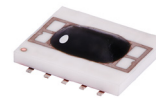


# X2 Frequency Multiplier

50Ω Output 3400 to 7200 MHz

KC2-36+



Generic photo used for illustration purposes only

CASE STYLE: DZ885

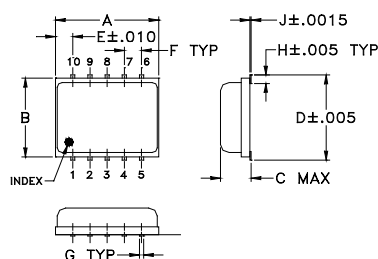
## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -55°C to 100°C |
| Storage Temperature                                             | -55°C to 100°C |
| RF Input, 25°C                                                  | 200mW          |
| Permanent damage may occur if any of these limits are exceeded. |                |

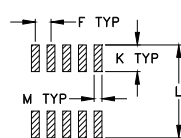
## Pin Connections

|                    |               |
|--------------------|---------------|
| INPUT              | 10            |
| OUTPUT             | 5             |
| 50Ω TERMINATE EXT. | 3             |
| GROUND             | 1,2,4,6,7,8,9 |

## Outline Drawing



### PCB Land Pattern



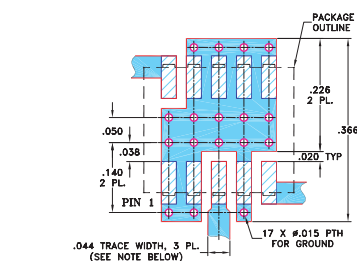
Suggested Layout,  
Tolerance to be within ±.002

## Outline Dimensions (inch/mm)

| A    | B    | C    | D    | E    | F    | G     |
|------|------|------|------|------|------|-------|
| .30  | .250 | .085 | .266 | .050 | .050 | .012  |
| 7.62 | 6.35 | 2.16 | 6.76 | 1.27 | 1.27 | 0.30  |
| H    | J    | K    | L    | M    |      | wt    |
| .029 | .004 | .085 | .296 | .030 |      | grams |
| 0.74 | 0.10 | 2.16 | 7.52 | 0.76 |      | 0.25  |

## Demo Board MCL P/N: TB-144

### Suggested PCB Layout (PL-045)



- NOTES: 1. TRACE WIDTH IS 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.
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, 11 dB typ.
- LTCC design
- low profile, 0.085"
- low cost

## Applications

- synthesizers
- local oscillators

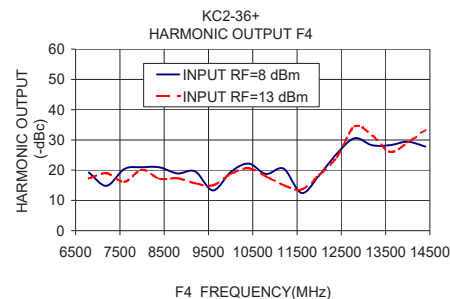
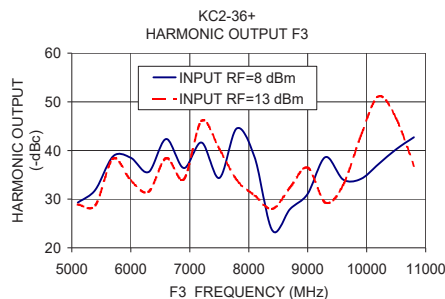
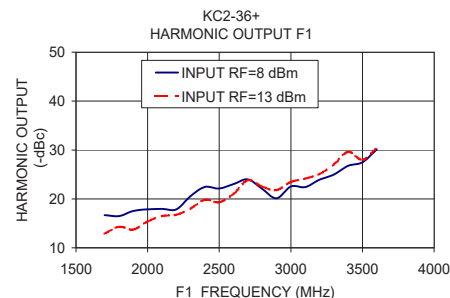
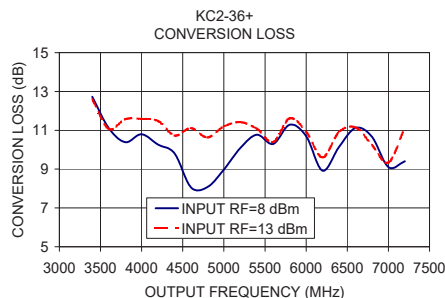
## Electrical Specifications

