

## Frequency Mixer

## HJK-ED10324E/3A

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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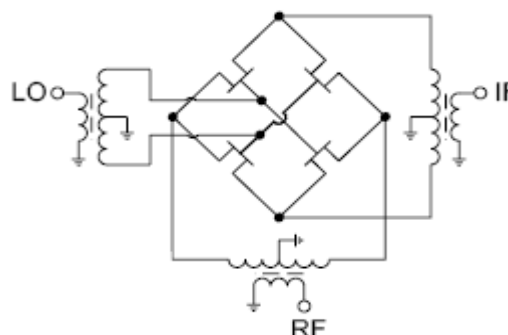
CASE STYLE : TTT881

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                                        |      |      |      |       |
|---------------------------------------|----------------------------------------|------|------|------|-------|
| Parameter                             |                                        | Min. | Typ. | Max. | Units |
| Frequency                             | LO (f <sub>L</sub> to f <sub>U</sub> ) | 1560 |      | 1960 | MHz   |
|                                       | RF (f <sub>L</sub> to f <sub>U</sub> ) | 1700 |      | 2100 | MHz   |
|                                       | IF                                     | 10   |      | 270  | MHz   |
| Conversion Loss                       | Total Range                            |      | 6.7  |      | dB    |
| LO-RF Isolation                       |                                        |      | 45   |      | dB    |
| LO-IF Isolation                       |                                        |      | 35   |      | dB    |
| Input IP3                             |                                        |      | +31  |      | dBm   |
| 1 dB Compression                      |                                        |      | +20  |      | 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-ED10324E/3A

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=140MHz<br>(dB) |      |       |
|---------------------|-------------|--------------------------------------------------------|------|-------|
|                     |             | @LO (dBm)                                              |      |       |
|                     |             | +14                                                    | +17  | +20   |
| 780.0               | 640.0       | 10.62                                                  | 9.38 | 8.57  |
| 830.0               | 690.0       | 9.93                                                   | 8.77 | 7.96  |
| 880.0               | 740.0       | 9.66                                                   | 8.57 | 7.88  |
| 930.0               | 790.0       | 9.17                                                   | 8.25 | 7.60  |
| 980.0               | 840.0       | 9.09                                                   | 8.21 | 7.62  |
| 1030.0              | 890.0       | 8.95                                                   | 8.21 | 7.69  |
| 1080.0              | 940.0       | 8.87                                                   | 8.20 | 7.72  |
| 1130.0              | 990.0       | 8.76                                                   | 8.15 | 7.71  |
| 1180.0              | 1040.0      | 8.70                                                   | 8.18 | 7.81  |
| 1230.0              | 1090.0      | 8.57                                                   | 8.07 | 7.70  |
| 1280.0              | 1140.0      | 8.46                                                   | 8.00 | 7.66  |
| 1330.0              | 1190.0      | 8.31                                                   | 7.88 | 7.56  |
| 1380.0              | 1240.0      | 8.26                                                   | 7.86 | 7.57  |
| 1430.0              | 1290.0      | 8.08                                                   | 7.72 | 7.45  |
| 1480.0              | 1340.0      | 8.05                                                   | 7.72 | 7.49  |
| 1530.0              | 1390.0      | 7.78                                                   | 7.48 | 7.26  |
| 1580.0              | 1440.0      | 7.65                                                   | 7.36 | 7.15  |
| 1630.0              | 1490.0      | 7.41                                                   | 7.15 | 6.95  |
| 1690.0              | 1550.0      | 7.29                                                   | 6.99 | 6.76  |
| 1740.0              | 1600.0      | 7.17                                                   | 6.86 | 6.60  |
| 1800.0              | 1660.0      | 7.07                                                   | 6.72 | 6.38  |
| 1850.0              | 1710.0      | 6.99                                                   | 6.64 | 6.24  |
| 1910.0              | 1770.0      | 6.85                                                   | 6.55 | 6.22  |
| 1960.0              | 1820.0      | 6.94                                                   | 6.65 | 6.36  |
| 2020.0              | 1880.0      | 6.80                                                   | 6.51 | 6.28  |
| 2070.0              | 1930.0      | 6.94                                                   | 6.64 | 6.39  |
| 2130.0              | 1990.0      | 6.93                                                   | 6.62 | 6.42  |
| 2180.0              | 2040.0      | 7.09                                                   | 6.75 | 6.50  |
| 2240.0              | 2100.0      | 7.23                                                   | 6.88 | 6.65  |
| 2290.0              | 2150.0      | 7.37                                                   | 7.02 | 6.80  |
| 2350.0              | 2210.0      | 7.62                                                   | 7.23 | 7.02  |
| 2400.0              | 2260.0      | 7.70                                                   | 7.30 | 7.12  |
| 2460.0              | 2320.0      | 8.05                                                   | 7.60 | 7.42  |
| 2510.0              | 2370.0      | 8.18                                                   | 7.73 | 7.58  |
| 2570.0              | 2430.0      | 8.63                                                   | 8.11 | 7.95  |
| 2620.0              | 2480.0      | 8.81                                                   | 8.27 | 8.15  |
| 2680.0              | 2540.0      | 9.17                                                   | 8.62 | 8.55  |
| 2730.0              | 2590.0      | 9.48                                                   | 8.88 | 8.95  |
| 2790.0              | 2650.0      | 9.79                                                   | 9.17 | 9.37  |
| 2840.0              | 2700.0      | 10.40                                                  | 9.65 | 10.28 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +14                | +17   | +20   |
| 780.0               | 640.0       | 10.74              | 12.66 | 15.55 |
| 830.0               | 690.0       | 11.02              | 13.23 | 17.14 |
| 880.0               | 740.0       | 11.24              | 13.81 | 17.64 |
