

# Surface Mount Frequency Mixer

## SKY-53LHR+

Level 10 (LO Power +10 dBm) 2800 to 5300 MHz

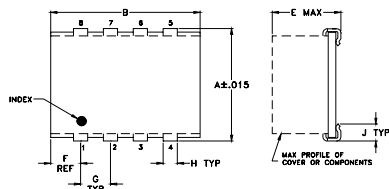
### Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| RF Power                                                        | 50mW           |
| IF Current                                                      | 40mA           |
| Permanent damage may occur if any of these limits are exceeded. |                |

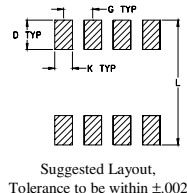
### Pin Connections

|        |           |
|--------|-----------|
| LO     | 5         |
| RF     | 1         |
| IF     | 7         |
| GROUND | 2,3,4,6,8 |

### Outline Drawing



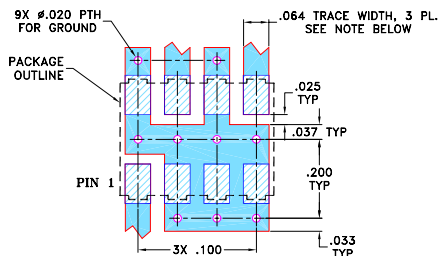
#### PCB Land Pattern



### Outline Dimensions (inch)

| A    | B    | C    | D    | E     | F    | G    |
|------|------|------|------|-------|------|------|
| .305 | .390 | --   | .100 | .105  | .045 | .100 |
| 7.75 | 9.91 | --   | 2.54 | 2.67  | 1.14 | 2.54 |
| H    | J    | K    | L    | wt    |      |      |
| .047 | .065 | .065 | .325 | grams |      |      |
| 1.19 | 1.65 | 1.65 | 8.26 | 0.20  |      |      |

### Demo Board MCL P/N: TB-11 Suggested PCB Layout (PL-056)



#### NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .002". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - 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

#### 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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

### Features

- wide bandwidth, 2800 to 5300 MHz.
- low conversion loss, 5.7 dB typ.
- good L-R isolation, 28 dB typ.
- J-leads for strain relief

### Applications

- line of sight links
- fixed satellite



Generic photo used for illustration purposes only  
CASE STYLE: BJ398

### +RoHS Compliant

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

### Electrical Specifications

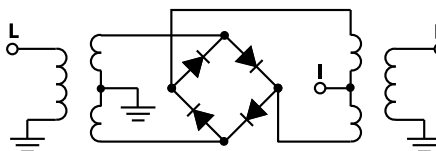
| FREQUENCY<br>(MHz)     |        | CONVERSION LOSS<br>(dB) |          | LO-RF ISOLATION<br>(dB) |  | LO-IF ISOLATION<br>(dB) |    | IP3<br>at center<br>band<br>(dBm) |      |      |      |
|------------------------|--------|-------------------------|----------|-------------------------|--|-------------------------|----|-----------------------------------|------|------|------|
| LO/RF<br>$f_L$ - $f_U$ | IF     | Mid-Band                |          | Total<br>Range<br>Max.  |  |                         |    |                                   |      |      |      |
|                        |        | $\overline{X}$          | $\sigma$ |                         |  |                         |    |                                   | Typ. | Min. | Typ. |
| 2800-5300              | DC-500 | 6.2                     | .20      | 9.5                     |  | 28                      | 15 |                                   | 12   | 8    | 14   |

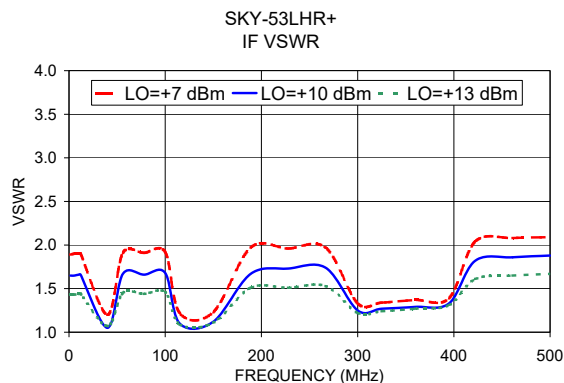
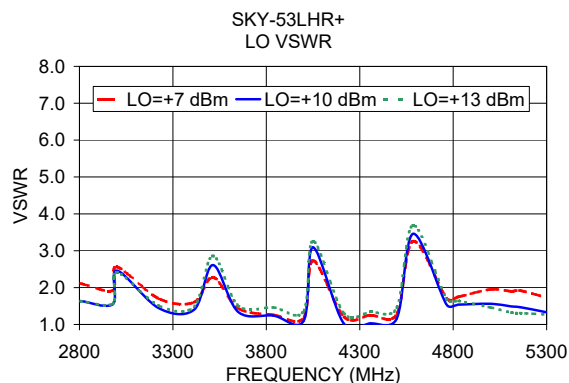
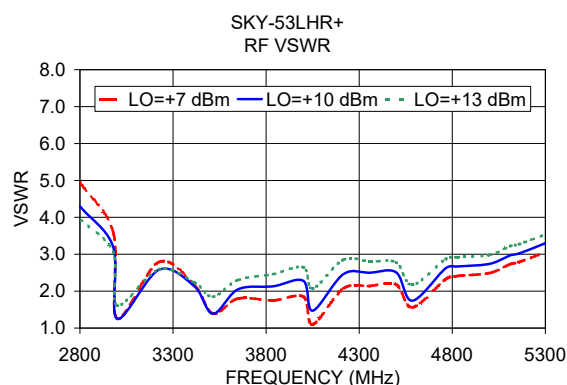
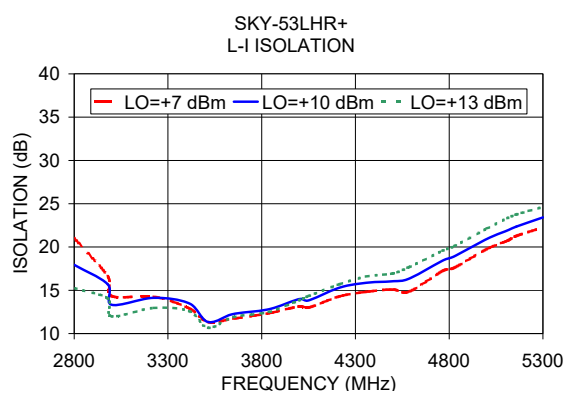
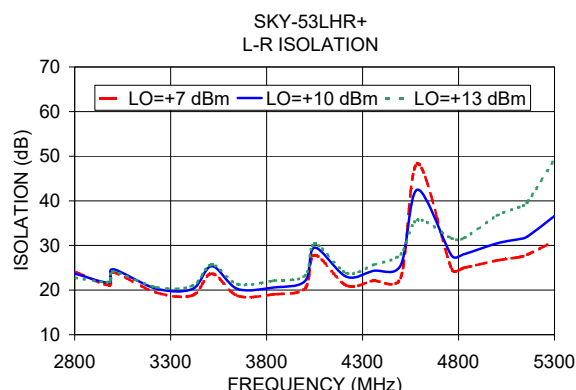
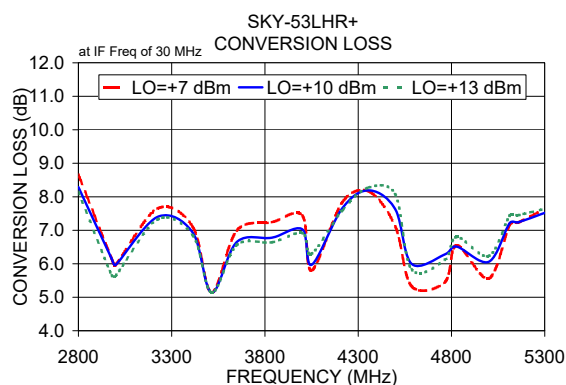
1 dB COMP.: +5 dBm typ.

