

# Frequency Mixer

## SYM-ED14497/1

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 (fL to fu) | 40   |      | 775  | MHz   |
|                                       | RF (fL to fu) | 10   |      | 745  | MHz   |
|                                       | IF            | DC   |      | 400  | MHz   |
| Conversion Loss                       | mid band      |      | 7.8  |      | dB    |
|                                       | Total Range   |      | 8.2  |      | dB    |
| LO-RF Isolation                       | Low Range     |      | 60   |      | dB    |
|                                       | Mid Range     |      | 55   |      | dB    |
|                                       | Upper Range   |      | 48   |      | dB    |
| LO-IF Isolation                       | Low Range     |      | 48   |      | dB    |
|                                       | Mid Range     |      | 45   |      | dB    |
|                                       | Upper Range   |      | 40   |      | dB    |
| Input IP3                             |               |      | +29  |      | dBm   |
| 1 dB Compression                      |               |      | +14  |      | dBm   |

Note: Low Range = [fL to 10fL]  
mid band = [2fL to fu/2]

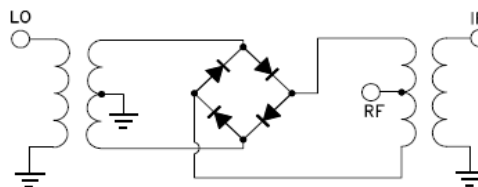
Mid Range = [10fL to fu/2]

Upper Range = [fu/2 to fu]

| 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 |

### Electrical Schematic



# Frequency Mixer

SYM-ED14497/1

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=30MHz<br>(dB) |       |       |
|---------------------|-------------|-------------------------------------------------------|-------|-------|
|                     |             | @LO (dBm)                                             |       |       |
|                     |             | +17                                                   | +20   | +23   |
| 10.1                | 40.1        | 7.47                                                  | 7.05  | 6.98  |
| 45.1                | 75.1        | 7.61                                                  | 7.30  | 7.12  |
| 80.1                | 110.1       | 7.71                                                  | 7.47  | 7.33  |
| 120.1               | 150.1       | 7.69                                                  | 7.44  | 7.30  |
| 155.1               | 185.1       | 7.74                                                  | 7.46  | 7.36  |
| 190.1               | 220.1       | 7.80                                                  | 7.60  | 7.47  |
| 230.1               | 260.1       | 7.65                                                  | 7.45  | 7.33  |
| 265.1               | 295.1       | 7.69                                                  | 7.50  | 7.44  |
| 305.1               | 335.1       | 7.74                                                  | 7.55  | 7.46  |
| 340.1               | 370.1       | 7.74                                                  | 7.56  | 7.45  |
| 375.1               | 405.1       | 7.84                                                  | 7.66  | 7.57  |
| 415.1               | 445.1       | 7.77                                                  | 7.58  | 7.46  |
| 450.1               | 480.1       | 7.88                                                  | 7.70  | 7.59  |
| 490.1               | 520.1       | 7.91                                                  | 7.73  | 7.64  |
| 530.1               | 560.1       | 7.96                                                  | 7.76  | 7.65  |
| 560.1               | 590.1       | 8.10                                                  | 7.89  | 7.76  |
| 600.1               | 630.1       | 8.15                                                  | 7.92  | 7.77  |
| 635.1               | 665.1       | 8.25                                                  | 8.02  | 7.86  |
| 670.1               | 700.1       | 8.42                                                  | 8.17  | 8.01  |
| 710.1               | 740.1       | 8.46                                                  | 8.19  | 8.02  |
| 745.1               | 775.1       | 8.50                                                  | 8.22  | 8.06  |
| 785.1               | 815.1       | 8.57                                                  | 8.30  | 8.13  |
| 820.1               | 850.1       | 8.71                                                  | 8.43  | 8.25  |
| 855.1               | 885.1       | 8.82                                                  | 8.54  | 8.36  |
| 895.1               | 925.1       | 8.94                                                  | 8.68  | 8.48  |
| 930.1               | 960.1       | 9.09                                                  | 8.86  | 8.66  |
| 970.1               | 1000.1      | 9.20                                                  | 8.96  | 8.77  |
| 1005.1              | 1035.1      | 9.20                                                  | 8.97  | 8.79  |
| 1040.1              | 1070.1      | 9.31                                                  | 9.02  | 8.86  |
| 1080.1              | 1110.1      | 9.44                                                  | 9.12  | 8.95  |
| 1115.1              | 1145.1      | 9.66                                                  | 9.27  | 9.09  |
| 1150.1              | 1180.1      | 9.74                                                  | 9.35  | 9.12  |
| 1190.1              | 1220.1      | 10.02                                                 | 9.52  | 9.25  |
| 1225.1              | 1255.1      | 10.32                                                 | 9.78  | 9.44  |
| 1265.1              | 1295.1      | 10.52                                                 | 9.92  | 9.56  |
| 1300.1              | 1330.1      | 10.79                                                 | 10.12 | 9.73  |
| 1335.1              | 1365.1      | 11.19                                                 | 10.35 | 9.86  |
| 1375.1              | 1405.1      | 11.59                                                 | 10.64 | 10.06 |
| 1410.1              | 1440.1      | 11.89                                                 | 10.86 | 10.21 |
| 1450.1              | 1480.1      | 12.34                                                 | 11.27 | 10.44 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP-3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|---------------------|-------|-------|
|                     |             | @LO (dBm)           |       |       |
|                     |             | +17                 | +20   | +23   |
| 10.1                | 40.1        | 31.38               | 34.10 | 34.85 |
| 45.1                | 75.1        | 31.58               | 31.28 | 31.20 |
| 80.1                | 110.1       | 31.38               | 30.70 | 33.45 |
| 120.1               | 150.1       | 28.96               | 31.50 | 39.51 |
| 155.1               | 185.1       | 28.02               | 32.42 | 42.13 |
| 190.1               | 220.1       | 28.63               | 32.94 | 36.71 |
| 230.1               | 260.1       | 33.51               | 35.43 | 34.53 |
| 265.1               | 295.1       | 33.79               | 33.46 | 33.41 |
| 305.1               | 335.1       | 32.19               | 35.82 | 34.88 |
| 340.1               | 370.1       | 33.32               | 30.56 | 30.73 |
| 375.1               | 405.1       | 30.83               | 29.37 | 31.98 |
| 415.1               | 445.1       | 31.89               | 31.15 | 31.81 |
| 450.1               | 480.1       | 28.45               | 29.84 | 34.51 |
| 490.1               | 520.1       | 26.92               | 26.99 | 29.15 |
| 530.1               | 560.1       | 25.69               | 27.01 | 29.75 |
| 560.1               | 590.1       | 24.90               | 26.93 | 31.42 |
| 600.1               | 630.1       | 23.42               | 24.63 | 29.11 |
| 635.1               | 665.1       | 24.15               | 25.20 | 28.54 |
| 670.1               | 700.1       | 27.20               | 27.91 | 31.67 |
| 710.1               | 740.1       | 29.49               | 31.78 | 30.79 |
| 745.1               | 775.1       | 29.45               | 30.00 | 28.81 |
| 785.1               | 815.1       | 26.35               | 33.39 | 28.82 |
| 820.1               | 850.1       | 23.96               | 26.97 | 37.24 |
| 855.1               | 885.1       | 23.13               | 25.24 | 29.80 |
| 895.1               | 925.1       | 22.38               | 23.99 | 28.04 |
| 930.1               | 960.1       | 21.99               | 23.08 | 25.67 |
| 970.1               | 1000.1      | 22.25               | 23.93 | 26.77 |
| 1005.1              | 1035.1      | 22.60               | 25.45 | 29.27 |
| 1040.1              | 1070.1      | 22.64               | 26.15 | 31.29 |
| 1080.1              | 1110.1      | 22.58               | 27.12 | 34.94 |
| 1115.1              | 1145.1      | 20.98               | 26.36 | 34.84 |
| 1150.1              | 1180.1      | 19.79               | 25.68 | 37.42 |
| 1190.1              | 1220.1      | 18.01               | 22.63 | 30.87 |
| 1225.1              | 1255.1      | 17.08               | 20.54 | 24.75 |
| 1265.1              | 1295.1      | 17.12               | 20.84 | 25.26 |
| 1300.1              | 1330.1      | 16.94               | 20.80 | 26.38 |
| 1335.1              | 1365.1      | 16.36               | 20.06 | 25.07 |
| 1375.1              | 1405.1      | 16.35               | 20.21 | 25.68 |
| 1410.1              | 1440.1      | 16.64               | 20.72 | 27.03 |
| 1450.1              | 1480.1      | 16.55               | 19.80 | 26.03 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+14dBm<br>(dB) |      |      |
|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                            |      |      |
|                     |             | +17                                  | +20  | +23  |
| 10.1                | 40.1        | 1.18                                 | 0.93 | 0.54 |
| 45.1                | 75.1        | 1.33                                 | 0.94 | 0.72 |
| 80.1                | 110.1       | 1.37                                 | 0.98 | 0.70 |
| 120.1               | 150.1       | 1.18                                 | 0.82 | 0.56 |
| 155.1               | 185.1       | 1.32                                 | 0.92 | 0.64 |
| 190.1               | 220.1       | 1.36                                 | 0.93 | 0.68 |
| 230.1               | 260.1       | 1.27                                 | 0.86 | 0.61 |
| 265.1               | 295.1       | 1.34                                 | 0.94 | 0.62 |
| 305.1               | 335.1       | 1.24                                 | 0.82 | 0.58 |
| 340.1               | 370.1       | 1.14                                 | 0.77 | 0.52 |
| 375.1               | 405.1       | 1.25                                 | 0.84 | 0.59 |
| 415.1               | 445.1       | 1.15                                 | 0.77 | 0.56 |
| 450.1               | 480.1       | 1.21                                 | 0.83 | 0.60 |
| 490.1               | 520.1       | 1.09                                 | 0.73 | 0.50 |
| 530.1               | 560.1       | 1.06                                 | 0.71 | 0.51 |
| 560.1               | 590.1       | 1.19                                 | 0.82 | 0.61 |
| 600.1               | 630.1       | 1.08                                 | 0.74 | 0.56 |
| 635.1               | 665.1       | 1.03                                 | 0.69 | 0.51 |
| 670.1               | 700.1       | 1.04                                 | 0.72 | 0.52 |
| 710.1               | 740.1       | 1.10                                 | 0.77 | 0.55 |
| 745.1               | 775.1       | 1.22                                 | 0.87 | 0.63 |
| 785.1               | 815.1       | 1.17                                 | 0.82 | 0.55 |
| 820.1               | 850.1       | 1.27                                 | 0.91 | 0.64 |
| 855.1               | 885.1       | 1.25                                 | 0.89 | 0.64 |
| 895.1               | 925.1       | 1.22                                 | 0.84 | 0.61 |
| 930.1               | 960.1       | 1.50                                 | 1.04 | 0.77 |
| 970.1               | 1000.1      | 1.50                                 | 1.04 | 0.76 |
| 1005.1              | 1035.1      | 1.47                                 | 1.00 | 0.72 |
| 1040.1              | 1070.1      | 1.52                                 | 1.06 | 0.76 |
| 1080.1              | 1110.1      | 1.62                                 | 1.12 | 0.82 |
| 1115.1              | 1145.1      | 1.72                                 | 1.26 | 0.90 |
| 1150.1              | 1180.1      | 1.64                                 | 1.16 | 0.83 |
| 1190.1              | 1220.1      | 1.58                                 | 1.19 | 0.85 |
| 1225.1              | 1255.1      | 1.70                                 | 1.31 | 0.96 |
| 1265.1              | 1295.1      | 1.61                                 | 1.26 | 0.93 |
| 1300.1              | 1330.1      | 1.60                                 | 1.32 | 0.99 |
| 1335.1              | 1365.1      | 1.42                                 | 1.31 | 1.04 |
| 1375.1              | 1405.1      | 1.18                                 | 1.22 | 1.03 |
| 1410.1              | 1440.1      | 0.99                                 | 1.13 | 1.01 |
| 1450.1              | 1480.1      | 0.74                                 | 0.92 | 0.97 |

