

# X2 Frequency Multiplier

50Ω Output 10 to 20 GHz

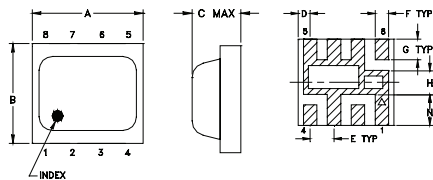
## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| RF Input, 25°C                                                  | 100 mW         |
| Permanent damage may occur if any of these limits are exceeded. |                |

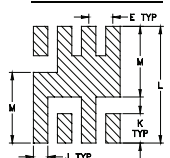
## Pin Connections

|                    |           |
|--------------------|-----------|
| INPUT              | 4         |
| OUTPUT             | 8         |
| 50Ω TERMINATE EXT. | 2         |
| GROUND             | 1,3,5,6,7 |

## Outline Drawing



PCB Land Pattern

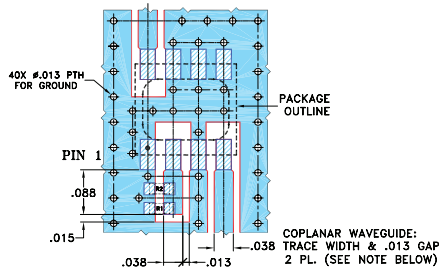


Suggested Layout,  
Tolerance to be within ±.002

## Outline Dimensions (inch)

|      |      |      |       |       |       |       |
|------|------|------|-------|-------|-------|-------|
| A    | B    | C    | D     | E     | F     | G     |
| .200 | .180 | .087 | .025  | .050  | .028  | .043  |
| 5.08 | 4.57 | 2.21 | 0.64  | 1.27  | 0.71  | 1.09  |
| H    | J    | K    | L     | M     | N     | wt    |
| .050 | .030 | .060 | 0.238 | 0.144 | 0.065 | grams |
| 1.27 | 0.76 | 1.52 | 6.05  | 3.66  | 1.65  | 0.08  |

## Demo Board MCL P/N: TB-473+ Suggested PCB Layout (PL-287)



RESISTORS R1, R2: 100 Ohm, 0402 SIZE

NOTES: 1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; 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-Circuits' applicable established test performance criteria and measurement instructions.

C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

## Features

- low conversion loss, 11.5 dB typ.
- high fundamental & harmonic suppression, F1, 30 dBc typ.; F3, 35 dBc typ.; F4, 25 dBc typ.
- LTCC design
- low profile, 0.085"
- aqueous washable

## Applications

- synthesizers
- local oscillators

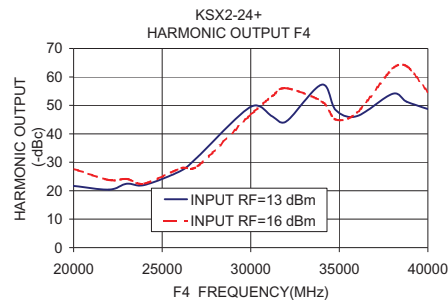
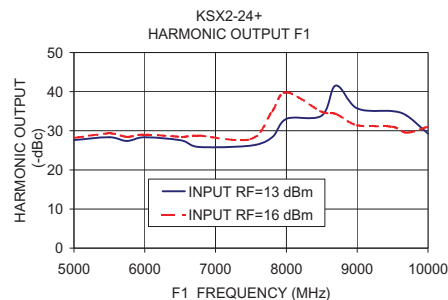
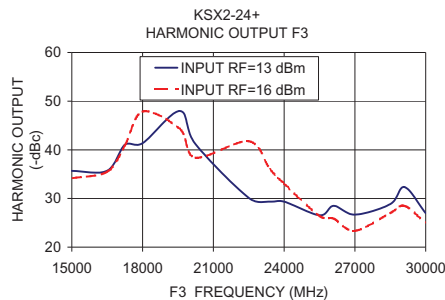
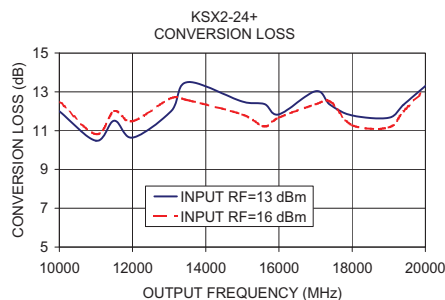
## Electrical Specifications

