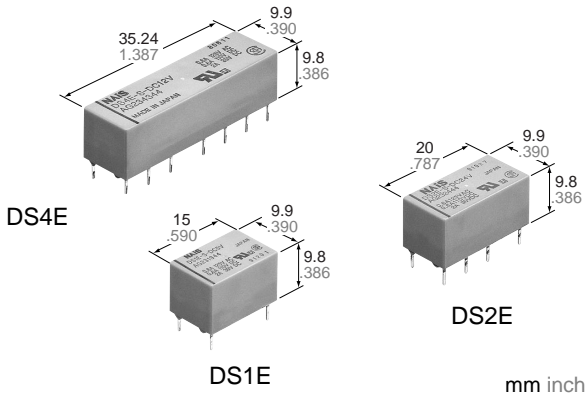


NAIS

HIGHLY SENSITIVE 1500 V FCC SURGE WITHSTANDING MINIATURE RELAY

DS-RELAYS



FEATURES

- High sensitivity: 200 mW pick-up power
100 mW pick-up power types available
- Latching types available
- High switching capacity: 60 W, 125 V A
- High breakdown voltage: 1,500 V FCC surge between open contacts
1,000 V AC between open contacts
- DIP-1C type can be used with 14 pin IC socket
2C type can be used with 16 pin IC socket,
4C type can be used with 2 sets of 14 pin IC sockets
- Gold-cap silver palladium types available for 2 Form C type
- Bifurcated contacts are standard

SPECIFICATIONS

Contact

| | | |
|--|------------------------------------|--|
| Arrangement | 1 Form C, 2 Form C, 4 Form C | |
| Initial contact resistance, max. (By voltage drop 6 V DC 1 A) | 50 mΩ | |
| Contact material | Gold-clad silver | |
| Rating (resistive) | Max. switching power | 60 W, 125 VA |
| | Max. switching voltage | 220 V DC, 250 V AC |
| | Max. switching current | 2 A DC, AC |
| | Max. carrying current | 3 A DC, AC |
| Expected life (min. operations) | Mechanical (at 600 cpm) | 10 ⁸ (1 Form C 2 coil latching type: 10 ⁷) |
| | Electrical 2 A 30 VDC resistive | 5×10 ⁵ |

* Gold capped silver palladium contact also available for 2 Form C 10⁷ operations at 0.1 A 50 V DC resistive

Coil (polarized) (at 20°C 68°F)

| M type | Single side stable | Minimum operating power | Approx. 200 mW | |
|-----------------|--------------------|-----------------------------|-----------------------------|-------------------------|
| | | Nominal operating power | Approx. 400 mW | |
| 1 coil latching | Single side stable | Minimum set and reset power | Approx. 90 mW | |
| | | Nominal set and reset power | Approx. 180 mW | |
| 2 coil latching | Single side stable | Minimum set and reset power | Approx. 180 mW | |
| | | Nominal set and reset power | Approx. 360 mW | |
| S type | Single side stable | Minimum operating power | Approx. 100 mW (128 mW)* | |
| | | Nominal operating power | Approx. 200 mW | |
| | 1 coil latching | Single side stable | Minimum set and reset power | Approx. 45 mW (58 mW)* |
| | | | Nominal set and reset power | Approx. 90 mW |
| | 2 coil latching | Single side stable | Minimum set and reset power | Approx. 90 mW (115 mW)* |
| | | | Nominal set and reset power | Approx. 180 mW |

* For 1 Form C high sensitive types.

