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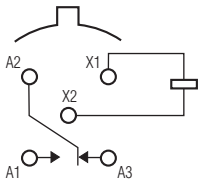
Single Pole, Electrically Held, 1 Amp and Less

1MA, 1MAD, 1MADD

1MA

Standard TO-5 High Performance Relay

Qualified to MIL-R-39016/7



Terminal View

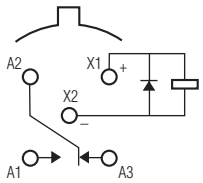
Product Facts

- 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

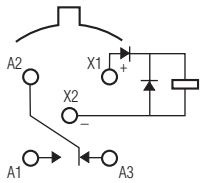
Product Facts

- 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

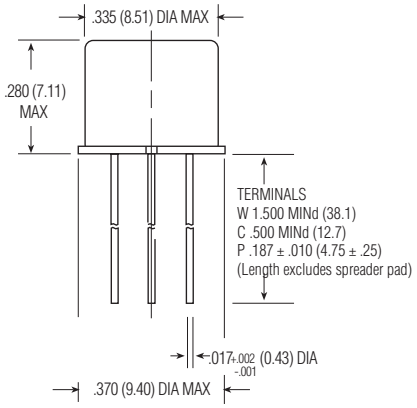
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

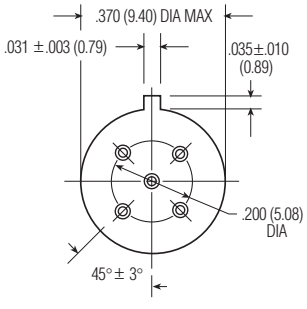
Contact Ratings

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

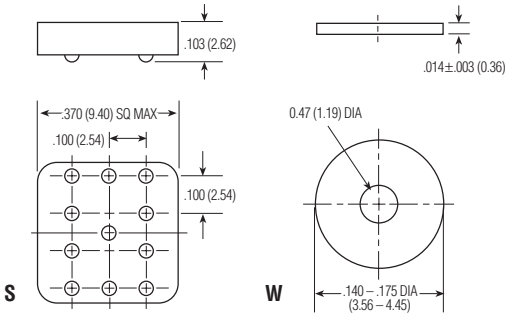
Vibration Resistance —
30 G's, 10 to 3,000 Hz

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.

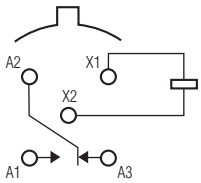
Single Pole, Electrically Held, 1 Amp and Less (Continued)

1MS, 1MSD, 1MSDD

1MS

Sensitive TO-5 High Performance Relay

Qualified to MIL-R-39016/10



Terminal View

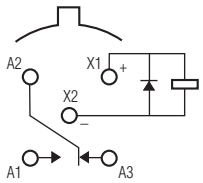
Product Facts

- 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

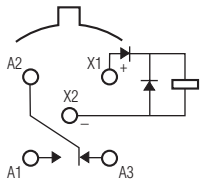
Product Facts

- 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

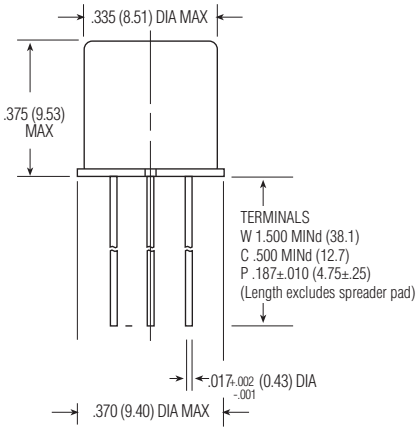
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

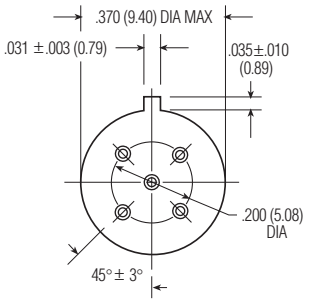
Contact Ratings

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

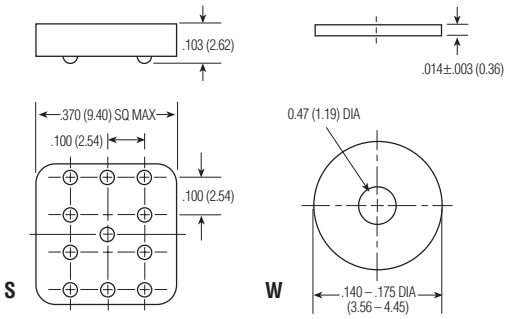
Vibration Resistance —
30 G's, 10 to 3,000 Hz

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.

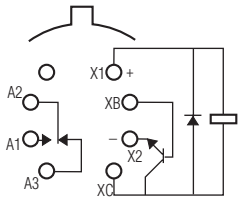
Single Pole, Electrically Held, 1 Amp and Less (Continued)

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

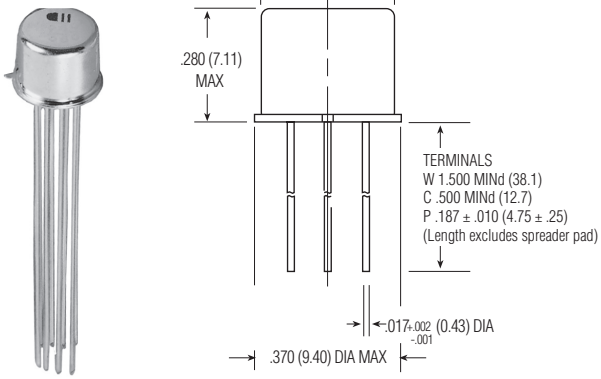
Duty Cycle — Continuous

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

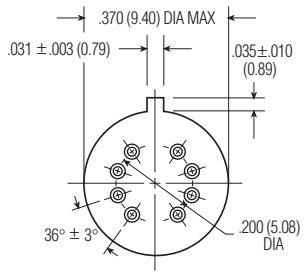
Pick-up Sensitivity — 100 mW max. @ 25°C

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

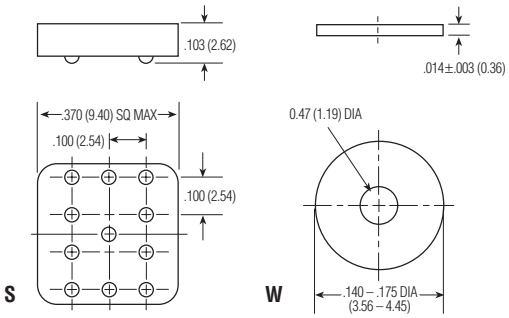
Shock Resistance —
75 G's, 6 ±1 ms max.

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

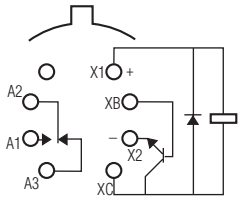
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

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

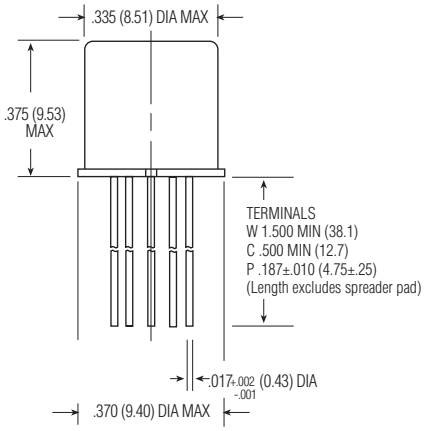
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

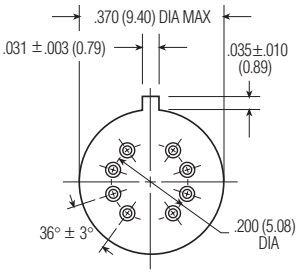
Contact Ratings

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

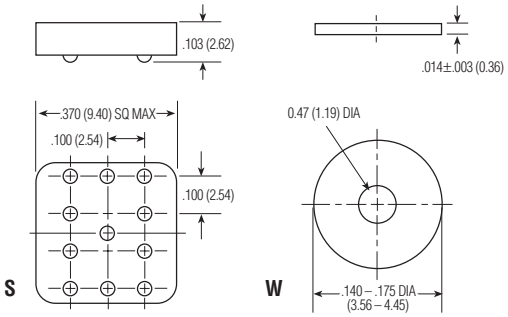
Shock Resistance —
75 G's, 6 ±1 ms max.

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.

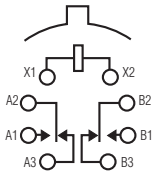
Double Pole, Electrically Held, 1 Amp and Less

MA, MAD, MADD

MA

Standard TO-5 High Performance Relay

Qualified to MIL-R-39016/9



Terminal View

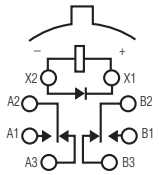
Product Facts

- 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

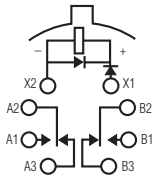
Product Facts

- 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

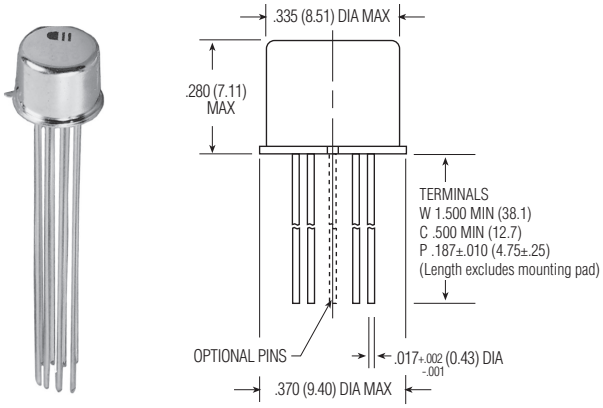
Duty Cycle — Continuous

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

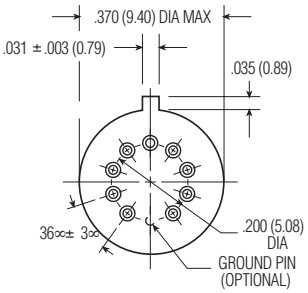
Pick-up Sensitivity — 130 mW max. @ 25°C

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

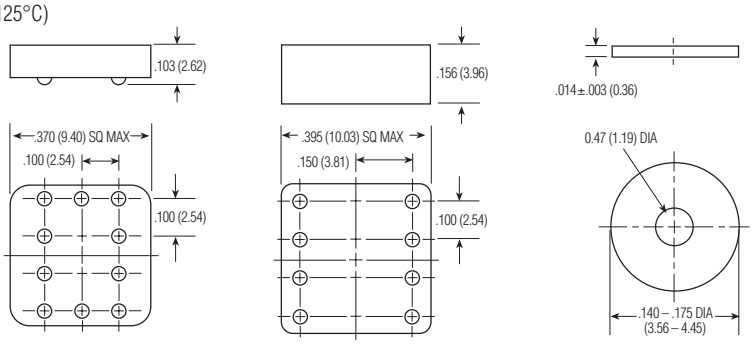
Vibration Resistance —
30 G's, 10 to 3,000 Hz

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.

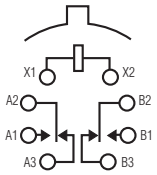
Double Pole, Electrically Held, 1 Amp and Less (Continued)

MS, MSD, MSDD

MS

Sensitive TO-5 High Performance Relay

Qualified to MIL-R-39016/11



Terminal View

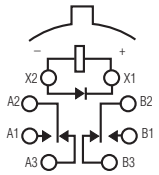
Product Facts

- 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

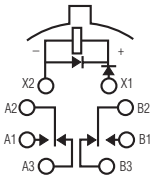
Product Facts

- 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

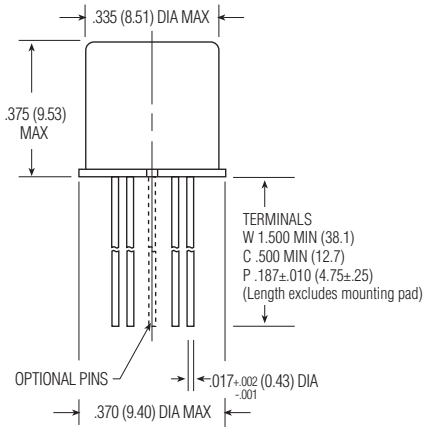
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

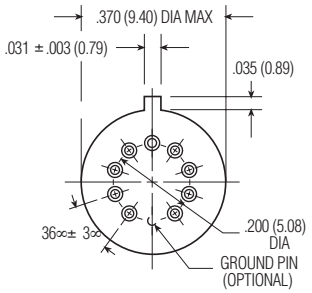
Contact Ratings

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

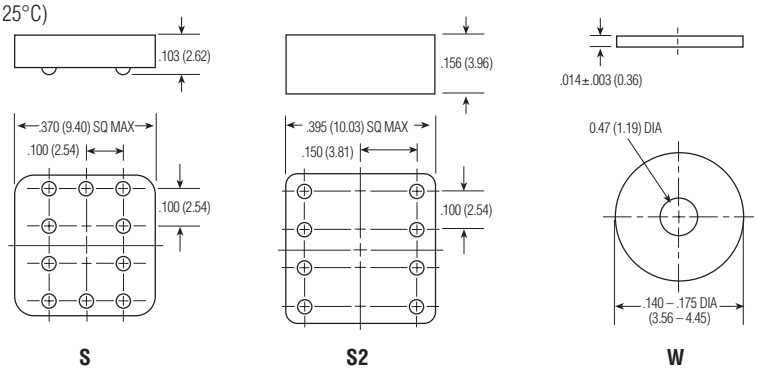
Vibration Resistance —
30 G's, 10 to 3,000 Hz

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.