### Typical Performance Data

| Frequency<br>(MHz) |         | Conversion<br>Loss<br>(dB) | Isolation<br>L-R<br>(dB) | Isolation<br>L-I<br>(dB) | VSWR<br>RF Port<br>(:1) | VSWR<br>LO Port<br>(:1) |
|--------------------|---------|----------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| RF                 | LO      |                            |                          |                          |                         |                         |
|                    |         | LO<br>+10dBm               | LO<br>+10dBm             | LO<br>+10dBm             | LO<br>+10dBm            | LO<br>+10dBm            |
| 2800.00            | 2830.00 | 8.29                       | 23.70                    | 17.95                    | 4.30                    | 1.64                    |
| 2978.57            | 3008.57 | 6.15                       | 21.68                    | 15.70                    | 3.20                    | 1.55                    |
| 3000.00            | 3030.00 | 5.97                       | 24.67                    | 13.33                    | 1.25                    | 2.46                    |
| 3224.53            | 3254.53 | 7.40                       | 20.33                    | 14.13                    | 2.58                    | 1.44                    |
| 3413.21            | 3443.21 | 6.93                       | 20.24                    | 13.49                    | 2.14                    | 1.40                    |
| 3514.29            | 3544.29 | 5.14                       | 25.34                    | 11.33                    | 1.39                    | 2.61                    |
| 3649.06            | 3679.06 | 6.65                       | 20.25                    | 12.26                    | 2.05                    | 1.34                    |
| 3837.74            | 3867.74 | 6.78                       | 20.59                    | 12.81                    | 2.13                    | 1.24                    |
| 4000.00            | 4030.00 | 7.03                       | 22.00                    | 13.98                    | 2.28                    | 1.10                    |
| 4050.00            | 4080.00 | 5.97                       | 29.50                    | 13.83                    | 1.47                    | 3.09                    |
| 4215.09            | 4185.09 | 7.66                       | 23.01                    | 15.30                    | 2.46                    | 1.02                    |
| 4356.60            | 4326.60 | 8.19                       | 24.31                    | 15.86                    | 2.50                    | 1.03                    |
| 4498.11            | 4468.11 | 7.63                       | 25.54                    | 16.04                    | 2.51                    | 1.16                    |
| 4585.71            | 4615.71 | 6.00                       | 42.50                    | 16.34                    | 1.74                    | 3.46                    |
| 4764.29            | 4794.29 | 6.28                       | 27.73                    | 18.42                    | 2.62                    | 1.54                    |
| 4828.30            | 4798.30 | 6.51                       | 28.05                    | 18.93                    | 2.67                    | 1.54                    |
| 5000.00            | 5030.00 | 6.06                       | 30.48                    | 20.92                    | 2.74                    | 1.56                    |
| 5111.32            | 5081.32 | 7.21                       | 31.40                    | 21.92                    | 2.97                    | 1.49                    |
| 5158.49            | 5128.49 | 7.24                       | 31.98                    | 22.36                    | 3.02                    | 1.47                    |
| 5300.00            | 5270.00 | 7.52                       | 36.61                    | 23.42                    | 3.30                    | 1.33                    |

### Electrical Schematic





## Notes

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# Frequency Mixer

# SKY-53LHR+

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=30MHz<br>(dB) |       |       |
|---------------------|-------------|-------------------------------------------------------|-------|-------|
|                     |             | @LO (dBm)                                             |       |       |
|                     |             | +7                                                    | +10   | +13   |
| 2020.1              | 2050.1      | 10.73                                                 | 10.34 | 10.26 |
| 2180.6              | 2210.6      | 9.55                                                  | 9.29  | 9.25  |
| 2341.1              | 2371.1      | 8.67                                                  | 8.39  | 8.15  |
| 2501.6              | 2531.6      | 7.79                                                  | 7.50  | 7.21  |
| 2662.1              | 2692.1      | 7.46                                                  | 7.24  | 7.06  |
| 2822.7              | 2852.7      | 7.05                                                  | 6.74  | 6.44  |
| 2983.2              | 3013.2      | 6.67                                                  | 6.32  | 6.05  |
| 3143.7              | 3173.7      | 6.56                                                  | 6.05  | 5.83  |
| 3304.2              | 3334.2      | 5.98                                                  | 5.58  | 5.46  |
| 3464.7              | 3494.7      | 5.98                                                  | 5.65  | 5.57  |
| 3625.2              | 3655.2      | 6.41                                                  | 6.14  | 6.02  |
| 3785.7              | 3815.7      | 6.30                                                  | 6.17  | 6.09  |
| 3946.2              | 3976.2      | 6.19                                                  | 6.52  | 6.74  |
| 4106.7              | 4136.7      | 5.74                                                  | 6.27  | 6.74  |
| 4267.3              | 4297.3      | 5.61                                                  | 5.76  | 6.12  |
| 4427.8              | 4457.8      | 5.78                                                  | 5.87  | 6.19  |
| 4588.3              | 4618.3      | 6.06                                                  | 6.12  | 6.36  |
| 4748.8              | 4778.8      | 6.29                                                  | 6.31  | 6.49  |
| 4909.3              | 4939.3      | 6.56                                                  | 6.61  | 6.84  |
| 5069.8              | 5099.8      | 6.62                                                  | 6.62  | 6.83  |
| 5230.3              | 5260.3      | 6.43                                                  | 6.28  | 6.34  |
| 5390.8              | 5420.8      | 6.98                                                  | 6.47  | 6.30  |
| 5551.3              | 5581.3      | 8.18                                                  | 7.56  | 7.19  |
| 5711.9              | 5741.9      | 8.86                                                  | 8.40  | 8.11  |
| 5872.4              | 5902.4      | 8.72                                                  | 8.45  | 8.33  |
| 6032.9              | 6062.9      | 8.48                                                  | 8.53  | 9.07  |
| 6193.4              | 6223.4      | 8.25                                                  | 8.32  | 8.74  |
| 6353.9              | 6383.9      | 8.30                                                  | 8.24  | 8.43  |
| 6514.4              | 6544.4      | 8.77                                                  | 8.44  | 8.52  |
| 6674.9              | 6704.9      | 8.75                                                  | 8.39  | 8.47  |
| 6835.4              | 6865.4      | 8.45                                                  | 8.16  | 8.21  |
| 6995.9              | 7025.9      | 8.24                                                  | 7.99  | 8.09  |
| 7156.5              | 7186.5      | 7.79                                                  | 7.59  | 7.76  |
| 7317.0              | 7347.0      | 7.38                                                  | 7.25  | 7.70  |
| 7477.5              | 7507.5      | 7.33                                                  | 6.97  | 7.43  |
| 7638.0              | 7668.0      | 7.28                                                  | 6.70  | 7.23  |
| 7798.5              | 7828.5      | 7.58                                                  | 6.77  | 7.46  |
| 7959.0              | 7989.0      | 8.44                                                  | 7.25  | 8.36  |
| 8119.5              | 8149.5      | 9.14                                                  | 7.97  | 10.18 |
| 8300.1              | 8330.1      | 10.12                                                 | 10.56 | 12.36 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +7                 | +10   | +13   |
| 2020.1              | 2050.1      | 18.14              | 17.30 | 12.77 |
| 2180.6              | 2210.6      | 18.23              | 16.62 | 16.07 |
| 2341.1              | 2371.1      | 14.01              | 12.59 | 11.07 |
| 2501.6              | 2531.6      | 11.50              | 12.24 | 10.20 |
| 2662.1              | 2692.1      | 9.35               | 10.12 | 10.73 |
| 2822.7              | 2852.7      | 9.94               | 10.71 | 11.77 |
| 2983.2              | 3013.2      | 13.25              | 12.94 | 13.28 |
| 3143.7              | 3173.7      | 14.48              | 13.96 | 14.72 |
| 3304.2              | 3334.2      | 12.46              | 14.28 | 14.92 |
| 3464.7              | 3494.7      | 13.91              | 15.43 | 16.21 |
| 3625.2              | 3655.2      | 16.85              | 18.46 | 17.40 |
| 3785.7              | 3815.7      | 18.83              | 16.38 | 15.21 |
| 3946.2              | 3976.2      | 9.26               | 14.09 | 15.25 |
| 4106.7              | 4136.7      | 6.56               | 11.49 | 16.14 |
| 4267.3              | 4297.3      | 8.36               | 11.35 | 15.39 |
| 4427.8              | 4457.8      | 10.98              | 14.67 | 19.03 |
| 4588.3              | 4618.3      | 14.24              | 16.54 | 18.37 |
| 4748.8              | 4778.8      | 14.44              | 18.19 | 20.16 |
| 4909.3              | 4939.3      | 13.34              | 18.40 | 19.42 |
| 5069.8              | 5099.8      | 10.38              | 16.02 | 18.67 |
| 5230.3              | 5260.3      | 5.81               | 9.82  | 14.26 |
| 5390.8              | 5420.8      | 5.99               | 10.36 | 14.27 |
| 5551.3              | 5581.3      | 9.89               | 14.32 | 16.46 |
| 5711.9              | 5741.9      | 11.42              | 17.52 | 16.06 |
| 5872.4              | 5902.4      | 11.53              | 16.55 | 14.24 |
| 6032.9              | 6062.9      | 10.48              | 13.85 | 13.58 |
| 6193.4              | 6223.4      | 13.07              | 14.66 | 15.46 |
| 6353.9              | 6383.9      | 12.16              | 13.95 | 16.65 |
| 6514.4              | 6544.4      | 14.28              | 14.50 | 16.54 |
| 6674.9              | 6704.9      | 17.28              | 15.93 | 17.03 |
| 6835.4              | 6865.4      | 18.78              | 17.27 | 16.95 |
| 6995.9              | 7025.9      | 17.38              | 16.60 | 15.28 |
| 7156.5              | 7186.5      | 17.33              | 15.92 | 12.89 |
| 7317.0              | 7347.0      | 15.65              | 13.73 | 10.42 |
| 7477.5              | 7507.5      | 15.02              | 11.87 | 10.32 |
| 7638.0              | 7668.0      | 13.63              | 10.45 | 9.00  |
| 7798.5              | 7828.5      | 10.34              | 9.35  | 8.41  |
| 7959.0              | 7989.0      | 8.43               | 7.63  | 8.17  |
| 8119.5              | 8149.5      | 7.33               | 5.87  | 12.70 |
| 8300.1              | 8330.1      | 5.87               | 6.89  | 16.41 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+5dBm<br>(dB) |      |      |
|---------------------|-------------|-------------------------------------|------|------|
|                     |             | @LO (dBm)                           |      |      |
|                     |             | +7                                  | +10  | +13  |
| 2020.1              | 2050.1      | 0.57                                | 0.47 | 0.41 |
| 2180.6              | 2210.6      | 0.59                                | 0.48 | 0.62 |
| 2341.1              | 2371.1      | 0.77                                | 0.81 | 1.29 |
| 2501.6              | 2531.6      | 1.10                                | 1.23 | 1.83 |
| 2662.1              | 2692.1      | 1.18                                | 1.28 | 1.66 |
| 2822.7              | 2852.7      | 1.27                                | 1.33 | 1.69 |
| 2983.2              | 3013.2      | 1.30                                | 1.23 | 1.34 |
| 3143.7              | 3173.7      | 1.31                                | 1.14 | 1.03 |
| 3304.2              | 3334.2      | 1.50                                | 1.26 | 1.06 |
| 3464.7              | 3494.7      | 1.40                                | 1.04 | 0.90 |
| 3625.2              | 3655.2      | 0.91                                | 0.63 | 0.58 |
| 3785.7              | 3815.7      | 1.15                                | 0.83 | 0.83 |
| 3946.2              | 3976.2      | 1.59                                | 0.96 | 0.79 |
| 4106.7              | 4136.7      | 2.07                                | 1.21 | 0.65 |
| 4267.3              | 4297.3      | 2.17                                | 1.65 | 1.21 |
| 4427.8              | 4457.8      | 2.11                                | 1.58 | 1.13 |
| 4588.3              | 4618.3      | 1.90                                | 1.33 | 0.94 |
| 4748.8              | 4778.8      | 1.64                                | 1.02 | 0.67 |
| 4909.3              | 4939.3      | 1.37                                | 0.74 | 0.47 |
| 5069.8              | 5099.8      | 1.51                                | 0.85 | 0.52 |
| 5230.3              | 5260.3      | 2.90                                | 1.97 | 1.32 |
| 5390.8              | 5420.8      | 3.16                                | 2.31 | 1.69 |
| 5551.3              | 5581.3      | 1.82                                | 1.37 | 1.00 |
| 5711.9              | 5741.9      | 0.98                                | 0.76 | 0.66 |
| 5872.4              | 5902.4      | 0.86                                | 0.74 | 0.73 |
| 6032.9              | 6062.9      | 1.09                                | 1.01 | 0.82 |
| 6193.4              | 6223.4      | 0.92                                | 0.73 | 0.73 |
| 6353.9              | 6383.9      | 0.91                                | 0.66 | 0.60 |
| 6514.4              | 6544.4      | 0.67                                | 0.62 | 0.66 |
| 6674.9              | 6704.9      | 0.52                                | 0.57 | 0.68 |
| 6835.4              | 6865.4      | 0.50                                | 0.56 | 0.73 |
| 6995.9              | 7025.9      | 0.57                                | 0.64 | 0.79 |
| 7156.5              | 7186.5      | 0.82                                | 0.97 | 1.21 |
| 7317.0              | 7347.0      | 1.04                                | 1.25 | 1.48 |
| 7477.5              | 7507.5      | 1.27                                | 1.66 | 1.89 |
| 7638.0              | 7668.0      | 1.59                                | 2.11 | 2.44 |
| 7798.5              | 7828.5      | 1.50                                | 2.17 | 2.38 |
| 7959.0              | 7989.0      | 1.49                                | 2.37 | 2.08 |
| 8119.5              | 8149.5      | 2.17                                | 2.92 | 1.38 |
| 8300.1              | 8330.1      | 3.20                                | 2.41 | 0.90 |

