

## Frequency Mixer

## HJK-ED9154/1

Level 17 (LO Power + 17 dBm)

### Important Note

This model has been designed, built and tested in our engineering department. Performance data represents model capability. At present it is a non-catalog model. On request, we can supply a final specification sheet, part number and price/delivery information.



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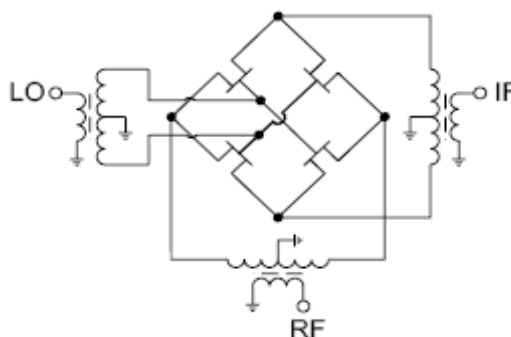
CASE STYLE : TTT167

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                                        |      |      |      |       |
|---------------------------------------|----------------------------------------|------|------|------|-------|
| Parameter                             |                                        | Min. | Typ. | Max. | Units |
| Frequency                             | LO (f <sub>L</sub> to f <sub>U</sub> ) | 1850 |      | 2650 | MHz   |
|                                       | RF (f <sub>L</sub> to f <sub>U</sub> ) | 1850 |      | 2650 | MHz   |
|                                       | IF                                     | 10   |      | 300  | MHz   |
| Conversion Loss                       | Total Range                            |      | 7.6  |      | dB    |
| LO-RF Isolation                       |                                        |      | 34   |      | dB    |
| LO-IF Isolation                       |                                        |      | 30   |      | dB    |
| Input IP3                             |                                        |      | +31  |      | dBm   |
| 1 dB Compression                      |                                        |      | +17  |      | dBm   |

| MAXIMUM RATINGS       |                 |
|-----------------------|-----------------|
| Operating Temperature | -20°C to 85°C   |
| Storage Temperature   | -55°C to +100°C |

| PIN CONNECTIONS |       |
|-----------------|-------|
| LO              | 2     |
| RF              | 1     |
| IF              | 3     |
| GROUND          | 4,5,6 |

### Electrical Schematics



# Frequency Mixer

HJK-ED9154/1

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=270MHz<br>(dB) |       |       |
|---------------------|-------------|--------------------------------------------------------|-------|-------|
|                     |             | @LO (dBm)                                              |       |       |
|                     |             | +14                                                    | +17   | +20   |
| 1750.1              | 1480.1      | 9.50                                                   | 10.14 | 10.97 |
| 1775.1              | 1505.1      | 9.40                                                   | 9.48  | 9.43  |
| 1800.1              | 1530.1      | 9.03                                                   | 8.17  | 7.91  |
| 1825.1              | 1555.1      | 8.69                                                   | 8.11  | 7.95  |
| 1850.1              | 1580.1      | 8.55                                                   | 8.05  | 7.89  |
| 1875.1              | 1605.1      | 8.37                                                   | 7.91  | 7.77  |
| 1900.1              | 1630.1      | 8.18                                                   | 7.82  | 7.72  |
| 1925.1              | 1655.1      | 8.08                                                   | 7.82  | 7.76  |
| 1950.1              | 1680.1      | 7.94                                                   | 7.68  | 7.62  |
| 1975.1              | 1705.1      | 7.75                                                   | 7.53  | 7.50  |
| 2000.1              | 1730.1      | 7.65                                                   | 7.52  | 7.55  |
| 2025.1              | 1755.1      | 7.63                                                   | 7.53  | 7.58  |
| 2050.1              | 1780.1      | 7.51                                                   | 7.43  | 7.49  |
| 2075.1              | 1805.1      | 7.52                                                   | 7.35  | 7.44  |
| 2100.1              | 1830.1      | 7.37                                                   | 7.32  | 7.48  |
| 2125.1              | 1855.1      | 7.37                                                   | 7.31  | 7.36  |
| 2150.1              | 1880.1      | 7.26                                                   | 7.26  | 7.37  |
| 2175.1              | 1905.1      | 7.22                                                   | 7.28  | 7.54  |
| 2200.1              | 1930.1      | 7.35                                                   | 7.42  | 7.63  |
| 2225.1              | 1955.1      | 7.39                                                   | 7.43  | 7.59  |
| 2250.1              | 1980.1      | 7.30                                                   | 7.37  | 7.56  |
| 2275.1              | 2005.1      | 7.32                                                   | 7.39  | 7.58  |
| 2300.1              | 2030.1      | 7.39                                                   | 7.41  | 7.53  |
| 2325.1              | 2055.1      | 7.38                                                   | 7.35  | 7.44  |
| 2350.1              | 2080.1      | 7.29                                                   | 7.27  | 7.35  |
| 2375.1              | 2105.1      | 7.36                                                   | 7.33  | 7.39  |
| 2400.1              | 2130.1      | 7.50                                                   | 7.42  | 7.44  |
| 2425.1              | 2155.1      | 7.49                                                   | 7.42  | 7.43  |
| 2450.1              | 2180.1      | 7.45                                                   | 7.38  | 7.40  |
| 2475.1              | 2205.1      | 7.59                                                   | 7.50  | 7.51  |
| 2500.1              | 2230.1      | 7.78                                                   | 7.65  | 7.63  |
| 2525.1              | 2255.1      | 7.70                                                   | 7.56  | 7.55  |
| 2550.1              | 2280.1      | 7.75                                                   | 7.58  | 7.56  |
| 2575.1              | 2305.1      | 7.94                                                   | 7.72  | 7.67  |
| 2600.1              | 2330.1      | 8.10                                                   | 7.85  | 7.79  |
| 2625.1              | 2355.1      | 8.15                                                   | 7.89  | 7.83  |
| 2650.1              | 2380.1      | 8.39                                                   | 8.10  | 8.04  |
| 2675.1              | 2405.1      | 8.83                                                   | 8.59  | 8.63  |
| 2705.1              | 2435.1      | 9.56                                                   | 9.62  | 9.98  |
| 2730.1              | 2460.1      | 10.63                                                  | 10.97 | 11.49 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +14                | +17   | +20   |
| 1750.1              | 1480.1      | 28.77              | 22.54 | 28.22 |
| 1775.1              | 1505.1      | 35.78              | 27.50 | 27.71 |
| 1800.1              | 1530.1      | 24.43              | 23.54 | 27.68 |
| 1825.1              | 1555.1      | 22.58              | 26.12 | 29.43 |
| 1850.1              | 1580.1      | 23.19              | 27.57 | 30.57 |
| 1875.1              | 1605.1      | 23.52              | 28.25 | 30.60 |
| 1900.1              | 1630.1      | 24.16              | 29.30 | 31.27 |
| 1925.1              | 1655.1      | 25.65              | 30.11 | 31.48 |
| 1950.1              | 1680.1      | 25.62              | 29.66 | 31.16 |
| 1975.1              | 1705.1      | 25.85              | 29.83 | 31.27 |
| 2000.1              | 1730.1      | 27.31              | 30.60 | 32.62 |
| 2025.1              | 1755.1      | 28.62              | 31.17 | 33.04 |
| 2050.1              | 1780.1      | 29.14              | 32.05 | 33.89 |
| 2075.1              | 1805.1      | 25.43              | 30.95 | 32.90 |
| 2100.1              | 1830.1      | 28.60              | 34.12 | 34.00 |
| 2125.1              | 1855.1      | 31.05              | 33.41 | 35.03 |
| 2150.1              | 1880.1      | 33.00              | 35.46 | 32.48 |
| 2175.1              | 1905.1      | 33.89              | 36.99 | 28.89 |
| 2200.1              | 1930.1      | 34.14              | 36.52 | 29.86 |
| 2225.1              | 1955.1      | 34.16              | 36.06 | 30.48 |
| 2250.1              | 1980.1      | 34.03              | 36.03 | 30.60 |
| 2275.1              | 2005.1      | 33.28              | 35.26 | 31.25 |
| 2300.1              | 2030.1      | 32.22              | 33.72 | 33.17 |
| 2325.1              | 2055.1      | 31.02              | 33.84 | 34.87 |
| 2350.1              | 2080.1      | 29.90              | 33.80 | 34.81 |
| 2375.1              | 2105.1      | 28.03              | 33.35 | 34.36 |
| 2400.1              | 2130.1      | 26.25              | 31.95 | 34.63 |
| 2425.1              | 2155.1      | 25.83              | 30.96 | 34.71 |
| 2450.1              | 2180.1      | 25.31              | 29.73 | 33.49 |
| 2475.1              | 2205.1      | 24.20              | 28.13 | 31.91 |
| 2500.1              | 2230.1      | 24.10              | 27.65 | 31.03 |
| 2525.1              | 2255.1      | 24.25              | 27.56 | 30.37 |
| 2550.1              | 2280.1      | 23.62              | 26.84 | 29.38 |
| 2575.1              | 2305.1      | 22.98              | 26.35 | 28.85 |
| 2600.1              | 2330.1      | 23.11              | 26.69 | 29.25 |
| 2625.1              | 2355.1      | 22.98              | 26.73 | 29.52 |
| 2650.1              | 2380.1      | 21.71              | 25.38 | 28.16 |
| 2675.1              | 2405.1      | 21.29              | 24.65 | 27.13 |
| 2705.1              | 2435.1      | 21.83              | 24.33 | 26.92 |
| 2730.1              | 2460.1      | 21.86              | 24.41 | 27.77 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+17dBm<br>(dB) |       |       |
|---------------------|-------------|--------------------------------------|-------|-------|
|                     |             | @LO (dBm)                            |       |       |
|                     |             | +14                                  | +17   | +20   |
| 1750.1              | 1480.1      | 0.50                                 | -0.97 | -0.23 |
| 1775.1              | 1505.1      | 0.54                                 | 0.00  | 0.32  |
| 1800.1              | 1530.1      | 0.70                                 | 0.76  | 0.61  |
| 1825.1              | 1555.1      | 0.78                                 | 0.67  | 0.44  |
| 1850.1              | 1580.1      | 0.74                                 | 0.60  | 0.35  |
| 1875.1              | 1605.1      | 0.75                                 | 0.58  | 0.33  |
| 1900.1              | 1630.1      | 0.77                                 | 0.54  | 0.27  |
| 1925.1              | 1655.1      | 0.68                                 | 0.45  | 0.22  |
| 1950.1              | 1680.1      | 0.65                                 | 0.44  | 0.24  |
| 1975.1              | 1705.1      | 0.65                                 | 0.41  | 0.24  |
| 2000.1              | 1730.1      | 0.59                                 | 0.34  | 0.19  |
| 2025.1              | 1755.1      | 0.50                                 | 0.28  | 0.17  |
| 2050.1              | 1780.1      | 0.46                                 | 0.25  | 0.16  |
| 2075.1              | 1805.1      | 0.63                                 | 0.34  | 0.22  |
| 2100.1              | 1830.1      | 0.42                                 | 0.23  | 0.19  |
| 2125.1              | 1855.1      | 0.32                                 | 0.21  | 0.15  |
| 2150.1              | 1880.1      | 0.25                                 | 0.16  | 0.09  |
| 2175.1              | 1905.1      | 0.22                                 | 0.12  | 0.02  |
| 2200.1              | 1930.1      | 0.20                                 | 0.11  | 0.04  |
| 2225.1              | 1955.1      | 0.19                                 | 0.11  | 0.07  |
| 2250.1              | 1980.1      | 0.19                                 | 0.11  | 0.07  |
| 2275.1              | 2005.1      | 0.18                                 | 0.11  | 0.08  |
| 2300.1              | 2030.1      | 0.19                                 | 0.13  | 0.09  |
| 2325.1              | 2055.1      | 0.20                                 | 0.14  | 0.11  |
| 2350.1              | 2080.1      | 0.20                                 | 0.14  | 0.11  |
| 2375.1              | 2105.1      | 0.23                                 | 0.14  | 0.12  |
| 2400.1              | 2130.1      | 0.29                                 | 0.15  | 0.12  |
| 2425.1              | 2155.1      | 0.32                                 | 0.15  | 0.12  |
| 2450.1              | 2180.1      | 0.38                                 | 0.18  | 0.12  |
| 2475.1              | 2205.1      | 0.48                                 | 0.23  | 0.12  |
| 2500.1              | 2230.1      | 0.50                                 | 0.26  | 0.13  |
| 2525.1              | 2255.1      | 0.53                                 | 0.28  | 0.13  |
| 2550.1              | 2280.1      | 0.65                                 | 0.36  | 0.18  |
| 2575.1              | 2305.1      | 0.76                                 | 0.45  | 0.24  |
| 2600.1              | 2330.1      | 0.78                                 | 0.50  | 0.27  |
| 2625.1              | 2355.1      | 0.84                                 | 0.59  | 0.35  |
| 2650.1              | 2380.1      | 1.02                                 | 0.80  | 0.55  |
| 2675.1              | 2405.1      | 1.14                                 | 0.95  | 0.68  |
| 2705.1              | 2435.1      | 1.14                                 | 0.93  | 0.64  |
| 2730.1              | 2460.1      | 1.04                                 | 0.78  | 0.50  |

