



CERAMIC

Low Pass Filter

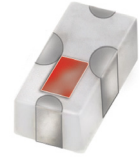
LFCW-1292+

Mini-Circuits

50Ω DC to 12900 MHz

THE BIG DEAL

- Low loss, 1.3 dB typ.
- Good rejection 45 dB typ.
- Small size 0603 (0.063" x 0.032" x 0.024")



Generic photo used for illustration purposes only

CASE STYLE: JC0603C-1

+RoHS Compliant

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

APPLICATIONS

- Test & Measurement
- 5G MIMO
- EW, Radar and ECM Defense Systems
- Satellite Communications

PRODUCT OVERVIEW

Mini-Circuits' LFCW-1292+ is an LTCC low pass filter with a passband from DC to 12900 MHz, supporting a variety of applications. This model provides 1.3 dB typ. passband insertion loss and provides a very good stopband rejection due to strategically constructed layout with minimal interaction between components. It handles up to 2.5W RF input power and provides a wide operating temperature range from -55 to +125°C. Housed in a small 0603 ceramic form factor, the filter is ideal for dense PCB layouts and with minimal performance variation due to parasitics.

KEY FEATURES

Feature	Advantages
Ultra-wide stopband	The LTCC lowpass filter provides a very good stopband rejection until 26.5 GHz suitable for high end 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 (0.063" x 0.032" x 0.024")	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Good power handling, 2.5W	Supports a wide range of system power requirements.

REV. OR
ECO-014772
LFCW-1292+
EDU4325
URJ
220830





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Low Pass Filter

LFCW-1292+

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

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Units	
Passband	Insertion Loss	DC-F1	DC - 12900	—	1.3	2.2	dB
	Freq. Cut-Off	F2*	13900	—	3	—	dB
	Return Loss	DC-F1	DC - 12900	—	13	—	dB
Stop Band	Rejection Loss	F3-F4	17000 - 19500	20	45	—	dB
		F4-F5	19500 - 22900	25	36	—	dB
		F5-F6	22900 - 25000	20	33	—	dB
		F6-F7	25000 - 26500	—	25	—	dB

¹ 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 alternatives if DC pass from IN-OUT is required.

² Measured on Mini-Circuits Characterization Test Board TB-LFCW-1292+

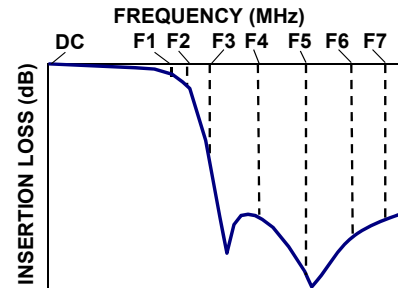
* Typically, a ±5% frequency deviation from the stated value may occur on a unit-to-unit basis.

MAXIMUM RATINGS

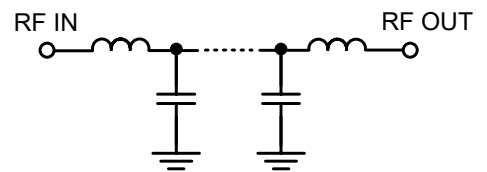
Parameter	Ratings
Operating temperature	-55°C to 125°C
Storage temperature	-55°C to 125°C
RF Power Input*	2.5W @25°C

*Passband rating, derate linearly to 0.7W at 125°C ambient
Permanent damage may occur if any of these limits are exceeded.