# Frequency Mixer

SYM-ED14497/1

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=220MHz<br>(dB) |
|----------------------|-------------|---------------------------------------------------------------|
|                      |             | @LO (dBm)<br><br>+20                                          |
| 209.9                | 10.1        | 7.39                                                          |
| 199.9                | 20.1        | 7.30                                                          |
| 189.9                | 30.1        | 7.32                                                          |
| 179.9                | 40.1        | 7.33                                                          |
| 169.9                | 50.1        | 7.39                                                          |
| 159.9                | 60.1        | 7.34                                                          |
| 149.9                | 70.1        | 7.37                                                          |
| 139.9                | 80.1        | 7.35                                                          |
| 129.9                | 90.1        | 7.29                                                          |
| 119.9                | 100.1       | 7.34                                                          |
| 107.9                | 112.1       | 7.21                                                          |
| 97.9                 | 122.1       | 7.25                                                          |
| 87.9                 | 132.1       | 7.27                                                          |
| 75.9                 | 144.1       | 7.27                                                          |
| 65.9                 | 154.1       | 7.30                                                          |
| 55.9                 | 164.1       | 7.25                                                          |
| 45.9                 | 174.1       | 7.32                                                          |
| 35.9                 | 184.1       | 7.37                                                          |
| 25.9                 | 194.1       | 7.39                                                          |
| 15.9                 | 204.1       | 7.49                                                          |
| 15.1                 | 235.1       | 7.58                                                          |
| 75.1                 | 295.1       | 7.29                                                          |
| 135.1                | 355.1       | 7.46                                                          |
| 205.1                | 425.1       | 7.41                                                          |
| 265.1                | 485.1       | 7.54                                                          |
| 335.1                | 555.1       | 7.52                                                          |
| 395.1                | 615.1       | 7.57                                                          |
| 455.1                | 675.1       | 7.69                                                          |
| 525.1                | 745.1       | 7.86                                                          |
| 585.1                | 805.1       | 7.82                                                          |
| 655.1                | 875.1       | 8.03                                                          |
| 715.1                | 935.1       | 8.02                                                          |
| 775.1                | 995.1       | 7.95                                                          |
| 845.1                | 1065.1      | 7.71                                                          |
| 905.1                | 1125.1      | 7.51                                                          |
| 975.1                | 1195.1      | 7.41                                                          |
| 1035.1               | 1255.1      | 7.43                                                          |
| 1095.1               | 1315.1      | 7.41                                                          |
| 1165.1               | 1385.1      | 7.55                                                          |
| 1225.1               | 1445.1      | 7.77                                                          |

