

# Surface Mount RF Transformer

## SBTX2-113-2W+

50Ω 2.6 to 11.0 GHz

### The Big Deal

- Super wideband, 2.6 to 11.0 GHz
- Low insertion loss, 1.4 dB typ.
- Amplitude Unbalance,  $\pm 0.9$  dB typ.
- Low phase unbalance,  $\pm 6^\circ$  typ.
- Common mode rejection, 22 dB typ.



CASE STYLE: AH2765

### Product Overview

Mini-Circuits' SBTX2-113-2W+ is a surface-mount transmission line transformer (core and Semi-Rigid cable) covering a very wide frequency range from 2.6 to 11.0 GHz. The transformer provides low insertion loss with excellent phase and amplitude performance. Featuring core and cable construction on a 8-lead PCB unit measures 0.32 x 0.32 x 0.69 accommodating dense circuit board layouts.

### Key Features

Feature	Advantages
Wideband, 2.6 to 11.0 GHz	Super wide frequency range covers bandwidth requirements for many broadband applications.
Low insertion loss, 1.4dB	Provides excellent signal transmission from input to output with consistent performance across its entire frequency range.
Good Phase and Amplitude Unbalance	Provides good CMRR and IP2.
Small size (0.32 x 0.32 x 0.69)	Provide good solderability and tight layouts.

# Surface Mount RF Transformer

## SBTX2-113-2W+

50Ω      2.6 to 11.0 GHz      1:2 Ratio

### Features

- wide bandwidth 2.6 to 11.0 GHz
- unbalanced to balanced transformer
- excellent amplitude and phase unbalance
- aqueous washable

### Applications

- defense communication
- defense radar
- line of sight links
- PCS
- cellular
- wideband push-pull amplifiers
- ADC (Analog to Digital Converter)
- Balanced Receivers



Generic photo used for illustration purposes only

CASE STYLE: AH2765

**+RoHS Compliant**

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

### Electrical Specifications at 25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary/primary)			2		
Frequency Range		2.6		11.0	GHz
Insertion Loss (Average) (above theoretical 3 dB)	2.6 - 6.0	—	1.4	1.9	dB
	6.0 - 10.0	—	1.5	2.2	
	10.0 - 11.0	—	1.7	2.5	
Amplitude Unbalance (±)	2.6 - 11.0	—	0.9	1.3	dB
	4.0 - 9.0	—	0.7	1.0	
Phase Unbalance (±)	4.0 - 9.0	—	4	8	Degree
	2.6 - 11.0	—	6	12	
Common mode rejection	4.0 - 9.0	18	24	—	dB
	2.6 - 11.0	15	22	—	

### Maximum Ratings

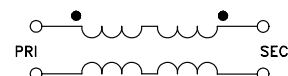
Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power	2W

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

### Pin Connections

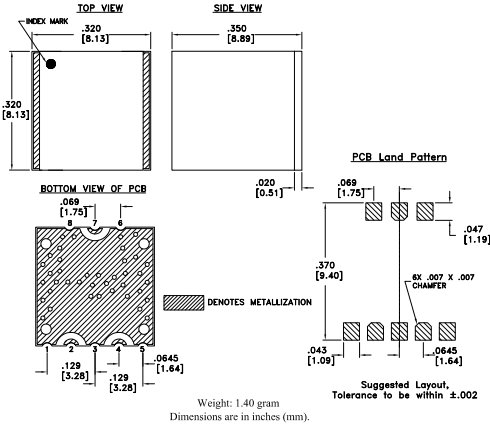
Function	Pin Number
PRIMARY DOT	7
PRIMARY (GND)	6,8
SECONDARY DOT	4
SECONDARY	2
GND	1,3,5,6,8

