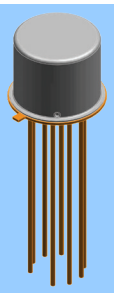
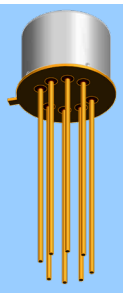
TELEDYNE RELAYS
Everywhereyoulook™

Series RF300/RF303

DPDT Non-Latching Electromechanical Relay
Signal Integrity up to 18Gbps



HIGH REPEATABILITY, BROADBAND TO-5 RELAYS DPDT



SERIES	RELAY TYPE
RF300	Repeatable, RF relay
RF300D	Repeatable, RF relay with internal diode for coil transient suppression
RF300DD	Repeatable, RF relay with internal diodes for coil transient suppression and polarity reversal protection
RF303	Sensitive, repeatable, RF relay
RF303D	Sensitive, repeatable, RF relay with internal diode for coil transient suppression
RF303DD	Sensitive, repeatable, RF relay with internal diodes for coil transient suppression and polarity

DESCRIPTION

The ultraminiature RF300and RF303 relays are designed to provide improved RF signal switching repeatability over the frequency range. These relays are engineered for use in RF attenuator, RF switch matrices, ATE and other applications that require dependable high frequency signal fidelity and performance.

The RF300 and RF303 features:

- High repeatability
- Broader bandwidth
- Metal enclosure for EMI shielding
- High isolation between control and signal paths
- High resistance to ESD

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

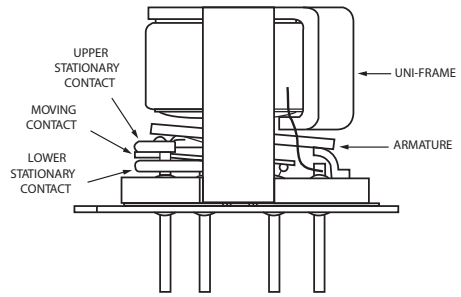
- Uniframe motor design provides high magnetic efficiency and mechanical rigidity
- Minimum mass components and welded construction provide maximum resistance to shock and vibration
- Advanced cleaning techniques provide maximum assurance of internal cleanliness
- Hermetically sealed
- Solder Dipped Leads, (RoHS compliant solder option available)

The Series RF300D/RF303D and RF300DD/RF303DD relays have internal discrete silicon diodes for coil suppression and polarity reversal protection. This hybrid package reduces required PC board floor space by reducing the number of external components needed to drive the relay.

ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS

Temperature (Ambient)	**Storage**	–65°C to +125°C
	Operating	–55°C to +85°C
Vibration (Note 1)		10 g's to 500 Hz
Shock (Note 1)		30 g's, 6ms half sine
Enclosure		Hermetically sealed
Weight	**RF300**	0.09 oz. (2.55g) max.
	RF303	0.16 oz. (4.5g) max.

INTERNAL CONSTRUCTION



GENERAL ELECTRICAL SPECIFICATIONS (@25°C)

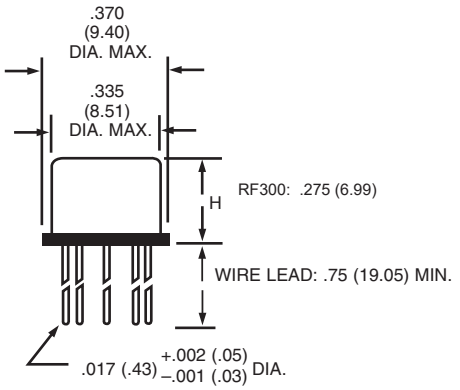
Contact Arrangement	2 Form C (DPDT)	
Rated Duty	Continuous	
Contact Resistance	0.15 Ω max.	
Contact Load Rating	Resistive: 1Amp/28Vdc Low level: 10 to 50 µA @ 10 to 50 mV	
Contact Life Ratings	10,000,000 cycles (typical) at low level	
Coil Operating Power	RF300-5: 500 mW @ nominal coil	RF300-12: 370 mW @ nominal coil
	RF303-5: 250 mW @ nominal coil	RF303-12: 169 mW @ nominal coil
Operate Time	RF300: 4.0 ms max.	
	RF303: 6.0 ms max.	
Release Time	RF300: 3.0 mS max.	RF300D, RF300DD: 4.0 ms max.
	RF303: 3.0 ms	RF303D, RF303DD: 7.5 ms max.
Intercontact Capacitance	0.4 pf typical	
Insulation Resistance	1,000 MΩ min. between mutually isolated terminals	
Dielectric Strength	350 Vrms (60 Hz) @ atmospheric pressure	
Negative Coil Transient (Vdc)	RF300D/RF303D,RF300DD/RF303DD	1.0 max
Diode P.I.V. (Vdc)	RF300D/RF303D,RF300DD/RF303DD	100 min.

