

Level 17 (LO Power +17 dBm) 2 to 500 MHz

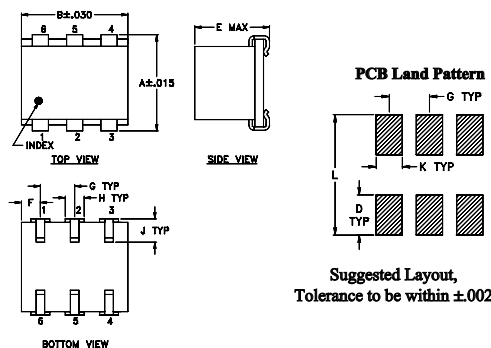
## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| RF Power                                                        | 200mW          |
| IF Current                                                      | 40mA           |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

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

## Outline Drawing

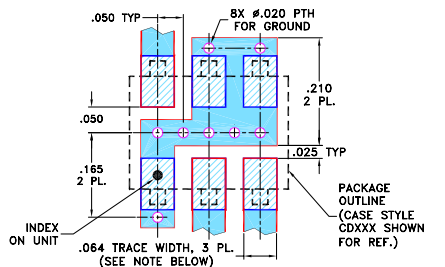


## Outline Dimensions (inch)

| A    | B    | C  | D    | E    | F    | G    |
|------|------|----|------|------|------|------|
| .280 | .310 | -- | .100 | .225 | .055 | .100 |
| 7.11 | 7.87 | -- | 2.54 | 5.72 | 1.40 | 2.54 |

| H    | J    | K    | L    | wt    |
|------|------|------|------|-------|
| .047 | .065 | .065 | .300 | grams |
| 1.19 | 1.65 | 1.65 | 7.62 | 0.45  |

Demo Board MCL P/N: TB-03  
Suggested PCB Layout (PL-052)

NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030" ± .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

## Notes

- A. 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.  
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
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## Features

- low conversion loss, 5.90 dB typ.
- excellent L-R isolation, up to 60 dB typ.
- miniature surface mount
- J-leads for strain relief and excellent solderability

## Applications

- up & down converters for receivers & transmitters
- VHF/UHF



Generic photo used for illustration purposes only

CASE STYLE: BH292

## 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              | 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. |                                   |
|                    |        |                         |          |      |                        |                         |      |      |      |      |    |                         |      |      |      |      |      |                                   |
| 2-500              | DC-500 | 5.90                    | .10      | 7.0  | 8.5                    | 60                      | 45   | 50   | 25   | 37   | 22 | 55                      | 45   | 50   | 25   | 37   | 22   | 22                                |

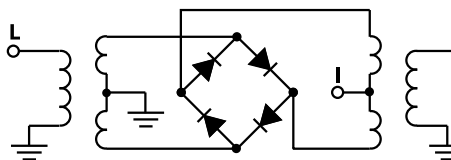
1 dB COMP.: +14 dBm typ.

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

## Typical Performance Data

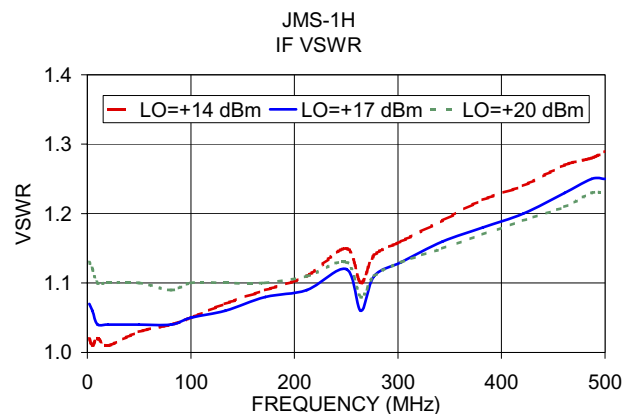
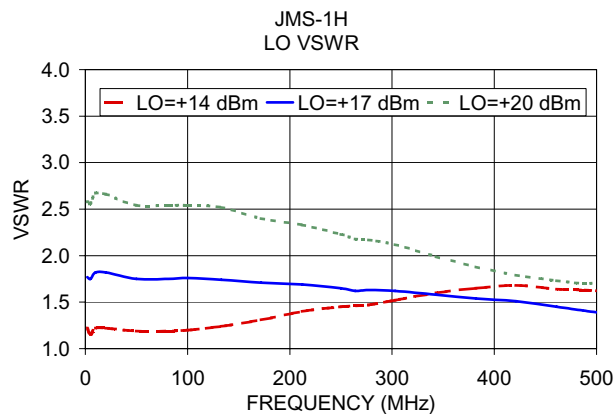
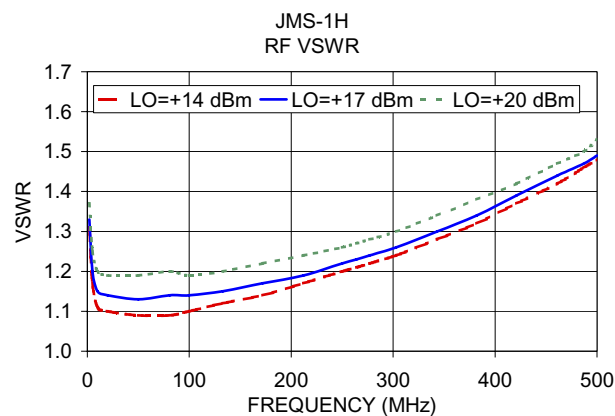
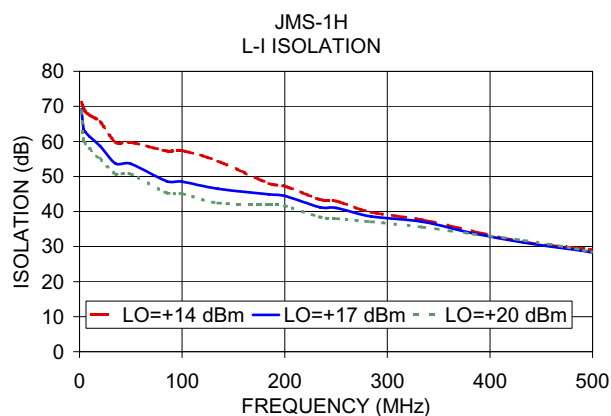
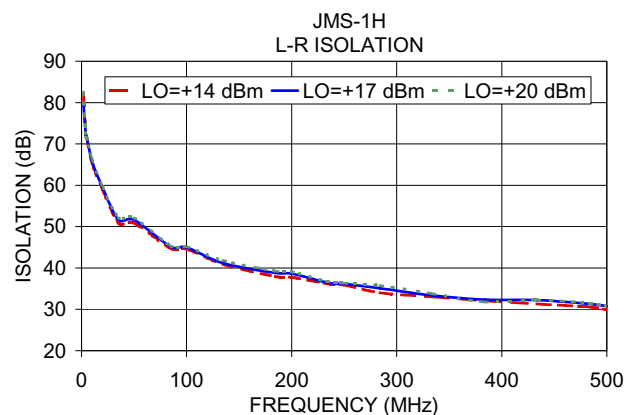
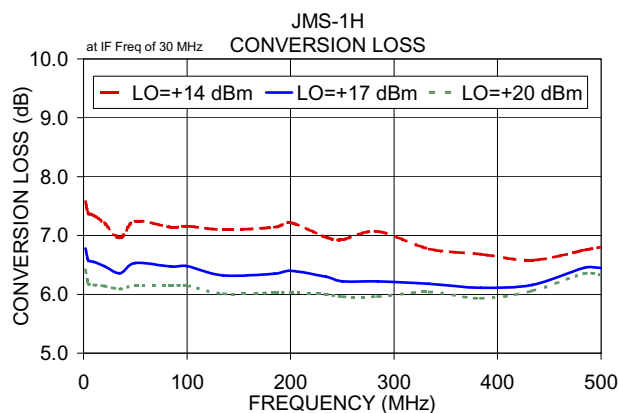
| Frequency (MHz) |        | Conversion Loss (dB) | Isolation L-R (dB) | Isolation L-I (dB) | VSWR RF Port (:1) | VSWR LO Port (:1) |
|-----------------|--------|----------------------|--------------------|--------------------|-------------------|-------------------|
| RF              | LO     | LO +17dBm            | LO +17dBm          | LO +17dBm          | LO +17dBm         | LO +17dBm         |
| 2.00            | 32.00  | 6.78                 | 79.29              | 69.19              | 1.33              | 1.77              |
| 4.00            | 34.00  | 6.60                 | 72.35              | 63.39              | 1.20              | 1.75              |
| 5.00            | 35.00  | 6.57                 | 71.51              | 62.98              | 1.15              | 1.82              |
| 10.00           | 40.00  | 6.55                 | 65.84              | 61.30              | 1.14              | 1.82              |
| 20.00           | 50.00  | 6.48                 | 59.50              | 58.68              | 1.13              | 1.75              |
| 35.20           | 65.20  | 6.36                 | 51.64              | 53.67              | 1.14              | 1.75              |
| 50.00           | 80.00  | 6.53                 | 51.61              | 53.63              | 1.14              | 1.76              |
| 85.00           | 55.00  | 6.47                 | 45.13              | 48.67              | 1.15              | 1.74              |
| 100.00          | 70.00  | 6.48                 | 44.98              | 48.52              | 1.17              | 1.71              |
| 134.80          | 104.80 | 6.32                 | 41.19              | 46.50              | 1.19              | 1.69              |
| 184.60          | 154.60 | 6.35                 | 38.78              | 44.90              | 1.22              | 1.65              |
| 200.00          | 170.00 | 6.40                 | 38.62              | 44.42              | 1.23              | 1.62              |
| 234.40          | 204.40 | 6.30                 | 36.44              | 41.20              | 1.24              | 1.63              |
| 250.00          | 220.00 | 6.22                 | 36.14              | 41.01              | 1.26              | 1.62              |
| 284.20          | 254.20 | 6.22                 | 35.11              | 38.57              | 1.30              | 1.58              |
| 334.00          | 304.00 | 6.18                 | 33.38              | 37.07              | 1.34              | 1.54              |
| 383.80          | 353.80 | 6.11                 | 32.33              | 33.77              | 1.39              | 1.51              |
| 433.60          | 403.60 | 6.16                 | 32.22              | 31.10              | 1.44              | 1.45              |
| 483.40          | 453.40 | 6.45                 | 31.29              | 29.09              | 1.47              | 1.41              |
| 500.00          | 470.00 | 6.45                 | 30.80              | 28.30              | 1.49              | 1.39              |

