

top hat®

# Surface Mount Power Splitter/Combiner

2 Way-180° 75Ω 5 to 1250 MHz

## SBTCJ-122-75X+

### Features

- wide band frequency 5-1250 MHz.
- low insertion, 1.5 dB typ.
- excellent amplitude unbalance, 0.3 dB typ.
- very good phase unbalance, 2.7 deg. typ.
- external resistor inductor & capacitor required
- aqueous washable
- leads for excellent solderability
- low cost

### Applications

- DOCSIS® 3.1 Systems
- CATV
- cellular
- UHV/VHV



Generic photo used for illustration purposes only

CASE STYLE: DB1627

**+RoHS Compliant**

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

| Available Tape and Reel at no extra cost |                  |
|------------------------------------------|------------------|
| Reel Size                                | Devices/Reel     |
| 7"                                       | 20, 50, 100, 500 |
| 13"                                      | 1000, 2000       |

### Electrical Specifications at 25°C

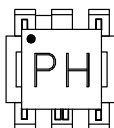
| Parameter                   | Frequency (MHz) | Min. | Typ. | Max. | Unit   |
|-----------------------------|-----------------|------|------|------|--------|
| Frequency Range             |                 | 5    |      | 1250 | MHz    |
| Insertion Loss Above 3.0 dB | 5 - 50          | —    | 1.1  | 1.7  | dB     |
|                             | 50 - 1000       | —    | 1.5  | 2.0  |        |
|                             | 1000 - 1250     | —    | 2.1  | 2.7  |        |
| Isolation                   | 5 - 50          | 20   | 29   | —    | dB     |
|                             | 50 - 1000       | 20   | 28   | —    |        |
|                             | 1000 - 1250     | 17   | 20   | —    |        |
| Phase Unbalance             | 5 - 50          | —    | 0.6  | 3    | Degree |
|                             | 50 - 1000       | —    | 2.7  | 9    |        |
|                             | 1000 - 1250     | —    | 5.0  | 12   |        |
| Amplitude Unbalance         | 5 - 50          | —    | 0.4  | 0.6  | dB     |
|                             | 50 - 1000       | —    | 0.5  | 0.9  |        |
|                             | 1000 - 1250     | —    | 1.0  | 1.7  |        |
| VSWR (Port-S)               | 5 - 50          | —    | 1.27 | 1.5  | :1     |
|                             | 50 - 1000       | —    | 1.25 | 1.5  |        |
|                             | 1000 - 1250     | —    | 1.25 | 1.6  |        |
| VSWR (Port 1-2)             | 5 - 50          | —    | 1.23 | 1.5  | :1     |
|                             | 50 - 1000       | —    | 1.28 | 1.8  |        |
|                             | 1000 - 1250     | —    | 1.68 | 2.1  |        |

### Maximum Ratings

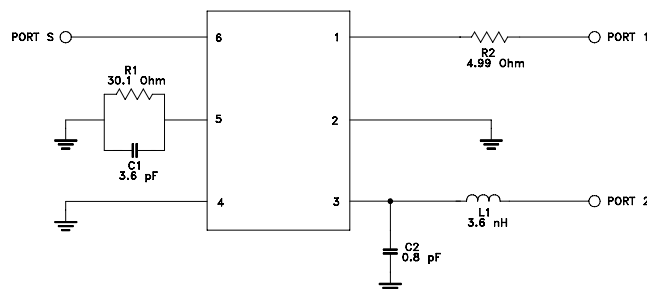
| Parameter                   | Ratings        |
|-----------------------------|----------------|
| Operating Temperature       | -40°C to 85°C  |
| Storage Temperature         | -55°C to 100°C |
| Power Input (as a splitter) | 1.0W max.      |

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

### Product Marking



### Electrical Schematic



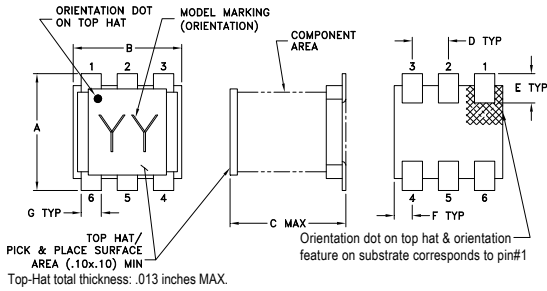
### Pin Connections

| Function                   | Pin Number |
|----------------------------|------------|
| Sum port                   | 6          |
| port 1 (180°)              | 1          |
| port 2 (0°)                | 3          |
| ground                     | 4          |
| Ext. inductor series 3.6nh | 3          |
| Ext. capacitor 0.8pf       | 3 to Gnd   |
| Ext. capacitor 3.6pf       | 5 to Gnd   |
| Ext. resistor 30.1Ω        | 5 to Gnd   |
| Ext. resistor series 4.99Ω | 1          |
| Ground or not used         | 2          |

