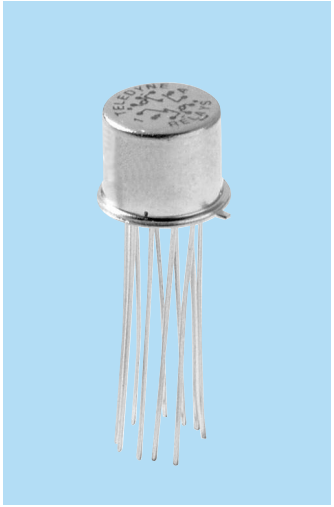


TELEDYNE RELAYS

A Teledyne Technologies Company

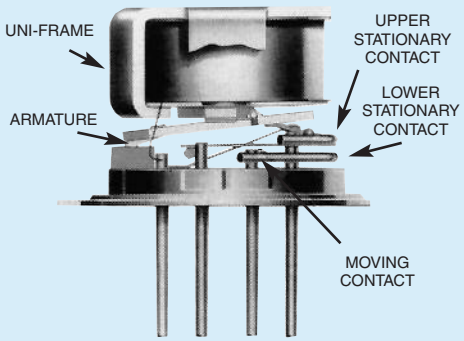
HIGH-VIBRATION, HIGH-PERFORMANCE TO-5 RELAY

DPDT

SERIES 412V 432V

SERIES DESIGNATION	RELAY TYPE
412V	DPDT basic high-vibration relay
412DV	DPDT high-vibration relay with internal diode for coil transient suppression
412DDV	DPDT high-vibration relay with internal diodes for coil transient suppression and polarity reversal protection
432V	DPDT basic high-vibration, sensitive relay
432DV	DPDT high-vibration sensitive relay with internal diode for coil transient suppression

INTERNAL CONSTRUCTION



ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS		
Temperature (Ambient)		–65°C to +125°C
Vibration (General Note 1)		250 g's at 140±5Hz 350 g's at 170±5Hz 380 g's at 200±5Hz
Shock (General Note 1)		150 g's, 11 msec, half-sine
Acceleration		50 g's
Enclosure		Hermetically sealed
Weight	**412V**	0.09 oz. (2.55g) max.
	432V	0.15 oz. (4.26g) max.

DESCRIPTION

The 412V and 432V TO-5 relays, originally conceived and developed by Teledyne, have become the industry standards for low level switching from dry circuit to 1 ampere in high-vibration environments. Designed for high-density PC board mounting, these TO-5 relays are some of the most versatile ultraminiature relay available because of their small size and low coil power dissipation.

The V Series high-vibration relays are designed to withstand vibration levels of 250 to 380 g's at the frequencies noted, when tested on a resonant beam for 10 to 20 seconds, in the axis parallel to contact motion (x-axis), or 100 g's 10-2000 Hz for 20 minutes in the x-axis. A unique magnetic circuit prevents contact opening (chatter) in excess of 10 microseconds under vibration or shock conditions.

Typical applications:

- Avionics aircraft control
- Aircraft control systems
- Transportation systems (rail/truck)

By virtue of their inherently low intercontact capacitance and contact circuit losses, these TO-5 relays have proven to be excellent ultraminiature RF switches for applications with 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 (see Figure 1).

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SERIES 412V/432V
GENERAL ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (Notes 2 & 3)

