

## 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

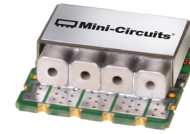
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# Surface Mount Bandpass Filter

## CBP4-942C+

50Ω 925 to 960 MHz



Generic photo used for illustration purposes only  
CASE STYLE: MP1766

### Features

- Low Insertion Loss, 1dB typ.
- High rejection, 60dB typ.
- Miniature shielded package

### Applications

- Public mobile
- Private land mobile
- GSM downlink band

### Electrical Specifications at 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	-	-	-	942	-	MHz
	Insertion Loss	F1-F2	925 - 960	-	1.0	1.6	dB
	VSWR	F1-F2	925 - 960	-	1.29	1.67	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 650	65	75	-	dB
		F3-F4	650 - 840	20	26	-	dB
Stop Band, Upper	Insertion Loss	F5-F6	1045 - 1250	20	26	-	dB
		F6-F7	1250 - 1750	50	60	-	dB

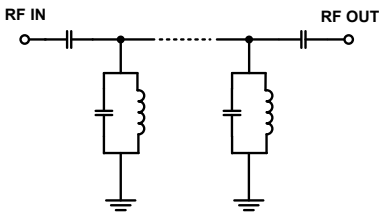
1. Measured on Mini-Circuits Characterization Test Board TB-CBP4-942C+

### Maximum Ratings

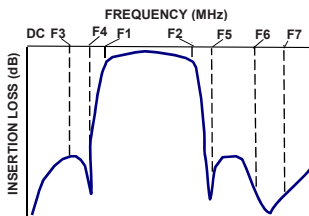
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5W at 25°C

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

### Functional Schematic



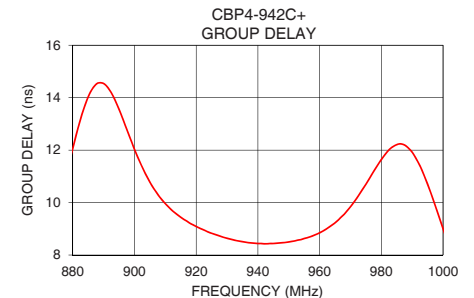
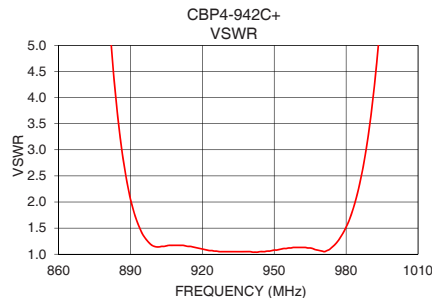
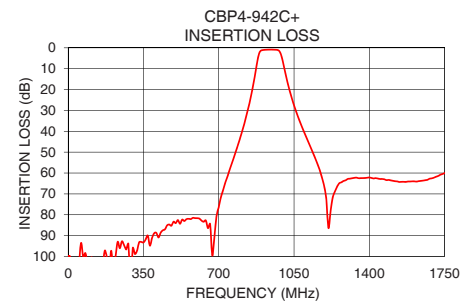
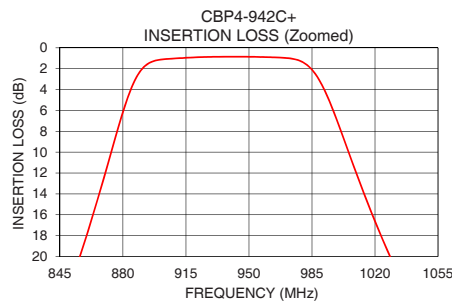
### Typical Frequency Response



### Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
1	104.28	42841.20	925	8.83
10	104.29	2322.56	927	8.75
650	86.43	218.22	928	8.71
834	30.36	53.82	930	8.64
840	27.77	48.58	932	8.58
856	20.06	32.53	934	8.53
886	3.34	3.14	936	8.49
900	1.15	1.15	938	8.46
925	0.88	1.06	940	8.44
935	0.85	1.05	942	8.43
942	0.85	1.04	944	8.44
950	0.86	1.08	946	8.45
960	0.89	1.13	947	8.46
980	1.38	1.52	948	8.47
989	3.08	3.20	950	8.50
1029	20.25	52.90	952	8.54
1045	25.93	76.69	954	8.59
1060	30.59	93.33	956	8.66
1250	66.62	94.50	958	8.74
1750	60.06	53.87	960	8.85

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



#### Notes

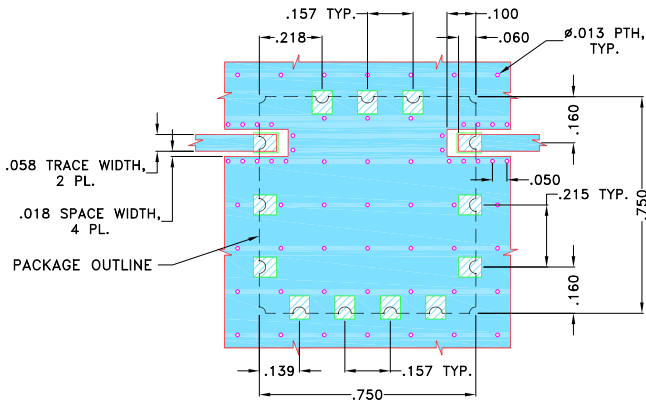
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## Pad Connections