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL SCHEMATIC



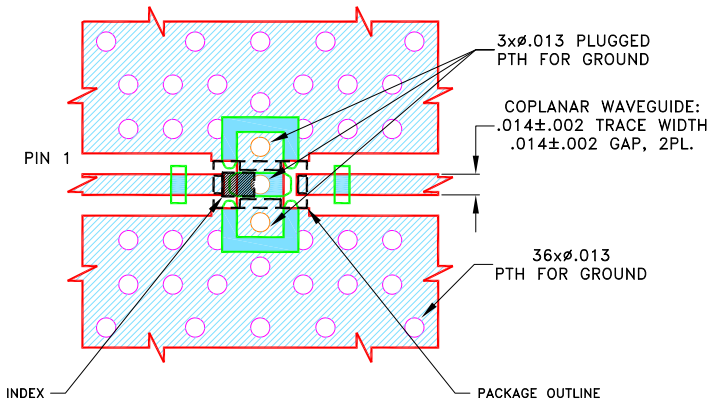


PAD CONNECTIONS

INPUT	1
OUTPUT	3
GROUND	2, 4

PRODUCT MARKING: 9

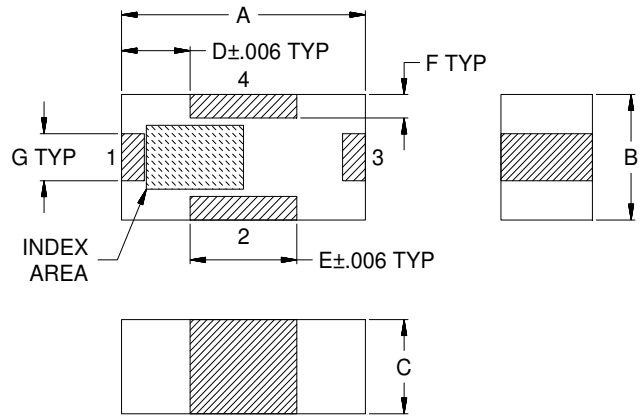
DEMO BOARD MCL P/N: TB-LFCW-1292+ SUGGESTED PCB LAYOUT (PL-661)



NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS .0066±.0007. 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.
.063	.032	.024	.018	.028	.006	.012	grams
1.60	0.80	0.60	0.45	0.70	0.15	0.30	.005

Note: Please refer to case style drawing for details



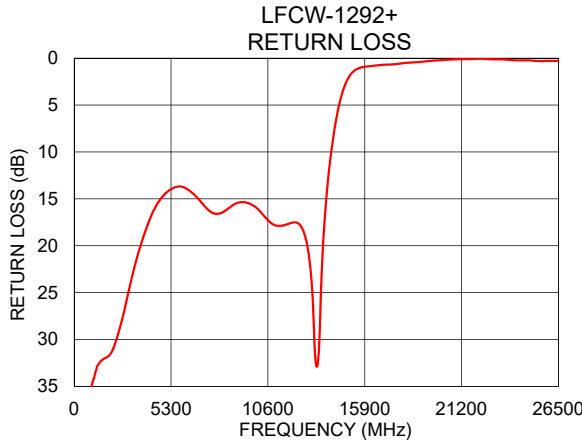
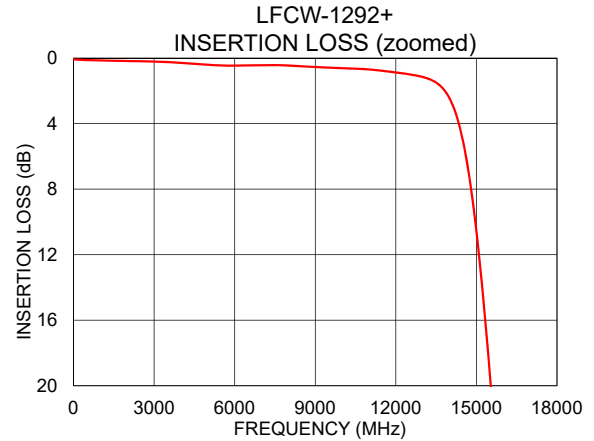
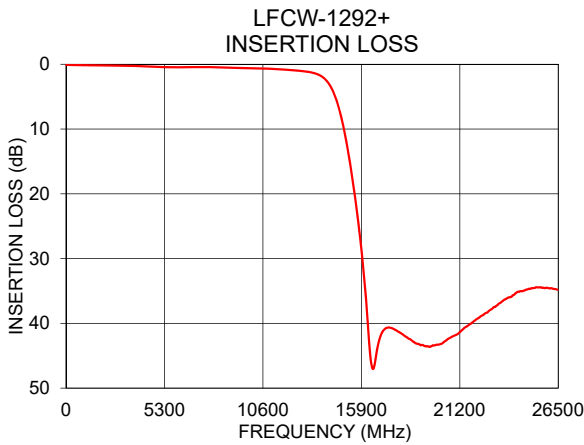
CERAMIC

Low Pass Filter

LFCW-1292+

TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	0.08	48.69
100	0.10	44.02
2000	0.19	31.50
5000	0.41	14.42
10000	0.62	16.01
12900	1.12	21.92
13900	2.18	12.80
14200	3.23	8.13
15550	20.34	1.09
16000	31.38	0.90
17000	41.50	0.70
19500	43.56	0.29
22900	37.82	0.13
25000	34.67	0.25
26500	34.84	0.30