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=20MHz<br>(dB) |
|----------------------|-------------|--------------------------------------------------------------|
|                      |             | @LO (dBm)<br><br>+20                                         |
| 10.1                 | 30.1        | 7.53                                                         |
| 50.1                 | 70.1        | 7.08                                                         |
| 85.1                 | 105.1       | 7.01                                                         |
| 125.1                | 145.1       | 7.02                                                         |
| 160.1                | 180.1       | 7.14                                                         |
| 200.1                | 220.1       | 7.01                                                         |
| 235.1                | 255.1       | 7.09                                                         |
| 270.1                | 290.1       | 7.11                                                         |
| 310.1                | 330.1       | 7.22                                                         |
| 345.1                | 365.1       | 7.19                                                         |
| 385.1                | 405.1       | 7.22                                                         |
| 420.1                | 440.1       | 7.26                                                         |
| 455.1                | 475.1       | 7.26                                                         |
| 495.1                | 515.1       | 7.39                                                         |
| 530.1                | 550.1       | 7.37                                                         |
| 570.1                | 590.1       | 7.29                                                         |
| 605.1                | 625.1       | 7.38                                                         |
| 640.1                | 660.1       | 7.33                                                         |
| 680.1                | 700.1       | 7.39                                                         |
| 715.1                | 735.1       | 7.41                                                         |
| 755.1                | 775.1       | 7.42                                                         |
| 790.1                | 810.1       | 7.51                                                         |
| 830.1                | 850.1       | 7.50                                                         |
| 865.1                | 885.1       | 7.46                                                         |
| 900.1                | 920.1       | 7.55                                                         |
| 940.1                | 960.1       | 7.41                                                         |
| 975.1                | 995.1       | 7.40                                                         |
| 1015.1               | 1035.1      | 7.24                                                         |
| 1050.1               | 1070.1      | 7.13                                                         |
| 1085.1               | 1105.1      | 7.05                                                         |
| 1125.1               | 1145.1      | 7.08                                                         |
| 1160.1               | 1180.1      | 7.00                                                         |
| 1200.1               | 1220.1      | 7.02                                                         |
| 1235.1               | 1255.1      | 7.12                                                         |
| 1270.1               | 1290.1      | 7.06                                                         |
| 1310.1               | 1330.1      | 7.14                                                         |
| 1345.1               | 1365.1      | 7.13                                                         |
| 1385.1               | 1405.1      | 7.36                                                         |
| 1420.1               | 1440.1      | 7.40                                                         |
| 1460.1               | 1480.1      | 7.29                                                         |

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=425MHz<br>(dB) |
|----------------------|-------------|---------------------------------------------------------------|
|                      |             | @LO (dBm)<br><br>+20                                          |
| 414.9                | 10.1        | 7.50                                                          |
| 404.9                | 20.1        | 7.43                                                          |
| 394.9                | 30.1        | 7.35                                                          |
| 384.9                | 40.1        | 7.41                                                          |
| 374.9                | 50.1        | 7.37                                                          |
| 364.9                | 60.1        | 7.38                                                          |
| 354.9                | 70.1        | 7.33                                                          |
| 344.9                | 80.1        | 7.33                                                          |
| 334.9                | 90.1        | 7.34                                                          |
| 324.9                | 100.1       | 7.27                                                          |
| 314.9                | 110.1       | 7.29                                                          |
| 304.9                | 120.1       | 7.25                                                          |
| 294.9                | 130.1       | 7.23                                                          |
| 279.9                | 145.1       | 7.22                                                          |
| 269.9                | 155.1       | 7.26                                                          |
| 259.9                | 165.1       | 7.25                                                          |
| 249.9                | 175.1       | 7.25                                                          |
| 239.9                | 185.1       | 7.24                                                          |
| 229.9                | 195.1       | 7.29                                                          |
| 219.9                | 205.1       | 7.31                                                          |
| 209.9                | 215.1       | 7.25                                                          |
| 199.9                | 225.1       | 7.28                                                          |
| 189.9                | 235.1       | 7.23                                                          |
| 179.9                | 245.1       | 7.26                                                          |
| 169.9                | 255.1       | 7.32                                                          |
| 159.9                | 265.1       | 7.35                                                          |
| 144.9                | 280.1       | 7.33                                                          |
| 134.9                | 290.1       | 7.33                                                          |
| 124.9                | 300.1       | 7.35                                                          |
| 114.9                | 310.1       | 7.38                                                          |
| 104.9                | 320.1       | 7.39                                                          |
| 94.9                 | 330.1       | 7.30                                                          |
| 84.9                 | 340.1       | 7.32                                                          |
| 74.9                 | 350.1       | 7.37                                                          |
| 64.9                 | 360.1       | 7.46                                                          |
| 54.9                 | 370.1       | 7.42                                                          |
| 44.9                 | 380.1       | 7.48                                                          |
| 34.9                 | 390.1       | 7.50                                                          |
| 24.9                 | 400.1       | 7.53                                                          |
| 9.9                  | 415.1       | 8.00                                                          |

