



## COMMERCIAL TO-5 RELAYS DPDT

SERIES	RELAY TYPE
712	DPDT basic relay
712D	DPDT relay with internal diode for coil transient suppression
712TN	DPDT relay with internal transistor driver and coil transient suppression diode

### DESCRIPTION

The TO-5 relay, originally conceived and developed by Teledyne, has become one of the industry standards for low-level switching from dry circuit to 1 ampere. Designed for high-density PC board mounting, the Series 712 relays are some of the most versatile ultraminiature relays available because of their small size and low coil power dissipation.

The following unique construction features and manufacturing techniques provide excellent resistance to environmental extremes and overall high reliability:

#### The 712 feature:

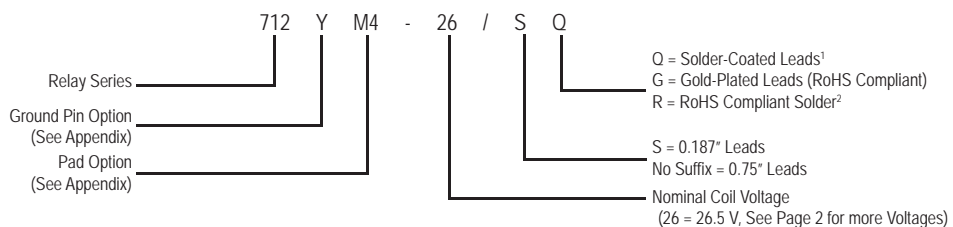
- All welded construction.
- Unique uni-frame design providing high magnetic efficiency and mechanical rigidity.
- High force/mass ratios for resistance to shock and vibration.

- Advanced cleaning techniques provide maximum assurance of internal cleanliness.
- Precious metal alloy contact material with gold plating assures excellent high current and dry circuit switching capabilities.

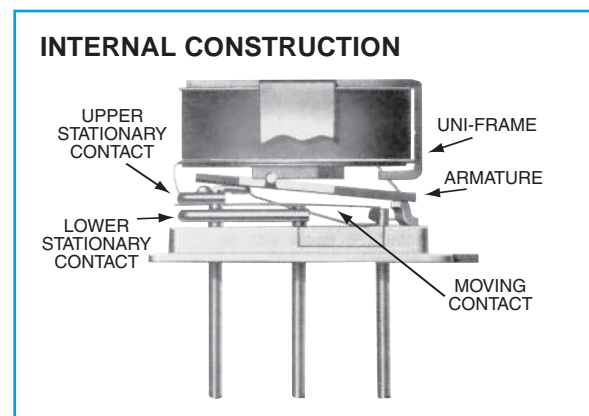
The Series 712D relay has an internal discrete silicon diode for coil transient suppression. The hybrid Series 712TN relay has an internal silicon diode and transistor driver. The integrated packaging of the relay with its associated semiconductor devices greatly reduces PC board floor space requirements as well as component installation costs.

By virtue of its inherently low intercontact capacitance and contact circuit losses, the 712 has proven to be excellent ultraminiature RF switch for frequency ranges well into the UHF spectrum. A typical RF application for the TO-5 relay is in handheld radio transceivers, wherein the combined features of good RF performance, small size, low coil power dissipation and high reliability make it a preferred method of Transmit-Receive switching

### Part Numbering System



ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS	
<b>Temperature (Ambient)</b>	-65°C to +125°C
<b>Vibration (General Note I)</b>	10 g's to 500 Hz
<b>Shock (General Note I)</b>	30 g's, 6ms half sine
<b>Enclosure</b>	Hermetically sealed
<b>Weight</b>	0.09 oz. (2.55g) max.



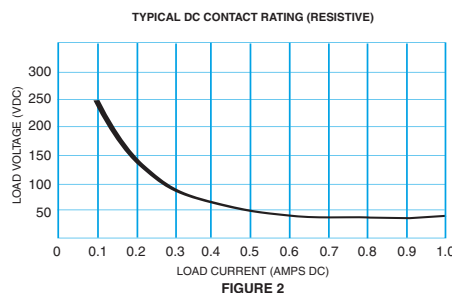
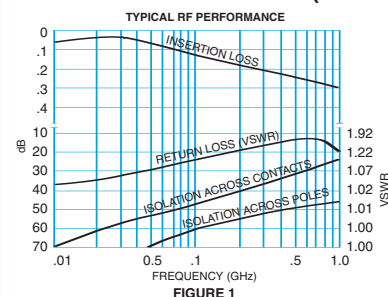
**SERIES 712**  
**GENERAL ELECTRICAL SPECIFICATIONS (@25°C)**

