

# Bandpass Filter

50Ω 75 to 131 MHz

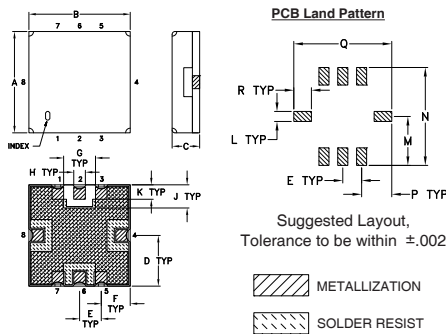
## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -40°C to 85°C  |
| Storage Temperature                                             | -55°C to 100°C |
| RF Power Input                                                  | 0.5W at 25°C   |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|        |                  |
|--------|------------------|
| RF IN  | 2                |
| RF OUT | 6                |
| GROUND | 1, 3, 4, 5, 7, 8 |

## Outline Drawing

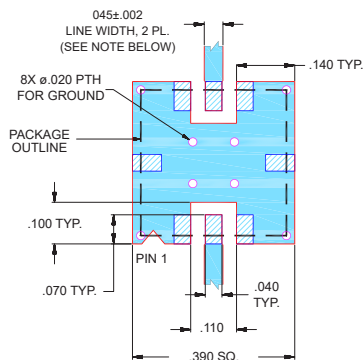


## Outline Dimensions (inch/mm)

| A    | B    | C    | D    | E    | F    | G    | H    | J          |
|------|------|------|------|------|------|------|------|------------|
| .350 | .350 | .100 | .175 | .075 | .100 | .110 | .040 | .080       |
| 8.89 | 8.89 | 2.54 | 4.45 | 1.91 | 2.54 | 2.79 | 1.02 | 2.03       |
| K    | L    | M    | N    | P    | Q    | R    | wt.  |            |
| .050 | .040 | .195 | .390 | .120 | .390 | .070 |      |            |
| 1.27 | 1.02 | 4.95 | 9.91 | 3.05 | 9.91 | 1.78 |      | 0.25 grams |

Note: Please refer to case style drawing for details

## Demo Board MCL P/N: TB-332 Suggested PCB Layout (PL-176)



- NOTES:
1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025" ± .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

## Features

- good VSWR, 1.3:1 typ. @ passband
- small size 0.35" x 0.35"
- shielded case
- aqueous washable

## Applications

- harmonic rejection
- transmitters / receivers
- navigation



Generic photo used for illustration purposes only  
CASE STYLE: GP731

## +RoHS Compliant

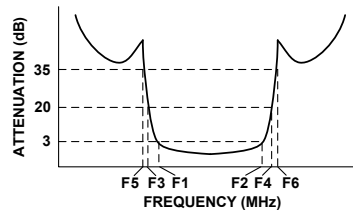
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

| Reel Size | Devices/Reel         |
|-----------|----------------------|
| 7"        | 10, 20, 50, 100, 200 |
| 13"       | 500, 1000            |

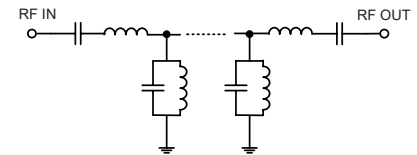
## Bandpass Filter Electrical Specifications (T<sub>AMB</sub> = 25°C)

| CENTER FREQ. (MHz) | PASSBAND (MHz)<br>(Loss < 3dB)<br>F1 - F2 | STOPBANDS (MHz) |     |             |            | VSWR (:1)     |               |
|--------------------|-------------------------------------------|-----------------|-----|-------------|------------|---------------|---------------|
|                    |                                           | Loss > 20dB     |     | Loss > 35dB |            | Passband Max. | Stopband Typ. |
| 103                | 75 - 131                                  | 55              | 170 | 45          | 210 - 2000 | 1.7           | 18            |

