Panasonic
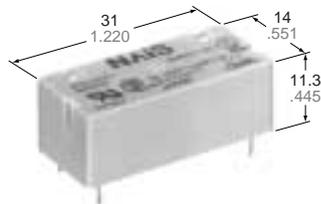## ideas for life

IC DRIVABLE PC BOARD RELAY FOR FIELD LOAD SWITCHING

ST RELAYS

FEATURES

- **Sealed to meet the combination process of automatic wave soldering and cleaning needs**
- **Latching types available**

- **High switching capacity and high sensitivity in subminiature size 150 mW pick-up, 8 A inrush capacity: 51 A for 1a1b, 35 A for 2a**
- **High shock and vibration resistance Shock: 20 G, Vibration: 10 to 55 Hz at double amplitude of 2 mm**

31 1.220 14 .551 11.3 .445

mm inch

SPECIFICATIONS

Contacts

Arrangement		1 Form A 1 Form B	2 Form A
Contact material		Gold flash over silver alloy	
Initial contact resistance, max.		30 mΩ	
Rating (resistive)	Max. switching power	2,000 VA, 150 W	
	Max. switching voltage	380 V AC, 250 V DC	
	Max. switching current	8 A	
	Min. switching capacity#1	100 mA, 5 V DC	
HP rating		1/4 HP 125, 250 V AC	
Inrush current capability		51 A (TV-3 equivalence) for 1a1b 35 A (TV-1 equivalence) for 2a	
Expected life (min. operations)	Mechanical (at 180 cpm)	10^7	
	Electrical 8 A 250 V AC (resistive)	10^5	
	5 A 30 V DC (resistive)	2×10^5	
	3 A 100 V AC (lamp)	3×10^4	—
	1 A 100 V AC (lamp)	—	3×10^4

Coil (polarized) (at 25°C 77°F)

Single side stable	Nominal operating power	Approx. 240 mW
Latching	Nominal set and reset power	Approx. 240 mW

#1 This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

Remarks
* Specifications will vary with foreign standards certification ratings.
*1 Measurement at same location as "Initial breakdown voltage" section
*2 Detection current: 10 mA
*3 Wave is standard shock voltage of $\pm 1.2 \times 50\mu s$ according to JEC-212-1981
*4 Excluding contact bounce time
*5 Half-wave pulse of sine wave: 11ms; detection time: 10µs
*6 Half-wave pulse of sine wave: 6ms
*7 Detection time: 10µs
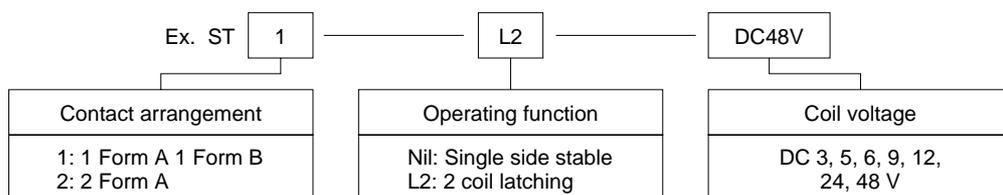*8 Refer to 6. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT

Characteristics (at 25°C 77°F 50% Relative humidity)

Max. operating speed		20 cpm (at rated load)
Initial insulation resistance*1		1,000 MΩ (at 500 V DC)
Initial breakdown voltage*2	Between contact sets	2,000 Vrms
	Between open contacts	1,200 Vrms
	Between contacts and coil	3,750 Vrms
Surge voltage between coil and contact*3		Min. 6,000 V
Operate time*4 (at nominal voltage)		Max. 15 ms (Approx. 10 ms)
Release time (without diode)*4 (at nominal voltage)		Max. 10 ms (Approx. 8 ms)
Set time*4 (latching) (at nominal voltage)		Max. 10 ms (Approx. 8 ms)
Reset time*4 (latching) (at nominal voltage)		Max. 10 ms (Approx. 8 ms)
Temperature rise (at 60°C)		Max. 55°C with nominal coil voltage and at 8 A switching current
Shock resistance	Functional*5	Min. 196 m/s² {20 G}
	Destructive*6	Min. 980 m/s² {100 G}
Vibration resistance	Functional*7	117.6 m/s² {12 G}, 10 to 55 Hz at double amplitude of 2 mm
	Destructive	176.4 m/s² {18 G}, 10 to 55 Hz at double amplitude of 3 mm
Conditions for operation, transport and storage*8 (Not freezing and condensing at low temperature)	Ambient temp.	−40°C to +60°C −40°F to +140°F
	Humidity	5 to 85% R.H.
Unit weight		Approx. 10g .353 oz

TYPICAL APPLICATIONS

Sequence controllers, facsimiles, telephone controls, remote control security devices and security equipment.

