



TO-5 CASE RELAY DPDT

Series
MA

• Basic • Suppression • Suppression/Steering • Transistor Driven

Product Description

A series of ultra miniature hermetically sealed relays constructed in a transistor style case, providing superior performance and established reliability characteristics. Available in a variety of sensitivities, contact configurations and hybrid improvements to provide a most versatile element to the circuit designer.

The following construction features ensure the highest reliability in extreme environments:

- All welded relay construction
- Cleaning and sealing techniques ensures maximum internal cleanliness
- Low level to 1 amp. switching
- 2 form C, DPDT contacts, special metal alloy with gold plating
- Frame design and force / mass ratio provides exceptional shock and vibration immunity

Low Intercontact capacitance and contact circuit losses, provides also a reliable switching functions in demanding RF applications, combined with small size and low coil power dissipation (see figure 1).

Series Types (note 2)

- **MA*** Basic Relay, 2 form C, DPDT
- **MA*D** Basic Relay combined with an internal diode for coil transient suppression
- **MA*DD** Basic Relay incorporates two internal diodes for coil transient suppression and polarity reversal protection
- **MA*T** Basic Relay incorporating an internal transistor driver and diode for coil transient suppression

Environmental and Physical Specifications

Temperature (Ambient)	-65°C to +125°C
Shock	75 g's, 6 msec.
Vibration (sinusoidal)	30 g's, 10 to 3000 Hz
Vibration (random)	0,4 g ² s / Hz, 50 to 2000 Hz
Acceleration	50 g's
Sealing	All welded, Hermetic
Weight	0,09 oz. (2,55 grams) max.

MIL-PRF-39016/9, 15 & 20
MIL-PRF-28776/1

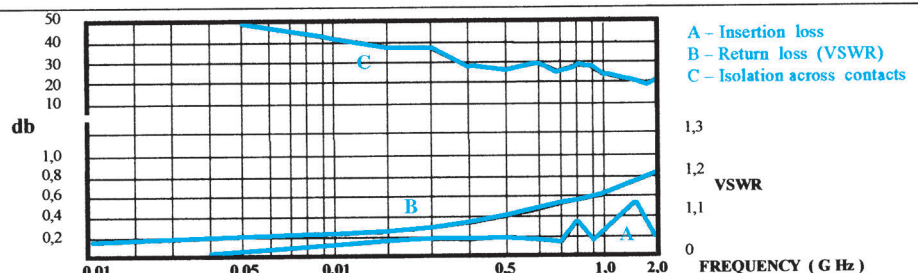


Electrical Characteristics (over the Temperature range, unless otherwise noted)

Electrical Characteristics (over the Temperature range, unless otherwise specified)			
Coil Data	See Typical Characteristics chart		
Contact Rating	Type Load	Contact Load	Cycles min.
(Note: All ratings with grounded case)	Low Level	10 to 50 μ A / 10 to 50 mV	1.000.000
	Resistive	1 Amp / 28 Vdc	100.000
		250 mA / 115 Vac, 60 and 400 Hz (Case not grounded)	100.000
		100 mA / 115 Vac, 60 and 400 Hz	100.000
	Resistive overload	2 Amp / 28 V dc	100
	Inductive	200 mA / 28 Vdc (320 mH)	100.000
Lamp	100 mA / 28 Vdc	100.000	
Contact Resistance	0,1 ohm max. initial, 0,2 ohm max. after life		
Operate Time	2,0 msec. max.		
Release Time	1,5 msec. max. Series: MA*	4,0 msec. max. Series: MA*D, MA*DD	7.5 msec. max. Series MA*T
Contact Bounce	1,5 msec. max.		
Contact stabilisation Time	2,0 msec. max.		
Dielectric Strength	500 Vrms min., 60 Hz, all points at sea level	125 Vrms min. 60 Hz, all points at 70.000 ft.	
Insulation Resistance	10.000 megohms min. all points at 500 Vdc		
Intercontact Capacitance	0,7pF typical		
Sensitivity	130 milliwatts at pick-up, 450 milliwatts at nominal rated coil voltage, at 25 °C		
Diode P.I.V.	100 Vdc min. Series : MA*D, MA*DD, MA*T		
Negative Coil Transient	1,0 Vdc max. Series : MA*D, MA*DD, MA*T		
Transistor Characteristics at 25 °C (Series MA*T)	Emitter-Base Voltage (Vebo)		6,0 Vdc min.
	Collector-Base Breakdown Voltage (Vcbo) (Ic = 100 μ A)		80 Vdc min.
	Base Turn-Off Voltage		0,3 Vdc min.

