

# Surface Mount Bandpass Filter

## RBPF-485+

50Ω 435 to 535 MHz



Generic photo used for illustration purposes only  
CASE STYLE: CK605

### The Big Deal

- Better passband insertion loss and return loss
- High rejection
- Miniature shielded package

### Product Overview

The RBPF-485+ is a 50Ω bandpass filter fabricated using SMT technology. This bandpass filter covers from 435-535 MHz. This filter is built with high Q capacitors, chip inductors and wire wound inductors for superior performance. In addition it has repeatable performance across production lots and consistent performance across temperature.

### Key Features

| Feature                              | Advantages   |
|--------------------------------------|--|
| Low insertion loss                   | Can be used in high performance applications such as radio astronomy.                                |
| Good rejection                       | This enables the filter to attenuate spurious signals and reject harmonics for broad frequency band. |
| Small size, 0.500" x 0.500" x 0.180" | The small surface mount package enables the RBPF-485+ to be used in compact designs.                 |

#### Notes

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### Features

- Better passband insertion loss and return loss
- High rejection
- Miniature shielded package

### Applications

- Military-aircraft
- Marine communication

### Electrical Specifications at 25°C

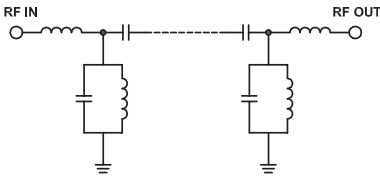
| Parameter        | F#               | Frequency (MHz) | Min.     | Typ. | Max. | Unit |    |
|------------------|------------------|-----------------|----------|------|------|------|----|
| Pass Band        | Center Frequency | —               | —        | 485  | —    | MHz  |    |
|                  | Insertion Loss   | F1-F2           | 435-535  | —    | 1.3  | 2.5  | dB |
|                  | VSWR             | F1-F2           | 435-535  | —    | 1.3  | 1.67 | :1 |
| Stop Band, Lower | Insertion Loss   | DC-F3           | DC-320   | 20   | 30   | —    | dB |
|                  | VSWR             | DC-F3           | DC-320   | —    | 20   | —    | :1 |
| Stop Band, Upper | Insertion Loss   | F4-F5           | 700-3700 | 20   | 30   | —    | dB |
|                  | VSWR             | F4-F5           | 700-3700 | —    | 20   | —    | :1 |

### Maximum Ratings

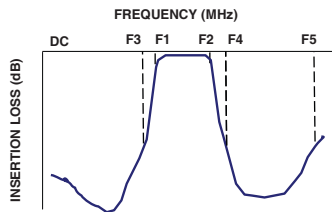
|                       |                |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| RF Power Input        | 5W max.        |

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

### Functional Schematic



### Typical Frequency Response

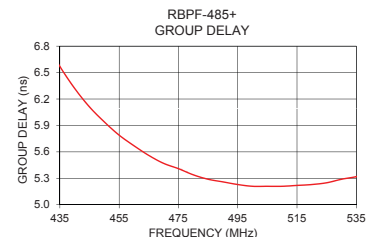
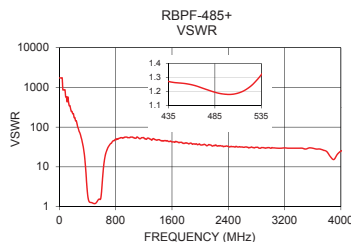
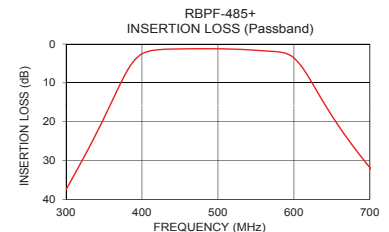
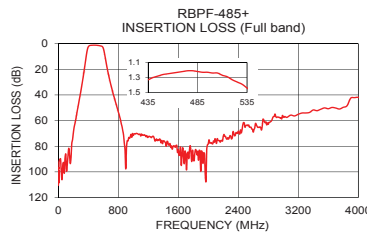


### Typical Performance Data at 25°C

| Frequency (MHz) | Insertion Loss (dB) | VSWR (:1) | Frequency (MHz) | Group Delay (nsec) |
|-----------------|---------------------|-----------|-----------------|--------------------|
| 1               | 110.48              | 1737.18   | 435             | 6.57               |
| 240             | 56.89               | 144.77    | 440             | 6.32               |
| 320             | 30.41               | 46.96     | 445             | 6.11               |
| 355             | 16.98               | 20.70     | 450             | 5.94               |
| 375             | 8.87                | 8.35      | 455             | 5.79               |
| 390             | 4.19                | 3.44      | 460             | 5.67               |
| 405             | 2.09                | 1.79      | 465             | 5.56               |
| 435             | 1.33                | 1.27      | 470             | 5.47               |
| 455             | 1.25                | 1.26      | 475             | 5.41               |
| 485             | 1.22                | 1.20      | 480             | 5.34               |
| 520             | 1.33                | 1.22      | 485             | 5.29               |
| 535             | 1.44                | 1.32      | 490             | 5.26               |
| 600             | 3.58                | 2.42      | 500             | 5.21               |
| 620             | 8.75                | 7.00      | 505             | 5.21               |
| 650             | 18.48               | 18.50     | 510             | 5.21               |
| 700             | 31.82               | 32.79     | 515             | 5.22               |
| 830             | 59.46               | 49.64     | 520             | 5.23               |
| 1330            | 74.85               | 51.10     | 525             | 5.25               |
| 2500            | 64.01               | 31.60     | 530             | 5.29               |
| 3700            | 50.23               | 28.03     | 535             | 5.32               |

