



Plug-in type



PC board type

**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 and Plug-in type, Resistor 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.  $5 \times 10^4$   
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.

**TYPICAL APPLICATIONS**

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

**ORDERING INFORMATION**



Contact arrangement

1a: 1 Form A

1: 1 Form C

Protective construction

Nil: Sealed type

F: Flux-resistant type

Protective element

Nil: None (Standard type)

R: With resistor inside

Mounting classification

Nil: Plug-in type

P: PC board type (24 V only)

Coil voltage (DC)

12 V, 24 V

**TYPES**

**Standard type**

Contact arrangement	Coil voltage	Plug-in type		PC board type	
		Sealed type	Flux-resistant type	Sealed type	Flux-resistant type
		Part No.	Part No.	Part No.	Part No.
1 Form A	12 V DC	CM1a-12V	CM1aF-12V	—	—
	24 V DC	CM1a-24V	CM1aF-24V	CM1a-P-24V	CM1aF-P-24V
1 Form C	12 V DC	CM1-12V	CM1F-12V	—	—
	24 V DC	CM1-24V	CM1F-24V	CM1-P-24V	CM1F-P-24V

Standard packing: Carton: 50 pcs.; Case: 200 pcs.

Note: Please use "CM\*\*R-\*\*\*" built-in resistor type. (Asterisks " \* " should be filled in from ORDERING INFORMATION.)

# 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 [ $\pm 10\%$ ] (at 20°C 68°F)	Coil resistance [ $\pm 10\%$ ] (at 20°C 68°F)	Nominal operating power	Usable voltage range
12 V DC	3 to 7 V DC	1.2 to 4.2 V DC	125 mA	96Ω	1.5 W	10 to 16V DC
24 V DC	6 to 14 V DC	2.4 to 8.4 V DC	75 mA	320Ω	1.8 W	20 to 32V DC

## 2. Specifications

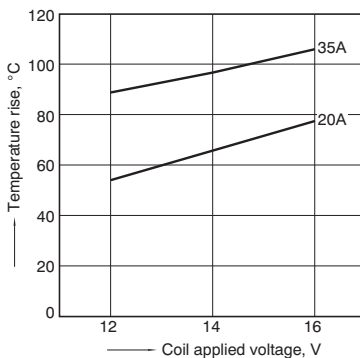
Characteristics	Item	Specifications			
		12 V DC		24 V DC	
Contact	Arrangement	1 Form A	1 Form C	1 Form A	1 Form C
	Contact resistance (Initial)	Typ 2mΩ (By voltage drop 6V DC 1A)			
	Contact voltage drop (after electrical life test)	N.O.: Max. 0.5 V (By voltage drop 14 V DC 35 A)	N.O.: Max. 0.5 V (By voltage drop 14 V DC 35 A) N.C.: Max. 0.3 V (By voltage drop 14 V DC 20 A)	N.O.: Max. 0.3 V (By voltage drop 28 V DC 15 A)	N.O.: Max. 0.3 V (By voltage drop 28 V DC 15 A) N.C.: Max. 0.2 V (By voltage drop 28 V DC 8 A)
	Contact material	Ag alloy (Cadmium free)			
Rating	Nominal switching capacity (resistive load)	N.O.: 35 A 14V DC	N.O.: 35 A 14V DC N.C.: 20 A 14V DC	N.O.: 15 A 28V DC	N.O.: 15 A 28V DC N.C.: 8 A 28V DC
	Max. carrying current (at 85°C 185°F, continuous)	N.O.: 20 A 14V DC	N.O.: 20 A 14V DC N.C.: 10 A 14V DC	N.O.: 15 A 28V DC	N.O.: 15 A 28V DC N.C.: 8 A 28V DC
	Nominal operating power	1.5 W, 1.7 W (with resistor inside type)		1.8 W, 2.0 W (with resistor inside type)	
	Min. switching capacity (resistive load)*1	1 A 12V DC		1 A 24V DC	
Electrical characteristics	Insulation resistance (Initial)	Min. 20 MΩ (at 500V DC, Measurement at same location as "Breakdown voltage" section.)			
	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) (at 20°C 68°F)	Max. 10ms (excluding contact bounce time) (Initial)			
Release time (at nominal voltage) (at 20°C 68°F)	Max. 10ms (excluding contact bounce time) (Initial)				
Mechanical characteristics	Shock resistance	Functional	Min. 200 m/s <sup>2</sup> {20G} (Half-wave pulse of sine wave: 11ms; detection time: 10μs)		
		Destructive	Min. 1,000 m/s <sup>2</sup> {100G} (Half-wave pulse of sine wave: 6ms)		
	Vibration resistance	Functional	10 Hz to 500 Hz, Min. 44.1 m/s <sup>2</sup> {4.5G}		
		Destructive	10 Hz to 2,000 Hz, Min. 44.1 m/s <sup>2</sup> {4.5G}, Time of vibration for each direction; X, Y, Z direction: 4 hours		
Expected life	Mechanical (at 120 cpm)	Min. 10 <sup>6</sup>			
	Electrical (operating frequency: 2s ON, 2s OFF)	Flux-resistant type: Min. 10 <sup>5</sup> , Sealed type: Min. 5 × 10 <sup>4</sup>			
Conditions	Conditions for operation, transport and storage*2	Ambient temperature: -40°C to +85°C -40°F to +185°F*3, Humidity: 5% R.H. to 85% R.H. (Not freezing and condensing at low temperature), Air pressure: 86 to 106 kPa			
Mass		Approx. 20 g .71 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 "6. Usage, Storage and Transport Conditions" in [AMBIENT ENVIRONMENT section in Relay Technical Information](#).  
 \*3. Please inquire if you will be using the relay in a high temperature atmosphere.

