

**THE BIG DEAL**

- Low loss, less than 1 dB max at 20 GHz
- Return loss, 14 dB typical below 20 GHz
- Standard 1812 (4.5mm x 3.2mm) case style
- Suited for very high-volume production

*Generic photo used for illustration purposes only*

CASE STYLE: NM1812C-3

APPLICATIONS

- Test and Measurement
- EW, Radar and ECM Defense Systems
- 5G MIMO and Back Haul Radio
- Satellite Communications

+RoHS Compliant

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

PRODUCT OVERVIEW

The TPHK-3002+ is a 50 Ohm transmission line which can pass signals with low insertion loss typ 1.3 dB up to 30 GHz. This can be used as a place holder in system boards in the absence of LTCC filters. In addition, this low loss device provides excellent matching between devices.

KEY FEATURES

Feature	Advantages
Cost effective	LTCC is scalable technology that is cost effective due to ease of production in high quantities.
Small size (4.5mm x 3.2mm)	Allows for high layout density of circuit boards, while minimizing effects of parasitics.
Surface Mountable	Suitable for very high volume automated assembly process.



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CERAMIC

Thru-Line

50Ω DC to 30 GHz

TPHK-3002+

ELECTRICAL SPECIFICATIONS¹ AT 25°C

Parameter	F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC-F1	—	0.2	0.5	dB
		F1-F2	—	0.6	1	
		F2-F3	—	1.3	2.0	
	Return Loss	DC-F1	—	20	—	dB
		F1-F2	—	14	—	
		F2-F3	—	7	—	

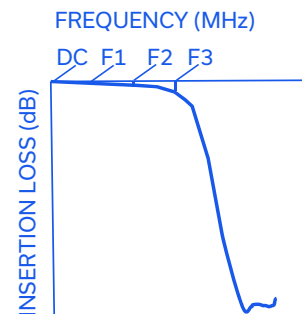
1. Measured on Mini-Circuits Test Board TB-TPHK-3002C+ with connectors and feedlines de-embedded.

MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-55°C to 125°C
Storage Temperature	-55°C to 125°C
RF Power Input	1 W max.

Permanent damage may occur if any of these limits are exceeded

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL SCHEMATIC





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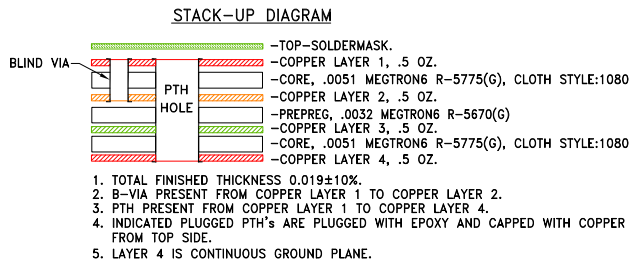
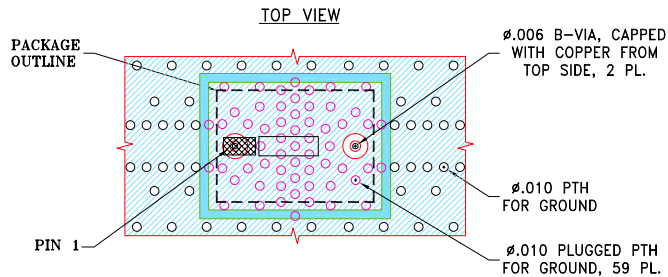
CERAMIC

Thru-Line

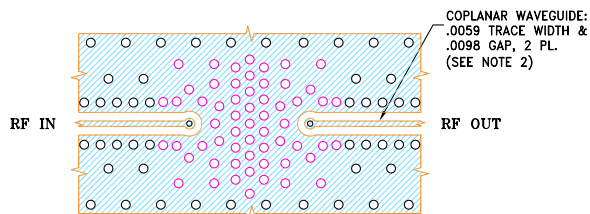
50Ω DC to 30 GHz

TPHK-3002+

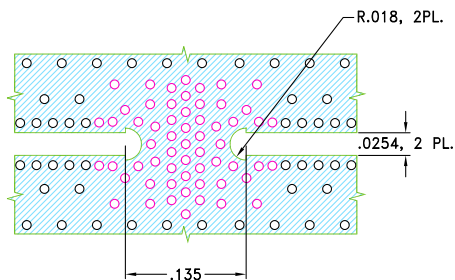
DEMO BOARD MCL P/N: TB-TPHK-3002C+
SUGGESTED PCB LAYOUT (PL-730)



