

# Surface Mount Frequency Mixer

Level 7 (LO Power +7dBm) 5 to 1000 MHz

## LRMS-2J+



Generic photo used for illustration purposes only

CASE STYLE: QQQ569

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

### Maximum Ratings

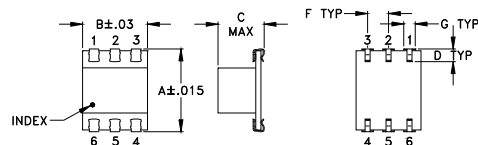
|                       |                |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| RF Power              | 50mW           |
| IF Current            | 40mA           |

Permanent damage may occur if any of these limits are exceeded.

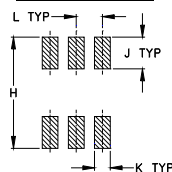
### Pin Connections

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

### Outline Drawing



#### PCB Land Pattern

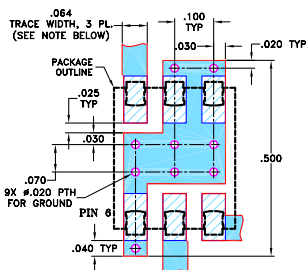


Suggested Layout,  
Tolerance to be within ±.002

### Outline Dimensions (inch/mm)

| A     | B    | C    | D    | E  | F     | G    |
|-------|------|------|------|----|-------|------|
| .390  | .31  | .225 | .060 | -- | .100  | .045 |
| 9.91  | 7.87 | 5.72 | 1.52 | -- | 2.54  | 1.14 |
| H     | J    | K    | L    | M  | wt    |      |
| .420  | .120 | .060 | .100 | -- | grams |      |
| 10.67 | 3.05 | 1.52 | 2.54 | -- | 0.50  |      |

### Demo Board MCL P/N: TB-44+ Suggested PCB Layout (PL-083)



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" ± 0.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.  
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
4. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

### Features

- low conversion loss, 6.67 dB typ.
- excellent L-R isolation, 40 dB typ.
- aqueous washable
- J-leads for strain relief

### Applications

- VHF/UHF
- instrumentation
- cellular

### Electrical Specifications

| FREQUENCY<br>(MHz)     |         | CONVERSION LOSS<br>(dB) |          |      |                        | LO-RF ISOLATION<br>(dB) |      |      |      |      |      | LO-IF ISOLATION<br>(dB) |      |      |      |    |    | IP3<br>at center<br>band<br>(dBm) |
|------------------------|---------|-------------------------|----------|------|------------------------|-------------------------|------|------|------|------|------|-------------------------|------|------|------|----|----|-----------------------------------|
| LO/RF<br>$f_L$ - $f_U$ | IF      | Mid-Band<br>m           |          |      | Total<br>Range<br>Max. | L                       |      | M    |      | U    |      | L                       |      | M    |      | U  |    |                                   |
|                        |         | $\overline{X}$          | $\sigma$ | Max. |                        | Typ.                    | Min. | Typ. | Min. | Typ. | Min. | Typ.                    | Min. | Typ. | Min. |    |    |                                   |
|                        |         |                         |          |      |                        |                         |      |      |      |      |      |                         |      |      |      |    |    |                                   |
| 5-1000                 | DC-1000 | 6.67                    | .26      | 8.0  | 9.5                    | 60                      | 40   | 40   | 20   | 25   | 18   | 55                      | 30   | 30   | 20   | 20 | 12 | 16                                |

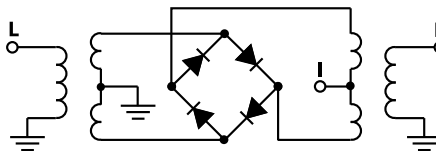
1 dB COMP.: +1 dBm typ.

L = low range [ $f_L$  to  $10 f_L$ ]  
M = mid range [ $10 f_L$  to  $f_U/2$ ]  
U = upper range [ $f_U/2$  to  $f_U$ ]

### Typical Performance Data

| Frequency<br>(MHz) |        | Conversion<br>Loss<br>(dB) | Isolation<br>L-R<br>(dB) | Isolation<br>L-I<br>(dB) | VSWR<br>RF Port<br>(:1) | VSWR<br>LO Port<br>(:1) |
|--------------------|--------|----------------------------|--------------------------|--------------------------|-------------------------|-------------------------|
| RF                 | LO     | LO<br>+7dBm                | LO<br>+7dBm              | LO<br>+7dBm              | LO<br>+7dBm             | LO<br>+7dBm             |
| 5.00               | 35.00  | 6.93                       | 67.42                    | 57.23                    | 1.35                    | 2.44                    |
| 10.00              | 40.00  | 7.00                       | 66.49                    | 56.87                    | 1.25                    | 2.37                    |
| 20.00              | 50.00  | 6.97                       | 65.94                    | 56.78                    | 1.22                    | 2.52                    |
| 35.15              | 65.15  | 6.92                       | 62.92                    | 55.59                    | 1.22                    | 2.57                    |
| 50.00              | 80.00  | 6.86                       | 60.51                    | 53.87                    | 1.23                    | 2.54                    |
| 65.30              | 95.30  | 6.89                       | 58.52                    | 52.15                    | 1.23                    | 2.49                    |
| 100.00             | 70.00  | 6.84                       | 55.07                    | 48.85                    | 1.22                    | 2.44                    |
| 155.76             | 125.76 | 6.72                       | 52.10                    | 46.19                    | 1.22                    | 2.43                    |
| 200.00             | 170.00 | 6.70                       | 49.75                    | 44.71                    | 1.23                    | 2.36                    |
| 246.21             | 216.21 | 6.75                       | 48.10                    | 43.71                    | 1.23                    | 2.37                    |
| 306.52             | 276.52 | 6.96                       | 45.81                    | 41.99                    | 1.25                    | 2.40                    |
| 366.82             | 336.82 | 6.97                       | 44.49                    | 39.66                    | 1.27                    | 2.39                    |
| 427.12             | 397.12 | 6.99                       | 42.09                    | 37.81                    | 1.30                    | 2.44                    |
| 500.00             | 470.00 | 7.03                       | 39.89                    | 35.06                    | 1.36                    | 2.58                    |
| 577.88             | 547.88 | 7.29                       | 38.51                    | 32.59                    | 1.44                    | 2.74                    |
| 668.33             | 638.33 | 7.63                       | 36.87                    | 29.46                    | 1.56                    | 2.95                    |
| 758.79             | 728.79 | 7.68                       | 34.71                    | 26.72                    | 1.72                    | 3.17                    |
| 849.24             | 819.24 | 7.98                       | 33.07                    | 23.71                    | 1.95                    | 3.58                    |
| 909.54             | 879.54 | 8.51                       | 32.47                    | 22.35                    | 2.13                    | 3.70                    |
| 1000.00            | 970.00 | 8.90                       | 32.02                    | 20.21                    | 2.45                    | 3.80                    |

