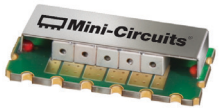
Surface Mount

Bandpass Filter

CBP-2400A+

50Ω 2200 to 2600 MHz



Generic photo used for illustration purposes only
CASE STYLE: KU1513

The Big Deal

- Excellent Rejection
- Low passband Insertion Loss
- Miniature shielded package

Product Overview

CBP-2400A+ is a ceramic-coaxial-resonator based bandpass filter in a shielded package fabricated using SMT technology. This filter offers outstanding close-in rejection, low insertion loss and high power handling for use in mobile satellite, ISM and amateur radio

Key Features

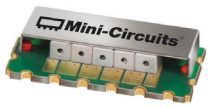
Feature	Advantages
High Selectivity	The CBP-2400A+ filter incorporates High-Q ceramic resonators that enables sharp rejection near passband.
Low Passband VSWR	This filter maintains typical VSWR over a wide passband frequency range making this filter easier to integrate into receiver and transmitter RF chains with less concerns for in band frequency ripple.
Small size, 0.550" x 1.040" x 0.185"	The small surface mount package enables the CBP-2400A+ to be used in compact designs.
Rugged construction	The CBP-2400A+ has been qualified over wide range of thermal, mechanical and environmental conditions including withstanding the stress of extensive solder reflow cycles.

Surface Mount

Bandpass Filter

CBP-2400A+

50Ω 2200 to 2600 MHz



Generic photo used for illustration purposes only
CASE STYLE: KU1513

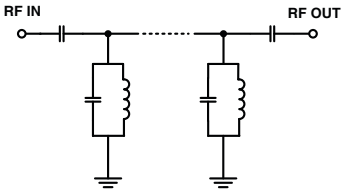
Features

- Low Insertion loss
- High selectivity
- Miniature shielded package

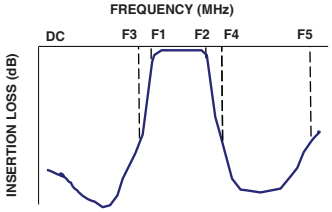
Applications

- Defense systems
- ISM
- Mobile satellite
- Amateur radio

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	—	—	—	2400	—	MHz
	Insertion Loss	F1-F2	2200-2600	—	1.1	2	dB
	VSWR	F1-F2	2200-2600	—	1.6	2.32	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC-1780	20	31	—	dB
	VSWR	DC-F3	DC-1780	—	20	—	:1
Stop Band, Upper	Insertion Loss	F4-F5	3480-4200	20	31	—	dB
	VSWR	F4-F5	3480-4200	—	20	—	:1

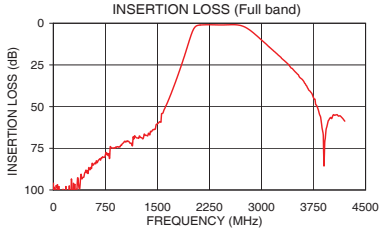
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5W Max.

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

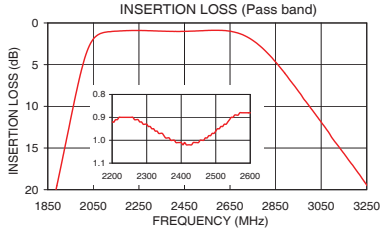
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
1	100.12	1737.18	2200	2.02
750	78.92	115.81	2220	1.95
1500	60.32	59.91	2250	1.86
1780	32.95	38.61	2300	1.73
1800	30.59	36.20	2350	1.63
1880	20.80	25.94	2400	1.55
1915	16.25	19.98	2420	1.52
1990	6.52	6.39	2440	1.51
2020	3.59	3.33	2450	1.50
2060	1.63	1.60	2460	1.49
2200	0.92	1.03	2480	1.49
2400	1.01	1.47	2500	1.48
2600	0.88	1.04	2510	1.48
2800	3.22	3.67	2520	1.48
2900	6.37	7.76	2530	1.49
3100	13.87	21.73	2540	1.49
3280	20.46	32.79	2550	1.49
3480	28.90	41.37	2560	1.50
3510	30.15	43.44	2580	1.51
4200	58.74	40.41	2600	1.53

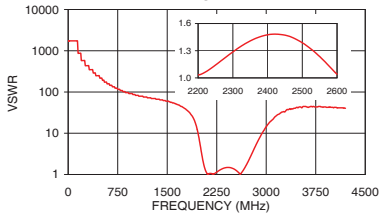
CBP-2400A+
INSERTION LOSS (Full band)



