

# Frequency Mixer

## HJK-ED9189/1

Level 17 (LO Power +17 dBm)

### Important Note

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



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**CASE STYLE : TTT167**

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                                        |      |      |      |       |
|---------------------------------------|----------------------------------------|------|------|------|-------|
| Parameter                             |                                        | Min. | Typ. | Max. | Units |
| Frequency                             | LO (f <sub>L</sub> to f <sub>U</sub> ) | 1840 |      | 1920 | MHz   |
|                                       | RF (f <sub>L</sub> to f <sub>U</sub> ) | 1840 |      | 1920 | MHz   |
|                                       | IF                                     | 162  |      | 173  | MHz   |
| Conversion Loss                       |                                        |      | 7.1  |      | dB    |
| LO-RF Isolation                       |                                        |      | 33   |      | dB    |
| LO-IF Isolation                       |                                        |      | 33   |      | dB    |
| IP3 Input                             |                                        |      | +31  |      | dBm   |

| MAXIMUM RATINGS       |                |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |

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

# Frequency Mixer

HJK-ED9189/1

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=167MHz<br>(dB) |       |      |
|---------------------|-------------|--------------------------------------------------------|-------|------|
|                     |             | @LO (dBm)                                              |       |      |
|                     |             | +14                                                    | +17   | +20  |
| 1320.1              | 1153.1      | 16.42                                                  | 11.43 | 9.76 |
| 1360.1              | 1193.1      | 15.61                                                  | 11.33 | 9.15 |
| 1400.1              | 1233.1      | 15.32                                                  | 11.23 | 8.64 |
| 1440.1              | 1273.1      | 14.44                                                  | 10.63 | 8.06 |
| 1480.1              | 1313.1      | 13.92                                                  | 10.15 | 8.00 |
| 1520.1              | 1353.1      | 13.37                                                  | 9.64  | 7.78 |
| 1560.1              | 1393.1      | 12.52                                                  | 9.11  | 7.66 |
| 1600.1              | 1433.1      | 12.15                                                  | 8.83  | 7.54 |
| 1640.1              | 1473.1      | 11.28                                                  | 8.48  | 7.43 |
| 1680.1              | 1513.1      | 10.75                                                  | 8.28  | 7.46 |
| 1720.1              | 1553.1      | 10.18                                                  | 8.08  | 7.53 |
| 1760.1              | 1593.1      | 9.38                                                   | 7.88  | 7.61 |
| 1800.1              | 1633.1      | 8.82                                                   | 7.63  | 7.46 |
| 1840.1              | 1673.1      | 8.26                                                   | 7.54  | 7.52 |
| 1880.1              | 1713.1      | 7.90                                                   | 7.39  | 7.39 |
| 1920.1              | 1753.1      | 7.74                                                   | 7.39  | 7.40 |
| 1960.1              | 1793.1      | 7.62                                                   | 7.38  | 7.36 |
| 2000.1              | 1833.1      | 7.58                                                   | 7.38  | 7.33 |
| 2040.1              | 1873.1      | 7.63                                                   | 7.46  | 7.40 |
| 2080.1              | 1913.1      | 7.58                                                   | 7.46  | 7.42 |
| 2120.1              | 1953.1      | 7.68                                                   | 7.56  | 7.52 |
| 2160.1              | 1993.1      | 7.63                                                   | 7.54  | 7.55 |
| 2200.1              | 2033.1      | 7.72                                                   | 7.60  | 7.60 |
| 2240.1              | 2073.1      | 7.74                                                   | 7.58  | 7.60 |
| 2280.1              | 2113.1      | 7.85                                                   | 7.61  | 7.61 |
| 2320.1              | 2153.1      | 7.99                                                   | 7.62  | 7.54 |
| 2360.1              | 2193.1      | 8.10                                                   | 7.67  | 7.58 |
| 2400.1              | 2233.1      | 8.52                                                   | 7.83  | 7.61 |
| 2440.1              | 2273.1      | 8.56                                                   | 7.89  | 7.71 |
| 2480.1              | 2313.1      | 9.16                                                   | 8.19  | 7.82 |
| 2520.1              | 2353.1      | 9.35                                                   | 8.32  | 7.90 |
| 2560.1              | 2393.1      | 9.81                                                   | 8.66  | 8.10 |
| 2600.1              | 2433.1      | 10.36                                                  | 8.97  | 8.20 |
| 2640.1              | 2473.1      | 10.44                                                  | 9.12  | 8.33 |
| 2680.1              | 2513.1      | 11.30                                                  | 9.64  | 8.60 |
| 2720.1              | 2553.1      | 11.35                                                  | 9.71  | 8.73 |
| 2760.1              | 2593.1      | 12.12                                                  | 10.24 | 9.05 |
| 2810.1              | 2643.1      | 12.46                                                  | 10.52 | 9.22 |
| 2850.1              | 2683.1      | 13.12                                                  | 10.89 | 9.61 |
| 2900.1              | 2733.1      | 13.66                                                  | 11.30 | 9.83 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +14                | +17   | +20   |
| 1320.1              | 1153.1      | 11.72              | 14.81 | 18.92 |
| 1360.1              | 1193.1      | 10.43              | 17.90 | 19.19 |
| 1400.1              | 1233.1      | 10.01              | 20.85 | 19.27 |
| 1440.1              | 1273.1      | 10.49              | 20.13 | 20.99 |