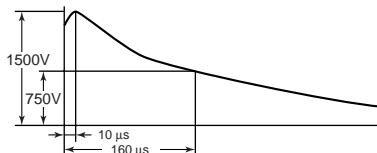
Characteristics (at 20°C 68°F)

| | | | |
|--|--|--|---------------|
| Max. operating speed | 20 cpm at rated load 50 cps at low level load | | |
| Initial insulation resistance*1 | Min. 100 MΩ (at 500 V DC) | | |
| Initial break-down voltage*2 | Type of relay | (DS1-S type) | (Other types) |
| | Between open contacts | 500 Vrms | 1,000 Vrms |
| | Between contacts sets | — | 1,000 Vrms |
| | Between contacts and coil | 1,000 Vrms | 1,500 Vrms |
| FCC surge voltage between contacts and coil | 1,500 V (Expect DS1-S type) | | |
| Operate time*3 (at nominal voltage) | Approx. 3 ms | | |
| Release time (without diode)*3 (at nominal voltage) | Approx. 2 ms | | |
| Set time*3 (at nominal voltage) | Approx. 3 ms | | |
| Reset time*3 (at nominal voltage) | Approx. 3 ms | | |
| Temperature rise (at nominal voltage, Contact current: 2A) | Max. 65°C | | |
| Shock resistance | Functional*4 | 1C, 2C:Min. 490 m/s ² {50 G} 4C:Min. 294 m/s ² {30 G} | |
| | Destructive*5 | Min. 980 m/s ² {100 G} | |
| Vibration resistance | Functional*6 | 10 to 55 Hz at double amplitude of 3.3 mm | |
| | Destructive | 10 to 55 Hz at double amplitude of 5 mm | |
| Conditions for operation, transport and storage*7 (Not freezing and condensing at low temperature) | Ambient temp. | -40°C to +70°C -40°F to +158°F | |
| | Humidity | 5 to 85% R.H. | |
| Unit weight | 1 Form C | Approx. 3.2g .11oz | |
| | 2 Form C | Approx. 4g .14oz | |
| | 4 Form C | Approx. 7g .25oz | |

Remarks

- * Specifications will vary with foreign standards certification ratings.
- *1 Measurement at same location as "Initial breakdown voltage" section
- *2 Detection current: 10 mA
- *3 Excluding contact bounce time
- *4 Half-wave pulse of sine wave: 11ms; detection time: 10μs
- *5 Half-wave pulse of sine wave: 6ms
- *6 Detection time: 10μs
- *7 Refer to 5. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT (Page 61)

FCC (Federal Communication Commission) requests following standard as Breakdown Voltage specification.



TYPICAL APPLICATIONS ORDERING INFORMATION

- Telecommunication equipment
- Office equipment
- Computer peripherals
- Security equipment
- Measuring instrumentation

Ex DS 2 E — M L2 — DC 48 V — R *

| Contact arrangement | Classification of type | Sensitivity | Operating function | Coil voltage |
|---|------------------------|--|--|----------------------------------|
| 1: 1 Form C 2: 2 Form C 4: 4 Form C | E: Amber sealed type | M: 400 mW nominal operating power S: 200 mW nominal operating power | Nil: Single side stable L: 1 coil latching L2: 2 coil latching | DC 1.5, 3, 5, 6, 9, 12, 24, 48 V |

*Reverse polarity types available (add suffix-R). Standard packing: Carton: 50 pcs.; Case: 500 pcs.

TYPES

Single side stable

| | Nominal Voltage, V DC | Part No. | | |
|-----------------------|-----------------------|---------------|---------------|---------------|
| | | 1 Form C | 2 Form C | 4 Form C |
| M (400 mW) type | 1.5 | DS1E-M-DC1.5V | DS2E-M-DC1.5V | DS4E-M-DC1.5V |
| | 3 | DS1E-M-DC3V | DS2E-M-DC3V | DS4E-M-DC3V |
| | 5 | DS1E-M-DC5V | DS2E-M-DC5V | DS4E-M-DC5V |
| | 6 | DS1E-M-DC6V | DS2E-M-DC6V | DS4E-M-DC6V |
| | 9 | DS1E-M-DC9V | DS2E-M-DC9V | DS4E-M-DC9V |
| | 12 | DS1E-M-DC12V | DS2E-M-DC12V | DS4E-M-DC12V |
| | 24 | DS1E-M-DC24V | DS2E-M-DC24V | DS4E-M-DC24V |
| S (200 mW) type | 1.5 | DS1E-S-DC1.5V | DS2E-S-DC1.5V | DS4E-S-DC1.5V |
| | 3 | DS1E-S-DC3V | DS2E-S-DC3V | DS4E-S-DC3V |
| | 5 | DS1E-S-DC5V | DS2E-S-DC5V | DS4E-S-DC5V |
| | 6 | DS1E-S-DC6V | DS2E-S-DC6V | DS4E-S-DC6V |
| | 9 | DS1E-S-DC9V | DS2E-S-DC9V | DS4E-S-DC9V |
| | 12 | DS1E-S-DC12V | DS2E-S-DC12V | DS4E-S-DC12V |
| | 24 | DS1E-S-DC24V | DS2E-S-DC24V | DS4E-S-DC24V |
| | 48 | DS1E-S-DC48V | DS2E-S-DC48V | DS4E-S-DC48V |