ORDERING INFORMATION

Ex. ST **1** — **L2** — **DC48V**

Contact arrangement	Operating function	Coil voltage
1: 1 Form A 1 Form B 2: 2 Form A	Nil: Single side stable L2: 2 coil latching	DC 3, 5, 6, 9, 12, 24, 48 V

(Notes) 1. Standard packing: Carton; 50 pcs., Case; 500 pcs.
2. 1 coil latching type available.

TYPES AND COIL DATA (at 20°C 68°F)
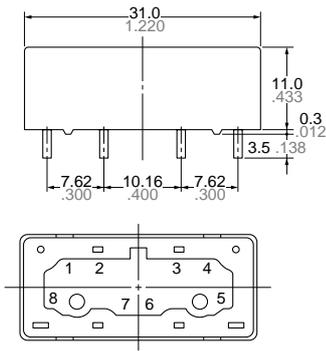
Single side stable

Part No.		Nominal voltage, V DC	Pick-up voltage, V DC (max.)	Drop-out voltage, V DC (min.)	Maximum allowable voltage, V DC (60°C 140°F)	Coil resistance, Ω (±10%)	Nominal operating current, mA
1 Form A 1 Form B	2 Form A						
ST1-DC3V	ST2-DC3V	3	2.4	0.3	4.5	38	78.9
ST1-DC5V	ST2-DC5V	5	4.0	0.5	7.5	105	47.6
ST1-DC6V	ST2-DC6V	6	4.8	0.6	9.0	150	40
ST1-DC9V	ST2-DC9V	9	7.2	0.9	13.5	360	25
ST1-DC12V	ST2-DC12V	12	9.6	1.2	18.0	600	20
ST1-DC24V	ST2-DC24V	24	19.2	2.4	36.0	2,400	10
ST1-DC48V	ST2-DC48V	48	38.4	4.8	72.0	9,000	5.3

2 coil latching

| Part No.		Nominal voltage, V DC	Set and reset voltage, V DC (max.)	Maximum allowable voltage, V DC (60°C 140°F)	Coil resistance, Ω (±10%)	Nominal operating current, mA
1 Form A 1 Form B	2 Form A					
ST1-L2-DC3V	ST2-L2-DC3V	3	2.4	4.5	40	75
ST1-L2-DC5V	ST2-L2-DC5V	5	4.0	7.5	110	45.5
ST1-L2-DC6V	ST2-L2-DC6V	6	4.8	9.0	155	38.7
ST1-L2-DC9V	ST2-L2-DC9V	9	7.2	13.5	360	25
ST1-L2-DC12V	ST2-L2-DC12V	12	9.6	18.0	640	18.8
ST1-L2-DC24V	ST2-L2-DC24V	24	19.2	36.0	2,400	10
ST1-L2-DC48V	ST2-L2-DC48V	48	38.4	72.0	10,200	4.7

DIMENSIONS

mm inch

General tolerance: ±0.2 ±.008
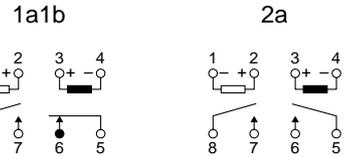
PC board pattern (Copper-side view)

Tolerance: ±0.1 ±.004

Schematic (Bottom view) Single side stable

1a1b   2a
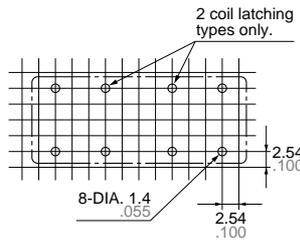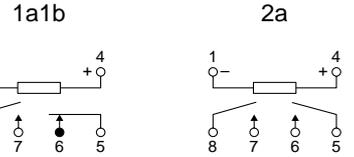
(Deenergized condition)
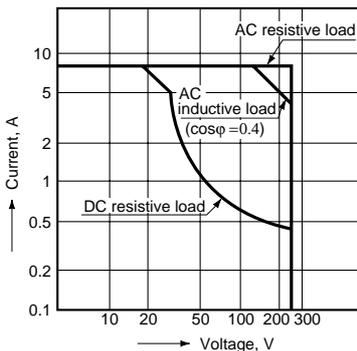
2 coil latching