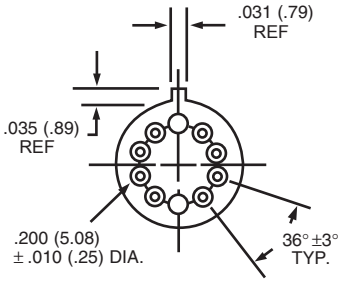
DETAILED ELECTRICAL SPECIFICATIONS (@25°C)

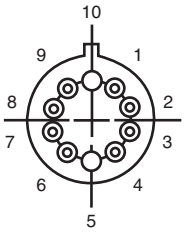
BASE PART NUMBERS (RF300, RF300D, RF300DD)		**RF300-5 RF300D-5 RF300DD-5**	**RF300-12 RF300D-12 RF300DD-12**
Coil Voltage, Nominal (Vdc)		5.0	12.0
Coil Resistance (Ohms ±20%)	**RF300, RF300D**	50	390
	RF300DD (Note 2)	39	390
Coil Current (mAdc@ 25 °C) (RF300DD Series)	**Min.**	93.2	25.6
	Max.	128.2	32.8
Pick-up Voltage (Vdc max.)	**RF300, RF300D,**	3.6	9.0
	RF300DD	3.9	10.0

BASE PART NUMBERS (RF303, RF303D, RF303DD)		**RF303-5 RF303D-5 RF303DD-5**	**RF303-12 RF303D-12 RF303DD-12**
Coil Voltage, Nominal (Vdc)		5.0	12.0
Coil Resistance (Ohms ±20%)	**RF303, RF303D**	100	850
	RF303DD (Note 2)	64	850
Coil Current (mAdc@ 25 °C) (RF303DD Series)	**Min.**	56.8	11.7
	Max.	78.1	15.0
Pick-up Voltage (Vdc max.)	**RF303, RF303D,**	3.6	9.0
	RF303DD	3.7	11.0

OUTLINE DIMENSIONS

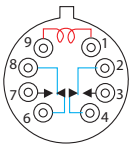






DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS)
(Viewed from Terminals)

SCHEMATIC DIAGRAMS



RF300

NOTES:

1. **DIMENSIONS ARE IN INCHES, METRIC EQUIVALENTS SHOWN IN ( ).**
2. **POSTITIONS 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.**

Part Numbering System (Notes 3 & 4)

RF300 YZ - 5 / S R

Relay Series

Ground Pin Option
(See Appendix A)

Nominal Coil Voltage
5 = 5V
12 = 12V

Q = Solder-Coated Leads (Sn60/Pb40)
R = RoHS Compliant Solder (Sn99.3/Cu0.7)
No Sufix = Gold-plated Leads

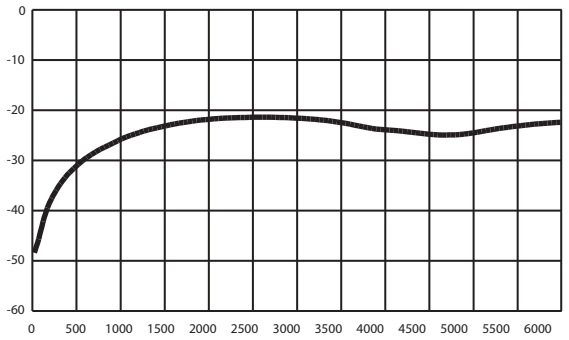
S = 0.187" Leads
No Suffix = 0.75" Leads