| SEQ.   | Description                | Suggested Supplier Part # |
|--------|----------------------------|---------------------------|
| CAP C1 | S-SER 3.6±.1 pF; 0603 Size | AVX. 0603 1U3R6 * AT2A    |
| CAP C2 | HIQ 0.8 ±.1 pF; 0603 Size  | AVX. 0603 1U0R8 * AT2A    |
| IND L1 | 3.6±.1 nH; 0402 Size       | Murata LQP15MN3N6B00      |
| RES R1 | .1W 30.1Ω 1%; 0603 Size    | KOA RK73HIJTTD30R1F       |
| RES R2 | .1W 4.99 Ω 1%; 0603 Size   | KOA RK73HIJTTD4R99F       |

# SBTCJ-122-75X+

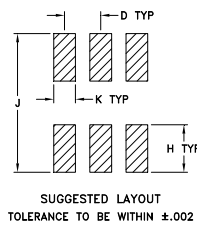
## Outline Drawing



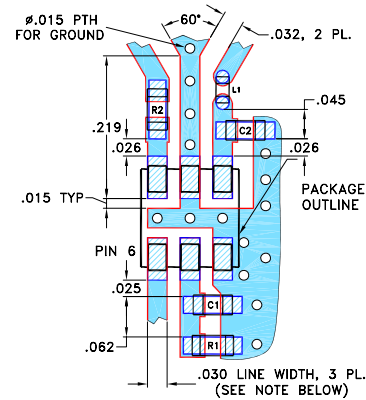
## Outline Dimensions (inch/mm)

| A    | B    | C    | D    | E    | F     |
|------|------|------|------|------|-------|
| .160 | .150 | .160 | .050 | .040 | .025  |
| 4.06 | 3.81 | 4.06 | 1.27 | 1.02 | 0.64  |
| G    | H    | J    | K    | L    | wt    |
| .028 | .065 | .190 | .030 |      | grams |
| 0.71 | 1.65 | 4.83 | 0.76 |      | 0.15  |

## PCB Land Pattern



Demo Board MCL P/N: TB-580+  
Suggested PCB Layout (PL-342)

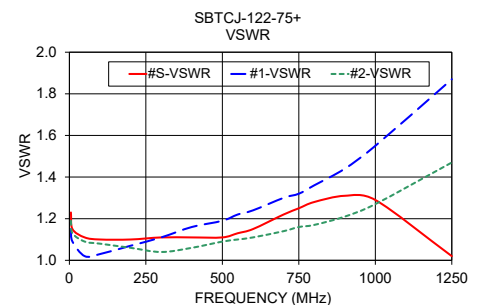
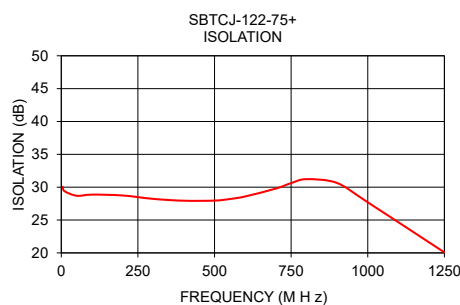
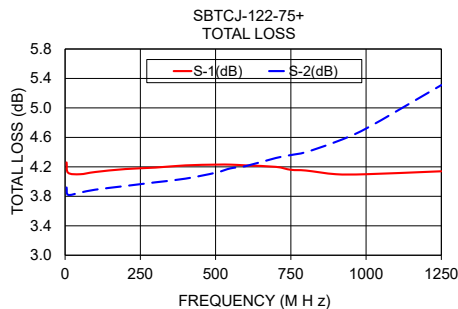


- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
-  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

