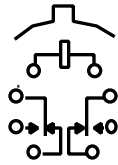


# MA · MAD · MADD · MAT

## MA

**STANDARD TO-5  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO  
MIL-R-39016/9**



TERMINAL VIEW

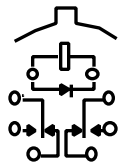
**FEATURES**

- 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

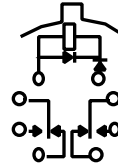
**FEATURES**

- 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

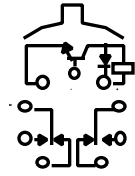
**FEATURES**

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

## MAT

**STANDARD TO-5 DIODE  
SUPPRESSED/TRANSISTOR  
DRIVEN HIGH-PERFORMANCE  
RELAY**

**QUALIFIED TO  
MIL-R-28776/1**



TERMINAL VIEW

**FEATURES**

- 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 30 Vdc

**COIL POWER**

675 mW max. @ 25°C

**DUTY CYCLE**

Continuous

**PICK-UP VOLTAGE**

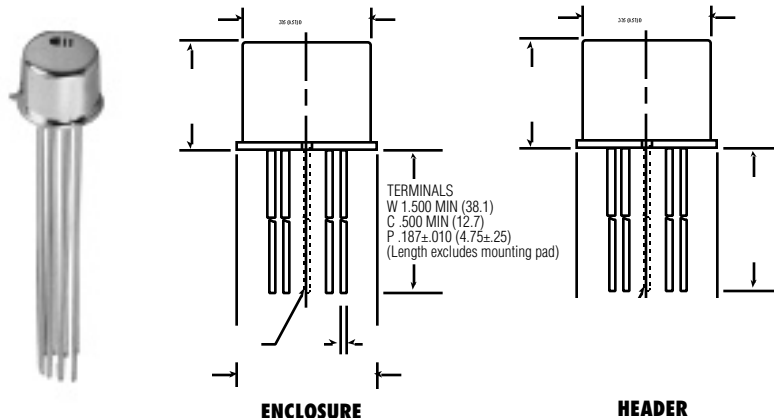
Approximately 50% of nominal coil voltage

**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



### 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)  
MAT: 7.5 ms max.  
(transistor driven)

#### 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)  
0.10 oz. (2.80 gms) 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)  
MIL-R-28776/1 (JMA<sub>T</sub>)

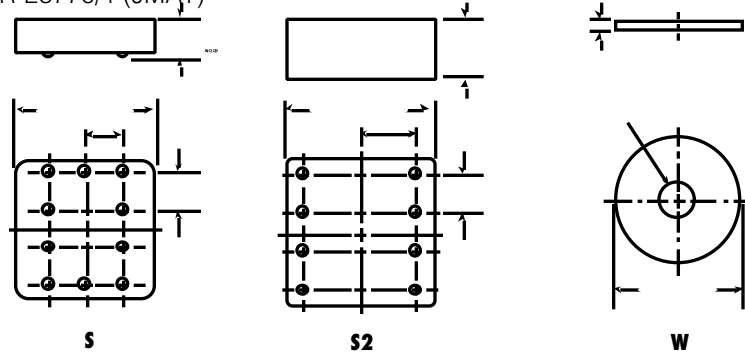
### SEMICONDUCTOR CHARACTERISTICS

#### 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<sub>EBO</sub>) @ 25°C  
80.0 Vdc min. collector-base  
breakdown voltage (BV<sub>CBO</sub>) @ 25°C  
& I<sub>C</sub>=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.
<b>MA/MAD</b>												
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
<b>MADD</b>												
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
<b>MAT</b>												
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

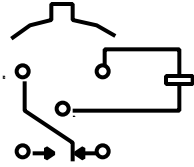
Note 1: Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

Note 2: Set base current at 3 mA to 15 mA during measurements.

## 1MA

**STANDARD TO-5  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO  
MIL-R-39016/7**



TERMINAL VIEW

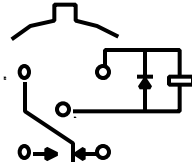
### FEATURES

- 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

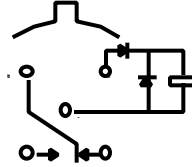
### FEATURES

- 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

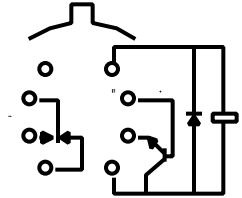
### FEATURES

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

## 1MAT

**STANDARD TO-5 DIODE  
SUPPRESSED/TRANSISTOR  
DRIVEN HIGH-PERFORMANCE  
RELAY**

**QUALIFIED TO  
MIL-R-28776/5**



TERMINAL VIEW

### FEATURES

- 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 Vdc

### COIL POWER

512 mW max. @ 25°C

### DUTY CYCLE

Continuous

### PICK-UP VOLTAGE

Approximately 50% of nominal coil voltage

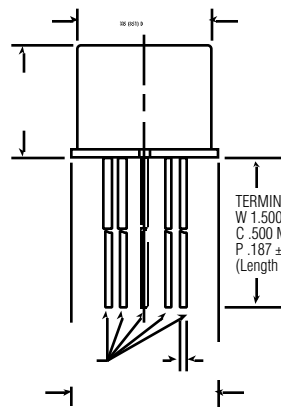
### PICK-UP SENSITIVITY

100 mW max. @ 25°C



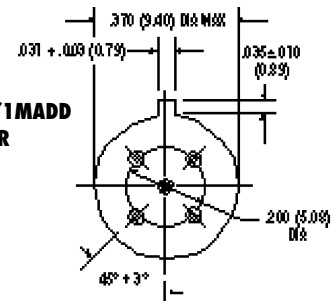
## CONTACT RATINGS

CONTACT LOAD	TYPE	OPERATIONS 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 mA @ 50 mVdc	Low Level	1,000,000
0.1 A @ 28 Vdc	Intermediate Current	50,000

