
デュアル	1200	40	2.8	250	0.055	✓
		60	2.8	250	0.063	✓

シングル　1 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
FDRW12S120J	1200	12 (Tc=97°C)	100	-40 to +150	2.8	250	0.042	1.6	TO-247-P2	4.9
FDRW20S120J	1200	20 (Tc=88°C)	120	-40 to +150	2.8	250	0.055	1.2	TO-247-P2	4.9
FDRW30S120J	1200	30 (Tc=89°C)	150	-40 to +150	2.8	250	0.063	0.781	TO-247-P2	4.9

( ) 条件
*1 50Hz方形波 duty=1/2
*2 正弦波 10ms. 1 パルス　　*3 I_F=Io
*4 V_R=V_{RRM}　　*5 V_R=30V, I_F=0.1 Io, -di/dt=200A/us

( ) Conditions
*1 50Hz Square wave duty=1/2
*2 Sine wave, 10ms 1shot　　*3 I_F=Io
*4 V_R=V_{RRM}　　*5 V_R=30V, I_F=0.1 Io, -di/dt=200A/us

デュアル　2 in one-package

型 式 Device type	絶対最大定格 Maximum rating V_{RRM} Volts	I_O*1 Amps.	I_{FSM}*2 Amps.	接合、保存温度 Thermal rating T_j and T_{stg} ℃	電気的特性(Ta=25℃) Characteristics V_{FM}*3 Max. Volts	I_{RRM}*4 Max. μA	t_{rr}*5 μsec.	$R_{th\ (j\text{-}c)}$ ℃/W	パッケージ Package	質　量 Net mass Grams
FDRW40C120J	1200	40 (Tc=98°C)	120	-40 to +150	2.8	250	0.055	0.5	TO-247-P2	4.9
FDRW60C120J	1200	60 (Tc=87°C)	150	-40 to +150	2.8	250	0.063	0.397	TO-247-P2	4.9

( ) 条件
*1 50Hz方形波 duty=1/2 (センタータップ平均出力電流)
*2 正弦波 10ms.　1チップあたり　　*3 I_F=0.5 Io,　1チップあたり
*4 V_R=V_{RRM}　1チップあたり
*5 V_R=30V, I_F=0.05 Io, -di/dt=200A/us, 1 チップあたり

( ) Conditions
*1 50Hz Square wave duty=1/2, Output Current of center tap full wave connection
*2 Sine wave, 10ms 1shot, Rating per element　　*3 I_F=0.5 Io, Rating per element
*4 V_R=V_{RRM}, Rating per element
*5 V_R=30V, I_F=0.05 Io, -di/dt=200A/us, Rating per element

■ 圧力センサ
Pressure Sensors

TS 16949

富士電機の圧力センサは、ピエゾ抵抗、調整回路、EMC 保護を 1 チップに一体化しているため、システム全体の小型化に貢献できます。また、広範囲な圧力レンジに対応可能であり、様々な用途への適用が可能です。

Fuji Electric's pressure sensors combine piezo resistance, adjustment circuits, and EMC protection on single chip and contribute to reduction of system size. They operate in wide pressure range and are applicable to various uses.

■特長

- 絶対圧測定
- デジタルトリミングによる高精度保証
- 広範囲な圧力範囲に対応、フルスケール 100kPa ～ 300kPa
- センサチップに過電圧保護回路、電磁波遮断回路、サージ保護回路を備えており、特にサージに関しては、世界的な国際基準である ISO7637-level 4 をクリア
- Vcc、Vout、GND 配線が断線した場合のダイアグ自己検出機能搭載
- EPROM の冗長性による高信頼性を確保

■Features

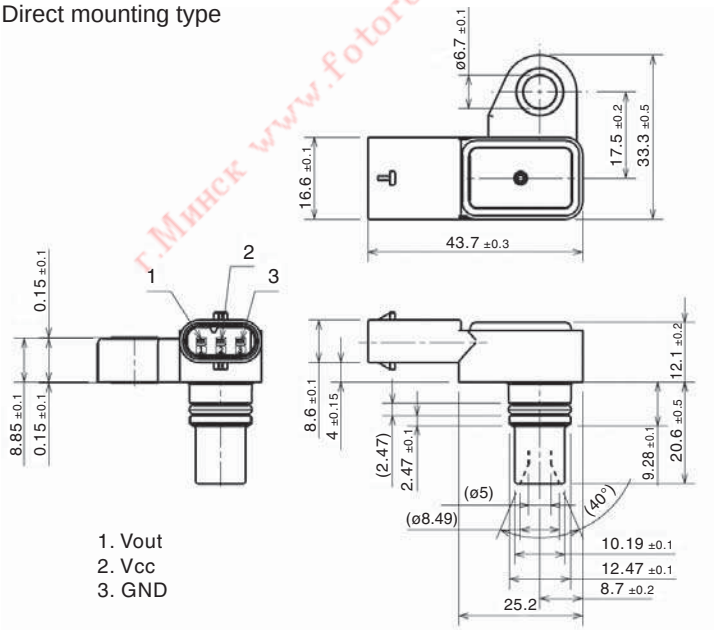
- Absolute pressure measurement
- High accuracy with digital trimming
- Wide pressure range, full scale of 100kPa to 300kPa
- Provided with overvoltage protection circuit, EMC filter, and surge protective device in the sensor chip
- Surge protection conforms to ISO7637-level 4 for automotive components
- Diagnostic self-detecting function in the event of a wire opened among Vcc, Vout and GND terminals
- High reliability ensured by EPROM bit redundancy

主な製品　Products

型　　式 **Device type**	最大印加圧力 Max. applied voltage (kPa.abs)	許容電圧 Allowable voltage (V)	使用温度 Operating temperature (℃)	使用圧力 Operating pressure (kPa.abs)	使用電圧 Operating voltage (V)	出力電圧範囲 Output Voltage range (V)	絶対圧・相対圧	パッケージ Package
EPL4PC-R3S	500	7	-40 to 125	20 to 106.7	5.0±0.25	0.789 to 4.211	絶対圧	外装
EPL6GC-R3S	500	7	-40 to 125	25 to 242	5.0±0.25	0.5 to 4.5	絶対圧	外装

外形寸法　Dimensions, mm

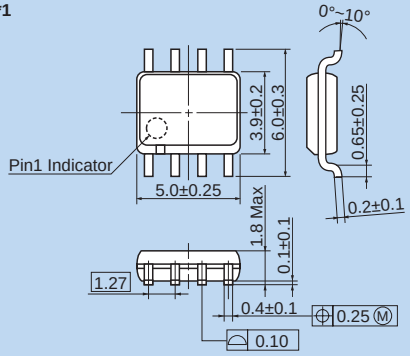
Direct mounting type



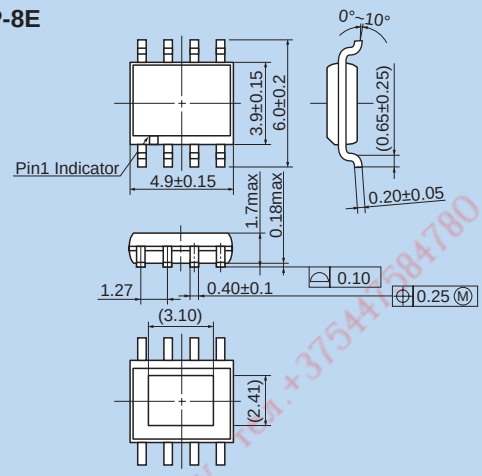
＜集積回路 / ディスクリートデバイス　Integrated circuits / Discrete devices＞

mm

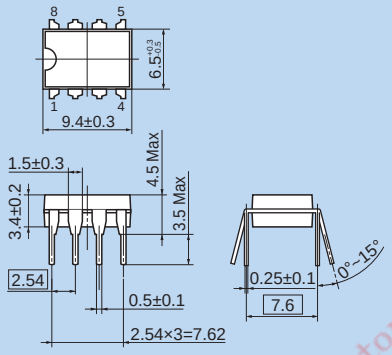
SOP-8*1



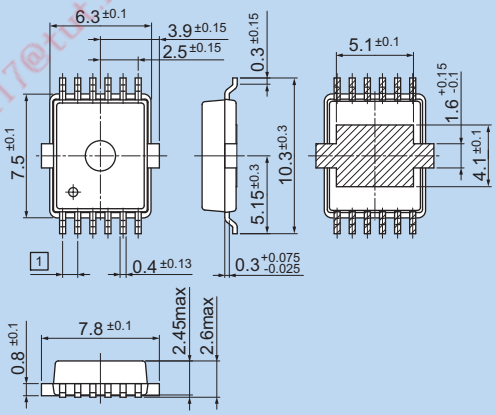
SOP-8E



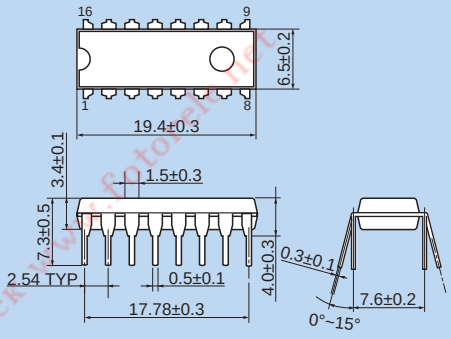
DIP-8



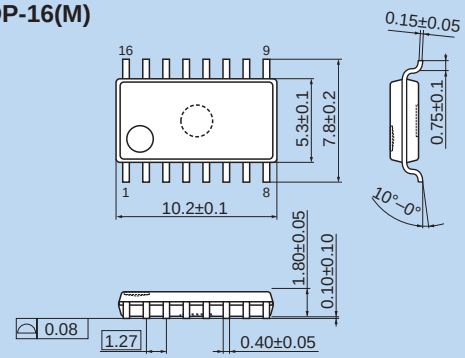
PSOP-12



DIP-16



SOP-16(M)



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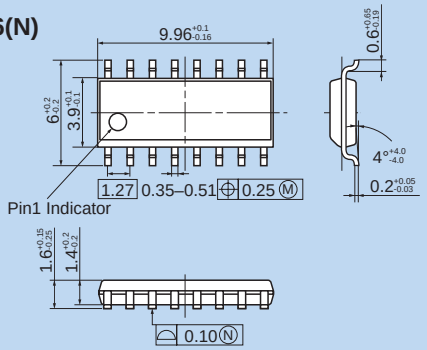
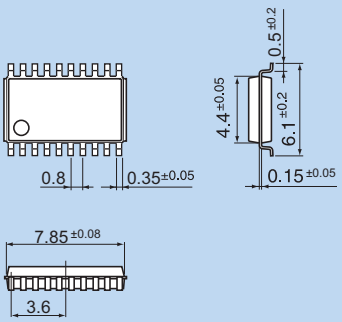


SSOP-20



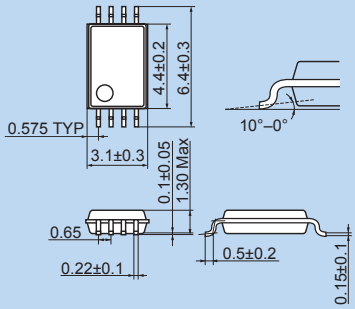
*1）代表型式（FA8AxxN) のパッケージサイズです。他の IC については個別アプリケーションノート（仕様書）を参照ください。

*1) This is the package size for the representative device type (FA8AxxN). For other ICs, please refer to the separate application note (specifications).

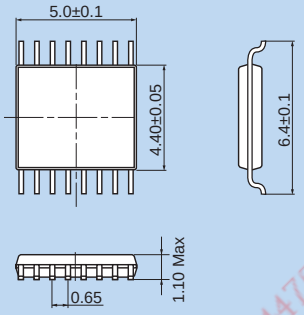
外形図/Outline

mm

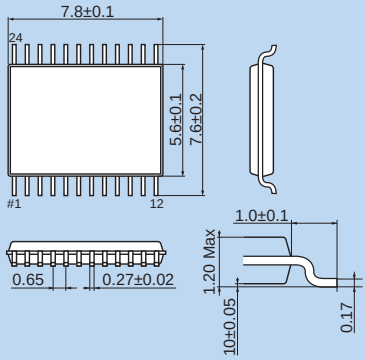
TSSOP-8



TSSOP-16



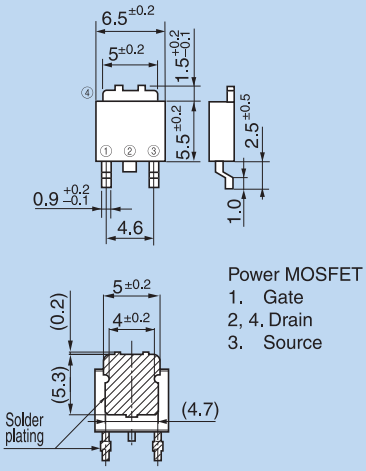
TSSOP-24



Outline

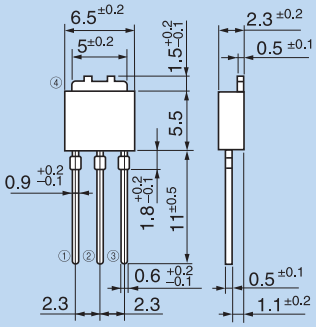
mm

K-pack(S)



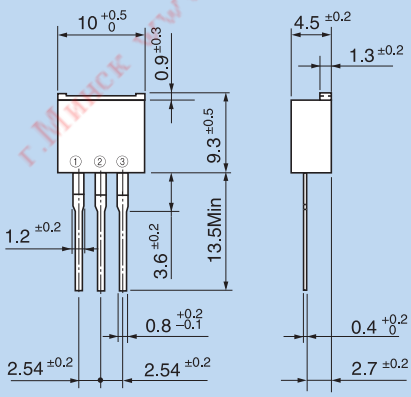
Power MOSFET
1. Gate
2, 4. Drain
3. Source