## REFERENCE DATA

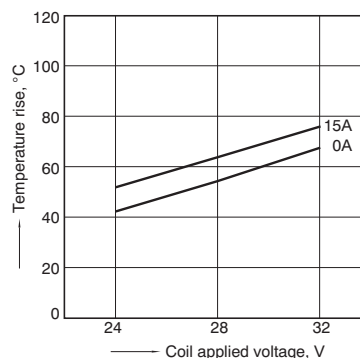
1.-(1) Coil temperature rise (12V type, 85°C 185°F)

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

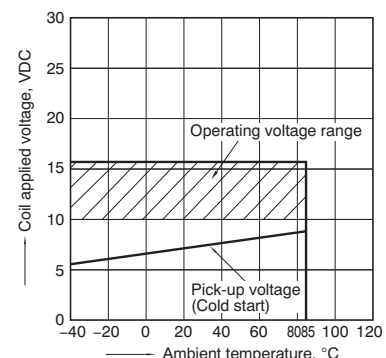


1.-(2) Coil temperature rise (24V type, 85°C 185°F)

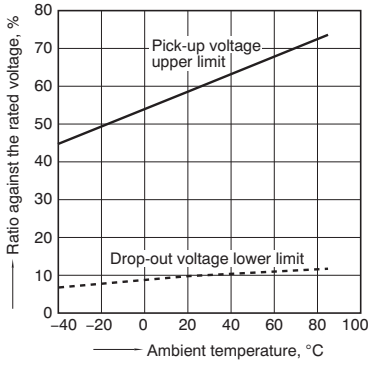
Sample: CM1F-24V, 4 pcs.  
 Measured portion: Inside the coil  
 Contact carrying current: 0A, 15A  
 Ambient temperature: 85°C 185°F



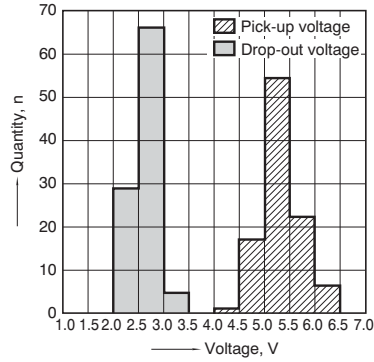
2. Ambient temperature and operating voltage range (12V type)



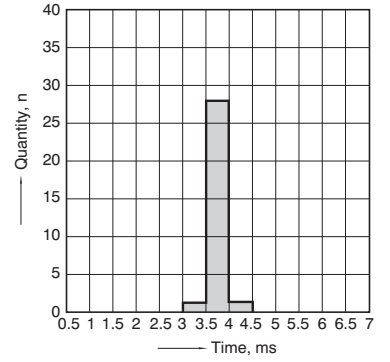
3. Ambient temperature characteristics (Cold/initial)



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

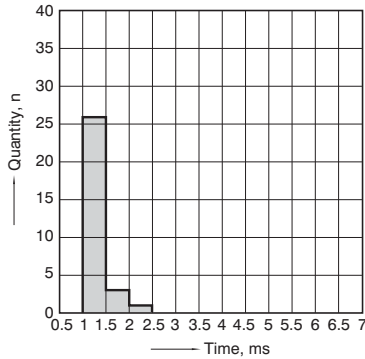


5. Distribution of operate time  
Sample: CM1F-12V, 30pcs.  
\* Max. 10ms standard (excluding contact bounce)



6. Distribution of release time

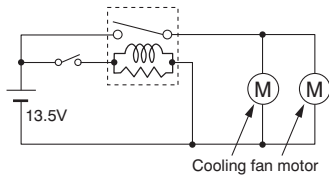
Sample: CM1F-12V, 30pcs.  
\* Max. 10ms standard (excluding contact bounce)



