

## Frequency Mixer

## SYM-ED17165/1

Level 17 (LO Power + 17 dBm)

### Important Note

This model has been designed, built and tested in our engineering department. Performance data represents model capability.

At present it is a non-catalog model. On request, we can supply a final specification sheet, part number and price/delivery information.



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

**CASE STYLE : TTT167**

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                       |      |      |      |       |
|---------------------------------------|-----------------------|------|------|------|-------|
| Parameter                             |                       | Min. | Typ. | Max. | Units |
| Frequency                             | LO ( $f_L$ to $f_U$ ) | 40   |      | 2530 | MHz   |
|                                       | RF ( $f_L$ to $f_U$ ) | 10   |      | 2500 | MHz   |
|                                       | IF                    | 10   |      | 1500 | MHz   |
| Conversion Loss                       | Mid Band              |      | 6.5  |      | dB    |
|                                       | Total Range           |      | 7.3  |      |       |
| LO-RF Isolation                       | Low Range             |      | 43   |      | dB    |
|                                       | Mid Range             |      | 37   |      | dB    |
|                                       | Upper Range           |      | 28   |      | dB    |
| LO-IF Isolation                       | Low Range             |      | 43   |      | dB    |
|                                       | Mid Range             |      | 38   |      | dB    |
|                                       | Upper Range           |      | 31   |      | dB    |
| Input IP3                             |                       |      | +25  |      | dBm   |
| 1 dB Compression                      |                       |      | +14  |      | dBm   |

Note: Low Range = [ $f_L$  to  $10f_L$ ]

Mid Range = [ $10f_L$  to  $f_U/2$ ]

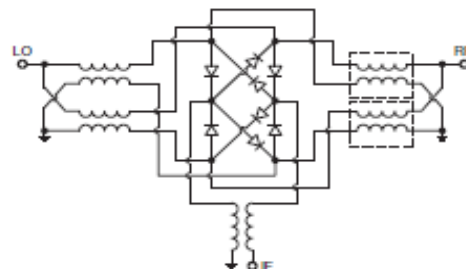
Upper Range = [ $f_U/2$  to  $f_U$ ]

Mid band =  $2f_L$  to  $f_U/2$

| 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)=30MHz<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=+14dBm<br>(dB) |       |       |
|---------------------|-------------|-------------------------------------------------------|-------|------|---------------------|-------------|---------------------|-------|-------|---------------------|-------------|--------------------------------------|-------|-------|
|                     |             | @LO (dBm)                                             |       |      |                     |             | @LO (dBm)           |       |       |                     |             | @LO (dBm)                            |       |       |
|                     |             | +14                                                   | +17   | +20  |                     |             | +14                 | +17   | +20   |                     |             | +14                                  | +17   | +20   |
| 10.1                | 40.1        | 5.70                                                  | 5.35  | 5.16 | 10.1                | 40.1        | 26.68               | 26.93 | 28.92 | 10.1                | 40.1        | -0.85                                | -0.86 | -0.70 |
| 90.1                | 120.1       | 5.86                                                  | 5.46  | 5.26 | 90.1                | 120.1       | 25.39               | 25.22 | 24.90 | 90.1                | 120.1       | -0.74                                | -0.83 | -0.66 |
| 180.1               | 210.1       | 6.07                                                  | 5.62  | 5.38 | 180.1               | 210.1       | 22.64               | 23.36 | 25.42 | 180.1               | 210.1       | -0.70                                | -0.80 | -0.65 |
| 270.1               | 300.1       | 6.42                                                  | 5.82  | 5.45 | 270.1               | 300.1       | 21.42               | 23.57 | 25.31 | 270.1               | 300.1       | -0.67                                | -0.95 | -0.82 |
| 350.1               | 380.1       | 6.42                                                  | 5.75  | 5.46 | 350.1               | 380.1       | 23.38               | 24.98 | 26.92 | 350.1               | 380.1       | -0.79                                | -1.08 | -0.92 |
| 440.1               | 470.1       | 6.63                                                  | 5.88  | 5.57 | 440.1               | 470.1       | 23.54               | 25.21 | 28.87 | 440.1               | 470.1       | -0.83                                | -1.22 | -1.07 |
| 530.1               | 560.1       | 6.72                                                  | 5.96  | 5.63 | 530.1               | 560.1       | 23.02               | 25.09 | 29.85 | 530.1               | 560.1       | -0.74                                | -1.30 | -1.18 |
| 610.1               | 640.1       | 6.63                                                  | 6.01  | 5.73 | 610.1               | 640.1       | 24.43               | 27.56 | 34.08 | 610.1               | 640.1       | -0.52                                | -1.30 | -1.15 |
| 700.1               | 730.1       | 6.76                                                  | 6.17  | 5.91 | 700.1               | 730.1       | 26.12               | 31.03 | 30.75 | 700.1               | 730.1       | -0.35                                | -1.15 | -1.07 |
| 790.1               | 820.1       | 6.90                                                  | 6.33  | 6.06 | 790.1               | 820.1       | 26.85               | 31.51 | 29.74 | 790.1               | 820.1       | -0.12                                | -1.04 | -0.94 |
| 870.1               | 900.1       | 7.12                                                  | 6.42  | 6.13 | 870.1               | 900.1       | 28.23               | 28.21 | 27.41 | 870.1               | 900.1       | -0.16                                | -0.89 | -0.83 |
| 960.1               | 990.1       | 6.92                                                  | 6.26  | 5.99 | 960.1               | 990.1       | 26.98               | 26.08 | 25.83 | 960.1               | 990.1       | -0.24                                | -0.93 | -0.87 |
| 1050.1              | 1080.1      | 6.66                                                  | 6.09  | 5.86 | 1050.1              | 1080.1      | 27.10               | 25.91 | 26.10 | 1050.1              | 1080.1      | -0.32                                | -1.02 | -0.91 |
| 1130.1              | 1160.1      | 6.69                                                  | 6.20  | 6.00 | 1130.1              | 1160.1      | 27.86               | 26.51 | 26.34 | 1130.1              | 1160.1      | -0.22                                | -0.84 | -0.74 |