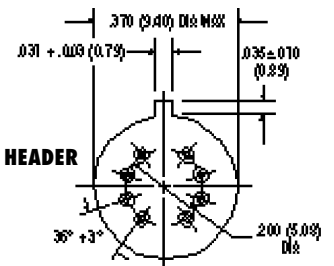


1MA/1MAD/1MADD/1MAT ENCLOSURE

1MA/1MAD/1MADD HEADER



1MAT HEADER



### 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)  
1MAT: 4.0 ms max.  
(transistor driven)

#### 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)  
0.19 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)  
MIL-R-28776/5 (J1MAT)

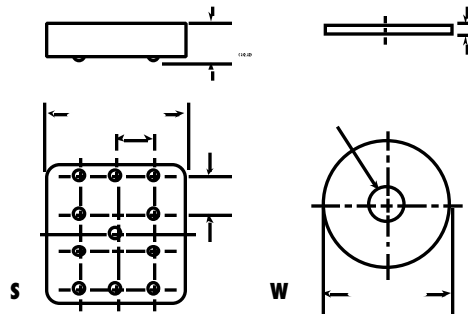
### SEMICONDUCTOR CHARACTERISTICS

#### 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<sub>EBO</sub>) @ 25°C  
80.0 Vdc min. collector-base  
breakdown voltage (BV<sub>CBO</sub>) @ 25°C  
& I<sub>C</sub>=100 mA



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.
<b>1MA/1MAD</b>												
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
<b>1MADD</b>												
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
<b>1MAT</b>												
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

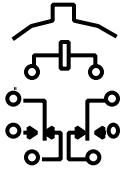
Note 1: Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

Note 2: Set base current at 3 mA to 15 mA during measurements.

## MS

**SENSITIVE TO-5  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO  
MIL-R-39016/11**



TERMINAL VIEW

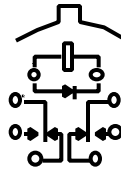
### FEATURES

- 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

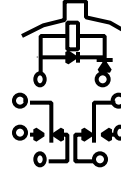
### FEATURES

- 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

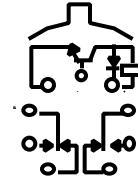
### FEATURES

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

## MST

**SENSITIVE TO-5 DIODE  
SUPPRESSED/TRANSISTOR  
DRIVEN HIGH-PERFORMANCE  
RELAY**

**QUALIFIED TO  
MIL-R-28776/3**



TERMINAL VIEW

### FEATURES

- 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

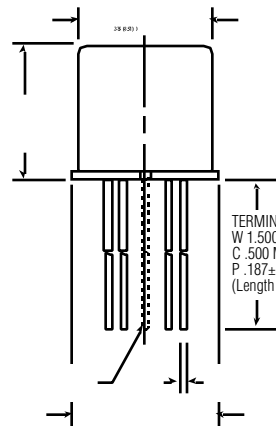
Approximately 50% of nominal coil voltage

### PICK-UP SENSITIVITY

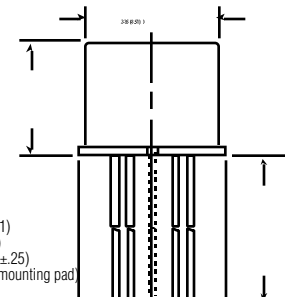
60 mW max. @ 25°C

## 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

### 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)  
MST: 7.5 ms max.  
(transistor driven)

#### 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 gms)  
0.13 oz. (3.45 gms) 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)  
MIL-R-28776/3 (JMST)

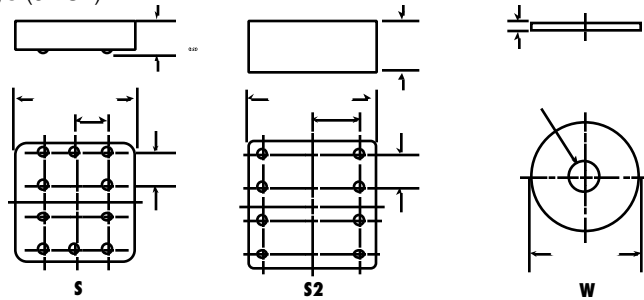
### SEMICONDUCTOR CHARACTERISTICS

#### 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<sub>EBO</sub>) @ 25°C  
80.0Vdc min. collector-base  
breakdown voltage (BV<sub>CEO</sub>) @ 25°C  
& I<sub>C</sub>=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.
<b>MS/MSD</b>												
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
<b>MSDD</b>												
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
<b>MST</b>												
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

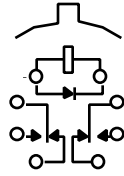
Note 1: Coil resistance not directly measurable. Coil current should be within limits shown when tested at nominal voltage at 25°C for 5 seconds max.

Note 2: Set base current at 3 mA to 15 mA during measurements.