<b>Contact Arrangement</b>	2 Form C (DPDT)	
<b>Rated Duty</b>	Continuous	
<b>Contact Resistance</b>	0.15 Ω max.	
<b>Contact Load Rating (DC)</b>	Resistive: 1 A / 28 Vdc Inductive: 200 mA / 28 Vdc (320mH) Lamp: 100 mA / 28 Vdc (320mH) Low level: 10 to 50 μA @ 10 to 50 mV	
<b>Contact Load Rating (AC)</b>	Resistive: 250 mA / 115Vac, 60 and 400 Hz (Case not grounded) 100 mA / 115 Vac, 60 and 400 Hz (Case grounded)	
<b>Contact Life Ratings</b>	10,000,000 cycles (typical) at low level 1,000,000 cycles (typical) at 0.5 A / 28 Vdc resistive 100,000 cycles min. at all other loads specified above	
<b>Contact Overload Rating</b>	2 A / 28 Vdc Resistive (100 cycles min.)	
<b>Coil Operating Power</b>	450 mW typical at nominal rated voltage	
<b>Contact Carry Rating</b>	Contact Factory	
<b>Operate Time</b>	4.0 msec max. at nominal rated coil voltage	
<b>Release Time</b>	712: 3.0 ms max.	712D, 712TN: 6.0 ms max.
<b>Intercontact Capacitance</b>	0.4 pf typical	
<b>Insulation Resistance</b>	1,000 MΩ min. between mutually isolated terminals	
<b>Dielectric Strength</b>	350 Vrms (60 Hz) @ atmospheric pressure	
<b>Negative Coil Transient (Vdc)</b>	2.0 Vdc Max.	
<b>Diode P.I.V. (Vdc)</b>	60 Vdc Min.	
<b>712TN Transistor Characteristics</b>	Base Voltage to Turn Off (Vdc)	0.3 min
	Emitter-Base breakdown Voltage (BV <sub>EBO</sub> ) (Vdc)	6.0 min
	Collector-Base breakdown Voltage (BV <sub>CBO</sub> ) (Vdc)	60 min

**DETAILED ELECTRICAL SPECIFICATIONS (@25°C)**

BASE PART NUMBERS (712, 712D, 712TN)	712-5	712-6	712-9	712-12	712-18	712-26	
	712D-5 712TN-5	712D-6 712TN-6	712D-9 712TN-9	712D-12 712TN-12	712D-18 712TN-18	712D-26 712TN-26	
<b>Coil Voltage</b>	Nom.	5.0	6.0	9.0	12.0	18.0	26.5
	Max.	5.8	8.0	12.0	16.0	24.0	32.0
<b>Coil Resistance (Ohms ±20%)</b>	50	98	220	390	880	1560	
<b>Pick-up Voltage (Vdc, Max.) Pulse Operation</b>	3.6	4.2	6.5	8.4	13.0	17.0	
<b>712TN Base Current to Turn On (mAdc, min.)</b>	3.00	2.04	1.36	1.03	0.68	0.50	

