SURFACE MOUNT top hat

RF Transformer

TCM2-722X+

50/100Ω 400 to 7200 MHz

KEY FEATURES

- Ultra-wide bandwidth 400-7200 MHz
- One model covers all telecommunication bands
- Aqueous washable
- Protected by US Patent 9,071,229B1



Generic photo used for illustration purposes only

APPLICATIONS

- Differential modulator/demodulator and active mixers
- Wideband push-pull amplifiers
- LTE, Cellular, PCS, UMTS, Wi-Fi, WiMAX

CONFIGURATION G



PRODUCT OVERVIEW

Mini-Circuits' TCM2-722X+ is a surface-mount, transmission line, core and wire transformer covering a very wide frequency range, specified from 400 to 7200 MHz and usable from 100 to 7200 MHz. The transformer provides a 1:2 impedance ratio with low insertion loss, excellent flatness, as well as low phase and amplitude unbalance. Featuring core and wire construction on a 6-lead plastic base with tin over nickel termination finish. The unit measures 0.16" x 0.15" x 0.16" accommodating dense circuit board layouts. It also incorporates the Mini-Circuits' Top Hat® feature for faster, more accurate pick-and-place assembly and easy visual inspection.

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio			2		
Frequency Range		400		7200	MHz
Insertion Loss (Avg.)	400 – 4300 4300 – 7200		1 2.2	2.0 3.5	dB
Amplitude Unbalance	400 – 4300 4300 – 7200		0.5 1.9	2.0 3.2	dB
Phase Unbalance	400 – 4300 4300 – 7200		4 10	10 —	Degree
Primary Return Loss (Input)	400 – 4300 4300 – 7200		13 10		dB

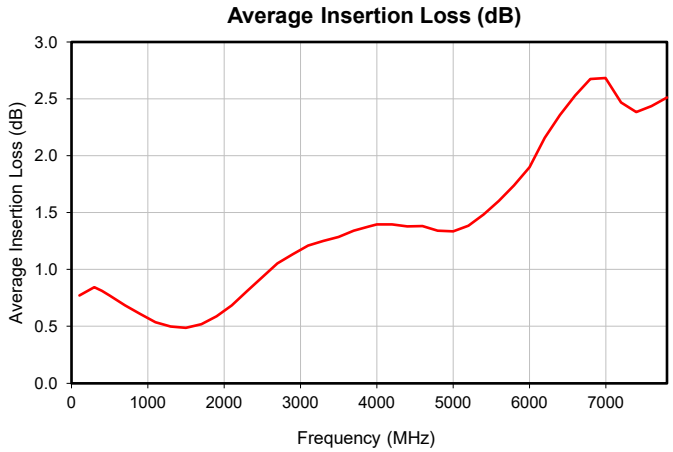
ABSOLUTE MAXIMUM RATINGS[2]

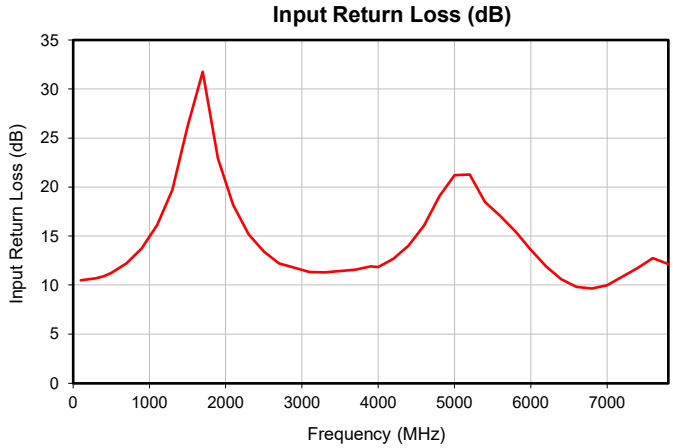
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Input Power	0.2 W

