



Mini-Circuits

BALANCED TO UNBALANCED



# RF Transformer

## TC1.33-182X-75+

100 to 75Ω 5 to 1800 MHz

### THE BIG DEAL

- Suitable for tin/lead and RoHS solder systems
- Wideband, 5 to 1800 MHz
- Balanced transmission line
- Good return loss, 20 dB typ. at 1 dB band
- Excellent amplitude unbalance, 0.4 dB typ. and phase unbalance, 5° typ.
- Aqueous washable



Generic photo used for illustration purposes only

CASE STYLE: AT1521

### +RoHS Compliant

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

### APPLICATIONS

- Balanced to unbalanced transmission
- Push-pull amplifiers
- PCS/DCS
- Cable TV
- Cellular
- DOCSIS 3.1

### PRODUCT OVERVIEW

The TC1.33-182X-75+ is a balanced-to-unbalanced 75Ω transmission line transformer. This rugged, wire welded, rectangular core with top hat design is rated for up to 0.25W maximum power, in an aqueous washable case suitable for both RoHS and tin/lead solder systems.

### KEY FEATURES

| Feature                                 | Advantages                                                                                                                                       |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Very wide bandwidth                     | 50-1800 MHz bandwidth covers CATV (forward & return), medical wireless and D2A/A2D, and other communications applications                        |
| Excellent amplitude and phase unbalance | 0.4 dB amplitude and 5° phase unbalance aid rejection of even harmonics (in push-pull amplifiers) and common mode signals (when used as a balun) |
| Good return loss                        | Provides excellent matching for 75Ω circuitry                                                                                                    |
| Low and flat insertion loss             | Consistently low signal loss, ±0.2dB across all 100-1218 MHz CATV bands                                                                          |

REV. A  
ECO-021661  
TC1.33-182X-75+  
MCL NY  
240501





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## ELECTRICAL SPECIFICATIONS AT +25°C

| Parameter                           | Frequency (MHz) | Min. | Typ. | Max. | Unit   |
|-------------------------------------|-----------------|------|------|------|--------|
| Impedance Ratio (secondary/primary) |                 |      | 1.33 |      | Ohm    |
| Frequency Range                     |                 | 5    | —    | 1800 | MHz    |
| Insertion Loss*                     | 5 - 1800        | —    | 1.2  | 2.3  | dB     |
| Amplitude Unbalance                 | 5 - 1200        | —    | 0.4  | 1.0  | dB     |
|                                     | 1200 - 1800     | —    | 1.3  | 2.1  |        |
| Phase Unbalance                     | 5 - 1800        | —    | 5    | 10   | Degree |

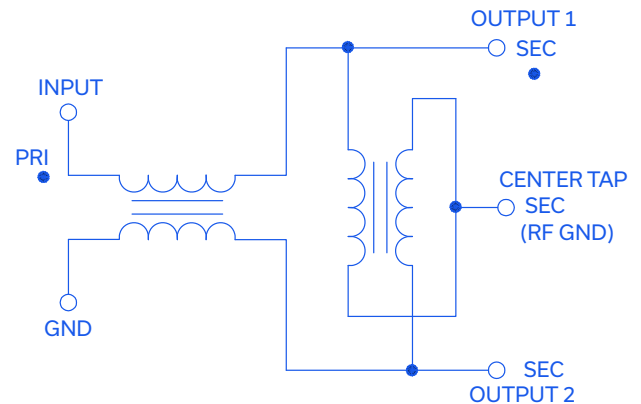
\* Insertion Loss is referenced to mid-band loss, 1.0 dB typ. Measured in 75 $\Omega$  system.

## MAXIMUM RATINGS

| Parameter             | Ratings        |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| RF Power              | 0.25W          |
| DC Current            | 30mA           |

Permanent damage may occur if any of these limits are exceeded.

