CERAMIC

High Pass Filter

HFCG-4000+

50Ω 4500 to 18000 MHz

THE BIG DEAL

- Low loss, 0.8 dB typ.
- Return loss, 12 dB typ.
- Stop Band Rejection, 42 dB typ.
- Small size 2.0 mm x 1.25 mm

Generic photo used for illustration purposes only

CASE STYLE: GE0805C-9

+RoHS Compliant

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

APPLICATIONS

- Test and measurements
- Military applications
- Telecommunications and broadband wireless systems
- 5G Sub 6 GHz
- WiFi 6E and X-band Radar

PRODUCT OVERVIEW

HFCG-4000+ is a high pass filter with passband from 4500 MHz to 18000 MHz supporting a variety of applications. This model provides 0.8 dB typical insertion loss over a wide band due to strategically constructed layout. Housed in a tiny 0805 ceramic form factor with wraparound terminations, the filter is ideal for dense PCB layouts with minimal performance variation due to parasitics.

KEY FEATURES

Feature	Advantages
Small size, 2.0 mm x 1.25 mm	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 4.5 GHz to 18 GHz.

REV. OR
ECO-015247
HFCG-4000+
EDU4330
URJ
221003

ELECTRICAL SPECIFICATIONS[1,2] AT 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Units
Stopband	Rejection Loss	DC-F1	DC - 2500	36	42	—	dB
		F1-F2	2500 - 3200	25	40	—	dB
	Freq. Cut-Off	F3*	4100	—	3	—	dB
Passband	Insertion Loss	F4-F5	4500 - 5200	—	2.0	—	dB
		F5-F6	5200 - 5600	—	0.8	1.9	dB
		F6-F7	5600 - 16000	—	0.8	1.5	dB
		F7-F8	16000 - 18000	—	1.2	—	dB
	Return Loss	F4-F8	4500 - 18000	—	12	—	dB

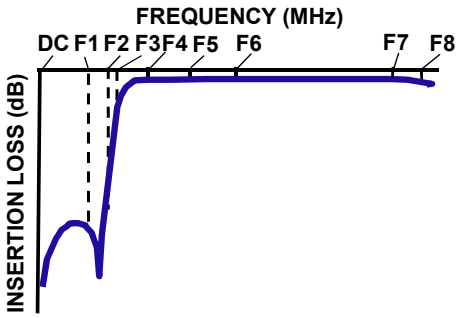
1 This component should not be employed as a DC-block. DC de-coupling capacitors are required in Applications where DC voltage and/or current is present at either input or output ports. Please contact Mini-Circuits for further support.
2 Measured on Mini-Circuits Characterization Test Board TB-HFCG-4000+
* Typically, a ±5% frequency deviation from the stated value may occur on a unit-to-unit basis.

MAXIMUM RATINGS

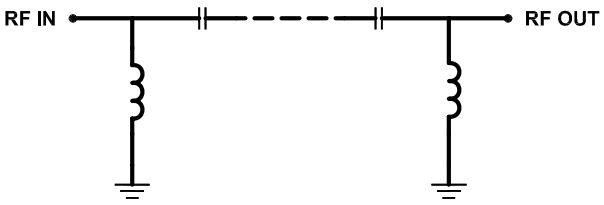
Parameter	Ratings
Operating temperature	-55°C to 125°C
Storage temperature	-55°C to 125°C
RF Power Input*	3W @25°C

*Passband rating, derate linearly to 0.6W at 125°C ambient
Permanent damage may occur if any of these limits are exceeded.

