SURFACE MOUNT top hat®

RF Transformer

TCM2-452AX+

50Ω 1000 to 4500 MHz

THE BIG DEAL

- Wideband, 1000 to 4500 MHz
- Balanced Transmission Line
- Low Insertion Loss 0.6 dB
- Flat Insertion Loss, 0.6 dB Typ.
- Good Input Return Loss, 15 dB Typ.
- Low Phase and Amplitude Unbalance, 6°, 0.8 dB
- Aqueous Washable



Generic photo used for illustration purposes only

CASE STYLE: DB1627

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

APPLICATIONS

- Wideband Push-Pull Amplifiers
- LTE & 5G MIMO Infrastructure
- CBRS 3.45 to 3.98 GHz
- IoT & ISM

PRODUCT OVERVIEW

Mini-Circuits' TCM2-452AX+ is a surface-mount transmission line core and wire transformer covering a very wide frequency range from 1000 to 4500 MHz. The transformer provides low insertion loss with excellent flatness over its entire frequency range. It achieves low phase and amplitude unbalance and excellent input return loss performance. Featuring core and wire construction on a 6-lead plastic base with tin over nickel termination finish, the unit measures 0.16x0.15x0.16", 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.

KEY FEATURES

Feature	Advantages
Wideband, 1000 to 4500 MHz	Very wide frequency range covers bandwidth requirements for many broadband applications.
Low Insertion Loss, 0.6 dB at 2.75 GHz	TCM2-452AX+ provides excellent signal transmission from input to output with consistent performance across its entire frequency range.
Good Input Return Loss, 15 dB Typ.	Provides good matching with minimal signal reflection.
Small Footprint 0.16x0.15x0.16"	Accommodates tight space requirements for dense PCB layouts.
Top Hat® Feature	Improves speed and accuracy of pick and place assembly and provides clear device marking for visual inspection.

REV. B
ECO-013812
TCM2-452AX+
MCL NY
251202

RF Transformer

TCM2-452AX+

50Ω 1000 to 4500 MHz

ELECTRICAL SPECIFICATIONS AT +25°C

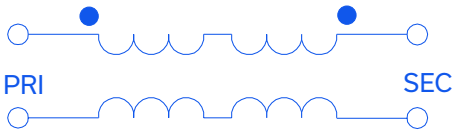
Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Impedance Ratio (Secondary/Primary)			2		
Frequency Range		1000		4500	MHz
Insertion Loss[1]	1000-4500		0.8	1.5	dB
Amplitude Unbalance	1000-4500		0.8	1.2	dB
Phase Unbalance	1000-4500		8	12	Degree
Return Loss	1000-4500		15		dB

1. Referenced to nominal loss of 0.2 dB typ.

ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +100°C
RF Power	1.0 W
DC Current	30 mA

CONFIGURATION G



SURFACE MOUNT top hat

RF Transformer

TCM2-452AX+

50Ω 1000 to 4500 MHz

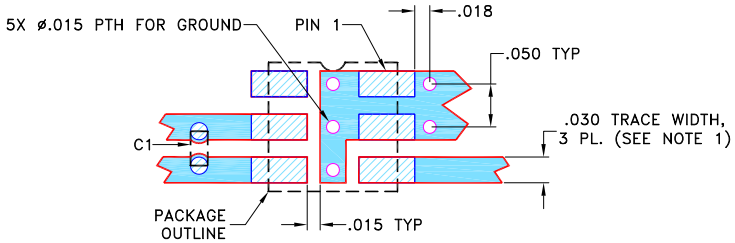
PAD CONNECTIONS

PRIMARY DOT	3
PRIMARY (GND)	2
SECONDARY DOT	4
SECONDARY	5
NOT USED	1,6

PRODUCT MARKING: YL

DEMO BOARD MCL P/N: TB-TCM2-452AX+

SUGGESTED PCB LAYOUT (PL-422)



COMPONENT	SIZE
C1	0402

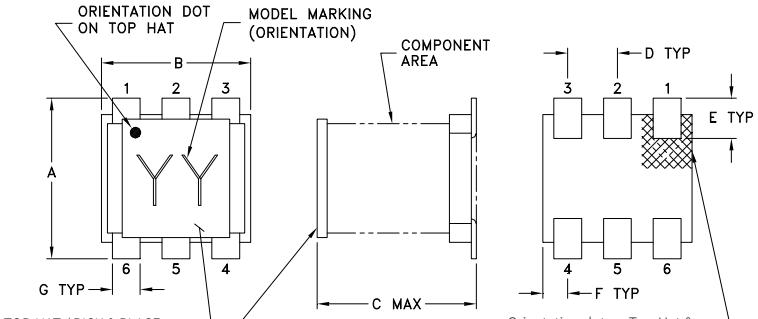
NOTES:

1. TRACE WIDTH PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .0133"±.001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-742+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

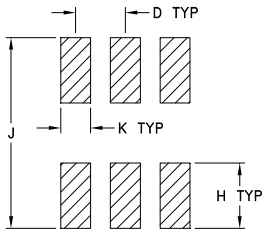
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

OUTLINE DRAWING



PCB Land Pattern



SUGGESTED LAYOUT
TOLERANCE TO BE WITHIN ±.002

OUTLINE DIMENSIONS (Inches / 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

TAPE & REEL INFORMATION: F47

SURFACE MOUNT top hat®

RF Transformer

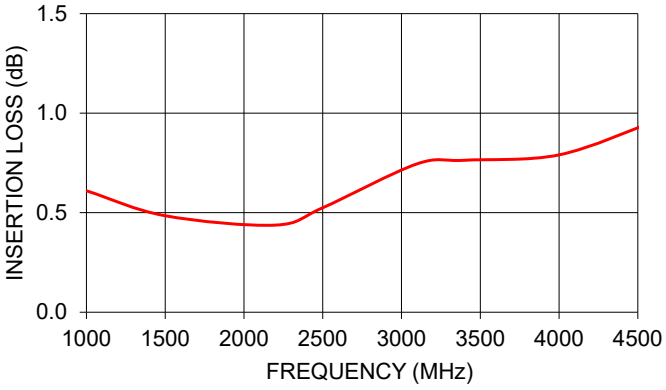
TCM2-452AX+

50Ω 1000 to 4500 MHz

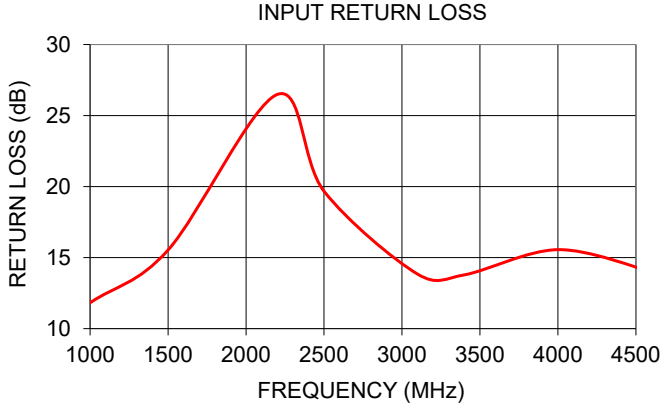
TYPICAL PERFORMANCE DATA

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Amplitude Unbalance (dB)	Phase Unbalance (deg)
1000	0.61	11.82	0.93	3.87
1500	0.48	15.53	0.65	3.09
2200	0.44	26.48	0.36	6.70
2500	0.52	19.67	0.11	7.81
3100	0.75	13.84	0.23	6.93
3400	0.76	13.79	0.23	6.76
4000	0.79	15.56	0.53	4.59
4500	0.96	14.00	0.26	0.16