## Electrical Schematic



## Performance Charts

## JMS-1H



### Notes

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# Frequency Mixer

**JMS-1H**

## Typical Performance Data

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>IF FIXED<br>@IF(OUT)=30MHz<br>(dB) |       |      | RF<br>(IN)<br>(MHz) | LO<br>(MHz) | IP3 INPUT<br>(dBm) |       |       | RF<br>(IN)<br>(MHz) | LO<br>(MHz) | COMPRESSION<br>@RF IN=+14dBm<br>(dB) |      |      |
|---------------------|-------------|-------------------------------------------------------|-------|------|---------------------|-------------|--------------------|-------|-------|---------------------|-------------|--------------------------------------|------|------|
|                     |             | @LO (dBm)                                             |       |      |                     |             | @LO (dBm)          |       |       |                     |             | @LO (dBm)                            |      |      |
|                     |             | +14                                                   | +17   | +20  |                     |             | +14                | +17   | +20   |                     |             | +14                                  | +17  | +20  |
| 2.0                 | 32.0        | 7.57                                                  | 6.78  | 6.41 | 10.1                | 40.1        | 26.94              | 30.37 | 34.44 | 10.1                | 40.1        | 0.90                                 | 0.53 | 0.34 |
| 5.0                 | 35.0        | 7.37                                                  | 6.57  | 6.17 | 49.8                | 79.8        | 24.72              | 28.84 | 30.94 | 49.8                | 79.8        | 0.72                                 | 0.44 | 0.30 |
| 10.0                | 40.0        | 7.34                                                  | 6.55  | 6.16 | 89.5                | 119.5       | 25.01              | 27.92 | 28.85 | 89.5                | 119.5       | 0.76                                 | 0.40 | 0.26 |
| 49.8                | 79.8        | 6.98                                                  | 6.37  | 6.07 | 129.2               | 159.2       | 26.59              | 28.31 | 28.59 | 129.2               | 159.2       | 0.79                                 | 0.42 | 0.25 |
| 89.5                | 119.5       | 6.96                                                  | 6.32  | 6.04 | 168.9               | 198.9       | 25.94              | 26.82 | 28.43 | 168.9               | 198.9       | 0.75                                 | 0.39 | 0.23 |
| 168.9               | 198.9       | 6.84                                                  | 6.28  | 6.09 | 208.6               | 238.6       | 27.31              | 27.25 | 33.65 | 208.6               | 238.6       | 0.84                                 | 0.41 | 0.24 |
| 208.6               | 238.6       | 6.69                                                  | 6.24  | 6.06 | 248.3               | 278.3       | 24.49              | 26.95 | 33.17 | 248.3               | 278.3       | 0.82                                 | 0.43 | 0.26 |
| 248.3               | 278.3       | 6.86                                                  | 6.36  | 6.17 | 287.9               | 317.9       | 24.59              | 28.97 | 27.40 | 287.9               | 317.9       | 0.88                                 | 0.41 | 0.29 |
| 287.9               | 317.9       | 6.71                                                  | 6.32  | 6.14 | 327.6               | 357.6       | 24.64              | 28.20 | 29.68 | 327.6               | 357.6       | 0.84                                 | 0.40 | 0.26 |
| 327.6               | 357.6       | 6.78                                                  | 6.41  | 6.25 | 367.3               | 397.3       | 25.22              | 29.09 | 31.07 | 367.3               | 397.3       | 0.82                                 | 0.47 | 0.34 |
| 367.3               | 397.3       | 6.83                                                  | 6.39  | 6.17 | 407.0               | 437.0       | 26.61              | 24.07 | 24.61 | 407.0               | 437.0       | 0.80                                 | 0.43 | 0.34 |
| 407.0               | 437.0       | 6.81                                                  | 6.44  | 6.19 | 446.7               | 476.7       | 25.29              | 24.45 | 23.17 | 446.7               | 476.7       | 0.77                                 | 0.35 | 0.26 |
| 446.7               | 476.7       | 6.95                                                  | 6.60  | 6.38 | 486.4               | 516.4       | 24.37              | 28.08 | 26.16 | 486.4               | 516.4       | 0.91                                 | 0.41 | 0.34 |
| 486.4               | 516.4       | 6.94                                                  | 6.56  | 6.31 | 526.1               | 556.1       | 23.10              | 30.99 | 27.73 | 526.1               | 556.1       | 1.01                                 | 0.53 | 0.40 |
| 526.1               | 556.1       | 7.04                                                  | 6.57  | 6.27 | 565.8               | 595.8       | 24.26              | 29.52 | 27.87 | 565.8               | 595.8       | 1.06                                 | 0.71 | 0.48 |
| 565.8               | 595.8       | 7.08                                                  | 6.52  | 6.23 | 585.6               | 615.6       | 28.16              | 27.25 | 28.32 | 585.6               | 615.6       | 0.99                                 | 0.68 | 0.48 |
| 585.6               | 615.6       | 7.20                                                  | 6.58  | 6.27 | 625.3               | 655.3       | 21.03              | 30.35 | 28.79 | 625.3               | 655.3       | 1.05                                 | 0.75 | 0.56 |
| 625.3               | 655.3       | 7.28                                                  | 6.72  | 6.38 | 645.2               | 675.2       | 20.51              | 24.12 | 28.75 | 645.2               | 675.2       | 1.00                                 | 0.70 | 0.56 |
| 645.2               | 675.2       | 7.37                                                  | 6.85  | 6.47 | 684.9               | 714.9       | 18.64              | 19.42 | 23.43 | 684.9               | 714.9       | 0.98                                 | 0.69 | 0.54 |
| 684.9               | 714.9       | 7.45                                                  | 6.99  | 6.63 | 704.7               | 734.7       | 18.22              | 18.36 | 21.03 | 704.7               | 734.7       | 1.09                                 | 0.77 | 0.60 |
| 704.7               | 734.7       | 7.54                                                  | 7.10  | 6.76 | 744.4               | 774.4       | 18.02              | 17.48 | 18.85 | 744.4               | 774.4       | 1.05                                 | 0.73 | 0.58 |
| 764.3               | 794.3       | 7.76                                                  | 7.35  | 7.03 | 764.3               | 794.3       | 18.21              | 17.56 | 18.26 | 764.3               | 794.3       | 1.08                                 | 0.81 | 0.65 |
| 803.9               | 833.9       | 7.95                                                  | 7.52  | 7.16 | 823.8               | 853.8       | 18.94              | 18.76 | 19.21 | 823.8               | 853.8       | 1.17                                 | 0.84 | 0.69 |
| 823.8               | 853.8       | 8.00                                                  | 7.53  | 7.15 | 863.5               | 893.5       | 18.93              | 19.23 | 20.58 | 863.5               | 893.5       | 1.20                                 | 0.90 | 0.74 |
| 863.5               | 893.5       | 8.11                                                  | 7.51  | 7.07 | 883.3               | 913.3       | 19.36              | 19.66 | 21.50 | 883.3               | 913.3       | 1.28                                 | 1.00 | 0.78 |
| 883.3               | 913.3       | 8.05                                                  | 7.41  | 7.01 | 923.0               | 953.0       | 18.98              | 20.82 | 23.93 | 923.0               | 953.0       | 1.37                                 | 1.05 | 0.83 |
| 923.0               | 953.0       | 8.06                                                  | 7.36  | 6.99 | 942.9               | 972.9       | 19.21              | 21.79 | 24.59 | 942.9               | 972.9       | 1.44                                 | 1.07 | 0.85 |
| 942.9               | 972.9       | 8.07                                                  | 7.37  | 7.03 | 982.6               | 1012.6      | 20.50              | 24.02 | 27.90 | 982.6               | 1012.6      | 1.56                                 | 1.14 | 0.91 |
| 982.6               | 1012.6      | 8.10                                                  | 7.46  | 7.12 | 1002.4              | 1032.4      | 21.56              | 25.95 | 31.73 | 1002.4              | 1032.4      | 1.55                                 | 1.18 | 0.96 |
| 1002.4              | 1032.4      | 8.22                                                  | 7.56  | 7.23 | 1042.1              | 1072.1      | 24.21              | 30.15 | 27.44 | 1042.1              | 1072.1      | 1.61                                 | 1.30 | 1.04 |
| 1042.1              | 1072.1      | 8.43                                                  | 7.68  | 7.34 | 1061.9              | 1091.9      | 24.96              | 27.80 | 26.18 | 1061.9              | 1091.9      | 1.51                                 | 1.27 | 1.05 |
| 1061.9              | 1091.9      | 8.70                                                  | 7.90  | 7.50 | 1101.6              | 1131.6      | 22.17              | 23.67 | 25.11 | 1101.6              | 1131.6      | 1.41                                 | 1.29 | 1.13 |
| 1101.6              | 1131.6      | 9.17                                                  | 8.18  | 7.70 | 1121.5              | 1151.5      | 20.64              | 22.95 | 24.74 | 1121.5              | 1151.5      | 1.32                                 | 1.28 | 1.13 |
| 1121.5              | 1151.5      | 9.50                                                  | 8.37  | 7.83 | 1161.2              | 1191.2      | 18.73              | 21.92 | 25.17 | 1161.2              | 1191.2      | 1.18                                 | 1.29 | 1.21 |
| 1181.0              | 1211.0      | 10.46                                                 | 8.99  | 8.28 | 1181.0              | 1211.0      | 17.91              | 21.54 | 25.47 | 1181.0              | 1211.0      | 1.04                                 | 1.28 | 1.25 |
| 1220.7              | 1250.7      | 11.01                                                 | 9.43  | 8.65 | 1220.7              | 1250.7      | 17.70              | 23.20 | 26.92 | 1220.7              | 1250.7      | 0.94                                 | 1.29 | 1.29 |
| 1240.6              | 1270.6      | 11.29                                                 | 9.66  | 8.87 | 1240.6              | 1270.6      | 17.21              | 23.95 | 25.45 | 1240.6              | 1270.6      | 0.88                                 | 1.22 | 1.26 |
| 1280.3              | 1310.3      | 11.89                                                 | 10.30 | 9.50 | 1280.3              | 1310.3      | 17.53              | 24.46 | 24.75 | 1280.3              | 1310.3      | 0.77                                 | 1.11 | 1.12 |
| 1300.1              | 1330.1      | 12.18                                                 | 10.53 | 9.76 | 1300.1              | 1330.1      | 17.44              | 25.14 | 23.70 | 1300.1              | 1330.1      | 0.81                                 | 1.04 | 1.05 |

