

# Frequency Mixer

## SYM-ED16061/2

Level 20 (LO Power + 20dBm)

### 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.

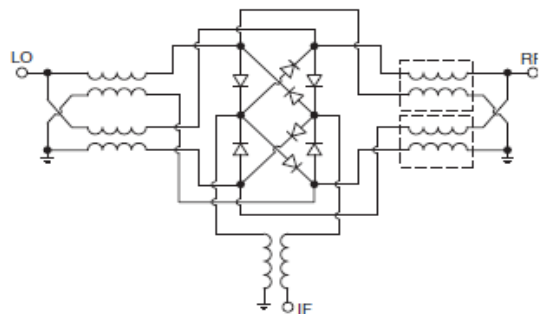
CASE STYLE : TTT167

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                                        |      |      |      |       |
|---------------------------------------|----------------------------------------|------|------|------|-------|
| Parameter                             |                                        | Min. | Typ. | Max. | Units |
| Frequency                             | LO (f <sub>L</sub> to f <sub>U</sub> ) | 119  |      | 1099 | MHz   |
|                                       | RF (f <sub>L</sub> to f <sub>U</sub> ) | 10   |      | 990  | MHz   |
|                                       | IF                                     | 10   |      | 300  | MHz   |
| Conversion Loss                       | mid band                               |      | 7.8  |      | dB    |
|                                       | Total Range                            |      | 8.2  |      | dB    |
| LO-RF Isolation                       | Total Range                            |      | 48   |      | dB    |
| LO-IF Isolation                       | Total Range                            |      | 48   |      | dB    |
| Input IP3                             |                                        |      | +30  |      | dBm   |
| 1 dB Compression                      |                                        |      | +17  |      | dBm   |

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

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

Electrical Schematic



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## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=109MHz<br>(dB) |      |      | RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP-3 INPUT<br>(dBm) |       |       | RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+17dBm<br>(dB) |      |      |
|---------------------|-------------|--------------------------------------------------------|------|------|---------------------|-------------|---------------------|-------|-------|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                                              |      |      |                     |             | @LO (dBm)           |       |       |                     |             | @LO (dBm)                            |      |      |
|                     |             | +17                                                    | +20  | +23  |                     |             | +17                 | +20   | +23   |                     |             | +17                                  | +20  | +23  |
| 10.1                | 119.1       | 7.98                                                   | 7.62 | 7.47 | 10.1                | 119.1       | 28.71               | 28.25 | 32.73 | 10.1                | 119.1       | 0.54                                 | 0.13 | 0.08 |
| 50.1                | 159.1       | 7.92                                                   | 7.63 | 7.51 | 50.1                | 159.1       | 26.28               | 31.32 | 37.27 | 50.1                | 159.1       | 0.62                                 | 0.29 | 0.10 |
| 90.1                | 199.1       | 7.90                                                   | 7.61 | 7.50 | 90.1                | 199.1       | 27.94               | 33.45 | 37.76 | 90.1                | 199.1       | 0.64                                 | 0.27 | 0.12 |
| 140.1               | 249.1       | 7.88                                                   | 7.62 | 7.52 | 140.1               | 249.1       | 29.75               | 35.34 | 36.49 | 140.1               | 249.1       | 0.67                                 | 0.25 | 0.10 |
| 180.1               | 289.1       | 7.89                                                   | 7.62 | 7.52 | 180.1               | 289.1       | 28.91               | 35.29 | 40.33 | 180.1               | 289.1       | 0.65                                 | 0.26 | 0.10 |
| 230.1               | 339.1       | 7.89                                                   | 7.64 | 7.53 | 230.1               | 339.1       | 31.64               | 33.50 | 38.21 | 230.1               | 339.1       | 0.64                                 | 0.25 | 0.10 |
| 270.1               | 379.1       | 7.97                                                   | 7.67 | 7.55 | 270.1               | 379.1       | 28.27               | 34.19 | 37.56 | 270.1               | 379.1       | 0.64                                 | 0.26 | 0.11 |
| 320.1               | 429.1       | 7.92                                                   | 7.69 | 7.58 | 320.1               | 429.1       | 30.94               | 35.12 | 32.99 | 320.1               | 429.1       | 0.70                                 | 0.28 | 0.13 |
| 360.1               | 469.1       | 7.97                                                   | 7.70 | 7.58 | 360.1               | 469.1       | 29.53               | 34.03 | 33.75 | 360.1               | 469.1       | 0.72                                 | 0.28 | 0.10 |
| 410.1               | 519.1       | 7.95                                                   | 7.69 | 7.56 | 410.1               | 519.1       | 28.51               | 30.39 | 35.62 | 410.1               | 519.1       | 0.72                                 | 0.28 | 0.10 |
| 450.1               | 559.1       | 8.03                                                   | 7.71 | 7.56 | 450.1               | 559.1       | 28.32               | 33.17 | 30.31 | 450.1               | 559.1       | 0.78                                 | 0.30 | 0.12 |
| 500.1               | 609.1       | 8.08                                                   | 7.77 | 7.62 | 500.1               | 609.1       | 27.34               | 31.44 | 32.61 | 500.1               | 609.1       | 0.86                                 | 0.44 | 0.21 |
| 540.1               | 649.1       | 8.12                                                   | 7.77 | 7.61 | 540.1               | 649.1       | 29.05               | 31.56 | 30.36 | 540.1               | 649.1       | 0.88                                 | 0.46 | 0.23 |
| 590.1               | 699.1       | 8.18                                                   | 7.87 | 7.68 | 590.1               | 699.1       | 28.88               | 32.71 | 31.21 | 590.1               | 699.1       | 1.11                                 | 0.47 | 0.22 |
| 630.1               | 739.1       | 8.12                                                   | 7.85 | 7.69 | 630.1               | 739.1       | 30.75               | 28.67 | 26.91 | 630.1               | 739.1       | 1.12                                 | 0.46 | 0.26 |