| 930.0               | 790.0       | 11.94              | 15.08 | 18.98 |
| 980.0               | 840.0       | 12.29              | 15.06 | 17.59 |
| 1030.0              | 890.0       | 13.28              | 15.57 | 17.76 |
| 1080.0              | 940.0       | 14.10              | 16.48 | 18.67 |
| 1130.0              | 990.0       | 15.07              | 17.63 | 20.00 |
| 1180.0              | 1040.0      | 16.00              | 18.59 | 21.18 |
| 1230.0              | 1090.0      | 17.03              | 19.45 | 21.75 |
| 1280.0              | 1140.0      | 17.86              | 20.15 | 22.34 |
| 1330.0              | 1190.0      | 18.92              | 21.24 | 23.63 |
| 1380.0              | 1240.0      | 20.02              | 22.60 | 25.23 |
| 1430.0              | 1290.0      | 21.23              | 24.03 | 26.71 |
| 1480.0              | 1340.0      | 23.10              | 26.34 | 28.92 |
| 1530.0              | 1390.0      | 25.08              | 28.83 | 31.48 |
| 1580.0              | 1440.0      | 26.49              | 30.31 | 32.83 |
| 1630.0              | 1490.0      | 28.18              | 31.90 | 34.94 |
| 1690.0              | 1550.0      | 29.12              | 32.29 | 35.97 |
| 1740.0              | 1600.0      | 30.12              | 33.28 | 38.40 |
| 1800.0              | 1660.0      | 30.88              | 34.72 | 38.27 |
| 1850.0              | 1710.0      | 30.68              | 35.43 | 36.96 |
| 1910.0              | 1770.0      | 29.03              | 32.48 | 34.95 |
| 1960.0              | 1820.0      | 27.87              | 31.27 | 34.50 |
| 2020.0              | 1880.0      | 26.92              | 29.87 | 33.08 |
| 2070.0              | 1930.0      | 26.03              | 29.08 | 32.39 |
| 2130.0              | 1990.0      | 25.28              | 28.35 | 32.32 |
| 2180.0              | 2040.0      | 24.02              | 27.21 | 30.91 |
| 2240.0              | 2100.0      | 23.33              | 26.61 | 29.93 |
| 2290.0              | 2150.0      | 22.26              | 25.44 | 28.44 |
| 2350.0              | 2210.0      | 21.06              | 24.24 | 27.79 |
| 2400.0              | 2260.0      | 20.70              | 23.89 | 27.39 |
| 2460.0              | 2320.0      | 19.08              | 22.36 | 25.52 |
| 2510.0              | 2370.0      | 18.95              | 22.17 | 25.68 |
| 2570.0              | 2430.0      | 17.43              | 20.74 | 23.98 |
| 2620.0              | 2480.0      | 17.05              | 20.35 | 23.69 |
| 2680.0              | 2540.0      | 16.21              | 19.39 | 22.59 |
| 2730.0              | 2590.0      | 15.16              | 18.36 | 21.54 |
| 2790.0              | 2650.0      | 14.89              | 18.35 | 21.13 |
| 2840.0              | 2700.0      | 13.46              | 16.80 | 19.41 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+20dBm<br>(dB) |      |      |
|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                            |      |      |
|                     |             | +14                                  | +17  | +20  |
| 780.0               | 640.0       | 10.26                                | 9.26 | 7.65 |
| 830.0               | 690.0       | 10.33                                | 9.15 | 7.44 |
| 880.0               | 740.0       | 10.30                                | 9.09 | 7.44 |
| 930.0               | 790.0       | 9.99                                 | 8.63 | 6.87 |
| 980.0               | 840.0       | 9.61                                 | 8.18 | 6.45 |
| 1030.0              | 890.0       | 9.03                                 | 7.36 | 5.36 |
| 1080.0              | 940.0       | 8.53                                 | 6.75 | 4.78 |
| 1130.0              | 990.0       | 7.98                                 | 6.08 | 4.05 |
| 1180.0              | 1040.0      | 7.41                                 | 5.42 | 3.39 |
| 1230.0              | 1090.0      | 6.72                                 | 4.67 | 2.75 |
| 1280.0              | 1140.0      | 5.98                                 | 3.96 | 2.17 |
| 1330.0              | 1190.0      | 5.27                                 | 3.29 | 1.72 |
| 1380.0              | 1240.0      | 4.43                                 | 2.57 | 1.32 |
| 1430.0              | 1290.0      | 3.62                                 | 1.99 | 1.04 |
| 1480.0              | 1340.0      | 2.81                                 | 1.54 | 0.81 |
| 1530.0              | 1390.0      | 2.15                                 | 1.15 | 0.60 |
| 1580.0              | 1440.0      | 1.78                                 | 0.92 | 0.45 |
| 1630.0              | 1490.0      | 1.39                                 | 0.67 | 0.31 |
| 1690.0              | 1550.0      | 1.28                                 | 0.54 | 0.22 |
| 1740.0              | 1600.0      | 1.05                                 | 0.39 | 0.16 |
| 1800.0              | 1660.0      | 0.87                                 | 0.31 | 0.10 |
| 1850.0              | 1710.0      | 0.80                                 | 0.30 | 0.19 |
| 1910.0              | 1770.0      | 0.75                                 | 0.30 | 0.18 |
| 1960.0              | 1820.0      | 0.81                                 | 0.33 | 0.19 |
| 2020.0              | 1880.0      | 1.20                                 | 0.50 | 0.27 |
| 2070.0              | 1930.0      | 1.53                                 | 0.61 | 0.30 |
| 2130.0              | 1990.0      | 2.03                                 | 0.86 | 0.40 |
| 2180.0              | 2040.0      | 2.74                                 | 1.24 | 0.54 |
| 2240.0              | 2100.0      | 3.27                                 | 1.58 | 0.66 |
| 2290.0              | 2150.0      | 4.01                                 | 2.20 | 0.92 |
| 2350.0              | 2210.0      | 4.80                                 | 2.89 | 1.28 |
| 2400.0              | 2260.0      | 5.14                                 | 3.12 | 1.49 |
| 2460.0              | 2320.0      | 6.15                                 | 4.15 | 2.27 |
| 2510.0              | 2370.0      | 5.98                                 | 4.01 | 2.15 |
| 2570.0              | 2430.0      | 6.95                                 | 5.03 | 2.82 |
| 2620.0              | 2480.0      | 7.32                                 | 5.47 | 3.27 |
| 2680.0              | 2540.0      | 7.55                                 | 5.85 | 3.61 |
| 2730.0              | 2590.0      | 7.66                                 | 6.14 | 3.71 |
| 2790.0              | 2650.0      | 7.49                                 | 6.04 | 3.65 |
| 2840.0              | 2700.0      | 7.92                                 | 6.60 | 3.89 |

