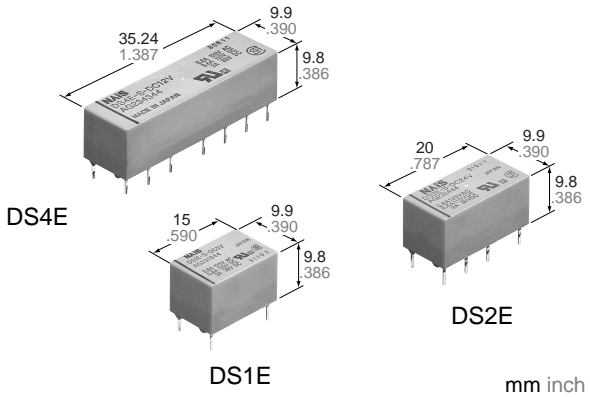


# NAIS

## 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 <sup>8</sup> (1 Form C 2 coil latching type: 10 <sup>7</sup> )
	Electrical 2 A 30 VDC resistive	5×10 <sup>5</sup>

\* Gold capped silver palladium contact also available for 2 Form C 10<sup>7</sup> 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	Approx. 400 mW
M type	1 coil latching	Minimum set and reset power	Approx. 90 mW
		Nominal set and reset power	Approx. 180 mW
	2 coil latching	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	Minimum set and reset power	Approx. 45 mW (58 mW)*
		Nominal set and reset power	Approx. 90 mW
	2 coil latching	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.

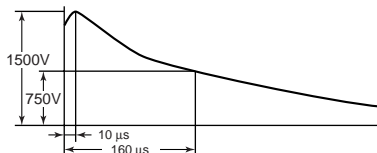
#### Characteristics (at 20°C 68°F)

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 <sup>2</sup> {50 G} 4C:Min. 294 m/s <sup>2</sup> {30 G}	
	Destructive*5	Min. 980 m/s <sup>2</sup> {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, $\Omega$ ( $\pm 10\%$ )	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, $\Omega$ ( $\pm 10\%$ )	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

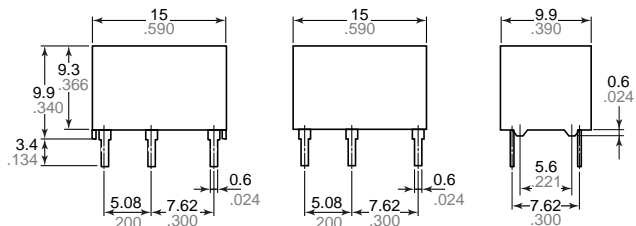
**2 coil latching**

	Nominal voltage, V DC	Reset Set, V DC (max.)		Coil resistance, $\Omega$ ( $\pm 10\%$ )		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

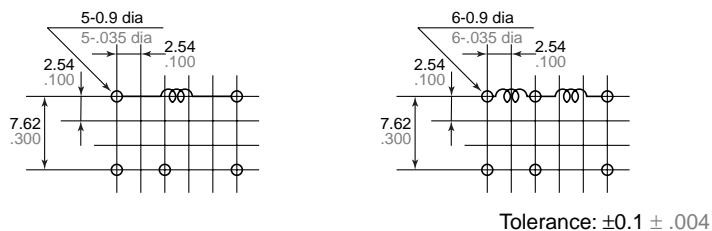
## 1 Form C

Single side stable, 1 coil latching, 2 coil latching



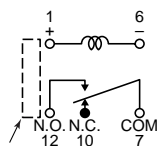
General tolerance:  $\pm 0.3 \pm .012$

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



Schematic (Bottom view)

Single side stable  
Deenergized condition



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

1 coil latching

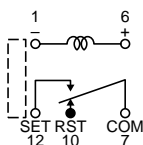


Diagram shows the "reset" position when terminals 1 and 6 are energized.  
Energize with reverse polarity to transfer contacts.

2 coil latching

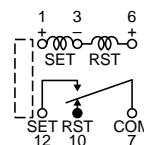
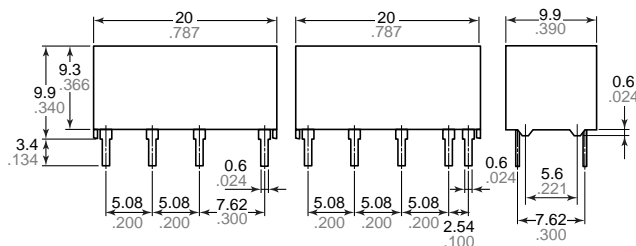


Diagram shows the "reset" position when terminals 3 and 6 are energized.  
Energize terminals 1 and 3 to transfer contacts.

