



LTCC SURFACE MOUNT

Thru-Line

TPCG-183+

50Ω DC to 18 GHz

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

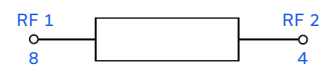


Generic photo used for illustration purposes only

APPLICATIONS

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

FUNCTIONAL DIAGRAM



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

Features	Advantages
Footprint Compatible "Thru-Line" for Mini-Circuits, Low Pass (LPGE, LFCE series) and High Pass (HFCE series) filters with same Case Style and pad connections as TPCG-183+	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.
Good Power Handling, 7.5W	This enables the device to be used in high power applications
LTCC Construction	Provides repeatable performance in a rugged, ceramic package well suited for tough environments such as high humidity and temperature extremes.
Small Size, 0805	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Wrap-around Terminations	Provides excellent solderability and easy visual inspection.



ELECTRICAL SPECIFICATIONS^{1,2,3} AT +25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Pass Band	Insertion Loss	DC-F1	DC - 10	—	0.5	0.9	dB
		F1-F2	10 - 15	—	0.5	1.1	
		F2-F3	15 - 18	—	0.6	—	
	Return Loss	DC-F1	DC - 10	—	12	—	dB
		F1-F2	10 - 15	—	10	—	
		F2-F3	15 - 18	—	9	—	
	Group Delay	DC-F3	DC - 18	—	25	—	psec

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+

2. Bi Directional, RF1 and RF2 ports can be interchanged, see S-parameters for actual performance

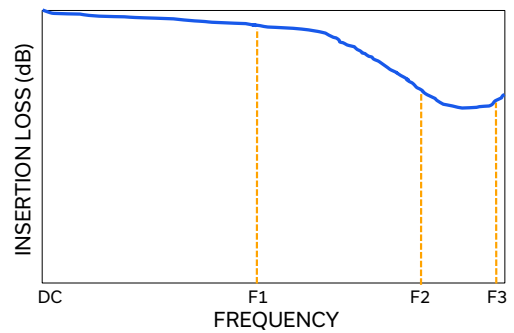
ABSOLUTE MAXIMUM RATINGS³

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power ⁴	7.5W @25°C

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

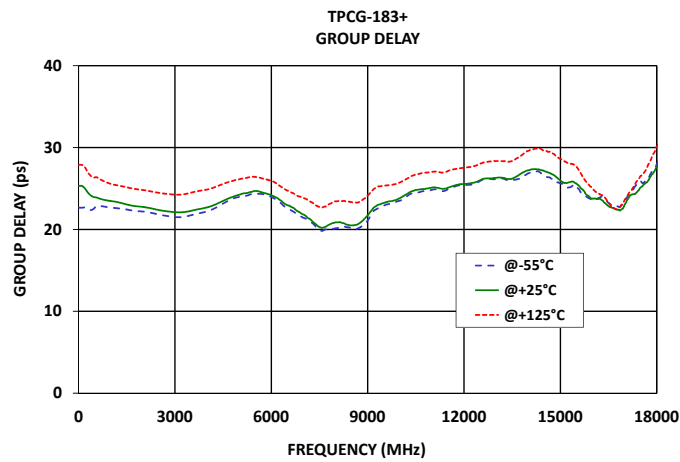
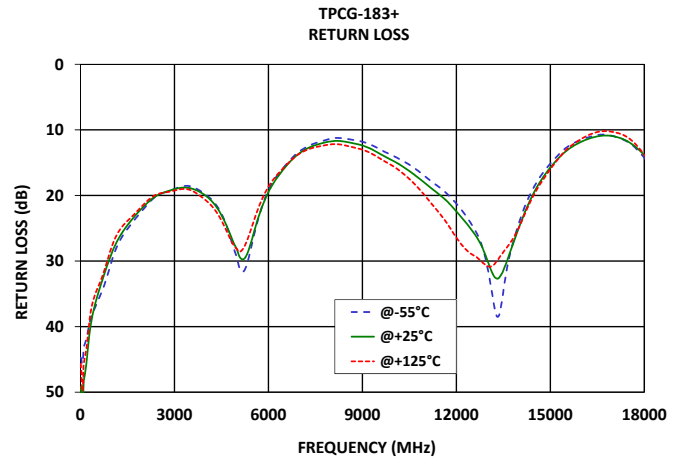
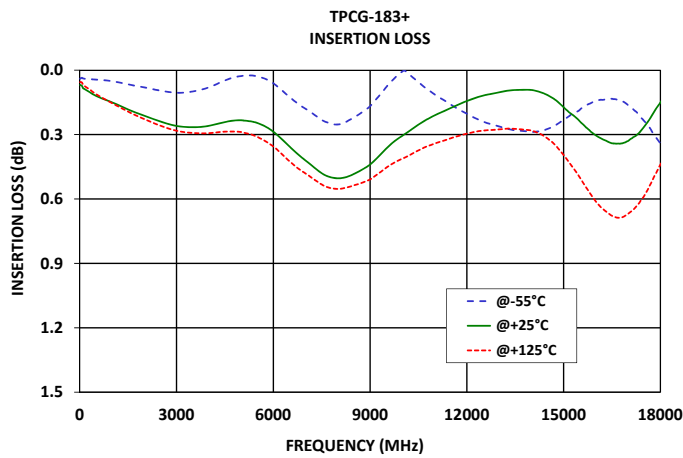
4. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 1.9W at +125°C.

