

TELEDYNE RELAYS

*A Unit of Teledyne Electronics and Communications*

# SURFACE MOUNT, MAGNETIC-LATCHING BROADBAND RF RELAYS DPDT

# SERIES GRF180

## DESCRIPTION

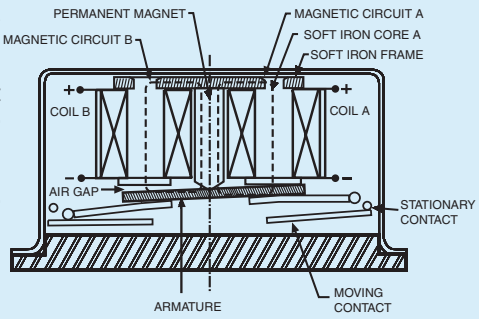
The Series GRF180 relay is the first hermetically sealed, ultraminiature RF relay designed from inception for surface mount applications. This magnetic-latching relay features extremely low internal circuit losses for exceptional time and frequency domain response characteristics through and beyond the UHF spectrum and into the S band. The GRF180 features a unique ground shield that isolates and shields each lead to ensure excellent contact-to-contact and pole-to-pole isolation. This ground shield provides a ground interface that results in improved high-frequency performance as well as parametric repeatability. The GRF180 extends performance advantages over similar RF devices that simply offer formed leads for surface mounting.

The GRF180 is robust to shock, vibration and temperature extremes for use in space applications and other demanding environments. It is engineered for use in RF attenuators, RF switch matrices, automated test equipment, spacecraft and other applications that require dependable high-frequency signal fidelity and performance. Its low profile and .100" grid spaced terminals make the GRF180 ideal for applications where extreme packaging density and/or close PC board spacing are required.

Unique features and manufacturing techniques include:

- Positive mounting means to RF ground plane.
- Unique uniframe design provides 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.
- Gold-plated precious metal alloy contacts ensure reliable dc and RF signal switching, as well as low and stable insertion loss.
- Robust to high temperature solder reflow environments.

## PRINCIPLE OF OPERATION




Energizing Coil A produces a magnetic field opposing the magnetic field of the permanent magnet in Circuit A. As the net holding force decreases, the attractive force in the air gap of Circuit B, which also results from the magnetic field of the permanent magnet, becomes great enough to break the armature free of Core A, and snap it into a closed position against Core B. The armature remains in this position upon removal of power from Coil A, but will snap back into position A upon energizing Coil B. 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 magnetic neutral position.

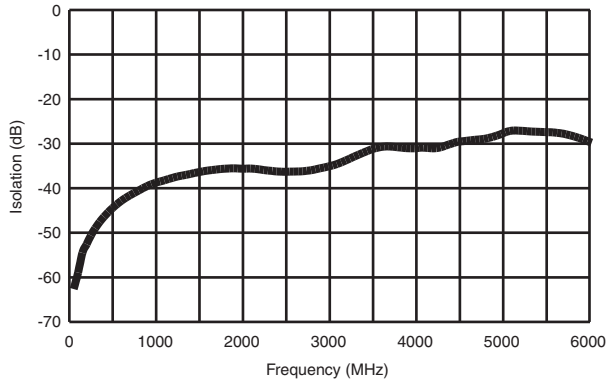
| ENVIRONMENTAL AND PHYSICAL SPECIFICATIONS | | |
|---|---|---|
| **Temperature** (Ambient) | **Storage** | –65°C to +125°C |
| | **Operating** | –55°C to +85°C |
| **Vibration** (General Note 1) | | 30 g's to 500 Hz |
| **Shock** (General Note 1) | | 100 g's, 6 msec, half-sine |
| **Enclosure** | | Hermetically sealed |
| **Weight** | | 0.10 oz. (2.9g) max. |

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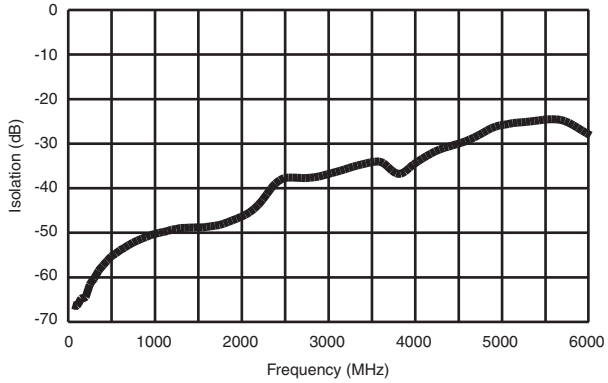
## SERIES GRF180

