

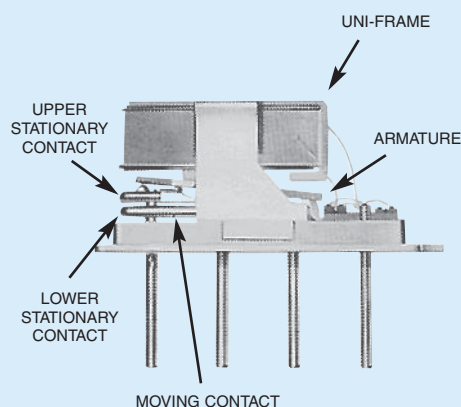
*A Unit of Teledyne Electronics and Communications*

# **CENTIGRID® ESTABLISHED RELIABILITY RELAY DPDT CMOS COMPATIBLE**

# **SERIES 116C**

SERIES DESIGNATION	RELAY TYPE
116C	DPDT general-purpose relay with internal power MOSFET driver, Zener diode gate protection, and diode coil suppression

## INTERNAL CONSTRUCTION



## DESCRIPTION

The 116C Centigrd® 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 preclude the need for spreader pads, make it ideal for applications where extreme packaging density and/or close PC board spacing are required.

The basic concept and internal mechanical structure are similar to the 114 DPDT relay. 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 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.

By virtue of its inherently low intercontact capacitance and contact circuit losses, the 116C relay has proven to be an excellent ultraminiature RF switch for frequency ranges well into the UHF spectrum. A typical RF application for this Centigrd® 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).

The Series 116C utilizes an internal silicon diode for coil suppression, a Zener diode to protect the MOSFET gate input, and an N-channel enhancement mode MOSFET chip, which enables direct relay interfacing with most Microprocessor and IC logic families (CMOS, TTL and MOS).

## ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS

<b>Temperature</b> (Ambient)	–65°C to +125°C
<b>Vibration</b> (General Note 1)	30 g's to 3000 Hz
<b>Shock</b> (General Note 1)	75 g's, 6 msec, half-sine
<b>Acceleration</b>	50 g's
<b>Enclosure</b>	Hermetically sealed
<b>Weight</b>	0.11 oz. (3.12g) max.

# SERIES 116C

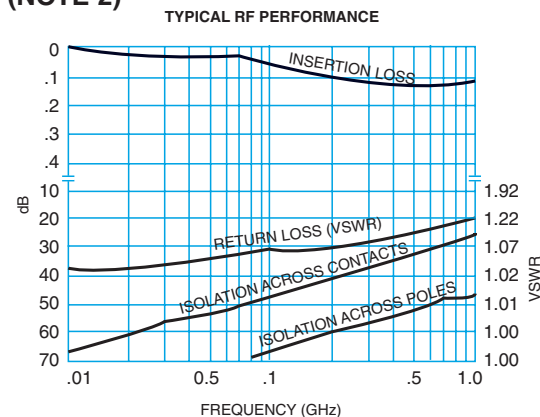
## GENERAL ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (Notes 2 & 3)

<b>Contact Arrangement</b>	2 Form C (DPDT)	
<b>Rated Duty</b>	Continuous	
<b>Contact Resistance</b>	0.1 ohm max. before life; 0.2 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>	2.5 msec max. at nominal rated coil voltage	
<b>Release Time</b>	4.0 msec max.	
<b>Contact Bounce</b>	1.5 msec max.	
<b>Intercontact Capacitance</b>	0.4 pf typical	
<b>Insulation Resistance</b>	10,000 megohms min. between mutually isolated terminals	
<b>Dielectric Strength</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 (<math>\mu</math>A @ 15.2 Vdc)</b>		2.5 max
<b>Power FET Characteristics</b> –65°C to +125°C	<b>Gate Voltage to Turn Off (Vdc, Max.)</b>	0.5
	<b>Gate Voltage to Turn On (Vdc, Max.)</b>	3.8 (Note 4)
	<b>Drain-Source Voltage (Vdc, Max.)</b>	55