| 670.1               | 779.1       | 8.20                                                   | 7.92 | 7.76 | 670.1               | 779.1       | 27.22               | 27.54 | 26.48 | 670.1               | 779.1       | 1.37                                 | 0.59 | 0.39 |
| 720.1               | 829.1       | 7.99                                                   | 7.77 | 7.65 | 720.1               | 829.1       | 29.07               | 26.38 | 26.87 | 720.1               | 829.1       | 1.41                                 | 0.51 | 0.26 |
| 760.1               | 869.1       | 8.07                                                   | 7.81 | 7.68 | 760.1               | 869.1       | 26.73               | 29.31 | 30.44 | 760.1               | 869.1       | 1.48                                 | 0.62 | 0.34 |
| 810.1               | 919.1       | 7.98                                                   | 7.75 | 7.63 | 810.1               | 919.1       | 27.19               | 33.39 | 38.70 | 810.1               | 919.1       | 1.68                                 | 0.64 | 0.29 |
| 850.1               | 959.1       | 8.14                                                   | 7.86 | 7.71 | 850.1               | 959.1       | 26.53               | 33.02 | 33.56 | 850.1               | 959.1       | 1.57                                 | 0.50 | 0.20 |
| 900.1               | 1009.1      | 8.23                                                   | 7.94 | 7.78 | 900.1               | 1009.1      | 26.28               | 33.31 | 29.67 | 900.1               | 1009.1      | 1.73                                 | 0.63 | 0.29 |
| 940.1               | 1049.1      | 8.40                                                   | 8.06 | 7.86 | 940.1               | 1049.1      | 27.70               | 31.75 | 28.36 | 940.1               | 1049.1      | 1.72                                 | 0.67 | 0.37 |
| 990.1               | 1099.1      | 8.63                                                   | 8.25 | 8.02 | 990.1               | 1099.1      | 29.26               | 28.06 | 26.53 | 990.1               | 1099.1      | 1.78                                 | 0.70 | 0.33 |
| 1030.1              | 1139.1      | 8.68                                                   | 8.28 | 8.04 | 1030.1              | 1139.1      | 29.44               | 25.63 | 25.17 | 1030.1              | 1139.1      | 1.67                                 | 0.69 | 0.35 |
| 1080.1              | 1189.1      | 8.93                                                   | 8.39 | 8.08 | 1080.1              | 1189.1      | 27.09               | 26.81 | 24.66 | 1080.1              | 1189.1      | 1.64                                 | 0.88 | 0.52 |
| 1120.1              | 1229.1      | 8.85                                                   | 8.34 | 8.02 | 1120.1              | 1229.1      | 28.05               | 23.61 | 23.46 | 1120.1              | 1229.1      | 1.52                                 | 0.78 | 0.53 |
| 1170.1              | 1279.1      | 8.86                                                   | 8.35 | 8.04 | 1170.1              | 1279.1      | 24.51               | 22.59 | 23.61 | 1170.1              | 1279.1      | 1.68                                 | 0.95 | 0.61 |
| 1210.1              | 1319.1      | 8.68                                                   | 8.27 | 8.04 | 1210.1              | 1319.1      | 22.29               | 23.58 | 25.72 | 1210.1              | 1319.1      | 1.74                                 | 0.87 | 0.46 |
| 1250.1              | 1359.1      | 8.98                                                   | 8.54 | 8.28 | 1250.1              | 1359.1      | 23.49               | 24.15 | 26.00 | 1250.1              | 1359.1      | 1.64                                 | 0.72 | 0.38 |
| 1300.1              | 1409.1      | 9.09                                                   | 8.64 | 8.38 | 1300.1              | 1409.1      | 24.18               | 25.06 | 27.56 | 1300.1              | 1409.1      | 1.53                                 | 0.65 | 0.37 |
| 1340.1              | 1449.1      | 9.33                                                   | 8.82 | 8.53 | 1340.1              | 1449.1      | 25.95               | 25.30 | 27.21 | 1340.1              | 1449.1      | 1.55                                 | 0.72 | 0.43 |
| 1390.1              | 1499.1      | 9.32                                                   | 8.79 | 8.48 | 1390.1              | 1499.1      | 25.74               | 25.66 | 28.22 | 1390.1              | 1499.1      | 1.42                                 | 0.74 | 0.48 |
| 1430.1              | 1539.1      | 9.34                                                   | 8.75 | 8.44 | 1430.1              | 1539.1      | 26.74               | 26.03 | 28.03 | 1430.1              | 1539.1      | 1.42                                 | 0.75 | 0.45 |
| 1480.1              | 1589.1      | 9.45                                                   | 8.70 | 8.33 | 1480.1              | 1589.1      | 24.33               | 25.56 | 27.36 | 1480.1              | 1589.1      | 1.20                                 | 0.73 | 0.49 |
| 1520.1              | 1629.1      | 9.64                                                   | 8.87 | 8.46 | 1520.1              | 1629.1      | 23.06               | 25.26 | 27.10 | 1520.1              | 1629.1      | 1.10                                 | 0.73 | 0.53 |
| 1570.1              | 1679.1      | 10.35                                                  | 9.33 | 8.78 | 1570.1              | 1679.1      | 20.66               | 24.28 | 27.46 | 1570.1              | 1679.1      | 0.80                                 | 0.58 | 0.42 |
| 1610.1              | 1719.1      | 10.42                                                  | 9.51 | 8.95 | 1610.1              | 1719.1      | 20.67               | 23.58 | 27.77 | 1610.1              | 1719.1      | 0.74                                 | 0.46 | 0.39 |
| 1660.1              | 1769.1      | 10.89                                                  | 9.86 | 9.17 | 1660.1              | 1769.1      | 20.85               | 21.96 | 26.21 | 1660.1              | 1769.1      | 0.55                                 | 0.28 | 0.28 |
| 1700.1              | 1809.1      | 10.61                                                  | 9.73 | 9.10 | 1700.1              | 1809.1      | 21.48               | 22.50 | 26.22 | 1700.1              | 1809.1      | 0.54                                 | 0.27 | 0.27 |
| 1750.1              | 1859.1      | 10.86                                                  | 9.86 | 9.18 | 1750.1              | 1859.1      | 21.77               | 22.80 | 24.89 | 1750.1              | 1859.1      | 0.36                                 | 0.03 | 0.01 |