## TYPICAL RF CHARACTERISTICS (See RF Notes)

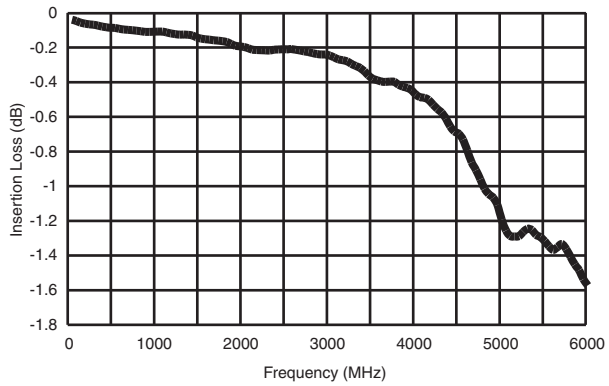
**Isolation Contact to Contact (RF Note 4)**



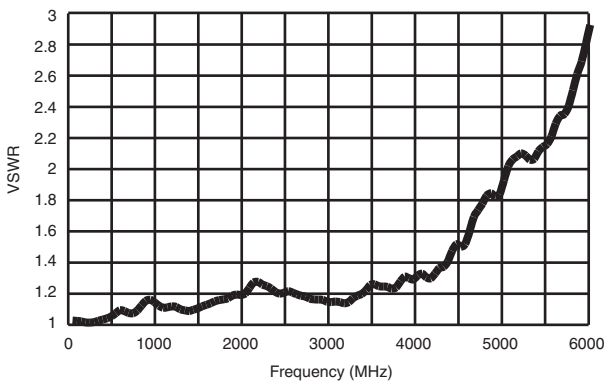

**Isolation Pole to Pole (RF Note 5)**



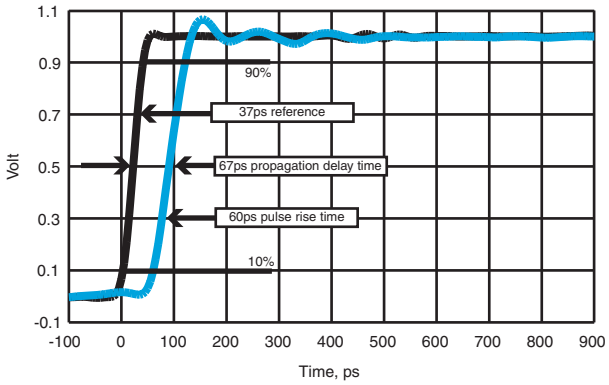

**Insertion Loss (RF Note 6)**




**VSWR (RF Note 6)**




**Time Domain Reponse**




## 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.* RF ground shield is soldered to PCB RF ground plane.
   - *c.* Room ambient temperature.
   - *d.* Terminals not tested were terminated with 50-ohm load.
   - *e.* Contact signal level: –10 dBm.
   - *f.* No. of test samples: 3.
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 after Coil A is energized then Coil B is 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.


SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE
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## SERIES GRF180

## GENERAL ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (General Note 2)

| | |
|---|---|
| **Contact Arrangement** | 2 Form C (DPDT) |
| **Rated Duty** | Continuous |
| **Contact Resistance** | .15Ω maximum before life; 0.25Ω maximum after life at 0.25A/28Vdc |
| **Contact Load Rating (DC)** | Resistive: 0.25A/28Vdc<br>Low Level: 10 to 50 µA/10 to 50 mV |
| **Characteristic Contact Life Ratings (General Note 3)** | 10,000,000 cycles characteristic life at low level (General Note 3)<br>100,000 cycles minimum at all other loads specified above |
| **Contact Overload Rating** | 0.5A/28Vdc Resistive (100 cycles minimum) |
| **Contact Carry Rating** | Contact factory |
| **Coil Operating Power** | GRF180-5: 410 mW typical @ nominal rated voltage |
| | GRF180-12: 288 mW typical @ nominal rated voltage |
| | GRF180-26: 351 mW typical @ nominal rated voltage |
| **Operate Time** | 2.0 msec. maximum at nominal rated coil voltage |
| **Minimum Operate Pulse** | 6.0 msec. width at rated voltage |
| **Interconnect Capacitance** | 0.02 pf typical |
| **Insulation Resistance** | 1,000 MΩ minimum between mutually isolated terminals |
| **Dielectric Strength** | Atmospheric pressure: 350 Vrms (60 Hz) |