### Config. G

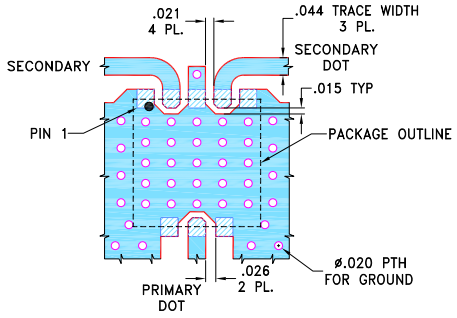


# SBTX2-113-2W+

## Outline Drawing



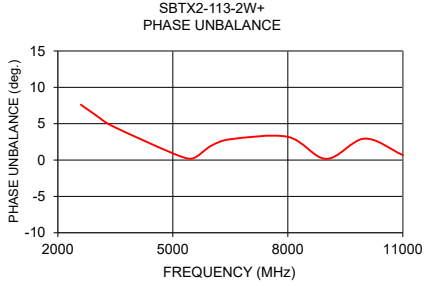
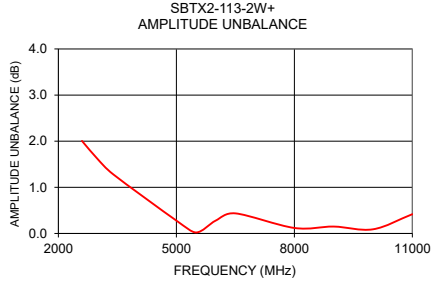
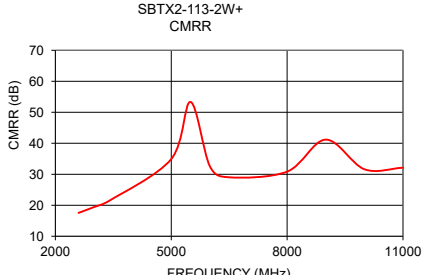
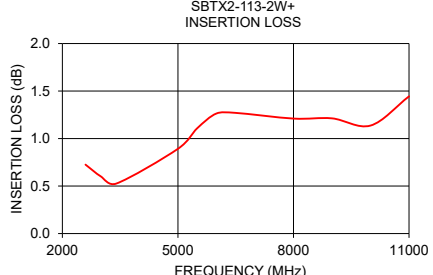
## Demo Board MCL P/N: TB-1081+ Suggested PCB Layout (PL-629)



- NOTES:**
- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .010+.001. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS LINE WIDTH & GAP MAY NEED TO BE MODIFIED.
  - 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.

## Typical Performance Data

Frequency (MHz)	Avg. Insertion Loss (dB)	CMRR (dB)	Amplitude Unbalance (dB)	Phase Unbalance (Deg.)
2600	0.73	17.53	2.01	7.61
3000	0.60	19.42	1.61	6.14
3400	0.53	21.49	1.28	4.73
5000	0.89	34.90	0.28	0.93
5500	1.11	53.33	0.02	0.20
6000	1.26	32.59	0.28	1.96
6500	1.27	29.02	0.44	2.86
8000	1.21	30.85	0.12	3.19
9000	1.21	41.17	0.15	0.16
10000	1.14	31.62	0.09	2.95
11000	1.44	32.11	0.42	0.69



