

Miniature Relays



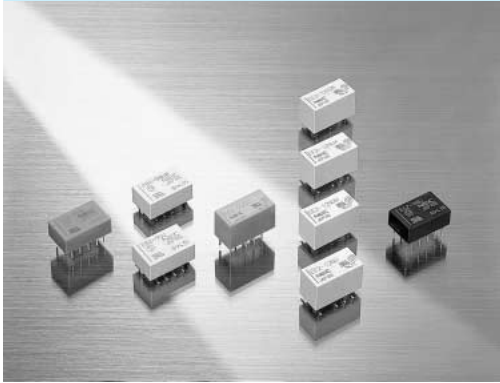
Introduction to NEC TOKIN E.M. Devices

Since NEC industrialized telephone relays in Japan more than a half century ago, many technological innovations have taken place in its electromechanical devices (E.M. devices).

NEC's relays were designed and manufactured always on the basis of the newest technology that the company develops. Their high reliability and advanced features assure the high reliability and high performance of your products.

NEC divided and transferred its business of manufacturing and sale of relays to Tokin, as of April 1, 2002. Then Tokin Corporation changed its corporate name to "NEC TOKIN Corporation," which has charge of electronic components business within the NEC Group.

Miniature Relay



Miniature Signal Relay



Miniature Power Relay

Introduction of NEC TOKIN's miniature relays

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

Feature

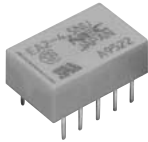



Miniature signal relay

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

Miniature power relay

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

Selector Chart

| Miniature Relay-Signal | | | | • Group |
|---|--|--|--|--|
| EA2  | EB2  | EC2  | EE2  | • Type of Relay |
| <ul style="list-style-type: none"> • Low power consumption • Low magnetic interference • 1500V FCC surge 1000Vac FCC • compact, light weight • latching type available | <ul style="list-style-type: none"> • surface mount • Low power consumption • Low magnetic interference • 1500V FCC surge 1000Vac FCC • compact, light weight • latching type available • ultra-low profile type is line up. | <ul style="list-style-type: none"> • Low power consumption • dual-inline leads (small mounting space) • 2500 V surge (2 x 10 μs*) coil to contacts • latching type available • high-insulation type is line up. | <ul style="list-style-type: none"> • Low power consumption • surface mount (reduced mounting space) • 2500 V surge (2 x 10 μs*) coil to contacts • latching type available • high-insulation type is line up. | • Features |
| 2c | | | | • Contact Arrangement |
| silver alloy with gold alloy overlay | | | | • Contact Material (standard) |
| 30W/62.5 VA | | 60W/125 VA (UL/CSA Rating) | | <ul style="list-style-type: none"> • Contact Rating (resistive) (switching) |
| 1.0A | | 2.0A | | |
| 3,4,5,5,6,9,12,24 Vdc | | | | |
| 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) |
| 1X 10 ⁶ (50 Vdc, 0.1 A at 85°C,5Hz) 1X 10 ⁶ (10 Vdc, 10 mA at 85°C,2Hz) | | | | Load |
| 10 x10 ⁶ | | | | Nonload |
| 1000Vac | | | | Between open contacts |
| 1000Vac | | | | Between adjacent contacts |
| 1000Vac | | 1500 Vac or 1000Vac** | | Between contacts and coil |
| 1500V FCC | | 1500V (FCC), 2500 V*** (2x10ms, coil to contacts) | | • Surge Withstand Voltage |
| UL, CSA | | | | • Safety Standard |
| latching type | | | | • Option |
| 5.4 | 7.5 | 9.4 | 10.0 | • Height (mm) |
| 9.2 X 14.2 | 9.3 X 14.3 | 7.5 X 15.0 | 9.5 X 15.0 | • Mounting Space (mm ²) |
| 22 to 23, 28 | 24 to 28 | 29 to 31, 36 | 32 to 36 | • Page |






* 2 μs of rise time and 10 μs of decay time to half crest.

★ For individual correspondence at Nonlatch type only

** for double coil latch type







*** 1500V for double coil latch type

Selector Chart




| • Group | Miniature Relay-Signal | | | | |
|--|--|---|---|---|---|
| • Type of Relay | ED2  | EF2  | MR62  | MR62-K -Y -KY  | MR82  |
| • Features | <ul style="list-style-type: none"> • ultra-low power consumption • dual-inline leads (small mounting space) • 2500 V surge (2 x 10 μs*) coil to contacts • latching type available | <ul style="list-style-type: none"> • ultra-low power consumption • surface mount (reduced mounting space) • 2500V surge (2 x 10 μs*) coil to contacts • latching type available | <ul style="list-style-type: none"> • DIP terminal • sealed package for flow soldering • stable contact resistance at high temperature • 1500V FCC surge # | <ul style="list-style-type: none"> • DIP terminal • sealed package for flow soldering • stable contact resistance at high temperature • 1500V FCC surge # | <ul style="list-style-type: none"> • DIP terminal • sealed package • lower power consumption (200mW) • stable contact resistance at high temperature • 1500V FCC surge # coil and contacts |
| • Contact Arrangement | 2c | | | | |
| • Contact Material (standard) | silver alloy with gold alloy overlay | | | | |
| • Contact Rating (resistive) (switching) | 30W/62.5 VA | | 60W/125 VA | | |
| 3A | ----- | | ----- | | |
| 2A | ----- | | ----- | | |
| 1A | 1.0A | ----- | 2.0A | ----- | ----- |
| • Coil Voltage | 1.5,3,4,5,5,6,9,12,24 Vdc | | 5,6,9,12,24,48 Vdc | | 4.5,5,6,9,12,24 Vdc |
| • Nominal Operate Power | 30 to 70mW | | 550mW | 400mW or 550mW | 200mW |
| • Must Operate Voltage | 80% (75%*) | | 62 to 72 % | 70 % 48 %...80 % | 70 % |
| • Must Release Voltage | 10% | | 5% | | |
| • Operate Time (typ.) (Excluding bounce) | 3ms | | 2.5ms | 2.5ms (K type 3.5ms) | 5.5ms |
| • Release Time (typ.) (Excluding bounce Without Diode) | 2ms | | | | |
| • Running Specifications | Load | 1X10 ⁶ (50 Vdc, 0.1 A at 70°C,5Hz) 1X10 ⁶ (10 Vdc, 10 mA at 70°C,2Hz) | | 1 X 10 ⁶ (50 Vdc, 0.1 A at 85°C,5Hz) 1 X 10 ⁶ (10 Vdc, 10 mA at 85°C,2Hz) | |
| | Nonload | 10 x10 ⁶ | | | |
| • Withstand Voltage | Between open contacts | 1000Vac | | 500Vac | 1000Vac or 500Vac |
| | Between adjacent contacts | 1000Vac | | | |
| | Between contacts and coil | 1500Vac or 1000Vac** | | 1000Vac | |
| • Surge Withstand Voltage | 1500V(FCC), 2500 V*** (2x10 μs, coil to contacts) | | | 1500V FCC# | |
| • Safety Standard | UL, CSA | | | | |
| • Option | latching type | | | — | |
| • Height (mm) | 9.4 | 10.0 | | 11.4 | |
| • Mounting Space (mm ²) | 7.5 X 15.0 | | 9.5 X 15.0 | | 9.8 X 20.2 |
| • Page | 37 to 38 , 42 | | 39 to 41, 42 | | 43, 46 |
| | 44, 46 | | 44, 46 | | 45, 46 |

#FCC surge between coi and contacts and between adjacent contacts


Selector Chart

| Miniature Relay-Power | | | • Group |
|---|---|--|---|
|  EN2 |  EP2 |  EP1 | • Type of Relay |
| <ul style="list-style-type: none"> •motor reversible control •30% less relay space than 2 MR301 relays •symmetrical structure •flux tight housing | <ul style="list-style-type: none"> •motor reversible control •50% less relay space than 2 MR301 relays •symmetrical structure •flux tight housing | <ul style="list-style-type: none"> •motor reversible control •65% relay volume than MR301 •62% relay weight than MR301 •flux tight housing | • Features |
| 1c X 2 | 1c X 2 | 1c | • Contact Arrangement |
| silver oxide complex alloy | | | • Contact Material (standard) |
|  35A (16Vdc) |  30A(16Vdc) |  30A (16Vdc) | 30A 25A 20A 15A 10A 5A 1A • Contact Rating (DC motor load) (switching) |
| 12 Vdc | | | • Coil Voltage |
| 640mW / 800mW / 1150mW | 480mW / 640mW | | • Nominal Operate Power |
| 6.5 to 8.5Vdc | | | • Must Operate Voltage |
| 0.6 or 0.9 Vdc | 0.9 Vdc | | • Must Release Voltage |
| Approx. 5ms | | | • Operate Time (typ.) (Excluding bounce) |
| Approx. 7ms | | | • Release Time (typ.) (Excluding bounce With Diode) |
| 100 X 10 ³ motor load 14Vdc, 30A / 7A | 100 X 10 ³ motor load 14Vdc, 25A / 3A | | Load |
| 1 X 10 ⁶ | | | Nonload |
| 500Vac | | | Between open contacts |
| 500Vac | | — | Between adjacent contacts |
| 500Vac | | | Between contacts and coil |
| — | | | • Surge Withstand Voltage |
| — | | | • Safety Standard |
| Separate type | | — | • Option |
| 17.0 | 16.5 | 16.5 | • Height (mm) |
| 16.5 X 33.5 | 16.7 X 24.3 | 16.7 X 15.1 | • Mounting Space (mm ²) |
| 47 to 49 | 50 to 52 | 53 to 55 | • Page |

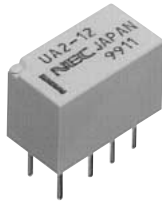
Selector Chart

| • Group | Miniature Relay-Power | | | | | |
|---|--|---|---|---|---|--|
| | EQ1-31000 | EQ1-11040 | EQ1-11111 | EQ1-22111 | ET 1 | ET 2 |
| • Type of Relay |  | | | |  |  |
| • Features | <ul style="list-style-type: none"> • same pin-layout as MR301 • for general purpose • small size & light weight • flux tight housing | <ul style="list-style-type: none"> • same pin-layout as MR301 • for jump start • small size & light weight • flux tight housing | <ul style="list-style-type: none"> • same pin-layout as MR301 • for lamp & LCR circuit control • small size & light weight • flux tight housing | | <ul style="list-style-type: none"> • motor heater and solenoid control • 45% less relay volume than EP1 • 56% less relay weight than EP1 • flux tight housing | <ul style="list-style-type: none"> • motor reversible control • 50% less relay volume than EP2 • 50% less relay weight than EP2 • flux tight housing |
| • Contact Arrangement | 1c | | 1a | | 1c | 1c × 2 |
| • Contact Material (standard) | silver oxide complex alloy | | | | silver oxide complex alloy | |
| • Contact Rating (DC motor load) (switching) | 30A | 30A(16Vdc) | | | 25A(16Vdc) | |
| | 25A | | | | | |
| | 20A | | | | | |
| | 15A | | | | | |
| | 10A | | | | | |
| | 5A | | | | | |
| | 1A | | | | | |
| • Coil Voltage | 12 Vdc | | | | | |
| • Nominal Operate Power | 640mW | 1000mW | | 800mW | 640mW | |
| • Must Operate Voltage | 6.5Vdc | | | 7.2Vdc | 6.5Vdc | |
| • Must Release Voltage | 0.9 Vdc | 0.6Vdc | | 0.7Vdc | 0.9 Vdc | |
| • Operate Time (typ.) (Excluding bounce) | Approx. 3ms | | | | Approx. 2.5ms | |
| • Release Time (typ.) (Excluding bounce With Diode) | Approx. 4ms | | | | Approx. 3ms | |
| • Running Specifications | Load | 100 × 10 ³ motor load, 25A / 3A | | 100 × 10 ³ lamp load or LCR circuit (peak current 70A) | | 100 × 10 ³ motor load |
| | Nonload | 1 × 10 ⁶ | | | | |
| • Withstand Voltage | Between open contacts | 500Vac | | | | |
| | Between adjacent contacts | — | | | | |
| | Between contacts and coil | 500Vac | | | | |
| • Surge Withstand Voltage | — | | | | | |
| • Safety Standard | — | | | | | |
| • Option | — | | | | | |
| • Height (mm) | 15.4 | | | | 11.0 | |
| • Mounting Space (mm ²) | 15.0 × 21.8 | | | 13.3 × 14.5 | 13.3 × 22.5 | |
| • Page | 56 to 57 | | | | 58 to 61 | |

Selector Chart

| Miniature Relay-Power | | | • Group |
|---|---|---|--|
| MR301 | MR301-H | MR301-E | |
|  | | | • Type of Relay |
| <ul style="list-style-type: none"> • low profile • specialty for automotive • flux tight | <ul style="list-style-type: none"> • low profile • high power switching • flux tight | <ul style="list-style-type: none"> • low profile • high power switching • flux tight • specialty for automotive | • Features |
| 1c | | | • Contact Arrangement |
| silver nickel alloy | silver oxide complex alloy | | • Contact Material (standard) |
| 150W/600 VA (resistive load) | 300W/1200 VA (resistive load) | 240W (DC motor load) 15A (16Vdc) | <ul style="list-style-type: none"> • Contact Rating (switching) 15A 10A 5A 1A 0.1A |
| 5A | 10A | 15A (16Vdc) | |
| 3,5,6,9,12,24 Vdc | | 9,12 Vdc | |
| 360mW | | | |
| 70% | | | • Must Operate Voltage |
| 10% | | | • Must Release Voltage |
| Approx. 5ms | | | • Operate Time (typ.) (Excluding bounce) |
| Approx. 6ms (with diode) | | | • Release Time (typ.) (Excluding bounce Without Diode) |
| 100 × 10 ³ 14Vdc, 5A | 100 × 10 ³ 14Vdc, 10A | 100 × 10 ³ (DC motor load) 14Vdc, 15A | Load |
| | | | Nonload |
| 750Vac | | | Between open contacts |
| — | | | Between adjacent contacts |
| 1500Vac | | | Between contacts and coil |
| — | | | • Surge Withstand Voltage |
| UL, CSA | | | • Safety Standard |
| — | | | • Option |
| 17.0 | | | • Height (mm) |
| 16.5 × 22.5 | | | • Mounting Space (mm ²) |
| 62 to 63 | | | • Page |

UA2 Series

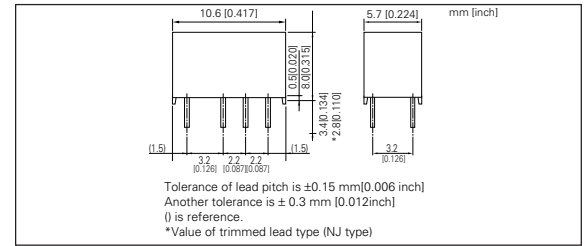


NECTOKIN's UA2 relay is a new generation Miniature Signal Relay of super-compact size and slim-package.

FEATURES

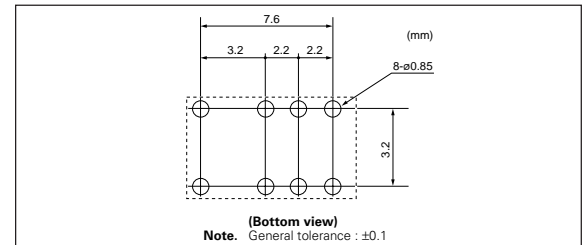
- small mounting size of slim package for dense mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Power consumption 140mW, Low power consumption 100mW type is available
-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

DIMENSIONS mm(inch)

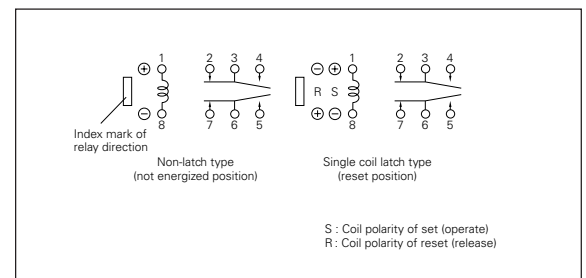


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



SCHEMATICS (bottom view)



SPECIFICATIONS

| | | |
|---------------------------------|---|--|
| Contact Form | 2 Form c | |
| Contact Material | Silver alloy with gold alloy overlay | |
| Contact Ratings | Maximum Switching Power | 30 W, 37.5 VA |
| | Maximum Switching Voltage | 220 Vdc, 250 Vac |
| | Maximum Switching Current | 1 A |
| | Maximum Carrying Current | 1 A |
| Minimum Contact Ratings | 10 mVdc, 10 μ A* ¹ | |
| Initial Contact Resistance | 100 m Ω max.(Initial) | |
| Nominal Operating Power | Nonlatch type | 140 mW (1.5 to 12 V), 230 mW (24 V) 100 mW (low power consumption type) |
| | Single coil latch type | 100 mW (1.5 to 12 V), 120 mW (24 V) |
| Operate Time (Excluding bounce) | Approx. 2 ms | |
| Release Time (Excluding bounce) | Approx. 1 ms | |
| Insulation Resistance | 1000 M Ω at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) |
| | Between adjacent contacts | 1500 V surge (10 \times 160 μ s* ²) |
| | Between coil to contacts | 1500 Vac (for one minute) 2500 V surge (2 \times 10 μ s* 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 | Nonload | 5 \times 10 ⁷ * ⁴ operations(Non-latch type) |
| | Load | 30 Vdc, 1 A (resistive), 1 \times 10 ⁵ operations at 20°C |
| | | 125 Vac, 0.3 A (resistive), 1 \times 10 ⁵ operations at 20°C |
| Weight | Approx. 1 g | |

* 1 This value is a reference value in the resistance load.

Minimum capacity changes depending on switching frequency and environment temperature and the load.

* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

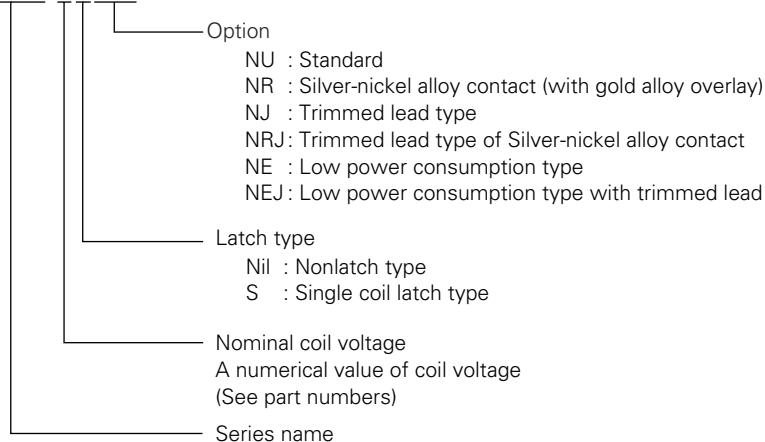
* 3 rise time : 2 μ s, decay time to half crest : 10 μ s

* 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 \times 10⁷ times.

UA2 Series

■ PART NUMBER SYSTEM

UA2-3SNU



■ SAFETY STANDARD AND RATING

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

* Spacing : UL840

+ Spacing : CSA std950

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

■ PART NUMBERS

• Nonlatch Type

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

• Single Coil Latch Type

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

• Nonlatch NE Type (Low power consumption)

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

Note * Test by pulse voltage

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

UB2 Series



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

FEATURES

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

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 μ A*1 | |
| Initial Contact Resistance | 100 m Ω max.(Initial) | |
| Nominal Operating Power | Nonlatch type | 140 mW (1.5 to 12 V), 230 mW (24 V) 100 mW (low power consumption type) |
| | Single coil latch type | 100 mW (1.5 to 12 V), 120 mW (24 V) |
| Operate Time (Excluding bounce) | Approx. 2 ms | |
| Release Time (Excluding bounce) | Approx. 1 ms | |
| Insulation Resistance | 1000 M Ω at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) |
| | Between adjacent contacts | 1500 V surge (10 \times 160 μ s*2) |
| | Between coil to contacts | 1500 Vac (for one minute) 2500 V surge (2 \times 10 μ s*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 | |
| Coil Temperature Rise | 18 degrees at nominal coil voltage (140 mW) | |
| Running Specifications | Nonload | 5 \times 10 ⁷ *4 operations(Nonlatch type) |
| | Load | 30 Vdc, 1 A (resistive), 1 \times 10 ⁵ operations at 20°C |
| | | 125 Vac, 0.3 A (resistive), 1 \times 10 ⁵ operations at 20°C |
| Weight | Approx. 1 g | |

* 1 This value is a reference value in the resistance load.

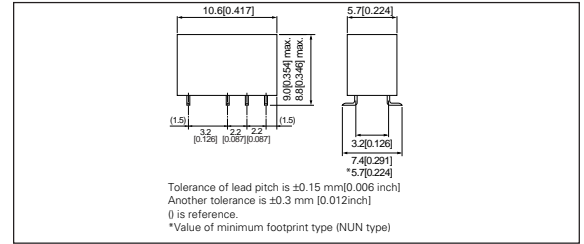
Minimum capacity changes depending on switching frequency and environment temperature and the load.

* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

* 3 rise time : 2 μ s, decay time to half crest : 10 μ s

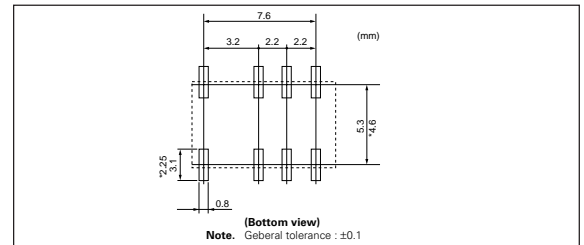
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1 \times 10⁷ times.