### +RoHS Compliant

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



### Notes

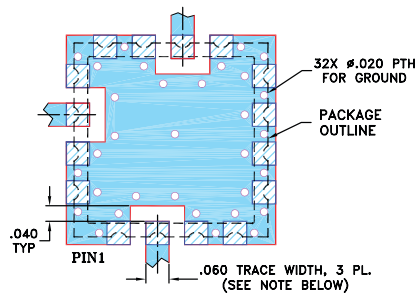
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## Pad Connections

|               |                                |
|---------------|--------------------------------|
| INPUT         | 2                              |
| OUTPUT        | 10                             |
| NOT CONNECTED | 14                             |
| GROUND        | 1,3,4,5,6,7,8,9,11,12,13,15,16 |

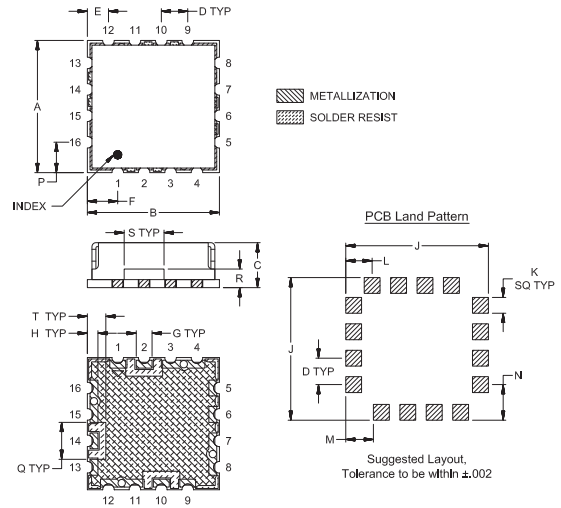
**Demo Board MCL P/N: TB-10**  
**Suggested PCB Layout (PL-012)**



- NOTES:**
- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS  $.030 \pm .002$ ; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
  - 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

## Outline Drawing



## Outline Dimensions (inch / mm)

| A    | B    | C    | D    | E    | F    | G    | H    | J     |       |  |
|------|------|------|------|------|------|------|------|-------|-------|--|
| .500 | .500 | .180 | .100 | .080 | .115 | .060 | .040 | .540  |       |  |
| 12.7 | 12.7 | 4.57 | 2.54 | 2.03 | 2.92 | 1.52 | 1.02 | 13.72 |       |  |
| K    | L    | M    | N    | P    | Q    | R    | S    | T     | wt.   |  |
| .060 | .100 | .135 | .135 | .115 | .140 | .070 | .150 | .070  | grams |  |
| 1.52 | 2.54 | 3.43 | 3.43 | 2.92 | 3.56 | 1.78 | 3.81 | 1.78  | 1.0   |  |