| 1480.1              | 1313.1      | 10.97              | 21.88 | 23.25 |
| 1520.1              | 1353.1      | 10.96              | 21.43 | 25.61 |
| 1560.1              | 1393.1      | 12.79              | 25.22 | 28.91 |
| 1600.1              | 1433.1      | 13.70              | 22.55 | 28.87 |
| 1640.1              | 1473.1      | 16.57              | 21.30 | 30.06 |
| 1680.1              | 1513.1      | 19.08              | 22.08 | 27.05 |
| 1720.1              | 1553.1      | 23.86              | 21.81 | 27.10 |
| 1760.1              | 1593.1      | 21.72              | 23.32 | 27.97 |
| 1800.1              | 1633.1      | 20.87              | 23.77 | 28.52 |
| 1840.1              | 1673.1      | 21.61              | 25.39 | 30.35 |
| 1880.1              | 1713.1      | 23.23              | 26.18 | 30.53 |
| 1920.1              | 1753.1      | 24.15              | 27.55 | 30.96 |
| 1960.1              | 1793.1      | 25.16              | 28.62 | 31.05 |
| 2000.1              | 1833.1      | 24.84              | 28.87 | 31.27 |
| 2040.1              | 1873.1      | 24.80              | 29.10 | 31.53 |
| 2080.1              | 1913.1      | 23.84              | 27.55 | 31.70 |
| 2120.1              | 1953.1      | 22.95              | 26.75 | 31.36 |
| 2160.1              | 1993.1      | 22.40              | 25.58 | 30.69 |
| 2200.1              | 2033.1      | 21.64              | 24.20 | 28.85 |
| 2240.1              | 2073.1      | 21.60              | 23.84 | 27.93 |
| 2280.1              | 2113.1      | 21.03              | 23.06 | 26.12 |
| 2320.1              | 2153.1      | 20.59              | 22.76 | 25.37 |
| 2360.1              | 2193.1      | 19.86              | 22.17 | 24.47 |
| 2400.1              | 2233.1      | 19.24              | 21.40 | 23.79 |
| 2440.1              | 2273.1      | 19.20              | 21.14 | 25.20 |
| 2480.1              | 2313.1      | 18.97              | 20.35 | 22.89 |
| 2520.1              | 2353.1      | 19.05              | 20.27 | 22.92 |
| 2560.1              | 2393.1      | 18.80              | 20.01 | 22.46 |
| 2600.1              | 2433.1      | 17.67              | 19.96 | 22.09 |
| 2640.1              | 2473.1      | 18.10              | 20.27 | 22.54 |
| 2680.1              | 2513.1      | 15.79              | 20.46 | 22.29 |
| 2720.1              | 2553.1      | 16.26              | 20.70 | 22.72 |
| 2760.1              | 2593.1      | 14.98              | 21.17 | 22.79 |
| 2810.1              | 2643.1      | 14.74              | 21.60 | 23.16 |
| 2850.1              | 2683.1      | 14.37              | 22.83 | 23.69 |
| 2900.1              | 2733.1      | 13.99              | 23.13 | 23.79 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+14dBm<br>(dB) |       |      |
|---------------------|-------------|--------------------------------------|-------|------|
|                     |             | @LO (dBm)                            |       |      |
|                     |             | +14                                  | +17   | +20  |
| 1320.1              | 1153.1      | -2.05                                | 1.94  | 1.30 |
| 1360.1              | 1193.1      | -2.13                                | 0.09  | 0.85 |
| 1400.1              | 1233.1      | -2.26                                | -0.53 | 0.28 |
| 1440.1              | 1273.1      | -1.97                                | -0.33 | 0.39 |
| 1480.1              | 1313.1      | -2.08                                | -0.42 | 0.36 |
| 1520.1              | 1353.1      | -1.56                                | -0.30 | 0.34 |
| 1560.1              | 1393.1      | -1.03                                | -0.07 | 0.16 |
| 1600.1              | 1433.1      | -0.73                                | 0.16  | 0.08 |
| 1640.1              | 1473.1      | -0.32                                | 0.51  | 0.18 |
| 1680.1              | 1513.1      | 0.00                                 | 1.28  | 0.24 |
| 1720.1              | 1553.1      | 0.37                                 | 0.72  | 0.29 |
| 1760.1              | 1593.1      | 0.76                                 | 0.71  | 0.24 |
| 1800.1              | 1633.1      | 0.81                                 | 0.71  | 0.24 |
| 1840.1              | 1673.1      | 0.97                                 | 0.56  | 0.13 |
| 1880.1              | 1713.1      | 0.87                                 | 0.45  | 0.12 |
| 1920.1              | 1753.1      | 0.68                                 | 0.34  | 0.12 |
| 1960.1              | 1793.1      | 0.50                                 | 0.27  | 0.12 |
| 2000.1              | 1833.1      | 0.30                                 | 0.20  | 0.11 |
| 2040.1              | 1873.1      | 0.22                                 | 0.18  | 0.13 |
| 2080.1              | 1913.1      | 0.24                                 | 0.16  | 0.12 |
| 2120.1              | 1953.1      | 0.28                                 | 0.16  | 0.11 |
| 2160.1              | 1993.1      | 0.38                                 | 0.19  | 0.09 |
| 2200.1              | 2033.1      | 0.52                                 | 0.25  | 0.10 |
| 2240.1              | 2073.1      | 0.62                                 | 0.31  | 0.09 |
| 2280.1              | 2113.1      | 0.78                                 | 0.45  | 0.12 |
| 2320.1              | 2153.1      | 0.80                                 | 0.53  | 0.18 |
| 2360.1              | 2193.1      | 0.87                                 | 0.63  | 0.23 |
| 2400.1              | 2233.1      | 0.79                                 | 0.66  | 0.35 |
| 2440.1              | 2273.1      | 0.78                                 | 0.65  | 0.30 |
| 2480.1              | 2313.1      | 0.65                                 | 0.64  | 0.42 |
| 2520.1              | 2353.1      | 0.55                                 | 0.58  | 0.38 |
| 2560.1              | 2393.1      | 0.47                                 | 0.54  | 0.41 |
| 2600.1              | 2433.1      | 0.23                                 | 0.42  | 0.49 |
| 2640.1              | 2473.1      | 0.13                                 | 0.34  | 0.45 |
| 2680.1              | 2513.1      | -0.25                                | 0.14  | 0.57 |
| 2720.1              | 2553.1      | -0.28                                | 0.16  | 0.51 |
| 2760.1              | 2593.1      | -0.62                                | -0.01 | 0.48 |
| 2810.1              | 2643.1      | -0.83                                | -0.14 | 0.51 |
| 2850.1              | 2683.1      | -1.14                                | -0.32 | 0.51 |
| 2900.1              | 2733.1      | -1.43                                | -0.33 | 0.21 |

