

The Big Deal

- Low insertion loss
- High stopband isolation
- Very small size, 0402



CASE STYLE: NK0402C

Product Overview

Mini-Circuits' LDPO-33-53+ is a tiny, surface-mount diplexer with a low pass channel from DC to 3000 MHz and a high pass channel from 5000 to 5750 MHz. This model provides low passband insertion loss, high stopband rejection, and RF input power handling up to 3W. Fabricated using LTCC technology, the unit comes housed in a tiny, 0402 ceramic package with excellent thermal stability from -55 to +125°C.

Key Features

Feature	Advantages
Low passband insertion loss	Ensures low signal loss through both channels
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.
Wide operating temperature range, -55 to +125°C	Enables reliable performance in extreme environments.

Notes

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 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 Diplexer

50Ω DC to 3000 MHz (5000 to 5750 MHz)

Maximum Ratings

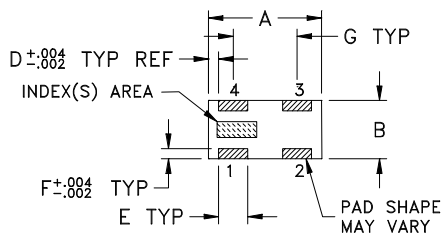
Operating Temperature	-55°C to 125°C
Storage Temperature*	-55°C to 125°C
RF Power Input**	3W

*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.
Permanent damage may occur if any of these limits are exceeded.
**Derate linearly to 1W at 125°C

Pad Connections

Low Pass Port	4
Band Pass Port	3
Common Port	1
Ground	2

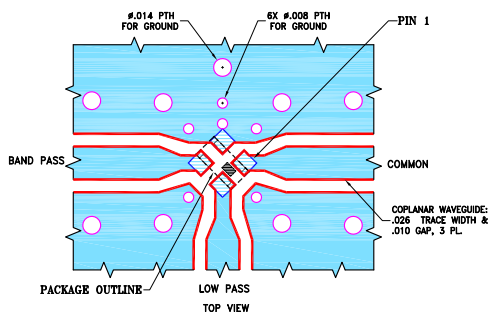
Outline Drawing



Outline Dimensions (inch mm)

A	B	C	D	E	F	G	wt
.039	.020	.015	.004	.010	.004	.022	grams
1.0	0.51	0.38	0.10	0.25	0.10	0.56	.0007

Evaluation Board MCL P/N: TB-LDPO-33-53+ Suggested PCB Layout (PL-571)



NOTES:
1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH AND GAP ARE SHOWN FOR FR4, GRADE IT-180TC (ITEO CORP.) WITH DIELECTRIC THICKNESS .0034-.0005; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
3. LAYERS 3 & 4 OF THE PCB ARE CONTINUOUS GROUND PLANES.
4. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
5. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

Features

- low insertion loss
- miniature size 0402
- low cost
- aqueous washable

Applications

- ISM Band
- WIFI
- Bluetooth
- Cellular

LDPO-33-53+



Generic photo used for illustration purposes only

CASE STYLE: NK0402C

+RoHS Compliant

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



Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7"	20, 50, 100, 200, 500, 1000, 4000

Electrical Specifications¹ at 25°C

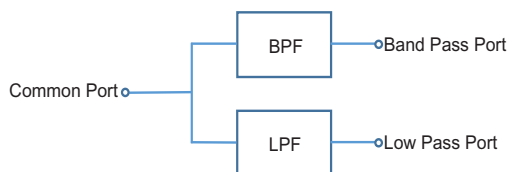
Parameter	Port	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Insertion Loss	Low Pass	DC - 3000	—	0.8	1.2
		Band Pass	5000 - 5750	—	2.5	3.0
	Return Loss	Low Pass	DC - 3000	—	15	—
		Band Pass	5000 - 5750	—	11	—
Stop Band Rejection	Common	DC - 3000	—	18	—	dB
		5000 - 5750	—	15	—	dB
	Band Pass	5000 - 12000	—	17	—	dB
		DC - 3000	19	25	—	dB
Stop Band Rejection	Band Pass	7800 - 12000	15	23	—	dB