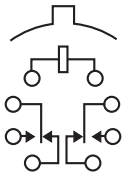
Double Pole, Electrically Held, 1 Amp and Less (Continued)

HM, HMD, HS, HSD



HM, HS

Standard / Sensitive TO-5 Commercial Relay



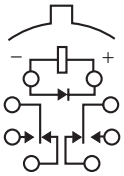
Terminal View

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

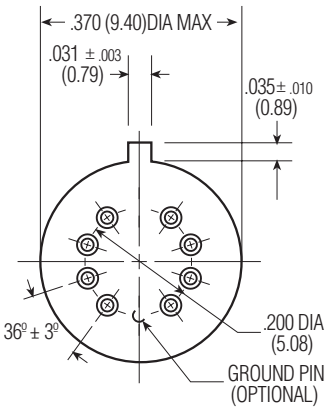
Coil Voltage —
5 to 30 Vdc (HM/HMD)
5 to 48 Vdc (HS/HSD)

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

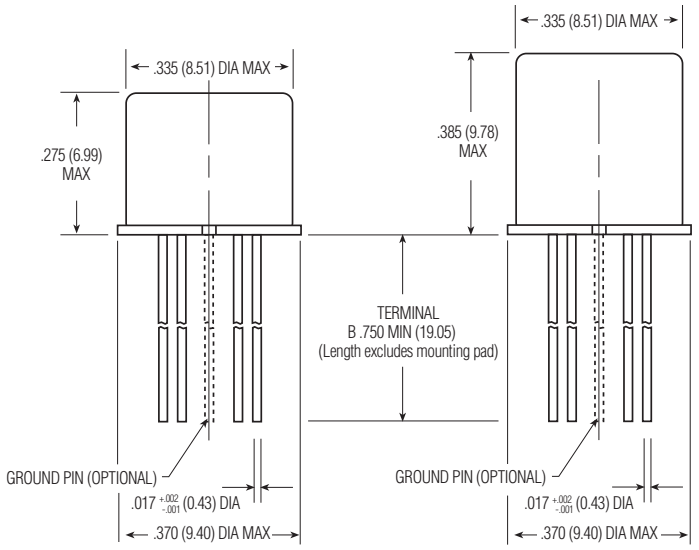
Shock Resistance —
30 G's, 6 ±1 ms

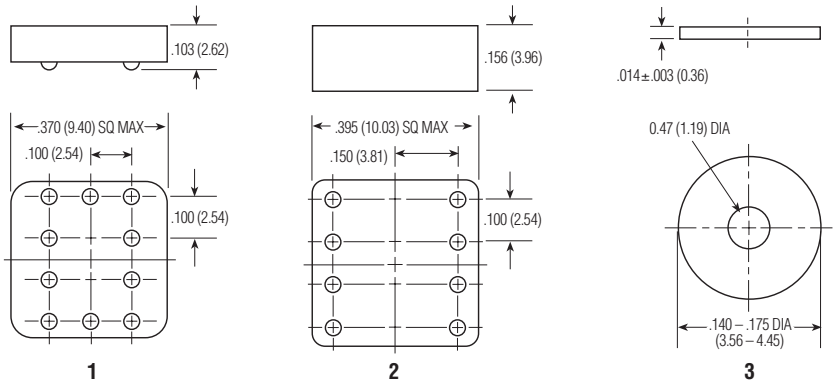
Semiconductor Characteristics

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

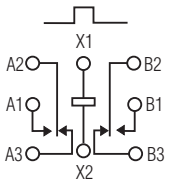
Double Pole, Electrically Held, 1 Amp and Less (Continued)

MGA, MGAD, MGADD

MGA

Standard .100 Grid High Performance Relay

Qualified to MIL-R-39016/17



Terminal View

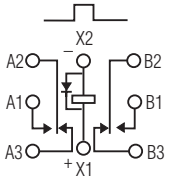
Product Facts

- 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

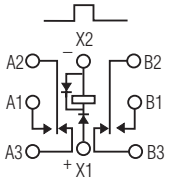
Product Facts

- 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

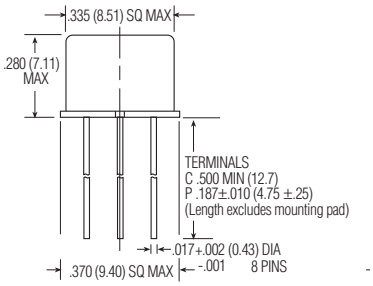
Pick-up Sensitivity — 130 mW max. @ 25°C

Contact Ratings

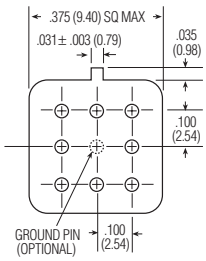
Contact Load	Type	Operations Min.
1.0 A @ 28 Vdc	Resistive	100,000
250 mA @ 115 Vac, 60 Hz & 400 Hz	Resistive (case not grounded)	100,000
100 mA @ 115 Vac, 60 Hz & 400 Hz	Resistive	100,000
0.2 A @ 28 Vdc	Inductive (0.32 Henry)	100,000
0.1 A @ 28 Vdc	Lamp	100,000
30 µA @ 50 mVdc	Low Level	1,000,000
0.1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

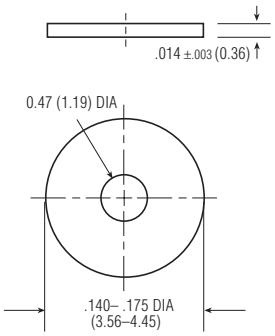
Vibration Resistance —
30 G's, 10 to 3,000 Hz

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.

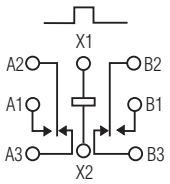
Double Pole, Electrically Held, 1 Amp and Less (Continued)

MGS, MGSD, MGSDD

MGS

Sensitive .100 Grid High Performance Relay

Qualified to MIL-R-39016/41



Terminal View

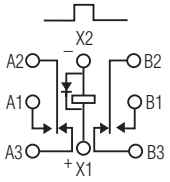
Product Facts

- 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

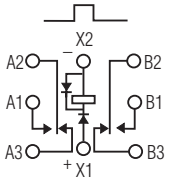
Product Facts

- 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

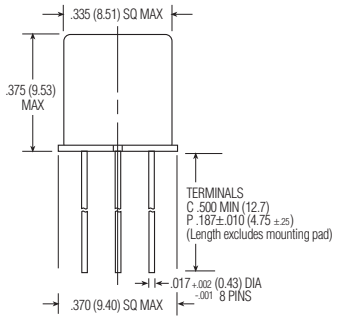
Pick-up Sensitivity — 60 mW max. @ 25°C

Contact Ratings

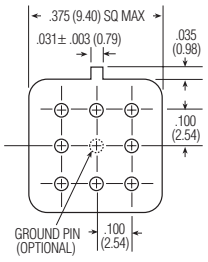
Contact Load	Type	Operations Min.
1.0 A @ 28 Vdc	Resistive	100,000
250 mA @ 115 Vac, 60 Hz & 400 Hz	Resistive (case not grounded)	100,000
100 mA @ 115 Vac, 60 Hz & 400 Hz	Resistive	100,000
0.2 A @ 28 Vdc	Inductive (0.32 Henry)	100,000
0.1 A @ 28 Vdc	Lamp	100,000
30 µA @ 50 mVdc	Low Level	1,000,000
0.1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

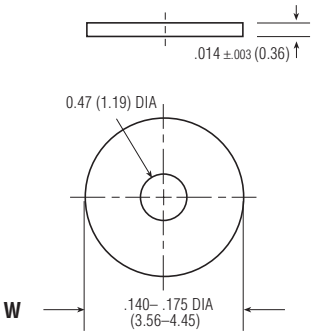
Vibration Resistance —
30 G's, 10 to 3,000 Hz

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.

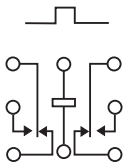
Double Pole, Electrically Held, 1 Amp and Less (Continued)

HC, HCD, HCS, HCSD



HC, HCS

Standard / Sensitive
.100 Grid Commercial Relay



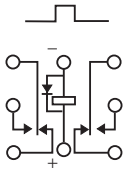
Terminal View

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

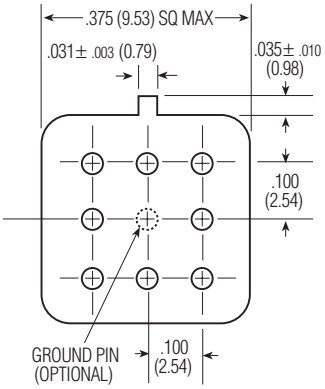
Coil Voltage —
5 to 26.5 Vdc (HC/HCD)
5 to 48 Vdc (HCS/HCSD)

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

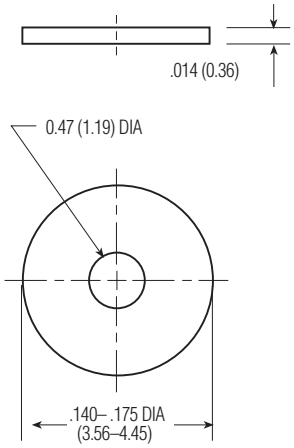
Duty Cycle — Continuous

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

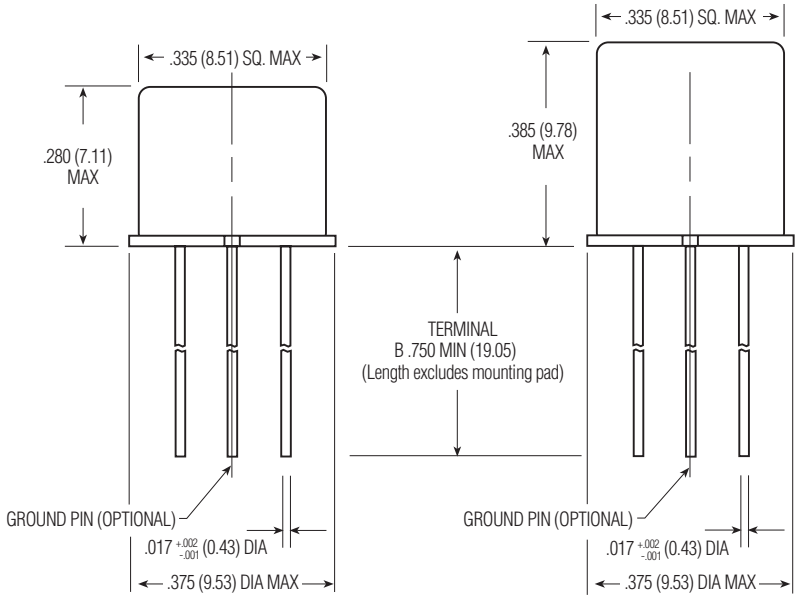
Shock Resistance —
30 G's, 6 ±1 ms

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.