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# Frequency Mixer

HJK-ED10324E/3A

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1900MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1689.9MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=2100.1MHz<br>(dB) |
|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |
|                      |             | +17                                                            |                      |             | +17                                                              |                      |             | +17                                                              |
| 800.0                | 1100.0      | 11.56                                                          | 10.1                 | 1700.0      | 7.11                                                             | 710.1                | 1390.0      | 11.07                                                            |
| 753.5                | 1146.5      | 11.22                                                          | 30.1                 | 1720.0      | 6.73                                                             | 690.1                | 1410.0      | 10.87                                                            |
| 707.1                | 1192.9      | 11.00                                                          | 50.1                 | 1740.0      | 6.73                                                             | 670.1                | 1430.0      | 10.70                                                            |
| 660.6                | 1239.4      | 10.68                                                          | 70.1                 | 1760.0      | 6.74                                                             | 650.1                | 1450.0      | 10.45                                                            |
| 614.1                | 1285.9      | 10.33                                                          | 90.1                 | 1780.0      | 6.73                                                             | 630.1                | 1470.0      | 10.20                                                            |
| 567.6                | 1332.4      | 9.90                                                           | 100.1                | 1790.0      | 6.72                                                             | 610.1                | 1490.0      | 9.87                                                             |
| 521.2                | 1378.8      | 9.47                                                           | 120.1                | 1810.0      | 6.75                                                             | 590.1                | 1510.0      | 9.59                                                             |
| 474.7                | 1425.3      | 8.96                                                           | 130.1                | 1820.0      | 6.76                                                             | 570.1                | 1530.0      | 9.39                                                             |
| 428.2                | 1471.8      | 8.48                                                           | 150.1                | 1840.0      | 6.80                                                             | 550.1                | 1550.0      | 9.09                                                             |
| 381.8                | 1518.2      | 8.05                                                           | 160.1                | 1850.0      | 6.83                                                             | 530.1                | 1570.0      | 8.75                                                             |
| 335.3                | 1564.7      | 7.59                                                           | 180.1                | 1870.0      | 6.86                                                             | 510.1                | 1590.0      | 8.45                                                             |
| 288.8                | 1611.2      | 7.10                                                           | 190.1                | 1880.0      | 6.88                                                             | 490.1                | 1610.0      | 8.19                                                             |
| 242.4                | 1657.6      | 6.83                                                           | 210.1                | 1900.0      | 6.95                                                             | 470.1                | 1630.0      | 7.96                                                             |
| 195.9                | 1704.1      | 6.66                                                           | 220.1                | 1910.0      | 6.98                                                             | 450.1                | 1650.0      | 7.72                                                             |
| 149.4                | 1750.6      | 6.63                                                           | 240.1                | 1930.0      | 7.07                                                             | 430.1                | 1670.0      | 7.43                                                             |
| 102.9                | 1797.1      | 6.58                                                           | 250.1                | 1940.0      | 7.12                                                             | 410.1                | 1690.0      | 7.29                                                             |
| 56.5                 | 1843.5      | 6.57                                                           | 270.1                | 1960.0      | 7.21                                                             | 390.1                | 1710.0      | 7.14                                                             |
| 10.0                 | 1890.0      | 6.95                                                           | 280.1                | 1970.0      | 7.26                                                             | 370.1                | 1730.0      | 7.01                                                             |
| 26.9                 | 1926.9      | 6.58                                                           | 300.1                | 1990.0      | 7.38                                                             | 350.1                | 1750.0      | 6.66                                                             |
| 60.6                 | 1960.6      | 6.66                                                           | 310.1                | 2000.0      | 7.45                                                             | 330.1                | 1770.0      | 6.61                                                             |
| 94.3                 | 1994.3      | 6.72                                                           | 330.1                | 2020.0      | 7.57                                                             | 310.1                | 1790.0      | 6.58                                                             |
| 128.0                | 2028.0      | 6.85                                                           | 340.1                | 2030.0      | 7.64                                                             | 290.1                | 1810.0      | 6.57                                                             |
| 161.7                | 2061.7      | 6.93                                                           | 360.1                | 2050.0      | 7.81                                                             | 270.1                | 1830.0      | 6.57                                                             |
| 195.4                | 2095.4      | 7.04                                                           | 370.1                | 2060.0      | 7.87                                                             | 250.1                | 1850.0      | 6.58                                                             |
| 229.1                | 2129.1      | 7.26                                                           | 390.1                | 2080.0      | 8.03                                                             | 230.1                | 1870.0      | 6.58                                                             |
| 246.0                | 2146.0      | 7.33                                                           | 400.1                | 2090.0      | 8.11                                                             | 220.1                | 1880.0      | 6.54                                                             |
| 279.7                | 2179.7      | 7.48                                                           | 420.1                | 2110.0      | 8.21                                                             | 200.1                | 1900.0      | 6.52                                                             |
| 296.6                | 2196.6      | 7.61                                                           | 430.1                | 2120.0      | 8.35                                                             | 190.1                | 1910.0      | 6.55                                                             |
| 330.3                | 2230.3      | 7.90                                                           | 450.1                | 2140.0      | 8.66                                                             | 170.1                | 1930.0      | 6.55                                                             |
| 347.1                | 2247.1      | 7.96                                                           | 460.1                | 2150.0      | 8.70                                                             | 160.1                | 1940.0      | 6.57                                                             |
| 380.9                | 2280.9      | 8.16                                                           | 480.1                | 2170.0      | 8.85                                                             | 140.1                | 1960.0      | 6.60                                                             |
| 397.7                | 2297.7      | 8.34                                                           | 490.1                | 2180.0      | 8.97                                                             | 130.1                | 1970.0      | 6.59                                                             |
| 431.4                | 2331.4      | 8.63                                                           | 510.1                | 2200.0      | 9.14                                                             | 110.1                | 1990.0      | 6.59                                                             |
| 448.3                | 2348.3      | 8.75                                                           | 520.1                | 2210.0      | 9.28                                                             | 100.1                | 2000.0      | 6.61                                                             |
| 482.0                | 2382.0      | 9.07                                                           | 540.1                | 2230.0      | 9.53                                                             | 80.1                 | 2020.0      | 6.64                                                             |
| 498.9                | 2398.9      | 9.37                                                           | 550.1                | 2240.0      | 9.56                                                             | 70.1                 | 2030.0      | 6.69                                                             |
| 532.6                | 2432.6      | 9.78                                                           | 570.1                | 2260.0      | 9.69                                                             | 50.1                 | 2050.0      | 6.70                                                             |
| 549.4                | 2449.4      | 9.87                                                           | 580.1                | 2270.0      | 9.82                                                             | 40.1                 | 2060.0      | 6.70                                                             |
| 583.1                | 2483.1      | 10.49                                                          | 600.1                | 2290.0      | 9.97                                                             | 20.1                 | 2080.0      | 6.74                                                             |
| 600.0                | 2500.0      | 10.98                                                          | 610.1                | 2300.0      | 10.09                                                            | 10.1                 | 2090.0      | 7.08                                                             |