K-pack(L)/I-pack: Power MOSFET
K-pack(P)/I-pack: Diode



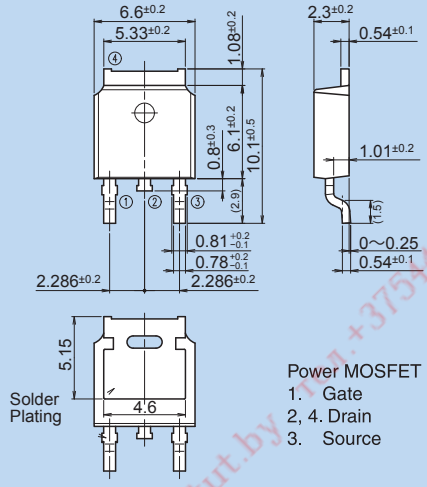
Power MOSFET
1. Gate
2, 4. Drain
3. Source

T-pack(L): Power MOSFET
T-pack(P): Diode



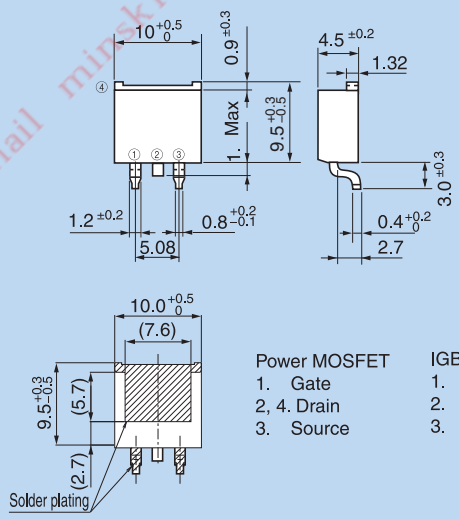
Power MOSFET
1. Gate
2. Drain
3. Source

TO-252



Power MOSFET
1. Gate
2, 4. Drain
3. Source

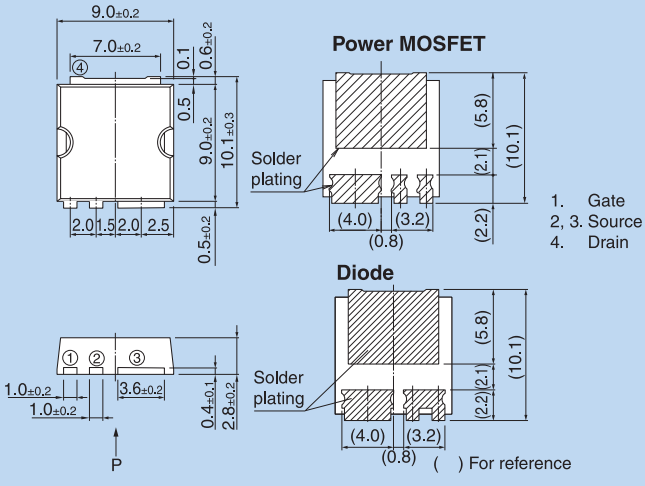
T-pack(S)



Power MOSFET
1. Gate
2, 4. Drain
3. Source

IGBT
1. Gate
2. Collector
3. Emitter

TFP



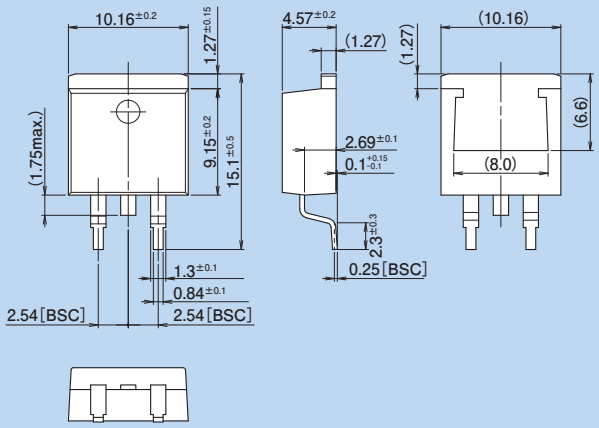
1. Gate
2, 3. Source
4. Drain

View from P

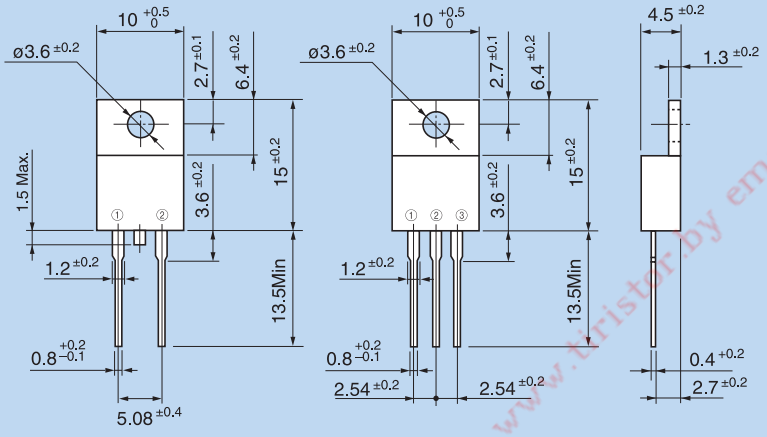
外形図/Outline

mm

D2-Pack



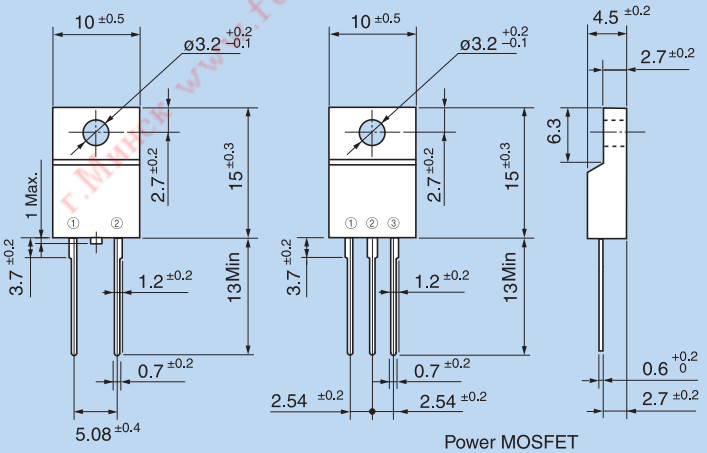
TO-220AB



Power MOSFET
1. Gate
2. Drain
3. Source

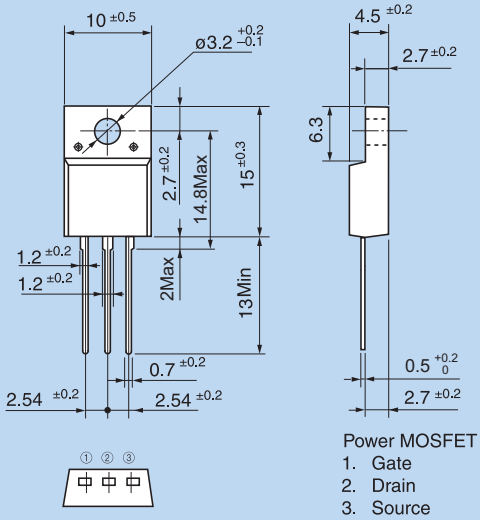
IGBT
1. Gate
2. Collector
3. Emitter

TO-220F



Power MOSFET
1. Gate
2. Drain
3. Source

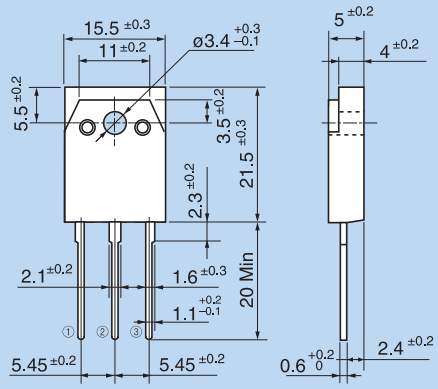
TO-220F (SLS)



Power MOSFET
1. Gate
2. Drain
3. Source

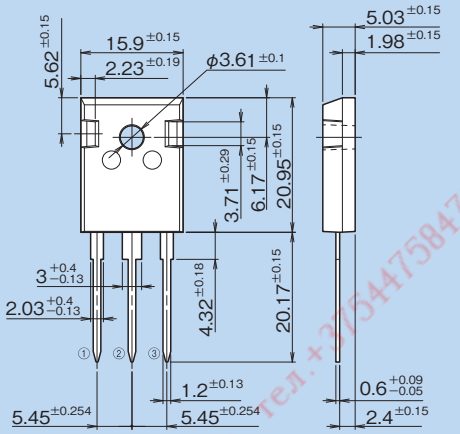
mm

TO-247



Power MOSFET
1. Gate
2. Drain
3. Source

TO-247-P2

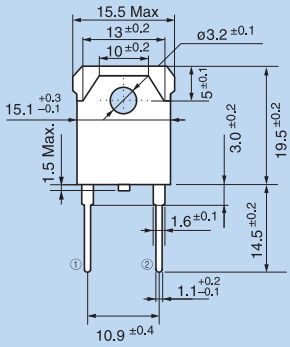


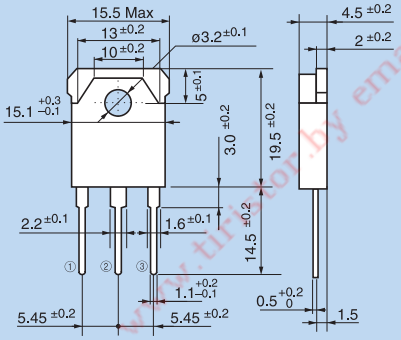
Power MOSFET
1. Gate
2. Drain
3. Source

IGBT
1. Gate
2. Collector
3. Emitter

FWD
1. Anode
2. Cathode
3. Anode

TO-3P

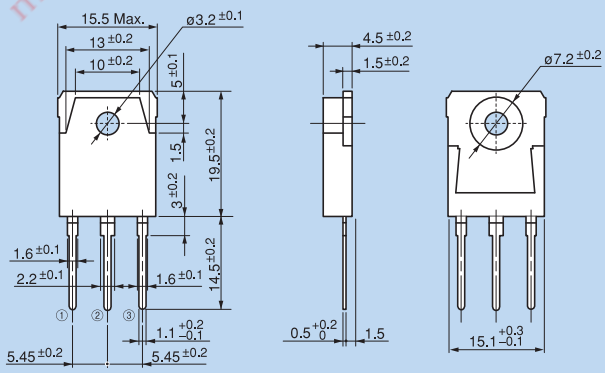




Power MOSFET
1. Gate
2. Drain
3. Source

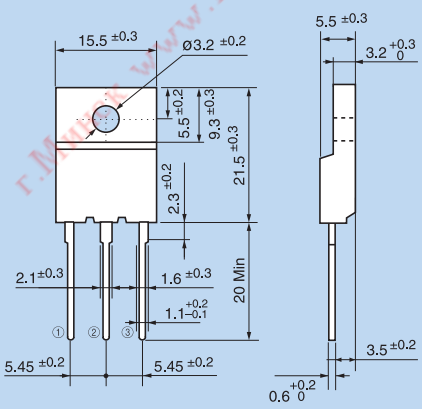
IGBT
1. Gate
2. Collector
3. Emitter

TO-3P(Q)