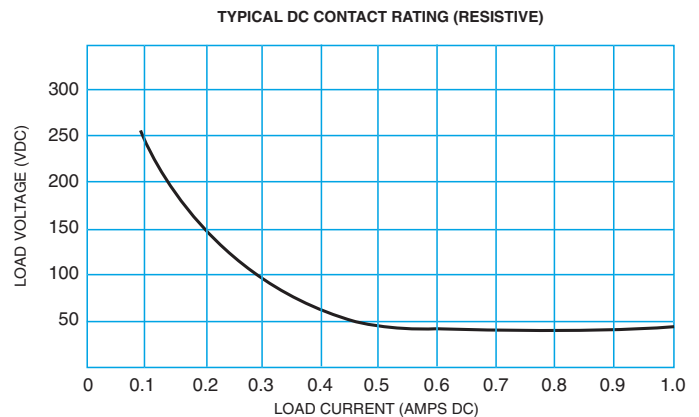
## DETAILED ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (Note 3)

BASE PART NUMBERS (See Note 8 for full P/N example)		116C-5	116C-6	116C-9	116C-12	116C-18	116C-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)</b>	Max.	132.3	83.9	47.1	36.1	24.1	19.9
	Min.	96.5	60.3	33.1	24.9	16.1	12.9
<b>Nominal Coil Operating Power @ 25°C (Milliwatts)</b>		641	462	368	369	368	450
<b>Pick-up Voltage (Vdc) (Note 4)</b>	Max.	4.0	4.9	7.3	9.8	14.6	19.5
<b>Drop-out Voltage (Vdc) (Note 4)</b>	Min.	0.13	0.18	0.27	0.36	0.54	0.72
	Max.	2.3	3.2	4.9	6.5	9.8	13.0

## PERFORMANCE CURVES (NOTE 2)

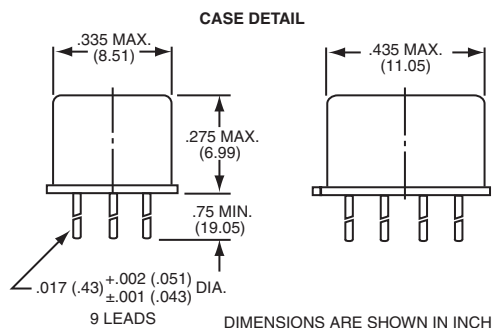


**FIGURE 1**



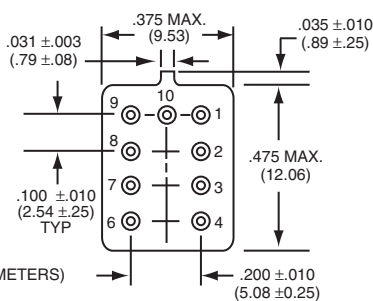
**FIGURE 2**

## OUTLINE DIMENSIONS

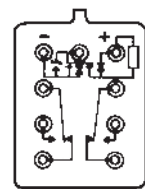


## TERMINAL LOCATIONS

(Viewed from Terminals; Numbers for Reference Only)



## SCHEMATIC DIAGRAM



PIN 1: + SUPPLY  
PIN 9: - SUPPLY  
PIN 10: GATE

SCHEMATIC IS VIEWED FROM TERMINALS

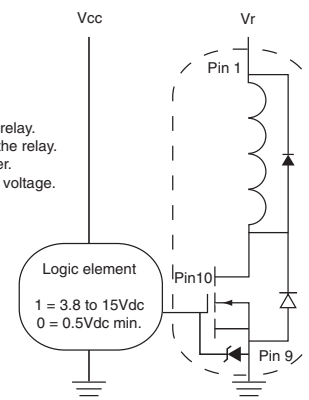
## GENERAL NOTES

- 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.
- Maximum rated gate voltage = 15 Vdc.
- Unless otherwise specified, relays will be supplied with either gold plated or solder coated leads.
- The slash and character appearing after the slash are not marked on the relay.
- Screened HI-REL versions available. Contact factory.
- 

