Devices thru Material Innovation

NEC/TOKIN

Miniature Relays

11th edition

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- All specifications in this catalog and production status of products are subject to change without notice. Prior to the purchase, please contact NEC TOKIN for updated product data.
- Please request for a specification sheet for detailed product data prior to the purchase.
- Before using the product in this catalog, please read "Precautions" and other safety precautions listed in the printed version catalog.

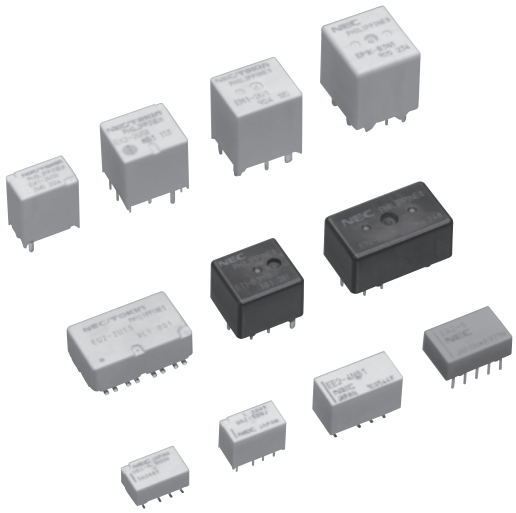
9600RSGVOL11E1003N1

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.

9600RSGVOL11E1003N1

Miniature 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.

Feature

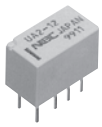
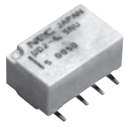
Miniature signal relay

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

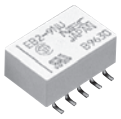
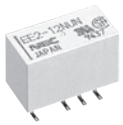
Miniature power relay

- 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
- Reflow soldering type available

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 •Low power consumption type available	•super-compact size •surface mount (low profile type) •2500V surge (2 x 10 μs*) •latching type available •Low power consumption type available
• Contact Form		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		3,4.5,5,9,12,(24) VDC			
• Nominal Operate Power		100 to 230mW (latch type 100 to 120 mW)			
• Must Operate Voltage		75%(Low power consumption type of UC2/UD2=80%)			
• Must Release Voltage		10%			
• Operate Time (typ.) (Excluding bounce)		2ms			
• Release Time (typ.) (Excluding bounce Without Diode)		1ms			
• Running Specifications	Load	1×10^5 (30 VDC, 1 A at 20°C) 1×10^5 (125 VAC, 0.3A at 20°C)			
	Non-load	10×10^6			
• Withstand 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, IEC			
• 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		12 to 13, 16 to 18	14 to 18	19, 20, 23 to 25	21 to 25

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	•Low power consumption •dual-inline leads (small mounting space) •2500 V surge (2 x 10 μs*) coil to contacts •latching type available •high-insulation 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, high-voltage type is line up.	• Features
2c				• Contact Form
Silver alloy with gold alloy overlay				• Contact Material (standard)
30W/62.5 VA		60W/125 VA (UL/CSA Rating)		• Contact Rating (resistive) (switching) 3A 2A 1A 2.0A 1.0A
3,4.5,5,12,24 VDC		3,4.5,5,9,12,24 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)				• Running Specifications — Load
10 x10^6				• Running Specifications — Non-load
1000VAC(1500VAC: NK type of EE2 at make contact)				• Withstand Voltage — Between open contacts
1000VAC				• Withstand Voltage — Between adjacent contacts
1000VAC		1500VAC or 1000VAC**		• Withstand Voltage — Between contacts and coil
1500V FCC		1500V (FCC), 2500V***(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)
26, 27, 30 to 32	28 to 32	33 to 35, 39 to 43	36 to 43	• Page

* 2 μs of rise time and 10 μs of decay time to half crest.
** for double coil latch type
*** 1500V for double coil latch type

Selector Chart

• Group		Miniature Relay-Signal	
• Type of Relay		***ED2*** 	***EF2*** 
• Features		•ultra-low power consumption •dual-inline leads (small mounting space) •2500 V surge (2 x 10 μs*) coil to contacts	•ultra-low power consumption •surface mount (reduced mounting space) •2500V surge (2 x 10 μs*) coil to contacts
• Contact Form		2c	
• Contact Material (standard)		Silver alloy with gold alloy overlay	
• Contact Rating (resistive) (switching)		30W/62.5 VA	
	3A	.....	
	2A	.....	
	1A	1.0A	
• Coil Voltage		1.5,3,4.5,5,9,12,24 VDC	
• Nominal Operate Power		30 to 70mW	
• Must Operate Voltage		75%	
• Must Release Voltage		10%	
• Operate Time (typ.) (Excluding bounce)		3ms	
• 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)	
	Non-load	10×10^6	
• Withstand Voltage	Between open contacts	1000VAC	
	Between adjacent contacts	1000VAC	
	Between contacts and coil	1500VAC or 1000VAC**	
• Surge Withstand Voltage		1500V(FCC), 2500 V***(2x10 μs, coil to contacts)	
• Safety Standard		UL, CSA	
• Option		—	
• Height (mm)		9.4	10.0
• Mounting Space (mm^2)		7.5 × 15.0	9.5 × 15.0
• Page		44, 45, 48 to 50	46 to 50

#FCC surge between coi and contacts and between adjacent contacts

Selector Chart

Miniature Relay-Power			• Group
EU2 	***EX2*** 	***EX1*** 	• Type of Relay
•Ultra low profile SMD twin relay for motor reversible control •Light weight •PC board mounting •Reflow soldering available •75% lower mounting height than ET2 •57% lower mounting height than EX2	•Ultra miniature twin relay for motor reversible control •Light weight •Small footprint •Small mounting area •PC board mounting •Flux tight housing •75% less relay volume than ET2 •60% less relay space than ET2	•Ultra miniature single relay for motor control •Small footprint •Small mounting area •Light weight •PC board mounting •Flux tight housing •65% less relay volume than ET1 •50% less relay space than ET1	• Features
1c × 2	1c × 2	1c	• Contact Form
Silver oxide complex alloy			• Contact Material (standard)
30A(16VDC)			30A 25A 20A 15A 10A 5A 1A • Contact Rating (DC motor load) (switching)
12 VDC			• Coil Voltage
960mW	900mW		• Nominal Operate Power
6.5VDC			• Must Operate Voltage
0.6 VDC	0.9 VDC		• Must Release Voltage
Approx. 2.5ms			• Operate Time (typ.) (Excluding bounce)
Approx. 3ms			• Release Time (typ.) (Excluding bounce With Diode)
100×10^3 motor load			Load — • Running Specifi-cations
1×10^6			Non-load
500VAC			Between open contacts — • With-stand Voltage
—			Between adjacent contacts
500VAC			Between contacts and coil
—			• Surge Withstand Voltage
—			• Safety Standard
—			• Option
8	14.2		• Height (mm)
12.2 × 21	12.6 × 14.1	8.0 × 12.6	• Mounting Space (mm^2)
51 to 52	53 to 54	55 to 56	• Page

Selector Chart

• Group		Miniature Relay-Power	
• Type of Relay		***ET2*** 	***ET1*** 
• Features		•Miniature twin relay for motor reversible control •Low profile •Light weight •PC board mounting •Flux tight housing •50% less relay volume than EP2 •50% less relay weight than EP2 *ET2F:High heat resistivity	•Miniature single relay •Motor, Heater & solenoid control •Low profile •Light weight •PC board mounting •Flux tight housing •45% less relay volume than EP1 •56% less relay weight than EP1 *ET1F:High heat resistivity
• Contact Form		1c × 2	1c
• Contact Material (standard)		Silver oxide complex alloy	
• Contact Rating (resistive) (switching)	30A 25A 20A 15A 10A 5A 1A	25A(16VDC)	
• Coil Voltage		12 VDC	
• Nominal Operate Power		640mW	
• Must Operate Voltage		6.5VDC	
• Must Release Voltage		0.9 VDC	
• Operate Time (typ.) (Excluding bounce)		Approx. 2.5ms	
• Release Time (typ.) (Excluding bounce Without Diode)		Approx. 3ms	
• Running Specifi-cations	Load	100×10^3 motor load	
	Non-load	1×10^6	
• With-stand Voltage	Between open contacts	500VAC	
	Between adjacent contacts	—	
	Between contacts and coil	500VAC	
• Surge Withstand Voltage		—	
• Safety Standard		—	
• Option		—	
• Height (mm)		11.0	
• Mounting Space (mm^2)		13.3 × 22.5	13.3 × 14.5
• Page		57 to 58	59 to 60

Selector Chart

Miniature Relay-Power				• Group
EP2 	***EP1*** 	***EP1K*** 	***EN2*** 	• Type of Relay
•Twin relay for motor reversible control •PC board mounting •Flux tight housing •Symmetrical structure *EP2F:High heat resistivity	•Single relay •For motor control •PC board mounting •Flux tight housing *EP1F:High heat resistivity	•Large capacity single relay for motor, heater & solenoid control •High heat resistance •PC board mounting •Flux tight housing •Through-hole reflow soldering available •About 10A larger current than EP1	•Twin relay for motor reversible control •PC board mounting •Flux tight housing •Symmetrical structure	• Features
1c × 2	1c	1c	1c × 2	• Contact Form
Silver oxide complex alloy				• Contact Material (standard)
30A (16VDC)			35A (16VDC)	30A 25A 20A 15A 10A 5A 1A • Contact Rating (resistive) (switching)
12 VDC				• Coil Voltage
480mW / 640mW		640mW	640mW / 800mW / 1150mW	• Nominal Operate Power
6.5 to 8.5VDC		6.5VDC	6.5 to 8.5VDC	• Must Operate Voltage
0.9 VDC			0.6 or 0.9 VDC	• Must Release Voltage
Approx. 5ms				• Operate Time (typ.) (Excluding bounce)
Approx. 7ms				• Release Time (typ.) (Excluding bounce Without Diode)
100×10^3 motor load 14VDC, 25A / 3A			100×10^3 motor load 14VDC, 30A / 7A	Load • Running Specifi-cations
1×10^6				Non-load • Running Specifi-cations
500VAC				Between open contacts • With-stand Voltage
–				Between adjacent contacts • With-stand Voltage
500VAC				Between contacts and coil • With-stand Voltage
–				• Surge Withstand Voltage
–				• Safety Standard
Separate type	–		Separate type	• Option
16.5		17.5	17.0	• Height (mm)
16.7 × 24.3	16.7 × 15.1		16.5 × 33.5	• Mounting Space (mm^2)
61 to 63	64 to 66	67 to 68	69 to 70	• Page

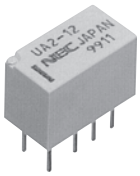
Selector Chart

• Group		Miniature Relay-Power		
• Type of Relay		***EQ1-31000***	***EQ1-11040***	***EQ1-11111***	***EQ1-22111***
				
• Features		•Single relay •For general purpose •Small size & light weight •PC board mounting •Flux tight housing	•Single relay •For jump start •Small size & light weight •PC board mounting •Flux tight housing	•Single relay •For lamp & LCR circuit control •Small size & light weight •PC board mounting •Flux tight housing	
• Contact Form		1c		1a	
• Contact Material (standard)		Silver oxide complex alloy			
• Contact Rating (resistive) (switching)	30A 25A 20A 15A 10A 5A 1A	30A(16VDC)			
• Coil Voltage		12 VDC			
• Nominal Operate Power		640mW	1000mW		800mW
• Must Operate Voltage		6.5VDC			7.2VDC
• Must Release Voltage		0.9VDC	0.6VDC		0.7VDC
• Operate Time (typ.) (Excluding bounce)		Approx. 3ms			
• Release Time (typ.) (Excluding bounce Without Diode)		Approx. 4ms			
• Running Specifi-cations	Load	100×10^3 motor load, 25A / 5A		100×10^3 lamp load or LCR circuit (peak current 70A)	
	Non-load	1×10^6			
• With-stand Voltage	Between open contacts	500VAC			
	Between adjacent contacts	—			
	Between contacts and coil	500VAC			
• Surge Withstand Voltage		—			
• Safety Standard		—			
• Option		—			
• Height (mm)		15.4			
• Mounting Space (mm^2)		15.0 × 21.8			
• Page		71 to 72			

Selector Chart

Miniature Relay-Power	• Group	
EM1	• Type of Relay	
		
•Large capacity single relay for lamp, condenser & motor control •High heat resistance •PC board mounting •Flux tight housing •Through-hole reflow soldering available •The smallest 40A class relay	• Features	
1u	• Contact Form	
Silver oxide complex alloy	• Contact Material (standard)	
40A(16VDC)	35A 30A 25A 20A 15A 10A 5A 1A	• Contact Rating (DC motor load) (switching)
12 VDC	• Coil Voltage	
640mW	• Nominal Operate Power	
6.5VDC	• Must Operate Voltage	
0.9VDC	• Must Release Voltage	
Approx. 6ms	• Operate Time (typ.) (Excluding bounce)	
Approx. 1ms (Excluding bounce Without Diode)	• Release Time (typ.) (Excluding bounce With Diode)	
100×10^3 resistive load, 40A	Load	• Running Specifi-cations
1×10^6	Non-load	
500VAC	Between open contacts	• With-stand Voltage
—	Between adjacent contacts	
500VAC	Between contacts and coil	
—	• Surge Withstand Voltage	
—	• Safety Standard	
—	• Option	
16.5	• Height (mm)	
12.9 × 14.9	• Mounting Space (mm^2)	
73 to 74	• Page	

UA2 Series



NEC TOKIN'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.
- Telcordia (2500 V) and FCC (1500 V) surge capability.
- IEC60950 / 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)

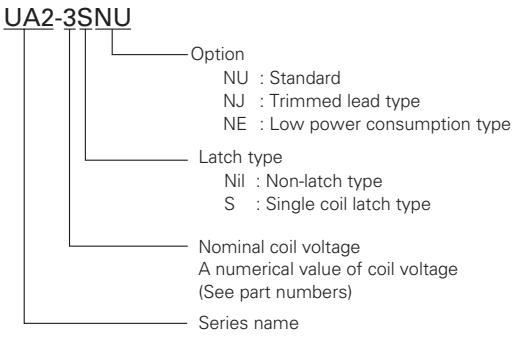
■ SPECIFICATIONS

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	Non-latch 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)
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/s^2 (misoperation) 980 m/s^2 (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	Non-load	5 × 10^7 *4 operations(Non-latch type)
	Load	30 VDC, 1 A (resistive), 1 × 10^5 operations at 20°C, 1 Hz
		125 VAC, 0.3 A (resistive), 1 × 10^5 operations at 20°C, 1 Hz
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 1×10^7 operations.

UA2 Series

■ 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 to EN60950)
Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
9	579	6.75	0.9	140
12	1028	9.0	1.2	140
24	2504	18.0	2.4	230

• Single Coil Latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	1440	9.0	9.0	100

• Non-latch Low Power Consumption Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	0.3	100
4.5	202.5	3.38	0.45	100
5	250	3.75	0.5	100

* Test by pulse voltage

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.
- Telcordia (2500 V) and FCC (1500 V) surge capability.
- IEC60950 / 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.

■ 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	Non-latch 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)
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	Non-load	5×10^7 *4 operations(Non-latch type)
	Load	30 VDC, 1 A (resistive), 1×10^5 operations at 20°C, 1 Hz
		125 VAC, 0.3 A (resistive), 1×10^5 operations at 20°C, 1 Hz
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 1×10^7 operations.

UB2 Series

■ PART NUMBER SYSTEM

UB2-3SNU - L

- Packing
  - Nil : Tube
  - L : Embossed carrying tape of L type
- Option
  - NU : Standard
  - NUN : Minimum footprint type
  - NE : Low power consumption type
  - NEN : Low power consumption type with minimum footprint
- Latch type
  - Nil : Non-latch 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 to EN60950)
Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
9	579	6.75	0.9	140
12	1028	9.0	1.2	140
24	2504	18.0	2.4	230

• Single Coil Latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	1440	9.0	9.0	100

• Non-latch Low Power Consumption Type

at 20°C

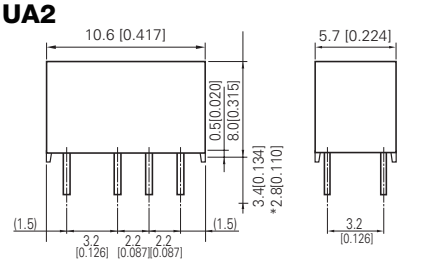
Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	0.3	100
4.5	202.5	3.38	0.45	100
5	250	3.75	0.5	100

* Test by pulse voltage

UA2/UB2 Series

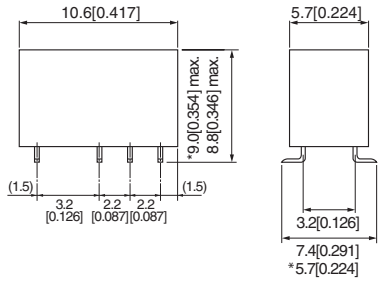
■ DIMENSIONS mm(inch)

UA2



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)

UB2

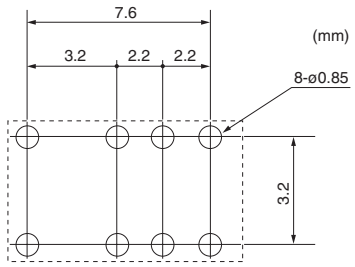


Tolerance of lead pitch is ±0.15 mm[0.006 inch]
Another tolerance is ±0.3 mm [0.012inch]
() is reference.
*Value of minimum footprint type (NUN type)

■ RECOMMENDED PAD LAYOUT

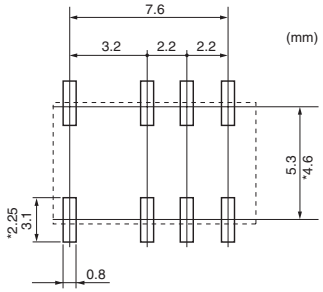
(bottom view)

UA2



Note. General tolerance : ±0.1

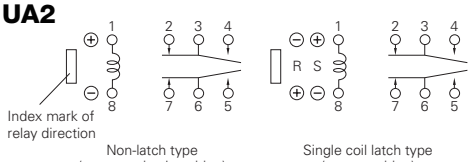
UB2



*Value of minimum footprint type (NUN type)
Note. Geberal tolerance : ±0.1

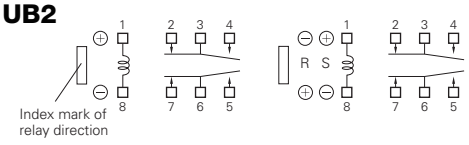
■ SCHEMATICS (bottom view)

UA2



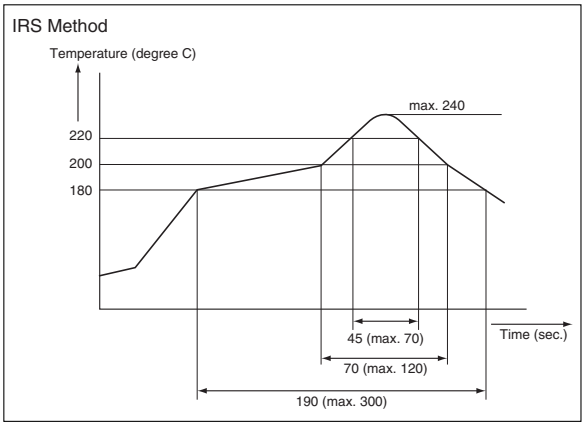
S : Coil polarity of set (operate)
R : Coil polarity of reset (release)

UB2



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

■ SOLDERING CONDITION (UB2 Series)



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.