1 coil latching

| | Nominal Voltage, V DC | Part No. | | |
|-----------------------|-----------------------|----------------|----------------|----------------|
| | | 1 Form C | 2 Form C | 4 Form C |
| M (180 mW) type | 1.5 | DS1E-ML-DC1.5V | DS2E-ML-DC1.5V | DS4E-ML-DC1.5V |
| | 3 | DS1E-ML-DC3V | DS2E-ML-DC3V | DS4E-ML-DC3V |
| | 5 | DS1E-ML-DC5V | DS2E-ML-DC5V | DS4E-ML-DC5V |
| | 6 | DS1E-ML-DC6V | DS2E-ML-DC6V | DS4E-ML-DC6V |
| | 9 | DS1E-ML-DC9V | DS2E-ML-DC9V | DS4E-ML-DC9V |
| | 12 | DS1E-ML-DC12V | DS2E-ML-DC12V | DS4E-ML-DC12V |
| | 24 | DS1E-ML-DC24V | DS2E-ML-DC24V | DS4E-ML-DC24V |
| S (90 mW) type | 1.5 | DS1E-SL-DC1.5V | DS2E-SL-DC1.5V | DS4E-SL-DC1.5V |
| | 3 | DS1E-SL-DC3V | DS2E-SL-DC3V | DS4E-SL-DC3V |
| | 5 | DS1E-SL-DC5V | DS2E-SL-DC5V | DS4E-SL-DC5V |
| | 6 | DS1E-SL-DC6V | DS2E-SL-DC6V | DS4E-SL-DC6V |
| | 9 | DS1E-SL-DC9V | DS2E-SL-DC9V | DS4E-SL-DC9V |
| | 12 | DS1E-SL-DC12V | DS2E-SL-DC12V | DS4E-SL-DC12V |
| | 24 | DS1E-SL-DC24V | DS2E-SL-DC24V | DS4E-SL-DC24V |
| | 48 | DS1E-SL-DC48V | DS2E-SL-DC48V | DS4E-SL-DC48V |

2 coil latching

| | Nominal Voltage, V DC | Part No. | | |
|-----------------------|-----------------------|-----------------|-----------------|-----------------|
| | | 1 Form C | 2 Form C | 4 Form C |
| M (360 mW) type | 1.5 | DS1E-ML2-DC1.5V | DS2E-ML2-DC1.5V | DS4E-ML2-DC1.5V |
| | 3 | DS1E-ML2-DC3V | DS2E-ML2-DC3V | DS4E-ML2-DC3V |
| | 5 | DS1E-ML2-DC5V | DS2E-ML2-DC5V | DS4E-ML2-DC5V |
| | 6 | DS1E-ML2-DC6V | DS2E-ML2-DC6V | DS4E-ML2-DC6V |
| | 9 | DS1E-ML2-DC9V | DS2E-ML2-DC9V | DS4E-ML2-DC9V |
| | 12 | DS1E-ML2-DC12V | DS2E-ML2-DC12V | DS4E-ML2-DC12V |
| | 24 | DS1E-ML2-DC24V | DS2E-ML2-DC24V | DS4E-ML2-DC24V |
| S (180 mW) type | 1.5 | DS1E-SL2-DC1.5V | DS2E-SL2-DC1.5V | DS4E-SL2-DC1.5V |
| | 3 | DS1E-SL2-DC3V | DS2E-SL2-DC3V | DS4E-SL2-DC3V |
| | 5 | DS1E-SL2-DC5V | DS2E-SL2-DC5V | DS4E-SL2-DC5V |
| | 6 | DS1E-SL2-DC6V | DS2E-SL2-DC6V | DS4E-SL2-DC6V |
| | 9 | DS1E-SL2-DC9V | DS2E-SL2-DC9V | DS4E-SL2-DC9V |
| | 12 | DS1E-SL2-DC12V | DS2E-SL2-DC12V | DS4E-SL2-DC12V |
| | 24 | DS1E-SL2-DC24V | DS2E-SL2-DC24V | DS4E-SL2-DC24V |
| | 48 | DS1E-SL2-DC48V | DS2E-SL2-DC48V | DS4E-SL2-DC48V |