REV. X2

HJK-ED9154/1

101012

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IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED • RoHS compliant

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# Frequency Mixer

HJK-ED9154/1

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=2140MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=2079.8MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=2200.1MHz<br>(dB) |
|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |
|                      |             | +17                                                            |                      |             | +17                                                              |                      |             | +17                                                              |
| 740.0                | 1400.0      | 10.66                                                          | 10.1                 | 2090.0      | 7.27                                                             | 730.1                | 1470.0      | 10.30                                                            |
| 710.8                | 1429.2      | 10.17                                                          | 20.1                 | 2100.0      | 7.22                                                             | 710.1                | 1490.0      | 10.78                                                            |
| 681.6                | 1458.4      | 9.69                                                           | 30.1                 | 2110.0      | 7.26                                                             | 690.1                | 1510.0      | 9.75                                                             |
| 652.4                | 1487.6      | 10.76                                                          | 40.1                 | 2120.0      | 7.27                                                             | 670.1                | 1530.0      | 8.93                                                             |
| 623.2                | 1516.8      | 9.14                                                           | 50.1                 | 2130.0      | 7.23                                                             | 650.1                | 1550.0      | 8.59                                                             |
| 594.0                | 1546.0      | 8.57                                                           | 60.1                 | 2140.0      | 7.25                                                             | 630.1                | 1570.0      | 8.37                                                             |
| 564.8                | 1575.2      | 8.27                                                           | 70.1                 | 2150.0      | 7.28                                                             | 610.1                | 1590.0      | 8.24                                                             |
| 535.6                | 1604.4      | 8.09                                                           | 80.1                 | 2160.0      | 7.32                                                             | 590.1                | 1610.0      | 8.14                                                             |
| 506.4                | 1633.6      | 7.88                                                           | 90.1                 | 2170.0      | 7.29                                                             | 570.1                | 1630.0      | 8.02                                                             |
| 477.2                | 1662.8      | 7.65                                                           | 100.1                | 2180.0      | 7.26                                                             | 550.1                | 1650.0      | 7.84                                                             |
| 448.0                | 1692.0      | 7.55                                                           | 110.1                | 2190.0      | 7.32                                                             | 530.1                | 1670.0      | 7.70                                                             |
| 418.8                | 1721.2      | 7.43                                                           | 120.1                | 2200.0      | 7.40                                                             | 510.1                | 1690.0      | 7.62                                                             |
| 389.6                | 1750.4      | 7.40                                                           | 130.1                | 2210.0      | 7.37                                                             | 490.1                | 1710.0      | 7.56                                                             |
| 360.4                | 1779.6      | 7.39                                                           | 140.1                | 2220.0      | 7.32                                                             | 470.1                | 1730.0      | 7.53                                                             |
| 331.2                | 1808.8      | 7.39                                                           | 150.1                | 2230.0      | 7.33                                                             | 450.1                | 1750.0      | 7.44                                                             |
| 302.0                | 1838.0      | 7.31                                                           | 160.1                | 2240.0      | 7.42                                                             | 430.1                | 1770.0      | 7.39                                                             |
| 273.0                | 1867.2      | 7.26                                                           | 170.1                | 2250.0      | 7.47                                                             | 410.1                | 1790.0      | 7.38                                                             |
| 243.6                | 1896.4      | 7.40                                                           | 180.1                | 2260.0      | 7.48                                                             | 390.1                | 1810.0      | 7.41                                                             |
| 214.4                | 1925.6      | 7.40                                                           | 190.1                | 2270.0      | 7.47                                                             | 370.1                | 1830.0      | 7.37                                                             |
| 185.2                | 1954.8      | 7.31                                                           | 200.1                | 2280.0      | 7.52                                                             | 350.1                | 1850.0      | 7.31                                                             |
| 156.0                | 1984.0      | 7.35                                                           | 210.1                | 2290.0      | 7.59                                                             | 330.1                | 1870.0      | 7.38                                                             |
| 126.8                | 2013.2      | 7.26                                                           | 220.1                | 2300.0      | 7.63                                                             | 310.1                | 1890.0      | 7.36                                                             |
| 97.6                 | 2042.4      | 7.28                                                           | 230.1                | 2310.0      | 7.69                                                             | 290.1                | 1910.0      | 7.41                                                             |
| 68.4                 | 2071.6      | 7.38                                                           | 240.1                | 2320.0      | 7.70                                                             | 270.1                | 1930.0      | 7.43                                                             |
| 39.2                 | 2100.8      | 7.33                                                           | 250.1                | 2330.0      | 7.76                                                             | 250.1                | 1950.0      | 7.38                                                             |
| 10.0                 | 2150.0      | 7.36                                                           | 260.1                | 2340.0      | 7.82                                                             | 230.1                | 1970.0      | 7.46                                                             |
| 21.6                 | 2161.6      | 7.32                                                           | 270.1                | 2350.0      | 7.92                                                             | 210.1                | 1990.0      | 7.36                                                             |
| 44.8                 | 2184.8      | 7.42                                                           | 280.1                | 2360.0      | 7.99                                                             | 190.1                | 2010.0      | 7.36                                                             |
| 56.4                 | 2196.4      | 7.42                                                           | 290.1                | 2370.0      | 8.11                                                             | 170.1                | 2030.0      | 7.35                                                             |
| 79.6                 | 2219.6      | 7.51                                                           | 300.1                | 2380.0      | 8.18                                                             | 160.1                | 2040.0      | 7.38                                                             |
| 91.2                 | 2231.2      | 7.53                                                           | 310.1                | 2390.0      | 8.29                                                             | 140.1                | 2060.0      | 7.23                                                             |
| 114.4                | 2254.4      | 7.59                                                           | 320.1                | 2400.0      | 8.43                                                             | 130.1                | 2070.0      | 7.34                                                             |
