

# Surface Mount Power Splitter/Combiner

## SBB-2-13 SBB-2-13+

2 Way-0° 50Ω 950 to 1300 MHz



CASE STYLE: SM31

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

### Maximum Ratings

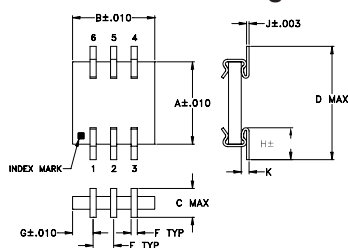
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	10W max.
Internal Dissipation	0.25W max.

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

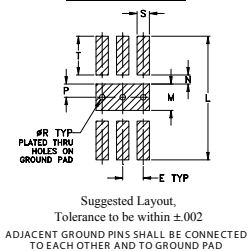
### Pin Connections

SUM PORT	2
PORT 1	6
PORT 2	4
GROUND	1,3,5

### Outline Drawing



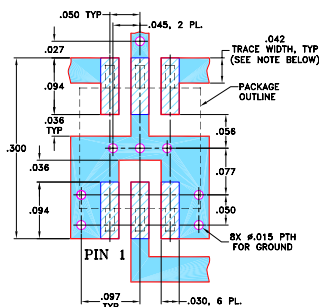
### PCB Land Pattern



### Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	K
.200	.200	.070	.275	.050	.015	.050	.085	.006	.019
5.08	5.08	1.78	6.99	1.27	0.38	1.27	2.16	0.15	0.48
L	M	N	P	Q	R	S	T	wt	
.300	.064	.022	.032	-.014	.030	.094		grams	
7.62	1.63	0.56	0.81	-	0.36	0.76	2.39	0.1	

### Demo Board MCL P/N: TB-156 Suggested PCB Layout (PL-003)



- NOTES:
- 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.
  - 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

### Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuit's 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-Circuit's website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)

### Features

- very stable performance over temp. range
- excellent insertion loss, 0.6 dB typ.
- excellent isolation, 24 dB typ.
- solder plated leads for excellent solderability and strain relief
- small size, 0.2"x0.275"x0.07"
- very low cost
- aqueous washable
- protected by U.S Patent, 6,819,202

### Applications

- satellite communications
- aeronautical

### Electrical Specifications

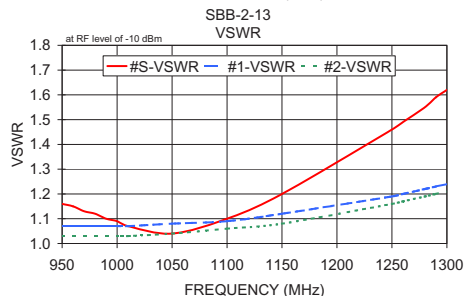
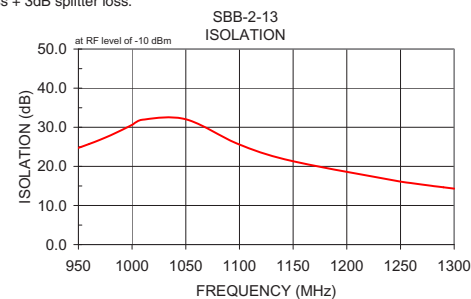
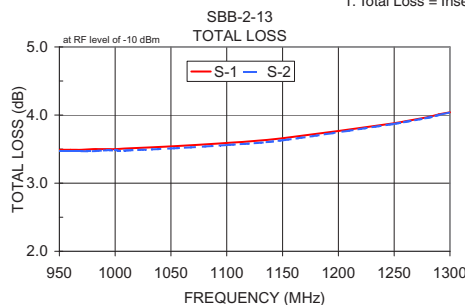
FREQ. RANGE (MHz)	ISOLATION <sup>2</sup> (dB)		INSERTION LOSS <sup>1</sup> (dB) ABOVE 3.0 dB		PHASE UNBALANCE (Degrees)	AMPLITUDE UNBALANCE (dB)
	Typ.	Min	Typ.	Max.	Max.	Max.
f <sub>L</sub> -f <sub>U</sub>						
950-1300	24	15	0.6	1.3	3.0	0.6

