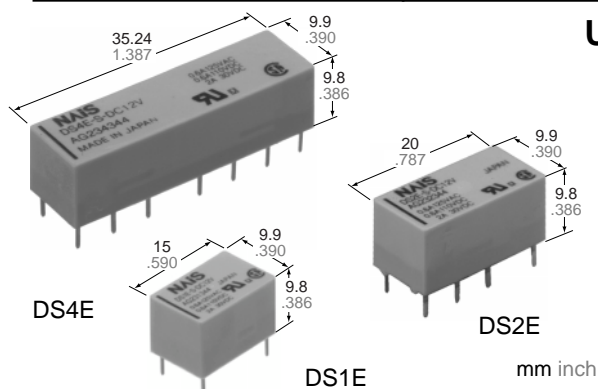


**NAIS****HIGHLY SENSITIVE 1500 V  
FCC SURGE WITHSTANDING  
MINIATURE RELAY****DS-RELAYS****UL File No.: E43149 CSA File No.: LR26550**

- 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
UL/CSA rating	0.6 A 125 V AC 0.6 A 110 V DC 2 A 30 V DC	
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 V DC 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 25°C 77°F)

"M" type	Single side stable	Minimum operating power	Approx. 200 mW
		Nominal operating power	Approx. 400 mW
1 coil latching	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.

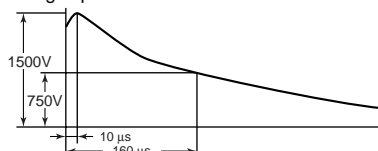
### Characteristics (at 25°C 77°F, 50% Relative humidity)

Max. operating speed	20 cpm at rated load 50 cps at low level load	
Initial insulation resistance* <sup>1</sup>	Min. 1,000 MΩ (at 500 V DC)	
Initial breakdown voltage* <sup>2</sup>	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 (Except DS1-S type)	
Operate time* <sup>3</sup> (at nominal voltage)	Approx. 10 ms (Approx. 3 ms)	
Release time (without diode)* <sup>3</sup> (at nominal voltage)	Approx. 5 ms (Approx. 2 ms)	
Set time* <sup>3</sup> (at nominal voltage)	Approx. 3 ms	
Reset time* <sup>3</sup> (at nominal voltage)	Approx. 3 ms	
Temperature rise (at nominal voltage, Contact current: 2A)	Max. 65°C	
Shock resistance	Functional* <sup>4</sup>	1C, 2C: Min. 490 m/s <sup>2</sup> {50 G} 4C: Min. 294 m/s <sup>2</sup> {30 G}
	Destructive* <sup>5</sup>	Min. 980 m/s <sup>2</sup> {100 G}
Vibration resistance	Functional* <sup>6</sup>	196 m/s <sup>2</sup> {20 G}, 10 to 55 Hz at double amplitude of 3.3 mm
	Destructive	294 m/s <sup>2</sup> {30 G}, 10 to 55 Hz at double amplitude of 5 mm
Conditions for operation, transport and storage * <sup>7</sup> (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. 3.2 g .11 oz
	2 Form C	Approx. 4 g .14 oz
	4 Form C	Approx. 7 g .25 oz

### Remarks

- \*<sup>1</sup> Measurement at same location as "Initial breakdown voltage" section  
\*<sup>2</sup> Detection current: 10mA  
\*<sup>3</sup> Excluding contact bounce time  
\*<sup>4</sup> Half-wave pulse of sine wave: 11ms, detection time: 10μs  
\*<sup>5</sup> Half-wave pulse of sine wave: 6ms  
\*<sup>6</sup> Detection time: 10μs  
\*<sup>7</sup> Refer to 5. Conditions for operation, transport and storage mentioned in AMBIENT ENVIRONMENT (Page 49)

