

# Frequency Mixer

## SYM-ED7348/2

Level 17 (LO Power +17 dBm)

### Important Note

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



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**CASE STYLE : TTT167**

| ELECTRICAL SPECIFICATIONS 50Ω @ +25°C |                                        |      |      |      |       |
|---------------------------------------|----------------------------------------|------|------|------|-------|
| Parameter                             |                                        | Min. | Typ. | Max. | Units |
| Frequency                             | LO (f <sub>L</sub> to f <sub>U</sub> ) | 500  |      | 2625 | MHz   |
|                                       | RF (f <sub>L</sub> to f <sub>U</sub> ) | 500  |      | 2625 | MHz   |
|                                       | IF                                     | 1    |      | 1500 | MHz   |
| Conversion Loss                       | mid band                               |      | 5.9  |      | dB    |
|                                       | Total Range                            |      | 6.3  |      | dB    |
| LO-RF Isolation                       |                                        |      | 34   |      | dB    |
| LO-IF Isolation                       |                                        |      | 32   |      | dB    |

**Note:** mid band = [2f<sub>L</sub> to f<sub>U</sub>/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 |

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SYM-ED7348/2

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=30MHz<br>(dB) |       |      |
|---------------------|-------------|-------------------------------------------------------|-------|------|
|                     |             | @LO (dBm)                                             |       |      |
|                     |             | +14                                                   | +17   | +20  |
| 10.1                | 40.1        | 6.31                                                  | 6.15  | 5.78 |
| 110.6               | 140.6       | 6.21                                                  | 6.00  | 5.96 |
| 211.1               | 241.1       | 6.40                                                  | 6.18  | 6.07 |
| 311.5               | 341.5       | 6.50                                                  | 6.20  | 6.09 |
| 412.0               | 442.0       | 6.67                                                  | 6.36  | 6.23 |
| 512.5               | 542.5       | 6.68                                                  | 6.38  | 6.25 |
| 613.0               | 643.0       | 6.78                                                  | 6.48  | 6.32 |
| 713.4               | 743.4       | 6.80                                                  | 6.51  | 6.37 |
| 813.9               | 843.9       | 6.84                                                  | 6.56  | 6.43 |
| 914.4               | 944.4       | 6.81                                                  | 6.57  | 6.46 |
| 1014.9              | 1044.9      | 6.88                                                  | 6.67  | 6.56 |
| 1115.4              | 1145.4      | 7.03                                                  | 6.81  | 6.69 |
| 1235.9              | 1265.9      | 6.98                                                  | 6.79  | 6.69 |
| 1336.4              | 1366.4      | 6.95                                                  | 6.78  | 6.71 |
| 1457.0              | 1487.0      | 6.93                                                  | 6.75  | 6.69 |
| 1557.5              | 1587.5      | 6.96                                                  | 6.79  | 6.74 |
| 1678.0              | 1708.0      | 7.17                                                  | 6.94  | 6.85 |
| 1778.5              | 1808.5      | 7.39                                                  | 7.13  | 7.04 |
| 1899.1              | 1929.1      | 7.68                                                  | 7.32  | 7.20 |
| 1999.6              | 2029.6      | 8.03                                                  | 7.62  | 7.43 |
| 2120.1              | 2150.1      | 8.24                                                  | 7.79  | 7.57 |
| 2220.6              | 2250.6      | 8.49                                                  | 8.00  | 7.76 |
| 2341.2              | 2371.2      | 8.70                                                  | 8.21  | 7.97 |
| 2441.7              | 2471.7      | 8.77                                                  | 8.31  | 8.04 |
| 2562.3              | 2592.3      | 8.85                                                  | 8.41  | 8.12 |
| 2662.7              | 2692.7      | 9.00                                                  | 8.57  | 8.34 |
| 2783.3              | 2813.3      | 9.09                                                  | 8.69  | 8.49 |
| 2883.8              | 2913.8      | 9.13                                                  | 8.75  | 8.56 |
| 3004.4              | 3034.4      | 9.29                                                  | 8.87  | 8.67 |
| 3104.8              | 3134.8      | 9.40                                                  | 9.00  | 8.80 |
| 3225.4              | 3255.4      | 9.17                                                  | 8.75  | 8.55 |
| 3325.9              | 3355.9      | 9.30                                                  | 8.81  | 8.55 |
| 3446.5              | 3476.5      | 9.20                                                  | 8.76  | 8.51 |
| 3546.9              | 3576.9      | 9.37                                                  | 8.93  | 8.66 |
| 3667.5              | 3697.5      | 9.82                                                  | 9.32  | 8.98 |
| 3768.0              | 3798.0      | 10.05                                                 | 9.52  | 9.16 |
| 3888.6              | 3918.6      | 10.45                                                 | 9.78  | 9.37 |
| 3989.0              | 4019.0      | 10.80                                                 | 10.02 | 9.52 |
| 4109.6              | 4139.6      | 11.08                                                 | 10.18 | 9.63 |
| 4210.1              | 4240.1      | 11.54                                                 | 10.40 | 9.81 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +14                | +17   | +20   |
| 10.1                | 40.1        | 30.89              | 32.24 | 27.51 |
| 110.6               | 140.6       | 21.57              | 22.10 | 24.63 |
| 211.1               | 241.1       | 21.65              | 23.39 | 24.60 |
| 311.5               | 341.5       | 22.18              | 23.20 | 27.55 |