*Note: Please refer to case style drawing for details*

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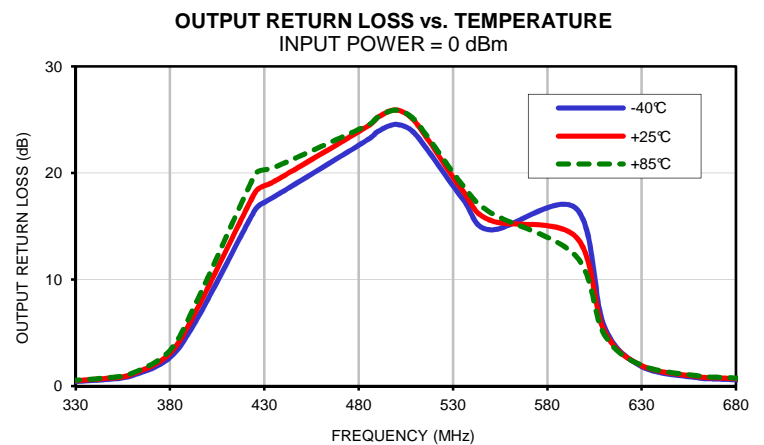
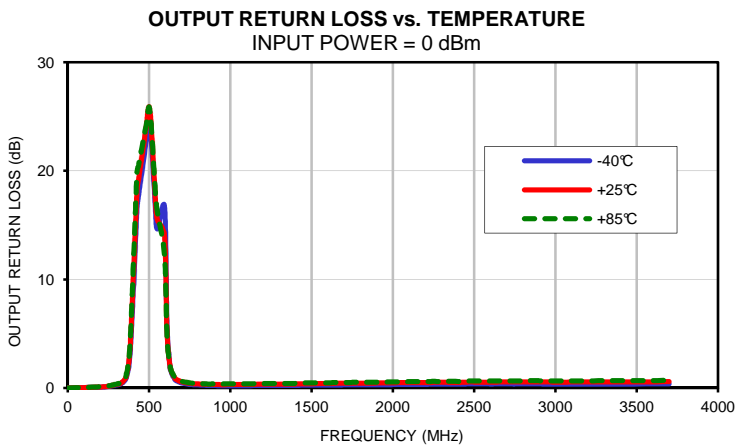
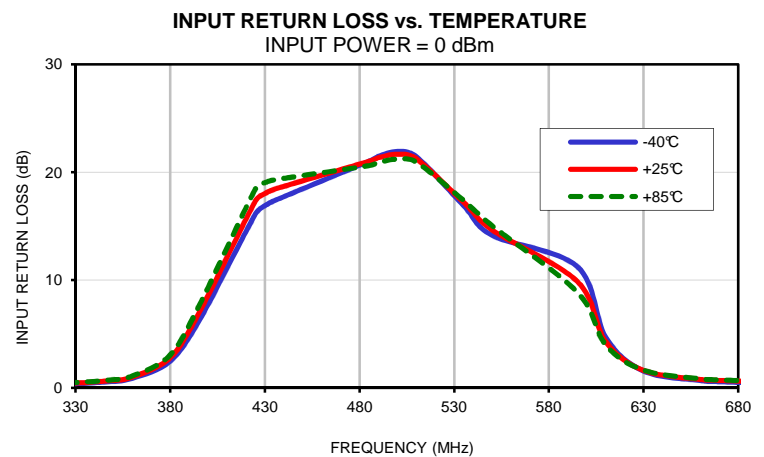
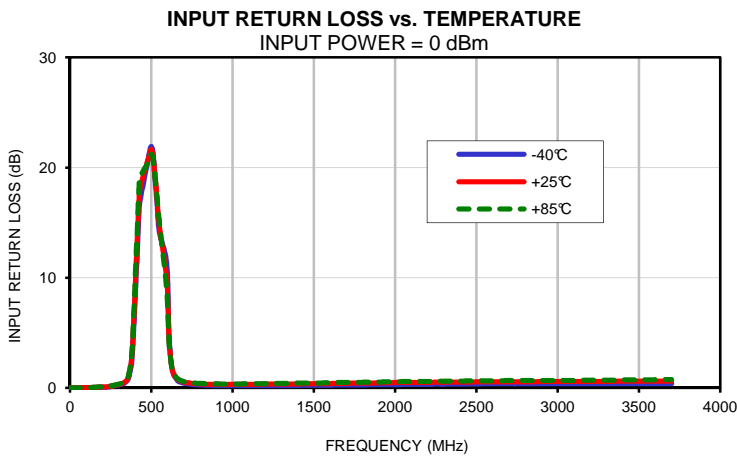
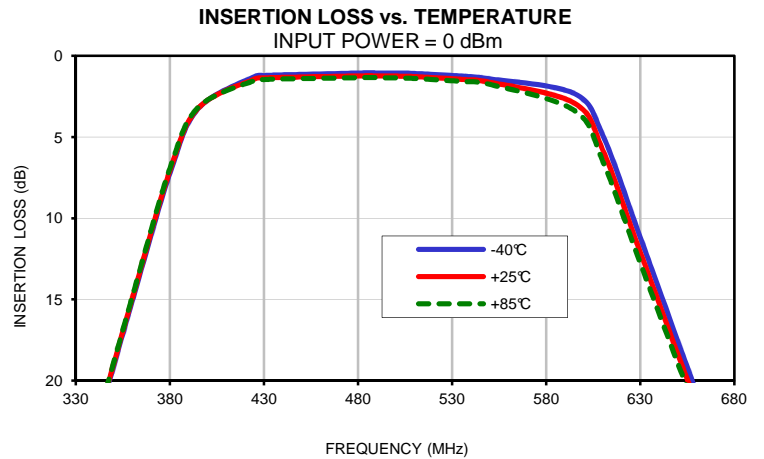
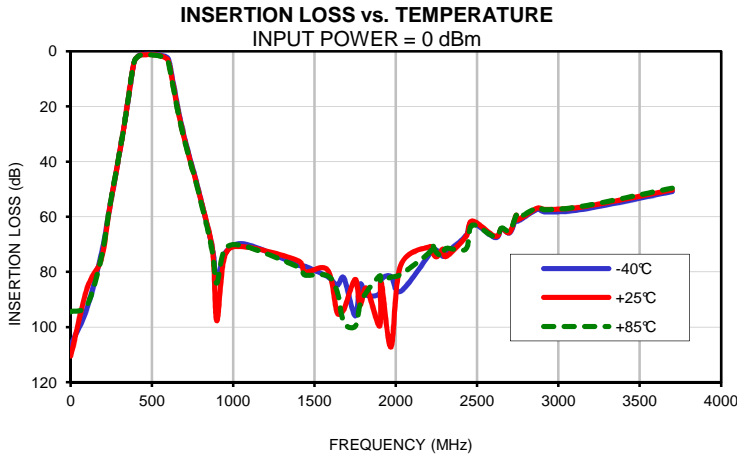
*Typical Performance Data*