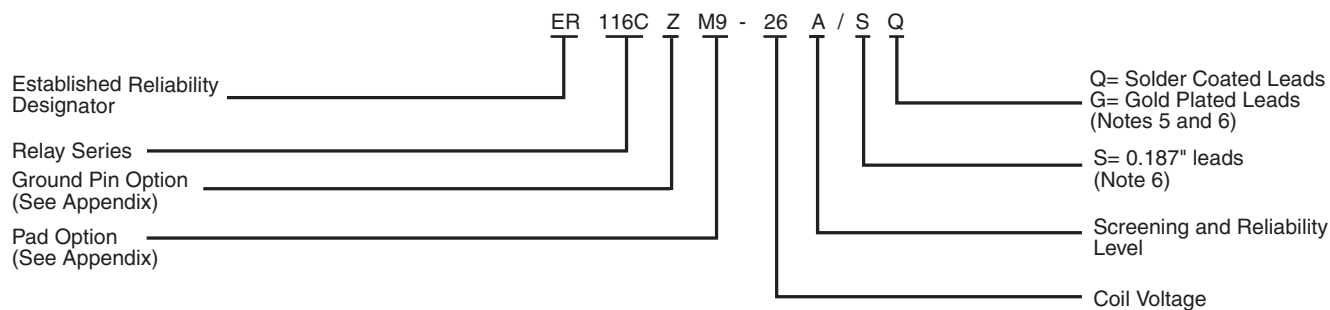
## TYPICAL CMOS INTERFACE CIRCUIT

DC Logic Voltage Supply

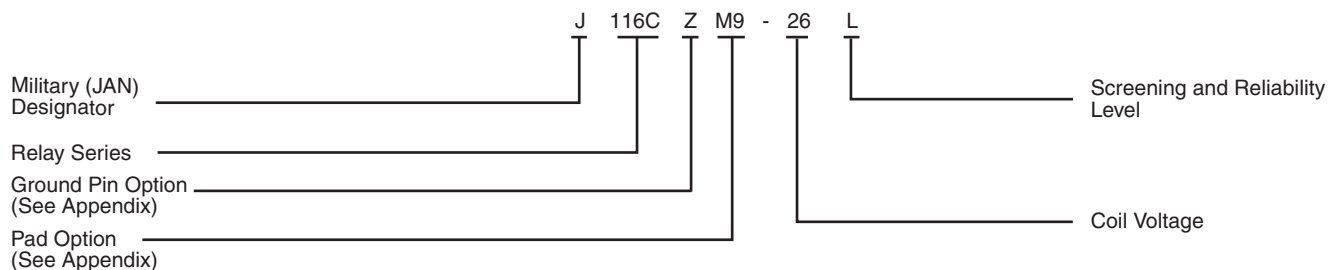
Notes:  
Logic 1 activates the relay.  
Logic 0 de-activates the relay.  
Vcc = logic bias power.  
Vr = coil energization voltage.



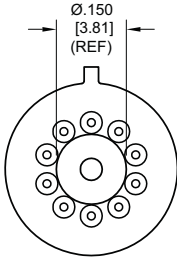
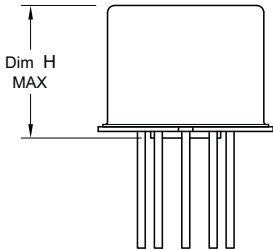
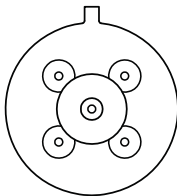
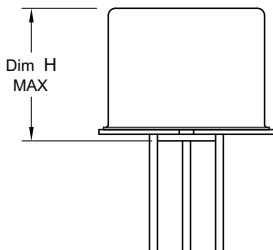
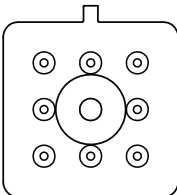
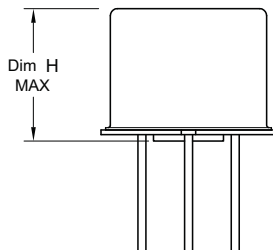
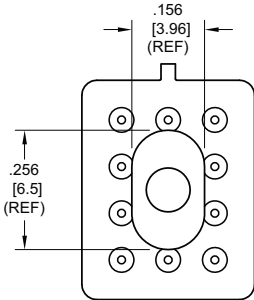
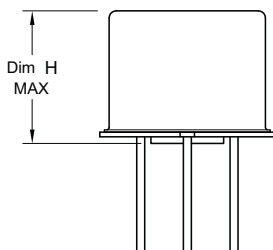
## Teledyne Part Numbering System for $T^2R^{\circledast}$ Established Reliability Relay



## Teledyne Part Numbering System for Military Qualified (JAN) 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 m $\Omega$  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.