# Frequency Mixer

**SKY-53LHR+**

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=4050MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=2789.8MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=5310.1MHz<br>(dB) |
|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |
|                      |             | +10                                                            |                      |             | +10                                                              |                      |             | +10                                                              |
| 2550.0               | 1500.0      | 5.91                                                           | 10.1                 | 2800.0      | 6.96                                                             | 1210.1               | 4100.0      | 10.19                                                            |
| 2421.2               | 1628.8      | 5.80                                                           | 90.1                 | 2880.0      | 6.64                                                             | 1169.4               | 4140.7      | 10.15                                                            |
| 2292.3               | 1757.7      | 5.65                                                           | 170.1                | 2960.0      | 6.57                                                             | 1128.7               | 4181.4      | 9.98                                                             |
| 2163.5               | 1886.5      | 5.47                                                           | 250.1                | 3040.0      | 6.28                                                             | 1108.4               | 4201.7      | 9.86                                                             |
| 2034.6               | 2015.4      | 5.43                                                           | 330.1                | 3120.0      | 6.09                                                             | 1067.7               | 4242.4      | 9.73                                                             |
| 1905.8               | 2144.2      | 5.35                                                           | 410.1                | 3200.0      | 6.17                                                             | 1047.4               | 4262.7      | 9.46                                                             |
| 1777.0               | 2273.0      | 5.38                                                           | 490.1                | 3280.0      | 6.21                                                             | 1006.7               | 4303.4      | 9.15                                                             |
| 1648.1               | 2401.9      | 5.45                                                           | 570.1                | 3360.0      | 6.18                                                             | 986.4                | 4323.7      | 9.20                                                             |
| 1519.3               | 2530.7      | 5.60                                                           | 650.1                | 3440.0      | 6.15                                                             | 945.7                | 4364.4      | 9.00                                                             |
| 1390.4               | 2659.6      | 5.87                                                           | 730.1                | 3520.0      | 6.29                                                             | 925.4                | 4384.7      | 8.71                                                             |
| 1261.6               | 2788.4      | 6.18                                                           | 810.1                | 3600.0      | 6.51                                                             | 884.7                | 4425.4      | 8.62                                                             |
| 1132.8               | 2917.2      | 6.11                                                           | 890.1                | 3680.0      | 6.82                                                             | 864.3                | 4445.8      | 8.47                                                             |
| 1003.9               | 3046.1      | 6.36                                                           | 970.1                | 3760.0      | 7.06                                                             | 823.7                | 4486.4      | 8.13                                                             |
| 875.1                | 3174.9      | 6.96                                                           | 1050.1               | 3840.0      | 7.04                                                             | 803.3                | 4506.8      | 8.33                                                             |
| 746.2                | 3303.8      | 6.88                                                           | 1130.1               | 3920.0      | 7.20                                                             | 762.6                | 4547.5      | 8.23                                                             |
| 617.4                | 3432.6      | 6.84                                                           | 1190.1               | 3980.0      | 7.23                                                             | 742.3                | 4567.8      | 7.89                                                             |
| 488.6                | 3561.4      | 7.03                                                           | 1270.1               | 4060.0      | 7.07                                                             | 701.6                | 4608.5      | 7.81                                                             |
| 359.7                | 3690.3      | 6.93                                                           | 1330.1               | 4120.0      | 7.27                                                             | 681.3                | 4628.8      | 7.94                                                             |
| 230.9                | 3819.1      | 6.69                                                           | 1410.1               | 4200.0      | 7.03                                                             | 640.6                | 4669.5      | 7.71                                                             |
| 102.0                | 3948.0      | 6.66                                                           | 1470.1               | 4260.0      | 7.26                                                             | 620.3                | 4689.8      | 7.54                                                             |
| 31.7                 | 4081.7      | 6.31                                                           | 1550.1               | 4340.0      | 7.32                                                             | 579.6                | 4730.5      | 7.52                                                             |
| 183.9                | 4233.9      | 5.62                                                           | 1610.1               | 4400.0      | 7.01                                                             | 559.3                | 4750.8      | 7.57                                                             |
| 336.1                | 4386.1      | 5.60                                                           | 1690.1               | 4480.0      | 6.91                                                             | 518.6                | 4791.5      | 7.44                                                             |
| 488.3                | 4538.3      | 5.69                                                           | 1750.1               | 4540.0      | 7.04                                                             | 498.2                | 4811.9      | 7.31                                                             |
| 640.4                | 4690.4      | 5.96                                                           | 1830.1               | 4620.0      | 7.01                                                             | 457.6                | 4852.5      | 7.18                                                             |
| 792.6                | 4842.6      | 6.27                                                           | 1890.1               | 4680.0      | 6.92                                                             | 437.2                | 4872.9      | 7.10                                                             |
| 944.8                | 4994.8      | 5.99                                                           | 1970.1               | 4760.0      | 7.06                                                             | 396.5                | 4913.6      | 7.04                                                             |
| 1097.0               | 5147.0      | 6.17                                                           | 2030.1               | 4820.0      | 7.39                                                             | 376.2                | 4933.9      | 6.94                                                             |
| 1249.1               | 5299.1      | 6.59                                                           | 2110.1               | 4900.0      | 7.52                                                             | 335.5                | 4974.6      | 6.80                                                             |
| 1401.3               | 5451.3      | 7.10                                                           | 2170.1               | 4960.0      | 7.41                                                             | 315.2                | 4994.9      | 6.76                                                             |
| 1553.5               | 5603.5      | 7.11                                                           | 2250.1               | 5040.0      | 7.71                                                             | 274.5                | 5035.6      | 6.61                                                             |
| 1705.7               | 5755.7      | 7.18                                                           | 2310.1               | 5100.0      | 8.11                                                             | 254.2                | 5055.9      | 6.51                                                             |
| 1879.6               | 5929.6      | 7.80                                                           | 2390.1               | 5180.0      | 8.06                                                             | 213.5                | 5096.6      | 6.40                                                             |
| 2031.7               | 6081.7      | 8.32                                                           | 2450.1               | 5240.0      | 8.11                                                             | 193.2                | 5116.9      | 6.30                                                             |
| 2205.7               | 6255.7      | 7.83                                                           | 2530.1               | 5320.0      | 8.58                                                             | 152.5                | 5157.6      | 6.23                                                             |
| 2357.8               | 6407.8      | 7.76                                                           | 2590.1               | 5380.0      | 8.93                                                             | 132.1                | 5178.0      | 6.22                                                             |
| 2531.7               | 6581.7      | 7.56                                                           | 2670.1               | 5460.0      | 9.11                                                             | 91.5                 | 5218.6      | 6.22                                                             |
| 2683.9               | 6733.9      | 7.84                                                           | 2730.1               | 5520.0      | 9.51                                                             | 71.1                 | 5239.0      | 6.26                                                             |
| 2857.8               | 6907.8      | 8.65                                                           | 2810.1               | 5600.0      | 10.20                                                            | 30.4                 | 5279.7      | 6.26                                                             |
| 3010.0               | 7060.0      | 10.63                                                          | 2870.1               | 5660.0      | 10.63                                                            | 10.1                 | 5300.0      | 6.43                                                             |