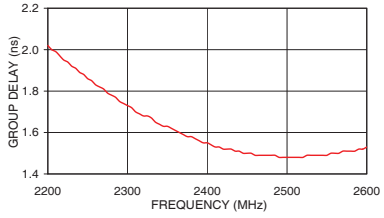
CBP-2400A+
INSERTION LOSS (Pass band)



CBP-2400A+
VSWR



CBP-2400A+
GROUP DELAY

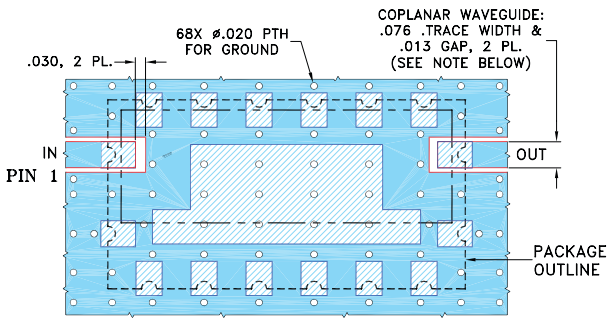


Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

Pad Connections

INPUT	1
OUTPUT	10
GROUND	2 to 9, 11 to 16

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

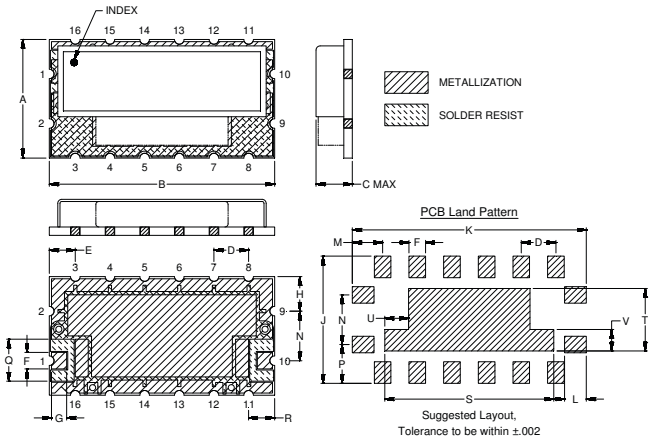


NOTE: 1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .060" ± .004"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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.