| FREQ.<br><br>(MHz) | INSERTION LOSS |        |        | INPUT RETURN LOSS |        |        | OUTPUT RETURN LOSS |        |        |
|--------------------|----------------|--------|--------|-------------------|--------|--------|--------------------|--------|--------|
|                    | (dB)           |        |        | (dB)              |        |        | (dB)               |        |        |
|                    | @-40°C         | @+25°C | @+85°C | @-40°C            | @+25°C | @+85°C | @-40°C             | @+25°C | @+85°C |
| 1                  | 106.42         | 110.48 | 94.43  | 0.00              | 0.00   | 0.00   | 0.00               | 0.00   | 0.00   |
| 100                | 93.36          | 86.20  | 92.20  | 0.02              | 0.03   | 0.03   | 0.03               | 0.03   | 0.04   |
| 190                | 73.13          | 75.08  | 74.42  | 0.06              | 0.08   | 0.10   | 0.06               | 0.08   | 0.10   |
| 240                | 56.76          | 56.89  | 56.51  | 0.10              | 0.12   | 0.15   | 0.11               | 0.14   | 0.16   |
| 320                | 30.47          | 30.41  | 30.34  | 0.33              | 0.37   | 0.42   | 0.33               | 0.39   | 0.43   |
| 325                | 28.66          | 28.61  | 28.53  | 0.36              | 0.41   | 0.45   | 0.37               | 0.44   | 0.48   |
| 345                | 21.12          | 21.01  | 20.93  | 0.55              | 0.63   | 0.69   | 0.59               | 0.69   | 0.74   |
| 360                | 15.09          | 14.93  | 14.83  | 0.90              | 1.02   | 1.11   | 0.97               | 1.11   | 1.20   |
| 380                | 7.22           | 7.06   | 6.92   | 2.49              | 2.81   | 3.06   | 2.66               | 3.06   | 3.34   |
| 395                | 3.25           | 3.22   | 3.17   | 6.17              | 6.91   | 7.54   | 6.50               | 7.45   | 8.25   |
| 425                | 1.27           | 1.42   | 1.51   | 16.13             | 17.33  | 18.45  | 16.50              | 18.14  | 19.83  |
| 430                | 1.21           | 1.36   | 1.46   | 16.89             | 18.01  | 19.03  | 17.24              | 18.79  | 20.29  |
| 435                | 1.18           | 1.33   | 1.43   | 17.36             | 18.42  | 19.29  | 17.73              | 19.17  | 20.49  |
| 485                | 1.04           | 1.22   | 1.33   | 21.02             | 21.01  | 20.61  | 23.14              | 24.41  | 24.50  |
| 490                | 1.05           | 1.23   | 1.34   | 21.47             | 21.35  | 20.91  | 23.87              | 25.21  | 25.22  |
| 500                | 1.05           | 1.24   | 1.35   | 21.92             | 21.66  | 21.21  | 24.55              | 25.91  | 25.89  |
| 510                | 1.08           | 1.27   | 1.39   | 21.44             | 21.25  | 20.93  | 23.65              | 24.79  | 24.90  |
| 535                | 1.24           | 1.44   | 1.57   | 16.89             | 17.20  | 17.38  | 17.58              | 18.35  | 18.87  |
| 550                | 1.41           | 1.62   | 1.75   | 14.15             | 14.65  | 15.04  | 14.65              | 15.53  | 16.26  |
| 595                | 2.32           | 2.91   | 3.36   | 11.25             | 9.87   | 8.88   | 16.70              | 14.02  | 12.22  |
| 610                | 4.85           | 5.76   | 6.45   | 4.70              | 4.29   | 3.99   | 5.68               | 5.23   | 4.88   |
| 630                | 11.16          | 12.07  | 12.74  | 1.57              | 1.63   | 1.65   | 1.83               | 1.91   | 1.93   |
| 660                | 20.74          | 21.46  | 21.98  | 0.69              | 0.79   | 0.85   | 0.76               | 0.87   | 0.94   |
| 670                | 23.54          | 24.23  | 24.71  | 0.58              | 0.70   | 0.75   | 0.65               | 0.76   | 0.82   |
| 700                | 31.22          | 31.82  | 32.23  | 0.43              | 0.53   | 0.58   | 0.46               | 0.56   | 0.61   |
| 740                | 40.19          | 40.76  | 41.10  | 0.34              | 0.44   | 0.48   | 0.34               | 0.44   | 0.49   |
| 770                | 46.39          | 46.93  | 47.28  | 0.29              | 0.38   | 0.43   | 0.30               | 0.39   | 0.44   |
| 860                | 68.06          | 67.87  | 69.14  | 0.23              | 0.33   | 0.37   | 0.23               | 0.32   | 0.36   |
| 880                | 74.35          | 77.35  | 76.48  | 0.22              | 0.32   | 0.36   | 0.22               | 0.31   | 0.36   |
| 900                | 83.57          | 97.70  | 83.99  | 0.22              | 0.33   | 0.37   | 0.22               | 0.32   | 0.37   |
| 950                | 73.18          | 73.91  | 71.56  | 0.21              | 0.31   | 0.36   | 0.20               | 0.30   | 0.36   |
| 1070               | 69.88          | 70.88  | 70.64  | 0.21              | 0.33   | 0.37   | 0.21               | 0.32   | 0.38   |
| 1400               | 77.52          | 75.93  | 78.26  | 0.22              | 0.36   | 0.43   | 0.23               | 0.36   | 0.42   |
| 1440               | 77.92          | 80.03  | 81.11  | 0.24              | 0.38   | 0.44   | 0.25               | 0.38   | 0.45   |
| 1580               | 81.71          | 79.27  | 81.38  | 0.24              | 0.39   | 0.46   | 0.25               | 0.40   | 0.46   |
| 1640               | 84.81          | 94.92  | 87.31  | 0.26              | 0.42   | 0.49   | 0.26               | 0.42   | 0.49   |
| 1680               | 82.17          | 93.60  | 98.38  | 0.26              | 0.41   | 0.49   | 0.27               | 0.43   | 0.50   |
| 1750               | 95.91          | 82.68  | 99.74  | 0.27              | 0.44   | 0.52   | 0.28               | 0.43   | 0.51   |
| 1780               | 84.51          | 91.96  | 91.83  | 0.27              | 0.44   | 0.51   | 0.28               | 0.45   | 0.52   |
| 1820               | 88.44          | 85.92  | 87.26  | 0.28              | 0.44   | 0.52   | 0.28               | 0.43   | 0.51   |
| 1900               | 87.89          | 99.65  | 81.46  | 0.29              | 0.46   | 0.54   | 0.29               | 0.45   | 0.53   |
| 1910               | 82.73          | 83.87  | 83.52  | 0.30              | 0.46   | 0.54   | 0.29               | 0.45   | 0.53   |
| 1970               | 81.63          | 107.25 | 81.87  | 0.31              | 0.48   | 0.56   | 0.29               | 0.46   | 0.54   |
| 2030               | 87.01          | 77.63  | 80.91  | 0.31              | 0.49   | 0.57   | 0.31               | 0.48   | 0.56   |
| 2210               | 73.28          | 70.82  | 72.77  | 0.33              | 0.51   | 0.60   | 0.32               | 0.49   | 0.58   |
| 2220               | 71.44          | 72.33  | 69.68  | 0.32              | 0.49   | 0.59   | 0.33               | 0.49   | 0.59   |
| 2250               | 72.13          | 74.54  | 73.00  | 0.35              | 0.52   | 0.62   | 0.34               | 0.51   | 0.60   |
| 2290               | 74.34          | 71.72  | 74.13  | 0.33              | 0.51   | 0.60   | 0.34               | 0.51   | 0.59   |
| 2310               | 73.10          | 74.36  | 71.46  | 0.34              | 0.52   | 0.61   | 0.34               | 0.51   | 0.60   |
| 2430               | 66.93          | 67.27  | 71.72  | 0.36              | 0.54   | 0.63   | 0.34               | 0.51   | 0.60   |
| 2470               | 62.15          | 61.55  | 63.03  | 0.36              | 0.54   | 0.64   | 0.37               | 0.54   | 0.64   |
| 2610               | 67.56          | 67.06  | 67.31  | 0.38              | 0.56   | 0.66   | 0.36               | 0.52   | 0.63   |
| 2650               | 64.34          | 64.35  | 64.10  | 0.37              | 0.55   | 0.65   | 0.37               | 0.54   | 0.65   |
| 2700               | 65.84          | 65.66  | 65.13  | 0.38              | 0.57   | 0.67   | 0.38               | 0.56   | 0.65   |
| 2740               | 60.65          | 59.49  | 59.50  | 0.36              | 0.56   | 0.65   | 0.36               | 0.54   | 0.65   |
| 2750               | 61.61          | 61.12  | 60.55  | 0.38              | 0.57   | 0.66   | 0.36               | 0.54   | 0.63   |
| 2870               | 57.30          | 56.87  | 56.68  | 0.38              | 0.57   | 0.69   | 0.39               | 0.56   | 0.67   |
| 2920               | 58.26          | 57.32  | 57.45  | 0.39              | 0.58   | 0.68   | 0.36               | 0.54   | 0.65   |
| 3150               | 57.31          | 56.41  | 56.16  | 0.38              | 0.59   | 0.69   | 0.35               | 0.54   | 0.65   |
| 3700               | 50.88          | 50.23  | 49.62  | 0.39              | 0.62   | 0.76   | 0.37               | 0.57   | 0.69   |