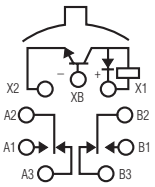
Specifying a Part Number Example:	Type	Diodes	Ground Pin	Mounting Pads	Coils	Terminals
	HC	D	X	3	-26	B

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

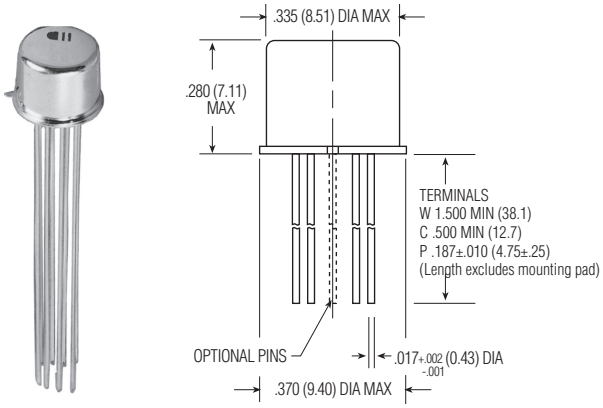
Duty Cycle — Continuous

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

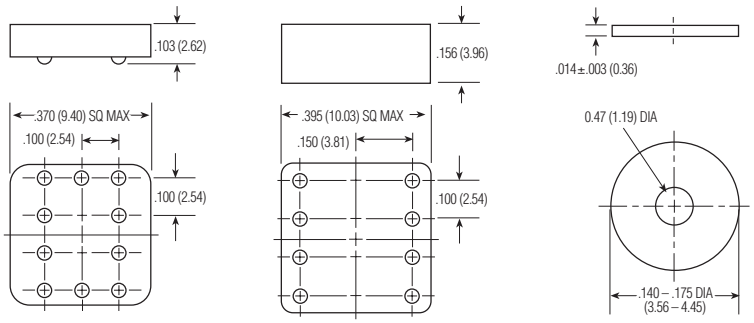
Timing —
Operate Time — 2.0 ms max.
Release Time — 7.5 ms max.
Contact Bounce — 1.5 ms max
Dielectric Withstanding Voltage —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz
Insulation Resistance —
10,000 megohms @ 500 Vdc
1,000 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

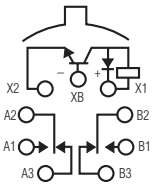
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

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

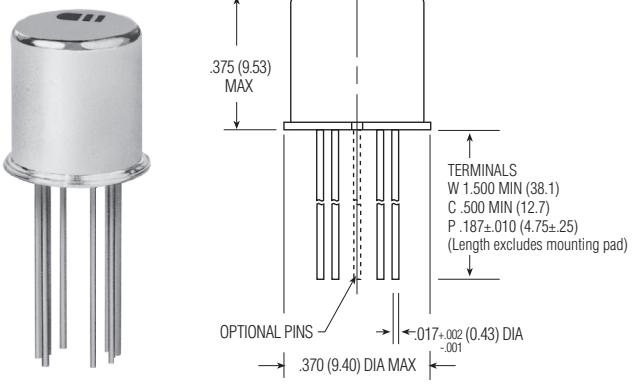
Duty Cycle — Continuous

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

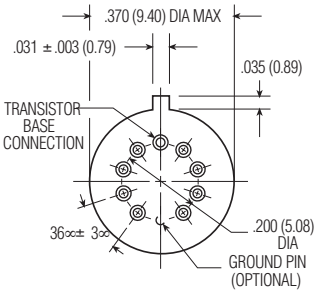
Pick-up Sensitivity — 60 mW max. @ 25°C

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

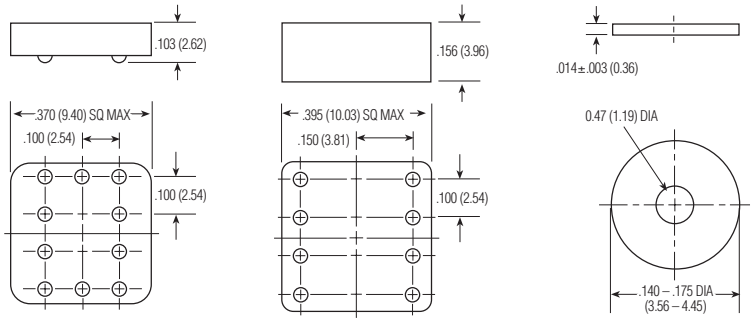
Timing —
Operate Time — 4.0 ms max.
Release Time — 7.5 ms max.
Contact Bounce — 1.5 ms max
Dielectric Withstanding Voltage —
Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz
Insulation Resistance —
10,000 megohms min. @ 500 Vdc
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.

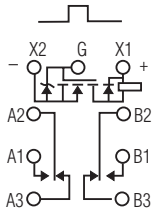
Double Pole, Electrically Held, 1 Amp and Less (Continued)

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

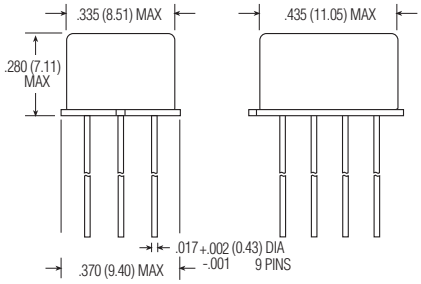
Pick-up Sensitivity — 130 mW max. @ 25°C

Contact Ratings

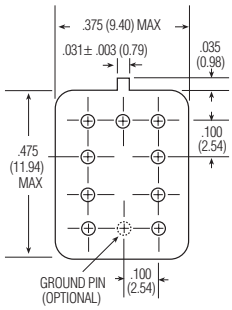
Contact Load	Type	Operations Min.
1.0 A @ 28 Vdc	Resistive	100,000
250 mA @ 115 Vac, 60 Hz & 400 Hz	Resistive (case not grounded)	100,000
100 mA @ 115 Vac, 60 Hz & 400 Hz	Resistive	100,000
0.2 A @ 28 Vdc	Inductive (0.32 Henry)	100,000
0.1 A @ 28 Vdc	Lamp	100,000
30 µA @ 50 mVdc	Low Level	1,000,000
0.1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

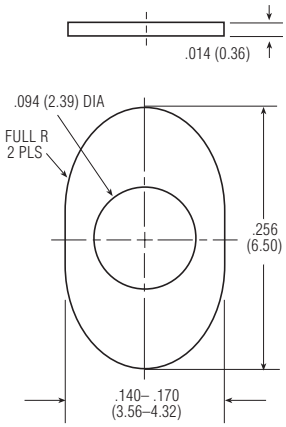
Timing —
Operate Time — 2.0 ms max.
Contact Bounce — 1.5 ms max.
Dielectric Withstanding Voltage — Between Open Contacts — 500 Vrms 60 Hz
Between Adjacent Contacts — 500 Vrms 60 Hz
Between Contacts & Coil — 500 Vrms 60 Hz
Insulation Resistance —
10,000 megohms min. @ 500 Vdc
1,000 megohms @ 500 Vdc (coil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

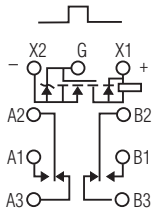
Double Pole, Electrically Held, 1 Amp and Less (Continued)

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

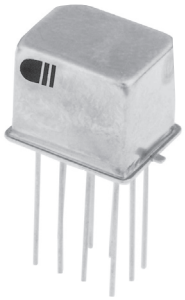
Duty Cycle — Continuous

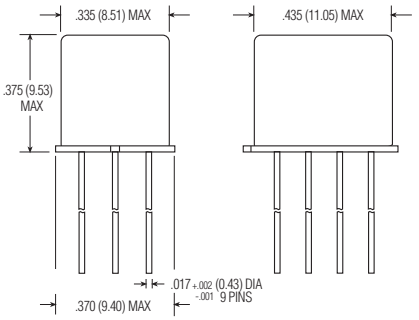
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

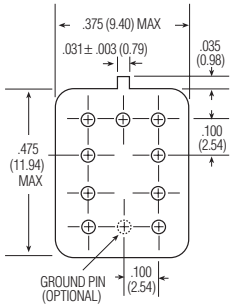
Contact Ratings

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

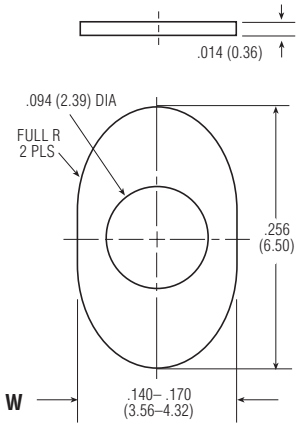
Timing —
Operate Time — 4.0 ms max.
Release Time — 7.5 ms max.
Contact Bounce — 1.5 ms max.
Dielectric Withstanding Voltage
— Between Open Contacts —
500 Vrms 60 Hz
Between Adjacent Contacts —
500 Vrms 60 Hz
Between Contacts & Coil —
500 Vrms 60 Hz
Insulation Resistance —
10,000 megohms min. @ 500 Vdc
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.

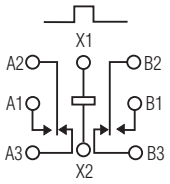
Double Pole, Electrically Held, 1 Amp and Less (Continued)

SMGA, SMGAD, SMGADD

SMGA

Standard .100 Grid Surface Mount High Performance Relay

Designed to MIL-R-39016/17



Terminal View

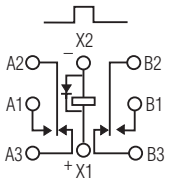
Product Facts

- 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

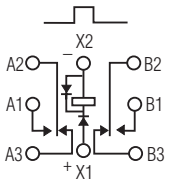
Product Facts

- 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

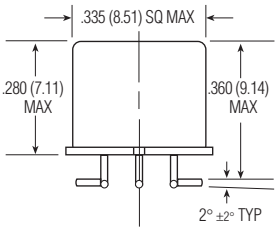
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

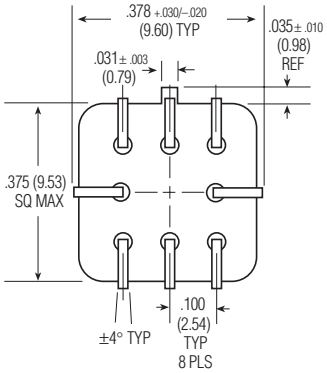
Contact Ratings

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

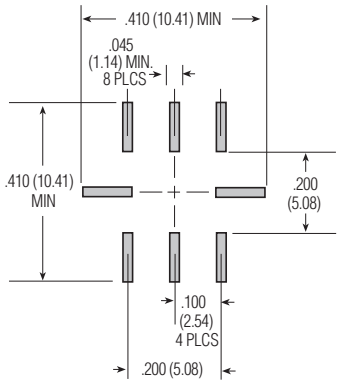
Weight —
0.09 oz. (2.55 gms)

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

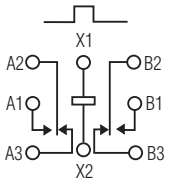
Double Pole, Electrically Held, 1 Amp and Less (Continued)

SMGS, SMGSD, SMGSDD

SMGS

Sensitive .100 Grid Surface Mount High Performance Relay

Designed to MIL-R-39016/41



Terminal View

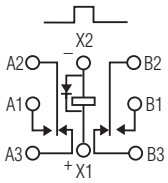
Product Facts

- 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

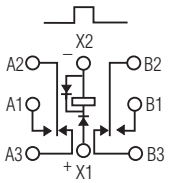
Product Facts

- 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

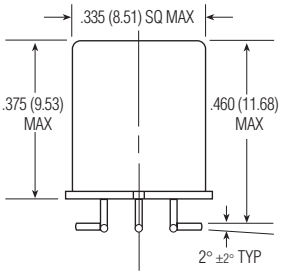
Pick-up Voltage — Approximately 50% of nominal coil voltage

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

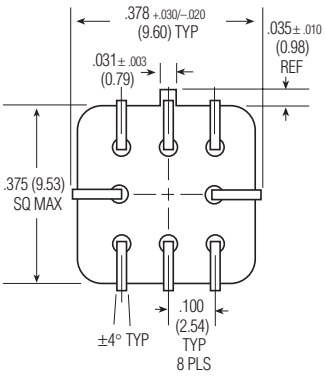
Contact Ratings

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

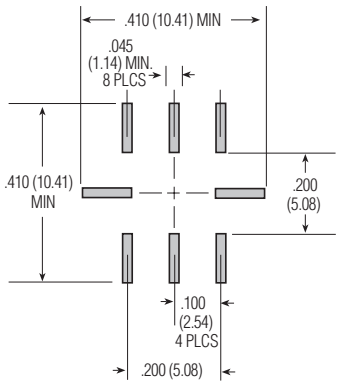
Weight —
0.09 oz. (2.55 gms)

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

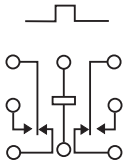
Double Pole, Electrically Held, 1 Amp and Less (Continued)

SHC, SHCD, SHCS, SHCSD



SHC, SHCS

Standard / Sensitive
.100 Grid Surface Mount
Commercial Relay



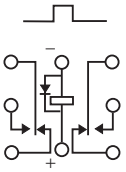
Terminal View

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)

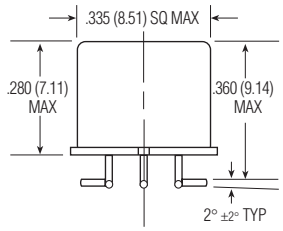
Vibration Resistance —
10 G's, 10 to 500 Hz