Band Pass Filter CBP-2400A+

Typical Performance Data

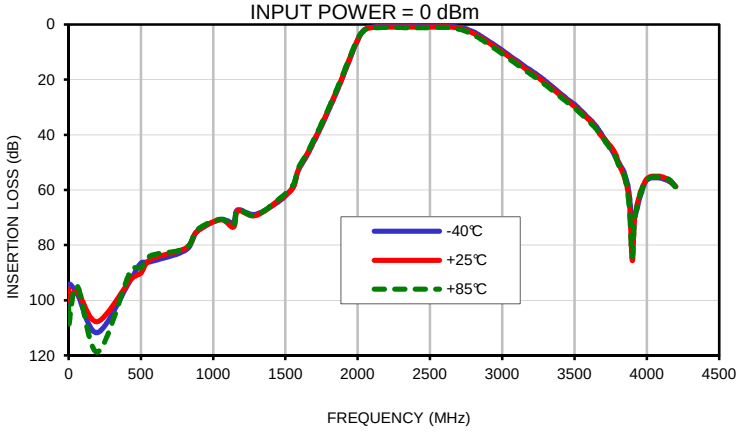
FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40℃	@+25˚C	@+85˚C	@-40℃	@+25˚C	@+85˚C	@-40℃	@+25˚C	@+85˚C
0.50	107.90	95.89	102.46	0.00	0.00	0.00	0.00	0.00	0.00
1	94.43	100.12	109.06	0.00	0.00	0.00	0.00	0.00	0.00
60	97.75	96.96	94.91	0.01	0.01	0.01	0.00	0.01	0.01
200	111.71	107.72	118.75	0.01	0.03	0.03	0.01	0.03	0.03
430	92.43	92.50	89.03	0.05	0.07	0.08	0.05	0.07	0.08
500	86.50	90.13	88.25	0.06	0.08	0.10	0.07	0.09	0.10
570	85.96	85.09	83.79	0.08	0.10	0.12	0.09	0.11	0.12
810	81.81	81.08	81.12	0.13	0.16	0.19	0.15	0.18	0.19
890	74.95	74.96	74.36	0.15	0.18	0.21	0.16	0.20	0.21
1050	70.75	70.74	70.62	0.19	0.21	0.24	0.20	0.23	0.24
1140	71.84	73.47	72.87	0.20	0.23	0.25	0.21	0.25	0.25
1170	67.20	67.53	67.19	0.21	0.23	0.26	0.21	0.25	0.26
1290	68.84	69.33	69.28	0.22	0.25	0.28	0.22	0.27	0.28
1450	64.30	63.88	63.52	0.24	0.28	0.32	0.23	0.29	0.32
1550	59.07	59.35	58.35	0.25	0.31	0.36	0.24	0.31	0.36
1590	52.86	52.51	52.07	0.26	0.32	0.39	0.24	0.32	0.39
1650	47.40	46.98	46.57	0.27	0.35	0.42	0.25	0.35	0.42
1710	41.13	40.74	40.31	0.29	0.39	0.48	0.27	0.38	0.48
1780	33.36	32.95	32.53	0.34	0.45	0.56	0.32	0.46	0.56
1800	30.99	30.59	30.18	0.36	0.48	0.60	0.34	0.48	0.60
1840	26.19	25.80	25.39	0.41	0.55	0.68	0.39	0.56	0.68
1880	21.18	20.80	20.40	0.51	0.67	0.82	0.49	0.68	0.82
1915	16.62	16.25	15.84	0.67	0.87	1.05	0.66	0.89	1.05
1945	12.61	12.25	11.85	0.96	1.22	1.46	0.96	1.25	1.46
1975	8.65	8.34	7.97	1.62	2.02	2.38	1.62	2.03	2.38
2010	4.60	4.44	4.22	3.56	4.29	4.99	3.56	4.31	4.99
2025	3.28	3.22	3.10	5.10	6.05	6.99	5.09	6.05	6.99
2045	2.05	2.12	2.12	8.05	9.39	10.75	8.04	9.37	10.75
2075	1.15	1.35	1.47	14.80	17.10	19.58	14.71	16.92	19.58
2140	0.77	1.00	1.17	36.75	31.27	28.66	37.65	31.66	28.66
2200	0.69	0.92	1.08	35.14	35.88	36.35	47.81	48.32	36.35
2260	0.67	0.90	1.07	22.98	22.11	21.13	23.08	22.16	21.13
2340	0.73	0.97	1.16	16.53	15.81	15.29	16.53	15.83	15.29
2400	0.77	1.01	1.20	14.84	14.34	14.04	14.83	14.34	14.04
2460	0.77	1.00	1.17	14.75	14.54	14.49	14.75	14.55	14.49
2535	0.69	0.92	1.08	17.48	18.02	18.63	17.46	17.95	18.63
2600	0.64	0.88	1.07	28.32	33.96	35.81	28.68	32.55	35.81
2655	0.71	1.01	1.26	20.18	18.00	16.43	20.47	18.08	16.43
2715	1.13	1.53	1.89	10.97	10.13	9.43	11.05	10.18	9.43
2745	1.53	2.00	2.41	8.32	7.78	7.29	8.38	7.83	7.29
2795	2.54	3.09	3.60	5.29	5.07	4.82	5.33	5.11	4.82
2830	3.48	4.06	4.62	3.89	3.81	3.66	3.92	3.84	3.66
2945	7.37	8.00	8.62	1.57	1.67	1.70	1.59	1.70	1.70
3055	11.40	12.08	12.71	0.81	0.93	1.00	0.83	0.96	1.00
3170	15.70	16.42	17.05	0.51	0.62	0.71	0.51	0.64	0.71
3270	19.35	20.11	20.73	0.41	0.52	0.60	0.40	0.52	0.60
3480	28.29	28.90	29.45	0.32	0.42	0.51	0.30	0.42	0.51
3510	29.42	30.15	30.68	0.30	0.40	0.50	0.29	0.42	0.50
3630	35.73	36.26	36.73	0.30	0.41	0.51	0.29	0.41	0.51
3680	39.21	40.05	39.94	0.29	0.39	0.50	0.29	0.41	0.50
3770	46.63	45.59	46.92	0.29	0.40	0.51	0.30	0.41	0.51
3810	50.39	50.97	51.44	0.28	0.39	0.50	0.29	0.40	0.50
3850	54.58	56.10	55.72	0.30	0.40	0.51	0.29	0.41	0.51
3880	61.99	64.51	67.09	0.29	0.40	0.51	0.30	0.41	0.51
3900	74.98	85.60	84.12	0.30	0.40	0.52	0.30	0.41	0.52
3920	69.28	68.63	69.05	0.30	0.41	0.52	0.30	0.41	0.52
3990	57.18	56.72	56.98	0.30	0.41	0.53	0.30	0.42	0.53
4070	55.58	54.95	55.23	0.31	0.42	0.53	0.30	0.43	0.53
4150	56.74	56.26	56.02	0.31	0.42	0.54	0.31	0.43	0.54
4200	58.80	58.74	59.07	0.32	0.43	0.55	0.31	0.44	0.55