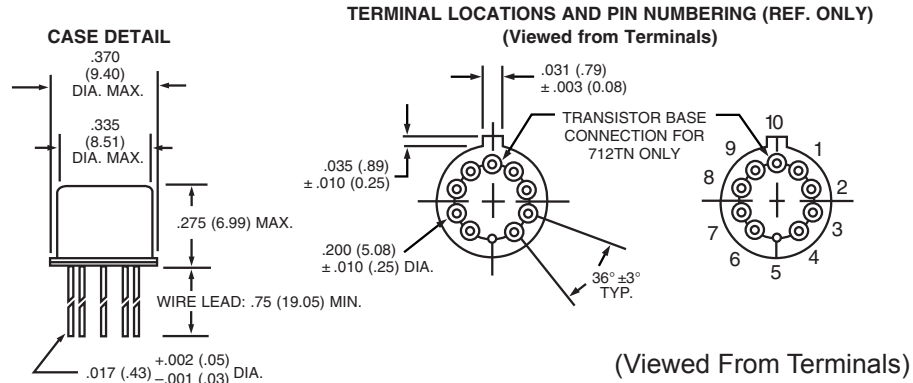
**PERFORMANCE CURVES (Note 2)**



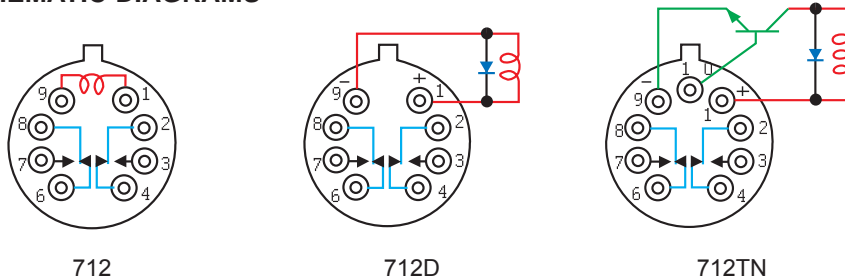
**GENERAL NOTES**

- Relay contacts will exhibit no chatter in excess of 10 μsec or transfer in excess of 1 μsec.
- "Typical" characteristics are based on available data and are best estimates. No on-going verification tests are performed.
- Unless otherwise specified, parameters are initial values.
- Relays can be supplied with a spacer pad. See appendix.

**SERIES 712  
OUTLINE DIMENSIONS**



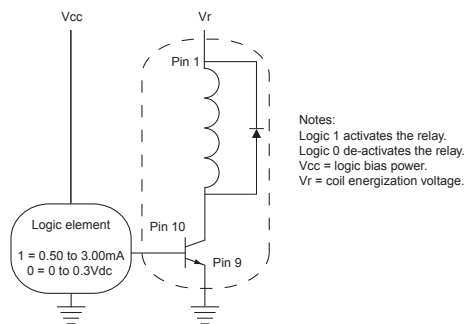
**SCHEMATIC DIAGRAMS**



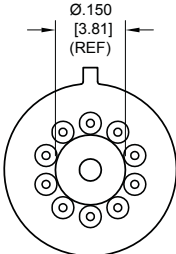
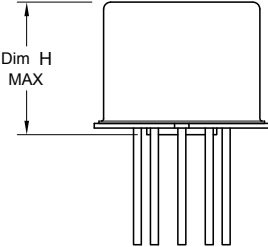
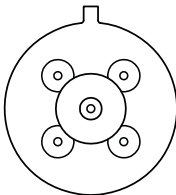
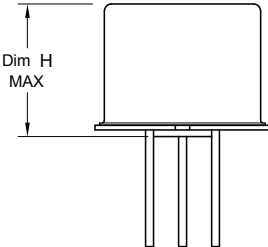
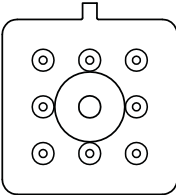
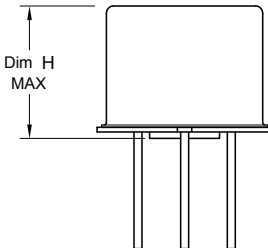
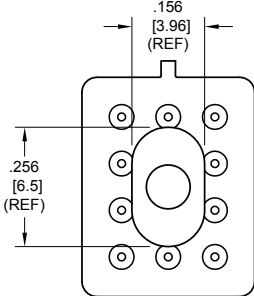
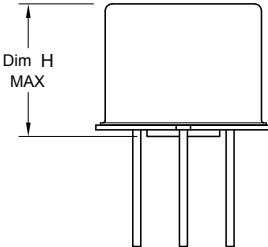
**NOTES:**

1. DIMENSIONS ARE IN INCHES, METRIC EQUIVALENTS SHOWN IN [ ].
2. POSITIONS 5 AND 10 ARE FOR UNINSULATED CASE GROUND OPTIONS.
3. NO PROTRUSION BELOW BOTTOM OF HEADER WHEN GROUND PINS ARE INSTALLED
4. TO ORDER THE CASE GROUND OPTION, AFTER THE SERIES DESIGNATOR, ADD "Y" TO THE PART NUMBER FOR POSITION 5 OR "Z" TO THE PART NUMBER FOR POSITION 10.
5. UNLESS OTHERWISE SPECIFIED, TOLERANCES ON DIMENSIONS ARE ± .010 INCH (0.025 MM)

