CERAMIC

Thru-Line

50Ω DC to 30 GHz

TPHK-3002+

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

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

APPLICATIONS

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

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.

REV. A
ECO-022343
TPHK-3002+
MCL NY
240808

ELECTRICAL SPECIFICATIONS[1] AT 25°C

Parameter	F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband Insertion Loss	DC-F1	0.1-10	—	0.2	0.5	dB
	F1-F2	10-20	—	0.6	1	
	F2-F3	20-30	—	1.3	2.0	
Passband Return Loss	DC-F1	0.1-10	—	20	—	dB
	F1-F2	10-20	—	14	—	
	F2-F3	20-30	—	7	—	

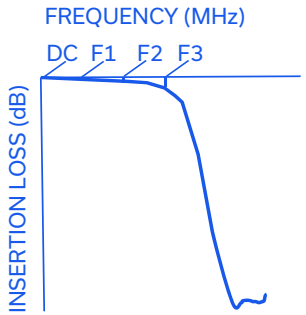
1. Measured on Mini-Circuits Test Board TB-TPHK-3002C+ with connectors and feed lines de-embedded.

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

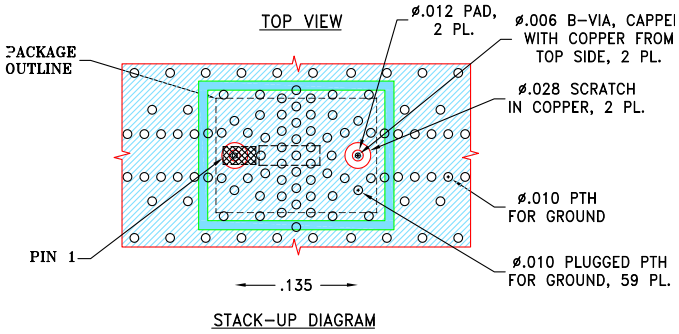
TYPICAL FREQUENCY RESPONSE



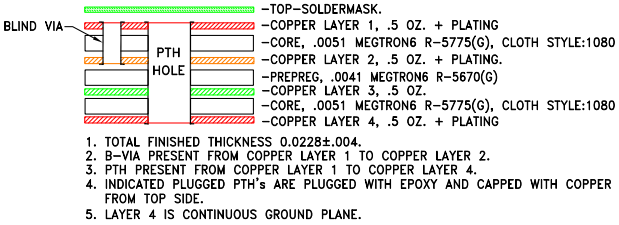
FUNCTIONAL SCHEMATIC



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



STACK-UP DIAGRAM



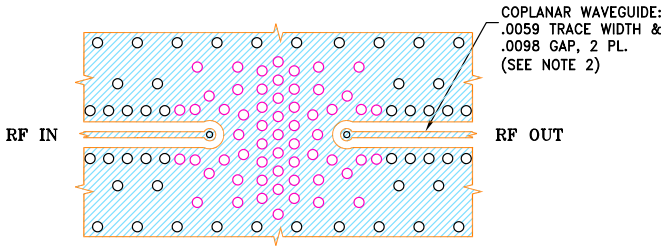
1. TOTAL FINISHED THICKNESS 0.0228±.004.
2. B-VIA PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 2.
3. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
4. INDICATED PLUGGED PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
5. LAYER 4 IS CONTINUOUS GROUND PLANE.

NOTES:

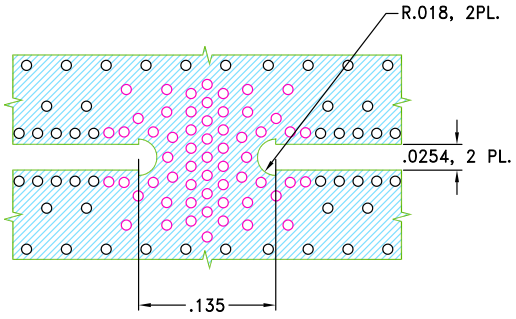
1. PCB IS MULTILAYER PCB, SEE STACK-UP DIAGRAM.
2. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR MEGTRON6 R-5775(G), CLOTH STYLE:1080 WITH DIELECTRIC THICKNESS .0051; COPPER: 1/2 OZ.+PLATING. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
3. COPPER LAYER 4 OF THE PCB ARE CONTINUOUS GROUND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