Non-latch type	Voltage:within ±5% of nominal voltage	
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% of 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
Information	UA2/UB2 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

■ ORDERING PART NUMBERS

• UA2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Non-latch Low Power Consumption
Standard	Tube	3	UA2-3NU	UA2-3SNU	UA2-3NE
		4.5	UA2-4.5NU	UA2-4.5SNU	UA2-4.5NE
		5	UA2-5NU	UA2-5SNU	UA2-5NE
		9	UA2-9NU	UA2-9SNU	-
		12	UA2-12NU	UA2-12SNU	-
		24	UA2-24NU	-	-
Trimmed lead		3	UA2-3NJ	UA2-3SNJ	-
		4.5	UA2-4.5NJ	UA2-4.5SNJ	-
		5	UA2-5NJ	UA2-5SNJ	-
		9	UA2-9NJ	UA2-9SNJ	-
		12	UA2-12NJ	UA2-12SNJ	-
		24	UA2-24NJ	-	-

• UB2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Non-latch Low Power Consumption
Standard	Tube	3	UB2-3NU	UB2-3SNU	UB2-3NE
		4.5	UB2-4.5NU	UB2-4.5SNU	UB2-4.5NE
		5	UB2-5NU	UB2-5SNU	UB2-5NE
		9	UB2-9NU	UB2-9SNU	-
		12	UB2-12NU	UB2-12SNU	-
		24	UB2-24NU	-	-
	Taping	3	UB2-3NU-L	UB2-3SNU-L	UB2-3NE-L
		4.5	UB2-4.5NU-L	UB2-4.5SNU-L	UB2-4.5NE-L
		5	UB2-5NU-L	UB2-5SNU-L	UB2-5NE-L
		9	UB2-9NU-L	UB2-9SNU-L	-
		12	UB2-12NU-L	UB2-12SNU-L	-
		24	UB2-24NU-L	-	-
Minimum footprint	Tube	3	UB2-3NUN	UB2-3SNUN	UB2-3NEN
		4.5	UB2-4.5NUN	UB2-4.5SNUN	UB2-4.5NEN
		5	UB2-5NUN	UB2-5SNUN	UB2-5NEN
		9	UB2-9NUN	UB2-9SNUN	-
		12	UB2-12NUN	UB2-12SNUN	-
		24	UB2-24NUN	-	-
	Taping	3	UB2-3NUN-L	UB2-3SNUN-L	UB2-3NEN-L
		4.5	UB2-4.5NUN-L	UB2-4.5SNUN-L	UB2-4.5NEN-L
		5	UB2-5NUN-L	UB2-5SNUN-L	UB2-5NEN-L
		9	UB2-9NUN-L	UB2-9SNUN-L	-
		12	UB-12NUN-L	UB2-12SNUN-L	-
		24	UB2-24NUN-L	-	-

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.
- Telcordia (2500 V) and FCC (1500 V) surge capability.
- IEC60950 / UL1950 / EN60950 spacing and high breakdown voltage.
  (Basic insulation class on 200 V working voltage)
- Low power consumption 100mW type is available
- UL recognized (E73266), CSA certified (LR46266)

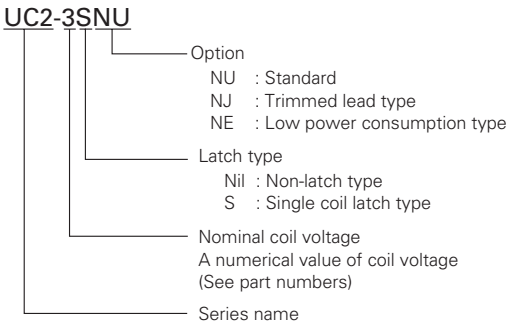
■ SPECIFICATIONS

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	Non-latch type	140 mW (1.5 to 12 V)	100mW(Low power consumption type)
	Single coil latch type	100 mW (1.5 to 12 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 $\times$ 160 μs*2)	
	Between adjacent contacts		
	Between coil to contacts	1500 VAC (for one minute) 2500 V surge (2 $\times$ 10 μs*3)	
Shock Resistance		735 m/s^2 (misoperation) 980 m/s^2 (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 (Low power consumption type: -40 to + 70˚C)	
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)	
Running Specifications	Non-load	5×10^7 *4 operations(Non-latch type)	
	Load	30 VDC, 1 A (resistive), 1×10^5 operations at 20˚C, 1 Hz	
		125 VAC, 0.3 A (resistive), 1×10^5 operations at 20˚C, 1 Hz	
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 operations.

UC2 Series

■ 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 to EN60950)
Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
9	579	6.75	0.9	140
12	1028	9.0	1.2	140

• Single Coil Latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	1440	9.0	9.0	100

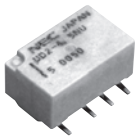
• Non-latch Low Power Consumption Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.4	0.3	100
4.5	202.5	3.6	0.45	100
5	250	4.0	0.5	100

* Test by pulse voltage

UD2 Series



NEC TOKIN's UD2 relay is a new generation Miniature Singnal Relay of super-compact size and flat-package for surface mounting.

■ FEATURES

- Small mounting size of flat package for dence mounting.
- Telcordia (2500 V) and FCC (1500 V) surge capability.
- IEC60950 / UL1950 / EN60950 spacing and high breakdown voltage.
  (Basic insulation class on 200 V working voltage)
- Low power consumption 100 mW type is available
- UL recognized (E73266), CSA certified (LR46266)
- Tube or embossed tape packaging.

■ SPECIFICATIONS

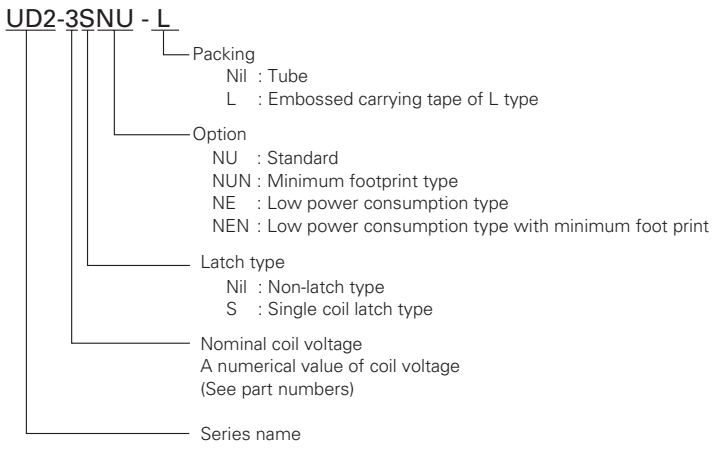
Contact Form		2 Form c	
Contact Material		Silver alloy with gold alloy overlay	
Contact Ratings	Maximum Switching Power	30 W, 37.5 VA	
	Maximum Switching Voltage	220 VDC, 250 VAC	
	Maximum Switching Current	1 A	
	Maximum Carrying Current	1 A	
Minimum Contact Ratings		10 mVDC, 10 μA*1	
Initial Contact Resistance		100 mΩ max.(Initial)	
Nominal Operating Power	Non-latch type	140 mW (1.5 to 12 V)	100mW(Low power consumption type)
	Single coil latch type	100 mW (1.5 to 12 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 Between adjacent contacts	1000 VAC (for one minute) 1500 V surge (10 $\times$ 160 μs*2)	
	Between coil to contacts	1500 VAC (for one minute) 2500 V surge (2 $\times$ 10 μs*3)	
Shock Resistance		735 m/s^2 (misoperation) 980 m/s^2 (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 (Low power consumption type: -40 to + 70˚C)	
Coil Temperature Rise		18 degrees at nominal coil voltage (140 mW)	
Running Specifications	Non-load	5×10^7 *4 operations(Non-latch type)	
	Load	30 VDC, 1 A (resistive), 1×10^5 operations at 20˚C, 1 Hz	
		125 VAC, 0.3 A (resistive), 1×10^5 operations at 20˚C, 1 Hz	
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 operations.

9600RSGVOL11E1003N1

UD2 Series

■ PART NUMBER SYSTEM



■ 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 to EN60950)
Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
9	579	6.75	0.9	140
12	1028	9.0	1.2	140

• Single Coil Latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	1440	9.0	9.0	100

• Non-latch Low Power Consumption Type

at 20°C

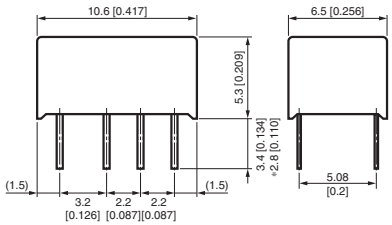
Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.4	0.3	100
4.5	202.5	3.6	0.45	100
5	250	4.0	0.5	100

* Test by pulse voltage

■ DIMENSIONS mm(inch)

UC2

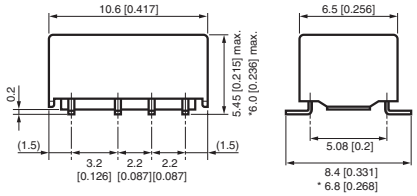
mm [inch]



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

UD2

mm [inch]

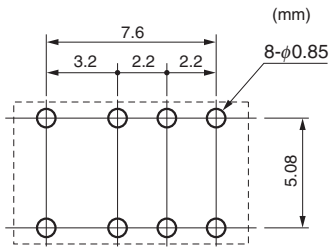


Tolerance of lead pitch is : ±0.15 mm [0.006inch]
Another tolerance is ±0.3 mm [0.012 inch]
( ) is reference value.
*Value of minimum footprint type (NUN)

■ RECOMMENDED PAD LAYOUT

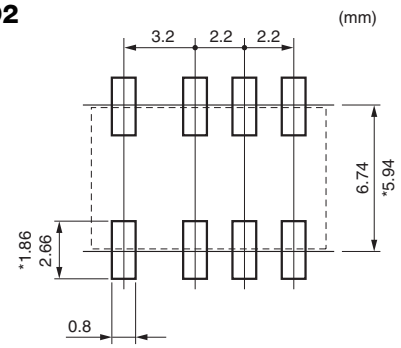
(bottom view)

UC2



Note. General tolerance : ±0.1

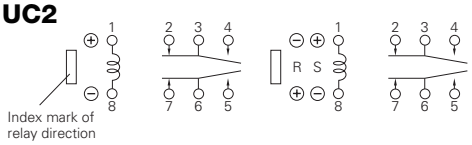
UD2



*Value of minimum footprint type (NUN)
Note. General tolerance : ±0.1

■ SCHEMATICS (bottom view)

UC2

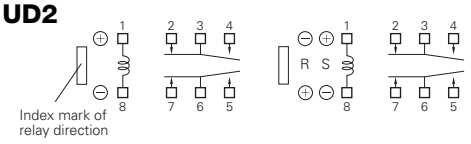


Non-latch type
(not energized position)

Single coil latch type
(reset position)

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

UD2

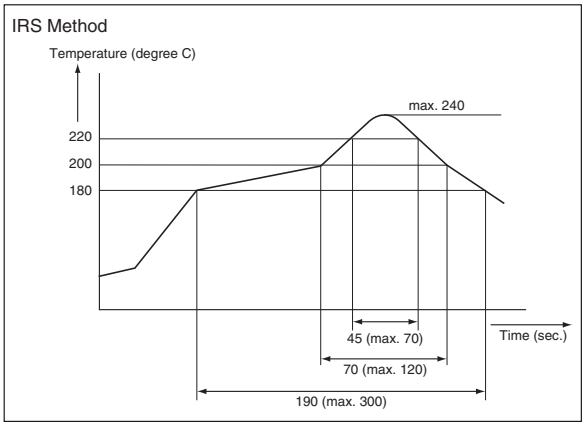


Non-latch type
(not energized position)

Single coil latch type
(reset position)

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

■ SOLDERING CONDITION (UD2 Series)



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.

Non-latch type	Voltage:within ±5% of nominal voltage	Ambient temperature -40~+85˚C
Non-latch NE type		Ambient temperature -40~+70˚C
Single coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% of 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

■ ORDERING PART NUMBERS

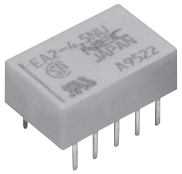
• UC2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Non-latch Low Power Consumption
Standard	Tube	3	UC2-3NU	UC2-3SNU	UC2-3NE
		4.5	UC2-4.5NU	UC2-4.5SNU	UC2-4.5NE
		5	UC2-5NU	UC2-5SNU	UC2-5NE
		9	UC2-9NU	UC2-9SNU	-
		12	UC2-12NU	UC2-12SNU	-
Trimmed lead		3	UC2-3NJ	UC2-3SNJ	-
		4.5	UC2-4.5NJ	UC2-4.5SNJ	-
		5	UC2-5NJ	UC2-5SNJ	-
		9	UC2-9NJ	UC2-9SNJ	-
		12	UC2-12NJ	UC2-12SNJ	-

• UD2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Non-latch Low Power Consumption
Standard	Tube	3	UD2-3NU	UD2-3SNU	UD2-3NE
		4.5	UD2-4.5NU	UD2-4.5SNU	UD2-4.5NE
		5	UD2-5NU	UD2-5SNU	UD2-5NE
		9	UD2-9NU	UD2-9SNU	-
		12	UD2-12NU	UD2-12SNU	-
	Taping	3	UD2-3NU-L	UD2-3SNU-L	UD2-3NE-L
		4.5	UD2-4.5NU-L	UD2-4.5SNU-L	UD2-4.5NE-L
		5	UD2-5NU-L	UD2-5SNU-L	UD2-5NE-L
		9	UD2-9NU-L	UD2-9SNU-L	-
		12	UD2-12NU-L	UD2-12SNU-L	-
Minimum footprint	Tube	3	UD2-3NUN	UD2-3SNUN	UD2-3NEN
		4.5	UD2-4.5NUN	UD2-4.5SNUN	UD2-4.5NEN
		5	UD2-5NUN	UD2-5SNUN	UD2-5NEN
		9	UD2-9NUN	UD2-9SNUN	-
		12	UD2-12NUN	UD2-12SNUN	-
	Taping	3	UD2-3NUN-L	UD2-3SNUN-L	UD2-3NEN-L
		4.5	UD2-4.5NUN-L	UD2-4.5SNUN-L	UD2-4.5NEN-L
		5	UD2-5NUN-L	UD2-5SNUN-L	UD2-5NEN-L
		9	UD2-9NUN-L	UD2-9SNUN-L	-
		12	UD2-12NUN-L	UD2-12SNUN-L	-

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)

■ 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		75 mΩ max.(Initial)
Nominal Operating Power	Non-latch 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 $\times$ 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1000 VAC (for one minute) 1500 V surge (10 $\times$ 160 μs*2)
Shock Resistance		735 m/s^2 (misoperating) 980 m/s^2 (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	Non-load	1×10^8 *3 operations(Non-latch type) 1×10^7 operations(latch type)
	Load	50 VDC, 0.1 A (resistive) 1×10^5 operations at 85˚C, 5 Hz
		10 VDC, 10 mA (resistive) 1×10^5 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 operations.

EA2 Series

■ PART NUMBER SYSTEM

EA2-3SNU

- NU : Standard type
  NJ : Trimmed leads type
- Latch type
  - Nil : Non-latch 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

■ COIL SPECIFICATIONS

• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
12	1028	9.0	1.2	140
24	2880	18.0	2.4	200

• Single Coil Latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
12	1440	9.0	9.0	100
24	3840	18.0	18.0	150

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

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%		Set Voltage** (VDC)	Reset Voltage** (VDC)	Nominal Operating Power (mW)
3	S	64.3	2.25	-	140
	R	64.3	-	2.25	
4.5	S	145	3.38	-	140
	R	145	-	3.38	
5	S	178	3.75	-	140
	R	178	-	3.75	
12	S	1028	9.0	-	140
	R	1028	-	9.0	
24	S	2880	18.0	-	200
	R	2880	-	18.0	

* 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 energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, please contact NEC TOKIN for availability.

9600RSGVOL11E1003N1

EB2 Series

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

■ 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)

■ 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		75 mΩ max.(Initial)
Nominal Operating Power	Non-latch 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 $\times$ 160 μs*2)
	Between adjacent contacts	
	Between coil to contacts	1000 VAC (for one minute) 1500 V surge (10 $\times$ 160 μs*2)
Shock Resistance		735 m/s^2 (misoperating) 980 m/s^2 (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	Non-load	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 1×210^7 operations.

