

Reflective

# SPDT RF Switch

**ZYSW-2-50DR+**

50Ω    DC<sup>2</sup> - 5000 MHz

## The Big Deal

- Wide bandwidth DC<sup>2</sup> to 5000 MHz
- Very fast switching, 20ns typ.
- Low video break thru 30 mVp-p typ.



CASE STYLE: ZZ121

## Product Overview

The ZYSW-2-50DR+ is an excellent general purpose SPDT solid state reflective RF switch. With its broad frequency range, fast switching time and excellent RF performance, the ZYSW-2-50DR+ is an excellent replacement for the Mini-Circuits' legacy switch model ZYSW-2-50DR+. Refer app note [AN-80-018](#) for more details. The smaller size and wider bandwidth makes this switch a versatile choice for several RF applications & systems.

## Key Features

| Feature                                                                     | Advantages                                                                                                                                |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated CMOS Driver                                                      | -Operates at +5V to -5V<br>-Low control current allows compatibility with a variety of driver circuits<br>-Fast 20 ns typ. Switching time |
| Excellent for a Variety of Applications<br>From Bench to Integrated Systems | -High speed testers<br>-Automated switching networks<br>-Wireless Infrastructure<br>-Military                                             |
| Excellent RF Performance                                                    | -Wide bandwidth: DC <sup>2</sup> to 5000 MHz<br>-Low Insertion Loss: 1.4 dB Typ<br>-Low video leakage, 30 mVp-p typ.                      |

2. All RF connections must be blocked or held at 0V DC. Low frequency is determined by value of Coupling capacitors at RF ports.

### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
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Coaxial

# SPDT RF Switch

50Ω DC<sup>2</sup>-5000 MHz

Reflective RF Switch with Internal Driver  
Dual Supply Voltage, +5V to -5V

## Product Features

- Wide bandwidth, DC<sup>2</sup> to 5000 MHz
- Low Insertion loss, 1.4 dB typ.
- Internal driver circuitry
- Fast switching, Rise/fall time, 5 ns typ.
- Wide operating temperature, -20°C to +85°C



Generic photo used for illustration purposes only

## ZYSW-2-50DR+

CASE STYLE: ZZ121

| Connectors           | Model        |
|----------------------|--------------|
| SMA                  | ZYSW-2-50DR+ |
| BRACKET (OPTION "B") |              |

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

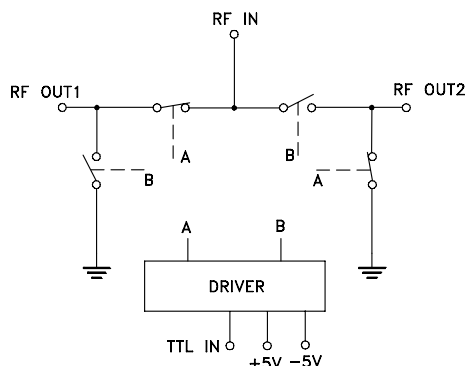
## Typical Applications

- Cellular
- ISM, WCDMA, WIMAX
- PCN
- Automated switching networks
- Military

## General Description

The ZYSW-2-50DR+ is a 50Ω reflective, SPDT RF switch designed for wireless applications, covering a broad frequency range from DC<sup>2</sup> to 5000 MHz with low insertion loss. The ZYSW-2-50DR+ operates with a dual supply voltage  $\pm 5V$ . This unit includes an internal CMOS driver which makes it easier to control switching with standard TTL voltage levels.

## Schematic and Application Circuit



2. All RF connections must be blocked or held at 0V DC. Low frequency is determined by value of Coupling capacitors at RF ports.

