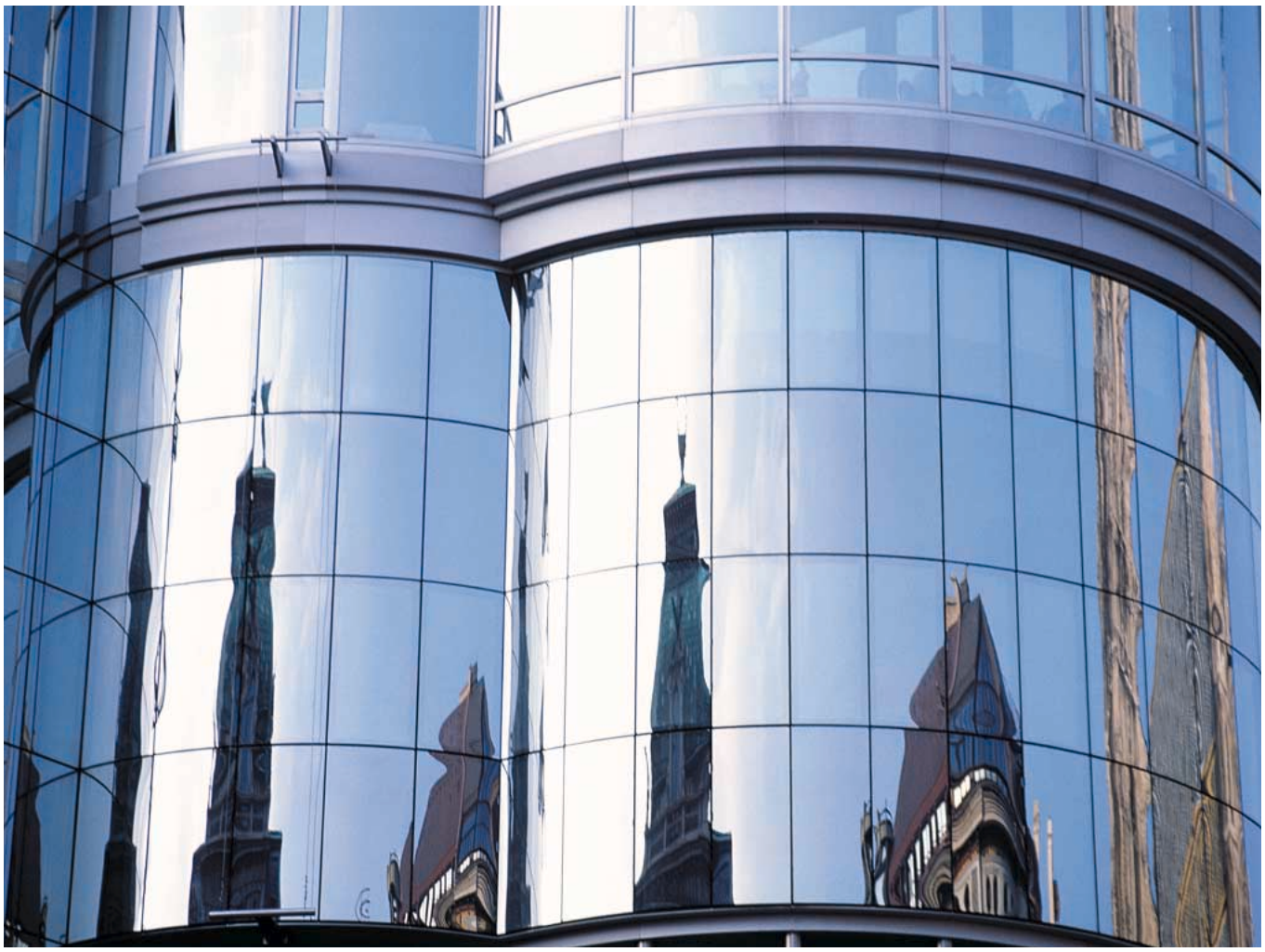
Devices thru Material Innovation

NEC/TOKIN

Miniature Relays

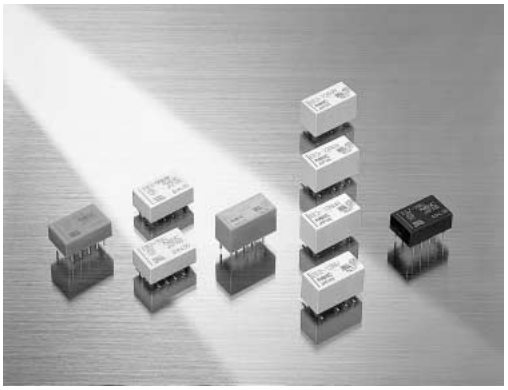


2nd edition

Introduction to NEC TOKIN E.M. Devices

Since NEC industrialized telephone relays in Japan more than a half century ago, many technological innovations have taken place in its electromechanical devices (E.M. devices).
NEC's relays were designed and manufactured always on the basis of the newest technology that the company develops. Their high reliability and advanced features assure the high reliability and high performance of your products.
NEC divided and transferred its business of manufacturing and sale of relays to Tokin, as of April 1, 2002. Then Tokin Corporation changed its corporate name to "NEC TOKIN Corporation," which has charge of electronic components business within the NEC Group.

Miniature Relay



Miniature Signal Relay

Miniature Power Relay

Introduction of NEC TOKIN's miniature relays

NEC TOKIN's miniature relays can be classified into two types. Signal relays that are mainly used by communication equipment manufacturers in the world, and power relays that satisfy the needs of automobile electronic systems and household electronic appliances.

Feature

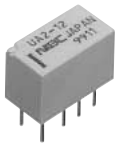
Miniature signal relay

- Compact and lightweight for dense mounting
- Low power consumption
- Plastic-sealed package
- High withstand voltage
- Surface mounting product lineup

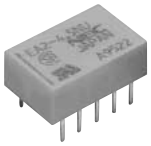
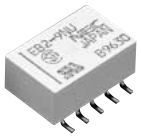
Miniature power relay

- High power switching capability
- Compact and lightweight with twin relay structure
- Flux tight housing
- Washable with plastic-sealed package
- Semicustom-made-product available for various application

Selector Chart

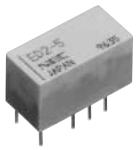
•Group		Miniature Relay-Signal			
•Type of Relay		***UA2*** 	***UB2*** 	***UC2*** 	***UD2*** 
•Features		•super-compact size •dual-inline leads (small mounting space) •2500V surge (2 x 10 μs*) •latching type available •Low power consumption type available	•super-compact size •surface mount (small mounting space) •2500V surge (2 x 10 μs*) •latching type available •Low power consumption type available	•super-compact size •dual-inline leads (low profile type) •2500V surge (2 x 10 μs*) •latching type available	•super-compact size •surface mount (low profile type) •2500V surge (2 x 10 μs*) •latching type available
•Contact Arrangement		2c			
•Contact Material (standard)		silver alloy with gold alloy overlay			
•Contact Rating (resistive) (switching)		30W/37.5 VA			
	3A	.....			
	2A	.....			
	1A	..... 1.0A			
•Coil Voltage		1.5,3,4.5,5,6,9,12,24 Vdc			
•Nominal Operate Power		100 to 230mW (latch type 100 to 120 mW)			
•Must Operate Voltage		75%			
•Must Release Voltage		10%			
•Operate Time (typ.) (Excluding bounce)		2ms			
•Release Time (typ.) (Excluding bounce Without Diode)		1ms			
•Running Specifi-cations	Load	1×10^5 (30 Vdc, 1 A at 20°C) 1×10^5 (125 Vac, 0.3A at 20°C)			
	Nonload	10 $\times10^6$			
•With-stand Voltage	Between open contacts	1000Vac			
	Between adjacent contacts	1000Vac			
	Between contacts and coil	1500Vac			
•Surge Withstand Voltage		1500V(FCC), 2500 V***(2x10 μs, coil to contacts)			
•Safety Standard		UL, CSA, TUV			
•Option		latching type			
•Height (mm)		8.3	8.8	5.6	5.45
•Mounting Space (mm^2)		6.0 × 10.9	7.4 × 10.9	6.8 × 10.9	8.4 × 10.9
•Page		10 to 11 , 15	12 to 15	16 to 17, 21	18 to 20, 21

Selector Chart

Miniature Relay-Signal				• Group
EA2 	***EB2*** 	***EC2*** 	***EE2*** 	• Type of Relay
•Low power consumption •Low magnetic interference •1500V FCC surge 1000Vac FCC •compact, light weight •latching type available	•surface mount •Low power consumption •Low magnetic interference •1500V FCC surge 1000Vac FCC •compact, light weight •latching type available •ultra-low profile type is line up.	•Low power consumption •dual-inline leads (small mounting space) •2500 V surge (2 x 10 μs*) coil to contacts •latching type available •high-insulation type is line up.	•Low power consumption •surface mount (reduced mounting space) •2500 V surge (2 x 10 μs*) coil to contacts •latching type available •high-insulation type is line up.	• Features
2c				• Contact Arrangement
silver alloy with gold alloy overlay				• Contact Material (standard)
30W/62.5 VA		60W/125 VA (UL/CSA Rating)		• Contact Rating (resistive) (switching)
1.0A		2.0A		3A / 2A / 1A
3,4.5,5,6,9,12,24 Vdc				• Coil Voltage
140mW (latch type 100 ~ 200 mW)				• Nominal Operate Power
75%				• Must Operate Voltage
10%				• Must Release Voltage
2ms				• Operate Time (typ.) (Excluding bounce)
1ms				• Release Time (typ.) (Excluding bounce Without Diode)
1× 10^6 (50 Vdc, 0.1 A at 85°C,5Hz) 1× 10^6 (10 Vdc, 10 mA at 85°C,2Hz)				Load — • Running Specifications
10 x10^6				Nonload — • Running Specifications
1000Vac				Between open contacts — • Withstand Voltage
1000Vac				Between adjacent contacts — • Withstand Voltage
1000Vac		1500 Vac or 1000Vac**		Between contacts and coil — • Withstand Voltage
1500V FCC		1500V (FCC), 2500 V***(2x10ms, coil to contacts)		• Surge Withstand Voltage
UL, CSA				• Safety Standard
latching type				• Option
5.4	7.5	9.4	10.0	• Height (mm)
9.2 × 14.2	9.3 × 14.3	7.5 × 15.0	9.5 × 15.0	• Mounting Space (mm^2)
22 to 23, 28	24 to 28	29 to 31, 36	32 to 36	• Page

* 2 μs of rise time and 10 μs of decay time to half crest. ★ For individual correspondence at Nonlatch type only
** for double coil latch type
*** 1500V for double coil latch type

Selector Chart

• Group		Miniature Relay-Signal				
• Type of Relay		**ED2** 	**EF2** 	**MR62** 	**MR62-K -Y -KY** 	**MR82** 
• Features		•ultra-low power consumption •dual-inline leads (small mounting space) •2500 V surge (2 x 10 μs*) coil to contacts •latching type available	•ultra-low power consumption •surface mount (reduced mounting space) •2500V surge (2 x 10 μs*) coil to contacts •latching type available	•DIP terminal •sealed package for flow soldering •stable contact resistance at high temperature •1500V FCC surge #	•DIP terminal •sealed package for flow soldering •stable contact resistance at high temperature •1500V FCC surge #	• DIP terminal • sealed package • lower power comsumption (200mW) • stable contact resistance at high temperature • 1500V FCC surge # coil and contacts
• Contact Arrangement		2c				
• Contact Material (standard)		silver alloy with gold alloy overlay				
• Contact Rating (resistive) (switching)	3A 2A 1A	30W/62.5 VA 1.0A		60W/125 VA 2.0A		
• Coil Voltage		1.5,3,4.5,5,6,9,12,24 Vdc		5,6,9,12,24,48 Vdc		4.5,5,6,9,12,24 Vdc
• Nominal Operate Power		30 to 70mW		550mW	400mW or 550mW	200mW
• Must Operate Voltage		80% (75%*)		62 to 72 %	70 % 48 %...80 %	70 %
• Must Release Voltage		10%		5%		
• Operate Time (typ.) (Excluding bounce)		3ms		2.5ms	2.5ms (K type 3.5ms)	5.5ms
• Release Time (typ.) (Excluding bounce Without Diode)		2ms				
• Running Specifications	Load	1×10^6 (50 Vdc, 0.1 A at 70°C,5Hz) 1×10^6 (10 Vdc, 10 mA at 70°C,2Hz)		1×10^6 (50 Vdc, 0.1 A at 85°C,5Hz) 1×10^6 (10 Vdc, 10 mA at 85°C,2Hz)		
	Nonload	10×10^6				
• With-stand Voltage	Between open contacts	1000Vac		500Vac	1000Vac or 500Vac	500Vac
	Between adjacent contacts	1000Vac				
	Between contacts and coil	1500Vac or 1000Vac**		1000Vac		
• Surge Withstand Voltage		1500V(FCC), 2500 V***(2x10 μs, coil to contacts)		1500V FCC#		
• Safety Standard		UL, CSA				
• Option		latching type		—		
• Height (mm)		9.4	10.0	11.4		
• Mounting Space (mm^2)		7.5 × 15.0	9.5 × 15.0	9.8 × 20.2		
• Page		37 to 38 , 42	39 to 41, 42	43, 46	44, 46	45, 46

#FCC surge between coi and contacts and between adjacent contacts

Selector Chart

Miniature Relay-Power			• Group
EN2 	***EP2*** 	***EP1*** 	• Type of Relay
• motor reversible control • 30% less relay space than 2 MR301 relays • symmetrical structure • flux tight housing	• motor reversible control • 50% less relay space than 2 MR301 relays • symmetrical structure • flux tight housing	• motor reversible control • 65% relay volume than MR301 • 62% relay weight than MR301 • flux tight housing	• Features
1c × 2	1c × 2	1c	• Contact Arrangement
silver oxide complex alloy			• Contact Material (standard)
35A (16Vdc)	30A(16Vdc)	30A (16Vdc)	• Contact Rating (DC motor load) (switching) 30A 25A 20A 15A 10A 5A 1A
12 Vdc			• Coil Voltage
640mW / 800mW / 1150mW	480mW / 640mW		• Nominal Operate Power
6.5 to 8.5Vdc			• Must Operate Voltage
0.6 or 0.9 Vdc	0.9 Vdc		• Must Release Voltage
Approx. 5ms			• Operate Time (typ.) (Excluding bounce)
Approx. 7ms			• Release Time (typ.) (Excluding bounce With Diode)
100×10^3 motor load 14Vdc, 30A / 7A	100×10^3 motor load 14Vdc, 25A / 3A		• Running Specifications — Load
1×10^6			• Running Specifications — Nonload
500Vac			• Withstand Voltage — Between open contacts
500Vac		—	• Withstand Voltage — Between adjacent contacts
500Vac			• Withstand Voltage — Between contacts and coil
—			• Surge Withstand Voltage
—			• Safety Standard
Separate type		—	• Option
17.0	16.5	16.5	• Height (mm)
16.5 × 33.5	16.7 × 24.3	16.7 × 15.1	• Mounting Space (mm^2)
47 to 49	50 to 52	53 to 55	• Page

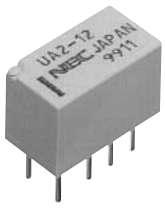
Selector Chart

• Group		Miniature Relay-Power					
		EQ1-31000	***EQ1-11040***	***EQ1-11111***	***EQ1-22111***	***ET 1***	***ET 2***
• Type of Relay							
• Features		•same pin-layout as MR301 •for general purpose •small size & light weight •flux tight housing	•same pin-layout as MR301 •for jump start •small size & light weight •flux tight housing	•same pin-layout as MR301 •for lamp & LCR circuit control •small size & light weight •flux tight housing		•motor heater and solenoid control •45% less relay volume than EP1 •56% less relay weight than EP1 •flux tight housing	•motor reversible control •50% less relay volume than EP2 •50% less relay weight than EP2 •flux tight housing
• Contact Arrangement		1c		1a		1c	1c × 2
• Contact Material (standard)		silver oxide complex alloy				silver oxide complex alloy	
• Contact Rating (DC motor load) (switching)	30A 25A 20A 15A 10A 5A 1A	30A(16Vdc)				25A(16Vdc)	
• Coil Voltage		12 Vdc					
• Nominal Operate Power		640mW	1000mW		800mW	640mW	
• Must Operate Voltage		6.5Vdc			7.2Vdc	6.5Vdc	
• Must Release Voltage		0.9 Vdc	0.6Vdc		0.7Vdc	0.9 Vdc	
• Operate Time (typ.) (Excluding bounce)		Approx. 3ms				Approx. 2.5ms	
• Release Time (typ.) (Excluding bounce With Diode)		Approx. 4ms				Approx. 3ms	
• Running Specifications	Load	100×10^3 motor load, 25A / 3A		100×10^3 lamp load or LCR circuit (peak current 70A)		100×10^3 motor load	
	Nonload	1×10^6					
• Withstand Voltage	Between open contacts	500Vac					
	Between adjacent contacts	—					
	Between contacts and coil	500Vac					
• Surge Withstand Voltage		—					
• Safety Standard		—					
• Option		—					
• Height (mm)		15.4				11.0	
• Mounting Space (mm^2)		15.0 × 21.8				13.3 × 14.5	13.3 × 22.5
• Page		56 to 57				58 to 61	

Selector Chart

Miniature Relay-Power			• Group	
MR301	***MR301-H***	***MR301-E***		
			• Type of Relay	
• low profile • specialty for automotive • flux tight	• low profile • high power switching • flux tight	• low profile • high power switching • flux tight • specialty for automotive	• Features	
1c			• Contact Arrangement	
silver nickel alloy	silver oxide complex alloy		• Contact Material (standard)	
150W/600 VA (resistive load) 5A	300W/1200 VA (resistive load) 10A	240W (DC motor load) 15A (16Vdc)	15A 10A 5A 1A 0.1A	• Contact Rating (switching)
3,5,6,9,12,24 Vdc		9,12 Vdc	• Coil Voltage	
360mW			• Nominal Operate Power	
70%			• Must Operate Voltage	
10%			• Must Release Voltage	
Approx. 5ms			• Operate Time (typ.) (Excluding bounce)	
Approx. 6ms (with diode)			• Release Time (typ.) (Excluding bounce Without Diode)	
100×10^3 14Vdc, 5A	100×10^3 14Vdc, 10A	100×10^3 (DC motor load) 14Vdc, 15A	Load	• Running Specifications
10×10^6			Nonload	
750Vac			Between open contacts	• Withstand Voltage
—			Between adjacent contacts	
1500Vac			Between contacts and coil	
—			• Surge Withstand Voltage	
UL, CSA			• Safety Standard	
—			• Option	
17.0			• Height (mm)	
16.5 × 22.5			• Mounting Space (mm^2)	
62 to 63			• Page	

UA2 Series

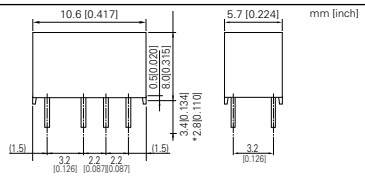


NECTOKIN's UA2 relay is a new generation Miniature Singnal Relay of super-compact size and slim-package.

■ FEATURES

- small mounting size of slim package for dence mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Power consumption 140mW, Low power consumption 100mW type is available
- UL recognized (E73266), CSA certified (LR46266)

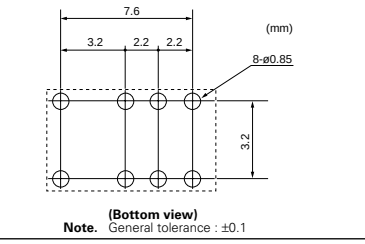
■ DIMENSIONS mm(inch)



Tolerance of lead pitch is ±0.15 mm[0.006 inch]
Another tolerance is ± 0.3 mm [0.012inch]
() is reference.
*Value of trimmed lead type (NJ type)

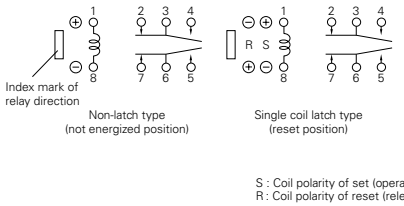
■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



(Bottom view)
Note. General tolerance : ±0.1

■ SCHEMATICS (bottom view)



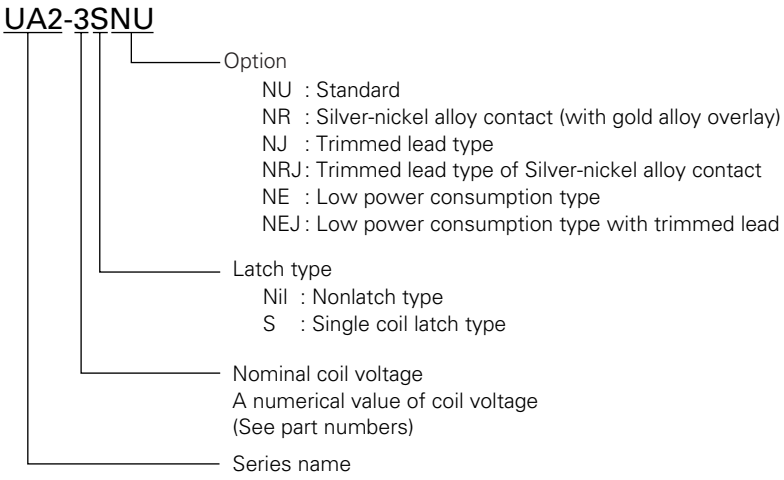
S : Coil polarity of set (operate)
R : Coil polarity of reset (release)

■ SPECIFICATIONS

Contact Form			2 Form c
Contact Material			Silver alloy with gold alloy overlay
Contact Ratings		Maximum Switching Power	30 W, 37.5 VA
		Maximum Switching Voltage	220 Vdc, 250 Vac
		Maximum Switching Current	1 A
		Maximum Carrying Current	1 A
Minimum Contact Ratings			10 mVdc, 10 μA*1
Initial Contact Resistance			100 mΩ max.(Initial)
Nominal Operating Power		Nonlatch type	140 mW (1.5 to 12 V), 230 mW (24 V) | 100 mW (low power consumption type)
		Single coil latch type	100 mW (1.5 to 12 V), 120 mW (24 V)
Operate Time (Excluding bounce)			Approx. 2 ms
Release Time (Excluding bounce)			Approx. 1 ms
Insulation Resistance			1000 MΩ at 500 Vdc
Withstand Voltage		Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
		Between adjacent contacts	
		Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)
Shock Resistance			735 m/s² (misoperation) 980 m/s² (destructive failure)
Vibration Resistance			10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature			-40 to + 85°C
Coil Temperature Rise			18 degrees at nominal coil voltage (140 mW)
Running Specifications		Nonload	5 × 10⁷ *4 operations(Non-latch type)
		Load	30 Vdc, 1 A (resistive), 1 × 10⁵ operations at 20°C
			125 Vac, 0.3 A (resistive), 1 × 10⁵ operations at 20°C
Weight			Approx. 1 g

* 1 This value is a reference value in the resistance load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

■ PART NUMBER SYSTEM



■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certified (CSA C22.2 No14)+ File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.3 A (Resistive)	

* Spacing : UL840
\+ Spacing : CSA std950

TUV Certified (EN61810)
No. R 2050596
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)
Basic insulation class

■ PART NUMBERS

• Nonlatch Type

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UA2-1.5NU	1.5	16	1.13	0.15
UA2-3NU	3	64.3	2.25	0.3
UA2-4.5NU	4.5	145	3.38	0.45
UA2-5NU	5	178	3.75	0.5
UA2-6NU	6	257	4.5	0.6
UA2-9NU	9	579	6.75	0.9
UA2-12NU	12	1028	9.0	1.2
UA2-24NU	24	2504	18.0	2.4

• Single Coil Latch Type

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UA2-1.5SNU	1.5	22.5	1.13	1.13
UA2-3SNU	3	90	2.25	2.25
UA2-4.5SNU	4.5	202.5	3.38	3.38
UA2-5SNU	5	250	3.75	3.75
UA2-6SNU	6	360	4.5	4.5
UA2-9SNU	9	810	6.75	6.75
UA2-12SNU	12	1440	9.0	9.0
UA2-24SNU	24	4800	18.0	18.0

• Nonlatch NE Type (Low power consumption)

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UA2-3NE	3	90	2.25	0.3
UA2-4.5NE	4.5	202.5	3.38	0.45
UA2-5NE	5	250	3.75	0.5

Note * Test by pulse voltage
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

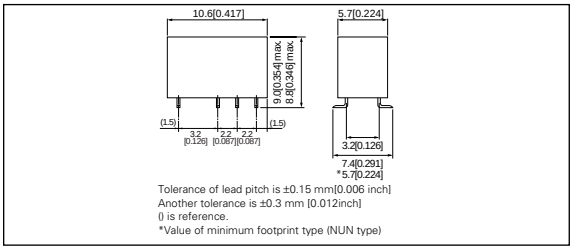
UB2 Series

NEC TOKN's UB2 relay is a new generation Miniature Singnal Relay of super-compact size and slim-package for surface mounting.

■ FEATURES

- Small mounting size of slim package for dence mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Power consumption 140 mW, Low power consumption 100 mW type is available.
- UL recognized (E73266), CSA certified (LR46266)
- Tube or embossed tape packaging.

