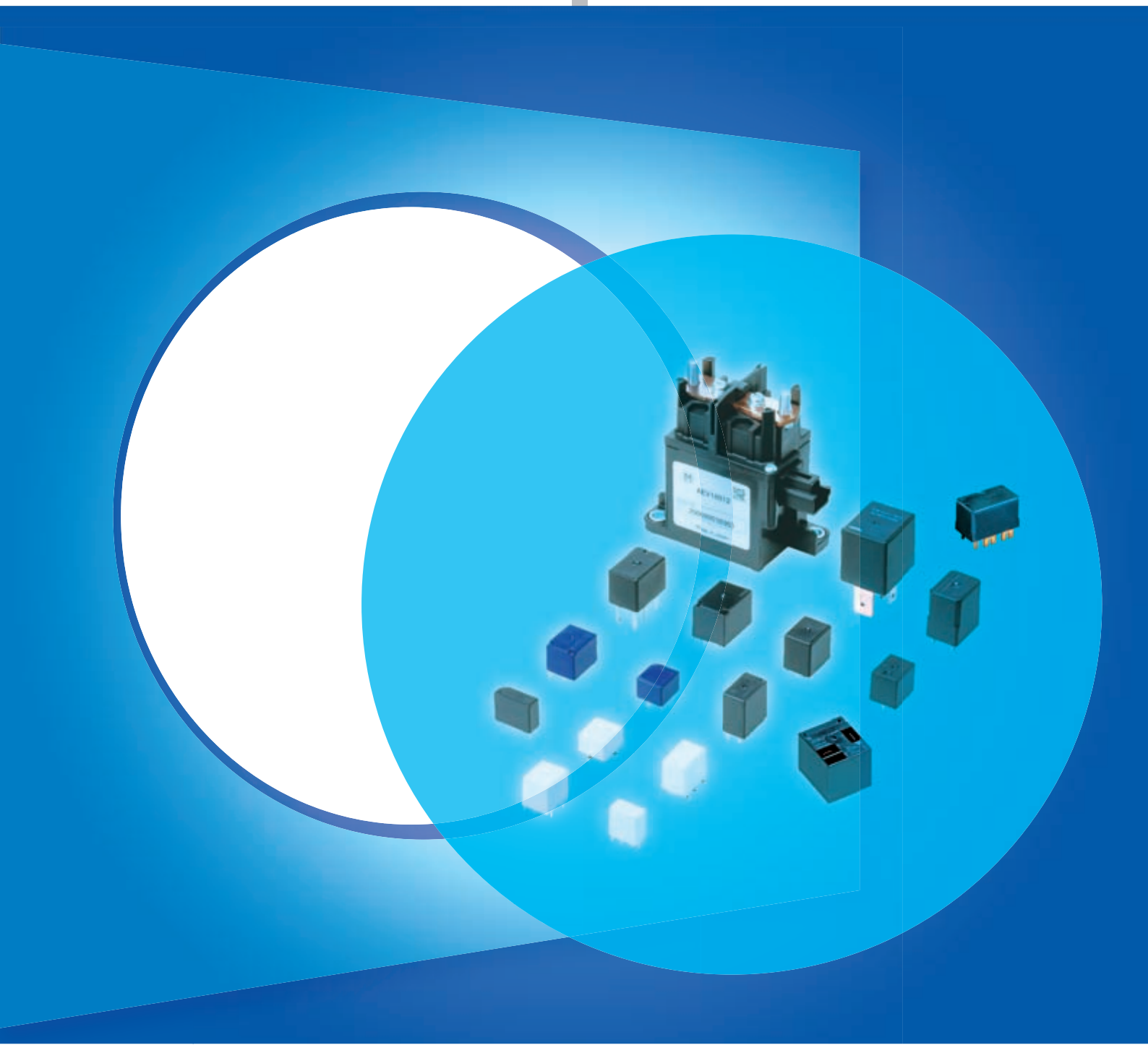
Panasonic
ideas for life

GENERAL CATALOG

AUTOMOTIVE RELAYS



Notes and Guidelines

Panasonic is part of a large worldwide group selling relays and associated switching products under different brand names in different territories. The conditions of use in some territories may differ from those customary in Europe. In particular there are often major differences in regard to national and international specifications, such as UL, CSA, VDE, SEV, EVE, SEMKO, etc. Thus, when considering contact loads as stated in this catalogue (e.g. 10 A, 30 VDC for the SP relay) it should be understood that these values are not necessarily an absolute maximum but tested ratings. Mostly the stated value has been tested for a certain life expectancy as stated by the manufacturer or the respective test house. Thus, under different conditions, the stated “maximum” may, in practice, be safely exceeded.

Therefore consideration should be given to each specific application for:

- rating and type of load
- switching frequency - cycles per second (or minute)
- environmental conditions

A general statement of compliance on data sheets, publicity, etc. concerning industrial standards, approvals or certification may imply compliance to a certain standard is available. However, because of the multiplicity of types available, in general not all types within the product family are covered to the same extent by the standard. Thus, in the event of a specific query regarding a particular product and its compliance with the standard, users are asked to refer to Panasonic for detailed information.

In case of uncertainty, contact should be made with Panasonic locally to ascertain the likelihood of the relay meeting the required life expectancy in the specific planned operational circumstances. It is also pointed out that in this book, and in deviation from EN / IEC 61810-1, operational life data is given under a normal ambient temperature of about 25°C.

The features and specifications quoted have been carefully tested using modern methods and represent the values which are to be expected with a product in new condition at room temperature. They are not guaranteed values and may change during operational life or due to ambient influences. Statistical test information covering major operating features is available on request. Panasonic reserves the right to make alterations and changes to specifications without notice from time to time as may be deemed necessary.

Application of the EC Directives to All-or-Nothing Relays

1 EMC Directive

The EMC Directive concerns primarily the finished products. In applying the Directive to components, the Guidelines[1] should be consulted to determine whether the component in question has a "direct function". Electric motors, power supply units or temperature controls represent examples of such components with "direct function". These types of components must be provided with a CE marking.

Components which are integrated into a device, such as relays, do not have an independent function of their own. A given relay may perform differing functions in different devices. Consequently, all-or-nothing relays must be considered components without "direct function" which are not subject to the EMC Directive.

All-or-nothing - be they electro-mechanical relays or solid state relays - shall not be labeled with a CE marking nor shall a declaration of conformity be issued within the scope of the EMC Directive.

2 Low Voltage Directive

Relays with terminals for printed boards/plug-and-socket connections do not come within the purview of the Low Voltage Directive.

The Low Voltage Directive concerns electrical equipment intended for incorporation into a device as well as equipment intended for direct use. In the case of electrical equipment which is considered a basic component intended for incorporation into other electrical equipment, the properties and safety of the final product will be largely dependent on how it is integrated: as such, these components do not fall within the Low Voltage Directive and shall not be CE marked. The Guidelines[2] specifically cite electro-mechanical basic components such as connectors, relays with terminals for printed circuit boards and micro switches. They are therefore not subject to the scope of the Low Voltage Directive.

Except for larger relays which may, for example, find application in switching cabinets, the same considerations apply to common-place relays with plug-in connections available also with printed board terminals. Here again, safety is a function of the individual application. In evaluating these relays' performance from the perspective of the Low Voltage Directive, the same conclusion is reached as with the printed board relay. As such, CE marking is not mandatory for this type of relay.

3 Machinery Directive

The Machinery Directive differentiates between machines, machine parts and safety components. Relays are not part of any of these categories. The listing of safety components in Appendix IV is conclusive and does not include relays.

Consequently, a CE marking shall not be affixed nor shall a declaration of conformity or manufacturer's declaration be issued under the Machinery Directive.

As of this moment, none of the aforementioned directives require CE marking for all-or-nothing relays[3].

4 RoHS Directive

The substances prohibited by the RoHS Directive (Pb, Hg, Cd, Cr^{+6}, PBB, PBDE) concern 10 categories of devices that are mostly, but not entirely, intended for private use. Components such as relays are not listed in these categories. Therefore they do not directly fall within the scope of this directive. However, if the user employs relays in devices that fall within the scope of this directive, the user must also acknowledge the substances prevented. In order to adapt to this situation in good time, all Panasonic relays are generally RoHS compliant.

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1. Guidelines (version dated March 22, 2007) for the Application of the Council Directive 2004/108/EC.
2. Guidelines (version dated August 2007) for the Application of the Council Directive 2006/95/EC.
3. This writing deals exclusively with "non-specified-time all-or-nothing relays". The abbreviated term "all-or-nothing relay" has been introduced merely for purposes of convenience. The term includes solid state all-or-nothing relays.

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About the Selector Chart

This selector chart is designed to help you quickly select a relay best suited for your needs.

Please note: the values given for switching current and switching voltage do not necessarily indicate standard operating conditions. For the nominal switching capacity and other critical values or CAD Data, please refer to the respective data sheet. In case of doubt, please contact your Panasonic representative.

Line Up

▶Automotive Relays

Contributing to the ever increasing need for versatility and innovation in car electronics with numerous relays for high voltage-cut-off and space savings.

Special Types

High-Voltage





Vertical (silent)


EV 300A	EV 120A	EV 80A	EVS 60A	EV 20A	EV 10A	EB 100A
(1a)	(1a)	(1a)	(1a)	(1a)	(1a)	(1a)




CW 120A	JT 30A 230V AC	JT 20A 230V AC	JT 10A 230V AC
(2a)	(1a)	(1c)	(1c)

Plug-In



CB high capacity 70A	CB standard 40A	CM 35A
(1a)Mini ISO	(1a, 1c)Mini ISO	(1a, 1c)Micro ISO


CV 20A	CA 20A to 30A
(1a, 1c)Micro ISO	(1a, 1b, 1c)JIS terminal

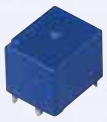
PC-Board

Silent Type

CQ 20A

(1c)

Twin Type



CT-P 30A

(1cx2)

CT 20A

(1cx2)

CJ 20A

(1cx2)

Single Type

CB high capacity 70A

(1a)

CB standard 40A

(1a, 1c)

CN-H 30A

(1a)

CN-M 30A

(1a, 1c)

JJM 20A

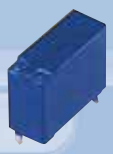
(1a, 1c)

JJ-M Double make type 12A

(2w)(6Ax2)

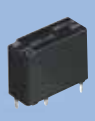
JSM 15A

(1a,1c)



CT-P 30A

(1c)



CT 20A

(1c)

CJ 20A

(1c)

CP 20A

(1a, 1c)

CP-P 30A

(1a, 1c)

CP-SMD 20A

(1c)

Recommended Applications

Highly reliable relays that have proven record when it comes to safety, power train control, comfort and special vehicles.

Safety

Features	Item	Contact arrangement	Coil voltage (DC)	Headlights	Tail lights	Fog lamps (front and rear)	Signal lights	Windshield wipers	Power Mirrors (incl. ones with heaters	
Twin	CT/CT-P	1c x 2	12V						✓	
	CJ	1c x 2							✓	
Single	CN-H	1a		✓	✓	✓				
	CN-M	1a, 1c		✓	✓	✓				
	CW	2a								
	JJ-M	1a, 1c			✓		✓	✓	✓	
	JJ-M Double make contact	Double make contact								
	CT/CT-P	1c			✓				✓	
	CJ	1c								
	CP-P	1a, 1c						✓	✓	
	CP	1a, 1c						✓	✓	
SMD	CP	1c						✓	✓	
	CN-M	1a, 1c		✓	✓	✓				
Quiet	CQ	1c						✓	✓	
Mini ISO	CB	1a, 1c	Standard: 12V, 24V 1a high capacity: 12V	✓	✓	✓				
Micro ISO	CM	1a, 1c	12V, 24V	✓	✓	✓				

Power Train Control

	Windshield washers	Defoggers	Horns	Blower fans	Radiator fan motors	Engine starter motors	EPS (electrical power steering)	Magnetic clutches	ABS/TRC	Semi-active suspension
			✓							
		✓		✓	✓	✓	✓			
		✓		✓	✓	✓				
							✓			
			✓						✓	✓
	✓		✓						✓	✓
								✓	✓	✓
	✓	✓	✓					✓	✓	✓
	✓	✓	✓					✓	✓	✓
	✓	✓	✓					✓	✓	✓
		✓		✓	✓	✓				
			✓							
		✓		✓	✓	✓	✓	✓	✓	
		✓		✓	✓	✓	✓	✓	✓	

Recommended Applications

Highly reliable relays that have proven record when it comes to safety, power train control, comfort and special vehicles.

Comfort

Features	Item	Contact arrangement	Coil voltage (DC)	Power sunroofs	Power seats	Lift gate	Power window motor	Keyless entry	Door locks	
Twin	CT/CT-P	1c x 2	12V	✓	✓	✓	✓		✓	
	CJ	1c x 2		✓	✓	✓	✓		✓	
Single	CN-H	1a								
	CN-M	1a, 1c								
	CW	2a								
	JJ-M	1a, 1c		✓	✓	✓	✓		✓	
	JJ-M Double make contact	Double make contact						✓		
	CT/CT-P	1c			✓				✓	
	CJ	1c			✓				✓	
	CP-P	1a, 1c		✓	✓	✓	✓		✓	
	CP	1a, 1c		✓	✓	✓	✓		✓	
SMD	CP	1c		✓	✓	✓	✓		✓	
	CN-M	1a, 1c								
Quiet	CQ	1c		✓	✓		✓		✓	
Mini ISO	CB	1a, 1c	Standard: 12V, 24V 1a high capacity: 12V							
Micro ISO	CM	1a, 1c	12V, 24V							

Special vehicle

	Slide door closer	Car security	Seat heaters	Car stereo	Interior lights	Auto antennae	Cruise control	Motorcycles	Forklifts
	✓					✓			
	✓					✓			
			✓						
			✓						
	✓			✓	✓	✓	✓		
		✓							
	✓			✓		✓	✓		
	✓			✓		✓	✓		
	✓		✓	✓		✓	✓		
	✓		✓	✓		✓	✓		
	✓		✓	✓		✓	✓		
			✓						
	✓			✓		✓	✓		
								✓	✓
			✓					✓	✓

Quality Control

ISO/TS16949 Certificate of approval

Our Automation Components Division has been accredited for ISO/TS16949. This covers our quality management system for an entire spectrum of automotive products from mechanical to semiconductor relays. Based on QS9000, a quality management standard employed by the “Big 3” United States automobile manufacturers, ISO/TS16949 is a quality management system standard that also incorporates the requirements put forth by the automobile industries of each European country. It calls for a comprehensive quality management system that includes CS, cost performance, and ongoing improvement.

IMDS (International Material Data System)

Panasonic Electric Works is a registered corporation in the European automotive industry’s International Material Data System.

ISO/TS16949

ISO14001

ISO9001

Certification Status

- Switching Device Division approved.
- Mechatro Device Division approved.
- Panasonic Electric Works Obihiro Co., Ltd. approved.
- Panasonic Electric Works (Thailand), Ltd. approved.
- Panasonic Electric Works Europe AG, German Factory approved.

APQP
Advanced Product Quality Planning & Control Plan

DFMEA
Design Potential Failure Mode & Effects Analysis
PFMEA
Process Potential Failure Mode & Effects Analysis
CONTROL PLAN
PROCESS CAPABILITY
MSA Measurement Analysis etc.

PPAP
Production Part Approval Process

CS
Customer Satisfaction

Global Network

Panasonic Electric Works’ automotive relays meet higher level and ever more complex user needs through new product development, stable quality, speedy customer service, and production on a global scale.

Germany

Panasonic Electric Works Europe AG

Japan

Panasonic Electric Works Obihiro Co., Ltd.

Panasonic Electric Works, Ise plant

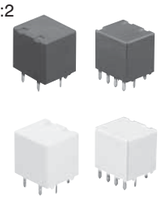
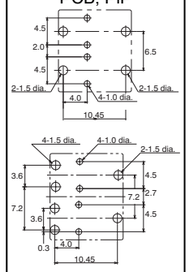
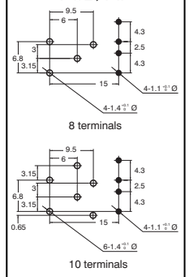
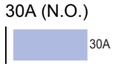
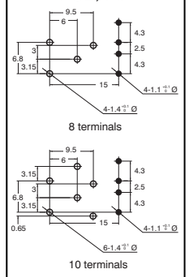
Mexico

Panasonic Electric Works, Mexicana S.A. de C.V.

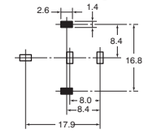
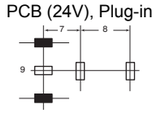
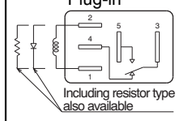
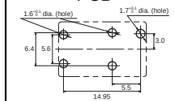
Thailand

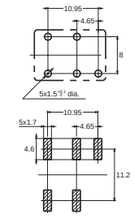
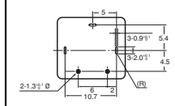
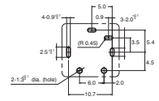
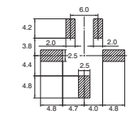
Panasonic Electric Works (Thailand), Ltd.

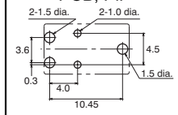
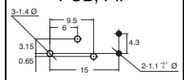
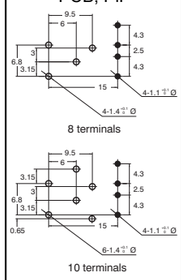
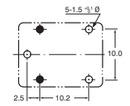
Selector Chart

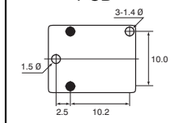
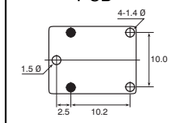
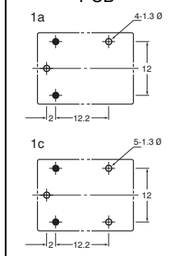
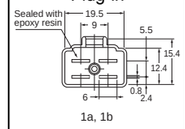
Type ★ = Popular Type (Picture scale: DIN A4)	Features	Switching current (Min.: see data sheet)	Max. switching voltage	Contact arrangement	Coil voltage	Coil power	Breakdown voltage Between open contacts	Breakdown voltage Between contact sets	Breakdown voltage Contacts to coil	Surge withstand voltage	Mounting method (bottom view)	Page Approvals
Twin												
★**CJ** 1:2  8 Pin Print: 13.7 x 12.2 x 13.5mm PiP: 13.7 x 12.2 x 13.8mm 10 Pin Print: 14.4 x 12.2 x 13.5mm PiP: 14.4 x 12.2 x 13.8mm	• Ultra small size • Twin (1 Form C x 2) • High capacity in a compact body • H-bridge type available (twin relay) • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 20A (N.O.)  10A (N.C.) 	• 16V DC	1c, 1c x 2	(DC) 12V	**Standard:** 800mW **High sensitivity:** 640mW	500Vrms	—	500Vrms	—	PCB, PiP 	— 44
★**CT** 1:2  17.4 x 14 x 13.5mm	• Super miniature size • Twin (1 Form C x 2) • ACT512 layout = layout of 2 x ACT112 • H-bridge type available (twin relay) • Quiet operation • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 20A (N.O.)  10A (N.C.) 	• 16V DC	1c, 1c x 2	(DC) 12V	800mW	500Vrms	—	500Vrms	—	PCB, PiP 	— 76
★**CT POWER** 1:2  17.4 x 14 x 13.5mm	• Super miniature size • Twin (1 Form C x 2) • Footprint same as CT standard type • 30A switching capacity (motor load) • H-bridge type available (twin relay) • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 30A (N.O.)  10A (N.C.) 	• 16V DC	1c, 1c x 2	(DC) 12V	1000mW	500Vrms	—	500Vrms	—	PCB, PiP 	— 82

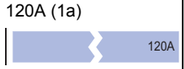
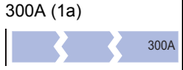
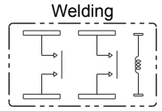
Type ★ = Popular Type (Picture scale: DIN A4)	Features	Switching current (Min.: see data sheet)	Max. switching voltage	Contact arrangement	Coil voltage
Single					
CB 1:2  26 x 22 x 25mm	• 40A switching current at 85°C • Mini-ISO type terminals • High shock resistance • High thermal resistance • 1 Form A available with 70A switching current • Broad lineup • RTIII (IP67) available	**Max.:** 70A (N.O. H type)  40A (1a, 1c N.O.)  30A (1c N.C.)  	• 16V DC (12V DC type) • 32V DC (24V DC type)	1a, 1c	(DC) 12, 24V
★**CM** 1:2  20 x 15 x 22mm	• Small substitute for Mini-ISO relay • Micro-ISO terminal type • RTIII (IP67) available	**Max.:** 35A (N.O.)  20A (N.C.)  	• 16V DC (12V DC type) • 32V DC (24V DC type)	1a, 1c	(DC) 12, 24V
CV 1:2  22.5 x 15 x 15.7mm	• Low profile • 20A Micro-ISO terminal type • RTIII (IP67)	**Max.:** 20A (N.O.)  10A (N.C.)  	• 16V DC	1a, 1c	(DC) 12V
★**CN-H** 1:2  17 x 10.6 x 18.3mm	• Best space savings in its class • Substitute for Micro-ISO relay • High current-carrying capacity • RTIII (IP67)	**Max.:**  	• 16V DC	1a	(DC) 12V

Coil power	Breakdown voltage			Surge withstand voltage	Mounting method (bottom view)	Page Approvals
	Between open contacts	Between contact sets	Contacts to coil			
1400mW (12V DC type) 1800mW (24V DC type) 1800mW (12V DC, H type)	500Vrms	—	500Vrms	—	PCB, Plug-in  (PCB standard type)	— 33
1500mW (12V DC type) 1800mW (24V DC type)	500Vrms	—	500Vrms	—	PCB (24V), Plug-in  	— 50
800mW	500Vrms	—	500Vrms	—	Plug-in  Including resistor type also available	— 87
450mW 640mW	500Vrms	—	500Vrms	—	PCB  	— 55

Type ★ = Popular Type (Picture scale: DIN A4)	Features	Switching current (Min.: see data sheet)	Max. switching voltage	Contact arrangement	Coil voltage	Coil power	Breakdown voltage Between open contacts	Breakdown voltage Between contact sets	Breakdown voltage Contacts to coil	Surge withstand voltage	Mounting method (bottom view)	Page Approvals
CN-M 1:2  15,5 x 11 x 14.4mm	• Space-saving design • High switching capacity (up to 30A) • SMD type available • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 30A (N.O.) 30A 25A (N.C.) 25A	• 16V DC	1a, 1c	(DC) 12V	640mW	500Vrms	—	500Vrms	—	PCB, SMT 	— 59
★**CP** 1:2  14 x 13 x 9.5mm	• Very low profile • High capacity • 24V DC type available on request • RTIII (IP67)	**Max.:** 20A (N.O.) 20A 10A (N.C.) 10A	• 16V DC	1a, 1c	(DC) 12V, 24V	640mW	500Vrms	—	500Vrms	—	PCB 	— 64
★**CP POWER** 1:2  14 x 13 x 9.5mm	• Very low profile • High capacity type: 45A maximum carrying current • Improved heat conduction thanks to additional pin • Layout is downward compatible to CP • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 20A (N.O.) 20A 10A (N.C.) 10A	• 16V DC	1a, 1c	(DC) 12V	450mW 640mW	500Vrms	—	500Vrms	—	PCB 	— 68
★**CP (SMD)** 1:2  14 x 13 x 10.5mm	• Very low profile • High capacity • RTIII (IP67)	**Max.:** 20A (N.O.) 20A 10A (N.C.) 10A	• 16V DC	1c	(DC) 12V	640mW	500Vrms	—	500Vrms	—	SMT 	— 64

Type ★ = Popular Type (Picture scale: DIN A4)	Features	Switching current (Min.: see data sheet)	Max. switching voltage	Contact arrangement	Coil voltage	Coil power	Breakdown voltage Between open contacts	Breakdown voltage Between contact sets	Breakdown voltage Contacts to coil	Surge withstand voltage	Mounting method (bottom view)	Page Approvals
★**CJ** 1:2  Print : 13.5 x 12.2 x 7.2mm PiP : 13.8 x 12.2 x 7.2mm	• Ultra small size • Twin (1 Form C x 2) • High capacity in a compact body • H-bridge type available (twin relay) • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 20A (N.O.)  10A (N.C.) 	• 16V DC	1c, 1c x 2	(DC) 12V	**Standard:** 800mW **High sensitivity:** 640mW	500Vrms	—	500Vrms	—	PCB, PiP 	— 44
★**CT** 1:2  17.4 x 7.2 x 13.5mm	• Super miniature size • Twin (1 Form C x 2) • ACT512 layout = layout of 2 x ACT112 • H-bridge type available (twin relay) • Quiet operation • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 20A (N.O.)  10A (N.C.) 	• 16V DC	1c, 1c x 2	(DC) 12V	800mW	500Vrms	—	500Vrms	—	PCB, PiP 	— 76
★**CT POWER** 1:2  17.4 x 7.2 x 13.5mm	• Super miniature size • Twin (1 Form C x 2) • Footprint same as CT standard type • 30A switching capacity (motor load) • H-bridge type available (twin relay) • RTIII (IP67) • Pin in Paste (with vent hole) available	**Max.:** 30A (N.O.)  10A (N.C.) 	• 16V DC	1c, 1c x 2	(DC) 12V	1000mW	500Vrms	—	500Vrms	—	PCB, PiP 	— 82
CQ 1:2  17 x 13 x 16.6mm	• Very quiet operation • Terminal layout identical to JJM • RTIII (IP67)	**Max.:** 20A (N.O.)  10A (N.C.) 	• 16V DC	1c	(DC) 12V	640mW	500Vrms	—	500Vrms	—	PCB 	— 72

Type ★ = Popular Type (Picture scale: DIN A4)	Features	Switching current (Min.: see data sheet)	Max. switching voltage	Contact arrangement	Coil voltage	Coil power	Breakdown voltage Between open contacts	Breakdown voltage Between contact sets	Breakdown voltage Contacts to coil	Surge withstand voltage	Mounting method (bottom view)	Page Approvals
★**JJM** 1:2  15.5 x 12 x 13.9mm	• Compact (half the size of JS-M) • Best-selling, familiar blinker sound • RTIII (IP67)	**Max.:** 20A (N.O.)  10A (N.C.) 	• 16V DC	1a, 1c	(DC) 12V	640mW	500Vrms	—	500Vrms	—	PCB 	— 114
JJM-DM 1:2  15.5 x 12 x 13.9mm	• Small size • Double make contact arrangement • Terminal layout compatible to JJM • RTIII (IP67)	**Max.:** 2 x 6A 	• 16V DC	Double make contact	(DC) 12V	1000mW	500Vrms	—	500Vrms	—	PCB 	— 118
JS-M 1:2  22 x 16 x 16.4mm	• Low pick-up voltage for high ambient temperatures • RTIII (IP67)	**Standard:** **Max.:** 10A  **High capacity:** **Max.:** 15A 	• 16V DC	1a, 1c	(DC) 9, 12V	640mW	750Vrms	—	1500Vrms	—	PCB 	— 122
CA 1:2  21.5 x 14.4 x 37mm	• Small size • Direct plug-in • RTIII (IP67)	**Max.:** 20A (1a, 1.4W type)  30A (1a, 1.8W type)  20A (1b, 1c) 	• 15V DC (1c - 12V DC type) • 16V DC (1a, 1b - 12V DC type) • 30V DC (1c - 24V DC type)	1a, 1b, 1c	(DC) 12, 24V	1800mW 1400mW (type S)	500Vrms	—	500Vrms	—	Plug-in 	— 26

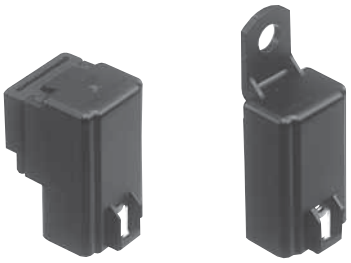
Type ★ = Popular Type (Picture scale: DIN A4)	Features	Switching current (Min.: see data sheet)	Max. switching voltage	Contact arrangement	Coil voltage	Coil power	Breakdown voltage Between open contacts	Breakdown voltage Between contact sets	Breakdown voltage Contacts to coil	Surge withstand voltage	Mounting method (bottom view)	Page Approvals
Special Types												
EV 1:8  66.8 x 49.7 x 37.9mm 78 x 40 x 48.1mm 82.8 x 40 x 79mm 75.5 x 40 x 80mm 111 x 63 x 75mm	• 5 versions available:10, 20, 80, 120, 300A • DC type with sealed capsule for electric and hybrid vehicles • Compact size • Small arcing space required thanks to blow-out magnets • Safety construction • High contact reliability	**Max.:** 10A (1a)  20A (1a)  80A (1a)  120A (1a)  300A (1a) 	• 400V DC	1a	(DC) 12, 24V	**Stable:** • 1240mW (10A, 12/24V) • 3900mW (20A, 12V) • 4200mW (80A/120A, 12/24V) • 3600mW (300A, 12V) • 3800mW (300A, 24V) **Inrush:** • 37.9W (300A, 12V) • 44.4W (300A, 24V)	2500Vrms	—	2500Vrms	—	Faston terminal —	— 100
EV QUIET TYPE 1:4  76 x 36 x 72.3mm  77 x 67.8 x 37.7mm	• DC type with sealed capsule, mainly for hybrid vehicles • Very quiet operation • Small size and light weight • Small arcing space required thanks to blow-out magnets • Safety construction • High contact reliability • Standard type for horizontal mounting available	**Max.:** 60A (1a) 	• 400V DC	1a	(DC) 12V	4500mW	Vertical: 2500Vrms Horizontal: 2000Vrms	—	Vertical: 2500Vrms Horizontal: 2000Vrms	—	Vertical type:lead wire Horizontal type: faston terminal —	— 108
CW 1:2  32 x 18 x 26mm	• Ideal relay for high output,3-phase motors (Electric Power Steering) • High cut-off current capability and high carrying current • RTIII (IP67)	**Max.:** 	• 14V DC	2a	(DC) 12V	1400mW	500Vrms	—	500Vrms	—	Welding 	— 92
EB 1:2  70 x 80 x 34mm	• Automotive high-capacity DC cutoff relay • Supports even 42V vehicles	**Max.:** 100A (1a) 	• 42V DC	1a	(DC) 12, 24, 36V	5000mW	1500Vrms	—	2500Vrms	—	Screw terminal —	— 95

Automotive Relays

Panasonic
ideas for life

Automotive power relays - small size, light weight

CA RELAYS



✂ Products to be discontinued.