## Typical Frequency Response

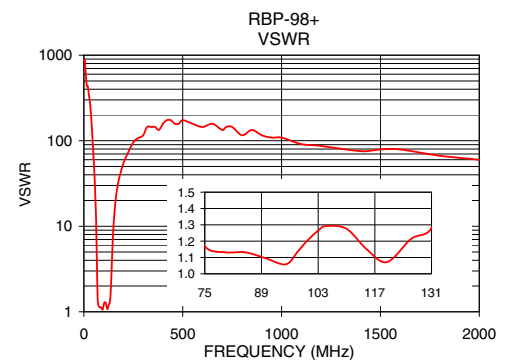
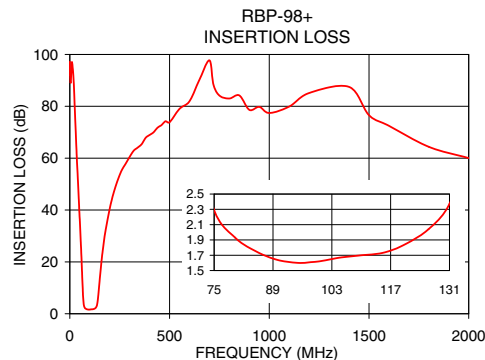


## Functional Schematic



## Typical Performance Data at 25°C

| Frequency (MHz) | Insertion Loss (dB) | VSWR (:1) |
|-----------------|---------------------|-----------|
| 0.3             | 97.25               | 868.59    |
| 20              | 88.97               | 434.30    |
| 45              | 44.01               | 91.43     |
| 55              | 27.51               | 33.42     |
| 62              | 14.67               | 10.75     |
| 66              | 7.56                | 3.83      |
| 70              | 3.49                | 1.40      |
| 75              | 2.29                | 1.17      |
| 103             | 1.65                | 1.26      |
| 131             | 2.37                | 1.28      |
| 137             | 3.66                | 1.98      |
| 143             | 7.29                | 4.56      |
| 150             | 13.21               | 10.19     |
| 170             | 27.25               | 28.96     |
| 210             | 43.79               | 62.05     |
| 650             | 90.23               | 157.93    |
| 1000            | 77.43               | 108.58    |
| 2000            | 60.02               | 59.91     |



## 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.
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# Metal Shield Band Pass Filter