Notes:

1. Reverse polarity types available (add suffix-R).
2. Standard packing: carton: 50 pcs.; case: 500 pcs.

COIL DATA (at 20°C 68°F)**Single side stable**

| | Nominal voltage, V DC | Pick-up voltage, V DC (max.) | | Drop-out voltage, V DC (min.) | Coil resistance, Ω ($\pm 10\%$) | Maximum allowable, V DC (at 50°C 122°F) | |
|--------|-----------------------|------------------------------|-------------|-------------------------------|--|---|-------------|
| | | 1 Form C | 2, 4 Form C | | | 1 Form C | 2, 4 Form C |
| M type | 1.5 | 1.05 | 1.05 | 0.15 | 5.63 | 1.8 | 2.25 |
| | 3 | 2.1 | 2.1 | 0.3 | 22.5 | 3.6 | 4.5 |
| | 5 | 3.5 | 3.5 | 0.5 | 62.5 | 6 | 7.5 |
| | 6 | 4.2 | 4.2 | 0.6 | 90 | 7.2 | 9 |
| | 9 | 6.3 | 6.3 | 0.9 | 203 | 10.8 | 13.5 |
| | 12 | 8.4 | 8.4 | 1.2 | 360 | 14.4 | 18 |
| | 24 | 16.8 | 16.8 | 2.4 | 1440 | 28.8 | 36 |
| S type | 1.5 | 1.2 | 1.05 | 0.15 | 11.3 | 2.4 | 3 |
| | 3 | 2.4 | 2.1 | 0.3 | 45 | 4.8 | 6 |
| | 5 | 4.0 | 3.5 | 0.5 | 125 | 8.0 | 10 |
| | 6 | 4.8 | 4.2 | 0.6 | 180 | 9.6 | 12 |
| | 9 | 7.2 | 6.3 | 0.9 | 405 | 14.4 | 18 |
| | 12 | 9.6 | 8.4 | 1.2 | 720 | 19.2 | 24 |
| | 24 | 19.2 | 16.8 | 2.4 | 2880 | 38.4 | 48 |
| | 48 | 38.6 | 33.6 | 4.8 | 11520 | 76.8 | 96 |

1 coil latching

| | Nominal voltage, V DC | Reset Set, V DC (max.) | | Coil resistance, Ω ($\pm 10\%$) | Maximum allowable, V DC (at 50°C 122°F) | |
|--------|-----------------------|------------------------|-------------|--|---|-------------|
| | | 1 Form C | 2, 4 Form C | | 1 Form C | 2, 4 Form C |
| M type | 1.5 | 1.05 | 1.05 | 12.5 | 1.8 | 2.25 |
| | 3 | 2.1 | 2.1 | 50 | 3.6 | 4.5 |
| | 5 | 3.5 | 3.5 | 139 | 6 | 7.5 |
| | 6 | 4.2 | 4.2 | 200 | 7.2 | 9 |
| | 9 | 6.3 | 6.3 | 450 | 10.8 | 13.5 |
| | 12 | 8.4 | 8.4 | 800 | 14.4 | 18 |
| | 24 | 16.8 | 16.8 | 3200 | 28.8 | 36 |
| S type | 1.5 | 1.2 | 1.05 | 25 | 2.4 | 3 |
| | 3 | 2.4 | 2.1 | 100 | 4.8 | 6 |
| | 5 | 4.0 | 3.5 | 278 | 8.0 | 10 |
| | 6 | 4.8 | 4.2 | 400 | 9.6 | 12 |
| | 9 | 7.2 | 6.3 | 900 | 14.4 | 18 |
| | 12 | 9.6 | 8.4 | 1600 | 19.2 | 24 |
| | 24 | 19.2 | 16.8 | 6400 | 38.4 | 48 |
| | 48 | 38.4 | 33.6 | 25600 | 76.8 | 96 |