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

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK



LAYER 3 & PTH

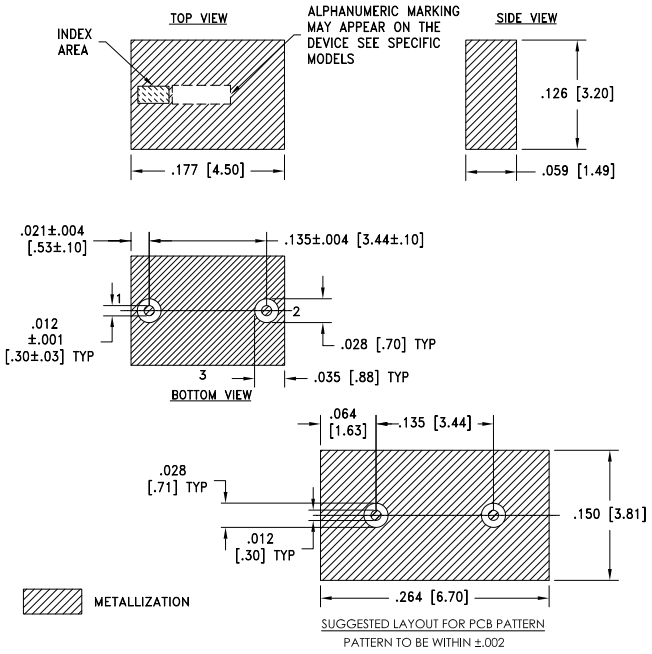


PAD CONNECTIONS

INPUT	1
OUTPUT	2
GROUND	3

PRODUCT MARKING: : F446

OUTLINE DRAWING

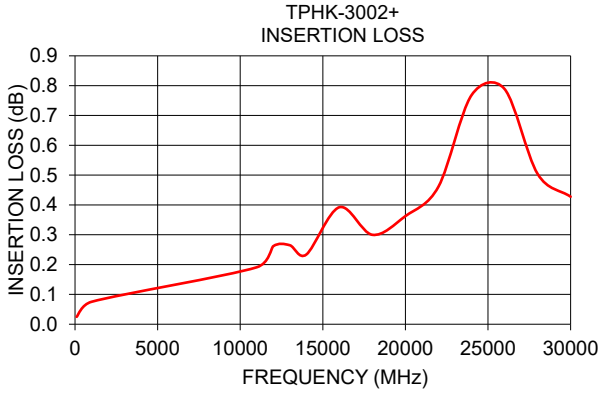


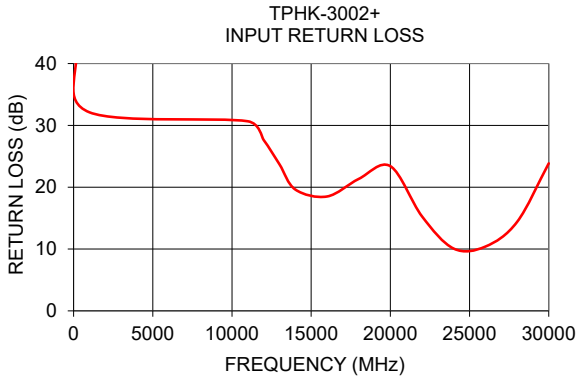
Weight: .126 grams.

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

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

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.