## CONFIG. M1





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# RF Transformer

TC1.33-182X-75+

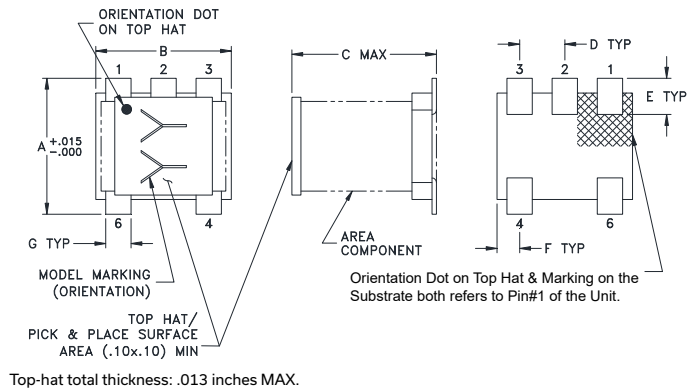
100 to 75Ω 5 to 1800 MHz

## PIN CONNECTIONS

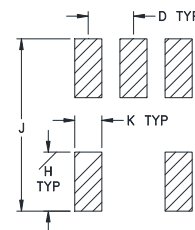
| Function      | Pin Number |
|---------------|------------|
| PRIMARY DOT   | 6          |
| PRIMARY       | 4          |
| SECONDARY DOT | 1          |
| SECONDARY     | 3          |
| SECONDARY CT  | 2          |

PRODUCT MARKING: HZ

## OUTLINE DRAWING



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

## OUTLINE DIMENSIONS (Inch mm)

| A    | B    | C    | D    | E    | F    | G    | H    | J    | K    |
|------|------|------|------|------|------|------|------|------|------|
| .150 | .150 | .160 | .050 | .040 | .025 | .028 | .065 | .190 | .030 |
| 3.81 | 3.81 | 4.06 | 1.27 | 1.02 | 0.64 | 0.71 | 1.65 | 4.83 | 0.76 |

Weight: 0.15 grams

TAPE & REEL INFORMATION: F17





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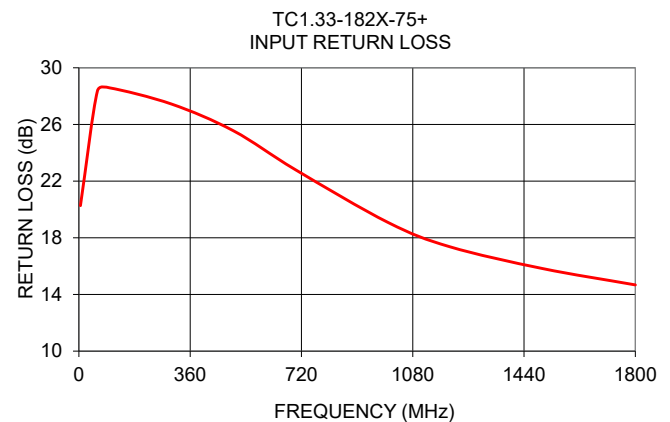
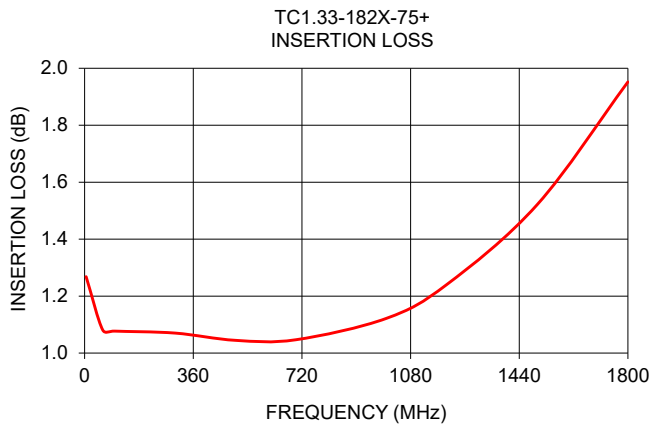
## RF Transformer

