

Surface Mount

Coaxial-Ceramic Resonator Filters and Multiplexers

50Ω DC to 6 GHz

The Big Deal

- Low insertion loss with excellent power handling
- Passbands up to 6 GHz
- Fractional bandwidth from <1 to 25%
- Low profile designs with min. height of 0.120"
- Excellent temperature stability
- Rugged construction to handle demanding environmental conditions



Product Overview

Mini-Circuits' *Coaxial-Ceramic Resonator filters* offer low insertion loss in very small form factors, using ceramic material with high dielectric constant and superior Q factor. Bandpass and bandstop filters, diplexer and multiplexer designs can be constructed using this technology. Low insertion loss combined with excellent power handling makes these filters well suited for transmitter and receiver signal chains. Advanced filter design and construction can achieve stopband width greater than 3x the center frequency as high as 20 GHz.

All our coaxial-ceramic resonator filters are built with rugged construction, qualified to withstand multiple demanding reflow cycles. Excellent repeatability across units is achieved through precise tuning and process control.

Key Features

Feature	Advantages
Low insertion loss	Low signal loss results in better SNR in signal chain
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stop band	Wide spur-free stopband results in better receiver sensitivity
Excellent power handling	Well suited for transmitter applications
Rugged Construction	These filter assemblies have been qualified over a wide range of thermal, mechanical and environmental conditions including withstanding the stress of extensive solder reflow cycles
Small Size	Very well suited for high performance applications where size is a constraint.
Temperature stability	Very minimal change in electrical performance across temperature makes these filters suitable for a wide range of operating conditions.

Notes

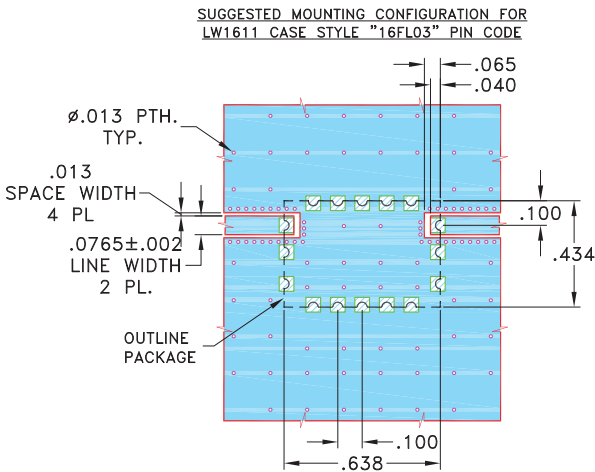
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- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. 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



Pad Connections

INPUT	1
OUTPUT	11
GROUND	2,3,4,5,6,7,8,9,10,12,13,14,15,16

Demo Board MCL P/N: TB-611+
Suggested PCB Layout (PL-338)

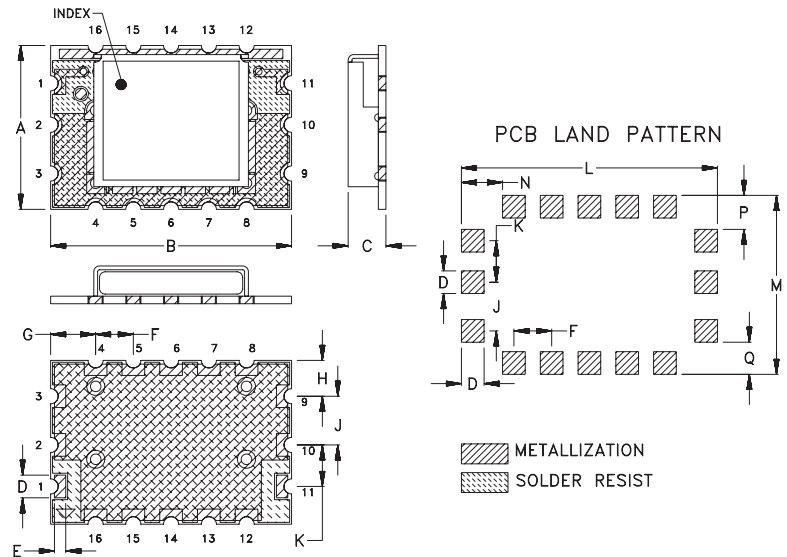


NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .060"±.004". COPPER: 1/2 OZ. EACH SIDE.
 FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- 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

