Ceramic

Bandpass Filter

BFCO-252+

50Ω 2400 to 2500 MHz

The Big Deal

- Very good rejection
- Rugged, ceramic construction
- Tiny size

CASE STYLE: NK0402C-1

Product Overview

Mini-Circuits' BFCO-252+ is a LTCC Bandpass Filter with a passband from 2400 to 2500 MHz, supporting a variety of applications. This model provides a very good stopband rejection due to strategically constructed layout with minimal interaction between components. It provides a wide operating temperature range from -55 to +125°C. Housed in a tiny 0402 ceramic form factor with wrap-around terminations, 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 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.
Tiny size	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Wrap-around terminations	Provides excellent solderability and easy visual inspection

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BFCO-252+

Generic photo used for illustration purposes only

CASE STYLE: NK0402C-1

+RoHS Compliant

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

Features

- Miniature size 0402 (0.039"[1.0mm] x 0.020"[0.5mm] x 0.015"[0.37mm])
- High rejection up to 8.5 GHz
- Low cost
- Aqueous washable

Applications

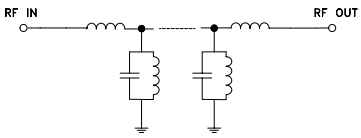
- ISM Band
- WLAN
- Bluetooth

Electrical Specifications[1] at 25°C

Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—		—	2450	—	dB
	Insertion Loss	F1-F2	2400-2500	—	3.7	—	dB
	Return Loss	F1-F2	2400-2500	—	12	—	dB
Stop Band, Lower	Insertion Loss	DC-F3	DC-1500	30	35	—	dB
		F3-F4	1500-1800	20	25	—	dB
Stop Band, Upper	Insertion Loss	F4-F5	3200-4500	17	23	—	dB
		F5-F6	4500-8500	—	16	—	dB

1. Tested on Evaluation Board TB-BFCO-252+

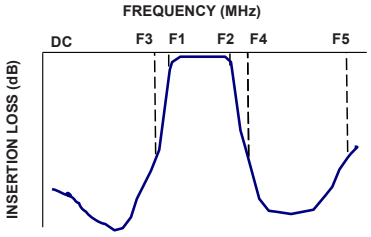
Functional Schematic



Maximum Ratings	
Operating Temperature	-55°C to 125°C
Storage Temperature*	-55°C to 125°C
RF Power Input**	2W at 25°C

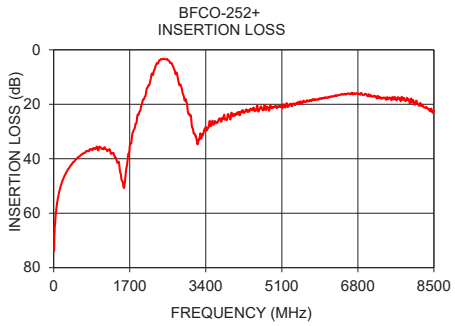
Permanent damage may occur if any of these limits exceeded.
*Refer to product storage temperature after installation
Suggestion for T&R unused product storage condition:
+5 ~ +35 °C, Humidity 45~75%RH, 12 month Max
** Derate linearly to 0.5W at 125°C

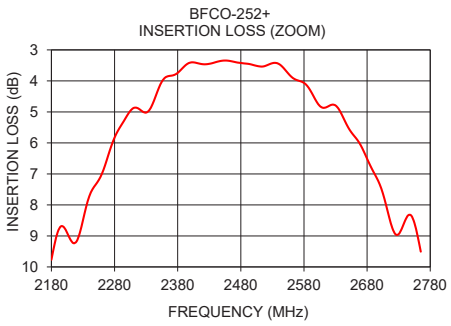
Typical Frequency Response

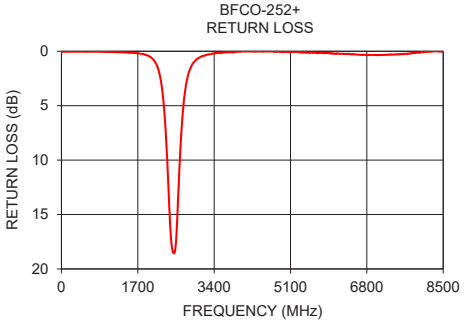


Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	73.88	0.05
100	54.11	0.04
500	40.18	0.04
1000	36.83	0.06
1500	45.53	0.13
1800	29.20	0.25
2000	18.21	0.59
2400	3.41	14.21
2500	3.49	18.55
3000	22.70	0.77
3200	33.41	0.39
4500	22.48	0.02
5000	21.04	0.08
6000	18.00	0.21
7000	16.67	0.34
8500	22.37	0.04







