



Mini-Circuits

LTCC SMT

High Pass Filter

50Ω

3.65 to 16.5 GHz

HFCG-3250+

THE BIG DEAL

- Low Insertion Loss, 0.8 dB Typ.
- Return Loss, 11 dB Typ.
- Stop Band Rejection, 44 dB Typ.
- 0805 Surface Mount Footprint
- Power Handling: 3 Watts



Generic photo used for illustration purposes only

CASE STYLE: GE0805C-9

APPLICATIONS

- Test and Measurement Equipment
- SATCOM
- 5G MIMO and Back Haul Radio Systems
- Radar
- WiFi 6E

+RoHS Compliant

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

PRODUCT OVERVIEW

HFCG-3250+ is a miniature low temperature co-fired ceramic (LTCC) high pass filter with a 3.65 to 16.5 GHz passband supporting a variety of applications. This model provides 0.8 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 filter 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

Feature	Advantages
Small size, 0805	Accommodates tight space requirements for dense PCB layouts.
Wrap around termination	Provides excellent solderability and easy visual inspection capability.
LTCC construction	Provides a rugged package that is well suited for tough environments including high humidity and high temperature extremes.
Ultra-wide pass band	This filter has a very wide passband from 3.65 to 16.5 GHz.
Rugged Power handling	Handles up to 3 Watts in a small 0805 package.

REV. B
ECO-016177
HFCG-3250+
EDU4459
URJ
221220





LTCC SMT

High Pass Filter

HFCG-3250+

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

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Stopband	Rejection	DC-F1	DC - 2	38	44	—	dB
		F1-F2	2 - 2.5	27	39	—	
	Freq. Cut-Off	F3 ^(note 3)	3.25	—	3	—	
Passband	Insertion Loss	F4-F5	3.65 - 4.3	—	1.6	—	dB
		F5-F6	4.3 - 5.5	—	0.8	1.5	
		F6-F7	5.5 - 14.1	—	0.7	1.3	
		F7-F8	14.1 - 16.5	—	2.0	—	
	Return Loss	F4-F7	3.65 - 14.1	—	11	—	dB
		F7-F8	14.1 - 16.5	—	13	—	

1. This component should not be employed as a DC-block. 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 further support.

2. Measured on Mini-Circuits Characterization Test Board TB-HFCG-3250+

3. Typically, a $\pm 5\%$ frequency deviation from the stated value may occur on a unit-to-unit basis.

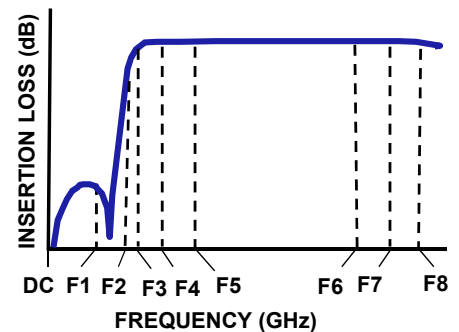
ABSOLUTE MAXIMUM RATINGS¹

Parameter	Ratings
Operating temperature	-55°C to 125°C
Storage temperature	-55°C to 125°C
RF Power Input ²	3W @25°C

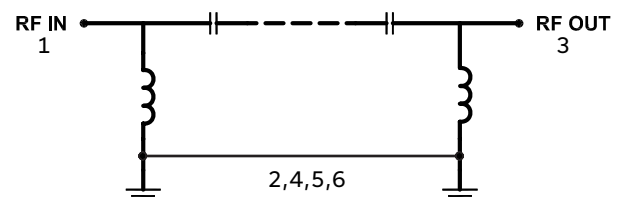
1. Permanent damage may occur if any of these limits are exceeded.

2. Power rating applies only to signals within the passband. Power rating above +25°C should be derated linearly to 0.6W at +125°C.