## Typical Performance Data

| Frequency (MHz) | Total Loss <sup>1</sup> (dB) |      | Amplitude Unbalance (dB) | Isolation (dB) | Phase Unbalance (deg.) | VSWR S | VSWR 1 | VSWR 2 |
|-----------------|------------------------------|------|--------------------------|----------------|------------------------|--------|--------|--------|
|                 | S-1                          | S-2  |                          |                |                        |        |        |        |
| 5.00            | 4.26                         | 3.92 | 0.34                     | 30.05          | 179.61                 | 1.23   | 1.15   | 1.19   |
| 10.00           | 4.12                         | 3.82 | 0.30                     | 29.41          | 179.60                 | 1.15   | 1.09   | 1.13   |
| 50.00           | 4.10                         | 3.85 | 0.25                     | 28.70          | 179.99                 | 1.11   | 1.02   | 1.09   |
| 100.00          | 4.13                         | 3.89 | 0.24                     | 28.87          | 179.77                 | 1.10   | 1.03   | 1.08   |
| 200.00          | 4.17                         | 3.94 | 0.23                     | 28.74          | 179.39                 | 1.10   | 1.07   | 1.06   |
| 300.00          | 4.19                         | 3.99 | 0.21                     | 28.22          | 179.06                 | 1.11   | 1.11   | 1.04   |
| 400.00          | 4.22                         | 4.04 | 0.17                     | 27.94          | 178.93                 | 1.11   | 1.16   | 1.06   |
| 500.00          | 4.23                         | 4.12 | 0.10                     | 27.96          | 178.85                 | 1.11   | 1.19   | 1.09   |
| 550.00          | 4.23                         | 4.18 | 0.05                     | 28.20          | 178.94                 | 1.13   | 1.22   | 1.10   |
| 600.00          | 4.22                         | 4.21 | 0.01                     | 28.59          | 179.11                 | 1.15   | 1.24   | 1.11   |
| 700.00          | 4.20                         | 4.32 | 0.12                     | 29.79          | 179.42                 | 1.22   | 1.30   | 1.14   |
| 750.00          | 4.16                         | 4.36 | 0.20                     | 30.62          | 179.59                 | 1.25   | 1.32   | 1.16   |
| 800.00          | 4.15                         | 4.40 | 0.26                     | 31.22          | 179.85                 | 1.28   | 1.36   | 1.17   |
| 900.00          | 4.10                         | 4.54 | 0.44                     | 30.64          | 179.53                 | 1.31   | 1.44   | 1.21   |
| 1000.00         | 4.10                         | 4.72 | 0.61                     | 27.70          | 178.60                 | 1.29   | 1.55   | 1.27   |
| 1250.00         | 4.14                         | 5.31 | 1.17                     | 20.08          | 174.23                 | 1.02   | 1.87   | 1.47   |

1. Total Loss = Insertion Loss + 3dB splitter loss.



## Additional 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-Circuits' 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