**RBP-98+**

## Typical Performance Data

| FREQ.<br>(MHz) | INSERTION LOSS<br>(dB) |          |          | INPUT RETURN LOSS<br>(dB) |          |          | OUTPUT RETURN LOSS<br>(dB) |          |          |
|----------------|------------------------|----------|----------|---------------------------|----------|----------|----------------------------|----------|----------|
|                | @ -40° C               | @ +25° C | @ +85° C | @ -40° C                  | @ +25° C | @ +85° C | @ -40° C                   | @ +25° C | @ +85° C |
| 0.5            | 77.47                  | 88.55    | 86.24    | 0.021                     | 0.008    | 0.008    | 0.010                      | 0.017    | 0.011    |
| 10             | 81.43                  | 94.18    | 89.87    | 0.007                     | 0.007    | 0.010    | 0.005                      | 0.002    | 0.008    |
| 20             | 78.35                  | 89.64    | 79.31    | 0.02                      | 0.01     | 0.01     | 0.005                      | 0.01     | 0.02     |
| 30             | 69.25                  | 68.57    | 69.64    | 0.03                      | 0.04     | 0.06     | 0.03                       | 0.05     | 0.05     |
| 40             | 52.01                  | 51.89    | 51.63    | 0.09                      | 0.12     | 0.15     | 0.09                       | 0.12     | 0.13     |
| 45             | 43.93                  | 43.75    | 43.64    | 0.14                      | 0.18     | 0.20     | 0.14                       | 0.18     | 0.21     |
| 55             | 27.29                  | 27.07    | 26.87    | 0.43                      | 0.52     | 0.59     | 0.43                       | 0.53     | 0.61     |
| 70             | 2.94                   | 3.24     | 3.45     | 16.94                     | 17.57    | 18.00    | 16.96                      | 17.34    | 17.58    |
| 75             | 2.03                   | 2.28     | 2.47     | 19.58                     | 19.57    | 19.58    | 19.50                      | 19.43    | 19.41    |
| 80             | 1.70                   | 1.94     | 2.11     | 25.28                     | 25.24    | 25.23    | 26.54                      | 25.63    | 25.10    |
| 90             | 1.47                   | 1.68     | 1.82     | 23.65                     | 24.13    | 24.47    | 24.11                      | 24.69    | 25.21    |
| 100            | 1.42                   | 1.63     | 1.76     | 22.59                     | 22.14    | 21.71    | 23.26                      | 22.95    | 22.67    |
| 103            | 1.46                   | 1.65     | 1.81     | 19.55                     | 19.37    | 19.20    | 19.75                      | 19.65    | 19.55    |
| 110            | 1.52                   | 1.73     | 1.88     | 18.51                     | 18.62    | 18.63    | 17.90                      | 17.99    | 18.01    |
| 120            | 1.62                   | 1.87     | 2.02     | 28.81                     | 29.70    | 30.10    | 22.08                      | 22.27    | 22.24    |
| 130            | 2.07                   | 2.39     | 2.61     | 19.50                     | 18.93    | 18.44    | 30.91                      | 31.78    | 31.12    |
| 131            | 2.19                   | 2.49     | 2.75     | 18.25                     | 17.60    | 17.04    | 28.61                      | 27.32    | 26.14    |
| 137            | 3.66                   | 4.10     | 4.44     | 8.52                      | 8.36     | 8.20     | 9.71                       | 9.60     | 9.49     |
| 150            | 13.47                  | 13.88    | 14.19    | 1.48                      | 1.61     | 1.70     | 1.58                       | 1.73     | 1.84     |
| 160            | 21.22                  | 21.50    | 21.74    | 0.76                      | 0.85     | 0.92     | 0.79                       | 0.90     | 0.99     |
| 170            | 27.50                  | 27.75    | 27.92    | 0.52                      | 0.60     | 0.66     | 0.53                       | 0.62     | 0.69     |
| 180            | 32.71                  | 32.90    | 33.06    | 0.39                      | 0.46     | 0.50     | 0.39                       | 0.47     | 0.52     |
| 190            | 37.12                  | 37.29    | 37.39    | 0.33                      | 0.38     | 0.43     | 0.31                       | 0.39     | 0.44     |
| 200            | 40.92                  | 41.00    | 41.08    | 0.28                      | 0.33     | 0.38     | 0.25                       | 0.34     | 0.37     |
| 210            | 44.19                  | 44.27    | 44.39    | 0.23                      | 0.28     | 0.32     | 0.22                       | 0.29     | 0.34     |