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL SCHEMATIC



High Pass Filter

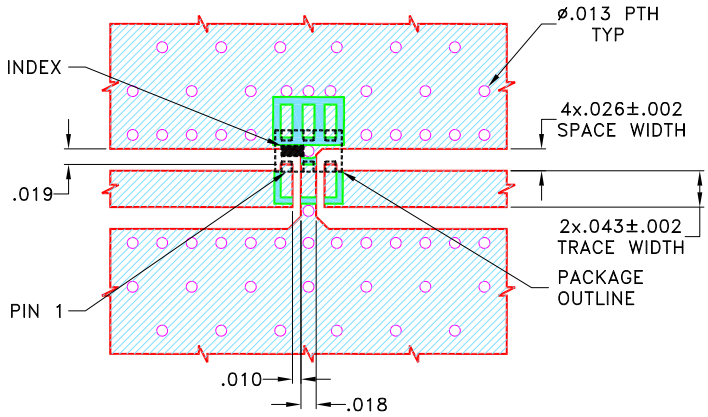
HFCG-4000+

PAD CONNECTIONS

INPUT	1
OUTPUT	3
GROUND	2,4,5,6

PRODUCT MARKING: VE

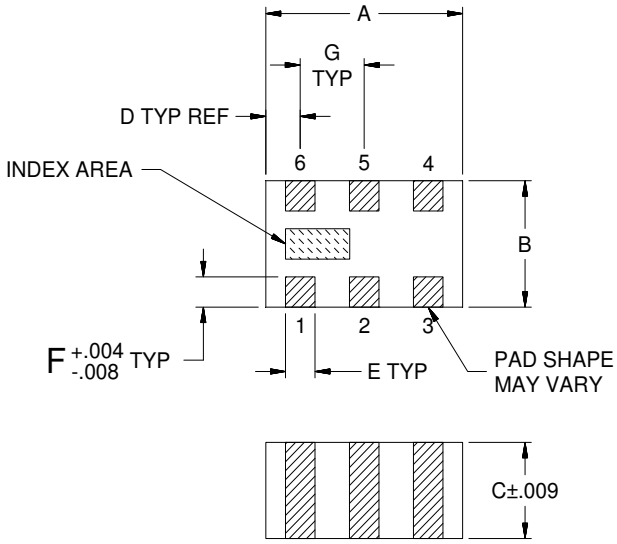
DEMO BOARD MCL P/N: TB-HFCG-4000+
SUGGESTED PCB LAYOUT (PL-633)



NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (RO4350B) WITH DIELECTRIC THICKNESS .020±.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

Note: Please refer to case style drawing for details

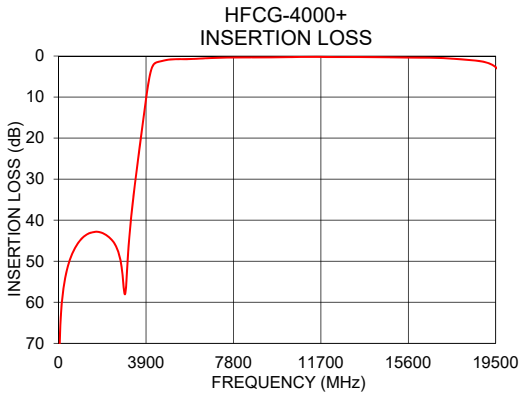
CERAMIC

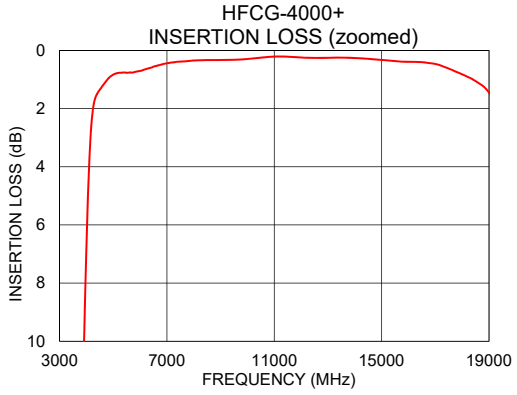
High Pass Filter

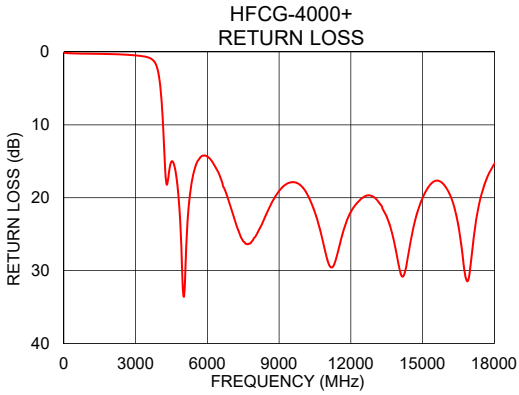
HFCG-4000+

TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	83.07	0.11
500	49.66	0.21
1000	44.65	0.23
2500	45.76	0.36
3200	41.29	0.54
3420	30.48	0.65
3660	20.32	0.95
4000	6.76	3.89
4100	3.97	7.50
4500	1.35	15.03
5200	0.77	21.87
5600	0.76	14.93
10000	0.30	18.64
16000	0.39	18.72
18000	0.82	15.40