# Frequency Mixer

SYM-ED14497/1

## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +17                     | +20   | +23   | +17                     | +20   | +23   |
| 40.1        | 80.56                   | 76.07 | 79.60 | 60.98                   | 60.72 | 60.65 |
| 75.1        | 69.24                   | 73.63 | 81.36 | 56.56                   | 56.64 | 56.66 |
| 110.1       | 66.04                   | 69.25 | 75.16 | 53.28                   | 53.46 | 53.66 |
| 150.1       | 62.11                   | 66.38 | 71.77 | 50.91                   | 51.21 | 51.41 |
| 185.1       | 59.96                   | 64.07 | 70.24 | 49.48                   | 49.98 | 50.16 |
| 220.1       | 58.43                   | 62.97 | 68.94 | 48.29                   | 48.63 | 48.59 |
| 260.1       | 56.87                   | 60.94 | 65.46 | 47.40                   | 47.65 | 47.62 |
| 295.1       | 55.51                   | 59.33 | 63.38 | 46.55                   | 46.71 | 46.69 |
| 335.1       | 54.41                   | 58.06 | 62.13 | 45.51                   | 45.57 | 45.52 |
| 370.1       | 53.09                   | 56.46 | 60.03 | 44.84                   | 45.00 | 45.03 |
| 405.1       | 52.35                   | 55.47 | 58.51 | 43.93                   | 44.03 | 44.06 |
| 445.1       | 51.23                   | 54.38 | 57.60 | 43.15                   | 43.43 | 43.62 |
| 480.1       | 50.16                   | 52.95 | 55.80 | 42.73                   | 42.86 | 43.05 |
| 520.1       | 48.31                   | 50.77 | 53.04 | 42.05                   | 42.39 | 42.48 |
| 560.1       | 47.32                   | 49.51 | 51.62 | 40.88                   | 41.60 | 42.10 |
| 590.1       | 47.20                   | 49.19 | 51.26 | 40.05                   | 40.59 | 41.14 |
| 630.1       | 47.08                   | 49.06 | 50.89 | 39.61                   | 39.76 | 40.13 |
| 665.1       | 46.68                   | 48.90 | 50.71 | 39.32                   | 39.57 | 39.71 |
| 700.1       | 46.07                   | 48.32 | 50.16 | 38.76                   | 39.38 | 39.79 |
| 740.1       | 45.28                   | 47.46 | 49.35 | 38.17                   | 38.95 | 39.58 |
| 775.1       | 44.49                   | 46.48 | 48.37 | 37.77                   | 38.56 | 39.20 |
| 815.1       | 43.63                   | 45.27 | 46.95 | 37.42                   | 38.10 | 38.85 |
| 850.1       | 43.12                   | 44.75 | 46.27 | 37.21                   | 37.63 | 38.34 |
| 885.1       | 42.66                   | 44.27 | 45.72 | 37.20                   | 37.24 | 37.57 |
| 925.1       | 41.99                   | 43.75 | 45.23 | 37.40                   | 37.51 | 37.50 |
| 960.1       | 41.50                   | 43.46 | 45.12 | 37.30                   | 37.85 | 37.90 |
| 1000.1      | 40.74                   | 42.82 | 44.71 | 36.75                   | 37.84 | 38.37 |
| 1035.1      | 39.95                   | 41.94 | 43.74 | 36.12                   | 37.39 | 38.15 |
| 1070.1      | 39.33                   | 41.32 | 43.22 | 35.61                   | 36.96 | 37.79 |
| 1110.1      | 38.68                   | 40.72 | 42.84 | 35.08                   | 36.44 | 37.37 |
| 1145.1      | 38.34                   | 40.36 | 42.66 | 34.52                   | 35.97 | 37.04 |
| 1180.1      | 38.18                   | 40.08 | 42.13 | 34.03                   | 35.59 | 36.79 |
| 1220.1      | 38.24                   | 40.22 | 42.49 | 33.33                   | 34.95 | 36.23 |
| 1255.1      | 38.76                   | 41.18 | 44.66 | 32.84                   | 34.42 | 35.63 |
| 1295.1      | 38.71                   | 41.12 | 43.80 | 32.45                   | 34.04 | 35.41 |
| 1330.1      | 38.32                   | 40.69 | 43.14 | 32.08                   | 33.58 | 35.02 |
| 1365.1      | 38.12                   | 40.57 | 43.79 | 32.05                   | 33.29 | 34.75 |
| 1405.1      | 37.83                   | 40.16 | 43.91 | 32.26                   | 33.06 | 34.49 |
| 1440.1      | 37.47                   | 39.45 | 42.45 | 32.71                   | 33.16 | 34.49 |
| 1480.1      | 37.53                   | 39.33 | 41.91 | 34.18                   | 34.43 | 35.20 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +17                     | +20   | +23   |
| 10.1                | 40.1        | 54.18                   | 55.21 | 52.98 |
| 45.1                | 75.1        | 43.37                   | 42.70 | 42.67 |
| 80.1                | 110.1       | 38.48                   | 38.67 | 38.97 |
| 120.1               | 150.1       | 35.47                   | 35.59 | 35.84 |
| 155.1               | 185.1       | 33.53                   | 33.60 | 33.71 |
| 190.1               | 220.1       | 32.21                   | 32.24 | 32.05 |
| 230.1               | 260.1       | 30.96                   | 31.03 | 31.14 |
| 265.1               | 295.1       | 30.40                   | 30.59 | 30.68 |
| 305.1               | 335.1       | 29.85                   | 29.99 | 30.09 |
| 340.1               | 370.1       | 29.33                   | 29.54 | 29.65 |
| 375.1               | 405.1       | 29.15                   | 29.35 | 29.61 |
| 415.1               | 445.1       | 29.00                   | 29.18 | 29.20 |
| 450.1               | 480.1       | 29.02                   | 29.41 | 29.79 |
| 490.1               | 520.1       | 28.92                   | 29.41 | 29.68 |
| 530.1               | 560.1       | 28.44                   | 28.82 | 29.16 |
| 560.1               | 590.1       | 28.27                   | 28.67 | 28.81 |
| 600.1               | 630.1       | 28.21                   | 28.32 | 28.65 |
| 635.1               | 665.1       | 28.38                   | 28.53 | 28.60 |
| 670.1               | 700.1       | 28.06                   | 28.17 | 28.09 |
| 710.1               | 740.1       | 27.62                   | 27.99 | 28.28 |
| 745.1               | 775.1       | 27.25                   | 27.77 | 28.14 |
| 785.1               | 815.1       | 25.94                   | 26.40 | 26.68 |
| 820.1               | 850.1       | 24.51                   | 24.90 | 24.91 |
| 855.1               | 885.1       | 23.19                   | 23.56 | 23.72 |
| 895.1               | 925.1       | 21.79                   | 21.96 | 22.06 |
| 930.1               | 960.1       | 20.93                   | 20.93 | 20.95 |
| 970.1               | 1000.1      | 20.07                   | 19.93 | 19.86 |
| 1005.1              | 1035.1      | 19.59                   | 19.44 | 19.39 |
| 1040.1              | 1070.1      | 19.23                   | 19.09 | 19.00 |
| 1080.1              | 1110.1      | 18.82                   | 18.68 | 18.57 |
| 1115.1              | 1145.1      | 18.56                   | 18.44 | 18.32 |
| 1150.1              | 1180.1      | 18.28                   | 18.15 | 18.04 |
| 1190.1              | 1220.1      | 17.93                   | 17.75 | 17.56 |
| 1225.1              | 1255.1      | 17.65                   | 17.44 | 17.06 |
| 1265.1              | 1295.1      | 17.34                   | 17.23 | 17.02 |
| 1300.1              | 1330.1      | 17.25                   | 17.16 | 16.97 |
| 1335.1              | 1365.1      | 17.16                   | 17.13 | 16.87 |
| 1375.1              | 1405.1      | 17.19                   | 17.28 | 17.23 |
| 1410.1              | 1440.1      | 17.40                   | 17.59 | 17.66 |
| 1450.1              | 1480.1      | 17.30                   | 17.57 | 17.64 |