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[www.minicircuits.com](http://www.minicircuits.com) P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 [sales@minicircuits.com](mailto:sales@minicircuits.com)

REV. OR  
M166609  
ZYSW-2-50DR+  
Anish D/CP/AM  
200818  
Page 2 of 5

**RF Electrical Specifications, DC<sup>2</sup> - 5000 MHz, T<sub>AMB</sub>=25°C, Supply Voltage (+V, -V) =+5V, -5V**

| Parameter                                          | Condition (MHz)       | Min.            | Typ. | Max. | Units             |
|----------------------------------------------------|-----------------------|-----------------|------|------|-------------------|
| Frequency Range                                    |                       | DC <sup>2</sup> |      | 5000 | MHz               |
| Insertion Loss                                     | DC <sup>2</sup> -500  | —               | 0.8  | 1.5  | dB                |
|                                                    | 500-2000              | —               | 1.2  | 1.7  |                   |
|                                                    | 2000-5000             | —               | 2.1  | —    |                   |
| Isolation between Common port and RF1/RF2 Ports    | DC <sup>2</sup> -500  | 38              | 50   | —    | dB                |
|                                                    | 500-2000              | 28              | 40   | —    |                   |
|                                                    | 2000-5000             | —               | 18   | —    |                   |
| Return Loss (IN PORT)                              | DC <sup>2</sup> -3000 | —               | 15   | —    | dB                |
|                                                    | 3000-5000             | —               | 13   | —    |                   |
| Return Loss @ RF1/RF2 ports (ON STATE)             | DC <sup>2</sup> -3000 | —               | 18   | —    | dB                |
|                                                    | 3000-5000             | —               | 15   | —    |                   |
| Input 1dB Compression <sup>(1)</sup>               | 10-500                | —               | >20  | —    | dBm               |
|                                                    | 500-2000              | —               | >24  | —    |                   |
|                                                    | 2000-5000             | —               | >23  | —    |                   |
| DC Electrical Specifications                       |                       |                 |      |      |                   |
| Supply Voltage (+V)                                |                       | —               | 5    | —    | V                 |
| Supply Voltage (-V)                                |                       |                 | -5   |      | V                 |
| Positive Supply Current                            | +V=5V                 |                 | 4.5  |      | mA                |
| Negative Supply Current                            | -V=-5V                |                 | 3.3  |      | mA                |
| Control Voltage Low                                |                       | 0               |      | 0.7  | V                 |
| Control Voltage High                               |                       | 2.1             |      | 5    | V                 |
| Control Current                                    |                       | —               | —    | 2    | mA                |
| Switching Specifications                           |                       |                 |      |      |                   |
| Rise/Fall Time (10 to 90% or 90 to 10% RF)         | +V=5V, -V=-5V         | —               | 6    | —    | nSec              |
| Switching Time (50% CTRL to 90/10% RF)             | +V=5V, -V=-5V         | —               | 20   | —    | nSec              |
| Video Feed through (Control 0-5V, Frequency 1 MHz) | +V=5V, -V=-5V         | —               | 30   | —    | mV <sub>P-P</sub> |

1. At low frequency(<100 MHz), the dynamic range of switch decreases.

**Absolute Maximum Ratings**

| Parameter                   | Ratings                                 |
|-----------------------------|-----------------------------------------|
| Operating Temperature       | -20°C to 85°C                           |
| Storage Temperature         | -55°C to 100°C                          |
| Supply Voltage (+V & -V)    | +5.5V, -5.5V                            |
| Voltage Control             | -0.2V min, +5.5V max                    |
| RF input power <sup>3</sup> | 31 dBm                                  |
| ESD, HBM                    | Class 1A (250 to <500V) per JESD22-A114 |

2. All RF connections must be blocked or held at 0V DC. Low frequency is determined by value of Coupling capacitors at RF ports.

3. Frequency range of 500-5000 MHz.

**Notes**

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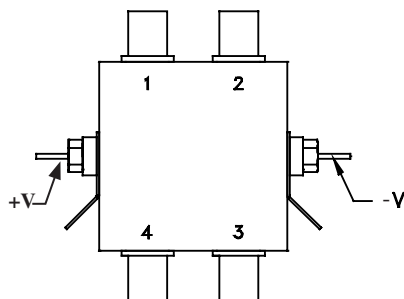
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**Truth Table** *(State of control voltage selects the desired switch state)*

| State of Control Voltage                             | Switch State - RF IN to |     |
|------------------------------------------------------|-------------------------|-----|
|                                                      | RF1                     | RF2 |
| Low                                                  | ON                      | OFF |
| High                                                 | OFF                     | ON  |
| ON- low insertion loss state<br>OFF- Isolation State |                         |     |