Typical Performance Data

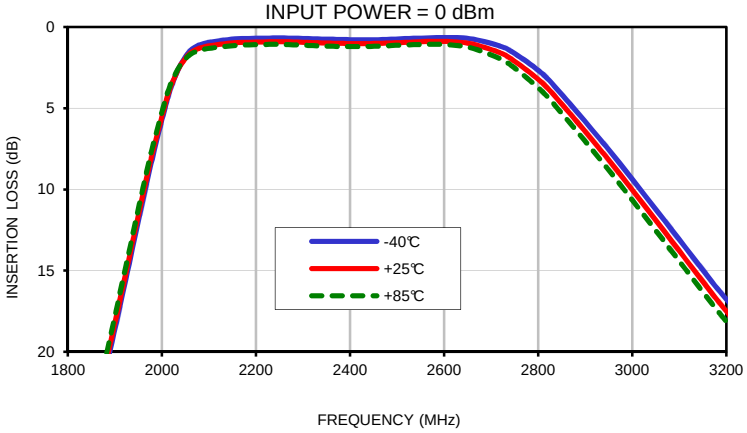
FREQ. (MHz)	GROUP DELAY (nsec)		
	@-40°C	@+25°C	@+85°C
2200	2.05	2.02	2.01
2205	2.03	2.00	1.99
2210	2.01	1.99	1.97
2215	1.99	1.97	1.95
2220	1.97	1.95	1.94
2225	1.96	1.94	1.92
2230	1.94	1.92	1.91
2235	1.92	1.91	1.89
2240	1.91	1.89	1.88
2245	1.89	1.88	1.86
2250	1.88	1.86	1.85
2255	1.86	1.85	1.83
2260	1.85	1.83	1.82
2265	1.84	1.82	1.81
2270	1.82	1.81	1.79
2275	1.81	1.79	1.78
2280	1.80	1.78	1.76
2290	1.77	1.75	1.74
2295	1.76	1.74	1.73
2300	1.75	1.73	1.71
2310	1.72	1.70	1.69
2315	1.71	1.69	1.68
2320	1.70	1.68	1.67
2330	1.68	1.67	1.65
2335	1.67	1.65	1.64
2340	1.66	1.64	1.63
2350	1.64	1.63	1.61
2355	1.63	1.62	1.60
2360	1.63	1.61	1.59
2370	1.61	1.59	1.58
2375	1.60	1.58	1.57
2380	1.59	1.58	1.57
2390	1.58	1.56	1.55
2395	1.57	1.55	1.54
2400	1.56	1.55	1.54
2410	1.55	1.53	1.53
2415	1.55	1.53	1.52
2420	1.54	1.52	1.52
2425	1.54	1.52	1.51
2430	1.53	1.52	1.51
2435	1.53	1.51	1.51
2440	1.52	1.51	1.50
2445	1.52	1.50	1.50
2450	1.51	1.50	1.50
2460	1.50	1.49	1.49
2470	1.50	1.49	1.49
2480	1.49	1.49	1.49
2490	1.49	1.48	1.49
2495	1.49	1.48	1.49
2500	1.49	1.48	1.49
2510	1.49	1.48	1.49
2520	1.49	1.48	1.49
2530	1.49	1.49	1.49
2540	1.49	1.49	1.50
2550	1.49	1.49	1.50
2560	1.49	1.50	1.51
2570	1.50	1.51	1.52
2580	1.50	1.51	1.52
2590	1.51	1.52	1.53
2600	1.52	1.53	1.54

Typical Performance Curves

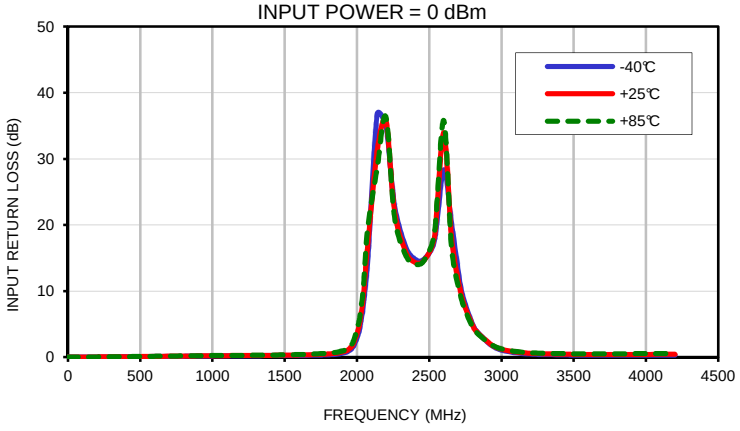
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