GENERAL NOTES

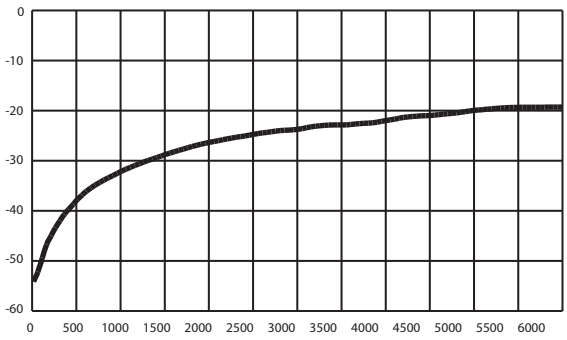
1. Relays will exhibit no contact chatter in excess of 10 µsec or transfer in excess of 1 µsec.
2. For reference only. Coil resistance not directly measureable at relay terminals due to internal series diode.
3. The slash and characters appearing after the slash are not marked on the relay.
4. Unless otherwise specified, relays will be supplied with either gold-plated leads.

TYPICAL RF CHARACTERISTICS (See RF Notes)

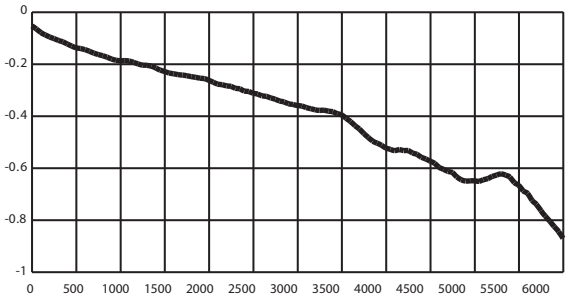
Isolation Across Contacts (RF Note 4)



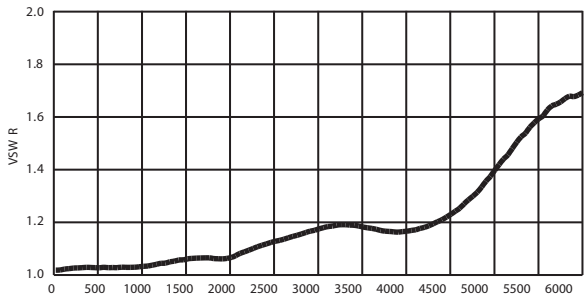
Isolation Pole to Pole (RF Note 5)



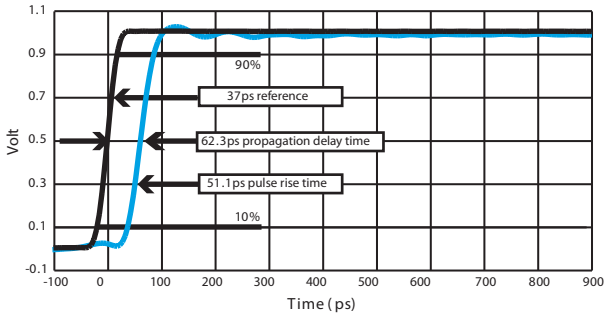
Insertion Loss (RF Note 6)



VSWR (RF Note 6)



RF300 Time Response (RF Note 6)