| MULTIPLICATION<br>FACTOR | FREQUENCY<br>(GHz) |         | INPUT<br>POWER<br>(dBm) | CONVERSION<br>LOSS<br>(dB) | *HARMONIC OUTPUT<br>(dBc) |      |      |      |      |      |    |    |
|--------------------------|--------------------|---------|-------------------------|----------------------------|---------------------------|------|------|------|------|------|----|----|
|                          | F1                 | F2      |                         |                            | F1                        |      | F3   |      | F4   |      |    |    |
|                          | Input              | Output  |                         |                            | Typ.                      | Max. | Typ. | Min. | Typ. | Min. |    |    |
| 2                        | 5 - 8              | 10 - 16 | 13                      | 16                         | 11.5                      | 15   | 30   | 18   | 35   | 23   | 25 | 15 |
|                          |                    |         | 10                      | 13                         | 15                        | 18   | 21   | 14   | 30   | 18   | 20 | 13 |
|                          | 8 - 10             | 16 - 20 | 13                      | 16                         | 12                        | 15   | 33   | 20   | 27   | 17   | 50 | 35 |
|                          |                    |         | 10                      | 13                         | 15                        | 18.5 | 30   | 16   | 23   | 16   | 40 | 30 |

\* Harmonics of input frequency below the power level of F2

## Typical Performance Data

| INPUT RF= 13dBm       |                      |                                 |       |       | INPUT RF= 16dBm      |                                 |       |       |
|-----------------------|----------------------|---------------------------------|-------|-------|----------------------|---------------------------------|-------|-------|
| Input Frequency (MHz) | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) |       |       | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) |       |       |
|                       | F2                   | F1                              | F3    | F4    |                      | F2                              | F1    | F3    |
| 5000.00               | 12.00                | 27.66                           | 35.68 | 21.67 | 12.50                | 28.16                           | 34.16 | 27.66 |
| 5500.00               | 10.48                | 28.33                           | 35.69 | 20.40 | 10.81                | 29.34                           | 35.52 | 23.74 |
| 5750.00               | 11.51                | 27.39                           | 41.04 | 22.47 | 12.01                | 28.45                           | 40.87 | 24.16 |
| 6000.00               | 10.64                | 28.35                           | 41.35 | 22.02 | 11.48                | 29.02                           | 47.85 | 22.52 |
| 6525.00               | 12.00                | 27.53                           | 47.97 | 27.17 | 12.67                | 28.45                           | 44.30 | 28.00 |
| 6750.00               | 13.50                | 25.87                           | 41.12 | 31.83 | 12.57                | 28.77                           | 38.39 | 28.54 |
| 7500.00               | 12.50                | 26.19                           | 30.10 | 49.49 | 11.83                | 27.87                           | 41.77 | 46.76 |
| 7800.00               | 12.37                | 28.34                           | 29.35 | 46.17 | 11.21                | 34.97                           | 36.01 | 53.17 |
| 8000.00               | 11.84                | 33.06                           | 29.35 | 44.32 | 11.67                | 39.81                           | 33.03 | 56.06 |
| 8500.00               | 13.03                | 33.87                           | 26.54 | 57.26 | 12.36                | 34.83                           | 26.38 | 51.43 |
| 8700.00               | 12.33                | 41.57                           | 28.51 | 48.32 | 12.50                | 34.33                           | 25.85 | 44.99 |
| 9000.00               | 11.78                | 35.72                           | 26.68 | 46.24 | 11.28                | 31.39                           | 23.35 | 47.40 |
| 9500.00               | 11.66                | 35.01                           | 28.85 | 54.08 | 11.16                | 31.02                           | 27.02 | 62.92 |
| 9700.00               | 12.33                | 33.85                           | 32.33 | 51.30 | 12.00                | 29.51                           | 28.50 | 63.80 |
| 10000.00              | 13.30                | 29.27                           | 26.97 | 48.71 | 13.13                | 31.03                           | 24.97 | 54.71 |



KSX2-24+



CASE STYLE: HV1195  
PRICE: \$ 7.95 ea. QTY (10-49)

## +RoHS Compliant

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