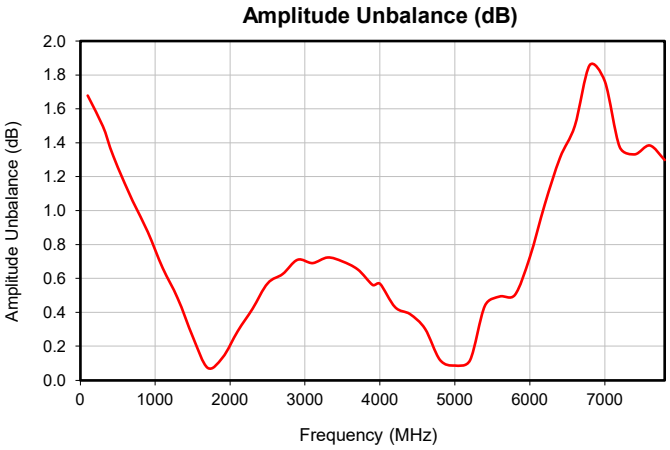
2. Permanent damage may occur if any of these limits are exceeded.

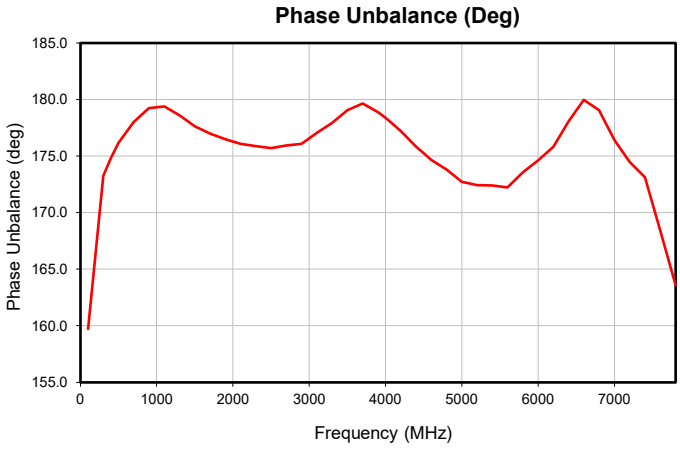
REV. A
ECO-025824
TCM2-722X+
MCL NY
250616

TYPICAL PERFORMANCE GRAPHS









SURFACE MOUNT top hat

RF Transformer

TCM2-722X+

50/100Ω 400 to 7200 MHz

CONFIGURATION G

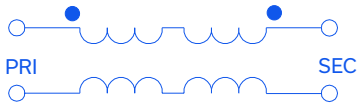
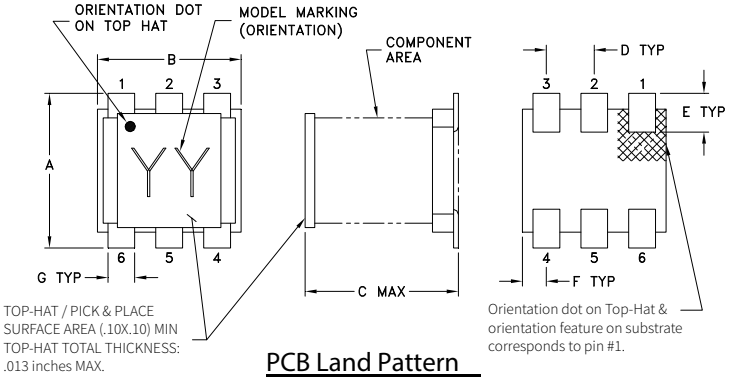


Figure 1. TCM2-722X+ Configuration

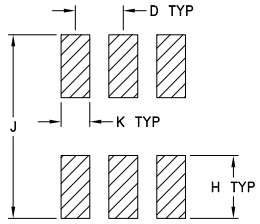
PAD DESCRIPTION

Function	Pad Number	Description
Primary Dot	3	Connects to RF–IN
Primary	1,2	Connects to GND
Secondary Dot	5	Out 1
Secondary	4	Out 2
Not Connected (NC)	6	Not Used