Outline Drawing



Outline Dimensions (Inch/mm)

A	B	C	D	E	F	G	H	J	K	L	M
.434	.638	.120	.060	.030	.100	.119	.095	.129	.110	.678	.474
11.02	16.21	3.05	1.52	0.76	2.54	3.02	2.41	3.28	2.79	17.22	12.04
N	P	Q	wt,								
.109	.090	.085	grams								
2.77	2.29	2.16	0.8								

Note: Please refer to case style drawing for details

Notes

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Typical Performance Data

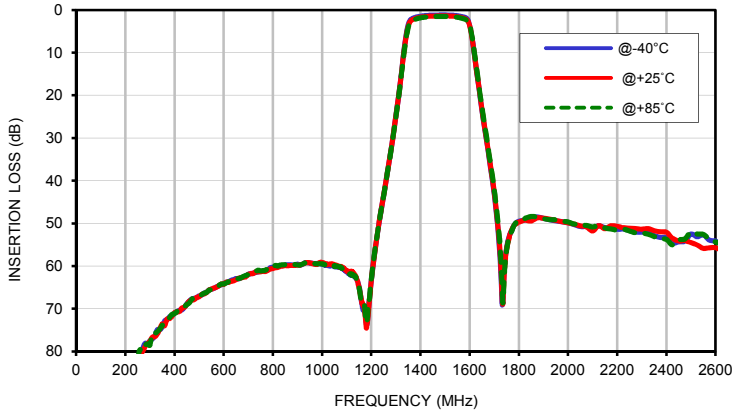
FREQ. (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1.0	101.69	100.69	99.86	0.05	0.05	0.05	0.05	0.05	0.05
5.0	95.53	106.85	102.86	0.05	0.05	0.05	0.05	0.05	0.05
50.0	100.73	106.51	100.01	0.05	0.05	0.05	0.04	0.04	0.04
100.0	98.55	99.97	100.77	0.04	0.05	0.05	0.03	0.04	0.04
200.0	87.86	87.12	88.84	0.05	0.06	0.07	0.02	0.05	0.05
250.0	81.47	81.41	81.18	0.05	0.08	0.09	0.04	0.06	0.07
500.0	66.99	67.21	67.06	0.12	0.17	0.20	0.10	0.14	0.16
600.0	64.12	64.29	64.20	0.13	0.20	0.23	0.12	0.16	0.18
700.0	61.93	61.99	61.97	0.15	0.22	0.26	0.13	0.19	0.21
800.0	60.32	60.59	60.33	0.16	0.23	0.27	0.14	0.20	0.22
900.0	59.55	59.78	59.75	0.17	0.24	0.27	0.15	0.21	0.23
1000.0	59.53	59.15	59.48	0.17	0.25	0.28	0.15	0.22	0.24
1100.0	61.30	61.22	61.21	0.17	0.25	0.29	0.15	0.23	0.26
1230.0	50.62	50.52	50.53	0.27	0.36	0.41	0.22	0.33	0.37
1250.0	43.62	43.57	43.61	0.31	0.41	0.46	0.27	0.38	0.43
1260.0	40.16	40.11	40.16	0.35	0.46	0.51	0.30	0.42	0.47
1280.0	32.98	32.94	33.03	0.46	0.58	0.64	0.39	0.53	0.59
1290.0	29.13	29.11	29.24	0.55	0.68	0.75	0.47	0.61	0.68
1300.0	25.05	25.05	25.21	0.67	0.83	0.90	0.58	0.74	0.82
1310.0	20.69	20.73	20.93	0.89	1.07	1.15	0.77	0.96	1.04
1320.0	16.03	16.11	16.38	1.30	1.52	1.61	1.13	1.36	1.45
1330.0	11.14	11.31	11.64	2.21	2.50	2.60	1.97	2.25	2.34
1340.0	6.57	6.86	7.23	4.62	4.98	5.01	4.17	4.51	4.53
1350.0	3.49	3.85	4.17	10.93	11.22	10.97	9.74	9.93	9.71
1360.0	2.28	2.61	2.84	27.80	26.71	25.15	19.19	18.86	18.32