Contact Arrangement	2 Form C (DPDT)	
Rated Duty	Continuous	
Contact Resistance	0.1 ohm max. before life; 0.2 ohm max. after life at 1A/28Vdc (measured 1/8" from header)	
Contact Load Ratings (DC) (See Fig. 2 for other DC resistive voltage/current ratings)	Resistive: 1 Amp/28Vdc Inductive: 200 mA/28Vdc (320 mH) Lamp: 100 mA/28Vdc Low Level: 10 to 50µA/10 to 50mV	
Contact Load Ratings (AC)	Resistive: 250 mA/115Vac, 60 and 400 Hz (Case not grounded) 100 mA/115Vac, 60 and 400 Hz (Case grounded)	
Contact Life Ratings	10,000,000 cycles (typical) at low level 1,000,000 cycles (typical) at 0.5A/28Vdc resistive 100,000 cycles min. at all other loads specified above	
Contact Overload Rating	2A/28Vdc Resistive (100 cycles min.)	
Contact Carry Rating	Contact factory	
Coil Operating Power	432V: 350 mW typ. @ 25°C	412V: 620 mW typ. @ 25°C
Operate Time	432V: 4.0 msec max.	412V: 3.0 msec max.
Release Time	432V: 3.0 msec max. 412V: 2.0 msec max.	432DV: 4.0 msec max. 412DV, 412DDV: 4.0 msec max.
Contact Bounce	1.5 msec max.	
Intercontact Capacitance	0.4 pf typical	
Insulation Resistance	10,000 megohms min. between mutually isolated terminals	
Dielectric Strength	Atmospheric pressure: 500 Vrms/60Hz	70,000 ft.: 125 Vrms/60Hz
Negative Coil Transient (Vdc max.)	All DV, DDV versions: 1.0 max.	
Diode P.I.V. (Vdc min.)	All DV, DDV versions: 100 min.	

412V SERIES RELAY
DETAILED ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (Note 2)

			BASE PART NUMBERS ➡	**412V-5 412DV-5 412DDV-5**	**412V-6 412DV-6 412DDV-6**	**412V-9 412DV-9 412DDV-9**	**412V-12 412DV-12 412DDV-12**	**412V-18 412DV-18 412DDV-18**	**412V-26 412DV-26 412DDV-26**
Coil Voltage (Vdc)	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
Coil Resistance (Ohms ±10% @25°C)	412V			50	70	155	235	610	1130
	412DV, 412DDV (Note 4)			33	44	125	215	470	1050
Coil Current (mAdc @ 25°C) (Note 5)	412DDV	Min.		92.8	90.4	54.3	37.8	31.3	21.3
		Max.		126.4	122.6	73.4	59.4	42.0	28.3
Pick-up Voltage (Vdc, Max				4.6	5.5	8.2	11.0	16.5	22.0
Drop-out Voltage (Vdc)	412V 412DV	Min.		0.14	0.18	0.35	0.41	0.59	0.89
		Max.		2.3	3.2	4.9	6.5	10.0	13.0
	412DDV	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

432V SERIES RELAY
DETAILED ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (Note 2)

		BASE PART NUMBERS ➡	**432V-5 432DV-5**	**432V-6 432DV-6**	**432V-9 432DV-9**	**432V-12 432DV-12**	**432V-18 432DV-18**	**432V-26 432DV-26**
Coil Voltage (Vdc)	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
Coil Resistance (Ohms ±10% @25°C)			80	120	240	480	950	1900
Pick-up Voltage (Vdc, max.)			4.6	5.5	8.2	11.0	16.5	22.0
Drop-out Voltage (Vdc)	Min.		0.14	0.18	0.35	0.41	0.59	0.89
	Max.		2.5	3.2	4.9	6.5	10.0	13.0

PERFORMANCE CURVES (NOTE 2)

TYPICAL RF PERFORMANCE

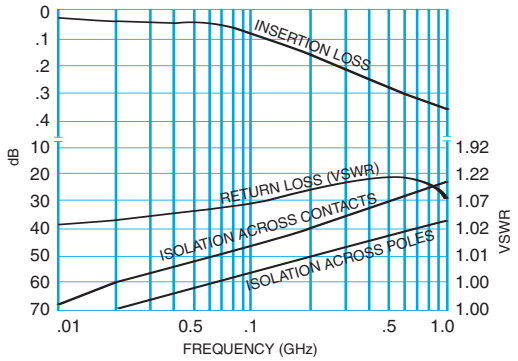


FIGURE 1

TYPICAL DC CONTACT RATING (RESISTIVE)