REV. X2

JMS-1H

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# Frequency Mixer

**JMS-1H**

## Typical Performance Data

| IF<br>(OUT)<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>VS. IF FREQUENCY<br>@RF(IN)=250.1MHz<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)=500.1MHz<br>(dB) |
|----------------------|-------------|-----------------------------------------------------------------|----------------------|-------------|----------------------------------------------------------------|----------------------|-------------|-----------------------------------------------------------------|
|                      |             | @LO (dBm)                                                       |                      |             | @LO (dBm)                                                      |                      |             | @LO (dBm)                                                       |
|                      |             | +17                                                             |                      |             | +17                                                            |                      |             | +17                                                             |
| 240.0                | 10.1        | 6.38                                                            | 10.0                 | 20.1        | 6.15                                                           | 490.0                | 10.1        | 6.48                                                            |
| 234.1                | 16.0        | 6.40                                                            | 22.3                 | 32.4        | 6.12                                                           | 477.7                | 22.4        | 6.42                                                            |
| 228.2                | 21.9        | 6.27                                                            | 34.6                 | 44.7        | 6.12                                                           | 465.4                | 34.7        | 6.38                                                            |
| 222.3                | 27.8        | 6.32                                                            | 46.9                 | 57.0        | 6.12                                                           | 453.1                | 47.0        | 6.42                                                            |
| 216.4                | 33.7        | 6.29                                                            | 59.2                 | 69.3        | 6.04                                                           | 440.8                | 59.3        | 6.46                                                            |
| 210.5                | 39.6        | 6.26                                                            | 71.5                 | 81.6        | 6.10                                                           | 428.5                | 71.6        | 6.30                                                            |
| 204.6                | 45.5        | 6.34                                                            | 83.8                 | 93.9        | 6.19                                                           | 416.2                | 83.9        | 6.29                                                            |
| 198.7                | 51.4        | 6.24                                                            | 96.2                 | 106.3       | 6.12                                                           | 403.8                | 96.3        | 6.25                                                            |
| 192.8                | 57.3        | 6.26                                                            | 108.5                | 118.6       | 6.11                                                           | 391.5                | 108.6       | 6.19                                                            |
| 186.9                | 63.2        | 6.26                                                            | 120.8                | 130.9       | 6.06                                                           | 379.2                | 120.9       | 6.20                                                            |
| 181.0                | 69.1        | 6.24                                                            | 133.1                | 143.2       | 6.04                                                           | 366.9                | 133.2       | 6.10                                                            |
| 175.1                | 75.0        | 6.34                                                            | 145.4                | 155.5       | 6.16                                                           | 354.6                | 145.5       | 6.04                                                            |
| 169.2                | 80.9        | 6.30                                                            | 157.7                | 167.8       | 6.21                                                           | 342.3                | 157.8       | 6.06                                                            |
| 163.3                | 86.8        | 6.24                                                            | 170.0                | 180.1       | 6.16                                                           | 330.0                | 170.1       | 6.06                                                            |
| 157.4                | 92.7        | 6.30                                                            | 182.3                | 192.4       | 6.19                                                           | 317.7                | 182.4       | 6.05                                                            |
| 151.5                | 98.6        | 6.19                                                            | 194.6                | 204.7       | 6.19                                                           | 305.4                | 194.7       | 6.02                                                            |
| 145.6                | 104.5       | 6.25                                                            | 206.9                | 217.0       | 6.21                                                           | 293.1                | 207.0       | 5.98                                                            |
| 139.7                | 110.4       | 6.23                                                            | 219.2                | 229.3       | 6.26                                                           | 280.8                | 219.3       | 5.96                                                            |
| 133.8                | 116.3       | 6.14                                                            | 231.5                | 241.6       | 6.23                                                           | 268.5                | 231.6       | 6.03                                                            |
| 127.9                | 122.2       | 6.16                                                            | 243.8                | 253.9       | 6.24                                                           | 256.2                | 243.9       | 6.02                                                            |
| 122.1                | 128.0       | 6.09                                                            | 256.2                | 266.3       | 6.33                                                           | 243.8                | 256.3       | 6.03                                                            |
| 116.2                | 133.9       | 6.08                                                            | 268.5                | 278.6       | 6.36                                                           | 231.5                | 268.6       | 6.07                                                            |
| 110.3                | 139.8       | 6.19                                                            | 280.8                | 290.9       | 6.35                                                           | 219.2                | 280.9       | 6.05                                                            |
| 104.4                | 145.7       | 6.14                                                            | 293.1                | 303.2       | 6.38                                                           | 206.9                | 293.2       | 6.09                                                            |
| 98.5                 | 151.6       | 6.16                                                            | 305.4                | 315.5       | 6.35                                                           | 194.6                | 305.5       | 6.11                                                            |
| 92.6                 | 157.5       | 6.13                                                            | 317.7                | 327.8       | 6.43                                                           | 182.3                | 317.8       | 6.07                                                            |
| 86.7                 | 163.4       | 6.10                                                            | 330.0                | 340.1       | 6.47                                                           | 170.0                | 330.1       | 6.11                                                            |
| 80.8                 | 169.3       | 6.17                                                            | 342.3                | 352.4       | 6.42                                                           | 157.7                | 342.4       | 6.15                                                            |
| 74.9                 | 175.2       | 6.15                                                            | 354.6                | 364.7       | 6.43                                                           | 145.4                | 354.7       | 6.15                                                            |
| 69.0                 | 181.1       | 6.15                                                            | 366.9                | 377.0       | 6.46                                                           | 133.1                | 367.0       | 6.21                                                            |
| 63.1                 | 187.0       | 6.14                                                            | 379.2                | 389.3       | 6.47                                                           | 120.8                | 379.3       | 6.20                                                            |
| 57.2                 | 192.9       | 6.09                                                            | 391.5                | 401.6       | 6.55                                                           | 108.5                | 391.6       | 6.19                                                            |
| 51.3                 | 198.8       | 6.13                                                            | 403.8                | 413.9       | 6.50                                                           | 96.2                 | 403.9       | 6.27                                                            |
| 45.4                 | 204.7       | 6.16                                                            | 416.2                | 426.3       | 6.51                                                           | 83.8                 | 416.3       | 6.29                                                            |
| 39.5                 | 210.6       | 6.20                                                            | 428.5                | 438.6       | 6.62                                                           | 71.5                 | 428.6       | 6.34                                                            |
| 33.6                 | 216.5       | 6.22                                                            | 440.8                | 450.9       | 6.66                                                           | 59.2                 | 440.9       | 6.42                                                            |
| 27.7                 | 222.4       | 6.19                                                            | 453.1                | 463.2       | 6.71                                                           | 46.9                 | 453.2       | 6.42                                                            |
| 21.8                 | 228.3       | 6.23                                                            | 465.4                | 475.5       | 6.69                                                           | 34.6                 | 465.5       | 6.52                                                            |
| 15.9                 | 234.2       | 6.26                                                            | 477.7                | 487.8       | 6.58                                                           | 22.3                 | 477.8       | 6.60                                                            |
| 10.0                 | 240.1       | 6.25                                                            | 490.0                | 500.1       | 6.57                                                           | 10.0                 | 490.1       | 6.54                                                            |

