

# Engineering Development Model

Level 13 (LO Power +13 dBm)

## Frequency Mixer

HJK-ED9291/1

### 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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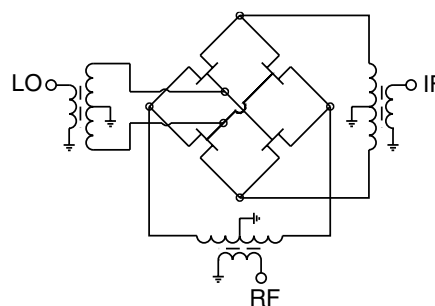
**CASE STYLE: TTT167**

| ELECTRICAL SPECIFICATIONS 50Ω @25°C |       |      |      |      |       |
|-------------------------------------|-------|------|------|------|-------|
| Parameter                           |       | Min. | Typ. | Max. | Units |
| Frequency                           | LO/RF | 1300 |      | 1900 | MHz   |
|                                     | IF    | 5    |      | 250  | MHz   |
| Conversion Loss                     |       |      | 7.5  |      | dB    |
| L-R Isolation                       |       |      | 25   |      | dB    |
| L-I Isolation                       |       |      | 30   |      | dB    |
| IP3                                 |       |      | +25  |      | dBm   |
| 1 dB Compression                    |       |      | +16  |      | dBm   |

| MAXIMUM RATINGS       |                |
|-----------------------|----------------|
| Operating Temperature | -20°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| RF Power              | +18 dBm        |

| PIN CONNECTIONS |            |
|-----------------|------------|
| LO              | 2          |
| RF              | 1          |
| IF              | 3          |
| GROUND          | all others |