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

**Demo Board MCL P/N: TB-CBP4-942C+**  
**Suggested PCB Layout (PL-373)**



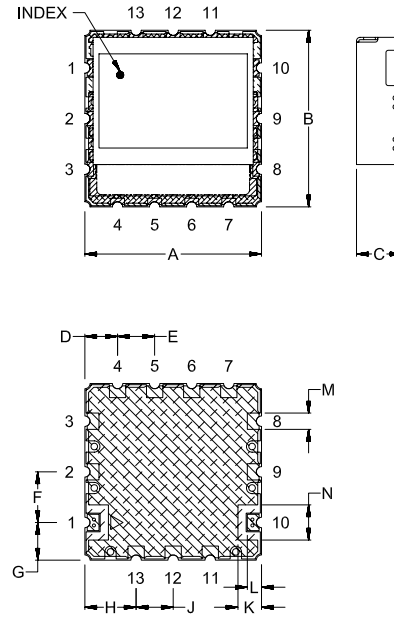
### NOTES:

- TRACE WIDTH IS SHOWN FOR OAK (OAK-602) WITH DIELECTRIC THICKNESS  $.022 \pm .0015$ ". 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.

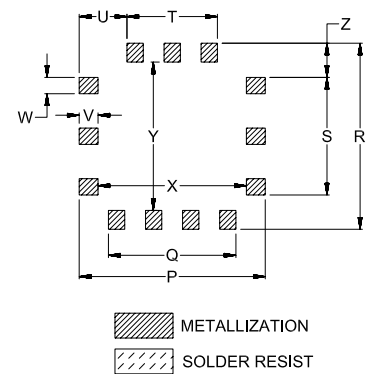
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

## Outline Drawing



## PCB Land Pattern



## Outline Dimensions ( inch mm )

A	B	C	D	E	F	G	H	J	K	L	M	N
.750	.750	.210	.139	.157	.215	.160	.218	.157	.100	.060	.069	.149
19.05	19.05	5.33	3.53	3.99	5.46	4.06	5.54	3.99	2.54	1.52	1.75	3.78
P	Q	R	S	T	U	V	W	X	Y	Z		wt.
.790	.541	.790	.499	.384	.203	.080	.069	.630	.630	.145		grams
20.07	13.74	20.07	12.67	9.75	5.16	2.03	1.75	16.00	16.00	3.68		4.6

Note: Please refer to case style drawing for details

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# Surface mount Band Pass Filter