TYPICAL FREQUENCY RESPONSE





TYPICAL PERFORMANCE GRAPHS





FUNCTIONAL DIAGRAM

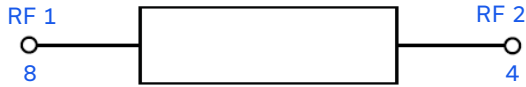
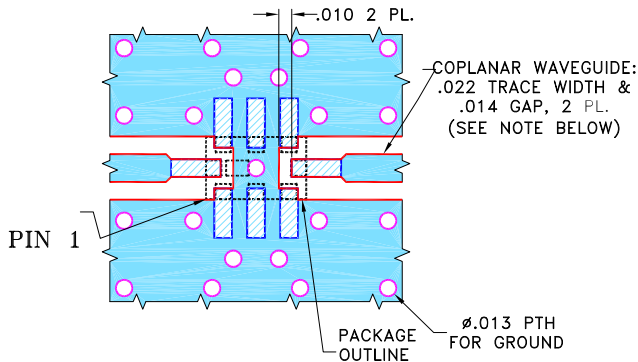


Figure 1. TPCG-183+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1 ^(Note 2)	8	Connects to RF Input Port
RF2 ^(Note 2)	4	Connects to RF Output Port
GROUND	1,2,3,5,6,7	Connects to Ground on PCB, (See drawing PL-429)
NC	-	No connection, not used internally. See drawing PL-429 for connection to PCB

SUGGESTED PCB LAYOUT (PL-429)



NOTES:

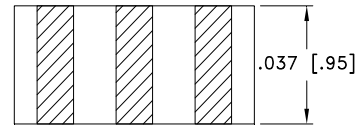
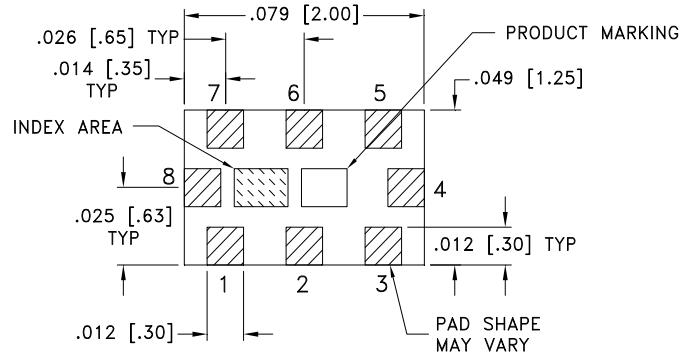
1. COPLANAR WAVEGUIDE IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS $.010" \pm .001"$. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

Figure 2. Suggested PCB Layout PL-429

CASE STYLE DRAWING



METALLIZATION

Weight: .008 grams.

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

PRODUCT MARKING*: VS

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



LTCC SURFACE MOUNT

Thru-Line

TPCG-183+

Mini-Circuits

50Ω DC to 18 GHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD. [CLICK HERE](#)

