модуль, igbt, мост диодный Минск +375447584780

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Мы работаем только с юридическими лицами(организациями) и ИП и только по безналичному расчёту.

каталог, описание, технические, характеристики, datasheet, параметры, маркировка,габариты, фото

КАТАЛОГ МИНСК

модуль, igbt, модуль диодный

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PRODUCT SELECTOR GUIDE

IXYS

IGBT & Rectifier Modules

MAY 2007

Selector Guide incl.:

Product Overview Tables

Application Overview

Technology Overview

MiniPack 2 NEW

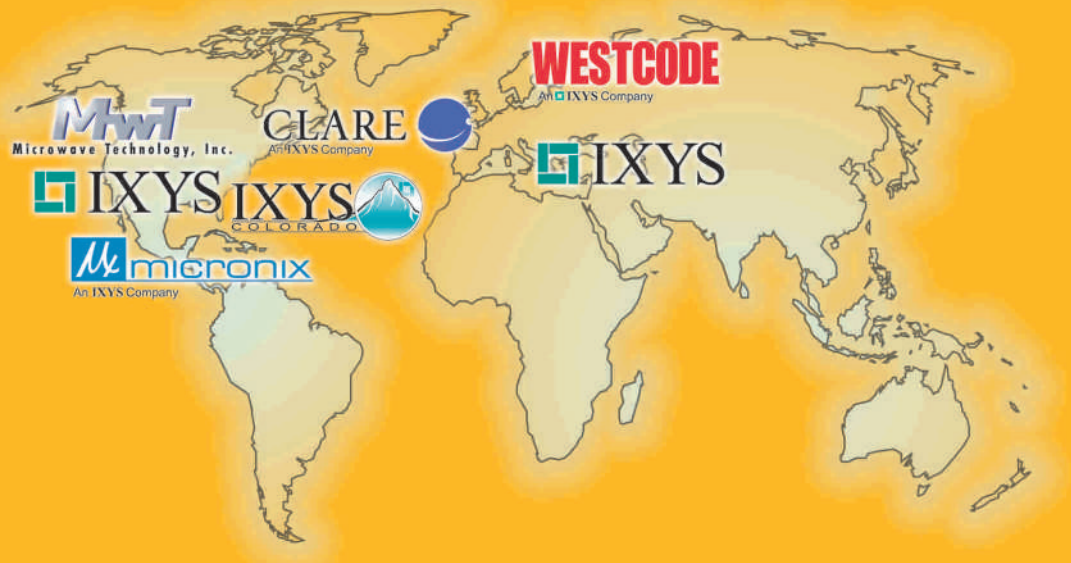
Press-Pack IGBTs

POWER DEVICES
- Power MOSFET Discreets
- RF Power MOSFETs
- IGBT Discreets
- >>> IGBT Modules
- Ultra Fast Rectifiers
- Silicon Schottky Rectifiers
- GaAs Schottky Rectifiers
- SCRs and Thyristors
- >>> Rectifier Bridges

ICS AND GATE DRIVERS
- MOSFET and IGBT Gate Drivers
- RF Power MOSFETs
- PWM Controllers

FUNCTIONAL SOLUTIONS
- PFC Modules
- Converter/Brake/Inverter Modules
- Boost & Buck Power Modules

WWW.IXYS.COM



IXYS Corporation is a global supplier of Power and Control Semiconductors with a wide range of Power MOSFETs, IGBTs, Bipolar products, GaAs RF devices, Mixed-Signal ICs, Modules and subsystem solutions that provide higher efficiency, reduced energy cost and improved performance in a wide range of power management and system applications. For over 20 years, IXYS has been at the forefront of Power Semiconductor and IC technologies having over 120 patents and innovations in the development of the IGBTs, High Current Power MOSFETs, Fast Recovery Diodes, BiMOSFETs, Reverse Blocking IGBTs, Gate Driver ICs, SOI technology, Opto-coupled ICs for telecommunication and VOIP, flat and flexible Display Driver ICs, Solar cells and GaAs RF PHEMT.

Since the beginning of the Internet boom, IXYS has been recognized as the leader in the Telecom and IT infrastructure Power Supply market with its family of »ruggedized« Power MOSFETs known as HiPerFETs™. IXYS also achieved a leadership position in the burgeoning Factory Automation market with its innovation in Direct Bond Copper (DCB) module technology and a family of industrial rated Power Semiconductors and Integrated Power Modules.

IXYS serves a variety of consumers and industries, including energy management and conservation, wind power, medical, automotive, transportation, military and aerospace, through an extensive product portfolio produced by its seven divisions. Headquartered in Santa Clara, California, IXYS is a public company trading on the **NASDAQ**. IXYS continually focuses on serving the global market through its divisions: IXYS Corp and IXYS Semiconductor GmbH for power products, Westcode for high power bipolar products, Clare and Micronix for Mixed Signal ICs and ASICs, MwT for GaAs RF products, and IXYS COLORADO for RF POWER systems and RF Silicon products.

To date, IXYS has substantially grown its business around its key strategic objective to become a more diversified supplier of medium to high power devices, mixed signal ICs, optoelectronic and RF semiconductors, keeping the emphasis on »power« as the company's strategic theme.

Contents

For further products see main catalog 2006/2007

Please note:

IXYS offers the broadest line of IGBT technology, including our PT line of IGBT's that we introduced in 1986, which we improved on.

Please refer to factory for your special requirement of our Fast PT IGBT based products.

Sales Representatives and Distributors: See „Sales Offices" at

www.ixys.com

IGBT & Rectifier Modules Catalog, Edition 2007

Note

As far as patents or other rights of third parties are concerned, liability is only assumed for components per se, not for applications, processes and circuits implemented with components or assemblies. The information describes the type of component and shall not be considered as assured characteristics. Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. Terms of delivery and rights to change design or specifications are reserved. Changes have been made to earlier published specifications. The data herein supersedes all previously published informations.

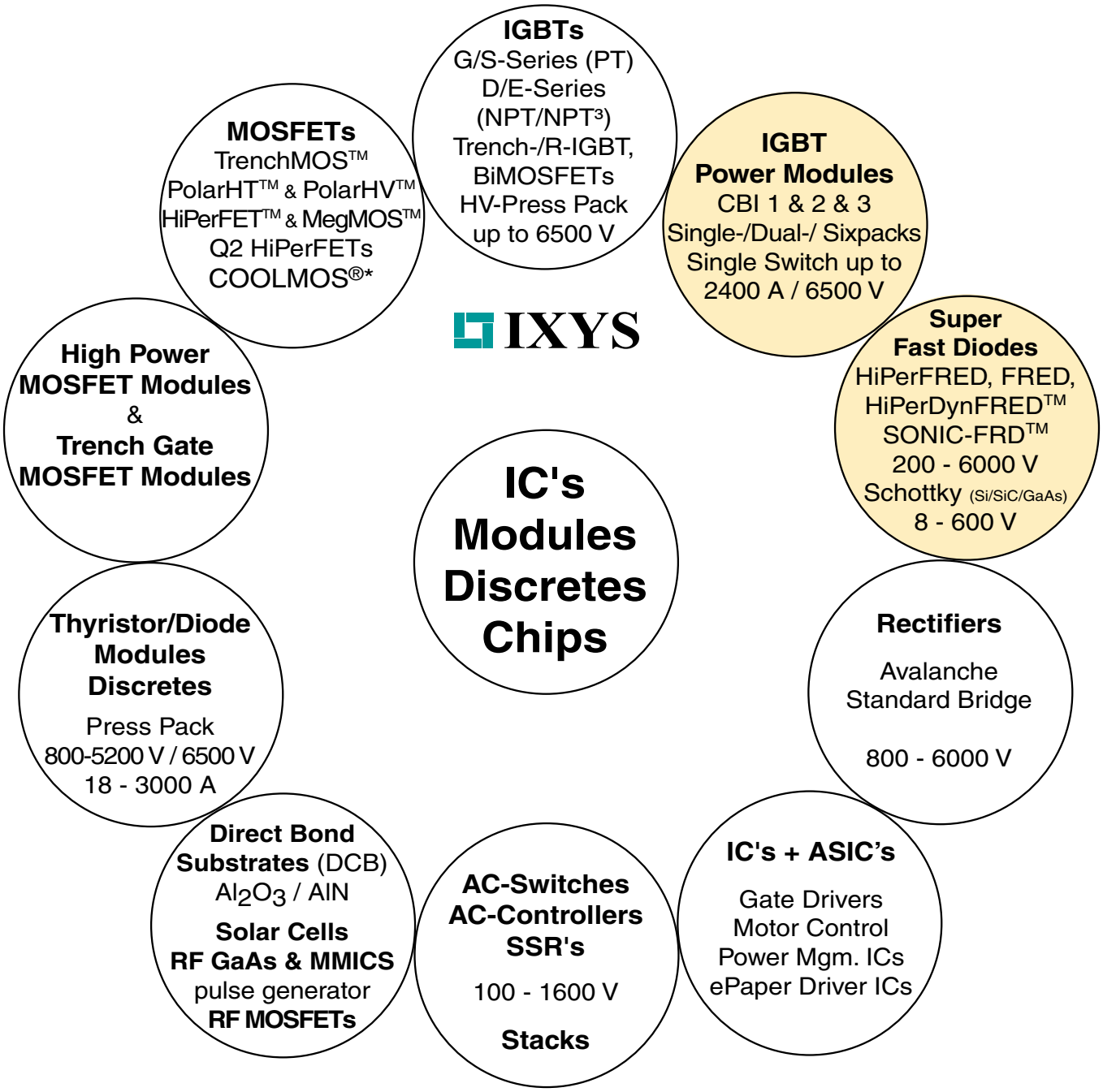
Life support applications

IXYS products used in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury must be expressly authorized for such purposes.

QA and Environmental Management Systems

		Certificates
IXYS Corporation	ISO 9001:2000	
IXYS Semiconductor GmbH	ISO/TS 16949:2002 (includes ISO 9001:2000) ISO 14001:2004	 
CLARE	ISO 9001:2000	
micronix	ISO 9001:2000	
WESTCODE	BS EN 9001:2000	 
MwT MicroWave Technology	ISO 9001:2000	

IXYS Product Portfolio



* COOLMOS is a trademark of Infineon Technologies AG.

Symbols and Terms

(-)di/dt	Rate of change of current
E_{off}	Turn-off energy per pulse
E_{on}	Turn-on energy per pulse
I_C	Collector current
I_{CES}	Leakage current
I_{GES}	Gate - emitter leakage current
I_{C25}	Continuous DC collector current at T_C = 25°C
I_{C90}	Continuous DC collector current at T_C = 90°C
I_{CM}	Maximum pulsed collector current in on state
I_{DAV}	Average DC output current (rectifier output)
$I_{D(AV)M}$	Maximum average DC output current
I_F	Forward current (diode)
I_{FAV}	Average forward current
I_{FSM}	Maximum surge forward current
I_{RM}	Maximum reverse recovery current
I^2t	I^2t value for fusing
NTC	Thermistor
Q_r	Reverse recovery charge
r_T , R_0	Slope resistance (for power loss calculation)
R_{thJC}	Thermal resistance junction to case
R_{thJK}; R_{thJH}	Thermal resistance junction to heatsink
T_C	Case temperature
T_{Jmax}, T_{VJM}	Maximum virtual junction temperature
t_{rr}	Reverse recovery time
$V_{CE(sat)}$	Collector emitter saturation voltage
V_{CES}	Collector emitter voltage
V_{RRM}	Maximum repetitive reverse voltage
V_{T0} , V_0	Threshold voltage (for power loss calculation)
$V_{GE(th)}$	Threshold voltage

Nomenclature

IGBT Modules

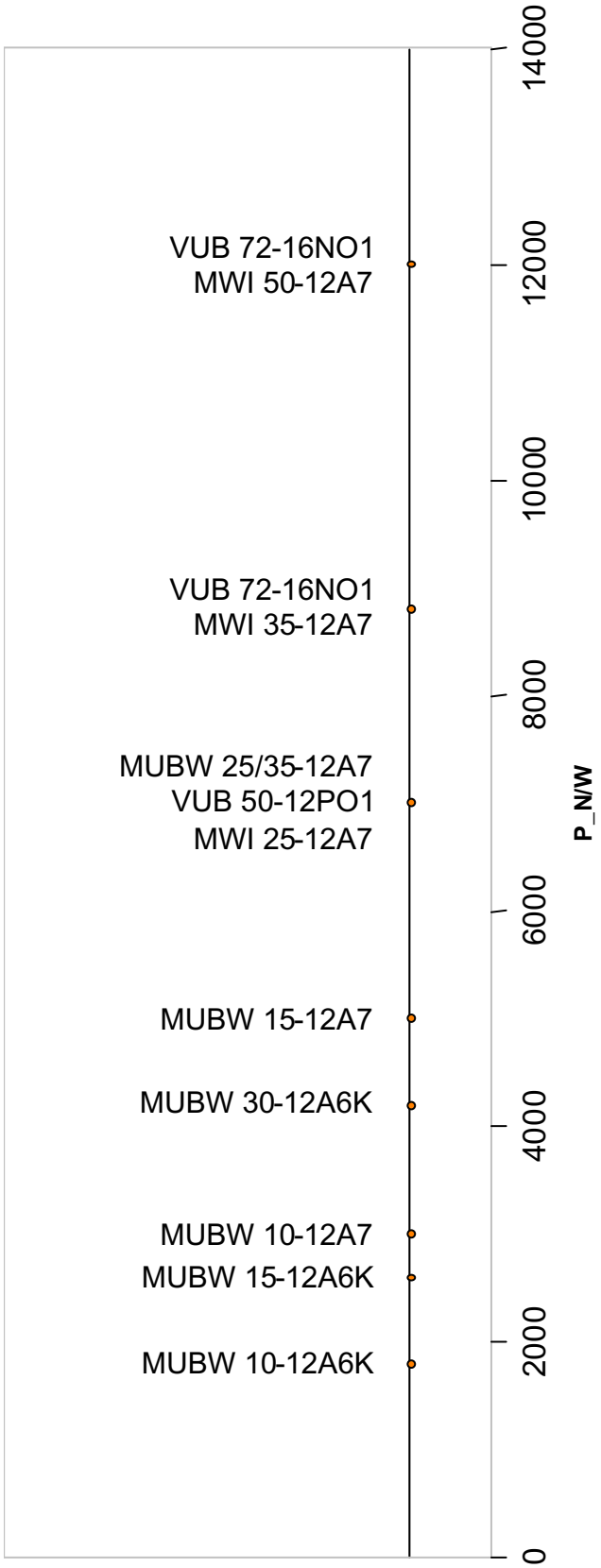
M	W	I	100	-12	T	8	T	(Example)
F								ISOPLUS-I4
M								Module
V								Module
	C							Thyristor
	D							Diode
	I							IGBT with SCSOA capability
	M							MOSFET
	W							Three phase bridge
	U							Uncontrolled 3 phase input rectifier
		C						Thyristor
		D						Diode
		I						IGBT with SCSOA capability
		K						Common cathode
		M						MOSFET
		O						No meaning. Reserved for future function
		BW						Brake chopper and IGBT sixpack
			100					Current rating 100 = 100 A
				-12				Voltage class, 12 = 1200 V
					A			NPT IGBT
					E			NPT³ IGBT
					F			Fast NPT IGBT
					G			PT IGBT
					T			Trench IGBT
						6K		E1 Package
						7		E2 Package
						8		E3 Package
						9		E+ Package
						10		High Power Module
						11		High Power Module with enlarged clearance and creepage distance
							T	NTC temperature sensor

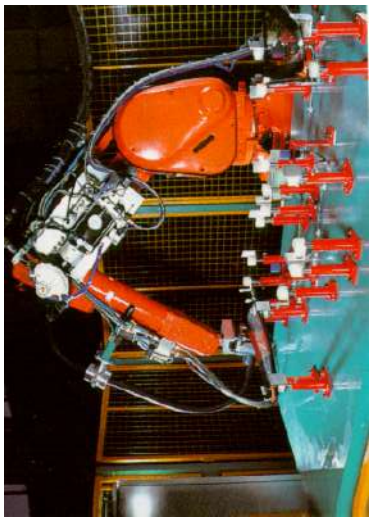
New nomenclature

M	I	AA	10	WB	600	T	MH	Example
M								Module
	I							IGBT
		AA						NPT
		TA						Trench standard version
		TB						Trench fast version
			10					Current
				W				Six-Pack
				WB				Six-Pack with 3~ bridge and brake
				WD				Six-Pack with 1~ bridge
				WE				Six-Pack with 1~ bridge and brake
				WF				Six-Pack with 3~ bridge
					600			Voltage
						T		NTC inside
							MH	MiniPack 2 housing

CBI-Modules 1200 V

Estimation of typ. nom. power of the drive connection to 230/400 V 3~





Product Overview

Sixpack Modules

I_{C80} [A]	NPT	NPT³	SPT+	Trench IGBT	PT IGBT	Package
➢ New			600 V			
41					MWI 60 - 06 G6K	E1
30	MWI 30 - 06 A7(T)					
50	MWI 50 - 06 A7(T)					E2
60	MWI 75 - 06 A7(T)					
88	MWI 100 - 06 A8 (T)					
115	MWI 150 - 06 A8 (T)					E3
155	MWI 200 - 06 A8 (T)					
			1200 V			
13	MWI 15 - 12 A6K					
21		➢ MWI 30 - 12 E6K				
31				MWI 45 - 12 T6K		E1
36		➢ MWI 50 - 12 E6K				
41				MWI 60 - 12 T6K		
56				MWI 80 - 12 T6K		
20	MWI 15 - 12 A7					
35	MWI 25 - 12 A7(T)	MWI 25 - 12 E7				
44	MWI 35 - 12 A7(T)					
50				MWI 50-12T7T*		E2
60	MWI 50 - 12 A7(T)					
62		MWI 50 - 12 E7				
75				MWI 75-12T7T*		
75				MWI 75-12T8T*		
85	MWI 75 - 12 A8 (T)					
90		MWI 75 - 12 E8				
100				MWI 100-12T8T*		E3
110	MWI 100 - 12 A8 (T)					
115		MWI 100 - 12 E8				
150				MWI 150-12T8T*		
250		➢ MWI 225 - 12 E9				
375		➢ MWI 300 - 12 E9				E9
440		➢ MWI 450 - 12 E9				
			1700 V			
235		➢ MWI 225 - 17 E9				
350		➢ MWI 300 - 17 E9				E9
440			➢ MWI 451 - 17 E9			

* different pin-out compared to NPT and NPT³ modules

Product Overview

CBI Modules

I_{C80} [A]	NPT	NPT³	Trench Standard	Trench Fast	Package
➢ New			600 V		
13 16 20 27	➢ MIAA10WB600TMH ➢ MIAA15WB600TMH ➢ MIAA20WB600TMH ➢ MIAA30WB600TMH				MiniPack2
8 14 17 21 29	MUBW 10 - 06 A6K MUBW 15 - 06 A6K MUBW 20 - 06 A6K MUBW 25 - 06 A6K MUBW 35 - 06 A6K				E1
15 18 25 35 50	MUBW 10 - 06 A7 MUBW 15 - 06 A7 MUBW 20 - 06 A7 MUBW 30 - 06 A7 MUBW 50 - 06 A7				E2
50 65 85	MUBW 50 - 06 A8 MUBW 75 - 06 A8 MUBW 100 - 06 A8				E3
			1200 V		
11 17			➢ MITA10WB1200TMH ➢ MITA15WB1200TMH	➢ MITB10WB1200TMH ➢ MITB15WB1200TMH	MiniPack2
13 21 32	MUBW 15 - 12 A6K MUBW 30 - 12 A6K	➢ MUBW 30 - 12 E6K	➢ MUBW 45 - 12 T6K		E1
15 25 35 35 40	MUBW 10 - 12 A7 MUBW 15 - 12 A7 MUBW 25 - 12 A7 MUBW 35 - 12 A7	MUBW 35 - 12 E7	➢ MUBW 15-12T7 ➢ MUBW 25-12T7	➢ MUBW 40-12T7	E2
35 50 60 75	MUBW 35 - 12 A8 MUBW 50 - 12 A8	MUBW 50 - 12 E8	➢ MUBW 50 - 12 T8 ➢ MUBW 75 - 12 T8		E3
			1700 V		
53 80			MUBW 50 - 17 T8 MUBW 80 - 17 T8		E 3

Full Bridge Modules (Four Pack)

I_{C80} [A]	NPT	Fast NPT	NPT³	Trench Standard	Package
			600 V		
67				MWI 80 - 06 T6K	E1
45 67 85	MKI 50 - 06 A7(T) MKI 65 - 06 A7 (T) MKI 75 - 06 A7				E2
			1200 V		
45 62		MKI 50 - 12 F7	MKI 50 - 12 E7		E2
85 90 115		MKI 100 - 12 F8	MKI 75 - 12 E8 MKI 100 - 12 E8		E3

Insulated Gate Bipolar Transistor (IGBT) Modules

The IGBT is a combination of bipolar and MOS technologies. The best features of bipolar transistors are merged with the voltage-controlled properties of MOSFETs.

Advantages to the user:
- rugged, short-circuit-proof device (S-series, D-series and E-series)
- operation without protective snubber networks possible
- frequency range to well above 100 kHz
- low switching losses
- compact equipment design
- high efficiency

The IGBT is suitable for numerous applications in power electronics, especially in Pulse Width Modulated servo and three-phase drives requiring high dynamic range control and low noise. It also can be used in Uninterruptible Power Supplies (UPS), Switch Mode Power Supplies (SMPS), and other power circuits requiring high switch repetition rates. IGBTs improve dynamic performance and efficiency and reduce the level of audible noise. IGBTs are equally suitable in resonant converter circuits. Optimized IGBTs are available for both low conduction loss and low switching loss. See table 1 and 2.

Discrete standard „G“ series IGBTs are characterized by a high control gain, which limits their short-circuit withstand time. Newer „S“, „D“ and „E“ series products utilize newly developed IGBT chips capable of withstanding up to 10 ms in short-circuit, even with a 15 V gate drive.
A switch is only as good as its companion free-wheeling diode. For this reason, all IGBTs with integrated diodes incorporate ultra-fast-recovery epitaxial diodes (FREDs) with very low reverse recovery charge (Q_{rr}). These same diodes are also available as separate elements for use in IGBT circuits or any other application requiring high diode switching speeds.
The IGBT modules use **D**irect **C**opper **B**onded (DCB) substrates, which consist of an aluminium oxide (Al_2O_3) insulator to which copper is directly bonded using the latest techniques developed by IXYS.

Chip Type	Low V_{CEsat}	Low Switching Losses	R_{thJC}	Short Circuit Rated	Optimized Operation Frequency
Low loss NPT	-	-	++	yes	up to 20 kHz
Fast NPT	- -	++	++	yes	up to 30 kHz
NPT³	o	+	++	yes	10 to 20 kHz
Standard Trench	++	o	+	yes	up to 8 kHz
Fast Trench	++	+	+	yes	up to 12 kHz
PT IGBT	-	+++	++	no/yes	up to 50 kHz
PT IGBT LV*	+++	++++	++	no	up to 200 kHz

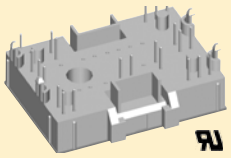
IGBT Modules

PT IGBT	punch through IGBT, very low switching losses, someone short circuit rated
PT IGBT LV*	punch through IGBT 250 - 300 V, very fast, low V_{SAT} up to 200 kHz switching, *for new products consult factory*
NPT IGBT	non-punch through insulated gate bipolar transistor; square RBSOA, short circuit rated
NPT³ IGBT	improved NPT IGBT • reduced Vcesat • reduced switching losses • optimized for switching frequencies from 10 kHz up to 25 kHz
Trench IGBT	improved NPT IGBT • very low Vcesat • reduced switching losses • optimized for switching frequencies up to 10 kHz
SPT+	soft punch through IGBT, improved NPT³ IGBT

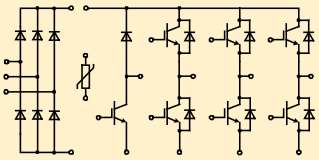
CBI Modules

CBI = Converter Brake Inverter
Rectifier, IGBT brake chopper, three phase IGBT inverter, temperature sensor
* PT IGBT (LV 250 V, 300 V, 600 V) are available too, *consult factory*

CBI

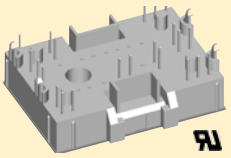


X110 MiniPack2
Package style
Outline drawings on pages O-1...O-3
See data sheet for pin arrangement

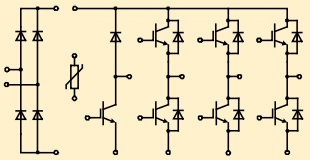


Type	Rectifier 3~			Inverter 3~					Brake chopper		
	V_{RRM} V	I_{DAVM} T_H = 80°C A	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 25°C A	I_C T_C = 80°C A	$V_{CE(sat)}$ typ. V	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 80°C A	R_{thJC} typ. K/W
600 V NPT IGBT											
MIAA10WB600TMH	1600	62	2.1	600	18	13	2.1	1.8	600	13	1.8
MIAA10WF600TMH		62	2.1		18	13	2.1	1.8	no brake chopper included		
MIAA15WB600TMH		62	2.1		23	16	2.1	1.6	600	16	1.6
MIAA20WB600TMH		62	2.1		29	20	2.1	1.3		20	1.3
600 V Trench IGBT											
MITA30WB600TMH	1600	90	1.4	600	40	27	1.5	1.4	600	27	1.4
1200 V Trench IGBT											
MITA10WB1200TMH	1600	62	2.1	1200	17	12	1.8	1.9	1200	12	1.9
MITA15WB1200TMH		62	2.1		30	21	1.8	1.1		21	1.1
MITB10WB1200TMH		62	2.1		17	12	1.9	1.85		12	1.85
MITB15WB1200TMH		62	2.1		29	20	1.7	1.2		17	1.6

CBI



X110 MiniPack2
Package style
Outline drawings on pages O-1...O-3
See data sheet for pin arrangement



Type	Rectifier			Inverter					Brake chopper		
	V_{RRM} V	I_{DAVM} T_H = 80°C A	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 25°C A	I_C T_C = 80°C A	$V_{CE(sat)}$ typ. V	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 80°C A	R_{thJC} typ. K/W
600 V NPT IGBT											
MIAA10WE600TMH	1600	23	2.1	600	18	13	2.1	1.8	600	13	1.8
MIAA10WD600TMH		23	2.1		18	13	2.1	1.8	no brake chopper included		
MIAA15WE600TMH		23	2.1		23	16	2.1	1.6	600	16	1.6
MIAA15WD600TMH		23	2.1		23	16	2.1	1.6	no brake chopper included		
MIAA20WE600TMH		23	2.1		29	20	2.1	1.3	600	20	1.3
MIAA20WD600TMH		23	2.1		29	20	2.1	1.3	no brake chopper included		

Mechanical mounting part

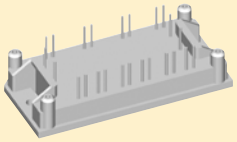
IXKU 5-505

CBI Modules

CBI = Converter Brake Inverter
Rectifier, IGBT brake chopper, three phase IGBT inverter, temperature sensor

CBI 1

IGBT Modules

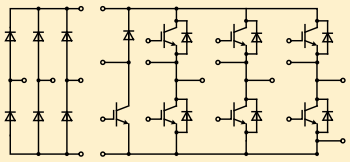


X111 E1-pack

Package style

Outline drawings on pages O-1...O-3

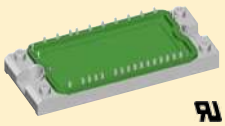
See data sheet for pin arrangement



Type	Rectifier 3~			Inverter 3~					Brake chopper		
	V_{RRM} V	I_{DAVM} T_H = 80°C A	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 25°C A	I_C T_C = 80°C A	$V_{CE(sat)}$ typ. V	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 80°C A	R_{thJC} typ. K/W
600 V NPT IGBT											
MUBW 10-06A6K		61	2.1		12	8	2.5	2.8		8	2.8
MUBW 15-06A6K		65	1.9		19	14	2.4	1.7		8	2.8
MUBW 20-06A6K	1600	65	1.9	600	25	17	2	1.5	600	8	2.8
MUBW 25-06A6K		65	1.9		31	21	2.1	1.25		14	1.7
MUBW 35-06A6K		89	1.4		42	29	2.3	0.95		17	1.5
1200 V NPT IGBT											
MUBW 15-12A6K	1600	89	1.4	1200	19	13	3	1.35	1200	13	1.35
MUBW 30-12A6K		89	1.4		30	21	3	0.95		13	1.35
1200 V NPT³ IGBT											
MUBW 30-12E6K	1600	89	1.4	1200	30	21	3.1	0.95	1200	13	1.35
1200 V Trench IGBT											
MUBW 45-12T6K	1600	104	1.1	1200	43	31	2.5	0.8	1200	13	1.35

CBI 2

IGBT Modules

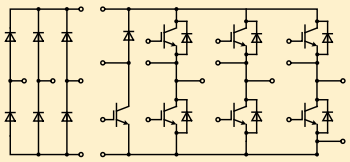


X112 E2-pack

Package style

Outline drawings on pages O-1...O-3

See data sheet for pin arrangement



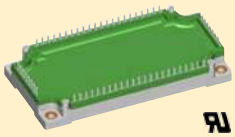
Type	Rectifier 3~			Inverter 3~					Brake chopper		
	V_{RRM} V	I_{DAVM} T_H = 80°C A	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 25°C A	I_C T_C = 80°C A	$V_{CE(sat)}$ typ. V	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 80°C A	R_{thJC} typ. K/W
600 V NPT IGBT											
MUBW 10-06A7		18	1.5		20	15	1.9	1.5		15	1.5
MUBW 15-06A7		18	1.5		25	18	1.9	1.3		15	1.5
MUBW 20-06A7	1600	24	1.3	600	35	25	1.9	1	600	18	1.4
MUBW 30-06A7		24	1.3		50	35	1.9	0.7		18	1.3
MUBW 50-06A7		29	1.1		75	50	1.9	0.5		25	1
1200 V NPT IGBT											
MUBW 10-12A7		18	1.5		20	15	2.3	1.2		15	1.2
MUBW 15-12A7	1600	24	1.3	1200	35	25	2	0.7	1200	15	1.2
MUBW 25-12A7		24	1.3		50	35	2.2	0.55		15	1.2
MUBW 35-12A7		29	1.1		50	35	2.5	0.55		25	0.7
1200 V NPT³ IGBT											
MUBW 35-12E7	1600	29	1.1	1200	52	36	2.2	0.55	1200	25	0.7
1200 V Trench IGBT											
MUBW15-12T7		24	1.3		25	15	1.7	1.2		15	1.2
MUBW25-12T7	1600	24	1.3	1200	40	25	1.7	0.8	1200	15	1.2
MUBW40-12T7		80	1.3		62	44	2.0	0.8		25	0.7