# CBP4-942C+

## 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	112.70	100.86	108.47	0.00	0.00	0.00	0.00	0.00	0.00
10	107.48	106.57	108.99	0.00	0.00	0.00	0.00	0.00	0.00
100	101.49	99.57	92.85	0.00	0.01	0.01	0.00	0.01	0.01
150	96.75	98.73	101.29	0.01	0.01	0.02	0.01	0.01	0.02
200	107.98	104.86	95.54	0.01	0.02	0.03	0.01	0.02	0.03
250	94.43	95.72	97.07	0.02	0.03	0.04	0.02	0.04	0.05
280	100.16	95.56	96.70	0.02	0.04	0.05	0.02	0.04	0.05
300	94.56	97.17	99.47	0.02	0.04	0.05	0.02	0.05	0.06
350	91.24	92.29	92.54	0.03	0.05	0.06	0.04	0.06	0.07
380	87.44	94.62	93.78	0.03	0.06	0.07	0.04	0.07	0.08
400	89.86	87.72	86.78	0.04	0.06	0.08	0.05	0.07	0.09
450	87.26	88.69	85.05	0.05	0.08	0.09	0.07	0.10	0.11
500	84.22	83.54	83.52	0.06	0.10	0.11	0.08	0.12	0.13
550	81.35	82.74	80.74	0.08	0.11	0.13	0.10	0.14	0.16
600	81.10	79.66	81.97	0.10	0.14	0.16	0.13	0.17	0.19
650	86.41	88.68	87.76	0.12	0.17	0.19	0.15	0.20	0.22
700	75.45	75.29	75.12	0.15	0.20	0.22	0.19	0.24	0.26
750	58.69	58.55	58.41	0.19	0.24	0.27	0.23	0.29	0.32
800	43.10	43.00	42.86	0.25	0.31	0.34	0.31	0.37	0.41
834	30.56	30.32	30.29	0.34	0.42	0.46	0.41	0.49	0.54
840	27.96	27.73	27.68	0.37	0.45	0.50	0.44	0.53	0.58
856	20.22	20.01	19.96	0.52	0.63	0.69	0.61	0.72	0.79
873	10.40	10.26	10.26	1.27	1.48	1.60	1.39	1.64	1.77
887	2.89	3.01	3.14	6.09	6.63	6.82	6.37	7.06	7.28
925	0.78	0.95	1.06	27.79	30.69	33.17	26.75	30.57	33.12
928	0.77	0.94	1.04	28.20	32.59	35.40	26.36	30.79	32.85
932	0.76	0.93	1.03	28.08	33.35	35.85	25.53	29.70	31.07
935	0.76	0.93	1.02	27.98	33.42	35.91	25.08	28.96	30.14
940	0.75	0.92	1.02	28.29	33.89	36.72	24.81	28.34	29.33
942	0.75	0.92	1.02	28.41	33.71	35.99	24.80	28.14	28.98
946	0.75	0.92	1.02	28.01	31.52	31.99	24.67	27.41	27.77
950	0.75	0.93	1.03	26.44	28.27	27.93	24.13	26.04	25.90
954	0.76	0.94	1.04	24.59	25.69	25.10	23.30	24.57	24.11
958	0.78	0.96	1.06	23.29	24.21	23.46	22.71	23.66	22.97
960	0.79	0.97	1.07	23.02	23.96	23.11	22.67	23.56	22.75
989	2.84	3.17	3.19	5.57	5.59	5.94	5.55	5.57	5.94
1006	10.15	10.40	10.33	1.01	1.14	1.24	1.02	1.16	1.27
1029	20.22	20.34	20.26	0.30	0.40	0.45	0.34	0.44	0.49
1045	25.94	26.02	25.93	0.22	0.31	0.35	0.26	0.35	0.40
1060	30.62	30.67	30.57	0.20	0.28	0.32	0.24	0.32	0.36
1100	41.18	41.20	41.05	0.18	0.25	0.29	0.23	0.30	0.34
1150	53.24	53.23	53.01	0.20	0.26	0.29	0.25	0.31	0.34
1180	62.18	61.91	62.00	0.21	0.26	0.29	0.25	0.31	0.35
1200	74.31	71.25	73.29	0.21	0.27	0.30	0.26	0.32	0.35
1250	66.44	66.24	66.58	0.22	0.28	0.31	0.28	0.33	0.36
1280	64.40	63.61	64.17	0.23	0.29	0.32	0.28	0.34	0.37
1300	62.68	63.11	62.80	0.24	0.30	0.32	0.29	0.35	0.38
1330	61.74	62.49	61.93	0.25	0.30	0.33	0.29	0.35	0.38
1360	62.25	62.48	62.26	0.25	0.30	0.33	0.30	0.35	0.38
1380	62.73	63.13	62.60	0.26	0.31	0.34	0.30	0.36	0.39
1410	63.51	63.74	63.21	0.26	0.31	0.34	0.31	0.37	0.40
1440	64.92	64.96	64.48	0.27	0.32	0.35	0.31	0.37	0.40
1460	65.90	65.41	65.86	0.27	0.32	0.35	0.31	0.37	0.40
1500	70.31	65.80	70.35	0.28	0.33	0.36	0.31	0.38	0.41
1550	58.20	62.31	58.53	0.29	0.34	0.37	0.33	0.38	0.42
1600	60.61	61.94	60.74	0.29	0.34	0.37	0.32	0.39	0.42
1650	61.78	62.05	62.05	0.29	0.35	0.37	0.31	0.38	0.42
1700	61.09	61.05	61.13	0.30	0.35	0.38	0.32	0.39	0.42
1730	60.84	60.30	60.28	0.30	0.35	0.38	0.32	0.39	0.42
1750	59.52	59.62	59.87	0.30	0.36	0.39	0.31	0.39	0.43