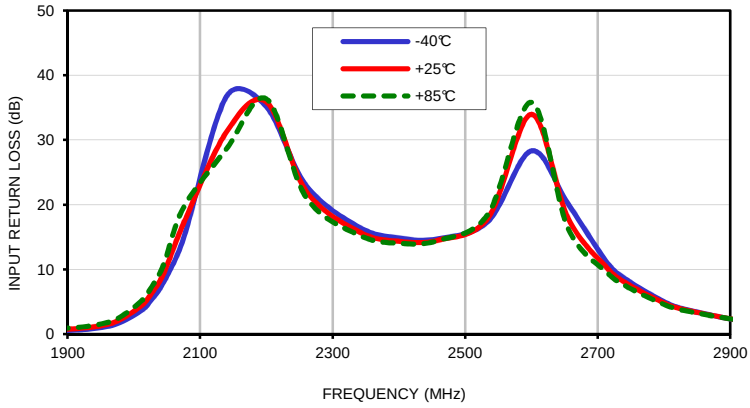
INSERTION LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



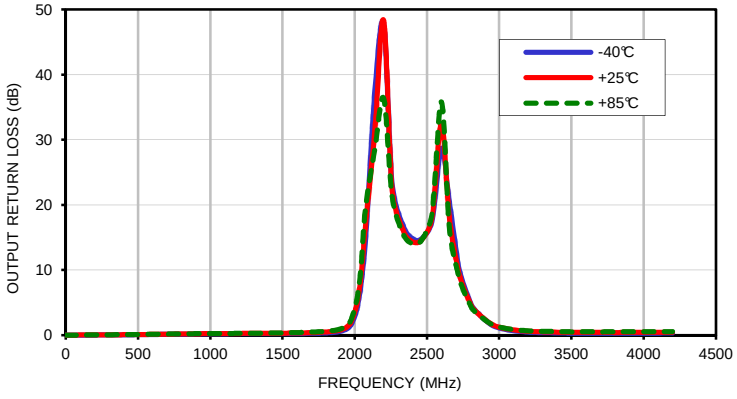
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



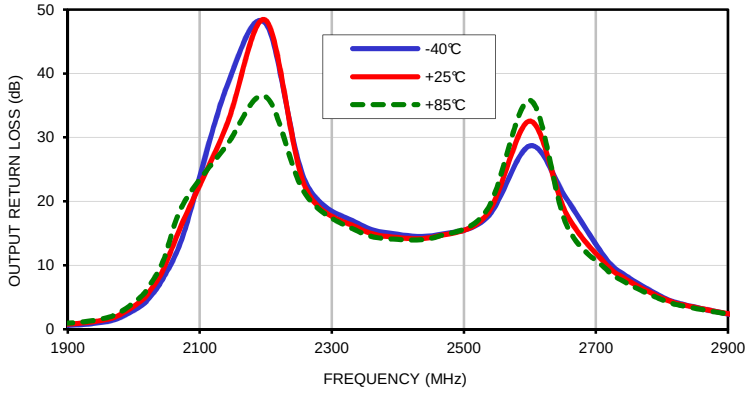
INPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



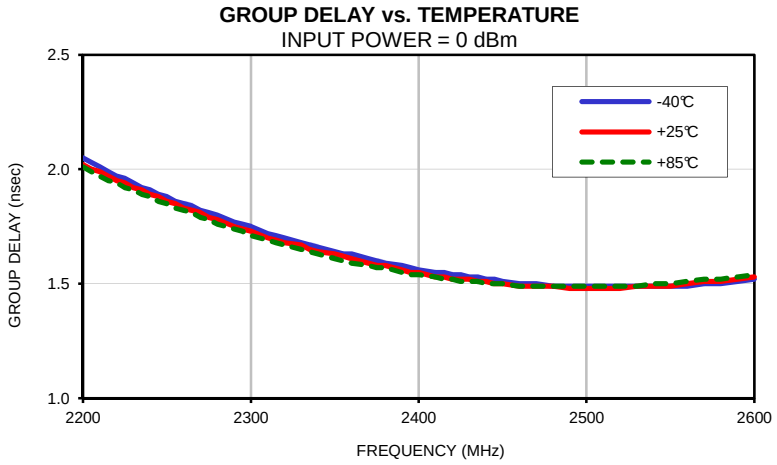
OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS vs. TEMPERATURE
INPUT POWER = 0 dBm