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



# DS

## 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 at 20°C 68°F

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
	48	DS1E-M-DC48V	DS2E-M-DC48V	DS4E-M-DC48V
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
	48	DS1E-ML-DC48V	DS2E-ML-DC48V	DS4E-ML-DC48V
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
	48	DS1E-ML2-DC48V	DS2E-ML2-DC48V	DS4E-ML2-DC48V
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 voltage, 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
	48	33.6	33.6	4.8	5760	57.6	72
"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

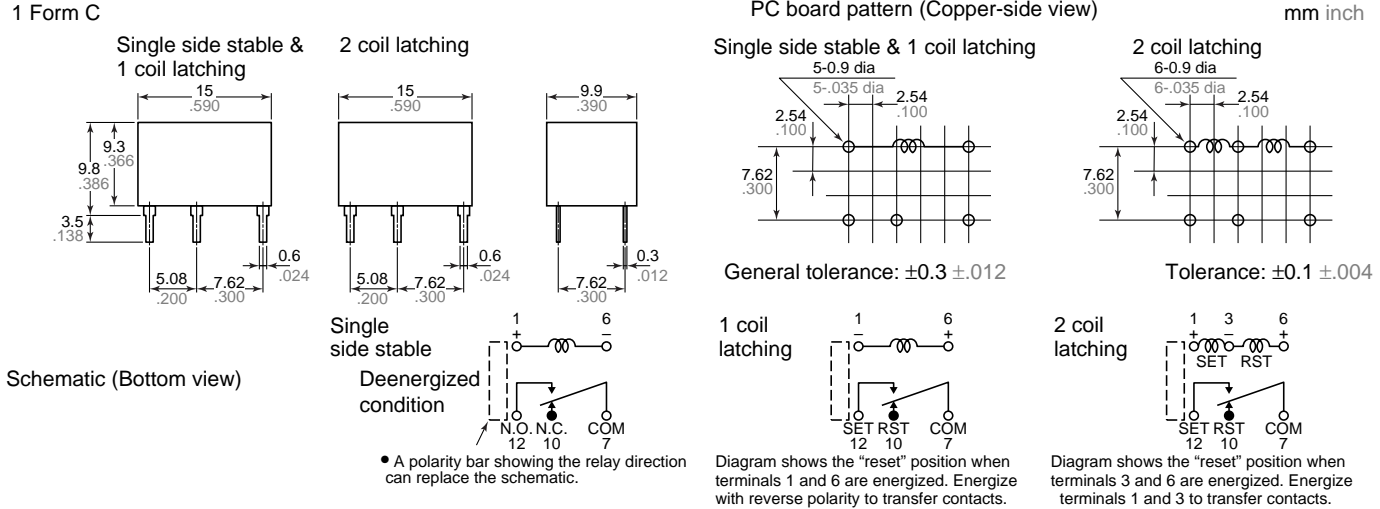
	Nominal voltage, V DC	Set/Reset, V DC (max.)		Coil resistance, $\Omega$ ( $\pm 10\%$ )	Maximum allowable voltage, V DC (at 50°C 122°F)	
		1 Form C	2, 4 Form C		1 Form C	2, 4 Form C
"M" type	1.5	1.05	1.05	12.5	1.8	2.25
	3	2.1	2.1	50	3.6	4.5
	5	3.5	3.5	139	6	7.5
	6	4.2	4.2	200	7.2	9
	9	6.3	6.3	450	10.8	13.5
	12	8.4	8.4	800	14.4	18
	24	16.8	16.8	3200	28.8	36
	48	33.6	33.6	12800	57.6	72
"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