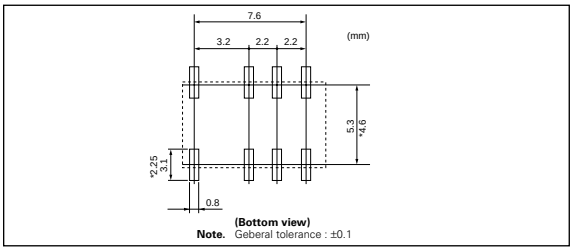
■ DIMENSIONS mm(inch)



Tolerance of lead pitch is ±0.15 mm[0.006 inch]
Another tolerance is ±0.3 mm [0.012inch]
() is reference.
*Value of minimum footprint type (NUN type)

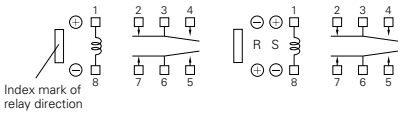
■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



(Bottom view)
Note. Geberal tolerance : ±0.1

■ SCHEMATICS (bottom view)



Index mark of relay direction

Non-latch type (not energized position)

Single coil latch type (reset position)

S : Coil polarity of set (operate)
R : Coil polarity of reset (release)

■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	30 W, 37.5 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	1 A
	Maximum Carrying Current	1 A
Minimum Contact Ratings		10 mVdc, 10 μA*1
Initial Contact Resistance		100 mΩ max.(Initial)
Nominal Operating Power	Nonlatch type	140 mW (1.5 to 12 V), 230 mW (24 V) | 100 mW (low power consumption type)
	Single coil latch type	100 mW (1.5 to 12 V), 120 mW (24 V)
Operate Time (Excluding bounce)		Approx. 2 ms
Release Time (Excluding bounce)		Approx. 1 ms
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)
Shock Resistance		735 m/s² (misoperation) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperation) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 85°C
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)
Running Specifications	Nonload	5 × 10⁷ *4 operations(Nonlatch type)
	Load	30 Vdc, 1 A (resistive), 1 × 10⁵ operations at 20°C
		125 Vac, 0.3 A (resistive), 1 × 10⁵ operations at 20°C
Weight		Approx. 1 g

* 1 This value is a reference value in the resistance load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

UB2 Series

■ PART NUMBER SYSTEM

UB2-3SNU - L1

- Package
  - Nil : Tube
  - L : Embossed carrying tape of L type
  - R : Embossed carrying tape of R type
- Option
  - NU : Standard
  - NR : Silver-nickel alloy contact (with gold alloy overlay)
  - NUN : Minimum footprint type
  - NRN : Minimum footprint type of Silver-nickel alloy contact
  - NE : Low power consumption type
  - NEN : Low power consumption type with trimmed lead
- Latch type
  - Nil : Nonlatch type
  - S : Single coil latch type
- Nominal coil voltage
  A numerical value of coil voltage
  (See part numbers)
- Series name

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14)+ File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.3 A (Resistive)	

* Spacing : UL840
+ Spacing : CSA std950

TUV Certified (EN61810)
No. R 2050596
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)
Basic insulation class

■ PART NUMBERS

• Nonlatch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UB2-1.5NU	1.5	16	1.13	0.15
UB2-3NU	3	64.3	2.25	0.3
UB2-4.5NU	4.5	145	3.38	0.45
UB2-5NU	5	178	3.75	0.5
UB2-6NU	6	257	4.5	0.6
UB2-9NU	9	579	6.75	0.9
UB2-12NU	12	1028	9.0	1.2
UB2-24NU	24	2504	18.0	2.4

• Single Coil Latch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UB2-1.5SNU	1.5	22.5	1.13	1.13
UB2-3SNU	3	90	2.25	2.25
UB2-4.5SNU	4.5	202.5	3.38	3.38
UB2-5SNU	5	250	3.75	3.75
UB2-6SNU	6	360	4.5	4.5
UB2-9SNU	9	810	6.75	6.75
UB2-12SNU	12	1440	9.0	9.0
UB2-24SNU	24	4800	18.0	18.0

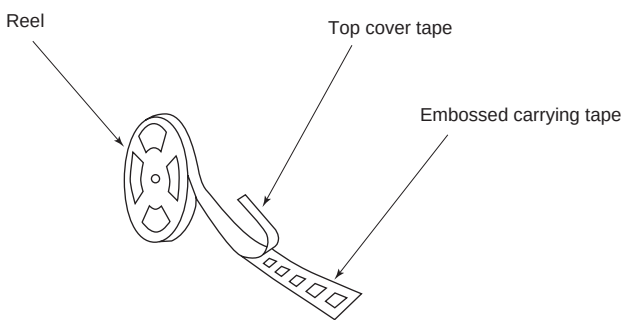
• Nonlatch NE Type (Low power consumption)

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UB2-3NE	3	90	2.25	0.3
UB2-4.5NE	4.5	202.5	3.38	0.45
UB2-5NE	5	250	3.75	0.5

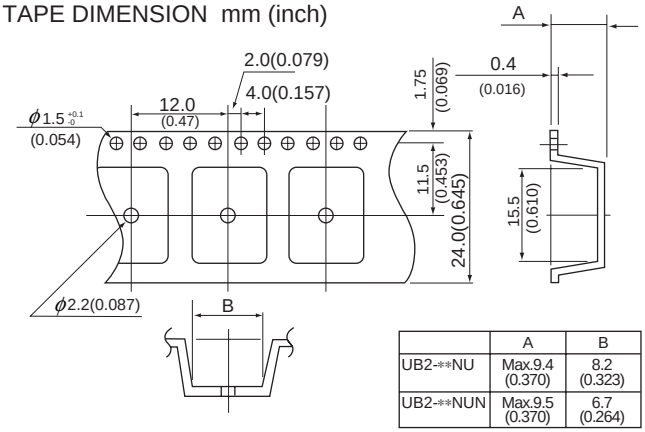
Note * Test by pulse voltage
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

■ TAPE PACKAGE (OPTION)

APPEARANCE

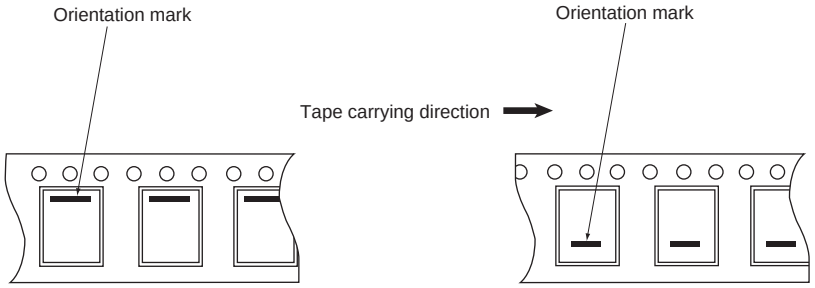


TAPE DIMENSION mm (inch)



	A	B
UB2-**NU	Max.9.4 (0.370)	8.2 (0.323)
UB2-**NUN	Max.9.5 (0.370)	6.7 (0.264)

Relay orientation mark and tape carrying direction.

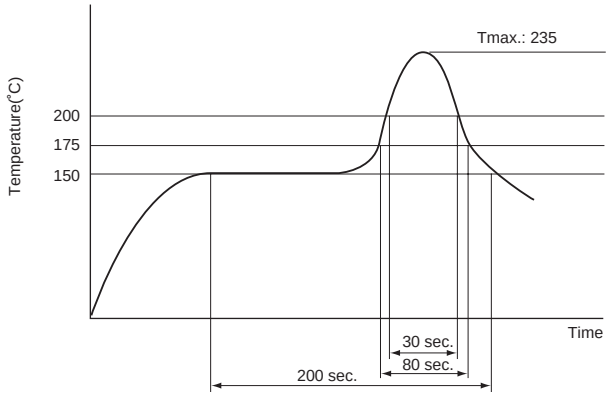


UB2-⋆⋆⋆-L

UB2-⋆⋆⋆⋆-R

■ SOLDERING CONDITION

IRS Method



Note

1. Temperature profile shows printed circuit board surface temperature on the relay terminal portion.
2. Check the actual soldering condition to use other method except above mentioned temperature profiles.

■ Recommended relay drive conditions

Drive under conditions. If it is impossible, please inquire to NEC TOKIN.

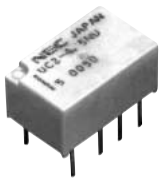
Nonlatch type	Voltage:within ±5% at nominal voltage	
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% at nominal voltage Pulse width: more than 10 ms	Ambient temperature -40~+85˚C

■ Technical document

Please confirm technical document before use.
It is able to receive a document at NEC TOKIN's World-wide-web site.
(http://www.nec-tokin.com)

ITEM	TITLE
Data sheet	UA2/UB2 series
	UA2/UB2 series NE type
Information	UA2/UB2 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

UC2 Series

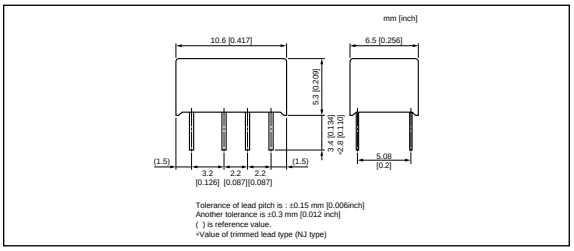


NEC TOKIN's UC2 relay is a new generation Miniature Singnal Relay of super-compact size and flat-package.

■ FEATURES

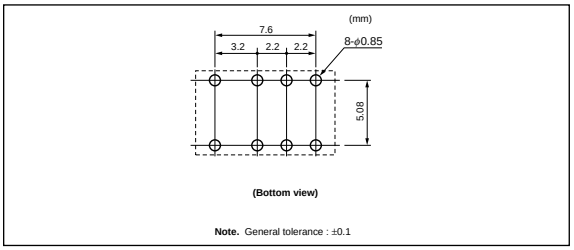
- small mounting size of flat package for dence mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Low power consumption 140mW
- UL recognized (E73266), CSA certified (LR46266)

■ DIMENSIONS mm(inch)

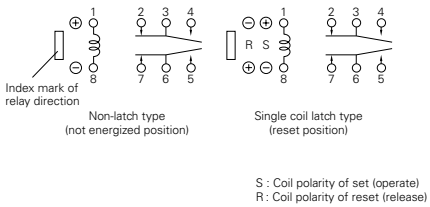


■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ SCHEMATICS (bottom view)

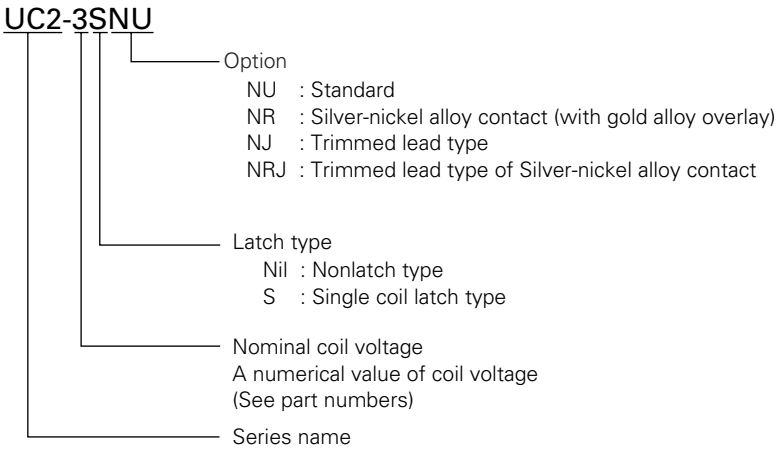


■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	30 W, 37.5 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	1 A
	Maximum Carrying Current	1 A
Minimum Contact Ratings		10 mVdc, 10 μA*1
Initial Contact Resistance		100 mΩ max.(Initial)
Nominal Operating Power	Nonlatch type	140 mW (1.5 to 12 V), 230 mW (24 V)
	Single coil latch type	100 mW (1.5 to 12 V), 120 mW (24 V)
Operate Time (Excluding bounce)		Approx. 2 ms
Release Time (Excluding bounce)		Approx. 1 ms
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)
Shock Resistance		735 m/s² (misoperation) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 85°C
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)
Running Specifications	Nonload	5×10^7 *4 operations(Non-latch type)
	Load	30 Vdc, 1 A (resistive), 1×10^5 operations at 20°C
		125 Vac, 0.3 A (resistive), 1×10^5 operations at 20°C
Weight		Approx. 0.8 g

* 1 This value is a reference value in the resistance load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10^7 times.

■ PART NUMBER SYSTEM



■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certified (CSA C22.2 No14)+ File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL840
\+ Spacing : CSA std950

TUV Certified (EN61810)
No. R 2050596
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)
Basic insulation class

■ PART NUMBERS

• Nonlatch Type

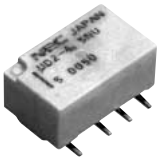
Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UC2-1.5NU	1.5	16	1.13	0.15
UC2-3NU	3	64.3	2.25	0.3
UC2-4.5NU	4.5	145	3.38	0.45
UC2-5NU	5	178	3.75	0.5
UC2-6NU	6	257	4.5	0.6
UC2-9NU	9	579	6.75	0.9
UC2-12NU	12	1028	9.0	1.2
UC2-24NU	24	2504	18.0	2.4

• Single Coil Latch Type

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UC2-1.5SNU	1.5	22.5	1.13	1.13
UC2-3SNU	3	90	2.25	2.25
UC2-4.5SNU	4.5	202.5	3.38	3.38
UC2-5SNU	5	250	3.75	3.75
UC2-6SNU	6	360	4.5	4.5
UC2-9SNU	9	810	6.75	6.75
UC2-12SNU	12	1440	9.0	9.0
UC2-24SNU	24	4800	18.0	18.0

Note * Test by pulse voltage
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

UD2 Series

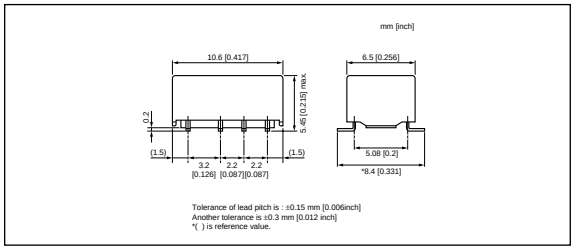


NEC TOKIN's UD2 relay is a new generation Miniature Singnal Relay of super-compact size and flat-package for surface mounting.
But , the latching type production is going to start after June 2000.

■ FEATURES

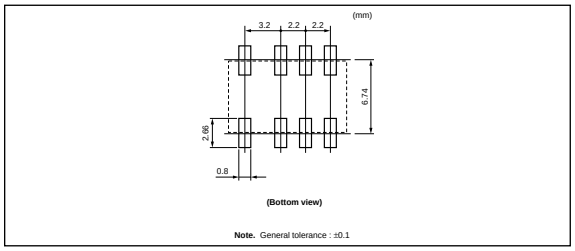
- Small mounting size of flat package for dence mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Low power consumption 140 mW
- UL recognized (E73266), CSA certified (LR46266)
- Tube or embossed tape packaging.

■ DIMENSIONS mm(inch)

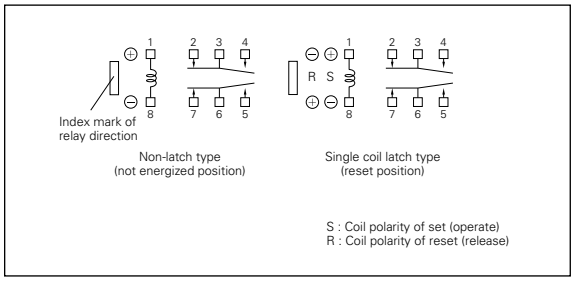


■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ SCHEMATICS (bottom view)



■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	30 W, 37.5 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	1 A
	Maximum Carrying Current	1 A
Minimum Contact Ratings		10 mVdc, 10 μA*1
Initial Contact Resistance		100 mΩ max.(Initial)
Nominal Operating Power	Nonlatch type	140 mW (1.5 to 12 V), 230 mW (24 V)
	Single coil latch type	100 mW (1.5 to 12 V), 120 mW (24 V)
Operate Time (Excluding bounce)		Approx. 2 ms
Release Time (Excluding bounce)		Approx. 1 ms
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)
Shock Resistance		735 m/s² (misoperation) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperation) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 85°C
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)
Running Specifications	Nonload	5 × 10⁷ *4 operations(Nonlatch type)
	Load	30 Vdc, 1 A (resistive), 1 × 10⁵ operations at 20°C
		125 Vac, 0.3 A (resistive), 1 × 10⁵ operations at 20°C
Weight		Approx. 0.8 g

* 1 This value is a reference value in the resistance load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

■ PART NUMBER SYSTEM

UD2-3SNU - L1

- Package
  - Nil : Tube
  - L : Embossed carrying tape of L type
  - R : Embossed carrying tape of R type
- Option
  - NU : Standard
  - NR : Silver-nickel alloy contact (with gold alloy overlay)
  - NUN : Minimum footprint type
  - NRN : Minimum footprint type of Silver-nickel alloy contact
- Latch type
  - Nil : Nonlatch type
  - S : Single coil latch type
- Nominal coil voltage
  A numerical value of coil voltage
  (See part numbers)
- Series name

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14)+ File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL508
+ Spacing : CSA std950

TUV Certified (EN61810)
No. R 2050596
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)
Basic insulation class

■ PART NUMBERS

• Nonlatch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UD2-1.5NU	1.5	16	1.13	0.15
UD2-3NU	3	64.3	2.25	0.3
UD2-4.5NU	4.5	145	3.38	0.45
UD2-5NU	5	178	3.75	0.5
UD2-6NU	6	257	4.5	0.6
UD2-9NU	9	579	6.75	0.9
UD2-12NU	12	1028	9.0	1.2
UD2-24NU	24	2504	18.0	2.4

• Single Coil Latch Type

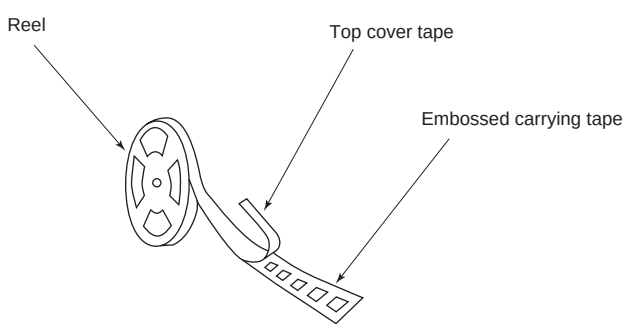
at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
UD2-1.5SNU	1.5	22.5	1.13	1.13
UD2-3SNU	3	90	2.25	2.25
UD2-4.5SNU	4.5	202.5	3.38	3.38
UD2-5SNU	5	250	3.75	3.75
UD2-6SNU	6	360	4.5	4.5
UD2-9SNU	9	810	6.75	6.75
UD2-12SNU	12	1440	9.0	9.0
UD2-24SNU	24	4800	18.0	18.0

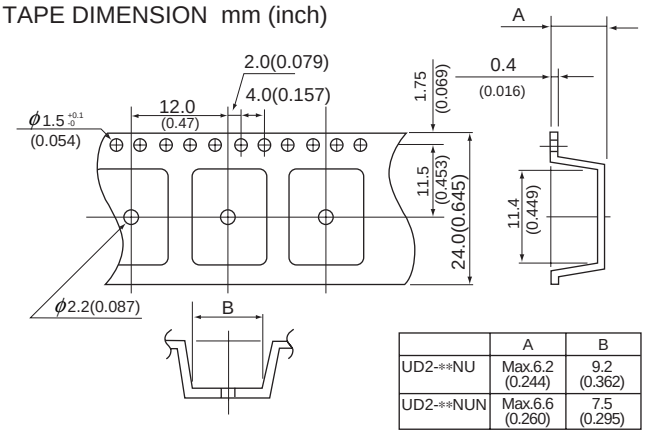
Note * Test by pulse voltage
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

■ TAPE PACKAGE (OPTION)

APPEARANCE

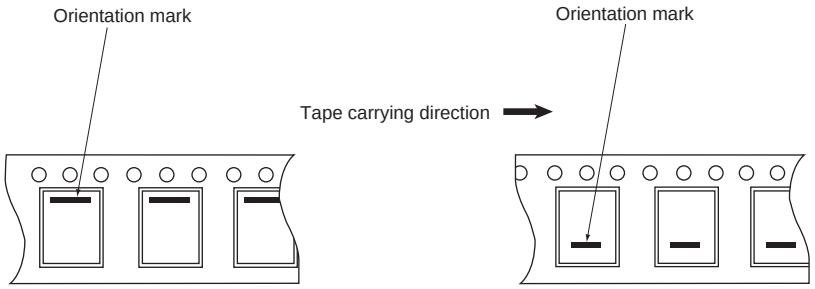


TAPE DIMENSION mm (inch)



	A	B
UD2-**NU	Max.6.2 (0.244)	9.2 (0.362)
UD2-**NUN	Max.6.6 (0.260)	7.5 (0.295)

Relay orientation mark and tape carrying direction.

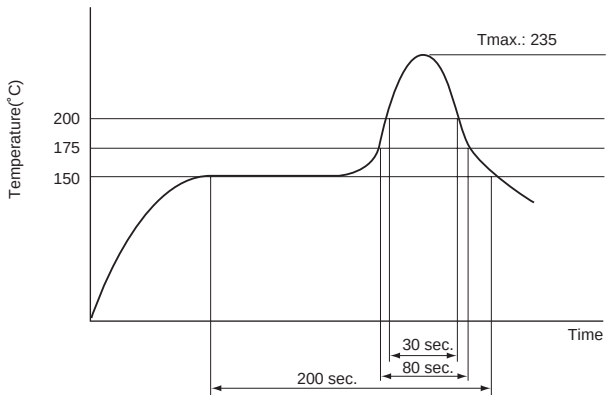


UD2-⋆⋆⋆-L

UD2-⋆⋆⋆⋆-R

■ SOLDERING CONDITION

IRS Method



Note

1. Temperature profile shows printed circuit board surface temperature on the relay terminal portion.
2. Check the actual soldering condition to use other method except above mentioned temperature profiles.

■ Recommended relay drive conditions

Drive under conditions. If it is impossible, please inquire to NEC TOKN.

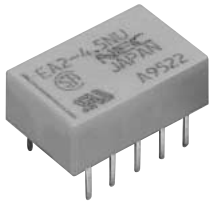
Nonlatch type	Voltage:within ±5% at nominal voltage	
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% at nominal voltage Pulse width: more than 10 ms	Ambient temperature -40~+85˚C

■ Technical document

Please confirm technical document before use.
It is able to receive a document at NEC TOKIN's World-wide-web site.
(http://www.nec-tokin.com)

ITEM	TITLE
Data sheet	UC2/UD2 series
Information	UC2/UD2 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

EA2 Series

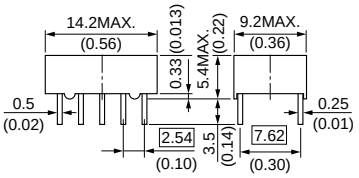


The EA2 series has reduced package size and power consumption compared to other NEC TOKIN conventional relays. Furthermore, it complies with 1500 V surge-voltage requirement of FCC Part 68 by the unique structure and the efficient magnetic circuit.

■ FEATURES

- Low power consumption
- Compact and light weight
- 2 form c contact arrangement
- Low magnetic interference
- Breakdown voltage : 1000 Vac (surge voltage 1500 V), FCC Part 68 compliant
- Tube packaging
- UL recognized (E73266), CSA certified (LR46266)

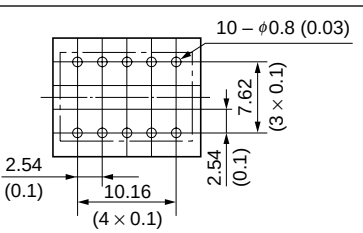
■ DIMENSIONS mm(inch)



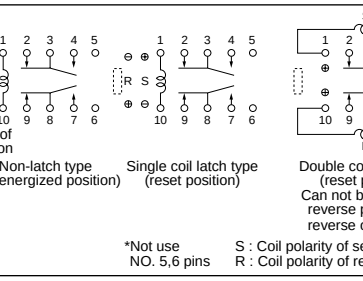
Note: Tolerance ±0.2 unless otherwise specified
NJ: Cover hight — 6.3mm, Lead —2.8mm

■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ SCHEMATICS (bottom view)



Non-latch type (not energized position)
Single coil latch type (reset position)
Double coil latch type (reset position) Can not be driven by reverse polarity for reverse operation.

*Not use NO. 5,6 pins
S : Coil polarity of set (operate)
R : Coil polarity of reset (release)

■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	30 W, 62.5 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	1 A
	Maximum Carrying Current	2 A
Minimum Contact Ratings		10 mVdc, 10 μA*1
Initial Contact Resistance		50 mΩtyp.(Initial)
Nominal Operating Power	Nonlatch type	140 mW (3 to 12 V), 200 mW (24 V)
	Single coil latch type	100 mW (3 to 12 V), 150 mW (24 V)
	Double coil latch type	140 mW (3 to 12 V), 200 mW (24 V)
Operate Time (Excluding bounce)		Approx. 2 ms
Release Time (Excluding bounce)		Approx. 1 ms without diode
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
Shock Resistance		735 m/s² (misoperating) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 85°C
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)
Running Specifications	Nonload	1×10^8 *3 operations(Non-latch type) 1×10^7 operations(latch type)
	Load	50 Vdc, 0.1 A (resistive) 1×10^6 operations at 85°C, 5 Hz
		10 Vdc, 10 mA (resistive) 1×10^6 operations at 85°C, 2 Hz
Weight		Approx. 1.5 g

* 1 This value is a reference value in the resistance load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10^7 times.

■ PART NUMBER SYSTEM

EA2-3SNU

- NU : Standard type
- NJ : Trimmed leads type
- NP : Silver-palladium alloy contact (with gold alloy overlay)

Latch type
- Nil : Nonlatch type (standard)
- S : Single coil latch type
- T : Double coil latch type

Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 1A (Resistive) 110 Vdc, 0.3A (Resistive) 125 Vac, 0.5A (Resistive)	

* Spacing : UL114, UL478

■ PART NUMBERS

• Nonlatch Type at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EA2-3	3	64.3	2.25	0.3
EA2-4.5	4.5	145	3.38	0.45
EA2-5	5	178	3.75	0.5
EA2-6	6	257	4.5	0.6
EA2-9	9	579	6.75	0.9
EA2-12	12	1028	9.0	1.2
EA2-24	24	2880	18.0	2.4

• Single Coil Latch Type at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EA2-3S	3	90	2.25	2.25
EA2-4.5S	4.5	202.5	3.38	3.38
EA2-5S	5	250	3.75	3.75
EA2-6S	6	360	4.5	4.5
EA2-9S	9	810	6.75	6.75
EA2-12S	12	1440	9.0	9.0
EA2-24S	24	3840	18.0	18.0

• Double Coil Latch Type** (Can not be driven by reverse polarity for reverse operation) at 20 °C

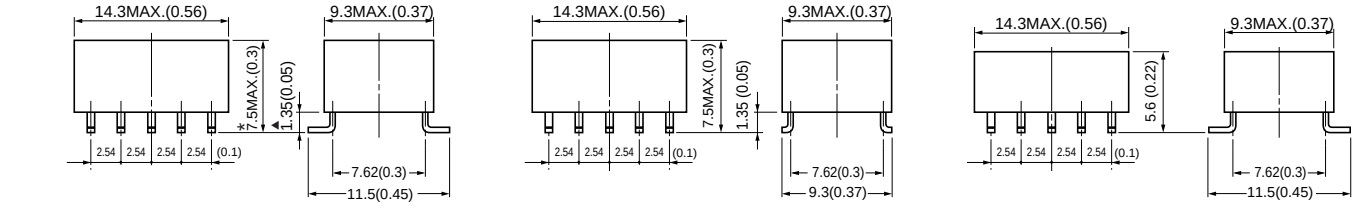
Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EA2-3T	3	S 64.3 R 64.3	2.25 –	– 2.25
EA2-4.5T	4.5	S 145 R 145	3.38 –	– 3.38
EA2-5T	5	S 178 R 178	3.75 –	– 3.75
EA2-6T	6	S 257 R 257	4.5 –	– 4.5
EA2-9T	9	S 579 R 579	6.75 –	– 6.75
EA2-12T	12	S 1028 R 1028	9.0 –	– 9.0
EA2-24T	24	S 2880 R 2880	18.0 –	– 18.0

Note * Test by pulse voltage
** S : Set coil (pin No.1⋯ ⊕ , pin No.5⋯ ⊖) R : Reset coil (pin No.10⋯ ⊕ , pin No.6⋯ ⊖)
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

EB2 Series

The EB2 series has adapted IRS, VPS surface mounting technique, and sustained the high-performance of EA2 series.

■ DIMENSIONS mm(inch)



*NUE TYPE
6.5 mm MAX.
(0.26)

EB-..
EB-..NU
EB-..NUE

▲NUE TYPE
0.8 mm MAX.
(0.03)

EB-..NUH

EB2-..NUL

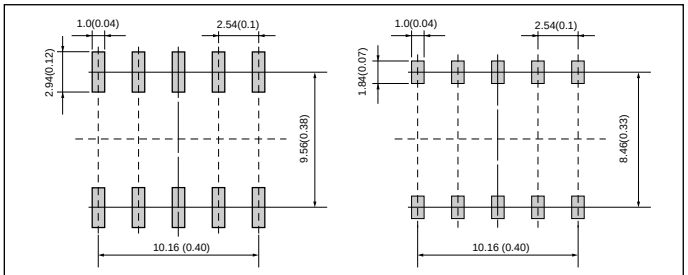
Note : Tolerance ±0.2 mm unless otherwise specified

■ FEATURES

- Compact and light weight
- 2 form c contact arrangement
- Low power consumption
- Low magnetic interference
- Breakdown voltage : 1000 Vac (surge voltage 1500 V), FCC Part 68 compliant
- Tube or Embossed tape packaging
- UL recognized (E73266), CSA certified (LR46266)

■ RECOMMENDED PAD LAYOUT

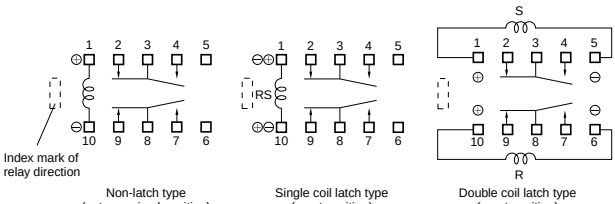
(bottom view)mm(inch)



EB2-..
EB2-..NU,EB2-..NUL
EB2-..NUE

EB2-..NUH

■ SCHEMATICS (bottom view)



Non-latch type
(not energized position)

Single coil latch type
(reset position)

Double coil latch type
(reset position)

Can not be driven by reverse polarity for reverse operation.