CASE STYLE DRAWING

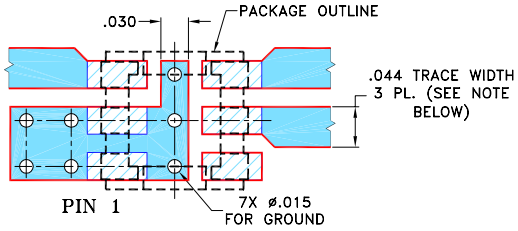


PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

SUGGESTED PCB LAYOUT (PL-395)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 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

Figure 2. Suggested PCB Layout PL-395

OUTLINE DIMENSIONS (Inch / mm)

A	B	C	D	E	F
.160	.150	.160	.050	.040	.025
4.06	3.81	4.06	1.27	1.02	0.64

G	H	J	K		wt
.028	.065	.190	.030		grams
0.71	1.65	4.83	0.76		0.15

PRODUCT MARKING*: BQ

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

SURFACE MOUNT top hat

RF Transformer

TCM2-722X+

50/100Ω 400 to 7200 MHz

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD CLICK HERE

Performance Data & Graphs	Data Graphs S-Parameter (S3P Files) Data Set (.zip file) De-embedded to device pads
Case Style	DB1627 Lead Finish: Pure Tin
RoHS Status	Compliant
Tape and Reel	F47
Suggested Layout for PCB Design	PL-395
Evaluation Board	TB-TCM2-722X+ Gerber File
Environmental Rating	ENV02T1