**HM·HS**

**STANDARD • SENSITIVE TO-5  
COMMERCIAL RELAY**



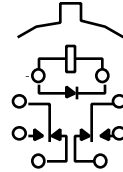
TERMINAL VIEW

**FEATURES**

- Hermetically sealed
- Spreader Pads
- Excellent RF switching

**HMD·HSD**

**STANDARD • SENSITIVE TO-5  
DIODE SUPPRESSED  
COMMERCIAL RELAY**



TERMINAL VIEW

**FEATURES**

- 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

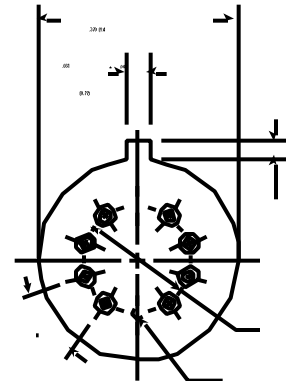
**PICK-UP VOLTAGE**

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

**7  
RELAYS**

**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

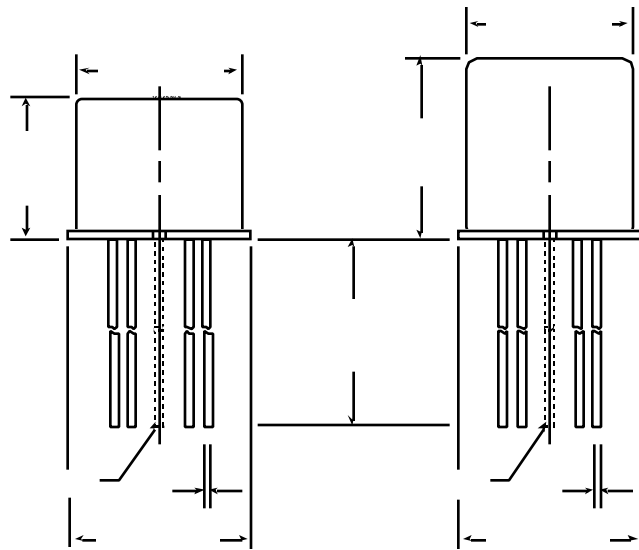
**SEMICONDUCTOR CHARACTERISTICS**

**DIODE**

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

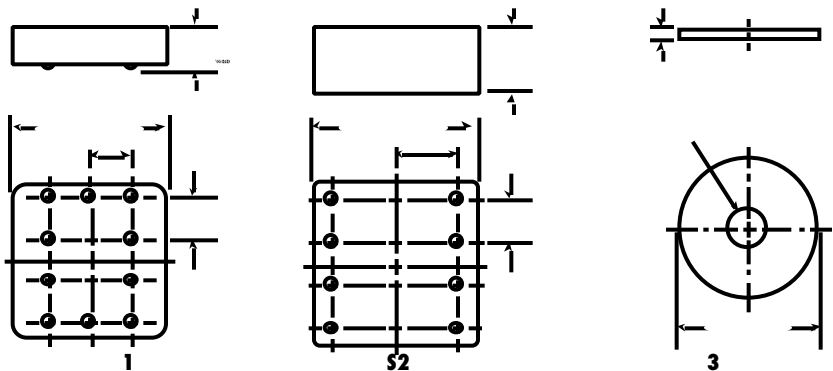
**STANDARD COIL DATA**

	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.
<b>HM/HMD</b>	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
<b>HS/HSD</b>	30.0	2,500	22.0	360	36.0	30
	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	



**HM/HMD ENCLOSURE**

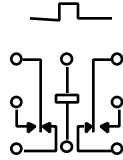
**HS/HSD ENCLOSURE**





**SHC·SHCS**

**STANDARD • SENSITIVE  
.100 GRID SURFACE MOUNT  
COMMERCIAL RELAY**



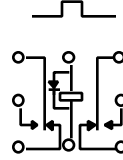
TERMINAL VIEW

**FEATURES**

- Hermetically sealed
- Mounting Pads
- Excellent RF switching

**SHCD·SHCSD**

**STANDARD • SENSITIVE  
.100 GRID SURFACE MOUNT  
DIODE SUPPRESSED  
COMMERCIAL RELAY**



TERMINAL VIEW

**FEATURES**

- 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

**ELECTRICAL CHARACTERISTICS**

**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

**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

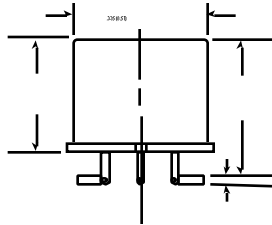
**SEMICONDUCTOR CHARACTERISTICS**

**DIODE**

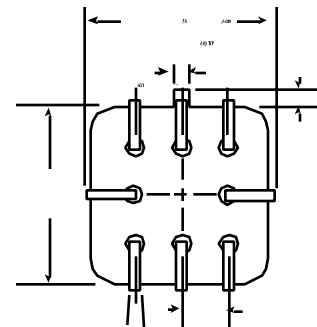
100 Vdc peak inverse voltage (PIV)  
 1.0 Vdc max. transient voltage

**STANDARD COIL DATA**

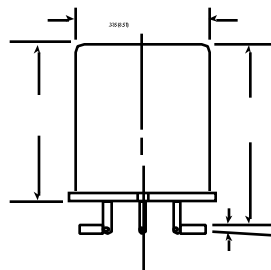
	NOM. COIL VOLTAGE (Vdc)	COIL RESISTANCE IN OHMS ±20% @ 25°C	PICKUP VOLTAGE Vdc (MAX.) @ 25°C	NOM. COIL POWER (mW) @ 25°C	MAX. COIL VOLTAGE	COIL DESIG.
<b>SHC/SHCD</b>	5.0	64	3.8	391	5.8	5
	6.0	98	4.9	367	8.0	6
	9.0	220	7.0	368	12.0	9
	12.0	400	9.0	360	16.0	12
	18.0	880	14.0	368	24.0	18
	26.5	1,600	18.0	439	32.0	26
<b>SHCS/SHCSD</b>	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	



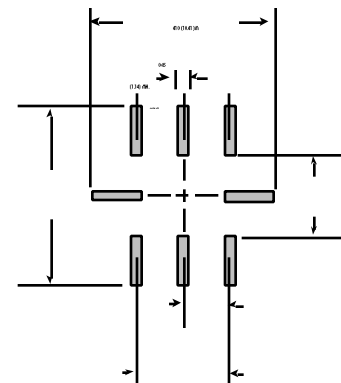
**SHC/SHCD ENCLOSURE**



**SHC/SHCD/SHCS/SHCSD HEADER**



**SHCS/SHCSD ENCLOSURE**

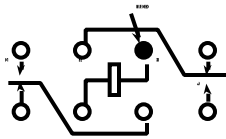


**RECOMMENDED SOLDER PAD LAYOUT**

**HFW-HFW4A-HFW5A**

**STANDARD HALF SIZE  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO MIL-R-39016/6**



TERMINAL VIEW

**FEATURES**

- 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

**COIL POWER**

1.4 watts max. @ 25°C

**DUTY CYCLE**

Continuous

**PICK-UP VOLTAGE**

Approximately 50% of  
nominal coil voltage

**PICK-UP SENSITIVITY**

145 to 260 mW (HFW)