CBI Modules

CBI = Converter Brake Inverter
Rectifier, IGBT brake chopper, three phase IGBT inverter, temperature sensor

CBI 3

IGBT Modules

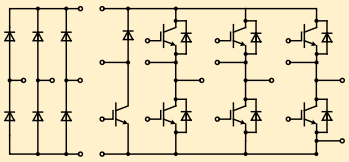


X113 E3-pack

Package style

Outline drawings on pages O-1...O-3

See data sheet for pin arrangement



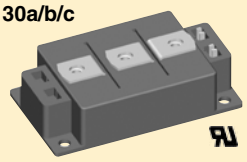
Type	Rectifier 3~			Inverter 3~					Brake chopper		
	V_{RRM} V	I_{DAVM} T_H = 80°C A	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 25°C A	I_C T_C = 80°C A	$V_{CE(sat)}$ typ. V	R_{thJC} typ. K/W	V_{CES} V	I_C T_C = 80°C A	R_{thJC} typ. K/W
600 V NPT IGBT											
MUBW 50-06A8		40	1.1		75	50	1.9	0.5		25	1
MUBW 75-06A8	1600	46	0.94	600	100	65	2	0.39	600	35	0.75
MUBW 100-06A8		60	0.73		125	85	1.9	0.3		50	0.55
1200 V NPT IGBT											
MUBW 35-12A8	1600	27	1.3	1200	50	35	2.5	0.55	1200	25	0.7
MUBW 50-12A8		46	0.94		85	60	2.2	0.35		35	0.55
1200 V NPT³ IGBT											
MUBW 50-12E8	1600	50	0.94	1200	90	62	1.9	0.35	1200	35	0.55
1200 V Trench IGBT											
MUBW 50-12T8	1600	50	0.94	1200	75	50	1.7	0.45	1200	35	0.55
MUBW 75-12T8		50	0.94		105	75	1.7	0.35		35	0.55
1700 V Trench IGBT											
MUBW 50-17T8	2200	120	1.1	1700	74	53	2.0	0.43	1700	34	0.62
MUBW 75-17T8		140	0.95		113	80	2.0	0.48		34	0.62

Phase-Leg Modules

NPT

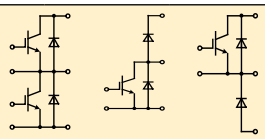
IGBT Modules

X130a/b/c



Outline drawings on pages O-1...O-3

See data sheet for pin arrangement



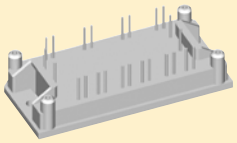
MII **MID** **MDI**

Type ➢ New	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)}$ typ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	Fig.
1200 V Half Bridge with 3rd generation NPT³									
➢ **MII 300-12E4**	1200	280	200	2.0	20	0.11	300	190	X130a
➢ **MII 400-12E4**		420	300	2.2	30	0.08	450	290	
1200 V Boost chopper with 3rd generation NPT³									
➢ **MID 400-12E4**	1200	420	300	2.2	30	0.08	450	290	X130b
1200 V Buck chopper with 3rd generation NPT³									
➢ **MDI 400-12E4**	1200	420	300	2.2	30	0.08	450	290	X130c

Sixpack configuration

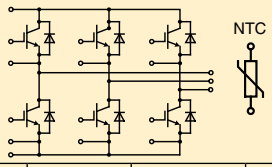
Sixpack

IGBT Modules



X111 E1-pack
Package style
Outline drawings on pages O-1...O-3

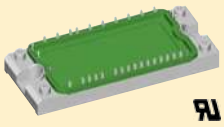
See data sheet for pin arrangement



Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
600 V PT IGBT									
MWI 60-06G6K	600	60	41	2.3	0.5	0.7	48	33	•
1200 V NPT IGBT									
MWI 15-12A6K	1200	19	13	3	1.1	1.37	24	16	•
1200 V NPT³ IGBT									
MWI 30-12E6K	1200	29	21	2.5	1.8	0.95	24	16	•
MWI 50-12E6K		51	36	2.4	2.6	0.6	49	32	•
1200 V Trench IGBT									
MWI 45-12T6K	1200	43	31	1.9	3.4	0.8	49	32	•
MWI 60-12T6K		58	41	1.9	4.8	0.62	49	32	•
MWI 80-12T6K		80	56	2	6.5	0.46	80	51	•

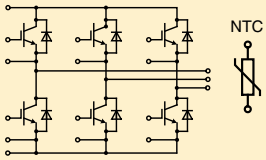
Sixpack

IGBT Modules



X112 E2-pack
Package style
Outline drawings on pages O-1...O-3

See data sheet for pin arrangement

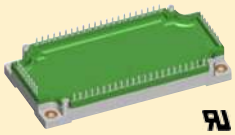


Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
600 V NPT IGBT									
MWI 30-06A7	600	45	30	1.9	1	0.88	36	24	
MWI 30-06A7T		45	30	1.9	1	0.88	36	24	•
MWI 50-06A7		75	50	1.9	1.7	0.55	72	45	
MWI 50-06A7T		75	50	1.9	1.7	0.55	72	45	•
MWI 75-06A7		90	60	2.1	2.5	0.44	140	85	
MWI 75-06A7T		90	60	2.1	2.5	0.44	140	85	•
1200 V NPT IGBT									
MWI 15-12A7	1200	30	20	1	1.8	0.88	25	17	
MWI 25-12A7		50	35	2.2	2.8	0.55	50	33	
MWI 25-12A7T		50	35	2.2	2.8	0.55	50	33	•
MWI 35-12A7		62	44	2.2	4.2	0.44	50	33	
MWI 35-12A7T		62	44	2.2	4.2	0.44	50	33	•
MWI 50-12A7		85	60	2.2	5.6	0.35	110	70	
MWI 50-12A7T		85	60	2.2	5.6	0.35	110	70	•
1200 V NPT³ IGBT									
MWI 25-12E7	1200	52	36	1.9	2.5	0.55	50	33	
MWI 50-12E7		90	62	2.1	4	0.35	110	70	
1200 V Trench IGBT									
MWI 50-12T7T	1200	75	50	1.7	6.5	0.49	110	70	•
MWI 75-12T7T		105	75	1.7	9.5	0.35	150	100	•

Sixpack configuration

Sixpack

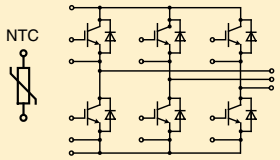
IGBT Modules



X113 E3-pack
Package style

Outline drawings on pages O-1...O-3

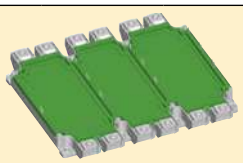
See data sheet for pin arrangement



Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
600 V NPT IGBT									
MWI 100-06A8	600	130	88	2	2.9	0.3	140	88	
MWI 100-06A8T		130	88	2	2.9	0.3	140	88	•
MWI 150-06A8		170	115	2	4.6	0.24	210	130	
MWI 150-06A8T		170	115	2	4.6	0.24	210	130	•
MWI 200-06A8		215	155	2	6.3	0.18	260	165	
MWI 200-06A8T		215	155	2	6.3	0.18	260	165	•
1200 V NPT IGBT									
MWI 75-12A8	1200	125	85	2.2	10.5	0.25	150	100	
MWI 75-12A8T		125	85	2.2	10.5	0.25	150	100	•
MWI 100-12A8		160	110	2.2	14.6	0.19	200	130	
MWI 100-12A8T		160	110	2.2	14.6	0.19	200	130	•
1200 V NPT³ IGBT									
MWI 75-12E8	1200	130	90	2	7.5	0.25	150	100	
MWI 100-12E8		165	115	2	10.0	0.19	200	130	
1200 V Trench IGBT									
MWI 75-12T8T	1200	100	75	1.7	9.5	0.35	150	100	•
MWI 100-12T8T		140	100	1.7	12.0	0.26	200	130	•
MWI 150-12T8T		200	150	1.7	17.0	0.18	tbd	tbd	•

Sixpack

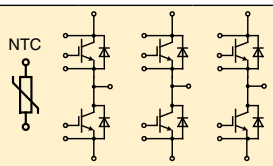
IGBT Modules



X114 E9-pack
Package style

Outline drawings on pages O-1...O-3

See data sheet for pin arrangement

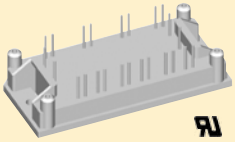


Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
1200 V NPT³ IGBT									
MWI 225-12E9	1200	355	250	2.1	20	0.09		205	•
MWI 300-12E9		530	375	2	30	0.06		300	•
MWI 450-12E9		640	440	2.2	45	0.057		450	•
1700 V NPT³ IGBT									
MWI 225-17E9	1700	335	235	2.5	54	0.085		200	•
MWI 300-17E9		500	350	2.3	80	0.057		290	•
1700 V SPT⁺ IGBT									
MWI 451-17E9	1700	580	475	2.25	90	0.057		450	•

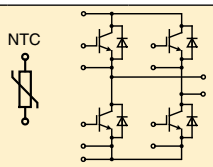
Full Bridge configuration

Full Bridge

IGBT Modules



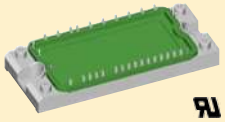
X111 E1-pack
Package style
Outline drawings on pages O-1...O-3
See data sheet for pin arrangement



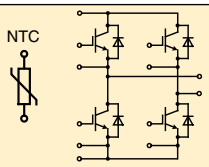
Type ➢ New	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
600 V Trench IGBT									
➢ **MKI 80-06T6K**	600	89	67	1.8	2.8	0.6	105	67	•

Full Bridge

IGBT Modules



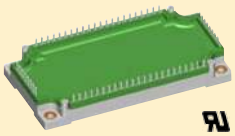
X112 E2-pack
Package style
Outline drawings on pages O-1...O-3
See data sheet for pin arrangement



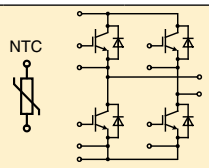
Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
600 V NPT IGBT									
MKI 50-06A7	600	72	50	1.9	1.7	0.55	72	45	
MKI 50-06A7T		72	50	1.9	1.7	0.55	72	45	•
➢ **MKI 65-06A7T**		100	67	2.0	2.3	0.39	140	85	•
MKI 75-06A7		90	60	2.5	6.3	0.44	140	85	
MKI 75-06A7T		90	60	2.5	6.3	0.44	140	85	•
1200 V Fast NPT IGBT									
MKI 50-12F7	1200	65	45	3.2	2.5	0.35	110	70	
1200 V NPT³ IGBT									
MKI 50-12E7	1200	90	62	1.9	4.0	0.35	110	70	

Full Bridge

IGBT Modules



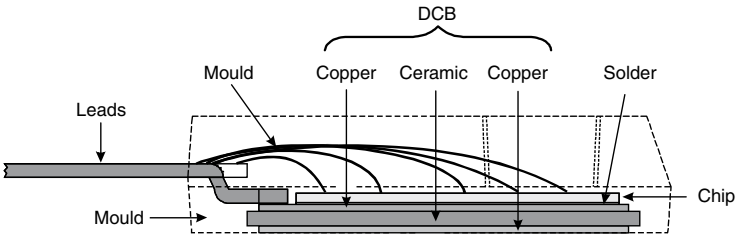
X113 E3-pack
Package style
Outline drawings on pages O-1...O-3
See data sheet for pin arrangement

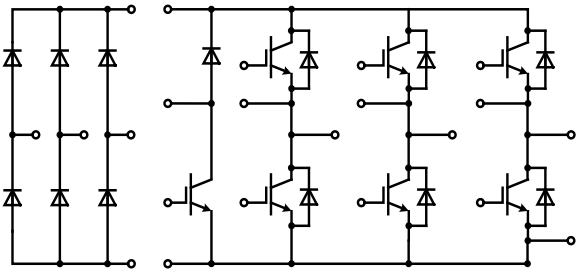


Type	V_{CES} V	I_{C25} A T_C = 25°C IGBT	I_{C80} A T_C = 80°C IGBT	$V_{CE(sat)\ typ}$ V T_J = 25°C IGBT	E_{off} mJ T_J = 125°C IGBT	R_{thJC} K/W IGBT	I_{F25} A T_C = 25°C diode	I_{F80} A T_C = 80°C diode	NTC
1200 V Fast NPT IGBT									
MKI 100-12F8	1200	65	45	3.2	2.5	0.35	110	70	
1200 V NPT³ IGBT									
MKI 75-12E8	1200	130	90	2.0	7.5	0.25	150	100	
MKI 100-12E8		150	115	2.0	10	0.19	200	130	

IXYS *ISOPLUS Technology*

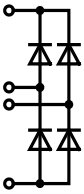
DCB base plate
- 2500 V electrical isolation
- low thermal resistance
- increased power & temperature cycling
- saves space
- replaces multiple discretes
- reduces parasitic inductance and capacitance
- reduces EMI
- heat spreading



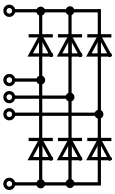


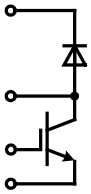
Rectifier Bridge | **Brake (Boost)** | **Converter (3x phaseleg)**

FBO 16-12N
FBO 40-12N

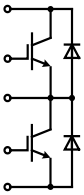


FUO 22-12N
FUO 22-16N
FUO 50-16N





FID 35-06C
FID 36-06D
FID 60-06D



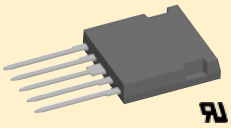
FII 30-06D
FII 40-06D
FII 30-12E
FII 50-12E

* PT IGBT LV available too
(*inquire factory*)

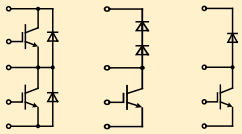
Building blocks for your ideal converter

ISOPLUS i4-PAC™

Package



X024a
Package style
Outline drawings on pages O-1...O-4



FII | **FID** HiPerDyn | **FID** HiPerFRED

Type	Configu-ration	Technology	V_{RRM} / V_{CES} V	I_{C25} @ 25°C A	$I_{D(AV)M}$ / I_{C80} @ 90°C A	$V_{CE(sat)}$ typ. T_C = 25°C V
FBO 16-12N	*1~*	Rectifier Bridge	1200		22	
FBO 40-12N					40	
FUO 22-12N	*3~*	Rectifier Bridge	1200		27	
FUO 22-16N			1600		27	
FUO 50-16N			1600		50	
FID 35-06C	*boost*	NPT IGBT & HiPerDynFRED	600	38	24	1.9
FID 36-06D		NPT IGBT & HiPerFRED		38	24	1.9
FID 60-06D		NPT IGBT & HiPerFRED		65	40	1.6
FII 30-06D	*phaseleg*	NPT IGBT	600	30	18	1.9
FII 40-06D		NPT IGBT	600	40	25	1.8
FII 30-12E		NPT³ IGBT	1200	32	20	2.4
FII 50-12E		NPT³ IGBT	1200	50	32	2.0

Thyristor / Diode Modules

One of the essential advantages of power semiconductor modules compared to discrete designs is the electrical isolation between the baseplate of the module and the parts subject to voltage (3.6 kV_{RMS} tested). This makes possible the mount-down of any number of the same or different modules on a common heatsink. It is feasible to use standard housings with appropriate accessories for designing compact power converter operating from AC mains up to 690 V.

Plastic Housing with DCB Substrate

IXYS has succeeded in simplifying the conventional multilayer module construction by the DCB (Direct Copper Bonding) technique.

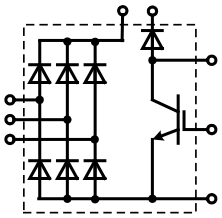
Other features are:

- top-side electrical terminals with captured nuts;
- series-connected diode/diode, thyristor/diode and thyristor/thyristor modules;
- easy assembly.

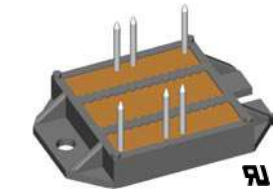
All thyristor modules with DCB ceramic base contacts are available in volume with two standardized twin plugs (2.8 mm x 0.8 mm) for gate and auxiliary cathode control terminals (version 1). Modules in TO-240 housing of the version 8 are delivered with gate plugs only (without auxiliary cathode terminal; mounting srews available on request). The module housing is designed for adequate clearance and creepage distance resulting in recognition by Underwriters Laboratories, Inc., USA for all types.

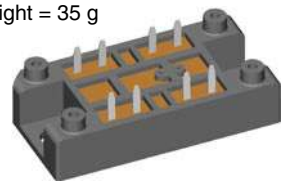
3~ Rectifier Bridges

with IGBT and Diode for Brake Unit



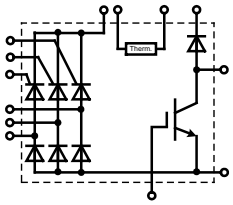
Type	Rectifier V_{RRM} V	Rectifier I_{dAV} @ T_C A	Rectifier I_{dAV} @ T_C °C	IGBT V_{CES} V	IGBT I_{C80} A	fast Diode V_{RRM} V	fast Diode $I_{F(AV)}$ A	fast Diode t_{rr} ns	Fig. No.	Package style Outline drawings on pages O-1...O-3
VUB 50-12PO1	1200	56	100	1200	14	1200	10	110	X102	**X102 ECO-PAC 2** Weight = 24 g See data sheet for pin arrangement
VUB 50-16PO1	1600									
VUB 72-12NO1	1200	110	80	1200	35	1200	15	130	X103	
VUB 72-16NO1	1600									
VUB 116-16NO1	1600	116	100	1200	67	1200	27	40	X112	
VUB 120-12NO2	1200	188	80	1200	100	1200	32	40	X104	
VUB 120-16NO2	1600									
VUB 135-16NO1	2200	135	100	1700	50	1800	50	40	X112	**X103 V1-Package** Weight = 35 g
VUB 145-16NO1	1600	145	100	1200	100	1200	27	40		
VUB 160-12NO2	1200	188	80	1200	125	1200	34	40	X104	
VUB 160-16NO2	1600									



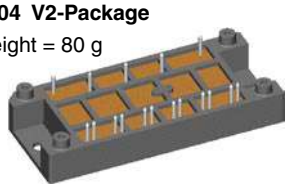


3~ Half Controlled Rectifier Bridges

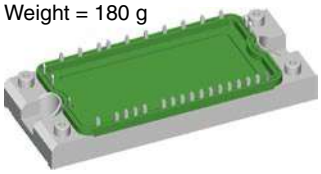
with IGBT and Diode for Brake Unit



X104 V2-Package
Weight = 80 g

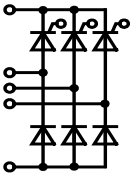


X112 V2-Package
Weight = 180 g



VVZB 120-12io1	1200	120	80	1200	100	1200	27	40	X104
VVZB 120-16io1	1600								
VVZB 135-16NO1	1600	135	85		67				X112
VVZB 170-16NO1		170			100				

3~ Rectifier Bridges



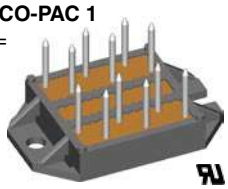
3~ Half Controlled Rectifier Bridges, B6HK

Type	V_{RRM} V	V_{vRMS} V	I_{dAV} T_H = 100°C A	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thJH} per Chip K/W	Fig. No.
VVZ 12-12io1	1200	400	15	110	1.1	30	125	2.5	3.1	X106a
VVZ 12-14io1	1400	440								
VVZ 12-16io1	1600	500								
VVZ 24-12io1	1200	400	21	300	1	16	125	2.1	2.7	
VVZ 24-14io1	1400	440								
VVZ 24-16io1	1600	500								
VVZ 39-08ho7	800	250	39 T_C = 85°C	200	0.85	27	125	1.3	1.8	X101
VVZ 39-12ho7	1200	400								
VVZ 40-12io1	1200	400	34	320	0.85	15	125	1.0	1.6	X106a
VVZ 40-14io1	1400	440								
VVZ 40-16io1	1600	500								
VVZ 70-08io7	800	250	70 T_C = 85°C	550	0.85	11	125	0.9	1.1	X118c
VVZ 70-12io7	1200	400								
VVZ 70-14io7	1400	440								
VVZ 70-16io7	1600	500								
VVZ 110-12io7	1200	400	110 T_C = 85°C	1150	0.85	6	125	0.65	0.8	X123b
VVZ 110-14io7	1400	440								
VVZ 175-12io7	1200	400	167 T_C = 85°C	1500	0.85	3.5	125	0.46	0.55	
VVZ 175-14io7	1400	440								
VVZ 175-16io7	1600	500								

Package style

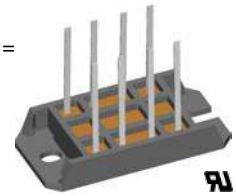
Outline drawings on pages O-5...O-17

X101 ECO-PAC 1
Weight = 19 g

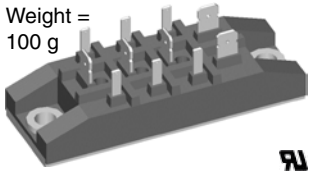


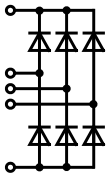
See data sheet for pin arrangement

X106a
Weight = 28 g



X118c
Weight = 100 g





X123b
Weight = 300 g

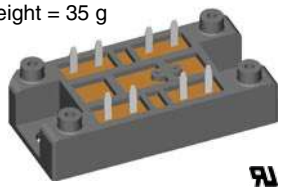
3~ Rectifier Bridges, B6U

Type	V_{RRM} V	V_{vRMS} V	I_{dAV} A	T_C °C	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thJH} per Chip K/W	Fig. No.
VUO 16-08NO1	800	250	15	T_H = 90°C	100	0.8	50	130	-	4.5	X103
VUO 16-12NO1	1200	400									
VUO 16-14NO1	1400	440									
VUO 16-16NO1	1600	500									
VUO 16-18NO1	1800	575									
FUO 22-12N	1200	400	27	90	100	0.83	28	150	4	5	X024a
FUO 22-16N	1600	500									
VUO 22-08NO1	800	250	22	T_H = 90°C	100	0.8	40	130	-	3.1	X103
VUO 22-12NO1	1200	400									
VUO 22-14NO1	1400	440									
VUO 22-16NO1	1600	500									
VUO 22-18NO1	1800	575									
VUO 34-08NO1	800	250	36		300	0.8	15	130	-	2.5	X103
VUO 34-14NO1	1400	440									
VUO 34-16NO1	1600	500									
VUO 34-18NO1	1800	575									
FUO 50-16N	1600	500	50	90	200 25°C	tbd	tbd	150	2.1	3.2	X024a

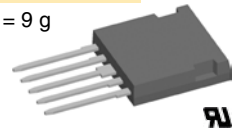
Package style

Outline drawings on pages O-5...O-17

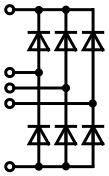
X103 V1-Package
Weight = 35 g



X024a V1-Package
ISOPLUS i4-PAC™
Weight = 9 g



3~ Rectifier Bridges, B6U

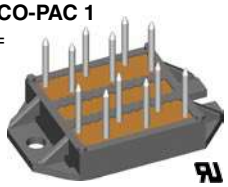


Type	V_{RRM} V	V_{vRMS} V	I_{dAV} A	T_C °C	I_{FSM} 45°C 10 ms A	V_{T0} V	r_T mΩ	T_{VJM} °C	R_{thJC} per Chip K/W	R_{thJH} per Chip K/W	Fig. No.
VUO 52-08NO1	800	250	54	T_H = 90°C	350	0.8	12.5	130	-	1.5	X103
VUO 52-12NO1	1200	400									
VUO 52-14NO1	1400	440									
VUO 52-16NO1	1600	500									
VUO 52-18NO1	1600	500									
VUO 52-20NO1	1800	575									
VUO 68-08NO7	800	250	68	100	300	0.8	13	150	1.1	1.6	X101
VUO 68-12NO7	1200	400									
VUO 68-14NO7	1400	440									
VUO 68-16NO7	1600	500									
VUO 80-08NO1	800	250	82	T_H = 90°C	600	0.8	7.5	150	-	1.42	X103
VUO 80-12NO1	1200	400									
VUO 80-14NO1	1400	440									
VUO 80-16NO1	1600	500									
VUO 80-18NO1	1800	575									
VUO 86-08NO7	600	125	86	90	530	0.8	7.5	150	1.2	1.5	X101
VUO 86-12NO7	1200	400									
VUO 86-14NO7	1400	440									
VUO 86-16NO7	1600	500									
VUO 98-08NO7	800	250	95	85	750	0.8	6	150	1.2	1.5	X102
VUO 98-12NO7	1200	400									
VUO 98-14NO7	1400	440									
VUO 98-16NO7	1600	500									
VUO 100-08NO7	800	250	100	100	1000	0.8	5	150	1.12	1.5	X118d
VUO 100-12NO7	1200	400									
VUO 100-14NO7	1400	440									
VUO 100-16NO7	1600	500									
VUO 120-12NO1	1200	1200	121	75	650	0.8	6.1	150	1	1.3	X104
VUO 120-16NO1	1600	1600									
VUO 121-16NO1	1600	575	118	100	650	0.8	5	150	0.8	0.9	X112
VUO 122-08NO7	800	250	117	100	900	0.8	4	150	0.85	1.15	X102
VUO 122-12NO7	1200	400									
VUO 122-14NO7	1400	440									
VUO 122-16NO7	1600	500									
VUO 122-18NO7	1800	575									
VUO 155-12NO1	1200	1200	157	75	850	0.75	4.6	150	0.8	1.1	X104
VUO 155-16NO1	1600	1600									
VUO 160-08NO7	800	250	175	90	1800	0.8	3	150	0.65	0.83	X123a
VUO 160-12NO7	1200	400									
VUO 160-14NO7	1400	440									
VUO 160-16NO7	1600	500									
VUO 160-18NO7	1800	575									
VUO 190-08NO7	800	250	248	110	2800	0.8	2.2	150	0.45	0.6	X123c
VUO 190-12NO7	1200	400									
VUO 190-14NO7	1400	440									
VUO 190-16NO7	1600	500									
VUO 190-18NO7	1800	575									

Package style

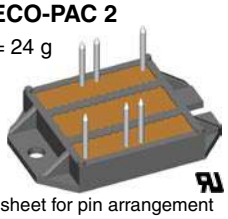
Outline drawings on pages O-1...O-4

X101 ECO-PAC 1
Weight = 19 g



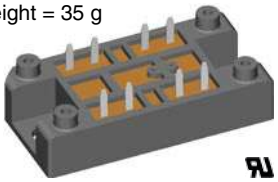
See data sheet for pin arrangement

X102 ECO-PAC 2
Weight = 24 g

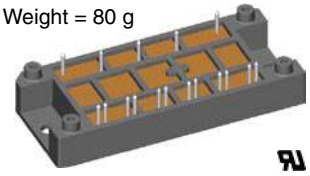


See data sheet for pin arrangement

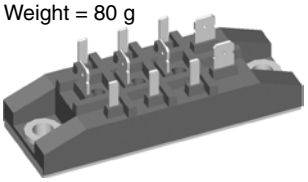
X103 V1-Package
Weight = 35 g



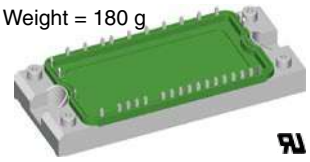
X104 V2-Package
Weight = 80 g



X118d
Weight = 80 g



X112
Weight = 180 g



X123a/c
Weight = 80 g

Product Overview

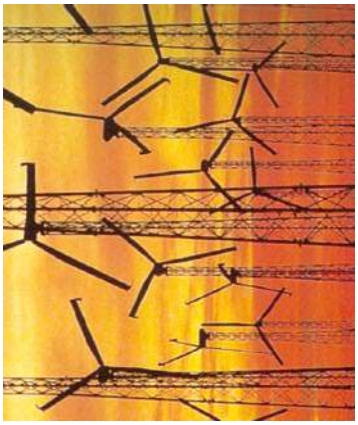
Press-Pack IGBTs (T Types) 1.7kV, 2.5kV, and 4.5kV 160A to 2500A

4.5kV	2.5kV	1.7kV	
		TX116TA17E	**2500A**
T2400GA45E			**2400A**
		TX115TA16A	**1900A**
T1800GA45A			**1800A**
T1500EA45E	T1500TA25E		**1500A**
	T1200TA25A		**1200A**
T0900EA45A			**900A**
T0800TA45A		TX167NA17E	**800A**
T0600TA45A		TX168NA17A	**600A**
	T0500NA25E		**500A**
	T0360NA25A		**360A**
T0240NA45E			**240A**
T0160NA45A			**160A**

HSR-350X - Korean Rail

E10 Shunting Locomotive - Polish Rail

Induction Heating



Wind Power

Press-Pack IGBTs - 1.7kV, 2.5kV and 4.5kV

As a pioneer of Press-Pack IGBT technology, we are able to offer a range of class leading devices with voltage ratings of 2.5kV (1.25kV DC link), 4.5kV (2.8kV DC link) and 1.7kV.

The construction of these devices is totally free from wire and solder bonds which all but eliminates the problems of mechanical fatigue associated with conventional modules. Internal stray inductance in both the gate connections and emitter connections is vastly reduced when compared to conventional modules leading to improved ruggedness and short circuit behaviour, which is further enhanced by direct cooling of the emitter side of the chip. Double sided cooling allows full use of the nominal rated collector current without derating of voltage or frequency.

Devices are available with or without integral anti-parallel diode – a range of complementary HP Sonic-FRDs™ optimised for use with these IGBTs are outlined below.

The press pack construction offers several advantages over conventional IGBT modules:

- exceptional power cycling performance – typically an order of magnitude better than modules – making them highly suited to applications such as transportation and induction heating where there are repeated cyclic power demands.
- high rupture ratings making them a good choice in critical applications such as transportation applications, mining, and the petro-chemical industry.
- stable short circuit failure mode which, as well as safety benefits, makes them an ideal choice for medium and high voltage applications where series connection is required. Press-pack construction is the obvious choice where series connection is needed and the short circuit failure mode allows for the design in of n+1 redundancy. Typical examples include medium voltage drives, HVDC, and active VAr controllers.