TC1.33-182X-75+

100 to 75 $\Omega$  5 to 1800 MHz

## TYPICAL PERFORMANCE DATA

| FREQUENCY (MHz) | INSERTION LOSS (dB) | INPUT R. LOSS (dB) | AMPLITUDE UNBALANCE (dB) | PHASE UNBALANCE (Deg.) |
|-----------------|---------------------|--------------------|--------------------------|------------------------|
| 5               | 1.27                | 20.27              | 0.01                     | 0.04                   |
| 60              | 1.08                | 28.36              | 0.02                     | 0.49                   |
| 100             | 1.08                | 28.58              | 0.03                     | 0.62                   |
| 300             | 1.07                | 27.44              | 0.09                     | 2.01                   |
| 500             | 1.04                | 25.55              | 0.13                     | 2.79                   |
| 700             | 1.05                | 22.81              | 0.09                     | 3.26                   |
| 1000            | 1.12                | 19.08              | 0.07                     | 3.06                   |
| 1200            | 1.24                | 17.37              | 0.27                     | 2.36                   |
| 1500            | 1.52                | 15.83              | 0.63                     | 0.75                   |
| 1800            | 1.95                | 14.67              | 1.09                     | 1.40                   |



## 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.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



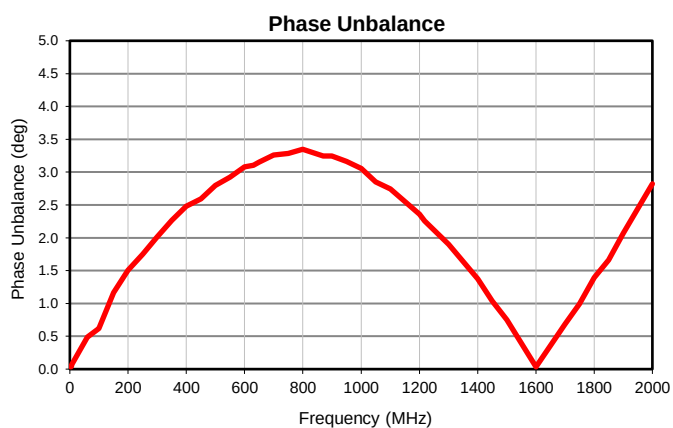
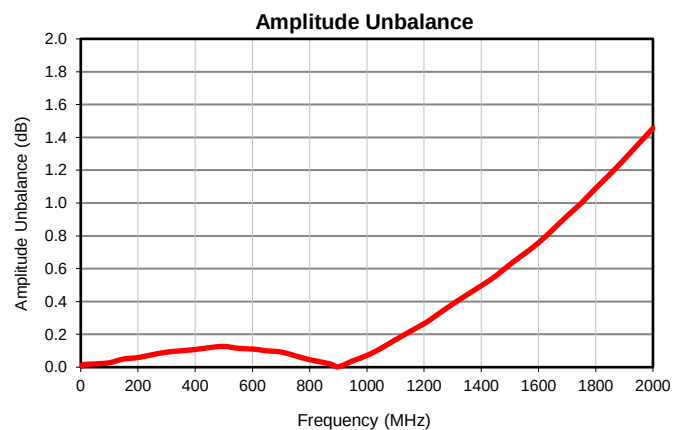
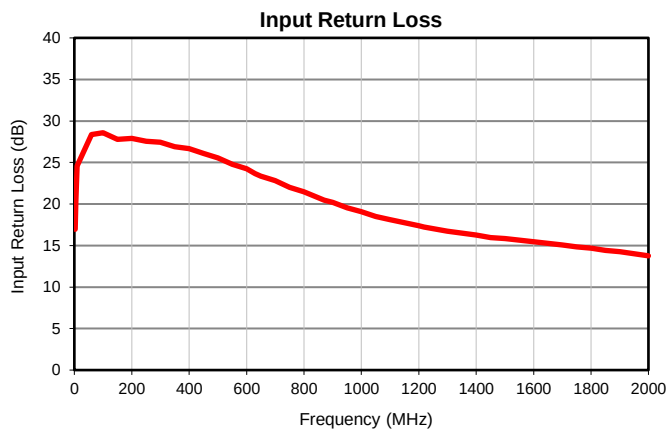
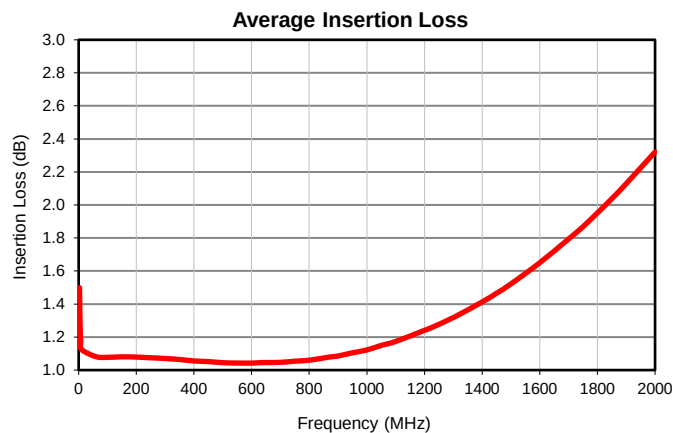
# RF Transformer