Notes

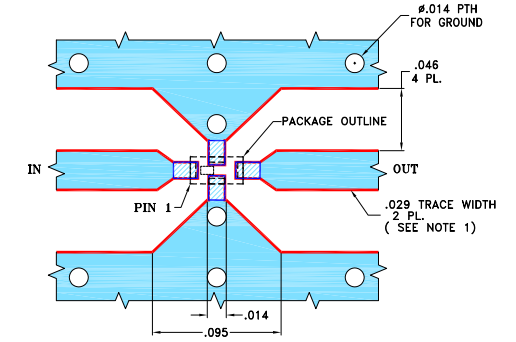
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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	3
OUTPUT	1
GROUND	2,4

Product Marking: N/A

Evaluation Board MCL P/N: TB-BFCO-252+
Suggested PCB Layout (PL-552)

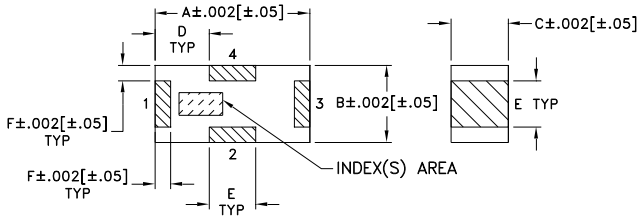


NOTES:
1. TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS .016±.0015. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

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	wt
.039	.020	.015	.014	.012	.004	grams
0.99	0.51	0.38	0.36	0.30	0.10	.0007