125 mm 85 mm 75 mm 47 mm

- largely backwardly compatible with standard 2.5kV and 4.5kV Gate Turn-Off thyristors (including GCTs) in many applications such as transportation and AC drives. This makes these parts a simple and economical path to upgrade or refurbish equipment that previously used Gate Turn-Off thyristors, such as locomotives or medium voltage drives.
- suitable for all cooling options including direct liquid immersion.

Complementary gate drives (shown on Page 15), mounting clamps and passive components are available by contacting the UK Factory.

HP Sonic-FRDs

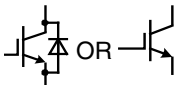
Anti-parallel Diodes for IGBTs and IGCTs - 1.7kV to 4.5kV

New world-leading class of ultra fast and ultra soft recovery diode available from 1.7kV to 4.5kV in current ratings from 300 to 2500A.

These high power super fast, soft recovery diodes incorporate a unique manufacturing process and novel lifetime control to offer a class leading trade-off between conduction and switching loses. Their exceptionally wide safe operating area (SOA) makes them the number one choice for freewheeling diodes for snubberless IGBT and IGCT applications. In fact, most applications which require a fast, low loss diode can benefit from this new technology - for example, traction, medium voltage drives, induction heating and pulsed power applications.

Ø 63 mm Ø 25 mm Ø 47 mm

Press-Pack IGBTs



Type Part No. ➢ New	V_{CES} V	I_C A	I_{CM} A	$V_{CE(sat)}$ $I_F = I_C$ V	IGBT Switching Typical E_{ON} J	E_{OFF} J	V_F $I_F = I_C$ V	Diode Recovery Typical I_{rm} A	t_{rr} µs	Q_r µC	$T_{j\,max}$ °C	R_{thJK} IGBT K/W	Diode K/W	Fig. No.
T0160NA45A	4500	160	310	4.6	0.50	0.42	3.8	400	0.96	340	125	0.058	0.095	W40
T0240NA45E	4500	240	400	4.7	0.73	0.88	N/A	N/A	N/A	N/A	125	0.042	N/A	W40
T0360NA25A	2500	360	720	3.6	0.75	0.34	2.1	250	0.93	285	125	0.054	0.087	W40
T0500NA25E	2500	500	1000	3.6	0.80	0.50	N/A	N/A	N/A	N/A	125	0.039	N/A	W40
T0600TA45A	4500	600	1000	4.7	1.75	1.50	3.6	1400	0.92	650	125	0.016	0.039	W41
T0800TA45E	4500	800	1500	4.6	2.20	1.92	N/A	N/A	N/A	N/A	125	0.012	N/A	W41
T0900EA45A	4500	900	1500	4.6	2.80	2.60	3.6	1800	0.85	800	125	0.014	0.026	W44
T1200TA25A	2500	1200	2400	3.6	2.50	1.40	2.5	670	1.50	830	125	0.017	0.029	W41
T1200EA45E	4500	1200	2100	4.6	3.20	3.80	N/A	N/A	N/A	N/A	125	0.010	N/A	W44
T1500TA25E	2500	1500	3000	3.6	3.30	1.70	N/A	N/A	N/A	N/A	125	0.013	N/A	W41
➢ T1800GA45A	4500	1800	3000	4.7	5.60	6.40	3.6	2150	2.20	3500	125	0.008	0.014	W45
➢ T2400GA45E	4500	2400	4200	4.7	7.20	7.80	N/A	N/A	N/A	N/A	125	0.005	N/A	W45
• TX168NA17A	1700	600	900	4.0	• Products Under Development							0.054	0.073	W40
• TX167NA17E	1700	840	1260	4.0								0.039	N/A	W40
• TX115TA17A	1700	1900	2850	4.0								0.017	0.029	W41
• TX116TA17E	1700	2500	3750	4.0								0.013	N/A	W41

Press-Pack IGBT Outlines on page O - 5

HP Sonic-FRDs™

Type Part No. ➢ New	Old Part No.	V_{RRM} V	I_{FAV} T_K = 55°C A	I_{FSM} 10 ms ½ sine $V_R \leq 60\%\ V_{RRM}$ A	I^2t A^2s	Typ. Reverse Recovery Parameters T_{jmax} (50% Chord) I_{rm} A	t_{rr} µs	Q_r µC	@I_{FM} A	@-di_F/dt A/µs	V_{T0} @T_{jmax} V	r_T mΩ	T_{jmax} °C	R_{thJK} 180° Sine K/W	Fig. No.
E0300YH400	N/A	4000	277	2630	34.58×10^3	605	0.75	245	300	2000	2.170	3.800	150	0.073	W3
E0300YH450	N/A	4500	277	2630	34.58×10^3	605	0.75	245	300	2000	2.170	3.800	150	0.073	W3
E0400YH200	N/A	2000	348	3542	62.7×10^3	572	0.74	175	400	1500	1.770	2.290	150	0.073	W3
E0400YH250	N/A	2500	348	3542	62.7×10^3	572	0.74	175	400	1500	1.770	2.290	150	0.073	W3
E0900NC400	N/A	4000	969	15270	1.17×10^6	1340	2.20	1440	900	2000	2.140	1.150	150	0.020	W5
E0900NC450	N/A	4500	969	15270	1.17×10^6	1340	2.20	1440	900	2000	2.140	1.150	150	0.020	W5
E1500NC200	N/A	2000	1557	15180	1.15×10^6	1450	2.30	1550	1500	2000	1.670	0.360	150	0.020	W5
E1500NC250	N/A	2500	1557	15180	1.15×10^6	1450	2.30	1550	1500	2000	1.670	0.360	150	0.020	W5
E1500VF400	N/A	4000	1995	23600	2.78×10^6	1730	3.00	2700	1500	2000	2.350	0.270	150	0.013	W43
E1500VF450	N/A	4500	1995	23600	2.78×10^6	1730	3.00	2700	1500	2000	2.350	0.270	150	0.013	W43
E2000NC140	N/A	1400	1568	16500	1.13×10^6	1880	1.00	950	2000	4000	1.770	0.350	150	0.020	W5
E2000NC170	N/A	1700	1568	16500	1.13×10^6	1880	1.00	950	2000	4000	1.770	0.350	150	0.020	W5
E2500VF200	N/A	2000	2516	28600	4.10×10^6	1750	1.40	1350	2500	3000	1.630	0.210	150	0.013	W43
E2500VF250	N/A	2500	2516	28600	4.10×10^6	1750	1.40	1350	2500	3000	1.630	0.210	150	0.013	W43
➢ E2400TC400	N/A	4000	2227	25600	3.29×10^6	2400	1.12	1330	2400	4000	2.039	0.598	150	0.008	W28
➢ E2400TC450	N/A	4500	2227	25600	3.29×10^6	2400	1.12	1330	2400	4000	2.039	0.598	150	0.008	W28

HP Sonic-FRD Outlines on page O - 6

High Voltage IGBT Gate Drive Units – C0030BG400

The C0030BG400 is a single channel 30A peak rated gate drive unit (GDU), suitable for low and high side applications with DC link voltages of up to 3.5kV (5kV available on request) and with dv/dt immunity of over 100kV/µs.

This GDU performs all of the necessary supervisory functions including under voltage lockout and SCSOA protection with user configurable response and feedback. The unit requires a simple 15V DC power supply and features fibre optic command and feedback signals.

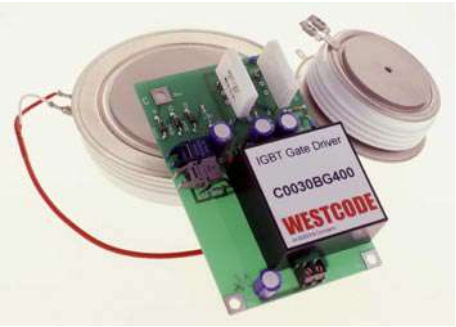
This GDU is capable of driving virtually all IGBTs including our range of press-pack devices at frequencies from DC up to 20kHz with no duty cycle limitations.

Options include standard variants set up for use with each of Westcode's range of IGBTs (see table) and the core module for integration into end user PCBs. Additionally our application engineers can develop semi-custom solutions based around the standard core module.

Features

- 30A peak drive current (500ns rise time)
- 10kV AC rms isolation test
- Partial discharge free up to 4kV AC rms
- 100kV/µs dv/dt immunity
- Temperature range –40°C up to +70°C (–55°C up to +80°C available)
- ±15V gate drive voltage
- Standard HP Versatile Link™ Fibre optic links
- Status feedback signal
- User configurable SCSOA protection

IGBT Part Number	$R_{g(on)}$ (W)	$R_{g(off)}$ (W)	C_g (nF)	GDU Part Number
T0160NA45A	15	8.2	100	C0030BG400SAK
T0240NA45E	10	5.6	100	C0030BG400SAL
T0360NA25A	33	18	100	C0030BG400SAA
T0500NA25E	22	15	100	C0030BG400SAB
T0600TA45A	5.6	3.3	100	C0030BG400SAM
T0800TA45E	4.7	3.3	100	C0030BG400SAN
T0900EA45A	4.7	2.7	100	C0030BG400SAP
T1200EA45E	3.3	2.2	100	C0030BG400SAR
T1200TA25A	4.7	6.8	100	C0030BG400SAC
T1500TA25E	3.3	6.8	100	C0030BG400SAD
T1800GA45A	3.3	2.2	100	C0030BG400SAS
T2400GA45E	2.2	1.5	100	C0030BG400SAT



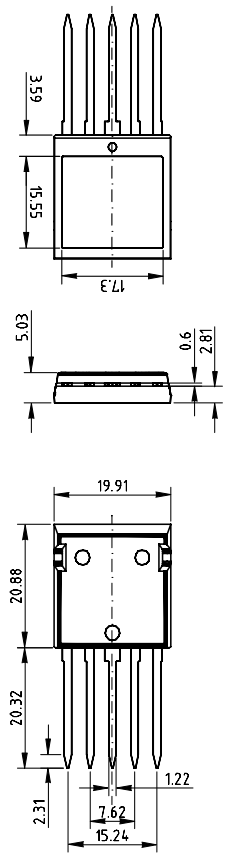
The launch of this complementary product demonstrates our continued commitment to provide our customers with complete solutions for power electronics and further strengthens our assemblies' capability.

This GDU also provides our customers with a rapid route to prototype with our range of high voltage press-pack IGBTs without having to solve the additional problems associated with high isolation voltage gate drives.

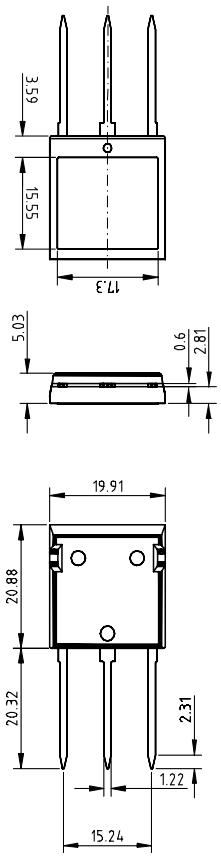
IXYS

Dimensions in mm and inches (1 mm = 0.0394“)

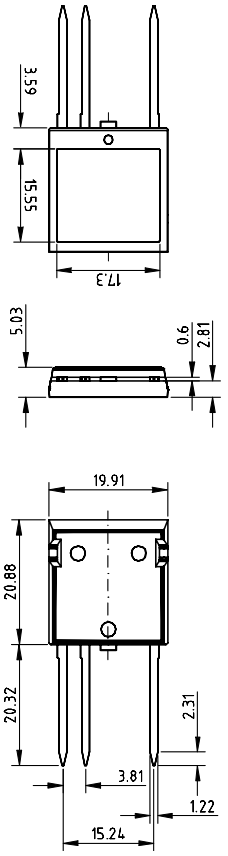
X024a ISOPLUS i4-Pac™



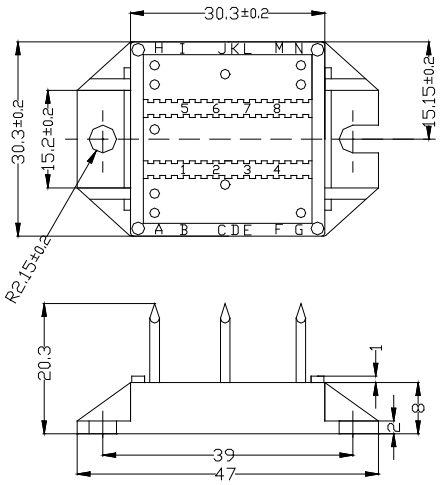
X024b ISOPLUS i4-Pac™



X024c ISOPLUS i4-Pac™

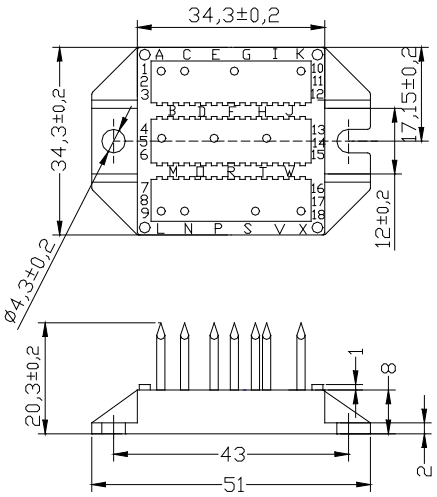


X101 ECO-PAC1



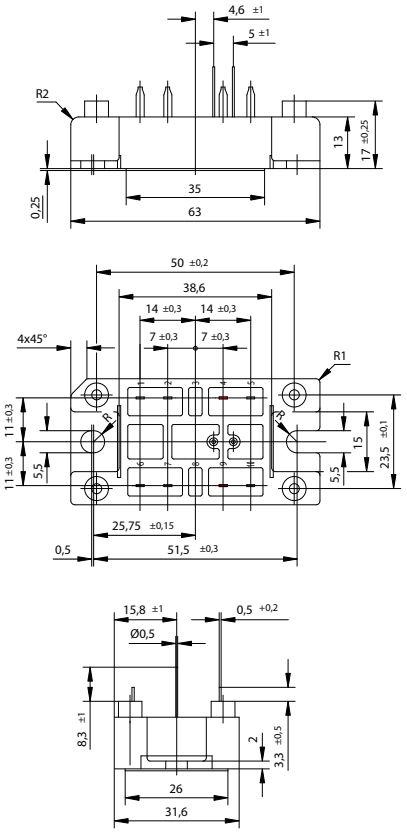
See data sheet for pin arrangement

X102 ECO-PAC2



See data sheet for pin arrangement

X103 V1-A-Pack

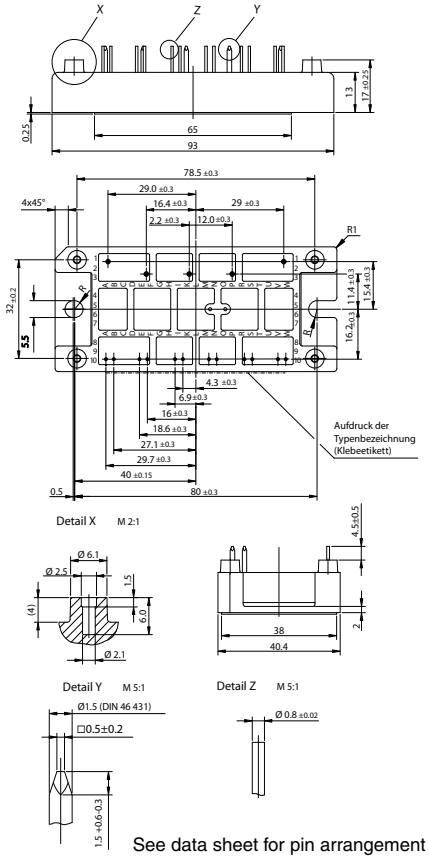


See data sheet for pin arrangement

IXYS

Dimensions in mm and inches (1 mm = 0.0394“)

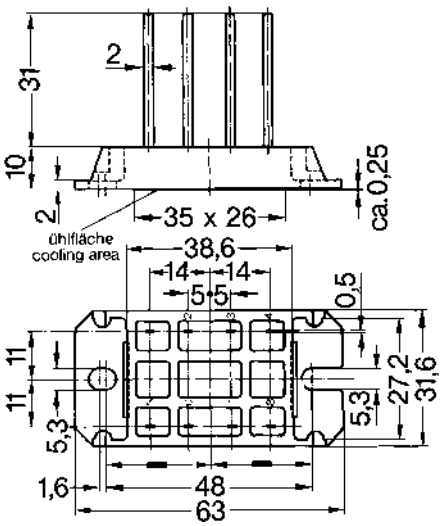
X104 V2-Pack



See data sheet for pin arrangement

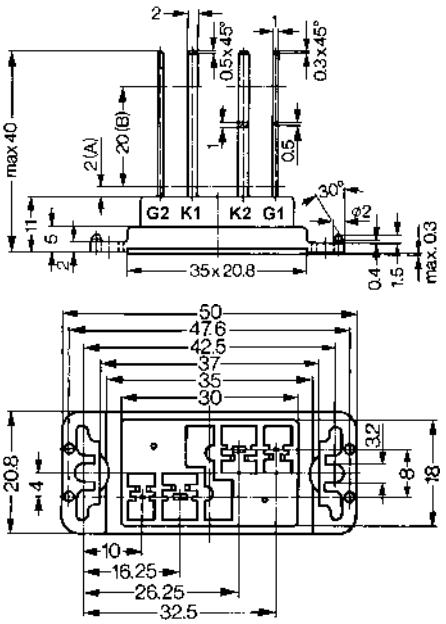
X105 V1-B-Pack

a: pin length = 31 mm
b: pin length = 15 mm

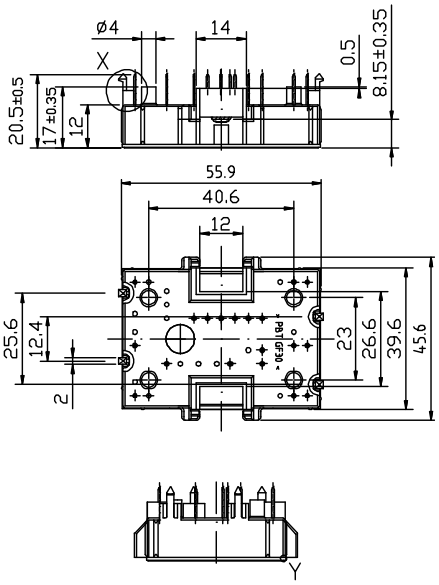


X106 Kamm-Modul

a: with gate pin G2
b: without gate pin G2

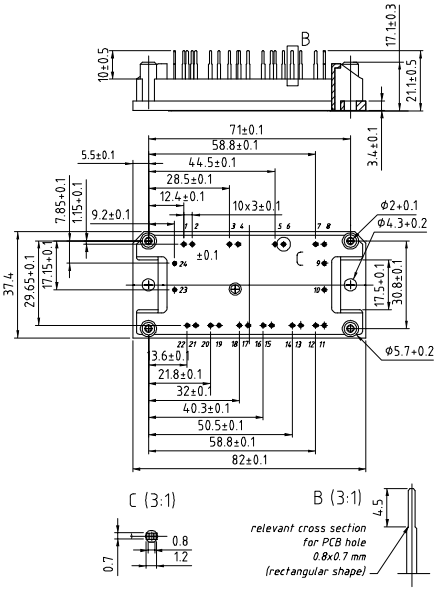


X110 Mini-Pack 2



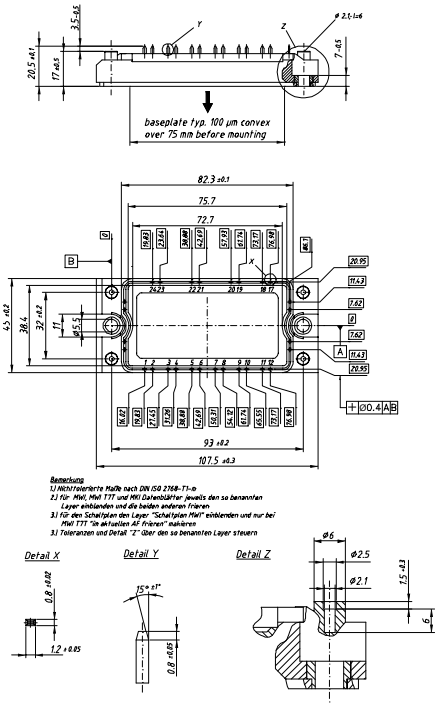
See data sheet for pin arrangement

X111 E1-Pack



See data sheet for pin arrangement

X112 E2-Pack

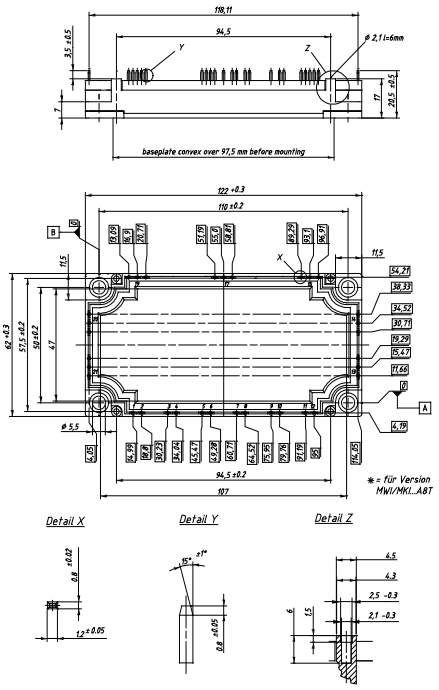


See data sheet for pin arrangement

IXYS

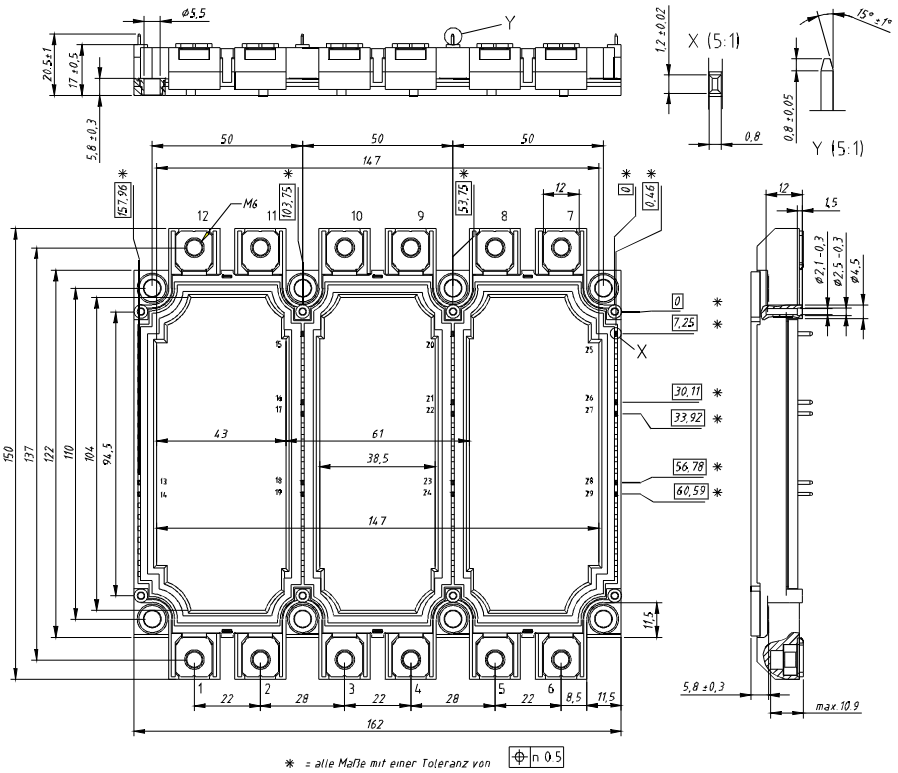
Dimensions in mm and inches (1 mm = 0.0394“)

X113 E3-Pack



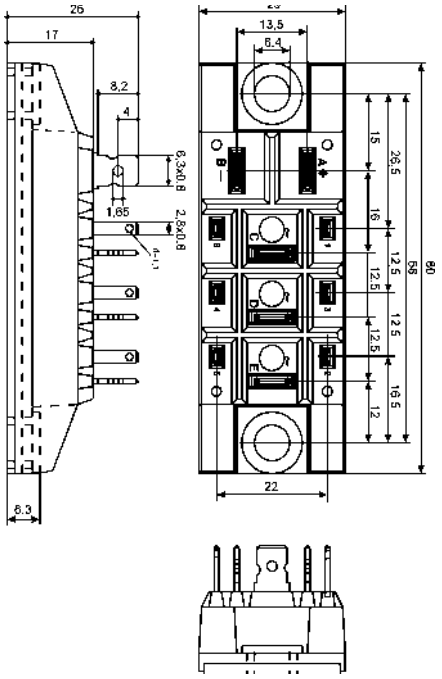
See data sheet for pin arrangement

X114 E9-Pack



X118 FO-T-A

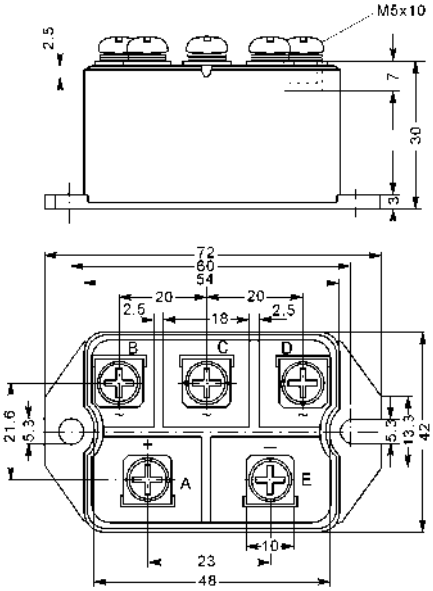
a: VTO & VTOF
c: w/o terminal 4, 5, & 6 (VVZ & VVZF)
d: w/o terminal 1, 2, 3, 4, 5, & 6 (VUO)
e: w/o terminal D, 4 & 5 (VKF & VKO)
f: w/o terminal D, 2, 3, 4 & 5 (VGO)
g: w/o terminal D, 3, 4, 5, & 6 (VHF & VHO)
h: w/o terminal D, 1, 2, 3, 4, 5, & 6 (VBO)



See data sheet for pin arrangement

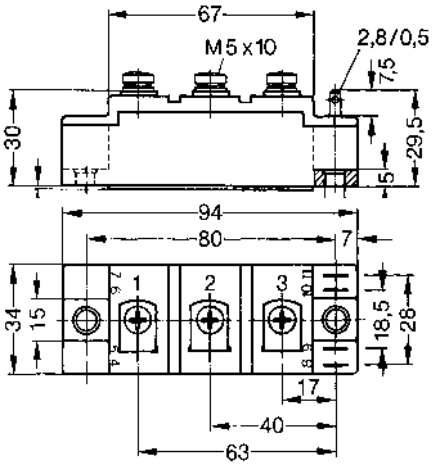
X122 PWS-D

a: VUO
b: w/o terminal d (VBO)



X127 Y4-M5

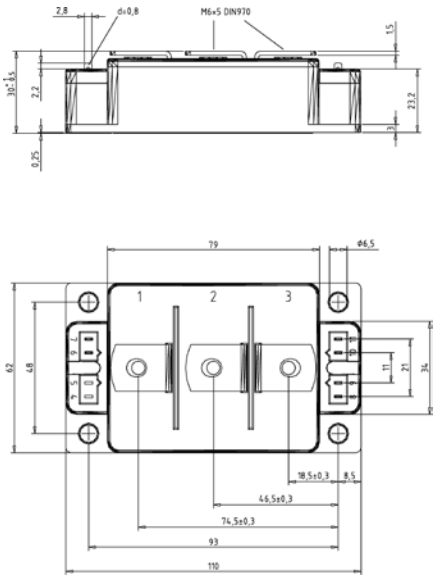
a: MII
b: w/o pin 6 & 7 (MID)
c: w/o pin 4 & 5 (MDI)



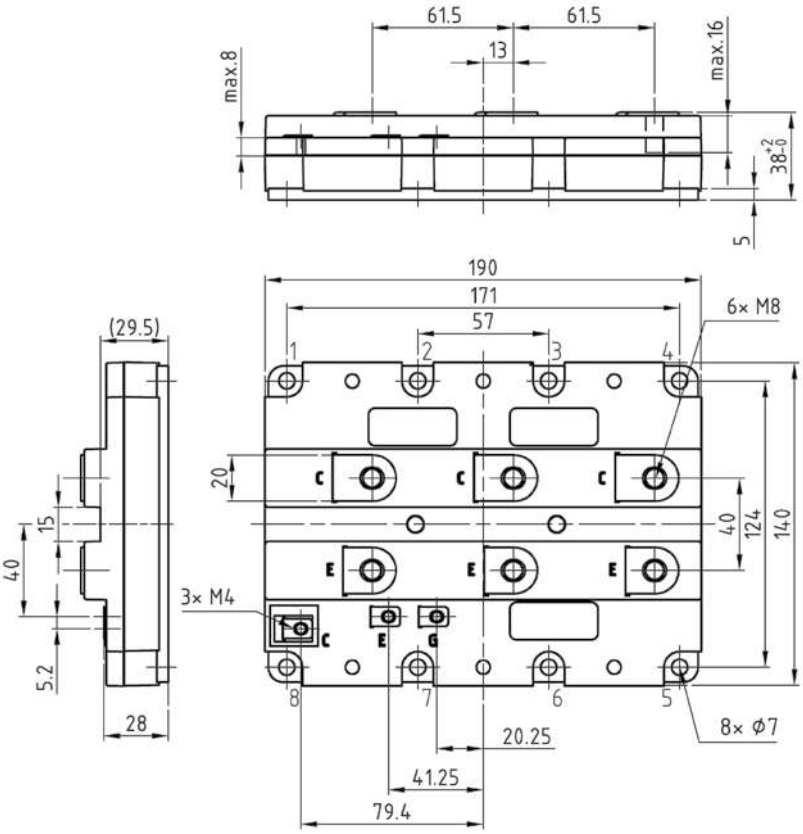
IXYS

Dimensions in mm and inches (1 mm = 0.0394“)

