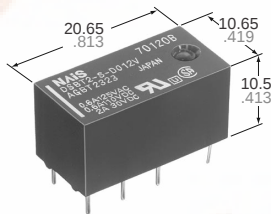


# NAIS

## 4,000 V BREAKDOWN VOLTAGE DS RELAYS

# DS-BT RELAYS



mm inch

## FEATURES

- 4,000 V breakdown voltage
- Reinforced insulation between coil and contacts
- Surge voltage withstand: 1500 V FCC Parts 68

## SPECIFICATIONS

### Contact

| Arrangement                                                      |                            | 2 Form C           | 2 Form D        |
|------------------------------------------------------------------|----------------------------|--------------------|-----------------|
| Initial contact resistance, max.<br>(By voltage drop 6 V DC 1 A) |                            | 50 mΩ              |                 |
| Contact material                                                 |                            | Gold-clad silver   |                 |
| Rating<br>(resistive load)                                       | Nominal switching capacity | 2 A 30 V DC        | 1 A 30 V DC     |
|                                                                  | Max. switching power       | 60 W, 125 VA       | 30 W, 62.5 VA   |
|                                                                  | Max. switching voltage     | 220 V DC, 250 V AC |                 |
|                                                                  | Max. switching current     | 2 A                | 1 A             |
|                                                                  | Min. switching capacity**1 | 10 μA 10 mV DC     |                 |
| Electrical life (min. op.)                                       | Mechanical (at 180 cpm)    | 2×10 <sup>7</sup>  | 10 <sup>6</sup> |
|                                                                  | Electrical (at 20 cpm)     | 2×10 <sup>5</sup>  |                 |

\*\*1 This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

### Coil

| Arrangement             | 2 Form C | 2 Form D |
|-------------------------|----------|----------|
| Nominal operating power | 360 mW   | 540 mW   |

### Remarks

\* Specifications will vary with foreign standards certification ratings.

\*1 Measurement at same location as "Initial breakdown voltage" section

\*2 Detection current: 10mA

\*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)

### Characteristics

| Arrangement                                                                                        |                           | 2 Form C                                  | 2 Form D                          |
|----------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------------|-----------------------------------|
| Max. operating speed                                                                               |                           | 60 cpm at rated load                      |                                   |
| Initial insulation resistance*1                                                                    |                           | Min. 100 MΩ (at 500 V DC)                 |                                   |
| Initial break-down voltage*2                                                                       | Between open contacts     | 750 Vrms for 1 min.                       | 500 Vrms for 1 min.               |
|                                                                                                    | Between contacts and coil | 4,000 Vrms for 1 min.                     |                                   |
|                                                                                                    | Between contacts sets     | 750 V                                     | 500 V                             |
| FCC surge voltage between open contacts                                                            |                           | 1,500 V                                   |                                   |
| Operate time*3 (at nominal voltage)                                                                |                           | Approx. 3 ms                              |                                   |
| Release time (without diode)*3 (at nominal voltage)                                                |                           | Approx. 2 ms                              |                                   |
| Temperature rise                                                                                   |                           | Max. 65°C                                 |                                   |
| Vibration resistance                                                                               | Functional*4              | 10 to 55 Hz at double amplitude of 3.3 mm |                                   |
|                                                                                                    | Destruction*5             | 10 to 55 Hz at double amplitude of 5 mm   |                                   |
| Shock resistance                                                                                   | Functional*6              | Min. 294 m/s <sup>2</sup> (30 G)          |                                   |
|                                                                                                    | Destruction               | Min. 980 m/s <sup>2</sup> (100 G)         |                                   |
| Conditions for operation, transport and storage*7 (Not freezing and condensing at low temperature) | Ambient temp.             | -40°C to +70°C<br>-40°F to +158°F         | -40°C to +60°C<br>-40°F to +140°F |
|                                                                                                    | Humidity                  | 5 to 85%R.H.                              |                                   |
| Unit weight                                                                                        |                           | Approx. 4.0 g 0.14 oz                     |                                   |

## TYPICAL APPLICATIONS ORDERING INFORMATION

Modem  
Facsimile  
Telecommunication equipment

DSBT

2

M

2D

DC3V

| Contact arrangement     | Sensitivity                                            | MBB function                             | Coil voltage                 |
|-------------------------|--------------------------------------------------------|------------------------------------------|------------------------------|
| 2: 2 Form C or 2 Form D | S: 360 mW (2 Form C only)<br>M: 540 mW (2 Form D only) | Nil: BBM (Form C)<br>2D: 2MBB (2 Form D) | DC 1.5, 3, 5, 6, 9, 12, 24 V |

Note: Standard packing; Carton: 25 pcs. Case 1,000 pcs.