LAYER 2, B-VIA & PTH



LAYER 3 & PTH

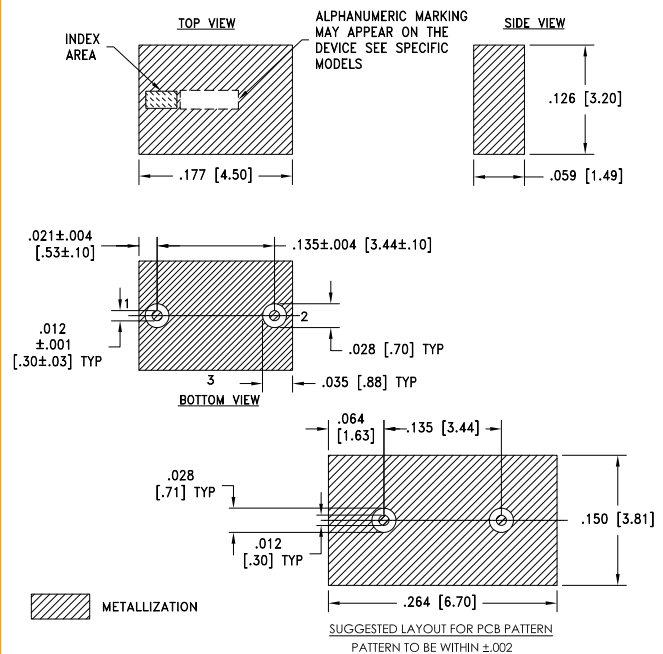


PAD CONNECTIONS

INPUT	1
OUTPUT	2
GROUND	3

PRODUCT MARKING: : F446

OUTLINE DRAWING



Weight: .126 grams.

Dimensions are in inches [mm]. Tolerances: 2Pl. ±.01; 3Pl. ±.005



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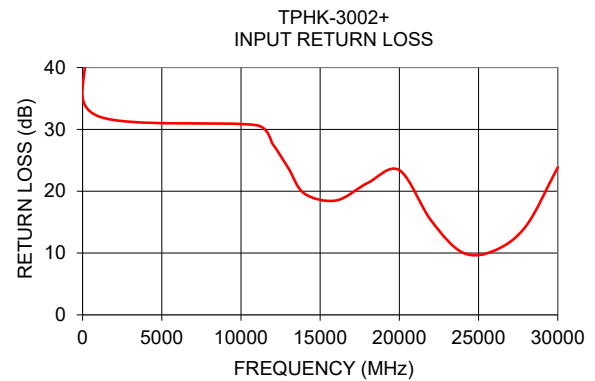
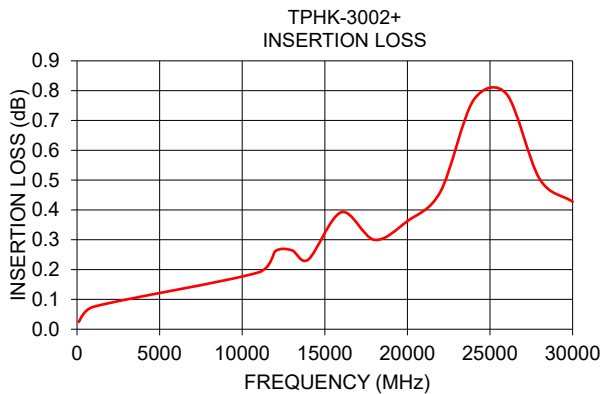
Thru-Line

50Ω DC to 30 GHz

TPHK-3002+

TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)
100	0.02	41.80
1000	0.08	32.12
11000	0.19	30.66
12000	0.26	27.64
13000	0.26	23.70
14000	0.23	19.62
16000	0.39	18.50
18000	0.30	21.34
20000	0.36	23.40
22000	0.46	15.27
24000	0.77	10.07
26000	0.79	10.40
28000	0.50	14.38
30000	0.43	23.85