| 412.0               | 442.0       | 21.89              | 25.65 | 33.42 |
| 512.5               | 542.5       | 23.46              | 28.75 | 28.31 |
| 613.0               | 643.0       | 25.41              | 26.97 | 25.57 |
| 713.4               | 743.4       | 28.96              | 27.02 | 26.00 |
| 813.9               | 843.9       | 28.20              | 25.30 | 24.31 |
| 914.4               | 944.4       | 24.04              | 23.65 | 24.02 |
| 1014.9              | 1044.9      | 23.52              | 23.37 | 24.13 |
| 1115.4              | 1145.4      | 22.47              | 22.56 | 23.54 |
| 1235.9              | 1265.9      | 21.97              | 22.06 | 22.77 |
| 1336.4              | 1366.4      | 21.02              | 21.96 | 22.52 |
| 1457.0              | 1487.0      | 19.98              | 21.48 | 22.83 |
| 1557.5              | 1587.5      | 20.47              | 21.06 | 22.01 |
| 1678.0              | 1708.0      | 23.16              | 22.92 | 23.70 |
| 1778.5              | 1808.5      | 28.87              | 26.12 | 25.94 |
| 1899.1              | 1929.1      | 23.43              | 28.28 | 30.66 |
| 1999.6              | 2029.6      | 22.48              | 26.82 | 32.86 |
| 2120.1              | 2150.1      | 24.10              | 28.68 | 28.53 |
| 2220.6              | 2250.6      | 26.31              | 28.71 | 27.84 |
| 2341.2              | 2371.2      | 24.08              | 23.85 | 24.15 |
| 2441.7              | 2471.7      | 22.37              | 22.79 | 23.23 |
| 2562.3              | 2592.3      | 21.71              | 22.04 | 22.28 |
| 2662.7              | 2692.7      | 21.25              | 22.04 | 22.33 |
| 2783.3              | 2813.3      | 21.02              | 21.87 | 22.06 |
| 2883.8              | 2913.8      | 20.77              | 21.58 | 22.14 |
| 3004.4              | 3034.4      | 20.70              | 21.09 | 22.19 |
| 3104.8              | 3134.8      | 21.60              | 20.83 | 21.30 |
| 3225.4              | 3255.4      | 21.12              | 20.68 | 20.84 |
| 3325.9              | 3355.9      | 20.88              | 21.31 | 21.04 |
| 3446.5              | 3476.5      | 20.35              | 21.46 | 21.22 |
| 3546.9              | 3576.9      | 19.07              | 20.97 | 21.18 |
| 3667.5              | 3697.5      | 18.49              | 20.24 | 21.56 |
| 3768.0              | 3798.0      | 18.14              | 19.77 | 21.74 |
| 3888.6              | 3918.6      | 18.33              | 19.93 | 22.16 |
| 3989.0              | 4019.0      | 18.11              | 18.98 | 20.96 |
| 4109.6              | 4139.6      | 17.20              | 18.44 | 20.39 |
| 4210.1              | 4240.1      | 16.38              | 17.56 | 19.26 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+10dBm<br>(dB) |      |      |
|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                            |      |      |
|                     |             | +14                                  | +17  | +20  |
| 10.1                | 40.1        | 0.44                                 | 0.54 | 0.04 |
| 110.6               | 140.6       | 0.57                                 | 0.35 | 0.24 |
| 211.1               | 241.1       | 0.54                                 | 0.35 | 0.21 |
| 311.5               | 341.5       | 0.59                                 | 0.44 | 0.30 |
| 412.0               | 442.0       | 0.62                                 | 0.45 | 0.30 |
| 512.5               | 542.5       | 0.75                                 | 0.58 | 0.38 |
| 613.0               | 643.0       | 0.78                                 | 0.59 | 0.41 |
| 713.4               | 743.4       | 0.82                                 | 0.60 | 0.43 |
| 813.9               | 843.9       | 0.77                                 | 0.55 | 0.36 |
| 914.4               | 944.4       | 0.74                                 | 0.52 | 0.37 |
| 1014.9              | 1044.9      | 0.67                                 | 0.49 | 0.35 |
| 1115.4              | 1145.4      | 0.51                                 | 0.37 | 0.27 |
| 1235.9              | 1265.9      | 0.45                                 | 0.33 | 0.26 |
| 1336.4              | 1366.4      | 0.39                                 | 0.27 | 0.22 |
| 1457.0              | 1487.0      | 0.33                                 | 0.22 | 0.18 |
| 1557.5              | 1587.5      | 0.33                                 | 0.20 | 0.15 |
| 1678.0              | 1708.0      | 0.28                                 | 0.17 | 0.12 |
| 1778.5              | 1808.5      | 0.32                                 | 0.21 | 0.13 |
| 1899.1              | 1929.1      | 0.35                                 | 0.25 | 0.18 |
| 1999.6              | 2029.6      | 0.32                                 | 0.25 | 0.20 |
| 2120.1              | 2150.1      | 0.39                                 | 0.35 | 0.26 |
| 2220.6              | 2250.6      | 0.40                                 | 0.32 | 0.28 |
| 2341.2              | 2371.2      | 0.41                                 | 0.33 | 0.28 |
| 2441.7              | 2471.7      | 0.40                                 | 0.34 | 0.31 |
| 2562.3              | 2592.3      | 0.46                                 | 0.40 | 0.40 |
| 2662.7              | 2692.7      | 0.44                                 | 0.34 | 0.37 |
| 2783.3              | 2813.3      | 0.44                                 | 0.34 | 0.32 |
| 2883.8              | 2913.8      | 0.46                                 | 0.34 | 0.33 |
| 3004.4              | 3034.4      | 0.47                                 | 0.35 | 0.30 |
| 3104.8              | 3134.8      | 0.49                                 | 0.36 | 0.33 |
| 3225.4              | 3255.4      | 0.58                                 | 0.38 | 0.33 |
| 3325.9              | 3355.9      | 0.59                                 | 0.43 | 0.31 |
| 3446.5              | 3476.5      | 0.85                                 | 0.52 | 0.41 |
| 3546.9              | 3576.9      | 0.86                                 | 0.51 | 0.38 |
| 3667.5              | 3697.5      | 0.92                                 | 0.51 | 0.36 |
| 3768.0              | 3798.0      | 1.04                                 | 0.57 | 0.41 |
| 3888.6              | 3918.6      | 1.15                                 | 0.57 | 0.38 |
| 3989.0              | 4019.0      | 1.11                                 | 0.54 | 0.35 |
| 4109.6              | 4139.6      | 1.29                                 | 0.67 | 0.44 |
| 4210.1              | 4240.1      | 1.32                                 | 0.76 | 0.45 |

