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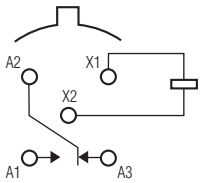
## Single Pole, Electrically Held, 1 Amp and Less

**1MA, 1MAD, 1MADD**

### 1MA

**Standard TO-5 High Performance Relay**

**Qualified to MIL-R-39016/7**




Terminal View

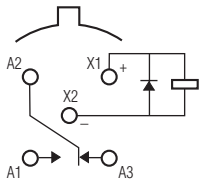
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Spreader pad
- Excellent RF switching

### 1MAD

**Standard TO-5 Diode Suppressed High Performance Relay**

**Qualified to MIL-R-39016/23**




Terminal View

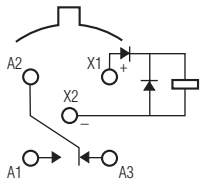
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Spreader pad
- Excellent RF switching

### 1MADD

**Standard TO-5 Diode Suppressed/Protected High Performance Relay**

**Qualified to MIL-R-39016/24**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Spreader pad
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 1 Form C (SPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 512 mW max. @ 25°C

**Duty Cycle** — Continuous

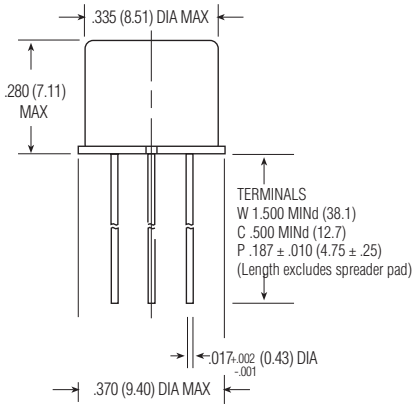
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 100 mW max. @ 25°C

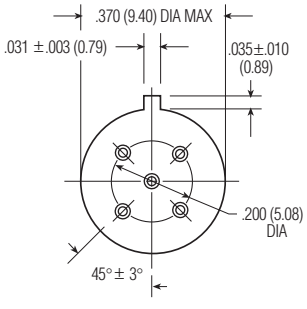
### Contact Ratings

| Contact Load | Type | Operations MINd. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






1MA/1MAD/1MADD Enclosure




1MA/1MAD/1MADD Header

## Single Pole, Electrically Held, 1 Amp and Less (Continued)

### 1MA, 1MAD, 1MADD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time — 2.0 ms max.
Release Time —
1MA — 2.0 ms max.
1MAD/1MADD — 4.0 ms max.
(suppression diode, suppression/ steering diodes)

**Contact Bounce** — 1.5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms @ 500 Vdc
1,000 megohms @ 500 Vdc (coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.08 oz. (2.27 grms)
0.09 oz. (2.52 grms) with spreader pad attached

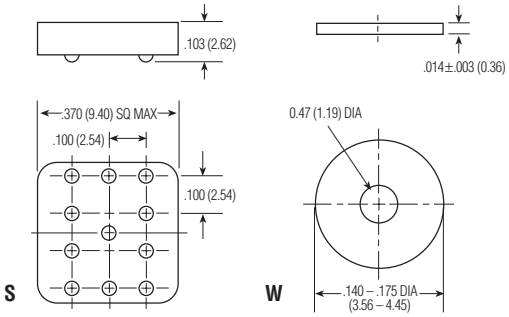
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-39016/7 (J1MA)
MIL-R-39016/23 (J1MAD)
MIL-R-39016/24 (J1MADD)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (Min.) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C (Note 2) | Drop-Out Voltage Vdc (Min.) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1MA/MAD | | | | | | | | | | | | |
| 5.0 | 63 | n/a | n/a | 2.8 | n/a | 3.7 | n/a | 0.23 | 0.15 | 397 | 6.0 | 5 |
| 6.0 | 125 | n/a | n/a | 3.5 | n/a | 4.5 | n/a | 0.28 | 0.18 | 288 | 8.0 | 6 |
| 9.0 | 280 | n/a | n/a | 5.3 | n/a | 6.8 | n/a | 0.54 | 0.35 | 289 | 12.0 | 9 |
| 12.0 | 500 | n/a | n/a | 7.0 | n/a | 9.0 | n/a | 0.63 | 0.40 | 288 | 16.0 | 12 |
| 18.0 | 1,130 | n/a | n/a | 10.5 | n/a | 13.5 | n/a | 0.91 | 0.58 | 287 | 24.0 | 18 |
| 26.5 | 2,000 | n/a | n/a | 14.2 | n/a | 18.0 | n/a | 1.37 | 0.89 | 351 | 32.0 | 26 |
| 1MADD | | | | | | | | | | | | |
| 5.0 | 50 | 100.0 | 72.7 | 3.5 | n/a | 4.5 | n/a | 0.23 | 0.15 | 500 | 6.0 | 5 |
| 6.0 | 98 | 62.4 | 46.3 | 4.1 | n/a | 5.5 | n/a | 0.28 | 0.18 | 367 | 8.0 | 6 |
| 9.0 | 280 | 33.7 | 25.9 | 6.3 | n/a | 7.8 | n/a | 0.54 | 0.35 | 289 | 12.0 | 9 |
| 12.0 | 500 | 25.6 | 20.0 | 8.0 | n/a | 10.0 | n/a | 0.63 | 0.40 | 288 | 16.0 | 12 |
| 18.0 | 1,130 | 17.2 | 13.6 | 11.6 | n/a | 14.5 | n/a | 0.91 | 0.58 | 287 | 24.0 | 18 |
| 26.5 | 2,000 | 14.4 | 11.5 | 15.4 | n/a | 19.0 | n/a | 1.37 | 0.89 | 351 | 32.0 | 26 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example*: | Type | Terminal | Diodes | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|
| | 1MA | C | D | -26 | S |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

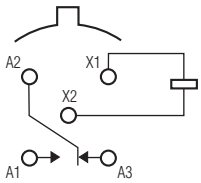
## Single Pole, Electrically Held, 1 Amp and Less (Continued)

**1MS, 1MSD, 1MSDD**

### 1MS

**Sensitive TO-5 High Performance Relay**

**Qualified to MIL-R-39016/10**




Terminal View

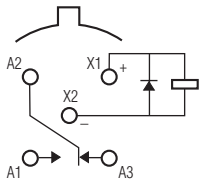
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Spreader pad
- Excellent RF switching

### 1MSD

**Sensitive TO-5 Diode Suppressed High Performance Relay**

**Qualified to MIL-R-39016/25**




Terminal View

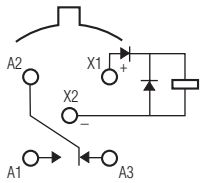
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Spreader pad
- Excellent RF switching

### 1MSDD

**Sensitive TO-5 Diode Suppressed/Protected High Performance Relay**

**Qualified to MIL-R-39016/26**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Spreader pad
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 1 Form C (SPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 40 Vdc

**Coil Power** — 506 mW max. @ 25°C

**Duty Cycle** — Continuous

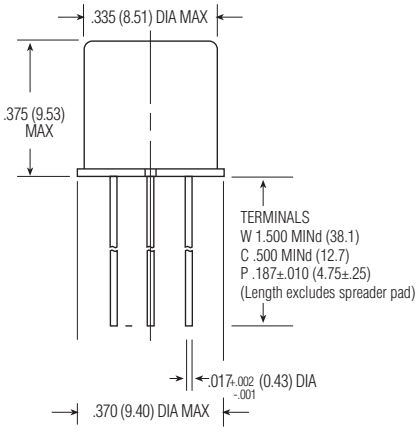
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 40 mW max. @ 25°C

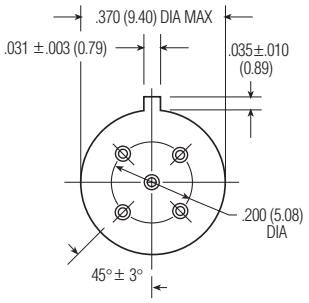
### Contact Ratings

| Contact Load | Type | Operations MINd. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






1MS/1MSD/1MSDD Enclosure




1MS/1MSD/1MSDD Header

## Single Pole, Electrically Held, 1 Amp and Less (Continued)

### 1MS, 1MSD, 1MSDD
(Continued)

**Operating Characteristics**

**Timing** —
Operate Time — 4.0 ms max.
Release Time —
1MS — 2.5 ms max.
1MSD/1MSDD — 7.5 ms max.
(suppression diode, suppression/steering diodes)

**Contact Bounce** — 1.5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms @ 500 Vdc
1,000 megohms @ 500 Vdc (coil to case @ +125°C)

**Environmental Characteristics**

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.10 oz. (2.84 grms)
0.11 oz. (3.09 grms) with spreader pad attached

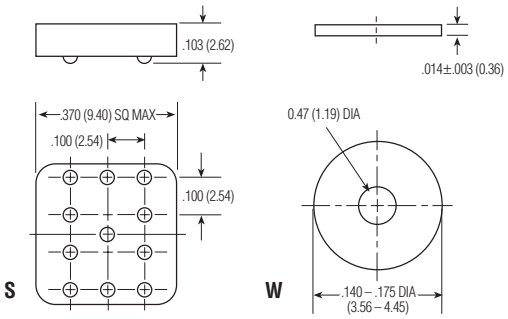
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-39016/10 (J1MS)
MIL-R-39016/25 (J1MSD)
MIL-R-39016/26 (J1MSDD)

**Semiconductor Characteristics**

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (MINd) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (MINd) @ 25°C (Note 2) | Drop-Out Voltage Vdc (MINd) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1MS/MSD | | | | | | | | | | | | |
| 5.0 | 125 | n/a | n/a | 2.8 | n/a | 3.7 | n/a | 0.23 | 0.15 | 200 | 8.0 | 5 |
| 6.0 | 255 | n/a | n/a | 3.5 | n/a | 4.5 | n/a | 0.28 | 0.18 | 141 | 11.0 | 6 |
| 9.0 | 630 | n/a | n/a | 5.3 | n/a | 6.8 | n/a | 0.54 | 0.35 | 129 | 12.0 | 9 |
| 12.0 | 1,025 | n/a | n/a | 7.0 | n/a | 9.0 | n/a | 0.63 | 0.40 | 140 | 22.0 | 12 |
| 18.0 | 2,300 | n/a | n/a | 10.5 | n/a | 13.5 | n/a | 0.91 | 0.59 | 141 | 24.0 | 18 |
| 26.5 | 4,000 | n/a | n/a | 14.2 | n/a | 18.0 | n/a | 1.37 | 0.89 | 176 | 45.0 | 26 |
| 32.0 | 6,500 | n/a | n/a | 18.7 | n/a | 24.0 | n/a | 1.59 | 1.0 | 158 | 57.0 | 32 |
| 40.0 | 11,000 | n/a | n/a | 23.3 | n/a | 30.0 | n/a | 2.0 | 1.3 | 145 | 75.0 | 40 |
| 1MSDD | | | | | | | | | | | | |
| 5.0 | 100 | 50.0 | 36.3 | 3.5 | n/a | 4.5 | n/a | 0.23 | 0.15 | 250 | 8.0 | 5 |
| 6.0 | 200 | 30.6 | 22.7 | 4.1 | n/a | 5.5 | n/a | 0.28 | 0.18 | 180 | 11.0 | 6 |
| 9.0 | 630 | 15.0 | 11.5 | 6.3 | n/a | 7.8 | n/a | 0.54 | 0.35 | 129 | 16.0 | 9 |
| 12.0 | 1,025 | 12.5 | 9.7 | 8.0 | n/a | 10.0 | n/a | 0.63 | 0.40 | 140 | 22.0 | 12 |
| 18.0 | 2,300 | 8.5 | 6.7 | 11.6 | n/a | 14.5 | n/a | 0.91 | 0.58 | 141 | 33.0 | 18 |
| 26.5 | 4,000 | 7.2 | 5.7 | 15.4 | n/a | 19.0 | n/a | 1.37 | 0.89 | 176 | 45.0 | 26 |
| 32.0 | 6,500 | 5.4 | 4.3 | 17.0 | n/a | 21.0 | n/a | 1.5 | 0.95 | 158 | 57.0 | 32 |
| 40.0 | 11,000 | 4.0 | 3.2 | 22.0 | n/a | 27.0 | n/a | 2.0 | 1.28 | 145 | 75.0 | 40 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminal | Diodes | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|
| | 1MS | C | D | -26 | S |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

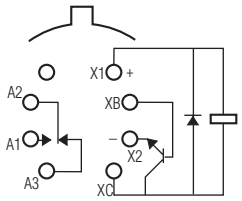
## Single Pole, Electrically Held, 1 Amp and Less (Continued)

**1MAT**

**1MAT**

**Standard TO-5**
**Diode Suppressed/**
**Transistor Driven**
**High Performance Relay**

**Qualified to**
**MIL-R-28776/5**




**Terminal View**

### Product Facts

- **Transistor driver & suppression diode**
- **Hermetically sealed**
- **High shock & vibration ratings**
- **Spreader pad**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 1 Form C (SPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 512 mW max. @ 25°C

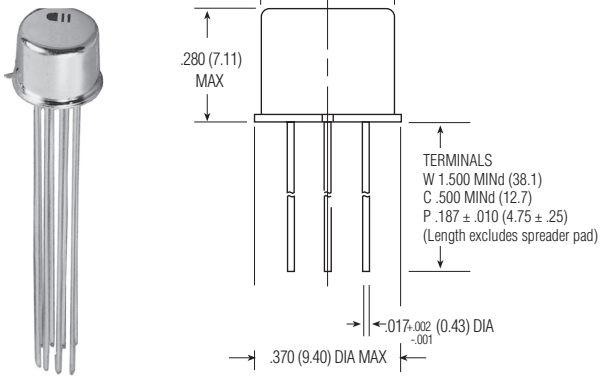
**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

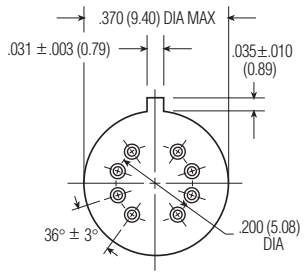
**Pick-up Sensitivity** — 100 mW max. @ 25°C

### Contact Ratings

| Contact Load | Type | Operations MINd. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |




**1MAT Enclosure**




**1MAT Header**

## Single Pole, Electrically Held, 1 Amp and Less (Continued)

**1MAT** (Continued)

### Operating Characteristics

**Timing** —
Operate Time — 2.0 ms max.
Release Time —
4.0 ms max.

**Contact Bounce** — 1.5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.08 oz. (2.27 grms)
0.09 oz. (2.52 grms) with spreader pad attached

**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

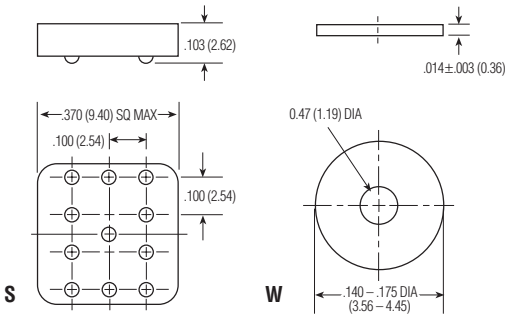
**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-28776/5 (J1MAT)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage

**Transistor** —
0.3 Vdc MINd. base turn off voltage;
6.0 Vdc min. emitter-base breakdown voltage ($BV_{EBO}$) @ 25°C;
80.0 Vdc min. collector-base breakdown voltage ($BV_{CBO}$) @ 25°C & $I_C$=100 µA




**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (MINd) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (MINd) @ 25°C (Note 2) | Drop-Out Voltage Vdc (MINd) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1MAT | | | | | | | | | | | | |
| 5.0 | 63 | 89.6 | 66.6 | 3.0 | 0.60 | 3.9 | 2.38 | 0.24 | 0.15 | 397 | 5.8 | 5 |
| 6.0 | 125 | 55.5 | 42.0 | 3.8 | 0.42 | 5.2 | 1.60 | 0.31 | 0.18 | 288 | 8.0 | 6 |
| 9.0 | 280 | 38.1 | 28.0 | 5.6 | 0.27 | 7.8 | 1.07 | 0.47 | 0.35 | 289 | 12.0 | 9 |
| 12.0 | 500 | 28.1 | 20.9 | 7.2 | 0.21 | 10.0 | 0.80 | 0.62 | 0.40 | 288 | 16.0 | 12 |
| 18.0 | 1,130 | 18.8 | 13.8 | 10.7 | 0.12 | 14.5 | 0.53 | 0.94 | 0.58 | 287 | 24.0 | 18 |
| 26.5 | 2,000 | 15.5 | 11.5 | 14.4 | 0.10 | 19.0 | 0.40 | 1.25 | 0.89 | 351 | 32.0 | 26 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminal | Diodes | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|
| | 1MA | C | T | -26 | S |

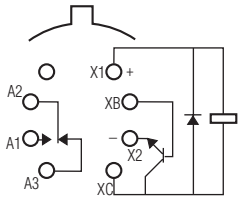
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Single Pole, Electrically Held, 1 Amp and Less (Continued)

**1MST**

**1MST**

**Sensitive TO-5**
**Diode Suppressed/**
**Transistor Driven**
**High Performance Relay**
**Qualified to MIL-R-28776/4**




**Terminal View**

### Product Facts

- **Transistor driver & suppression diode**
- **Hermetically sealed**
- **High shock & vibration ratings**
- **Spreader pad**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 1 Form C (SPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 40 Vdc

**Coil Power** — 506 mW max. @ 25°C

**Duty Cycle** — Continuous

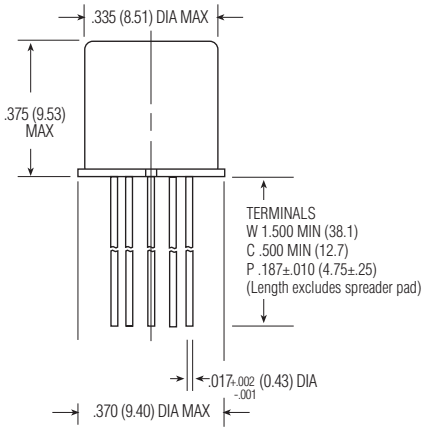
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 40 mW max. @ 25°C

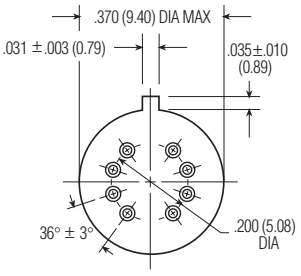
### Contact Ratings

| | | |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






**1MST Enclosure**




**1MST Header**

## Single Pole, Electrically Held, 1 Amp and Less (Continued)

**1MST** (Continued)

### Operating Characteristics

**Timing** —
Operate Time —
3.5 ms max.
Release Time —
7.5 ms max.

**Contact Bounce** — 1.5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.10 oz. (2.84 grms)
0.11 oz. (3.09 grms) with spreader pad attached

**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

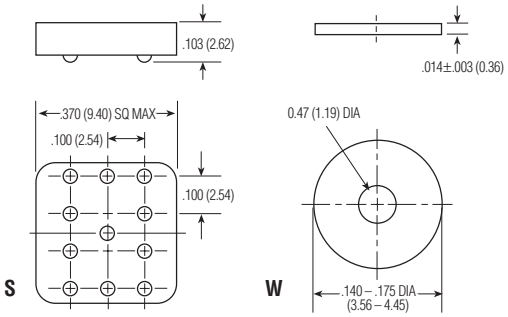
**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-28776/4 (J1MST)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage

**Transistor** —
0.3 Vdc min. base turn off voltage;
6.0 Vdc min. emitter-base breakdown voltage ($BV_{EBO}$) @ 25°C;
80.0 Vdc min. collector-base breakdown voltage ($BV_{CBO}$) @ 25°C & $I_C$=100 µA




**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (Min.) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C (Note 2) | Drop-Out Voltage Vdc (Min.) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1MST | | | | | | | | | | | | |
| 5.0 | 125 | 47.8 | 34.7 | 2.6 | 0.28 | 3.6 | 1.20 | 0.22 | 0.15 | 200 | 8.0 | 5 |
| 6.0 | 255 | 27.7 | 21.2 | 3.5 | 0.20 | 4.8 | 0.78 | 0.28 | 0.18 | 141 | 11.0 | 6 |
| 9.0 | 630 | 16.8 | 11.8 | 5.4 | 0.13 | 7.8 | 0.48 | 0.54 | 0.35 | 129 | 16.0 | 9 |
| 12.0 | 1,025 | 13.6 | 10.1 | 6.6 | 0.10 | 10.0 | 0.39 | 0.63 | 0.41 | 140 | 22.0 | 12 |
| 18.0 | 2,300 | 9.1 | 6.7 | 9.8 | 0.07 | 14.5 | 0.26 | 0.91 | 0.58 | 141 | 33.0 | 18 |
| 26.5 | 4,000 | 7.7 | 5.7 | 12.8 | 0.05 | 19.0 | 0.20 | 1.37 | 0.89 | 176 | 45.0 | 26 |
| 32.0 | 6,500 | 5.8 | 4.2 | 18.7 | 0.04 | 24.0 | 0.16 | 1.60 | 1.00 | 158 | 57.0 | 32 |
| 40.0 | 11,000 | 4.3 | 3.1 | 23.3 | 0.03 | 30.0 | 0.13 | 2.10 | 1.30 | 145 | 75.0 | 40 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminal | Diodes | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|
| | 1MS | C | T | -26 | S |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

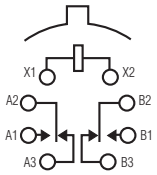
## Double Pole, Electrically Held, 1 Amp and Less

**MA, MAD, MADD**

### MA

**Standard TO-5 High Performance Relay**

**Qualified to MIL-R-39016/9**




Terminal View

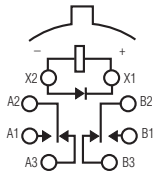
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Spreader pads
- Excellent RF switching

### MAD

**Standard TO-5 Diode Suppressed High Performance Relay**

**Qualified to MIL-R-39016/15**




Terminal View

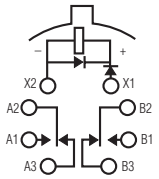
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Spreader pads
- Excellent RF switching

### MADD

**Standard TO-5 Diode Suppressed/Protected High Performance Relay**

**Qualified to MIL-R-39016/20**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Spreader pads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 30 Vdc (MA/MAD) 5 to 26.5 Vdc (MADD)

**Coil Power** — 675 mW max. @ 25°C

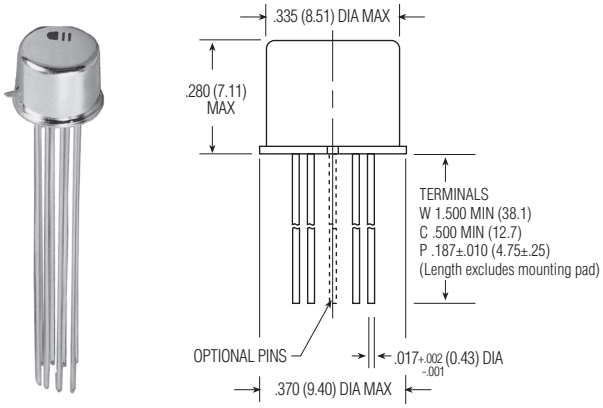
**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

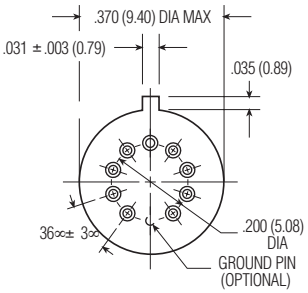
**Pick-up Sensitivity** — 130 mW max. @ 25°C

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |




Enclosure




Header

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### MA, MAD, MADD (Continued)

**Operating Characteristics**

**Timing** —
Operate Time — 2.0 ms max.
Release Time —
MA — 1.5 ms max.
MAD/MADD — 4.0 ms max.
(suppression diode, suppression/ steering diodes)

**Contact Bounce** — 1.5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

**Environmental Characteristics**

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.09 oz. (2.55 grms)
0.10 oz. (2.80 grms) with spreader pad attached

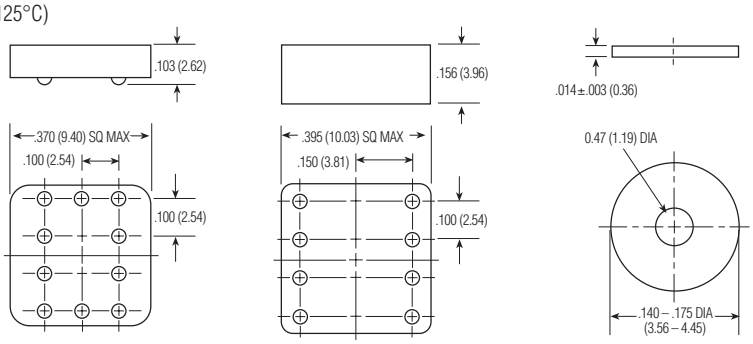
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-39016/9 (JMA)
MIL-R-39016/15 (JMAD)
MIL-R-39016/20 (JMADD)

**Semiconductor Characteristics**

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




S S2 W

Spreader & Mounting Pads

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (Min.) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C (Note 2) | Drop-Out Voltage Vdc (Min.) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MA/MAD | | | | | | | | | | | | |
| 5.0 | 50 | n/a | n/a | 2.7 | n/a | 3.5 | n/a | 0.22 | 0.14 | 500 | 5.8 | 5 |
| 6.0 | 98 | n/a | n/a | 3.5 | n/a | 4.5 | n/a | 0.28 | 0.18 | 367 | 8.0 | 6 |
| 9.0 | 220 | n/a | n/a | 5.3 | n/a | 6.8 | n/a | 0.54 | 0.35 | 368 | 12.0 | 9 |
| 12.0 | 390 | n/a | n/a | 7.0 | n/a | 9.0 | n/a | 0.63 | 0.41 | 369 | 16.0 | 12 |
| 18.0 | 880 | n/a | n/a | 10.5 | n/a | 13.5 | n/a | 0.91 | 0.59 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | n/a | n/a | 14.2 | n/a | 18.0 | n/a | 1.37 | 0.89 | 450 | 32.0 | 26 |
| 30.0 | 2,500 | n/a | n/a | 17.7 | n/a | 22.0 | n/a | 1.50 | 1.00 | 360 | 36.0 | 30 |
| MADD | | | | | | | | | | | | |
| 5.0 | 39 | 128.2 | 93.2 | 3.2 | n/a | 4.0 | n/a | 0.6 | 0.6 | 641 | 5.8 | 5 |
| 6.0 | 78 | 78.3 | 58.3 | 4.0 | n/a | 5.0 | n/a | 0.7 | 0.7 | 462 | 8.0 | 6 |
| 9.0 | 220 | 42.9 | 33.0 | 6.3 | n/a | 7.8 | n/a | 0.9 | 0.8 | 368 | 12.0 | 9 |
| 12.0 | 390 | 32.8 | 25.6 | 8.0 | n/a | 10.0 | n/a | 1.1 | 0.9 | 369 | 16.0 | 12 |
| 18.0 | 880 | 22.1 | 17.5 | 11.5 | n/a | 14.5 | n/a | 1.4 | 1.1 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | 18.5 | 14.8 | 15.2 | n/a | 19.0 | n/a | 1.8 | 1.4 | 450 | 32.0 | 26 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminal | Diodes | Ground Pins | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|---|
| | MA | C | D | G | -26 | S |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

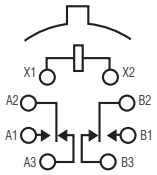
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MS, MSD, MSDD**

### MS

**Sensitive TO-5 High Performance Relay**

**Qualified to MIL-R-39016/11**




Terminal View

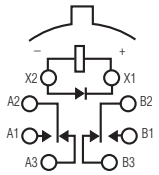
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Spreader pads
- Excellent RF switching

### MSD

**Sensitive TO-5 Diode Suppressed High Performance Relay**

**Qualified to MIL-R-39016/16**




Terminal View

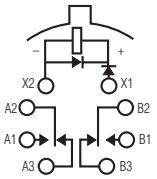
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Spreader pads
- Excellent RF switching

### MSDD

**Sensitive TO-5 Diode Suppressed/Protected High Performance Relay**

**Qualified to MIL-R-39016/21**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Spreader pads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 48 Vdc

**Coil Power** — 565 mW max. @ 25°C

**Duty Cycle** — Continuous

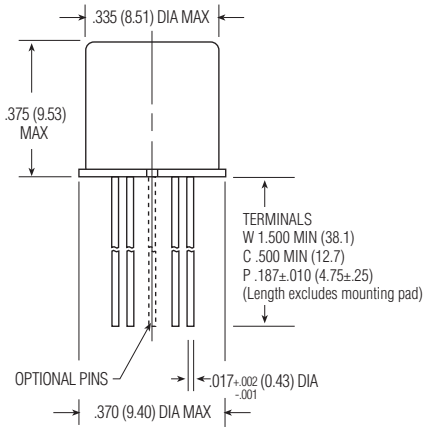
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 60 mW max. @ 25°C

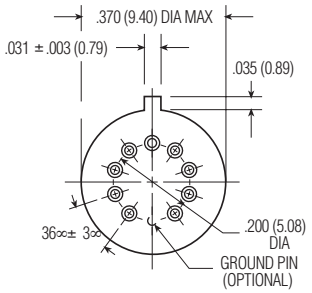
### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






Enclosure




Header

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### MS, MSD, MSDD (Continued)

**Operating Characteristics**

**Timing** —
Operate Time — 4.0 ms max.
Release Time —
MS — 2.0 ms max.
MSD/MSDD — 7.5 ms max.
(suppression diode, suppression/steering diodes)