1. Tested on Evaluation Board TB-LDPO-33-53+

Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)		Return Loss (dB)		
	Low Pass Port	Band Pass Port	Common Port	Low Pass Port	Band Pass Port
10	0.04	70.45	56.56	58.15	0.16
50	0.08	55.54	45.75	46.53	0.14
100	0.06	49.20	41.19	42.00	0.08
500	0.11	35.41	26.09	26.14	0.03
1000	0.18	30.43	21.17	21.42	0.01
1500	0.26	28.83	19.97	20.73	0.08
2000	0.31	29.52	21.54	22.84	0.07
2500	0.37	35.58	27.11	30.07	0.16
3000	0.49	31.63	29.21	28.99	0.37
3500	0.89	17.49	19.25	17.35	0.79
4000	2.99	7.53	13.12	7.74	2.83
4500	11.93	2.39	12.19	2.11	9.27
5000	27.40	1.33	17.31	1.11	14.02
6000	19.61	1.29	41.28	1.17	22.94
7000	15.63	7.70	3.57	1.27	2.90
8000	23.80	26.88	0.55	1.26	0.60
9000	30.25	20.83	0.12	1.32	0.18
10000	25.09	22.08	0.13	0.84	0.26
11000	28.56	25.29	0.22	0.25	0.46
12000	40.40	31.81	0.03	0.07	0.47

Block Diagram



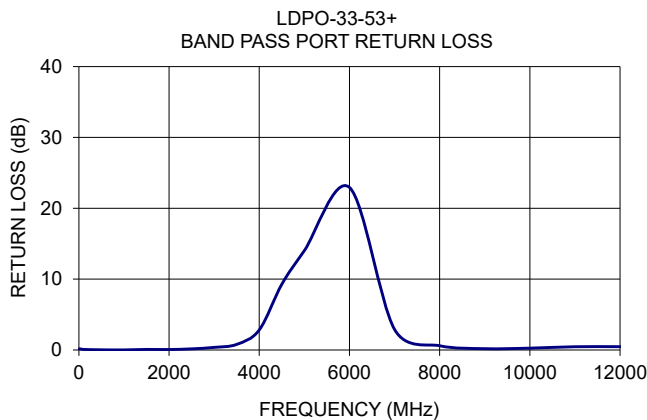
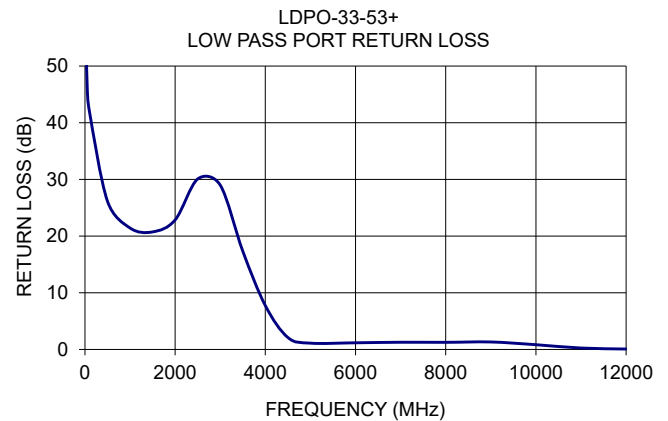
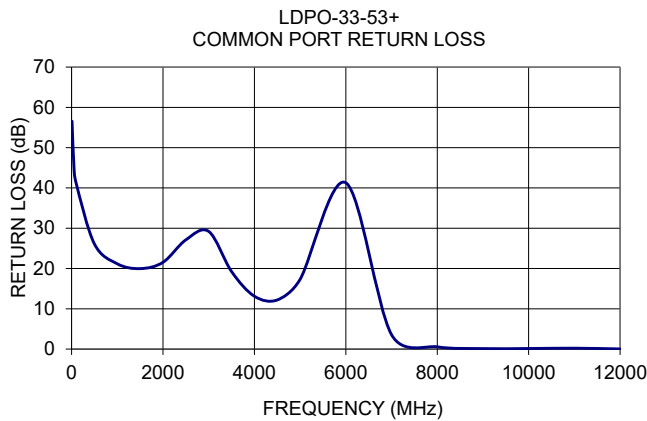
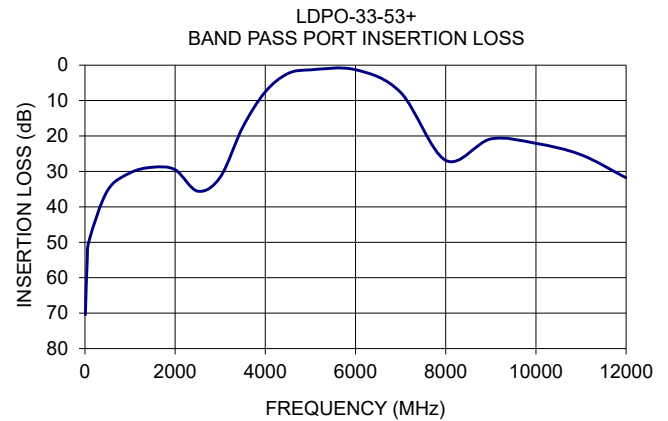
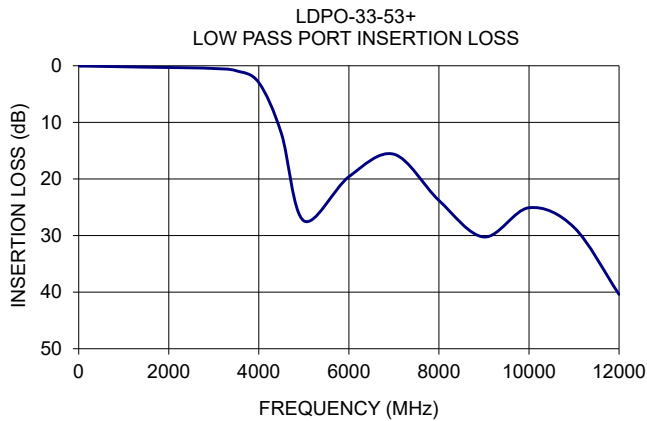
Notes