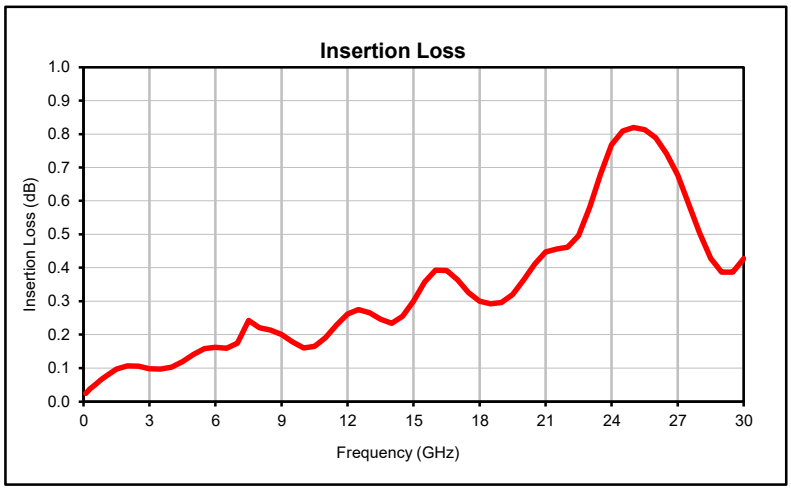
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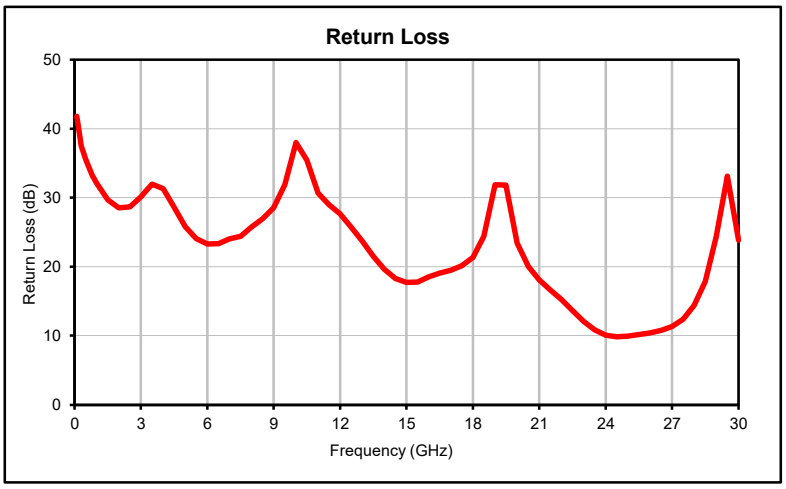
Ceramic Bandpass Filter TPHK-3002+