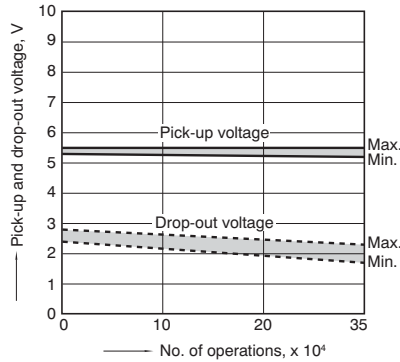
7.-(1) Electrical life test (Motor free)

Sample: CM1aF-R-12V, 6pcs.  
Load: 16 A 13.5 V DC  
Cooling fan motor actual load (free condition)  
Operating frequency: ON 2s, OFF 6s  
Ambient temperature: Room temperature

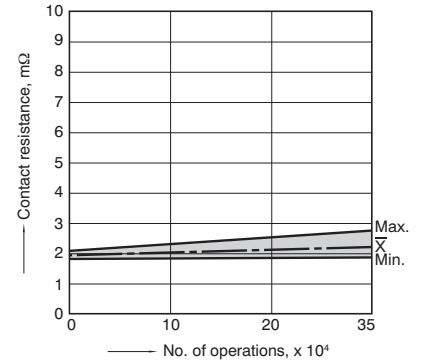
Circuit



Change of pick-up and drop-out voltage

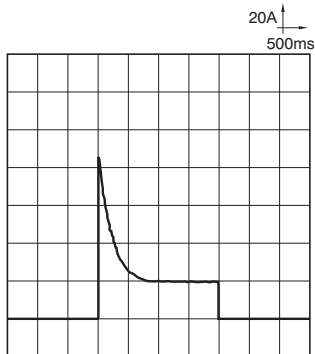


Change of contact resistance



Load current waveform

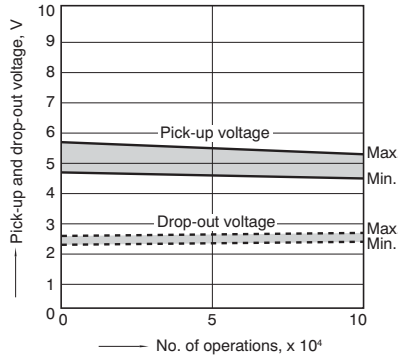
Inrush current: 85A, Steady current: 18A,



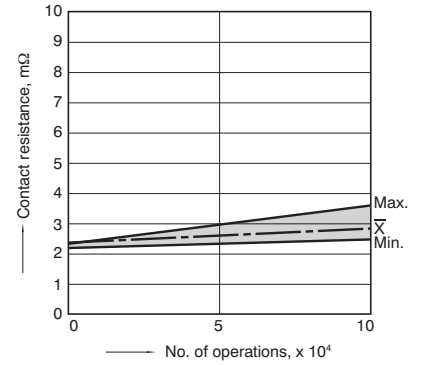
## 7.-(2) Electrical life test (Halogen lamp load)

Sample: CM1aF-R-12V, 6pcs.  
 Load: 20A 13.5V DC  
 Operating frequency: ON 1s, OFF 14s  
 Ambient temperature: Room temperature

## Change of pick-up and drop-out voltage



## Change of contact resistance



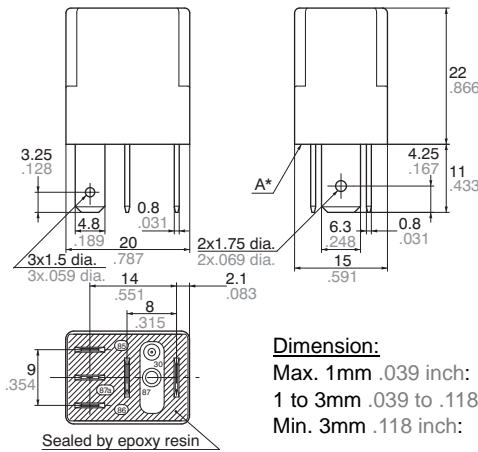
## DIMENSIONS (mm inch)

Download [CAD Data](#) from our Web site.

### 1. Plug-in type (1 Form C)

[CAD Data](#)

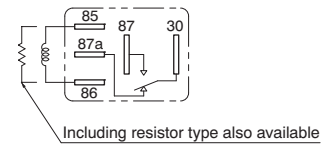
#### External dimensions



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

\* Intervals between terminals is measured at A surface level.