## Typical Performance Data

| FREQ.<br><br>(MHz) | GROUP DELAY |        |        |
|--------------------|-------------|--------|--------|
|                    | (nsec)      |        |        |
|                    | @-40°C      | @+25°C | @+85°C |
| 435                | 6.62        | 6.57   | 6.53   |
| 440                | 6.36        | 6.32   | 6.29   |
| 445                | 6.15        | 6.11   | 6.09   |
| 450                | 5.97        | 5.94   | 5.92   |
| 455                | 5.81        | 5.79   | 5.78   |
| 460                | 5.68        | 5.67   | 5.65   |
| 465                | 5.58        | 5.56   | 5.55   |
| 470                | 5.48        | 5.47   | 5.47   |
| 475                | 5.41        | 5.41   | 5.40   |
| 480                | 5.35        | 5.34   | 5.34   |
| 485                | 5.30        | 5.29   | 5.30   |
| 490                | 5.26        | 5.26   | 5.26   |
| 495                | 5.23        | 5.23   | 5.24   |
| 500                | 5.21        | 5.21   | 5.23   |
| 505                | 5.21        | 5.21   | 5.22   |
| 510                | 5.20        | 5.21   | 5.22   |
| 515                | 5.21        | 5.22   | 5.23   |
| 520                | 5.22        | 5.23   | 5.25   |
| 525                | 5.23        | 5.25   | 5.28   |
| 530                | 5.27        | 5.29   | 5.31   |
| 535                | 5.30        | 5.32   | 5.36   |