NOTES

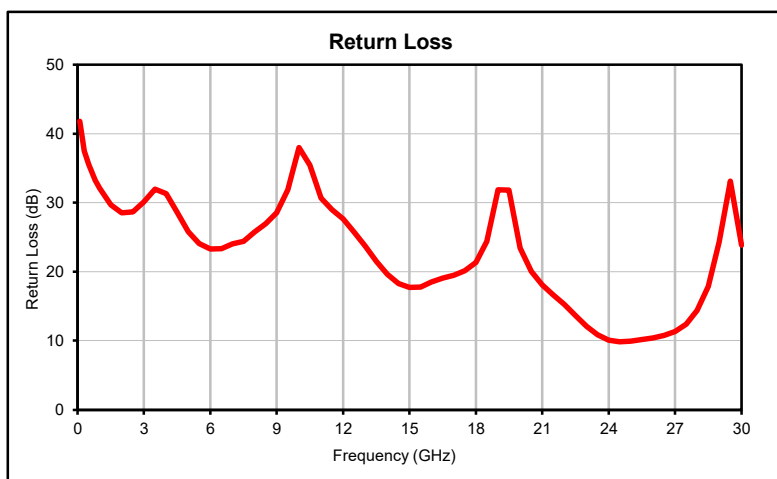
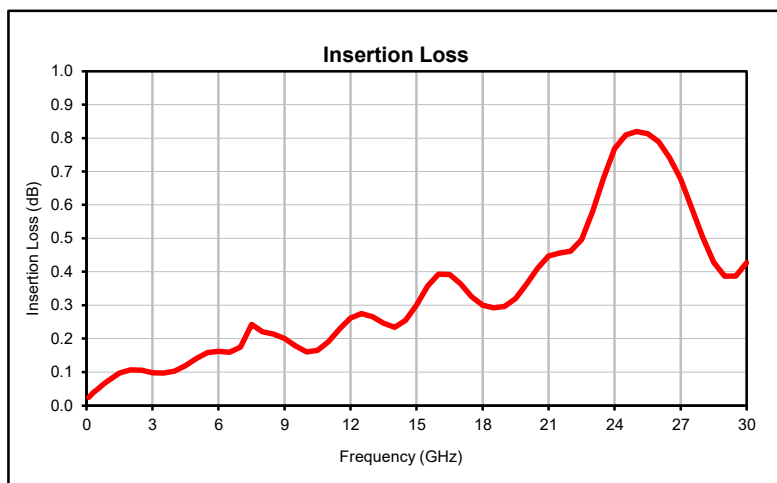
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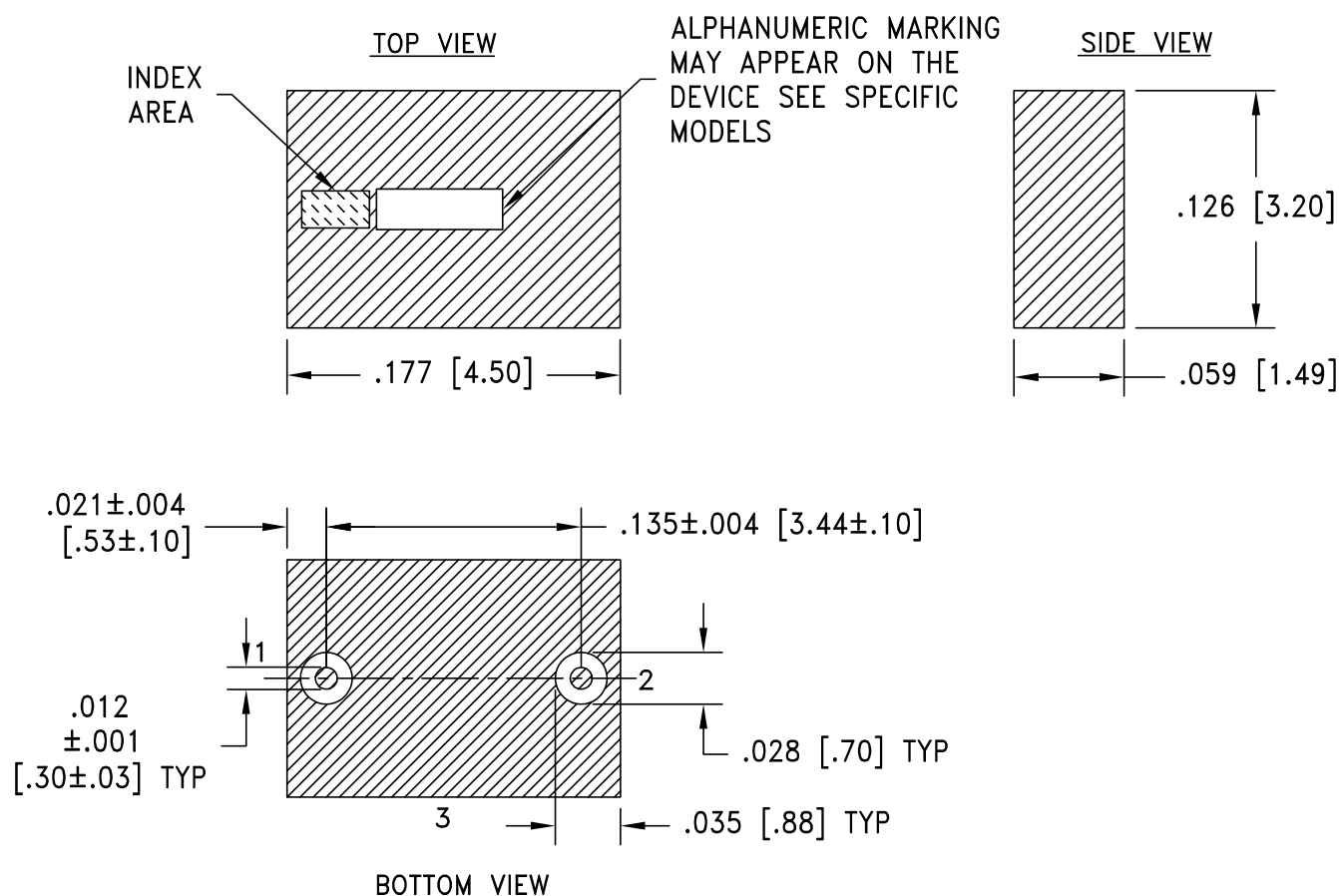