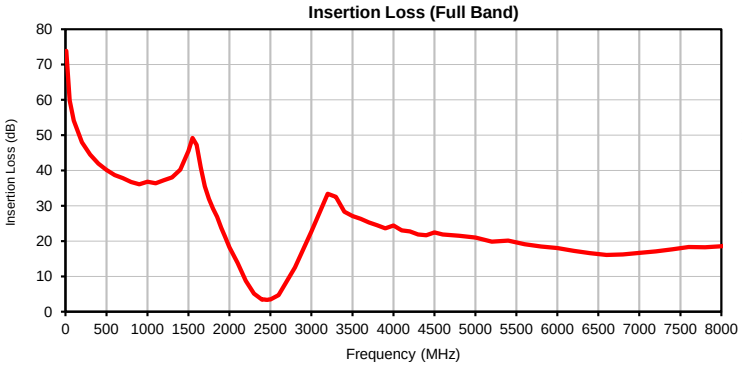
Ceramic Bandpass Filter BFCO-252+

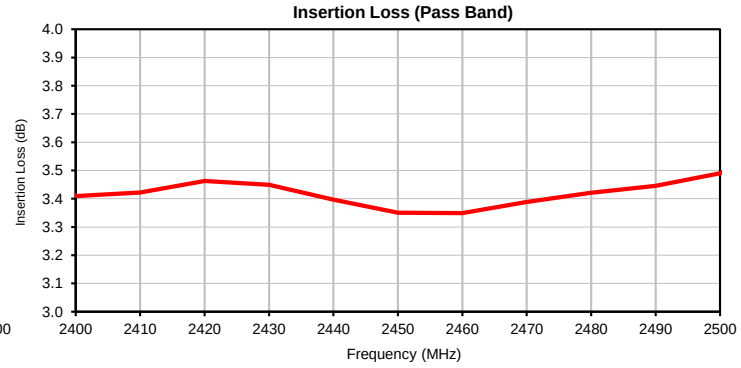
Typical Performance Data

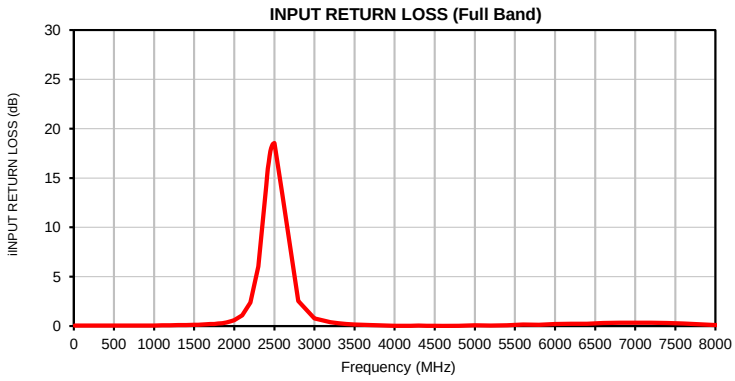
FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	73.88	0.05	0.05
50	59.88	0.04	0.05
100	54.11	0.04	0.05
200	47.95	0.04	0.05
300	44.47	0.04	0.05
400	41.98	0.04	0.05
500	40.18	0.04	0.05
600	38.71	0.04	0.06
700	37.81	0.04	0.06
800	36.71	0.04	0.06
900	36.09	0.05	0.07
1000	36.83	0.06	0.07
1100	36.36	0.06	0.08
1200	37.22	0.08	0.09
1300	38.02	0.09	0.10
1400	40.24	0.10	0.12
1500	45.53	0.13	0.14
1550	49.22	0.14	0.15
1600	47.22	0.15	0.17
1650	40.89	0.17	0.19
1700	35.53	0.20	0.22
1750	31.97	0.22	0.25
1800	29.20	0.25	0.29
1850	26.87	0.29	0.35
1900	23.73	0.36	0.43
1950	21.08	0.46	0.54
2000	18.21	0.59	0.69
2100	13.79	1.09	1.27
2200	8.72	2.39	2.76
2300	5.11	6.04	7.04
2400	3.41	14.21	19.19
2410	3.42	15.13	21.14
2420	3.46	15.94	22.92
2430	3.45	16.62	24.08
2440	3.40	17.24	24.27
2450	3.35	17.71	23.60
2460	3.35	18.03	22.53
2470	3.39	18.25	21.44
2480	3.42	18.41	20.48
2490	3.45	18.50	19.63
2500	3.49	18.55	18.88
2600	4.67	13.29	12.13
2800	12.51	2.54	2.58
3000	22.70	0.77	0.85
3200	33.41	0.39	0.45
3300	32.51	0.28	0.34
3400	28.30	0.22	0.28
3500	27.10	0.16	0.23
3600	26.29	0.11	0.18
3700	25.29	0.09	0.15
3800	24.50	0.08	0.14
3900	23.60	0.05	0.11
4000	24.38	0.03	0.09
4100	23.02	0.03	0.08
4200	22.75	0.02	0.10
4300	21.89	0.04	0.07
4400	21.65	0.02	0.05
4500	22.48	0.02	0.04
4600	21.90	0.02	0.03
4800	21.48	0.02	0.03
5000	21.04	0.08	0.04
5200	19.86	0.04	0.02
5400	20.13	0.08	0.04
5600	19.11	0.15	0.09
5800	18.46	0.13	0.11
6000	18.00	0.21	0.18
6200	17.23	0.23	0.20
6400	16.55	0.24	0.25
6600	16.07	0.30	0.31
6800	16.19	0.33	0.33
7000	16.67	0.34	0.37
7200	17.08	0.33	0.38
7400	17.64	0.30	0.37
7600	18.29	0.27	0.33
7800	18.24	0.17	0.25
8000	18.57	0.09	0.18
8200	19.63	0.04	0.13
8400	22.10	0.02	0.06
8500	22.37	0.04	0.03