**Contact Bounce** — 1.5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

**Environmental Characteristics**

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.12 oz. (3.40 grms)
0.13 oz. (3.45 grms) with spreader pad attached

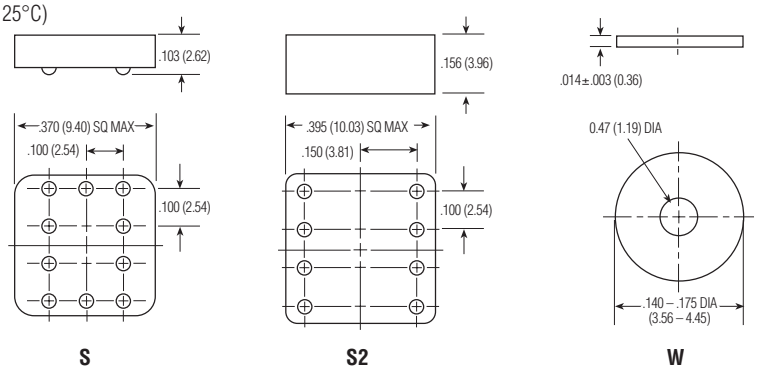
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-39016/11 (JMS)
MIL-R-39016/16 (JMSD)
MIL-R-39016/21 (JMSDD)

**Semiconductor Characteristics**

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**S** **S2** **W**

**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (Min.) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C (Note 2) | Drop-Out Voltage Vdc (Min.) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MS/MSD | | | | | | | | | | | | |
| 5.0 | 100 | n/a | n/a | 2.6 | n/a | 3.5 | n/a | 0.23 | 0.12 | 250 | 7.5 | 5 |
| 6.0 | 200 | n/a | n/a | 3.4 | n/a | 4.5 | n/a | 0.28 | 0.18 | 180 | 10.0 | 6 |
| 9.0 | 400 | n/a | n/a | 4.85 | n/a | 6.8 | n/a | 0.55 | 0.35 | 203 | 15.0 | 9 |
| 12.0 | 850 | n/a | n/a | 7.0 | n/a | 9.0 | n/a | 0.64 | 0.41 | 169 | 20.0 | 12 |
| 18.0 | 1,600 | n/a | n/a | 9.8 | n/a | 13.5 | n/a | 0.92 | 0.59 | 203 | 30.0 | 18 |
| 26.5 | 3,300 | n/a | n/a | 14.0 | n/a | 18.0 | n/a | 1.4 | 0.89 | 213 | 40.0 | 26 |
| 36.0 | 6,500 | n/a | n/a | 20.0 | n/a | 27.0 | n/a | 1.8 | 1.25 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | n/a | n/a | 25.8 | n/a | 36.0 | n/a | 2.4 | 1.60 | 209 | 75.0 | 48 |
| MSDD | | | | | | | | | | | | |
| 5.0 | 64 | 78.1 | 56.8 | 2.9 | n/a | 3.7 | n/a | 0.8 | 0.7 | 391 | 7.0 | 5 |
| 6.0 | 125 | 48.9 | 36.3 | 4.0 | n/a | 4.8 | n/a | 0.9 | 0.8 | 288 | 10.0 | 6 |
| 9.0 | 400 | 23.6 | 18.1 | 6.1 | n/a | 8.0 | n/a | 1.1 | 0.9 | 203 | 15.0 | 9 |
| 12.0 | 850 | 15.0 | 11.7 | 7.8 | n/a | 11.0 | n/a | 1.3 | 1.0 | 169 | 20.0 | 12 |
| 18.0 | 1,600 | 12.2 | 9.6 | 11.3 | n/a | 14.5 | n/a | 1.5 | 1.1 | 203 | 30.0 | 18 |
| 26.5 | 3,300 | 8.8 | 7.0 | 15.2 | n/a | 19.0 | n/a | 1.7 | 1.3 | 213 | 40.0 | 26 |
| 36.0 | 6,500 | 6.1 | 4.9 | 21.7 | n/a | 27.2 | n/a | 2.3 | 1.7 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | 4.8 | 3.9 | 27.8 | n/a | 34.8 | n/a | 2.8 | 2.0 | 209 | 75.0 | 48 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

**Specifying a Part Number Example:**

| Type | Terminal | Diodes | Ground Pins | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|
| MS | C | D | G | -26 | S |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

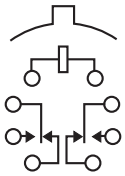
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**HM, HMD, HS, HSD**



### HM, HS

**Standard / Sensitive TO-5 Commercial Relay**



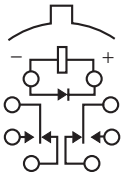
Terminal View

#### Product Facts

- Hermetically sealed
- Spreader Pads
- Excellent RF switching

### HMD, HSD

**Standard / Sensitive TO-5 Diode Suppressed Commercial Relay**




Terminal View

#### Product Facts

- Suppression Diode
- Hermetically sealed
- Spreader Pads
- Excellent RF switching

#### Electrical Characteristics

**Contact Arrangement** —
2 Form C (DPDT)

**Contact Material** —
Stationary —
Gold/platinum/palladium/silver alloy (gold plated)
Moveable —
Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** —
Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc)
After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** —
1 million operations

#### Electrical Characteristics

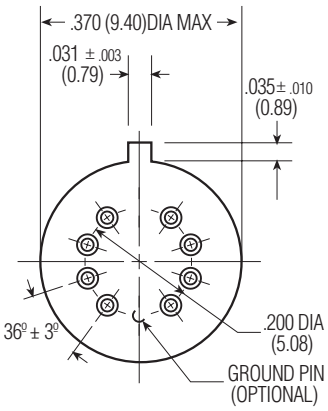
**Coil Voltage** —
5 to 30 Vdc (HM/HMD)
5 to 48 Vdc (HS/HSD)

**Coil Power** —
HM/HMD — 675 mW max. @ 25°C
HS/HSD — 565 mW max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 70% of nominal coil voltage

**Pick-up Sensitivity** —
HM/HMD — 180 mW max. @ 25°C
HS/HSD — 90 mW max. @ 25°C




Header

#### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (Case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### HM, HMD, HS, HSD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time —
HM/HMD — 4.0 ms max.
HS/HSD — 6.0 ms max.
Release Time —
HM — 3.0 ms max.
HS — 3.0 ms max.
HMD — 6.0 ms max.
(suppression diode)
HSD — 7.5 ms max.
(suppression diode)

**Dielectric Withstanding Voltage** —
Between Open Contacts —
350 Vrms 60 Hz
Between Adjacent Contacts —
350 Vrms 60 Hz
Between Contacts & Coil —
350 Vrms 60 Hz

**Insulation Resistance** —
1,000 megohms @ 500 Vdc

### Environmental Characteristics

**Temperature Range** —
-55°C to +85°C

**Weight** —
HM/HMD —
0.09 oz. (2.55 gms)
0.099 oz. (2.80 gms) w/ spreader pad
HS/HSD —
0.12 oz. (3.40 gms)
0.129 oz. (3.45 gms) w/ spreader pad

**Vibration Resistance** —
10 G's, 10 to 500 Hz

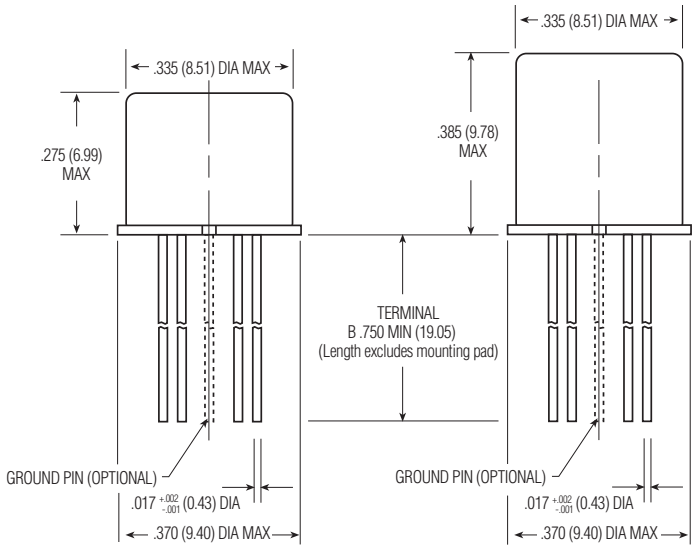
**Shock Resistance** —
30 G's, 6 ±1 ms

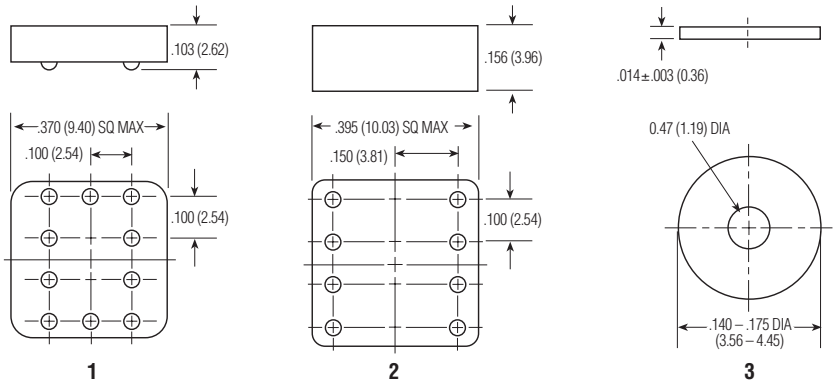
### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage

### Standard Coil Data

| | Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±20% @ 25°C | Pickup Voltage Vdc (max.) @ 25°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|
| HM/HMD | 5.0 | 50 | 3.6 | 500 | 5.8 | 5 |
| | 6.0 | 98 | 4.2 | 367 | 8.0 | 6 |
| | 9.0 | 220 | 6.5 | 368 | 12.0 | 9 |
| | 12.0 | 390 | 8.4 | 369 | 16.0 | 12 |
| | 18.0 | 880 | 13.0 | 368 | 24.0 | 18 |
| | 26.5 | 1,560 | 17.0 | 450 | 32.0 | 26 |
| | 30.0 | 2,500 | 22.0 | 360 | 36.0 | 30 |
| HS/HSD | 5.0 | 100 | 3.5 | 250 | 7.5 | 5 |
| | 6.0 | 200 | 4.5 | 180 | 10.0 | 6 |
| | 9.0 | 400 | 6.8 | 203 | 15.0 | 9 |
| | 12.0 | 850 | 9.0 | 169 | 20.0 | 12 |
| | 18.0 | 1,600 | 13.5 | 203 | 30.0 | 18 |
| | 26.5 | 3,300 | 18.0 | 213 | 40.0 | 26 |
| | 36.0 | 6,500 | 24.0 | 199 | 57.0 | 36 |
| | 48.0 | 11,000 | 32.0 | 209 | 75.0 | 48 |




**Spreader and Mounting Pads**

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

**Specifying a Part Number Example:**

| Type | Diodes | Ground Pin | Spreader/Mounting Pads | Coils | Terminals |
|---|---|---|---|---|---|
| HM | D | X | 3 | -26 | B |

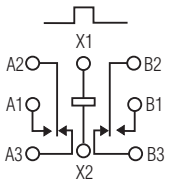
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MGA, MGAD, MGADD**

### MGA

**Standard .100 Grid High Performance Relay**

**Qualified to MIL-R-39016/17**




Terminal View

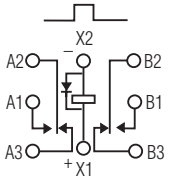
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Mounting pads
- Excellent RF switching

### MGAD

**Standard .100 Grid Diode Suppressed High Performance Relay**

**Qualified to MIL-R-39016/18**




Terminal View

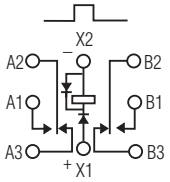
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Mounting pads
- Excellent RF switching

### MGADD

**Standard .100 Grid Diode Suppressed/Protected High Performance Relay**

**Qualified to MIL-R-39016/19**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Mounting pads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver (gold plated) Moveable — Gold/platinum/palladium/silver (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 660 mW max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

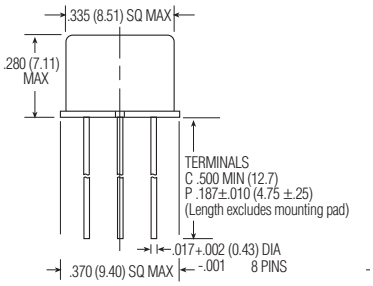
**Pick-up Sensitivity** — 130 mW max. @ 25°C

### Contact Ratings

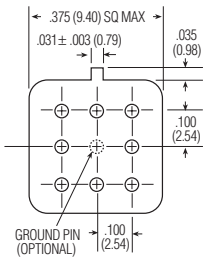
| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |



MGA




MGA/MGAD/MGADD Enclosure




MGA/MGAD/MGADD Header

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### MGA, MGAD, MGADD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time — 2.0 ms max.
Release Time —
MGA — 1.5 ms max.
MGAD/MGADD — 4.0 ms max.
(suppression diode, protection/ suppression diodes)

**Contact Bounce** — 1.5 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.09 oz. (2.55 gms)
0.129 oz. (3.45 gms) w/ mounting pad attached

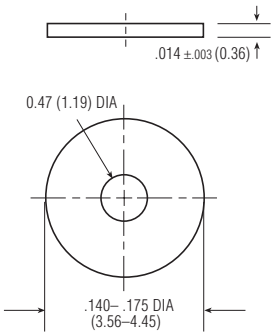
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-39016/17 (JMGA)
MIL-R-39016/18 (JMGAD)
MIL-R-39016/19 (JMGADD)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**MGA/MGAD/MGADD Mounting Pad**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note) | Coil Circuit Current mA (Max.) (Note) | Coil Circuit Current mA (Min.) (Note) | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C | Drop-Out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|
| MGA/MGAD | | | | | | | | | | |
| 5.0 | 50 | n/a | n/a | 2.7 | 3.5 | 0.22 | 0.14 | 500 | 5.8 | 5 |
| 6.0 | 98 | n/a | n/a | 3.5 | 4.5 | 0.28 | 0.18 | 367 | 8.0 | 6 |
| 9.0 | 220 | n/a | n/a | 5.3 | 6.8 | 0.54 | 0.35 | 368 | 12.0 | 9 |
| 12.0 | 390 | n/a | n/a | 7.0 | 9.0 | 0.63 | 0.41 | 369 | 16.0 | 12 |
| 18.0 | 880 | n/a | n/a | 10.5 | 13.5 | 0.91 | 0.59 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | n/a | n/a | 14.2 | 18.0 | 1.37 | 0.89 | 450 | 32.0 | 26 |
| MGADD | | | | | | | | | | |
| 5.0 | 39 | 128.2 | 93.2 | 3.2 | 4.0 | 0.6 | 0.6 | 641 | 5.8 | 5 |
| 6.0 | 78 | 78.3 | 58.3 | 4.0 | 5.0 | 0.7 | 0.7 | 462 | 8.0 | 6 |
| 9.0 | 220 | 42.9 | 33.0 | 6.3 | 7.8 | 0.9 | 0.8 | 368 | 12.0 | 9 |
| 12.0 | 390 | 32.8 | 25.6 | 8.0 | 10.0 | 1.1 | 0.9 | 369 | 16.0 | 12 |
| 18.0 | 880 | 22.1 | 17.5 | 11.5 | 14.5 | 1.4 | 1.1 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | 18.5 | 14.8 | 15.2 | 19.0 | 1.8 | 1.4 | 450 | 32.0 | 26 |

**Note:** Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminals | Diodes | Ground Pins | Coils | Mounting Pads |
|---|---|---|---|---|---|---|
| | MGA | C | D | G | -26 | W |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

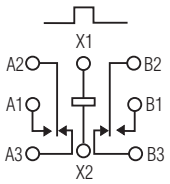
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MGS, MGSD, MGSDD**

### MGS

**Sensitive .100 Grid High Performance Relay**

**Qualified to MIL-R-39016/41**




Terminal View

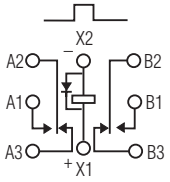
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Mounting pads
- Excellent RF switching

### MGSD

**Sensitive .100 Grid Diode Suppressed High Performance Relay**

**Qualified to MIL-R-39016/42**




Terminal View

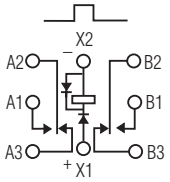
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Mounting pads
- Excellent RF switching

### MGSDD

**Sensitive .100 Grid Diode Suppressed/Protected High Performance Relay**

**Qualified to MIL-R-39016/43**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Mounting pads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver (gold plated) Moveable — Gold/platinum/palladium/silver (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 48 Vdc

**Coil Power** — 565 mW max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

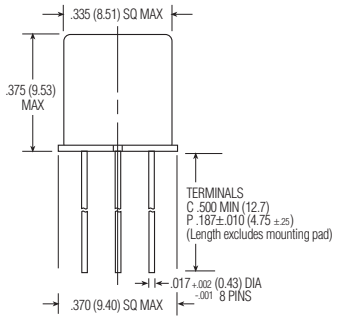
**Pick-up Sensitivity** — 60 mW max. @ 25°C

### Contact Ratings

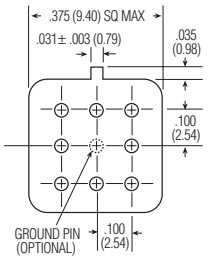
| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |



MGS




MGS/MGSD/MGSDD Enclosure




MGS/MGSD/MGSDD Header

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### MGS, MGSD, MGSDD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time — 4.0 ms max.
Release Time —
MGS — 2.0 ms max.
MGSD/MGSDD — 7.5 ms max.
(suppression diode, protection/ suppression diodes)

**Contact Bounce** — 1.5 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

**Weight** —
0.09 oz. (2.55 gms)
0.129 oz. (3.45 gms) w/ mounting pad attached

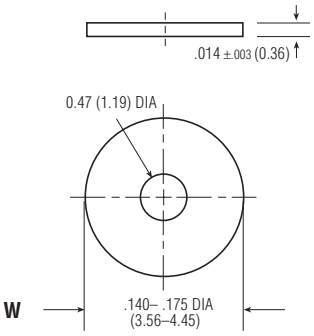
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

**QPL Approval** —
MIL-R-39016/41 (JMGS)
MIL-R-39016/42 (JMGSD)
MIL-R-39016/43 (JMGSDD)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**MGS/MGSD/MGSDD Mounting Pad**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note) | Coil Circuit Current mA (Max.) (Note) | Coil Circuit Current mA (Min.) (Note) | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C | Drop-Out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|
| MGS/MGSD | | | | | | | | | | |
| 5.0 | 100 | n/a | n/a | 2.6 | 3.5 | 0.23 | 0.12 | 250 | 7.5 | 5 |
| 6.0 | 200 | n/a | n/a | 3.4 | 4.5 | 0.28 | 0.18 | 180 | 10.0 | 6 |
| 9.0 | 400 | n/a | n/a | 4.85 | 6.8 | 0.55 | 0.35 | 203 | 15.0 | 9 |
| 12.0 | 800 | n/a | n/a | 7.0 | 9.0 | 0.64 | 0.41 | 180 | 20.0 | 12 |
| 18.0 | 1,600 | n/a | n/a | 9.8 | 13.5 | 0.92 | 0.59 | 203 | 30.0 | 18 |
| 26.5 | 3,200 | n/a | n/a | 14.0 | 18.0 | 1.4 | 0.89 | 219 | 40.0 | 26 |
| 36.0 | 6,500 | n/a | n/a | 20.0 | 27.0 | 1.8 | 1.25 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | n/a | n/a | 25.8 | 36.0 | 2.4 | 1.60 | 209 | 75.0 | 48 |
| MGSDD | | | | | | | | | | |
| 5.0 | 64 | 78.1 | 56.8 | 2.9 | 3.7 | 0.8 | 0.7 | 391 | 7.5 | 5 |
| 6.0 | 125 | 48.9 | 36.3 | 4.0 | 4.8 | 0.9 | 0.8 | 288 | 10.0 | 6 |
| 9.0 | 400 | 23.6 | 18.1 | 6.1 | 8.0 | 1.1 | 0.9 | 203 | 15.0 | 9 |
| 12.0 | 800 | 16.0 | 12.5 | 7.8 | 11.0 | 1.3 | 1.0 | 180 | 20.0 | 12 |
| 18.0 | 1,600 | 12.2 | 9.6 | 11.3 | 14.5 | 1.5 | 1.1 | 203 | 30.0 | 18 |
| 26.5 | 3,200 | 9.0 | 7.2 | 15.2 | 19.0 | 1.7 | 1.3 | 219 | 40.0 | 26 |
| 36.0 | 6,500 | 6.1 | 4.9 | 21.7 | 27.2 | 2.3 | 1.7 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | 4.8 | 3.9 | 27.8 | 34.8 | 2.8 | 2.0 | 209 | 75.0 | 48 |

**Note:** Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminals | Diodes | Ground Pins | Coils | Mounting Pads |
|---|---|---|---|---|---|---|
| | MGS | C | D | G | -26 | W |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

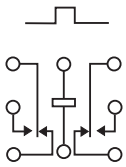
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**HC, HCD, HCS, HCSD**



### HC, HCS

**Standard / Sensitive**
**.100 Grid Commercial Relay**



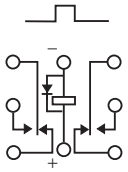
Terminal View

**Product Facts**

- Hermetically sealed
- Mounting pads
- Excellent RF switching

### HCD, HCSD

**Standard / Sensitive**
**.100 Grid Diode Suppressed**
**Commercial Relay**



Terminal View

**Product Facts**

- Suppression diode
- Hermetically sealed
- Mounting pads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** —
2 Form C (DPDT)

**Contact Material** —
Stationary —
Gold/platinum/palladium/silver alloy (gold plated)
Moveable —
Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** —
Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc)
After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** —
1 million operations

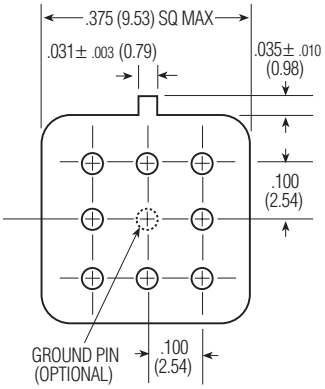
**Coil Voltage** —
5 to 26.5 Vdc (HC/HCD)
5 to 48 Vdc (HCS/HCSD)

**Coil Power** —
HC/HCD — 660 mW max. @ 25°C
HCS/HCSD — 565 mW max. @ 25°C

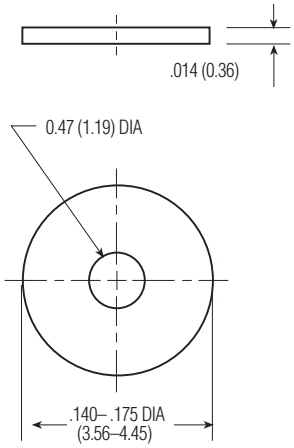
**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 70% of nominal coil voltage

**Pick-up Sensitivity** —
HC/HCD — 180 mW max. @ 25°C
HCS/HCSD — 90 mW max. @ 25°C




Header




Mounting Pad

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (Case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### HC, HCD, HCS, HCSD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time —
HC/HCD — 4.0 ms max.
HCS/HCSD — 6.0 ms max.
Release Time —
HC — 3.0 ms max.
HCS — 3.0 ms max.
HCD — 6.0 ms max.
(suppression diode)
HCSD — 7.5 ms max.
(suppression diode)

**Dielectric Withstanding Voltage** —
Between Open Contacts —
350 Vrms 60 Hz
Between Adjacent Contacts —
350 Vrms 60 Hz
Between Contacts & Coil —
350 Vrms 60 Hz

**Insulation Resistance** —
1,000 megohms @ 500 Vdc

### Environmental Characteristics

**Temperature Range** —
-55°C to +85°C

**Weight** —
HC/HCD —
0.09 oz. (2.55 gms)
HCS/HCSD —
0.15 oz. (4.30 gms)

**Vibration Resistance** —
10 G's, 10 to 500 Hz

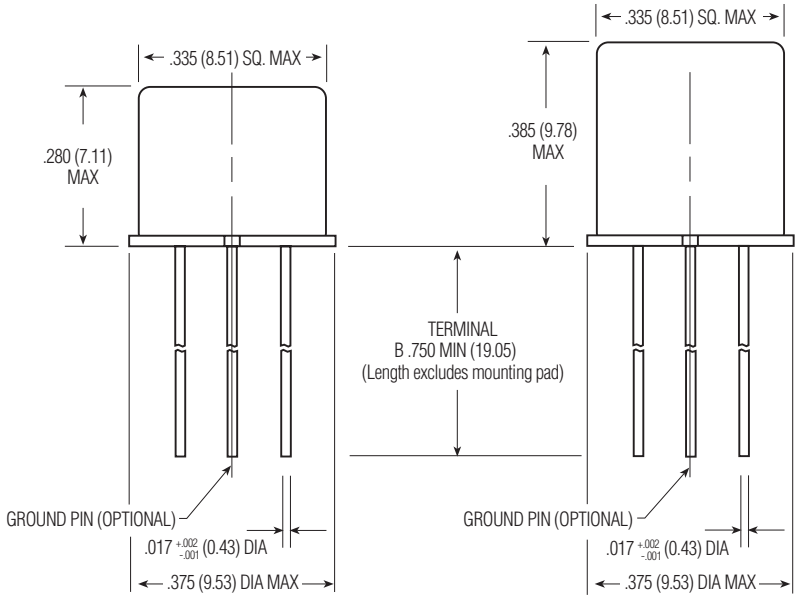
**Shock Resistance** —
30 G's, 6 ±1 ms

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage

### Standard Coil Data

| | Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±20% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|
| HC/HCD | 5.0 | 64 | 3.8 | 391 | 5.8 | 5 |
| | 6.0 | 98 | 4.9 | 367 | 8.0 | 6 |
| | 9.0 | 220 | 7.0 | 368 | 12.0 | 9 |
| | 12.0 | 400 | 9.0 | 360 | 16.0 | 12 |
| | 18.0 | 880 | 14.0 | 368 | 24.0 | 18 |
| | 26.5 | 1,600 | 18.0 | 439 | 32.0 | 26 |
| HCS/HCSD | 5.0 | 100 | 3.5 | 250 | 7.5 | 5 |
| | 6.0 | 200 | 4.5 | 180 | 10.0 | 6 |
| | 9.0 | 400 | 6.8 | 203 | 15.0 | 9 |
| | 12.0 | 800 | 9.0 | 180 | 20.0 | 12 |
| | 18.0 | 1,600 | 13.5 | 203 | 30.0 | 18 |
| | 26.5 | 3,200 | 18.0 | 219 | 40.0 | 26 |
| | 36.0 | 6,500 | 24.0 | 199 | 57.0 | 36 |
| | 48.0 | 11,000 | 32.0 | 209 | 75.0 | 48 |




**HC/HCD Enclosure** **HCS/HCSD Enclosure**

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

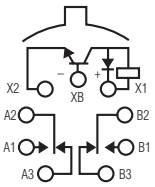
| Specifying a Part Number Example: | Type | Diodes | Ground Pin | Mounting Pads | Coils | Terminals |
|---|---|---|---|---|---|---|
| | HC | D | X | 3 | -26 | B |

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MAT**

**MAT**

**Standard TO-5**
**Diode Suppressed/**
**Transistor Driven**
**High Performance Relay**
**Qualified to MIL-R-28776/1**




**Terminal View**

### Product Facts

- **Transistor driver & suppression diode**
- **Hermetically sealed**
- **High shock & vibration ratings**
- **Spreader pads**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 675 mW max. @ 25°C

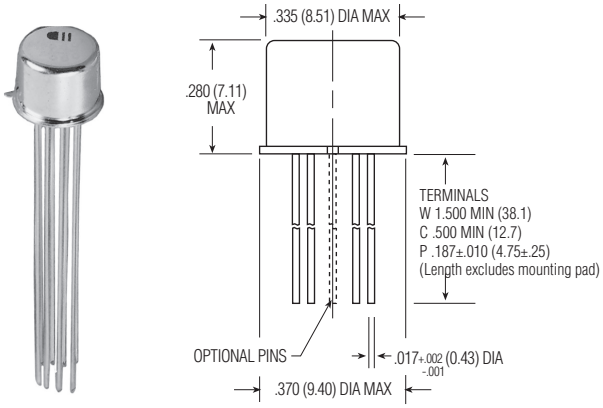
**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 130 mW max. @ 25°C

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |




**Enclosure**

**Header**

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MAT** (Continued)

### Operating Characteristics

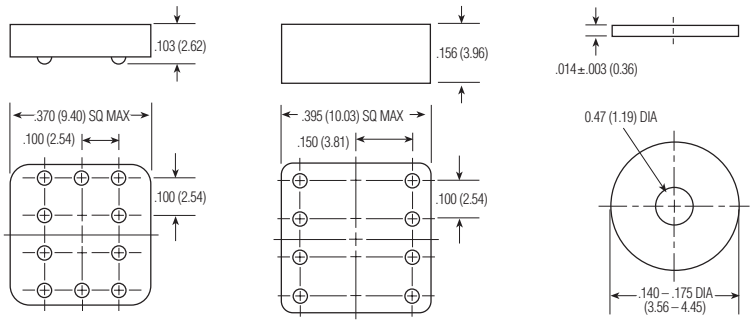
**Timing** —
Operate Time — 2.0 ms max.
Release Time — 7.5 ms max.
**Contact Bounce** — 1.5 ms max
**Dielectric Withstanding Voltage** —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz
**Insulation Resistance** —
10,000 megohms @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C
**Weight** —
0.09 oz. (2.55 grms)
0.10 oz. (2.80 grms) with spreader pad attached
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz
**Shock Resistance** —
75 G's, 6 ±1 ms max.
**QPL Approval** —
MIL-R-28776/1 (JMAT)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage
**Transistor** —
0.3 Vdc min. base turn off voltage;
6.0 Vdc min. emitter-base breakdown voltage ($BV_{EBO}$) @ 25°C;
80.0 Vdc min. collector-base breakdown voltage ($BV_{CBO}$) @ 25°C & $I_C$=100 µA