- 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



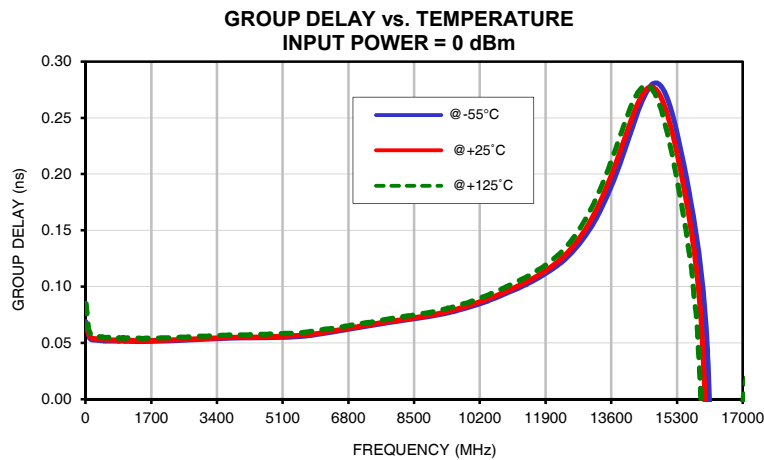
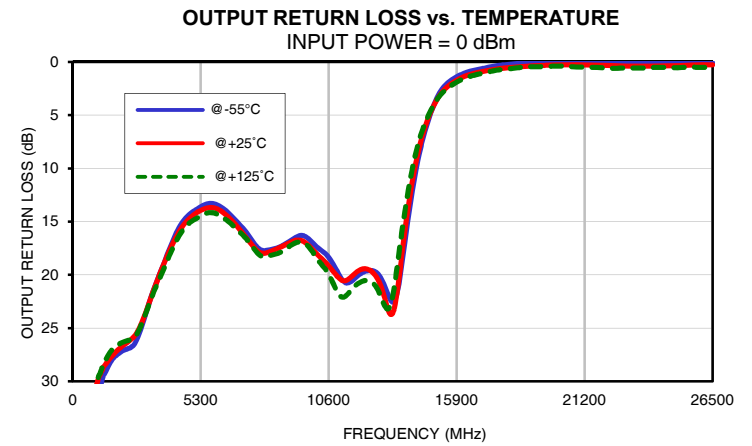
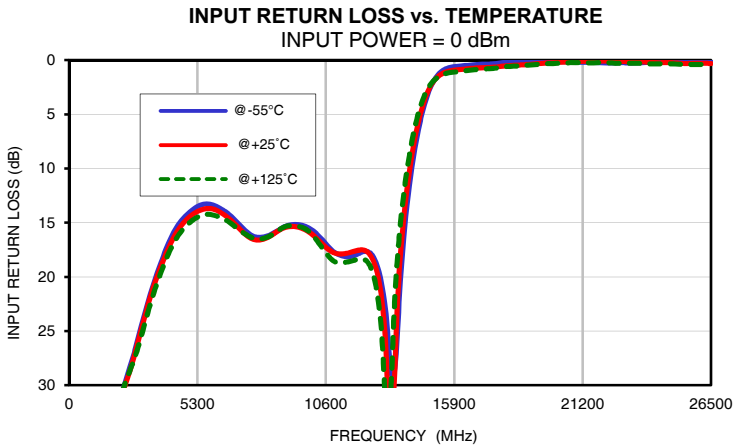
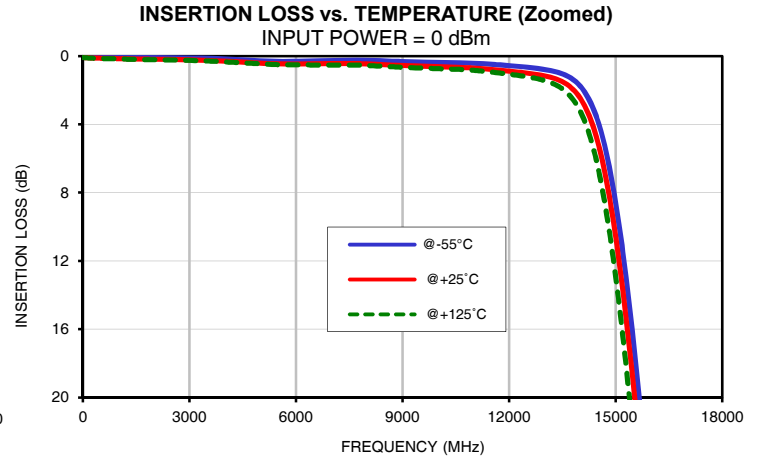
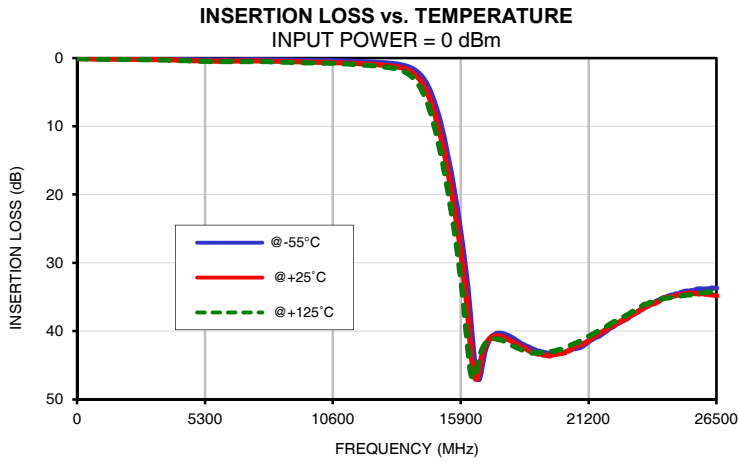
Typical Performance Data