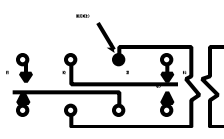
325 mW (HMB)

100 to 125 mW (HMS)

**HMB**

**BIFILAR HALF SIZE  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO MIL-R-39016/22**



TERMINAL VIEW

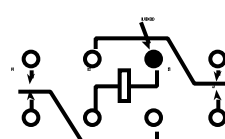
**FEATURES**

- 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

**FEATURES**

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

**CONTACT RATINGS**

	CONTACT LOAD	TYPE	OPERATIONS MIN.
<b>HFW4A</b>	2 A @ 28 Vdc	Resistive	100,000
	4 A @ 28 Vdc	Resistive	100,000
<b>HFW5A</b>	5 A @ 28 Vdc	Resistive	100,000
	0.75 A @ 28 Vdc	Inductive (200mH)	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

### 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

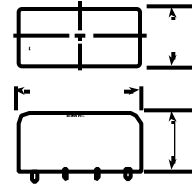
#### SHOCK RESISTANCE

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

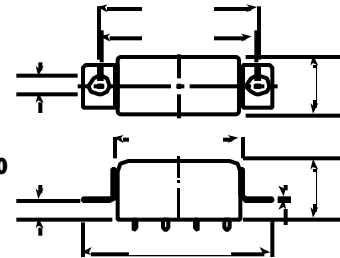
#### QPL APPROVAL

MIL-R-39016/6 (HFW)  
 MIL-R-39016/22 (HMB)  
 MIL-R-39016/44 (HMS)

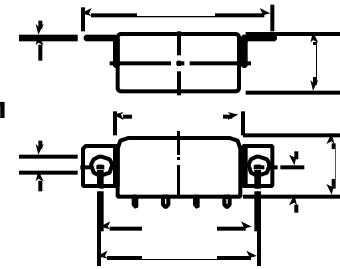
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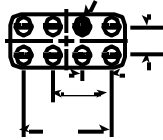
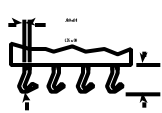
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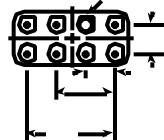
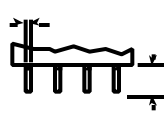
31



11



12



TERMINALS

MOUNTING STYLES

# 7 RELAYS

### STANDARD COIL DATA

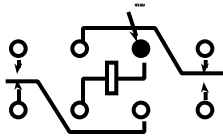
	NOM. COIL VOLTAGE (Vdc)	COIL RESISTANCE IN OHMS ±10% @ 25°C	PICKUP VOLTAGE Vdc (MAX.) @ 25°C	PICKUP VOLTAGE Vdc (MIN.) @ 125°C	DROP-OUT VOLTAGE Vdc (MIN.) @ 25°C	DROP-OUT VOLTAGE Vdc (MIN.) @ -65°C	NOM. COIL POWER (mW) @ 25°C	MAX. COIL VOLTAGE	COIL DESIG.	
<b>HFW/HFW4A/HFW5A</b>	5.0	27	2.7	3.8	0.29	0.21	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	
<b>HMB</b>	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	
<b>HMS</b>	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	
<b>OTHER</b>	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	
	HFW/HFW4A	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** HFW    **TERMINALS** 12    **MOUNTINGS** 30    **COILS** K    **FEATURES** 00 (n/a HMS)

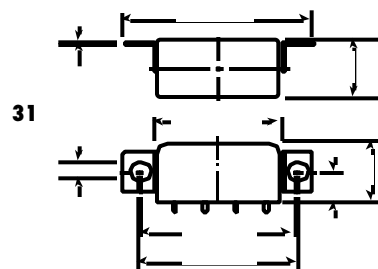
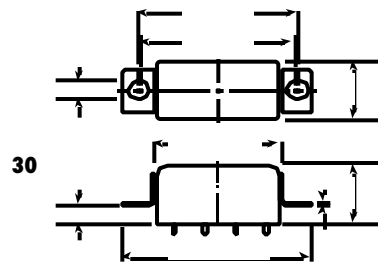
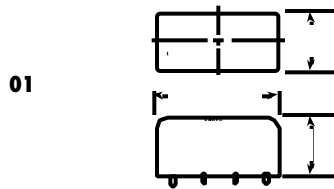
## HFC

### COMMERCIAL/INDUSTRIAL HALF SIZE RELAY



#### FEATURES

- Hermetically sealed
- Up to 5 amps switching
- Economical configuration
- Optional terminals & mounting styles



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

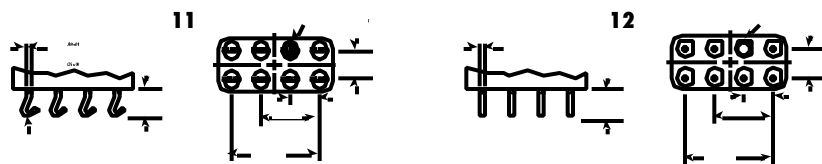
30 G's, 6 ± 1 ms

#### CONTACT RATINGS

	CONTACT LOAD	TYPE	OPERATIONS MIN.
	2 A @ 28 Vdc	Resistive	100,000
<b>HFC4A</b>	4 A @ 28 Vdc	Resistive	100,000
<b>HFC5A</b>	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



TERMINALS

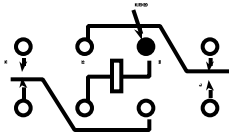
SPECIFYING A PART NUMBER EXAMPLE:

**TYPE** HFC    **TERMINALS** 12    **MOUNTINGS** 30    **COILS** K    **FEATURES** 00

## 2G

**STANDARD ONE-FIFTH SIZE  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO MIL-R-39016/13**



### FEATURES

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

### ELECTRICAL CHARACTERISTICS

#### CONTACT ARRANGEMENT

2 Form C (DPDT)

#### CONTACT MATERIAL

Stationary:  
Palladium alloy

Moveable:  
Palladium alloy

#### CONTACT RESISTANCE

Before Life: 50 milliohms max.  
(measured at 10 mA @ 6 Vdc)