| 1220.1              | 1250.1      | 6.77                                                  | 6.27  | 6.09 | 1220.1              | 1250.1      | 28.21               | 27.41 | 26.86 | 1220.1              | 1250.1      | -0.19                                | -0.77 | -0.67 |
| 1310.1              | 1340.1      | 6.64                                                  | 6.15  | 5.95 | 1310.1              | 1340.1      | 31.07               | 27.89 | 27.31 | 1310.1              | 1340.1      | -0.11                                | -0.97 | -0.86 |
| 1400.1              | 1430.1      | 6.61                                                  | 6.09  | 5.89 | 1400.1              | 1430.1      | 27.21               | 29.28 | 27.77 | 1400.1              | 1430.1      | -0.12                                | -1.12 | -1.01 |
| 1480.1              | 1510.1      | 6.84                                                  | 6.23  | 5.99 | 1480.1              | 1510.1      | 24.17               | 32.58 | 28.31 | 1480.1              | 1510.1      | -0.18                                | -1.10 | -0.98 |
| 1570.1              | 1600.1      | 7.26                                                  | 6.51  | 6.20 | 1570.1              | 1600.1      | 22.59               | 31.46 | 29.11 | 1570.1              | 1600.1      | -0.17                                | -1.02 | -0.91 |
| 1660.1              | 1690.1      | 7.72                                                  | 6.85  | 6.46 | 1660.1              | 1690.1      | 22.10               | 29.26 | 29.63 | 1660.1              | 1690.1      | -0.13                                | -0.94 | -0.87 |
| 1740.1              | 1770.1      | 8.05                                                  | 7.08  | 6.63 | 1740.1              | 1770.1      | 22.41               | 29.27 | 29.77 | 1740.1              | 1770.1      | -0.07                                | -0.97 | -0.93 |
| 1830.1              | 1860.1      | 8.13                                                  | 7.16  | 6.69 | 1830.1              | 1860.1      | 24.10               | 27.88 | 27.30 | 1830.1              | 1860.1      | -0.06                                | -1.17 | -1.13 |
| 1920.1              | 1950.1      | 8.28                                                  | 7.27  | 6.79 | 1920.1              | 1950.1      | 25.20               | 25.43 | 25.05 | 1920.1              | 1950.1      | -0.13                                | -1.19 | -1.16 |
| 2000.1              | 2030.1      | 8.31                                                  | 7.34  | 6.86 | 2000.1              | 2030.1      | 23.48               | 23.48 | 23.46 | 2000.1              | 2030.1      | -0.18                                | -1.22 | -1.18 |
| 2090.1              | 2120.1      | 7.96                                                  | 7.09  | 6.67 | 2090.1              | 2120.1      | 21.90               | 21.89 | 22.14 | 2090.1              | 2120.1      | -0.44                                | -1.51 | -1.43 |
| 2180.1              | 2210.1      | 7.77                                                  | 6.98  | 6.59 | 2180.1              | 2210.1      | 21.27               | 21.36 | 21.61 | 2180.1              | 2210.1      | -0.56                                | -1.62 | -1.52 |
| 2260.1              | 2290.1      | 7.79                                                  | 7.02  | 6.63 | 2260.1              | 2290.1      | 20.93               | 21.08 | 21.22 | 2260.1              | 2290.1      | -0.76                                | -1.69 | -1.56 |
| 2350.1              | 2380.1      | 7.68                                                  | 6.99  | 6.62 | 2350.1              | 2380.1      | 20.04               | 20.41 | 20.71 | 2350.1              | 2380.1      | -0.90                                | -1.68 | -1.59 |
| 2440.1              | 2470.1      | 7.71                                                  | 7.02  | 6.68 | 2440.1              | 2470.1      | 19.68               | 20.23 | 20.76 | 2440.1              | 2470.1      | -0.99                                | -1.67 | -1.52 |
| 2530.1              | 2560.1      | 7.83                                                  | 7.17  | 6.83 | 2530.1              | 2560.1      | 20.01               | 20.40 | 21.05 | 2530.1              | 2560.1      | -1.04                                | -1.57 | -1.46 |
| 2610.1              | 2640.1      | 7.98                                                  | 7.31  | 6.99 | 2610.1              | 2640.1      | 20.89               | 21.16 | 21.79 | 2610.1              | 2640.1      | -0.99                                | -1.44 | -1.28 |
| 2700.1              | 2730.1      | 8.21                                                  | 7.54  | 7.19 | 2700.1              | 2730.1      | 21.32               | 21.53 | 22.11 | 2700.1              | 2730.1      | -0.93                                | -1.27 | -1.20 |
| 2790.1              | 2820.1      | 8.43                                                  | 7.73  | 7.36 | 2790.1              | 2820.1      | 21.03               | 21.27 | 21.89 | 2790.1              | 2820.1      | -0.84                                | -1.16 | -1.11 |
| 2870.1              | 2900.1      | 8.74                                                  | 8.05  | 7.68 | 2870.1              | 2900.1      | 22.01               | 22.09 | 22.71 | 2870.1              | 2900.1      | -0.80                                | -1.01 | -0.92 |
| 2960.1              | 2990.1      | 9.28                                                  | 8.50  | 8.11 | 2960.1              | 2990.1      | 23.58               | 23.75 | 23.99 | 2960.1              | 2990.1      | -0.89                                | -0.89 | -0.70 |
| 3050.1              | 3080.1      | 9.74                                                  | 8.81  | 8.31 | 3050.1              | 3080.1      | 23.06               | 24.65 | 24.56 | 3050.1              | 3080.1      | -1.04                                | -1.02 | -0.80 |
| 3130.1              | 3160.1      | 10.11                                                 | 9.05  | 8.49 | 3130.1              | 3160.1      | 21.41               | 25.66 | 25.54 | 3130.1              | 3160.1      | -1.16                                | -1.29 | -0.97 |
| 3220.1              | 3250.1      | 10.64                                                 | 9.49  | 8.91 | 3220.1              | 3250.1      | 20.73               | 26.98 | 27.55 | 3220.1              | 3250.1      | -1.11                                | -1.20 | -0.82 |
| 3310.1              | 3340.1      | 11.29                                                 | 10.01 | 9.35 | 3310.1              | 3340.1      | 20.40               | 27.93 | 28.76 | 3310.1              | 3340.1      | -0.99                                | -1.00 | -0.66 |
| 3400.1              | 3430.1      | 11.92                                                 | 10.45 | 9.67 | 3400.1              | 3430.1      | 19.29               | 28.12 | 28.87 | 3400.1              | 3430.1      | -0.79                                | -0.87 | -0.59 |

