

Ceramic Low Pass Filter

LFCO-252+

50Ω DC to 2500 MHz

The Big Deal

- Rugged, ceramic construction
- Tiny size
- Good power handling



CASE STYLE: NK0402C-1

Product Overview

Mini-Circuits' LFCO-252+ is a LTCC low pass Filter with a passband from DC to 2500 MHz, supporting a variety of applications. This model provides a very good insertion loss 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
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

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



Ceramic Low Pass Filter

50Ω DC to 2500 MHz

LFCO-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
- Low Insertion Loss
- Aqueous washable

Applications

- ISM Band
- WLAN
- Bluetooth

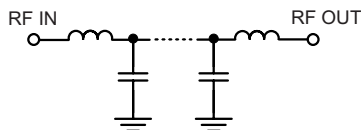
Electrical Specifications^{1,2} at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Pass Band	Insertion Loss	DC-F1	DC - 2500	—	0.88	1.75	dB
	Freq. Cut-Off	F2	3000	—	2	—	dB
	Return Loss	DC-F1	DC - 2500	—	12	—	dB
Stop Band	Rejection Loss	F3-F4	4400 - 8500	—	20	—	dB

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

2. In Application where DC voltage is present at either input or output ports, coupling capacitors are required.

Functional Schematic



Maximum Ratings

Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input	3W 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:

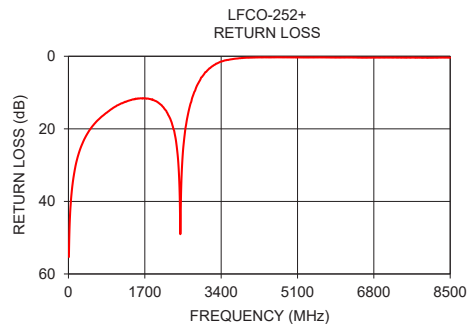
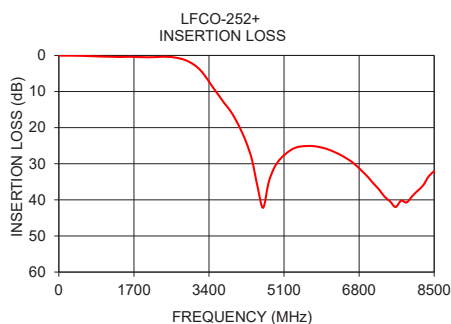
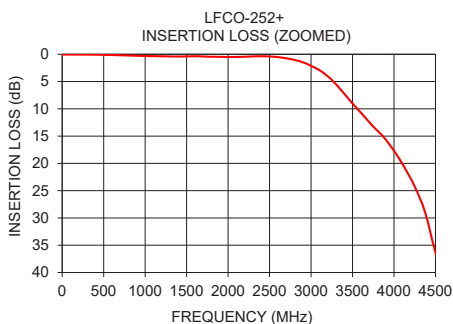
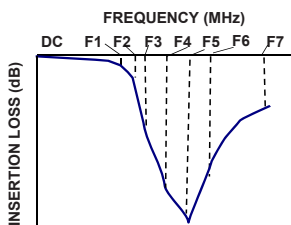
+5 ~ +35 °C, Humidity 45~75%RH, 12 month Max

** Derate linearly to 1W at 125°C

Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
10	0.05	55.32
100	0.05	34.45
500	0.11	19.85
1000	0.21	14.18
1500	0.32	11.68
1800	0.58	11.77
2000	0.55	12.78
2400	0.27	23.81
2500	0.41	42.85
3000	2.75	5.27
3200	5.08	2.77
4400	30.18	0.31
5000	28.39	0.32
6000	25.65	0.35
7000	34.02	0.37
8500	31.50	0.39

Typical Frequency Response



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



www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

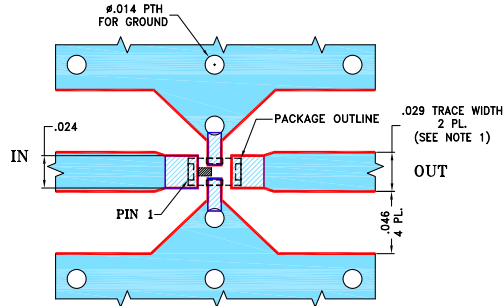
REV. OR
ECO-005335
LFCO-252+
RS/CP/AM
201221
Page 2 of 3

