

## Frequency Mixer

## SYM-ED7654/1

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.



Please click "Back", and then click "Contact Us" for Applications support.

**CASE STYLE : TTT167**

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                                        |      |      |      |       |
|---------------------------------------|----------------------------------------|------|------|------|-------|
| Parameter                             |                                        | Min. | Typ. | Max. | Units |
| Frequency                             | LO (f <sub>L</sub> to f <sub>U</sub> ) | 900  |      | 3100 | MHz   |
|                                       | RF (f <sub>L</sub> to f <sub>U</sub> ) | 900  |      | 3100 | MHz   |
|                                       | IF                                     | 0.5  |      | 1121 | MHz   |
| Conversion Loss                       |                                        |      | 6.2  |      | dB    |
| LO-RF Isolation                       |                                        |      | 29   |      | dB    |
| LO-IF Isolation                       |                                        |      | 29   |      | dB    |

| 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 |

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SYM-ED7654/1

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=30MHz<br>(dB) |       |       | RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       | RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+14dBm<br>(dB) |      |      |
|---------------------|-------------|-------------------------------------------------------|-------|-------|---------------------|-------------|--------------------|-------|-------|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                                             |       |       |                     |             | @LO (dBm)          |       |       |                     |             | @LO (dBm)                            |      |      |
|                     |             | +14                                                   | +17   | +20   |                     |             | +14                | +17   | +20   |                     |             | +14                                  | +17  | +20  |
| 420.1               | 450.1       | 15.20                                                 | 11.05 | 8.98  | 420.1               | 450.1       | 15.88              | 23.37 | 34.70 | 420.1               | 450.1       | -1.05                                | 0.07 | 0.03 |
| 500.7               | 530.7       | 12.32                                                 | 8.89  | 7.64  | 500.7               | 530.7       | 13.81              | 19.55 | 27.45 | 500.7               | 530.7       | 0.03                                 | 0.72 | 0.21 |
| 581.2               | 611.2       | 11.28                                                 | 8.76  | 7.51  | 581.2               | 611.2       | 14.74              | 24.11 | 25.37 | 581.2               | 611.2       | 0.26                                 | 0.15 | 0.33 |
| 661.8               | 691.8       | 11.09                                                 | 9.28  | 8.03  | 661.8               | 691.8       | 17.14              | 19.12 | 25.36 | 661.8               | 691.8       | 0.79                                 | 0.16 | 0.29 |
| 742.3               | 772.3       | 12.29                                                 | 9.32  | 7.52  | 742.3               | 772.3       | 14.13              | 25.29 | 29.43 | 742.3               | 772.3       | 0.34                                 | 0.49 | 0.56 |
| 822.9               | 852.9       | 12.60                                                 | 8.23  | 6.71  | 822.9               | 852.9       | 13.23              | 33.13 | 29.50 | 822.9               | 852.9       | -0.45                                | 1.15 | 1.17 |
| 903.5               | 933.5       | 9.02                                                  | 7.55  | 6.22  | 903.5               | 933.5       | 15.71              | 23.04 | 24.33 | 903.5               | 933.5       | 2.33                                 | 1.72 | 1.80 |
| 984.0               | 1014.0      | 7.34                                                  | 6.46  | 5.73  | 984.0               | 1014.0      | 17.64              | 18.36 | 19.42 | 984.0               | 1014.0      | 3.25                                 | 2.49 | 2.14 |
| 1064.6              | 1094.6      | 6.76                                                  | 5.62  | 5.06  | 1064.6              | 1094.6      | 18.76              | 17.67 | 17.52 | 1064.6              | 1094.6      | 3.08                                 | 2.91 | 2.68 |
| 1145.1              | 1175.1      | 6.48                                                  | 5.36  | 5.00  | 1145.1              | 1175.1      | 16.98              | 17.77 | 17.48 | 1145.1              | 1175.1      | 3.16                                 | 3.06 | 2.72 |
| 1225.7              | 1255.7      | 6.33                                                  | 5.33  | 4.91  | 1225.7              | 1255.7      | 14.52              | 16.39 | 20.95 | 1225.7              | 1255.7      | 3.24                                 | 2.90 | 2.52 |
| 1306.3              | 1336.3      | 6.50                                                  | 5.40  | 5.03  | 1306.3              | 1336.3      | 13.19              | 15.98 | 23.94 | 1306.3              | 1336.3      | 2.97                                 | 2.70 | 2.35 |
| 1386.8              | 1416.8      | 6.75                                                  | 5.70  | 5.26  | 1386.8              | 1416.8      | 15.26              | 17.54 | 24.30 | 1386.8              | 1416.8      | 2.40                                 | 2.29 | 2.06 |
| 1467.4              | 1497.4      | 7.23                                                  | 6.30  | 5.66  | 1467.4              | 1497.4      | 21.36              | 19.02 | 22.10 | 1467.4              | 1497.4      | 1.96                                 | 1.87 | 1.80 |
| 1547.9              | 1577.9      | 7.49                                                  | 6.88  | 6.36  | 1547.9              | 1577.9      | 20.24              | 23.59 | 21.17 | 1547.9              | 1577.9      | 1.75                                 | 1.61 | 1.61 |
| 1608.4              | 1638.4      | 7.21                                                  | 6.96  | 6.81  | 1608.4              | 1638.4      | 20.55              | 25.38 | 21.96 | 1608.4              | 1638.4      | 1.48                                 | 1.21 | 1.12 |