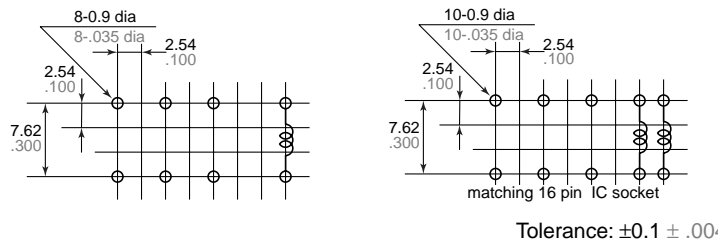
## 2 Form C

Single side stable, 1 coil latching, 2 coil latching



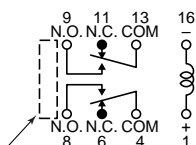
General tolerance:  $\pm 0.3 \pm .012$

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



Schematic (Bottom view)

Single side stable  
Deenergized condition



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

1 coil latching

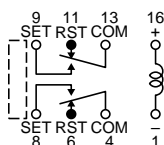


Diagram shows the "reset" position when terminals 1 and 16 are energized.  
Energize with reverse polarity to transfer contacts.

2 coil latching

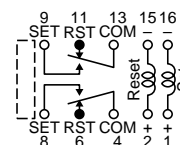
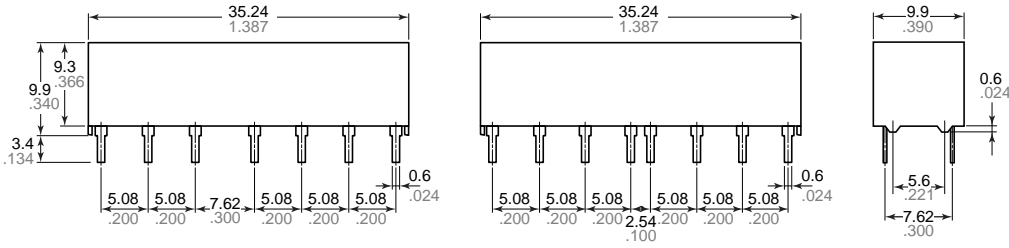


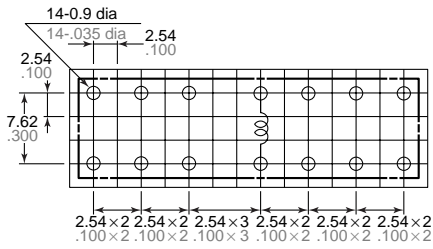
Diagram shows the "reset" position when terminals 2 and 15 are energized.  
Energize terminals 1 and 16 to transfer contacts.

Single side stable, 1 coil latching, 2 coil latching

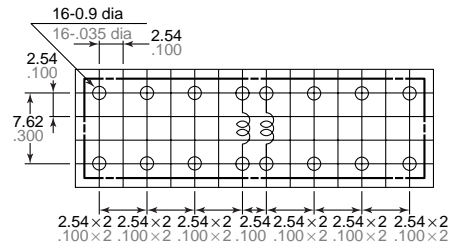


General tolerance:  $\pm 0.3 \pm 0.12$

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

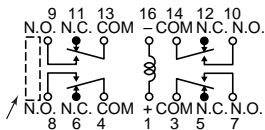


2 coil latching



Tolerance:  $\pm 0.1 \pm 0.004$

Schematic (Bottom view)  
Single side stable  
Deenergized condition



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

1 coil latching

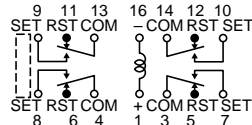


Diagram shows the "reset" position when terminals 1 and 16 are energized.  
Energize with reverse polarity to transfer contacts.

2 coil latching

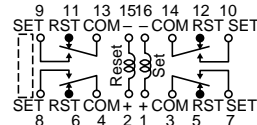
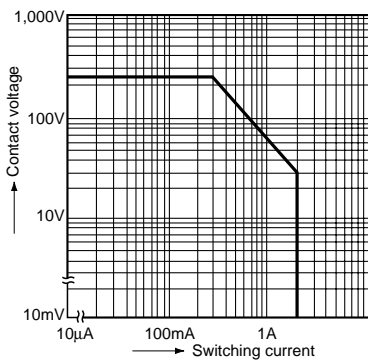


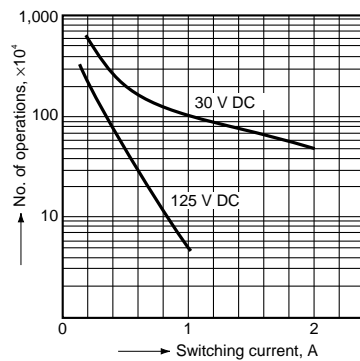
Diagram shows the "reset" position when terminals 2 and 15 are energized.  
Energize terminals 1 and 16 to transfer contacts.