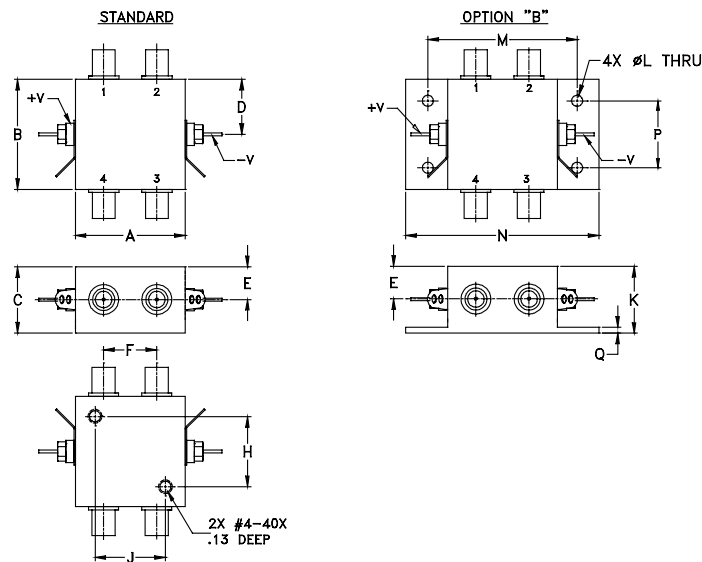
**Coaxial Configuration****Coaxial Connections**

| Function | Port Number | Description             |
|----------|-------------|-------------------------|
| RF IN    | 3           | RF Common/ SUM Port     |
| RF1      | 2           | RF Out #1/In Port #1    |
| RF2      | 1           | RF Out #2/In Port #2    |
| Control  | 4           | TTL Control IN          |
| +5       | +V          | Positive Supply Voltage |
| -5       | -V          | Negative Supply Voltage |

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Outline Drawing (ZZ121)



Outline Dimensions (inch mm)

| A     | B     | C     | D     | E     | F     | G    | H     |
|-------|-------|-------|-------|-------|-------|------|-------|
| 1.25  | 1.25  | 0.75  | 0.63  | 0.38  | 0.61  | --   | 0.800 |
| 31.75 | 31.75 | 19.05 | 16.00 | 9.65  | 15.49 | --   | 20.32 |
| J     | K     | L     | M     | N     | P     | Q    | wt    |
| 0.800 | 0.76  | 0.125 | 1.688 | 2.18  | 0.75  | 0.07 | grams |
| 20.32 | 19.30 | 3.18  | 42.88 | 55.37 | 19.05 | 1.78 | 85    |

Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs

Case Style: ZZ121

Environmental Ratings: ENV28T16

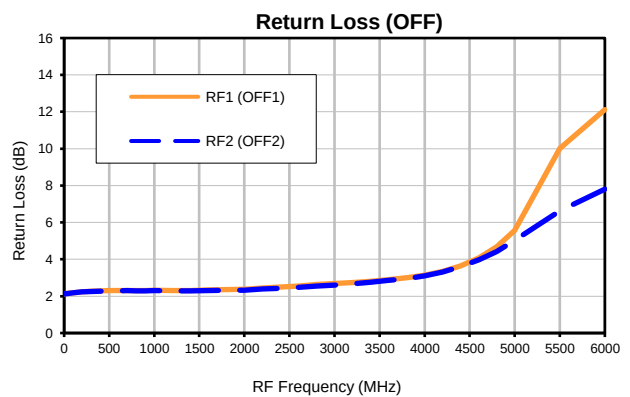
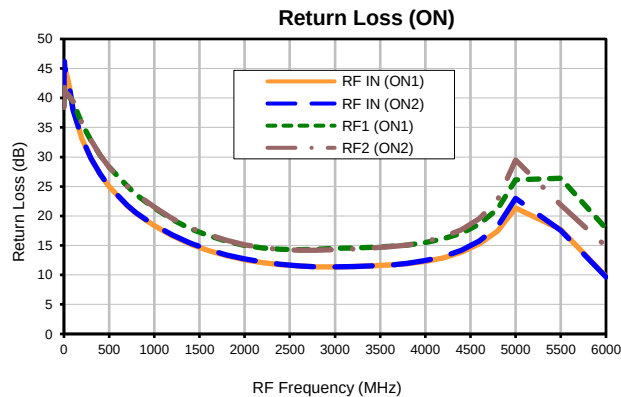
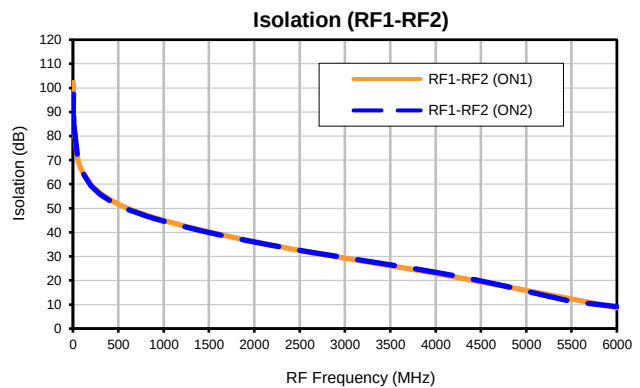
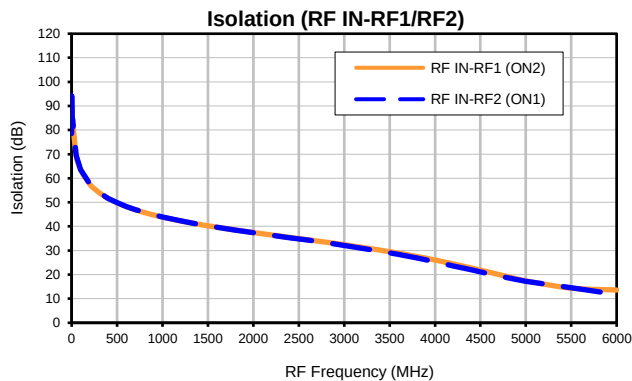
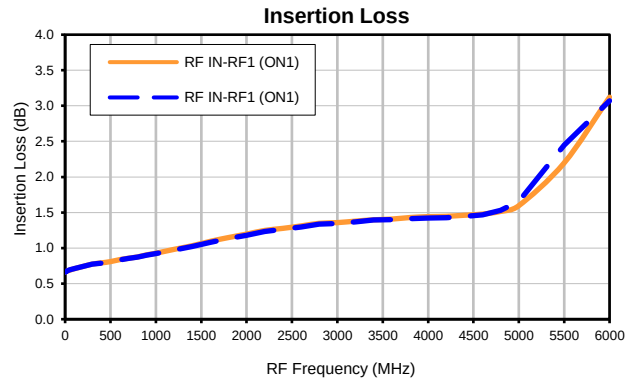
Pricing & Availability Information