| 126.0                | 2266.0      | 7.71                                                           | 330.1                | 2410.0      | 8.70                                                             | 110.1                | 2090.0      | 7.29                                                             |
| 149.2                | 2289.2      | 7.87                                                           | 340.1                | 2420.0      | 8.85                                                             | 100.1                | 2100.0      | 7.24                                                             |
| 160.8                | 2300.8      | 7.94                                                           | 350.1                | 2430.0      | 9.08                                                             | 80.1                 | 2120.0      | 7.30                                                             |
| 184.0                | 2324.0      | 8.27                                                           |                      |             |                                                                  | 70.1                 | 2130.0      | 7.29                                                             |
| 195.6                | 2335.6      | 8.47                                                           |                      |             |                                                                  | 50.1                 | 2150.0      | 7.29                                                             |
| 218.8                | 2358.8      | 8.88                                                           |                      |             |                                                                  | 40.1                 | 2160.0      | 7.29                                                             |
| 230.4                | 2370.4      | 9.40                                                           |                      |             |                                                                  | 20.1                 | 2180.0      | 7.31                                                             |
| 253.6                | 2393.6      | 10.28                                                          |                      |             |                                                                  | 10.1                 | 2190.0      | 7.32                                                             |
| 265.2                | 2405.2      | 10.77                                                          |                      |             |                                                                  |                      |             |                                                                  |
| 288.4                | 2428.4      |                                                                |                      |             |                                                                  |                      |             |                                                                  |
| 300.0                | 2440.0      |                                                                |                      |             |                                                                  |                      |             |                                                                  |

# Frequency Mixer

HJK-ED9154/1

## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +14                     | +17   | +20   | +14                     | +17   | +20   |
| 1480.1      | 41.40                   | 42.38 | 43.25 | 34.69                   | 36.00 | 37.22 |
| 1505.1      | 41.65                   | 41.83 | 41.60 | 34.37                   | 35.54 | 35.89 |
| 1530.1      | 41.44                   | 40.87 | 40.69 | 33.70                   | 33.88 | 34.04 |
| 1555.1      | 40.97                   | 40.48 | 40.22 | 33.18                   | 33.26 | 33.33 |
| 1580.1      | 40.66                   | 40.14 | 39.77 | 32.67                   | 32.68 | 32.60 |
| 1605.1      | 40.45                   | 39.94 | 39.43 | 32.05                   | 32.03 | 31.96 |
| 1630.1      | 40.53                   | 39.87 | 39.41 | 31.46                   | 31.27 | 31.21 |
| 1655.1      | 40.43                   | 39.61 | 38.87 | 30.81                   | 30.76 | 30.67 |
| 1680.1      | 41.11                   | 40.02 | 39.16 | 30.19                   | 29.95 | 29.94 |
| 1705.1      | 42.98                   | 42.18 | 40.68 | 29.47                   | 29.31 | 29.14 |
| 1730.1      | 45.66                   | 44.78 | 42.44 | 29.05                   | 28.75 | 28.67 |
| 1755.1      | 52.82                   | 49.24 | 44.24 | 28.73                   | 28.43 | 28.33 |
| 1780.1      | 48.67                   | 45.71 | 39.85 | 28.46                   | 28.14 | 27.88 |
| 1805.1      | 40.27                   | 41.52 | 40.37 | 28.55                   | 28.26 | 27.87 |
| 1830.1      | 37.11                   | 36.65 | 36.48 | 28.79                   | 28.75 | 28.61 |
| 1855.1      | 33.72                   | 33.30 | 33.03 | 29.19                   | 29.39 | 29.67 |
| 1880.1      | 31.46                   | 31.12 | 30.97 | 29.82                   | 30.15 | 30.76 |
| 1905.1      | 30.29                   | 29.92 | 29.96 | 31.06                   | 31.50 | 32.63 |
| 1930.1      | 29.57                   | 29.45 | 29.61 | 33.22                   | 33.97 | 35.40 |
| 1955.1      | 29.54                   | 29.61 | 29.92 | 36.89                   | 37.89 | 39.71 |
| 1980.1      | 30.16                   | 30.38 | 30.89 | 42.53                   | 45.69 | 48.88 |
| 2005.1      | 30.60                   | 30.80 | 31.15 | 40.05                   | 41.61 | 41.32 |
| 2030.1      | 30.95                   | 31.08 | 31.31 | 35.68                   | 36.36 | 36.29 |
| 2055.1      | 31.33                   | 31.41 | 31.54 | 33.30                   | 33.68 | 33.63 |
| 2080.1      | 31.86                   | 31.97 | 32.11 | 31.79                   | 32.01 | 31.93 |
| 2105.1      | 31.97                   | 32.00 | 32.12 | 30.78                   | 30.83 | 30.69 |
| 2130.1      | 31.98                   | 31.97 | 32.12 | 30.04                   | 29.99 | 29.81 |
| 2155.1      | 32.01                   | 31.98 | 32.05 | 29.28                   | 29.13 | 28.84 |
| 2180.1      | 32.18                   | 32.30 | 32.35 | 28.44                   | 28.32 | 27.99 |
| 2205.1      | 31.84                   | 31.91 | 31.98 | 27.94                   | 27.77 | 27.52 |
| 2230.1      | 31.37                   | 31.45 | 31.43 | 27.40                   | 27.16 | 26.81 |
| 2255.1      | 31.10                   | 31.01 | 31.16 | 26.70                   | 26.30 | 26.12 |
| 2280.1      | 30.58                   | 30.46 | 30.58 | 26.02                   | 25.64 | 25.45 |
| 2305.1      | 30.02                   | 29.84 | 29.84 | 25.41                   | 25.08 | 24.84 |
| 2330.1      | 29.15                   | 28.79 | 28.78 | 24.72                   | 24.36 | 24.19 |
| 2355.1      | 28.64                   | 28.28 | 28.19 | 23.80                   | 23.44 | 23.25 |
| 2380.1      | 27.90                   | 27.59 | 27.56 | 23.10                   | 22.66 | 22.51 |
| 2405.1      | 27.16                   | 26.89 | 26.94 | 22.40                   | 22.00 | 21.82 |
| 2435.1      | 26.44                   | 26.29 | 26.23 | 21.29                   | 20.84 | 20.43 |
| 2460.1      | 26.66                   | 26.66 | 26.54 | 20.33                   | 19.96 | 19.46 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 1750.1              | 1480.1      | 21.73                   | 23.31 | 25.48 |
| 1775.1              | 1505.1      | 22.00                   | 23.79 | 25.50 |
| 1800.1              | 1530.1      | 22.88                   | 25.91 | 28.02 |
| 1825.1              | 1555.1      | 23.86                   | 26.43 | 28.09 |
| 1850.1              | 1580.1      | 24.56                   | 26.94 | 28.38 |
| 1875.1              | 1605.1      | 25.18                   | 27.44 | 28.95 |
| 1900.1              | 1630.1      | 25.72                   | 27.80 | 28.75 |
| 1925.1              | 1655.1      | 26.77                   | 28.91 | 29.77 |
| 1950.1              | 1680.1      | 27.45                   | 29.75 | 30.33 |
| 1975.1              | 1705.1      | 27.66                   | 29.86 | 30.18 |
| 2000.1              | 1730.1      | 28.76                   | 30.94 | 31.25 |
| 2025.1              | 1755.1      | 29.57                   | 31.08 | 31.51 |
| 2050.1              | 1780.1      | 30.41                   | 31.51 | 32.23 |
| 2075.1              | 1805.1      | 30.43                   | 32.01 | 31.00 |
| 2100.1              | 1830.1      | 33.81                   | 35.68 | 36.47 |
| 2125.1              | 1855.1      | 35.70                   | 37.10 | 39.50 |
| 2150.1              | 1880.1      | 37.81                   | 39.29 | 40.88 |
| 2175.1              | 1905.1      | 39.19                   | 40.77 | 39.65 |
| 2200.1              | 1930.1      | 40.20                   | 41.58 | 41.10 |
| 2225.1              | 1955.1      | 40.51                   | 41.68 | 41.62 |
| 2250.1              | 1980.1      | 40.07                   | 40.62 | 39.08 |
| 2275.1              | 2005.1      | 40.58                   | 40.81 | 39.56 |
| 2300.1              | 2030.1      | 40.94                   | 41.16 | 41.41 |
| 2325.1              | 2055.1      | 40.57                   | 40.84 | 41.08 |
| 2350.1              | 2080.1      | 39.70                   | 39.82 | 39.81 |
| 2375.1              | 2105.1      | 38.47                   | 38.85 | 38.51 |
| 2400.1              | 2130.1      | 36.64                   | 37.48 | 37.09 |
| 2425.1              | 2155.1      | 35.06                   | 36.04 | 35.57 |
| 2450.1              | 2180.1      | 33.77                   | 34.99 | 34.19 |
| 2475.1              | 2205.1      | 32.00                   | 33.52 | 32.66 |
| 2500.1              | 2230.1      | 30.62                   | 32.18 | 31.49 |
| 2525.1              | 2255.1      | 29.16                   | 30.74 | 30.17 |
| 2550.1              | 2280.1      | 27.35                   | 28.62 | 28.31 |
| 2575.1              | 2305.1      | 25.35                   | 26.27 | 25.99 |
| 2600.1              | 2330.1      | 23.61                   | 24.31 | 24.09 |
| 2625.1              | 2355.1      | 21.93                   | 22.36 | 22.07 |
| 2650.1              | 2380.1      | 20.77                   | 20.73 | 20.39 |
| 2675.1              | 2405.1      | 20.32                   | 20.11 | 19.90 |
| 2705.1              | 2435.1      | 20.62                   | 20.76 | 20.84 |
| 2730.1              | 2460.1      | 21.96                   | 22.63 | 23.13 |