DIMENSIONS mm(inch)

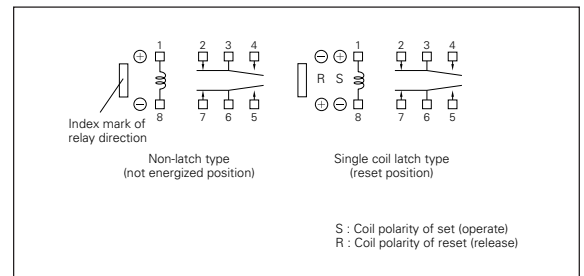


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



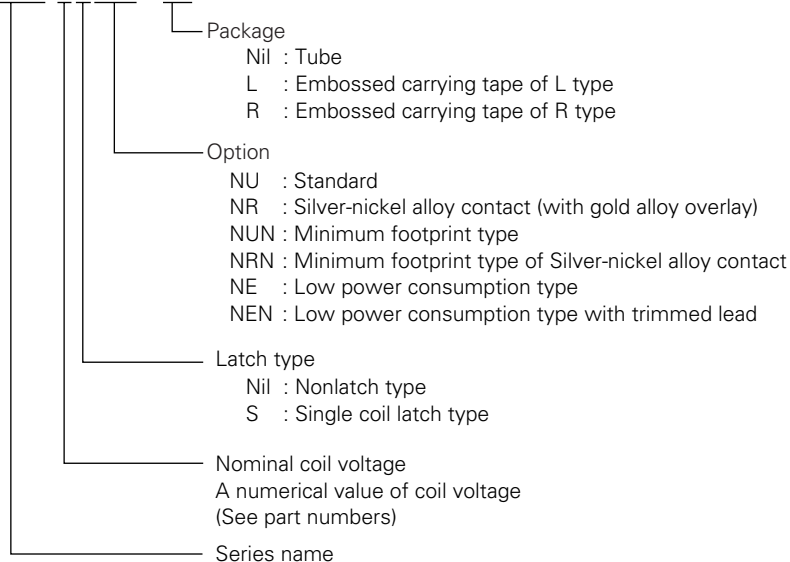
SCHEMATICS (bottom view)



UB2 Series

■ PART NUMBER SYSTEM

UB2-3SNU - L1



■ 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) |
| 110 Vdc, 0.3 A (Resistive) | 125 Vac, 0.3 A (Resistive) |

* Spacing : UL840

+ Spacing : CSA std950

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

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

• Nonlatch NE Type (Low power consumption)

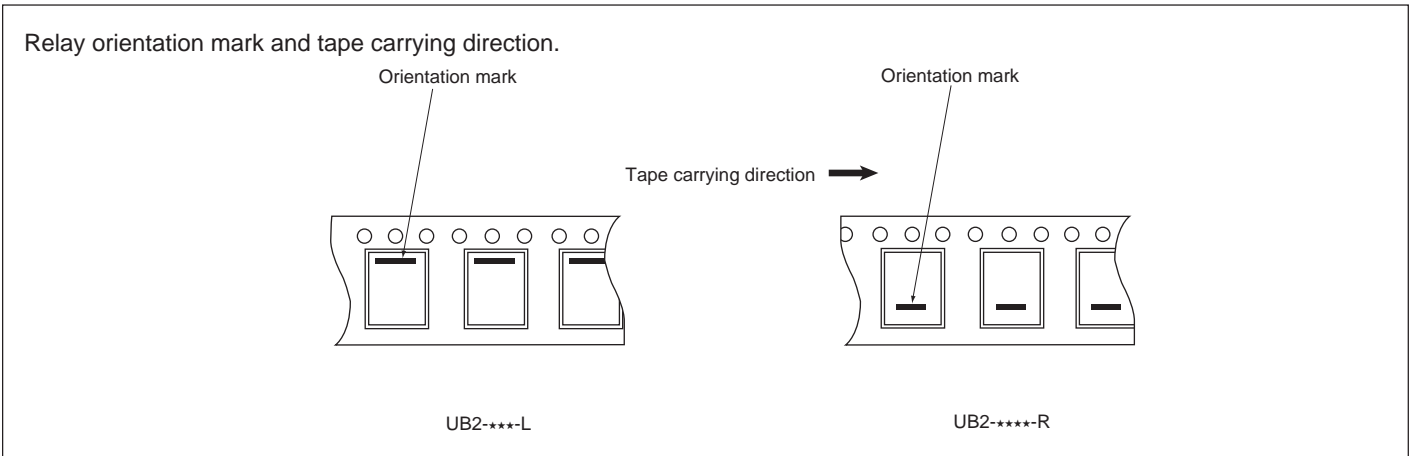
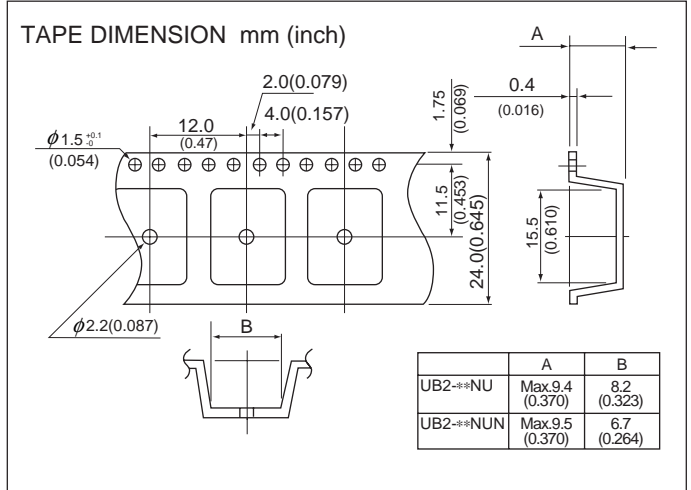
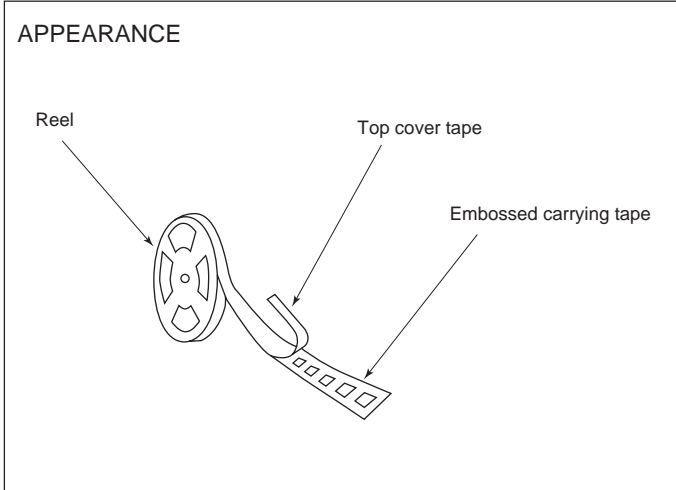
| Part Number (Standard) | Nominal Coil Voltage (Vdc) | Coil Resistance (Ω) ±10% | Must Operate Voltage* (Vdc) | Must Release Voltage* (Vdc) |
|---------------------------|----------------------------------|--------------------------------|-----------------------------------|-----------------------------------|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

Note * Test by pulse voltage

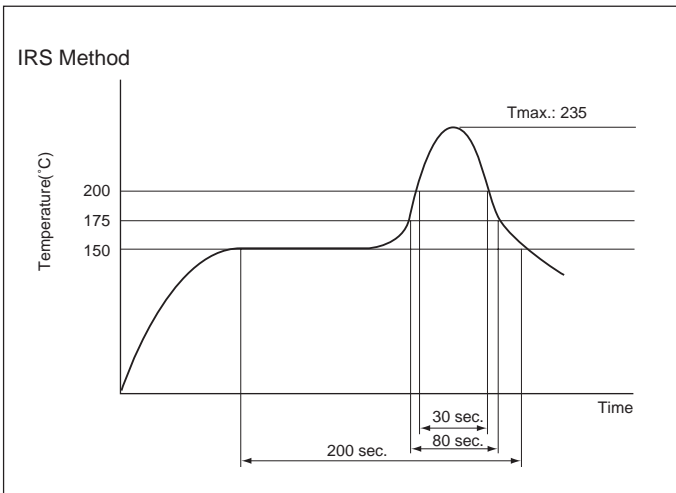
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

UB2 Series

TAPE PACKAGE (OPTION)



SOLDERING CONDITION



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.

UA2/UB2 Series

■ Recommended relay drive conditions

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

| | | |
|--|---|----------------------------------|
| Nonlatch type | Voltage:within $\pm 5\%$ at 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 $\pm 5\%$ at nominal voltage Pulse width: more than 10 ms | |

■ Technical document

Please confirm technical document before use.

It is able to receive a document at NECTOKIN's World-wide-web site.

(<http://www.nec-tokin.com>)

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

UC2 Series

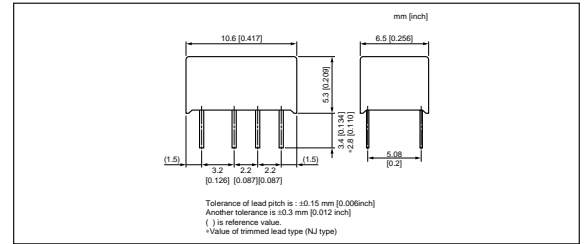


NEC TOKIN's UC2 relay is a new generation Miniature Singnal Relay of super-compact size and flat-package.

FEATURES

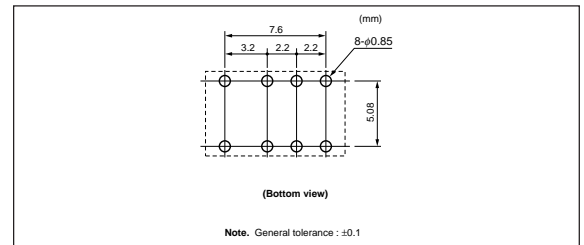
- small mounting size of flat package for dence mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Low power consumption 140mW
- UL recognized (E73266), CSA certified (LR46266)

DIMENSIONS mm(inch)

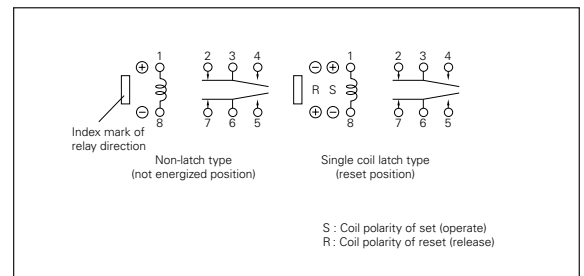


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



SCHEMATICS (bottom view)



SPECIFICATIONS

| | | |
|---------------------------------|--|--|
| Contact Form | 2 Form c | |
| Contact Material | Silver alloy with gold alloy overlay | |
| Contact Ratings | Maximum Switching Power | 30 W, 37.5 VA |
| | Maximum Switching Voltage | 220 Vdc, 250 Vac |
| | Maximum Switching Current | 1 A |
| | Maximum Carrying Current | 1 A |
| Minimum Contact Ratings | 10 mVdc, 10 μA*1 | |
| Initial Contact Resistance | 100 mΩ max.(Initial) | |
| Nominal Operating Power | Nonlatch type | 140 mW (1.5 to 12 V), 230 mW (24 V) |
| | Single coil latch type | 100 mW (1.5 to 12 V), 120 mW (24 V) |
| Operate Time (Excluding bounce) | Approx. 2 ms | |
| Release Time (Excluding bounce) | Approx. 1 ms | |
| Insulation Resistance | 1000 MΩ at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) |
| | Between adjacent contacts | 1500 V surge (10 × 160 μs*2) |
| | Between coil to contacts | 1500 Vac (for one minute) 2500 V surge (2 × 10 μs*3) |
| 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 | Nonload | 5 × 10 ⁷ *4 operations(Non-latch type) |
| | Load | 30 Vdc, 1 A (resistive), 1 × 10 ⁵ operations at 20°C |
| | | 125 Vac, 0.3 A (resistive), 1 × 10 ⁵ operations at 20°C |
| Weight | Approx. 0.8 g | |

* 1 This value is a reference value in the resistance load.

Minimum capacity changes depending on switching frequency and environment temperature and the load.

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

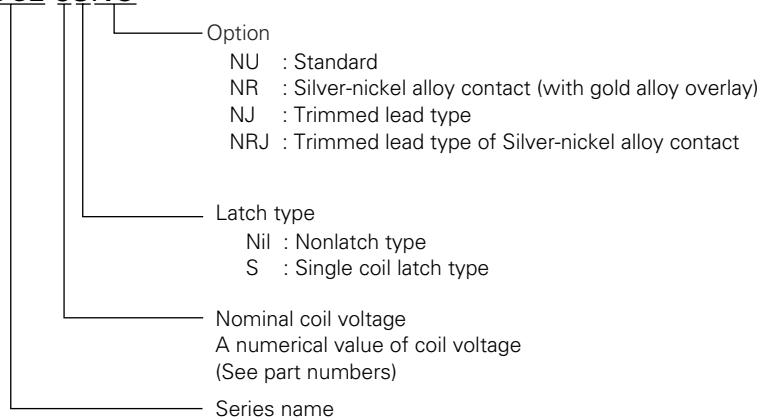
* 3 rise time : 2 μs, decay time to half crest : 10 μs

* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

UC2 Series

■ PART NUMBER SYSTEM

UC2-3SNU



■ SAFETY STANDARD AND RATING

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

* Spacing : UL840
+ Spacing : CSA std950

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

■ PART NUMBERS

• Nonlatch Type

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

• Single Coil Latch Type

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

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

UD2 Series

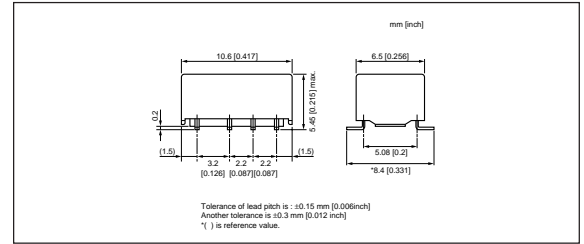


NEC TOKIN's UD2 relay is a new generation Miniature Singnal Relay of super-compact size and flat-package for surface mounting. But , the latching type production is going to start after June 2000.

FEATURES

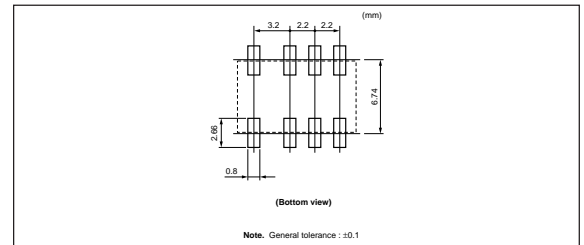
- Small mounting size of flat package for dence mounting.
- Bellcore (2500 V) and FCC (1500 V) surge capability.
- IEC950 / UL1950 / EN60950 spacing and high breakdown voltage. (Basic insulation class on 200 V working voltage)
- Low power consumption 140 mW
- UL recognized (E73266), CSA certified (LR46266)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

DIMENSIONS mm(inch)

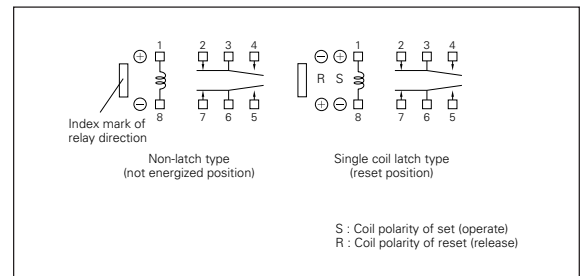


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



SCHEMATICS (bottom view)



SPECIFICATIONS

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

* 1 This value is a reference value in the resistance load.

Minimum capacity changes depending on switching frequency and environment temperature and the load.

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

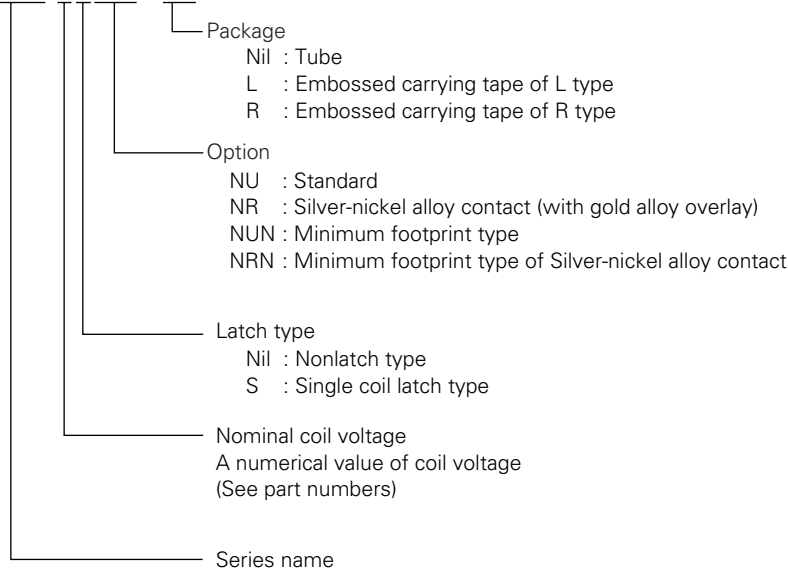
* 3 rise time : 2 μs, decay time to half crest : 10 μs

* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

UD2 Series

■ PART NUMBER SYSTEM

UD2-3SNU - L1



■ SAFETY STANDARD AND RATING

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

* Spacing : UL508

+ Spacing : CSA std950

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

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

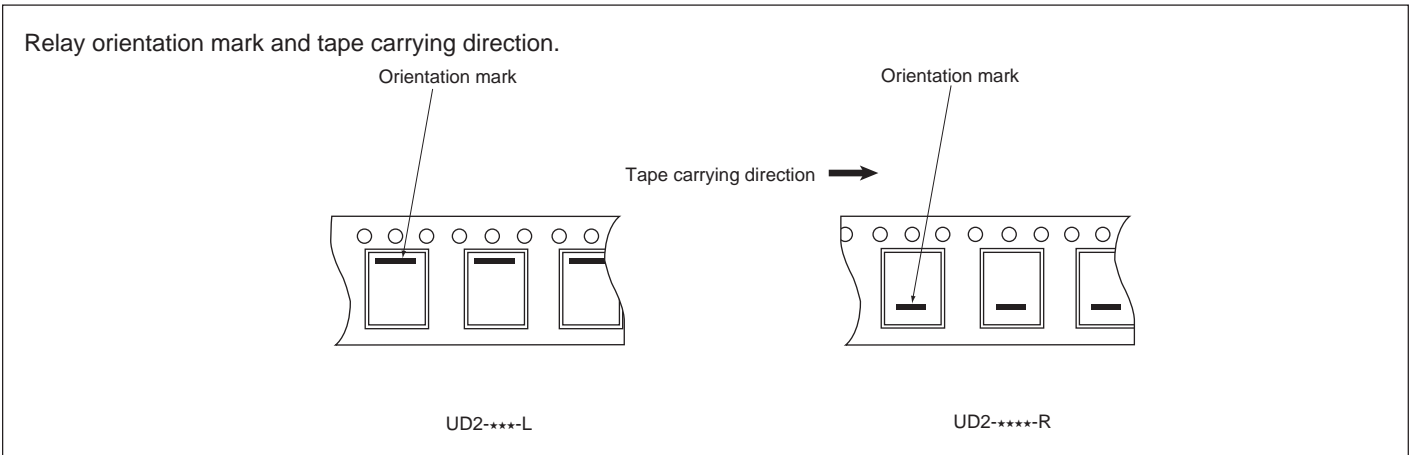
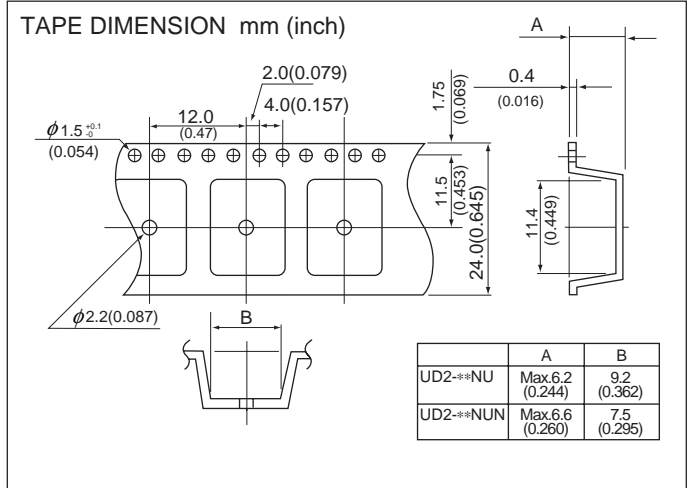
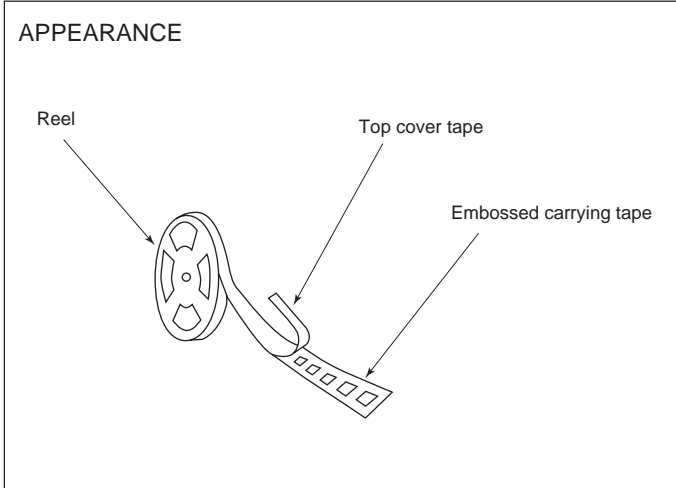
| Part Number (Standard) | Nominal Coil Voltage (Vdc) | Coil Resistance (Ω) ±10% | Must Operate Voltage* (Vdc) | Must Release Voltage* (Vdc) |
|---------------------------|----------------------------------|--------------------------------|-----------------------------------|-----------------------------------|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

Note * Test by pulse voltage

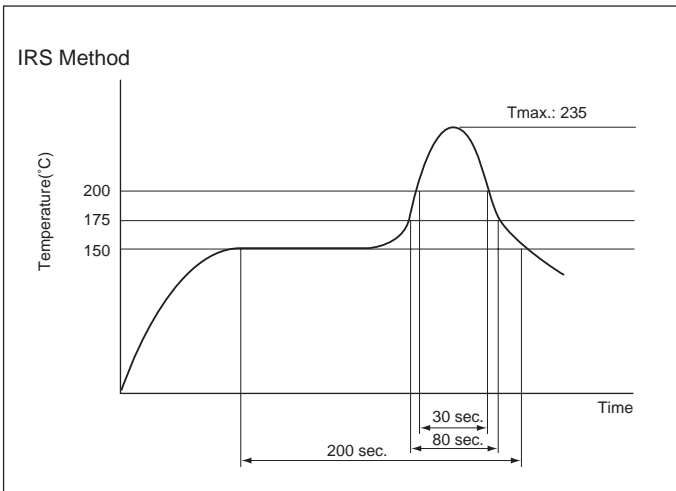
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.
 Any special coil requirement, Please contact NEC TOKIN for availability.

UD2 Series

TAPE PACKAGE (OPTION)



SOLDERING CONDITION



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.

UC2/UD2 Series

■ Recommended relay drive conditions

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

| | | |
|--|---|----------------------------------|
| Nonlatch type | Voltage: within $\pm 5\%$ at 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 $\pm 5\%$ at nominal voltage Pulse width: more than 10 ms | |

■ Technical document

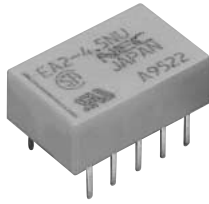
Please confirm technical document before use.

It is able to receive a document at NEC TOKIN's World-wide-web site.

(<http://www.nec-tokin.com>)

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

EA2 Series



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

FEATURES

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

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 μ A*1 | |
| Initial Contact Resistance | 50 m Ω typ.(Initial) | |
| Nominal Operating Power | Nonlatch type | 140 mW (3 to 12 V), 200 mW (24 V) |
| | Single coil latch type | 100 mW (3 to 12 V), 150 mW (24 V) |
| | Double coil latch type | 140 mW (3 to 12 V), 200 mW (24 V) |
| Operate Time (Excluding bounce) | Approx. 2 ms | |
| Release Time (Excluding bounce) | Approx. 1 ms without diode | |
| Insulation Resistance | 1000 M Ω at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) |
| | Between adjacent contacts | 1500 V surge (10 \times 160 μ s*2) |
| | Between coil to contacts | 1000 Vac (for one minute) 1500 V surge (10 \times 160 μ s*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 | Nonload | 1 \times 10 ⁸ *3 operations(Non-latch type) 1 \times 10 ⁷ operations(latch type) |
| | Load | 50 Vdc, 0.1 A (resistive) 1 \times 10 ⁶ operations at 85°C, 5 Hz |
| | | 10 Vdc, 10 mA (resistive) 1 \times 10 ⁶ operations at 85°C, 2 Hz |
| Weight | Approx. 1.5 g | |

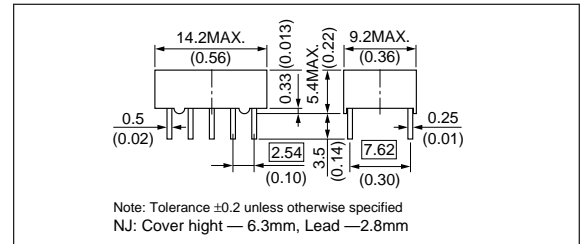
* 1 This value is a reference value in the resistance load.

Minimum capacity changes depending on switching frequency and environment temperature and the load.

* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

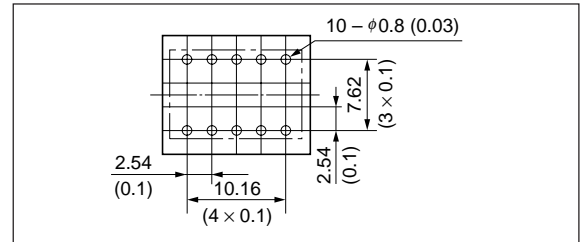
* 3 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1 \times 10⁷ times.