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REV. OR
ECO-005333
LDPO-33-53+
SL/CP/AM
201216
Page 2 of 3



Notes

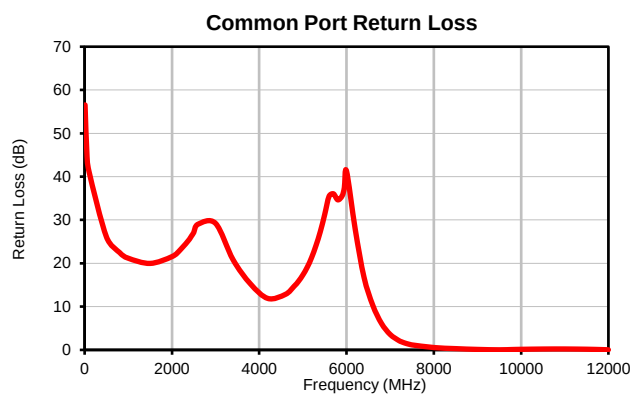
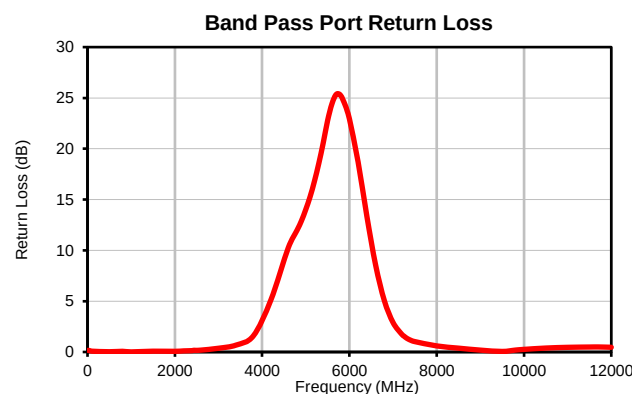
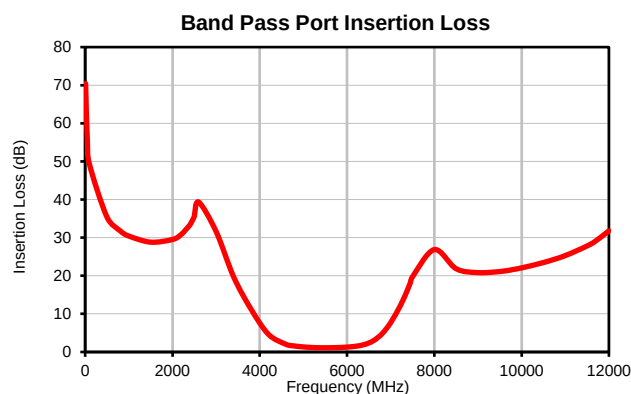
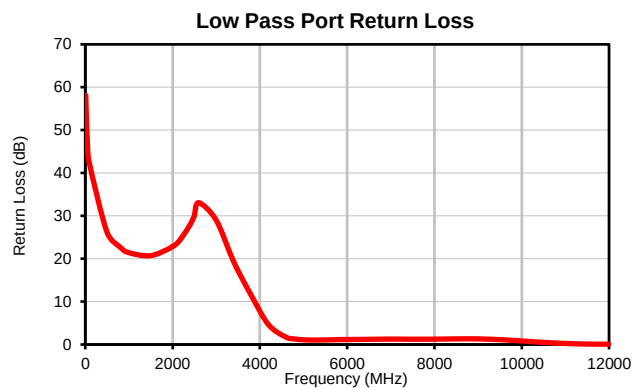
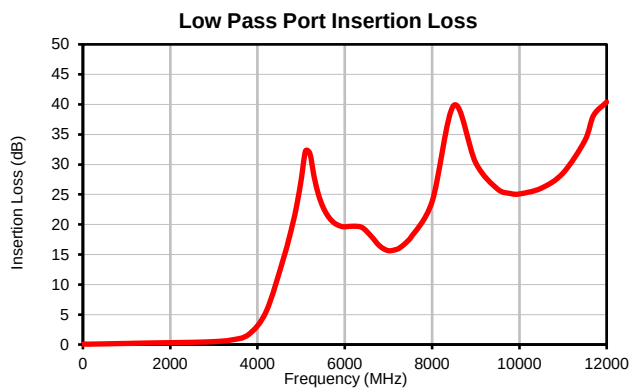
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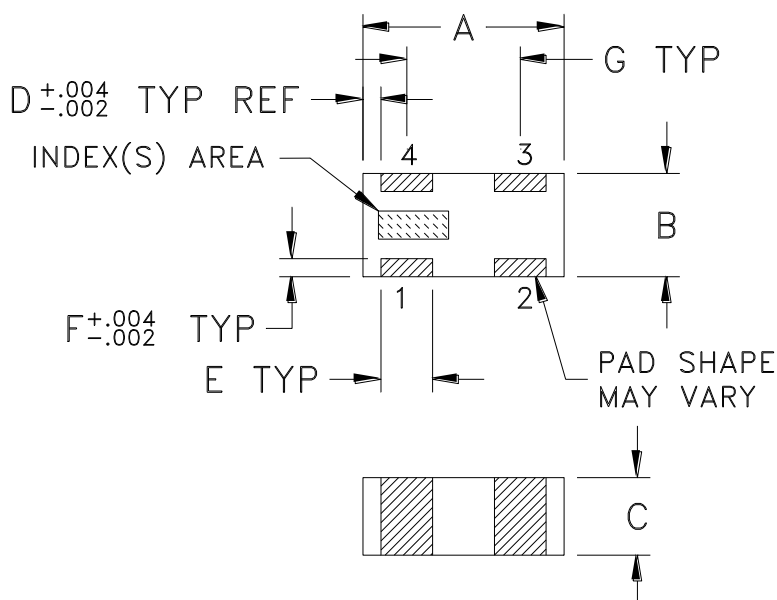
Typical Performance Data

