LTCC SURFACE MOUNT

Thru-Line

50Ω  DC to 18 GHz

TPCG-183+

THE BIG DEAL

- Low Insertion Loss, 0.5dB Typ.
- Return Loss, 10dB Typ.
- 0805 Surface Mount Footprint
- Power Handling: 7.5 Watts
- Versatile “Place Holder” for Mini-Circuits LTCC Filters

APPLICATIONS

- Test and Measurement Equipment
- Communication, EW, Radar and ECM Defense Systems
- 5G MIMO and Back Haul Radio Systems
- Satellite Communications

PRODUCT OVERVIEW

TPCG-183+ is a miniature low temperature co-fired ceramic (LTCC) 50 Ohm transmission line with low insertion loss through 18 GHz acting as a place holder for Mini-Circuits LPF and HPF filters, on customer PCB. This model provides 0.5 dB typical insertion loss over a wide band due to its rugged monolithic construction. Housed in a tiny 0805 ceramic form factor with inspectable wrap-around terminations, the transmission line is ideal for dense signal chain PCB layouts where it complements MMIC size and performance. The LTCC fabrication process assures minimal RF performance variation while delivering a product that is well suited for environmental extremes of high humidity and temperature.

KEY FEATURES

<table>
<thead>
<tr>
<th>Features</th>
<th>Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footprint Compatible “Thru-Line” for Mini-Circuits, Low Pass (LPGE, LFCG series) and High Pass (HFCG series) filters with same Case Style and pad connections as TPCG-183+</td>
<td>Enables system designers the flexibility to plan to add LTCC filters to the PCB layout at a later stage in the design process, after system test results are available.</td>
</tr>
<tr>
<td>Good Power Handling, 7.5W</td>
<td>This enables the device to be used in high power applications</td>
</tr>
<tr>
<td>LTCC Construction</td>
<td>Provides repeatable performance in a rugged, ceramic package well suited for tough environments such as high humidity and temperature extremes.</td>
</tr>
<tr>
<td>Small Size, 0805</td>
<td>Saves space in dense circuit board layouts and minimizes the effects of parasitics.</td>
</tr>
<tr>
<td>Wrap-around Terminations</td>
<td>Provides excellent solderability and easy visual inspection.</td>
</tr>
</tbody>
</table>
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**ELECTRICAL SPECIFICATIONS**\(^{1,2,3}\) AT \(+25°C\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>F#</th>
<th>Frequency (GHz)</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pass Band</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>DC-F1</td>
<td>DC - 10</td>
<td>—</td>
<td>0.5</td>
<td>0.9</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td>F1-F2</td>
<td>10 - 15</td>
<td>—</td>
<td>0.5</td>
<td>1.1</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td>F2-F3</td>
<td>15 - 18</td>
<td>—</td>
<td>0.6</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Return Loss</td>
<td>DC-F1</td>
<td>DC - 10</td>
<td>—</td>
<td>12</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td>F1-F2</td>
<td>10 - 15</td>
<td>—</td>
<td>10</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td>F2-F3</td>
<td>15 - 18</td>
<td>—</td>
<td>9</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Group Delay</td>
<td>DC-F3</td>
<td>DC - 18</td>
<td>—</td>
<td>25</td>
<td>—</td>
<td>psec</td>
</tr>
</tbody>
</table>

1. DC blocking capacitors are required in applications where DC voltage and/or current is present at either input or output ports. Please contact Mini-Circuits for alternatives if DC pass from IN-OUT is required.
2. Measured on Mini-Circuits Evaluation Board TB-TPCG-183+
3. Bi-Directional, RF1 and RF2 ports can be interchanged, see S-parameters for actual performance

**ABSOLUTE MAXIMUM RATINGS**\(^3\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°C to +125°C</td>
</tr>
<tr>
<td>Input Power(^4)</td>
<td>7.5W @25°C</td>
</tr>
</tbody>
</table>

3. Permanent damage may occur if any of these limits are exceeded.
4. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 1.9W at +125°C.

**TYPICAL FREQUENCY RESPONSE**

![Graph showing typical frequency response](chart)
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**Thru-Line**

**TPCG-183+**

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**TYPICAL PERFORMANCE GRAPHS**

**TPCG-183+**

**INSERTION LOSS**

0.0

0.3

0.6

0.9

1.2

1.5

0 3000 6000 9000 12000 15000 18000

FREQUENCY (MHz)

- @-55°C
- @+25°C
- @+125°C

**RETURN LOSS**

0

10

20

30

40

50

0 3000 6000 9000 12000 15000 18000

FREQUENCY (MHz)

- @-55°C
- @+25°C
- @+125°C

**GROUP DELAY**

0

10

20

30

40

0 3000 6000 9000 12000 15000 18000

FREQUENCY (MHz)

- @-55°C
- @+25°C
- @+125°C
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Thru-Line
TPCG-183+
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FUNCTIONAL DIAGRAM

Figure 1. TPCG-183+ Functional Diagram

PAD DESCRIPTION

<table>
<thead>
<tr>
<th>Function</th>
<th>Pad Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF1(Note 2)</td>
<td>8</td>
<td>Connects to RF Input Port</td>
</tr>
<tr>
<td>RF2(Note 2)</td>
<td>4</td>
<td>Connects to RF Output Port</td>
</tr>
<tr>
<td>GROUND</td>
<td>1,2,3,5,6,7</td>
<td>Connects to Ground on PCB, (See drawing PL-429)</td>
</tr>
<tr>
<td>NC</td>
<td>–</td>
<td>No connection, not used internally. See drawing PL-429 for connection to PCB</td>
</tr>
</tbody>
</table>

PRODUCT MARKING*:

*Marking may contain other features or characters for internal lot control.

SUGGESTED PCB LAYOUT (PL-429)

Figure 2. Suggested PCB Layout PL-429

CASE STYLE DRAWING

MINCIRCUITS

NOTES:
1. COPLANAR WAVEGUIDE IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010 ± .001". COPPER: 1/2 OZ. EACH SIDE, FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES COPPER LAYER PATTERN FREE OF SOLDER MASK.

PRODUCT MARKING*: VS

*Marking may contain other features or characters for internal lot control.

Weight: .008 grams.
Dimensions are in inches (mm). Tolerances: 2Pl. ± .01; 3 Pl. ± .005
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**TPCG-183+**

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## ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.

| Performance Data and Graphs | Data  
|----------------------------|-------
|                             | Graphs
|                             | S-Parameter (S2P Files) Data Set (.zip file) De-embedded to device pads

| Case Style | GE0805C-2  
|------------|------------
|            | Lead Finish: Nickel-Tin

| RoHS Status | Compliant
|-------------|---------

| Tape and Reel | TR-F114
|--------------|---------

| Suggested Layout for PCB Design | 98-PL-429
|--------------------------------|---------

| Evaluation Board | TB-TPCG-183+
|------------------|-------------
| Gerber File      |-------------

| Environmental Rating | ENV126
|----------------------|--------

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**ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD.**

[CLICK HERE](#)

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### 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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)
Mini-Circuits:  
TPCG-183+