# Frequency Mixer

SKY-53LHR+

## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +7                      | +10   | +13   | +7                      | +10   | +13   |
| 2050.1      | 29.47                   | 29.10 | 29.26 | 15.88                   | 15.01 | 14.80 |
| 2210.6      | 30.44                   | 29.76 | 29.11 | 17.83                   | 16.78 | 15.60 |
| 2371.1      | 32.52                   | 30.47 | 28.49 | 20.38                   | 17.91 | 15.48 |
| 2531.6      | 31.51                   | 29.23 | 27.18 | 20.84                   | 17.04 | 14.75 |
| 2692.1      | 28.08                   | 27.13 | 26.26 | 18.27                   | 15.95 | 14.13 |
| 2852.7      | 26.56                   | 26.09 | 24.97 | 15.99                   | 14.65 | 12.76 |
| 3013.2      | 26.98                   | 26.44 | 25.51 | 15.67                   | 14.30 | 12.97 |
| 3173.7      | 27.02                   | 27.27 | 26.51 | 15.73                   | 14.45 | 13.22 |
| 3334.2      | 26.87                   | 27.67 | 27.17 | 15.56                   | 14.90 | 13.51 |
| 3494.7      | 27.06                   | 28.48 | 28.30 | 16.05                   | 15.53 | 14.22 |
| 3655.2      | 28.66                   | 31.43 | 31.83 | 15.74                   | 16.04 | 15.15 |
| 3815.7      | 28.68                   | 31.45 | 32.54 | 15.86                   | 16.38 | 15.99 |
| 3976.2      | 32.94                   | 36.44 | 33.34 | 15.81                   | 16.39 | 16.44 |
| 4136.7      | 40.60                   | 39.83 | 32.38 | 15.79                   | 16.53 | 16.71 |
| 4297.3      | 34.50                   | 35.95 | 32.68 | 16.14                   | 16.71 | 17.20 |
| 4457.8      | 33.91                   | 35.12 | 30.65 | 16.55                   | 17.42 | 18.01 |
| 4618.3      | 35.04                   | 33.77 | 29.32 | 17.34                   | 18.27 | 18.94 |
| 4778.8      | 35.39                   | 31.53 | 28.41 | 17.95                   | 19.07 | 20.03 |
| 4939.3      | 34.15                   | 29.46 | 26.39 | 18.86                   | 20.06 | 21.17 |
| 5099.8      | 32.65                   | 28.58 | 25.49 | 19.99                   | 21.26 | 22.47 |
| 5260.3      | 24.41                   | 23.12 | 21.89 | 20.93                   | 22.25 | 23.41 |
| 5420.8      | 23.81                   | 21.59 | 20.27 | 21.89                   | 22.95 | 23.85 |
| 5581.3      | 27.64                   | 23.65 | 21.34 | 23.45                   | 24.18 | 24.35 |
| 5741.9      | 26.76                   | 23.15 | 20.78 | 25.15                   | 25.29 | 24.42 |
| 5902.4      | 24.70                   | 21.81 | 19.68 | 26.95                   | 25.98 | 24.17 |
| 6062.9      | 23.79                   | 21.41 | 19.74 | 30.24                   | 27.83 | 25.28 |
| 6223.4      | 20.96                   | 18.99 | 17.92 | 28.90                   | 26.07 | 24.04 |
| 6383.9      | 20.34                   | 18.62 | 17.13 | 26.88                   | 24.36 | 22.33 |
| 6544.4      | 19.46                   | 18.16 | 16.91 | 24.52                   | 22.91 | 21.35 |
| 6704.9      | 17.98                   | 17.12 | 16.02 | 22.23                   | 21.17 | 19.95 |
| 6865.4      | 16.95                   | 16.50 | 15.60 | 20.41                   | 20.11 | 19.34 |
| 7025.9      | 16.19                   | 15.92 | 15.18 | 19.14                   | 19.30 | 18.99 |
| 7186.5      | 16.07                   | 15.92 | 15.44 | 18.12                   | 18.69 | 19.15 |
| 7347.0      | 16.17                   | 17.08 | 17.40 | 17.06                   | 18.34 | 19.29 |
| 7507.5      | 14.86                   | 16.42 | 17.27 | 16.02                   | 17.54 | 18.57 |
| 7668.0      | 13.73                   | 15.30 | 16.27 | 15.29                   | 16.86 | 18.12 |
| 7828.5      | 13.37                   | 15.06 | 16.33 | 15.03                   | 16.54 | 17.84 |
| 7989.0      | 13.45                   | 14.80 | 16.32 | 15.36                   | 16.55 | 17.44 |
| 8149.5      | 13.95                   | 15.06 | 16.43 | 16.27                   | 16.74 | 16.85 |
| 8330.1      | 14.62                   | 15.67 | 16.90 | 17.43                   | 16.33 | 15.58 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +7                      | +10   | +13   |
| 2020.1              | 2050.1      | 13.37                   | 14.43 | 15.66 |
| 2180.6              | 2210.6      | 13.53                   | 14.69 | 16.49 |
| 2341.1              | 2371.1      | 14.41                   | 15.33 | 16.50 |
| 2501.6              | 2531.6      | 15.79                   | 16.04 | 16.13 |
| 2662.1              | 2692.1      | 15.13                   | 14.89 | 14.77 |
| 2822.7              | 2852.7      | 13.85                   | 13.81 | 13.80 |
| 2983.2              | 3013.2      | 12.61                   | 12.72 | 12.74 |
| 3143.7              | 3173.7      | 11.71                   | 11.74 | 11.87 |
| 3304.2              | 3334.2      | 12.00                   | 11.96 | 11.94 |
| 3464.7              | 3494.7      | 11.94                   | 11.89 | 11.89 |
| 3625.2              | 3655.2      | 12.27                   | 12.20 | 12.21 |
| 3785.7              | 3815.7      | 12.90                   | 12.63 | 12.53 |
| 3946.2              | 3976.2      | 13.62                   | 12.95 | 12.80 |
| 4106.7              | 4136.7      | 14.67                   | 13.90 | 13.53 |
| 4267.3              | 4297.3      | 15.71                   | 15.15 | 14.81 |
| 4427.8              | 4457.8      | 17.27                   | 16.78 | 16.32 |
| 4588.3              | 4618.3      | 18.60                   | 18.05 | 17.69 |
| 4748.8              | 4778.8      | 20.04                   | 19.37 | 18.99 |
| 4909.3              | 4939.3      | 20.91                   | 20.15 | 19.82 |
| 5069.8              | 5099.8      | 21.72                   | 20.85 | 20.48 |
| 5230.3              | 5260.3      | 22.05                   | 21.34 | 20.92 |
| 5390.8              | 5420.8      | 24.03                   | 23.52 | 23.08 |
| 5551.3              | 5581.3      | 26.21                   | 25.52 | 24.97 |
| 5711.9              | 5741.9      | 27.56                   | 26.20 | 25.59 |
| 5872.4              | 5902.4      | 27.88                   | 26.31 | 25.60 |
| 6032.9              | 6062.9      | 27.91                   | 25.70 | 24.67 |
| 6193.4              | 6223.4      | 27.80                   | 26.02 | 24.82 |
| 6353.9              | 6383.9      | 27.08                   | 25.74 | 24.55 |
| 6514.4              | 6544.4      | 27.73                   | 26.21 | 24.75 |
| 6674.9              | 6704.9      | 27.63                   | 26.26 | 24.91 |
| 6835.4              | 6865.4      | 26.86                   | 25.77 | 24.71 |
| 6995.9              | 7025.9      | 25.99                   | 24.92 | 23.77 |
| 7156.5              | 7186.5      | 25.85                   | 24.77 | 24.02 |
| 7317.0              | 7347.0      | 24.90                   | 23.94 | 23.60 |
| 7477.5              | 7507.5      | 26.33                   | 25.83 | 25.08 |
| 7638.0              | 7668.0      | 27.77                   | 27.68 | 27.19 |
| 7798.5              | 7828.5      | 26.94                   | 27.61 | 27.79 |
| 7959.0              | 7989.0      | 25.51                   | 26.42 | 27.86 |
| 8119.5              | 8149.5      | 22.89                   | 24.08 | 26.59 |
| 8300.1              | 8330.1      | 21.74                   | 23.81 | 27.24 |