Power MOSFET
1. Gate
2. Drain
3. Source

TO-3PF



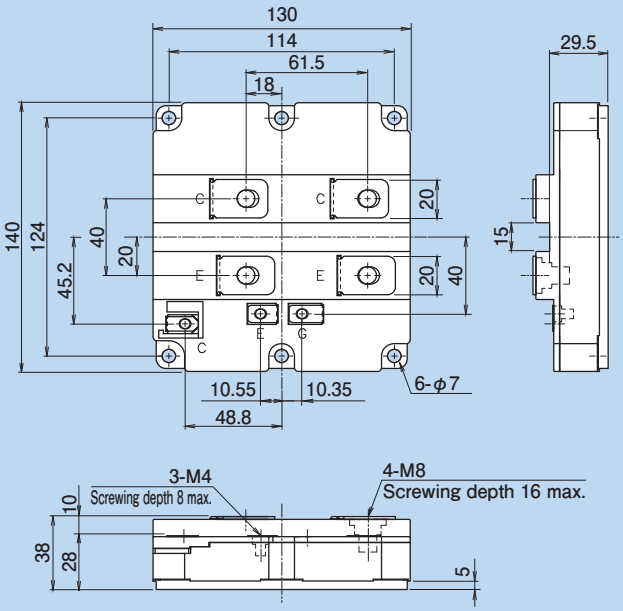
Power MOSFET
1. Gate
2. Drain
3. Source

外形図/Outline

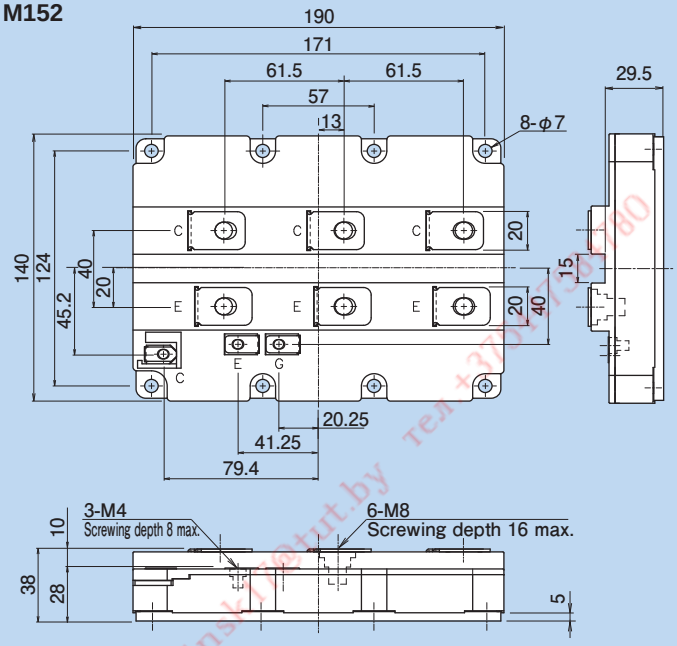
< パワーデバイス　Power devices>

mm

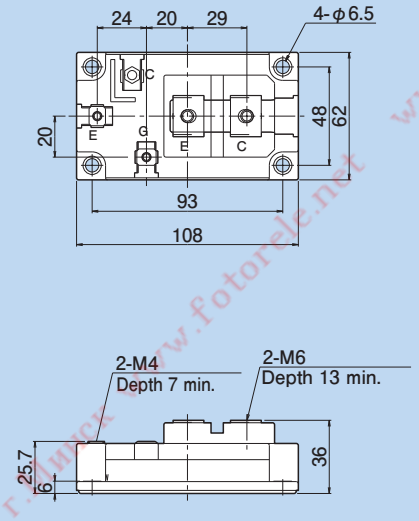
M151



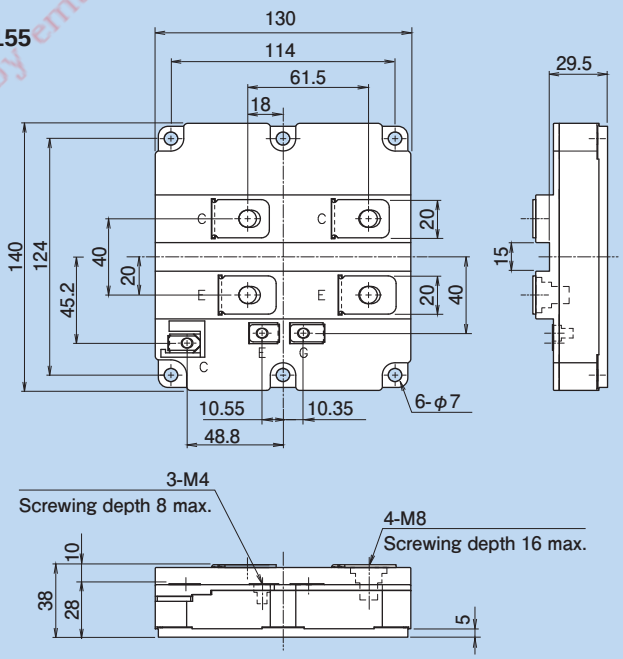
M152



M153



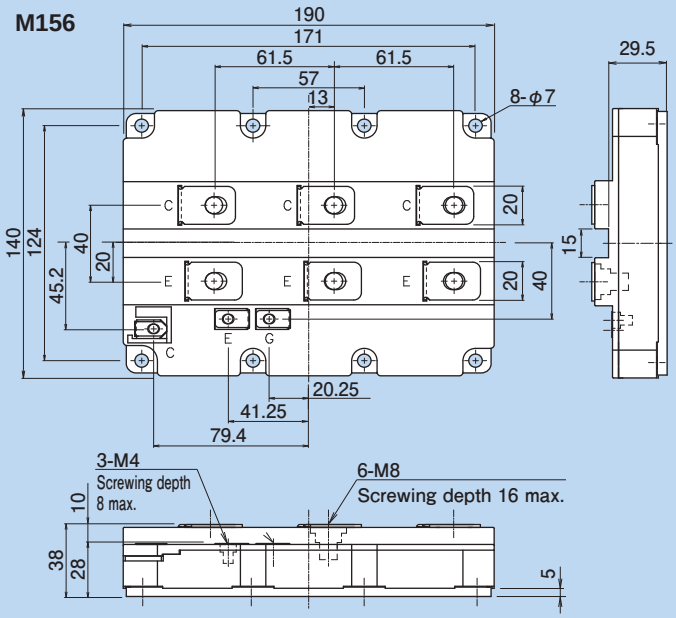
M155



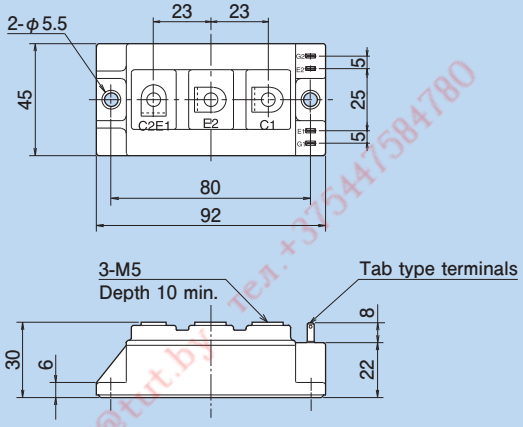
Outline

mm

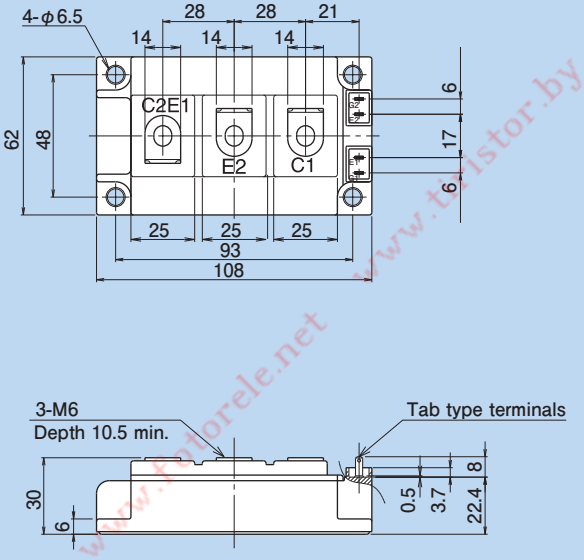
M156



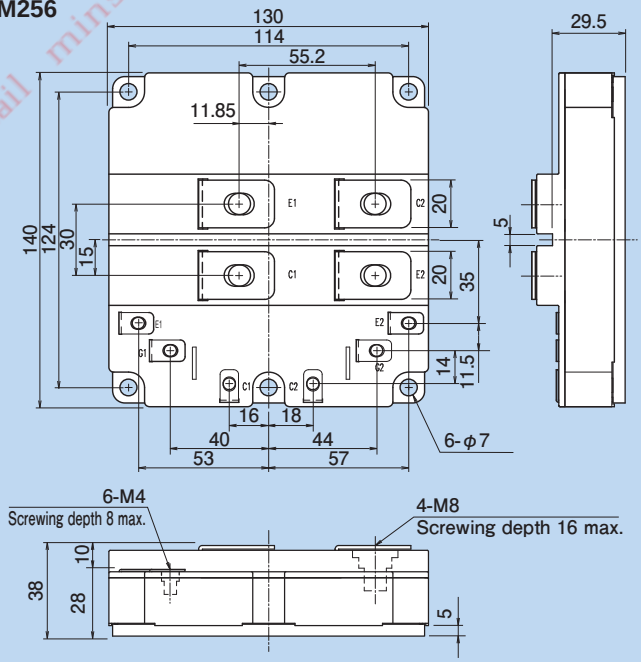
M233



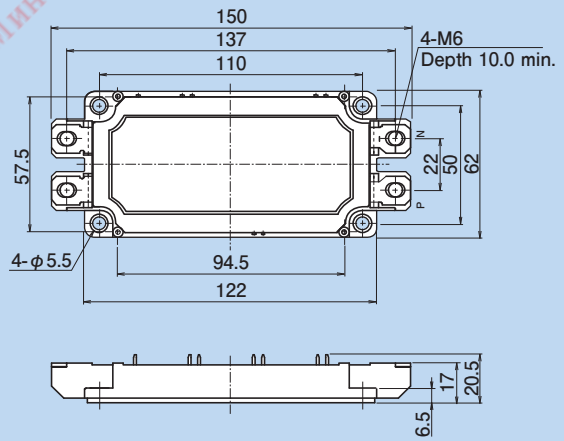
M249



M256



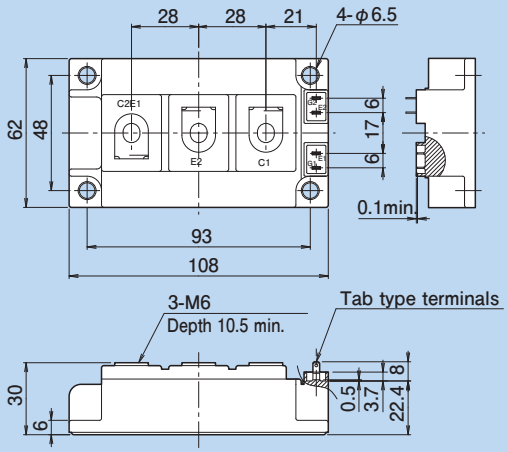
M254



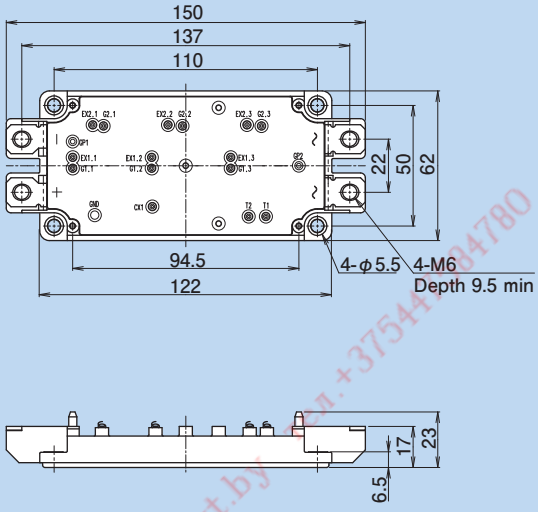
外形図/Outline

mm

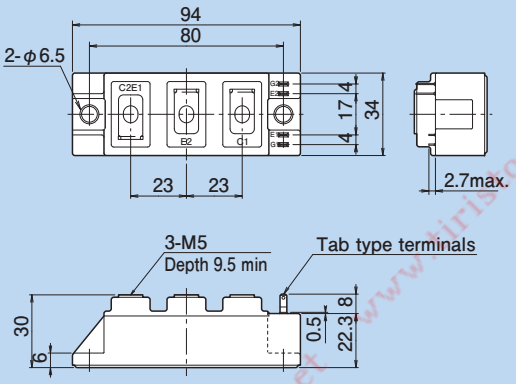
M259



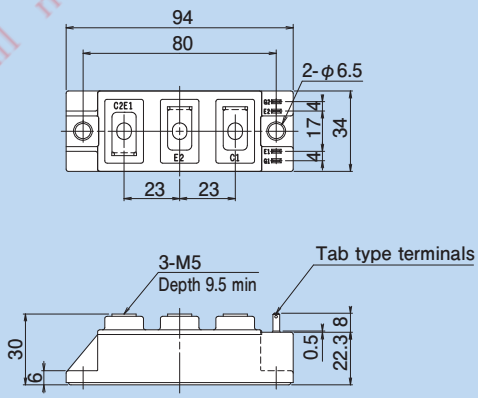
M260