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## Typical Performance Data

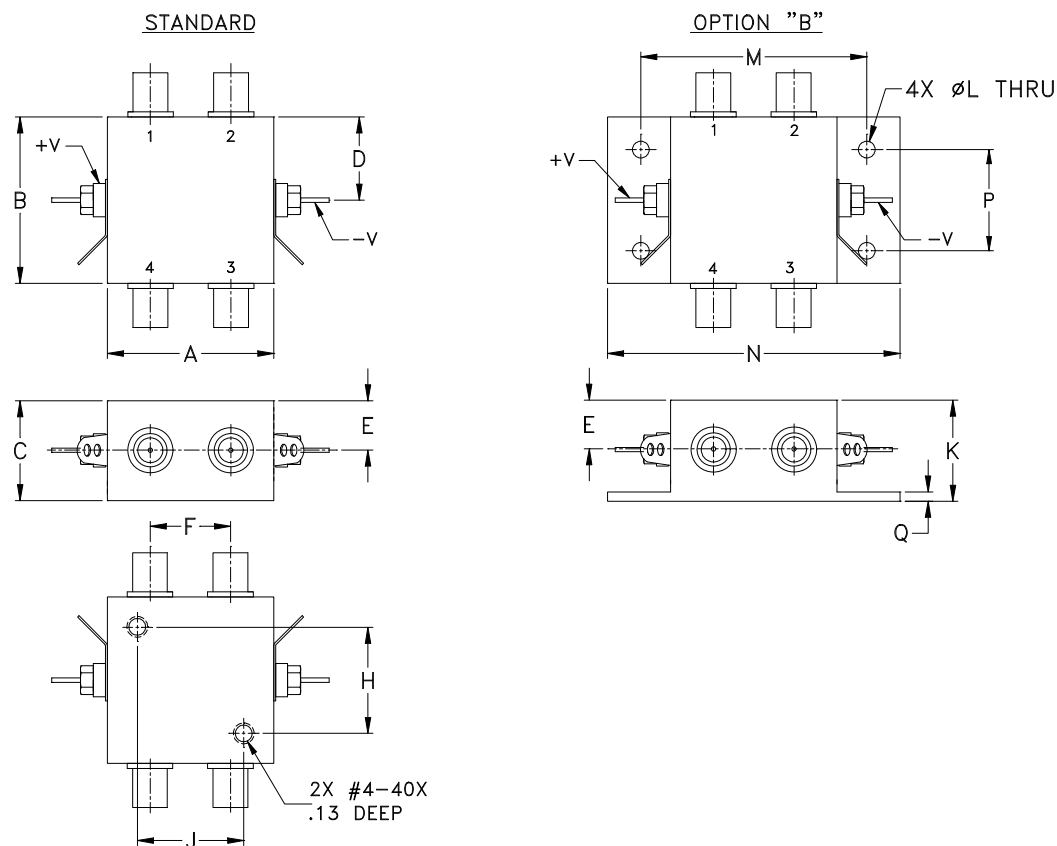
| RF<br>(MHz) | INSERTION LOSS     |                    | ISOLATION          |                    | ISOLATION        |                  | RETURN LOSS    |                |              |              |               |               |
|-------------|--------------------|--------------------|--------------------|--------------------|------------------|------------------|----------------|----------------|--------------|--------------|---------------|---------------|
|             | (dB)               |                    | (dB)               |                    | (dB)             |                  | (dB)           |                |              |              |               |               |
|             | RF IN-RF1<br>(ON1) | RF IN-RF2<br>(ON2) | RF IN-RF1<br>(ON2) | RF IN-RF2<br>(ON1) | RF1-RF2<br>(ON1) | RF1-RF2<br>(ON2) | RF IN<br>(ON1) | RF IN<br>(ON2) | RF1<br>(ON1) | RF2<br>(ON2) | RF1<br>(OFF1) | RF2<br>(OFF2) |
| 0.1         | 0.66               | 0.66               | 81.37              | 78.55              | 89.66            | 83.26            | 40.86          | 41.37          | 38.64        | 38.41        | 2.13          | 2.13          |
| 0.5         | 0.66               | 0.66               | 89.96              | 87.74              | 102.20           | 82.92            | 43.37          | 44.04          | 40.07        | 39.89        | 2.13          | 2.12          |
| 1           | 0.66               | 0.67               | 83.72              | 98.54              | 84.52            | 89.03            | 45.70          | 45.84          | 41.42        | 41.33        | 2.13          | 2.12          |
| 5           | 0.67               | 0.67               | 81.12              | 83.14              | 88.19            | 97.39            | 46.14          | 46.20          | 41.45        | 41.77        | 2.13          | 2.13          |
| 10          | 0.67               | 0.67               | 83.60              | 84.61              | 84.74            | 84.78            | 45.16          | 45.26          | 41.02        | 41.08        | 2.13          | 2.13          |
| 50          | 0.69               | 0.69               | 69.53              | 69.59              | 71.25            | 71.11            | 42.66          | 42.76          | 40.34        | 40.49        | 2.16          | 2.16          |
| 100         | 0.71               | 0.71               | 63.50              | 63.58              | 65.53            | 65.09            | 38.12          | 37.96          | 39.38        | 39.41        | 2.19          | 2.18          |
| 200         | 0.74               | 0.74               | 57.51              | 57.62              | 59.74            | 59.25            | 33.01          | 33.15          | 35.63        | 35.68        | 2.23          | 2.23          |
| 300         | 0.78               | 0.77               | 54.13              | 54.16              | 56.28            | 55.78            | 29.78          | 29.78          | 32.82        | 32.84        | 2.26          | 2.25          |
| 400         | 0.79               | 0.79               | 51.69              | 51.69              | 53.75            | 53.26            | 27.07          | 27.10          | 30.23        | 30.28        | 2.29          | 2.28          |
| 500         | 0.81               | 0.81               | 49.80              | 49.87              | 51.71            | 51.28            | 24.96          | 24.95          | 28.29        | 28.26        | 2.30          | 2.28          |
| 600         | 0.84               | 0.83               | 48.24              | 48.31              | 50.00            | 49.61            | 23.35          | 23.41          | 26.69        | 26.67        | 2.30          | 2.29          |
| 700         | 0.86               | 0.85               | 46.95              | 47.01              | 48.58            | 48.19            | 21.75          | 21.82          | 25.08        | 25.06        | 2.31          | 2.30          |
| 800         | 0.88               | 0.87               | 45.78              | 45.84              | 47.26            | 46.88            | 20.42          | 20.56          | 23.63        | 23.72        | 2.30          | 2.29          |
| 900         | 0.91               | 0.90               | 44.76              | 44.81              | 46.06            | 45.70            | 19.33          | 19.47          | 22.46        | 22.59        | 2.30          | 2.29          |
| 1000        | 0.93               | 0.92               | 43.86              | 43.89              | 44.95            | 44.62            | 18.34          | 18.49          | 21.35        | 21.49        | 2.31          | 2.30          |
| 1200        | 0.98               | 0.97               | 42.27              | 42.28              | 42.89            | 42.60            | 16.64          | 16.80          | 19.40        | 19.58        | 2.31          | 2.29          |