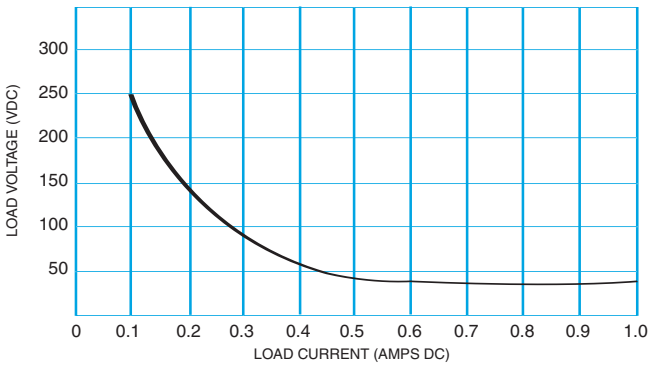
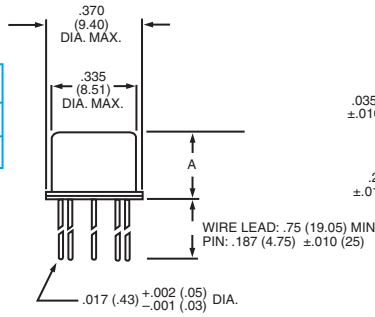


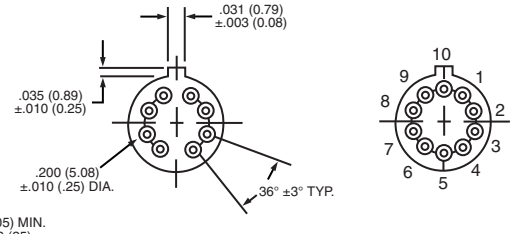
FIGURE 2

OUTLINE DIMENSIONS

DIMENSION "A" MAX.	
412V	.270 (6.86)
432V	.375 (9.52)

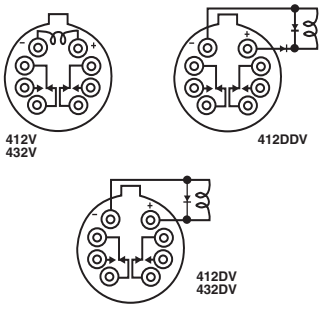


TERMINAL LOCATIONS AND PIN NUMBERS (REF. ONLY)
(Viewed from Terminals)



DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS)

SCHEMATIC DIAGRAMS



SCHEMATICS ARE VIEWED FROM TERMINALS

GENERAL NOTES

1. Relay contacts will exhibit no chatter in excess of 10 µsec or transfer in excess of 1 µsec.
2. "Typical" characteristics are based on available data and are best estimates. No on-going verification tests are performed.
3. Unless otherwise specified, parameters are initial values.
4. For reference only. Coil resistance not directly measurable at relay terminals due to internal series diode. 412DDV only.
5. Measured at nominal voltage for 5 sec. maximum.

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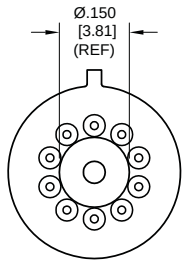
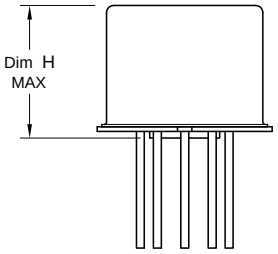
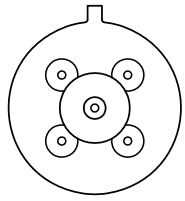
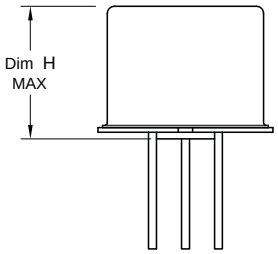
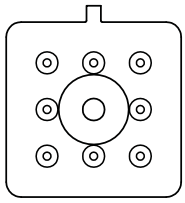
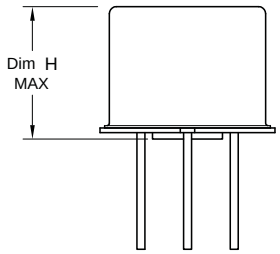
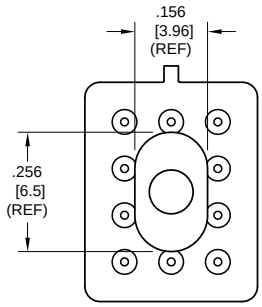
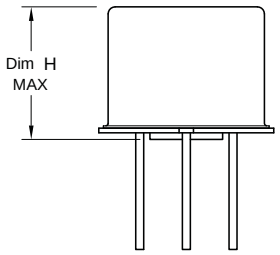
412V/422V/1205/Q1