FEATURES

1. Small size and light weight
For space saving, the outside dimensions of the main body are reduced to be 21.5 mm (length) × 14.4 mm (width) × 37 mm (height) (.846 × .567 × 1.457 inch) and the weight is also reduced to be approx. 19 g .67 oz (direct coupling 1 Form A, 1 Form B type)

2. Low operating power (1.4W) type is available (1 Form A, 1 Form B)

3. Since the terminal arrangement complies with JIS D5011 B4-M1, commercial connectors are available for these types of relays.

SPECIFICATIONS

Contact

Type			12 V DC			24 V DC
Arrangement			1 Form A	1 Form B	1 Form C	1 Form C
Initial contact resistance (By voltage drop 6 V DC 1A)			Max. 50 mΩ			
Contact material			$AgSnO_2$ type			
Contact voltage drop			Max. 0.3 V After electrical life test, by voltage drop 12 V DC 20 A (1.4 W type), 12 V DC 30 A (1.8 W type)	Max. 0.3 V After electrical life test, by voltage drop 12 V DC 20 A	Max. 0.4 V After electrical life test, by voltage drop 12 V DC 20 A	Max. 0.4 V After electrical life test, by voltage drop 24 V DC 10 A
Rating	Nominal switching capacity (resistive load)		20 A 12 V DC (1.4 W type) 30 A 12 V DC (1.8 W type)	20 A 12 V DC		10 A 24 V DC (ON: 2s, OFF: 2s)
	Max. switching voltage		16 V		15 V	30 V
	Max. switching current		120 A (1.4 W type) 150 A (1.8 W type)	120 A	100 A	50 A (Inrush current)
	Max. carrying current		20 A continuous (1.4 W type) 30 A for 1 min (1.8 W type)	20 A continuous	20 A continuous	10 A continuous
	Min. switching capacity#1		1 A 12 V DC			1 A 24 V DC
Nominal operating power			1.4 W / 1.8 W		1.8 W	
Expected life (min. operations)	Mechanical (at 120 cpm)		10^6		5×10^5	
	Electrical	20 A (1.4 W, 1.8 W type)	10^5 (ON: 2s, OFF: 2s)	10^5 (ON 2s, OFF 2s)		10^5 (ON 2s, OFF 2s)
		30 A (1.8 W type)	2×10^4 (ON: 3s, OFF: 15s)			

#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.

Characteristics (at 20°C 68°F)

Type		12 V DC		24 V DC
Max. operating speed		15 cpm (1.4 W type: at nominal load; 1.8 W type: at 20 A)	15 cpm (at nominal load)	
Initial insulation resistance		Min. 10 MΩ at 500 V DC		
Initial breakdown voltage*1	Between open contacts	500 V rms for 1 min.		
	Between contacts and coil	500 V rms for 1 min.		
Operate time*2 (at nominal voltage)		Max. 10 ms at 20°C (initial)		Max. 10 ms (initial)
Release time (without diode)*2 (at nominal voltage)		Max. 10 ms at 20°C (initial)		Max. 10 ms (initial)
Shock resistance	Functional*3	Min. 200 m/s² {20 G}	Min. 100 m/s² {10 G}	Min. 100 m/s² {10 G}
	Destructive*4	Min. 1,000 m/s² {100 G}		
Vibration resistance	Functional*5	Rubber bracket A type: Min. 100 m/s² {10 G}, 50 Hz to 500 Hz Direct coupling type or Screw-mounting type: Min. 44.1 m/s² {4.5 G}, 33Hz		Min. 44.1 m/s² {4.5 G}, 33 Hz
	Destructive*6	Rubber bracket A type: Min. 100m/s² {10 G}, 50 Hz to 500 Hz Direct coupling type or Screw-mounting type: Min. 44.1 m/s² {4.5 G}, 33Hz		Min. 44.1 m/s² {4.5 G}, 33 Hz
Conditions for operation, transport and storage*7 (Not freezing and condensing low temperature)	Ambient temp.	–30°C to +80°C –22°F to +176°F		
	Humidity	5% R.H. to 85% R.H.		
Water-proof standard		Plastic sealed type: JIS DO203S2, Dust cover type: JIS DO203R2		JIS DO203S2
Mass		Rubber bracket A type: 23 g .81 oz Direct coupling type or Screw-mounting type: 19 g .67 oz	31 g 1.09 oz	

Electrical life (min. operation)

	Nominal coil voltage, V DC	Motor load (operating frequency ON: 2 s, OFF: 2 s)	Halogen lamp load (operating frequency ON: 1 s, OFF: 14 s)
1 Form A, 1 Form B	12	10^5, 20 A 12 V DC	10^5, 20 A 12 V DC
1 Form C	12	10^5, 20 A 12 V DC	10^5, 20 A 12 V DC
	24	10^5, 10 A 24 V DC	10^5, 6 A 24 V DC

Remarks

*1 Detection current: 10 mA
*2 Excluding contact bounce time
*3 Half-wave pulse of sine wave: 11ms; detection time: 10μs
*4 Half-wave pulse of sine wave: 6ms
*5 Detection time: 10μs
*6 Time of vibration for each direction; X, Y, direction: 2 hours, Z direction: 4 hours
*7 Refer to "Usage ambient condition" on page 139..

ORDERING INFORMATION

CA | 1a | F | S | — | 12 V | — | A | — | 5

Contact arrangement	Protective construction	Nominal operating power	Coil voltage (DC)	Mounting method	Classification by type
1a: 1 Form A 1b: 1 Form B 1 : 1 Form C	Nil: Plastic sealed type F: Dust cover type	Nil: Standard type (1.8 W) S: Low operating power type (1.4 W) (1 Form A, 1 Form B)	12 V 24 V (1 Form C only)	A: Rubber bracket A type (1 Form A, 1 Form B) N: Screw mounting type C: Direct coupling type	Nil: 1 Form C 5: 1 Form A or 1 Form B

Notes: 1. Type with resistor/diode inside are available as options. Please consult our sales office.
2. Standard packing: Carton: 20 pcs. Case: 200 pcs.
✂ Types with diode inside are only available until 2014.

COIL DATA

1) Standard type

Contact arrangement	Mounting type	Plastic sealed type	Dust cover type	Nominal voltage, V DC	Pick-up voltage, V DC (at 20°C 68°F)	Drop-out voltage, V DC (at 20°C 68°F)	Nominal operating current, mA (at 20°C 68°F)	Coil resistance, Ω (at 20°C 68°F)	Nominal operating power, W (at 20°C 68°F)	Usable voltage range, V DC
1 Form A	Rubber bracket A	CA1a-12V-A-5	CA1aF-12V-A-5	12	Max. 8	Min. 0.6 to 6	150±10%	80±10%	1.8	10 to 16
	Screw-mounting	CA1a-12V-N-5	CA1aF-12V-N-5	12	Max. 8	Min. 0.6 to 6	150±10%	80±10%	1.8	10 to 16
	Direct coupling	CA1a-12V-C-5	CA1aF-12V-C-5	12	Max. 8	Min. 0.6 to 6	150±10%	80±10%	1.8	10 to 16
1 Form B	Rubber bracket A	CA1b-12V-A-5	CA1bF-12V-A-5	12	Max. 8	Min. 0.6 to 6	150±10%	80±10%	1.8	10 to 16
	Screw-mounting	CA1b-12V-N-5	CA1bF-12V-N-5	12	Max. 8	Min. 0.6 to 6	150±10%	80±10%	1.8	10 to 16
	Direct coupling	CA1b-12V-C-5	CA1bF-12V-C-5	12	Max. 8	Min. 0.6 to 6	150±10%	80±10%	1.8	10 to 16
1 Form C	Screw-mounting	CA1-DC12V-N	–	12	Max. 8	Min. 0.6	150±10%	80±10%	1.8	10 to 15
	Direct coupling	CA1-DC12V-C	–	12	Max. 8	Min. 0.6	150±10%	80±10%	1.8	10 to 15
	Screw-mounting	CA1-DC24V-N	–	24	Max. 16	Min. 1.2	75±10%	320±10%	1.8	20 to 30
	Direct coupling	CA1-DC24V-C	–	24	Max. 16	Min. 1.2	75±10%	320±10%	1.8	20 to 30

2) Low operating power type

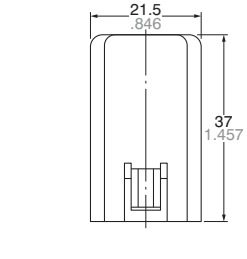
Contact arrangement	Mounting type	Plastic sealed type	Dust cover type	Nominal voltage, V DC	Pick-up voltage, V DC (at 20°C 68°F)	Drop-out voltage, V DC (at 20°C 68°F)	Nominal operating current, mA (at 20°C 68°F)	Coil resistance, Ω (at 20°C 68°F)	Nominal operating power, W (at 20°C 68°F)	Usable voltage range, V DC
1 Form A	Rubber bracket A	CA1aS-12V-A-5	CA1aFS-12V-A-5	12	Max. 8	Min. 0.6 to 6	120±10%	100±10%	1.4	10 to 16
	Screw-mounting	CA1aS-12V-N-5	CA1aFS-12V-N-5	12	Max. 8	Min. 0.6 to 6	120±10%	100±10%	1.4	10 to 16
	Direct coupling	CA1aS-12V-C-5	CA1aFS-12V-C-5	12	Max. 8	Min. 0.6 to 6	120±10%	100±10%	1.4	10 to 16
1 Form B	Rubber bracket A	CA1bS-12V-A-5	CA1bFS-12V-A-5	12	Max. 8	Min. 0.6 to 6	120±10%	100±10%	1.4	10 to 16
	Screw-mounting	CA1bS-12V-N-5	CA1bFS-12V-N-5	12	Max. 8	Min. 0.6 to 6	120±10%	100±10%	1.4	10 to 16
	Direct coupling	CA1bS-12V-C-5	CA1bFS-12V-C-5	12	Max. 8	Min. 0.6 to 6	120±10%	100±10%	1.4	10 to 16

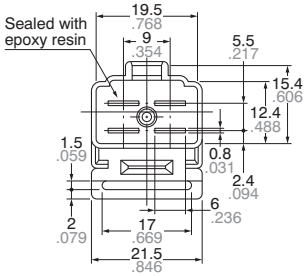
DIMENSIONS (mm inch)

Download CAD Data from our Web site.

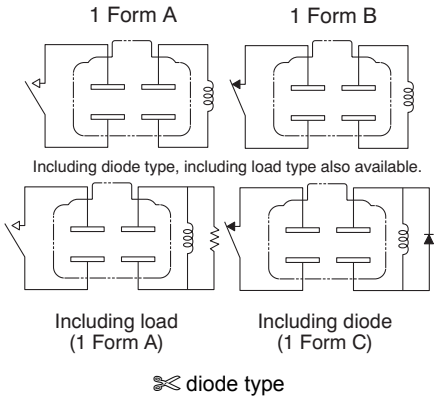
1. 1 Form A/1 Form B
Rubber bracket A type

CAD Data





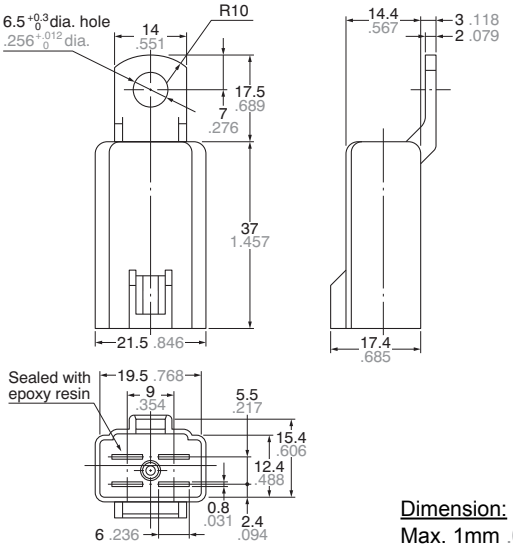
SCHEMATIC (Bottom View)



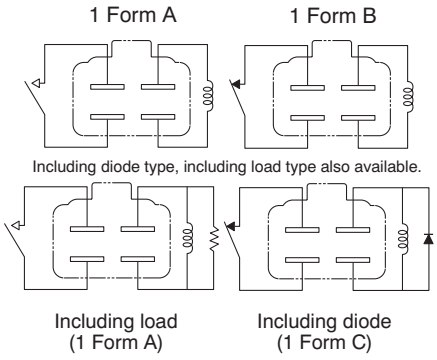
Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

2. 1 Form A/1 Form B
Screw-mounting type

CAD Data



SCHEMATIC (Bottom View)

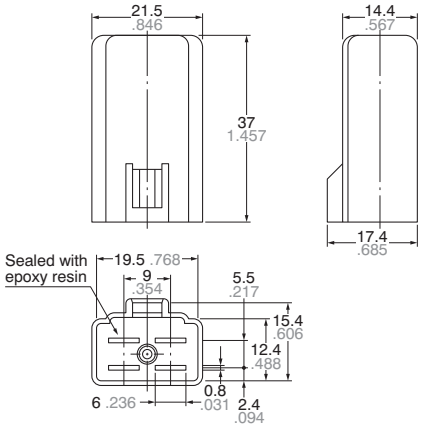


Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

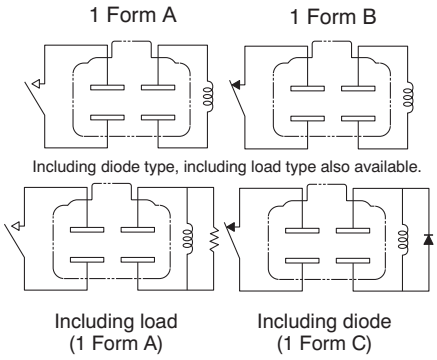
3. 1 Form A/1 Form B
Direct coupling type

mm inch

CAD Data



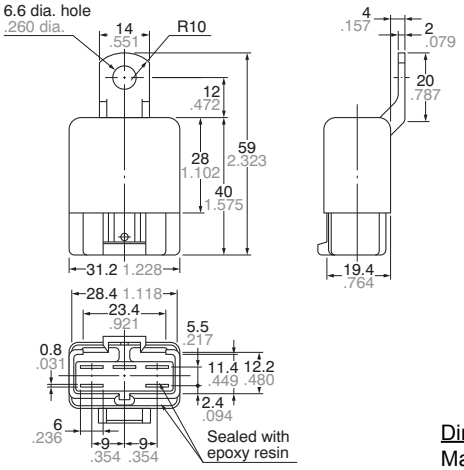
SCHEMATIC (Bottom View)



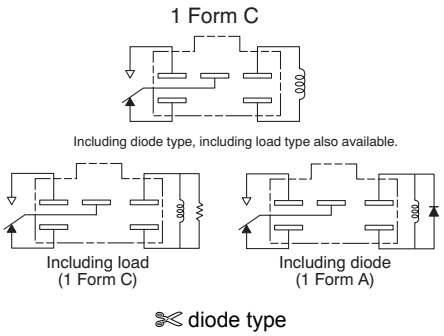
Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

4. 1 Form C
Screw-mounting type

CAD Data



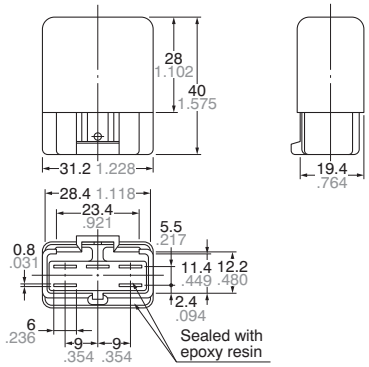
SCHEMATIC (Bottom View)



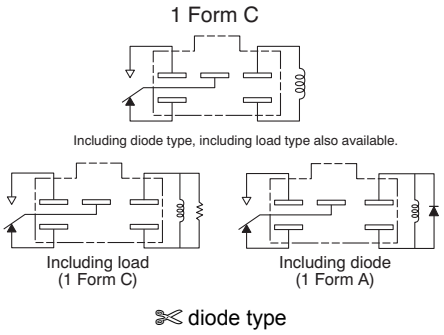
Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

5. 1 Form C
Direct coupling type

CAD Data



SCHEMATIC (Bottom View)

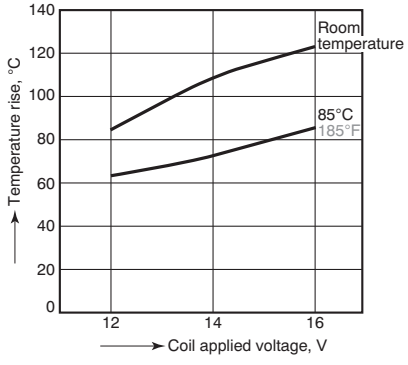


Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

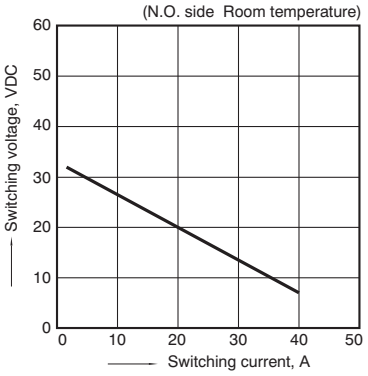
REFERENCE DATA

1. Coil temperature rise

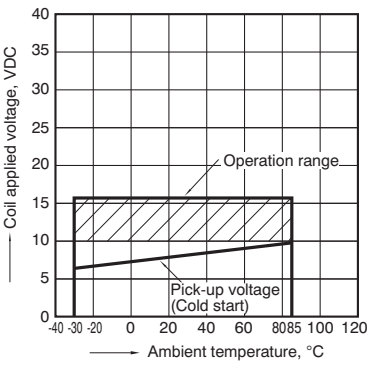
Samples: CA1aS-12V-N-5, 5pcs.
Measured portion: Inside the coil
Contact carrying current: 20A
Ambient temperature: Room temperature, 85°C
185°F



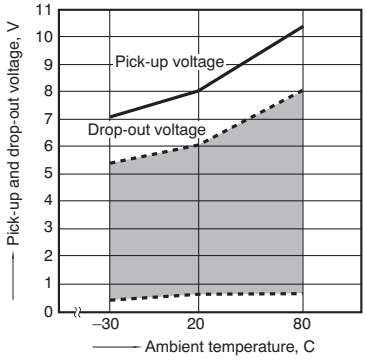
2. Max. switching capability (Resistive load)



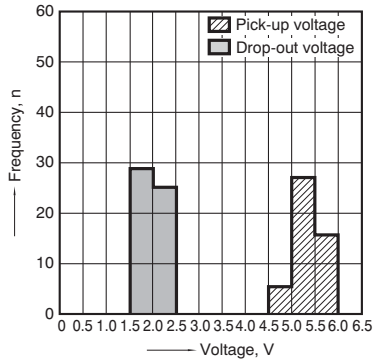
3. Ambient temperature and operating temperature range



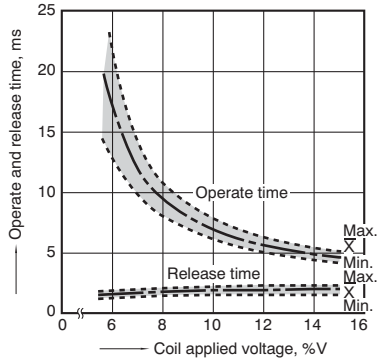
4. Ambient temperature characteristics (Cold start)
Samples: CA1bS-12V-N-5



5. Distribution of pick-up and drop-out voltage
Quantity: 50pcs.

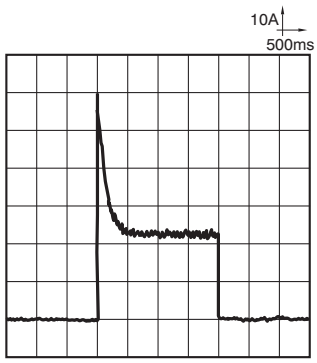


6. Distribution of operate and release time
Sample: CA1a-12V-N-5, 10pcs.

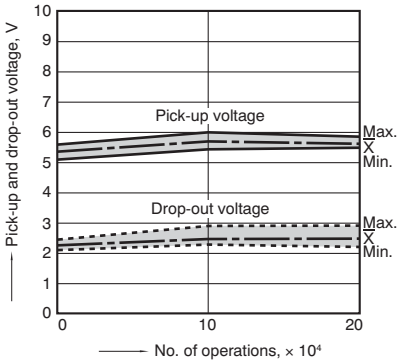


7-(1). Electrical life test (Motor load)
Sample: CA1a-12V-C, 3pcs.
Load: Inrush current: 63A, steady current: 23A
Blower fan motor actual load (motor free)
Switching frequency: (ON:OFF = 2s:2s)
Ambient temperature: Room temperature

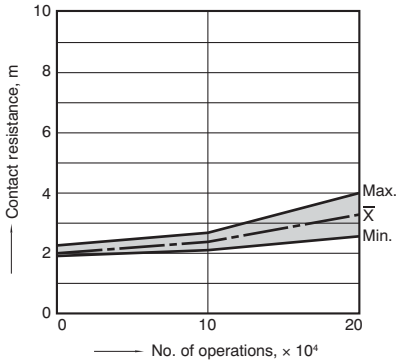
Load current waveform
Load: Inrush current: 63A, steady current: 23A,



Change of pick-up and drop-out voltage

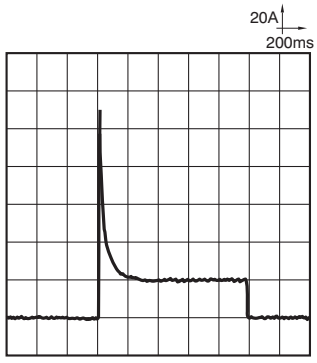


Change of contact resistance

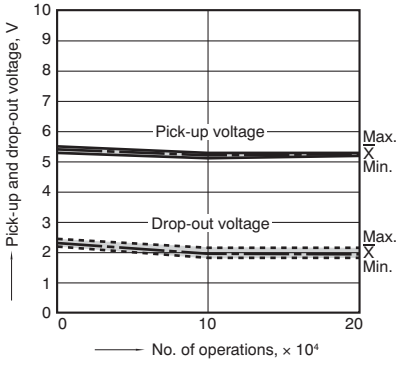


7-(2). Electrical life test (Lamp load)
Sample: CA1a-12V-C, 3pcs.
Load: 60Wx4, Inrush current: 110A, steady current: 20A
Halogen lamp actual load
Switching frequency: (ON:OFF = 1s:14s)
Ambient temperature: Room temperature

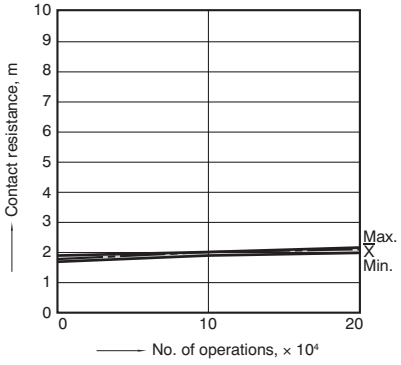
Load current waveform
Load: Inrush current: 110A, steady current: 20A,



Change of pick-up and drop-out voltage



Change of contact resistance



Cautions regarding the protection element

1. Part numbers without protection elements

1) 12 V models

When connecting a coil surge protection circuit to these relays, we recommend a Zener diode with a Zener voltage of 24 V or higher, or a resistor (680Ω to 1,000Ω). When a diode is connected to the coil in parallel, the release time will slow down and working life may shorten. Before use, please check the circuit and verify that the diode is not connected in parallel to the coil drive circuit.

2) 24 V models

When connecting a coil surge protection circuit to these relays, we recommend a Zener diode with a Zener voltage of 48 V or higher, or a resistor (2,800Ω to 4,700Ω). When a diode is connected to the coil in parallel, the release time will slow down and working life may shorten. Before use, please check the circuit and verify that the diode is not connected in parallel to the coil drive circuit.

✂ **2. Part numbers with diodes**

These relays use a diode in the coil surge protection element. Therefore, the release time is slower and the working life might be shorter compared to part numbers without protection elements and part numbers with resistors.

Be sure to use only after evaluating under actual load conditions.

3. Part numbers with resistors

This part number employs a resistor in the coil surge protection circuit; therefore, an external surge protection element is not required. In particular, when a diode is connected in parallel with a coil, the revert time becomes slower which could adversely affect working life. Please check the circuit and make sure that a diode is not connected in parallel with the coil drive circuit.

For Cautions for Use, see Relay Technical Information (page 126).

Panasonic
ideas for life

Automotive relay with ISO terminal arrangement

CB RELAYS

✂ Products to be discontinued.

FEATURES

1. This relay has an ISO (International Organization for Standardization) terminal arrangement.
Terminals are all solder plated.
*35 A type: Terminal is the plug-in type (no plating).

