

A Unit of Teledyne Electronics and Communications

# CENTIGRID® MAGNETIC-LATCHING COMMERCIAL RELAYS DPDT CMOS COMPATIBLE

## SERIES 122C

SERIES DESIGNATION	RELAY TYPE
122C	DPDT general-purpose magnetic-latching relay with internal power MOSFET driver and diode coil transient suppression

### DESCRIPTION

The 122C Centigrad® magnetic-latching relay is an ultraminiature, hermetically sealed, armature relay capable of being directly driven by most IC logic families. Its low profile height and .100" grid spaced terminals, which precludes the need for spreader pads, make it ideal for applications where extreme packaging density and/or close PC board spacing are required.

The basic operating function and internal structure are similar to Teledyne's TO-5, 422 relay series. The 122C is capable of meeting Teledyne Relays' T²R® requirements. The following unique construction features and manufacturing techniques provide overall high reliability and excellent resistance to environmental extremes:

- All welded construction.
- Unique uni-frame design providing high magnetic efficiency and mechanical rigidity.
- High force/mass ratios to withstand 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 122C relay has internal silicon diodes for coil suppression, Zener diodes to protect the MOSFET gate inputs, and N-channel enhancement-mode MOSFET chips, which enable direct relay interfacing with most microprocessor and IC logic families (CMOS, TTL and MOS).

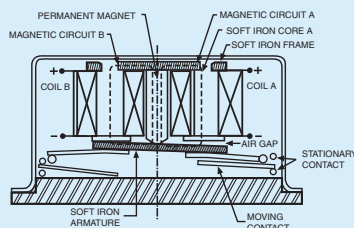
The 122C magnetic-latching relay is ideally suited for applications where coil operating power must be minimized. The relays can be operated with a short-duration pulse. After the contacts have transferred, no external coil power is required.

The magnetic-latching feature of the Series 122C relay provides a "memory" capability, since the relays will not reset upon removal of coil power.

By virtue of its inherently low intercontact capacitance and contact circuit losses, the 122C relay has proven to be an excellent ultraminiature RF switch for frequency ranges well into the UHF spectrum. A typical RF application for this Centigrad® 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).

### PRINCIPLE OF OPERATION

Energizing Coil B produces a magnetic field opposing the holding flux of the permanent magnet in Circuit B. As this net holding force decreases, the attractive force in the air gap of Circuit A, which also results from the flux of the permanent magnet, becomes great enough to break the armature free of Core B, and snap it into a closed position against Core A. The armature then remains in this position upon removal of energy from Coil B, but will snap back to position B upon energizing Coil A. Since operation depends upon cancellation of a magnetic field, it is necessary to apply the correct polarity to the relay coils as indicated on the relay schematic. When latching relays are installed in equipment, the latch and reset coils should not be pulsed simultaneously. Coils should not be pulsed with less than rated coil voltage and the pulse width should be a minimum of three times the specified operate time of the relay. If these conditions are not followed, it is possible for the relay to be in the magnetically neutral position.



### ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS

Temperature (Ambient)	Storage	-65°C to +125°C
	Operating	-55°C to +85°C
Vibration (General Note 1)		30 g's to 3000 Hz
Shock (General Note 1)		100 g's, 6 msec, half-sine
Acceleration		50 g's
Enclosure		Hermetically sealed
Weight		0.10 oz. (2.75g) max.

# SERIES 122C

## GENERAL ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (Notes 2 & 3)

<b>Contact Arrangement</b>		2 Form C (DPDT)
<b>Rated Duty</b>		Continuous
<b>Contact Resistance</b>		0.125 ohm max. before life; 0.225 ohm max. after life at 1A/28Vdc (measured 1/8" from header)
<b>Contact Load Ratings (DC)</b> (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 50 $\mu$ A/10 to 50mV
<b>Contact Load Ratings (AC)</b>		Resistive: 250 mA/115Vac, 60 and 400 Hz (Case not grounded) 100 mA/115Vac, 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 0.5A/28Vdc resistive 100,000 cycles min. at all other loads specified above
<b>Contact Overload Rating</b>		2A/28Vdc Resistive (100 cycles min.)
<b>Contact Carry Rating</b>		Contact factory
<b>Operate Time</b>		1.5 msec max. at nominal rated coil voltage @ 25°C
<b>Contact Bounce</b>		2.0 msec max.
<b>Minimum Operate Pulse</b>		4.5 msec width @ rated voltage
<b>Intercontact Capacitance</b>		0.4 pf typical
<b>Insulation Resistance (Note 4)</b>		10,000 megohms min. between mutually isolated terminals
<b>Dielectric Strength (Note 4)</b>		Atmospheric pressure: 500 Vrms/60Hz 70,000 ft.: 125 Vrms/60Hz
<b>Negative Coil Transient (Vdc)</b>		1.0 max.
<b>Diode P.I.V. (Vdc)</b>		100 min.
<b>Zener Voltage (Vdc)</b>		17 min. to 23 max.
<b>Zener Leakage Current @ 15.2 Vdc (<math>\mu</math>A)</b>		2.5 max.
<b>Power FET Characteristics</b> –65°C to +125°C	<b>Gate Voltage to Turn Off (Vdc)</b>	0.5 max.
	<b>Gate Voltage to Turn On (Vdc)</b>	3.8 min (Note 8)
	<b>Drain-Source (Vdc)</b>	55 max.