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# Frequency Mixer

# HJK-ED10324E/3A

## 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   |
| 640.0       | 39.96                   | 39.55 | 39.28 | 39.94                   | 39.77 | 39.66 |
| 690.0       | 40.11                   | 39.65 | 39.40 | 39.45                   | 39.27 | 39.18 |
| 740.0       | 40.06                   | 39.37 | 39.21 | 38.89                   | 38.68 | 38.70 |
| 790.0       | 39.61                   | 39.10 | 38.85 | 38.63                   | 38.61 | 38.53 |
| 840.0       | 39.58                   | 39.31 | 39.32 | 38.53                   | 38.47 | 38.37 |
| 890.0       | 38.86                   | 38.58 | 38.48 | 38.94                   | 38.98 | 38.84 |
| 940.0       | 38.92                   | 38.77 | 38.77 | 39.45                   | 39.59 | 39.58 |
| 990.0       | 39.45                   | 39.47 | 39.58 | 40.12                   | 40.32 | 40.38 |
| 1040.0      | 40.09                   | 40.22 | 40.15 | 41.10                   | 41.46 | 41.69 |
| 1090.0      | 42.41                   | 42.84 | 43.07 | 42.05                   | 42.41 | 42.69 |
| 1140.0      | 44.53                   | 45.43 | 46.14 | 43.34                   | 43.74 | 44.02 |
| 1190.0      | 40.10                   | 40.39 | 40.65 | 44.25                   | 44.89 | 45.25 |
| 1240.0      | 40.51                   | 40.57 | 40.73 | 45.27                   | 45.82 | 46.29 |
| 1290.0      | 42.83                   | 43.17 | 43.50 | 46.72                   | 47.35 | 47.86 |
| 1340.0      | 47.16                   | 47.51 | 47.61 | 46.99                   | 47.50 | 47.88 |
| 1390.0      | 51.82                   | 51.87 | 51.26 | 44.63                   | 44.89 | 45.15 |
| 1440.0      | 57.58                   | 54.75 | 52.17 | 41.57                   | 41.69 | 41.74 |
| 1490.0      | 57.18                   | 53.44 | 51.10 | 38.64                   | 38.71 | 38.72 |
| 1550.0      | 54.99                   | 51.94 | 50.19 | 35.97                   | 35.97 | 36.01 |
| 1600.0      | 51.45                   | 49.35 | 48.36 | 34.08                   | 34.10 | 34.15 |
| 1660.0      | 49.27                   | 47.79 | 47.51 | 32.15                   | 32.25 | 32.30 |
| 1710.0      | 46.24                   | 44.98 | 45.60 | 31.18                   | 31.20 | 31.27 |
| 1770.0      | 44.11                   | 43.16 | 45.88 | 30.55                   | 30.82 | 31.03 |
| 1820.0      | 44.91                   | 43.87 | 46.05 | 30.74                   | 31.01 | 31.44 |
| 1880.0      | 47.97                   | 46.37 | 52.20 | 31.57                   | 31.76 | 32.51 |
| 1930.0      | 52.47                   | 50.02 | 66.12 | 32.48                   | 32.74 | 33.58 |
| 1990.0      | 57.30                   | 52.94 | 51.57 | 33.60                   | 33.76 | 34.56 |
| 2040.0      | 49.45                   | 49.23 | 45.49 | 34.22                   | 34.31 | 34.91 |
| 2100.0      | 44.44                   | 44.60 | 42.45 | 34.43                   | 34.49 | 34.81 |
| 2150.0      | 41.81                   | 41.95 | 40.28 | 33.99                   | 34.14 | 34.31 |
| 2210.0      | 39.72                   | 39.80 | 38.54 | 33.25                   | 33.30 | 33.35 |
| 2260.0      | 38.16                   | 37.87 | 37.27 | 32.46                   | 32.34 | 32.51 |
| 2320.0      | 36.77                   | 36.53 | 35.97 | 31.52                   | 31.47 | 31.54 |
| 2370.0      | 35.90                   | 35.52 | 35.10 | 30.74                   | 30.68 | 30.72 |
| 2430.0      | 35.11                   | 34.73 | 34.10 | 29.84                   | 29.80 | 29.67 |
| 2480.0      | 34.28                   | 34.12 | 33.61 | 29.03                   | 29.22 | 29.05 |
| 2540.0      | 33.95                   | 33.55 | 33.13 | 28.37                   | 28.42 | 28.27 |
| 2590.0      | 33.48                   | 33.29 | 32.96 | 27.73                   | 27.88 | 27.77 |
| 2650.0      | 33.07                   | 32.83 | 32.50 | 27.12                   | 27.26 | 27.11 |
| 2700.0      | 32.99                   | 32.77 | 32.59 | 26.64                   | 26.83 | 26.69 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 780.0               | 640.0       | 24.45                   | 23.41 | 21.56 |
| 830.0               | 690.0       | 24.93                   | 23.88 | 22.01 |
| 880.0               | 740.0       | 25.90                   | 25.19 | 23.67 |
| 930.0               | 790.0       | 26.60                   | 25.98 | 24.46 |
| 980.0               | 840.0       | 26.62                   | 25.57 | 23.80 |
| 1030.0              | 890.0       | 28.90                   | 28.55 | 27.54 |
| 1080.0              | 940.0       | 30.39                   | 30.39 | 29.65 |
| 1130.0              | 990.0       | 31.56                   | 31.76 | 31.11 |
| 1180.0              | 1040.0      | 33.64                   | 34.23 | 34.30 |
| 1230.0              | 1090.0      | 34.27                   | 35.21 | 35.32 |
| 1280.0              | 1140.0      | 34.40                   | 35.36 | 35.34 |
| 1330.0              | 1190.0      | 34.72                   | 35.80 | 36.03 |
| 1380.0              | 1240.0      | 35.02                   | 36.26 | 36.75 |
| 1430.0              | 1290.0      | 35.13                   | 36.34 | 36.67 |
| 1480.0              | 1340.0      | 35.16                   | 36.25 | 36.70 |
| 1530.0              | 1390.0      | 35.26                   | 36.18 | 36.49 |
| 1580.0              | 1440.0      | 34.78                   | 35.48 | 35.75 |
| 1630.0              | 1490.0      | 34.34                   | 34.76 | 34.88 |
| 1690.0              | 1550.0      | 33.49                   | 33.77 | 33.48 |
| 1740.0              | 1600.0      | 33.28                   | 33.49 | 33.13 |
| 1800.0              | 1660.0      | 33.63                   | 33.81 | 33.38 |
| 1850.0              | 1710.0      | 34.13                   | 34.19 | 33.67 |
| 1910.0              | 1770.0      | 34.56                   | 34.54 | 34.25 |
| 1960.0              | 1820.0      | 34.45                   | 34.32 | 34.10 |
| 2020.0              | 1880.0      | 33.78                   | 33.47 | 33.27 |
| 2070.0              | 1930.0      | 33.21                   | 32.85 | 32.60 |
| 2130.0              | 1990.0      | 32.56                   | 32.13 | 31.89 |
| 2180.0              | 2040.0      | 32.24                   | 31.69 | 31.47 |
| 2240.0              | 2100.0      | 31.76                   | 31.20 | 30.97 |
| 2290.0              | 2150.0      | 31.33                   | 30.80 | 30.61 |
| 2350.0              | 2210.0      | 30.69                   | 30.15 | 29.94 |
| 2400.0              | 2260.0      | 30.09                   | 29.54 | 29.35 |
| 2460.0              | 2320.0      | 29.57                   | 29.11 | 28.90 |
| 2510.0              | 2370.0      | 29.01                   | 28.62 | 28.40 |
| 2570.0              | 2430.0      | 28.49                   | 28.14 | 27.90 |
| 2620.0              | 2480.0      | 27.98                   | 27.75 | 27.50 |
| 2680.0              | 2540.0      | 27.61                   | 27.40 | 27.16 |
| 2730.0              | 2590.0      | 27.29                   | 27.10 | 26.86 |
| 2790.0              | 2650.0      | 26.97                   | 26.84 | 26.65 |
| 2840.0              | 2700.0      | 26.65                   | 26.56 | 26.24 |