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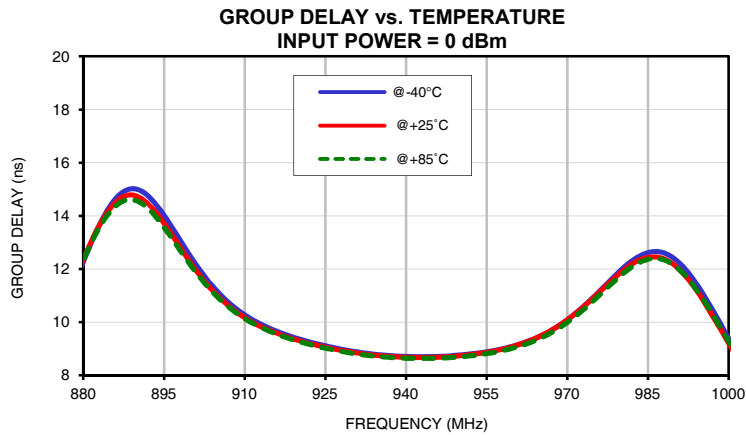
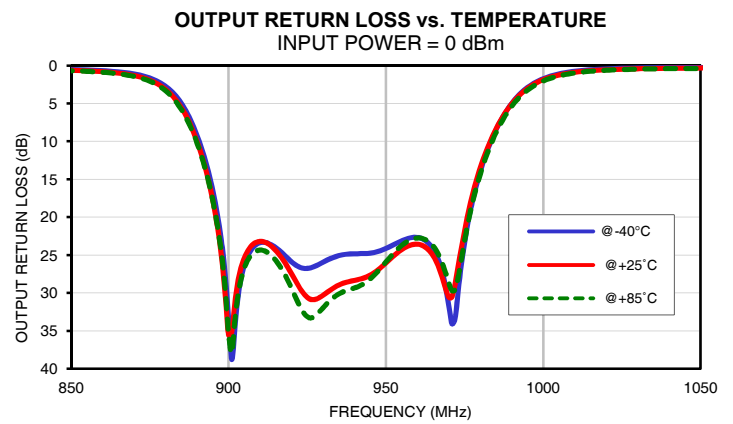
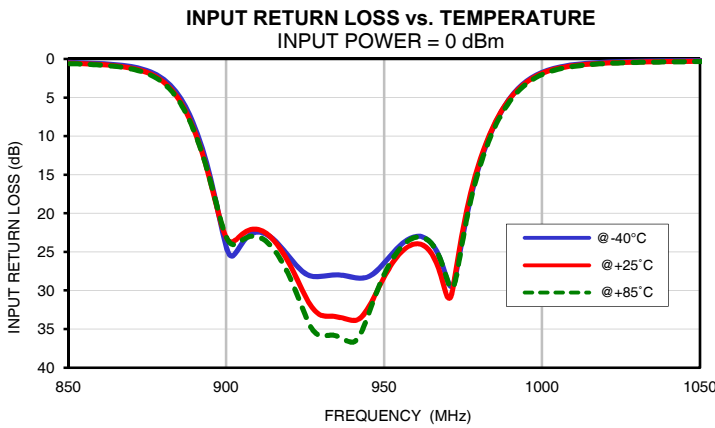
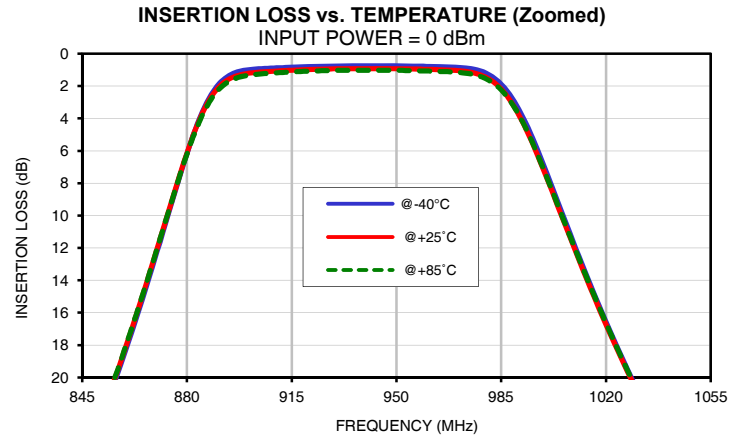
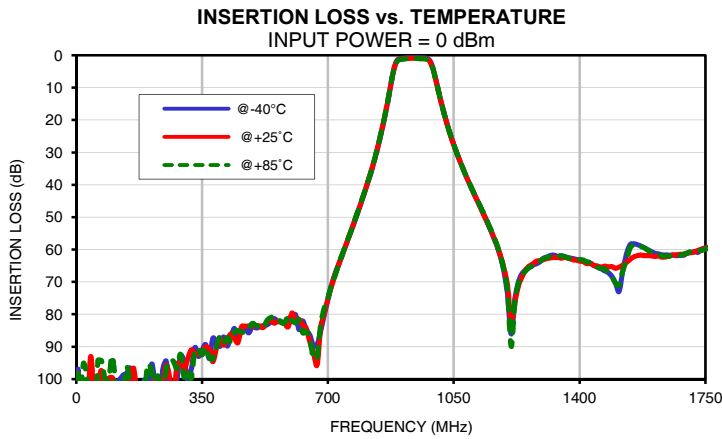
IF/RF MICROWAVE COMPONENTS