1a1b   2a

(Reset condition)

Diagram shows the "reset" position when terminals 3 and 4 are energized. Energize terminals 1 and 2 to transfer contacts.
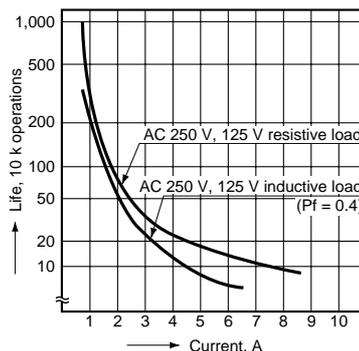
Diagram shows the "reset" position when terminals 3 and 4 are energized. Energize terminals 1 and 2 to transfer contacts.
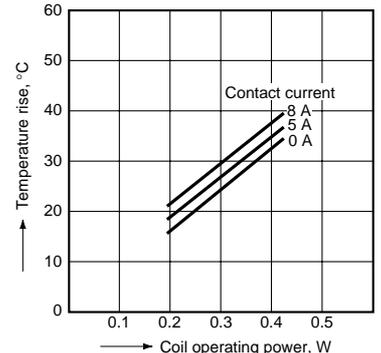
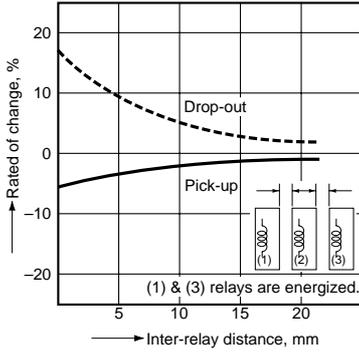# REFERENCE DATA

1. Max. switching power

2. Life curve

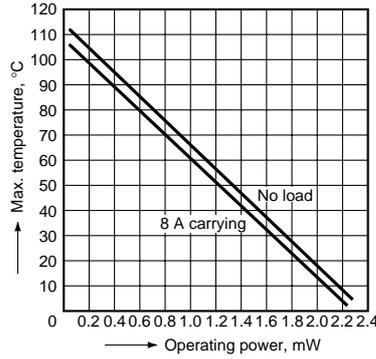3. Coil temperature rise
Sample: ST1-DC24V