# 2 Way-180° Power Splitter/Combiner SBTJC-122-75X+

## Typical Performance Data

| FREQUENCY<br>(MHz) | TOTAL LOSS <sup>1</sup><br>(dB) |      | AMPLITUDE<br>UNBALANCE<br>(dB) | ISOLATION<br>(dB) | PHASE<br>UNBALANCE<br>(deg.) | FREQUENCY<br>(MHz) | VSWR<br>(:1) |      |      |
|--------------------|---------------------------------|------|--------------------------------|-------------------|------------------------------|--------------------|--------------|------|------|
|                    | S-1                             | S-2  |                                |                   |                              |                    | S            | 1    | 2    |
| 3                  | 4.44                            | 4.08 | 0.36                           | 27.63             | 179.67                       | 3                  | 1.33         | 1.19 | 1.25 |
| 5                  | 4.26                            | 3.92 | 0.34                           | 30.05             | 179.61                       | 5                  | 1.23         | 1.15 | 1.19 |
| 7                  | 4.18                            | 3.86 | 0.33                           | 30.07             | 179.58                       | 7                  | 1.19         | 1.12 | 1.16 |
| 9                  | 4.14                            | 3.83 | 0.31                           | 29.62             | 179.59                       | 9                  | 1.16         | 1.09 | 1.14 |
| 10                 | 4.12                            | 3.82 | 0.30                           | 29.41             | 179.60                       | 10                 | 1.15         | 1.09 | 1.13 |
| 30                 | 4.08                            | 3.82 | 0.26                           | 28.55             | 179.85                       | 30                 | 1.11         | 1.03 | 1.09 |
| 50                 | 4.10                            | 3.85 | 0.25                           | 28.70             | 179.99                       | 50                 | 1.11         | 1.02 | 1.09 |
| 70                 | 4.11                            | 3.86 | 0.24                           | 28.81             | 179.91                       | 70                 | 1.10         | 1.03 | 1.09 |
| 90                 | 4.12                            | 3.88 | 0.24                           | 28.87             | 179.82                       | 90                 | 1.10         | 1.03 | 1.08 |
| 100                | 4.13                            | 3.89 | 0.24                           | 28.87             | 179.77                       | 100                | 1.10         | 1.03 | 1.08 |
| 150                | 4.14                            | 3.91 | 0.23                           | 28.90             | 179.57                       | 150                | 1.10         | 1.05 | 1.07 |
| 200                | 4.17                            | 3.94 | 0.23                           | 28.74             | 179.39                       | 200                | 1.10         | 1.07 | 1.06 |
| 250                | 4.18                            | 3.96 | 0.23                           | 28.49             | 179.22                       | 250                | 1.10         | 1.09 | 1.04 |
| 300                | 4.19                            | 3.99 | 0.21                           | 28.22             | 179.06                       | 300                | 1.11         | 1.11 | 1.04 |
| 350                | 4.20                            | 4.01 | 0.19                           | 28.02             | 178.99                       | 350                | 1.11         | 1.14 | 1.05 |
| 400                | 4.22                            | 4.04 | 0.17                           | 27.94             | 178.93                       | 400                | 1.11         | 1.16 | 1.06 |
| 450                | 4.22                            | 4.08 | 0.15                           | 27.88             | 178.86                       | 450                | 1.11         | 1.17 | 1.07 |
| 500                | 4.23                            | 4.12 | 0.10                           | 27.96             | 178.85                       | 500                | 1.11         | 1.19 | 1.09 |
| 550                | 4.23                            | 4.18 | 0.05                           | 28.20             | 178.94                       | 550                | 1.13         | 1.22 | 1.10 |
| 600                | 4.22                            | 4.21 | 0.01                           | 28.59             | 179.11                       | 600                | 1.15         | 1.24 | 1.11 |
| 650                | 4.21                            | 4.26 | 0.05                           | 29.12             | 179.25                       | 650                | 1.18         | 1.27 | 1.13 |
| 700                | 4.20                            | 4.32 | 0.12                           | 29.79             | 179.42                       | 700                | 1.22         | 1.30 | 1.14 |
| 750                | 4.16                            | 4.36 | 0.20                           | 30.62             | 179.59                       | 750                | 1.25         | 1.32 | 1.16 |
| 800                | 4.15                            | 4.40 | 0.26                           | 31.22             | 179.85                       | 800                | 1.28         | 1.36 | 1.17 |
| 850                | 4.13                            | 4.49 | 0.36                           | 31.18             | 179.75                       | 850                | 1.30         | 1.40 | 1.19 |
| 900                | 4.10                            | 4.54 | 0.44                           | 30.64             | 179.53                       | 900                | 1.31         | 1.44 | 1.21 |
| 950                | 4.07                            | 4.61 | 0.54                           | 29.43             | 179.12                       | 950                | 1.31         | 1.50 | 1.23 |
| 1000               | 4.10                            | 4.72 | 0.61                           | 27.70             | 178.60                       | 1000               | 1.29         | 1.55 | 1.27 |
| 1050               | 4.13                            | 4.84 | 0.72                           | 26.00             | 178.00                       | 1050               | 1.25         | 1.61 | 1.30 |
| 1100               | 4.13                            | 4.95 | 0.83                           | 24.42             | 177.29                       | 1100               | 1.22         | 1.67 | 1.34 |
| 1150               | 4.14                            | 5.07 | 0.93                           | 22.92             | 176.53                       | 1150               | 1.17         | 1.74 | 1.38 |
| 1200               | 4.14                            | 5.19 | 1.05                           | 21.57             | 175.43                       | 1200               | 1.11         | 1.80 | 1.43 |
| 1250               | 4.14                            | 5.31 | 1.17                           | 20.51             | 174.23                       | 1250               | 1.06         | 1.87 | 1.47 |
| 1300               | 4.18                            | 5.50 | 1.32                           | 19.48             | 172.94                       | 1300               | 1.02         | 1.92 | 1.54 |
| 1350               | 4.27                            | 5.52 | 1.25                           | 18.53             | 171.78                       | 1350               | 1.07         | 1.98 | 1.61 |
| 1400               | 4.33                            | 5.87 | 1.54                           | 17.92             | 170.47                       | 1400               | 1.11         | 2.05 | 1.67 |