| 300            | 61.49                  | 61.43    | 61.39    | 0.11                      | 0.17     | 0.21     | 0.09                       | 0.16     | 0.22     |
| 400            | 68.43                  | 69.73    | 70.30    | 0.09                      | 0.15     | 0.21     | 0.04                       | 0.13     | 0.20     |
| 500            | 75.62                  | 74.42    | 77.51    | 0.08                      | 0.14     | 0.21     | 0.04                       | 0.15     | 0.20     |
| 600            | 92.57                  | 82.35    | 83.12    | 0.08                      | 0.17     | 0.24     | 0.04                       | 0.18     | 0.25     |
| 650            | 89.78                  | 98.35    | 86.52    | 0.08                      | 0.16     | 0.22     | 0.04                       | 0.15     | 0.28     |
| 700            | 79.54                  | 83.62    | 86.15    | 0.10                      | 0.18     | 0.27     | 0.06                       | 0.19     | 0.30     |
| 800            | 79.49                  | 106.87   | 79.08    | 0.12                      | 0.21     | 0.29     | 0.07                       | 0.21     | 0.33     |
| 900            | 78.84                  | 80.58    | 90.70    | 0.13                      | 0.22     | 0.32     | 0.09                       | 0.25     | 0.36     |
| 1000           | 79.64                  | 84.60    | 78.05    | 0.15                      | 0.25     | 0.35     | 0.11                       | 0.29     | 0.40     |
| 1200           | 76.75                  | 82.36    | 100.94   | 0.18                      | 0.30     | 0.40     | 0.12                       | 0.33     | 0.47     |
| 1500           | 76.96                  | 74.30    | 77.97    | 0.19                      | 0.33     | 0.44     | 0.15                       | 0.38     | 0.54     |
| 1800           | 68.42                  | 64.19    | 65.53    | 0.24                      | 0.37     | 0.49     | 0.18                       | 0.42     | 0.58     |
| 2000           | 67.67                  | 64.83    | 67.94    | 0.25                      | 0.39     | 0.50     | 0.18                       | 0.42     | 0.60     |
| 2200           | 59.20                  | 58.71    | 58.97    | 0.26                      | 0.41     | 0.50     | 0.17                       | 0.45     | 0.62     |
| 2500           | 58.96                  | 56.88    | 56.23    | 0.27                      | 0.41     | 0.54     | 0.20                       | 0.46     | 0.64     |
| 2800           | 46.82                  | 46.44    | 47.51    | 0.27                      | 0.44     | 0.58     | 0.13                       | 0.44     | 0.63     |
| 3000           | 47.06                  | 46.32    | 47.23    | 0.28                      | 0.46     | 0.62     | 0.12                       | 0.43     | 0.64     |
| 3200           | 43.42                  | 42.05    | 42.24    | 0.28                      | 0.47     | 0.65     | 0.16                       | 0.48     | 0.72     |
| 3500           | 40.88                  | 38.13    | 39.79    | 0.37                      | 0.65     | 0.86     | 0.32                       | 0.91     | 1.20     |
| 3800           | 32.25                  | 31.32    | 31.81    | 0.51                      | 0.80     | 1.04     | 0.26                       | 0.70     | 0.98     |
| 4000           | 28.88                  | 28.25    | 28.40    | 0.75                      | 1.16     | 1.72     | 0.25                       | 0.70     | 1.07     |
| 4200           | 25.06                  | 24.72    | 26.10    | 2.09                      | 3.53     | 4.23     | 0.45                       | 0.93     | 1.34     |
| 4500           | 31.90                  | 35.89    | 41.25    | 2.19                      | 1.83     | 1.90     | 0.58                       | 1.12     | 1.55     |
| 4800           | 33.26                  | 30.80    | 29.68    | 0.94                      | 1.27     | 1.60     | 1.04                       | 1.94     | 2.61     |
| 5000           | 23.76                  | 22.73    | 22.95    | 1.11                      | 1.59     | 2.04     | 2.60                       | 5.10     | 7.01     |
| 5200           | 17.56                  | 18.99    | 20.70    | 1.92                      | 3.17     | 3.89     | 23.30                      | 12.28    | 9.73     |
| 5500           | 26.30                  | 33.64    | 36.57    | 5.32                      | 3.78     | 3.87     | 2.65                       | 2.99     | 3.49     |
| 5800           | 40.98                  | 39.27    | 39.80    | 2.47                      | 2.81     | 3.00     | 1.91                       | 2.49     | 2.93     |
| 6000           | 37.85                  | 38.58    | 42.56    | 1.19                      | 1.49     | 1.79     | 0.93                       | 1.50     | 2.00     |