Figure 1 - Radio Frequency Curves

Note:
Radio frequency curves are typical characteristics based on factory knowledge. Tests to ensure compliance on RF performance, are not performed.





TO-5 CASE RELAY DPDT

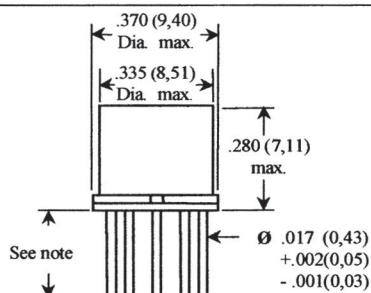
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Typical Characteristics (over the Temperature range, unless otherwise noted)

Description	Measur.	Series Types		Coil Voltage Code						
				5	6	9	12	18	26	30 (MA only)
Coil Voltage	Vdc	MA*, MA*D, MA*DD, MA*T	Nom.	5,0	6,0	9,0	12,0	18,0	26,5	30,0
		MA*, MA*D, MA*DD, MA*T	Max.	5,8	8,0	12,0	16,0	24,0	32,0	36,0
Coil Resistance at 25°C	ohms	MA*, MA*D, MA*T	±10%	50	98	220	390	880	1560	2500
		MA*DD		39	78					-
Coil Current at 25 °C	mAcd	MA*DD	Min.	93,2	58,3	33,0	25,6	17,5	14,8	-
			Max.	128,2	78,3	42,9	32,8	22,1	18,5	-
		MA*T	Min.	82,2	52,9	35,3	26,6	17,9	14,7	-
			Max.	112,1	69,9	47,4	35,8	24,0	19,8	-
Pick-up Voltage	Vdc	MA*, MA*D, MA*T	Max.	3,5	4,5	6,8	9,0	13,5	18,0	22,0
		MA*DD	Max.	4,0	5,0	7,8	10,0	14,5	19,0	-
Drop-Out Voltage	Vdc	MA*, MA*D, MA*T	Min.	0,14	0,18	0,35	0,41	0,59	0,89	1,0
			Max.	2,3	3,2	4,9	6,5	10,0	13,0	16,0
		MA*DD	Min.	0,6	0,7	0,8	0,9	1,1	1,4	-
			Max.	2,8	3,4	5,3	6,5	10,0	13,0	-
Base Current to Turn-on	mAcd	MA*T (limit for base / emitter current to 15 mA max.)	Max.	3,00	2,04	1,36	1,03	0,68	0,50	-

Outline Dimensions

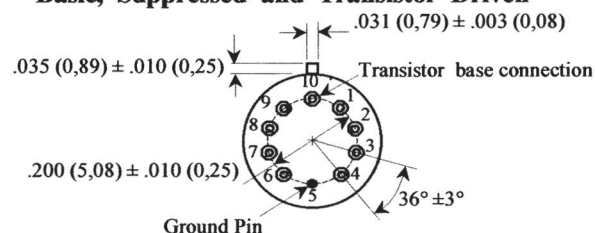


Note :

- Dimensions are shown in inches (millimetres)
- Terminal Variants: - (C) Standard Wire Terminal = .500 (12,7) min.
- (W) Long Wire Terminal = 1.500 (38,1) min.
- (P) Pin Terminal = .187 ± .01 (4,75 ± 0,25)