**TYPICAL LOGIC INTERFACE**



## APPENDIX: Spacer Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 <p style="text-align: center;">“M4” Pad for TO-5</p>		ER412, ER412D, ER412DD	.295 (7.49)
		712, 712D, 712TN, RF300, RF310, RF320 RF700, RF703	.300 (7.62)
		ER420, ER420D, ER420DD, 421, ER421D, ER421DD, ER422, ER422D, ER422DD, 722, 722D, RF341	.305 (7.75)
		ER431T, ER432T, ER432, ER432D, ER432DD	.400 (10.16)
		732, 732D, 732TN, RF303, RF313, RF323	.410 (10.41)
		RF312, RF332 SI800, SI803	.350 (8.89)
 <p style="text-align: center;">“M4” Pad for TO-5</p>		ER411, ER411D, ER411DD, ER411T	.295 (7.49)
		ER431, ER431D, ER431DD	.400 (10.16)
		RF311	.300 (7.62)
		RF331	.410 (10.41)
 <p style="text-align: center;">“M4” Pad for Centigrid®</p>		172, 172D	.305 (7.75)
		ER114, ER114D, ER114DD, J114, J114D, J114DD	.300 (7.62)
		ER134, ER134D, ER134DD, J134, J134D, J134DD	.400 (10.16)
		RF100	.315 (8.00)
		RF103	.420 (10.67)
 <p style="text-align: center;">“M9” Pad for Centigrid®</p>		122C, A152	.320 (8.13)
		ER116C, J116C	.300 (7.62)
		ER136C, J136C	.400 (10.16)
		RF180	.325 (8.25)
		A150	.305 (7.75)

**Notes:**

1. Spacer pad material: Polyester film.
2. To specify an “M4” or “M9” spacer pad, refer to the mounting variants portion of the part numbering example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is  $\pm .010$ " (.25 mm).
5. Add 10 m $\Omega$  to the contact resistance shown in the datasheet.
6. Add 0.01 oz. (0.25 g) to the weight of the relay assembly shown in the datasheet.

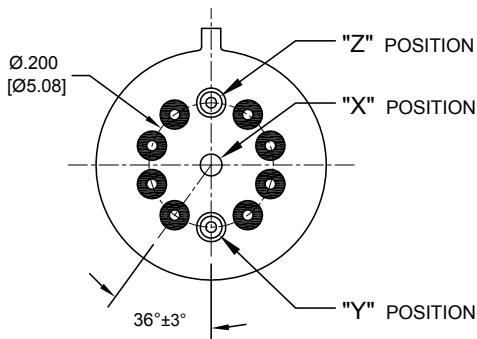
## APPENDIX: Spreader Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
<p style="text-align: center;"><b>"M" Pad <u>5/ 6/</u></b></p>		ER411T, J411T, ER412, ER412D ER412DD, J412, J412D, J412DD ER412T, J412T	.388 (9.86)
		712, 712D, 712TN	.393 (9.99)
		ER431T, J431T, ER432, ER432D ER432DD, J432, J432D, J432DD ER432T, J432T	.493 (12.52)
		732, 732D, 732TN	.503 (12.78)
		ER420, J420, ER420D, J420D ER420DD, J420DD, ER421, J421 ER421D, J421D, ER421DD J422D, ER422DD, J422DD, 722	.398 (10.11)
<p style="text-align: center;"><b>"M2" Pad <u>7/ 8/</u></b></p>		ER411T ER412, ER412D, ER412DD J412, J412D, J412DD	.441 (11.20)
		712, 712D	.451 (11.46)
		ER421, ER421D, ER421DD 722, 732D	.451 (11.46)
		ER431T ER432, ER432D, ER432DD	.546 (13.87)
<p style="text-align: center;"><b>"M3" Pad <u>5/ 6/ 9/</u></b></p>		ER411, ER411D, ER411DD, ER411TX ER412X, ER412DX, ER412DDX ER412TX	.388 (9.86)
		712X, 712DX, 712TNX	.393 (9.99)
		ER420X, ER420DX, ER420DDX ER421X, ER421DX, ER421DDX ER422X, ER422DX ER422DDX, 722X, 722DDX	.398 (10.11)
		ER431, ER431D, ER431DD ER431TX ER432X, ER432DX, ER432DDX ER432TX	.493 (12.52)
		732X, 732DX, 732TNX	.503 (12.78)