REV. X2

RBP-98+

101006

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## Typical Performance Data

| FREQ.<br>(MHz) | GROUP DELAY<br>(nsec) |          |          |
|----------------|-----------------------|----------|----------|
|                | @ -40° C              | @ +25° C | @ +85° C |
| 75             | 28.86                 | 28.47    | 28.16    |
| 80             | 23.15                 | 23.02    | 22.90    |
| 85             | 20.16                 | 20.06    | 19.98    |
| 90             | 18.31                 | 18.27    | 18.23    |
| 95             | 17.16                 | 17.10    | 17.09    |
| 100            | 16.33                 | 16.26    | 16.25    |
| 103            | 15.93                 | 15.90    | 15.89    |
| 110            | 15.54                 | 15.53    | 15.58    |
| 115            | 15.77                 | 15.81    | 15.83    |
| 120            | 16.35                 | 16.36    | 16.40    |
| 125            | 17.33                 | 17.43    | 17.51    |
| 130            | 19.40                 | 19.41    | 19.47    |
| 131            | 19.90                 | 19.89    | 19.91    |
| 132            | 20.44                 | 20.40    | 20.34    |
| 133            | 20.95                 | 20.83    | 20.77    |
| 134            | 21.34                 | 21.16    | 21.07    |
| 135            | 21.67                 | 21.45    | 21.28    |
| 136            | 21.80                 | 21.56    | 21.35    |
| 137            | 21.83                 | 21.50    | 21.24    |
| 138            | 21.70                 | 21.27    | 20.97    |
| 139            | 21.25                 | 20.83    | 20.49    |
| 140            | 20.70                 | 20.23    | 19.94    |
| 145            | 16.03                 | 15.68    | 15.39    |
| 150            | 11.26                 | 11.10    | 10.96    |
| 155            | 8.11                  | 8.02     | 8.00     |
| 158            | 6.79                  | 6.78     | 6.71     |
| 159            | 6.52                  | 6.47     | 6.44     |
| 160            | 6.15                  | 6.14     | 6.08     |
| 161            | 5.85                  | 5.83     | 5.82     |
| 162            | 5.56                  | 5.60     | 5.56     |
| 163            | 5.27                  | 5.30     | 5.27     |
| 164            | 5.15                  | 5.15     | 5.15     |
| 165            | 4.89                  | 4.82     | 4.82     |
| 170            | 3.99                  | 3.97     | 4.00     |
| 175            | 3.30                  | 3.36     | 3.33     |
| 180            | 2.91                  | 2.90     | 2.95     |
| 185            | 2.54                  | 2.54     | 2.61     |
| 190            | 2.36                  | 2.31     | 2.32     |
| 195            | 1.90                  | 1.89     | 2.12     |
| 196            | 2.09                  | 2.06     | 1.97     |
| 197            | 1.94                  | 1.91     | 1.98     |
| 198            | 1.99                  | 1.86     | 1.88     |
| 199            | 2.14                  | 2.01     | 2.03     |
| 200            | 1.53                  | 2.08     | 1.73     |
| 201            | 1.77                  | 1.66     | 1.91     |
| 202            | 1.68                  | 1.71     | 1.73     |
| 203            | 1.58                  | 1.96     | 1.70     |
| 204            | 1.86                  | 1.97     | 1.65     |
| 205            | 1.58                  | 1.79     | 1.65     |
| 210            | 1.22                  | 1.57     | 1.27     |
| 220            | 1.50                  | 1.30     | 1.23     |
| 230            | 1.30                  | 1.83     | 1.69     |
| 240            | 0.60                  | 0.60     | 1.02     |
| 250            | 1.30                  | 1.02     | 0.70     |

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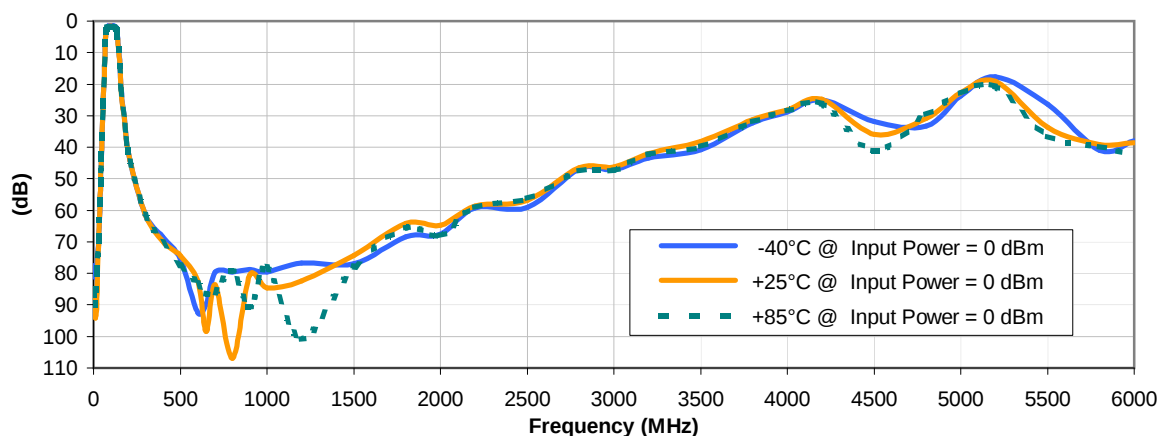