4. Influence of adjacent mounting
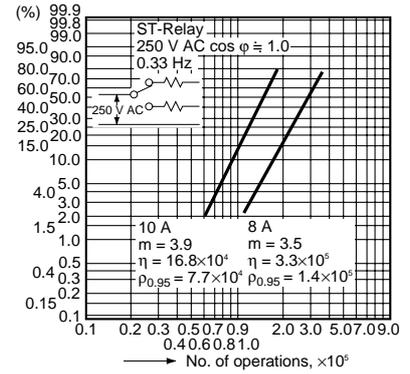Sample: ST1-DC24V

5. Max. ambient temperature by operating power

6. Contact reliability

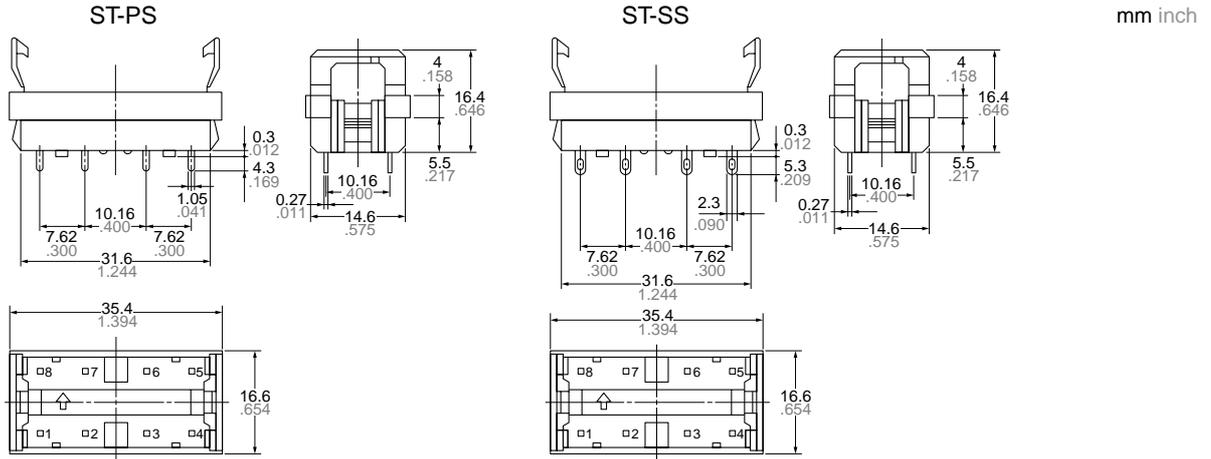

ST relay socket

ST-SS
Solder terminal socket

ST-PS
PC board terminal socket

Specifications

Breakdown voltage	4,000 Vrms Coil/Contacts 2,000 Vrms Contacts/Contacts
Insulation resistance	More than 1,000 MΩ between terminals
Heat resistance	150°C (302°F) for 1 hr
Max. continuous current	10 A
Relay insertion life	15 times

DIMENSIONS

ST-PS   ST-SS   mm inch
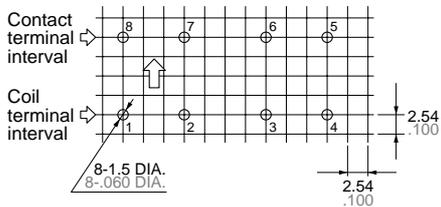

Precautions for use (socket)

1. PC board mounting method
PC board pattern

The terminal configuration is symmetrical on the left and right, so an arrow mark ⇧ is stamped on the socket to prevent mis-insertion. We recommend printing the same arrow mark ⇧ on the component mounting side (side opposite from pattern) of the PC board. In this case, the terminal configuration becomes the terminal nos. noted near the drilling holes.

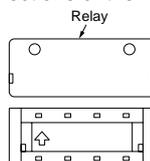### 2. Chassis cutout
Chassis cutting dimensions
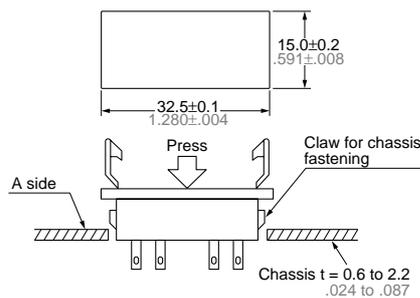
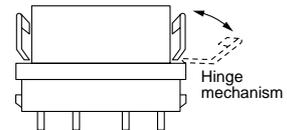If the chassis hole is punched with a press, set so the release R on the front side (A side).
The range for chassis thickness is 0.6 to 2.2 mm .024 to .087 inch.

3. Relay mounting and removal
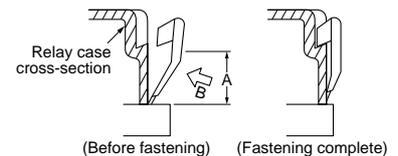(1) Align the directions of the relay and socket.

(2) Insert the relay all the way in, so it is securely in place.

(3) Press the part indicated by A in the B direction, and fasten by placing the hook on the relay.
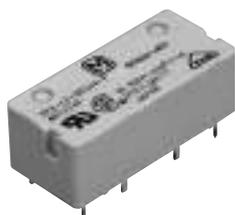

(Before fastening)   (Fastening complete)

(4). When removing the relay, completely release the hooks on both sides and pull the relay out.

For Cautions for Use, see Relay Technical Information

1a1b/2a 8A polarized power relays | ST RELAYS

RoHS compliant

Protective construction: Sealed type

FEATURES

1. **Even with small form factor, sensitive enough for direct IC-driving**
   The dimensions of this high-density 4-gap balanced armature are 31 mm × 14 mm × 11 mm 1.220 inch × .551 inch × .433 inch. Despite this small size, high sensitivity is achieved by a mechanism that incorporates high-efficiency polarized magnetic circuits along with our exclusive spring alignment method. With an minimum operating power of about 150 mW, nominal operating power of 240 mW, this relay can be directly driven by transistor or chip controllers.

2. **High switching capability**
   High contact pressure, low contact bounce, and forced separation structure that radically improves resistance to contact welding (1 Form A 1 Form B type equivalent to TV-3). Strong against lamp inductive loads, maximum switching capacity has reached 3,040 VA (8A 380V AC).