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

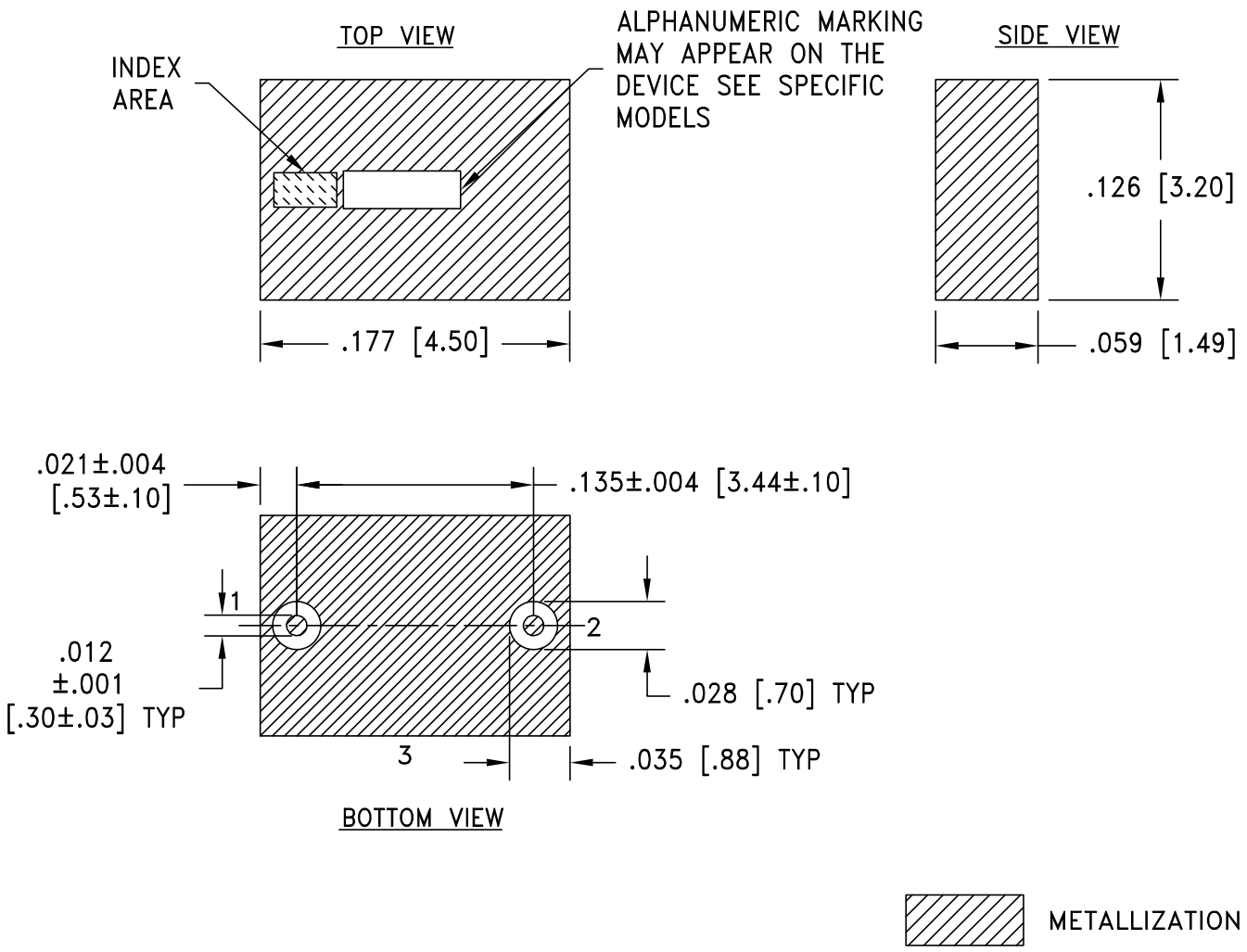




Case Style NM

Outline Dimensions

NM1812C-3



Weight: .126 grams.

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

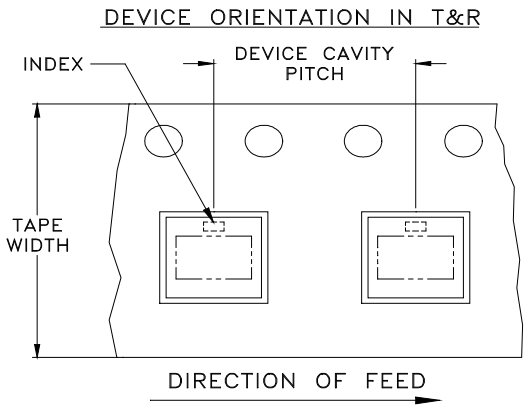
Notes:

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.

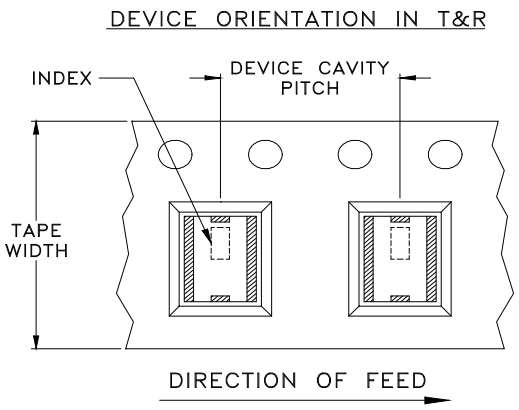
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Tape & Reel Packaging TR-F77



Note: The shape of the pocket may differ



Note: The location and shape of the metallization may differ

Applicable Case Styles
GU1604, GU1804, GU2644, TT1618-2

Applicable Case Styles
MZ4532C, NM1812C, NM1812C-1, NM1812C-2, NM1812C-3, NM1812C-5, NM1812C-6, NM3237 NM1812C-9

Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
12	8	7	Small quantity standards (see note)	20
				50
				100
				200
				500
				1000
		13	Standard	2000

Note: Please Consult individual model data sheet to determine device per reel availability.