| 1688.9              | 1718.9      | 6.49                                                  | 6.32  | 6.32  | 1688.9              | 1718.9      | 19.48              | 25.17 | 21.57 | 1688.9              | 1718.9      | 1.47                                 | 1.09 | 0.99 |
| 1749.3              | 1779.3      | 6.65                                                  | 6.23  | 6.18  | 1749.3              | 1779.3      | 19.90              | 23.31 | 25.26 | 1749.3              | 1779.3      | 1.03                                 | 0.82 | 0.66 |
| 1829.9              | 1859.9      | 6.63                                                  | 6.08  | 5.97  | 1829.9              | 1859.9      | 19.27              | 22.04 | 28.89 | 1829.9              | 1859.9      | 1.01                                 | 0.63 | 0.38 |
| 1890.3              | 1920.3      | 6.94                                                  | 6.32  | 6.10  | 1890.3              | 1920.3      | 21.64              | 22.61 | 26.56 | 1890.3              | 1920.3      | 0.87                                 | 0.58 | 0.43 |
| 1970.9              | 2000.9      | 7.50                                                  | 6.98  | 6.66  | 1970.9              | 2000.9      | 31.28              | 37.13 | 30.57 | 1970.9              | 2000.9      | 0.62                                 | 0.37 | 0.29 |
| 2031.3              | 2061.3      | 7.44                                                  | 7.09  | 6.87  | 2031.3              | 2061.3      | 27.66              | 32.08 | 28.91 | 2031.3              | 2061.3      | 0.59                                 | 0.32 | 0.23 |
| 2111.8              | 2141.8      | 7.12                                                  | 6.79  | 6.59  | 2111.8              | 2141.8      | 25.77              | 28.58 | 30.29 | 2111.8              | 2141.8      | 0.70                                 | 0.47 | 0.36 |
| 2172.3              | 2202.3      | 6.92                                                  | 6.54  | 6.34  | 2172.3              | 2202.3      | 26.85              | 29.02 | 29.25 | 2172.3              | 2202.3      | 0.77                                 | 0.55 | 0.45 |
| 2252.8              | 2282.8      | 6.92                                                  | 6.57  | 6.39  | 2252.8              | 2282.8      | 25.87              | 28.30 | 27.78 | 2252.8              | 2282.8      | 0.76                                 | 0.50 | 0.43 |
| 2313.2              | 2343.2      | 6.90                                                  | 6.53  | 6.38  | 2313.2              | 2343.2      | 24.80              | 27.62 | 27.36 | 2313.2              | 2343.2      | 0.84                                 | 0.62 | 0.55 |
| 2393.8              | 2423.8      | 6.69                                                  | 6.22  | 6.05  | 2393.8              | 2423.8      | 22.84              | 26.62 | 27.81 | 2393.8              | 2423.8      | 1.05                                 | 0.91 | 0.87 |
| 2454.2              | 2484.2      | 6.54                                                  | 6.00  | 5.82  | 2454.2              | 2484.2      | 20.09              | 23.94 | 25.59 | 2454.2              | 2484.2      | 1.10                                 | 1.04 | 1.00 |
| 2534.8              | 2564.8      | 6.61                                                  | 6.10  | 5.91  | 2534.8              | 2564.8      | 20.38              | 21.09 | 22.13 | 2534.8              | 2564.8      | 1.18                                 | 0.96 | 0.87 |
| 2595.2              | 2625.2      | 6.55                                                  | 6.23  | 6.01  | 2595.2              | 2625.2      | 22.47              | 21.26 | 24.79 | 2595.2              | 2625.2      | 1.36                                 | 0.93 | 0.79 |
| 2675.8              | 2705.8      | 6.50                                                  | 6.23  | 6.08  | 2675.8              | 2705.8      | 22.62              | 24.99 | 26.31 | 2675.8              | 2705.8      | 1.41                                 | 0.96 | 0.77 |
| 2736.2              | 2766.2      | 6.45                                                  | 6.18  | 6.07  | 2736.2              | 2766.2      | 23.68              | 25.90 | 26.19 | 2736.2              | 2766.2      | 1.48                                 | 0.93 | 0.69 |
| 2816.7              | 2846.7      | 6.85                                                  | 6.53  | 6.37  | 2816.7              | 2846.7      | 24.10              | 26.01 | 28.24 | 2816.7              | 2846.7      | 1.30                                 | 0.69 | 0.59 |
| 2877.2              | 2907.2      | 7.32                                                  | 6.98  | 6.81  | 2877.2              | 2907.2      | 24.61              | 26.63 | 27.16 | 2877.2              | 2907.2      | 0.96                                 | 0.46 | 0.43 |
| 2957.7              | 2987.7      | 7.84                                                  | 7.58  | 7.43  | 2957.7              | 2987.7      | 25.70              | 28.91 | 26.85 | 2957.7              | 2987.7      | 0.75                                 | 0.30 | 0.28 |
| 3018.1              | 3048.1      | 8.18                                                  | 7.92  | 7.83  | 3018.1              | 3048.1      | 25.22              | 29.76 | 31.05 | 3018.1              | 3048.1      | 0.81                                 | 0.24 | 0.19 |
| 3098.7              | 3128.7      | 8.83                                                  | 8.43  | 8.38  | 3098.7              | 3128.7      | 22.80              | 27.88 | 32.25 | 3098.7              | 3128.7      | 0.72                                 | 0.26 | 0.13 |
| 3159.1              | 3189.1      | 9.59                                                  | 9.08  | 8.97  | 3159.1              | 3189.1      | 22.81              | 25.03 | 30.38 | 3159.1              | 3189.1      | 0.53                                 | 0.22 | 0.11 |
| 3239.7              | 3269.7      | 10.69                                                 | 9.85  | 9.68  | 3239.7              | 3269.7      | 22.73              | 22.42 | 25.43 | 3239.7              | 3269.7      | 0.38                                 | 0.26 | 0.14 |
| 3300.1              | 3330.1      | 11.83                                                 | 10.59 | 10.17 | 3300.1              | 3330.1      | 31.22              | 28.10 | 24.42 | 3300.1              | 3330.1      | 0.13                                 | 0.13 | 0.14 |