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## Typical Performance Data

| LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             | +14                     | +17   | +20   | +14                     | +17   | +20   |
| 2.0         | 81.98                   | 79.29 | 82.48 | 71.18                   | 69.19 | 68.76 |
| 5.0         | 71.15                   | 71.51 | 71.45 | 68.75                   | 62.98 | 59.64 |
| 10.0        | 65.40                   | 65.84 | 66.21 | 67.50                   | 61.30 | 57.95 |
| 49.8        | 57.76                   | 57.96 | 58.09 | 60.52                   | 51.59 | 48.08 |
| 89.5        | 52.71                   | 52.48 | 52.55 | 59.09                   | 48.58 | 44.72 |
| 168.9       | 45.96                   | 45.94 | 46.30 | 54.53                   | 44.41 | 40.47 |
| 208.6       | 43.79                   | 44.16 | 44.33 | 49.72                   | 43.38 | 39.59 |
| 248.3       | 41.98                   | 42.27 | 42.33 | 47.34                   | 42.53 | 38.58 |
| 287.9       | 40.89                   | 41.12 | 40.81 | 41.79                   | 40.70 | 37.67 |
| 327.6       | 39.63                   | 39.94 | 39.99 | 38.80                   | 38.43 | 36.62 |
| 367.3       | 38.61                   | 38.46 | 38.63 | 35.97                   | 35.79 | 34.92 |
| 407.0       | 38.06                   | 37.52 | 37.37 | 33.89                   | 34.41 | 33.85 |
| 446.7       | 37.11                   | 36.93 | 36.67 | 31.81                   | 32.82 | 32.84 |
| 486.4       | 36.29                   | 36.22 | 36.28 | 29.90                   | 31.02 | 31.72 |
| 526.1       | 35.54                   | 35.77 | 36.05 | 28.56                   | 29.62 | 30.34 |
| 565.8       | 35.14                   | 35.65 | 35.65 | 26.81                   | 27.79 | 28.76 |
| 585.6       | 34.89                   | 35.49 | 35.53 | 26.57                   | 27.42 | 28.37 |
| 625.3       | 34.00                   | 34.46 | 34.38 | 25.44                   | 26.55 | 27.36 |
| 645.2       | 33.60                   | 34.21 | 34.15 | 24.98                   | 26.29 | 27.01 |
| 684.9       | 32.45                   | 33.37 | 33.59 | 24.10                   | 25.75 | 26.84 |
| 704.7       | 31.90                   | 32.79 | 33.16 | 23.80                   | 25.46 | 26.73 |
| 764.3       | 31.03                   | 31.84 | 32.78 | 22.97                   | 24.69 | 26.35 |
| 803.9       | 30.80                   | 31.67 | 32.84 | 22.70                   | 24.55 | 26.23 |
| 823.8       | 30.79                   | 31.72 | 33.00 | 22.50                   | 24.40 | 26.12 |
| 863.5       | 30.87                   | 32.27 | 34.52 | 22.09                   | 24.17 | 25.96 |
| 883.3       | 30.88                   | 32.60 | 34.97 | 21.92                   | 24.10 | 25.76 |
| 923.0       | 31.72                   | 34.25 | 36.01 | 21.31                   | 23.37 | 24.68 |
| 942.9       | 32.22                   | 34.56 | 35.79 | 21.17                   | 23.18 | 24.44 |
| 982.6       | 32.88                   | 33.90 | 34.30 | 20.61                   | 22.50 | 23.65 |
| 1002.4      | 32.62                   | 33.20 | 33.48 | 20.43                   | 22.27 | 23.38 |
| 1042.1      | 31.88                   | 31.78 | 31.83 | 19.78                   | 21.63 | 22.89 |
| 1061.9      | 31.42                   | 31.08 | 31.13 | 19.64                   | 21.55 | 22.90 |
| 1101.6      | 30.13                   | 29.69 | 29.71 | 19.02                   | 20.95 | 22.42 |
| 1121.5      | 29.84                   | 29.19 | 29.13 | 18.75                   | 20.80 | 22.44 |
| 1181.0      | 28.05                   | 27.67 | 27.65 | 18.07                   | 20.34 | 22.43 |
| 1220.7      | 26.87                   | 26.72 | 26.79 | 17.43                   | 19.77 | 22.16 |
| 1240.6      | 26.34                   | 26.39 | 26.54 | 17.30                   | 19.70 | 22.26 |
| 1280.3      | 25.28                   | 25.64 | 25.85 | 16.89                   | 19.30 | 22.02 |
| 1300.1      | 24.56                   | 25.06 | 25.48 | 16.77                   | 19.20 | 22.01 |

| RF<br>(IN)<br>(MHz) | LO<br>(MHz) | RF-IF ISOLATION<br>(dB) |       |       |
|---------------------|-------------|-------------------------|-------|-------|
|                     |             | @LO (dBm)               |       |       |
|                     |             | +14                     | +17   | +20   |
| 10.1                | 40.1        | 44.10                   | 47.29 | 41.99 |
| 49.8                | 79.8        | 33.67                   | 33.76 | 33.32 |
| 89.5                | 119.5       | 29.24                   | 29.25 | 29.29 |
| 129.2               | 159.2       | 26.54                   | 26.79 | 26.78 |
| 168.9               | 198.9       | 24.78                   | 24.98 | 25.14 |
| 208.6               | 238.6       | 23.59                   | 23.90 | 24.05 |
| 248.3               | 278.3       | 22.76                   | 22.97 | 23.18 |
| 287.9               | 317.9       | 22.52                   | 22.73 | 22.87 |
| 327.6               | 357.6       | 22.13                   | 22.69 | 23.04 |
| 367.3               | 397.3       | 21.72                   | 22.54 | 23.29 |
| 407.0               | 437.0       | 21.98                   | 22.58 | 23.42 |
| 446.7               | 476.7       | 22.61                   | 22.97 | 23.31 |
| 486.4               | 516.4       | 23.40                   | 23.57 | 23.66 |
| 526.1               | 556.1       | 23.37                   | 23.72 | 24.02 |
| 565.8               | 595.8       | 21.53                   | 22.20 | 23.02 |
| 585.6               | 615.6       | 20.39                   | 20.86 | 21.55 |
| 625.3               | 655.3       | 18.23                   | 18.56 | 18.90 |
| 645.2               | 675.2       | 17.38                   | 17.71 | 17.98 |
| 684.9               | 714.9       | 15.86                   | 16.01 | 16.31 |
| 704.7               | 734.7       | 15.28                   | 15.36 | 15.62 |
| 744.4               | 774.4       | 14.32                   | 14.23 | 14.36 |
| 764.3               | 794.3       | 13.92                   | 13.79 | 13.73 |
| 823.8               | 853.8       | 13.05                   | 12.66 | 12.45 |
| 863.5               | 893.5       | 12.45                   | 12.00 | 11.87 |
| 883.3               | 913.3       | 12.13                   | 11.73 | 11.71 |
| 923.0               | 953.0       | 11.47                   | 11.33 | 11.37 |
| 942.9               | 972.9       | 11.27                   | 11.16 | 11.25 |
| 982.6               | 1012.6      | 10.94                   | 10.93 | 11.03 |
| 1002.4              | 1032.4      | 10.84                   | 10.86 | 11.01 |
| 1042.1              | 1072.1      | 10.60                   | 10.73 | 10.91 |
| 1061.9              | 1091.9      | 10.57                   | 10.71 | 10.93 |
| 1101.6              | 1131.6      | 10.35                   | 10.58 | 10.88 |
| 1121.5              | 1151.5      | 10.18                   | 10.53 | 10.85 |
| 1161.2              | 1191.2      | 9.99                    | 10.41 | 10.83 |
| 1181.0              | 1211.0      | 9.83                    | 10.35 | 10.74 |
| 1220.7              | 1250.7      | 9.57                    | 10.21 | 10.59 |
| 1240.6              | 1270.6      | 9.43                    | 10.10 | 10.44 |
| 1280.3              | 1310.3      | 9.08                    | 9.77  | 10.12 |
| 1300.1              | 1330.1      | 8.87                    | 9.59  | 9.89  |