## TYPES AND COIL DATA (at 20°C 68°F)

### 1) 2 Form C type

| Operating function | Part No.       | Coil voltage, V DC | Pick-up voltage, V DC (max.) | Drop-out voltage, V DC (min.) | Nominal operating current, mA (±10%) | Coil resistance, Ω (±10%) | Nominal operating power, mW | Max. allowable voltage, V DC (at 50°C 122°F) |
|--------------------|----------------|--------------------|------------------------------|-------------------------------|--------------------------------------|---------------------------|-----------------------------|----------------------------------------------|
| Single side stable | DSBT2-S-DC1.5V | 1.5                | 1.125                        | 0.15                          | 240                                  | 6.25                      | 360                         | 1.95                                         |
|                    | DSBT2-S-DC3V   | 3                  | 2.25                         | 0.3                           | 120                                  | 25                        |                             | 3.9                                          |
|                    | DSBT2-S-DC5V   | 5                  | 3.75                         | 0.5                           | 72                                   | 69.4                      |                             | 6.5                                          |
|                    | DSBT2-S-DC6V   | 6                  | 4.5                          | 0.6                           | 60                                   | 100                       |                             | 7.8                                          |
|                    | DSBT2-S-DC9V   | 9                  | 6.75                         | 0.9                           | 40                                   | 225                       |                             | 11.7                                         |
|                    | DSBT2-S-DC12V  | 12                 | 9                            | 1.2                           | 30                                   | 400                       |                             | 15.6                                         |
|                    | DSBT2-S-DC24V  | 24                 | 18                           | 2.4                           | 15                                   | 1,600                     |                             | 31.2                                         |

### 2) 2 Form D type

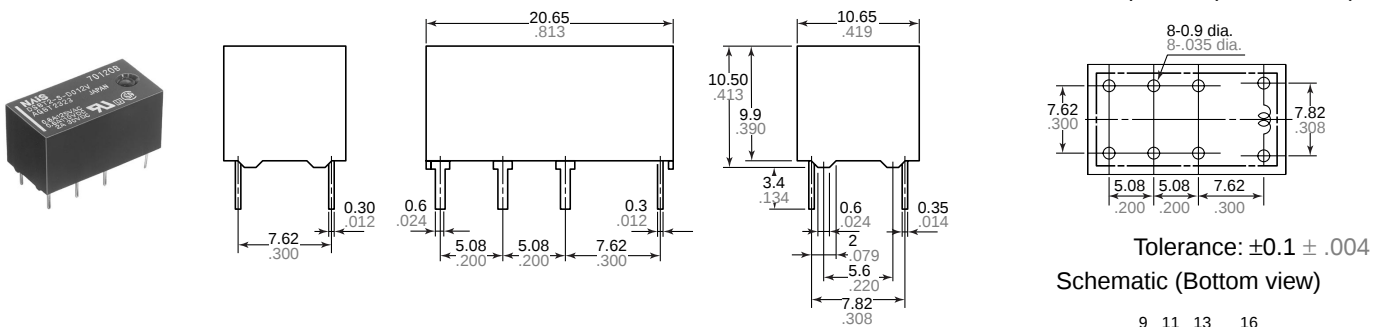
| Operating function | Part No.          | Coil voltage, V DC | Pick-up voltage, V DC (max.) | Drop-out voltage, V DC (min.) | Nominal operating current, mA (±10%) | Coil resistance, Ω (±10%) | Nominal operating power, mW | Max. allowable voltage, V DC (at 50°C 122°F) |
|--------------------|-------------------|--------------------|------------------------------|-------------------------------|--------------------------------------|---------------------------|-----------------------------|----------------------------------------------|
| Single side stable | DSBT2-M-2D-DC1.5V | 1.5                | 1.125                        | 0.15                          | 360                                  | 4.2                       | 540                         | 1.8                                          |
|                    | DSBT2-M-2D-DC3V   | 3                  | 2.25                         | 0.3                           | 180                                  | 16.7                      |                             | 3.6                                          |
|                    | DSBT2-M-2D-DC5V   | 5                  | 3.75                         | 0.5                           | 108                                  | 46.3                      |                             | 6                                            |
|                    | DSBT2-M-2D-DC6V   | 6                  | 4.5                          | 0.6                           | 90                                   | 66.7                      |                             | 7.2                                          |
|                    | DSBT2-M-2D-DC9V   | 9                  | 6.75                         | 0.9                           | 60                                   | 150                       |                             | 10.8                                         |
|                    | DSBT2-M-2D-DC12V  | 12                 | 9                            | 1.2                           | 45                                   | 266.7                     |                             | 14.4                                         |
|                    | DSBT2-M-2D-DC24V  | 24                 | 18                           | 2.4                           | 22.5                                 | 1,066.7                   |                             | 28.8                                         |