Typical Performance Data

FREQUENCY (GHz)	INSERTION LOSS (dB)	RETURN LOSS (dB)
0.1	0.02	41.80
0.3	0.04	37.46
0.5	0.05	35.52
0.8	0.06	33.25
1.0	0.08	32.12
1.5	0.10	29.70
2.0	0.11	28.53
2.5	0.11	28.64
3.0	0.10	30.10
3.5	0.10	31.98
4.0	0.10	31.33
4.5	0.12	28.62
5.0	0.14	25.77
5.5	0.16	24.09
6.0	0.16	23.30
6.5	0.16	23.31
7.0	0.17	24.03
7.5	0.24	24.42
8.0	0.22	25.74
8.5	0.21	26.94
9.0	0.20	28.53
9.5	0.18	31.85
10.0	0.16	37.97
10.5	0.17	35.44
11.0	0.19	30.66
11.5	0.23	28.98
12.0	0.26	27.64
12.5	0.28	25.72
13.0	0.26	23.70
13.5	0.25	21.48
14.0	0.23	19.62
14.5	0.25	18.27
15.0	0.30	17.74
15.5	0.36	17.77
16.0	0.39	18.50
16.5	0.39	19.04
17.0	0.36	19.50
17.5	0.33	20.11
18.0	0.30	21.34
18.5	0.29	24.38
19.0	0.30	31.87
19.5	0.32	31.84
20.0	0.36	23.40
20.5	0.41	20.05
21.0	0.45	18.11
21.5	0.46	16.62
22.0	0.46	15.27
22.5	0.50	13.65
23.0	0.58	12.05
23.5	0.68	10.87
24.0	0.77	10.07
24.5	0.81	9.86
25.0	0.82	9.92
25.5	0.81	10.16
26.0	0.79	10.40
26.5	0.74	10.79
27.0	0.68	11.30
27.5	0.59	12.40
28.0	0.50	14.38
28.5	0.43	17.85
29.0	0.39	24.32
29.5	0.39	33.10
30.0	0.43	23.85

Typical Performance Curves





Weight: .126 grams.

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl. ±.005 Inches

Notes:

1. Case material: Ceramic.
2. Termination Finish: **as shown below or indicated on Data Sheet.**
For RoHS Case Styles: Tin Plate over Nickel plate. All models, (+) suffix.