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

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



Typical Performance Data

FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
10	0.02	0.06	0.06	44.73	49.16	45.67	46.15	50.45	46.60
100	0.01	0.08	0.07	43.25	48.54	45.90	49.93	50.56	55.84
200	0.02	0.09	0.08	41.66	45.18	42.98	48.05	46.91	50.55
250	0.02	0.09	0.08	40.38	42.63	40.76	46.77	44.77	47.96
300	0.02	0.10	0.09	39.23	40.64	38.63	45.24	42.51	44.74
350	0.02	0.10	0.09	38.44	39.09	37.15	43.63	40.47	41.73
400	0.02	0.11	0.10	37.85	37.90	36.15	41.97	38.73	38.78
500	0.03	0.12	0.11	36.68	35.98	34.67	38.35	36.06	35.37
550	0.03	0.12	0.12	36.12	35.16	34.09	36.61	34.92	34.01
600	0.03	0.12	0.12	35.59	34.38	33.53	35.09	33.90	32.86
650	0.04	0.13	0.12	35.01	33.64	32.94	33.86	32.96	31.82
700	0.04	0.13	0.13	34.43	32.89	32.30	32.83	32.13	30.92
750	0.04	0.13	0.13	33.81	32.16	31.60	31.98	31.36	30.12
800	0.05	0.14	0.14	33.10	31.42	30.83	31.32	30.68	29.43
850	0.05	0.14	0.14	32.36	30.71	30.05	30.70	30.04	28.81
900	0.05	0.14	0.15	31.56	30.03	29.27	30.21	29.48	28.29
950	0.05	0.15	0.15	30.74	29.36	28.49	29.73	28.95	27.82
1000	0.06	0.15	0.15	29.97	28.75	27.80	29.30	28.45	27.41
1100	0.06	0.16	0.16	28.54	27.64	26.58	28.51	27.55	26.69
1200	0.07	0.17	0.17	27.42	26.71	25.66	27.76	26.73	26.04
1300	0.07	0.17	0.18	26.53	25.91	24.95	26.93	25.94	25.36
1400	0.08	0.18	0.19	25.78	25.19	24.37	26.00	25.16	24.63
1500	0.08	0.19	0.19	25.11	24.53	23.88	25.08	24.44	23.92
1600	0.09	0.20	0.20	24.49	23.92	23.42	24.21	23.78	23.25
1700	0.09	0.20	0.21	23.87	23.34	22.94	23.44	23.18	22.64
1800	0.10	0.21	0.21	23.28	22.79	22.45	22.79	22.64	22.12
1900	0.10	0.21	0.22	22.71	22.27	21.96	22.27	22.16	21.68
2000	0.11	0.22	0.23	22.14	21.77	21.46	21.83	21.72	21.30
2200	0.12	0.23	0.24	21.05	20.85	20.56	21.07	20.93	20.69
2400	0.13	0.24	0.25	20.18	20.13	19.92	20.37	20.26	20.21
2600	0.13	0.25	0.26	19.68	19.66	19.62	19.83	19.79	19.85
2800	0.14	0.26	0.27	19.36	19.32	19.46	19.35	19.45	19.55
3000	0.14	0.27	0.28	19.01	19.03	19.26	19.02	19.21	19.37
3500	0.15	0.28	0.29	18.59	18.88	19.17	19.01	19.15	19.71
4000	0.14	0.28	0.29	19.87	20.05	20.74	20.08	20.35	21.17
4500	0.13	0.26	0.29	22.79	22.99	23.81	23.25	23.50	25.26
5000	0.12	0.26	0.29	29.52	28.27	28.21	29.08	29.56	33.83
5500	0.14	0.28	0.31	26.88	26.25	24.36	26.21	27.19	26.15
6000	0.18	0.32	0.36	19.20	19.48	18.67	19.81	20.18	19.72
6500	0.24	0.39	0.42	15.65	15.90	15.71	15.93	16.17	16.11
7000	0.29	0.45	0.48	13.25	13.52	13.60	13.75	13.90	14.15
7500	0.32	0.51	0.53	12.03	12.33	12.65	12.38	12.58	13.06
8000	0.34	0.53	0.55	11.33	11.74	12.21	11.60	11.98	12.64
8500	0.31	0.51	0.54	11.37	11.85	12.43	11.62	12.08	12.95
9000	0.29	0.47	0.51	11.81	12.38	13.03	11.90	12.55	13.55
9500	0.23	0.41	0.45	12.81	13.49	14.19	12.89	13.62	14.78
10000	0.19	0.36	0.41	13.99	14.77	15.60	14.24	15.03	16.39
10500	0.15	0.31	0.37	15.31	16.28	17.49	15.78	16.62	18.27
11000	0.12	0.28	0.34	17.09	18.13	20.06	17.76	18.47	20.51
11500	0.09	0.25	0.32	18.92	20.04	22.96	19.75	20.29	22.90
12000	0.06	0.22	0.30	21.25	22.44	26.43	21.48	22.01	24.78
12500	0.05	0.20	0.28	24.54	25.35	29.00	23.69	23.90	27.22
13000	0.04	0.19	0.28	31.19	30.03	30.80	25.30	25.49	29.57
13500	0.04	0.18	0.27	34.58	31.42	28.62	24.52	24.95	29.89
14000	0.04	0.19	0.28	24.14	24.83	24.84	20.84	21.84	24.90
14500	0.08	0.22	0.32	18.51	19.33	19.68	17.28	18.10	19.59
15000	0.16	0.28	0.40	15.15	15.73	16.00	14.16	14.87	15.38
16000	0.40	0.46	0.61	11.48	11.78	11.35	10.84	11.20	10.75
17000	0.43	0.50	0.67	10.94	10.96	10.32	10.88	10.72	9.95
18000	0.16	0.30	0.44	14.27	13.87	13.82	15.03	13.95	13.63