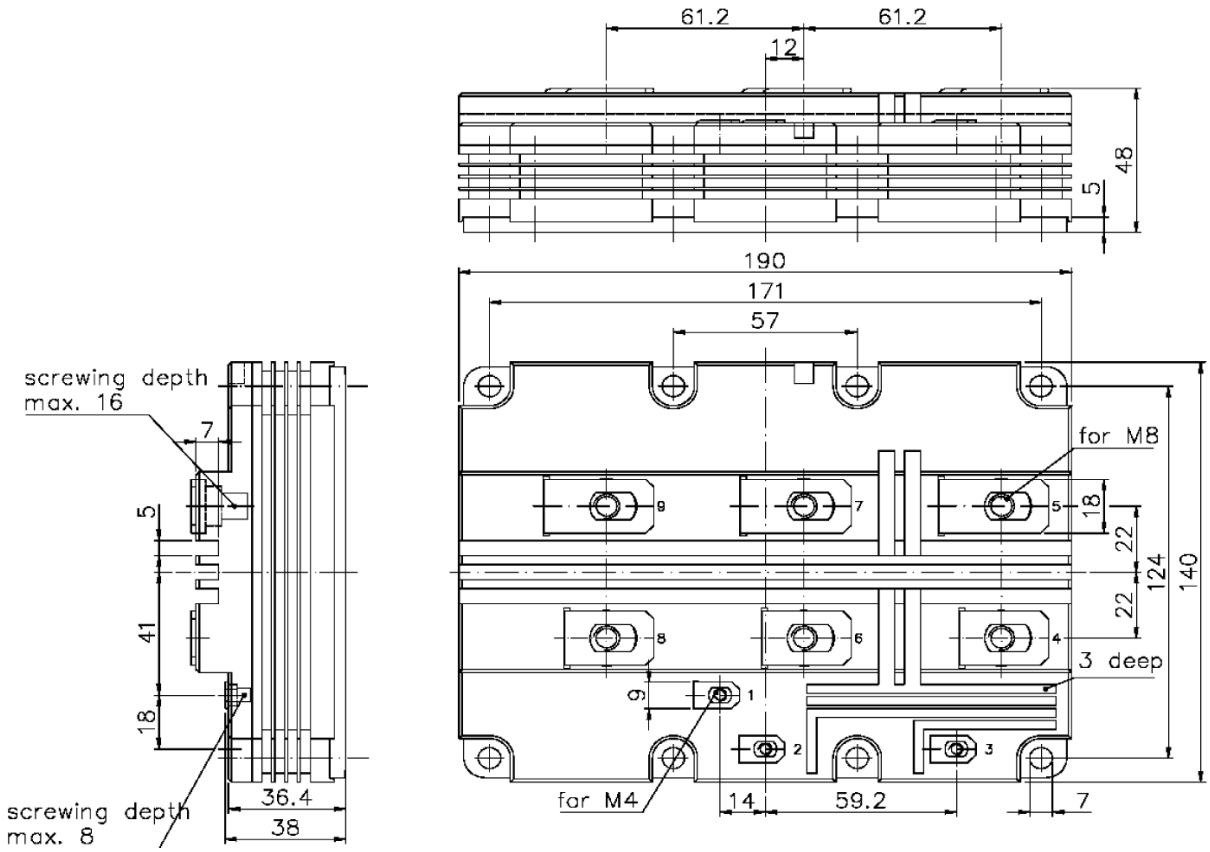
X130 Y3-Li
a: low inductance (VMM, MII)
b: w/o pin 8 & 9, low inductance (MID)
c: w/o pin 10 & 11, low inductance (MDI)
d: w/o terminal 1, low inductance (VMO)



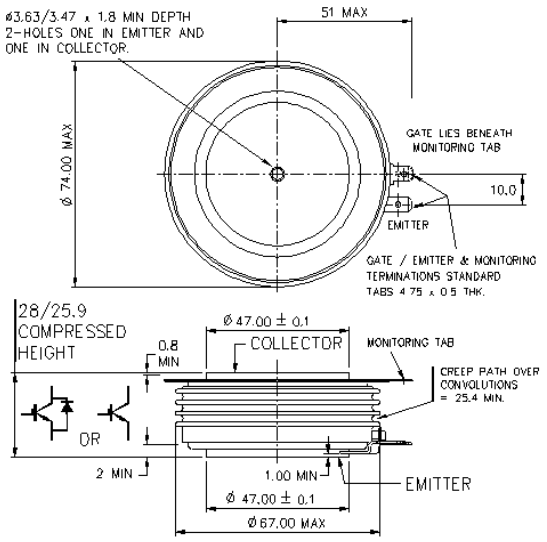
X134 E10-Pack



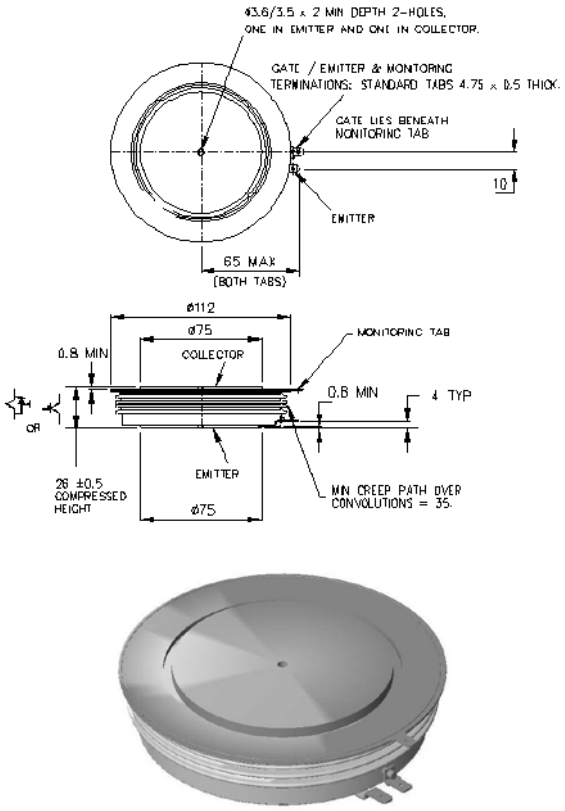
X135 E11-Pack



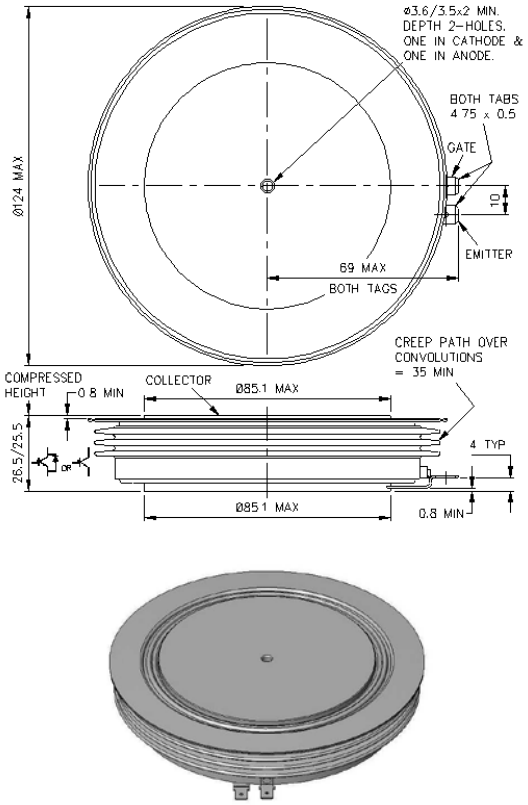
W40 - 171A107 - 47mm - Weight 430g



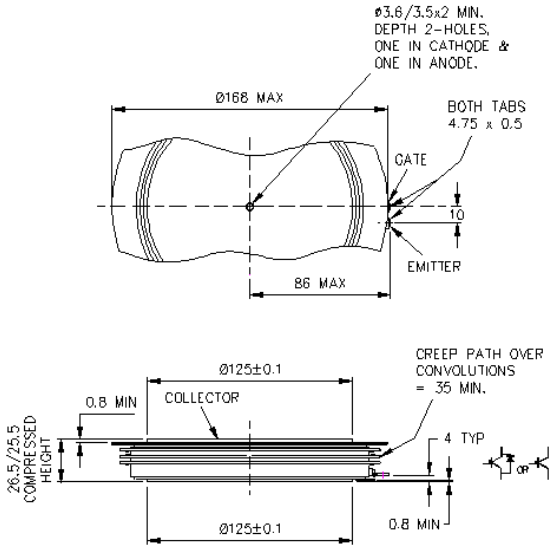
W41 - 171A108 - 75mm - Weight 1100g

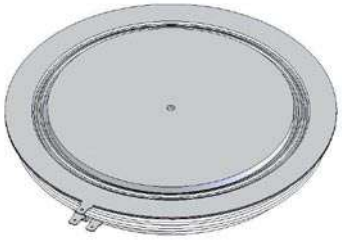


W44 - 101A340 - 85mm - Weight 1200g

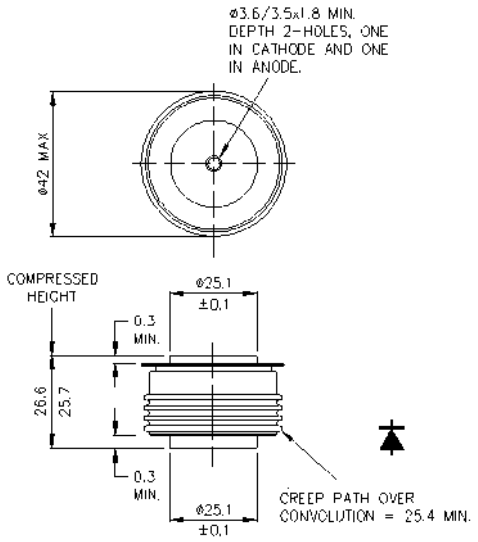


W45 - 101A359 - 125mm - Weight 2000g

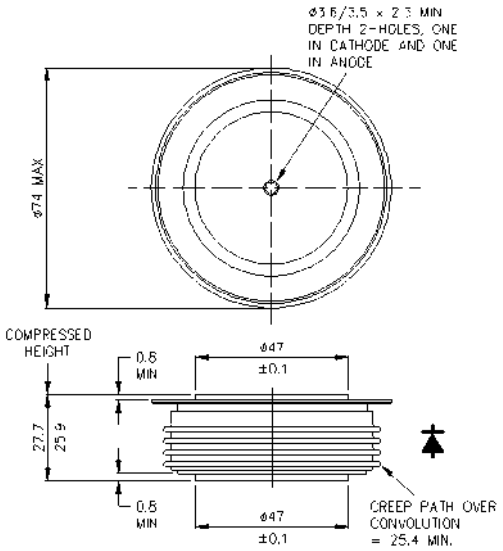




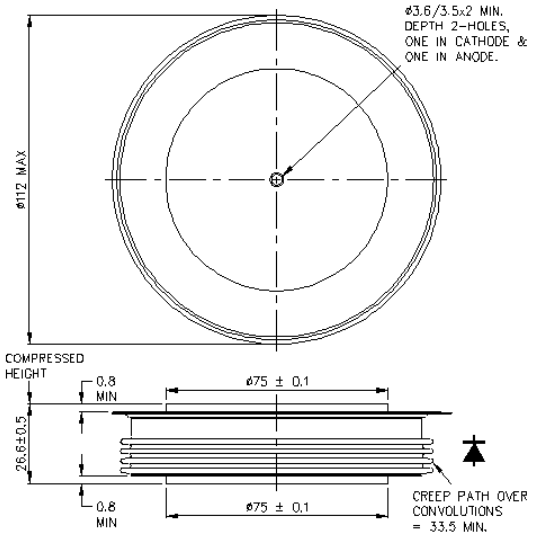
W3 - 100A317 - 25mm - Weight 140g



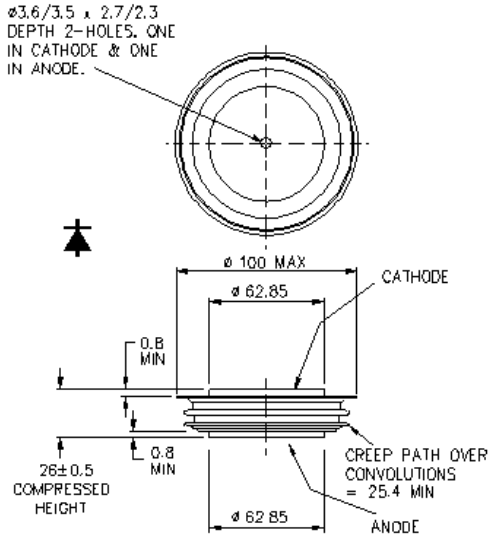
W5 - 100A249 - 47mm - Weight 510g



W28 - 100A330 - 73mm - Weight 1240g



W43 - 100A320 - 63mm - Weight 1000g

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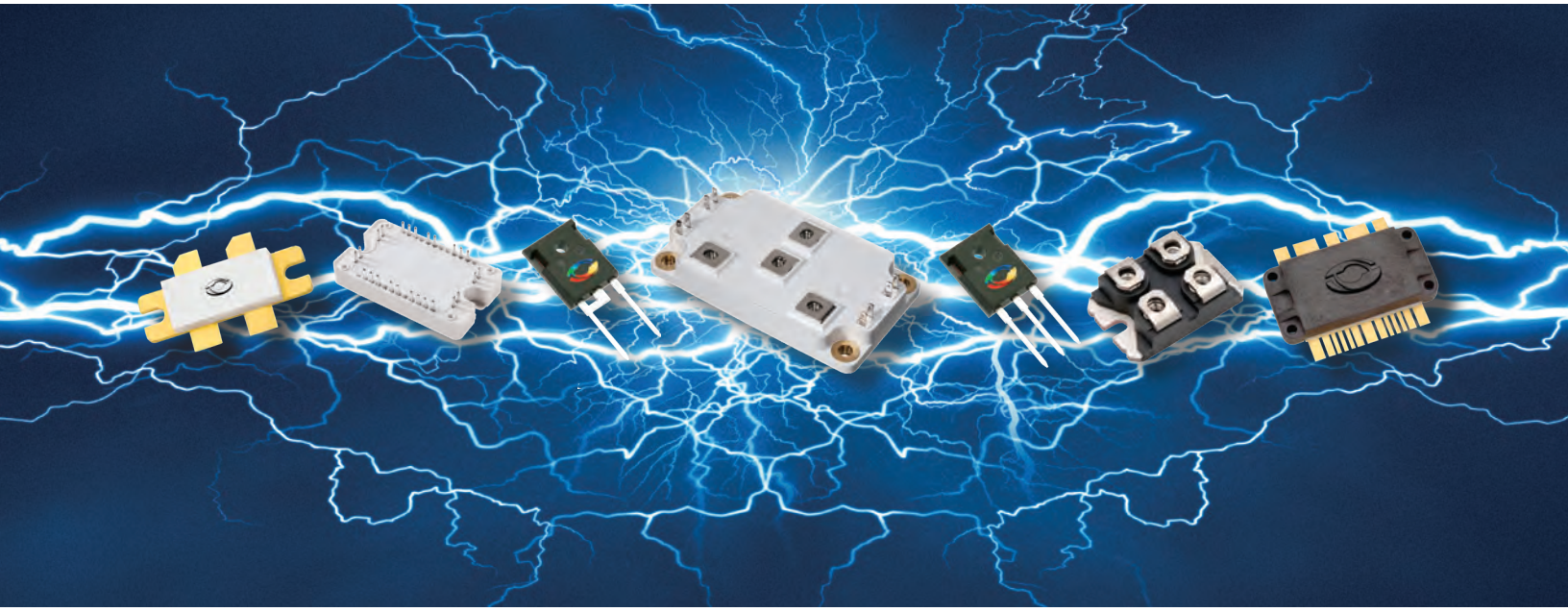
Power Products

Microsemi Power Portfolio 2017



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About Microsemi

Microsemi Corporation (Nasdaq: MSCC) offers a comprehensive portfolio of semiconductor and system solutions for communications, defense and security, aerospace, and industrial markets. Products include high-performance and radiation-hardened analog mixed-signal integrated circuits, FPGAs, SoCs, and ASICs; power management products; timing and synchronization devices and precise time solutions; voice processing devices; RF solutions; discrete components; enterprise storage and communications solutions, security technologies, and scalable anti-tamper products; Ethernet solutions; Power-over-Ethernet ICs and midspans; custom design capabilities and services. Microsemi is headquartered in Aliso Viejo, California, and has approximately 4,800 employees worldwide. Learn more at www.microsemi.com.

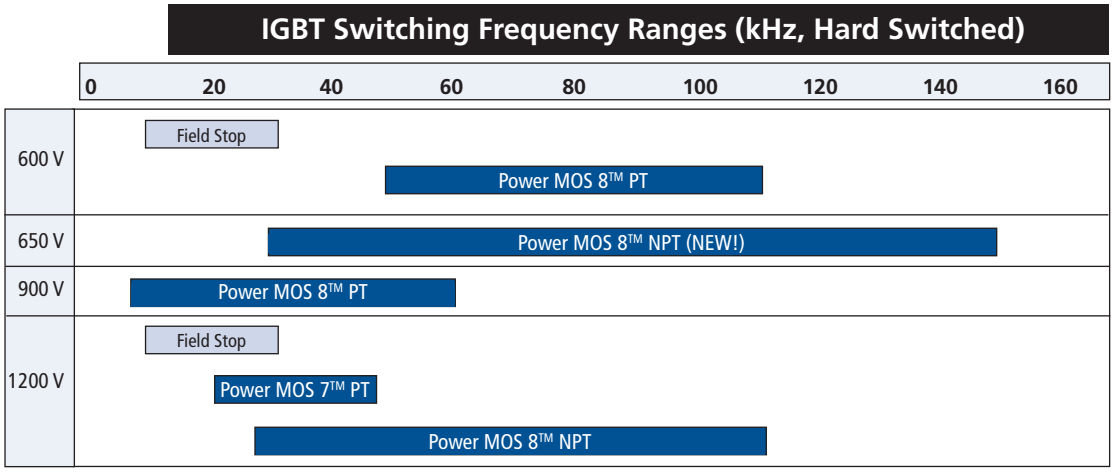
CONTENTS

Page No.

Insulated Gate Bipolar Transistors (IGBTs)

IGBTs from Microsemi

IGBT products from Microsemi provide high-quality solutions for a wide range of high voltage, high-power applications. The switching frequency range spans from DC for minimal conduction loss to 150 kHz for very-high-power-density SMPS applications. The frequency range for each product type is shown in the following graph. Each IGBT product represents the latest in IGBT technology, providing the best possible performance/cost combination for the targeted application. There are six product series that utilize three different IGBT technologies: non-punch-through (NPT), punch-through (PT), and field stop.



Note: Frequency ranges shown are typical for a 50 A IGBT. Refer to product data sheet max frequency versus current graph for more information.

Standard Series	Voltage Ratings (V)	Technology	Easy to Parallel	Short Circuit SOA	Parameter
MOS 7™	1200	PT			Ultra-low gate charge
MOS 8™	600, 650, 900, 1200	PT, NPT			Highest efficiency
Field Stop Trench Gate	600, 1200	Field Stop	X	X	Lowest conduction loss

Product Options

All standard IGBT products are available as a single IGBT or as a Combi product packaged with an anti-parallel DQ series diode. Package options include TO-220, TO-247, T-MAX®, TO-264, and SOT-227. Customized products are available; contact factory for details.

Insulated Gate Bipolar Transistors (IGBTs)

POWER MOS 8™

- NPT technology
- High-speed switching
- Low switching losses
- Easy to parallel

BV_{CES} Volts	$V_{CE(ON)}$ Typ 25 °C	I_{C2} 100 °C	Maximum I_C at Frequency		Part Number	Package Style
SINGLE			150 kHz	200 kHz		
650	1.9	45	31	25	APT45GR65B	TO-247
			100 kHz	150 kHz		
	1.9	70	52	39	APT70GR65B	TO-247
			50 kHz	100 kHz		
	1.9	95	69	41	APT95GR65B2	T-MAX®
1200			50 kHz	80 kHz		
	2.5	25	25	21	APT25GR120B	TO-247
	2.5	25	25	21	APT25GR120S	D³
	2.5	40	38	28	APT40GR120B	TO-247
	2.5	40	38	28	APT40GR120S	D³
	2.5	50	48	36	APT50GR120B2	T-MAX®
	2.5	50	48	36	APT50GR120L	TO-264
			25 kHz	50 kHz		
	2.5	70	66	42	APT70GR120B2	T-MAX®
	2.5	70	66	42	APT70GR120L	TO-264
	2.5	70*	42	30	APT70GR120J	ISOTOP®
	2.5	85	72	46	APT85GR120B2	T-MAX®
	2.5	85	72	46	APT85GR120L	TO-264
	2.5	85*	46	31	APT85GR120J	ISOTOP®
Combi (IGBT and Diode)			150 kHz	200 kHz		
650	1.9	45	31	25	APT45GR65BSCD10	TO-247 (SiC SBD)
			100 kHz	150 kHz		
	1.9	45	30	18	APT45GR65B2DU30	T-MAX® (DU diode)
	1.9	70	52	39	APT70GR65B2SCD30	T-MAX® (SiC SBD)
			50 kHz	100 kHz		
	1.9	70	59	38	APT70GR65B2DU40	T-MAX® (DU diode)
			40 kHz	80 kHz		
	1.9	95	50	35	APT95GR65JDU60	ISOTOP® (DU diode)
1200			50 kHz	80 kHz		
	2.5	25	25	21	APT25GR120BD15	TO-247 (DQ)
	2.5	25	25	21	APT25GR120SD15	D3 (DQ)
	2.5	25	25	21	APT25GR120BSCD10	TO-247 (SiC SBD)
	2.5	25	25	21	APT25GR120SSCD10	D3 (SiC SBD) v
	2.5	40	38	28	APT40GR120B2D30	T-MAX® (DQ)
	2.5	40	38	28	APT40GR120B2SCD10	T-MAX® (SiC SBD)
			25 kHz	50 kHz		
	2.5	50*	42	32	APT50GR120JD30	ISOTOP® (DQ)
	2.5	70*	42	30	APT70GR120JD60	ISOTOP® (DQ)
	2.5	85*	46	31	APT85GR120JD60	ISOTOP® (DQ)

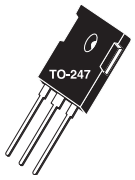
POWER MOS 8™

- PT technology
- Fast switching
- Highest efficiency
- Combi with high-speed DQ diode

BV_{CES} Volts	$V_{CE(ON)}$ Typ 25 °C	I_{C2} 100 °C	Maximum I_C at Frequency		Part Number	Package Style
SINGLE			50 kHz	80 kHz		
600	2.0	36	21	17	APT36GA60B	TO-247 or D³
	2.0	44	26	20	APT44GA60B	TO-247 or D³
	2.0	54	30	23	APT54GA60B	TO-247 or D³
	2.0	68	35	27	APT68GA60B	TO-247 or D³
	2.0	80	40	31	APT80GA60B	TO-247 or D³
	2.0	102	51	39	APT102GA60B2	T-MAX® or TO-264
900			25 kHz	50 kHz		
	2.5	35	17	10	APT35GA90B	TO-247 or D³
	2.5	43	21	13	APT43GA90B	TO-247 or D³
	2.5	64	29	19	APT64GA90B	TO-247 or D³
	2.5	80	34	23	APT80GA90B	TO-247 or D³
Combi (IGBT and "DQ" FRED)			50 kHz	80 kHz		
600	2.0	36	21	17	APT36GA60BD15	TO-247 or D³
	2.0	44	26	20	APT44GA60BD30	TO-247 or D³
	2.0	54	30	23	APT54GA60BD30	TO-247 or D³
	2.0	60	48	36	APT60GA60JD60	ISOTOP®
	2.0	68	35	27	APT68GA60B2D40	T-MAX® or TO-264
	2.0	80	40	31	APT80GA60LD40	TO-264
900			25 kHz	50 kHz		
	2.5	27	14	8	APT27GA90BD15	TO-247 or D³
	2.5	35	17	10	APT35GA90BD15	TO-247 or D³
	2.5	43	21	13	APT43GA90BD30	TO-247 or D³
	2.5	46	33	21	APT46GA90JD40	ISOTOP®
	2.5	64	29	19	APT64GA90B2D30	T-MAX® or TO-264
	2.5	80	34	23	APT80GA90LD40	TO-264

Current at frequency test conditions: T_j = 125 °C, Tc = 100 °C except Isotop® where Tc = 80 °C, Vcc = 67% rated voltage hard switch.

* I_{C2} for ISOTOP® packages measured at 70 °C for 1200 V NPT IGBTs.

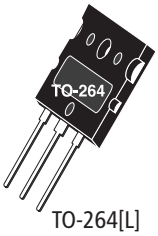


TO-247[B]

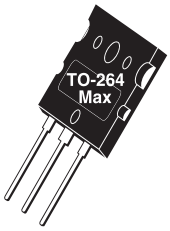
D³ PAK[S]

Part numbers for D³ packages—replace "B" with "S" in part number

T-MAX®[B2]

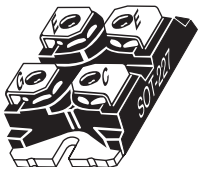


TO-264[L]

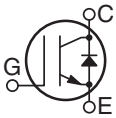


264-MAX™[L2]

Part numbers for TO-264 packages—replace "B2" with "L" in part number



ISOTOP®[J]
SOT-227



Insulated Gate Bipolar Transistors (IGBTs)

FIELD STOP

- Trench technology
- Short circuit rated
- Lowest conduction loss
- Easy paralleling
- Combi with high-speed DQ diode

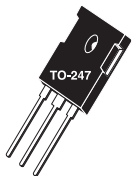
Power MOS 7® and IGBT

- PT technology
- Ultra-low gate charge
- Combi with high-speed DQ diode

BV_{CES} Volts	$V_{CE(ON)}$ Typ 25°C	I_{C2} 100°C	Maximum I_C at Frequency		Part Number	Package Style
SINGLE			15 kHz	30 kHz		
600	1.5	24	15	10	APT20GN60BG	TO-247
	1.5	37	20	14	APT30GN60BG	TO-247
	1.5	64	30	21	APT50GN60BG	TO-247
	1.5	93	42	30	APT75GN60BG	TO-247
	1.5	123	75	47	APT150GN60J	ISOTOP®
	1.5	135	54	39	APT100GN60B2G	T-MAX®
	1.5	190	79	57	APT150GN60B2G	T-MAX®
	1.5	230	103	75	APT200GN60B2G	T-MAX®
	1.5	158	100	66	APT200GN60J	ISOTOP®
1200			10 kHz	20 kHz		
	1.7	33	19	13	APT25GN120BG	TO-247 or D³
	1.7	46	24	17	APT35GN120BG	TO-247
	1.7	66	32	22	APT50GN120B2G	T-MAX®
	1.7	70	44	27	APT100GN120J	ISOTOP®
	1.7	99	45	30	APT75GN120B2G	T-MAX® or TO-264
	1.7	120	58	38	APT100GN120B2G	T-MAX®
	1.7	99	60	36	APT150GN120J	ISOTOP®
Combi (IGBT and "DQ" FRED)			15 kHz	30 kHz		
600	1.5	24	15	10	APT20GN60BDQ1G	TO-247
	1.5	37	20	14	APT30GN60BDQ2G	TO-247
	1.5	64	30	21	APT50GN60BDQ2G	TO-247
	1.5	93	42	30	APT75GN60LDQ3G	TO-264
	1.5	123	75	47	APT150GN60JDQ4	ISOTOP®
	1.5	135	54	39	APT100GN60LDQ4G	TO-264v
	1.5	190	79	57	APT150GN60LDQ4G	TO-264
	1.5	158	100	66	APT200GN60JDQ4	ISOTOP®
1200			10 kHz	20 kHz		
	1.7	22	14	10	APT15GN120BDQ1G	TO-247 or D³
	1.7	33	19	13	APT25GN120B2DQ2G	T-MAX®
	1.7	46	24	17	APT35GN120L2DQ2G	264-MAX™
	1.7	57	36	22	APT75GN120JDQ3	ISOTOP®
	1.7	66	32	22	APT50GN120L2DQ2G	264-MAX™
	1.7	70	44	27	APT100GN120JDQ4	ISOTOP®
	1.7	99	60	36	APT150GN120JDQ4	ISOTOP®
SINGLE			20 kHz	40 kHz		
1200	3.3	33	19	12	APT25GP120BG	TO-247
	3.3	46	24	15	APT35GP120BG	TO-247
	3.3	54	29	18	APT45GP120BG	TO-247
	3.3	34	28	18	APT45GP120J	ISOTOP
	3.3	91	42	24	APT75GP120B2G	T-MAX®
	3.3	57	40	23	APT75GP120J	ISOTOP
Combi (IGBT and "DQ" FRED)			20 kHz	40 kHz		
1200	3.3	33	19	12	APT25GP120BDQ1G	TO-247
	3.3	46	24	15	APT35GP120B2DQ2G	T-MAX®
	3.3	54	29	18	APT45GP120B2DQ2G	T-MAX®
	3.3	34	28	18	APT45GP120JDQ2	ISOTOP
	3.3	57	40	23	APT75GP120JDQ3	ISOTOP

Current at frequency test conditions: T_j = 125 °C, Tc = 100 °C except Isotop® where Tc = 80 °C, Vcc = 67% rated voltage hard switch.

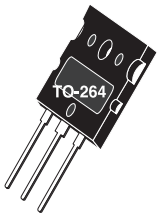
D³ PAK[S]



TO-247[B]

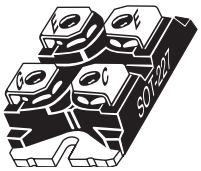
Part Numbers for D³ packages - replace "B" with "S" in part number

T-MAX®[B2]

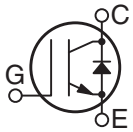


TO-264[L]

Part Numbers for L packages - replace "B2" with "L" in part number



ISOTOP®[J]
SOT-227



Silicon Carbide (SiC) MOSFETs

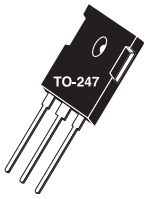
Silicon Carbide (SiC) MOSFETs

Silicon Carbide (SiC) is the ideal technology for higher switching frequency, higher efficiency, and higher power (>650 V) applications.
Target markets and applications include:

- Commercial Aviation: Actuation, air conditioning, power distribution
- Industrial: Motor drives, welding, UPS, SMPS, induction heating
- Transportation/Automotive: EV battery charger, H/EV powertrain, DC-DC converter, energy recovery
- Smart Energy: PV inverter, wind turbine
- Medical: MRI power supply, X-Ray power supply
- Defense & Oil Drilling: Motor drives, auxiliary power supplies

SiC MOSFET and SiC Schottky Barrier Diode product lines from Microsemi increase your system efficiency over silicon MOSFET and IGBT solutions while lowering your total cost of ownership by enabling downsized systems and smaller/lower cost cooling.