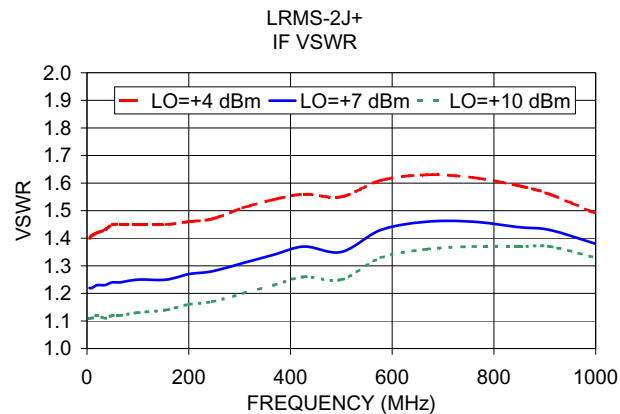
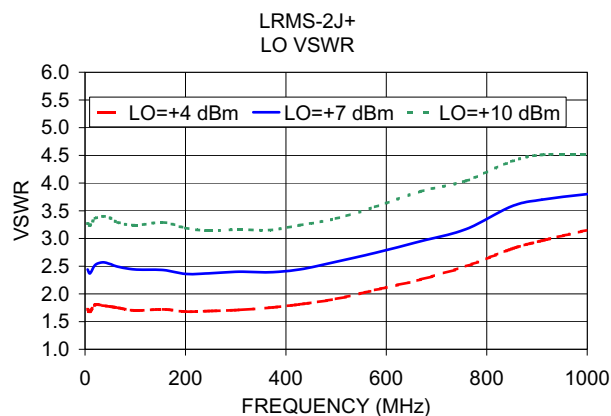
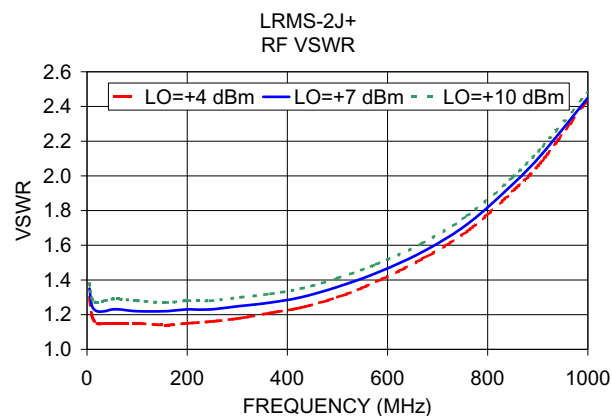
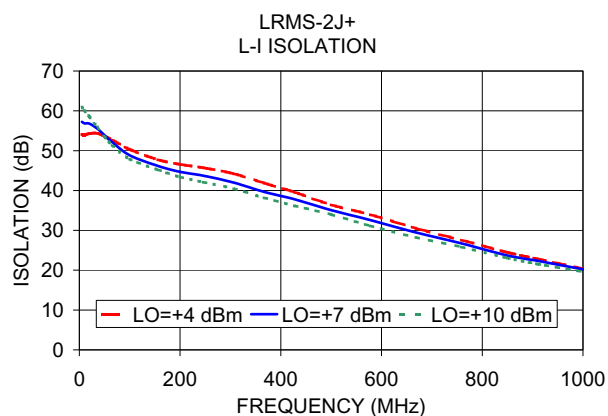
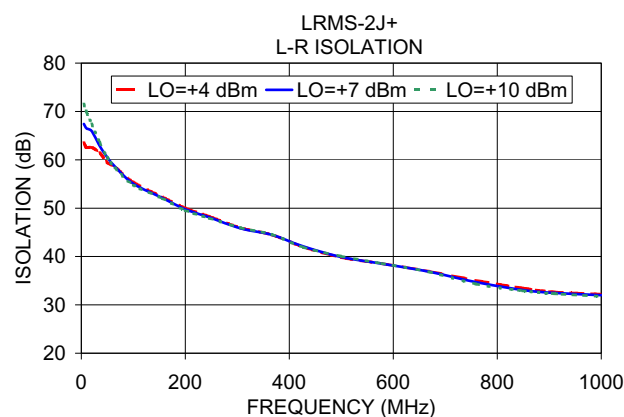
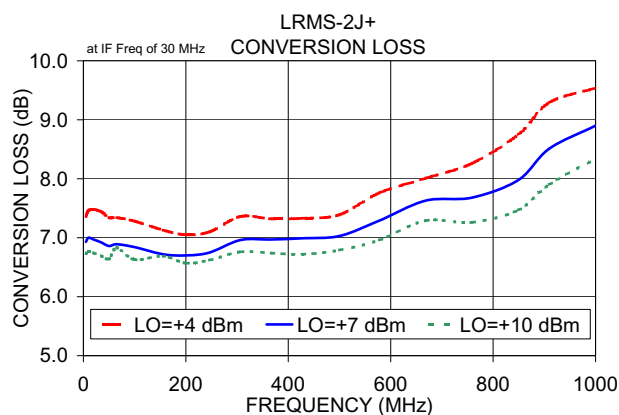
### Electrical Schematic



#### Notes

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
A. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.  
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# Frequency Mixer

# LRMS-2J+

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=30MHz<br>(dB) |      |      |
|---------------------|-------------|-------------------------------------------------------|------|------|
|                     |             | @LO (dBm)                                             |      |      |
|                     |             | +4                                                    | +7   | +10  |
| 5.0                 | 35.0        | 7.36                                                  | 6.93 | 6.73 |
| 10.0                | 40.0        | 7.46                                                  | 7.00 | 6.77 |
| 50.1                | 80.1        | 7.31                                                  | 6.87 | 6.66 |
| 90.1                | 120.1       | 7.34                                                  | 6.95 | 6.77 |
| 130.1               | 160.1       | 7.37                                                  | 6.98 | 6.82 |
| 170.1               | 200.1       | 7.36                                                  | 7.04 | 6.87 |
| 210.1               | 240.1       | 7.34                                                  | 7.01 | 6.86 |
| 250.1               | 280.1       | 7.36                                                  | 7.06 | 6.88 |
| 290.1               | 320.1       | 7.38                                                  | 7.03 | 6.86 |
| 330.1               | 360.1       | 7.43                                                  | 7.11 | 6.93 |
| 370.1               | 400.1       | 7.48                                                  | 7.15 | 6.93 |
| 410.1               | 440.1       | 7.56                                                  | 7.14 | 6.98 |
| 450.1               | 480.1       | 7.53                                                  | 7.22 | 6.98 |
| 490.1               | 520.1       | 7.56                                                  | 7.18 | 6.98 |
| 530.1               | 560.1       | 7.57                                                  | 7.14 | 6.92 |
| 570.1               | 600.1       | 7.56                                                  | 7.17 | 6.94 |
| 610.1               | 640.1       | 7.64                                                  | 7.25 | 7.02 |
| 650.1               | 680.1       | 7.74                                                  | 7.36 | 7.12 |
| 690.1               | 720.1       | 7.80                                                  | 7.40 | 7.15 |
| 730.1               | 760.1       | 7.84                                                  | 7.39 | 7.16 |
| 750.1               | 780.1       | 7.85                                                  | 7.41 | 7.11 |
| 790.1               | 820.1       | 7.99                                                  | 7.45 | 7.16 |
| 810.1               | 840.1       | 8.07                                                  | 7.52 | 7.19 |
| 850.1               | 880.1       | 8.26                                                  | 7.68 | 7.31 |
| 870.1               | 900.1       | 8.38                                                  | 7.78 | 7.37 |
| 910.1               | 940.1       | 8.55                                                  | 7.93 | 7.51 |
| 930.1               | 960.1       | 8.61                                                  | 7.97 | 7.58 |
| 970.1               | 1000.1      | 8.79                                                  | 8.22 | 7.81 |
| 990.1               | 1020.1      | 8.86                                                  | 8.31 | 7.84 |
| 1050.1              | 1080.1      | 9.10                                                  | 8.61 | 8.24 |
| 1090.1              | 1120.1      | 9.18                                                  | 8.78 | 8.46 |
| 1110.1              | 1140.1      | 9.23                                                  | 8.81 | 8.49 |
| 1150.1              | 1180.1      | 9.37                                                  | 8.97 | 8.72 |
| 1170.1              | 1200.1      | 9.39                                                  | 9.05 | 8.81 |
| 1210.1              | 1240.1      | 9.51                                                  | 9.14 | 8.94 |
| 1230.1              | 1260.1      | 9.62                                                  | 9.28 | 9.08 |
| 1270.1              | 1300.1      | 9.81                                                  | 9.43 | 9.28 |
| 1290.1              | 1320.1      | 9.88                                                  | 9.56 | 9.46 |
| 1330.1              | 1360.1      | 10.14                                                 | 9.87 | 9.75 |
| 1350.1              | 1380.1      | 10.28                                                 | 9.92 | 9.87 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       |
|---------------------|-------------|--------------------|-------|-------|
|                     |             | @LO (dBm)          |       |       |
|                     |             | +4                 | +7    | +10   |
| 10.1                | 40.1        | 18.69              | 23.41 | 24.55 |
| 50.1                | 80.1        | 19.31              | 18.89 | 18.14 |
| 90.1                | 120.1       | 17.00              | 17.01 | 22.84 |
| 130.1               | 160.1       | 17.03              | 19.38 | 24.21 |
| 170.1               | 200.1       | 17.80              | 23.69 | 21.11 |
| 210.1               | 240.1       | 18.58              | 22.83 | 20.22 |
| 250.1               | 280.1       | 18.64              | 19.52 | 19.83 |
| 290.1               | 320.1       | 17.75              | 17.49 | 19.02 |
| 330.1               | 360.1       | 18.30              | 18.13 | 18.92 |
| 370.1               | 400.1       | 16.85              | 19.83 | 16.97 |
| 410.1               | 440.1       | 15.92              | 18.12 | 18.73 |
| 450.1               | 480.1       | 15.45              | 19.09 | 18.74 |
| 490.1               | 520.1       | 15.28              | 15.28 | 15.65 |
| 530.1               | 560.1       | 13.52              | 14.47 | 15.68 |
| 570.1               | 600.1       | 13.92              | 15.01 | 15.28 |
| 610.1               | 640.1       | 15.15              | 16.42 | 14.93 |
| 650.1               | 680.1       | 15.76              | 17.02 | 18.15 |
| 690.1               | 720.1       | 14.92              | 18.01 | 16.77 |
| 730.1               | 760.1       | 15.04              | 17.82 | 15.19 |
| 750.1               | 780.1       | 14.13              | 16.36 | 15.98 |
| 790.1               | 820.1       | 14.26              | 14.85 | 15.78 |
| 810.1               | 840.1       | 13.97              | 14.27 | 14.18 |
| 850.1               | 880.1       | 12.87              | 13.59 | 14.01 |
| 870.1               | 900.1       | 12.50              | 12.86 | 13.55 |
| 910.1               | 940.1       | 11.98              | 12.89 | 12.64 |
| 930.1               | 960.1       | 12.23              | 14.08 | 12.51 |
| 970.1               | 1000.1      | 10.88              | 12.51 | 10.92 |
| 990.1               | 1020.1      | 10.84              | 12.38 | 10.66 |
| 1030.1              | 1060.1      | 10.93              | 11.51 | 10.92 |
| 1050.1              | 1080.1      | 10.52              | 11.54 | 11.37 |
| 1090.1              | 1120.1      | 11.15              | 11.68 | 12.39 |
| 1110.1              | 1140.1      | 11.72              | 12.37 | 13.76 |
| 1150.1              | 1180.1      | 12.13              | 13.39 | 15.05 |
| 1170.1              | 1200.1      | 12.06              | 12.91 | 15.11 |
| 1210.1              | 1240.1      | 11.75              | 12.54 | 13.09 |
| 1230.1              | 1260.1      | 11.39              | 12.34 | 12.92 |
| 1270.1              | 1300.1      | 10.73              | 11.98 | 13.13 |
| 1290.1              | 1320.1      | 10.53              | 12.13 | 12.12 |
| 1330.1              | 1360.1      | 10.62              | 11.83 | 12.87 |
| 1350.1              | 1380.1      | 10.47              | 12.10 | 12.59 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+1dBm<br>(dB) |      |      |
|---------------------|-------------|-------------------------------------|------|------|
|                     |             | @LO (dBm)                           |      |      |
|                     |             | +4                                  | +7   | +10  |
| 10.1                | 40.1        | 0.83                                | 0.70 | 0.41 |
| 50.1                | 80.1        | 0.89                                | 0.64 | 0.41 |
| 90.1                | 120.1       | 0.99                                | 0.57 | 0.41 |
| 130.1               | 160.1       | 0.86                                | 0.73 | 0.45 |
| 170.1               | 200.1       | 0.91                                | 0.60 | 0.47 |
| 210.1               | 240.1       | 0.85                                | 0.60 | 0.42 |
| 250.1               | 280.1       | 0.88                                | 0.62 | 0.46 |
| 290.1               | 320.1       | 0.93                                | 0.64 | 0.49 |
| 330.1               | 360.1       | 0.89                                | 0.71 | 0.55 |
| 370.1               | 400.1       | 0.95                                | 0.66 | 0.60 |
| 410.1               | 440.1       | 1.03                                | 0.61 | 0.61 |
| 450.1               | 480.1       | 0.99                                | 0.73 | 0.59 |
| 490.1               | 520.1       | 1.11                                | 0.85 | 0.62 |
| 530.1               | 560.1       | 1.09                                | 0.74 | 0.65 |
| 570.1               | 600.1       | 1.18                                | 0.83 | 0.74 |
| 610.1               | 640.1       | 1.06                                | 0.90 | 0.66 |
| 650.1               | 680.1       | 1.36                                | 1.02 | 0.85 |
| 690.1               | 720.1       | 1.36                                | 0.96 | 0.79 |
| 730.1               | 760.1       | 1.38                                | 1.03 | 0.88 |
| 750.1               | 780.1       | 1.41                                | 1.08 | 0.93 |
| 790.1               | 820.1       | 1.36                                | 1.13 | 0.95 |
| 810.1               | 840.1       | 1.47                                | 1.33 | 1.12 |
| 850.1               | 880.1       | 1.43                                | 1.26 | 1.12 |
| 870.1               | 900.1       | 1.39                                | 1.11 | 1.09 |
| 910.1               | 940.1       | 1.40                                | 1.24 | 1.18 |
| 930.1               | 960.1       | 1.28                                | 1.14 | 0.95 |
| 970.1               | 1000.1      | 1.36                                | 1.31 | 1.22 |
| 990.1               | 1020.1      | 1.44                                | 1.10 | 1.15 |
| 1030.1              | 1060.1      | 1.29                                | 0.98 | 0.97 |
| 1050.1              | 1080.1      | 1.26                                | 1.00 | 0.85 |
| 1090.1              | 1120.1      | 1.23                                | 0.89 | 0.87 |
| 1110.1              | 1140.1      | 1.18                                | 0.90 | 0.85 |
| 1150.1              | 1180.1      | 1.22                                | 0.92 | 0.81 |
| 1170.1              | 1200.1      | 1.18                                | 0.98 | 0.87 |
| 1210.1              | 1240.1      | 1.21                                | 0.80 | 0.84 |
| 1230.1              | 1260.1      | 1.18                                | 0.95 | 0.77 |
| 1270.1              | 1300.1      | 1.22                                | 0.95 | 0.72 |
| 1290.1              | 1320.1      | 1.12                                | 0.87 | 0.72 |
| 1330.1              | 1360.1      | 1.34                                | 0.83 | 0.69 |
| 1350.1              | 1380.1      | 1.18                                | 0.75 | 0.68 |