# 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)=2000MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=889.9MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=3110.1001MHz<br>(dB) |
|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|-----------------------------------------------------------------|----------------------|-------------|---------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                       |                      |             | @LO (dBm)                                                           |
|                      |             | +17                                                            |                      |             | +17                                                             |                      |             | +17                                                                 |
| 1200.0               | 800.0       | 10.85                                                          | 10.1                 | 900.0       | 7.89                                                            | 810.1                | 2300.0      | 10.11                                                               |
| 1139.5               | 860.5       | 9.44                                                           | 50.1                 | 940.0       | 7.68                                                            | 789.6                | 2320.5      | 9.99                                                                |
| 1079.0               | 921.0       | 8.88                                                           | 90.1                 | 980.0       | 7.87                                                            | 769.1                | 2341.0      | 9.81                                                                |
| 1018.5               | 981.5       | 8.44                                                           | 130.1                | 1020.0      | 7.89                                                            | 748.6                | 2361.5      | 9.70                                                                |
| 958.0                | 1042.0      | 8.65                                                           | 170.1                | 1060.0      | 7.62                                                            | 728.0                | 2382.1      | 9.58                                                                |
| 897.5                | 1102.5      | 9.14                                                           | 210.1                | 1100.0      | 7.25                                                            | 707.5                | 2402.6      | 9.52                                                                |
| 836.9                | 1163.1      | 8.74                                                           | 250.1                | 1140.0      | 6.83                                                            | 687.0                | 2423.1      | 9.42                                                                |
| 776.4                | 1223.6      | 8.70                                                           | 290.1                | 1180.0      | 6.53                                                            | 666.5                | 2443.6      | 9.41                                                                |
| 715.9                | 1284.1      | 7.80                                                           | 330.1                | 1220.0      | 6.38                                                            | 646.0                | 2464.1      | 9.34                                                                |
| 655.4                | 1344.6      | 8.07                                                           | 370.1                | 1260.0      | 6.42                                                            | 625.5                | 2484.6      | 9.39                                                                |
| 594.9                | 1405.1      | 7.90                                                           | 410.1                | 1300.0      | 6.33                                                            | 605.0                | 2505.1      | 9.36                                                                |
| 534.4                | 1465.6      | 7.59                                                           | 450.1                | 1340.0      | 6.27                                                            | 584.5                | 2525.6      | 9.53                                                                |
| 473.9                | 1526.1      | 7.35                                                           | 490.1                | 1380.0      | 6.30                                                            | 563.9                | 2546.2      | 9.55                                                                |
| 413.4                | 1586.6      | 6.81                                                           | 530.1                | 1420.0      | 6.44                                                            | 543.4                | 2566.7      | 9.70                                                                |
| 352.9                | 1647.1      | 6.66                                                           | 570.1                | 1460.0      | 6.67                                                            | 522.9                | 2587.2      | 9.73                                                                |
| 292.4                | 1707.6      | 6.43                                                           | 610.1                | 1500.0      | 6.69                                                            | 502.4                | 2607.7      | 9.92                                                                |
| 231.9                | 1768.1      | 7.05                                                           | 650.1                | 1540.0      | 6.74                                                            | 481.9                | 2628.2      | 9.72                                                                |
| 171.4                | 1828.6      | 7.26                                                           | 690.1                | 1580.0      | 6.68                                                            | 461.4                | 2648.7      | 9.72                                                                |
| 110.8                | 1889.2      | 7.26                                                           | 730.1                | 1620.0      | 6.71                                                            | 440.9                | 2669.2      | 9.46                                                                |
| 50.3                 | 1949.7      | 7.03                                                           | 750.1                | 1640.0      | 6.71                                                            | 420.4                | 2689.7      | 9.61                                                                |
| 10.0                 | 2010.0      | 7.33                                                           | 790.1                | 1680.0      | 6.75                                                            | 399.8                | 2710.3      | 9.51                                                                |
| 70.5                 | 2070.5      | 6.91                                                           | 810.1                | 1700.0      | 6.79                                                            | 379.3                | 2730.8      | 9.51                                                                |
| 131.0                | 2131.0      | 6.87                                                           | 850.1                | 1740.0      | 6.94                                                            | 358.8                | 2751.3      | 9.40                                                                |
| 191.5                | 2191.5      | 6.94                                                           | 870.1                | 1760.0      | 7.08                                                            | 338.3                | 2771.8      | 9.49                                                                |
| 252.0                | 2252.0      | 7.13                                                           | 910.1                | 1800.0      | 7.25                                                            | 317.8                | 2792.3      | 9.39                                                                |
| 312.5                | 2312.5      | 7.37                                                           | 930.1                | 1820.0      | 7.27                                                            | 297.3                | 2812.8      | 9.47                                                                |
| 373.1                | 2373.1      | 7.36                                                           | 970.1                | 1860.0      | 7.38                                                            | 276.8                | 2833.3      | 9.46                                                                |
| 433.6                | 2433.6      | 7.31                                                           | 990.1                | 1880.0      | 7.74                                                            | 256.3                | 2853.8      | 9.48                                                                |
| 494.1                | 2494.1      | 7.36                                                           | 1030.1               | 1920.0      | 7.88                                                            | 235.7                | 2874.4      | 9.43                                                                |
| 554.6                | 2554.6      | 7.75                                                           | 1050.1               | 1940.0      | 7.75                                                            | 215.2                | 2894.9      | 9.43                                                                |
| 615.1                | 2615.1      | 8.05                                                           | 1090.1               | 1980.0      | 7.92                                                            | 194.7                | 2915.4      | 9.37                                                                |
| 675.6                | 2675.6      | 8.05                                                           | 1110.1               | 2000.0      | 8.14                                                            | 174.2                | 2935.9      | 9.32                                                                |
| 736.1                | 2736.1      | 8.15                                                           | 1150.1               | 2040.0      | 8.07                                                            | 153.7                | 2956.4      | 9.27                                                                |
| 796.6                | 2796.6      | 8.03                                                           | 1170.1               | 2060.0      | 7.91                                                            | 133.2                | 2976.9      | 9.21                                                                |
| 857.1                | 2857.1      | 8.26                                                           | 1210.1               | 2100.0      | 7.90                                                            | 112.7                | 2997.4      | 9.12                                                                |
| 917.6                | 2917.6      | 8.16                                                           | 1230.1               | 2120.0      | 7.84                                                            | 92.2                 | 3017.9      | 9.03                                                                |
| 998.3                | 2998.3      | 8.08                                                           | 1270.1               | 2160.0      | 8.17                                                            | 71.6                 | 3038.5      | 8.96                                                                |
| 1058.8               | 3058.8      | 8.42                                                           | 1290.1               | 2180.0      | 8.70                                                            | 51.1                 | 3059.0      | 8.84                                                                |
| 1139.5               | 3139.5      | 9.28                                                           | 1330.1               | 2220.0      | 9.59                                                            | 30.6                 | 3079.5      | 8.78                                                                |
| 1200.0               | 3200.0      | 10.11                                                          | 1350.1               | 2240.0      | 10.05                                                           | 10.1                 | 3100.0      | 9.03                                                                |