| 1400        | 1.03               | 1.02               | 40.88              | 40.89              | 41.02            | 40.77            | 15.25          | 15.38          | 17.82        | 18.00        | 2.30          | 2.28          |
| 1600        | 1.09               | 1.08               | 39.66              | 39.66              | 39.31            | 39.11            | 14.13          | 14.28          | 16.66        | 16.86        | 2.34          | 2.31          |
| 1800        | 1.15               | 1.13               | 38.53              | 38.50              | 37.65            | 37.52            | 13.25          | 13.38          | 15.74        | 15.89        | 2.35          | 2.31          |
| 2000        | 1.20               | 1.18               | 37.47              | 37.42              | 36.07            | 36.00            | 12.58          | 12.72          | 15.02        | 15.12        | 2.38          | 2.33          |
| 2200        | 1.25               | 1.23               | 36.46              | 36.39              | 34.60            | 34.60            | 12.08          | 12.19          | 14.59        | 14.65        | 2.45          | 2.39          |
| 2400        | 1.28               | 1.26               | 35.44              | 35.34              | 33.18            | 33.22            | 11.74          | 11.80          | 14.35        | 14.32        | 2.50          | 2.43          |
| 2600        | 1.31               | 1.30               | 34.44              | 34.31              | 31.83            | 31.92            | 11.53          | 11.54          | 14.29        | 14.19        | 2.55          | 2.47          |
| 2800        | 1.35               | 1.34               | 33.46              | 33.28              | 30.54            | 30.68            | 11.38          | 11.38          | 14.36        | 14.22        | 2.63          | 2.54          |
| 3000        | 1.36               | 1.35               | 32.39              | 32.14              | 29.28            | 29.48            | 11.36          | 11.35          | 14.51        | 14.31        | 2.68          | 2.60          |
| 3200        | 1.38               | 1.37               | 31.29              | 30.95              | 28.01            | 28.29            | 11.42          | 11.40          | 14.59        | 14.38        | 2.74          | 2.66          |
| 3400        | 1.40               | 1.39               | 30.12              | 29.73              | 26.75            | 27.11            | 11.54          | 11.51          | 14.67        | 14.55        | 2.81          | 2.75          |
| 3600        | 1.41               | 1.40               | 28.88              | 28.40              | 25.51            | 25.91            | 11.67          | 11.66          | 14.86        | 14.78        | 2.89          | 2.86          |
| 3800        | 1.43               | 1.41               | 27.52              | 26.88              | 24.26            | 24.67            | 11.93          | 11.98          | 15.06        | 15.08        | 2.99          | 2.95          |
| 4000        | 1.44               | 1.42               | 26.06              | 25.30              | 22.92            | 23.37            | 12.31          | 12.43          | 15.50        | 15.63        | 3.14          | 3.10          |
| 4200        | 1.45               | 1.42               | 24.44              | 23.64              | 21.54            | 22.00            | 12.87          | 13.09          | 16.14        | 16.47        | 3.35          | 3.32          |
| 4400        | 1.46               | 1.44               | 22.74              | 21.95              | 20.15            | 20.56            | 13.87          | 14.22          | 17.08        | 17.66        | 3.65          | 3.61          |
| 4600        | 1.48               | 1.47               | 20.98              | 20.26              | 18.73            | 19.04            | 15.30          | 15.77          | 18.62        | 19.55        | 4.08          | 3.97          |
| 4800        | 1.52               | 1.53               | 19.14              | 18.63              | 17.32            | 17.41            | 17.47          | 18.28          | 21.21        | 22.74        | 4.68          | 4.42          |
| 5000        | 1.60               | 1.66               | 17.41              | 17.16              | 15.84            | 15.59            | 21.35          | 23.00          | 26.12        | 29.48        | 5.57          | 5.03          |
| 5500        | 2.20               | 2.45               | 14.39              | 14.53              | 12.30            | 11.30            | 17.72          | 17.53          | 26.39        | 21.92        | 10.02         | 6.62          |
| 6000        | 3.12               | 3.07               | 13.61              | 11.78              | 8.66             | 9.14             | 9.76           | 9.66           | 17.89        | 14.85        | 12.12         | 7.80          |