$BV_{(DSS)}$ Volts	$R_{DS(ON)}$ Ohms	$I_{D(Cont)}$ Amps	Part Number	Package Style
700 V	125 mΩ*	35	APT35SM70B	TO-247
	125 mΩ*	35	APT35SM70S	D^3PAK
	75 mΩ*	58	APT70SM70B	TO-247
	75 mΩ*	58	APT70SM70S	D^3PAK
	75 mΩ*	58	APT70SM70J	SOT-227
	35 mΩ*	78	APT130SM70B	TO-247
	35 mΩ*	78	APT130SM70J	SOT-227
1200 V	140 mΩ	25	APT25SM120B	TO-247
	140 mΩ	25	APT25SM120S	D^3PAK
	80 mΩ	40	APT40SM120B	TO-247
	80 mΩ	40	APT40SM120S	D^3PAK
	80 mΩ	40	APT40SM120J	TO-247
	40 mΩ	80	APT80SM120B	TO-247
	40 mΩ	80	APT80SM120S	D^3PAK
	40 mΩ	80	APT80SM120J	TO-247



TO-247

TO-268
D^3 PAK

*Preliminary Current & typical Rds(on) values. Consult the datasheet for device ratings by package.

Characteristics	SiC Vs. Si	Results	Benefits
Breakdown field (MV/cm)	10X higher	Lower on-resistance	Higher efficiency
Electron sat. velocity (cm/s)	2X higher	Faster switching	Size reduction
Bandgap energy (ev)	3X higher	Higher Junction Temperature	Improved cooling
Thermal conductivity (W/m.K)	3X higher	Higher power density	Higher current capabilities
Positive temperature coefficient		Self-regulation	Easy paralleling

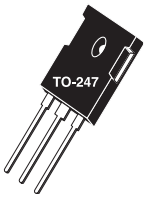
Microsemi Advantages Versus Competition

- Lowest conduction losses at high temperature
- Low switching losses
- High short circuit withstand rating
- Low gate resistance
- High avanlance (UIS) rating
- Patented sic technology

SiC is the perfect technology to address high-frequency and high-power density applications → Lower power losses, higher frequency cap., and higher junction temperature → Easier cooling, downsized system, and higher reliability

Power MOS 8™ MOSFETs/FREDFETs

$BV_{(DSS)}$ Volts	$R_{DS(ON)}$ Max	I_D	MOSFET Part Number	I_D	FREDFET Part Number	Package Style
1200	2.40			7	APT7F120B	TO-247 or D³
	2.10	8	APT7M120B			TO-247
	1.20			14	APT13F120B	TO-247 or D³
	1.10	14	APT14M120B			TO-247
	0.70			23	APT22F120B2	T-MAX® or TO-264
	0.63	24	APT24M120B2			T-MAX® or TO-264
	0.58			27	APT26F120B2	T-MAX® or TO-264
	0.58			18	APT17F120J	ISOTOP®
	0.53	29	APT28M120B2			T-MAX® or TO-264
	0.53	19	APT19M120J			ISOTOP®
	0.32			33	APT32F120J	ISOTOP®
	0.29	35	APT34M120J			ISOTOP®
1000	2.00			7	APT7F100B	TO-247
	1.80	8	APT8M100B			TO-247
	1.60			9	APT9F100B	TO-247 or D³
	1.40	9	APT9M100B			TO-247
	0.98			14	APT14F100B	TO-247 or D³
	0.88	14	APT14M100B			TO-247 or D³
	0.78			17	APT17F100B	TO-247 or D³
	0.70	18	APT18M100B			TO-247
	0.44			30	APT29F100B2	T-MAX® or TO-264
	0.44			20	APT19F100J	ISOTOP®
	0.38	32	APT31M100B2	35	APT34F100B2	T-MAX® or TO-264
	0.38	21	APT21M100J	23	APT22F100J	ISOTOP®
	0.33	37	APT37M100B2			T-MAX® or TO-264
	0.33	25	APT25M100J			ISOTOP®
	0.20			42	APT41F100J	ISOTOP®
	0.18	45	APT45M100J			ISOTOP®
800	0.90			12	APT11F80B	TO-247 or D³
	0.80	13	APT12M80B			TO-247
	0.58			18	APT17F80B	TO-247 or D³
	0.53	19	APT18M80B			TO-247 or D³
	0.43			23	APT22F80B	TO-247 or D³
	0.39	25	APT24M80B			TO-247 or D³
	0.24			41	APT38F80B2	T-MAX® or TO-264
	0.21	43	APT41M80B2	47	APT44F80B2	T-MAX® or TO-264
	0.21			31	APT29F80J	ISOTOP®
	0.19	49	APT48M80B2			T-MAX® or TO-264
	0.19	33	APT32M80J			ISOTOP®
	0.11			57	APT53F80J	ISOTOP®
	0.10	60	APT58M80J			ISOTOP®

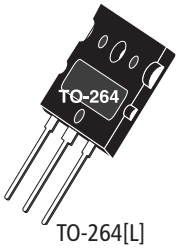


TO-247[B]

D³ PAK[S]

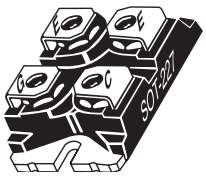
Part Numbers for D³ packages—replace "B" with "S" in part number

T-MAX®[B2]



TO-264[L]

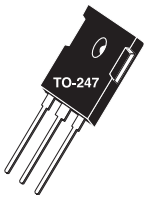
Part Numbers for TO-264 packages—replace "B2" with "L" in part number



ISOTOP®[J]
SOT-227
(ISOLATED BASE)

Power MOS 8™ MOSFETs/FREDFETs

$BV_{(DSS)}$ Volts	$R_{DS(ON)}$ Max	I_D	MOSFET Part Number	I_D	FREDFET Part Number	Package Style
600	0.43			16	APT15F60B	TO-247 or D³
	0.37			19	APT18F60B	TO-247 or D³
	0.29			24	APT23F60B	TO-247 or D³
	0.22			30	APT28F60B	TO-247 or D³
	0.19	36	APT34M60B	36	APT34F60B	TO-247
	0.15	45	APT43M60B2	45	APT43F60B2	T-MAX® or TO-264
	0.15	31	APT30M60J	31	APT30F60J	ISOTOP®
	0.11	60	APT56M60B2	60	APT56F60B2	T-MAX® or TO-264
	0.11	42	APT39M60J	42	APT39F60J	ISOTOP®
	0.09	70	APT66M60B2	70	APT66F60B2	T-MAX® or TO-264
	0.09	49	APT47M60J	49	APT47F60J	ISOTOP®
	0.055	84	APT80M60J	84	APT80F60J	ISOTOP®
500	0.24			24	APT24F50B	TO-247 or D³
	0.19			30	APT30F50B	TO-247 or D³
	0.15			37	APT37F50B	TO-247 or D³
	0.13			43	APT42F50B	TO-247 or D³
	0.10	56	APT56M50B2	56	APT56F50B2	T-MAX® or TO-264
	0.10	38	APT38M50J	38	APT38F50J	ISOTOP®
	0.075	75	APT75M50B2	75	APT75F50B2	T-MAX® or TO-264
	0.075	51	APT51M50J	51	APT51F50J	ISOTOP®
	0.062	84	APT84M50B2	84	APT84F50B2	T-MAX® or TO-264
	0.062	58	APT58M50J	58	APT58F50J	ISOTOP®
	0.036	103	APT100M50J	103	APT100F50J	ISOTOP®

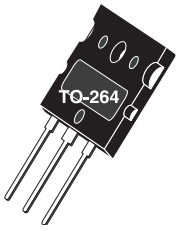


TO-247[B]

D³ PAK[S]

Part numbers for D³ packages—replace "B" with "S" in part number

T-MAX®[B2]

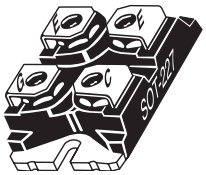


TO-264[L]

Part numbers for TO-264 packages—replace "B2" with "L" in part number

Low Voltage Power MOS V® MOSFETs/FREDFETs

$BV_{(DSS)}$ Volts	$R_{DS(ON)}$ Max	I_D	MOSFET Part Number	I_D	FREDFET Part Number	Package Style
300	0.085	40	APT30M85BVRG	40	APT30M85BVFRG	TO-247
	0.070	48	APT30M70BVRG	48	APT30M70BVFRG	TO-247 or D³
	0.040	70	APT30M40JVRG	70	APT30M40JVFRG	ISOTOP®
	0.019	130	APT30M19JVR	130	APT30M19JVFR	ISOTOP®
200	0.045	56	APT20M45BVRG	56	APT20M45BVFRG	TO-247
	0.038	67	APT20M38BVRG	37	APT20M38BVFRG	TO-247 or D³ or T/R
	0.022	100	APT20M22B2VRG	100	APT20M22B2VFRG	T-MAX® or TO-264
	0.011	175	APT20M11JVR	175	APT20M11JVFR	ISOTOP®



ISOTOP®[J]
SOT-227
(ISOLATED BASE)

Ultra-Fast, Low Gate Charge MOSFETs

FOR 250 kHz–2 MHz SWITCHING APPLICATIONS

The Ultra-Fast, Low Gate Charge MOSFET family combines the lowest gate charge available in the industry with Microsemi's proprietary self-aligned aluminum metal gate structure. The result is a MOSFET capable of extremely fast switching speeds and very low switching losses. The metal gate structure and the layout of these chips provide an internal series gate resistance (EGR) an order of magnitude lower than competitive devices built with a polysilicon gate.

These devices are ideally suited for high frequency and pulsed high voltage applications.

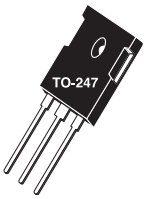
Typical Applications:

- Class D amplifiers up to 2 MHz
- High voltage pulsed DC
- AM transmitters
- Plasma deposition/etch

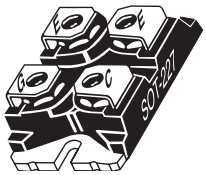
FEATURES	BENEFITS
• Series gate resistance (R_G) <0.1 Ω	• Fast switching, uniform signal propagation
• T_R and T_F times of <10 ns	• Pulse power applications
• Industry's lowest gate charge	• Fast switching, reduced gate drive power

$BV_{(DSS)}$ Volts	$R_{DS(ON)}$ Max	I_D	MOSFET Part Number	FREDFET Part Number	Package Style
1200	4.700	3.5		APT1204R7BFLLG	TO-247 or D^3
	1.400	9		APT1201R4BFLLG	TO-247
	0.670	18	APT12067B2LLG		T-MAX®
	0.670	17	APT12067JLL		ISOTOP®
	0.570	22	APT12057B2LLG		T-MAX®
	0.570	19	APT12057JLL		ISOTOP®
1000	0.900	12	APT10090BLLG		TO-247
	0.780	14	APT10078BLLG		TO-247 or D^3
	0.450	23	APT10045B2LLG		T-MAX® or TO-264
	0.450	21	APT10045JLL		ISOTOP®
	0.350	28	APT10035B2LLG		T-MAX®
	0.350	25	APT10035JLL		ISOTOP®
	0.260	38		APT10026L2FLLG	TO-264 MAX
	0.260	30	APT10026JLL	APT10026JFLL	ISOTOP®
	0.210	37	APT10021JLL	APT10021JFLL	ISOTOP®
800	0.140	52	APT8014L2LLLG	APT8014L2FLLG	TO-264 MAX
	0.110	51	APT8011JLL	APT8011JFLL	T-MAX® or TO-264
	0.200	38	APT8020B2LL		T-MAX®
	0.200	33	APT8020JLL		ISOTOP® or D^3 or T/R
500	0.140	35	APT5014BLLG		TO-247
	0.100	46	APT5010B2LLG	APT5010B2FLLG	T-MAX® or TO-264
	0.065	67	APT50M65B2LLG	APT50M65B2FLLG	T-MAX® or TO-264
	0.065	58	APT50M65JLLG	APT50M65JFLLG	ISOTOP®
	0.075	51	APT50M75JLL	APT50M75JFLL	ISOTOP®
	0.075	57	APT50M75B2LLG		T-MAX® or TO-264
	0.050	71	APT50M50JLL		ISOTOP®
	0.038	88	APT50M38JLL		ISOTOP®

T-MAX®[B2]



TO-247[B]

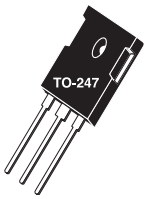


ISOTOP®[J]
SOT-227
(ISOLATED BASE)

Super Junction MOSFETs

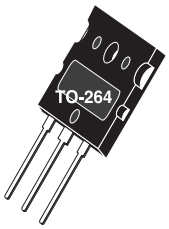
BV_{DSS} Volts	$R_{DS(ON)}$ Ohms	$I_{D(Cont)}$ Amps	Part Number	Package Style
	C3 TECHNOLOGY			
900	0.120	36	APT36N90BC3G	TO-247
800	0.450	11	APT11N80BC3G	TO-247
	0.145	34	APT34N80B2C3G	T-MAX® or TO-264
	0.145	34	APT34N80LC3G	TO-264
650	0.035	94	APT94N65B2C3G	T-MAX® or TO-264
	0.070	47	APT47N65BC3G	TO-247 or D³
	0.070	47	APT47N60BC3G	TO-247 or D³
600	0.035	77	APT77N60JC3	ISOTOP®
	0.042	94	APT94N60L2C3G	264-MAX™
	SERVER SERIES			
	0.045	60	APT60N60BCSG	TO-247 or D³ or T/R
	C6 TECHNOLOGY			
600	0.041	77	APT77N60BC6	TO-247 or D³
	0.070	53	APT53N60BC6	TO-247 or D³
	0.099	38	APT38N60BC6	TO-247 or D³
	0.125	30	APT30N60BC6	TO-247 or D³
	0.035	106	APT106N60B2C6	T-MAX™ or TO-264
650	0.041	85	APT97N65B2C6	T-MAX™ or TO-264
	0.035	94	APT94N65B2C6	T-MAX™

D³ PAK[S]
TO-268

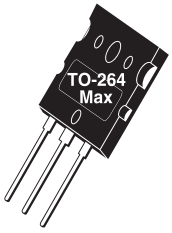


TO-247[B]

T-MAX®[B2]

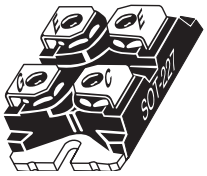


TO-264[L]



264-MAX™ [L2]

ISOTOP®[J]
SOT-227
(ISOLATED BASE)



Linear MOSFETs

What is a Linear MOSFET?

A MOSFET specifically designed to be more robust than a standard MOSFET when operated with both high voltage and high current near DC conditions (>100 msecs).

The Problem with SMPS MOSFETs

MOSFETs optimized for high frequency SMPS applications have poor high voltage DC SOA. Most SMPS type MOSFETs over-state SOA capability at high voltage on the data sheets. Above ~30 V and DC conditions, SOA drops faster than is indicated by P_D limited operation. For pulsed loads (t < 10 ms) there is generally no problem using a standard MOSFET.

Technology Innovation

Introduced in 1999, Microsemi modified its proprietary patented self-aligned metal gate MOSFET technology for enhanced performance in high voltage, linear applications. These Linear MOSFETs typically provide 1.5–2.0 times the DC SOA capability at high voltage compared to other MOSFET technologies optimized for switching applications.

Designers Will Need Linear MOSFETs In the Following Situations

- High current and less than 200 volts at less than 100 milliseconds
- Used as a variable power resistor
- Soft start application (limit surge currents)
- Linear amplifier circuit

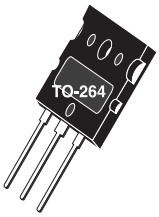
Typical Applications

- Active loads above 200 volts, such as DC dynamic loads for testing power supplies, batteries, fuel cells, etc.
- High voltage, high current, constant current sources.

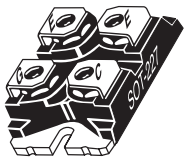
BV_{DSS} Volts	$R_{DS(ON)}$ Ohms	$I_{D(Cont)}$ Amps	SOA Watts	Part Number	Package Style
1000	0.600	18	325	APL1001J	
600	0.125	49	325	APL602B2G	
	0.125	43	325	APL602J	
500	0.090	58	325	APL502B2G	
	0.090	52	325	APL502J	

Part numbers for TO-264 packages—replace "B2" with "L" in part number.

T-MAX®[B2]



TO-264[L]



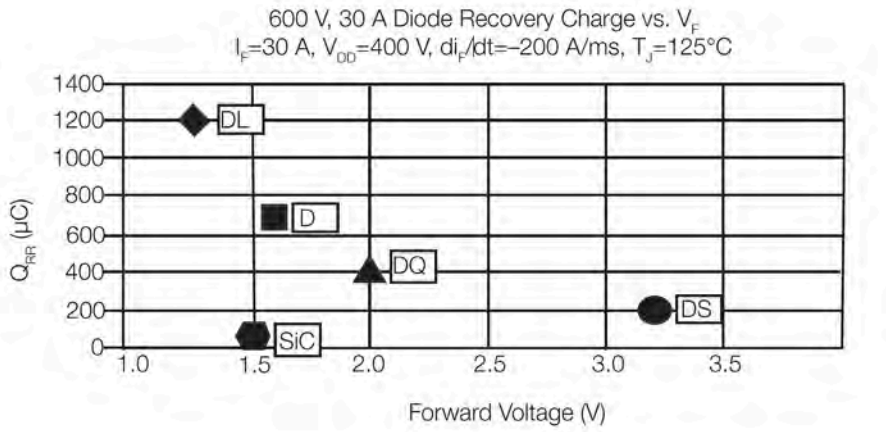
ISOTOP®[J]
SOT-227
(ISOLATED BASE)

Ultra-Fast Recovery Diodes

Microsemi offers five series of discrete diode products: a new DL series low VF ultra-soft recovery, the medium-speed medium VF D series, the high-speed DQ series, the very-high-speed DS series, and the silicon Schottky S series. These series of diodes are designed to provide high quality solutions to a wide range of high voltage, high power application requirements, ranging from fast recovery for continuous conduction mode power factor correction to low conduction loss for output rectification. The following table summarizes each product family's distinguishing features, features, and potential applications.

Series	Voltage Ratings	Features	Applications	Comment
DL	600	Low V_F Ultra-soft recovery Avalanche-rated	Output rectifier Resonant circuits	Ultra-soft recovery minimizes or eliminates snubber
D	200, 300, 400, 600, 1000, 1200	Medium V_F medium-speed	Freewheeling diode Output rectifier DC-DC converter	Proprietary platinum process
DQ	600, 1000, 1200	High-speed Avalanche-rated	PFC Freewheeling diode DC-DC converter	Stepped epi improves softness Proprietary platinum process
DS	600	Very-high-speed	High-frequency PFC	Proprietary platinum process
Schottky	200	Low V_F Avalanche-rated	Output rectifier Freewheeling diode DC-DC converter	
SiC Schottky	650, 1200, 1700	Zero reverse recovery	PFC, Freewheeling diode DC-DC converter	Low switching losses, high power density, and high temperature operation

The following graph shows the relative recovery speed and forward voltage positions of 600 V DL, D, DQ, and DS series diodes.



SiC Schottky Barrier Diodes

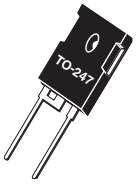
Volts	I_F (A)	V_F (Typical at 25°C)	Part Number	Package Style
700	10	1.5	MSC010SDA070K	TO-220
	30	1.5	MSC030SDA070K	TO-220
	50	1.5	MSC050SDA070B	TO-247
1200	10	1.5	MSC010SDA120B	TO-247
	10	1.5	MSC010SDA120K	TO-220
	15	1.5	MSC015SDA120B	TO-247
	30	1.5	MSC030SDA120B	TO-247
	30	1.5	MSC030SDA120S	D3PAK
	50	1.5	MSC050SDA120B	TO-247
	50	1.5	MSC050SDA120S	D3PAK
1700	10	1.5	MSC010SDA170B	TO-247
	30	1.5	MSC030SDA170B	TO-247
	50	1.5	MSC050SDA170B	TO-247

Ultra-Fast Recovery Diodes

Volts	$I_{F\,(avg)}$ Amps	V_F (Volts) Typ 25 °C	t_{RR}(ns) Typ 25 °C	Q_{RR} (nC) Typ 125 °C at $I_F = I_F$ (avg)	Diode Series	Part Number	Package Style
SINGLE	15	2.8	21	960	DQ	APT15DQ120BG	TO-247
1200	15	2.8	21	960	DQ	APT15DQ120KG	TO-220
	15	2.0	32	1300	D	APT15D120BG	TO-247
	15	2.0	32	1300	D	APT15D120KG	TO-220
	30	2.8	24	1800	DQ	APT30DQ120BG	TO-247
	30	2.8	24	1800	DQ	APT30DQ120KG	TO-220
	30	2.0	31	3450	D	APT30D120BG	TO-247
	40	2.8	26	2200	DQ	APT40DQ120BG	TO-247
	60	2.8	30	2800	DQ	APT60DQ120BG	TO-247
	60	2.0	38	4000	D	APT60D120BG	TO-247 or D³
	75	2.8	32	3340	DQ	APT75DQ120BG	TO-247
1000	15	2.5	20	810	DQ	APT15DQ100BG	TO-247
	15	2.5	20	810	DQ	APT15DQ100KG	TO-220
	15	1.9	28	1550	D	APT15D100KG	TO-220
	30	2.5	22	1250	DQ	APT30DQ100BG	TO-247
	30	2.5	22	1250	DQ	APT30DQ100KG	TO-247
	30	1.9	29	2350	D	APT30D100BG	TO-247
	40	2.5	24	1430	DQ	APT40DQ100BG	TO-247
	60	2.5	29	2325	DQ	APT60DQ100BG	TO-247
	60	1.9	34	3600	D	APT60D100BG	TO-247 or D³
	75	2.5	33	2660	DQ	APT75DQ100BG	TO-247
600	15	2.0	16	250	DQ	APT15DQ60BG	TO-247
	15	2.0	16	250	DQ	APT15DQ60KG	TO-220
	15	1.6	21	520	D	APT15D60BG	TO-247
	15	1.6	21	520	D	APT15D60KG	TO-220
	30	2.0	19	400	DQ	APT30DQ60BG	TO-247
	30	2.0	19	400	DQ	APT30DQ60KG	TO-220
	30	1.6	23	700	D	APT30D60BG	TO-247
	40	2.0	22	480	DQ	APT40DQ60BG	TO-247
	60	2.0	26	640	DQ	APT60DQ60BG	TO-247
	60	1.6	40	920	D	APT60D60BG	TO-247 or D³
	75	2.0	29	650	DQ	APT75DQ60BG	TO-247
	100	1.25	45	3800	DL	APT100DL60BG	TO-247
400	30	1.3	22	360	D	APT30D40BG	TO-247
	60	1.3	30	540	D	APT60D40BG	TO-247
200	30	1.1	21	150	D	APT30D20BG	TO-247
	30	0.83	25	448	Schottky	APT30S20BG	TO-247 or D³
	60	1.1	30	250	D	APT60D20BG	TO-247
	60	0.83	35	490	Schottky	APT60S20BG	TO-247 or D³ or T/R
	100	0.89	40	690	Schottky	APT100S20BG	TO-247

TO-220[K]

D³ PAK[S]
TO-268



TO-247[B]

T-MAX®[B2]

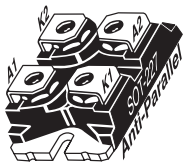
Part numbers for D³ package—replace "B" with "S" in part number

Datasheets available on www.microsemi.com

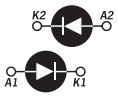
All Products RoHS-Compliant

Ultra Fast Recovery Diodes

Volts	$I_{F(avg)}$ Amps	V_F (volts) Typ 25 °C	t_{RR}(ns) Typ 25 °C	Q_{RR} (nC) Typ 125 °C at $I_F = I_F$ (avg)	Diode Series	Part Number	Package Style
DUAL	2 × 27	2.0	31	3450	D	APT2X30D120J	ISOTOP®
1200	2 × 30	2.6	25	1800	DQ	APT2X30DQ120J	
	2 × 53	2.0	38	4000	D	APT2X60D120J	
	2 × 60	2.5	30	2890	DQ	APT2X60DQ120J	
	2 × 93	2.0	47	5350	D	APT2X100D120J	
	2 × 100	2.4	45	5240	DQ	APT2X100DQ120J	
1000	2 × 28	1.9	29	2350	D	APT2X30D100J	
	2 × 55	1.9	34	3600	D	APT2X60D100J	
	2 × 60	2.2	30	2350	DQ	APT2X60DQ100J	
	2 × 95	1.9	43	4050	D	APT2X100D100J	
	2 × 100	2.1	45	3645	DQ	APT2X100DQ100J	
600	2 × 30	1.8	20	400	DQ	APT2X30DQ60J	
	2 × 30	1.6	23	700	D	APT2X30D60J	
	2 × 60	1.7	27	650	DQ	APT2X60DQ60J	
	2 × 60	1.6	40	920	D	APT2X60D60J	
	2 × 100	1.6	30	980	DQ	APT2X100DQ60J	
	2 × 100	1.6	34	1450	D	APT2X100D60	
	2 × 150	1.25	53	3800	DL	APT2X150DL60J	
400	2 × 30	1.3	22	360	D	APT2X30D40J	
	2 × 60	1.3	30	540	D	APT2X60D40J	
	2 × 100	1.3	37	1050	D	APT2X100D40J	
	2 × 100	1.0	40	3550	DL	APT2X101DL40J++	
300	2 × 100	1.2	36	650	D	APT2X101D30J	
200	2 × 30	0.80	25	448	Schottky	APT2X31S20J	
	2 × 60	0.83	35	490	Schottky	APT2X61S20J	
	2 × 100	1.1	39	840	D	APT2X100D20J	
	2 × 100	0.89	40	690	Schottky	APT2X101S20	
1200	2 × 30	2.8	26	2100	DQ	APT30DQ120BCTG	TO-247 [BCT]
1000	2 × 15	2.5	20	810	DQ	APT15DQ100BCTG	TO-247 [BCT]
	2 × 15	1.9	28	1550	D	APT15D100BCTG	TO-247 [BHB]
	2 × 30	1.9	29	2360	D	APT30D100BCTG	TO-247 [BHB]
	2 × 30	1.9	30	2350	D	APT30D100BHBG	TO-247 [BCA]
	2 × 60	2.5	29	2325	DQ	APT60DQ100LCTG	TO-264 [LCT
	2 × 60	1.9	35	3600	D	APT60D100LCTG	TO-264 [LCT]
600	2 × 15	1.6	21	520	D	APT15D60BCTG	TO-247
	2 × 15	2.0	15	250	DQ	APT15DQ60BCTG	TO-247 [BCT]
	2 × 15	1.6	20	520	D	APT15D60BCAG	TO-247 [BCA]
	2 × 30	2.0	22	480	DQ	APT30DQ60BHBG	TO-247 [BHB]
	2 × 30	2.0	19	400	DQ	APT30DQ60BCTG	TO-247 [BCT]
	2 × 30	1.6	23	700	D	APT30D60BCTG	TO-247 [BCT]
	2 × 30	1.6	25	700	D	APT30D60BHBG	TO-247 [BHB]
	2 × 30	1.6	25	700	D	APT30D60BCAG	TO-247 [BCA]
	2 × 40	2.0	22	480	DQ	APT40DQ60BCTG	TO-247 [BCT]
	2 × 60	2.0	26	640	DQ	APT60DQ60BCTG	TO-247 [BCT]
	2 × 60	1.6	30	920	D	APT60D60LCTG	TO-264 [LCT]
400	2 × 30	1.3	22	360	D	APT30D40BCTG	TO-247 [BCT]
	2 × 60	1.3	30	540	D	APT60D40LCTG	TO-264 [LCT]
300	2 × 30	1.2	25	1300	D	APT30D30BCTG	TO-247 [BCT]
200	2 × 30	1.1	21	150	D	APT30D20BCTG	TO-247 [BCT]
	2 × 30	1.1	21	150	D	APT30D20BCAG	TO-247 [BCA]
	2 × 30	0.80	25	448	Schottky	APT30S20BCTG	TO-247 [BCT]
	2 × 60	0.83	35	490	Schottky	APT60S20B2CTG	T-MAX® [B2CT]
	2 × 100	0.89	40	690	Schottky	APT100S20LCTG	TO-264[LCT]
TANDEM, DS DIODES FOR PFC BOOST APPLICATIONS							
600	15	3.2	13	85	DS	APT15DS60BG	TO-247
	30	3.2	17	180	DS	APT30DS60BG	TO-247
	(2,300 V diodes connected in series)						

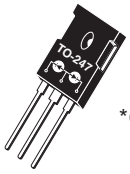


ISOTOP®[J] SOT-227 Antiparallel Configuration (ISOLATED BASE)

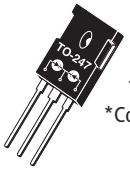


Part numbers for parallel configuration: replace 30, 60, or 100 with 31, 61, or 101, unless Schottky.

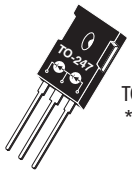
Example: 2X30D120J becomes 2X31D120J



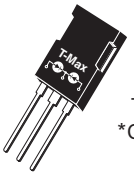
TO-247[BCA]
*Common anode



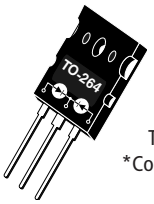
TO-247[BCT]
*Common cathode



TO-247[BHB]
*Half-bridge



T-MAX® [B2CT]
*Common cathode



TO-264[LCT]
*Common cathode

Part numbers for D³ packages—replace "B" with "S" in part number.

*Current ratings per leg. ++ Parallel form only.

Datasheets available on www.microsemi.com

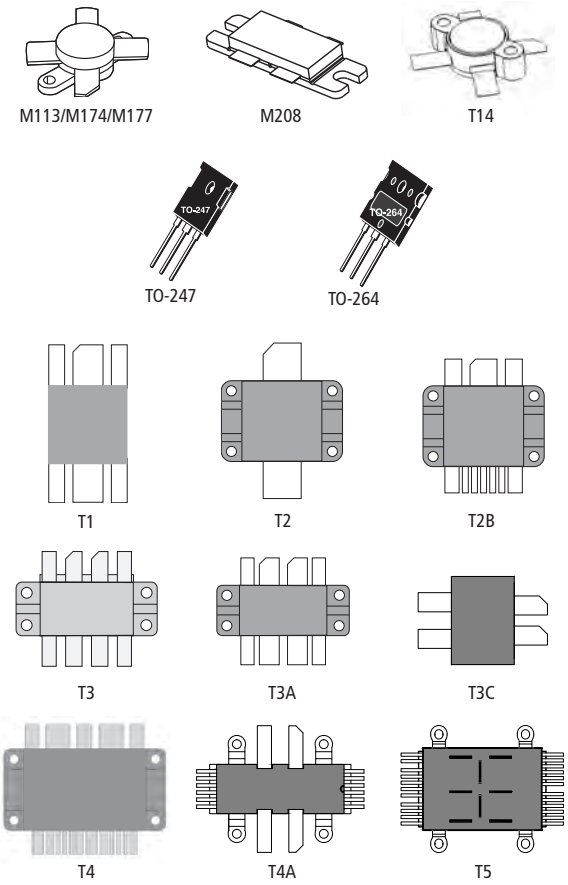
All Products RoHS-Compliant

High Voltage RF MOSFETs

The ARF family of RF Power MOSFETs are optimized for applications requiring frequencies as high as 150MHz and operating voltages as high as 400 V. Historically, RF Power MOSFETs were limited to applications of 50 V or less. This limitation has been removed by combining Microsemi's high voltage MOSFET technology with RF specific die geometries.

