

Surface Mount

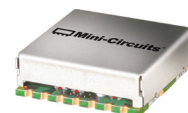
Phase Shifter

SCPHS-51+

50Ω 360° Voltage Variable 25 to 48 MHz

The Big Deal

- Low insertion loss, 2 dB typ.
- Wide phase shift, 360°
- Low frequency and small size



CASE STYLE: HU1371

Product Overview

Mini-Circuits' SCPHS-51+ is a voltage variable phase shifter providing 360° phase control from 25 to 48 MHz in a miniature surface mount package. This model has a control bandwidth of DC to 30 kHz and a control voltage range from 0 to +15V. Housed in a shielded, 12-lead package with wrap-around terminations, the unit measures only 0.87 x 0.80 x 0.25", offering a space-efficient, low-cost alternative to larger, expensive connectorized phase shifters typical for low frequency operation.

Feature	Advantages
Low insertion loss, 2.0 dB typ.	Enables good transmission of signal power from input to output and minimizes effect on system noise figure.
Wide phase shift, 360°	In test environments, 360° phase control allows the user to experiment with various incident phases. This can be used to test residual phase noise of amplifiers and to determine the influence of phase between two mismatched components in a system.
Low frequency operation and tiny size, 0.87 x 0.80 x 0.25"	Typically, lower frequency phase shifters are large, connectorized designs. SCPHS-51+ provides low frequency phase shift capability in a tiny surface mount package, saving space and reducing system cost.

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-Circuit's 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/MCLStore/terms.jsp



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Generic photo used for illustration purposes only

CASE STYLE: HU1371

+RoHS Compliant

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



Available Tape and Reel at no extra cost

Reel Size Devices/Reel
13" 200

Maximum Ratings

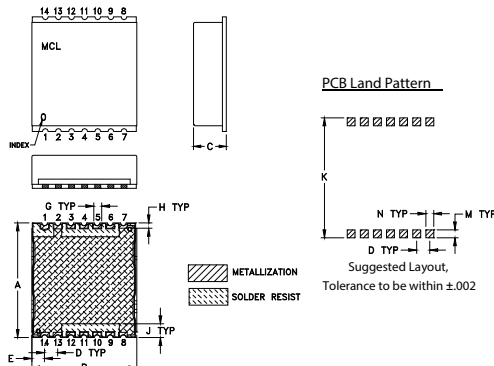
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	24 dBm max.
Control Voltage	20V
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

IN	1
OUT	6
BIAS	10,11^
GROUND	2,3,4,5,7,8,9,12,13,14

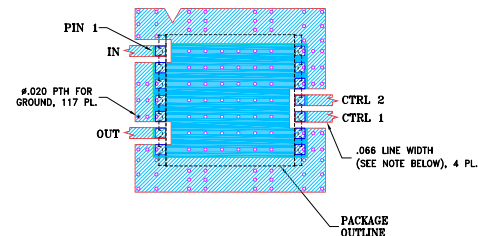
^ proper operation is achieved with pins 10 or 11 or both connected to BIAS.

Outline Drawing



Outline Dimensions (inch mm)

A	B	C	D	E	F	G	H
.870	.800	.250	.100	.097	-	.060	.040
22.10	20.32	6.35	2.54	2.46	-	1.52	1.02
J	K	L	M	N	P		wt
.105	.910	-	.060	.060	-		grams
2.67	23.11	-	1.52	1.52	-		2.85

Demo Board MCL P/N: TB-1141+
Suggested PCB Layout (PL-690)

NOTES:

- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS (30±.002"); 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.