# 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)=350.1MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=300.1MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=400.1MHz<br>(dB) |
|----------------------|-------------|-----------------------------------------------------------------|----------------------|-------------|-----------------------------------------------------------------|----------------------|-------------|-----------------------------------------------------------------|
|                      |             | @LO (dBm)                                                       |                      |             | @LO (dBm)                                                       |                      |             | @LO (dBm)                                                       |
|                      |             | +20                                                             |                      |             | +20                                                             |                      |             | +20                                                             |
| 340.0                | 10.1        | 7.74                                                            | 10.0                 | 310.1       | 8.10                                                            | 390.0                | 10.1        | 7.86                                                            |
| 325.0                | 25.1        | 7.75                                                            | 40.0                 | 340.1       | 7.72                                                            | 385.0                | 15.1        | 7.90                                                            |
| 310.0                | 40.1        | 7.72                                                            | 80.0                 | 380.1       | 7.62                                                            | 375.0                | 25.1        | 7.87                                                            |
| 290.0                | 60.1        | 7.76                                                            | 120.0                | 420.1       | 7.75                                                            | 365.0                | 35.1        | 7.85                                                            |
| 275.0                | 75.1        | 7.76                                                            | 160.0                | 460.1       | 7.81                                                            | 355.0                | 45.1        | 7.89                                                            |
| 260.0                | 90.1        | 7.67                                                            | 200.0                | 500.1       | 7.82                                                            | 345.0                | 55.1        | 7.87                                                            |
| 240.0                | 110.1       | 7.62                                                            | 240.0                | 540.1       | 7.79                                                            | 335.0                | 65.1        | 7.77                                                            |
| 225.0                | 125.1       | 7.61                                                            | 280.0                | 580.1       | 7.86                                                            | 325.0                | 75.1        | 7.85                                                            |
| 205.0                | 145.1       | 7.64                                                            | 320.0                | 620.1       | 8.10                                                            | 315.0                | 85.1        | 7.82                                                            |
| 190.0                | 160.1       | 7.63                                                            | 360.0                | 660.1       | 8.07                                                            | 305.0                | 95.1        | 7.78                                                            |
| 175.0                | 175.1       | 7.41                                                            | 400.0                | 700.1       | 8.03                                                            | 295.0                | 105.1       | 7.76                                                            |
| 155.0                | 195.1       | 7.48                                                            | 440.0                | 740.1       | 8.09                                                            | 285.0                | 115.1       | 7.77                                                            |
| 140.0                | 210.1       | 7.61                                                            | 480.0                | 780.1       | 8.07                                                            | 275.0                | 125.1       | 7.70                                                            |
| 120.0                | 230.1       | 7.63                                                            | 520.0                | 820.1       | 8.02                                                            | 265.0                | 135.1       | 7.69                                                            |
| 105.0                | 245.1       | 7.64                                                            | 560.0                | 860.1       | 8.01                                                            | 255.0                | 145.1       | 7.76                                                            |
| 90.0                 | 260.1       | 7.51                                                            | 600.0                | 900.1       | 8.05                                                            | 245.0                | 155.1       | 7.70                                                            |
| 70.0                 | 280.1       | 7.53                                                            | 640.0                | 940.1       | 8.17                                                            | 235.0                | 165.1       | 7.71                                                            |
| 55.0                 | 295.1       | 7.58                                                            | 680.0                | 980.1       | 8.22                                                            | 225.0                | 175.1       | 7.71                                                            |
| 40.0                 | 310.1       | 7.59                                                            | 720.0                | 1020.1      | 8.15                                                            | 215.0                | 185.1       | 7.71                                                            |
| 20.0                 | 330.1       | 7.68                                                            | 760.0                | 1060.1      | 8.26                                                            | 205.0                | 195.1       | 7.70                                                            |
| 10.0                 | 360.1       | 8.03                                                            | 790.0                | 1090.1      | 8.28                                                            | 200.0                | 200.1       | 7.50                                                            |
| 80.0                 | 430.1       | 7.64                                                            | 830.0                | 1130.1      | 8.33                                                            | 190.0                | 210.1       | 7.63                                                            |
| 160.0                | 510.1       | 7.67                                                            | 870.0                | 1170.1      | 8.45                                                            | 180.0                | 220.1       | 7.59                                                            |
| 240.0                | 590.1       | 7.80                                                            | 910.0                | 1210.1      | 8.60                                                            | 170.0                | 230.1       | 7.62                                                            |
| 310.0                | 660.1       | 7.80                                                            | 950.0                | 1250.1      | 8.70                                                            | 160.0                | 240.1       | 7.70                                                            |
| 390.0                | 740.1       | 8.09                                                            | 990.0                | 1290.1      | 8.47                                                            | 150.0                | 250.1       | 7.70                                                            |
| 470.0                | 820.1       | 7.93                                                            | 1030.0               | 1330.1      | 8.45                                                            | 140.0                | 260.1       | 7.75                                                            |
| 540.0                | 890.1       | 7.90                                                            | 1070.0               | 1370.1      | 8.49                                                            | 130.0                | 270.1       | 7.66                                                            |
| 620.0                | 970.1       | 8.05                                                            | 1110.0               | 1410.1      | 8.50                                                            | 120.0                | 280.1       | 7.72                                                            |
| 700.0                | 1050.1      | 8.10                                                            | 1150.0               | 1450.1      | 8.63                                                            | 110.0                | 290.1       | 7.71                                                            |
| 770.0                | 1120.1      | 8.32                                                            | 1190.0               | 1490.1      | 8.66                                                            | 100.0                | 300.1       | 7.71                                                            |
| 850.0                | 1200.1      | 8.49                                                            | 1230.0               | 1530.1      | 8.84                                                            | 90.0                 | 310.1       | 7.58                                                            |
| 930.0                | 1280.1      | 8.38                                                            | 1270.0               | 1570.1      | 8.89                                                            | 80.0                 | 320.1       | 7.58                                                            |
| 1010.0               | 1360.1      | 8.33                                                            | 1310.0               | 1610.1      | 9.05                                                            | 70.0                 | 330.1       | 7.72                                                            |
| 1080.0               | 1430.1      | 8.41                                                            | 1350.0               | 1650.1      | 9.28                                                            | 60.0                 | 340.1       | 7.69                                                            |
| 1160.0               | 1510.1      | 8.60                                                            | 1390.0               | 1690.1      | 9.34                                                            | 50.0                 | 350.1       | 7.76                                                            |
| 1240.0               | 1590.1      | 8.83                                                            | 1430.0               | 1730.1      | 9.66                                                            | 40.0                 | 360.1       | 7.73                                                            |
| 1310.0               | 1660.1      | 9.19                                                            | 1470.0               | 1770.1      | 9.73                                                            | 30.0                 | 370.1       | 7.76                                                            |
| 1390.0               | 1740.1      | 9.57                                                            | 1510.0               | 1810.1      | 9.91                                                            | 20.0                 | 380.1       | 7.77                                                            |
| 1470.0               | 1820.1      | 9.74                                                            | 1550.0               | 1850.1      | 10.04                                                           | 10.0                 | 390.1       | 8.13                                                            |