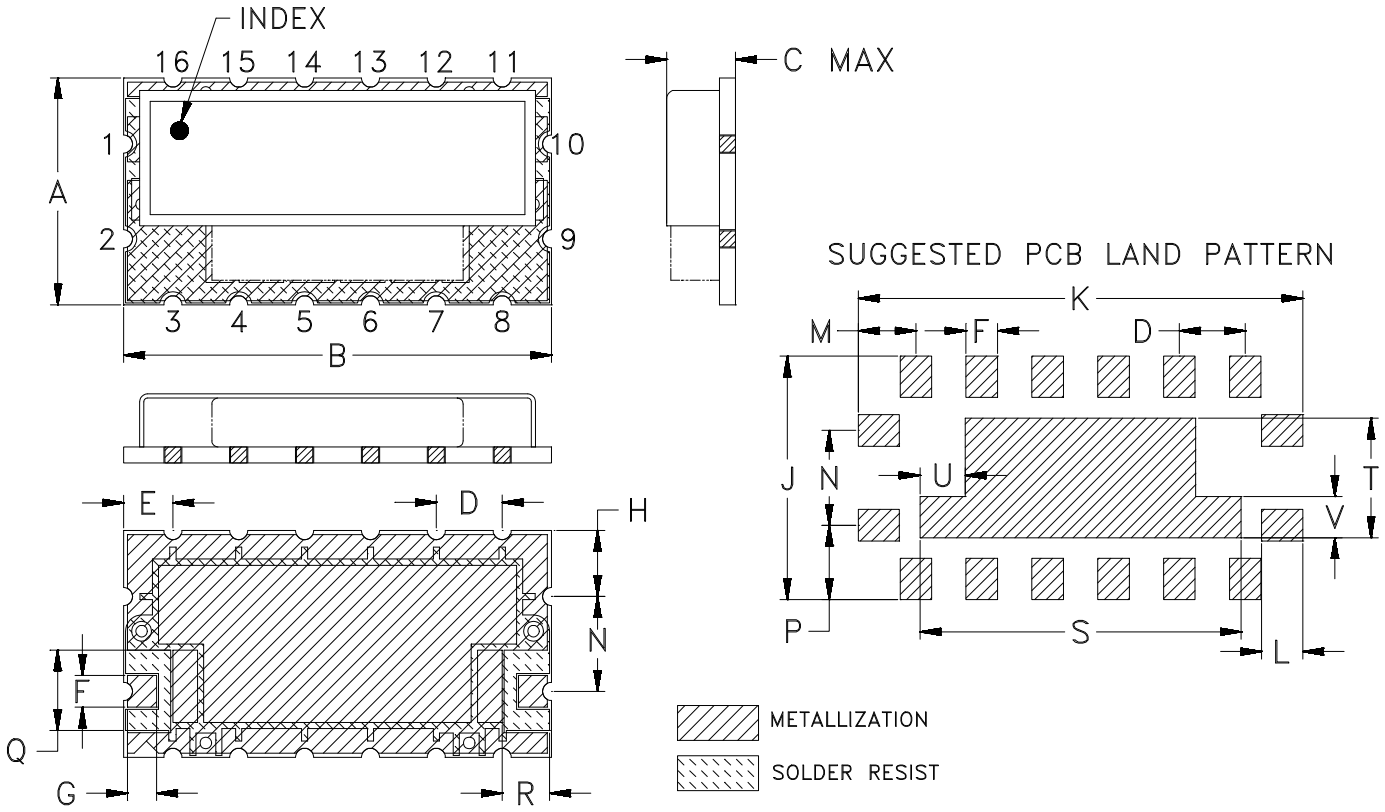
Typical Performance Curves



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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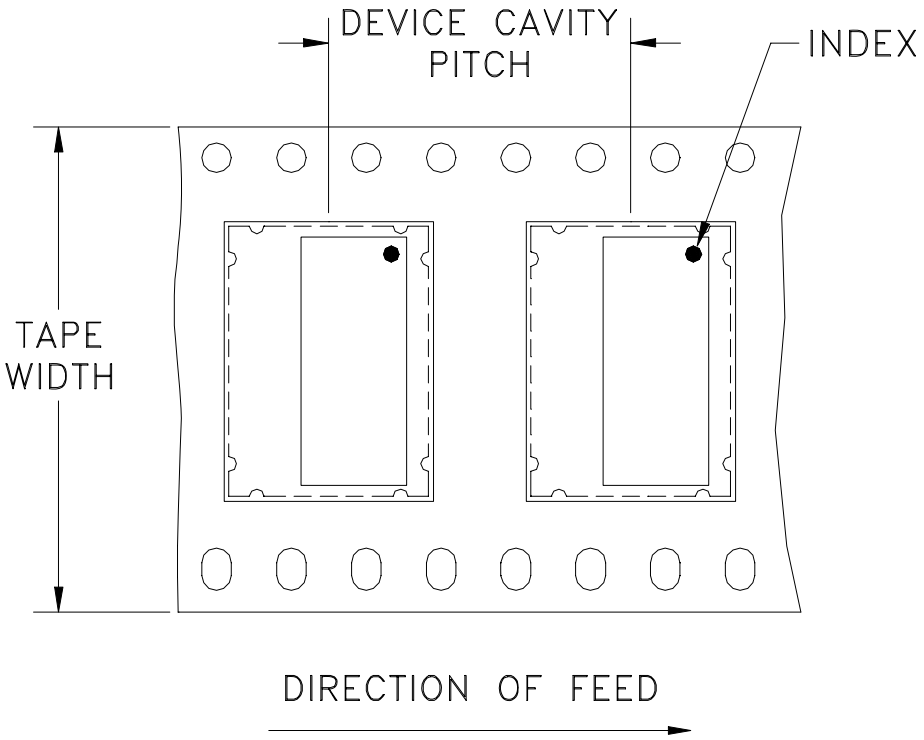
Tape & Reel Packaging TR-F106