1370.0	1.91	2.19	2.38	19.96	20.68	20.76	18.78	19.31	19.25
1375.0	1.80	2.07	2.25	18.64	19.27	19.23	18.15	18.74	18.65
1475.0	1.18	1.39	1.51	22.33	22.28	22.62	22.26	22.36	22.69
1575.0	1.64	1.90	2.03	18.82	18.31	18.04	18.77	18.16	17.80
1600.0	3.42	3.60	3.60	8.63	9.43	10.37	8.64	9.49	10.45
1610.0	6.41	6.45	6.22	3.87	4.37	4.92	3.84	4.35	4.89
1620.0	10.59	10.52	10.12	1.96	2.28	2.58	1.91	2.23	2.52
1640.0	19.31	19.15	18.64	0.85	1.03	1.16	0.82	0.99	1.11
1650.0	23.39	23.20	22.67	0.67	0.82	0.92	0.64	0.79	0.88
1660.0	27.29	27.08	26.54	0.55	0.70	0.78	0.53	0.66	0.74
1670.0	31.11	30.87	30.31	0.47	0.61	0.68	0.45	0.58	0.64
1675.0	33.00	32.76	32.19	0.45	0.58	0.64	0.42	0.54	0.60
1700.0	43.17	42.73	42.05	0.35	0.46	0.52	0.32	0.43	0.48
1750.0	55.88	56.14	56.45	0.23	0.33	0.37	0.21	0.31	0.35
1800.0	49.50	49.71	49.36	0.17	0.27	0.30	0.16	0.25	0.29
1850.0	48.61	49.45	48.40	0.14	0.24	0.27	0.12	0.22	0.25
1900.0	48.81	48.83	48.89	0.10	0.19	0.22	0.09	0.18	0.22
1950.0	49.43	49.32	49.18	0.08	0.17	0.20	0.06	0.17	0.20
2000.0	49.83	49.91	49.67	0.07	0.15	0.19	0.05	0.15	0.19
2050.0	50.73	50.60	50.40	0.05	0.13	0.17	0.03	0.13	0.17
2100.0	51.07	51.78	50.83	0.04	0.13	0.17	0.02	0.13	0.17
2150.0	50.99	51.26	51.08	0.02	0.11	0.15	0.01	0.12	0.17
2200.0	51.42	50.68	51.57	0.01	0.11	0.15	0.00	0.11	0.15
2250.0	51.68	51.15	51.78	0.01	0.10	0.14	0.01	0.11	0.16
2300.0	52.03	51.37	52.27	0.00	0.09	0.14	0.01	0.11	0.16
2350.0	52.86	51.70	53.08	0.00	0.09	0.14	0.02	0.11	0.16
2400.0	53.38	52.08	53.74	0.00	0.09	0.14	0.01	0.11	0.16
2425.0	54.63	53.51	55.06	0.00	0.09	0.15	0.02	0.11	0.16
2450.0	54.33	54.12	53.86	0.00	0.09	0.15	0.01	0.11	0.17
2475.0	54.16	54.03	53.67	0.00	0.09	0.15	0.01	0.11	0.17
2500.0	52.51	54.52	52.02	0.00	0.10	0.16	0.01	0.12	0.18
2525.0	53.14	55.05	52.50	0.01	0.11	0.16	0.01	0.12	0.18
2550.0	52.70	55.85	52.58	0.02	0.12	0.17	0.00	0.13	0.19
2575.0	53.93	55.73	53.68	0.02	0.12	0.18	0.00	0.14	0.19
2600.0	54.14	55.71	54.37	0.03	0.13	0.19	0.01	0.15	0.20