# Frequency Mixer

SYM-ED16061/2

## 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   |
| 119.1       | 52.57                   | 53.96 | 53.60 | 52.89                   | 52.87 | 51.75 |
| 159.1       | 53.47                   | 53.99 | 53.29 | 53.43                   | 52.25 | 50.86 |
| 199.1       | 53.75                   | 52.90 | 51.64 | 53.31                   | 50.92 | 49.31 |
| 249.1       | 54.97                   | 52.94 | 51.33 | 53.23                   | 50.15 | 48.43 |
| 289.1       | 54.81                   | 52.00 | 50.27 | 52.42                   | 49.24 | 47.56 |
| 339.1       | 56.27                   | 52.74 | 50.85 | 52.30                   | 48.89 | 47.20 |
| 379.1       | 55.06                   | 51.99 | 50.31 | 51.35                   | 48.33 | 46.81 |
| 429.1       | 55.06                   | 52.87 | 51.48 | 51.37                   | 48.57 | 47.06 |
| 469.1       | 54.00                   | 52.65 | 51.59 | 50.10                   | 48.12 | 46.88 |
| 519.1       | 52.48                   | 52.60 | 52.47 | 49.13                   | 47.69 | 46.64 |
| 559.1       | 49.83                   | 50.48 | 50.85 | 48.42                   | 47.43 | 46.55 |
| 609.1       | 49.00                   | 49.77 | 50.29 | 48.42                   | 47.91 | 47.39 |
| 649.1       | 48.14                   | 48.99 | 49.68 | 48.52                   | 48.17 | 47.77 |
| 699.1       | 47.59                   | 48.40 | 49.08 | 47.94                   | 48.54 | 48.43 |
| 739.1       | 45.85                   | 46.58 | 47.23 | 47.80                   | 49.23 | 49.43 |
| 779.1       | 45.62                   | 46.41 | 47.06 | 46.45                   | 48.13 | 49.04 |
| 829.1       | 44.16                   | 45.00 | 45.72 | 45.01                   | 46.84 | 48.40 |
| 869.1       | 44.43                   | 45.23 | 45.84 | 43.97                   | 45.89 | 47.93 |
| 919.1       | 44.56                   | 45.38 | 46.15 | 43.60                   | 45.80 | 48.09 |
| 959.1       | 43.01                   | 43.70 | 44.30 | 43.41                   | 45.64 | 47.86 |
| 1009.1      | 41.90                   | 42.65 | 43.34 | 43.28                   | 45.31 | 47.21 |
| 1049.1      | 42.18                   | 42.82 | 43.35 | 43.28                   | 45.17 | 46.90 |
| 1099.1      | 41.33                   | 41.89 | 42.34 | 43.12                   | 44.63 | 45.83 |
| 1139.1      | 41.95                   | 42.58 | 43.07 | 42.93                   | 44.13 | 45.04 |
| 1189.1      | 41.89                   | 42.48 | 42.95 | 41.88                   | 43.04 | 43.81 |
| 1229.1      | 41.15                   | 41.94 | 42.51 | 40.37                   | 41.25 | 42.23 |
| 1279.1      | 40.59                   | 41.71 | 42.63 | 39.35                   | 40.18 | 40.94 |
| 1319.1      | 40.86                   | 42.12 | 43.12 | 39.72                   | 40.31 | 40.67 |
| 1359.1      | 41.70                   | 43.17 | 44.31 | 40.40                   | 40.68 | 40.76 |
| 1409.1      | 41.78                   | 43.28 | 44.52 | 40.66                   | 40.49 | 40.08 |
| 1449.1      | 40.22                   | 41.67 | 42.96 | 41.24                   | 40.90 | 40.22 |
| 1499.1      | 41.45                   | 43.20 | 44.92 | 41.32                   | 40.55 | 39.33 |
| 1539.1      | 41.95                   | 43.65 | 45.38 | 41.31                   | 40.52 | 39.26 |
| 1589.1      | 42.80                   | 44.94 | 47.03 | 39.86                   | 39.05 | 37.85 |
| 1629.1      | 45.85                   | 49.08 | 52.71 | 39.33                   | 38.64 | 37.62 |
| 1679.1      | 43.92                   | 46.69 | 48.95 | 38.86                   | 38.08 | 36.84 |
| 1719.1      | 42.46                   | 45.42 | 47.85 | 38.51                   | 38.10 | 36.97 |
| 1769.1      | 43.20                   | 46.65 | 50.05 | 38.02                   | 37.79 | 36.78 |
| 1809.1      | 42.75                   | 46.04 | 49.48 | 37.26                   | 37.25 | 36.52 |
| 1859.1      | 43.61                   | 47.79 | 53.31 | 36.95                   | 37.06 | 36.50 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +17                     | +20   | +23   |
| 10.1                | 119.1       | 35.22                   | 36.87 | 38.50 |
| 50.1                | 159.1       | 35.56                   | 36.50 | 37.44 |
| 90.1                | 199.1       | 37.05                   | 38.12 | 39.45 |
| 140.1               | 249.1       | 36.87                   | 37.86 | 39.02 |
| 180.1               | 289.1       | 38.19                   | 39.28 | 40.93 |
| 230.1               | 339.1       | 37.83                   | 38.78 | 39.96 |
| 270.1               | 379.1       | 37.99                   | 38.78 | 40.17 |
| 320.1               | 429.1       | 37.61                   | 37.82 | 38.25 |
| 360.1               | 469.1       | 37.47                   | 37.86 | 38.08 |
| 410.1               | 519.1       | 36.61                   | 36.58 | 36.72 |
| 450.1               | 559.1       | 36.04                   | 36.17 | 36.28 |
| 500.1               | 609.1       | 34.72                   | 34.79 | 34.93 |
| 540.1               | 649.1       | 34.20                   | 34.16 | 34.27 |
| 590.1               | 699.1       | 34.20                   | 33.94 | 33.78 |
| 630.1               | 739.1       | 33.82                   | 33.61 | 33.34 |
| 670.1               | 779.1       | 33.67                   | 33.48 | 33.37 |
| 720.1               | 829.1       | 33.45                   | 33.25 | 33.07 |
| 760.1               | 869.1       | 33.42                   | 33.35 | 33.38 |
| 810.1               | 919.1       | 33.54                   | 33.49 | 33.45 |
| 850.1               | 959.1       | 33.43                   | 33.53 | 33.55 |
| 900.1               | 1009.1      | 33.47                   | 33.64 | 33.89 |
| 940.1               | 1049.1      | 33.37                   | 33.54 | 33.71 |
| 990.1               | 1099.1      | 33.64                   | 33.91 | 34.07 |
| 1030.1              | 1139.1      | 33.53                   | 33.74 | 33.89 |
| 1080.1              | 1189.1      | 33.41                   | 33.74 | 33.90 |
| 1120.1              | 1229.1      | 33.13                   | 33.56 | 33.66 |
| 1170.1              | 1279.1      | 32.85                   | 33.13 | 33.28 |
| 1210.1              | 1319.1      | 32.53                   | 32.86 | 33.16 |
| 1250.1              | 1359.1      | 32.34                   | 32.79 | 33.17 |
| 1300.1              | 1409.1      | 31.89                   | 32.54 | 33.03 |
| 1340.1              | 1449.1      | 31.93                   | 32.66 | 33.22 |
| 1390.1              | 1499.1      | 31.43                   | 32.24 | 32.75 |
| 1430.1              | 1539.1      | 31.25                   | 32.16 | 32.62 |
| 1480.1              | 1589.1      | 30.55                   | 31.54 | 32.03 |
| 1520.1              | 1629.1      | 30.57                   | 31.52 | 32.09 |
| 1570.1              | 1679.1      | 30.24                   | 31.41 | 32.05 |
| 1610.1              | 1719.1      | 30.21                   | 31.33 | 32.22 |
| 1660.1              | 1769.1      | 29.80                   | 31.04 | 32.04 |
| 1700.1              | 1809.1      | 29.35                   | 30.54 | 31.58 |
| 1750.1              | 1859.1      | 28.89                   | 30.19 | 31.35 |