# Frequency Mixer

HJK-ED9154/1

## 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=1900MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|-------|-------|----------------------|--------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |       |       |                      | @LO (dBm)                      |      |      |
|                     |             | +14             | +17  | +20  |             | +14             | +17   | +20   |                      | +14                            | +17  | +20  |
| 1750.1              | 1480.1      | 2.72            | 2.37 | 2.15 | 1480.1      | 21.20           | 18.70 | 16.11 | 10.0                 | 1.56                           | 1.77 | 1.96 |
| 1775.1              | 1505.1      | 2.68            | 2.32 | 2.15 | 1505.1      | 19.76           | 17.57 | 15.96 | 50.4                 | 1.59                           | 1.81 | 1.99 |
| 1800.1              | 1530.1      | 2.59            | 2.24 | 2.14 | 1530.1      | 19.11           | 18.30 | 17.22 | 90.9                 | 1.57                           | 1.77 | 1.95 |
| 1825.1              | 1555.1      | 2.45            | 2.17 | 2.09 | 1555.1      | 17.75           | 17.05 | 16.26 | 131.3                | 1.60                           | 1.80 | 1.98 |
| 1850.1              | 1580.1      | 2.36            | 2.12 | 2.05 | 1580.1      | 16.26           | 15.39 | 14.50 | 171.7                | 1.59                           | 1.78 | 1.95 |
| 1875.1              | 1605.1      | 2.31            | 2.09 | 2.02 | 1605.1      | 14.87           | 14.03 | 12.99 | 212.2                | 1.64                           | 1.82 | 1.99 |
| 1900.1              | 1630.1      | 2.23            | 2.03 | 1.97 | 1630.1      | 13.70           | 12.99 | 12.26 | 252.6                | 1.63                           | 1.81 | 1.96 |
| 1925.1              | 1655.1      | 2.12            | 1.97 | 1.93 | 1655.1      | 12.26           | 11.69 | 10.96 | 293.0                | 1.67                           | 1.81 | 1.95 |
| 1950.1              | 1680.1      | 2.06            | 1.93 | 1.89 | 1680.1      | 10.89           | 10.25 | 9.48  | 333.4                | 1.69                           | 1.82 | 1.95 |
| 1975.1              | 1705.1      | 2.02            | 1.88 | 1.85 | 1705.1      | 9.69            | 9.08  | 8.35  | 373.9                | 1.70                           | 1.80 | 1.91 |
| 2000.1              | 1730.1      | 1.96            | 1.84 | 1.82 | 1730.1      | 8.55            | 8.05  | 7.47  | 414.3                | 1.76                           | 1.84 | 1.92 |
| 2025.1              | 1755.1      | 1.89            | 1.80 | 1.78 | 1755.1      | 7.38            | 6.89  | 6.32  | 474.9                | 1.79                           | 1.83 | 1.89 |
| 2050.1              | 1780.1      | 1.86            | 1.77 | 1.75 | 1780.1      | 6.37            | 5.93  | 5.34  | 515.4                | 1.83                           | 1.85 | 1.89 |
| 2075.1              | 1805.1      | 1.94            | 1.79 | 1.74 | 1805.1      | 5.89            | 5.51  | 5.16  | 576.0                | 1.88                           | 1.85 | 1.85 |
| 2100.1              | 1830.1      | 1.81            | 1.72 | 1.70 | 1830.1      | 4.91            | 4.64  | 4.47  | 616.5                | 1.93                           | 1.89 | 1.89 |
| 2125.1              | 1855.1      | 1.77            | 1.70 | 1.68 | 1855.1      | 4.21            | 3.96  | 3.82  | 677.1                | 2.01                           | 1.92 | 1.89 |
| 2150.1              | 1880.1      | 1.70            | 1.66 | 1.66 | 1880.1      | 3.69            | 3.49  | 3.37  | 717.5                | 2.02                           | 1.92 | 1.87 |
| 2175.1              | 1905.1      | 1.66            | 1.63 | 1.64 | 1905.1      | 3.42            | 3.30  | 3.16  | 778.2                | 2.16                           | 2.03 | 1.95 |
| 2200.1              | 1930.1      | 1.63            | 1.60 | 1.61 | 1930.1      | 3.34            | 3.29  | 3.25  | 818.6                | 2.08                           | 1.95 | 1.88 |
| 2225.1              | 1955.1      | 1.61            | 1.58 | 1.59 | 1955.1      | 3.45            | 3.46  | 3.49  | 879.2                | 2.16                           | 2.01 | 1.92 |
| 2250.1              | 1980.1      | 1.58            | 1.56 | 1.57 | 1980.1      | 3.74            | 3.82  | 3.93  | 919.7                | 2.17                           | 2.01 | 1.90 |
| 2275.1              | 2005.1      | 1.56            | 1.53 | 1.55 | 2005.1      | 4.20            | 4.34  | 4.47  | 980.3                | 2.19                           | 2.03 | 1.93 |
| 2300.1              | 2030.1      | 1.55            | 1.52 | 1.52 | 2030.1      | 4.70            | 4.88  | 4.98  | 1020.8               | 2.13                           | 1.96 | 1.85 |
| 2325.1              | 2055.1      | 1.53            | 1.49 | 1.49 | 2055.1      | 5.34            | 5.58  | 5.74  | 1081.4               | 2.13                           | 1.96 | 1.85 |
| 2350.1              | 2080.1      | 1.51            | 1.47 | 1.46 | 2080.1      | 6.05            | 6.30  | 6.46  | 1121.8               | 2.19                           | 2.01 | 1.89 |
| 2375.1              | 2105.1      | 1.51            | 1.45 | 1.43 | 2105.1      | 6.63            | 6.83  | 6.83  | 1182.5               | 2.09                           | 1.93 | 1.82 |
| 2400.1              | 2130.1      | 1.52            | 1.44 | 1.42 | 2130.1      | 7.22            | 7.44  | 7.41  | 1222.9               | 2.08                           | 1.92 | 1.80 |
| 2425.1              | 2155.1      | 1.51            | 1.43 | 1.40 | 2155.1      | 7.94            | 8.23  | 8.31  | 1283.5               | 2.01                           | 1.85 | 1.73 |
| 2450.1              | 2180.1      | 1.51            | 1.42 | 1.39 | 2180.1      | 8.55            | 8.77  | 8.72  | 1324.0               | 2.01                           | 1.86 | 1.75 |
| 2475.1              | 2205.1      | 1.54            | 1.43 | 1.39 | 2205.1      | 8.86            | 8.90  | 8.55  | 1384.6               | 1.86                           | 1.71 | 1.61 |
| 2500.1              | 2230.1      | 1.57            | 1.44 | 1.39 | 2230.1      | 9.28            | 9.38  | 9.13  | 1425.1               | 1.87                           | 1.73 | 1.63 |
| 2525.1              | 2255.1      | 1.56            | 1.43 | 1.39 | 2255.1      | 9.63            | 9.79  | 9.69  | 1485.7               | 1.76                           | 1.64 | 1.54 |
| 2550.1              | 2280.1      | 1.60            | 1.46 | 1.41 | 2280.1      | 9.53            | 9.58  | 9.28  | 1526.1               | 1.66                           | 1.56 | 1.48 |
| 2575.1              | 2305.1      | 1.65            | 1.49 | 1.43 | 2305.1      | 9.23            | 9.13  | 8.60  | 1586.8               | 1.57                           | 1.48 | 1.41 |
| 2600.1              | 2330.1      | 1.67            | 1.51 | 1.44 | 2330.1      | 8.99            | 8.99  | 8.64  | 1627.2               | 1.49                           | 1.43 | 1.38 |
| 2625.1              | 2355.1      | 1.67            | 1.51 | 1.43 | 2355.1      | 8.51            | 8.51  | 8.27  | 1687.8               | 1.40                           | 1.37 | 1.35 |
| 2650.1              | 2380.1      | 1.71            | 1.53 | 1.44 | 2380.1      | 7.70            | 7.56  | 7.17  | 1728.3               | 1.30                           | 1.32 | 1.33 |
| 2675.1              | 2405.1      | 1.72            | 1.52 | 1.41 | 2405.1      | 6.81            | 6.63  | 6.24  | 1788.9               | 1.25                           | 1.32 | 1.38 |
| 2705.1              | 2435.1      | 1.60            | 1.40 | 1.26 | 2435.1      | 5.75            | 5.61  | 5.38  | 1829.4               | 1.22                           | 1.34 | 1.43 |
| 2730.1              | 2460.1      | 1.50            | 1.28 | 1.15 | 2460.1      | 4.80            | 4.62  | 4.37  | 1890.0               | 1.22                           | 1.38 | 1.48 |