After Life: 150 milliohms max.  
(measured at 2 A @ 28 Vdc)

#### MECHANICAL LIFE EXPECTANCY

Operations min. 1,000,000

#### COIL VOLTAGE

5 to 36 Vdc

#### COIL POWER

1.2 watts max. @ 25°C

#### DUTY CYCLE

Continuous

#### PICK-UP VOLTAGE

Approximately 50% of  
nominal coil voltage

#### PICK-UP SENSITIVITY

135 mW

### CONTACT RATINGS

CONTACT LOAD	TYPE	OPERATIONS MIN.
2 A @ 28 Vdc	Resistive	50,000
1 A @ 28 Vdc	Resistive	100,000
0.125 A @ 115 Vac 60 & 400 Hz	Resistive	100,000
0.3 A 200 mH @ 28 Vdc	Inductive	100,000
0.1 A @ 28 Vdc	Lamp	100,000
10 µA @ 30mVdc	Low Level	1,000,000

### 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:  
750 Vrms 60 Hz

Between Adjacent Contacts:  
750 Vrms 60 Hz

Between Contacts & Coil:  
500 Vrms 60 Hz

#### INSULATION RESISTANCE

10,000 megohms min @ 500 Vdc

### ENVIRONMENTAL CHARACTERISTICS

#### TEMPERATURE RANGE

-65°C to +125°C

#### WEIGHT

0.17 oz. (4.82 grams)

#### VIBRATION RESISTANCE

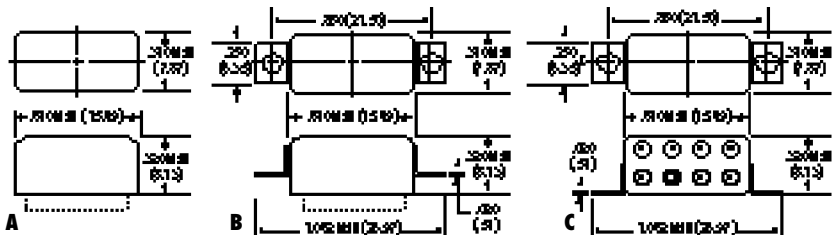
Standard: 30 G's, 10 to 3,000 Hz  
QPL: 30 G's, 10 to 3,000 Hz

#### SHOCK RESISTANCE

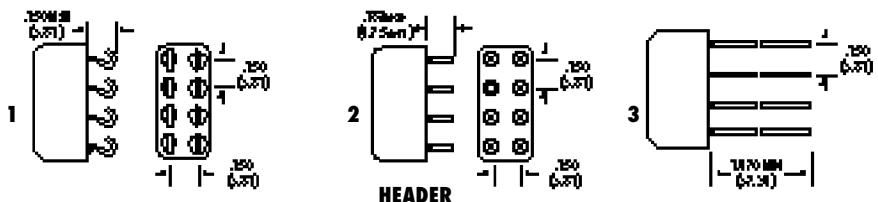
100 G's, 6 ms

#### QPL APPROVAL

MIL-R-39016/13



### ENCLOSURE



### STANDARD COIL DATA

NOM. RESISTANCE VOLTAGE (Vdc)	COIL VOLTAGE IN OHMS ±10% @ 25°C	PICKUP VOLTAGE Vdc (MAX.) @ 25°C	PICK-UP 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.
5.0	44	2.4	3.3	0.26	0.16	568	7	105
6.0	56	2.7	3.8	0.30	0.18	645	8	106
9.0	140	4.4	6.0	0.50	0.30	579	12	109
12.0	210	5.4	7.4	0.60	0.36	686	16	112
18.0	650	9.5	12.8	1.00	0.60	498	24	118
26.5	1,350	13.5	18.0	1.50	0.90	520	35	126
36.0	2,245	17.1	23.0	1.90	1.20	577	46	136

SPECIFYING A PART NUMBER EXAMPLE:

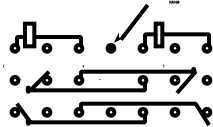
**TYPE**    **MOUNTINGS**    **TERMINALS**    **COIL**  
2G-    1    C-    126

# 7 RELAYS

## LR

**MAGNETIC LATCHING FOUR POLE  
HALF SIZE HIGH-PERFORMANCE RELAY**

**DESIGNED TO MIL-R-39016**



TERMINAL VIEW

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

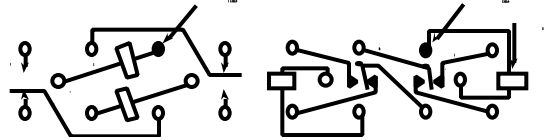
### FEATURES

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

## 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.

### FEATURES

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

### ELECTRICAL CHARACTERISTICS

#### CONTACT ARRANGEMENT

LS: 2 Form C (DPDT)

LR: 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

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 (LS ONLY)

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

**7  
RELAYS**

**OPERATING CHARACTERISTICS**

**TIMING**

Set-Reset Time:  
5.0 ms max.