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	0.06	0.08	0.09	49.51	48.69	45.56	55.55	48.69	46.69
50	0.06	0.09	0.09	49.97	46.22	45.30	54.48	46.08	45.14
100	0.07	0.10	0.10	47.98	44.02	42.47	45.99	43.63	42.49
500	0.07	0.13	0.14	39.97	38.31	37.35	36.22	35.76	34.22
1000	0.07	0.15	0.17	35.11	34.59	33.50	31.67	30.23	30.06
1200	0.08	0.16	0.18	33.65	33.28	32.56	30.00	29.04	28.80
1400	0.08	0.16	0.19	33.13	32.46	32.11	28.93	28.29	27.82
1600	0.09	0.17	0.20	32.80	32.09	31.95	28.05	27.68	27.11
1800	0.09	0.18	0.21	32.42	31.87	31.77	27.57	27.20	26.69
2000	0.09	0.19	0.21	31.78	31.50	31.45	27.23	26.80	26.41
2200	0.09	0.19	0.22	30.57	30.65	30.54	27.00	26.44	26.22
2400	0.10	0.20	0.23	29.13	29.43	29.29	26.83	26.11	26.08
2600	0.10	0.20	0.24	27.72	28.03	28.15	26.33	25.62	25.74
2800	0.10	0.21	0.24	26.11	26.42	26.86	25.23	24.81	24.92
3000	0.10	0.22	0.25	24.38	24.69	25.31	23.80	23.68	23.76
3500	0.13	0.25	0.29	20.57	20.82	21.46	20.52	20.53	20.86
4000	0.17	0.30	0.34	17.48	17.88	18.40	17.62	17.76	18.22
4500	0.22	0.36	0.40	15.22	15.68	16.20	15.22	15.61	15.98
5000	0.27	0.41	0.45	13.99	14.42	14.95	14.03	14.37	14.86
5500	0.31	0.46	0.50	13.33	13.78	14.30	13.38	13.76	14.24
6000	0.31	0.46	0.51	13.42	13.78	14.32	13.45	13.82	14.32
6500	0.29	0.45	0.52	14.06	14.43	14.79	14.31	14.70	15.09
7000	0.26	0.44	0.52	15.12	15.47	15.62	15.51	15.95	16.17
7500	0.24	0.43	0.52	16.13	16.43	16.33	17.01	17.42	17.53
8000	0.25	0.46	0.55	16.32	16.54	16.46	17.72	17.95	18.28
10000	0.37	0.62	0.74	15.63	16.01	16.03	17.13	17.78	18.08
12000	0.56	0.88	1.06	17.80	17.52	18.34	19.78	19.45	20.60
12900	0.75	1.12	1.38	20.61	21.92	25.15	20.95	22.04	22.80
13900	1.54	2.18	2.86	14.42	12.80	10.92	14.55	13.51	12.02
14200	2.35	3.23	4.23	9.18	8.13	6.95	10.34	9.58	8.62
15000	8.61	10.59	12.94	2.12	2.12	2.02	3.80	3.87	3.83
15550	17.71	20.34	23.56	0.81	1.09	1.23	1.95	2.27	2.43
16000	27.98	31.38	35.80	0.58	0.90	1.07	1.28	1.60	1.78
17000	41.94	41.50	41.44	0.38	0.70	0.83	0.61	0.89	1.05
17200	40.74	40.78	41.15	0.37	0.69	0.80	0.51	0.81	0.95
17400	40.32	40.65	41.14	0.36	0.67	0.78	0.42	0.73	0.85
17600	40.33	40.81	41.34	0.32	0.64	0.74	0.34	0.66	0.76
17800	40.59	41.12	41.69	0.26	0.59	0.67	0.28	0.60	0.71
18000	40.90	41.49	42.06	0.20	0.53	0.61	0.24	0.55	0.66
18200	41.33	41.89	42.40	0.16	0.50	0.57	0.20	0.51	0.61
18400	41.80	42.28	42.71	0.14	0.48	0.55	0.15	0.47	0.56
18600	42.18	42.63	42.95	0.12	0.45	0.52	0.11	0.44	0.51
18800	42.50	43.04	43.09	0.09	0.42	0.49	0.07	0.41	0.47
19000	42.82	43.22	43.21	0.06	0.39	0.45	0.05	0.38	0.45
19200	43.02	43.34	43.15	0.02	0.35	0.42	0.04	0.36	0.45
19500	43.26	43.56	43.10	0.04	0.29	0.36	0.02	0.33	0.44
20000	43.24	43.31	42.73	0.10	0.23	0.31	0.04	0.28	0.40
20500	42.70	42.57	42.00	0.15	0.17	0.26	0.05	0.27	0.43
21000	42.06	41.78	41.17	0.20	0.11	0.23	0.03	0.28	0.49
21500	40.92	40.61	40.17	0.21	0.11	0.25	0.06	0.29	0.52
22000	39.81	39.60	39.17	0.25	0.07	0.23	0.06	0.32	0.57
22500	38.74	38.60	38.18	0.26	0.09	0.28	0.04	0.37	0.60
22900	37.93	37.82	37.38	0.24	0.13	0.31	0.05	0.38	0.58
23500	36.62	36.58	36.09	0.26	0.13	0.30	0.00	0.40	0.58
24000	35.63	35.85	35.51	0.18	0.21	0.35	0.01	0.39	0.53
24500	34.87	35.03	35.15	0.15	0.24	0.34	0.02	0.37	0.52
25000	34.40	34.67	34.87	0.13	0.25	0.35	0.03	0.36	0.54
25500	34.10	34.46	34.62	0.05	0.31	0.41	0.04	0.31	0.50
26000	33.83	34.58	34.35	0.07	0.29	0.40	0.07	0.28	0.51
26500	33.71	34.84	34.36	0.07	0.30	0.44	0.10	0.27	0.51