EB2 Series

■ PART NUMBER SYSTEM

EB2-3SNU-L

- Packing
  - Nil: Tube
  - L:Embossed carrying tape (L type)
- NU: Standard type
- Latch type
  - Nil: Non-latch 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

■ COIL SPECIFICATIONS

• Non-latch Type at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
12	1028	9.0	1.2	140
24	2880	18.0	2.4	200

• Single Coil Latch Type at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
12	1440	9.0	9.0	100
24	3840	18.0	18.0	150

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

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%		Set Voltage** (VDC)	Reset Voltage** (VDC)	Nominal Operating Power (mW)
3	S	64.3	2.25	-	140
	R	64.3	-	2.25	
4.5	S	145	3.38	-	140
	R	145	-	3.38	
5	S	178	3.75	-	140
	R	178	-	3.75	
12	S	1028	9.0	-	140
	R	1028	-	9.0	
24	S	2880	18.0	-	200
	R	2880	-	18.0	

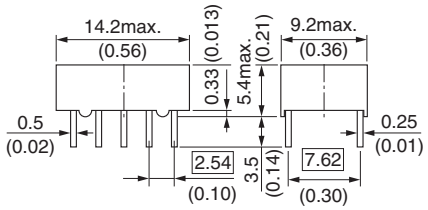
* Test by pulse voltage

** 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 energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, please contact NEC TOKIN for availability.

9600RSGVOL11E1003N1

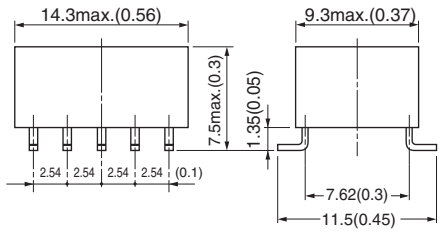
■ DIMENSIONS mm(inch)

EA2



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

EB2

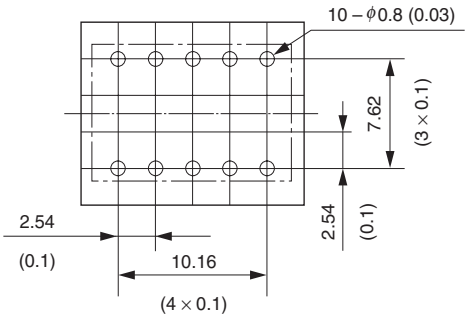


Note : Tolerance ±0.2 mm unless otherwise specified

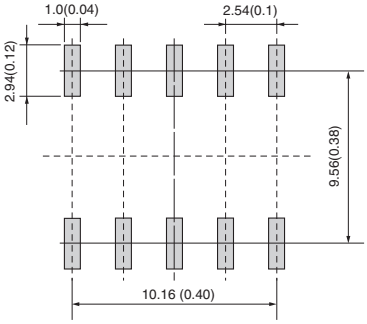
■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)

EA2

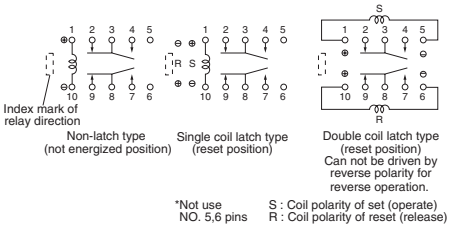


EB2

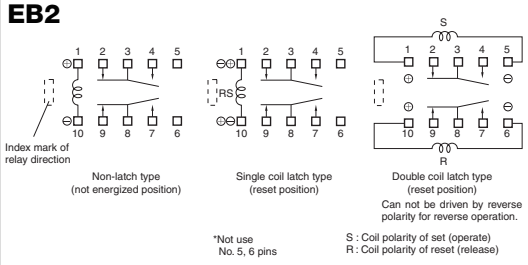


■ SCHEMATICS (bottom view)

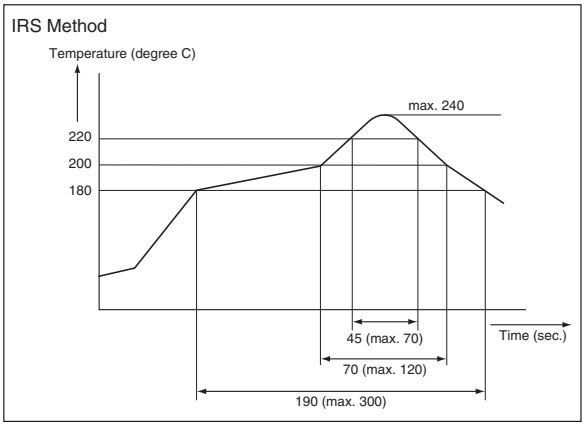
EA2



EB2



■ SOLDERING CONDITION (EB2 Series)



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.

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

■ 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/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

■ ORDERING PART NUMBERS

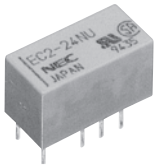
• EA2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Double Coil Latch
Standard	Tube	3	EA2-3NU	EA2-3SNU	EA2-3TNU
		4.5	EA2-4.5NU	EA2-4.5SNU	EA2-4.5TNU
		5	EA2-5NU	EA2-5SNU	EA2-5TNU
		12	EA2-12NU	EA2-12SNU	EA2-12TNU
		24	EA2-24NU	EA2-24SNU	EA2-24TNU
Trimmed lead		3	EA2-3NJ	EA2-3SNJ	EA2-3TNJ
		4.5	EA2-4.5NJ	EA2-4.5SNJ	EA2-4.5TNJ
		5	EA2-5NJ	EA2-5SNJ	EA2-5TNJ
		12	EA2-12NJ	EA2-12SNJ	EA2-12TNJ
		24	EA2-24NJ	EA2-24SNJ	EA2-24TNJ

• EB2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Double Coil Latch
Standard	Tube	3	EB2-3NU	EB2-3SNU	EB2-3TNU
		4.5	EB2-4.5NU	EB2-4.5SNU	EB2-4.5TNU
		5	EB2-5NU	EB2-5SNU	EB2-5TNU
		12	EB2-12NU	EB2-12SNU	EB2-12TNU
		24	EB2-24NU	EB2-24SNU	EB2-24TNU
	Taping	3	EB2-3NU-L	EB2-3SNU-L	EB2-3TNU-L
		4.5	EB2-4.5NU-L	EB2-4.5SNU-L	EB2-4.5TNU-L
		5	EB2-5NU-L	EB2-5SNU-L	EB2-5TNU-L
		12	EB2-12NU-L	EB2-12SNU-L	EB2-12TNU-L
		24	EB2-24NU-L	EB2-24SNU-L	EB2-24TNU-L

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 Telcordia 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
- ND type (High-insulation type) conform to
  supplemetary 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	2A
	Maximum Carrying Current	2A
Minimum Contact Ratings		10 mVDC, 10 μA*1
Initial Contact Resistance		75 mΩ max.(Initial)
Nominal Operating Power	Non-latch 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	1000 VAC (for one minute), 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 latch type] 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	Non-load	1×10^8 *4 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. 1.9 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 1×10^7 operations.

EC2 Series

■ PART NUMBER SYSTEM

EC2-3SNU

- NU : Standard type
- NJ : Trimmed leads type
- ND : High insulation type (TUV certified)

Latch type

- Nil : Non-latch 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 Certificate	
(IEC61810/EN61810)	(EN61810)
No. R 9750561	No. R 9751153
ND Type (Non-latch and Single coil latch)	NU, NJ Type (Non-latch and Single coil latch)
Creepage and clearance of coil to contact is more than 2 mm. (According to EN60950)	
Supplementary insulation class	Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
9	579	6.75	0.9	140
12	1028	9.0	1.2	140
24	2880	18.0	2.4	200

• Single Coil Latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	1440	9.0	9.0	100
24	5760	18.0	18.0	100

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

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%		Set Voltage** (VDC)	Reset Voltage** (VDC)	Nominal Operating Power (mW)
3	S	64.3	2.25	-	140
	R	64.3	-	2.25	
4.5	S	145	3.38	-	140
	R	145	-	3.38	
5	S	178	3.75	-	140
	R	178	-	3.75	
9	S	579	6.75	-	140
	R	579	-	6.75	
12	S	1028	9.0	-	140
	R	1028	-	9.0	
24	S	4114	18.0	-	140
	R	4114	-	18.0	

• **Non-latch High Insulation (ND) Type** at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	45	2.25	0.3	200
4.5	101	3.38	0.45	200
5	125	3.75	0.5	200
9	405	6.75	0.9	200
12	720	9.0	1.2	200
24	2504	18.0	2.4	230

• **Single Coil Latch High Insulation (ND) Type** at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	203	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	960	9.0	9.0	150
24	3388	18.0	18.0	170

* 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 energized 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 NEC TOKIN EC2 series.

■ 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
- NK type gurantee 1.5KVAC over withstanding voltage at open contact. (Only make contact)
- 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		75 mΩ max.(Initial)
Nominal Operating Power	Non-latch type	140 mW (3 to 12 V), 200mW (24 V) (ND type:200 to 230 mW) (NKX type: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)
		NK type: Make contact: 1500 VAC (for one minute) 2500 V surge (2 × 10 μs*3) Break contact: 1000 VAC (for one minute) 1500 V surge (10 × 160 μs*2)
	Between adjacent contacts	1000 VAC (for one minute), 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 latch type] 1000 VAC (for one minute), 1500 V surge (10 × 160 μs*2)
Shock Resistance		735 m/s^2 (misoperating) 980 m/s^2 (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	Non-load	1×10^8 *4 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. 1.9 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 1×10^7 operations.

EE2 Series

■ PART NUMBER SYSTEM

EE2-3SNU-L

- Packing
  - Nil: Tube
  - L: Embossed carrying tape (L type)
- NU: Standard type
  NUH: Minimum footprint type
  NUX: High solder joint reliability type
  ND: High-insulation type (TUV certified)
- Latch type
  - Nil: Non-latch 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 Certificate	
(IEC61810/EN61810)	(EN61810)
No. R 9750561	No. R 9751153
ND Type (Non-latch and Single coil latch)	NU, NUH, NUX Type (Non-latch and Single coil latch)
Creepage and clearance of coil to contact is more than 2 mm. (According to EN60950)	
Supplementary insulation class	Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	64.3	2.25	0.3	140
4.5	145	3.38	0.45	140
5	178	3.75	0.5	140
9	579	6.75	0.9	140
12	1028	9.0	1.2	140
24	2880	18.0	2.4	200

• Single Coil Latch Type at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	202.5	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	1440	9.0	9.0	100
24	5760	18.0	18.0	100

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

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%		Set Voltage** (VDC)	Reset Voltage** (VDC)	Nominal Operating Power (mW)
3	S	64.3	2.25	-	140
	R	64.3	-	2.25	
4.5	S	145	3.38	-	140
	R	145	-	3.38	
5	S	178	3.75	-	140
	R	178	-	3.75	
9	S	579	6.75	-	140
	R	579	-	6.75	
12	S	1028	9.0	-	140
	R	1028	-	9.0	
24	S	4114	18.0	-	140
	R	4114	-	18.0	

* 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 energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, please contact NEC TOKIN for availability.

9600RSGVOL11E1003N1

• Non-latch High Insulation (ND) Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	45	2.25	0.3	200
4.5	101	3.38	0.45	200
5	125	3.75	0.5	200
9	405	6.75	0.9	200
12	720	9.0	1.2	200
24	2504	18.0	2.4	230

• Single Coil Latch High Insulation (ND) Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Set Voltage* (VDC)	Reset Voltage* (VDC)	Nominal Operating Power (mW)
3	90	2.25	2.25	100
4.5	203	3.38	3.38	100
5	250	3.75	3.75	100
9	810	6.75	6.75	100
12	960	9.0	9.0	150
24	3388	18.0	18.0	170

• Non-latch High Breakdown Voltage (NKX) Type

at 20°C

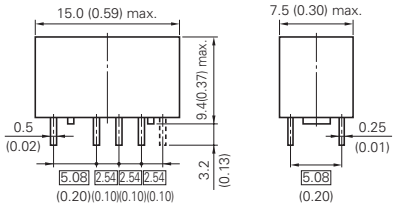
Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
3	39.1	2.25	0.3	230
4.5	88.0	3.38	0.45	230
12	626	9.0	1.2	230

* 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 energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, please contact NEC TOKIN for availability.

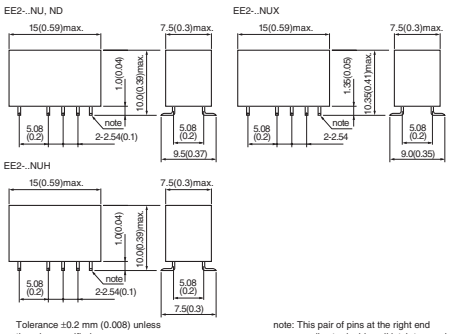
■ DIMENSIONS mm(inch)

EC2



Note. General tolerance : ±0.2 (±0.008)
Dimensions in ☐ show basic size.
NJ type : Leads-2.8 mm (0.11)

EE2



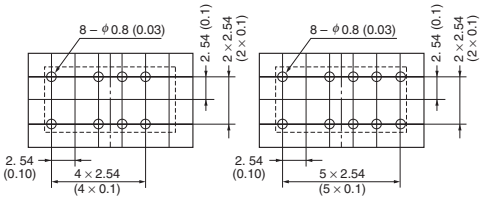
Tolerance ±0.2 mm (0.008) unless therwise specified.

note: This pair of pins at the right end applies to double coil latch type only.

■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)

EC2

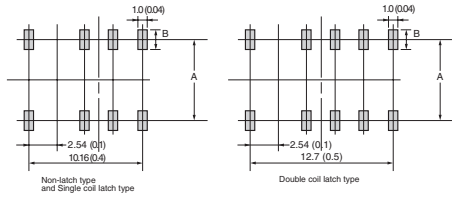


Non-latch type and Single coil latch type

Double coil latch type

Note: Tolerance ± 0.2 mm unless otherwise specified

EE2



Non-latch type and Single coil latch type

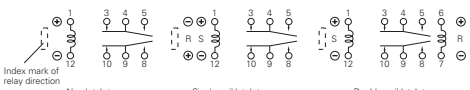
Double coil latch type

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)

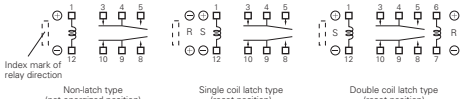
Tolerance ± 0.1 mm (0.004) unless otherwise specified.

■ SCHEMATICS (bottom view)

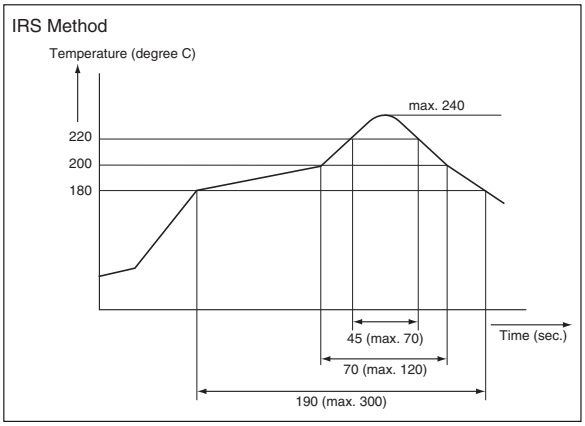
EC2



EE2



■ SOLDERING CONDITION (EE2 Series)



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.

Non-latch type	Voltage:within ±5% of nominal voltage	
Single coil latch type Double coil latch type	Square pulse (rise and fall time is rapidly) Pulse height: within ±5% of 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/EE2 series
Information	EC2/EE2 series technical data
User's manual	Function and note on correct use
Application note	Application circuit of miniature signal relay

9600RSGVOL11E1003N1

■ ORDERING PART NUMBERS

• EC2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Double Coil Latch
Standard	Tube	3	EC2-3NU	EC2-3SNU	EC2-3TNU
		4.5	EC2-4.5NU	EC2-4.5SNU	EC2-4.5TNU
		5	EC2-5NU	EC2-5SNU	EC2-5TNU
		9	EC2-9NU	EC2-9SNU	EC2-9TNU
		12	EC2-12NU	EC2-12SNU	EC2-12TNU
		24	EC2-24NU	EC2-24SNU	EC2-24TNU
Trimmed lead		3	EC2-3NJ	EC2-3SNJ	EC2-3TNJ
		4.5	EC2-4.5NJ	EC2-4.5SNJ	EC2-4.5TNJ
		5	EC2-5NJ	EC2-5SNJ	EC2-5TNJ
		9	EC2-9NJ	EC2-9SNJ	EC2-9TNJ
		12	EC2-12NJ	EC2-12SNJ	EC2-12TNJ
		24	EC2-24NJ	EC2-24SNJ	EC2-24TNJ

• EC2 series High Insulation Type (ND Type)

Option		Nominal Coil Voltage (VDC)	Coil Type	
Terminal	Packing		Non-latch	Single Coil Latch
Standard	Tube	3	EC2-3ND	EC2-3SND
		4.5	EC2-4.5ND	EC2-4.5SND
		5	EC2-5ND	EC2-5SND
		9	EC2-9ND	EC2-9SND
		12	EC2-12ND	EC2-12SND
		24	EC2-24ND	EC2-24SND