**CONTACT BOUNCE**

2.0 ms max. (LS)  
5.0 ms max. (LR)

**DIELECTRIC WITHSTANDING VOLTAGE**

Between Open Contacts:  
500 Vrms 60 Hz (LS)  
350 Vrms 60 Hz (LR)

Between Adjacent Contacts:  
1000 Vrms 60 Hz (LS)  
500 Vrms 60 Hz (LR)

Between Contacts and Coil:  
1000 Vrms 60 Hz (LS)  
500 Vrms 60 Hz (LR)

**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**

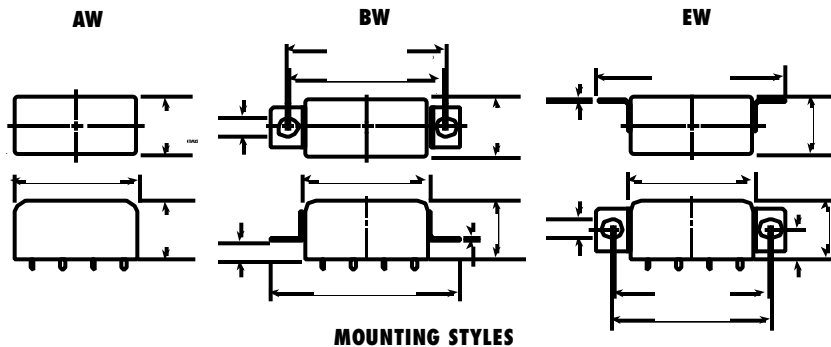
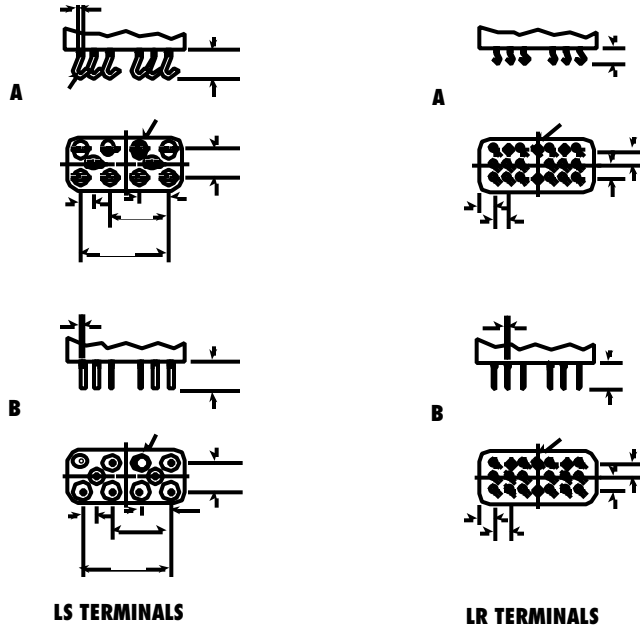
Standard: 20 G's, 10 to 2,000 Hz  
QPL Equiv: 30 G's, 10 to 2,500 Hz

**SHOCK RESISTANCE**

100 G's, 6 ±1 ms

**QPL EQUIVALENT**

MIL-R-39016/45 (LS)  
MIL-R-39016 (LR)



**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

**SPECIFYING A PART NUMBER EXAMPLE:**

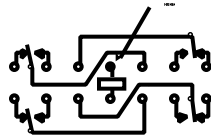
TYPE	MOUNTINGS	CONTACTS	COILS	TERMINALS
LR	BW-	4C-	24	B
LS	BW-	2C-	24	B



## SR

**FOUR POLE HALF SIZE  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO MIL-R-39016/40**



TERMINAL VIEW

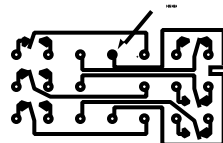
### FEATURES

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

## SS

**SIX POLE HALF SIZE  
HIGH-PERFORMANCE RELAY**

**DESIGNED TO MIL-R-39016**



TERMINAL VIEW

### FEATURES

- 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

SR: 4 Form C (4PDT)  
SS: 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

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

# SR-SS

# 7

# RELAYS

**OPERATING CHARACTERISTICS**

**TIMING**

Operate Time:  
5.0 ms max.

Release Time:  
5.0 ms max.

**CONTACT BOUNCE**

2.0 ms max. (SR)  
5.0 ms max. (SS)

**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**

-65°C to +125°C

**WEIGHT**

0.28 oz. (7.8 gms)

**VIBRATION RESISTANCE**

20 G's, 10 to 2,000 Hz

**SHOCK RESISTANCE**

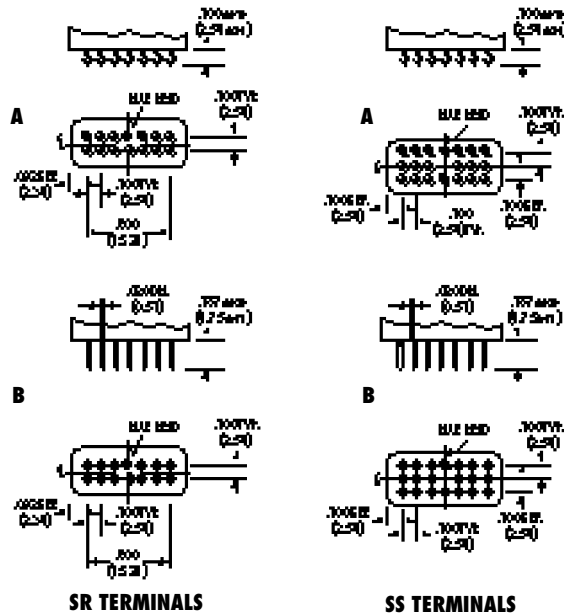
100 G's, 6 ±1 ms

**QPL APPROVAL**

MIL-R-39016/40 (SR)

**QPL EQUIVALENT**

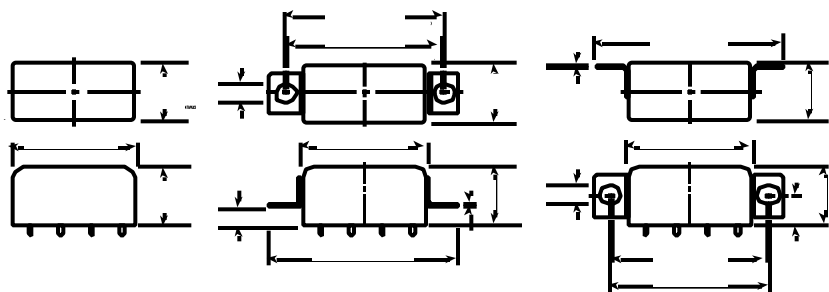
MIL-R-39016 (SS)



AW

BW

EW



**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 (W) @ 25°C	MAX. COIL VOLTAGE	COIL DESIG.
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