Typical Performance Data

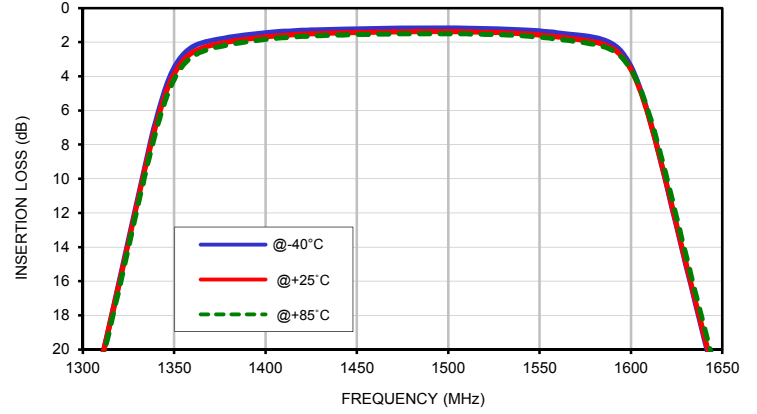
FREQ. (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
1375.0	8.21	8.16	8.17
1380.0	7.75	7.72	7.71
1385.0	7.40	7.36	7.35
1390.0	7.11	7.08	7.07
1395.0	6.88	6.84	6.83
1400.0	6.68	6.64	6.63
1405.0	6.50	6.47	6.45
1410.0	6.35	6.32	6.30
1415.0	6.22	6.18	6.17
1420.0	6.09	6.06	6.04
1425.0	5.98	5.95	5.93
1427.5	5.93	5.90	5.88
1435.0	5.80	5.77	5.75
1440.0	5.72	5.69	5.67
1445.0	5.65	5.62	5.60
1450.0	5.59	5.56	5.54
1455.0	5.54	5.51	5.49
1460.0	5.51	5.48	5.45
1465.0	5.48	5.45	5.42
1470.0	5.46	5.43	5.41
1475.0	5.45	5.41	5.38
1477.5	5.44	5.41	5.38
1480.0	5.44	5.41	5.38
1482.5	5.44	5.41	5.38
1485.0	5.44	5.41	5.38
1487.5	5.45	5.41	5.38
1490.0	5.44	5.41	5.38
1492.5	5.45	5.42	5.39
1495.0	5.46	5.42	5.39
1497.5	5.47	5.44	5.40
1500.0	5.48	5.45	5.41
1502.5	5.50	5.47	5.42
1505.0	5.51	5.48	5.44
1507.5	5.53	5.49	5.46
1510.0	5.55	5.51	5.48
1512.5	5.57	5.54	5.50
1515.0	5.60	5.56	5.52
1517.5	5.63	5.59	5.54
1520.0	5.65	5.62	5.57
1522.5	5.69	5.65	5.61
1525.0	5.72	5.68	5.64
1527.5	5.76	5.72	5.67
1530.0	5.80	5.76	5.71
1535.0	5.89	5.85	5.80
1540.0	5.99	5.94	5.89
1545.0	6.11	6.06	6.00
1550.0	6.23	6.18	6.11
1555.0	6.38	6.33	6.25
1560.0	6.56	6.50	6.41
1565.0	6.78	6.71	6.62
1575.0	7.45	7.35	7.21

Typical Performance Curves

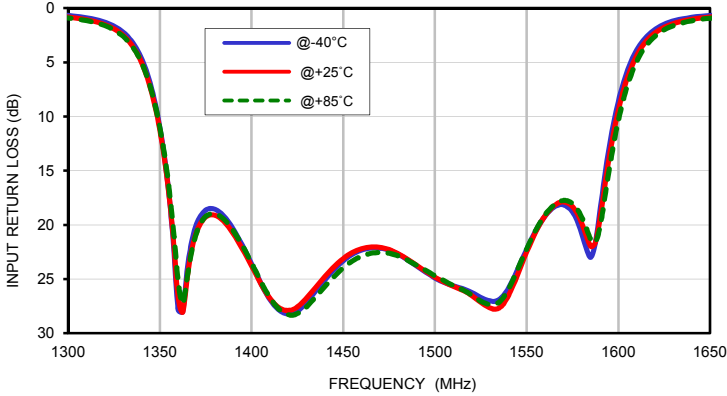
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