| MULTIPLICATION FACTOR | FREQUENCY (MHz) |           | INPUT POWER (dBm) |      | CONVERSION LOSS (dB) | *HARMONIC OUTPUT (dBc) |         |         |         |         |         |
|-----------------------|-----------------|-----------|-------------------|------|----------------------|------------------------|---------|---------|---------|---------|---------|
|                       | F1 Input        | F2 Output | Min.              | Max. |                      | F1 Typ.                | F1 Min. | F3 Typ. | F3 Min. | F4 Typ. | F4 Min. |
| 2                     | 1700-3600       | 3400-7200 | 8                 | 13   | 11.0 15.5            | 18                     | 9       | 30      | 17      | 17      | 8       |
|                       | 2100-2700       | 4200-5400 | 8                 | 13   | 11.0 14.8            | 20                     | 12      | 35      | 17      | 17      | 8       |

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

## Typical Performance Data

| Input Frequency (MHz) | INPUT RF= 8 dBm      |                                 |       |       | INPUT RF= 13 dBm     |                                 |       |       |
|-----------------------|----------------------|---------------------------------|-------|-------|----------------------|---------------------------------|-------|-------|
|                       | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) |       |       | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) |       |       |
|                       |                      | F1                              | F3    | F4    |                      | F1                              | F3    | F4    |
| 1700.00               | 12.73                | 16.68                           | 29.28 | 19.21 | 12.59                | 12.88                           | 28.90 | 17.27 |
| 1900.00               | 10.39                | 17.55                           | 38.81 | 20.40 | 11.57                | 13.73                           | 38.30 | 16.13 |
| 2100.00               | 10.26                | 17.96                           | 35.56 | 20.93 | 11.48                | 16.50                           | 31.51 | 17.12 |
| 2300.00               | 8.06                 | 20.57                           | 36.41 | 19.59 | 11.11                | 18.03                           | 34.08 | 15.65 |
| 2500.00               | 8.97                 | 22.13                           | 34.37 | 19.35 | 11.20                | 19.32                           | 40.32 | 18.67 |
| 2700.00               | 10.77                | 24.00                           | 38.60 | 18.73 | 11.08                | 23.82                           | 30.77 | 17.97 |
| 2900.00               | 11.29                | 20.11                           | 27.97 | 12.47 | 11.61                | 21.78                           | 32.40 | 13.59 |
| 3100.00               | 8.92                 | 22.40                           | 38.64 | 25.49 | 9.60                 | 24.16                           | 29.28 | 24.36 |
| 3300.00               | 11.12                | 24.98                           | 34.14 | 28.23 | 11.15                | 27.05                           | 43.00 | 31.47 |
| 3500.00               | 9.10                 | 27.48                           | 40.25 | 29.40 | 9.34                 | 28.00                           | 46.57 | 29.15 |
| 3600.00               | 9.40                 | 30.15                           | 42.70 | 27.81 | 11.14                | 30.40                           | 36.82 | 33.33 |