Typical Performance Data

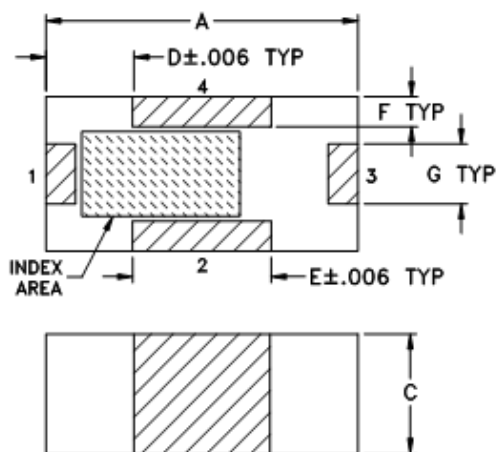
FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-55°C	@+25°C	@+125°C
10	0.07	0.07	0.08
50	0.06	0.06	0.07
100	0.05	0.06	0.06
300	0.05	0.05	0.06
500	0.05	0.05	0.05
700	0.05	0.05	0.05
900	0.05	0.05	0.05
1000	0.05	0.05	0.05
1200	0.05	0.05	0.05
1400	0.05	0.05	0.05
1600	0.05	0.05	0.05
1800	0.05	0.05	0.05
2000	0.05	0.05	0.05
2200	0.05	0.05	0.05
2400	0.05	0.05	0.05
2600	0.05	0.05	0.06
2800	0.05	0.05	0.06
3000	0.05	0.05	0.06
3200	0.05	0.05	0.06
3400	0.05	0.05	0.06
3600	0.05	0.05	0.06
3800	0.05	0.05	0.06
4000	0.05	0.06	0.06
4500	0.05	0.06	0.06
5000	0.05	0.06	0.06
5500	0.06	0.06	0.06
6000	0.06	0.06	0.06
6500	0.06	0.06	0.06
7000	0.06	0.06	0.07
7500	0.07	0.07	0.07
8000	0.07	0.07	0.07
8500	0.07	0.07	0.07
9000	0.07	0.08	0.08
9500	0.08	0.08	0.08
10000	0.08	0.08	0.09
10500	0.09	0.09	0.09
11000	0.10	0.10	0.10
11500	0.10	0.11	0.11
12000	0.11	0.12	0.12
12900	0.14	0.15	0.16