ISO 9001 ISO 14001 CERTIFIED



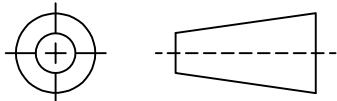
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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

RF/IF MICROWAVE COMPONENTS

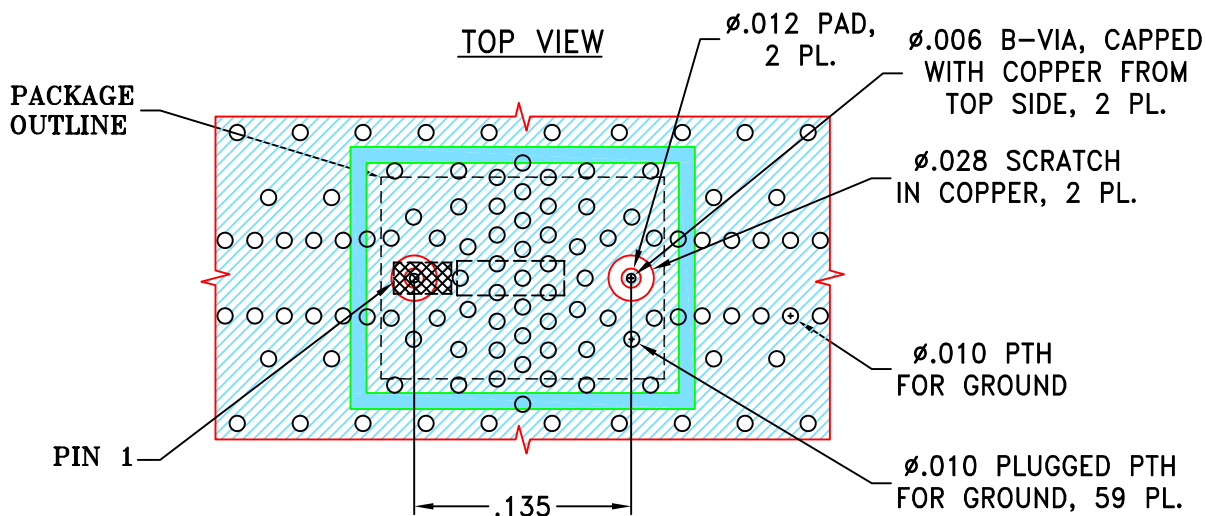
THIRD ANGLE PROJECTION



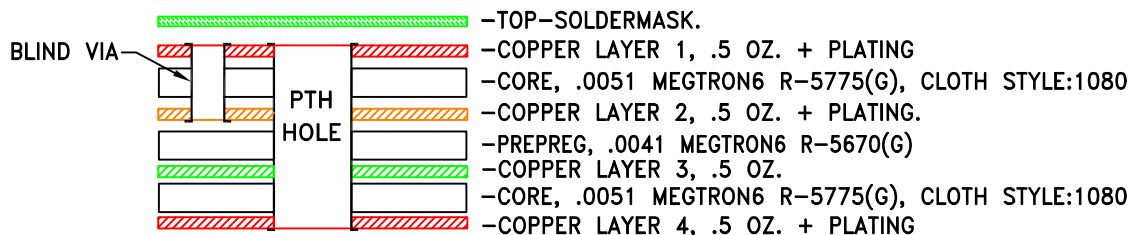
REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-013254	NEW RELEASE	05/16/22	ITG	IL
A	ECO-015587	UPDATED STACK-UP DIAGRAM	11/01/22	ITG	IL
B	ECO-020890	ADDED DIMENSIONS	02/16/24	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR NM1812C-3 CASE STYLE



STACK-UP DIAGRAM



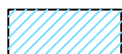
1. TOTAL FINISHED THICKNESS $0.0228 \pm .004$.
2. B-VIA PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 2.
3. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
4. INDICATED PLUGGED PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
5. LAYER 4 IS CONTINUOUS GROUND PLANE.