1. Includes test fixture losses
2. Isolation degrades to 12 dB min from 1200 to 1300 MHz.

### Typical Performance Data

Frequency (MHz)	Total Loss <sup>1</sup> (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
950.00	3.49	3.47	0.02	24.74	0.59	1.16	1.07	1.03
960.00	3.49	3.47	0.02	25.72	0.59	1.15	1.07	1.03
970.00	3.49	3.47	0.02	26.78	0.61	1.13	1.07	1.03
980.00	3.50	3.47	0.02	27.95	0.62	1.12	1.07	1.03
990.00	3.50	3.48	0.02	29.24	0.63	1.10	1.07	1.03
1000.00	3.50	3.48	0.02	30.61	0.63	1.09	1.07	1.03
1010.00	3.51	3.48	0.02	31.95	0.63	1.07	1.07	1.03
1050.00	3.54	3.51	0.03	32.06	0.63	1.04	1.08	1.04
1100.00	3.59	3.56	0.03	25.59	0.65	1.10	1.09	1.06
1150.00	3.66	3.63	0.03	21.31	0.65	1.20	1.12	1.08
1250.00	3.88	3.87	0.02	16.11	0.69	1.46	1.19	1.16
1260.00	3.91	3.90	0.02	15.72	0.68	1.49	1.20	1.17
1280.00	3.97	3.96	0.01	14.99	0.69	1.55	1.22	1.19
1290.00	4.01	4.00	0.01	14.65	0.70	1.59	1.23	1.20
1300.00	4.04	4.04	0.00	14.32	0.72	1.62	1.24	1.21