*Not use
No. 5, 6 pins

S : Coil polarity of set (operate)
R : Coil polarity of reset (release)

■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	30 W, 62.5 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	1 A
	Maximum Carrying Current	2 A
Minimum Contact Ratings		10 mVdc, 10 μA*1
Initial Contact Resistance		50 mΩtyp.(Initial)
Nominal Operating Power	Nonlatch type	140 mW (3 to 12 V), 200 mW (24 V)
	Single coil latch type	100 mW (3 to 12 V), 150 mW (24 V)
	Double coil latch type	140 mW (3 to 12 V), 200 mW (24 V)
Operate Time (Excluding bounce)		Approx. 2 ms
Release Time (Excluding bounce)		Approx. 1 ms without diode
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)
Shock Resistance		735 m/s² (misoperating) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 85°C
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)
Running Specifications	Nonload	1×10^8 *3 operations(Non-latch type) 1×10^7 operations(latch type)
	Load	50 Vdc, 0.1 A (resistive) 1×10^6 operations at 85°C, 5 Hz
		10 Vdc, 10 mA (resistive) 1×10^6 operations at 85°C, 2 Hz
Weight		Approx. 1.5 g

* 1 This value is a reference value in the resistance load.
  Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10^7 times.

■ PART NUMBER SYSTEM

EB2-3SNU-L

- Packaging code
  - Nil: Tube
  - L:Embossed carrying tape (L type)
  - R:Embossedcarryingtape(Rtype)
- NU: Standard type
  - NUH: Minimum footprint type
  - NUE: Low profile type (h =6.5 mm)
  - NUL: Ultra-low profile type (h= 5.6 mm)
- Latch type
  - Nil: Nonlatch type (standard)
  - S: Single coil latch type
  - T: Double coil latch type
- Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL114, UL478

■ PART NUMBERS

• Nonlatch Type at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EB2-3	3	64.3	2.25	0.3
EB2-4.5	4.5	145	3.38	0.45
EB2-5	5	178	3.75	0.5
EB2-6	6	257	4.5	0.6
EB2-9	9	579	6.75	0.9
EB2-12	12	1028	9	1.2
EB2-24	24	2880	18	2.4

• Single Coil Latch Type at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EB2-3S	3	90	2.25	2.25
EB2-4.5S	4.5	202.5	3.38	3.38
EB2-5S	5	250	3.75	3.75
EB2-6S	6	360	4.5	4.5
EB2-9S	9	810	6.75	6.75
EB2-12S	12	1440	9.0	9.0
EB2-24S	24	3840	18.0	18.0

• Double Coil Latch Type** (Can not be driven by reverse polarity for reverse operation) at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EB2-3T	3	S 64.3 R 64.3	2.25 –	– 2.25
EB2-4.5T	4.5	S 145 R 145	3.38 –	– 3.38
EB2-5T	5	S 178 R 178	3.75 –	– 3.75
EB2-6T	6	S 257 R 257	4.5 –	– 4.5
EB2-9T	9	S 579 R 579	6.75 –	– 6.75
EB2-12T	12	S 1028 R 1028	9.0 –	– 9.0
EB2-24T	24	S 2880 R 2880	18.0 –	– 18.0

Note * Test by pulse voltage

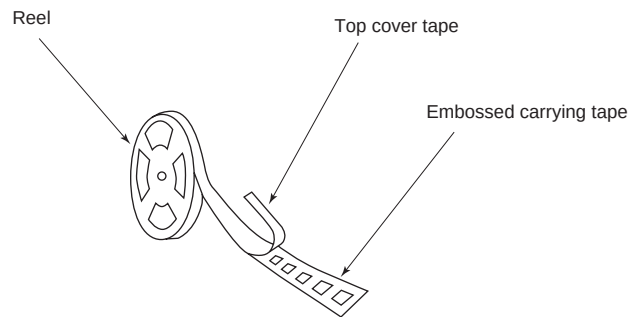
** S : Set coil (pin No.1⋯⊕ , pin No.5⋯⊖) R : Reset coil (pin No.10⋯⊕ , pin No.6⋯⊖)

The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.

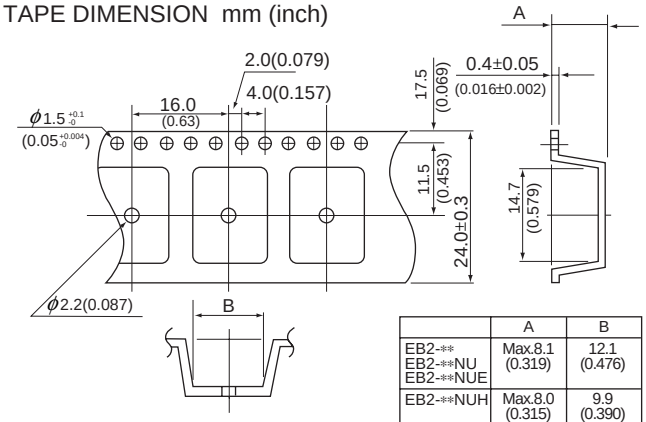
Any special coil requirement, Please contact NEC TOKIN for availability.

■ TAPE PACKAGE (OPTION)

APPEARANCE

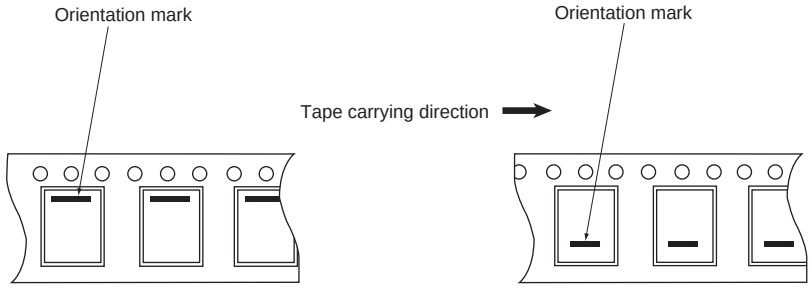


TAPE DIMENSION mm (inch)



	A	B
EB2-** EB2-**NU EB2-**NUE	Max.8.1 (0.319)	12.1 (0.476)
EB2-**NUH	Max.8.0 (0.315)	9.9 (0.390)
EB2-**NUL	Max.6.5 (0.256)	12.1 (0.476)

Relay orientation mark and tape carrying direction.

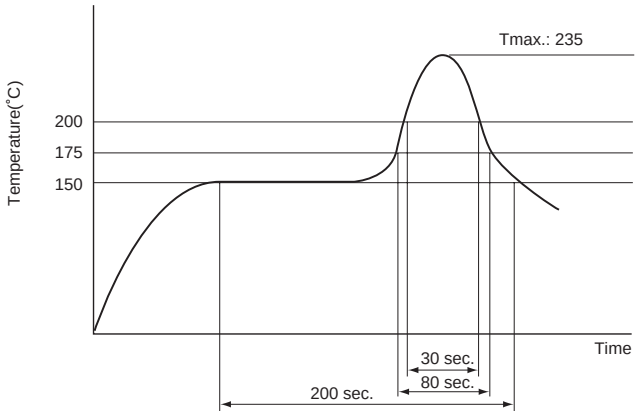


EB2-⋆⋆⋆-L

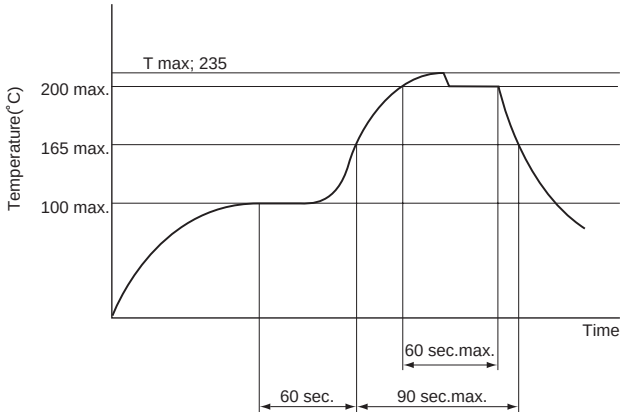
EB2-⋆⋆⋆⋆-R

■ SOLDERING CONDITION

IRS Method



VPS Method



Note

1. Temperature profile shows printed circuit board surface temperature on the relay terminal portion.
2. Please check the actual soldering condition to use other method except above mentioned temperature profiles.

■ Recommended relay drive conditions

Drive under conditions. If it is impossible, please inquire to NEC TOKIN.

Nonlatch type	Voltage:within ±5% at nominal voltage	
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% at nominal voltage Pulse width: more than 10 ms	Ambient temperature -40~+85˚C

■ Technical document

Please confirm technical document before use.
It is able to receive a document at NEC TOKIN's World-wide-web site.
(http://www.nec-tokin.com)

ITEM	TITLE
Data sheet	EA2 series
	EB2 series
Information	EA2 series technical data
	EB2 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

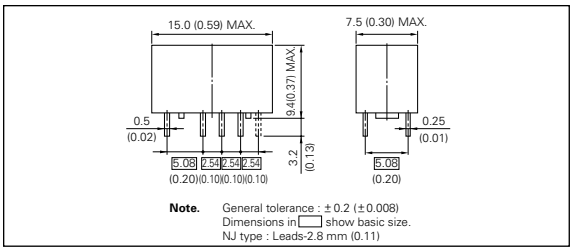
EC2 Series

The EC2 series has reduced mounting space but sustained high- performance of NEC EA2 series. Furthermore, it complies with 2500 V surge-voltage requirement of Bellcore specifications.

■ FEATURES

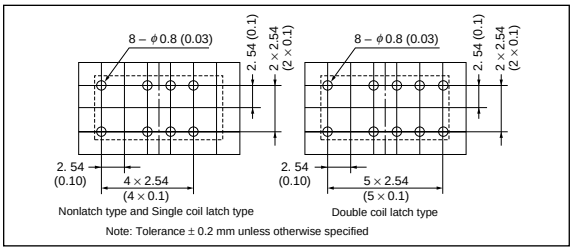
- Compact and light weight
- 2 form c contact arrangement
- Low power consumption
- Reduced mounting space: 15 mm × 7.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V, (2 × 10 μs*3)
- Capable of High-power switching: 700 Vac, 4.2A, 4 times in case of accident
- UL recognized (E73266), CSA certified (LR46266)
- ND type (High-insulation type) conform to supplemetary insulation for EN60950 (TUV certified)

■ DIMENSIONS mm(inch)

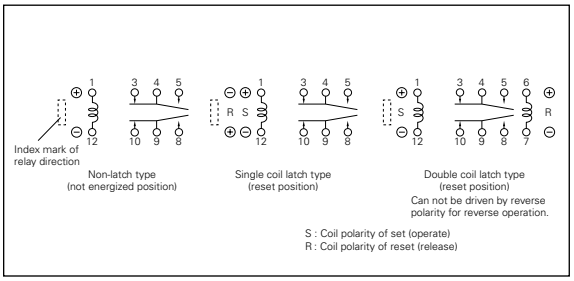


■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ SCHEMATICS (bottom view)



■ SPECIFICATIONS

Contact Form		2 Form c	
Contact Material		Silver alloy with gold alloy overlay	
Contact Ratings (UL/CSA Rating)	Maximum Switching Power	60 W, 125 VA	
	Maximum Switching Voltage	220 Vdc, 250 Vac	
	Maximum Switching Current	2A	
	Maximum Carrying Current	2A	
Minimum Contact Ratings		10 mVdc, 10 μA*1	
Initial Contact Resistance		50 mΩ typ.(Initial)	
Nominal Operating Power	Nonlatch type	140 mW (3 to 12 V), 200 mW (24 V)	ND type 200 to 230 mW
	Single coil latch type	100 mW	ND type 100 to 170 mW
	Double coil latch type	140 mW	
Operate Time (Excluding bounce)		Approx. 2 ms	
Release Time (Excluding bounce)		Approx. 1 ms without diode	
Insulation Resistance		1000 MΩ at 500 Vdc	
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)	
	Between adjacent contacts		
	Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)	Double Coil 1000 Vac (for one miniute) Latch type 1500 V surge (10 × 160 μs*3)
Shock Resistance		735 m/s² (misoperating) 980 m/s² (destructive failure)	
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)	
Ambient Temperature		-40 to + 85°C	
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)	
Running Specifications	Nonload	1 × 10⁸ *4 operations(Non-latch type) 1 × 10⁷ operations(latch type)	
	Load	50 Vdc, 0.1 A (resistive) 1 × 10⁶ operations at 85°C, 5 Hz	
		10 Vdc, 10 mA (resistive) 1 × 10⁶ operations at 85°C, 2 Hz	
Weight		Approx. 1.9 g	

* 1 This value is a reference value in the resistance load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

EC2 Series

■ PART NUMBER SYSTEM

EC2-3SNU

- NU : Standard type
- NJ : Trimmed leads type
- NP : Silver-palladium alloy contact (with gold alloy overlay)
- ND : High insulation type (TUV certified)

Latch type

- Nil : Nonlatch type (standard)
- S : Single coil latch type
- T : Double coil latch type

Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 2 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL114, UL478

TUV Certified (EN60255 / IEC60255)	
No. R 9750561	No. R 9751153
"ND" Type (Nonlatch and Single-coil-latch)	Except ND Type (Nonlatch and Single-coil-latch)
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)	
Supplementary insulation class	Basic insulation class

■ PART NUMBERS

• Nonlatch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EC2-3	3	64.3	2.25	0.3
EC2-4.5	4.5	145	3.38	0.45
EC2-5	5	178	3.75	0.5
EC2-6	6	257	4.5	0.6
EC2-9	9	579	6.75	0.9
EC2-12	12	1028	9.0	1.2
EC2-24	24	2880	18.0	2.4

• Single Coil Latch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EC2-3S	3	90	2.25	2.25
EC2-4.5S	4.5	202.5	3.38	3.38
EC2-5S	5	250	3.75	3.75
EC2-6S	6	360	4.5	4.5
EC2-9S	9	810	6.75	6.75
EC2-12S	12	1440	9.0	9
EC2-24S	24	5760	18.0	18

Note * Test by pulse voltage

** S : Set coil (pin No.1··· ⊕ , pin No.12··· ⊖) R : Reset coil (pin No.6··· ⊕ , pin No.7··· ⊖)

The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.

Any special coil requirement, Please contact NEC TOKIN for availability.

• Double Coil Latch Type** (Can not be driven by reverse polarity for reverse operation) at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EC2-3T	3	S 64.3 R 64.3	2.25 –	– 2.25
EC2-4.5T	4.5	S 145 R 145	3.38 –	– 3.38
EC2-5T	5	S 178 R 178	3.75 –	– 3.75
EC2-6T	6	S 257 R 257	4.5 –	– 4.5
EC2-9T	9	S 579 R 579	6.75 –	– 6.75
EC2-12T	12	S 1028 R 1028	9.0 –	– 9.0
EC2-24T	24	S 4114 R 4114	18.0 –	– 18.0

• Nonlatch ND Type at 20 °C

Part Number	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EC2-3ND	3	45	2.25	0.3
EC2-4.5ND	4.5	101	3.38	0.45
EC2-5ND	5	125	3.75	0.5
EC2-6ND	6	180	4.5	0.6
EC2-9ND	9	405	6.75	0.9
EC2-12ND	12	720	9.0	1.2
EC2-24ND	24	2504	18.0	2.4

• Single Coil Latch ND Type at 20 °C

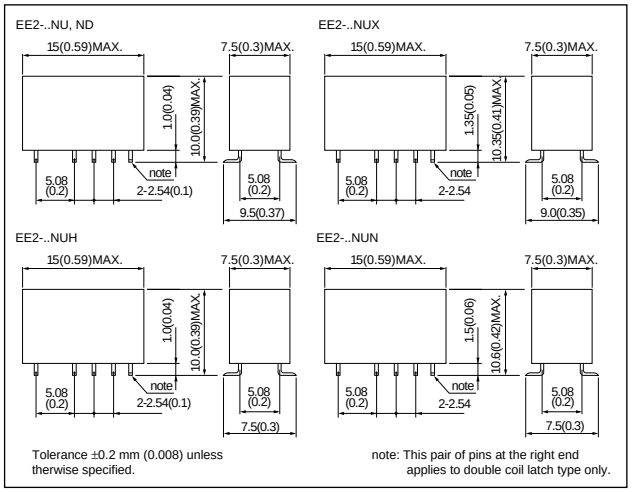
Part Number	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EC2-3SND	3	90	2.25	2.25
EC2-4.5SND	4.5	203	3.38	3.38
EC2-5SND	5	250	3.75	3.75
EC2-6SND	6	360	4.5	4.5
EC2-9SND	9	810	6.75	6.75
EC2-12SND	12	960	9.0	9
EC2-24SND	24	3388	18.0	18

Note * Test by pulse voltage
** S : Set coil (pin No.1⋯ ⊕ , pin No.12⋯ ⊖) R : Reset coil (pin No.6⋯⊕ , pin No.7⋯⊖)
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

EE2 Series

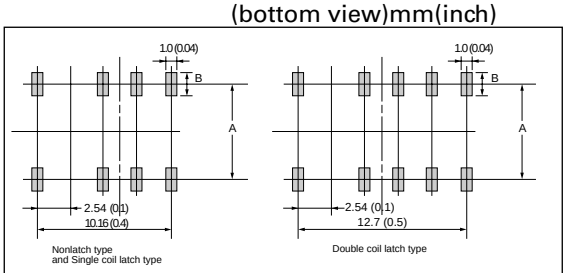
The EE2 series is surface-mounting type sustaining high-performance of NECTOKIN EC2 series.

■ DIMENSIONS mm(inch)



■ RECOMMENDED PAD LAYOUT

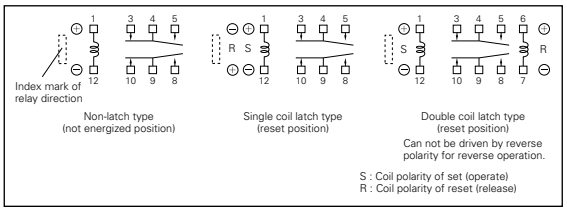
(bottom view)mm(inch)



TYPE	A	B
EE2-..NU,ND	7.3 (0.287)	3.0 (0.118)
EE2-..NUX	7.02 (0.276)	2.73 (0.107)
EE2-..NUH	6.29 (0.248)	2.0 (0.079)
EE2-..NUN	6.29 (0.248)	2.0 (0.079)

Tolerance ± 0.1 mm (0.004) unless otherwise specified.

■ SCHEMATICS (bottom view)



■ FEATURES

- Compact and light weight
- 2 form c contact arrangement
- Low power consumption
- Reduced mounting space: 15 mm × 9.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V, (2 × 10μs*3)
- Capable of High-power switching : 700 Vac, 4.2 A ,4 times in case of accident
- UL recognized (E73266), CSA certified (LR46266)
- ND type (High-insulation type) conform to supplementary insulation for EN60950 (TUV certified)

■ SPECIFICATIONS

Contact Form		2 Form c	
Contact Material		Silver alloy with gold alloy overlay	
Contact Ratings (UL / CSA Rating)	Maximum Switching Power	60 W, 125 VA	
	Maximum Switching Voltage	220 Vdc, 250 Vac	
	Maximum Switching Current	2 A	
	Maximum Carrying Current	2 A	
Minimum Contact Ratings		10 mVdc, 10 μA*1	
Initial Contact Resistance		50 mΩ typ.(Initial)	
Nominal Operating Power	Nonlatch type	140 mW (3 to 12 V), 200mW (24 V)	ND type 200 to 230 mW
	Single coil latch type	100 mW	ND type 100 to 170 mW
	Double coil latch type	140 mW	
Operate Time (Excluding bounce)		Approx. 2 ms	
Release Time (Excluding bounce)		Approx. 1 ms without diode	
Insulation Resistance		1000 MΩ at 500 Vdc	
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)	
	Between adjacent contacts		
	Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)	Double Coil 1000 Vac (for one miniute) Latch type 1500 V surge (10 × 160 μs*2)
Shock Resistance		735 m/s² (misoperating) 980 m/s² (destructive failure)	
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)	
Ambient Temperature		-40 to + 85°C	
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)	
Running Specifications	Nonload	1 × 10⁸ *4 operations(Non-latch type) 1 × 10⁷ operations(latch type)	
	Load	50 Vdc, 0.1 A (resistive) 1 × 10⁶ operations at 85°C, 5 Hz	
		10 Vdc, 10 mA (resistive) 1 × 10⁶ operations at 85°C, 2 Hz	
Weight		Approx. 1.9 g	

* 1 This value is a reference value in the resistance load.
  Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

■ PART NUMBER SYSTEM

EE2-3SNU-L

- Packaging code
  - Nil: Tube
  - L: Embossed carrying tape (L type)
  - R: Embossed carrying tape (R type)
- NU: Standard type
  NUH: Minimum footprint type
  NUX: High solder joint reliability type
  NUN: High solder joint reliability with Minimum footprint type
  ND: High-insulation type (TUV certified)
- Latch type
  - Nil: Nonlatch type (standard)
  - S: Single coil latch type
  - T: Double coil latch type
- Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 2 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL114, UL478

TUV Certified (EN60255 / IEC60255)	
No. R 9750561	No. R 9751153
"ND" Type (Nonlatch and Single-coil-latch)	Except ND Type (Nonlatch and Single-coil-latch)
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)	
Supplementary insulation class	Basic insulation class

■ PART NUMBERS

• Nonlatch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EE2-3	3	64.3	2.25	0.3
EE2-4.5	4.5	145	3.38	0.45
EE2-5	5	178	3.75	0.5
EE2-6	6	257	4.5	0.6
EE2-9	9	579	6.75	0.9
EE2-12	12	1028	9.0	1.2
EE2-24	24	2880	18.0	2.4

• Single Coil Latch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EE2-3S	3	90	2.25	2.25
EC2-4.5S	4.5	202.5	3.38	3.38
EE2-5S	5	250	3.75	3.75
EE2-6S	6	360	4.5	4.5
EE2-9S	9	810	6.75	6.75
EE2-12S	12	1440	9.0	9.0
EE2-24S	24	5760	18.0	18.0

Note * Test by pulse voltage

** S : Set coil (pin No.1⋯⊕ , pin No.12⋯⊖) R : Reset coil (pin No.6⋯⊕ , pin No.7⋯⊖)

The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.

Any special coil requirement, Please contact NEC TOKIN for availability.

• **Double Coil Latch Type**** (Can not be driven by reverse polarity for reverse operation) at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EE2-3T	3	S 64.3 R 64.3	2.25 –	– 2.25
EE2-4.5T	4.5	S 145 R 145	3.38 –	– 3.38
EE2-5T	5	S 178 R 178	3.75 –	– 3.75
EE2-6T	6	S 257 R 257	4.5 –	– 4.5
EE2-9T	9	S 579 R 579	6.75 –	– 6.75
EE2-12T	12	S 1028 R 1028	9.0 –	– 9.0
EE2-24T	24	S 4114 R 4114	18.0 –	– 18.0

• **Nonlatch ND Type** at 20 °C

Part Number	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EE2-3ND	3	45	2.25	0.3
EE2-4.5ND	4.5	101	3.38	0.45
EE2-5ND	5	125	3.75	0.5
EE2-6ND	6	180	4.5	0.6
EE2-9ND	9	405	6.75	0.9
EE2-12ND	12	720	9.0	1.2
EE2-24ND	24	2504	18.0	2.4

• **Single Coil Latch ND Type** at 20 °C

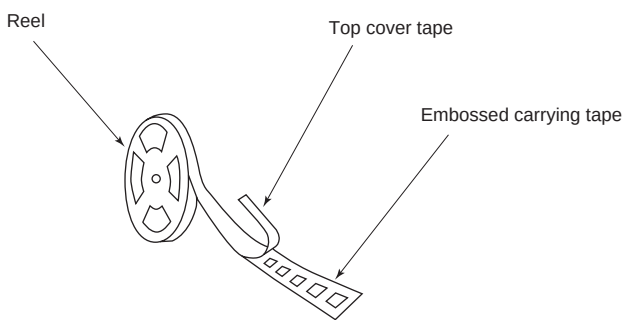
Part Number	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EE2-3SND	3	90	2.25	2.25
EE2-4.5SND	4.5	203	3.38	3.38
EE2-5SND	5	250	3.75	3.75
EE2-6SND	6	360	4.5	4.5
EE2-9SND	9	810	6.75	6.75
EE2-12SND	12	960	9.0	9.0
EE2-24SND	24	3388	18.0	18.0

Note * Test by pulse voltage

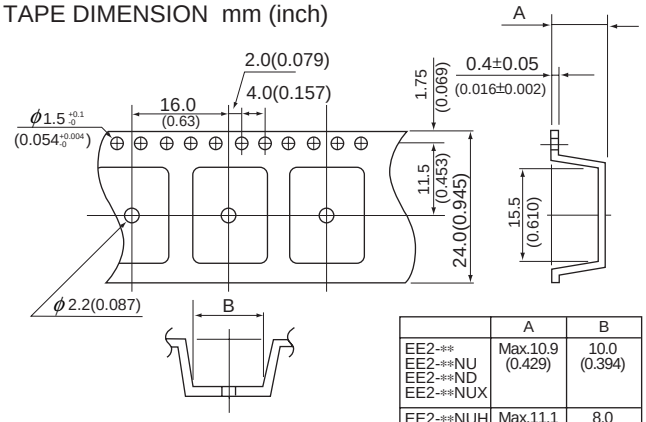
** S : Set coil (pin No.1⋯ ⊕ , pin No.12⋯⊖) R : Reset coil (pin No.6⋯⊕ , pin No.7⋯ ⊖)
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

■ TAPE PACKAGE (OPTION)

APPEARANCE

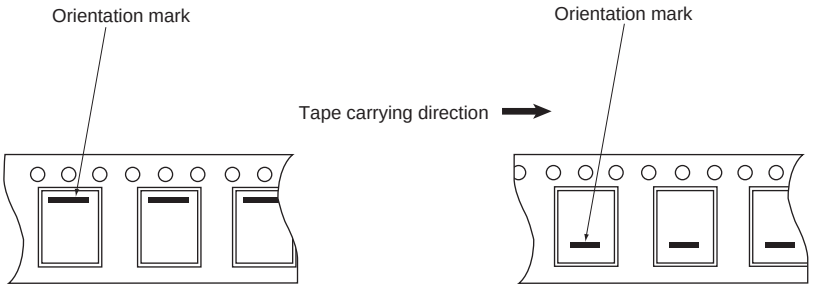


TAPE DIMENSION mm (inch)



	A	B
EE2-** EE2-**NU EE2-**ND EE2-**NUX	Max.10.9 (0.429)	10.0 (0.394)
EE2-**NUH EE2-**NUN	Max.11.1 (0.437)	8.0 (0.315)

Relay orientation mark and tape carrying direction.