Features

- low insertion loss, 2 dB typ.
- wide phase shift, 360°
- aqueous washable

Applications

- cellular
- PCS
- DCS

Electrical Specifications at 25°C

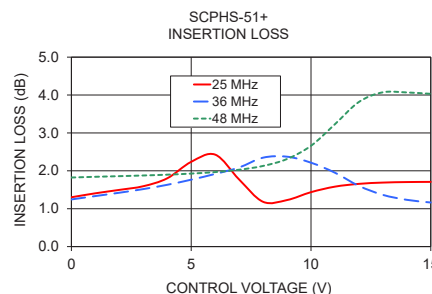
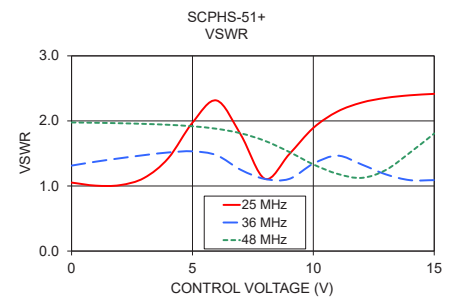
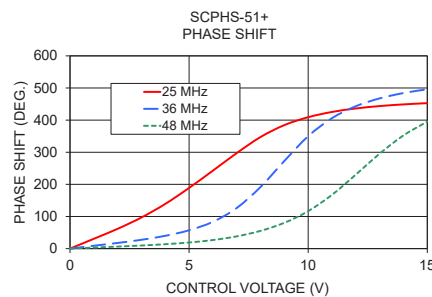
Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		25		48	MHz
Phase Range	25 - 48	360	—	—	Degrees
Insertion Loss	25 - 48	—	2	5	dB
Control Voltage	25 - 48	—	0-15	—	V
Control Bandwidth	25 - 48	—	DC-30	—	kHz
VSWR	25 - 48	—	1.3	—	:1

DC input resistance at Control port: 1460 ohms typ.

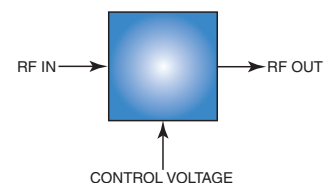
Typical Performance Data

Control Voltage (V)	Phase Shift* (Degrees)			VSWR (:1)			Insertion Loss (dB)		
	25 MHz	36 MHz	48 MHz	25 MHz	36 MHz	48 MHz	25 MHz	36 MHz	48 MHz
0	0.00	0.00	0.00	1.05	1.31	1.98	1.30	1.24	1.82
1	30.63	8.93	3.27	1.01	1.37	1.97	1.41	1.33	1.84
2	61.71	17.67	6.36	1.01	1.43	1.96	1.50	1.42	1.86
3	96.98	27.52	9.71	1.12	1.47	1.95	1.59	1.52	1.88
4	139.22	39.87	13.73	1.43	1.52	1.94	1.80	1.63	1.90
5	189.01	57.10	19.07	1.97	1.53	1.92	2.24	1.77	1.93
6	242.80	83.57	26.73	2.31	1.47	1.88	2.43	1.92	1.97
7	297.41	126.54	38.22	1.79	1.25	1.81	1.77	2.09	2.03
8	347.41	191.95	55.35	1.11	1.11	1.69	1.18	2.35	2.13
9	384.48	272.98	80.40	1.49	1.11	1.52	1.23	2.37	2.31
10	409.11	350.06	116.80	1.89	1.34	1.33	1.44	2.21	2.66
11	425.41	406.15	167.54	2.14	1.47	1.19	1.58	1.95	3.23
12	436.27	443.24	230.39	2.28	1.33	1.12	1.66	1.60	3.82
13	443.66	467.67	295.74	2.35	1.18	1.25	1.69	1.37	4.07
14	448.92	484.24	352.40	2.39	1.09	1.51	1.70	1.23	4.07
15	452.83	496.02	395.47	2.42	1.09	1.81	1.71	1.16	4.03

* Normalized at control voltage = 0V



Electrical Schematic



Notes

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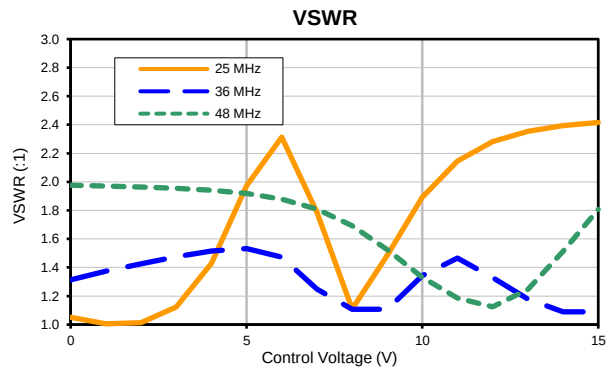
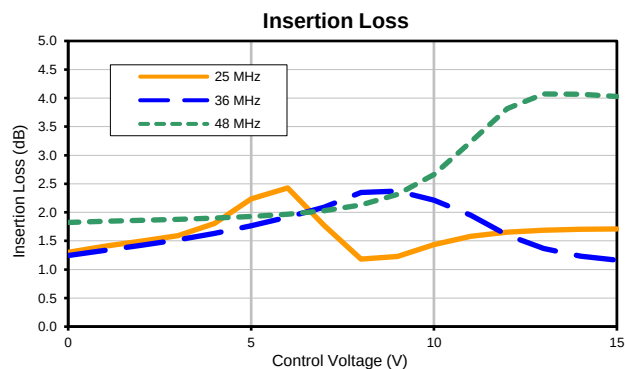
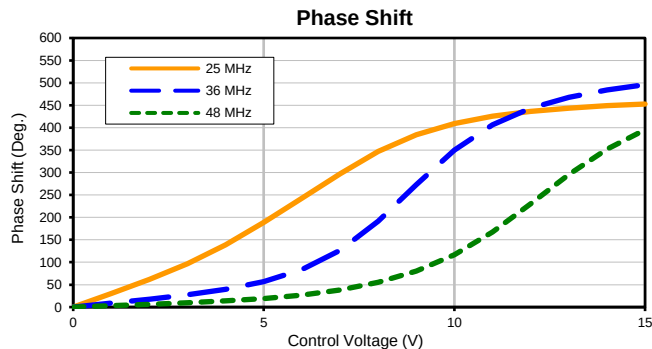


