LTCC SURFACE MOUNT

RF Crossover

COHKI-3002+

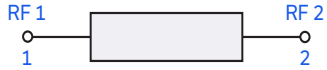
50Ω DC to 30 GHz

THE BIG DEAL

- Extended Frequency Range up to 30 GHz
- Best-in-Class Wideband Performance
- Superior Isolation of 45 dB across Full Band
- Ideal for High Density RF Layouts
- 4.95 × 3.65 mm outline as drop in for BFHKI footprint

Generic photo used for illustration purposes only

FUNCTIONAL DIAGRAM



APPLICATIONS

- Test & Measurement Equipment
- Radar Systems in X, Ku and Ka-Bands
- SATCOM Payloads and Terminals
- Small Cells and Massive MIMO Radios

PRODUCT OVERVIEW

Mini-Circuits' COHKI-3002+ is a high-performance, wideband RF crossover designed to enable the seamless routing of transmission lines without the need for additional PCB layers. Supporting operation from DC to 30 GHz, this compact surface-mount device delivers industry-leading insertion loss and isolation performance in a manufacturing-friendly form factor. Housed in a 4.95 × 3.65 mm SMT package, the crossover is footprint compatible with our BFHKI filter footprints for easy integration in compact RF front-end designs. The device is optimized for high-frequency applications where PCB real estate, performance and cost efficiencies are key considerations.

KEY FEATURES

Features	Advantages
Extended Frequency Leadership	Provides wideband performance from DC to 30 GHz
Superior Isolation	Provides 45 dB typical across full band and 55 dB below 15 GHz enabling cleaner signal routing in dense RF architectures
Small Size (4.95 × 3.65 mm)	Allows for high layout density of circuit boards, while minimizing effects of parasitics
Low Insertion Loss	Insertion loss of 0.3 dB below 10 GHz, 0.8 dB below 20 GHz and 1.1 dB across full band for high performance applications.
Cost Effective	Eliminates need for additional PCB layers, reducing board complexity, fabrication cost and signal via transitions

REV. OR
ECO-029690
COHKI-3002+
MCL NY
260521

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ELECTRICAL SPECIFICATIONS[1,2,3] AT +25 °C, Z_0 = 50Ω

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units
Passband	Insertion Loss	DC–F1	DC–10	—	0.3	0.6	dB
		F1–F3	10–20	—	0.8	1.2	
		F3–F4	20–30	—	1.1	2	
	Return Loss	DC–F1	DC–10	—	17	—	dB
		F1–F3	10–20	—	9.5	—	
		F3–F4	20–30	—	8	—	
	Isolation	DC–F1	DC–10	45	55	—	dB
		F1–F2	10–15	45	55	—	
		F2–F3	15–20	38	48	—	
		F3–F4	20–30	35	45	—	

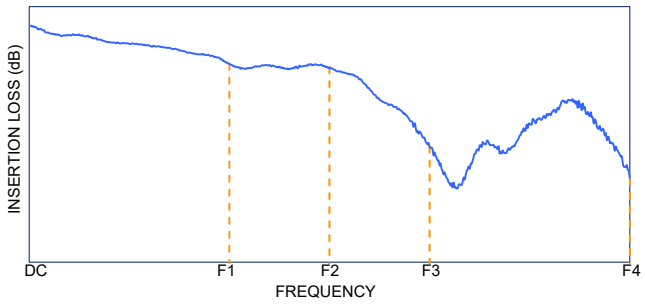
1. Tested in Evaluation Board P/N TB-COHKI-3002C+.Measured with the connector and feedline effects de-embedded using the 2X Thru IEEE P370 method
2. Bi-directional, RF1 and RF2 ports can be interchanged.
3. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	-55°C to +125°C
Storage Temperature	-55°C to +125°C
RF Power Input [5]	1 W

5. Permanent damage may occur if any of these limits are exceeded.
6. Power rating applies only to signals within the passband. Power rating above +25°C operating temperature decreases linearly to 0.5 W at +125°C.