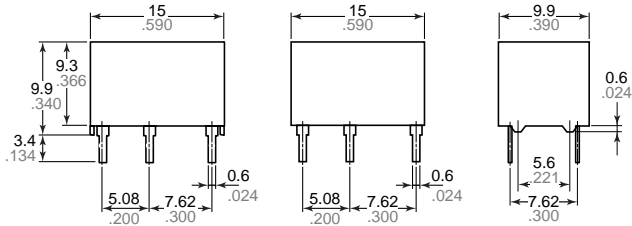
2 coil latching

| | Nominal voltage, V DC | Reset Set, V DC (max.) | | Coil resistance, Ω ($\pm 10\%$) | | Maximum allowable, V DC (at 50°C 122°F) | |
|--------|-----------------------|------------------------|-------------|--|---------|---|-------------|
| | | 1 Form C | 2, 4 Form C | Coil I | Coil II | 1 Form C | 2, 4 Form C |
| M type | 1.5 | 1.05 | 1.05 | 6.25 | | 1.8 | 2.25 |
| | 3 | 2.1 | 2.1 | 25 | | 3.6 | 4.5 |
| | 5 | 3.5 | 3.5 | 69.4 | | 6 | 7.5 |
| | 6 | 4.2 | 4.2 | 100 | | 7.2 | 9 |
| | 9 | 6.3 | 6.3 | 225 | | 10.8 | 13.5 |
| | 12 | 8.4 | 8.4 | 400 | | 14.4 | 18 |
| | 24 | 16.8 | 16.8 | 1600 | | 28.8 | 36 |
| S type | 1.5 | 1.2 | 1.05 | 12.5 | | 2.4 | 3 |
| | 3 | 2.4 | 2.1 | 50 | | 4.8 | 6 |
| | 5 | 4.0 | 3.5 | 139 | | 8.0 | 10 |
| | 6 | 4.8 | 4.2 | 200 | | 9.6 | 12 |
| | 9 | 7.2 | 6.3 | 450 | | 14.4 | 18 |
| | 12 | 9.6 | 8.4 | 800 | | 19.2 | 24 |
| | 24 | 19.2 | 16.8 | 3200 | | 38.4 | 48 |
| | 48 | 38.4 | 33.6 | 12800 | | 76.8 | 96 |

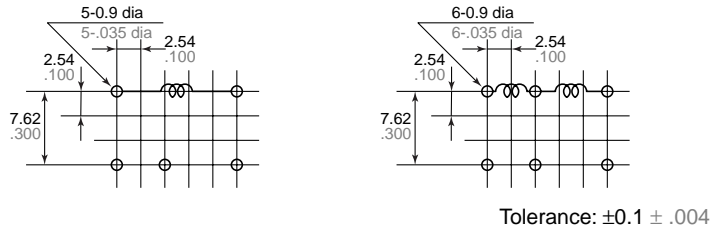
DIMENSIONS

1 Form C

Single side stable, 1 coil latching, 2 coil latching

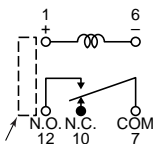


PC board pattern (Copper-side view)
Single side stable, 1 coil latching 2 coil latching



General tolerance: $\pm 0.3 \pm .012$

Schematic (Bottom view)
Single side stable
Deenergized condition



• A polarity bar showing the relay direction can replace the schematic.