3. **High breakdown voltage – Optimal for control in 250 V power circuits**
   High breakdown voltage has been achieved. Between contacts and coil of 3,750 Vrms; Surge breakdown voltage between coil and contact of 6,000 V, and between open contacts of 1,200 Vrms mean that these relays are suitable even for 250 V power circuit control.

4. **Improved stability**
   Conforms to all types of safety standards
   Insulating distance of more than 3 mm .118 inch secured. Complies with Japan Electrical Appliance and Material Safety Law requirements for operating 200 V power supply circuits, and conforms with UL, CSA and VDE standards.

5. **Latching types available**
   In addition to single side stable types, convenient 2 coil latching types with memory functions are also available. Moreover, we offer 2 Form A specifications which, with double pole switching for applications such as 250 V power circuit switching, can enable safer designs.

6. **Automatic cleaning possible**
   The sealed design means that these relays can undergo immersion in automatic washing systems and are suitable for automatic soldering. Even in difficult environments, the contacts remain reliable.

7. **Easy to design PC board patterns**
   Features 4/10 dual-in-line terminals. Because the lead spacing has a pitch greater than 7.54 mm .297 inch, designers can make easy adjustments with the width of the land size. This, along with the large insulation distance, simplifies the drawing of PC board patterns.

8. **To improve soldering efficiency, preapplication of solder to the terminals is recommended**

9. **Sockets for PC board and soldering are available**

ORDERING INFORMATION

ST ☐ - ☐ - ☐ - **F**

Contact arrangement
1: 1 Form A 1 Form B
2: 2 Form A

Operating function
Nil: Single side stable
L2: 2 coil latching

Nominal coil voltage
DC 3, 5, 6, 9, 12, 24, 48 V

Contact material
F: AgSnO2 type contact

Note: Certified by UL, CSA and VDE

TYPES

Contact arrangement	Nominal coil voltage	Single side stable	2 coil latching
		Part No.	Part No.
1 Form A 1 Form B	3V DC	ST1-DC3V-F	ST1-L2-DC3V-F
	5V DC	ST1-DC5V-F	ST1-L2-DC5V-F
	6V DC	ST1-DC6V-F	ST1-L2-DC6V-F
	9V DC	ST1-DC9V-F	ST1-L2-DC9V-F
	12V DC	ST1-DC12V-F	ST1-L2-DC12V-F
	24V DC	ST1-DC24V-F	ST1-L2-DC24V-F
	48V DC	ST1-DC48V-F	ST1-L2-DC48V-F
2 Form A	3V DC	ST2-DC3V-F	ST2-L2-DC3V-F
	5V DC	ST2-DC5V-F	ST2-L2-DC5V-F
	6V DC	ST2-DC6V-F	ST2-L2-DC6V-F
	9V DC	ST2-DC9V-F	ST2-L2-DC9V-F
	12V DC	ST2-DC12V-F	ST2-L2-DC12V-F
	24V DC	ST2-DC24V-F	ST2-L2-DC24V-F
	48V DC	ST2-DC48V-F	ST2-L2-DC48V-F

Standard packing: Carton: 50 pcs.; Case: 500 pcs.

* Terminal sockets available.

RATING

1. Coil data

1) Single side stable

Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Nominal operating power	Max. applied voltage (at 20°C 68°F)
3V DC			75mA	38Ω		
5V DC			47mA	105Ω		
6V DC			40mA	150Ω		
9V DC	80%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	25mA	360Ω	Approx. 240mW	150%V of nominal voltage
12V DC			20mA	600Ω		
24V DC			10mA	2,400Ω		
48V DC			4.7mA	9,000Ω		

2) 2 coil latching

Nominal coil voltage	Set voltage (at 20°C 68°F)	Reset voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)		Coil resistance [±10%] (at 20°C 68°F)		Nominal operating power		Max. applied voltage (at 20°C 68°F)
			Set coil	Reset coil	Set coil	Reset coil	Set coil	Reset coil	
3V DC			75mA	75mA	40Ω	40Ω			
5V DC			45mA	45mA	110Ω	110Ω			
6V DC			37.5mA	37.5mA	155Ω	155Ω			
9V DC	80%V or less of nominal voltage (Initial)	80%V or less of nominal voltage (Initial)	25mA	25mA	360Ω	360Ω	Approx. 240mW	Approx. 240mW	150%V of nominal voltage
12V DC			18.8mA	18.8mA	640Ω	640Ω			
24V DC			10mA	10mA	2,400Ω	2,400Ω			
48V DC			4.7mA	4.7mA	10,200Ω	10,200Ω			