Typical Performance Data

CONTROL VOLTAGE (V)	PHASE SHIFT*			VSWR			INSERTION LOSS		
	(Deg.)			(:1)			(dB)		
	25 MHz	36 MHz	48 MHz	25 MHz	36 MHz	48 MHz	25 MHz	36 MHz	48 MHz
0	0.00	0.00	0.00	1.05	1.31	1.98	1.30	1.24	1.82
1	30.63	8.93	3.27	1.01	1.37	1.97	1.41	1.33	1.84
2	61.71	17.67	6.36	1.01	1.43	1.96	1.50	1.42	1.86
3	96.98	27.52	9.71	1.12	1.47	1.95	1.59	1.52	1.88
4	139.22	39.87	13.73	1.43	1.52	1.94	1.80	1.63	1.90
5	189.01	57.10	19.07	1.97	1.53	1.92	2.24	1.77	1.93
6	242.80	83.57	26.73	2.31	1.47	1.88	2.43	1.92	1.97
7	297.41	126.54	38.22	1.79	1.25	1.81	1.77	2.09	2.03
8	347.41	191.95	55.35	1.11	1.11	1.69	1.18	2.35	2.13
9	384.48	272.98	80.40	1.49	1.11	1.52	1.23	2.37	2.31
10	409.11	350.06	116.80	1.89	1.34	1.33	1.44	2.21	2.66
11	425.41	406.15	167.54	2.14	1.47	1.19	1.58	1.95	3.23
12	436.27	443.24	230.39	2.28	1.33	1.12	1.66	1.60	3.82
13	443.66	467.67	295.74	2.35	1.18	1.25	1.69	1.37	4.07
14	448.92	484.24	352.40	2.39	1.09	1.51	1.70	1.23	4.07
15	452.83	496.02	395.47	2.42	1.09	1.81	1.71	1.16	4.03