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL DIAGRAM





Mini-Circuits

LTCC SMT

High Pass Filter

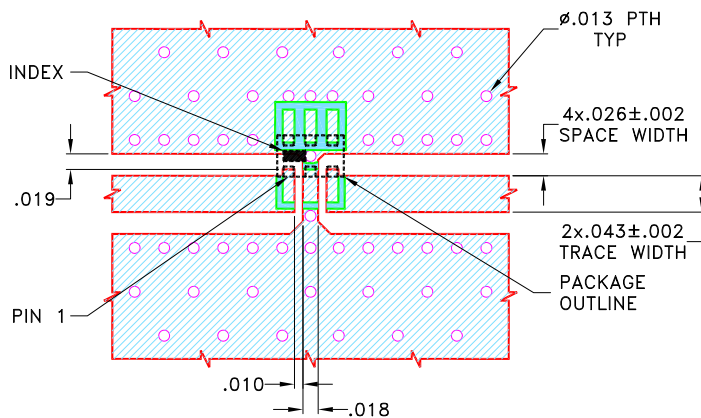
HFCG-3250+

PAD CONNECTIONS

RF IN	1
RF OUT	3
GROUND	2,4,5,6

PRODUCT MARKING: VY

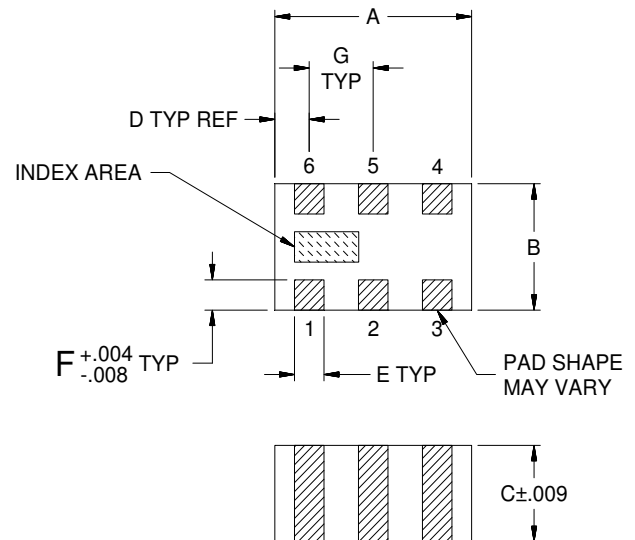
DEMO BOARD MCL P/N: TB-HFCG-3250+
SUGGESTED PCB LAYOUT (PL-633)



NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS $.020 \pm .0015$. 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 PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

OUTLINE DRAWING

OUTLINE DIMENSIONS (Inches)
mm

A	B	C	D	E	F	G	Wt.
.079	.049	.037	.014	.012	.012	.026	grams
2.00	1.25	0.95	0.35	0.30	0.30	0.65	.008



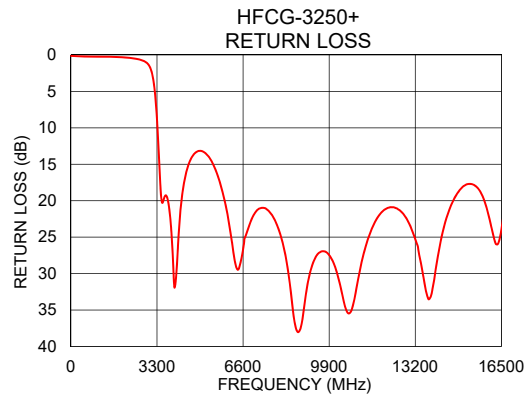
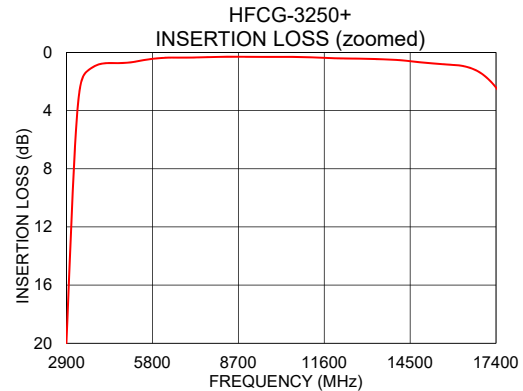
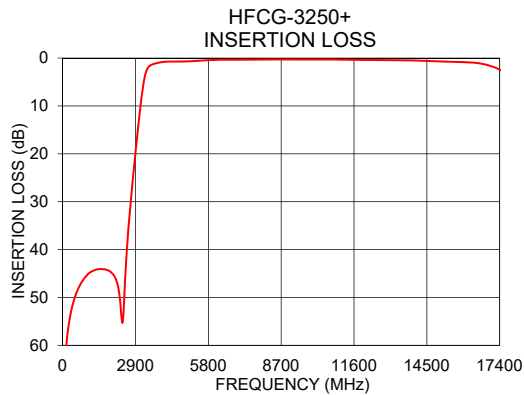
LTCC SMT