REV. X2

LRMS-2J+

100817

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

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



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# Frequency Mixer

LRMS-2J+

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=500.1MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=10.1MHz<br>(dB) | IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=1000.1MHz<br>(dB) |
|----------------------|-------------|-----------------------------------------------------------------|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|------------------------------------------------------------------|
|                      |             | @LO (dBm)                                                       |                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                        |
|                      |             | +7                                                              |                      |             | +7                                                             |                      |             | +7                                                               |
| 490.0                | 10.1        | 7.16                                                            | 10.0                 | 20.1        | 6.84                                                           | 990.0                | 10.1        | 8.23                                                             |
| 477.7                | 22.4        | 7.17                                                            | 30.2                 | 40.3        | 6.50                                                           | 970.0                | 30.1        | 8.18                                                             |
| 465.4                | 34.7        | 7.15                                                            | 50.4                 | 60.5        | 6.55                                                           | 950.0                | 50.1        | 8.17                                                             |
| 453.1                | 47.0        | 7.14                                                            | 70.6                 | 80.7        | 6.54                                                           | 930.0                | 70.1        | 8.15                                                             |
| 440.8                | 59.3        | 7.15                                                            | 90.8                 | 100.9       | 6.54                                                           | 910.0                | 90.1        | 8.10                                                             |
| 428.5                | 71.6        | 7.12                                                            | 111.0                | 121.1       | 6.53                                                           | 890.0                | 110.1       | 8.06                                                             |
| 416.2                | 83.9        | 7.08                                                            | 131.2                | 141.3       | 6.52                                                           | 870.0                | 130.1       | 8.00                                                             |
| 403.8                | 96.3        | 7.06                                                            | 151.4                | 161.5       | 6.62                                                           | 850.0                | 150.1       | 7.99                                                             |
| 391.5                | 108.6       | 7.06                                                            | 171.6                | 181.7       | 6.60                                                           | 830.0                | 170.1       | 7.96                                                             |
| 379.2                | 120.9       | 7.04                                                            | 191.8                | 201.9       | 6.65                                                           | 810.0                | 190.1       | 7.93                                                             |
| 366.9                | 133.2       | 6.99                                                            | 212.0                | 222.1       | 6.63                                                           | 790.0                | 210.1       | 7.91                                                             |
| 354.6                | 145.5       | 6.99                                                            | 232.2                | 242.3       | 6.70                                                           | 770.0                | 230.1       | 7.88                                                             |
| 342.3                | 157.8       | 7.00                                                            | 252.4                | 262.5       | 6.73                                                           | 750.0                | 250.1       | 7.83                                                             |
| 330.0                | 170.1       | 6.98                                                            | 272.7                | 282.8       | 6.72                                                           | 730.0                | 270.1       | 7.84                                                             |
| 317.7                | 182.4       | 6.99                                                            | 292.9                | 303.0       | 6.79                                                           | 710.0                | 290.1       | 7.84                                                             |
| 305.4                | 194.7       | 6.98                                                            | 313.1                | 323.2       | 6.81                                                           | 690.0                | 310.1       | 7.80                                                             |
| 293.1                | 207.0       | 6.98                                                            | 333.3                | 343.4       | 6.83                                                           | 670.0                | 330.1       | 7.79                                                             |
| 280.8                | 219.3       | 6.97                                                            | 353.5                | 363.6       | 6.83                                                           | 650.0                | 350.1       | 7.79                                                             |
| 268.5                | 231.6       | 6.96                                                            | 373.7                | 383.8       | 6.90                                                           | 630.0                | 370.1       | 7.77                                                             |
| 256.2                | 243.9       | 6.98                                                            | 393.9                | 404.0       | 6.94                                                           | 610.0                | 390.1       | 7.76                                                             |
| 243.8                | 256.3       | 6.92                                                            | 434.3                | 444.4       | 6.97                                                           | 570.0                | 430.1       | 7.73                                                             |
| 231.5                | 268.6       | 6.88                                                            | 454.5                | 464.6       | 7.00                                                           | 550.0                | 450.1       | 7.72                                                             |
| 219.2                | 280.9       | 6.88                                                            | 494.9                | 505.0       | 7.02                                                           | 510.0                | 490.1       | 7.72                                                             |
| 206.9                | 293.2       | 6.98                                                            | 515.1                | 525.2       | 7.05                                                           | 490.0                | 510.1       | 7.66                                                             |
| 194.6                | 305.5       | 6.96                                                            | 555.5                | 565.6       | 7.08                                                           | 450.0                | 550.1       | 7.67                                                             |
| 182.3                | 317.8       | 6.96                                                            | 575.7                | 585.8       | 7.14                                                           | 430.0                | 570.1       | 7.69                                                             |
| 170.0                | 330.1       | 6.97                                                            | 616.1                | 626.2       | 7.22                                                           | 390.0                | 610.1       | 7.67                                                             |
| 157.7                | 342.4       | 6.93                                                            | 636.3                | 646.4       | 7.24                                                           | 370.0                | 630.1       | 7.70                                                             |
| 145.4                | 354.7       | 6.98                                                            | 676.7                | 686.8       | 7.26                                                           | 330.0                | 670.1       | 7.68                                                             |
| 133.1                | 367.0       | 6.99                                                            | 696.9                | 707.0       | 7.26                                                           | 310.0                | 690.1       | 7.66                                                             |
| 120.8                | 379.3       | 7.01                                                            | 737.3                | 747.4       | 7.25                                                           | 270.0                | 730.1       | 7.68                                                             |
| 108.5                | 391.6       | 6.99                                                            | 757.6                | 767.7       | 7.25                                                           | 250.0                | 750.1       | 7.70                                                             |
| 96.2                 | 403.9       | 7.01                                                            | 798.0                | 808.1       | 7.33                                                           | 210.0                | 790.1       | 7.68                                                             |
| 83.8                 | 416.3       | 7.00                                                            | 818.2                | 828.3       | 7.37                                                           | 190.0                | 810.1       | 7.71                                                             |
| 71.5                 | 428.6       | 7.04                                                            | 858.6                | 868.7       | 7.47                                                           | 150.0                | 850.1       | 7.78                                                             |
| 59.2                 | 440.9       | 7.04                                                            | 878.8                | 888.9       | 7.62                                                           | 130.0                | 870.1       | 7.78                                                             |
| 46.9                 | 453.2       | 7.04                                                            | 919.2                | 929.3       | 7.70                                                           | 90.0                 | 910.1       | 7.92                                                             |
| 34.6                 | 465.5       | 7.07                                                            | 939.4                | 949.5       | 7.78                                                           | 70.0                 | 930.1       | 7.96                                                             |
| 22.3                 | 477.8       | 7.10                                                            | 979.8                | 989.9       | 7.95                                                           | 30.0                 | 970.1       | 8.15                                                             |
| 10.0                 | 490.1       | 7.21                                                            | 1000.0               | 1010.1      | 7.97                                                           | 10.0                 | 990.1       | 8.68                                                             |