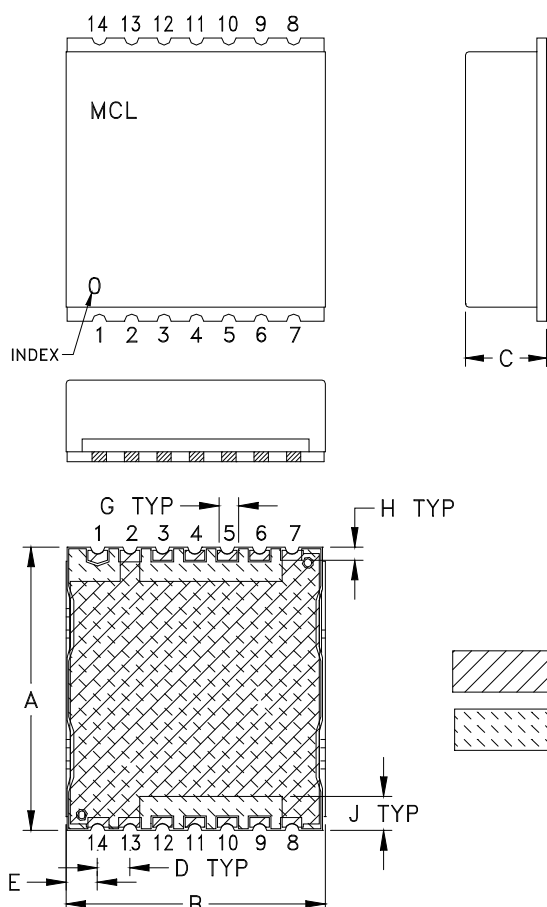
*Normalized at control voltage = 0V

Typical Performance Curves

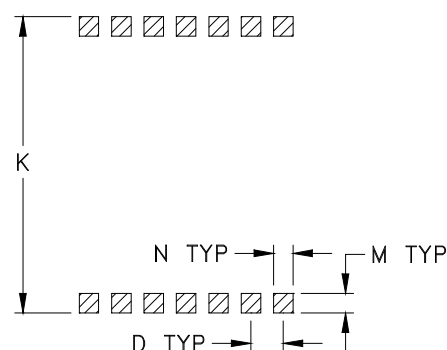


Outline Dimensions

HU1371



PCB Land Pattern



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

CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT, GRAM
HU1371	.870 (22.10)	.800 (20.32)	.25 (6.35)	.100 (2.54)	.097 (2.46)	-	.060 (1.52)	.040 (1.02)	.105 (2.67)	.910 (23.11)	-	.060 (1.52)	.060 (1.52)	-	2.85

Dimensions are in inches (mm). Tolerances: 2PL. +/- .03; 3PL. +/- .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:

For RoHS Case Styles: 2-5 μ inch (.05-.13 microns) Gold over .120-.240 μ inch (3.05-6.10 microns) Nickel plate. All models (+) suffix.



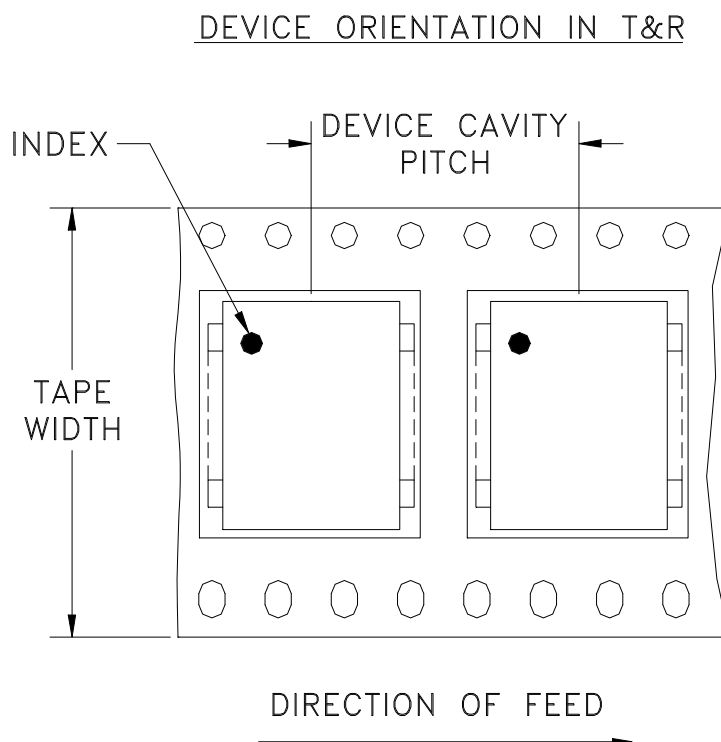
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The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F21