TYPICAL FREQUENCY RESPONSE



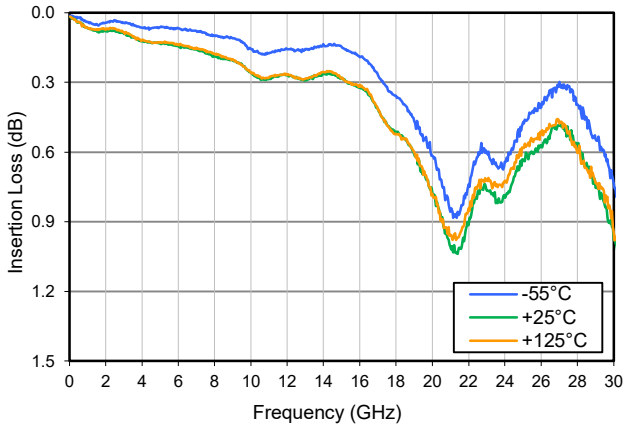
RF Crossover

COHKI-3002+

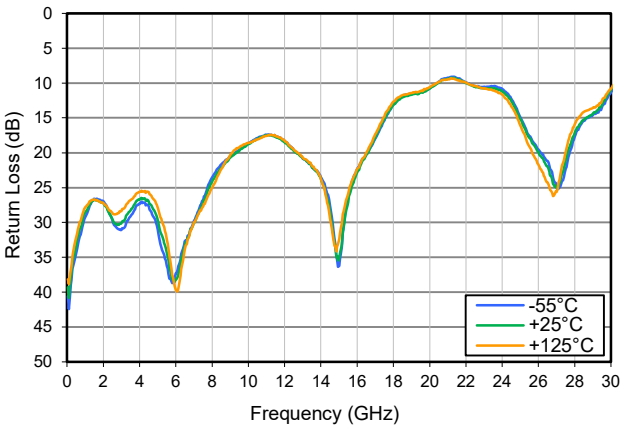
50Ω DC to 30 GHz

TYPICAL PERFORMANCE GRAPHS

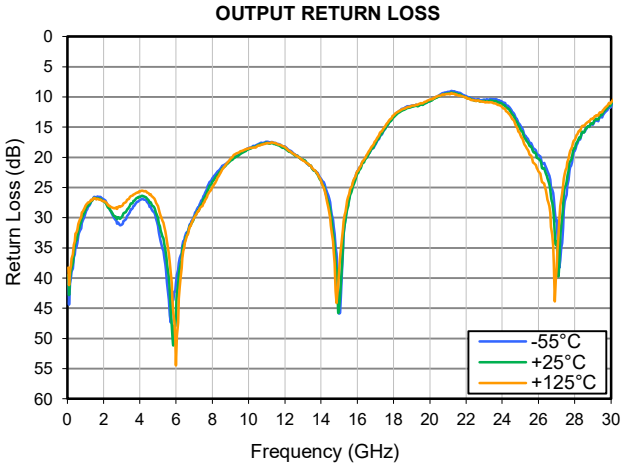
INSERTION LOSS



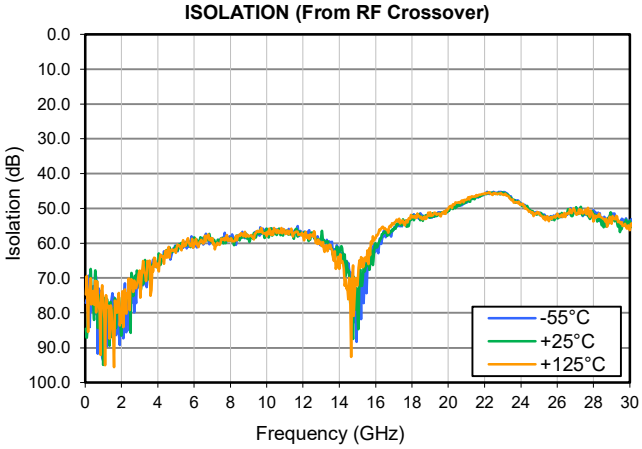
INPUT RETURN LOSS



OUTPUT RETURN LOSS



ISOLATION (From RF Crossover)