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# Frequency Mixer

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## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1880MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1829.9MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1930.1MHz<br>(dB) |
|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |
|                      |             | +17                                                            |                      |             | +17                                                              |                      |             | +17                                                              |
| 360.0                | 1520.0      | 8.28                                                           | 10.1                 | 1840.0      | 7.47                                                             | 390.1                | 1540.0      | 8.63                                                             |
| 343.3                | 1536.7      | 8.17                                                           | 22.9                 | 1852.8      | 7.20                                                             | 380.4                | 1549.7      | 8.44                                                             |
| 326.7                | 1553.3      | 8.09                                                           | 35.7                 | 1865.6      | 7.16                                                             | 370.6                | 1559.5      | 8.26                                                             |
| 310.0                | 1570.0      | 7.95                                                           | 48.6                 | 1878.5      | 7.16                                                             | 360.9                | 1569.2      | 8.17                                                             |
| 293.3                | 1586.7      | 7.88                                                           | 61.4                 | 1891.3      | 7.17                                                             | 351.1                | 1579.0      | 8.10                                                             |
| 276.7                | 1603.3      | 7.77                                                           | 74.2                 | 1904.1      | 7.17                                                             | 341.4                | 1588.7      | 8.00                                                             |
| 260.0                | 1620.0      | 7.70                                                           | 87.0                 | 1916.9      | 7.19                                                             | 331.6                | 1598.5      | 7.95                                                             |
| 243.3                | 1636.7      | 7.62                                                           | 99.8                 | 1929.7      | 7.22                                                             | 321.9                | 1608.2      | 7.92                                                             |
| 226.7                | 1653.3      | 7.57                                                           | 112.7                | 1942.6      | 7.25                                                             | 312.2                | 1617.9      | 7.86                                                             |
| 210.0                | 1670.0      | 7.49                                                           | 125.5                | 1955.4      | 7.25                                                             | 302.4                | 1627.7      | 7.80                                                             |
| 193.3                | 1686.7      | 7.43                                                           | 138.3                | 1968.2      | 7.30                                                             | 292.7                | 1637.4      | 7.76                                                             |
| 176.7                | 1703.3      | 7.37                                                           | 151.1                | 1981.0      | 7.31                                                             | 282.9                | 1647.2      | 7.69                                                             |
| 160.0                | 1720.0      | 7.35                                                           | 163.9                | 1993.8      | 7.32                                                             | 273.2                | 1656.9      | 7.64                                                             |
| 143.3                | 1736.7      | 7.36                                                           | 176.8                | 2006.7      | 7.37                                                             | 263.4                | 1666.7      | 7.61                                                             |
| 126.7                | 1753.3      | 7.31                                                           | 189.6                | 2019.5      | 7.42                                                             | 253.7                | 1676.4      | 7.59                                                             |
| 110.0                | 1770.0      | 7.28                                                           | 202.4                | 2032.3      | 7.45                                                             | 243.9                | 1686.2      | 7.53                                                             |
| 93.3                 | 1786.7      | 7.26                                                           | 215.2                | 2045.1      | 7.47                                                             | 234.2                | 1695.9      | 7.53                                                             |
| 76.7                 | 1803.3      | 7.26                                                           | 228.0                | 2057.9      | 7.52                                                             | 224.5                | 1705.6      | 7.52                                                             |
| 60.0                 | 1820.0      | 7.26                                                           | 240.9                | 2070.8      | 7.57                                                             | 214.7                | 1715.4      | 7.47                                                             |
| 43.3                 | 1836.7      | 7.25                                                           | 253.7                | 2083.6      | 7.60                                                             | 205.0                | 1725.1      | 7.46                                                             |
| 26.7                 | 1853.3      | 7.24                                                           | 266.5                | 2096.4      | 7.69                                                             | 195.2                | 1734.9      | 7.46                                                             |
| 10.0                 | 1870.0      | 7.52                                                           | 279.3                | 2109.2      | 7.81                                                             | 185.5                | 1744.6      | 7.43                                                             |
| 10.0                 | 1890.0      | 7.54                                                           | 292.2                | 2122.1      | 7.92                                                             | 175.7                | 1754.4      | 7.40                                                             |
| 33.3                 | 1913.3      | 7.27                                                           | 305.0                | 2134.9      | 8.01                                                             | 166.0                | 1764.1      | 7.42                                                             |
| 56.7                 | 1936.7      | 7.29                                                           | 317.8                | 2147.7      | 8.09                                                             | 156.3                | 1773.8      | 7.40                                                             |
| 80.0                 | 1960.0      | 7.35                                                           | 330.6                | 2160.5      | 8.15                                                             | 146.5                | 1783.6      | 7.39                                                             |
| 103.3                | 1983.3      | 7.35                                                           | 343.4                | 2173.3      | 8.19                                                             | 136.8                | 1793.3      | 7.42                                                             |
| 126.7                | 2006.7      | 7.42                                                           | 356.3                | 2186.2      | 8.33                                                             | 127.0                | 1803.1      | 7.42                                                             |
| 150.0                | 2030.0      | 7.46                                                           | 369.1                | 2199.0      | 8.49                                                             | 117.3                | 1812.8      | 7.36                                                             |
| 173.3                | 2053.3      | 7.49                                                           | 381.9                | 2211.8      | 8.60                                                             | 107.5                | 1822.6      | 7.38                                                             |
| 196.7                | 2076.7      | 7.56                                                           | 394.7                | 2224.6      | 8.72                                                             | 97.8                 | 1832.3      | 7.41                                                             |
| 220.0                | 2100.0      | 7.68                                                           | 407.5                | 2237.4      | 8.79                                                             | 88.0                 | 1842.1      | 7.38                                                             |
| 266.7                | 2146.7      | 7.94                                                           | 420.4                | 2250.3      | 8.80                                                             | 78.3                 | 1851.8      | 7.40                                                             |
| 290.0                | 2170.0      | 8.04                                                           | 433.2                | 2263.1      | 8.83                                                             | 68.6                 | 1861.5      | 7.41                                                             |
| 336.7                | 2216.7      | 8.48                                                           | 446.0                | 2275.9      | 8.97                                                             | 58.8                 | 1871.3      | 7.38                                                             |
| 360.0                | 2240.0      | 8.61                                                           | 458.8                | 2288.7      | 9.16                                                             | 49.1                 | 1881.0      | 7.35                                                             |
| 406.7                | 2286.7      | 8.92                                                           | 471.6                | 2301.5      | 9.30                                                             | 39.3                 | 1890.8      | 7.38                                                             |
| 430.0                | 2310.0      | 9.16                                                           | 484.5                | 2314.4      | 9.46                                                             | 29.6                 | 1900.5      | 7.39                                                             |
| 476.7                | 2356.7      | 9.42                                                           | 497.3                | 2327.2      | 9.59                                                             | 19.8                 | 1910.3      | 7.38                                                             |
| 500.0                | 2380.0      | 9.59                                                           | 510.1                | 2340.0      | 9.61                                                             | 10.1                 | 1920.0      | 7.65                                                             |