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-Circuit's 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/MCLStore/terms.jsp

Ceramic High Pass Filter HFCG-4000+

Typical Performance Data

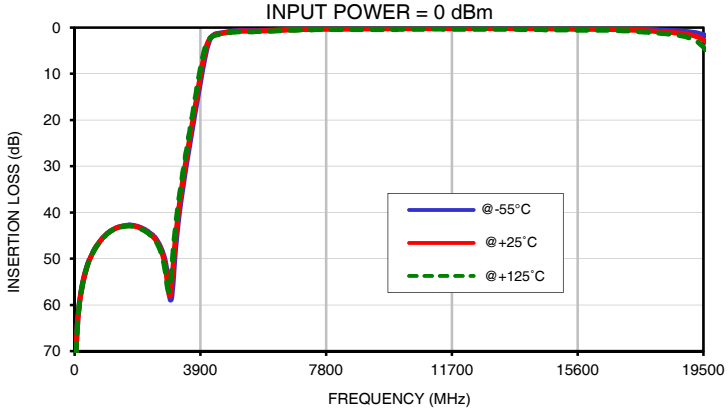
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
10	78.99	83.07	74.91	0.09	0.11	0.13	0.09	0.11	0.13
50	70.57	69.71	70.12	0.10	0.12	0.15	0.10	0.12	0.15
100	63.36	63.21	63.22	0.11	0.14	0.17	0.11	0.14	0.17
150	59.68	59.68	59.76	0.12	0.16	0.19	0.13	0.16	0.19
200	57.20	57.26	57.29	0.13	0.17	0.20	0.14	0.17	0.21
250	55.32	55.37	55.37	0.14	0.17	0.21	0.15	0.18	0.22
300	53.80	53.88	53.83	0.15	0.18	0.22	0.16	0.19	0.23
350	52.55	52.57	52.59	0.15	0.19	0.23	0.16	0.20	0.24
400	51.46	51.45	51.49	0.16	0.20	0.24	0.17	0.21	0.25
450	50.50	50.50	50.52	0.16	0.20	0.25	0.18	0.22	0.26
500	49.65	49.66	49.70	0.16	0.21	0.25	0.18	0.23	0.27
550	48.89	48.90	48.95	0.16	0.21	0.26	0.18	0.23	0.28
600	48.21	48.25	48.29	0.16	0.21	0.26	0.18	0.23	0.28
650	47.61	47.65	47.68	0.17	0.22	0.27	0.19	0.24	0.29
700	47.08	47.10	47.14	0.17	0.22	0.27	0.19	0.24	0.29
750	46.58	46.60	46.65	0.17	0.22	0.27	0.20	0.25	0.30
800	46.13	46.15	46.21	0.17	0.23	0.28	0.20	0.25	0.30
900	45.30	45.32	45.37	0.17	0.23	0.28	0.20	0.26	0.31
1000	44.62	44.65	44.69	0.17	0.23	0.28	0.20	0.26	0.31
1200	43.66	43.69	43.75	0.18	0.24	0.29	0.21	0.27	0.32
1500	42.93	42.98	43.04	0.18	0.26	0.31	0.22	0.29	0.34
1700	42.73	42.81	42.88	0.19	0.27	0.32	0.23	0.30	0.36
2000	43.13	43.24	43.36	0.20	0.29	0.35	0.25	0.33	0.40
2500	45.49	45.76	46.00	0.25	0.36	0.44	0.31	0.41	0.50
3000	58.70	56.68	53.55	0.35	0.47	0.59	0.41	0.54	0.66
3200	43.11	41.29	39.31	0.41	0.54	0.67	0.48	0.61	0.76
3420	31.89	30.48	28.85	0.50	0.65	0.82	0.58	0.74	0.92
3660	21.71	20.32	18.70	0.74	0.95	1.22	0.81	1.05	1.35
3900	11.80	10.46	9.00	1.64	2.19	3.02	1.75	2.37	3.31
4000	7.88	6.76	5.68	2.87	3.89	5.43	3.05	4.21	5.98
4100	4.65	3.97	3.44	5.63	7.50	10.08	6.02	8.26	11.71
4500	1.23	1.35	1.48	14.80	15.03	15.61	14.79	14.86	15.18
4600	1.12	1.22	1.33	14.51	15.39	16.65	14.08	14.76	15.65
4800	0.89	0.98	1.10	17.91	20.13	23.36	16.31	17.62	18.99
5100	0.67	0.79	0.93	31.74	28.08	24.25	20.95	20.42	19.55
5200	0.65	0.77	0.91	24.11	21.87	20.22	19.69	18.73	17.89
5500	0.64	0.77	0.89	16.10	15.71	15.46	15.35	14.98	14.74
5600	0.64	0.76	0.89	15.12	14.93	14.83	14.52	14.32	14.23
5900	0.61	0.72	0.83	14.02	14.21	14.44	13.69	13.85	14.01
6100	0.59	0.68	0.79	14.17	14.62	14.98	13.98	14.32	14.64
6300	0.52	0.62	0.72	14.89	15.59	16.04	14.72	15.31	15.73
6500	0.46	0.56	0.65	15.93	16.82	17.45	15.80	16.63	17.21
7000	0.32	0.44	0.53	19.95	21.56	23.13	20.01	21.58	23.05
7500	0.24	0.38	0.47	24.13	25.98	28.98	24.60	26.66	29.73
8000	0.20	0.35	0.44	25.07	25.37	28.31	25.59	25.91	29.26
8500	0.18	0.33	0.42	22.26	22.01	23.48	22.57	22.17	23.80
9000	0.18	0.33	0.43	18.96	19.07	19.74	19.02	19.04	19.73
9500	0.18	0.32	0.43	17.09	17.88	18.24	17.02	17.79	18.11
10000	0.16	0.30	0.41	17.25	18.64	19.05	17.19	18.60	18.96
10500	0.11	0.25	0.36	20.01	22.05	23.00	20.20	22.49	23.34
11000	0.05	0.21	0.33	26.59	28.34	30.07	29.75	35.18	39.66
11500	0.04	0.22	0.34	27.13	26.91	25.43	29.94	29.07	26.68
12000	0.07	0.24	0.37	21.06	21.94	21.11	20.92	21.89	21.18
12500	0.08	0.26	0.39	18.99	19.98	19.82	18.76	19.94	19.86
13000	0.06	0.25	0.39	19.30	20.01	20.69	19.40	20.49	21.15
14000	0.06	0.26	0.42	29.47	29.23	29.28	38.04	40.83	35.66
15000	0.10	0.33	0.51	20.73	20.03	18.76	20.80	20.21	18.86
16000	0.14	0.39	0.57	18.80	18.72	18.71	18.71	18.83	18.94
17000	0.20	0.47	0.70	32.42	29.38	27.17	34.22	32.00	30.24
18000	0.50	0.82	1.16	15.68	15.40	14.48	15.48	15.35	14.50