**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (Min.) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C (Note 2) | Drop-Out Voltage Vdc (Min.) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAT | | | | | | | | | | | | |
| 5.0 | 50 | 112.1 | 82.2 | 2.7 | 0.75 | 3.5 | 3.00 | 0.22 | 0.14 | 500 | 5.8 | 5 |
| 6.0 | 98 | 69.9 | 52.9 | 3.5 | 0.55 | 4.5 | 2.04 | 0.28 | 0.18 | 367 | 8.0 | 6 |
| 9.0 | 220 | 47.4 | 35.3 | 5.3 | 0.36 | 6.8 | 1.36 | 0.54 | 0.35 | 368 | 12.0 | 9 |
| 12.0 | 390 | 35.8 | 26.6 | 7.0 | 0.27 | 9.0 | 1.03 | 0.63 | 0.41 | 369 | 16.0 | 12 |
| 18.0 | 880 | 24.0 | 17.9 | 10.5 | 0.16 | 13.5 | 0.68 | 0.91 | 0.59 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | 19.8 | 14.7 | 14.2 | 0.13 | 18.0 | 0.50 | 1.37 | 0.89 | 450 | 32.0 | 26 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminal | Diodes | Ground Pins | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|---|
| | MA | C | T | G | -26 | S |

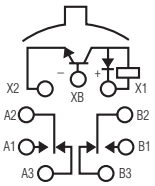
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MST**

**MST**

**Sensitive TO-5**
**Diode Suppressed/**
**Transistor Driven**
**High Performance Relay**
**Qualified to MIL-R-28776/3**




**Terminal View**

### Product Facts

- **Transistor driver & suppression diode**
- **Hermetically sealed**
- **High shock & vibration ratings**
- **Spreader pads**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver alloy (gold plated) Moveable — Gold/platinum/palladium/silver alloy (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 48 Vdc

**Coil Power** — 565 mW max. @ 25°C

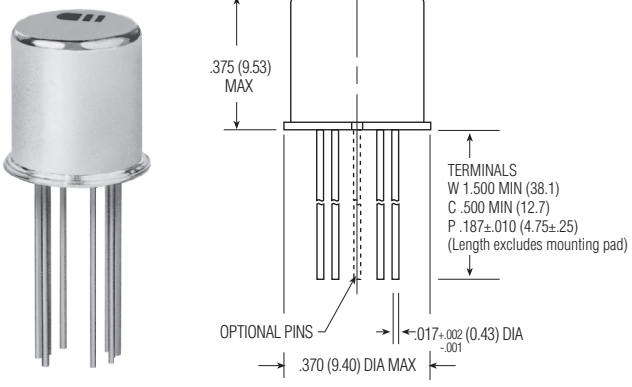
**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

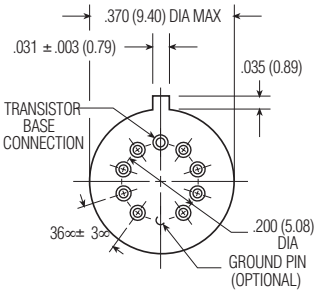
**Pick-up Sensitivity** — 60 mW max. @ 25°C

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |




**Enclosure**




**Header**

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MST** (Continued)

### Operating Characteristics

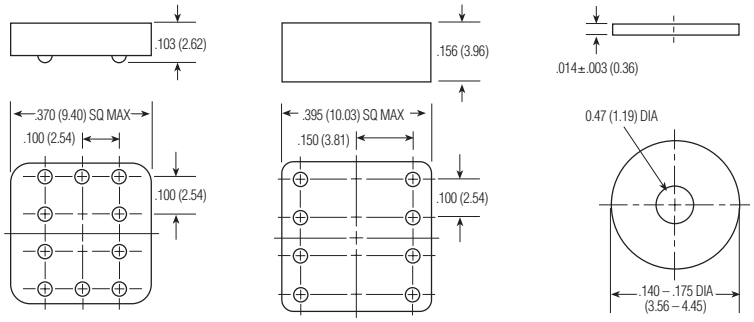
**Timing** —
Operate Time — 4.0 ms max.
Release Time — 7.5 ms max.
**Contact Bounce** — 1.5 ms max
**Dielectric Withstanding Voltage** —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz
**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C
**Weight** —
0.12 oz. (3.40 grms)
0.13 oz. (3.45 grms) with spreader pad attached
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz
**Shock Resistance** —
75 G's, 6 ±1 ms max.
**QPL Approval** —
MIL-R-28776/3 (JMST)

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage
**Transistor** —
0.3 Vdc min. base turn off voltage;
6.0 Vdc min. emitter-base breakdown voltage ($BV_{EBO}$) @ 25°C;
80.0 Vdc min. collector-base breakdown voltage ($BV_{CBO}$) @ 25°C & $I_C$=100 µA




**Spreader & Mounting Pads**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note 1) | Coil Circuit Current mA (Max.) (Note 1&2) | Coil Circuit Current mA (Min.) (Note 1&2) | Pickup Voltage Vdc (Max.) @ 25°C (Note 2) | Base Turn On Current mA (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C (Note 2) | Base Turn On Current mA (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C (Note 2) | Drop-Out Voltage Vdc (Min.) @ -65°C (Note 2) | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MST | | | | | | | | | | | | |
| 5.0 | 100 | 59.3 | 43.5 | 2.8 | 0.37 | 3.6 | 1.50 | 0.22 | 0.14 | 250 | 7.0 | 5 |
| 6.0 | 200 | 35.4 | 26.4 | 3.8 | 0.25 | 4.8 | 1.00 | 0.28 | 0.18 | 180 | 10.0 | 6 |
| 9.0 | 400 | 25.8 | 19.7 | 5.2 | 0.18 | 7.8 | 0.75 | 0.54 | 0.35 | 203 | 15.0 | 9 |
| 12.0 | 850 | 16.7 | 12.2 | 7.4 | 0.12 | 11.0 | 0.47 | 0.63 | 0.41 | 169 | 20.0 | 12 |
| 18.0 | 1,600 | 13.1 | 9.7 | 10.0 | 0.09 | 14.5 | 0.38 | 0.91 | 0.59 | 203 | 30.0 | 18 |
| 26.5 | 3,300 | 9.5 | 6.9 | 14.2 | 0.06 | 19.0 | 0.24 | 1.37 | 0.89 | 213 | 40.0 | 26 |
| 36.0 | 6,500 | 6.4 | 4.8 | 20.0 | 0.034 | 27.0 | 0.17 | 1.80 | 1.25 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | 5.1 | 3.7 | 25.8 | 0.026 | 36.0 | 0.13 | 2.40 | 1.60 | 209 | 75.0 | 48 |

**Notes:** 1. Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.
2. Set base current at 3 mA to 15 mA during measurements.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminal | Diodes | Ground Pins | Coils | Spreader/Mounting Pads |
|---|---|---|---|---|---|---|
| | MS | C | T | G | -26 | S |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

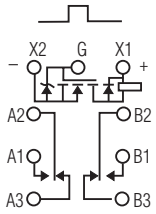
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MGAT**

**MGAT**

**Standard .100 Grid Diode Suppressed/MOSFET Driven High Performance Relay**

**Qualified to MIL-R-28776/6**




**Terminal View**

### Product Facts

- **MOSFET driver, zener & suppression diodes**
- **Hermetically sealed**
- **High shock & vibration ratings**
- **Mounting pads**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver (gold plated) Moveable — Gold/platinum/palladium/silver (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 660 mW max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

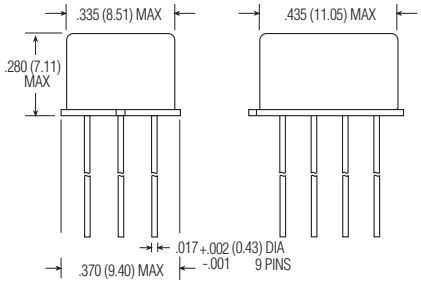
**Pick-up Sensitivity** — 130 mW max. @ 25°C

### Contact Ratings

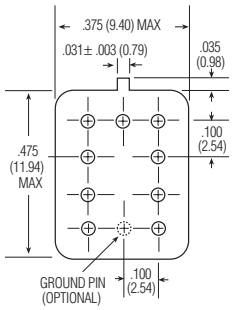
| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |



**MGAT**




**MGAT Enclosure**




**MGAT Header**

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### MGAT (Continued)

**Operating Characteristics**

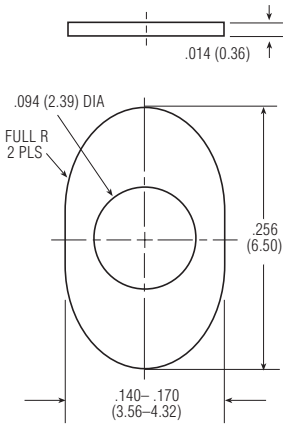
**Timing** —
Operate Time — 2.0 ms max.
**Contact Bounce** — 1.5 ms max.
**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz
**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc (coil to case @ +125°C)

**Environmental Characteristics**

**Temperature Range** —
-65°C to +125°C
**Weight** —
0.09 oz. (2.55 gms)
0.129 oz. (3.45 gms) w/ mounting pad attached
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz
**Shock Resistance** —
75 G's, 6 ±1 ms max.
**QPL Approval** —
MIL-R-28776/6 (JMGAT)

**Semiconductor Characteristics**

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage
**Zener Diode** —
20 Vdc ±3 Vdc over temperature range
**MOSFET** —
0.5 Vdc min. gate turn-off voltage
4.3 Vdc max. gate turn-on voltage




**MGAT Mounting Pad**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note) | Coil Circuit Current mA (Max.) (Note) | Coil Circuit Current mA (Min.) (Note) | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C | Drop-Out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|
| MGAT | | | | | | | | | | |
| 5.0 | 39 | 132.3 | 96.5 | 2.9 | 3.5 | 0.23 | 0.13 | 641 | 5.8 | 5 |
| 6.0 | 78 | 83.9 | 60.3 | 3.5 | 4.5 | 0.32 | 0.18 | 462 | 8.0 | 6 |
| 9.0 | 220 | 47.1 | 33.1 | 5.3 | 6.8 | 0.48 | 0.27 | 368 | 12.0 | 9 |
| 12.0 | 390 | 36.1 | 24.9 | 7.1 | 9.0 | 0.65 | 0.36 | 369 | 16.0 | 12 |
| 18.0 | 880 | 24.1 | 16.1 | 10.6 | 13.5 | 0.97 | 0.54 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | 19.9 | 12.9 | 14.2 | 18.0 | 1.30 | 0.72 | 450 | 32.0 | 26 |

**Note:** Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

**Specifying a Part Number Example:**

| Type | Terminals | Diodes | Ground Pins | Coils | Mounting Pads |
|---|---|---|---|---|---|
| MGA | C | T | G | -26 | W |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

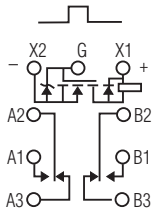
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**MGST**

**MGST**

**Sensitive .100 Grid Diode Suppressed/MOSFET Driven High Performance Relay**

**Qualified to MIL-R-28776/7**




**Terminal View**

### Product Facts

- **MOSFET driver, zener & suppression diodes**
- **Hermetically sealed**
- **High shock & vibration ratings**
- **Mounting pads**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver (gold plated) Moveable — Gold/platinum/palladium/silver (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 565 mW max. @ 25°C

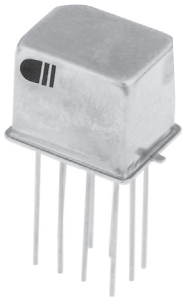
**Duty Cycle** — Continuous

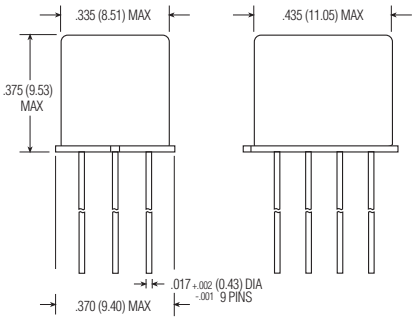
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 60 mW max. @ 25°C

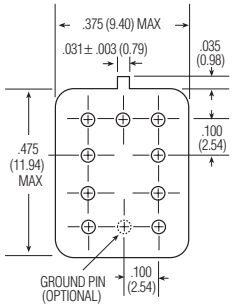
### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






**MGST Enclosure**




**MGST Header**

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### MGST (Continued)

**Operating Characteristics**

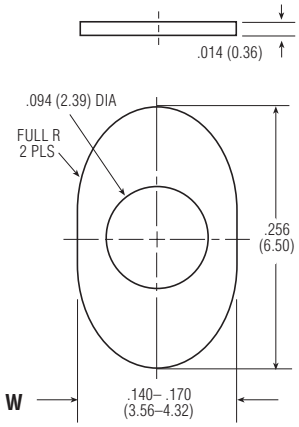
**Timing** —
Operate Time — 4.0 ms max.
Release Time — 7.5 ms max.
**Contact Bounce** — 1.5 ms max.
**Dielectric Withstanding Voltage**
— Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz
**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

**Environmental Characteristics**

**Temperature Range** —
-65°C to +125°C
**Weight** —
0.09 oz. (2.55 gms)
0.129 oz. (3.45 gms) w/ mounting pad attached
**Vibration Resistance** —
30 G's, 10 to 3,000 Hz
**Shock Resistance** —
75 G's, 6 ±1 ms max.
**QPL Approval** —
MIL-R-28776/7 (JMGST)

**Semiconductor Characteristics**

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage
**Zener Diode** —
20 Vdc ±3 Vdc over temperature range
**MOSFET** —
0.5 Vdc min. gate turn off voltage
4.3 Vdc max. gate turn on voltage




**MGST Mounting Pad**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note) | Coil Circuit Current mA (Max.) (Note) | Coil Circuit Current mA (Min.) (Note) | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C | Drop-Out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|
| MGST | | | | | | | | | | |
| 5.0 | 100 | 56.0 | 43.0 | 2.9 | 4.0 | 0.23 | 0.13 | 250 | 5.6 | 5 |
| 6.0 | 200 | 33.0 | 27.0 | 3.5 | 4.9 | 0.32 | 0.18 | 180 | 8.0 | 6 |
| 9.0 | 400 | 26.4 | 17.8 | 5.3 | 7.3 | 0.48 | 0.27 | 203 | 12.0 | 9 |
| 12.0 | 800 | 17.7 | 11.3 | 7.1 | 9.8 | 0.65 | 0.36 | 180 | 16.0 | 12 |
| 18.0 | 1,600 | 13.8 | 8.4 | 10.6 | 14.6 | 0.97 | 0.54 | 203 | 24.0 | 18 |
| 26.5 | 3,200 | 10.2 | 5.8 | 14.2 | 19.5 | 1.30 | 0.72 | 219 | 32.0 | 26 |

**Note:** Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Terminals | Diodes | Ground Pins | Coils | Mounting Pads |
|---|---|---|---|---|---|---|
| | MGS | C | T | G | -26 | W |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

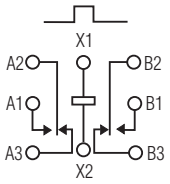
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**SMGA, SMGAD, SMGADD**

### SMGA

**Standard .100 Grid Surface Mount High Performance Relay**

**Designed to MIL-R-39016/17**




Terminal View

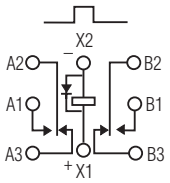
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Surface mount leads
- Excellent RF switching

### SMGAD

**Standard .100 Grid Diode Suppressed Surface Mount High Performance Relay**

**Designed to MIL-R-39016/18**




Terminal View

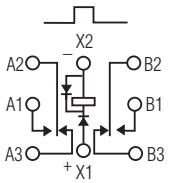
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Surface mount leads
- Excellent RF switching

### SMGADD

**Standard .100 Grid Diode Suppressed/Protected Surface Mount High Performance Relay**

**Designed to MIL-R-39016/19**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Surface mount leads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver (gold plated) Moveable — Gold/platinum/palladium/silver (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 660 mW max. @ 25°C

**Duty Cycle** — Continuous

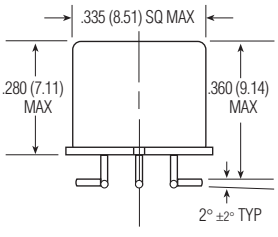
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 130 mW max. @ 25°C

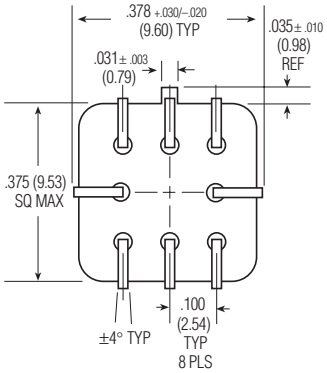
### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






Enclosure




Header

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### SMGA, SMGAD, SMGADD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time — 2.0 ms max.
Release Time —
SMGA — 1.5 ms max.
SMGAD/SMGADD — 4.0 ms max.
(suppression diode, protection/ suppression diodes)

**Contact Bounce** — 1.5 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

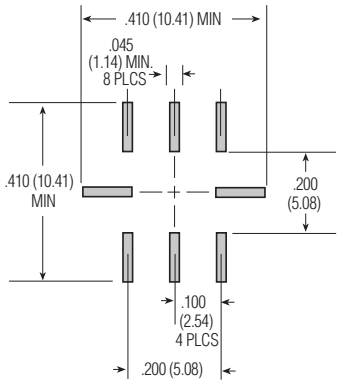
**Weight** —
0.09 oz. (2.55 gms)

**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**Recommended Solder Pad Layout**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note) | Coil Circuit Current mA (Max.) (Note) | Coil Circuit Current mA (Min.) (Note) | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C | Drop-Out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|
| SMGA/SMGAD | | | | | | | | | | |
| 5.0 | 50 | n/a | n/a | 2.7 | 3.5 | 0.22 | 0.14 | 500 | 5.8 | 5 |
| 6.0 | 98 | n/a | n/a | 3.5 | 4.5 | 0.28 | 0.18 | 367 | 8.0 | 6 |
| 9.0 | 220 | n/a | n/a | 5.3 | 6.8 | 0.54 | 0.35 | 368 | 12.0 | 9 |
| 12.0 | 390 | n/a | n/a | 7.0 | 9.0 | 0.63 | 0.41 | 369 | 16.0 | 12 |
| 18.0 | 880 | n/a | n/a | 10.5 | 13.5 | 0.91 | 0.59 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | n/a | n/a | 14.2 | 18.0 | 1.37 | 0.89 | 450 | 32.0 | 26 |
| SMGADD | | | | | | | | | | |
| 5.0 | 39 | 128.2 | 93.2 | 3.2 | 4.0 | 0.6 | 0.6 | 641 | 5.8 | 5 |
| 6.0 | 78 | 78.3 | 58.3 | 4.0 | 5.0 | 0.7 | 0.7 | 462 | 8.0 | 6 |
| 9.0 | 220 | 42.9 | 33.0 | 6.3 | 7.8 | 0.9 | 0.8 | 368 | 12.0 | 9 |
| 12.0 | 390 | 32.8 | 25.6 | 8.0 | 10.0 | 1.1 | 0.9 | 369 | 16.0 | 12 |
| 18.0 | 880 | 22.1 | 17.5 | 11.5 | 14.5 | 1.4 | 1.1 | 368 | 24.0 | 18 |
| 26.5 | 1,560 | 18.5 | 14.8 | 15.2 | 19.0 | 1.8 | 1.4 | 450 | 32.0 | 26 |

**Note:** Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| **Specifying a Part Number Example:** | **Type** | **Diode** | **Coils** |
|---|---|---|---|
| | SMGA | D | -26 |

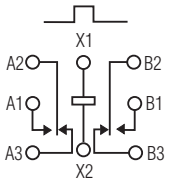
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

**SMGS, SMGSD, SMGSDD**

### SMGS

**Sensitive .100 Grid Surface Mount High Performance Relay**

**Designed to MIL-R-39016/41**




Terminal View

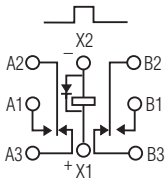
**Product Facts**

- Hermetically sealed
- High shock & vibration ratings
- Surface mount leads
- Excellent RF switching

### SMGSD

**Sensitive .100 Grid Diode Suppressed Surface Mount High Performance Relay**

**Designed to MIL-R-39016/42**




Terminal View

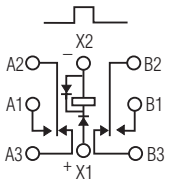
**Product Facts**

- Suppression diode
- Hermetically sealed
- High shock & vibration ratings
- Surface mount leads
- Excellent RF switching

### SMGSDD

**Sensitive .100 Grid Diode Suppressed/Protected Surface Mount High Performance Relay**

**Designed to MIL-R-39016/43**




Terminal View

**Product Facts**

- Suppression & protection diodes
- Hermetically sealed
- High shock & vibration ratings
- Surface mount leads
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold/platinum/palladium/silver (gold plated) Moveable — Gold/platinum/palladium/silver (gold plated)

**Contact Resistance** — Before Life — 100 milliohms max. (measured @ 10 mA @ 6 Vdc) After Life — 200 milliohms max. (measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 5 to 48 Vdc

**Coil Power** — 565 mW max. @ 25°C

**Duty Cycle** — Continuous

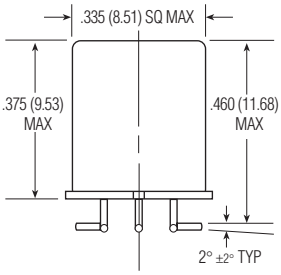
**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 130 mW max. @ 25°C

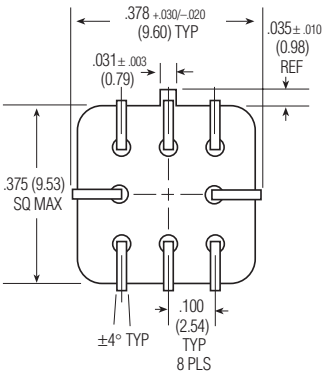
### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |
| 0.1 A @ 28 Vdc | Intermediate Current | 50,000 |






Enclosure




Header

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### SMGS, SMGSD, SMGSDD
(Continued)

### Operating Characteristics

**Timing** —
Operate Time — 4.0 ms max.
Release Time —
SMGS — 2.0 ms max.
SMGSD/SMGSDD — 7.5 ms max.
(suppression diode, protection/ suppression diodes)

**Contact Bounce** — 1.5 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc
(coil to case @ +125°C)

### Environmental Characteristics

**Temperature Range** —
-65°C to +125°C

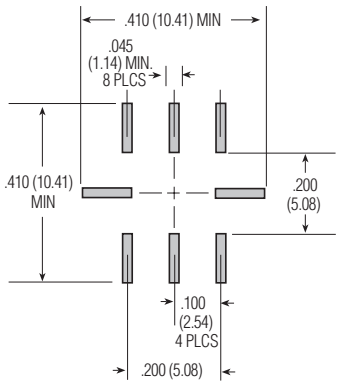
**Weight** —
0.09 oz. (2.55 gms)

**Vibration Resistance** —
30 G's, 10 to 3,000 Hz

**Shock Resistance** —
75 G's, 6 ±1 ms max.

### Semiconductor Characteristics

**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage




**Recommended Solder Pad Layout**

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C (Note) | Coil Circuit Current mA (Max.) (Note) | Coil Circuit Current mA (Min.) (Note) | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-Out Voltage Vdc (Min.) @ 25°C | Drop-Out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|---|
| SMGS/SMGSD | | | | | | | | | | |
| 5.0 | 100 | n/a | n/a | 2.6 | 3.5 | 0.23 | 0.12 | 250 | 7.5 | 5 |
| 6.0 | 200 | n/a | n/a | 3.4 | 4.5 | 0.28 | 0.18 | 180 | 10.0 | 6 |
| 9.0 | 400 | n/a | n/a | 4.85 | 6.8 | 0.55 | 0.35 | 203 | 15.0 | 9 |
| 12.0 | 800 | n/a | n/a | 7.0 | 9.0 | 0.64 | 0.41 | 180 | 20.0 | 12 |
| 18.0 | 1,600 | n/a | n/a | 9.8 | 13.5 | 0.92 | 0.59 | 203 | 30.0 | 18 |
| 26.5 | 3,200 | n/a | n/a | 14.0 | 18.0 | 1.4 | 0.89 | 219 | 40.0 | 26 |
| 36.0 | 6,500 | n/a | n/a | 20.0 | 27.0 | 1.8 | 1.25 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | n/a | n/a | 25.8 | 36.0 | 2.4 | 1.60 | 209 | 75.0 | 48 |
| SMGSDD | | | | | | | | | | |
| 5.0 | 64 | 78.1 | 56.8 | 2.9 | 3.7 | 0.8 | 0.7 | 391 | 7.5 | 5 |
| 6.0 | 125 | 48.9 | 36.3 | 4.0 | 4.8 | 0.9 | 0.8 | 288 | 10.0 | 6 |
| 9.0 | 400 | 23.6 | 18.1 | 6.1 | 8.0 | 1.1 | 0.9 | 203 | 15.0 | 9 |
| 12.0 | 800 | 16.0 | 12.5 | 7.8 | 11.0 | 1.3 | 1.0 | 180 | 20.0 | 12 |
| 18.0 | 1,600 | 12.2 | 9.6 | 11.3 | 14.5 | 1.5 | 1.1 | 203 | 30.0 | 18 |
| 26.5 | 3,200 | 9.0 | 7.2 | 15.2 | 19.0 | 1.7 | 1.3 | 219 | 40.0 | 26 |
| 36.0 | 6,500 | 6.1 | 4.9 | 21.7 | 27.2 | 2.3 | 1.7 | 199 | 57.0 | 36 |
| 48.0 | 11,000 | 4.8 | 3.9 | 27.8 | 34.8 | 2.8 | 2.0 | 209 | 75.0 | 48 |

**Note:** Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| **Specifying a Part Number Example:** | **Type** | **Diode** | **Coils** |
|---|---|---|---|
| | SMGS | D | -26 |

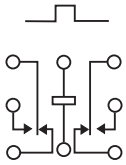
## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### SHC, SHCD, SHCS, SHCSD



### SHC, SHCS

**Standard / Sensitive**
**.100 Grid Surface Mount**
**Commercial Relay**



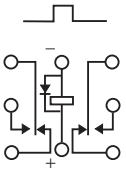
Terminal View

#### Product Facts

- Hermetically sealed
- Excellent RF switching

### SHCD, SHCSD

**Standard / Sensitive**
**.100 Grid Surface Mount**
**Diode Suppressed**
**Commercial Relay**



Terminal View

#### Product Facts

- Suppression Diode
- Hermetically sealed
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** —
2 Form C (DPDT)

**Contact Material** —
Stationary —
Gold/platinum/palladium/silver alloy
(gold plated)
Moveable —
Gold/platinum/palladium/silver alloy
(gold plated)

**Contact Resistance** —
Before Life — 100 milliohms max.
(measured @ 10 mA @ 6 Vdc)
After Life — 200 milliohms max.
(measured @ 1 A @ 28 Vdc)

**Mechanical Life Expectancy** —
1 million operations

**Coil Voltage** —
5 to 26.5 Vdc (SHC/SHCD)
5 to 48 Vdc (SHCS/SHCSD)

**Coil Power** —
SHC/SHCD — 660 mW max. @ 25°C
SHCS/SHCSD — 565 mW max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately
70% of nominal coil voltage

**Pick-up Sensitivity** —
SHC/SHCD — 180 mW max. @ 25°C
SHCS/SHCSD — 90 mW max. @ 25°C

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 1.0 A @ 28 Vdc | Resistive | 100,000 |
| 250 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive (Case not grounded) | 100,000 |
| 100 mA @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.2 A @ 28 Vdc | Inductive (0.32 Henry) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |

## Double Pole, Electrically Held, 1 Amp and Less (Continued)

### SHC, SHCD, SHCS, SHCSD
(Continued)

### Operating Characteristics
**Timing** —
Operate Time —
SHC/SHCD — 4.0 ms max.
SHCS/SHCSD — 6.0 ms max.
Release Time —
SHC — 3.0 ms max.
SHCS — 3.0 ms max.
SHCD — 6.0 ms max.
(suppression diode)
SHCSD — 7.5 ms max.
(suppression diode)

**Dielectric Withstanding Voltage** —
Between Open Contacts —
350 Vrms 60 Hz
Between Adjacent Contacts —
350 Vrms 60 Hz
Between Contacts & Coil —
350 Vrms 60 Hz

**Insulation Resistance** —
1,000 megohms @ 500 Vdc

### Environmental Characteristics
**Temperature Range** —
-55°C to +85°C

**Weight** —
SHC/SHCD —
0.09 oz. (2.55 gms)
SHCS/SHCSD —
0.15 oz. (4.30 gms)

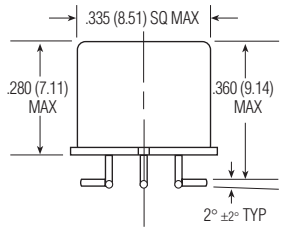
**Vibration Resistance** —
10 G's, 10 to 500 Hz