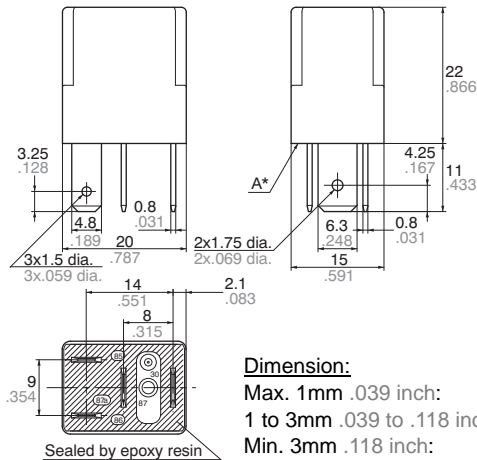
#### Schematic (Bottom view)



### 2. Plug-in type (1 Form A)

[CAD Data](#)

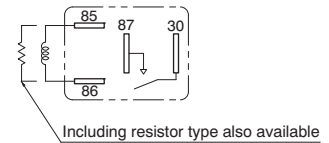
#### External dimensions



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

\* Intervals between terminals is measured at A surface level.

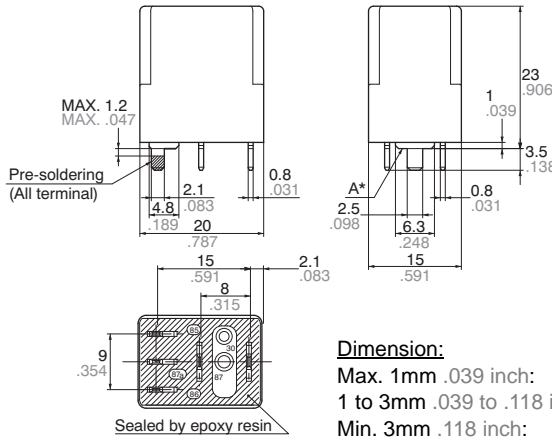
#### Schematic (Bottom view)



3. PC board type (1 Form C) \*24V only

CAD Data

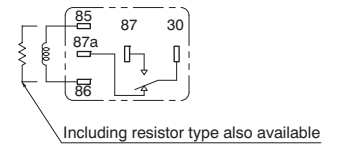
External dimensions



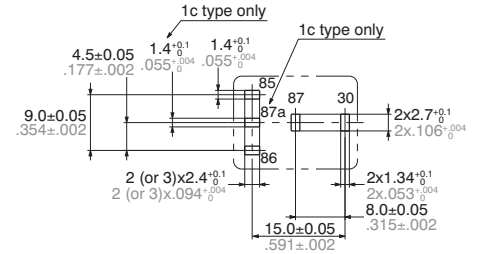
<b>Dimension:</b>	<b>General tolerance</b>
Max. 1mm .039 inch:	$\pm 0.1 \pm .004$
1 to 3mm .039 to .118 inch:	$\pm 0.2 \pm .008$
Min. 3mm .118 inch:	$\pm 0.3 \pm .012$

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

Schematic (Bottom view)



PC board pattern (Bottom view)

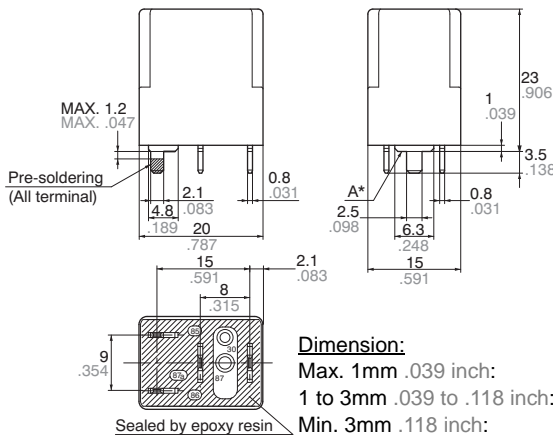


Tolerance:  $\pm 0.1 \pm .004$

4. PC board type (1 Form A) \*24V only

CAD Data

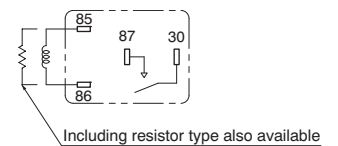
External dimensions



<b>Dimension:</b>	<b>General tolerance</b>
Max. 1mm .039 inch:	$\pm 0.1 \pm .004$
1 to 3mm .039 to .118 inch:	$\pm 0.2 \pm .008$
Min. 3mm .118 inch:	$\pm 0.3 \pm .012$

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

Schematic (Bottom view)



NOTES

1. Soldering

Max. 350°C 662°F (solder temperature),  
within 3 seconds (soldering time)  
The effect on the relay depends on the  
actual PC board used. Please verify the  
PC board to be used.

For Cautions for Use, see [Relay Technical Information](#).