## 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   |
| 450.1       | 38.15                   | 31.83 | 29.35 | 20.68                   | 14.93 | 12.15 |
| 530.7       | 36.33                   | 29.61 | 27.52 | 19.15                   | 13.24 | 11.69 |
| 611.2       | 31.34                   | 27.34 | 27.30 | 15.90                   | 12.30 | 12.13 |
| 691.8       | 29.06                   | 26.23 | 27.08 | 14.44                   | 11.61 | 11.97 |
| 772.3       | 27.59                   | 25.63 | 26.71 | 13.63                   | 11.12 | 11.83 |
| 852.9       | 26.86                   | 25.19 | 26.57 | 12.84                   | 10.76 | 11.59 |
| 933.5       | 26.98                   | 25.30 | 26.70 | 12.51                   | 10.40 | 11.15 |
| 1014.0      | 27.18                   | 26.41 | 28.28 | 12.27                   | 10.12 | 10.72 |
| 1094.6      | 28.40                   | 29.11 | 29.36 | 11.90                   | 9.86  | 10.19 |
| 1175.1      | 30.59                   | 31.74 | 31.81 | 12.16                   | 10.06 | 10.21 |
| 1255.7      | 32.32                   | 33.49 | 33.47 | 12.72                   | 10.94 | 11.24 |
| 1336.3      | 32.44                   | 33.54 | 35.05 | 13.38                   | 12.75 | 13.18 |
| 1416.8      | 29.17                   | 31.84 | 34.94 | 13.70                   | 14.39 | 14.81 |
| 1497.4      | 27.12                   | 30.44 | 33.52 | 15.98                   | 16.29 | 16.41 |
| 1577.9      | 27.88                   | 30.40 | 33.39 | 19.09                   | 18.82 | 18.42 |
| 1638.4      | 28.70                   | 31.25 | 35.04 | 21.74                   | 21.09 | 20.30 |
| 1718.9      | 29.81                   | 32.07 | 35.70 | 25.15                   | 23.80 | 22.62 |
| 1779.3      | 29.46                   | 32.13 | 35.52 | 26.91                   | 25.31 | 24.18 |
| 1859.9      | 30.84                   | 35.00 | 40.23 | 29.98                   | 27.67 | 26.39 |
| 1920.3      | 30.87                   | 35.16 | 39.87 | 31.80                   | 28.92 | 27.60 |
| 2000.9      | 30.55                   | 34.22 | 37.83 | 33.18                   | 30.34 | 28.79 |
| 2061.3      | 30.16                   | 33.29 | 36.35 | 33.62                   | 31.33 | 29.97 |
| 2141.8      | 29.49                   | 32.21 | 34.70 | 33.97                   | 32.42 | 31.24 |
| 2202.3      | 28.93                   | 31.60 | 34.04 | 34.30                   | 32.82 | 32.07 |
| 2282.8      | 28.13                   | 30.69 | 32.70 | 34.38                   | 33.42 | 32.88 |
| 2343.2      | 27.22                   | 29.67 | 31.61 | 34.30                   | 33.89 | 33.60 |
| 2423.8      | 26.09                   | 28.52 | 30.45 | 33.87                   | 34.17 | 34.03 |
| 2484.2      | 25.00                   | 27.10 | 28.99 | 33.42                   | 33.96 | 34.09 |
| 2564.8      | 21.56                   | 23.71 | 25.72 | 32.39                   | 33.18 | 33.85 |
| 2625.2      | 21.72                   | 22.76 | 24.37 | 33.54                   | 33.57 | 34.14 |
| 2705.8      | 22.68                   | 23.76 | 24.72 | 35.35                   | 35.52 | 35.75 |
| 2766.2      | 23.21                   | 24.60 | 25.69 | 36.62                   | 37.21 | 37.66 |
| 2846.7      | 23.73                   | 25.24 | 26.40 | 38.48                   | 39.64 | 40.45 |
| 2907.2      | 24.03                   | 25.57 | 26.72 | 39.79                   | 41.54 | 42.66 |
| 2987.7      | 24.51                   | 26.49 | 27.60 | 42.03                   | 45.68 | 47.77 |
| 3048.1      | 24.65                   | 26.98 | 28.30 | 45.87                   | 52.31 | 54.40 |
| 3128.7      | 24.92                   | 27.23 | 28.82 | 53.29                   | 60.04 | 50.75 |
| 3189.1      | 25.20                   | 27.19 | 28.77 | 70.24                   | 51.30 | 46.99 |
| 3269.7      | 25.27                   | 27.05 | 28.47 | 46.54                   | 43.44 | 41.73 |
| 3330.1      | 25.12                   | 26.94 | 28.36 | 39.80                   | 38.61 | 38.03 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 420.1               | 450.1       | 15.25                   | 17.44 | 18.73 |
| 500.7               | 530.7       | 14.36                   | 16.57 | 18.16 |
| 581.2               | 611.2       | 13.87                   | 16.20 | 19.99 |
| 661.8               | 691.8       | 14.05                   | 15.89 | 18.65 |
| 742.3               | 772.3       | 13.88                   | 15.98 | 18.47 |
| 822.9               | 852.9       | 14.30                   | 17.44 | 19.31 |
| 903.5               | 933.5       | 16.69                   | 18.55 | 19.82 |
| 984.0               | 1014.0      | 19.48                   | 20.21 | 21.11 |
| 1064.6              | 1094.6      | 20.67                   | 20.93 | 20.36 |
| 1145.1              | 1175.1      | 21.91                   | 20.46 | 20.48 |
| 1225.7              | 1255.7      | 23.20                   | 21.04 | 20.59 |
| 1306.3              | 1336.3      | 24.38                   | 22.32 | 22.32 |
| 1386.8              | 1416.8      | 21.09                   | 21.47 | 22.14 |
| 1467.4              | 1497.4      | 20.89                   | 20.89 | 21.46 |
| 1547.9              | 1577.9      | 22.45                   | 22.22 | 22.10 |
| 1608.4              | 1638.4      | 24.10                   | 23.84 | 23.68 |
| 1688.9              | 1718.9      | 27.29                   | 27.30 | 27.11 |
| 1749.3              | 1779.3      | 28.59                   | 29.23 | 29.55 |
| 1829.9              | 1859.9      | 29.30                   | 30.38 | 31.05 |
| 1890.3              | 1920.3      | 28.57                   | 29.26 | 29.71 |
| 1970.9              | 2000.9      | 28.07                   | 28.40 | 28.63 |
| 2031.3              | 2061.3      | 27.46                   | 27.66 | 27.85 |
| 2111.8              | 2141.8      | 26.47                   | 26.60 | 26.74 |
| 2172.3              | 2202.3      | 25.81                   | 25.91 | 25.99 |
| 2252.8              | 2282.8      | 25.22                   | 25.35 | 25.43 |
| 2313.2              | 2343.2      | 24.77                   | 24.87 | 24.94 |
| 2393.8              | 2423.8      | 24.25                   | 24.24 | 24.25 |
| 2454.2              | 2484.2      | 23.68                   | 23.60 | 23.47 |
| 2534.8              | 2564.8      | 22.39                   | 21.67 | 21.37 |
| 2595.2              | 2625.2      | 21.24                   | 20.66 | 19.92 |
| 2675.8              | 2705.8      | 19.02                   | 18.55 | 18.13 |
| 2736.2              | 2766.2      | 17.51                   | 17.03 | 16.63 |
| 2816.7              | 2846.7      | 15.40                   | 15.00 | 14.79 |
| 2877.2              | 2907.2      | 14.01                   | 13.72 | 13.56 |
| 2957.7              | 2987.7      | 12.41                   | 12.24 | 12.11 |
| 3018.1              | 3048.1      | 11.50                   | 11.36 | 11.28 |
| 3098.7              | 3128.7      | 10.29                   | 10.24 | 10.19 |
| 3159.1              | 3189.1      | 9.48                    | 9.50  | 9.55  |
| 3239.7              | 3269.7      | 8.64                    | 8.70  | 8.77  |
| 3300.1              | 3330.1      | 8.09                    | 8.17  | 8.23  |