REV. OR  
 CBP4-942C+  
 210503  
 Page 1 of 2

Typical Performance Data

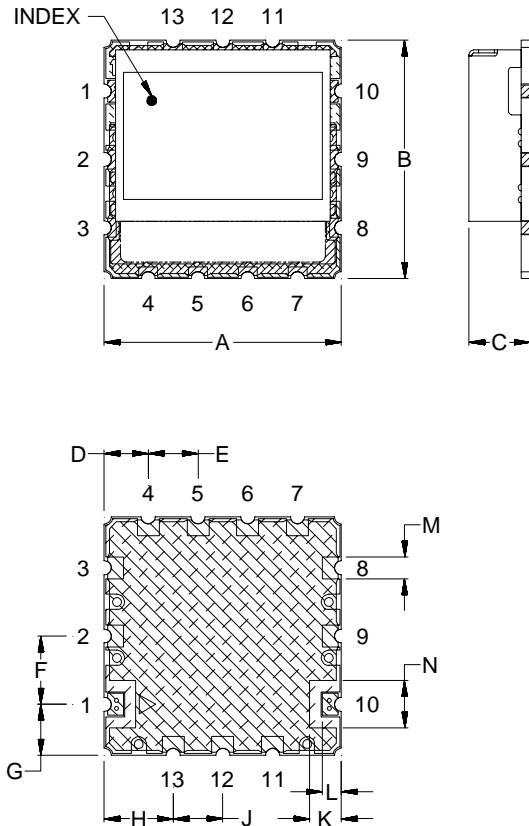
FREQ.  (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
912	10.03	9.94	9.91
913	9.92	9.83	9.80
914	9.82	9.75	9.72
915	9.73	9.65	9.62
916	9.65	9.58	9.55
917	9.57	9.50	9.47
918	9.50	9.43	9.40
919	9.43	9.37	9.34
920	9.37	9.31	9.28
921	9.31	9.25	9.22
923	9.21	9.15	9.12
924	9.16	9.10	9.07
925	9.10	9.05	9.01
926	9.06	9.01	8.98
927	9.01	8.97	8.93
928	8.98	8.93	8.90
929	8.94	8.90	8.86
930	8.91	8.87	8.83
931	8.88	8.84	8.80
932	8.84	8.81	8.77
933	8.82	8.78	8.75
934	8.79	8.76	8.72
935	8.77	8.74	8.70
936	8.75	8.72	8.69
937	8.74	8.70	8.67
938	8.73	8.69	8.66
939	8.71	8.68	8.65
940	8.70	8.67	8.64
941	8.70	8.67	8.63
942	8.70	8.67	8.63
943	8.69	8.66	8.63
944	8.70	8.67	8.63
945	8.70	8.67	8.64
946	8.71	8.68	8.65
947	8.72	8.69	8.65
948	8.72	8.70	8.66
949	8.74	8.71	8.67
950	8.76	8.73	8.69
951	8.78	8.75	8.71
952	8.80	8.77	8.73
953	8.82	8.80	8.75
954	8.85	8.83	8.78
955	8.88	8.86	8.81
956	8.91	8.89	8.84
957	8.95	8.93	8.88
958	9.00	8.98	8.93
959	9.05	9.03	8.98
960	9.10	9.09	9.03
961	9.16	9.15	9.09
962	9.23	9.22	9.15
963	9.30	9.29	9.22

## Typical Performance Curves

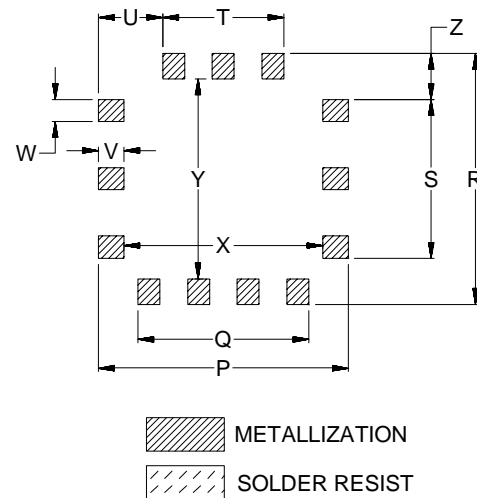


## Outline Dimensions

MP1766



## PCB Land Pattern



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
MP1766	.750 (19.05)	.750 (19.05)	.210 (5.33)	.139 (3.53)	.157 (3.99)	.215 (5.46)	.160 (4.06)	.218 (5.54)	.157 (3.99)	.100 (2.54)	.060 (1.52)	.069 (1.75)	.149 (3.78)

CASE#	P	Q	R	S	T	U	V	W	X	Y	Z	WT.GRAMS
MP1766	.790 (20.07)	.541 (13.74)	.790 (20.07)	.499 (12.67)	.384 (9.75)	.203 (5.16)	.080 (2.03)	.069 (1.75)	.630 (16.00)	.630 (16.00)	.145 (3.68)	4.6

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  $\mu$  inch (.05-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate.  
All models, (+) suffix.