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel
32	32	13	200

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



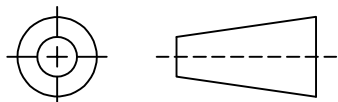
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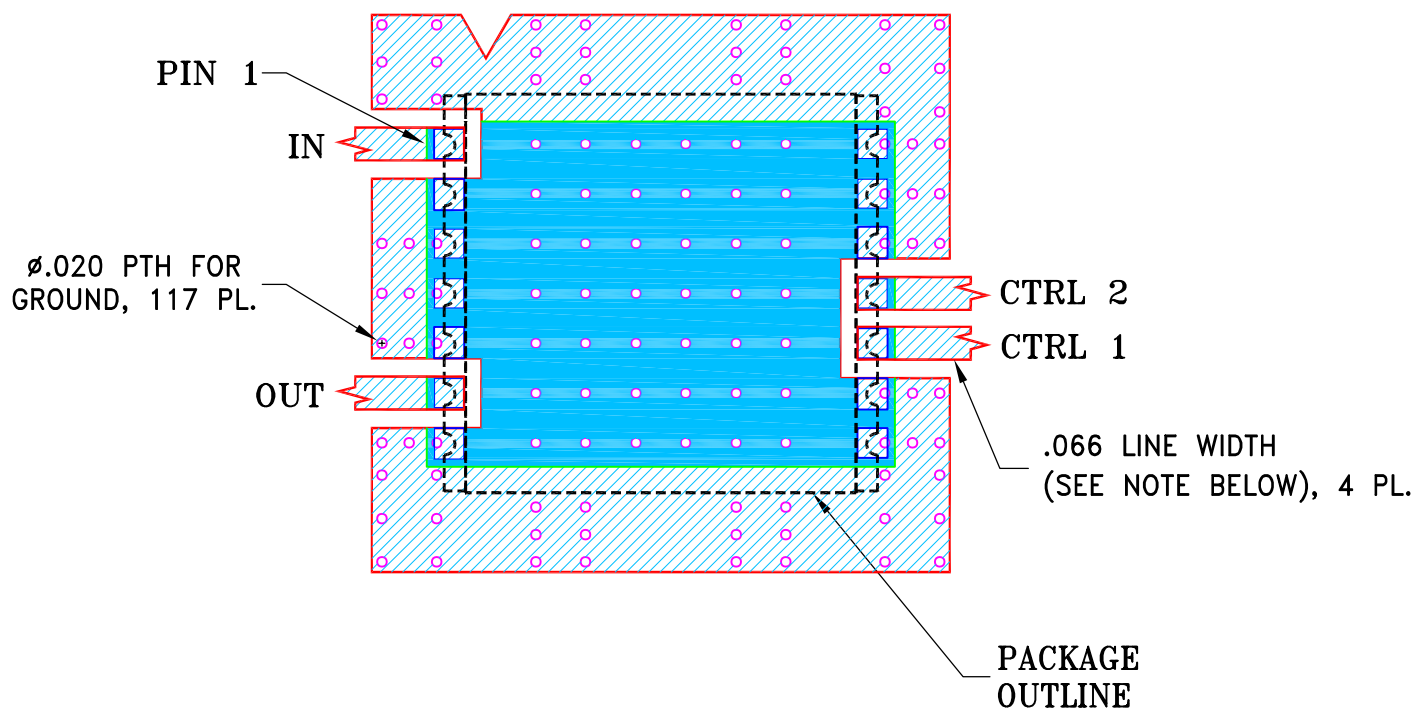
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-003790	NEW RELEASE	08/24/20	ITG	IL

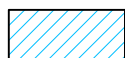
SUGGESTED MOUNTING CONFIGURATION FOR
HU1371 CASE STYLE

**NOTES:**

- TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS $.030 \pm .002$ "; 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.

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

ITG

08/24/20

TOLERANCES ON:

CHECKED

GF

08/24/20

2 PL DECIMALS $\pm$

APPROVED

IL

08/24/20

3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$

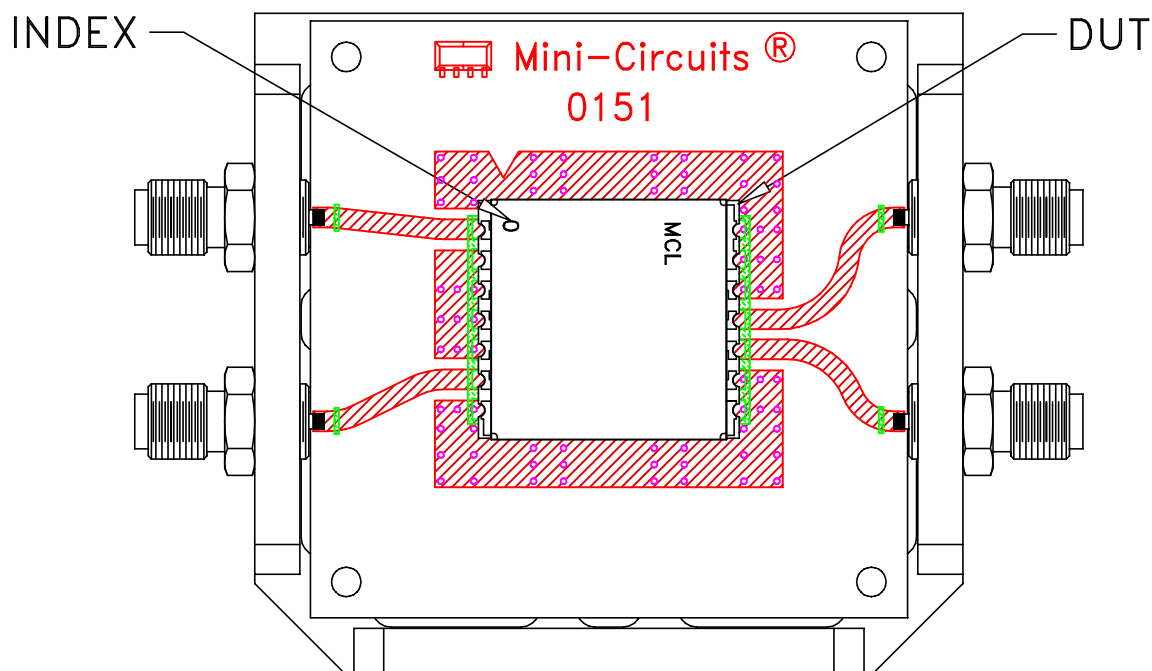
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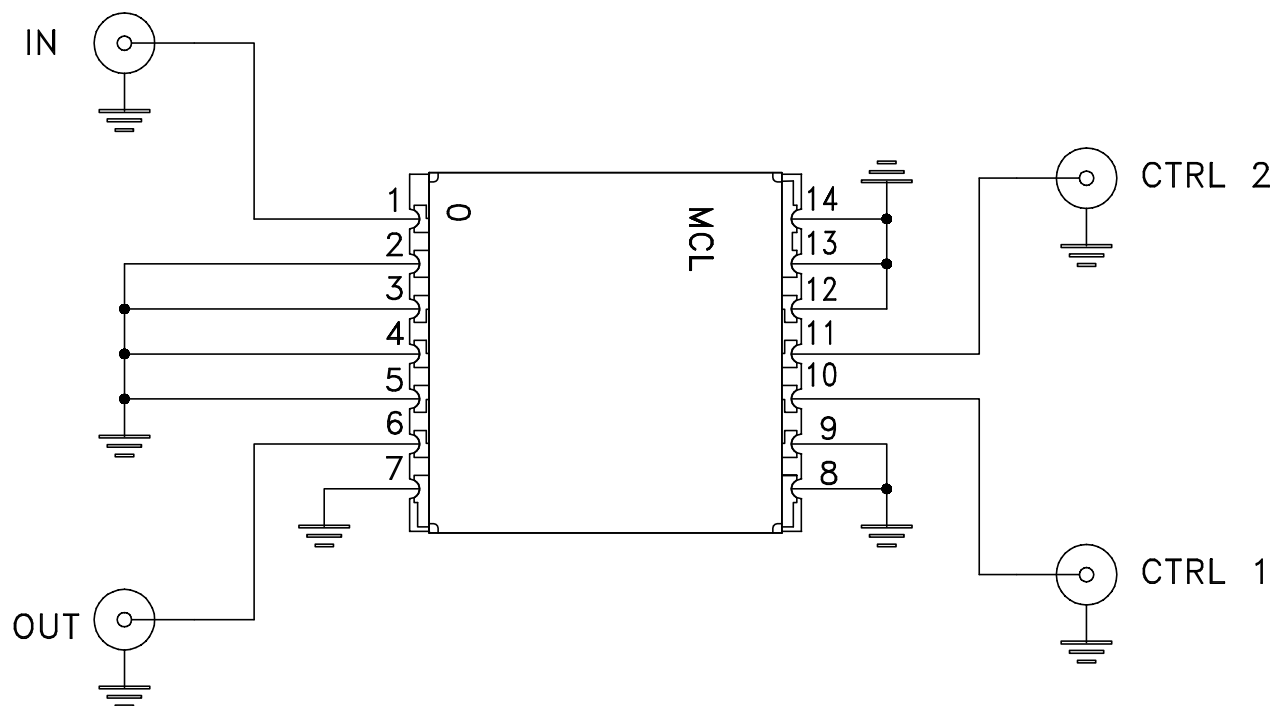
ASHEETA1.DWG REV:A DATE:01/12/95

**Mini-Circuits®**13 Neptune Avenue
Brooklyn NY 11235**PL, HU1371, TB-1141+**SIZE
ACODE IDENT
15542DRAWING NO:
98-PL-690REV:
ORFILE: **98PL690**SCALE: **2.5:1**SHEET: **1 OF 1**

Evaluation Board and Circuit



TB-SCPHS-51+



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent.
Dielectric Constant=3.5, Thickness=.030 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