1. Total Loss = Insertion Loss + 3dB splitter loss.



### electrical schematic



# 2 Way-0° Power Splitter/Combiner

# SBB-2-13+

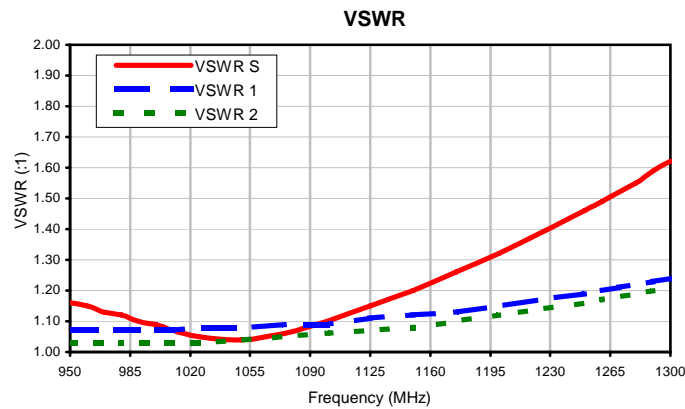
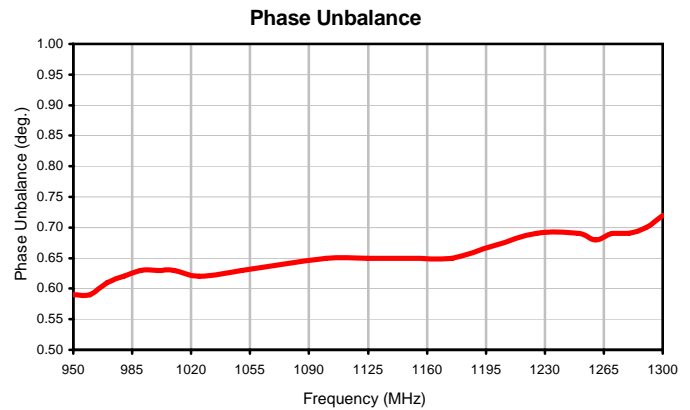
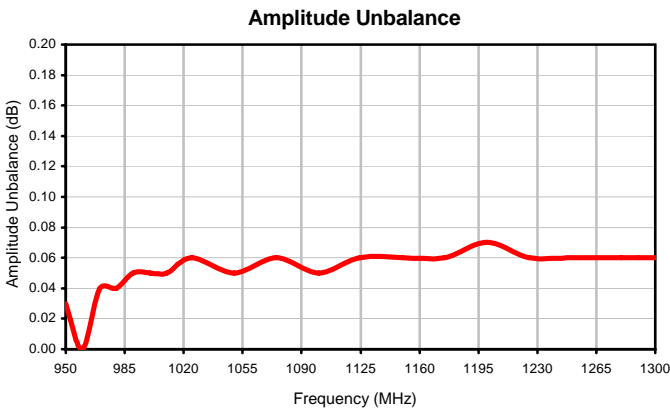
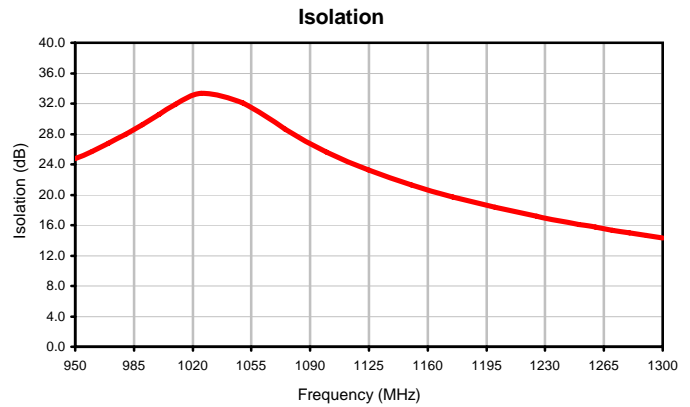
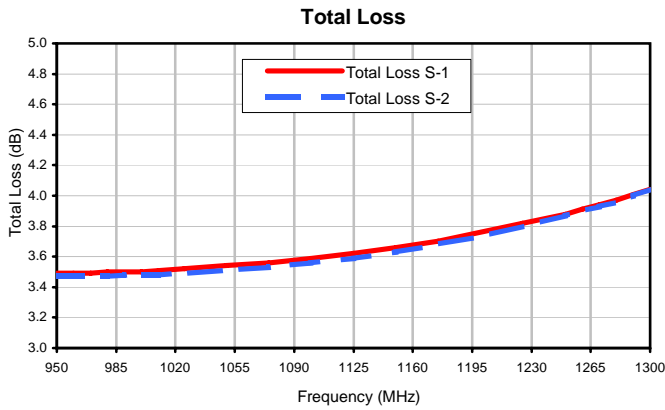
## Typical Performance Data