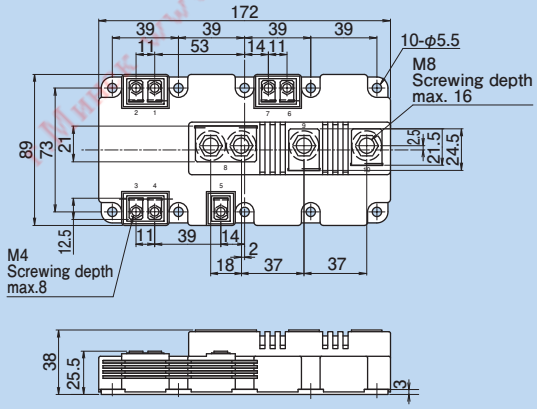
M262



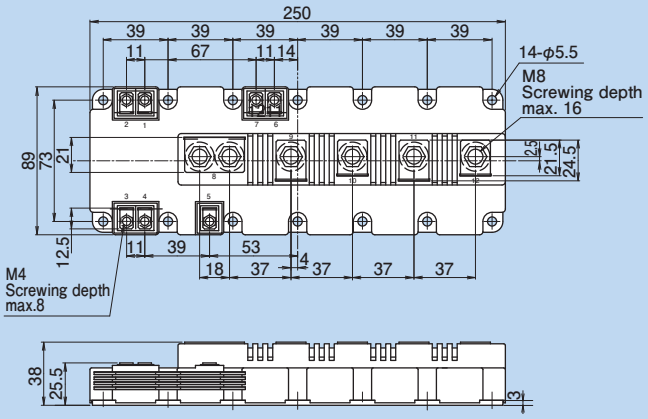
M263



M271

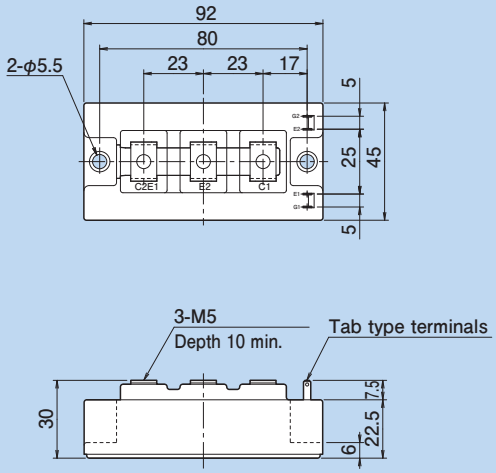


M272

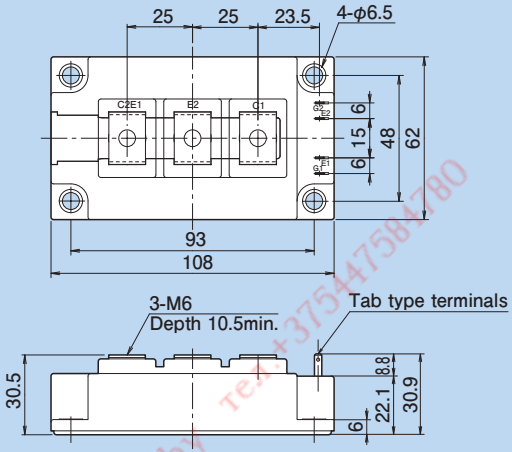


mm

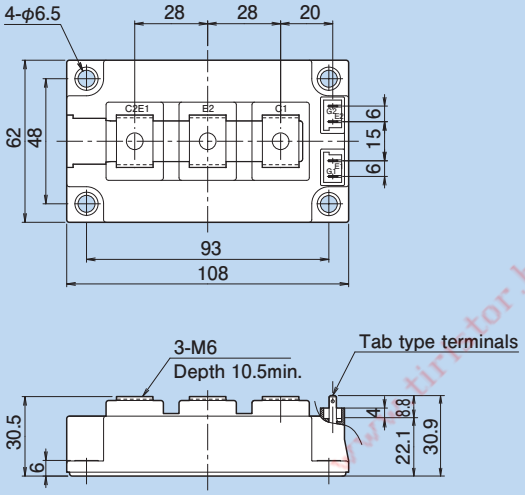
M274



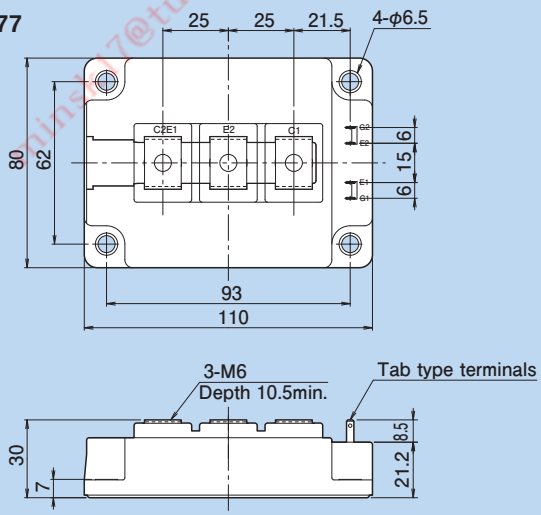
M275



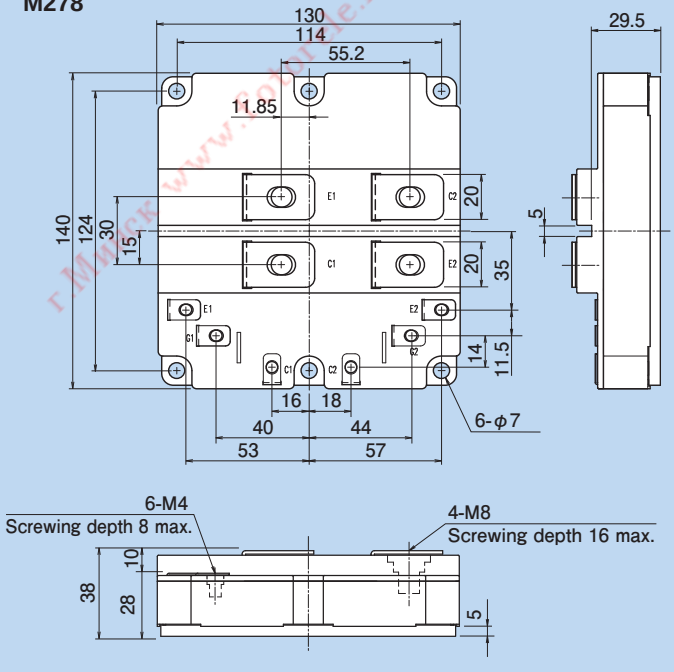
M276



M277



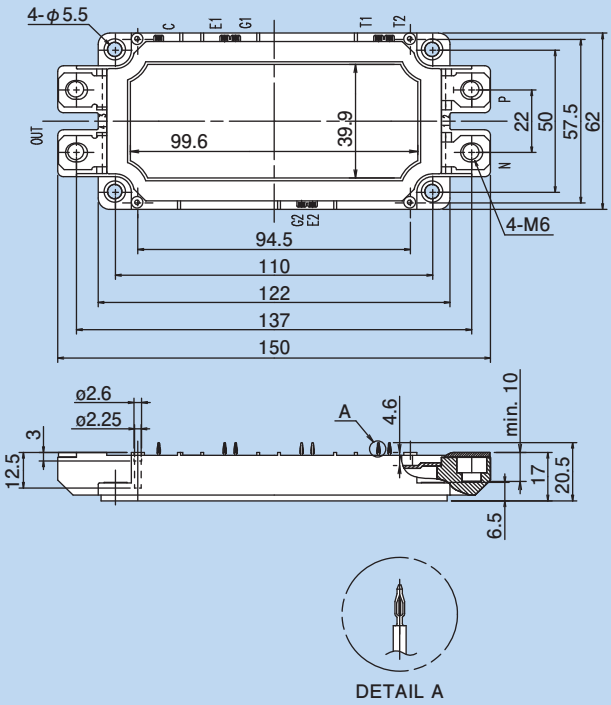
M278



外形図/Outline

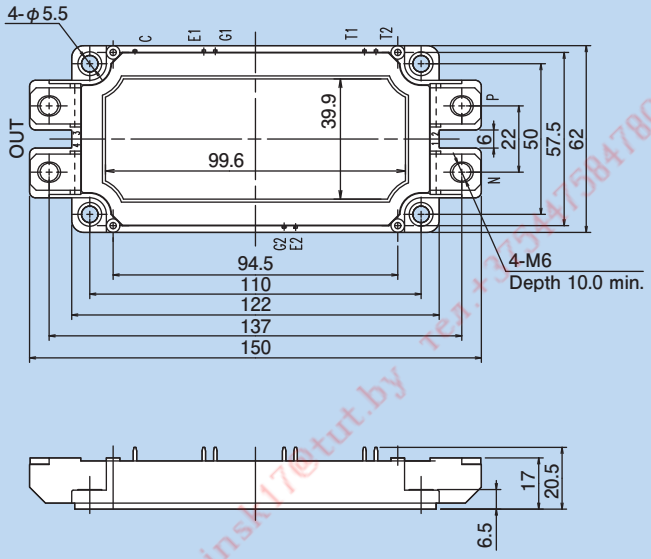
mm

M282



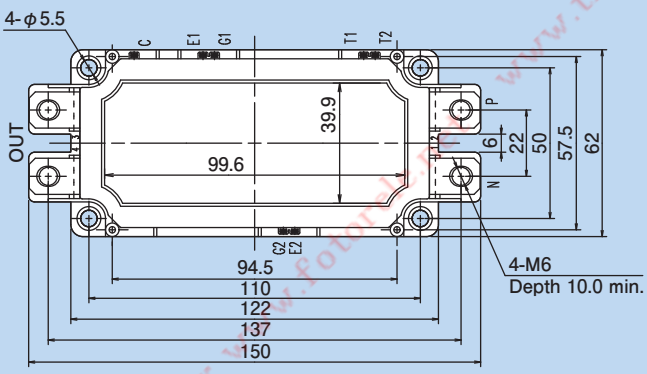
DETAIL A

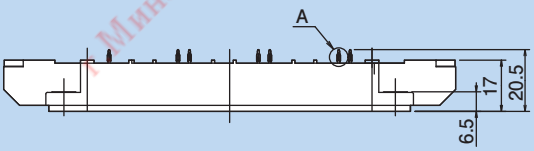
M285



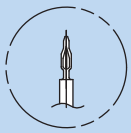
NOTE) ▭ shows theoretical dimension and tolerance is ⌖ ø0.5

M286



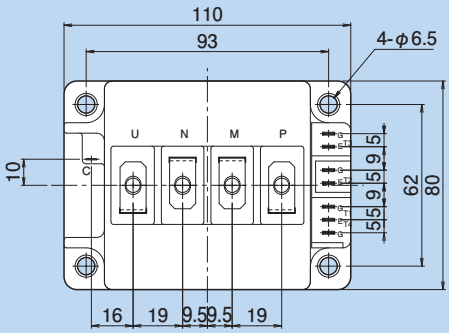


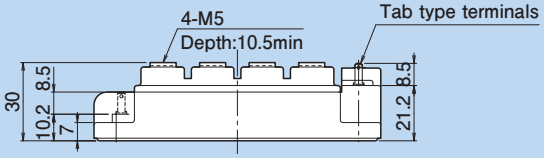
NOTE) ▭ shows theoretical dimension and tolerance is ⌖ ø0.5