Shock Resistance —
30 G's, 6 ±1 ms

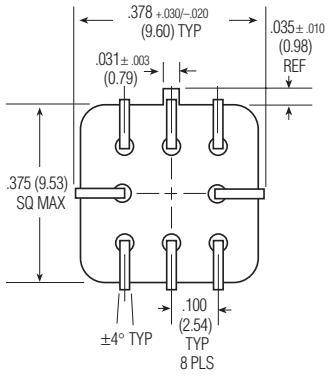
Semiconductor Characteristics
Diode —
100 Vdc peak inverse voltage (PIV)
1.0 Vdc max. transient voltage

Standard Coil Data

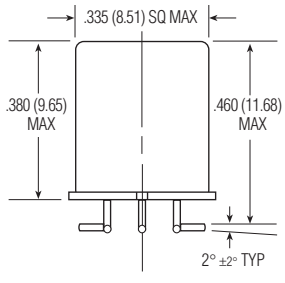
	Nom. Coil Voltage (Vdc)	Coil Resistance in Ohms ±20% @ 25°C	Pickup Voltage Vdc (Max.) @ 25°C	Nom. Coil Power (mW) @ 25°C	Max. Coil Voltage	Coil Desig.
SHC/SHCD	5.0	64	3.8	391	5.8	5
	6.0	98	4.9	367	8.0	6
	9.0	220	7.0	368	12.0	9
	12.0	400	9.0	360	16.0	12
	18.0	880	14.0	368	24.0	18
	26.5	1,600	18.0	439	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



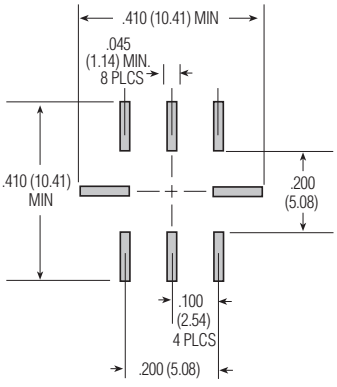
SHC/SHCD Enclosure



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

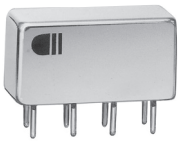
Double Pole, Electrically Held, 2 Amps and Less

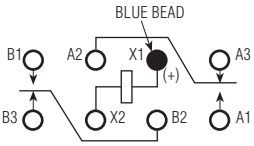
HFW, HMB, HMS

HFW

Standard Half Size High Performance Relay

Qualified to MIL-R-39016/6





Terminal View

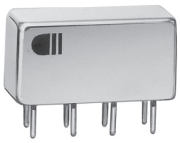
Product Facts

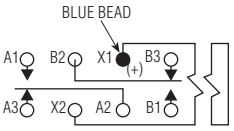
- Hermetically sealed
- Up to 2 amps switching
- High shock & vibration ratings
- Optional terminals & mounting styles
- Excellent RF switching

HMB

Bifilar Half Size High Performance Relay

Qualified to MIL-R-39016/22





Terminal View

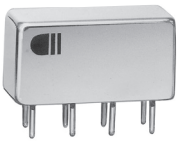
Product Facts

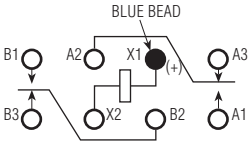
- Hermetically sealed
- Up to 2 amps switching
- High shock & vibration ratings
- Optional terminals & mounting styles
- Excellent RF switching

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

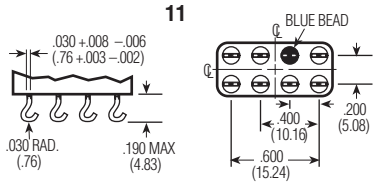
Temperature Range —
-65°C to +125°C

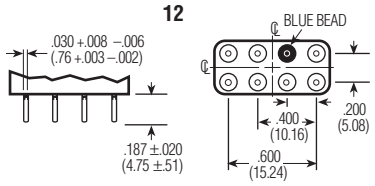
Weight — 0.46 oz. (13 gms max.)

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

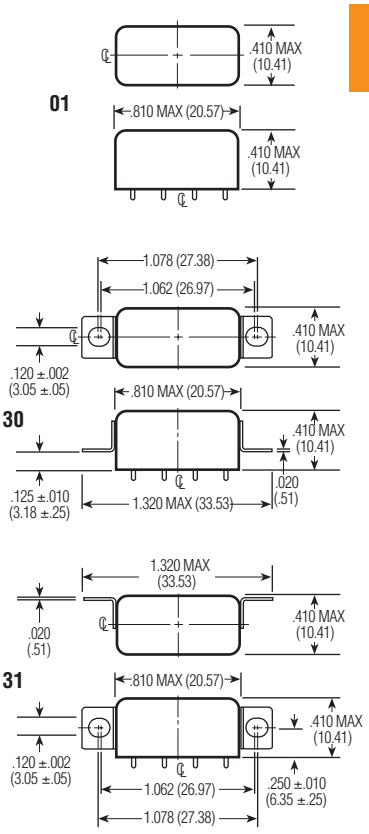
Shock Resistance —
100 G's, 6 ±1 ms
50 G's, 11 ±1 ms (HMS)

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.

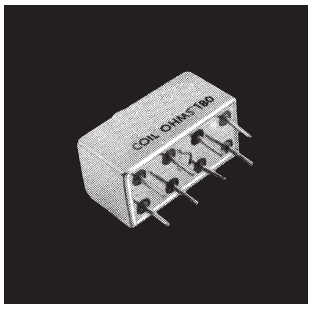
Double Pole, Electrically Held, 2 Amps and Less (Continued)

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.

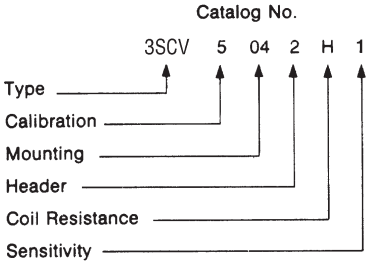
Coil Table (All Values DC)* 340 mW Sensitivity: (Code 1)

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)

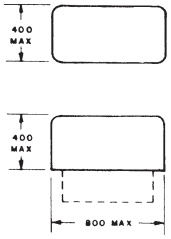
All dimensions in inches

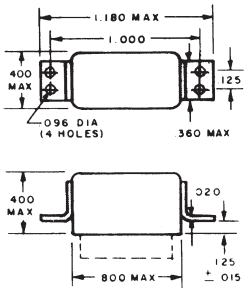
TOLERANCES	
(Unless otherwise specified)	
Hundredths	±0.020
Thousandths	±0.005

No Mount

Mounting Code
00

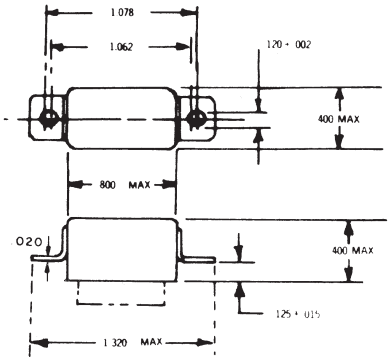
* Assumes relay held securely by potting or other means.





Four-hole End Bracket

Mounting Code
01

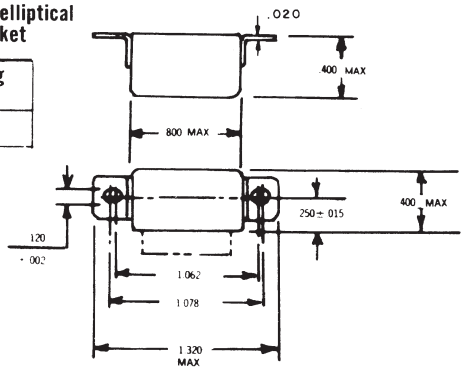


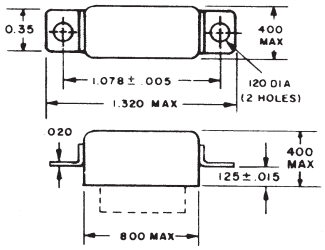
Two-hole elliptical END bracket

Mounting Code
53

Two-hole elliptical Side Bracket

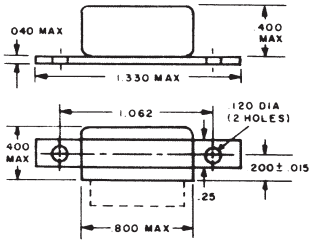
Mounting Code
54





Two-hole End Bracket

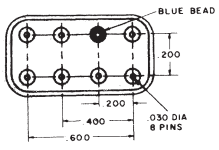
Mounting Code
13

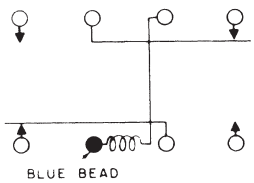


Two-hole Side Bracket

Mounting Code
04

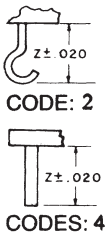
Header and Connection Diagrams





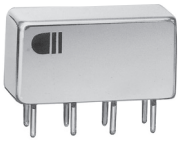
Header Types

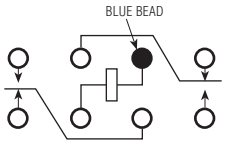
Type	Z Dim.	Header Code
Solder hook	0.16	2
Straight pin (socket or PCB type)	0.19	4



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

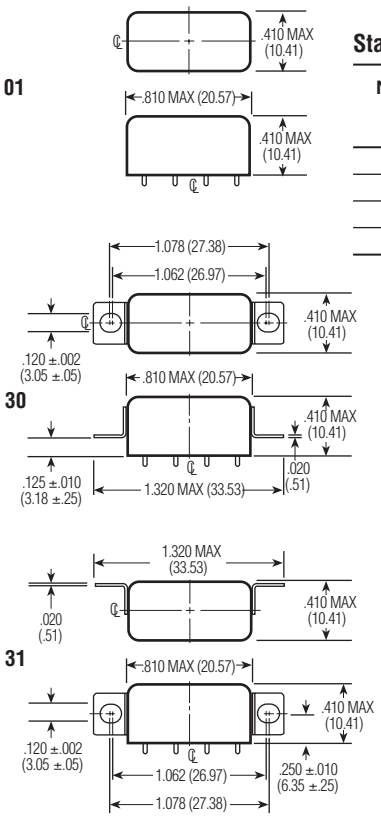
Shock Resistance — 30 G's, 6 ±1 ms

Contact Ratings

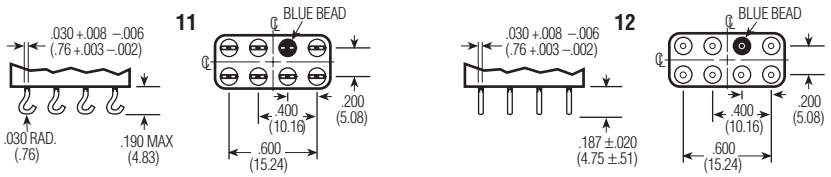
Contact Load	Type	Operations Min.
2 A @ 28 Vdc	Resistive	100,000
0.75 A @ 28 Vdc	Inductive (200 mH)	100,000
0.3 A @ 115 Vac, 60 Hz & 400 Hz	Resistive	100,000

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)

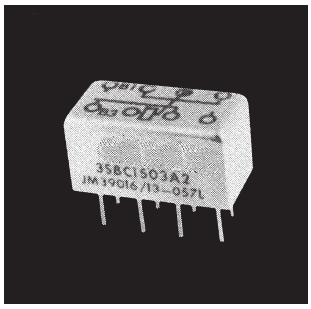
.150 Grid-space Relays

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

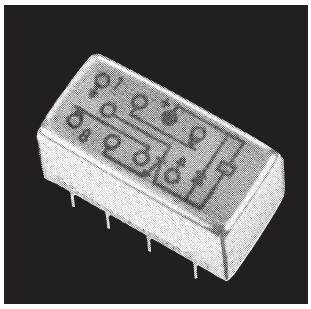
Single Diode, Dual Diode

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

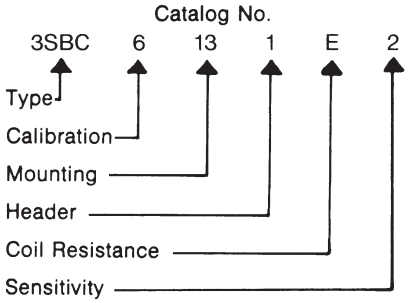
Coil Table Dual Diode (All Values DC)*(2DPT), 135 mW Sensitivity: (Code 6)

	**								
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)

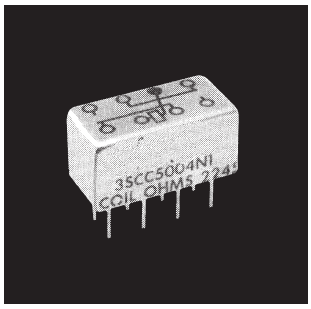
.150 Grid-space Long-life Relays

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)

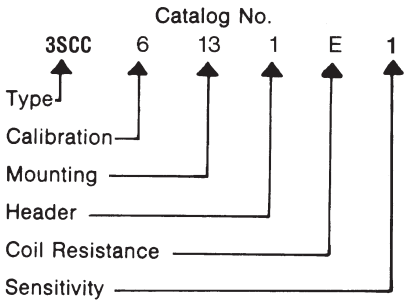
Coil Code Letter	Coil Resistance @ 25C (ohms)	Voltage Calibrated, Code 5				Current Calibrated, Code 6			
		Suggested Source Volts†	Max. Operate Volts @25C	Release Voltage Range @ 25C		Max. Continuous Current @ 125C (mA)	Max. Operate Current @ 25C (mA)	Release Current Range @ 25C (mA)	
				Max.	Min.			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.