FREQUENCY (MHz)	TOTAL LOSS <sup>1</sup>		AMPLITUDE UNBALANCE (dB)	ISOLATION (dB) 1-2	PHASE UNBALANCE (deg.)	FREQUENCY (MHz)	VSWR (:1)		
	(dB)						S	1	2
	S-1	S-2							
950.0	3.49	3.47	0.03	24.74	0.59	950.0	1.16	1.07	1.03
960.0	3.49	3.47	0.00	25.72	0.59	960.0	1.15	1.07	1.03
970.0	3.49	3.47	0.04	26.78	0.61	970.0	1.13	1.07	1.03
980.0	3.50	3.47	0.04	27.95	0.62	980.0	1.12	1.07	1.03
990.0	3.50	3.48	0.05	29.24	0.63	990.0	1.10	1.07	1.03
1000.0	3.50	3.48	0.05	30.61	0.63	1000.0	1.09	1.07	1.03
1010.0	3.51	3.48	0.05	31.95	0.63	1010.0	1.07	1.07	1.03
1025.0	3.52	3.49	0.06	33.35	0.62	1025.0	1.05	1.08	1.03
1050.0	3.54	3.51	0.05	32.06	0.63	1050.0	1.04	1.08	1.04
1075.0	3.56	3.53	0.06	28.59	0.64	1075.0	1.06	1.09	1.05
1100.0	3.59	3.56	0.05	25.59	0.65	1100.0	1.10	1.09	1.06
1125.0	3.62	3.59	0.06	23.23	0.65	1125.0	1.15	1.11	1.07
1150.0	3.66	3.63	0.06	21.31	0.65	1150.0	1.20	1.12	1.08
1175.0	3.70	3.68	0.06	19.72	0.65	1175.0	1.26	1.13	1.10
1200.0	3.76	3.73	0.07	18.34	0.67	1200.0	1.32	1.15	1.12
1225.0	3.82	3.80	0.06	17.15	0.69	1225.0	1.39	1.17	1.14
1250.0	3.88	3.87	0.06	16.11	0.69	1250.0	1.46	1.19	1.16
1260.0	3.91	3.90	0.06	15.72	0.68	1260.0	1.49	1.20	1.17
1270.0	3.94	3.93	0.06	15.35	0.69	1270.0	1.52	1.21	1.18
1280.0	3.97	3.96	0.06	14.99	0.69	1280.0	1.55	1.22	1.19
1290.0	4.01	4.00	0.06	14.65	0.70	1290.0	1.59	1.23	1.20
1300.0	4.04	4.04	0.06	14.32	0.72	1300.0	1.62	1.24	1.21

<sup>1</sup>Total Loss = Insertion Loss + 3dB Splitter Loss



## Typical Performance Curves

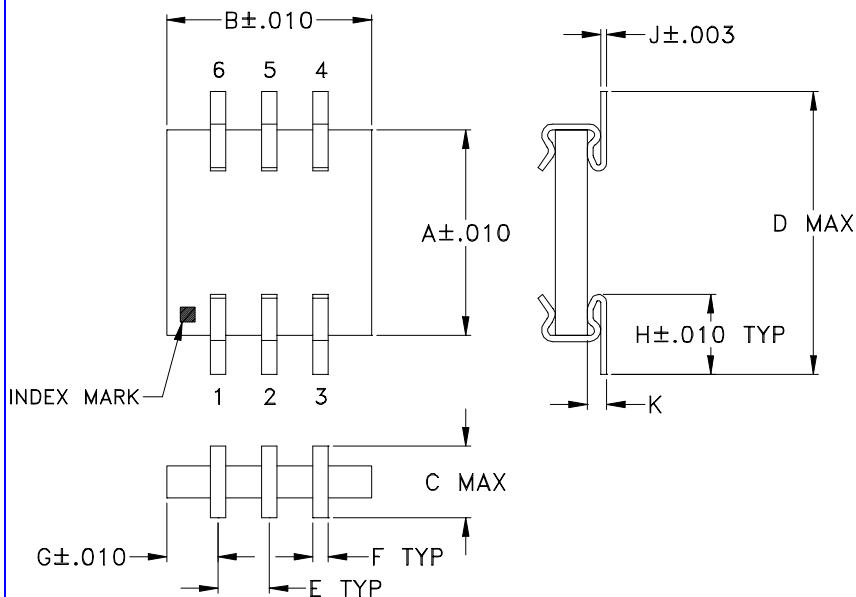


# Case Style

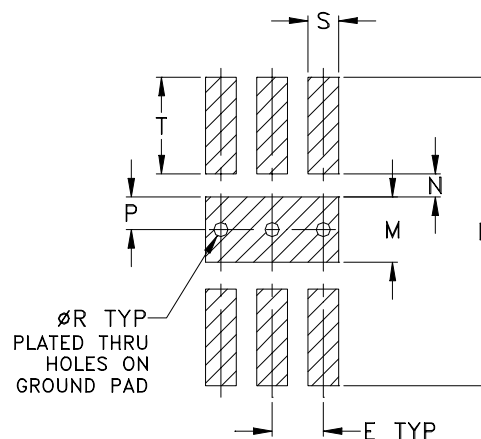
# SM31

SM31

## Outline Dimensions



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

ADJACENT GROUND PINS SHALL BE CONNECTED  
TO EACH OTHER AND TO GROUND PAD

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P
SM31	.200 (5.08)	.200 (5.08)	.070 (1.78)	.275 (6.99)	.050 (1.27)	.015 (0.38)	.050 (1.27)	.085 (2.16)	.006 (0.15)	.019 (0.48)	.300 (7.62)	.064 (1.63)	.022 (0.56)	.032 (0.81)

