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. Custom integrated assembly with LNA in greatly simplifying system integration. They can be realized in small form factors with high-quality, precise machining for applications where size is critical. 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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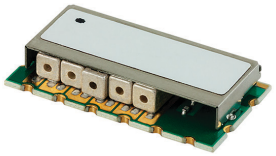
Surface Mount

Bandpass Filter

50Ω 2000 to 2500 MHz

CBP-2250A+



Generic photo used for illustration purposes only
CASE STYLE: KU1513

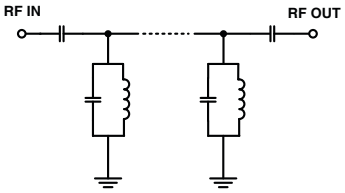
Features

- Low insertion loss
- Better rejection
- Miniature shielded package

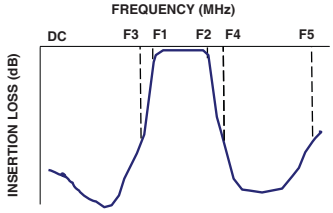
Applications

- Amateur radio
- Space operation
- ISM

Functional Schematic



Typical Frequency Response



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

Electrical Specifications at 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	2250	-	MHz
	Insertion Loss	F1-F2	2000-2500	-	1.1	2.0	dB
	VSWR	F1-F2	2000-2500	-	1.6	2.1	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-1630	20.0	31.0	-	dB
	VSWR	DC-F3	DC-1630	-	20.0	-	:1
Stop Band, Upper	Insertion Loss	F4-F5	2900-6000	20.0	31.0	-	dB
	VSWR	F4-F5	2900-6000	-	20.0	-	:1

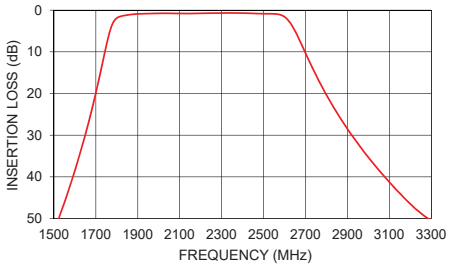
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	2 W Max.

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

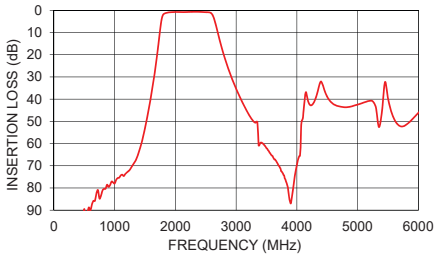
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
1	109.86	408.42	2000	2.21
750	84.77	238.23	2025	2.12
1630	33.42	51.25	2050	2.04
1695	20.93	31.81	2075	1.96
1740	10.73	13.36	2100	1.90
1775	3.84	3.71	2125	1.85
2000	0.76	1.14	2150	1.80
2200	0.76	1.39	2175	1.77
2250	0.71	1.31	2200	1.75
2300	0.69	1.25	2225	1.74
2500	0.85	1.37	2250	1.72
2630	3.26	3.76	2275	1.72
2700	10.31	18.35	2300	1.72
2800	20.37	59.73	2325	1.72
2900	28.51	87.45	2350	1.73
2930	30.67	91.69	2375	1.75
3500	62.12	78.51	2400	1.76
4000	69.58	51.50	2425	1.79
5450	32.34	56.51	2450	1.82
6000	46.17	51.46	2500	1.94

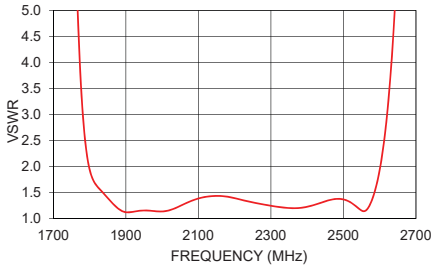
CBP-2250A+
INSERTION LOSS (Zoomed)



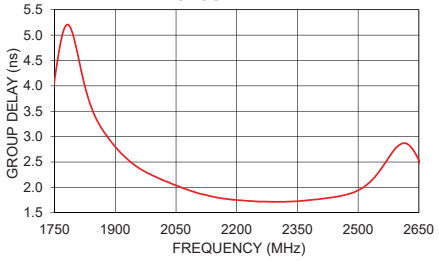
CBP-2250A+
INSERTION LOSS (Full band)