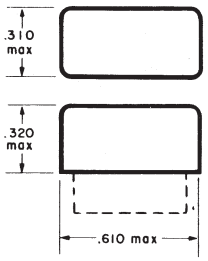
Double Pole, Electrically Held, 2 Amps and Less (Continued)

Mounting Forms (3SBC, 3SCC)

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

All dimensions in inches

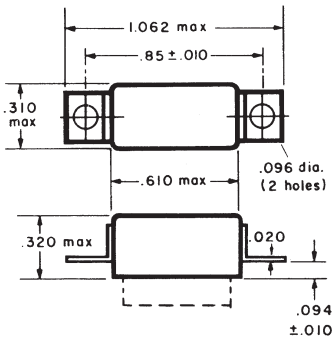
TOLERANCES (Unless otherwise specified)	
Hundredths	±0.020
Thousandths	±0.005



No Mount

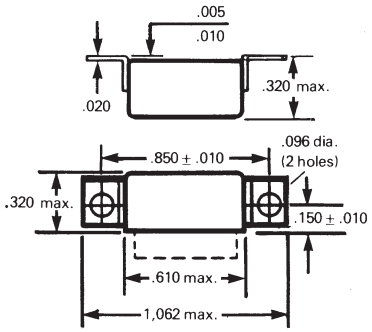
Mounting Code	Vibration
00	30g

*Assumes relay held securely by potting or other means



End Bracket

Mounting Code	Vibration
13	30g



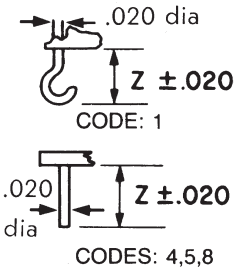
Side Bracket

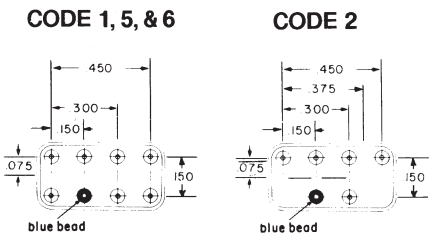
Mounting Code	Vibration
25	30g

Header and Connection Diagrams

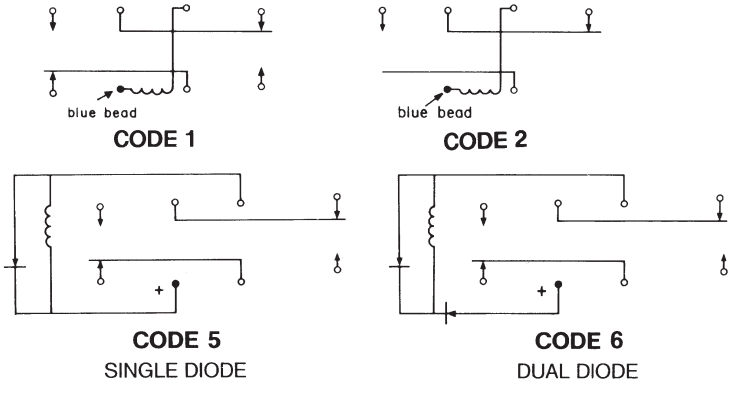
Header Types

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

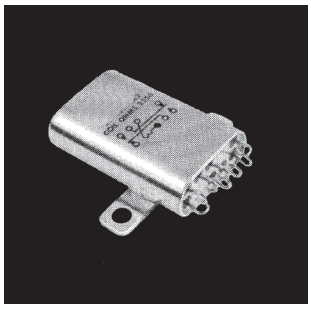
CODE 6
DUAL DIODE

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.

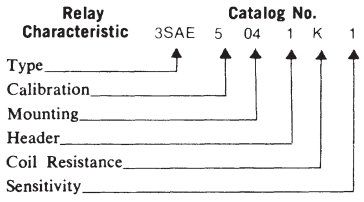
Coil Table (All Values DC)*
Type 3SAE 330 mW Sensitivity: (Code 1)

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)

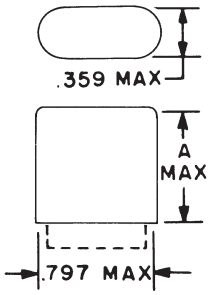
All dimensions in inches

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

No Mount

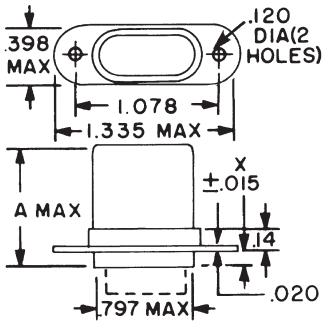
Mounting Code	A Dim. (Max)	Vibration*	Relay Type
00	0.875	20g	3SAE

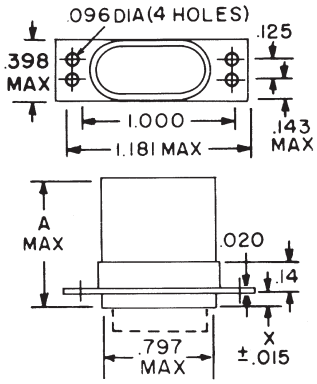
* Assumes relay securely held by potting or other means.



Flange Mount, 2 in-line holes

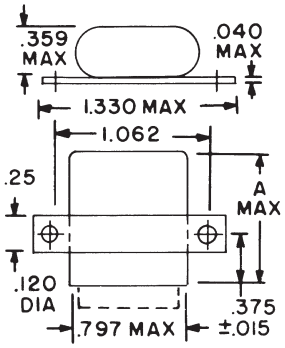
Mounting Code	A Dim. (Max)	X Dim.	Vibration	Relay Type
13	0.875	0.125	15g	3SAE
14	0.875	0.375	20g	3SAE





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

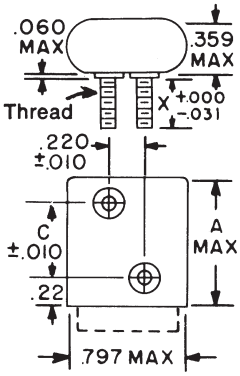


Two-hole Side Bracket

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

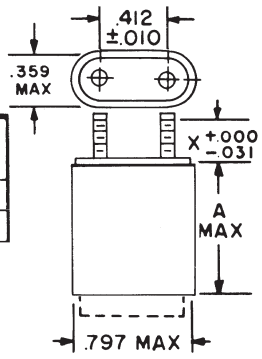
Side Studs

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

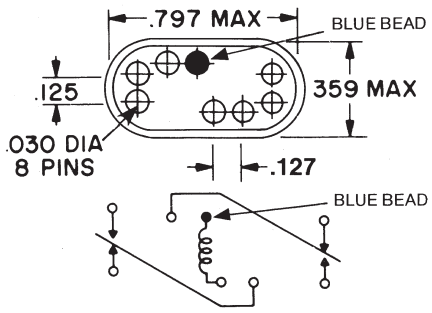


Top Studs

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

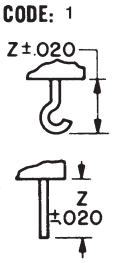


Header and Connection Diagrams



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

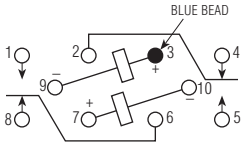
LS

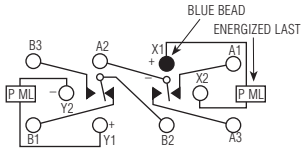
LS

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

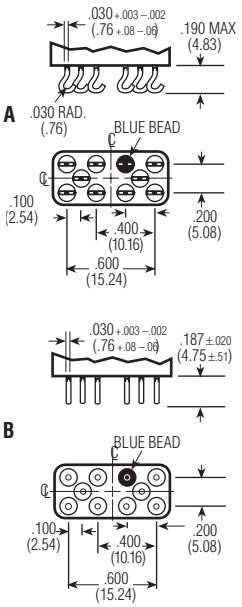
Temperature Range —
-65°C to +125°C

Weight — .46 oz (13 gms) max.

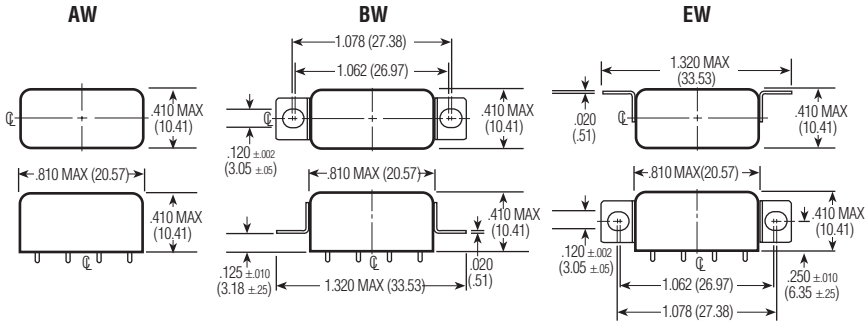
Vibration Resistance —
Standard — 20 G's, 10 to 2,000 Hz
QPL Equiv. — 30 G's, 10 to 2,500 Hz

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:

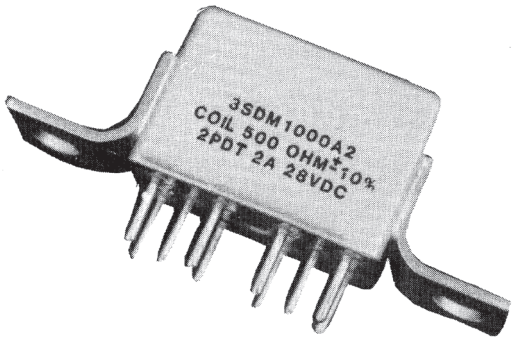
Type	Mountings	Contacts	Coils	Terminals
LS	BW-	2C-	24	B

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

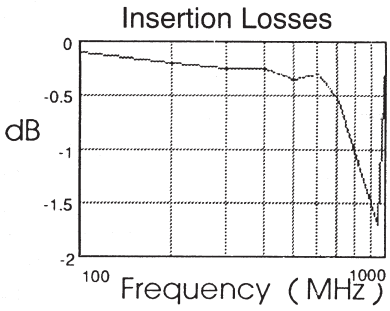
Insulation Resistance —
1,000 megohms min.

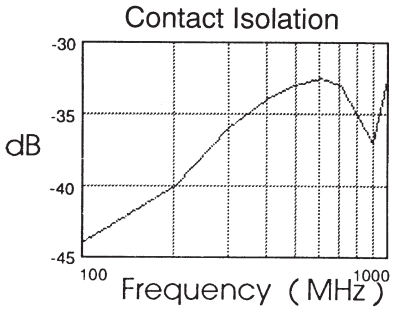
Environmental Characteristics

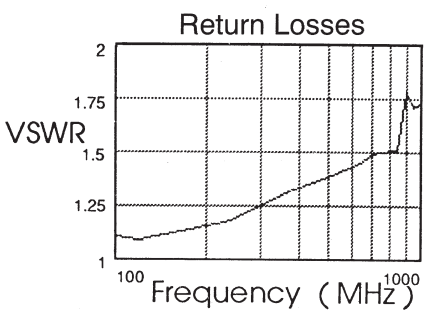
Vibration —
Sine — 30G; 55 to 3000 Hz
Random — 0.4 G^2/Hz; 100 to 1,000 Hz