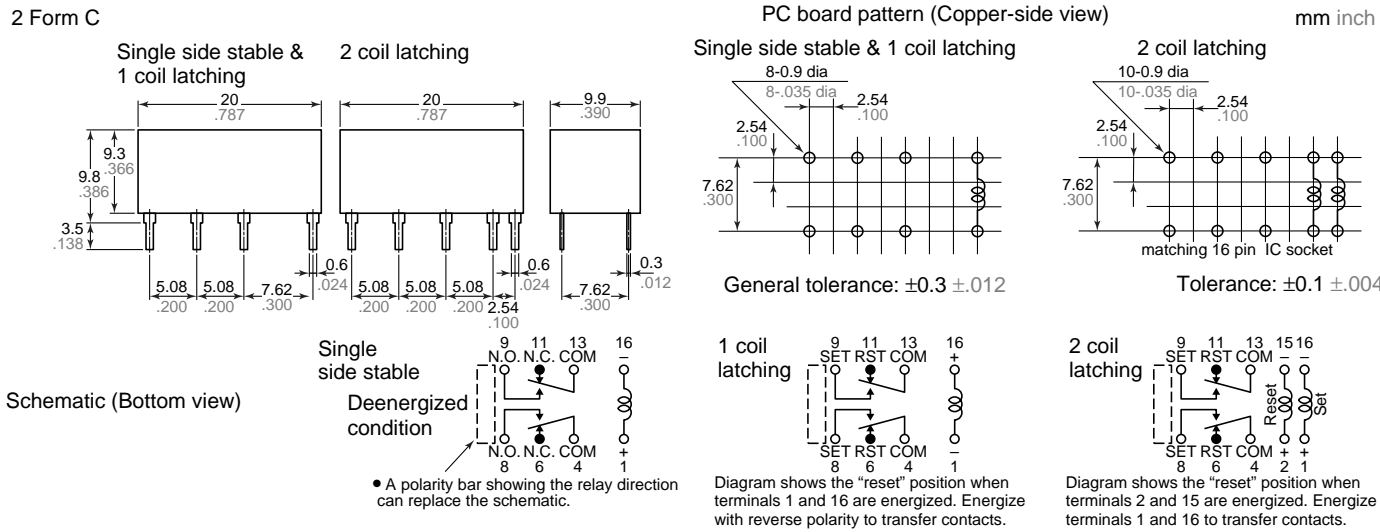
	Nominal voltage, V DC	Set/Reset, V DC (max.)		Coil resistance, $\Omega$ ( $\pm 10\%$ )		Maximum allowable voltage, V DC (at 50°C 122°F)	
		1 Form C	2, 4 Form C	Coil I	Coil II	1 Form C	2, 4 Form C
"M" type	1.5	1.05	1.05	6.25		1.8	2.25
	3	2.1	2.1	25		3.6	4.5
	5	3.5	3.5	69.4		6	7.5
	6	4.2	4.2	100		7.2	9
	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
	48	33.6	33.6	6400		57.6	72
"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**