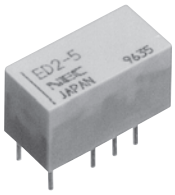
• EE2 series

Option		Nominal Coil Voltage (VDC)	Coil Type		
Terminal	Packing		Non-latch	Single Coil Latch	Double Coil Latch
Standard	Tube	3	EE2-3NU	EE2-3SNU	EE2-3TNU
		4.5	EE2-4.5NU	EE2-4.5SNU	EE2-4.5TNU
		5	EE2-5NU	EE2-5SNU	EE2-5TNU
		9	EE2-9NU	EE2-9SNU	EE2-9TNU
		12	EE2-12NU	EE2-12SNU	EE2-12TNU
		24	EE2-24NU	EE2-24SNU	EE2-24TNU
	Taping	3	EE2-3NU-L	EE2-3SNU-L	EE2-3TNU-L
		4.5	EE2-4.5NU-L	EE2-4.5SNU-L	EE2-4.5TNU-L
		5	EE2-5NU-L	EE2-5SNU-L	EE2-5TNU-L
		9	EE2-9NU-L	EE2-9SNU-L	EE2-9TNU-L
		12	EE2-12NU-L	EE2-12SNU-L	EE2-12TNU-L
		24	EE2-24NU-L	EE2-24SNU-L	EE2-24TNU-L
Minimum footprint	Tube	3	EE2-3NUH	EE2-3SNUH	EE2-3TNUH
		4.5	EE2-4.5NUH	EE2-4.5SNUH	EE2-4.5TNUH
		5	EE2-5NUH	EE2-5SNUH	EE2-5TNUH
		9	EE2-9NUH	EE2-9SNUH	EE2-9TNUH
		12	EE2-12NUH	EE2-12SNUH	EE2-12TNUH
		24	EE2-24NUH	EE2-24SNUH	EE2-24TNUH
	Taping	3	EE2-3NUH-L	EE2-3SNUH-L	EE2-3TNUH-L
		4.5	EE2-4.5NUH-L	EE2-4.5SNUH-L	EE2-4.5TNUH-L
		5	EE2-5NUH-L	EE2-5SNUH-L	EE2-5TNUH-L
		9	EE2-9NUH-L	EE2-9SNUH-L	EE2-9TNUH-L
		12	EE2-12NUH-L	EE2-12SNUH-L	EE2-12TNUH-L
		24	EE2-24NUH-L	EE2-24SNUH-L	EE2-24TNUH-L
High solder joint reliability	Tube	3	EE2-3NUX	EE2-3SNUX	EE2-3TNUX
		4.5	EE2-4.5NUX	EE2-4.5SNUX	EE2-4.5TNUX
		5	EE2-5NUX	EE2-5SNUX	EE2-5TNUX
		9	EE2-9NUX	EE2-9SNUX	EE2-9TNUX
		12	EE2-12NUX	EE2-12SNUX	EE2-12TNUX
		24	EE2-24NUX	EE2-24SNUX	EE2-24TNUX
	Taping	3	EE2-3NUX-L	EE2-3SNUX-L	EE2-3TNUX-L
		4.5	EE2-4.5NUX-L	EE2-4.5SNUX-L	EE2-4.5TNUX-L
		5	EE2-5NUX-L	EE2-5SNUX-L	EE2-5TNUX-L
		9	EE2-9NUX-L	EE2-9SNUX-L	EE2-9TNUX-L
		12	EE2-12NUX-L	EE2-12SNUX-L	EE2-12TNUX-L
		24	EE2-24NUX-L	EE2-24SNUX-L	EE2-24TNUX-L

• EE2 series High Insulation Type (ND Type)

Option		Nominal Coil Voltage (VDC)	Coil Type	
Terminal	Packing		Non-latch	Single Coil Latch
Standard	Tube	3	EE2-3ND	EE2-3SND
		4.5	EE2-4.5ND	EE2-4.5SND
		5	EE2-5ND	EE2-5SND
		9	EE2-9ND	EE2-9SND
		12	EE2-12ND	EE2-12SND
		24	EE2-24ND	EE2-24SND
	Taping	3	EE2-3ND-L	EE2-3SND-L
		4.5	EE2-4.5ND-L	EE2-4.5SND-L
		5	EE2-5ND-L	EE2-5SND-L
		9	EE2-9ND-L	EE2-9SND-L
		12	EE2-12ND-L	EE2-12SND-L
		24	EE2-24ND-L	EE2-24SND-L

ED2 Series



The ED2 series has reduced coil power consumption but sustained high-performance of NEC TOKIN SIGNAL RELAYS. Furthermore, it complies with 2500 V surge-voltage requirement of Telcordia 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)

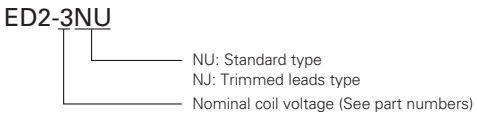
■ SPECIFICATIONS

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		75 mΩ max.(Initial)
Nominal Operating Power	Non-latch type	50 mW (1.5 to 5 V), 55 mW (9 V), 60 mW (12 V), 70 mW (24 V)
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)
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		7 degrees at nominal coil voltage (50 mW)
Running Specifications	Non-load	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. 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 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 operations.

ED2 Series

■ PART NUMBER SYSTEM



■ 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 (EN61810)
No. R9950557
Non-latch and Single-coil-latch
Creepage and clearance of coil to contact is over than 2 mm. (According to EN60950)
Basic insulation class

■ COIL SPECIFICATIONS

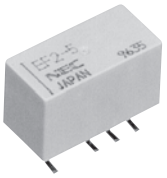
• Non-latch Type

at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
1.5	45	1.13	0.15	50
3	180	2.25	0.3	50
4.5	405	3.38	0.45	50
5	500	3.75	0.5	50
9	1473	6.75	0.9	55
12	2400	9.0	1.2	60
24	8229	18.0	2.4	70

* Test by pulse voltage

EF2 Series



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

■ 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)

■ 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		75 mΩ max.(Initial)
Nominal Operating Power	Non-latch type	50 mW (1.5 to 5 V), 55 mW (9 V), 60 mW (12 V), 70 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	1500 VAC (for one minute) 2500 V surge (2 × 10 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		7 degrees at nominal coil voltage (50 mW)
Running Specifications	Non-load	1×10^8 *4 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. 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 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 operations.

EF2 Series

■ PART NUMBER SYSTEM

EF2-3NU-L

- Packing
  - Nil: Tube
  - L: Embossed carrying tape (L type)
- NU: Standard type
  NUH: Minimum footprint type
  NUX: High solder joint reliability 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 (EN61810)
No. R9950557
Non-latch and Single-coil-latch
Creepage and clearance of coil to contact is over than 2 mm. (According to EN60950)
Basic insulation class

■ COIL SPECIFICATIONS

• Non-latch Type

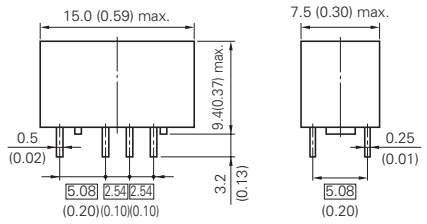
at 20°C

Nominal Coil Voltage (VDC)	Coil Resistance (Ω)±10%	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)	Nominal Operating Power (mW)
1.5	45	1.13	0.15	50
3	180	2.25	0.3	50
4.5	405	3.38	0.45	50
5	500	3.75	0.5	50
9	1473	6.75	0.9	55
12	2400	9.0	1.2	60
24	8229	18.0	2.4	70

* Test by pulse voltage

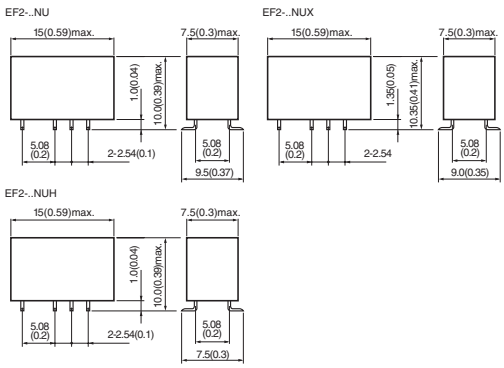
■ DIMENSIONS mm(inch)

ED2



Note. General tolerance : ±0.2 (±0.008)
Dimensions in ☐ show basic size.
NJ type : Leads-2.8 mm (0.11)

EF2

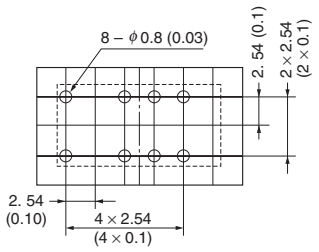


Tolerance ±0.2 mm (0.008) unless therwise specified.

■ RECOMMENDED PAD LAYOUT

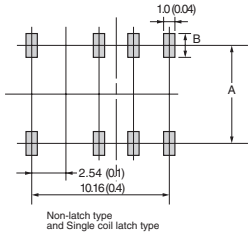
(bottom view)mm(inch)

ED2



Note: Tolerance ± 0.2 mm unless otherwise specified

EF2

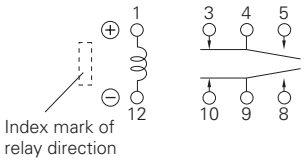


TYPE	A	B
EF2-..NU	7.3 (0.287)	3.0 (0.118)
EF2-..NUX	7.02 (0.276)	2.73 (0.107)
EF2-..NUH	6.29 (0.248)	2.0 (0.079)

Tolerance ± 0.1 mm (0.004) unless otherwise specified.

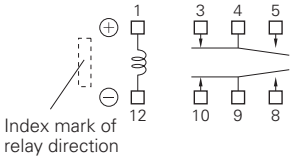
■ SCHEMATICS (bottom view)

ED2



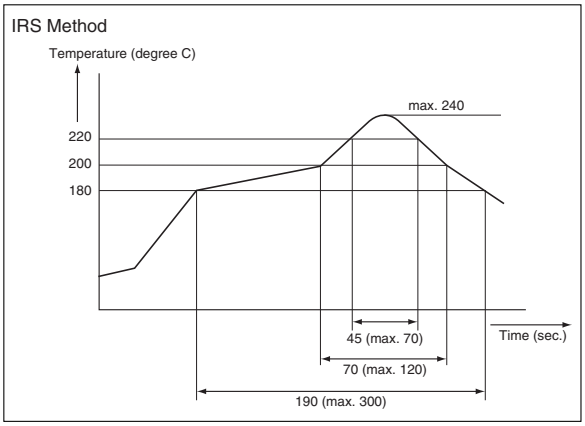
(not energized position)

EF2



(not energized position)

■ SOLDERING CONDITION (EF2 Series)



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.

Non-latch type	Voltage:within ±5% of nominal voltage	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	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

■ ORDERING PART NUMBERS

• ED2 series

Option		Nominal Coil Voltage (VDC)	Coil Type
Terminal	Packing		Non-latch
Standard	Tube	1.5	ED2-1.5NU
		3	ED2-3NU
		4.5	ED2-4.5NU
		5	ED2-5NU
		9	ED2-9NU
		12	ED2-12NU
		24	ED2-24NU
Trimmed lead		1.5	ED2-1.5NJ
		3	ED2-3NJ
		4.5	ED2-4.5NJ
		5	ED2-5NJ
		9	ED2-9NJ
		12	ED2-12NJ
		24	ED2-24NJ

• EF2 series

Option		Nominal Coil Voltage (VDC)	Coil Type
Terminal	Packing		Non-latch
Standard	Tube	1.5	EF2-1.5NU
		3	EF2-3NU
		4.5	EF2-4.5NU
		5	EF2-5NU
		9	EF2-9NU
		12	EF2-12NU
		24	EF2-24NU
	Taping	1.5	EF2-1.5NU-L
		3	EF2-3NU-L
		4.5	EF2-4.5NU-L
		5	EF2-5NU-L
		9	EF2-9NU-L
		12	EF2-12NU-L
		24	EF2-24NU-L
Minimum footprint	Tube	1.5	EF2-1.5NUH
		3	EF2-3NUH
		4.5	EF2-4.5NUH
		5	EF2-5NUH
		9	EF2-9NUH
		12	EF2-12NUH
		24	EF2-24NUH
	Taping	1.5	EF2-1.5NUH-L
		3	EF2-3NUH-L
		4.5	EF2-4.5NUH-L
		5	EF2-5NUH-L
		9	EF2-9NUH-L
		12	EF2-12NUH-L
		24	EF2-24NUH-L
High solder joint reliability	Tube	1.5	EF2-1.5NUX
		3	EF2-3NUX
		4.5	EF2-4.5NUX
		5	EF2-5NUX
		9	EF2-9NUX
		12	EF2-12NUX
		24	EF2-24NUX
	Taping	1.5	EF2-1.5NUX-L
		3	EF2-3NUX-L
		4.5	EF2-4.5NUX-L
		5	EF2-5NUX-L
		9	EF2-9NUX-L
		12	EF2-12NUX-L
		24	EF2-24NUX-L

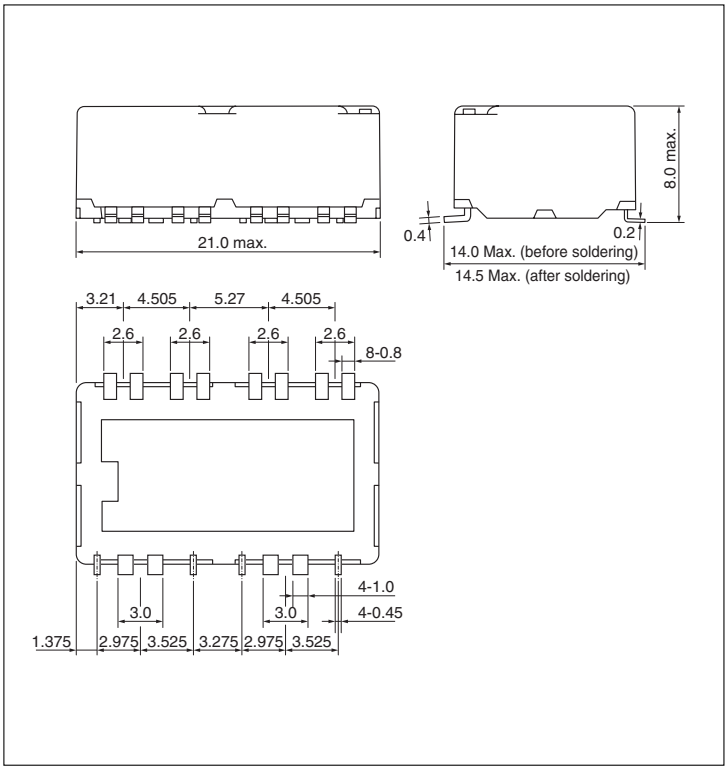
EU2 Series

The new NEC TOKIN EU2 Series are PC-board mount automotive relay suitable for various motor and solenoid control application. The EU2 series are ultra low profile SMD relays. The EU2 series are succeeding in about 75% of low profiling in comparison with the ET2 series.

■ FEATURES

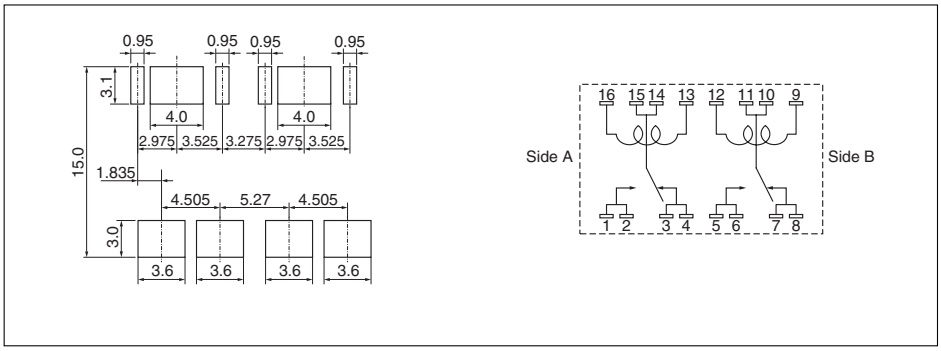
- Ultra miniature twin relay
- Low profile SMD relay
- Approx. 75% relay height of ET2
- Approx. 57% relay height of EX2

■ DIMENSIONS mm



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(top view) mm



9600RSGVOL11E1003N1

EU2 Series

■ SPECIFICATIONS

Items		Specifications
Contact Form		1 Form C × 2 (separate)
Contact Ratings	Maximum Switching Voltage	16 VDC
	Maximum Switching Current	30 A
	Minimum Switching Current	1 A (5 VDC)
	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)		3 ms typical (at Nominal Voltage, with diode) initial
Nominal Operating Power		960 mW
Insulation Resistance		100 MΩ at 500 VDC
Withstand Voltage	Between open contacts	500 VAC min. (for 1 minute)
	Between coil and contacts	500 VAC min. (for 1 minute)
Shock Resistance	Misoperation	98 m/s²
	Destructive Failure	980 m/s²
Vibration Resistance	Misoperation	10 to 300 Hz, 43 m/s²
	Destructive Failure	10 to 500 Hz, 43 m/s², 200 hours
Ambient Temperature		–40 to + 85˚C
Running Specifications	Non-load	1×10^6 operations
	Load	100×10^3 operations (at 14 VDC, Motor Load 25 A) 100×10^3 operations (at 14 VDC, Motor Load 25 A/7 A)
Weight		Approx. 6 g

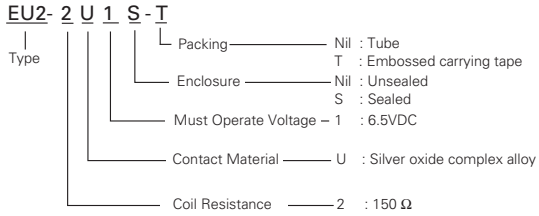
■ COIL RATING

at 20 °C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EU2-2U1	12	150	6.5	0.6

* Test by pulse voltage

■ PART NUMBER SYSTEM



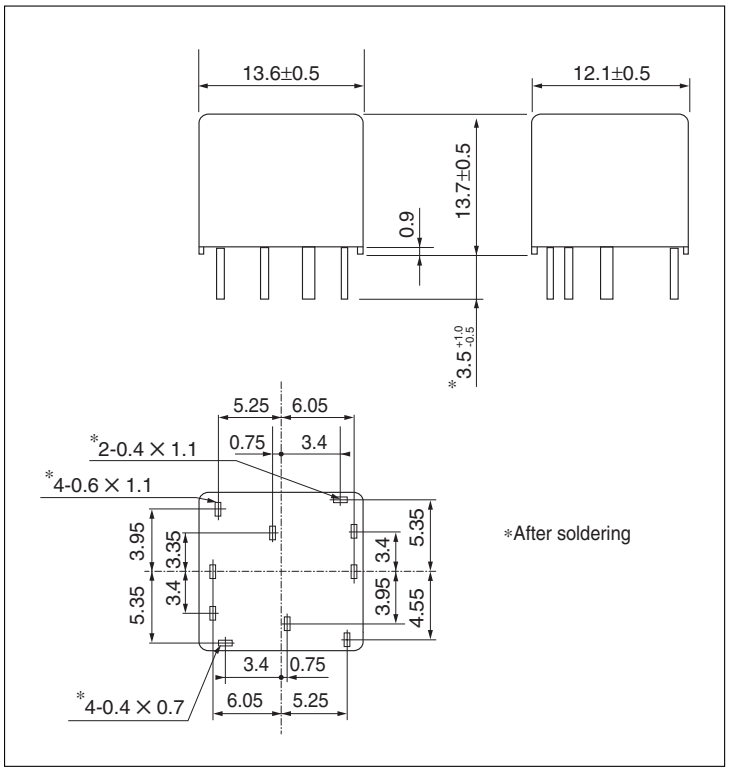
EX2 Series

The new NEC TOKIN EX2 Series are PC-board mount automotive relay suitable for various motor control application that require a high quality and performance. The EX2 series are succeeding in a about 75% of miniaturization in comparison with the ET2 series.