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ISO 9001 ISO 14001 CERTIFIED

ALL NEW  
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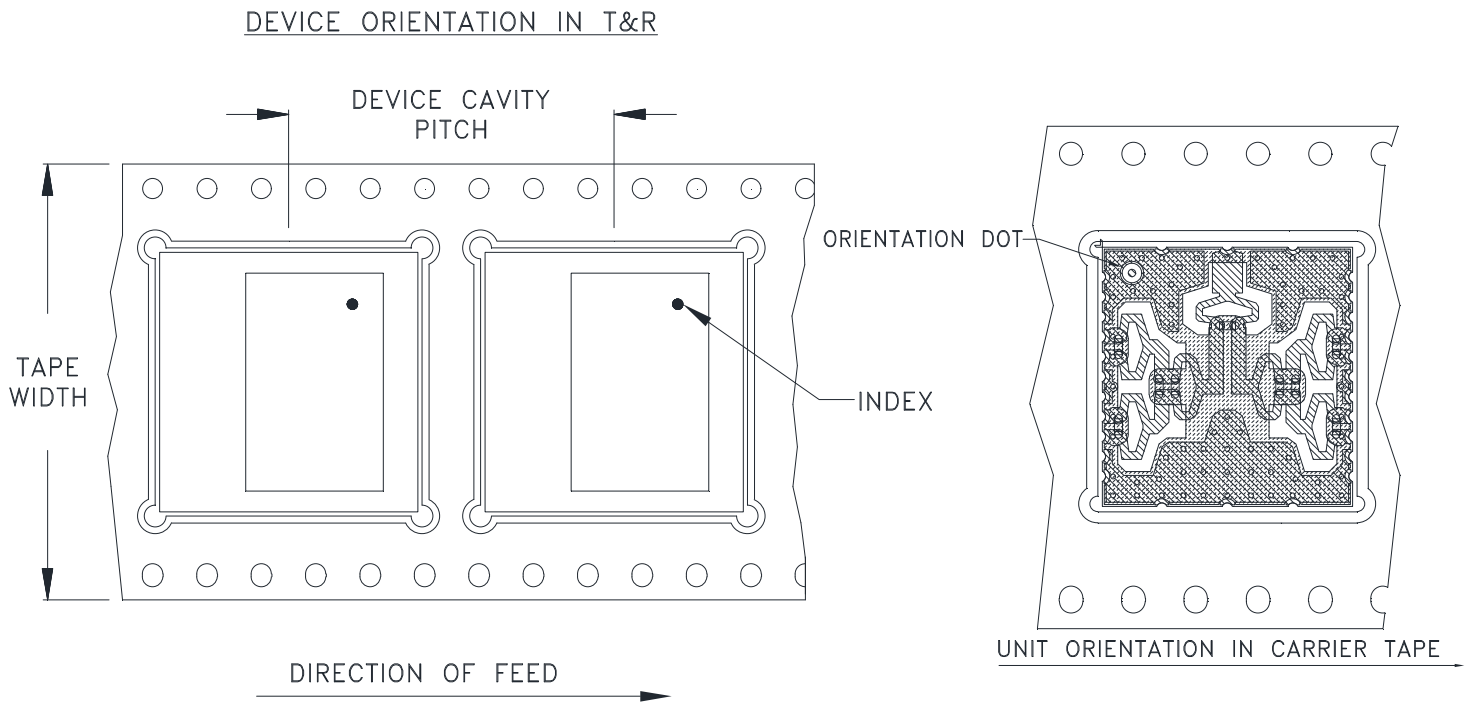
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RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F111



Applicable Case styles:

Applicable Case styles:RS1539

Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



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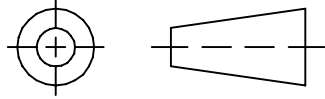
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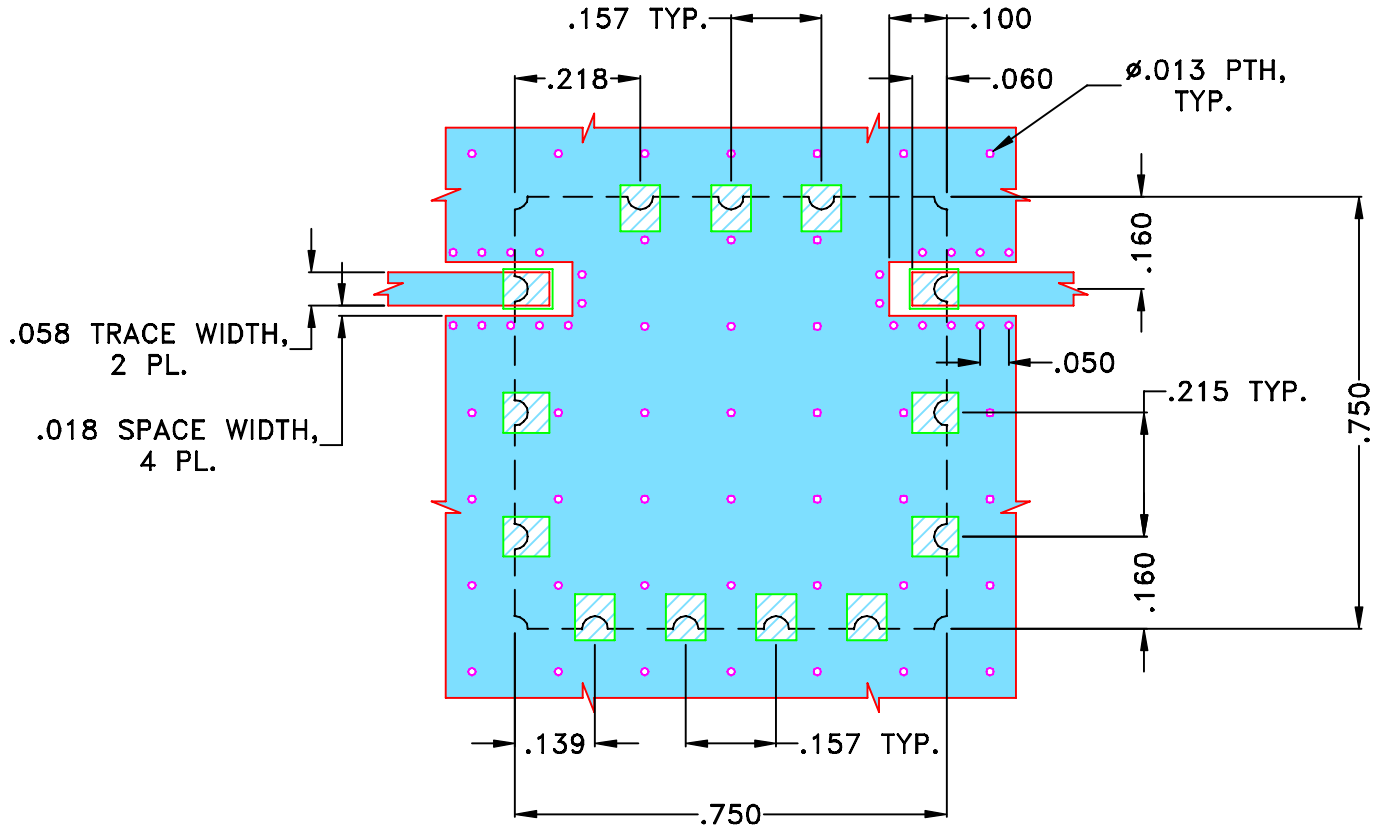
THIRD ANGLE PROJECTION



REVISIONS

REV OR	ECN No.	DESCRIPTION	DATE	DR	AUTH
	M137721	NEW RELEASE	JUN 12	DDR	KG

SUGGESTED MOUNTING CONFIGURATION FOR MP1766 CASE STYLE "13FL01" PIN CODE



NOTES:

- TRACE WIDTH IS SHOWN FOR OAK (OAK-602) WITH DIELECTRIC THICKNESS .022"±.0015". 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	DDR 22 JUN 12
	CHECKED	MD 22 JUN 12
	APPROVED	GM 22 JUN 12