Appendix A: Spacer Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 "M4" Pad for TO-5		ER411T ER412, ER412D, ER412DD	.295 (7.49)
		712, 712D, 712TN, RF300, RF310, RF320	.300 (7.62)
		ER420, ER422D, 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	.350 (8.89)
 "M4" Pad for TO-5		ER411, ER411D, ER411DD	.295 (7.49)
		ER431, ER431D, ER431DD	.400 (10.16)
		RF311	.300 (7.62)
		RF331	.410 (10.41)
 "M4" Pad for Centigrid®		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)
 "M9" Pad for Centigrid®		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 ± .010 (.25).
5. Add 10 mΩ to the contact resistance show in the datasheet.
6. Add 0.01 oz. (0.25 g) to the weight of the relay assembly shown in the datasheet.

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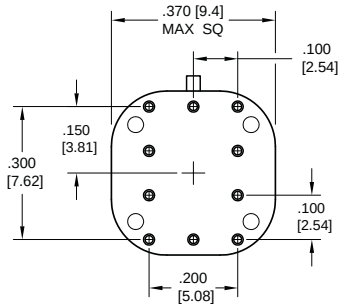
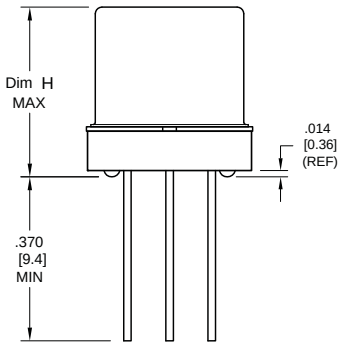
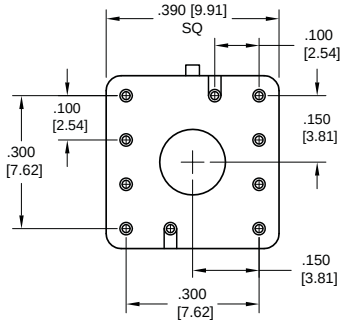
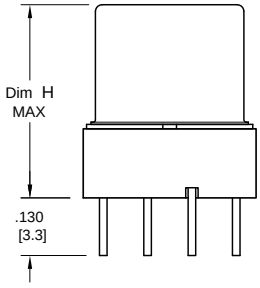
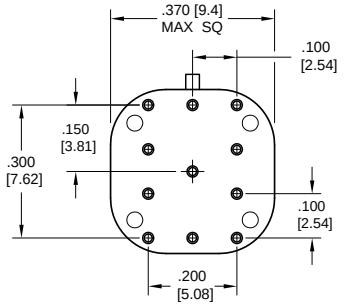
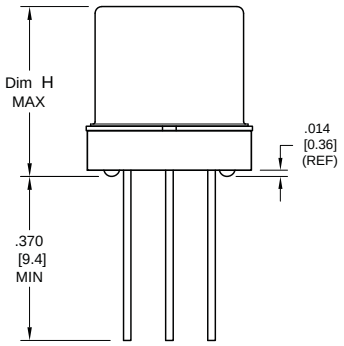
Appendix A: Spreader Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 "M" Pad 5/ 6/		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)
 "M2" Pad 7/ 8/		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)
		732, 732D	.556 (14.12)
 "M3" Pad 5/ 6/ 9/		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 ± .010" (0.25).