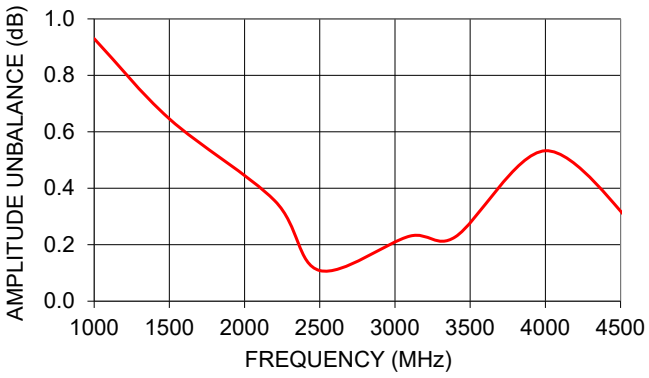
INSERTION LOSS



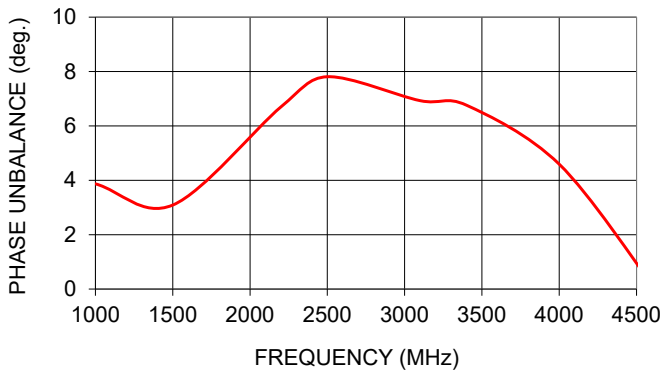
INPUT RETURN LOSS



AMPLITUDE UNBALANCE



PHASE UNBALANCE



NOTES

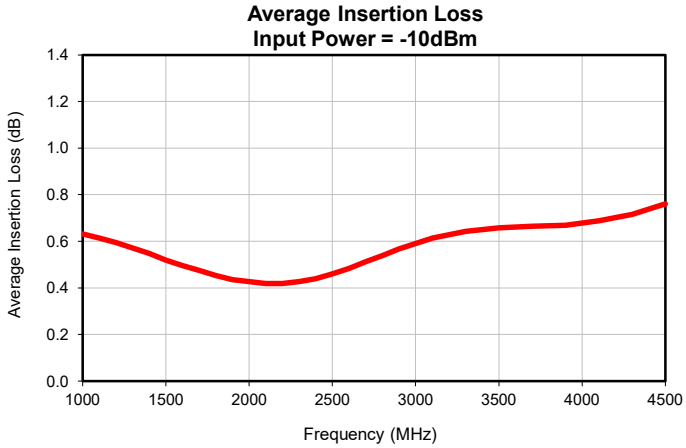
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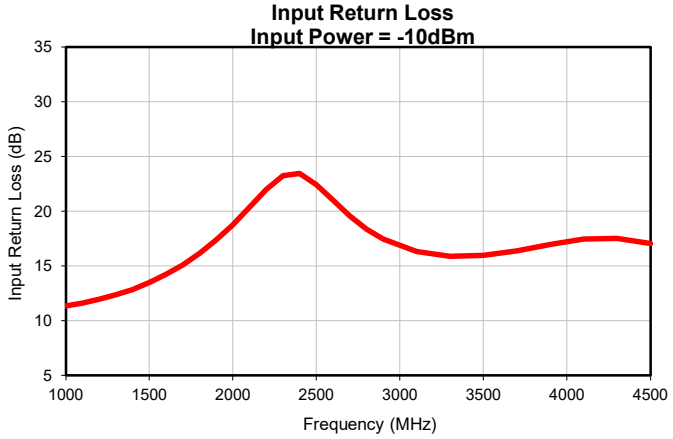
RF Transformer TCM2-452AX+