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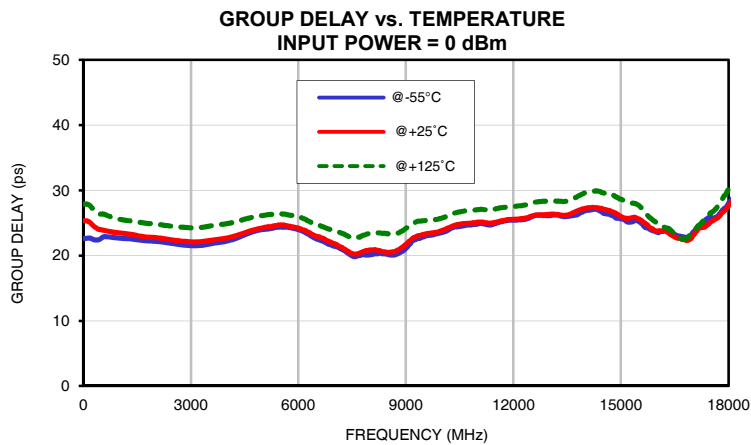
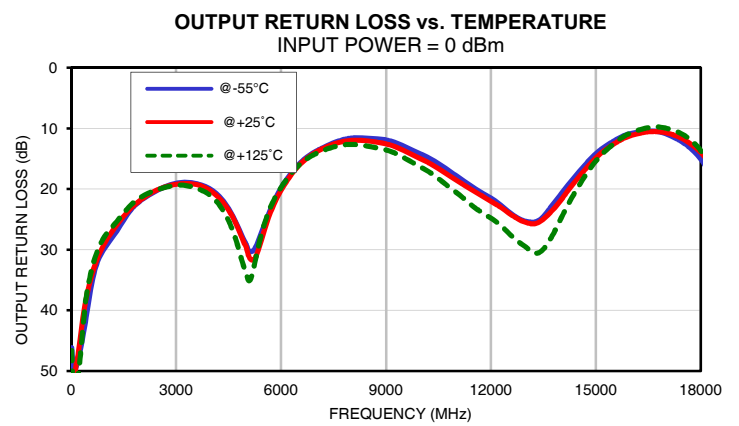
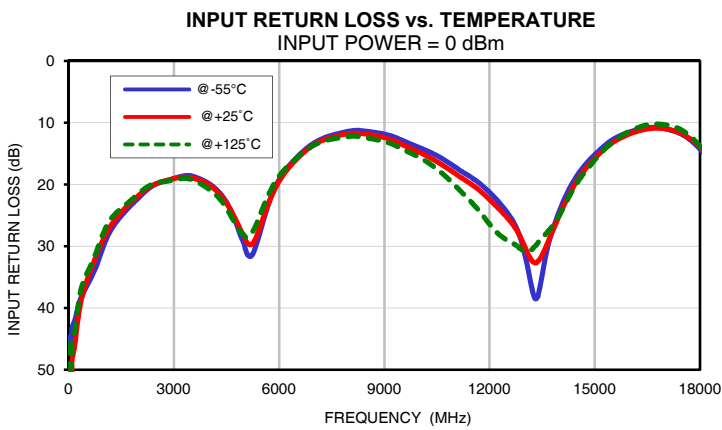
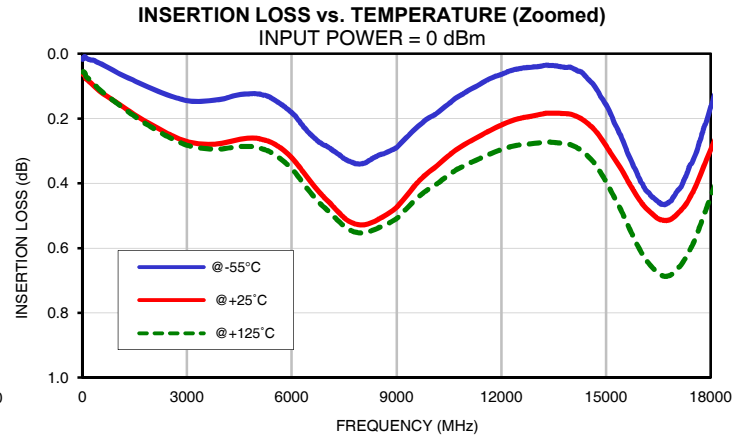
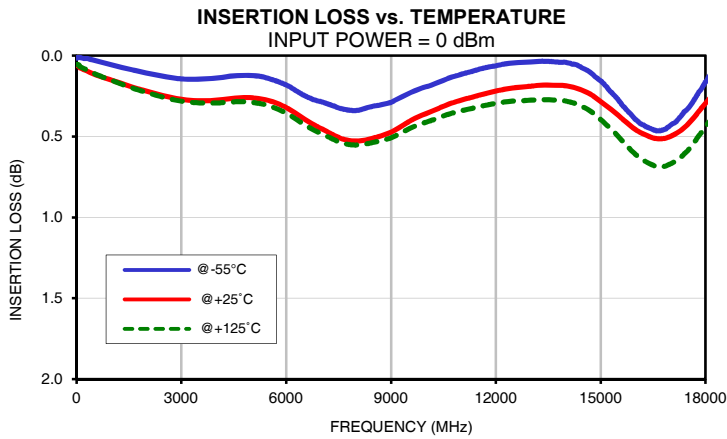
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IF/RF MICROWAVE COMPONENTS