DIMENSIONS mm(inch)

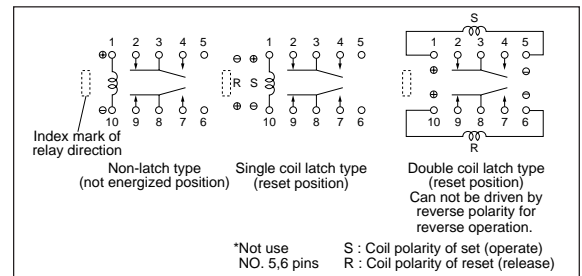


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



SCHEMATICS (bottom view)



EA2 Series

■ PART NUMBER SYSTEM

EA2-3SNU

- NU : UL recognized CSA certified type
- NJ : Trimmed leads type (UL recognized CSA certified type)
- NP : Silver-palladium alloy contact (with gold alloy overlay)
(UL recognized CSA certified type)
- Latch type
 - Nil : Nonlatch type (standard)
 - S : Single coil latch type
 - T : Double coil latch type
- Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

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

* Spacing : UL114, UL478

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

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

at 20 °C

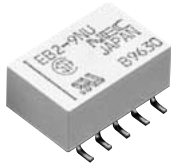
| Part Number (Standard) | Nominal Coil Voltage (Vdc) | Coil Resistance (Ω) ±10% | Must Operate Voltage* (Vdc) | Must Release Voltage* (Vdc) |
|---------------------------|----------------------------------|--------------------------------|-----------------------------------|-----------------------------------|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

Note * Test by pulse voltage

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

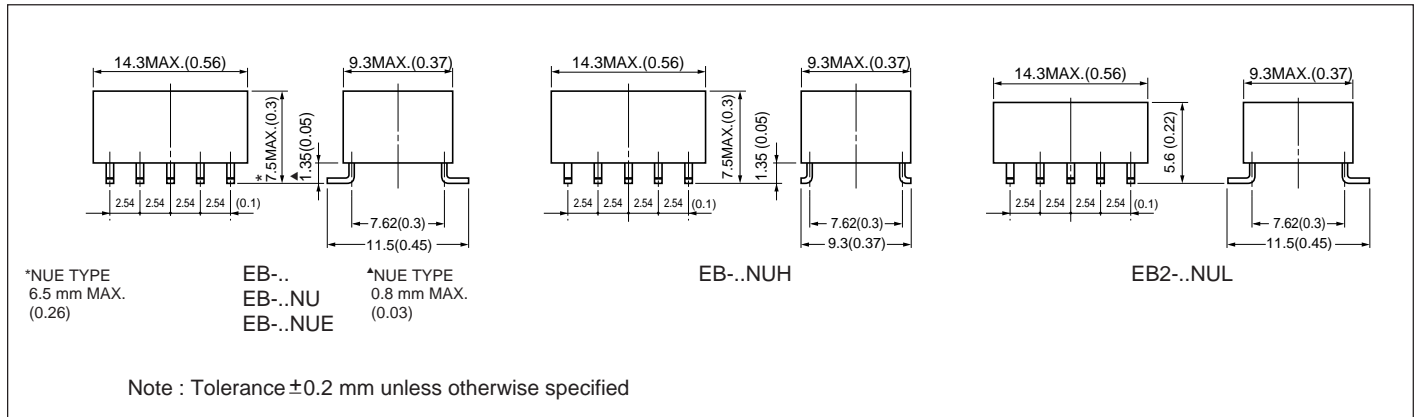
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

EB2 Series



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

■ DIMENSIONS mm(inch)

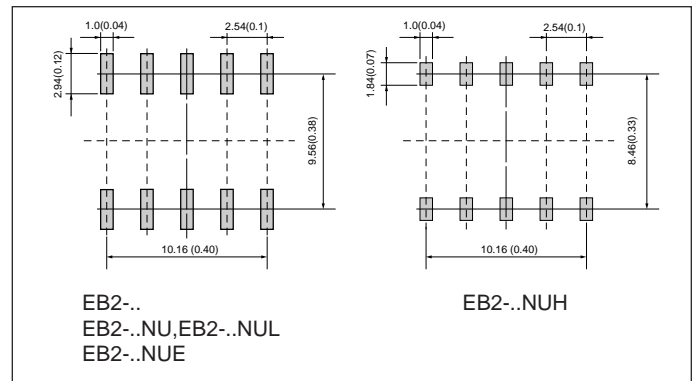


■ FEATURES

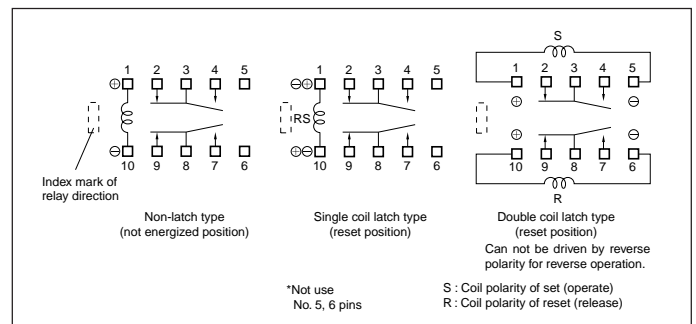
- Compact and light weight
- 2 form c contact arrangement
- Low power consumption
- Low magnetic interference
- Breakdown voltage : 1000 Vac (surge voltage 1500 V), FCC Part 68 compliant
- Tube or Embossed tape packaging
- UL recognized (E73266), CSA certified (LR46266)

■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ SCHEMATICS (bottom view)



EB2 Series

■ 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 μ A* ¹ |
| Initial Contact Resistance | | 50 m Ω typ.(Initial) |
| Nominal Operating Power | Nonlatch type | 140 mW (3 to 12 V), 200 mW (24 V) |
| | Single coil latch type | 100 mW (3 to 12 V), 150 mW (24 V) |
| | Double coil latch type | 140 mW (3 to 12 V), 200 mW (24 V) |
| Operate Time (Excluding bounce) | | Approx. 2 ms |
| Release Time (Excluding bounce) | | Approx. 1 ms without diode |
| Insulation Resistance | | 1000 M Ω at 500 Vdc |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) |
| | Between adjacent contacts | 1500 V surge (10 \times 160 μ s* ²) |
| | Between coil to contacts | 1000 Vac (for one minute) 1500 V surge (10 \times 160 μ s* 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 | Nonload | 1 \times 10 ⁸ * ³ operations(Non-latch type) 1 \times 10 ⁷ operations(latch type) |
| | Load | 50 Vdc, 0.1 A (resistive) 1 \times 10 ⁶ operations at 85°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 \times 10 ⁶ operations at 85°C, 2 Hz |
| Weight | | Approx. 1.5 g |

* 1 This value is a reference value in the resistance load.

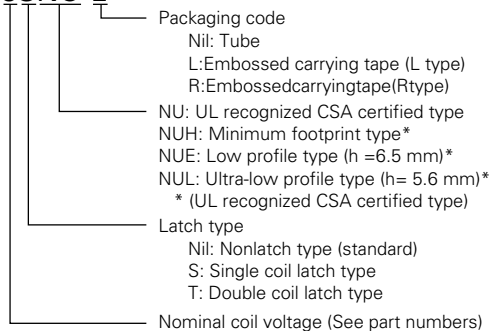
Minimum capacity changes depending on switching frequency and environment temperature and the load.

* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

* 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 \times 10⁷ times.

■ PART NUMBER SYSTEM

EB2-3SNU-L



■ 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

EB2 Series

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

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

at 20 °C

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

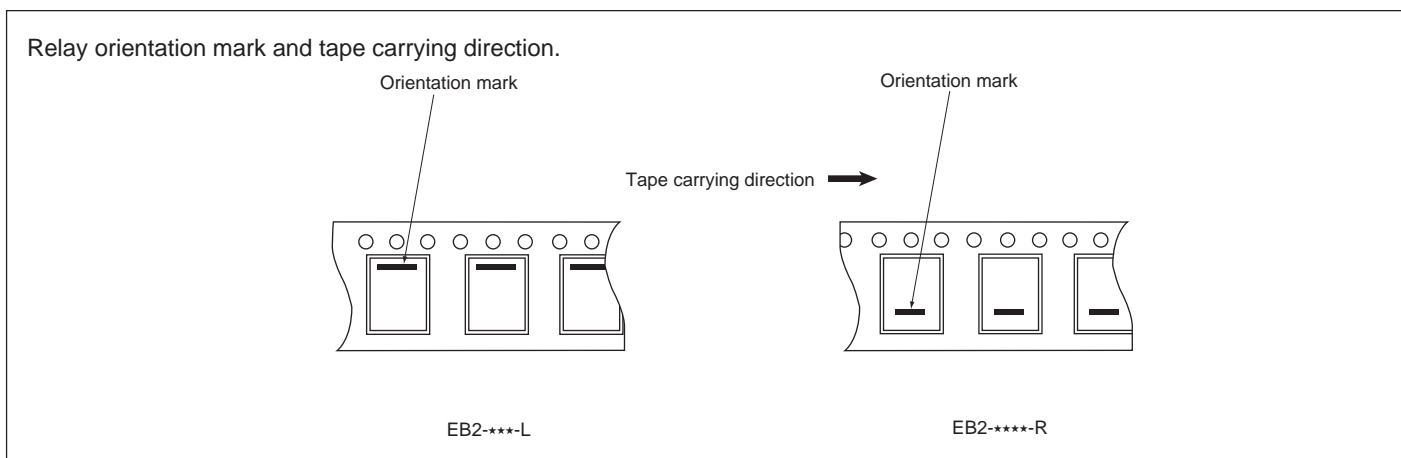
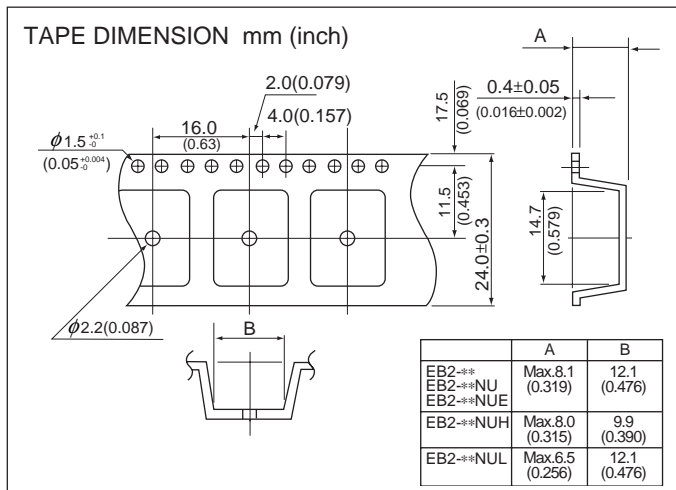
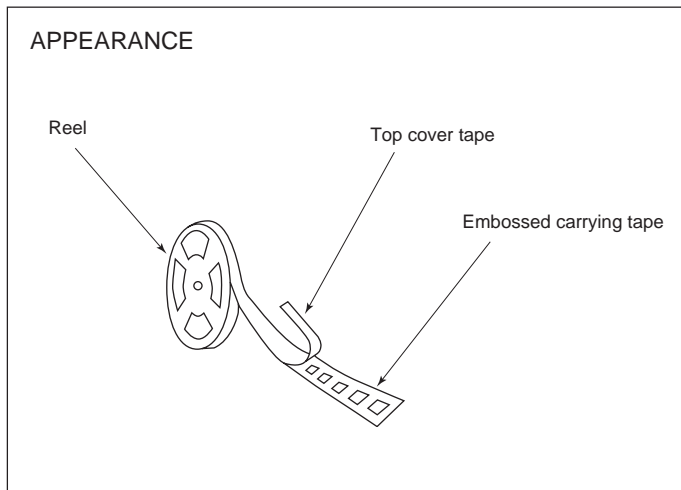
Note * Test by pulse voltage

** S : Set coil (pin No.1... \oplus , pin No.5... \ominus) R : Reset coil (pin No.10... \oplus , pin No.6... \ominus)

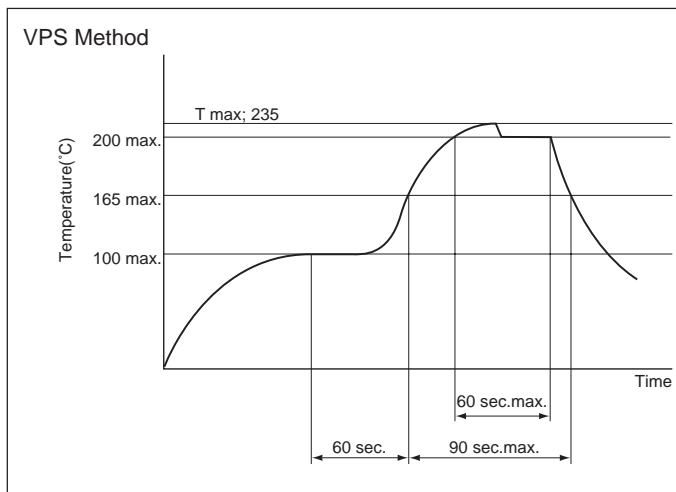
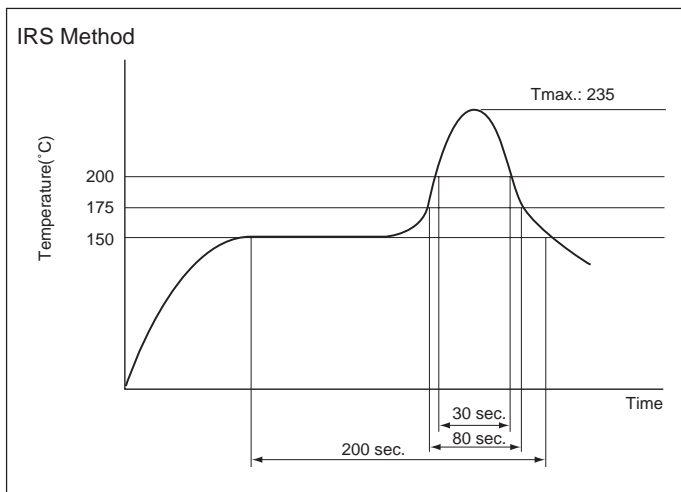
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

EB2 Series

TAPE PACKAGE (OPTION)



SOLDERING CONDITION



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.

EA2/EB2 Series

■ Recommended relay drive conditions

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

| | | |
|--|---|----------------------------------|
| Nonlatch type | Voltage: within $\pm 5\%$ at 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 $\pm 5\%$ at nominal voltage Pulse width: more than 10 ms | |

■ Technical document

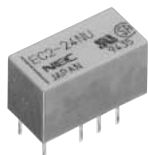
Please confirm technical document before use.

It is able to receive a document at NECTOKIN's World-wide-web site.

(<http://www.nec-tokin.com>)

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

EC2 Series



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

FEATURES

- Compact and light weight
- 2 form c contact arrangement
- Low power consumption
- Reduced mounting space: 15 mm X 7.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V, (2 × 10 μS*³)
- Capable of High-power switching: 700 Vac, 4.2A, 4 times in case of accident
- UL recognized (E73266), CSA certified (LR46266)
- ND type (High-insulation type) conform to 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 | 2A | |
| | Maximum Carrying Current | 2A | |
| Minimum Contact Ratings | | 10 mVdc, 10 μA* ¹ | |
| Initial Contact Resistance | | 50 mΩ typ.(Initial) | |
| Nominal Operating Power | Nonlatch type | 140 mW (3 to 12 V), 200 mW (24 V) | ND type 200 to 230 mW |
| | Single coil latch type | 100 mW | ND type 100 to 170 mW |
| | Double coil latch type | 140 mW | |
| Operate Time (Excluding bounce) | | Approx. 2 ms | |
| Release Time (Excluding bounce) | | Approx. 1 ms without diode | |
| Insulation Resistance | | 1000 MΩ at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) | |
| | Between adjacent contacts | 1500 V surge (10 × 160 μS* ²) | |
| | Between coil to contacts | 1500 Vac (for one minute) 2500 V surge (2 × 10 μS* ³) | Double Coil Latch type 1000 Vac (for one minute) 1500 V surge (10 × 160 μS* ³) |
| 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 | Nonload | 1 × 10 ⁸⁻¹⁴ 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.

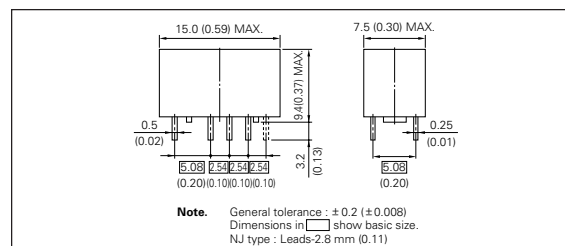
Minimum capacity changes depending on switching frequency and environment temperature and the load.

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

* 3 rise time : 2 μs, decay time to half crest : 10 μs

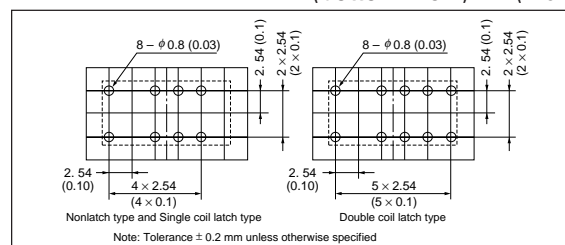
* 4 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1×10⁷ times.

DIMENSIONS mm(inch)

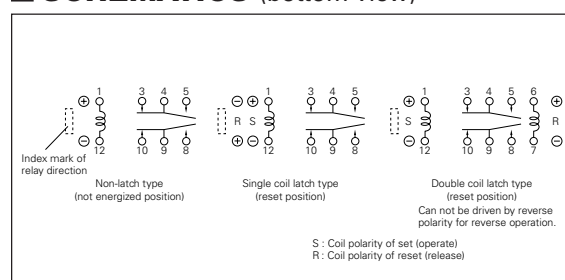


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



SCHEMATICS (bottom view)



EC2 Series

■ PART NUMBER SYSTEM

EC2-3SNU

- NU : UL recognized CSA certified type
- NJ : Trimmed leads type (UL recognized CSA certified type)
- NP : Silver-palladium alloy contact (with gold alloy overlay)
(UL recognized CSA certified type)
- ND : High insulation type (TUV certified)
- Latch type
 - Nil : Nonlatch type (standard)
 - S : Single coil latch type
 - T : Double coil latch type
- Nominal coil voltage (See part numbers)

■ SAFETY STANDARD AND RATING

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

* Spacing : UL114, UL478

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

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

Note * Test by pulse voltage

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

The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NECTOKIN for availability.

EC2 Series

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

at 20 °C

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

• Nonlatch ND Type

at 20 °C

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

• Single Coil Latch ND Type

at 20 °C

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

Note * Test by pulse voltage

** S : Set coil (pin No.1... \oplus , pin No.12... \ominus) R : Reset coil (pin No.6... \oplus , pin No.7... \ominus)

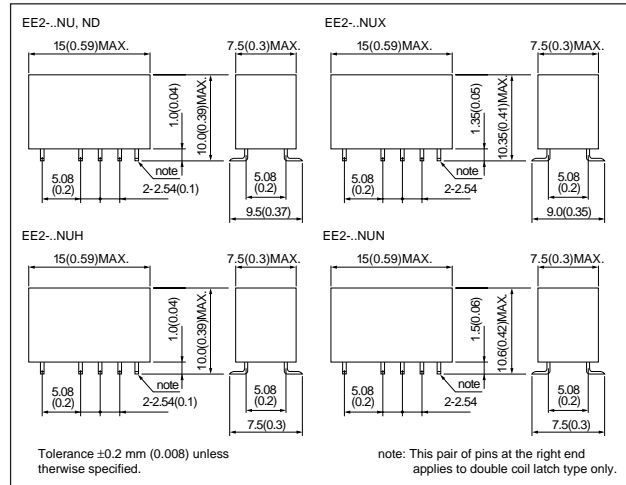
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation. Any special coil requirement, Please contact NEC TOKIN for availability.

EE2 Series

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

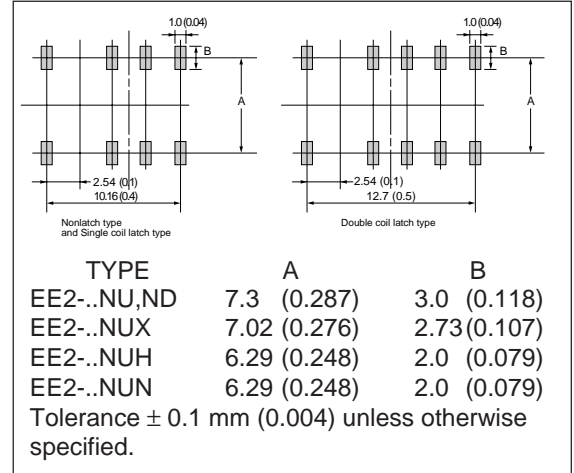


■ DIMENSIONS mm(inch)



■ RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



■ FEATURES

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

■ SPECIFICATIONS

| | | | |
|--------------------------------------|---|--|------------------------|
| Contact Form | 2 Form c | | |
| Contact Material | Silver alloy with gold alloy overlay | | |
| Contact Ratings (UL / CSA Rating) | Maximum Switching Power | 60 W, 125 VA | |
| | Maximum Switching Voltage | 220 Vdc, 250 Vac | |
| | Maximum Switching Current | 2 A | |
| | Maximum Carrying Current | 2 A | |
| Minimum Contact Ratings | 10 mVdc, 10 μ A*1 | | |
| Initial Contact Resistance | 50 m Ω typ.(Initial) | | |
| Nominal Operating Power | Nonlatch type | 140 mW (3 to 12 V), 200mW (24 V) | ND type 200 to 230 mW |
| | Single coil latch type | 100 mW | ND type 100 to 170 mW |
| | Double coil latch type | 140 mW | |
| Operate Time (Excluding bounce) | Approx. 2 ms | | |
| Release Time (Excluding bounce) | Approx. 1 ms without diode | | |
| Insulation Resistance | 1000 M Ω at 500 Vdc | | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) | |
| | Between adjacent contacts | 1500 V surge (10 x 160 μ s*2) | |
| | Between coil to contacts | 1500 Vac (for one minute) 2500 V surge (2 x 10 μ s*3) | Double Coil Latch type |
| 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 | Nonload | 1 x 10 ⁸ *4 operations(Non-latch type) 1 x 10 ⁷ operations(latch type) | |
| | Load | 50 Vdc, 0.1 A (resistive) 1 x 10 ⁶ operations at 85°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 x 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.

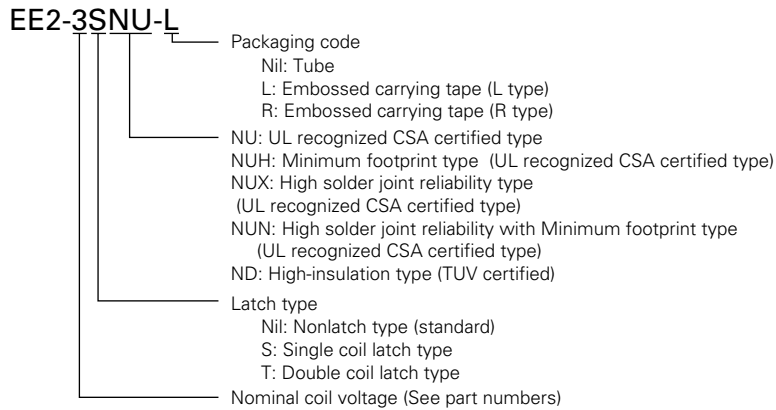
* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

* 3 rise time : 2 μ s, decay time to half crest : 10 μ s

* 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 1x10⁷ times.

EE2 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, 2 A (Resistive) | |
| 110 Vdc, 0.3 A (Resistive) | |
| 125 Vac, 0.5 A (Resistive) | |

* Spacing : UL114, UL478

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

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

Note * Test by pulse voltage

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

The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation. Any special coil requirement, Please contact NECTOKIN for availability.