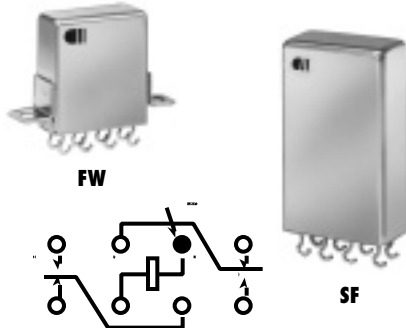
**SPECIFYING A PART NUMBER EXAMPLE:**

TYPE	MOUNTINGS	CONTACTS	COILS	TERMINALS
SR	BW-	4C-	24	B
SS	BW-	6C-	24	B

## FW · FW5A · SF · SF5A

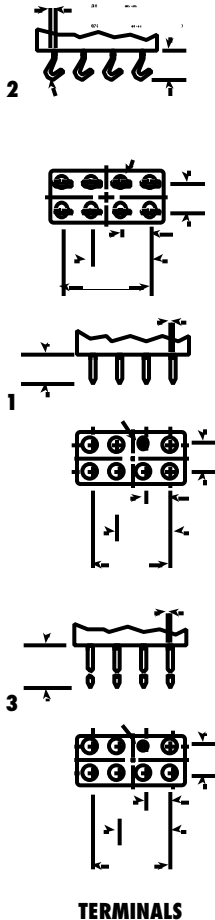
TWO POLE FULL SIZE  
CRYSTAL CAN RELAY

FW QUALIFIED TO MIL-R-5757/10



### FEATURES

- Hermetically sealed
- Up to 5 amps switching
- High shock & vibration ratings
- Optional terminals & mounting options
- Excellent RF switching



TERMINALS

### ELECTRICAL CHARACTERISTICS

#### CONTACT ARRANGEMENT

2 Form C

#### CONTACT MATERIAL

Stationary:  
Bifurcated hardened silver alloy

Moveable:  
Gold plated hardened silver alloy

#### CONTACT RESISTANCE

Before Life: 50 milliohms max.  
(measured @ 10 mA @ 6 Vdc)

After Life: 100 Milliohms max.  
(measured @ 2 mA @ 28 Vdc)

#### MECHANICAL LIFE EXPECTANCY

50 million operations

#### COIL VOLTAGE

1.8 Vdc to 110 Vdc

#### 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)

40 mW (SF)

80 mW (SF 5A)

### RF PERFORMANCE (FW ONLY)

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

### OPERATING CHARACTERISTICS

#### TIMING

Operate Time:

15 ms max. (SF)

5 ms (FW)

6 ms max. (MIL-R-5757/10)

Release Time:

10 ms max. (SF)

5 ms max. (FW)

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 @ 500 Vdc

### ENVIRONMENTAL CHARACTERISTICS

#### TEMPERATURE RANGE

-65° to +125°C

#### WEIGHT

0.6 oz. max. (FW)

0.7 oz. max. (SF 6)

1.1 oz. max. (SF/SF 5A)

#### STANDARD VIBRATION RESISTANCE

20 G's, 10 to 2000 Hz (FW)

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)

### CONTACT RATINGS

CONTACT LOAD	TYPE	OPERATIONS MIN.
5 A @ 28 Vdc (FW5A/SF5A)	Resistive	250,000
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 uA @ 50 mVdc	Low Level	1,000,000
75 WATTS @ 50 MHz (FW)	RF	10,000,000

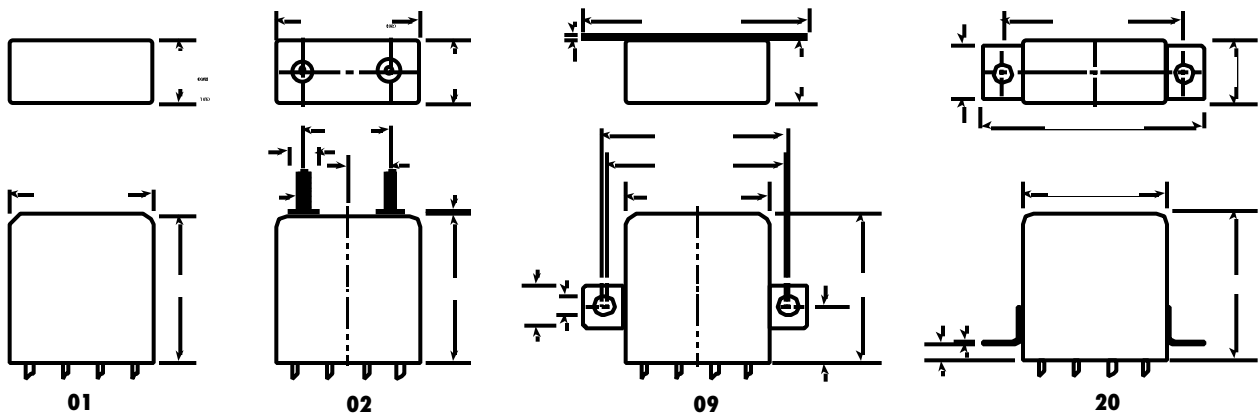
**7  
RELAYS**

FW 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 = .875 (22.23) MAX  
SF6 = .900 (22.86) MAX  
SF/SF5A = 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

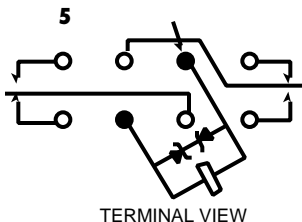
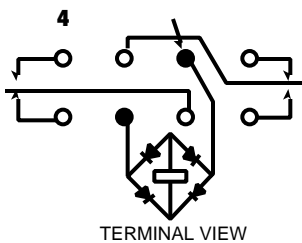
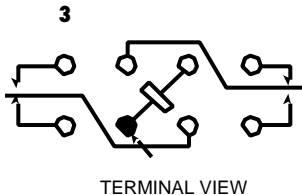
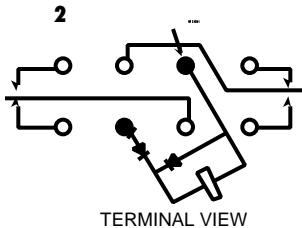
## 07

**TWO POLE 10 AMP  
HIGH-PERFORMANCE RELAY**

**QUALIFIED TO MIL-R-5757/23  
MS 27245 & MS 27247**

### FEATURES

- 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

### 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

### OPERATING CHARACTERISTICS

#### TIMING

Operate time:  
Std: 10 ms max.  
QPL: 15 ms max.