## Typical Performance Curves



## Outline Dimensions

ZZ121



| CASE# | A               | B               | C              | D              | E             | F              | G  | H               | J               | K              | L              | M                | N               |
|-------|-----------------|-----------------|----------------|----------------|---------------|----------------|----|-----------------|-----------------|----------------|----------------|------------------|-----------------|
| ZZ121 | 1.25<br>(31.75) | 1.25<br>(31.75) | .75<br>(19.05) | .63<br>(16.00) | .38<br>(9.65) | .61<br>(15.49) | -- | .800<br>(20.32) | .800<br>(20.32) | .76<br>(19.30) | .125<br>(3.18) | 1.688<br>(42.88) | 2.18<br>(55.37) |

| CASE# | P              | Q             | WT.GRAMS |
|-------|----------------|---------------|----------|
| ZZ121 | .75<br>(19.05) | .07<br>(1.78) | 85.0     |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

- Case material: Aluminum alloy.
- Case finish:  
For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
- Mounting bracket available on request. Add suffix B to part number



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS





All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification              | Test/Inspection Condition                                                              | Reference/Spec                       |
|----------------------------|----------------------------------------------------------------------------------------|--------------------------------------|
| Operating Temperature      | -20° to 85°C<br>Ambient Environment                                                    | Individual Model Data Sheet          |
| Storage Temperature        | -55° to 100° C<br>Ambient Environment                                                  | Individual Model Data Sheet          |
| Barometric Pressure        | 100,000 Feet                                                                           | MIL-STD-202, Method 105, Condition D |
| Humidity                   | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103              |
| Vibration (High Frequency) | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)    | MIL-STD-202, Method 204, Condition D |
| Mechanical Shock           | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)                          | MIL-STD-202, Method 213, Condition I |