# Frequency Mixer

SYM-ED7654/1

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF VSWR<br>(:1) |      |      | LO<br>(MHz) | LO VSWR<br>(:1) |       |      |        | IF<br>(OUT)<br>(MHz) | IF VSWR<br>@LO=3100MHz<br>(:1) |      |  |  |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|-------|------|--------|----------------------|--------------------------------|------|--|--|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |       |      |        |                      | @LO (dBm)                      |      |  |  |
|                     |             | +14             | +17  | +20  |             | +14             | +17   | +20  | +14    |                      | +17                            | +20  |  |  |
| 420.1               | 450.1       | 11.85           | 8.43 | 6.76 | 450.1       | 23.81           | 14.26 | 7.20 | 10.0   | 1.47                 | 1.26                           | 1.11 |  |  |
| 500.7               | 530.7       | 8.01            | 5.91 | 4.79 | 530.7       | 22.00           | 10.37 | 5.83 | 50.0   | 1.46                 | 1.25                           | 1.11 |  |  |
| 581.2               | 611.2       | 6.49            | 5.02 | 4.53 | 611.2       | 16.89           | 9.28  | 4.28 | 90.0   | 1.46                 | 1.25                           | 1.10 |  |  |
| 661.8               | 691.8       | 5.77            | 5.34 | 5.25 | 691.8       | 14.03           | 6.97  | 3.41 | 130.0  | 1.43                 | 1.23                           | 1.10 |  |  |
| 742.3               | 772.3       | 6.13            | 5.52 | 4.80 | 772.3       | 11.53           | 5.39  | 2.95 | 170.0  | 1.42                 | 1.20                           | 1.08 |  |  |
| 822.9               | 852.9       | 6.13            | 4.43 | 3.74 | 852.9       | 9.28            | 4.39  | 2.60 | 210.0  | 1.35                 | 1.16                           | 1.09 |  |  |
| 903.5               | 933.5       | 3.66            | 3.47 | 2.92 | 933.5       | 7.41            | 3.59  | 2.30 | 250.0  | 1.33                 | 1.13                           | 1.09 |  |  |
| 984.0               | 1014.0      | 2.46            | 2.45 | 2.13 | 1014.0      | 5.83            | 2.96  | 2.01 | 290.0  | 1.23                 | 1.09                           | 1.17 |  |  |
| 1064.6              | 1094.6      | 1.88            | 1.77 | 1.51 | 1094.6      | 4.56            | 2.54  | 1.79 | 330.0  | 1.20                 | 1.11                           | 1.22 |  |  |
| 1145.1              | 1175.1      | 1.52            | 1.35 | 1.31 | 1175.1      | 3.76            | 2.29  | 1.74 | 370.0  | 1.10                 | 1.16                           | 1.34 |  |  |
| 1225.7              | 1255.7      | 1.35            | 1.30 | 1.30 | 1255.7      | 3.37            | 2.26  | 1.85 | 410.0  | 1.10                 | 1.23                           | 1.41 |  |  |
| 1306.3              | 1336.3      | 1.49            | 1.57 | 1.62 | 1336.3      | 3.13            | 2.11  | 1.84 | 450.0  | 1.09                 | 1.32                           | 1.54 |  |  |
| 1386.8              | 1416.8      | 1.77            | 1.90 | 1.92 | 1416.8      | 2.95            | 1.97  | 1.87 | 490.0  | 1.18                 | 1.42                           | 1.66 |  |  |
| 1467.4              | 1497.4      | 2.38            | 2.40 | 2.36 | 1497.4      | 2.57            | 1.85  | 1.93 | 530.0  | 1.20                 | 1.47                           | 1.73 |  |  |
| 1547.9              | 1577.9      | 2.95            | 2.96 | 2.92 | 1577.9      | 2.36            | 1.82  | 2.01 | 570.0  | 1.31                 | 1.60                           | 1.89 |  |  |
| 1608.4              | 1638.4      | 3.03            | 3.22 | 3.31 | 1638.4      | 2.46            | 1.87  | 2.07 | 590.0  | 1.29                 | 1.59                           | 1.89 |  |  |
| 1688.9              | 1718.9      | 2.73            | 2.84 | 3.01 | 1718.9      | 2.40            | 1.86  | 2.15 | 630.0  | 1.38                 | 1.72                           | 2.03 |  |  |
| 1749.3              | 1779.3      | 2.97            | 2.86 | 2.89 | 1779.3      | 2.32            | 1.91  | 2.23 | 650.0  | 1.39                 | 1.72                           | 2.05 |  |  |
| 1829.9              | 1859.9      | 3.03            | 2.76 | 2.64 | 1859.9      | 2.37            | 1.88  | 2.22 | 690.0  | 1.39                 | 1.72                           | 2.06 |  |  |
| 1890.3              | 1920.3      | 3.27            | 2.98 | 2.80 | 1920.3      | 2.19            | 1.76  | 2.20 | 710.0  | 1.45                 | 1.80                           | 2.14 |  |  |
| 1970.9              | 2000.9      | 3.91            | 3.67 | 3.48 | 2000.9      | 1.86            | 1.68  | 2.26 | 750.0  | 1.49                 | 1.84                           | 2.20 |  |  |
| 2031.3              | 2061.3      | 3.94            | 3.75 | 3.61 | 2061.3      | 1.64            | 1.64  | 2.28 | 770.0  | 1.43                 | 1.75                           | 2.12 |  |  |
| 2111.8              | 2141.8      | 3.85            | 3.68 | 3.54 | 2141.8      | 1.42            | 1.60  | 2.28 | 810.0  | 1.45                 | 1.73                           | 2.06 |  |  |
| 2172.3              | 2202.3      | 3.76            | 3.57 | 3.43 | 2202.3      | 1.30            | 1.62  | 2.37 | 830.0  | 1.55                 | 1.81                           | 2.14 |  |  |
| 2252.8              | 2282.8      | 3.46            | 3.28 | 3.16 | 2282.8      | 1.13            | 1.65  | 2.45 | 870.0  | 1.53                 | 1.71                           | 1.97 |  |  |
| 2313.2              | 2343.2      | 3.18            | 3.01 | 2.90 | 2343.2      | 1.05            | 1.63  | 2.39 | 890.0  | 1.52                 | 1.64                           | 1.88 |  |  |
| 2393.8              | 2423.8      | 2.78            | 2.61 | 2.49 | 2423.8      | 1.10            | 1.65  | 2.37 | 930.0  | 1.57                 | 1.57                           | 1.72 |  |  |
| 2454.2              | 2484.2      | 2.44            | 2.30 | 2.18 | 2484.2      | 1.15            | 1.69  | 2.45 | 950.0  | 1.60                 | 1.57                           | 1.70 |  |  |
| 2534.8              | 2564.8      | 2.17            | 1.88 | 1.80 | 2564.8      | 1.22            | 1.70  | 2.42 | 990.0  | 1.68                 | 1.52                           | 1.51 |  |  |
| 2595.2              | 2625.2      | 2.01            | 1.85 | 1.66 | 2625.2      | 1.33            | 1.78  | 2.40 | 1010.0 | 1.70                 | 1.48                           | 1.40 |  |  |
| 2675.8              | 2705.8      | 1.84            | 1.74 | 1.68 | 2705.8      | 1.58            | 1.90  | 2.53 | 1050.0 | 1.77                 | 1.47                           | 1.26 |  |  |
| 2736.2              | 2766.2      | 1.77            | 1.70 | 1.67 | 2766.2      | 1.76            | 2.01  | 2.64 | 1070.0 | 1.85                 | 1.53                           | 1.28 |  |  |
| 2816.7              | 2846.7      | 1.80            | 1.78 | 1.77 | 2846.7      | 1.99            | 2.09  | 2.63 | 1110.0 | 1.98                 | 1.62                           | 1.36 |  |  |
| 2877.2              | 2907.2      | 1.90            | 1.90 | 1.91 | 2907.2      | 2.14            | 2.14  | 2.57 | 1130.0 | 2.09                 | 1.73                           | 1.48 |  |  |
| 2957.7              | 2987.7      | 2.08            | 2.10 | 2.13 | 2987.7      | 2.36            | 2.27  | 2.63 | 1170.0 | 2.32                 | 1.97                           | 1.80 |  |  |
| 3018.1              | 3048.1      | 2.28            | 2.30 | 2.32 | 3048.1      | 2.52            | 2.35  | 2.69 | 1190.0 | 2.43                 | 2.10                           | 1.96 |  |  |
| 3098.7              | 3128.7      | 2.52            | 2.51 | 2.53 | 3128.7      | 2.75            | 2.40  | 2.66 | 1230.0 | 2.68                 | 2.43                           | 2.37 |  |  |
| 3159.1              | 3189.1      | 2.67            | 2.63 | 2.63 | 3189.1      | 2.86            | 2.48  | 2.68 | 1250.0 | 2.93                 | 2.69                           | 2.68 |  |  |
| 3239.7              | 3269.7      | 2.90            | 2.82 | 2.80 | 3269.7      | 3.02            | 2.54  | 2.74 | 1290.0 | 3.31                 | 3.15                           | 3.22 |  |  |
| 3300.1              | 3330.1      | 3.09            | 2.99 | 2.94 | 3330.1      | 3.26            | 2.54  | 2.66 | 1310.0 | 3.45                 | 3.33                           | 3.41 |  |  |

## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 6   | 13  | 19  | 25  | 16  | 21  | 29  | 42  | 41  | 53  |
| 1  | -      | 21     | +0  | 40  | 32  | 36  | 32  | 42  | 39  | 47  | 47  | 70  |
| 2  | 61     | 61     | 63  | 54  | 63  | 70  | 63  | 63  | 53  | 53  | 61  | 70  |
| 3  | >90    | 71     | 70  | 82  | 76  | >82 | 72  | 73  | 70  | 76  | 75  | 80  |
| 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: 2000 MHz; -1.00 dBm.  
LO IN: 2030 MHz; +17.00 dBm  
IF OUT: 30 MHz; -8.03 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 16  | 23  | 29  | 36  | 28  | 36  | 44  | 59  | 54  | 68  |
| 1  | -      | 21     | +0  | 41  | 31  | 40  | 33  | 42  | 42  | 46  | 53  | 76  |
| 2  | 41     | 54     | 53  | 43  | 54  | 60  | 57  | 55  | 46  | 48  | 54  | 66  |
| 3  | 70     | 51     | 50  | 64  | 48  | 64  | 57  | 55  | 53  | 71  | 57  | 73  |
| 4  | >90    | 70     | 71  | 67  | 83  | 65  | 84  | 84  | 76  | 70  | 62  | 62  |
| 5  | >90    | 74     | 91  | 73  | 73  | 80  | 64  | 85  | 72  | 72  | 67  | 74  |
| 6  | >90    | 85     | 81  | 86  | 84  | 85  | >92 | 91  | >92 | 87  | >92 | 86  |
| 7  | >90    | >92    | 90  | 86  | >92 | 89  | 85  | 91  | 78  | 90  | 83  | 87  |
| 8  | >90    | >92    | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 |
| 9  | >90    | >92    | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 |
| 10 | >90    | >92    | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

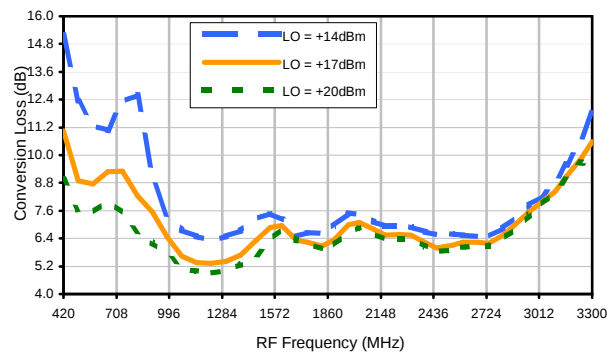
### LO HARMONICS ORDER

Test conditions: RF IN: 2000 MHz; 9.00 dBm.  
LO IN: 2030 MHz; +17.00 dBm  
IF OUT: 30 MHz; 1.97 dBm

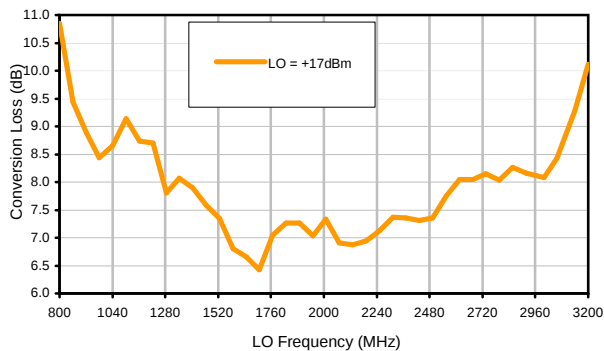
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Typical Performance Curves