2. Relay is compact and high capacity (40 A).
Compact form factor realized with space saving 22 × 26 mm .866 × 1.024 inch small base area thanks to integrated bobbin and base construction. Features high switching capacity of 40 A

3. Features high thermal resistance of 125°C 257°F (heat resistant type).
Heat resistant type is available that can withstand use near engines. (40 A switching capacity)

4. Sealed type available for resisting adverse environments.

5. Protective element type is also available.

6. For only plug-in types, types with nominal switching capacities of 35 A (12 V) and 15 A (24 V) are available.

TYPICAL APPLICATIONS

1. Automobiles
Headlights, Cell motors, Air conditioners, ABS, EPS, etc.

2. Construction equipment

3. Agricultural equipment, Conveyor, etc.

ORDERING INFORMATION

CB ☐ ☐ ☐ - ☐ ☐ - ☐ - ☐

Contact arrangement
1a: 1 Form A
1: 1 Form C

Contact rating
Nil: Standard type
H: High contact capacity type
V: 35 A type

Protective construction
Nil: Sealed type
F: Flux-resistant type

Heat resistant of types
Nil: Standard type
T: Heat resistant type

Protective element
Nil: None
D: with diode inside
R: with resistor inside

Mounting classification
Nil: Plug-in type
P: PC board type
M: Bracket type

Coil voltage (DC)
12V, 24 V

✂ D: with diode inside

Automotive

TYPES

1. Standard type

Contact arrangement	Mounting classification	Nominal coil voltage	Sealed type	Flux-resistant type
			Part No.	Part No.
1 Form A	PC board type	12V DC	CB1a-P-12V	CB1aF-P-12V
		24V DC	CB1a-P-24V	CB1aF-P-24V
	Plug-in type	12V DC	CB1a-12V	CB1aF-12V
		24V DC	CB1a-24V	CB1aF-24V
	Bracket type	12V DC	CB1a-M-12V	CB1aF-M-12V
		24V DC	CB1a-M-24V	CB1aF-M-24V
1 Form C	PC board type	12V DC	CB1-P-12V	CB1F-P-12V
		24V DC	CB1-P-24V	CB1F-P-24V
	Plug-in type	12V DC	CB1-12V	CB1F-12V
		24V DC	CB1-24V	CB1F-24V
	Bracket type	12V DC	CB1-M-12V	CB1F-M-12V
		24V DC	CB1-M-24V	CB1F-M-24V
High contact capacity (1 Form A)	PC board type*	12V DC	CB1aH-P-12V	CB1aHF-P-12V
		24V DC	CB1aH-P-24V	CB1aHF-P-24V
	Plug-in type	12V DC	CB1aH-12V	CB1aHF-12V
		24V DC	CB1aH-24V	CB1aHF-24V
	Bracket type	12V DC	CB1aH-M-12V	CB1aHF-M-12V
		24V DC	CB1aH-M-24V	CB1aHF-M-24V

Packing quantity; Carton: 50 pcs. Case: 200 pcs.
Notes: 1. Please use “CB∗∗∗R∗∗” to order built-in resistor type and “CB∗∗∗D∗∗” to order ✂ built-in diode type. (Asterisks “∗” should be filled in from parts table.)
2. *Regarding solder, this product is not MIL (Military Standard) compliant. Please evaluate solder mounting by the actual equipment before using.

2. Heat resistant type

Contact arrangement	Mounting classification	Nominal coil voltage	Sealed type	Flux-resistant type
			Part No.	Part No.
1 Form A	PC board type	12V DC	CB1a-T-P-12V	CB1aF-T-P-12V
		24V DC	CB1a-T-P-24V	CB1aF-T-P-24V
	Plug-in type	12V DC	CB1a-T-12V	CB1aF-T-12V
		24V DC	CB1a-T-24V	CB1aF-T-24V
	Bracket type	12V DC	CB1a-T-M-12V	CB1aF-T-M-12V
		24V DC	CB1a-T-M-24V	CB1aF-T-M-24V
1 Form C	PC board type	12V DC	CB1-T-P-12V	CB1F-T-P-12V
		24V DC	CB1-T-P-24V	CB1F-T-P-24V
	Plug-in type	12V DC	CB1-T-12V	CB1F-T-12V
		24V DC	CB1-T-24V	CB1F-T-24V
	Bracket type	12V DC	CB1-T-M-12V	CB1F-T-M-12V
		24V DC	CB1-T-M-24V	CB1F-T-M-24V
High contact capacity (1 Form A)	PC board type*	12V DC	CB1aH-T-P-12V	CB1aHF-T-P-12V
		24V DC	CB1aH-T-P-24V	CB1aHF-T-P-24V
	Plug-in type	12V DC	CB1aH-T-12V	CB1aHF-T-12V
		24V DC	CB1aH-T-24V	CB1aHF-T-24V
	Bracket type	12V DC	CB1aH-T-M-12V	CB1aHF-T-M-12V
		24V DC	CB1aH-T-M-24V	CB1aHF-T-M-24V

Packing quantity; Carton: 50 pcs. Case: 200 pcs.
Notes: 1. Please use “CB∗∗∗R∗∗” to order built-in resistor type and “CB∗∗∗D∗∗” to order ✂ built-in diode type. (Asterisks “∗” should be filled in from parts table.)
2. *Regarding solder, this product is not MIL (Military Standard) compliant. Please evaluate solder mounting by the actual equipment before using.

3. 35 A type (*Terminals are all of the plug-in type.)

Contact arrangement	Nominal coil voltage	Sealed type	Flux-resistant type
		Part No.	Part No.
1 Form A	12V DC	CB1aV-12V	CB1aVF-12V
	24V DC	CB1aV-24V	CB1aVF-24V
1 Form C	12V DC	CB1V-12V	CB1VF-12V
	24V DC	CB1V-24V	CB1VF-24V
1 Form A with resistor inside	12V DC	CB1aV-R-12V	CB1aVF-R-12V
	24V DC	CB1aV-R-24V	CB1aVF-R-24V
1 Form C with resistor inside	12V DC	CB1V-R-12V	CB1VF-R-12V
	24V DC	CB1V-R-24V	CB1VF-R-24V
✂ 1 Form A with diode inside	12V DC	✂ CB1aV-D-12V	✂ CB1aVF-D-12V
	24V DC	✂ CB1aV-D-24V	✂ CB1aVF-D-24V
✂ 1 Form C with diode inside	12V DC	✂ CB1V-D-12V	✂ CB1VF-D-12V
	24V DC	✂ CB1V-D-24V	✂ CB1VF-D-24V

Packing quantity; Carton: 50 pcs. Case: 200 pcs.

RATING

1. Coil data

1) 1. No protective element

Contact arrangement	Nominal coil voltage	Pick-up voltage (Initial, at 20°C 68°F)	Drop-out voltage (Initial, at 20°C 68°F)	Nominal operating current (at 20°C 68°F)	Coil resistance (±10%) (at 20°C 68°F)	Nominal operating power (at 20°C 68°F)	Usable voltage range
1 Form A, 1 Form C	12V DC	3 to 7V DC	1.2 to 4.2V DC	117mA	103Ω	1.4W	10 to 16V DC
	24V DC	6 to 14V DC	2.4 to 8.4V DC	75mA	320Ω	1.8W	20 to 32V DC
High contact capacity (1 Form A)	12V DC	3 to 7V DC	1.2 to 4.2V DC	117mA	103Ω	1.4W (PC board type)	10 to 16V DC
				150mA	80Ω	1.8W	
	24V DC	6 to 14V DC	2.4 to 8.4V DC	58mA	411Ω	1.4W (PC board type)	20 to 32V DC
				75mA	320Ω	1.8W	

Note: Other pick-up voltage types are also available. Please contact us for details.

2) With resistor inside

Contact arrangement	Nominal coil voltage	Pick-up voltage (Initial, at 20°C 68°F)	Drop-out voltage (Initial, at 20°C 68°F)	Nominal operating current (at 20°C 68°F)	Combined resistance (±10%) (at 20°C 68°F)	Nominal operating power (at 20°C 68°F)	Usable voltage range
1 Form A, 1 Form C	12V DC	3 to 7V DC	1.2 to 4.2V DC	134mA	89.5Ω	1.6W	10 to 16V DC
	24V DC	6 to 14V DC	2.4 to 8.4V DC	84mA	287.2Ω	2.0W	20 to 32V DC

2. Specifications

1) Standard type (12 V coil voltage)

Characteristics	Item		Specifications		
Contact	Arrangement		1 Form A	1 Form C	High contact capacity (1 Form A)
	Contact resistance (Initial)		Typ2mΩ (By voltage drop 6 V DC 1 A)		
	Contact material		Ag alloy (Cadmium free)		
Rating	Nominal switching capacity (Initial)		40A 14V DC	N.O.: 40A 14V DC N.C.: 30A 14V DC	70A 14V DC (at 20°C 68°F) 50A 14V DC (at 85°C 185°F)
	Max. carrying current (Initial) (14V DC, at 85°C 185°F, continuous)		N.O.: 40A	N.O.: 40A, N.C.: 30A	N.O.: 40A
	Nominal operating power		1.4W	1.4W	1.8W (1.4W: PC board type)
	Min. switching capacity*1		1A 12V DC (12V DC), 1A 24V DC (24V DC)		
Electrical characteristics	Initial insulation resistance		Min. 20 MΩ (at 500 V DC)		
	Initial breakdown voltage	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)		
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)		
	Operate time (at nominal voltage) (at 20°C 68°F)		Max. 15ms (at 20°C 68°F, excluding contact bounce time) (Initial)		
	Release time (at nominal voltage) (at 20°C 68°F)		Max. 15ms (at 20°C 68°F, excluding contact bounce time, without diode) (Initial)		
Mechanical characteristics	Shock resistance	Functional	Min. 200 m/s² {20G}		
		Destructive	Min. 1,000 m/s² {100G}		
	Vibration resistance	Functional	10 Hz to 500 Hz, Min. 44.1m/s² {4.5G}		
		Destructive	10 Hz to 2,000 Hz, Min. 44.1m/s² {4.5G} Time of vibration for each direction; X. Y. Z direction: 4 hours		
Expected life	Electrical (at nominal switching capacity)		Flux-resistant type: Min. 10^5, Sealed type: Min. 5×10^4 (Operating frequency: 2s ON, 2s OFF)		
	Mechanical		Min. 10^6 (at 120 cpm)		
Conditions	Conditions for operation, transport and storage*2		Standard type; Ambient temp: –40 to +85°C –40 to +185°F, Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)		
			Heat resistant type; Ambient temp: –40 to +125°C –40 to +257°F, Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)		
	Max. operating speed		15 cpm (At nominal switching capacity)		
Unit weight			Approx. 33 g 1.16 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 The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. Refer to “Usage ambient condition“ on page 139.

2) Standard type (24 V coil voltage)

Characteristics	Item	Specifications		
Contact	Arrangement	1 Form A	1 Form C	High contact capacity (1 Form A)
	Contact resistance (Initial)	Max. 15mΩ (By voltage drop 6 V DC 1 A)		
	Contact material	Ag alloy (Cadmium free)		
Rating	Nominal switching capacity (Initial)	20A 28V DC	N.O.: 20A 28V DC N.C.: 10A 28V DC	20A 28V DC
	Max. carrying current (Initial) (28V DC, at 85°C 185°F, continuous)	20A	N.O.: 20A, N.C.: 10A	20A
	Nominal operating power	1.8W	1.8W	1.8W, 1.4W (PC board type)

Note: All other specifications are the same as those of standard type (12 V coil voltage)

3) Heat resistant type (12 V and 24 V coil voltage)

Characteristics	Item	Specifications						
		12V				24V		
Contact	Arrangement	1 Form A	1 Form C	High contact capacity (1 Form A)		1 Form A	1 Form C	High contact capacity (1 Form A)
	Contact resistance (Initial)	Max. 15mΩ (By voltage drop 6 V DC 1 A)						
	Contact material	Ag alloy (Cadmium free)						
Rating	Nominal switching capacity (Initial)	40A 14V DC	N.O.: 40A 14V DC N.C.: 30A 14V DC	40A 14V DC		20A 28V DC	N.O.: 20A 28V DC N.C.: 10A 28V DC	20A 28V DC
	Max. carrying current (Initial) (at 85°C 185°F, continuous)*	50A 14V DC	N.O.: 50A 14V DC N.C.: 30A 14V DC	45A 14V DC	50A 14V DC	25A 28V DC	N.O.: 25A 28V DC N.C.: 10A 28V DC	25A 28V DC
	Nominal operating power	1.4W	1.4W	1.8W	1.4W (PC board type)	1.8W	1.8W	1.8W, 1.4W (PC board type)

Notes: 1. All other specifications are the same as those of standard type (12 V coil voltage)
2. *Current value in which carry current is possible when the coil temperature is 180°C 356°F

4) 35 A type (12 V coil voltage)

Characteristics	Item		Specifications	
Contact	Arrangement		1 Form A	1 Form C
	Contact resistance (Initial)		Typ2mΩ (By voltage drop 6 V DC 1 A)	
	Contact material		Ag alloy (Cadmium free)	
Rating	Nominal switching capacity (Resistive load)		35A 14V DC	N.O.: 35A 14V DC, N.C.: 25A 14V DC
	Max. carrying current (Initial) (14V DC, at 85°C 185°F, continuous)		N.O.: 35A	N.O.: 35A, N.C.: 25A
	Nominal operating power		1.4W, 1.6W (with resistor inside)	
	Min. switching capacity (Reference value)*		1A 12V DC (12V DC), 1A 24V DC (24V DC)	
Electrical characteristics	Initial insulation resistance		Min. 20 MΩ (at 500 V DC)	
	Initial breakdown voltage	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)	
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)	
	Operate time (at nominal voltage)		Max. 15ms (excluding contact bounce time) (Initial)	
	Release time (at nominal voltage)		Max. 15ms (excluding contact bounce time, without diode) (Initial)	
Mechanical characteristics	Shock resistance	Functional	Min. 100 m/s² {10G} (Half-wave pulse of sine wave: 11ms; detection: 10μs)	
		Destructive	Min. 1,000 m/s² {100G} (Half-wave pulse of sine wave: 6ms)	
	Vibration resistance	Functional	10 Hz to 100 Hz, Min. 44.1m/s² {4.5G} (Detection time: 10μs)	
		Destructive	10 Hz to 2,000 Hz, Min. 44.1m/s² {4.5G} Time of vibration for each direction; X. Y. Z direction: 4 hours	
Expected life	Electrical (at nominal switching capacity)		Flux-resistant type: Min. 10^5, Sealed type: Min. 5×10^4 (Operating frequency: 2s ON, 2s OFF)	
	Mechanical		Min. 10^6 (at 120 cpm)	
Conditions	Conditions for operation, transport and storage		Ambient temp: –40°C to +85°C –40°F to +185°F Humidity: 5% R.H. to 85% R.H. (Not freezing and condensing at low temperature)	
	Max. operating speed		15 cpm (At nominal switching capacity)	
Unit weight			Approx. 26 g .92 oz	

Note: * 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.

5) 35 A type (24 V coil voltage)

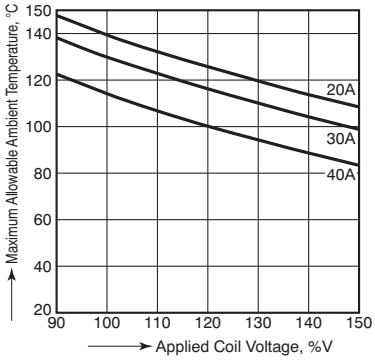
Characteristics	Item	Specifications	
Contact	Arrangement	1 Form A	1 Form C
Rating	Nominal switching capacity (Resistive load)	15A 28V DC	N.O.: 15A 28V DC, N.C.: 8A 28V DC
	Max. carrying current (14V DC, at 85°C 185°F, continuous)	N.O.: 15A	N.O.: 15A, N.C.: 8A
	Nominal operating power	1.8W, 2.0W (with resistor inside)	

Note: All other specifications are the same as those of 35 A type (12 V coil voltage).

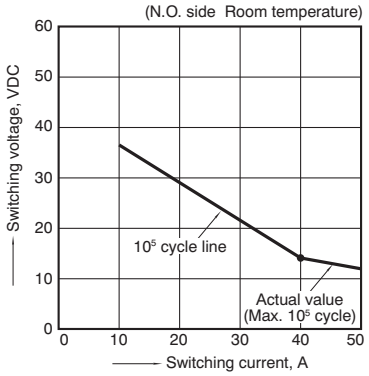
REFERENCE DATA

CB RELAYS (Standard type)

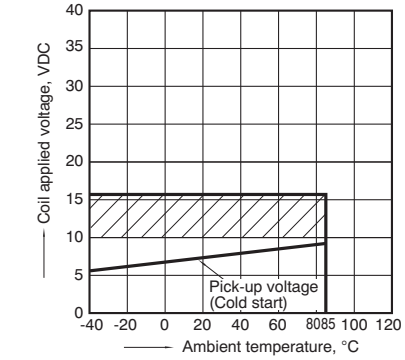
1. Allowable ambient temperature



2. Max. switching capability (Resistive load)
(Standard type)

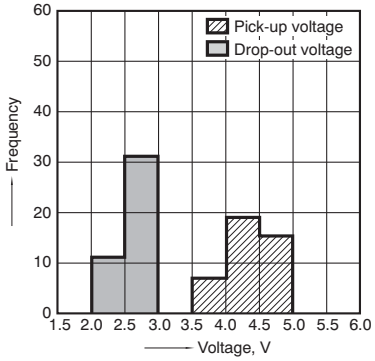


3. Ambient temperature and operating voltage range
(Standard type)

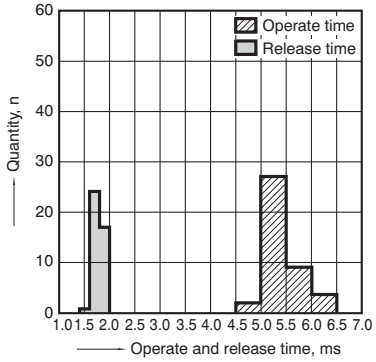


Asssumption:
- Maximum mean coil temperature: 180°C
- Curves are based on 1.4W (Nominal power consumption of the unsupprressed coil at nominal voltage)

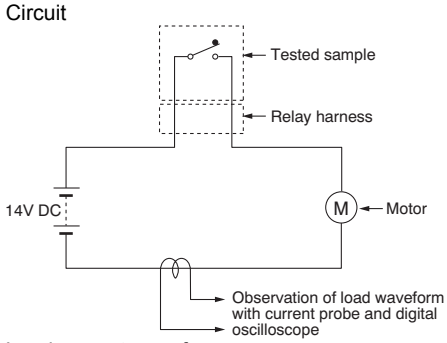
4. Distribution of pick-up and drop-out voltage
Sample: CB1-P-12V, 42pcs.



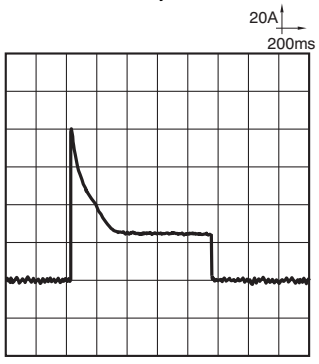
5. Distribution of operate and release time
Sample: CB1-P-24V, 42pcs.
* Without diode



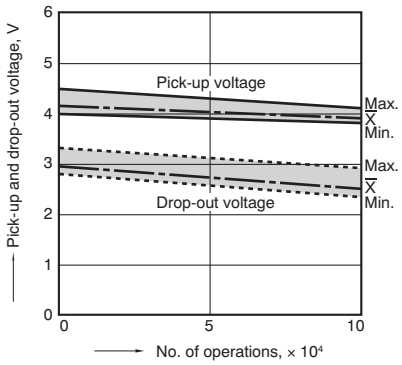
6-(1). Electrical life test (Motor free)
Sample: CB1F-12V, 5pcs.
Load: 25A 14V DC, motor free actual load
Switching frequency: (ON:OFF = 1s:9s)
Ambient temperature: Room temperature
Circuit



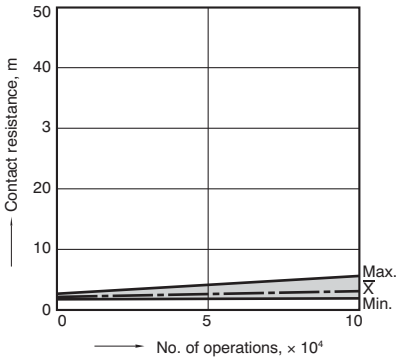
Load current waveform
Inrush current: 80A, Steady current: 25A



Change of pick-up and drop-out voltage

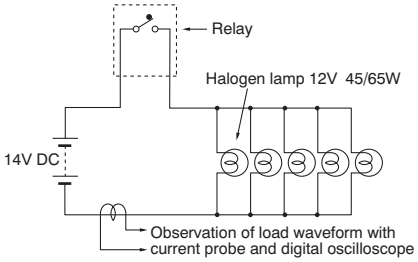


Change of contact resistance

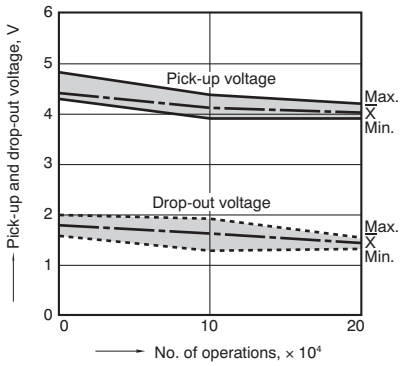


6-(2). Electrical life test (Lamp load)

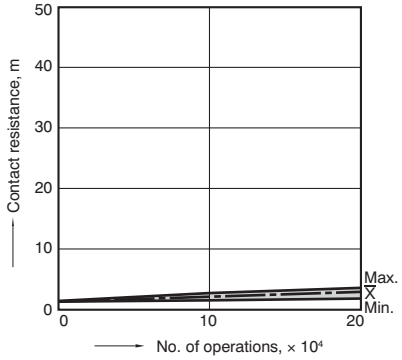
Sample: CB1F-12V, 5pcs.
Load: 45/65Wx5 parallel, 14V DC, halogen lamp actual load
Switching frequency: (ON:OFF = 1s:8s)
Ambient temperature: Room temperature
Circuit



Change of pick-up and drop-out voltage

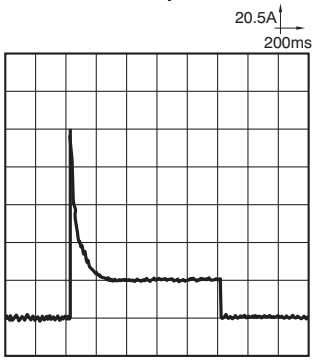


Change of contact resistance



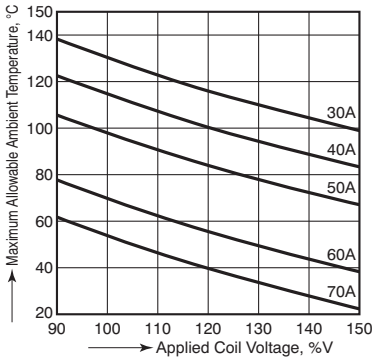
Load current waveform

Inrush current: 100A, Steady current: 20A

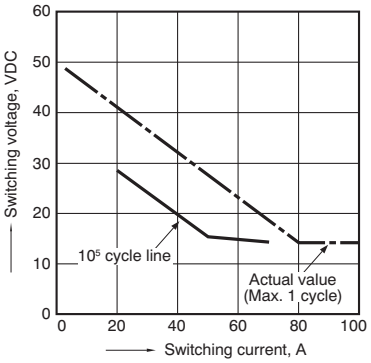


CB RELAYS (High contact capacity type)

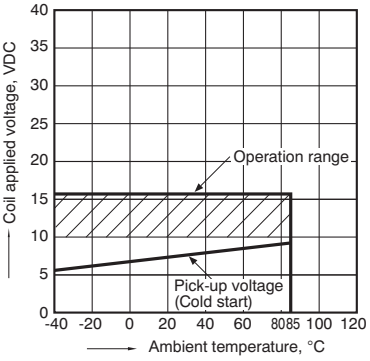
1. Allowable ambient temperature



2. Max. switching capability
(High contact capacity type)

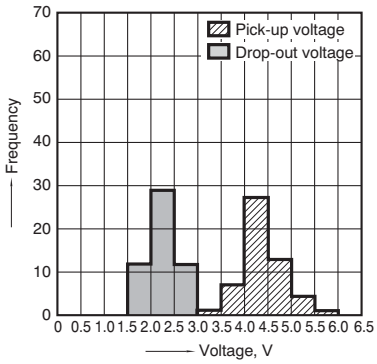


3. Ambient temperature and operating voltage range
(High contact capacity type)

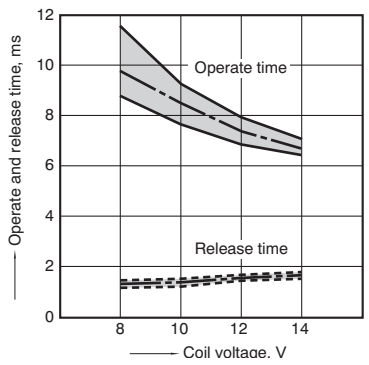


Asssumption:
• Maximum mean coil temperature: 180°C
• Curves are based on 1.4W (Nominal power consumption of the unsupprressed coil at nominal voltage)

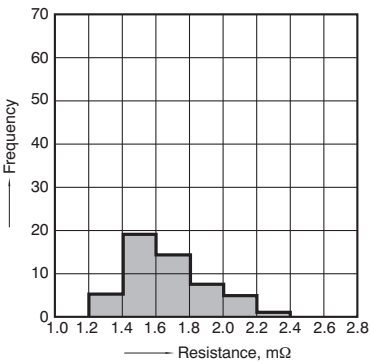
4. Distribution of pick-up and drop-out voltage
Sample: CB1aHF-12V, 53pcs.