### Additional Notes

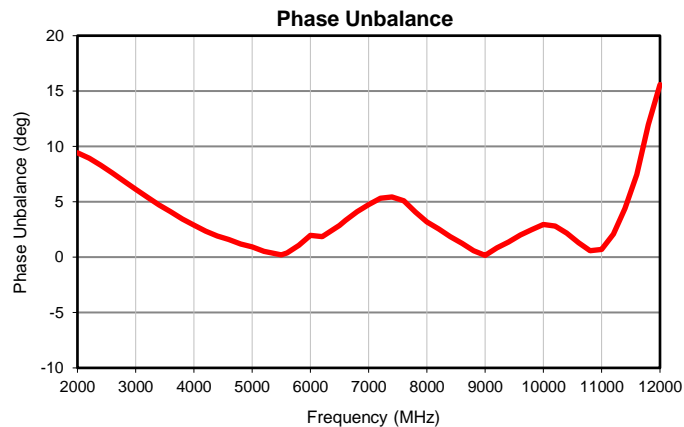
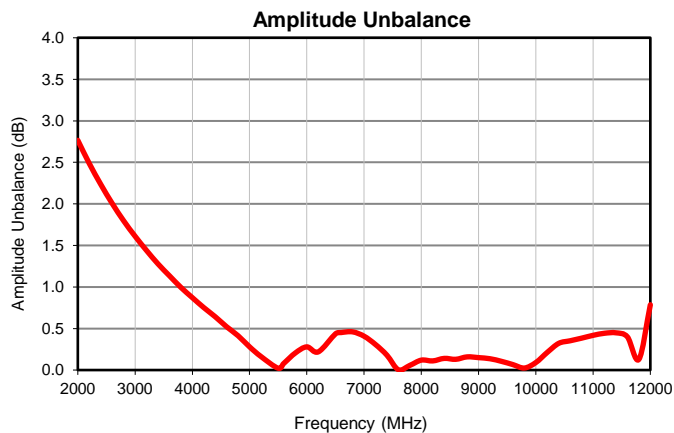
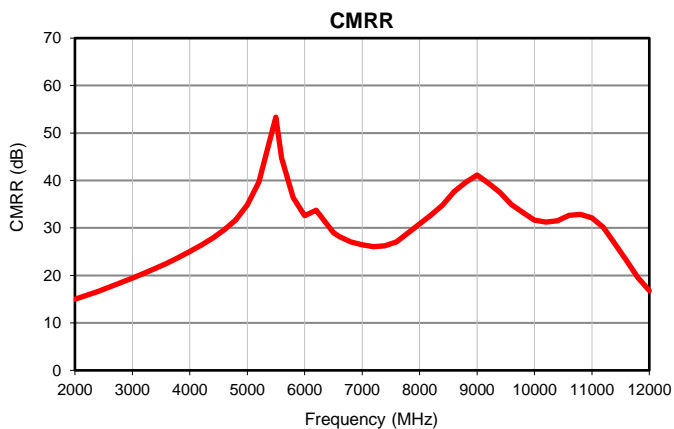
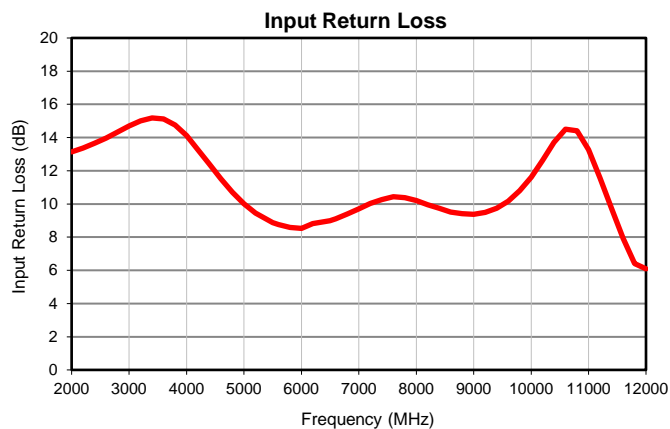
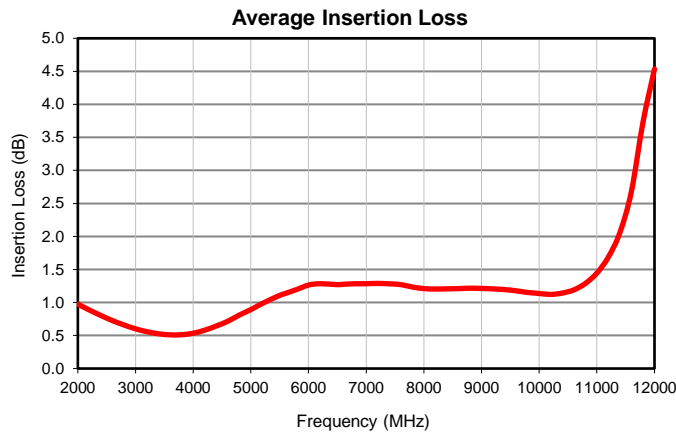
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## Typical Performance Data