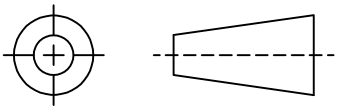
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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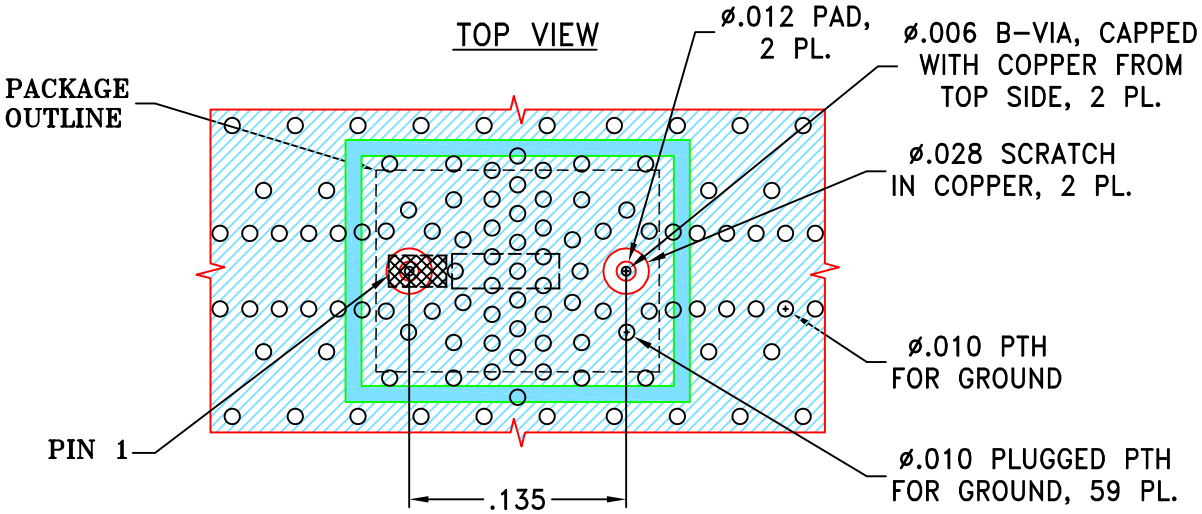
THIRD ANGLE PROJECTION



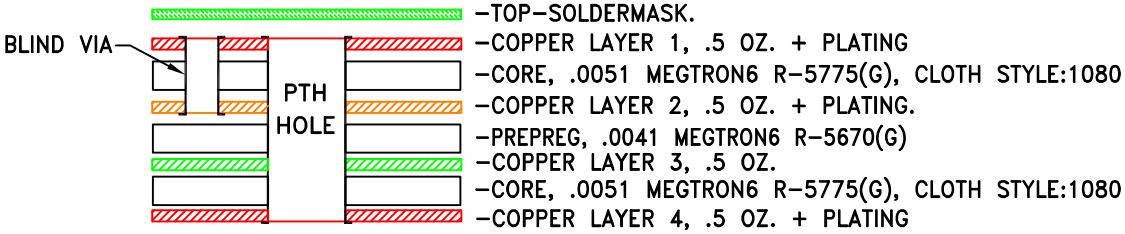
REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-013254	NEW RELEASE	05/16/22	ITG	IL
A	ECO-015587	UPDATED STACK-UP DIAGRAM	11/01/22	ITG	IL
B	ECO-020890	ADDED DIMENSIONS	02/16/24	ITG	IL

SUGGESTED MOUNTING CONFIGURATION FOR NM1812C-3 CASE STYLE

TOP VIEW



STACK-UP DIAGRAM



1. TOTAL FINISHED THICKNESS 0.0228±.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	DRAWN	ITG	05/16/22
TOLERANCES ON:	CHECKED	GF	05/16/22
2 PL DECIMALS ±	APPROVED	IL	05/16/22
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