## 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)



# Frequency Multiplier (Doubler)

**KC2-36+**

## Typical Performance Data

| FREQUENCY<br>(MHz) |            |            |            | RF IN=+8dBm                |                  |            |            |
|--------------------|------------|------------|------------|----------------------------|------------------|------------|------------|
|                    |            |            |            | CONVERSION<br>LOSS<br>(dB) | HARMONIC OUTPUT* |            |            |
| X 1 OUTPUT         | X 2 OUTPUT | X 3 OUTPUT | X 4 OUTPUT |                            | (-dBc)           |            |            |
|                    |            |            |            | X 2 OUTPUT                 | X 1 OUTPUT       | X 3 OUTPUT | X 4 OUTPUT |
| 1700               | 3400       | 5100       | 6800       | 12.73                      | 16.68            | 29.28      | 19.21      |
| 1800               | 3600       | 5400       | 7200       | 11.11                      | 16.49            | 31.92      | 14.84      |
| 1900               | 3800       | 5700       | 7600       | 10.39                      | 17.55            | 38.81      | 20.40      |
| 2000               | 4000       | 6000       | 8000       | 10.80                      | 17.85            | 38.51      | 20.95      |
| 2100               | 4200       | 6300       | 8400       | 10.26                      | 17.96            | 35.56      | 20.93      |
| 2200               | 4400       | 6600       | 8800       | 9.80                       | 17.85            | 42.34      | 18.89      |
| 2300               | 4600       | 6900       | 9200       | 8.06                       | 20.57            | 36.41      | 19.59      |
| 2400               | 4800       | 7200       | 9600       | 8.08                       | 22.46            | 41.63      | 13.30      |
| 2500               | 5000       | 7500       | 10000      | 8.97                       | 22.13            | 34.37      | 19.35      |
| 2600               | 5200       | 7800       | 10400      | 10.09                      | 23.03            | 44.55      | 22.20      |
| 2700               | 5400       | 8100       | 10800      | 10.77                      | 24.00            | 38.60      | 18.73      |
| 2800               | 5600       | 8400       | 11200      | 10.30                      | 22.04            | 23.54      | 20.50      |
| 2900               | 5800       | 8700       | 11600      | 11.29                      | 20.11            | 27.97      | 12.47      |
| 3000               | 6000       | 9000       | 12000      | 10.70                      | 22.55            | 31.08      | 18.26      |
| 3100               | 6200       | 9300       | 12400      | 8.92                       | 22.40            | 38.64      | 25.49      |
| 3200               | 6400       | 9600       | 12800      | 10.15                      | 23.92            | 34.04      | 30.56      |
| 3300               | 6600       | 9900       | 13200      | 11.12                      | 24.98            | 34.14      | 28.23      |
| 3400               | 6800       | 10200      | 13600      | 10.67                      | 26.76            | 37.17      | 28.28      |
| 3500               | 7000       | 10500      | 14000      | 9.10                       | 27.48            | 40.25      | 29.40      |
| 3600               | 7200       | 10800      | 14400      | 9.40                       | 30.15            | 42.70      | 27.81      |

\*Harmonic Output below power level of X 2 Output .