### Electrical Schematic



# Frequency Mixer

HJK-ED9291/1

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=75MHz<br>(dB) |       |       |
|---------------------|-------------|-------------------------------------------------------|-------|-------|
|                     |             | @LO (dBm)                                             |       |       |
|                     |             | +10                                                   | +13   | +16   |
| 1100.1              | 1175.1      | 13.63                                                 | 10.54 | 8.59  |
| 1130.1              | 1205.1      | 13.11                                                 | 10.22 | 8.42  |
| 1160.1              | 1235.1      | 12.55                                                 | 9.74  | 8.19  |
| 1190.1              | 1265.1      | 11.76                                                 | 9.27  | 7.87  |
| 1220.1              | 1295.1      | 11.56                                                 | 9.10  | 7.82  |
| 1250.1              | 1325.1      | 11.06                                                 | 8.85  | 7.67  |
| 1280.1              | 1355.1      | 10.28                                                 | 8.35  | 7.39  |
| 1310.1              | 1385.1      | 10.06                                                 | 8.23  | 7.37  |
| 1340.1              | 1415.1      | 9.72                                                  | 8.12  | 7.33  |
| 1370.1              | 1445.1      | 9.04                                                  | 7.71  | 7.06  |
| 1400.1              | 1475.1      | 8.75                                                  | 7.63  | 6.97  |
| 1430.1              | 1505.1      | 8.60                                                  | 7.61  | 7.04  |
| 1460.1              | 1535.1      | 8.01                                                  | 7.25  | 6.81  |
| 1490.1              | 1565.1      | 7.89                                                  | 7.21  | 6.80  |
| 1520.1              | 1595.1      | 7.91                                                  | 7.31  | 6.96  |
| 1550.1              | 1625.1      | 7.61                                                  | 7.15  | 6.90  |
| 1580.1              | 1655.1      | 7.53                                                  | 7.15  | 6.95  |
| 1610.1              | 1685.1      | 7.72                                                  | 7.41  | 7.26  |
| 1640.1              | 1715.1      | 7.69                                                  | 7.46  | 7.36  |
| 1670.1              | 1745.1      | 7.58                                                  | 7.31  | 7.18  |
| 1700.1              | 1775.1      | 7.73                                                  | 7.42  | 7.25  |
| 1730.1              | 1805.1      | 7.76                                                  | 7.45  | 7.28  |
| 1760.1              | 1835.1      | 7.63                                                  | 7.27  | 7.09  |
| 1790.1              | 1865.1      | 7.84                                                  | 7.43  | 7.22  |
| 1820.1              | 1895.1      | 8.08                                                  | 7.64  | 7.43  |
| 1850.1              | 1925.1      | 8.03                                                  | 7.55  | 7.34  |
| 1870.1              | 1945.1      | 8.08                                                  | 7.55  | 7.30  |
| 1900.1              | 1975.1      | 8.41                                                  | 7.86  | 7.61  |
| 1920.1              | 1995.1      | 8.57                                                  | 8.01  | 7.77  |
| 1950.1              | 2025.1      | 8.46                                                  | 7.94  | 7.67  |
| 1970.1              | 2045.1      | 8.58                                                  | 8.04  | 7.76  |
| 2000.1              | 2075.1      | 8.96                                                  | 8.44  | 8.19  |
| 2020.1              | 2095.1      | 9.07                                                  | 8.60  | 8.37  |
| 2050.1              | 2125.1      | 9.10                                                  | 8.61  | 8.38  |
| 2070.1              | 2145.1      | 9.27                                                  | 8.75  | 8.54  |
| 2100.1              | 2175.1      | 9.75                                                  | 9.32  | 9.17  |
| 2120.1              | 2195.1      | 10.00                                                 | 9.65  | 9.56  |
| 2150.1              | 2225.1      | 10.17                                                 | 9.85  | 9.81  |
| 2170.1              | 2245.1      | 10.37                                                 | 10.07 | 10.06 |
| 2200.1              | 2275.1      | 11.08                                                 | 10.95 | 11.07 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +10                | +13   | +16   |
| 1100.1              | 1175.1      | 12.75              | 21.06 | 19.53 |
| 1130.1              | 1205.1      | 13.57              | 22.51 | 20.11 |
| 1160.1              | 1235.1      | 14.56              | 23.83 | 20.70 |
| 1190.1              | 1265.1      | 15.97              | 22.71 | 21.42 |
| 1220.1              | 1295.1      | 16.97              | 22.20 | 21.95 |
| 1250.1              | 1325.1      | 18.39              | 21.59 | 22.28 |
| 1280.1              | 1355.1      | 20.70              | 21.67 | 23.07 |
| 1310.1              | 1385.1      | 23.20              | 22.38 | 23.91 |
| 1340.1              | 1415.1      | 29.10              | 22.83 | 24.50 |
| 1370.1              | 1445.1      | 27.82              | 23.66 | 25.31 |
| 1400.1              | 1475.1      | 24.60              | 24.37 | 26.21 |
| 1430.1              | 1505.1      | 24.91              | 25.52 | 27.38 |
| 1460.1              | 1535.1      | 24.51              | 25.86 | 27.66 |
| 1490.1              | 1565.1      | 25.08              | 26.61 | 28.21 |
| 1520.1              | 1595.1      | 25.78              | 26.89 | 28.47 |
| 1550.1              | 1625.1      | 24.44              | 26.54 | 29.16 |
| 1580.1              | 1655.1      | 24.71              | 27.20 | 30.65 |
| 1610.1              | 1685.1      | 25.46              | 28.17 | 31.67 |
| 1640.1              | 1715.1      | 26.27              | 29.04 | 32.40 |
| 1670.1              | 1745.1      | 26.85              | 29.21 | 33.11 |
| 1700.1              | 1775.1      | 27.31              | 29.21 | 33.29 |
| 1730.1              | 1805.1      | 26.90              | 28.67 | 32.37 |
| 1760.1              | 1835.1      | 26.46              | 28.22 | 31.75 |
| 1790.1              | 1865.1      | 26.40              | 28.05 | 31.32 |
| 1820.1              | 1895.1      | 25.48              | 27.71 | 31.08 |
| 1850.1              | 1925.1      | 24.72              | 27.56 | 31.35 |
| 1870.1              | 1945.1      | 24.69              | 27.54 | 31.26 |
| 1900.1              | 1975.1      | 23.94              | 27.19 | 30.84 |
| 1920.1              | 1995.1      | 23.45              | 26.83 | 30.83 |
| 1950.1              | 2025.1      | 23.21              | 26.04 | 30.55 |
| 1970.1              | 2045.1      | 23.39              | 25.73 | 30.26 |
| 2000.1              | 2075.1      | 22.94              | 24.67 | 28.85 |
| 2020.1              | 2095.1      | 22.01              | 23.81 | 28.08 |
| 2050.1              | 2125.1      | 21.16              | 22.89 | 26.76 |
| 2070.1              | 2145.1      | 20.91              | 22.66 | 25.84 |
| 2100.1              | 2175.1      | 20.20              | 21.67 | 24.31 |
| 2120.1              | 2195.1      | 20.29              | 21.54 | 23.99 |
| 2150.1              | 2225.1      | 20.49              | 21.80 | 24.00 |
| 2170.1              | 2245.1      | 20.72              | 21.69 | 23.90 |
| 2200.1              | 2275.1      | 22.00              | 22.25 | 24.53 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+16dBm<br>(dB) |      |      |
|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                            |      |      |
|                     |             | +10                                  | +13  | +16  |
| 1100.1              | 1175.1      | -0.72                                | 0.34 | 0.89 |
| 1130.1              | 1205.1      | -0.27                                | 0.66 | 1.02 |
| 1160.1              | 1235.1      | 0.29                                 | 0.97 | 1.09 |
| 1190.1              | 1265.1      | 0.82                                 | 1.27 | 1.19 |
| 1220.1              | 1295.1      | 0.90                                 | 1.28 | 1.13 |
| 1250.1              | 1325.1      | 1.03                                 | 1.25 | 1.04 |
| 1280.1              | 1355.1      | 1.30                                 | 1.32 | 1.02 |
| 1310.1              | 1385.1      | 1.16                                 | 1.13 | 0.89 |
| 1340.1              | 1415.1      | 1.14                                 | 1.04 | 0.80 |
| 1370.1              | 1445.1      | 1.19                                 | 0.95 | 0.71 |
| 1400.1              | 1475.1      | 0.98                                 | 0.77 | 0.57 |
| 1430.1              | 1505.1      | 0.84                                 | 0.70 | 0.49 |
| 1460.1              | 1535.1      | 0.95                                 | 0.74 | 0.46 |
| 1490.1              | 1565.1      | 0.84                                 | 0.65 | 0.39 |
| 1520.1              | 1595.1      | 0.76                                 | 0.58 | 0.34 |
| 1550.1              | 1625.1      | 0.81                                 | 0.56 | 0.31 |
| 1580.1              | 1655.1      | 0.74                                 | 0.49 | 0.27 |
| 1610.1              | 1685.1      | 0.68                                 | 0.42 | 0.23 |
| 1640.1              | 1715.1      | 0.72                                 | 0.42 | 0.22 |
| 1670.1              | 1745.1      | 0.65                                 | 0.38 | 0.19 |
| 1700.1              | 1775.1      | 0.57                                 | 0.34 | 0.17 |
| 1730.1              | 1805.1      | 0.60                                 | 0.38 | 0.19 |
| 1760.1              | 1835.1      | 0.66                                 | 0.41 | 0.22 |
| 1790.1              | 1865.1      | 0.70                                 | 0.45 | 0.25 |
| 1820.1              | 1895.1      | 0.88                                 | 0.56 | 0.31 |
| 1850.1              | 1925.1      | 1.08                                 | 0.63 | 0.34 |
| 1870.1              | 1945.1      | 1.12                                 | 0.66 | 0.34 |
| 1900.1              | 1975.1      | 1.29                                 | 0.77 | 0.42 |
| 1920.1              | 1995.1      | 1.36                                 | 0.80 | 0.43 |
| 1950.1              | 2025.1      | 1.46                                 | 0.88 | 0.45 |
| 1970.1              | 2045.1      | 1.51                                 | 0.88 | 0.44 |
| 2000.1              | 2075.1      | 1.61                                 | 0.96 | 0.50 |
| 2020.1              | 2095.1      | 1.71                                 | 1.02 | 0.51 |
| 2050.1              | 2125.1      | 1.81                                 | 1.07 | 0.55 |
| 2070.1              | 2145.1      | 1.86                                 | 1.04 | 0.58 |
| 2100.1              | 2175.1      | 1.99                                 | 1.14 | 0.66 |
| 2120.1              | 2195.1      | 2.08                                 | 1.17 | 0.70 |
| 2150.1              | 2225.1      | 2.12                                 | 1.18 | 0.70 |
| 2170.1              | 2245.1      | 2.19                                 | 1.23 | 0.71 |
| 2200.1              | 2275.1      | 2.23                                 | 1.18 | 0.67 |