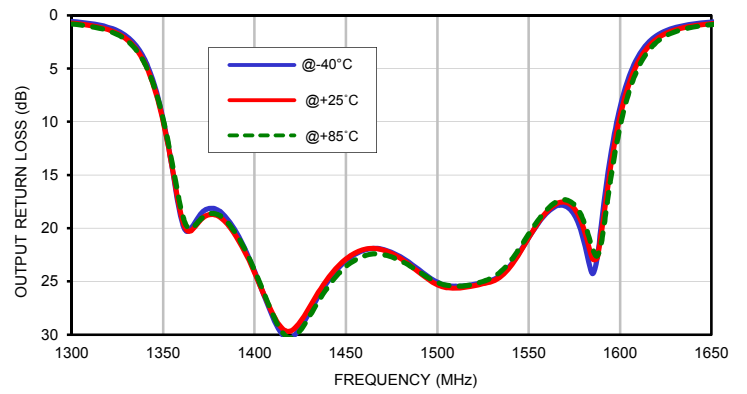
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



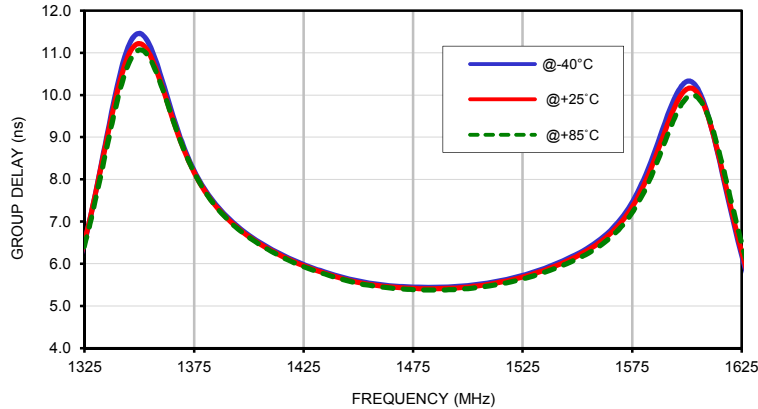
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



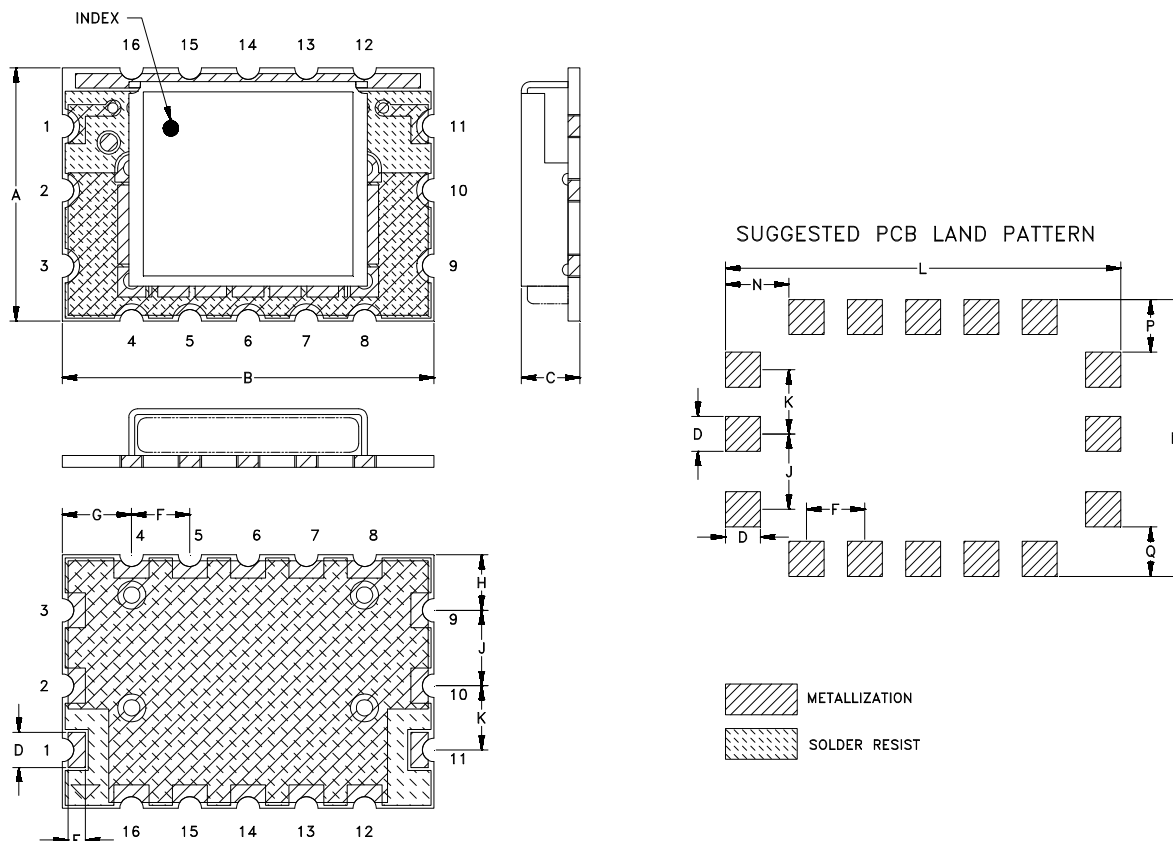
OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	M
LW1611	.434 (11.02)	.638 (16.21)	.120 (3.05)	.060 (1.52)	.030 (.76)	.100 (2.54)	.119 (3.02)	.095 (2.41)	.129 (3.28)	.110 (2.79)	.678 (17.22)	.474 (12.04)