EE2 Series

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

at 20 °C

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

• Nonlatch ND Type

at 20 °C

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

• Single Coil Latch ND Type

at 20 °C

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

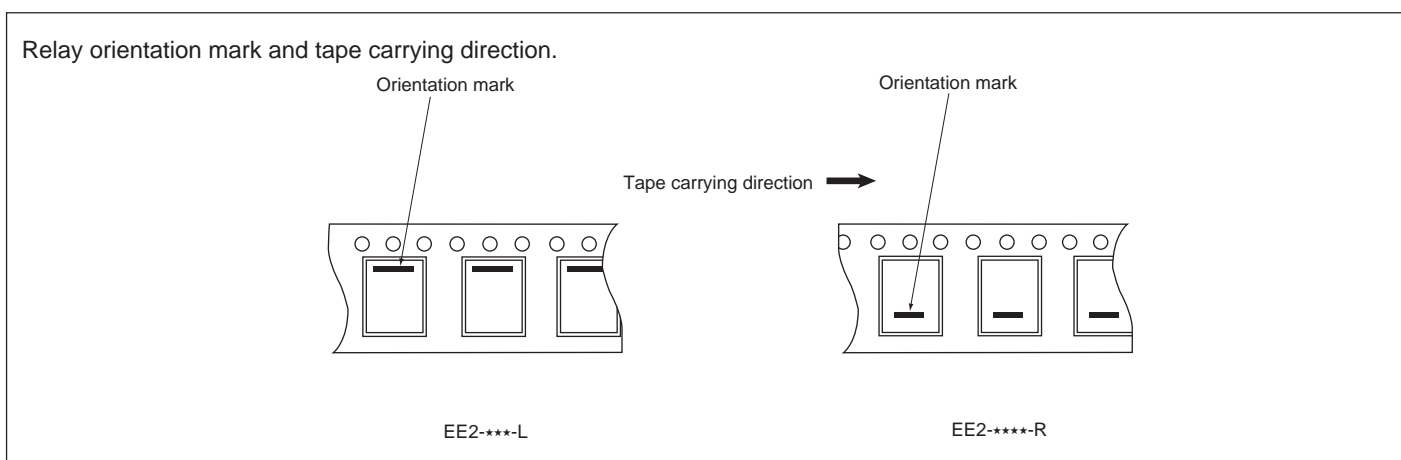
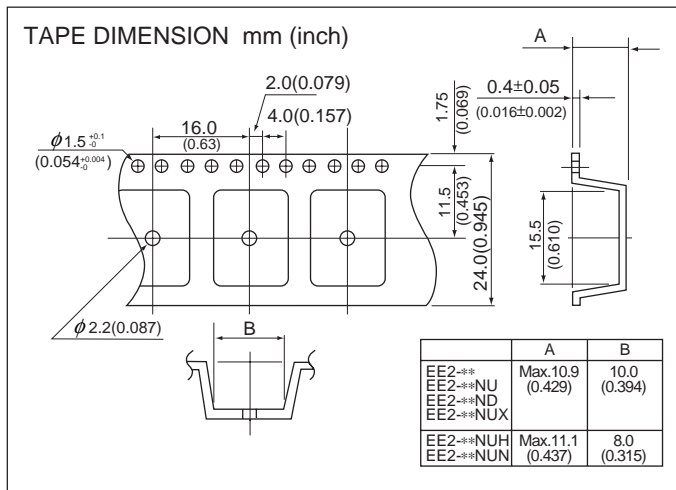
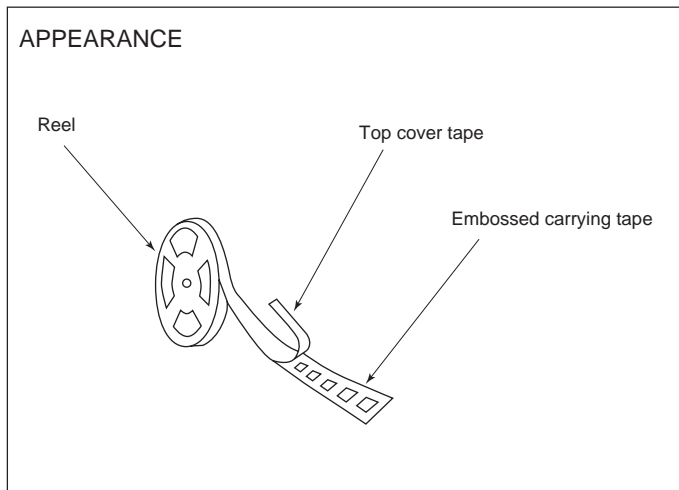
Note * Test by pulse voltage

** S : Set coil (pin No.1... \oplus , pin No.12... \ominus) R : Reset coil (pin No.6... \oplus , pin No.7... \ominus)

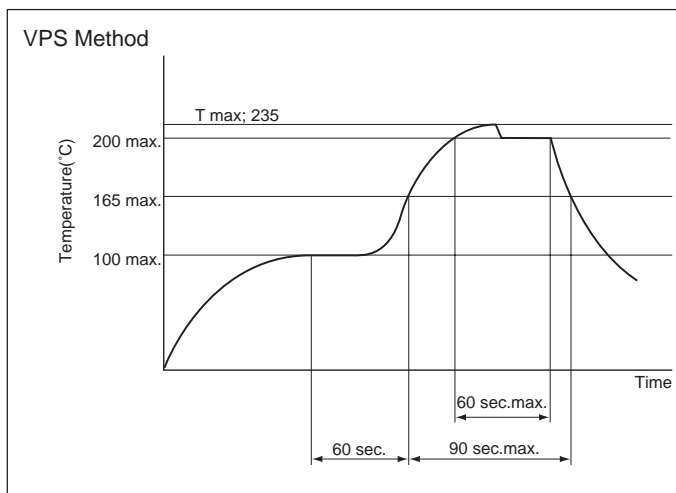
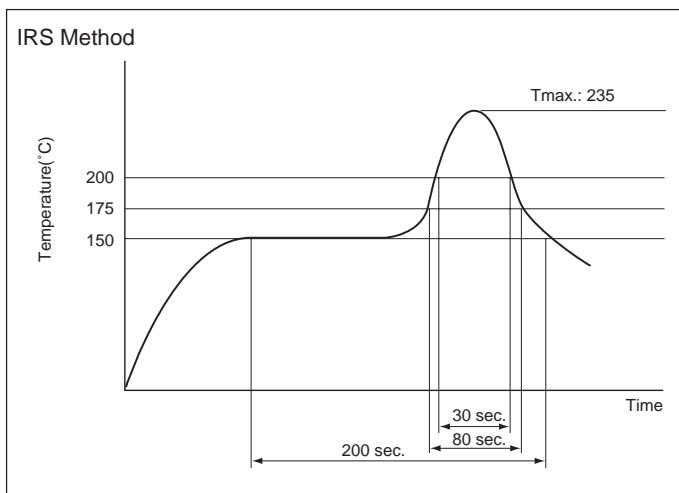
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.
Any special coil requirement, Please contact NEC TOKIN for availability.

EE2 Series

TAPE PACKAGE (OPTION)



SOLDERING CONDITION



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.

EC2/EE2 Series

■ Recommended relay drive conditions

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

| | | |
|--|---|----------------------------------|
| Nonlatch type | Voltage: within $\pm 5\%$ at 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 $\pm 5\%$ at nominal voltage Pulse width: more than 10 ms | |

■ Technical document

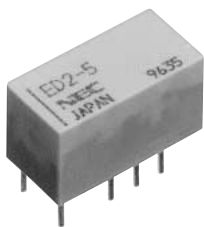
Please confirm technical document before use.

It is able to receive a document at NECTOKIN's World-wide-web site.

(<http://www.nec-tokin.com>)

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

ED2 Series



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

FEATURES

- Low power consumption (30 to 70 mW)
- Compact and light weight
- 2 form c contact arrangement
- Reduced mounting space: 15 mm X 7.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V (2 X 10 μ S*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 μ A* ¹ | |
| Initial Contact Resistance | 50 m Ω typ.(Initial) | |
| Nominal Operating Power | Nonlatch type | 50 mW (1.5 to 9 V), 55 mW (9 V), 60 mW (12 V), 70 mW (24 V) |
| | Single coil latch type | 30 mW |
| | Double coil latch type | 50 mW |
| Operate Time (Excluding bounce) | Approx. 3 ms | |
| Release Time (Excluding bounce) | Approx. 2 ms without diode | |
| Insulation Resistance | 1000 M Ω at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) |
| | Between adjacent contacts | 1500 V surge (10 x 160 μ S* ²) |
| | Between coil to contacts | 1500 Vac (for one minute) Double Coil 1000 Vac (for one minute) 2500 V surge (2 x 10 μ S* ³) Latch type 1500 V surge (10 x 160 μ S* 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 +70°C* ⁴ | |
| Coil Temperature Rise | 7 degrees at nominal coil voltage (50 mW) | |
| Running Specifications | Nonload | 1 x 10 ⁸ * ⁵ operations(Non-latch type) 1 x 10 ⁷ operations(latch type) |
| | Load | 50 Vdc, 0.1 A (resistive) 1 x 10 ⁸ operations at 70°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 x 10 ⁶ operations at 70°C, 2 Hz |
| Weight | Approx. 2.2 g | |

* 1 This value is a reference value in the resistance load.

Minimum capacity changes depending on switching frequency and environment temperature and the load.

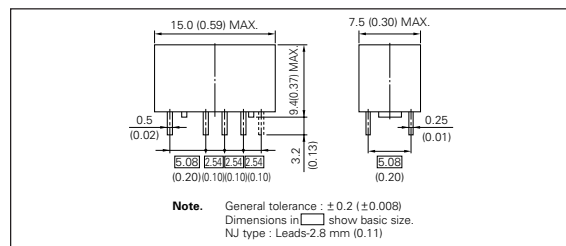
* 2 rise time : 10 μ S, decay time to half crest : 160 μ S

* 3 rise time : 2 μ S, decay time to half crest : 10 μ S

* 4 Up to 85°C (75% operation of rated voltage at Nonlatch type only), it is possible to respond to a customer's requirement individually.

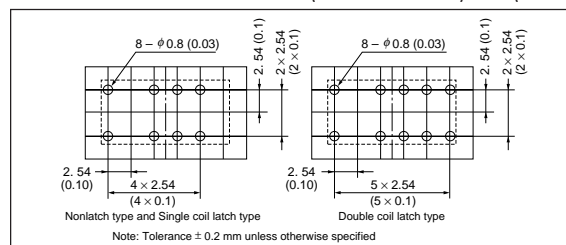
* 5 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1x10⁷ times.

DIMENSIONS mm(inch)

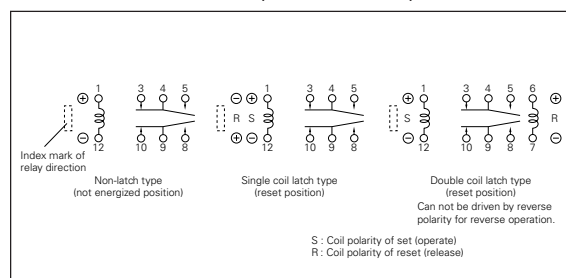


RECOMMENDED PAD LAYOUT

(bottom view)mm(inch)



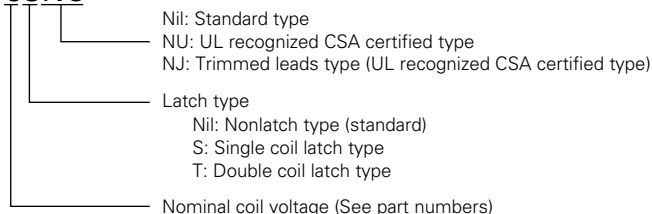
SCHEMATICS (bottom view)



ED2 Series

■ PART NUMBER SYSTEM

ED2-3SNU



■ 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 : UL114, UL478

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

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

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

at 20 °C

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

Note * Test by pulse voltage

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

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

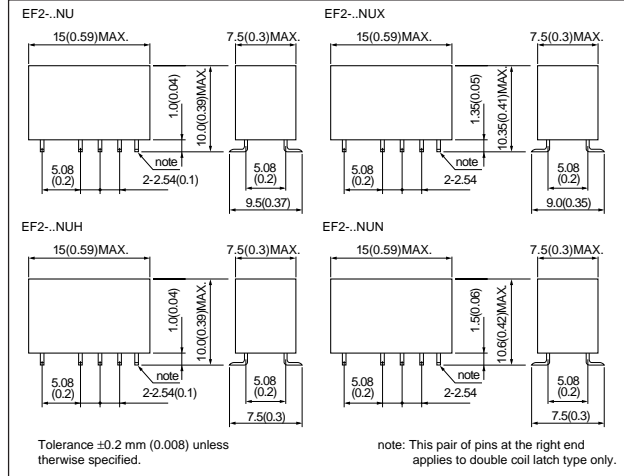
★75%operation of rated voltage (at +70°C to +85°C) is possible individually. Please contact NEC TOKIN for availability.

EF2 Series

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



■ DIMENSIONS mm(inch)



■ FEATURES

- Low power consumption(30 to 70 mW)
- Compact and light weight
- 2 form c contact arrangement
- Reduced mounting space: 15 mm X 9.5 mm
- High-breakdown voltage of coil to contacts: 1500 Vac, 2500 V, (2 X 10 μ s*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 μ A*1 | |
| Initial Contact Resistance | | 50 m Ω typ.(Initial) | |
| Nominal Operating Power | Nonlatch type | 50 mW (1.5 to 9 V), 55 mW (9 V), 60 mW (12 V), 70 mW (24 V) | |
| | Single coil latch type | 30 mW | |
| | Double coil latch type | 50 mW | |
| Operate Time (Excluding bounce) | | Approx. 2 ms | |
| Release Time (Excluding bounce) | | Approx. 1 ms without diode | |
| Insulation Resistance | | 1000 M Ω at 500 Vdc | |
| Withstand Voltage | Between open contacts | 1000 Vac (for one minute) | |
| | Between adjacent contacts | 1500 V surge (10 x 160 μ s*2) | |
| | Between coil to contacts | 1500 Vac (for one minute) 2500 V surge (2 x 10 μ s*3) | Double Coil Latch type 1000 Vac (for one minute) 1500 V surge (10 x 160 μ s*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 +70°C*4 | |
| Coil Temperature Rise | | 7 degrees at nominal coil voltage (50 mW) | |
| Running Specifications | Nonload | 1 x 10 ⁸ *5 operations(Non-latch type) 1 x 10 ⁷ operations(latch type) | |
| | Load | 50 Vdc, 0.1 A (resistive) 1 x 10 ⁵ operations at 70°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 x 10 ⁶ operations at 70°C, 2 Hz | |
| Weight | | Approx. 2.2 g | |

* 1 This value is a reference value in the resistance load.

Minimum capacity changes depending on switching frequency and environment temperature and the load.

* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

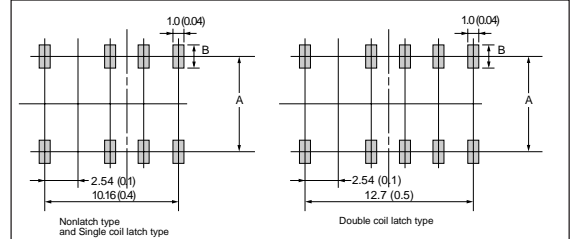
* 3 rise time : 2 μ s, decay time to half crest : 10 μ s

* 4 Up to 85°C (75% operation of rated voltage at Nonlatch type only),it is possible to respond to a customer's requirement individually.

* 5 This shows a number of operation where it can be running by which a fatal defect is not caused, and a number of operation by which a steady characteristic is maintained is 1x10⁷ times.

■ RECOMMENDED PAD LAYOUT

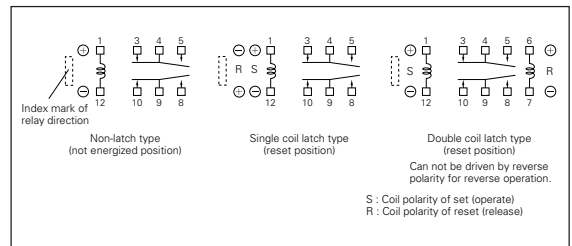
(bottom view)mm(inch)



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

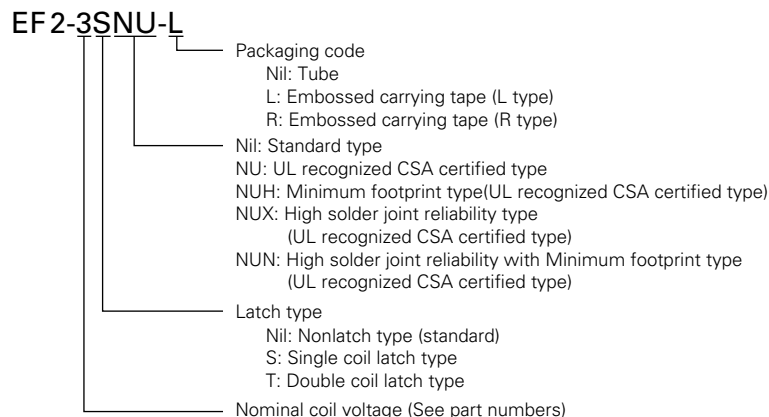
Tolerance ± 0.1 mm (0.004) unless otherwise specified.

■ SCHEMATICS (bottom view)



EF2 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 : UL114, UL478

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

■ PART NUMBERS

• Nonlatch Type

at 20 °C

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

• Single Coil Latch Type

at 20 °C

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

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

at 20 °C

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

Note * Test by pulse voltage

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

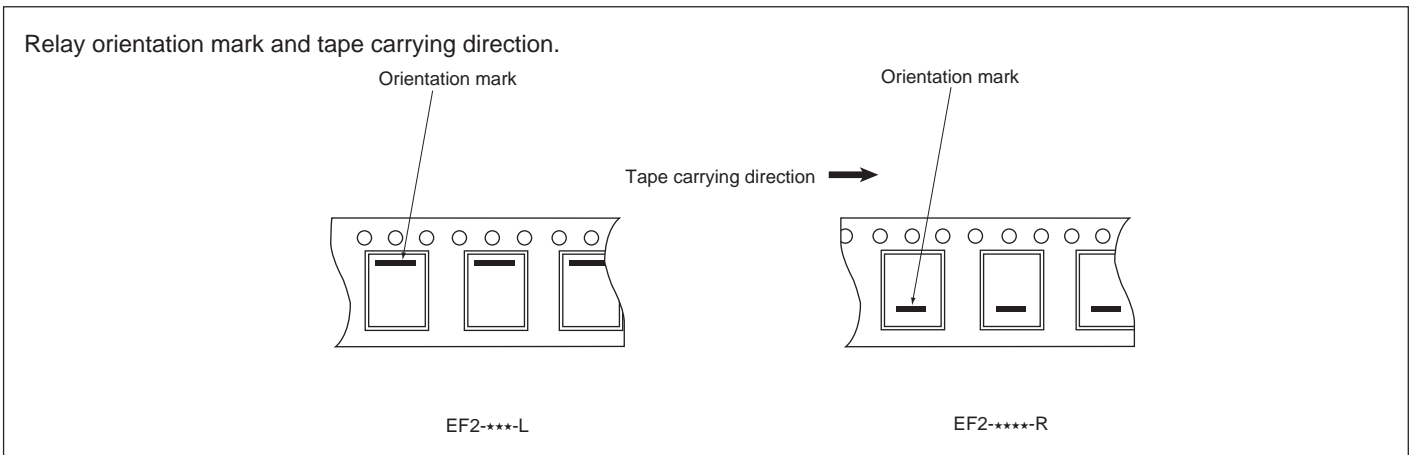
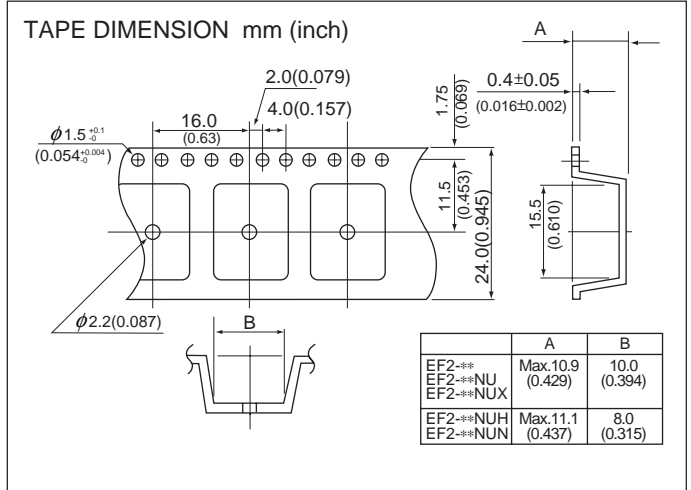
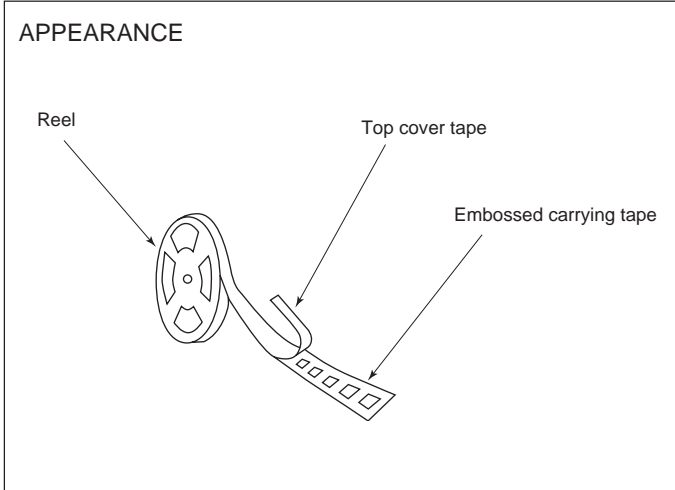
The latch type relays should be initialized at appointed position before using, and should be energized to specific polarity by above polarity to avoid wrong operation.

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

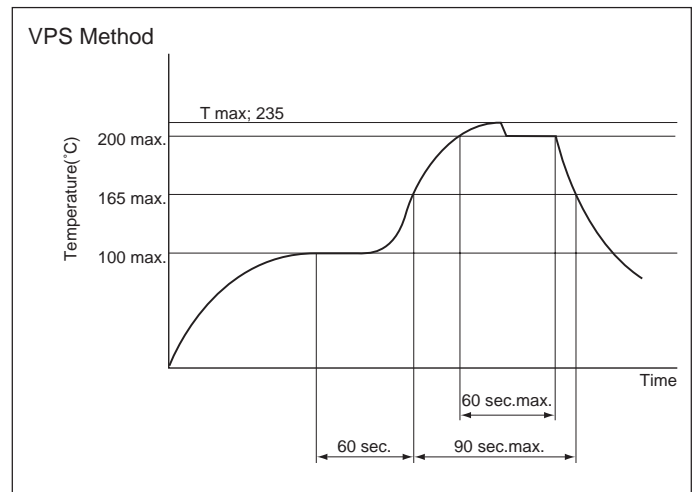
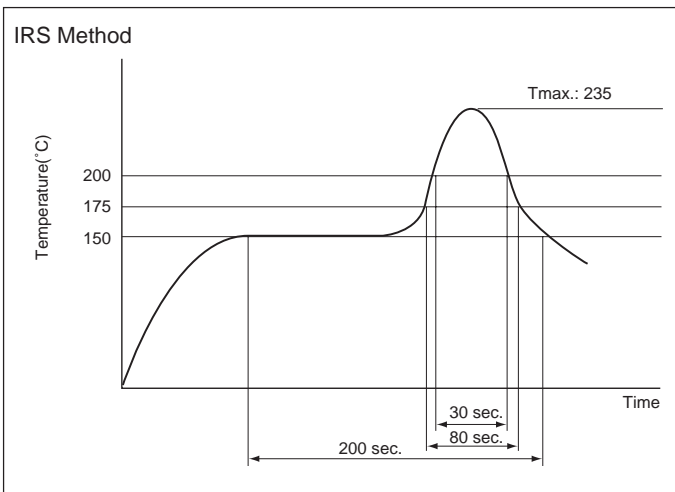
★75%operation of rated voltage (at +70°C to +85°C) is possible individually. Please contact NEC TOKIN for availability.