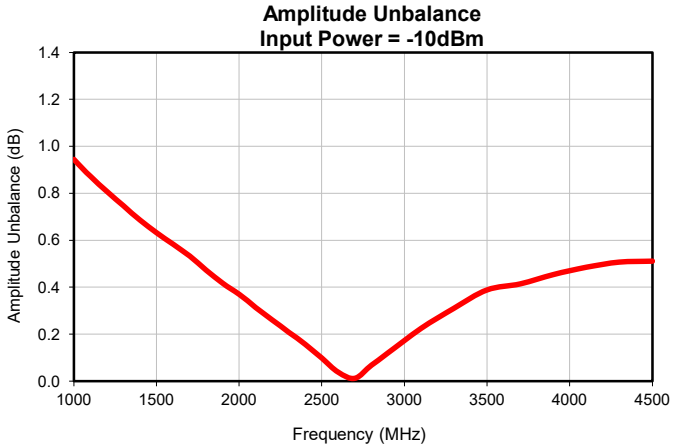
Typical Performance Data

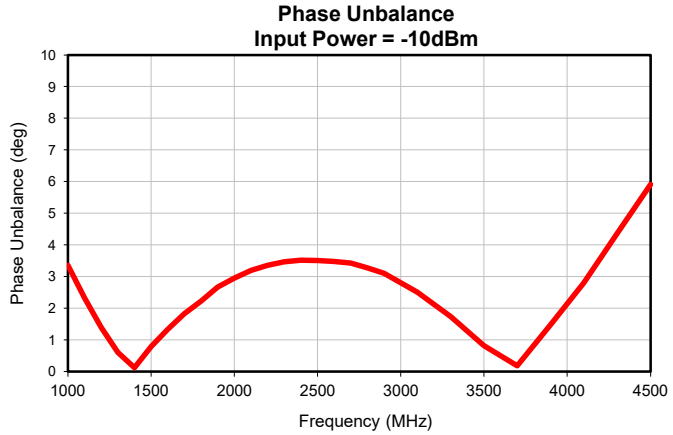
FREQUENCY MHz	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
1000	0.63	11.36	0.94	3.35
1100	0.61	11.61	0.87	2.32
1200	0.59	11.95	0.81	1.39
1300	0.57	12.36	0.75	0.60
1400	0.55	12.85	0.69	0.12
1500	0.52	13.49	0.63	0.79
1600	0.50	14.24	0.58	1.33
1700	0.47	15.10	0.53	1.82
1800	0.45	16.14	0.47	2.22
1900	0.44	17.36	0.42	2.67
2000	0.43	18.75	0.37	2.95
2100	0.42	20.37	0.31	3.20
2200	0.42	21.99	0.26	3.36
2300	0.43	23.23	0.21	3.47
2400	0.44	23.47	0.16	3.52
2500	0.46	22.43	0.10	3.51
2600	0.48	21.00	0.04	3.48
2700	0.51	19.56	0.01	3.43
2800	0.54	18.37	0.07	3.28
2900	0.57	17.44	0.12	3.11
3100	0.61	16.30	0.22	2.51
3300	0.64	15.89	0.31	1.74
3500	0.66	15.98	0.39	0.82
3700	0.66	16.39	0.41	0.18
3900	0.67	16.96	0.45	1.48
4100	0.69	17.47	0.49	2.80
4300	0.72	17.51	0.51	4.36
4500	0.76	17.05	0.51	5.92