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

RF Transformer TCM2-722X+

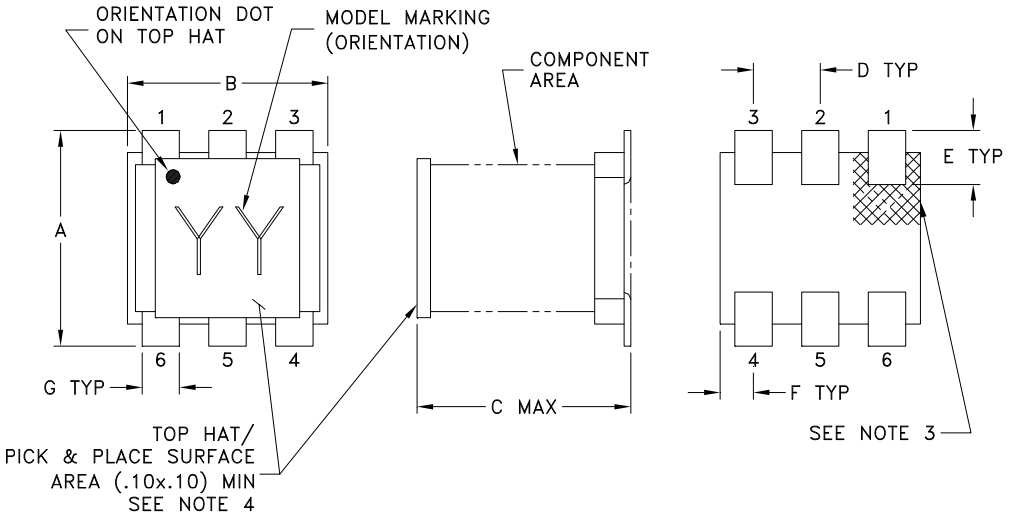
Typical Performance Data

FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
100	0.77	10.48	1.68	159.71
300	0.84	10.69	1.50	173.24
400	0.81	10.91	1.37	174.84
500	0.77	11.24	1.26	176.16
700	0.68	12.21	1.06	178.02
900	0.61	13.73	0.87	179.25
1100	0.54	16.12	0.66	179.39
1300	0.50	19.70	0.48	178.58
1500	0.49	26.18	0.26	177.62
1700	0.52	31.79	0.07	176.99
1900	0.59	22.93	0.13	176.48
2100	0.68	18.18	0.29	176.08
2300	0.81	15.16	0.42	175.88
2500	0.93	13.42	0.57	175.71
2700	1.05	12.20	0.63	175.95
2900	1.13	11.78	0.71	176.07
3100	1.21	11.32	0.69	177.04
3300	1.25	11.28	0.72	177.91
3500	1.29	11.44	0.70	179.06
3700	1.34	11.58	0.65	179.64
3900	1.38	11.91	0.56	178.89
4000	1.39	11.84	0.57	178.39
4200	1.40	12.69	0.43	177.22
4400	1.38	14.01	0.39	175.84
4600	1.38	16.07	0.30	174.65
4800	1.34	19.07	0.12	173.79
5000	1.33	21.20	0.09	172.73
5200	1.38	21.26	0.12	172.43
5400	1.48	18.48	0.44	172.41
5600	1.60	17.04	0.49	172.23
5800	1.74	15.43	0.50	173.58
6000	1.90	13.59	0.73	174.63
6200	2.16	11.90	1.04	175.83
6400	2.36	10.58	1.31	178.08
6600	2.53	9.83	1.50	179.98
6800	2.67	9.67	1.86	179.07
7000	2.69	9.97	1.76	176.42
7200	2.47	10.84	1.37	174.48
7400	2.38	11.74	1.33	173.12
7600	2.43	12.73	1.38	168.45
7800	2.51	12.14	1.30	163.57

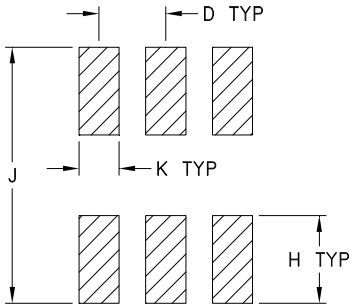
Case Style DB

DB1627

Outline Dimensions



PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

CASE #	A	B	C	D	E	F	G	H	J	K	WT. GRAM
DB1627	.160 (4.06)	.150 (3.81)	.160 (4.06)	.050 (1.27)	.040 (1.02)	.025 (0.64)	.028 (0.71)	.065 (1.65)	.190 (4.83)	.030 (0.76)	.15

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

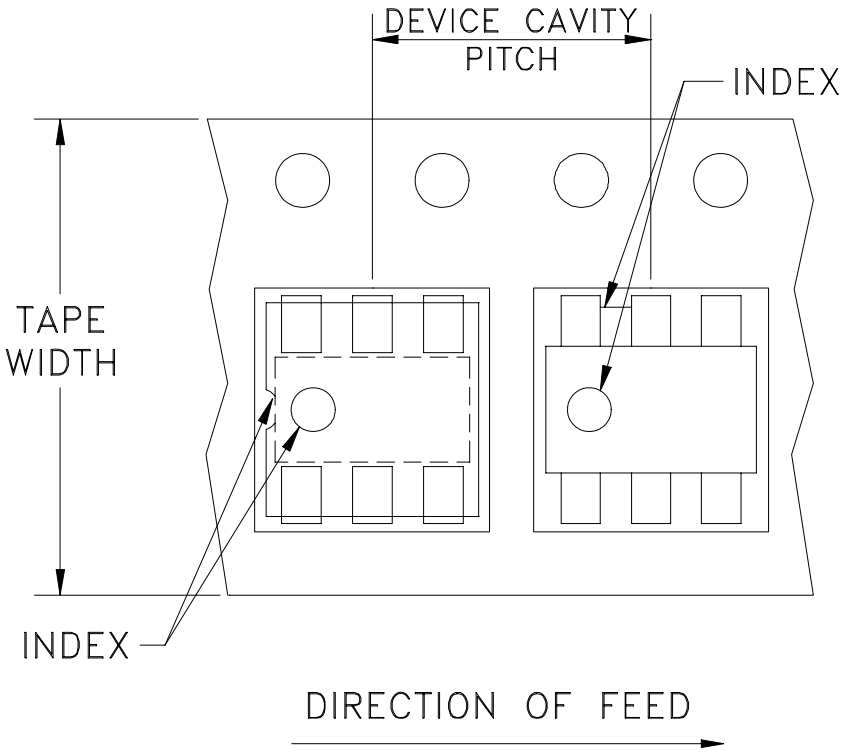
Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.
3 Orientation dot on top hat & orientation feature on substrate correspondence to pin #1.
4 Top-Hat total thickness: .013 inches MAX.