# Frequency Mixer

SYM-ED17165/1

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1505.1MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1220.1MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1790.1MHz<br>(dB) |
|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                        |
|                      |             | +17                                                              |                      |             | +17                                                              |                      |             | +17                                                              |
| 1495.0               | 10.1        | 7.69                                                             | 10.0                 | 1230.1      | 7.47                                                             | 1780.0               | 10.1        | 8.21                                                             |
| 1425.0               | 80.1        | 7.61                                                             | 60.0                 | 1280.1      | 7.72                                                             | 1740.0               | 50.1        | 8.14                                                             |
| 1345.0               | 160.1       | 7.50                                                             | 120.0                | 1340.1      | 7.56                                                             | 1690.0               | 100.1       | 8.22                                                             |
| 1275.0               | 230.1       | 7.47                                                             | 170.0                | 1390.1      | 7.68                                                             | 1650.0               | 140.1       | 8.04                                                             |
| 1195.0               | 310.1       | 7.35                                                             | 230.0                | 1450.1      | 7.57                                                             | 1600.0               | 190.1       | 8.01                                                             |
| 1125.0               | 380.1       | 7.24                                                             | 290.0                | 1510.1      | 7.53                                                             | 1560.0               | 230.1       | 7.95                                                             |
| 1045.0               | 460.1       | 7.17                                                             | 340.0                | 1560.1      | 7.61                                                             | 1510.0               | 280.1       | 7.77                                                             |
| 965.0                | 540.1       | 7.15                                                             | 400.0                | 1620.1      | 7.58                                                             | 1470.0               | 320.1       | 7.75                                                             |
| 895.0                | 610.1       | 7.00                                                             | 460.0                | 1680.1      | 7.70                                                             | 1420.0               | 370.1       | 7.77                                                             |
| 815.0                | 690.1       | 6.97                                                             | 510.0                | 1730.1      | 7.65                                                             | 1380.0               | 410.1       | 7.69                                                             |
| 745.0                | 760.1       | 6.97                                                             | 570.0                | 1790.1      | 7.87                                                             | 1330.0               | 460.1       | 7.74                                                             |
| 665.0                | 840.1       | 7.00                                                             | 630.0                | 1850.1      | 7.94                                                             | 1290.0               | 500.1       | 7.70                                                             |
| 585.0                | 920.1       | 6.90                                                             | 680.0                | 1900.1      | 8.10                                                             | 1240.0               | 550.1       | 7.62                                                             |
| 515.0                | 990.1       | 6.83                                                             | 740.0                | 1960.1      | 8.33                                                             | 1190.0               | 600.1       | 7.63                                                             |
| 435.0                | 1070.1      | 6.89                                                             | 790.0                | 2010.1      | 8.41                                                             | 1150.0               | 640.1       | 7.55                                                             |
| 365.0                | 1140.1      | 6.94                                                             | 850.0                | 2070.1      | 8.44                                                             | 1100.0               | 690.1       | 7.56                                                             |
| 285.0                | 1220.1      | 6.97                                                             | 910.0                | 2130.1      | 8.39                                                             | 1060.0               | 730.1       | 7.50                                                             |
| 205.0                | 1300.1      | 7.01                                                             | 960.0                | 2180.1      | 8.46                                                             | 1010.0               | 780.1       | 7.56                                                             |
| 135.0                | 1370.1      | 7.12                                                             | 1020.0               | 2240.1      | 8.42                                                             | 970.0                | 820.1       | 7.51                                                             |
| 55.0                 | 1450.1      | 7.16                                                             | 1080.0               | 2300.1      | 8.62                                                             | 920.0                | 870.1       | 7.60                                                             |
| 15.0                 | 1520.1      | 7.06                                                             | 1130.0               | 2350.1      | 8.63                                                             | 880.0                | 910.1       | 7.59                                                             |
| 105.0                | 1610.1      | 7.14                                                             | 1190.0               | 2410.1      | 8.81                                                             | 830.0                | 960.1       | 7.56                                                             |
| 205.0                | 1710.1      | 7.29                                                             | 1250.0               | 2470.1      | 8.89                                                             | 790.0                | 1000.1      | 7.63                                                             |
| 305.0                | 1810.1      | 7.45                                                             | 1300.0               | 2520.1      | 9.01                                                             | 740.0                | 1050.1      | 7.58                                                             |
| 405.0                | 1910.1      | 7.76                                                             | 1360.0               | 2580.1      | 9.14                                                             | 700.0                | 1090.1      | 7.73                                                             |
| 495.0                | 2000.1      | 7.98                                                             | 1420.0               | 2640.1      | 9.20                                                             | 650.0                | 1140.1      | 7.69                                                             |
| 595.0                | 2100.1      | 8.11                                                             | 1470.0               | 2690.1      | 9.32                                                             | 600.0                | 1190.1      | 7.86                                                             |
| 695.0                | 2200.1      | 8.11                                                             | 1530.0               | 2750.1      | 9.40                                                             | 560.0                | 1230.1      | 7.88                                                             |
| 795.0                | 2300.1      | 8.11                                                             | 1580.0               | 2800.1      | 9.55                                                             | 510.0                | 1280.1      | 8.02                                                             |
| 895.0                | 2400.1      | 8.05                                                             | 1640.0               | 2860.1      | 9.75                                                             | 470.0                | 1320.1      | 8.04                                                             |
| 985.0                | 2490.1      | 8.06                                                             | 1700.0               | 2920.1      | 9.77                                                             | 420.0                | 1370.1      | 8.27                                                             |
| 1085.0               | 2590.1      | 8.08                                                             | 1750.0               | 2970.1      | 10.12                                                            | 380.0                | 1410.1      | 8.21                                                             |
| 1185.0               | 2690.1      | 8.12                                                             | 1810.0               | 3030.1      | 10.09                                                            | 330.0                | 1460.1      | 8.47                                                             |
| 1285.0               | 2790.1      | 8.17                                                             | 1870.0               | 3090.1      | 10.36                                                            | 290.0                | 1500.1      | 8.50                                                             |
| 1385.0               | 2890.1      | 8.20                                                             | 1920.0               | 3140.1      | 10.53                                                            | 240.0                | 1550.1      | 8.64                                                             |
| 1475.0               | 2980.1      | 8.27                                                             | 1980.0               | 3200.1      | 10.51                                                            | 200.0                | 1590.1      | 8.76                                                             |
| 1575.0               | 3080.1      | 8.41                                                             | 2040.0               | 3260.1      | 11.01                                                            | 150.0                | 1640.1      | 8.86                                                             |
| 1675.0               | 3180.1      | 8.59                                                             | 2090.0               | 3310.1      | 10.87                                                            | 110.0                | 1680.1      | 8.97                                                             |
| 1775.0               | 3280.1      | 8.71                                                             | 2150.0               | 3370.1      | 11.87                                                            | 60.0                 | 1730.1      | 9.12                                                             |
| 1875.0               | 3380.1      | 8.87                                                             | 2210.0               | 3430.1      | 11.42                                                            | 10.0                 | 1780.1      | 9.21                                                             |