Why higher voltage? Higher V_{DD} means higher load impedance. For 150 W output from a 50 V supply, the load impedance is only 8 Ω. At 125 V, the load impedance is 50 Ω. The higher impedance allows simpler transformers and combiners. Paralleled devices can still operate into reasonable and convenient impedances. The increased operating voltage also lowers the DC current required for any given power output, increasing efficiency and reducing the size, weight, and cost of other system components. High breakdown voltage is a necessity in high-efficiency switchmode amplifiers, such as class C-E, which can see peak drain voltages of over 4X the applied V_{DD}.

Part Number	P_{out} (W)	Freq. (MHz)	VDD/BVDSS (V)	Rthjc (OC/W)	Package Style	Class of Operation
ARF449AG/BG	90	120	150/450	0.76	TO-247	A-E
ARF463AG/BG	100	100	125/500	0.70	TO-247	A-E
ARF463AP1G/BP1G	100	100	125/500	0.70	TO-247	A-E
ARF446G/ARF447G	140	65	250/900	0.55	TO-247	A-E
ARF521	150	150	165/500	0.60	M174	A-E
ARF460AG/BG	150	65	125/500	0.50	TO-247	A-E
ARF461AG/BG	150	65	250/1000	0.50	TO-247	A-E
ARF465AG/BG	150	60	300/1200	0.50	TO-247	A-E
ARF468AG/BG	270	45	165/500	0.38	TO-264	A-E
ARF475FL	300	150	165/500	0.31	T3A	A-E
ARF476FL	300	150	165/500	0.31	T3	A-E
ARF466AG/BG	300	45	200/1000	0.35	TO-264	A-E
ARF466FL	300	45	200/1000	0.13	T3A	A-E
ARF479	300	150	165/500	0.31	T3C	A-E
ARF469AG/BG	350	45	165/500	0.28	TO-264	A-E
ARF477FL	400	65	165/500	0.18	T3A	A-E
ARF1500	750	40	125/500	0.12	T1	A-E
ARF1501	750	40	250/1000	0.12	T1	A-E
ARF1510	750	40	700/1000	0.12	T1	D
ARF1511	750	40	380/500	0.12	T1	D
ARF1519	750	25	250/1000	0.13	T2	A-E



High-Frequency RF MOSFETs

The VRF family of RF MOSFETs are improved replacements for industry-standard RF transistors. They provide improved ruggedness by increasing the B_{VDSS} over 30 percent from the industry-standard 125 V to 170 V minimum. Low-cost flangeless packages are another improvement that shows Microsemi's dedication to optimizing performance, reducing cost, and improving reliability. We will continue to offer more products with the new reduced-cost flangeless packages.

Part Number	P_{out} (W)	Freq. (MHz)	Gain Typ (dB)	Eff. Typ (%)	VDD/BVDSS (V)	Rthjc (OC/W)	Package Style
VRF148A	30	175	16	50	65/170	1.52	M113
VRF141	150	175	13	45	28/80	0.60	M174
VRF151	150	175	14	50	65/170	0.60	M174
VRF152	150	175	14	50	50/140	0.60	M174
VRF150	150	150	11	50	65/170	0.60	M174
VRF161	200	175	25	50	65/170	0.50	M177
VRF151G	300	175	16	55	65/170	0.30	M208
VRF2933	300	150	25	50	65/170	0.27	M177
VRF2933FL	300	150	25	50	65/170	0.27	T14
VRF2944	400	150	25	50	65/170	0.22	M177
VRF154FL	600	30	17	45	65/170	0.13	T2
VRF157FL	600	30	21	45	65/170	0.13	T2
VRF164FL	600	30	21	45	65/170	0.10	T2

Drivers and Driver-RF MOSFET Hybrids

The DRF1200/01/02/03 Hybrids integrate drivers, bypass capacitors, and RF MOSFETS into a single package. Integration maximizes amplifier performance by minimizing transmission line parasitics between the driver and the MOSFET. The DRF1300 and DRF1301 have two independent channels, each containing a driver and RF MOSFET in a push-pull configuration. The DRF1400A and B are is a half-bridge hybrid with symmetrically orientated leads that can easily be configured into a full bridge converter. The new DRF1510 is a full bridge products optimized for maximum efficiency in class D amplifiers. All DRF parts feature a proprietary anti-ring function to eliminate cross conduction in a bridge or push-pull topologies. All DRF parts can be externally selected in either an inverting or non-inverting configuration.

Part Number	P_{out} (W)	Frequency (MHz)	VDD/BVDSS (V)	Package Style	Class of Operation
DRF1200	400	30	15/1000	T2B	D-E
DRF1201	600	30	15/1000	T2B	D-E
DRF1300	1000	30	15/500	T4	D-E
DRF1301	1000	30	15/1000	T4	D-E
DRF1400	1000	30	15/500	T4	D-E
DRF1211	600	30	15/500	T2B	D-E
DRF1410	1000	30	15/500	T4A	D-E
DRF1510	2000	30	15/500	T5	D-E

Reference Design Kits

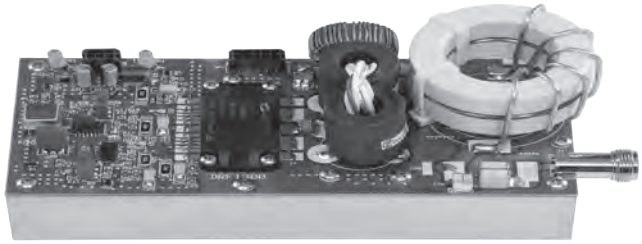
DRF1200/CLASS-E, 13.56 MHz

DRF1200/CLASS-E, 27.12 MHz

The DRF1200/CLASS-E Single-Ended RF Generator is a reference design that allows the designer to evaluate an 85 percent efficient 1000 W CLASS-E RF Generator.

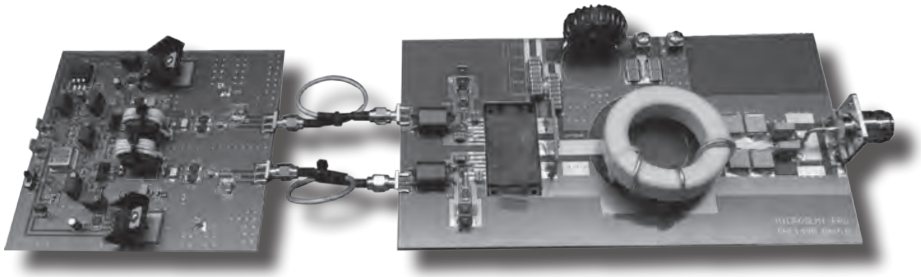
DRF1300/CLASS-D, 13.56 MHz

The DRF1300/CLASS-D Push-Pull RF Generator is a reference designthat allows the designer the ability to evaluate an 80 percent efficient 2000 W CLASS-D RF Generator.



DRF1400/CLASS-D, 13.56 MHz

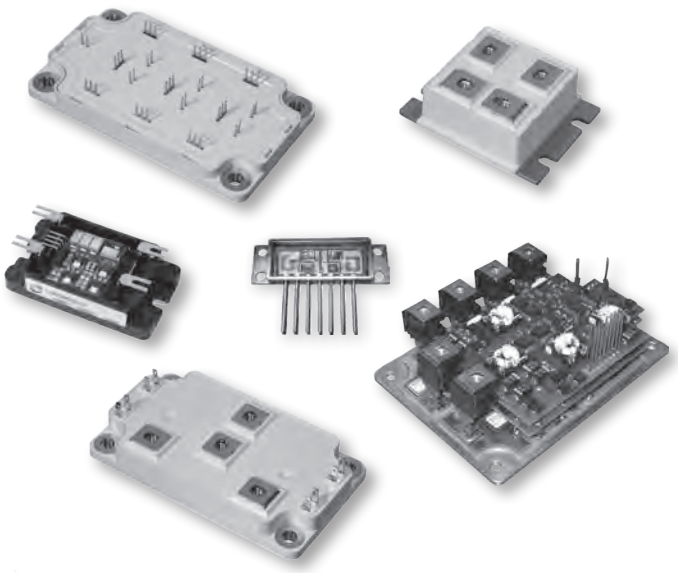
The DRF1400/CLASS-D Half-Bridge RF Generator is a reference design that allows the designer the ability to evaluate an 85 percent efficient 2500W CLASS- D RF Generator.



All kits include a fully populated board attached to an aluminum heat sink, an extensive application note explaining the theory of operation with designer's recommendations for evaluation and board layout, with a ll key waveforms illustrated and described, a complete parts list with recommended vendor part numbers and the board's Gerber file are provided for an easy transition into an end application.

New DRF1410 and DRF1510 Reference Designs Coming Soon

Power Modules Contents



Microsemi combines a formidable array of technologies in semiconductors, packaging and automated manufacturing to produce a wide range of high-quality modules optimized for the following traits:

- Reliability
- Efficiency and electrical performance
- Low cost
- Space savings
- Reduced assembly time

The readily available standard module product line spans a wide selection of circuit topologies, semiconductors including Silicon Carbide, voltage and current ratings, and packages. If you need even more flexibility or intellectual property protection, Microsemi can customize a standard module with low setup cost and short lead time. Unique requirements can be met with application specific power modules (ASPM®).

Microsemi serves a broad spectrum of industrial applications for Welding, Solar, Induction Heating, Medical, UPS, Motor Control, and SMPS markets as well as High-reliability applications for Semicap, Defense, and Aerospace markets. A wide selection of construction materials enables Microsemi to manufacture with short lead times modules with the following features:

- Extended temperature range: –60 °C to 200 °C
- High reliability
- Reduced size and weight
- High-reliability testing and screening options

Microsemi's experience and expertise in power electronic conversion brings the most effective technical support for your new development.

- Isolated gate driver
- Snubbers
- Mix-and-match semiconductors
- Short-circuit protection
- Temperature and current sensing
- Parameter binning

Standard Electrical Configurations

Microsemi offers a wide range of standard electrical configurations housed in a variety of packages to match your specific need for high power density and performance. Various semiconductor types are offered in the same topology.

Electrical Topology	IGBT 600 V–1700 V	MOSFET 75 V–1200 V	Diode 200 V–1700 V	Mix Si-SiC 600 V–1200 V	Full SiC 600 to 1700V
Asymmetrical bridge	X	X			
Boost buck	X	X			
Boost and buck chopper	X	X		X	X
Common anode			X		
Common cathode			X		
Dual boost and buck chopper	X	X		X	
Dual common source	X	X			
Dual diode					X
Full bridge	X	X	X		X
Full bridge with PFC	X	X		X	
Full bridge with secondary fast rectifier bridge	X	X		X	
Full bridge with series and parallel diodes		X		X	
Interleaved PFC	X	X			
Linear single and dual switch		X			
Phase leg	X	X	X		X
Phase leg intelligent	X				
Phase leg with PFC		X		X	
Phase leg with series and parallel diodes		X		X	
Single switch	X	X	X		
Single switch with series and parallel diodes		X		X	
Single switch with series diodes	X	X			
3-Level NPC inverter	X				X
3-Level T-type inverter	X			X	X
3-Phase bridge	X		X		
Triple dual common source	X	X			
Triple phase leg	X	X		X	X
	Trench3 Trench4 Trench4 Fast Trench5	MOSFET FREDFET Super Junction Mosfet	FRED Std Rectifier	IGBT MOSFET Diode	Diode MOSFET

Packaging

Improved Low-Profile Packages

SP1 (12 mm)
SP3F (12 mm)
SP4 (17 mm)
SP6 (17 mm)
SP6-P (12 mm)


SP1


SP3F


SP4


SP6


SP6-P

Industry-Standard Packages

SOT-227 (Isotop®)
SP2 (17 mm)
D3 (62 mm wide)
D4 (62 mm wide)

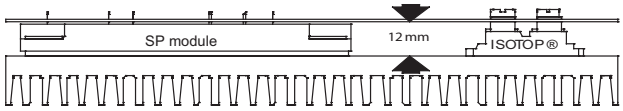

SOT-227


SP2


D3


D4

Package Advantages



SP1 package:

-Replaces two SOT-227 parts
-Improved assembly time and cost
-Height compatible with SOT-227
-Copper base plate

SP3F package:

-Replaces up to four SOT-227 parts
-Reduced assembly time and cost
-Height compatible with SOT-227
-Copper base plate


30 mm


17 mm

SP6 package:

Offers the same footprint and the same pinout location as the popular 62 mm package but with lower height, giving it the following advantages:
- Reduced stray inductance
- Reduced parasitic resistance
- Higher efficiency at high frequency

SP6-P package:

-Replaces up to siz SOT-227 parts
-Height compatible with SOT-227
-Low inductance solder pins
-High current capability

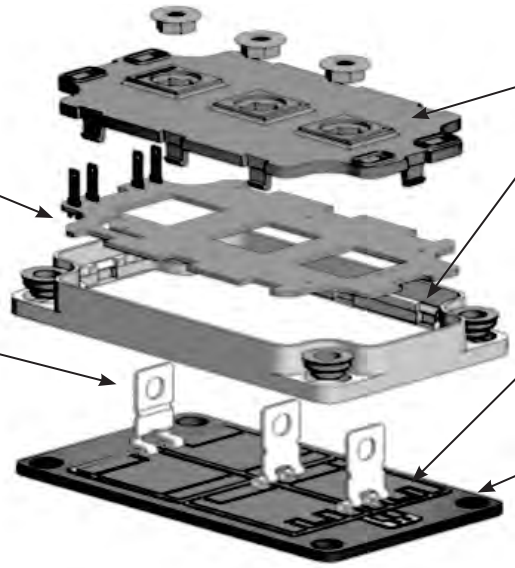
Custom Power Modules

Microsemi PMP created the application specific power module (ASPM) concept ,and has been offering customized power modules since 1983. Microsemi PMP offers a complete engineered solution with mix-and-match capabilities in term of package, configuration, performance, and cost.

Internal Printed Circuit Board
Not available in all modules.
Used to route gate signals tracks to small signal terminals.
Used to mount gate circuit and protection in case of intelligent power module.

Terminals
Screw-on or solder pins.
Provides the user with power and signal connections with minimum parasitic resistance and inductance.

Substrates
Al2O3, AlN, and Si3N4 provide isolation and good heat transfer to the base plate .



Package
Standard or custom.
Ensure environmental protection and mechanical robustness.

Power Semiconductor Die
IGBT, MOSFET, diode, SiC, thyristor and switching devices soldered to the substrates and connected by ultrasonic Al wire bonds.

Base Plate
Improves the heat transfer to the heat sink
Copper for good thermal transfer.
AlSiC, CuW, and CuMoCu for improved reliability.

The following table shows the three customization levels.

Change Options:	Die	Substrate	Base Plate	Plastic Lid	Terminals	NRE Level	MOQ
Elect./thermal performance	Die P/N	Material	Material	-	-	None to low	5 to 10 pieces
Elect./thermal performance and electrical configuration	Die P/N	Material and layout	Material	-	-	Low to medium	
Elect./thermal performance, and electrical configuration, and module housing	Die P/N	Material and layout	Material and shape	Material and shape	Shape	Medium to high	

Microsemi PMP power modules are made of different sub-elements. Most of them are standard and can be reused to build infinite solutions for the end user.

Microsemi PMP offers optimum development cost and cycle time thanks to long term experience and wide range of available technologies.

Power Modules Features	Customer Benefits
High-power density	Size and cost reduction
Isolated and highly thermally conductive substrate	Excellent thermal management
Internal wiring	Reduced external hardware
Minimum parasitics	Improved performance
Minimum output terminals	Reduced assembly time
Mix-and-match components	Optimizes losses
Fully engineered solutions	Easy to upgrade, lower part count, shorter time to market, and IP protection

FLEXIBILITY

Great level of integration
Mix of silicon within the same package
No quantity limitation

PACKAGING CAPABILITY

Standard and custom packages
Standard and custom terminals
Various substrate technologies

TECHNOLOGY

Application oriented

RELIABILITY

Coefficient of thermal expansion matching

APPLICATIONS

Solar, welding, plasma cutting, semicap, MRI and X-ray, EV/HEV, induction heating, UPS, motor control, data communication

Rugged Custom Power Modules

Microsemi PMP has acquired much experience and know-how in module customization that addresses rugged and wide temperature range applications, offering solution to meet the expectations of next-generation integrated power systems in terms of the following attributes:

- Improved reliability
- Wider operating temperatures
- Higher power
- Higher efficiency
- Lower weight and size
- Lower cost

Applications

- Avionics actuation system
- Avionics lift and pump
- Military ground vehicle
- power supply and motor control
- Navy ship auxiliary power supply
- Down hole drilling

Test Capabilities

- X-Ray inspection
- Dielectric test (up to 6 KV)
- Electrical testing at specified temperature
- Burn-in
- Acoustic imaging

Reliability Testing Capabilities

- Power cycling
- Hermetic sealing
- Moisture
- Salt atmosphere
- HTGB
- Temperature shock
- HAST
- H3TRB
- Altitude
- Mechanical shock, vibration

Expertise Capabilities

- Cross-sectioning
- Structural analysis

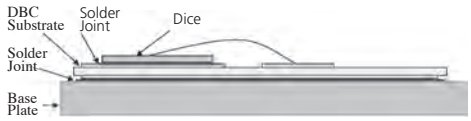
All tests can be conducted upon demand by sampling or at 100 percent. Tests can be performed in-house or in an external lab.

Our Core Competencies

- Extensive experience with rugged solutions for harsh environments
- Wide range of Silicon technologies
- Wafer fab capabilities
- Mix of assembly technologies
- Hermetic and robust plastic packages
- Custom test and burn-in solutions
- ISO9001-certified
- End-of-life (obsolescence) management
- Thermal management
- Material expertise
- Product life management and risk analysis

Various solutions are proposed offering different cost and low volume of entry:

	Industrial Application	Extended Temperature Application	Harsh Environment Application	
Standard module	X			No NRE Low-volume entry
Modified standard	X	X		Low NRE Low-volume entry
Custom module	X	X	X	Medium to high NRE Low-volume entry



	CTE (ppm/K)	Thermal Conductivity (W/m.K)	$R_{\theta JC}$ or R_{thJC} (K/W)
Silicon die (120 mm_2)	4	136	
Cu/Al_2O_3	17/7	390/25	0.35
$AlSiC/Al_2O_3$	7/7	170/25	0.38
Cu/AlN	17/5	390/170	0.28
AlSiC/AlN	7/5	170/170	0.31
$AlSiC/Si_3N_4$	7/3	170/60	0.31

	Material	CTE (ppm/K) (W/m.K)	Thermal Conductivity	Density (g/cc)
Base plate	CuW AlSiC Cu	6.5 7 17	190 170 390	17 2.9 8.9
Substrate	Al_2O_3 AlN Si_3N4	7 5 3	25 170 60	- - -
Die	Si SiC	4 2.6	136 270	- -

Module performance and reliability depends on the choice of assembly materials

TCEs with more closely matched materials increase the module's lifetime by reducing the stress at both the interface and interior of the materials.

The higher the thermal conductivity, the lower the junction-to-case thermal resistance and the lower the delta of junction temperature of the device during operation. This will minimize the effect of power cycling on the dice.

Another important feature is the material density, particularly for the baseplate. Taking copper as the reference, AlSiC has a density of 1/3, while CuW has twice the density. Therefore, AlSiC will provide substantial weight reduction while increasing reliability.

Power Module Part Numbering System

IGBT Modules

APT	GL	475	A	120	T	D3	G
I	II	III	IV	V	VI	VII	VIII

I — **TradeMark**

II — **IGBT Type:**
GL = TRENCH 4
GLQ = High-speed TRENCH 4
GT = TRENH 3
GTQ = TRENCH 5
GV = Mix NPT/TRENCH
CV = Mix TRENCH/Super Junction Mosfet

III — **Current:**
I_c at T_c = 80 °C

IV — **Topology:**
A = Phase Leg
BB = Boost Buck
DA = Boost Chopper
DDA = Double Boost Chopper
DH = Asymmetrical Bridge
DSK = Double Buck Chopper
DU = Dual Common Source
H = Full Bridge
HR = T-Type 3-Level
SDA = Double Boost + Bypass Diode
SK = Buck Chopper
TA = Triple Phase Leg
TDU = Triple Dual Common Source
TL = Three Level
U = Single Switch
VDA = Interleaved PFC
X = Three Phase Bridge

V — **Blocking Voltage:**
60 = 600 V
120 = 1200 V
170 = 1700 V

VI — **Option:**
A = AlN Substrate
C = SiC Diode
D = Series Diode
T = Temperature Sensor
W = Clamping Parallel Diode

VII — **Package:**
1 = SP1
2 = SP2
3 = SP3F
P = SP6-P
D3 = D3 (62 mm)
D4 = D4 (62 mm)

VIII — G = RoHS-compliant

MOSFET Modules

APT	C	60	DA	M24	T	1	G
I	II	III	IV	V	VI	VII	VIII

I — **TradeMark**

II — **MOSFET Type:**
MC - SM = MOSFET SiC
M = MOSFET
C = Super Junction Mosfet

III — **Blocking Voltage:**
08 = 75 V
10 = 100 V
20 = 200 V
50 = 500 V
60 = 600 V
80 = 800 V
90 = 900 V
100 = 100 V
120 = 120 V

IV — **Topology:**
A = Phase Leg
BB = Boost Buck
DA = Boost Chopper
DDA = Double Boost Chopper
DH = Asymmetrical Bridge
DSK = Double Buck Chopper
DU = Dual Common Source
H = Full Bridge
HR = T-Type 3-Level
SDA = Double Boost and Bypass Diode
SK = Buck Chopper
TA = Triple Phase Leg
TDU = Triple Dual Common Source
TL = Three Level NPC
U = Single Switch
VDA = Interleaved PFC

V — RDSON at T_c = 25 °C
240 = 2400 mΩ
24 = 240 m Ω
M24 = 24 m Ω

VI — **Option:**
A = AlN Substrate
C = SiC Diode
D = Series Diode
F = FREDFET
S = Series and Parallel Diodes
T = Temperature Sensor
U = Ultrafast FREDFET

VII — **Package:**
1 = SP1
2 = SP2
3 = SP3F
P = SP6-P

VIII — G = RoHS-compliant

Diode Modules

APT	DR	90	X	160	1	G
I	II	III	IV	V	VI	VII

I — **TradeMark**

II — **Diode Type:**
DF = FRED
DR = Standard Rectifier
DC = SiC
DSK = Schottky

III — **Current:**
I_F at T_c=8 0 °C

IV — **Topology:**
AA = Dual Common Anode
BB = Boost Buck
AK = Dual Series
KK = Dual Common Cathode
H = Single Phase Bridge
U = Single Switch
X = Three Phase Bridge

V — **Blocking Voltage:**
20 = 200 V
40 = 400 V
60 = 600 V
100 = 1000 V
120 = 1200 V
160 = 1600 V
170 = 1700 V

VI — **Package:**
1 = SP1
3 = SP3F

VII — G = RoHS-compliant

Optional Materials

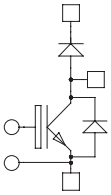
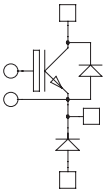
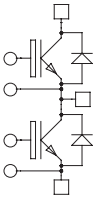
Optional materials are available upon demand for most of the listed standard power modules. Options are indicated with a letter in the suffix of the module part number. The temperature sensor option is listed as "YES" or "OPTION" when available for a standard part or on-demand.

The following tables list the options available for our product categories.

- **A** AlN substrate for higher thermal conductivity
- **M** AlSiC base plate material for improved temperature cycling capabilities
- **T** Temperature sensor (NTC or PTC) for case temperature information
- **C** SiC diode for higher efficiency
- **N** Si3N4 substrate
- **E** Press fit terminals (for SP3F package only)
- **X** Gold pin terminals (SP1 only)
- **L** Phase change material option

IGBT Power Modules

CHOPPER AND PHASE LEG

V_{CES} (V)	IGBT Type	I_C (A) T_C = 80 °C	$V_{CE(on)}$(V) at Rated I_c	Package	NTC	 …DA… or …U2	 …SK… or …U3	 …A…	
600	TRENCH 3	75	1.5	SP1	YES	APTGT75DA60T1G	APTGT75SK60T1G	APTGT75A60T1G	
		100	1.5	SP1	YES	APTGT100DA60T1G	APTGT100SK60T1G	APTGT100A60T1G	
		100	1.5	SP2	-	N/A	N/A	APTGT100A602G	
		150	1.5	SP1	YES	APTGT150DA60T1G	APTGT150SK60T1G	APTGT150A60T1G	
		150	1.5	SP3F	YES	N/A	N/A	APTGT150A60T3AG	
		200	1.5	SP2	-	N/A	N/A	APTGT200A602G	
		200	1.5	SP3F	YES	APTGT200DA60T3AG	APTGT200SK60T3AG	APTGT200A60T3AG	
		300	1.5	SP4	YES	N/A	N/A	APTGT300A60TG	
		300	1.5	SP6	OPTION	APTGT300DA60G	APTGT300SK60G	APTGT300A60G	
		300	1.5	D3	OPTION	APTGT300DA60D3G	APTGT300SK60D3G	APTGT300A60D3G	
		400	1.5	D3	OPTION	APTGT400DA60D3G	APTGT400SK60D3G	APTGT400A60D3G	
		450	1.5	SP6	OPTION	APTGT450DA60G	APTGT450SK60G	APTGT450A60G	
		600	1.5	SP6	OPTION	APTGT600DA60G	APTGT600SK60G	APTGT600A60G	
650	TRENCH 4 FAST	50	1.85	SOT227		APT50GLQ65JU2	N/A	N/A	NEW!
		50	1.85	SOT227		APT100GLQ65JU2	APT100GLQ65JU3	N/A	NEW!
		100	1.85	SP1	YES	N/A	N/A	APTGLQ100A65T1G	
		600	1.85	SP6	YES	N/A	N/A	APTGLQ600A65T6G	
650	TRENCH 5	60	1.65	SP1	YES	APTGTQ100DA65T1G	APTGTQ100SK65T1G	APTGTQ100A65T1G	
		120	1.65	SP3F	YES	APTGTQ200DA65T3G	APTGTQ200SK65T3G	APTGTQ200A65T3G	
1200	TRENCH 3	35	1.7	SP1	YES	N/A	N/A	APTGT35A120T1G	
		35	1.7	SOT227	-	APT35GT120JU2	APT35GT120JU3	N/A	
		50	1.7	SOT227	-	APT50GT120JU2	APT50GT120JU3	N/A	
		50	1.7	SP1	YES	N/A	N/A	APTGT50A120T1G	
		50	1.7	SP2	-	N/A	N/A	APTGT50A1202G	
		50	1.7	SP4	YES	APTGT50DA120TG	APTGT50SK120TG	N/A	
		75	1.7	SOT227	-	APT75GT120JU2	APT75GT120JU3	N/A	
		75	1.7	SP1	YES	N/A	N/A	APTGT75A120T1G	
		75	1.7	SP2	-	N/A	N/A	APTGT75A1202G	
		75	1.7	SP4	YES	APTGT75DA120TG	APTGT75SK120TG	N/A	
		100	1.7	SP1	YES	APTGT100DA120T1G	N/A	N/A	
		100	1.7	SOT227	-	APT100GT120JU2	APT100GT120JU3	N/A	
		100	1.7	SP2	-	N/A	N/A	APTGT100A1202G	
		100	1.7	SP3F	YES	N/A	N/A	APTGT100A120T3AG	
		100	1.7	SP4	YES	N/A	N/A	APTGT100A120TG	
		150	1.7	SP6	OPTION	APTGT150DA120G	APTGT150SK120G	APTGT150A120G	
		150	1.7	SP3F	YES	N/A	N/A	APTGT150A120T3AG	
		150	1.7	SP4	YES	N/A	N/A	APTGT150A120TG	
		200	1.7	SP6	OPTION	APTGT200DA120G	APTGT200SK120G	APTGT200A120G	
		200	1.7	D3	OPTION	APTGT200DA120D3G	APTGT200SK120D3G	APTGT200A120D3G	
		300	1.7	SP6	OPTION	APTGT300DA120G	APTGT300SK120G	APTGT300A120G	
		300	1.7	D3	OPTION	APTGT300DA120D3G	APTGT300SK120D3G	APTGT300A120D3G	
		400	1.7	SP6	OPTION	APTGT400DA120G	APTGT400SK120G	APTGT400A120G	
		400	1.7	D3	OPTION	N/A	N/A	APTGT400A120D3G	
1200	TRENCH 4	40	1.85	SOT227	-	APT40GL120JU2	APT40GL120JU3	N/A	
		90	1.85	SP1	YES	APTGL90DA120T1G	APTGL90SK120T1G	APTGL90A120T1G	
		180	1.85	SP2	-	N/A	N/A	APTGL180A1202G	
		180	1.85	SP3F	YES	N/A	N/A	APTGL180A120T3AG	
		325	1.85	D3	OPTION	APTGL325DA120D3G	APTGL325SK120D3G	APTGL325A120D3G	
		475	1.85	D3	OPTION	APTGL475DA120D3G	APTGL475SK120D3G	APTGL475A120D3G	
		700	1.85	D3	OPTION	APTGL700DA120D3G	APTGL700SK120D3G	N/A	
	TRENCH 4 FAST	100	2.05	SP3F	YES	N/A	N/A	APTGLQ100A120T3AG	
		100	2.05	SP1	YES	APTGLQ100DA120T1G	N/A	N/A	NEW!
		100	2.05	SP4	YES			APTGLQ100A120TG	NEW!
		150	2.05	SP4	YES			APTGLQ150A120TG	NEW!
		200	2.05	SP3F	YES			APTGLQ200A120T3AG	NEW!
		300	2.05	SP6C		N/A	APTGLQ300SK120G	APTGLQ300A120G	NEW!
		400	2.05	SP6	YES	N/A	N/A	APTGLQ400A120T6G	
1700	TRENCH 3	30	2.0	SP1	YES	APTGT30DA170T1G	APTGT30SK170T1G	APTGT30A170T1G	
		50	2.0	SP1	YES	APTGT50DA170T1G	APTGT50SK170T1G	APTGT50A170T1G	
		50	2.0	SP4	YES	APTGT50DA170TG	APTGT50SK170TG	APTGT50A170TG	
		75	2.0	SP1	YES	APTGT75DA170T1G	N/A	N/A	
		100	2.0	SP4	YES	APTGT100DA170TG	APTGT100SK170TG	APTGT100A170TG	
		150	2.0	SP6	OPTION	APTGT150DA170G	APTGT150SK170G	APTGT150A170G	
		200	2.0	D3	OPTION	APTGT200DA170D3G	APTGT200SK170D3G	APTGT200A170D3G	
		225	2.0	SP6	OPTION	APTGT225DA170G	APTGT225SK170G	APTGT225A170G	
		300	2.0	SP6	OPTION	APTGT300DA170G	APTGT300SK170G	APTGT300A170G	
		300	2.0	D3	OPTION	APTGT300DA170D3G	APTGT300SK170D3G	APTGT300A170D3G	