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## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +4                      | +7    | +10   | +4                      | +7    | +10   |
| 5.0         | 63.51                   | 67.42 | 71.51 | 54.09                   | 57.23 | 60.91 |
| 10.0        | 62.56                   | 66.49 | 69.85 | 53.93                   | 56.87 | 60.05 |
| 50.1        | 57.23                   | 56.64 | 56.89 | 52.64                   | 52.46 | 51.99 |
| 90.1        | 52.27                   | 51.94 | 51.91 | 48.43                   | 47.49 | 47.10 |
| 130.1       | 48.86                   | 48.98 | 48.78 | 45.22                   | 44.73 | 44.27 |
| 170.1       | 46.75                   | 46.80 | 46.74 | 43.14                   | 42.72 | 42.32 |
| 210.1       | 45.01                   | 45.05 | 45.02 | 41.65                   | 41.19 | 40.66 |
| 250.1       | 43.67                   | 43.71 | 43.73 | 40.55                   | 39.85 | 39.21 |
| 290.1       | 42.49                   | 42.54 | 42.62 | 39.38                   | 38.66 | 37.97 |
| 330.1       | 41.40                   | 41.54 | 41.63 | 38.22                   | 37.31 | 36.60 |
| 370.1       | 40.59                   | 40.78 | 40.84 | 36.87                   | 35.98 | 35.32 |
| 410.1       | 39.69                   | 39.92 | 40.04 | 35.64                   | 34.81 | 34.18 |
| 450.1       | 38.62                   | 38.90 | 39.09 | 34.26                   | 33.51 | 32.90 |
| 490.1       | 37.66                   | 37.94 | 38.13 | 32.99                   | 32.36 | 31.92 |
| 530.1       | 36.99                   | 37.34 | 37.57 | 31.62                   | 30.95 | 30.54 |
| 570.1       | 36.36                   | 36.70 | 36.94 | 30.53                   | 29.86 | 29.34 |
| 610.1       | 35.92                   | 36.24 | 36.46 | 29.38                   | 28.82 | 28.28 |
| 650.1       | 35.39                   | 35.59 | 35.72 | 28.32                   | 27.91 | 27.49 |
| 690.1       | 34.90                   | 34.98 | 35.02 | 27.23                   | 26.95 | 26.66 |
| 730.1       | 34.20                   | 34.16 | 34.08 | 25.88                   | 25.68 | 25.48 |
| 750.1       | 34.07                   | 34.01 | 33.91 | 25.41                   | 25.20 | 25.02 |
| 790.1       | 33.48                   | 33.40 | 33.24 | 24.32                   | 24.11 | 23.91 |
| 810.1       | 33.08                   | 32.99 | 32.78 | 23.80                   | 23.59 | 23.38 |
| 850.1       | 32.42                   | 32.40 | 32.21 | 22.82                   | 22.66 | 22.44 |
| 870.1       | 32.14                   | 32.19 | 32.06 | 22.46                   | 22.33 | 22.10 |
| 910.1       | 31.41                   | 31.54 | 31.45 | 21.36                   | 21.32 | 21.13 |
| 930.1       | 31.10                   | 31.30 | 31.27 | 20.98                   | 20.99 | 20.84 |
| 970.1       | 30.63                   | 30.93 | 31.05 | 20.10                   | 20.20 | 20.11 |
| 990.1       | 30.36                   | 30.69 | 30.87 | 19.71                   | 19.87 | 19.83 |
| 1050.1      | 29.99                   | 30.54 | 31.06 | 18.49                   | 18.76 | 18.81 |
| 1090.1      | 29.96                   | 30.62 | 31.33 | 17.65                   | 17.98 | 18.06 |
| 1110.1      | 29.91                   | 30.67 | 31.50 | 17.31                   | 17.66 | 17.74 |
| 1150.1      | 30.00                   | 30.99 | 32.11 | 16.59                   | 17.01 | 17.11 |
| 1170.1      | 30.02                   | 31.11 | 32.34 | 16.24                   | 16.70 | 16.82 |
| 1210.1      | 30.56                   | 32.03 | 33.60 | 15.45                   | 15.90 | 16.06 |
| 1230.1      | 30.87                   | 32.67 | 34.58 | 15.18                   | 15.64 | 15.78 |
| 1270.1      | 31.78                   | 34.28 | 36.84 | 14.42                   | 14.92 | 15.08 |
| 1290.1      | 32.48                   | 35.54 | 38.63 | 14.20                   | 14.68 | 14.82 |
| 1330.1      | 34.41                   | 39.38 | 44.28 | 13.43                   | 13.95 | 14.09 |
| 1350.1      | 34.60                   | 40.71 | 48.16 | 13.15                   | 13.71 | 13.89 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +4                      | +7    | +10   |
| 10.1                | 40.1        | 39.34                   | 29.58 | 45.35 |
| 50.1                | 80.1        | 37.57                   | 35.29 | 35.47 |
| 90.1                | 120.1       | 31.64                   | 31.66 | 31.76 |
| 130.1               | 160.1       | 29.26                   | 29.05 | 28.98 |
| 170.1               | 200.1       | 27.02                   | 27.33 | 27.10 |
| 210.1               | 240.1       | 25.80                   | 25.89 | 25.96 |
| 250.1               | 280.1       | 24.94                   | 25.07 | 24.96 |
| 290.1               | 320.1       | 24.43                   | 24.39 | 24.36 |
| 330.1               | 360.1       | 23.88                   | 24.04 | 24.04 |
| 370.1               | 400.1       | 23.54                   | 23.77 | 23.77 |
| 410.1               | 440.1       | 23.34                   | 23.55 | 23.67 |
| 450.1               | 480.1       | 23.31                   | 23.54 | 23.78 |
| 490.1               | 520.1       | 23.19                   | 23.46 | 23.75 |
| 530.1               | 560.1       | 22.91                   | 23.27 | 23.51 |
| 570.1               | 600.1       | 22.01                   | 22.34 | 22.57 |
| 610.1               | 640.1       | 20.76                   | 21.01 | 21.14 |
| 650.1               | 680.1       | 19.26                   | 19.39 | 19.50 |
| 690.1               | 720.1       | 17.75                   | 17.82 | 17.83 |
| 730.1               | 760.1       | 16.54                   | 16.53 | 16.52 |
| 750.1               | 780.1       | 15.98                   | 15.97 | 15.93 |
| 790.1               | 820.1       | 15.07                   | 15.07 | 15.06 |
| 810.1               | 840.1       | 14.65                   | 14.62 | 14.65 |
| 850.1               | 880.1       | 13.99                   | 14.00 | 14.06 |
| 870.1               | 900.1       | 13.69                   | 13.73 | 13.80 |
| 910.1               | 940.1       | 13.23                   | 13.30 | 13.41 |
| 930.1               | 960.1       | 13.03                   | 13.11 | 13.26 |
| 970.1               | 1000.1      | 12.71                   | 12.84 | 13.03 |
| 990.1               | 1020.1      | 12.62                   | 12.78 | 13.01 |
| 1030.1              | 1060.1      | 12.46                   | 12.70 | 13.00 |
| 1050.1              | 1080.1      | 12.39                   | 12.69 | 13.04 |
| 1090.1              | 1120.1      | 12.39                   | 12.78 | 13.24 |
| 1110.1              | 1140.1      | 12.37                   | 12.82 | 13.30 |
| 1150.1              | 1180.1      | 12.34                   | 12.87 | 13.37 |
| 1170.1              | 1200.1      | 12.39                   | 12.93 | 13.41 |
| 1210.1              | 1240.1      | 12.43                   | 12.95 | 13.35 |
| 1230.1              | 1260.1      | 12.37                   | 12.88 | 13.27 |
| 1270.1              | 1300.1      | 12.31                   | 12.75 | 13.04 |
| 1290.1              | 1320.1      | 12.28                   | 12.67 | 12.93 |
| 1330.1              | 1360.1      | 12.07                   | 12.41 | 12.57 |
| 1350.1              | 1380.1      | 11.92                   | 12.22 | 12.32 |