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IF/RF MICROWAVE COMPONENTS

REV. X1

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# Frequency Mixer

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## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +14                     | +17   | +20   | +14                     | +17   | +20   |
| 40.1        | 40.85                   | 43.93 | 46.96 | 43.65                   | 46.55 | 48.74 |
| 120.1       | 40.77                   | 43.52 | 45.37 | 43.86                   | 46.25 | 46.94 |
| 210.1       | 40.87                   | 42.52 | 43.15 | 44.30                   | 45.10 | 43.94 |
| 300.1       | 40.75                   | 41.51 | 41.53 | 44.47                   | 43.08 | 41.29 |
| 380.1       | 41.88                   | 42.81 | 41.63 | 44.86                   | 41.96 | 40.01 |
| 470.1       | 43.15                   | 43.80 | 41.81 | 44.19                   | 41.01 | 38.89 |
| 560.1       | 45.95                   | 45.21 | 42.22 | 43.91                   | 40.53 | 38.38 |
| 640.1       | 51.21                   | 45.36 | 41.23 | 42.75                   | 39.44 | 37.30 |
| 730.1       | 56.17                   | 44.24 | 40.00 | 42.17                   | 38.41 | 36.18 |
| 820.1       | 61.06                   | 44.16 | 39.60 | 42.59                   | 38.06 | 35.63 |
| 900.1       | 55.00                   | 44.03 | 39.07 | 45.53                   | 38.71 | 35.36 |
| 990.1       | 48.07                   | 42.53 | 38.34 | 50.30                   | 40.01 | 35.86 |
| 1080.1      | 44.37                   | 40.56 | 37.51 | 50.10                   | 40.53 | 36.21 |
| 1160.1      | 41.35                   | 38.89 | 36.78 | 47.18                   | 40.46 | 36.67 |
| 1250.1      | 39.37                   | 37.45 | 35.85 | 45.52                   | 40.74 | 37.07 |
| 1340.1      | 38.36                   | 36.57 | 35.27 | 44.40                   | 41.16 | 37.58 |
| 1430.1      | 38.13                   | 36.39 | 35.05 | 43.20                   | 41.20 | 38.03 |
| 1510.1      | 38.68                   | 36.74 | 35.36 | 42.36                   | 40.89 | 38.05 |
| 1600.1      | 39.13                   | 37.42 | 36.00 | 41.49                   | 39.82 | 37.28 |
| 1690.1      | 38.53                   | 37.65 | 36.54 | 40.72                   | 38.63 | 36.36 |
| 1770.1      | 37.09                   | 37.07 | 36.55 | 39.99                   | 37.77 | 35.43 |
| 1860.1      | 34.78                   | 35.75 | 35.86 | 38.97                   | 36.76 | 34.62 |
| 1950.1      | 32.32                   | 33.56 | 34.17 | 37.68                   | 35.89 | 33.90 |
| 2030.1      | 30.32                   | 31.71 | 32.61 | 36.13                   | 34.87 | 33.41 |
| 2120.1      | 28.50                   | 30.01 | 31.11 | 34.78                   | 33.81 | 32.74 |
| 2210.1      | 27.07                   | 28.65 | 29.88 | 33.78                   | 32.81 | 31.94 |
| 2290.1      | 26.19                   | 27.78 | 29.09 | 32.74                   | 32.09 | 31.37 |
| 2380.1      | 25.51                   | 27.08 | 28.46 | 31.60                   | 31.23 | 30.68 |
| 2470.1      | 25.22                   | 26.81 | 28.12 | 30.53                   | 30.36 | 30.00 |
| 2560.1      | 25.19                   | 26.76 | 27.93 | 29.40                   | 29.32 | 29.12 |
| 2640.1      | 25.36                   | 26.81 | 27.76 | 28.47                   | 28.42 | 28.23 |
| 2730.1      | 25.78                   | 27.15 | 27.92 | 27.71                   | 27.85 | 27.76 |
| 2820.1      | 26.27                   | 27.45 | 28.07 | 27.00                   | 27.33 | 27.39 |
| 2900.1      | 26.71                   | 27.80 | 28.39 | 26.51                   | 27.07 | 27.36 |
| 2990.1      | 27.11                   | 28.09 | 28.64 | 25.93                   | 26.75 | 27.35 |
| 3080.1      | 27.35                   | 28.29 | 28.84 | 25.36                   | 26.34 | 27.17 |
| 3160.1      | 27.47                   | 28.45 | 29.00 | 24.82                   | 26.02 | 27.01 |
| 3250.1      | 27.56                   | 28.41 | 28.80 | 24.07                   | 25.38 | 26.47 |
| 3340.1      | 27.69                   | 28.36 | 28.68 | 23.41                   | 24.80 | 26.00 |
| 3430.1      | 27.80                   | 28.36 | 28.63 | 22.78                   | 24.32 | 25.63 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 10.1                | 40.1        | 39.29                   | 40.16 | 41.71 |
| 90.1                | 120.1       | 39.85                   | 41.28 | 43.26 |
| 180.1               | 210.1       | 41.52                   | 43.09 | 45.31 |
| 270.1               | 300.1       | 42.46                   | 43.87 | 46.44 |
| 350.1               | 380.1       | 44.91                   | 47.10 | 49.58 |
| 440.1               | 470.1       | 46.50                   | 49.27 | 50.87 |
| 530.1               | 560.1       | 49.55                   | 52.11 | 49.52 |
| 610.1               | 640.1       | 54.27                   | 50.76 | 46.92 |
| 700.1               | 730.1       | 53.77                   | 48.39 | 45.54 |
| 790.1               | 820.1       | 47.74                   | 45.33 | 43.68 |
| 870.1               | 900.1       | 45.32                   | 43.27 | 41.71 |
| 960.1               | 990.1       | 43.88                   | 41.89 | 40.29 |
| 1050.1              | 1080.1      | 43.18                   | 41.14 | 39.61 |
| 1130.1              | 1160.1      | 42.00                   | 40.69 | 38.99 |
| 1220.1              | 1250.1      | 41.91                   | 41.35 | 39.67 |
| 1310.1              | 1340.1      | 43.01                   | 43.80 | 43.09 |
| 1400.1              | 1430.1      | 45.09                   | 47.52 | 47.64 |
| 1480.1              | 1510.1      | 45.08                   | 47.50 | 49.08 |
| 1570.1              | 1600.1      | 41.64                   | 42.85 | 43.75 |
| 1660.1              | 1690.1      | 39.02                   | 39.59 | 40.23 |
| 1740.1              | 1770.1      | 37.76                   | 37.93 | 38.17 |
| 1830.1              | 1860.1      | 37.71                   | 37.67 | 37.83 |
| 1920.1              | 1950.1      | 37.83                   | 37.80 | 37.97 |
| 2000.1              | 2030.1      | 38.26                   | 38.03 | 38.05 |
| 2090.1              | 2120.1      | 38.91                   | 38.96 | 39.39 |
| 2180.1              | 2210.1      | 39.77                   | 39.96 | 40.97 |
| 2260.1              | 2290.1      | 40.05                   | 40.66 | 41.64 |
| 2350.1              | 2380.1      | 40.06                   | 40.91 | 41.85 |
| 2440.1              | 2470.1      | 39.79                   | 41.00 | 41.83 |
| 2530.1              | 2560.1      | 38.66                   | 39.33 | 40.09 |
| 2610.1              | 2640.1      | 37.35                   | 37.33 | 37.60 |
| 2700.1              | 2730.1      | 36.56                   | 35.71 | 35.45 |
| 2790.1              | 2820.1      | 35.85                   | 34.65 | 33.99 |
| 2870.1              | 2900.1      | 34.92                   | 33.51 | 32.78 |
| 2960.1              | 2990.1      | 33.98                   | 32.53 | 31.64 |
| 3050.1              | 3080.1      | 32.94                   | 31.81 | 30.91 |
| 3130.1              | 3160.1      | 32.10                   | 31.31 | 30.46 |
| 3220.1              | 3250.1      | 31.04                   | 30.65 | 30.00 |
| 3310.1              | 3340.1      | 30.06                   | 29.97 | 29.51 |
| 3400.1              | 3430.1      | 29.16                   | 29.38 | 29.05 |