Typical Performance Curves

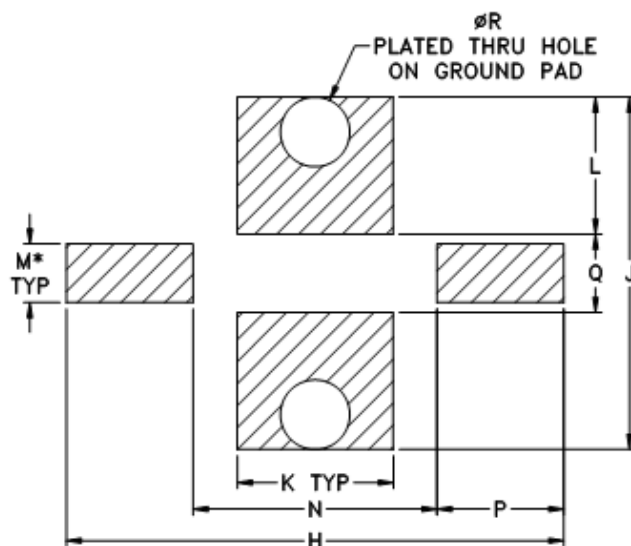


Outline Dimensions

JC0603C-1



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	L
JC0603C-1	.063 (1.60)	.031 (0.80)	.024 (0.60)	.018 (0.45)	.028 (0.70)	.006 (0.15)	.012 (0.30)	.100 (2.54)	.071 (1.80)	.032 (0.80)	.028 (0.70)

CASE #	M*	N	P	Q	R	WT. GRAMS
JC0603C-1	.012 (0.30)	.049 (1.24)	.026 (0.65)	.016 (0.40)	.014 (0.35)	.005

Dimensions are in inches (mm). Tolerances: 3 Pl. $\pm .004$

Notes:

1. Open style, ceramic base.
2. Termination finish:
For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
- 3.* - Line width should be designed to match 50 OHMS characteristic impedance, depending on PCB material & thickness.



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



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

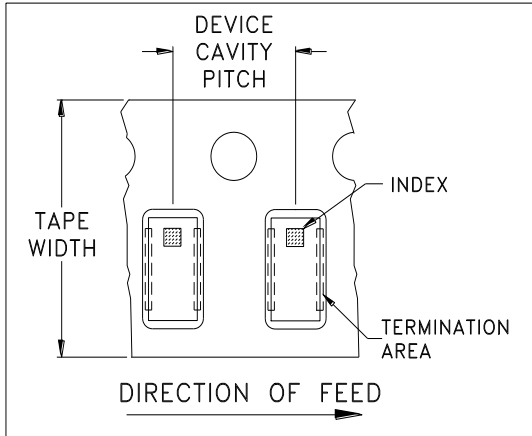


ILLUSTRATION 1

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

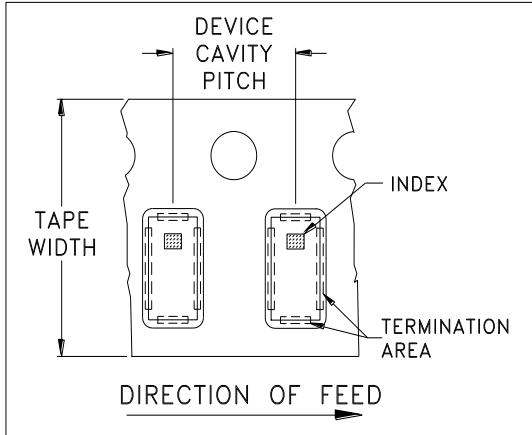


ILLUSTRATION 2

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
				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