| FREQUENCY<br>(MHz) |            |            |            | RF IN=+13dBm               |                  |            |            |
|--------------------|------------|------------|------------|----------------------------|------------------|------------|------------|
|                    |            |            |            | CONVERSION<br>LOSS<br>(dB) | HARMONIC OUTPUT* |            |            |
| X 1 OUTPUT         | X 2 OUTPUT | X 3 OUTPUT | X 4 OUTPUT |                            | (-dBc)           |            |            |
|                    |            |            |            | X 2 OUTPUT                 | X 1 OUTPUT       | X 3 OUTPUT | X 4 OUTPUT |
| 1700               | 3400       | 5100       | 6800       | 12.59                      | 12.88            | 28.90      | 17.27      |
| 1800               | 3600       | 5400       | 7200       | 11.07                      | 14.32            | 28.74      | 18.96      |
| 1900               | 3800       | 5700       | 7600       | 11.57                      | 13.73            | 38.30      | 16.13      |
| 2000               | 4000       | 6000       | 8000       | 11.59                      | 15.36            | 33.83      | 20.12      |
| 2100               | 4200       | 6300       | 8400       | 11.48                      | 16.50            | 31.51      | 17.12      |
| 2200               | 4400       | 6600       | 8800       | 10.73                      | 16.75            | 38.41      | 17.30      |
| 2300               | 4600       | 6900       | 9200       | 11.11                      | 18.03            | 34.08      | 15.65      |
| 2400               | 4800       | 7200       | 9600       | 10.63                      | 19.84            | 46.09      | 14.99      |
| 2500               | 5000       | 7500       | 10000      | 11.20                      | 19.32            | 40.32      | 18.67      |
| 2600               | 5200       | 7800       | 10400      | 11.42                      | 21.03            | 33.90      | 20.60      |
| 2700               | 5400       | 8100       | 10800      | 11.08                      | 23.82            | 30.77      | 17.97      |
| 2800               | 5600       | 8400       | 11200      | 10.40                      | 22.50            | 28.00      | 15.03      |
| 2900               | 5800       | 8700       | 11600      | 11.61                      | 21.78            | 32.40      | 13.59      |
| 3000               | 6000       | 9000       | 12000      | 10.92                      | 23.47            | 36.46      | 18.39      |
| 3100               | 6200       | 9300       | 12400      | 9.60                       | 24.16            | 29.28      | 24.36      |
| 3200               | 6400       | 9600       | 12800      | 10.91                      | 25.07            | 32.87      | 34.43      |
| 3300               | 6600       | 9900       | 13200      | 11.15                      | 27.05            | 43.00      | 31.47      |
| 3400               | 6800       | 10200      | 13600      | 10.24                      | 29.62            | 51.12      | 26.03      |
| 3500               | 7000       | 10500      | 14000      | 9.34                       | 28.00            | 46.57      | 29.15      |
| 3600               | 7200       | 10800      | 14400      | 11.14                      | 30.40            | 36.82      | 33.33      |

\*Harmonic Output below power level of X 2 Output .



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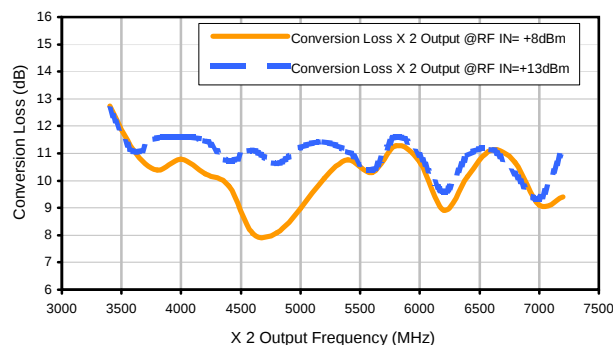
REV. X1  
 KC2-36+  
 061217  
 Page 1 of 1