# Frequency Mixer

**JMS-1H**

## 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=500.5MHz<br>(:1) |      |      |
|---------------------|-------------|-----------------|------|------|-------------|-----------------|------|------|----------------------|---------------------------------|------|------|
|                     |             | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      |                      | @LO (dBm)                       |      |      |
|                     |             | +14             | +17  | +20  |             | +14             | +17  | +20  |                      | +14                             | +17  | +20  |
| 2.0                 | 32.0        | 1.31            | 1.33 | 1.37 | 2.0         | 1.22            | 1.77 | 2.58 | 2.0                  | 1.02                            | 1.07 | 1.13 |
| 5.0                 | 35.0        | 1.17            | 1.20 | 1.25 | 5.0         | 1.15            | 1.75 | 2.56 | 5.0                  | 1.01                            | 1.06 | 1.12 |
| 10.0                | 40.0        | 1.11            | 1.15 | 1.20 | 10.0        | 1.22            | 1.82 | 2.67 | 10.0                 | 1.02                            | 1.04 | 1.10 |
| 49.8                | 79.8        | 1.21            | 1.07 | 1.02 | 49.8        | 1.04            | 1.66 | 2.48 | 22.3                 | 2.07                            | 1.84 | 1.64 |
| 89.5                | 119.5       | 1.20            | 1.07 | 1.03 | 89.5        | 1.01            | 1.56 | 2.26 | 34.5                 | 1.97                            | 1.76 | 1.58 |
| 129.2               | 159.2       | 1.18            | 1.05 | 1.04 | 129.2       | 1.02            | 1.62 | 2.42 | 46.8                 | 2.01                            | 1.80 | 1.61 |
| 168.9               | 198.9       | 1.17            | 1.04 | 1.05 | 168.9       | 1.02            | 1.58 | 2.31 | 59.0                 | 2.04                            | 1.81 | 1.61 |
| 208.6               | 238.6       | 1.14            | 1.02 | 1.07 | 208.6       | 1.04            | 1.60 | 2.35 | 71.3                 | 2.01                            | 1.79 | 1.59 |
| 248.3               | 278.3       | 1.16            | 1.03 | 1.06 | 248.3       | 1.05            | 1.64 | 2.40 | 83.5                 | 2.04                            | 1.81 | 1.62 |
| 287.9               | 317.9       | 1.11            | 1.01 | 1.09 | 287.9       | 1.10            | 1.63 | 2.35 | 95.8                 | 2.06                            | 1.83 | 1.63 |
| 327.6               | 357.6       | 1.10            | 1.03 | 1.10 | 327.6       | 1.12            | 1.70 | 2.46 | 108.0                | 2.09                            | 1.87 | 1.66 |
| 367.3               | 397.3       | 1.09            | 1.06 | 1.15 | 367.3       | 1.19            | 1.70 | 2.41 | 120.3                | 2.03                            | 1.81 | 1.62 |
| 407.0               | 437.0       | 1.07            | 1.06 | 1.16 | 407.0       | 1.21            | 1.75 | 2.47 | 132.5                | 2.04                            | 1.82 | 1.62 |
| 446.7               | 476.7       | 1.07            | 1.07 | 1.14 | 446.7       | 1.26            | 1.80 | 2.52 | 144.8                | 2.00                            | 1.78 | 1.59 |
| 486.4               | 516.4       | 1.08            | 1.13 | 1.21 | 486.4       | 1.30            | 1.80 | 2.50 | 157.0                | 2.02                            | 1.79 | 1.60 |
| 526.1               | 556.1       | 1.12            | 1.20 | 1.29 | 526.1       | 1.34            | 1.84 | 2.55 | 169.3                | 2.03                            | 1.80 | 1.60 |
| 565.8               | 595.8       | 1.16            | 1.27 | 1.37 | 565.8       | 1.43            | 1.87 | 2.54 | 181.5                | 2.07                            | 1.83 | 1.64 |
| 585.6               | 615.6       | 1.18            | 1.30 | 1.40 | 585.6       | 1.46            | 1.91 | 2.58 | 193.8                | 2.12                            | 1.88 | 1.68 |
| 625.3               | 655.3       | 1.21            | 1.33 | 1.45 | 625.3       | 1.54            | 2.03 | 2.69 | 206.0                | 2.07                            | 1.85 | 1.65 |
| 645.2               | 675.2       | 1.23            | 1.32 | 1.45 | 645.2       | 1.55            | 2.05 | 2.71 | 218.3                | 2.08                            | 1.85 | 1.65 |
| 684.9               | 714.9       | 1.26            | 1.33 | 1.46 | 684.9       | 1.59            | 2.10 | 2.77 | 230.5                | 2.04                            | 1.80 | 1.62 |
| 704.7               | 734.7       | 1.28            | 1.33 | 1.44 | 704.7       | 1.61            | 2.15 | 2.83 | 242.8                | 2.03                            | 1.80 | 1.61 |
| 764.3               | 794.3       | 1.31            | 1.34 | 1.41 | 764.3       | 1.65            | 2.17 | 2.85 | 255.0                | 2.02                            | 1.79 | 1.61 |
| 803.9               | 833.9       | 1.33            | 1.35 | 1.42 | 803.9       | 1.66            | 2.18 | 2.87 | 267.3                | 2.04                            | 1.81 | 1.62 |
| 823.8               | 853.8       | 1.34            | 1.36 | 1.43 | 823.8       | 1.67            | 2.18 | 2.86 | 291.8                | 2.08                            | 1.85 | 1.65 |
| 863.5               | 893.5       | 1.37            | 1.40 | 1.48 | 863.5       | 1.67            | 2.14 | 2.80 | 304.0                | 2.08                            | 1.84 | 1.65 |
| 883.3               | 913.3       | 1.40            | 1.44 | 1.51 | 883.3       | 1.67            | 2.13 | 2.80 | 316.3                | 2.10                            | 1.86 | 1.66 |
| 923.0               | 953.0       | 1.48            | 1.52 | 1.58 | 923.0       | 1.68            | 2.12 | 2.79 | 328.5                | 2.04                            | 1.81 | 1.62 |
| 942.9               | 972.9       | 1.54            | 1.58 | 1.63 | 942.9       | 1.69            | 2.12 | 2.80 | 340.8                | 2.04                            | 1.81 | 1.62 |
| 982.6               | 1012.6      | 1.69            | 1.72 | 1.76 | 982.6       | 1.76            | 2.18 | 2.84 | 353.0                | 2.04                            | 1.81 | 1.62 |
| 1002.4              | 1032.4      | 1.78            | 1.81 | 1.84 | 1002.4      | 1.83            | 2.22 | 2.88 | 365.3                | 2.06                            | 1.83 | 1.64 |
| 1042.1              | 1072.1      | 1.99            | 1.99 | 2.02 | 1042.1      | 1.98            | 2.32 | 2.95 | 377.5                | 2.06                            | 1.83 | 1.64 |
| 1061.9              | 1091.9      | 2.13            | 2.11 | 2.13 | 1061.9      | 2.07            | 2.38 | 2.99 | 389.8                | 2.06                            | 1.83 | 1.64 |
| 1101.6              | 1131.6      | 2.43            | 2.37 | 2.35 | 1101.6      | 2.26            | 2.49 | 3.05 | 402.0                | 2.10                            | 1.86 | 1.66 |
| 1121.5              | 1151.5      | 2.60            | 2.52 | 2.48 | 1121.5      | 2.35            | 2.54 | 3.09 | 414.3                | 2.11                            | 1.87 | 1.67 |
| 1161.2              | 1191.2      | 2.93            | 2.79 | 2.71 | 1161.2      | 2.55            | 2.66 | 3.17 | 426.5                | 2.09                            | 1.85 | 1.66 |
| 1181.0              | 1211.0      | 3.10            | 2.93 | 2.83 | 1181.0      | 2.64            | 2.71 | 3.20 | 438.8                | 2.09                            | 1.85 | 1.65 |
| 1220.7              | 1250.7      | 3.38            | 3.19 | 3.05 | 1220.7      | 2.85            | 2.81 | 3.25 | 451.0                | 2.02                            | 1.80 | 1.61 |
| 1240.6              | 1270.6      | 3.49            | 3.29 | 3.14 | 1240.6      | 2.95            | 2.87 | 3.30 | 463.3                | 2.03                            | 1.81 | 1.63 |
| 1280.3              | 1310.3      | 3.69            | 3.50 | 3.37 | 1280.3      | 3.15            | 2.99 | 3.38 | 487.8                | 2.11                            | 1.88 | 1.70 |
| 1300.1              | 1330.1      | 3.74            | 3.57 | 3.44 | 1300.1      | 3.30            | 3.05 | 3.40 | 500.0                | 1.99                            | 1.78 | 1.62 |

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## Harmonics Tables

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | 16  | 21  | 11  | 28  | 16  | 29  | 21  | 47  | 27  | 42  |
| 1      | -      | 17     | +0  | 28  | 14  | 32  | 21  | 34  | 34  | 46  | 30  | 51  |
| 2      | 88     | 71     | 46  | 64  | 45  | 61  | 44  | 58  | 45  | 56  | 49  | 61  |
| 3      | >100   | 61     | 60  | 66  | 53  | 67  | 50  | 67  | 50  | 64  | 47  | 62  |
| 4      | >100   | 81     | 78  | 79  | 82  | 81  | 73  | 81  | 70  | 91  | 69  | 74  |
| 5      | >100   | 80     | 79  | 85  | 73  | 85  | 71  | 79  | 70  | 81  | 70  | >93 |
| 6      | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | 90  | >93 | 88  | >93 |
| 7      | >100   | >93    | >93 | >93 | >93 | >93 | 89  | 88  | 88  | >93 | 90  | >93 |
| 8      | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 9      | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 71  | >93 | >93 |
| 10     | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 83  | >93 |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

### LO HARMONICS ORDER

Test conditions:

RF IN: 250.1 MHz; -1.00 dBm.