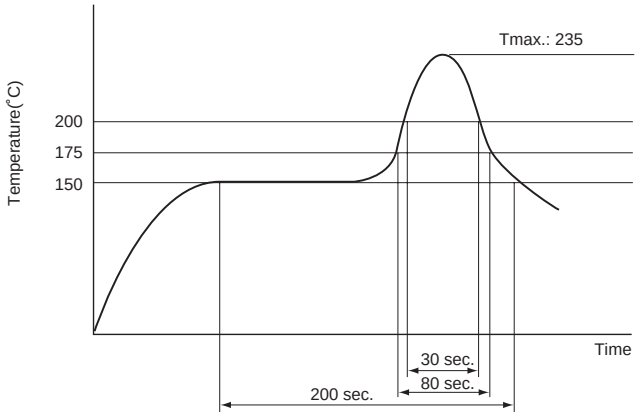


EE2-★★★-L

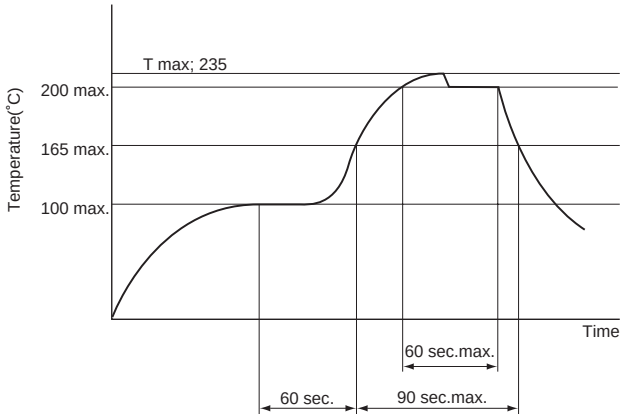
EE2-★★★★-R

■ SOLDERING CONDITION

IRS Method



VPS Method



Note

1. Temperature profile shows printed circuit board surface temperature on the relay terminal portion.
2. Please check the actual soldering condition to use other method except above mentioned temperature profiles.

■ Recommended relay drive conditions

Drive under conditions. If it is impossible, please inquire to NEC TOKIN.

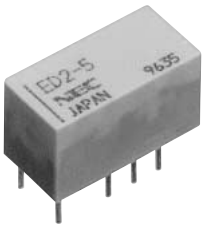
Nonlatch type	Voltage:within ±5% at nominal voltage	
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% at nominal voltage Pulse width: more than 10 ms	Ambient temperature -40~+85˚C

■ Technical document

Please confirm technical document before use.
It is able to receive a document at NEC TOKIN's World-wide-web site.
(http://www.nec-tokin.com)

ITEM	TITLE
Data sheet	EC2 series EE2 series EC2(ND)/EE2(ND) series
Information	EC2/EE2 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

ED2 Series

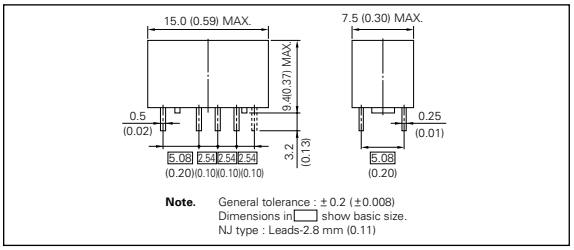


The ED2 series has reduced coil power consumption but sustained high-performance of NECTOKIN SIGNAL RELAYS. Furthermore, it complies with 2500V surge-voltage requirement of Bellcore specifications.

■ FEATURES

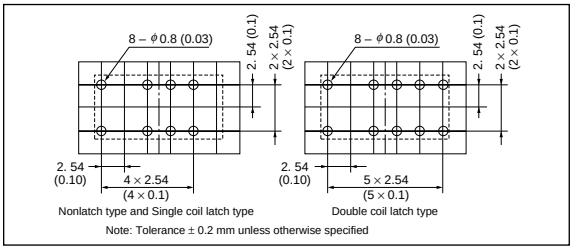
- Low power consumption (30 to 70 mW)
- Compact and light weight
- 2 form c contact arrangement
- Reduced mounting space: 15 mm × 7.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V (2 × 10 μs*3)
- UL recognized (E73266), CSA certified (LR46266)

■ DIMENSIONS mm(inch)

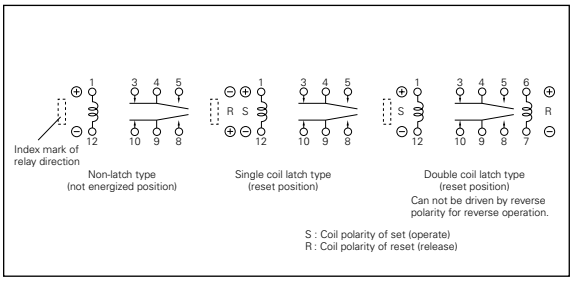


■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ SCHEMATICS (bottom view)



■ SPECIFICATIONS

Contact Form		2 Form c	
Contact Material		Silver alloy with gold alloy overlay	
Contact Ratings	Maximum Switching Power	30 W, 62.5VA	
	Maximum Switching Voltage	220 Vdc, 250 Vac	
	Maximum Switching Current	1 A	
	Maximum Carrying Current	2 A	
Minimum Contact Ratings		10 mVdc, 10 μA*1	
Initial Contact Resistance		50 mΩtyp.(Initial)	
Nominal Operating Power	Nonlatch type	50 mW (1.5 to 9 V), 55 mW (9 V), 60 mW (12 V), 70 mW (24 V)	
	Single coil latch type	30 mW	
	Double coil latch type	50 mW	
Operate Time (Excluding bounce)		Approx. 3 ms	
Release Time (Excluding bounce)		Approx. 2 ms without diode	
Insulation Resistance		1000 MΩ at 500 Vdc	
Withstand Voltage	Between open contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*2)	
	Between adjacent contacts		
	Between coil to contacts	1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3)	Double Coil 1000 Vac (for one miniute) Latch type 1500 V surge (10 × 160 μs*2)
Shock Resistance		735 m/s² (misoperating), 980 m/s² (destructive failure)	
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)	
Ambient Temperature		-40 to + 70°C*4	
Coil Temperature Rise		7 degrees at nominal coil voltage (50 mW)	
Running Specifications	Nonload	1 × 10⁸ *5 operations(Non-latch type) 1 × 10⁷ operations(latch type)	
	Load	50 Vdc, 0.1 A (resistive) 1 × 10⁶ operations at 70°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 × 10⁶ operations at 70°C, 2 Hz	
Weight		Approx. 2.2 g	

* 1 This value is a reference value in the resistance load.
  Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 Up to 85°C (75% operation of rated voltage at Nonlatch type only),it is possible to respond to a customer's requirement individually.
* 5 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

ED2 Series

■ PART NUMBER SYSTEM

ED2-3SNU

- Nil: Standard type
- NU: UL recognized CSA certified type
- NJ: Trimmed leads type (UL recognized CSA certified type)

Latch type
- Nil: Nonlatch type (standard)
- S: Single coil latch type
- T: Double coil latch type

Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL114, UL478

TUV Certified (EN60255 / IEC60255)
No. R9950557
Nonlatch and Single-coil-latch
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)
Basic insulation class

■ PART NUMBERS

• Nonlatch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage** (Vdc)	Must Release Voltage* (Vdc)
ED2-1.5	1.5	45	1.2	0.15
ED2-3	3	180	2.4	0.3
ED2-4.5	4.5	405	3.6	0.45
ED2-5	5	500	4.0	0.5
ED2-6	6	720	4.8	0.6
ED2-9	9	1473	7.2	0.9
ED2-12	12	2400	9.6	1.2
ED2-24	24	8229	19.2	2.4

• Single Coil Latch Type

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
ED2-1.5S	1.5	75	1.2	1.2
ED2-3S	3	300	2.4	2.4
ED2-4.5S	4.5	675	3.6	3.6
ED2-5S	5	833	4.0	4
ED2-6S	6	1200	4.8	4.8
ED2-9S	9	2700	7.2	7.2
ED2-12S	12	4800	9.6	9.6

• Double Coil Latch Type** (Can not be driven by reverse polarity for reverse operation)

at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
ED2-1.5T	1.5	S 45 R 45	1.2 –	– 1.2
ED2-3T	3	S 180 R 180	2.4 –	– 2.4
ED2-4.5T	4.5	S 405 R 405	3.6 –	– 3.6
ED2-5T	5	S 500 R 500	4.0 –	– 4
ED2-6T	6	S 720 R 720	4.8 –	– 4.8
ED2-9T	9	S 1620 R 1620	7.2 –	– 7.2
ED2-12T	12	S 2880 R 2880	9.6 –	– 9.6

Note * Test by pulse voltage

** S : Set coil (pin No.1⋯⊕ , pin No.12⋯⊖) R : Reset coil (pin No.6⋯⊕ , pin No.7⋯⊖)

The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.

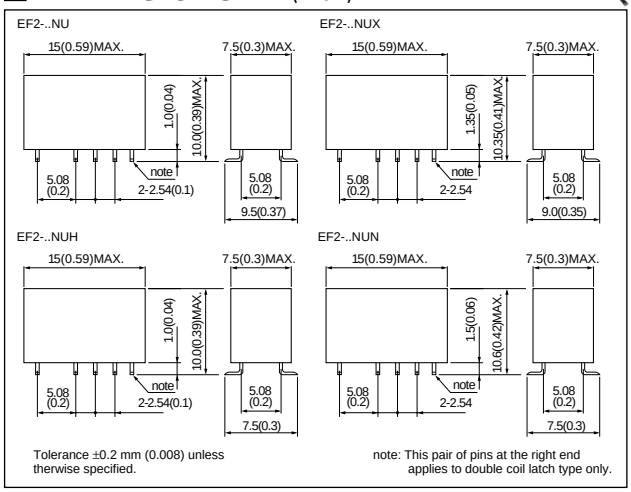
Any special coil requirement, Please contact NEC TOKIN for availability.

★75%operation of rated voltage (at +70˚C to +85˚C) is possible individually. Please contact NEC TOKIN for availability.

EF2 Series

The EF2 series is surface-mounting type sustaining high-performance of NEC TOKIN ED2 series.

■ DIMENSIONS mm(inch)

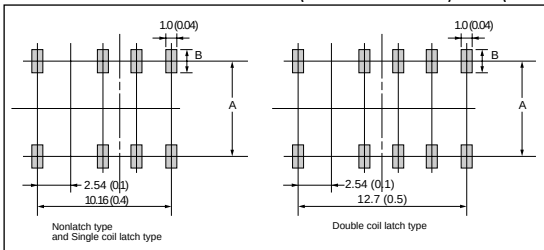


■ FEATURES

- Low power consumption(30 to 70 mW)
- Compact and light weight
- 2 form c contact arrangement
- Reduced mounting space: 15 mm × 9.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V, (2 × 10 μs*3)
- UL recognized (E73266), CSA certified (LR46266)

■ RECOMMENDED PAD LAYOUT

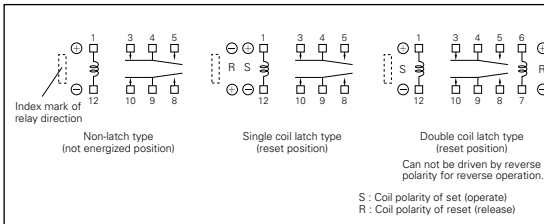
(bottom view)mm(inch)



TYPE	A	B
EF2-..NU	7.3 (0.287)	3.0 (0.118)
EF2-..NUX	7.02 (0.276)	2.73 (0.107)
EF2-..NUH	6.29 (0.248)	2.0 (0.079)
EF2-..NUN	6.29 (0.248)	2.0 (0.079)

Tolerance ± 0.1 mm (0.004) unless otherwise specified.

■ SCHEMATICS (bottom view)



■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	30 W, 62.5 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	1 A
	Maximum Carrying Current	2 A
Minimum Contact Ratings		10 mVdc, 10 μA*1
Initial Contact Resistance		50 mΩ typ.(Initial)
Nominal Operating Power	Nonlatch type	50 mW (1.5 to 9 V), 55 mW (9 V), 60 mW (12 V), 70 mW (24 V)
	Single coil latch type	30 mW
	Double coil latch type	50 mW
Operate Time (Excluding bounce)		Approx. 2 ms
Release Time (Excluding bounce)		Approx. 1 ms without diode
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	1000 Vac (for one minute)
	Between adjacent contacts	1500 V surge (10 × 160 μs*2)
	Between coil to contacts	1500 Vac (for one minute) / 2500 V surge (2 × 10 μs*3) — Double Coil 1000 Vac (for one miniute) / Latch type 1500 V surge (10 × 160 μs*2)
Shock Resistance		735 m/s² (misoperating), 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 3 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 70°C*4
Coil Temperature Rise		7 degrees at nominal coil voltage (50 mW)
Running Specifications	Nonload	1 × 10⁸ *5 operations(Non-latch type) 1 × 10⁷ operations(latch type)
	Load	50 Vdc, 0.1 A (resistive) 1 × 10⁶ operations at 70°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 × 10⁶ operations at 70°C, 2 Hz
Weight		Approx. 2.2 g

* 1 This value is a reference value in the resistance load.
  Minimum capacity changes depending on switching frequency and environment temperature and the load.
* 2 rise time : 10 μs, decay time to half crest : 160 μs
* 3 rise time : 2 μs, decay time to half crest : 10 μs
* 4 Up to 85°C (75% operation of rated voltage at Nonlatch type only),it is possible to respond to a customer's requirement individually.
* 5 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

EF2 Series

■ PART NUMBER SYSTEM

EF 2-3SNU-L

- Packaging code
  - Nil: Tube
  - L: Embossed carrying tape (L type)
  - R: Embossed carrying tape (R type)
- Nil: Standard type
  - NU: UL recognized CSA certified type
  - NUH: Minimum footprint type(UL recognized CSA certified type)
  - NUX: High solder joint reliability type (UL recognized CSA certified type)
  - NUN: High solder joint reliability with Minimum footprint type (UL recognized CSA certified type)
- Latch type
  - Nil: Nonlatch type (standard)
  - S: Single coil latch type
  - T: Double coil latch type
- Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL114, UL478

TUV Certified (EN60255 / IEC60255)
No. R9950557
Nonlatch and Single-coil-latch
Creepage and clearance of coil to contact is over than 2 mm (According EN60950)
Basic insulation class

■ PART NUMBERS

• Nonlatch Type at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage** (Vdc)	Must Release Voltage* (Vdc)
EF2-1.5	1.5	45	1.2	0.15
EF2-3	3	180	2.4	0.3
EF2-4.5	4.5	405	3.6	0.45
EF2-5	5	500	4.0	0.5
EF2-6	6	720	4.8	0.6
EF2-9	9	1473	7.2	0.9
EF2-12	12	2400	9.6	1.2
EF2-24	24	8229	19.2	2.4

• Single Coil Latch Type at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EF2-1.5S	1.5	75	1.2	1.2
EF2-3S	3	300	2.4	2.4
EF2-4.5S	4.5	675	3.6	3.6
EF2-5S	5	833	4.0	4
EF2-6S	6	1200	4.8	4.8
EF2-9S	9	2700	7.2	7.2
EF2-12S	12	4800	9.6	9.6

• Double Coil Latch Type** (Can not be driven by reverse polarity for reverse operation) at 20 °C

Part Number (Standard)	Nominal Coil Voltage (Vdc)	Coil Resistance (Ω) ±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
EF2-1.5T	1.5	S 45 R 45	1.2 –	– 1.2
EF2-3T	3	S 180 R 180	2.4 –	– 2.4
EF2-4.5T	4.5	S 405 R 405	3.6 –	– 3.6
EF2-5T	5	S 500 R 500	4.0 –	– 4
EF2-6T	6	S 720 R 720	4.8 –	– 4.8
EF2-9T	9	S 1620 R 1620	7.2 –	– 7.2
EF2-12T	12	S 2880 R 2880	9.6 –	– 9.6

Note * Test by pulse voltage

** S : Set coil (pin No.1⋯⊕ , pin No.12⋯⊖) R : Reset coil (pin No.6⋯⊕ , pin No.7⋯⊖)

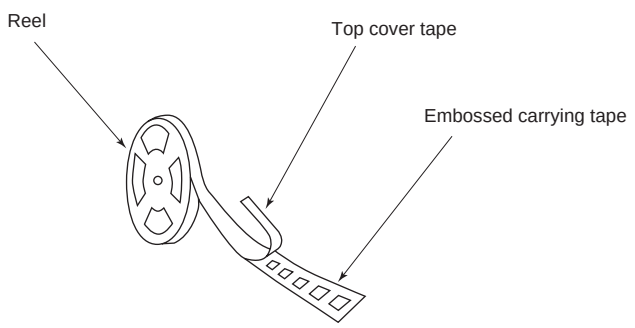
The latch type relays should be initialized at appointed position before using, and should be enegized to specific polarity by above polarity to avoid wrong operation.

Any special coil requirement, Please contact NEC TOKIN for availability.

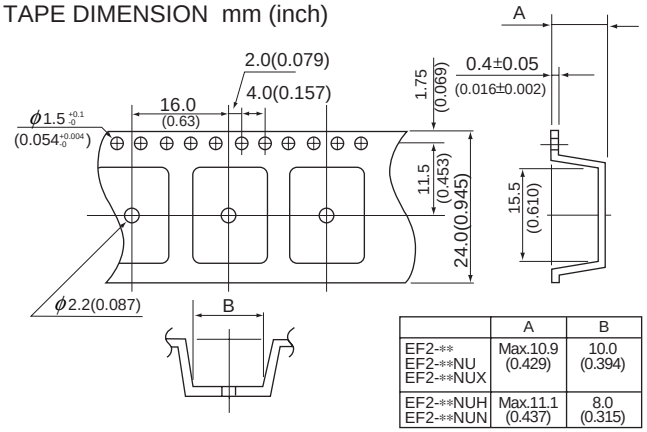
★75%operation of rated voltage (at +70˚C to +85˚C) is possible individually. Please contact NEC TOKIN for availability.

■ TAPE PACKAGE (OPTION)

APPEARANCE

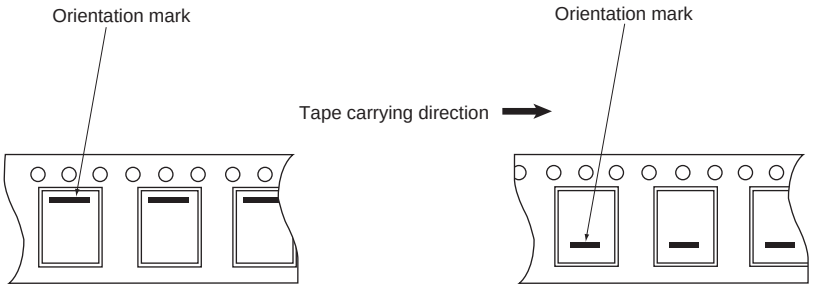


TAPE DIMENSION mm (inch)



	A	B
EF2-** EF2-**NU EF2-**NUX	Max.10.9 (0.429)	10.0 (0.394)
EF2-**NUH EF2-**NUN	Max.11.1 (0.437)	8.0 (0.315)

Relay orientation mark and tape carrying direction.

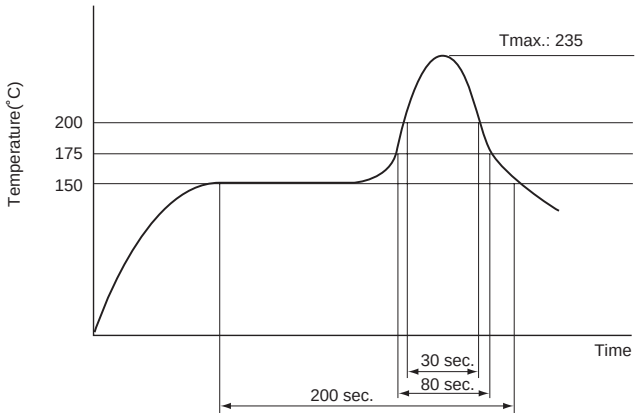


EF2-★★★-L

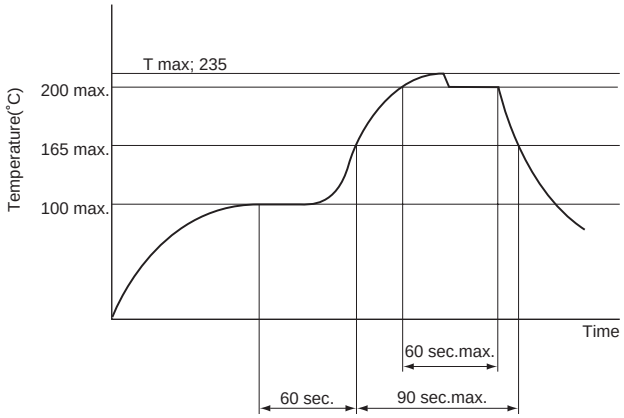
EF2-★★★★-R

■ SOLDERING CONDITION

IRS Method



VPS Method



Note

1. Temperature profile shows printed circuit board surface temperature on the relay terminal portion.
2. Please check the actual soldering condition to use other method except above mentioned temperature profiles.

■ Recommended relay drive conditions

Drive under conditions. If it is impossible, please inquire to NEC TOKIN.

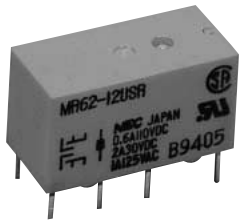
Nonlatch type	Voltage:within ±5% at nominal voltage	Ambient temperature -40~+70˚C(80% operate type) Ambient temperature -40~+85˚C(75% operate type)
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% at nominal voltage Pulse width: more than 10 ms	Ambient temperature -40~+70˚C

■ Technical document

Please confirm technical document before use.
It is able to receive a document at NEC TOKIN's World-wide-web site.
(http://www.nec-tokin.com)

ITEM	TITLE
Data sheet	ED2/EF2 series
Information	ED2/EF22 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

MR62 Series Standard Type

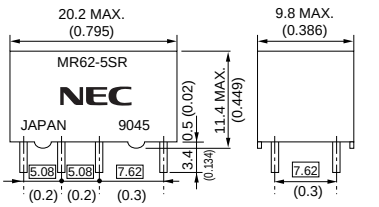


The MR62 series is a plastic sealed miniature relay designed to offer completely dust-and-water-proof package with bifurcated and crossbar contacts for assuring high reliability.

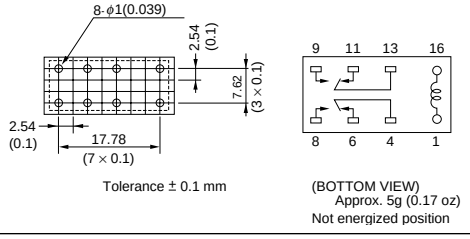
■ FEATURES

- DIP terminal
- 2 Form c Bifurcated-Crossbar contacts
- Plastic sealed package for flow-soldering process
- Super reliability at signal level
- UL recognized (E73266), C SA certified (LR46266)
- 1500V FCC surge between coil and contacts and between adjacent contacts.

■ DIMENSIONS mm(inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS mm(inch)



■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No E73266	CSA Certificated (CSA C22.2 No14) File No LR46266
30 Vdc, 2 A (Resistive) 110 Vdc, 0.6 A (Resistive) 125 Vac, 1 A (Resistive)	

* Spacing : UL114, UL478

■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	60 W, 125 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	2 A
	Maximum Carrying Current	2 A
Minimum Contact Ratings		100 mVdc, 100 μA
Initial Contact Resistance		50 mΩ typ.(Initial)
Nominal Operating Power		Approx. 550 mW
Operate Time (Excluding bounce)		Approx. 2.5 ms
Release Time (Excluding bounce)		Approx. 2 ms without diode
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	500 Vac (for one minute)
	Between adjacent contacts	1000 Vac (for one minute) 1500 V surge (10 × 160 μs*1)
	Between coil to contacts	
Shock Resistance		294 m/s² (misoperating) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 1.5 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 to + 85°C
Coil Temperature Rise		40 degrees at nominal coil voltage (550 mW)
Running Specifications	Nonload	10×10^6 operations
	Load	50 Vdc, 0.1 A (resistive), 1×10^6 operations at 85°C 5Hz
		10 Vdc, 10m A (resistive), 1×10^6 operations at 85°C 2Hz
Weight		Approx. 5 g

* 1 rise time : 10 μs, decay time to half crest : 160 μs

■ STANDARD PART NUMBERS

at 20 °C

Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω)±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
MR62- 5SR	5	42	3.1	0.25
MR62- 6SR	6	66	3.9	0.33
MR62- 9SR	9	140	5.7	0.45
MR62-12SR	12	280	8.1	0.68
MR62-24SR	24	1,050	15.8	1.3
MR62-48SR	48	4,200	34.4	2.6

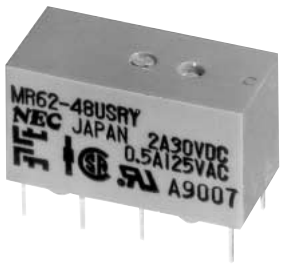
* Test by pulse voltage

■ PART NUMBER SYSTEM

MR62-5USR

- Contact material
  - Nil : Silver-palladium alloy with gold alloy overlay
  - R : Silver-nickel alloy with gold alloy overlay
- Sealed type (Washable)
- Safety standard
  - Nil : Standard type
  - U : UL recognized CSA certified type
- Nominal coil voltage (See part numbers)

MR62 Series-K, Y, KY Type



■ FEATURES

- 1500V FCC surge between open contacts (K, KY type)
- 1500V FCC surge between coil and contacts and between adjacent contacts
- 400mW nominal operate power. (Y, KY type)

■ SPECIFICATIONS

Types		MR62-**K**	MR62-****Y	MR62-**K*Y
Contact Form		2 Form c		
Contact Material		Silver alloy with gold alloy overlay		
Contact Ratings	Maximum Switching Power	60 W, 125 VA		
	Maximum Switching Voltage	220 Vdc, 250 Vac		
	Maximum Switching Current	2 A		
	Maximum Carrying Current	2 A		
Minimum Contact Ratings		100 mVdc, 100 μA		
Initial Contact Resistance		50 mΩtyp.(Initial)		
Nominal Operating Power		Approx. 550 mW	Approx. 400 mW	
Operate Time (Excluding bounce)		Approx. 3.5 ms	Approx. 2.5 ms	
Release Time (Excluding bounce without diode)			Approx. 2 ms	
Insulation Resistance		100 MΩ at 500 Vdc		
Withstand Voltage	Between open contacts	1000 Vac*1 1500 V surge*2	500 Vac*1	1000 Vac*1 1500 V surge*2
	Between adjacent contacts	1000 Vac*1		
	Between coil to contacts	1500 V surge*2		
Shock Resistance		294 m/s² (misoperating) 980 m/s² (destructive failure)		
Vibration Resistance		10 to 55 Hz, double amplitude 1.5 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)		
Ambient Temperature		-40 ~ + 85℃		
Coil Temperature Rise		40℃ (550 mW)	35℃ (400 mW)	
Running Specifications	Nonload	10 × 10⁶ operations		
	Load	50 Vdc, 0.1 A (resistive) 1 × 10⁶ operations at 85°C, 5 Hz		
		10 Vdc, 10 mA (resistive) 1 × 10⁶ operations at 85°C, 2 Hz		
Weight		Approx. 5 g		

* 1 for one minute
* 2 rise time : 10 μs, decay time to half crest : 160 μs

■ STANDARD PART NUMBERS

at 20°C

Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω)±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
MR62- 5SRY	5	62.5	3.5	0.25
MR62- 6SRY	6	90	4.2	0.33
MR62- 9SRY	9	202.5	6.3	0.45
MR62-12SRY	12	360	8.4	0.68
MR62-24SRY	24	1,440	16.8	1.3
MR62-48SRY	48	5,760	33.6	2.6
MR62- 5KSR	5	42	3.5	0.25
MR62- 6KSR	6	66	4.2	0.33
MR62- 9KSR	9	140	6.3	0.45
MR62-12KSR	12	280	8.4	0.68
MR62-24KSR	24	1,050	16.8	1.3
MR62-48KSR	48	4,200	38.4	2.6
MR62- 5KSRY	5	62.5	3.5	0.25
MR62- 6KSRY	6	90	4.2	0.33
MR62- 9KSRY	9	202.5	6.3	0.45
MR62-12KSRY	12	360	8.4	0.68
MR62-24KSRY	24	1,440	16.8	1.3
MR62-48KSRY	48	5,360	38.4	2.6