CASE #	Q	R	S	T	WT. GRAM
SM31	--	.014 (0.36)	.030 (0.76)	.094 (2.39)	0.1

Dimensions are in inches (mm). Tolerances:  $\pm .005$

### Notes:

- Case material: Ceramic.
- Termination finish:  
For RoHS Case Styles: Tin plate over Nickel plate.  
For RoHS-5 Case Styles: Tin-Lead plate.

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# Tape & Reel Packaging TR-F34



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
16	12	7	Small quantity standard (see note)	20
				50
				100
				200
		13	Standard	500
				1000

Note: Availability of small reel quantity varies by model.  
Refer to pricing and availability on individual model dashboard.

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.

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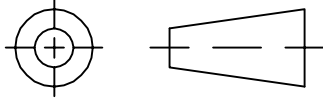
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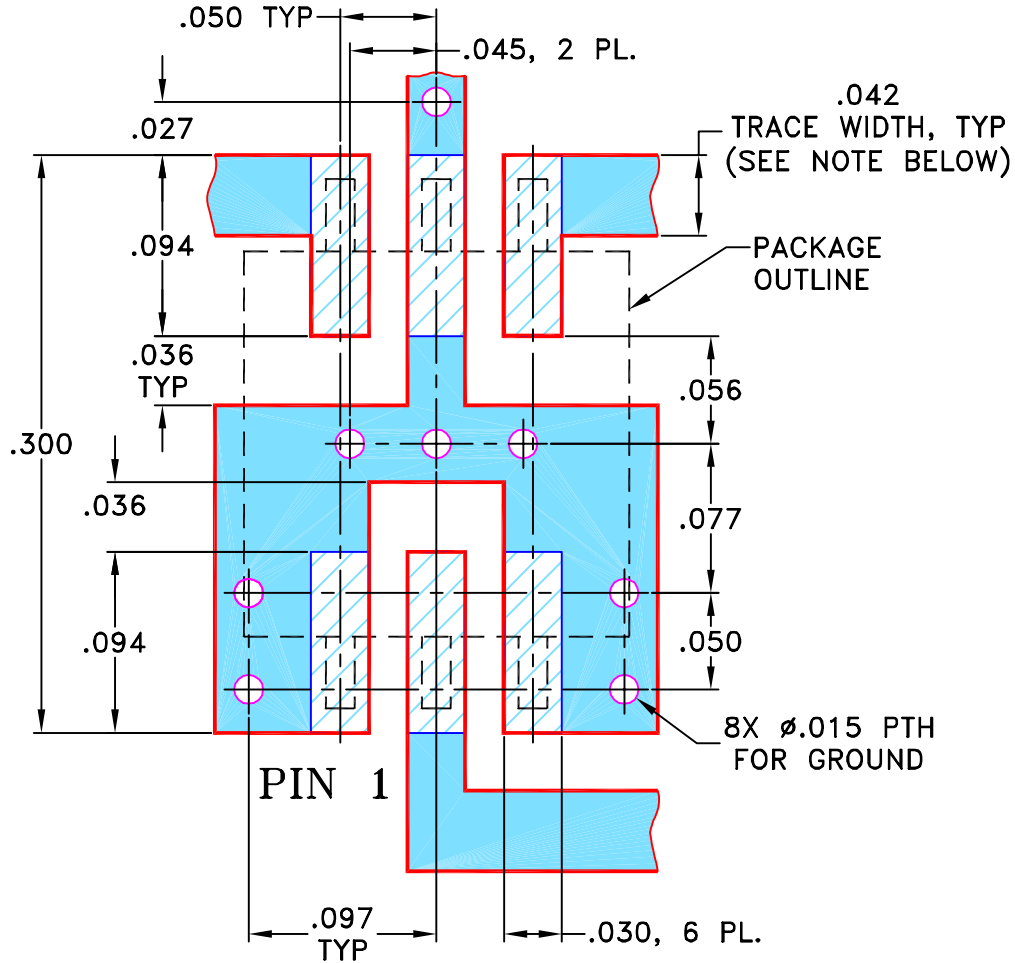
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M71387	NEW RELEASE	04/00	MMG	DB
A	M82575	UPDATED DRAWING	08/08/02	AV	HY
B	M102713	UPDATED NOTES	01/12/06	GF	IL