# Frequency Multiplier (Doubler)

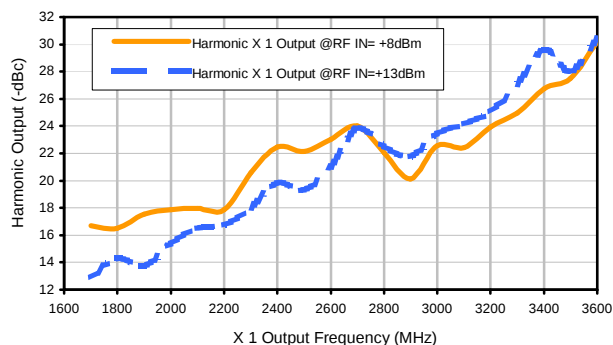
KC2-36+

## Typical Performance Curves

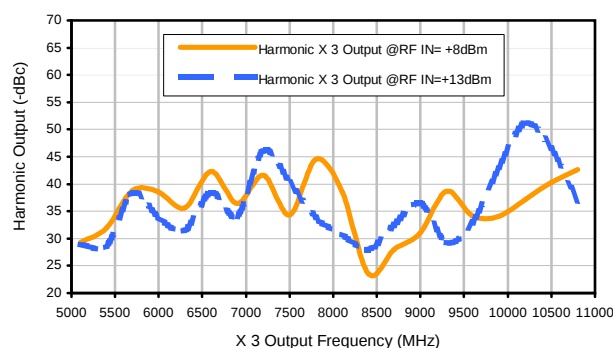
Conversion Loss X 2 Output



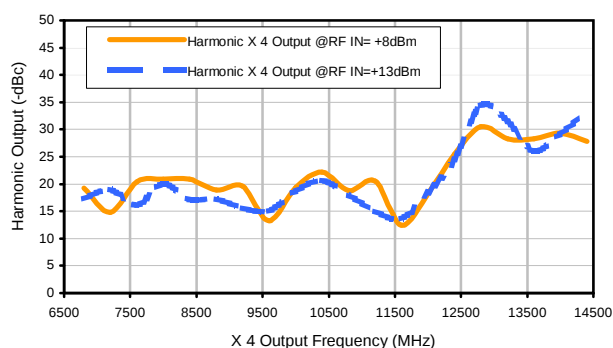
Harmonic X 1 Output



Harmonic X 3 Output

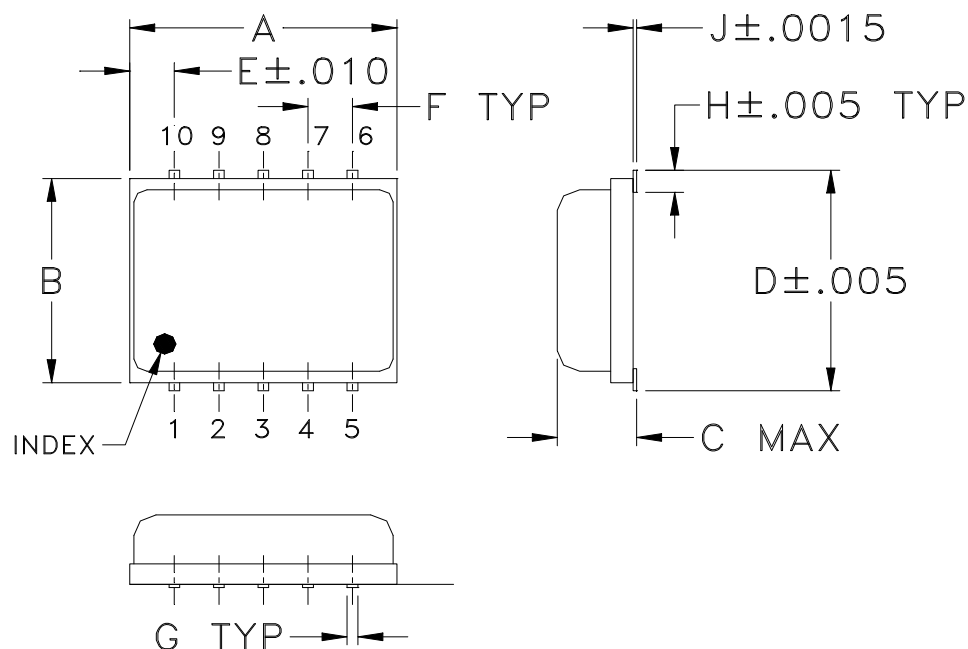


Harmonic X 4 Output

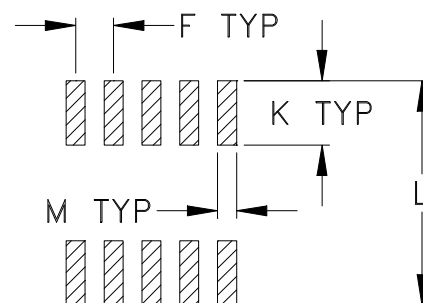


## Outline Dimensions

DZ885  
DZ1034



## 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>GRAMS |
|--------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|
| DZ885  | .30<br>(7.62) | .250<br>(6.35) | .085<br>(2.16) | .266<br>(6.76) | .050<br>(1.27) | .050<br>(1.27) | .012<br>(0.30) | .029<br>(0.74) | .004<br>(0.10) | .085<br>(2.16) | .296<br>(7.52) | .030<br>(0.76) | 0.25         |
| DZ1034 |               |                | .105<br>(2.67) |                |                |                |                |                |                |                |                |                | 0.3          |

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

### Notes:

- Case material: Plastic encapsulation on Ceramic base.
- Termination finish:
  - For RoHS Case Styles: Tin plate. All models, (+) suffix.
  - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.