# Frequency Mixer

SYM-ED14497/1

## 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=455MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|------|------|----------------------|-------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      |                      | @LO (dBm)                     |      |      |
|                     |             | +17             | +20  | +23  |             | +17             | +20  | +23  |                      | +17                           | +20  | +23  |
| 10.1                | 40.1        | 1.18            | 1.16 | 1.23 | 40.1        | 1.64            | 2.00 | 2.32 | 10.1                 | 1.22                          | 1.14 | 1.07 |
| 45.1                | 75.1        | 1.35            | 1.40 | 1.44 | 75.1        | 1.62            | 1.96 | 2.29 | 20.1                 | 1.25                          | 1.16 | 1.09 |
| 80.1                | 110.1       | 1.39            | 1.44 | 1.50 | 110.1       | 1.59            | 1.92 | 2.24 | 30.1                 | 1.25                          | 1.16 | 1.09 |
| 120.1               | 150.1       | 1.35            | 1.42 | 1.46 | 150.1       | 1.63            | 1.97 | 2.30 | 40.1                 | 1.23                          | 1.14 | 1.08 |
| 155.1               | 185.1       | 1.38            | 1.45 | 1.50 | 185.1       | 1.59            | 1.92 | 2.24 | 50.1                 | 1.24                          | 1.15 | 1.08 |
| 190.1               | 220.1       | 1.37            | 1.43 | 1.47 | 220.1       | 1.61            | 1.95 | 2.27 | 65.1                 | 1.26                          | 1.17 | 1.11 |
| 230.1               | 260.1       | 1.40            | 1.47 | 1.51 | 260.1       | 1.61            | 1.95 | 2.27 | 75.1                 | 1.26                          | 1.17 | 1.11 |
| 265.1               | 295.1       | 1.41            | 1.47 | 1.51 | 295.1       | 1.60            | 1.93 | 2.24 | 85.1                 | 1.23                          | 1.15 | 1.08 |
| 305.1               | 335.1       | 1.40            | 1.46 | 1.50 | 335.1       | 1.63            | 1.96 | 2.27 | 95.1                 | 1.22                          | 1.13 | 1.07 |
| 340.1               | 370.1       | 1.45            | 1.50 | 1.54 | 370.1       | 1.62            | 1.94 | 2.25 | 110.1                | 1.27                          | 1.18 | 1.11 |
| 375.1               | 405.1       | 1.44            | 1.49 | 1.53 | 405.1       | 1.63            | 1.95 | 2.25 | 120.1                | 1.28                          | 1.19 | 1.12 |
| 415.1               | 445.1       | 1.44            | 1.49 | 1.53 | 445.1       | 1.65            | 1.97 | 2.27 | 130.1                | 1.26                          | 1.17 | 1.10 |
| 450.1               | 480.1       | 1.47            | 1.53 | 1.57 | 480.1       | 1.64            | 1.96 | 2.25 | 140.1                | 1.25                          | 1.16 | 1.09 |
| 490.1               | 520.1       | 1.47            | 1.52 | 1.55 | 520.1       | 1.66            | 1.98 | 2.27 | 155.1                | 1.27                          | 1.18 | 1.11 |
| 530.1               | 560.1       | 1.50            | 1.55 | 1.58 | 560.1       | 1.67            | 1.98 | 2.26 | 165.1                | 1.29                          | 1.19 | 1.13 |
| 560.1               | 590.1       | 1.49            | 1.54 | 1.57 | 590.1       | 1.68            | 1.99 | 2.27 | 175.1                | 1.27                          | 1.18 | 1.12 |
| 600.1               | 630.1       | 1.49            | 1.53 | 1.57 | 630.1       | 1.70            | 2.01 | 2.28 | 185.1                | 1.26                          | 1.17 | 1.10 |
| 635.1               | 665.1       | 1.52            | 1.55 | 1.59 | 665.1       | 1.71            | 2.00 | 2.28 | 195.1                | 1.28                          | 1.18 | 1.11 |
| 670.1               | 700.1       | 1.51            | 1.55 | 1.58 | 700.1       | 1.73            | 2.02 | 2.29 | 210.1                | 1.30                          | 1.21 | 1.14 |
| 710.1               | 740.1       | 1.55            | 1.59 | 1.62 | 740.1       | 1.74            | 2.03 | 2.30 | 220.1                | 1.29                          | 1.19 | 1.12 |
| 745.1               | 775.1       | 1.58            | 1.63 | 1.66 | 775.1       | 1.75            | 2.04 | 2.30 | 230.1                | 1.27                          | 1.18 | 1.11 |
| 785.1               | 815.1       | 1.58            | 1.62 | 1.66 | 815.1       | 1.78            | 2.06 | 2.33 | 240.1                | 1.28                          | 1.19 | 1.12 |
| 820.1               | 850.1       | 1.62            | 1.66 | 1.69 | 850.1       | 1.78            | 2.07 | 2.32 | 255.1                | 1.31                          | 1.22 | 1.15 |
| 855.1               | 885.1       | 1.61            | 1.65 | 1.68 | 885.1       | 1.80            | 2.08 | 2.33 | 265.1                | 1.30                          | 1.21 | 1.15 |
| 895.1               | 925.1       | 1.62            | 1.66 | 1.69 | 925.1       | 1.83            | 2.11 | 2.36 | 275.1                | 1.29                          | 1.20 | 1.13 |
| 930.1               | 960.1       | 1.65            | 1.68 | 1.71 | 960.1       | 1.83            | 2.10 | 2.35 | 285.1                | 1.30                          | 1.21 | 1.14 |
| 970.1               | 1000.1      | 1.61            | 1.64 | 1.67 | 1000.1      | 1.86            | 2.13 | 2.38 | 300.1                | 1.34                          | 1.24 | 1.17 |
| 1005.1              | 1035.1      | 1.66            | 1.69 | 1.72 | 1035.1      | 1.88            | 2.15 | 2.39 | 310.1                | 1.33                          | 1.23 | 1.16 |
| 1040.1              | 1070.1      | 1.67            | 1.70 | 1.72 | 1070.1      | 1.88            | 2.14 | 2.37 | 320.1                | 1.31                          | 1.21 | 1.14 |
| 1080.1              | 1110.1      | 1.64            | 1.67 | 1.69 | 1110.1      | 1.92            | 2.19 | 2.43 | 330.1                | 1.32                          | 1.22 | 1.15 |
| 1115.1              | 1145.1      | 1.69            | 1.72 | 1.75 | 1145.1      | 1.94            | 2.19 | 2.42 | 340.1                | 1.35                          | 1.25 | 1.18 |
| 1150.1              | 1180.1      | 1.67            | 1.70 | 1.72 | 1180.1      | 1.95            | 2.20 | 2.42 | 355.1                | 1.35                          | 1.25 | 1.18 |
| 1190.1              | 1220.1      | 1.69            | 1.72 | 1.74 | 1220.1      | 2.00            | 2.25 | 2.48 | 365.1                | 1.33                          | 1.23 | 1.17 |
| 1225.1              | 1255.1      | 1.76            | 1.78 | 1.81 | 1255.1      | 2.01            | 2.25 | 2.46 | 375.1                | 1.34                          | 1.24 | 1.17 |
| 1265.1              | 1295.1      | 1.77            | 1.78 | 1.80 | 1295.1      | 2.04            | 2.29 | 2.51 | 385.1                | 1.38                          | 1.28 | 1.20 |
| 1300.1              | 1330.1      | 1.85            | 1.86 | 1.88 | 1330.1      | 2.09            | 2.33 | 2.56 | 400.1                | 1.40                          | 1.30 | 1.22 |
| 1335.1              | 1365.1      | 1.95            | 1.95 | 1.96 | 1365.1      | 2.08            | 2.32 | 2.52 | 410.1                | 1.38                          | 1.28 | 1.20 |
| 1375.1              | 1405.1      | 1.99            | 1.98 | 1.98 | 1405.1      | 2.14            | 2.38 | 2.60 | 420.1                | 1.38                          | 1.28 | 1.20 |
| 1410.1              | 1440.1      | 2.15            | 2.12 | 2.11 | 1440.1      | 2.16            | 2.40 | 2.62 | 430.1                | 1.42                          | 1.31 | 1.23 |
| 1450.1              | 1480.1      | 2.23            | 2.18 | 2.15 | 1480.1      | 2.17            | 2.40 | 2.61 | 445.1                | 1.43                          | 1.33 | 1.25 |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site [www.minicircuits.com](http://www.minicircuits.com)