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IF/RF MICROWAVE COMPONENTS

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# Frequency Mixer

SYM-ED17165/1

## 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=1820MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|------|------|----------------------|--------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      |                      | @LO (dBm)                      |      |      |
|                     |             | +14             | +17  | +20  |             | +14             | +17  | +20  |                      | +14                            | +17  | +20  |
| 10.1                | 40.1        | 1.36            | 1.22 | 1.15 | 40.1        | 1.10            | 1.57 | 2.39 | 10.1                 | 1.58                           | 1.06 | 1.08 |
| 90.1                | 120.1       | 1.42            | 1.26 | 1.14 | 120.1       | 1.14            | 1.51 | 2.24 | 50.1                 | 1.51                           | 1.13 | 1.07 |
| 180.1               | 210.1       | 1.51            | 1.34 | 1.24 | 210.1       | 1.20            | 1.49 | 2.18 | 100.1                | 1.50                           | 1.13 | 1.10 |
| 270.1               | 300.1       | 1.62            | 1.47 | 1.37 | 300.1       | 1.28            | 1.48 | 2.13 | 140.1                | 1.51                           | 1.16 | 1.11 |
| 350.1               | 380.1       | 1.74            | 1.58 | 1.47 | 380.1       | 1.29            | 1.43 | 2.06 | 190.1                | 1.47                           | 1.15 | 1.15 |
| 440.1               | 470.1       | 1.93            | 1.73 | 1.61 | 470.1       | 1.36            | 1.42 | 2.03 | 240.1                | 1.49                           | 1.18 | 1.18 |
| 530.1               | 560.1       | 2.19            | 1.95 | 1.83 | 560.1       | 1.40            | 1.38 | 1.96 | 280.1                | 1.43                           | 1.18 | 1.22 |
| 610.1               | 640.1       | 2.31            | 2.09 | 1.98 | 640.1       | 1.49            | 1.36 | 1.91 | 330.1                | 1.44                           | 1.21 | 1.24 |
| 700.1               | 730.1       | 2.44            | 2.23 | 2.12 | 730.1       | 1.62            | 1.37 | 1.84 | 370.1                | 1.40                           | 1.21 | 1.27 |
| 790.1               | 820.1       | 2.61            | 2.39 | 2.27 | 820.1       | 1.73            | 1.37 | 1.75 | 420.1                | 1.39                           | 1.23 | 1.29 |
| 870.1               | 900.1       | 2.72            | 2.49 | 2.36 | 900.1       | 1.79            | 1.35 | 1.66 | 470.1                | 1.37                           | 1.23 | 1.29 |
| 960.1               | 990.1       | 2.75            | 2.51 | 2.37 | 990.1       | 1.87            | 1.33 | 1.55 | 510.1                | 1.36                           | 1.24 | 1.31 |
| 1050.1              | 1080.1      | 2.81            | 2.55 | 2.40 | 1080.1      | 1.93            | 1.32 | 1.45 | 560.1                | 1.34                           | 1.22 | 1.29 |
| 1130.1              | 1160.1      | 2.79            | 2.52 | 2.37 | 1160.1      | 1.98            | 1.29 | 1.37 | 600.1                | 1.32                           | 1.24 | 1.31 |
| 1220.1              | 1250.1      | 2.79            | 2.50 | 2.33 | 1250.1      | 2.01            | 1.26 | 1.29 | 650.1                | 1.31                           | 1.21 | 1.28 |
| 1310.1              | 1340.1      | 2.72            | 2.41 | 2.24 | 1340.1      | 2.02            | 1.22 | 1.24 | 700.1                | 1.29                           | 1.21 | 1.28 |
| 1400.1              | 1430.1      | 2.69            | 2.34 | 2.16 | 1430.1      | 2.00            | 1.19 | 1.25 | 740.1                | 1.26                           | 1.18 | 1.26 |
| 1480.1              | 1510.1      | 2.68            | 2.34 | 2.15 | 1510.1      | 1.94            | 1.16 | 1.30 | 790.1                | 1.22                           | 1.16 | 1.26 |
| 1570.1              | 1600.1      | 2.66            | 2.34 | 2.15 | 1600.1      | 1.83            | 1.16 | 1.40 | 840.1                | 1.21                           | 1.11 | 1.21 |
| 1660.1              | 1690.1      | 2.61            | 2.33 | 2.16 | 1690.1      | 1.70            | 1.20 | 1.52 | 880.1                | 1.18                           | 1.11 | 1.23 |
| 1740.1              | 1770.1      | 2.58            | 2.33 | 2.18 | 1770.1      | 1.58            | 1.25 | 1.61 | 930.1                | 1.19                           | 1.05 | 1.18 |
| 1830.1              | 1860.1      | 2.50            | 2.28 | 2.14 | 1860.1      | 1.46            | 1.32 | 1.73 | 970.1                | 1.16                           | 1.07 | 1.21 |
| 1920.1              | 1950.1      | 2.34            | 2.13 | 2.00 | 1950.1      | 1.35            | 1.40 | 1.84 | 1020.1               | 1.19                           | 1.04 | 1.17 |
| 2000.1              | 2030.1      | 2.09            | 1.91 | 1.79 | 2030.1      | 1.27            | 1.47 | 1.94 | 1070.1               | 1.17                           | 1.09 | 1.21 |
| 2090.1              | 2120.1      | 1.83            | 1.66 | 1.55 | 2120.1      | 1.22            | 1.55 | 2.06 | 1110.1               | 1.20                           | 1.11 | 1.20 |
| 2180.1              | 2210.1      | 1.62            | 1.47 | 1.36 | 2210.1      | 1.22            | 1.66 | 2.19 | 1160.1               | 1.23                           | 1.16 | 1.24 |
| 2260.1              | 2290.1      | 1.45            | 1.32 | 1.22 | 2290.1      | 1.28            | 1.76 | 2.32 | 1200.1               | 1.26                           | 1.19 | 1.26 |
| 2350.1              | 2380.1      | 1.34            | 1.23 | 1.15 | 2380.1      | 1.37            | 1.88 | 2.44 | 1250.1               | 1.33                           | 1.25 | 1.31 |
| 2440.1              | 2470.1      | 1.31            | 1.23 | 1.20 | 2470.1      | 1.48            | 1.99 | 2.56 | 1300.1               | 1.36                           | 1.29 | 1.35 |
| 2530.1              | 2560.1      | 1.36            | 1.33 | 1.32 | 2560.1      | 1.60            | 2.11 | 2.65 | 1340.1               | 1.41                           | 1.34 | 1.38 |
| 2610.1              | 2640.1      | 1.47            | 1.45 | 1.47 | 2640.1      | 1.70            | 2.19 | 2.69 | 1390.1               | 1.44                           | 1.38 | 1.42 |
| 2700.1              | 2730.1      | 1.60            | 1.61 | 1.63 | 2730.1      | 1.86            | 2.33 | 2.80 | 1440.1               | 1.54                           | 1.47 | 1.50 |
| 2790.1              | 2820.1      | 1.75            | 1.77 | 1.80 | 2820.1      | 2.02            | 2.48 | 2.93 | 1480.1               | 1.53                           | 1.45 | 1.47 |
| 2870.1              | 2900.1      | 1.89            | 1.90 | 1.94 | 2900.1      | 2.19            | 2.63 | 3.07 | 1530.1               | 1.63                           | 1.56 | 1.58 |
| 2960.1              | 2990.1      | 2.03            | 2.03 | 2.05 | 2990.1      | 2.37            | 2.78 | 3.20 | 1570.1               | 1.63                           | 1.55 | 1.56 |
| 3050.1              | 3080.1      | 2.18            | 2.15 | 2.15 | 3080.1      | 2.54            | 2.91 | 3.29 | 1620.1               | 1.72                           | 1.65 | 1.67 |
| 3130.1              | 3160.1      | 2.31            | 2.24 | 2.22 | 3160.1      | 2.66            | 2.98 | 3.33 | 1670.1               | 1.76                           | 1.68 | 1.69 |
| 3220.1              | 3250.1      | 2.49            | 2.39 | 2.34 | 3250.1      | 2.81            | 3.05 | 3.35 | 1710.1               | 1.81                           | 1.74 | 1.75 |
| 3310.1              | 3340.1      | 2.68            | 2.53 | 2.45 | 3340.1      | 2.97            | 3.12 | 3.34 | 1760.1               | 1.86                           | 1.78 | 1.78 |
| 3400.1              | 3430.1      | 2.85            | 2.64 | 2.54 | 3430.1      | 3.15            | 3.20 | 3.34 | 1800.1               | 1.90                           | 1.82 | 1.81 |