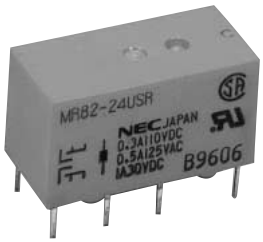
* Test by pulse voltage

■ PART NUMBER SYSTEM

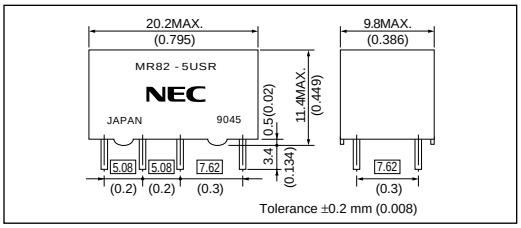
MR62-5UKSRY

- Nominal operate power
  - Nil :550 mW
  - Y :400 mW
- Contact material
  - Nil :Silver-palladium alloy with gold alloy overlay
  - R :Silver-nickel alloy with gold alloy overlay
- Sealed type (Washable)
- Breakdown voltage between open contacts
  - Nil :500 Vac
  - K :1000 Vac
- Safety standard
  - Nil :Standard type
  - U :UL recognized CSA certified type
- Nominal coil voltage (See part numbers)

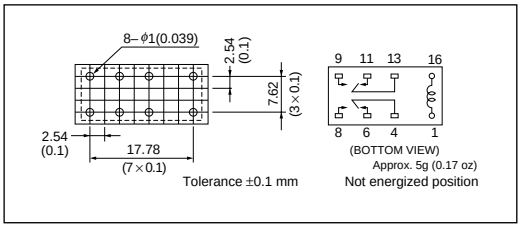
MR82 Series



■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS mm (inch)



■ FEATURES

- 200mW nominal operate power
- 1500V FCC surge strength between coil to contacts, and between adjacent contacts

■ SPECIFICATIONS

Contact Form		2 Form c
Contact Material		Silver alloy with gold alloy overlay
Contact Ratings	Maximum Switching Power	60 W, 125 VA
	Maximum Switching Voltage	220 Vdc, 250 Vac
	Maximum Switching Current	2 A
	Maximum Carrying Current	2 A
Minimum Contact Ratings		100 mVdc, 100 μA
Initial Contact Resistance		50 mΩ typ.(Initial)
Nominal Operating Power		200 mW
Operate Time (Excluding bounce)		Approx. 5.5 ms
Release Time (Excluding bounce)		Approx. 2 ms without diode
Insulation Resistance		1000 MΩ at 500 Vdc
Withstand Voltage	Between open contacts	500 Vac (for one minute)
	Between adjacent contacts	1000 Vac (for one minute)
	Between coil to contacts	1500 V surge (10 × 160 μs*1)
Shock Resistance		294 m/s² (misoperating) 980 m/s² (destructive failure)
Vibration Resistance		10 to 55 Hz, double amplitude 1.5 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure)
Ambient Temperature		-40 ~ +85℃
Coil Temperature Rise		Approx. 22 degrees at nominal coil voltage (200 mW)
Running Specifications	Nonload	10 × 10⁶ operations
	Load	50 Vdc, 0.1 A (resistive) 1 × 10⁶ operations at 85℃, 5 Hz
		10 Vdc, 10 mA (resistive) 1 × 10⁶ operations at 85˚C, 2 Hz
Weight		Approx. 5 g

* 1 rise time : 10 μs, decay time to half crest : 160 μs

■ STANDARD PART NUMBERS

at 20°C

Part Number	Nominal Voltage (Vdc)	Coil Resistance (Ω)±10%	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
MR82- 4.5USR	4.5	101	3.15	0.23
MR82- 5USR	5	125	3.5	0.25
MR82- 6USR	6	180	4.2	0.33
MR82-9USR	9	405	6.3	0.45
MR82-12USR	12	720	8.4	0.68
MR82-24USR	24	2880	16.8	1.2

* Test by pulse voltage

■ PART NUMBER SYSTEM

MR82-5USR

Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

UL Recognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No14) File No. LR46266
30 Vdc, 1 A (Resistive) 110 Vdc, 0.3 A (Resistive) 125 Vac, 0.5 A (Resistive)	

* Spacing : UL114, UL478

■ Recommended relay drive conditions

Drive under conditions. If it is impossible, please inquire to NEC TOKIN.

Nominal coil voltage = < 24 V	Voltage : within±5% at nominal voltage	Ambient temperature -40~+85℃
Nominal coil voltage = 48 V		Ambient temperature -40~+70℃

■ Technical document

Please confirm technical document before use.
It is able to receive a document at NEC TOKIN's World-wide-web site.
(http://www.nec-tokin.com)

ITEM	TITLE
Data sheet	MR82 Series
Information	MR82 Series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

EN2 Series

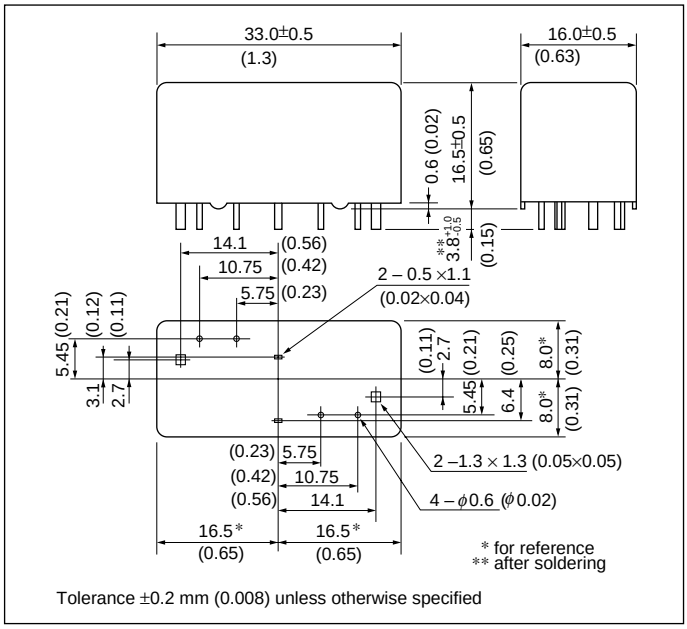
Automotive twin relay EN2 series is printed circuit board mount type and the most suitable for various motor controls in the automotive which require high-quality and high-performance.
EN2 series has two types for different applications. One is H bridge type which is desigined for forword and reverse control of the motor. The other is separate type which contains two separated relays in one package.

■ FEATURES

- Twin relay for motor reversible control
- 30% less relay space than 2 conventional relays
- High performance & productivity by unique symmetrical structure
- Flux tight housing

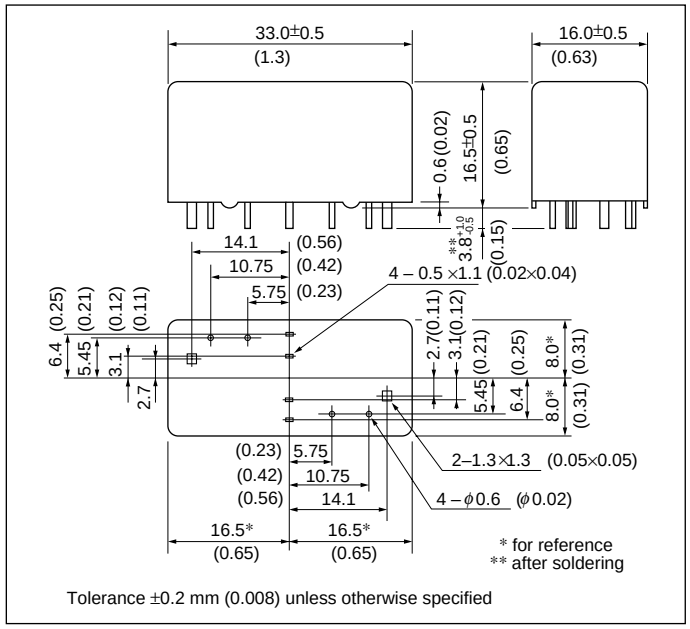
■ DIMENSIONS mm (inch)

[H Bridge Type]



Tolerance ±0.2 mm (0.008) unless otherwise specified

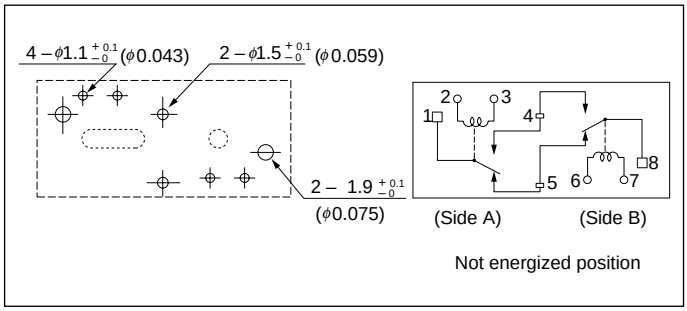
[Separate (T) Type]



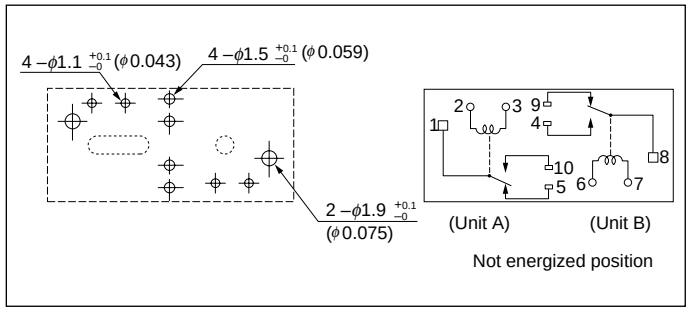
Tolerance ±0.2 mm (0.008) unless otherwise specified

■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS (bottom view) mm (inch)

[H Bridge Type]



[Separate (T) Type]



EN2 Series

■ SPECIFICATIONS

at 20 °C

Items \ Types (Contact Rating)		EN2 (Standard)	EN2-B (High Current)
Contact Form		1 Form c × 2 (H Bridge Type or Separate Type)	
Contact Material		Silver oxide complex alloy	
Initial Contact Resistance * figure 1.		H Bridge (route A) : 8.1 mΩ typ. H Bridge (route B) : 7.8 mΩ typ. Separate (N/C) : 3.9 mΩ typ. Separate (N/O) : 3.9 mΩ typ. (measured by voltage drop at 6 Vdc, 7A)	H Bridge (route A) : 4.9 mΩ typ. H Bridge (route B) : 4.6 mΩ typ. Separate (N/C) : 2.3 mΩ typ. Separate (N/O) : 2.3 mΩ typ. (measured by voltage drop at 6 Vdc, 7A)
Contact Switching Voltage		16 Vdc	
Contact Switching Current		35 A Max. (at 16 Vdc)	
Contact Carrying Current		25 A Max. (1 hour Max.) 30 A Max. (2 minutes Max.) at 12 Vdc	35 A Max. (1 hour Max.) 40 A Max. (2 minutes Max.) at 12 Vdc
Operate Time (Excluding bounce)		Approx. 5 ms (at Nominal Voltage)	
Release Time (Excluding bounce)		Approx. 2 ms (at Nominal Voltage, without diode) initial	
Nominal Operate Power		0.64 W/ 0.8 W / 1.15 W (at 12 Vdc)	
Insulation Resistance		100 MΩ at 500Vdc, initial	
Withstand Voltage		500 Vac (for 1 minute), initial	
Shock Resistance		98 m/s² (misoperating), 980 m/s² (destructive failure)	
Vibration Resistance		10 to 300 Hz, 43 m/s² (misoperating), 10 to 500 Hz, 43 m/s² , 200 hours (destructive failure)	
Ambient Temperature		-40 to +85˚C (-40 to + 185˚F)	
Coil Temperature Rise		50˚C / W (122 ˚F / W)	
Running Specifications	Nonload	10×10^6 operations	
	Load	100×10^3 operations (at 14 Vdc, Motor Load 30 A/7 A)	
Weight		Approx. 18 g (0.63 oz)	

■ COIL RATING

at 20 °C

Part Numbers		Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage * (Vdc)	Must Release Voltage * (Vdc)	Nominal Operate Power (W)
H Bridge Type	Separate Type					
EN2-1N1	EN2-1N1T	12	125	6.5	0.6	1.15
EN2-1N2	EN2-1N2T	12	125	7.0	0.6	1.15
EN2-1N3	EN2-1N3T	12	125	7.5	0.6	1.15
EN2-2N3	EN2-2N3T	12	180	7.5	0.6	0.8
EN2-2N4	EN2-2N4T	12	180	8.0	0.6	0.8
EN2-2N5	EN2-2N5T	12	180	8.5	0.6	0.8
EN2-3N5	EN2-3N5T	12	225	8.5	0.9	0.64

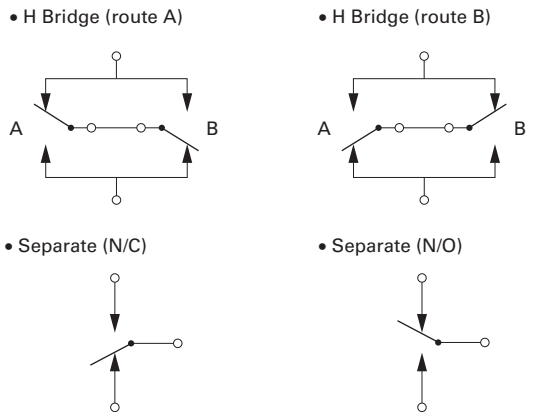
* Test by pulse voltage

■ PART NUMBER SYSTEM

EN2-B1N1 ST

- Wiring: Nil : H bridge type; T : Separate type
- Enclosure: Nil : Unsealed; S : Sealed
- Must Operate Voltage (at 20°C): 1 : 6.5 V; 2 : 7.0 V; 3 : 7.5 V; 4 : 8.0 V; 5 : 8.5 V
- Contact Material: N : Silver oxide complex alloy type I; G : Silver oxide complex alloy type II
- Coil Resistance (at 20°C): 1 : 125 Ω ± 10 %; 2 : 180 Ω ± 10 %; 3 : 225 Ω ± 10 %
- Carrying Current Capacity: Nil : Standard type; B : High current type
- Type

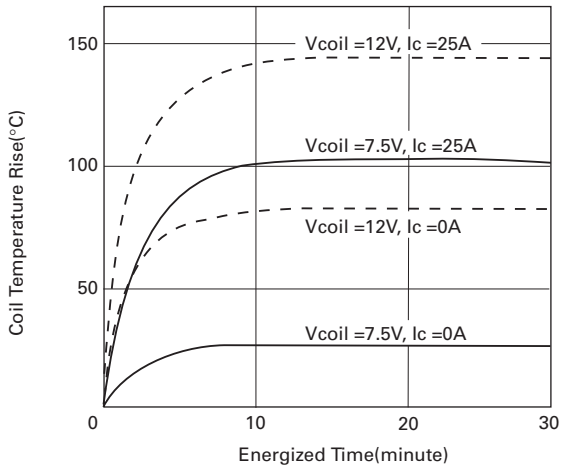
★ Contact Resistance (figure 1)

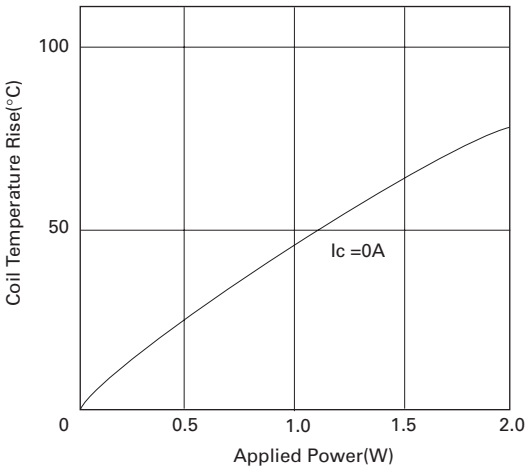


■ DATA

● Coil Temperature Rise

(Sample: EN2-1N2)

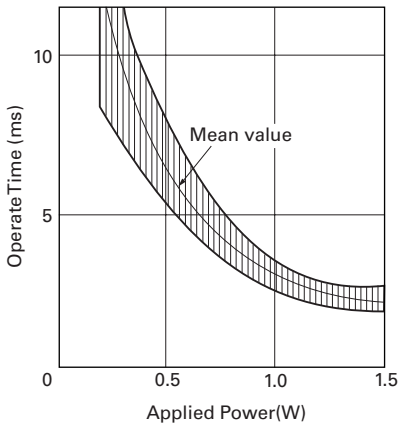




Vcoil: Energized Coil Voltage
Ic: Contact current

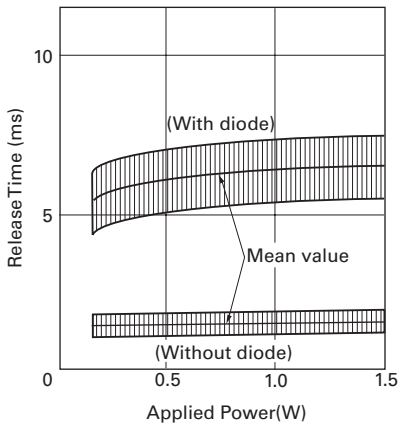
● Operate Time

(Sample: EN2-2N4)



● Release Time

(Sample: EN2-2N4)



EP2 Series

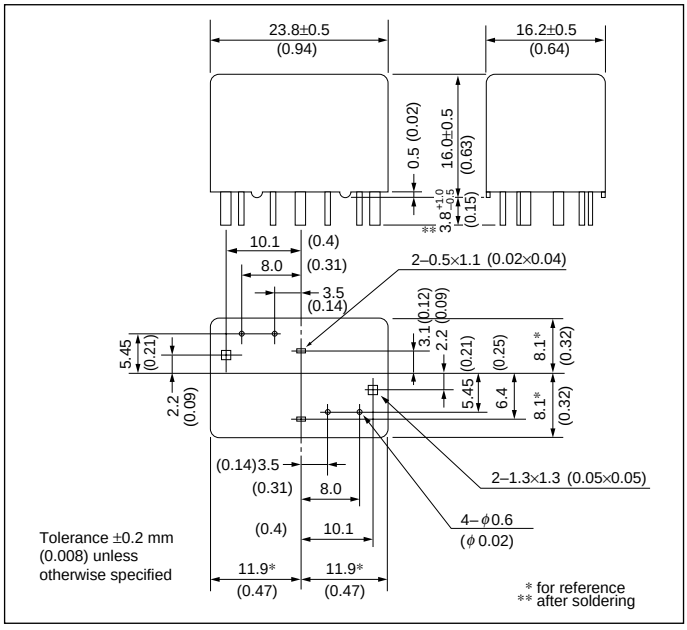
Automotive twin relay EP2 series is printed circuit board mount type and the most suitable for various motor controls in the automotive which require high-quality and high-performance.
EP2 series has two types for different applications. One is H bridge type which is desigined for forword and reverse control of the motor. The other is separate type which contains two separated relays in one package.

■ FEATURES

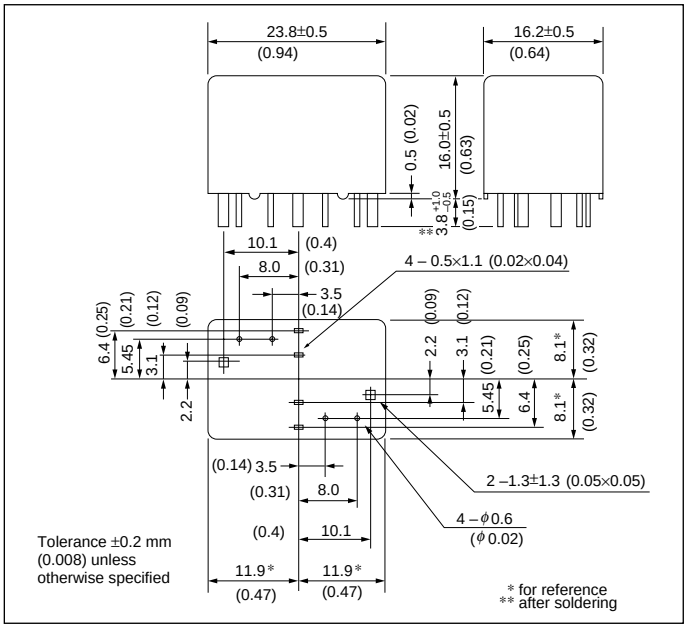
- Twin relay for motor reversible control
- 50% less relay space than 2 conventional relays
- High performance & productivity by unique symmetrical structure
- Flux tight housing

■ DIMENSIONS mm (inch)

[H Bridge Type]

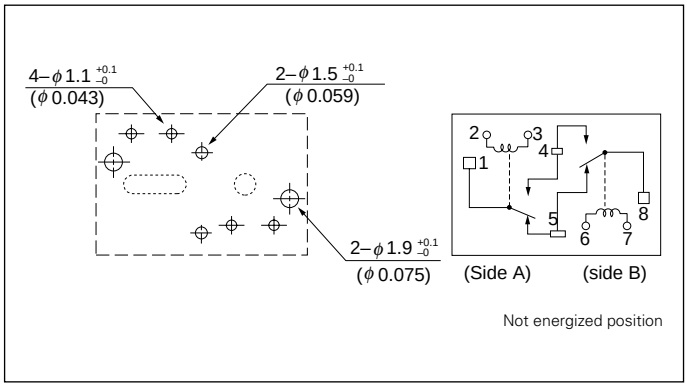


[Separate (T) Type]

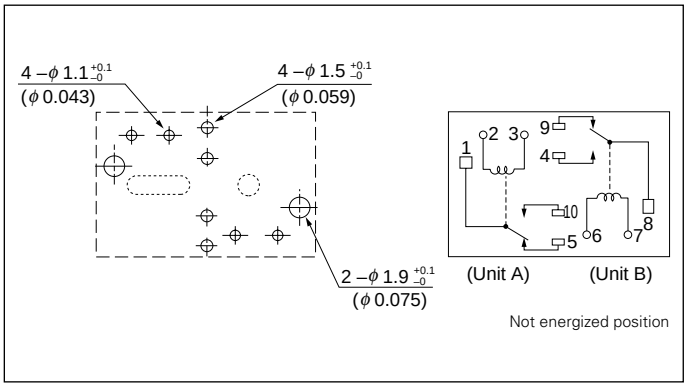


■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS (bottom view) mm (inch)

[H Bridge Type]



[Separate (T) Type]



0256EMDD03VOL01E

■ SPECIFICATIONS

at 20 °C

Items \ Types (Contact Rating)		EP2 (Standard)	EP2-B (High Current)
Contact Form		1 Form c × 2 (H Bridge Type or Separate Type)	
Contact Material		Silver oxide complex alloy (Special type available)	
Initial Contact Resistance * figure 1.		H Bridge (route A) : 10.7 mΩ typ. H Bridge (route B) : 10.4 mΩ typ. Separate (N/C) : 5.2 mΩ typ. Separate (N/O) : 5.2 mΩ typ. (measured by voltage drop at 6 Vdc, 7 A)	H Bridge (route A) : 6.7 mΩ typ. H Bridge (route B) : 6.4 mΩ typ. Separate (N/C) : 3.2 mΩ typ. Separate (N/O) : 3.2 mΩ typ. (measured by voltage drop at 6 Vdc, 7 A)
Contact Switching Voltage		16 Vdc	
Contact Switching Current		30 A Max. (at 16 Vdc)	
Contact Carrying Current		20 A Max. (1 hour Max.) 25 A Max. (2 minutes Max.) at 12 Vdc	25 A Max. (1 hour Max.) 30 A Max. (2 minutes Max.) at 12 Vdc
Operate Time (Excluding bounce)		Approx. 5 ms (at Nominal Voltage)	
Release Time (Excluding bounce)		Approx. 2 ms (at Nominal Voltage), without diode	
Nominal Operate Power		0.48 W/ 0.64 W (at 12 Vdc)	
Insulation Resistance		100 MΩ at 500 Vdc, initial	
Withstand Voltage		500 Vac (for 1 minute), initial	
Shock Resistance		98 m/s² (misoperating), 980 m/s² (destructive failure)	
Vibration Resistance		10 to 300 Hz, 43 m/s² (misoperating), 10 to 500 Hz, 43 m/s² , 200 hours (destructive failure)	
Ambient Temperature		-40 to + 85˚C (-40 to +185˚F)	
Coil Temperature Rise		50˚C / W (122 ˚F/W) (Contact Carrying Current : 0 A)	
Running Specifications	Nonload	1×10^6 operations	
	Load	100×10^3 operations (at 14 Vdc, Motor Load 25 A/5 A)	
Weight		Approx. 15 g (0.53 oz)	

■ COIL RATING

at 20 °C

Part Numbers		Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)	Nominal Operate Power (W)
H Bridge Type	Separate Type					
EP2-3N1	EP2-3N1T	12	225	6.5	0.9	0.64
EP2-3N2	EP2-3N2T	12	225	7.0	0.9	0.64
EP2-3N3	EP2-3N3T	12	225	7.5	0.9	0.64
EP2-4N3	EP2-4N3T	12	300	7.5	0.9	0.48
EP2-4N4	EP2-4N4T	12	300	8.0	0.9	0.48
EP2-4N5	EP2-4N5T	12	300	8.5	0.9	0.48

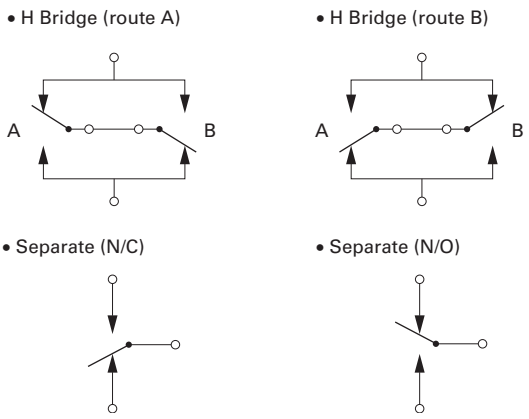
* Test by pulse voltage

■ PART NUMBER SYSTEM

EP2-B3L1 ST

- Wiring: Nil : H bridge type; T : Separate type
- Enclosure: Nil : Unsealed; S : Sealed
- Must Operate Voltage (at 20°C): 1 : 6.5 V; 2 : 7.0 V; 3 : 7.5 V; 4 : 8.0 V; 5 : 8.5 V
- Contact Material: L : Silver oxide complex alloy type I; N : Silver oxide complex alloy type II; G : Silver oxide complex alloy type III
- Coil Resistance (at 20°C): 3 : 225 Ω ± 10 %; 4 : 300 Ω ± 10 %
- Carrying Current Capacity: Nil : Standard type; B : High current type
- Type

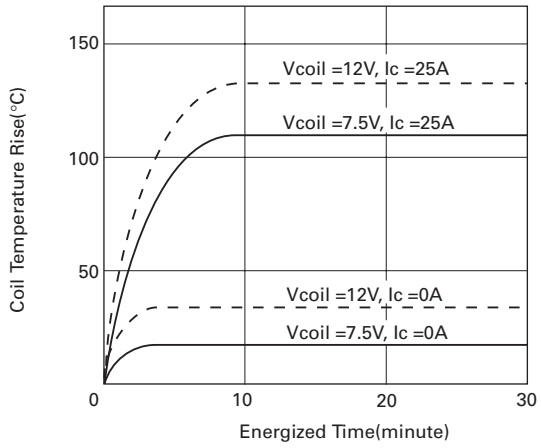
★ Contact Resistance (figure 1)

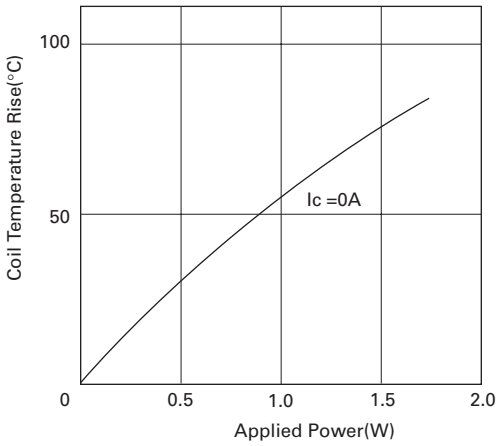


■ DATA

● Coil Temperature Rise

(Sample: EP2-3L1)

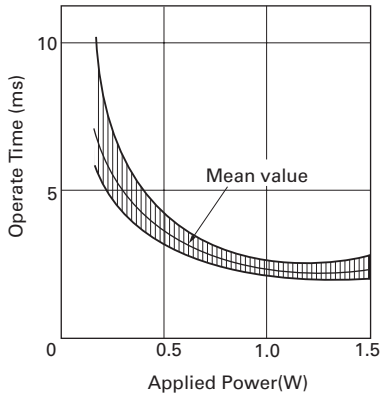




Vcoil: Energized Coil Voltage
Ic: Contact current

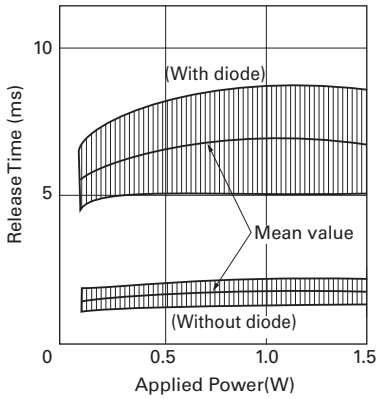
● Operate Time

(Sample: EP2-3L1)



● Release Time

(Sample: EP2-3L1)



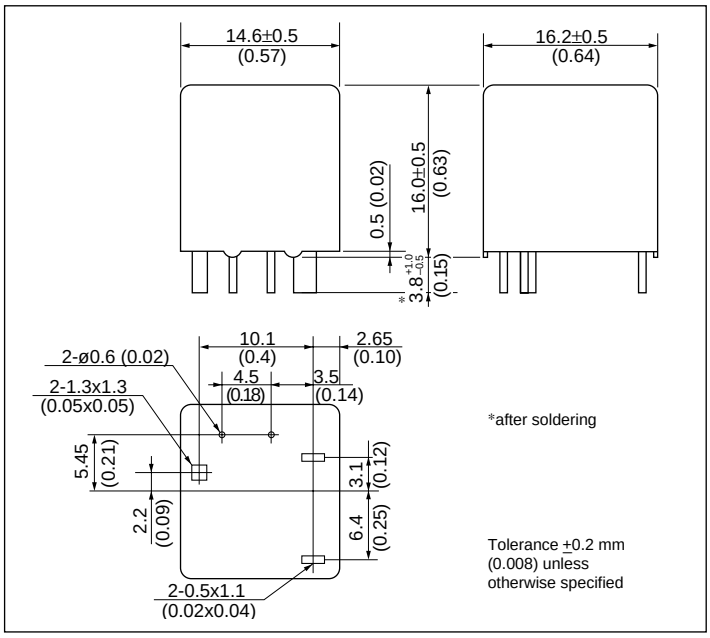
EP1 Series

The automotive relay EP1 Series is printed-circuit-board-mount-type and the most suitable for various motor controls in automotive applications pursuing quality and performance.