FREQUENCY (MHz)	INSERTION LOSS (dB)		RETURN LOSS (dB)		
	Low Pass port	Band Pass port	Common port	Low Pass port	Band Pass port
10	0.04	70.45	56.56	58.15	0.16
50	0.08	55.54	45.75	46.53	0.14
100	0.06	49.20	41.19	42.00	0.08
500	0.11	35.41	26.09	26.14	0.03
800	0.16	31.82	22.49	22.71	0.07
1000	0.18	30.43	21.17	21.42	0.01
1500	0.26	28.83	19.97	20.73	0.08
2000	0.31	29.52	21.54	22.84	0.07
2200	0.33	30.83	23.20	24.81	0.11
2400	0.36	33.34	25.53	27.92	0.13
2410	0.36	33.52	25.70	28.09	0.14
2420	0.36	33.73	25.84	28.30	0.16
2430	0.36	33.94	26.01	28.48	0.16
2440	0.36	34.15	26.15	28.68	0.17
2450	0.36	34.36	26.33	28.90	0.17
2460	0.36	34.59	26.48	29.09	0.16
2470	0.37	34.81	26.59	29.35	0.16
2480	0.37	35.02	26.78	29.55	0.16
2490	0.37	35.32	26.94	29.83	0.16
2500	0.37	35.58	27.11	30.07	0.16
2600	0.39	39.36	29.03	33.08	0.19
3000	0.49	31.63	29.21	28.99	0.37
3400	0.76	19.77	20.83	19.32	0.68
3800	1.69	11.25	15.23	11.53	1.59
4200	5.52	4.64	11.88	4.62	5.11
4600	14.45	2.03	12.83	1.72	10.26
4800	19.92	1.58	14.70	1.29	11.98
4900	23.24	1.44	15.85	1.18	12.89
5000	27.40	1.33	17.31	1.11	14.02
5100	32.23	1.25	19.08	1.07	15.28
5200	31.83	1.18	21.32	1.05	16.82
5300	27.85	1.13	24.08	1.05	18.58
5400	24.91	1.11	27.31	1.06	20.56
5500	22.91	1.11	31.25	1.08	22.76
5600	21.56	1.12	35.46	1.10	24.42
5700	20.63	1.14	36.04	1.12	25.36
5800	20.05	1.17	34.64	1.14	25.25
5900	19.73	1.22	35.57	1.16	24.33
5950	19.65	1.25	37.45	1.16	23.71
6000	19.61	1.29	41.28	1.17	22.94
6200	19.71	1.50	27.82	1.19	18.68
6400	19.48	1.97	16.82	1.21	13.37
6600	18.08	2.93	10.35	1.23	8.57
6800	16.42	4.76	6.13	1.25	5.06
7000	15.63	7.70	3.57	1.27	2.90
7200	15.88	11.70	2.16	1.27	1.75
7250	16.08	12.85	1.92	1.26	1.56
7300	16.33	14.07	1.72	1.25	1.40
7350	16.62	15.36	1.54	1.25	1.27
7400	16.94	16.73	1.40	1.24	1.17
7450	17.31	18.18	1.27	1.24	1.08
7500	17.70	19.74	1.15	1.24	1.02
8000	23.80	26.88	0.55	1.26	0.60
8500	39.86	21.85	0.29	1.32	0.38
9000	30.25	20.83	0.12	1.32	0.18
9500	25.90	21.12	0.03	1.15	0.05
9800	25.16	21.63	0.10	0.97	0.19
10000	25.09	22.08	0.13	0.84	0.26
10500	26.04	23.47	0.20	0.50	0.39
11000	28.56	25.29	0.22	0.25	0.46
11500	33.98	27.83	0.16	0.11	0.49
11700	38.18	29.16	0.12	0.09	0.50
12000	40.40	31.81	0.03	0.07	0.47