DETAIL A

M403

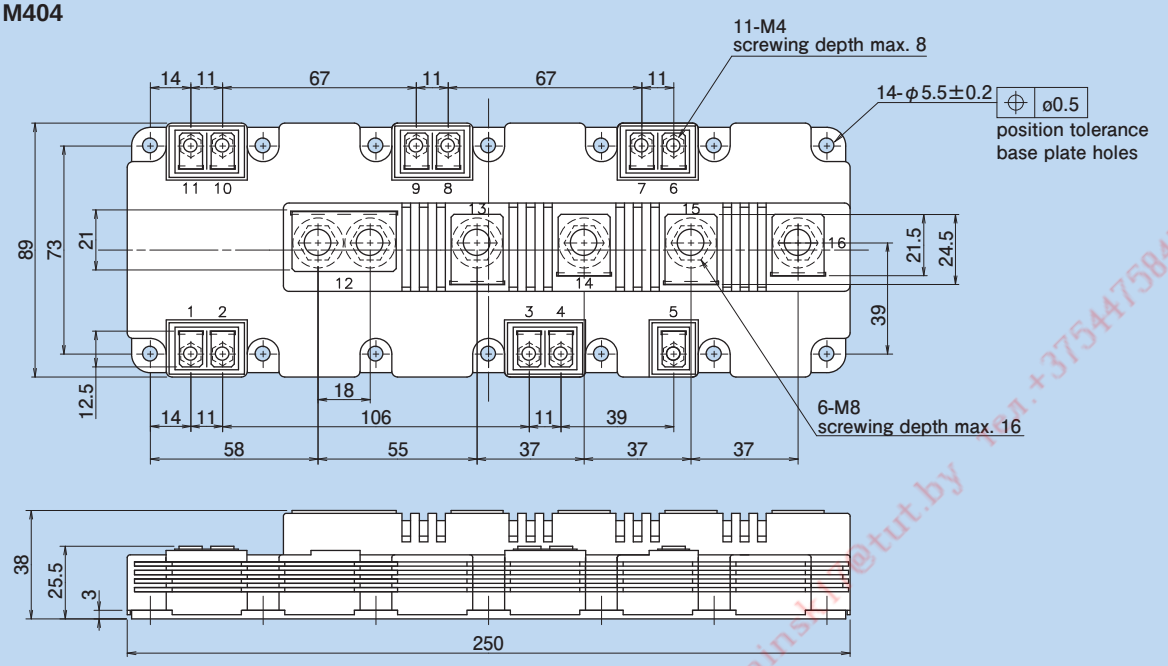




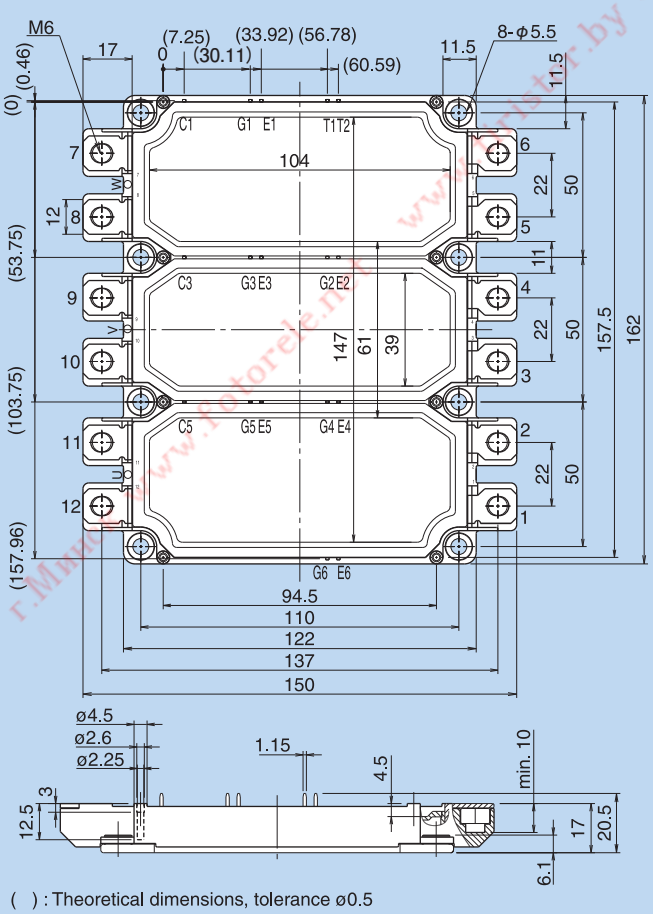
Outline

mm

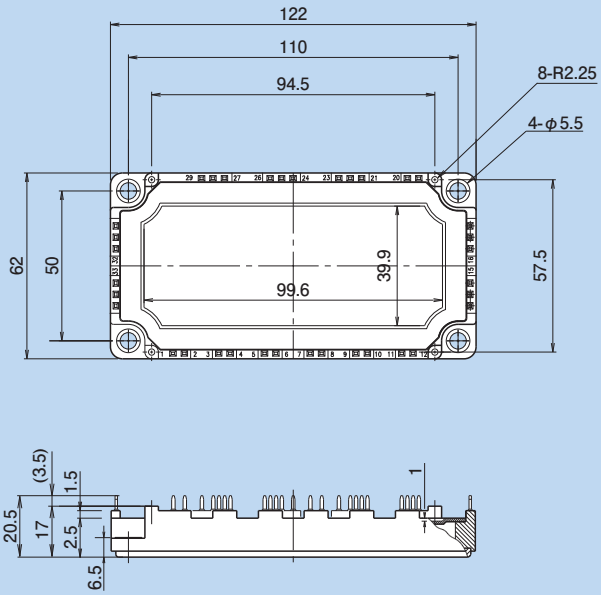
M404



M629



M633

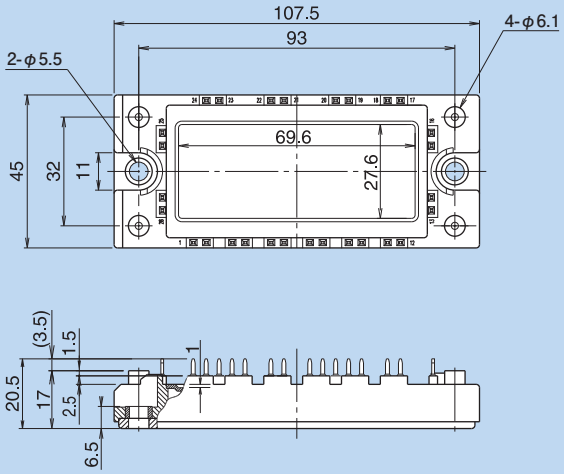


( ) : Theoretical dimensions, tolerance ø0.5

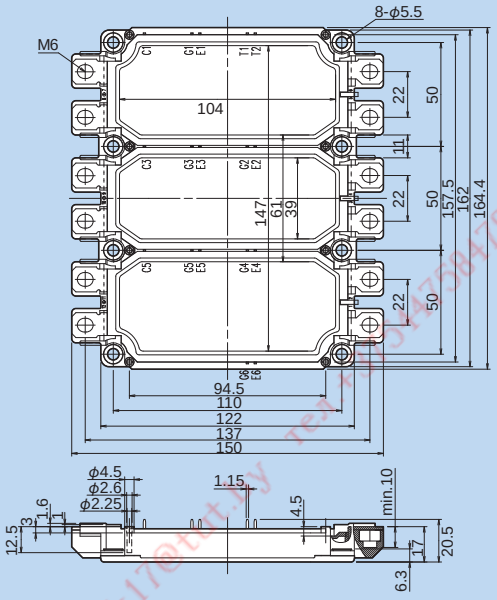
外形図/Outline

mm

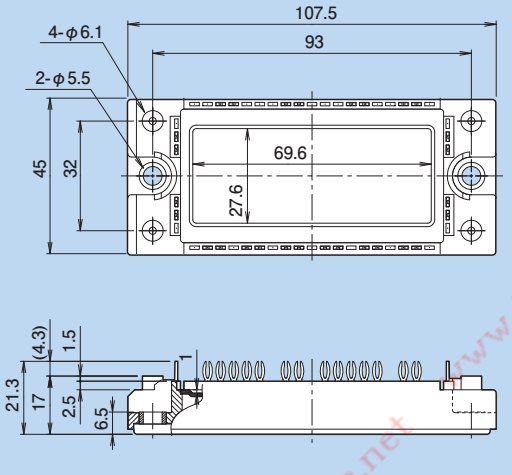
M636



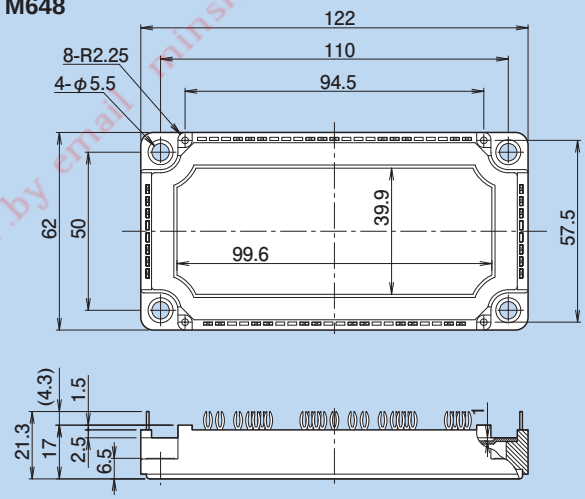
M639



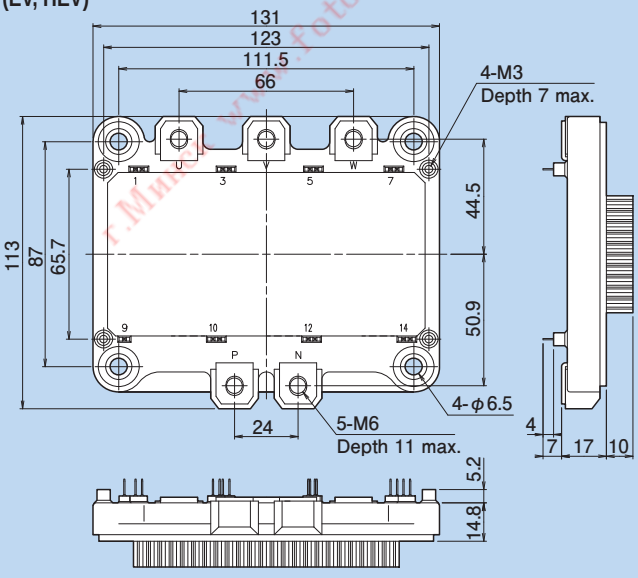
M647



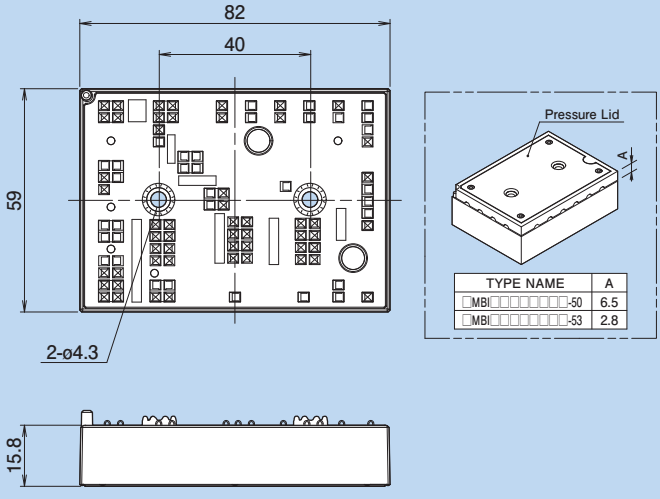
M648



M652
(EV, HEV)



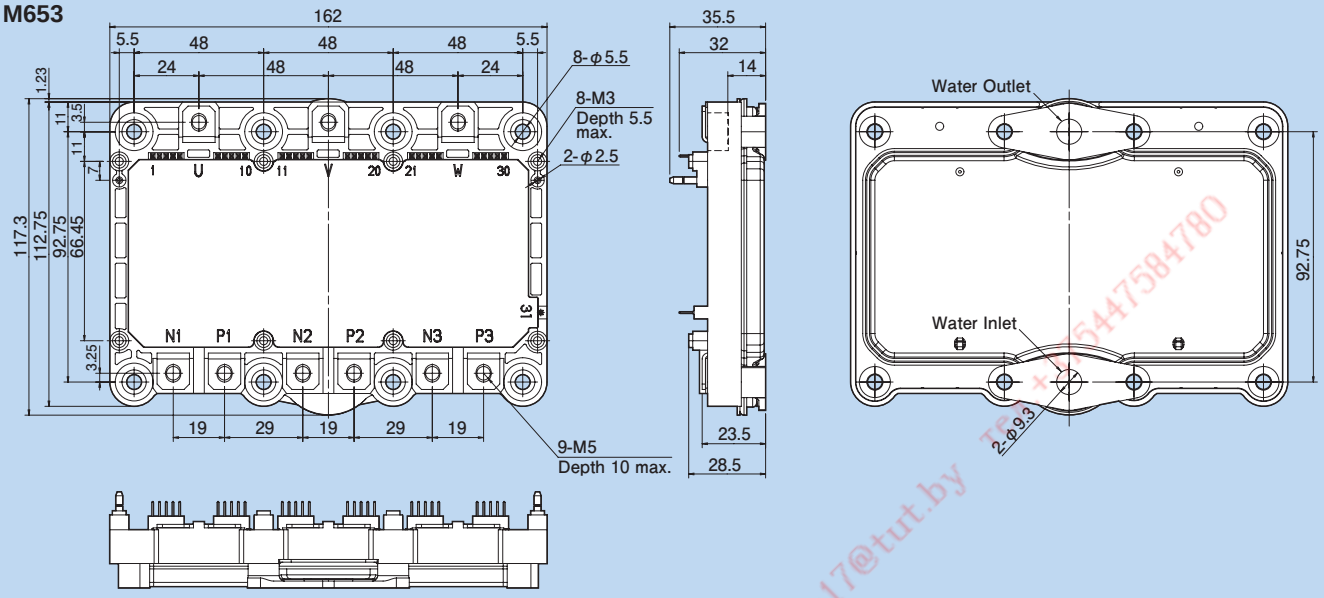
M664



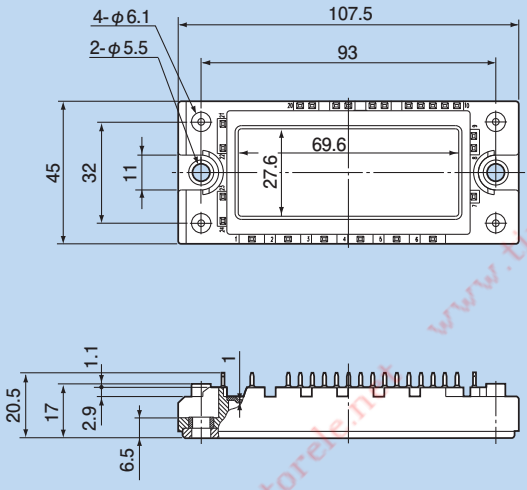
Outline

mm

M653



M711



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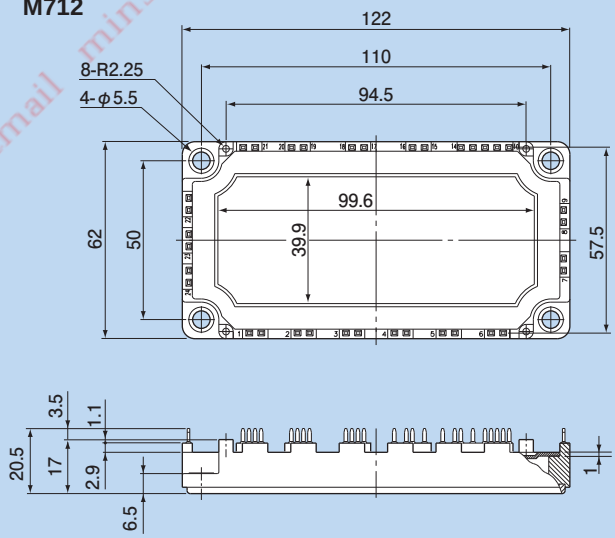
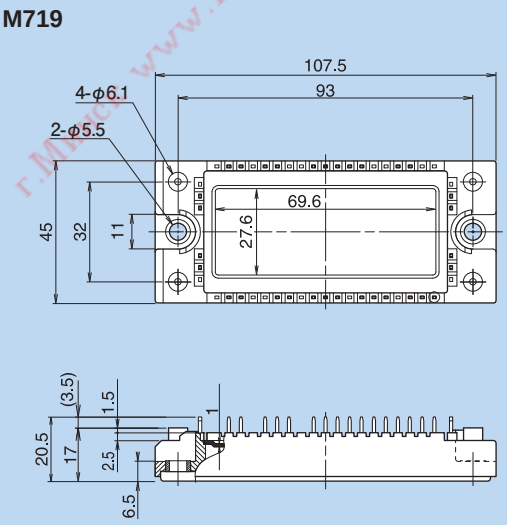
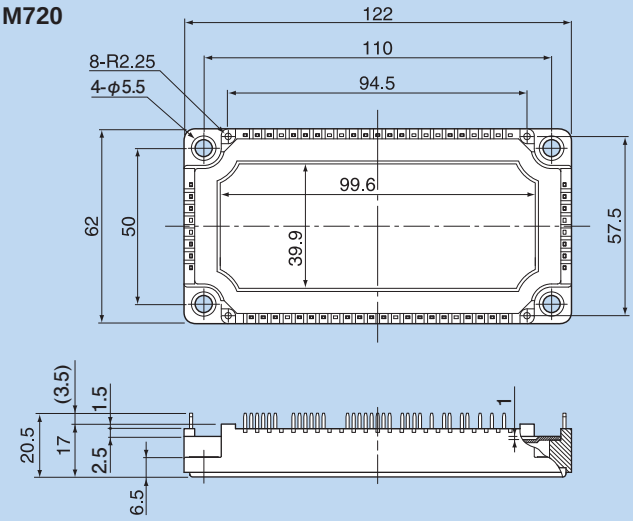


M719



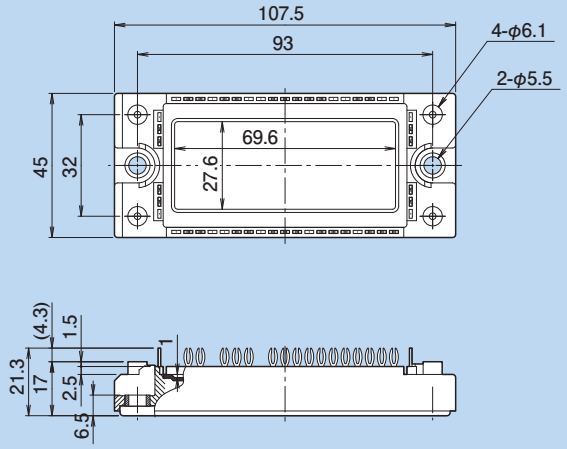
M720



外形図/Outline

mm

M721



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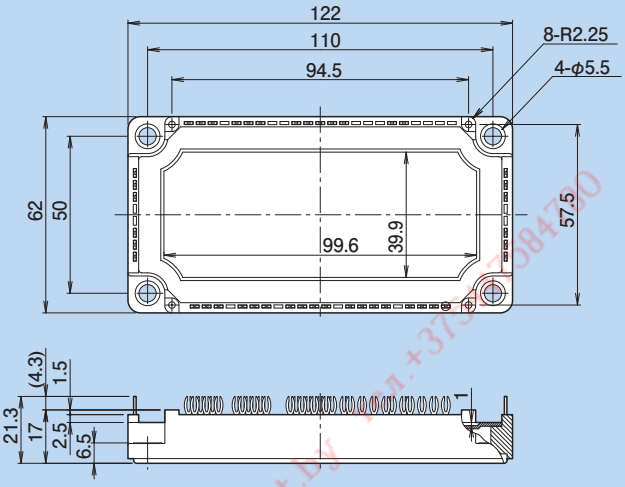