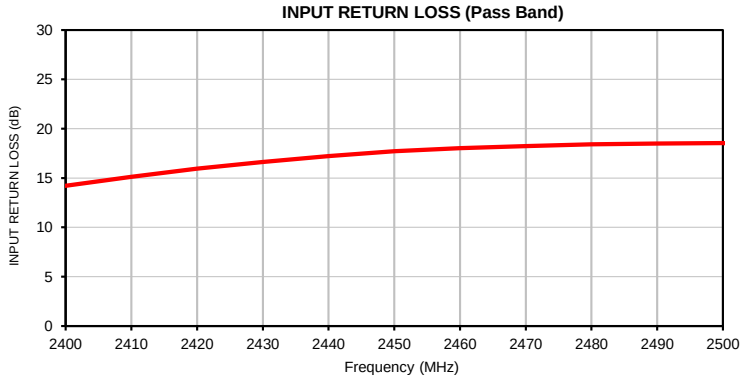
Ceramic Bandpass Filter BFCO-252+

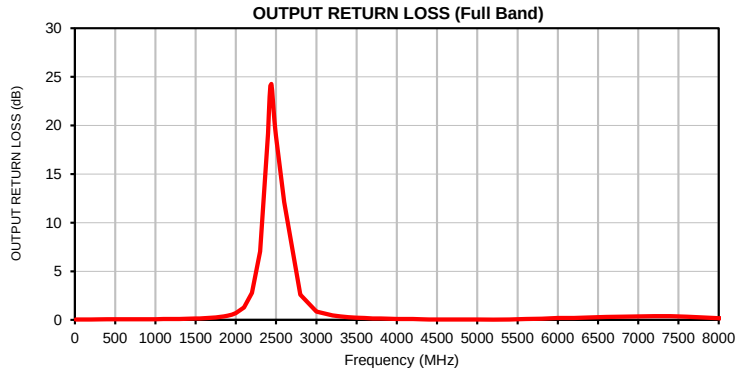
Typical Performance Curves

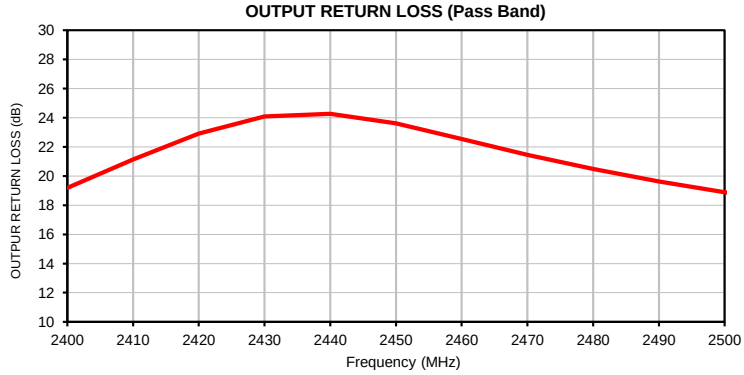








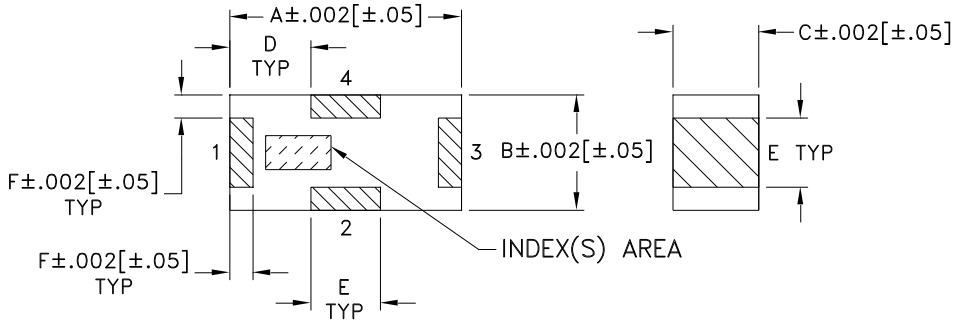




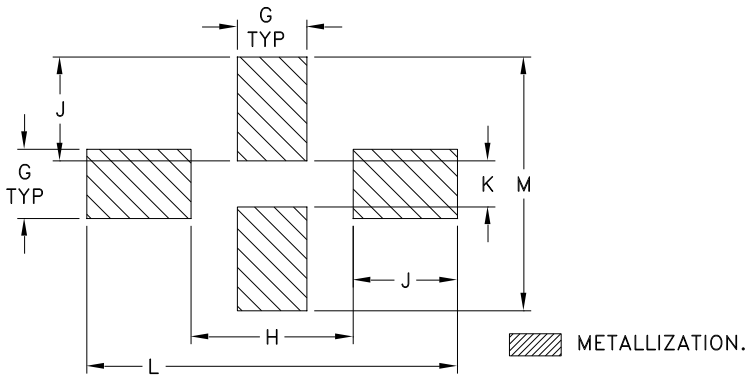
Case Style NK

NK0402C-1

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	WT.GRAMS
NK0402C-1	.039 (1.00)	.020 (.50)	.015 (.37)	.014 (.35)	.012 (.30)	.004 (.10)	.012 (.30)	.028 (.70)	.018 (.45)	.008 (.20)	.063 (1.60)	.043 (1.10)	.0007