Pad Connections

INPUT	3
OUTPUT	1
GROUND	2,4

Product Marking: N/A

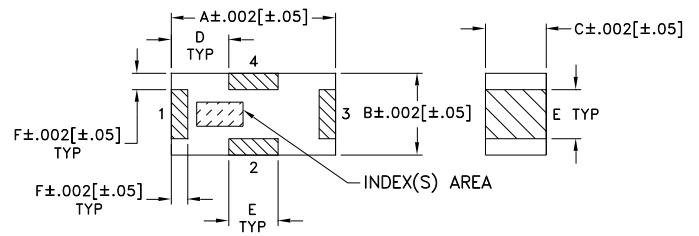
Evaluation Board MCL P/N: TB-LFCO-252+ Suggested PCB Layout (PL-568)



NOTES:

- 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.
 - 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

Notes

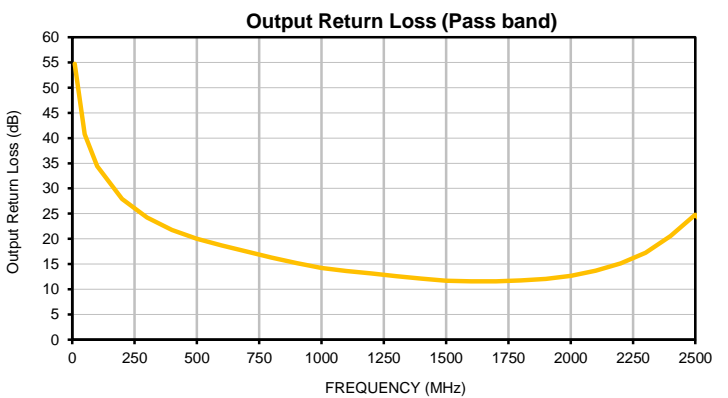