CASE#	N	P	Q	WT. GRAMS
LW1611	.109 (2.77)	.090 (2.29)	.085 (2.16)	0.8

Dimensions are in inches (mm). Tolerances: 2Pl. $\pm .03$; 3Pl. $\pm .015$

Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:
For RoHS Case Styles: 2-5 μ inch (.05-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate.
All models, (+) suffix.



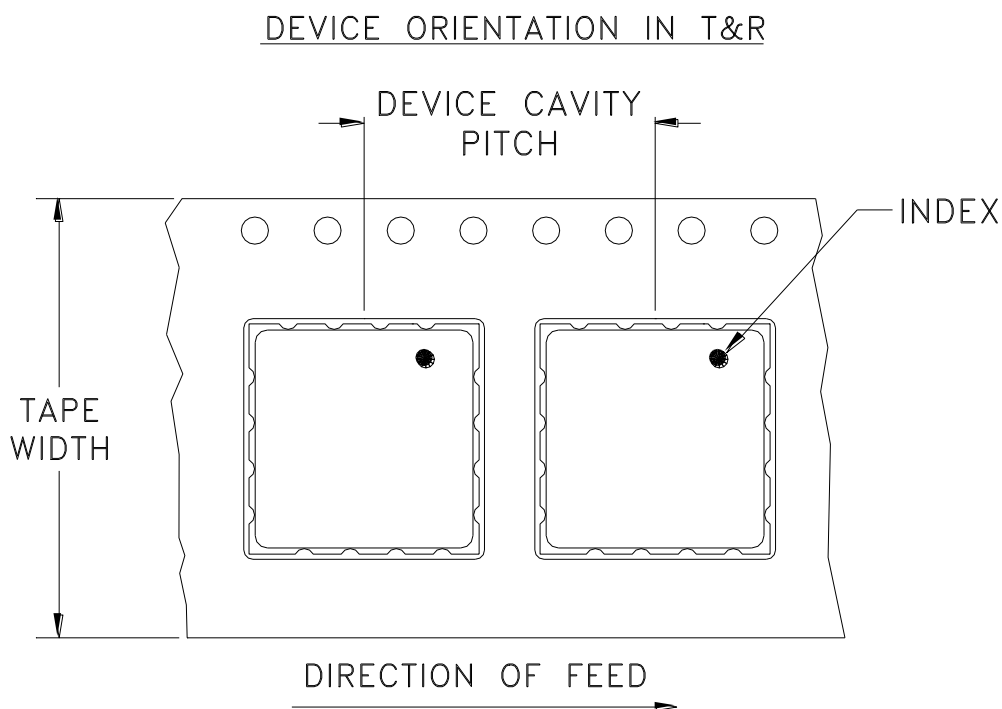
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F37



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	16	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200
500				

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



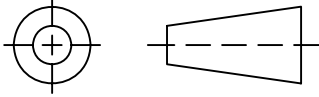
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P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