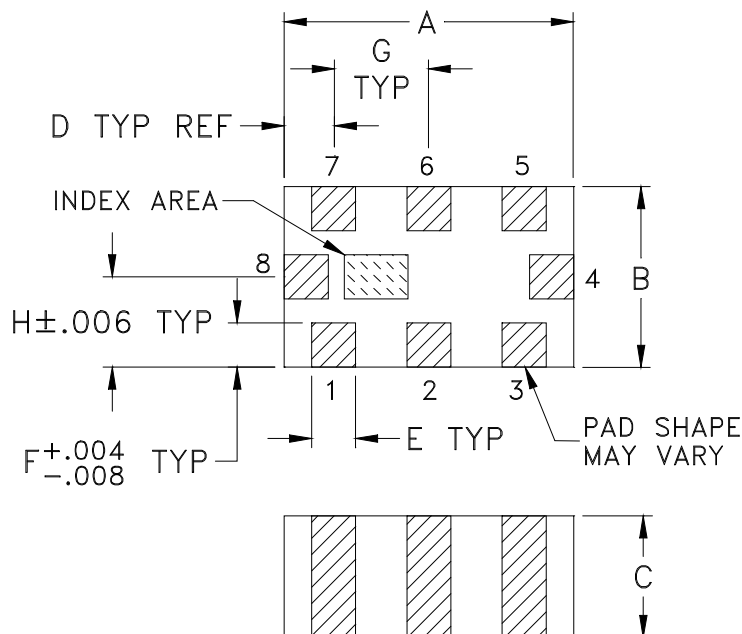
Typical Performance Data

FREQ. (MHz)	GROUP DELAY		
	(psec)		
	@-55°C	@+25°C	@+125°C
10	22.65	25.33	27.90
400	22.38	24.10	26.47
800	22.79	23.61	25.87
1200	22.59	23.34	25.39
1600	22.35	22.95	25.06
2000	22.19	22.75	24.82
2400	21.91	22.45	24.54
2800	21.62	22.19	24.32
3200	21.51	22.09	24.26
3600	21.83	22.36	24.59
4000	22.20	22.69	24.87
4400	22.93	23.30	25.41
4800	23.75	23.97	25.94
5200	24.10	24.42	26.28
5600	24.34	24.66	26.33
6000	23.98	24.18	25.95
6400	22.84	23.19	24.97
6800	21.86	22.25	24.14
7200	20.99	21.26	23.44
7600	19.85	20.22	22.70
8000	20.15	20.87	23.44
8400	20.25	20.56	23.40
8800	20.34	20.93	23.48
9200	22.31	22.70	24.98
9600	23.06	23.35	25.37
10000	23.51	23.83	25.74
10400	24.41	24.69	26.58
10800	24.70	24.96	26.93
11200	24.81	25.06	27.02
11600	25.09	25.24	27.28
12000	25.43	25.56	27.53
12400	25.67	25.83	27.84
12800	26.18	26.24	28.30
13200	26.21	26.31	28.34
13600	26.08	26.40	28.58
14000	26.86	27.23	29.60
14500	26.52	27.12	29.61
15000	25.62	25.97	28.63
16000	23.58	23.77	25.04
17000	23.49	23.03	23.60
18000	27.99	27.62	30.09