5. Distribution of operate and release time
Sample: CB1aHF-12V, 53pcs.



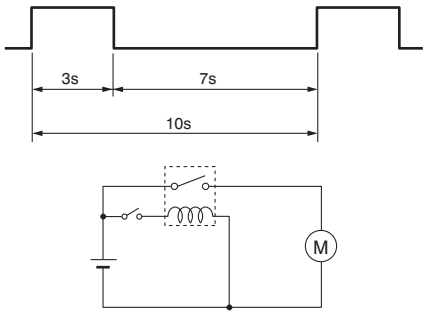
6. Contact resistance
Sample: CB1aHF-12V, 53pcs.
(By voltage drop 6V DC 1A)



7-(1). Electrical life test (Motor free)

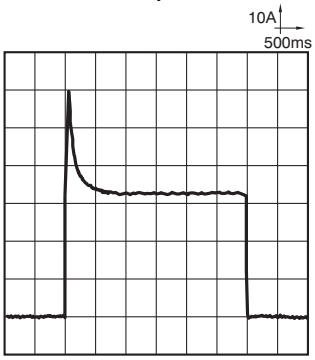
Sample: CB1aH-12V, 3pcs.
Load: Inrush current: 64A/Steady current: 35A
Fan motor actual load (motor free) 12V DC
Switching frequency: (ON:OFF = 3s:7s)
Ambient temperature: Room temperature

Circuit

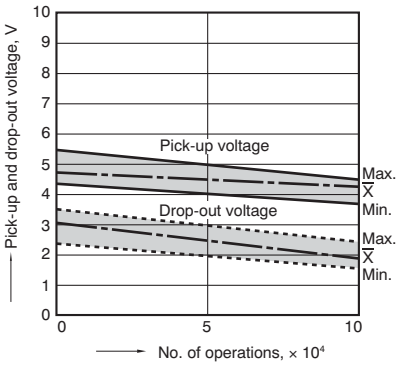


Load current waveform

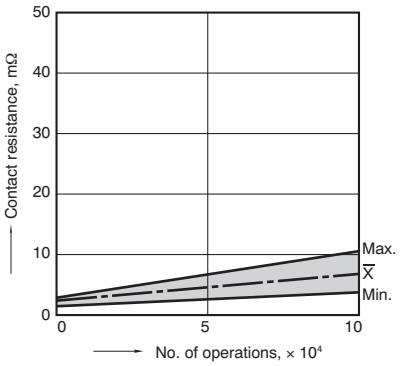
Inrush current: 64A, Steady current: 35A



Change of pick-up and drop-out voltage



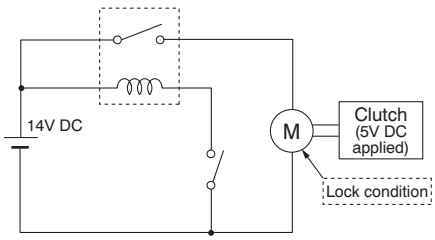
Change of contact resistance



7-(2). Electrical life test (Motor lock)

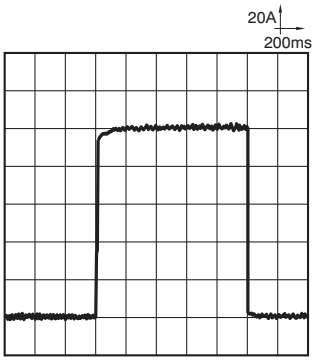
Sample: CB1aH-12V, 5pcs.
Load: 100A 14V DC
Magnet clutch actual load (lock condition)
Switching frequency: (ON:OFF = 1s:9s)
Ambient temperature: Room temperature

Circuit

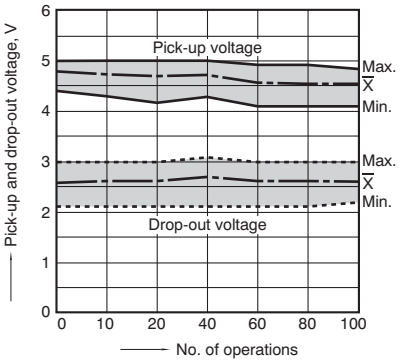


Load current waveform

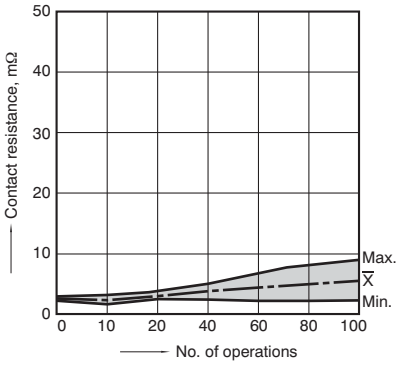
100A 14V DC



Change of pick-up and drop-out voltage

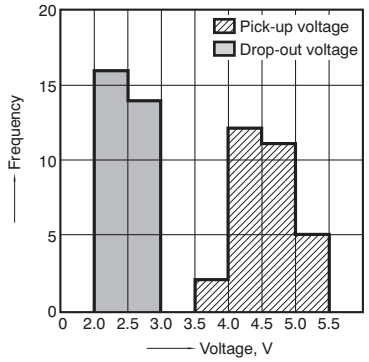


Change of contact resistance

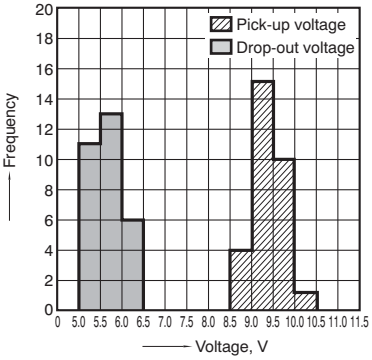


CB RELAY (35 A type)

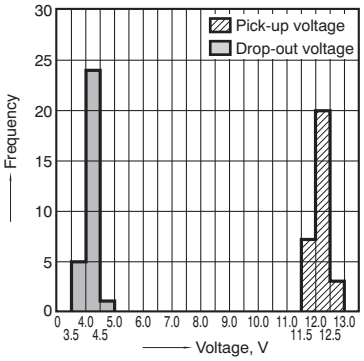
1-(1). Distribution of pick-up and drop-out voltage
Sample: CB1aV-12V, 30pcs.



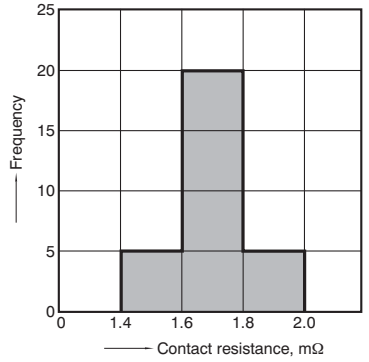
1-(2). Distribution of pick-up and drop-out voltage
Sample: CB1aV-24V, 30pcs.



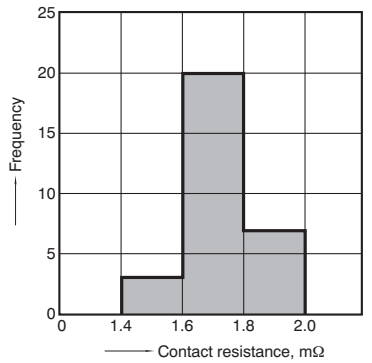
1-(3). Distribution of pick-up and drop-out voltage
Sample: CB1V-24V, 30pcs.



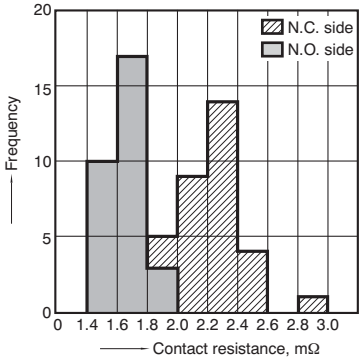
2.-(1) Contact resistance
Sample: CB1aV-12V, 30pcs.
(By voltage drop 12 V DC 1A)



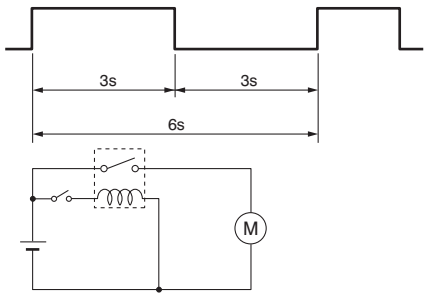
2.-(2) Contact resistance
Sample: CB1aV-24V, 30pcs.
(By voltage drop 24 V DC 1A)



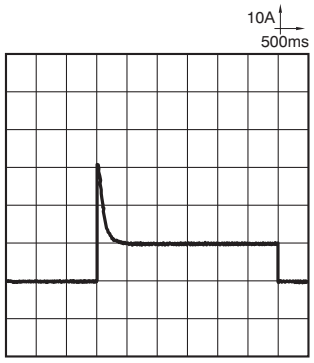
2.-(3) Contact resistance
Sample: CB1V-24V, 30pcs.
(By voltage drop 24 V DC 1A)



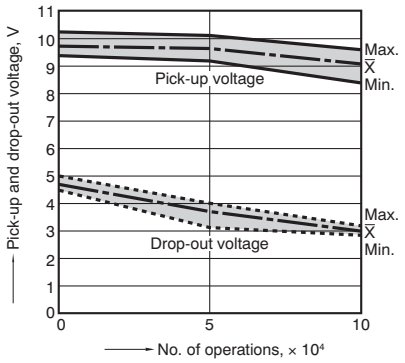
3. Electrical life test (Blower fan)
Sample: CB1aV-D-24V, 3pcs.
Load: Blower fan load 28 V DC
Inrush current: 30 A/Steady current: 10 A
Switching frequency: (ON:OFF = 3s:3s)
Switching cycle: 10^5
Ambient temperature: 85°C
Coil protective element: Diode
Circuit



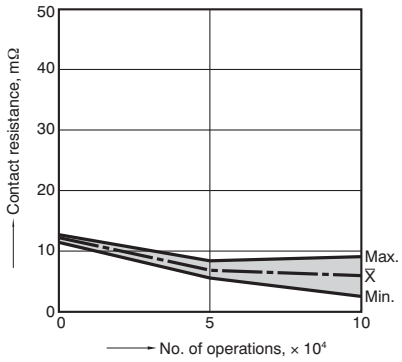
Load current waveform
Inrush current: 30 A, Steady current: 10 A



Change of pick-up and drop-out voltage



Change of contact resistance



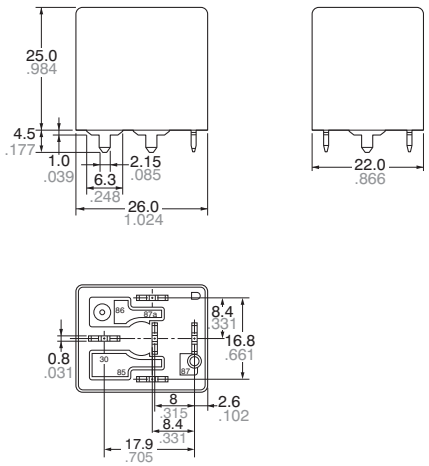
DIMENSIONS (mm inch)

Download CAD Data from our Web site.

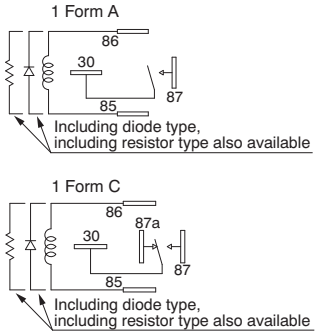
1. PC board type

CAD Data

External dimensions

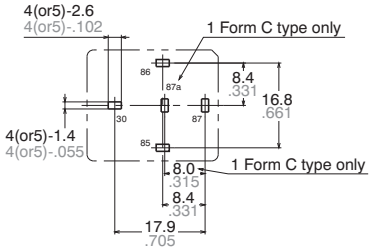


Schematic (Bottom view)



✂ diode type

PC board pattern (Bottom view)

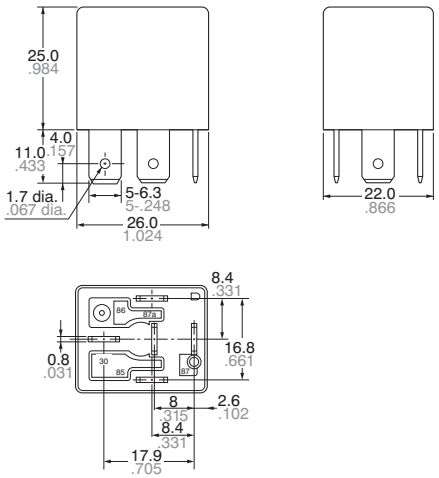


Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

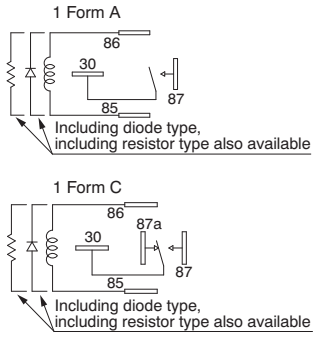
2. Plug-in type * The dimensions are the same as those of 35A type.

CAD Data

External dimensions



Schematic (Bottom view)



✂ diode type

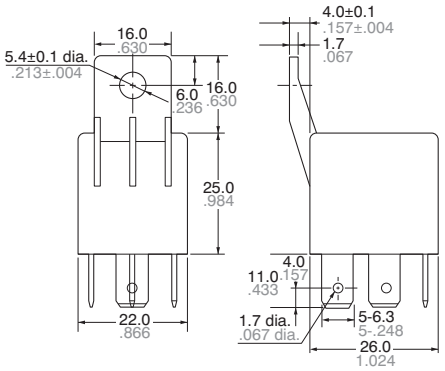
Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

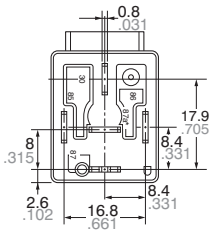
Automotive

3. Bracket type

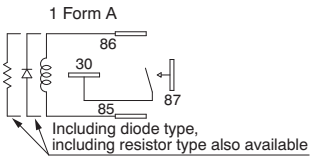
CAD Data

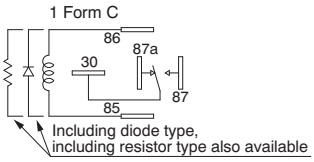
External dimensions





Schematic (Bottom view)





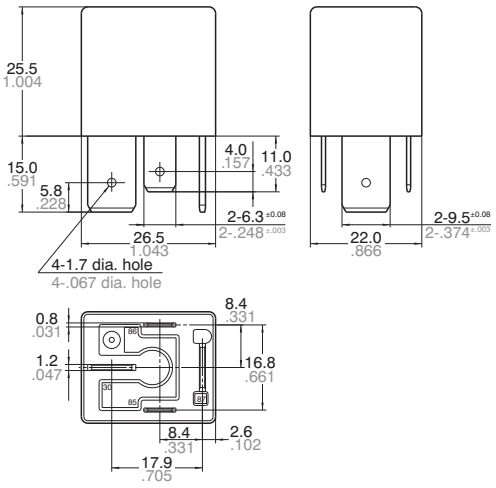
✂ diode type

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

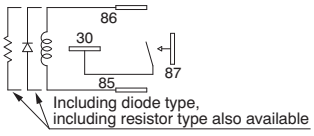
4. High contact capacity (1 Form A) (Plug-in type)

CAD Data

External dimensions



Schematic (Bottom view)



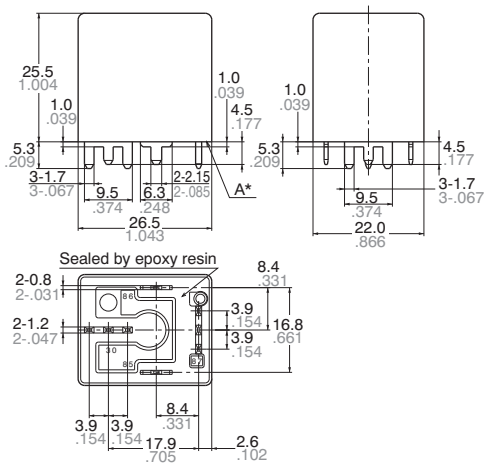
✂ diode type

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

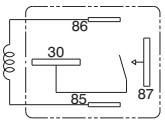
5. High contact capacity (1 Form A) (PC board type)

CAD Data

External dimensions

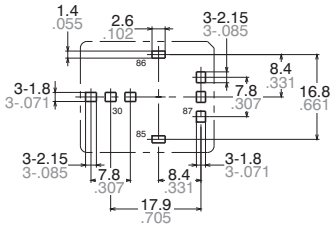


Schematic (Bottom view)



✂ diode type

PC board pattern (Bottom view)



* Intervals between terminals is measured at A surface level.

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

Cautions regarding the protection element

1. Part numbers without protection elements

1) 12 V models

When connecting a coil surge protection circuit to these relays, we recommend a zener diode with a zener voltage of 24 V or higher, or a resistor (680Ω to 1,000Ω). When a diode is connected to the coil in parallel, the release time will slow down and working life may shorten. Before use, please check the circuit and verify that the diode is not connected in parallel to the coil drive circuit.

2) 24 V models

When connecting a coil surge protection circuit to these relays, we recommend a zener diode with a zener voltage of 48 V or higher, or a resistor (2,800Ω to 4,700Ω).

When a diode is connected to the coil in parallel, the release time will slow down and working life may shorten. Before use, please check the circuit and verify that the diode is not connected in parallel to the coil drive circuit.

✂ 2. Part numbers with diodes

These relays use a diode in the coil surge protection element. Therefore, the release time is slower and the working life might be shorter compared to part numbers without protection elements and part numbers with resistors.

Be sure to use only after evaluating under actual load conditions.

3. Part numbers with resistors

This part number employs a resistor in the coil surge protection circuit; therefore, an external surge protection element is not required. In particular, when a diode is connected in parallel with a coil, the release time becomes slower which could adversely affect working life.

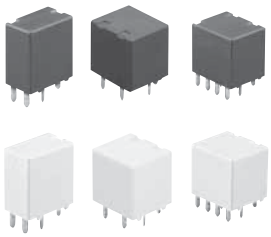
Please check the circuit and make sure that a diode is not connected in parallel with the coil drive circuit.

For Cautions for Use, see Relay Technical Information (page 126).

Panasonic
ideas for life

Super miniature PC board type automotive relay

CJ RELAYS (ACJ)



FEATURES

1. Smallest in its class, it is extremely compact at approx. 2/3 the size of previous products.
Compared to our previous miniature type CT relay, the 1 Form C as well as the 10-pin and 8-pin twin types take up approx. two-thirds the space and volume.
2. High-capacity 25 A load switching
High capacity control capable of motor lock load switching at 25 A, 14 V DC is possible despite contact size.
3. Pin in Paste (PiP)* compatible model added
Models compatible with the recently increasingly popular PiP technique (reflow solder mounting) have been added.
PiP compatible models are the flux tight type.
* The PiP method may sometimes be referred to as THR (Through-Hole Reflow).
4. Environmental protection specifications
Cadmium-free contacts and use of lead-free solder are standard. Environmental pollutants are not used.

TYPICAL APPLICATIONS

- Power windows
- Automatic door locks
- Power mirrors
- Power sunroofs
- Power seats
- Lift gates
- Smart junction box related products, etc.

ORDERING INFORMATION

Ex. A CJ 1 1 12 P

Product name	Contact arrangement	Pick-up voltage (V DC)	Coil voltage (V DC)	Coil voltage (V DC)
CJ	1: 1 Form C 2: 1 Form C × 2 (8 terminals type) 5: 1 Form C × 2 (10 terminals type)	1: Max. 6.5 V DC 2: Max. 7.2 V DC	12: 12	Nil: Standard type P : Pin in Paste type

Standard packing: 1 Form C: Tube: 70 pcs.; Outer carton: 2,800 pcs.
1 Form C × 2, 8 terminals: Tube: 40 pcs.; Outer carton: 1,000 pcs.
1 Form C × 2, 10 terminals: Tube: 35 pcs.; Outer carton: 1,400 pcs.

TYPES

Contact arrangement	Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Part No.	
			Standard type	Pin in Paste type
1 Form C	12 V DC	Max.6.5 V DC (Initial)	ACJ1112	ACJ1112P
		Max.7.2 V DC (Initial)	ACJ1212	ACJ1212P
1 Form C × 2 (8 terminal)		Max.6.5 V DC (Initial)	ACJ2112	ACJ2112P
		Max.7.2 V DC (Initial)	ACJ2212	ACJ2212P
1 Form C × 2 (10 terminal)		Max.6.5V DC (Initial)	ACJ5112	ACJ5112P
		Max.7.2 V DC (Initial)	ACJ5212	ACJ5212P

RATING

1. Coil data

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 (at 20°C 68°F)	Max. continuous voltage*
12 V DC	Max. 7.2 V DC (Initial)	Min. 1.0 V DC (Initial)	53.3 mA	225Ω	640 mW	10 to 16 V DC
	Max. 6.5 V DC (Initial)	Min. 0.8 V DC (Initial)	66.7 mA	180Ω	800 mW	9 to 16 V DC

* Other usable voltage range types are also available. Please contact us for details.

2. Specifications

Characteristics	Item		Specifications
Contact	Arrangement		1 Form C, 1 Form C×2
	Initial contact resistance (Initial)		N.O.: Typ7mΩ, N.C.: Typ10mΩ (By voltage drop 6 V DC 1 A)
	Contact material		Ag alloy (Cadmium free)
Protective construction			Standard type: Sealed type Pin in Paste type: Flux tight type
Rating	Nominal switching capacity		N.O.: 20A 14V DC, N.C.: 10A 14V DC
	Max. carrying current (14V DC)		N.O.: 20 A for 1 hour, 30 A for 2 minutes (at 20°C 68°F)
	Nominal operating power		640 mW (for pick-up voltage max. 7.2 V DC), 800 mW (for pick-up voltage max. 6.5 V DC)
	Min. switching capacity*1		1A 12V DC
Electrical characteristics	Initial insulation resistance		Min. 100 MΩ (at 500 V DC)
	Initial breakdown voltage	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)
	Operate time (at nominal voltage)		Max. 10ms (at 20°C 68° F, excluding contact bounce time) (Initial)
	Release time (at nominal voltage)		Max. 10ms (at 20°C 68° F, excluding contact bounce time) (Initial)
Mechanical characteristics	Shock resistance	Functional	Min. 100 m/s² {10G} (Half-wave pulse of sine wave: 11ms; detection: 10μs)
		Destructive	Min. 1,000 m/s² {100G} (Half-wave pulse of sine wave: 6ms)
	Vibration resistance	Functional	10 Hz to 100 Hz, Min. 44.1m/s² {4.5G} (Detection time: 10μs)
		Destructive	10 Hz to 500 Hz, Min. 44.1m/s² {4.5G} Time of vibration for each direction; X, Y direction: 2 hours, Z direction: 4 hours
Expected life	Mechanical		Min. 10^7 (at 120 cpm)
	Electrical		[Standard type] <Resistive load> Min. 10^5 (At nominal switching capacity, operating frequency: 1s ON, 9s OFF) <Motor load> N.O. side: Min. 2×10^5: at 25 A (inrush), 5 A (steady), 14 V DC; Min. 10^5: at 25 A 14 V DC (Motor lock) N.C. side: Min. 2×10^5: at 20 A 14 V DC (brake) (Operating frequency: 0.5s ON, 9.5s OFF) [Pin in Paste type] <Resistive load> Min. 10^5 (At nominal switching capacity, operating frequency: 1s ON, 9s OFF) <Motor load> N.O. side: Min. 10^5: at 25 A (inrush), 5 A (steady), 14 V DC; Min. 5×10^4: at 25 A 14 V DC (Motor lock) N.C. side: Min. 10^5: at 20 A 14 V DC (brake) (Operating frequency: 0.5s ON, 9.5s OFF)
Conditions	Conditions for operation, transport and storage*2		Ambient temp: –40°C to +85°C –40°F to +185°F Humidity: 5% R.H. to 85% R.H. (Not freezing and condensing at low temperature)
	Max. operating speed		6 cpm (At nominal switching capacity)
Unit weight			1 Form C type: approx. 3.5 g .12 oz Twin type: approx. 6.5 g .23 oz

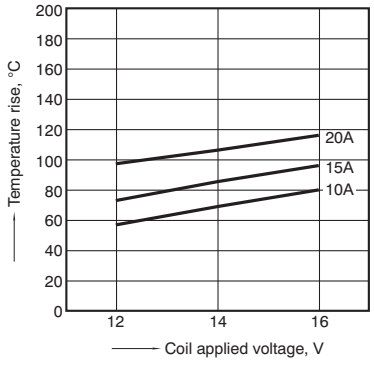
Notes:

*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 Please inquire if you will be using the relay in a high temperature atmosphere (110°C 230°F).
Refer to “Usage ambient condition“ on page 139.

REFERENCE DATA

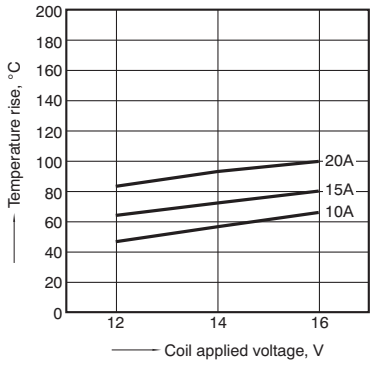
1-(1). Coil temperature rise (at room temperature)

Sample: ACJ1212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 15A, 20A
Ambient temperature: 25°C 77°F



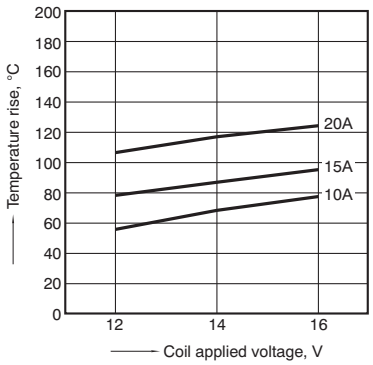
1-(2). Coil temperature rise (at 85°C 185°F)

Sample: ACJ1212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 15A, 20A
Ambient temperature: 85°C 185°F

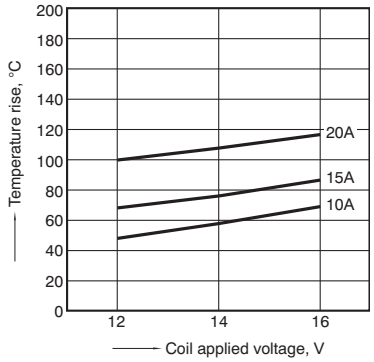


1-(3). Coil temperature rise (at room temperature)

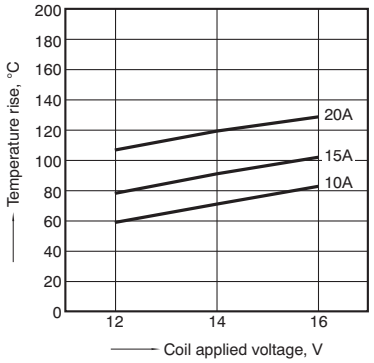
Sample: ACJ2212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 15A, 20A
Ambient temperature: 25°C 77°F



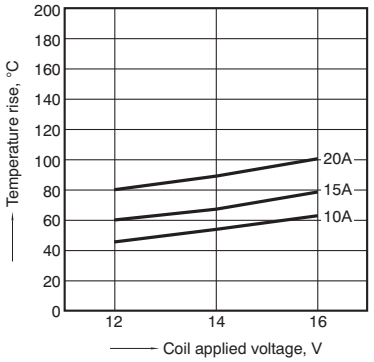
1-(4). Coil temperature rise (at 85°C 185°F)
Sample: ACJ2212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 15A, 20A
Ambient temperature: 85°C 185°F



1-(5). Coil temperature rise (at room temperature)
Sample: ACJ5212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 15A, 20A
Ambient temperature: 25°C 77°F

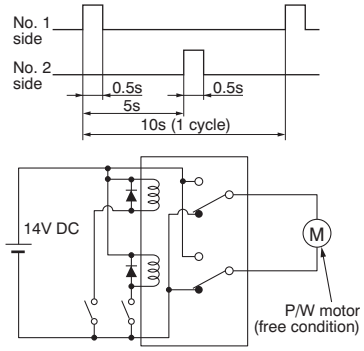


1-(6). Coil temperature rise (at 85°C 185°F)
Sample: ACJ5212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 15A, 20A
Ambient temperature: 85°C 185°F

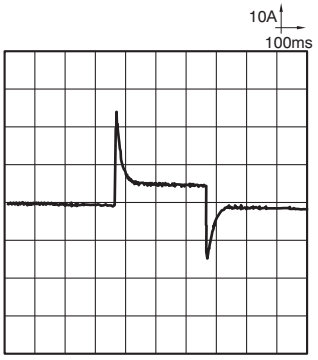


2-(1). Electrical life test (Motor free)
Sample: ACJ2212, 3pcs; Load: Inrush current: 25A/ Steady current: 5A, Power window motor actual load (free condition); Tested voltage: 14V DC; Switching frequency: (ON:OFF = 0.5s:9.5s); Switching cycle: 2×10^5; Ambient temperature: Room temperature

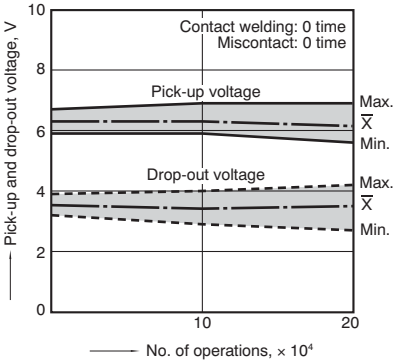
Circuit



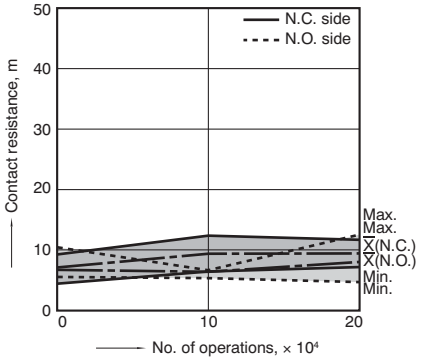
Load current waveform
Inrush current: 25A, Steady current: 6A,
Brake current: 13A



Change of pick-up and drop-out voltage



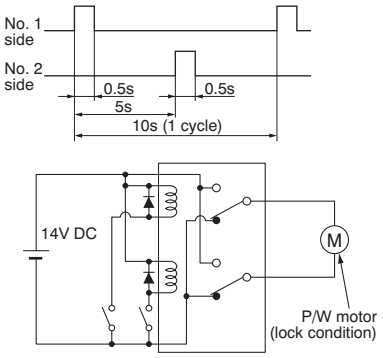
Change of contact resistance



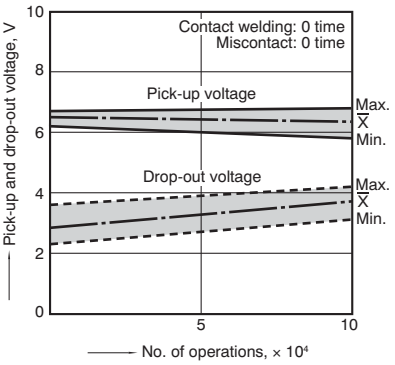
2-(2). Electrical life test (Motor lock)

Sample: ACJ2212, 3pcs; Load: Steady current: 25A, Power window motor actual load (lock condition); Tested voltage: 14V DC; Switching frequency: (ON:OFF = 0.5s:9.5s); Switching cycle: 10^5; Ambient temperature: Room temperature

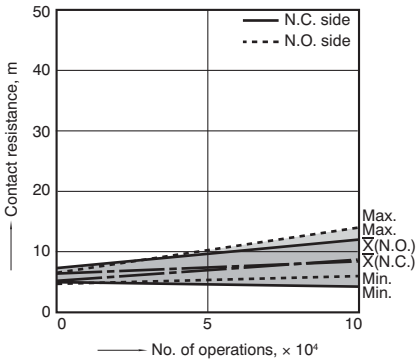
Circuit



Change of pick-up and drop-out voltage

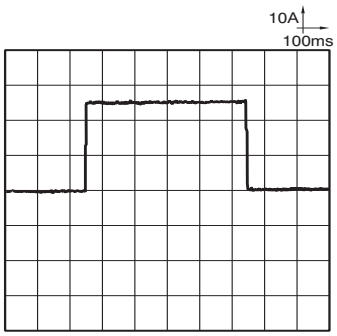


Change of contact resistance



Load current waveform

Current value: 25A



DIMENSIONS (mm inch)

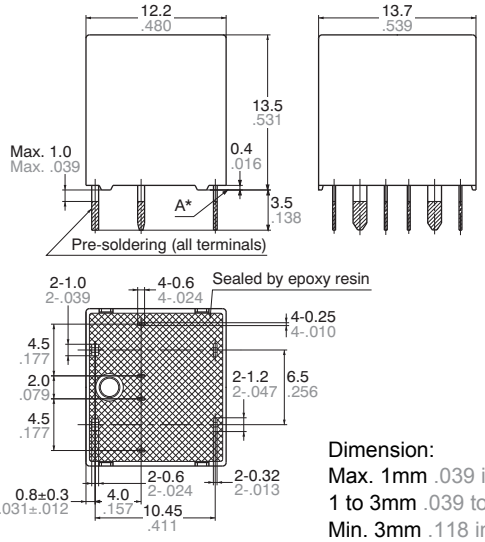
Download CAD Data from our Web site.