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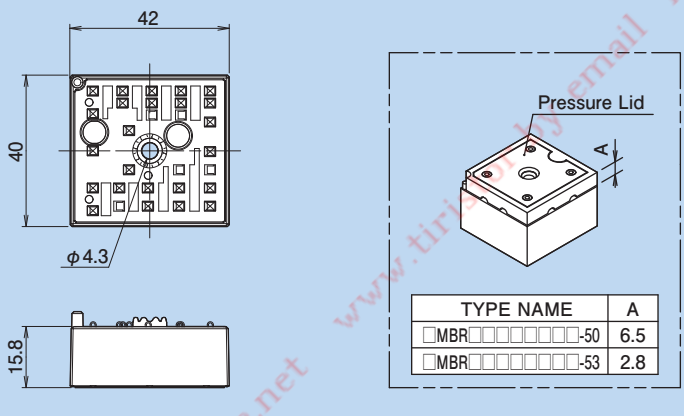
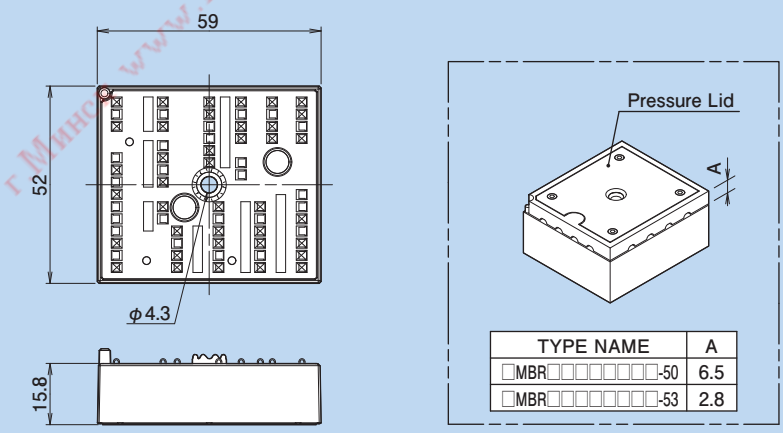


TYPE NAME	A
□MBR□□□□□□□□-50	6.5
□MBR□□□□□□□□-53	2.8

M724

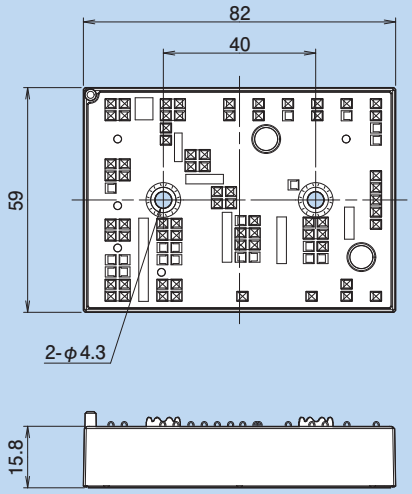


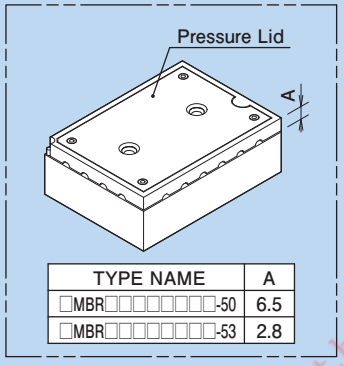
TYPE NAME	A
□MBR□□□□□□□□-50	6.5
□MBR□□□□□□□□-53	2.8

Outline

mm

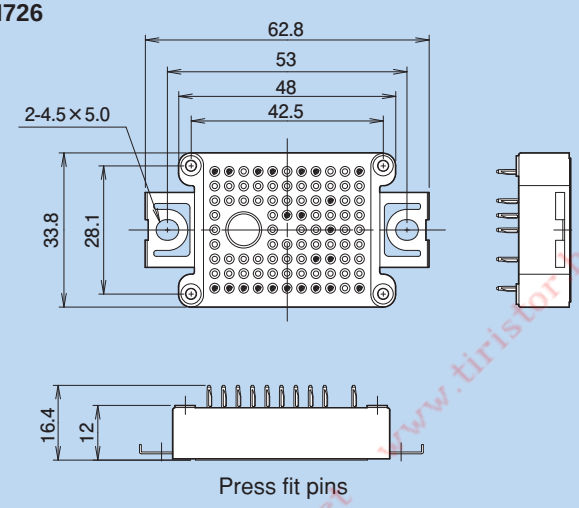
M725





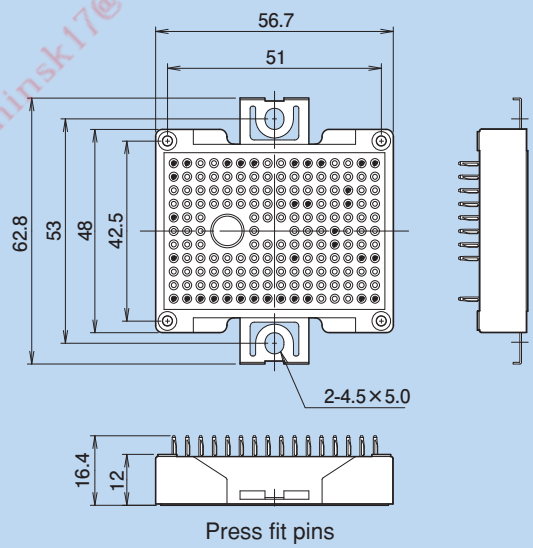
TYPE NAME	A
□MBR□□□□□□□□-50	6.5
□MBR□□□□□□□□-53	2.8

M726



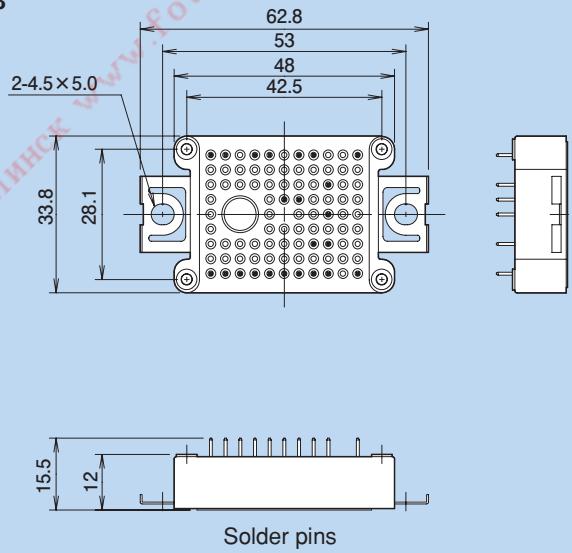
Press fit pins

M727



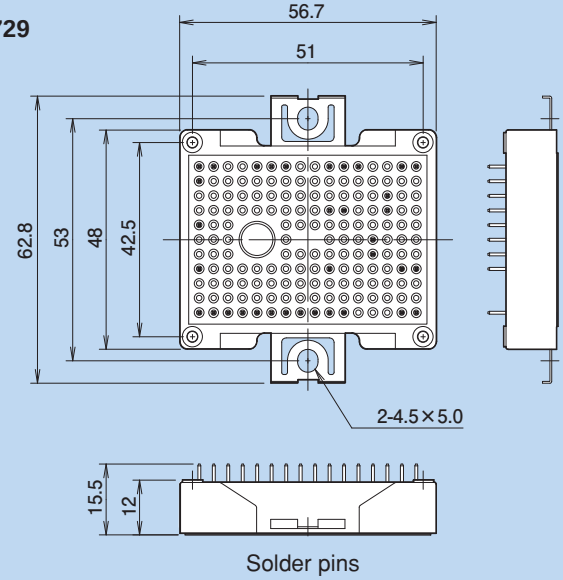
Press fit pins

M728



Solder pins

M729

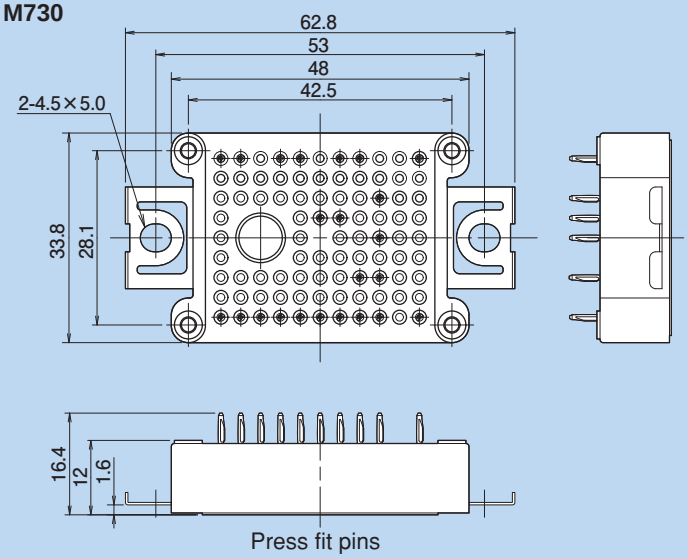


Solder pins

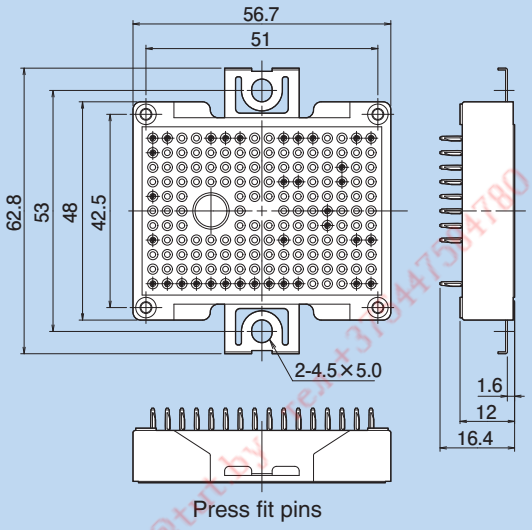
外形図/Outline

mm

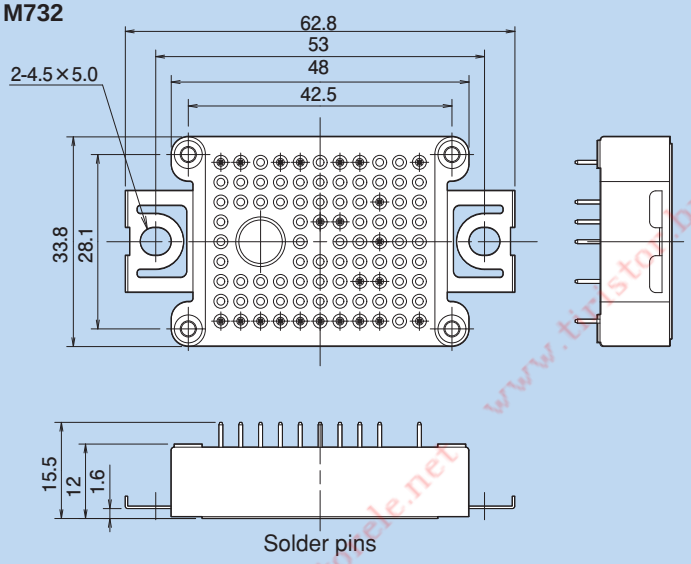
M730



M731



M732



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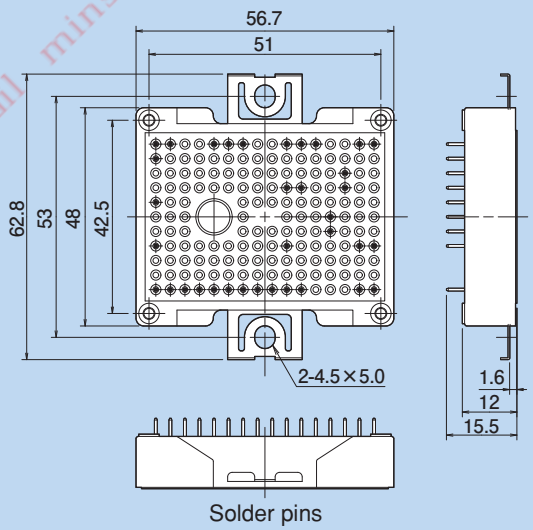

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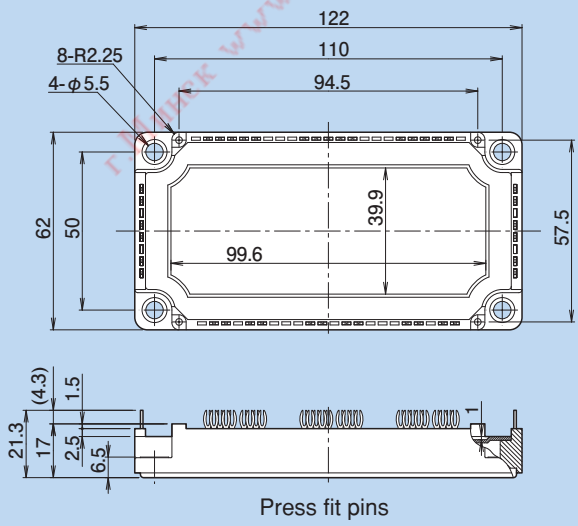