**Shock Resistance** —
30 G's, 6 ±1 ms

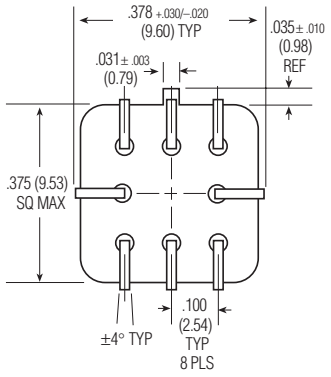
### Semiconductor Characteristics
**Diode** —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage

### Standard Coil Data

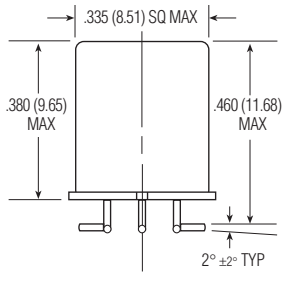
| | Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±20% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|
| SHC/SHCD | 5.0 | 64 | 3.8 | 391 | 5.8 | 5 |
| | 6.0 | 98 | 4.9 | 367 | 8.0 | 6 |
| | 9.0 | 220 | 7.0 | 368 | 12.0 | 9 |
| | 12.0 | 400 | 9.0 | 360 | 16.0 | 12 |
| | 18.0 | 880 | 14.0 | 368 | 24.0 | 18 |
| | 26.5 | 1,600 | 18.0 | 439 | 32.0 | 26 |
| SHCS/SHCSD | 5.0 | 100 | 3.5 | 250 | 7.5 | 5 |
| | 6.0 | 200 | 4.5 | 180 | 10.0 | 6 |
| | 9.0 | 400 | 6.8 | 203 | 15.0 | 9 |
| | 12.0 | 800 | 9.0 | 180 | 20.0 | 12 |
| | 18.0 | 1,600 | 13.5 | 203 | 30.0 | 18 |
| | 26.5 | 3,200 | 18.0 | 219 | 40.0 | 26 |
| | 36.0 | 6,500 | 24.0 | 199 | 57.0 | 36 |
| | 48.0 | 11,000 | 32.0 | 209 | 75.0 | 48 |



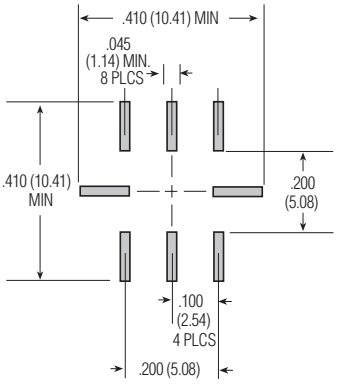
SHC/SHCD Enclosure



SHC/SHCD/SHCS/SHCSD Header



SHCS/SHCSD Enclosure



Recommended Solder Pad Layout

### Ordering Instructions
Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the relay characteristics in the order in which the codes are listed.

| Specifying a Part Number Example: | Type | Diodes | Coils |
|---|---|---|---|
| | SHC | D | -26 |

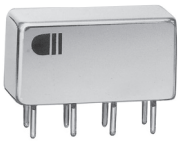
## Double Pole, Electrically Held, 2 Amps and Less

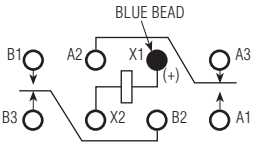
**HFW, HMB, HMS**

### HFW

**Standard Half Size High Performance Relay**

**Qualified to MIL-R-39016/6**






Terminal View

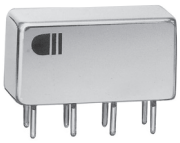
**Product Facts**

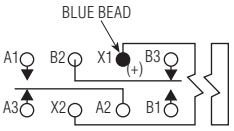
- Hermetically sealed
- Up to 2 amps switching
- High shock & vibration ratings
- Optional terminals & mounting styles
- Excellent RF switching

### HMB

**Bifilar Half Size High Performance Relay**

**Qualified to MIL-R-39016/22**






Terminal View

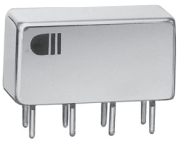
**Product Facts**

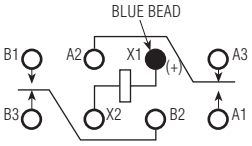
- Hermetically sealed
- Up to 2 amps switching
- High shock & vibration ratings
- Optional terminals & mounting styles
- Excellent RF switching

### HMS

**Sensitive Half Size High Performance Relay**

**Qualified to MIL-R-39016/44**






Terminal View

**Product Facts**

- Hermetically sealed
- Up to 2 amps switching
- High shock & vibration ratings
- Optional terminals & mounting styles
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Hardened silver alloy Moveable — Gold plated hardened silver alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 50 million operations

**Coil Voltage** — 5 to 48 Vdc (HFW) 6 to 26.5 Vdc (HMB) 5 to 36 Vdc (HMS)

**Coil Power** — 1.4 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity @ 25°C** — 145 to 260 mW (HFW) 325 mW (HMB) 100 to 125 mW (HMS)

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 2 A @ 28 Vdc | Resistive | 100,000 |
| 0.75 A @ 28 Vdc | Inductive (200mH) | 100,000 |
| 0.1 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.1 A @ 28 Vdc | Intermediate | 50,000 |
| 0.160 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |

### RF Performance

| Frequency (MHz) | RF Losses (dB) | VSWR | Isolation (dB) |
|---|---|---|---|
| 100 | 0.1 | 1.17:1 | 40 |
| 500 | 0.3 | 1.19:1 | 28 |
| 1000 | 0.4 | 1.19:1 | 23 |

## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### HFW, HMB, HMS (Continued)

#### Operating Characteristics

**Timing** —
Operate Time —
4.0 ms max. (HFW)
5.0 ms max. (HMB)
6.0 ms max. (HMS)
Release Time —
4.0 ms max. (HFW)
5.0 ms max. (HMB/HMS)

**Contact Bounce** — 2.0 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
1000 Vrms 60 Hz
Between Contacts & Coil —
1000 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc

#### Environmental Characteristics

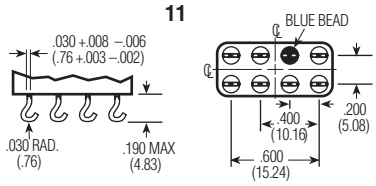
**Temperature Range** —
-65°C to +125°C

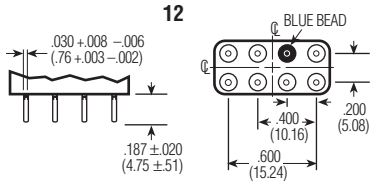
**Weight** — 0.46 oz. (13 gms max.)

**Vibration Resistance** — HFW/HMB/HMS —
Standard — 20 G's, 10 to 2,000 Hz
HFW/HMB —
QPL — 30 G's, 10 to 3,000 Hz
HMS —
QPL — 20 G's, 10 to 2,500 Hz

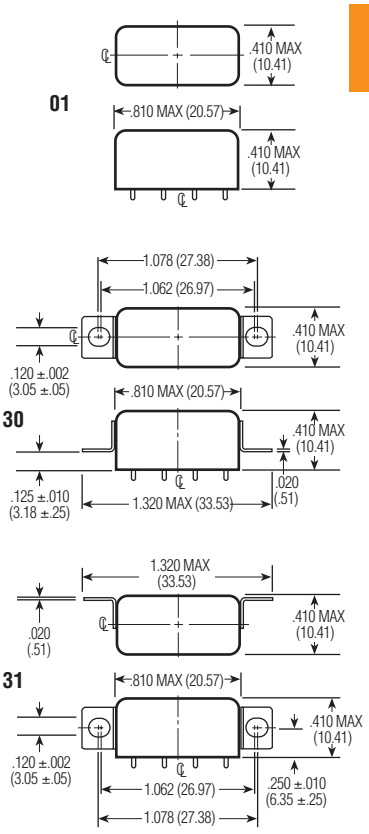
**Shock Resistance** —
100 G's, 6 ±1 ms
50 G's, 11 ±1 ms (HMS)

**QPL Approval** —
MIL-R-39016/6 (HFW)
MIL-R-39016/22 (HMB)
MIL-R-39016/44 (HMS)




**Terminals**




**Mounting Styles**

### Standard Coil Data

| | Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Min.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|
| HFW | 5.0 | 27 | 2.7 | 3.8 | 0.29 | 0.21 | 926 | 6.0 | L |
| | 6.0 | 40 | 3.2 | 4.5 | 0.35 | 0.25 | 900 | 7.5 | F |
| | 12.0 | 160 | 6.4 | 9.0 | 0.7 | 0.5 | 900 | 15.0 | G |
| | 26.5 | 700 | 13.5 | 18.0 | 1.5 | 1.0 | 1003 | 32.0 | K |
| HMB | 6.0 | 40 | 3.6 | 4.8 | 0.35 | 0.25 | 900 | 7.5 | F |
| | 12.0 | 160 | 7.2 | 9.6 | 0.7 | 0.5 | 900 | 15.0 | G |
| | 26.5 | 700 | 15.0 | 20.0 | 1.5 | 1.0 | 1003 | 32.0 | K |
| HMS | 5.0 | 47 | 2.2 | 3.2 | 0.21 | 0.12 | 532 | 7.0 | S001 |
| | 6.0 | 75 | 2.75 | 4.0 | 0.27 | 0.17 | 480 | 9.0 | S002 |
| | 12.0 | 310 | 5.6 | 8.0 | 0.55 | 0.35 | 465 | 20.0 | S003 |
| | 26.5 | 1,030 | 11.4 | 16.5 | 1.1 | 0.7 | 682 | 35.0 | S004 |
| | 30.0 | 1,620 | 14.3 | 21.0 | 1.4 | 0.9 | 556 | 44.0 | S005 |
| | 36.0 | 2,640 | 18.0 | 26.0 | 1.8 | 1.1 | 491 | 56.0 | S006 |
| Other | 6-8 | 60 | 3.5 | 4.85 | 0.35 | 0.22 | 817 | 9.0 | A |
| (avail. for HFW | 12-15 | 320 | 6.8 | 9.42 | 0.68 | 0.44 | 570 | 21.0 | B |
| relays only) | 18.0 | 520 | 9.5 | 13.16 | 0.95 | 0.62 | 623 | 27.0 | J |
| | 26.5-32 | 1,250 | 14.0 | 19.4 | 1.5 | 0.98 | 684 | 42.0 | D |
| | 40.0 | 2,700 | 21.3 | 29.5 | 2.1 | 1.37 | 593 | 61.0 | H |
| | 48.0 | 3,500 | 25.5 | 35.3 | 2.5 | 1.63 | 658 | 70.0 | E |

**Specifying a Part Number Example:**

| Type | Terminals | Mountings | Coils | Features |
|---|---|---|---|---|
| HFW | 12 | 30 | K | 00 (n/a HMS) |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

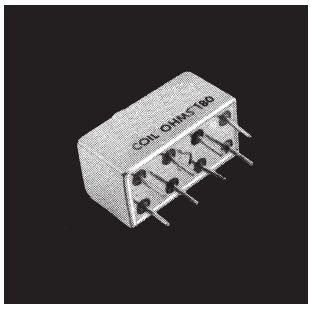
## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### Long-life Half size Industrial Relay

### Type 3SCV (2PDT)

### Product Facts

- **100,000,000 operations at low-level**
- **Hermetic seal**




The 3SCV is an exceptionally long life relay for low level applications which is designed for industrial applications such as business machines and computer peripheral equipment. The design is such that the phenomenon of sticking contacts is all but eliminated. Because of its low contact resistance and its ability to handle overloads the 3SCV relay is well suited for applications which have previously required reed devices.

### Electrical Characteristics

**Contacts** — 2 Form C

**Contact Resistance** — 0.050 ohms; 0.100 ohms after life test

**Life** — $10^5$-2A 28 volts DC, 115 volts AC (not grounded, resistive)
0.5A
Low-level — 100,000,000 operations — 50 µA at 50 mV Peak AC or DC

**Sensitivity** — 340 mW

### Operating Characteristics

**Operate Time** — 6 ms max.

**Release Time** — 4 ms max.

**Contact Bounce** — 2 ms max.

**Enclosure** — All welded, hermetically sealed

**Terminals** — Weldable and solderable

**Dielectric Strength** — 500 volts rms at sea level

**Insulation Resistance** — 1,000 megohm min.

### Environmental Characteristics

**Weight** — 0.30 oz.

**Vibration** — 10G, 10-2000 Hz

**Shock** — 50 G 6ms, 1/2 sine

**Temperature** — -14°C to +125°C

See page 1-39 for Mounting Forms, Terminals and Circuit Diagrams.

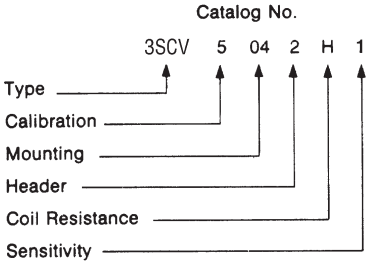
## Coil Table (All Values DC)* 340 mW Sensitivity: (Code 1)

| Coil Code Letter | Coil Resistance at 25C (ohms) | Voltage Calibrated, CODE: 5 | | | |
|---|---|---|---|---|---|
| | | Suggested Source Volts† | Maximum Operate Volts at 25C | Release Voltage Range at 25C | |
| | | | | Max | Min |
| A | 47 ± 10% | 4.8-7 | 3.9 | 2.7 | .43 |
| B | 75 ± 10% | 6.1-9 | 4.9 | 3.4 | .5 |
| C | 120 ± 10% | 7.7-12 | 6.3 | 4.4 | .69 |
| D | 180 ± 10% | 9.5-15 | 7.7 | 5.4 | .85 |
| E | 310 ± 10% | 12.5-20 | 10.1 | 7.0 | 1.1 |
| F | 440 ± 10% | 15.0-23 | 12.0 | 8.4 | 1.3 |
| H | 700 ± 10% | 20.0-30 | 15.5 | 10.9 | 1.7 |
| K | 1030 ± 10% | 24.0-35 | 18.5 | 12.9 | 2.0 |
| L | 1620 ± 10% | 30.0-44 | 23.1 | 16.2 | 2.5 |
| M | 2640 ± 10% | 39.0-56 | 29.5 | 20.68 | 3.2 |

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Example:** The relay selected in this example is a 2PDT half size relay, voltage calibrated, two-hole side bracket mounting, solder hook header, 700 ohms coil resistance, and 340 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SCV5042H1. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SCV5042H1R.



## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### Mounting Forms (3SCV)



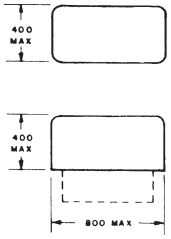
All dimensions in inches

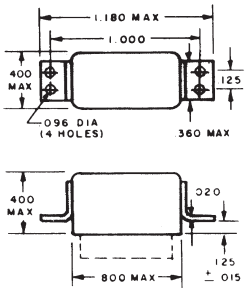
| TOLERANCES | |
|---|---|
| (Unless otherwise specified) | |
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |

**No Mount**

| Mounting Code |
|---|
| 00 |

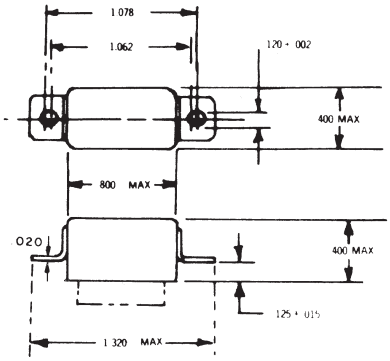
* Assumes relay held securely by potting or other means.




**Four-hole End Bracket**

| Mounting Code |
|---|
| 01 |

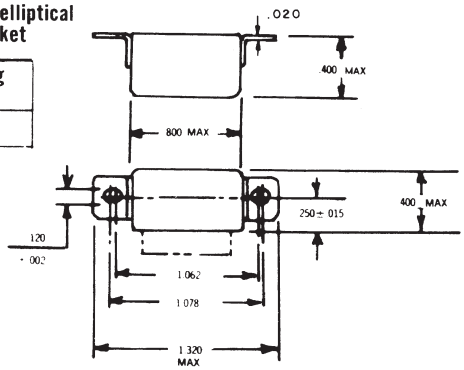


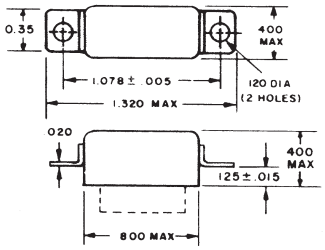

**Two-hole elliptical END bracket**

| Mounting Code |
|---|
| 53 |

**Two-hole elliptical Side Bracket**

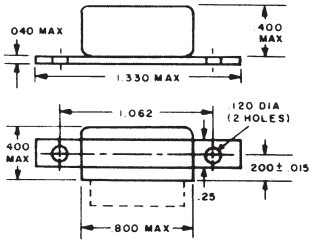
| Mounting Code |
|---|
| 54 |




**Two-hole End Bracket**

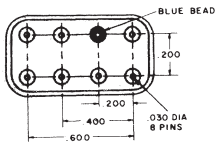
| Mounting Code |
|---|
| 13 |

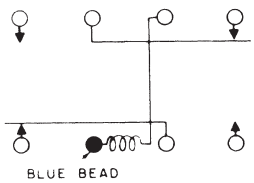



**Two-hole Side Bracket**

| Mounting Code |
|---|
| 04 |

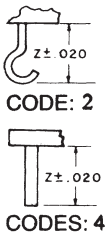
## Header and Connection Diagrams



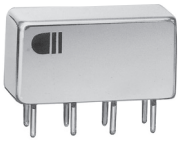

## Header Types

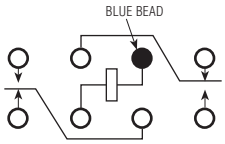
| Type | Z Dim. | Header Code |
|---|---|---|
| Solder hook | 0.16 | 2 |
| Straight pin (socket or PCB type) | 0.19 | 4 |



## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### HFC
### Commercial/Industrial Half Size Relay






Terminal View

### Product Facts

- Hermetically sealed
- Up to 2 amps switching
- Economical configuration
- Optional terminals & mounting styles

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Bifurcated hardened silver alloy Moveable — Gold plated hardened alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 10 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 1.4 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 60% of nominal coil voltage

**Pick-up Sensitivity** — 360 mW

### Operating Characteristics

**Timing** — Operate Time — 6.0 ms max. Release Time — 6.0 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 350 Vrms 60 Hz Between Adjacent Contacts — 500 Vrms 60 Hz Between Contacts and Coil — 500 Vrms 60 Hz

**Insulation Resistance** — 1,000 megohms min @ 500 Vdc

### Environmental Characteristics

**Temperature Range** — -55°C to +85°C

**Weight** — 0.46 oz. (13 gms) max.

**Vibration Resistance** — 10 G's, 10 to 500 Hz

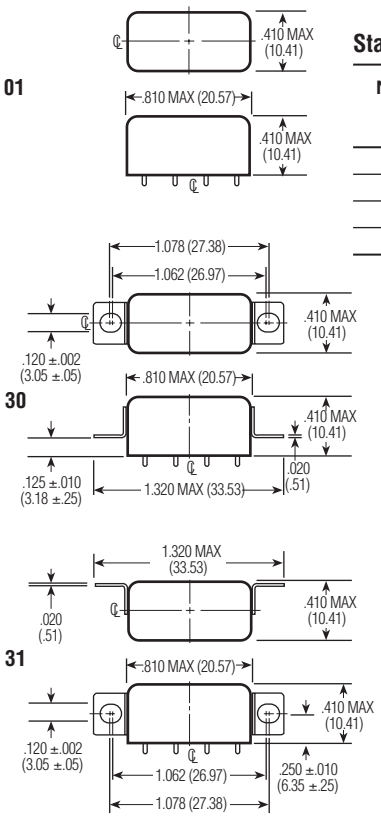
**Shock Resistance** — 30 G's, 6 ±1 ms

### Contact Ratings

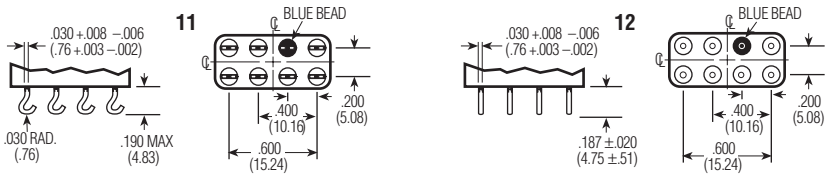
| Contact Load | Type | Operations Min. |
|---|---|---|
| 2 A @ 28 Vdc | Resistive | 100,000 |
| 0.75 A @ 28 Vdc | Inductive (200 mH) | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |

### Standard Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ± 20% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 85°C | Nom. Coil Power (W) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|
| 5.0 | 27 | 3.0 | 3.7 | .92 | 6.0 | L |
| 6.0 | 40 | 3.6 | 4.5 | .90 | 7.5 | F |
| 12.0 | 160 | 7.2 | 8.9 | .90 | 15.0 | G |
| 26.5 | 700 | 16.0 | 19.7 | 1.00 | 32.0 | K |




Mounting Styles




Terminals

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Specifying a Part Number Example:**

| Type | Terminals | Mountings | Coils | Features |
|---|---|---|---|---|
| HFC | 12 | 30 | K | 00 |

## Double Pole, Electrically Held, 2 Amps and Less (Continued)

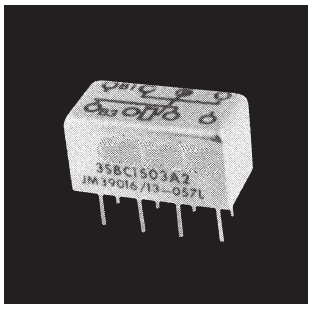
### .150 Grid-space Relays

### Type 3SBC (2PDT) Standard

**135 mW 2PDT**
**50 mW (Form AB)**
**1 PNC–1 PNO**

### Product Facts

- **Low profile… only 0.32 inches high**
- **Internal diode for coil transient suppression and transistor driven models available**
- **Qualified to MIL-R-39016/13**
- **RF designs available**




The .150 Grid-space relay — only 0.32 inches high — saves space in electronic packaging. The pin spacing allows you to insert the relay with no intermediate pin spreaders as well as meet applicable military specifications.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts (50,000 operations)
1 Amp @ 28 V (100,000 operations)
DC inductive — 0.5 amps at 28 volts, 200 mH
AC resistive — 0.5 amps at 115 volts
AC — 0.125 amps at 115 volts (case grounded)
Low-level — 50 µA at 50 mV
Peak AC or DC

**Contact Resistance** —
0.050 ohms max.; 0.150 ohms after life test

**Life** — 100,000 operations at rated loads listed; 1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 4 ms max.

**Contact Bounce** — 1.5 ms

**Dielectric Strength** —
500 volts rms at sea level;
350 volts rms at 70,000 feet and above

**Insulation Resistance** — 1,000 megohm min. over temperature range

### Environmental Characteristics

**Vibration** — 30G, to 3000 Hz

**Shock** — 100 G at 11 ms

**Temperature** — -65°C to +125°C

See page 1-44 for Mounting Forms, Terminals and Circuit Diagrams.



### Coil Table Type 3SBC (All Values DC)*2PDT, 135 mW Sensitivity: (Code 1)

| Coil Code Letter | Coil Resistance @ 25C (ohms) | Voltage Calibrated, Code 5 | | | | Current Calibrated, Code 6 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Suggested Source Volts† | Max. Operate Volts @ 25C | Release Voltage Range @ 25C | | Max. Continuous Current @ 125C (mA) | Max. Operate Current @ 25C (mA) | Release Current Range @ 25C (mA) | |
| | | | | Max. | Min. | | | Max. | Min. |
| A | 44 ± 10% | 3.5-6.2 | 2.4 | 1.45 | 0.26 | 87.0 | 54.5 | 32.7 | 6.00 |
| B | 56 ± 10% | 4.0-7.0 | 2.7 | 1.6 | 0.3 | 77.0 | 48.3 | 28.6 | 5.30 |
| D | 140 ± 10% | 6.4-12.0 | 4.4 | 2.6 | 0.5 | 50.3 | 31.4 | 18.5 | 3.60 |
| E | 210 ± 10% | 8.0-16.0 | 5.4 | 3.2 | 0.6 | 40.0 | 25.7 | 15.4 | 2.80 |
| L | 650 ± 10% | 13.6-24.0 | 9.5 | 5.6 | 1.0 | 22.9 | 14.3 | 8.6 | 1.54 |
| K | 1350 ± 10% | 20.0-35.0 | 13.5 | 8.1 | 1.5 | 15.5 | 10.0 | 6.0 | 1.10 |
| N | 2245 ± 10% | 26.0-46.0 | 17.1 | 10.5 | 1.9 | 12.0 | 7.6 | 4.7 | 0.84 |

### Coil-Data (All Values DC)* Type 3SBC Form AB 50 mW Sensitivity non mil spec: (Code 2)

| Coil Code Letter | Coil Resistance @ 25C (ohms) | Voltage Calibrated, Code 5 | | | | Current Calibrated, Code 6 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Suggested Source Volts† | Max. Operate Volts @ 25C | Release Voltage Range @ 25C | | Max. Continuous Current @ 125C (mA) | Max. Operate Current @ 25C (mA) | Release Current Range @ 25C (mA) | |
| | | | | Max. | Min. | | | Max. | Min. |
| B | 56 ± 10% | 2.6-7.0 | 1.8 | 1.1 | 0.16 | 46.5 | 29.1 | 18.2 | 3.30 |
| C | 85 ± 10% | 3.3-9.5 | 2.3 | 1.4 | 0.20 | 38.7 | 24.2 | 15.1 | 2.70 |
| D | 140 ± 10% | 4.3-12.0 | 2.9 | 1.8 | 0.27 | 30.4 | 19.0 | 11.9 | 2.10 |
| E | 210 ± 10% | 5.3-14.0 | 3.6 | 2.2 | 0.33 | 24.8 | 15.5 | 9.7 | 1.75 |
| F | 360 ± 10% | 6.7-19.0 | 4.5 | 2.8 | 0.41 | 18.9 | 11.8 | 7.2 | 1.30 |
| G | 510 ± 10% | 8.2-23.0 | 5.6 | 3.5 | 0.51 | 15.8 | 9.9 | 6.2 | 1.10 |
| H | 775 ± 10% | 10.0-26.0 | 6.8 | 4.2 | 0.62 | 12.8 | 8.0 | 5.0 | 0.90 |
| K | 1350 ± 10% | 13.2-35.0 | 9.0 | 5.6 | 0.82 | 9.8 | 6.1 | 3.8 | 0.68 |
| N | 2245 ± 10% | 16.8-46.0 | 11.4 | 7.1 | 1.00 | 7.4 | 4.6 | 2.9 | 0.52 |

*Values listed are factory test and inspection data. User should allow for meter variations.
†At nominal resistance plus 10%. ‡Applicable over the operating temperature range in circulating air.

See Page 1-42 for ordering instructions.

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### .150 Grid-space Hybrid Relays

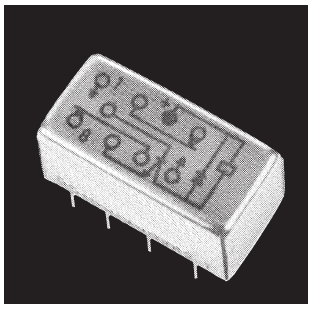
**Single Diode, Dual Diode**

**Type 3SBC (2PDT)**

**135 mW**

### Product Facts

- **Low profile… only 0.32 inches high**
- **50 milliwatt forms available**
- **Qualified to MIL-R-39016/37**
- **Qualified to MIL-R-39016/38**
- **RF designs available**



The hybrid .150 Grid-space relay — only 0.32 inches high — saves space in electronic packaging. The pin spacing allows you to insert the relay with no intermediate pin spreader.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts (50,000 operations)
1 Amp @ 28 V (100,000 operations)
DC inductive — 0.5 amps at 28 volts, 200 mH
AC resistive — 0.5 amps at 115 volts
AC — 0.125 amps at 115 volts (case grounded)
Low-level — 50 µA at 50 mV
Peak AC or DC

**Contact Resistance** —
0.050 ohms max.; 0.150 ohms after life test

**Life** — 100,000 operations at rated loads listed; 1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 6 ms max.

**Contact Bounce** — 1.5 ms

**Dielectric Strength (Note 1)** —
500 volts rms at sea level;
350 volts rms at 70,000 feet and above

**Insulation Resistance (Note 1)** —
1,000 megohm min. over temperature range

### Environmental Characteristics

**Vibration** — 30G, to 3000 Hz

**Shock** — 100 G at 11 ms

**Temperature** — -65°C to +125°C

### Semiconductor Characteristics at 25°C

**Diode** —
Max. Negative Transient — 1.0 volt
Breakdown Voltage — 100 VDC @ 10 µA
Max. Leakage Current — 1 µA @ 50 VDC

See page 1-44 for Mounting Forms, Terminals and Circuit Diagrams.