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

Temperature — -65°C to +125°C

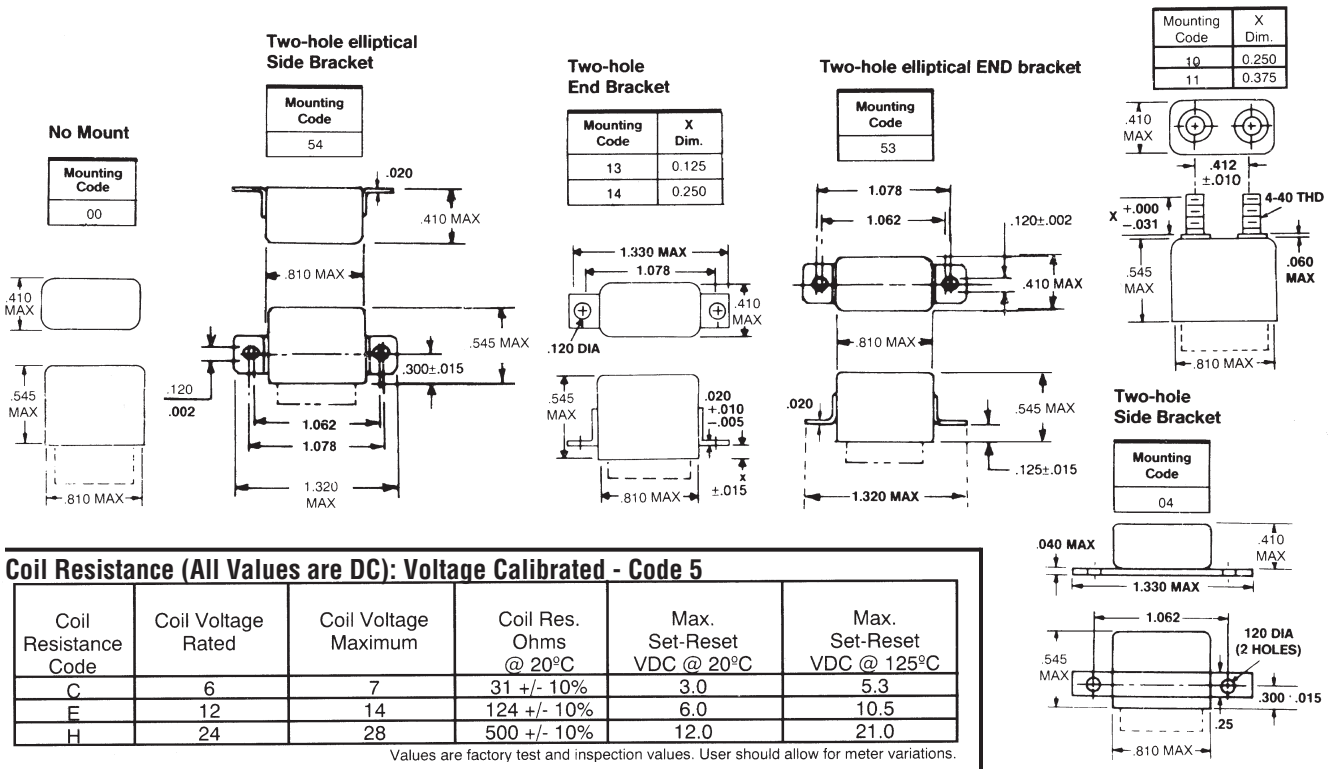






Double Pole, Magnetic Latching, 2 Amps and Less (Continued)

Mounting Forms (3SDM)



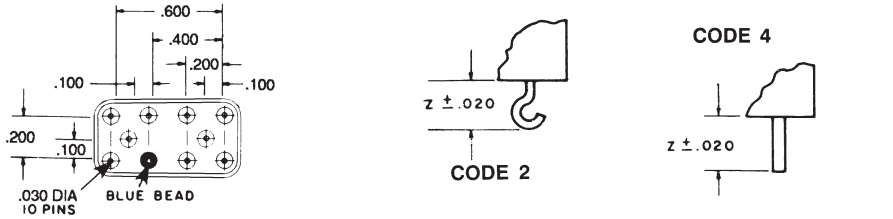
Coil Resistance (All Values are DC): Voltage Calibrated - Code 5

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:

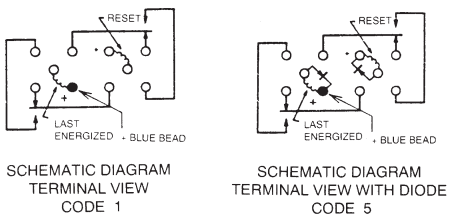
Type	Z Dimensions	Header Code
Straight Pin (socket or PCB Type)	0.19 +/-.020	4
Solder Hook	0.16 +/-.020	2



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)

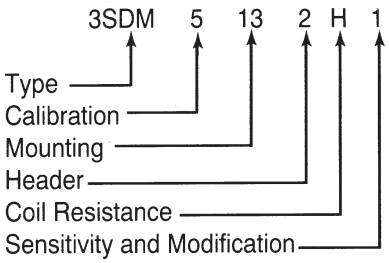


Ordering Instructions

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



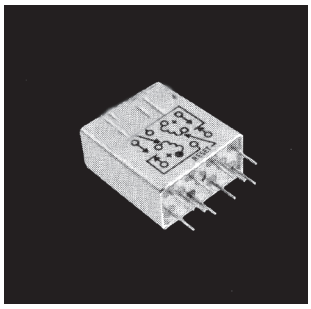
Double Pole, Magnetic Latching, 2 Amps and Less (Continued)

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.

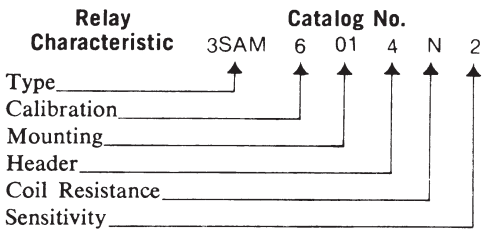
Coil Table (All Values DC) Dual Coil 75 mW Sensitivity: (Code: 2)

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)

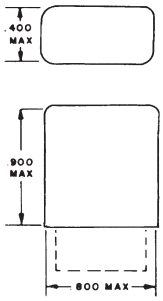
Mounting Forms (3SAM)

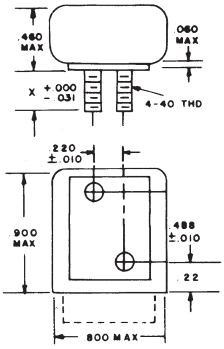
(Vibration note with each form is acceleration from 55 to 3000 Hz)

No Mount

Mounting Code	Vibration*
00	30g

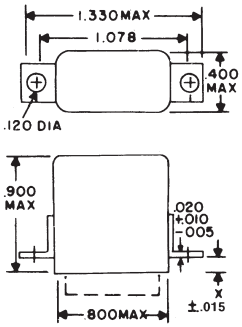
* Assumes relay securely held by potting or other means.





Two-hole End Bracket

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



Side Studs

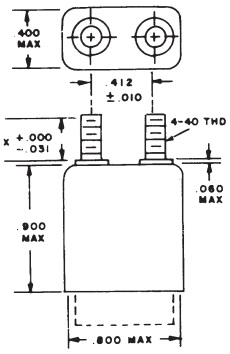
Mounting Code	X Dim.	Vibration
07	0.250	30g
08	0.375	30g

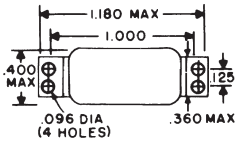
All dimensions in inches

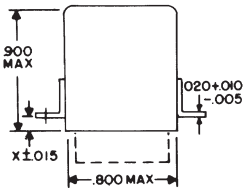
TOLERANCES (unless otherwise specified)	
Hundredths	±0.020
Thousandths	±0.005

Top Studs

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







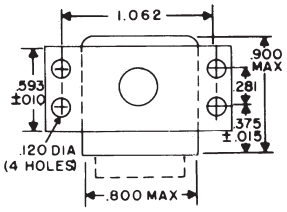
Four-hole Side Bracket

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



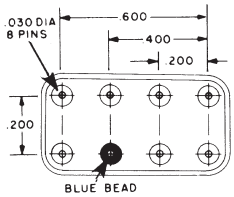


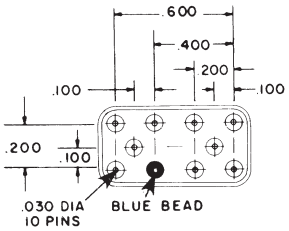
Header and Connection Diagrams

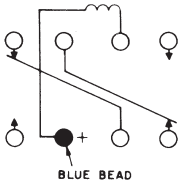
Single Coil **Dual Coil**

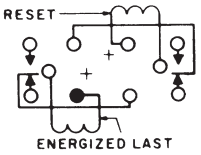
(Terminal View)

(+ on blue bead closes as shown)





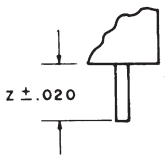


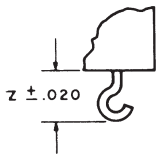


Header Types

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

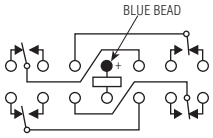
SR

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

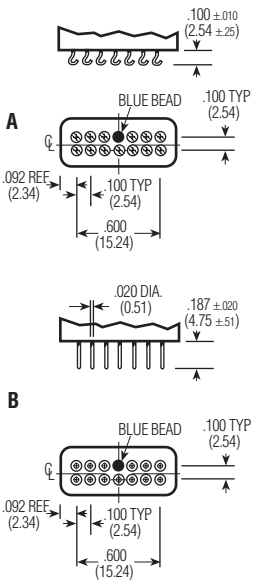
Temperature Range —
-65°C to +125°C

Weight —
0.28 oz. (7.8 grms)

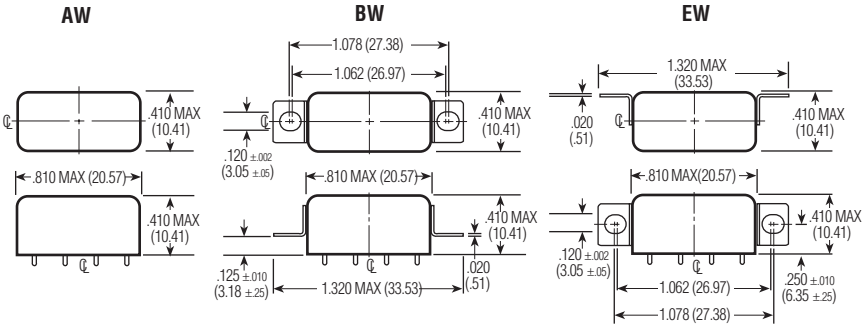
Vibration Resistance —
15 G's, 10 to 2,000 Hz

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

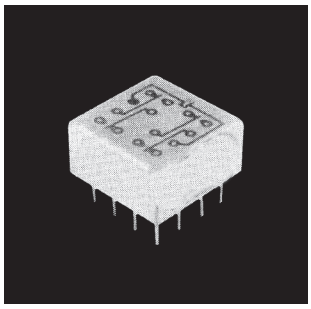
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

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)

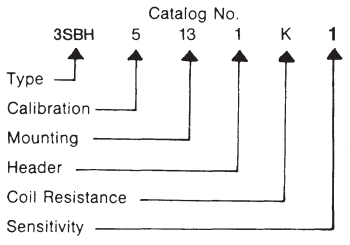
SENSITIVITY CODE: 1					
		Voltage Calibrated, Code: 5			
Coil Code Letter	Coil Resistance at 25C ohms	Suggested Source Volts†	Maximum Operate Volts at 25C	Release Voltage Range at 25C	
				Max.	Min.
B	28 ± 10%	4.0- 7.0	2.7	1.6	0.3
D	73 ± 10%	6.0-11.0	4.2	2.5	0.4
E	115 ± 10%	8.0-14.0	5.4	3.2	0.6
G	280 ± 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.

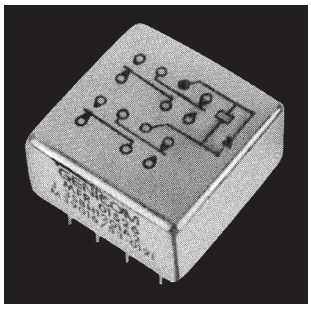
Four Pole, Electrically Held, 2 Amps and Less (Continued)

.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

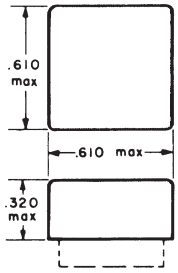
*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

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

No Mount

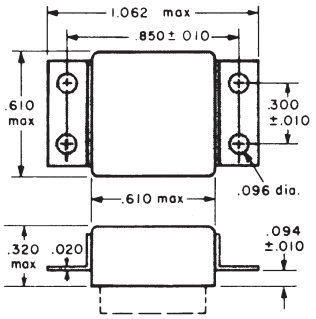
Mounting Code	Vibration*
00	30g

*Assumes relay held securely by potting or other means.