RF Crossover

COHKI-3002+

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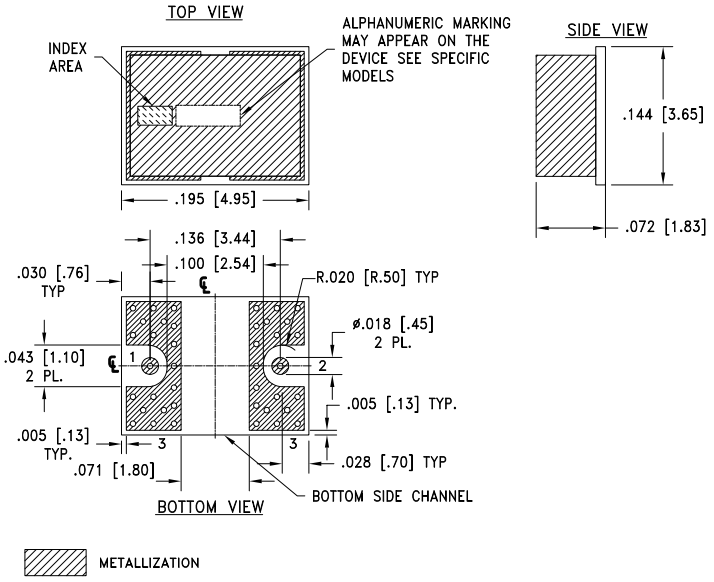
FUNCTIONAL DIAGRAM

Figure 1. COHKI-3002+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
RF1[2]	1	Connects to RF Input Port
RF2[2]	2	Connects to RF Output Port
GROUND	3	Connects to Ground on PCB, (See drawing PL-868)

CASE STYLE DRAWING



Weight: .135 grams
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl. ±.005

SUGGESTED PCB LAYOUT (PL-868)

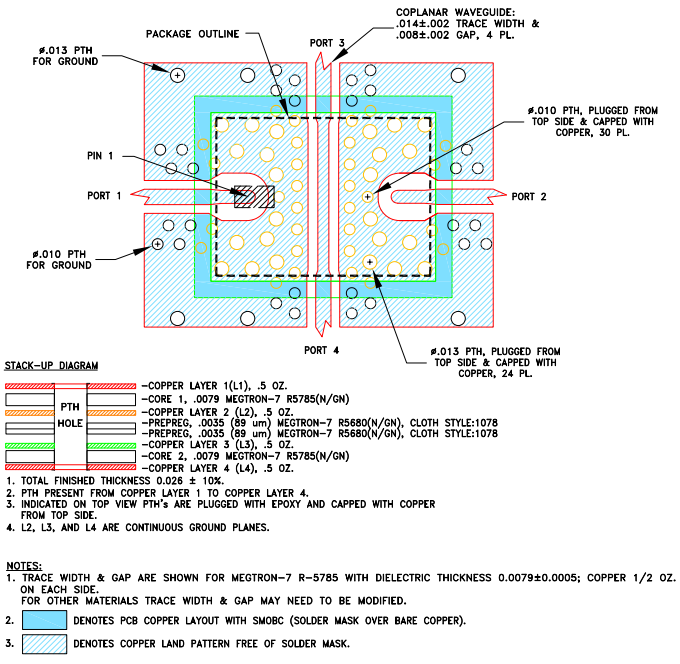


Figure 2. Suggested PCB Layout PL-868

PRODUCT MARKING*: F446

*Marking may contain other features or characters for internal lot control.

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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASH BOARD. CLICK HERE

Performance Data & Graphs	Data Graphs S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
Case Style	NM3237-1 Lead Finish: Gold over Nickel plating
RoHS Status	Compliant
Tape and Reel	F77
Suggested Layout for PCB Design	PL-868
Evaluation Board	TB-COHKI-3002C+ Gerber File
Environmental Rating	ENV163

NOTES

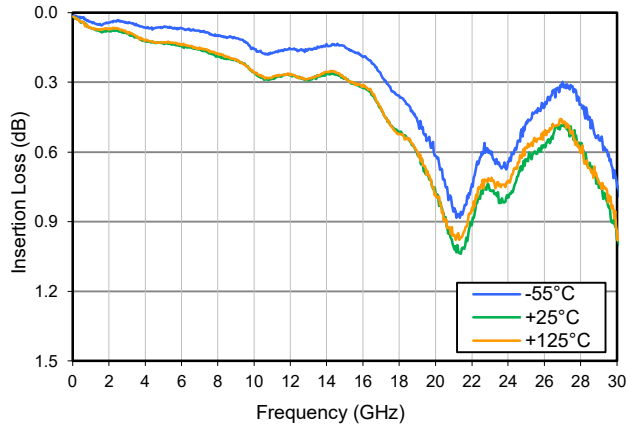
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' 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/terms/viewterm.html