2. Specifications

| Characteristics	Item		Specifications
Contact	Arrangement		1 Form A 1 Form B, 2 Form A
	Contact material		Au-flashed AgSnO$_2$ type
	Contact resistance (Initial)		Max. 30 mΩ (By voltage drop 6 V DC 1A)
Rating	Max. switching power (resistive load)		3,040 VA, 150 W
	Max. switching voltage		380 V AC, 250 V DC
	Max. switching current		8 A
	Nominal operating power		Approx. 240mW (Single side stable, 2 coil latching)
	Min. switching capacity (Reference value)*1		100 mA 5V DC
Electrical characteristics	Insulation resistance (Initial) (at 25°C, 50% relative humidity)		Min. 1,000MΩ (at 500V DC) Measurement at same location as "Breakdown voltage" section.
	Breakdown voltage (Initial)	Between open contacts	1,200 Vrms for 1 min. (Detection current: 10 mA)
		Between contact sets	2,000 Vrms for 1 min. (Detection current: 10 mA)
		Between contact and coil	3,750 Vrms for 1 min. (Detection current: 10 mA)
	Surge breakdown voltage (Initial)*2		6,000 V (Between contact and coil)
	Operate time [Set time] (at 20°C 68°F)		Max. 15 ms [Max. 15 ms] (Nominal coil voltage applied to the coil, excluding contact bounce time.)
	Release time [Reset time] (at 20°C 68°F)		Max. 10 ms [Max. 15 ms] (Nominal coil voltage applied to the coil, excluding contact bounce time.) (without diode)
	Temperature rise (coil) (at 60°C 140°F)		Max. 55°C (By resistive method, nominal voltage applied to the coil; contact carrying current: 8A.)
Mechanical characteristics	Shock resistance	Functional	Min. 196 m/s^2 (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.)
		Destructive	Min. 980 m/s^2 (Half-wave pulse of sine wave: 6 ms.)
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 2 mm (Detection time: 10μs.)
		Destructive	10 to 55 Hz at double amplitude of 3 mm
Expected life	Mechanical		Min. 10^7 (at 180 times/min.)
	Electrical		Min. 10^5 (8 A 250 V AC resistive) (ON : OFF = 1 s : 5 s)
Conditions	Conditions for operation, transport and storage*3		Ambient temperature: −40°C to +60°C −40°F to +140°F; Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)
	Max. operating speed		30 cps
Unit weight			Approx. 10g .353 oz

Notes: *1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.
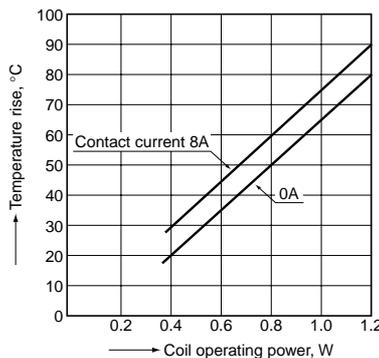*2. Wave is standard shock voltage of ±1.2×50μs according to JEC-212-1981
*3. The upper limit of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.
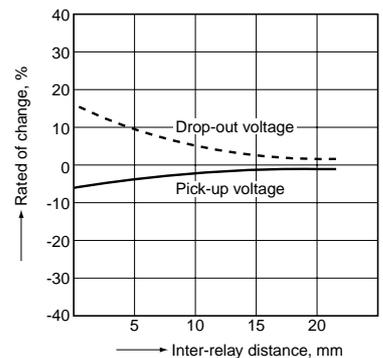
REFERENCE DATA