# 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)=1322.6MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=489.9MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=2635.1MHz<br>(dB) |
|----------------------|-------------|------------------------------------------------------------------|----------------------|-------------|-----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                        |                      |             | @LO (dBm)                                                       |                      |             | @LO (dBm)                                                        |
|                      |             | +17                                                              |                      |             | +17                                                             |                      |             | +17                                                              |
| 1310.1               | 12.5        | 7.84                                                             | 10.2                 | 500.1       | 6.77                                                            | 2620.1               | 15.0        | 10.14                                                            |
| 1270.1               | 52.5        | 7.80                                                             | 110.2                | 600.1       | 6.29                                                            | 2560.3               | 74.8        | 10.05                                                            |
| 1230.1               | 92.5        | 7.82                                                             | 210.2                | 700.1       | 6.31                                                            | 2500.6               | 134.5       | 10.05                                                            |
| 1190.1               | 132.5       | 7.74                                                             | 310.2                | 800.1       | 6.34                                                            | 2440.8               | 194.3       | 9.87                                                             |
| 1150.1               | 172.5       | 7.71                                                             | 410.2                | 900.1       | 6.37                                                            | 2381.0               | 254.1       | 9.94                                                             |
| 1110.1               | 212.5       | 7.67                                                             | 510.2                | 1000.1      | 6.37                                                            | 2321.2               | 313.9       | 9.92                                                             |
| 1070.1               | 252.5       | 7.63                                                             | 610.2                | 1100.1      | 6.51                                                            | 2261.5               | 373.6       | 9.85                                                             |
| 1030.1               | 292.5       | 7.60                                                             | 710.2                | 1200.1      | 6.78                                                            | 2201.7               | 433.4       | 9.86                                                             |
| 990.1                | 332.5       | 7.47                                                             | 810.2                | 1300.1      | 6.97                                                            | 2141.9               | 493.2       | 9.69                                                             |
| 950.1                | 372.5       | 7.47                                                             | 910.2                | 1400.1      | 6.99                                                            | 2082.2               | 552.9       | 9.75                                                             |
| 910.1                | 412.5       | 7.43                                                             | 1010.2               | 1500.1      | 6.98                                                            | 2022.4               | 612.7       | 9.67                                                             |
| 870.1                | 452.5       | 7.37                                                             | 1110.2               | 1600.1      | 6.95                                                            | 1962.6               | 672.5       | 9.65                                                             |
| 830.1                | 492.5       | 7.31                                                             | 1210.2               | 1700.1      | 7.00                                                            | 1882.9               | 752.2       | 9.59                                                             |
| 790.1                | 532.5       | 7.25                                                             | 1310.2               | 1800.1      | 7.02                                                            | 1823.2               | 811.9       | 9.50                                                             |
| 750.1                | 572.5       | 7.27                                                             | 1410.2               | 1900.1      | 6.99                                                            | 1743.5               | 891.6       | 9.35                                                             |
| 730.1                | 592.5       | 7.19                                                             | 1510.2               | 2000.1      | 7.04                                                            | 1683.7               | 951.4       | 9.23                                                             |
| 690.1                | 632.5       | 7.19                                                             | 1610.2               | 2100.1      | 7.16                                                            | 1604.0               | 1031.1      | 9.16                                                             |
| 670.1                | 652.5       | 7.25                                                             | 1710.2               | 2200.1      | 7.25                                                            | 1544.2               | 1090.9      | 9.09                                                             |
| 630.1                | 692.5       | 7.08                                                             | 1810.2               | 2300.1      | 7.28                                                            | 1464.5               | 1170.6      | 9.05                                                             |
| 610.1                | 712.5       | 7.15                                                             | 1910.2               | 2400.1      | 7.38                                                            | 1404.8               | 1230.3      | 9.05                                                             |
| 570.1                | 752.5       | 7.10                                                             | 1990.2               | 2480.1      | 7.50                                                            | 1325.1               | 1310.0      | 8.98                                                             |
| 550.1                | 772.5       | 7.12                                                             | 2090.2               | 2580.1      | 7.79                                                            | 1265.3               | 1369.8      | 8.94                                                             |
| 510.1                | 812.5       | 7.07                                                             | 2170.2               | 2660.1      | 7.92                                                            | 1185.6               | 1449.5      | 8.85                                                             |
| 490.1                | 832.5       | 7.03                                                             | 2270.2               | 2760.1      | 8.25                                                            | 1125.8               | 1509.3      | 8.87                                                             |
| 450.1                | 872.5       | 7.06                                                             | 2350.2               | 2840.1      | 8.45                                                            | 1046.1               | 1589.0      | 8.89                                                             |
| 430.1                | 892.5       | 6.92                                                             | 2450.2               | 2940.1      | 8.71                                                            | 986.4                | 1648.7      | 8.92                                                             |
| 390.1                | 932.5       | 7.00                                                             | 2530.2               | 3020.1      | 8.90                                                            | 906.7                | 1728.4      | 9.00                                                             |
| 370.1                | 952.5       | 7.01                                                             | 2630.2               | 3120.1      | 8.90                                                            | 846.9                | 1788.2      | 9.09                                                             |
| 330.1                | 992.5       | 6.98                                                             | 2710.2               | 3200.1      | 8.82                                                            | 767.2                | 1867.9      | 9.12                                                             |
| 310.1                | 1012.5      | 6.97                                                             | 2810.2               | 3300.1      | 8.91                                                            | 707.4                | 1927.7      | 9.07                                                             |
| 270.1                | 1052.5      | 6.93                                                             | 2890.2               | 3380.1      | 8.87                                                            | 627.7                | 2007.4      | 9.11                                                             |
| 250.1                | 1072.5      | 6.91                                                             | 2990.2               | 3480.1      | 8.75                                                            | 568.0                | 2067.1      | 9.11                                                             |
| 210.1                | 1112.5      | 6.81                                                             | 3070.2               | 3560.1      | 8.60                                                            | 488.3                | 2146.8      | 8.96                                                             |
| 190.1                | 1132.5      | 6.86                                                             | 3170.2               | 3660.1      | 8.65                                                            | 428.5                | 2206.6      | 8.80                                                             |
| 150.1                | 1172.5      | 6.83                                                             | 3250.2               | 3740.1      | 8.79                                                            | 348.8                | 2286.3      | 8.70                                                             |
| 130.1                | 1192.5      | 6.80                                                             | 3350.2               | 3840.1      | 8.91                                                            | 289.0                | 2346.1      | 8.59                                                             |
| 90.1                 | 1232.5      | 6.82                                                             | 3430.2               | 3920.1      | 9.00                                                            | 209.3                | 2425.8      | 8.58                                                             |
| 70.1                 | 1252.5      | 6.81                                                             | 3530.2               | 4020.1      | 9.36                                                            | 149.6                | 2485.5      | 8.54                                                             |
| 30.1                 | 1292.5      | 6.81                                                             | 3610.2               | 4100.1      | 9.67                                                            | 69.9                 | 2565.2      | 8.53                                                             |
| 10.1                 | 1312.5      | 7.24                                                             | 3710.2               | 4200.1      | 10.07                                                           | 10.1                 | 2625.0      | 8.99                                                             |