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## 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   |
| 1153.1      | 43.62                   | 39.83 | 35.84 | 42.53                   | 44.45 | 44.80 |
| 1193.1      | 44.13                   | 41.00 | 39.30 | 41.15                   | 41.64 | 39.59 |
| 1233.1      | 43.49                   | 41.88 | 40.44 | 40.06                   | 40.00 | 37.63 |
| 1273.1      | 43.91                   | 42.80 | 41.02 | 39.43                   | 39.21 | 36.41 |
| 1313.1      | 43.72                   | 42.33 | 40.11 | 38.85                   | 38.63 | 35.89 |
| 1353.1      | 38.11                   | 41.26 | 38.31 | 37.97                   | 38.19 | 35.36 |
| 1393.1      | 38.14                   | 40.94 | 37.07 | 37.99                   | 37.70 | 34.77 |
| 1433.1      | 37.61                   | 39.65 | 37.29 | 37.81                   | 37.57 | 35.89 |
| 1473.1      | 37.50                   | 39.27 | 37.00 | 37.93                   | 37.80 | 36.34 |
| 1513.1      | 38.63                   | 38.96 | 36.71 | 38.16                   | 38.96 | 38.59 |
| 1553.1      | 40.53                   | 39.57 | 35.94 | 38.27                   | 39.88 | 40.74 |
| 1593.1      | 41.17                   | 37.78 | 36.21 | 37.90                   | 39.10 | 39.77 |
| 1633.1      | 40.09                   | 39.16 | 35.47 | 36.98                   | 37.89 | 38.02 |
| 1673.1      | 39.48                   | 36.87 | 34.43 | 34.40                   | 37.14 | 37.06 |
| 1713.1      | 39.13                   | 37.76 | 33.85 | 35.66                   | 36.92 | 36.92 |
| 1753.1      | 38.49                   | 37.02 | 32.82 | 35.62                   | 36.89 | 37.19 |
| 1793.1      | 38.56                   | 36.89 | 32.75 | 35.79                   | 37.35 | 38.03 |
| 1833.1      | 39.20                   | 36.90 | 33.94 | 36.25                   | 38.22 | 39.36 |
| 1873.1      | 40.77                   | 37.25 | 34.46 | 37.33                   | 39.69 | 41.25 |
| 1913.1      | 42.07                   | 37.40 | 34.80 | 37.91                   | 40.26 | 42.07 |
| 1953.1      | 41.68                   | 37.00 | 34.62 | 38.74                   | 40.62 | 42.19 |
| 1993.1      | 41.78                   | 37.86 | 35.78 | 39.69                   | 41.10 | 42.23 |
| 2033.1      | 42.24                   | 38.47 | 36.28 | 40.24                   | 41.16 | 41.86 |
| 2073.1      | 43.08                   | 39.66 | 37.58 | 40.10                   | 40.65 | 41.00 |
| 2113.1      | 45.38                   | 41.27 | 39.14 | 39.55                   | 39.87 | 40.13 |
| 2153.1      | 46.78                   | 42.59 | 40.33 | 39.03                   | 39.36 | 39.57 |
| 2193.1      | 49.16                   | 44.50 | 42.04 | 38.63                   | 38.82 | 38.94 |
| 2233.1      | 49.39                   | 45.89 | 43.70 | 38.45                   | 38.51 | 38.72 |
| 2273.1      | 47.43                   | 46.33 | 45.01 | 38.07                   | 38.20 | 38.18 |
| 2313.1      | 46.06                   | 46.21 | 45.92 | 37.78                   | 38.03 | 37.85 |
| 2353.1      | 45.49                   | 45.79 | 46.31 | 37.65                   | 37.79 | 37.55 |
| 2393.1      | 45.08                   | 45.45 | 46.67 | 37.32                   | 37.48 | 37.15 |
| 2433.1      | 45.18                   | 45.26 | 46.40 | 37.27                   | 37.45 | 36.90 |
| 2473.1      | 45.57                   | 45.73 | 46.70 | 36.94                   | 37.11 | 36.23 |
| 2513.1      | 45.93                   | 45.78 | 46.05 | 36.93                   | 36.91 | 36.21 |
| 2553.1      | 47.11                   | 46.68 | 46.70 | 36.89                   | 36.68 | 35.69 |
| 2593.1      | 47.64                   | 46.74 | 45.75 | 36.70                   | 36.44 | 35.42 |
| 2643.1      | 49.26                   | 48.09 | 46.13 | 36.38                   | 36.02 | 35.01 |
| 2683.1      | 49.53                   | 48.20 | 45.75 | 36.07                   | 35.60 | 34.61 |
| 2733.1      | 49.50                   | 48.64 | 46.46 | 35.65                   | 35.00 | 34.24 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 1320.1              | 1153.1      | 38.26                   | 21.22 | 20.34 |
| 1360.1              | 1193.1      | 35.82                   | 28.81 | 23.97 |
| 1400.1              | 1233.1      | 31.70                   | 26.38 | 25.80 |
| 1440.1              | 1273.1      | 29.00                   | 25.21 | 27.70 |
| 1480.1              | 1313.1      | 26.91                   | 27.20 | 29.29 |
| 1520.1              | 1353.1      | 25.86                   | 25.73 | 29.86 |
| 1560.1              | 1393.1      | 24.74                   | 26.89 | 29.96 |
| 1600.1              | 1433.1      | 24.84                   | 27.51 | 30.01 |
| 1640.1              | 1473.1      | 25.01                   | 28.51 | 31.24 |
| 1680.1              | 1513.1      | 25.32                   | 28.49 | 30.72 |
| 1720.1              | 1553.1      | 25.55                   | 28.85 | 30.41 |
| 1760.1              | 1593.1      | 26.45                   | 29.03 | 29.43 |
| 1800.1              | 1633.1      | 27.31                   | 28.90 | 28.57 |
| 1840.1              | 1673.1      | 28.13                   | 28.53 | 27.42 |
| 1880.1              | 1713.1      | 28.13                   | 27.99 | 26.67 |
| 1920.1              | 1753.1      | 27.91                   | 27.37 | 25.99 |
| 1960.1              | 1793.1      | 27.42                   | 26.84 | 25.83 |
| 2000.1              | 1833.1      | 26.76                   | 26.36 | 25.80 |
| 2040.1              | 1873.1      | 26.22                   | 25.96 | 25.85 |
| 2080.1              | 1913.1      | 25.83                   | 25.70 | 25.79 |
| 2120.1              | 1953.1      | 25.48                   | 25.45 | 25.62 |
| 2160.1              | 1993.1      | 25.14                   | 25.21 | 25.39 |
| 2200.1              | 2033.1      | 24.76                   | 24.96 | 25.10 |
| 2240.1              | 2073.1      | 24.53                   | 24.73 | 24.88 |
| 2280.1              | 2113.1      | 24.51                   | 24.61 | 24.74 |
| 2320.1              | 2153.1      | 24.60                   | 24.49 | 24.56 |
| 2360.1              | 2193.1      | 24.59                   | 24.41 | 24.39 |
| 2400.1              | 2233.1      | 24.58                   | 24.33 | 24.25 |
| 2440.1              | 2273.1      | 24.97                   | 24.64 | 24.45 |
| 2480.1              | 2313.1      | 25.65                   | 25.31 | 24.90 |
| 2520.1              | 2353.1      | 26.41                   | 26.03 | 25.48 |
| 2560.1              | 2393.1      | 27.15                   | 27.02 | 26.29 |
| 2600.1              | 2433.1      | 27.47                   | 27.69 | 27.04 |
| 2640.1              | 2473.1      | 27.47                   | 27.91 | 27.48 |
| 2680.1              | 2513.1      | 26.50                   | 27.16 | 27.27 |
| 2720.1              | 2553.1      | 25.41                   | 26.01 | 26.28 |
| 2760.1              | 2593.1      | 24.32                   | 24.74 | 25.24 |
| 2810.1              | 2643.1      | 23.24                   | 23.47 | 23.91 |
| 2850.1              | 2683.1      | 22.60                   | 22.73 | 23.10 |
| 2900.1              | 2733.1      | 22.02                   | 22.03 | 22.30 |