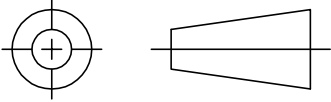
INTERNET <http://www.minicircuits.com>

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

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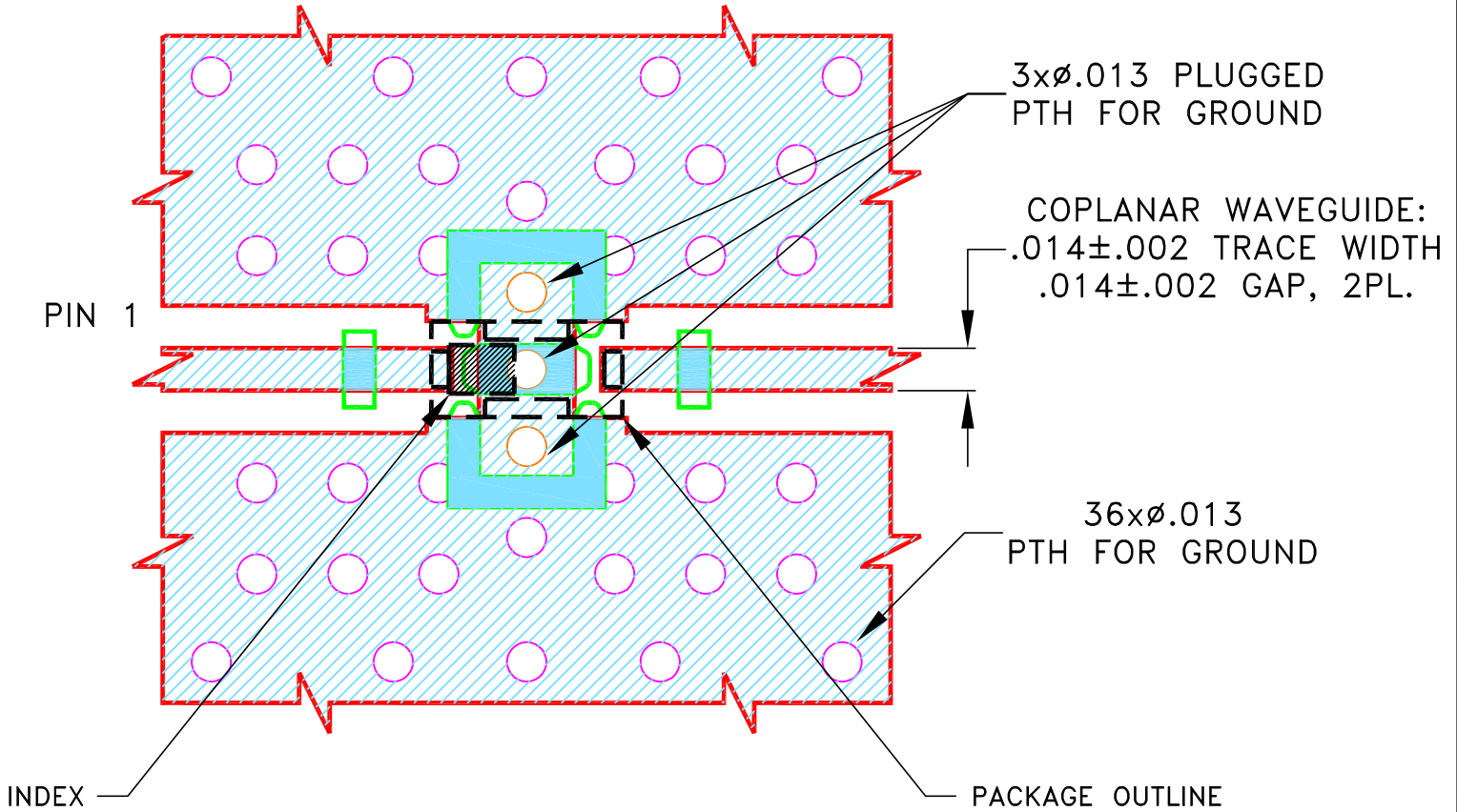
THIRD ANGLE PROJECTION



REVISIONS

REV OR	ECN No.	DESCRIPTION	DATE	DR	AUTH
	M176778	NEW RELEASE	DEC 19	DDR	VC

**SUGGESTED MOUNTING CONFIGURATION
FOR JC0603C-1 CASE STYLE**



NOTES:

- COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R04350B) WITH DIELECTRIC THICKNESS $.0066 \pm .0007$. COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
- 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

UNLESS OTHERWISE SPECIFIED	INITIALS		DATE
DIMENSIONS ARE IN INCHES	DRAWN	DDR	14 DEC 19
TOLERANCES ON:	CHECKED	RV	14 DEC 19
2 PL DECIMALS ±	APPROVED	RKS	14 DEC 19
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