# Frequency Mixer

# SKY-53LHR+

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF VSWR<br>(:1) |      |      | LO<br>(MHz) | LO VSWR<br>(:1) |      |      | IF<br>(OUT)<br>(MHz) | IF VSWR<br>@LO=5300MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|------|------|----------------------|--------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      |                      | @LO (dBm)                      |      |      |
|                     |             | +7              | +10  | +13  |             | +7              | +10  | +13  |                      | +7                             | +10  | +13  |
| 2020.1              | 2050.1      | 9.63            | 9.08 | 8.39 | 2050.1      | 2.46            | 2.18 | 2.45 | 10.0                 | 1.57                           | 1.42 | 1.34 |
| 2180.6              | 2210.6      | 7.34            | 6.89 | 6.13 | 2210.6      | 1.99            | 1.92 | 2.28 | 90.6                 | 1.53                           | 1.39 | 1.31 |
| 2341.1              | 2371.1      | 5.91            | 5.33 | 4.67 | 2371.1      | 1.73            | 1.74 | 2.11 | 171.2                | 1.53                           | 1.37 | 1.29 |
| 2501.6              | 2531.6      | 4.60            | 4.07 | 3.60 | 2531.6      | 1.52            | 1.60 | 2.01 | 251.7                | 1.53                           | 1.36 | 1.29 |
| 2662.1              | 2692.1      | 3.90            | 3.52 | 3.25 | 2692.1      | 1.33            | 1.49 | 1.95 | 332.3                | 1.54                           | 1.37 | 1.32 |
| 2822.7              | 2852.7      | 3.09            | 2.93 | 2.82 | 2852.7      | 1.21            | 1.40 | 1.84 | 412.9                | 1.59                           | 1.41 | 1.37 |
| 2983.2              | 3013.2      | 2.43            | 2.40 | 2.41 | 3013.2      | 1.18            | 1.37 | 1.81 | 493.5                | 1.65                           | 1.46 | 1.41 |
| 3143.7              | 3173.7      | 2.14            | 2.20 | 2.31 | 3173.7      | 1.15            | 1.28 | 1.73 | 553.9                | 1.61                           | 1.42 | 1.38 |
| 3304.2              | 3334.2      | 1.94            | 2.06 | 2.15 | 3334.2      | 1.19            | 1.22 | 1.68 | 634.5                | 1.63                           | 1.45 | 1.41 |
| 3464.7              | 3494.7      | 2.08            | 2.24 | 2.32 | 3494.7      | 1.23            | 1.24 | 1.69 | 694.9                | 1.72                           | 1.54 | 1.51 |
| 3625.2              | 3655.2      | 2.31            | 2.50 | 2.58 | 3655.2      | 1.28            | 1.27 | 1.67 | 775.5                | 1.76                           | 1.59 | 1.55 |
| 3785.7              | 3815.7      | 2.20            | 2.56 | 2.67 | 3815.7      | 1.33            | 1.31 | 1.69 | 835.9                | 1.80                           | 1.59 | 1.53 |
| 3946.2              | 3976.2      | 2.07            | 2.66 | 2.88 | 3976.2      | 1.39            | 1.31 | 1.66 | 916.5                | 1.86                           | 1.64 | 1.58 |
| 4106.7              | 4136.7      | 2.05            | 2.55 | 2.87 | 4136.7      | 1.47            | 1.38 | 1.69 | 976.9                | 1.87                           | 1.70 | 1.67 |
| 4267.3              | 4297.3      | 2.02            | 2.35 | 2.59 | 4297.3      | 1.54            | 1.37 | 1.66 | 1057.5               | 1.90                           | 1.73 | 1.69 |
| 4427.8              | 4457.8      | 2.11            | 2.44 | 2.71 | 4457.8      | 1.68            | 1.43 | 1.65 | 1117.9               | 2.03                           | 1.81 | 1.73 |
| 4588.3              | 4618.3      | 2.32            | 2.59 | 2.83 | 4618.3      | 1.73            | 1.38 | 1.56 | 1198.5               | 2.03                           | 1.81 | 1.74 |
| 4748.8              | 4778.8      | 2.63            | 2.89 | 3.09 | 4778.8      | 1.82            | 1.41 | 1.52 | 1258.9               | 2.04                           | 1.83 | 1.75 |
| 4909.3              | 4939.3      | 2.95            | 3.24 | 3.46 | 4939.3      | 1.89            | 1.39 | 1.41 | 1339.5               | 2.04                           | 1.81 | 1.73 |
| 5069.8              | 5099.8      | 3.10            | 3.34 | 3.52 | 5099.8      | 1.83            | 1.33 | 1.35 | 1399.9               | 2.13                           | 1.82 | 1.70 |
| 5230.3              | 5260.3      | 2.39            | 2.42 | 2.48 | 5260.3      | 1.73            | 1.20 | 1.26 | 1480.5               | 2.10                           | 1.81 | 1.69 |
| 5390.8              | 5420.8      | 2.91            | 2.76 | 2.71 | 5420.8      | 1.65            | 1.17 | 1.29 | 1540.9               | 1.97                           | 1.68 | 1.56 |
| 5551.3              | 5581.3      | 4.09            | 3.76 | 3.57 | 5581.3      | 1.46            | 1.06 | 1.37 | 1621.5               | 1.92                           | 1.62 | 1.51 |
| 5711.9              | 5741.9      | 5.46            | 5.03 | 4.80 | 5741.9      | 1.39            | 1.07 | 1.40 | 1681.9               | 1.95                           | 1.65 | 1.53 |
| 5872.4              | 5902.4      | 5.41            | 4.98 | 4.83 | 5902.4      | 1.26            | 1.12 | 1.48 | 1762.5               | 1.85                           | 1.55 | 1.42 |
| 6032.9              | 6062.9      | 5.03            | 4.50 | 4.39 | 6062.9      | 1.19            | 1.19 | 1.54 | 1822.9               | 1.72                           | 1.42 | 1.32 |
| 6193.4              | 6223.4      | 4.59            | 4.17 | 3.97 | 6223.4      | 1.17            | 1.23 | 1.59 | 1903.5               | 1.65                           | 1.37 | 1.28 |
| 6353.9              | 6383.9      | 4.32            | 3.86 | 3.52 | 6383.9      | 1.11            | 1.30 | 1.68 | 1964.0               | 1.68                           | 1.37 | 1.25 |
| 6514.4              | 6544.4      | 4.78            | 4.20 | 3.68 | 6544.4      | 1.07            | 1.35 | 1.74 | 2044.5               | 1.59                           | 1.27 | 1.15 |
| 6674.9              | 6704.9      | 4.66            | 4.15 | 3.65 | 6704.9      | 1.09            | 1.45 | 1.85 | 2105.0               | 1.46                           | 1.17 | 1.11 |
| 6835.4              | 6865.4      | 4.51            | 3.97 | 3.51 | 6865.4      | 1.18            | 1.55 | 1.95 | 2185.5               | 1.40                           | 1.13 | 1.10 |
| 6995.9              | 7025.9      | 3.80            | 3.30 | 2.84 | 7025.9      | 1.32            | 1.69 | 2.07 | 2246.0               | 1.40                           | 1.13 | 1.08 |
| 7156.5              | 7186.5      | 3.53            | 3.00 | 2.56 | 7186.5      | 1.46            | 1.79 | 2.15 | 2326.5               | 1.24                           | 1.06 | 1.16 |
| 7317.0              | 7347.0      | 2.76            | 2.25 | 1.87 | 7347.0      | 1.63            | 1.90 | 2.23 | 2387.0               | 1.16                           | 1.16 | 1.28 |
| 7477.5              | 7507.5      | 2.71            | 2.21 | 1.60 | 7507.5      | 1.77            | 1.97 | 2.25 | 2467.6               | 1.21                           | 1.28 | 1.38 |
| 7638.0              | 7668.0      | 2.45            | 1.96 | 1.39 | 7668.0      | 1.97            | 2.00 | 2.20 | 2528.0               | 1.29                           | 1.35 | 1.42 |
| 7798.5              | 7828.5      | 1.93            | 1.52 | 1.05 | 7828.5      | 2.01            | 1.85 | 1.90 | 2608.6               | 1.47                           | 1.55 | 1.62 |
| 7959.0              | 7989.0      | 1.62            | 1.28 | 1.26 | 7989.0      | 2.07            | 1.77 | 1.72 | 2669.0               | 1.69                           | 1.78 | 1.83 |
| 8119.5              | 8149.5      | 1.52            | 1.27 | 1.52 | 8149.5      | 1.95            | 1.61 | 1.48 | 2749.6               | 1.99                           | 2.03 | 2.03 |
| 8300.1              | 8330.1      | 1.64            | 1.58 | 1.98 | 8330.1      | 1.86            | 1.57 | 1.33 | 2810.0               | 2.24                           | 2.25 | 2.25 |

## Harmonics Tables

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | +10 | 11  | 11  | 12  | 30  | --- | --- | --- | --- | --- |
| 1      | -      | 7      | +0  | 28  | 33  | 34  | 41  | 46  | --- | --- | --- | --- |
| 2      | 85     | 66     | 47  | 43  | 54  | 59  | 57  | 54  | 68  | --- | --- | --- |
| 3      | >90    | 67     | >74 | 65  | 56  | 67  | 68  | 70  | 62  | >74 | --- | --- |
| 4      | >90    | >74    | >74 | >74 | >74 | 60  | >74 | >74 | >74 | 73  | >74 | --- |
| 5      | >90    | >74    | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 6      | ---    | ---    | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 7      | ---    | ---    | --- | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 8      | ---    | ---    | --- | --- | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 9      | ---    | ---    | --- | --- | --- | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 10     | ---    | ---    | --- | --- | --- | --- | >74 | >74 | >74 | >74 | >74 | >74 |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

Test conditions:

RF IN: 4050 MHz; -10.00 dBm.