## 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=1920MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|-------|------|----------------------|--------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |       |      |                      | @LO (dBm)                      |      |      |
|                     |             | +14             | +17  | +20  |             | +14             | +17   | +20  |                      | +14                            | +17  | +20  |
| 1320.1              | 1153.1      | 5.58            | 2.68 | 2.08 | 1153.1      | 13.81           | 11.69 | 7.97 | 10.0                 | 1.24                           | 1.39 | 1.56 |
| 1360.1              | 1193.1      | 5.49            | 2.82 | 2.28 | 1193.1      | 10.50           | 9.90  | 7.63 | 50.0                 | 1.24                           | 1.39 | 1.54 |
| 1400.1              | 1233.1      | 5.07            | 3.20 | 2.52 | 1233.1      | 9.85            | 10.89 | 7.14 | 90.0                 | 1.29                           | 1.43 | 1.57 |
| 1440.1              | 1273.1      | 4.98            | 3.21 | 2.52 | 1273.1      | 9.79            | 9.69  | 7.02 | 130.0                | 1.33                           | 1.47 | 1.61 |
| 1480.1              | 1313.1      | 4.86            | 3.11 | 2.47 | 1313.1      | 8.43            | 10.19 | 6.49 | 170.0                | 1.38                           | 1.48 | 1.60 |
| 1520.1              | 1353.1      | 4.92            | 3.02 | 2.39 | 1353.1      | 8.20            | 8.01  | 6.21 | 210.0                | 1.46                           | 1.56 | 1.68 |
| 1560.1              | 1393.1      | 4.42            | 2.74 | 2.21 | 1393.1      | 7.56            | 7.66  | 5.85 | 250.0                | 1.49                           | 1.54 | 1.64 |
| 1600.1              | 1433.1      | 4.26            | 2.66 | 2.12 | 1433.1      | 7.17            | 5.97  | 5.44 | 310.0                | 1.62                           | 1.65 | 1.72 |
| 1640.1              | 1473.1      | 3.80            | 2.42 | 1.94 | 1473.1      | 7.41            | 6.03  | 5.07 | 350.0                | 1.73                           | 1.74 | 1.80 |
| 1680.1              | 1513.1      | 3.47            | 2.22 | 1.79 | 1513.1      | 6.30            | 5.79  | 4.55 | 410.0                | 1.84                           | 1.82 | 1.85 |
| 1720.1              | 1553.1      | 2.80            | 1.97 | 1.63 | 1553.1      | 6.32            | 3.95  | 4.19 | 450.0                | 1.97                           | 1.91 | 1.92 |
| 1760.1              | 1593.1      | 2.56            | 1.80 | 1.50 | 1593.1      | 5.19            | 5.20  | 3.67 | 510.0                | 2.15                           | 2.05 | 2.03 |
| 1800.1              | 1633.1      | 2.44            | 1.70 | 1.43 | 1633.1      | 4.73            | 3.74  | 3.16 | 550.0                | 2.30                           | 2.19 | 2.15 |
| 1840.1              | 1673.1      | 2.18            | 1.58 | 1.35 | 1673.1      | 4.31            | 2.64  | 2.63 | 610.0                | 2.47                           | 2.32 | 2.25 |
| 1880.1              | 1713.1      | 2.03            | 1.53 | 1.31 | 1713.1      | 3.24            | 2.20  | 2.10 | 650.0                | 2.63                           | 2.46 | 2.37 |
| 1920.1              | 1753.1      | 1.82            | 1.45 | 1.27 | 1753.1      | 2.93            | 1.72  | 1.64 | 710.0                | 2.84                           | 2.64 | 2.52 |
| 1960.1              | 1793.1      | 1.66            | 1.39 | 1.23 | 1793.1      | 2.42            | 1.33  | 1.28 | 750.0                | 2.93                           | 2.71 | 2.57 |
| 2000.1              | 1833.1      | 1.53            | 1.32 | 1.20 | 1833.1      | 2.15            | 1.08  | 1.32 | 810.0                | 3.06                           | 2.81 | 2.65 |
| 2040.1              | 1873.1      | 1.42            | 1.26 | 1.17 | 1873.1      | 2.12            | 1.48  | 1.74 | 850.0                | 3.14                           | 2.89 | 2.71 |
| 2080.1              | 1913.1      | 1.34            | 1.20 | 1.14 | 1913.1      | 2.28            | 2.01  | 2.32 | 910.0                | 3.26                           | 2.97 | 2.78 |
| 2120.1              | 1953.1      | 1.29            | 1.15 | 1.13 | 1953.1      | 2.95            | 2.93  | 3.09 | 950.0                | 3.17                           | 2.89 | 2.70 |
| 2160.1              | 1993.1      | 1.24            | 1.11 | 1.13 | 1993.1      | 3.95            | 3.76  | 3.99 | 1010.0               | 3.22                           | 2.92 | 2.73 |
| 2200.1              | 2033.1      | 1.23            | 1.08 | 1.13 | 2033.1      | 5.06            | 4.52  | 4.86 | 1050.0               | 3.20                           | 2.90 | 2.71 |
| 2240.1              | 2073.1      | 1.20            | 1.06 | 1.17 | 2073.1      | 6.46            | 5.38  | 5.85 | 1110.0               | 3.20                           | 2.91 | 2.72 |
| 2280.1              | 2113.1      | 1.23            | 1.04 | 1.17 | 2113.1      | 7.56            | 5.83  | 6.19 | 1150.0               | 3.10                           | 2.82 | 2.63 |
| 2320.1              | 2153.1      | 1.22            | 1.03 | 1.19 | 2153.1      | 8.81            | 6.35  | 6.81 | 1210.0               | 3.01                           | 2.76 | 2.59 |
| 2360.1              | 2193.1      | 1.23            | 1.04 | 1.20 | 2193.1      | 9.79            | 6.61  | 6.97 | 1250.0               | 3.01                           | 2.76 | 2.60 |
| 2400.1              | 2233.1      | 1.25            | 1.06 | 1.22 | 2233.1      | 10.56           | 6.76  | 7.14 | 1310.0               | 2.83                           | 2.61 | 2.47 |
| 2440.1              | 2273.1      | 1.23            | 1.11 | 1.28 | 2273.1      | 11.46           | 7.00  | 7.38 | 1350.0               | 2.71                           | 2.50 | 2.37 |
| 2480.1              | 2313.1      | 1.29            | 1.13 | 1.27 | 2313.1      | 11.61           | 6.94  | 7.08 | 1410.0               | 2.50                           | 2.33 | 2.20 |
| 2520.1              | 2353.1      | 1.29            | 1.20 | 1.36 | 2353.1      | 12.26           | 7.14  | 7.14 | 1450.0               | 2.45                           | 2.30 | 2.18 |
| 2560.1              | 2393.1      | 1.35            | 1.26 | 1.43 | 2393.1      | 12.26           | 6.51  | 6.32 | 1510.0               | 2.23                           | 2.10 | 2.00 |
| 2600.1              | 2433.1      | 1.42            | 1.34 | 1.50 | 2433.1      | 12.26           | 6.35  | 6.11 | 1550.0               | 2.08                           | 1.96 | 1.88 |
| 2640.1              | 2473.1      | 1.49            | 1.45 | 1.61 | 2473.1      | 12.52           | 6.11  | 5.87 | 1610.0               | 1.90                           | 1.80 | 1.74 |
| 2680.1              | 2513.1      | 1.62            | 1.55 | 1.67 | 2513.1      | 12.09           | 5.79  | 5.42 | 1650.0               | 1.79                           | 1.72 | 1.69 |
| 2720.1              | 2553.1      | 1.74            | 1.68 | 1.81 | 2553.1      | 12.26           | 5.56  | 5.39 | 1710.0               | 1.59                           | 1.57 | 1.57 |
| 2760.1              | 2593.1      | 1.88            | 1.80 | 1.89 | 2593.1      | 11.85           | 5.23  | 5.00 | 1750.0               | 1.47                           | 1.48 | 1.52 |
| 2810.1              | 2643.1      | 2.10            | 2.01 | 2.08 | 2643.1      | 11.77           | 5.13  | 4.86 | 1810.0               | 1.33                           | 1.42 | 1.52 |
| 2850.1              | 2683.1      | 2.28            | 2.17 | 2.21 | 2683.1      | 11.31           | 4.83  | 4.53 | 1850.0               | 1.26                           | 1.41 | 1.56 |
| 2900.1              | 2733.1      | 2.54            | 2.39 | 2.42 | 2733.1      | 11.03           | 4.64  | 4.34 | 1910.0               | 1.23                           | 1.42 | 1.58 |

## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 9   | 25  | 16  | 35  | 32  | 38  | 49  | 49  | 46  | 49  |
| 1  | -      | 20     | +0  | 32  | 16  | 41  | 25  | 47  | 40  | 60  | 52  | 57  |
| 2  | 61     | 63     | 55  | 49  | 57  | 50  | 59  | 55  | 67  | 70  | 73  | 66  |
| 3  | >90    | 71     | 64  | >82 | 56  | 72  | 60  | 73  | 61  | 78  | 72  | >82 |
| 4  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 5  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 6  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 7  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 8  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 9  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 10 | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions: RF IN: 1880 MHz; -1.00 dBm.  
LO IN: 1713 MHz; +17.00 dBm  
IF OUT: 167 MHz; -8.43 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |    |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 0  | -      | -      | 20  | 32  | 28  | 50  | 42  | 47  | 57  | 53  | 55  | 56 |
| 1  | -      | 19     | +0  | 31  | 17  | 42  | 27  | 50  | 42  | 58  | 57  | 59 |
| 2  | 41     | 51     | 44  | 39  | 45  | 41  | 47  | 49  | 57  | 62  | 68  | 62 |
| 3  | 70     | 56     | 45  | 53  | 37  | 56  | 41  | 62  | 44  | 62  | 57  | 70 |
| 4  | >90    | 68     | 82  | 72  | 66  | 57  | 63  | 60  | 69  | 60  | 71  | 80 |
| 5  | >90    | 82     | 72  | 70  | 66  | 71  | 61  | 65  | 62  | 72  | 60  | 73 |
| 6  | >90    | >91    | 87  | 85  | 79  | 79  | 78  | 74  | 75  | 76  | 80  | 71 |
| 7  | >90    | >91    | >91 | >91 | 90  | 81  | 84  | 75  | 80  | 72  | 79  | 81 |
| 8  | >90    | >91    | >91 | >91 | >91 | >91 | 91  | >91 | 82  | >91 | 77  | 85 |
| 9  | >90    | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | 86  | >91 | 83 |
| 10 | >90    | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | 88 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10 |

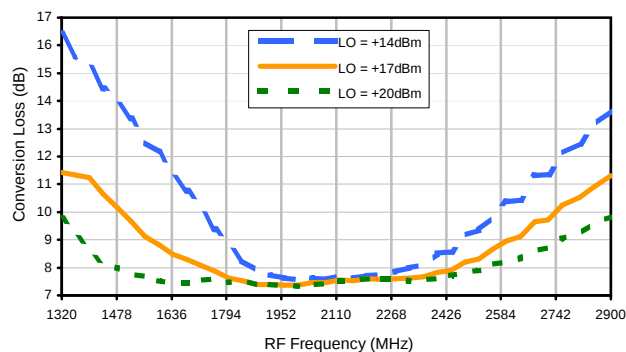
### LO HARMONICS ORDER

Test conditions: RF IN: 1880 MHz; 9.00 dBm.  
LO IN: 1713 MHz; +17.00 dBm  
IF OUT: 167 MHz; 1.48 dBm