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# Frequency Mixer

# HJK-ED10324E/3A

## 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=1840MHz<br>(:1) |      |  |  |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|-------|-------|-------|----------------------|--------------------------------|------|--|--|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |       |       |       |                      | @LO (dBm)                      |      |  |  |
|                     |             | +14             | +17  | +20  |             | +14             | +17   | +20   | +14   |                      | +17                            | +20  |  |  |
| 780.0               | 640.0       | 1.71            | 1.75 | 1.72 | 640.0       | 36.20           | 36.20 | 35.46 | 10.0  | 1.07                 | 1.03                           | 1.09 |  |  |
| 830.0               | 690.0       | 1.62            | 1.62 | 1.56 | 690.0       | 34.75           | 34.75 | 34.07 | 20.0  | 1.08                 | 1.03                           | 1.08 |  |  |
| 880.0               | 740.0       | 1.54            | 1.53 | 1.48 | 740.0       | 34.75           | 34.75 | 34.07 | 30.0  | 1.09                 | 1.05                           | 1.10 |  |  |
| 930.0               | 790.0       | 1.49            | 1.47 | 1.43 | 790.0       | 34.07           | 33.42 | 32.79 | 40.0  | 1.09                 | 1.06                           | 1.11 |  |  |
| 980.0               | 840.0       | 1.42            | 1.40 | 1.37 | 840.0       | 33.42           | 32.79 | 32.18 | 50.0  | 1.10                 | 1.06                           | 1.10 |  |  |
| 1030.0              | 890.0       | 1.42            | 1.42 | 1.40 | 890.0       | 32.79           | 32.18 | 31.60 | 60.0  | 1.13                 | 1.09                           | 1.09 |  |  |
| 1080.0              | 940.0       | 1.50            | 1.53 | 1.54 | 940.0       | 31.60           | 31.03 | 29.46 | 70.0  | 1.16                 | 1.11                           | 1.11 |  |  |
| 1130.0              | 990.0       | 1.56            | 1.61 | 1.64 | 990.0       | 30.49           | 29.96 | 29.46 | 80.0  | 1.17                 | 1.13                           | 1.11 |  |  |
| 1180.0              | 1040.0      | 1.63            | 1.68 | 1.73 | 1040.0      | 28.49           | 27.59 | 26.33 | 90.0  | 1.20                 | 1.16                           | 1.13 |  |  |
| 1230.0              | 1090.0      | 1.70            | 1.77 | 1.83 | 1090.0      | 26.33           | 26.33 | 25.94 | 100.0 | 1.24                 | 1.19                           | 1.15 |  |  |
| 1280.0              | 1140.0      | 1.74            | 1.82 | 1.89 | 1140.0      | 22.87           | 22.58 | 21.20 | 110.0 | 1.26                 | 1.21                           | 1.17 |  |  |
| 1330.0              | 1190.0      | 1.77            | 1.85 | 1.93 | 1190.0      | 19.76           | 19.54 | 19.32 | 120.0 | 1.28                 | 1.23                           | 1.19 |  |  |
| 1380.0              | 1240.0      | 1.76            | 1.85 | 1.93 | 1240.0      | 19.32           | 18.90 | 17.75 | 130.0 | 1.31                 | 1.25                           | 1.20 |  |  |
| 1430.0              | 1290.0      | 1.72            | 1.82 | 1.91 | 1290.0      | 18.70           | 18.50 | 18.11 | 140.0 | 1.32                 | 1.27                           | 1.21 |  |  |
| 1480.0              | 1340.0      | 1.65            | 1.75 | 1.85 | 1340.0      | 16.56           | 16.11 | 15.26 | 150.0 | 1.35                 | 1.29                           | 1.22 |  |  |
| 1530.0              | 1390.0      | 1.54            | 1.63 | 1.72 | 1390.0      | 14.62           | 14.62 | 14.38 | 160.0 | 1.40                 | 1.33                           | 1.25 |  |  |
| 1580.0              | 1440.0      | 1.39            | 1.47 | 1.56 | 1440.0      | 12.09           | 11.93 | 11.46 | 170.0 | 1.45                 | 1.38                           | 1.30 |  |  |
| 1630.0              | 1490.0      | 1.23            | 1.29 | 1.36 | 1490.0      | 9.85            | 9.79  | 9.63  | 180.0 | 1.48                 | 1.40                           | 1.32 |  |  |
| 1690.0              | 1550.0      | 1.05            | 1.06 | 1.12 | 1550.0      | 7.22            | 7.08  | 6.91  | 200.0 | 1.56                 | 1.49                           | 1.40 |  |  |
| 1740.0              | 1600.0      | 1.19            | 1.13 | 1.08 | 1600.0      | 5.36            | 5.23  | 5.12  | 210.0 | 1.61                 | 1.53                           | 1.44 |  |  |
| 1800.0              | 1660.0      | 1.47            | 1.41 | 1.31 | 1660.0      | 3.56            | 3.47  | 3.37  | 230.0 | 1.64                 | 1.56                           | 1.46 |  |  |
| 1850.0              | 1710.0      | 1.66            | 1.60 | 1.49 | 1710.0      | 2.40            | 2.33  | 2.21  | 240.0 | 1.72                 | 1.63                           | 1.51 |  |  |
| 1910.0              | 1770.0      | 1.79            | 1.72 | 1.62 | 1770.0      | 1.48            | 1.43  | 1.30  | 260.0 | 1.83                 | 1.73                           | 1.61 |  |  |
| 1960.0              | 1820.0      | 1.79            | 1.71 | 1.61 | 1820.0      | 1.02            | 1.03  | 1.13  | 270.0 | 1.89                 | 1.78                           | 1.66 |  |  |
| 2020.0              | 1880.0      | 1.73            | 1.65 | 1.55 | 1880.0      | 1.51            | 1.57  | 1.73  | 290.0 | 2.03                 | 1.92                           | 1.78 |  |  |
| 2070.0              | 1930.0      | 1.64            | 1.56 | 1.48 | 1930.0      | 2.04            | 2.10  | 2.30  | 300.0 | 2.05                 | 1.94                           | 1.80 |  |  |
| 2130.0              | 1990.0      | 1.51            | 1.43 | 1.35 | 1990.0      | 2.78            | 2.85  | 3.11  | 320.0 | 2.18                 | 2.06                           | 1.91 |  |  |
| 2180.0              | 2040.0      | 1.43            | 1.35 | 1.27 | 2040.0      | 3.42            | 3.47  | 3.73  | 330.0 | 2.25                 | 2.13                           | 1.97 |  |  |
| 2240.0              | 2100.0      | 1.34            | 1.27 | 1.20 | 2100.0      | 4.31            | 4.35  | 4.61  | 350.0 | 2.43                 | 2.29                           | 2.13 |  |  |
| 2290.0              | 2150.0      | 1.27            | 1.20 | 1.13 | 2150.0      | 5.02            | 5.04  | 5.31  | 360.0 | 2.52                 | 2.39                           | 2.22 |  |  |
| 2350.0              | 2210.0      | 1.18            | 1.11 | 1.06 | 2210.0      | 5.93            | 5.89  | 6.07  | 380.0 | 2.65                 | 2.51                           | 2.33 |  |  |
| 2400.0              | 2260.0      | 1.10            | 1.03 | 1.07 | 2260.0      | 6.78            | 6.78  | 7.08  | 390.0 | 2.76                 | 2.61                           | 2.42 |  |  |
| 2460.0              | 2320.0      | 1.05            | 1.05 | 1.14 | 2320.0      | 7.70            | 7.53  | 7.56  | 410.0 | 2.89                 | 2.73                           | 2.54 |  |  |
| 2510.0              | 2370.0      | 1.06            | 1.12 | 1.22 | 2370.0      | 8.64            | 8.55  | 8.81  | 420.0 | 2.98                 | 2.82                           | 2.62 |  |  |
| 2570.0              | 2430.0      | 1.15            | 1.22 | 1.34 | 2430.0      | 9.58            | 9.33  | 9.28  | 440.0 | 3.26                 | 3.09                           | 2.87 |  |  |
| 2620.0              | 2480.0      | 1.23            | 1.31 | 1.44 | 2480.0      | 10.43           | 10.25 | 10.25 | 450.0 | 3.30                 | 3.13                           | 2.92 |  |  |
| 2680.0              | 2540.0      | 1.34            | 1.43 | 1.58 | 2540.0      | 11.31           | 11.03 | 10.89 | 470.0 | 3.62                 | 3.44                           | 3.21 |  |  |
| 2730.0              | 2590.0      | 1.44            | 1.54 | 1.71 | 2590.0      | 12.01           | 11.53 | 10.89 | 480.0 | 3.72                 | 3.53                           | 3.29 |  |  |
| 2790.0              | 2650.0      | 1.56            | 1.67 | 1.85 | 2650.0      | 13.19           | 12.80 | 12.61 | 500.0 | 3.86                 | 3.67                           | 3.43 |  |  |
| 2840.0              | 2700.0      | 1.68            | 1.79 | 2.01 | 2700.0      | 13.29           | 12.44 | 11.31 | 510.0 | 4.04                 | 3.85                           | 3.60 |  |  |

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## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 7   | 25  | 25  | 34  | 31  | 46  | 28  | 35  | 40  | 49  |
| 1  | -      | 26     | +0  | 43  | 26  | 35  | 50  | 38  | 44  | 41  | 40  | 50  |
| 2  | 59     | 76     | 73  | 64  | 76  | 77  | >83 | 78  | 74  | >83 | 68  | 67  |
| 3  | >90    | >83    | >83 | >83 | 74  | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 4  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 5  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 6  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 7  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 8  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 9  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 10 | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 1900 MHz; 0.00 dBm.  
LO IN: 1760 MHz; +17.00 dBm  
IF OUT: 140 MHz; -6.53 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 17  | 36  | 35  | 43  | 41  | 51  | 39  | 46  | 52  | 63  |
| 1  | -      | 26     | +0  | 43  | 26  | 35  | 51  | 39  | 44  | 42  | 41  | 52  |
| 2  | 39     | 67     | 62  | 53  | 61  | 67  | 73  | 68  | 63  | 72  | 60  | 60  |
| 3  | 67     | 83     | 68  | 78  | 52  | 69  | 69  | 76  | 70  | 64  | 69  | 65  |
| 4  | >90    | 86     | 92  | 90  | >93 | 77  | 84  | 92  | 89  | 91  | 90  | 87  |
| 5  | >90    | >93    | 91  | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 6  | >90    | >93    | 91  | >93 | >93 | >93 | >93 | >93 | 87  | >93 | >93 | >93 |
| 7  | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 8  | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 91  | >93 |
| 9  | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 10 | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

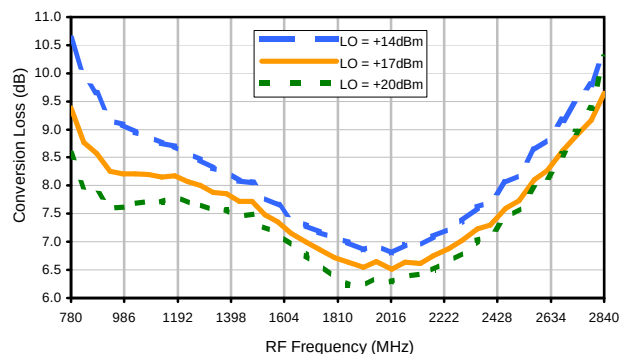
Test conditions:

RF IN: 1900 MHz; 10.00 dBm.  
LO IN: 1760 MHz; +17.00 dBm  
IF OUT: 140 MHz; 3.45 dBm

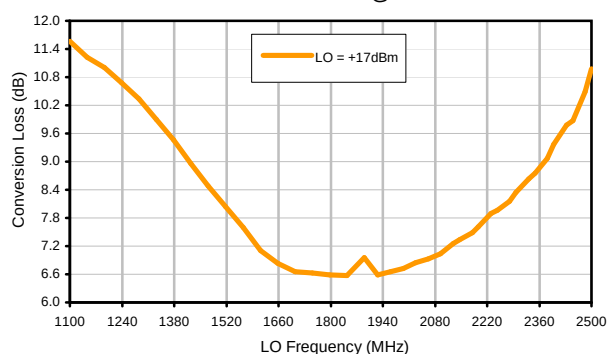
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Typical Performance Curves

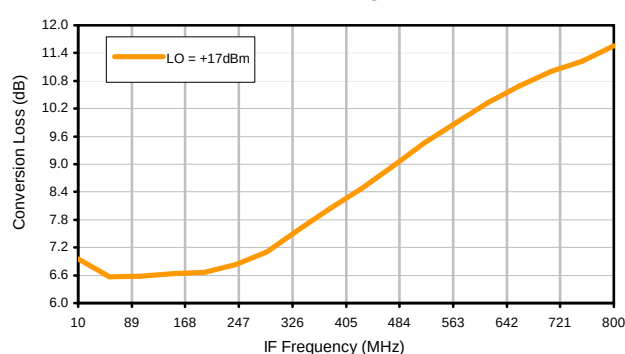
Conversion Loss @ IF=140MHz



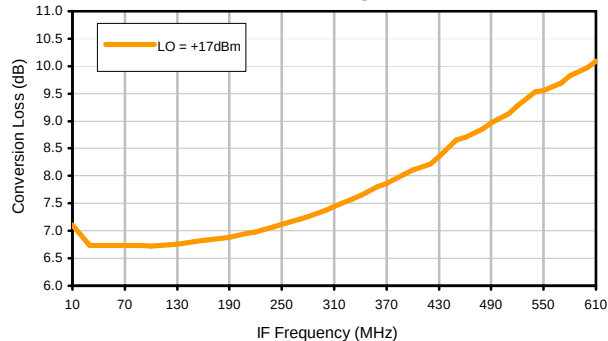
Conversion Loss vs. LO @ RF=1900MHz



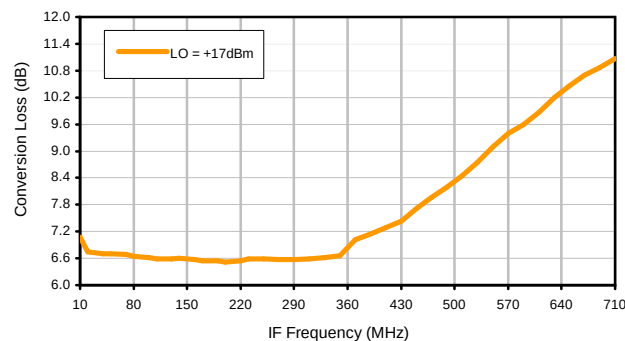
Conversion Loss vs. IF @ RF=1900MHz



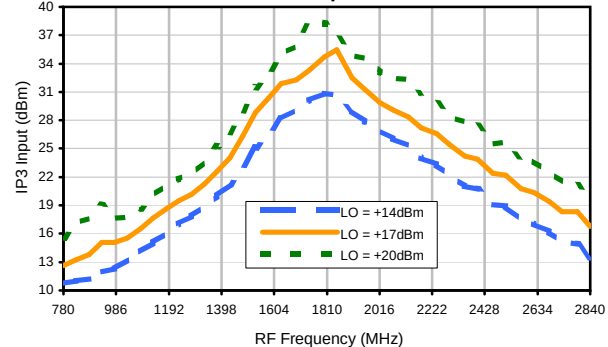
Conversion Loss vs. IF @ RF=1689.9MHz



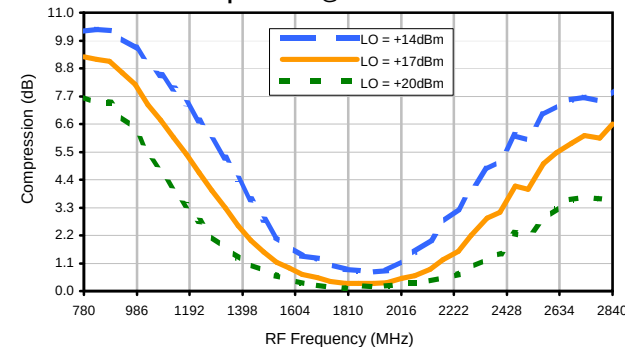
Conversion Loss vs. IF @ RF=2100.1MHz



IP3 Input



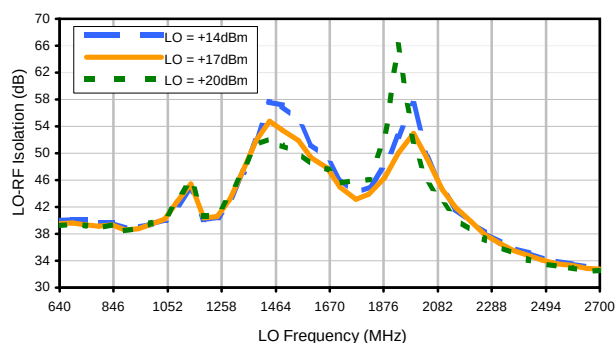
Compression @ RF IN=+20dBm



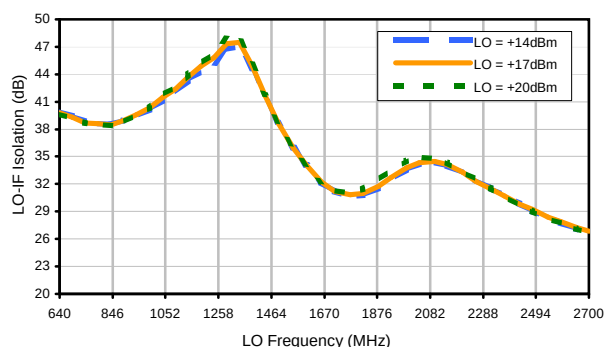


## Typical Performance Curves

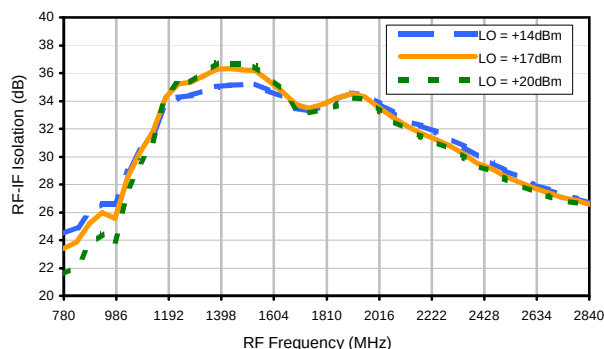
LO-RF Isolation



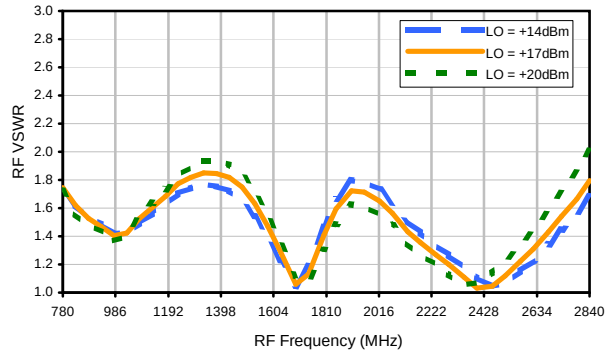
LO-IF Isolation



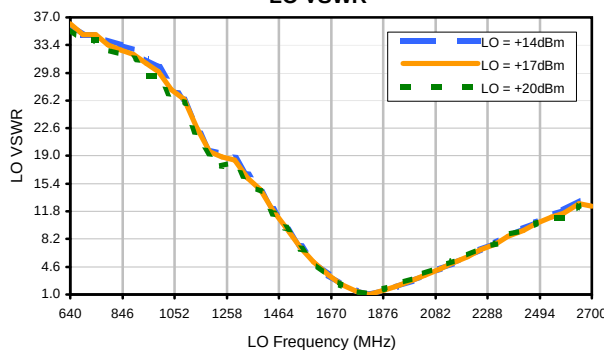
RF-IF Isolation



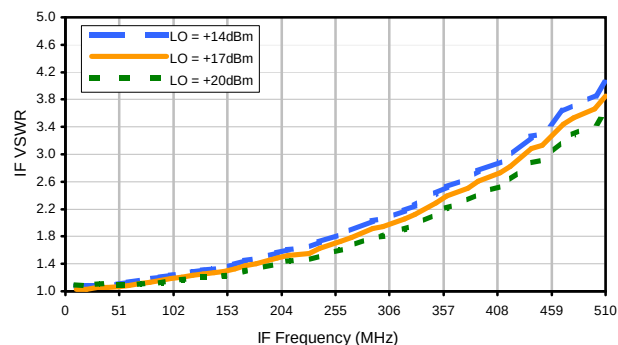
RF VSWR



LO VSWR



IF VSWR



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## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 7   | 25  | 25  | 34  | 31  | 46  | 28  | 35  | 40  | 49  |
| 1  | -      | 26     | +0  | 43  | 26  | 35  | 50  | 38  | 44  | 41  | 40  | 50  |
| 2  | 59     | 76     | 73  | 64  | 76  | 77  | >83 | 78  | 74  | >83 | 68  | 67  |
| 3  | >90    | >83    | >83 | >83 | 74  | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 4  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 5  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 6  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 7  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 8  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 9  | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
| 10 | >90    | >83    | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 | >83 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 1900 MHz; 0.00 dBm.  
LO IN: 1760 MHz; +17.00 dBm  
IF OUT: 140 MHz; -6.53 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 17  | 36  | 35  | 43  | 41  | 51  | 39  | 46  | 52  | 63  |