Typical Performance Data

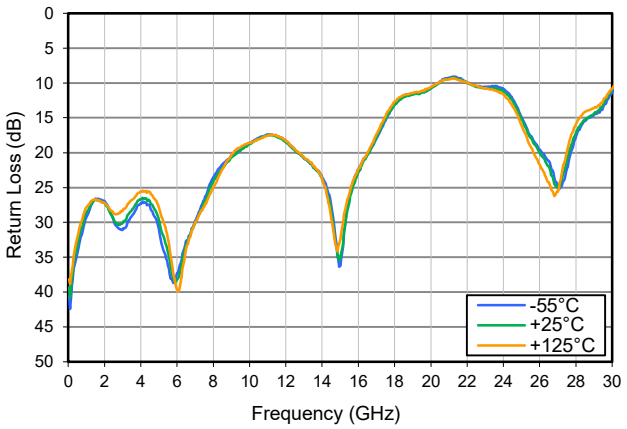
FREQUENCY (GHz)	INSERTION LOSS (dB)			INPUT RETURN LOSS (dB)			OUTPUT RETURN LOSS (dB)			ISOLATION (dB)		
	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C	@-55°C	@+25°C	@+125°C
0.05	0.01	0.02	0.02	40.60	39.33	38.18	39.49	38.18	40.21	74.73	84.52	78.43
0.10	0.01	0.02	0.02	42.42	40.83	38.84	42.78	38.84	44.39	69.40	87.18	80.39
0.50	0.02	0.04	0.04	34.39	33.48	32.08	33.77	32.08	34.92	77.63	81.75	79.84
1.00	0.04	0.07	0.06	29.25	28.58	27.82	28.75	27.82	29.30	78.27	94.96	80.50
2.00	0.04	0.08	0.07	26.93	27.28	27.22	27.27	27.22	26.94	82.88	86.35	85.15
4.00	0.06	0.12	0.12	27.35	26.75	25.63	26.56	25.63	27.10	66.01	67.03	63.02
6.00	0.07	0.14	0.14	37.29	38.28	39.71	45.21	39.71	40.82	60.44	58.36	59.92
8.00	0.10	0.19	0.18	23.51	24.12	24.98	24.06	24.98	23.46	58.89	58.50	59.00
10.00	0.16	0.26	0.26	18.64	18.77	18.60	18.68	18.60	18.50	58.02	55.78	56.51
12.00	0.16	0.26	0.27	18.32	18.52	18.29	18.48	18.29	18.21	57.68	57.73	56.75
14.00	0.14	0.26	0.25	23.46	23.81	23.75	23.93	23.75	23.52	67.34	62.71	64.42
16.00	0.19	0.32	0.31	22.29	22.82	22.36	22.72	22.36	22.31	58.43	59.98	57.21
18.00	0.36	0.51	0.52	13.09	13.12	12.67	13.41	12.67	13.27	52.44	52.44	51.22
20.00	0.64	0.70	0.74	16.17	0.70	16.69	16.14	16.43	16.74	50.10	50.56	50.51
22.00	0.74	0.92	0.84	9.89	10.02	9.93	10.05	9.93	9.82	45.85	45.85	46.39
24.00	0.45	0.55	0.57	22.44	21.98	21.48	23.53	23.62	23.34	48.90	48.57	48.53
26.00	0.41	0.57	0.52	19.50	19.90	21.66	20.23	21.66	19.63	51.45	52.79	52.35
28.00	0.39	0.59	0.60	17.67	17.11	15.90	18.55	15.90	18.95	53.74	52.50	51.19
30.00	0.74	0.98	0.95	11.27	10.93	10.72	11.24	10.72	11.58	56.22	53.60	56.09