# Frequency Mixer

# LRMS-2J+

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF VSWR<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|
|                     |             | @LO (dBm)       |      |      |
|                     |             | +4              | +7   | +10  |
| 5.0                 | 35.0        | 1.72            | 2.44 | 3.27 |
| 10.0                | 40.0        | 1.68            | 2.37 | 3.24 |
| 50.1                | 80.1        | 1.27            | 1.38 | 1.43 |
| 90.1                | 120.1       | 1.20            | 1.28 | 1.33 |
| 130.1               | 160.1       | 1.27            | 1.35 | 1.39 |
| 170.1               | 200.1       | 1.20            | 1.26 | 1.32 |
| 210.1               | 240.1       | 1.27            | 1.34 | 1.39 |
| 250.1               | 280.1       | 1.26            | 1.33 | 1.37 |
| 290.1               | 320.1       | 1.27            | 1.34 | 1.38 |
| 330.1               | 360.1       | 1.28            | 1.34 | 1.39 |
| 370.1               | 400.1       | 1.28            | 1.35 | 1.40 |
| 410.1               | 440.1       | 1.31            | 1.38 | 1.43 |
| 450.1               | 480.1       | 1.32            | 1.39 | 1.44 |
| 490.1               | 520.1       | 1.34            | 1.41 | 1.46 |
| 530.1               | 560.1       | 1.37            | 1.44 | 1.50 |
| 570.1               | 600.1       | 1.41            | 1.48 | 1.54 |
| 610.1               | 640.1       | 1.43            | 1.49 | 1.56 |
| 650.1               | 680.1       | 1.50            | 1.56 | 1.62 |
| 690.1               | 720.1       | 1.49            | 1.56 | 1.62 |
| 730.1               | 760.1       | 1.61            | 1.69 | 1.75 |
| 750.1               | 780.1       | 1.62            | 1.70 | 1.76 |
| 790.1               | 820.1       | 1.68            | 1.76 | 1.83 |
| 810.1               | 840.1       | 1.76            | 1.84 | 1.91 |
| 850.1               | 880.1       | 1.81            | 1.88 | 1.95 |
| 870.1               | 900.1       | 1.83            | 1.90 | 1.97 |
| 910.1               | 940.1       | 2.05            | 2.11 | 2.17 |
| 930.1               | 960.1       | 2.09            | 2.14 | 2.20 |
| 970.1               | 1000.1      | 2.22            | 2.27 | 2.33 |
| 990.1               | 1020.1      | 2.37            | 2.43 | 2.49 |
| 1030.1              | 1060.1      | 2.49            | 2.54 | 2.59 |
| 1050.1              | 1080.1      | 2.57            | 2.63 | 2.68 |
| 1090.1              | 1120.1      | 2.89            | 2.96 | 3.02 |
| 1110.1              | 1140.1      | 2.91            | 2.98 | 3.05 |
| 1150.1              | 1180.1      | 3.18            | 3.27 | 3.35 |
| 1170.1              | 1200.1      | 3.33            | 3.42 | 3.50 |
| 1210.1              | 1240.1      | 3.43            | 3.53 | 3.60 |
| 1230.1              | 1260.1      | 3.61            | 3.73 | 3.80 |
| 1270.1              | 1300.1      | 3.76            | 3.86 | 3.92 |
| 1290.1              | 1320.1      | 3.79            | 3.90 | 3.96 |
| 1330.1              | 1360.1      | 4.08            | 4.19 | 4.26 |
| 1350.1              | 1380.1      | 4.10            | 4.21 | 4.28 |

| LO<br>(MHz) | LO VSWR<br>(:1) |      |      |
|-------------|-----------------|------|------|
|             | @LO (dBm)       |      |      |
|             | +4              | +7   | +10  |
| 5.0         | 1.30            | 1.35 | 1.38 |
| 10.0        | 1.19            | 1.25 | 1.29 |
| 50.1        | 1.96            | 2.79 | 3.83 |
| 90.1        | 1.94            | 2.75 | 3.76 |
| 130.1       | 1.93            | 2.74 | 3.73 |
| 170.1       | 1.98            | 2.78 | 3.79 |
| 210.1       | 1.97            | 2.76 | 3.73 |
| 250.1       | 2.05            | 2.86 | 3.88 |
| 290.1       | 2.09            | 2.90 | 3.92 |
| 330.1       | 2.16            | 3.01 | 4.04 |
| 370.1       | 2.27            | 3.16 | 4.23 |
| 410.1       | 2.30            | 3.17 | 4.23 |
| 450.1       | 2.40            | 3.30 | 4.37 |
| 490.1       | 2.41            | 3.26 | 4.28 |
| 530.1       | 2.48            | 3.33 | 4.35 |
| 570.1       | 2.54            | 3.36 | 4.34 |
| 610.1       | 2.61            | 3.43 | 4.39 |
| 650.1       | 2.71            | 3.52 | 4.46 |
| 690.1       | 2.72            | 3.49 | 4.36 |
| 730.1       | 2.79            | 3.53 | 4.36 |
| 750.1       | 2.81            | 3.51 | 4.29 |
| 790.1       | 2.80            | 3.45 | 4.17 |
| 810.1       | 2.81            | 3.45 | 4.14 |
| 850.1       | 2.87            | 3.47 | 4.12 |
| 870.1       | 2.88            | 3.48 | 4.10 |
| 910.1       | 2.90            | 3.47 | 4.07 |
| 930.1       | 2.94            | 3.50 | 4.09 |
| 970.1       | 2.90            | 3.42 | 3.95 |
| 990.1       | 2.86            | 3.35 | 3.87 |
| 1030.1      | 2.89            | 3.37 | 3.86 |
| 1050.1      | 2.89            | 3.35 | 3.84 |
| 1090.1      | 2.84            | 3.26 | 3.71 |
| 1110.1      | 2.87            | 3.29 | 3.73 |
| 1150.1      | 2.90            | 3.29 | 3.72 |
| 1170.1      | 2.86            | 3.22 | 3.62 |
| 1210.1      | 2.89            | 3.24 | 3.63 |
| 1230.1      | 2.94            | 3.30 | 3.70 |
| 1270.1      | 2.95            | 3.27 | 3.63 |
| 1290.1      | 3.01            | 3.33 | 3.68 |
| 1330.1      | 3.15            | 3.45 | 3.79 |
| 1350.1      | 3.17            | 3.46 | 3.79 |

| IF<br>(OUT)<br>(MHz) | IF VSWR<br>@LO=1000.1MHz<br>(:1) |      |      |
|----------------------|----------------------------------|------|------|
|                      | @LO (dBm)                        |      |      |
|                      | +4                               | +7   | +10  |
| 5.0                  | 1.40                             | 1.22 | 1.11 |
| 10.0                 | 1.41                             | 1.22 | 1.11 |
| 30.1                 | 2.29                             | 1.92 | 1.58 |
| 50.1                 | 1.95                             | 1.62 | 1.40 |
| 70.1                 | 1.86                             | 1.62 | 1.38 |
| 90.1                 | 1.95                             | 1.67 | 1.44 |
| 110.1                | 2.02                             | 1.72 | 1.47 |
| 130.1                | 2.01                             | 1.69 | 1.47 |
| 150.1                | 1.95                             | 1.66 | 1.44 |
| 170.1                | 1.93                             | 1.64 | 1.43 |
| 190.1                | 1.98                             | 1.68 | 1.45 |
| 210.1                | 1.97                             | 1.67 | 1.46 |
| 230.1                | 1.93                             | 1.64 | 1.42 |
| 250.1                | 1.89                             | 1.62 | 1.41 |
| 270.1                | 1.87                             | 1.60 | 1.40 |
| 290.1                | 1.88                             | 1.61 | 1.41 |
| 310.1                | 1.85                             | 1.59 | 1.39 |
| 330.1                | 1.83                             | 1.56 | 1.38 |
| 350.1                | 1.80                             | 1.54 | 1.38 |
| 370.1                | 1.79                             | 1.55 | 1.39 |
| 390.1                | 1.80                             | 1.55 | 1.39 |
| 430.1                | 1.75                             | 1.53 | 1.39 |
| 450.1                | 1.74                             | 1.53 | 1.39 |
| 490.1                | 1.72                             | 1.52 | 1.39 |
| 510.1                | 1.71                             | 1.51 | 1.39 |
| 550.1                | 1.68                             | 1.50 | 1.41 |
| 570.1                | 1.69                             | 1.51 | 1.41 |
| 610.1                | 1.60                             | 1.44 | 1.38 |
| 630.1                | 1.59                             | 1.45 | 1.39 |
| 670.1                | 1.61                             | 1.47 | 1.42 |
| 690.1                | 1.58                             | 1.44 | 1.39 |
| 730.1                | 1.53                             | 1.42 | 1.40 |
| 750.1                | 1.55                             | 1.45 | 1.43 |
| 790.1                | 1.50                             | 1.40 | 1.38 |
| 810.1                | 1.45                             | 1.37 | 1.37 |
| 850.1                | 1.47                             | 1.41 | 1.43 |
| 870.1                | 1.47                             | 1.41 | 1.42 |
| 910.1                | 1.40                             | 1.35 | 1.37 |
| 930.1                | 1.39                             | 1.35 | 1.40 |
| 970.1                | 1.40                             | 1.37 | 1.41 |
| 990.1                | 1.38                             | 1.35 | 1.38 |