Frequency Mixer

SYM-ED17165/1

Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |       |       |       |       |       |       |       |       |       |       |
|----|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0  | ----   | ----   | 17.5  | 10.1  | 24.4  | 22.8  | 25.6  | 42.2  | 27.6  | 43.5  | 44.1  | 55.0  |
| 1  | ----   | 38.0   | ----  | 49.1  | 14.3  | 44.3  | 28.9  | 48.1  | 48.6  | 46.7  | 55.1  | 66.7  |
| 2  | -100.8 | 54.5   | 60.3  | 61.8  | 57.4  | 52.0  | 64.7  | 55.4  | 60.8  | 68.4  | 58.2  | 63.0  |
| 3  | -112.3 | 84.4   | 77.6  | 84.2  | 64.7  | 82.4  | 59.5  | 89.1  | 62.9  | 89.0  | 74.8  | 91.4  |
| 4  | -110.9 | 102.9  | 97.4  | 96.6  | 92.1  | 87.9  | 87.9  | 92.0  | 94.7  | 99.1  | 102.7 | 96.6  |
| 5  | -111.3 | 102.9  | 103.0 | 104.5 | 98.7  | 102.8 | 101.2 | 102.7 | 101.2 | 103.7 | 97.7  | 103.4 |
| 6  | -111.6 | 104.8  | 103.9 | 104.6 | 104.7 | 102.2 | 102.4 | 101.5 | 103.6 | 102.0 | 104.1 | 104.0 |
| 7  | -112.1 | 102.6  | 103.9 | 103.7 | 104.2 | 102.1 | 101.1 | 102.4 | 101.4 | 102.1 | 104.1 | 104.2 |
| 8  | -114.0 | 103.1  | 104.7 | 102.6 | 104.3 | 103.7 | 103.6 | 104.1 | 101.4 | 103.8 | 100.4 | 102.1 |
| 9  | -111.2 | 102.4  | 104.3 | 101.7 | 105.5 | 101.7 | 103.8 | 103.8 | 102.2 | 101.0 | 102.9 | 99.8  |
| 10 | -108.9 | 102.1  | 102.8 | 102.1 | 102.9 | 103.1 | 105.0 | 103.1 | 102.2 | 101.2 | 100.4 | 103.7 |
|    | RF CAL | 0      | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |

LO HARMONICS ORDER

Test conditions:

RF IN: 1505 MHz; 0 dBm.

LO IN: 1535 MHz; +17.00 dBm

IF OUT: 30 MHz; -6.50 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |       |       |       |       |       |       |       |       |       |      |
|----|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 0  | ----   | ----   | 26.7  | 20.7  | 36.6  | 35.6  | 40.0  | 53.2  | 48.2  | 63.3  | 60.4  | 74.5 |
| 1  | ----   | 38.7   | ----  | 48.9  | 14.7  | 46.0  | 31.0  | 52.1  | 63.5  | 51.6  | 58.5  | 76.2 |
| 2  | -85.8  | 45.9   | 49.9  | 56.3  | 45.2  | 44.8  | 52.1  | 49.5  | 52.0  | 74.8  | 51.1  | 61.9 |
| 3  | -97.6  | 70.8   | 44.9  | 65.4  | 55.9  | 83.4  | 43.8  | 64.7  | 49.1  | 64.0  | 63.5  | 64.1 |
| 4  | -106.1 | 69.1   | 83.0  | 59.0  | 69.5  | 57.2  | 76.3  | 56.2  | 86.8  | 59.7  | 75.8  | 67.8 |
| 5  | -107.5 | 80.8   | 65.3  | 89.0  | 58.5  | 78.8  | 55.3  | 71.6  | 54.0  | 72.0  | 57.8  | 84.3 |
| 6  | -106.1 | 89.2   | 99.3  | 82.6  | 97.9  | 72.6  | 79.4  | 67.8  | 73.0  | 72.4  | 79.4  | 83.1 |
| 7  | -105.1 | 87.6   | 91.4  | 93.7  | 82.0  | 95.4  | 74.0  | 88.9  | 71.9  | 92.5  | 80.1  | 88.2 |
| 8  | -105.7 | 103.9  | 92.5  | 99.3  | 102.5 | 90.8  | 107.2 | 82.7  | 96.4  | 80.7  | 92.6  | 81.5 |
| 9  | -104.8 | 114.0  | 108.1 | 101.5 | 103.7 | 113.4 | 97.5  | 109.9 | 88.6  | 101.7 | 84.0  | 90.7 |
| 10 | -103.5 | 111.6  | 112.5 | 112.6 | 101.1 | 109.3 | 108.4 | 104.8 | 113.2 | 100.8 | 101.0 | 94.5 |
|    | RF CAL | 0      | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10   |

LO HARMONICS ORDER

Test conditions:

RF IN: 1505 MHz;+10 dBm.

LO IN: 1535 MHz; +17.00 dBm

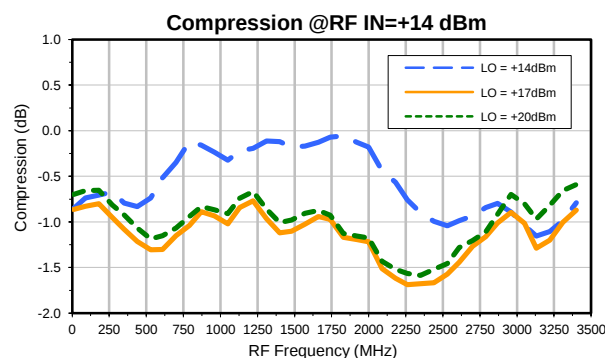
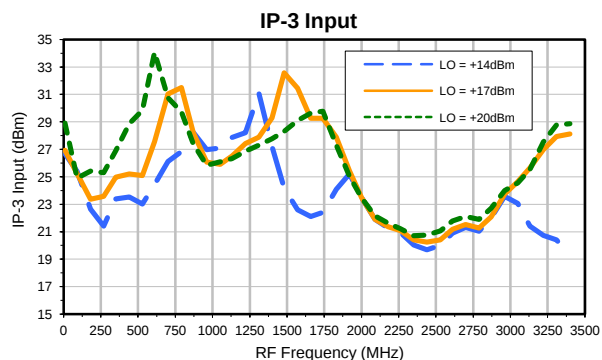
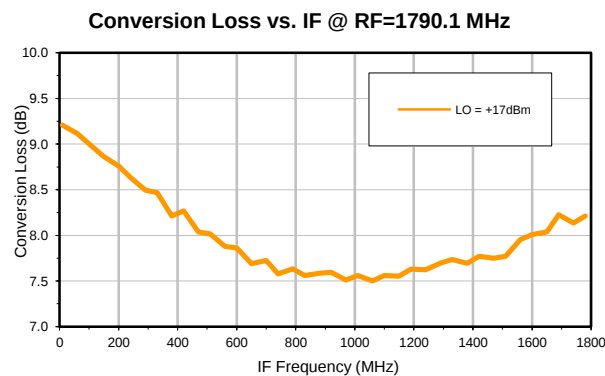
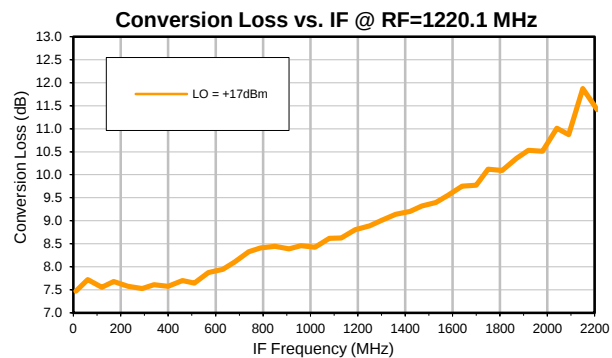
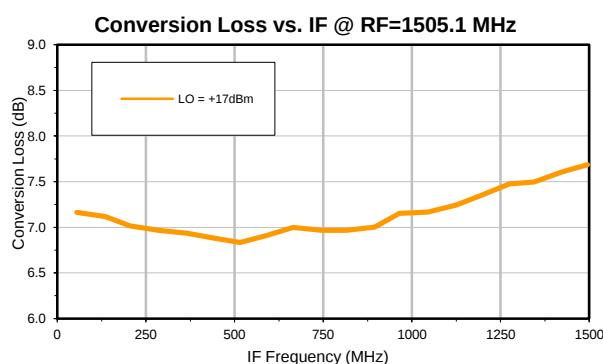
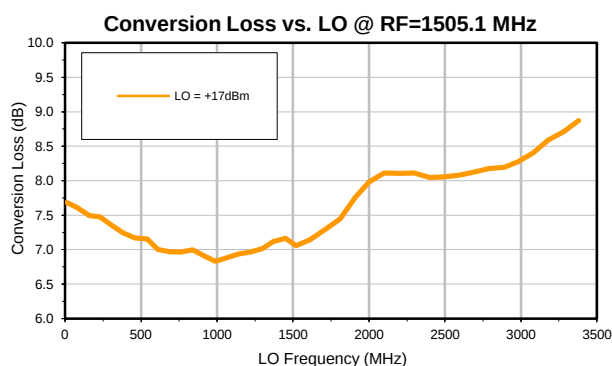
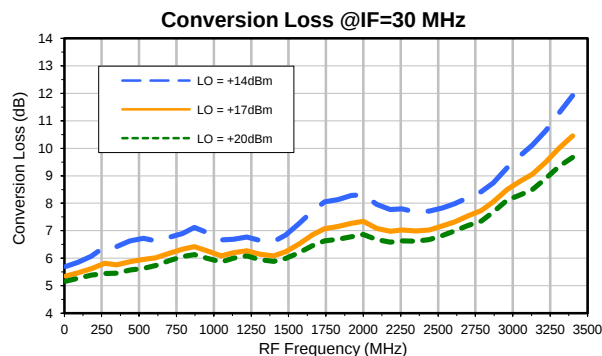
IF OUT: 30 MHz; 3.47 dBm