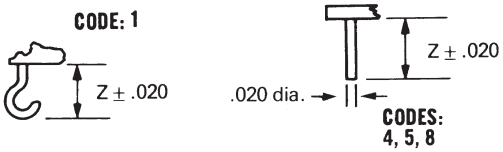
End Bracket

Mounting Code	Vibration
13	30g



Header Types

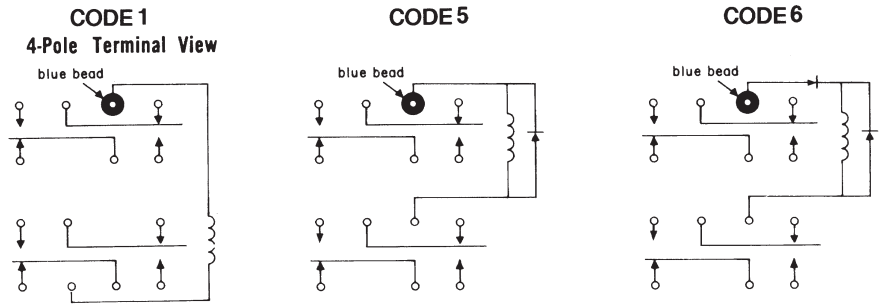
Type	Z Dimension	Header Code
Solder hook	0.13	1
Straight pin	0.12	8
Straight pin socket or PCB type)	0.19	4
Straight pin	0.25	5

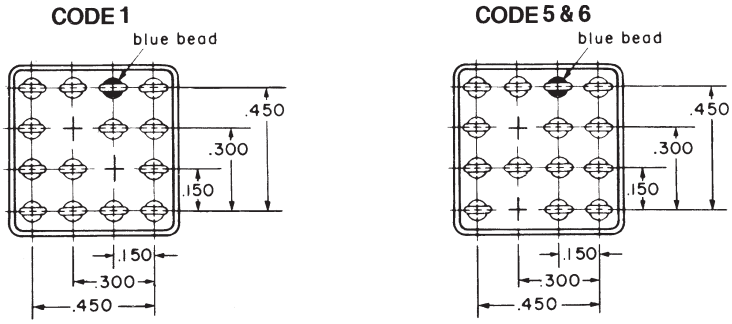


All dimensions in inches

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

Header and Connection Diagrams



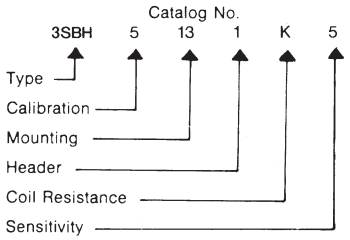


Terminals .020 dia

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)

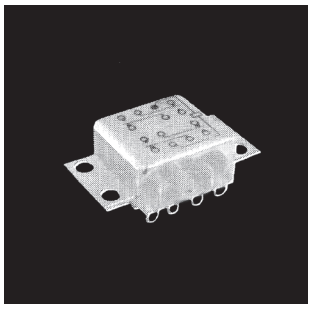
Long-life .150 Grid-space Relays

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

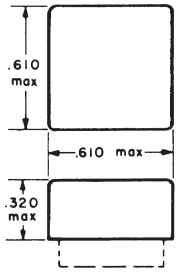
*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

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

No Mount

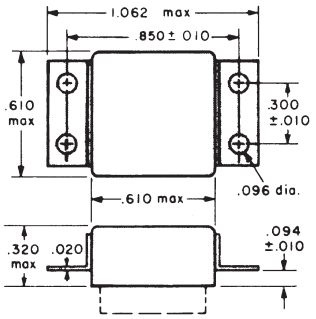
Mounting Code	Vibration*
00	30g

*Assumes relay held securely by potting or other means.



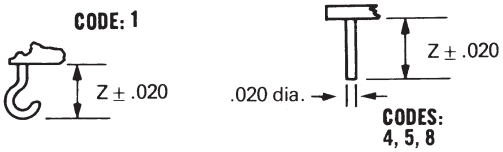
End Bracket

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

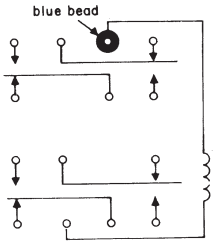


All dimensions in inches

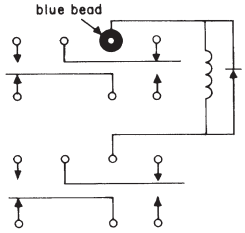
TOLERANCES (Unless otherwise specified)	
Hundredths	±0.020
Thousandths	±0.005

Header and Connection Diagrams

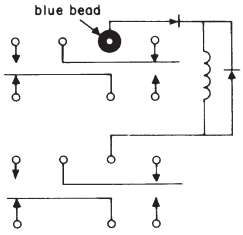
CODE 1
4-Pole Terminal View



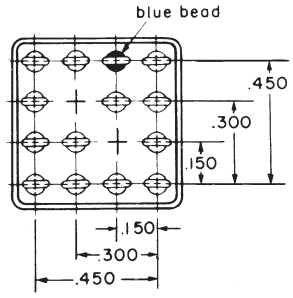
CODE 5



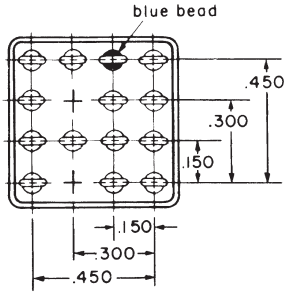
CODE 6



CODE 1



CODE 5 & 6

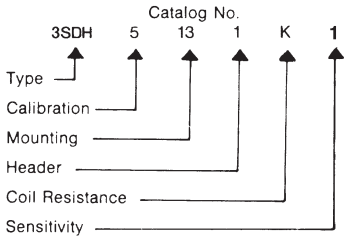


Terminals .020 dia

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.



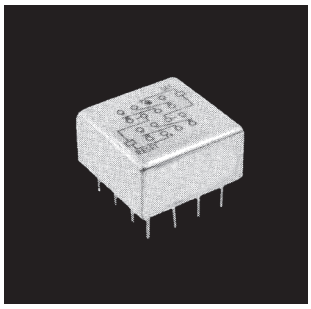
Four Pole, Magnetic Latching, 2 Amps and Less

.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

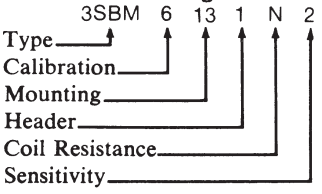
*Values listed are factory test and inspection values. User should allow for meter variations.
†Applicable over the operating temperature range in circulating air.

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.



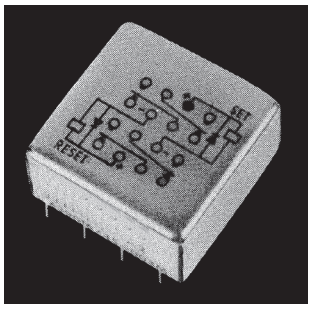
* The part number example shown on this page is for catalog items. For a list of specific QPL part numbers, please see the index in Section 15.

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.

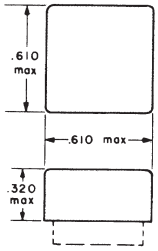
Note: See page 1-60 for ordering instructions.

* 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)

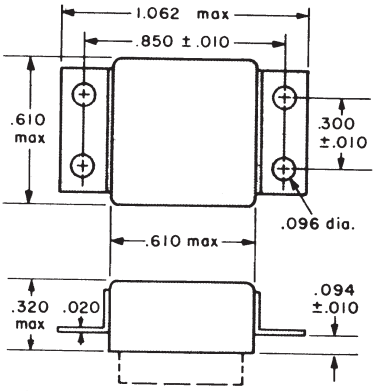
(Vibration note with each form is acceleration from 55 to 3000 Hz)



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

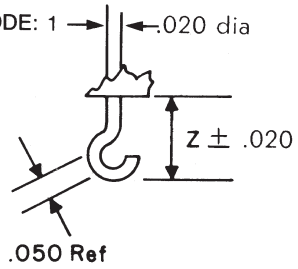
Header and Connection Diagrams

Dual Coil

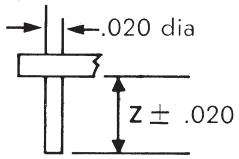
When the SET coil is pulsed with plus polarity on the blue bead, the movable contacts take the position shown in the connection diagram. The contacts are transferred when the RESET coil is pulsed with plus polarity on the reset terminal. A new pulse of the SET coil with plus polarity on the blue bead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



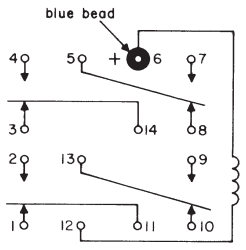
CODES: 4,5,8



Header Types

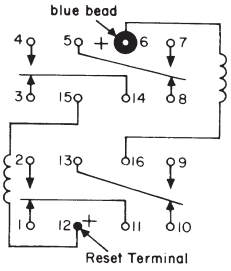
Type	Z Dimension	Header Code
Solder Hook	0.13	1
Straight Pin	0.12	8
Straight Pin (socket or PCB type)	0.19	4
Straight Pin	0.25	5

CODE 1

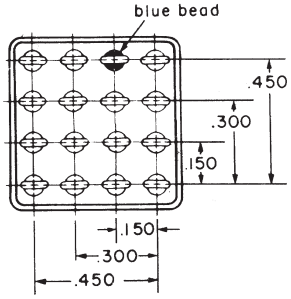


(Terminal numbers for reference only)

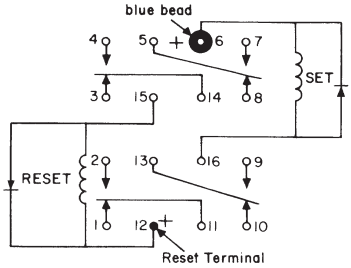
CODE 2



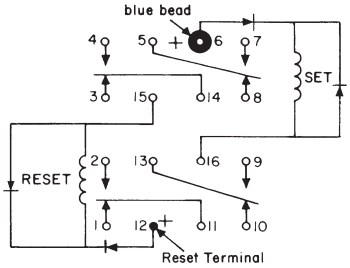
Terminal numbers for reference only



CODE 5
Single Diode



CODE 6
Dual Diode



Six Pole, Electrically Held, 2 Amps and Less

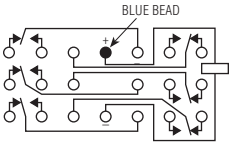
SS

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

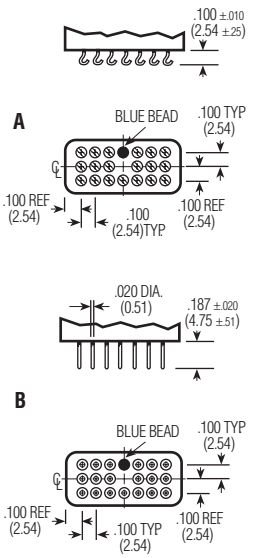
Temperature Range —
-65°C to +125°C

Weight —
0.28 oz. (7.8 grms)

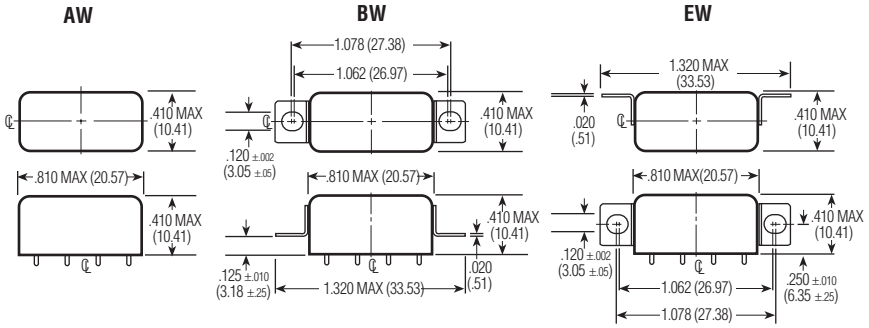
Vibration Resistance —
15 G's, 10 to 2,000 Hz

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

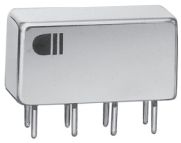
Double Pole, Electrically Held, 5 Amps and Less

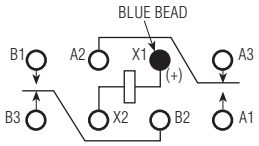
HFW4A, HFW5A

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

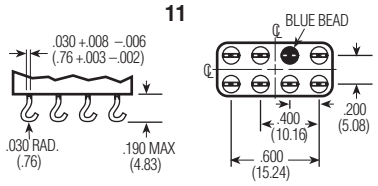
Environmental Characteristics

Temperature Range — -65°C to +125°C

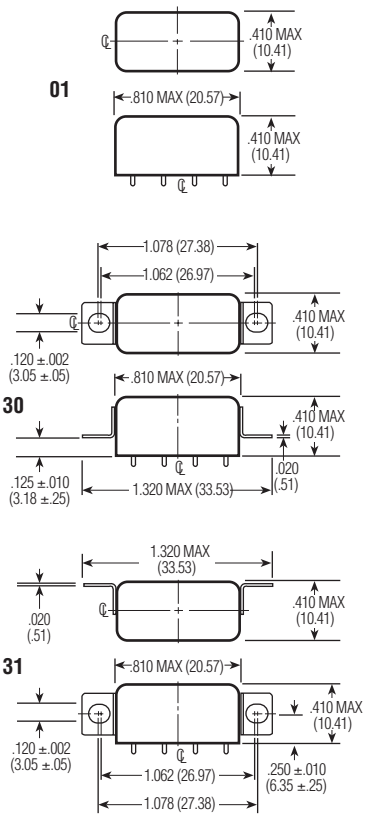
Weight — 0.46 oz. (13 gms max.)