# Frequency Mixer

SYM-ED7348/2

## 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        | 37.35                   | 40.60 | 43.64 | 46.09                   | 50.12 | 53.30 |
| 140.6       | 40.45                   | 43.81 | 47.01 | 46.97                   | 47.93 | 46.99 |
| 241.1       | 42.06                   | 45.68 | 49.44 | 46.24                   | 44.04 | 42.48 |
| 341.5       | 42.51                   | 46.90 | 51.64 | 44.08                   | 41.22 | 39.82 |
| 442.0       | 43.93                   | 49.32 | 55.51 | 41.98                   | 39.16 | 37.66 |
| 542.5       | 44.67                   | 51.52 | 66.33 | 40.60                   | 37.83 | 36.17 |
| 643.0       | 45.47                   | 52.38 | 57.09 | 39.49                   | 36.74 | 35.36 |
| 743.4       | 44.48                   | 49.02 | 50.22 | 38.61                   | 35.97 | 34.46 |
| 843.9       | 43.21                   | 45.44 | 45.63 | 38.36                   | 35.77 | 34.38 |
| 944.4       | 41.48                   | 42.71 | 42.73 | 37.81                   | 35.56 | 34.18 |
| 1044.9      | 39.71                   | 40.24 | 40.07 | 37.15                   | 35.24 | 34.14 |
| 1145.4      | 38.33                   | 38.60 | 38.48 | 37.16                   | 35.56 | 34.37 |
| 1265.9      | 37.12                   | 37.40 | 37.25 | 36.92                   | 35.81 | 34.78 |
| 1366.4      | 35.96                   | 36.07 | 36.21 | 36.31                   | 35.77 | 35.16 |
| 1487.0      | 35.41                   | 35.31 | 35.36 | 35.93                   | 35.92 | 35.45 |
| 1587.5      | 35.37                   | 35.57 | 35.30 | 36.13                   | 36.70 | 36.35 |
| 1708.0      | 34.52                   | 35.24 | 35.43 | 36.74                   | 37.82 | 37.54 |
| 1808.5      | 33.66                   | 34.95 | 35.53 | 36.69                   | 38.71 | 39.17 |
| 1929.1      | 32.51                   | 33.34 | 34.22 | 37.25                   | 40.00 | 41.48 |
| 2029.6      | 32.15                   | 33.35 | 34.49 | 37.46                   | 41.40 | 44.11 |
| 2150.1      | 31.14                   | 32.41 | 33.60 | 37.24                   | 41.56 | 46.75 |
| 2250.6      | 30.73                   | 31.66 | 32.77 | 36.98                   | 40.67 | 44.95 |
| 2371.2      | 30.57                   | 31.52 | 32.57 | 36.75                   | 40.20 | 43.93 |
| 2471.7      | 30.54                   | 31.71 | 32.74 | 37.19                   | 40.91 | 45.15 |
| 2592.3      | 30.41                   | 31.45 | 32.62 | 38.14                   | 41.96 | 46.00 |
| 2692.7      | 30.78                   | 31.52 | 32.74 | 39.73                   | 43.89 | 48.03 |
| 2813.3      | 31.07                   | 32.13 | 33.41 | 43.93                   | 48.45 | 47.10 |
| 2913.8      | 31.08                   | 32.55 | 34.10 | 49.06                   | 48.02 | 43.71 |
| 3034.4      | 30.89                   | 32.50 | 34.18 | 50.66                   | 43.80 | 40.06 |
| 3134.8      | 31.08                   | 32.69 | 34.42 | 49.74                   | 42.48 | 39.47 |
| 3255.4      | 32.00                   | 33.70 | 35.63 | 42.60                   | 39.29 | 37.50 |
| 3355.9      | 31.82                   | 33.66 | 35.67 | 39.56                   | 36.92 | 35.48 |
| 3476.5      | 33.94                   | 36.38 | 38.80 | 37.98                   | 36.15 | 35.00 |
| 3576.9      | 32.54                   | 35.14 | 37.85 | 35.63                   | 34.56 | 33.85 |
| 3697.5      | 33.23                   | 36.38 | 39.24 | 34.73                   | 34.33 | 33.38 |
| 3798.0      | 32.70                   | 35.94 | 38.97 | 34.18                   | 34.22 | 33.57 |
| 3918.6      | 32.07                   | 34.57 | 36.77 | 33.55                   | 33.97 | 33.93 |
| 4019.0      | 32.58                   | 35.20 | 37.31 | 32.78                   | 33.49 | 33.70 |
| 4139.6      | 32.38                   | 35.54 | 38.63 | 30.99                   | 32.06 | 32.40 |
| 4240.1      | 32.20                   | 36.25 | 41.30 | 29.83                   | 30.90 | 31.60 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 10.1                | 40.1        | 31.73                   | 31.39 | 31.85 |
| 110.6               | 140.6       | 33.29                   | 34.18 | 34.80 |
| 211.1               | 241.1       | 34.33                   | 35.29 | 35.71 |
| 311.5               | 341.5       | 36.44                   | 36.44 | 36.86 |
| 412.0               | 442.0       | 37.58                   | 38.33 | 39.09 |
| 512.5               | 542.5       | 38.79                   | 39.46 | 39.19 |
| 613.0               | 643.0       | 41.18                   | 40.73 | 41.05 |
| 713.4               | 743.4       | 43.39                   | 41.93 | 42.60 |
| 813.9               | 843.9       | 45.22                   | 44.52 | 42.88 |
| 914.4               | 944.4       | 53.72                   | 48.45 | 48.45 |
| 1014.9              | 1044.9      | 61.27                   | 62.19 | 52.67 |
| 1115.4              | 1145.4      | 56.18                   | 60.70 | 66.12 |
| 1235.9              | 1265.9      | 47.73                   | 47.80 | 48.40 |
| 1336.4              | 1366.4      | 46.19                   | 47.00 | 48.26 |
| 1457.0              | 1487.0      | 45.59                   | 45.69 | 47.01 |
| 1557.5              | 1587.5      | 43.14                   | 43.43 | 44.90 |
| 1678.0              | 1708.0      | 40.78                   | 41.77 | 43.11 |
| 1778.5              | 1808.5      | 39.80                   | 40.30 | 41.20 |
| 1899.1              | 1929.1      | 38.49                   | 38.60 | 39.67 |
| 1999.6              | 2029.6      | 37.55                   | 37.77 | 37.62 |
| 2120.1              | 2150.1      | 35.36                   | 35.35 | 35.51 |
| 2220.6              | 2250.6      | 33.81                   | 34.29 | 34.98 |
| 2341.2              | 2371.2      | 34.12                   | 34.60 | 35.42 |
| 2441.7              | 2471.7      | 34.63                   | 34.40 | 34.31 |
| 2562.3              | 2592.3      | 35.70                   | 36.04 | 36.43 |
| 2662.7              | 2692.7      | 37.14                   | 36.97 | 36.65 |
| 2783.3              | 2813.3      | 34.06                   | 33.75 | 33.55 |
| 2883.8              | 2913.8      | 35.56                   | 34.73 | 33.75 |
| 3004.4              | 3034.4      | 38.80                   | 37.22 | 35.96 |
| 3104.8              | 3134.8      | 39.68                   | 39.14 | 38.84 |
| 3225.4              | 3255.4      | 38.18                   | 37.69 | 37.29 |
| 3325.9              | 3355.9      | 37.24                   | 36.71 | 35.81 |
| 3446.5              | 3476.5      | 34.85                   | 34.28 | 33.50 |
| 3546.9              | 3576.9      | 35.48                   | 34.58 | 33.80 |
| 3667.5              | 3697.5      | 36.48                   | 36.06 | 35.97 |
| 3768.0              | 3798.0      | 35.51                   | 35.04 | 35.19 |
| 3888.6              | 3918.6      | 34.19                   | 34.04 | 33.70 |
| 3989.0              | 4019.0      | 32.39                   | 32.23 | 31.74 |
| 4109.6              | 4139.6      | 29.30                   | 29.25 | 28.94 |
| 4210.1              | 4240.1      | 26.29                   | 26.45 | 26.22 |