CBP-2250A+
VSWR



CBP-2250A+
GROUP DELAY



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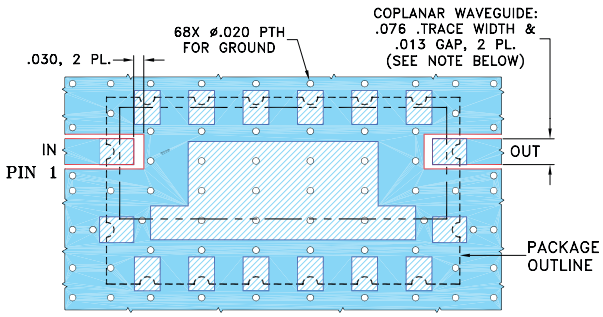
Pad Connections

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

Demo Board MCL P/N: TB-578+
Suggested PCB Layout (PL-331)

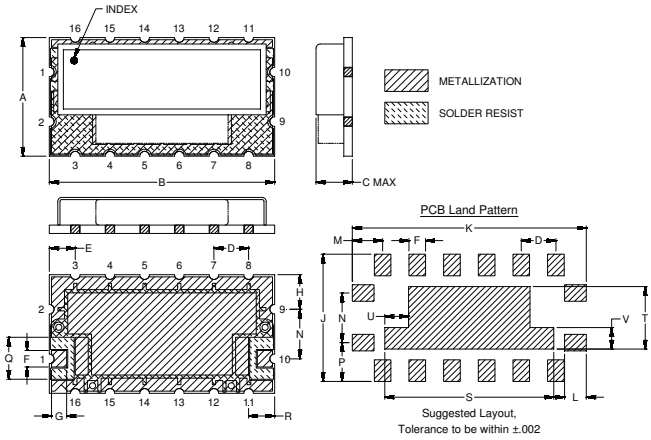


NOTE: 1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .060" ± .004"; COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J	K	L
.550	**1.040**	**.185**	**.160**	**.120**	**.077**	**.070**	**.160**	**.590**	**1.080**	**.100**
13.97	26.24	4.70	4.06	3.05	1.96	1.78	4.06	14.99	27.43	2.54

M	N	P	Q	R	S	T	U	V		Wt.
.140	**.230**	**.180**	**.195**	**.115**	**.780**	**.290**	**.110**	**.100**		grams
3.56	5.84	4.57	4.95	2.92	19.81	7.36	2.79	2.54		2.6

Note: Please refer to case style drawing for details.

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Surface mount Band Pass Filter CBP-2250A+