Typical Performance Data

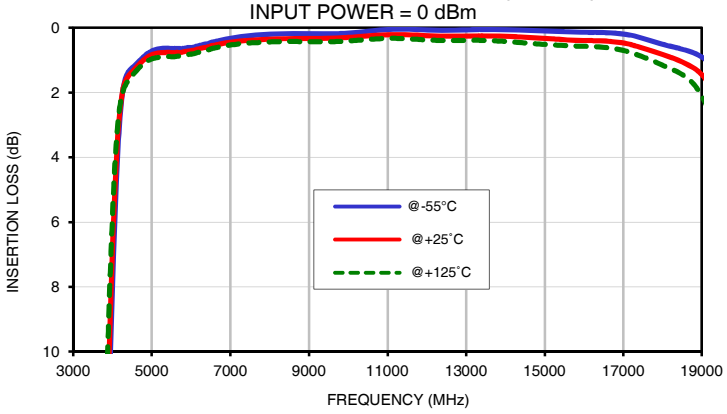
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-55°C	@+25°C	@+125°C
4500	0.45	0.42	0.40
4600	0.38	0.37	0.35
4800	0.31	0.31	0.30
5100	0.25	0.24	0.24
5200	0.23	0.22	0.22
5600	0.18	0.17	0.17
5800	0.16	0.15	0.15
6100	0.14	0.13	0.13
6400	0.12	0.12	0.12
6700	0.11	0.11	0.11
7000	0.10	0.10	0.10
7300	0.09	0.09	0.09
7600	0.09	0.08	0.09
7900	0.08	0.08	0.08
8200	0.08	0.07	0.08
8500	0.07	0.07	0.07
8800	0.07	0.07	0.07
9100	0.06	0.06	0.06
9400	0.06	0.06	0.06
9700	0.06	0.06	0.06
10000	0.06	0.06	0.06
10300	0.06	0.06	0.06
10600	0.05	0.05	0.06
10900	0.05	0.05	0.06
11200	0.05	0.05	0.06
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	0.05
13000	0.05	0.05	0.05
13300	0.05	0.05	0.05
13600	0.05	0.05	0.05
14000	0.05	0.05	0.05
14400	0.05	0.05	0.06
14800	0.05	0.05	0.06
15000	0.05	0.06	0.06
16000	0.06	0.06	0.06
17000	0.07	0.07	0.07
18000	0.08	0.08	0.09