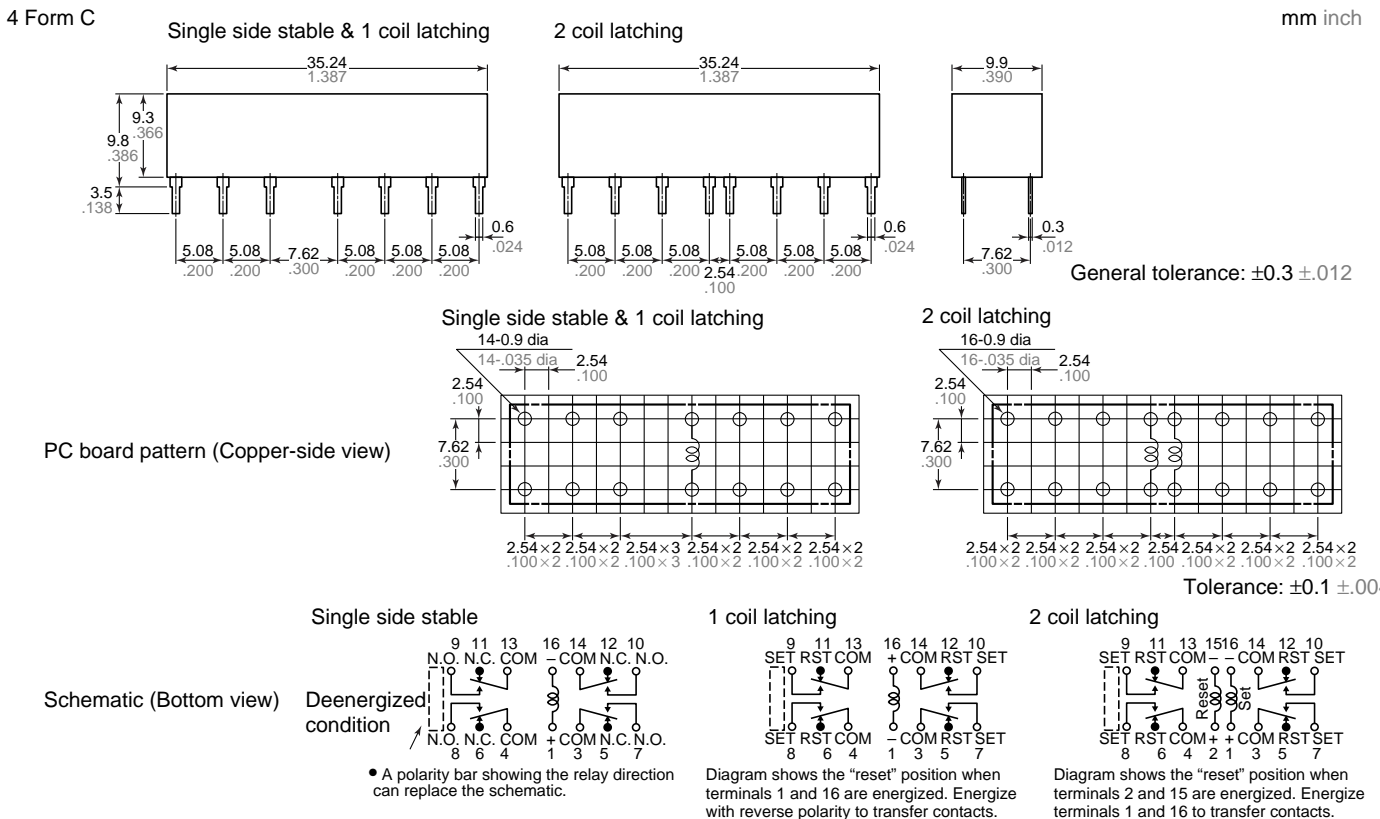
1 Form C



2 Form C

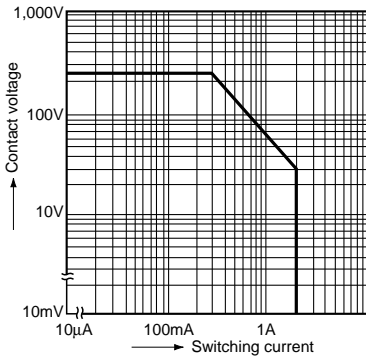


4 Form C

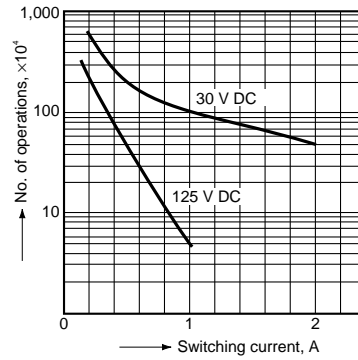


# REFERENCE DATA

## 1. Maximum switching capacity



## 2. Life curve (Resistive load)

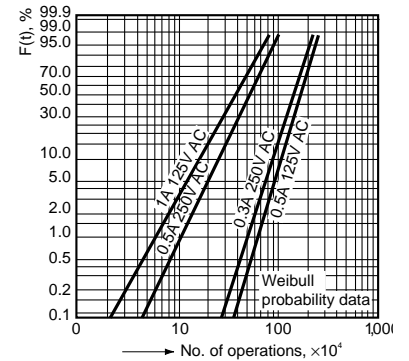


## 3. Contact reliability for AC loads

Sample: DS2E-M-DC24V 10 pcs.

Cycle rate: 20 cpm.