Typical Performance Data

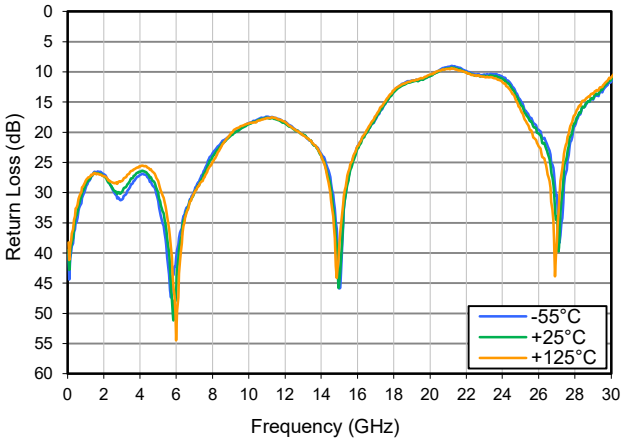
INSERTION LOSS



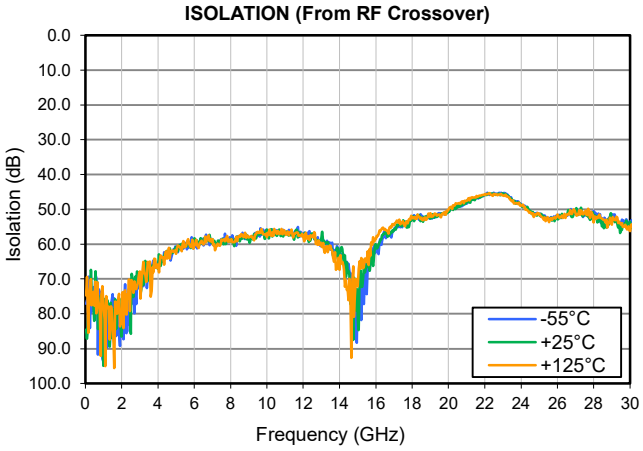
INPUT RETURN LOSS



OUTPUT RETURN LOSS



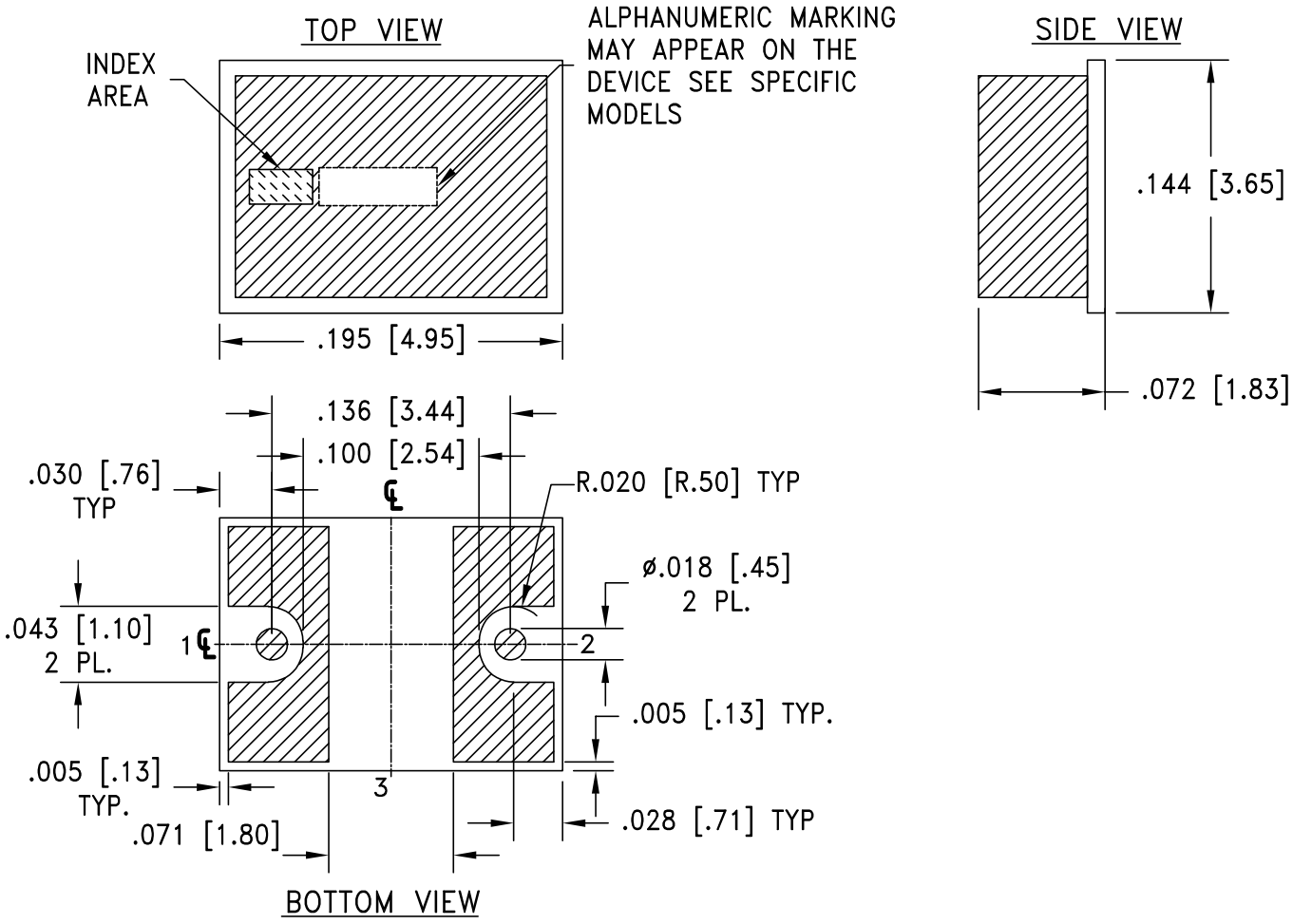
ISOLATION (From RF Crossover)