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# Tape & Reel Packaging TR-F34



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note                |      |
|-------------------|----------------------------|----------------------|---------------------------------------------|------|
| 16                | 12                         | 7                    | Small<br>quantity<br>standard<br>(see note) | 20   |
|                   |                            |                      |                                             | 50   |
|                   |                            |                      |                                             | 100  |
|                   |                            |                      |                                             | 200  |
|                   |                            | 13                   | Standard                                    | 500  |
|                   |                            |                      |                                             | 1000 |

Note: Availability of small reel quantity varies by model.  
Refer to pricing and availability on individual model dashboard.

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

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



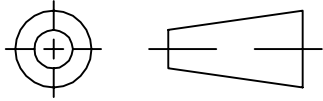
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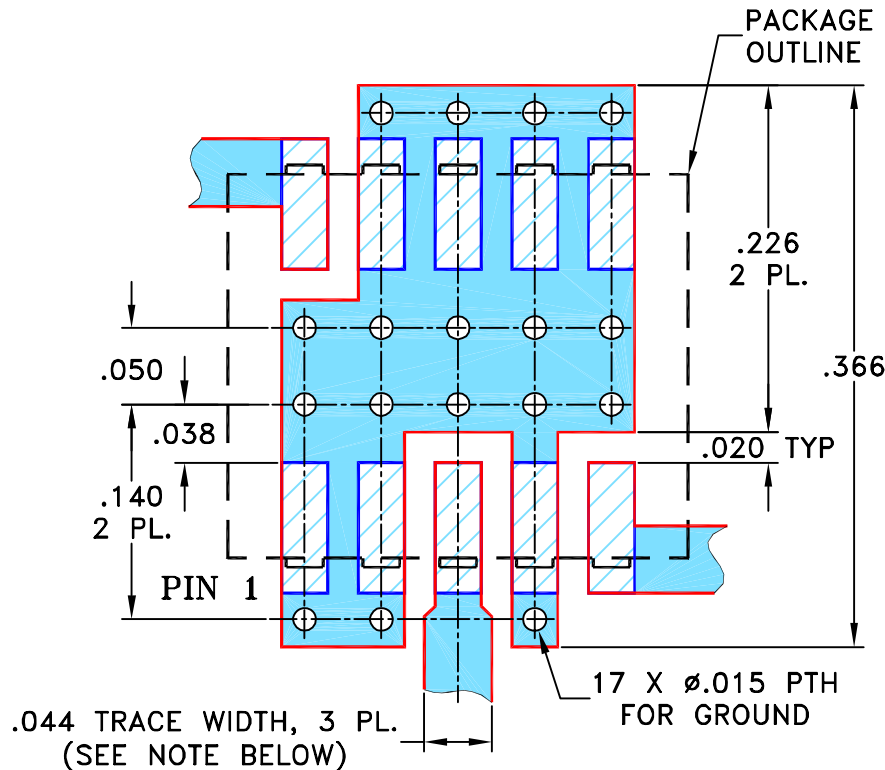
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION                     | DATE     | DR  | AUTH |
|-----|---------|---------------------------------|----------|-----|------|
| A   | M81781  | UPDATED PCB LAYOUT              | 06/07/02 | GF  | DJ   |
| B   | M82377  | UPDATED DRAWING                 | 07/31/02 | AV  | WL   |
| C   | M102713 | ADDED NOTE 2 & "...WITH SMOBC"  | 01/17/06 | MMG | IL   |
| D   | M135488 | ADDED DZ1650, CHANGED PIN CONN. | 02/02/12 | GF  | DJ   |