# TC1.33-182X-75+

## Typical Performance Data

| FREQUENCY<br>(MHz) | AVERAGE<br>INSERTION LOSS<br>(dB) | INPUT<br>RETURN LOSS<br>(dB) | AMPLITUDE<br>UNBALANCE<br>(dB) | PHASE<br>UNBALANCE<br>(deg.) |
|--------------------|-----------------------------------|------------------------------|--------------------------------|------------------------------|
| 3                  | 1.50                              | 16.96                        | 0.01                           | 0.03                         |
| 5                  | 1.27                              | 20.27                        | 0.01                           | 0.04                         |
| 7                  | 1.18                              | 22.45                        | 0.01                           | 0.08                         |
| 10                 | 1.12                              | 24.57                        | 0.02                           | 0.09                         |
| 60                 | 1.08                              | 28.36                        | 0.02                           | 0.49                         |
| 100                | 1.08                              | 28.58                        | 0.03                           | 0.62                         |
| 150                | 1.08                              | 27.77                        | 0.05                           | 1.17                         |
| 200                | 1.08                              | 27.90                        | 0.06                           | 1.51                         |
| 250                | 1.07                              | 27.56                        | 0.08                           | 1.75                         |
| 300                | 1.07                              | 27.44                        | 0.09                           | 2.01                         |
| 350                | 1.06                              | 26.91                        | 0.10                           | 2.26                         |
| 400                | 1.06                              | 26.66                        | 0.11                           | 2.48                         |
| 450                | 1.05                              | 26.09                        | 0.12                           | 2.59                         |
| 500                | 1.04                              | 25.55                        | 0.13                           | 2.79                         |
| 550                | 1.04                              | 24.79                        | 0.12                           | 2.92                         |
| 600                | 1.04                              | 24.24                        | 0.11                           | 3.08                         |
| 630                | 1.04                              | 23.67                        | 0.10                           | 3.10                         |
| 650                | 1.05                              | 23.35                        | 0.10                           | 3.15                         |
| 700                | 1.05                              | 22.81                        | 0.09                           | 3.26                         |
| 750                | 1.05                              | 21.99                        | 0.07                           | 3.29                         |
| 800                | 1.06                              | 21.47                        | 0.05                           | 3.35                         |
| 870                | 1.08                              | 20.48                        | 0.02                           | 3.25                         |
| 900                | 1.09                              | 20.18                        | 0.00                           | 3.25                         |
| 950                | 1.10                              | 19.53                        | 0.04                           | 3.16                         |
| 1000               | 1.12                              | 19.08                        | 0.07                           | 3.06                         |
| 1050               | 1.15                              | 18.51                        | 0.12                           | 2.85                         |
| 1100               | 1.17                              | 18.11                        | 0.17                           | 2.74                         |
| 1200               | 1.24                              | 17.37                        | 0.27                           | 2.36                         |
| 1218               | 1.25                              | 17.23                        | 0.28                           | 2.26                         |
| 1300               | 1.32                              | 16.73                        | 0.38                           | 1.90                         |
| 1400               | 1.41                              | 16.25                        | 0.50                           | 1.37                         |
| 1450               | 1.47                              | 15.96                        | 0.56                           | 1.04                         |
| 1500               | 1.52                              | 15.83                        | 0.63                           | 0.75                         |
| 1600               | 1.65                              | 15.44                        | 0.76                           | 0.04                         |
| 1700               | 1.79                              | 15.06                        | 0.92                           | 0.69                         |
| 1750               | 1.87                              | 14.83                        | 1.00                           | 0.99                         |
| 1800               | 1.95                              | 14.67                        | 1.09                           | 1.40                         |
| 1850               | 2.04                              | 14.42                        | 1.18                           | 1.66                         |
| 1900               | 2.13                              | 14.25                        | 1.27                           | 2.07                         |
| 2000               | 2.32                              | 13.76                        | 1.46                           | 2.82                         |