## REFERENCE DATA

1. Maximum switching capacity

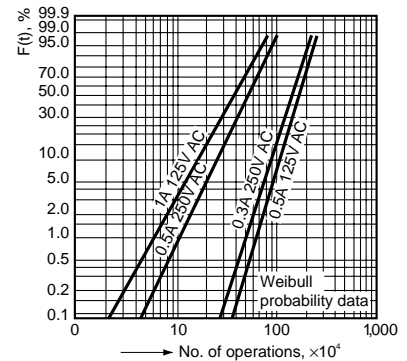


2. Life curve (Resistive load)



3. Contact reliability for AC loads

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

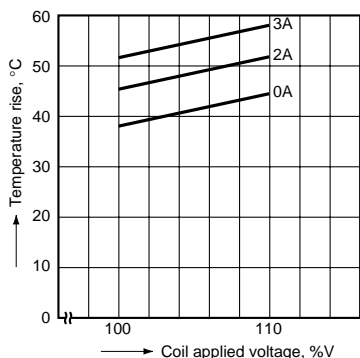


4-(1). Coil temperature rise

(2 Form C single side stable type)

Point measured: Inside the coil

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

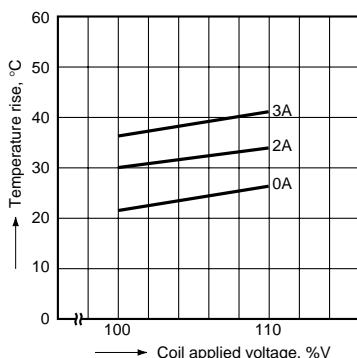


4-(2). Coil temperature rise

(4 Form C single side stable type)

Point measured: Inside the coil

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

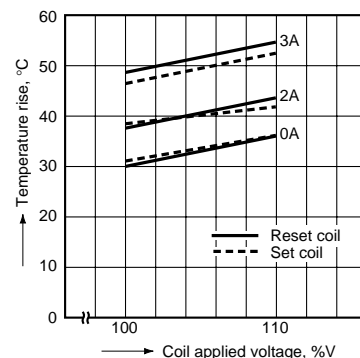


4-(3). Coil temperature rise

(2 Form C 2 coil latching type)

Point measured: Inside the coil

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

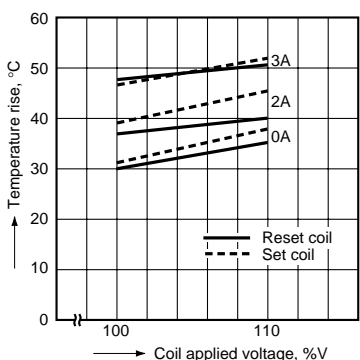


4-(4). Coil temperature rise

(4 Form C 2 coil latching type)

Point measured: Inside the coil

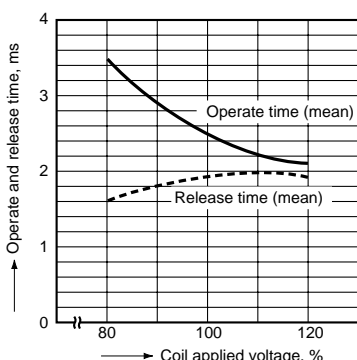
Ambient temperature: 20°C 68°F



5. Operate and release time characteristics

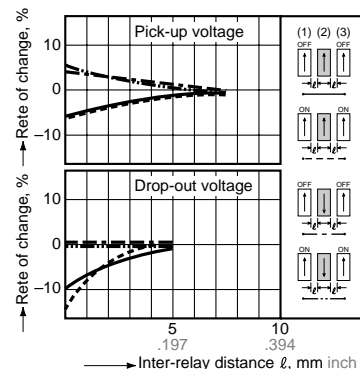
(2 Form C single side stable type)

Test condition: Without diode connected to coil in parallel



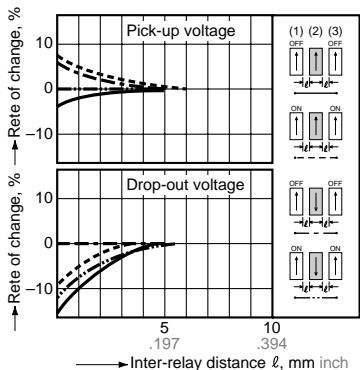
6-(1). Influence of adjacent mounting

(1 Form C)



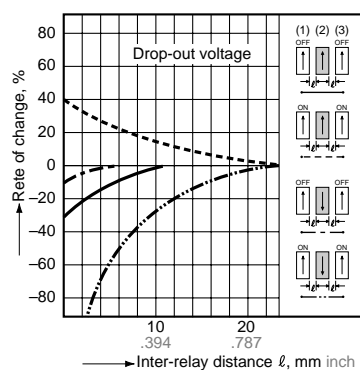
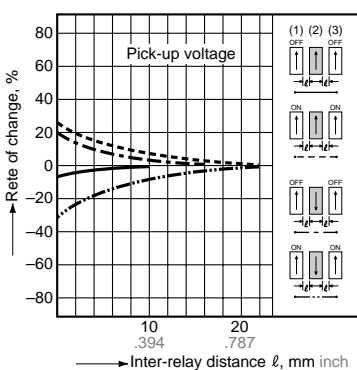
6-(2). Influence of adjacent mounting

(2 Form C)



6-(3). Influence of adjacent mounting

(4 Form C)



For Cautions for Use, see Relay Technical Information