Typical Performance Data





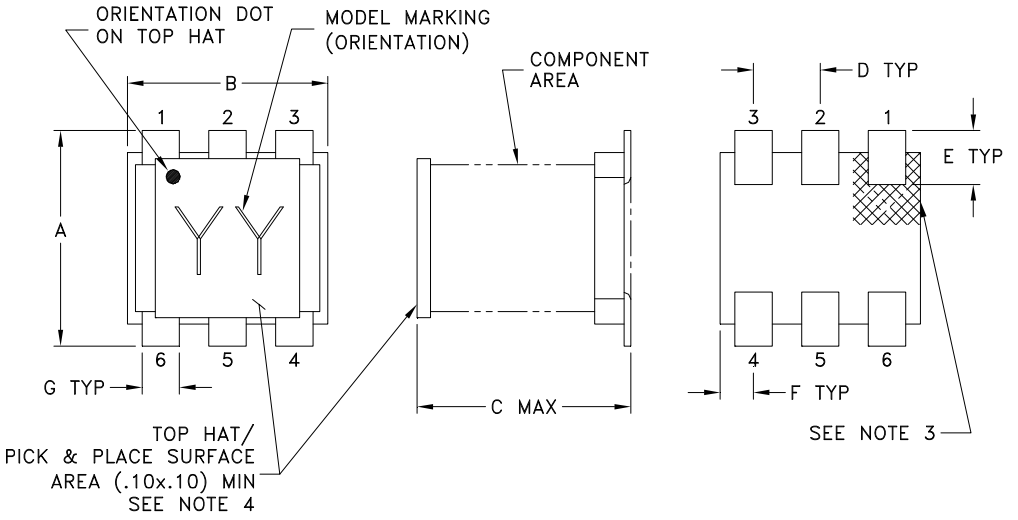




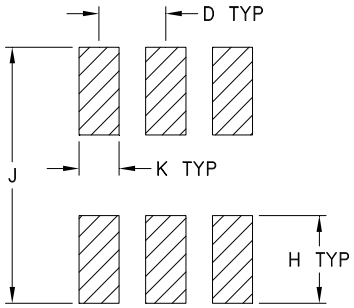
Case Style DB

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

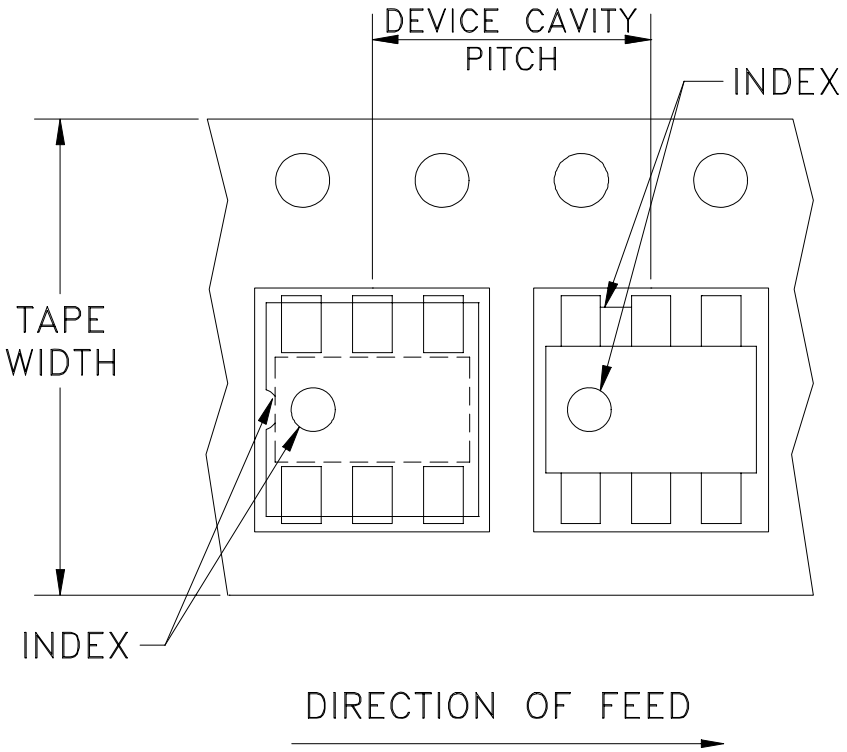
Notes:

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.

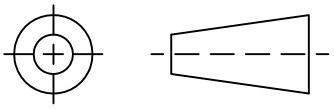
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Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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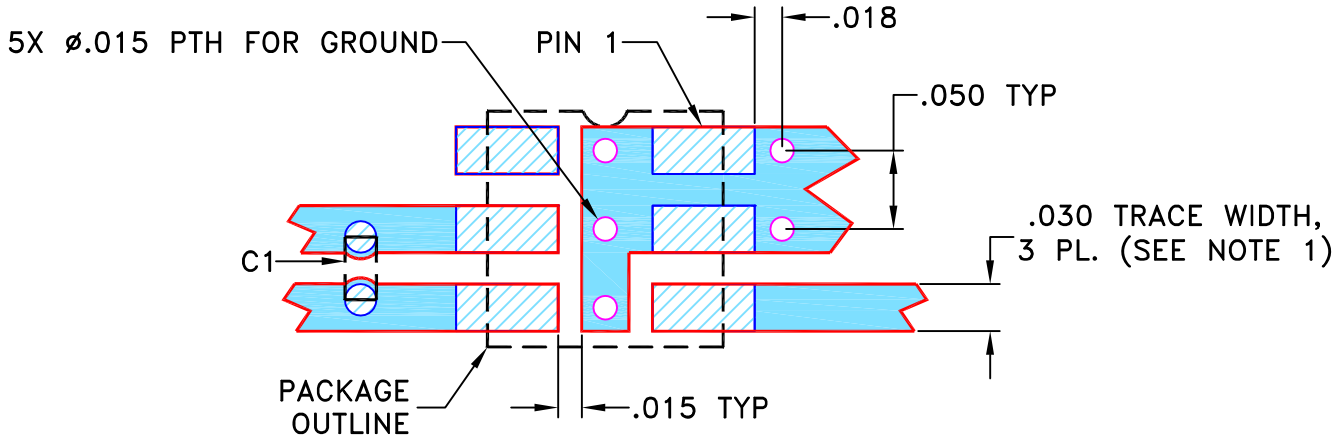
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THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M147897	NEW RELEASE	08/20/14	ITG	DJ

SUGGESTED MOUNTING CONFIGURATION FOR DB714 CASE STYLE, "06TG04" PIN CODE



COMPONENT	SIZE
C1	0402

NOTES:

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2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-742+.
3. 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	ITG	08/20/14
TOLERANCES ON:	CHECKED	GF	08/20/14
2 PL DECIMALS ±	APPROVED	DJ	08/20/14
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