Typical Performance Data

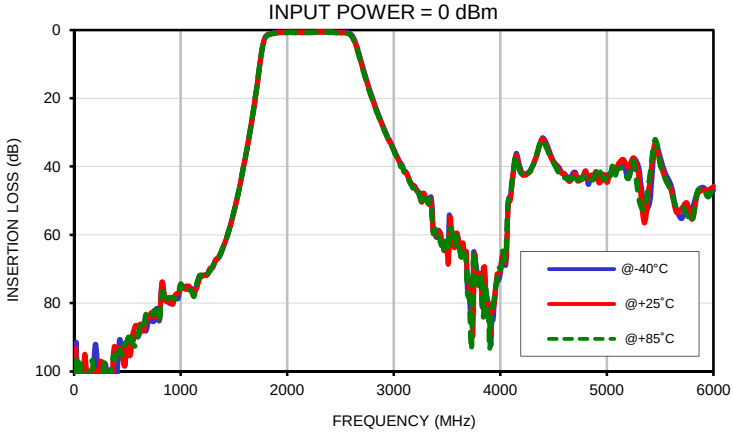
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
1	99.57	97.70	101.54	0.04	0.05	0.04	0.05	0.05	0.05
5	101.12	104.99	97.82	0.05	0.05	0.04	0.04	0.05	0.05
25	101.66	97.85	103.80	0.04	0.04	0.04	0.04	0.04	0.04
50	107.84	102.32	96.35	0.03	0.04	0.03	0.03	0.03	0.03
100	98.36	95.03	103.08	0.02	0.02	0.02	0.02	0.03	0.02
250	105.37	97.05	114.98	0.00	0.01	0.01	0.01	0.03	0.03
500	90.60	91.55	91.31	0.01	0.02	0.02	0.08	0.12	0.12
750	85.29	83.94	82.18	0.01	0.05	0.05	0.18	0.24	0.25
1000	74.86	75.93	74.38	0.04	0.09	0.09	0.22	0.30	0.31
1250	71.68	71.69	71.42	0.09	0.14	0.15	0.16	0.24	0.27
1500	53.22	53.14	53.06	0.16	0.23	0.24	0.13	0.23	0.26
1550	46.62	46.41	46.48	0.19	0.26	0.28	0.16	0.26	0.29
1600	38.56	38.45	38.29	0.21	0.29	0.31	0.21	0.32	0.36
1630	33.55	33.42	33.22	0.24	0.33	0.35	0.27	0.39	0.43
1650	29.97	29.82	29.62	0.27	0.36	0.39	0.32	0.45	0.49
1700	20.00	19.83	19.57	0.43	0.55	0.60	0.63	0.78	0.85
1725	14.38	14.21	13.94	0.68	0.83	0.92	1.05	1.25	1.36
1750	8.54	8.42	8.17	1.51	1.75	1.94	2.25	2.57	2.82
1780	3.17	3.21	3.16	5.18	5.65	6.05	7.01	7.70	8.32
1800	1.74	1.86	1.91	9.18	9.69	10.01	11.61	12.42	12.87
2000	0.59	0.73	0.79	22.38	23.48	23.45	20.74	21.34	20.99
2250	0.55	0.69	0.75	17.34	17.21	17.57	18.75	18.81	19.48
2500	0.66	0.83	0.89	16.08	16.06	16.35	15.98	15.99	16.28
2600	1.31	1.58	1.75	10.07	9.81	9.45	10.36	10.09	9.75
2635	3.24	3.63	3.89	4.19	4.11	3.97	4.60	4.57	4.45
2750	15.25	15.63	15.88	0.34	0.44	0.46	0.57	0.72	0.77
2800	20.05	20.37	20.59	0.19	0.29	0.31	0.37	0.52	0.57
2850	24.34	24.63	24.83	0.13	0.23	0.25	0.26	0.41	0.47
2900	28.18	28.42	28.63	0.09	0.20	0.22	0.20	0.35	0.40
2950	31.95	32.20	32.38	0.07	0.18	0.20	0.18	0.32	0.37
3000	35.01	35.16	35.44	0.06	0.17	0.19	0.14	0.28	0.32
3200	45.96	46.20	46.02	0.03	0.15	0.18	0.06	0.20	0.25
3250	49.28	49.37	49.05	0.03	0.14	0.18	0.06	0.19	0.23
3300	49.38	49.40	49.44	0.02	0.14	0.18	0.04	0.18	0.22
3350	48.95	50.28	51.27	0.06	0.20	0.23	0.04	0.18	0.22
3400	60.75	59.64	60.77	0.01	0.13	0.17	0.03	0.17	0.21
3450	61.68	62.05	63.37	0.00	0.13	0.18	0.02	0.16	0.20
3500	64.70	63.21	63.70	0.00	0.13	0.19	0.02	0.15	0.19
3600	60.64	60.57	61.39	0.00	0.14	0.18	0.01	0.15	0.18
3650	62.81	62.45	64.36	0.01	0.14	0.19	0.00	0.14	0.17
3750	65.08	75.98	65.08	0.05	0.16	0.26	0.00	0.13	0.15
3800	72.35	74.07	74.96	0.02	0.17	0.23	0.00	0.13	0.16
3900	84.68	85.68	93.51	0.03	0.19	0.25	0.01	0.12	0.14
4000	71.02	70.48	70.18	0.09	0.24	0.32	0.01	0.12	0.14
4100	47.29	48.20	46.91	0.70	1.02	1.18	0.01	0.12	0.13
4200	41.69	41.99	42.37	0.80	0.95	0.98	0.02	0.10	0.12
4300	40.05	40.03	39.85	0.69	0.92	1.08	0.02	0.11	0.13
4400	31.59	32.00	32.31	9.86	10.83	10.38	0.04	0.10	0.11
4500	38.54	38.76	39.06	0.84	1.00	1.06	0.04	0.09	0.11
4600	42.38	42.06	43.16	0.32	0.51	0.57	0.05	0.09	0.10
4700	41.66	42.16	42.32	0.25	0.40	0.51	0.05	0.08	0.10
4800	41.38	41.27	42.45	0.17	0.34	0.40	0.05	0.09	0.11
4900	41.70	41.49	41.03	0.20	0.35	0.41	0.03	0.10	0.12
5000	42.91	44.65	43.19	0.13	0.30	0.35	0.06	0.09	0.15
5100	40.28	39.63	40.75	0.16	0.32	0.34	0.04	0.12	0.16
5200	43.55	40.26	43.47	0.15	0.32	0.33	0.02	0.21	0.18
5500	37.41	38.90	39.61	0.11	0.26	0.30	0.13	0.25	0.27
5750	51.87	50.66	53.99	0.10	0.27	0.32	0.08	0.09	0.13
5800	52.26	55.40	55.91	0.09	0.26	0.30	0.08	0.11	0.15
6000	46.95	45.86	45.65	0.08	0.28	0.34	0.08	0.25	0.31