■ FEATURES

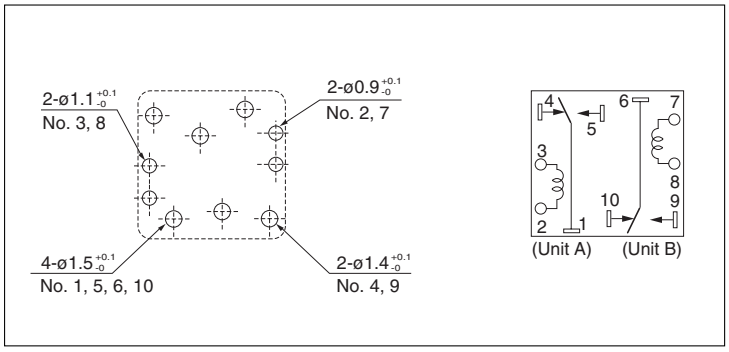
- Ultra miniature twin relay
- Flux tight housing
- Approx. 75% relay volume of ET2
- Approx. 60% relay space of ET2
- Approx. 88% relay weight of ET2

■ DIMENSIONS mm



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm



These hole diameters are recommended value for the reverse-insertion prevention, and mounting with the manual is assumed.
Please contact NEC TOKIN responsible staff if the relay is autonatically mounted.

EX2 Series

■ SPECIFICATIONS

Items		Specifications
Contact Form		1 Form C × 2 (separate)
Contact Ratings	Maximum Switching Voltage	16 VDC
	Maximum Switching Current	30 A (at 16 VDC, inductive load: 1mH)
	Minimum Switching Current	1 A (5 VDC)
	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)		3 ms typical (at Nominal Voltage, with diode)
Nominal Operating Power		900 mW
Insulation Resistance		100 MΩ at 500 VDC
Withstand Voltage	Between open contacts	500 VAC min. (for 1 minute)
	Between coil and contacts	500 VAC min. (for 1 minute)
Shock Resistance	Misoperation	98 m/s²
	Destructive Failure	980 m/s²
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 + 125°C
Running Specifications	Non-load	1×10^6 operations
	Load	100×10^3 operations (at 14 VDC, Motor Load 25 A) 100×10^3 operations (at 14 VDC, Motor Load 25 A/7 A)
Weight		Approx. 6.4 g

■ COIL RATING

● SEALED TYPE

at 20 °C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EX2-2U1S	12	160	6.5	0.9

* Test by pulse voltage

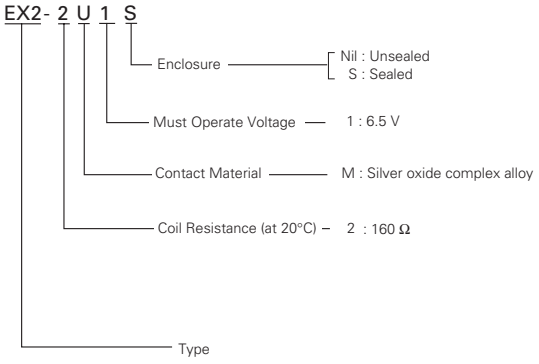
● UNSEALED TYPE

at 20 °C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EX2-2U1	12	160	6.5	0.9

* Test by pulse voltage

■ PART NUMBER SYSTEM



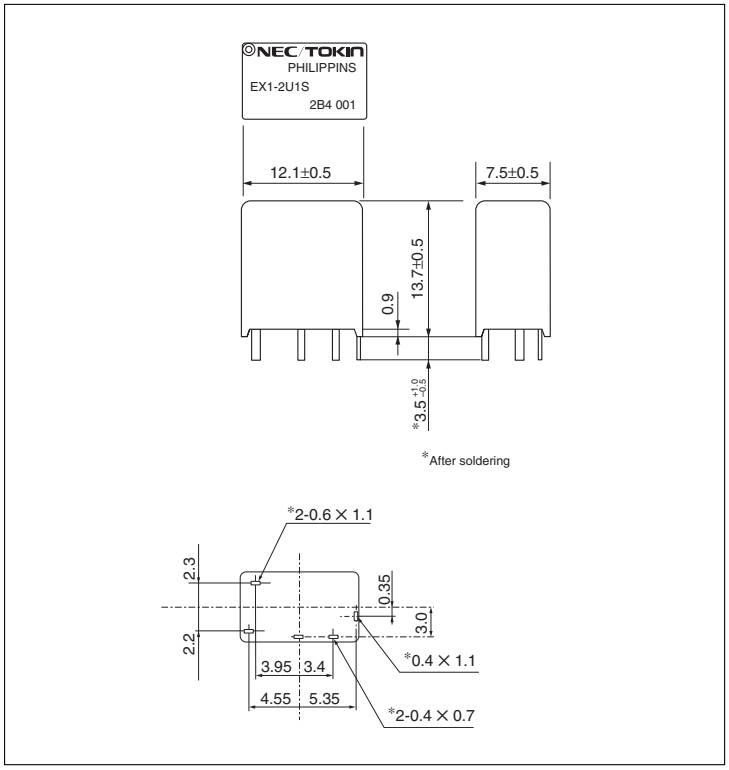
EX1 Series

The new NEC TOKIN EX1 Series are PC-board mount automotive relay suitable for various motor control application that require a high quality and performance. The EX1 series are succeeding in a about 65% of miniaturization in comparison with the ET1 series.

■ FEATURES

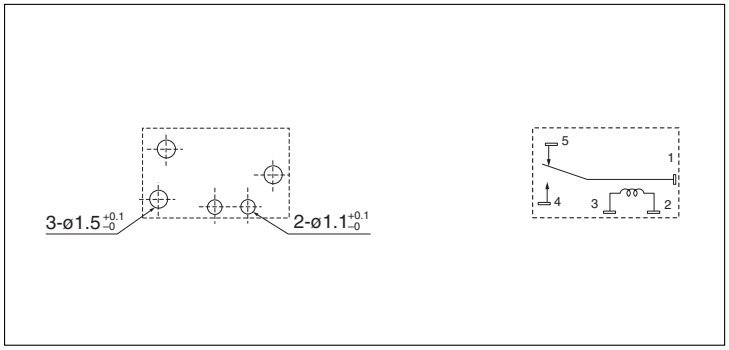
- Ultra miniature single relay
- Flux tight housing
- Approx. 65% relay volume of ET1
- Approx. 50% relay space of ET1
- Approx. 78% relay weight of ET1

■ DIMENSIONS mm



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm



■ SPECIFICATIONS

Items		Specifications
Contact Form		1 Form C
Contact Ratings	Maximum Switching Voltage	16 VDC
	Maximum Switching Current	30 A (at 16 VDC, inductive load: 1mH)
	Minimum Switching Current	1 A (5 VDC)
	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)		3 ms typical (at Nominal Voltage, with diode)
Nominal Operating Power		900 mW
Insulation Resistance		100 MΩ at 500 VDC
Withstand Voltage	Between open contacts	500 VAC min. (for 1 minute)
	Between coil and 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 + 125˚C
Running Specifications	Non-load	1×10^6 operations
	Load	100×10^3 operations (at 14 VDC, Motor Load 25 A) 100×10^3 operations (at 14 VDC, Motor Load 25 A/7 A)
Weight		Approx. 3.5 g

■ COIL RATING

• Sealed Type at 20°C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EX1-2U1S	12	160	6.5	0.9

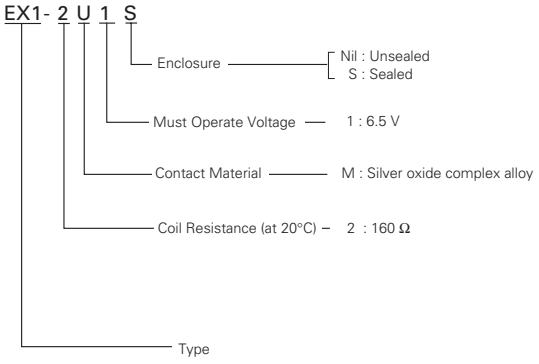
* Test by pulse voltage

• Unsealed Type at 20°C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EX1-2U1	12	160	6.5	0.9

* Test by pulse voltage

■ PART NUMBER SYSTEM



9600RSGVOL11E1003N1

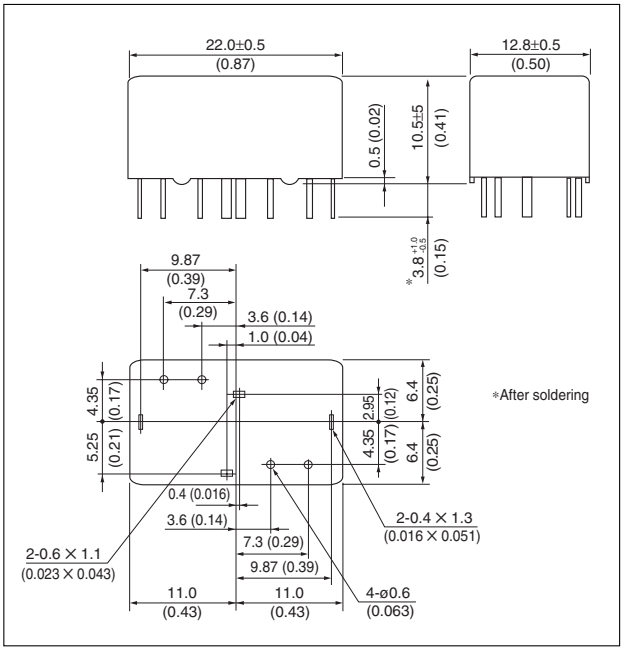
ET2 Series

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 in a about 50% of miniaturization in comparison with the EP2 series. This is H bridge type which is designed for forword and reverse control of the motor.
*ET2F:High heat resistivity

■ FEATURES

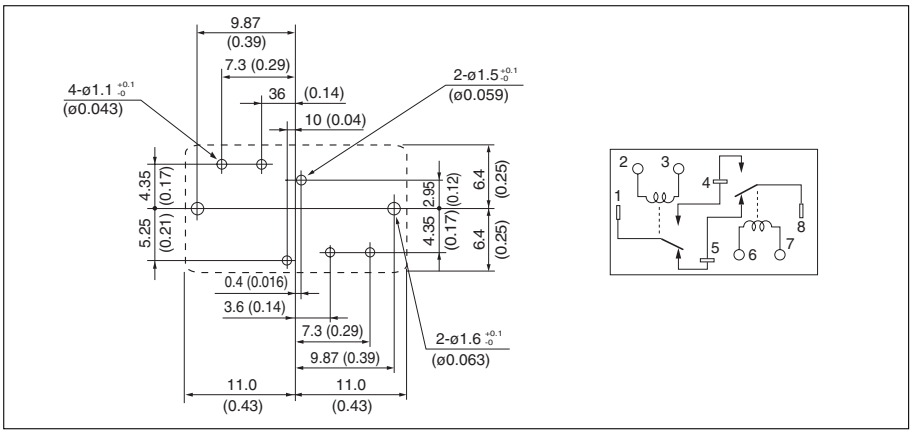
- Miniature twin relay
- Flux tight housing
- Approx. 50% relay volume of EP2
- Approx. 74% relay space of EP2
- Approx. 67% relay height of EP2
- Approx. 50% relay weight of EP2

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



ET2 Series

■ SPECIFICATIONS

Items		Specifications	
		ET2	ET2F
Contact Form		1 Form c × 2	1 Form c × 2 (H Bridge)
Contact Ratings	Maximum Switching Voltage	16 VDC	
	Maximum Switching Current	25 A (at 16 VDC, inductive loard : 1 mH)	
	Max. Carrying Current	25 A (2 minutes 12 VDC at 85˚C) 30 A (2 minutes 12 VDC at 20˚C)	25 A (2 minutes 12 VDC at 125˚C) 30 A (2 minutes 12 VDC at 85˚C) 35 A (2 minutes 12 VDC at 20˚C)
	Min. Switching Current	1A (at 5 VDC)	
	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 coil and 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 + 125˚C
Coil Temperature Rise		70 ˚C / W	
Running Specifications	Non-load	1×10^6 operations	
	Load	100×10^3 operations (at 14 VDC, Motor Load 20 A) 100×10^3 operations (at 14 VDC, Motor Load 20 A/3 A)	
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	ET2F-B3M1S	12	225	6.5	0.9

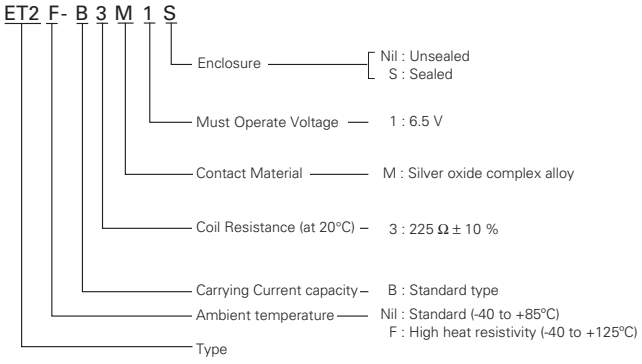
* Test by pulse voltage

• Unsealed Type at 20°C

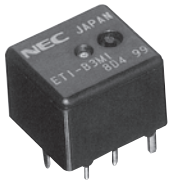
Part Numbers		Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)
ET2-B3M1	ET2F-B3M1	12	225	6.5	0.9

* Test by pulse voltage

■ PART NUMBER SYSTEM



ET1 Series

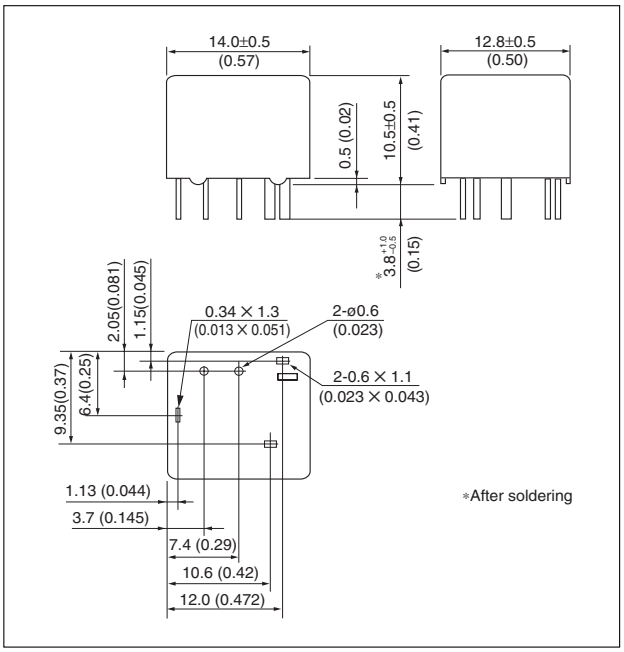


The new NEC TOKIN EP1 Series are PC-board mount automotive relay suitable for various motor and heater control application that require a high quality and performance. The ET1 series are succeeding ina about 50% of miniaturization in comparison with the EP1 series.
*ET1F:High heat resistivity

■ FEATURES

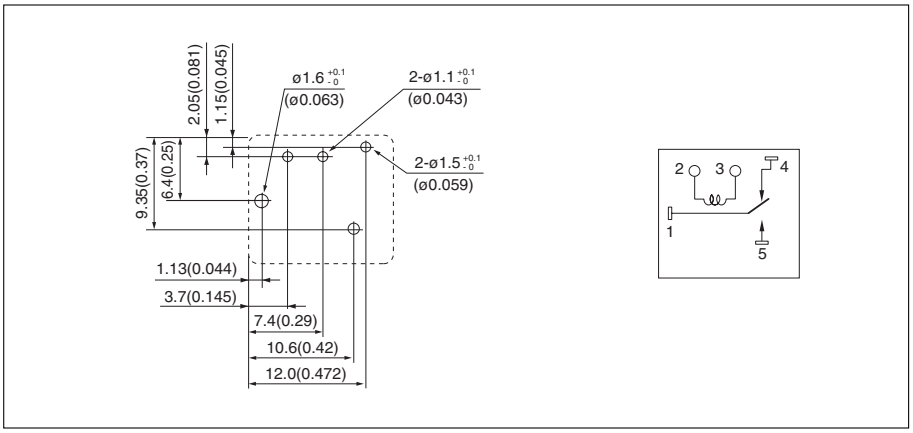
- Miniature single relay
- Flux tight housing
- Approx. 50% relay volume of EP1
- Approx. 76% relay space of EP1
- Approx. 67% relay height of EP1
- Approx. 56% relay weight of EP1

■ DIMENSIONS mm (inch)



■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



ET1 Series

■ SPECIFICATIONS

Items		Specifications	
		ET1	ET1F
Contact Form		1 Form c	
Contact Ratings	Maximum Switching Voltage	16 VDC	
	Maximum Switching Current	25 A (at 16 VDC, inductive loard : 1 mH)	
	Max. Carrying Current	30 A (2 minutes 12 VDC at 85˚C) 35 A (2 minutes 12 VDC at 20˚C)	30 A (2 minutes 12 VDC at 125˚C) 35 A (2 minutes 12 VDC at 85˚C) 40 A (2 minutes 12 VDC at 20˚C)
	Min. Switching Current	1A (at 5 VDC)	
	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 coil and contacts	500 VAC min. (for 1 minute)	
Shock Resistance	Misoperation	98 m/s^2 (10 G)	
	Destructive Failure	980 m/s^2 (100 G)	
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 + 125˚C
Coil Temperature Rise		70 ˚C / W	
Running Specifications	Non-load	1×10^6 operations	
	Load	100×10^3 operations (at 14 VDC, Motor Load 20 A) 100×10^3 operations (at 14 VDC, Motor Load 20 A/3 A)	
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	ET1F-B3M1S	12	225	6.5	0.9