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

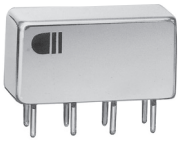
Specifying a Part Number Example:

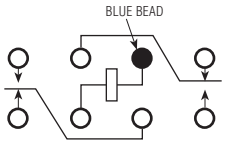
Type	Terminals	Mountings	Coils	Features
HFW5A	12	30	K	00

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

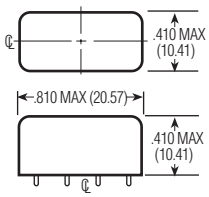
Contact Ratings

	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

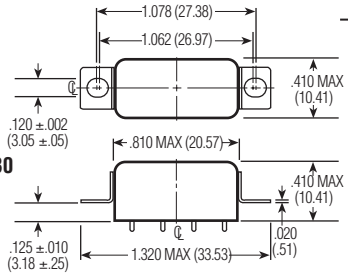
Standard Coil Data

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

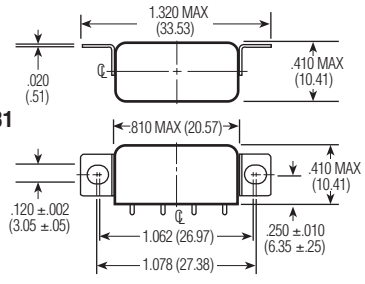
01



30

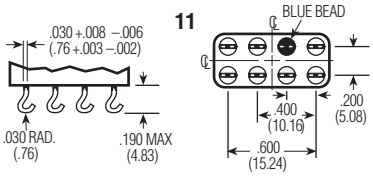


31

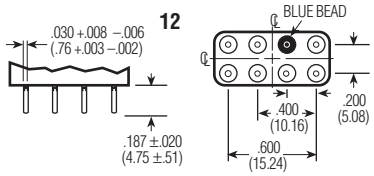


Mounting Styles

11



12



Terminals

Specifying a Part Number Example:

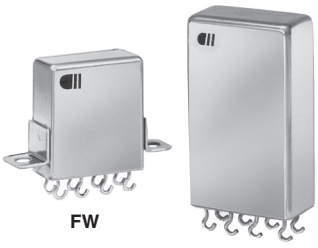
Type	Terminals	Mountings	Coils	Features
HFC5A	12	30	K	00

Double Pole, Electrically Held, 5 Amps and Less (Continued)

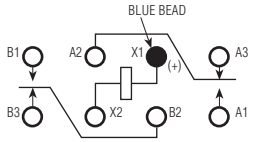
FW, FW5A, SF, SF5A

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)

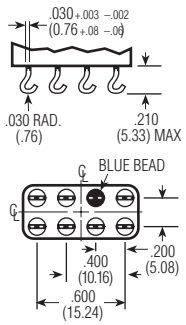
Vibration Resistance — Standard — 20 G's, 10 to 2000 Hz (FW, FWSA) 15 G's, 10 to 2000 Hz (SF) QPL — 20 G's, 10 to 2000 Hz

Shock Resistance — 100 G's, 6 ±1 ms

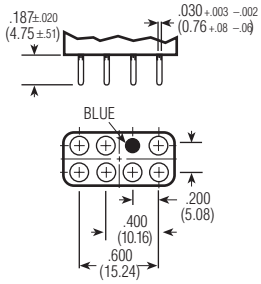
QPL Approval — MIL-R-5757/10 (FW only)

QPL Equivalent — MIL-R-5757/13 (SF only)

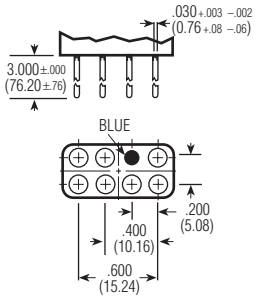
1



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

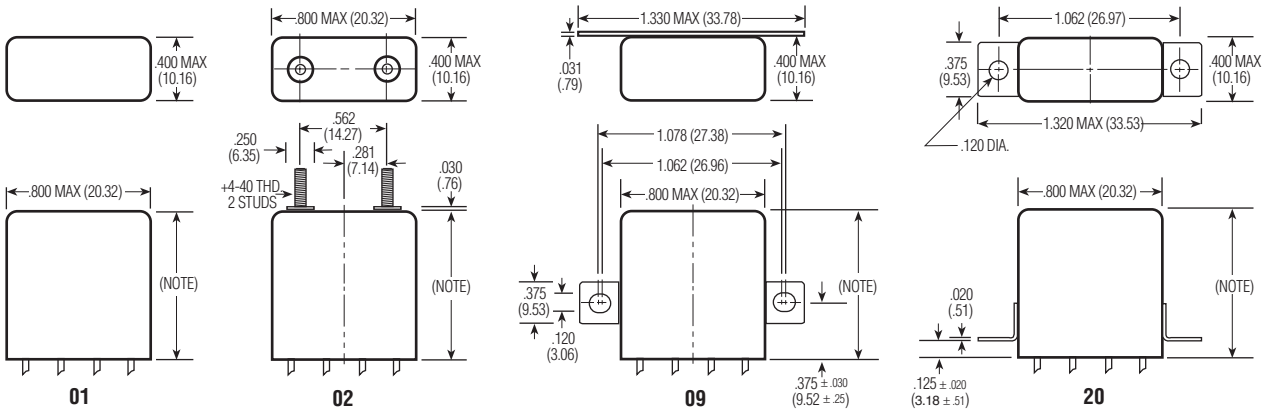
SF5/SF6 Coil Data

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

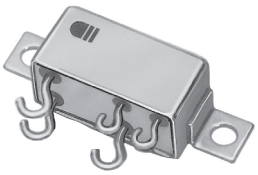
Specifying a Part Number Example:

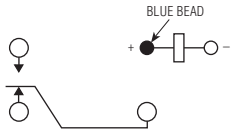
Type	Series	Terminals	Mountings	Coils	Features
FW	1	1	20	G	00
SF	5	1	20	W	00
SF5A	5	1	20	W	00
SF	6	1	20	W	00

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

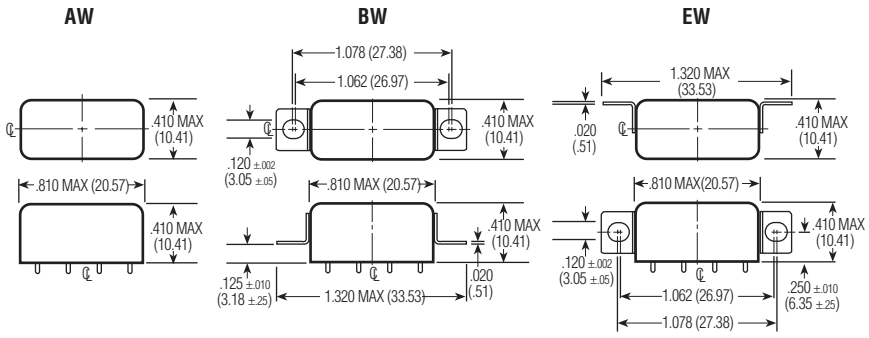
Temperature Range — -65°C to +125°C

Weight — 0.28 oz. (8 grams) max.

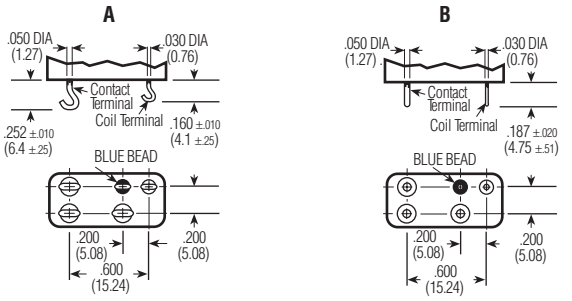
Vibration Resistance — 20 G's, 10 to 2,000 Hz

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

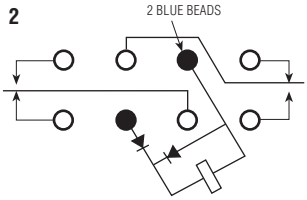
QPL Approval — MIL-R-5757/23 MS 27245 MS 27247

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

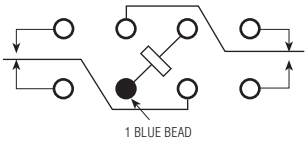
*All ratings grounded case

2



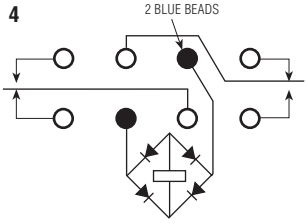
Terminal View

3



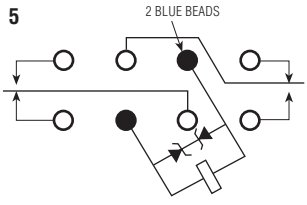
Terminal View

4



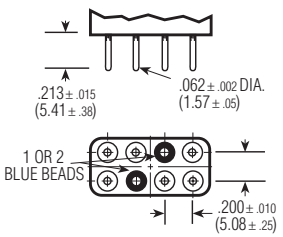
Terminal View

5

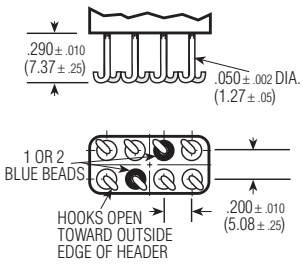


Terminal View

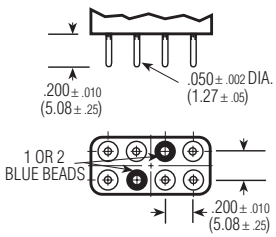
1: GOLD PLATED



2: SOLDER FINISH



4: GOLD PLATED
5: SOLDER FINISH

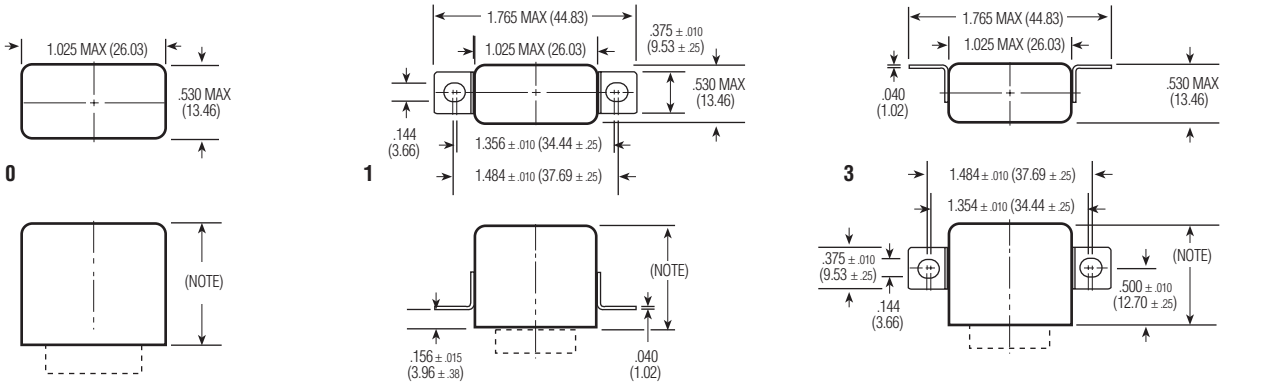


Terminals

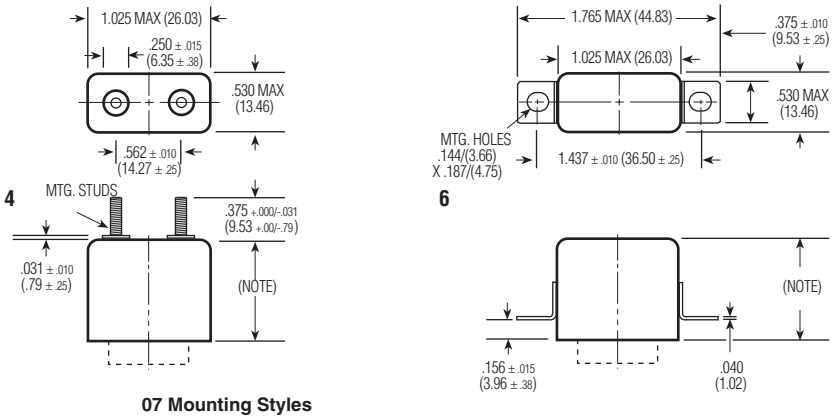
Double Pole, Electrically Held, 10 Amps and Less (Continued)

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.