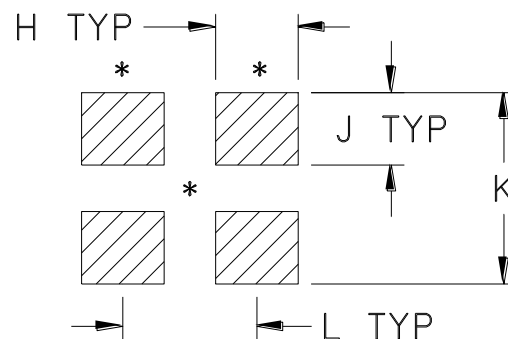
Typical Performance Curves



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	WT.GRAMS
NK0402C	.039 (1.00)	.020 (.50)	.015 (0.37)	.004 (0.10)	.010 (0.25)	.004 (0.10)	.022 (0.55)	.016 (0.41)	.014 (0.36)	.037 (0.94)	.026 (0.65)	.0007

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

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 50 Ω characteristic impedance, depending on PCB material and thickness.



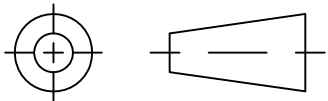
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

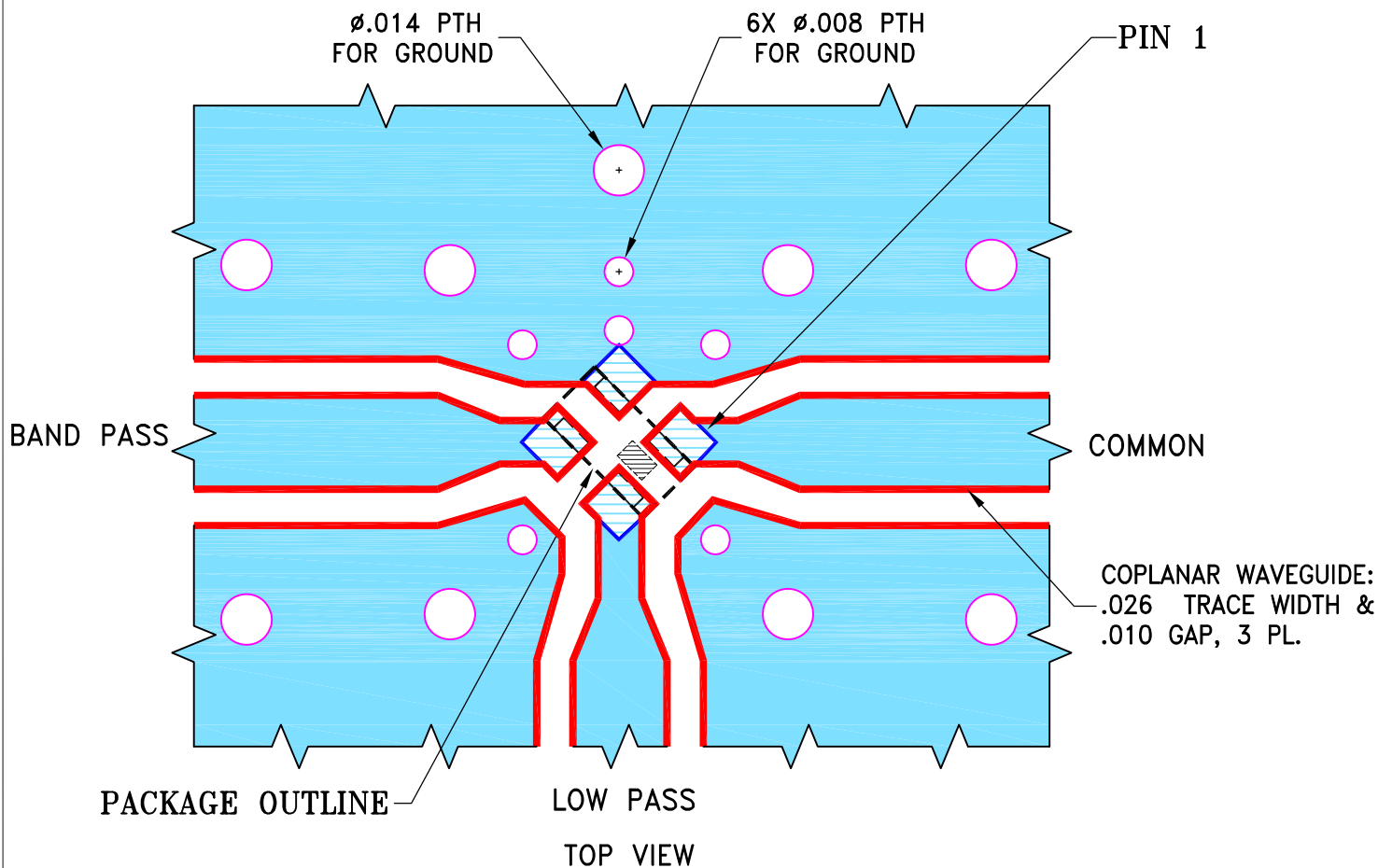
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M168200	NEW RELEASE	05/31/18	NP	SL
A	M174015	UPDATED DESCRIPTION OF THE PORTS	04/25/19	ITG	SL