NOTES:

1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON6 R-5775(G), CLOTH STYLE:1080 WITH DIELECTRIC THICKNESS .0051; COPPER: 1/2 OZ.+PLATING.
FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. COPPER LAYER 4 OF THE PCB ARE 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	ITG	05/16/22
	CHECKED	GF	05/16/22
	APPROVED	IL	05/16/22

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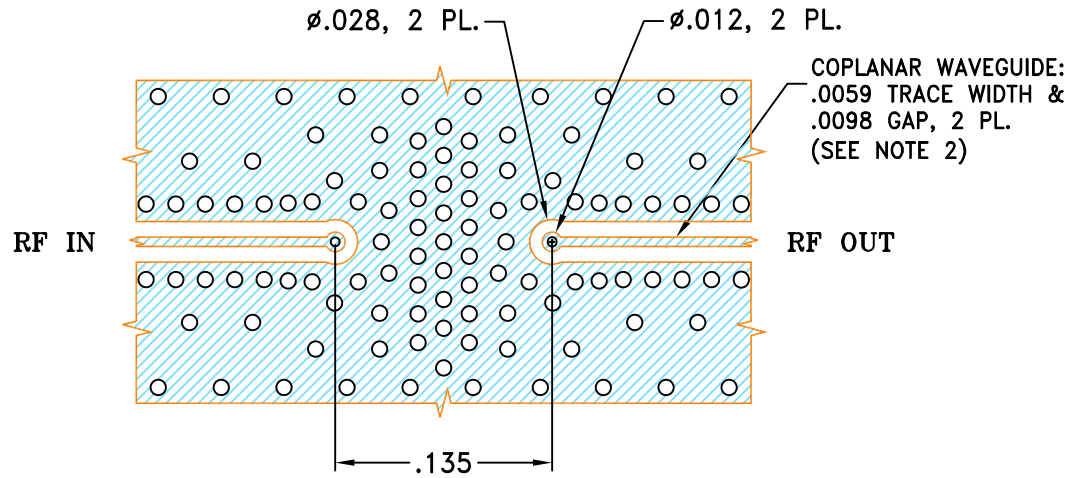


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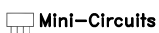
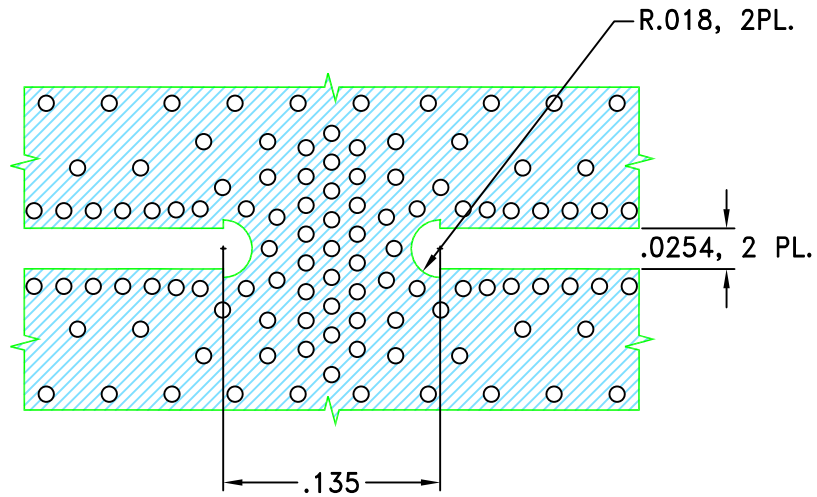
PL, NM1812C-3, TB-1239

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-730	B
FILE:	98PL730	SCALE:	8:1
		SHEET:	1 OF 2