High Pass Filter

HFCG-3250+

TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	75.28	0.12
100	63.42	0.14
2000	45.12	0.32
2500	44.98	0.53
2700	30.59	0.69
2900	19.77	1.05
3100	9.98	2.38
3250	4.41	6.33
3300	3.26	8.87
3650	1.20	19.28
4300	0.73	18.33
5500	0.53	15.40
10000	0.31	28.01
14100	0.53	26.95
16500	1.05	24.03



NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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



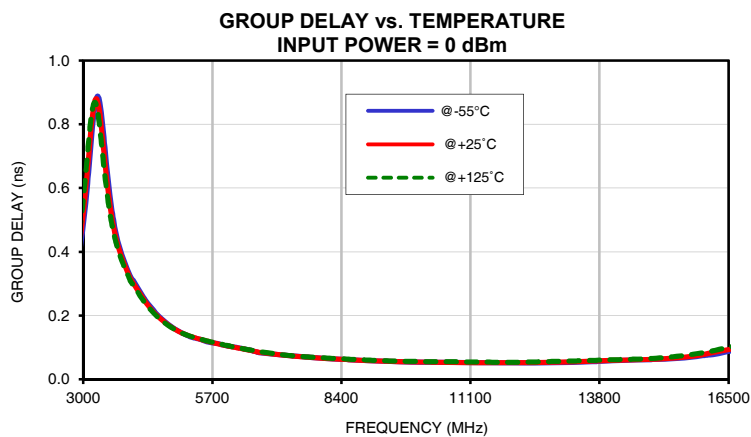
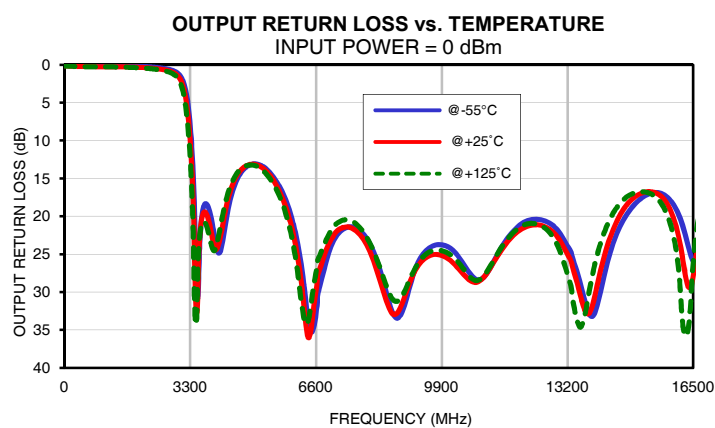
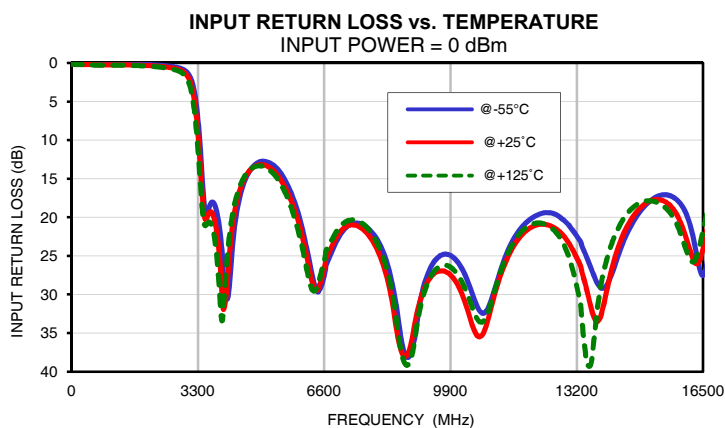
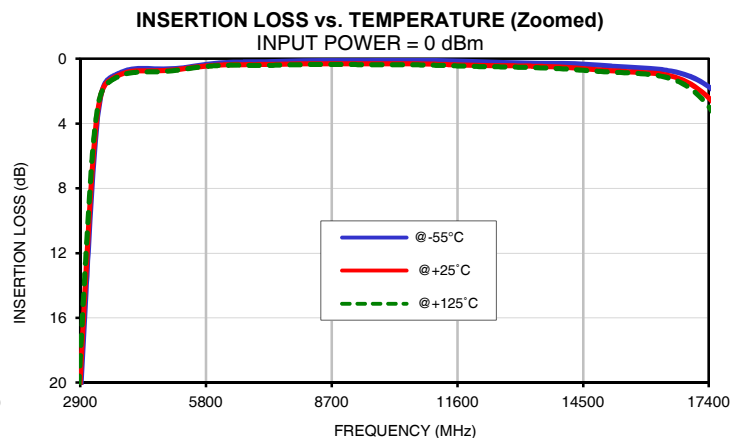
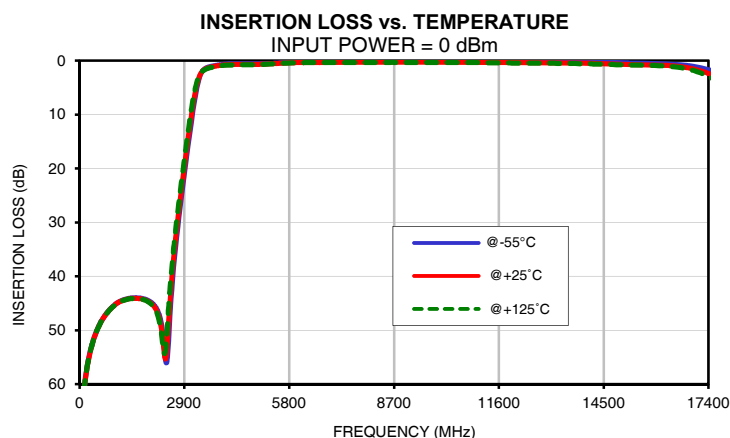
Typical Performance Data

FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
10	72.68	75.28	72.58	0.09	0.12	0.14	0.08	0.13	0.15
50	69.59	69.97	69.14	0.09	0.13	0.15	0.09	0.14	0.15
100	63.49	63.42	63.23	0.10	0.14	0.17	0.09	0.15	0.17
200	57.21	57.28	57.29	0.11	0.16	0.19	0.11	0.17	0.19
300	53.81	53.88	53.86	0.13	0.18	0.21	0.13	0.19	0.21
400	51.50	51.52	51.53	0.14	0.19	0.23	0.14	0.20	0.23
500	49.73	49.76	49.78	0.14	0.20	0.24	0.15	0.21	0.24
600	48.38	48.41	48.42	0.14	0.21	0.25	0.15	0.22	0.25
700	47.31	47.34	47.36	0.14	0.22	0.26	0.15	0.23	0.26
800	46.45	46.48	46.51	0.15	0.22	0.27	0.15	0.23	0.26
900	45.72	45.77	45.80	0.15	0.23	0.27	0.15	0.24	0.27
1000	45.13	45.16	45.18	0.15	0.23	0.28	0.15	0.24	0.27
1100	44.70	44.75	44.76	0.15	0.23	0.28	0.15	0.24	0.28
1200	44.41	44.47	44.49	0.14	0.23	0.28	0.14	0.25	0.28
1300	44.20	44.26	44.30	0.14	0.24	0.28	0.14	0.25	0.28
1400	44.05	44.11	44.14	0.14	0.24	0.29	0.14	0.25	0.28
1500	44.00	44.09	44.12	0.14	0.25	0.29	0.14	0.26	0.29
1600	44.01	44.10	44.14	0.15	0.26	0.31	0.15	0.27	0.31
1700	44.05	44.16	44.20	0.15	0.27	0.32	0.16	0.28	0.33
1800	44.22	44.33	44.38	0.17	0.28	0.34	0.17	0.29	0.35
1900	44.49	44.63	44.72	0.18	0.30	0.37	0.18	0.31	0.37
2000	44.92	45.12	45.25	0.19	0.32	0.39	0.19	0.34	0.40
2100	45.64	45.95	46.18	0.22	0.35	0.43	0.21	0.37	0.43
2200	47.05	47.59	48.05	0.24	0.38	0.47	0.24	0.40	0.47
2300	50.31	51.43	52.31	0.28	0.42	0.52	0.28	0.44	0.52
2500	47.48	44.98	42.67	0.36	0.53	0.65	0.39	0.56	0.66
2700	31.94	30.59	29.14	0.50	0.69	0.86	0.55	0.73	0.88
2900	20.97	19.77	18.45	0.78	1.05	1.32	0.86	1.12	1.35
3100	11.04	9.98	8.92	1.79	2.38	3.09	1.96	2.54	3.22
3250	4.96	4.41	3.95	4.92	6.33	7.94	5.34	6.83	8.56
3300	3.59	3.26	3.02	7.06	8.87	10.81	7.75	9.76	12.02
3650	1.07	1.20	1.27	18.10	19.28	20.89	18.80	19.55	20.68
4300	0.59	0.73	0.82	19.84	18.33	17.48	19.03	17.64	16.86
4800	0.63	0.73	0.78	13.15	13.34	13.41	13.39	13.27	13.28
5200	0.57	0.64	0.67	13.00	13.63	13.98	13.38	13.60	13.89
5500	0.46	0.53	0.56	14.51	15.40	15.98	14.91	15.36	15.85
5800	0.35	0.44	0.47	17.62	18.64	19.64	17.71	18.61	19.45
6100	0.26	0.38	0.41	22.97	23.99	25.59	23.04	24.65	26.58
6400	0.21	0.36	0.39	29.46	29.48	29.22	33.65	36.00	33.77
6700	0.19	0.36	0.40	25.66	24.81	23.85	29.23	27.01	25.18
7000	0.18	0.36	0.40	22.40	22.00	21.29	23.94	23.04	21.85
7300	0.17	0.34	0.40	20.88	20.99	20.35	21.72	21.49	20.52
7600	0.15	0.33	0.38	20.93	21.47	20.80	21.45	21.69	20.77
7900	0.13	0.32	0.37	22.23	23.35	22.57	22.66	23.46	22.48
8200	0.12	0.31	0.35	25.26	27.07	26.05	25.78	27.07	25.66
8500	0.10	0.30	0.35	31.88	34.75	33.65	30.95	31.86	29.86
8800	0.10	0.30	0.35	38.14	37.55	39.06	33.17	32.21	30.97
9000	0.10	0.30	0.35	34.47	33.04	34.69	30.39	29.56	29.07
9500	0.10	0.31	0.36	25.56	27.18	26.83	24.47	25.39	24.94
10000	0.10	0.31	0.36	25.29	28.01	26.89	23.87	25.37	24.70
10500	0.09	0.31	0.37	30.31	34.40	32.10	26.49	27.80	27.11
11000	0.10	0.33	0.39	30.20	31.00	30.46	28.04	28.05	27.91
11500	0.13	0.37	0.43	23.28	24.16	23.68	23.83	24.20	23.84
12000	0.17	0.40	0.47	20.17	21.28	20.93	20.96	21.65	21.29
12500	0.22	0.42	0.49	19.39	21.06	21.21	20.44	21.17	21.19
13000	0.25	0.44	0.52	21.04	23.37	25.18	22.20	23.15	24.54
13500	0.28	0.47	0.56	25.69	30.20	39.22	28.13	29.64	34.40
14100	0.29	0.53	0.63	27.50	26.95	23.57	29.16	26.50	23.05
15000	0.42	0.71	0.80	18.41	18.17	17.87	18.22	17.31	16.83
16500	0.74	1.05	1.21	27.51	24.03	21.70	25.94	27.89	25.92