Typical Performance Data

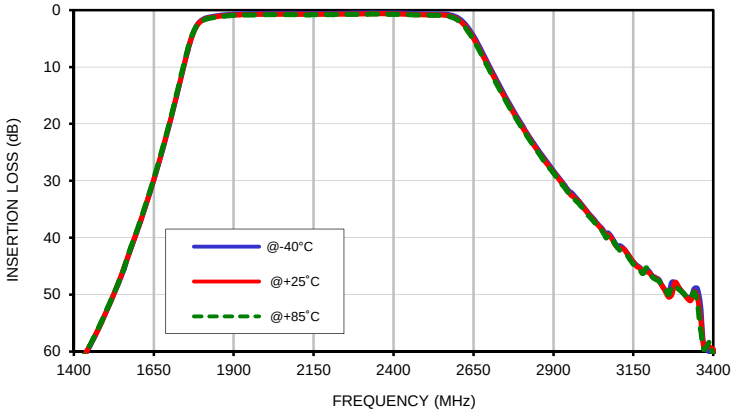
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
2000	2.22	2.21	2.19
2010	2.18	2.17	2.16
2020	2.15	2.14	2.13
2030	2.12	2.11	2.09
2040	2.08	2.07	2.06
2050	2.05	2.04	2.02
2060	2.02	2.01	2.00
2070	1.99	1.98	1.97
2080	1.96	1.95	1.94
2090	1.94	1.92	1.91
2100	1.91	1.90	1.88
2110	1.89	1.88	1.86
2120	1.87	1.86	1.85
2130	1.85	1.84	1.83
2140	1.83	1.82	1.81
2150	1.82	1.80	1.79
2160	1.80	1.79	1.78
2170	1.79	1.77	1.77
2180	1.78	1.77	1.76
2190	1.77	1.76	1.75
2200	1.76	1.75	1.74
2210	1.76	1.75	1.74
2220	1.75	1.74	1.73
2230	1.75	1.73	1.73
2240	1.74	1.73	1.72
2250	1.73	1.72	1.72
2260	1.73	1.72	1.71
2270	1.73	1.72	1.71
2280	1.73	1.72	1.71
2290	1.72	1.71	1.71
2300	1.72	1.72	1.71
2310	1.72	1.72	1.71
2320	1.72	1.72	1.71
2330	1.73	1.72	1.71
2340	1.73	1.72	1.72
2350	1.74	1.73	1.72
2360	1.74	1.73	1.73
2370	1.75	1.74	1.73
2380	1.76	1.75	1.74
2390	1.77	1.76	1.75
2400	1.78	1.76	1.76
2410	1.79	1.78	1.77
2420	1.80	1.78	1.78
2430	1.81	1.80	1.79
2440	1.82	1.81	1.80
2450	1.83	1.82	1.82
2460	1.85	1.84	1.83
2470	1.86	1.86	1.85
2480	1.89	1.88	1.88
2490	1.91	1.91	1.91
2500	1.95	1.94	1.95

Typical Performance Curves

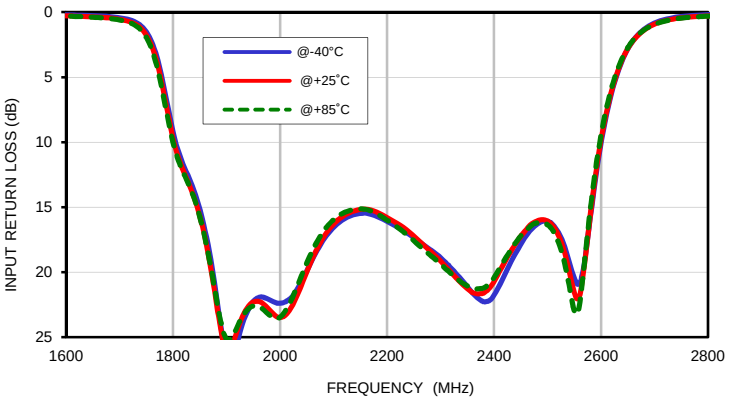
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