* Test by pulse voltage

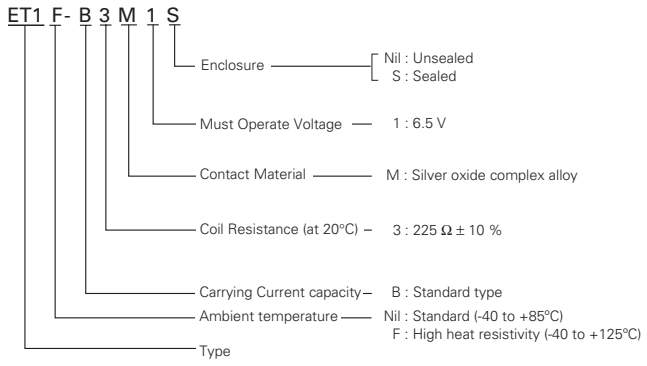
• Unsealed Type

at 20°C

Part Numbers		Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage* (VDC)	Must Release Voltage* (VDC)
ET1-B3M1	ET1F-B3M1	12	225	6.5	0.9

* Test by pulse voltage

■ PART NUMBER SYSTEM



EP2 Series

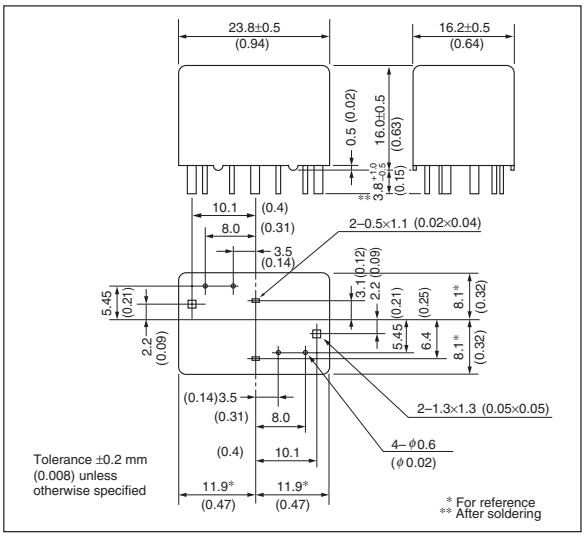
EP2 series is printed circuit board mount type and the most suitable for various motor controls in the automotive which require high-quality and high-performance.
EP2 series has two types for different applications. One is H bridge type which is desigined for forword and reverse control of the motor. The other is separate type which contains two separated relays in one package.
*EP2F:High heat resistivity

■ FEATURES

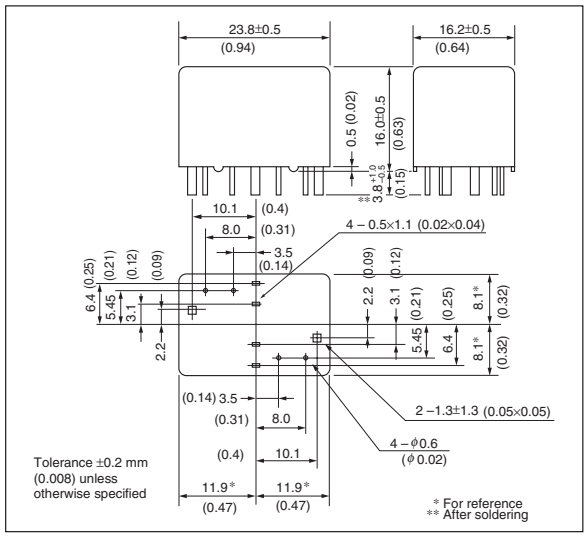
- Twin relay for motor reversible control
- High performance & productivity by unique symmetrical structure
- PC board mounting
- Flux tight housing

■ DIMENSIONS mm (inch)

[H Bridge Type]

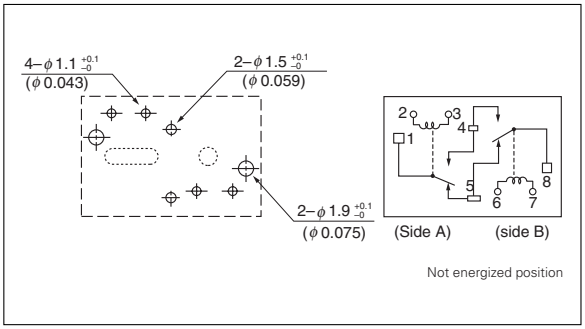


[Separate (T) Type]

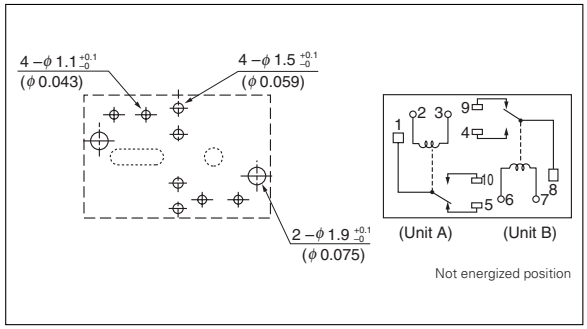


■ RECOMMENDED PCB PAD LAYOUT and SCHEMATICS (bottom view) mm (inch)

[H Bridge Type]



[Separate (T) Type]



9600RSGVOL11E1003N1

EP2 Series

■ 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 (90 ˚F/W) (Contact Carrying Current : 0 A)	
Running Specifications	Non-load	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

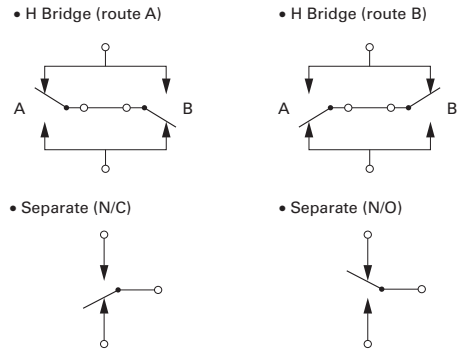
* Test by pulse voltage

■ PART NUMBER SYSTEM

EP2 F-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
- Ambient temperature: Nil : Standard (-40 to +85°C); F : High heat resistivity (-40 to +125°C)
- Type

☆ Contact Resistance (figure 1)



*EP2F:High heat resistivity

■ SPECIFICATIONS

at 20˚C

Items			EP2F
Contact Form			1 Form C × 2 (H bridg type and separate type)
Contact Material			Silver oxide complex alloy (Special type available)
Initial Contact Resistance			50 mΩ max. (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 (2 minutes max. 12 VDC at 125˚C) 30 A (2 minutes max. 12 VDC at 85˚C) 35 A (2 minutes max. 12 VDC at 25˚C)
Operate Time (Excluding bounce)			Approx. 5 ms (at Nominal Voltage)
Release Time (Excluding bounce)			Approx. 2 ms (at Nominal Voltage, without diode initial)
Normal Operate Power			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 / s^2 (misoperating), 980 m / s^2 (destructive failure)
Vibration 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˚C to +125˚C (-40˚F to +257˚F)
Coil Temperature Rise			50˚C / W (90˚F / W) (Contact Carrying Current: 0 A)
Running Specifications	Non-Load		1×10^6 operations
	Load	Contact G	1×10^5 operations (at 14 VDC, Motor Load 25 A / 7 A) at 25˚C 1×10^5 operations (at 14 VDC, Motor Load 18 A / 5 A) at 125˚C
		Contact L or N	1×10^5 operations (at 14 VDC, Motor Load 20 A / 3 A) at 25˚C 1×10^5 operations (at 14 VDC, Motor Load 12 A / 2 A) at 125˚C
Weight			Approx. 15 g (0.53 oz)

■ COIL RATING

• EP2F

at 20˚C

	Part Number		Nominal Voltage (VDC)	Coil Resistance (Ω) ±10%	Must Operate Voltage (VDC max.)	Must Release Voltage (VDC min.)	Nominal Operate Power (W)
	H Bridge Type	Separate Type					
Contact G	EP2F-B3G1	EP2F-B3G1T	12	225	6.5	0.9	0.64
	EP2F-B3G2	EP2F-B3G2T	12	225	7.0	0.9	0.64
	EP2F-B3G3	EP2F-B3G3T	12	225	7.5	0.9	0.64
Contact L or N	EP2F-B3L1	EP2F-B3L1T	12	225	6.5	0.9	0.64
	EP2F-B3L2	EP2F-B3L2T	12	225	7.0	0.9	0.64
	EP2F-B3L3	EP2F-B3L3T	12	225	7.5	0.9	0.64

* Test by pulse voltage

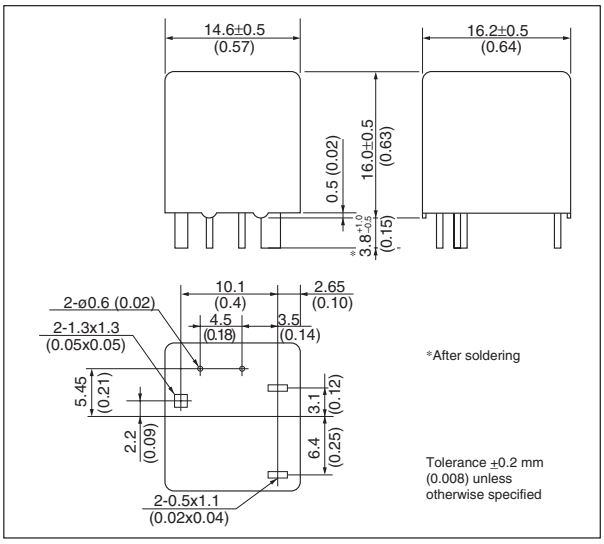
EP1 Series

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

■ FEATURES

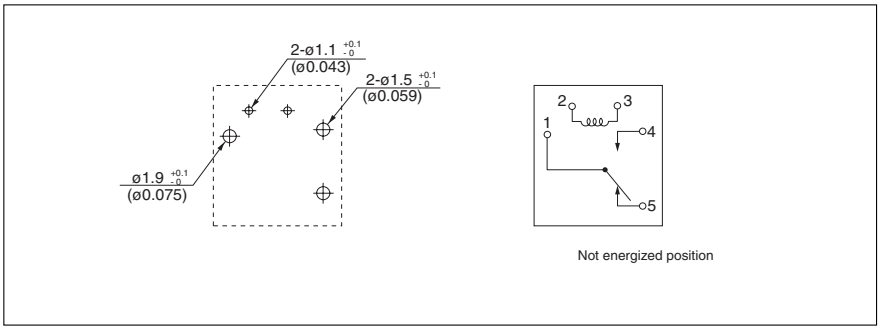
- For motor reversible control
- Two types of contact according to switching current.
  (Standard type: 25 A max, High current type: 30 A max.)
- PC board mounting
- Flux tight housing

■ 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 (90 ˚F/W)(Contact Carrying Current: 0A)	
Running Specifications	Non-load	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

*EP1F:High heat resistivity

■ SPECIFICATIONS

at 20˚C

Items			EP1F
Contact Form			1 Form C
Contact Material			Silver oxide complex alloy (Special type available)
Initial Contact Resistance			50 mΩ max. (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			30 A (2 minutes max. 12 VDC at 125˚C) 35 A (2 minutes max. 12 VDC at 85˚C) 40 A (2 minutes max. 12 VDC at 25˚C)
Operate Time (Excluding bounce)			Approx. 5 ms (at Nominal Voltage)
Release Time (Excluding bounce)			Approx. 2 ms (at Nominal Voltage, without diode initial)
Normal Operate Power			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 / s^2 (misoperating), 980 m / s^2 (destructive failure)
Vibration 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˚C to +125˚C (-40˚F to +257˚F)
Coil Temperature Rise			50˚C / W (90˚F / W) (Contact Carrying Current: 0 A)
Running Specifications	Non-Load		1×10^6 operations
	Load	Contact G	1×10^5 operations (at 14 VDC, Motor Load 25 A / 7 A) at 25˚C 1×10^5 operations (at 14 VDC, Motor Load 18 A / 5 A) at 125˚C
		Contact L or N	1×10^5 operations (at 14 VDC, Motor Load 20 A / 3 A) at 25˚C 1×10^5 operations (at 14 VDC, Motor Load 12 A / 2 A) at 125˚C
Weight			Approx. 8 g (0.28 oz)

■ COIL RATING

• EP1F

at 20˚C

	Part Number	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10%	Must Operate Voltage (VDC max.)	Must Release Voltage (VDC min.)	Nominal Operate Power (W)
Contact G	EP1F-B3G1	12	225	6.5	0.9	0.64
	EP1F-B3G2	12	225	7.0	0.9	0.64
	EP1F-B3G3	12	225	7.5	0.9	0.64
Contact L or N	EP1F-B3L1	12	225	6.5	0.9	0.64
	EP1F-B3L2	12	225	7.0	0.9	0.64
	EP1F-B3L3	12	225	7.5	0.9	0.64

* Test by pulse voltage

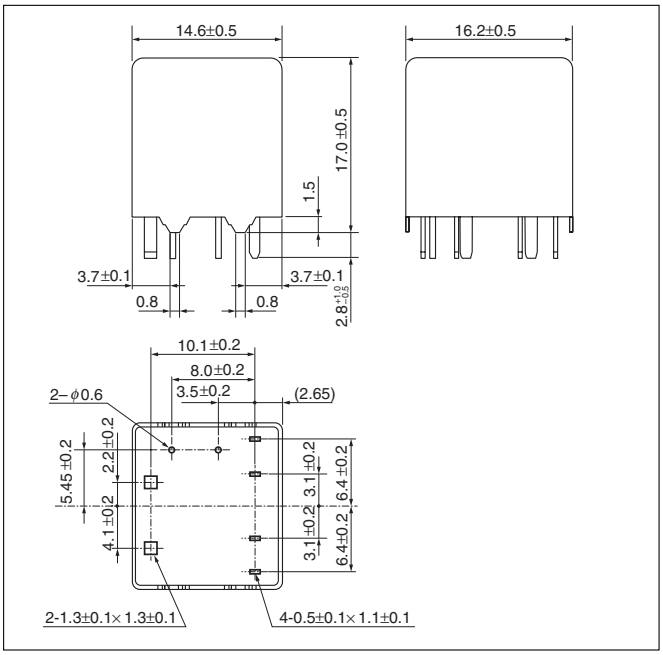
EP1K Series

The NEC TOKIN EP1K Series are PC-board mount automotive relay suitable for control of heaters, fans and pumps, etc. The EP1K relay was developed based on the EP1 relay, and the performance of carrying current is about 10A larger than the EP1 relay.

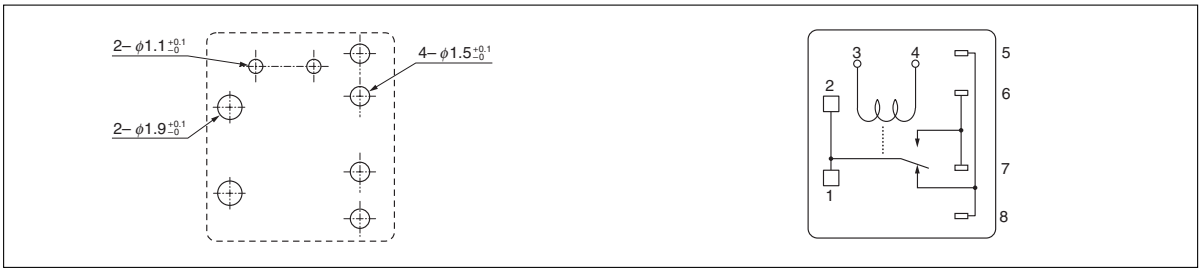
■ FEATURES

- The performance of carrying current is about 10A larger than the EP1 Series.
- High heat resistance
- Flux tight housing
- Through-hole reflow soldering available

■ DIMENSIONS mm



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



EP1K Series

■ SPECIFICATIONS

Items		Specifications
Contact Form		1 Form C
Contact Material		Silver oxide complex alloy
Contact Resistance		4 mΩ typical (measured at 7 A), initial
Maximum Switching Voltage		16 VDC
Maximum Switching Current		30 A
Minimum Switching Current		1A (5 VDC)
Contact Carrying Current		54 A (1hour 14 VDC at 20˚C)
Operate Time (Excluding bounce)		Approx. 5 ms typical (at Nominal Voltage)
Release Time (Excluding bounce)		Approx. 2 ms typical (at Nominal Voltage without diode), initial
Nominal Operating Power		0.64 W
Insulation Resistance		100 MΩ at 500 VDC, initial
Withstand Voltage	Between open contacts	500 VAC min. (for 1 minute)
	Between coil and contacts	500 VAC min. (for 1 minute)
Shock Resistance	Misoperation	98 m/s^2
	Destructive Failure	980 m/s^2
VibrationResistance	Misoperation	10 to 300 Hz, 43 m/s^2
	Destructive Failure	10 to 500 Hz, 43 m/s^2, 200 hours
Ambient Temperature		–40 to + 125˚C
Coil Temperature Rise		50˚C/W (Contact Carrying Current: 0 A)
Running Specifications	Non-Load	1×10^6 operations
	Load	1×10^5 operations (at 14 VDC, Motor Load 25 A / 7 A) at 25˚C 1×10^5 operations (at 14 VDC, Motor Load 18 A / 5 A) at 125˚C
Weight		Approx. 8 g

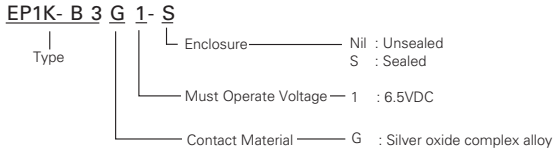
■ COIL RATING

at 20 °C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EP1K-B3G1	12	225	6.5	0.9