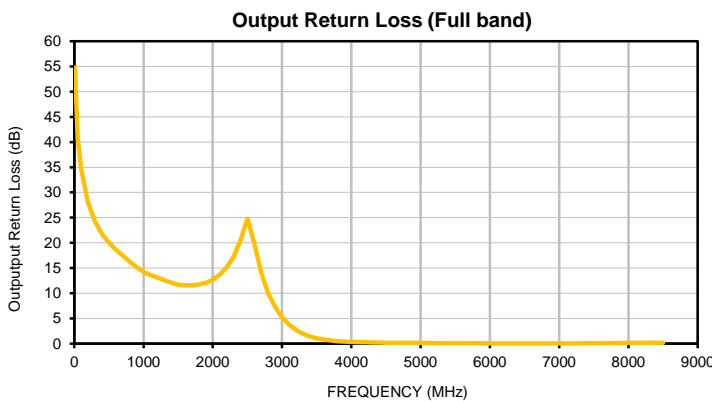
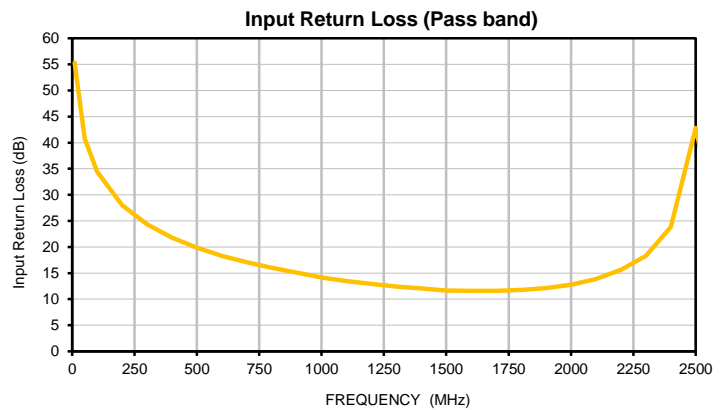
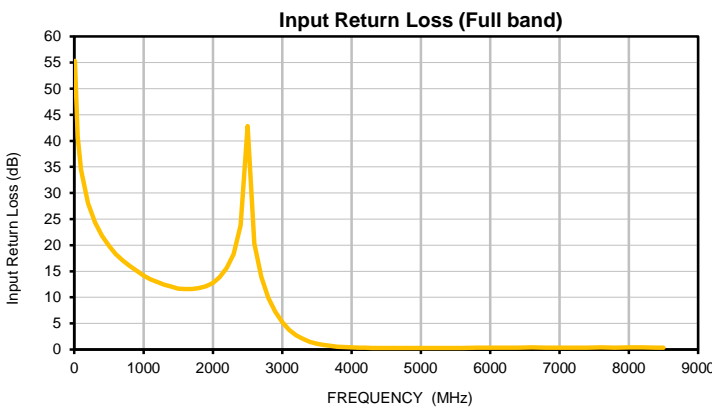
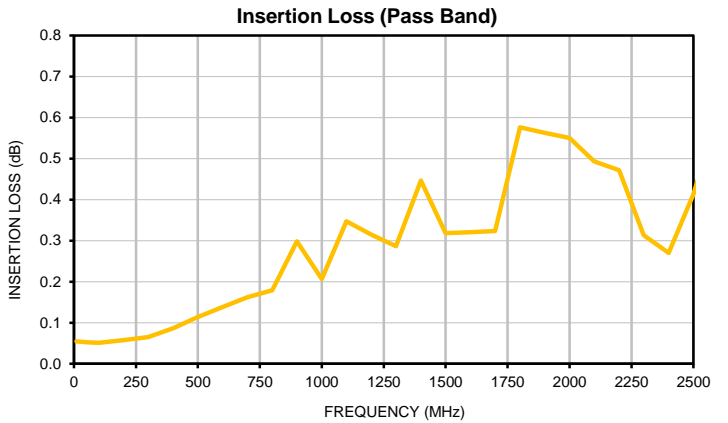
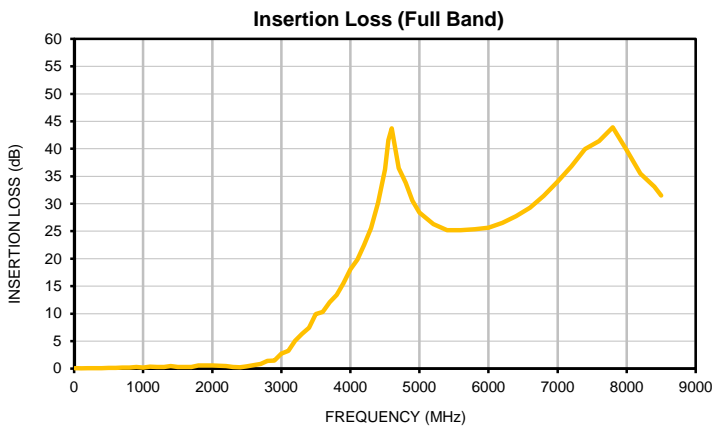
- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuit's 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-Circuit's website at www.minicircuits.com/MCLStore/terms.jsp