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Tape & Reel Packaging TR-F47

DEVICE ORIENTATION IN T&R



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

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

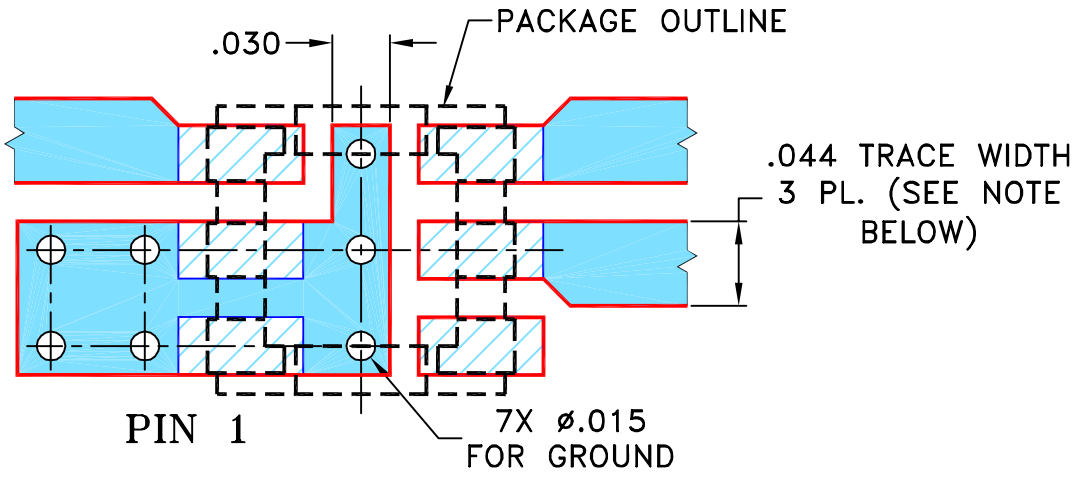
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THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M141791	NEW RELEASE	06/14/13	AV	DJ

SUGGESTED MOUNTING CONFIGURATION
FOR DB1627 CASE STYLE, "06TK03" PIN CODE



NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 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	DRAWN	AV	06/03/13
TOLERANCES ON:	CHECKED	IL	06/14/13
2 PL DECIMALS ±	APPROVED	DJ	06/14/13
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