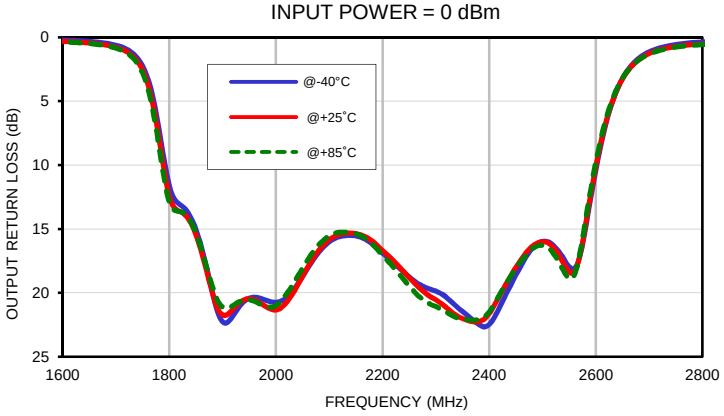
INSERTION LOSS vs. TEMPERATURE (Zoomed)
INPUT POWER = 0 dBm



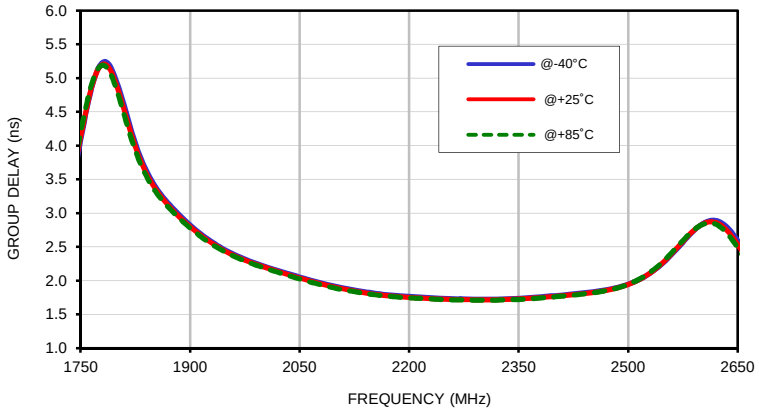
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



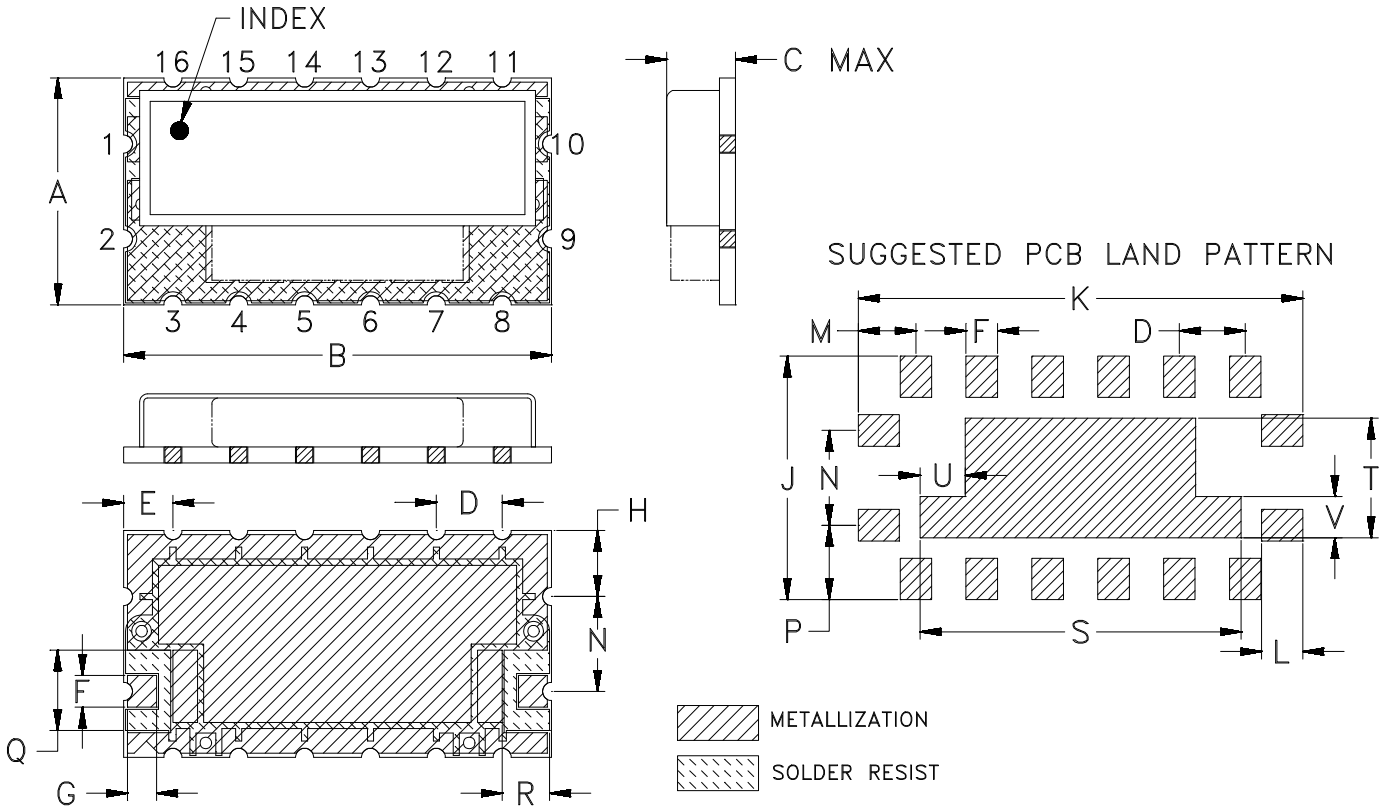
GROUP DELAY vs. TEMPERATURE
INPUT POWER = 0 dBm