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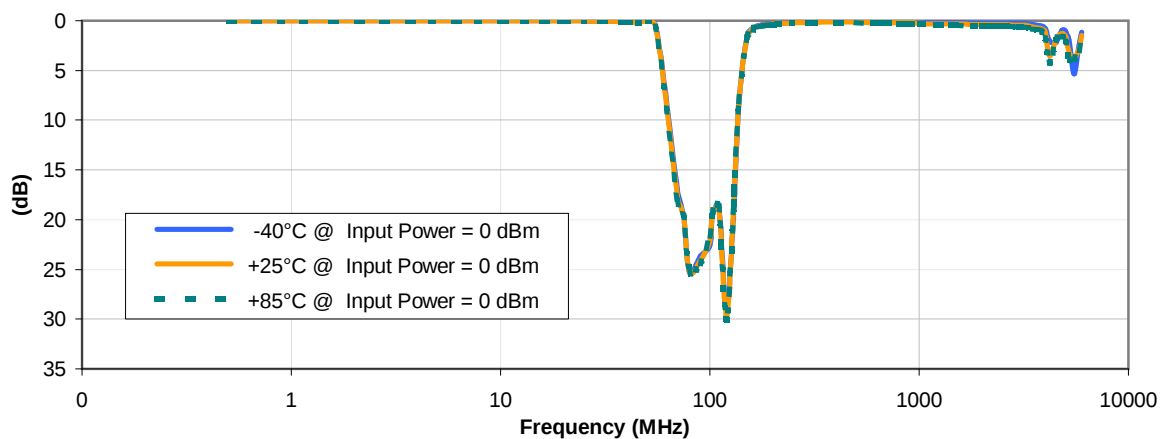