BASE PART NUMBERS (See Notes 3, 10)			122C-5	122C-6	122C-9	122C-12	122C-18	122C-26
<b>Coil Voltage (Vdc)</b>	Nom.		5.0	6.0	9.0	12.0	18.0	26.5
	Max.		5.6	8.0	12.0	16.0	24.0	32.0
<b>Coil Current (mAdc @ 25°C) (Note 9)</b>	Max.		114.9	57.0	37.2	27.8	18.2	15.2
	Min.		82.2	41.6	27.4	20.5	13.7	11.4
<b>Coil Operating Power @ 25°C and Rated Voltage (mW)</b>	Nom.		505	296	288	287	286	351
<b>Latch and Reset Voltage (Vdc)</b>	Max.		3.5	4.5	6.8	9.0	13.5	18.0

## PERFORMANCE CURVES (NOTE 2)

TYPICAL RF PERFORMANCE

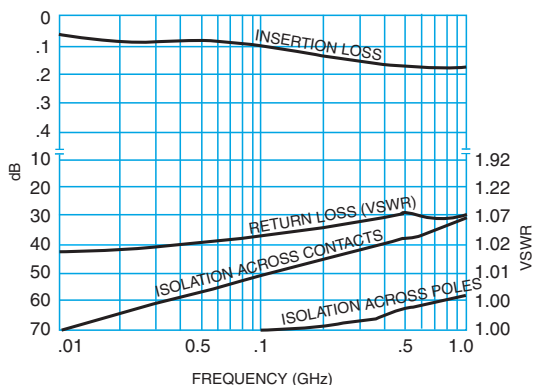


FIGURE 1

TYPICAL DC CONTACT RATING (RESISTIVE)

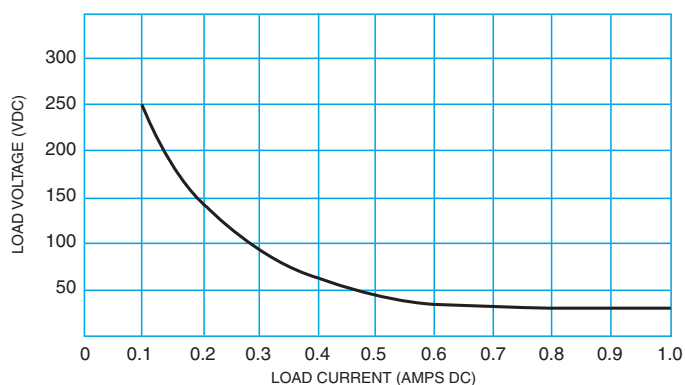
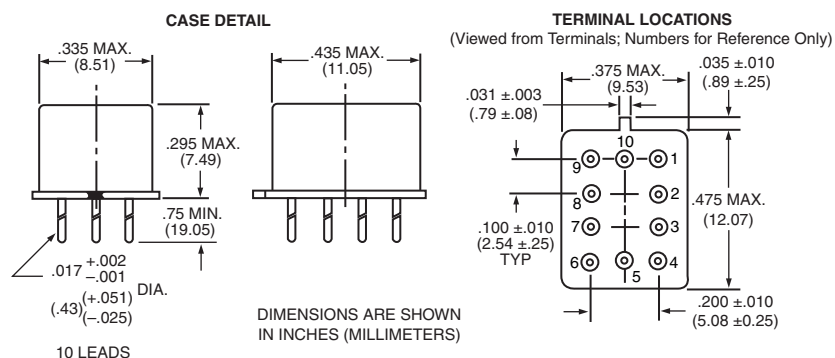
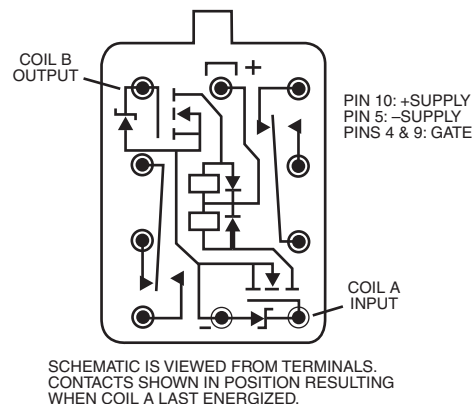