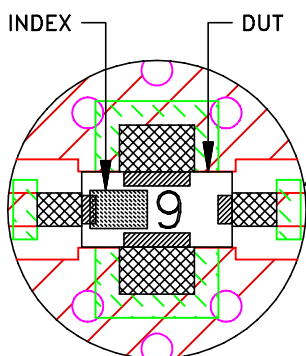
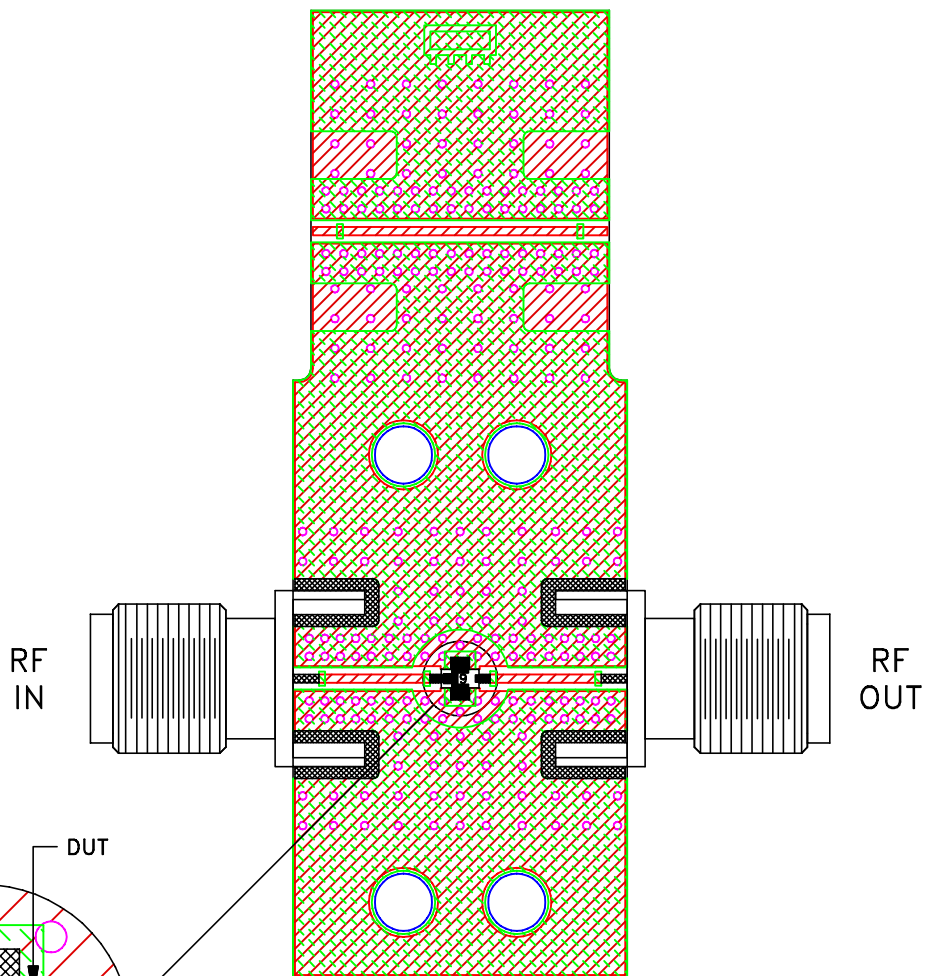
PL, JC0603C-1, TB-1124+

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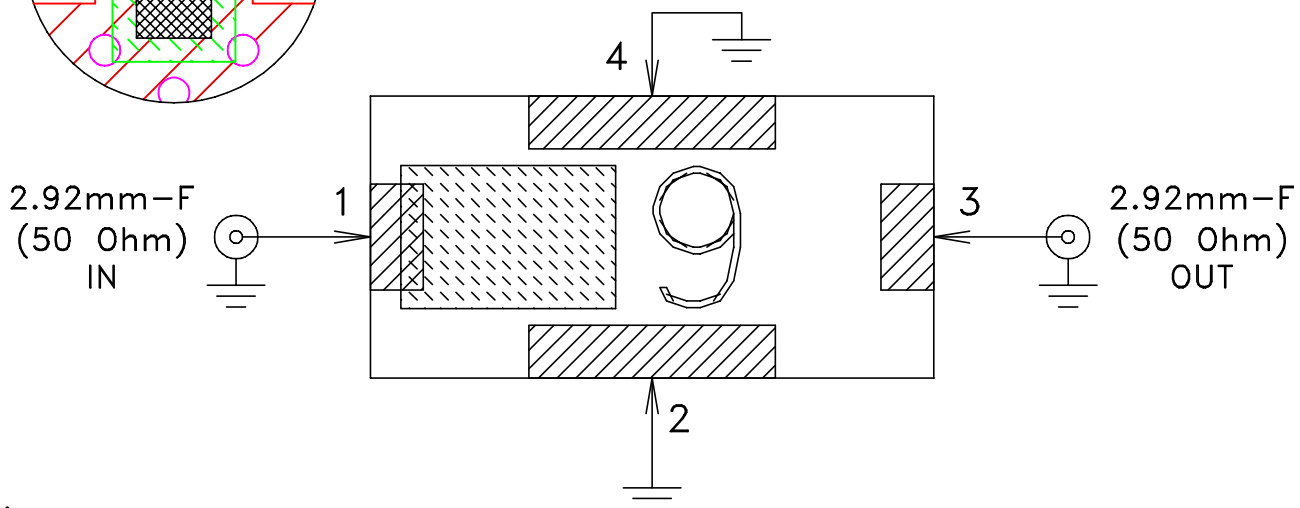
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-661	OR
FILE:	98PL661	SCALE:	SHEET: 1 OF 1
		16:1	

Evaluation Board and Circuit

TB-LFCW-1292+



Schematic diagram




Notes:

1. PCB Material: ROGERS (RO4350B) OR Equivalent, Dielectric Constant= 3.48 ± 0.05

Dielectric Thickness: $.0066 \pm .0007$

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