Case Style NM

Outline Dimensions

NM3237-1



METALLIZATION

Weight: .135 grams.

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

Notes:

1. Case material: LTCC on printed circut board base.
2. Termination Finish: **as shown below or indicated on Data Sheet.**
   For RoHS Case Styles: Gold Plate over Nickel plate. All models, (+) suffix.

Mini-Circuits®

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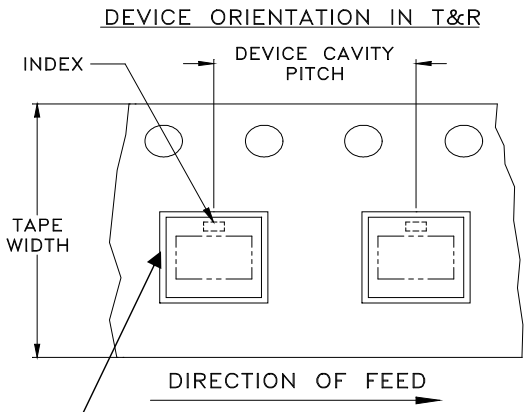
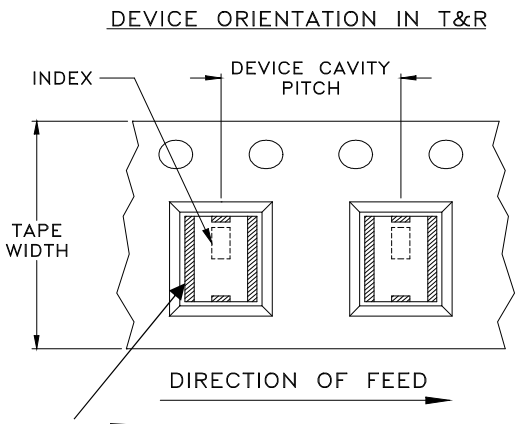
Tape & Reel Packaging TR-F77