## Typical Performance Curves

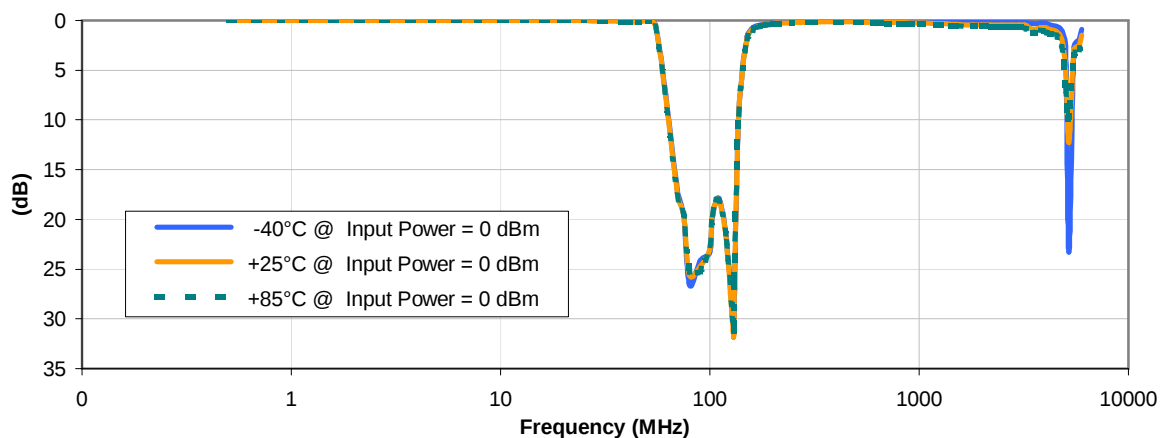
INSERTION LOSS vs. TEMPERATURE



INPUT RETURN LOSS vs. TEMPERATURE



OUTPUT RETURN LOSS vs. TEMPERATURE



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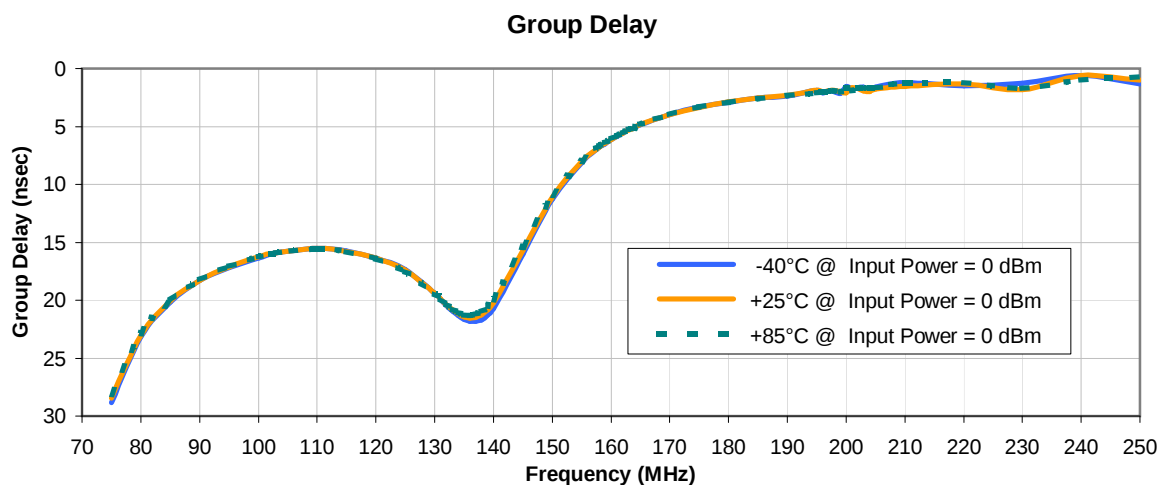
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## Typical Performance Curves



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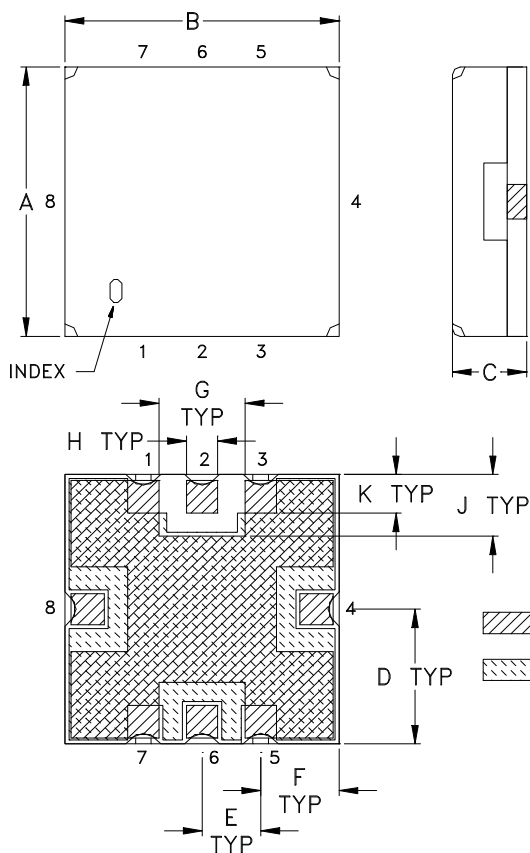


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## Outline Dimensions

GP731



| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              | L              | M              |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| GP731  | .350<br>(8.89) | .350<br>(8.89) | .100<br>(2.54) | .175<br>(4.45) | .075<br>(1.91) | .100<br>(2.54) | .110<br>(2.79) | .040<br>(1.02) | .080<br>(2.03) | .050<br>(1.27) | .040<br>(1.02) | .195<br>(4.95) |

| CASE # | N              | P              | Q              | R              | WT. GRAM           |
|--------|----------------|----------------|----------------|----------------|--------------------|
| GP731  | .390<br>(9.91) | .120<br>(3.05) | .390<br>(9.91) | .070<br>(1.78) | .4<br>+0.3<br>-0.0 |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3Pl.  $\pm .015$

### Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:

For RoHS Case Styles: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate.  
For RoHS-5 Case Styles: Tin-Lead plate.