# Frequency Mixer

SYM-ED7348/2

## 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=2625MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|------|------|----------------------|--------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      |                      | @LO (dBm)                      |      |      |
|                     |             | +14             | +17  | +20  |             | +14             | +17  | +20  |                      | +14                            | +17  | +20  |
| 10.1                | 40.1        | 1.32            | 1.35 | 1.31 | 40.1        | 1.77            | 2.56 | 3.51 | 10.0                 | 1.16                           | 1.04 | 1.11 |
| 110.6               | 140.6       | 1.22            | 1.14 | 1.09 | 140.6       | 1.69            | 2.43 | 3.31 | 70.6                 | 1.15                           | 1.05 | 1.12 |
| 211.1               | 241.1       | 1.26            | 1.19 | 1.14 | 241.1       | 1.65            | 2.35 | 3.18 | 131.2                | 1.14                           | 1.08 | 1.15 |
| 311.5               | 341.5       | 1.33            | 1.25 | 1.20 | 341.5       | 1.62            | 2.29 | 3.08 | 191.7                | 1.16                           | 1.11 | 1.16 |
| 412.0               | 442.0       | 1.43            | 1.34 | 1.29 | 442.0       | 1.60            | 2.24 | 2.98 | 252.3                | 1.17                           | 1.15 | 1.21 |
| 512.5               | 542.5       | 1.52            | 1.44 | 1.38 | 542.5       | 1.57            | 2.18 | 2.89 | 312.9                | 1.17                           | 1.17 | 1.24 |
| 613.0               | 643.0       | 1.62            | 1.53 | 1.47 | 643.0       | 1.54            | 2.13 | 2.79 | 373.5                | 1.18                           | 1.19 | 1.27 |
| 713.4               | 743.4       | 1.70            | 1.61 | 1.54 | 743.4       | 1.51            | 2.07 | 2.70 | 434.1                | 1.20                           | 1.23 | 1.30 |
| 813.9               | 843.9       | 1.75            | 1.65 | 1.59 | 843.9       | 1.47            | 2.01 | 2.60 | 494.7                | 1.19                           | 1.24 | 1.32 |
| 914.4               | 944.4       | 1.75            | 1.67 | 1.60 | 944.4       | 1.43            | 1.95 | 2.51 | 555.2                | 1.19                           | 1.26 | 1.35 |
| 1014.9              | 1044.9      | 1.73            | 1.65 | 1.59 | 1044.9      | 1.40            | 1.89 | 2.42 | 615.8                | 1.21                           | 1.28 | 1.38 |
| 1115.4              | 1145.4      | 1.69            | 1.61 | 1.55 | 1145.4      | 1.38            | 1.85 | 2.35 | 676.4                | 1.20                           | 1.30 | 1.40 |
| 1235.9              | 1265.9      | 1.59            | 1.52 | 1.47 | 1265.9      | 1.34            | 1.80 | 2.29 | 737.0                | 1.22                           | 1.33 | 1.43 |
| 1336.4              | 1366.4      | 1.46            | 1.40 | 1.35 | 1366.4      | 1.33            | 1.78 | 2.26 | 797.6                | 1.25                           | 1.38 | 1.49 |
| 1457.0              | 1487.0      | 1.32            | 1.25 | 1.20 | 1487.0      | 1.33            | 1.78 | 2.27 | 858.1                | 1.26                           | 1.40 | 1.52 |
| 1557.5              | 1587.5      | 1.25            | 1.17 | 1.12 | 1587.5      | 1.34            | 1.78 | 2.26 | 918.7                | 1.29                           | 1.43 | 1.56 |
| 1678.0              | 1708.0      | 1.18            | 1.10 | 1.04 | 1708.0      | 1.34            | 1.77 | 2.23 | 999.5                | 1.32                           | 1.47 | 1.61 |
| 1778.5              | 1808.5      | 1.15            | 1.06 | 1.02 | 1808.5      | 1.33            | 1.75 | 2.20 | 1060.1               | 1.35                           | 1.51 | 1.65 |
| 1899.1              | 1929.1      | 1.14            | 1.07 | 1.03 | 1929.1      | 1.31            | 1.72 | 2.17 | 1140.9               | 1.36                           | 1.51 | 1.65 |
| 1999.6              | 2029.6      | 1.17            | 1.11 | 1.09 | 2029.6      | 1.28            | 1.68 | 2.10 | 1201.4               | 1.40                           | 1.56 | 1.70 |
| 2120.1              | 2150.1      | 1.22            | 1.18 | 1.16 | 2150.1      | 1.23            | 1.60 | 2.00 | 1282.2               | 1.42                           | 1.58 | 1.72 |
| 2220.6              | 2250.6      | 1.37            | 1.34 | 1.31 | 2250.6      | 1.17            | 1.51 | 1.87 | 1342.8               | 1.43                           | 1.58 | 1.73 |
| 2341.2              | 2371.2      | 1.60            | 1.56 | 1.54 | 2371.2      | 1.11            | 1.40 | 1.71 | 1423.6               | 1.44                           | 1.59 | 1.73 |
| 2441.7              | 2471.7      | 1.80            | 1.76 | 1.73 | 2471.7      | 1.06            | 1.33 | 1.61 | 1484.1               | 1.43                           | 1.57 | 1.71 |
| 2562.3              | 2592.3      | 2.07            | 2.02 | 1.97 | 2592.3      | 1.03            | 1.29 | 1.53 | 1564.9               | 1.44                           | 1.58 | 1.70 |
| 2662.7              | 2692.7      | 2.25            | 2.20 | 2.15 | 2692.7      | 1.08            | 1.29 | 1.51 | 1625.5               | 1.43                           | 1.55 | 1.65 |
| 2783.3              | 2813.3      | 2.40            | 2.34 | 2.29 | 2813.3      | 1.14            | 1.32 | 1.51 | 1706.3               | 1.44                           | 1.54 | 1.63 |
| 2883.8              | 2913.8      | 2.50            | 2.44 | 2.38 | 2913.8      | 1.21            | 1.37 | 1.55 | 1766.9               | 1.41                           | 1.49 | 1.58 |
| 3004.4              | 3034.4      | 2.58            | 2.49 | 2.42 | 3034.4      | 1.28            | 1.44 | 1.59 | 1847.6               | 1.47                           | 1.53 | 1.61 |
| 3104.8              | 3134.8      | 2.67            | 2.57 | 2.49 | 3134.8      | 1.35            | 1.51 | 1.65 | 1908.2               | 1.52                           | 1.57 | 1.63 |
| 3225.4              | 3255.4      | 2.75            | 2.61 | 2.50 | 3255.4      | 1.43            | 1.59 | 1.73 | 1989.0               | 1.63                           | 1.66 | 1.70 |
| 3325.9              | 3355.9      | 2.83            | 2.67 | 2.52 | 3355.9      | 1.48            | 1.64 | 1.78 | 2049.6               | 1.71                           | 1.72 | 1.74 |
| 3446.5              | 3476.5      | 2.86            | 2.68 | 2.53 | 3476.5      | 1.55            | 1.71 | 1.85 | 2130.3               | 1.87                           | 1.86 | 1.87 |
| 3546.9              | 3576.9      | 2.81            | 2.63 | 2.48 | 3576.9      | 1.60            | 1.75 | 1.88 | 2190.9               | 2.00                           | 1.99 | 1.99 |
| 3667.5              | 3697.5      | 2.76            | 2.57 | 2.39 | 3697.5      | 1.65            | 1.79 | 1.90 | 2271.7               | 2.20                           | 2.16 | 2.15 |
| 3768.0              | 3798.0      | 2.71            | 2.51 | 2.33 | 3798.0      | 1.69            | 1.83 | 1.93 | 2332.3               | 2.29                           | 2.25 | 2.23 |
| 3888.6              | 3918.6      | 2.64            | 2.42 | 2.23 | 3918.6      | 1.76            | 1.89 | 1.99 | 2413.1               | 2.43                           | 2.38 | 2.34 |
| 3989.0              | 4019.0      | 2.62            | 2.39 | 2.20 | 4019.0      | 1.82            | 1.94 | 2.03 | 2473.6               | 2.59                           | 2.53 | 2.49 |
| 4109.6              | 4139.6      | 2.51            | 2.29 | 2.11 | 4139.6      | 1.90            | 2.01 | 2.11 | 2554.4               | 2.73                           | 2.66 | 2.61 |
| 4210.1              | 4240.1      | 2.44            | 2.22 | 2.06 | 4240.1      | 1.94            | 2.04 | 2.13 | 2615.0               | 2.87                           | 2.82 | 2.78 |

## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | +23 | +17 | +14 | 2   | +3  | 13  | +8  | 10  | 10  | 13  |
| 1  | -      | 3      | +0  | 6   | +20 | 23  | +7  | 21  | +0  | 13  | 14  | 22  |
| 2  | 66     | 32     | 30  | >48 | 31  | 32  | 28  | 35  | 31  | 31  | 30  | 39  |
| 3  | >90    | >48    | 25  | >48 | >48 | >48 | 31  | >48 | 40  | >48 | 44  | 47  |
| 4  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 5  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 6  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 7  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 8  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 9  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 10 | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions: RF IN: 1562.5 MHz; -5.00 dBm.  
LO IN: 1592.5 MHz; +17.00 dBm  
IF OUT: 30 MHz; -42.37 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | +9  | +2  | 3   | 17  | 14  | 28  | 8   | 30  | 22  | 32  |
| 1  | -      | 8      | +0  | 10  | +15 | 33  | +1  | 28  | 6   | 21  | 20  | 30  |
| 2  | 47     | 31     | 23  | 52  | 28  | 26  | 26  | 30  | 37  | 28  | 31  | 38  |
| 3  | 87     | 32     | 8   | 30  | 34  | 34  | 15  | 47  | 27  | 45  | 28  | 35  |
| 4  | >90    | 47     | 39  | 35  | 37  | 55  | 38  | 46  | 46  | 52  | 50  | 44  |
| 5  | >90    | 61     | 40  | 45  | 29  | 42  | 47  | 47  | 31  | >62 | 42  | 57  |
| 6  | >90    | >62    | 51  | 60  | 48  | 46  | 47  | >62 | 47  | 55  | 59  | 61  |
| 7  | >90    | >62    | 58  | >62 | 54  | 56  | 47  | 57  | 62  | >62 | 49  | >62 |
| 8  | >90    | 62     | >62 | >62 | 62  | >62 | 57  | 57  | 55  | >62 | 57  | >62 |
| 9  | >90    | >62    | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 |
| 10 | >90    | >62    | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions: RF IN: 1562.5 MHz; 5.00 dBm.  
LO IN: 1592.5 MHz; +17.00 dBm  
IF OUT: 30 MHz; -27.61 dBm

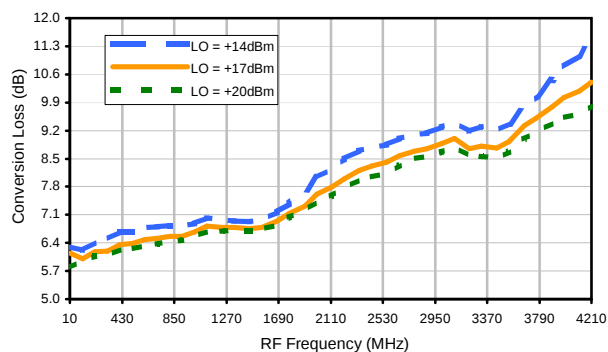
- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
3. RF Cal represent the Harmonics level of the RF input signal to the mixer.