SOT-227


SP1


SP2


SP3F


SP4

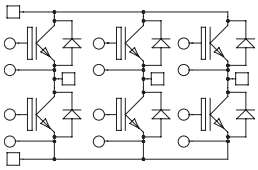

SP6


D3

All Power Modules RoHS-Compliant

IGBT Power Modules

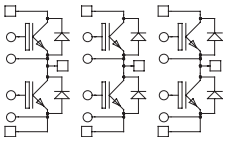
THREE-PHASE BRIDGE



V_{CES} (V)	IGBT Type	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Part Number
600	TRENCH 3	30	1.5	SP3F	YES	APTGT30X60T3G
		50	1.5	SP3F	YES	APTGT50X60T3G
		75	1.5	SP3F	YES	APTGT75X60T3G
1200	TRENCH 3	25	1.7	SP3F	YES	APTGT25X120T3G
		35	1.7	SP3F	YES	APTGT35X120T3G
	TRENCH 4	40	1.85	SP3F	YES	APTGL40X120T3G

SP3F

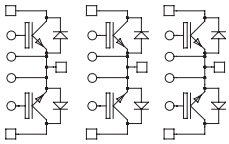
TRIPLE-PHASE LEG



V_{CES} (V)	IGBT Type	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Part Number
600	TRENCH 3	50	1.5	SP6-P	OPTION	APTGT50TA60PG
		75	1.5	SP6-P	OPTION	APTGT75TA60PG
		150	1.5	SP6-P	OPTION	APTGT150TA60PG
650	TRENCH 5	30	1.65	SP3F	YES	APTGTQ50TA65T3G
		90	1.65	SP6P	YES	APTGTQ150TA65TPG
1200	TRENCH 3	75	1.7	SP6-P	OPTION	APTGT75TA120PG
		100	1.7	SP6-P	YES	APTGT100TA120TPG
	TRENCH 4	120	1.85	SP6-P	YES	APTGL120TA120TPG

SP4

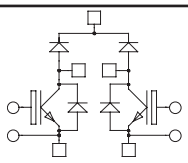
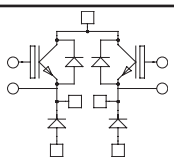
TRIPLE DUAL COMMON SOURCE



V_{CES} (V)	IGBT Type	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Part Number
600	TRENCH 3	50	1.5	SP6-P	OPTION	APTGT50TDU60PG
		75	1.5	SP6-P	OPTION	APTGT75TDU60PG
		100	1.5	SP6-P	OPTION	APTGT100TDU60PG
		150	1.5	SP6-P	OPTION	APTGT150TDU60PG
1200	TRENCH 3	75	1.7	SP6-P	OPTION	APTGT75TDU120PG
	TRENCH 4	120	1.85	SP6-P	YES	APTGL120TDU120TPG
1700	TRENCH 3	50	2.0	SP6-P	OPTION	APTGT50TDU170PG

SP6-P

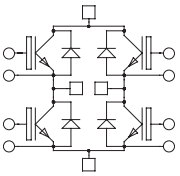
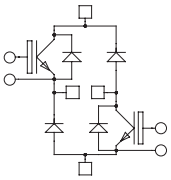
DUAL CHOPPER

V_{CES} (V)	IGBT Type	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	 ...DDA...	 ...DSK...	
600	TRENCH 3	50	1.5	SP3F	YES	APTGT50DDA60T3G	APTGT50DSK60T3G	
		75	1.5	SP3F	YES	APTGT75DDA60T3G	APTGT75DSK60T3G	
650	TRENCH 5	60	1.65	SP3F	YES	APTGTQ100DDA65T3G	N/A	
650	TRENCH 4 FAST	50	1.85	SP3F	YES	APTGLQ50DDA65T3G	N/A	***NEW!***
650	TRENCH 4 FAST	50	1.85	SP3F	YES	APTGLQ50VDA65T3G	N/A	***NEW!***
1200	TRENCH 3	50	1.7	SP3F	YES	APTGT50DDA120T3G	APTGT50DSK120T3G	
	TRENCH 4	60	1.85	SP3F	YES	APTGL60DDA120T3G	APTGL60DSK120T3G	
		90	1.85	SP3F	YES	APTGL90DDA120T3G	APTGL90DSK120T3G	

All Power Modules RoHS-Compliant

IGBT Power Modules

FULL AND ASYMMETRICAL BRIDGE

V_{CES} (V)	IGBT Type	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	 ...H...	 ...DH...	
600	TRENCH 3	20	1.5	SP1	YES	APTGT20H60T1G	N/A	
		30	1.5	SP1	YES	APTGT30H60T1G	N/A	
		50	1.5	SP1	YES	APTGT50H60T1G	APTGT50DH60T1G	
		50	1.5	SP2	YES	APTGT50H60T2G	N/A	
		50	1.5	SP3F	YES	APTGT50H60T3G	N/A	
		75	1.5	SP1	YES	APTGT75H60T1G	APTGT75DH60T1G	
		75	1.5	SP2	YES	APTGT75H60T2G	N/A	
		75	1.5	SP3F	YES	APTGT75H60T3G	N/A	
		100	1.5	SP4	YES	APTGT100H60TG	APTGT100DH60TG	
		100	1.5	SP3F	YES	APTGT100H60T3G	APTGT100DH60T3G	
		150	1.5	SP4	YES	APTGT150H60TG	APTGT150DH60TG	
		200	1.5	SP6		APTGT200H60G	APTGT200DH60G	
		300	1.5	SP6		APTGT300H60G	APTGT300DH60G	
650	TRENCH 4 FAST	30	1.95	SP3F	YES	APTGLQ30H65T3G		NEW!
		50	1.85	SP1	YES	APTGLQ30H65T1G		NEW!
		50	1.85	SP3F	YES	APTGLQ50H65T3G		NEW!
		75	1.85	SP1	YES	APTGLQ75H65T1G	N/A	
		100	1.85	SP3F	YES	APTGLQ100H65T3G		NEW!
		200	1.85	SP6C		APTGLQ200H65G		NEW!
		300	1.85	SP6	OPTION	APTGLQ300H65G	N/A	
650	TRENCH 5	60	1.65	SP3F	YES	APTGTQ100H65T3G	N/A	
1200	TRENCH 3	35	1.7	SP3F	YES	APTGT35H120T3G	N/A	
		50	1.7	SP3F	YES	APTGT50H120T3G	APTGT50DH120T3G	
		50	1.7	SP4	YES	APTGT50H120TG	APTGT50DH120TG	
		75	1.7	SP3F	YES	N/A	APTGT75DH120T3G	
		75	1.7	SP4	YES	APTGT75H120TG	APTGT75DH120TG	
		100	1.7	SP4	YES	N/A	APTGT100DH120TG	
		100	1.7	SP6		APTGT100H120G	N/A	
		150	1.7	SP6		APTGT150H120G	APTGT150DH120G	
		200	1.7	SP6		APTGT200H120G	APTGT200DH120G	
	TRENCH 4	40	1.85	SP1	YES	APTGL40H120T1G	N/A	
		60	1.85	SP3F	YES	APTGL60H120T3G	APTGL60DH120T3G	
		90	1.85	SP3F	YES	APTGL90H120T3G	APTGL90DH120T3G	
	TRENCH 4 FAST	25	2.05	SP1	YES	APTGLQ25H120T1G		NEW!
		25	2.05	SP2	YES	APTGLQ25H120T2G		NEW!
		40	2.05	SP1	YES	APTGLQ40H120T1G	N/A	
		75	2.05	SP3F	YES	APTGLQ75H120T3G	N/A	
		75	2.05	SP4	YES	APTGLQ75H120TG		NEW!
		150	2.05	SP6C		APTGLQ150H120G		NEW!
		200	2.05	SP6	OPTION	APTGLQ200H120G	N/A	
1700	TRENCH 3	30	2.0	SP3F	YES	APTGT30H170T3G	N/A	
		50	2.0	SP4	YES	APTGT50H170TG	APTGT50DH170TG	
		100	2.0	SP6		APTGT100H170G	APTGT100DH170G	
		150	2.0	SP6		APTGT150H170G	APTGT150DH170G	


SP1


SP2


SP3F

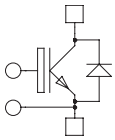

SP4


SP6 Full Bridge

All Power Modules RoHS-Compliant

IGBT Power Modules

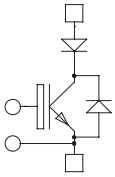
SINGLE SWITCH



V_{CES} (V)	IGBT Type	I_C (A) $T_C = 80$ °C	$V_{CE(on)}$(V) at Rated I_c	Package	NTC	Part Number
600	TRENCH 3	750	1.5	D4		APTGT750U60D4G
1200	TRENCH 3	400	1.7	D4		APTGT400U120D4G
		600	1.7	D4		APTGT600U120D4G
	TRENCH 4	475	1.85	D4		APTGL475U120D4G
		700	1.85	D4		APTGL700U120D4G
1700	TRENCH 3	400	2.0	D4		APTGT400U170D4G
		600	2.0	D4		APTGT600U170D4G

D4

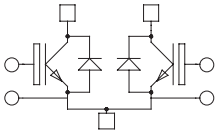
SINGLE SWITCH + SERIES DIODE



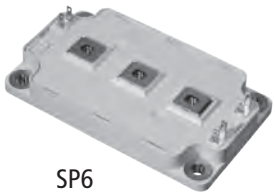
V_{CES} (V)	IGBT Type	I_C (A) $T_C = 80$ °C	$V_{CE(on)}$(V) at Rated I_c	Package	NTC	Part Number
1200	TRENCH 4	475	1.85	SP6		APTGL475U120DAG

SP4

DUAL COMMON SOURCE



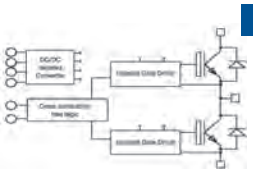
V_{CES} (V)	IGBT Type	I_C (A) $T_C = 80$ °C	$V_{CE(on)}$(V) at Rated I_c	Package	NTC	Part Number
600	TRENCH 3	100	1.5	SP4	YES	APTGT100DU60TG
		200	1.5	SP4	YES	APTGT200DU60TG
		300	1.4	SP6		APTGT300DU60G
		600	1.4	SP6		APTGT600DU60G
1200	TRENCH 3	50	1.7	SP4	YES	APTGT50DU120TG
		75	1.7	SP4	YES	APTGT75DU120TG
		100	1.7	SP4	YES	APTGT100DU120TG
		150	1.7	SP6		APTGT150DU120G
		150	1.7	SP4	YES	APTGT150DU120TG
		200	1.7	SP6		APTGT200DU120G
		300	1.7	SP6		APTGT300DU120G
		400	1.7	SP6		APTGT400DU120G
1700	TRENCH 3	100	2.0	SP4	YES	APTGT100DU170TG
		225	2.0	SP6		APTGT225DU170G
		300	2.0	SP6		APTGT300DU170G



SP6

Intelligent Power Modules

PHASE LEG



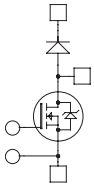
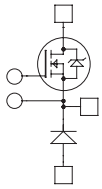
V_{CES} (V)	IGBT Type	I_C (A) $T_C = 80$ °C	$V_{CE(on)}$(V) at Rated I_c	Package	NTC	Part Number
600	TRENCH 3	400	1.5	LP8		APTLGT400A608G
1200	TRENCH 3	300	1.7	LP8		APTLGT300A1208G
	TRENCH 4	325	1.8	LP8		APTLGL325A1208G

LP8

All Power Modules RoHS-Compliant

MOSFET Power Modules

CHOPPER

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	 DA...or...U2	 SK...or...U3
100	MOS 5	11	100	SOT-227		APT10M11JVRU2	APT10M11JVRU3
		4.5	207	SP4	YES	APTM10DAM05TG	APTM10SKM05TG
		2.25	370	SP6		APTM10DAM02G	APTM10SKM02G
200	MOS 5	22	71	SOT-227		APT20M22JVRU2	APT20M22JVRU3
	MOS 7	8	147	SP4	YES	APTM20DAM08TG	APTM20SKM08TG
		5	250	SP6	OPTION	APTM20DAM05G	APTM20SKM05G
		4	300	SP6	OPTION	APTM20DAM04G	APTM20SKM04G
500	MOS 5	100	30	SOT-227		APT5010JVRU2	APT5010JVRU3
	MOS 7	100	30	SOT-227		APT5010JLLU2	APT5010JLLU3
		75	32	SOT-227		APT50M75JLLU2	APT50M75JLLU3
		19	125	SP6	OPTION	APTM50DAM19G	APTM50SKM19G
		17	140	SP6	OPTION	APTM50DAM17G	APTM50SKM17G
	MOS 8	65	43	SOT-227		APT58M50JU2	APT58M50JU3
600	SUPER JUNCTION MOSFET	70	40	SOT-227		APT40N60JCU2	APT40N60JCU3
		24	70	SP1	YES	APTC60DAM24T1G	APTC60SKM24T1G
900	SUPER JUNCTION MOSFET	120	25	SOT-227		APT33N90JCU2	APT33N90JCU3
		60	44	SP1	YES	APTC90DAM60T1G	APTC90SKM60T1G
1000	MOS 7	180	33	SP4	YES	APTM100DA18TG	APTM100SK18TG
		90	59	SP6	OPTION	APTM100DAM90G	APTM100SKM90G
	MOS 8	330	17	SP1	YES	APTM100DA33T1G	APTM100SK33T1G
1200	MOS8	300	23	SP1	YES	APTM120DA30T1G	N/A


SOT-227

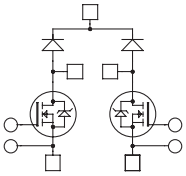
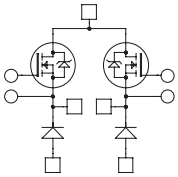

SP1


SP3F

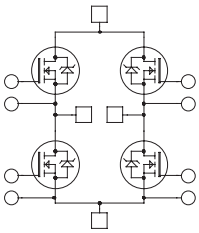

SP4


SP6

DUAL CHOPPER

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	 ...DDA...	 ...DSK...
100	MOS 5	19	50	SP3F	YES	APTM10DDAM19T3G	APTM10DSKM19T3G
		9	100	SP3F	YES	APTM10DDAM09T3G	APTM10DSKM09T3G
500	MOS 7	100	24	SP3F	YES	APTM50DDA10T3G	APTM50DSK10T3G
		65	37	SP3F	YES	APTM50DDAM65T3G	APTM50DSKM65T3G
600	SUPER JUNCTION MOSFET	45	38	SP1	YES	APTC60DDAM45T1G	APTC60DSKM45T1G
		70	29	SP1	YES	APTC60DDAM70T1G	APTC60DSKM70T1G
		35	54	SP3F	YES	APTC60DDAM35T3G	APTC60DSKM35T3G
		24	70	SP3F	YES	APTC60DDAM24T3G	APTC60DSKM24T3G
800	SUPER JUNCTION MOSFET	150	21	SP3F	YES	APTC80DDA15T3G	APTC80DSK15T3G
1000	MOS 7	350	17	SP3F	YES	APTM100DDA35T3G	APTM100DSK35T3G

MOSFET Power Modules



FULL BRIDGE

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
100	FREDFET 5	4.5	207	SP6		APTM10HM05FG
		19	50	SP3F	YES	APTM10HM19FT3G
		9	100	SP3F	YES	APTM10HM09FT3G
200	FREDFET 7	20	62	SP4	YES	APTM20HM20FTG
		16	74	SP4	YES	APTM20HM16FTG
		10	125	SP6		APTM20HM10FG
		8	147	SP6		APTM20HM08FG
500	FREDFET 7	140	18	SP3F	YES	APTM50H14FT3G
		100	24	SP3F	YES	APTM50H10FT3G
		75	32	SP4	YES	APTM50HM75FTG
		75	32	SP3F	YES	APTM50HM75FT3G
		65	37	SP4	YES	APTM50HM65FTG
		65	37	SP3F	YES	APTM50HM65FT3G
		38	64	SP6		APTM50HM38FG
		35	70	SP6		APTM50HM35FG
	FREDFET 8	150	19	SP1	YES	APTM50H15FT1G
600	SUPER JUNCTION MOSFET	70	29	SP1	YES	APTC60HM70T1G
		45	38	SP1	YES	APTC60HM45T1G
		83	21	SP2	YES	APTC60HM83FT2G
		70	29	SP3F	YES	APTC60HM70T3G
		35	54	SP3F	YES	APTC60HM35T3G
		24	70	SP3F	YES	APTC60HM24T3G
	FREDFET 8	230	15	SP1	YES	APTM60H23FT1G
800	SUPER JUNCTION MOSFET	150	21	SP1	YES	APTC80H15T1G
		290	11	SP3F	YES	APTC80H29T3G
		150	21	SP3F	YES	APTC80H15T3G
900	SUPER JUNCTION MOSFET	120	23	SP1	YES	APTC90H12T1G
		60	44	SP3F	YES	APTC90HM60T3G
1000	FREDFET 7	450	14	SP3F	YES	APTM100H45FT3G
		350	17	SP4	YES	APTM100H35FTG
		350	17	SP3F	YES	APTM100H35FT3G
		180	33	SP6		APTM100H18FG
	FREDFET 8	460	14	SP3F	YES	APTM100H46FT3G
1200	FREDFET 7	290	25	SP6		APTM120H29FG
	FREDFET 8	1400	6	SP1	YES	APTM120H140FT1G

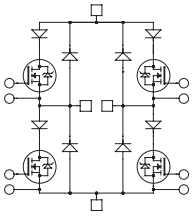
SP1

SP2

SP3F

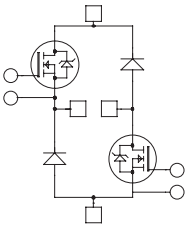
SP4

SP6



FULL BRIDGE + SERIES AND PARALLEL DIODES

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
200	MOS 7	20	62	SP4	YES	APTM20HM20STG
500	MOS 7	75	32	SP4	YES	APTM50HM75STG
1000	MOS 7	450	13	SP4	YES	APTM100H45STG



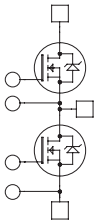
ASYMMETRICAL BRIDGE

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
100	MOS5	4.5	207	SP6		APTM10DHM05G
200	MOS 7	16	77	SP3F	YES	APTM20DHM16T3G
		8	147	SP6		APTM20DHM08G
500	MOS 7	38	64	SP6		APTM50DHM38G
	MOS 8	65	32	SP3F	YES	APTM50DHM65T3G
600	SUPER JUNCTION MOSFET	24	70	SP3F	YES	APTC60DHM24T3G

All Power Modules RoHS-Compliant

MOSFET Power Modules

PHASE LEG

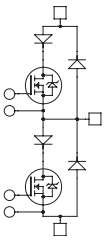


V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
100	FREDFET 5	4.5	207	SP4	YES	APTM10AM05FTG
		2.25	370	SP6	OPTION	APTM10AM02FG
200	FREDFET 7	10	125	SP4	YES	APTM20AM10FTG
		8	147	SP4	YES	APTM20AM08FTG
		5	250	SP6	OPTION	APTM20AM05FG
		4	300	SP6	OPTION	APTM20AM04FG
500	FREDFET 7	38	64	SP4	YES	APTM50AM38FTG
		35	70	SP4	YES	APTM50AM35FTG
		19	125	SP6	OPTION	APTM50AM19FG
		17	140	SP6	OPTION	APTM50AM17FG
600	SUPER JUNCTION MOSFET	45	38	SP1	YES	APTC60AM45T1G
		42	40	SP2		APTC60AM42F2G
		35	54	SP1	YES	APTC60AM35T1G
		24	70	SP1	YES	APTC60AM24T1G
		24	70	SP2		APTC60AM242G
	FREDFET 8	110	30	SP1	YES	APTM60A11FT1G
900	SUPER JUNCTION MOSFET	60	44	SP1	YES	APTC90AM60T1G
		60	44	SP2		APTC90AM602G
1000	FREDFET 7	180	33	SP4	YES	APTM100A18FTG
		90	59	SP6	OPTION	APTM100AM90FG
	FREDFET 8	400	16	SP1	YES	APTM100A40FT1G
1200	FREDFET 7	290	25	SP4	YES	APTM120A29FTG
		150	45	SP6	OPTION	APTM120A15FG
	FREDFET 8	650	12	SP1	YES	APTM120A65FT1G

SP1

SP2

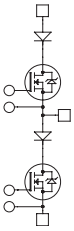
PHASE LEG + SERIES AND PARALLEL DIODES



V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
200	MOS 7	10	125	SP4	YES	APTM20AM10STG
		6	225	SP6		APTM20AM06SG
500	MOS 7	38	64	SP4	YES	APTM50AM38STG
		24	110	SP6		APTM50AM24SG
1000	MOS 7	230	26	SP4	YES	APTM100A23STG
		130	49	SP6		APTM100A13SG
1200	MOS 7	200	37	SP6		APTM120A20SG

SP4

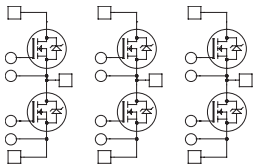
PHASE LEG + SERIES DIODES



V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
1000	MOS 7	130	49	SP6		APTM100A13DG
1200	MOS 7	200	37	SP6		APTM120A20DG

SP6

TRIPLE PHASE LEG

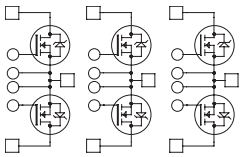


V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
75	MOSFET	4.2	90	SP6-P	OPTION	APTM08TAM04PG
100	FREDFET 5	19	50	SP6-P	OPTION	APTM10TAM19FPG
		9	100	SP6-P	OPTION	APTM10TAM09FPG
200	FREDFET 7	16	74	SP6-P	OPTION	APTM20TAM16FPG
500	FREDFET 7	65	37	SP6-P	OPTION	APTM50TAM65FPG
600	SUPER JUNCTION MOSFET	35	54	SP6-P	OPTION	APTC60TAM35PG
		24	70	SP6-P	YES	APTC60TAM24TPG
800	SUPER JUNCTION MOSFET	150	21	SP6-P	OPTION	APTC80TA15PG
900	SUPER JUNCTION MOSFET	60	44	SP6-P	YES	APTC90TAM60TPG
1000	FREDFET 7	350	17	SP6-P	OPTION	APTM100TA35FPG

SP6-P

All Power Modules RoHS-Compliant

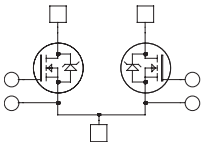
MOSFET Power Modules



TRIPLE DUAL COMMON SOURCE

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C =80 °C	Package	NTC	Part Number
100	MOS 5	9	100	SP6-P	OPTION	APTM10TDUM09PG
600	SUPER JUNCTION MOSFET	35	54	SP6-P	OPTION	APTC60TDUM35PG
800	SUPER JUNCTION MOSFET	150	21	SP6-P	OPTION	APTC80TDU15PG
1200	MOS 7	570	13	SP6-P	OPTION	APTM120TDU57PG

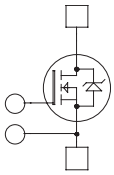
SP1



DUAL COMMON SOURCE

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
100	MOS 5	2.25	370	SP6		APTM10DUM02G
200	MOS 7	8	147	SP4	YES	APTM20DUM08TG
		5	250	SP6		APTM20DUM05G
		4	300	SP6		APTM20DUM04G
500	MOS 7	35	70	SP4	YES	APTM50DUM35TG
		17	140	SP6		APTM50DUM17G
1000	MOS 7	90	59	SP6		APTM100DUM90G
1200	MOS 7	150	45	SP6		APTM120DU15G

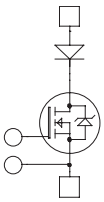
SP3F



SINGLE SWITCH

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
100	FREDFET 5	2.25	430	SP6	OPTION	APTM10UM02FAG
		1.5	640	SP6	OPTION	APTM10UM01FAG
200	FREDFET 7	3	434	SP6	OPTION	APTM20UM03FAG
500	FREDFET 7	9	371	SP6	OPTION	APTM50UM09FAG
1000	FREDFET 7	60	97	SP6	OPTION	APTM100UM60FAG
		45	160	SP6	OPTION	APTM100UM45FAG
1200	FREDFET 7	70	126	SP6	OPTION	APTM120UM70FAG

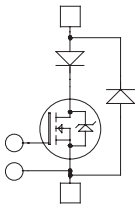
SP4



SINGLE SWITCH + SERIES DIODE

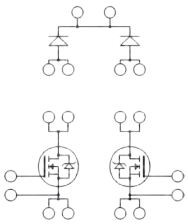
V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
1000	MOS 7	65	110	SP6		APTM100UM65DAG
		45	160	SP6		APTM100UM45DAG
1200	MOS 7	70	126	SP6		APTM120UM70DAG

SP6



SINGLE SWITCH + SERIES AND PARALLEL DIODES

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
200	MOS 7	4	310	SP6	OPTION	APTM20UM04SAG
500	MOS 7	13	250	SP6	OPTION	APTM50UM13SAG
1000	MOS 7	65	110	SP6	OPTION	APTM100UM65SAG
1200	MOS 7	100	86	SP6	OPTION	APTM120U10SAG



INTERLEAVED PFC

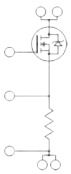
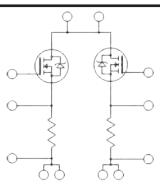
V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
600	SUPER JUNCTION MOSFET	45	38	SP1	YES	APTC60VDAM45T1G
		24	70	SP3F	YES	APTC60VDAM24T3G

SP6-P

All Power Modules RoHS-Compliant

MOSFET Power Modules

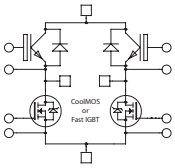
SINGLE AND DUAL LINEAR MOSFET

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	Shunt Resistor (mR)	Package	NTC		
100	MOS 5	9	4.4	SP1 OR SP3F	YES	APTML10UM09R004T1AG	APTML102UM09R004T3AG
200		18	10		YES	APTML20UM18R010T1AG	APTML202UM18R010T3AG
500	MOSFET	90	20		YES	APTML50UM90R020T1AG	APTML502UM90R020T3AG
600	LINEAR	125	20		YES	APTML60U12R020T1AG	APTML602U12R020T3AG
1000	MOS 4 LINEAR	600	20		YES	APTML100U60R020T1AG	APTML1002U60R020T3AG

SP1

SP3F

Renewable Energy Power Modules

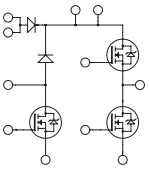


FULL BRIDGE

V_{CES} (V)	Technology	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Part Number
600	MIX TRENCH IGBT AND SUPER JUNCTION MOSFET	50	83MR/1.5	SP1	YES	APTCV40H60CT1G
		50	45MR/1.5	SP3F	YES	APTCV50H60T3G

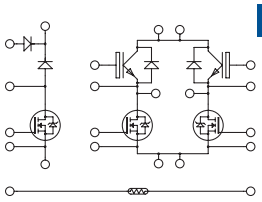
SP1

SP3F



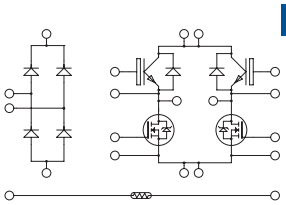
PFC + BYPASS DIODE + PHASE LEG

V_{CES} (V)	Technology	I_C (A) T_C=80° C	$V_{CE\ (on)}$(V) at rated Ic	Package	NTC	Special	Part Number
600	SUPER JUNCTION MOSFET	38	45MR	SP1	N/A	10 A PFC SIC DIODE	APTC60AM45BC1G
		38	45MR	SP1	N/A		APTC60AM45B1G
		27	83MR	SP1	N/A	10 A PFC SIC DIODE	APTC60AM83BC1G
		27	83MR	SP1	N/A		APTC60AM83B1G



PFC + BYPASS DIODE + FULL BRIDGE

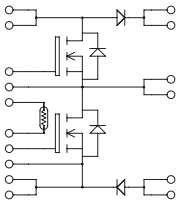
V_{CES} (V)	Technology	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Special	Part Number
600	MIX TRENCH IGBT AND SUPER JUNCTION MOSFET	38	1.5/45MR	SP3F	YES	20 A PFC SIC DIODE	APTCV60HM45BC20T3G
		38	1.5/45MR	SP3F	YES		APTCV60HM45BT3G
		29	1.5/70MR	SP3F	YES		APTCV60HM70BT3G
	SUPER JUNCTION MOSFET	29	70MR	SP3F	YES		APTC60HM70BT3G



SECONDARY FAST RECTIFIER + FULL BRIDGE

V_{CES} (V)	Technology	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Special	Part Number
600	MIX TRENCH IGBT AND SUPER JUNCTION MOSFET	38	1.5/45MR	SP3F	YES	20 A SIC ANTIPARALLEL DIODE	APTCV60HM45RCT3G
		38	1.5/45MR	SP3F	YES		APTCV60HM45RT3G
		29	1.5/70MR	SP3F	YES		APTCV60HM70RT3G
	SUPER JUNCTION MOSFET	29	70MR	SP3F	YES		APTC60HM70RT3G
	TRENCH 3	50	1.5	SP3F	YES		APTGT50H60RT3G

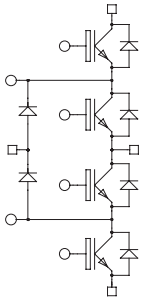
Renewable Energy Power Modules



BOOST BUCK

V_{CES} (V)	Technology	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Part Number
600	SUPER JUNCTION MOSFET	70	24MR	SP3F	YES	APTC60BBM24T3G
600	TRENCH 3	100	1.5	SP3F	YES	APTGT100BB60T3G