Note: Standard packing Tube: 25 pcs. Case: 1,000 pcs.

## DIMENSIONS

mm inch

### PC board pattern (Bottom view)



## REFERENCE DATA

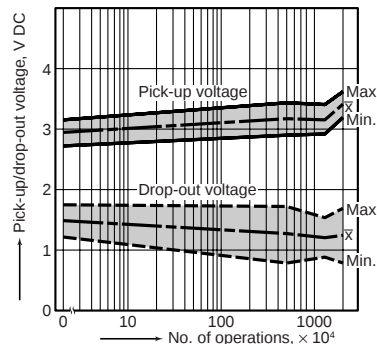
### 1. Mechanical life test

Tested sample: DSBT2-S-DC5V, 10 pcs.

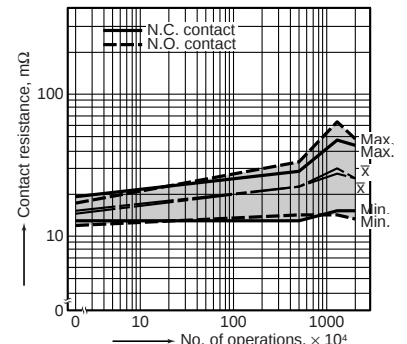
Coil applied voltage: 5 V DC

Operating frequency: 30 cpm

### Change of pick-up and drop-out voltage



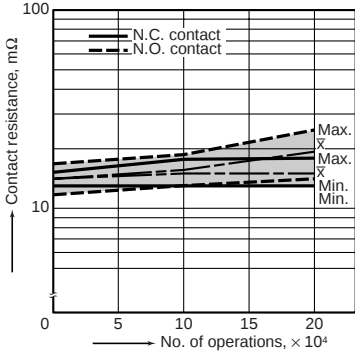
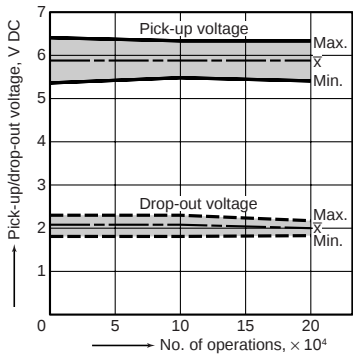
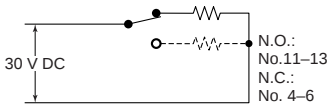
### Change of contact resistance



DS-BT

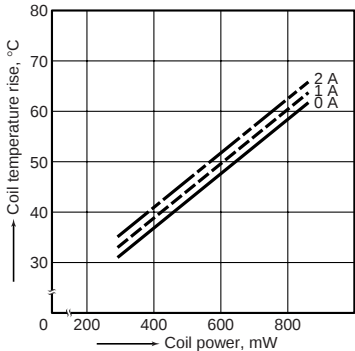
2. Electrical life test (resistive)

Tested sample: DSBT2-S-DC12V, 6 pcs.  
Condition: 2 A 30 V DC resistive load, 30 cpm  
Circuit