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

IF/RF MICROWAVE COMPONENTS

REV. X1

SYM-ED14497/1

4/26/2012

Page 4 of 5

## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |        |        |        |        |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 5.14   | 32.15  | 23.17  | 33.43  | 34.52  | 31.10  | 26.96  | 33.63  | 28.79  | 47.33  |
| 1  | ---    | 35.72  | ---    | 59.86  | 10.54  | 59.72  | 16.26  | 49.68  | 19.41  | 43.55  | 22.13  | 36.74  |
| 2  | 178.51 | 73.66  | 52.05  | 68.81  | 53.74  | 68.02  | 57.61  | 68.91  | 59.16  | 77.32  | 57.17  | 80.39  |
| 3  | 201.84 | 88.48  | 76.59  | 86.66  | 69.31  | 83.95  | 63.56  | 81.79  | 61.58  | 82.61  | 62.48  | 83.87  |
| 4  | 203.74 | 90.86  | 84.27  | 90.16  | 84.91  | 89.75  | 84.24  | 89.10  | 86.82  | 91.28  | 91.14  | 90.51  |
| 5  | 201.31 | 107.14 | 94.76  | 106.36 | 89.51  | 111.26 | 89.06  | 103.35 | 90.98  | 103.70 | 89.18  | 106.11 |
| 6  | 204.45 | 106.73 | 106.32 | 100.63 | 107.38 | 98.63  | 108.87 | 100.05 | 102.79 | 110.09 | 108.96 | 105.48 |
| 7  | 199.69 | 109.12 | 104.43 | 108.64 | 104.05 | 110.24 | 97.06  | 108.47 | 95.47  | 107.41 | 109.30 | 106.16 |
| 8  | 197.93 | 104.58 | 107.26 | 107.91 | 108.88 | 110.48 | 107.95 | 100.25 | 107.21 | 95.00  | 106.55 | 107.60 |
| 9  | 194.38 | 107.00 | 107.11 | 106.83 | 109.43 | 111.63 | 102.69 | 111.09 | 97.49  | 105.99 | 99.10  | 111.39 |
| 10 | 195.65 | 103.55 | 107.89 | 109.97 | 108.00 | 111.65 | 113.71 | 107.23 | 107.42 | 108.83 | 106.77 | 108.21 |
|    | RF CAL | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

### LO HARMONICS ORDER

Test conditions: RF IN: 220.1 MHz; -1 dBm.  
LO IN: 250.1 MHz; +20.00 dBm  
IF OUT: 30 MHz; -8.93 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |       |       |       |        |        |        |        |        |        |        |
|----|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 14.97 | 41.90 | 32.24 | 44.37  | 42.81  | 43.23  | 37.59  | 47.56  | 41.21  | 58.82  |
| 1  | ---    | 35.69  | ---   | 56.34 | 10.52 | 55.55  | 16.36  | 50.04  | 20.27  | 46.35  | 23.60  | 40.78  |
| 2  | 83.55  | 74.46  | 44.10 | 68.77 | 45.49 | 68.33  | 47.72  | 65.66  | 49.32  | 60.13  | 49.35  | 56.36  |
| 3  | 98.99  | 75.46  | 49.92 | 76.04 | 59.19 | 73.96  | 59.24  | 71.99  | 50.79  | 72.21  | 45.94  | 60.95  |
| 4  | 127.73 | 74.57  | 67.09 | 73.03 | 66.56 | 70.89  | 67.19  | 70.31  | 70.83  | 70.67  | 73.17  | 72.93  |
| 5  | 126.49 | 81.11  | 68.22 | 79.16 | 60.55 | 78.01  | 58.18  | 77.51  | 56.40  | 75.30  | 55.23  | 73.83  |
| 6  | 127.42 | 80.82  | 77.33 | 82.21 | 76.74 | 86.67  | 78.19  | 83.01  | 79.64  | 81.60  | 76.86  | 79.34  |
| 7  | 126.43 | 91.03  | 84.42 | 95.60 | 89.87 | 100.79 | 79.57  | 110.00 | 77.20  | 113.56 | 75.82  | 104.04 |
| 8  | 125.59 | 88.00  | 92.77 | 86.76 | 94.35 | 87.83  | 96.52  | 89.49  | 96.40  | 95.79  | 93.16  | 89.92  |
| 9  | 130.75 | 92.80  | 80.03 | 93.42 | 79.27 | 94.64  | 80.75  | 95.64  | 87.81  | 98.17  | 84.82  | 94.72  |
| 10 | 127.67 | 94.88  | 97.43 | 98.97 | 99.75 | 98.90  | 103.35 | 100.85 | 104.96 | 107.05 | 104.62 | 105.21 |
|    | RF CAL | 0      | 1     | 2     | 3     | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

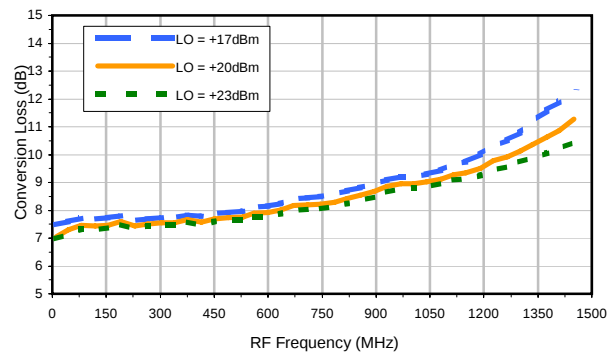
### LO HARMONICS ORDER

Test conditions: RF IN: 220.1 MHz; +9 dBm.  
LO IN: 250.1 MHz; +20.00 dBm  
IF OUT: 30 MHz; +1.02 dBm

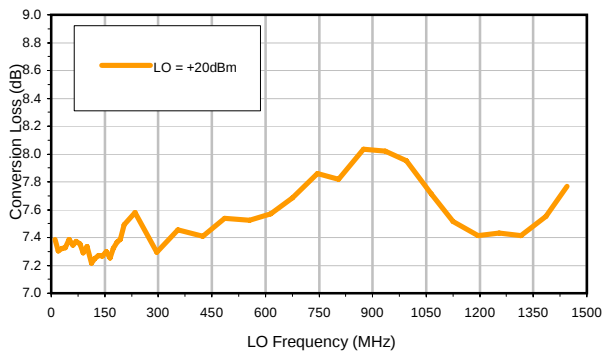
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Typical Performance Curves