FIGURE 2

## OUTLINE DIMENSIONS



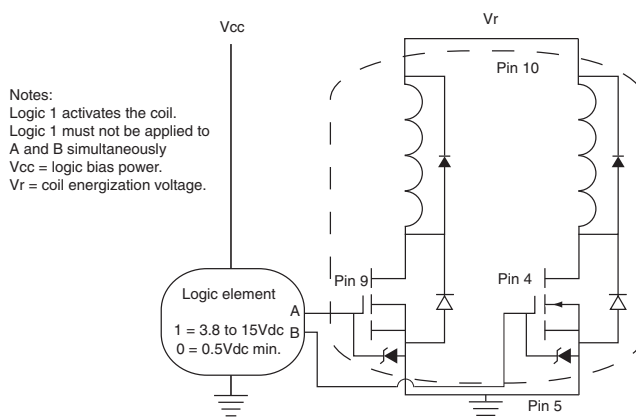
## SCHEMATIC DIAGRAMS



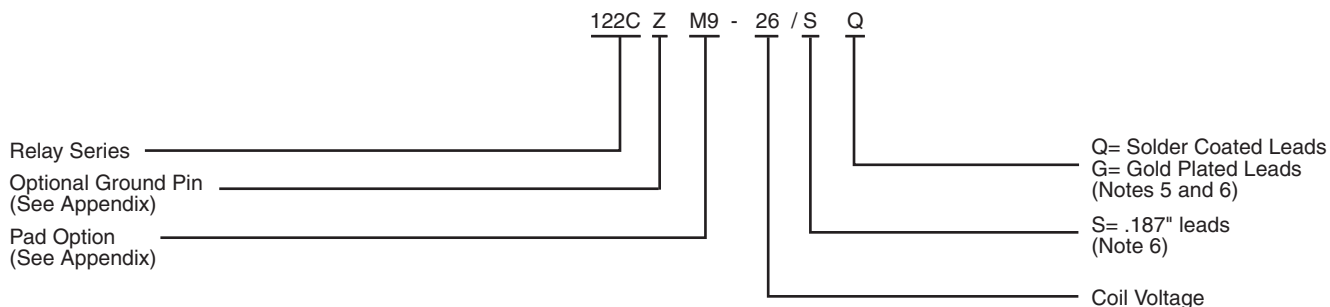
## GENERAL NOTES

- Relay contacts will exhibit no chatter in excess of 10  $\mu$ sec or transfer in excess of 1  $\mu$ sec.
- "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.
- Pins 4, 5 and 9 must be shorted when tested for Insulation Resistance and Dielectric Withstanding Voltage.
- Unless otherwise specified, relays will be supplied with either gold-plated or solder-coated leads.
- The slash and characters appearing after the slash are not marked on the relay.
- Screened HI-REL versions available. Contact factory.
- Maximum rated gate voltage = 15 VDC.
- Measured for 5 sec max. Includes allowance for "on" resistance of MOSFET.
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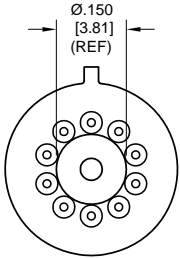
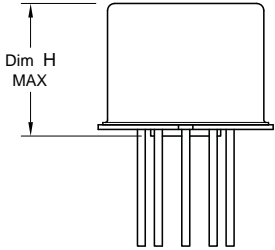
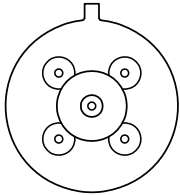
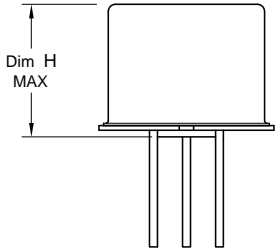
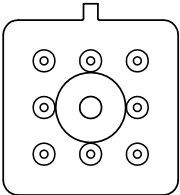
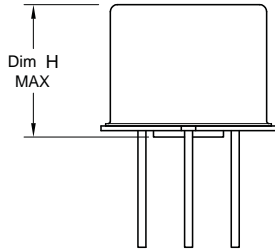
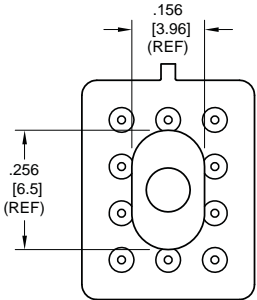
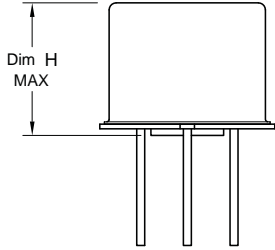
## TYPICAL CMOS INTERFACE CIRCUIT



## Teledyne Part Numbering System for Relays



# Appendix A: Spacer Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
 <p>“M4” Pad for TO-5</p>		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)
 <p>“M4” Pad for TO-5</p>		ER411, ER411D, ER411DD	.295 (7.49)
		ER431, ER431D, ER431DD	.400 (10.16)
		RF311	.300 (7.62)
		RF331	.410 (10.41)
 <p>“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>“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).
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.