Case Style KU

KU1513

Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	M
KU1513	.550 (13.97)	1.040 (26.24)	.185 (4. 70)	.160 (4.06)	.120 (3.05)	.077 (1.96)	.070 (1.78)	.160 (4.06)	.590 (14.99)	1.080 (27.43)	.100 (2.54)	.140 (3.56)

CASE#	N	P	Q	R	S	T	U	V	WT, GRAMS
KU1513	.230 (5.84)	.180 (4.57)	.195 (4.95)	.115 (2.92)	.780 (19.81)	.290 (7.36)	.110 (2.79)	.100 (2.54)	2.6

Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3PL. ± .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. 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.

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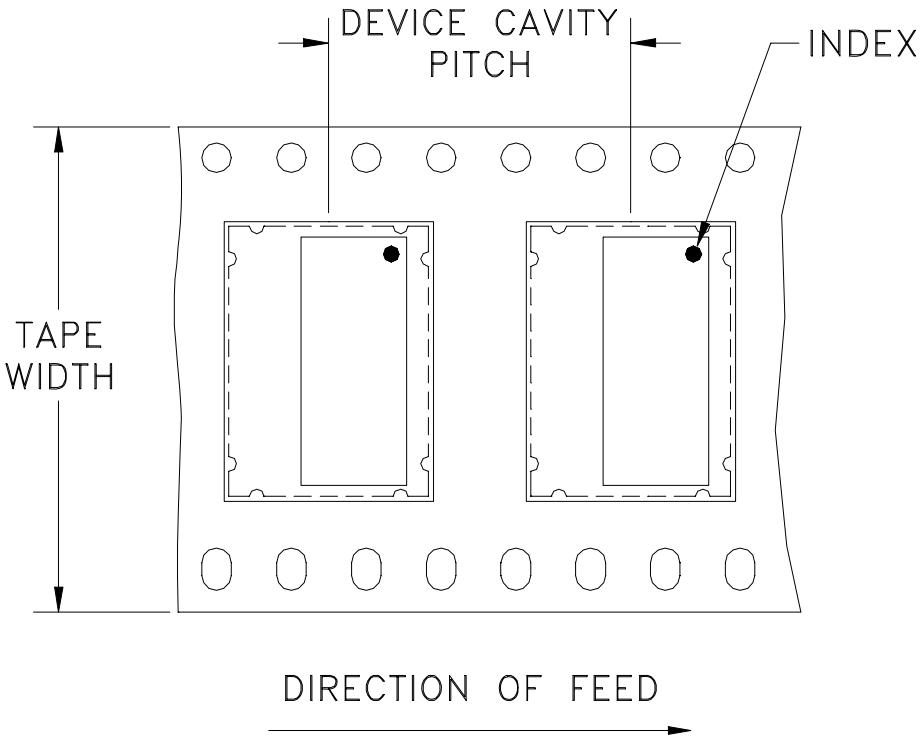
Tape & Reel Packaging TR-F106