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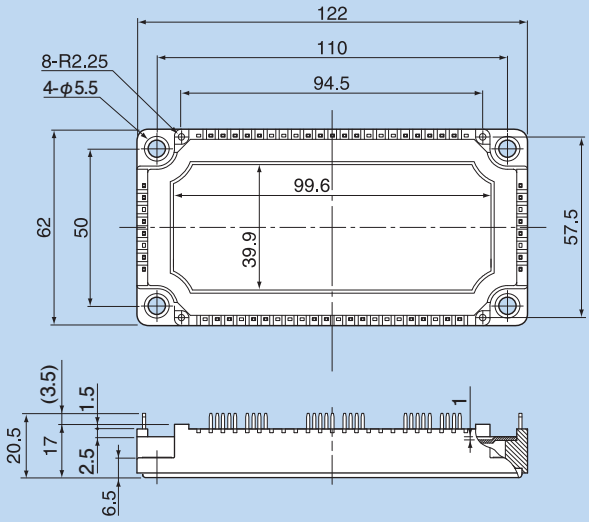
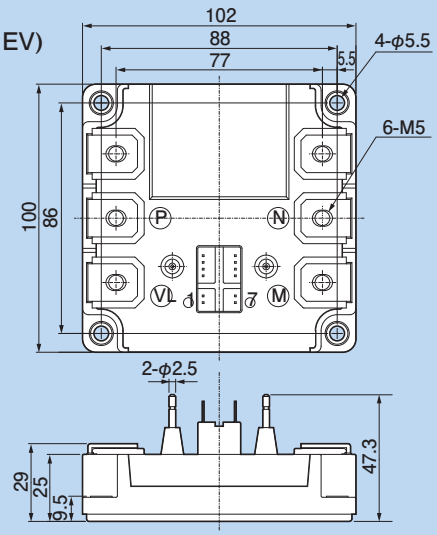


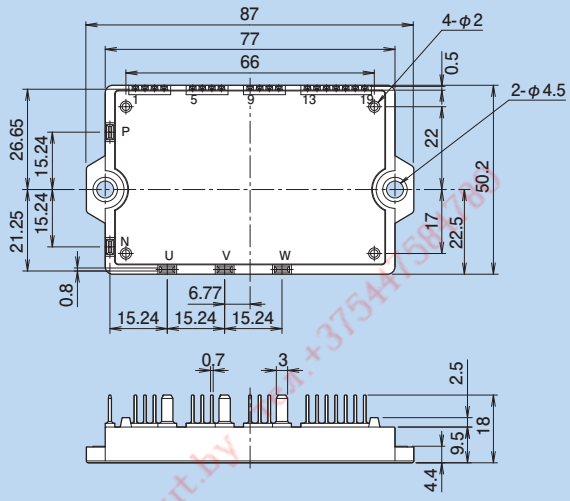
Outline

mm

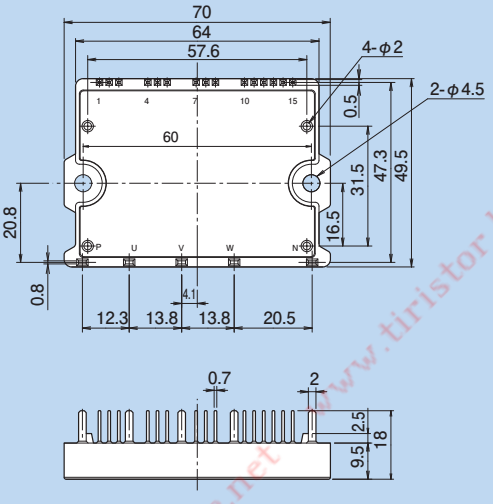
P401
(EV, HEV)



P626



P629



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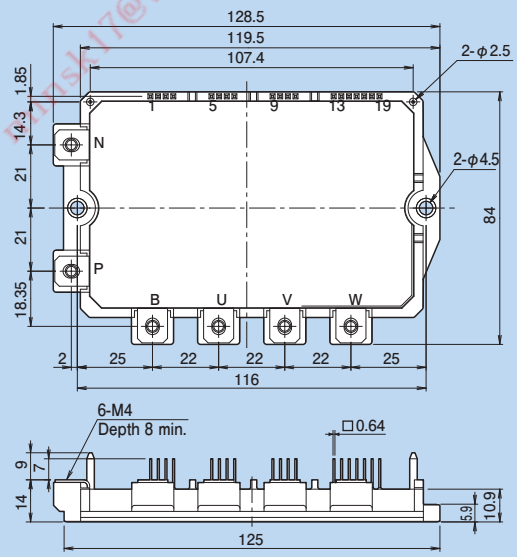

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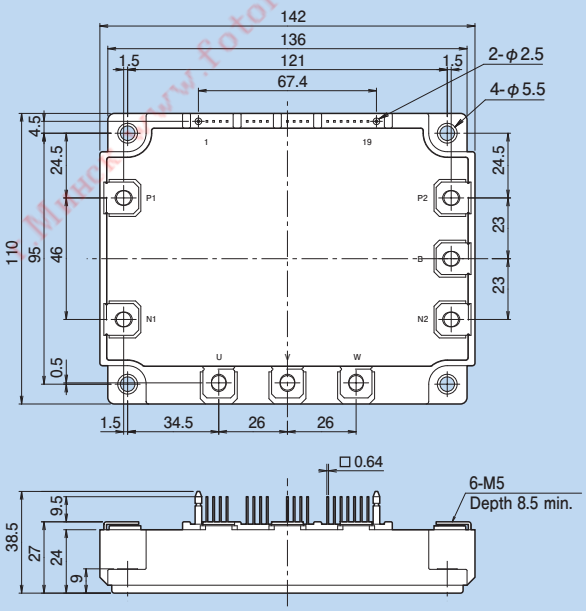

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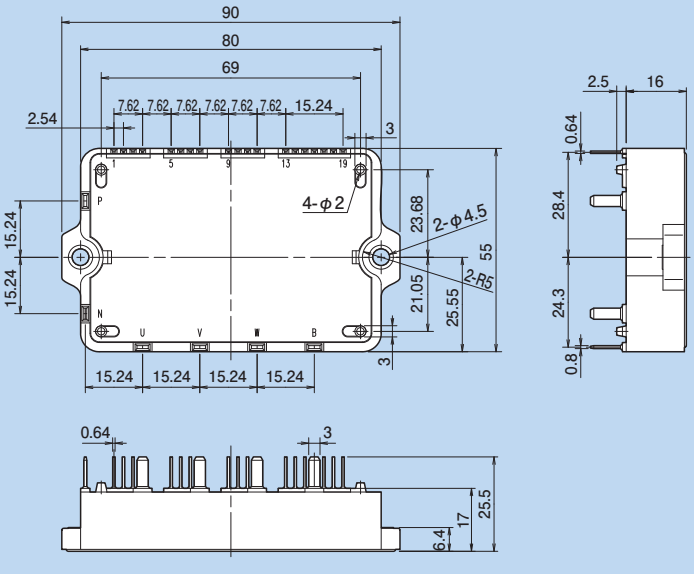
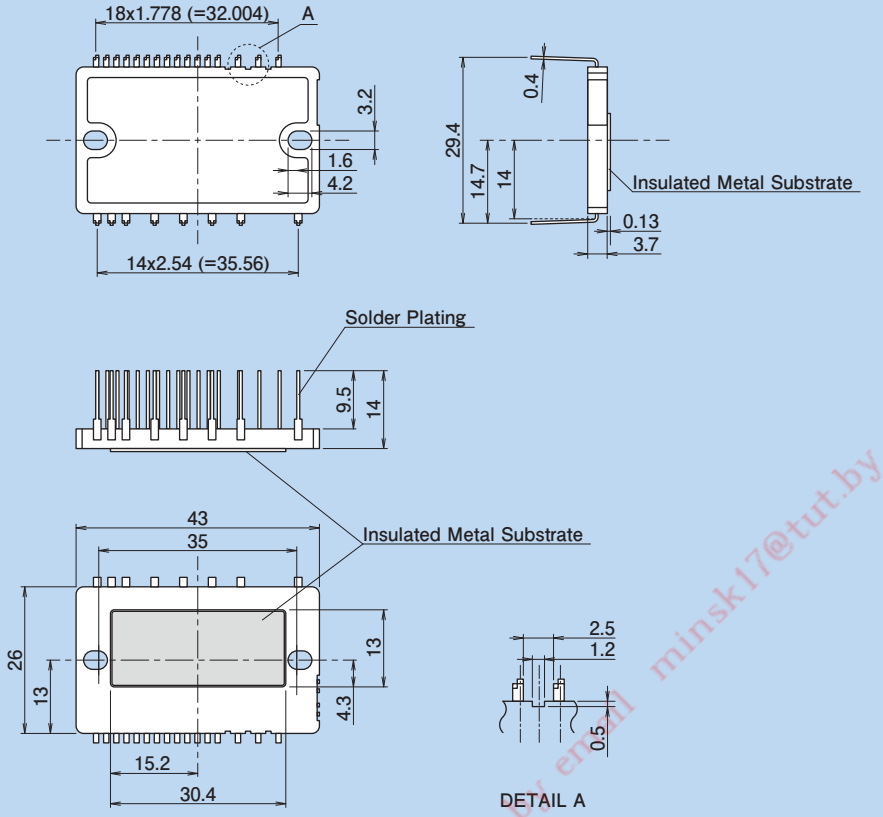


外形図/Outline

mm

P633A



Outline

注文単位/Order Quantity

・ご注文は最小注文単位以上、且つその整数倍にてお願い致します。
・下記一覧表は単品（テーピング品を除く）及びリール品が対象です。
・テーピング品は、仕様により注文単位が異なりますのでお問合せ願います。

・Please give us order above min order unit and that of integral multiplication.
・This table subjects to single or reel package items(Except for taping items)
・Order unit of taping package is different every spec.
If you'd like to know how to order it,Please contact us.

種　類 Description	パッケージ Package	型　式 Type number	最小注文単位 Min. quantity per order	最小梱包単位 Min. quantity per packing
パワーMOSFET ダイオード Power MOSFETs Diodes	TO-220	全型式　All types	100	500
	TO-220F/TO-220F(SLS)		100	500
	TFP		1,500	1,500
	TO-247		100	500
	TO-3P, TO-3P(Q)		100	500
	TO-3PF		100	500
	TO-3PL		50	50
	K-pack (S)		3,000	3,000
	T-pack (S)		1,000	1,000
	K-pack (L, P)		500	500
	T-pack (L, P)		100	500
	TO-220	-S2□PP (Tube)	1,000	1,000
	TO-220F	-S3□PP (Tube)	1,000	1,000
パワーMOSFET ディスクリートIGBT ダイオード Power MOSFETs Discrete IGBTs Diodes	TO-247-P2	全型式　All types	600	600
集積回路　ICs		下記を除く全型式 All types (except for below types)	2,000	2,000
		FA8A-□□, FA6A-□□, FA1A-□□	3,000	3,000
		FA5627, 28	3,000	3,000
		FA5637	3,000	3,000
		FA5641, 42, 43, 44	3,000	3,000
		FA5680, FA5681	3,000	3,000
		FA5696	3,000	3,000
		FA5651	3,000	3,000
		FA5752	3,000	3,000
		FA5760	3,000	3,000