- Notes:
1. All Harmonics are in (dBc) relative to IF OUTPUT.

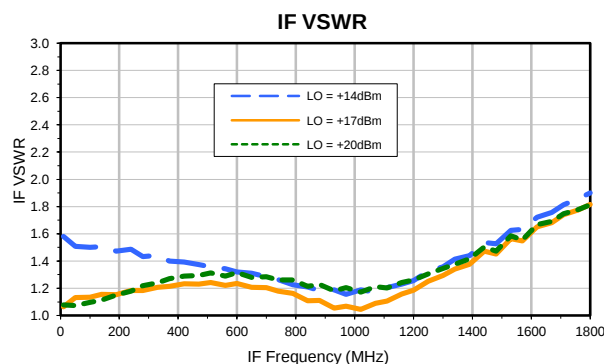
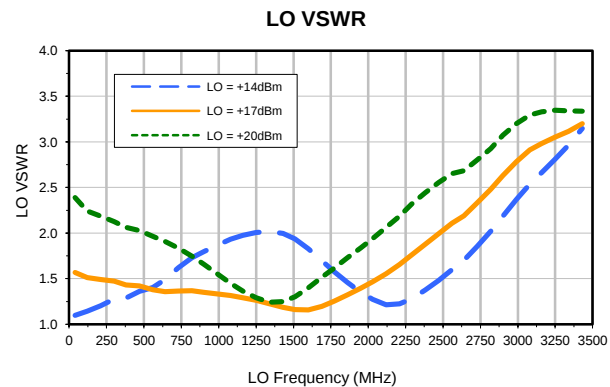
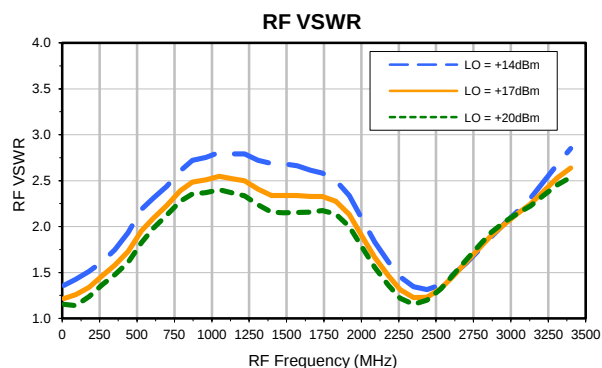
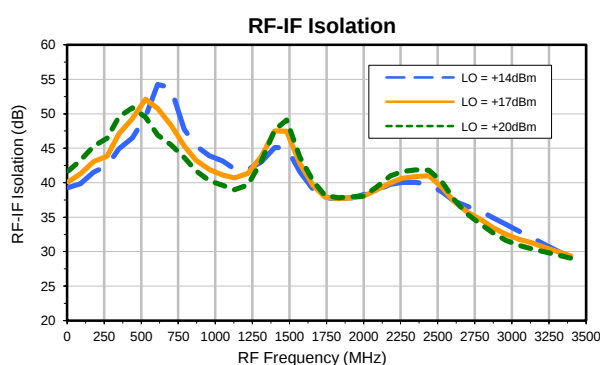
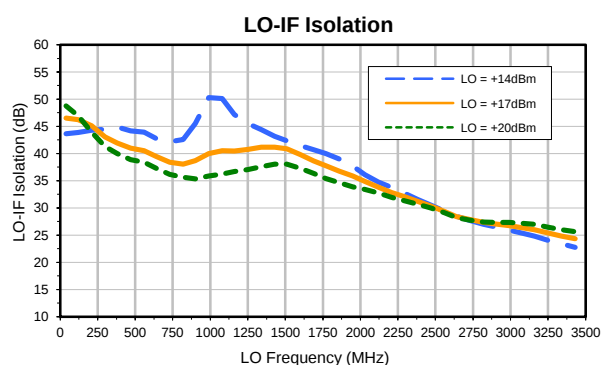
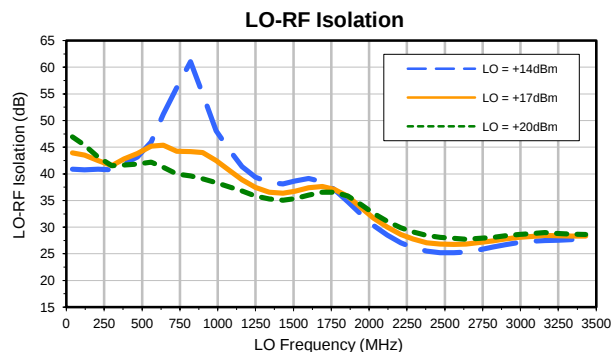
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.