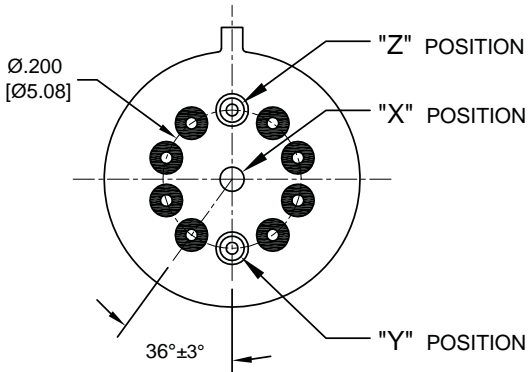
# Appendix A: Spreader Pads

Pad designation and bottom view dimensions	Height	For use with the following:	Dim. H Max.
<p>“M” Pad <u>5/</u> <u>6/</u></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>“M4” Pad <u>7/</u> <u>8/</u></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)
		732, 732D	.556 (14.12)
<p>“M5” Pad <u>5/</u> <u>6/</u> <u>9/</u></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:

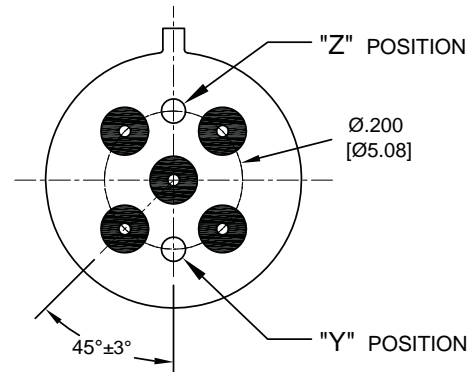
1. Spreader pad material: Diallyl Phthalate.
2. To specify an “M”, “M2” or “M3” spreader pad, refer to the mounting variants portion of the part number example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is  $\pm .010$ ” (0.25).
- 5/. Add 25 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.)

# Appendix A: Ground Pin Positions



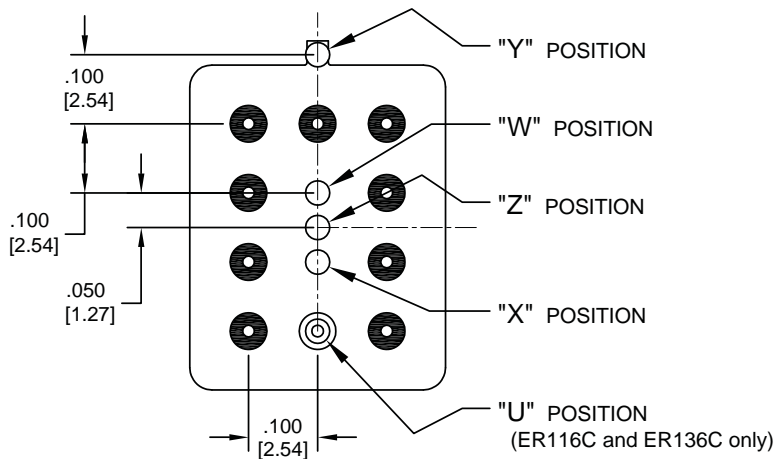
## TO-5 Relays:

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



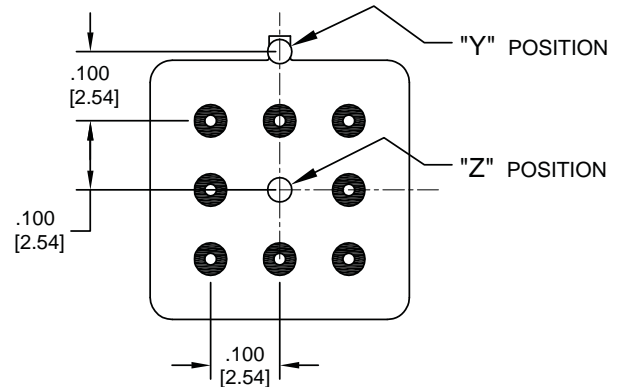
## TO-5 Relays:

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:  $\pm .010$  ( $\pm .25$ ) 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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