5/. Add 25 mΩ 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 mΩ 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.)

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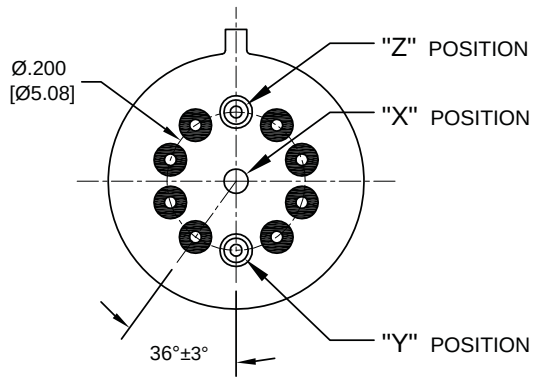
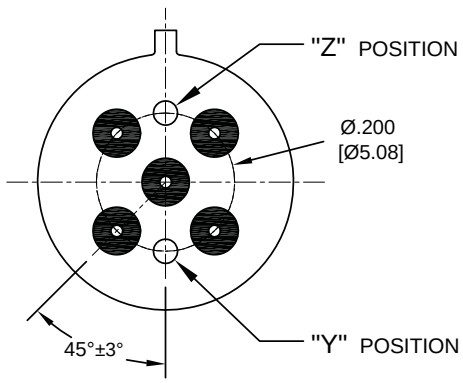
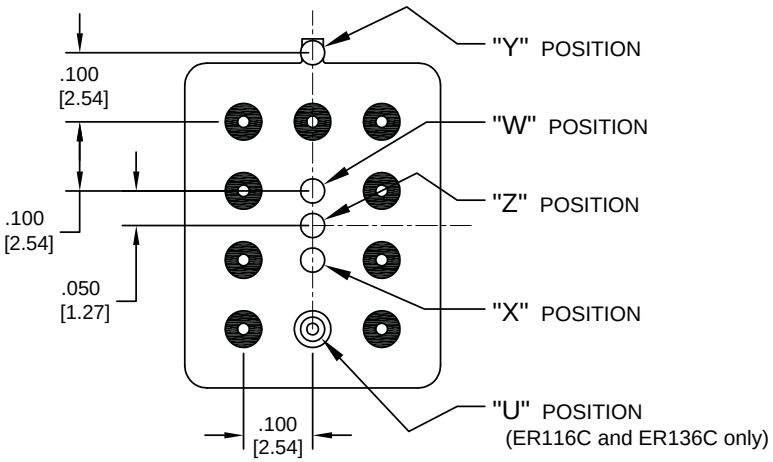
Appendix A: Ground Pin Positions



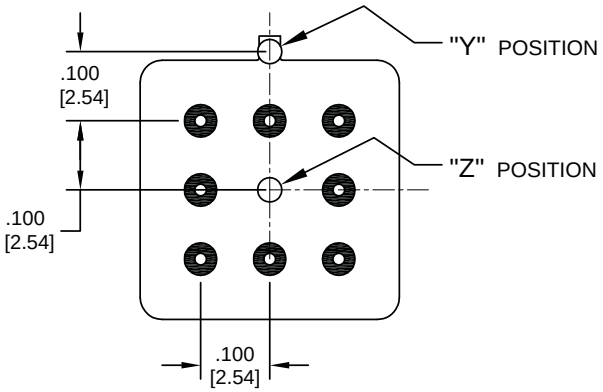
TO-5 Relays:
ER411T, ER412, ER412T, ER420, ER421, ER422, ER431T, ER432, ER432T, 712, 712TN, 400H, 400K, 400V, RF300, RF303, RF341, RF312, RF310, RF313, RF320, RF323



TO-5 Relays:
ER411, ER431, RF311, RF331



Centigrid® Relays:
RF180, ER116C, 122C, ER136C



Centigrid® Relays:
RF100, RF103, ER114, ER134, 172

○ Indicates ground pin position

● Indicates glass insulated lead position

◎ Indicates ground pin or lead position depending on relay type

NOTES
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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