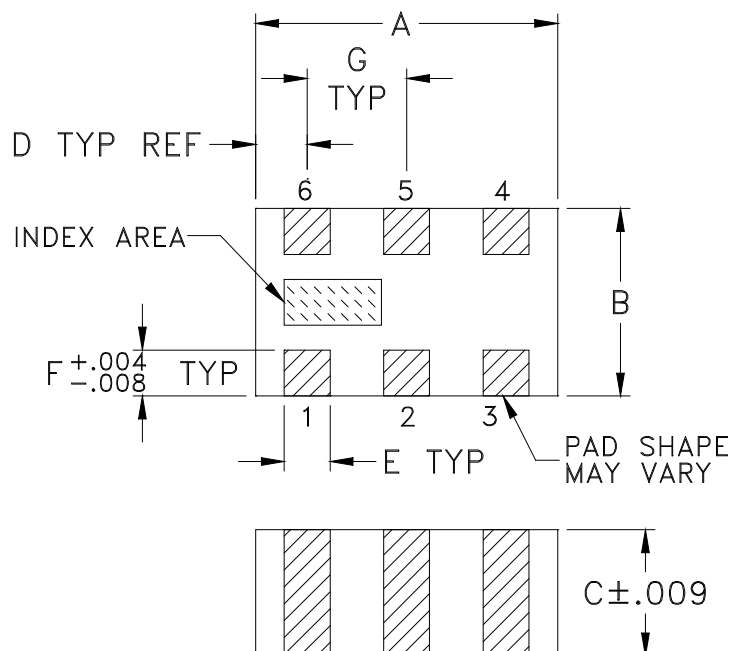
Typical Performance Data

FREQ.	GROUP DELAY		
(MHz)	(nsec)		
	@-55°C	@+25°C	@+125°C
3650	0.48	0.46	0.45
4000	0.32	0.31	0.30
4300	0.25	0.24	0.24
4600	0.20	0.19	0.19
4900	0.16	0.16	0.16
5200	0.14	0.14	0.14
5500	0.12	0.12	0.12
5800	0.11	0.11	0.11
6100	0.10	0.10	0.10
6400	0.09	0.09	0.09
6700	0.08	0.08	0.09
7000	0.08	0.08	0.08
7300	0.07	0.07	0.07
7600	0.07	0.07	0.07
7900	0.07	0.07	0.07
8200	0.06	0.06	0.07
8500	0.06	0.06	0.06
8800	0.06	0.06	0.06
9100	0.06	0.06	0.06
9400	0.06	0.06	0.06
9700	0.05	0.05	0.06
10000	0.05	0.05	0.06
10300	0.05	0.05	0.06
10600	0.05	0.05	0.06
10900	0.05	0.05	0.05
11200	0.05	0.05	0.05
11500	0.05	0.05	0.05
11800	0.05	0.05	0.05
12100	0.05	0.05	0.05
12400	0.05	0.05	0.05
12700	0.05	0.05	0.06
13000	0.05	0.05	0.06
13300	0.05	0.06	0.06
13800	0.06	0.06	0.06
14100	0.06	0.06	0.06
14400	0.06	0.06	0.06
14700	0.06	0.06	0.06
15000	0.06	0.06	0.07
15900	0.07	0.08	0.08
16500	0.09	0.09	0.10