# Frequency Mixer

SYM-ED16061/2

## 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=509MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|------|------|----------------------|-------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      |                      | @LO (dBm)                     |      |      |
|                     |             | +17             | +20  | +23  |             | +17             | +20  | +23  |                      | +17                           | +20  | +23  |
| 10.1                | 119.1       | 1.38            | 1.37 | 1.43 | 119.1       | 1.34            | 1.45 | 1.94 | 10.1                 | 1.12                          | 1.07 | 1.04 |
| 50.1                | 159.1       | 1.26            | 1.34 | 1.40 | 159.1       | 1.39            | 1.44 | 1.88 | 20.1                 | 1.18                          | 1.09 | 1.03 |
| 90.1                | 199.1       | 1.25            | 1.32 | 1.39 | 199.1       | 1.38            | 1.49 | 1.93 | 30.1                 | 1.18                          | 1.08 | 1.03 |
| 140.1               | 249.1       | 1.28            | 1.35 | 1.40 | 249.1       | 1.50            | 1.56 | 1.99 | 45.1                 | 1.12                          | 1.03 | 1.04 |
| 180.1               | 289.1       | 1.29            | 1.35 | 1.40 | 289.1       | 1.51            | 1.64 | 2.07 | 55.1                 | 1.15                          | 1.05 | 1.03 |
| 230.1               | 339.1       | 1.35            | 1.39 | 1.43 | 339.1       | 1.57            | 1.71 | 2.16 | 70.1                 | 1.19                          | 1.08 | 1.01 |
| 270.1               | 379.1       | 1.38            | 1.42 | 1.46 | 379.1       | 1.63            | 1.79 | 2.22 | 80.1                 | 1.16                          | 1.06 | 1.03 |
| 320.1               | 429.1       | 1.45            | 1.48 | 1.51 | 429.1       | 1.69            | 1.90 | 2.37 | 95.1                 | 1.15                          | 1.05 | 1.02 |
| 360.1               | 469.1       | 1.48            | 1.51 | 1.53 | 469.1       | 1.72            | 1.97 | 2.44 | 105.1                | 1.18                          | 1.07 | 1.01 |
| 410.1               | 519.1       | 1.52            | 1.53 | 1.55 | 519.1       | 1.76            | 2.07 | 2.57 | 120.1                | 1.19                          | 1.10 | 1.07 |
| 450.1               | 559.1       | 1.58            | 1.58 | 1.60 | 559.1       | 1.83            | 2.18 | 2.70 | 130.1                | 1.17                          | 1.09 | 1.08 |
| 500.1               | 609.1       | 1.63            | 1.61 | 1.61 | 609.1       | 1.98            | 2.32 | 2.84 | 145.1                | 1.13                          | 1.03 | 1.03 |
| 540.1               | 649.1       | 1.69            | 1.65 | 1.64 | 649.1       | 2.12            | 2.47 | 2.99 | 155.1                | 1.19                          | 1.09 | 1.03 |
| 590.1               | 699.1       | 1.74            | 1.70 | 1.67 | 699.1       | 2.20            | 2.57 | 3.11 | 170.1                | 1.20                          | 1.11 | 1.07 |
| 630.1               | 739.1       | 1.78            | 1.73 | 1.69 | 739.1       | 2.30            | 2.72 | 3.26 | 180.1                | 1.18                          | 1.09 | 1.07 |
| 670.1               | 779.1       | 1.81            | 1.75 | 1.71 | 779.1       | 2.35            | 2.81 | 3.38 | 190.1                | 1.17                          | 1.08 | 1.05 |
| 720.1               | 829.1       | 1.85            | 1.78 | 1.74 | 829.1       | 2.34            | 2.86 | 3.45 | 205.1                | 1.21                          | 1.11 | 1.07 |
| 760.1               | 869.1       | 1.87            | 1.78 | 1.74 | 869.1       | 2.33            | 2.89 | 3.52 | 215.1                | 1.21                          | 1.12 | 1.09 |
| 810.1               | 919.1       | 1.97            | 1.86 | 1.79 | 919.1       | 2.31            | 2.89 | 3.52 | 230.1                | 1.17                          | 1.10 | 1.09 |
| 850.1               | 959.1       | 2.06            | 1.94 | 1.86 | 959.1       | 2.33            | 2.95 | 3.60 | 240.1                | 1.18                          | 1.08 | 1.06 |
| 900.1               | 1009.1      | 2.18            | 2.04 | 1.94 | 1009.1      | 2.34            | 2.97 | 3.61 | 255.1                | 1.22                          | 1.13 | 1.09 |
| 940.1               | 1049.1      | 2.30            | 2.13 | 2.01 | 1049.1      | 2.37            | 3.01 | 3.64 | 265.1                | 1.21                          | 1.13 | 1.10 |
| 990.1               | 1099.1      | 2.44            | 2.26 | 2.12 | 1099.1      | 2.37            | 3.01 | 3.64 | 280.1                | 1.20                          | 1.11 | 1.09 |
| 1030.1              | 1139.1      | 2.55            | 2.33 | 2.18 | 1139.1      | 2.38            | 3.00 | 3.60 | 290.1                | 1.23                          | 1.13 | 1.09 |
| 1080.1              | 1189.1      | 2.77            | 2.48 | 2.27 | 1189.1      | 2.39            | 2.98 | 3.58 | 305.1                | 1.25                          | 1.16 | 1.13 |
| 1120.1              | 1229.1      | 2.95            | 2.66 | 2.43 | 1229.1      | 2.36            | 2.93 | 3.47 | 315.1                | 1.23                          | 1.15 | 1.13 |
| 1170.1              | 1279.1      | 2.92            | 2.64 | 2.46 | 1279.1      | 2.28            | 2.85 | 3.42 | 330.1                | 1.21                          | 1.12 | 1.10 |
| 1210.1              | 1319.1      | 2.89            | 2.66 | 2.51 | 1319.1      | 2.20            | 2.73 | 3.24 | 340.1                | 1.24                          | 1.15 | 1.11 |
| 1250.1              | 1359.1      | 2.97            | 2.76 | 2.62 | 1359.1      | 2.16            | 2.64 | 3.14 | 350.1                | 1.27                          | 1.18 | 1.14 |
| 1300.1              | 1409.1      | 3.09            | 2.88 | 2.74 | 1409.1      | 2.15            | 2.55 | 2.98 | 365.1                | 1.24                          | 1.16 | 1.14 |
| 1340.1              | 1449.1      | 3.22            | 2.99 | 2.84 | 1449.1      | 2.12            | 2.43 | 2.81 | 375.1                | 1.23                          | 1.15 | 1.12 |
| 1390.1              | 1499.1      | 3.32            | 3.08 | 2.94 | 1499.1      | 2.14            | 2.34 | 2.66 | 390.1                | 1.29                          | 1.20 | 1.16 |
| 1430.1              | 1539.1      | 3.42            | 3.15 | 3.00 | 1539.1      | 2.15            | 2.23 | 2.45 | 400.1                | 1.30                          | 1.22 | 1.19 |
| 1480.1              | 1589.1      | 3.48            | 3.19 | 3.04 | 1589.1      | 2.17            | 2.12 | 2.27 | 415.1                | 1.25                          | 1.18 | 1.15 |
| 1520.1              | 1629.1      | 3.56            | 3.25 | 3.09 | 1629.1      | 2.18            | 2.02 | 2.05 | 425.1                | 1.26                          | 1.18 | 1.14 |
| 1570.1              | 1679.1      | 3.60            | 3.27 | 3.09 | 1679.1      | 2.21            | 1.91 | 1.85 | 440.1                | 1.33                          | 1.24 | 1.20 |
| 1610.1              | 1719.1      | 3.57            | 3.28 | 3.09 | 1719.1      | 2.22            | 1.83 | 1.68 | 450.1                | 1.32                          | 1.24 | 1.21 |
| 1660.1              | 1769.1      | 3.55            | 3.26 | 3.07 | 1769.1      | 2.32            | 1.79 | 1.53 | 465.1                | 1.28                          | 1.20 | 1.17 |
| 1700.1              | 1809.1      | 3.44            | 3.20 | 3.02 | 1809.1      | 2.35            | 1.79 | 1.47 | 475.1                | 1.32                          | 1.22 | 1.18 |
| 1750.1              | 1859.1      | 3.36            | 3.11 | 2.94 | 1859.1      | 2.62            | 1.97 | 1.60 | 490.1                | 1.36                          | 1.28 | 1.23 |

## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |        |        |        |        |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 9.81   | 24.20  | 15.79  | 31.20  | 27.22  | 38.56  | 26.34  | 43.51  | 28.03  | 39.62  |
| 1  | ---    | 30.24  | ---    | 46.72  | 12.26  | 44.80  | 21.29  | 42.04  | 32.59  | 38.18  | 42.85  | 42.70  |
| 2  | 110.26 | 89.81  | 77.95  | 83.46  | 82.22  | 86.31  | 79.59  | 81.77  | 79.68  | 85.10  | 71.88  | 92.85  |
| 3  | 136.49 | 101.37 | 88.32  | 99.81  | 87.87  | 101.48 | 89.03  | 101.06 | 84.66  | 80.24  | 83.50  | 96.47  |
| 4  | 126.47 | 108.19 | 108.00 | 110.31 | 104.64 | 118.88 | 116.01 | 115.51 | 104.76 | 107.36 | 119.65 | 104.56 |
| 5  | 130.64 | 115.32 | 106.96 | 125.69 | 117.60 | 110.38 | 105.97 | 110.70 | 108.68 | 115.44 | 113.65 | 103.31 |
| 6  | 124.41 | 107.29 | 112.30 | 111.77 | 112.23 | 113.11 | 109.88 | 106.27 | 102.80 | 115.22 | 103.86 | 111.36 |
| 7  | 120.08 | 105.22 | 117.30 | 104.32 | 108.00 | 112.62 | 107.90 | 120.14 | 109.56 | 105.06 | 106.15 | 104.25 |
| 8  | 122.17 | 111.37 | 120.48 | 111.08 | 117.27 | 116.69 | 119.13 | 121.28 | 129.42 | 108.28 | 106.43 | 115.89 |
| 9  | 127.32 | 102.18 | 109.44 | 115.09 | 110.44 | 110.13 | 110.53 | 110.73 | 109.19 | 120.30 | 104.63 | 109.12 |
| 10 | 129.56 | 121.51 | 103.60 | 107.00 | 106.20 | 109.59 | 106.29 | 111.84 | 111.21 | 109.15 | 106.71 | 109.73 |
|    | RF CAL | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

### LO HARMONICS ORDER

Test conditions: RF IN: 350 MHz; -10 dBm.  
LO IN: 459 MHz; +20.00 dBm  
IF OUT: 109 MHz; -17.62 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |        |        |        |        |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 19.72  | 34.21  | 25.76  | 40.98  | 37.33  | 49.12  | 36.93  | 53.61  | 38.72  | 50.41  |
| 1  | ---    | 30.17  | ---    | 46.09  | 12.25  | 44.94  | 21.17  | 42.16  | 32.47  | 38.44  | 44.08  | 43.01  |
| 2  | 104.15 | 76.12  | 68.41  | 76.10  | 70.17  | 77.61  | 69.20  | 74.23  | 71.64  | 79.03  | 63.10  | 106.40 |
| 3  | 109.93 | 86.91  | 69.70  | 83.52  | 68.87  | 83.87  | 71.15  | 84.34  | 68.14  | 81.46  | 65.96  | 77.34  |
| 4  | 113.54 | 94.91  | 94.37  | 102.49 | 99.36  | 99.96  | 95.61  | 96.02  | 93.01  | 97.28  | 95.76  | 98.40  |
| 5  | 110.81 | 100.42 | 95.23  | 97.68  | 103.80 | 105.54 | 92.85  | 112.84 | 86.40  | 110.12 | 85.83  | 97.74  |
| 6  | 115.17 | 109.58 | 105.19 | 113.41 | 116.07 | 110.80 | 102.65 | 106.34 | 106.65 | 106.29 | 99.86  | 95.30  |
| 7  | 113.01 | 106.43 | 109.62 | 105.79 | 107.73 | 117.76 | 105.24 | 109.56 | 105.06 | 105.32 | 103.98 | 97.72  |
| 8  | 110.12 | 105.13 | 101.26 | 112.90 | 104.51 | 115.72 | 122.22 | 108.63 | 113.83 | 103.62 | 106.70 | 108.44 |
| 9  | 116.86 | 107.85 | 104.89 | 102.74 | 104.31 | 107.04 | 104.07 | 104.96 | 104.57 | 104.84 | 108.98 | 104.14 |
| 10 | 112.60 | 99.12  | 106.74 | 100.85 | 103.38 | 101.31 | 119.25 | 110.82 | 109.38 | 100.31 | 116.10 | 103.11 |
|    | RF CAL | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

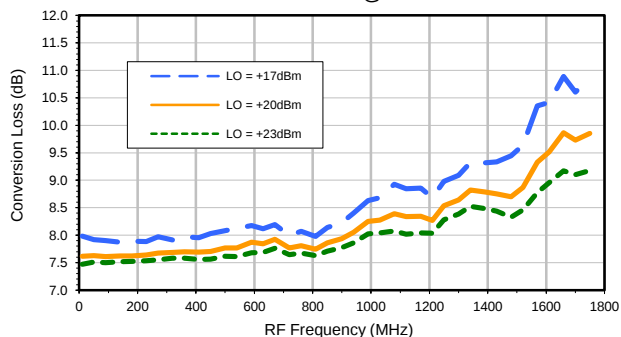
### LO HARMONICS ORDER

Test conditions: RF IN: 350 MHz; 0 dBm.  
LO IN: 459 MHz; +20.00 dBm  
IF OUT: 109 MHz; -7.59 dBm

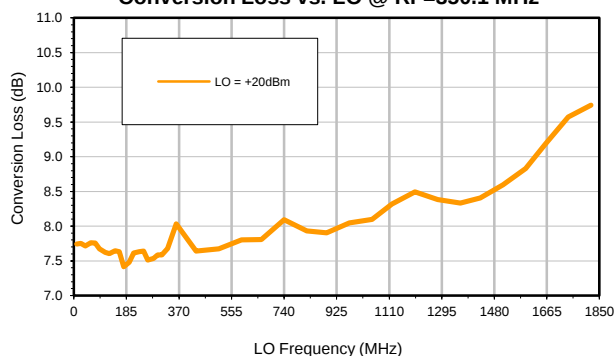
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT  
3. RF Cal represents the Harmonics level of the RF Input Signal to the mixer