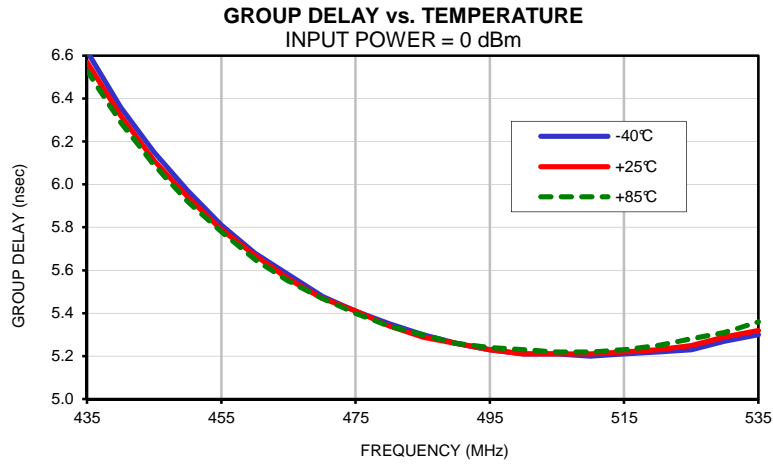
## Typical Performance Curves



# Band Pass Filter

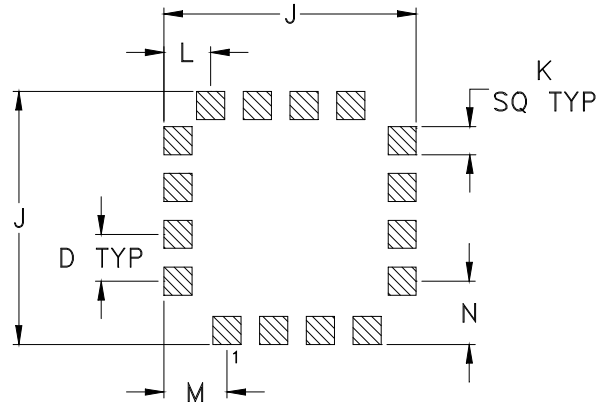
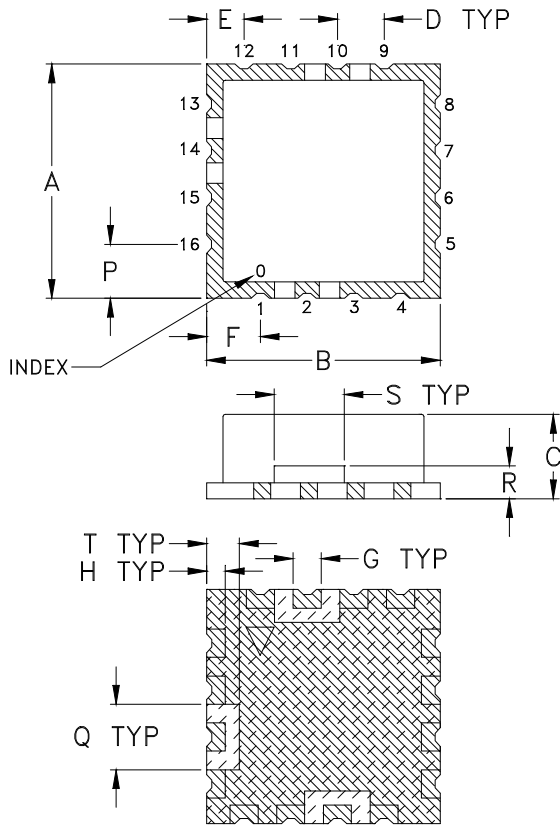
# RBPF-485+

## Typical Performance Curves



## Outline Dimensions

## PCB Land Pattern



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

| CASE # | A               | B               | C              | D              | E              | F              | G              | H              | J               | K              |
|--------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|----------------|
| CK605  | .500<br>(12.70) | .500<br>(12.70) | .180<br>(4.57) | .100<br>(2.54) | .080<br>(2.03) | .115<br>(2.92) | .060<br>(1.52) | .040<br>(1.02) | .540<br>(13.72) | .060<br>(1.52) |

| CASE # | L              | M              | N              | P              | Q              | R              | S              | T              | WT. GRAM            |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------------|
| CK605  | .100<br>(2.54) | .135<br>(3.43) | .135<br>(3.43) | .115<br>(2.92) | .140<br>(3.56) | .070<br>(1.78) | .150<br>(3.81) | .070<br>(1.78) | 1.2<br>+0.5<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.  
All models, (+) suffix.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site