Typical Performance Curves

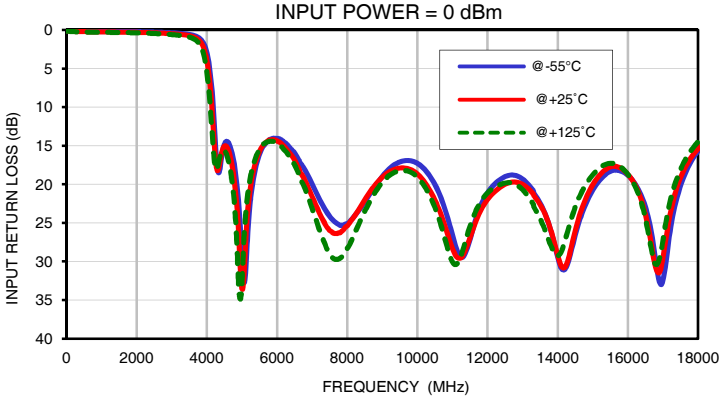
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



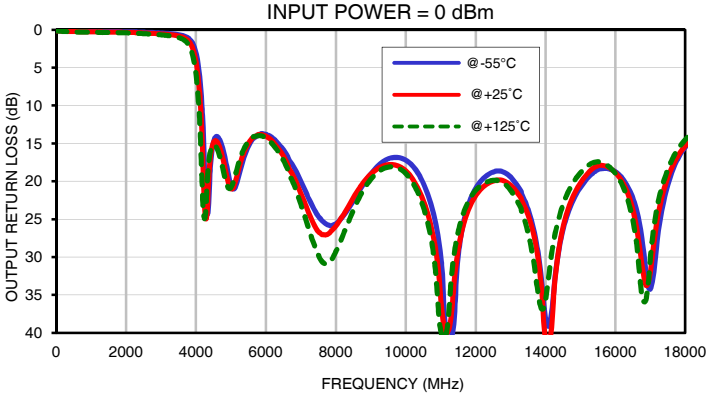
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



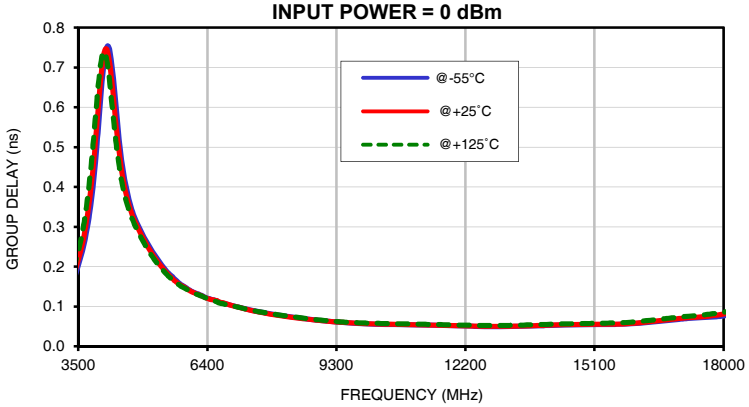
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm

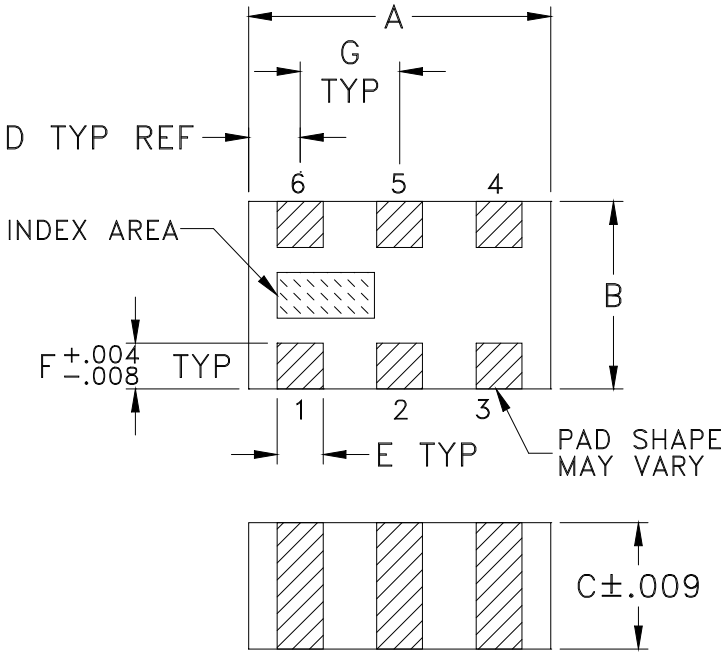


GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm

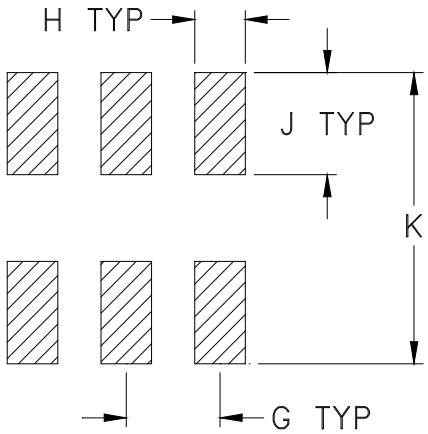


GE0805C-9

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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. ± .01; 3 Pl. ± .005

Notes:

1. Open style, ceramic base.
2. 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.

Tape & Reel Packaging TR-F114

DEVICE ORIENTATION IN T&R

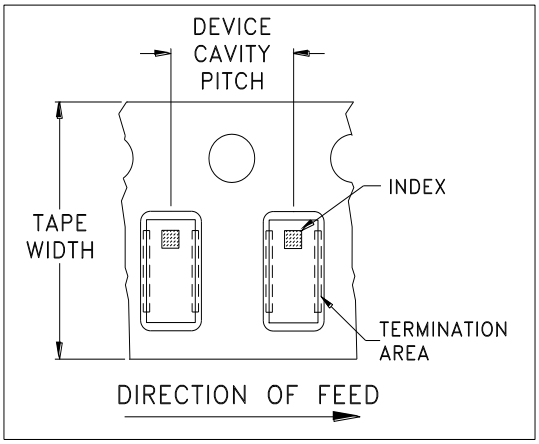


ILLUSTRATION 1

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

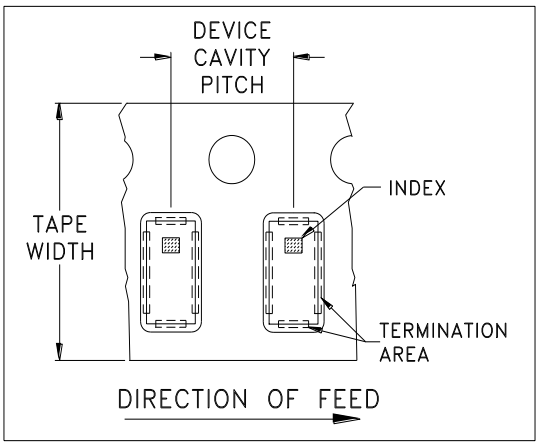


ILLUSTRATION 2

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
				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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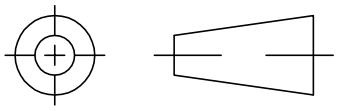
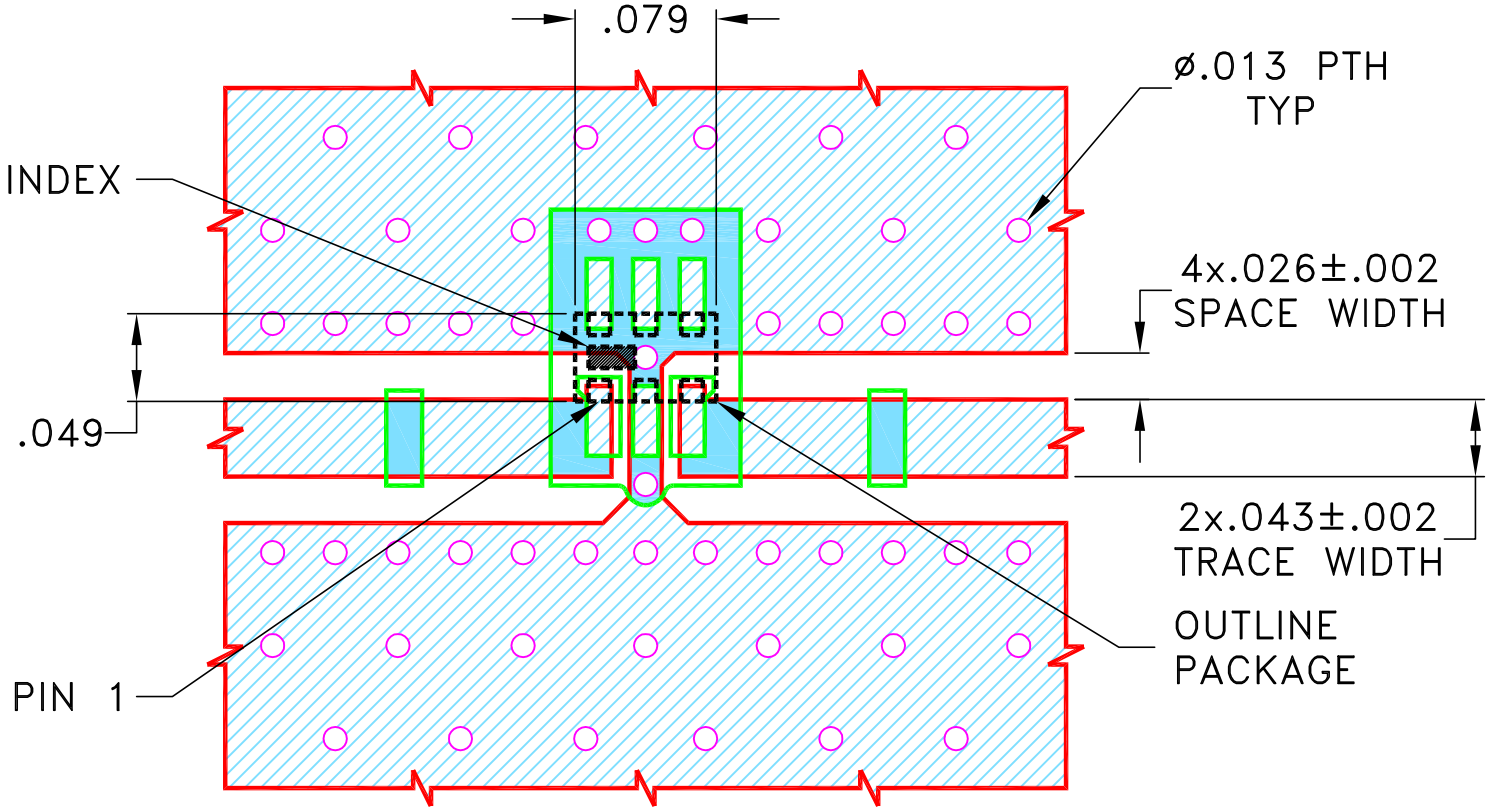
THIRD ANGLE PROJECTION



REVISIONS

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

SUGGESTED MOUNTING CONFIGURATION FOR GE0805C-9 CASE STYLE "06FL02" PIN CODE



NOTES:

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

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DDR	08 MAY 19
TOLERANCES ON:	CHECKED	RV	08 MAY 19
2 PL DECIMALS ±	APPROVED	RKS	08 MAY 19
3 PL DECIMALS ± .005"			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