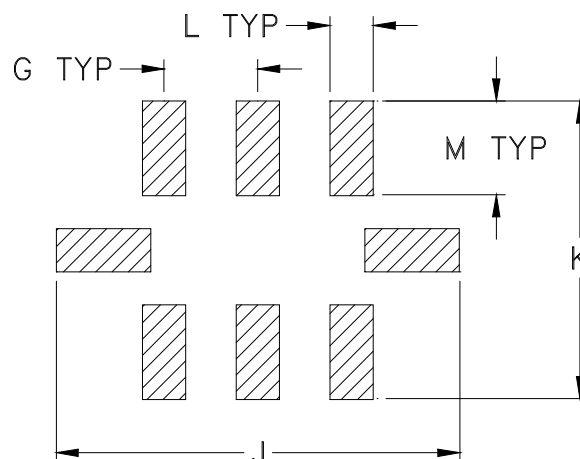
Typical Performance Curves



Outline Dimensions



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	L
GE0805C-2	.079 (2.00)	.049 (1.25)	.037 (0.95)	.014 (0.35)	.012 (0.30)	.012 (0.30)	.026 (0.65)	.025 (0.63)	.134 (3.40)	.110 (2.80)	.014 (0.35)

CASE #	M	WT. GRAM
GE0805C-2	.039 (1.00)	.008

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

Notes:

- Open style, ceramic base.
- Termination finish: For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
For RoHS-5 Case Styles: Tin-Lead plate over Nickel plate. All models, no (+) suffix.
- Pad tolerance to be non-cumulative. Minimum spacing between each pad is .004 (0.1).



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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F114

DEVICE ORIENTATION IN T&R



ILLUSTRATION 1

Applicable Case Styles	
GE0805C	JC0603C
GE0805C-1	JC0603C-4
GE0805C-1AP	JC0603C-6
GE0805C-7	
GE0805C-9	
GE0805C-10	
GE0805C-11	
GE0805C-12	

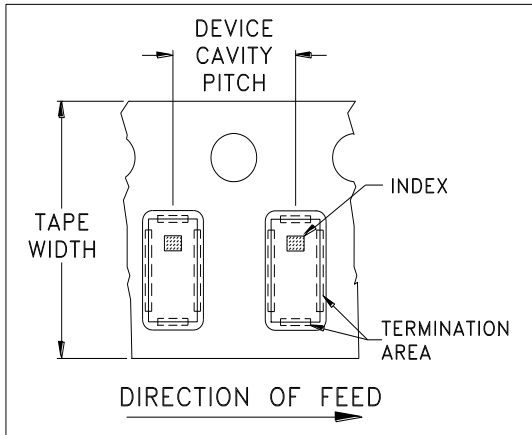


ILLUSTRATION 2

Applicable Case Styles	
GE0805C-2	JC0603C-1
GE0805C-3	JC0603C-2
GE0805C-4	JC0603C-3
GE0805C-5	JC0603C-5
GE0805C-6	JC0603C-7
GE0805C-8	
GE0805C-15	

Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
8	4	7	Small quantity standards (see note)	20
				50
				100
				200
				500
			Standard	1000
			Standard	4000