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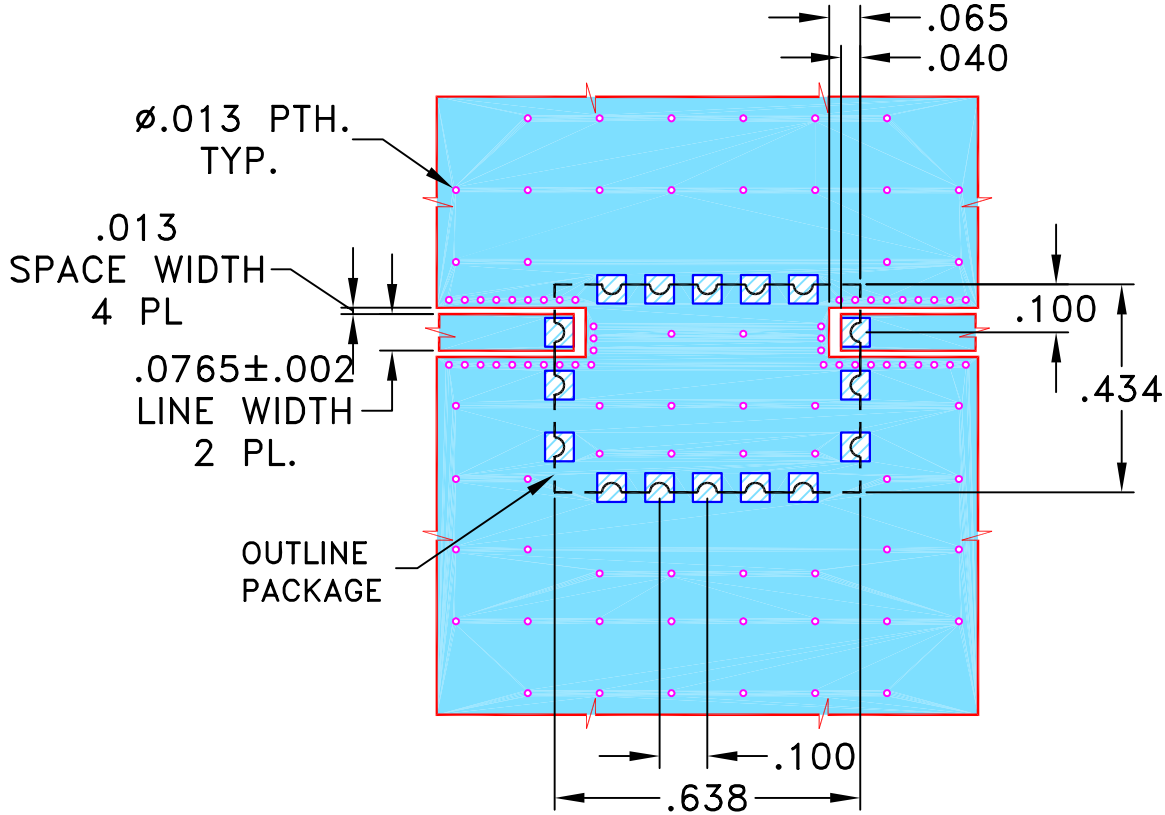
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M129915	NEW RELEASE	APR 11	MD	KG

SUGGESTED MOUNTING CONFIGURATION FOR
LW1611 CASE STYLE "16FL03" PIN CODE



NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .060" ± .004". COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- 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 TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005" ANGLES ± FRACTIONS ±	DRAWN	MD 16 APR 11
	CHECKED	MD 16 APR 11
	APPROVED	KR 16 APR 11