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## Harmonics Tables

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | 2   | 18  | 8   | 28  | 15  | 32  | 16  | 30  | 29  | 42  |
| 1      | -      | 17     | 0   | 30  | 13  | 30  | 25  | 39  | 36  | 37  | 47  | 39  |
| 2      | 109    | 67     | 47  | 68  | 48  | 71  | 48  | 72  | 58  | 64  | 53  | 58  |
| 3      | 117    | 73     | 78  | 77  | 69  | 75  | 67  | 73  | 79  | 78  | 67  | 77  |
| 4      | 117    | 100    | 92  | 98  | 89  | 88  | 89  | 96  | 89  | 97  | 94  | 94  |
| 5      | 114    | 99     | 107 | 109 | 98  | 96  | 86  | 100 | 97  | 107 | 101 | 105 |
| 6      | 113    | 107    | 103 | 111 | 108 | 104 | 94  | 85  | 101 | 110 | 113 | 98  |
| 7      | 119    | 107    | 114 | 106 | 100 | 110 | 100 | 113 | 93  | 96  | 102 | 97  |
| 8      | 118    | 103    | 126 | 106 | 108 | 107 | 105 | 96  | 85  | 95  | 97  | 102 |
| 9      | 120    | 103    | 109 | 100 | 102 | 102 | 109 | 107 | 99  | 86  | 86  | 99  |
| 10     | 127    | 104    | 104 | 105 | 106 | 104 | 104 | 104 | 131 | 101 | 91  | 89  |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

### LO HARMONICS ORDER

Test conditions:

RF IN: 500.1 MHz; -14.00 dBm.

LO IN: 530.01 MHz; +7.00 dBm

IF OUT: 29.91 MHz; -21.04 dBm

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |    |    |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| 0      | -      | -      | 12  | 28  | 19  | 39  | 25  | 42  | 28  | 44  | 44 | 64 |
| 1      | -      | 17     | 0   | 29  | 13  | 32  | 26  | 42  | 37  | 41  | 52 | 45 |
| 2      | 100    | 58     | 38  | 52  | 38  | 71  | 41  | 63  | 50  | 64  | 45 | 55 |
| 3      | 111    | 53     | 53  | 70  | 50  | 61  | 48  | 51  | 54  | 57  | 53 | 55 |
| 4      | 113    | 73     | 78  | 93  | 62  | 72  | 63  | 72  | 56  | 78  | 72 | 66 |
| 5      | 118    | 77     | 77  | 76  | 60  | 70  | 58  | 69  | 59  | 73  | 67 | 80 |
| 6      | 118    | 86     | 86  | 84  | 78  | 75  | 70  | 74  | 67  | 86  | 71 | 88 |
| 7      | 114    | 86     | 86  | 92  | 81  | 87  | 77  | 84  | 78  | 92  | 83 | 87 |
| 8      | 112    | 104    | 107 | 106 | 104 | 100 | 97  | 92  | 91  | 95  | 87 | 89 |
| 9      | 124    | 105    | 99  | 109 | 103 | 108 | 108 | 103 | 93  | 96  | 89 | 99 |
| 10     | 113    | 106    | 118 | 106 | 107 | 105 | 114 | 104 | 115 | 101 | 96 | 92 |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10 |    |

### LO HARMONICS ORDER

Test conditions:

RF IN: 500.1 MHz; -4.00 dBm.

LO IN: 530.01 MHz; +7.00 dBm

IF OUT: 29.91 MHz; -11.20 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.



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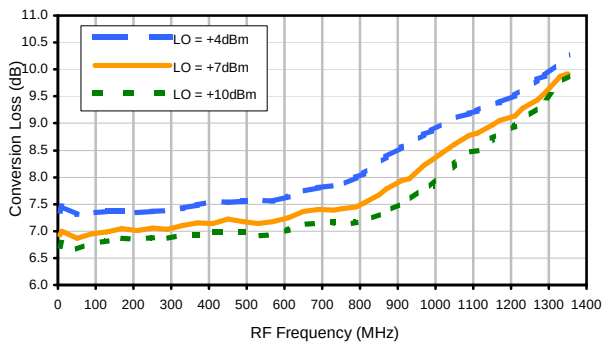


# Frequency Mixer

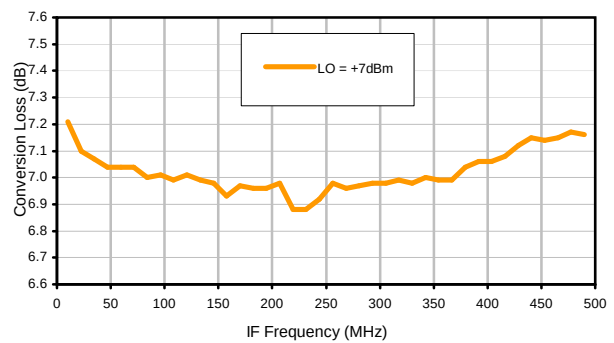
# LRMS-2J+

## Typical Performance Curves

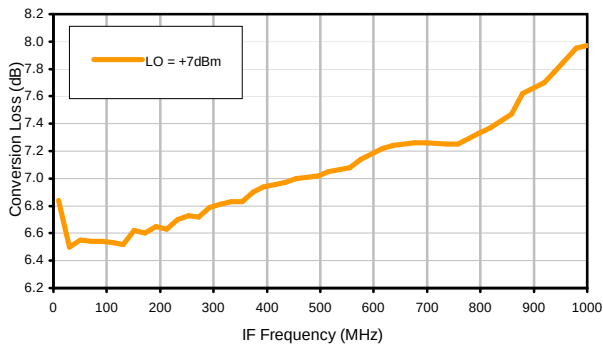
Conversion Loss @ IF=30MHz



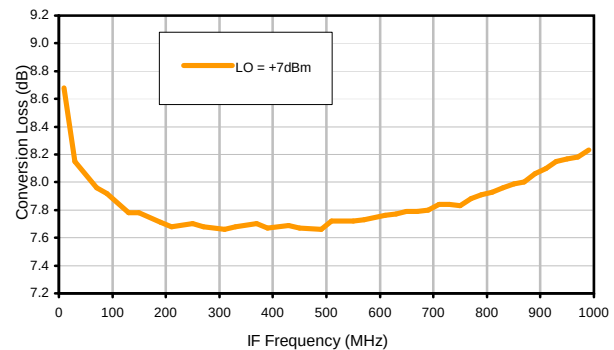
Conversion Loss vs. IF @ RF=500.1MHz



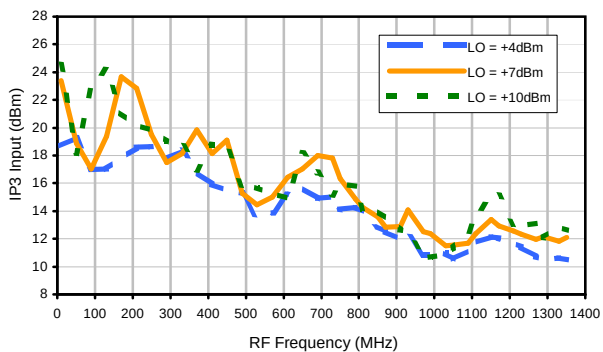
Conversion Loss vs. IF @ RF=10.1MHz



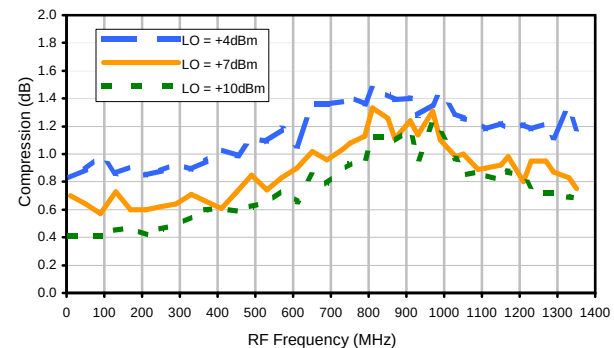
Conversion Loss vs. IF @ RF=1000.1MHz



IP3 Input



Compression @ RF IN=+1dBm



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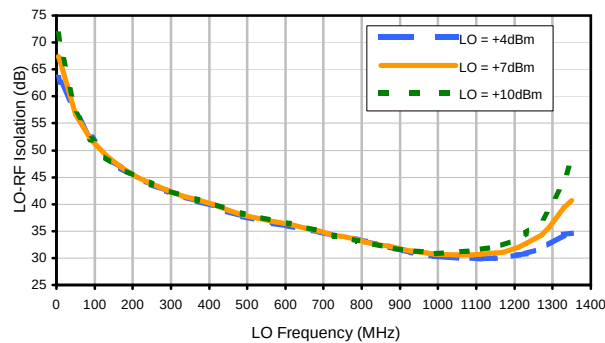