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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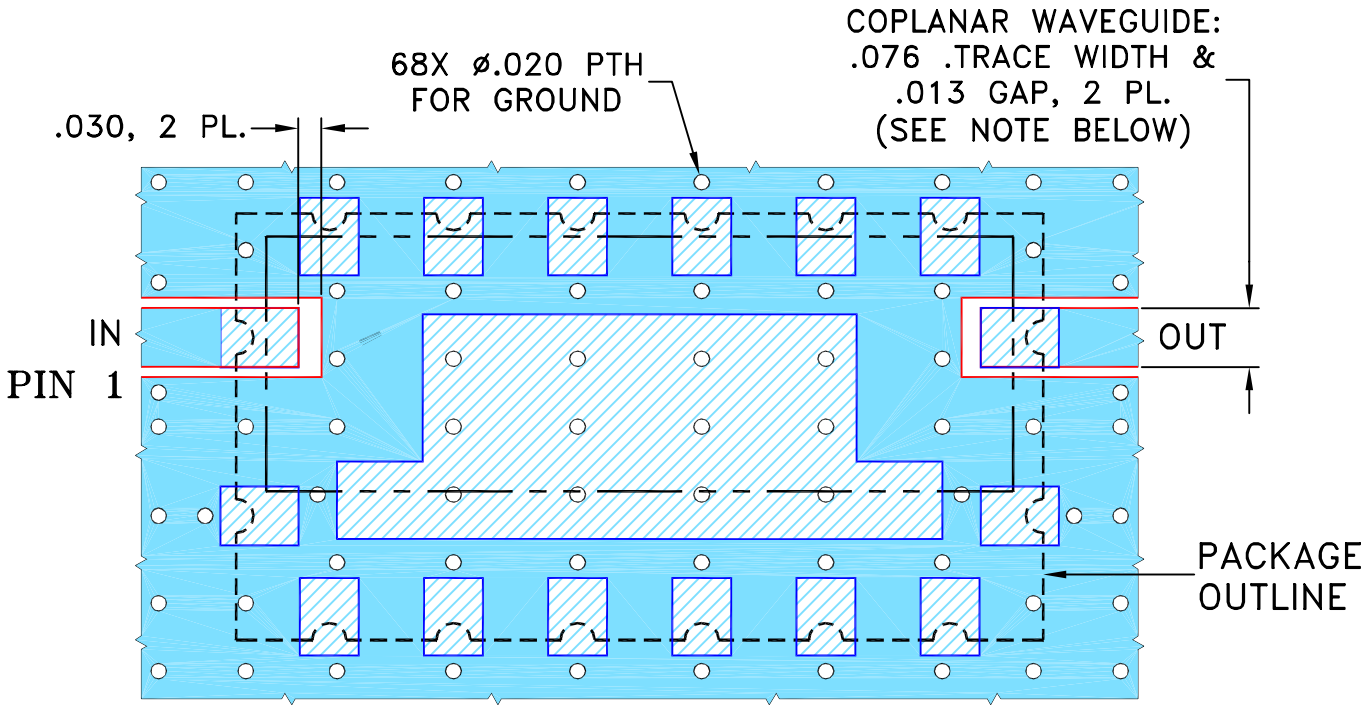
THIRD ANGLE PROJECTION