REV. X3

HJK-ED9291/1

101012

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

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# Frequency Mixer

HJK-ED9291/1

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1600MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1289.9MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1910.1MHz<br>(dB) |
|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |
|                      |             | +13                                                            |                      |             | +13                                                              |                      |             | +13                                                              |
| 500.0                | 1100.0      | 11.61                                                          | 10.1                 | 1300.0      | 9.44                                                             | 810.1                | 1100.0      | 11.84                                                            |
| 481.9                | 1118.1      | 11.29                                                          | 30.1                 | 1320.0      | 8.97                                                             | 790.1                | 1120.0      | 11.68                                                            |
| 463.7                | 1136.3      | 11.08                                                          | 50.1                 | 1340.0      | 8.66                                                             | 770.1                | 1140.0      | 11.46                                                            |
| 445.6                | 1154.4      | 10.80                                                          | 70.1                 | 1360.0      | 8.40                                                             | 750.1                | 1160.0      | 11.25                                                            |
| 427.4                | 1172.6      | 10.58                                                          | 90.1                 | 1380.0      | 8.25                                                             | 730.1                | 1180.0      | 10.96                                                            |
| 409.3                | 1190.7      | 10.31                                                          | 110.1                | 1400.0      | 8.03                                                             | 710.1                | 1200.0      | 10.76                                                            |
| 391.1                | 1208.9      | 10.02                                                          | 130.1                | 1420.0      | 7.98                                                             | 690.1                | 1220.0      | 10.53                                                            |
| 373.0                | 1227.0      | 9.85                                                           | 150.1                | 1440.0      | 7.78                                                             | 670.1                | 1240.0      | 10.26                                                            |
| 336.7                | 1263.3      | 9.33                                                           | 170.1                | 1460.0      | 7.59                                                             | 650.1                | 1260.0      | 10.05                                                            |
| 318.5                | 1281.5      | 9.11                                                           | 190.1                | 1480.0      | 7.57                                                             | 630.1                | 1280.0      | 9.79                                                             |
| 282.2                | 1317.8      | 8.80                                                           | 210.1                | 1500.0      | 7.39                                                             | 610.1                | 1300.0      | 9.62                                                             |
| 264.1                | 1335.9      | 8.62                                                           | 230.1                | 1520.0      | 7.33                                                             | 590.1                | 1320.0      | 9.31                                                             |
| 227.8                | 1372.2      | 8.23                                                           | 250.1                | 1540.0      | 7.22                                                             | 570.1                | 1340.0      | 9.16                                                             |
| 209.6                | 1390.4      | 8.09                                                           | 270.1                | 1560.0      | 7.27                                                             | 550.1                | 1360.0      | 8.80                                                             |
| 173.3                | 1426.7      | 7.94                                                           | 290.1                | 1580.0      | 7.22                                                             | 530.1                | 1380.0      | 8.72                                                             |
| 155.2                | 1444.8      | 7.85                                                           | 310.1                | 1600.0      | 7.15                                                             | 510.1                | 1400.0      | 8.56                                                             |
| 118.9                | 1481.1      | 7.62                                                           | 330.1                | 1620.0      | 7.12                                                             | 490.1                | 1420.0      | 8.35                                                             |
| 100.7                | 1499.3      | 7.67                                                           | 360.1                | 1650.0      | 7.22                                                             | 470.1                | 1440.0      | 8.19                                                             |
| 64.4                 | 1535.6      | 7.50                                                           | 380.1                | 1670.0      | 7.24                                                             | 450.1                | 1460.0      | 8.12                                                             |
| 46.3                 | 1553.7      | 7.53                                                           | 410.1                | 1700.0      | 7.31                                                             | 430.1                | 1480.0      | 8.15                                                             |
| 10.0                 | 1590.0      | 8.01                                                           | 430.1                | 1720.0      | 7.41                                                             | 410.1                | 1500.0      | 8.06                                                             |
| 10.0                 | 1610.0      | 8.00                                                           | 460.1                | 1750.0      | 7.44                                                             | 390.1                | 1520.0      | 8.04                                                             |
| 53.7                 | 1653.7      | 7.26                                                           | 480.1                | 1770.0      | 7.52                                                             | 370.1                | 1540.0      | 7.97                                                             |
| 75.6                 | 1675.6      | 7.39                                                           | 510.1                | 1800.0      | 7.79                                                             | 350.1                | 1560.0      | 8.00                                                             |
| 119.3                | 1719.3      | 7.24                                                           | 530.1                | 1820.0      | 7.87                                                             | 330.1                | 1580.0      | 7.91                                                             |
| 141.1                | 1741.1      | 7.33                                                           | 560.1                | 1850.0      | 8.01                                                             | 310.1                | 1600.0      | 7.93                                                             |
| 184.8                | 1784.8      | 7.37                                                           | 580.1                | 1870.0      | 8.09                                                             | 290.1                | 1620.0      | 7.95                                                             |
| 206.7                | 1806.7      | 7.43                                                           | 610.1                | 1900.0      | 8.25                                                             | 270.1                | 1640.0      | 7.95                                                             |
| 250.4                | 1850.4      | 7.61                                                           | 630.1                | 1920.0      | 8.23                                                             | 250.1                | 1660.0      | 7.84                                                             |
| 272.2                | 1872.2      | 7.89                                                           | 660.1                | 1950.0      | 8.36                                                             | 230.1                | 1680.0      | 7.85                                                             |
| 315.9                | 1915.9      | 8.18                                                           | 680.1                | 1970.0      | 8.39                                                             | 210.1                | 1700.0      | 7.82                                                             |
| 337.8                | 1937.8      | 8.31                                                           | 710.1                | 2000.0      | 8.56                                                             | 190.1                | 1720.0      | 7.86                                                             |
| 381.5                | 1981.5      | 8.61                                                           | 730.1                | 2020.0      | 8.65                                                             | 170.1                | 1740.0      | 7.72                                                             |
| 403.3                | 2003.3      | 8.84                                                           | 760.1                | 2050.0      | 8.83                                                             | 150.1                | 1760.0      | 7.75                                                             |
| 447.0                | 2047.0      | 9.03                                                           | 780.1                | 2070.0      | 9.00                                                             | 130.1                | 1780.0      | 7.72                                                             |
| 468.9                | 2068.9      | 9.28                                                           | 810.1                | 2100.0      | 9.24                                                             | 110.1                | 1800.0      | 7.59                                                             |
| 512.6                | 2112.6      | 9.73                                                           | 830.1                | 2120.0      | 9.40                                                             | 90.1                 | 1820.0      | 7.72                                                             |
| 534.4                | 2134.4      | 9.91                                                           | 860.1                | 2150.0      | 9.58                                                             | 60.1                 | 1850.0      | 7.60                                                             |
| 578.1                | 2178.1      | 10.43                                                          | 880.1                | 2170.0      | 9.78                                                             | 40.1                 | 1870.0      | 7.75                                                             |
| 600.0                | 2200.0      | 10.56                                                          | 910.1                | 2200.0      | 10.25                                                            | 10.1                 | 1900.0      | 8.23                                                             |

## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +10                     | +13   | +16   | +10                     | +13   | +16   |
| 1175.1      | 42.98                   | 44.29 | 44.88 | 36.47                   | 37.61 | 38.63 |
| 1205.1      | 43.39                   | 43.68 | 43.48 | 36.31                   | 37.29 | 38.21 |
| 1235.1      | 42.06                   | 41.95 | 41.62 | 36.26                   | 37.18 | 38.09 |
| 1265.1      | 40.98                   | 40.56 | 40.20 | 36.23                   | 37.06 | 38.01 |
| 1295.1      | 40.31                   | 39.89 | 39.62 | 36.06                   | 36.88 | 37.94 |
| 1325.1      | 39.40                   | 38.99 | 38.53 | 35.93                   | 36.74 | 37.77 |
| 1355.1      | 38.39                   | 37.66 | 37.01 | 35.83                   | 36.63 | 37.65 |
| 1385.1      | 37.24                   | 36.20 | 35.27 | 35.44                   | 36.20 | 37.12 |
| 1415.1      | 36.27                   | 34.88 | 33.83 | 34.98                   | 35.45 | 36.19 |
| 1445.1      | 35.00                   | 33.64 | 32.62 | 34.32                   | 34.59 | 35.05 |
| 1475.1      | 33.66                   | 32.07 | 31.06 | 33.33                   | 33.26 | 33.47 |
| 1505.1      | 32.08                   | 30.43 | 29.25 | 31.89                   | 31.44 | 31.47 |
| 1535.1      | 29.73                   | 28.29 | 26.86 | 29.93                   | 29.49 | 29.06 |
| 1565.1      | 28.36                   | 26.98 | 25.62 | 28.34                   | 27.76 | 27.20 |
| 1595.1      | 27.17                   | 25.92 | 24.67 | 26.81                   | 26.13 | 25.49 |
| 1625.1      | 25.98                   | 25.07 | 23.99 | 25.41                   | 24.87 | 24.27 |
| 1655.1      | 25.22                   | 24.44 | 23.48 | 25.02                   | 24.61 | 24.08 |
| 1685.1      | 24.11                   | 23.50 | 22.63 | 25.16                   | 25.01 | 24.64 |
| 1715.1      | 24.01                   | 23.59 | 22.98 | 26.04                   | 26.16 | 25.94 |
| 1745.1      | 24.39                   | 24.35 | 24.07 | 27.65                   | 28.16 | 28.07 |
| 1775.1      | 24.97                   | 25.27 | 25.33 | 29.84                   | 30.92 | 31.18 |
| 1805.1      | 25.53                   | 26.19 | 26.55 | 32.41                   | 34.60 | 35.47 |
| 1835.1      | 26.41                   | 27.39 | 28.03 | 35.33                   | 39.61 | 41.49 |
| 1865.1      | 27.40                   | 28.69 | 29.63 | 38.72                   | 47.80 | 47.22 |
| 1895.1      | 28.15                   | 29.60 | 30.85 | 42.22                   | 55.57 | 42.78 |
| 1925.1      | 29.38                   | 31.26 | 32.86 | 47.78                   | 43.22 | 38.24 |
| 1945.1      | 29.62                   | 31.61 | 33.31 | 47.68                   | 39.56 | 36.17 |
| 1975.1      | 30.05                   | 32.33 | 34.19 | 42.79                   | 36.40 | 33.72 |
| 1995.1      | 30.49                   | 33.04 | 35.17 | 39.66                   | 34.67 | 32.46 |
| 2025.1      | 31.23                   | 34.10 | 36.44 | 35.45                   | 32.52 | 30.52 |
| 2045.1      | 31.29                   | 34.30 | 36.68 | 33.95                   | 31.57 | 29.79 |
| 2075.1      | 31.43                   | 34.72 | 37.28 | 31.51                   | 29.83 | 28.41 |
| 2095.1      | 31.53                   | 34.93 | 37.54 | 30.07                   | 28.72 | 27.55 |
| 2125.1      | 31.92                   | 35.26 | 37.66 | 28.04                   | 27.09 | 26.24 |
| 2145.1      | 31.64                   | 34.78 | 36.92 | 27.10                   | 26.19 | 25.51 |
| 2175.1      | 31.19                   | 33.85 | 35.62 | 25.77                   | 24.71 | 24.32 |
| 2195.1      | 30.85                   | 33.12 | 34.51 | 24.96                   | 23.95 | 23.57 |
| 2225.1      | 30.53                   | 32.30 | 33.38 | 23.79                   | 22.92 | 22.70 |
| 2245.1      | 29.91                   | 31.49 | 32.40 | 23.23                   | 22.40 | 22.13 |
| 2275.1      | 29.30                   | 30.79 | 31.72 | 22.57                   | 21.88 | 21.69 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +10                     | +13   | +16   |
| 1100.1              | 1175.1      | 32.53                   | 31.38 | 29.38 |
| 1130.1              | 1205.1      | 33.58                   | 32.51 | 29.69 |
| 1160.1              | 1235.1      | 34.48                   | 32.89 | 29.95 |
| 1190.1              | 1265.1      | 35.65                   | 33.52 | 30.73 |
| 1220.1              | 1295.1      | 36.42                   | 33.55 | 30.84 |
| 1250.1              | 1325.1      | 36.10                   | 33.31 | 31.02 |
| 1280.1              | 1355.1      | 34.93                   | 32.87 | 31.35 |
| 1310.1              | 1385.1      | 33.52                   | 32.00 | 31.06 |
| 1340.1              | 1415.1      | 32.09                   | 31.31 | 30.88 |
| 1370.1              | 1445.1      | 30.75                   | 30.64 | 30.75 |
| 1400.1              | 1475.1      | 29.57                   | 29.93 | 30.48 |
| 1430.1              | 1505.1      | 28.55                   | 29.28 | 30.30 |
| 1460.1              | 1535.1      | 27.60                   | 28.65 | 30.03 |
| 1490.1              | 1565.1      | 26.89                   | 28.29 | 30.08 |
| 1520.1              | 1595.1      | 26.51                   | 28.32 | 30.71 |
| 1550.1              | 1625.1      | 26.83                   | 29.30 | 32.49 |
| 1580.1              | 1655.1      | 27.86                   | 30.92 | 33.93 |
| 1610.1              | 1685.1      | 28.66                   | 31.03 | 32.30 |
| 1640.1              | 1715.1      | 28.52                   | 30.39 | 31.97 |
| 1670.1              | 1745.1      | 29.23                   | 32.41 | 36.09 |
| 1700.1              | 1775.1      | 31.55                   | 37.17 | 41.97 |
| 1730.1              | 1805.1      | 35.05                   | 45.47 | 37.34 |
| 1760.1              | 1835.1      | 40.56                   | 41.30 | 33.97 |
| 1790.1              | 1865.1      | 39.75                   | 37.01 | 32.56 |
| 1820.1              | 1895.1      | 34.38                   | 34.72 | 32.31 |
| 1850.1              | 1925.1      | 30.94                   | 32.40 | 31.94 |
| 1870.1              | 1945.1      | 29.36                   | 31.07 | 31.45 |
| 1900.1              | 1975.1      | 27.27                   | 29.06 | 30.29 |
| 1920.1              | 1995.1      | 25.96                   | 27.52 | 28.89 |
| 1950.1              | 2025.1      | 24.93                   | 25.96 | 27.30 |
| 1970.1              | 2045.1      | 24.45                   | 25.15 | 26.20 |
| 2000.1              | 2075.1      | 24.15                   | 24.29 | 24.93 |
| 2020.1              | 2095.1      | 24.07                   | 23.94 | 24.24 |
| 2050.1              | 2125.1      | 24.70                   | 24.13 | 23.96 |
| 2070.1              | 2145.1      | 25.30                   | 24.34 | 23.95 |
| 2100.1              | 2175.1      | 27.12                   | 25.33 | 24.49 |
| 2120.1              | 2195.1      | 28.73                   | 26.18 | 24.96 |
| 2150.1              | 2225.1      | 31.42                   | 27.71 | 25.78 |
| 2170.1              | 2245.1      | 33.11                   | 28.91 | 26.48 |
| 2200.1              | 2275.1      | 31.55                   | 29.69 | 27.17 |