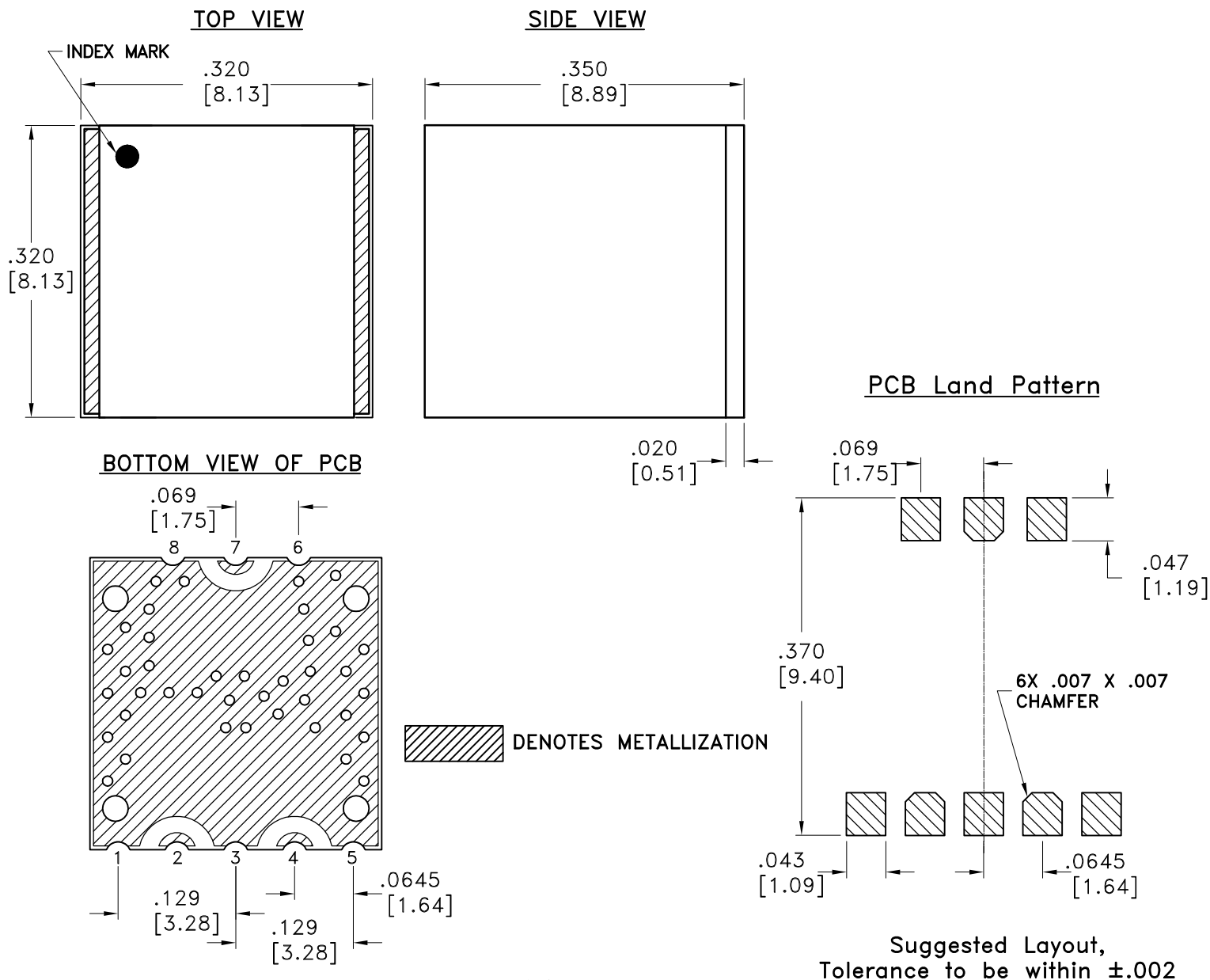
FREQUENCY (MHz)	AVERAGE INSERTION LOSS (dB)	INPUT RETURN LOSS (dB)	CMRR (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (deg.)
2000	0.98	13.14	14.99	2.77	9.44
2200	0.89	13.37	15.80	2.49	8.93
2400	0.80	13.65	16.64	2.24	8.31
2600	0.73	13.97	17.53	2.01	7.61
2800	0.66	14.34	18.47	1.80	6.85
3000	0.60	14.69	19.42	1.61	6.14
3200	0.56	15.01	20.43	1.44	5.40
3400	0.53	15.18	21.49	1.28	4.73
3600	0.51	15.12	22.56	1.14	4.11
3800	0.51	14.76	23.78	1.00	3.45
4000	0.53	14.12	25.02	0.87	2.88
4200	0.58	13.27	26.39	0.75	2.36
4400	0.64	12.40	27.84	0.64	1.92
4600	0.72	11.51	29.60	0.52	1.61
4800	0.81	10.70	31.74	0.41	1.19
5000	0.89	10.01	34.90	0.28	0.93
5200	0.99	9.45	39.67	0.16	0.52
5500	1.11	8.87	53.33	0.02	0.20
5600	1.14	8.75	44.73	0.08	0.39
5800	1.20	8.59	36.42	0.21	1.07
6000	1.26	8.52	32.59	0.28	1.96
6200	1.28	8.81	33.72	0.22	1.87
6500	1.27	8.98	29.02	0.44	2.86