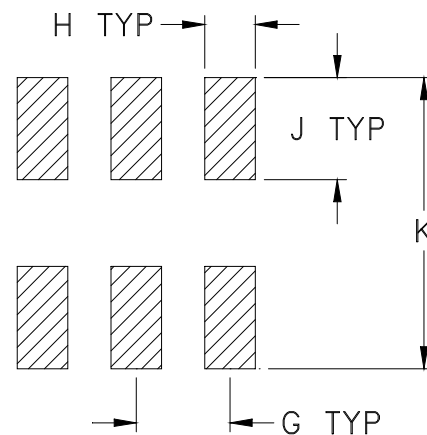
Typical Performance Curves



Outline Dimensions



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	WT.GRAM
GE0805C-9	.079 (2.00)	.049 (1.25)	.037 (0.95)	.014 (0.35)	.012 (0.30)	.012 (0.30)	.026 (0.65)	.014 (0.35)	.039 (1.00)	.110 (2.80)	.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.



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



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

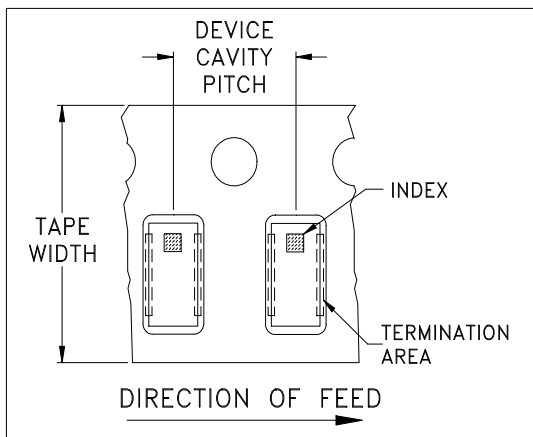


ILLUSTRATION 1

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

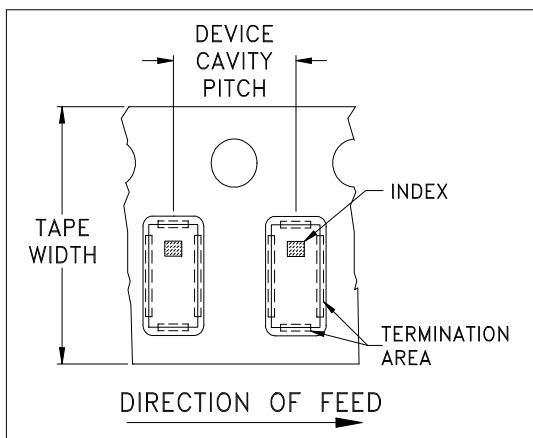


ILLUSTRATION 2

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	JV1210C-1
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
				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

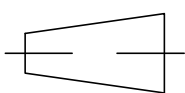


INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified



REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M174039	NEW RELEASE	MAY 19	DDR	VC

Technical drawing of a 16-pin package showing dimensions and features:

- INDEX**: Points to the top edge of the package.
- PIN 1**: Points to the first pin on the left side.
- 0.079**: Dimension for the width of the central pin area.
- 0.049**: Dimension for the height of the central pin area.
- 4x.026±.002 SPACE WIDTH**: Dimension for the space width between the central pins.
- 2x.043±.002 TRACE WIDTH**: Dimension for the trace width on the sides.
- Ø.013 PTH TYP**: Dimension for the typical through-hole diameter.
- OUTLINE PACKAGE**: Label for the package type.

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.

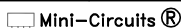


DENOTES PCB COPPER LAYOUT WITH SMOBC
(SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

08 MAY 19



THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE , MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, 06FL02, GE0805C-9
TB-1104+, 50 OHM