1. Max. switching power
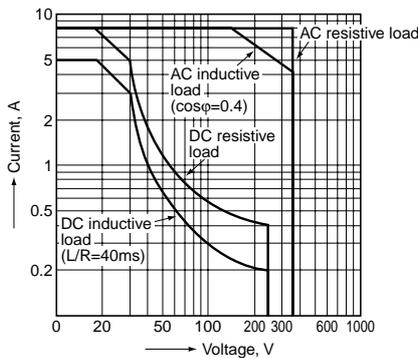
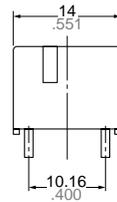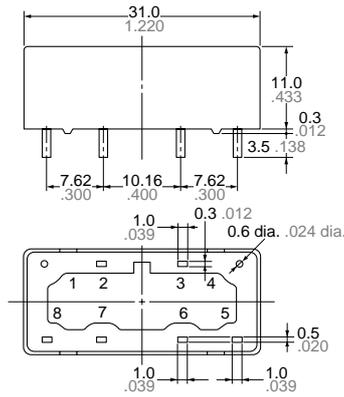2. Coil temperature rise

3. Influence of adjacent mounting

DIMENSIONS (mm inch)

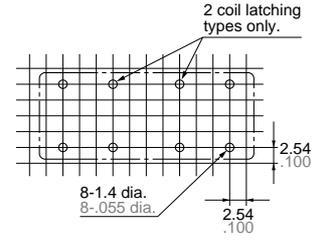The CAD data of the products with a **CAD Data** mark can be downloaded from: http://industrial.panasonic.com/ac/e/

CAD Data

External dimensions

31.0
1.220

14
.551

11.0
.433

0.3
.012

3.5 .138

7.62
.300

10.16
.400

7.62
.300

10.16
.400

1.0
.039

0.3 .012

0.6 dia. .024 dia.

| 1 | 2 | | 3 | 4 |
| 8 | 7 | | 6 | 5 |

0.5
.020

1.0
.039

1.0
.039

General tolerance: ±0.5 ±.020

PC board pattern (Bottom view)

2 coil latching types only.

2.54
.100

8-1.4 dia.
8-.055 dia.

2.54
.100

Tolerance: ±0.1 ±.004

Schematic (Bottom view)

Single side stable

1 Form A 1 Form B   2 Form A

2 coil latching

1 Form A 1 Form B   2 Form A
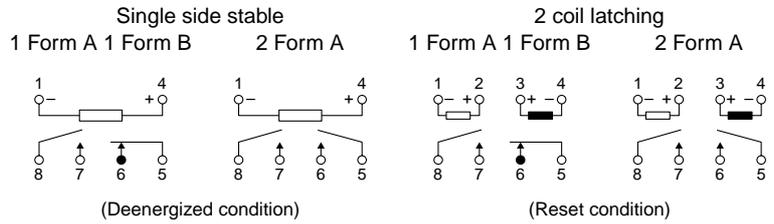
(Deenergized condition)   (Reset condition)

SAFETY STANDARDS

UL/C-UL (Recognized)		CSA (Certified)		VDE (Certified)		TV rating (UL/CSA)	
File No.	Contact rating	File No.	Contact rating	File No.	Contact rating	File No.	Rating
E43028	8A 250V AC 1/4HP 125, 250V AC 5A 30V DC	LR26550 etc.	8A 250V AC 1/4HP 125, 250V AC 5A 30V DC	1017	8A 250V AC (cosϕ=1.0) 4A 250V AC (cosϕ=0.4) 5A 30V DC	UL: E43028 CSA: LR26550	—

NOTES

1. For cautions for use, please read "GENERAL APPLICATION GUIDELINES" on page B-1.
2. PC board patterns for 2 coil latching types
When applying relays in power supply operation circuits for finished products regulated by the Electrical Appliance and Material Safety Law, use the pattern shown below.

Terminal No. 1   2   3   4
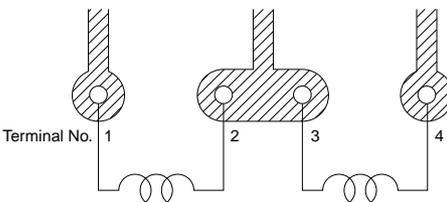
3. Soldering should be done under the following conditions:
1)
250°C 482°F within 10s
300°C 572°F within 5s
350°C 662°F within 3s
2) For automatic cleaning, the boiling method is recommended. Avoid ultrasonic cleaning which subjects the relays to high frequency vibrations, which may cause the contacts to stick.
It is recommended that a fluorinated hydrocarbon or other alcoholic solvents be used.

4. When using, please be aware that the a contact and b contact sides of 1 Form A 1 Form B type may go on simultaneously at operate time and release time.