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
44	24	13	250

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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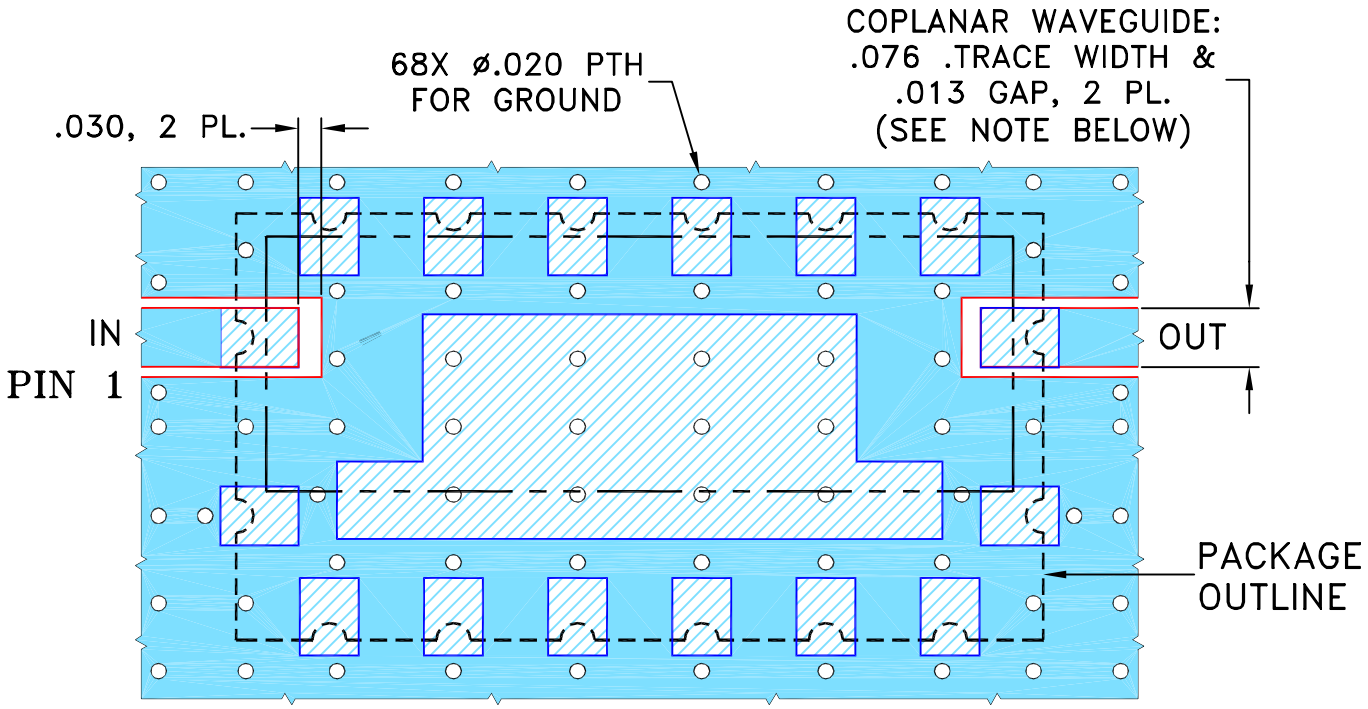
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M126876	NEW RELEASE	04/21/10	MMG	RD