■ FEATURES

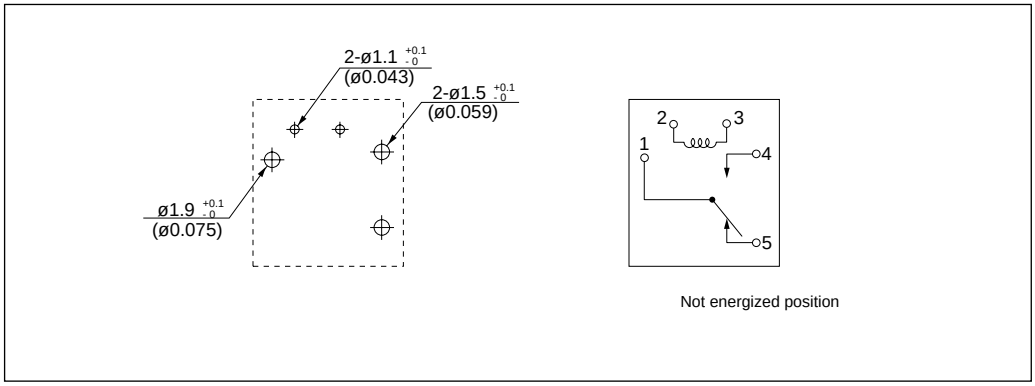
- Flux tight housing
- Low profile
- Two types of contact according to switching current.
  (Standard type: 25 A Max, High current type: 30 A Max.)

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



EP1 Series

■ SPECIFICATIONS

at 20 °C

Items \ Types (Contact Rating)		EP1 (Standard)	EP1-B (High Current)
Contact Form		1 Form c	
Contact Material		Silver oxide complex alloy (Special type available)	
Initial Contact Resistance		5.2 mΩ typ.(measured by voltage drop at 6 Vdc, 7A)	
Contact Switching Voltage		16 Vdc, Max.	
Contact Switching Current		30 A Max. (at 16 Vdc)	
Contact Carrying Current		25 A Max. (1 hour Max.) 30 A Max. (2 minutes Max.) at 12 Vdc	30 A Max. (1 hour Max.) 35 A Max. (2 minutes Max.) at 12 Vdc
Operate Time (Excluding bounce)		Approx. 5 ms (at Nominal Voltage)	
Release Time (Excluding bounce)		Approx. 2 ms (at Nominal Voltage, without diode) initial	
Nominal Operate Power		0.48 W/ 0.64 W (at 12 Vdc)	
Insulation Resistance		100 MΩ at 500 Vdc, initial	
Withstand Voltage		500 Vac (for 1 minute), initial	
Shock Resistance		98 m/s² (misoperating), 980 m/s² (destructive failure)	
Vibration Resistance		10 to 300 Hz, 43 m/s² (misoperating), 10 to 500 Hz, 43 m/s² , 200 hours (destructive failure)	
Ambient Temperature		-40 to + 85˚C (-40 to + 185˚F)	
Coil Temperature Rise		50˚C / W (122 ˚F/W)(Contact Carrying Current: 0A)	
Running Specifications	Nonload	1×10^6 operations	
	Load	100×10^3 operations (at 14 Vdc, Motor Load 25 A/5 A)	
Weight		Approx. 8 g (0.28 oz)	

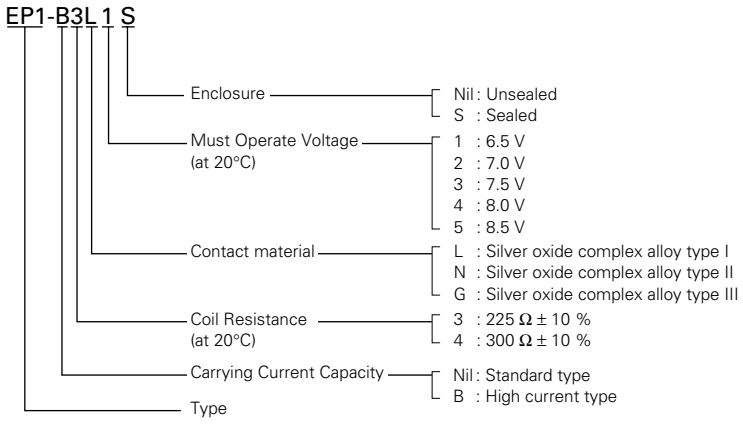
■ COIL RATING

at 20 °C

Part Numbers		Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)	Nominal Operate Power (W)
Standard Type	High Current Type					
EP1-3L1	EP1-B3G1	12	225	6.5	0.9	0.64
EP1-3L2	EP1-B3G2	12	225	7.0	0.9	0.64
EP1-3L3	EP1-B3G3	12	225	7.5	0.9	0.64
EP1-4L3	EP1-B4G3	12	300	7.5	0.9	0.48
EP1-4L4	EP1-B4G4	12	300	8.0	0.9	0.48
EP1-4L5	EP1-B4G5	12	300	8.5	0.9	0.48

* Test by pulse voltage

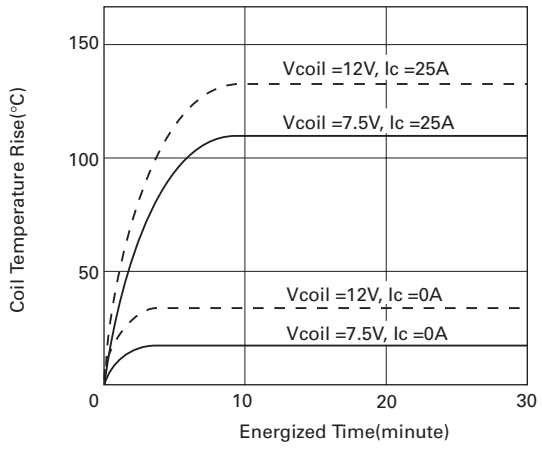
■ PART NUMBER SYSTEM

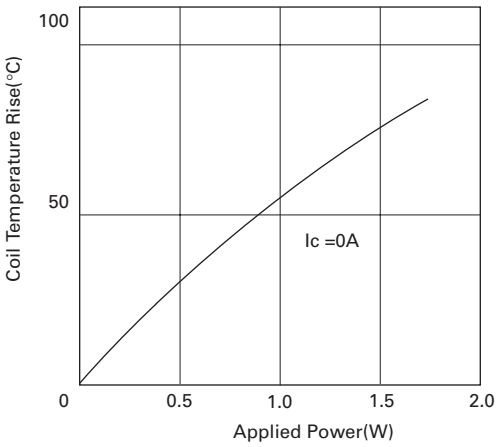


■ DATA

● Coil Temperature Rise

(Sample: EP1-3L1)

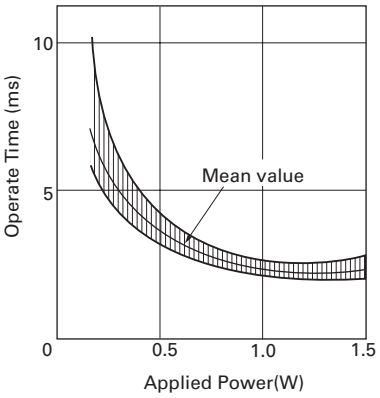




Vcoil: Energized Coil Voltage
Ic: Contact current

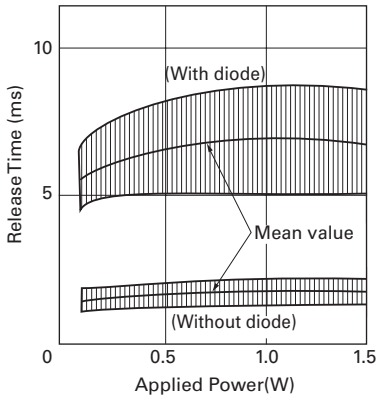
● Operate Time

(Sample: EP1-3L1)



● Release Time

(Sample: EP1-3L1)



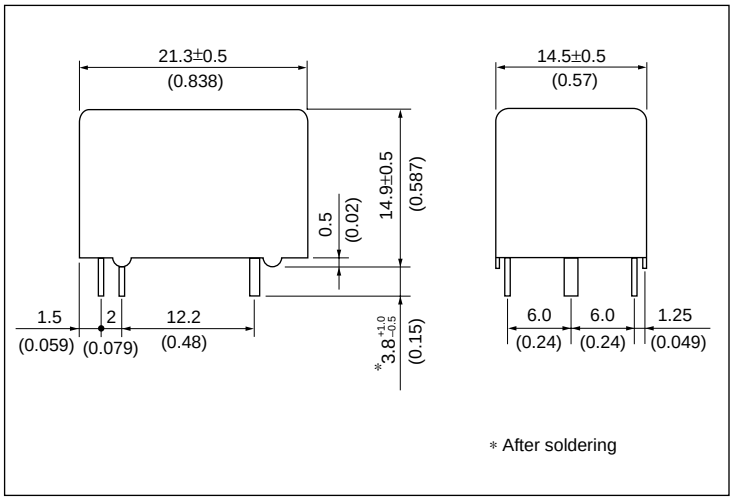
EQ1 Series

The new NECTOKIN EQ1 Series automotive relays are designed for motor and lamp control applications that require a high level of quality and performance. The EQ1 has a unique two-piece design for the magnetic circuit, which result in small size, and high peoductivity.

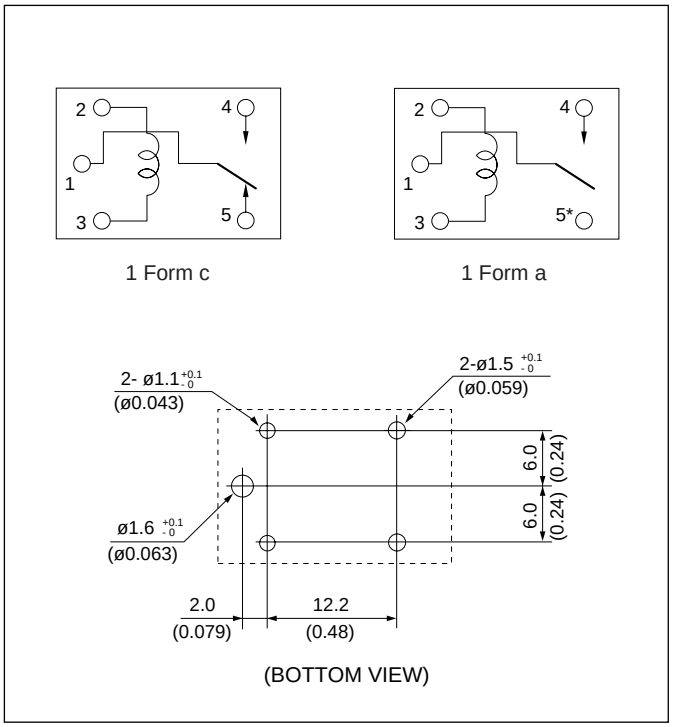
■ FEATURES

- PC board mounting
- Same pin-layout as MR301
- Approx, 70% relay volume of MR301
- Approx, 80% relay space of MR301
- Approx, 90% relay height of MR301
- Approx, 60% relay weight of MR301

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS (bottom view)mm (inch)



* Dummy terminal

■ PART NUMBER SYSTEM

EQ1-3 1 000 S

- Enclosure: Nil : Unsealed; S : Sealed
- Specific Code: 000 to 999
- Must Operate Voltage (at 20°C): 1 : 6.5 V; 2 : 7.2 V
- Coil Resistance (at 20°C): 1 : 144 Ω ± 10 %; 2 : 180 Ω ± 10 %; 3 : 225 Ω ± 10 %
- Type

■ SPECIFICATIONS

Items		For motor control		For lamp and LCR circuit control	
		EQ1-31000S	EQ1-11040S	EQ1-11111S	EQ1-22111S
Contact Form		1 Form c		1 Form a	
Contact Ratings	Maximum Switching Voltage	16 Vdc			
	Maximum Switching Current	35 A (at 16 Vdc)			
	Contact Resistance	Typical 5 mΩ (measureed at 7 A) initial			
Contact Material		Silver oxide complex alloy			
Operate Time (Excluding bounce)		Typical 3 ms (at Nominal Voltage)			
Release Time (Excluding bounce)		Typical 4 ms (at Nominal Voltage, with diode) initial			
Nominal Operating Power		640 mW	1000 mW		800 mW
Insulation Resistance		100 MΩ at 500 Vdc			
Withstand Voltage	Between open contacts	500 Vac min. (for 1 minute)			
	Between adjacent contacts	500 Vac min. (for 1 minute)			
Shock Resistance	Misoperation	98 m/s^2			
	Destructive Failure	980 m/s^2			
Vibration Resistance	Misoperation	10 to 300 Hz, 43 m/s^2			
	Destructive Failure	10 to 500 Hz, 43 m/s^2, 200 hour			
Ambient Temperature		-40 to +85˚C (-40 to + 185˚F)			
Coil Temperature Rise		60 ˚C/W (108 ˚F / W)			
Life Expectancy	Mechanical	1×10^6 operations			
	Motor : 25 A lock	100×10^3 operations		——	
	Lamp : 108 W Tungsten	——		100×10^3 operations	
	Lamp : 120 W Halogen	——		100×10^3 operations	
	LCR circuit : 70 A peak	——		100×10^3 operations	
Weight		Approx. 9 g (0.32 oz)			

■ COIL RATING

● SEALED TYPE

at 20 °C

Applications \ Items		Part Numbers	Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
Motor Control	General Purpose	EQ1-31000S	12	225	6.5	0.9
	For Jump Start	EQ1-11040S		144	6.5	0.6
Lamp and LCR circuit Control		EQ1-22111S		180	7.2	0.7
		EQ1-11111S		144	6.5	0.6

* Test by pulse voltage

● UNSEALED TYPE

at 20 °C

Applications \ Items		Part Numbers	Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
Motor Control	General Purpose	EQ1-31000	12	225	6.5	0.9
	For Jump Start	EQ1-11040		144	6.5	0.6
Lamp and LCR circuit Control		EQ1-22111		180	7.2	0.7
		EQ1-11111		144	6.5	0.6

* Test by pulse voltage

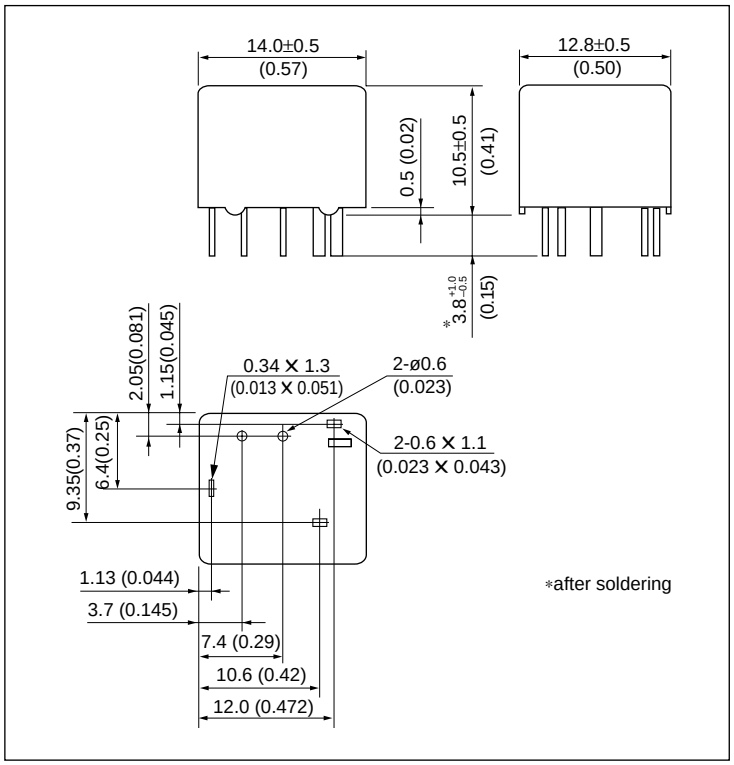
ET1 Series

The new NEC TOKIN EP1 Series are PC-board mount automotive relay suitable for various motor and heater control application that require a high quality and performance. The ET1 series are succeeding ina about 50% of miniaturization in comparison with the EP1 series.

■ FEATURES

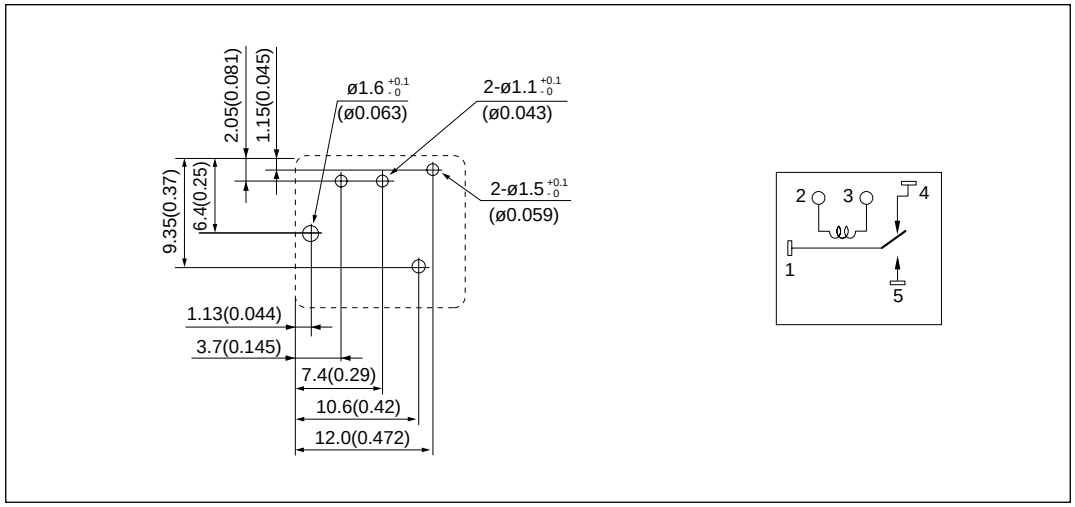
- Flux tight housing
- Approx, 50% relay volume of EP1
- Approx, 76% relay space of EP1
- Approx, 67% relay height of EP1
- Approx, 56% relay weight of EP1

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



■ SPECIFICATIONS

Items			Specifications
Contact Form			1 Form c
Contact Ratings		Maximum Switching Voltage	16 Vdc
		Maximum Switching Current	25 A (at 16 Vdc, inductive loard : 1 mH)
		Contact Resistance	4 mΩ typical (measureed at 7 A) initial
Contact Material			Silver oxide complex alloy
Operate Time (Excluding bounce)			2.5 ms typical (at Nominal Voltage)
Release Time (Excluding bounce)			2.5 ms typical (at Nominal Voltage, with diode) initial
Nominal Operating Power			640 mW
Insulation Resistance			100 MΩ at 500 Vdc
Withstand Voltage		Between open contacts	500 Vac min. (for 1 minute)
		Between adjacent contacts	500 Vac min. (for 1 minute)
Shock Resistance		Misoperation	98 m/s² (10 G)
		Destructive Failure	980 m/s² (100 G)
Vibration Resistance		Misoperation	10 to 300 Hz, 43 m/s²
		Destructive Failure	10 to 500 Hz, 43 m/s² , 200 hour
Ambient Temperature			-40 to + 85˚C
Coil Temperature Rise			70 ˚C/W
Life Expectancy	Mechanical		1×10^6 operations
	Electrical	Power Window Motor (14 V, 20 A, Locked)	100×10^3 operations
		Power Window Motor (14 V, 20 A/3 A, Unlocked)	100×10^3 operations
Weight			Approx. 4.5 g (0.16 oz)

■ COIL RATING

● SEALED TYPE

at 20 °C

Part Numbers	Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
ET1-B3M1S	12	225	6.5	0.9

*Test by pulse voltage

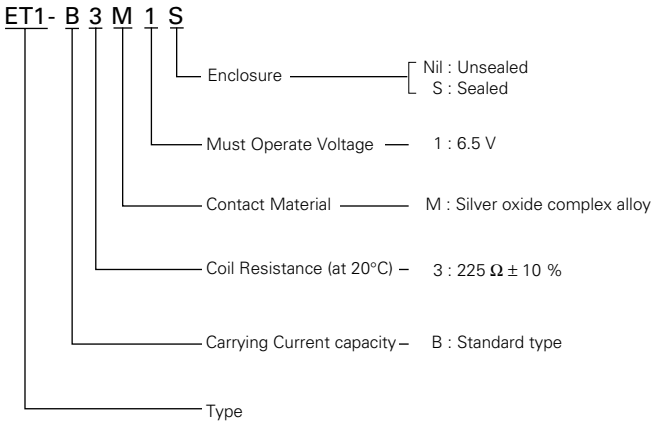
● UNSEALED TYPE

at 20 °C

Part Numbers	Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
ET1-B3M1	12	225	6.5	0.9

*Test by pulse voltage

■ PART NUMBER SYSTEM



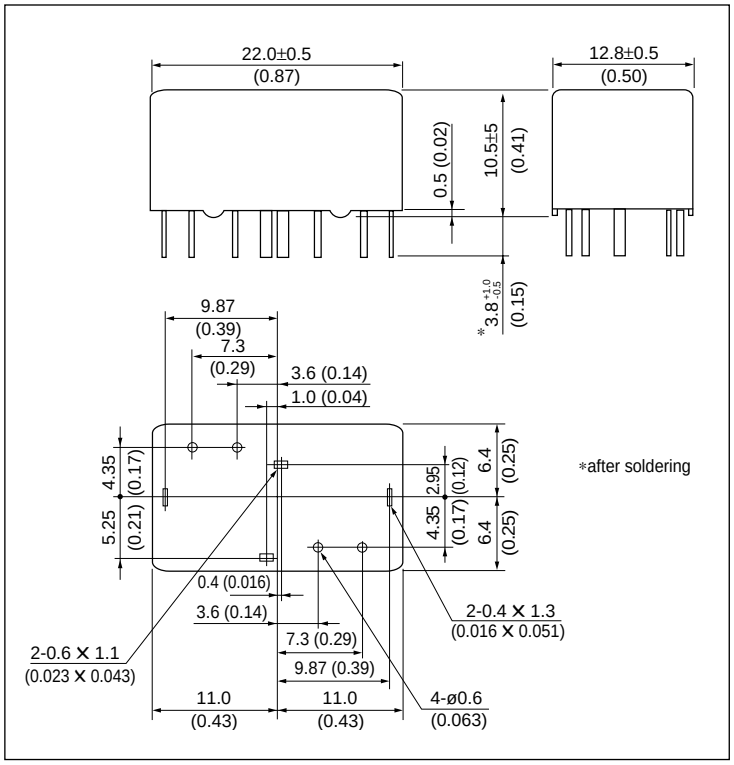
ET2 Series

The new NEC TOKIN ET2 Series are PC-board mount automotive relay suitable for various motor control application that require a high quality and performance. The ET2 series are succeeding ina about 50% of miniaturization in comparison with the EP2 series.