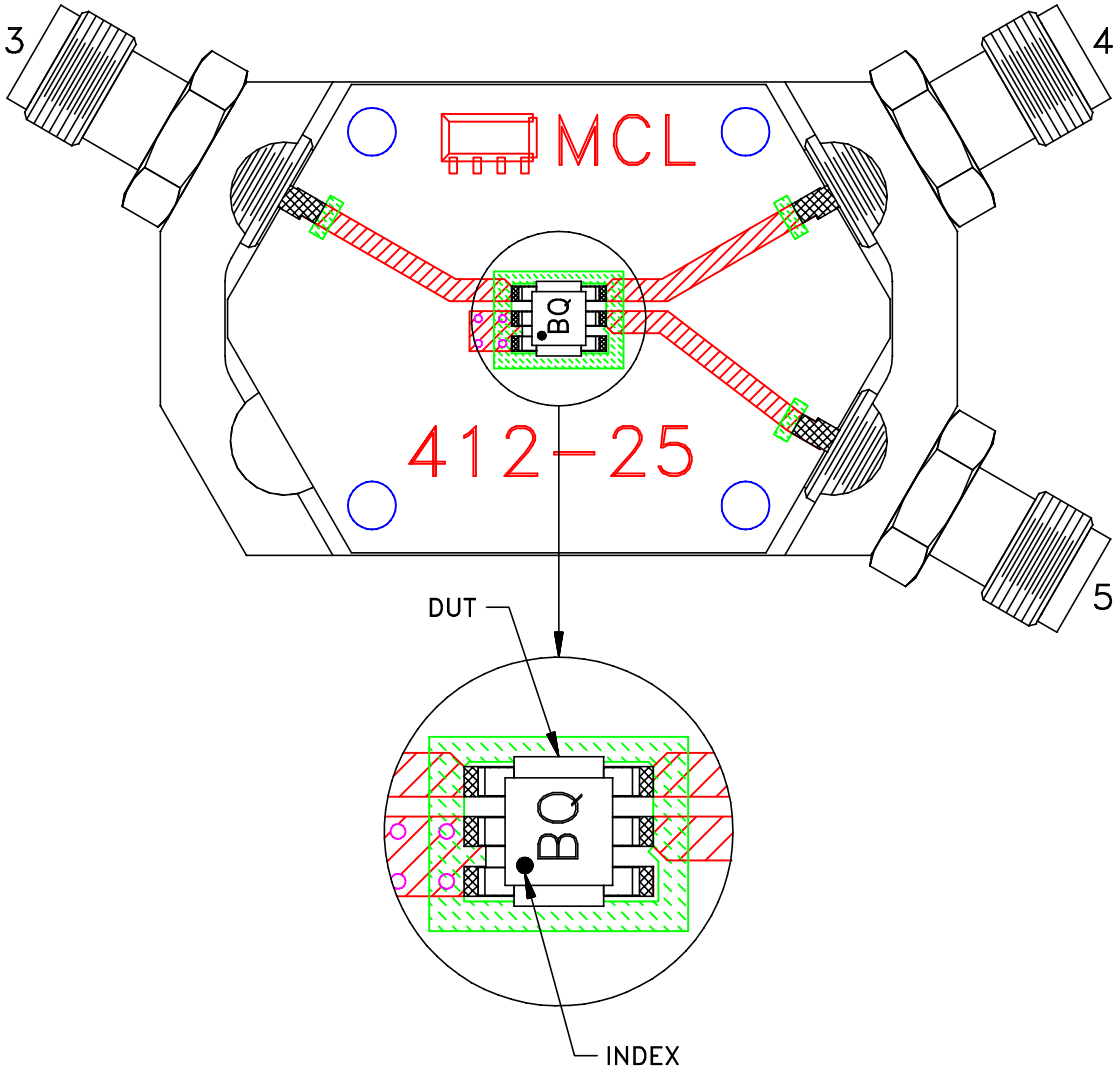
PL, 06TK03, DB1627, TB-717+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-395	OR
FILE: 98PL395	SCALE: 10:1	SHEET: 1 OF 1	

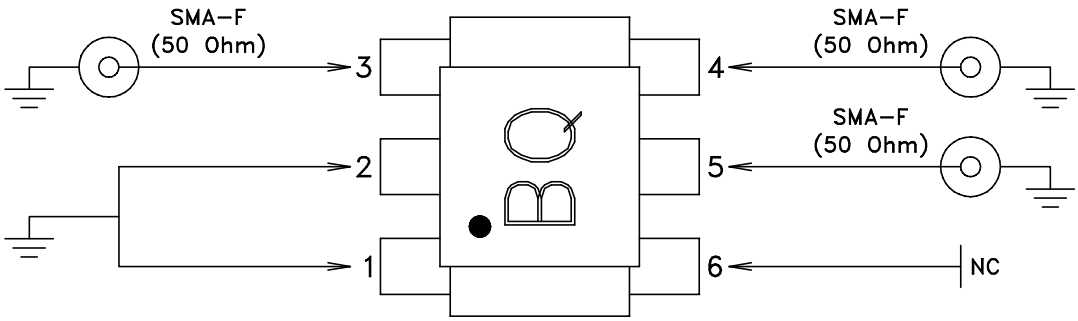
Evaluation Board and Circuit

TB-TCM2-722X+

Refer data sheet of the model for pin connections



Schematic diagram



Notes:

1. PCB Material: ROGERS (RO4350B) OR Equivalent, Dielectric Constant=3.48
   Thickness=.020±.0015 inch
2. 50 Ohm SMA Female Connectors.

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Environmental Specifications ENV02T1

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	-40° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° 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
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutetic Process: 225°C peak Pb-Free Process 245° - 250°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, 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
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215

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