### Coil Table Single Diode (All Values DC)*(2DPT), 135 mW Sensitivity: (Code 5)

| Coil Code Letter | Coil Resistance @ 25C (ohms) | Voltage Calibrated, Code 5 | | | | Current Calibrated, Code 6 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Suggested Source Volts† | Max. Operate Volts @ 25C | Release Voltage Range @ 25C | | Max. Continuous Current @ 125C (mA) | Max. Operate Current @ 25C (mA) | Release Current Range @ 25C (mA) | |
| | | | | Max. | Min. | | | Max. | Min. |
| A | 44 ± 10% | 3.5- 6.2 | 2.4 | 1.45 | 0.26 | 87.0 | 54.5 | 32.7 | 6.00 |
| B | 56 ± 10% | 4.0- 7.0 | 2.7 | 1.6 | 0.3 | 77.0 | 48.3 | 28.6 | 5.30 |
| D | 140 ± 10% | 6.4-12.0 | 4.4 | 2.6 | 0.5 | 50.3 | 31.4 | 18.5 | 3.60 |
| E | 210 ± 10% | 8.0-16.0 | 5.4 | 3.2 | 0.6 | 40.0 | 25.7 | 15.4 | 2.80 |
| L | 650 ± 10% | 13.6-24.0 | 9.5 | 5.6 | 1.0 | 22.9 | 14.3 | 8.6 | 1.54 |
| K | 1350 ± 10% | 20.0-35.0 | 13.5 | 8.1 | 1.5 | 15.5 | 10.0 | 6.0 | 1.10 |
| N | 2245 ± 10% | 26.0-46.0 | 17.1 | 10.5 | 1.9 | 12.0 | 7.6 | 4.7 | 0.84 |

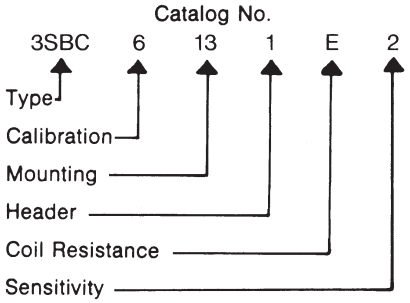
### Coil Table Dual Diode (All Values DC)*(2DPT), 135 mW Sensitivity: (Code 6)

| | ** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| A | 44 ± 10% | 3.9- 7.0 | 3.4 | 2.0 | 0.37 | 98.2 | 77.3 | 45.5 | 8.4 |
| B | 56 ± 10% | 4.6- 8.0 | 3.7 | 2.2 | 0.41 | 89.8 | 66.1 | 39.3 | 7.1 |
| D | 140 ± 10% | 7.8-12.0 | 5.4 | 3.2 | 0.6 | 52.4 | 38.6 | 22.9 | 4.3 |
| E | 210 ± 10% | 9.3-16.0 | 6.4 | 3.8 | 0.7 | 41.4 | 30.5 | 18.1 | 3.3 |
| L | 650 ± 10% | 15.0-24.0 | 10.5 | 6.2 | 1.1 | 23.6 | 16.2 | 9.5 | 1.7 |
| K | 1350 ± 10% | 21.0-35.0 | 14.5 | 8.7 | 1.6 | 16.0 | 10.7 | 6.4 | 1.2 |
| N | 2245 ± 10% | 27.0-46.0 | 18.1 | 10.9 | 2.0 | 12.1 | 8.1 | 4.9 | 0.9 |

### Ordering Instructions

**Example:** The relay selected in the example is a FORM AB .150-grid relay, current calibrated, end bracket mounting with 0.13-inch solder hook header, 210 ohms coil resistance, and 50 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is 3SBC6131E2. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SBC6131E2R.

**Note:** Relays specified by catalog numbers (per above directions) are general use items controlled by catalog specifications. Relays to be controlled by customer drawings — or relays having requirements not covered in this publication — will be assigned special catalog numbers upon request.




* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Double Pole, Electrically Held, 2 Amps and Less (Continued)



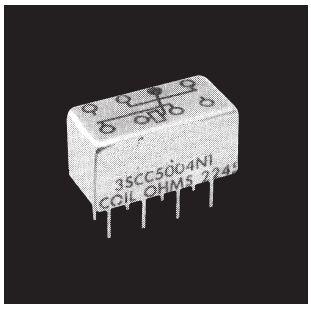
### .150 Grid-space Long-life Relays

### Type 3SCC (2PDT)

### 170 mW

### Product Facts

- **100,000,000 operations low-level signal loads**
- **RF designs available**
- **Low profile — 0.32 height**
- **Hermetic seal**
- **High reliability**
- **Performance tested**




The .150 Grid relay, the smallest (.320 inches high) 2 Amp rated relay available in commercial and military qualified models, is now available in the long life version. Capable of over 100,000,000 mechanical operations at low level and signal load, the .150 Grid relay provides the simplicity of relays for circuit design, the low circuit resistance of precious metal contact systems, and the long life processing that has made CII relays the standard for quality and reliability.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts (50,000 operations)
1 Amp @ 28 V (100,000 operations)
DC inductive — 0.5 amps at 28 volts, 200 mH
AC resistive — 0.5 amps at 115 volts
AC — 0.125 amps at 115 volts (case grounded)
Low-level — 50 µA at 50 mV
Peak AC or DC

**Contact Resistance** —
0.050 ohms max.; 0.150 ohms after life test

**Life** — 100,000 operations at rated loads listed; 1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 4 ms max.

**Contact Bounce** — 1.5 ms

**Dielectric Strength** —
500 volts rms at sea level;
350 volts rms at 70,000 feet and above

**Insulation Resistance** — 1,000 megohm min. over temperature range

### Environmental Characteristics

**Vibration** — 30G, to 3000 Hz

**Shock** — 100 G at 11 ms

**Temperature** — -40°C to +125°C

See page 1-44 for Mounting Forms, Terminals and Circuit Diagrams.

### Coil Table Type 3SCC (All Values DC)* 2 PDT Relay — 170mW Sensitivity: (Code 1)

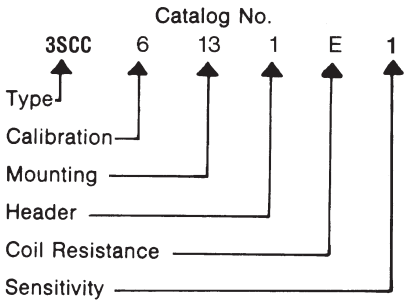
| Coil Code Letter | Coil Resistance @ 25C (ohms) | Voltage Calibrated, Code 5 | | | | Current Calibrated, Code 6 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Suggested Source Volts† | Max. Operate Volts @25C | Release Voltage Range @ 25C | | Max. Continuous Current @ 125C (mA) | Max. Operate Current @ 25C (mA) | Release Current Range @ 25C (mA) | |
| | | | | Max. | Min. | | | Max. | Min. |
| A | 44 ± 10% | 3.5- 6.2 | 2.7 | 1.45 | 0.26 | 87.0 | 61.4 | 32.7 | 6.00 |
| B | 56 ± 10% | 4.0- 7.0 | 3.1 | 1.6 | 0.3 | 77.0 | 55.4 | 28.6 | 5.30 |
| D | 140 ± 10% | 6.4-12.0 | 4.9 | 2.6 | 0.5 | 50.3 | 35.0 | 18.5 | 3.60 |
| E | 210 ± 10% | 8.0-16.0 | 5.9 | 3.2 | 0.6 | 40.0 | 28.0 | 15.4 | 2.80 |
| L | 650 ± 10% | 13.6-24.0 | 10.5 | 5.6 | 1.0 | 22.9 | 16.2 | 8.6 | 1.54 |
| K | 1350 ± 10% | 20.0-35.0 | 15.1 | 8.1 | 1.5 | 15.5 | 11.2 | 6.0 | 1.10 |
| N | 2245 ± 10% | 26.0-46.0 | 19.5 | 10.5 | 1.9 | 12.0 | 8.7 | 4.7 | 0.84 |

*Values listed are factory test and inspection data. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

### Ordering Instructions

**Example:** The relay selected in the example is a 2PDT .150-grid relay, current calibrated, end bracket mounting with 0.13-inch solder hook header, 210 ohms coil resistance, and 175 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is 3SCC6131E1. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SCC6131E1R.

**Note:** Relays specified by catalog numbers (per above directions) are general use items controlled by catalog specifications. Relays to be controlled by customer drawings — or relays having requirements not covered in this publication — will be assigned special catalog numbers upon request.



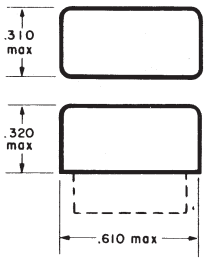
## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### Mounting Forms (3SBC, 3SCC)

**(Vibration note with each form is acceleration from 55 to 3000 Hz)**

All dimensions in inches

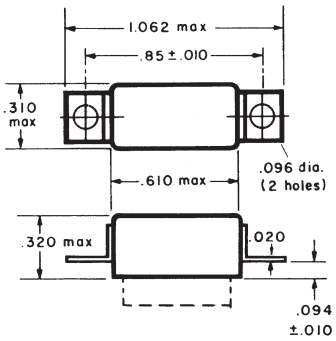
| TOLERANCES (Unless otherwise specified) | |
|---|---|
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |




No Mount

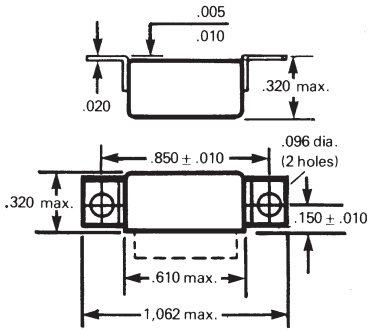
| Mounting Code | Vibration |
|---|---|
| 00 | 30g |

*Assumes relay held securely by potting or other means




End Bracket

| Mounting Code | Vibration |
|---|---|
| 13 | 30g |



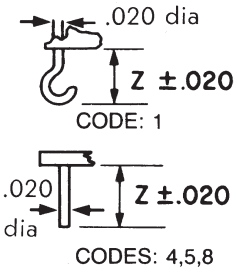

Side Bracket

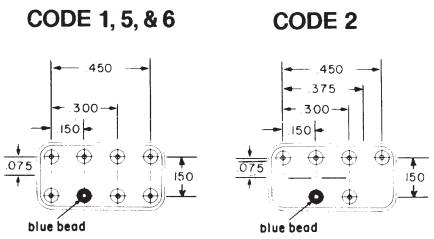
| Mounting Code | Vibration |
|---|---|
| 25 | 30g |

### Header and Connection Diagrams

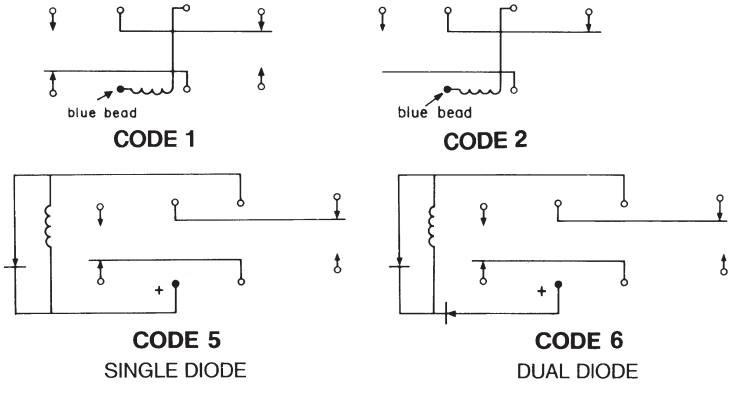
#### Header Types

| TYPE | Z DIMENSION | HEADER CODE |
|---|---|---|
| Solder hook | 0.13 | 1 |
| Straight pin | 0.12 | 8 |
| Straight pin | 0.19 | 4 |
| Straight pin | 0.25 | 5 |




Terminal View




CODE 5
SINGLE DIODE

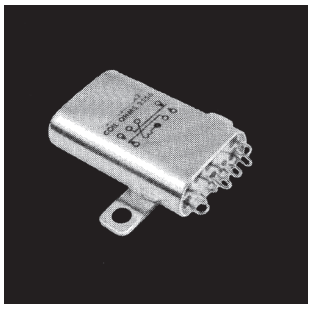
CODE 6
DUAL DIODE

## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### Crystal-Can Relays
### Type 3SAE (2PDT)

### Product Facts

- **Small lightweight crystal-can type**
- **0.25 cubic inch, 0.60 ounces**
- **Power or low-level switching**
- **20G to 2000 Hz vibration capability**



The TE Connectivity line of crystal-can relays is backed by years of experience and millions of relays operating in the field.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
DC inductive — 1 amp at 28 volts, L/R < .025
Low-level — 50 µA at 50 mV Peak AC or DC
AC resistive — 1.0 amp at 115 volts, case not grounded
AC resistive — 0.25 amps at 115 volts, case grounded

**Contact Resistance** —
0.050 ohms max. initial;
0.100 ohms max. after life test

**Life** — 100,000 operations at rated load; 1,000,000 at low-level

### Operating Characteristics

**Operate Time** — 6 ms max.

**Release Time** — 5 ms max.

**Contact Bounce** — 2.5 ms

**Dielectric Strength** —
1,000 volts rms at sea level;
700 volts rms across contact gaps;
350 volts rms at 70,000 feet

**Insulation Resistance** —
1,000 megohm min. except coil to case 500 min. at 125°C

### Environmental Characteristics

**Vibration** — Depends upon mounting forms

**Shock** — 50 G at 11 ms

**Temperature** — -65°C to +125°C

See page 1-46 for Mounting Forms, Terminals and Circuit Diagrams.



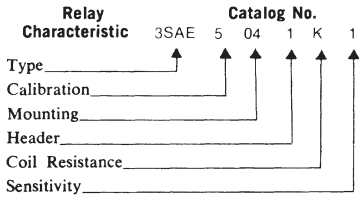
### Coil Table (All Values DC)*
### Type 3SAE 330 mW Sensitivity: (Code 1)

| Coil Code Letter | Voltage Calibrated, CODE: 5 | | | | |
|---|---|---|---|---|---|
| | Coil Resistance at 25C (Ohms) | Suggested Source Volts† | Maximum Operate Volts at 25C | Release Voltage at 25C | |
| | | | | Max | Min |
| A | 22 ± 10% | 3.9– 5.9 | 2.7 | 1.4 | 0.29 |
| B | 34 ± 10% | 4.8– 7.4 | 3.3 | 1.7 | 0.36 |
| C | 53 ± 10% | 6.2– 9.2 | 4.2 | 2.2 | 0.46 |
| D | 92 ± 10% | 8.0–12.0 | 5.4 | 2.8 | 0.60 |
| E | 146 ± 10% | 10.2–15.0 | 6.9 | 3.6 | 0.76 |
| F | 215 ± 10% | 12.3–18.5 | 8.3 | 4.3 | 0.92 |
| H | 342 ± 10% | 15.4–23.0 | 10.4 | 5.4 | 1.16 |
| K | 552 ± 10% | 20.0–29.5 | 13.5 | 7.0 | 1.50 |
| L | 814 ± 10% | 25.0–36.0 | 16.9 | 8.8 | 1.88 |
| M | 1180 ± 10% | 30.0–43.0 | 20.5 | 10.6 | 2.28 |
| N | 1278 ± 15% | 31.0–41.5 | 21.3 | 11.0 | 2.36 |
| P | 1800 ± 15% | 38.0–49.0 | 25.8 | 13.3 | 2.86 |
| R | 2530 ± 15% | 43.0–58.5 | 29.0 | 15.0 | 3.22 |
| S | 2950 ± 15% | 50.0–63.0 | 34.0 | 17.5 | 3.77 |
| T | 5000 ± 20% | 62.0–75.0 | 41.8 | 21.6 | 4.64 |
| V | 5170 ± 20% | 68.0–76.0 | 46.0 | 25.4 | 5.12 |

*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

### Ordering Instructions

**Example:** The relay selected in this example is a 2PDT crystal-can relay, voltage calibrated, two-hole side bracket mounting solder hook header, 552 ohms coil resistance, and 330 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SAE5041K1. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SAE5041K1R.



## Double Pole, Electrically Held, 2 Amps and Less (Continued)

### Mounting Forms (3SAE)

**(Vibration note with each form is acceleration from 55 to 2000 Hz)**

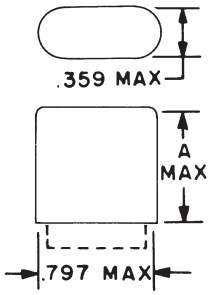
All dimensions in inches

| TOLERANCES (unless otherwise specified) | |
|---|---|
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |

**No Mount**

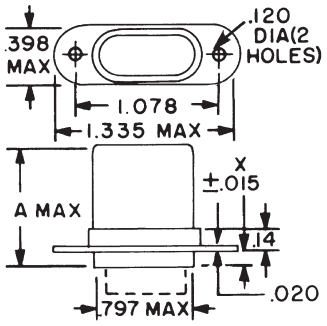
| Mounting Code | A Dim. (Max) | Vibration* | Relay Type |
|---|---|---|---|
| 00 | 0.875 | 20g | 3SAE |

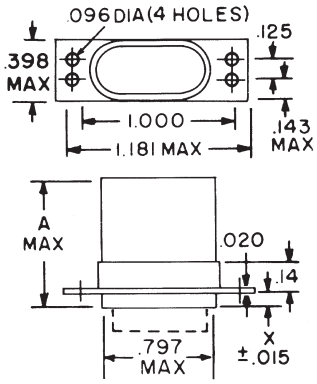
* Assumes relay securely held by potting or other means.




**Flange Mount, 2 in-line holes**

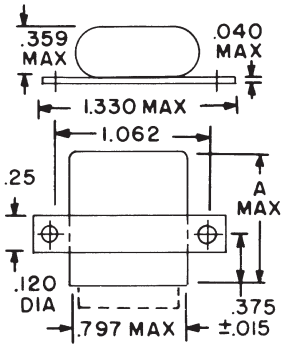
| Mounting Code | A Dim. (Max) | X Dim. | Vibration | Relay Type |
|---|---|---|---|---|
| 13 | 0.875 | 0.125 | 15g | 3SAE |
| 14 | 0.875 | 0.375 | 20g | 3SAE |




**Four-hole Flange**

| Mounting Code | A Dim. (Max) | X Dim. | Vibration | Relay Type |
|---|---|---|---|---|
| 01 | 0.875 | 0.125 | 15g | 3SAE |
| 02 | 0.875 | 0.375 | 20g | 3SAE |

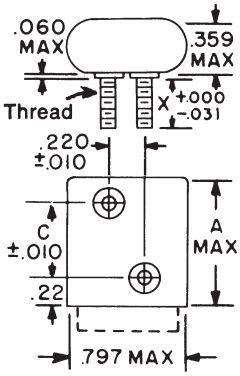



**Two-hole Side Bracket**

| Mounting Code | A Dim. (Max) | Vibration | Relay Type |
|---|---|---|---|
| 04 | 0.875 | 20g | 3SAE |

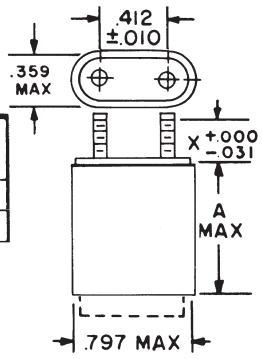
**Side Studs**

| Mounting Code | A Dim. (Max) | C Dim. | X Dim. | Vibration | Relay Type |
|---|---|---|---|---|---|
| 07 | 0.875 | 0.488 | 0.375 | 20g | 3SAE |
| 08 | 0.875 | 0.488 | 0.250 | 20g | 3SAE |

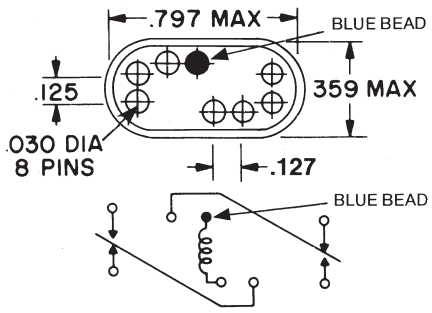



**Top Studs**

| Mounting Code | A Dim. (Max) | X Dim. | Vibration | Relay Type |
|---|---|---|---|---|
| 10 | 0.940 | 0.375 | 20g | 3SAE |
| 11 | 0.940 | 0.250 | 20g | 3SAE |

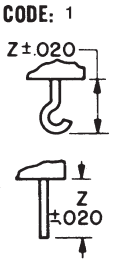



### Header and Connection Diagrams




### Header Types

| Type | Z Dim. | Header Code |
|---|---|---|
| Solder hook | 0.19 | 2 |
| Straight pin (socket or PCB type) | 0.19 | 4 |
| Straight pin | 2.99 | 8 |



## Double Pole, Magnetic Latching, 2 Amps and Less

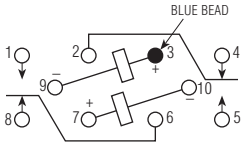
**LS**

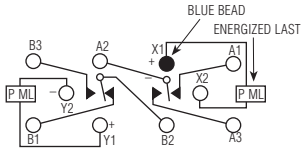
**LS**

**Magnetic Latching Half Size High Performance Relay**

**DESIGNED to MIL-R-39016/45**






**Terminal View**

**Standard Schematic** Contacts will switch from the indicated position when either coil is energized with polarity as shown.

**MIL-R-39016/45 SCHEMATIC** Contacts will switch from the indicated position when either coil is energized with polarity as shown.

### Product Facts

- **Hermetically sealed**
- **Up to 2 amps switching**
- **High shock & vibration ratings**
- **Optional terminals & mounting styles**
- **Latching design**

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Gold plated hardened silver alloy Moveable — Gold plated hardened silver alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations min.

**Coil Voltage** — 5 to 48 Vdc

**Coil Power** — 1.0 watts max.

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 170 mW

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 2 A @ 28 Vdc | Resistive | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.75 A @ 28 Vdc | Inductive (200mH) | 100,000 |
| 0.1 A @ 28 Vdc | Intermediate | 50,000 |
| 0.160 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |

### RF Performance

| Frequency (MHz) | RF Losses (dB) | VSWR | Isolation (dB) |
|---|---|---|---|
| 100 | 0.1 | 1.15:1 | 38 |
| 500 | 0.3 | 1.19:1 | 31 |
| 1000 | 0.6 | 1.32:1 | 45 |

## Double Pole, Magnetic Latching, 2 Amps and Less (Continued)

**LS (Continued)**

### Operating Characteristics

**Timing** —
Set-Reset Time — 5.0 ms max.

**Contact Bounce** —
2.0 ms max.

**Dielectric Withstanding Voltage** —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
1000 Vrms 60 Hz
Between Contacts and Coil —
1000 Vrms 60 Hz

**Insulation Resistance** —
10,000 megohms min. @ 500 Vdc

### Environmental Characteristics

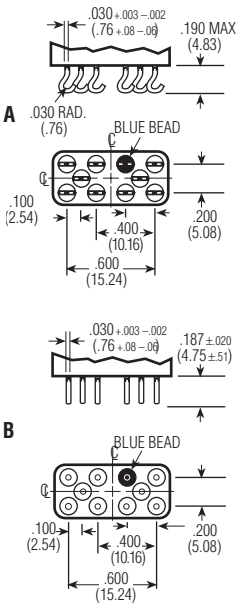
**Temperature Range** —
-65°C to +125°C

**Weight** — .46 oz (13 gms) max.

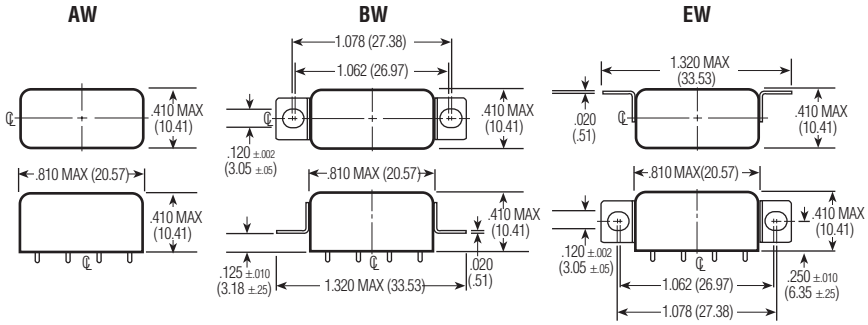
**Vibration Resistance** —
Standard — 20 G's, 10 to 2,000 Hz
QPL Equiv. — 30 G's, 10 to 2,500 Hz

**Shock Resistance** —
100 G's, 6 ±1 ms

**QPL Equivalent** —
MIL-R-39016/45




**LS Terminals**




**Mounting Styles**

### Standard Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Pickup Voltage Vdc (Min.) @ 25°C | Pickup Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|
| 5.0 | 45 | 2.7 | 3.8 | 1.6 | 1.0 | 556 | 6.7 | 5 |
| 6.0 | 63 | 3.25 | 4.5 | 2.0 | 1.3 | 571 | 8.0 | 6 |
| 12.0 | 254 | 6.5 | 9.0 | 4.0 | 2.6 | 567 | 16.0 | 12 |
| 26.5 | 1,000 | 13.0 | 18.0 | 8.0 | 5.2 | 702 | 32.0 | 24 |
| 48.0 | 3,800 | 26.0 | 36.0 | 16.0 | 10.4 | 606 | 64.0 | 48 |

### Ordering Instructions

Catalog-selected Relays: The catalog number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Specifying a Part Number Example:**

| Type | Mountings | Contacts | Coils | Terminals |
|---|---|---|---|---|
| LS | BW- | 2C- | 24 | B |

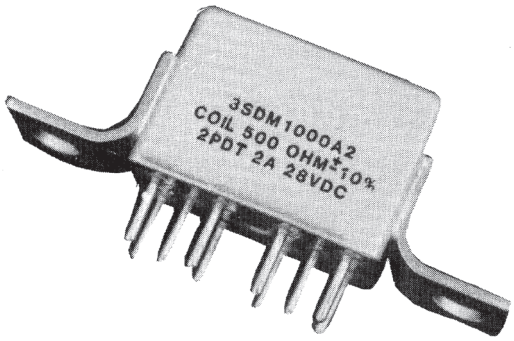
## Double Pole, Magnetic Latching, 2 Amps and Less (Continued)



### Magnetic Latching, Grid Space, Relay
### Type 3SDM (2PDT)

### Product Facts

- Suitable for pulse operation
- No hang up feature
- MIL-R-39016 type
- Special contact and coil wiring available




This magnetic latching relay maintains the high reliability attributes of the aerospace proven CII 3SAM relay family. By reducing the size of the coil and maintaining the contact system of the 3SAM, we can now offer a smaller 2 amp rated magnetic latching relay. The pulse operation can provide multiple hundred thousand operations in power saving circuits. The on or off circuits are maintained using no power until there is a need to switch the contacts. Suitable for matrix switches or relay trees, these versatile relays have contact systems capable of reliability switching high power or very low level signals in the same package. The relay's unique circuit prevents it from ever hanging up in an off-center or neutral position.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
Low-level — 50 µA at 50 mV DC or peak AC

**Contact Resistance** —
0.050 ohms initial;
0.100 ohms after life test (High level)
0.150 ohms after life test (Low level)

**Life** —
100,000 operations at rated load;
1,000,000 operations at low-level

### Operating Characteristics

**Operate Time** — 4 ms

**Reset Time** — 4 ms

**Contact Bounce** — 2 ms

**Dielectric Strength** —
1,000 volts at sea level;
500 volts across contact gap and
500 volts coil to case

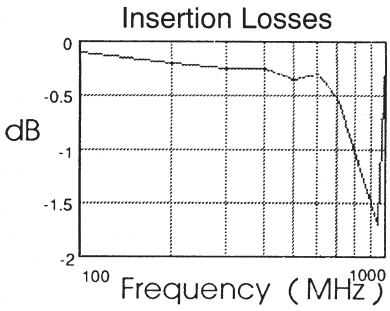
**Insulation Resistance** —
1,000 megohms min.