# Frequency Mixer

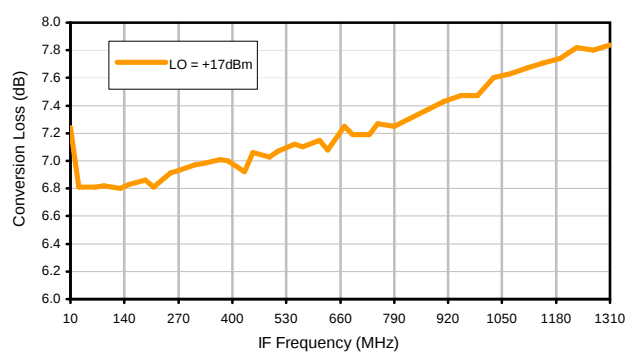
SYM-ED7348/2

## Typical Performance Curves

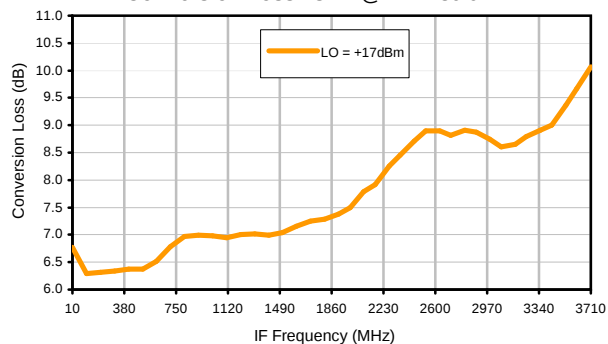
Conversion Loss @ IF=30MHz



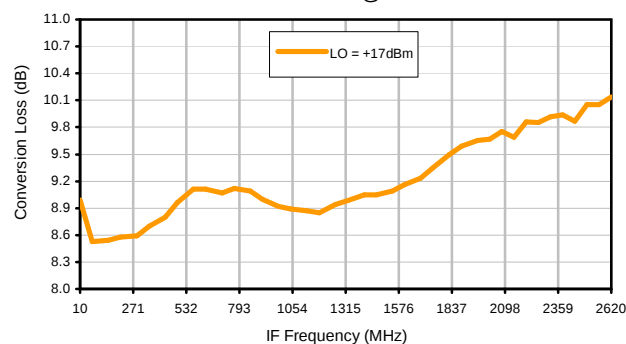
Conversion Loss vs. IF @ RF=1322.6MHz



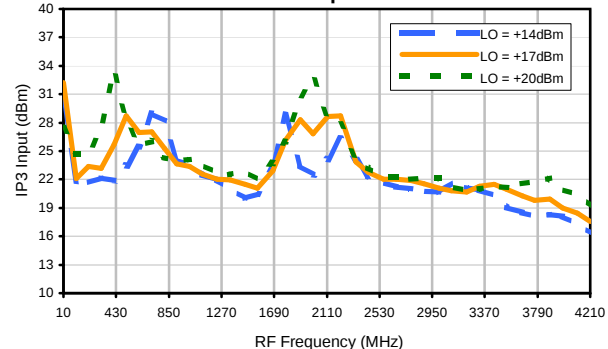
Conversion Loss vs. IF @ RF=489.9MHz



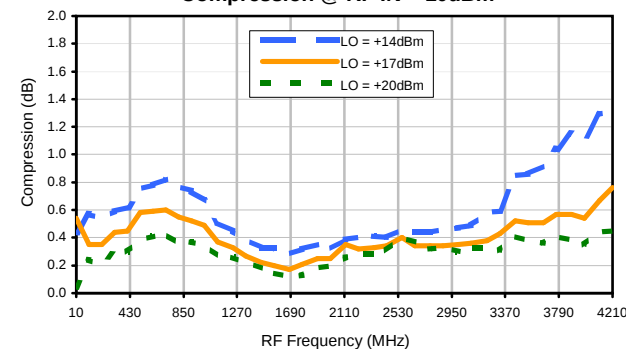
Conversion Loss vs. IF @ RF=2635.1MHz



IP3 Input

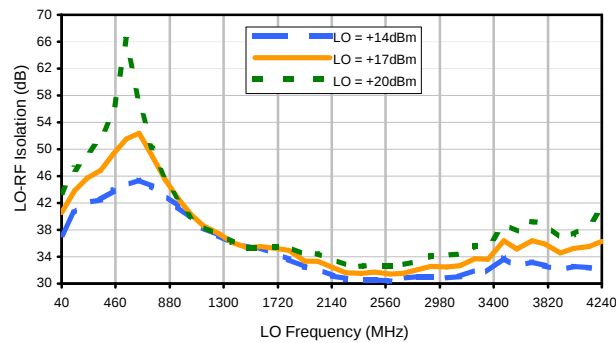


Compression @ RF IN=+10dBm

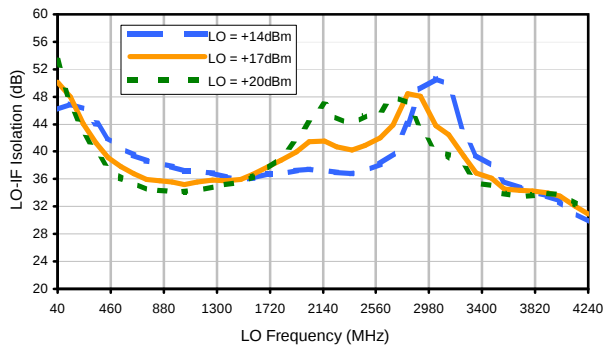


## Typical Performance Curves

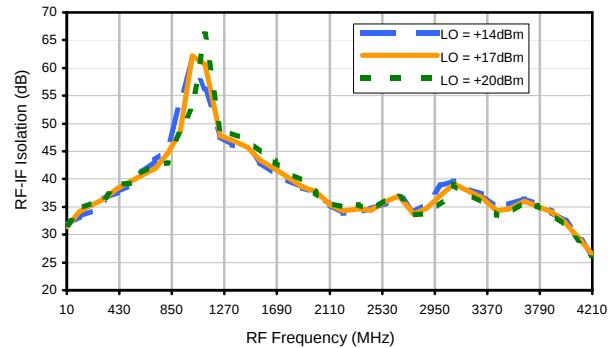
LO-RF Isolation



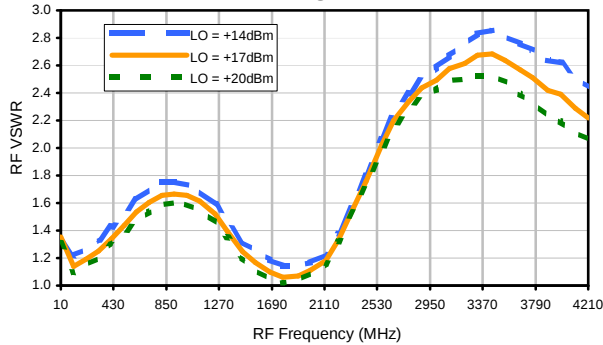
LO-IF Isolation



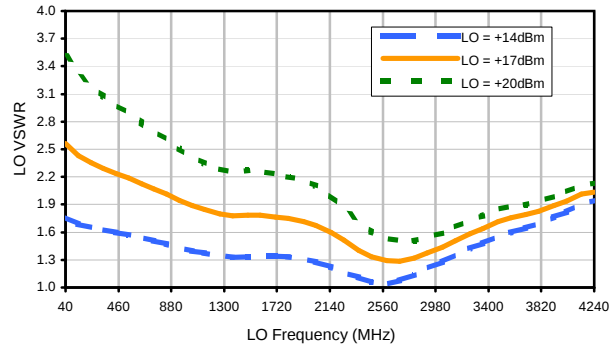
RF-IF Isolation



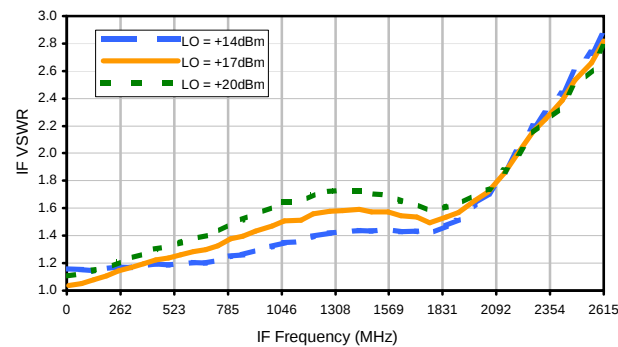
RF VSWR



LO VSWR



IF VSWR



## Harmonics Tables

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | +23 | +17 | +14 | 2   | +3  | 13  | +8  | 10  | 10  | 13  |
| 1  | -      | 3      | +0  | 6   | +20 | 23  | +7  | 21  | +0  | 13  | 14  | 22  |
| 2  | 66     | 32     | 30  | >48 | 31  | 32  | 28  | 35  | 31  | 31  | 30  | 39  |
| 3  | >90    | >48    | 25  | >48 | >48 | >48 | 31  | >48 | 40  | >48 | 44  | 47  |
| 4  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 5  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 6  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 7  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 8  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 9  | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
| 10 | >90    | >48    | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 | >48 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 1562.5 MHz; -5.00 dBm.

LO IN: 1592.5 MHz; +17.00 dBm

IF OUT: 30 MHz; -42.37 dBm

RF HARMONICS ORDER

|    | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|----|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0  | -      | -      | +9  | +2  | 3   | 17  | 14  | 28  | 8   | 30  | 22  | 32  |
| 1  | -      | 8      | +0  | 10  | +15 | 33  | +1  | 28  | 6   | 21  | 20  | 30  |
| 2  | 47     | 31     | 23  | 52  | 28  | 26  | 26  | 30  | 37  | 28  | 31  | 38  |
| 3  | 87     | 32     | 8   | 30  | 34  | 34  | 15  | 47  | 27  | 45  | 28  | 35  |
| 4  | >90    | 47     | 39  | 35  | 37  | 55  | 38  | 46  | 46  | 52  | 50  | 44  |
| 5  | >90    | 61     | 40  | 45  | 29  | 42  | 47  | 47  | 31  | >62 | 42  | 57  |
| 6  | >90    | >62    | 51  | 60  | 48  | 46  | 47  | >62 | 47  | 55  | 59  | 61  |
| 7  | >90    | >62    | 58  | >62 | 54  | 56  | 47  | 57  | 62  | >62 | 49  | >62 |