REV. X2  
LRMS-2J+  
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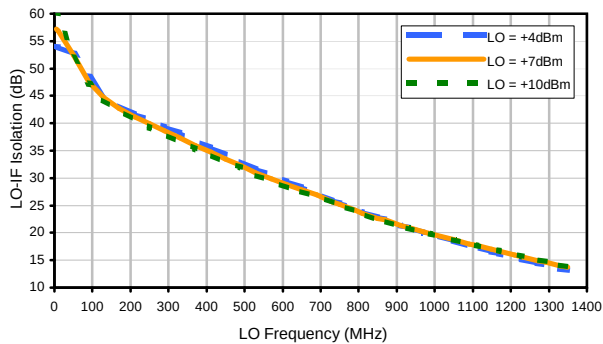


## Typical Performance Curves

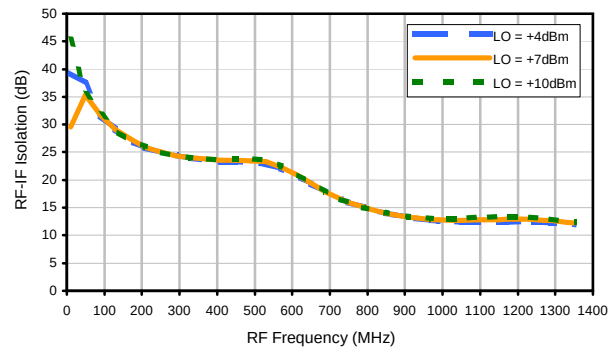
LO-RF Isolation



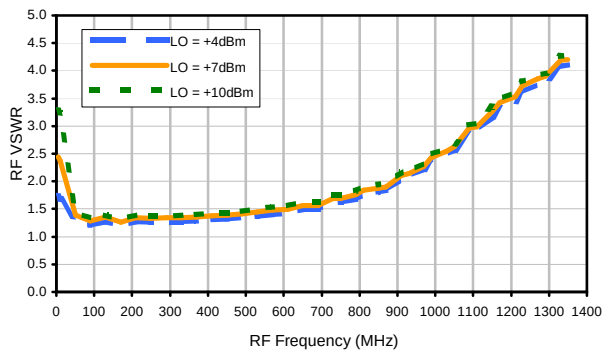
LO-IF Isolation



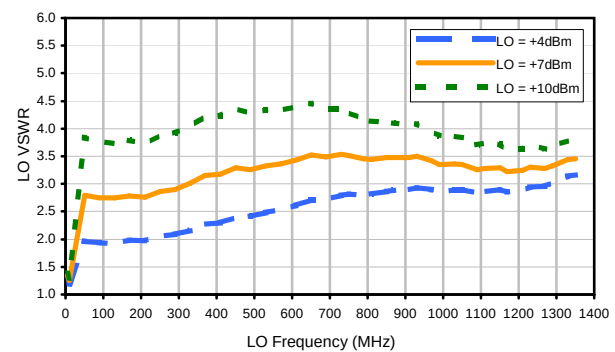
RF-IF Isolation



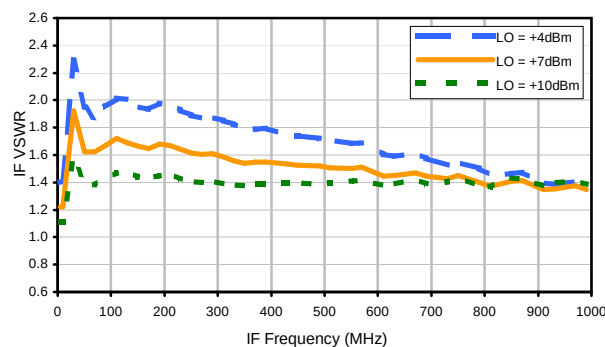
RF VSWR



LO VSWR



IF VSWR



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## Harmonics Tables

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | 2   | 18  | 8   | 28  | 15  | 32  | 16  | 30  | 29  | 42  |
| 1      | -      | 17     | 0   | 30  | 13  | 30  | 25  | 39  | 36  | 37  | 47  | 39  |
| 2      | 109    | 67     | 47  | 68  | 48  | 71  | 48  | 72  | 58  | 64  | 53  | 58  |
| 3      | 117    | 73     | 78  | 77  | 69  | 75  | 67  | 73  | 79  | 78  | 67  | 77  |
| 4      | 117    | 100    | 92  | 98  | 89  | 88  | 89  | 96  | 89  | 97  | 94  | 94  |
| 5      | 114    | 99     | 107 | 109 | 98  | 96  | 86  | 100 | 97  | 107 | 101 | 105 |
| 6      | 113    | 107    | 103 | 111 | 108 | 104 | 94  | 85  | 101 | 110 | 113 | 98  |
| 7      | 119    | 107    | 114 | 106 | 100 | 110 | 100 | 113 | 93  | 96  | 102 | 97  |
| 8      | 118    | 103    | 126 | 106 | 108 | 107 | 105 | 96  | 85  | 95  | 97  | 102 |
| 9      | 120    | 103    | 109 | 100 | 102 | 102 | 109 | 107 | 99  | 86  | 86  | 99  |
| 10     | 127    | 104    | 104 | 105 | 106 | 104 | 104 | 104 | 131 | 101 | 91  | 89  |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

### LO HARMONICS ORDER

Test conditions:

RF IN: 500.1 MHz; -14.00 dBm.

LO IN: 530.01 MHz; +7.00 dBm

IF OUT: 29.91 MHz; -21.04 dBm

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |    |    |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| 0      | -      | -      | 12  | 28  | 19  | 39  | 25  | 42  | 28  | 44  | 44 | 64 |
| 1      | -      | 17     | 0   | 29  | 13  | 32  | 26  | 42  | 37  | 41  | 52 | 45 |
| 2      | 100    | 58     | 38  | 52  | 38  | 71  | 41  | 63  | 50  | 64  | 45 | 55 |
| 3      | 111    | 53     | 53  | 70  | 50  | 61  | 48  | 51  | 54  | 57  | 53 | 55 |
| 4      | 113    | 73     | 78  | 93  | 62  | 72  | 63  | 72  | 56  | 78  | 72 | 66 |
| 5      | 118    | 77     | 77  | 76  | 60  | 70  | 58  | 69  | 59  | 73  | 67 | 80 |
| 6      | 118    | 86     | 86  | 84  | 78  | 75  | 70  | 74  | 67  | 86  | 71 | 88 |
| 7      | 114    | 86     | 86  | 92  | 81  | 87  | 77  | 84  | 78  | 92  | 83 | 87 |
| 8      | 112    | 104    | 107 | 106 | 104 | 100 | 97  | 92  | 91  | 95  | 87 | 89 |
| 9      | 124    | 105    | 99  | 109 | 103 | 108 | 108 | 103 | 93  | 96  | 89 | 99 |
| 10     | 113    | 106    | 118 | 106 | 107 | 105 | 114 | 104 | 115 | 101 | 96 | 92 |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10 |    |

### LO HARMONICS ORDER

Test conditions:

RF IN: 500.1 MHz; -4.00 dBm.

LO IN: 530.01 MHz; +7.00 dBm

IF OUT: 29.91 MHz; -11.20 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.



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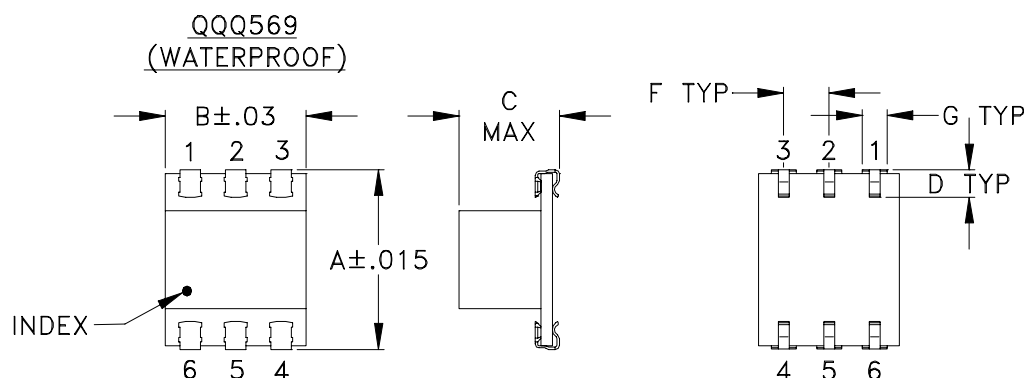
Page 3 of 3

# Case Style

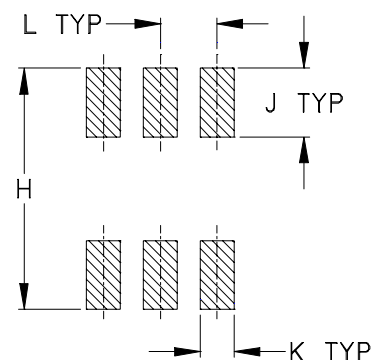
# QQQ

QQQ569 (waterproof)

## Outline Dimensions



## PCB Land Pattern



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

| CASE#  | A              | B             | C              | D              | E | F              | G              | H               | J              | K              | L              | M | WT,<br>GRAM |
|--------|----------------|---------------|----------------|----------------|---|----------------|----------------|-----------------|----------------|----------------|----------------|---|-------------|
| QQQ569 | .390<br>(9.90) | .31<br>(7.87) | .225<br>(5.72) | .060<br>(1.52) | - | .100<br>(2.54) | .045<br>(1.14) | .420<br>(10.67) | .120<br>(3.05) | .060<br>(1.52) | .100<br>(2.54) | - | .50         |

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

### Notes:

- Case material: Ceramic.
- Termination finish:
  - For RoHS Case Styles: Tin plate over Nickel plate.
  - For RoHS-5 Case Styles: Tin-Lead plate.