EF2 Series

TAPE PACKAGE (OPTION)



SOLDERING CONDITION



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.

ED2/EF2 Series

■ Recommended relay drive conditions

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

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

■ Technical document

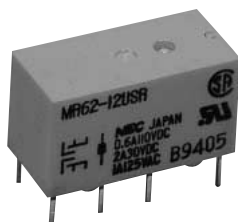
Please confirm technical document before use.

It is able to receive a document at NECTOKIN's World-wide-web site.

(<http://www.nec-tokin.com>)

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

MR62 Series Standard Type



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

FEATURES

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

SPECIFICATIONS

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

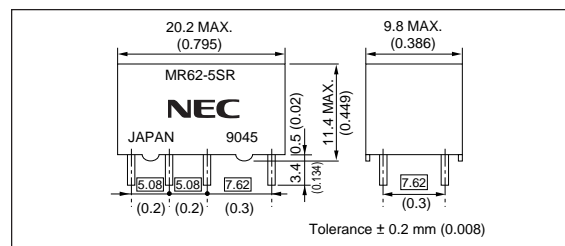
* 1 rise time : 10 μ s, decay time to half crest : 160 μ s

STANDARD PART NUMBERS

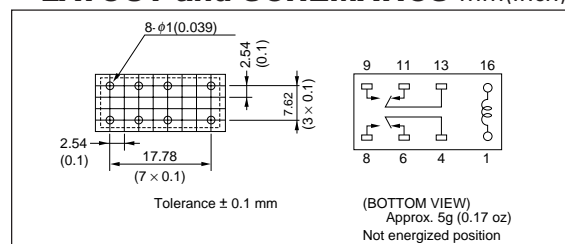
| Part Number | Nominal Voltage (Vdc) | Coil Resistance (Ω) \pm 10% | Must Operate Voltage* (Vdc) | Must Release Voltage* (Vdc) |
|-------------|-----------------------|--|-----------------------------|-----------------------------|
| MR62- 5SR | 5 | 42 | 3.1 | 0.25 |
| MR62- 6SR | 6 | 66 | 3.9 | 0.33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

* Test by pulse voltage

DIMENSIONS mm(inch)



RECOMMENDED PCB PAD LAYOUT and SCHEMATICS mm(inch)

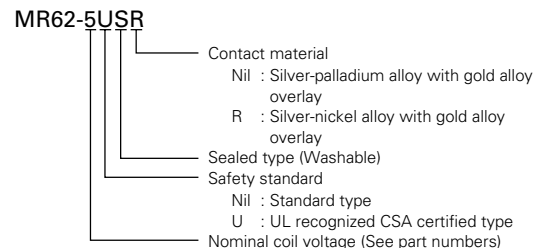


SAFETY STANDARD AND RATING

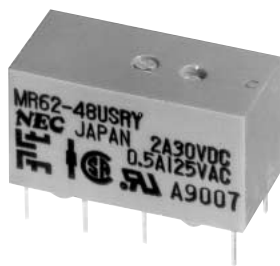
| | |
|--|---|
| UL Recognized (UL508)* File No E73266 | CSA Certified (CSA C22.2 No14) File No LR46266 |
| 30 Vdc, 2 A (Resistive) | 110 Vdc, 0.6 A (Resistive) |
| 125 Vac, 1 A (Resistive) | |

* Spacing : UL114, UL478

PART NUMBER SYSTEM



MR62 Series-K, Y, KY Type



FEATURES

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

SPECIFICATIONS

| Types | | MR62-**K** | MR62-***Y | MR62-**K*Y |
|---|---------------------------|--|-----------------------|--|
| Contact Form | | 2 Form c | | |
| Contact Material | | Silver alloy with gold alloy overlay | | |
| Contact Ratings | Maximum Switching Power | 60 W, 125 VA | | |
| | Maximum Switching Voltage | 220 Vdc, 250 Vac | | |
| | Maximum Switching Current | 2 A | | |
| | Maximum Carrying Current | 2 A | | |
| Minimum Contact Ratings | | 100 mVdc, 100 μ A | | |
| Initial Contact Resistance | | 50 m Ω typ.(Initial) | | |
| Nominal Operating Power | | Approx. 550 mW | Approx. 400 mW | |
| Operate Time (Excluding bounce) | | Approx. 3.5 ms | Approx. 2.5 ms | |
| Release Time (Excluding bounce without diode) | | Approx. 2 ms | | |
| Insulation Resistance | | 100 M Ω at 500 Vdc | | |
| Withstand Voltage | Between open contacts | 1000 Vac* ¹ 1500 V surge* ² | 500 Vac* ¹ | 1000 Vac* ¹ 1500 V surge* ² |
| | Between adjacent contacts | 1000 Vac* ¹ 1500 V surge* ² | | |
| | Between coil to contacts | 1000 Vac* ¹ 1500 V surge* ² | | |
| Shock Resistance | | 294 m/s ² (misoperating) 980 m/s ² (destructive failure) | | |
| Vibration Resistance | | 10 to 55 Hz, double amplitude 1.5 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure) | | |
| Ambient Temperature | | -40 ~ + 85°C | | |
| Coil Temperature Rise | | 40°C (550 mW) | 35°C (400 mW) | |
| Running Specifications | Nonload | 10 \times 10 ⁶ operations | | |
| | Load | 50 Vdc, 0.1 A (resistive) 1 \times 10 ⁶ operations at 85°C, 5 Hz 10 Vdc, 10 mA (resistive) 1 \times 10 ⁶ operations at 85°C, 2 Hz | | |
| Weight | | Approx. 5 g | | |

* 1 for one minute

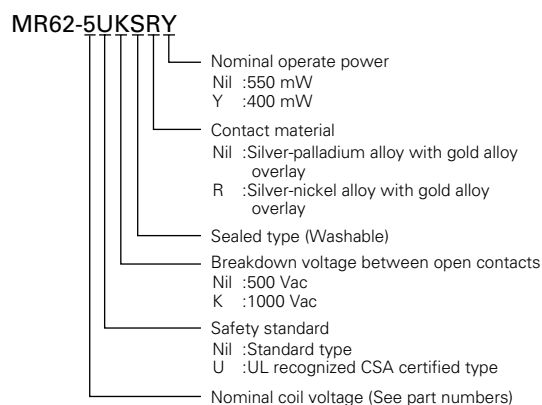
* 2 rise time : 10 μ s, decay time to half crest : 160 μ s

STANDARD PART NUMBERS

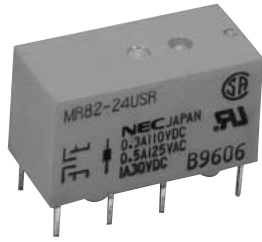
| Part Number | Nominal Voltage (Vdc) | Coil Resistance (Ω) \pm 10% | Must Operate Voltage* (Vdc) | Must Release Voltage* (Vdc) |
|-------------|-----------------------|--|-----------------------------|-----------------------------|
| MR62- 5SRy | 5 | 62.5 | 3.5 | 0.25 |
| MR62- 6SRy | 6 | 90 | 4.2 |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

* Test by pulse voltage

PART NUMBER SYSTEM



MR82 Series



FEATURES

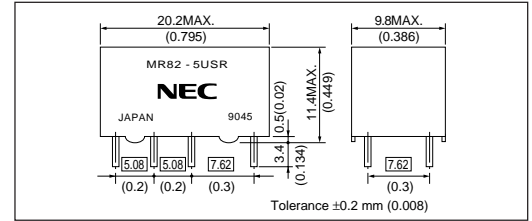
- 200mW nominal operate power
- 1500V FCC surge strength between coil to contacts, and between adjacent contacts

SPECIFICATIONS

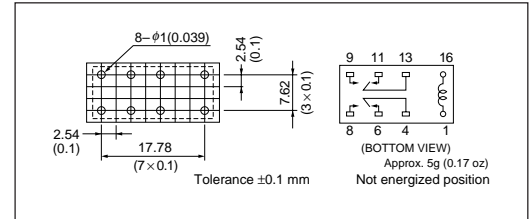
| | | |
|---------------------------------|---|--|
| Contact Form | 2 Form c | |
| Contact Material | Silver alloy with gold alloy overlay | |
| Contact Ratings | Maximum Switching Power | 60 W, 125 VA |
| | Maximum Switching Voltage | 220 Vdc, 250 Vac |
| | Maximum Switching Current | 2 A |
| | Maximum Carrying Current | 2 A |
| Minimum Contact Ratings | 100 mVdc, 100 μ A | |
| Initial Contact Resistance | 50 m Ω typ.(Initial) | |
| Nominal Operating Power | 200 mW | |
| Operate Time (Excluding bounce) | Approx. 5.5 ms | |
| Release Time (Excluding bounce) | Approx. 2 ms without diode | |
| Insulation Resistance | 1000 M Ω at 500 Vdc | |
| Withstand Voltage | Between open contacts | 500 Vac (for one minute) |
| | Between adjacent contacts | 1000 Vac (for one minute) |
| | Between coil to contacts | 1500 V surge (10 \times 160 μ s*1) |
| Shock Resistance | 294 m/s ² (misoperating) 980 m/s ² (destructive failure) | |
| Vibration Resistance | 10 to 55 Hz, double amplitude 1.5 mm (misoperating) 10 to 55 Hz, double amplitude 5 mm (destructive failure) | |
| Ambient Temperature | -40 ~ +85 $^{\circ}$ C | |
| Coil Temperature Rise | Approx. 22 degrees at nominal coil voltage (200 mW) | |
| Running Specifications | Nonload | 10 \times 10 ⁶ operations |
| | Load | 50 Vdc, 0.1 A (resistive) 1 \times 10 ⁶ operations at 85 $^{\circ}$ C, 5 Hz 10 Vdc, 10 mA (resistive) 1 \times 10 ⁶ operations at 85 $^{\circ}$ C, 2 Hz |
| Weight | Approx. 5 g | |

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

DIMENSIONS mm (inch)



RECOMMENDED PCB PAD LAYOUT and SCHEMATICS mm (inch)



STANDARD PART NUMBERS

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

* Test by pulse voltage

at 20 $^{\circ}$ C

PART NUMBER SYSTEM

MR82-5USR

Nominal coil voltage (See part numbers)

SAFETY STANDARD AND RATING

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

* Spacing : UL114, UL478

MR62/82 Series

■ Recommended relay drive conditions

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

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

■ Technical document

Please confirm technical document before use.

It is able to receive a document at NECTOKIN's World-wide-web site.

(<http://www.nec-tokin.com>)

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

EN2 Series



Automotive twin relay EN2 series is printed circuit board mount type and the most suitable for various motor controls in the automotive which require high-quality and high-performance.

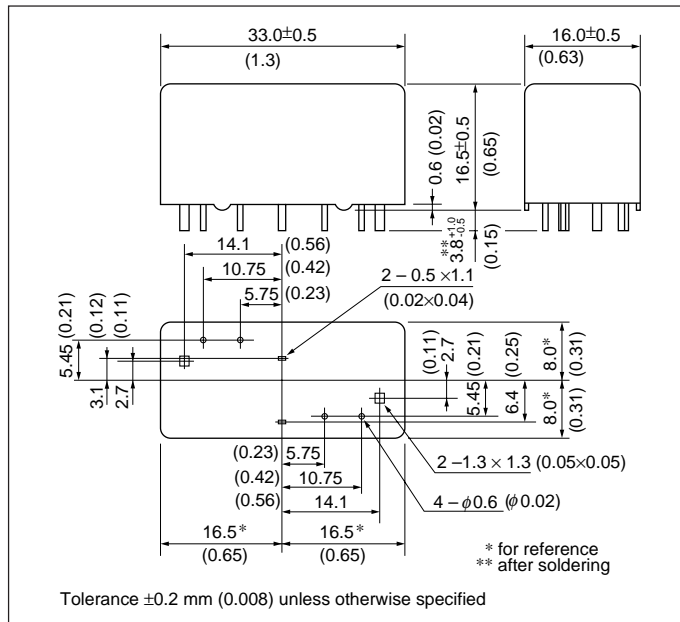
EN2 series has two types for different applications. One is H bridge type which is designed for forward and reverse control of the motor. The other is separate type which contains two separated relays in one package.

FEATURES

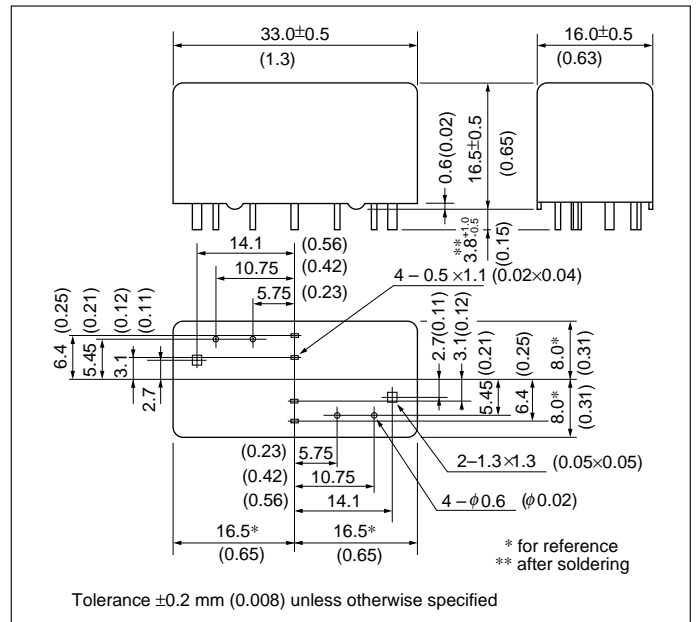
- Twin relay for motor reversible control
- 30% less relay space than 2 conventional relays
- High performance & productivity by unique symmetrical structure
- Flux tight housing

DIMENSIONS mm (inch)

[H Bridge Type]



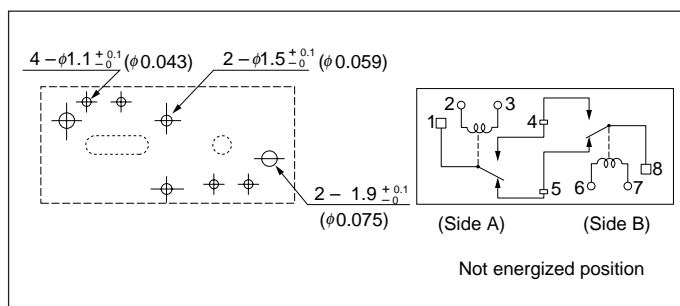
[Separate (T) Type]



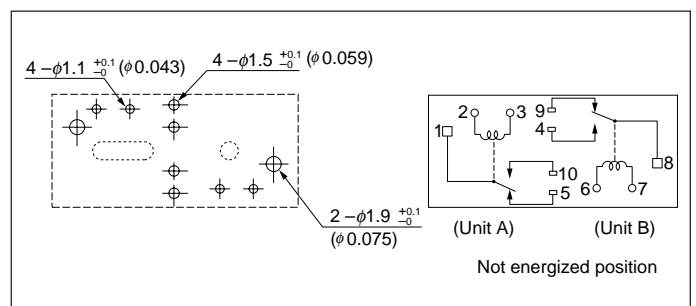
RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(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 X 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/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 to +85°C (-40 to + 185°F) | |
| Coil Temperature Rise | | 50°C / W (122 °F / W) | |
| Running Specifications | Nonload | 10 × 10 ⁶ operations | |
| | Load | 100 × 10 ³ operations (at 14 Vdc, Motor Load 30 A/7 A) | |
| Weight | | Approx. 18 g (0.63 oz) | |

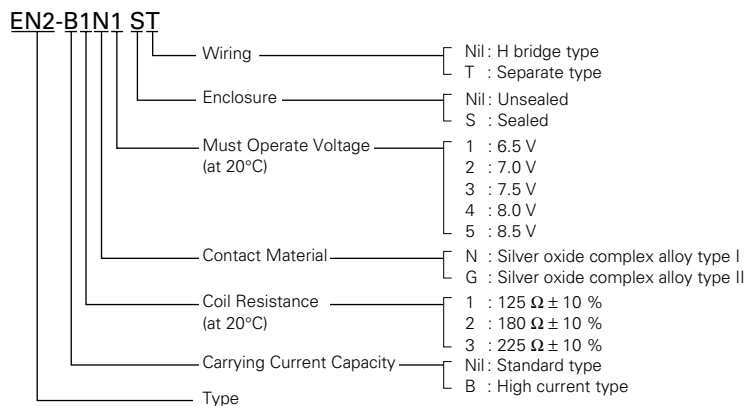
■ COIL RATING

at 20 °C

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

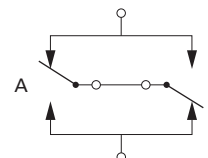
* Test by pulse voltage

■ PART NUMBER SYSTEM

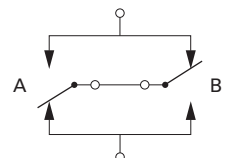


★ Contact Resistance (figure 1)

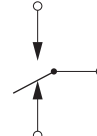
• H Bridge (route A)



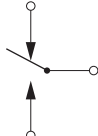
• H Bridge (route B)



• Separate (N/C)



• Separate (N/O)

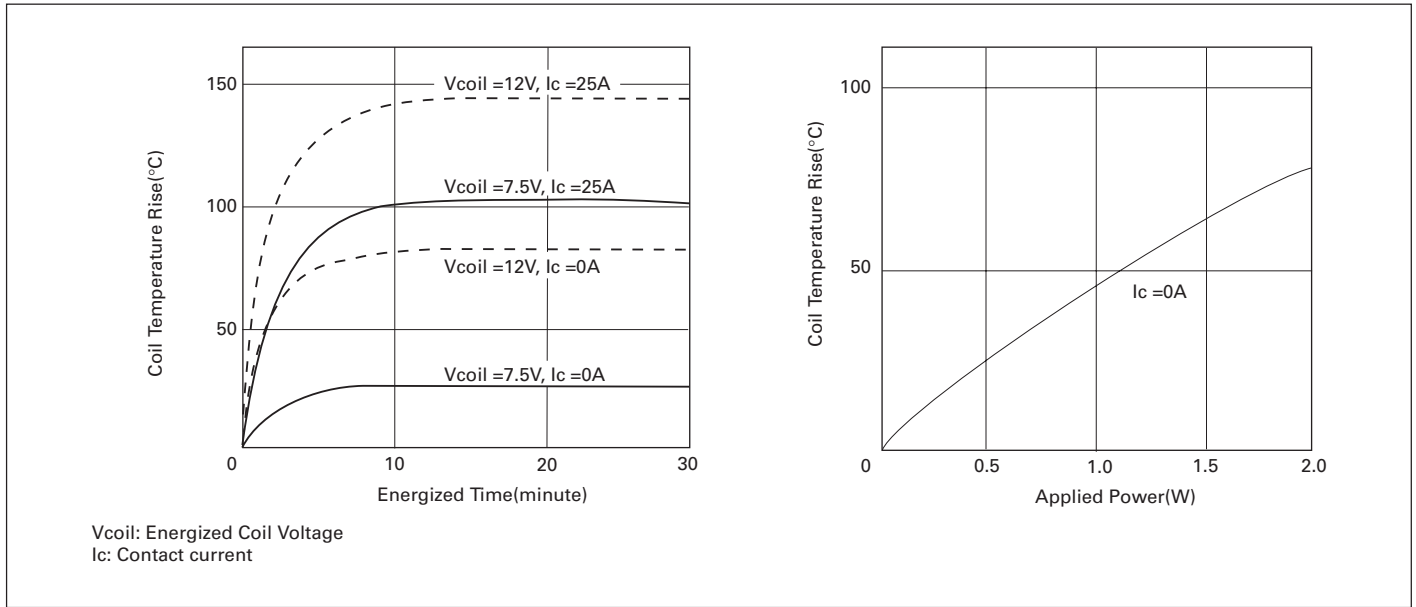


EN2 Series

DATA

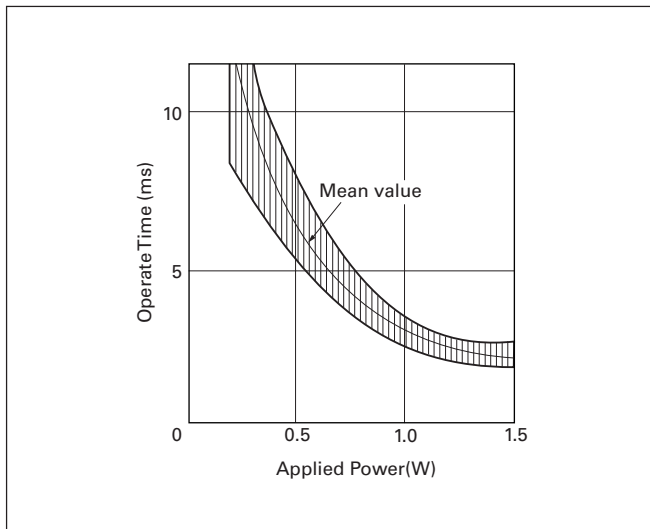
Coil Temperature Rise

(Sample: EN2-1N2)



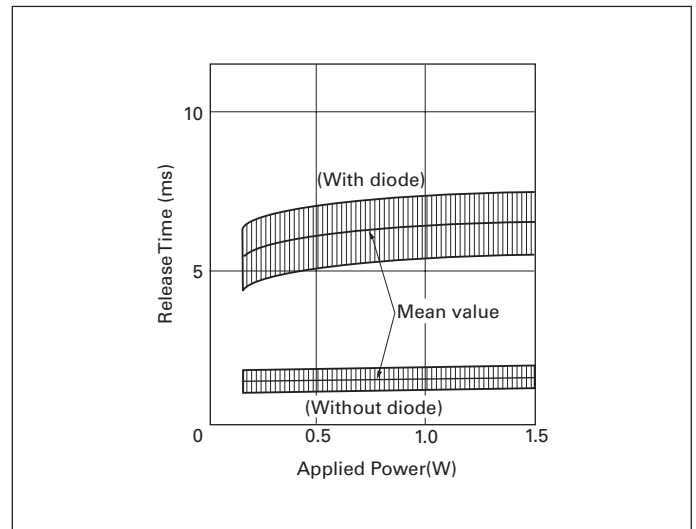
Operate Time

(Sample: EN2-2N4)



Release Time

(Sample: EN2-2N4)



EP2 Series



Automotive twin relay EP2 series is printed circuit board mount type and the most suitable for various motor controls in the automotive which require high-quality and high-performance.

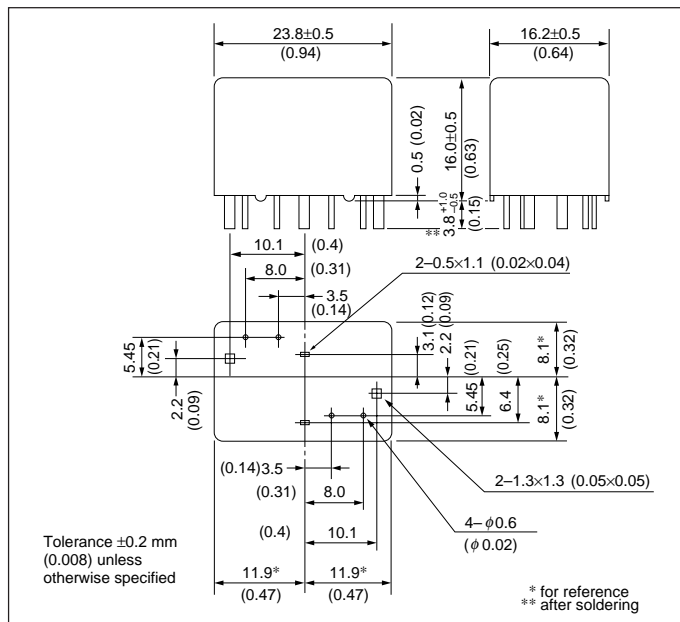
EP2 series has two types for different applications. One is H bridge type which is designed for forward and reverse control of the motor. The other is separate type which contains two separated relays in one package.