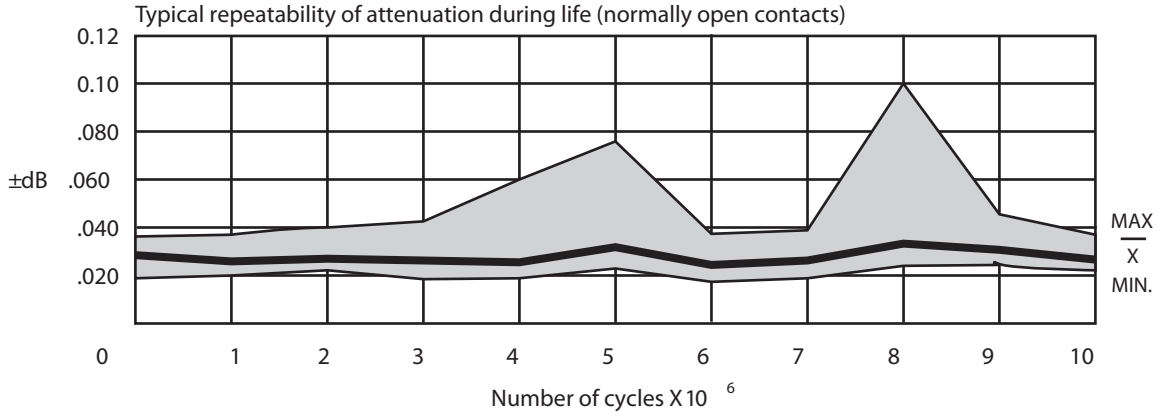
RF NOTES

1. Test conditions:
   - *a.* Fixture: .031" copper clad, reinforced PTFE, RT/duroid® 6002 with SMA connectors. (RT/duroid® is a registered trademark of Rogers Corporation.)
   - *b.* Room ambient temperature.
   - *c.* Terminals not tested were terminated with 50-ohm load.
   - *d.* Contact signal level: –10 dBm.
   - *e.* No. of test samples: 4.
2. Data presented herein represents typical characteristics and is not intended for use as specification limits.
3. Data is per pole, except for pole-to-pole data.
4. Data is the average from readings taken on all open contacts.
5. Data is the average from readings taken on poles with coil energized and de-energized.
6. Data is the average from readings taken on all closed contacts.
7. Test fixture effect de-embedded from frequency and time response data.

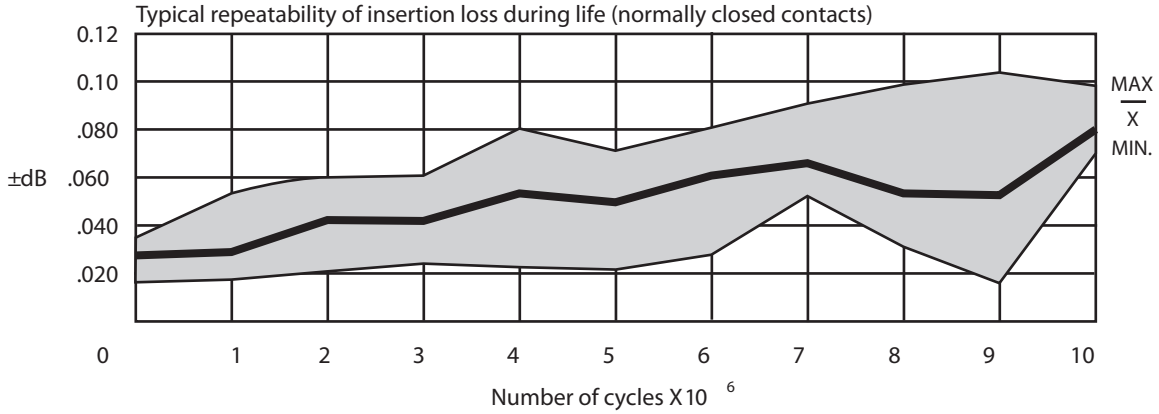
TYPICAL RF REPEATABILITY PERFORMANCE (See RF Notes 1, 2, and 3)

1 Million Cycle Repeatability **±0.1 dB from DC to 3GHz**

Typical repeatability of attenuation during life (normally open contacts)