Release Time:  
Std: 10 ms max.  
QPL: 15 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

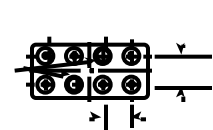
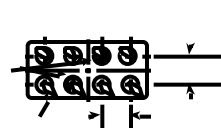
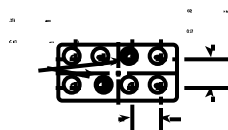
Standard: 30 G's, 10 to 2,000 Hz  
QPL: 20 G's, 10 to 2,000 Hz

#### SHOCK RESISTANCE

100 G's, 6 ±1 ms

#### QPL APPROVAL

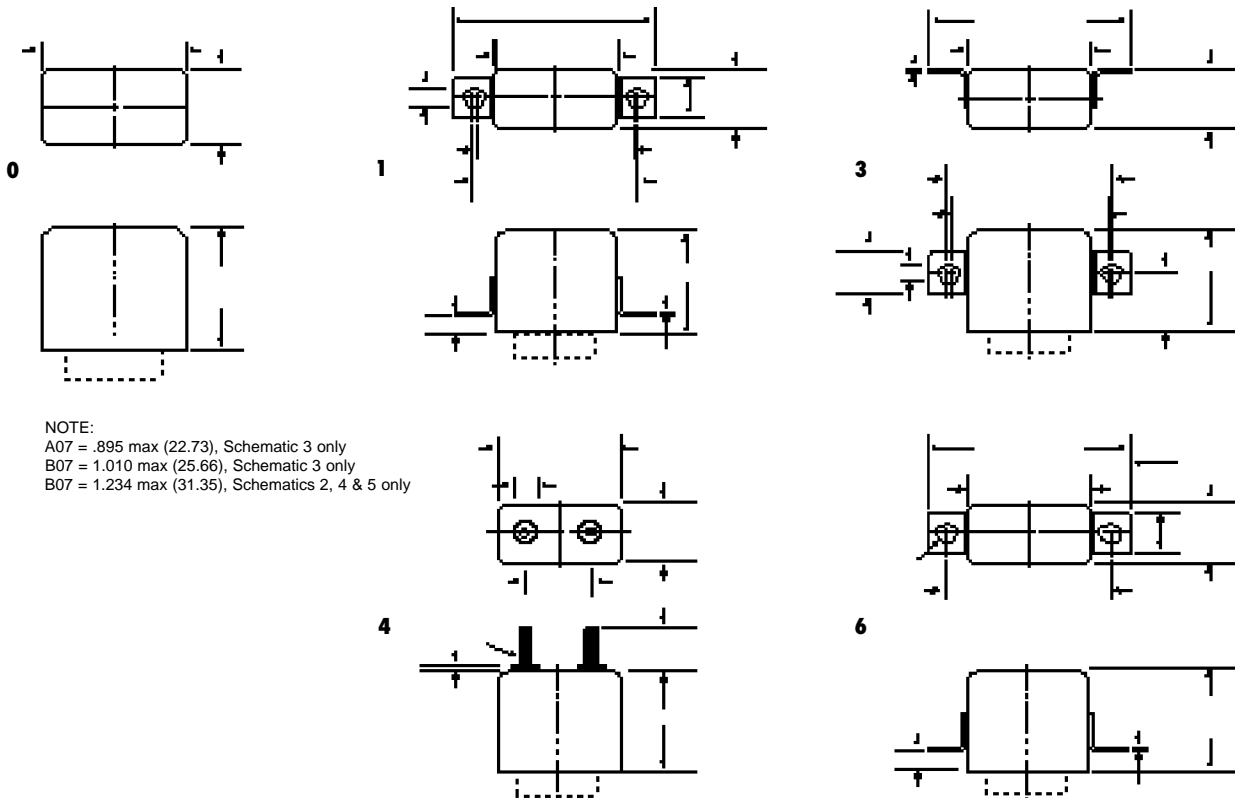
MIL-R-5757/23  
MS 27245  
MS 27247



### TERMINALS

**7  
RELAYS**

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.) @ 125°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	<b>TEMPERATURE</b> -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	<b>VIBRATION</b> 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	<b>SHOCK</b> 50G's, 11ms
115 Vac 400Hz	1,200	72.0	90.0	10.0	5.0	n/a	n/a	AR	
115 Vac60-400Hz	7,600	72.0	90.0	10.0	5.0	n/a	n/a	AS	<b>TEMPERATURE</b> -55°C to +85°C
6.0	19	3.3	4.5	0.4	0.25	1.89	9.0	BA	
12.0	75	6.5	9.0	0.9	0.5	1.92	16.0	BB	<b>VIBRATION</b> 20G's, 10 to 2,000Hz
26.5	300	13.0	18.0	1.8	1.0	2.34	32.0	BC	
48.0	1,200	26.0	36.0	3.6	2.0	1.92	52.0	BD	<b>SHOCK</b> 50G's, 11ms
120.0	7,600	66.0	90.0	9.0	5.0	1.89	122.0	BE	
115 Vac 400Hz	1,200	75.0	90.0	10.0	5.0	n/a	n/a	BR	<b>TEMPERATURE</b> -65°C to +125°C
115 Vac60-400Hz	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	<b>VIBRATION</b> 30G's, 10 to 2,000Hz
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	<b>SHOCK</b> 100G's, 6ms
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	
115 Vac 400Hz	1,200	80.0	100.0	10.0	5.0	n/a	n/a	CR	
115 Vac60-400Hz	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