| 8  | >90    | 62     | >62 | >62 | 62  | >62 | 57  | 57  | 55  | >62 | 57  | >62 |
| 9  | >90    | >62    | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 |
| 10 | >90    | >62    | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 | >62 |
|    | RF CAL | 0      | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |

### LO HARMONICS ORDER

Test conditions:

RF IN: 1562.5 MHz; 5.00 dBm.

LO IN: 1592.5 MHz; +17.00 dBm

IF OUT: 30 MHz; -27.61 dBm

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

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

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

REV. X3

SYM-ED7348/2

101011

Page 3 of 3



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

TTT166  
TTT167



## PCB Land Pattern



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

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

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

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

### Note:

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

# Tape & Reel Packaging TR-F12



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

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

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

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



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## THIRD ANGLE PROJECTION



## REVISIONS

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

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

**NOTE:**

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



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

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

DRAWN

GF

03/18/03

CHECKED

IL

04/15/03

APPROVED

DJ

04/15/03

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

SIZE  
ACODE IDENT  
15542DRAWING NO:  
98-PL-079REV:  
D

FILE: 98PL079

SCALE: 5:1

SHEET: 1 OF 1

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

# Evaluation Board and Circuit

For Pin Connections Refer to Data Sheet of the DUT



Schematic Diagram

## Notes:

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

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

| Specification                  | Test/Inspection Condition                                                                                                                                       | Reference/Spec                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Operating Temperature          | -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                                                                              |