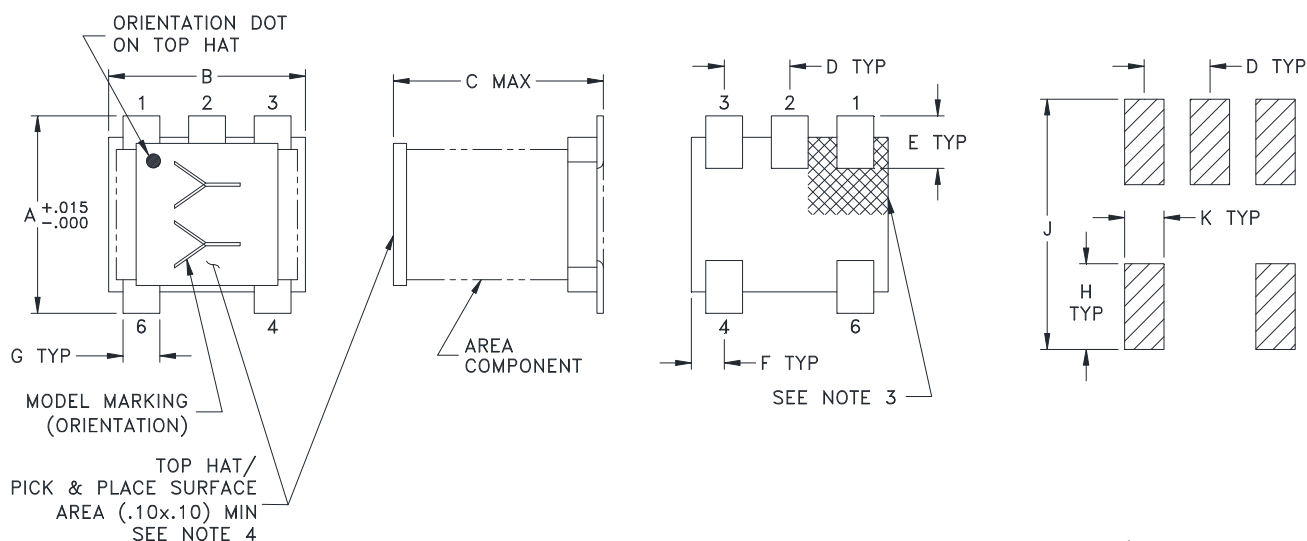
## Typical Performance Data



## Outline Dimensions

AT1521

## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

| CASE # | A              | B              | C              | D              | E              | F             | G             | H              | J              | K             | WT. GRAMS |
|--------|----------------|----------------|----------------|----------------|----------------|---------------|---------------|----------------|----------------|---------------|-----------|
| AT1521 | .150<br>(3.81) | .150<br>(3.81) | .160<br>(4.06) | .050<br>(1.27) | .040<br>(1.02) | .025<br>(.64) | .028<br>(.71) | .065<br>(1.65) | .190<br>(4.83) | .030<br>(.76) | .15       |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .01$ ; 3 Pl.  $\pm .005$

### Notes:

- Case material: Plastic.
- Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
- Orientation Dot on Top Hat & Marking on the Substrate both refers to Pin #1 of the Unit.
- Top-Hat total thickness: .013 inches MAX.