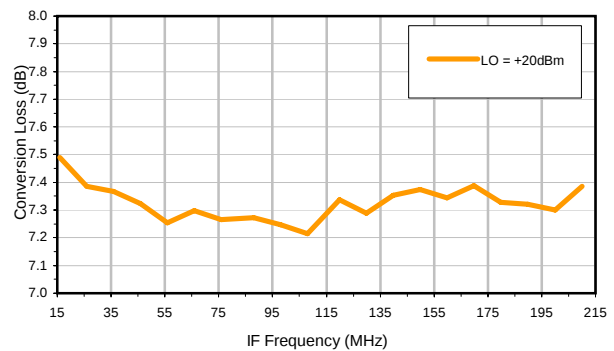
Conversion Loss @IF=30 MHz



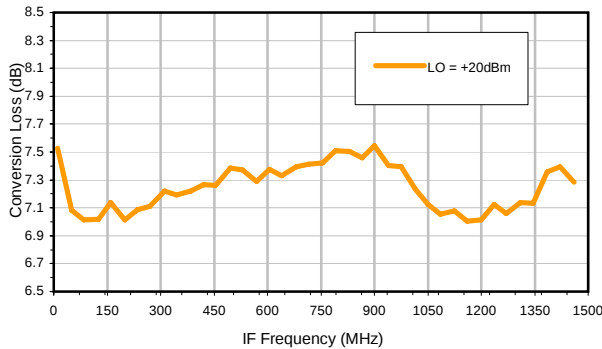
Conversion Loss vs. LO @ RF=220 MHz



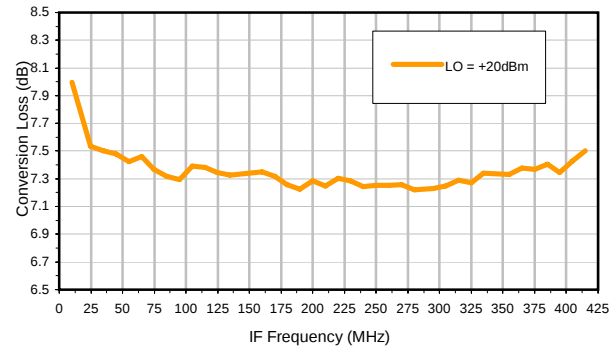
Conversion Loss vs. IF @ RF=220 MHz



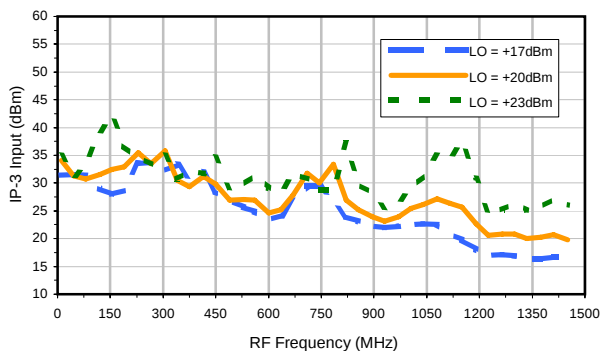
Conversion Loss vs. IF @ RF=20 MHz



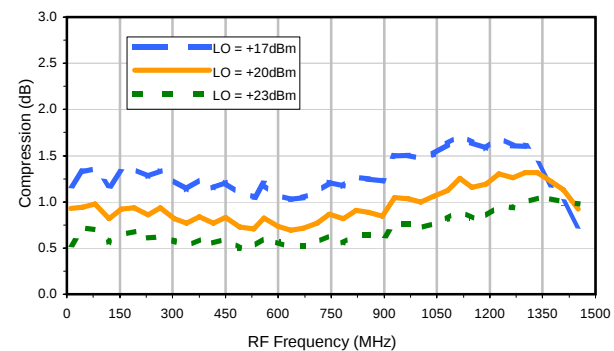
Conversion Loss vs. IF @ RF=425 MHz



IP-3 Input

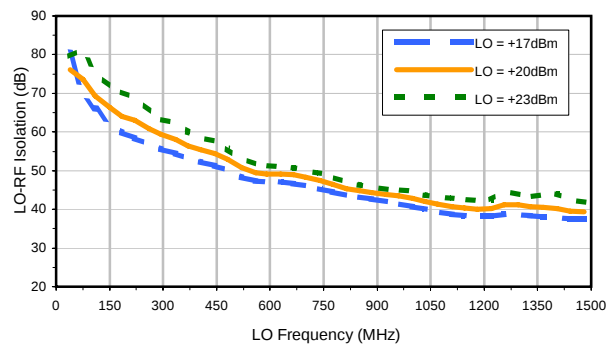


Compression @ RF IN=+14 dBm

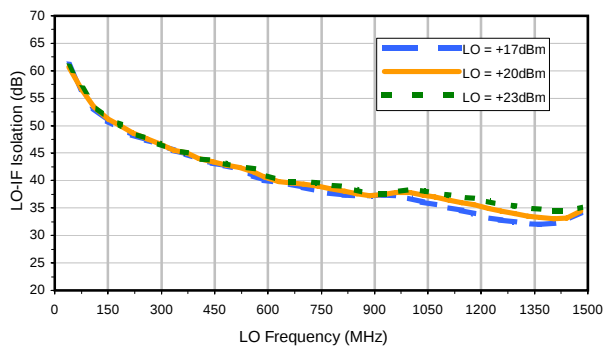


## Typical Performance Curves

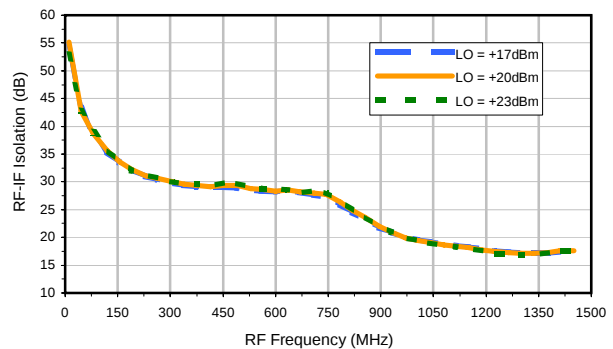
LO-RF Isolation



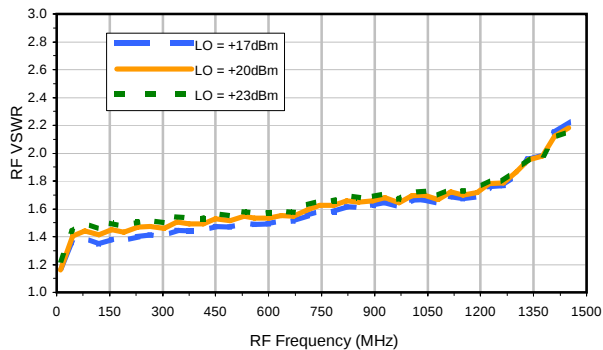
LO-IF Isolation



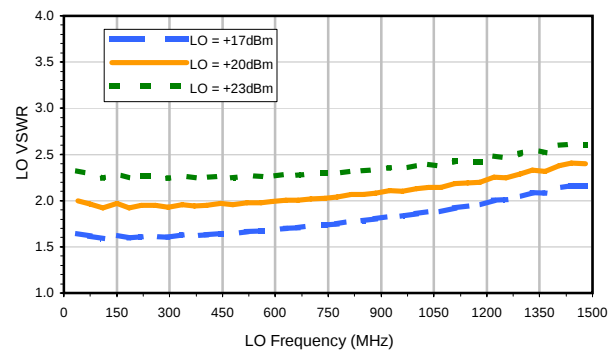
RF-IF Isolation



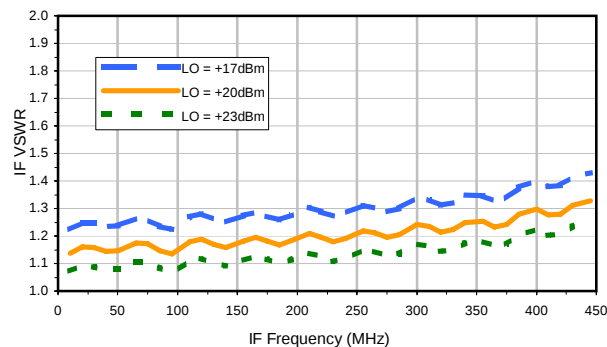
RF VSWR



LO VSWR



IF VSWR



## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |        |        |        |        |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 5.14   | 32.15  | 23.17  | 33.43  | 34.52  | 31.10  | 26.96  | 33.63  | 28.79  | 47.33  |
| 1  | ---    | 35.72  | ---    | 59.86  | 10.54  | 59.72  | 16.26  | 49.68  | 19.41  | 43.55  | 22.13  | 36.74  |
| 2  | 178.51 | 73.66  | 52.05  | 68.81  | 53.74  | 68.02  | 57.61  | 68.91  | 59.16  | 77.32  | 57.17  | 80.39  |
| 3  | 201.84 | 88.48  | 76.59  | 86.66  | 69.31  | 83.95  | 63.56  | 81.79  | 61.58  | 82.61  | 62.48  | 83.87  |
| 4  | 203.74 | 90.86  | 84.27  | 90.16  | 84.91  | 89.75  | 84.24  | 89.10  | 86.82  | 91.28  | 91.14  | 90.51  |
| 5  | 201.31 | 107.14 | 94.76  | 106.36 | 89.51  | 111.26 | 89.06  | 103.35 | 90.98  | 103.70 | 89.18  | 106.11 |
| 6  | 204.45 | 106.73 | 106.32 | 100.63 | 107.38 | 98.63  | 108.87 | 100.05 | 102.79 | 110.09 | 108.96 | 105.48 |
| 7  | 199.69 | 109.12 | 104.43 | 108.64 | 104.05 | 110.24 | 97.06  | 108.47 | 95.47  | 107.41 | 109.30 | 106.16 |
| 8  | 197.93 | 104.58 | 107.26 | 107.91 | 108.88 | 110.48 | 107.95 | 100.25 | 107.21 | 95.00  | 106.55 | 107.60 |
| 9  | 194.38 | 107.00 | 107.11 | 106.83 | 109.43 | 111.63 | 102.69 | 111.09 | 97.49  | 105.99 | 99.10  | 111.39 |
| 10 | 195.65 | 103.55 | 107.89 | 109.97 | 108.00 | 111.65 | 113.71 | 107.23 | 107.42 | 108.83 | 106.77 | 108.21 |
|    | RF CAL | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

## LO HARMONICS ORDER

Test conditions: RF IN: 220.1 MHz; -1 dBm.  