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## Harmonics Tables

| RF HARMONICS ORDER | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |     |
|--------------------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 0      | -      | -   | 5   | 14  | 30  | 27  | 32  | 32  | 28  | 38  | 42  | 58  |
|                    | 1      | -      | 31  | +0  | 39  | 19  | 46  | 31  | 55  | 54  | 54  | 51  | 69  |
|                    | 2      | 58     | 56  | 54  | 69  | 56  | 66  | 60  | 61  | 63  | 66  | 71  | 80  |
|                    | 3      | >90    | >81 | 75  | >81 | 69  | >81 | 76  | >81 | 75  | >81 | >81 | >81 |
|                    | 4      | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | 5      | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | 6      | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | 7      | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | 8      | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | 9      | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | 10     | >90    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
|                    | RF CAL |        | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 2140 MHz; 0.00 dBm.

LO IN: 1870 MHz; +17.00 dBm

IF OUT: 270 MHz; -8.61 dBm

| RF HARMONICS ORDER | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |     |
|--------------------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 0      | -      | -   | 15  | 24  | 43  | 38  | 43  | 40  | 39  | 50  | 54  | 77  |
|                    | 1      | -      | 31  | +0  | 38  | 19  | 48  | 32  | 55  | 54  | 53  | 54  | 70  |
|                    | 2      | 38     | 46  | 44  | 56  | 46  | 54  | 50  | 51  | 55  | 55  | 61  | 70  |
|                    | 3      | 65     | 65  | 52  | 81  | 47  | 66  | 53  | 75  | 53  | 74  | 77  | 69  |
|                    | 4      | >90    | 77  | 72  | 88  | 70  | 82  | 66  | 76  | 71  | >91 | 73  | 79  |
|                    | 5      | >90    | 87  | 89  | 81  | 75  | 89  | 71  | 77  | 72  | 80  | 75  | 84  |
|                    | 6      | >90    | >91 | >91 | >91 | 89  | >91 | 87  | >91 | 80  | >91 | 84  | >91 |
|                    | 7      | >90    | >91 | >91 | >91 | >91 | >91 | 91  | >91 | 85  | 89  | 84  | >91 |
|                    | 8      | >90    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 |
|                    | 9      | >90    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 |
|                    | 10     | >90    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 |
| RF CAL             |        | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

### LO HARMONICS ORDER

Test conditions:

RF IN: 2140 MHz; 10.00 dBm.

LO IN: 1870 MHz; +17.00 dBm

IF OUT: 270 MHz; 1.27 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.

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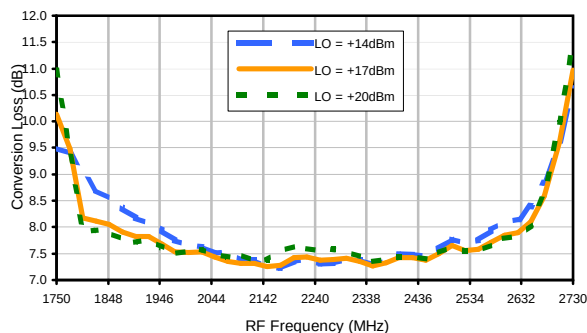
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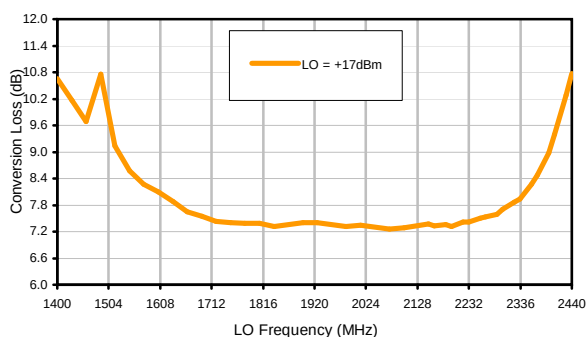