3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Typical Performance Curves



## Typical Performance Curves



Frequency Mixer

SYM-ED17165/1

Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |       |       |       |       |       |       |       |       |       |       |
|----|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0  | ----   | ----   | 17.5  | 10.1  | 24.4  | 22.8  | 25.6  | 42.2  | 27.6  | 43.5  | 44.1  | 55.0  |
| 1  | ----   | 38.0   | ----  | 49.1  | 14.3  | 44.3  | 28.9  | 48.1  | 48.6  | 46.7  | 55.1  | 66.7  |
| 2  | 100.8  | 54.5   | 60.3  | 61.8  | 57.4  | 52.0  | 64.7  | 55.4  | 60.8  | 68.4  | 58.2  | 63.0  |
| 3  | 112.3  | 84.4   | 77.6  | 84.2  | 64.7  | 82.4  | 59.5  | 89.1  | 62.9  | 89.0  | 74.8  | 91.4  |
| 4  | 110.9  | 102.9  | 97.4  | 96.6  | 92.1  | 87.9  | 87.9  | 92.0  | 94.7  | 99.1  | 102.7 | 96.6  |
| 5  | 111.3  | 102.9  | 103.0 | 104.5 | 98.7  | 102.8 | 101.2 | 102.7 | 101.2 | 103.7 | 97.7  | 103.4 |
| 6  | 111.6  | 104.8  | 103.9 | 104.6 | 104.7 | 102.2 | 102.4 | 101.5 | 103.6 | 102.0 | 104.1 | 104.0 |
| 7  | 112.1  | 102.6  | 103.9 | 103.7 | 104.2 | 102.1 | 101.1 | 102.4 | 101.4 | 102.1 | 104.1 | 104.2 |
| 8  | 114.0  | 103.1  | 104.7 | 102.6 | 104.3 | 103.7 | 103.6 | 104.1 | 101.4 | 103.8 | 100.4 | 102.1 |
| 9  | 111.2  | 102.4  | 104.3 | 101.7 | 105.5 | 101.7 | 103.8 | 103.8 | 102.2 | 101.0 | 102.9 | 99.8  |
| 10 | 108.9  | 102.1  | 102.8 | 102.1 | 102.9 | 103.1 | 105.0 | 103.1 | 102.2 | 101.2 | 100.4 | 103.7 |
|    | RF CAL | 0      | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |

LO HARMONICS ORDER

Test conditions:

RF IN: 1505 MHz; 0 dBm.

LO IN: 1535 MHz; +17.00 dBm

IF OUT: 30 MHz; -6.50 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |       |       |       |       |       |       |       |       |       |      |
|----|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 0  | ----   | ----   | 26.7  | 20.7  | 36.6  | 35.6  | 40.0  | 53.2  | 48.2  | 63.3  | 60.4  | 74.5 |
| 1  | ----   | 38.7   | ----  | 48.9  | 14.7  | 46.0  | 31.0  | 52.1  | 63.5  | 51.6  | 58.5  | 76.2 |
| 2  | 85.8   | 45.9   | 49.9  | 56.3  | 45.2  | 44.8  | 52.1  | 49.5  | 52.0  | 74.8  | 51.1  | 61.9 |
| 3  | 97.6   | 70.8   | 44.9  | 65.4  | 55.9  | 83.4  | 43.8  | 64.7  | 49.1  | 64.0  | 63.5  | 64.1 |
| 4  | 106.1  | 69.1   | 83.0  | 59.0  | 69.5  | 57.2  | 76.3  | 56.2  | 86.8  | 59.7  | 75.8  | 67.8 |
| 5  | 107.5  | 80.8   | 65.3  | 89.0  | 58.5  | 78.8  | 55.3  | 71.6  | 54.0  | 72.0  | 57.8  | 84.3 |
| 6  | 106.1  | 89.2   | 99.3  | 82.6  | 97.9  | 72.6  | 79.4  | 67.8  | 73.0  | 72.4  | 79.4  | 83.1 |
| 7  | 105.1  | 87.6   | 91.4  | 93.7  | 82.0  | 95.4  | 74.0  | 88.9  | 71.9  | 92.5  | 80.1  | 88.2 |
| 8  | 105.7  | 103.9  | 92.5  | 99.3  | 102.5 | 90.8  | 107.2 | 82.7  | 96.4  | 80.7  | 92.6  | 81.5 |
| 9  | 104.8  | 114.0  | 108.1 | 101.5 | 103.7 | 113.4 | 97.5  | 109.9 | 88.6  | 101.7 | 84.0  | 90.7 |
| 10 | 103.5  | 111.6  | 112.5 | 112.6 | 101.1 | 109.3 | 108.4 | 104.8 | 113.2 | 100.8 | 101.0 | 94.5 |
|    | RF CAL | 0      | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10   |

LO HARMONICS ORDER

Test conditions:

RF IN: 1505 MHz;+10 dBm.

LO IN: 1535 MHz; +17.00 dBm

IF OUT: 30 MHz; 3.47 dBm

- Notes:
1. All Harmonics are in (dBc) relative to IF OUTPUT.

2. + entry denotes harmonics are in (dBc) above IF OUTPUT.

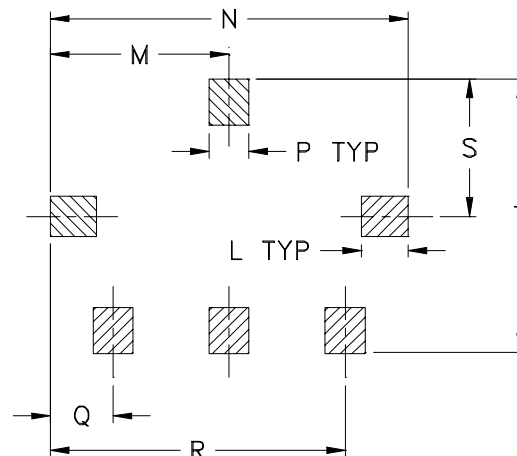
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

## Outline Dimensions

TTT166  
TTT167



## PCB Land Pattern



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

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

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

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

### Note:

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

# Tape & Reel Packaging TR-F12



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

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

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

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



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## THIRD ANGLE PROJECTION



## REVISIONS

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

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

**NOTE:**

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



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

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

DRAWN

GF

03/18/03

CHECKED

IL

04/15/03

APPROVED

DJ

04/15/03



**Mini-Circuits®**

13 Neptune Avenue  
Brooklyn NY 11235

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

SIZE  
A

CODE IDENT  
15542

DRAWING NO:  
98-PL-079

REV:  
D

FILE: 98PL079

SCALE: 5:1

SHEET: 1 OF 1

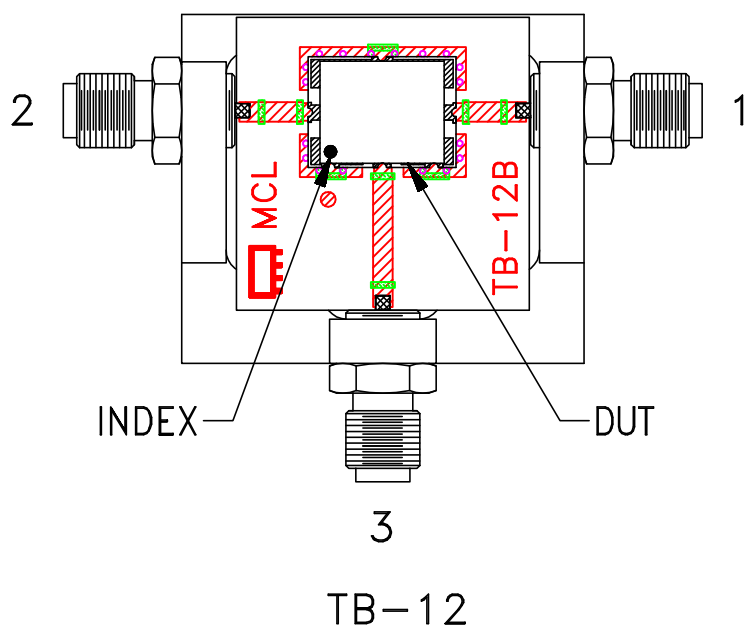
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ASHEETA1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit

For Pin Connections Refer to Data Sheet of the DUT



Schematic Diagram

## Notes:

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

 **Mini-Circuits®**



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

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