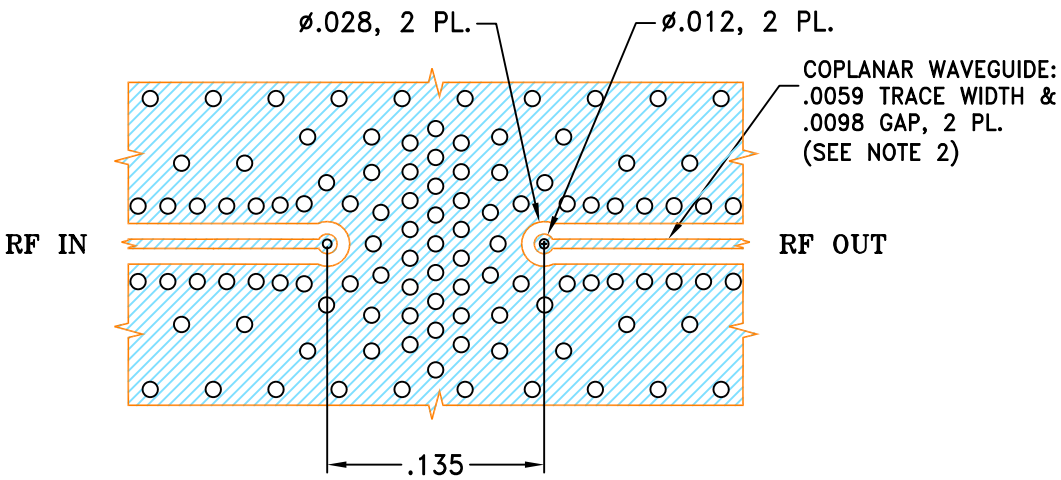
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PL, NM1812C-3, TB-1239

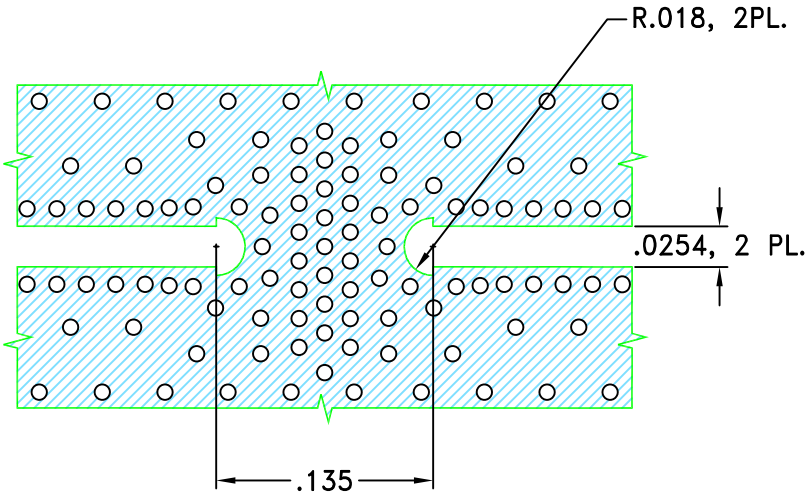
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-730	B