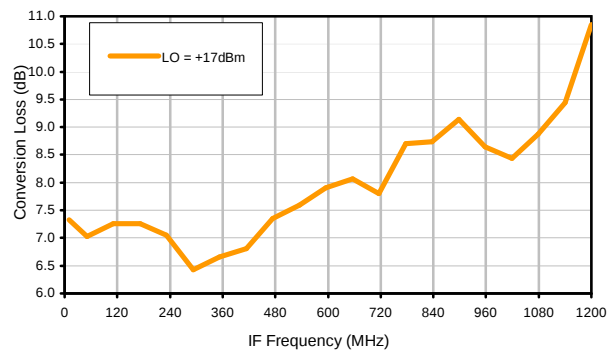
Conversion Loss @ IF=30MHz



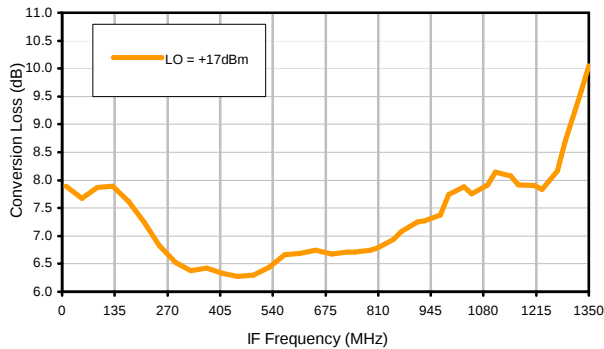
Conversion Loss vs. LO @ RF=2000MHz



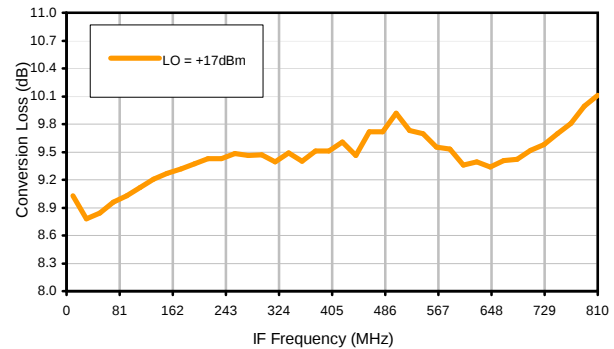
Conversion Loss vs. IF @ RF=2000MHz



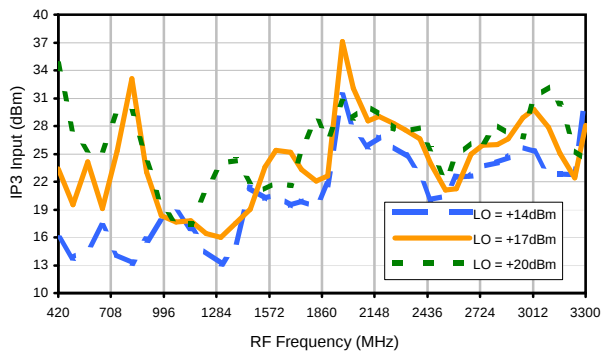
Conversion Loss vs. IF @ RF=889.9MHz



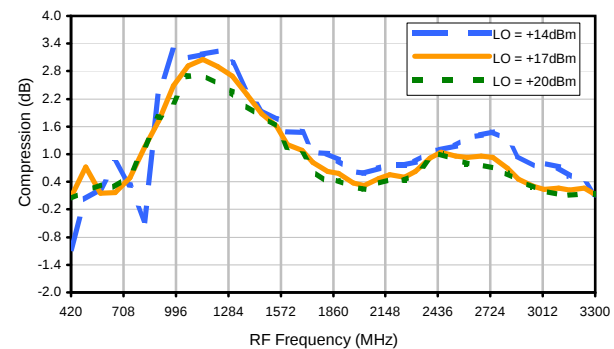
Conversion Loss vs. IF @ RF=3110.1001MHz