* Test by pulse voltage

■ PART NUMBER SYSTEM



9600RSGVOL11E1003N1

EN2 Series

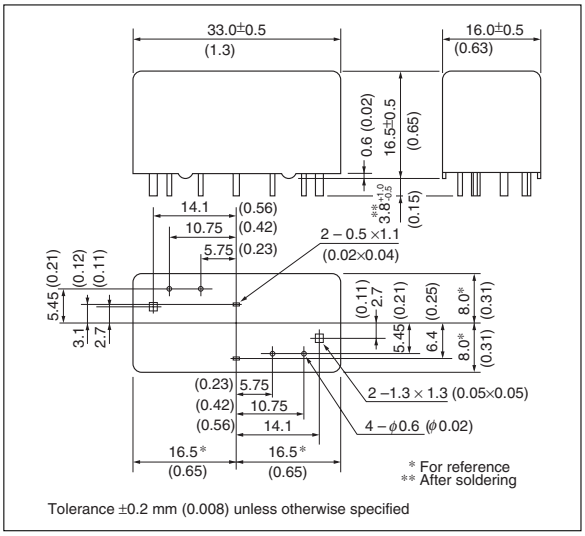
EN2 series is printed circuit board mount type and the most suitable for various motor controls in the automotive which require high-quality and high-performance.
EN2 series has two types for different applications. One is H bridge type which is desigined for forword and reverse control of the motor.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

■ FEATURES

- Twin relay for motor reversible control
- High performance & productivity by unique symmetrical structure
- Flux tight housing

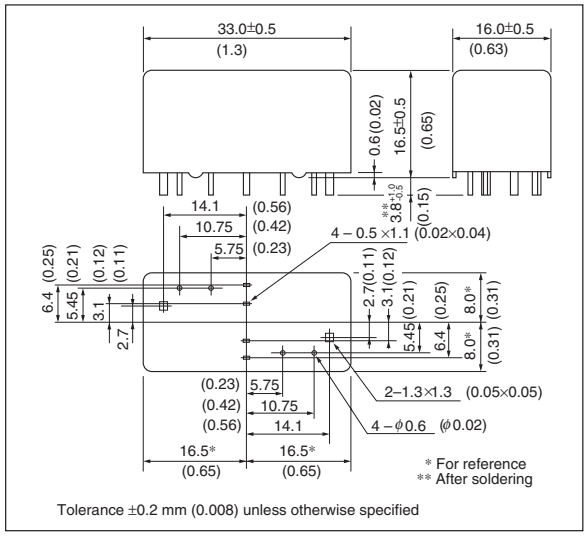
■ DIMENSIONS mm (inch)

[H Bridge Type]



Tolerance ±0.2 mm (0.008) unless otherwise specified

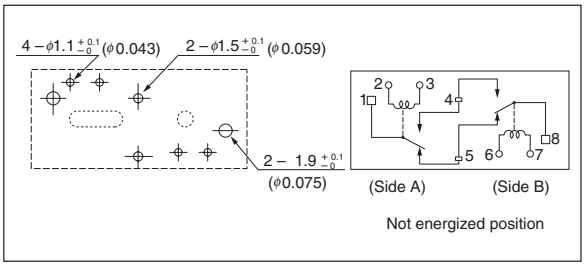
[Separate (T) Type]



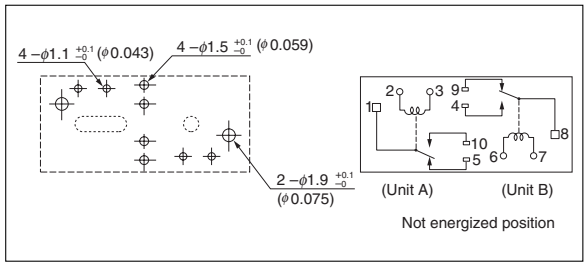
Tolerance ±0.2 mm (0.008) unless otherwise specified

■ 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 (90 ˚F / W)	
Running Specifications	Non-load	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)	

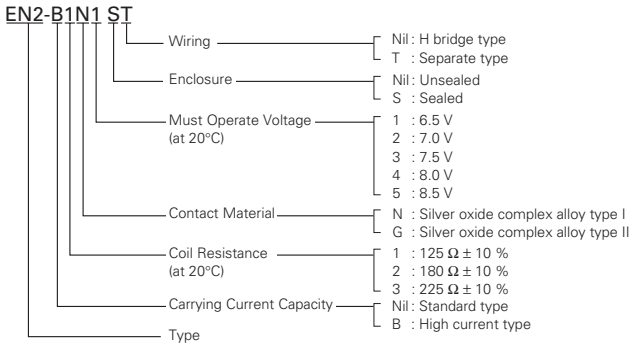
■ COIL RATING

at 20 °C

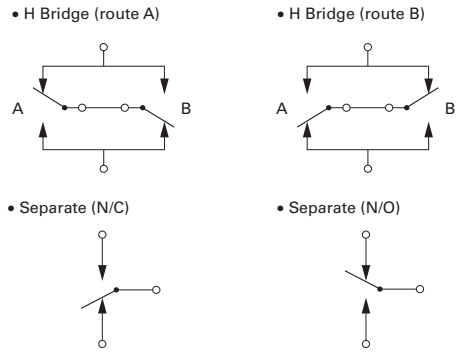
Part Numbers		Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage * (VDC)	Must Release Voltage * (VDC)	Nominal Operate Power (W)
H Bridge Type	Separate Type					
EN2-1N1	EN2-1N1T	12	125	6.5	0.6	1.15
EN2-1N2	EN2-1N2T	12	125	7.0	0.6	1.15
EN2-1N3	EN2-1N3T	12	125	7.5	0.6	1.15
EN2-2N3	EN2-2N3T	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



★ Contact Resistance (figure 1)



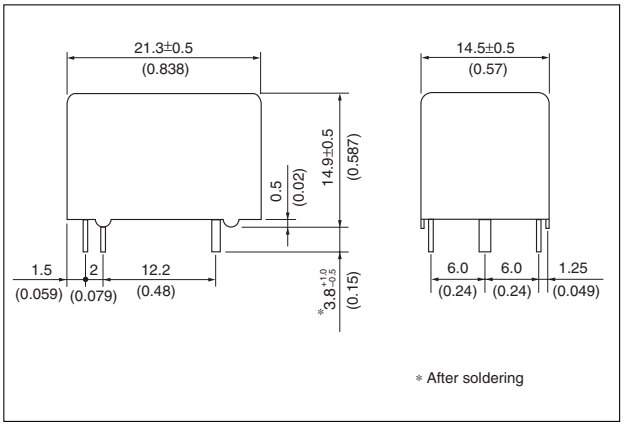
EQ1 Series

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.

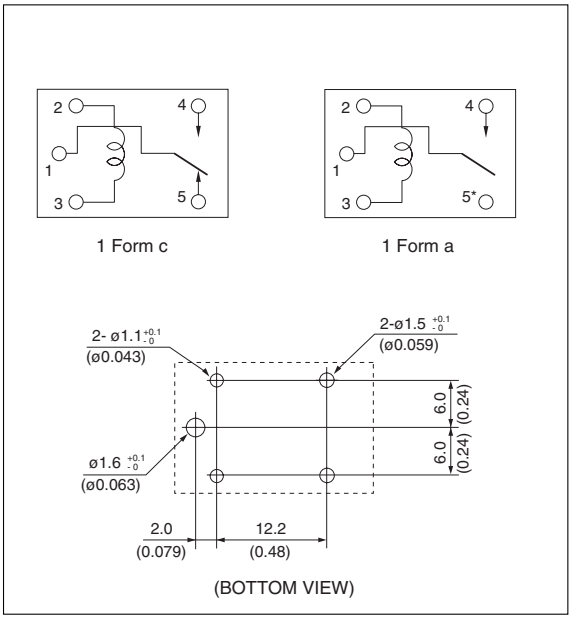
■ FEATURES

- Single relay (1 Form C & 1 Form a)
- For motor control (General purpose, Jump stant)
- For lamp and LCR circuit control
- Small size & light weight
- PC board mounting
- Flux tight housing

■ 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

EQ1 Series

■ 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	30 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/s²			
		Destructive Failure	980 m/s²			
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 (-40 to + 185˚F)			
Coil Temperature Rise			60 ˚C/W (108 ˚F / W)			
Running Specification	Non-load		1×10^6 operations			
	Load	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

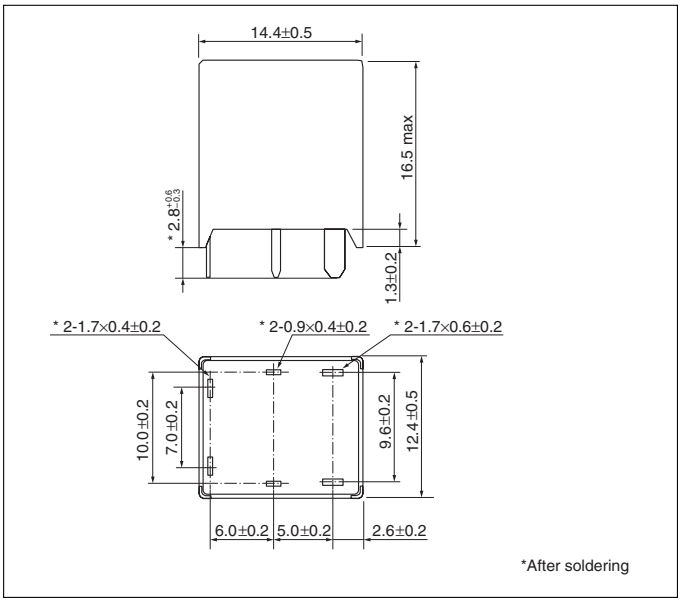
EM1 Series

The NEC TOKIN EM1 Series are PC-board mount automotive relay suitable for control of lamps, C-R circuits, heaters, fans and pumps, etc. The EM1 Series have higher switching performance than current relays; EP1, ET1, EX1 Series.

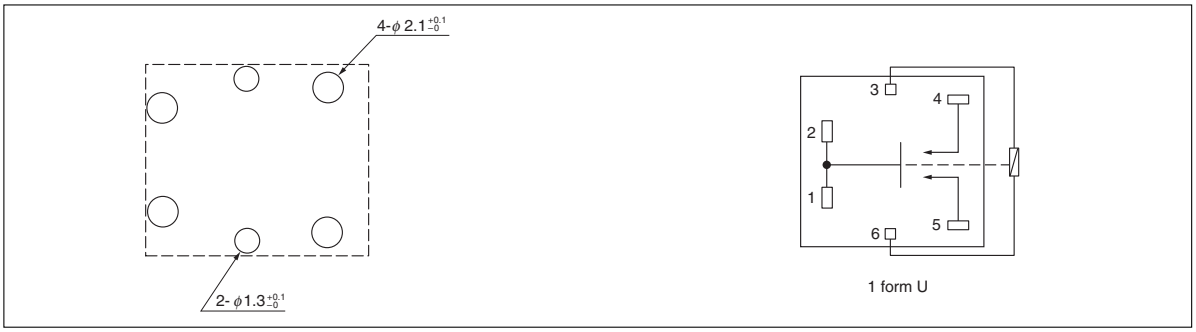
■ FEATURES

- Suitable for large inrush current load, such as lamps and CR-circuits, etc.
- Large current capacity (54A 1hour at 20˚C)
- High heat resistance
- Flux tight housing
- Through-hole reflow soldering available

■ DIMENSIONS mm



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



9600RSGVOL11E1003N1

EM1 Series

■ SPECIFICATIONS

Items			Specifications
Contact Form			1 u
Contact Ratings		Maximum Switching Voltage	16 VDC
		Maximum Switching Current	100 A ON / 60 A OFF at 14 VDC (Resistive, 10 operations)
		Minimum Switching Current	1 A (5 VDC)
		Contact Resistance	2.5 mΩ typical (measured at 7 A) initial
Contact Material			Silver oxide complex alloy
Operate Time (Excluding bounce)			6 ms typical (at Nominal Voltage)
Release Time (Excluding bounce)			1 ms typical (at Nominal Voltage, without 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 coil and contacts	500 VAC min. (for 1 minute)
Shock Resistance		Misoperation	98 m/s²
		Destructive Failure	980 m/s²
Vibration Resistance		Misoperation	10 to 300 Hz, 43 m/s²
		Destructive Failure	10 to 500 Hz, 43 m/s², 200 hours
Ambient Temperature			–40 to +125 ˚C
Running Specification	Non-load		1×10^6 operations
	Load	Resistive	100×10^3 operations (at 14VDC, 40A) at 20 ˚C
		Lamp	100×10^3 operations (at 14VDC, Inrush 120A/ Steady 14A) at 20 ˚C
Weight			Approx. 8 g

■ COIL RATING

at 20 °C

Part Numbers	Nominal Voltage (VDC)	Coil Resistance (Ω) ±10 %	Must Operate Voltage (VDC)	Must Release Voltage (VDC)
EM1-2U1	12	225	6.5	0.9

* Test by pulse voltage

■ PART NUMBER SYSTEM

EM1- 2 U 1 S

- Type
- Enclosure — Nil : Unsealed; S : Sealed
- Must Operate Voltage — 1 : 6.5VDC
- Contact Material — U : Silver oxide complex alloy
- Coil Resistance (at 20°C) — 2 : 225 Ω

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
Application	GOOD • Contacts may be unstable. • Thermal electromotive force and contact noise should be taken into consideration.	VERY GOOD • Contacts are stable and highly reliable.	NOT SO GOOD for some cases • 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 1 A	1 A to 40 A
Application	NOT SO GOOD for some cases • Contacts may be unstable. • Since a high capacitance type contact is not suitable, it is necessary to select the correct contacts.	VERY GOOD • Since different contact phenomena occur depending on the contact load, it is necessary to 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.

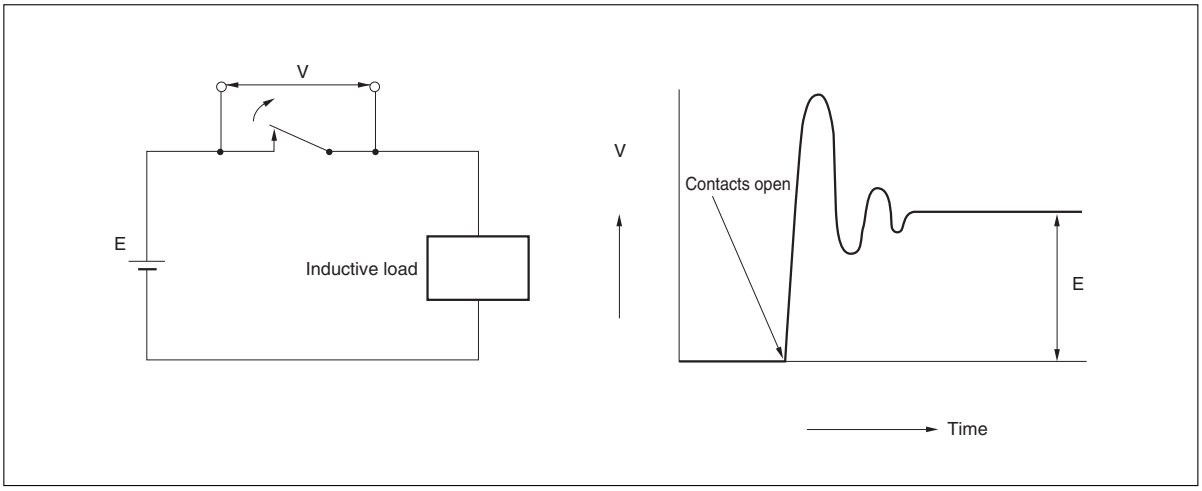


Fig.1 Inductive Load Circuit

Table 1 Inductive Load Contact Protection Circuits

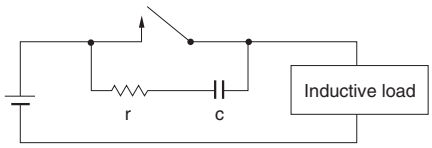
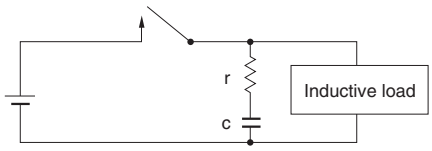
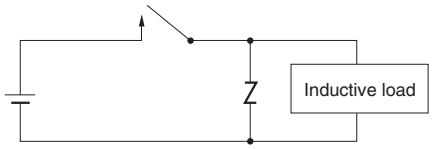
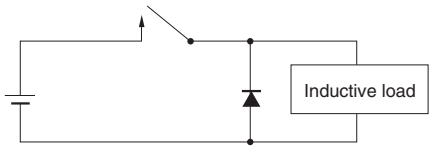
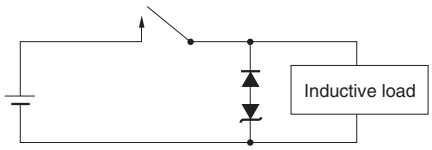
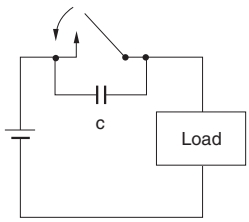
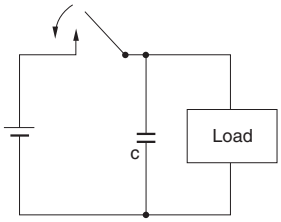
Protection element	Circuit example	Remarks
Capacitor + resistor (CR circuit)		$r\ (\Omega) = \frac{\text{contact voltage (V)}}{0.5 \text{ to } 1}$ C (μF) = (0.5 to 1) × contact current (A) The withstand voltage of a non-polar capacitor should be 300 V or higher.
		
Varistor		High voltage is suppressed 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).