ACCESSORIES	ST RELAYS TERMINAL SOCKETS

Terminal socket for PC board

Terminal socket for soldering

RoHS compliant

TYPES

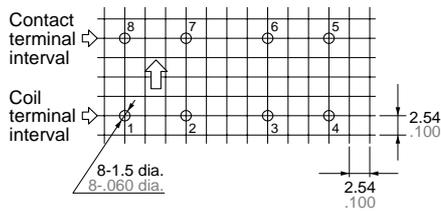| Product name	Part No.
Terminal socket for PC board	ST-PS
Terminal socket for soldering	ST-SS

FEATURES

1. **Possible to fit or remove the chassis with one touch (t = 0.6 mm to 2.2 mm** .024 inch to .087 inch**)**
2. **Easy design of PC board pattern** (2.54 mm x 4 pitch DIL terminal array)
3. **High breakdown voltage.**

SPECIFICATIONS

Item	Specifications
Breakdown voltage (Initial)	Between contact and coil: 4,000 Vrms for 1 min. (Detection current: 10 mA) Between contact and terminal: 2,000 Vrms for 1 min.
Insulation resistance (Initial)	Min. 1,000 MΩ between terminals (500V DC)
Heat resistance	150°C 302°F for 1 hr
Max. continuous current	10 A
Relay insertion life	15 times

DIMENSIONS (mm inch)

The CAD data of the products with a **CAD Data** mark can be downloaded from: http://industrial.panasonic.com/ac/e/

Terminal socket for PC board

CAD Data

Terminal socket for soldering

CAD Data

PRECAUTIONS FOR USE (SOCKET)

1. PC board mounting method
PC board pattern

Contact terminal interval

Coil terminal interval

8-1.5 dia.
8-.060 dia.

2.54 .100

2.54 .100

The terminal configuration is symmetrical on the left and right, so an arrow mark ⇧ is stamped on the socket to prevent mis-insertion. We recommend printing the same arrow mark ⇧ on the component mounting side (side opposite from pattern) of the PC board. In this case, the terminal configuration becomes the terminal nos. noted near the drilling holes.
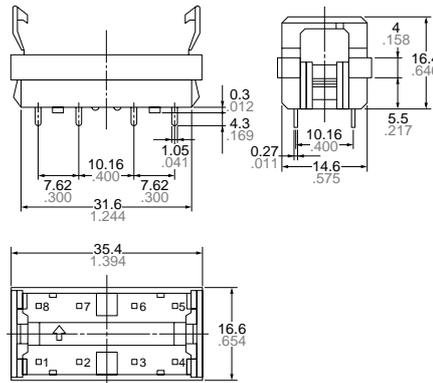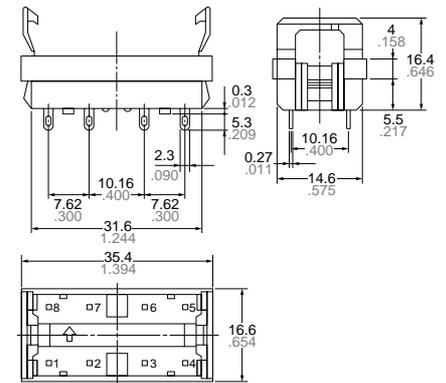
2. Chassis cutout
Chassis cutting dimensions

15.0±0.2 .591±.008

32.5±0.1 1.280±.004

A side

Press

Claw for chassis fastening

Chassis t = 0.6 to 2.2 .024 to .087
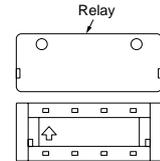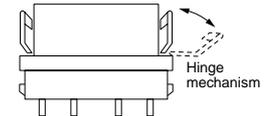
If the chassis hole is punched with a press, set so the release R on the front side (A side).
The range for chassis thickness is 0.6 to 2.2 mm .024 to .087 inch.
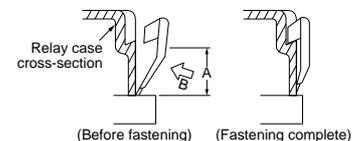
3. Relay mounting and removal
(1) Align the directions of the relay and socket.

Relay

(2) Insert the relay all the way in, so it is securely in place.

Hinge mechanism

(3) Press the part indicated by A in the B direction, and fasten by placing the hook on the relay.

Relay case cross-section

(Before fastening) (Fastening complete)

(4) When removing the relay, completely release the hooks on both sides and pull the relay out.