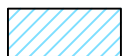
SUGGESTED MOUNTING CONFIGURATION
FOR NK0402C CASE STYLE, "04DP02" PIN CODE

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH AND GAP ARE SHOWN FOR FR4, GRADE IT-180TC (ITEQ CORP.) WITH DIELECTRIC THICKNESS $.003 \pm .0005$. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
3. LAYERS 3 & 4 OF THE PCB ARE CONTINUOUS GROUND PLANES.



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 $\pm$.005ANGLES $\pm$ 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, 04DP02, NK0402C, TB-1040+

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-571

REV:

A

FILE:

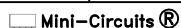
98PL571

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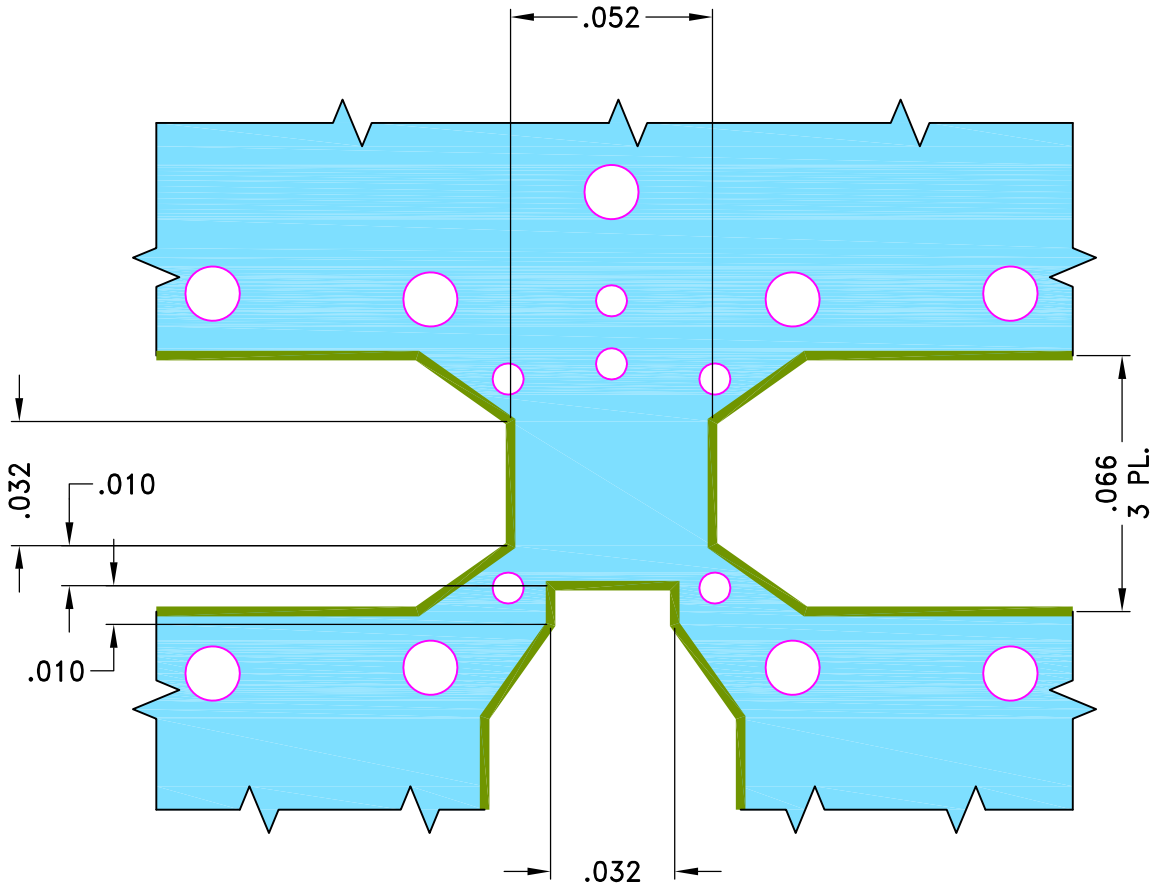
SHEET:

1 OF 2



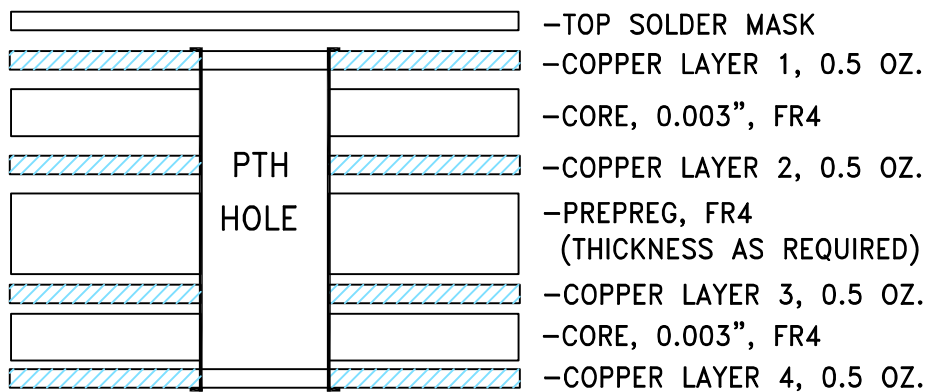
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ASHEETA1.DWG REV:A DATE:01/12/95



LAYER 2

STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS 0.020" $\pm$ 10%.
2. PTH HOLES PRESENT FROM COPPER LAYER 1 TO 4.