6600	1.28	9.11	28.18	0.45	3.33
6800	1.28	9.40	27.03	0.46	4.10
7000	1.28	9.71	26.46	0.41	4.73
7200	1.29	10.03	26.06	0.31	5.32
7400	1.28	10.27	26.25	0.18	5.45
7600	1.27	10.44	27.03	0.00	5.10
7800	1.23	10.37	28.93	0.06	4.08
8000	1.21	10.21	30.85	0.12	3.19
8200	1.20	9.96	32.71	0.11	2.55
8400	1.21	9.74	34.81	0.14	1.87
8600	1.21	9.51	37.62	0.13	1.24
8800	1.22	9.41	39.59	0.16	0.59
9000	1.21	9.38	41.17	0.15	0.16
9200	1.21	9.49	39.38	0.14	0.84
9400	1.20	9.74	37.48	0.10	1.37
9600	1.18	10.17	34.97	0.07	2.00
9800	1.15	10.80	33.24	0.02	2.49
10000	1.14	11.62	31.62	0.09	2.95
10200	1.12	12.62	31.27	0.21	2.80
10400	1.14	13.72	31.52	0.32	2.18
10600	1.19	14.50	32.67	0.35	1.30
10800	1.29	14.40	32.87	0.38	0.60
11000	1.44	13.27	32.11	0.42	0.69
11200	1.69	11.55	30.09	0.44	2.08
11400	2.06	9.72	26.70	0.45	4.40
11600	2.68	7.92	23.20	0.40	7.47
11800	3.73	6.41	19.57	0.13	11.97
12000	4.54	6.09	16.82	0.79	15.59