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

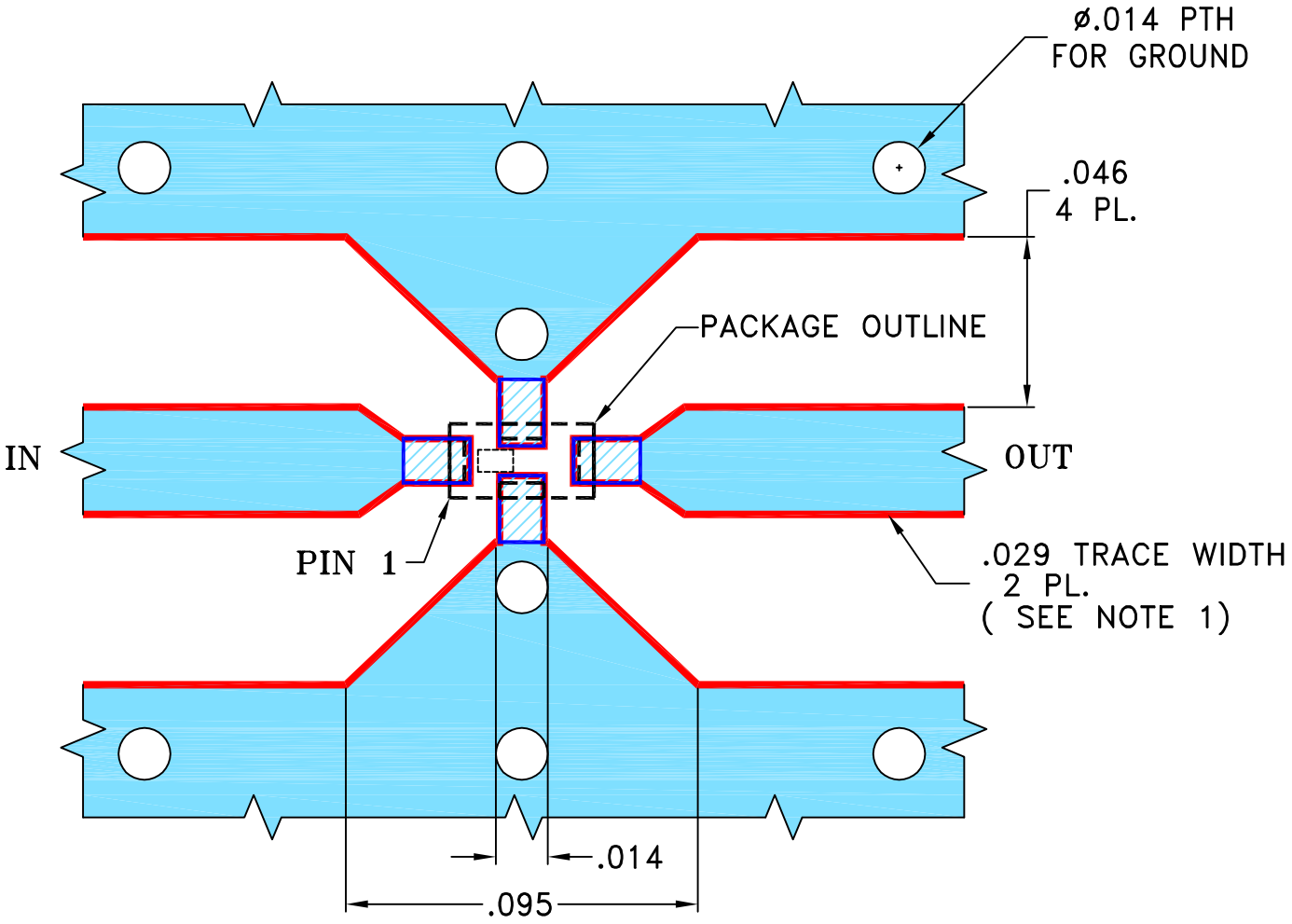
Notes:

1. Open style, ceramic base.
2. Termination finish:
   For RoHS Case Styles: Matte Tin over Nickel plating. Models with (+) suffix.
3. *Line width should be designed to match 50Ω characteristic impedance, depending on PCB material and thickness.

THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168200	NEW RELEASE	05/31/18	NP	SL

SUGGESTED MOUNTING CONFIGURATION
FOR NK0402C-1 CASE STYLE, "04FL01" PIN CODE



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS .016±.0015. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP 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	NP	05/30/18
TOLERANCES ON:	CHECKED	GF	05/30/18
2 PL DECIMALS ±	APPROVED	SL	05/31/18
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

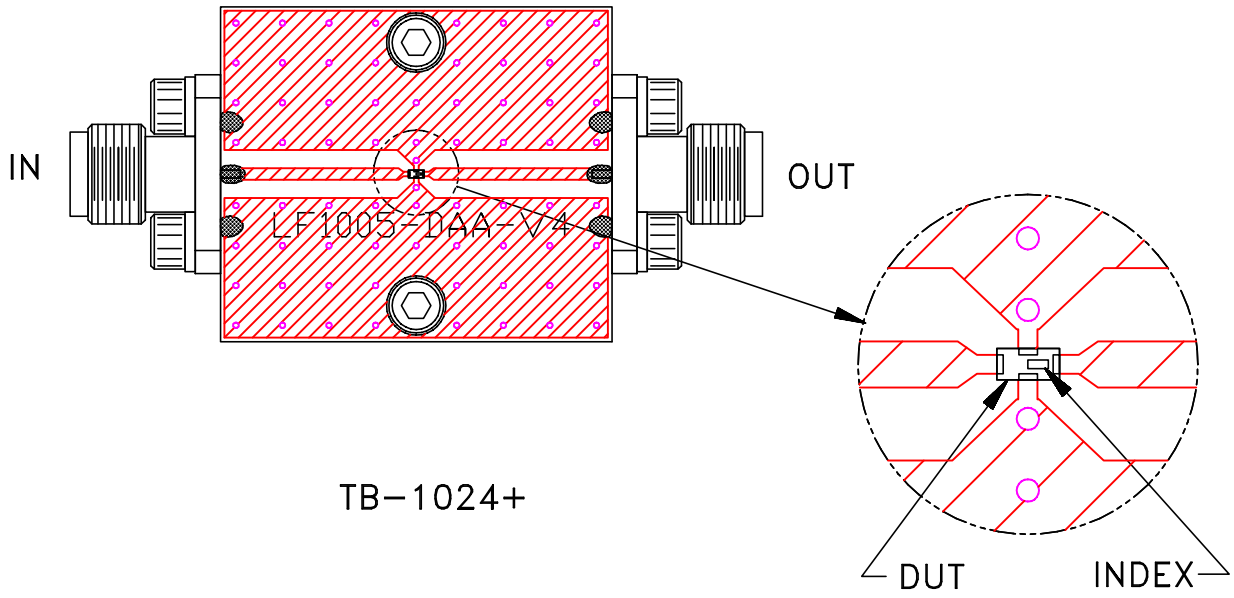
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 04FL01, NK0402C-1, TB-1024+

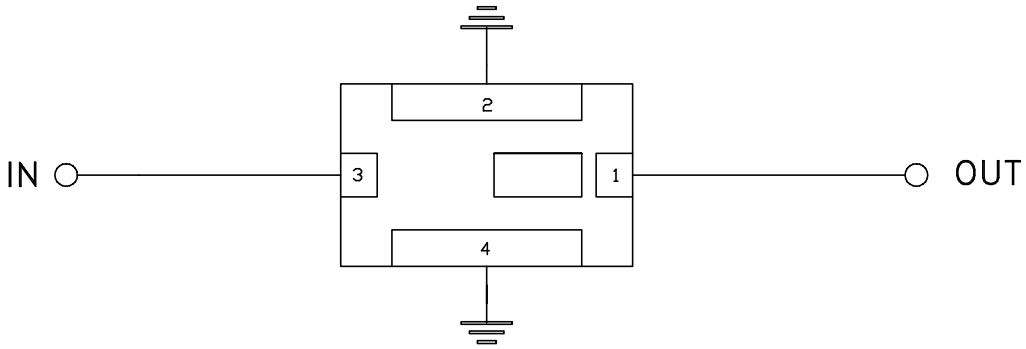
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-552	OR

FILE:	SCALE:	SHEET:
98PL552	20:1	1 OF 1

Evaluation Board and Circuit



TB-1024+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent,
   Dielectric Constant=4.5, Thickness=.016 inch.

Mini-Circuits®

Environmental Specifications ENV06T9

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: 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