■ FEATURES

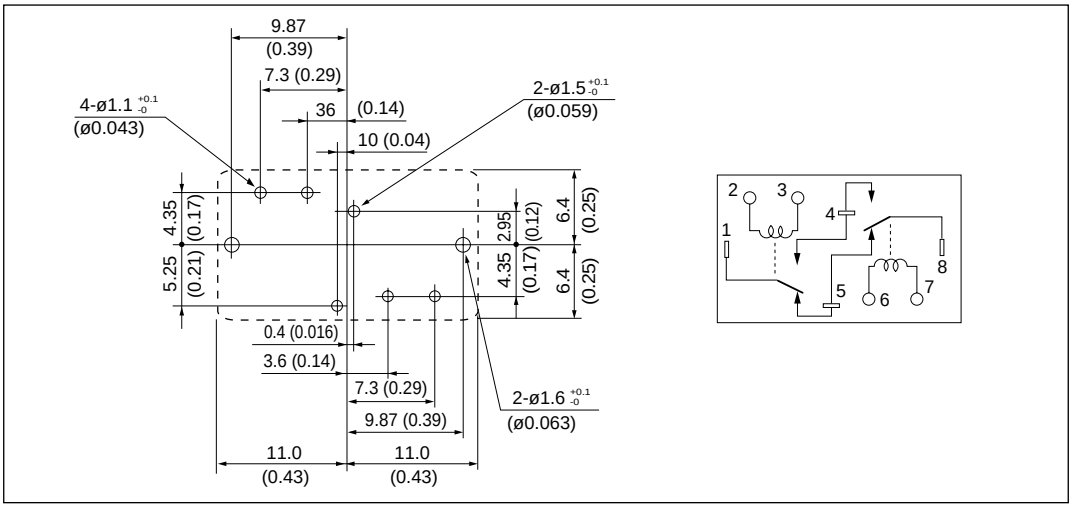
- Flux tight housing
- Approx, 50% relay volume of EP2
- Approx, 74% relay space of EP2
- Approx, 67% relay height of EP2
- Approx, 50% relay weight of EP2

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



■ SPECIFICATIONS

Items			Specifications
Contact Form			1 Form c X 2
Contact Ratings		Maximum Switching Voltage	16 Vdc
		Maximum Switching Current	25 A (at 16 Vdc, inductive loard : 1 mH)
		Contact Resistance	4 mΩ typical (measured at 7 A) initial
Contact Material			Silver oxide complex alloy
Operate Time (Excluding bounce)			2.5 ms typical (at Nominal Voltage)
Release Time (Excluding bounce)			2.5 ms typical (at Nominal Voltage, with diode) initial
Nominal Operating Power			640 mW
Insulation Resistance			100 MΩ at 500 Vdc
Withstand Voltage		Between open contacts	500 Vac min. (for 1 minute)
		Between adjacent contacts	500 Vac min. (for 1 minute)
Shock Resistance		Misoperation	98 m/s^2
		Destructive Failure	980 m/s^2
Vibration Resistance		Misoperation	10 to 300 Hz, 43 m/s^2
		Destructive Failure	10 to 500 Hz, 43 m/s^2, 200 hour
Ambient Temperature			-40 to + 85˚C
Coil Temperature Rise			70 ˚C / W
Life Expectancy	Mechanical		1 × 10^6 operations
	Electrical	Power Window Motor (14 V, 20 A, Locked)	100 × 10^3 operations
		Power Window Motor (14 V, 20 A/3 A, Unlocked)	100 × 10^3 operations
Weight			Approx. 7.5 g (0.26 oz)

■ COIL RATING

● SEALED TYPE

at 20 °C

Part Numbers	Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
ET2-B3M1S	12	225	6.5	0.9

*Test by pulse voltage

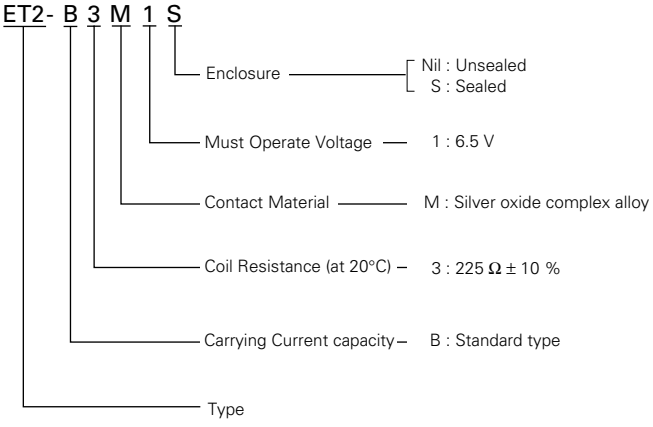
● UNSEALED TYPE

at 20 °C

Part Numbers	Nominal Voltage (Vdc)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
ET2-B3M1	12	225	6.5	0.9

*Test by pulse voltage

■ PART NUMBER SYSTEM



MR301 Series

The MR301 series, which has a low profile package and light weight, is suited for various kinds of consumer equipments, industrial machines and automobiles.

■ FEATURES

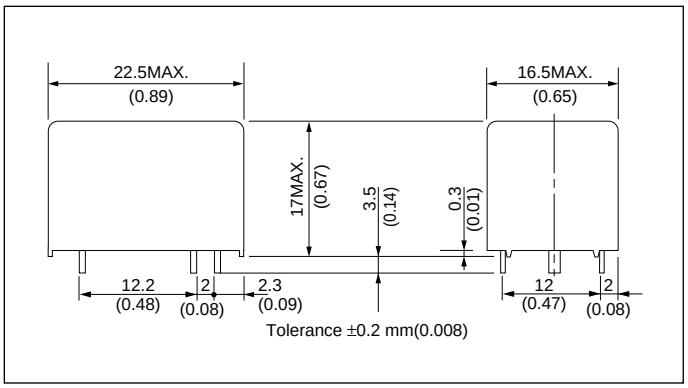
- Low profile, light weight.
- Two types of contact
  (General type: 5A switching, High power type; 10A switching)
- Fluxtight or washable package is available.
- UL recognized (E 73266), CSA certified (LR46266)

■ SAFETY STANDARD AND RATING

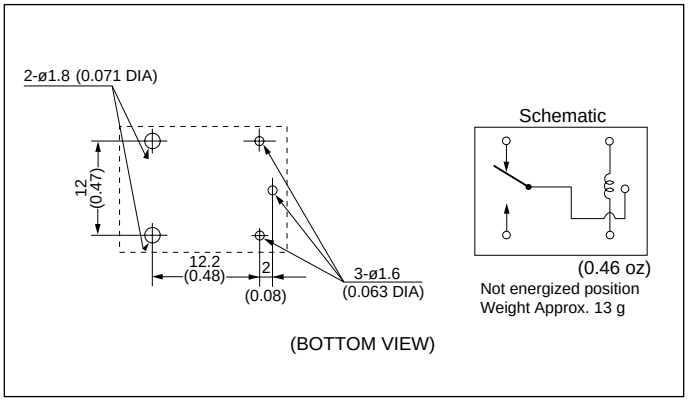
ULRecognized (UL508)* File No. E73266	CSA Certificated (CSA C22.2 No.14) File No. LR46266
MR301-**HU 1/2HP 240VAC 1/4HP 125VAC 30VDC, 7 A (Resistive) 60VDC, 1.0 A (Resistive) 277VDC, 5 A (Resistive) 120VDC, 10 A (Resistive) 360 W, 120VAC Tungsten 120VAC, 2 A Ballast TV-2, 120VAC	MR301- **HU 1/2HP 240VAC 1/4HP 125VAC 30VDC, 7 A (Resistive) 60VDC, 1.0 A (Resistive) 277VDC, 5 A (Resistive) 120VDC, 10 A (Resistive) 360 W, 120VAC Tungsten 120VAC, 2 A Ballast
MR301- **U 1/4HP 240VAC 1/8HP 125VAC 30VDC, 5 A (Resistive) 277VDC, 2.5 A (Resistive) 120VDC, 5 A (Resistive) 130 W, 120VAC Tungsten 120VAC, 2 A Ballast	

* Spacing : UL114, UL478

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS mm (inch)



■ PART NUMBER SYSTEM

MR301-3HUSL

- Nil : 0.3 mm Standoff
- L : 0.8 mm Standoff
- Nil : Unsealed
- S : Sealed
- Nil : Standard type
- U : UL recognized, CSA certified type
- Nominal coil voltage 3,5,6,9,12,24 Vdc
- Nil : General type (5A)
- H : High power type (10A)
- E : High power type (15A) for automotive

■ SPECIFICATIONS

Items \ Types (Contact Rating)			MR301(5A)	MR301-H(10A)	MR301-E(15A)
Contact Form			1 Form c		
Contact Ratings	Maximum Switching Power (Resistive Load)		150 W, 600 VA	300 W, 1200 VA	240 W
	Maximum Switching Voltage (Resistive Load)		250 Vac, 30 Vdc		16Vdc
	Maximum Switching Current (Resistive Load)		5A	10A	15A
	Maximum Switching Voltage & Current		5 Vdc, 0.1 A	5 Vdc, 1 A	
	Initial Contact Resistance		8.8 mΩ typ. (measured by voltage drop at 5 Vdc, 0.5A)	8.8 mΩ typ. (measured by voltage drop at 5 Vdc, 2A)	
Contact Material			Silver nickel alloy	Silver oxide complex alloy	
Operate Time (Excluding bounce)			Approx. 5 ms(at nominal voltage)		
Release Time (Excluding bounce)			Approx. 6 ms(at nominal voltage) without diode		
Nominal Operate Power			360 mW		
Insulation Resistance			1000 MΩ at 500 Vdc		
Withstand Voltage		Between open contacts	750 Vac (for one minute)		
		Between contacts and coil	1500 Vac (for one minute)		
Electrostatic Copacitance		Between open contacts	Approx. 1 pF		
		Between contacts and coil	Approx. 10 pF		
Shock Resistance			98 m/s^2 (misoperating), 980 m/s^2 (destructive failure)		
Withstand Resistance			10 to 300 Hz, 43 m/s^2 (misoperating), 10 to 500 Hz, 43 m/s^2, 200 hours (destructive failure)		
Ambient Temperature			-40 to + 85˚C (-40 to + 185˚F)		
Coil Temperature Rise			50˚C/W (125˚F/W)		
Running Specifications		Nonload	10×10^6 operations		
		Load	100×10^3 operations		
Weight			Approx. 13 g(0.46 oz)		

■ COIL RATING

at 20°C

Nominal Voltage		Coil Resistance ( )± 10 %	Must Operate Voltage* (Vdc)	Must Release Voltage* (Vdc)
Vdc	3	25	2.1	0.3
	5	70	3.5	0.5
	6	100	4.2	0.6
	9	225	6.3	0.9
	12	400	8.4	1.2
	24	1600	16.8	2.4

* Test by pulse voltage

This section provides notes on correctly using the miniature relay. Be sure to read this before using the relay.

Proper functioning of the miniature relay requires appropriate circuit design, mounting and evaluation according to the purpose of use.
Note that the responsibility for accidents caused by improper circuit design, mounting or evaluation falls on you and we cannot be responsible for them.

1. GENERAL

(1) Never allow the contact load to exceed the maximum ratings; otherwise, the lifetime of the relay will be dramatically shortened.
The lifetime specified in the catalog is for certain load conditions, and other factors must be taken into consideration in actual circuits. Therefore, an accurate lifetime must be measured in the actual circuit.
The two tables below show load current range guidelines.

[Signal relay]

Current range	100 mA to 1 mA	1 mA to 0.5 A	0.5 A to 2 A
	GOOD	VERY GOOD	NOT SO GOOD for some cases
Application	• Contacts may be unstable. • Thermal electromotive force and contact noise should be taken into consideration.	• Contacts are stable and highly reliable.	• Infrequent operation poses no problem, but frequent operation deteriorates contact stability. • Use of a power relay is preferred for 1 A or higher.

[Power relay]

Current range	to 100 mA	100 mA to 1 A	A to 35 A
	NOT SO GOOD for some cases	GOOD	VERY GOOD
Application	• Only for applications in which an increase in contact resistance poses no functional problems. • Use of a high capacitance type is not possible.	• It seldom has wear on contacts or dislocation and can be used without problems.	• Since differ-ent contact phenomena occur depending on the contact load, it is necessary to check the contact load and select the correct contacts.

(2) When using the relay with a high current or high capacitance load, an inrush current may cause contact dislocation or deposition; therefore check the feasibility of use in the actual circuit.

(3) Be sure to use the relay at an ambient temperature within the maximum ratings; otherwise, the life of the relay will be radically shortened. If use outside the specified temperature range in unavoidable, consult NEC TOKIN.

(4) With a relay whose coil polarity is specified in its internal circuit diagram, apply the polarity of the rated voltage as specified. Note that when a rippled DC power source is used, abnormalities such as beat in the coil may occur.

(5) Exercise care when handling the relay so as not to apply shock to it or drop it.

(6) The flow soldering conditions are for 5 to 10 seconds at 250 °C.

(7) When cleaning, use alcohol, or a water-based solvent. Avoid using ultrasonic cleaning.

2. NOTES ON CONTACT LOAD

(1) Minimum load

Use the relay at a voltage and current higher than the minimum load; otherwise, the contact resistance will increase and the signal cannot be correctly transmitted. This is because stabilization of the contact surface (electrically and mechanically eliminating minute substances generated on the contact surface) by opening/closing the contacts with the minimum load probably will not occur.

In addition, even if the load is within the maximum ratings, care is required to ensure that the current does not drop below the minimum load after opening/closing the contacts.

(2) Contact protection circuit

By providing a protection circuit that suppresses transient current and voltage applied to the contacts when the contacts are opened or closed, the switching life of a relay can be improved.

It is important to select a correct protection circuit suited to the load.

① General notes

(a) It is necessary to place the protection circuit close to the contacts. In principle, place it on the same printed circuit board as that for the contacts (within a distance of several tens of centimeters).

(b) It is important to confirm the effectiveness of the protection circuit in the actual circuit. In some cases, it is also necessary to conduct lifetime tests using an appropriate equivalent circuit.

② Examples of contact protection circuits

(a) Inductive load

With an inductive load, when the contacts are opened to break the circuit, a counter electromotive force as shown in Fig. 1 is generated, causing an electric discharge between the contacts. This discharge energy accelerates metal dislocation and wear on the contact surface. A protection circuit is therefore necessary to absorb this counter electromotive force. Table 1 shows guideline circuit examples and circuit constants. Never use a connection with a capacitor only as shown in Table 2.

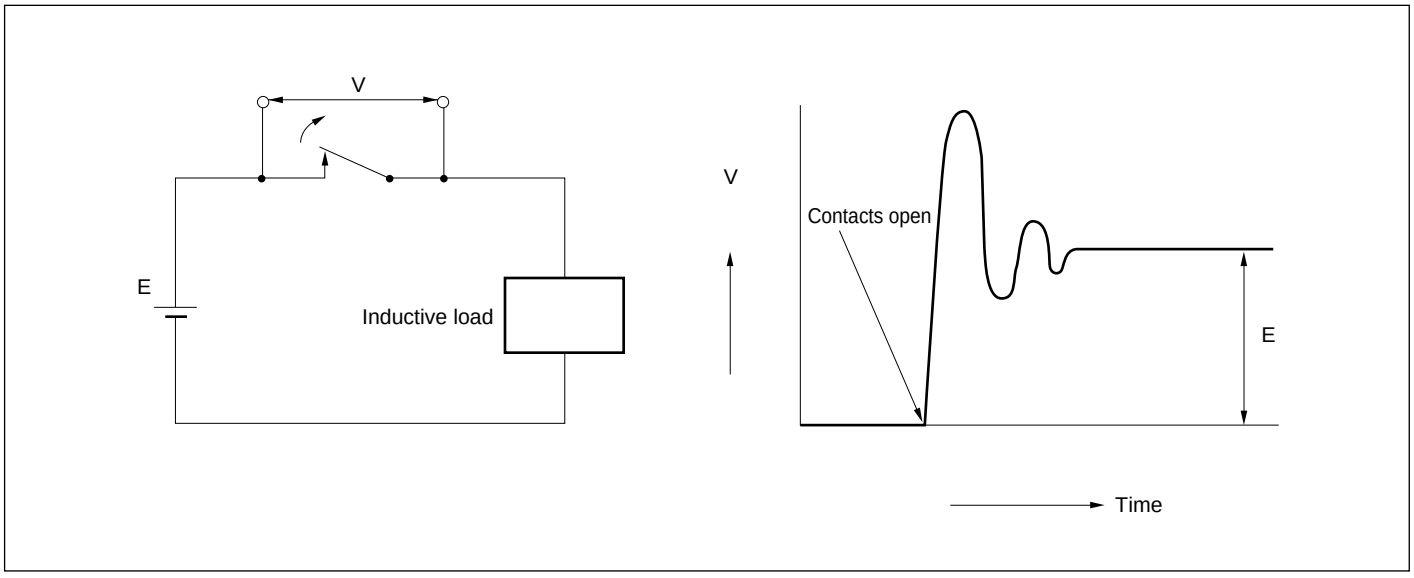


Fig.1 Inductive Load Circuit

Table 1 Inductive Load Contact Protection Circuits

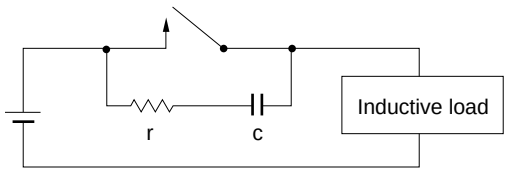
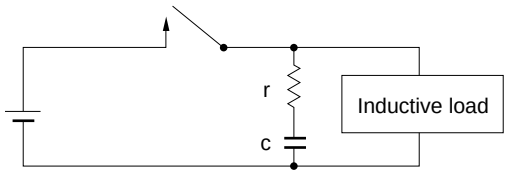
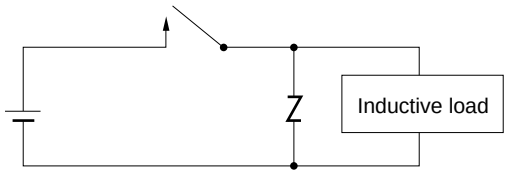
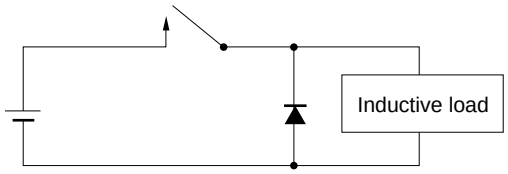
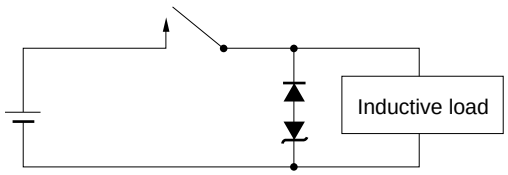
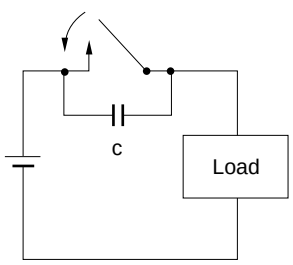
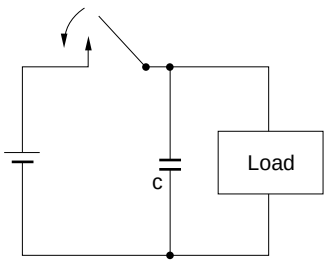
Protection element	Circuit example	Remarks
Capacitor + resistor (CR circuit)		$r\ (\Omega) = \frac{\text{contact voltage (V)}}{0.5 \text{ to } 1}$ $C\ (\mu F) = (0.5 \text{ to } 1) \times \text{contact current (A)}$ The withstand voltage of a non-polar capacitor should be 300 V or higher.
		
Varistor		High voltage is suppressed by using the voltage characteristics of the varistor.
Diode		Pay attention to the reverse withstand voltage of the diode.
Diode + Zener diode		The ON time of the diode is controlled by using the Zener voltage characteristic and the recovery time of the relay can be shortened.

Table 2 Examples of Wrong Circuits Using Capacitors

WRONG 	This circuit is effective for arc suppression when the contacts are opened, but when the contacts are closed a capacitor short-circuit current flows, making the contacts more susceptible to metal deposition.	**WRONG** 	This circuit is effective for arc suppression when the contacts are opened, but when the contacts are closed a capacitor charging current flows, making the contacts more susceptible to metal deposition.

(b) Lamp loads (inrush current), etc.

Some loads, such as halogen lamps, have a low initial resistance so that an inrush current 10 times as high as the steady-state current may flow through the relay on power application. A high inrush current may also flow when the relay is used to switch loads such as motors and capacitors. In these cases, a current-limiting resistor is connected to the contacts in series in order to keep the inrush current to within the maximum rated value (refer to Fig. 2).

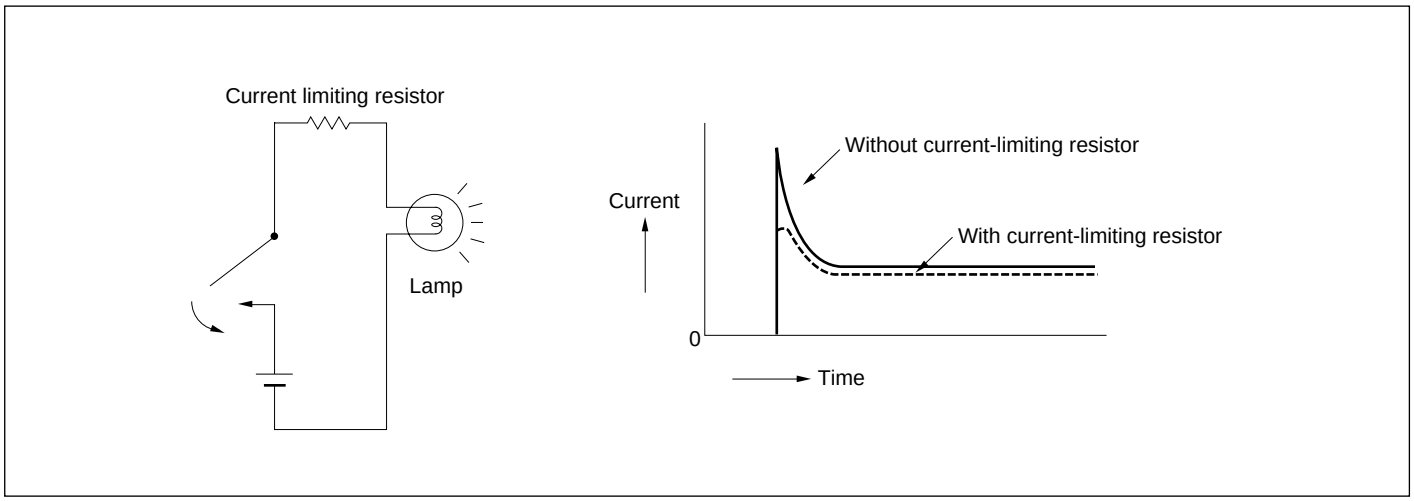


Fig.2 Example of Current-Limiting Resistor in Lamp Load Circuit

(c) Stray line capacitance

When the stray line capacitance is large, the inrush current that is generated due to the stray line capacitance poses a problem. As shown in Fig.3, the electric charge on the line capacitance is discharged directly through the contacts when the contacts are closed. The smaller the wiring cable characteristic impedance and the longer the cable, the greater wear on the contacts.

It is necessary to connect a current-limiting resistor or surge suppresser in series with the contacts as a protection circuit to suppress the inrush current.

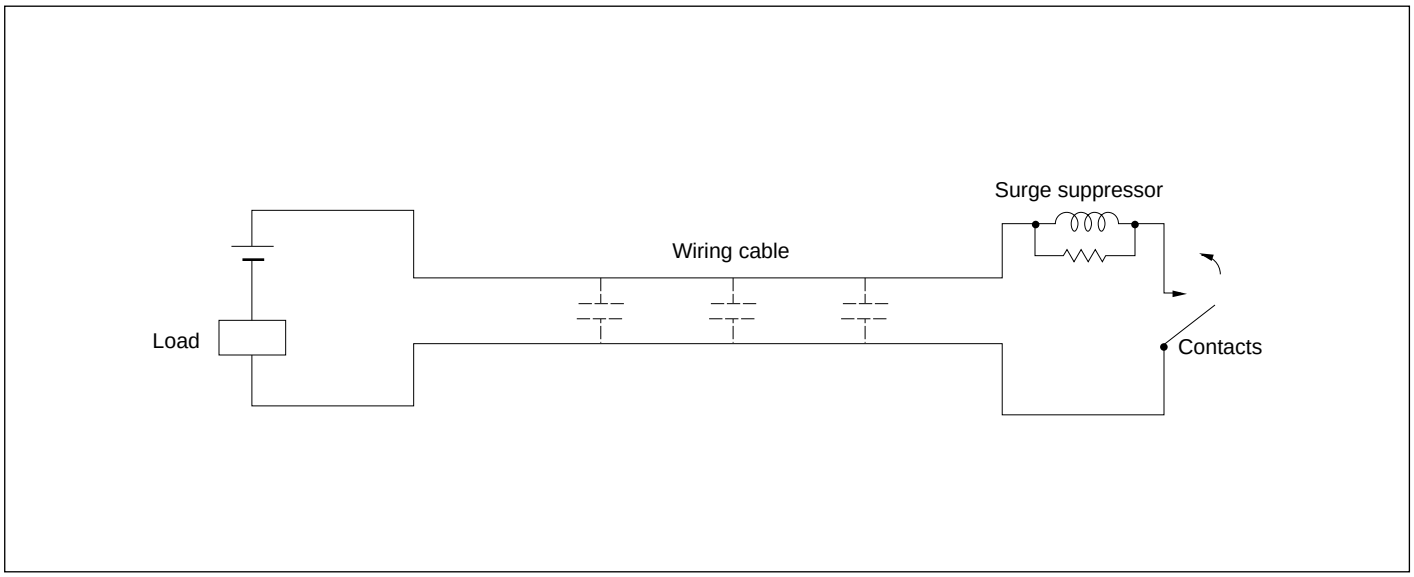


Fig.3 Example of Surge Suppression Circuit with Surge Suppressor

3. NOTES ON DRIVING RELAYS

(1) Temperature characteristics

If the relay is used at an ambient temperature exceeding the operating temperature range, the performance of the relay may be degraded and the life may be dramatically shortened.

① It is possible to use the relay at the rated coil voltage within the operating temperature range. Note, however, that at the upper limit of the operating temperature range the permissible voltage on the coil may be restricted, and must be confirmed before the relay is used.

② The must operate voltage, must release voltage, operate time and release time change with the ambient temperature. Refer to Technical Documents to confirm that the relay operates normally at a particular operating temperature.Fig.4 shows an example of the temperature characteristics of the relay.

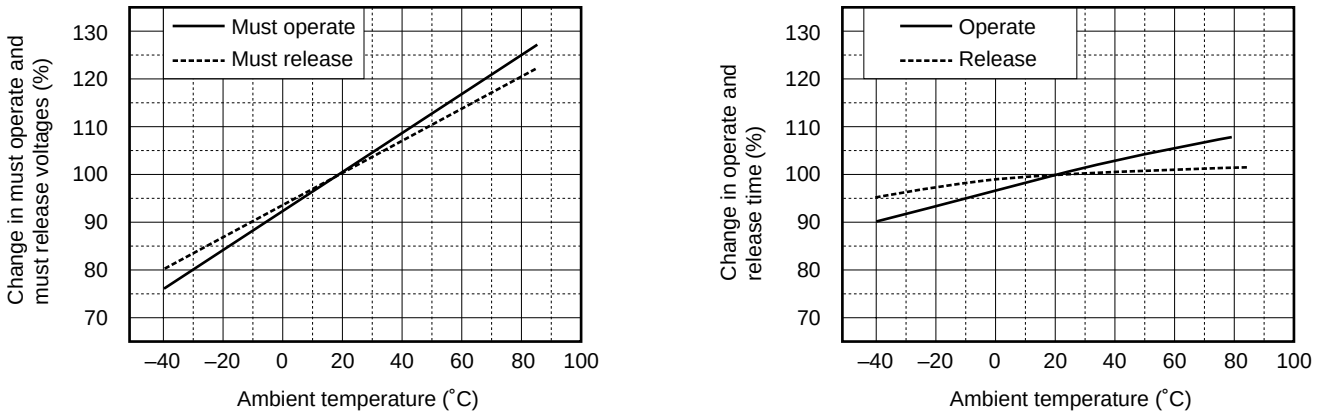


Fig.4 Temperature Characteristics of Relay (Example)

(2) Maximum applied voltage

The maximum applied voltage of the relay coil changes with the ambient temperature. The difference between the permissible temperature specified by relay design and the operating temperature is the permissible temperature rise (the self-heat temperature, i.e., the applied-voltage-dependent portion).

Refer to the coil voltage vs. temperature derating characteristics in the Technical Documents for this value. Fig. 5 shows an example.