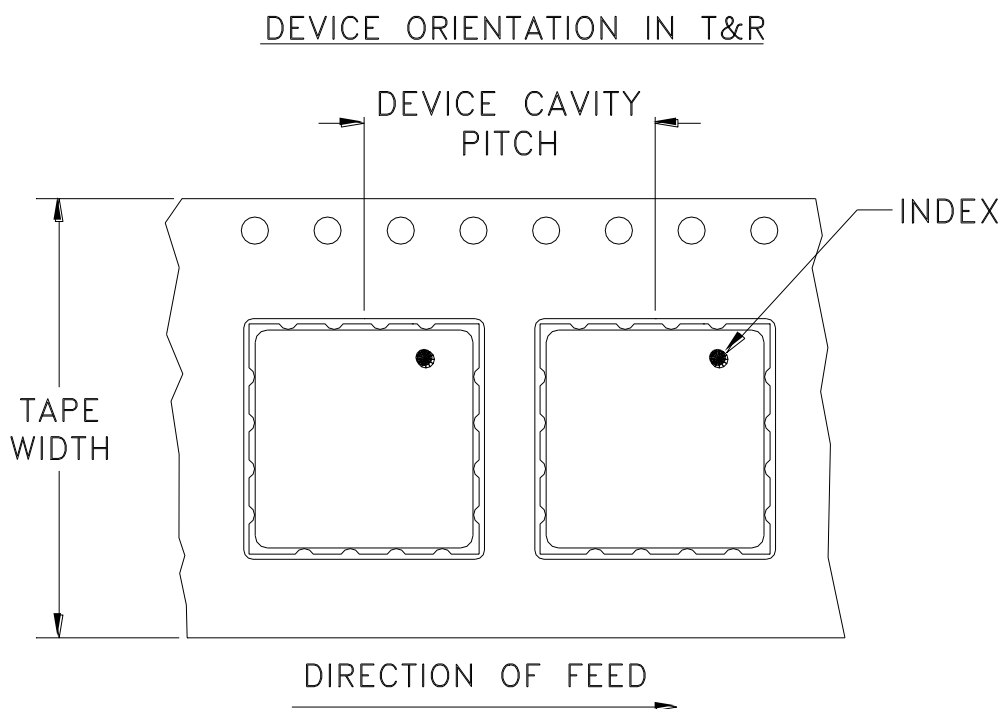


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RF/IF MICROWAVE COMPONENTS



# Tape & Reel Packaging TR-F37



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel                    |     |
|----------------|-------------------------|-------------------|-------------------------------------|-----|
| 24             | 16                      | 7                 | Small quantity standards (see note) | 10  |
|                |                         |                   |                                     | 20  |
|                |                         |                   |                                     | 50  |
|                |                         |                   |                                     | 100 |
|                |                         | 13                | Standard                            | 200 |
| 500            |                         |                   |                                     |     |

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.

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



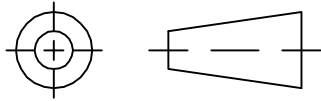
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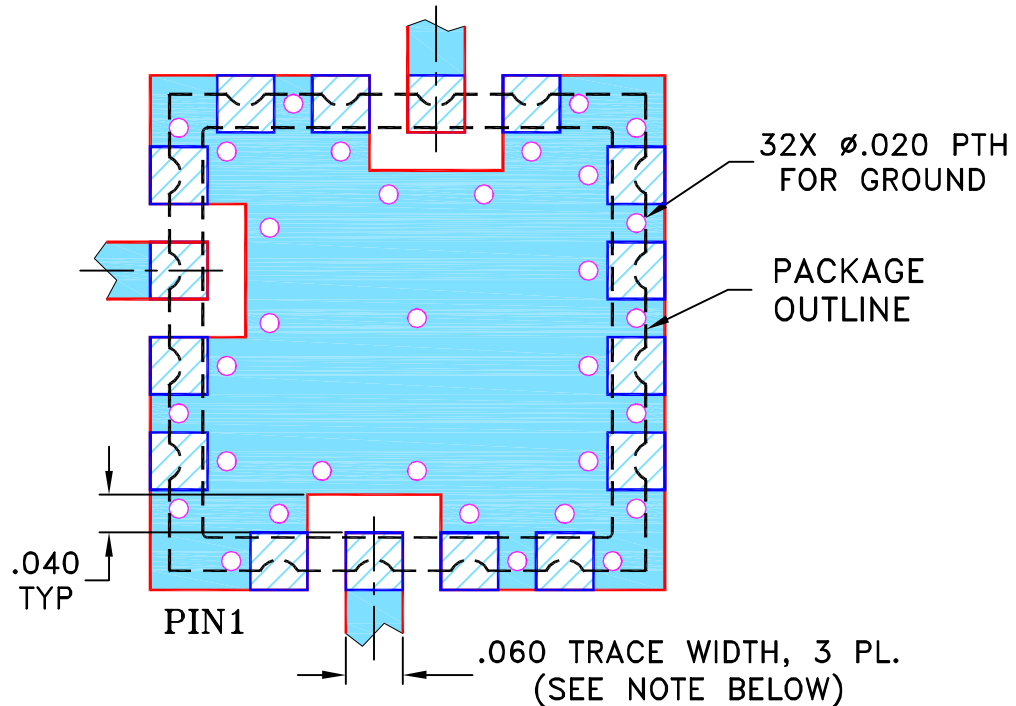
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION               | DATE     | DR  | AUTH |
|-----|---------|---------------------------|----------|-----|------|
| E   | M105563 | ADDED "r1" PIN CONNECTION | 06/02/06 | MMG | DJ   |
| F   | M105640 | CORRECTED NOTE 2          | 06/08/06 | MMG | MM   |
| G   | M124395 | ADDED "RAMP"              | 09/09    | EM  | HH   |
| G   | R77589  | ADDED "RAMP"              | 09/09    | EM  | HH   |