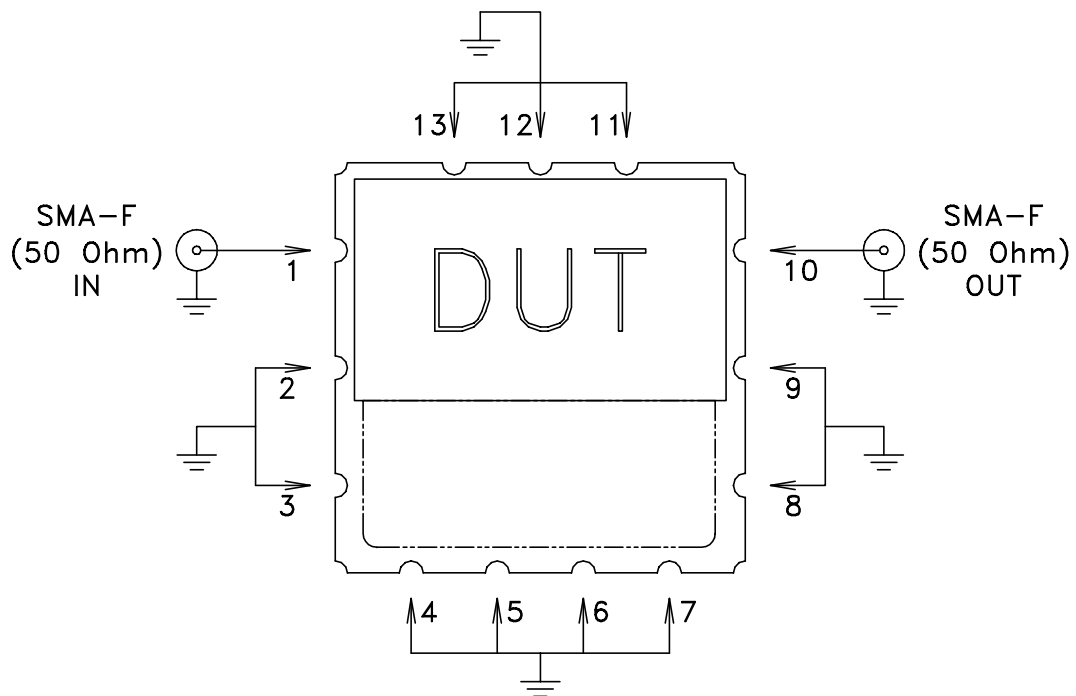
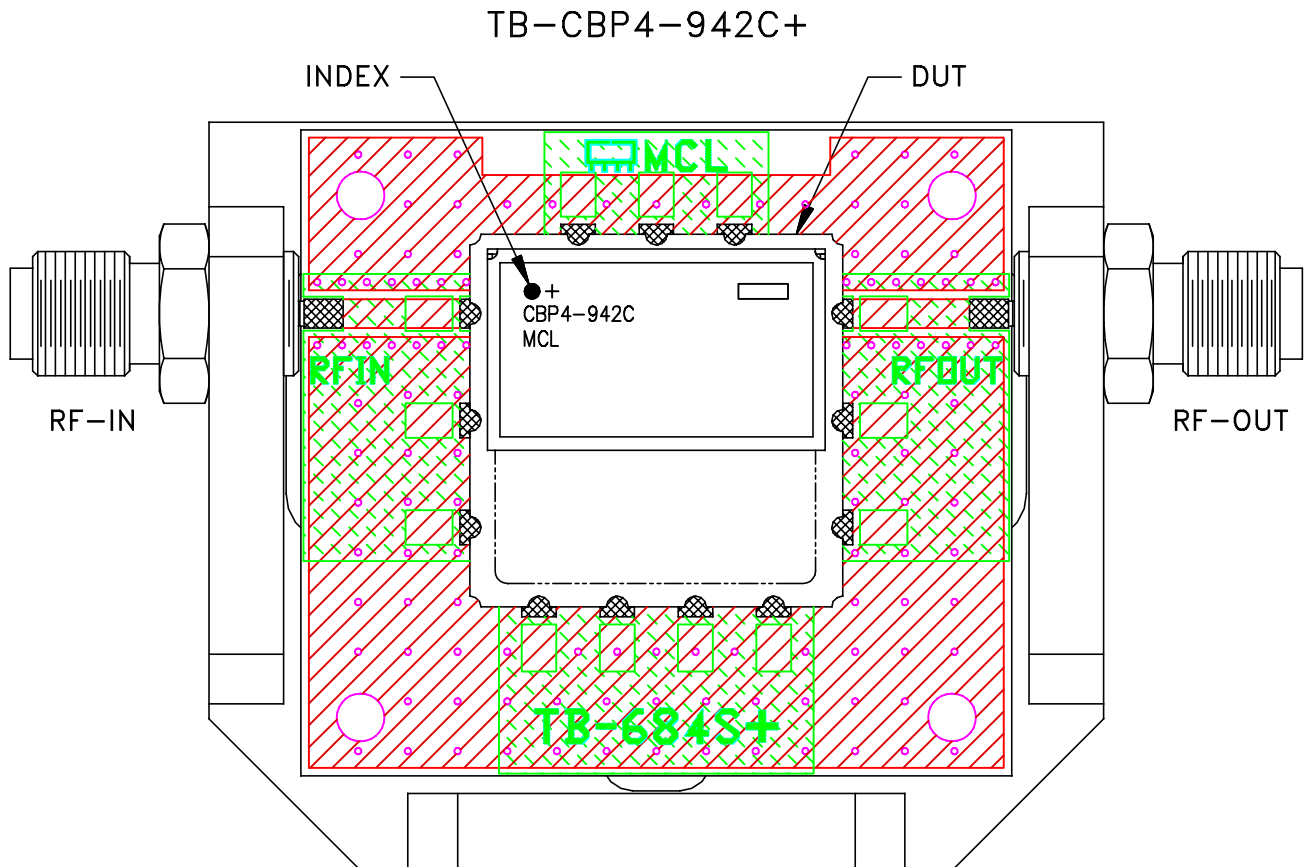
**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

PL, 13FL01, MP1766, BPF,  
TB-684+, 50 Ohm

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-373	REV: OR
FILE: 98PL373	SCALE: 4:1	SHEET: 1 OF 1	

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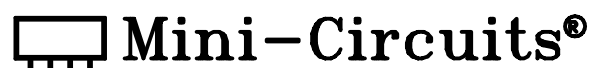
# Evaluation Board and Circuit



Schematic diagram

Notes:

1. 50 Ohm SMA female connectors.
2. PCB Material: OAK-602 OR Equivalent  
Dielectric Constant=2.50±.04, Thickness=.022 inch.



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