**Notes:**

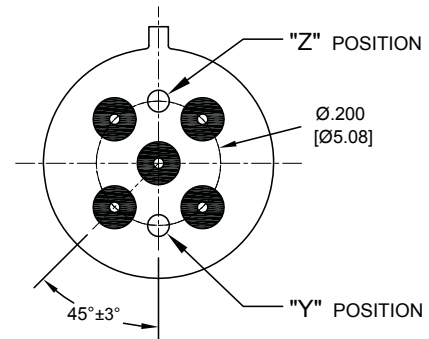
1. Spreader pad material: Diallyl Phthalate.
2. To specify an "M", "M2" or "M3" spreader pad, refer to the mounting variants portion of the part number example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is  $\pm .010$ " (0.25 mm).
- 5/. Add 25 m $\Omega$  to the contact resistance shown in the datasheet.
- 6/. Add .01 oz. (0.25 g) to the weight of the relay assembly shown in the datasheet.
- 7/. Add 50 m $\Omega$  to the contact resistance shown in the datasheet.
- 8/. Add 0.025 oz (0.71 g) to the weight of the relay assembly shown in the datasheet.
- 9/. M3 pad to be used only when the relay has a center pin (e.g. ER411M3-12A, 722XM3-26.)

## APPENDIX: Ground Pin Positions



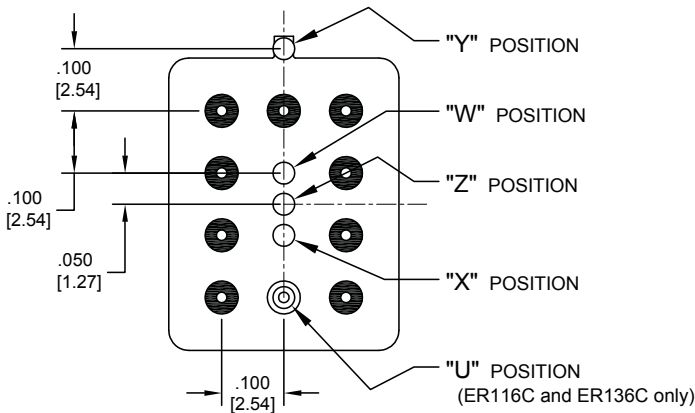
**TO-5 Relays:**

ER411T, ER412, ER412T, ER420, ER421, ER422, ER431T, ER432, ER432T, 712, 712TN, 400H, 400K, 400V, RF300, RF303, RF341, RF312, RF332, RF310, RF313, RF320, RF323, SI800, SI803, RF700, RF703



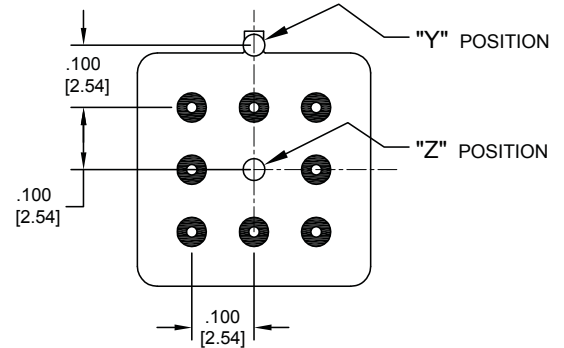
**TO-5 Relays:**

ER411, ER431, RF311, RF331



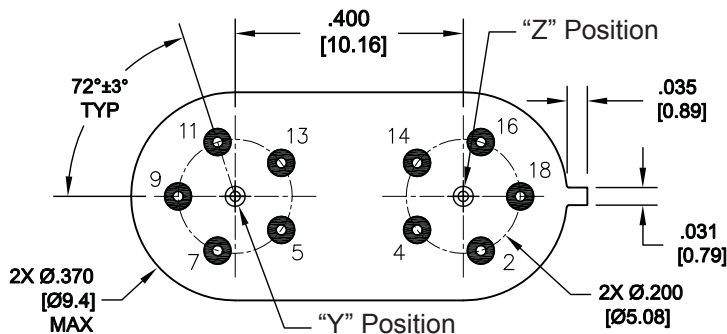
**Centigrid® Relays:**

RF180, ER116C, 122C, ER136C



**Centigrid® Relays:**

RF100, RF103, ER114, ER134, 172



**Loopback Relays:**

LB363

**NOTES**

- Indicates ground pin position
- Indicates glass insulated lead position
- ◎ Indicates ground pin or lead position depending on relay type

1. Terminal views shown
2. Dimensions are in inches (mm)
3. Tolerances: ± .010 (±.25) unless otherwise specified
4. Ground pin positions are within .015 (0.38) dia. of true position
5. Ground pin head dia., 0.035 (0.89) ref: height 0.010 (0.25) ref.
6. Lead dia. 0.017 (0.43) nom.

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