SUGGESTED MOUNTING CONFIGURATION FOR CK605 CASE STYLE, "kg/rl/16AM01" PIN CONNECTION

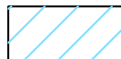


NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 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 BOTTOM IS CONTINUOUS GROUND PLANE.



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



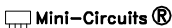
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

| UNLESS OTHERWISE SPECIFIED | INITIALS    | DATE     |
|----------------------------|-------------|----------|
| DIMENSIONS ARE IN INCHES   | DRAWN AV    | 08/07/00 |
| TOLERANCES ON:             | CHECKED SK  | 08/08/00 |
| 2 PL DECIMALS ±            | APPROVED DB | 08/08/00 |
| 3 PL DECIMALS ± .005       |             |          |
| ANGLES ±                   |             |          |
| FRACTIONS ±                |             |          |

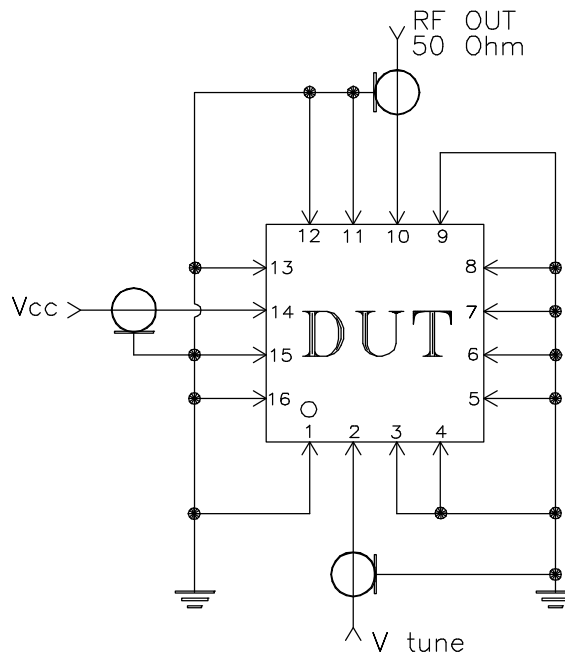
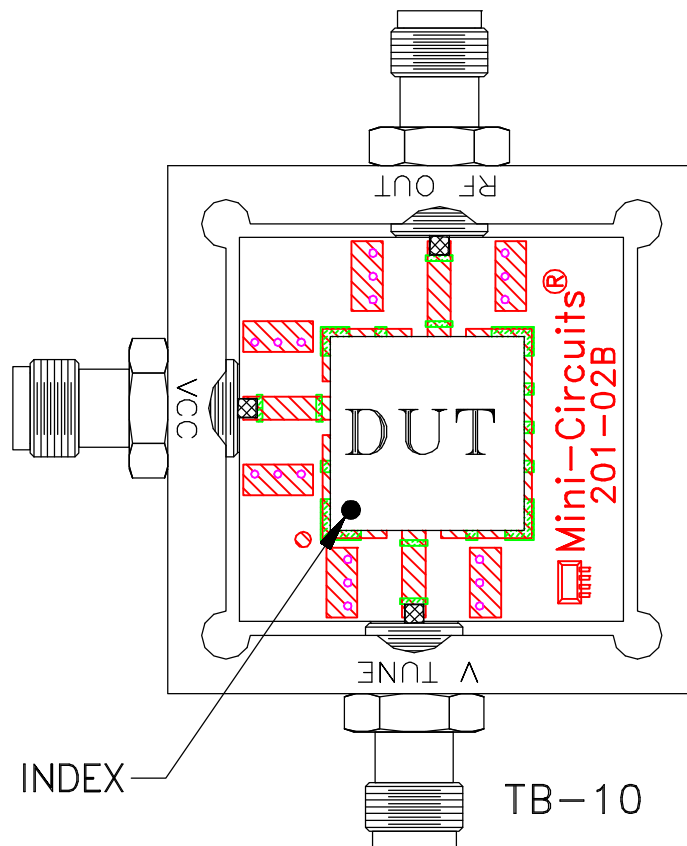
 **Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

PL,kg/rl/16AM01,CK605,ROS/LAVI/RAMP

|                  |                     |                          |           |
|------------------|---------------------|--------------------------|-----------|
| SIZE<br>A        | CODE IDENT<br>15542 | DRAWING NO:<br>98-PL-012 | REV:<br>G |
| FILE:<br>98PL012 | SCALE:<br>5:1       | SHEET:<br>1 OF 1         |           |

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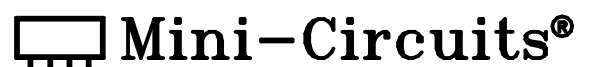
# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.030 inch.



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  |