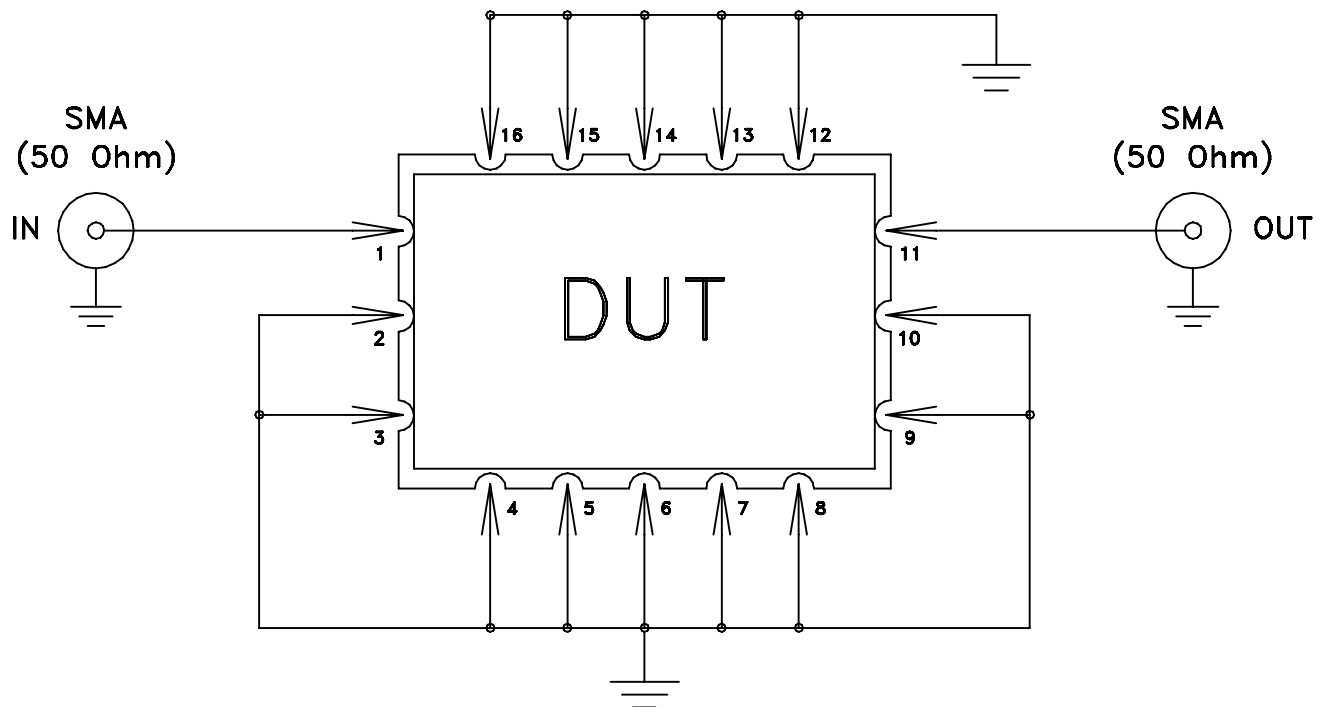
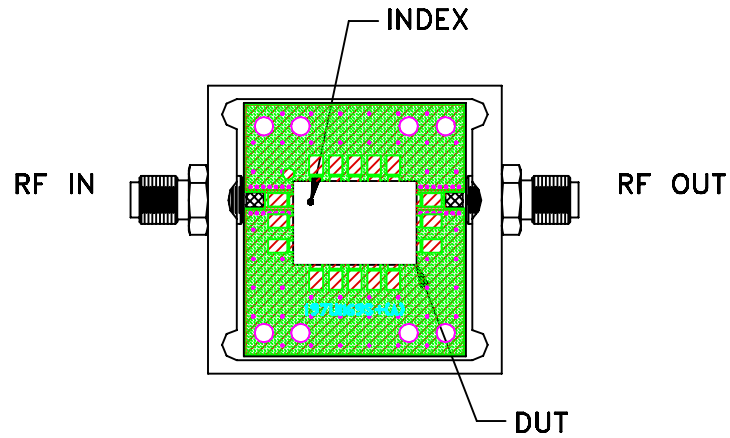
Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, 16FL03, LW1611, CSCR

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

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-338	REV: OR
FILE: 98PL338	SCALE: 2.5:1	SHEET: 1 OF 1	


Evaluation Board and Circuit



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: ROGERS (R04350B) or equivalent, Dielectric Constant=3.5, Thickness=.060 inch.

 **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	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 96 hours, 40°C	MIL-STD-202, Method 103B, Condition B, Except 50°C
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process, 245°C peak	J-STD-020, 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, 4 times in each of three axes (total 12)	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