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 ±			

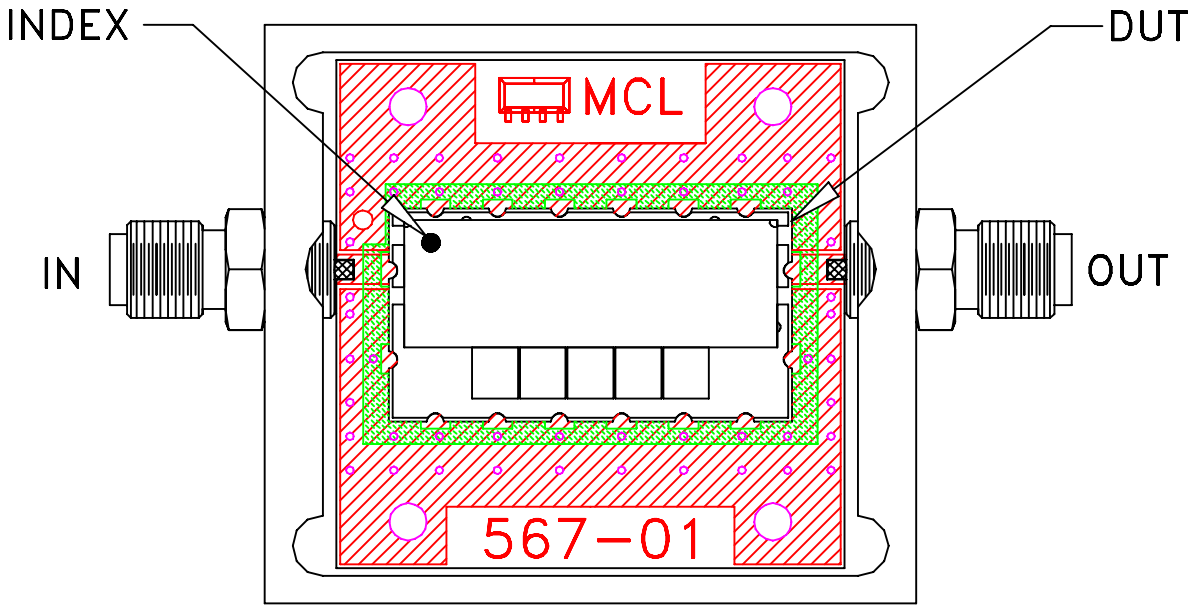
ASHEETA1.DWG REV:A DATE:01/12/95

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

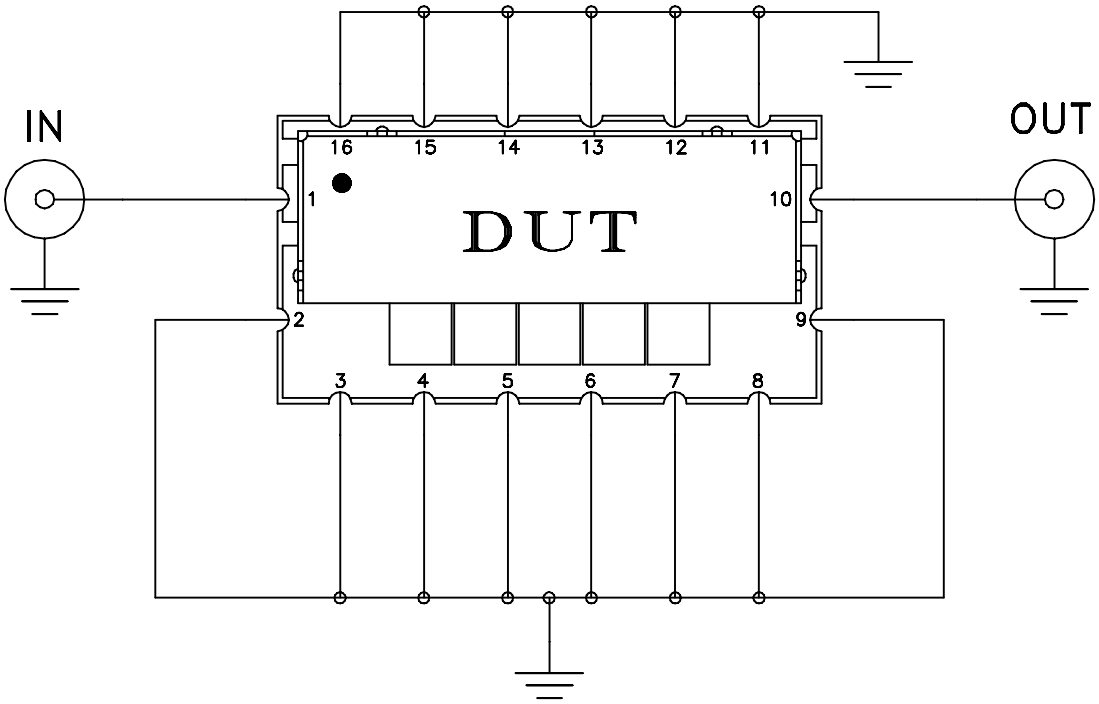
PL, 16FL02, KU1513/KV1514, TB-578+

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.

Mini-Circuits®

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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