**SUGGESTED MOUNTING CONFIGURATION  
FOR SM31 CASE STYLE, "mu" PIN CONNECTION**



**NOTES:** 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .020"  $\pm$  .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

MMG

04/12/00

TOLERANCES ON:

CHECKED

WP

04/27/00

2 PL DECIMALS  $\pm$

APPROVED

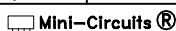
DB

04/27/00

3 PL DECIMALS  $\pm$  .005

ANGLES  $\pm$

FRACTIONS  $\pm$



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



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Brooklyn NY 11235

PL, mu, SM31, SBB, TB-156

SIZE

CODE IDENT

DRAWING NO:

REV:

A

15542

98-PL-003

B

FILE:

98PL003

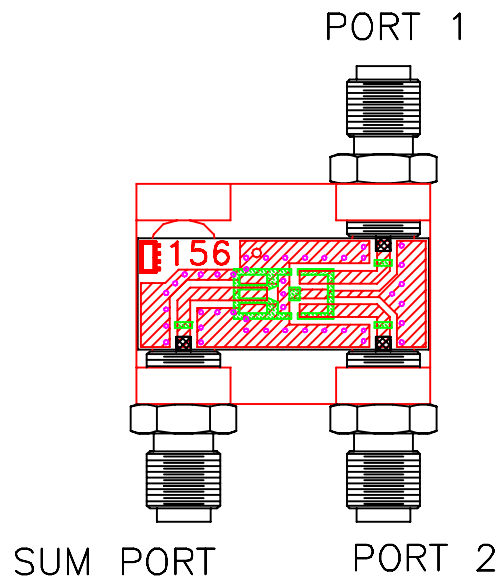
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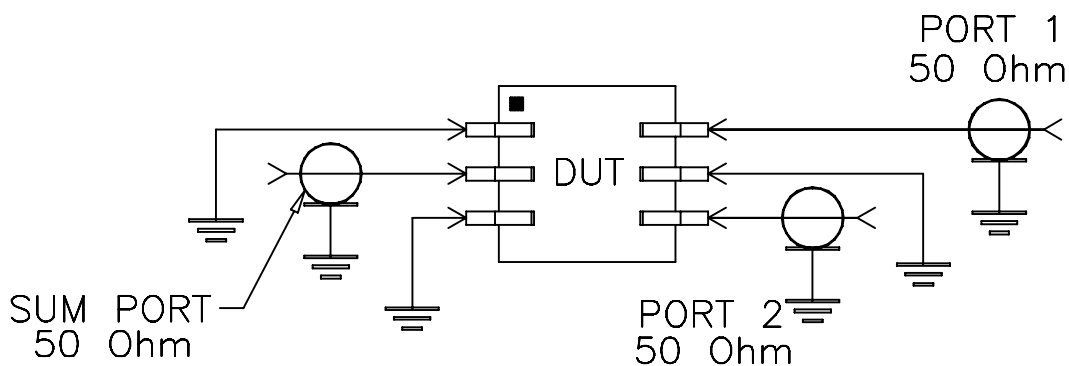
SHEET:

1 OF 1

# Evaluation Board and Circuit




TB-156



Schematic Diagram

## Notes:

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

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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