1. Twin type (8-pin)

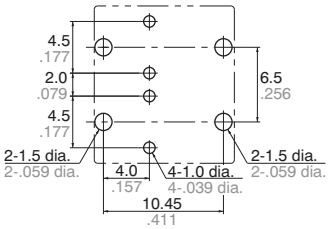
Standard type

CAD Data

External dimensions

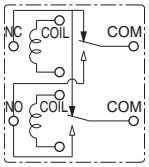


PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

Schematic (Bottom view)



Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

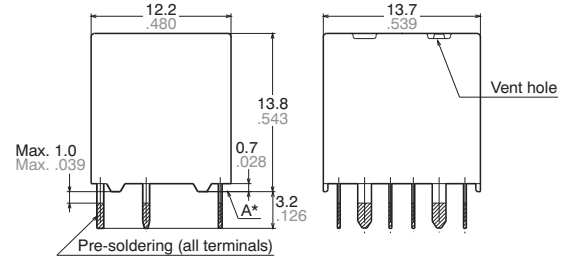
* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering. Intervals between terminals is measured at A surface level.

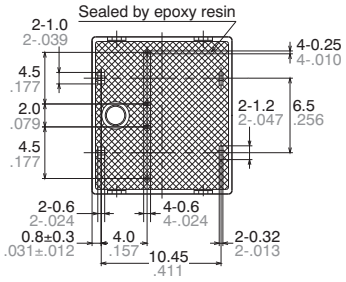
Automotive

2. Twin type (8-pin)
Pin in Paste type

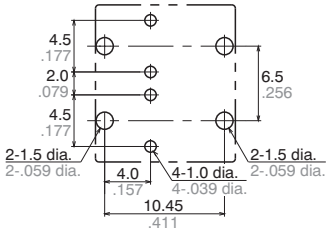
CAD Data

External dimensions



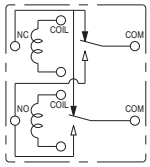


PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

Schematic (Bottom view)



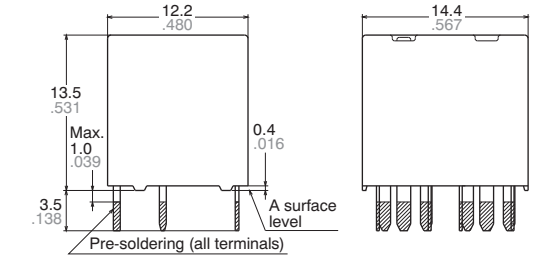
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

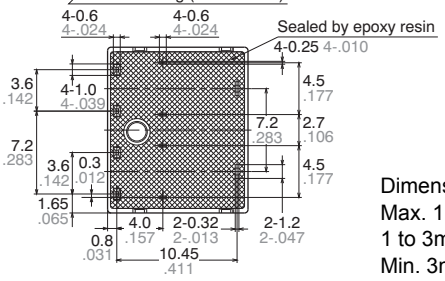
* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

3. Twin type (10-pin)
Standard type

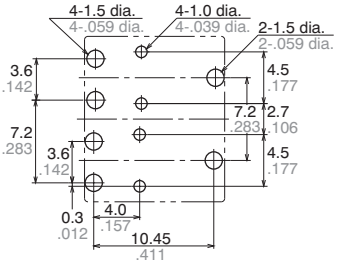
CAD Data

External dimensions



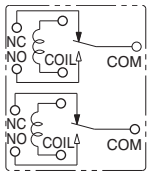


PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

Schematic (Bottom view)

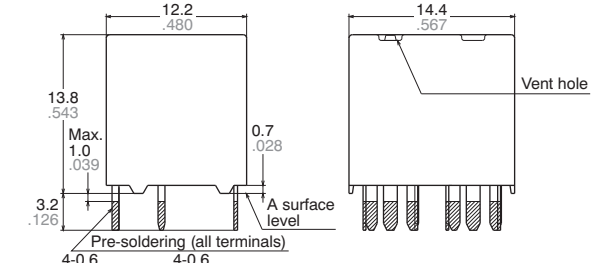


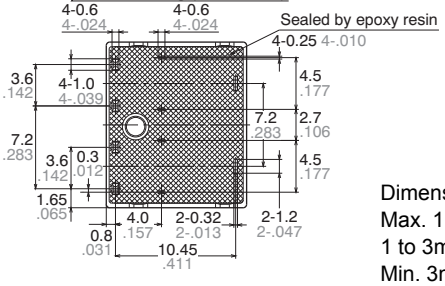
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

4. Twin type (10-pin)
Pin in Paste type

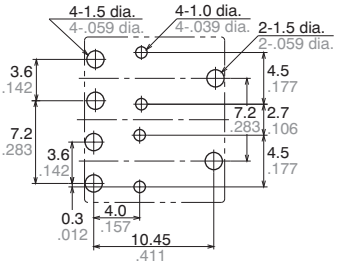
CAD Data

External dimensions



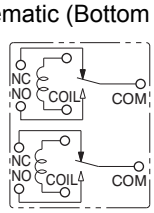


PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

Schematic (Bottom view)

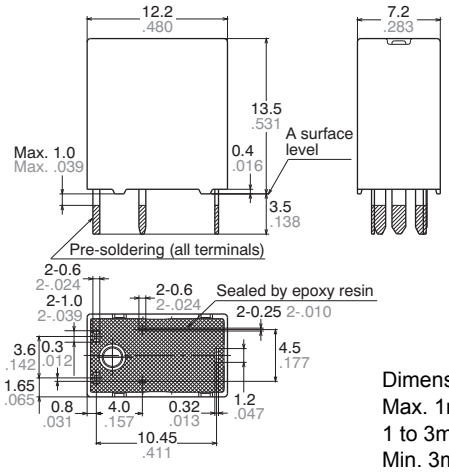


Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

5. Slim 1 Form C
Standard type

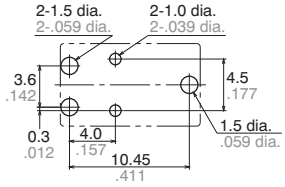
CAD Data

External dimensions



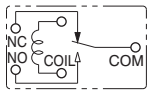
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

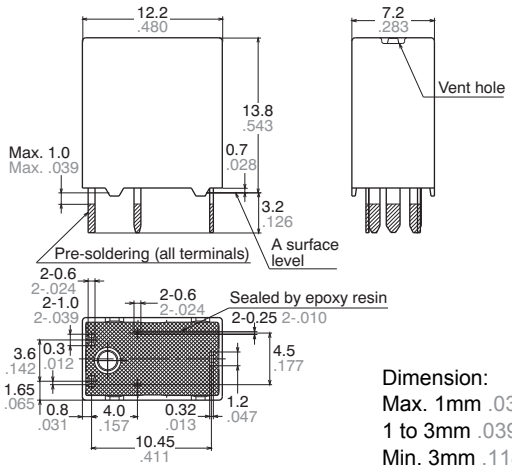
Schematic (Bottom view)



6. Slim 1 Form C
Pin in Paste type

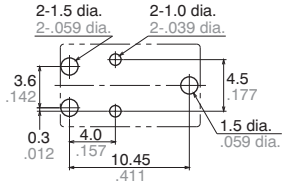
CAD Data

External dimensions



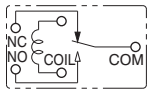
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

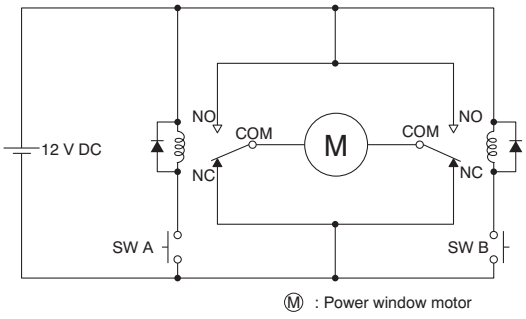
Schematic (Bottom view)



Automotive

EXAMPLE OF CIRCUIT

Forward/reverse control circuits of DC motor (for 1 Form C × 2 (8 terminal) type)

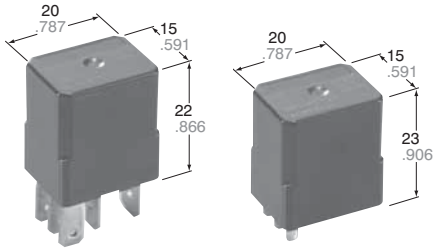


Ⓜ : Power window motor

For Cautions for Use, see Relay Technical Information (page 126).

Panasonic
ideas for life

Automotive micro-ISO relay | CM RELAYS



mm inch

✂ Products to be discontinued.

FEATURES

• Micro-ISO type terminals

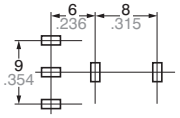
• Small size:
20 mm(L)×15 mm(W)×22 mm(H)
.787 inch(L)×.591 inch(L)×.866 inch(H)

• Wide line-up
PC board type, plug-in type and resistor and ✂ diode inside type.
24V DC type is also available.

• Compact and high-capacity 35A load switching
N.O.: 35A 14V DC, N.C.: 20A 14V DC (Sealed type)
Min. 5×10^4
N.O.: 35A 14V DC, N.C.: 20A 14V DC (Flux-resistant type)
Min. 10^5 *12V DC type

• Uses international standard ISO terminal arrangement.
The ISO international standard terminal arrangement is used.

(plug-in type)



TYPICAL APPLICATIONS

- Fan motor
- Heater
- Head lamp
- Air Compressor
- EPS
- ABS
- Blower fan
- Defogger, etc.

SPECIFICATIONS

Contact

Type		12 V coil voltage	24 V coil voltage
Arrangement		1 Form A, 1 Form C	
Contact material		Ag alloy (Cadmium free)	
Initial contact resistance (Initial) (By voltage drop 6 V DC 1 A)		Typ. 2 mΩ	
Contact voltage drop		Max. N.O.: 0.5 V (at 35 A 14 V DC) Max. N.C.: 0.3 V (at 20 A 14 V DC)	Max. N.O.: 0.3 V (at 15 A 28 V DC) Max. N.C.: 0.2 V (at 8 A 28 V DC)
Rating (resistive load)	Nominal switching capacity	N.O.: 35 A 14 V DC N.C.: 20 A 14 V DC	N.O.: 15 A 28 V DC N.C.: 8 A 28 V DC
	Max. carrying current	N.O.: 20 A (14 V DC, at 85°C 185°F) N.C.: 10 A (14 V DC, at 85°C 185°F)	N.O.: 15 A (28 V DC, at 85°C 185°F) N.C.: 8 A (28 V DC, at 85°C 185°F)
	Min. switching capacity#1	1 A 12 V DC	1 A 24 V DC
Expected life	Mechanical (at 120 cpm)	Min. 10^6	
	Electrical (at rated load)	Flux-resistant type: Min. 10^{5*1} Sealed type: Min. 5×10^4	

Coil

Nominal operating power	1.5 W 1.7 W (with resistor inside type)	1.8 W 2.0 W (with resistor inside type)

#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.

Characteristics

Type		24V coil type / 12V coil type
Max. operating speed (at nominal switching capacity)		15 cpm
Initial insulation resistance*2		Min. 20 MΩ (at 500 V DC)
Initial breakdown voltage*3	Between open contacts	500 Vrms for 1 min.
	Between contacts and coil	500 Vrms for 1 min.
Operate time*4 (at nominal voltage) (at 20°C 85°F)		Max. 10 ms (initial)
Release time*4 (at nominal voltage) (at 20°C 85°F)		Max. 10 ms Max. 15 ms (with diode) (initial)
Shock resistance	Functional*5	Min. 200 m/s² {20G}
	Destructive*6	Min. 1,000m/s² {100G}
Vibration resistance	Functional	10 Hz to 500 Hz, Min. 44.1 m/s² {4.5 G}
	Destructive*7	10 Hz to 2,000 Hz, Min. 44.1 m/s² {4.5 G}
Conditions for operation, transport and storage*8 (Not freezing and condensing at low temperature)	Ambient temp.	–40°C to + 85°C –40°F to + 185°F
	Humidity	5% R.H. to 85% R.H.
Mass		Approx. 20g .71oz

Remarks
*1 At nominal switching capacity, operating frequency: 2s ON, 2s OFF
*2 Measurement at same location as "Initial breakdown voltage" section.
*3 Detection current: 10mA
*4 Excluding contact bounce time.
*5 Half-wave pulse of sine wave: 11 ms; detection time: 10 μs
*6 Half-wave pulse of sine wave: 6 ms
*7 Time of vibration for each direction; X, Y, Z direction: 4 hours

*8 Refer to "Usage ambient condition" on page 139.
Please inquire if you will be using the relay in a high temperature atmosphere.

ORDERING INFORMATION

CM | 1 | F | R | P | 12V

Contact arrangement	Protective construction	Classification of types	Mounting classification	Coil voltage (DC)
1a: 1 Form A 1: 1 Form C	Nil: Sealed type F: Flux-resistant type	Nil: Standard type D: with diode inside R: with resistor inside	Nil: Plug-in type P: PC board type (24V type only)	12 V 24 V

Note: Bulk package: 50 pcs.; Case: 200 pcs.

✂ D: with diode inside

TYPES

Packing quantity: Inner 50pcs, Outer 200pcs.

Contact arrangement	Part No.	Coil voltage	Mounting classification	Protective construction
1 Form A	CM1a-12V	12 V DC	Plug-in type	Sealed type
	CM1aF-12V			Flux-resistant type
1 Form C	CM1-12V		Plug-in type	Sealed type
	CM1F-12V			Flux-resistant type

Contact arrangement	Part No.	Coil voltage	Mounting classification	Protective construction
1 Form A	CM1a-24V	24 V DC	Plug-in type	Sealed type
	CM1aF-24V			Flux-resistant type
	CM1a-P-24V		PC board type	Sealed type
	CM1aF-P-24V			Flux-resistant type
1 Form C	CM1-24V		Plug-in type	Sealed type
	CM1F-24V			Flux-resistant type
	CM1-P-24V		PC board type	Sealed type
	CM1F-P-24V			Flux-resistant type

COIL DATA (at 20°C 68°F)

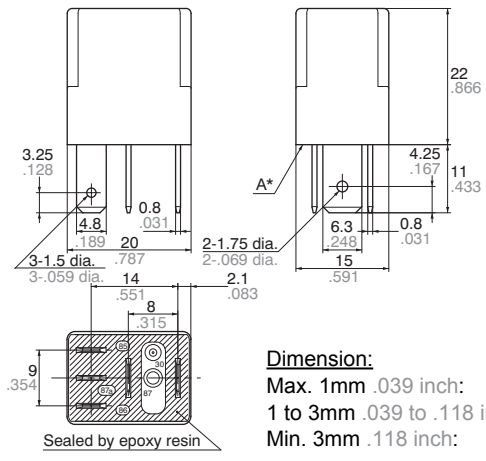
Nominal voltage, V DC	Pick-up voltage, V DC	Drop-out voltage, V DC	Nominal current, mA	Coil resistance, ohm	Nominal operating power, W	Usable voltage range, V DC
12	3 to 7	1.2 to 4.2	125±10%	96±10%	1.5	10 to 16
24	6 to 14	2.4 to 8.4	75±10%	320±10%	1.8	20 to 32

DIMENSIONS (mm inch)

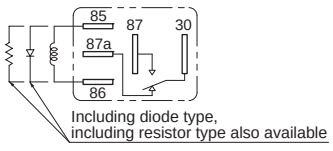
Download CAD Data from our Web site.

1. Micro-ISO Plug-in type (1 Form C)

CAD Data



Schematic (Bottom view)



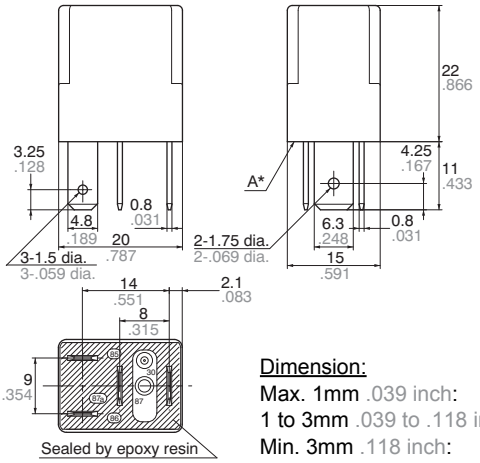
✂ diode type

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

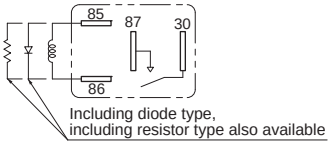
* Intervals between terminals is measured at A surface level.

2. Micro-ISO Plug-in type (1 Form A)

CAD Data



Schematic (Bottom view)



✂ diode type

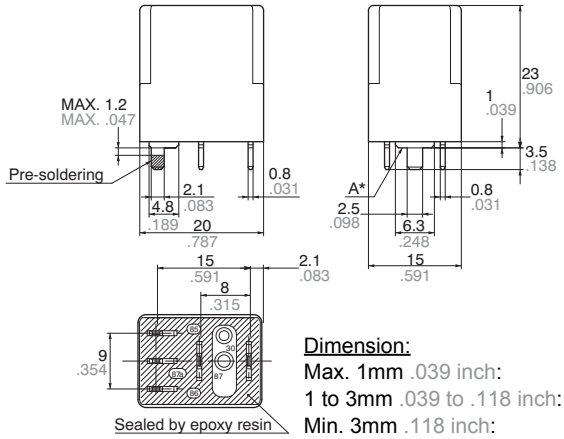
mm inch

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

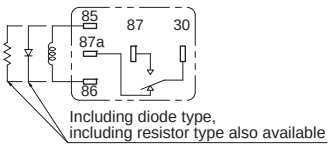
* Intervals between terminals is measured at A surface level.

3. Micro-ISO PC board type (1 Form C)

CAD Data

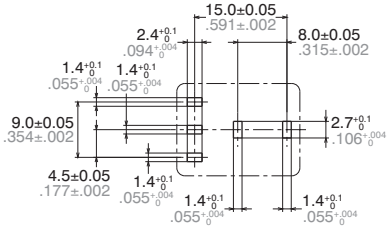


Schematic (Bottom view)



✂ diode type

PC board pattern (Bottom view)

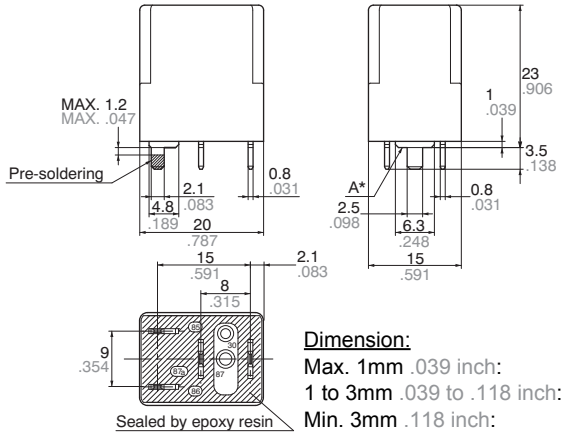


Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

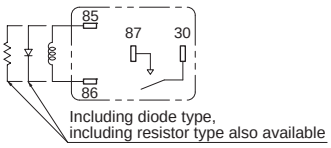
* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

4. Micro-ISO PC board type (1 Form A)

CAD Data



Schematic (Bottom view)



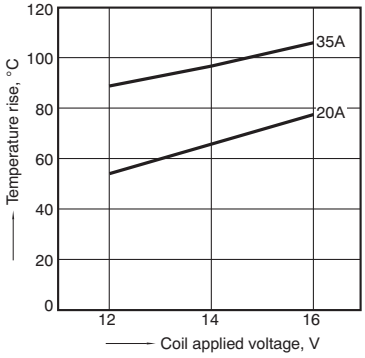
✂ diode type

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

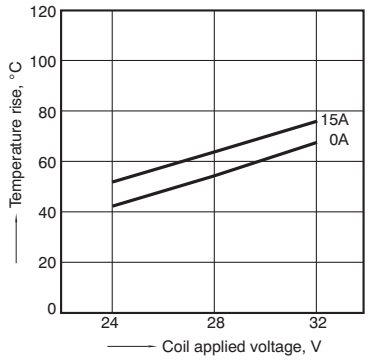
* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

REFERENCE DATA

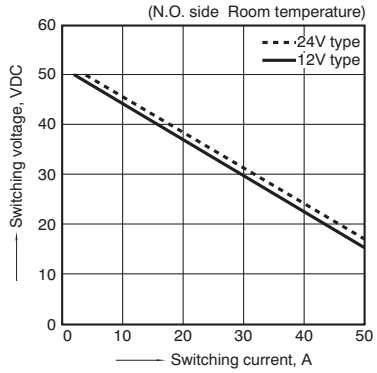
1-(1). Coil temperature rise (12V type)
Sample: CM1F-12V, 3 pcs.
Measured portion: Inside the coil
Contact carrying current: 20A, 35A
Ambient temperature: 85°C 185°F



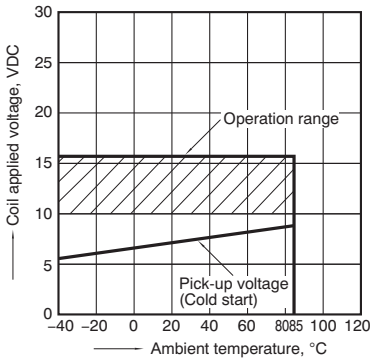
1-(2). Coil temperature rise (24V type)
Sample: CM1F-24V, 4 pcs.
Measured portion: Inside the coil
Contact carrying current: 0A, 15A
Ambient temperature: 85°C 185°F



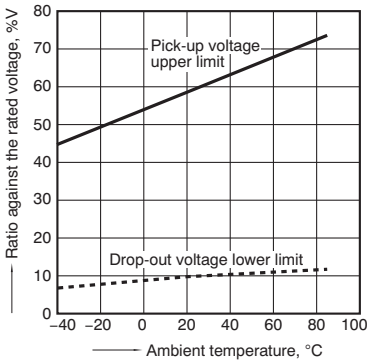
2. Max. switching capability (Resistive load, initial)



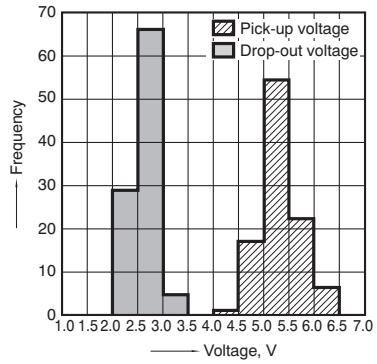
3. Ambient temperature and operating temperature range (12V type)



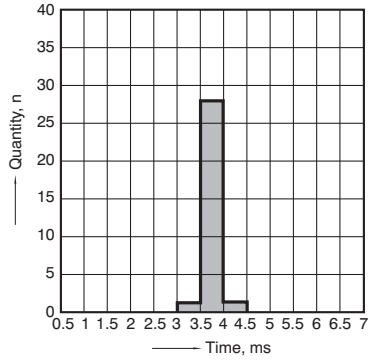
4. Ambient temperature characteristics (Cold/initial)



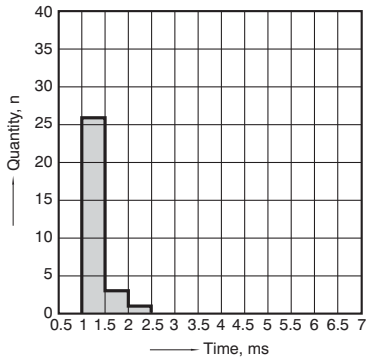
5. Distribution of pick-up and drop-out voltage
Sample: CM1F-12V, 100pcs.