Mini-Circuits

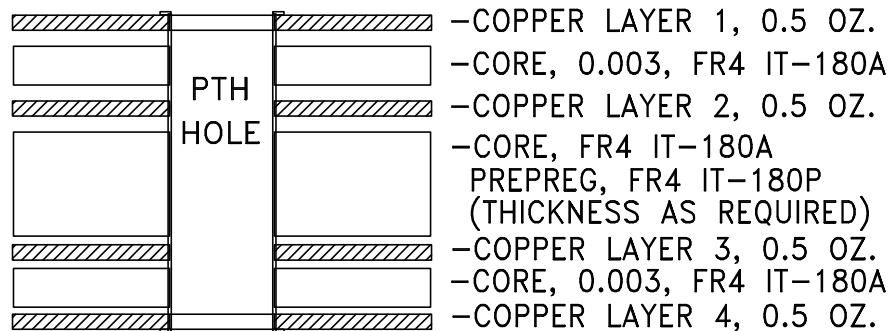
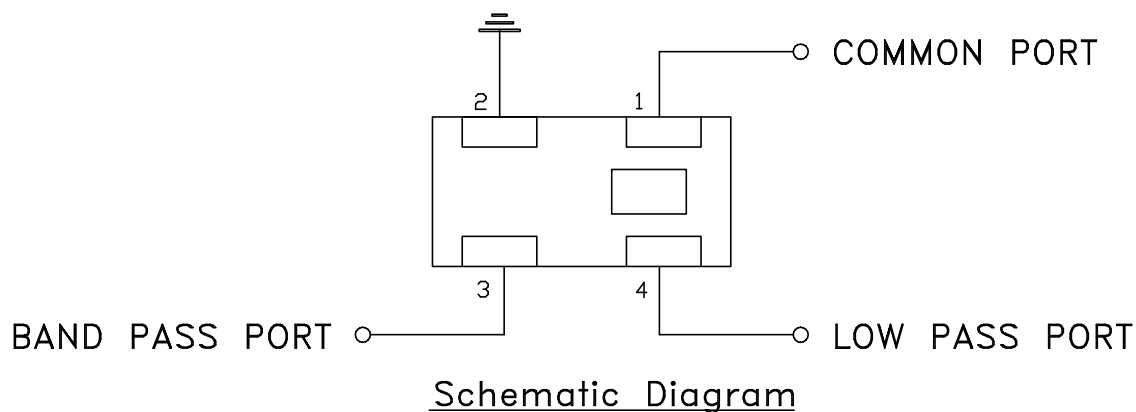
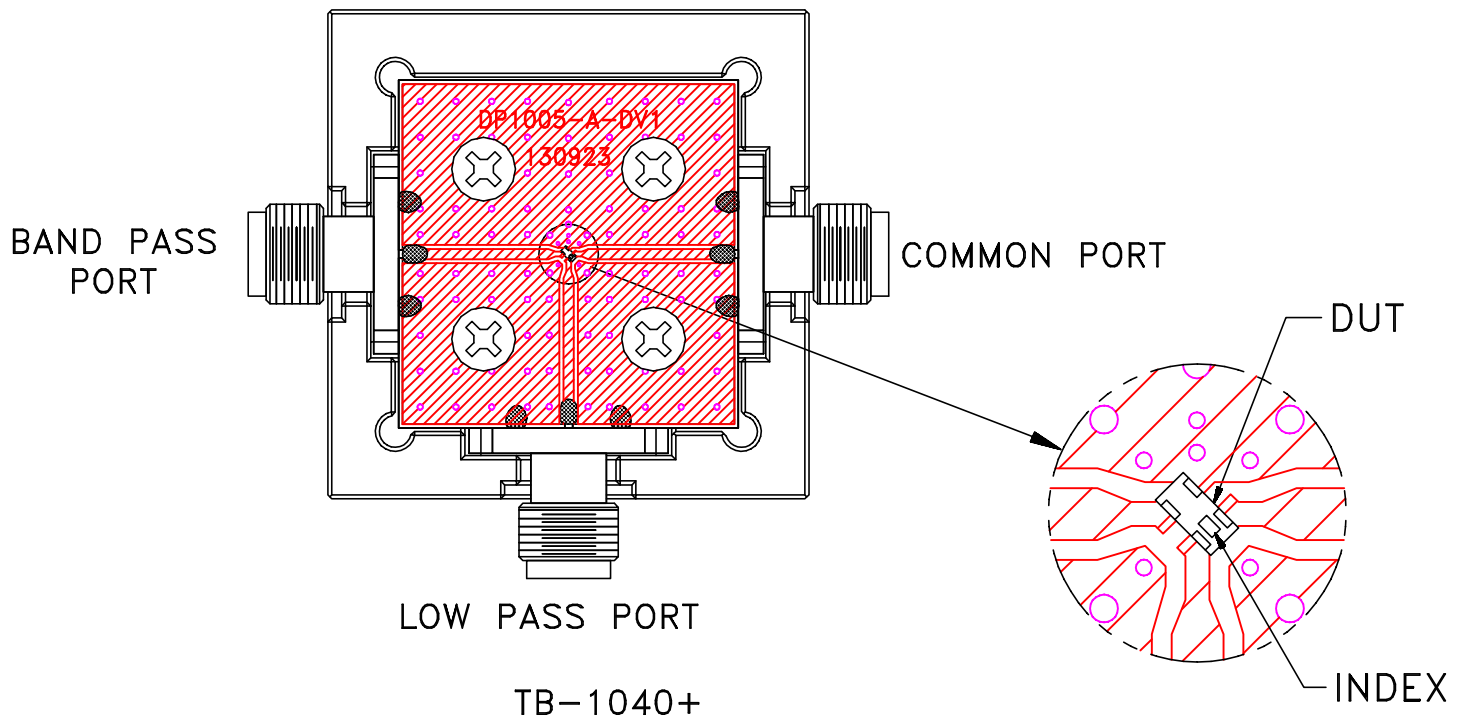
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ASHEETA2.DWG REV:A DATE: 01/12/94

ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-571	A
FILE:	98PL571	SCALE:	SHEET:
		20:1	2 OF 2

Evaluation Board and Circuit



Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: FR4 or equivalent, Dielectric Constant=4.5, Total finished Thickness = .025 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