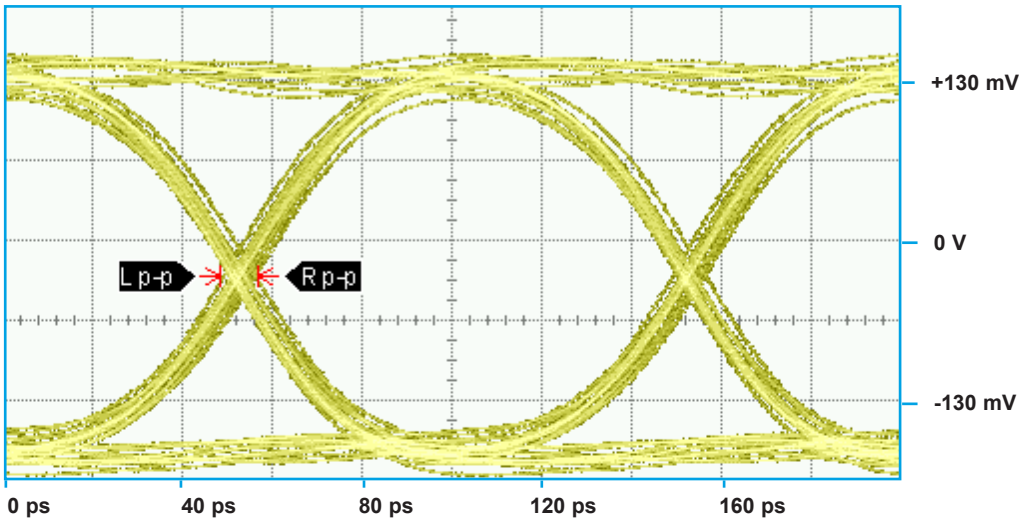
Typical repeatability of insertion loss during life (normally closed contacts)



RF NOTES
1. One million cycle repeatability data is based upon 396 observations with an average repeatability ±0.033 dB and a range of ±0.093 dB.
2. Repeatability of attenuation values were obtained from tests conducted in a 20 dB attenuator network with a 0 dBm input signal.
3. Relay operates at frequencies higher than 3 GHz with reduced RF performance characteristics.
4. Curves were developed from tests performed on a 0.031" copper clad, reinforced PTFE circuit board at 20°C (ref). The unutilized contacts were terminated in 50 ohms; characteristic impedance of measuring equipment is 50 ohms. The relays were mounted flush to the circuit board ground plane without the relay header soldered to the ground plane.

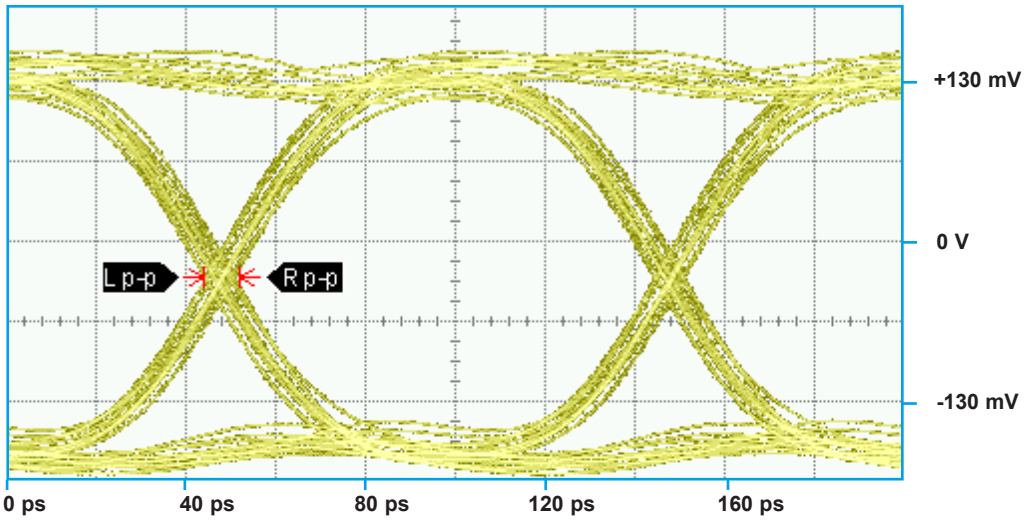
TYPICAL SIGNAL INTEGRITY CHARACTERISTICS @ 10 Gbps

Normally Closed (Typ.)