6. Distribution of operate time
Sample: CM1F-12V, 30pcs.
* Max. 10ms standard (excluding contact bounce)

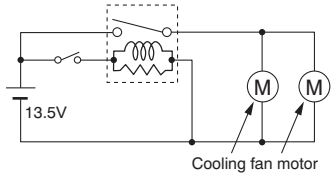


7. Distribution of release time
Sample: CM1F-12V, 30pcs.
* Max. 10ms standard (excluding contact bounce)
Without diode

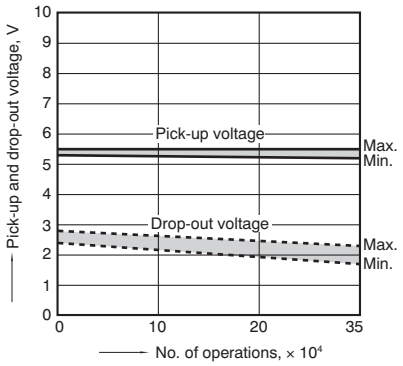


8-(1). Electrical life test (Motor free)
Sample: CM1aF-R-12V, 6pcs.
Load: 16 A 13.5 V DC
Cooling fan motor actual load (free condition)
Switching frequency: (ON:OFF = 2s:6s)
Ambient temperature: Room temperature

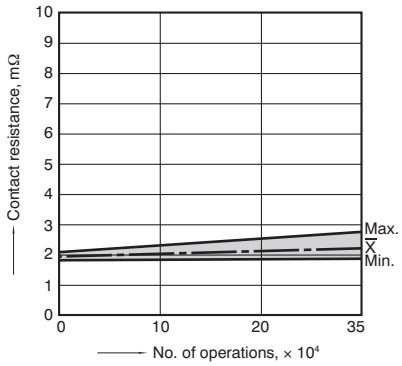
Circuit



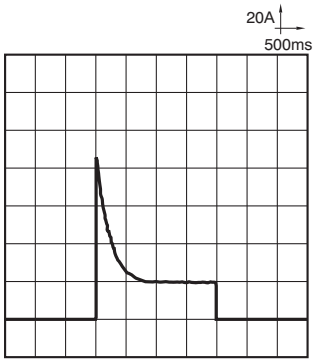
Change of pick-up and drop-out voltage



Change of contact resistance

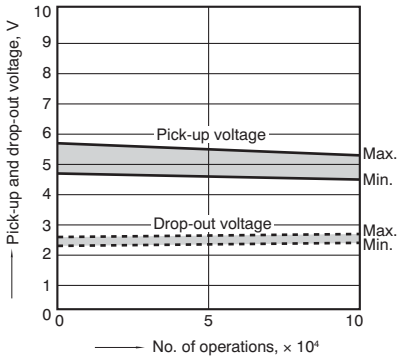


Load current waveform
Inrush current: 85A, Steady current: 18A,

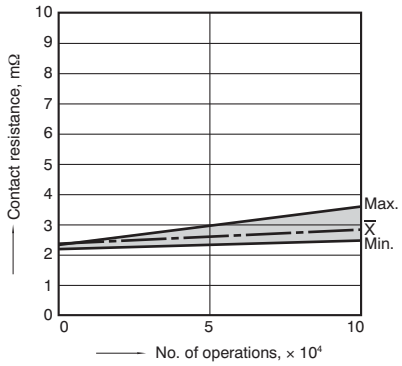


8-(2). Electrical life test (Halogen lamp load)
Sample: CM1aF-R-12V, 6pcs.
Load: 20A 13.5V DC
Switching frequency: (ON:OFF = 1s:14s)
Ambient temperature: Room temperature

Change of pick-up and drop-out voltage



Change of contact resistance



Cautions regarding the protection element

1. Part numbers without protection elements

1) 12 V models
When connecting a coil surge protection circuit to these relays, we recommend a Zener diode with a Zener voltage of 24 V or higher, or a resistor (680Ω to 1,000Ω). When a diode is connected to the coil in parallel, the release time will slow down and working life may shorten. Before use, please check the circuit and verify that the diode is not connected in parallel to the coil drive circuit.

2) 24 V models
When connecting a coil surge protection circuit to these relays, we recommend a Zener diode with a Zener voltage of 48 V or higher, or a resistor (2,800Ω to 4,700Ω).
When a diode is connected to the coil in parallel, the release time will slow down and working life may shorten. Before use, please check the circuit and verify that the diode is not connected in parallel to the coil drive circuit.

✂ **2. Part numbers with diodes**

These relays use a diode in the coil surge protection element. Therefore, the release time is slower and the working life might be shorter compared to part numbers without protection elements and part numbers with resistors.
Be sure to use only after evaluating under actual load conditions.

3. Part numbers with resistors

This part number employs a resistor in the coil surge protection circuit; therefore, an external surge protection element is not required. In particular, when a diode is connected in parallel with a coil, the revert time becomes slower which could adversely affect working life. Please check the circuit and make sure that a diode is not connected in parallel with the coil drive circuit.

For Cautions for Use, see Relay Technical Information (page 126).

Panasonic
ideas for life

High load relay for smart J/B CN-H RELAYS (ACNH)

FEATURES

1. Best space savings in its class.
2. Large capacity switching despite small size. Can replace micro ISO terminal type relays.
3. Terminals for PC board pattern designs are easily allocated.
4. Sealed type

TYPICAL APPLICATIONS

Head lamp, Fog lamp, Fan motor, EPS, Defogger, Seat heater, etc.

ORDERING INFORMATION

ACNH □ □ □

CN-H relay

Contact arrangement
3: 1 Form A

Pick-up voltage
1: Max. 5.5V DC
2: Max. 6.5V DC

Coil voltage (DC)
12: 12V

TYPES

Contact arrangement	Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Part No.
1 Form A	12V DC	Max. 6.5 V DC (Initial)	ACNH3212
		Max. 5.5 V DC (Initial)	ACNH3112

Standard packing; Carton (tube): 50 pcs.; Case: 1,000 pcs.

RATING

1. Coil data

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 (at 20°C 68°F)	Usable voltage range
12 V DC	Max. 6.5 V DC (Initial)	Min. 1.0 V DC (Initial)	37.5 mA	320Ω	450 mW	10 to 16 V DC
	Max. 5.5 V DC (Initial)	Min. 0.8 V DC (Initial)	53.3 mA	225Ω	640 mW	

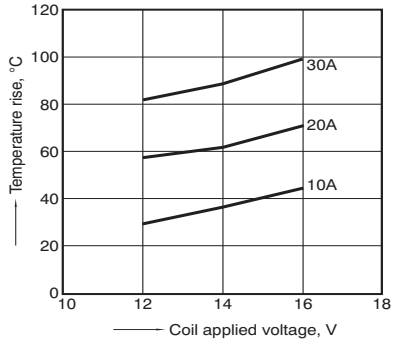
2. Specifications

Characteristics	Item		Specifications
Contact	Arrangement		1 Form A
	Initial contact resistance (Initial)		Typ5mΩ (By voltage drop 6 V DC 1 A)
	Contact material		Ag alloy (Cadmium free)
Rating	Nominal switching capacity (resistive load)		30A 14V DC
	Max. carrying current		<450mW> 35A/1 h, 45A/2 min. at 20°C 68°F 30A/1 h, 40A/2 min. at 85°C 185°F 25A/1 h, 35A/2 min. at 110°C 230°F <640mW> 30A/1 h, 40A/2 min. at 20°C 68°F 25A/1 h, 35A/2 min. at 85°C 185°F 20A/1 h, 30A/2 min. at 110°C 230°F
	Continuous carrying current		20A 14V DC (450mW) at 110°C 230°F, 15A 14V DC (640mW) at 110°C 230°F
	Nominal operating power		450 mW (for pick-up voltage max. 6.5 V DC), 640 mW (for pick-up voltage max. 5.5 V DC)
	Min. switching capacity (resistive load)		1A 12V DC
Electrical characteristics	Insulation resistance (Initial)		Min. 100 MΩ (at 500 V DC)
	Breakdown voltage (Initial)	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)
	Operate time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial)
	Release time (at nominal voltage)		Max. 10ms (at 20°C 68°F) (Initial) (without diode)
Mechanical characteristics	Shock resistance	Functional	Min. 100 m/s² {10G} (Half-wave pulse of sine wave: 11ms; detection: 10μs)
		Destructive	Min. 1,000 m/s² {100G} (Half-wave pulse of sine wave: 6ms)
	Vibration resistance	Functional	10 Hz to 100 Hz, Min. 44.1m/s² {4.5G} (Detection time: 10μs)
		Destructive	10 Hz to 500 Hz, Min. 44.1m/s² {4.5G} Time of vibration for each direction; X, Y direction: 2 hours, Z direction: 4 hours
Expected life	Mechanical		Min. 10^7 (at 120 cpm)
	Electrical		<Resistive load> Min. 10^5 (At nominal switching capacity, operating frequency: 1s ON, 1s OFF) <Motor load> Min. 3×10^5: at 84 A (inrush), 18 A (steady), 14 V DC (Operating frequency: 2s ON, 5s OFF) <Lamp load> Min. 2×10^5: at 84 A (inrush), 12 A (steady), 14 V DC (Operating frequency: 1s ON, 14s OFF)
Conditions	Conditions for operation, transport and storage		Ambient temp: –40°C to +110°C –40°F to +230°F Humidity: 2% R.H. to 85% R.H. (Not freezing and condensing at low temperature)
Unit weight			Approx. 9 g .32 oz

REFERENCE DATA

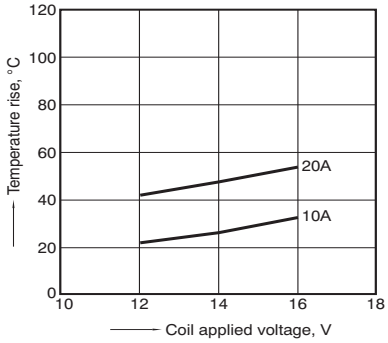
1-(1). Coil temperature rise

Sample: ACNH3212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 20A, 30A
Ambient temperature: 25°C 77°F

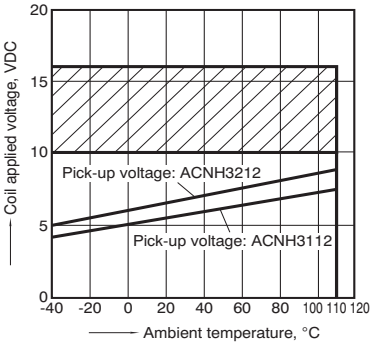


1-(2). Coil temperature rise

Sample: ACNH3212, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 20A
Ambient temperature: 110°C 230°F

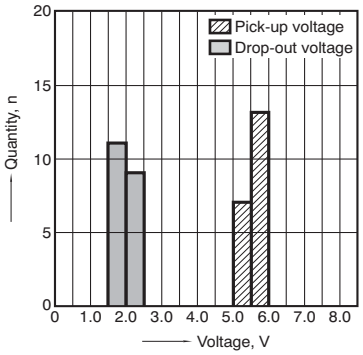


2. Ambient temperature and operating voltage range



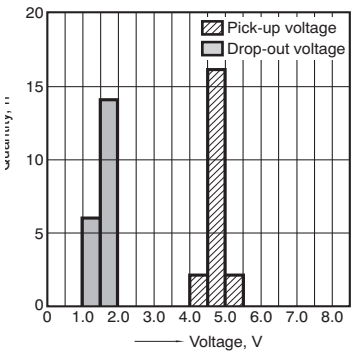
3-(1). Distribution of pick-up and drop-out voltage

Sample: ACNH3212, 20pcs.

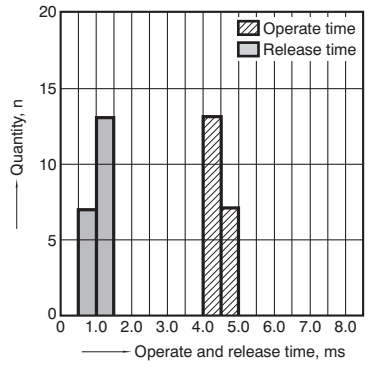


3-(2). Distribution of pick-up and drop-out voltage

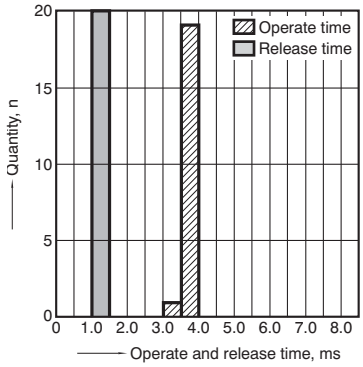
Sample: ACNH3112, 20pcs.



4-(1). Distribution of operate and release time
Sample: ACNH3212, 20pcs.

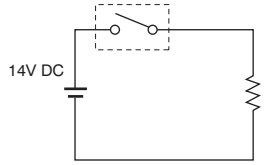


4-(2). Distribution of operate and release time
Sample: ACNH3112, 20pcs.

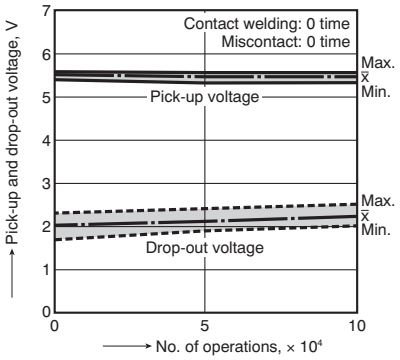


5. Electrical life test (Resistive load)
Sample: ACNH3212, 6pcs.
Load: Resistive load (NO side: 30A 14V DC)
Operating frequency: (ON:OFF = 1s:1s)
Ambient temperature: Room temperature

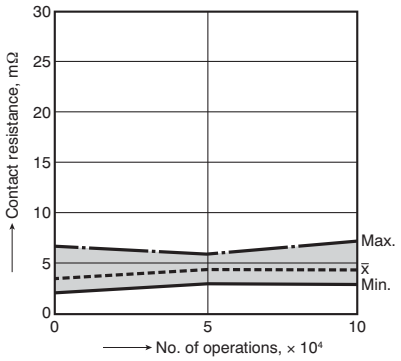
Circuit:



Change of pick-up and drop-out voltage

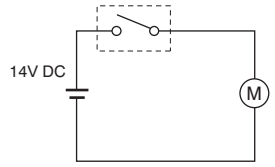


Change of contact resistance

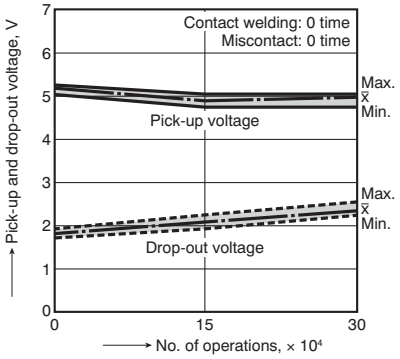


6-(1). Electrical life test (Motor load)
Sample: ACNH3212, 3pcs.
Load: inrush: 84A/steady: 18A,
radiator fan actual load (motor free)
Switching frequency: (ON:OFF = 2s:5s)
Ambient temperature: 110°C 230°F

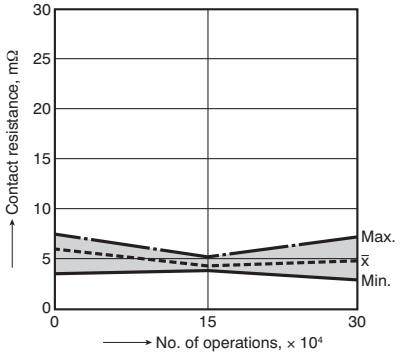
Circuit:



Change of pick-up and drop-out voltage

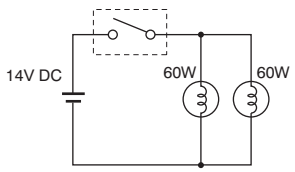


Change of contact resistance



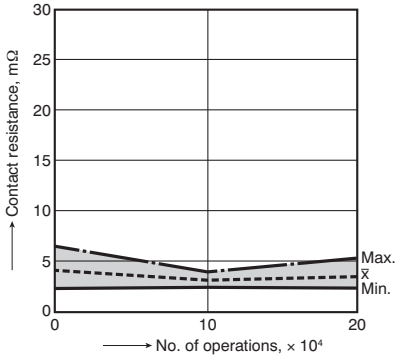
6-(2). Electrical life test (Lamp load)
Sample: ACNH3212, 6pcs.
Load: 60W×2, inrush: 84A/steady: 12A
Switching frequency: (ON:OFF = 1s:14s)
Ambient temperature: Room temperature

Circuit:



Change of pick-up and drop-out voltage

Change of contact resistance

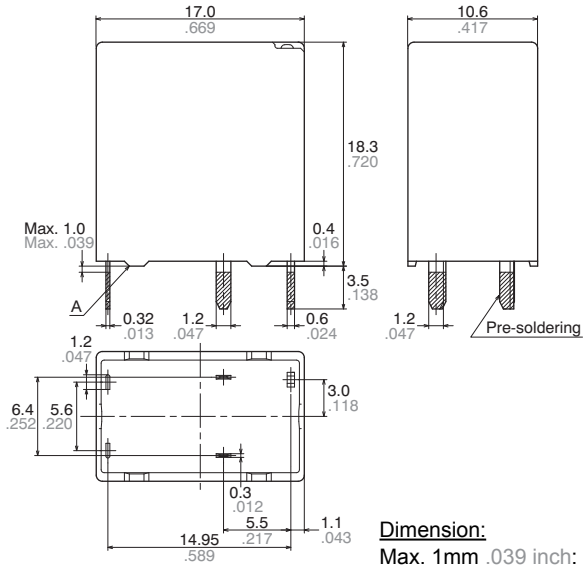


DIMENSIONS (mm inch)

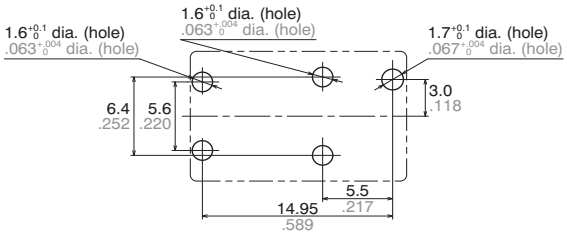
Download CAD Data from our Web site.

CAD Data

External dimensions

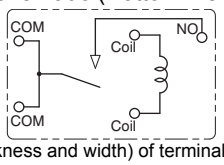


PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

Schematic (Bottom view)



* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

NOTES

1. Coil operating power

Pure DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%. However, check it with the actual circuit since the characteristics may be slightly different.

2. Coil applied voltage

To ensure proper operation, the voltage applied to the coil should be the rated operating voltage of the coil. Also, be aware that the pick-up and drop-out voltages will fluctuate depending on the ambient temperature and operating conditions.

3. Cycle lifetime

Check this with the real device as it is affected by coil driving circuit, load type, activation frequency, activation phase, ambient conditions and other factors.

4. Soldering

When soldering the relays, ensure conformance with the conditions listed below.

1) Automatic soldering

• Preheating: less than 100°C 212°F (solder target surface of PC board) for less than 120 sec

• Soldering: less than 260°C 500°F (solder temperature) for less than 5 sec (soldering time)

2) Manual soldering

• Soldering tip temperature: less than 280 to 300°C 536 to 572°F

• Soldering iron: 30 W to 60 W

• Soldering time: less than 5 sec

5. Usage, transport and storage conditions

1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:

(1) Temperature:

–40 to +110°C –40 to +230°F

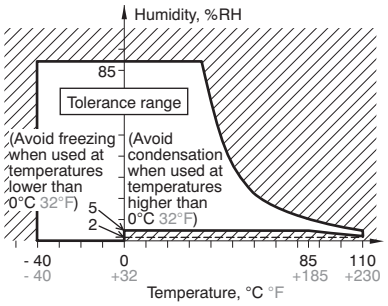
(2) Humidity: 2 to 85% RH

(Avoid freezing and condensation.)

(3) Atmospheric pressure: 86 to 106 kPa

The humidity range varies with the temperature. Use within the range indicated in the graph below.

(Temperature and humidity range for usage, transport, and storage)



2) Condensation

Condensation forms when there is a sudden change in temperature under high temperature and high humidity conditions. Condensation will cause deterioration of the relay insulation.

3) Freezing

Condensation or other moisture may freeze on the relay when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.

4) Low temperature, low humidity environments

The plastic becomes brittle if the relay is exposed to a low temperature, low humidity environment for long periods of time.

6. Others

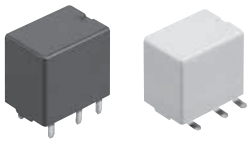
If the relay has been dropped, the appearance and characteristics should always be checked before use.

For Cautions for Use, see Relay Technical Information (page 126).

Panasonic
ideas for life

Middle load relay for smart J/B

CN-M RELAYS (ACNM)



FEATURES

1. Best space savings in its class.
2. Compact and high-capacity 30A load switching.
3. Full line up (High heat-resistant type and SMD type)
4. Terminals for PC board pattern designs are easily allocated.

TYPICAL APPLICATIONS

Defogger, Seat heater, Head lamp, Fog lamp, Fan motor, etc.

ORDERING INFORMATION

ACNM □ □ □ □ □

CN-M relay

Contact arrangement*1
1: 1 Form C
3: 1 Form A
5: 1 Form C high heat-resistant type
7: 1 Form A high heat-resistant type

Pick-up voltage
1: Max. 7.2V DC

Coil voltage (DC)
12: 12V

Terminal shape
Nil: PC board terminal
SA: Surface-mount terminal

Packing style*2
Nil: Tube packing
X: Tape and reel packing
(Reverse NO terminal direction in pull-out direction)
Z: Tape and reel packing
(Normal NO terminal direction in pull-out direction)

Notes: *1. Surface-mount terminal type is available in high heat-resistant type only.
*2. Tube packing: PC board terminal type only
Tape and reel packing: Surface-mount type only

TYPES

1. PC board terminal type

Contact arrangement	Nominal coil voltage	Part No.	
		Standard type	High heat-resistant type
1 Form A	12V DC	ACNM3112	ACNM7112
1 Form C		ACNM1112	ACNM5112

Standard packing; Carton (tube): 50 pcs.; Case: 1,500 pcs.

2. Surface-mount terminal type

Contact arrangement	Nominal coil voltage	Part No.
		High heat-resistant type
1 Form A	12V DC	ACNM7112SAX
		ACNM7112SAZ
1 Form C		ACNM5112SAX
		ACNM5112SAZ

Standard packing; Carton (tape and reel): 200 pcs.; Case: 600 pcs.
Notes: *1.Surface-mount terminal type is available in high heat-resistant type only.
*2.An "X" at the end of the part number indicates, for tape and reel packing, reverse NO terminal direction in pull-out direction.
A "Z" at the end of the part number indicates, for tape and reel packing, normal NO terminal direction in pull-out direction.

Automotive

RATING

1. Coil data

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 (at 20°C 68°F)	Usable voltage range
12 V DC	Max. 7.2 V DC (Initial)	Min. 1.0 V DC (Initial)	53.3 mA	225Ω	640 mW	10 to 16 V DC

2. Specifications

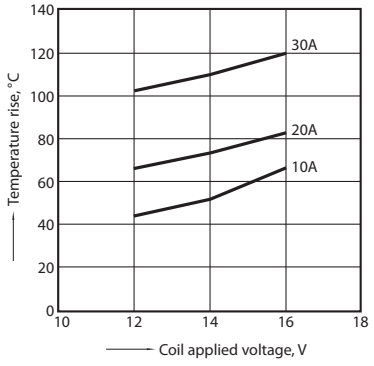
Characteristics	Item		Specifications
Contact	Arrangement		1 Form A, 1 Form C
	Contact resistance (Initial)		Typical 5mΩ (By voltage drop 6 V DC 1 A)
	Contact material		Ag alloy (Cadmium free)
Rating	Nominal switching capacity (resistive load)		N.O.: 30A 14V DC, N.C.: 15A 14V DC
	Max. carrying current (at 14V DC)		N.O. 30A/1 h, 40A/2 min. at 20°C 68°F 25A/1 h, 35A/2 min. at 85°C 185°F 20A/1 h, 30A/2 min. at 110°C 230°F (High heat-resistant type) N.C. 25A/1 h, 30A/2 min. at 20°C 68°F 20A/1 h, 25A/2 min. at 85°C 185°F 15A/1 h, 20A/2 min. at 110°C 230°F (High heat-resistant type)
	Nominal operating power		640 mW
	Min. switching capacity (resistive load)*		1A 12V DC
Electrical characteristics	Insulation resistance (Initial)		Min. 100 MΩ (at 500 V DC)
	Breakdown voltage (Initial)	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)
	Operate time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial)
	Release time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial) (without diode)
Mechanical characteristics	Shock resistance	Functional	Min. 100 m/s² {10G} (Half-wave pulse of sine wave: 11ms; detection time: 10μs)
		Destructive	Min. 1,000 m/s² {100G} (Half-wave pulse of sine wave: 6ms)
	Vibration resistance	Functional	10 Hz to 100 Hz, Min. 44.1m/s² {4.5G} (Detection time: 10μs)
		Destructive	10 Hz to 500 Hz, Min. 44.1m/s² {4.5G} Time of vibration for each direction; X, Y direction: 2 hours, Z direction: 4 hours
Expected life	Mechanical		Min. 10^7 (at 120 cpm)
	Electrical		<Resistive load> Min. 10^5 (At nominal switching capacity, operating frequency: 1s ON, 2s OFF)
			<Motor load> Min. 2×10^5: at 80 A (inrush), 16 A (steady), 14 V DC (Operating frequency: 2s ON, 6s OFF)
			<Lamp load> Min. 10^5: at 84 A (inrush), 12 A (steady), 14 V DC (Operating frequency: 1s ON, 14s OFF)
Conditions	Conditions for operation, transport and storage		Standard type; Ambient temp: –40°C to +85°C –40°F to +185°F, Humidity: 5 to 85% R.H. High heat-resistant type; Ambient temp: –40°C to +110°C –40°F to +230°F, Humidity: 2 to 85% R.H. (Not freezing and condensing at low temperature)
Unit weight			Approx. 5.5 g .19 oz

Note: *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.