Detection level: 200 mW

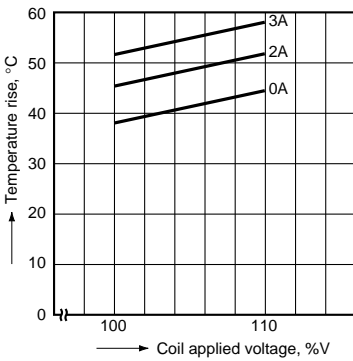


## 4-(1). Coil temperature rise

(2 Form C single side stable type)

Point measured: Inside the coil

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

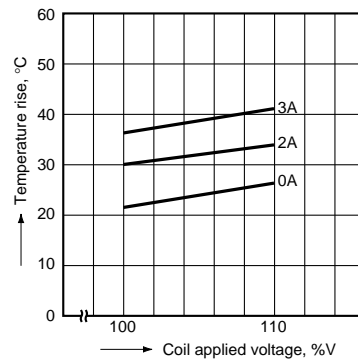


## 4-(2). Coil temperature rise

(4 Form C single side stable type)

Point measured: Inside the coil

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

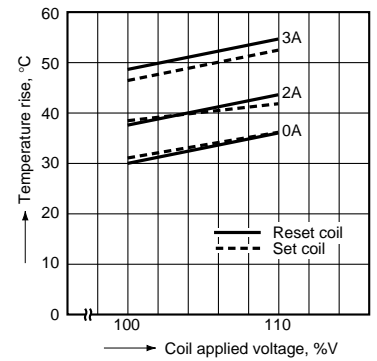


## 4-(3). Coil temperature rise

(2 Form C 2 coil latching type)

Point measured: Inside the coil

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

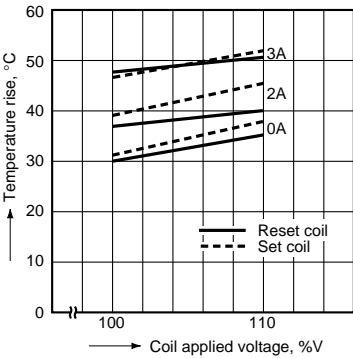


## 4-(4). Coil temperature rise

(4 Form C 2 coil latching type)

Point measured: Inside the coil

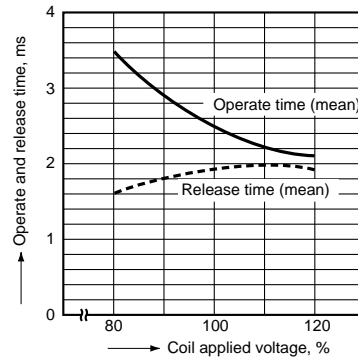
Ambient temperature: 20°C 68°F



## 5. Operate and release time characteristics

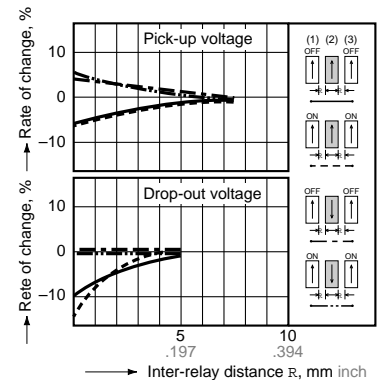
(2 Form C single side stable type)

Test condition: Without diode connected to coil in parallel



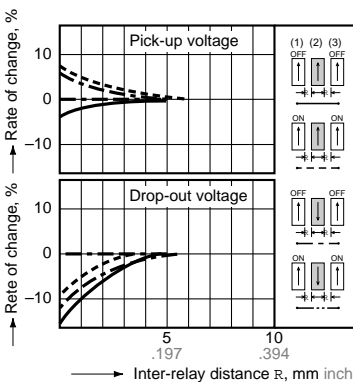
## 6-(1). Influence of adjacent mounting

(1 Form C)



## 6-(2). Influence of adjacent mounting

(2 Form C)



## 6-(3). Influence of adjacent mounting

(4 Form C)