## Typical Performance Curves

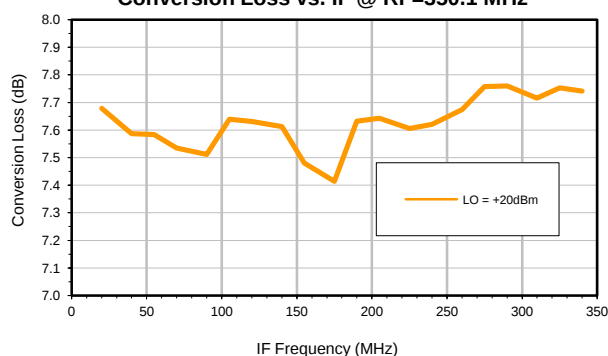
Conversion Loss @IF=109 MHz



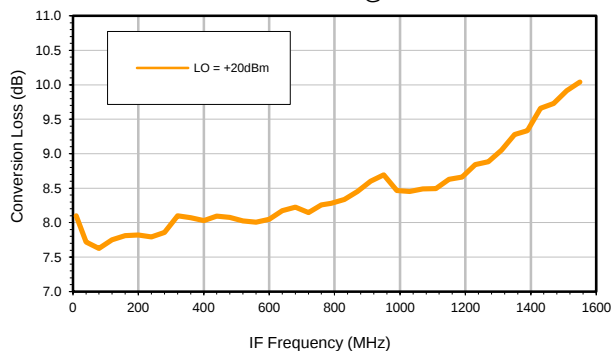
Conversion Loss vs. LO @ RF=350.1 MHz



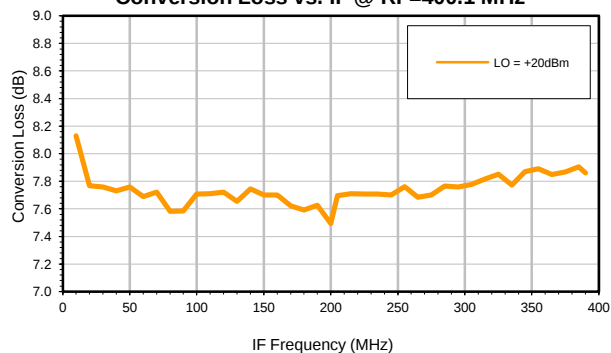
Conversion Loss vs. IF @ RF=350.1 MHz



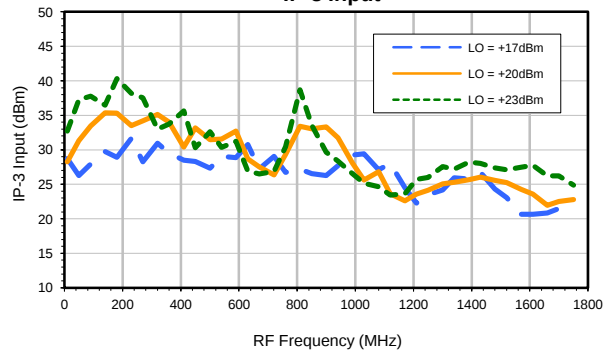
Conversion Loss vs. IF @ RF=300.1 MHz



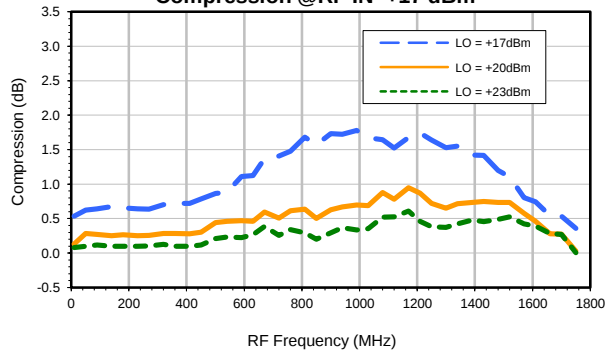
Conversion Loss vs. IF @ RF=400.1 MHz



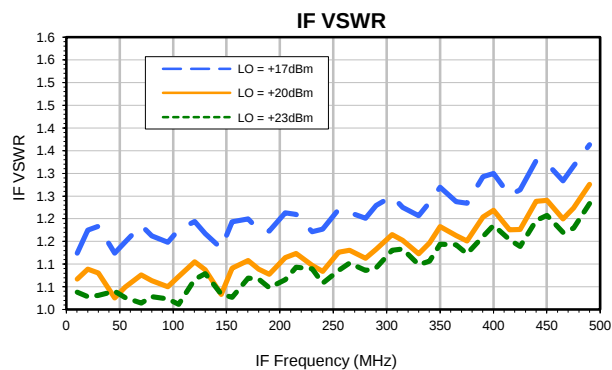
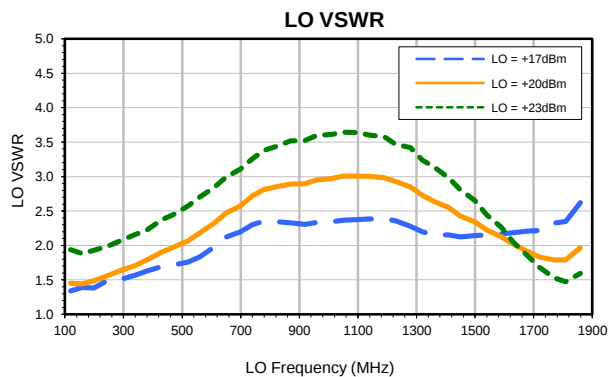
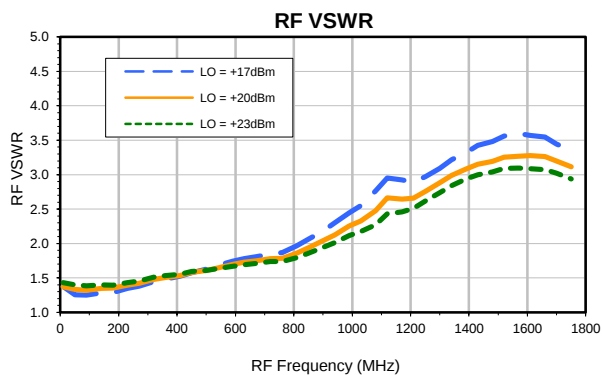
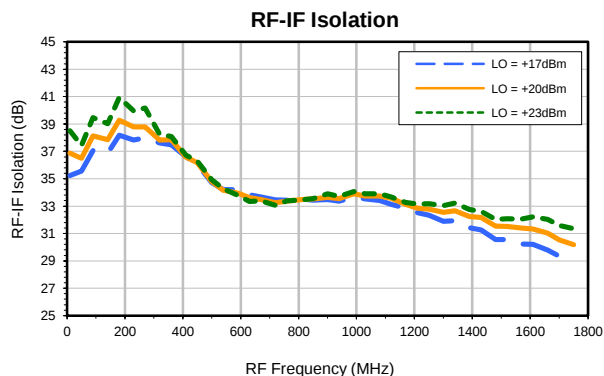
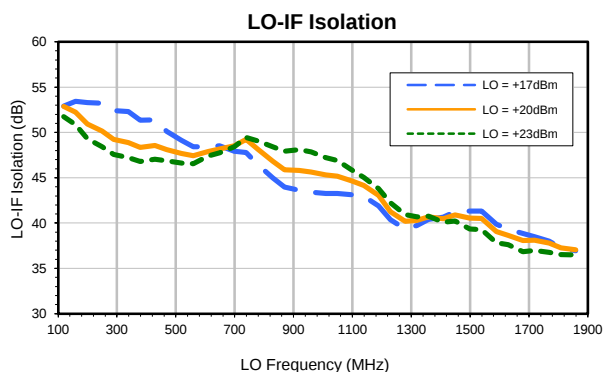
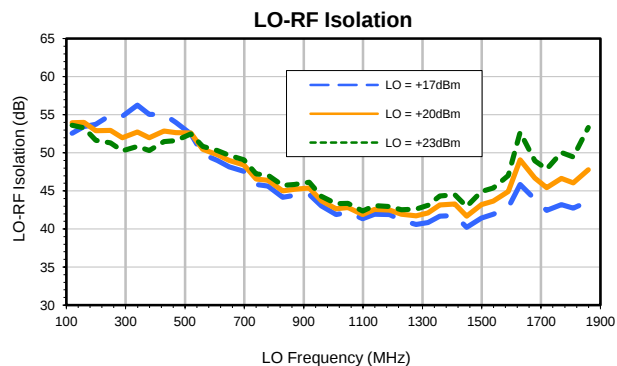
IP-3 Input