<sup>1</sup>Total Loss = Insertion Loss + 3dB Splitter Loss



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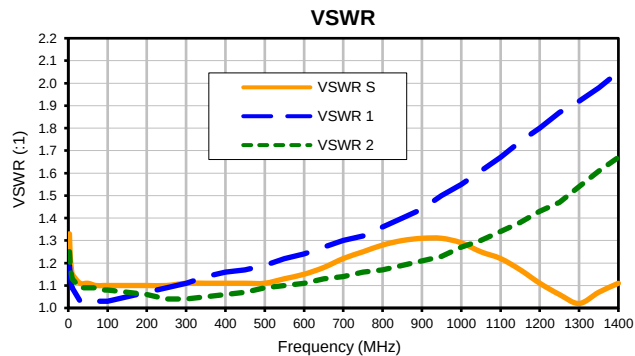
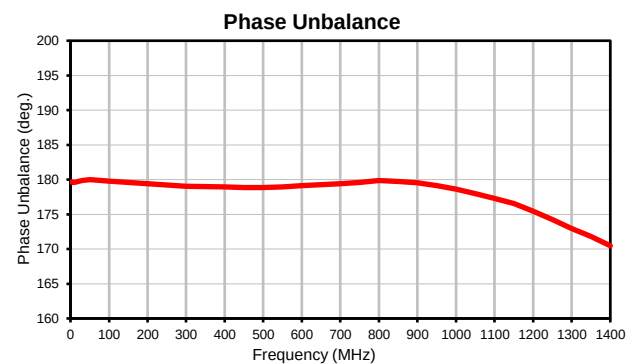
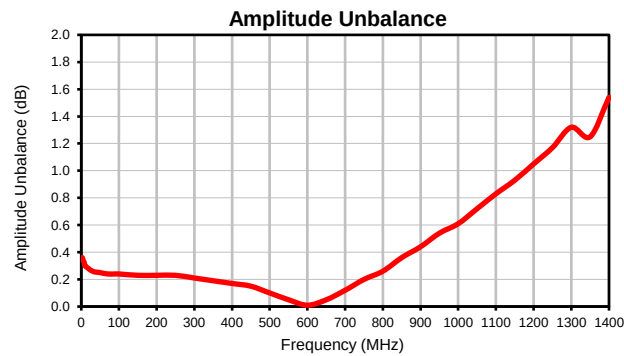
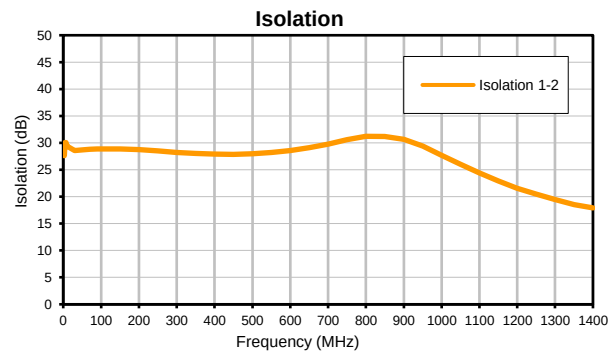
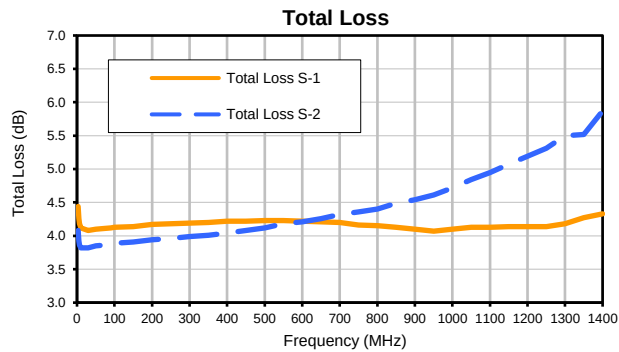
IF/RF MICROWAVE COMPONENTS