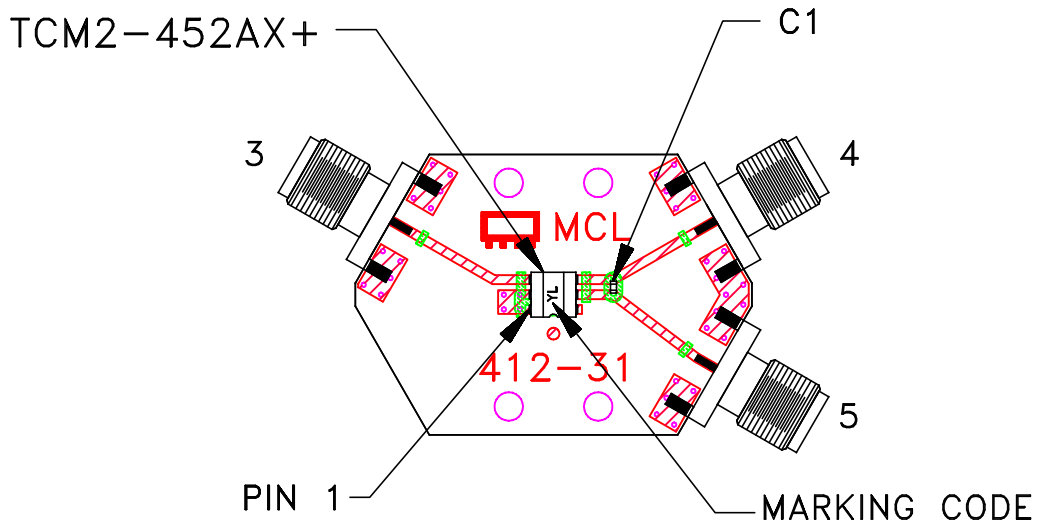
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 06TG04, DB714, TB-742+

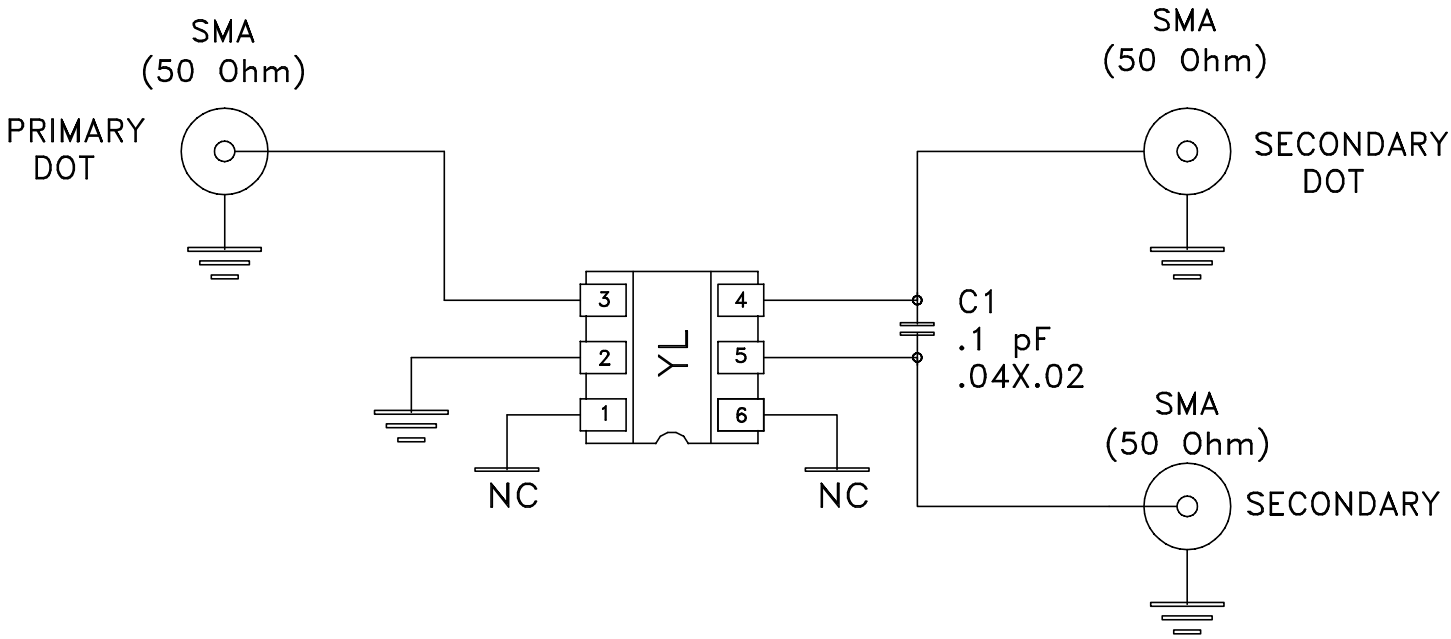
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-422	OR

FILE:	SCALE:	SHEET:
98PL422	8:1	1 OF 1

Evaluation Board and Circuit



TB-TCM2-452AX+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.0133 inch.

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Mini-Circuits

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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