Terminal Locations

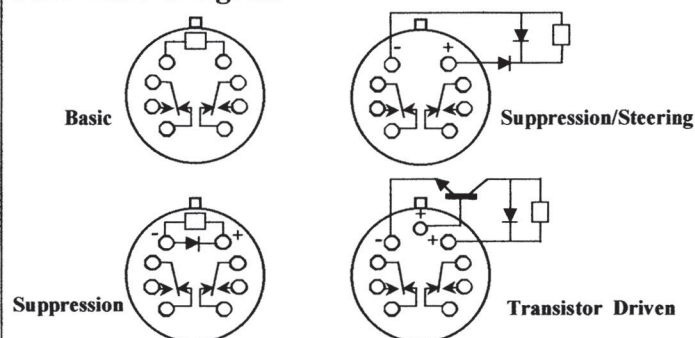
Basic, Suppressed and Transistor Driven



Note :

- dimensions are shown in inches (millimetres)
- Viewed from terminals, numbers are for reference only
- Ground pin is optional

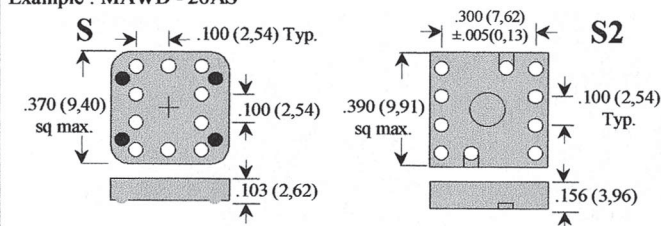
Schematic Diagram



Note : Schematics are viewed from terminals

Spreader Pads

Relays can be supplied with a spreader pad epoxied to the relay header, to prevent the possible shorting of printed circuit board land lines and to facilitate circuit board cleaning. To order relay with pad add. " S " to part Number.
Example : MAWD - 26AS



Note : - Dimensions are in inches (millimetres)

- Pad type S2 is not used on military qualified MA*T series

Note:

1 For qualified relays add. " I " and the applicable suffix for Failure Rate designation.

Example: I MAWD - 26A

2 " * " Indicates Terminal Variants: C, P or W

3 Failure Rate (Reliability Level)

Military Suffix	NHIG Suffix	F R %/10.000 cycles
L	A	3,0
M	B	1,0

How to Order, (note 1) (Part Numbering System)

Series	MA	W	D	G	- 26	A	S	Spreader Pad (optional)
C	- Wire terminal							
P	- Pin terminal							
W	- Long wire terminal							
- Basic								
D	- Diode Suppression							
DD	- Suppression/Steering							
T	- Transistor Driven							
								Reliability levels A or B (note 3)
								Coil Voltage Code
								Ground Pin (optional)