REV. OR  
SBTJC-122-75X+  
6/23/2015  
Page 1 of 1

# 2 Way-180° Power Splitter/Combiner

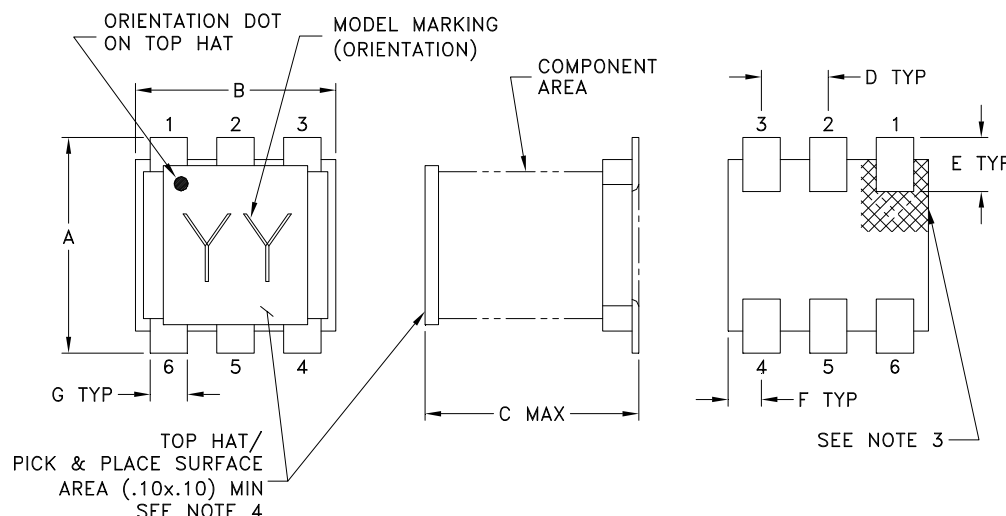
SBTCJ-122-75X+

## Typical Performance Curves

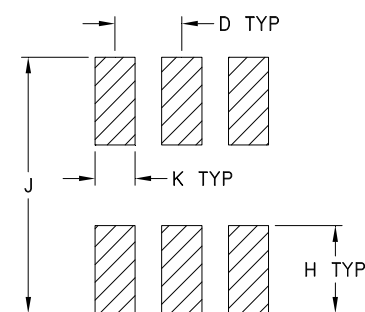


## Outline Dimensions

DB1627



## PCB Land Pattern



| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              | WT. GRAM |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| DB1627 | .160<br>(4.06) | .150<br>(3.81) | .160<br>(4.06) | .050<br>(1.27) | .040<br>(1.02) | .025<br>(0.64) | .028<br>(0.71) | .065<br>(1.65) | .190<br>(4.83) | .030<br>(0.76) | .15      |

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

### Notes:

- Case material: Plastic.
- Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.  
For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.
- Orientation dot on top hat & orientation feature on substrate correspondence to pin #1.
- Top-Hat total thickness: .013 inches MAX.



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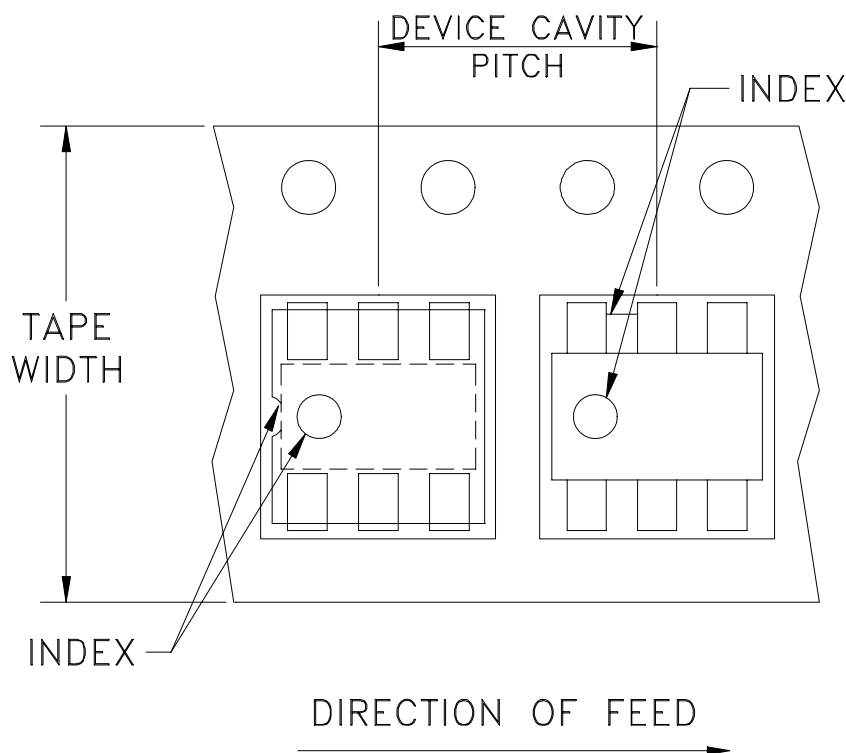
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RF/IF MICROWAVE COMPONENTS



# Tape & Reel Packaging TR-F47

## DEVICE ORIENTATION IN T&R



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note |
|-------------------|----------------------------|----------------------|------------------------------|
| 12                | 8                          | 13                   | 1000, 2000                   |
|                   |                            | 7                    | 20, 50, 100, 200, 500        |

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)