1 coil latching

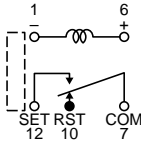


Diagram shows the "reset" position when terminals 1 and 6 are energized. Energize with reverse polarity to transfer contacts.

2 coil latching

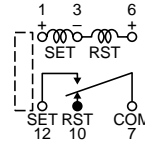
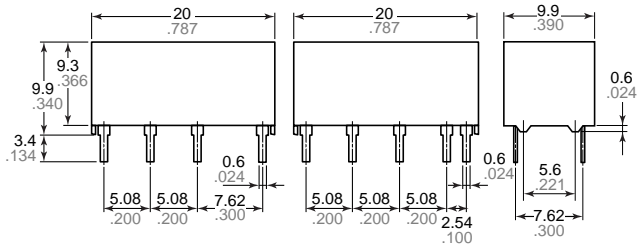


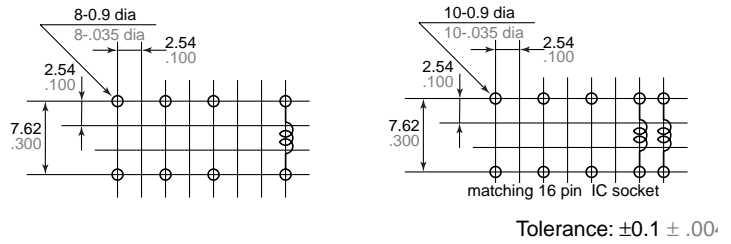
Diagram shows the "reset" position when terminals 3 and 6 are energized. Energize terminals 1 and 3 to transfer contacts.

2 Form C

Single side stable, 1 coil latching, 2 coil latching

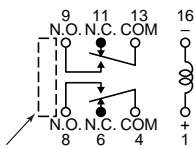


PC board pattern (Copper-side view)
Single side stable, 1 coil latching 2 coil latching



General tolerance: $\pm 0.3 \pm .012$

Schematic (Bottom view)
Single side stable
Deenergized condition



• A polarity bar showing the relay direction can replace the schematic.

1 coil latching

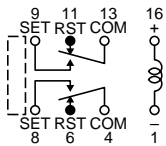


Diagram shows the "reset" position when terminals 1 and 16 are energized. Energize with reverse polarity to transfer contacts.

2 coil latching

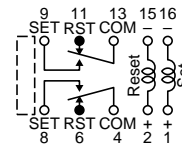
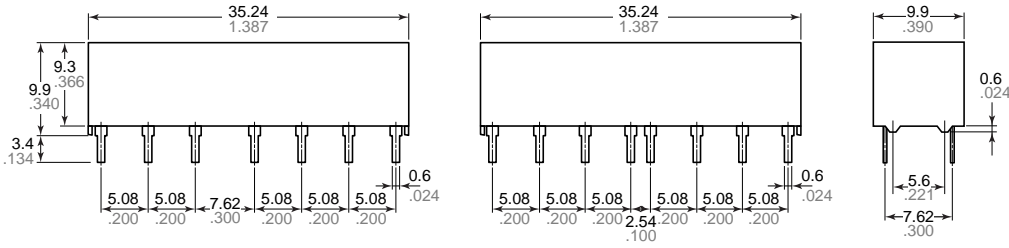


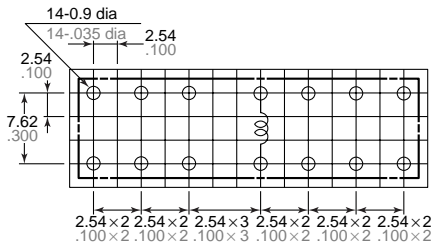
Diagram shows the "reset" position when terminals 2 and 15 are energized. Energize terminals 1 and 16 to transfer contacts.