型式索引 /Type Number Index

型式索引 /Type Number Index

	Page		Page		Page		Page		Page		Page
2SK3686-01	81	2SK3988-01	81	6MBI200XBA120-50	12	6MBP25VAA120-50	39	7MBP50VFN060-50	39	7MBR15VJA120-53	22
2SK3687-01MR	81	2SK3989-01MR	81	6MBI200XBE120-50	12	6MBP25VBA120-50	39	7MBP50VFN120-50	39	7MBR15VKA060-50	21
2SK3688-01L, S	81	2SK3990-01L, S	81	6MBI200XXA120-50	12	6MBP25VDA120-50	41	7MBP75VDA060-50	41	7MBR15VKA120-50	21
2SK3689-01	81	2SK4004-01MR	80	6MBI200XXE120-50	12	6MBP25VFN120-50	39	7MBP75VDA120-50	41	7MBR15VKB120-50	21
2SK3692-01	80	2SK4040-01	80	6MBI225V-120-50	27	6MBP300VEA060-50	41	7MBP75VDN120-50	41	7MBR15VKC060-50	21
2SK3693-01MR	80	2SK4047-01S	83	6MBI225V-120-80	27	6MBP30VAA060-50	39	7MBP75VFN060-50	39	7MBR15VKC120-50	21
2SK3694-01L, S	80	2SK4047-01S	87	6MBI225XNA120-50	13	6MBP30XSD060-50	17	7MBR100VB060-50	23	7MBR15VKD120-50	21
2SK3695-01	82	2SK4068-01	83	6MBI225XNA170-50	13	6MBP30XSF060-50	17	7MBR100VJC120-50	22	7MBR15XKA065-50	9
2SK3696-01MR	82	2SK4068-01	87	6MBI300V-120-50	27	6MBP35VBA120-50	39	7MBR100VJC120-53	22	7MBR15XKA120-50	9
2SK3697-01	82	4MBI220VF-170R2-50	37	6MBI300V-120-80	27	6MBP35VDA120-50	41	7MBR100VN120-50	23	7MBR15XKB120-50	9
2SK3698-01	81	4MBI300VG-120R1-50	37	6MBI300V-170-50	27	6MBP35VFN120-50	39	7MBR100VP060-50	23	7MBR15XKC065-50	9
2SK3699-01MR	81	4MBI300VG-120R-50	37	6MBI300XNA120-50	13	6MBP35XSD060-50	17	7MBR100VR060-50	23	7MBR15XKC120-50	9
2SK3725-01	80	4MBI340VF-120R-50	37	6MBI300XNA170-50	13	6MBP35XSF060-50	17	7MBR100VR120-50	23	7MBR15XKD120-50	9
2SK3726-01MR	80	4MBI400VF-120R-50	37	6MBI450V-120-50	27	6MBP400VEA060-50	41	7MBR100VX120-50	24	7MBR20VKA060-50	21
2SK3727-01	81	4MBI400VG-060R-50	37	6MBI450V-170-50	27	6MBP50VAA060-50	39	7MBR100VY060-50	24	7MBR20VKC060-50	21
2SK3728-01MR	81	4MBI450VB-120R1-50	37	6MBI450XNA120-50	13	6MBP50VBA060-50	39	7MBR100VZ060-50	24	7MBR20XKA065-50	9
2SK3730-01MR	83	4MBI450VB-170R2-50	37	6MBI450XNA170-50	13	6MBP50VBA120-50	39	7MBR100VZ120-50	24	7MBR20XKC065-50	9
2SK3730-01MR	87	4MBI450VF-120RD-50	37	6MBI50VA-060-50	26	6MBP50VDA060-50	41	7MBR100XNA065-50	10	7MBR25VA120-50	23
2SK3753-01R	81	4MBI600VB-170R2-50	37	6MBI50VA-120-50	26	6MBP50VDA120-50	41	7MBR100XNA120-50	10	7MBR25VJB120-50	22
2SK3772-01	80	4MBI600VC-120-50	37	6MBI50VW-060-50	26	6MBP50VDN120-50	41	7MBR100XPE065-50	10	7MBR25VJB120-53	22
2SK3773-01MR	80	4MBI600VM-120-50	37	6MBI50VW-120-50	26	6MBP50VFN060-50	39	7MBR100XRA065-50	10	7MBR25VKB120-50	21
2SK3774-01L, S	80	4MBI650VB-120R1-50	37	6MBI550V-120-50	27	6MBP50VFN120-50	39	7MBR100XRA120-50	10	7MBR25VKD120-50	21
2SK3775-01	80	4MBI900VB-120R1-50	37	6MBI600VW-065V	45	6MBP75VBA060-50	39	7MBR100XXA065-50	11	7MBR25VM120-50	23
2SK3778-01	79	6MBI100U4B-170-50	26	6MBI600XNA120-50	13	6MBP75VDA060-50	41	7MBR100XXA120-50	11	7MBR25VP120-50	23
2SK3779-01R	79	6MBI100VA-060-50	26	6MBI600XNA170-50	13	6MBP75VDA120-50	41	7MBR100XYE065-50	11	7MBR25VW120-50	24
2SK3804-01S	83	6MBI100VA-120-50	26	6MBI75VA-060-50	26	6MBP75VDN120-50	41	7MBR100XZA065-50	11	7MBR25VY120-50	24
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2SK3882-01	79	6MBI100VJC-120-50	25	6MBI75VW-060-50	26	6MSI100VB-120-50	46	7MBR10VKA060-50	21	7MBR25XKB120-50	9
2SK3886-01MR	79	6MBI100VJC-120-53	25	6MBI75VW-120-50	26	7MBP100VDA060-50	41	7MBR10VKA120-50	21	7MBR25XKC120-50	9
2SK3887-01	81	6MBI100VW-060-50	26	6MBI800XV-075V-01	45	7MBP100VDA120-50	41	7MBR10VKC060-50	21	7MBR25XKD120-50	9
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2SK3891-01R	81	6MBI100VX-170-50	26	6MBP100VDN060-50	41	7MBP100VEA120-50	41	7MBR10XKA120-50	9	7MBR30XKA065-50	9
2SK3916-01	80	6MBI100XBA120-50	12	6MBP100VDN120-50	41	7MBP100VFN060-50	39	7MBR10XKC065-50	9	7MBR30XKC065-50	9
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2SK3921-01L, S	79	6MBI150VB-060-50	26	6MBP10VAA120-50	39	7MBP150VEA120-50	41	7MBR150VR060-50	23	7MBR35VJB120-50	22
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2SK3932-01MR	80	6MBI150VX-060-50	26	6MBP15XSF060-50	17	7MBP25VFN120-50	39	7MBR150XNE120-50	10	7MBR35VM120-50	23
2SK3933-01L, S	80	6MBI150VX-120-50	26	6MBP200VDA060-50	41	7MBP300VEA060-50	41	7MBR150XRA065-50	10	7MBR35VP120-50	23
2SK3981-01	81	6MBI150XBA120-50	12	6MBP200VDN060-50	41	7MBP35VDA120-50	41	7MBR150XRE120-50	10	7MBR35VW120-50	24
2SK3982-01MR	81	6MBI150XXA120-50	12	6MBP200VEA060-50	41	7MBP35VFN120-50	39	7MBR150XXA065-50	11	7MBR35VY120-50	24
2SK3983-01L, S	81	6MBI180VB-120-50	26	6MBP200VEA120-50	41	7MBP400VEA060-50	41	7MBR150XXE120-50	11	7MBR35XKB120-50	9
2SK3985-01	80	6MBI180VB-120-55	26	6MBP20VAA060-50	39	7MBP50VDA060-50	41	7MBR150XZA065-50	11	7MBR35XKD120-50	9
2SK3986-01MR	80	6MBI180VX-120-50	26	6MBP20XSD060-50	17	7MBP50VDA120-50	41	7MBR150XZE120-50	11	7MBR35XMA120-50	10
2SK3987-01L, S	80	6MBI180VX-120-55	26	6MBP20XSF060-50	17	7MBP50VDN120-50	41	7MBR15VJA120-50	22	7MBR35XPA120-50	10

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保守移行機種 /Maintenance products

・下記記載の機種は保守品移行機種です。
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・Models listed below are for maintenance products only.
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機種 Description	型式 Type number	機種 Description	型式 Type number	機種 Description	型式 Type number
パワーデバイス Power Devices	6MBP100RA060	パワーデバイス Power Devices	7MBP25RJ120	整流ダイオード Rectifier Diodes	CB803-03
	6MBP100RA120		7MBP25RU2A120		CB863-06
	6MBP100RTB060		7MBP25TEA120-50		CB863-12
	6MBP100RTJ060		7MBP300RA060		CB863-15
	6MBP100TEA060-50		7MBP50RA060		ERA81-004
	6MBP150RA060		7MBP50RA120		ERA82-004
	6MBP150RA120		7MBP50RJ120		ERA83-004
	6MBP150RTB060		7MBP50RTB060		ERA83-006
	6MBP150RTJ060		7MBP50RTJ060		ERA84-009
	6MBP150TEA060-50		7MBP50RU2A120		ERA85-009
	6MBP15RA120		7MBP50TEA060-50		ERA91-02
	6MBP200RA060		7MBP50TEA120-50		ERA92-02
	6MBP20RTA060		7MBP75RA060		ERB81-004
	6MBP25RA120		7MBP75RA120		ERB83-004
	6MBP25RJ120		7MBP75RJ120		ERB83-006
	6MBP25RU2A120		7MBP75RTB060		ERB84-009
	6MBP25TEA120-50		7MBP75RTJ060		ERB91-02
	6MBP300RA060		7MBP75RU2A120		ERB93-02
	6MBP50RA060		7MBP75TEA060-50		ERC81-004
	6MBP50RA120		7MBP75TEA120-50		ERC81-006
	6MBP50RJ120		7MBR10UF120		ERC81S-004
	6MBP50RTB060		7MBR15UF060		ERC84-009
	6MBP50RTJ060		7MBR15UF120		ERC91-02
	6MBP50RU2A120		7MBR20UF060		FD867-12
	6MBP50TEA060-50		7MBR30UF060		FD867-15
	6MBP50TEA120-50				FD868-12
	6MBP75RA060				FD868-15
	6MBP75RA120				SC802-04
	6MBP75RJ120				SC802-06
	6MBP75RTB060				SC802-09
	6MBP75RTJ060				SC902-2
	6MBP75RU2A120				SD832-03
	6MBP75TEA060-50				SD832-04
	6MBP75TEA120-50				SD833-03
	7MBP100RA060				SD833-04
	7MBP100RA120				SD833-06
	7MBP100RTB060				SD833-09
	7MBP100RTJ060				SD834-03
	7MBP100TEA060-50				SD834-04
	7MBP150RA060				SD862-04
	7MBP150RA120				SD863-04
	7MBP150RTB060				SD863-06
	7MBP150RTJ060				SD863-10
	7MBP150TEA060-50				SD882-02
	7MBP200RA060				SD883-02
	7MBP25RA120				SD883-04

廃型機種 / Discontinued products

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パワーデバイス Power Devices	1MBI150NH-060	パワーデバイス Power Devices	6MBI35S-140	整流ダイオード Rectifier Diodes	FDLR20C20
	1MBI150NK-060		6MBI50S-060		KP823C03
	1MBI200N-120		6MBI50S-120		KP823C04
	1MBI200NH-060		6MBI50S-140		KP823C09
	1MBI200NK-060		6MBI75S-060		PA955C6R
	1MBI300N-120		6MBI75S-120		PG985C6R
	1MBI300NN-120		6MBI75S-140		TP858C12R
	1MBI300NP-120		6MBP15RH060-50		TP869C04R
	1MBI400N-120		6MBP20RH060-50		TS862C04R
	1MBI400NN-120		6MBP30RH060-50		TS906C3R
	1MBI400NP-120		7MBR100SB060		TS952C6R
	1MBI600NN-060		7MBR100SD060		TS955C6R
	1MBI600NP-060		7MBR10SA120		YA852C12R
	2MBI100N-060		7MBR10SA140		YA852C15R
	2MBI100N-120		7MBR10SC120		YA855C12R
	2MBI100NB-120		7MBR15SA120		YA855C15R
	2MBI100NC-120		7MBR15SA140		YA858C12R
	2MBI150N-060		7MBR15SC120		YA858C15R
	2MBI150N-120		7MBR20SC060		YA862C04R
	2MBI150NB-120		7MBR25SA120		YA869C04R
	2MBI150NC-060		7MBR25SA140		YA951S6R
	2MBI150NC-120		7MBR25SC120		YA952C6R
	2MBI200N-060		7MBR30SA060		YA952S6R
	2MBI200N-060-03		7MBR30SC060		YA955C6R
	2MBI200N-120		7MBR35SB120		YG801C09R
	2MBI200NB-120		7MBR35SB140		YG802C03R
	2MBI200NB-120-01		7MBR35SD120		YG802C09R
	2MBI300N-060		7MBR50SA060		YG803C04R
	2MBI300N-060-04		7MBR50SB060		YG811S09R
	2MBI300N-120		7MBR50SB120		YG831C03R
	2MBI300N-120-01		7MBR50SB140		YG831C04R
	2MBI300NB-060		7MBR50SC060		YG832C03R
	2MBI300NB-060-01		7MBR50SD120		YG832C04R
	2MBI400N-060		7MBR75SB060		YG835C03R
	2MBI400N-060-01		7MBR75SD060		YG835C04R
	2MBI50N-060				YG838C03R
	2MBI50N-120	集積回路 Integrated Circuits	FA3675F-H1		YG852C12R
	2MBI600NT-060		FA7709R-H1		YG852C15R
	2MBI75N-060		FA7716R-H4		YG855C12R
	2MBI75N-120		FA7723R-H4		YG855C15R
	4MBI75T-060		FA7724R-H4		YG858C12R
	4MBI100T-060		FA7724AR-H4		YG858C15R
	4MBI150T-060		FA7728F-D1		YG862C04R
	4MBI200T-060		FA7729R-H1		YG864S06R
	1MBI600PX-120		FA7730F-D1		YG869C04R
	1MBI600PX-140		FA7731F-D1		YG881C02R
	2MBI100PC-140		FA7743N-D1		YG882C02R
	2MBI100SC-120				YG885C02R
	2MBI150PC-140	IGBT ドライブ用 ハイブリッド IC Hybrid ICs for IGBT Drive	EXB840		YG906C3R
	2MBI150SC-120		EXB841		YG951S6R
	2MBI200PB-140				YG952C6R
	2MBI200S-120				YG952S6R
	2MBI300P-140				YG955C6R
	2MBI300S-120	IPS (インテリジェントパワースイッチ) IPS (Intelligent Power switch)	F5016H		
	2MBI50P-140		F5017H	パワー MOSFET Power MOSFET	2SJ314-01L, S
	2MBI75P-140		F5021H		2SJ472-01L, S
	6MBI100S-060		F5022		2SJ473-01L, S
	6MBI100S-120		F5038H		2SJ474-01L, S
	6MBI100S-140				2SJ475-01
	6MBI10S-120	整流ダイオード Rectifier Diodes	FDLA20C20		2SJ476-01L, S
	6MBI15S-120		FDLC20C20		2SJ477-01MR
	6MBI25S-120		FDLH20C20		2SK2687-01
	6MBI35S-120		FDLP20C20		2SK2688-01L, S

機種 Description	型式 Type number	機種 Description	型式 Type number
パワー MOSFET Power MOSFET	2SK2689-01MR	パワー MOSFET Power MOSFET	2SK3613-01
	2SK2690-01		2SK3644-01
	2SK2691-01R		2SK3645-01MR
	2SK2806-01		2SK3646-01L, S
	2SK2807-01L, S		2SK3647-01
	2SK2808-01MR		2SK3673-01MR
	2SK2809-01MR		2SK3674-01L, S
	2SK2890-01MR		2SK3675-01
	2SK2891-01		2SK3677-01MR
	2SK2892-01R		2SK3678-01
	2SK2893-01		2SK3679-01MR
	2SK2894-01R		2SK3690-01
	2SK2895-01		2SK3691-01MR
	2SK2896-01L, S		2SK3769-01MR
	2SK2897-01MR		2SK3770-01MR
	2SK2898-01		2SK3771-01MR
	2SK2899-01R		2SK3776-01
	2SK2900-01		2SK3777-01R
	2SK2901-01L, S		2SK3780-01
	2SK2902-01MR		2SK3781-01R
	2SK2903-01MR		2SK3788-01
	2SK2904-01		2SK3789-01R
	2SK2905-01R		2SK3870-01
	2SK2906-01		2SK3871-01MR
	2SK2907-01R		2SK3872-01L, S
	2SK3362-01		2SK3873-01
	2SK3363-01		2SK3874-01R
	2SK3364-01		2SK3875-01
	2SK3517-01		2SK3876-01R
	2SK3518-01MR		2SK3883-01
	2SK3529-01		2SK3884-01
	2SK3530-01MR		2SK3885-01
	2SK3531-01		2SK3913-01MR
	2SK3532-01MR		2SK3914-01
	2SK3533-01		2SK3915-01MR
	2SK3534-01MR		2SK3923-01
	2SK3549-01		2SK3924-01L, S
	2SK3550-01R		2SK3925-01
	2SK3586-01		2SK3926-01MR
	2SK3587-01MR		2SK3927-01L, S
	2SK3588-01L, S		2SK4005-01MR
	2SK3589-01		2SK4006-01L, S
	2SK3601-01		FMA18N25G
	2SK3605-01		

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