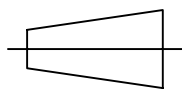
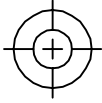
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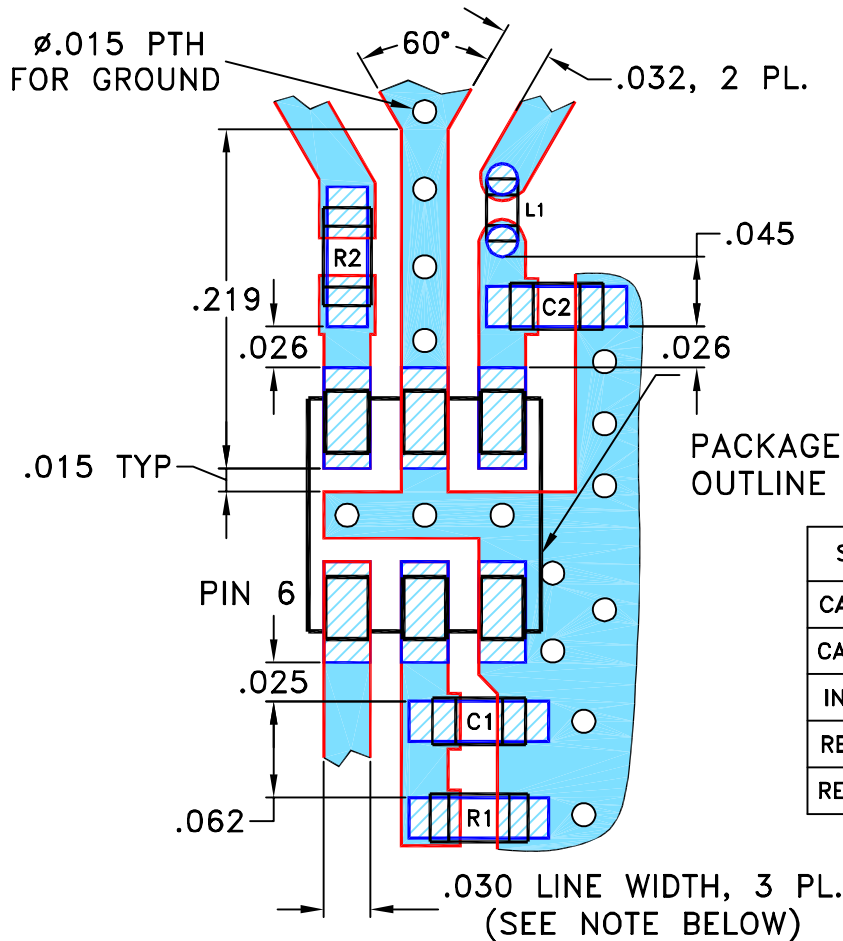
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION | DATE     | DR | AUTH |
|-----|---------|-------------|----------|----|------|
| OR  | M130562 | NEW RELEASE | 03/04/11 | GF | JC   |
|     |         |             |          |    |      |
|     |         |             |          |    |      |

### SUGGESTED MOUNTING CONFIGURATION FOR DB714 CASE STYLE, "06SP10" PIN CODE



| SEQ.   | DESCRIPTION                  |
|--------|------------------------------|
| CAP C1 | S-SER 3.6 ± .1 pF; 0603 SIZE |
| CAP C2 | HIQ 0.8 ±1 pF; 0603 SIZE     |
| IND L1 | 3.6 ± .1 NH; 0402 SIZE       |
| RES R1 | .1W 30.1 OHM 1%; 0603 SIZE   |
| RES R2 | .1W 4.99 OHM 1%; 0603 SIZE   |

- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC  
(SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

## UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES  
TOLERANCES ON:  
2 PL DECIMALS ±  
3 PL DECIMALS ± .005  
ANGLES ±  
FRACTIONS ±

| INITIALS    | DATE     |
|-------------|----------|
| DRAWN GF    | 02/14/11 |
| CHECKED AV  | 03/04/11 |
| APPROVED JC | 03/04/11 |