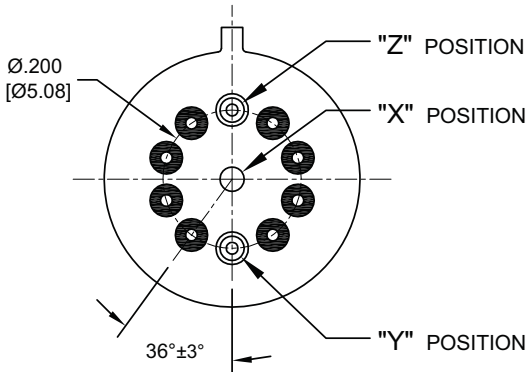
# Appendix A: Spreader Pads

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>“M2” 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>“M3” 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:

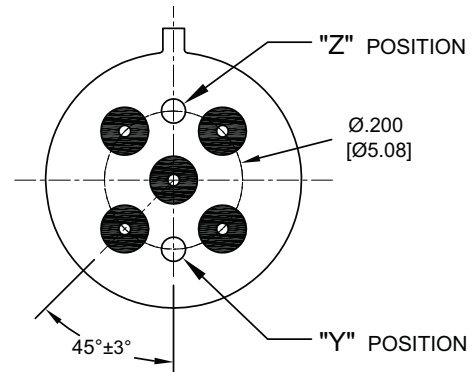
1. Spreader pad material: Diallyl Phthalate.
2. To specify an “M”, “M2” or “M3” spreader pad, refer to the mounting variants portion of the part number example in the applicable datasheet.
3. Dimensions are in inches (mm).
4. Unless otherwise specified, tolerance is  $\pm .010$ ” (0.25).
- 5/. Add 25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



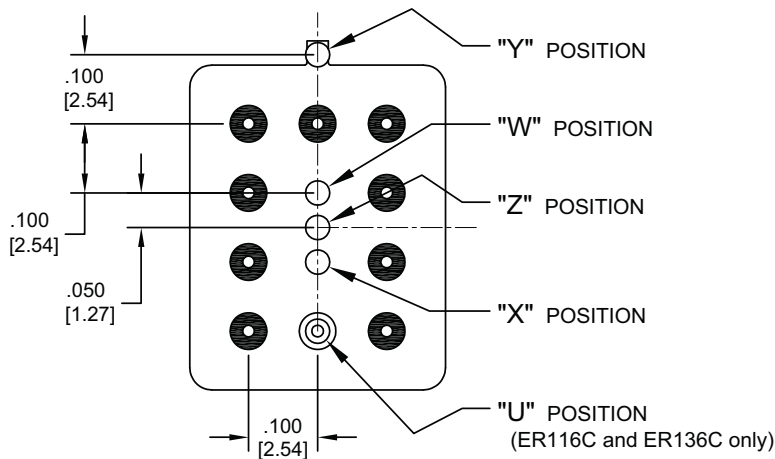
## TO-5 Relays:

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



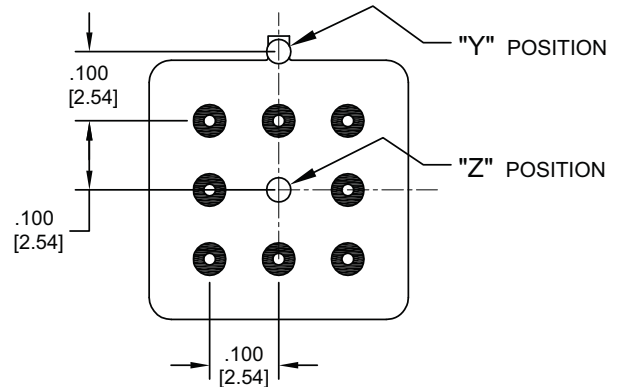
## TO-5 Relays:

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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## Teledyne Relays:

[J116C-5M](#) [J116CM9-12M](#) [J116CM9-5M](#) [J116C-18M](#) [J116CM9-26M](#) [J116CM9-5L](#)