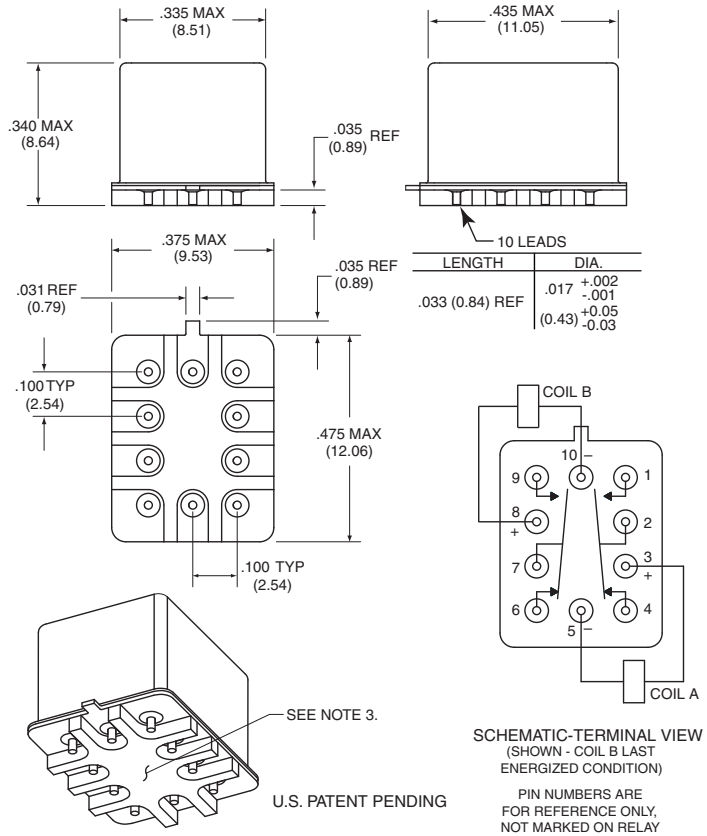
## DETAILED ELECTRICAL SPECIFICATIONS (–65°C to +125°C unless otherwise noted) (General Note 2)

| BASE PART NUMBERS ➡ | | GRF180-5 | GRF180-12 | GRF180-26 |
|---|---|---|---|---|
| **Coil Voltage (Vdc)** | **Nom.** | 5.0 | 12.0 | 26.5 |
| | **Max.** | 6.0 | 16.0 | 32.0 |
| **Coil Resistance (Ohms ±20%, @25°C)** | | 61 | 500 | 2000 |
| **Set & Reset Voltage (Vdc max.)** | | 4.6 | 11.0 | 22.0 |

## GENERAL NOTES

1. Relays will exhibit no contact chatter in excess of 10 µsec or transfer in excess of 1 µsec.
2. Unless otherwise specified, parameters are initial values.
3. For extended contact life ratings, contact factory.
4. Contacts shown in position resulting when Coil B last energized.
5. For hi-rel applications, contact factory at (800) 284-7007.
6. Relays may be subjected to 260°C, peak solder reflow temperature, 1 minute, 3 passes.
7. Butt-lead ends are coplanar within .003" (0.08).
8. Application notes available for PCB layout and mounting information.

## OUTLINE DIMENSIONS




NOTES:
1. DIMENSIONS ARE IN INCHES. METRIC EQUIVALENTS IN MILLIMETERS ARE SHOWN IN ( ).
2. UNLESS OTHERWISE SPECIFIED, TOLERANCES ON DIMENSIONS ARE .010 INCH (0.025 mm).
3. FOR OPTIMAL RF PERFORMANCE, SOLDER BOTTOM OF GROUND SHIELD TO PCB RF GROUND PLANE.

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