Bit Rate	Eye Height	Eye Width	$Jitter_{P-P}$
10 Gbps	254.7 mV	90.38 ps	8.44 ps

Normally Open (Typ.)

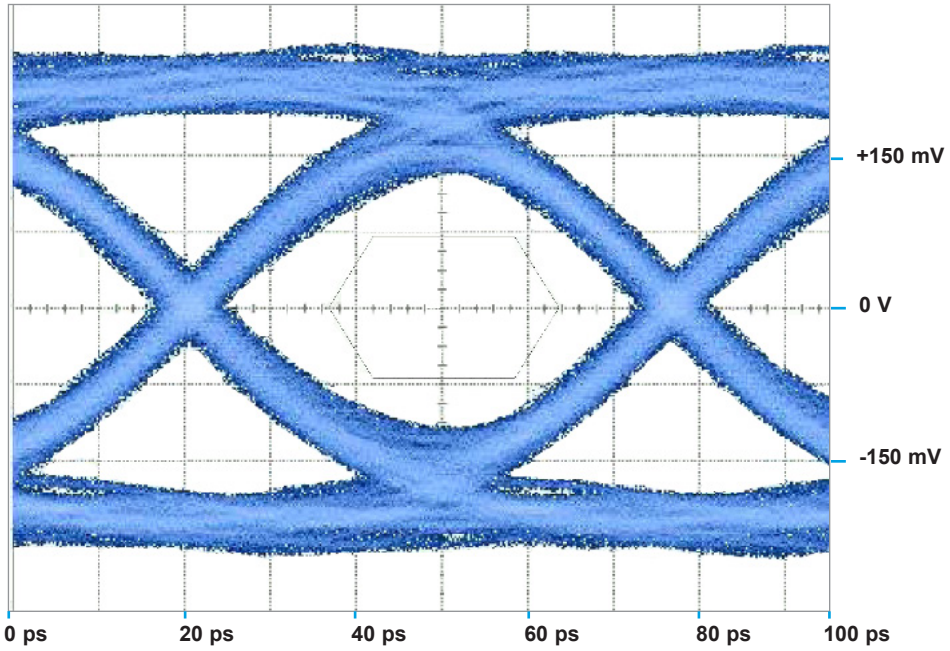


Bit Rate	Eye Height	Eye Width	$Jitter_{P-P}$
10 Gbps	250.9 mV	88.21 ps	8.00 ps

PATTERN GENERATOR SETTINGS

- 10 Gbps Random Pulse Pattern Generator
- 2^{31} - 1 PRBS signal
- PRBS output of 300 mV_{P-P} (nominal)
- RF PCB effect (negligible) not removed from measurement
- Data shown is typical of both poles

TYPICAL SIGNAL INTEGRITY CHARACTERISTICS @ 18 Gbps

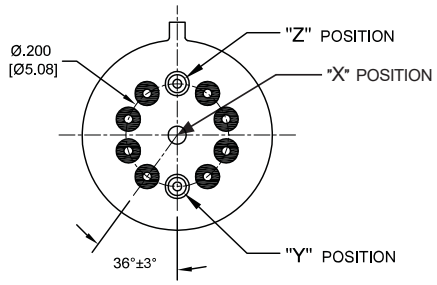


Bit Rate	Eye Height	Eye Width	$Jitter_{P-P}$
18 Gbps	185 mV	46.4 ps	10.44 ps

PATTERN GENERATOR SETTINGS

- 18 Gbps Random Pulse Pattern Generator
- 2^{31} - 1 PRBS signal
- PRBS output of 500 mV_{P-P} (nominal)
- RF PCB effect (negligible) not removed from measurement
- Data shown is typical of both poles

APPENDIX A : Ground Pin Positions



TO-5 Relays:
ER412, ER412T, ER422, ER432, ER432T, 712, 712TN, 400H, 400K, 400V, RF300, RF303, RF341, RF312, RF332, RF700, RF703

◯ 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.
7. “X” and “Z” Positions are not applicable for JAN Relays