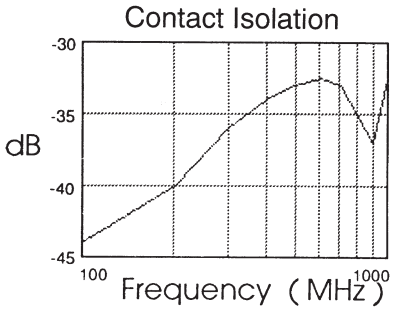
### Environmental Characteristics

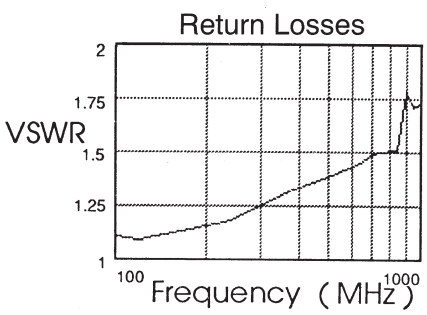
**Vibration** —
Sine — 30G; 55 to 3000 Hz
Random — 0.4 $G^2$/Hz; 100 to 1,000 Hz

**Shock** — 150 G at 11 ms, half-sine wave

**Temperature** — -65°C to +125°C

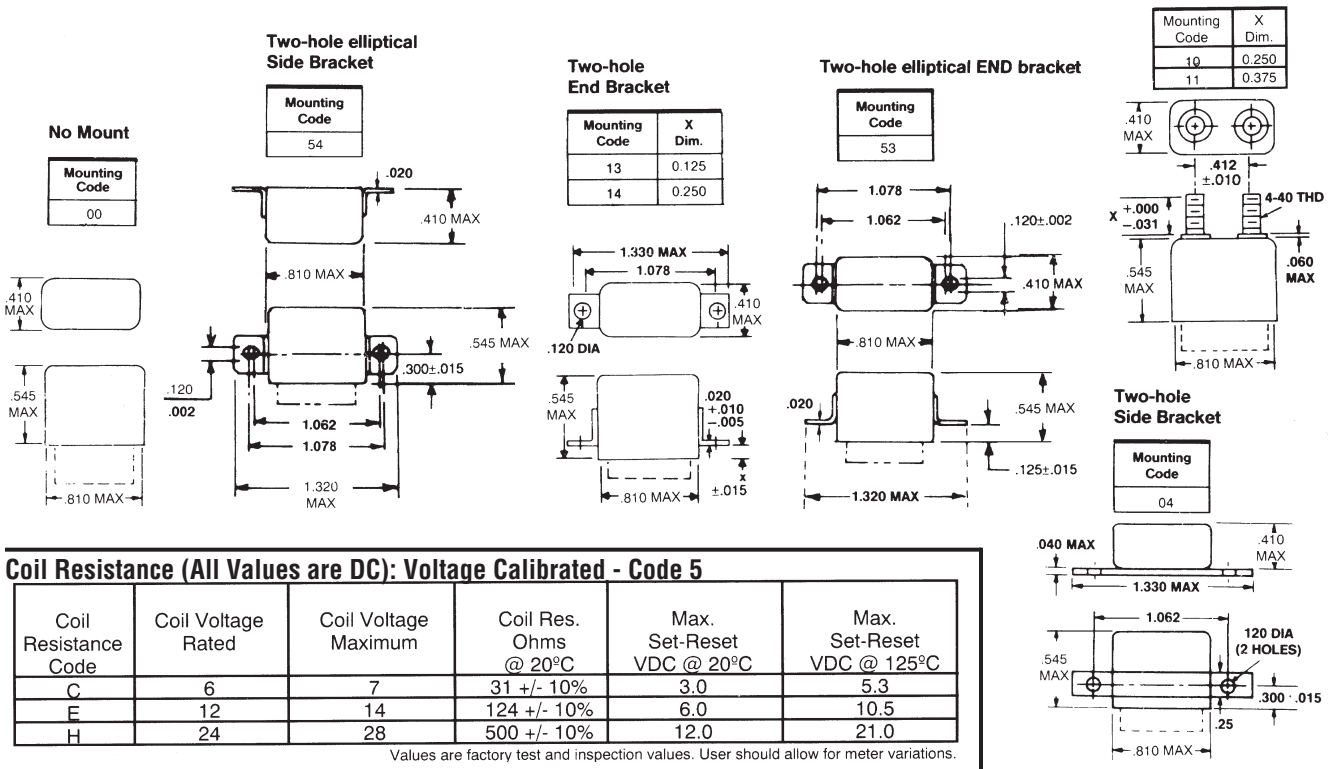


## Double Pole, Magnetic Latching, 2 Amps and Less (Continued)

### Mounting Forms (3SDM)



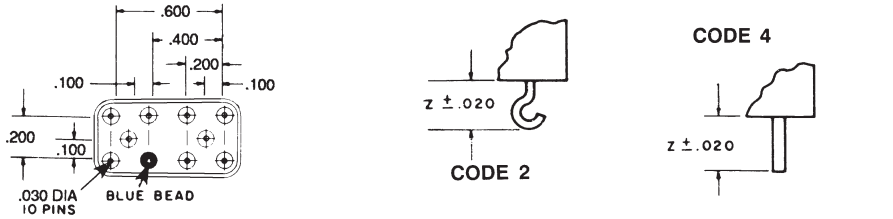

### Coil Resistance (All Values are DC): Voltage Calibrated - Code 5

| Coil Resistance Code | Coil Voltage Rated | Coil Voltage Maximum | Coil Res. Ohms @ 20ºC | Max. Set-Reset VDC @ 20ºC | Max. Set-Reset VDC @ 125ºC |
|---|---|---|---|---|---|
| C | 6 | 7 | 31 +/- 10% | 3.0 | 5.3 |
| E | 12 | 14 | 124 +/- 10% | 6.0 | 10.5 |
| H | 24 | 28 | 500 +/- 10% | 12.0 | 21.0 |

Values are factory test and inspection values. User should allow for meter variations.

### Header:

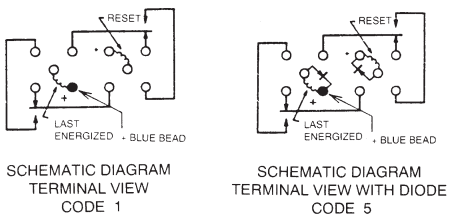
| Type | Z Dimensions | Header Code |
|---|---|---|
| Straight Pin (socket or PCB Type) | 0.19 +/-.020 | 4 |
| Solder Hook | 0.16 +/-.020 | 2 |




### Sensitivity and Modification: 290 mW Sensitivity

| Sensitivity Code | Modification (see connection diagrams at right) |
|---|---|
| 1 | No Diode |
| 5 | Single Diode |

(Terminal View)
(+ on blue bead
closes as shown)

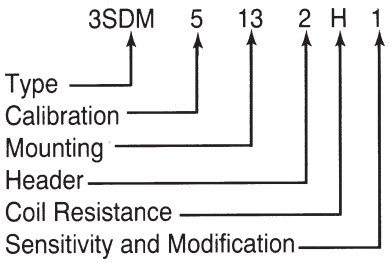



### Ordering Instructions

Type 3SDM relays can be ordered by specifying the correct catalog number. This number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed in the example. The letter R following the sensitivity code indicates relay received 5,000 operations miss-test.

**Example:** The relay selected is a 2PDT magnetic-latching relay, voltage calibrated, 2-hole end bracket mount, solder hook header, 500 ohm coil, and 290 mW sensitivity. **3SDM5132H1**

### Relay Characteristic Catalog Number



## Double Pole, Magnetic Latching, 2 Amps and Less (Continued)

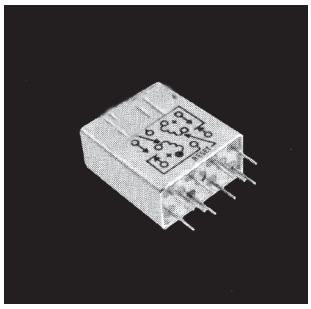


### Magnetic Latching, Grid-space, Relays

### Type 3SAM (2PDT)

### Product Facts

- Special shock designs up to 700 G, 1 ms
- Suitable for pulse operation
- No hang up feature on low power pulses
- Qualified to MIL-R-39016/32
- Special wiring is available



This relay has "memory" in that the contact positions do not change when coil power is removed. Switching is accomplished by applying power to the applicable coil (dual coil) or with the applicable polarity (single coil). The low switching power requirements are further enhanced by its ability to operate from capacitor discharge or other pulses or through its own contacts for batteries or similarly limited supplies.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
DC inductive — 0.5 amps at 28 volts, 200 mH
AC resistive — 1 amp at 115 volts (single coil), case not grounded
AC resistive — 0.25 amps at 115 volts (dual coil), case not grounded
Low-level — 50 µA at 50 mV Peak AC or DC

**Contact Resistance** —
0.050 ohms initial;
0.100 ohms after life test

**Life** —
100,000 operations at rated load;
1,000,000 at low-level

### Operating Characteristics

**Operate Time** — 4 ms

**Release Time** — 4 ms

**Contact Bounce** — 2 ms

**Dielectric Strength** —
1,000 volts rms at sea level;
700 volts rms across contact gap

**Insulation Resistance** —
1,000 megohm min.

### Environmental Characteristics

**Vibration** — 30 G, to 3,000 Hz

**Shock** — 150 G at 11 ms

**Temperature** — -65°C to +125°C

See page 1-52 for Mounting Forms, Terminals and Circuit Diagrams.

### Coil Table (All Values DC) Single Coil 50 mW Sensitivity: (Code: 1)

| Coil Code Letter | Current Calibrated, CODE: 6 | | |
|---|---|---|---|
| | Coil Resistance @25C (Ohms) | Max Operate and Reset Current (mA) ‡ | Suggested Source Voltage† |
| A | 16.4 ± 10% | 55.2 | 1.8–4.8 |
| B | 40 ± 10% | 35.3 | 2.7–7.5 |
| C | 96 ± 10% | 22.8 | 4.2–11.0 |
| D | 164 ± 10% | 17.4 | 5.5–15.0 |
| E | 260 ± 10% | 13.9 | 7.0–19.0 |
| F | 400 ± 10% | 11.2 | 8.5–23.0 |
| H | 600 ± 10% | 9.2 | 11.0–29.0 |
| K | 960 ± 10% | 7.2 | 13.0–37.0 |
| L | 1350 ± 10% | 6.1 | 16.0–43.0 |
| M | 1950 ± 10% | 5.1 | 19.0–52.0 |
| N | 3000 ± 15% | 4.1 | 25.0–64.0 |
| P | 4800 ± 15% | 3.3 | 32.0–81.0 |
| R* | 8200 ± 20% | 2.5 | 43.0–99.0 |

† Applicable over the operating temperature range in circulating air.
‡ Initial or inspection value. Allow 20% increase in value of maximum pickup during rated life.

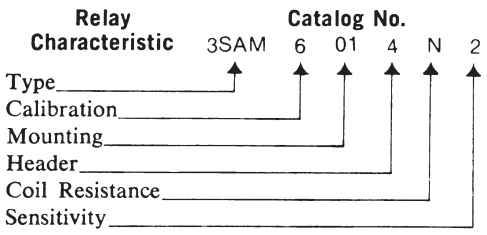
### Coil Table (All Values DC) Dual Coil 75 mW Sensitivity: (Code: 2)

| Coil Code Letter | Current Calibrated, CODE: 6 | | |
|---|---|---|---|
| | Coil Resistance @25C For Each Coil (Ohms) | Max‡ Operate Current For Each Coil (mA) | Suggested Source Voltage For Each Coil† |
| A | 8.2 ± 10% | 95.8 | 1.5–2.6 |
| B | 20 ± 10% | 61.2 | 2.3–4.1 |
| C | 48 ± 10% | 39.5 | 3.6–6.3 |
| D | 82 ± 10% | 30.2 | 4.7–8.3 |
| E | 130 ± 10% | 24.0 | 6.0–10.0 |
| F | 200± 10% | 19.4 | 7.4–13.0 |
| H | 300 ± 10% | 15.8 | 9.0–16.0 |
| K | 480 ± 10% | 12.5 | 12.0–20.0 |
| L | 675 ± 10% | 10.6 | 14.0–24.0 |
| M | 975 ± 10% | 8.8 | 16.0–29.0 |
| N | 1500 ± 15% | 7.1 | 21.0–35.0 |
| P | 2400 ± 15% | 5.6 | 27.0–44.0 |
| R | 4100 ± 20% | 4.3 | 37.0–55.0 |

† Applicable over the operating temperature range in circulating air.
‡ Initial or inspection value. Allow 20% increase in value of maximum pickup during rated life.

### Ordering Instructions

**Example:** The relay selected in this example is a 2PDT magnetic latching relay, current calibrated, four-hole end bracket mounting, solder hook header, 1500 ohms coil resistance, and 75 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SAM6014N2. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SAM6014N2R.




* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Double Pole, Magnetic Latching, 2 Amps and Less (Continued)

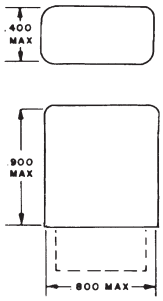
### Mounting Forms (3SAM)

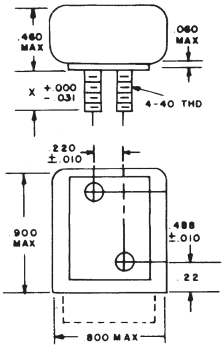
**(Vibration note with each form is acceleration from 55 to 3000 Hz)**

**No Mount**

| Mounting Code | Vibration* |
|---|---|
| 00 | 30g |

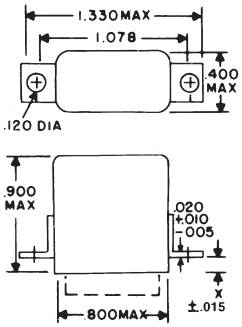
* Assumes relay securely held by potting or other means.




**Two-hole End Bracket**

| Mounting Code | X Dim. | Vibration |
|---|---|---|
| 13 | 0.125 | 30g |
| 14 | 0.250 | 30g |
| 15 | 0.450 | 30g |




**Side Studs**

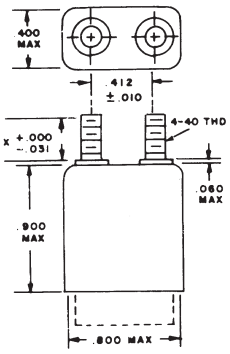
| Mounting Code | X Dim. | Vibration |
|---|---|---|
| 07 | 0.250 | 30g |
| 08 | 0.375 | 30g |

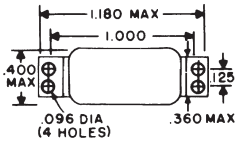
**All dimensions in inches**

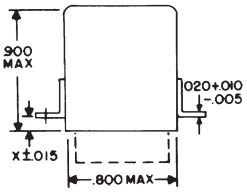
| TOLERANCES (unless otherwise specified) | |
|---|---|
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |

**Top Studs**

| Mounting Code | X Dim. | Vibration |
|---|---|---|
| 10 | 0.250 | 30g |
| 11 | 0.375 | 30g |



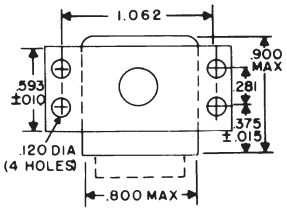

**Four-hole Side Bracket**

| Mounting Code | Vibration |
|---|---|
| 06 | 30g |

**Four-hole End Bracket**

| Mounting Code | X Dim. | Vibration |
|---|---|---|
| 01 | 0.125 | 30g |
| 02 | 0.250 | 30g |
| 03 | 0.450 | 30g |



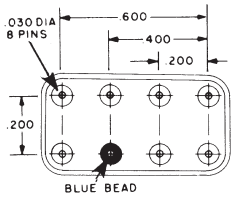



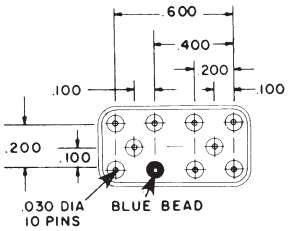

### Header and Connection Diagrams

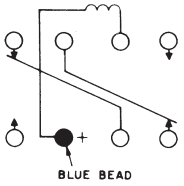
**Single Coil** **Dual Coil**

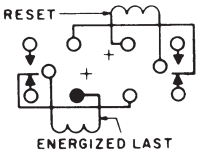
(Terminal View)

(+ on blue bead closes as shown)



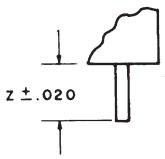



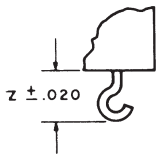




### Header Types

| Type | Z Dimension | Header Code | |
|---|---|---|---|
| | | Single | Dual |
| Solder hook | 0.16 | 1 | 4 |
| Straight pin (socket or PCB type) | 0.19 | 2 | 5 |

**CODES: 2, 5**




**CODES: 1, 4**

## Four Pole, Electrically Held, 2 Amps and Less

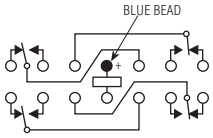
**SR**

**SR**

**Four Pole Half Size**
**High Performance Relay**

**Qualified to**
**MIL-R-39016/40**






**Terminal View**

### Product Facts

- **Hermetically sealed**
- **Up to 2 amps switching**
- **High shock & vibration ratings**
- **Optional terminals & mounting styles**
- **4 form C Hi-density design**

### Electrical Characteristics

**Contact Arrangement** — 4 Form C (4PDT)

**Contact Material** — Stationary — Gold plated hardened silver alloy Moveable — Gold plated hardened silver alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations min.

**Coil Voltage** — 6 to 26.5 Vdc

**Coil Power** — 2.6 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 475 mW

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 2 A @ 28 Vdc | Resistive | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.75 A @ 28 Vdc | Inductive (200mH) | 100,000 |
| 0.1 A @ 28 Vdc | Intermediate | 50,000 |
| 0.2 A @ 28 Vdc | Lamp | 100,000 |
| 10 µA @ 50 mV | Low Level | 1,000,000 |

## Four Pole, Electrically Held, 2 Amps and Less (Continued)

### SR (Continued)

#### Operating Characteristics

**Timing** —
Operate Time — 5.0 ms max.
Release Time — 5.0 ms max.

**Contact Bounce** — 5 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts —
350 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz

**Insulation Resistance** —
1,000 megohms min. @ 500 Vdc

#### Environmental Characteristics

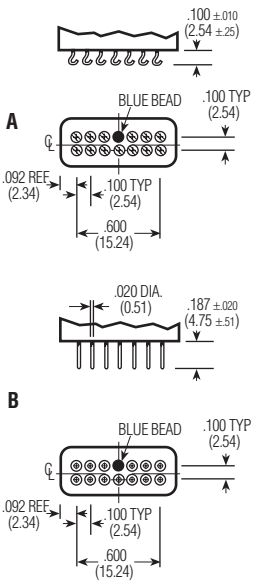
**Temperature Range** —
-65°C to +125°C

**Weight** —
0.28 oz. (7.8 grms)

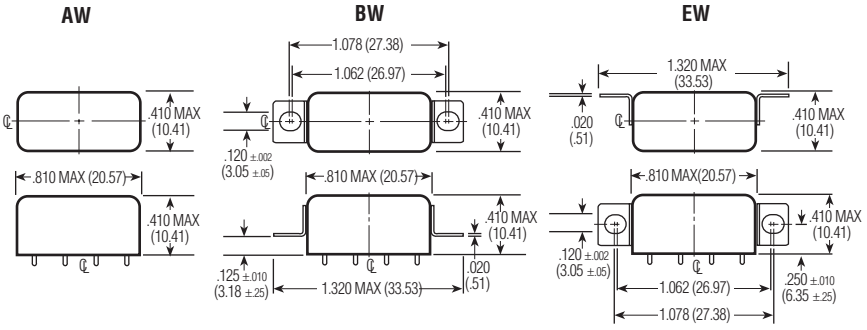
**Vibration Resistance** —
15 G's, 10 to 2,000 Hz

**Shock Resistance** —
100 G's, 6 ±1 ms

**QPL Approval** —
MIL-R-39016/40




**SR Terminals**




**Mounting Styles**

### Standard Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (W) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|
| 5.0 | 20 | 2.75 | 3.8 | 0.35 | 0.23 | 1.25 | 6.0 | 5 |
| 6.0 | 25 | 3.5 | 4.5 | 0.45 | 0.3 | 1.44 | 8.0 | 6 |
| 12.0 | 100 | 6.5 | 9.0 | 0.9 | 0.6 | 1.44 | 15.0 | 12 |
| 26.5 | 390 | 14.0 | 18.0 | 1.8 | 1.2 | 1.8 | 32.0 | 24 |

**Specifying a Part Number Example:**

| Type | Mountings | Contacts | Coils | Terminals |
|---|---|---|---|---|
| SR | BW- | 4C- | 24 | B |

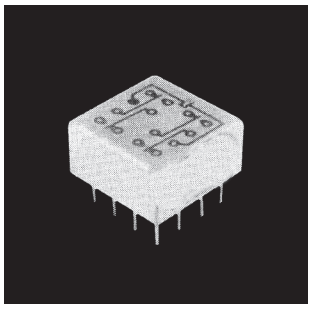
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Four Pole, Electrically Held, 2 Amps and Less (Continued)

### .150 Grid-space Relays
### Type 3SBH (4PDT)

### Product Facts

- **Low profile… only 0.32 inches high**
- **Long life version available**
- **Qualified to MIL-R-39016/14**



This .150 four pole double throw Grid-space relay is the companion to the two pole 3SBC type shown on page 1-41. It also features the same .150 inch pin spacing that allows you to insert the relay with no intermediate pin spreaders. There is adequate clearance for conductors to reach all pins. It is a very compact 4 pole double throw 2 ampere relay.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
DC inductive — 0.5 amps at 28 volts, 200 mH
AC resistive — 0.5 amps at 115 volts, 400 or 60 Hz (enclosure isolated from ground, or enclosure and movable contact at same potential)
AC — 0.125 amps at 115 volts (enclosure at line potential with respect to movable contact)
Low-level — low-level operation at 50 millivolts, 30 µA, 33 ohm miss level

**Contact Resistance** —
0.050 ohms max.;
0.150 ohms after life test

**Life** —
100,000 operations at rated loads listed;
1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 4 ms max.

**Contact Bounce** — 1.5 ms

**Dielectric Strength** —
500 volts rms at sea level;
350 volts rms at 70,000 feet

**Insulation Resistance** —
1,000 megohms min. over temperature range

### Environmental Characteristics

**Vibration** — 30 G, to 3,000 Hz

**Shock** — 100 G at 11 ms

**Temperature** — -65°C to +125°C

See page 1-57 for Mounting Forms, Terminals and Circuit Diagrams.



### Coil Table (All Values DC)* Type 3SBH, 4 Pole Relay — 250 mW Sensitivity: (Code 1)

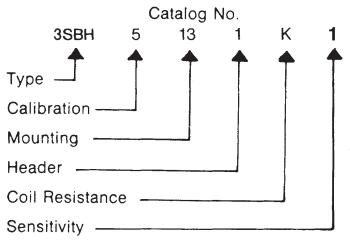
| SENSITIVITY CODE: 1 | | | | | |
|---|---|---|---|---|---|
| | | Voltage Calibrated, Code: 5 | | | |
| Coil Code Letter | Coil Resistance at 25C ohms | Suggested Source Volts† | Maximum Operate Volts at 25C | Release Voltage Range at 25C | |
| | | | | Max. | Min. |
| B | 28 ± 10% | 4.0- 7.0 | 2.7 | 1.6 | 0.3 |
| D | 73 ± 10% | 6.0-11.0 | 4.2 | 2.5 | 0.4 |
| E | 115 ± 10% | 8.0-14.0 | 5.4 | 3.2 | 0.6 |
| G | 280 ± 10% | 12 -22.0 | 8.4 | 5.0 | 0.8 |
| H | 430 ± 10% | 15 -26.0 | 10.3 | 6.0 | 1.0 |
| K | 720 ± 10% | 20 -35.0 | 13.5 | 8.1 | 1.5 |
| N | 1040 ± 10% | 26 -46.0 | 17.5 | 10.5 | 1.9 |

*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

### Ordering Instructions

**Catalog-selected Relays:** The catalog number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Example:** The relay selected in this example is a 4PDT .150-grid relay, voltage calibrated, end bracket mounting, 0.13 inch solder hook header, 720 ohms coil resistance, and 250 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SBH5131K1. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SBH5131K1R.




* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

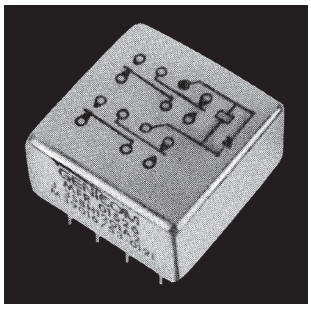
## Four Pole, Electrically Held, 2 Amps and Less (Continued)

### .150 Grid-space Hybrid Relays

### Type 3SBH (4PDT)

### Product Facts

- **Low profile… only 0.32 inches high**
- **Long life version available**
- **Qualified to MIL-R-39016/53 & 54**



The 4PDT .150 Grid-space hybrid relays are advanced designs of the standard high reliability 4PDT .150 Grid-space relays. In the single diode version, the relay coil-back electromotive force is suppressed to prevent circuit/component damage. With the dual diode version, a steering diode is added to the coil circuit, along with the suppression diode. This steering diode prevents operation of the relay by reverse polarity voltages and protects the suppression diode. The single diode version is qualified to MIL-R-39016/53 and the dual diode is qualified to MIL-R-39016/54.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
DC inductive — 0.5 amps at 28 volts, 200 mH
AC resistive — 0.5 amps at 115 volts, 400 or 60 Hz (enclosure isolated from ground, or enclosure and movable contact at same potential)
AC — 0.125 amps at 115 volts (enclosure at line potential with respect to movable contact)
Low-level — 50 µA at 50mV

**Contact Resistance** —
0.050 ohms max.;
0.150 ohms after life test

**Life** — 100,000 operations at rated loads listed; 1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 6 ms max.

**Contact Bounce** — 2.0 ms

**Dielectric Strength (Note 1)** —
500 volts rms at sea level;
350 volts rms at 70,000 feet

**Insulation Resistance (Note 1)** —
1,000 megohms min. over temperature range

### Semiconductor Characteristics at 25°C

**Max. Negative Transient** — 1 volt

**Breakdown Voltage** —
100 Vdc @ 10 µA min.

**Max. Leakage Current** —
1 µA @ 50 Vdc

**Note 1:** Tests for dielectric withstanding voltage and insulation resistance should be made with "coil terminals" shorted together to avoid unnecessary electrical stress to semiconductor elements.

See page 1-57 for Mounting Forms, Terminals and Circuit Diagrams.

### Coil Table (All Values DC)* Type 3SBH, 4 Pole Relay — 250 mW Sensitivity: (Code 5 single diode, Code 6 dual diodes)

| Single Diode | | SENSITIVITY CODE: 5 | | | |
|---|---|---|---|---|---|
| | | Voltage Calibrated, Code: 5 | | | |
| Coil Code Letter | Coil Resistance at 25C ohms | Suggested Source Volts† | Maximum Operate Volts at 25C | Release Voltage Range at 25C | |
| | | | | Max. | Min. |
| B | 28 ± 10% | 4.0- 7.0 | 2.7 | 1.6 | 0.3 |
| D | 73 ± 10% | 6.0-11.0 | 4.2 | 2.5 | 0.4 |
| E | 115 ± 10% | 8.0-14.0 | 5.4 | 3.2 | 0.6 |
| G | 280 ± 10% | 12 -22.0 | 8.4 | 5.0 | 0.8 |
| H | 430 ± 10% | 15 -26.0 | 10.3 | 6.0 | 1.0 |
| K | 720 ± 10% | 20 -35.0 | 13.5 | 8.1 | 1.5 |
| N | 1040 ± 10% | 26 -46.0 | 17.5 | 10.5 | 1.9 |
| **Dual Diode** | | **SENSITIVITY CODE: 6** | | | |
| B | 28 ± 10% | 4.0- 7.0 | 3.7 | 2.3 | 0.5 |
| D | 73 ± 10% | 6.0-11.0 | 5.2 | 3.2 | 0.6 |
| E | 115 ± 10% | 8.0-14.0 | 6.4 | 3.9 | 0.8 |
| G | 280 ± 10% | 12.0-22.0 | 9.4 | 5.7 | 1.0 |
| H | 430 ± 10% | 15 -26.0 | 11.3 | 6.7 | 1.2 |
| K | 720 ± 10% | 20 -35.0 | 14.5 | 8.8 | 1.7 |
| N | 1040 ± 10% | 26 -46.0 | 18.1 | 11.1 | 2.1 |

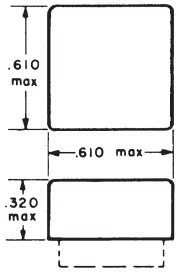
*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

## Four Pole, Electrically Held, 2 Amps and Less (Continued)

**No Mount**

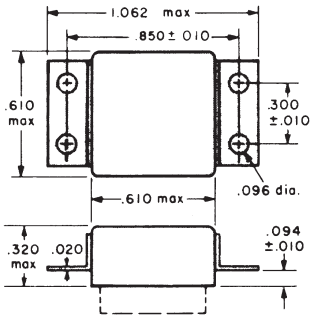
| Mounting Code | Vibration* |
|---|---|
| 00 | 30g |

*Assumes relay held securely by potting or other means.



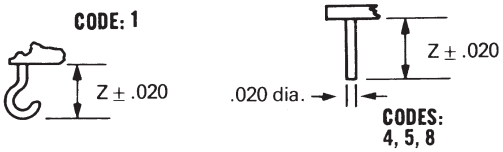

**End Bracket**

| Mounting Code | Vibration |
|---|---|
| 13 | 30g |




### Header Types

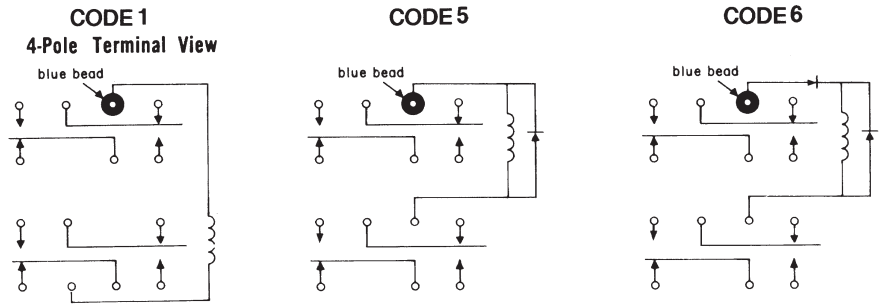
| Type | Z Dimension | Header Code |
|---|---|---|
| Solder hook | 0.13 | 1 |
| Straight pin | 0.12 | 8 |
| Straight pin socket or PCB type) | 0.19 | 4 |
| Straight pin | 0.25 | 5 |

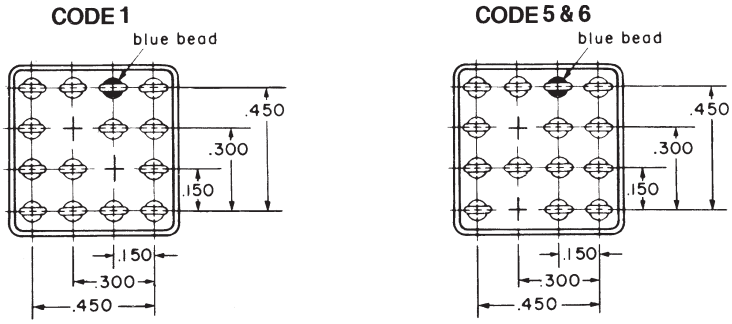



**All dimensions in inches**

| TOLERANCES (Unless otherwise specified) | |
|---|---|
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |

### Header and Connection Diagrams



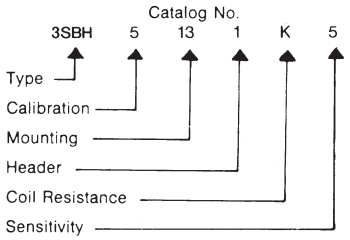




Terminals .020 dia

### Ordering Instructions

**Catalog-selected Relays:** The catalog number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Example:** The relay selected in this example is a 4PDT .150-grid relay, voltage calibrated, end bracket mounting, 0.13 inch solder hook header, 720 ohms coil resistance, and 250 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SBH5131K5. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SBH5131K5R.




* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Four Pole, Electrically Held, 2 Amps and Less (Continued)

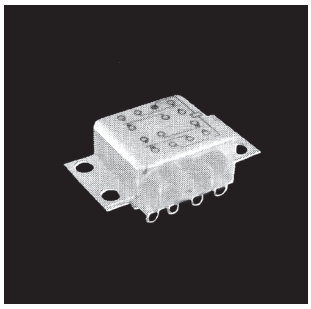
### Long-life .150 Grid-space Relays

### 100,000,000 Operations At Low Levels

### Type 3SDH (4PDT)

### Product Facts

- **Long life at low level or signal loads**
- **Low profile… only 0.32 inches high**



The 3SDH relay is designed for 100,000,000 operations at low levels. It is a four pole double throw Grid-space relay. The 0.150 inch pin spacing allows the user to insert the relay with no intermediate pin spreaders. There is adequate clearance for conductor to reach all pins.

### Electrical Characteristics

**Contact Ratings** —
DC resistive — 2 amps at 28 volts, (DC 100,000 operations)
DC inductive — 0.3 amp at 28 volts, (L/R not greater than 0.008)
AC resistive — 0.5 amp at 115 volts, 400 or 60 Hz (enclosure isolated from ground, or enclosure and movable contact at same potential)
AC resistive — 0.125 amp at 115 volts (enclosure at line potential with respect to movable contact)
Low-level — 50 µA at 50 mV Peak AC or DC

**Contact Resistance** —
0.050 ohms max.;
0.150 ohms after life test

**Life** — 100,000 operations at rated loads listed; 100,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time @ +25°C** —
4 ms max.

**Release Time @ +25°C** —
4 ms max.

**Contact Bounce @ +25°C** — 1.5 ms

**Dielectric Strength** —
500 volts rms at sea level;
350 volts rms at 70,000 feet

**Insulation Resistance** —
1,000 megohms min. over temperature range

### Environmental Characteristics

**Vibration** — 30 G, to 3,000 Hz

**Shock** — 100 G at 11 ms

**Temperature** — -40°C to +125°C

See page 1-59 for Mounting Forms, Terminals and Circuit Diagrams.

### Coil Table (All Values DC)*Type 3SDH, 4 Pole Relay—210mW Sensitivity: (Code 1)

| SENSITIVITY CODE: 1 | | | | | |
|---|---|---|---|---|---|
| | | Voltage Calibrated, Code: 5 | | | |
| Coil Code Letter | Coil Resistance at 25C ohms | Suggested Source Volts† | Maximum Operate Volts at 25C | Release Voltage Range at 25C | |
| | | | | Max. | Min. |
| B | 28 ± 10% | 4.0- 7.0 | 3.0 | 1.6 | 0.3 |
| D | 73 ± 10% | 6.0-11.0 | 4.8 | 2.5 | 0.4 |
| E | 115 ± 10% | 8.0-14.0 | 5.9 | 3.2 | 0.6 |
| G | 280 ± 10% | 12 -22.0 | 9.3 | 5.0 | 0.8 |
| H | 430 ± 10% | 15 -26.0 | 11.5 | 6.0 | 1.0 |
| K | 720 ± 10% | 20 -35.0 | 14.9 | 8.1 | 1.5 |
| N | 1040 ± 10% | 26 -46.0 | 17.9 | 10.5 | 1.9 |

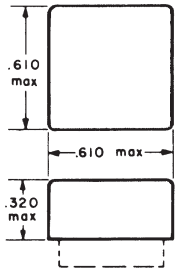
*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

## Four Pole, Electrically Held, 2 Amps and Less (Continued)

**No Mount**

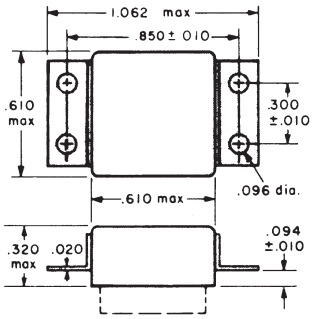
| Mounting Code | Vibration* |
|---|---|
| 00 | 30g |

*Assumes relay held securely by potting or other means.



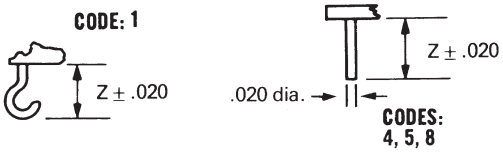

**End Bracket**

| Mounting Code | Vibration |
|---|---|
| 13 | 30g |




### Header Types

| Type | Z Dimension | Header Code |
|---|---|---|
| Solder hook | 0.13 | 1 |
| Straight pin | 0.12 | 8 |
| Straight pin socket or PCB type) | 0.19 | 4 |
| Straight pin | 0.25 | 5 |

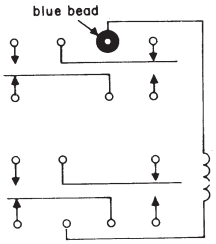



**All dimensions in inches**

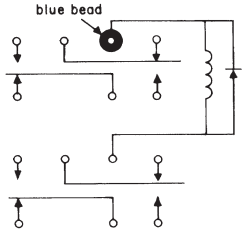
| TOLERANCES (Unless otherwise specified) | |
|---|---|
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |

### Header and Connection Diagrams

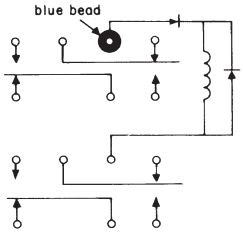
**CODE 1**
**4-Pole Terminal View**



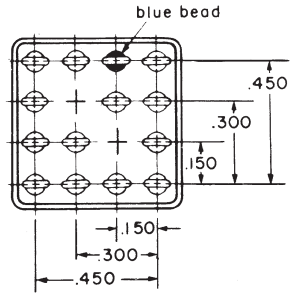

**CODE 5**



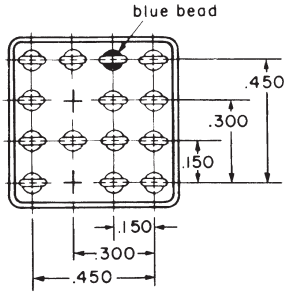

**CODE 6**




**CODE 1**




**CODE 5 & 6**

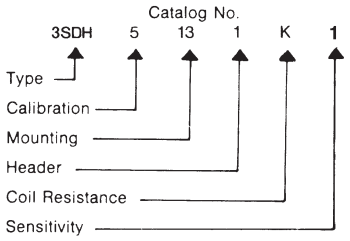



Terminals .020 dia

### Ordering Instructions

**Catalog-selected Relays:** The catalog number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Example:** The relay selected in this example is a 4PDT .150-grid relay, voltage calibrated, end bracket mounting, 0.13 inch solder hook header, 720 ohms coil resistance, and 210 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SDH5131K1. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SDH5131K1R.



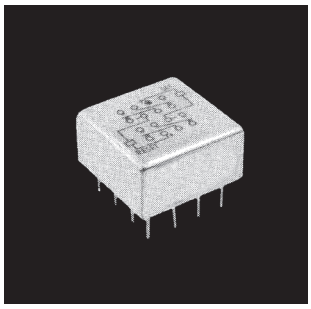
## Four Pole, Magnetic Latching, 2 Amps and Less

### .150 Grid-space Magnetic Latching Relays

### Type 3SBM (4PDT)

### Product Facts

- **Low profile… only 0.32 inches high**
- **Internal diode for coil transient suppression available**
- **Qualified to MIL-R-39016/31**



The Type 3SBM relay adds magnetic latching capability to the popular and growing family of .150-grid relays. This relay has memory in that the contact positions do not change when coil power is removed. Switching is accomplished by applying power to the applicable coil (dual coil) or with the applicable polarity (single coil). The low switching power requirements are further enhanced by its ability to operate from capacitor discharge or other pulses or through its own contacts from batteries or similarly limited supplies.

### Electrical Characteristics

**Operate Sensitivity**—
Single-coil form, 100 mW,
Dual-coil form, 180 mW

**Contact Arrangement**—
4-pole double-throw (4C)

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
DC inductive — 0.5 amp at 28 volts, 200 mH
AC resistive — 0.5 amp at 115 volts (enclosure isolated from ground, or enclosure and movable contact at same potential)
AC — 0.125 amp at 115 volts (enclosure at line potential with respect to movable contact)
Low-level — 50 µA at 50 mV
Peak AC or DC

**Contact Resistance** —
0.050 ohms max.;
0.150 ohms after life tests

**Life** —
100,000 operations at rated loads listed;
1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 4 ms max.

**Contact Bounce** — 1.5 ms

**Dielectric Strength** —
500 volts rms at sea level;
350 volts rms at 70,000 feet and above

**Insulation Resistance** —
1,000 megohms min. over temperature range

### Environmental Characteristics

**Vibration** — 30 G, 55 to 3,000 Hz

**Shock** — 150 G at 11 ms

**Temperature** — -65°C to +125°C

See page 1-62 for Mounting Forms, Terminals and Circuit Diagrams.

### Coil Table (All Values DC)*

| Coil Code Letter | SINGLE COIL, SENSITIVITY 1, (100 mW) | | | |
|---|---|---|---|---|
| | Coil Resistance @ 25C (Ohms) ± 10% | Maximum Set-Reset Values | | Suggested Source Volts‡ |
| | | Calibration Code 5 Voltage (Volts) | Calibration Code 6 Current (mA) | |
| N | 57 | 2.4 | 42 | 3.6– 8.5 |
| R | 256 | 5.1 | 20 | 7.6–18 |
| T | 830 | 9.1 | 11 | 14–32 |
| V | 1700 | 13.0 | 7.7 | 20–46 |
| W | 3250 | 18.0 | 5.5 | 28–63 |

| Coil Code Letter | DUAL COIL, SENSITIVITY CODE 2, (180 mW) | | | |
|---|---|---|---|---|
| | Coil Resistance @ 25C (Ohms) ± 10% | Maximum Set-Reset Values | | Suggested Source Volts‡ |
| | | Calibration Code 5 Voltage (Volts) | Calibration Code 6 Current (mA) | |
| H | 10 | 1.4 | 135 | 2.0– 3.7 |
| N | 37 | 2.6 | 70 | 3.8– 7.2 |
| R | 145 | 5.2 | 35 | 7.6–14.5 |
| T | 450 | 9.0 | 20 | 14–25 |
| V | 975 | 13.5 | 13.5 | 20–35 |
| W | 2140 | 20.0 | 9.2 | 30–54 |

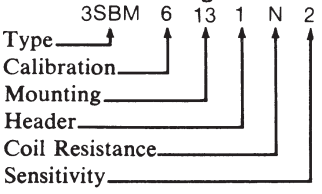
*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

### Ordering Instructions

Type 3SBM relays can be ordered by specifying the correct catalog number. This number is derived by choosing the proper CODE for each of the six relay characteristics in the order in which the codes are listed.

**Example:** The relay selected in this example is a dual coil, current calibrated, four-hole end bracket mounting, solder hook header, 37 ohms coil resistance, and 180 mW sensitivity. By choosing the proper code for each of these relay characteristics, the catalog number is identified as 3SBM6131N2. The letter R following sensitivity code indicates relay received 5000 operation miss-test. Ex. 3SBM6131N2R.

**Relay Characteristic**
**Catalog No.**



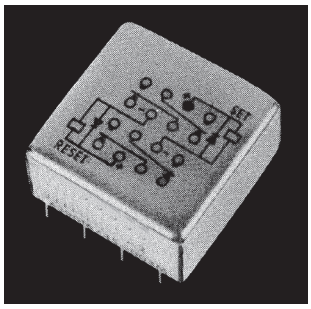

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Four Pole, Magnetic Latching, 2 Amps and Less (Continued)

### .150 Grid-space Hybrid Magnetic Latching Relays
### Single Diode, Dual Diode
### Type 3SBM (4PDT)

### Product Facts

- **Low profile… only 0.32 inches high**
- **Suitable for pulse operation**
- **Qualified to MIL-R-39016/35**
- **Qualified to MIL-R-39016/36**




The dual coil version of the 3SBM magnetic latching relay is now available with coil transient suppression with or without blocking diodes for reverse polarity protection. This hybrid magnetic latching relay is an addition to the growing family of .150 grid relays. The diode method is employed to limit the back EMF generated when the coil circuit is opened in order to protect other circuit components such as semi-conductors. The contact load capabilities of the 3SBM as well as the memory feature of the latching function are both maintained.

### Electrical Characteristics

**Contact Arrangement**—
4-pole double-throw (4C)

**Operate Sensitivity**—
Single-coil form, 100 mW,
Dual-coil form, 180 mW per coil

**Contact Ratings** —
DC resistive — 2 amps at 28 volts
DC inductive — 0.5 amp at 28 volts, 200 mH
AC resistive — 0.5 amp at 115 volts (enclosure isolated from ground, or enclosure and movable contact at same potential)
AC — 0.125 amp at 115 volts (enclosure at line potential with respect to movable contact)
Low-level — 50 µA at 50 mV
Peak AC or DC

**Contact Resistance** —
0.050 ohms max.;
0.150 ohms after life test

**Life** — 100,000 operations at rated loads listed; 1,000,000 operations at low-level loads

### Operating Characteristics

**Operate Time** — 4 ms max.

**Release Time** — 4 ms max.

**Contact Bounce** — 1.5 ms

**Dielectric Strength (Note 1)** — 500 volts rms at sea level;
350 volts rms at 70,000 feet and above

**Insulation Resistance (Note 1)** — 1,000 megohms min. over temperature range

### Environmental Characteristics

**Vibration** — 30 G, 55 to 3,000 Hz

**Shock** — 150 G at 11 ms

**Temperature** — -65°C to +125°C

### Semiconductor Characteristics at 25°C

**Max. Negative Transient** — 1 volt

**Breakdown Voltage** — 100 Vdc min.

**Max. Leakage Current** —
1 µA @ 50 Vdc

**Note 1:** Tests for dielectric withstanding voltage and insulation resistance should be made with "coil terminals" shorted together to avoid unnecessary electrical stress to semiconductor elements.

See page 1-62 for Mounting Forms, Terminals and Circuit Diagrams.

## Coil Table Single Diode (All Values DC)*

| Coil Code Letter | Dual Coil, Sensitivity Code 5 (180 mW) | | | |
|---|---|---|---|---|
| | Coil Resistance @ 25C (ohms) ± 10% | MAX. SET—RESET VALUES | | Suggested Source Volts† |
| | | Calibration Code 5 Voltage (Volts) | Calibration Code 6 Current (mA) | |
| H | 10 | 1.4 | 135 | 2.0- 3.7 |
| N | 37 | 2.6 | 70 | 3.8- 7.2 |
| R | 145 | 5.2 | 35 | 7.6-14.5 |
| T | 450 | 9.0 | 20 | 14-25 |
| V | 975 | 13.5 | 3.5 | 20-35 |
| W | 2140 | 20.0 | 9.2 | 30-54 |

## Coil Table Dual Diode (All Values DC)*

| Coil Code Letter | Dual Coil, Sensitivity Code 6 (180 mW) | | | |
|---|---|---|---|---|
| | Coil Resistance @ 25C (ohms) ± 10%** | MAX. SET—RESET VALUES | | Suggested Source Volts† |
| | | Calibration Code 5 Voltage (Volts) | Calibration Code 6 Current (mA) | |
| H | 10 | 2.4 | 135 | 2.6- 4.1 |
| N | 37 | 3.6 | 70 | 3.8- 7.2 |
| R | 145 | 6.2 | 35 | 7.6-14.5 |
| T | 450 | 10.0 | 20 | 14.0-25.0 |
| V | 975 | 14.5 | 13.5 | 20.0-35.0 |
| W | 2140 | 21.0 | 9.2 | 30.0-45.0 |

*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.
**Coil resistance cannot be measured by conventional bridge.

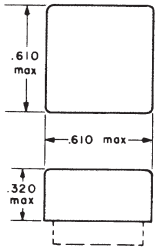
**Note: See page 1-60 for ordering instructions.**

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

## Four Pole, Magnetic Latching, 2 Amps and Less (Continued))

### Mounting Forms (3SBM)

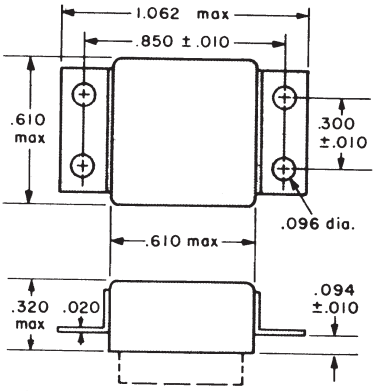
**(Vibration note with each form is acceleration from 55 to 3000 Hz)**




**No Mount**

| Mounting Code | Vibration* |
|---|---|
| 00 | 30g |

*Assumes relay held securely by potting or other means.




**End Bracket**

| Mounting Code | Vibration |
|---|---|
| 13 | 30g |

**ALL DIMENSIONS IN INCHES**

| TOLERANCES Unless otherwise specified: | |
|---|---|
| Hundredths | ±0.020 |
| Thousandths | ±0.005 |

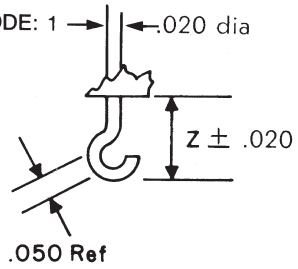
### Header and Connection Diagrams

#### Dual Coil

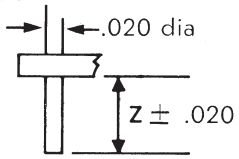
When the SET coil is pulsed with plus polarity on the blue bead, the movable contacts take the position shown in the connection diagram. The contacts are transferred when the RESET coil is pulsed with plus polarity on the reset terminal. A new pulse of the SET coil with plus polarity on the blue bead will transfer the contacts back.

The contacts can also be transferred by applying a pulse of opposite polarity to the coil previously pulsed. However, this method requires slightly more power than the more normal form of operation described in the previous paragraph.

CODE: 1



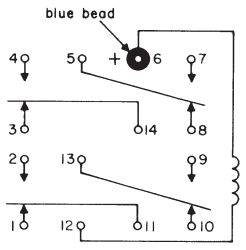

CODES: 4,5,8




### Header Types

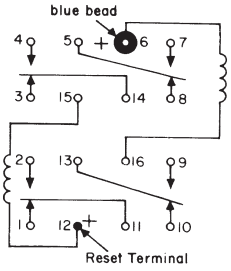
| Type | Z Dimension | Header Code |
|---|---|---|
| Solder Hook | 0.13 | 1 |
| Straight Pin | 0.12 | 8 |
| Straight Pin (socket or PCB type) | 0.19 | 4 |
| Straight Pin | 0.25 | 5 |

**CODE 1**

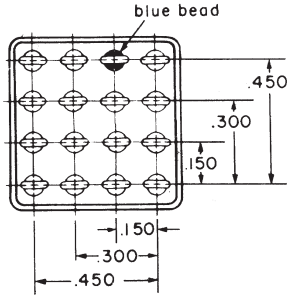



(Terminal numbers for reference only)

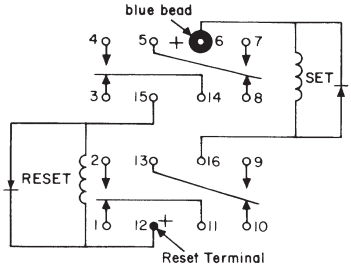
**CODE 2**



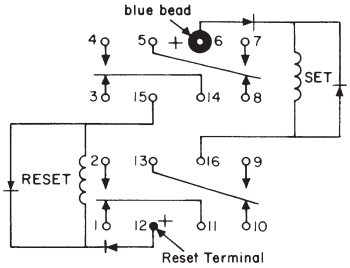

Terminal numbers for reference only




**CODE 5**
**Single Diode**




**CODE 6**
**Dual Diode**



## Six Pole, Electrically Held, 2 Amps and Less

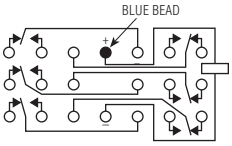
**SS**

**SS**

**Six Pole Half Size**
**High Performance Relay**

**Designed to**
**MIL-R-39016**






**Terminal View**

### Product Facts

- **Hermetically sealed**
- **Up to 2 amps switching**
- **High shock & vibration ratings**
- **Optional terminals & mounting styles**
- **6 form C Hi-density design**

### Electrical Characteristics

**Contact Arrangement** — 6 Form C (6PDT)

**Contact Material** — Stationary — Gold plated hardened silver alloy Moveable — Gold plated hardened silver alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations min.

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 2.6 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 475 mW

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 2 A @ 28 Vdc | Resistive | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.75 A @ 28 Vdc | Inductive (200mH) | 100,000 |
| 0.1 A @ 28 Vdc | Intermediate | 50,000 |
| 0.2 A @ 28 Vdc | Lamp | 100,000 |
| 10 µA @ 50 mV | Low Level | 1,000,000 |

## Six Pole, Electrically Held, 2 Amps and Less (Continued)

**SS (Continued)**

### Operating Characteristics

**Timing** —
Operate Time — 5.0 ms max.
Release Time — 5.0 ms max.

**Contact Bounce** — 5.0 ms max

**Dielectric Withstanding Voltage** —
Between Open Contacts —
350 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz

**Insulation Resistance** —
1,000 megohms min. @ 500 Vdc

### Environmental Characteristics

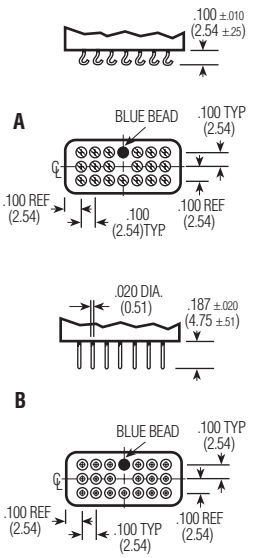
**Temperature Range** —
-65°C to +125°C

**Weight** —
0.28 oz. (7.8 grms)

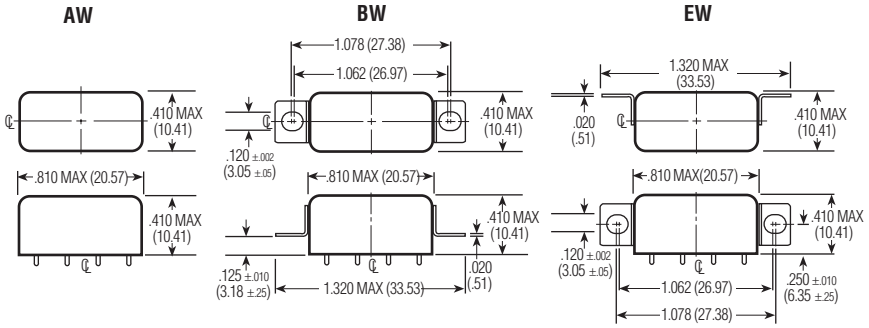
**Vibration Resistance** —
15 G's, 10 to 2,000 Hz

**Shock Resistance** —
100 G's, 6 ±1 ms

**QPL Equivalent** —
MIL-R-39016




**SS Terminals**




**Mounting Styles**

### Standard Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (W) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|
| 5.0 | 20 | 2.75 | 3.8 | 0.35 | 0.23 | 1.25 | 6.0 | 5 |
| 6.0 | 25 | 3.5 | 4.5 | 0.45 | 0.3 | 1.44 | 8.0 | 6 |
| 12.0 | 100 | 6.5 | 9.0 | 0.9 | 0.6 | 1.44 | 15.0 | 12 |
| 26.5 | 390 | 14.0 | 18.0 | 1.8 | 1.2 | 1.8 | 32.0 | 24 |

**Specifying a Part Number Example:**

| Type | Mountings | Contacts | Coils | Terminals |
|---|---|---|---|---|
| SS | BW- | 6C- | 24 | B |

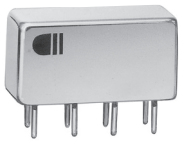
## Double Pole, Electrically Held, 5 Amps and Less

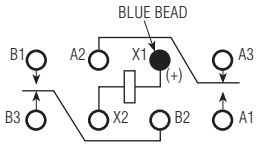
**HFW4A, HFW5A**

**HFW4A, HFW5A**

**Standard Half Size**
**High Performance Relay**

**Designed to**
**MIL-R-39016/6**






**Terminal View**

### Product Facts

- **Hermetically sealed**
- **Up to 5 amps switching**
- **High shock & vibration ratings**
- **Optional terminals & mounting styles**
- **Excellent RF switching**

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Hardened silver alloy
Moveable — Gold plated hardened silver alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc)
After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 50 million operations

**Coil Voltage** — 5 to 48 Vdc (HFW4A)
5 to 26.5 Vdc (HFW5A)

**Coil Power** — 1.4 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity @ 25°C** — 145 to 260 mW

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 4 A @ 28 Vdc (HFW4A) | Resistive | 100,000 |
| 5 A @ 28 Vdc (HFW5A) | Resistive | 100,000 |
| 0.75 A @ 28 Vdc | Inductive (200mH) | 100,000 |
| 0.1 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |
| 0.1 A @ 28 Vdc | Intermediate | 50,000 |
| 0.160 A @ 28 Vdc | Lamp | 100,000 |
| 30 µA @ 50 mVdc | Low Level | 1,000,000 |

### RF Performance

| Frequency (MHz) | RF Losses (dB) | VSWR | Isolation (dB) |
|---|---|---|---|
| 100 | 0.1 | 1.17:1 | 40 |
| 500 | 0.3 | 1.19:1 | 28 |
| 1000 | 0.4 | 1.19:1 | 23 |

## Double Pole, Electrically Held, 5 Amps and Less (Continued)

### HFW4A, HFW5A (Continued)

#### Operating Characteristics

**Timing** —
Operate Time — 4.0 ms max.
Release Time — 4.0 ms max.

**Contact Bounce** — 2.0 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 1000 Vrms 60 Hz
Between Contacts & Coil — 1000 Vrms 60 Hz

**Insulation Resistance** — 10,000 megohms min. @ 500 Vdc

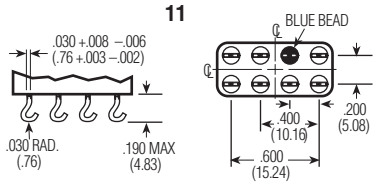
#### Environmental Characteristics

**Temperature Range** — -65°C to +125°C

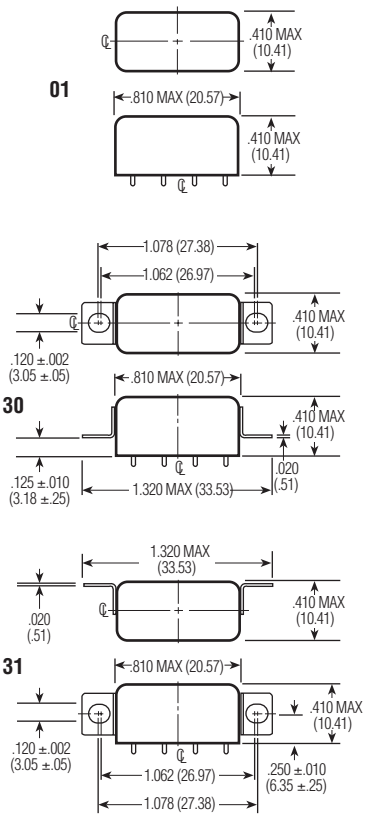
**Weight** — 0.46 oz. (13 gms max.)