REFERENCE DATA

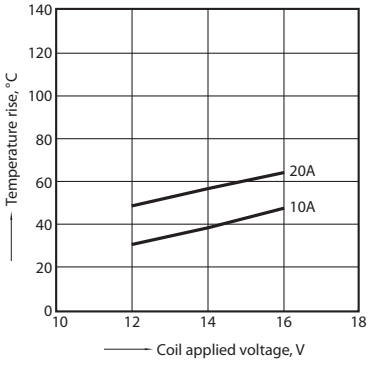
1-(1). Coil temperature rise

Sample: ACNM1112, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 20A, 30A
Ambient temperature: 26°C 78.8°F

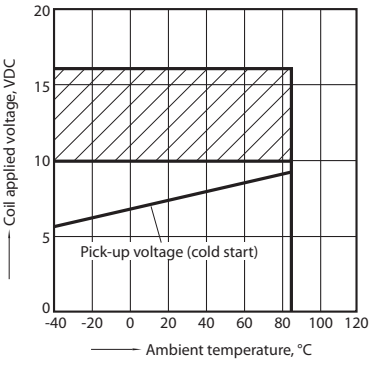


1-(2). Coil temperature rise

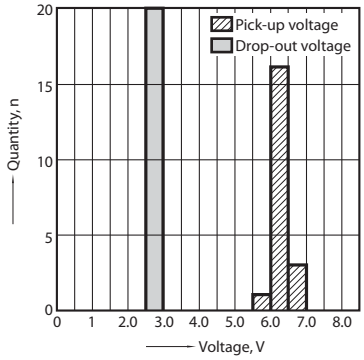
Sample: ACNM7112, 3pcs
Measured portion: Inside the coil
Contact carrying current: 10A, 20A
Ambient temperature: 110°C 230°F



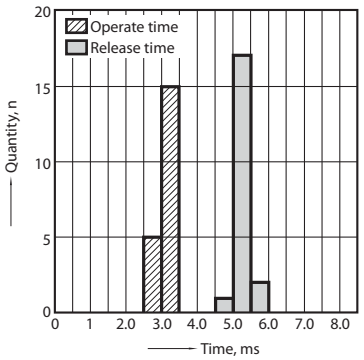
2. Ambient temperature and operating voltage range



3. Distribution of pick-up and drop-out voltage
Sample: ACNM1112, 20pcs.

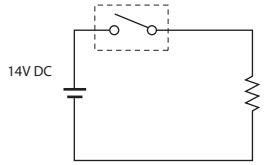


4. Distribution of operate and release time
Sample: ACNM1112, 20pcs.

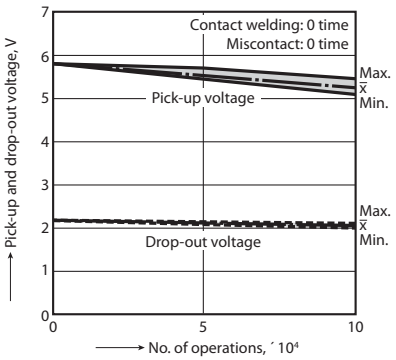


5-(1). Electrical life test (Resistive load)
Sample: ACNM1112, 3pcs.
Load: Resistive load (NO side: 30A 14V DC)
Operating frequency: (ON:OFF = 1s:1s)
Ambient temperature: Room temperature

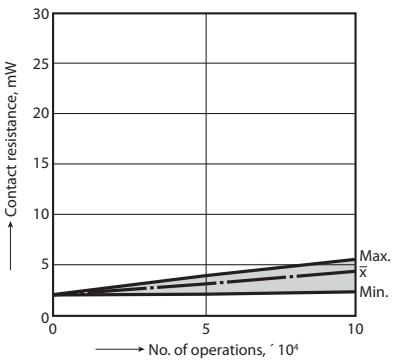
Circuit:



Change of pick-up and drop-out voltage

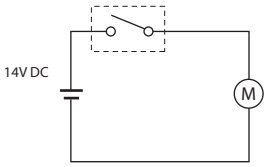


Change of contact resistance

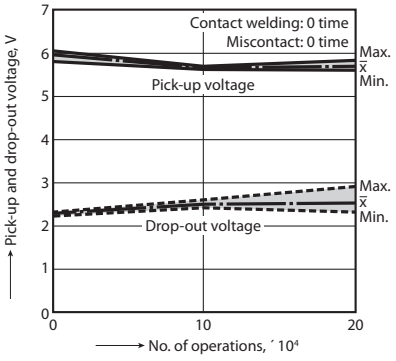


5-(2). Electrical life test (Motor load)
Sample: ACNM7112, 3pcs.
Load: inrush: 80A/steady: 16A,
radiator fan actual load (motor free)
Switching frequency: (ON:OFF = 2s:6s)
Ambient temperature: 110°C 230°F

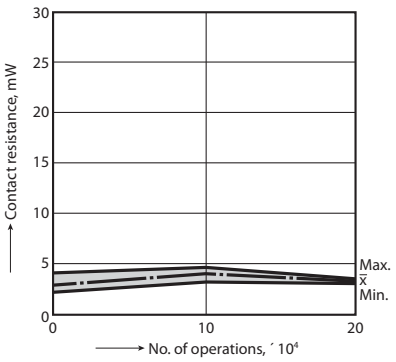
Circuit:



Change of pick-up and drop-out voltage

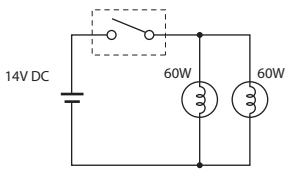


Change of contact resistance

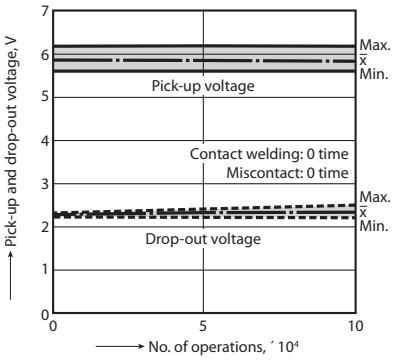


5-(3). Electrical life test (Lamp load)
Sample: ACNM3112, 3pcs.
Load: inrush: 84A/steady: 12A
Switching frequency: (ON:OFF = 1s:14s)
Ambient temperature: Room temperature

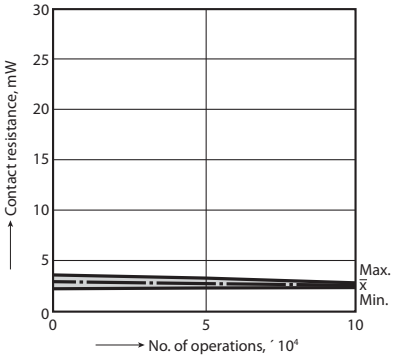
Circuit:



Change of pick-up and drop-out voltage



Change of contact resistance



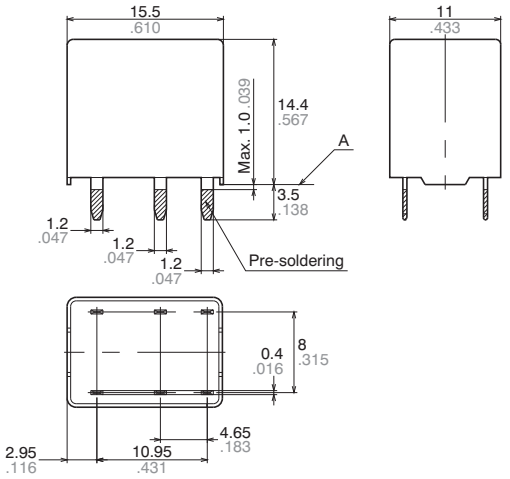
DIMENSIONS (mm inch)

Download CAD Data from our Web site.

1. PC board terminal type

CAD Data

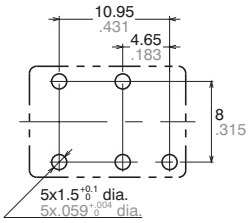
External dimensions



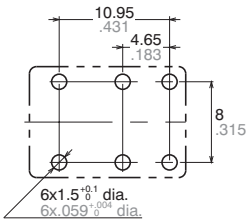
Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

PC board pattern (Bottom view)

1 Form A

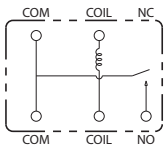


1 Form C

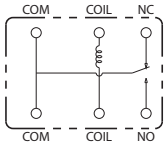


Schematic (Bottom view)

1 Form A



1 Form C



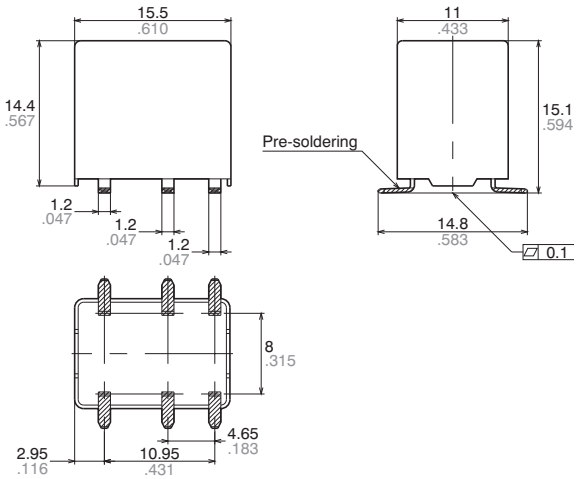
* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

Tolerance: ±0.1 ±.004

2. Surface-mount terminal type

CAD Data

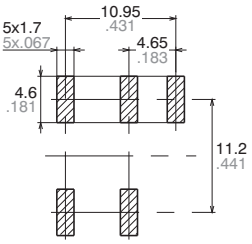
External dimensions



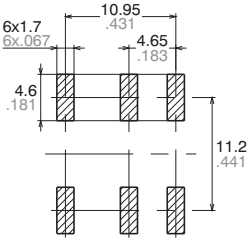
Dimension:	General tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

Recommended mounting pad (Top view)

1 Form A

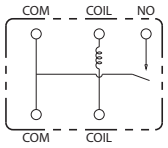


1 Form C

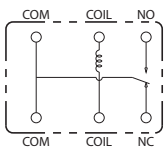


Schematic (Top view)

1 Form A



1 Form C



Tolerance: ±0.1 ±.004

NOTES

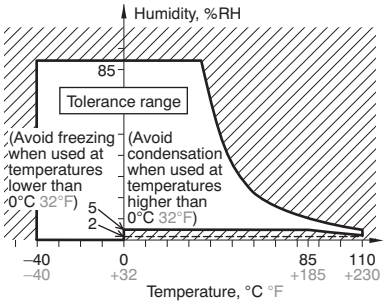
1. Coil operating power
Pure DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%. However, check it with the actual circuit since the characteristics may be slightly different.

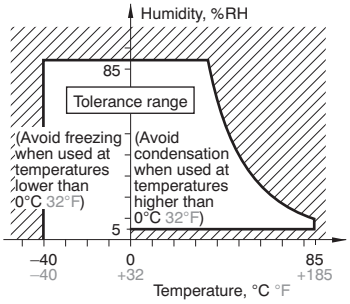
2. Coil applied voltage
To ensure proper operation, the voltage applied to the coil should be the rated operating voltage of the coil. Also, be aware that the pick-up and drop-out voltages will fluctuate depending on the ambient temperature and operating conditions.

3. Cycle lifetime
Check this with the real device as it is affected by coil driving circuit, load type, activation frequency, activation phase, ambient conditions and other factors.

4. Soldering
When soldering the relays, ensure conformance with the conditions listed below.
1) Automatic soldering
• Preheating: less than 100°C 212°F (solder target surface of PC board) for less than 120 sec
• Soldering: less than 260°C 500°F (solder temperature) for less than 5 sec (soldering time)
2) Manual soldering
• Soldering tip temperature: less than 280 to 300°C 536 to 572°F
• Soldering iron: 30 to 60 W
• Soldering time: less than 5 sec

5. Usage, transport and storage conditions
1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:
(1) Temperature:
–40 to +85°C –40 to +185°F
(Standard type)
–40 to +110°C –40 to +230°F
(High heat-resistant type)
(2) Humidity: 2 to 85% RH
(Avoid freezing and condensation.)
(3) Atmospheric pressure: 86 to 106 kPa
The humidity range varies with the temperature. Use within the range indicated in the graph below.
(Temperature and humidity range for usage, transport, and storage)





2) Condensation
Condensation forms when there is a sudden change in temperature under high temperature and high humidity conditions. Condensation will cause deterioration of the relay insulation.
3) Freezing
Condensation or other moisture may freeze on the relay when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.
4) Low temperature, low humidity environments
The plastic becomes brittle if the relay is exposed to a low temperature, low humidity environment for long periods of time.

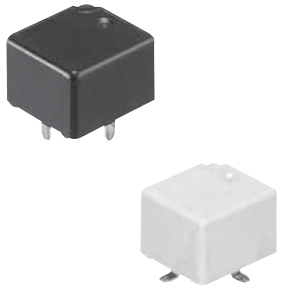
6. Others
If the relay has been dropped, the appearance and characteristics should always be checked before use.

For Cautions for Use, see Relay Technical Information (page 126).

Panasonic
ideas for life

Compact flat size PC board relay for automotive

CP RELAYS



FEATURES

1. Compact flat type
Flat size enables it to be built-in switch units.
<Height>
PC board terminal type:
9.5 mm .374 inch
Surface-mount terminal type:
10.5mm .413inch

2. High capacity
CP Relay provides low profile spacesaving advantages while offering high continuous current of 25A (1 hour).

3. Simple footprint pattern enables ease of PC board layout
Arrangement of coil and contact terminals designed to withstand large capacity which ensures leeway and facilitates PC board design.

4. Sealed construction
Sealed construction suitable for harsh environments

5. "PC board terminal" and "Surface mount terminal" types available
SMD automatic mounting is possible for surface mount terminal types because tape and reel packaging is used.

6. Model available for wiper load.

TYPICAL APPLICATIONS

For automotive system
Power windows, Auto door lock, Power sunroof, Memory seat, Wiper, Defogger, Blower fan, EPS, ABS etc.

ORDERING INFORMATION

CP □ □ - □ - □

Contact arrangement
1: 1 Form C
1a: 1 Form A
1W: 1 Form C for wiper load

Mounting classification
Nil: PC board terminal/wiper load
SA: Surface-mount terminal*1

Coil voltage (DC)
12 V

Packing style*2
Nil: Tube packing
X: Tape and reel packing (picked from the NC terminal side)
Z: Tape and reel packing (picked from the coil terminal side)

TYPES

1. PC board terminal type

Contact arrangement	Coil voltage	Part No.
1 Form A	12V DC	CP1a-12V
1 Form C		CP1-12V
1 Form C for wiper load		CP1W-12V

Standard packing; Carton (tube): 40 pcs.; Case: 1,000 pcs.

2. Surface mount terminal type

Contact arrangement	Coil voltage	Part No.
1 Form C	12V DC	CP1SA-12V-X
		CP1SA-12V-Z

Standard packing; Carton (tape and reel): 300 pcs.; Case: 900 pcs.

Notes: *1. Surface-mount terminal type is available only for 1 form C contact arrangement.
*2. Surface mount terminal type is only supplied in tape and reel packaging. Tube packaging is only available for PC board type. Tape and reel packing symbol "-z" or "-x" are not marked on the relay.

RATING

1. Coil data

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 (at 20°C 68°F)	Usable voltage range (at 85°C 185°F)
12V DC	Max. 7.2V DC (Initial)	Min. 1.0V DC (Initial)	53.3 mA	225Ω	640 mW	10 to 16V DC

Note: Other pick-up voltage types are also available. Please contact us for details.

2. Specifications

1) Standard CP relay

Characteristics	Item		Specifications	
Contact	Arrangement		1 Form A	1 Form C
	Initial contact resistance (Initial)		N.O.: Typ6mΩ, N.C.: Typ8mΩ (By voltage drop 6V DC 1A)	
	Contact material		Ag alloy (Cadmium free)	
Rating	Nominal switching capacity (resistive load)		20A 14V DC	N.O.: 20A 14V DC, N.C.: 10A 14V DC
	Max. carrying current (12V DC initial)*3		N.O.: 40A for 2 minutes, 30A for 1 hour (at 20°C 68°F) 35A for 2 minutes, 25A for 1 hour (at 85°C 185°F)	
	Nominal operating power		640 mW	
	Min. switching capacity (resistive load)*1		1A 12V DC	
Electrical characteristics	Insulation resistance (Initial)		Min. 100 MΩ (at 500V DC)	
	Breakdown voltage (Initial)	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)	
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)	
	Operate time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial)	
	Release time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial)	
Mechanical characteristics	Shock resistance	Functional	Min. 100 m/s² {10G} (Half-wave pulse of sine wave: 11ms; detection: 10μs)	
		Destructive	Min. 1,000 m/s² {100G} (Half-wave pulse of sine wave: 6ms)	
	Vibration resistance	Functional	10 Hz to 100 Hz, Min. 44.1 m/s² {4.5G} (Detection time: 10μs)	
		Destructive	10 Hz to 500 Hz, Min. 44.1 m/s² {4.5G} Time of vibration for each direction; X, Y direction: 2 hours, Z direction: 4 hours	
Expected life	Mechanical		Min. 10^7 (at 120 cpm)	
	Electrical *Motor load does not apply to wiper load applications.		<Resistive load> Min. 10^5 (At nominal switching capacity, operating frequency: 1s ON, 9s OFF) <Motor load*> Min. 2×105 (N.O. side, Inrush 25A, steady 5A at 14V DC) Min. 105 (N.O. side, 20A 14V DC at motor lock) Min. 2×105 (N.C. side, 20A 14V DC at brake current) (Operating frequency: 0.5s ON, 9.5s OFF)	
Conditions	Conditions for operation, transport and storage*2		Ambient temp: –40°C to +85°C –40°F to +185°F Humidity: 5% R.H. to 85% R.H. (Not freezing and condensing at low temperature)	
	Max. operating speed		6 cpm (at rated load)	
Mass			Approx. 4g .14 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.Refer to “Usage ambient condition“ on page 139.
Please inquire if you will be using the relay in a high temperature atmosphere (110°C 230°F).
*3.Depends on connection conditions. Also, this does not guarantee repeated switching. We recommend that you confirm operation under actual conditions.

2) For wiper load

Anything outside of that given below complies with standard CP relays.

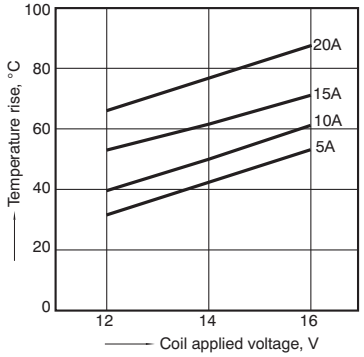
Characteristics	Item	Specifications
Rating	Max. carrying current (12V DC initial)	N.O.: 25A for 1 minutes, 15A for 1 hour (at 20°C 68°F)
Expected life	Electrical	<Wiper motor load (L = Approx. 1mH)> N.O. side: Min. 5×10^5 (Inrush 25A, steady 6A at 14V DC) N.C. side: Min. 5×10^5 (12A 14V DC at brake current) (Operating frequency: 1s ON, 9s OFF)

Note:*1. Depends on connection conditions. Also, this does not guarantee repeated switching. We recommend that you confirm operation under actual conditions.

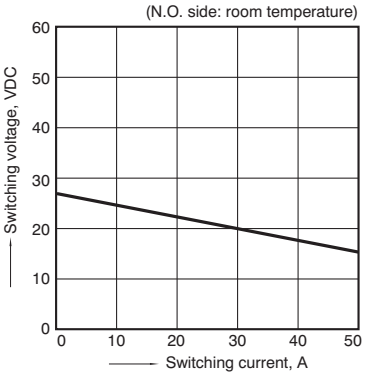
REFERENCE DATA

1. Coil temperature rise

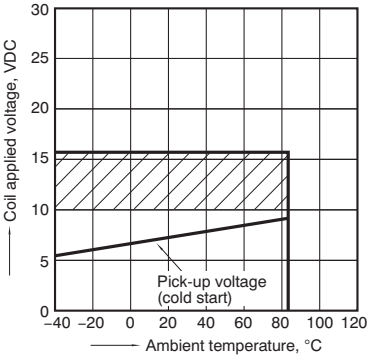
Sample: CP1-12V, 6pcs
Point measured: Inside the coil
Contact carrying current, 5A, 10A, 15A, 20A
Resistance method, ambient temperature 85°C 185°F



2. Max. switching capability (Resistive load)

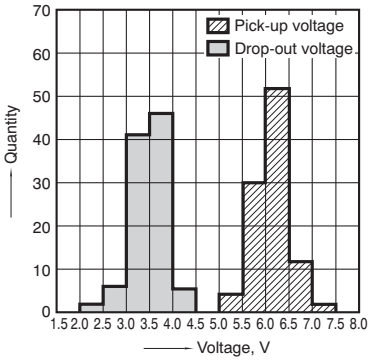


3. Ambient temperature and operating voltage range



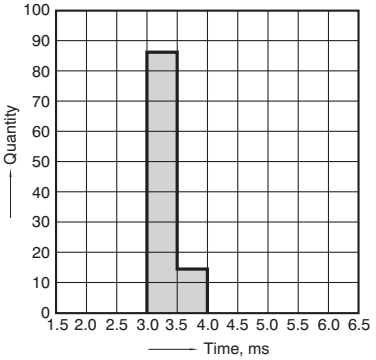
4. Distribution of pick-up and drop-out voltage

Sample: CP1-12V, 100pcs
Ambient temperature: 20°C 68°F



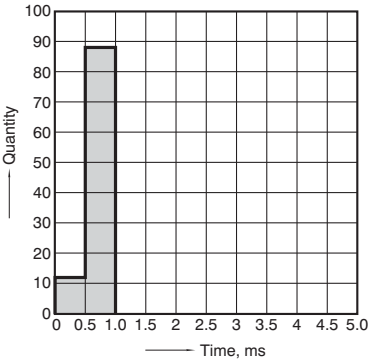
5. Distribution of operate time

Sample: CP1-12V, 100pcs
Ambient temperature: 20°C 68°F



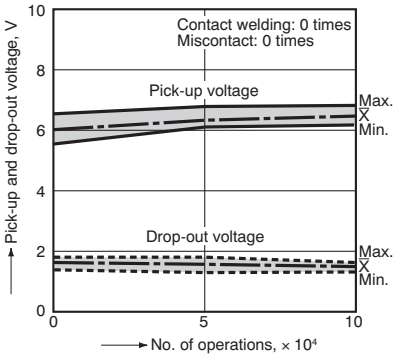
6. Distribution of release time

Sample: CP1-12V, 100pcs
Ambient temperature: 20°C 68°F
* Without diode



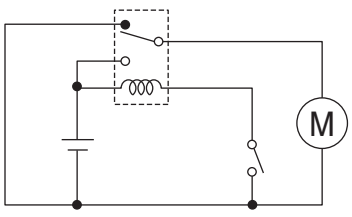
7.-(1) Electrical life test (at resistive load)

Sample: CP1-12V
Quantity: n = 4 (N.C. = 2, N.O. = 2)
Load: Resistive load (N.C. side: 10A 14V DC, N.O. side: 20A 14V DC)
Operating frequency: ON 1s, OFF 9s
Ambient temperature: Room temperature

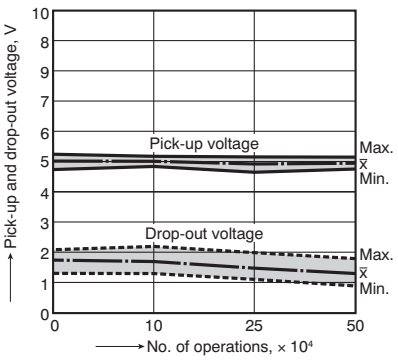


7.-(2) Electrical life test for wiper load (motor free)

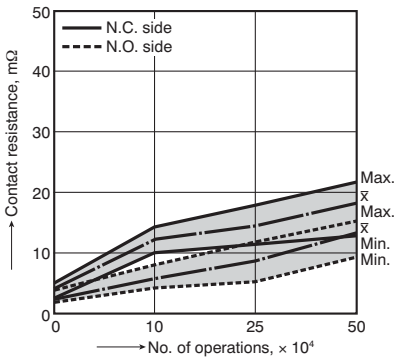
Sample: CP1W-12V
Quantity: n = 5
Load: N.O. side: Inrush 25A, steady 6A 14V DC
Load: N.C. side: Brake current 12A 14V DC
Operating frequency: ON 1s, OFF 9s
Ambient temperature: Room temperature
Circuit



Change of pick-up and drop-out voltage



Change of contact resistance



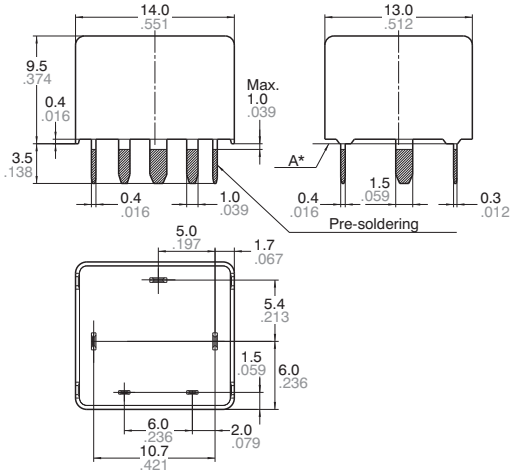
DIMENSIONS (mm inch)

Download CAD Data from our Web site.

1. PC board terminal type

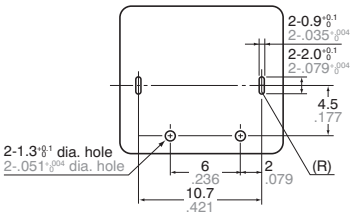
CAD Data

External dimensions



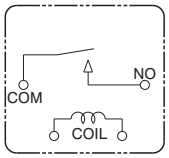
PC board pattern (Bottom view)

1 Form A

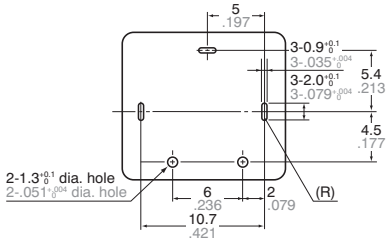


Schematic (Bottom view)

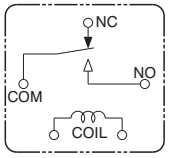
1 Form A



1 Form C



1 Form C



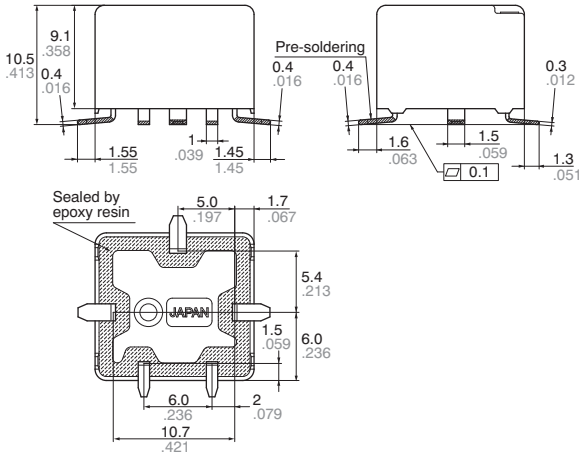
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

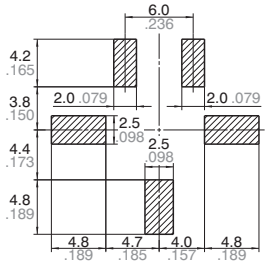
2. Surface mount terminal type

CAD Data

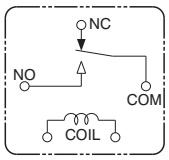
External dimensions



Recommendable mounting pad (Top view)



Schematic (Top view)



Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

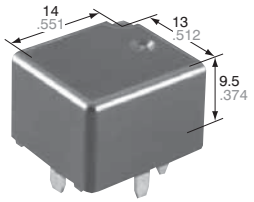
For Cautions for Use, see Relay Technical Information (page 126).

Automotive

Panasonic
ideas for life

Power type miniature low profile automotive relay

CP RELAYS
<POWER TYPE>



FEATURES

• Compact flat type
We successfully developed a power type that is the same size as our CP relay (14 mm (L) x 13 mm (W) x 9.5 mm (H) .551 inch (L) x .512 inch (W) x .374 inch (H)).

• 35A maximum carrying current
Current carrying of 35 A/1h and 45 A/2 min. at 20°C
(450 W type, 16 V applied) is possible due to use of N.O. double pin terminals and COM terminal width expansion.

• Supports capacitor loads required for power supply applications
Inrush current: 60A, steady-state current: 1A and 10^5 switching times possible.

• Plastic sealed type
This plastic sealed type can be automatically cleaned.

TYPICAL APPLICATIONS

For automotive system
Defoggers, Ignitions, Heaters, Accessories, Power windows, EPS and ABS etc.

SPECIFICATIONS

Contact

Arrangement			1 Form A, 1 Form C
Contact material			Ag alloy (Cadmium free)
Initial contact resistance (Initial) (By voltage drop 6V DC 1A)			Typ. 3 mΩ (N.O.) Typ. 4 mΩ (N.C.)
Rating	Nominal switching capacity		20A 14V DC (N.O.) 10A 14V DC (N.C.)
	Max. carrying current (16V DC)		N.O.: For 450mW 45A/2 minutes, 35A/1 hour at 20°C 68°F 40A/2 minutes, 30A/1 hour at 85°C 185°F 35A/2 minutes, 25A/1 hour at 110°C 230°F For 640mW 40A/2 minutes, 30A/1 hour at 20°C 68°F 35A/2 minutes, 25A/1 hour at 85°C 185°F 30A/2 minutes, 20A/1 hour at 110°C 230°F
	Min. switching capacity#1		1A 12V DC
Expected life (min. operations)	Mechanical (at 120cpm)		Min. 10^7
	Electrical (at 6cpm)	Resistive load	Min. 10^5*1
		Capacitor load	Min. 10^5*2

Coil

Nominal operating power	450 mW for pick-up voltage 7.2V DC 640 mW for pick-up voltage 6.5V DC

#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.

Characteristics

Max. operating speed (at nominal switching capacity)		6cpm
Initial insulation resistance		Min. 100MΩ (at 500 V DC)
Initial breakdown voltage*3	Between open contacts	500 Vrms for 1min.
	Between contact and coil	500 Vrms for 1min.
Operate time*4 (at nominal voltage) (Initial)		Max. 10ms (at 20°C 68°F)
Release time*4 (at nominal voltage) (Initial)		Max. 10ms (at 20°C 68°F)
Shock resistance	Functional 5	Min. 100 m/s²{10 G}
	Destructive*6	Min. 1,000 m/s²{100 G}
Vibration resistance	Functional*7	10 Hz to 100 Hz, Min.44.1 m/s² {4.5 G}
	Destructive*8	10 Hz to 500 Hz, Min.44.1 m/s² {4.5 G}
Conditions in case of operation, transport and storage*9 (Not freezing and condensing at low temperature)	Ambient temp	–40°C to +85°C –40 to +185°F
	Humidity	5% R.H. to 85% R.H.
Mass		Approx. 4.5g .16 oz

Remarks
*1 At nominal switching capacity, operating frequency: 1s ON, 9s OFF
*2 At 1A (steady), 60A (inrush), 14V DC, operating frequency: 1s ON, 9s OFF
*3 Detection current: 10mA
*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 Time of vibration for each direction;
- X, Y direction: 2 hours
- Z direction: 4 hours
*9 Refer to “Usage ambient condition“ on page 139.
Please inquire if you will be using the relay in a high temperature atmosphere (110°C 230°F).