## Typical Performance Curves

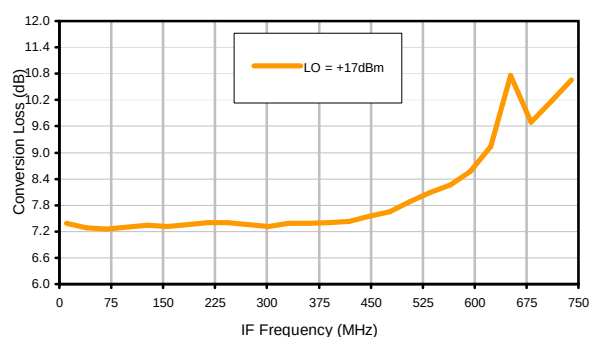
Conversion Loss @ IF=270MHz



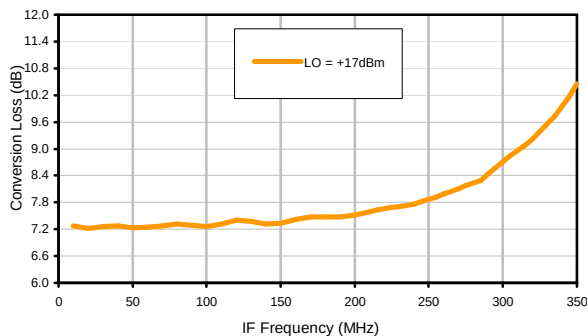
Conversion Loss vs. LO @ RF=2140MHz



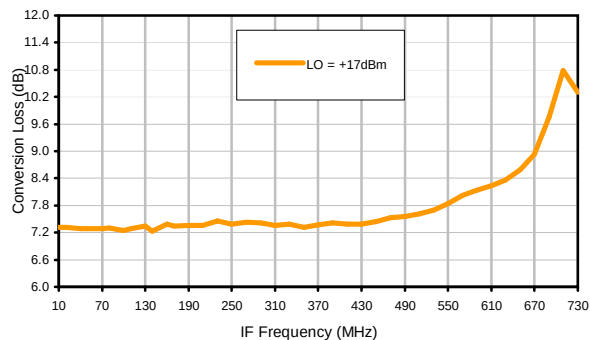
Conversion Loss vs. IF @ RF=2140MHz



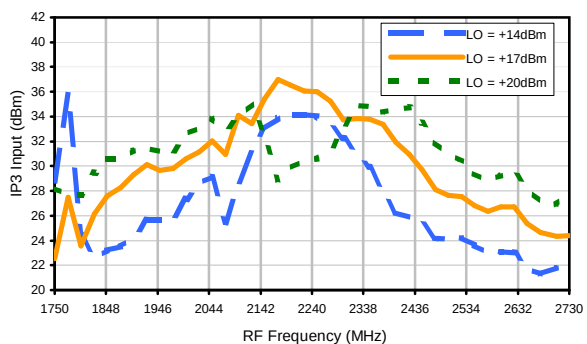
Conversion Loss vs. IF @ RF=2079.8MHz



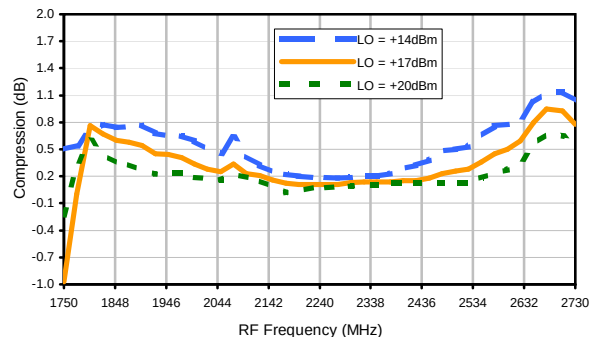
Conversion Loss vs. IF @ RF=2200.1MHz



IP3 Input



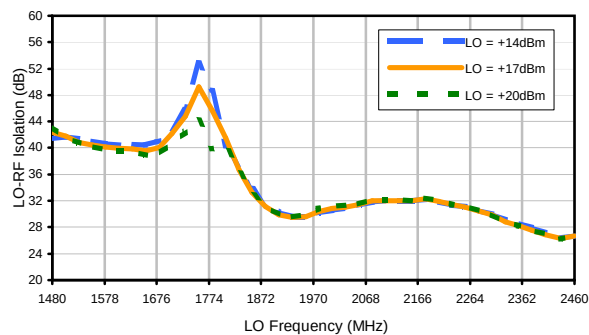
Compression @ RF IN=+17dBm



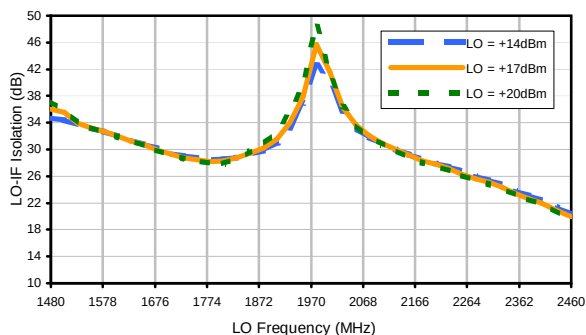


## Typical Performance Curves

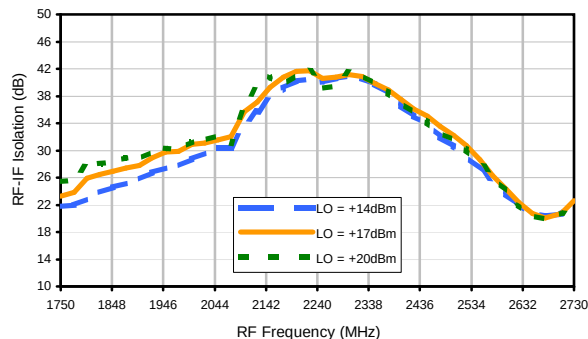
LO-RF Isolation



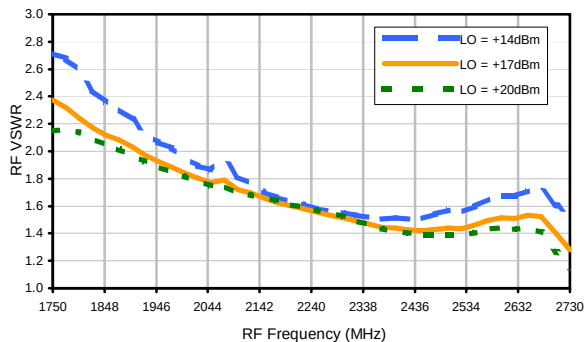
LO-IF Isolation



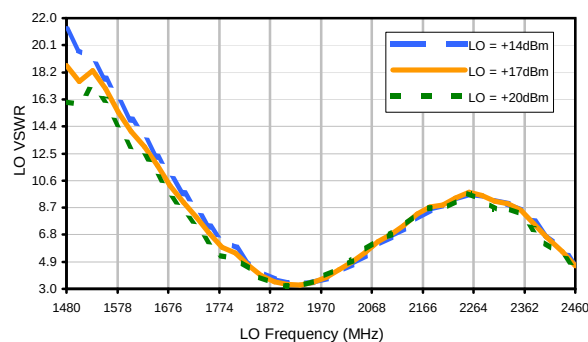
RF-IF Isolation



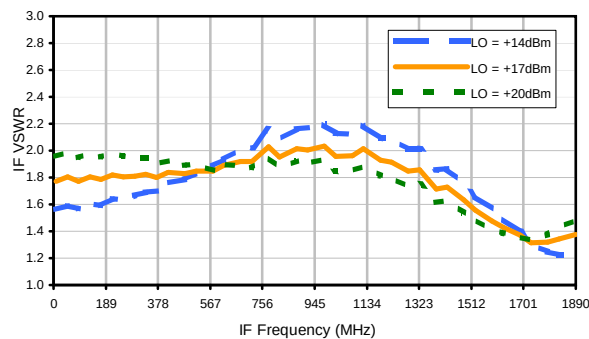
RF VSWR



LO VSWR



IF VSWR





## Harmonics Tables

| RF HARMONICS ORDER | (-dBm) |     | (-dBc) |     |     |     |     |     |     |     |     |     |
|--------------------|--------|-----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 0      | 1   | 2      | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
| 0                  | -      | -   | 5      | 14  | 30  | 27  | 32  | 32  | 28  | 38  | 42  | 58  |
| 1                  | -      | 31  | +0     | 39  | 19  | 46  | 31  | 55  | 54  | 54  | 51  | 69  |
| 2                  | 58     | 56  | 54     | 69  | 56  | 66  | 60  | 61  | 63  | 66  | 71  | 80  |
| 3                  | >90    | >81 | 75     | >81 | 69  | >81 | 76  | >81 | 75  | >81 | >81 | >81 |
| 4                  | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| 5                  | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| 6                  | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| 7                  | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| 8                  | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| 9                  | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| 10                 | >90    | >81 | >81    | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 | >81 |
| RF CAL             |        | 0   | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 2140 MHz; 0.00 dBm.