IP3 Input

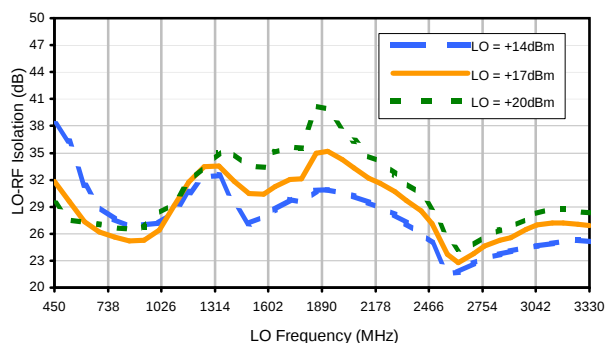


Compression @ RF IN=+14dBm

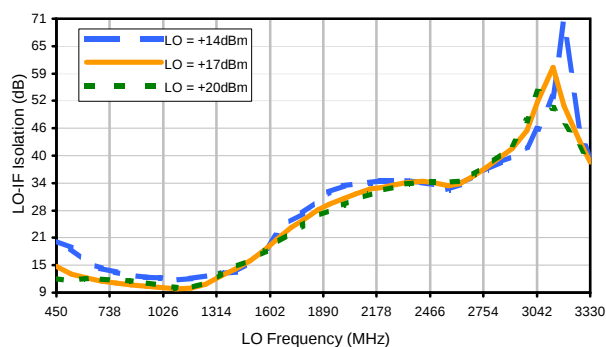


## Typical Performance Curves

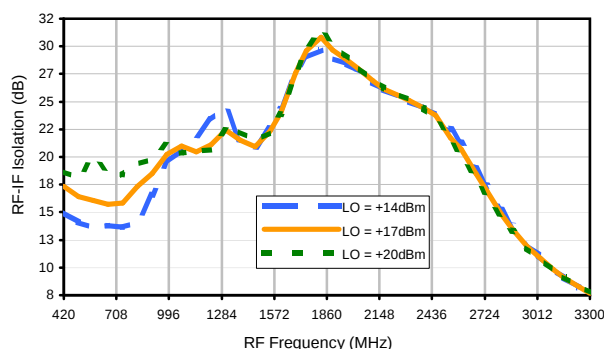
LO-RF Isolation



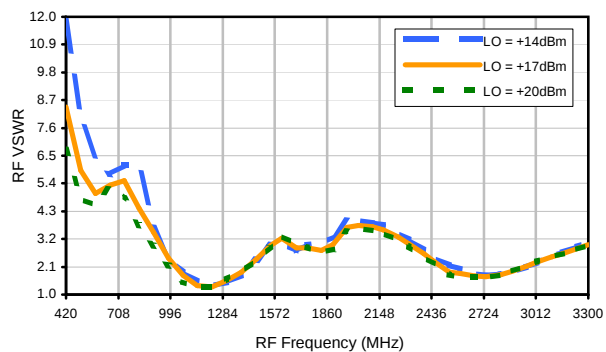
LO-IF Isolation



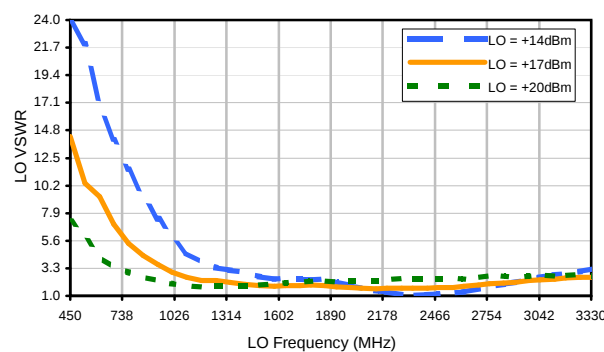
RF-IF Isolation



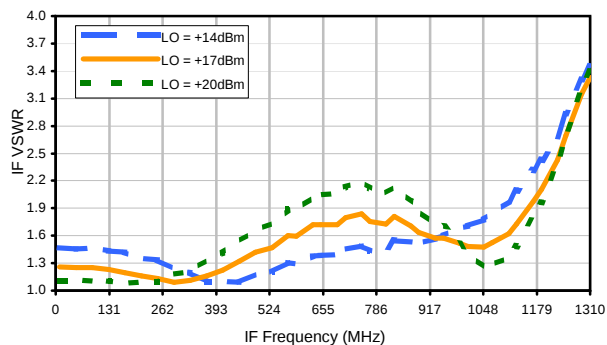
RF VSWR



LO VSWR



IF VSWR



## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 6   | 13  | 19  | 25  | 16  | 21  | 29  | 42  | 41  | 53  |
| 1  | -      | 21     | +0  | 40  | 32  | 36  | 32  | 42  | 39  | 47  | 47  | 70  |
| 2  | 61     | 61     | 63  | 54  | 63  | 70  | 63  | 63  | 53  | 53  | 61  | 70  |
| 3  | >90    | 71     | 70  | 82  | 76  | >82 | 72  | 73  | 70  | 76  | 75  | 80  |
| 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: 2000 MHz; -1.00 dBm.  
LO IN: 2030 MHz; +17.00 dBm  
IF OUT: 30 MHz; -8.03 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | 16  | 23  | 29  | 36  | 28  | 36  | 44  | 59  | 54  | 68  |
| 1  | -      | 21     | +0  | 41  | 31  | 40  | 33  | 42  | 42  | 46  | 53  | 76  |
| 2  | 41     | 54     | 53  | 43  | 54  | 60  | 57  | 55  | 46  | 48  | 54  | 66  |
| 3  | 70     | 51     | 50  | 64  | 48  | 64  | 57  | 55  | 53  | 71  | 57  | 73  |
| 4  | >90    | 70     | 71  | 67  | 83  | 65  | 84  | 84  | 76  | 70  | 62  | 62  |
| 5  | >90    | 74     | 91  | 73  | 73  | 80  | 64  | 85  | 72  | 72  | 67  | 74  |
| 6  | >90    | 85     | 81  | 86  | 84  | 85  | >92 | 91  | >92 | 87  | >92 | 86  |
| 7  | >90    | >92    | 90  | 86  | >92 | 89  | 85  | 91  | 78  | 90  | 83  | 87  |
| 8  | >90    | >92    | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 |
| 9  | >90    | >92    | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 |
| 10 | >90    | >92    | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 | >92 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions: RF IN: 2000 MHz; 9.00 dBm.  
LO IN: 2030 MHz; +17.00 dBm  
IF OUT: 30 MHz; 1.97 dBm

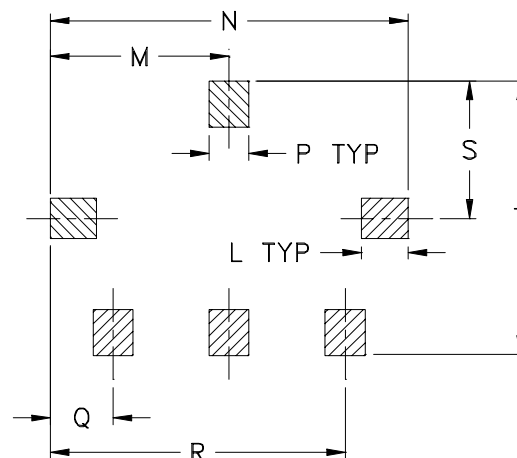
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Outline Dimensions

TTT166  
TTT167



## PCB Land Pattern



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

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

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

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

### Note:

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

# Tape & Reel Packaging TR-F12



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel                    |     |
|----------------|-------------------------|-------------------|-------------------------------------|-----|
| 24             | 12                      | 7                 | Small quantity standards (see note) | 10  |
|                |                         |                   |                                     | 20  |
|                |                         |                   |                                     | 50  |
|                |                         |                   |                                     | 100 |
|                |                         |                   |                                     | 200 |
|                |                         | 13                | Standard                            | 500 |

Note: Please Consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



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## THIRD ANGLE PROJECTION



## REVISIONS

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

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

**NOTE:**

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030"  $\pm$  .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. THE USE OF SOLDER MASK OVER THE GROUND AREA UNDER THE UNIT AS SHOWN IS RECOMMENDED TO PREVENT POTENTIAL SHORTING. IF USER CHOOSES TO EXPOSE METAL UNDER THE ENTIRE UNIT GROUND PAD FOR IMPROVED GROUNDING, IT IS RECOMMENDED A SOLDER MASK DAM BE APPLIED AROUND EACH GROUND PAD TO ENSURE FILLET AND CONNECTION AT GROUND PADS.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

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

DRAWN

GF

03/18/03

CHECKED

IL

04/15/03

APPROVED

DJ

04/15/03



**Mini-Circuits®**

13 Neptune Avenue  
Brooklyn NY 11235

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

SIZE  
A

CODE IDENT  
15542

DRAWING NO:  
98-PL-079

REV:  
D

FILE: 98PL079

SCALE: 5:1

SHEET: 1 OF 1

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

# Evaluation Board and Circuit

For Pin Connections Refer to Data Sheet of the DUT



Schematic Diagram

## Notes:

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

 **Mini-Circuits®**



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification                  | Test/Inspection Condition                                                                                                                                       | Reference/Spec                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Operating Temperature          | -40° to 85°C<br>Ambient Environment                                                                                                                             | Individual Model Data Sheet                                                                          |
| Storage Temperature            | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Humidity                       | 90 to 95% RH, 240 hours, 50°C                                                                                                                                   | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                                                       | MIL-STD-202, Method 107, Condition A-3, except +100°C                                                |
| Solder Reflow Heat             | Sn-Pb Eutetic Process: 225°C peak<br>Pb-Free Process 245° - 250°C peak                                                                                          | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1                                                        |
| Solderability                  | 10X Magnification                                                                                                                                               | J-STD-002, 95% Coverage                                                                              |
| Vibration (High Frequency)     | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)                                                                             | MIL-STD-202, Method 204, Condition D                                                                 |
| Mechanical Shock               | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes                                                                                               | MIL-STD-202, Method 213, Condition A                                                                 |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215                                                                              |