Compression @RF IN=+17 dBm



## Typical Performance Curves



## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |        |        |        |        |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 9.81   | 24.20  | 15.79  | 31.20  | 27.22  | 38.56  | 26.34  | 43.51  | 28.03  | 39.62  |
| 1  | ---    | 30.24  | ---    | 46.72  | 12.26  | 44.80  | 21.29  | 42.04  | 32.59  | 38.18  | 42.85  | 42.70  |
| 2  | 110.26 | 89.81  | 77.95  | 83.46  | 82.22  | 86.31  | 79.59  | 81.77  | 79.68  | 85.10  | 71.88  | 92.85  |
| 3  | 136.49 | 101.37 | 88.32  | 99.81  | 87.87  | 101.48 | 89.03  | 101.06 | 84.66  | 80.24  | 83.50  | 96.47  |
| 4  | 126.47 | 108.19 | 108.00 | 110.31 | 104.64 | 118.88 | 116.01 | 115.51 | 104.76 | 107.36 | 119.65 | 104.56 |
| 5  | 130.64 | 115.32 | 106.96 | 125.69 | 117.60 | 110.38 | 105.97 | 110.70 | 108.68 | 115.44 | 113.65 | 103.31 |
| 6  | 124.41 | 107.29 | 112.30 | 111.77 | 112.23 | 113.11 | 109.88 | 106.27 | 102.80 | 115.22 | 103.86 | 111.36 |
| 7  | 120.08 | 105.22 | 117.30 | 104.32 | 108.00 | 112.62 | 107.90 | 120.14 | 109.56 | 105.06 | 106.15 | 104.25 |
| 8  | 122.17 | 111.37 | 120.48 | 111.08 | 117.27 | 116.69 | 119.13 | 121.28 | 129.42 | 108.28 | 106.43 | 115.89 |
| 9  | 127.32 | 102.18 | 109.44 | 115.09 | 110.44 | 110.13 | 110.53 | 110.73 | 109.19 | 120.30 | 104.63 | 109.12 |
| 10 | 129.56 | 121.51 | 103.60 | 107.00 | 106.20 | 109.59 | 106.29 | 111.84 | 111.21 | 109.15 | 106.71 | 109.73 |
|    | RF CAL | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

### LO HARMONICS ORDER

Test conditions: RF IN: 350 MHz; -10 dBm.  
LO IN: 459 MHz; +20.00 dBm  
IF OUT: 109 MHz; -17.62 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |        |        |        |        |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0  | ---    | ---    | 19.72  | 34.21  | 25.76  | 40.98  | 37.33  | 49.12  | 36.93  | 53.61  | 38.72  | 50.41  |
| 1  | ---    | 30.17  | ---    | 46.09  | 12.25  | 44.94  | 21.17  | 42.16  | 32.47  | 38.44  | 44.08  | 43.01  |
| 2  | 104.15 | 76.12  | 68.41  | 76.10  | 70.17  | 77.61  | 69.20  | 74.23  | 71.64  | 79.03  | 63.10  | 106.40 |
| 3  | 109.93 | 86.91  | 69.70  | 83.52  | 68.87  | 83.87  | 71.15  | 84.34  | 68.14  | 81.46  | 65.96  | 77.34  |
| 4  | 113.54 | 94.91  | 94.37  | 102.49 | 99.36  | 99.96  | 95.61  | 96.02  | 93.01  | 97.28  | 95.76  | 98.40  |
| 5  | 110.81 | 100.42 | 95.23  | 97.68  | 103.80 | 105.54 | 92.85  | 112.84 | 86.40  | 110.12 | 85.83  | 97.74  |
| 6  | 115.17 | 109.58 | 105.19 | 113.41 | 116.07 | 110.80 | 102.65 | 106.34 | 106.65 | 106.29 | 99.86  | 95.30  |
| 7  | 113.01 | 106.43 | 109.62 | 105.79 | 107.73 | 117.76 | 105.24 | 109.56 | 105.06 | 105.32 | 103.98 | 97.72  |
| 8  | 110.12 | 105.13 | 101.26 | 112.90 | 104.51 | 115.72 | 122.22 | 108.63 | 113.83 | 103.62 | 106.70 | 108.44 |
| 9  | 116.86 | 107.85 | 104.89 | 102.74 | 104.31 | 107.04 | 104.07 | 104.96 | 104.57 | 104.84 | 108.98 | 104.14 |
| 10 | 112.60 | 99.12  | 106.74 | 100.85 | 103.38 | 101.31 | 119.25 | 110.82 | 109.38 | 100.31 | 116.10 | 103.11 |
|    | RF CAL | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |

### LO HARMONICS ORDER

Test conditions: RF IN: 350 MHz; 0 dBm.  
LO IN: 459 MHz; +20.00 dBm  
IF OUT: 109 MHz; -7.59 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 represents 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

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

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

INITIALS

DATE

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

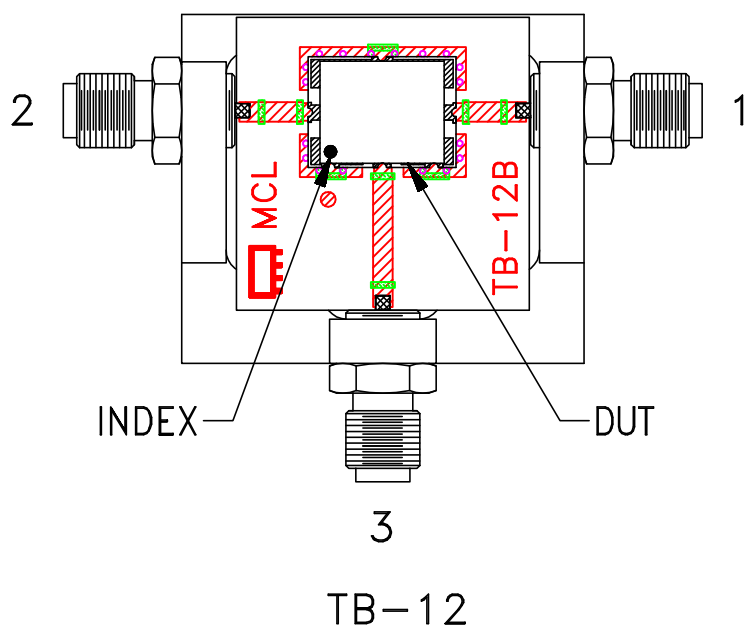
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ASHEETA1.DWG REV:A DATE:01/12/95

# 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                                                                              |