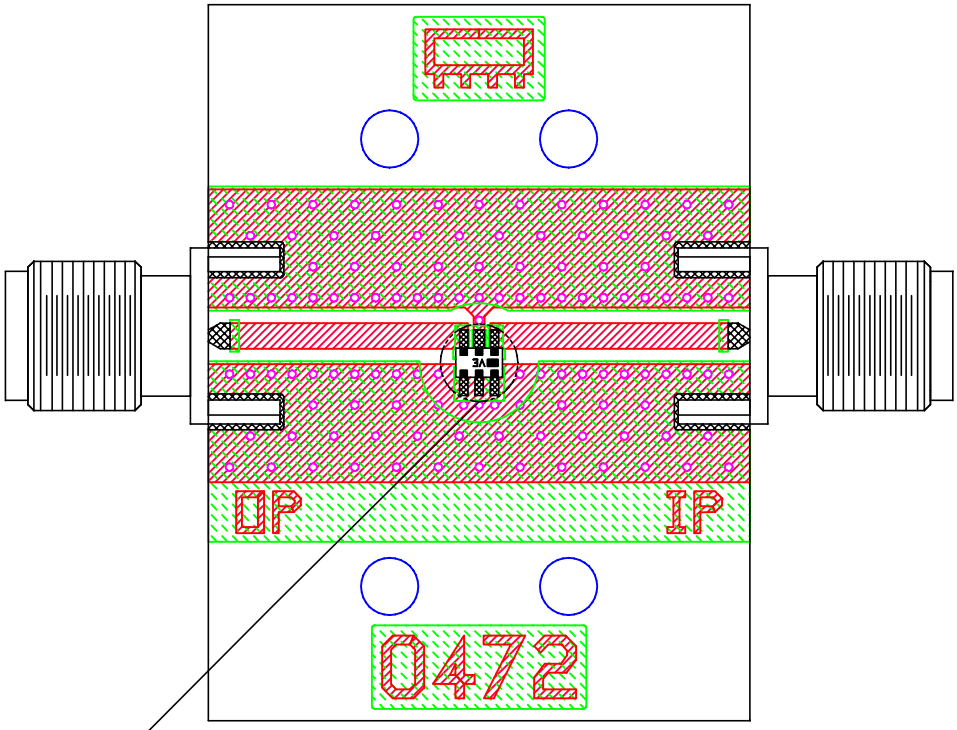
PL, 06FL02, GE0805C-9
TB-1104+, 50 OHM

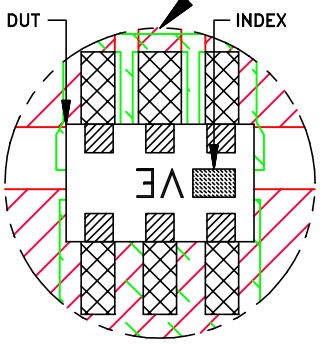
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-633	OR

FILE:	SCALE:	SHEET:
98PL633	9:1	1 OF 1

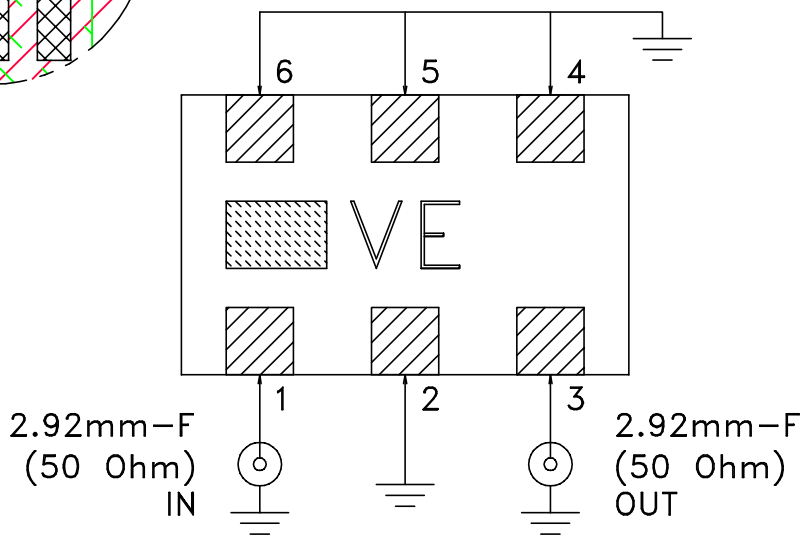
Evaluation Board and Circuit

TB-HFCG-4000+





Schematic diagram



Notes:

1. PCB Material: ROGERS (RO4350B) OR Equivalent, Dielectric Constant=3.48±.05 Dielectric Thickness: .020±.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.

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Environmental Specifications ENV126

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