# Frequency Mixer

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## 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)                      |      |      |
|                     |             | +10             | +13  | +16  |             | +10             | +13   | +16   |                      | +10                            | +13  | +16  |
| 1100.1              | 1175.1      | 5.83            | 4.15 | 3.09 | 1175.1      | 31.03           | 29.96 | 29.46 | 10.0                 | 1.65                           | 1.44 | 1.29 |
| 1130.1              | 1205.1      | 5.52            | 3.95 | 2.99 | 1205.1      | 28.49           | 27.59 | 26.74 | 50.4                 | 1.74                           | 1.51 | 1.36 |
| 1160.1              | 1235.1      | 5.39            | 3.88 | 2.95 | 1235.1      | 28.03           | 27.59 | 26.74 | 90.9                 | 1.78                           | 1.57 | 1.42 |
| 1190.1              | 1265.1      | 5.12            | 3.71 | 2.87 | 1265.1      | 24.48           | 23.81 | 23.49 | 131.3                | 1.92                           | 1.70 | 1.55 |
| 1220.1              | 1295.1      | 4.87            | 3.52 | 2.74 | 1295.1      | 21.20           | 20.45 | 19.76 | 171.7                | 2.00                           | 1.79 | 1.66 |
| 1250.1              | 1325.1      | 4.63            | 3.40 | 2.67 | 1325.1      | 20.22           | 19.54 | 18.90 | 212.2                | 2.09                           | 1.88 | 1.76 |
| 1280.1              | 1355.1      | 4.34            | 3.22 | 2.56 | 1355.1      | 17.75           | 17.22 | 16.56 | 252.6                | 2.21                           | 2.03 | 1.92 |
| 1310.1              | 1385.1      | 4.02            | 3.00 | 2.41 | 1385.1      | 14.87           | 14.26 | 13.60 | 293.0                | 2.30                           | 2.13 | 2.03 |
| 1340.1              | 1415.1      | 3.79            | 2.86 | 2.33 | 1415.1      | 13.29           | 12.61 | 12.18 | 333.4                | 2.44                           | 2.27 | 2.18 |
| 1370.1              | 1445.1      | 3.51            | 2.71 | 2.25 | 1445.1      | 11.38           | 10.82 | 10.37 | 373.9                | 2.50                           | 2.34 | 2.26 |
| 1400.1              | 1475.1      | 3.18            | 2.54 | 2.13 | 1475.1      | 9.23            | 8.72  | 8.27  | 414.3                | 2.61                           | 2.44 | 2.36 |
| 1430.1              | 1505.1      | 2.95            | 2.40 | 2.06 | 1505.1      | 7.73            | 7.28  | 6.91  | 474.9                | 2.71                           | 2.56 | 2.50 |
| 1460.1              | 1535.1      | 2.75            | 2.29 | 2.01 | 1535.1      | 6.32            | 5.93  | 5.61  | 515.4                | 2.72                           | 2.60 | 2.55 |
| 1490.1              | 1565.1      | 2.60            | 2.23 | 2.00 | 1565.1      | 4.93            | 4.60  | 4.34  | 576.0                | 2.75                           | 2.60 | 2.54 |
| 1520.1              | 1595.1      | 2.42            | 2.13 | 1.96 | 1595.1      | 3.91            | 3.65  | 3.44  | 616.5                | 2.69                           | 2.56 | 2.51 |
| 1550.1              | 1625.1      | 2.32            | 2.09 | 1.96 | 1625.1      | 3.10            | 2.91  | 2.76  | 677.1                | 2.59                           | 2.42 | 2.35 |
| 1580.1              | 1655.1      | 2.28            | 2.11 | 2.02 | 1655.1      | 2.41            | 2.28  | 2.18  | 717.5                | 2.53                           | 2.36 | 2.28 |
| 1610.1              | 1685.1      | 2.20            | 2.08 | 2.03 | 1685.1      | 1.90            | 1.81  | 1.74  | 778.2                | 2.43                           | 2.25 | 2.18 |
| 1640.1              | 1715.1      | 2.16            | 2.07 | 2.03 | 1715.1      | 1.51            | 1.46  | 1.41  | 818.6                | 2.32                           | 2.12 | 2.04 |
| 1670.1              | 1745.1      | 2.18            | 2.11 | 2.07 | 1745.1      | 1.26            | 1.24  | 1.24  | 879.2                | 2.33                           | 2.12 | 2.02 |
| 1700.1              | 1775.1      | 2.15            | 2.09 | 2.07 | 1775.1      | 1.31            | 1.37  | 1.42  | 919.7                | 2.25                           | 2.02 | 1.90 |
| 1730.1              | 1805.1      | 2.11            | 2.06 | 2.06 | 1805.1      | 1.58            | 1.68  | 1.76  | 980.3                | 2.12                           | 1.89 | 1.77 |
| 1760.1              | 1835.1      | 2.11            | 2.08 | 2.09 | 1835.1      | 1.94            | 2.07  | 2.18  | 1020.8               | 2.05                           | 1.80 | 1.67 |
| 1790.1              | 1865.1      | 2.09            | 2.08 | 2.12 | 1865.1      | 2.35            | 2.51  | 2.65  | 1081.4               | 1.88                           | 1.62 | 1.48 |
| 1820.1              | 1895.1      | 2.02            | 2.03 | 2.08 | 1895.1      | 2.76            | 2.94  | 3.09  | 1121.8               | 1.90                           | 1.63 | 1.46 |