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



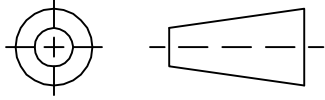
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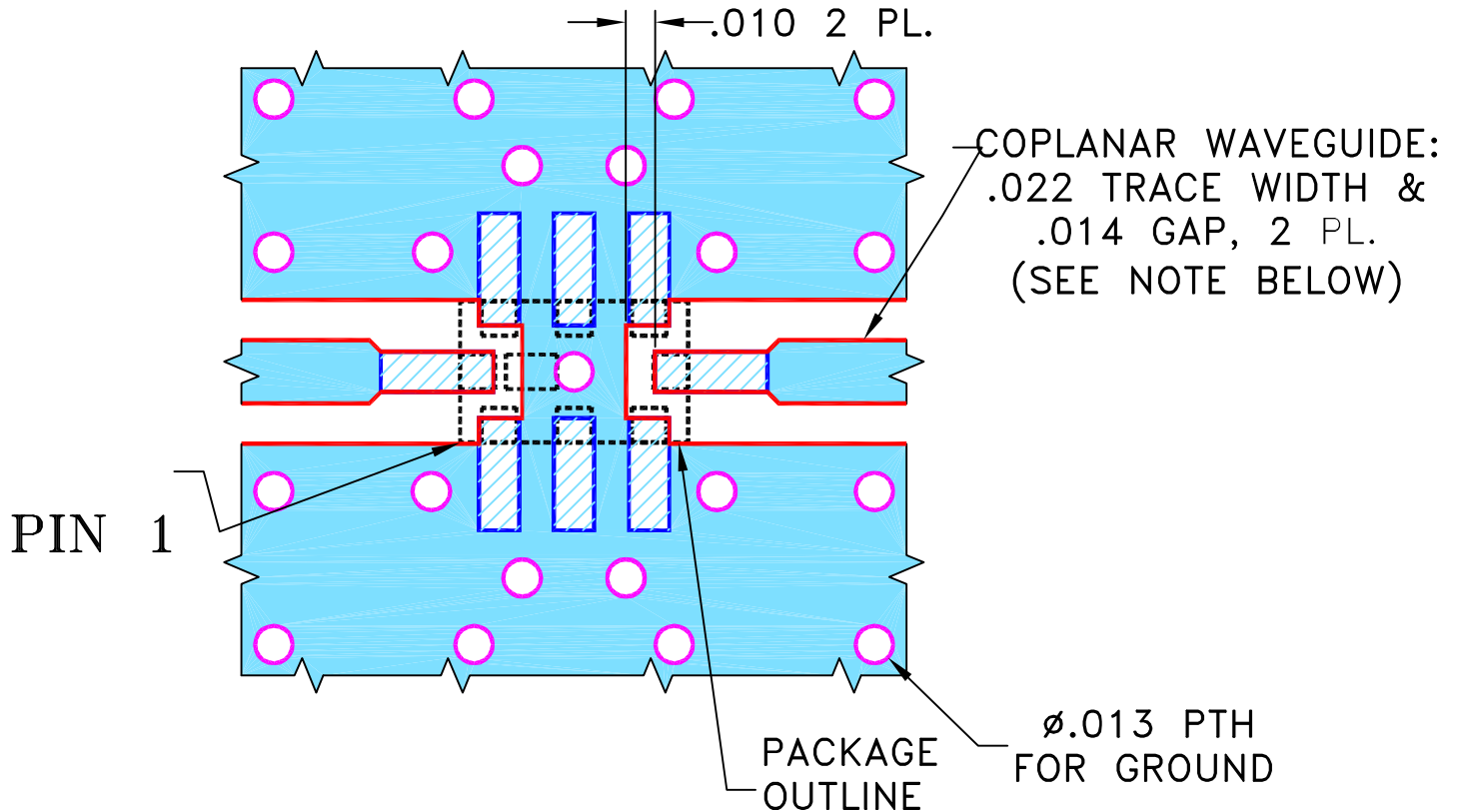
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M148457	NEW RELEASE	10/14/14	GF	MY

SUGGESTED MOUNTING CONFIGURATION
FOR GE0805C-4 CASE STYLE, "08FL07" PIN CODE



NOTES:

1. COPLANAR WAVEGUIDE IS SHOWN FOR ROGERS R04350B 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 PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

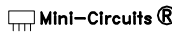


DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN GF	10/01/14
TOLERANCES ON:	CHECKED IL	10/14/14
2 PL DECIMALS ±	APPROVED MY	10/14/14
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		

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PL, 08FL07, GE0805C-4, TB-799+