FILE:	SCALE:	SHEET:
98PL730	8:1	1 OF 2

LAYER 2, B-VIA & PTH



LAYER 3 & PTH



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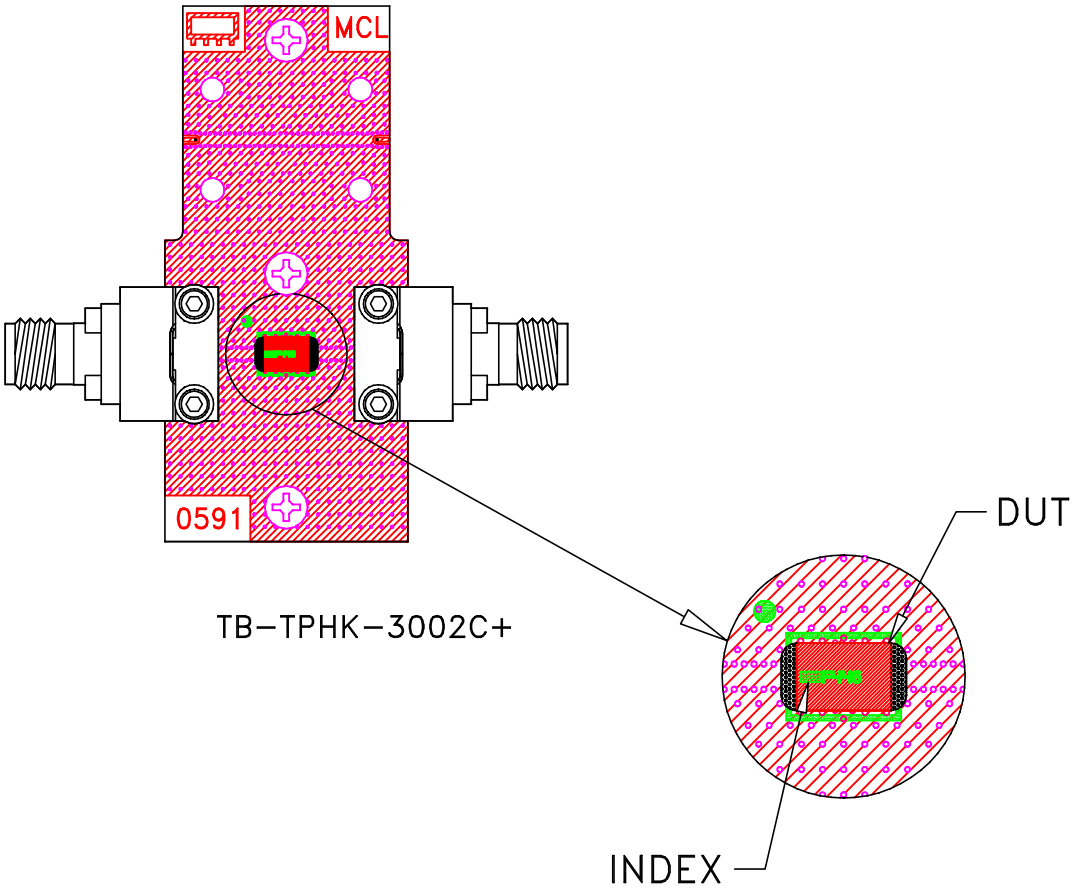
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ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

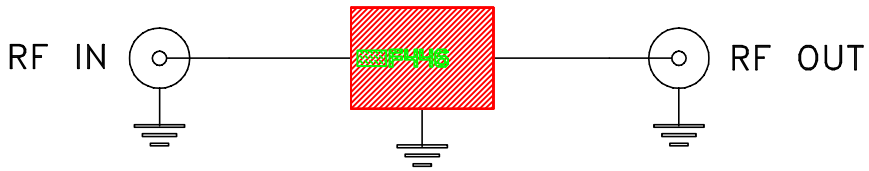
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A	15542	98-PL-730	B

FILE:	SCALE:	SHEET:
98PL730	8:1	2 OF 2

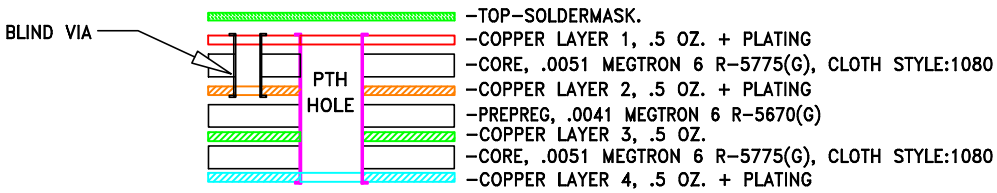
Evaluation Board and Circuit



TB-TPHK-3002C+



Schematic Diagram



STACK-UP DIAGRAM

Notes:

1. 2.92 mm Female End Launch Connector.
2. PCB Material: Megtron 6 R5775(N).
   Dielectric Constant=3.6.
3. Total finished thickness .023".

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Environmental Specifications ENV06T8

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	

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