The permissible temperature of the relay is determined mainly by the coil wire materials and the permissible temperature of the plastic materials used. In the case of the NEC TOKIN miniature signal relay, it is set at 120 °C in the standard specification.

The larger the coil applied voltage, the shorter the operate time becomes. Note, however, that bounces in the make contacts also become larger, increasing the contact opening/closing frequency, which may affect the life of the contacts.

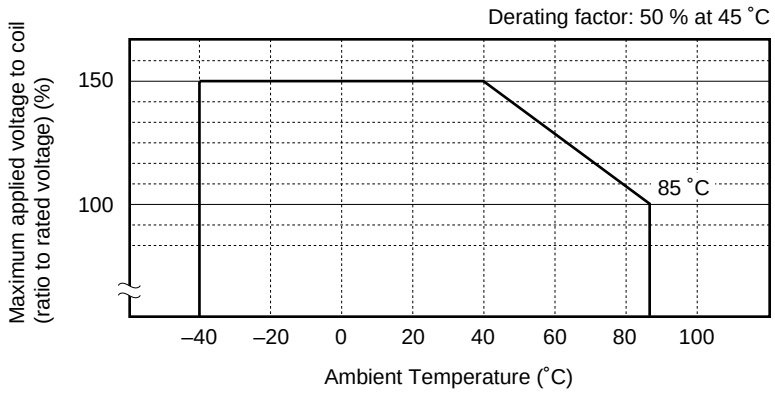


Fig.5 Coil Voltage vs. Ambient Temperature Derating Characteristics (Example)

(3) Hot start

When the temperature of the relay has risen due to heat generated by the voltage applied to the coil, the relay may not operate even if the coil is energized again immediately after it has been once deenergized. This is because an increase in the coil resistance due to heat in the relay causes the current to fall even though the applied voltage remains constant. This reenergizing state is called a hot start. This problem occurs especially when the operating temperature is high and a voltage lower than the relay rated voltage is applied. It is necessary to refer to Technical Documents to know in advance the must operate voltage at the time of a hot start in order to prevent this malfunction.

(4) Non-must operate and holding voltages

In some circuits, the relay must not operate at a certain voltage or release at a certain voltage. In such cases, contact NEC TOKIN because a special specification product with non-must operate and holding voltages specified can be provided.

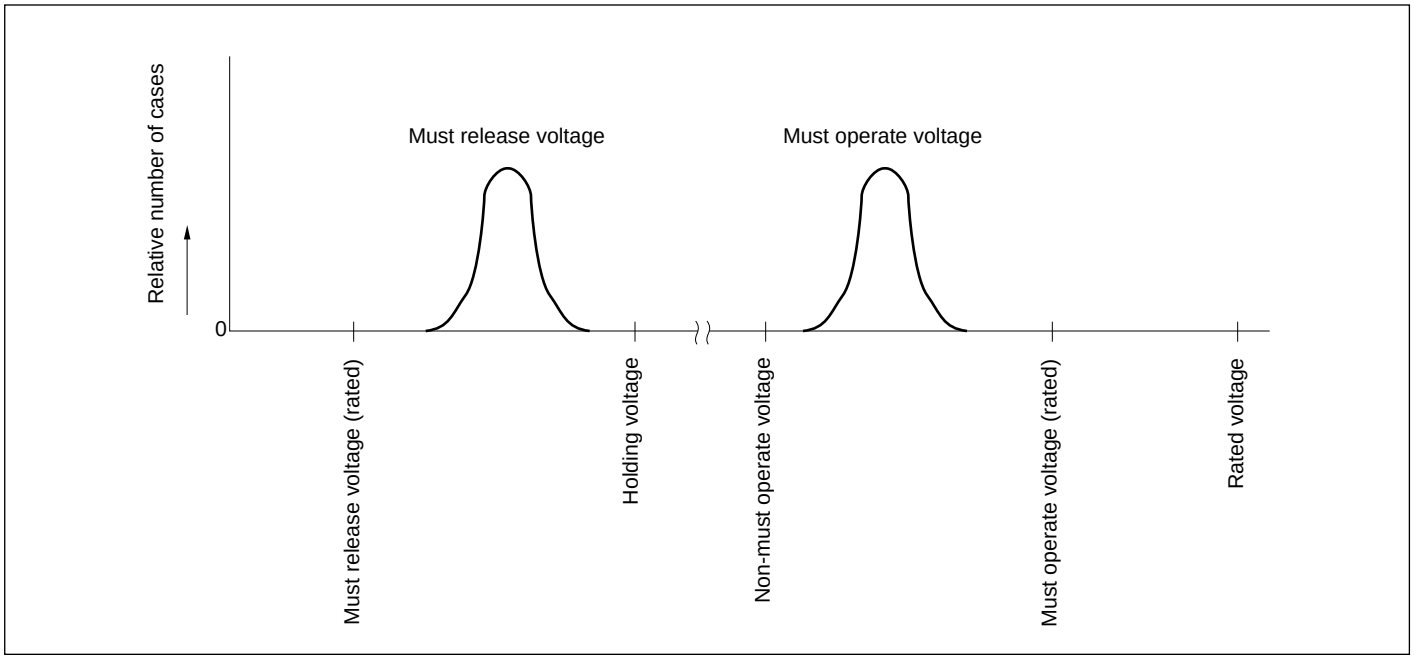


Fig.6 Example of Distribution of Relay Must Operate Voltage and Must Release Voltage

(5) Drive waveform

If the waveform of the relay coil drive voltage gradually increases and decreases, the relay may not be able to deliver its inherent performance. The voltage must instantaneously rise and fall as a pulse.

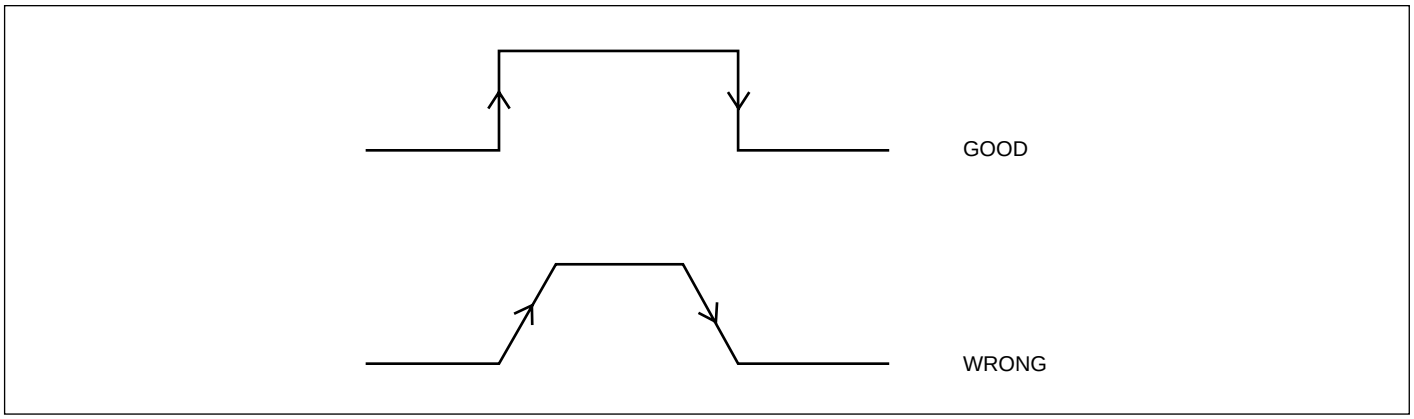


Fig.7 Relay Drive Waveform

(6) Latching relay drive circuit

① Since the relay coil has an inductive impedance, a counter electromotive force is generated when the circuit is opened. This voltage may damage the relay driver transistor, and therefore a diode is connected in parallel with each coil. With a single coil latching type relay, however, a diode cannot be used because the current direction of the coil is inverted. Therefore, when a single coil latching type relay is used, select a transistor with sufficient reverse breakdown voltage.

② A latching relay is driven by a pulsating coil voltage. The pulse width of this drive voltage must be 10 ms or wider. If the pulse is too short, the relay may not operate.

③ Apply a voltage to the coil in the polarity specified by the internal connection diagram of the relay. With a double coil latching type relay, do not apply voltage in a manner that both the set and reset coils are energized at the same time. (Refer to Fig. 8.)

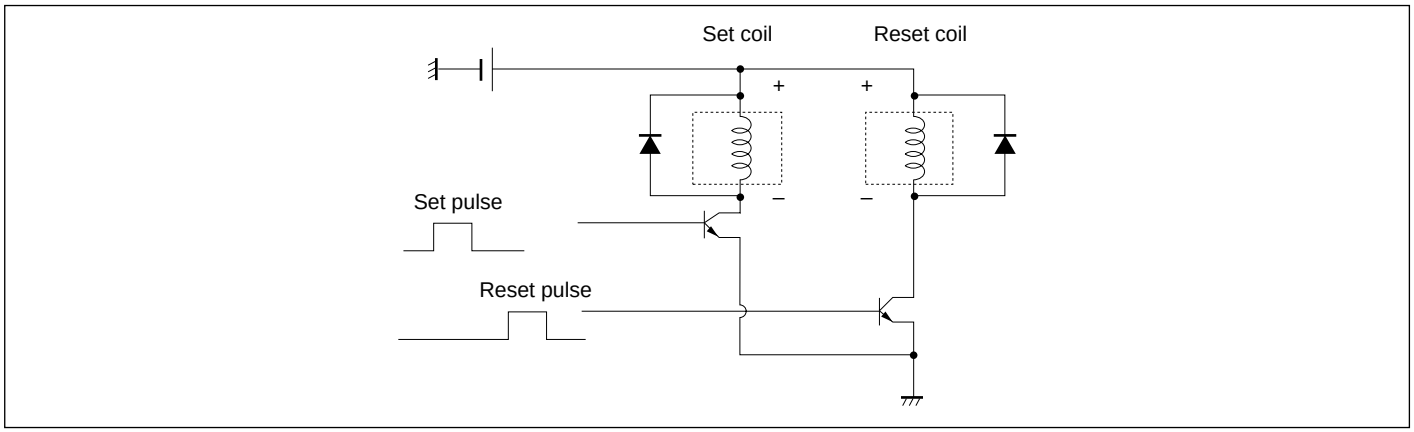


Fig.8 Drive Circuit of Latching Relay (Example of Double Coil Latching Type)

④ A latching relay is factory-set to the reset state for shipment. However, it may be set while being transported due to vibration or shock. Make sure that the relay is reset when its application system starts operating. When the relay is employed in a portable system, the circuit must be designed so that the relay is reset at the beginning of operation of the system because the relay may be set by unexpected vibration or shock.

⑤ When configuring a self-holding circuit that uses the self-break contacts of the relay, note that the coil drive circuit is disconnected by the self-contacts, causing troubles such as self-oscillation.

(7) Connection of coil diode

In the case of loads, such as solenoid and electromagnetic clutches, that produce large discharge energy when the contacts are opened, connect a Zener diode with the drive transistor.
Particularly when the diode is connected in parallel with the coil, the current in the coil diminishes gradually when the relay is released, and thus may slow down opening of the contacts, intensifying wear on the contacts.

(8) Opening/closing frequency

If the contacts are opened/closed frequently with a high current load, repeated electric discharges may cause contact metal deposition or damage to the contact spring. When using the relay with a high current load with frequent opening/closing of the contacts, consult NEC TOKIN.

(9) Long continuous energizing of coil

If the coil is energized continuously for a long time, the coil temperature may rise, promoting generation of organic gas inside the relay, which is likely to cause trouble in the contacts. When using a circuit requiring constant operation, consider the possibility of using a latching relay that does not need continuous energizing of the coil.

(10)Instantaneous voltage drop of circuit

When the same power source is used for the relay drive circuit and the load circuit in a circuit such as a lamp load circuit where an inrush current flows, the moment the contacts are closed the source voltage may drop if the power source capacitance is small. In this case, the relay may be released or an oscillation phenomenon where the relay repeatedly releases and operates may occur.
Add power source capacitance or a smoothing circuit to prevent this phenomenon.

4. NOTES ON OPERATING ENVIRONMENTS

(1) Ambient temperature

Ensure that the ambient temperature of the relay mounted on the device is within the “operating temperature range” in the catalog. Use of the relay at a temperature outside this range may adversely affect insulation or contact performance. For the relationship between the ambient temperature and relay drive conditions, refer to **3. Notes on Driving Relays**.

(2) Humidity

Use of a sealed type relay in a high humidity (RH85 % or higher) environment for a long time may introduce moisture inside the relay. This moisture may combine with NOx or SOx generated by glow discharges to produce nitric acid or sulfuric acid. In this case, the acid produced may corrode the metal that forms the relay, causing operation troubles in the relay. If use of the relay in such a high humidity environment is unavoidable, consult NEC TOKIN in advance.

(3) Atmosphere

Use of a relay in an atmosphere with a high concentration of sulfur gases (H_2S, SO_2), nitric acid gas (HNO_3), ammonia (NH_3), silicon vaporization gas, etc., may cause imperfect contacts and other functional trouble. Avoid use of the relay in such an atmosphere. If it is unavoidable, use a sealed type relay.

(4) Atmospheric pressure

A sealed type relay maintains constant sealability under normal pressures (810 to 1200 hpa). However, if it is used under other pressure conditions, its sealability may be destroyed or the relay may be deformed, causing functional trouble. Be sure to use the relay under normal pressure conditions.

(5) Vibration and shock

The vibration resistance and shock resistance of a relay are as shown in the catalog and use of the relay under conditions other than those specified may cause malfunctions or damage.
Be sure to use the relay within those vibration and shock conditions.
Even before the relay is used, repeated excessive vibration or shock load may cause malfunctioning of the relay, by causing metal deposition on the contacts and other functional trouble. Malfunctions due to vibration or shock during operation may cause considerable damage or wear of the contacts.
Note that operation of a snap switch mounted close to the relay or shock by operation of an electromagnet may cause malfunctioning.

(6) Influence of magnetic fields

The magnetic circuit of an NEC TOKIN miniature signal relay is constructed so that the relay does not easily malfunction due to influence of external magnetic fields. However, under the influence of magnetic flux leaking from a transformer, speaker, or magnet placed in the vicinity of the relay, the must operate voltage, must release voltage, operate time, release time and other dynamic characteristics may change.
In applications where these characteristics changes pose problems, it is necessary to take measures such as magnetic shielding. Also, when many make them miniature signal relays are closely located, the magnetic flux leaking from those relays may make them interfere with each other, causing changes in the must operate voltage, must release voltage, operate time, release time and other dynamic characteristics. Fig. 9 shows examples of the mounting, magnetization, and change in the must operate voltage of signal relays in the EA2 series. In applications where these characteristics changes pose a problem, it is necessary to reduce the mounting density.

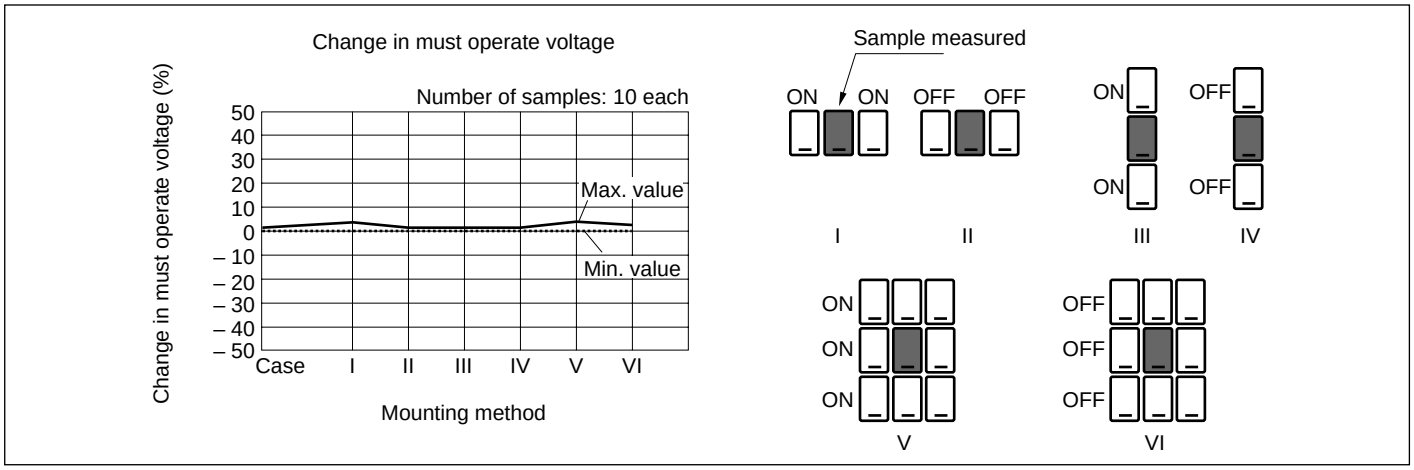


Fig.9 Change in Must Operate Voltage in Dense Mounting

5. INFLUENCE OF RELAY OPERATION ON SURROUNDINGS

(1) Electromagnetic noise

Switching the relay coil generates a high electromotive force due to induction. In general, a surge suppression circuit is connected in parallel with the relay coil to suppress generation of this electromotive force. However, if this suppression circuit is not appropriate, electronic circuits such as microcontrollers may malfunction due to the surge generated. Add an appropriate absorption circuit to prevent electronic circuits from malfunctioning due to the surge generated.

(2) Arc discharge

Connecting/disconnecting a high current at the relay contacts generates an arc discharge. This discharge may cause electronic circuits such as microcontrollers to malfunction and therefore it is necessary to take appropriate measures.

(3) Generation of leakage magnetic flux

Leakage magnetic flux exists in the vicinity of the relay in the magnetized state. Mounting a magnetic sensor, etc. close to the relay may cause malfunctioning.

6. NOTES ON MOUNTING

(1) Design of printed circuit boards

① If an electronic circuit such as a microcontroller is placed close to a relay, noise generated by the relay may cause malfunctioning.

② When designing patterns keep to the shortest possible distance in wiring.

③ For the printed circuit board on which a relay is mounted, use a board of 1 mm or more in thickness. If the printed circuit board is not thick enough, it may be subject to warpage which will add tension to the relay, causing variations in the relay characteristics. Because a flexible printed circuit board is particularly thin, it is necessary to solder near the root of the relay pins. Since preliminary soldering of the pin root part is often insufficient, its solder is likely to become loose.

④

If a thermal cycle is applied to the soldered part, cracks may be generated in it. Special care is required for the relay location, base material and through hole shape.

(2) Relay mounting position

The vibration resistance and shock resistance of a relay are greatly affected by its mounting position. It is particularly important to select the mounting position to prevent the break contacts from being instantaneously cut due to vibration and shock. The vibration resistance and shock resistance are at a minimum when the direction of vibration and shock applied to the relay matches the operation direction of the armature (mobile iron piece) and contacts. Therefore, if it is possible to anticipate the direction of vibration or shocks, mount the relay so that the direction in which vibration or shocks are applied is perpendicular to the direction of the relay armature operation. Fig. 10 shows the direction of relay armature operation.

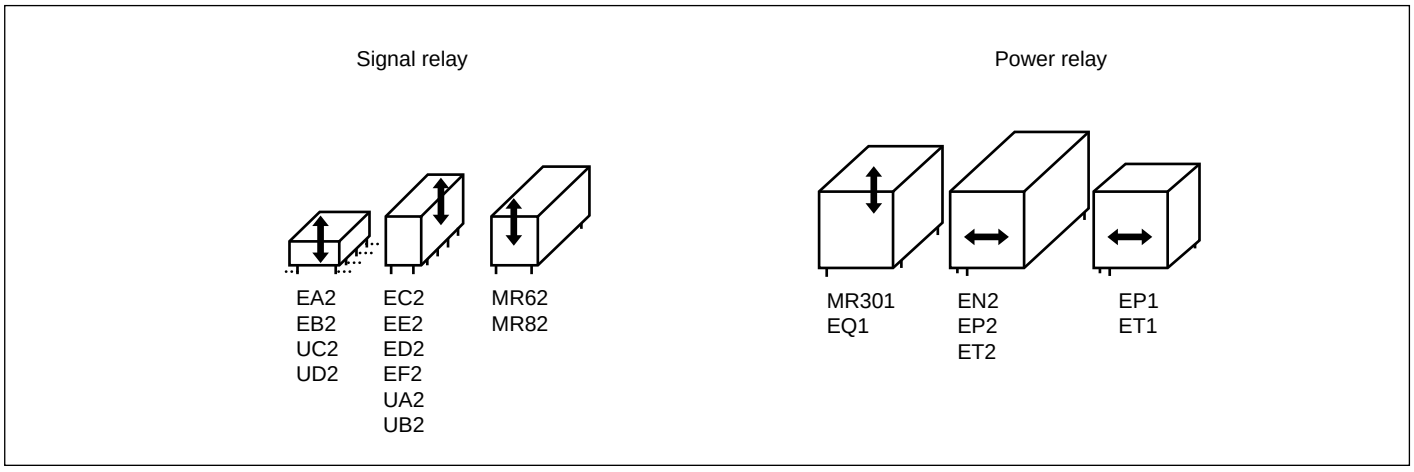


Fig.10 Direction of Armature Operation

(3) Notes on mounting

① Chucking

When a relay is mounted using an automatic machine, note that application of an excessive external force to the cover at the time of chucking or insertion of the relay may damage or change the characteristics of the cover.

② Temporary securing to printed circuit board

Avoid bending the pins to temporarily secure the relay to the printed circuit board. (Refer to Fig. 11.) Bending the pins may degrade sealability or adversely influence the internal mechanism. Pin bending may be allowed under certain conditions in the case of miniature signal relays. Contact NEC TOKIN for details.

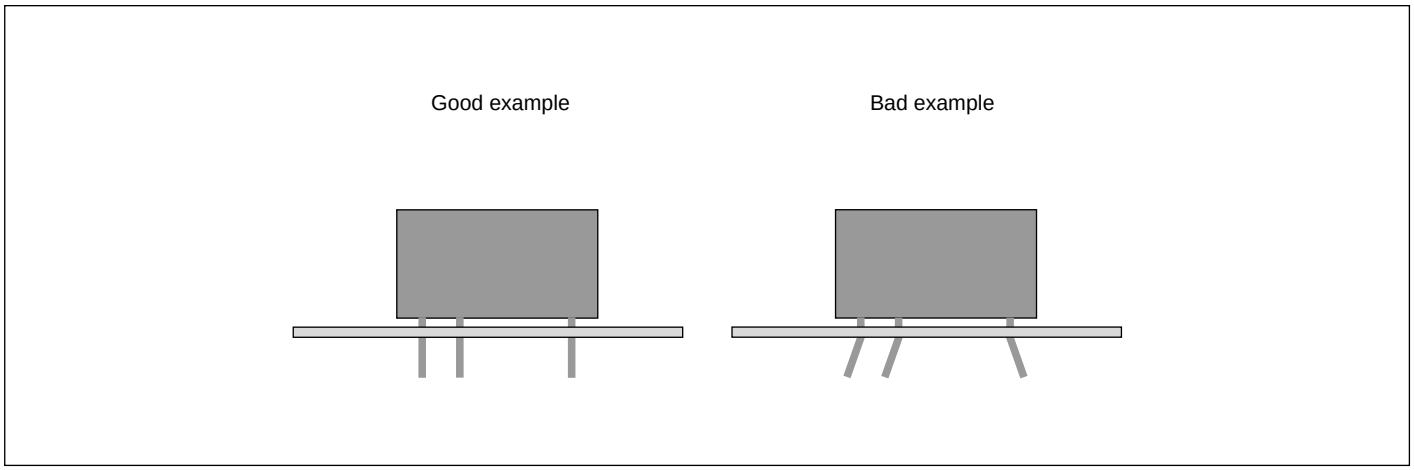


Fig.11 Bending Relay Pins

③ Application of soldering flux

For an unsealed type relay, do not directly apply soldering flux to the relay.

④ Soldering work

The following conditions are recommended for soldering a relay onto a printed circuit board.

(a) Automatic soldering: Flow solder is recommended.
<Recommended conditions> *Preheating: 100 °C max. 1 min. max.
*Solder temperature: 250 °C max.
*Solder time: 5 to 10 seconds

(b) Manual soldering (by soldering iron):
<Recommended conditions>
*Solder temperature: 350 °C max.
*Solder time: 2 to 3 seconds

Ventilation immediately after soldering is completed is recommended.
Avoid immersing the board in cleaning solvent immediately after soldering; otherwise thermal shock may be applied to it.

⑤ Pin cutting after soldering

Do not cut the pins of the relay with a revolving blade or an ultrasonic cutter, because vibration that is applied to the relay during the cutting may change the relay characteristics.

7. NOTES ON CLEANING

(1) Cleaning solvent

Use of alcohol or water-based cleaning solvents is recommended. Never use thinner or benzene because these solvents may damage the relay housing. A sealed type relay can be immerse-cleaned because solvent does not penetrate inside the relay.

(2) Avoid ultrasonic cleaning.

Ultrasonic cleaning may cause a break in the coil wire or sticking of the contacts due to the energy of vibration.

8. NOTES ON HANDLING RELAYS

(1) Use of magazine case stoppers

Relays are packaged in magazine cases for shipment.
When some relays are taken out from the case and space is freed inside the case, be sure to secure the relays in the case with a stopper. If the relays are not well secured, vibration during transportation may cause contact problems.

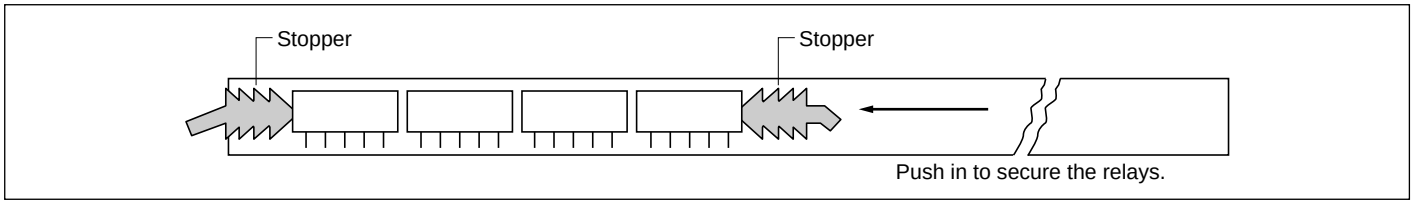


Fig.12 Storage in Magazine Case

(2) Do not use relays that have been dropped.

If an individual relay product falls from the work table, etc. a shock of 1000 G or more is applied to the relay and its functions may be destroyed. Even if the shock is apparently weak, confirm that there is no abnormality before using the relay.

9. NOTES ON USING SMT RELAYS

(1) Mounting pads

Determine the dimensions of the mounting pads on the printed circuit board taking into consideration such factors as solderability and insulation in order to accommodate the mounting accuracy of the automatic mounter. Use the dimensions of the mounting pads in the catalog.

(2) Solder reflow

The SMT relay is highly resistant to heat. However, solder the relay under the correct temperature conditions so that the full performance of the relay can be realized. The IRS (infrared ray reflow soldering) and VPS (vapor phase soldering: reflow by using latent heat of organic solvent) methods are recommended.
In addition, air reflow soldering may also be used. Whichever soldering method is used, be sure to confirm the temperature conditions for soldering and the influence of soldering on the relay in advance before setting work standards.

(3) Storage

The sealability of a surface-mount relay may be lost if the relay absorbs moisture and is then heated during soldering .
When storage relays, therefore,observe the following points:
<1> The storage humidity must be no more than 70% RH. The recommended storage period is 3 months maximum.
<2> When the relay is stored 3 months or longer, please keep the strage humidity to within 50% RH and mount relay in 6 months maximum.

[MEMO]

[MEMO]

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The information in this document is based on documents issued in July, 2002 at the latest.
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