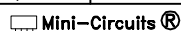


Mini-Circuits®

13 Neptune Avenue  
Brooklyn NY 11235

PL, 06SP10, 75, DB714, TB-580+

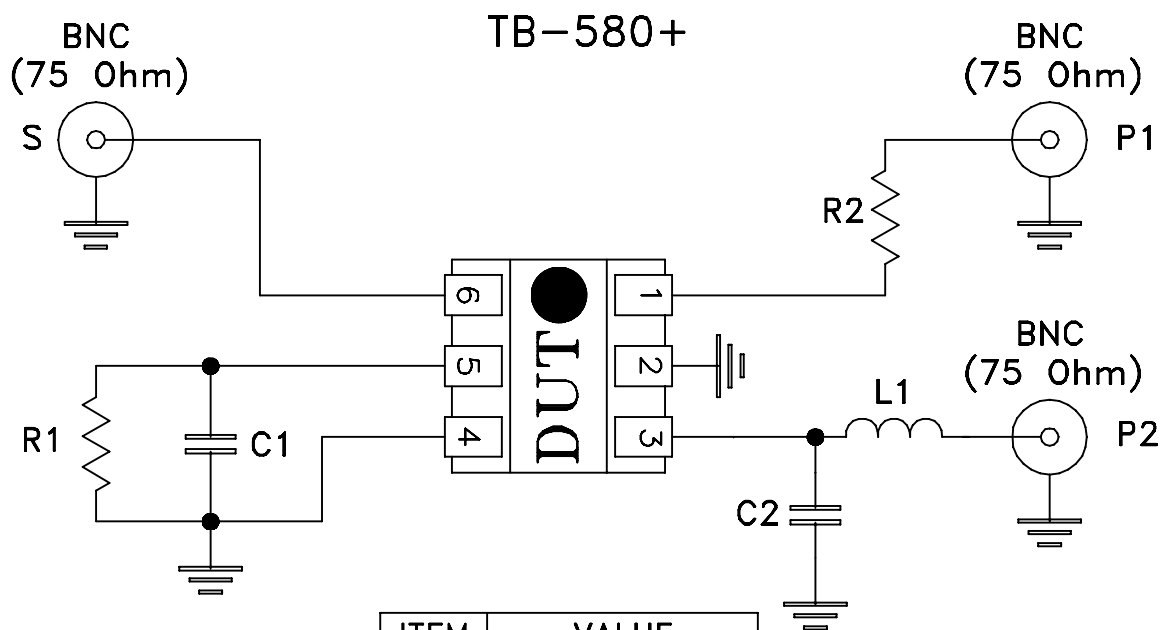
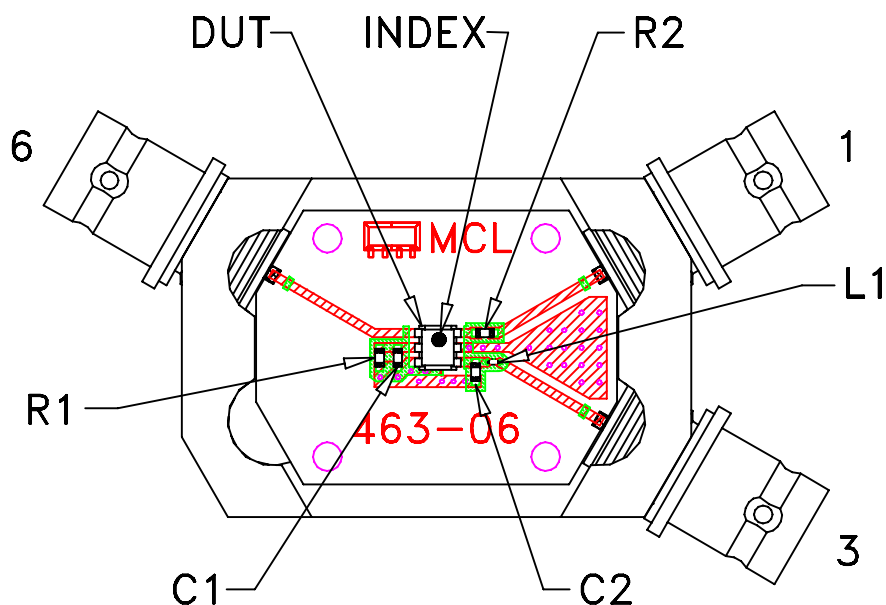
| SIZE  | CODE IDENT | DRAWING NO: | REV:   |
|-------|------------|-------------|--------|
| A     | 15542      | 98-PL-342   | OR     |
| FILE: | 98PL342    | SCALE:      | 8:1    |
|       |            | SHEET:      | 1 OF 1 |



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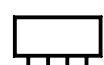
# Evaluation Board and Circuit



| ITEM | VALUE    |
|------|----------|
| R1   | 30.1 OHM |
| R2   | 4.99 OHM |
| C1   | 3.6 pF   |
| C2   | 0.8 pF   |
| L1   | 3.6 nH   |

## Notes:

1. 75 Ohm BNC connectors.
2. PCB Material: RO4350 or equivalent,  
Dielectric Constant=3.5, Thickness=.030 inch.

 Mini-Circuits®





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                                                                              |