LO IN: 280.01 MHz; +17.00 dBm

IF OUT: 29.91 MHz; -7.34 dBm

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |    |    |      |    |    |    |    |    |    |    |
|--------|--------|--------|----|----|------|----|----|----|----|----|----|----|
| 0      | -      | -      | 25 | 32 | 23   | 43 | 31 | 50 | 41 | 56 | 43 | 61 |
| 1      | -      | 17     | +0 | 29 | 13   | 35 | 21 | 34 | 31 | 45 | 40 | 66 |
| 2      | 76     | 56     | 41 | 64 | 39   | 53 | 38 | 50 | 39 | 51 | 43 | 63 |
| 3      | >100   | 45     | 45 | 49 | 56   | 56 | 43 | 49 | 55 | 62 | 42 | 59 |
| 4      | >100   | 69     | 57 | 69 | 56   | 65 | 56 | 62 | 52 | 64 | 53 | 68 |
| 5      | >100   | 61     | 83 | 69 | 57   | 65 | 51 | 58 | 47 | 59 | 47 | 64 |
| 6      | >100   | 72     | 64 | 81 | 64   | 79 | 68 | 78 | 66 | 74 | 62 | 80 |
| 7      | >100   | 73     | 72 | 81 | 68   | 74 | 71 | 75 | 63 | 70 | 62 | 68 |
| 8      | >100   | 82     | 76 | 81 | 76   | 87 | 75 | 85 | 75 | 81 | 71 | 78 |
| 9      | >100   | 85     | 77 | 77 | 75   | 85 | 74 | 85 | 71 | 77 | 70 | 79 |
| 10     | >100   | 96     | 88 | 90 | >103 | 85 | 83 | 83 | 80 | 96 | 78 | 90 |
| RF CAL | 0      | 1      | 2  | 3  | 4    | 5  | 6  | 7  | 8  | 9  | 10 |    |

### LO HARMONICS ORDER

Test conditions:

RF IN: 250.1 MHz; 9.00 dBm.

LO IN: 280.01 MHz; +17.00 dBm

IF OUT: 29.91 MHz; 2.61 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.

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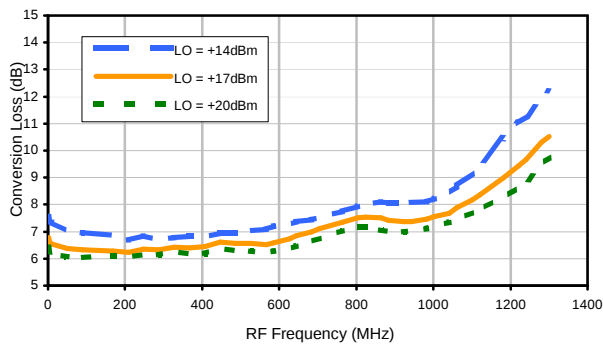


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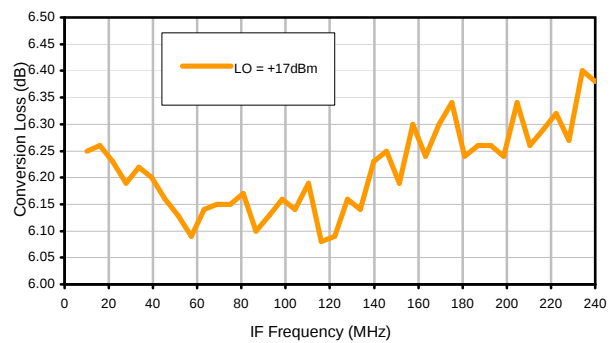