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

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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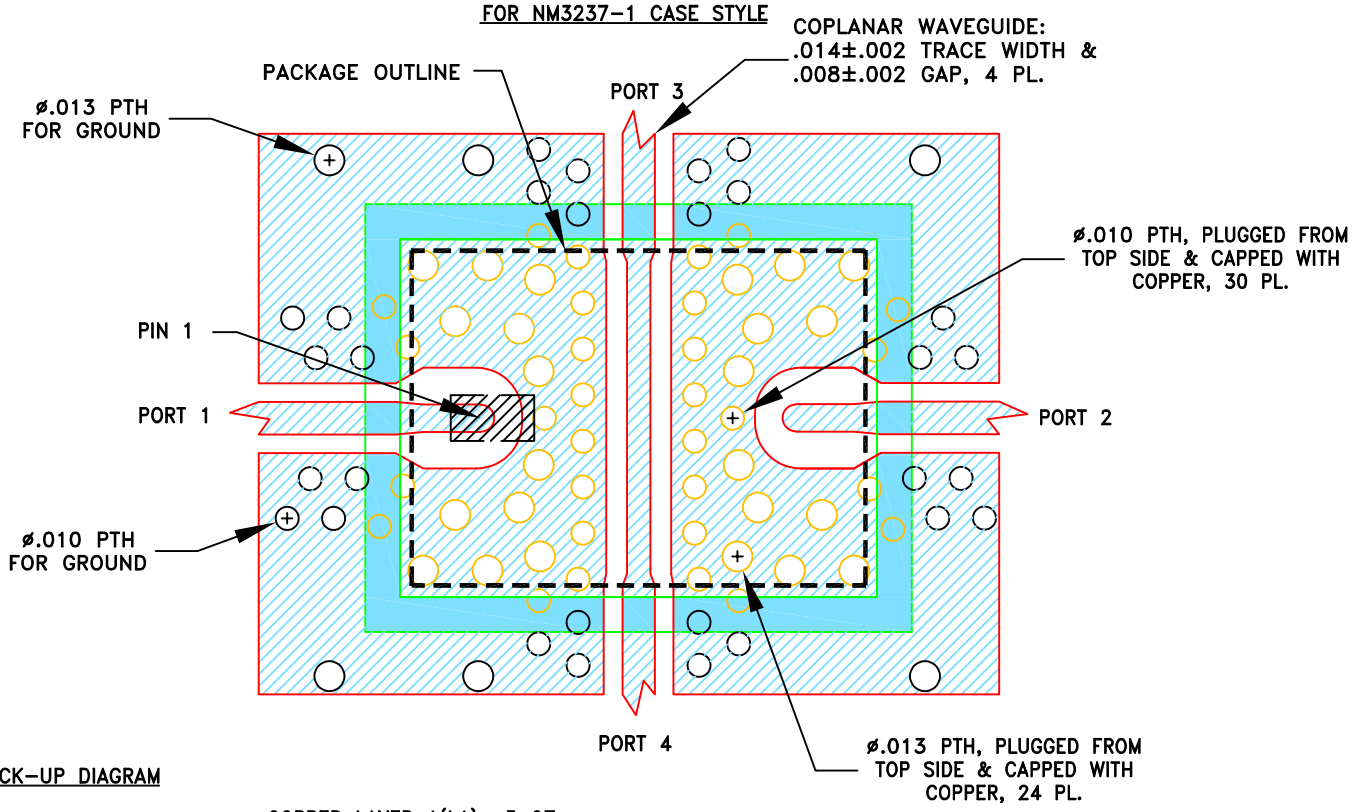
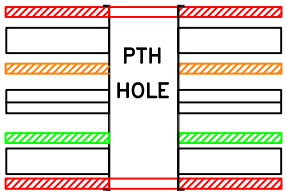
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-029589	NEW RELEASE	05.18.26	TP	IL
A	ECO-029780	DRAWING UPDATED	05.28.26	IL	SS

SUGGESTED MOUNTING CONFIGURATION
FOR NM3237-1 CASE STYLE



STACK-UP DIAGRAM



-COPPER LAYER 1(L1), .5 OZ.
-CORE 1, .0079 MEGTRON-7 R5785(N/GN)
-COPPER LAYER 2 (L2), .5 OZ.
-PREPREG, .0035 (89 um) MEGTRON-7 R5680(N/GN), CLOTH STYLE:1078
-PREPREG, .0035 (89 um) MEGTRON-7 R5680(N/GN), CLOTH STYLE:1078
-COPPER LAYER 3 (L3), .5 OZ.
-CORE 2, .0079 MEGTRON-7 R5785(N/GN)
-COPPER LAYER 4 (L4), .5 OZ.

1. TOTAL FINISHED THICKNESS 0.026 ± 10%.
2. PTH PRESENT FROM COPPER LAYER 1 TO COPPER LAYER 4.
3. INDICATED ON TOP VIEW PTH's ARE PLUGGED WITH EPOXY AND CAPPED WITH COPPER FROM TOP SIDE.
4. L2, L3, AND L4 ARE CONTINUOUS GROUND PLANES.