| 1850.1              | 1925.1      | 1.99            | 2.02 | 2.09 | 1925.1      | 3.17            | 3.38  | 3.56  | 1182.5               | 1.80                           | 1.53 | 1.36 |
| 1870.1              | 1945.1      | 1.97            | 2.03 | 2.12 | 1945.1      | 3.42            | 3.63  | 3.81  | 1222.9               | 1.78                           | 1.51 | 1.33 |
| 1900.1              | 1975.1      | 1.91            | 2.00 | 2.11 | 1975.1      | 3.70            | 3.91  | 4.07  | 1283.5               | 1.79                           | 1.53 | 1.36 |
| 1920.1              | 1995.1      | 1.84            | 1.95 | 2.08 | 1995.1      | 3.87            | 4.09  | 4.25  | 1324.0               | 1.77                           | 1.54 | 1.38 |
| 1950.1              | 2025.1      | 1.80            | 1.93 | 2.09 | 2025.1      | 4.08            | 4.29  | 4.44  | 1384.6               | 1.77                           | 1.58 | 1.47 |
| 1970.1              | 2045.1      | 1.79            | 1.94 | 2.13 | 2045.1      | 4.09            | 4.28  | 4.41  | 1425.1               | 1.75                           | 1.57 | 1.47 |
| 2000.1              | 2075.1      | 1.71            | 1.90 | 2.11 | 2075.1      | 4.02            | 4.15  | 4.24  | 1485.7               | 1.67                           | 1.51 | 1.41 |
| 2020.1              | 2095.1      | 1.69            | 1.89 | 2.13 | 2095.1      | 4.01            | 4.11  | 4.19  | 1526.1               | 1.58                           | 1.42 | 1.32 |
| 2050.1              | 2125.1      | 1.70            | 1.94 | 2.20 | 2125.1      | 3.85            | 3.90  | 3.94  | 1586.8               | 1.48                           | 1.33 | 1.24 |
| 2070.1              | 2145.1      | 1.74            | 2.04 | 2.30 | 2145.1      | 3.66            | 3.67  | 3.67  | 1627.2               | 1.41                           | 1.25 | 1.15 |
| 2100.1              | 2175.1      | 1.78            | 2.12 | 2.42 | 2175.1      | 3.40            | 3.36  | 3.33  | 1687.8               | 1.36                           | 1.20 | 1.10 |
| 2120.1              | 2195.1      | 1.82            | 2.18 | 2.51 | 2195.1      | 3.27            | 3.21  | 3.16  | 1728.3               | 1.31                           | 1.15 | 1.05 |
| 2150.1              | 2225.1      | 1.97            | 2.39 | 2.76 | 2225.1      | 3.04            | 2.95  | 2.89  | 1788.9               | 1.28                           | 1.12 | 1.01 |
| 2170.1              | 2245.1      | 2.07            | 2.54 | 2.93 | 2245.1      | 2.87            | 2.77  | 2.71  | 1829.4               | 1.26                           | 1.09 | 1.03 |
| 2200.1              | 2275.1      | 2.22            | 2.72 | 3.14 | 2275.1      | 2.71            | 2.62  | 2.56  | 1890.0               | 1.23                           | 1.06 | 1.07 |

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## Harmonics Tables

| RF HARMONICS ORDER | (-dBm) |     | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------------------|--------|-----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 0      | -   | -      | 4   | 24  | 27  | 23  | 35  | 36  | 39  | 40  | 45  | 60  |
|                    | 1      | -   | 23     | +0  | 22  | 21  | 35  | 34  | 47  | 44  | 47  | 54  | 57  |
|                    | 2      | 56  | 47     | 41  | 47  | 42  | 56  | 69  | 59  | 58  | 66  | 53  | 67  |
|                    | 3      | >90 | 70     | 58  | 62  | 58  | 54  | 63  | 60  | 74  | 69  | 70  | 68  |
|                    | 4      | >90 | >83    | >83 | 77  | 77  | 76  | 80  | 82  | >83 | >83 | 81  | >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: 1600 MHz; 0.00 dBm.  
LO IN: 1675 MHz; +13.00 dBm  
IF OUT: 75 MHz; -7.22 dBm

| RF HARMONICS ORDER | (-dBm) | (-dBc) |     |     |     |     |     |     |     |    |    |    |    |
|--------------------|--------|--------|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
|                    | 0      | -      | -   | 14  | 41  | 44  | 34  | 50  | 47  | 63 | 52 | 84 | 80 |
|                    | 1      | -      | 23  | +0  | 24  | 22  | 40  | 35  | 55  | 50 | 58 | 54 | 54 |
|                    | 2      | 37     | 37  | 32  | 37  | 34  | 48  | 62  | 55  | 55 | 70 | 54 | 63 |
|                    | 3      | 73     | 52  | 38  | 43  | 39  | 38  | 44  | 47  | 56 | 56 | 60 | 60 |
|                    | 4      | >90    | 65  | 65  | 56  | 50  | 56  | 50  | 61  | 70 | 69 | 62 | 77 |
|                    | 5      | >90    | 81  | 68  | 71  | 64  | 54  | 68  | 51  | 63 | 59 | 72 | 68 |
|                    | 6      | >90    | 84  | 73  | 74  | 75  | 65  | 73  | 61  | 70 | 66 | 79 | 87 |
|                    | 7      | >90    | >93 | 84  | 91  | 89  | 80  | 75  | 68  | 67 | 67 | 74 | 77 |
|                    | 8      | >90    | 90  | >93 | 90  | 92  | 83  | 82  | 77  | 73 | 69 | 74 | 74 |
|                    | 9      | >90    | >93 | >93 | >93 | >93 | 89  | >93 | 90  | 78 | 85 | 71 | 87 |
|                    | 10     | >90    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 85 | 92 | 77 | 87 |
| RF CAL             |        | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8  | 9  | 10 |    |