## Typical Performance Data



## Outline Dimensions

AH2765



Weight: 1.40 gram

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

### Notes:

- Case material: Nickel Silver alloy.
- Base material: Printed wiring laminate.
- Termination finish:
  - For RoHS Case Styles: 3-5  $\mu$  inch (.08-.13 microns) Gold over 120-240  $\mu$  inch (3.05-6.10 microns) Nickel plate. All models, (+) suffix.
  - For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix

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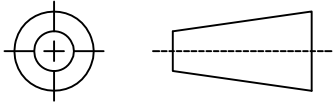
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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RF/IF MICROWAVE COMPONENTS

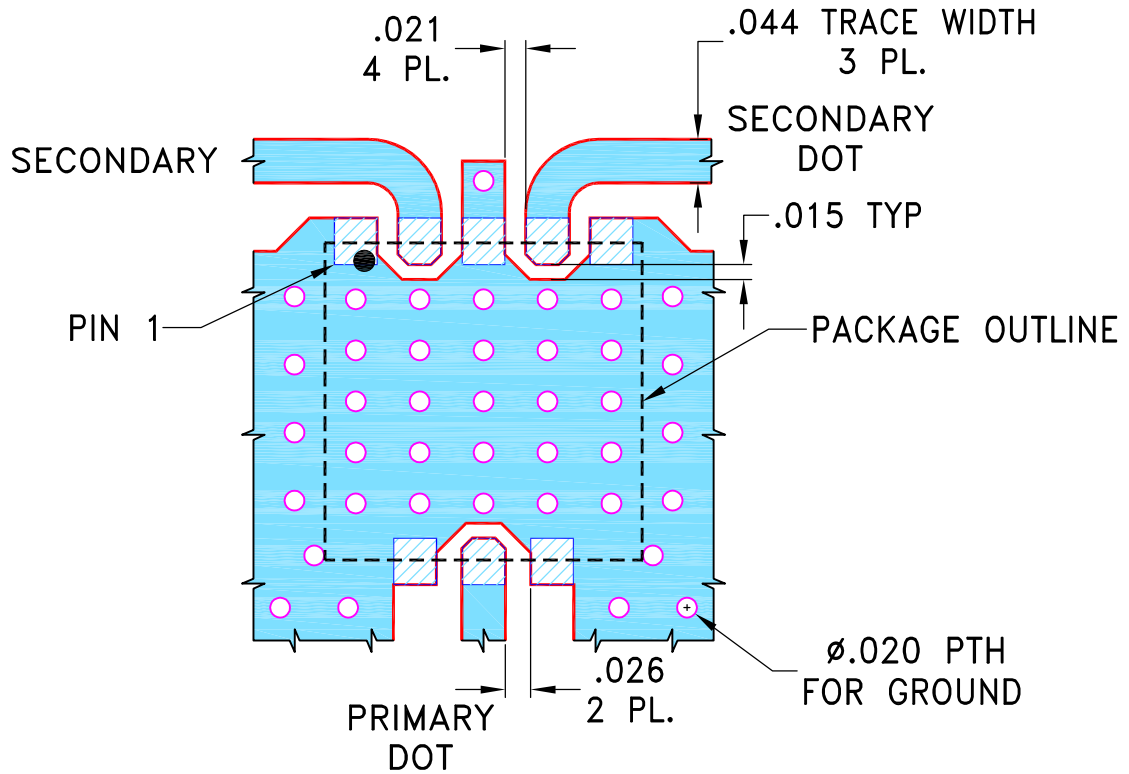
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M175300	NEW RELEASE	07/26/19	GF	TN

SUGGESTED MOUNTING CONFIGURATION  
FOR AH2765 CASE STYLE, "08TG01" PIN CODE

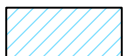


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DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

UNLESS OTHERWISE SPECIFIED	INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN GF	07/18/19
TOLERANCES ON:	CHECKED IL	07/25/19
2 PL DECIMALS ±	APPROVED TN	07/26/19
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		