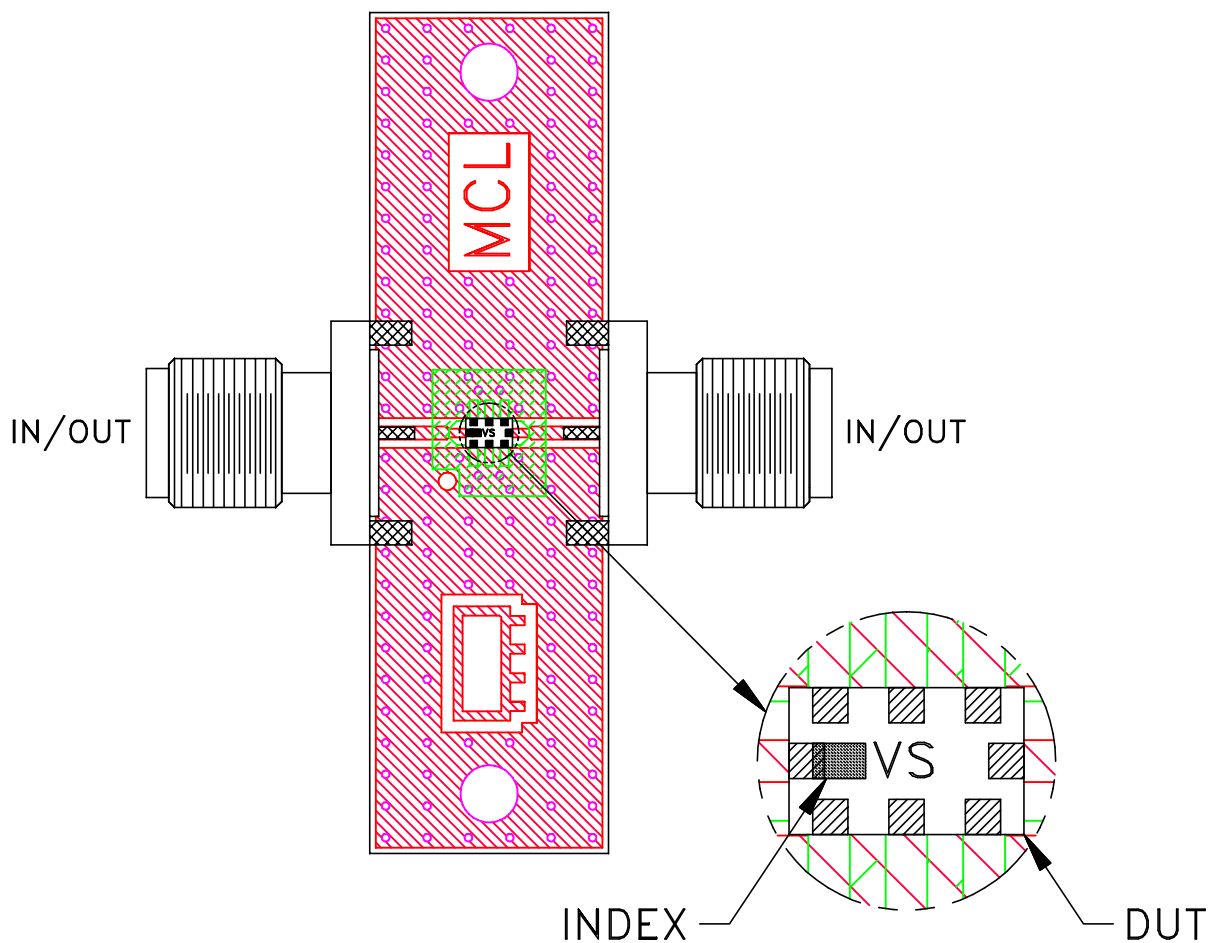
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ASHEETA1.DWG REV:A DATE:01/12/95

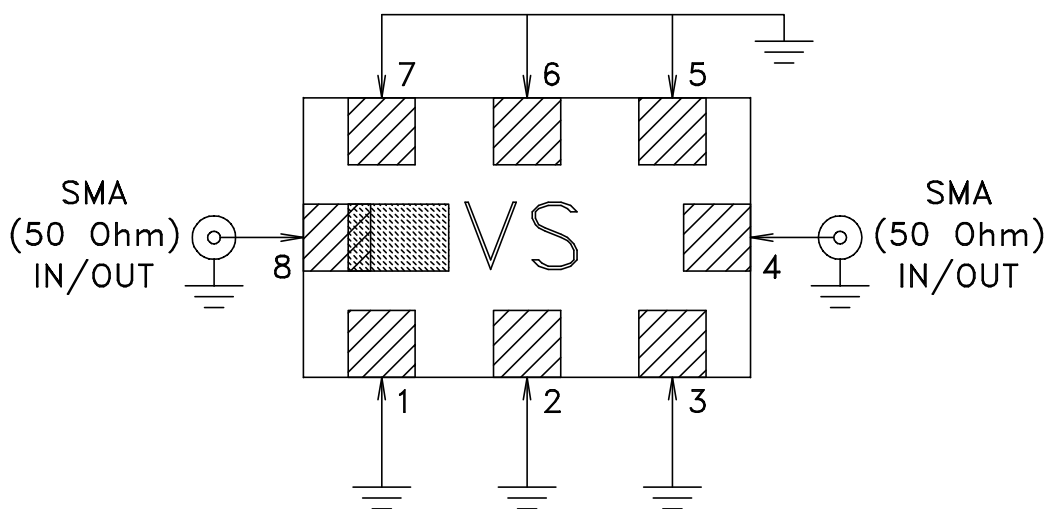
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-429	OR
FILE:	98PL429	SCALE: 15:1	SHEET: 1 OF 1

Evaluation Board and Circuit

TB-TPCG-183+




Schematic diagram



Notes:

1. PCB Material: ROGERS (R04350) OR Equivalent, Dielectric Constant=3.5
Dielectric Thickness: .010 inch
2. 50 Ohm SMA Female Connectors.

 **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	-55° to 125° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 125° C Ambient Environment	Individual Model Data Sheet
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
Solder Reflow Heat	Sn-Pb Eutectic Process 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020C, 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