## SUGGESTED MOUNTING CONFIGURATION FOR DZ883, DZ885 & DZ1650 CASE STYLES, "10MX01" PIN CONNECTION



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020"  $\pm$  .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

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

AV

05/08/02

TOLERANCES ON:

CHECKED

DB

05/16/02

2 PL DECIMALS  $\pm$ 

APPROVED

WL

05/16/02

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

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# Mini-Circuits®

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Brooklyn NY 11235

## PL, 10MX01, DZ883/885/1650, TB-144

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-045

REV:

D

FILE:

98PL045

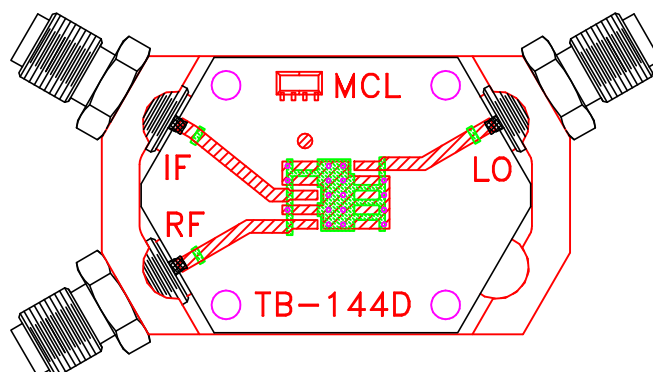
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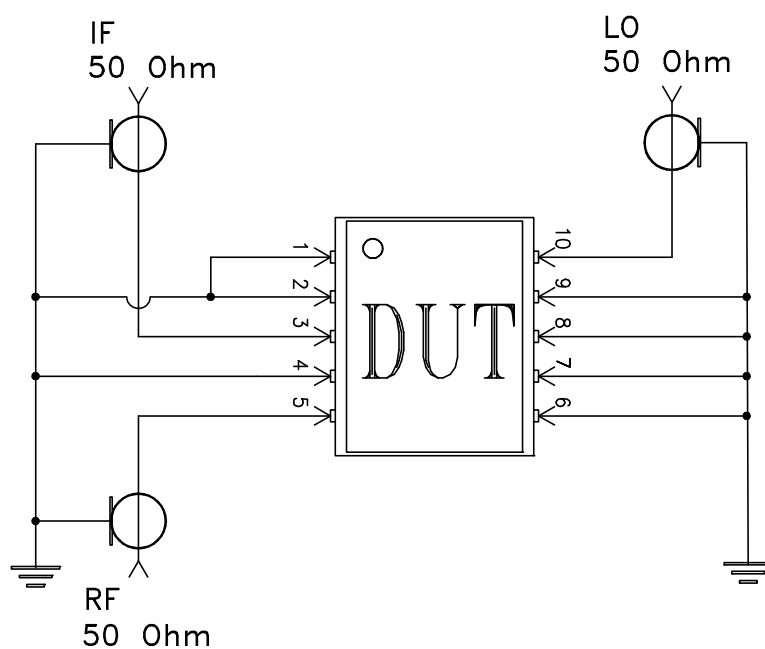
SHEET:

1 OF 1

# Evaluation Board and Circuit



TB-144



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 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          | -55° to 100°C<br>Ambient Environment                                                                                                                            | Individual Model Data Sheet                           |
| Storage Temperature            | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                           |
| Autoclave                      | 15 psig, 100% RH, 121°C, 96 hours                                                                                                                               | JESD22-A102-C, Condition C                            |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                                                       | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Solder Reflow Heat             | Sn-Pb Eutectic Process: 225°C peak<br>Pb-Free Process: 250°C peak                                                                                               | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1         |
| Solderability                  | 10X Magnification                                                                                                                                               | J-STD-002, Para 4.2.5, Test S, 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                               |