 LO IN: 250.1 MHz; +20.00 dBm  
 IF OUT: 30 MHz; -8.93 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |       |       |       |        |        |        |        |        |        |        |
|----|--------|--------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 14.97 | 41.90 | 32.24 | 44.37  | 42.81  | 43.23  | 37.59  | 47.56  | 41.21  | 58.82  |
| 1  | ---    | 35.69  | ---   | 56.34 | 10.52 | 55.55  | 16.36  | 50.04  | 20.27  | 46.35  | 23.60  | 40.78  |
| 2  | 83.55  | 74.46  | 44.10 | 68.77 | 45.49 | 68.33  | 47.72  | 65.66  | 49.32  | 60.13  | 49.35  | 56.36  |
| 3  | 98.99  | 75.46  | 49.92 | 76.04 | 59.19 | 73.96  | 59.24  | 71.99  | 50.79  | 72.21  | 45.94  | 60.95  |
| 4  | 127.73 | 74.57  | 67.09 | 73.03 | 66.56 | 70.89  | 67.19  | 70.31  | 70.83  | 70.67  | 73.17  | 72.93  |
| 5  | 126.49 | 81.11  | 68.22 | 79.16 | 60.55 | 78.01  | 58.18  | 77.51  | 56.40  | 75.30  | 55.23  | 73.83  |
| 6  | 127.42 | 80.82  | 77.33 | 82.21 | 76.74 | 86.67  | 78.19  | 83.01  | 79.64  | 81.60  | 76.86  | 79.34  |
| 7  | 126.43 | 91.03  | 84.42 | 95.60 | 89.87 | 100.79 | 79.57  | 110.00 | 77.20  | 113.56 | 75.82  | 104.04 |
| 8  | 125.59 | 88.00  | 92.77 | 86.76 | 94.35 | 87.83  | 96.52  | 89.49  | 96.40  | 95.79  | 93.16  | 89.92  |
| 9  | 130.75 | 92.80  | 80.03 | 93.42 | 79.27 | 94.64  | 80.75  | 95.64  | 87.81  | 98.17  | 84.82  | 94.72  |
| 10 | 127.67 | 94.88  | 97.43 | 98.97 | 99.75 | 98.90  | 103.35 | 100.85 | 104.96 | 107.05 | 104.62 | 105.21 |
|    | RF CAL | 0      | 1     | 2     | 3     | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

## LO HARMONICS ORDER

Test conditions: RF IN: 220.1 MHz; +9 dBm.  
 LO IN: 250.1 MHz; +20.00 dBm  
 IF OUT: 30 MHz; +1.02 dBm

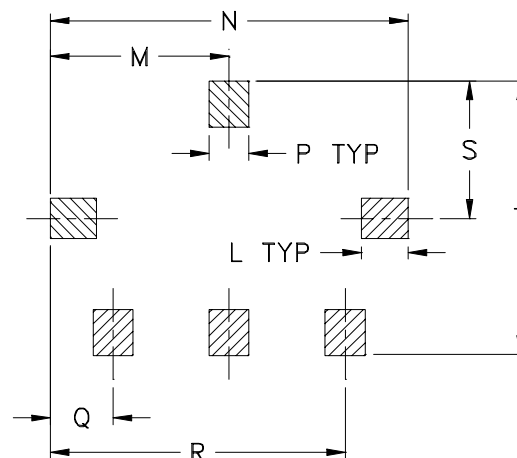
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
 2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
 3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## 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)



INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

## 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

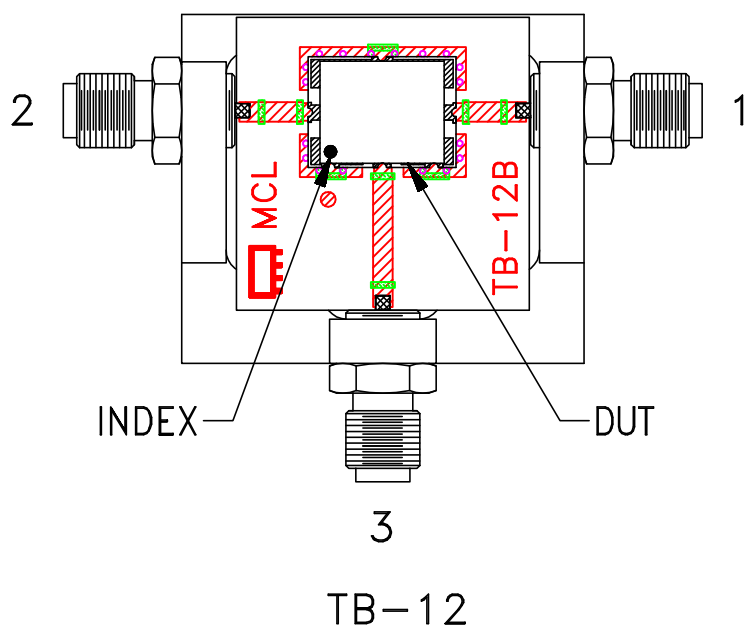
Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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                                                                              |