Typical Performance Data

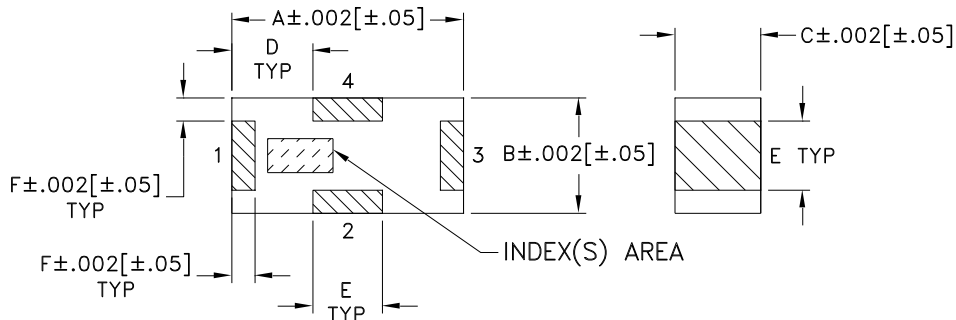
FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	OUTPUT RETURN LOSS (dB)
10	0.05	55.32	54.73
50	0.05	40.79	40.75
100	0.05	34.45	34.42
200	0.06	28.02	27.91
300	0.06	24.37	24.22
400	0.09	21.79	21.73
500	0.11	19.85	20.03
600	0.14	18.32	18.69
700	0.16	17.08	17.46
800	0.18	16.03	16.26
900	0.30	15.10	15.18
1000	0.21	14.18	14.24
1100	0.35	13.48	13.60
1200	0.31	12.95	13.12
1300	0.29	12.43	12.59
1400	0.45	12.05	12.14
1500	0.32	11.68	11.70
1600	0.32	11.59	11.56
1700	0.32	11.59	11.55
1800	0.58	11.77	11.73
1900	0.56	12.11	12.06
2000	0.55	12.78	12.69
2100	0.49	13.88	13.69
2200	0.47	15.60	15.14
2300	0.31	18.33	17.22
2400	0.27	23.81	20.58
2500	0.41	42.85	24.80
2600	0.61	20.33	19.94
2700	0.84	13.90	14.01
2800	1.39	9.92	9.94
2900	1.47	7.23	7.23
3000	2.75	5.27	5.26
3100	3.25	3.82	3.80
3200	5.08	2.77	2.72
3300	6.30	2.05	2.00
3400	7.43	1.46	1.42
3500	9.92	1.11	1.08
3600	10.29	0.89	0.84
3700	12.08	0.69	0.63
3800	13.41	0.54	0.50
3900	15.51	0.45	0.42
4000	18.04	0.39	0.33
4100	19.84	0.36	0.30
4200	22.51	0.34	0.27
4300	25.59	0.32	0.24
4400	30.18	0.31	0.22
4500	36.25	0.31	0.20
4550	41.57	0.30	0.19
4600	43.75	0.30	0.19
4700	36.47	0.29	0.18
4800	33.84	0.31	0.17
4900	30.55	0.31	0.16
5000	28.39	0.32	0.15
5200	26.28	0.32	0.13
5400	25.22	0.32	0.11
5600	25.19	0.32	0.10
5800	25.37	0.34	0.09
6000	25.65	0.35	0.08
6200	26.52	0.34	0.07
6400	27.71	0.36	0.07
6600	29.30	0.39	0.07
6800	31.45	0.37	0.07
7000	34.02	0.37	0.06
7200	36.79	0.37	0.08
7400	39.99	0.38	0.09
7600	41.37	0.39	0.12
7800	43.91	0.38	0.12
8000	39.76	0.42	0.16
8200	35.49	0.40	0.16
8400	33.13	0.37	0.18
8500	31.50	0.39	0.19



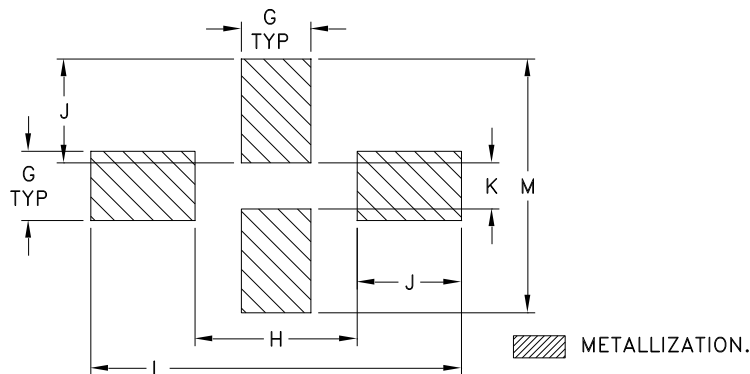
Typical Performance Curves



Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm.002$

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. $\pm .01$; 3 Pl. $\pm .005$

Notes:

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



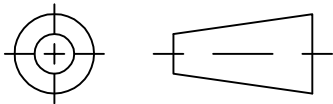
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