LO IN: 4080 MHz; +10.00 dBm

IF OUT: 30 MHz; -16.37 dBm

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | +0  | 21  | 19  | 24  | 39  | --- | --- | --- | --- | --- |
| 1      | -      | 7      | +0  | 29  | 34  | 38  | 46  | 52  | --- | --- | --- | --- |
| 2      | 65     | 52     | 39  | 39  | 51  | 48  | 46  | 50  | 61  | --- | --- | --- |
| 3      | >90    | 61     | 67  | 50  | 51  | 52  | 56  | 55  | 51  | 65  | --- | --- |
| 4      | >90    | 70     | 64  | 68  | 60  | 45  | 62  | 71  | 58  | 68  | 71  | --- |
| 5      | >90    | >83    | 72  | 69  | 82  | 73  | 48  | 67  | 62  | 69  | 62  | 79  |
| 6      | ---    | ---    | 83  | 76  | 79  | >83 | 72  | 52  | 75  | 74  | 69  | 72  |
| 7      | ---    | ---    | --- | >83 | 79  | 80  | >83 | >83 | 65  | >83 | 76  | 77  |
| 8      | ---    | ---    | --- | --- | >83 | >83 | >83 | >83 | 78  | 65  | 83  | >83 |
| 9      | ---    | ---    | --- | --- | --- | >83 | >83 | >83 | >83 | >83 | 74  | >83 |
| 10     | ---    | ---    | --- | --- | --- | --- | >83 | >83 | >83 | >83 | >83 | 70  |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

## LO HARMONICS ORDER

Test conditions:

RF IN: 4050 MHz; 0.00 dBm.

LO IN: 4080 MHz; +10.00 dBm

IF OUT: 30 MHz; -6.91 dBm

Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.

2. + entry denotes harmonics are in (dBc) above IF OUTPUT.

3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

REV. X3

SKY-53LHR+

101031

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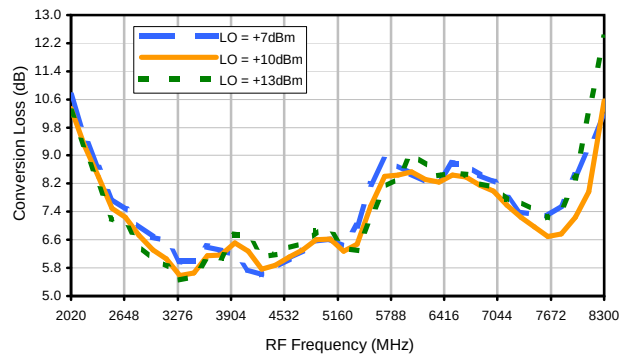


# Frequency Mixer

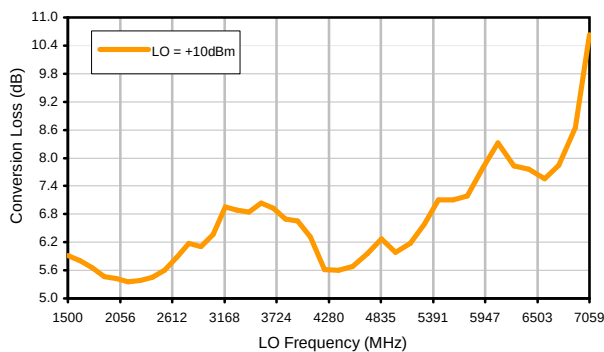
SKY-53LHR+

## Typical Performance Curves

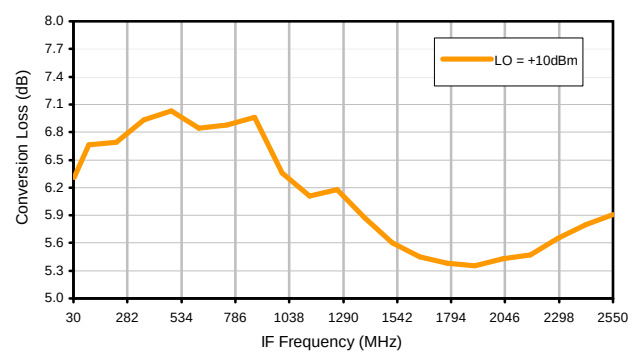
Conversion Loss @ IF=30MHz



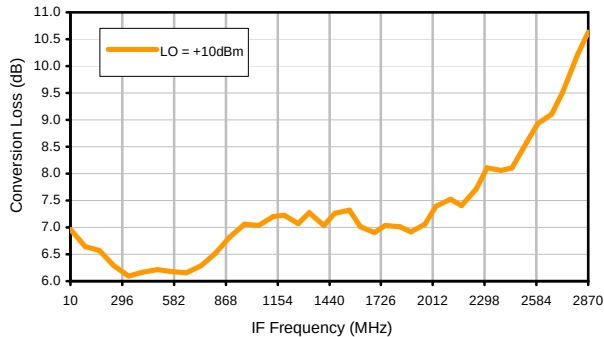
Conversion Loss vs. LO @ RF=4050MHz



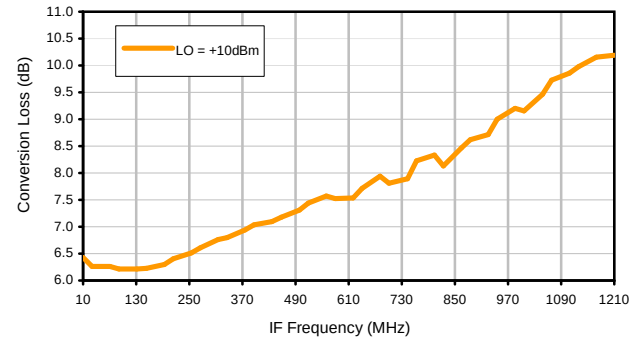
Conversion Loss vs. IF @ RF=4050MHz



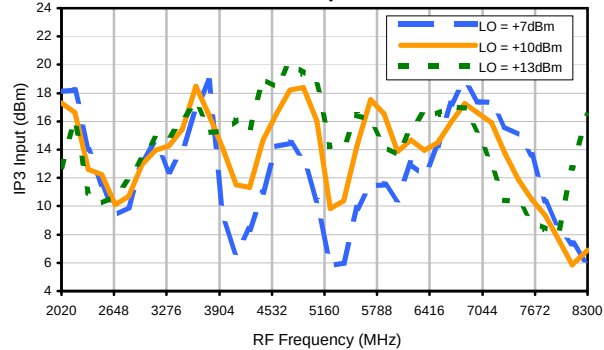
Conversion Loss vs. IF @ RF=2789.89MHz



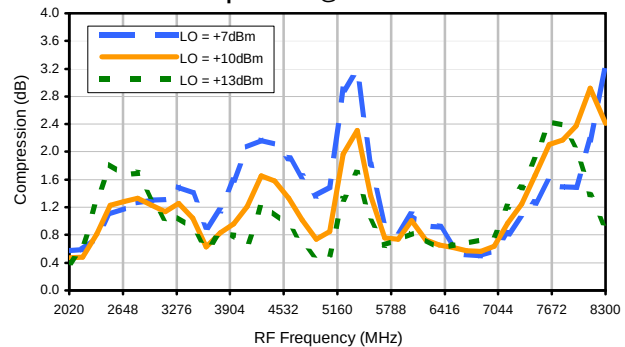
Conversion Loss vs. IF @ RF=5310.1MHz



IP3 Input



Compression @ RF IN=+5dBm



REV. X3  
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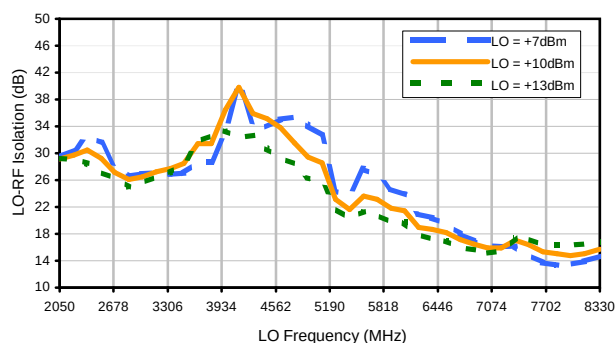
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[minicircuits.com](http://minicircuits.com)