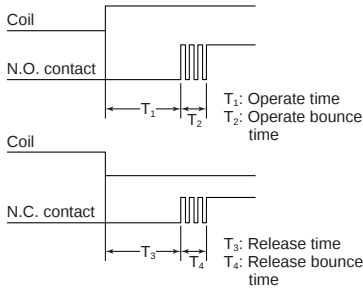
3. Coil temperature rise

Tested sample: DSBT2-S-DC12V, 5 pcs.  
Measured portion: Inside the coil

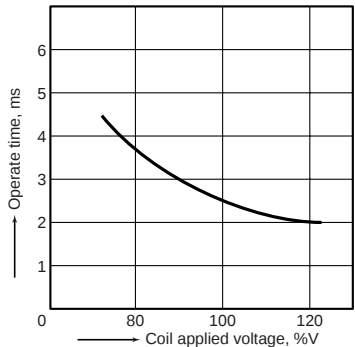


4. Operate and release time characteristics

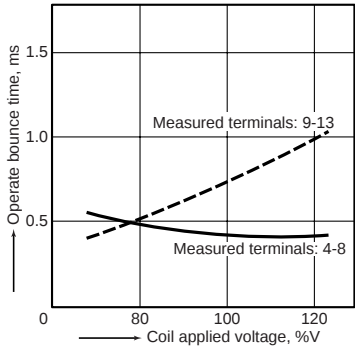
Tested sample: DSBT2-S-DC5V, 10 pcs.  
Ambient temperature: 23°C 73°F



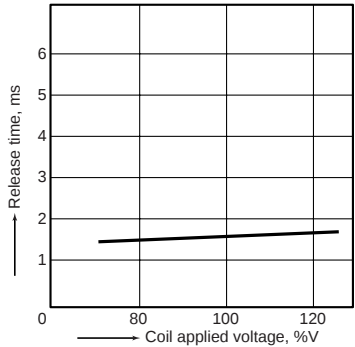
Without diode (T1)



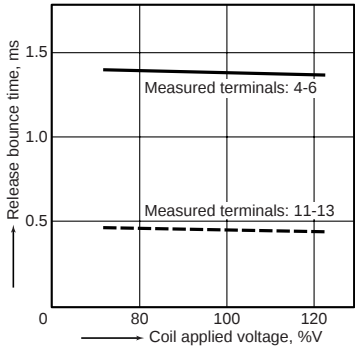
Without diode (T2)



Without diode (T3)

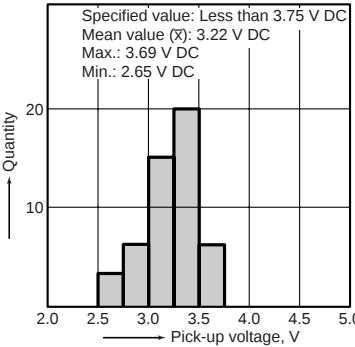


Without diode (T4)

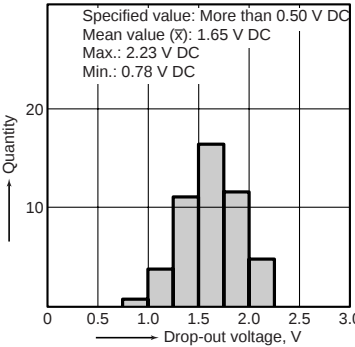


5. Distribution of pick-up and drop-out voltage

Tested sample: DSBT2-S-DC5V, 50 pcs.  
Pick-up voltage

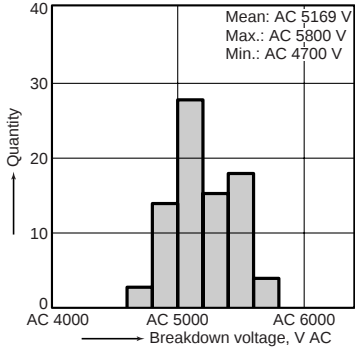


Drop-out voltage



6. Distribution of breakdown voltage

(between contacts and coil)  
Tested sample: DSBT2-S-DC5V, 100 pcs.



For Cautions for Use, see Relay Technical Information