Single side stable, 1 coil latching, 2 coil latching

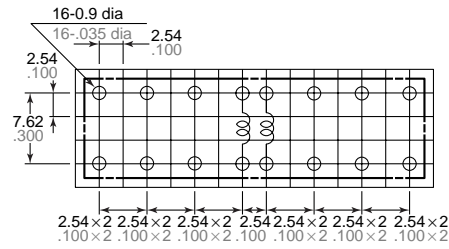


General tolerance: $\pm 0.3 \pm .012$

PC board pattern (Copper-side view)
Single side stable, 1 coil latching

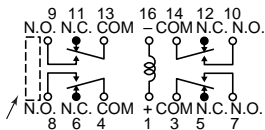


2 coil latching



Tolerance: $\pm 0.1 \pm .004$

Schematic (Bottom view)
Single side stable
Deenergized condition



• A polarity bar showing the relay direction can replace the schematic.

1 coil latching

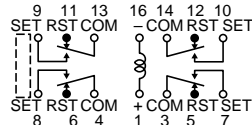


Diagram shows the "reset" position when terminals 1 and 16 are energized.
Energize with reverse polarity to transfer contacts.

2 coil latching

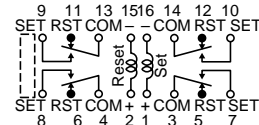
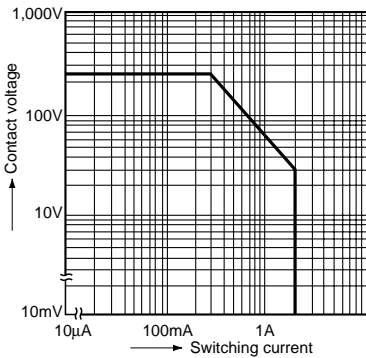


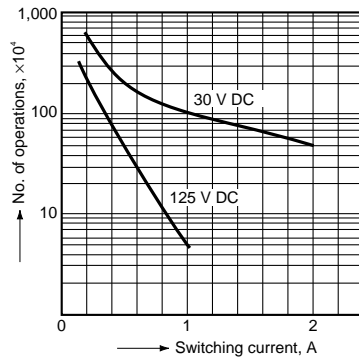
Diagram shows the "reset" position when terminals 2 and 15 are energized.
Energize terminals 1 and 16 to transfer contacts.

REFERENCE DATA

1. Maximum switching capacity

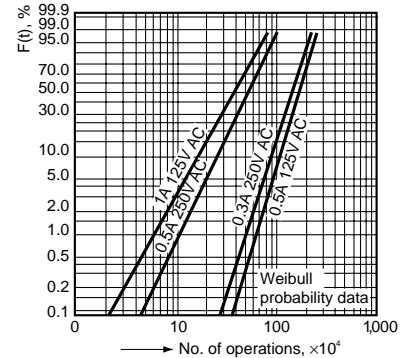


2. Life curve (Resistive load)



3. Contact reliability for AC loads

Sample: DS2E-M-DC24V 10 pcs.
Cycle rate: 20 cpm.
Detection level: 200 mΩ

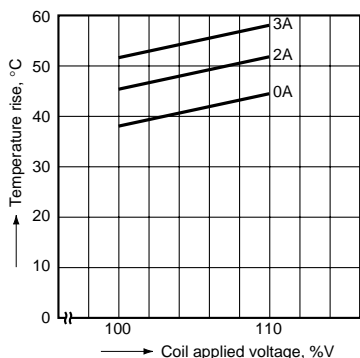


4-(1). Coil temperature rise

(2 Form C single side stable type)

Point measured: Inside the coil

Ambient temperature: 18° to 19°C 64° to 66°F

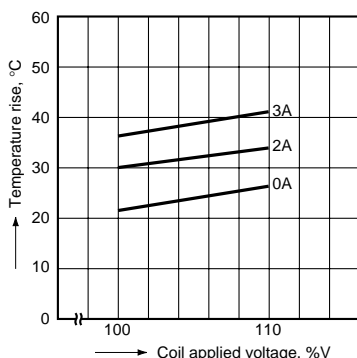


4-(2). Coil temperature rise

(4 Form C single side stable type)