### LO HARMONICS ORDER

Test conditions: RF IN: 1600 MHz; 10.00 dBm.  
LO IN: 1675 MHz; +13.00 dBm  
IF OUT: 75 MHz; 2.63 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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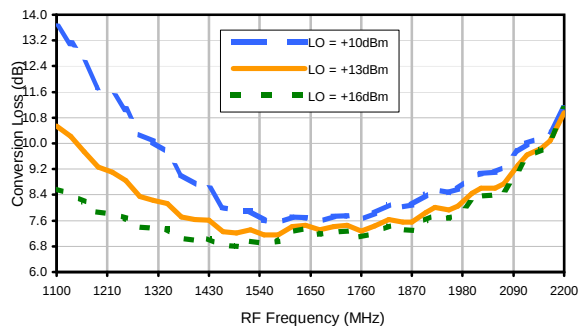


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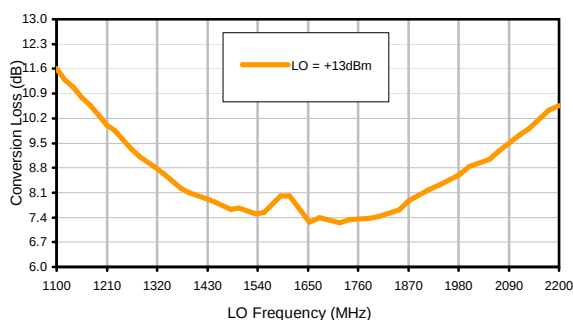


## Typical Performance Curves

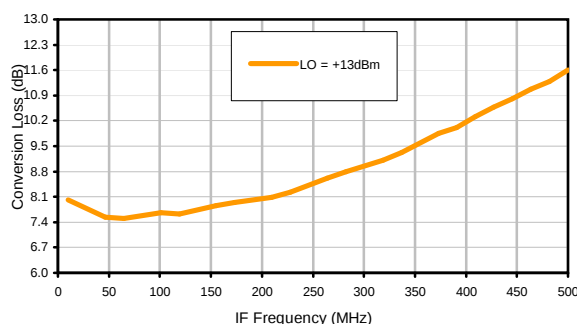
Conversion Loss @ IF=75MHz



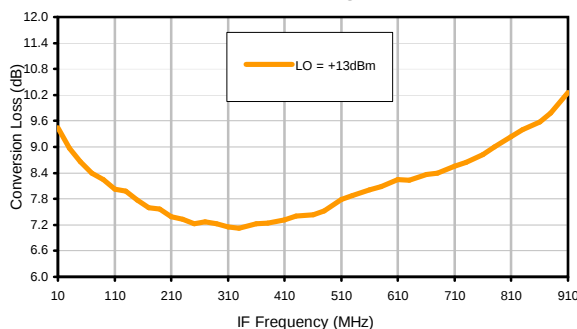
Conversion Loss vs. LO @ RF=1600MHz



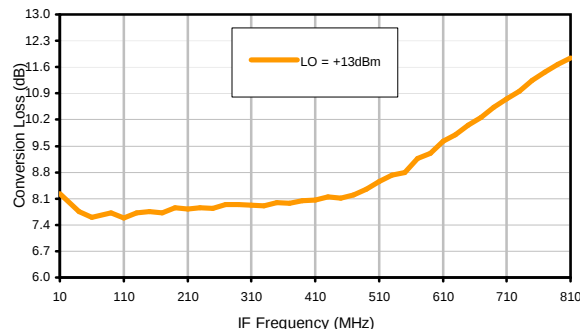
Conversion Loss vs. IF @ RF=1600MHz



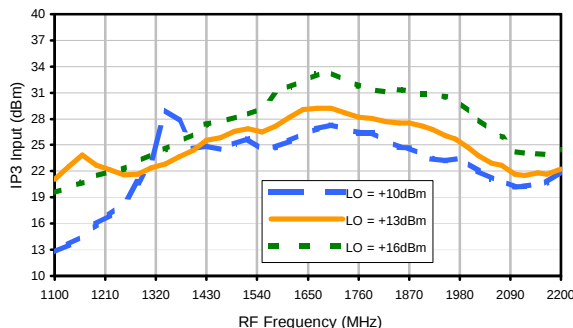
Conversion Loss vs. IF @ RF=1289.9MHz



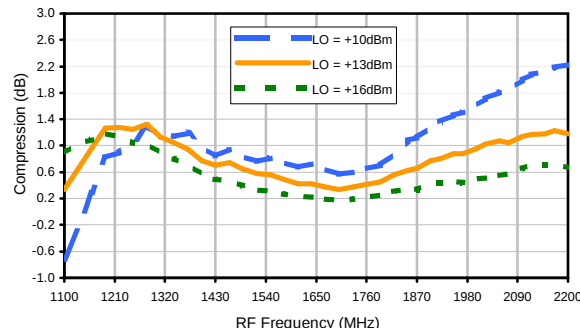
Conversion Loss vs. IF @ RF=1910.1MHz



IP3 Input



Compression @ RF IN=+16dBm



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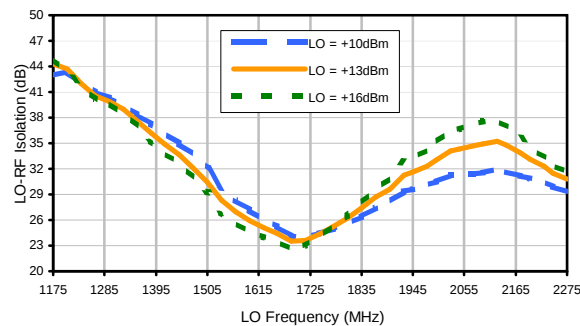