ORDERING INFORMATION

Ex. CP □ – □ – □

Contact arrangement	Pick-up voltage	Coil voltage (DC)
1H: 1 Form C Powr type 1aH: 1 Form A Powr type	Nil: Max. 7.2 V DC N: Max. 6.5 V DC	12 V

Note: Tube packing: Carton (Tube): 40 pcs.; Case: 1,000 pcs.

TYPES

Contact arrangement	Coil voltage	Pick-up voltage, V DC (Initial) (at 20°C 68°F)	Part No.
1 Form C	12 V DC	Max. 7.2	CP1H-12V
		Max. 6.5	CP1H-N-12V
1 Form A		Max. 7.2	CP1aH-12V
		Max. 6.5	CP1aH-N-12V

Note: THD type only

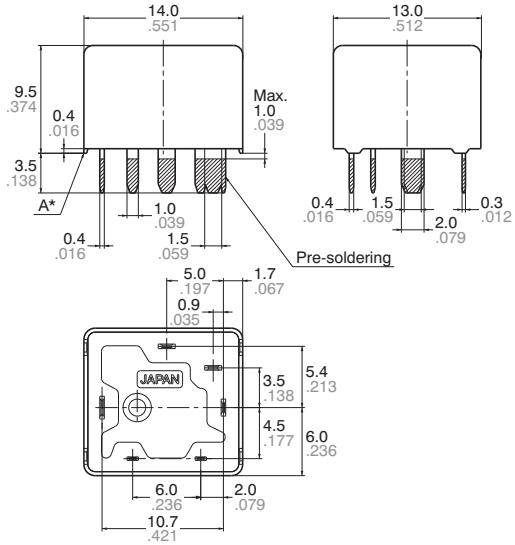
COIL DATA (at 20°C 68°F)

Nominal voltage, V DC (at 20°C 68°F)	Pick-up voltage, V DC (Initial) (at 20°C 68°F)	Drop-out voltage, V DC (Initial) (at 20°C 68°F)	Coil resistance Ω (at 20°C 68°F)	Nominal operating current mA (at 20°C 68°F)	Nominal operating power mW (at 20°C 68°F)	Usable voltage range, V DC (at 85°C 185°F)
12	Max. 7.2	Min. 1.0	320±10%	37.5±10%	450	10 to 16
	Max. 6.5		225±10%	53.3±10%	640	9 to 16

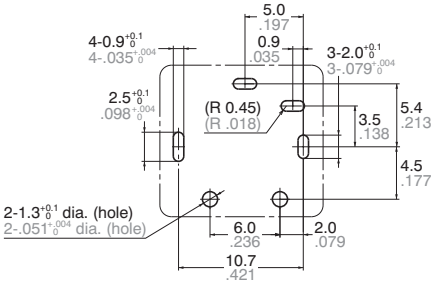
DIMENSIONS(mm inch)

Download CAD Data from our Web site.

CAD Data

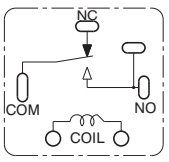


PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

Schematic (Bottom view)



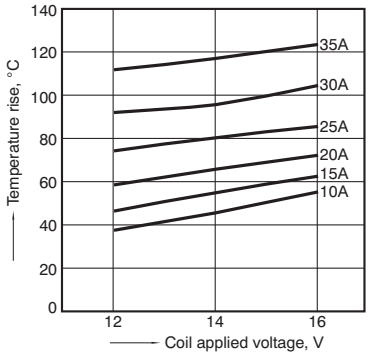
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

*Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering.
Intervals between terminals is measured at A surface level.

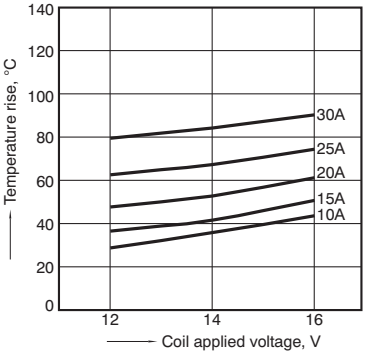
Automotive

REFERENCE DATA

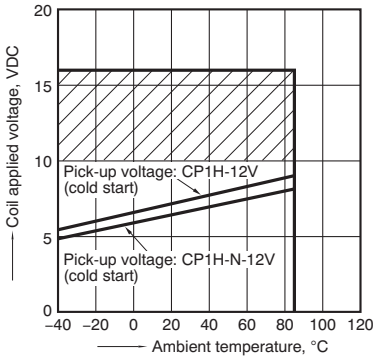
1-(1). Coil temperature rise
Sample : CP1H-12V, 3pcs
Point measured : Inside the coil
Ambient temperature: 27°C 81°F



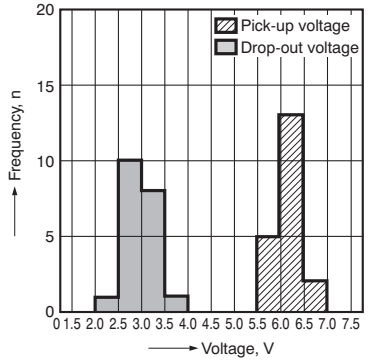
1-(2). Coil temperature rise
Sample : CP1H-12V, 3pcs
Point measured : Inside the coil
Ambient temperature: 85°C 185°F



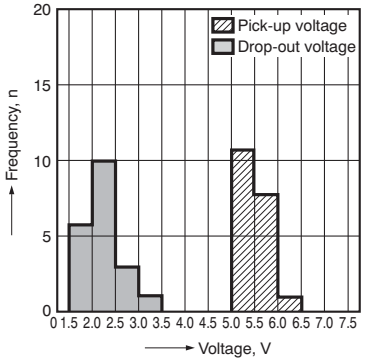
2. Ambient temperature and operating voltage range



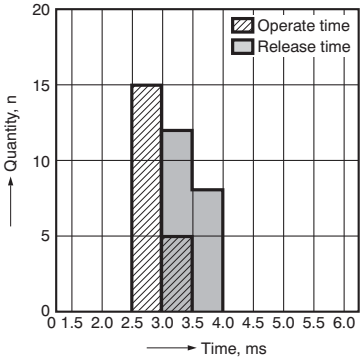
3-(1). Distribution of pick-up and drop-out voltage
Sample : CP1H-12V



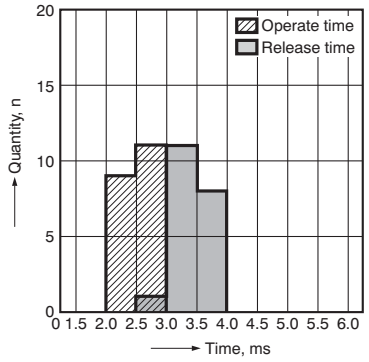
3-(2). Distribution of pick-up and drop-out voltage
Sample : CP1H-N-12V



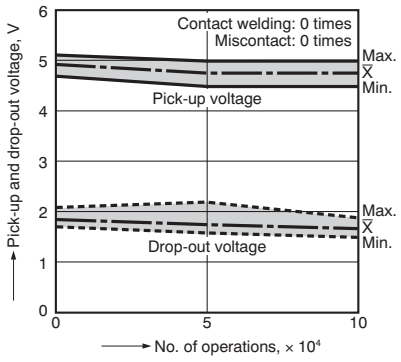
4-(1). Distribution of operate and release time
Sample : CP1H-12V

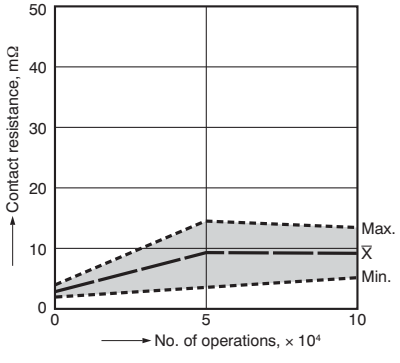


4-(2). Distribution of operate and release time
Sample : CP1H-N-12V



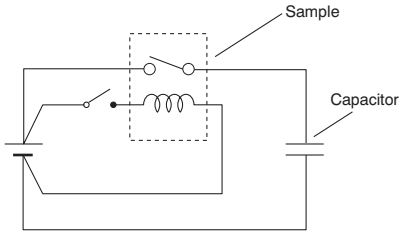
5-(1). Electrical life test (at rated load)
Sample : CP1H-12V
Quantity : n = 6
Load : Resistive load (NO side : 20 A 14 V DC)
Operating frequency : ON 1s, OFF 9s
Ambient temperature : Room temperature

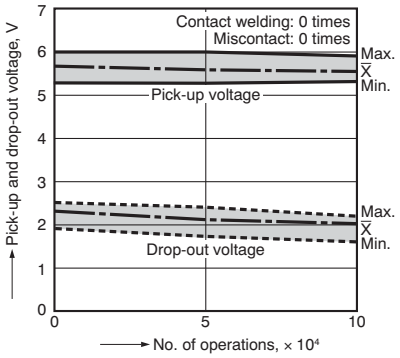


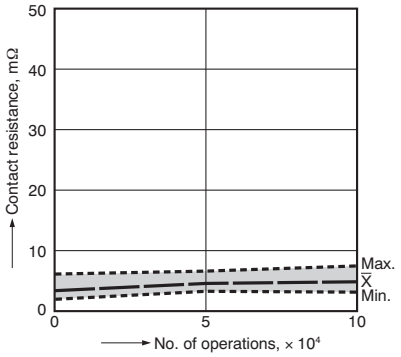


5-(2). Electrical life test (at capacitor load)
Sample : CP1H-12V, 6pcs.
Load : Inrush 60A/steady 1A
Operating frequency : (ON : OFF = 1s : 9s)
Ambient temperature : Room temperature

Circuit :







For Cautions for Use, see Relay Technical Information (page 126).

Automotive

Panasonic
ideas for life

1 Form C automotive silent relay

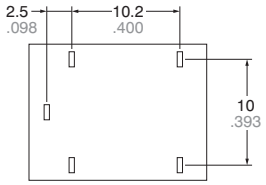
CQ RELAYS

FEATURES

1. Silent
Noise has been reduced by approximately 20 dB, using our own silencing design.

2. Less space required
Measuring only 17(L) × 13(W) mm .669(L) × .512(W) inches, this product ranks first among automotive quiet relays in terms of saving space.

3. Next-generation standard terminal pitch employed
The terminal array used is identical to that used in JJM relays.



4. Sealed construction

5. Model available for wiper load

TYPICAL APPLICATIONS

Intermittent wiper, Cruise control, Power windows, Auto door lock, Power supply of car stereo and car air-conditioner, Electrically powered seats, Electrically powered sunroof, etc.

TYPES

Contact arrangement	Coil voltage	Model No.	Part No.
1 Form C	12V DC	ACQ131	CQ1-12V
1 Form C for wiper load		ACQW131	CQ1W-12V

Standard packing; Carton (tube): 40 pcs.; Case: 800 pcs.

RATING

1. Coil data

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 (at 20°C 68°F)	Usable voltage range
12V DC	Max. 7.2V DC (Initial)	Min. 1.0V DC (Initial)	53.3 mA	225Ω	640 mW	10 to 16V DC

Note: Other pick-up voltage types are also available. Please contact us for details.

2. Specifications

1) Standard CQ relay

Characteristics	Item		Specifications
Contact	Arrangement		1 Form C
	Initial contact resistance (Initial)		N.O.: Typ7mΩ, N.C.: Typ8mΩ (By voltage drop 6V DC 1A)
	Contact voltage drop		Max. 0.2V (at 10 A)
	Contact material		Ag alloy (Cadmium free)
Rating	Nominal switching capacity (resistive load)		N.O.: 20A 14V DC, N.C.: 10A 14V DC
	Max. carrying current (12V DC initial)*1		N.O.: 35A for 2 minutes, 25A for 1 hour (at 20°C 68°F) 30A for 2 minutes, 20A for 1 hour (at 85°C 185°F)
	Nominal operating power		640 mW
	Min. switching capacity (resistive load)*2		1A 12V DC
Electrical characteristics	Insulation resistance (Initial)		Min. 100 MΩ (at 500V DC)
	Breakdown voltage (Initial)	Between open contacts	500 Vrms for 1 min. (Detection current: 10mA)
		Between contacts and coil	500 Vrms for 1 min. (Detection current: 10mA)
	Operate time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial)
	Release time (at nominal voltage)		Max. 10ms (at 20°C 68°F, excluding contact bounce time) (Initial)
Mechanical characteristics	Shock resistance	Functional	Min. 100 m/s² {10G} (Half-wave pulse of sine wave: 11ms; detection: 10μs)
		Destructive	Min. 1,000 m/s² {100G} (Half-wave pulse of sine wave: 6ms)
	Vibration resistance	Functional	10 Hz to 100 Hz, Min. 44.1 m/s² {4.5G} (Detection time: 10μs)
		Destructive	10 Hz to 500 Hz, Min. 44.1 m/s² {4.5G} Time of vibration for each direction; X, Y direction: 2 hours, Z direction: 4 hours
Expected life	Mechanical		Min. 10^7 (at 120 cpm)
	Electrical *Motor load does not apply to wiper load applications.		<Resistive load> Min. 10^5 (At nominal switching capacity, operating frequency: 1s ON, 9s OFF) <Motor load*> Min. 3×10^5 (Inrush 30A, steady 5A, 20A 14V DC at brake current) (Operating frequency: 1s ON, 2s OFF)
Conditions	Conditions for operation, transport and storage*3		Ambient temp: –40°C to +85°C –40°F to +185°F Humidity: 5% R.H. to 85% R.H. (Not freezing and condensing at low temperature)
	Max. operating speed		6 cpm (at rated load)
Mass			Approx. 6.5g .23 oz

*1 Depends on connection conditions. Also, this does not guarantee repeated switching. We recommend that you confirm operation under actual conditions.
*2 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.
*3 Refer to “Usage ambient condition“ on page 139.

2) For wiper load

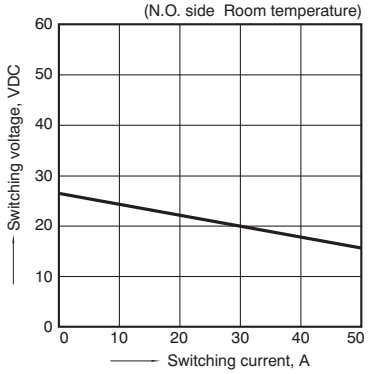
Anything outside of that given below complies with standard CQ relays.

Characteristics	Item	Specifications
Rating	Max. carrying current (12V DC initial)	N.O.: 25A for 1 minutes, 15A for 1 hour (at 20°C 68°F)
Expected life	Electrical	<Wiper motor load (L = Approx. 1mH)> N.O. side: Min. 5×10^5 (Inrush 25A, steady 6A at 14V DC) N.C. side: Min. 5×10^5 (12A 14V DC at brake current) (Operating frequency: 1s ON, 9s OFF)

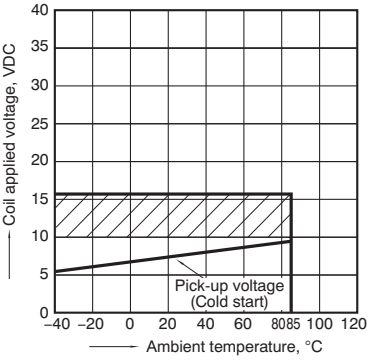
Note:*1. Depends on connection conditions. Also, this does not guarantee repeated switching. We recommend that you confirm operation under actual conditions.

REFERENCE DATA

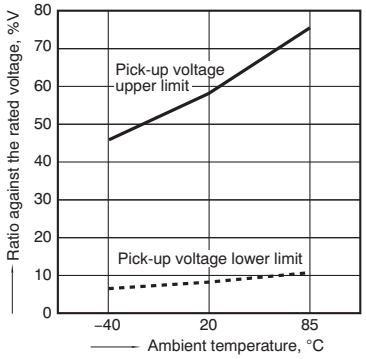
1. Max. switching capability (Resistive load, initial)



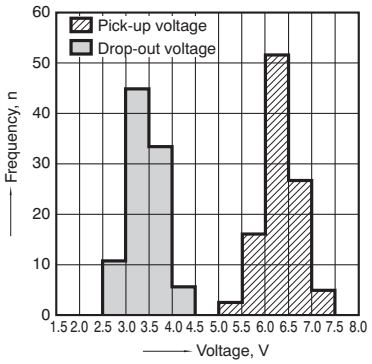
2. Ambient temperature and operating temperature range



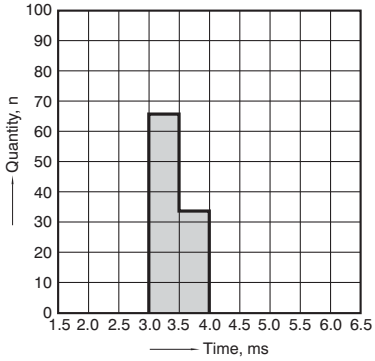
3. Ambient temperature characteristics



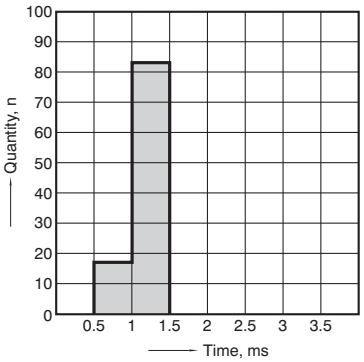
4. Distribution of pick-up and drop-out voltage
Sample: CQ1-12V, 100pcs



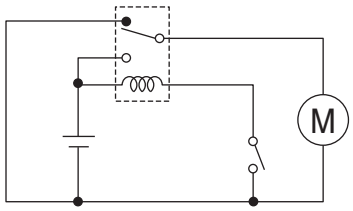
5. Distribution of operate time
Sample: CQ1-12V, 100pcs



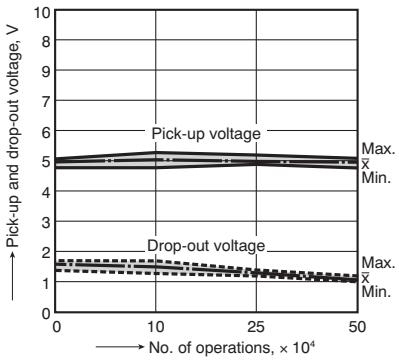
6. Distribution of release time
Sample: CQ1-12V, 100pcs
* Without diode



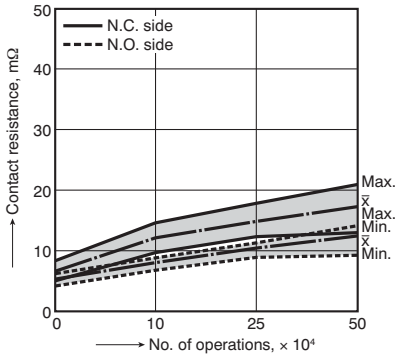
7. Electrical life test for wiper load (motor free)
Sample: CQ1W-12V
Quantity: n = 3
Load: N.O. side: Inrush 25A, steady 6A 14V DC
Load: N.C. side: Brake current 12A 14V DC
Operating frequency: ON 1s, OFF 9s
Ambient temperature: Room temperature
Circuit



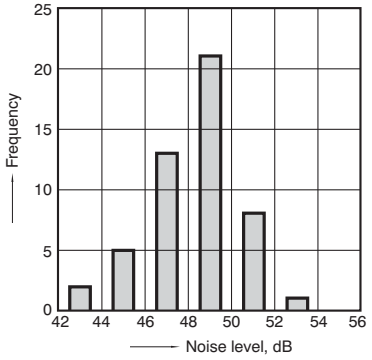
Change of pick-up and drop-out voltage



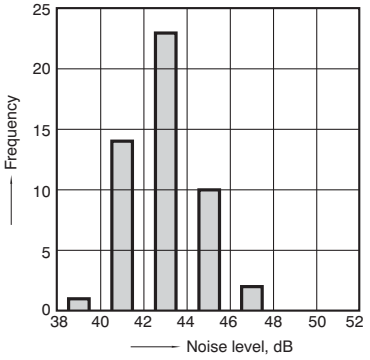
Change of contact resistance



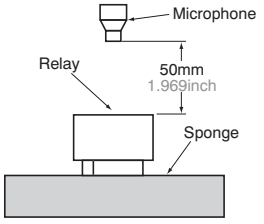
8.-(1) Operation noise distribution
When operate



8.-(2) Operation noise distribution
When release



Measuring conditions
Sample: CQ1-12 V, 50 pcs.
Equipment setting: “A” weighted, Fast, Max. hold
Coil voltage: 12V DC
Coil connection device: Diode
Background noise: Approx. 20dB

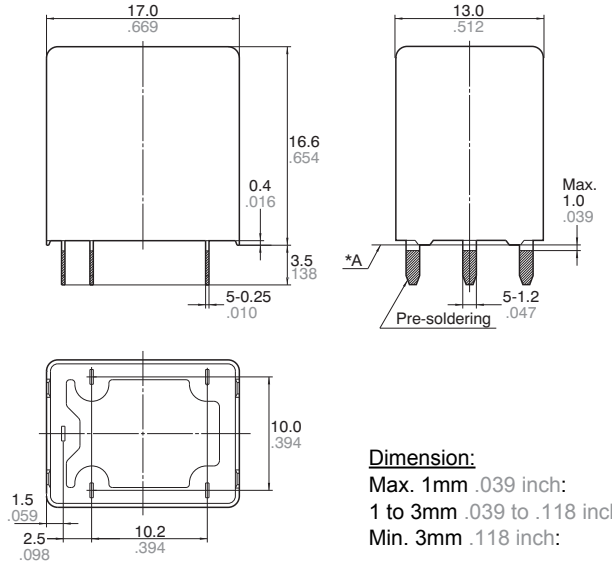


DIMENSIONS (mm inch)

Download CAD Data from our Web site.

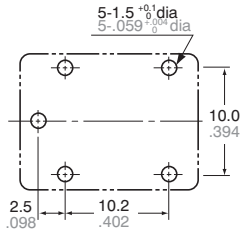
CAD Data

External dimensions



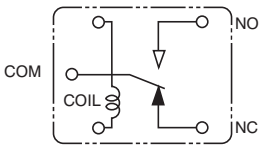
Dimension:	Tolerance
Max. 1mm .039 inch:	±0.1 ±.004
1 to 3mm .039 to .118 inch:	±0.2 ±.008
Min. 3mm .118 inch:	±0.3 ±.012

PC board pattern (Bottom view)



Tolerance: ±0.1 ±.004

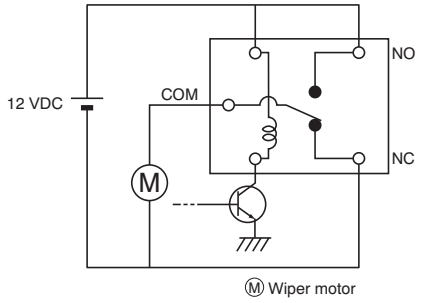
Schematic (Bottom view)



* Dimensions (thickness and width) of terminal specified in this catalog is measured before pre-soldering. Intervals between terminals is measured at A surface level.

EXAMPLE OF CIRCUIT

Control circuit for intermittent wiper motor

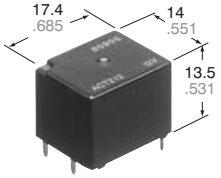


For Cautions for Use, see Relay Technical Information (page 126).

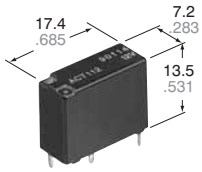
Panasonic
ideas for life

Super miniature twin type automotive relay

CT RELAYS (ACT)



Twin type (8 terminals)



mm inch

Slim 1c type

FEATURES

• Small & slim size

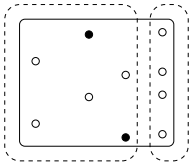
Twin type: 17.4(L)×14.0(W)×13.5(H)mm
.685(L)×.551(W)×.531(H)inch
Slim 1c type: 17.4(L)×7.2(W)×13.5(H)mm
.685(L)×.283(W)×.531(H)inch

• Twin (1 Form C × 2)

Forward/reverse motor control is possible with a single relay.

• Simple footprint enables ease of PC board layout

※10 terminals layout



○ = 8 terminals

TYPICAL APPLICATIONS

- Power windows
- Auto door lock
- Power sunroof
- Electrically powered mirrors
- Powered seats
- Lift gates
- Slide door closers, etc.
  (for DC motor forward/reverse control circuits)

SPECIFICATIONS

Contact

Arrangement			1 Form C×2, 1 Form C
Contact material			Ag alloy (Cadmium free)
Initial contact resistance (Initial) (By voltage drop 6 V DC 1 A)			Typ. 7 mΩ (N.O.) Typ. 10 mΩ (N.C.)
Rating	Nominal switching capacity		N.O.: 20 A 14 V DC N.C.: 10 A 14 V DC
	Max. carrying current (N.O.)		35 A for 2 minutes, 25 A for 1 hour (14 V, at 20°C 68°F) 30 A for 2 minutes, 20 A for 1 hour (14 V, at 85°C 185°F)
	Min. switching capacity#1		1 A 12 V DC
Expected life (min. operation)	Mechanical (at 120 cpm)		Min. 10^7
	Electrical	Resistive load	Min. 10^5*1
		Motor load	Min. 2×10^5*2 (free)
			Min. 10^5*3 (lock)

Coil

Nominal operating power	800 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.

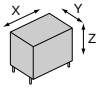
Remarks

*1 At nominal switching capacity, operating frequency: 1s ON, 9s OFF
*2 N.O.: at 5 A (steady), 25 A (inrush)/N.C.: at 20 A (brake) 14 V DC, operating frequency: 0.5s ON, 9.5s OFF
*3 At 25A 14 V DC (Motor lock), operating frequency: 0.5s ON, 9.5s OFF
*4 Measurement at same location as "Initial breakdown voltage" section
*5 Detection current: 10mA
*6 Excluding contact bounce time
*7 Half-wave pulse of sine wave: 11ms; detection: 10μs
*8 Half-wave pulse of sine wave: 6ms
*9 Detection time: 10μs

Characteristics

Max. operating speed (at nominal switching capacity)		6 cpm
Initial insulation resistance*4		Min. 100 MΩ (at 500 V DC)
Initial breakdown voltage*5	Between open contacts	500 Vrms for 1 min.
	Between contacts and coil	500 Vrms for 1 min.
Operate time*6 (at nominal voltage) (at 20°C 68° F)		Max. 10ms (Initial)
Release time*6 (at nominal voltage) (at 20°C 68° F)		Max. 10ms (Initial)
Shock resistance	Functional*7	Min. 100 m/s² {10G}
	Destructive*8	Min. 1,000 m/s² {100G}
Vibration resistance	Functional*9	10 Hz to 100 Hz, Min. 44.1m/s² {4.5G}
	Destructive*10	10 Hz to 500 Hz, Min. 44.1m/s² {4.5G}
Conditions for operation, transport and storage*11 (Not freezing and condensing at low temperature)	Ambient temp	–40°C to +85°C –40°F to +185°F
	Humidity	5% R.H. to 85% R.H.
Mass		Approx. 8.0g .28oz (Twin type) Approx. 4.0g .14oz (Slim 1c type)

*10 Time of vibration for each direction;



X, Y, direction: 2 hours
Z direction: 4 hours

*11 Refer to "Usage ambient condition" on page 139.
Please inquire if you will be using the relay in a high temperature atmosphere (110°C 230°F).

* If the relay is used continuously for long periods of time with coils on both sides in an energized condition, breakdown might occur due to abnormal heating depending on the carrying condition. Therefore, please inquire when using with a circuit that causes an energized condition on both sides simultaneously.