**Vibration Resistance** — 20 G's, 10 to 2,000 Hz

**Shock Resistance** — 100 G's, 6 ±1 ms




**Terminals**




**Mounting Styles**

### Standard Coil Data

| | Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Min.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|---|
| HFW4A/HFW5A | 5.0 | 27 | 2.7 | 3.8 | 0.29 | 0.21 | 926 | 6.0 | L |
| | 6.0 | 40 | 3.2 | 4.5 | 0.35 | 0.25 | 900 | 7.5 | F |
| | 12.0 | 160 | 6.4 | 9.0 | 0.7 | 0.5 | 900 | 15.0 | G |
| | 26.5 | 700 | 13.5 | 18.0 | 1.5 | 1.0 | 1003 | 32.0 | K |
| Other | 6-8 | 60 | 3.5 | 4.85 | 0.35 | 0.22 | 817 | 9.0 | A |
| (avail. for | 12-15 | 320 | 6.8 | 9.42 | 0.68 | 0.44 | 570 | 21.0 | B |
| HFW4A | 18.0 | 520 | 9.5 | 13.16 | 0.95 | 0.62 | 623 | 27.0 | J |
| relays only) | 26.5-32 | 1,250 | 14.0 | 19.4 | 1.5 | 0.98 | 684 | 42.0 | D |
| | 40.0 | 2,700 | 21.3 | 29.5 | 2.1 | 1.37 | 593 | 61.0 | H |
| | 48.0 | 3,500 | 25.5 | 35.3 | 2.5 | 1.63 | 658 | 70.0 | E |

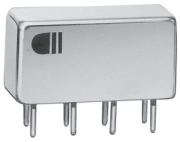
**Specifying a Part Number Example:**

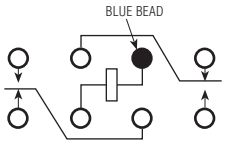
| Type | Terminals | Mountings | Coils | Features |
|---|---|---|---|---|
| HFW5A | 12 | 30 | K | 00 |

## Double Pole, Electrically Held, 5 Amps and Less (Continued)

### HFC4A, HFC5A

### Commercial/Industrial Half Size Relay






Terminal View

### Product Facts

- Hermetically sealed
- Up to 5 amps switching
- Economical configuration
- Optional terminals & mounting styles

### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Bifurcated hardened silver alloy Moveable — Gold plated hardened alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 A @ 28 Vdc)

**Mechanical Life Expectancy** — 10 million operations

**Coil Voltage** — 5 to 26.5 Vdc

**Coil Power** — 1.4 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 60% of nominal coil voltage

**Pick-up Sensitivity** — 360 mW

### Operating Characteristics

**Timing** — Operate Time — 6.0 ms max. Release Time — 6.0 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 350 Vrms 60 Hz Between Adjacent Contacts — 500 Vrms 60 Hz Between Contacts and Coil — 500 Vrms 60 Hz

**Insulation Resistance** — 1,000 megohms min @ 500 Vdc

### Environmental Characteristics

**Temperature Range** — -55°C to +85°C

**Weight** — 0.46 oz. (13 gms) max.

**Vibration Resistance** — 10 G's, 10 to 500 Hz

**Shock Resistance** — 30 G's, 6 ±1 ms

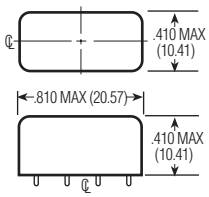
### Contact Ratings

| | Contact Load | Type | Operations Min. |
|---|---|---|---|
| HFC4A | 4 A @ 28 Vdc | Resistive | 100,000 |
| HFC5A | 5 A @ 28 Vdc | Resistive | 100,000 |
| | 0.75 A @ 28 Vdc | Inductive (200 mH) | 100,000 |
| | 0.3 A @ 115 Vac, 60 Hz & 400 Hz | Resistive | 100,000 |

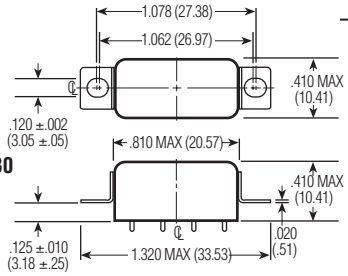
### Standard Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ± 20% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 85°C | Nom. Coil Power (W) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|
| 5.0 | 27 | 3.0 | 3.7 | .92 | 6.0 | L |
| 6.0 | 40 | 3.6 | 4.5 | .90 | 7.5 | F |
| 12.0 | 160 | 7.2 | 8.9 | .90 | 15.0 | G |
| 26.5 | 700 | 16.0 | 19.7 | 1.00 | 32.0 | K |

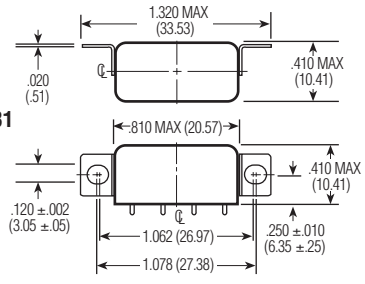
01




30

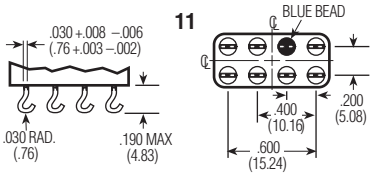



31

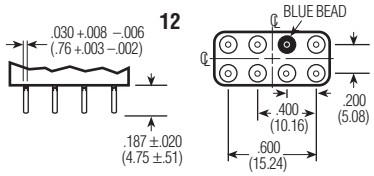



Mounting Styles

11




12




Terminals

**Specifying a Part Number Example:**

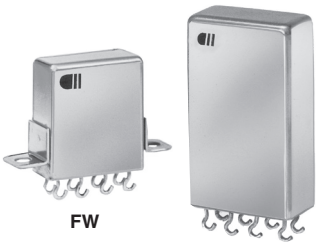
| Type | Terminals | Mountings | Coils | Features |
|---|---|---|---|---|
| HFC5A | 12 | 30 | K | 00 |

## Double Pole, Electrically Held, 5 Amps and Less (Continued)

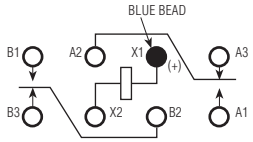
### FW, FW5A, SF, SF5A

**Two Pole Full Size Crystal-Can Relay**

**FW Qualified to MIL-R-5757/10**



FW SF




Terminal View

### Product Facts

- Hermetically sealed
- Up to 5 amps switching
- High shock & vibration ratings
- Optional terminals & mounting options
- Excellent RF switching

### Electrical Characteristics

**Contact Arrangement** — 2 Form C

**Contact Material** — Stationary — Bifurcated hardened silver alloy Moveable — Gold plated hardened alloy

**Contact Resistance** — Before Life — 50 milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 milliohms max. (measured @ 2 mA @ 28 Vdc)

**Mechanical Life Expectancy** — 50 million operations

**Coil Voltage** — 6.3 to 110 Vdc (FW, FWSA) 1.8 to 40 Vdc (SF) 2.8 to 40 Vdc (SFSA)

**Coil Power** — 1.5 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 250 mW (FW, FWSA) 40 mW (SF) 80 mW (SF5A)

### Operating Characteristics

**Operate Time** — 15 ms max. (SF) 5 ms (FW, FWSA)) 6 ms max. (MIL-R-5757/10)

**Release Time** — 10 ms max. (SF) 5 ms max. (FW, FWSA) 6 ms max. (MIL-R-5757/10)

**Contact Bounce** — 2 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz Between Adjacent Contacts — 1,000 Vrms 60 Hz Between Contacts and Coil — 1,000 Vrms 60 Hz

**Insulation Resistance** — 10,000 megohms min @ 500 Vdc

### Environmental Characteristics

**Temperature Range** — -65°C to +125°C

**Weight** — 0.6 oz. max. (FW, FWSA) 0.7 oz. max. (SF 6) 1.1 oz. max. (SF/SF 5A)

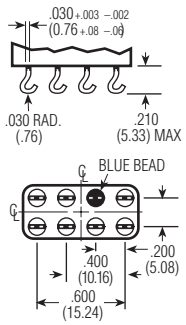
**Vibration Resistance** — Standard — 20 G's, 10 to 2000 Hz (FW, FWSA) 15 G's, 10 to 2000 Hz (SF) QPL — 20 G's, 10 to 2000 Hz

**Shock Resistance** — 100 G's, 6 ±1 ms

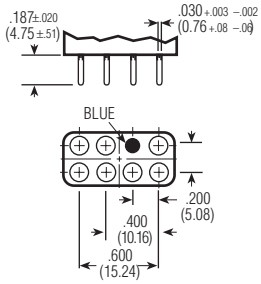
**QPL Approval** — MIL-R-5757/10 (FW only)

**QPL Equivalent** — MIL-R-5757/13 (SF only)

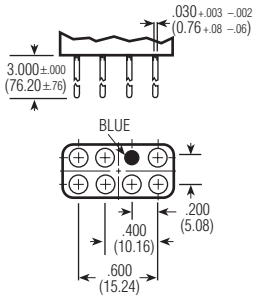
1




2




3




Terminals

### RF Performance

| Frequency (MHz) | RF Losses (dB) | VSWR | Isolation (dB) |
|---|---|---|---|
| 100 | 0.1 | 1.17:1 | 40 |
| 250 | 0.2 | 1.18:1 | 33 |
| 500 | 0.3 | 1.19:1 | 28 |
| 750 | 0.4 | 1.19:1 | 25 |
| 1,000 | 0.4 | 1.19:1 | 23 |

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 5 A @ 28 Vdc (FW5A/SF5A) | Resistive | 100,000 |
| 3 A @ 28 Vdc (FW) | Resistive | 100,000 |
| 2 A @ 28 Vdc (SF) | Resistive | 100,000 |
| 1 A @ 115 Vac, 60 Hz & 400 Hz (FW) | Resistive | 100,000 |
| 0.3 A @ 115 Vac, 60 Hz & 400 Hz (SF) | Resistive | 100,000 |
| 1 A @ 28 Vdc | Inductive (200 mH) | 100,000 |
| 0.1 A @ 28 Vdc | Lamp | 100,000 |
| 10 µA @ 50 mVdc | Low Level | 1,000,000 |
| 75 WATTS @ 50 MHz (FW) | RF | 10,000,000 |

## Double Pole, Electrically Held, 5 Amps and Less (Continued)



### FW, FWSA Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (W) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|
| 6.3 | 35 | 3.2 | 4.4 | 0.35 | 0.23 | 1.13 | 7.9 | A |
| 12.6 | 200 | 6.8 | 9.4 | 0.74 | 0.49 | .79 | 15.8 | D |
| 17.6 | 340 | 8.9 | 12.3 | 0.97 | 0.64 | .91 | 22.0 | E |
| 26.5 | 675 | 13.5 | 18.7 | 1.47 | 0.96 | 1.04 | 33.1 | G |
| 32.0 | 975 | 15.5 | 21.5 | 1.69 | 1.1 | 1.05 | 40.0 | H |
| 48.0 | 2,450 | 25.0 | 34.7 | 2.73 | 1.8 | .94 | 60.0 | L |
| 56.0 | 3,150 | 30.0 | 41.6 | 3.27 | 2.1 | 1.90 | 70.0 | M |
| 75.0 | 5,000 | 38.0 | 52.7 | 4.14 | 2.7 | 1.13 | 93.8 | N |
| 110.0 | 9,100 | 51.0 | 70.7 | 5.56 | 3.6 | 1.33 | 137.5 | R |

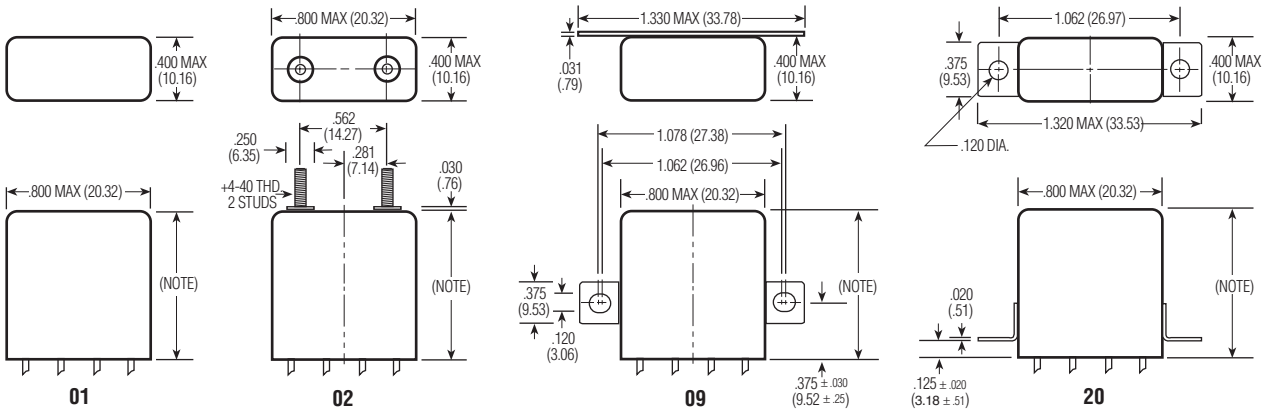
### SF5/SF6 Coil Data

| Nom. Coil Voltage (Vdc) | Nom. Current (mA) | Coil Resistance in Ohms ± 10% @ 25°C | Pickup Current (mA) @ 25°C | Nom. Coil Power (mW) @ 25°C | Coil Desig. |
|---|---|---|---|---|---|
| 1.8 | 90.0 | 20 | 45.0 | 162 | A |
| 9.0 | 18.0 | 500 | 9.0 | 162 | E |
| 12.6 | 12.6 | 1,000 | 6.5 | 159 | F |
| 16.5 | 11.0 | 1,500 | 5.2 | 182 | G |
| 18.0 | 9.0 | 2,000 | 4.5 | 162 | H |
| 20.0 | 8.0 | 2,500 | 4.0 | 160 | J |
| 26.5 | 5.3 | 5,000 | 2.8 | 140 | W |
| 36.0 | 4.5 | 8,000 | 2.3 | 162 | L |
| 40.0 | 4.0 | 10,000 | 2.0 | 160 | Y |

### SF5A Coil Data

| Nom. Coil Voltage (Vdc) | Nom. Current (mA) | Coil Resistance in Ohms ± 10% @ 25°C | Pickup Current (mA) @ 25°C | Nom. Coil Power (mW) @ 25°C | Coil Desig. |
|---|---|---|---|---|---|
| 2.8 | 140.0 | 20 | 65.0 | 392 | A |
| 4.0 | 80.0 | 50 | 41.6 | 320 | B |
| 12.0 | 24.0 | 500 | 12.5 | 288 | E |
| 18.0 | 18.0 | 1,000 | 9.3 | 324 | F |
| 26.5 | 10.6 | 2,500 | 5.6 | 281 | J |
| 40.0 | 8.0 | 5,000 | 4.0 | 320 | W |

**NOTE:**
FW/FW5A = .875 (22.23) Max.
SF6 = .900 (22.86) Max.
SF5/SF5A5 = 1.281 (32.54) Max.




**Mounting Styles**

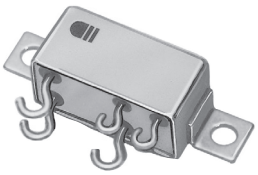
**Specifying a Part Number Example:**

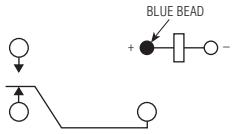
| Type | Series | Terminals | Mountings | Coils | Features |
|---|---|---|---|---|---|
| FW | 1 | 1 | 20 | G | 00 |
| SF | 5 | 1 | 20 | W | 00 |
| SF5A | 5 | 1 | 20 | W | 00 |
| SF | 6 | 1 | 20 | W | 00 |

## Single Pole, Electrically Held, 10 Amps and Less

### C

### Single Pole, Half Size High Performance Relay






Terminal View

### Product Facts

- Hermetically sealed
- Up to 10 amps switching
- High shock & vibration ratings
- Optional terminals & mounting styles

### Electrical Characteristics

**Contact Arrangement** — 1 Form C (SPDT)

**Contact Material** — Stationary — Hardened silver alloy Moveable — Hardened silver alloy

**Contact Resistance** — Before Life — 50 Milliohms max. (measured at 10 mA @ 6 Vdc) After Life — 100 Milliohms max. (measured @ 1 A @28 Vdc)

**Contact Rating** — Contact Load — 10 A 28 Vdc Type — Resistive Operations min. 50,000

**Mechanical Life Expectancy** — 1 million operations min.

**Coil Voltage** — 6 to 26.5 Vdc

**Coil Power** — 1.4 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 260 mW

### Operational Characteristics

**Operate Time** — 5.0 ms max.

**Release Time** — 5.0 ms max.

**Contact Bounce** — 5.0 ms max.

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz Between Adjacent Contacts — 1000 Vrms 60 Hz Between Contacts and Coils — 1000 Vrms 60 Hz

**Insulation Resistance** — 1,000 megohms min. @ 500 Vdc

### Environmental Characteristics

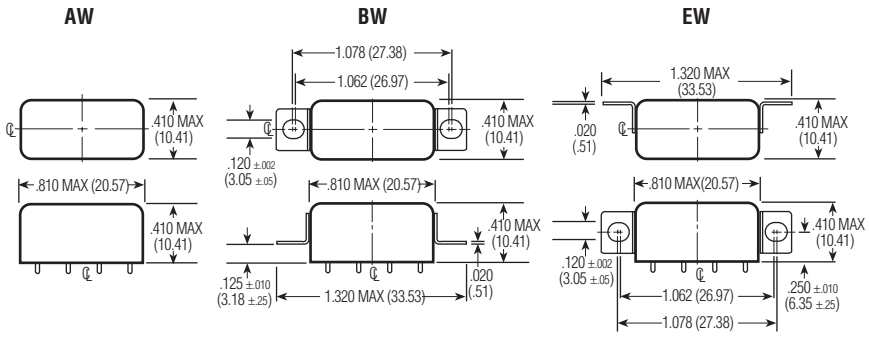
**Temperature Range** — -65°C to +125°C

**Weight** — 0.28 oz. (8 grams) max.

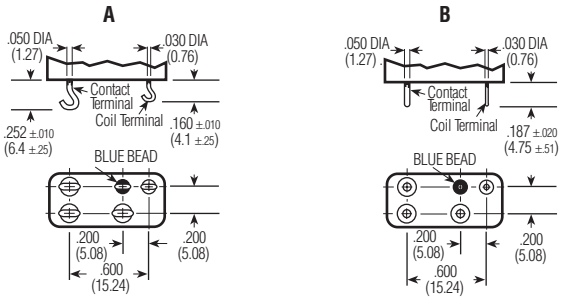
**Vibration Resistance** — 20 G's, 10 to 2,000 Hz

**Shock Resistance** — 100 G's, 6 ±1 ms

**Designed To** — MIL-R-39016




Mounting Styles




Terminals

### Standard Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (W) @ 25°C | Max. Coil Voltage | Coil Desig. |
|---|---|---|---|---|---|---|---|---|
| 6.0 | 40 | 3.5 | 4.5 | 0.45 | 0.3 | .9 | 8.0 | 6 |
| 12.0 | 160 | 6.5 | 9.0 | 0.9 | 0.6 | .9 | 15.0 | 12 |
| 26.5 | 700 | 14.0 | 18.0 | 1.8 | 1.2 | 1.0 | 32.0 | 24 |

**Specifying a Part Number Example:**

| Type | Mountings | Contacts | Coils | Terminals |
|---|---|---|---|---|
| C | BW- | 1C- | 24 | B |

## Double Pole, Electrically Held, 10 Amps and Less

**07**

**Two Pole 10 Amp High Performance Relay**

**Qualified to MIL-R-5757/23 MS 27245 & MS 27247**

### Product Facts

- **Hermetically sealed**
- **Up to 10 amps switching**
- **High shock & vibration ratings**
- **Optional terminals & mounting styles**
- **DC, AC & diode-suppressed coils**



### Electrical Characteristics

**Contact Arrangement** — 2 Form C (DPDT)

**Contact Material** — Stationary — Silver cadmium oxide Moveable — Silver cadmium oxide

**Contact Resistance** — Before Life — 10 milliohms max. After life — 20 milliohms max. (Measured at 10 A @ 28 Vdc)

**Mechanical Life Expectancy** — 1 million operations

**Coil Voltage** — 6 to 120 Vdc, 115 Vac

**Coil Power** — 4.3 watts max. @ 25°C

**Duty Cycle** — Continuous

**Pick-up Voltage** — Approximately 50% of nominal coil voltage

**Pick-up Sensitivity** — 565 mW

### Operating Characteristics

**Operate Time** — Std — 10 ms max. QPL — 15 ms max. AC Coil — 15 ms max.

**Release Time** — Std — 10 ms max. QPL — 15 ms max. AC Coil — 20 ms max.

**Contact Bounce** — Std — 5 ms max. (N.O. and N.C.) QPL — 2 ms max. (N.O.) QPL — 5 ms max. (N.C.)

**Dielectric Withstanding Voltage** — Between Open Contacts — 500 Vrms 60 Hz Between Adjacent Contacts — 1000 Vrms 60 Hz Between Contacts and Coil — 1000 Vrms 60 Hz

**Insulation Resistance** — 1,000 megohms min. @ 500 Vdc

### Environmental Characteristics

**Temperature Range** — -65°C TO +125°C

**Weight** — 1.3 oz (37 gms) max.

**Vibration Resistance** — Standard — 30 G's, 10 to 2,000 Hz QPL — 20 G's, 10 to 2,000 Hz

**Shock Resistance** — 100 G's, 6 ±1 ms

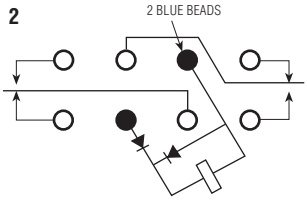
**QPL Approval** — MIL-R-5757/23 MS 27245 MS 27247

### Contact Ratings

| Contact Load | Type | Operations Min. |
|---|---|---|
| 10 A @ 28 Vdc | Resistive | 100,000 |
| 3 A @ 115 V, 60 Hz | Resistive | 50,000 |
| 5 A @ 115 V, 400 Hz | Resistive | 50,000 |
| 6 A @ 28 Vdc | Inductive | 50,000 |
| 2 A @ 115 V, 60 Hz | Inductive | 50,000 |
| 2.5 A @ 115 V, 400 Hz | Inductive | 50,000 |
| 1 A @ 28 Vdc | Lamp | 50,000 |
| 0.5 A @ 115 V, 60 Hz | Lamp | 50,000 |
| 0.8 A @ 115 V, 400 Hz | Lamp | 50,000 |
| 3 A @ 28 Vdc | Motor | 50,000 |
| 1.5 A @ 115 V, 60 Hz | Motor | 50,000 |
| 3 A @ 115 V, 400 Hz | Motor | 50,000 |

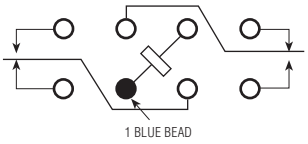
*All ratings grounded case

2



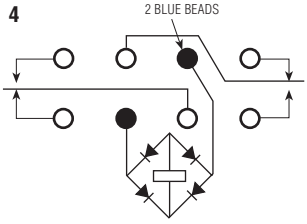

Terminal View

3



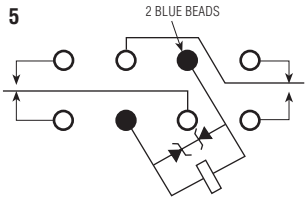

Terminal View

4



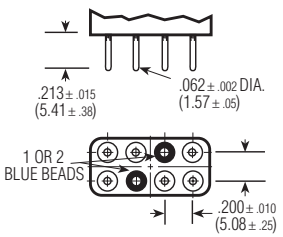

Terminal View

5

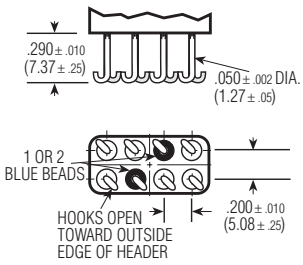



Terminal View

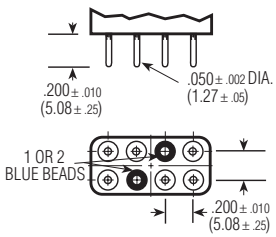
**1: GOLD PLATED**




**2: SOLDER FINISH**




**4: GOLD PLATED**
**5: SOLDER FINISH**

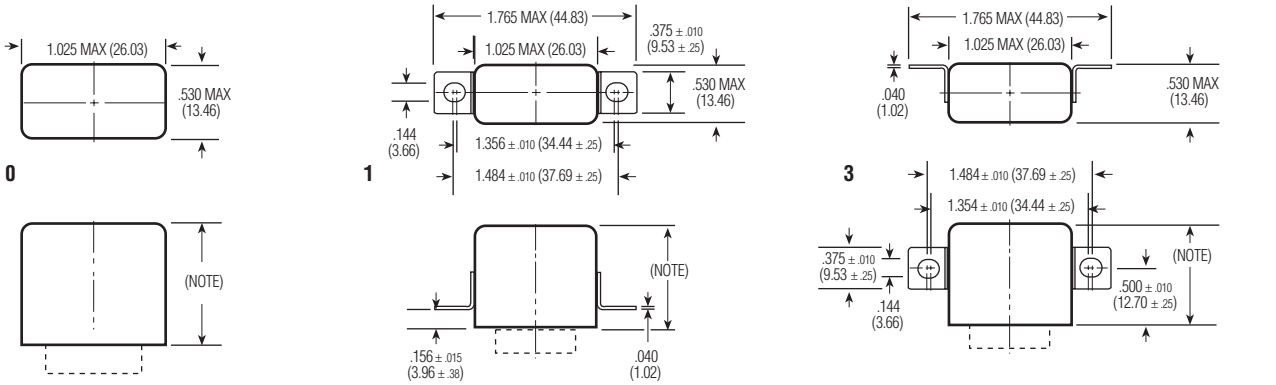



Terminals

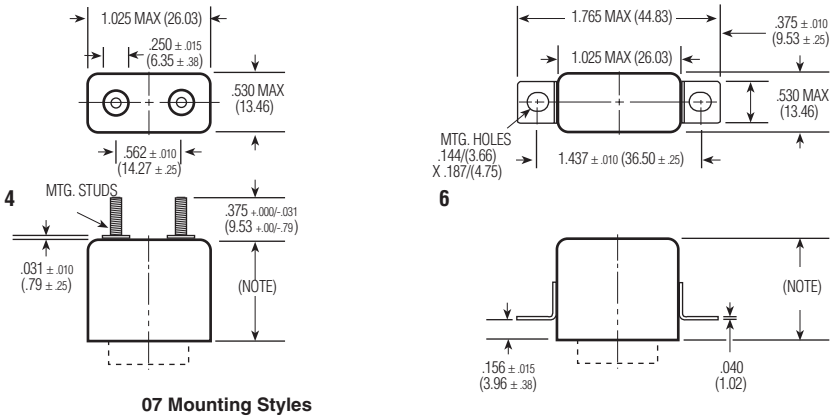
## Double Pole, Electrically Held, 10 Amps and Less (Continued)

### Coil Data

| Nom. Coil Voltage (Vdc) | Coil Resistance in Ohms ±10% @ 25°C | Pickup Voltage Vdc (Max.) @ 25°C | Pickup Voltage Vdc (Max.) @ 125°C | Drop-out Voltage Vdc (Min.) @ 25°C | Drop-out Voltage Vdc (Min.) @ -65°C | Nom. Coil Power (mW) @ 25°C | Max. Coil Voltage | Coil Desig. | Environmental |
|---|---|---|---|---|---|---|---|---|---|
| 6.0 | 19 | 3.6 | 4.5 | 0.4 | 0.25 | 1.89 | 9.0 | AA | **Temperature** -55˚C to +85˚C |
| 12.0 | 75 | 7.2 | 9.0 | 0.9 | 0.5 | 1.92 | 16.0 | AB | |
| 26.5 | 300 | 14.4 | 18.0 | 1.8 | 1.0 | 2.34 | 32.0 | AC | **Vibration** 20G's, 10 to 2,000Hz |
| 48.0 | 1,200 | 29.0 | 36.0 | 3.6 | 2.0 | 1.92 | 52.0 | AD | |
| 120.0 | 7,600 | 72.0 | 90.0 | 9.0 | 5.0 | 1.89 | 122.0 | AE | **Shock** 50G's, 11ms |
| 115 Vac 400 Hz | 1,200 | 72.0 | 90.0 | 10.0 | 5.0 | n/a | n/a | AR | |
| 115 Vac 60-400 Hz | 7,600 | 72.0 | 90.0 | 10.0 | 5.0 | n/a | n/a | AS | |
| 6.0 | 19 | 3.3 | 4.5 | 0.4 | 0.25 | 1.89 | 9.0 | BA | **Temperature** -65˚C to +125˚C |
| 12.0 | 75 | 6.5 | 9.0 | 0.9 | 0.5 | 1.92 | 16.0 | BB | |
| 26.5 | 300 | 13.0 | 18.0 | 1.8 | 1.0 | 2.34 | 32.0 | BC | **Vibration** 20G's, 10 to 2,000Hz |
| 48.0 | 1,200 | 26.0 | 36.0 | 3.6 | 2.0 | 1.92 | 52.0 | BD | |
| 120.0 | 7,600 | 66.0 | 90.0 | 9.0 | 5.0 | 1.89 | 122.0 | BE | **Shock** 50G's, 11ms |
| 115 Vac 400 Hz | 1,200 | 75.0 | 90.0 | 10.0 | 5.0 | n/a | n/a | BR | |
| 115 Vac 60-400 Hz | 7,600 | 75.0 | 90.0 | 10.0 | 5.0 | n/a | n/a | BS | |
| 6.0 | 19 | 3.7 | 5.0 | 0.4 | 0.25 | 1.89 | 9.0 | CA | **Temperature** -65˚C to +125˚C |
| 12.0 | 75 | 7.4 | 10.0 | 0.9 | 0.5 | 1.92 | 16.0 | CB | |
| 26.5 | 300 | 14.7 | 20.0 | 1.8 | 1.0 | 2.34 | 32.0 | CC | **Vibration** 30G's, 10 to 2,000Hz |
| 48.0 | 1,200 | 29.4 | 40.0 | 3.6 | 2.0 | 1.92 | 52.0 | CD | |
| 120.0 | 7,600 | 74.0 | 100.0 | 9.0 | 5.0 | 1.89 | 122.0 | CE | **Shock** 100G's, 6ms |
| 115 Vac 400 Hz | 1,200 | 80.0 | 100.0 | 10.0 | 5.0 | n/a | n/a | CR | |
| 115 Vac 60-400 Hz | 7,600 | 80.0 | 100.0 | 10.0 | 5.0 | n/a | n/a | CS | |




**Note:**
A07 = .895 max (22.73), Schematic 3 only
B07 = 1.010 max (25.66), Schematic 3 only
B07 = 1.234 max (31.35), Schematics 2, 4 & 5 only




**07 Mounting Styles**

**Specifying a Part Number Example:**

| Type | Ratings | Mountings | Schematic | Terminals | Coil | Testing |
|---|---|---|---|---|---|---|
| B07 | B | 3 | 3 | 2 | BC | 1 |

* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

# Unikeyic Electronics

Global Electronic Components Distributor

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## TE Connectivity:

CPF0402B37K4E1 RH73H2A40MKTN SMW73R0JT 1-794222-0 1903112-2 CRGCQ2010J3K3 ROX05SJ18R SBCHE64R7K 1-962915-1 1969656-1 3430B2F51RTDF 650075-000 TE50BR39J 2834055-1 175977-2 2005330-1 2310537-1 2377783-2 936348-1 2380312-2 U5254-000005-030PA 917696-1 MPT100C18RF SBCHE154R7K 2-292161-3 1393431-1 141991-2 1743455-2 3-1393225-0 3631B101LL