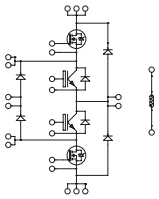
SP1



THREE-LEVEL NPC INVERTER

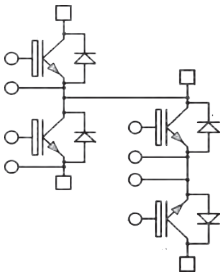
V_{CES} (V)	Technology	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Part Number	
600	TRENCH 3	20	1.5	SP1		APTGT20TL601G	
		30	1.5	SP3F	YES	APTGT30TL60T3G	
		30	1.5	SP1		APTGT30TL601G	
		50	1.5	SP3F	YES	APTGT50TL60T3G	
		50	1.5	SP1		APTGT50TL601G	
		75	1.5	SP3F	YES	APTGT75TL60T3G	
		100	1.5	SP3F	YES	APTGT100TL60T3G	
		150	1.5	SP6		APTGT150TL60G	
		200	1.5	SP6		APTGT200TL60G	
		300	1.5	SP6		APTGT300TL60G	
650	TRENCH 3	300	1.5	SP6		APTGT300TL65G	
		400	1.5	SP6		APTGT400TL65G	
	TRENCH 4 FAST	50	1.85	SP3F	YES	APTGLQ50TL65T3G	***NEW!***
1200	TRENCH 4	60	1.85	SP3F	YES	APTGL60TL120T3G	
		240	1.8	SP6		APTGL240TL120G	
1700	TRENCH 3	100	2.0	SP6		APTGT100TL170G	

SP3F



V_{CES} (V)	Technology	$R_{DS\ (ON)}$ CoolMOS (mΩ)	$V_{CE\ (on)}$ IGBT (V) /I_C (A)	Package	NTC	Part Number
600	MIX TRENCH IGBT AND SUPER JUNCTION MOSFET	24	1.5/75	SP3F	YES	APTCV60TLM24T3G
		45	1.5/75	SP3F	YES	APTCV60TLM45T3G
		70	1.5/50	SP3F	YES	APTCV60TLM70T3G
		99	1.5/30	SP3F	YES	APTCV60TLM99T3G
900	MIX TRENCH IGBT AND SUPER JUNCTION MOSFET	120	1.85/50	SP3F	YES	APTCV90TL12T3G

SP6 3-LEVEL



T-TYPE 3-LEVEL INVERTER

V_{CES} (V)	Technology	I_C (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated I_c	Package	NTC	Special	Part Number
600/1200	TRENCH 4 FAST	40	2.05	SP3F	YES	10A/600 V SIC	APTGLQ40HR120CT3G
		80	2.05	SP3F	YES	30A/600 V SIC	APTGLQ80HR120CT3G
		200	2.05	SP6	NO		APTGLQ200HR120G

Power Modules with SiC Schottky Diodes

Silicon Carbide (SiC) Schottky diodes offer superior dynamic and thermal performance over conventional Silicon power diodes. The main advantages of the SiC Schottky diodes are:

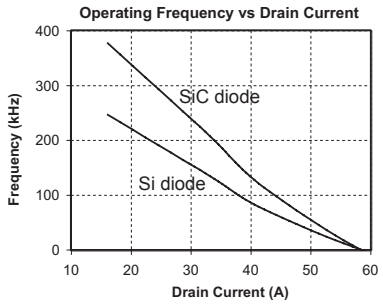
- Essentially zero forward and reverse recovery = reduced switch and diode switching losses
- Temperature independent switching behavior = stable high temperature performance
- Positive temperature coefficient of V_F = ease of parallel operation
- Usable 175 °C junction temperature = safely operate at higher temperatures

Extremely fast switching of SiC Schottky diode enables designs with:

- Improved system efficiency
- Higher reliability
- Lower system switching losses
- Lower system cost
  - smaller emi filter
  - Smaller magnetic components
  - smaller heat-sink
  - Smaller switches, eliminate snubbers
- Reduced system size
  - fewer/smaller components

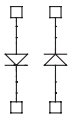
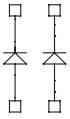
Applications:

- PFC
- Output rectification
- Solar inverter
- Motor control
- Snubber diode



Diode Power Modules with SiC Diodes

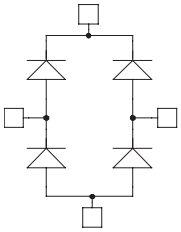
DUAL DIODE

V_{RRM} (V)	DIODE Type	I_F (A) T_C = 100 °C	V_F (V) T_J = 25 °C	Package	 Anti-Parallel	 Parallel
600	SiC	20	1.6	SOT-227	APT2X20DC60J	APT2X21DC60J
		30	1.6	SOT-227	APT2X30DC60J	APT2X31DC60J
		40	1.6	SOT-227	APT2X40DC60J	APT2X41DC60J
		50	1.6	SOT-227	APT2X50DC60J	APT2X51DC60J
		60	1.6	SOT-227	APT2X60DC60J	APT2X61DC60J
1200	SiC	20	1.6	SOT-227	APT2X20DC120J	APT2X21DC120J
		40	1.6	SOT-227	APT2X40DC120J	APT2X41DC120J
		50	1.6	SOT-227	APT2X50DC120J	APT2X51DC120J
		60	1.6	SOT-227	APT2X60DC120J	APT2X61DC120J

SOT-227

SP1

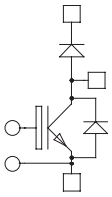
SP3F



FULL BRIDGE

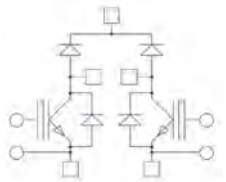
V_{RRM} (V)	DIODE Type	I_F (A) T_C = 100 °C	V_F (V) T_J = 25 °C	Package	Part Number
600	SiC	20	1.6	SP1	APTDC20H601G
		40	1.6	SP1	APTDC40H601G
		40	1.6	SOT-227	APT40DC60HJ
1200	SiC	10	1.6	SOT-227	APT10DC120HJ
		20	1.6	SP1	APTDC20H1201G
		20	1.6	SOT-227	APT20DC120HJ
		40	1.6	SP1	APTDC40H1201G
		40	1.6	SOT-227	APT40DC120HJ

IGBT Power Modules with SiC Diodes



BOOST CHOPPER

V_{RRM} (V)	IGBT Type	I_D (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated Ic	Package	NTC	Part Number
1200	TRENCH 4 FAST	25	2.05	SOT-227	-	APT25GLQ120JCU2
		40	2.05	SOT-227	-	APT40GLQ120JCU2

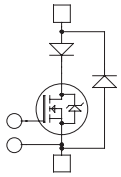


DUAL CHOPPER

V_{RRM} (V)	IGBT Type	I_D (A) T_C = 80 °C	$V_{CE\ (on)}$(V) at Rated Ic	Package	NTC	Part Number
1200	TRENCH 4 FAST	40	2.05	SP3F	YES	APTGLQ40DDA120CT3G

All Power Modules RoHS-Compliant

MOSFETs & CoolMOS™ Power Modules with SiC Diodes

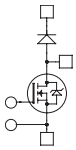
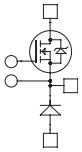


SINGLE SWITCH + SERIES FRED AND SIC PARALLEL DIODES

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
1000	MOS7	65	110	SP6	OPTION	APTM100UM65SCAVG
1200	MOS7	100	86	SP6	OPTION	APTM120U10SCAVG

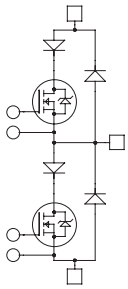
SOT-227

CHOPPER

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	 …DA… or U2	 …SK… or U3
500	MOS8	65	43	SOT-227	-	APT58M50JCU2	N/A
600	SUPER JUNCTION MOSFET	45	38	SOT-227	-	APT50N60JCCU2	N/A
		24	70	SP1	YES	N/A	APTC60SKM24CT1G
		18	107	SP4	YES	APTC60DAM18CTG	N/A
900	SUPER JUNCTION MOSFET	120	25	SOT-227	-	APT33N90JCCU2	N/A
		60	44	SP1	YES	APTC90DAM60CT1G	APTC90SKM60CT1G
1000	MOS 8	330	20	SOT-227	-	APT26M100JCU2	APT26M100JCU3
1200	MOS 8	560	15	SOT-227	-	APT20M120JCU2	APT20M120JCU3
		300	23	SP1	YES	APTM120DA30CT1G	N/A

SP1

SP3F

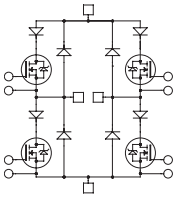


PHASE LEG + SERIES FRED AND SiC PARALLEL DIODES

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
500	MOS 7	38	67	SP4	YES	APTM50AM38SCTG
		24	110	SP6	-	APTM50AM24SCG
600	SUPER JUNCTION MOSFET	35	54	SP4	YES	APTC60AM35SCTG
		24	70	SP4	YES	APTC60AM24SCTG
		18	107	SP6	-	APTC60AM18SCG
900	SUPER JUNCTION MOSFET	60	44	SP4	YES	APTC90AM60SCTG
800	SUPER JUNCTION MOSFET	150	21	SP4	YES	APTC80A15SCTG
		100	32	SP4	YES	APTC80A10SCTG
		75	43	SP6	-	APTC80AM75SCG
1000	MOS 7	130	49	SP6	-	APTM100A13SCG

SP4

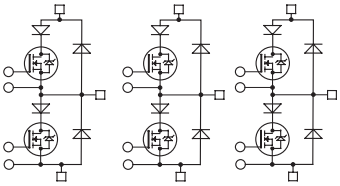
SP6



FULL BRIDGE + SERIES FRED AND SIC PARALLEL DIODES

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
500	MOS 7	75	34	SP4	YES	APTM50HM75SCTG
600	SUPER JUNCTION MOSFET	70	29	SP4	YES	APTC60HM70SCTG
		45	38	SP4	YES	APTC60HM45SCTG
800	SUPER JUNCTION MOSFET	290	11	SP4	YES	APTC80H29SCTG
900	SUPER JUNCTION MOSFET	120	23	SP4	YES	APTC90H12SCTG
1000	MOS 7	450	14	SP4	YES	APTM100H45SCTG

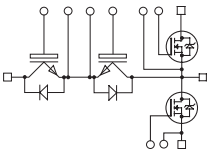
SP6-P



TRIPLE PHASE LEG

V_{DSS} (V)	MOSFET Type	$R_{DS\ (ON)}$ (mΩ)	I_D (A) T_C = 80 °C	Package	NTC	Part Number
600	SUPER JUNCTION MOSFET	24	87	SP6-P	YES	APTC60TAM21SCTPAG
1000	MOS 7	350	50	SP6-P	YES	APTM100TA35SCTPG

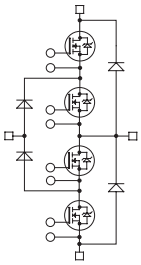
SiC MOSFET Power Modules



T-TYPE THREE-LEVEL INVERTER

V_{CES} (V)	Technology	$R_{DS\ (ON)}$ (mΩ)	I_D (A) $T_C = 80\ °C$	Package	NTC	Part Number
600/1200	IGBT AND SiC MOSFET	110	20	SP3F	YES	APTMC120HR11CT3AG
		40	50	SP3F	YES	APTMC120HRM40CT3AG

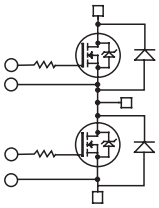
SOT-227



THREE-LEVEL NPC INVERTER

V_{CES} (V)	Technology	$R_{DS\ (ON)}$ (mΩ)	I_D (A) $T_C = 80\ °C$	Package	NTC	Part Number
600	SiC MOSFET	110	20	SP3F	YES	APTMC60TL11CT3AG
		55	40	SP3F	YES	APTMC60TLM55CT3AG
		14	160	SP6		APTMC60TLM14CAG

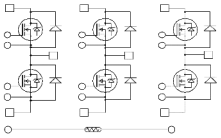
SP1



PHASE LEG

V_{CES} (V)	Technology	$R_{DS\ (ON)}$ (mΩ)	I_D (A) $T_C = 80\ °C$	Package	NTC	Part Number
1200	SiC MOSFET	55	40	SP1	YES	APTMC120AM55CT1AG
		25	80	SP3F	YES	APTMC120AM25CT3AG
		20	108	SP1	YES	APTMC120AM20CT1AG
		16	102	D3		APTMC120AM16CD3AG
		12	150	SP3F	YES	APTMC120AM12CT3AG
		9	200	SP3F	YES	APTMC120AM09CT3AG
		8	200	D3		APTMC120AM08CD3AG
1700	SiC MOSFET	60	40	SP1	YES	APTMC170AM60CT1AG
		30	80	SP1	YES	APTMC170AM30CT1AG

SP3F



TRIPLE PHASE LEG

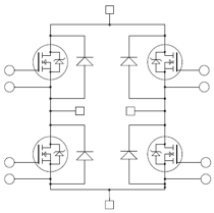
V_{CES} (V)	Technology	$R_{DS\ (ON)}$ (mΩ)	I_D (A) $T_C = 80\ °C$	Package	NTC	Part Number
1200	SiC MOSFET	34	55	SP3F	YES	APTMC120TAM34CT3AG
		33	60	SP6-P	YES	APTMC120TAM33CTPAG
		17	100	SP6-P	YES	APTMC120TAM17CTPAG
		12	150	SP6-P	YES	APTMC120TAM12CTPAG

SP6

BOOST CHOPPER

V_{CES} (V)	Technology	$R_{DS\ (ON)}$ (mΩ)	I_D (A) $T_C = 80\ °C$	Package	NTC	Part Number
1200	SiC MOSFET	40	50	SOT-227		APT50MC120JCU2

D3



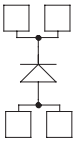
FULL BRIDGE

V_{CES} (V)	Technology	$R_{DS\ (ON)}$ (mΩ)	I_D (A) $T_C = 80\ °C$	Package	NTC	Part Number
1200	SiC MOSFET	17	110	SP3F	YES	APTMC120HM17CT3AG

SP6-P

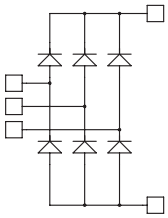
DIODE Power Modules

SINGLE DIODE

V_{RRM} (V)	DIODE Type	I_F (A) T_C = 80 °C	V_F (A) T_C = 80 °C	Package	
200	FRED	500	1.1	LP4	APTDF500U20G
400		500	1.5		APTDF500U40G
600		450	1.8		APTDF450U60G
1000		430	2.3		APTDF430U100G
1200		400	2.5		APTDF400U120G

SOT-227

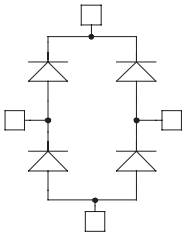
LP4



3-PHASE BRIDGE

V_{RRM} (V)	DIODE Type	IF (A) T_C=80° C	VF (V) T_J=25° C	Package	Part Number
1600	RECTIFIER	40	1.3	SP1	APTDR40X1601G
		90	1.3	SP1	APTDR90X1601G

SP1



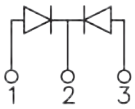
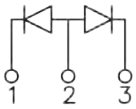
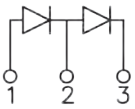
FULL BRIDGE

V_{RRM} (V)	DIODE Type	I_F (A) T_C = 80 °C	I_F (A) T_C = 80 °C	Package Style	Part Number
200	FRED	30	1.0	SOT-227	APT30DF20HJ
		60	1.0	SOT-227	APT60DF20HJ
		100	1.0	SP4	APTDF100H20G
600		30	1.8	SP1	APTDF30H601G
		30	1.8	SOT-227	APT30DF60HJ
		60	1.8	SOT-227	APT60DF60HJ
		60	1.8	SP1	APTDF60H601G
		75	1.6	SOT-227	APT75DL60HJ
		100	1.6	SOT-227	APT100DL60HJ
		100	1.6	SP1	APTDF100H601G
		200	1.6	SP6	APTDF200H60G
1000		30	2.1	SOT-227	APT30DF100HJ
		100	2.1	SP4	APTDF100H100G
		200	2.1	SP6	APTDF200H100G
1200		30	2.6	SP1	APTDF30H1201G
		60	2.6	SP1	APTDF60H1201G
		200	2.4	SP6	APTDF200H120G
1700		50	1.8	SOT-227	APT50DF170HJ
		75	1.8	SOT-227	APT75DF170HJ
		100	2.2	SP4	APTDF100H170G
		200	2.2	SP6	APTDF200H170G

SP4

SP6

COMMON CATHODE–COMMON ANODE–DOUBLER

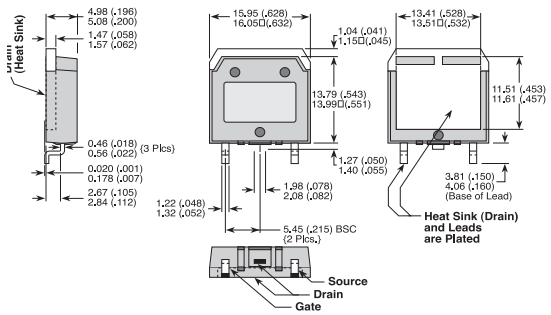
V_{RRM} (V)	DIODE Type	I^F (A) per Diode	V_F (V) T_J = 25 °C	Package	 Common Cathode	 Common Anode	 Doubler
200	FRED	400	1.0	SP6	APTDF400KK20G	APTDF400AA20G	APTDF400AK20G
600			1.6		APTDF400KK60G	APTDF400AA60G	APTDF400AK60G
1000			2.1		APTDF400KK100G	APTDF400AA100G	APTDF400AK100G
1200			2.4		APTDF400KK120G	APTDF400AA120G	APTDF400AK120G
1700			2.2		APTDF400KK170G	APTDF400AA170G	APTDF400AK170G

All Power Modules RoHS-Compliant

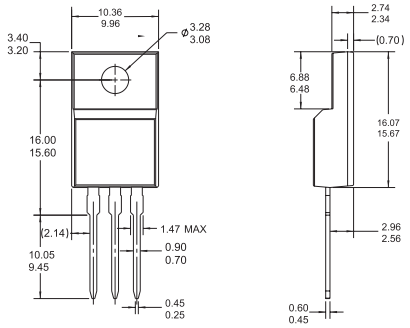
Package Outlines

Pin out location depends on the module configuration. Please refer to the product datasheet for pins assignment. All dimensions in millimeters.

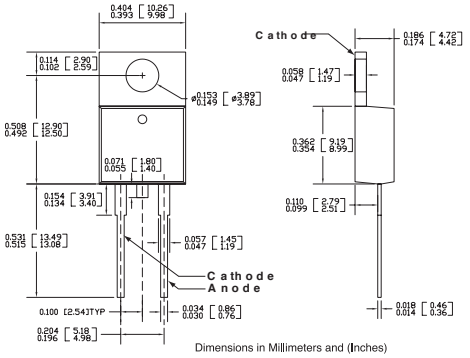
D³ Pak or TO-268



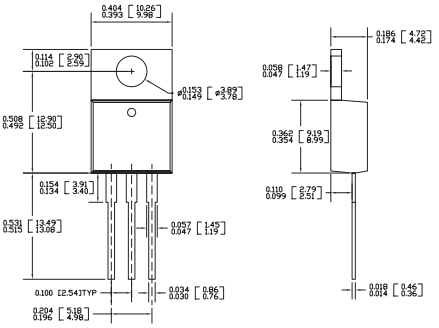
TO-220 [KF]



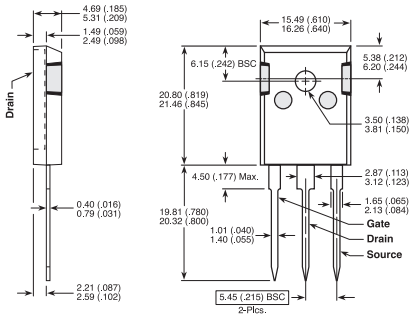
TO-220 2-Lead



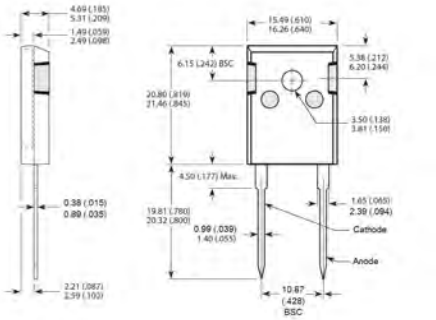
TO-220 3-Lead



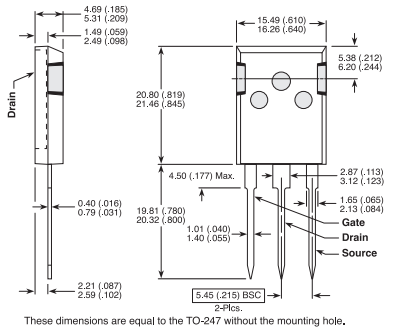
TO-247 3-Lead



TO-247 2-Lead

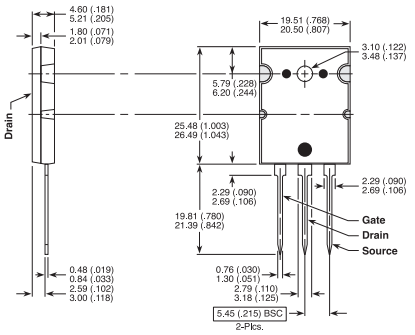


T-MAX®

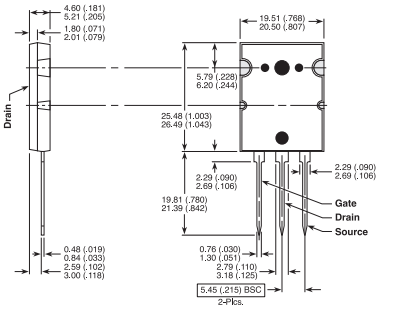


These dimensions are equal to the TO-247 without the mounting hole.

TO-264

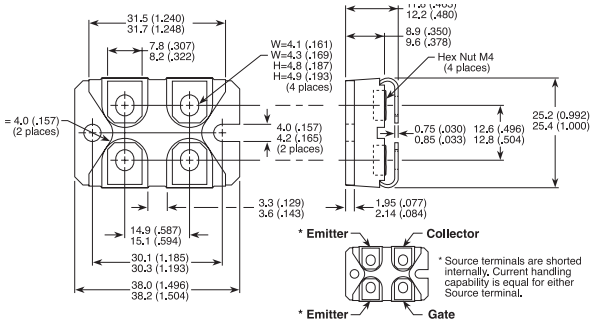


264 MAX™



These dimensions are equal to the TO-264 without the mounting hole.

ISOTOP® or SOT-227

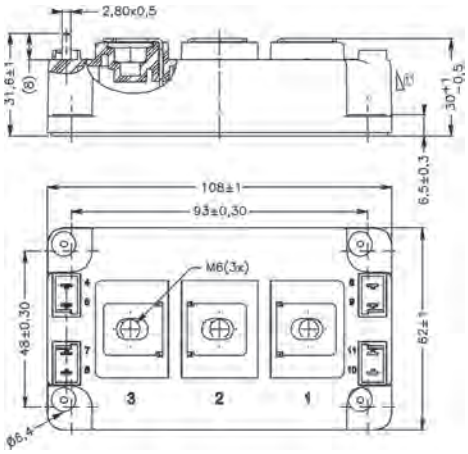


Refer to web page for additional package outline drawings

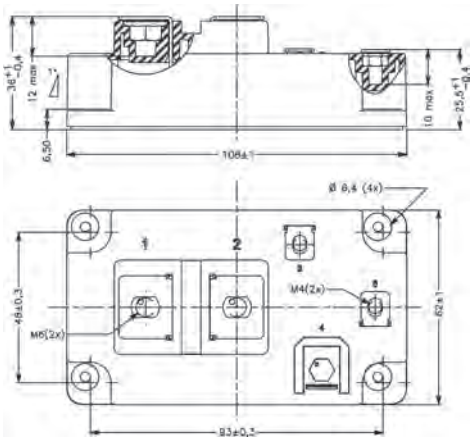
Power Module Outlines

Pin out location depends on the module configuration. Please refer to the product datasheet for pins assignment. All dimensions in millimeters.

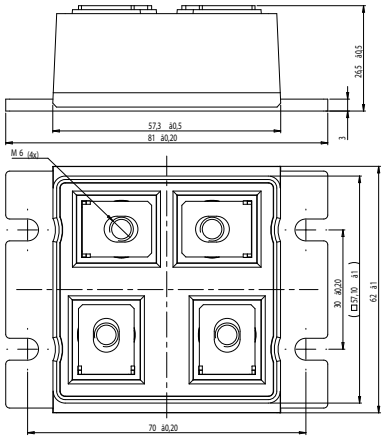
D3



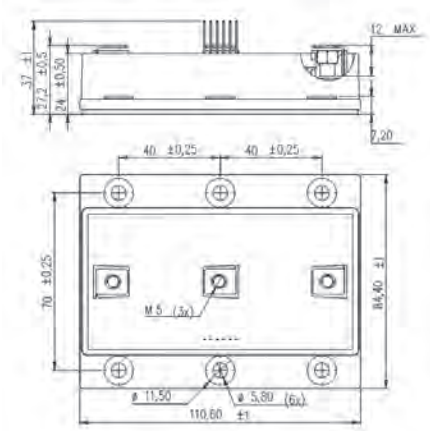
D4



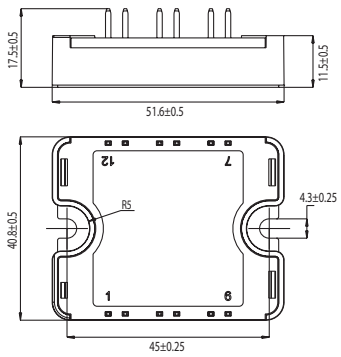
LP4



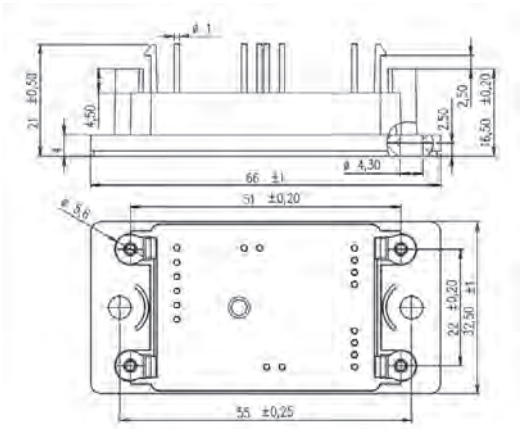
LP8



SP1



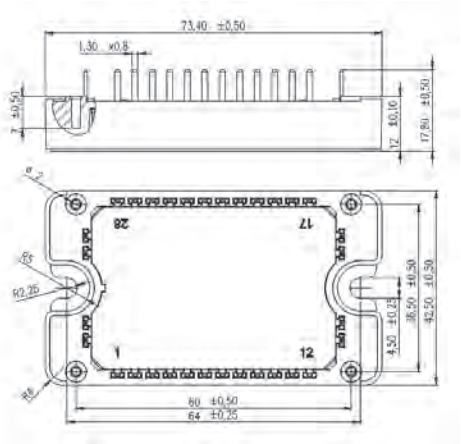
SP2



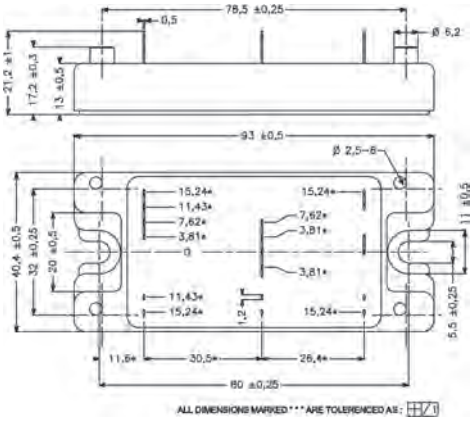
Power Module Outlines

Pin out location depends on the module configuration. Please refer to the product datasheet for pin assignments. All dimensions are in millimeters.

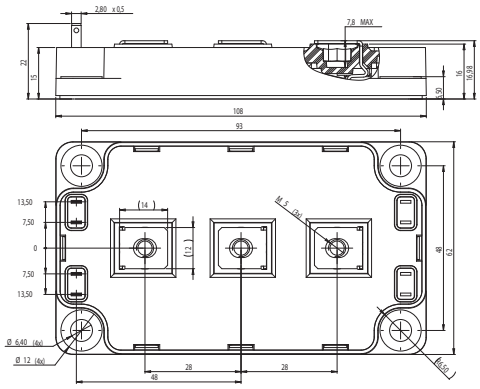
SP3F



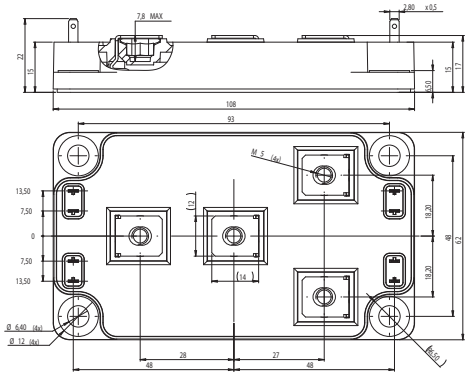
SP4



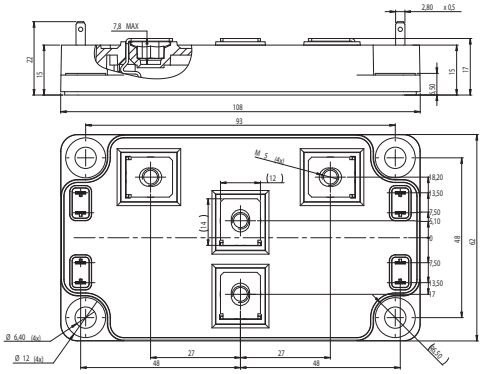
SP6–Three Outputs



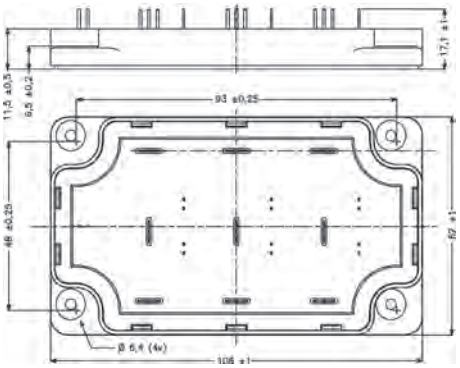
SP6–Four Outputs, Version 1



SP6–Four Outputs, Version 2



SP6-P



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