## Typical Performance Curves

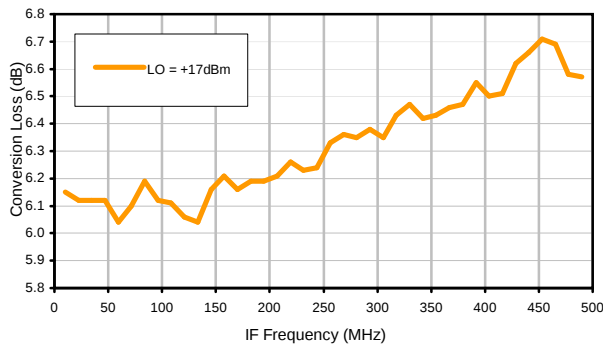
Conversion Loss @ IF=30MHz



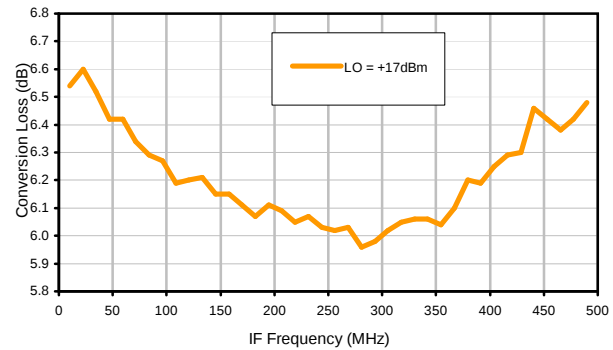
Conversion Loss vs. IF @ RF=250.1MHz



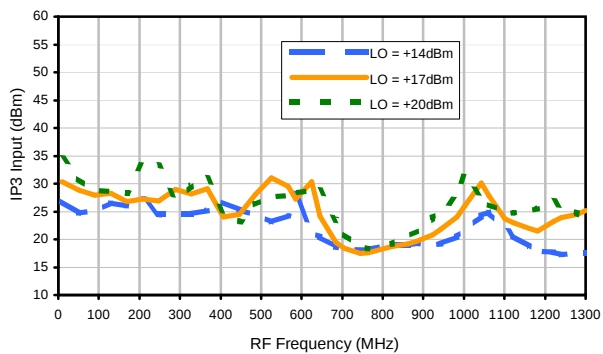
Conversion Loss vs. IF @ RF=10.1MHz



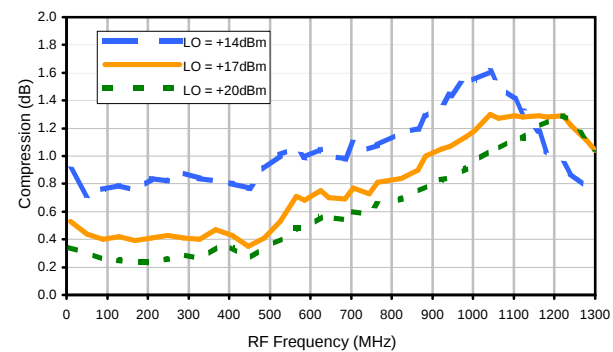
Conversion Loss vs. IF @ RF=500.1MHz



IP3 Input

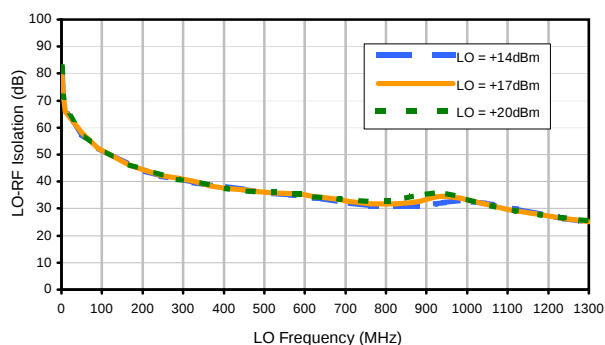


Compression @ RF IN=+14dBm

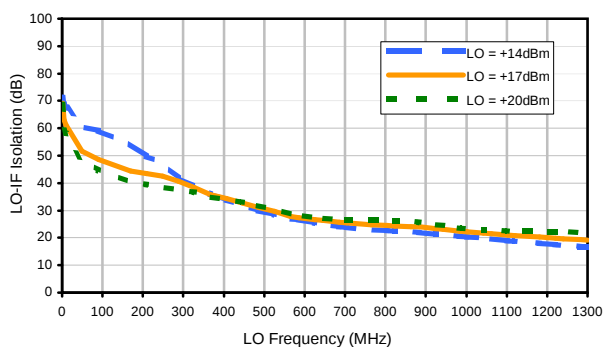


## Typical Performance Curves

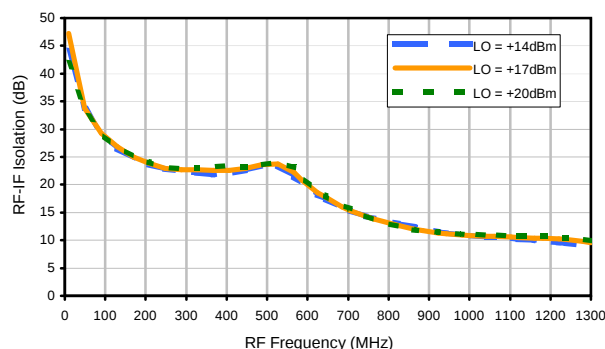
LO-RF Isolation



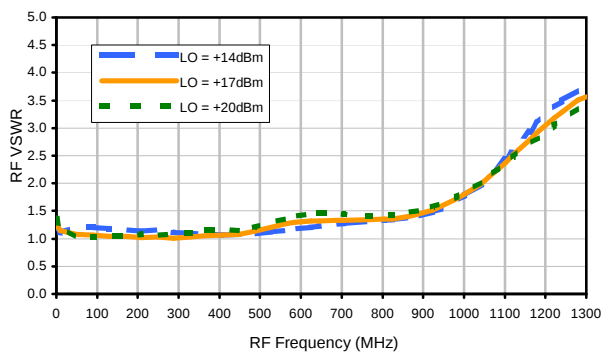
LO-IF Isolation



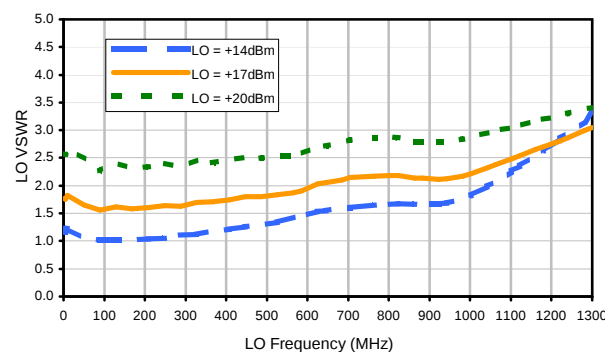
RF-IF Isolation



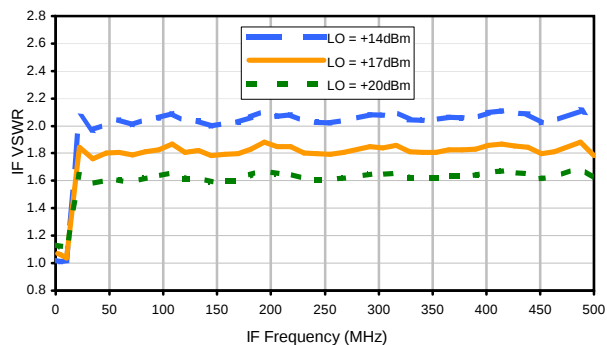
RF VSWR



LO VSWR



IF VSWR



REV. X2

JMS-1H

100817

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## Harmonics Tables

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |     |     |     |     |     |     |     |     |     |     |
|--------|--------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0      | -      | -      | 16  | 21  | 11  | 28  | 16  | 29  | 21  | 47  | 27  | 42  |
| 1      | -      | 17     | +0  | 28  | 14  | 32  | 21  | 34  | 34  | 46  | 30  | 51  |
| 2      | 88     | 71     | 46  | 64  | 45  | 61  | 44  | 58  | 45  | 56  | 49  | 61  |
| 3      | >100   | 61     | 60  | 66  | 53  | 67  | 50  | 67  | 50  | 64  | 47  | 62  |
| 4      | >100   | 81     | 78  | 79  | 82  | 81  | 73  | 81  | 70  | 91  | 69  | 74  |
| 5      | >100   | 80     | 79  | 85  | 73  | 85  | 71  | 79  | 70  | 81  | 70  | >93 |
| 6      | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | 90  | >93 | 88  | >93 |
| 7      | >100   | >93    | >93 | >93 | >93 | >93 | 89  | 88  | 88  | >93 | 90  | >93 |
| 8      | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 |
| 9      | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 71  | >93 | >93 |
| 10     | >100   | >93    | >93 | >93 | >93 | >93 | >93 | >93 | >93 | >93 | 83  | >93 |
| RF CAL | 0      | 1      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |     |

### LO HARMONICS ORDER

Test conditions: RF IN: 250.1 MHz; -1.00 dBm.  
LO IN: 280.01 MHz; +17.00 dBm  
IF OUT: 29.91 MHz; -7.34 dBm

RF HARMONICS ORDER

|        | (-dBm) | (-dBc) |    |    |      |    |    |    |    |    |    |    |
|--------|--------|--------|----|----|------|----|----|----|----|----|----|----|
| 0      | -      | -      | 25 | 32 | 23   | 43 | 31 | 50 | 41 | 56 | 43 | 61 |
| 1      | -      | 17     | +0 | 29 | 13   | 35 | 21 | 34 | 31 | 45 | 40 | 66 |
| 2      | 76     | 56     | 41 | 64 | 39   | 53 | 38 | 50 | 39 | 51 | 43 | 63 |
| 3      | >100   | 45     | 45 | 49 | 56   | 56 | 43 | 49 | 55 | 62 | 42 | 59 |
| 4      | >100   | 69     | 57 | 69 | 56   | 65 | 56 | 62 | 52 | 64 | 53 | 68 |
| 5      | >100   | 61     | 83 | 69 | 57   | 65 | 51 | 58 | 47 | 59 | 47 | 64 |
| 6      | >100   | 72     | 64 | 81 | 64   | 79 | 68 | 78 | 66 | 74 | 62 | 80 |
| 7      | >100   | 73     | 72 | 81 | 68   | 74 | 71 | 75 | 63 | 70 | 62 | 68 |
| 8      | >100   | 82     | 76 | 81 | 76   | 87 | 75 | 85 | 75 | 81 | 71 | 78 |
| 9      | >100   | 85     | 77 | 77 | 75   | 85 | 74 | 85 | 71 | 77 | 70 | 79 |
| 10     | >100   | 96     | 88 | 90 | >103 | 85 | 83 | 83 | 80 | 96 | 78 | 90 |
| RF CAL | 0      | 1      | 2  | 3  | 4    | 5  | 6  | 7  | 8  | 9  | 10 |    |

### LO HARMONICS ORDER

Test conditions: RF IN: 250.1 MHz; 9.00 dBm.  
LO IN: 280.01 MHz; +17.00 dBm  
IF OUT: 29.91 MHz; 2.61 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.

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100817  
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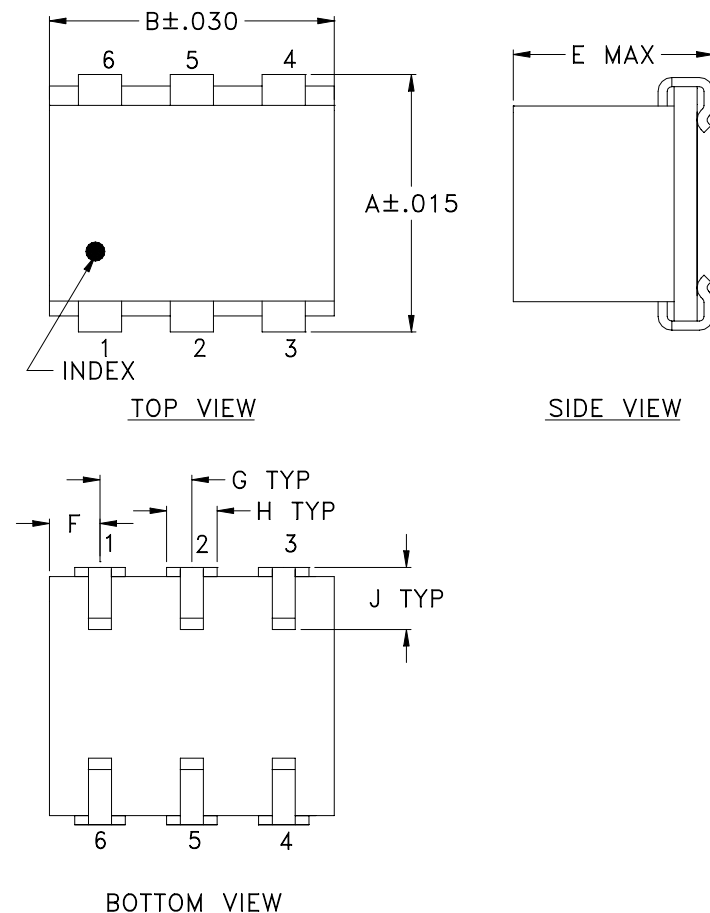
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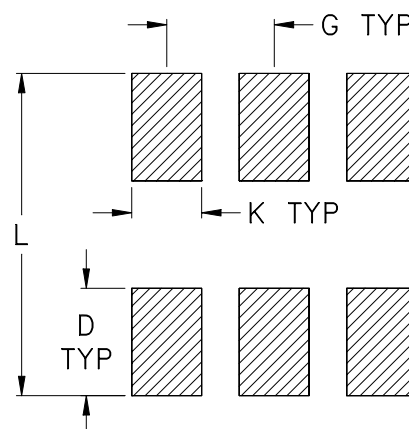
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### Outline Dimensions



### PCB Land Pattern



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

| CASE # | A              | B              | C      | D              | E              | F              | G              | H              | J              | K              | L              | WT. GRAM |
|--------|----------------|----------------|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| BH292  | .280<br>(7.11) | .310<br>(7.87) | -<br>- | .100<br>(2.54) | .225<br>(5.72) | .055<br>(1.40) | .100<br>(2.54) | .047<br>(1.19) | .065<br>(1.65) | .065<br>(1.65) | .300<br>(7.62) | .45      |

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

#### Notes:

- Case material: Ceramic.
- Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.  
For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

# Tape & Reel Packaging TR-F24



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel |
|-------------------|----------------------------|----------------------|------------------|
| 16                | 12                         | 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.