NOTES:
1. TRACE WIDTH & GAP ARE SHOWN FOR MEGTRON-7 R-5785 WITH DIELECTRIC THICKNESS 0.0079±0.0005; COPPER 1/2 OZ. ON EACH SIDE.
   FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).
3. DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	TP	05.18.26
TOLERANCES ON:	CHECKED	NP	05.18.26
2 PL DECIMALS ±	APPROVED	IL	05.18.26
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

Mini-Circuits®

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

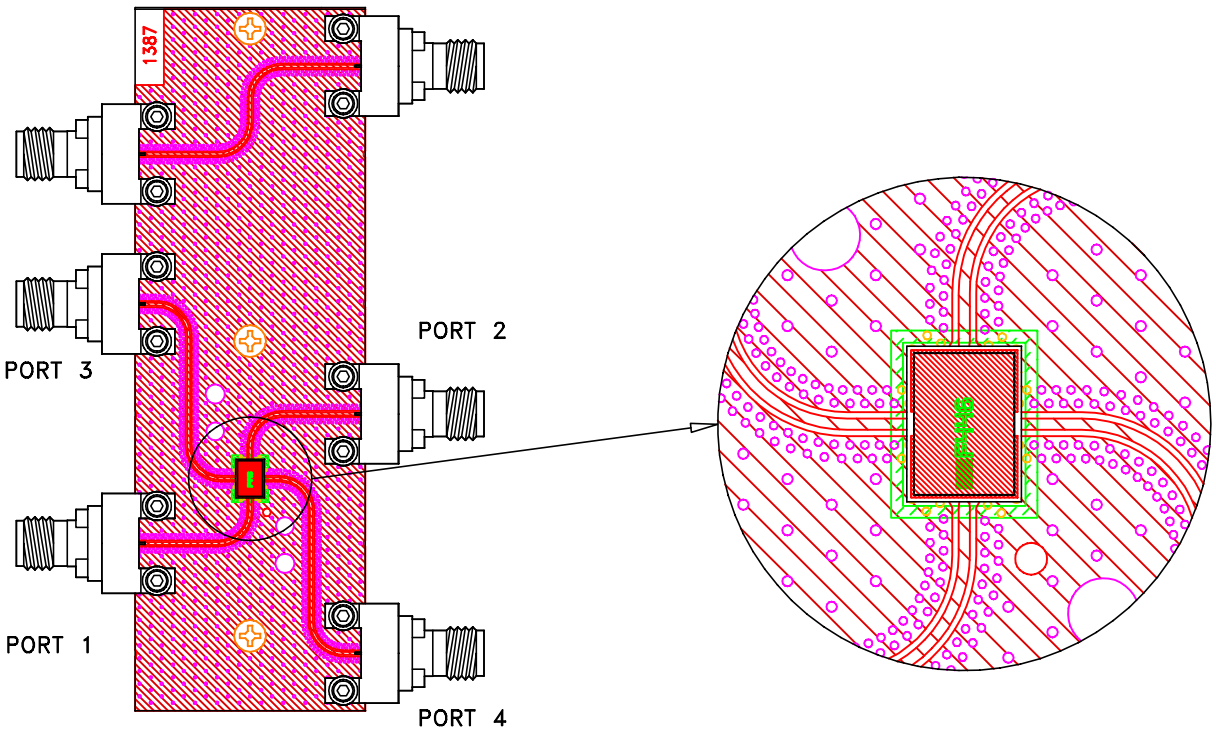
Mini-Circuits®
13 Neptune Avenue
Brooklyn NY 11235

PL, NM3237-1, TB-COHKI-3002C+

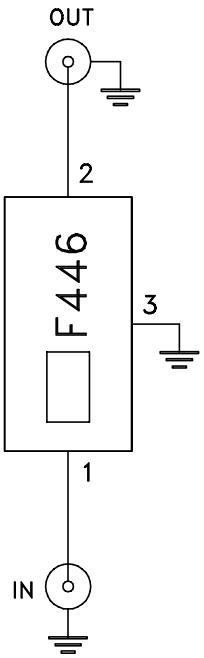
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-868	A

FILE:	SCALE:	SHEET:
98PL868	12:1	1 OF 1

Evaluation Board and Circuit



TB-COHKI-3002C+



Schematic Diagram

1. 50 Ohm 2.92 mm Female end Launch connectors.
2. PCB Material: Megtron 7(N) or equivalent,
   Dielectric Constant= 3.4 Thickness=.0079 inch.

Mini-Circuits®

Mini-Circuits

Environmental Specifications **ENV163**

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, 500 cycles, Dwell Time 15 minutes.	MIL-STD-202, Method 107, Condition A-3
Solderability	10X / 30X Magnification	J-STD-002 Method B, B1
Bend Test	1mm, deflection for 5 seconds	....
Solder Reflow Heat	Pb-Free Process 245° - 250°C peak,3X Reflow	J-STD-020