SUGGESTED MOUNTING CONFIGURATION FOR KU1513/KV1514 CASE STYLE, "16FL02" PIN CODE



NOTE: 1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .060" ± .004";
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 SOLDER MASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	MMG	04/08/10
TOLERANCES ON:	CHECKED	IL	04/21/10
2 PL DECIMALS ±	APPROVED	RD	04/21/10
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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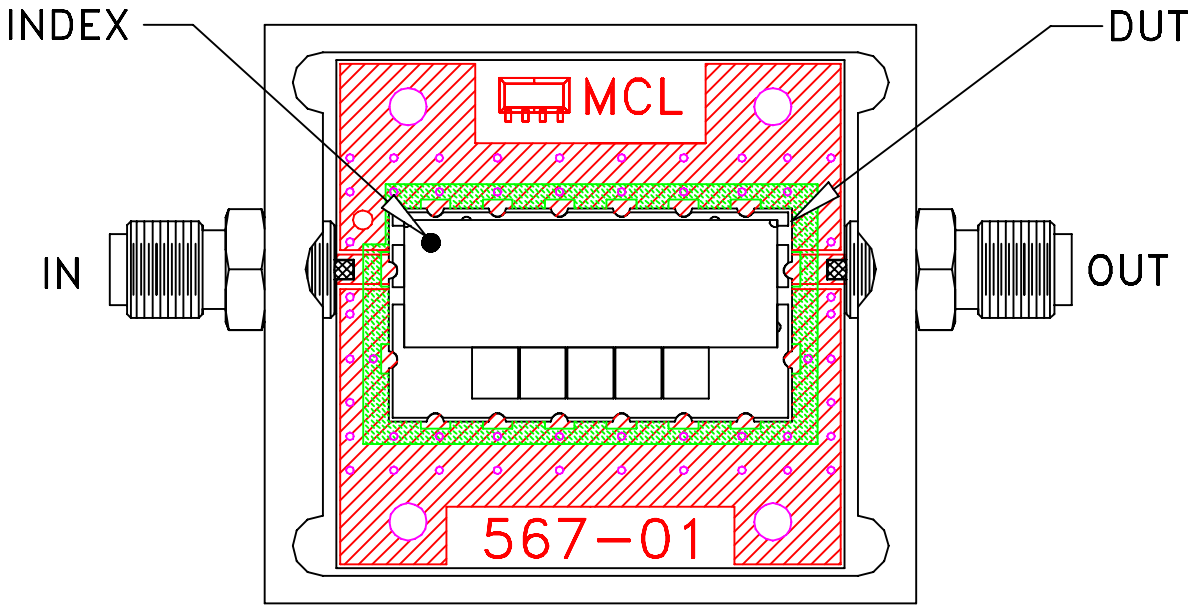
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

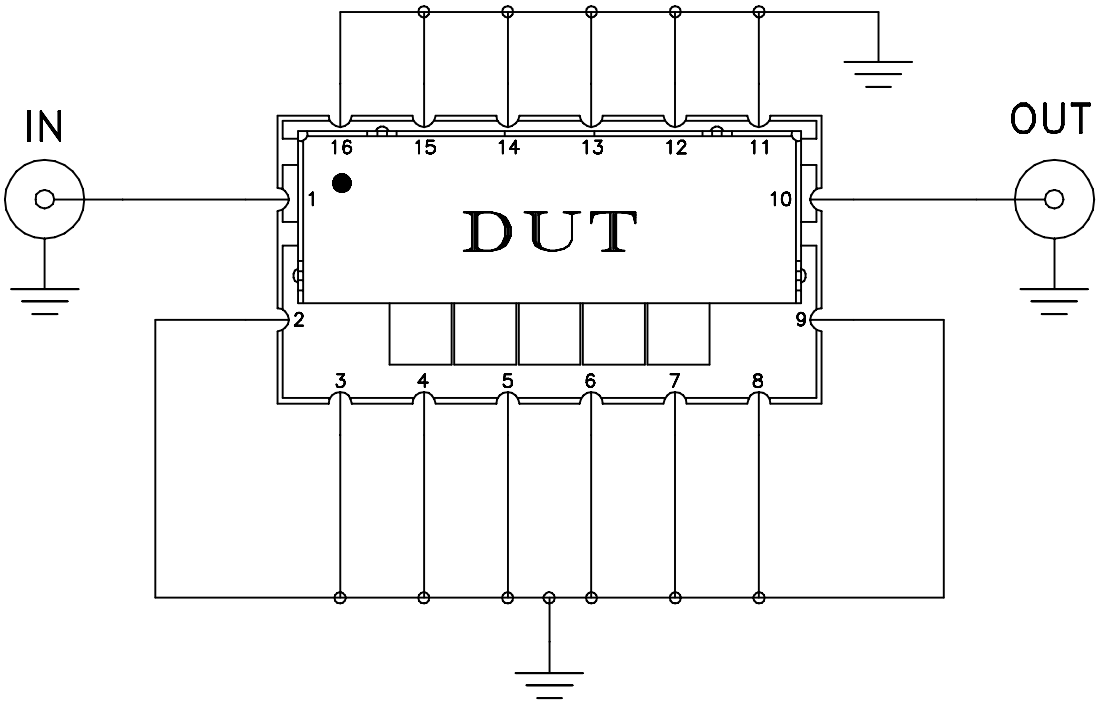
PL, 16FL02, KU1513/KV1514, TB-578+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-331	OR
FILE: 98PL331	SCALE: 4:1	SHEET: 1 OF 1	

Evaluation Board and Circuit



TB-578+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.060 inch.

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Environmental Specifications ENV54

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

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