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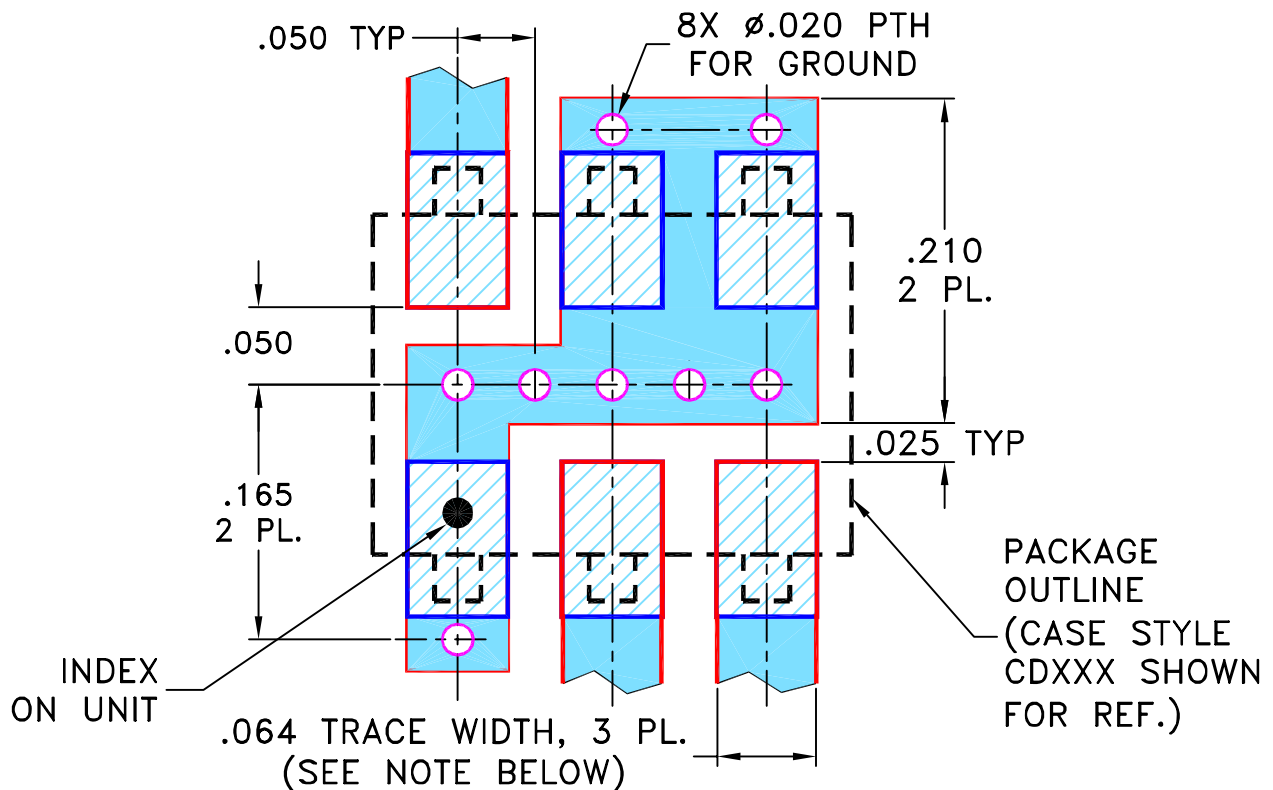
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION                                          | DATE     | DR  | AUTH |
|-----|---------|------------------------------------------------------|----------|-----|------|
| A   | M101143 | ADDED "gk" PIN CONNECTION, TT100 CASE STYLE & NOTE 2 | 10/10/05 | MMG | DJ   |
| B   | M102713 | ADDED "...WITH SMOBC"                                | 01/17/06 | MMG | IL   |
| C   | M108637 | REMOVED "PIN 1", ADDED INDEX ON UNIT                 | 12/01/06 | MYG | FL   |

**SUGGESTED MOUNTING CONFIGURATION**  
**FOR BH292, CD541/542/636/637, TT100/240 CASE**  
**STYLES, "gk", "ht", "hu", "nd", "w" PIN CONNECTIONS**



- NOTES:** 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. 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

TOLERANCES ON:

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

DRAWN

MMG

07/17/02

CHECKED

WL

08/02/02

APPROVED

DJ

08/05/02



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 Brooklyn NY 11235

PL, gk/ht/hu/nd/w, BH292,  
 CD541/542/636/637, TT100/240, TB-03

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-052

REV:

C

FILE:

98PL052

SCALE:

8:1

SHEET:

1 OF 1

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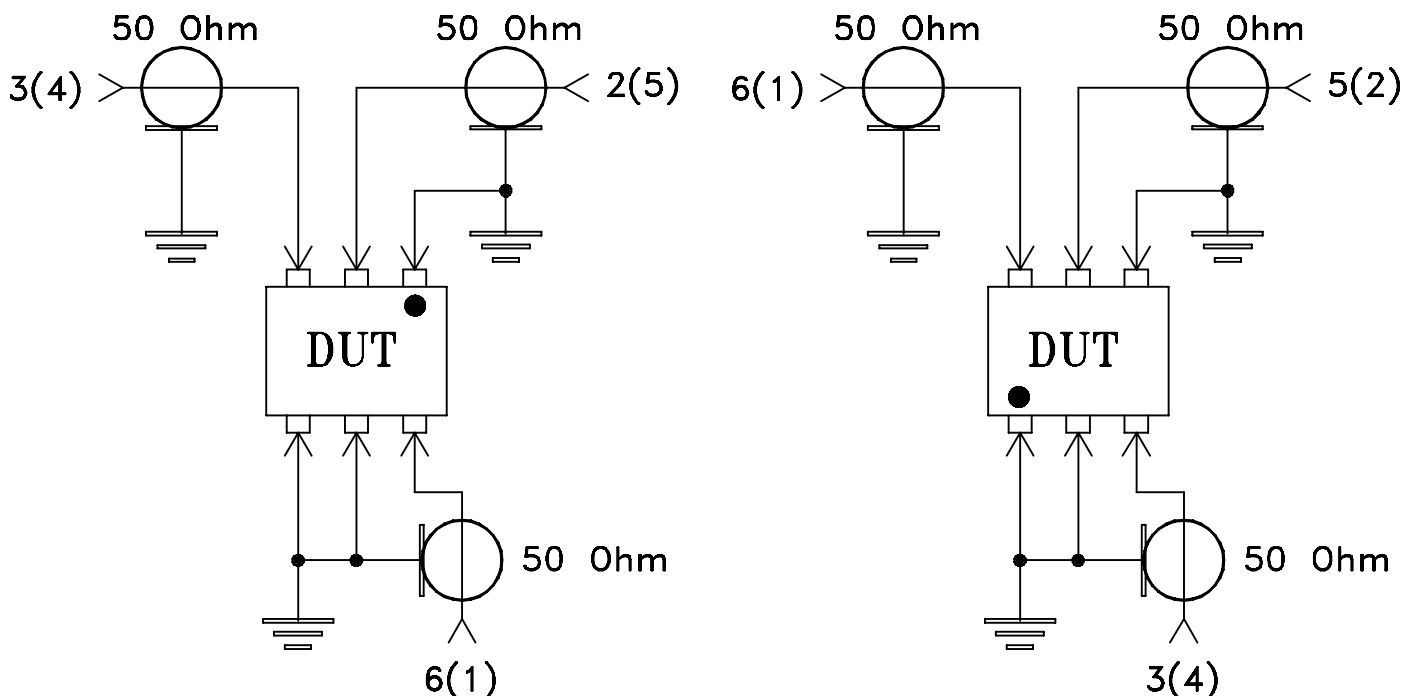
ASHEETA1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit

For Pin Connections and DUT Orientation Refer to  
Data Sheet of the DUT



TB-03



Schematic Diagram

## Notes:

1. 50 Ohm 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                                                                              |