LO IN: 1870 MHz; +17.00 dBm

IF OUT: 270 MHz; -8.61 dBm

| RF HARMONICS ORDER | (-dBm) |     | (-dBc) |     |     |     |     |     |     |     |     |     |
|--------------------|--------|-----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 0      | 1   | 2      | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
| 0                  | -      | -   | 15     | 24  | 43  | 38  | 43  | 40  | 39  | 50  | 54  | 77  |
| 1                  | -      | 31  | +0     | 38  | 19  | 48  | 32  | 55  | 54  | 53  | 54  | 70  |
| 2                  | 38     | 46  | 44     | 56  | 46  | 54  | 50  | 51  | 55  | 55  | 61  | 70  |
| 3                  | 65     | 65  | 52     | 81  | 47  | 66  | 53  | 75  | 53  | 74  | 77  | 69  |
| 4                  | >90    | 77  | 72     | 88  | 70  | 82  | 66  | 76  | 71  | >91 | 73  | 79  |
| 5                  | >90    | 87  | 89     | 81  | 75  | 89  | 71  | 77  | 72  | 80  | 75  | 84  |
| 6                  | >90    | >91 | >91    | >91 | 89  | >91 | 87  | >91 | 80  | >91 | 84  | >91 |
| 7                  | >90    | >91 | >91    | >91 | >91 | >91 | 91  | >91 | 85  | 89  | 84  | >91 |
| 8                  | >90    | >91 | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 |
| 9                  | >90    | >91 | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 |
| 10                 | >90    | >91 | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 |
| RF CAL             |        | 0   | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 2140 MHz; 10.00 dBm.

LO IN: 1870 MHz; +17.00 dBm

IF OUT: 270 MHz; 1.27 dBm

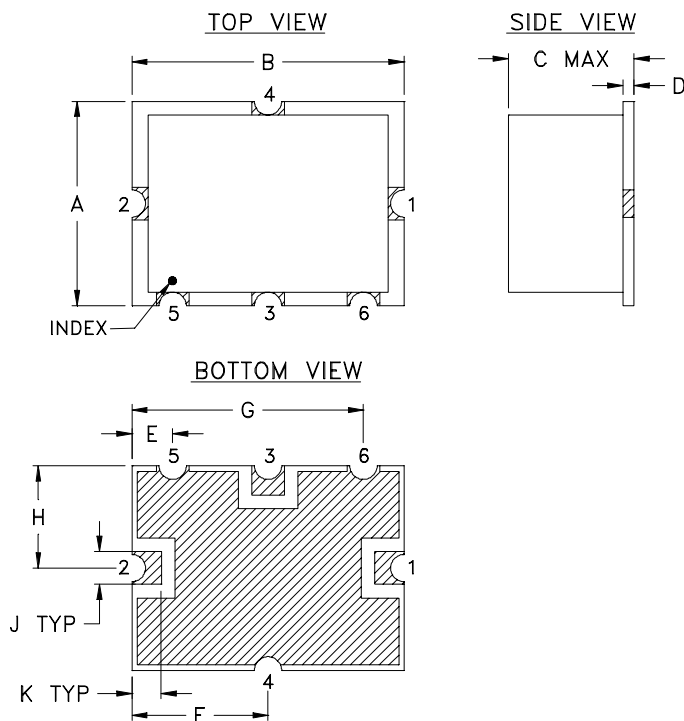
Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.

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

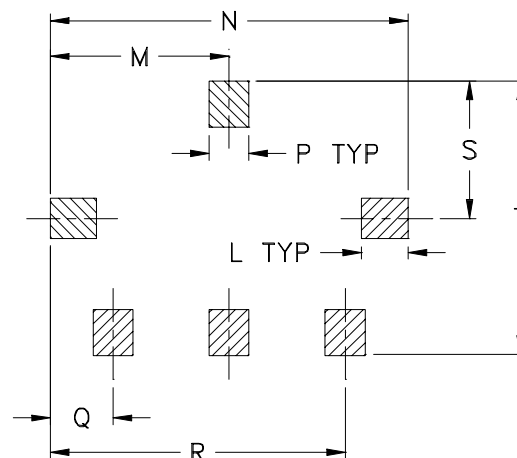
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Outline Dimensions

TTT166  
TTT167



## PCB Land Pattern



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

| CASE # | A             | B              | C             | D              | E              | F              | G               | H              | J              | K              | L              | M              | N               |
|--------|---------------|----------------|---------------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| TTT166 | .38<br>(9.65) | .50<br>(12.70) | .15<br>(3.81) | .020<br>(0.51) | .075<br>(1.91) | .250<br>(6.35) | .425<br>(10.80) | .187<br>(4.75) | .050<br>(1.27) | .050<br>(1.27) | .070<br>(1.78) | .270<br>(6.86) | .540<br>(13.72) |
| TTT167 |               |                | .23<br>(5.84) |                |                |                |                 |                |                |                |                |                |                 |

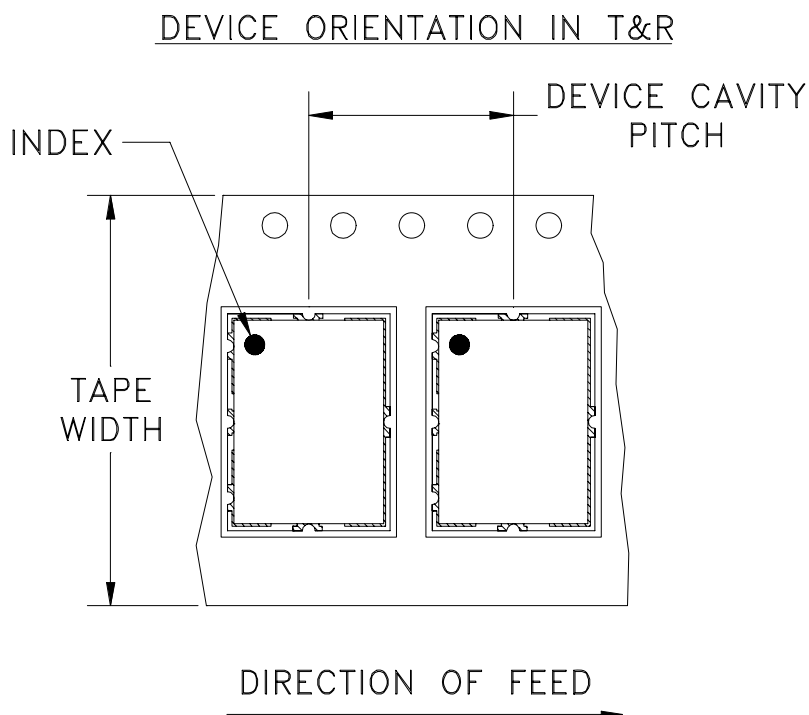
| CASE # | P              | Q              | R               | S              | T               | WT. GRAM |
|--------|----------------|----------------|-----------------|----------------|-----------------|----------|
| TTT166 | .060<br>(1.52) | .095<br>(2.41) | .445<br>(11.30) | .208<br>(5.28) | .415<br>(10.54) | .8       |
| TTT167 |                |                |                 |                |                 | .8       |

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

### Note:

- Case material: Plastic.
- Base material: Printed wiring laminate.
- Termination finish:
  - For RoHS Case Styles: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
  - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

# Tape & Reel Packaging TR-F12



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel                    |     |
|----------------|-------------------------|-------------------|-------------------------------------|-----|
| 24             | 12                      | 7                 | Small quantity standards (see note) | 10  |
|                |                         |                   |                                     | 20  |
|                |                         |                   |                                     | 50  |
|                |                         |                   |                                     | 100 |
|                |                         |                   |                                     | 200 |
|                |                         | 13                | Standard                            | 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)