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-633

REV: OR

FILE: 98PL633

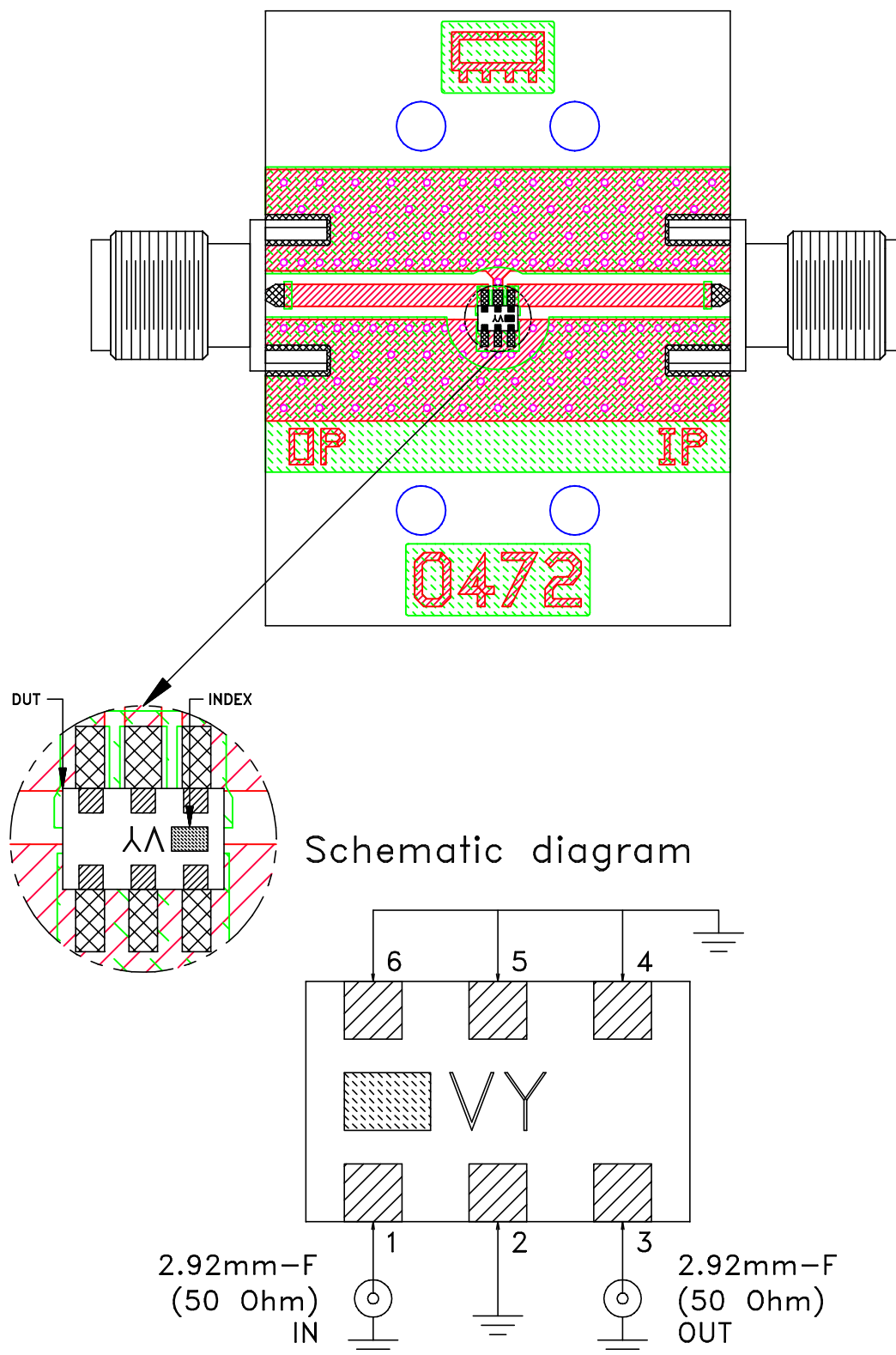
SCALE: 9:1

SHEET:	1 OF 1
--------	--------

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

Evaluation Board and Circuit

TB-HFCG-3250+



Schematic diagram

Notes:

1. PCB Material: ROGERS (R04350B) OR Equivalent, Dielectric Constant= 3.48 ± 0.05

Dielectric Thickness: $.020 \pm .0015$

2. 50 Ohm 2.92mm Female Connectors.

3. Connectors on the test board shall not be subjected to temperature greater than 200°C to avoid permanent damage to the 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