| 1  | -      | 26     | +0  | 43  | 26  | 35  | 51  | 39  | 44  | 42  | 41  | 52  |
| 2  | 39     | 67     | 62  | 53  | 61  | 67  | 73  | 68  | 63  | 72  | 60  | 60  |
| 3  | 67     | 83     | 68  | 78  | 52  | 69  | 69  | 76  | 70  | 64  | 69  | 65  |
| 4  | >90    | 86     | 92  | 90  | >93 | 77  | 84  | 92  | 89  | 91  | 90  | 87  |
| 5  | >90    | >93    | 91  | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 6  | >90    | >93    | 91  | >93 | >93 | >93 | >93 | >93 | 87  | >93 | >93 | >93 |
| 7  | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 8  | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 91  | >93 |
| 9  | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 10 | >90    | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

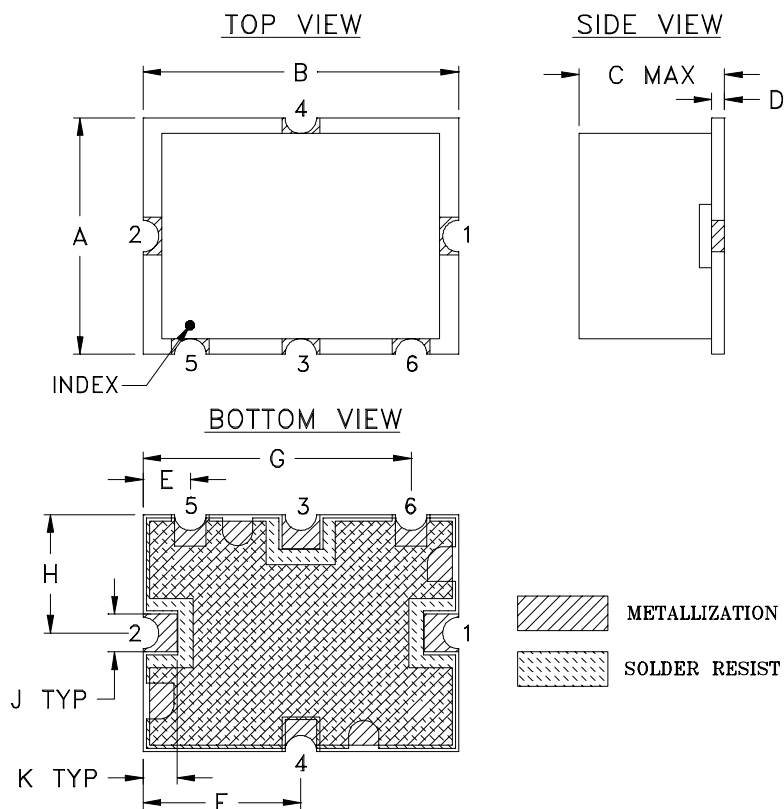
Test conditions:

RF IN: 1900 MHz; 10.00 dBm.  
LO IN: 1760 MHz; +17.00 dBm  
IF OUT: 140 MHz; 3.45 dBm

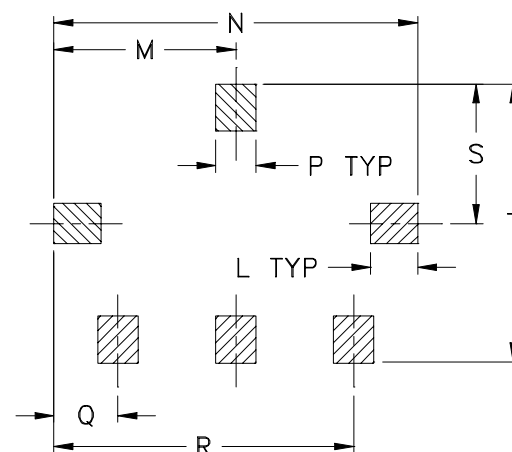
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Outline Dimensions

TTT881



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.002$

| CASE # | A             | B              | C             | D              | E              | F              | G               | H              | J              | K              | L              | M              | N               |
|--------|---------------|----------------|---------------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| TTT881 | .38<br>(9.65) | .50<br>(12.70) | .23<br>(5.84) | .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) |

| CASE # | P              | Q              | R               | S              | T               | WT.<br>GRAM |
|--------|----------------|----------------|-----------------|----------------|-----------------|-------------|
| TTT881 | .060<br>(1.52) | .095<br>(2.41) | .445<br>(11.30) | .208<br>(5.28) | .415<br>(10.54) | .8          |

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

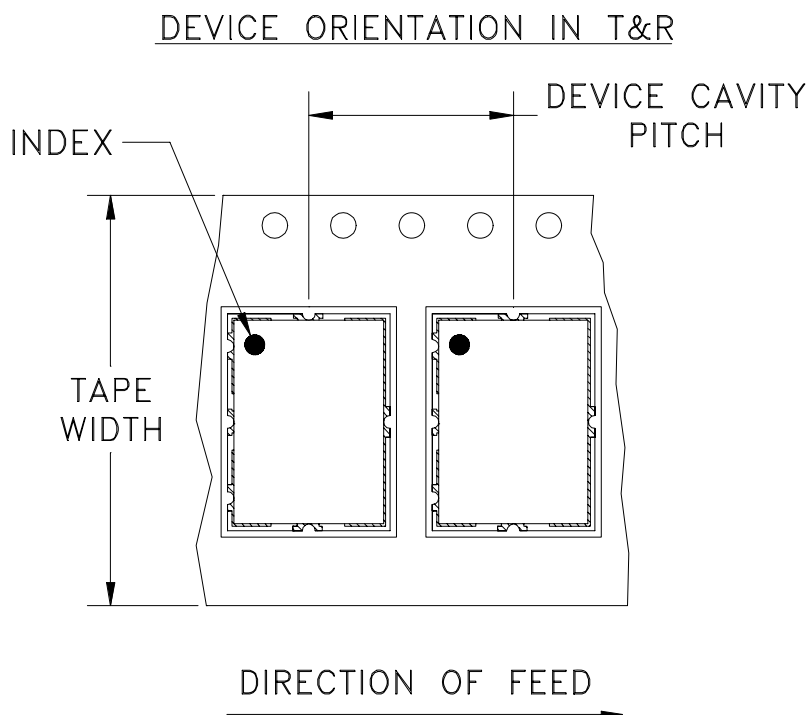
### Note:

- Case material: Nickel-Silver alloy.
- 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.