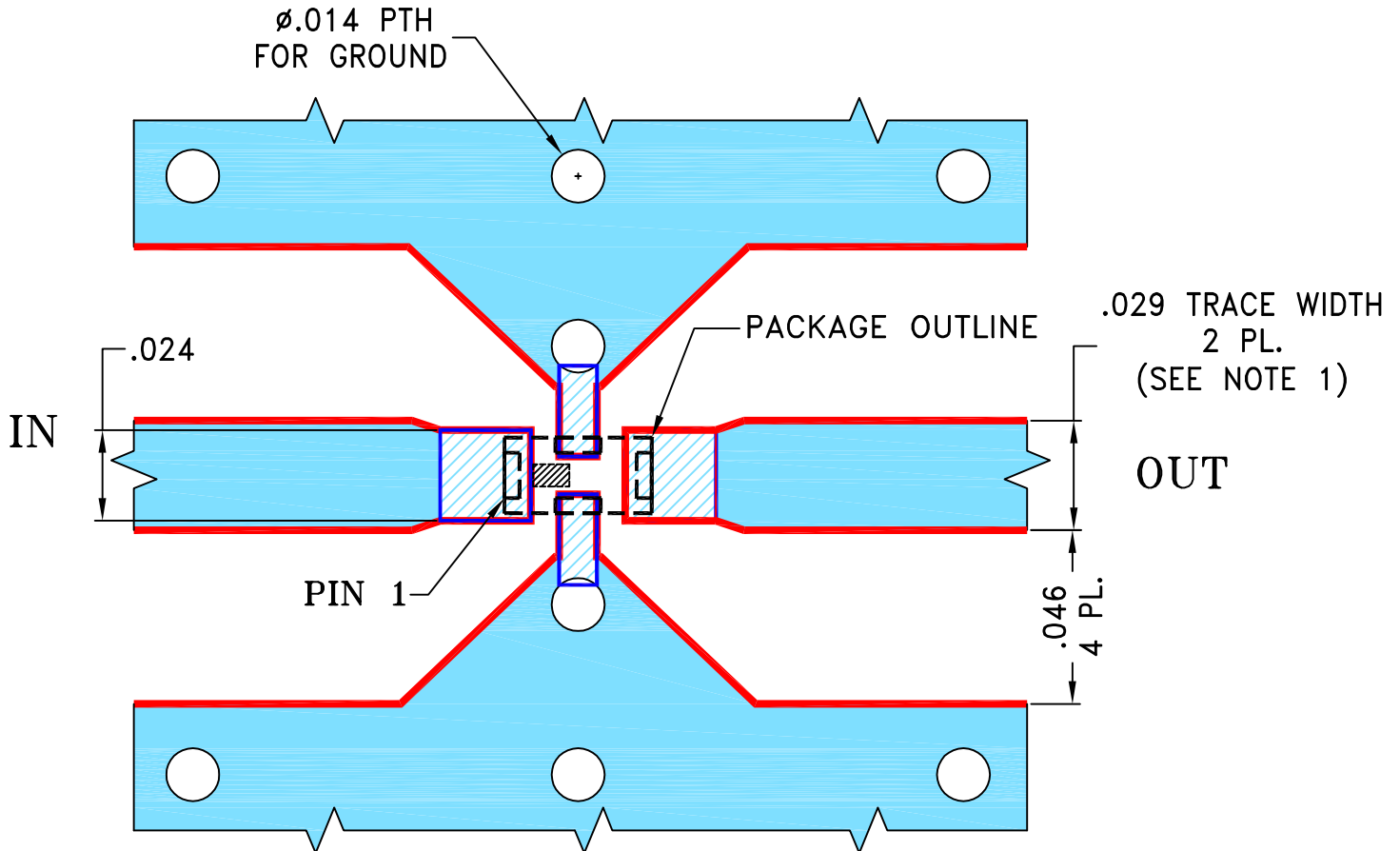
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168200	NEW RELEASE	05/31/18	NP	SL
A	M172925	CHANGED PIN 1 LOCATION	03/05/19	NP	CM

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



NOTES:

- TRACE WIDTH IS SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS $.016 \pm .0015$. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP 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 SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES TOLERANCES ON: 2 PL DECIMALS \pm 3 PL DECIMALS \pm .005 ANGLES \pm FRACTIONS \pm	DRAWN	NP 05/30/18
	CHECKED	GF 05/30/18
	APPROVED	SL 05/31/18