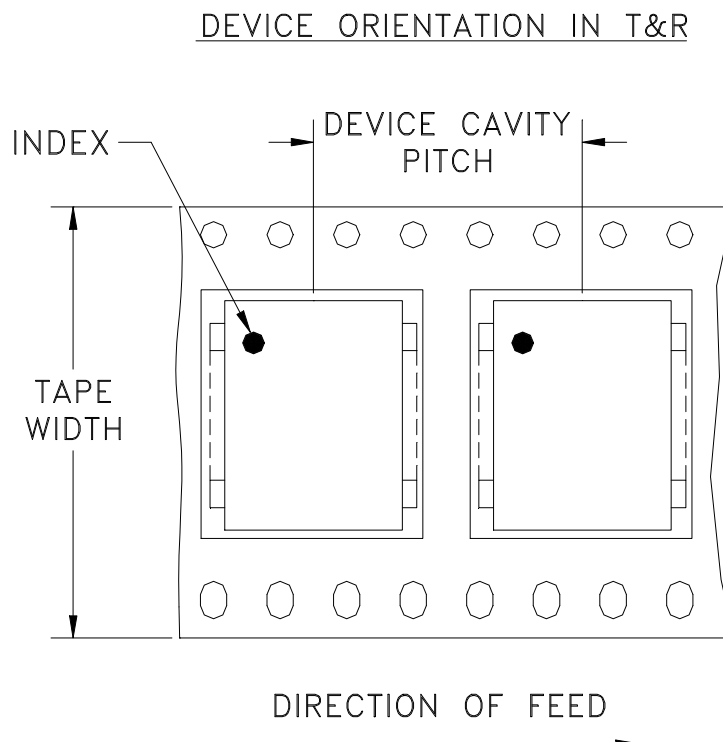
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# Tape & Reel Packaging TR-F5



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel |
|-------------------|----------------------------|----------------------|------------------|
| 32                | 16                         | 13                   | 500              |

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)



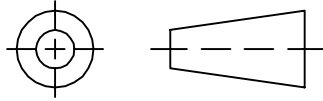
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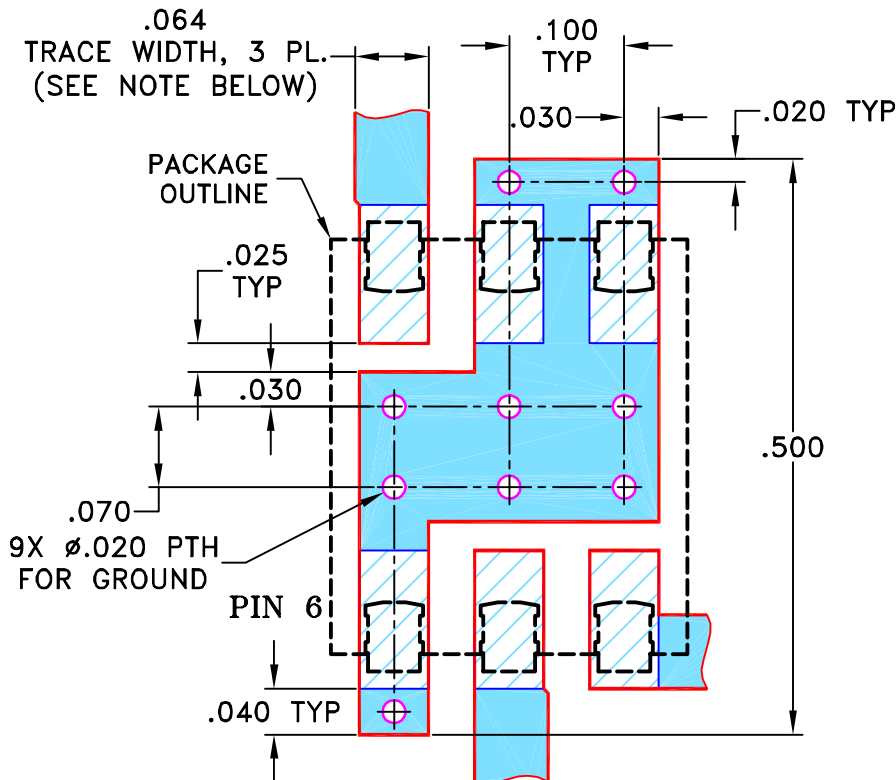
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION   | DATE     | DR | AUTH |
|-----|---------|---------------|----------|----|------|
| OR  | M82272  | NEW RELEASE   | 08/02/02 | AV | DJ   |
| A   | M102713 | UPDATED NOTES | 01/14/06 | GF | IL   |
|     |         |               |          |    |      |
|     |         |               |          |    |      |

### SUGGESTED MOUNTING CONFIGURATION FOR QQQ569 CASE STYLE, "w" PIN CONNECTION



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030"  $\pm$  0.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

AV

07/19/02

TOLERANCES ON:

CHECKED

WL

08/02/02

2 PL DECIMALS  $\pm$

APPROVED

DJ

08/02/02

3 PL DECIMALS  $\pm$  .005

ANGLES  $\pm$

FRACTIONS  $\pm$

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



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Brooklyn NY 11235

PL, w, QQQ569, LRMS-J, TB-44

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-083

REV:

A

FILE:

98PL083

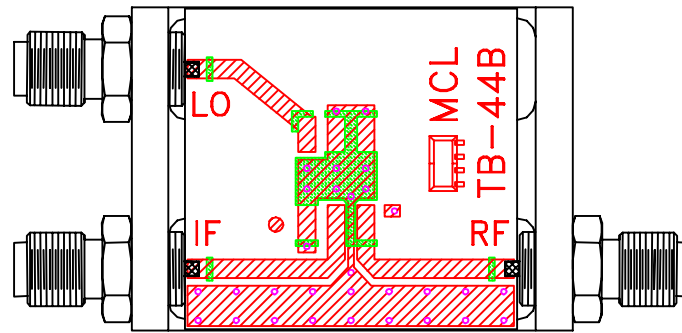
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6:1

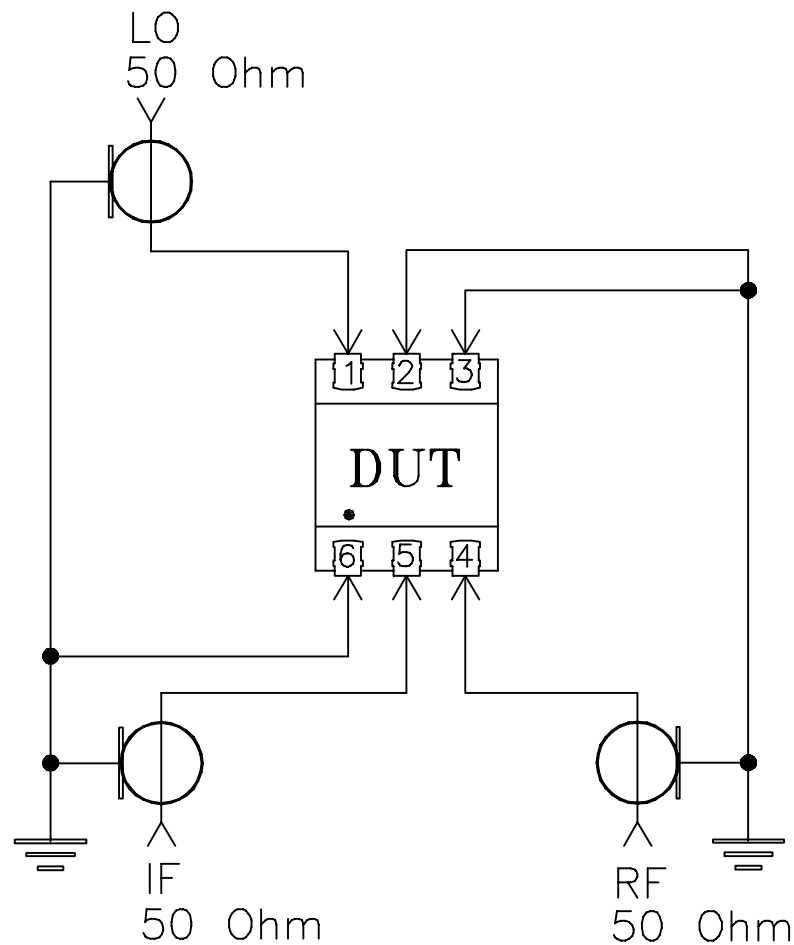
SHEET:

1 OF 1

# Evaluation Board and Circuit



TB-44+



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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| 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                                                                              |