FEATURES

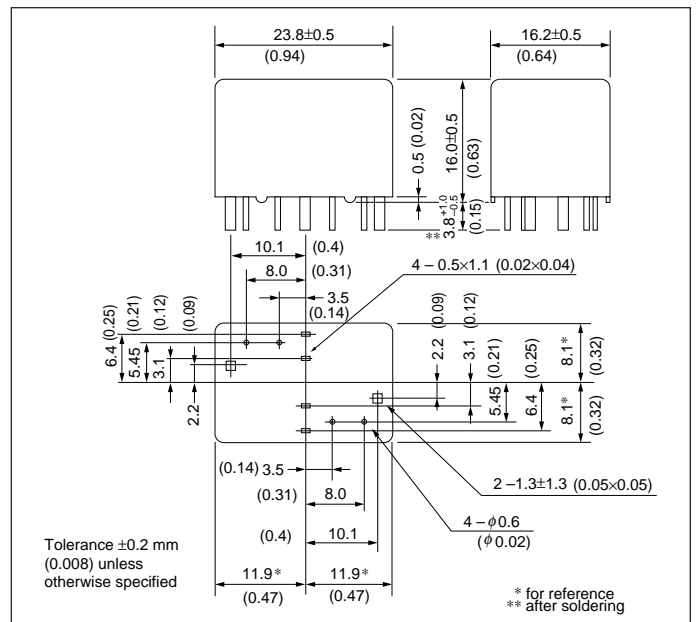
- Twin relay for motor reversible control
- 50% less relay space than 2 conventional relays
- High performance & productivity by unique symmetrical structure
- Flux tight housing

DIMENSIONS mm (inch)

[H Bridge Type]



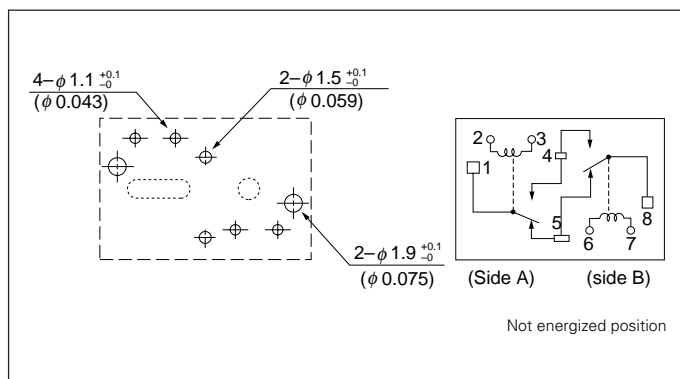
[Separate (T) Type]



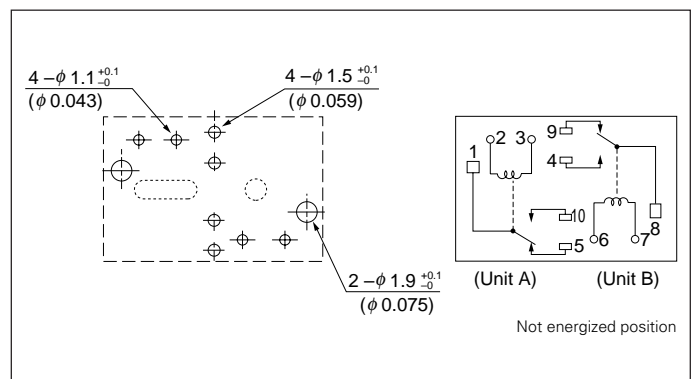
RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)

[H Bridge Type]



[Separate (T) Type]



EP2 Series

■ SPECIFICATIONS

at 20 °C

| Types (Contact Rating) | | EP2 (Standard) | EP2-B (High Current) |
|---|---------|--|--|
| Contact Form | | 1 Form c X 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/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 to +85°C (-40 to +185°F) | |
| Coil Temperature Rise | | 50°C / W (122 °F/W) (Contact Carrying Current : 0 A) | |
| Running Specifications | Nonload | 1 × 10 ⁶ operations | |
| | Load | 100 × 10 ³ operations (at 14 Vdc, Motor Load 25 A/5 A) | |
| Weight | | Approx. 15 g (0.53 oz) | |

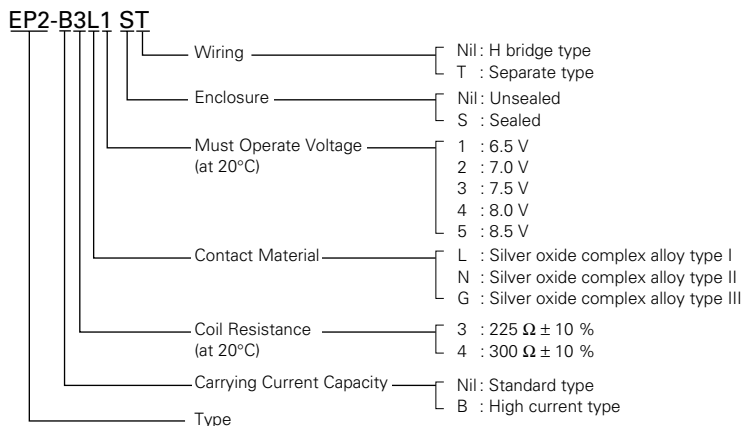
■ COIL RATING

at 20 °C

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

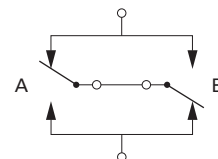
* Test by pulse voltage

■ PART NUMBER SYSTEM

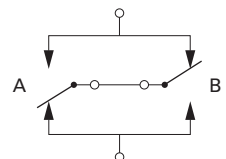


★ Contact Resistance (figure 1)

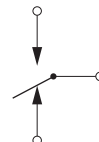
• H Bridge (route A)



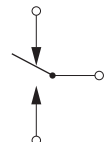
• H Bridge (route B)



• Separate (N/C)



• Separate (N/O)

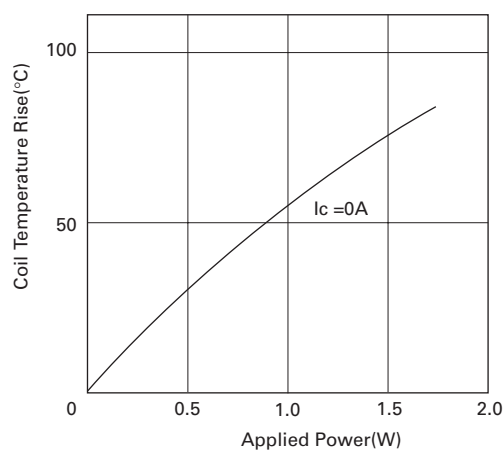
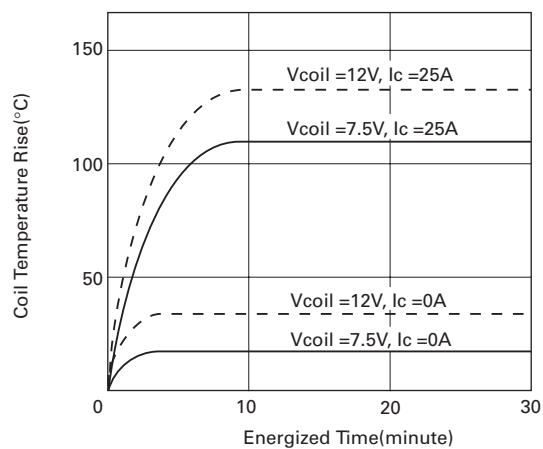


EP2 Series

DATA

Coil Temperature Rise

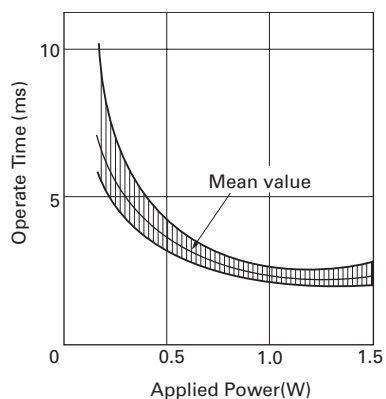
(Sample: EP2-3L1)



V_{coil} : Energized Coil Voltage
 I_c : Contact current

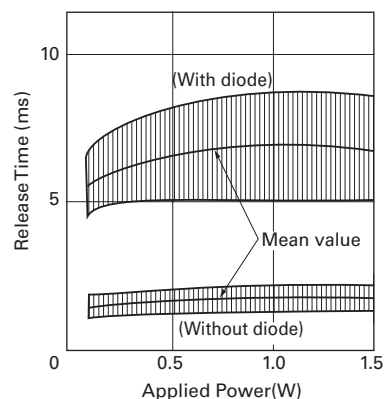
Operate Time

(Sample: EP2-3L1)



Release Time

(Sample: EP2-3L1)



EP1 Series

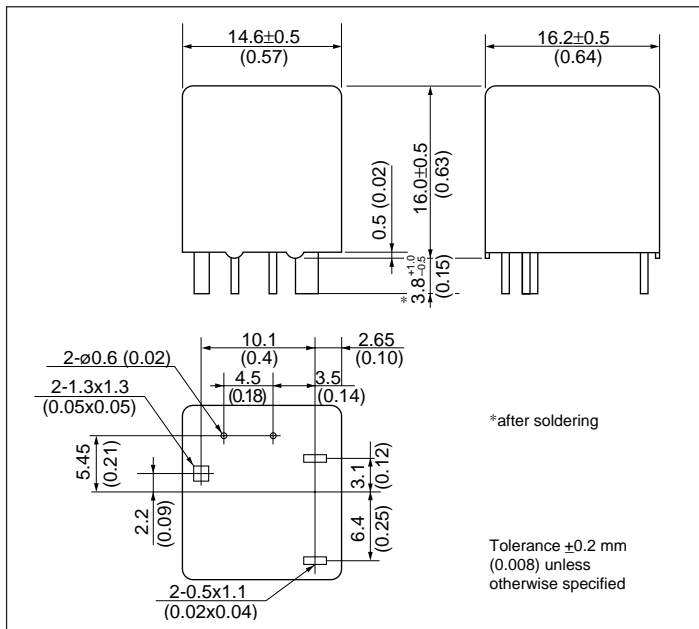


The automotive relay EP1 Series is printed-circuit-board-mount-type and the most suitable for various motor controls in automotive applications pursuing quality and performance.

FEATURES

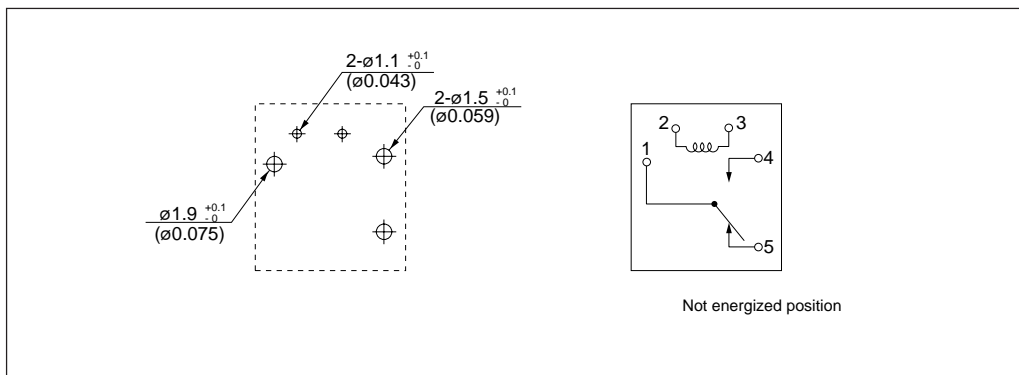
- Flux tight housing
- Low profile
- Two types of contact according to switching current.
(Standard type: 25 A Max, High current type: 30 A Max.)

DIMENSIONS mm (inch)



RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



EP1 Series

■ SPECIFICATIONS

at 20 °C

| Items | Types (Contact Rating) | EP1 | EP1-B |
|---------------------------------|------------------------|--|---|
| | | (Standard) | (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/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 to + 85°C (-40 to + 185°F) | |
| Coil Temperature Rise | | 50°C / W (122 °F/W)(Contact Carrying Current: 0A) | |
| Running Specifications | Nonload | 1 × 10 ⁶ operations | |
| | Load | 100 × 10 ³ operations (at 14 Vdc, Motor Load 25 A/5 A) | |
| Weight | | Approx. 8 g (0.28 oz) | |

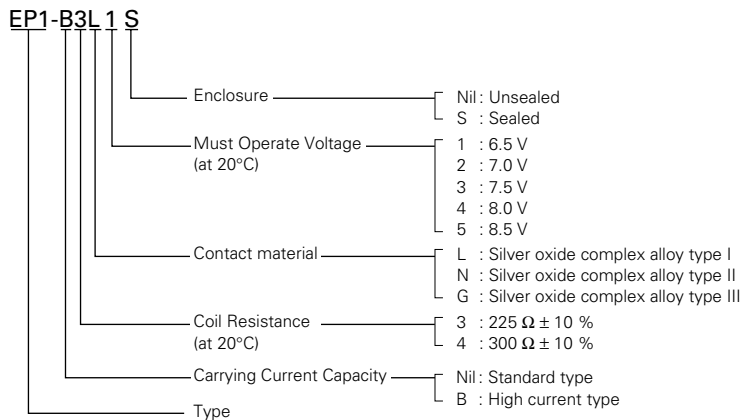
■ COIL RATING

at 20 °C

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

* Test by pulse voltage

■ PART NUMBER SYSTEM

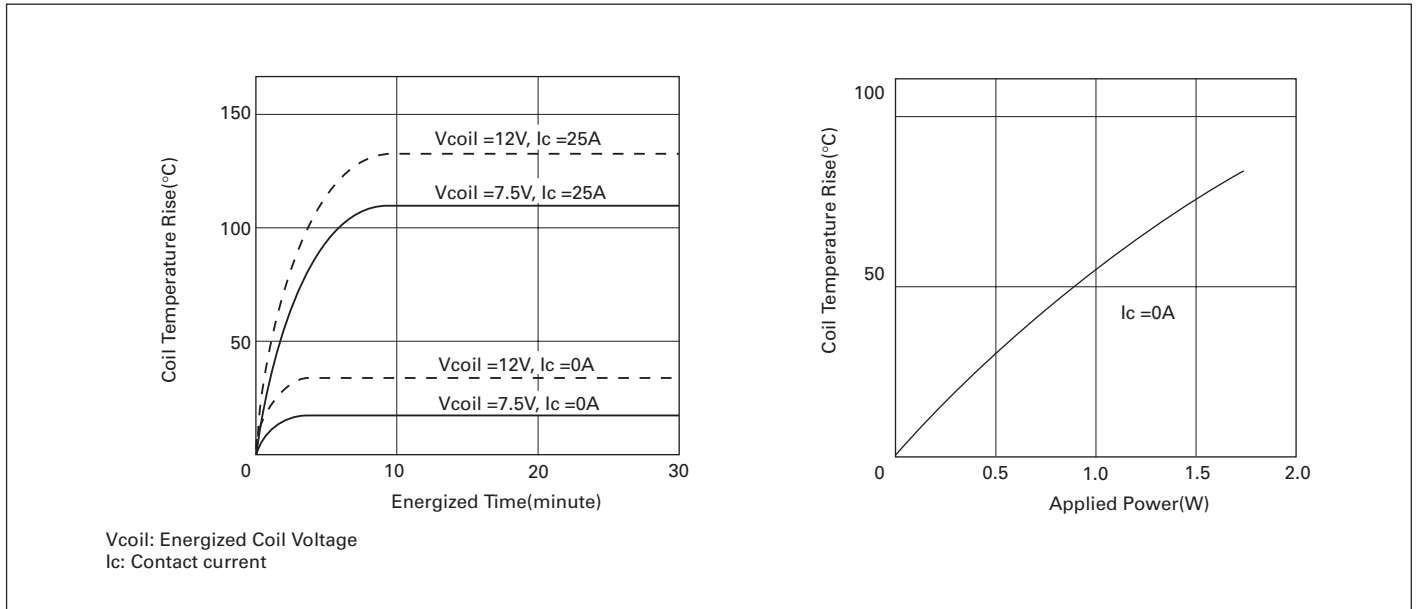


EP1 Series

DATA

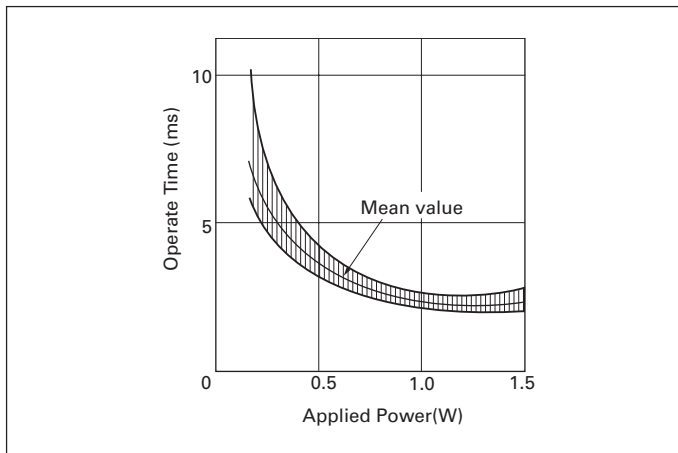
Coil Temperature Rise

(Sample: EP1-3L1)



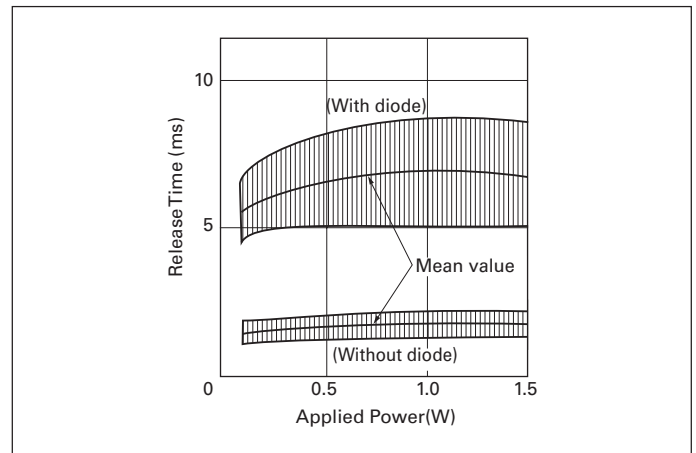
Operate Time

(Sample: EP1-3L1)



Release Time

(Sample: EP1-3L1)



EQ1 Series

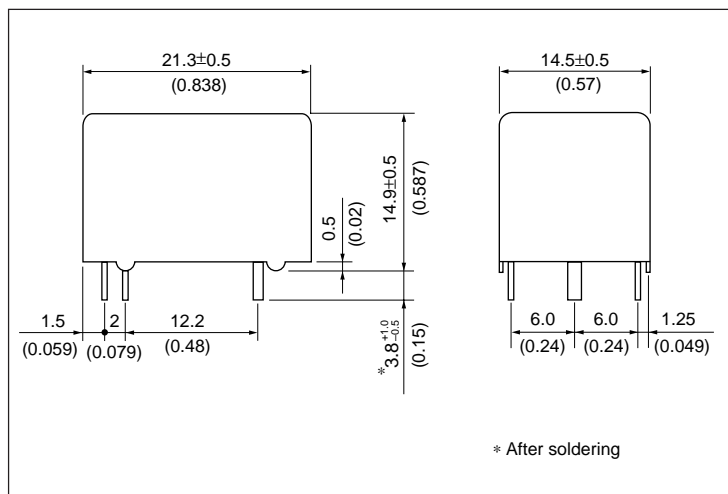


The new NECTOKIN EQ1 Series automotive relays are designed for motor and lamp control applications that require a high level of quality and performance. The EQ1 has a unique two-piece design for the magnetic circuit, which result in small size, and high productivity.

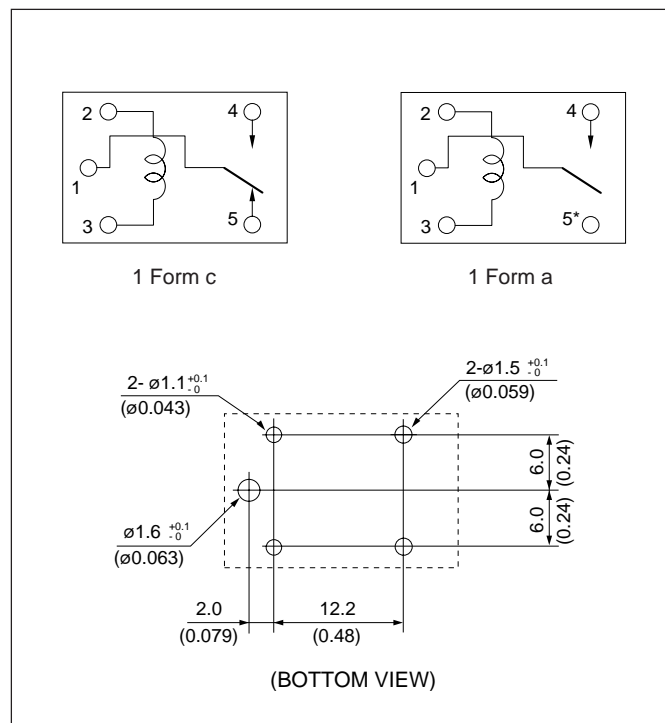
FEATURES

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

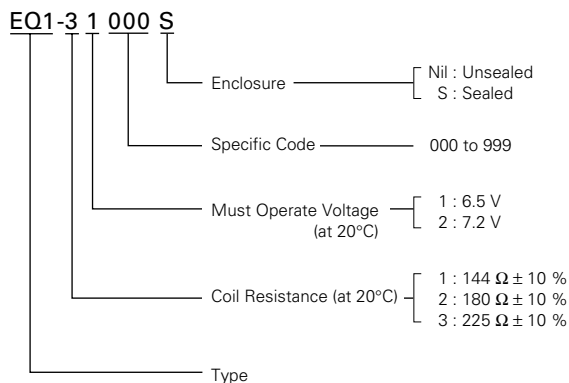
DIMENSIONS mm (inch)



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



PART NUMBER SYSTEM



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

■ COIL RATING

● SEALED TYPE

at 20 °C

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

* 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 |
| | | | EQ1-11040 | | 144 | 6.5 | 0.6 |
| | For Jump Start | EQ1-22111 | 180 | | 7.2 | 0.7 | |
| EQ1-11111 | | 144 | 6.5 | | 0.6 | | |
| Lamp and LCR circuit Control | | | | | | | |

* Test by pulse voltage

ET1 Series

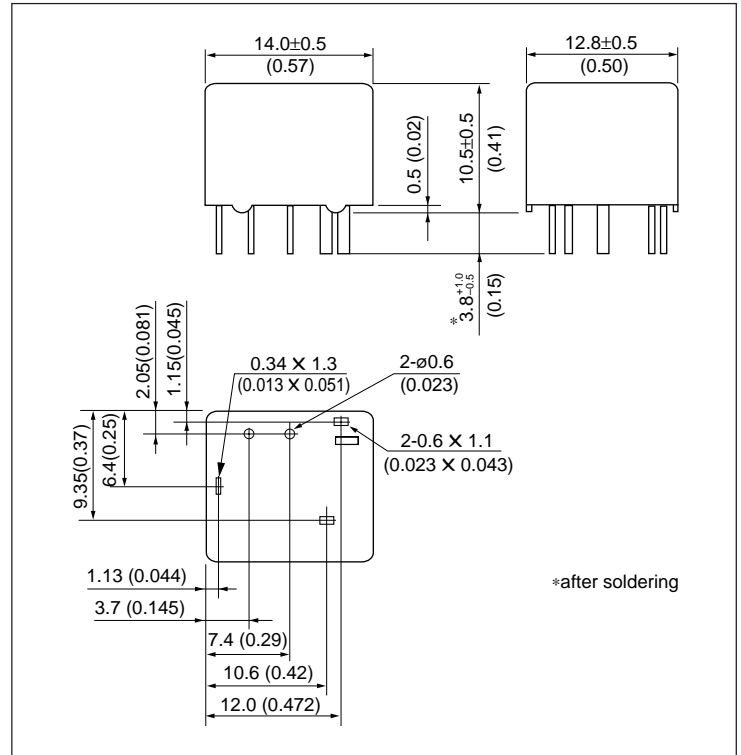


The new NEC TOKIN EP1 Series are PC-board mount automotive relay suitable for various motor and heater control application that require a high quality and performance. The ET1 series are succeeding in a about 50% of miniaturization in comparison with the EP1 series.