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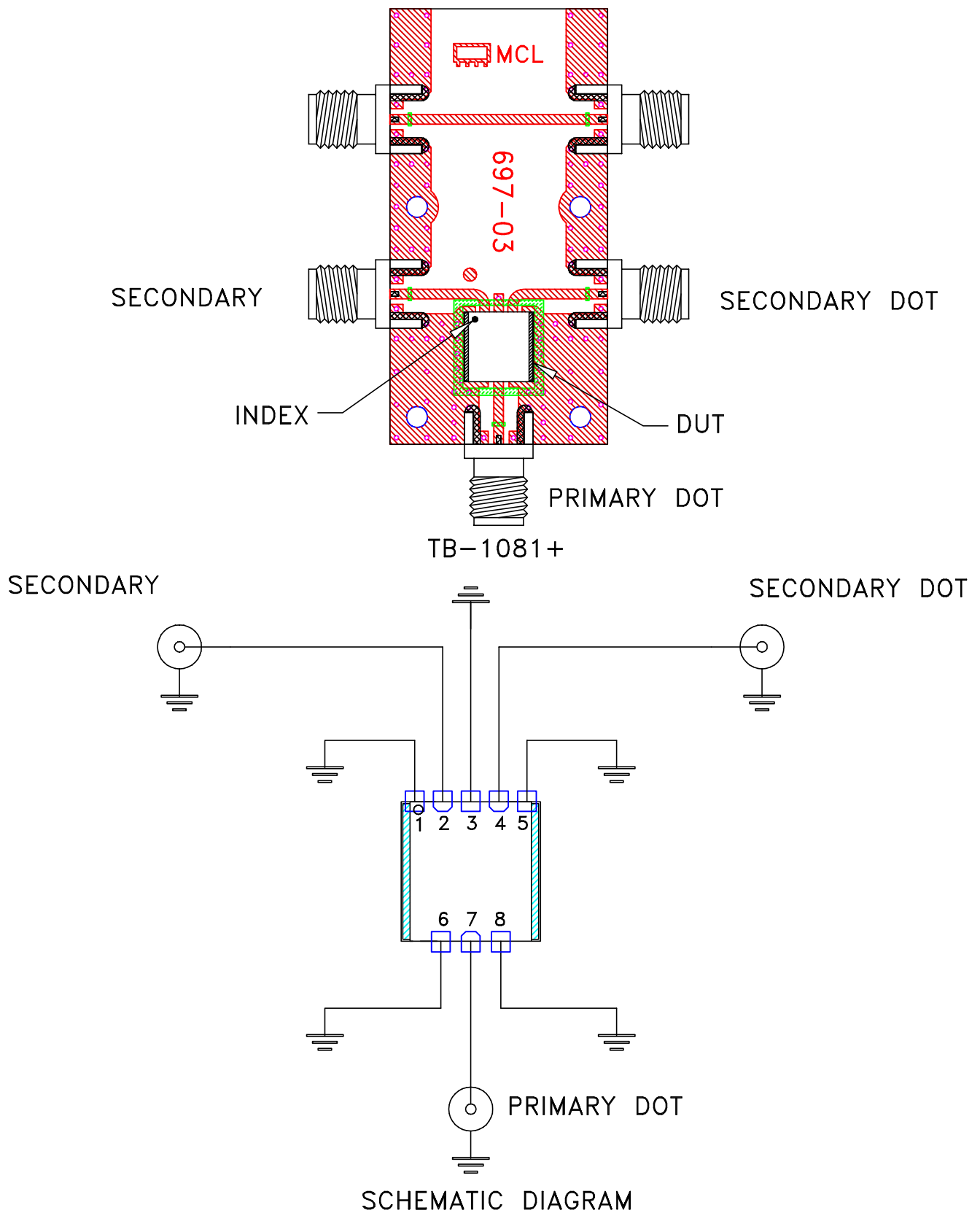
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PL, 08TG01, AH2765, TB-1081+

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SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-629	REV: OR
FILE: 98PL629	SCALE: 5:1	SHEET: 1	OF 1

# Evaluation Board and Circuit



## Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent.  
Dielectric Constant=3.5, Thickness=.020 inch.

 **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	-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