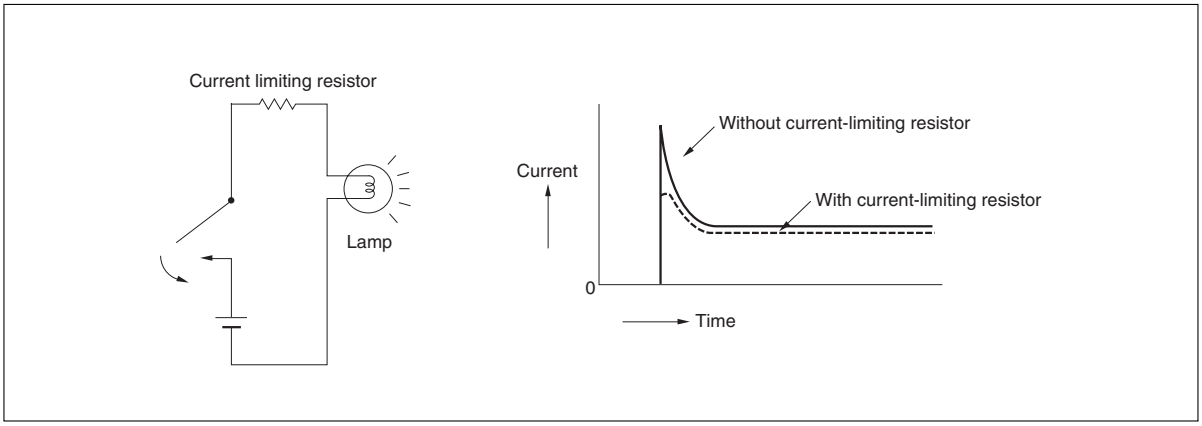


Fig.2 Example of Current-Limiting Resistor in Lamp Load Circuit

(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.

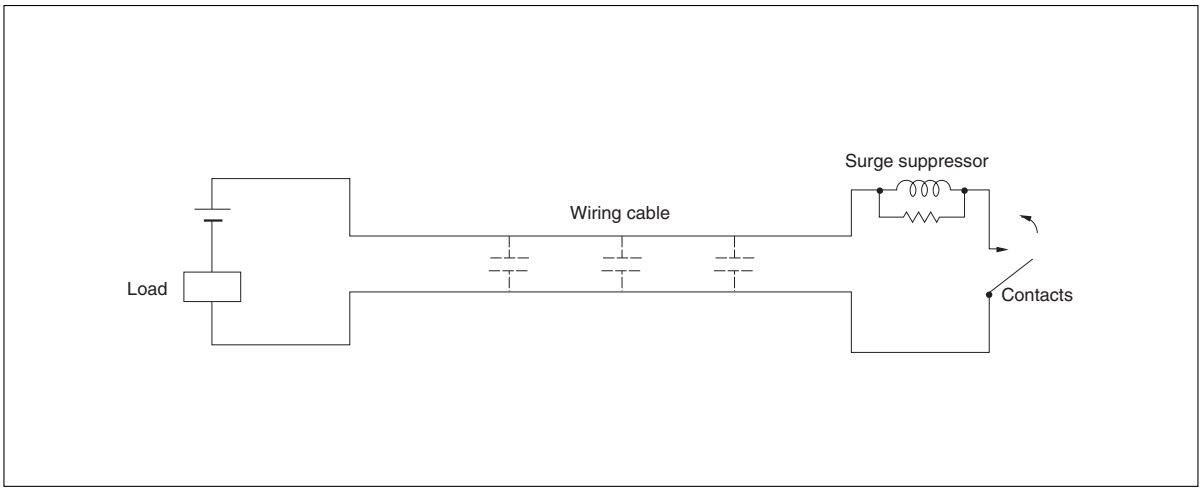


Fig.3 Example of Surge Suppression Circuit with Surge Suppressor

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.

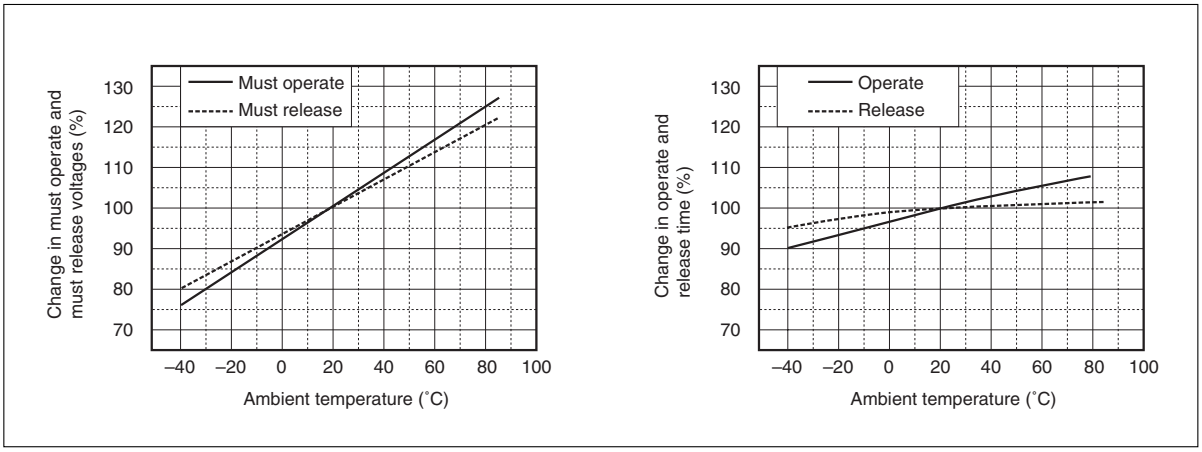


Fig.4 Temperature Characteristics of Relay (Example)

(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.

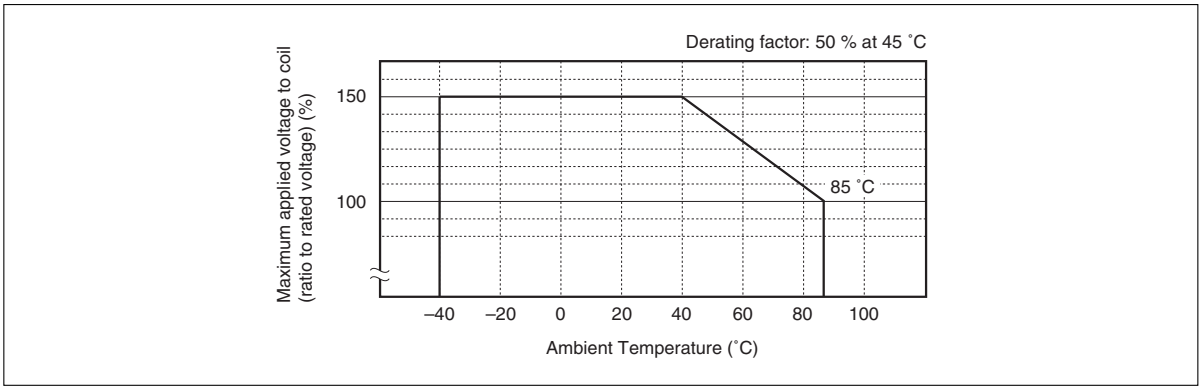


Fig.5 Coil Voltage vs. Ambient Temperature Derating Characteristics (Example)

(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.

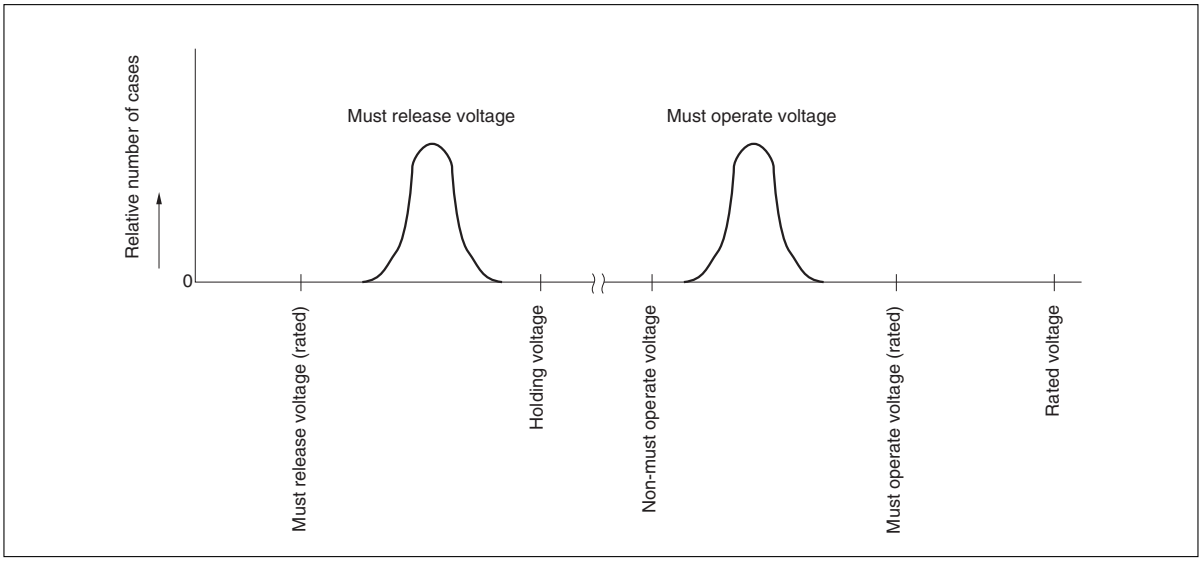


Fig.6 Example of Distribution of Relay Must Operate Voltage and Must Release Voltage

(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.

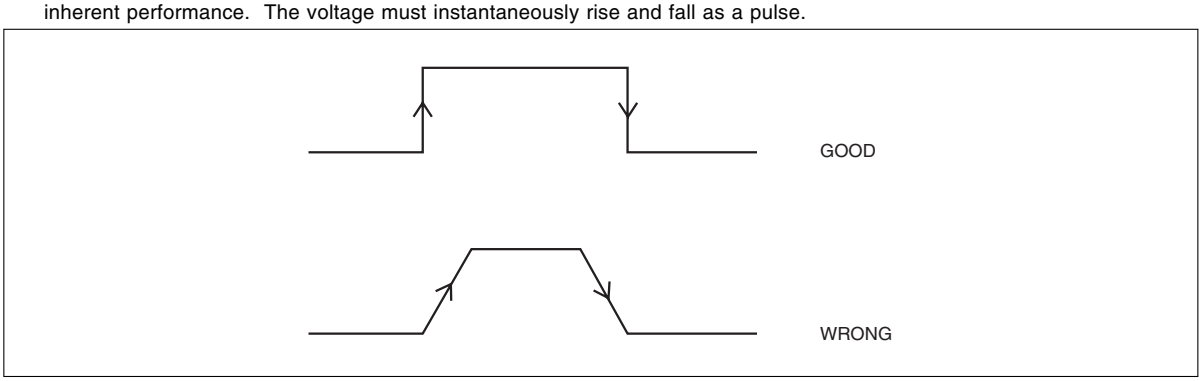


Fig.7 Relay Drive Waveform

(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.)

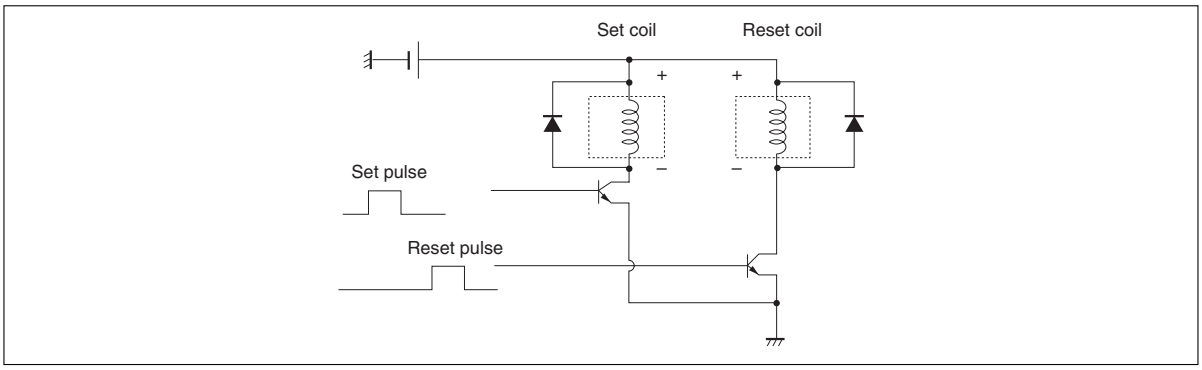


Fig.8 Drive Circuit of Latching Relay (Example of Double Coil Latching Type)

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.

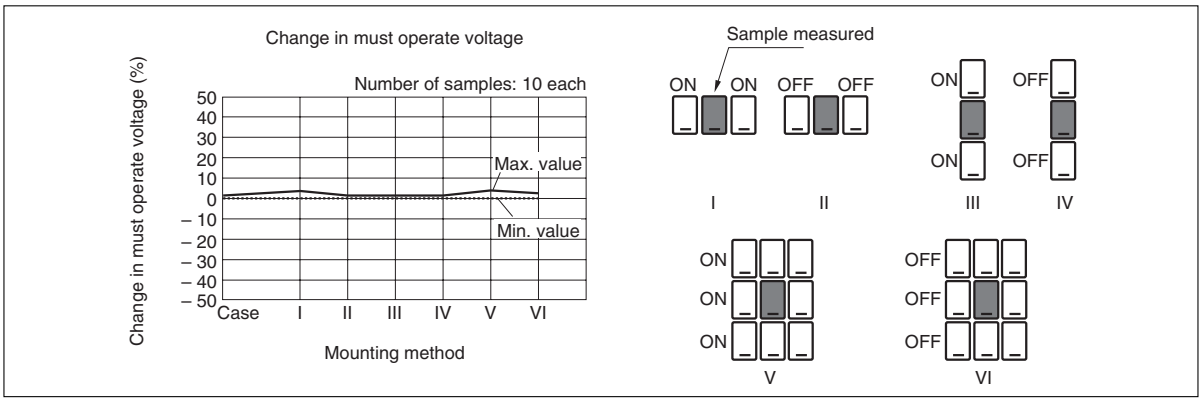


Fig.9 Change in Must Operate Voltage in Dense Mounting

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.

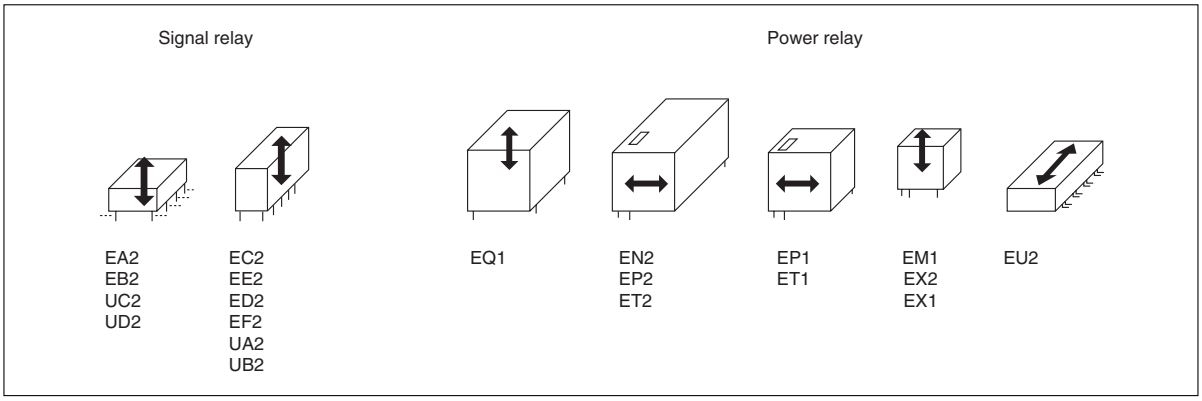


Fig.10 Direction of Armature Operation

(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.

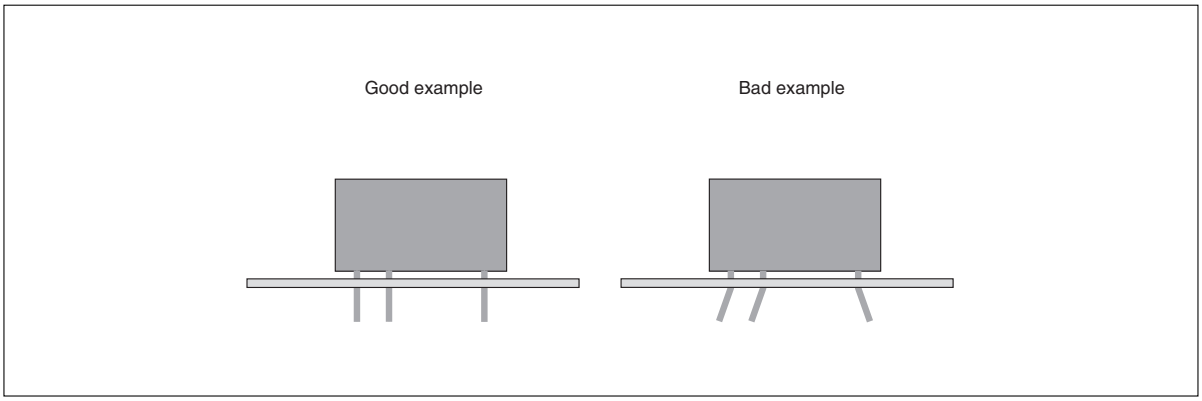


Fig.11 Bending Relay Pins

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: 260 °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.

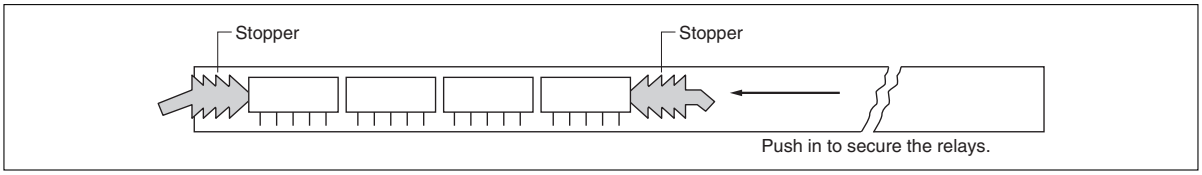


Fig.12 Storage in Magazine Case

(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 .
Please use relays within 12 months form the data of delivery. (Storage conditions : 30 degree C/60% RH)

MEMO

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- All specifications in this catalog and production status of products are subject to change without notice. Prior to the purchase, please contact NEC TOKIN for updated product data.
- Please request for a specification sheet for detailed product data prior to the purchase.
- Before using the product in this catalog, please read "Precautions" and other safety precautions listed in the printed version catalog.

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