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# 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)



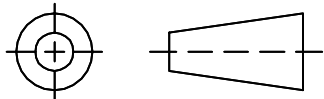
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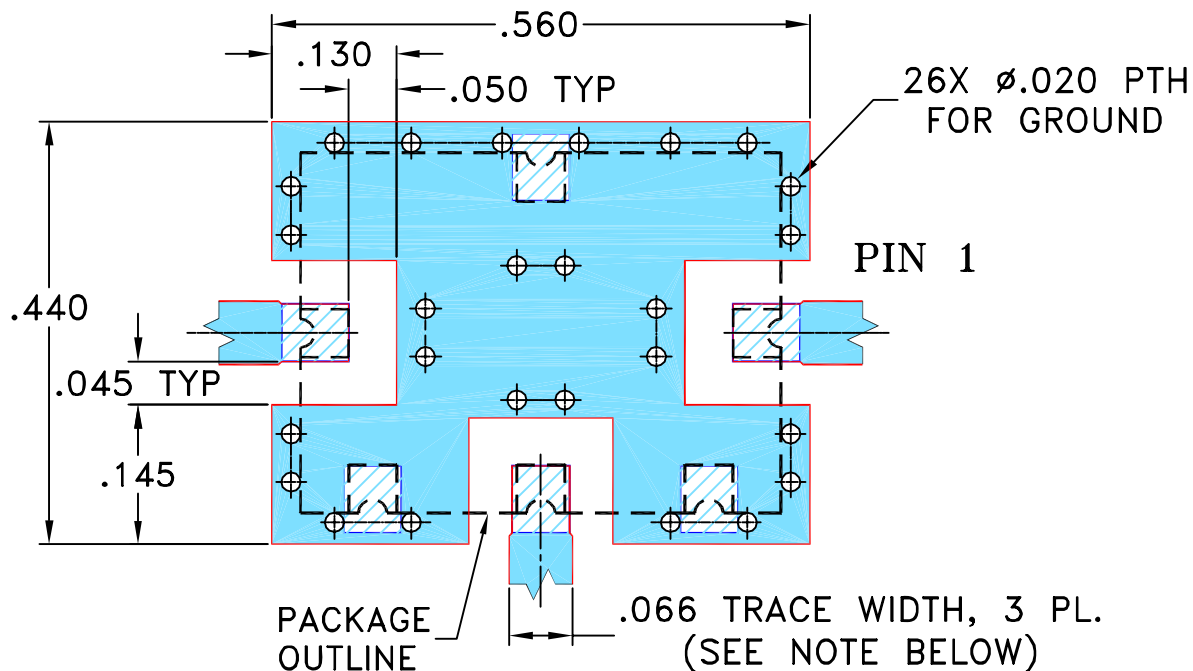
## THIRD ANGLE PROJECTION



## 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   |

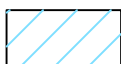
**SUGGESTED MOUNTING CONFIGURATION FOR  
TTT166/167 CASE STYLE, "hk"/"lp"/"lq"  
"x"/"ck"/"ec" PIN CONNECTIONS**

**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

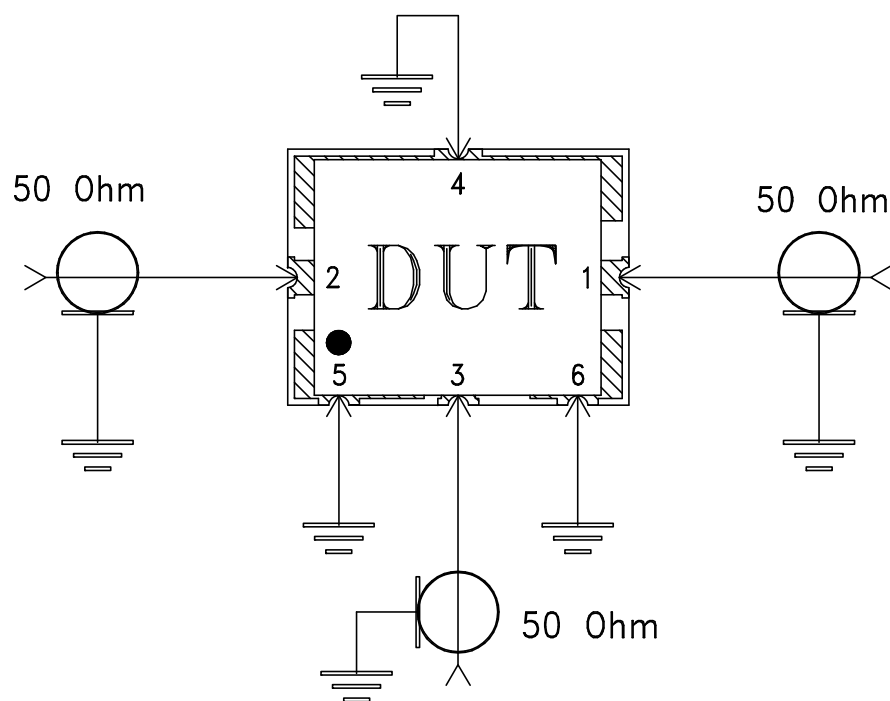
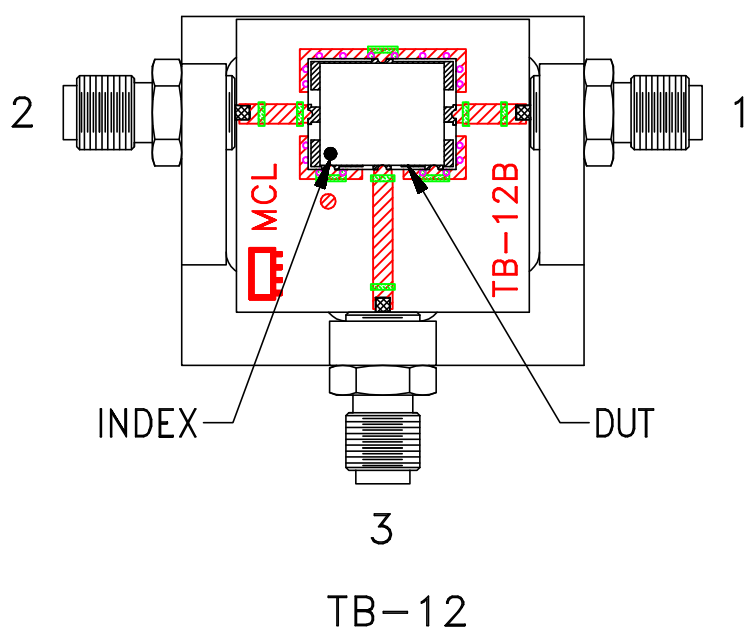
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ASHEETA1.DWG REV:A DATE:01/12/95

# 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.

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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          | -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                                                                              |