GENERAL INFORMATION

SELECTOR CHART

Series	Series Types	Enclosure	Contacts		Nominal Coil Voltage or Current	Operating Power at P.I. (mW)	Applicable Specification Approvals			
			Arrangement	Rating			MILITARY		CECC	
							Mil-PRF-39016/	Mil-PRF-28776/	16101-	16207-
MA	MA	TO-5	DPDT	1A / 28 Vdc	5...30,0 Vdc	130	9			
	MA-D				5...26,5 Vdc	15				
	MA-DD					20				
	MA-T					130		1		
MA2		TO-5	DPDT	1A / 28 Vdc	5...30,0 Vdc	130			003	
MCA		TO-5	DPDT	2A / 28 Vdc	5...26,5 Vdc	150				
MS	MS	TO-5	DPDT	1A / 28 Vdc	5...48,0 Vdc	60	11			
	MS-D					16				
	MS-DD					21				
	MS-T					60		3		
MS2		TO-5	DPDT	1A / 28 Vdc	5...48,0 Vdc	60			004	
1MA	1MA	TO-5	SPDT	1A / 28 Vdc	5...26,5 Vdc	100	7			
	1MA-D					23				
	1MA-DD					24				
	1MA-T					100		5		
1MA1		TO-5	SPDT	1A / 28 Vdc	5...26,5 Vdc	100			005	
1MS	1MS	TO-5	SPDT	1A / 28 Vdc	5...40,0 Vdc	50	10			
	1MS-D					25				
	1MS-DD					40	26			
	1MS-T					50		4		
1MS1		TO-5	SPDT	1A / 28 Vdc	5...40,0 Vdc	50			006	
MGA	MGA	CUBIC .100GRID	DPDT	1A / 28 Vdc	5...26,5 Vdc	130	17			
	MGA-D					18				
	MGA-DD					150	19			
MGAE	MGAE	CUBIC .100GRID	DPDT	1A / 28 Vdc	5...28,0 Vdc	130			801	
	MGAE-D									
	MGAE-DD					150				
MGA2	MGA2 / D2	CUBIC	DPDT	1A / 28 Vdc	5...28,0 Vdc	140			007	
MGS	MGS	CUBIC .100GRID	DPDT	1A / 28 Vdc	5...48,0 Vdc	60	41			
	MGS-D					42				
	MGS-DD					43				
MGSE	MGSE	CUBIC .100GRID	DPDT	1A / 28 Vdc	5...48,0 Vdc	60			802	
	MGSE-D									
	MGSE-DD									
MGS2	MGS2 / D2	CUBIC	DPDT	1A / 28 Vdc	5...48,0 Vdc	60			008	
I2K		1/2 CC	DPDT	2A / 28 Vdc	5...26,5 Vdc	250	6			
2K		1/2 CC	DPDT	2A / 28 Vdc	5...48,0 Vdc	250				
2K6600		1/2 CC	DPDT	2A / 28 Vdc	5...48,0 Vdc	250			007,014,021	
							MILITARY Compliance			
							Mil-R-39016/	Mil-R-5757/		
2K7940		1/2 CC	DPDT	2A / 28 Vdc	6...26,5 Vdc	250	22			
KA	2KA	1/2 CC	DPDT	2A / 28 Vdc	5...48,0 Vdc	100				
HA	2HA	1/2 CC	DPDT	5A / 28 Vdc	5...48,0 Vdc	300				
B	2B	CC	DPDT	2A / 28 Vdc	6...76,0 Vdc	250				
	2BR		DPDT		26,5...115 Vac	370				
2B6660		CC	DPDT	3A / 28 Vdc	6...76,0 Vdc	250			008	
2B7506		CC	DPDT	2A / 28 Vdc	6...26,5 Vdc	250		10		
BS	2BSA	CC	DPDT	2A / 28 Vdc	6...26,5 Vdc	100				
	1BSK		SPDT		3,2...70,6mA	25				
	2BSK		DPDT		4,0...89,2mA	40				
BN	1BN	CC	SPDT	5A / 28 Vdc	6...76,0 Vdc	280				
	2BN		DPDT							
2BC7201		CC	DPDT	2A / 28 Vdc	4,0...90,0mA	40		13		
BCN	1BCN	CC	SPDT	5A / 28 Vdc	6...40,0 Vdc	80				
	2BCN		DPDT							
4B			4PDT	2A / 28 Vdc	6...115 Vdc	400				
T	2T	CC	DPDT	10A / 28 Vdc	6...115 Vdc	500				
	2TR				115 Vac					
TN	2TN	CC	DPDT	15A / 28 Vdc	6...115 Vdc	500				
	2TNR				115 Vac					
2T7188		CC	DPDT	10A / 28 Vdc	6...120 Vdc	500		23		
RFK	RFK	1/2 CC	SPDT	2A / 28 Vdc	6...26,5 Vdc	250				
	2RFK		DPDT							
RFB	RFB	CC	SPDT	2A / 28 Vdc	6...76,5 Vdc	250				
	2RFB		DPDT							
RFBC	RFBC	CC	SPDT	2A / 28 Vdc	4,0...89,2 mA	40				
	2RFBC		DPDT							
4MA		CC	4PDT	1A / 28 Vdc	5,0...30,0 Vdc	260				
4MS		CC	4PDT	1A / 28 Vdc	5,0...48,0 Vdc	120				