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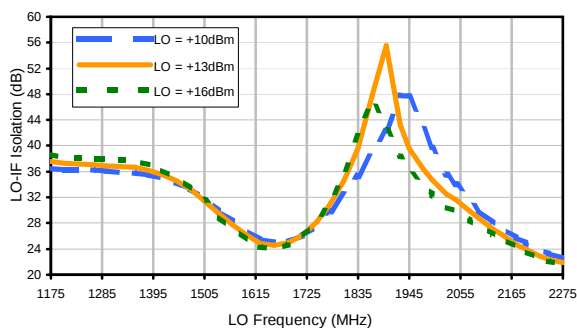


## Typical Performance Curves

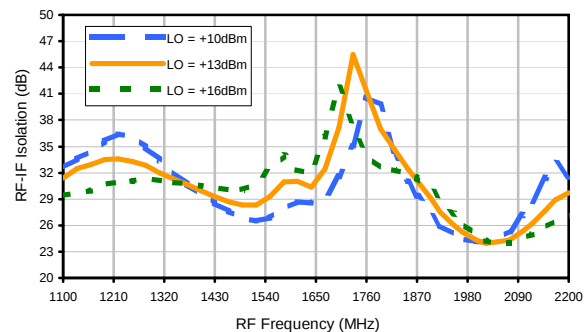
LO-RF Isolation



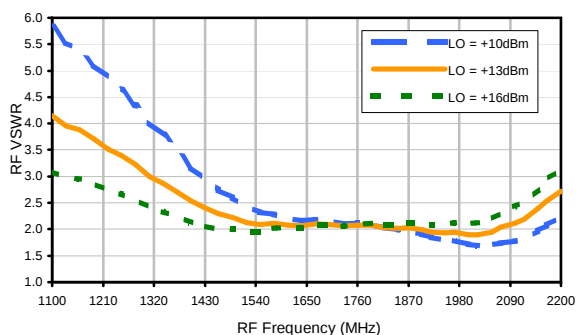
LO-IF Isolation



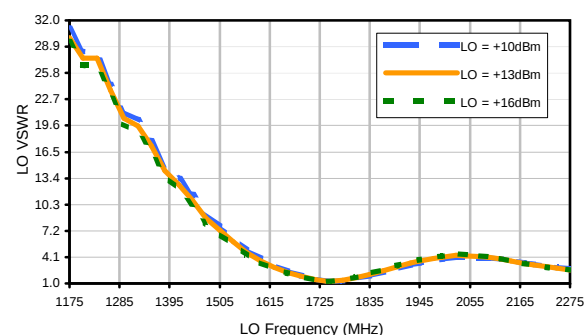
RF-IF Isolation



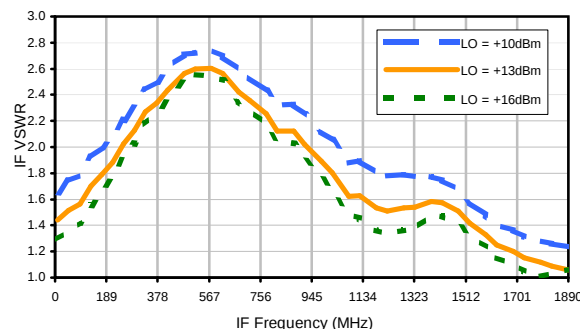
RF VSWR



LO VSWR



IF VSWR



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## Harmonics Tables

| RF HARMONICS ORDER                                                                   | (-dBm) |     |     |     |     |     |     |     |     |     |     |     |
|--------------------------------------------------------------------------------------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                                                                                      | (-dBc) |     |     |     |     |     |     |     |     |     |     |     |
| 0                                                                                    | -      | -   | 4   | 24  | 27  | 23  | 35  | 36  | 39  | 40  | 45  | 60  |
| 1                                                                                    | -      | 23  | +0  | 22  | 21  | 35  | 34  | 47  | 44  | 47  | 54  | 57  |
| 2                                                                                    | 56     | 47  | 41  | 47  | 42  | 56  | 69  | 59  | 58  | 66  | 53  | 67  |
| 3                                                                                    | >90    | 70  | 58  | 62  | 58  | 54  | 63  | 60  | 74  | 69  | 70  | 68  |
| 4                                                                                    | >90    | >83 | >83 | 77  | 77  | 76  | 80  | 82  | >83 | >83 | 81  | >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: 1600 MHz; 0.00 dBm.  
LO IN: 1675 MHz; +13.00 dBm  
IF OUT: 75 MHz; -7.22 dBm

| RF HARMONICS ORDER                                                                   | (-dBm) |     |     |     |     |     |     |     |    |    |    |    |
|--------------------------------------------------------------------------------------|--------|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
|                                                                                      | (-dBc) |     |     |     |     |     |     |     |    |    |    |    |
| 0                                                                                    | -      | -   | 14  | 41  | 44  | 34  | 50  | 47  | 63 | 52 | 84 | 80 |
| 1                                                                                    | -      | 23  | +0  | 24  | 22  | 40  | 35  | 55  | 50 | 58 | 54 | 54 |
| 2                                                                                    | 37     | 37  | 32  | 37  | 34  | 48  | 62  | 55  | 55 | 70 | 54 | 63 |
| 3                                                                                    | 73     | 52  | 38  | 43  | 39  | 38  | 44  | 47  | 56 | 56 | 60 | 60 |
| 4                                                                                    | >90    | 65  | 65  | 56  | 50  | 56  | 50  | 61  | 70 | 69 | 62 | 77 |
| 5                                                                                    | >90    | 81  | 68  | 71  | 64  | 54  | 68  | 51  | 63 | 59 | 72 | 68 |
| 6                                                                                    | >90    | 84  | 73  | 74  | 75  | 65  | 73  | 61  | 70 | 66 | 79 | 87 |
| 7                                                                                    | >90    | >93 | 84  | 91  | 89  | 80  | 75  | 68  | 67 | 67 | 74 | 77 |
| 8                                                                                    | >90    | 90  | >93 | 90  | 92  | 83  | 82  | 77  | 73 | 69 | 74 | 74 |
| 9                                                                                    | >90    | >93 | >93 | >93 | >93 | 89  | >93 | 90  | 78 | 85 | 71 | 87 |
| 10                                                                                   | >90    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 85 | 92 | 77 | 87 |
| RF CAL      0      1      2      3      4      5      6      7      8      9      10 |        |     |     |     |     |     |     |     |    |    |    |    |

### LO HARMONICS ORDER

Test conditions: RF IN: 1600 MHz; 10.00 dBm.  
LO IN: 1675 MHz; +13.00 dBm  
IF OUT: 75 MHz; 2.63 dBm

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

REV. X3

HJK-ED9291/1

101012

Page 3 of 3



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

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## 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



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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                                                                              |