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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F78



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note |
|-------------------|----------------------------|----------------------|------------------------------|
| 16                | 12                         | 7                    | 10                           |
|                   |                            |                      | 20                           |
|                   |                            |                      | 50                           |
|                   |                            |                      | 100                          |
|                   |                            |                      | 200                          |
|                   |                            | 13                   | 500, 1000                    |

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

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

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THIRD ANGLE PROJECTION

| REVISIONS |         |                                      |          |     |      |
|-----------|---------|--------------------------------------|----------|-----|------|
| REV       | ECN No. | DESCRIPTION                          | DATE     | DR  | AUTH |
| OR        | R59289  | NEW RELEASE (FROM RAVON)             | 02/05    | DK  | HH   |
| A         | M101151 | ADDED "RBP" & CORRECTED PIN          | 10/10/05 | MMG | DJ   |
|           |         | CONNECTION TO DESCRIPTION OF PL-DWG. |          |     |      |
| B         | M102713 | UPDATED NOTES, ADDED "...WITH SMOBC" | 01/20/06 | GT  | IL   |

SUGGESTED MOUNTING CONFIGURATION

FOR GP731 CASE STYLE, "qf" PIN CONNECTION.



- NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025" ± .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

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS ±

3 PL DECIMALS ± .005

ANGLES ±

FRACTIONS ±

INITIALS

DATE

DRAWN DK (RAVON) 10 FEB 05

CHECKED RZ (RAVON) 10 FEB 05

APPROVED HH (RAVON) 10 FEB 05

Mini-Circuits®

13 Neptune Avenue

Brooklyn NY 11235

PL, qf, GP731, RBP, TB-332

SIZE A

CODE IDENT 15542

DRAWING NO: 98-PL-176

REV: B

FILE: 98PL176

SCALE: 5:1

SHEET: 1 OF 1

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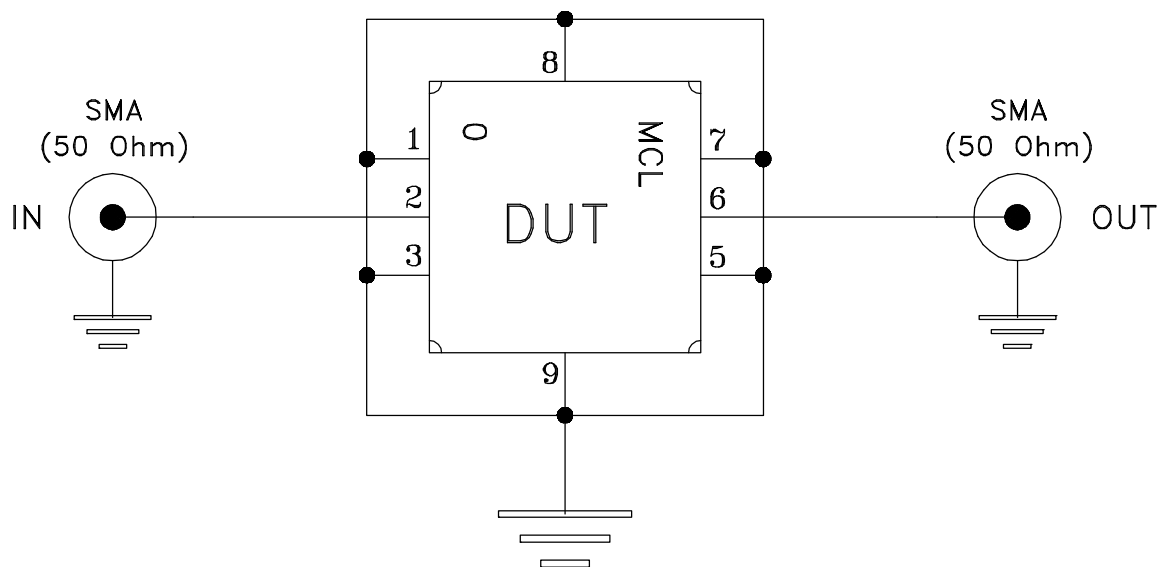
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ASHEETA1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit



TB-332



Schematic Diagram

## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.020 inch.

 **Mini-Circuits®**



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                                                                          |
| HAST                           | 130°C, 85% RH, 96 hours                                                                                                                                         | JESD22-A110                                                                                          |
| 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 Eutectic Process: 225°C peak<br>Pb-Free Process, 245°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, 20-2000 Hz, 4 times in each of three axes (total 12)                                                                                                  | MIL-STD-883, Method 2007.3, Condition A                                                              |
| 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                                                                              |