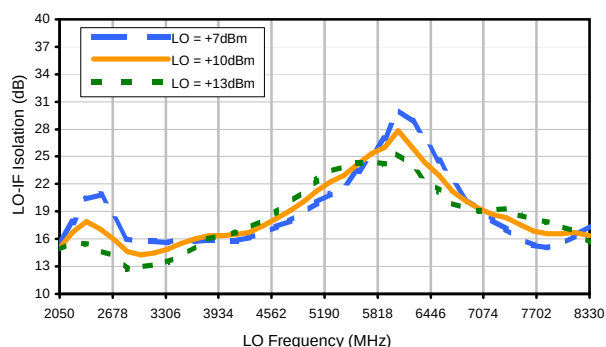


## Typical Performance Curves

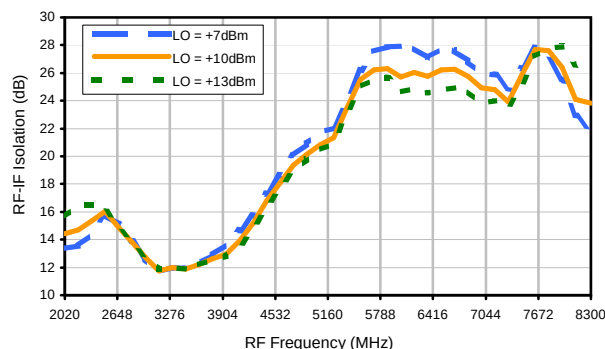
LO-RF Isolation



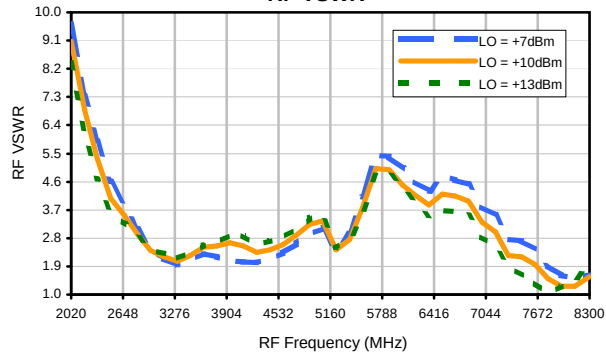
LO-IF Isolation



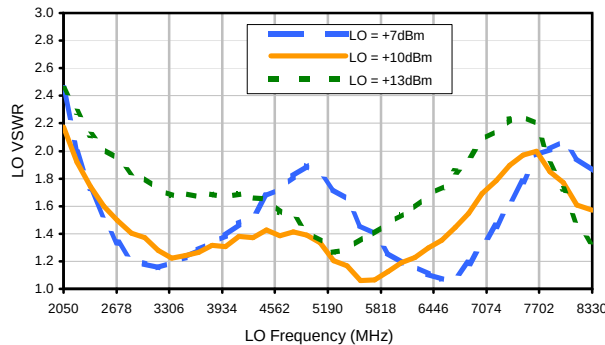
RF-IF Isolation



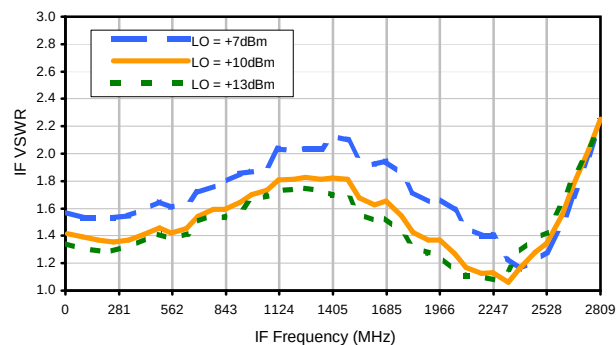
RF VSWR



LO VSWR



IF VSWR



## Harmonics Tables

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | +10 | 11  | 11  | 12  | 30  | --- | --- | --- | --- | --- |
| 1      | -      | 7      | +0  | 28  | 33  | 34  | 41  | 46  | --- | --- | --- | --- |
| 2      | 85     | 66     | 47  | 43  | 54  | 59  | 57  | 54  | 68  | --- | --- | --- |
| 3      | >90    | 67     | >74 | 65  | 56  | 67  | 68  | 70  | 62  | >74 | --- | --- |
| 4      | >90    | >74    | >74 | >74 | >74 | 60  | >74 | >74 | >74 | 73  | >74 | --- |
| 5      | >90    | >74    | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 6      | ---    | ---    | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 7      | ---    | ---    | --- | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 8      | ---    | ---    | --- | --- | >74 | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 9      | ---    | ---    | --- | --- | --- | >74 | >74 | >74 | >74 | >74 | >74 | >74 |
| 10     | ---    | ---    | --- | --- | --- | --- | >74 | >74 | >74 | >74 | >74 | >74 |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

Test conditions:

RF IN: 4050 MHz; -10.00 dBm.  
LO IN: 4080 MHz; +10.00 dBm  
IF OUT: 30 MHz; -16.37 dBm

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | +0  | 21  | 19  | 24  | 39  | --- | --- | --- | --- | --- |
| 1      | -      | 7      | +0  | 29  | 34  | 38  | 46  | 52  | --- | --- | --- | --- |
| 2      | 65     | 52     | 39  | 39  | 51  | 48  | 46  | 50  | 61  | --- | --- | --- |
| 3      | >90    | 61     | 67  | 50  | 51  | 52  | 56  | 55  | 51  | 65  | --- | --- |
| 4      | >90    | 70     | 64  | 68  | 60  | 45  | 62  | 71  | 58  | 68  | 71  | --- |
| 5      | >90    | >83    | 72  | 69  | 82  | 73  | 48  | 67  | 62  | 69  | 62  | 79  |
| 6      | ---    | ---    | 83  | 76  | 79  | >83 | 72  | 52  | 75  | 74  | 69  | 72  |
| 7      | ---    | ---    | --- | >83 | 79  | 80  | >83 | >83 | 65  | >83 | 76  | 77  |
| 8      | ---    | ---    | --- | --- | >83 | >83 | >83 | >83 | 78  | 65  | 83  | >83 |
| 9      | ---    | ---    | --- | --- | --- | >83 | >83 | >83 | >83 | >83 | 74  | >83 |
| 10     | ---    | ---    | --- | --- | --- | --- | >83 | >83 | >83 | >83 | >83 | 70  |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

## LO HARMONICS ORDER

Test conditions:

RF IN: 4050 MHz; 0.00 dBm.  
LO IN: 4080 MHz; +10.00 dBm  
IF OUT: 30 MHz; -6.91 dBm

- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

# Case Style

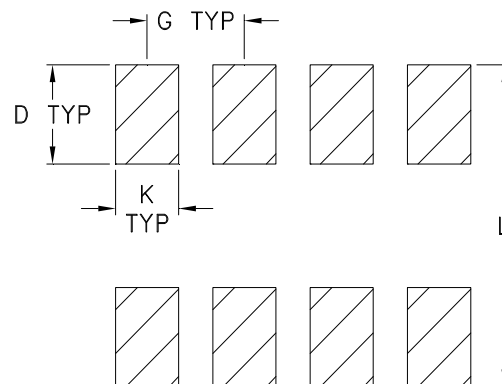
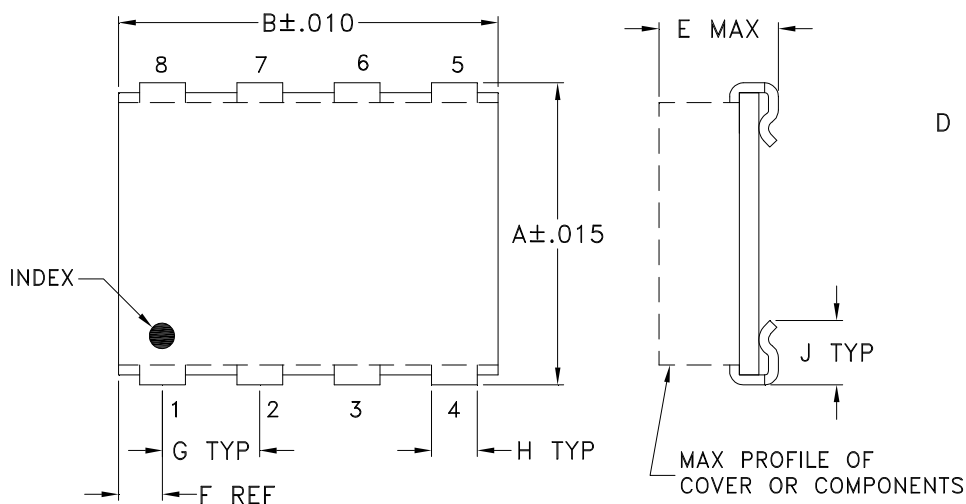
# BJ

## Outline Dimensions

BJ293

BJ398

## PCB Land Pattern



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

| CASE# | A               | B               | C        | D              | E              | F              | G              | H              | J              | K              | L               | WT.<br>GRAMS |
|-------|-----------------|-----------------|----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|--------------|
| BJ293 | .395<br>(10.03) | .500<br>(12.70) | --<br>-- | .100<br>(2.54) | .230<br>(5.84) | .100<br>(2.54) | .100<br>(2.54) | .047<br>(1.19) | .065<br>(1.65) | .065<br>(1.65) | .425<br>(10.80) | .80          |
| BJ398 | .305<br>(7.75)  | .390<br>(9.91)  | --<br>-- | .100<br>(2.54) | .105<br>(2.67) | .045<br>(1.14) | .100<br>(2.54) | .047<br>(1.19) | .065<br>(1.65) | .065<br>(1.65) | .325<br>(8.26)  | .20          |

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

### Notes:

- Case material: Plastic.
- Base material: Printed wiring laminate.
- 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.