FEATURES

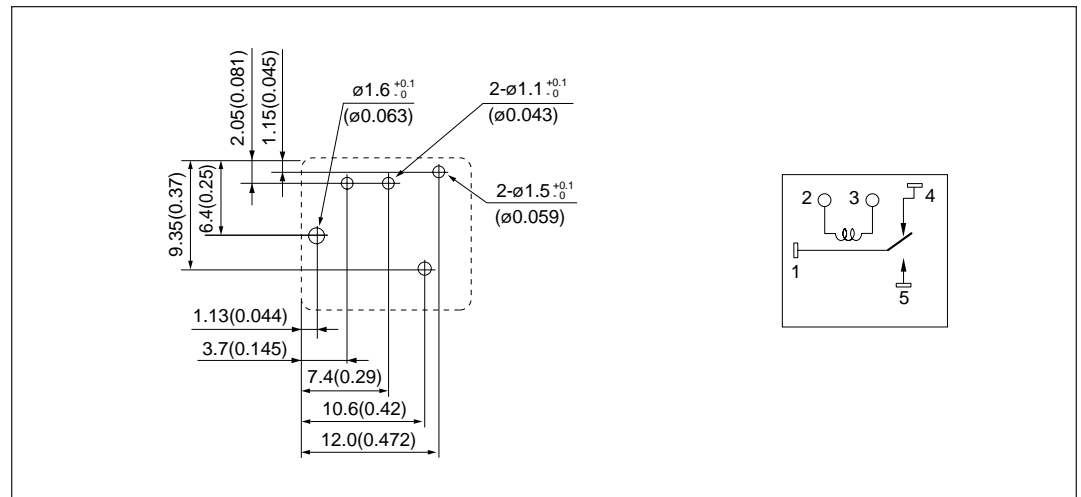
- Flux tight housing
- Approx, 50% relay volume of EP1
- Approx, 76% relay space of EP1
- Approx, 67% relay height of EP1
- Approx, 56% relay weight of EP1

DIMENSIONS mm (inch)



RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



ET1 Series

■ SPECIFICATIONS

| Items | | Specifications | |
|---------------------------------|---------------------------|---|----------------------------------|
| Contact Form | | 1 Form c | |
| Contact Ratings | Maximum Switching Voltage | 16 Vdc | |
| | Maximum Switching Current | 25 A (at 16 Vdc, inductive load : 1 mH) | |
| | Contact Resistance | 4 mΩ typical (measured at 7 A) initial | |
| Contact Material | | Silver oxide complex alloy | |
| Operate Time (Excluding bounce) | | 2.5 ms typical (at Nominal Voltage) | |
| Release Time (Excluding bounce) | | 2.5 ms typical (at Nominal Voltage, with diode) initial | |
| Nominal Operating Power | | 640 mW | |
| Insulation Resistance | | 100 MΩ at 500 Vdc | |
| Withstand Voltage | Between open contacts | 500 Vac min. (for 1 minute) | |
| | Between adjacent contacts | 500 Vac min. (for 1 minute) | |
| Shock Resistance | Misoperation | 98 m/s ² (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 | |
| Coil Temperature Rise | | 70 °C/W | |
| Life Expectancy | Mechanical | 1 × 10 ⁶ operations | |
| | Electrical | Power Window Motor (14 V, 20 A, Locked) | 100 × 10 ³ operations |
| | | Power Window Motor (14 V, 20 A/3 A, Unlocked) | 100 × 10 ³ operations |
| Weight | | Approx. 4.5 g (0.16 oz) | |

■ COIL RATING

● SEALED TYPE

at 20 °C

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

* Test by pulse voltage

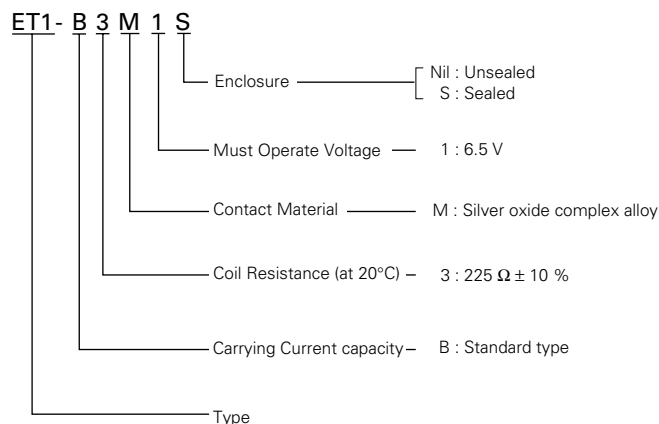
● UNSEALED TYPE

at 20 °C

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

* Test by pulse voltage

■ PART NUMBER SYSTEM



ET2 Series

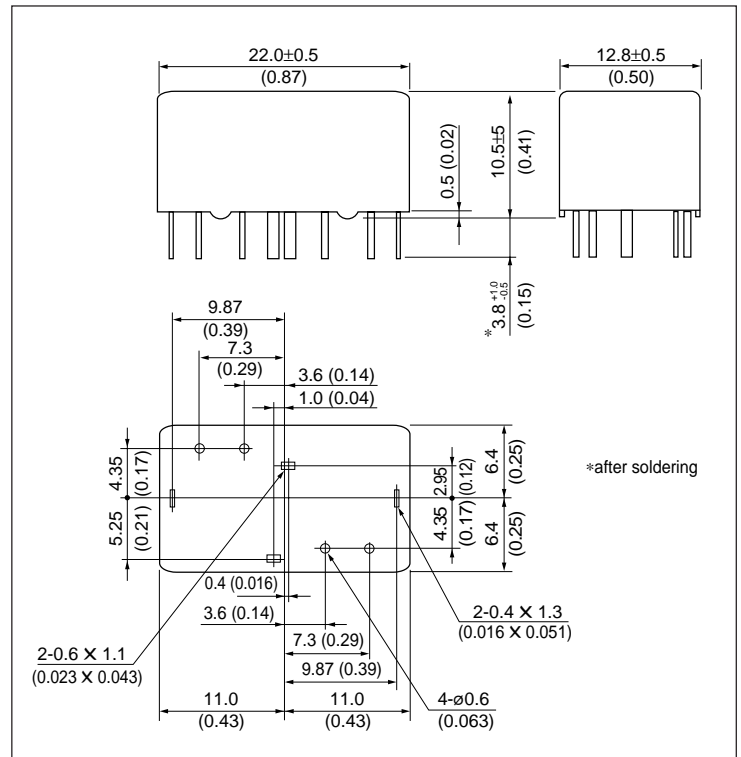


The new NEC TOKIN ET2 Series are PC-board mount automotive relay suitable for various motor control application that require a high quality and performance. The ET2 series are succeeding in about 50% of miniaturization in comparison with the EP2 series.

FEATURES

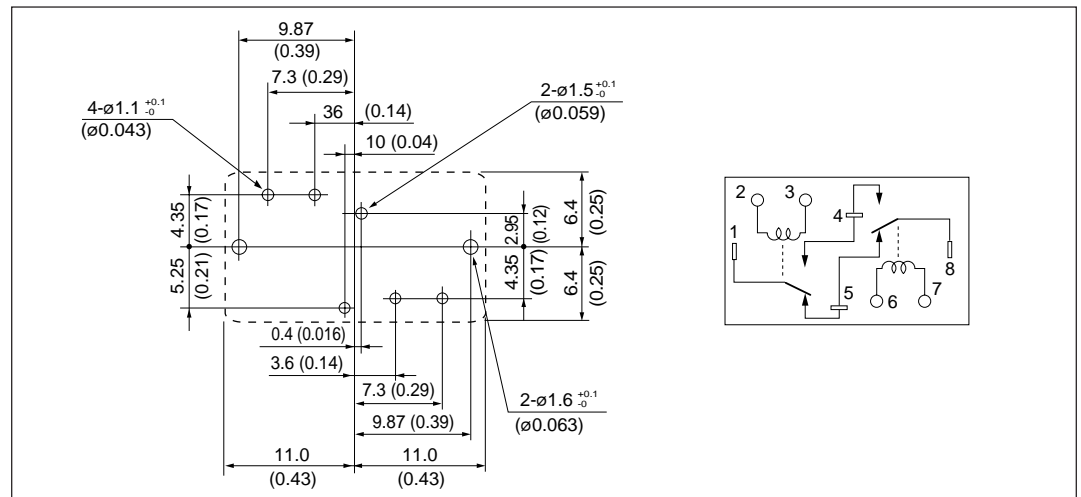
- Flux tight housing
- Approx, 50% relay volume of EP2
- Approx, 74% relay space of EP2
- Approx, 67% relay height of EP2
- Approx, 50% relay weight of EP2

DIMENSIONS mm (inch)



RECOMMENDED PCB PAD LAYOUT and SCHEMATICS

(bottom view) mm (inch)



ET2 Series

■ SPECIFICATIONS

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

■ COIL RATING

● SEALED TYPE

at 20 °C

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

* Test by pulse voltage

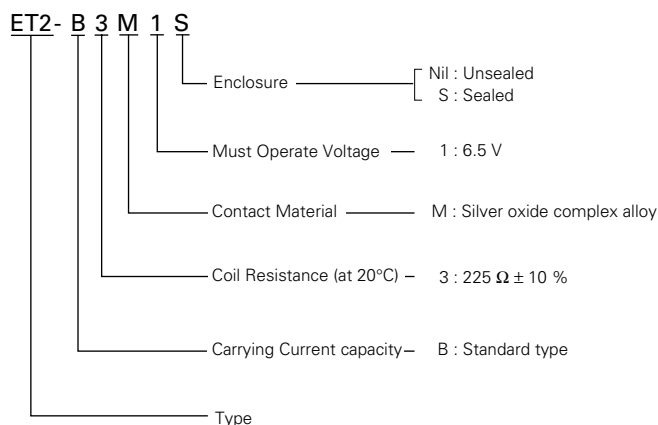
● UNSEALED TYPE

at 20 °C

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

* Test by pulse voltage

■ PART NUMBER SYSTEM



MR301 Series



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

FEATURES

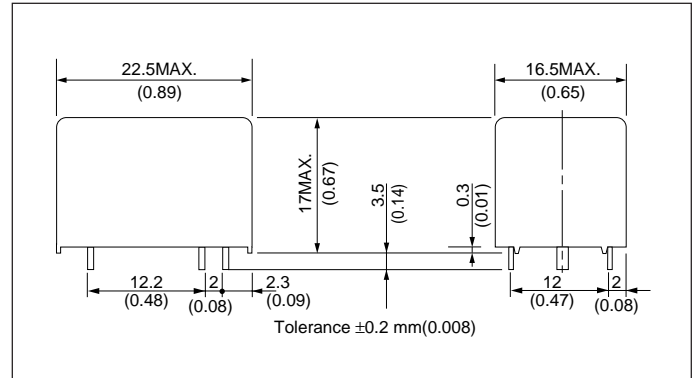
- Low profile, light weight.
- Two types of contact
(General type: 5A switching, High power type; 10A switching)
- Fluxtight or washable package is available.
- UL recognized (E 73266), CSA certified (LR46266)

SAFETY STANDARD AND RATING

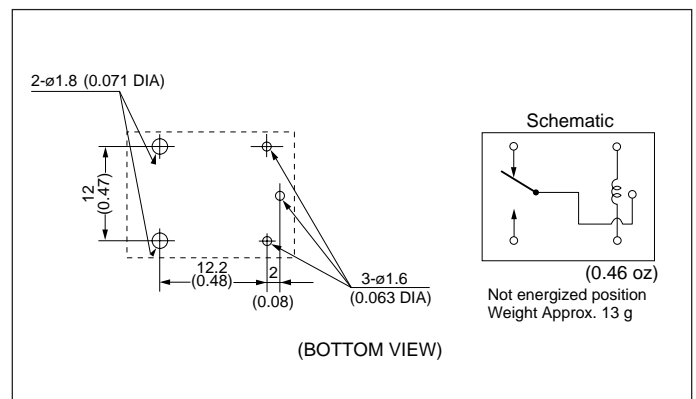
| | |
|--|---|
| ULRecognized (UL508)* File No. E73266 | CSA Certificated (CSA C22.2 No.14) File No. LR46266 |
| MR301-**HU 1/2HP 240VAC 1/4HP 125VAC 30VDC, 7 A (Resistive) 60VDC, 1.0 A (Resistive) 277VDC, 5 A (Resistive) 120VDC, 10 A (Resistive) 360 W, 120VAC Tungsten 120VAC, 2 A Ballast TV-2, 120VAC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

* Spacing : UL114, UL478

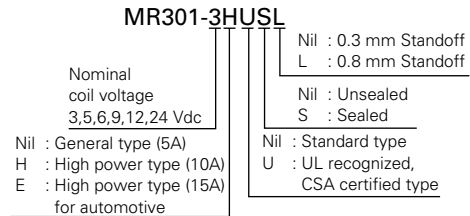
DIMENSIONS mm (inch)



RECOMMENDED PCB PAD LAYOUT and SCHEMATICS mm (inch)



PART NUMBER SYSTEM



MR301 Series

■ SPECIFICATIONS

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

■ COIL RATING

at 20°C

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

* Test by pulse voltage

NOTES ON CORRECT USE

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] | | | | [Power relay] | | | |
|----------------|--|--|---|---------------|---|---|---|
| Current range | 100 mA to 1 mA | 1 mA to 0.5 A | 0.5 A to 2 A | Current range | to 100 mA | 100 mA to 1 A | A to 35 A |
| Application | GOOD | VERY GOOD | NOT SO GOOD for some cases | Application | NOT SO GOOD for some cases | GOOD | VERY GOOD |
| | <ul style="list-style-type: none"> Contacts may be unstable. Thermal electromotive force and contact noise should be taken into consideration. | <ul style="list-style-type: none"> Contacts are stable and highly reliable. | <ul style="list-style-type: none"> Infrequent operation poses no problem, but frequent operation deteriorates contact stability. Use of a power relay is preferred for 1 A or higher. | | <ul style="list-style-type: none"> Only for applications in which an increase in contact resistance poses no functional problems. Use of a high capacitance type is not possible. | <ul style="list-style-type: none"> It seldom has wear on contacts or dislocation and can be used without problems. | <ul style="list-style-type: none"> Since different contact phenomena occur depending on the contact load, it is necessary to check the contact load and select the correct contacts. |

- (2) When using the relay with a high current or high capacitance load, an inrush current may cause contact dislocation or deposition; therefore check the feasibility of use in the actual circuit.
- (3) Be sure to use the relay at an ambient temperature within the maximum ratings; otherwise, the life of the relay will be radically shortened. If use outside the specified temperature range is unavoidable, consult NEC TOKIN.
- (4) With a relay whose coil polarity is specified in its internal circuit diagram, apply the polarity of the rated voltage as specified. Note that when a rippled DC power source is used, abnormalities such as beat in the coil may occur.
- (5) Exercise care when handling the relay so as not to apply shock to it or drop it.
- (6) The flow soldering conditions are for 5 to 10 seconds at 250 °C.
- (7) When cleaning, use alcohol, or a water-based solvent. Avoid using ultrasonic cleaning.

2. NOTES ON CONTACT LOAD

(1) Minimum load

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

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

(2) Contact protection circuit

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

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

① General notes

- (a) It is necessary to place the protection circuit close to the contacts. In principle, place it on the same printed circuit board as that for the contacts (within a distance of several tens of centimeters).
- (b) It is important to confirm the effectiveness of the protection circuit in the actual circuit. In some cases, it is also necessary to conduct lifetime tests using an appropriate equivalent circuit.

② Examples of contact protection circuits

(a) Inductive load

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

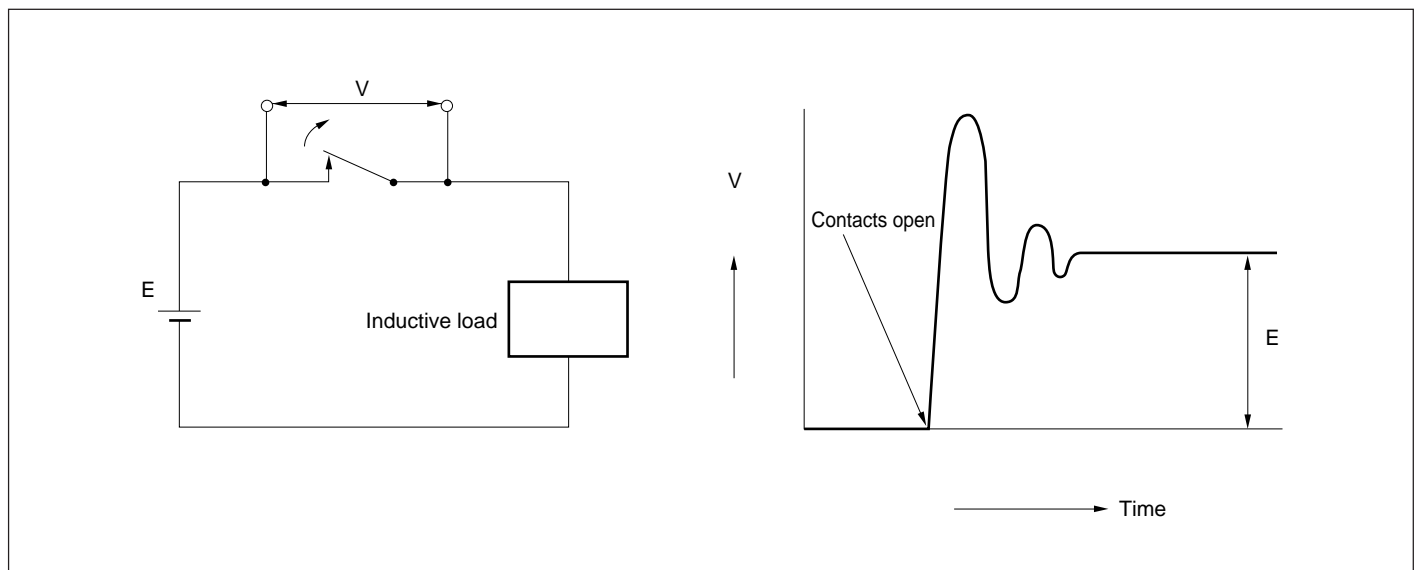


Fig.1 Inductive Load Circuit

Table 1 Inductive Load Contact Protection Circuits

| Protection element | Circuit example | Remarks |
|-----------------------------------|-----------------|--|
| Capacitor + resistor (CR circuit) | | $r (\Omega) = \frac{\text{contact voltage (V)}}{0.5 \text{ to } 1}$ $C (\mu\text{F}) = (0.5 \text{ to } 1) \times \text{contact current (A)}$ <p>The withstand voltage of a non-polar capacitor should be 300 V or higher.</p> |
| | | |
| 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

| | | | |
|---------------------|--|---------------------|---|
| <p>WRONG</p> | <p>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.</p> | <p>WRONG</p> | <p>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.</p> |
|---------------------|--|---------------------|---|

(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).

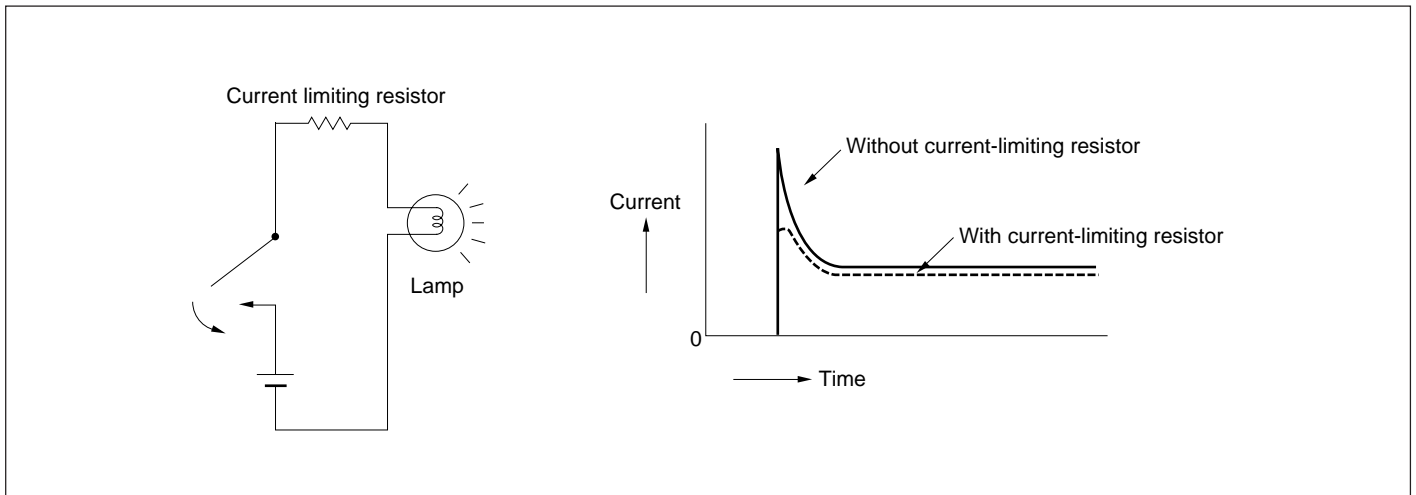


Fig.2 Example of Current-Limiting Resistor in Lamp Load Circuit

(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.

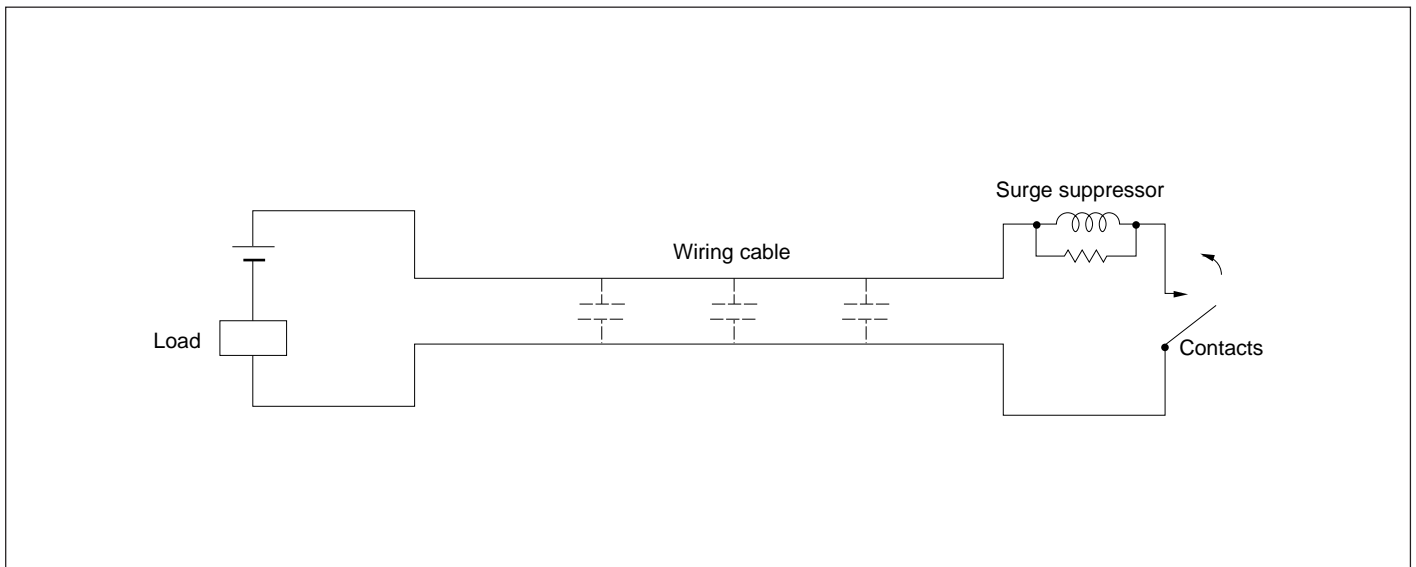


Fig.3 Example of Surge Suppression Circuit with Surge Suppressor

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.