P.O. Box 350186, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site

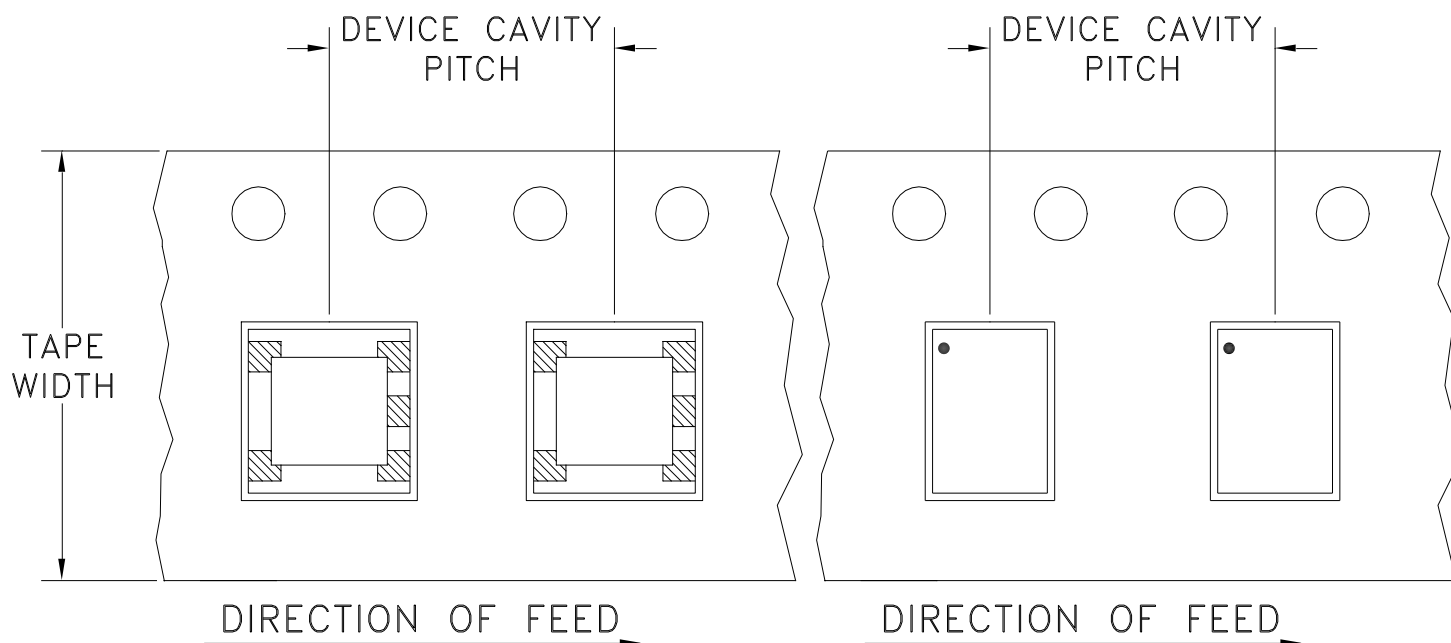


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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F17

## DEVICE ORIENTATION IN T&R



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel                    |      |
|----------------|-------------------------|-------------------|-------------------------------------|------|
| 12             | 8                       | 7                 | Small quantity standards (see note) | 20   |
|                |                         |                   |                                     | 50   |
|                |                         |                   |                                     | 100  |
|                |                         |                   |                                     | 200  |
|                |                         |                   |                                     | 500  |
|                |                         | 13                | Standard                            | 1000 |
|                |                         |                   |                                     | 2000 |

Note: Please Consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



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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          | -40° to 85°C<br>Ambient Environment                                                                                                                             | Individual Model Data Sheet                                                                          |
| Storage Temperature            | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Humidity                       | 90 to 95% RH, 240 hours, 50°C                                                                                                                                   | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                                                       | MIL-STD-202, Method 107, Condition A-3, except +100°C                                                |
| Solder Reflow Heat             | Sn-Pb Eutetic Process: 225°C peak<br>Pb-Free Process 245° - 250°C peak                                                                                          | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1                                                        |
| Solderability                  | 10X Magnification                                                                                                                                               | J-STD-002, 95% Coverage                                                                              |
| 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               | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes                                                                                               | MIL-STD-202, Method 213, Condition A                                                                 |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215                                                                              |