Point measured: Inside the coil

Ambient temperature: 17° to 18°C 63° to 64°F

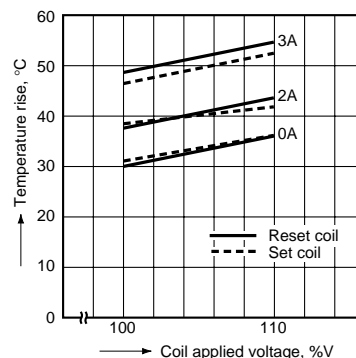


4-(3). Coil temperature rise

(2 Form C 2 coil latching type)

Point measured: Inside the coil

Ambient temperature: 20° to 21°C 68° to 70°F

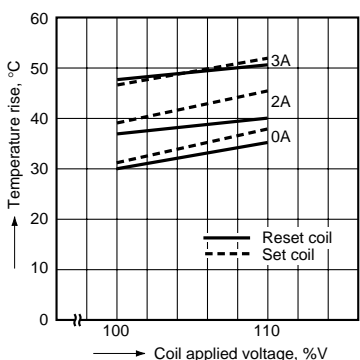


4-(4). Coil temperature rise

(4 Form C 2 coil latching type)

Point measured: Inside the coil

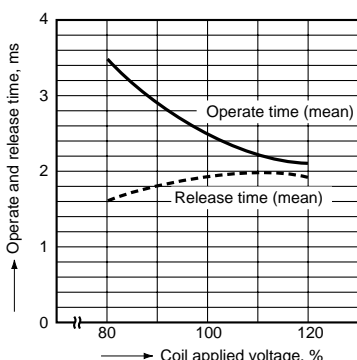
Ambient temperature: 20°C 68°F



5. Operate and release time characteristics

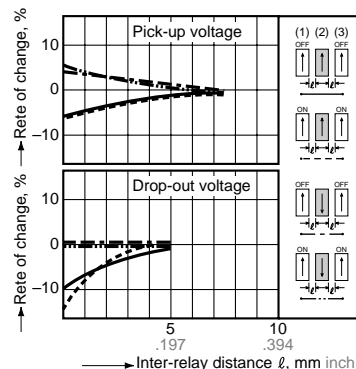
(2 Form C single side stable type)

Test condition: Without diode connected to coil in parallel



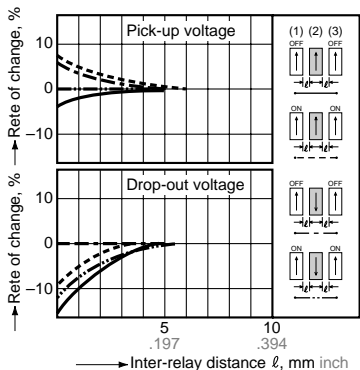
6-(1). Influence of adjacent mounting

(1 Form C)



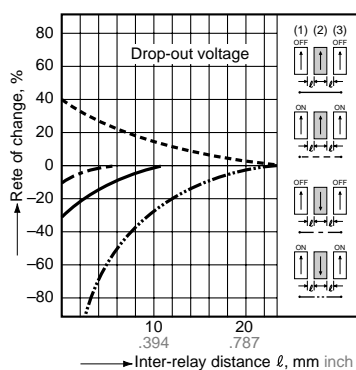
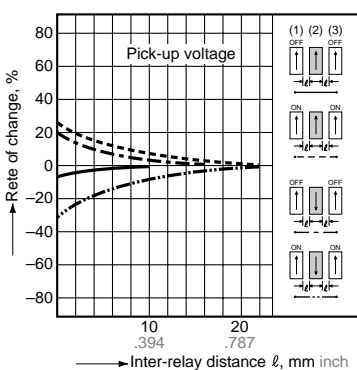
6-(2). Influence of adjacent mounting

(2 Form C)



6-(3). Influence of adjacent mounting

(4 Form C)



For Cautions for Use, see Relay Technical Information