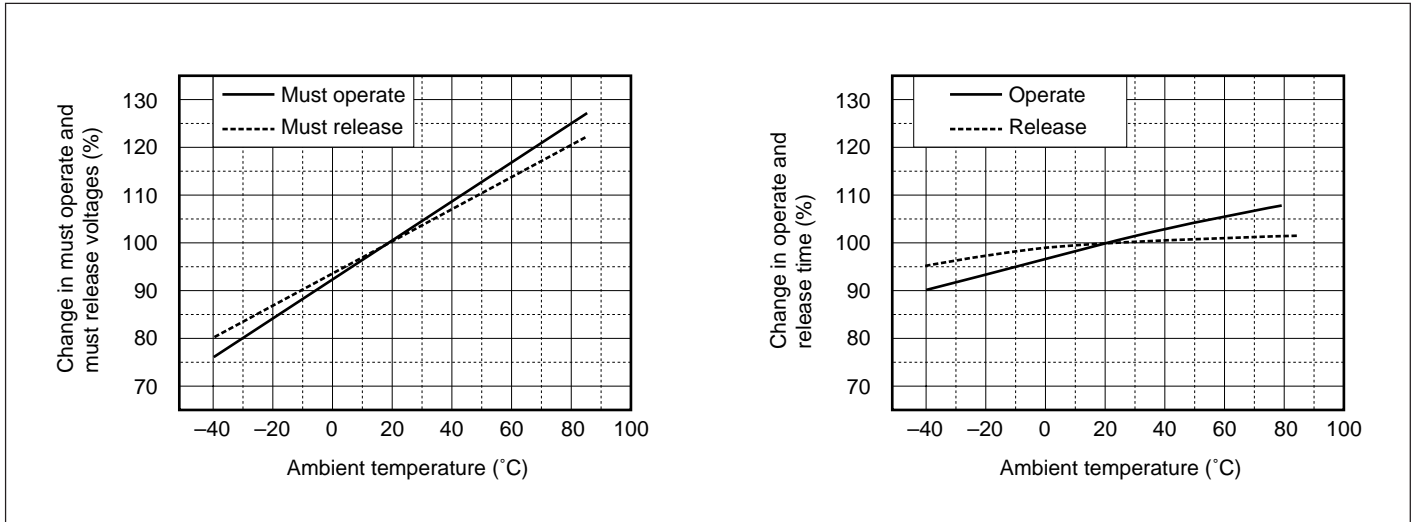


Fig.4 Temperature Characteristics of Relay (Example)

(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.

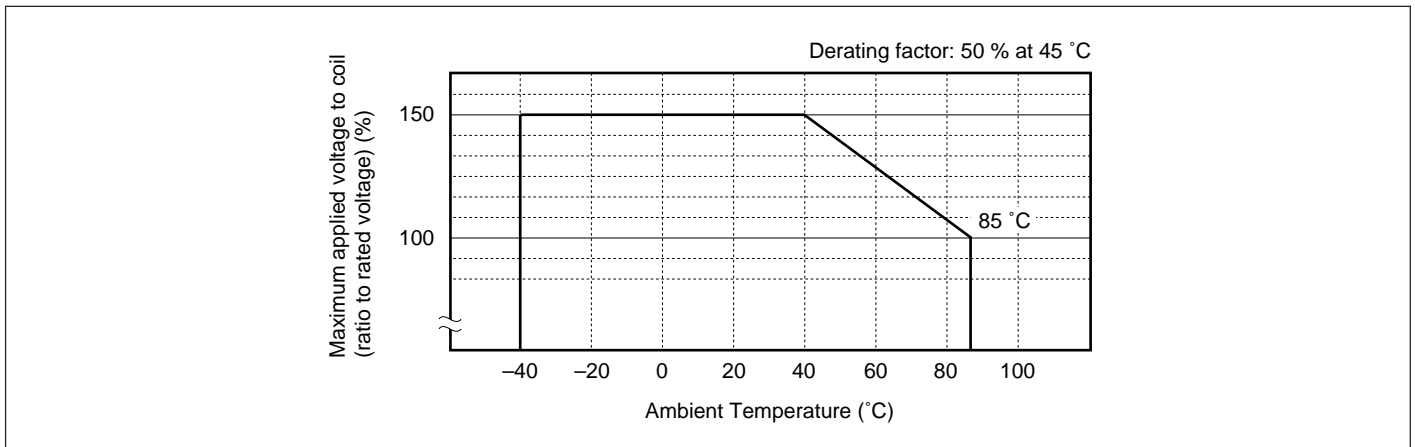


Fig.5 Coil Voltage vs. Ambient Temperature Derating Characteristics (Example)

(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.

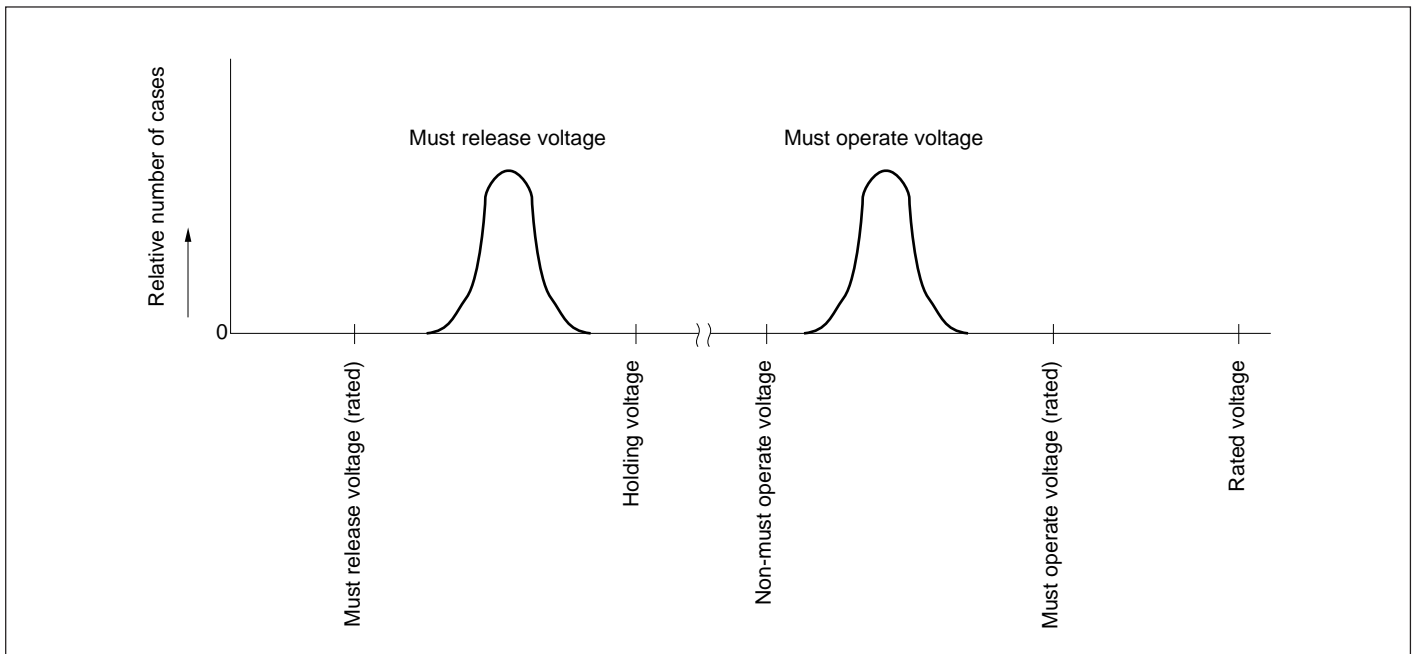


Fig.6 Example of Distribution of Relay Must Operate Voltage and Must Release Voltage

(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.

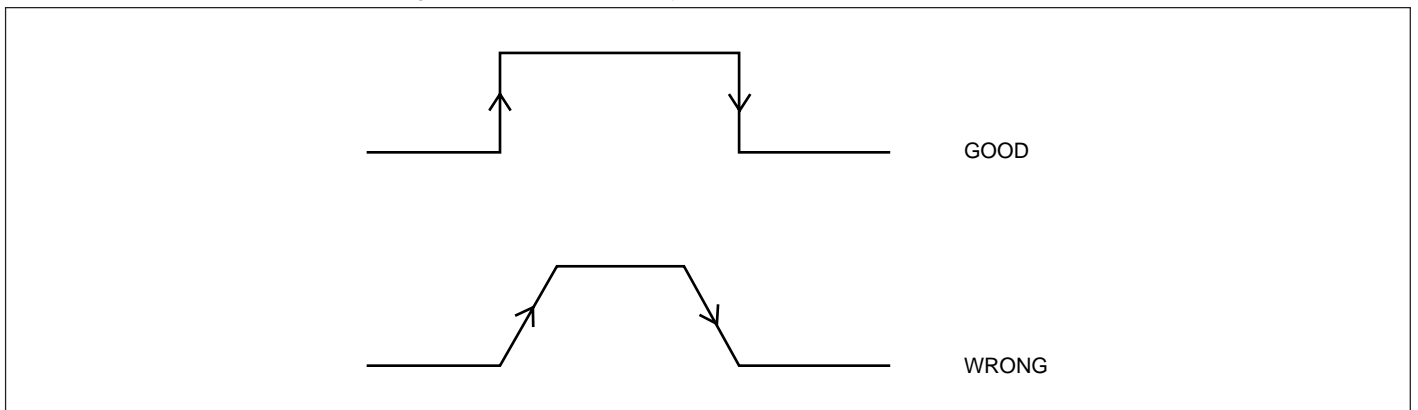


Fig.7 Relay Drive Waveform

(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.)

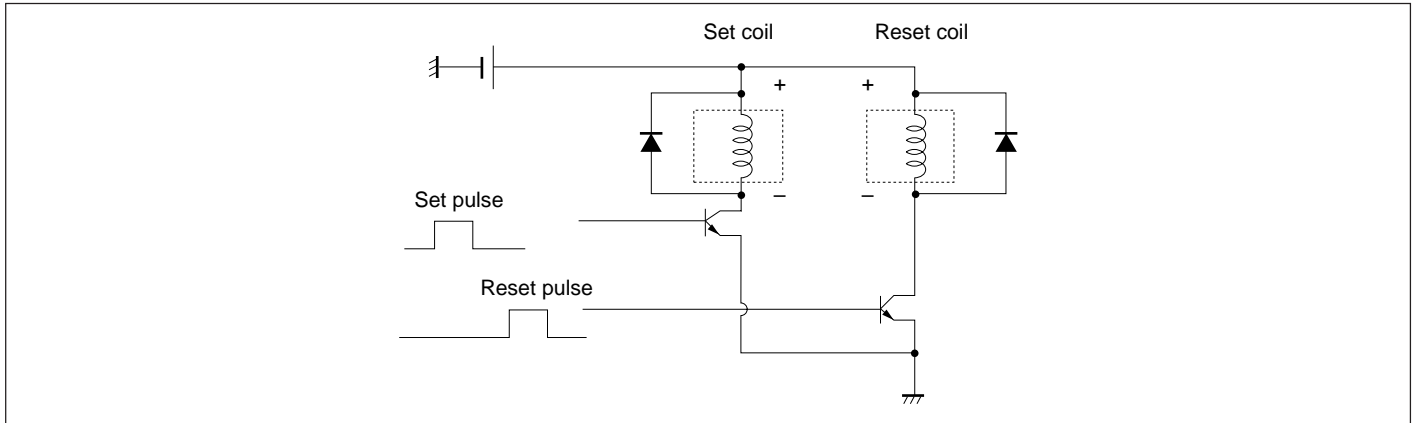


Fig.8 Drive Circuit of Latching Relay (Example of Double Coil Latching Type)

- 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 NO_x or SO_x 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 (H₂S, SO₂), nitric acid gas (HNO₃), ammonia (NH₃), silicon vaporization gas, etc., may cause imperfect contacts and other functional trouble. Avoid use of the relay in such an atmosphere. If it is unavoidable, use a sealed type relay.

(4) Atmospheric pressure

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

(5) Vibration and shock

The vibration resistance and shock resistance of a relay are as shown in the catalog and use of the relay under conditions other than those specified may cause malfunctions or damage.

Be sure to use the relay within those vibration and shock conditions.

Even before the relay is used, repeated excessive vibration or shock load may cause malfunctioning of the relay, by causing metal deposition on the contacts and other functional trouble. Malfunctions due to vibration or shock during operation may cause considerable damage or wear of the contacts.

Note that operation of a snap switch mounted close to the relay or shock by operation of an electromagnet may cause malfunctioning.

(6) Influence of magnetic fields

The magnetic circuit of an NEC TOKIN miniature signal relay is constructed so that the relay does not easily malfunction due to influence of external magnetic fields. However, under the influence of magnetic flux leaking from a transformer, speaker, or magnet placed in the vicinity of the relay, the must operate voltage, must release voltage, operate time, release time and other dynamic characteristics may change.

In applications where these characteristics changes pose problems, it is necessary to take measures such as magnetic shielding. Also, when many make them miniature signal relays are closely located, the magnetic flux leaking from those relays may make them interfere with each other, causing changes in the must operate voltage, must release voltage, operate time, release time and other dynamic characteristics. Fig. 9 shows examples of the mounting, magnetization, and change in the must operate voltage of signal relays in the EA2 series. In applications where these characteristics changes pose a problem, it is necessary to reduce the mounting density.

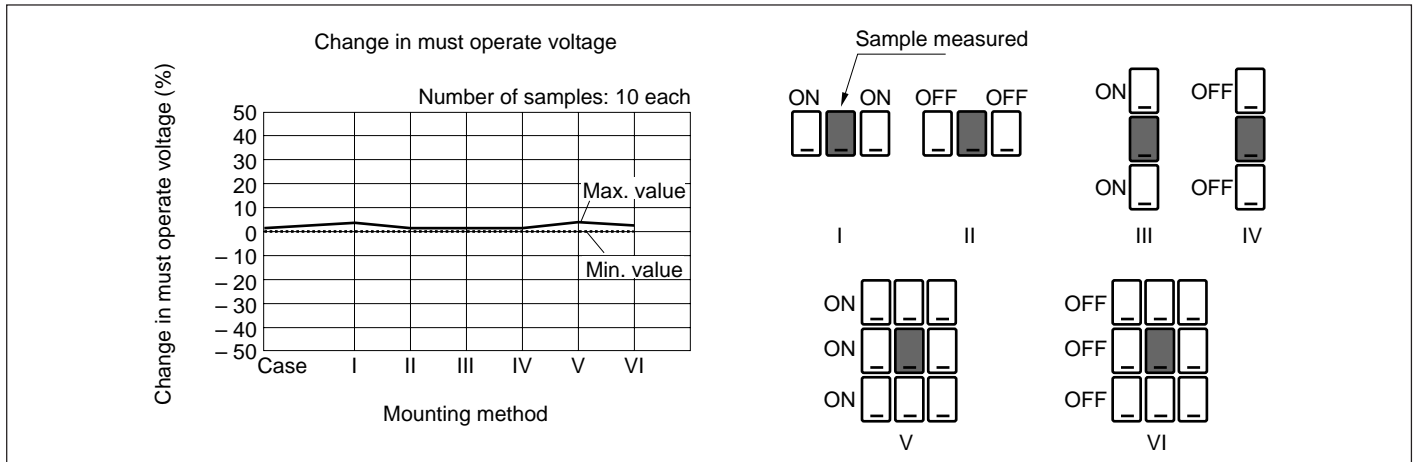


Fig.9 Change in Must Operate Voltage in Dense Mounting

5. INFLUENCE OF RELAY OPERATION ON SURROUNDINGS

(1) Electromagnetic noise

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

(2) Arc discharge

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

(3) Generation of leakage magnetic flux

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

6. NOTES ON MOUNTING

(1) Design of printed circuit boards

- ① If an electronic circuit such as a microcontroller is placed close to a relay, noise generated by the relay may cause malfunctioning.
- ② When designing patterns keep to the shortest possible distance in wiring.
- ③ For the printed circuit board on which a relay is mounted, use a board of 1 mm or more in thickness. If the printed circuit board is not thick enough, it may be subject to warpage which will add tension to the relay, causing variations in the relay characteristics. Because a flexible printed circuit board is particularly thin, it is necessary to solder near the root of the relay pins. Since preliminary soldering of the pin root part is often insufficient, its solder is likely to become loose.
- ④ If a thermal cycle is applied to the soldered part, cracks may be generated in it. Special care is required for the relay location, base material and through hole shape.

(2) Relay mounting position

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

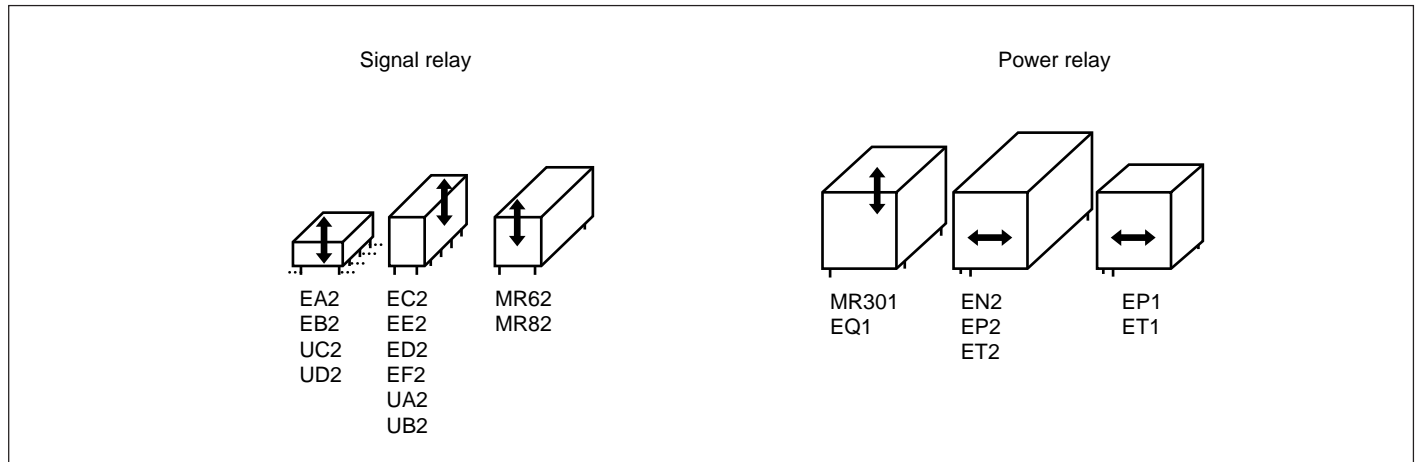


Fig.10 Direction of Armature Operation

(3) Notes on mounting

① Chucking

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

② Temporary securing to printed circuit board

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

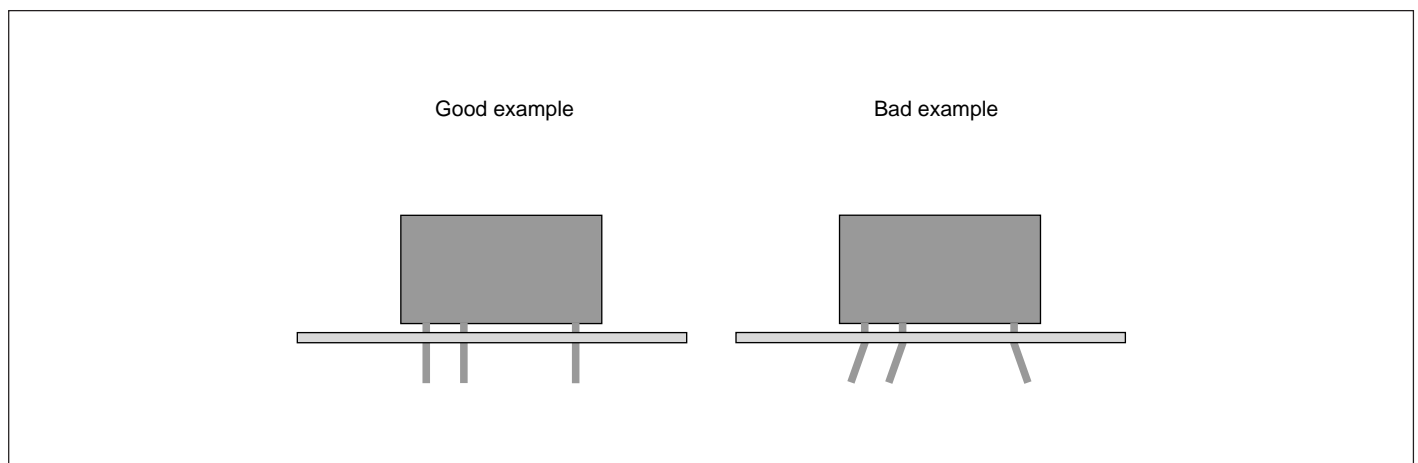


Fig.11 Bending Relay Pins

③ Application of soldering flux

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

④ Soldering work

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

(a) Automatic soldering: Flow solder is recommended.

- <Recommended conditions> *Preheating: 100 °C max. 1 min. max.
- *Solder temperature: 250 °C max.
- *Solder time: 5 to 10 seconds

(b) Manual soldering (by soldering iron):

- <Recommended conditions>
- *Solder temperature: 350 °C max.
- *Solder time: 2 to 3 seconds

Ventilation immediately after soldering is completed is recommended.

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

⑤ Pin cutting after soldering

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

7. NOTES ON CLEANING

(1) Cleaning solvent

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

(2) Avoid ultrasonic cleaning.

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

8. NOTES ON HANDLING RELAYS

(1) Use of magazine case stoppers

Relays are packaged in magazine cases for shipment.

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

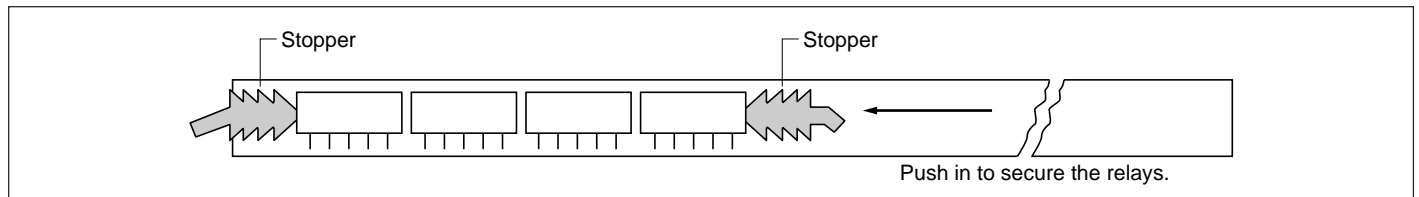


Fig.12 Storage in Magazine Case

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

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

9. NOTES ON USING SMT RELAYS

(1) Mounting pads

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

(2) Solder reflow

The SMT relay is highly resistant to heat. However, solder the relay under the correct temperature conditions so that the full performance of the relay can be realized. The IRS (infrared ray reflow soldering) and VPS (vapor phase soldering: reflow by using latent heat of organic solvent) methods are recommended.

In addition, air reflow soldering may also be used. Whichever soldering method is used, be sure to confirm the temperature conditions for soldering and the influence of soldering on the relay in advance before setting work standards.

(3) Storage

The sealability of a surface-mount relay may be lost if the relay absorbs moisture and is then heated during soldering .

When storage relays, therefore,observe the following points:

<1> The storage humidity must be no more than 70% RH. The recommended storage period is 3 months maximum.

<2> When the relay is stored 3 months or longer, please keep the strage humidity to within 50% RH and mount relay in 6 months maximum.

[MEMO]

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

The information is subject to change without notice. For actual design-in refer to the latest publications of data sheets, etc., for the most up-date specifications of the device.

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- Descriptions in this catalog regarding product characteristics and quality are based solely on discrete components. When using these components, be sure to check the specifications with the component in question mounted on the products.
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