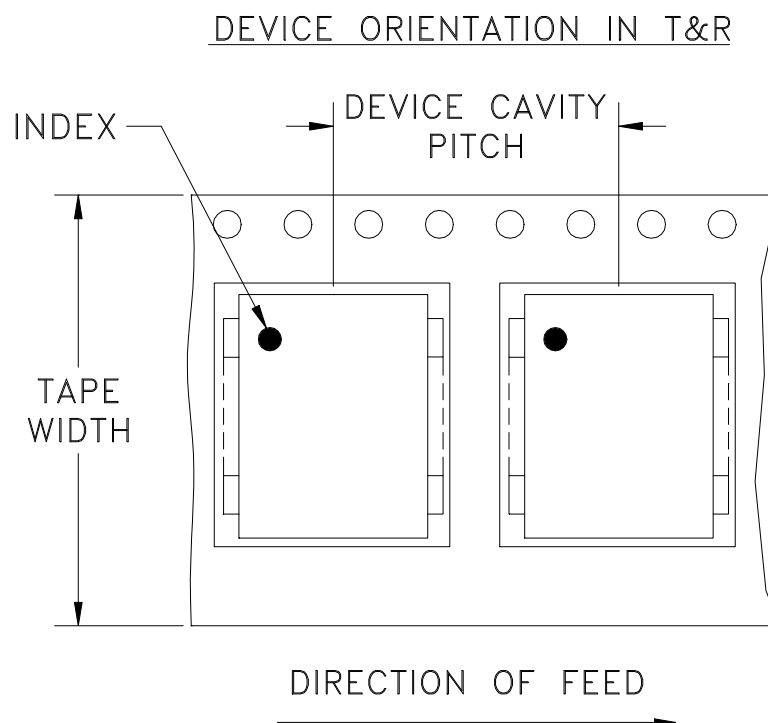
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# Tape & Reel Packaging TR-F29



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel |
|-------------------|----------------------------|----------------------|------------------|
| 24                | 12                         | 13                   | 500              |

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)



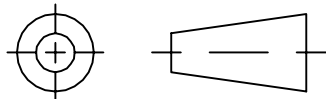
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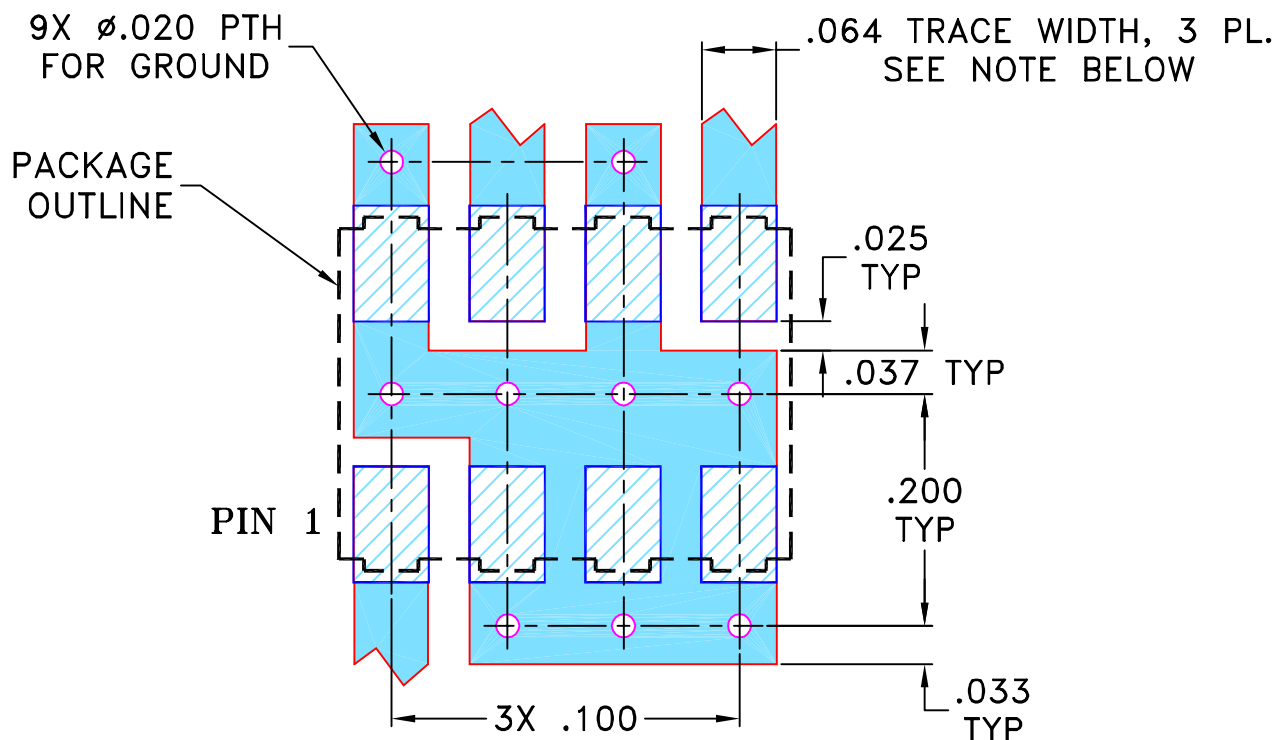
## THIRD ANGLE PROJECTION



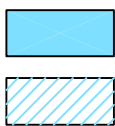
## REVISIONS

| REV | ECN No. | DESCRIPTION                          | DATE     | DR | AUTH |
|-----|---------|--------------------------------------|----------|----|------|
| OR  | M88233  | NEW RELEASE                          | 08/06/03 | AV | WL   |
| A   | M102713 | UPDATED NOTES, ADDED "...WITH SMOBC" | 01/16/06 | GT | IL   |
|     |         |                                      |          |    |      |
|     |         |                                      |          |    |      |

SUGGESTED MOUNTING CONFIGURATION  
FOR BJ398 CASE STYLE, "je/hp" PIN CONNECTIONS

NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030"  $\pm$  .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  $\pm$   
 3 PL DECIMALS  $\pm$  .005  
 ANGLES  $\pm$   
 FRACTIONS  $\pm$

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07/28/03

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IL

08/06/03

APPROVED

WL

08/06/03



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PL, je/hp, BJ398, SKY, TB-11

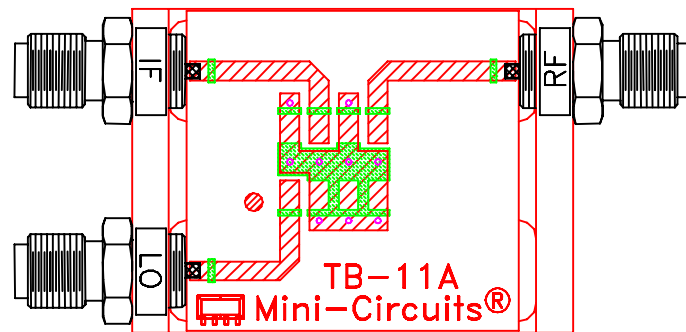
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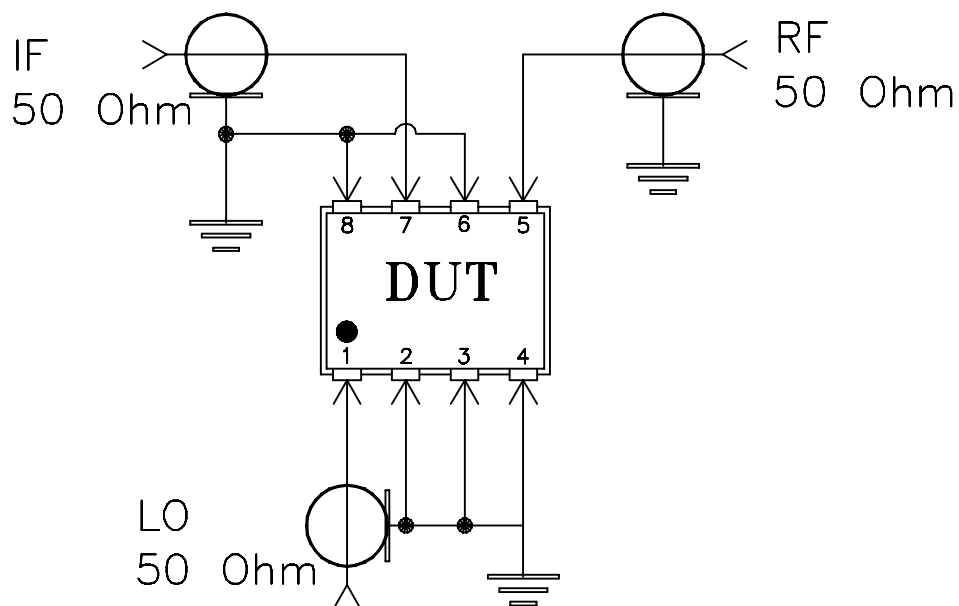
SCALE: 6:1

SHEET: 1 OF 1

# Evaluation Board and Circuit



TB-11



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.030 inch.

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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                                                                              |