LAYER 2, B-VIA & PTH



LAYER 3 & PTH



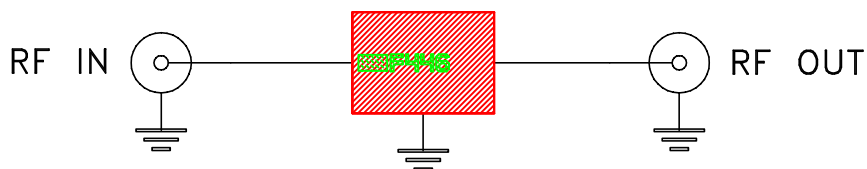
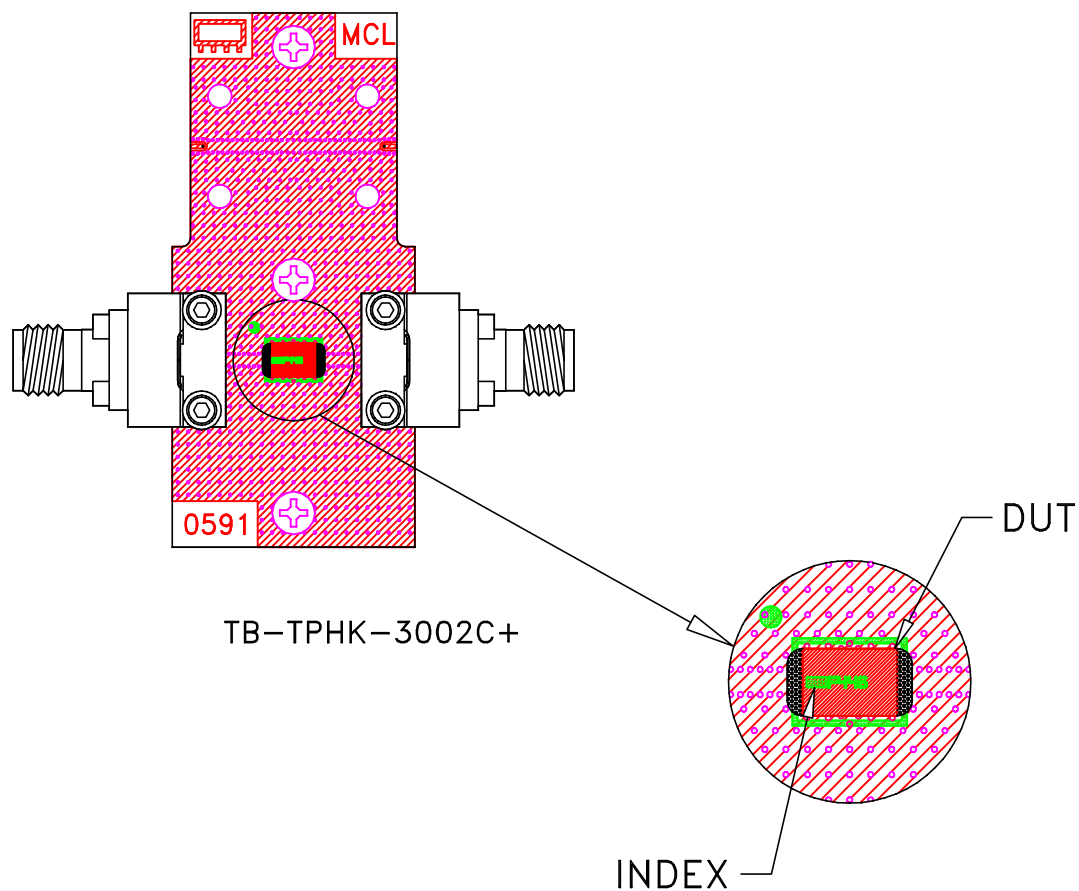
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ASHEETA2.DWG REV:A DATE: 01/12/94

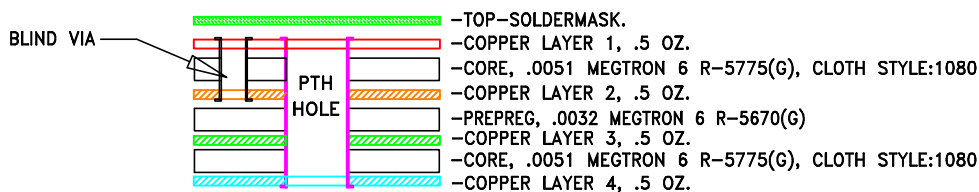
ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-730	B
FILE:	98PL730	SCALE: 8:1	SHEET: 2 OF 2

Evaluation Board and Circuit



Schematic Diagram



STACK-UP DIAGRAM

Notes:

1. 1.85 mm Female End Launch Connector.
2. PCB Material: Megtron 6 R5775(N).
Dielectric Constant=3.6.
3. Total finished thickness .019".

 **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
Thermal Cycling	-55 to 125°C, 100 cycles, Dwell Time 15 minutes.	MIL-STD-202, Method 107, Condition A-3
Mechanical Shock	50g, 11ms half-sine, 18 shocks applied each to 3 axes	MIL-STD-202 Method 213, Condition A
Vibration	10-2000Hz sine, 20g, 12 cycles applied each to 3 axes	MIL-STD-202, Method 204, Condition D
Constant Acceleration	30Kg, Y1 Direction	MIL-STD-883, Method 2001, Condition E
Humidity	85°C, 90-95% Relative Humidity, 250hours	
Solderability	10X / 30X Magnification	J-STD-002C Test S, J-STD-002C Test S1
High Temp Storage	125°C, 250 hours	