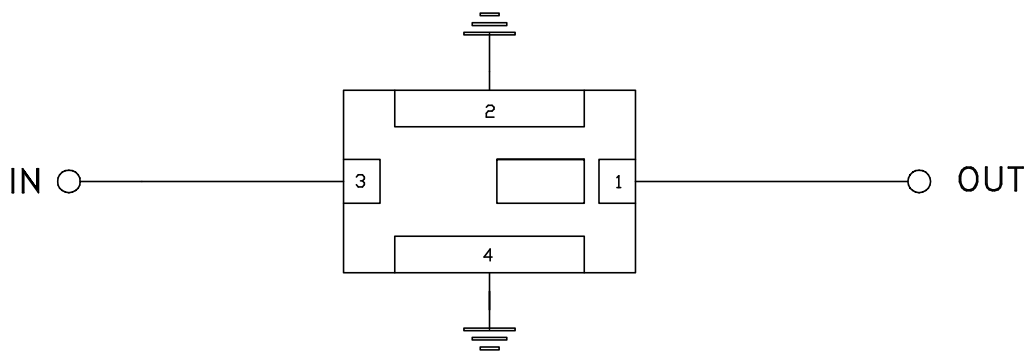
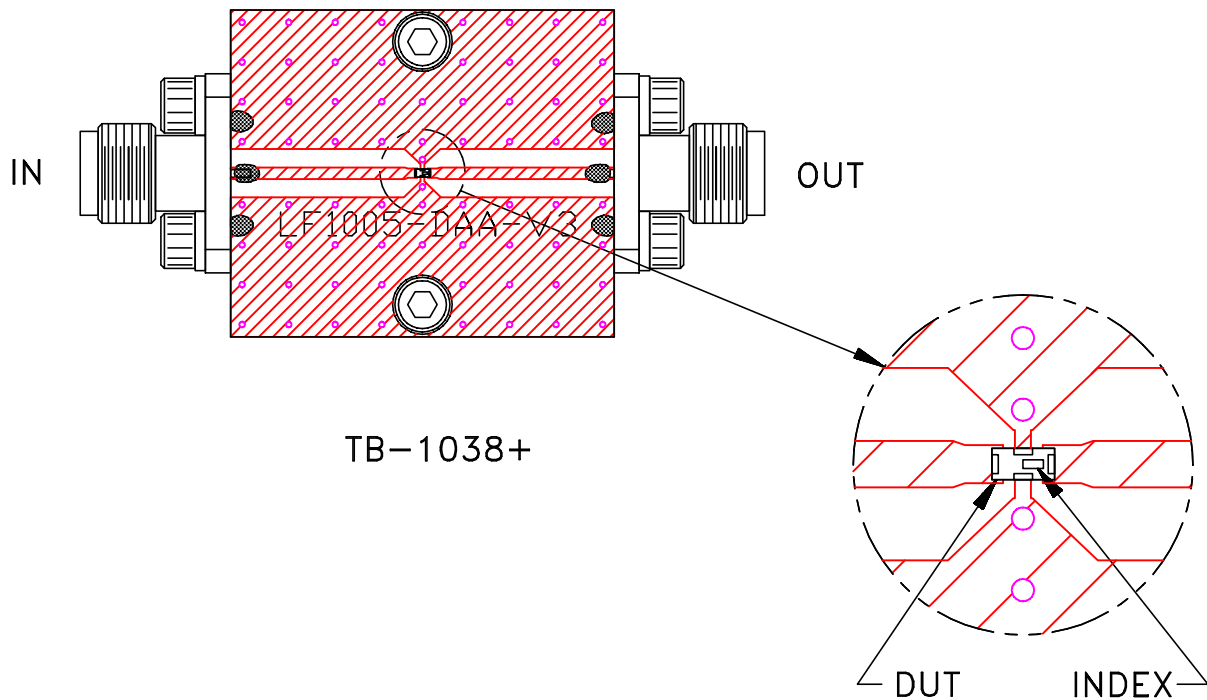
Mini-Circuits[®] 13 Neptune Avenue
 Brooklyn NY 11235

PL, 04FL01, NK0402C-1, TB-1038+

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-568	REV: A
FILE: 98PL568	SCALE: 15:1	SHEET: 1 OF 1	

Mini-Circuits[®]
 THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.
 ASHETA1.DWG REV:A DATE:01/12/95


Evaluation Board and Circuit



Schematic Diagram

Notes:

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