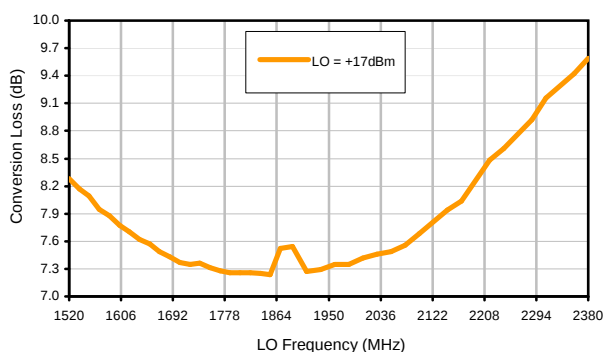
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Typical Performance Curves

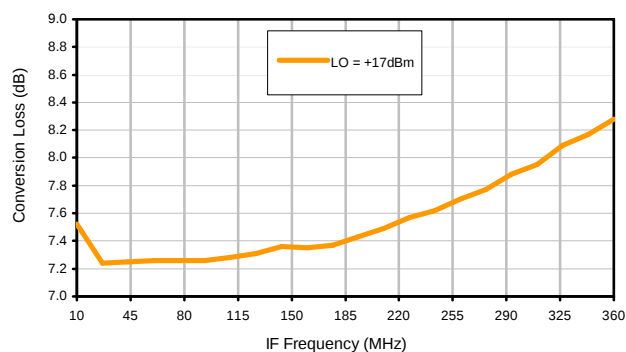
Conversion Loss @ IF=167MHz



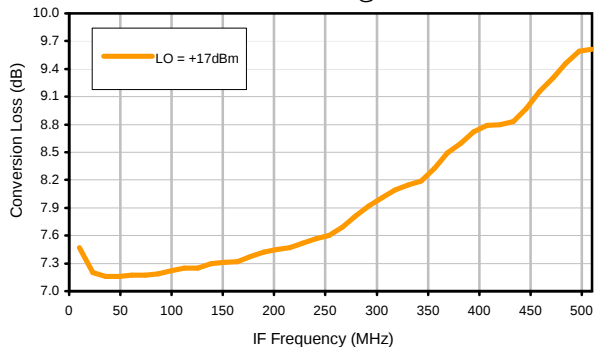
Conversion Loss vs. LO @ RF=1880MHz



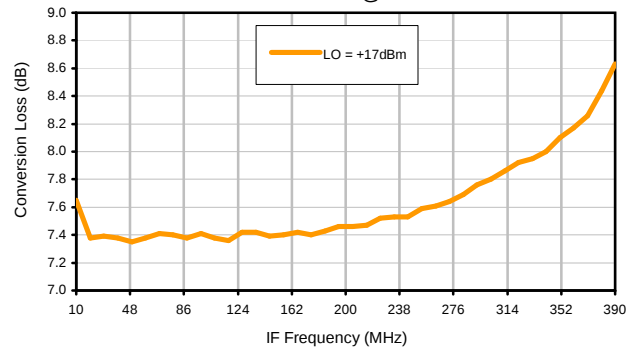
Conversion Loss vs. IF @ RF=1880MHz



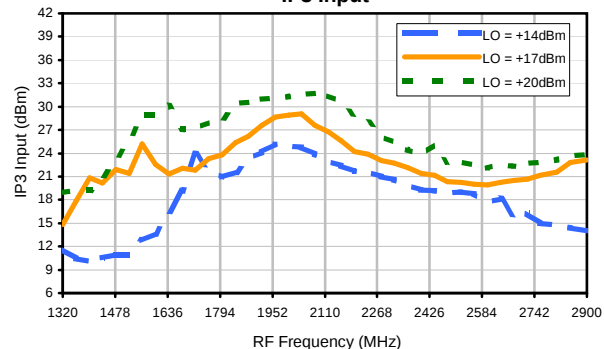
Conversion Loss vs. IF @ RF=1829.9MHz



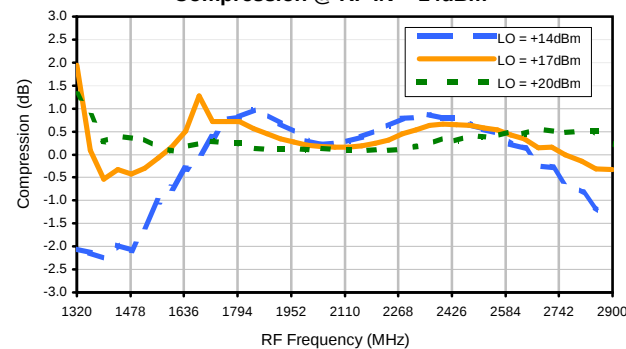
Conversion Loss vs. IF @ RF=1930.1MHz



IP3 Input

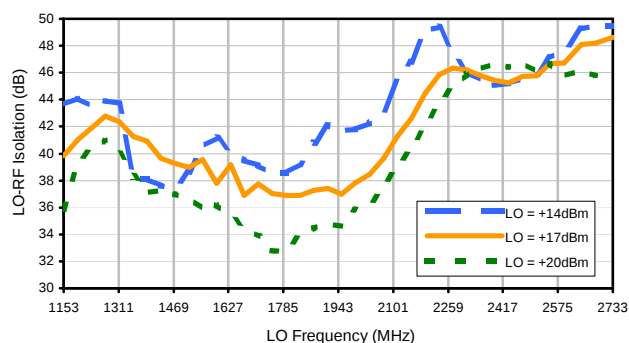


Compression @ RF IN=+14dBm

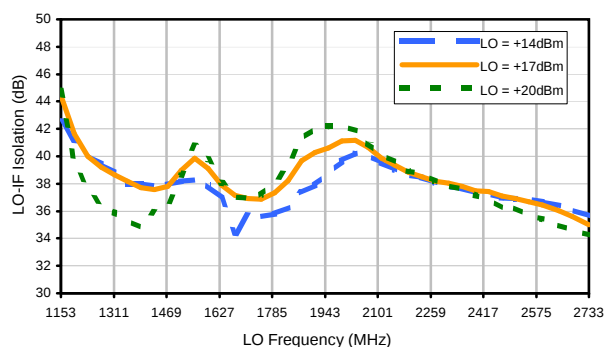


## Typical Performance Curves

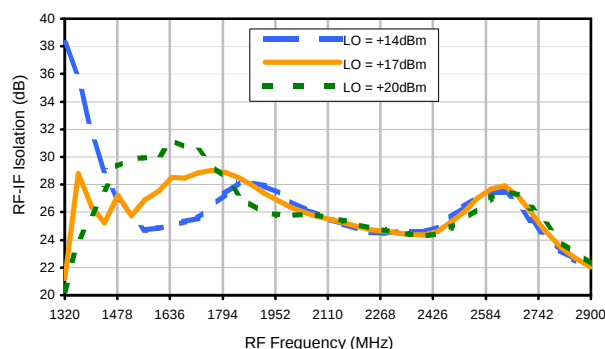
LO-RF Isolation



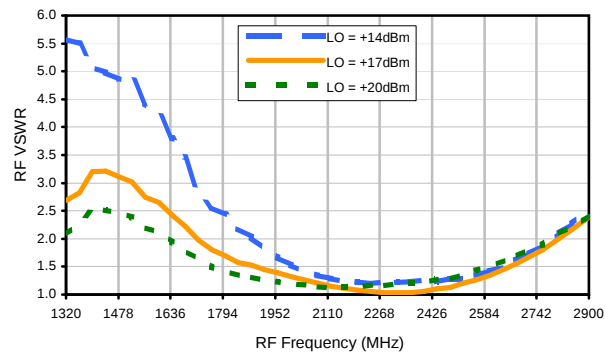
LO-IF Isolation



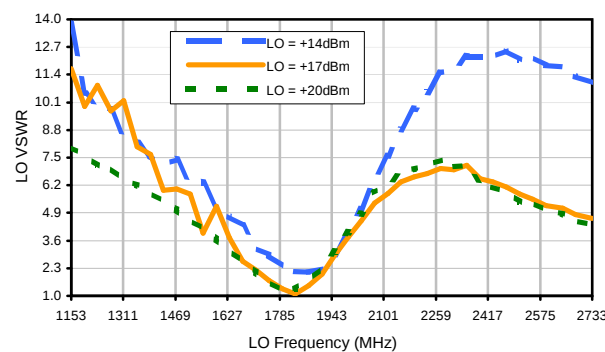
RF-IF Isolation



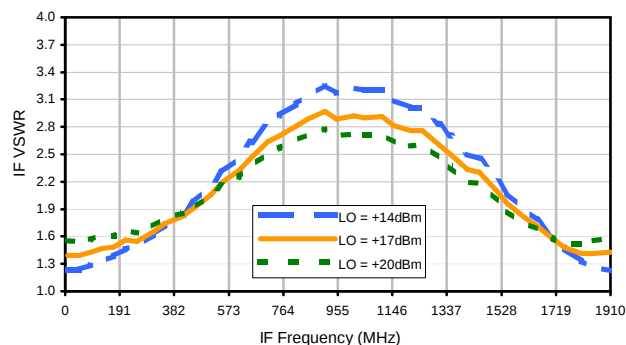
RF VSWR



LO VSWR



IF VSWR



## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 9   | 25  | 16  | 35  | 32  | 38  | 49  | 49  | 46  | 49  |
| 1  | -      | 20     | +0  | 32  | 16  | 41  | 25  | 47  | 40  | 60  | 52  | 57  |
| 2  | 61     | 63     | 55  | 49  | 57  | 50  | 59  | 55  | 67  | 70  | 73  | 66  |
| 3  | >90    | 71     | 64  | >82 | 56  | 72  | 60  | 73  | 61  | 78  | 72  | >82 |
| 4  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 5  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 6  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 7  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 8  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 9  | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
| 10 | >90    | >82    | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 | >82 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

## LO HARMONICS ORDER

Test conditions:

RF IN: 1880 MHz; -1.00 dBm.

LO IN: 1713 MHz; +17.00 dBm

IF OUT: 167 MHz; -8.43 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |    |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| 0  | -      | -      | 20  | 32  | 28  | 50  | 42  | 47  | 57  | 53  | 55  | 56 |
| 1  | -      | 19     | +0  | 31  | 17  | 42  | 27  | 50  | 42  | 58  | 57  | 59 |
| 2  | 41     | 51     | 44  | 39  | 45  | 41  | 47  | 49  | 57  | 62  | 68  | 62 |
| 3  | 70     | 56     | 45  | 53  | 37  | 56  | 41  | 62  | 44  | 62  | 57  | 70 |
| 4  | >90    | 68     | 82  | 72  | 66  | 57  | 63  | 60  | 69  | 60  | 71  | 80 |
| 5  | >90    | 82     | 72  | 70  | 66  | 71  | 61  | 65  | 62  | 72  | 60  | 73 |
| 6  | >90    | >91    | 87  | 85  | 79  | 79  | 78  | 74  | 75  | 76  | 80  | 71 |
| 7  | >90    | >91    | >91 | >91 | 90  | 81  | 84  | 75  | 80  | 72  | 79  | 81 |
| 8  | >90    | >91    | >91 | >91 | >91 | >91 | 91  | >91 | 82  | >91 | 77  | 85 |
| 9  | >90    | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | 86  | >91 | 83 |
| 10 | >90    | >91    | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | >91 | 88 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10 |

## LO HARMONICS ORDER

Test conditions:

RF IN: 1880 MHz; 9.00 dBm.

LO IN: 1713 MHz; +17.00 dBm

IF OUT: 167 MHz; 1.48 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-ED9189/1

101012

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

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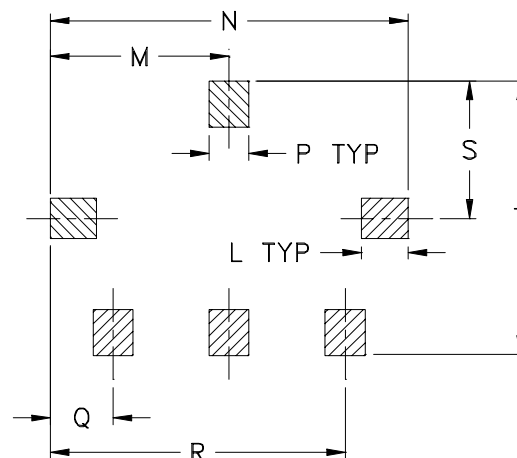


## Outline Dimensions

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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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                                                                              |