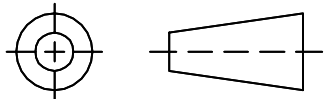
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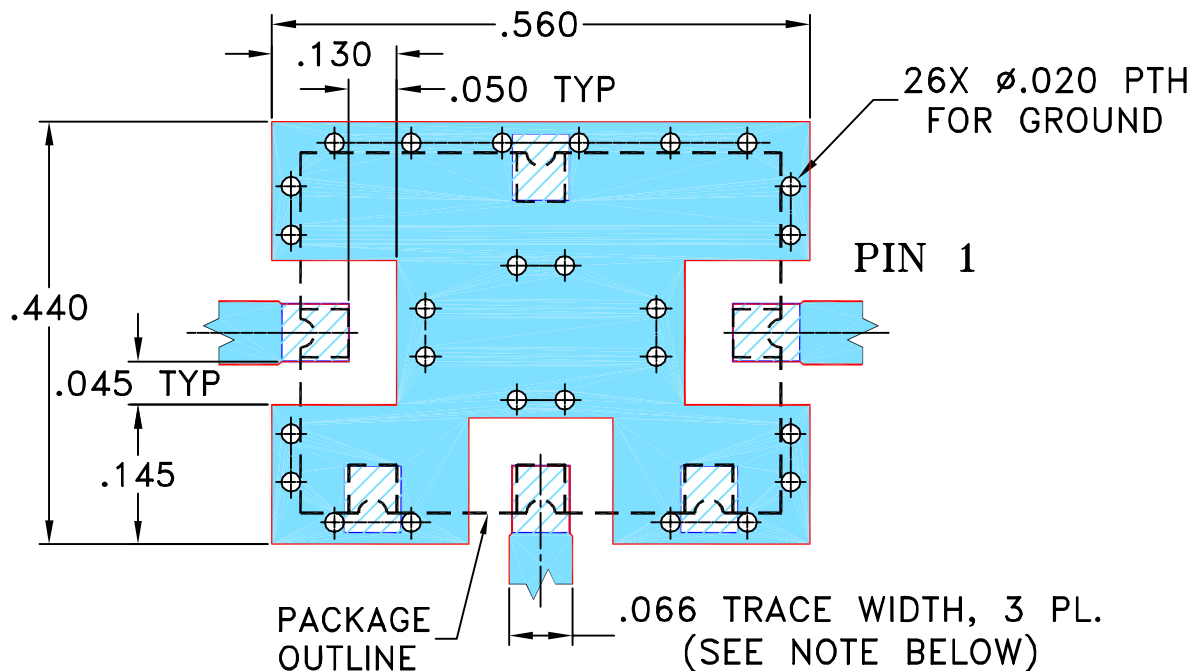
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION                 | DATE     | DR  | AUTH |
|-----|---------|-----------------------------|----------|-----|------|
| A   | M86762  | ADDED CONNECTIONS "lp & lq" | 05/23/03 | MMG | WL   |
| B   | M94598  | ADDED CONNECTION "hk"       | 10/08/04 | MMG | HY   |
| C   | M102713 | UPDATED NOTES & DESCRIPTION | 01/14/06 | GF  | IL   |
| D   | M132989 | UPDATED NOTE 2              | 08/24/11 | GF  | DJ   |

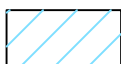
**SUGGESTED MOUNTING CONFIGURATION FOR  
TTT166/167 CASE STYLE, "hk"/"lp"/"lq"  
"x"/"ck"/"ec" PIN CONNECTIONS**

**NOTE:**

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. THE USE OF SOLDER MASK OVER THE GROUND AREA UNDER THE UNIT AS SHOWN IS RECOMMENDED TO PREVENT POTENTIAL SHORTING. IF USER CHOOSES TO EXPOSE METAL UNDER THE ENTIRE UNIT GROUND PAD FOR IMPROVED GROUNDING, IT IS RECOMMENDED A SOLDER MASK DAM BE APPLIED AROUND EACH GROUND PAD TO ENSURE FILLET AND CONNECTION AT GROUND PADS.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER), SEE NOTE 2.



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS  $\pm$ 3 PL DECIMALS  $\pm$  .005ANGLES  $\pm$ FRACTIONS  $\pm$ 

DRAWN

GF

03/18/03

CHECKED

IL

04/15/03

APPROVED

DJ

04/15/03

**Mini-Circuits®**13 Neptune Avenue  
Brooklyn NY 11235

PL, hk/lp/lq/x/ck/ec, TTT166/167,  
SYM/HJK/SYAS/SYPD, TB-12

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-079

REV:

D

FILE:

98PL079

SCALE:

5:1

SHEET:

1 OF 1

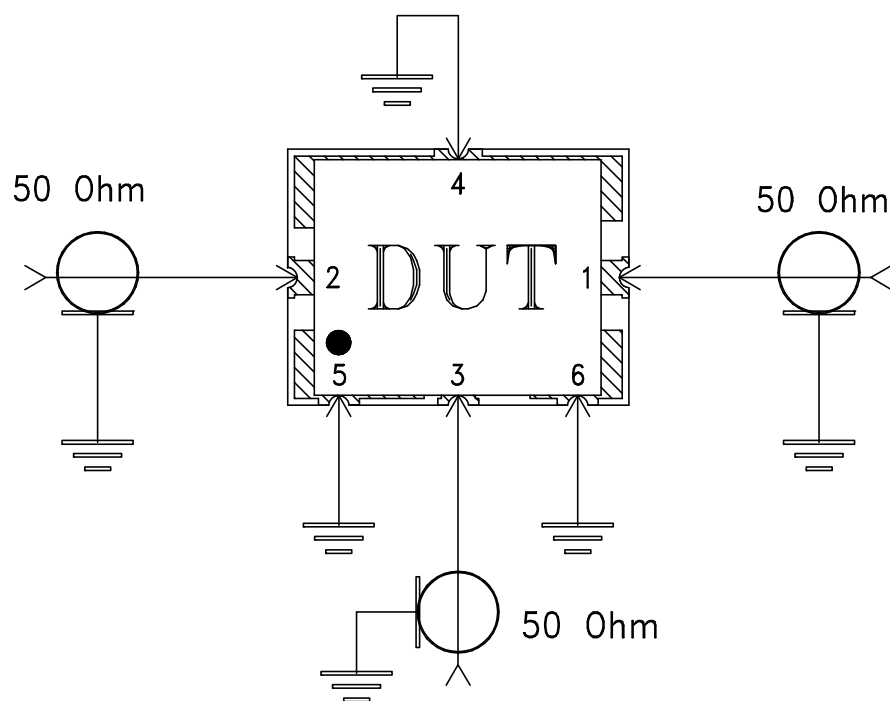
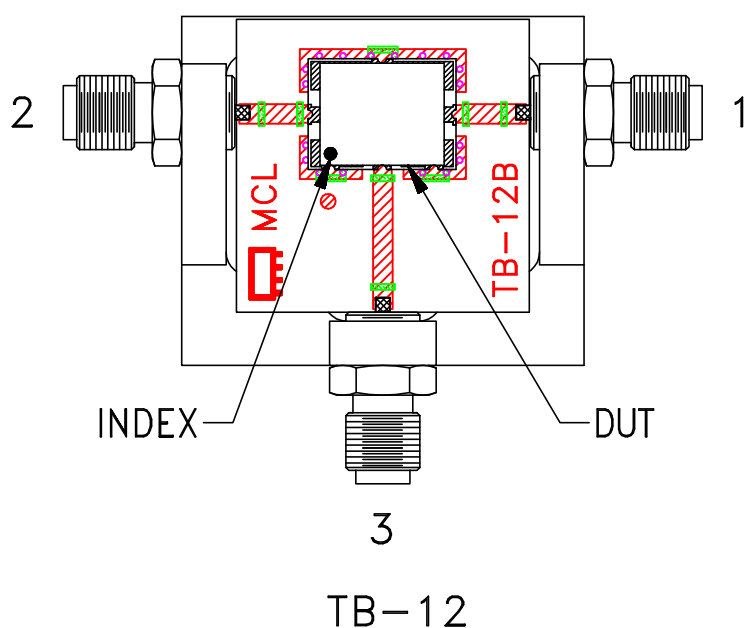
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ASHEETA1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit

For Pin Connections Refer to Data Sheet of the DUT



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 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          | -20° 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                                                                              |