

Surface Mount

Phase Shifter

SCPHS-13.6+

50Ω 360° Voltage Variable 10 to 16 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-13.6+ is a voltage variable phase shifter providing 360° phase control from 10 to 16 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 +12V. Housed in a shielded, 14-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 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.

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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50Ω 360° Voltage Variable 10 to 16 MHz

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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 13" Devices/Reel 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

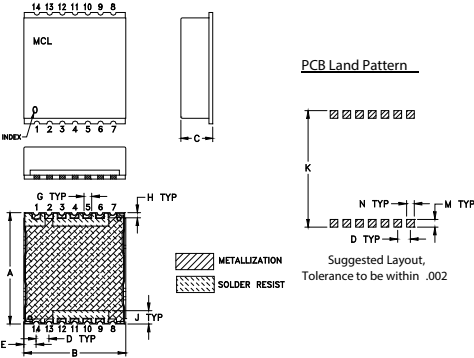
Permanent damage may occur if any of these limits are exceeded.

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.

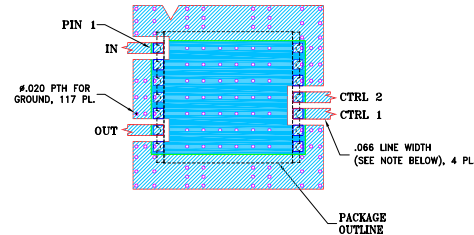
Outline Drawing



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:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .030±.002"; 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.

Features

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

Applications

- cellular
- PCS
- DCS

Electrical Specifications at 25°C

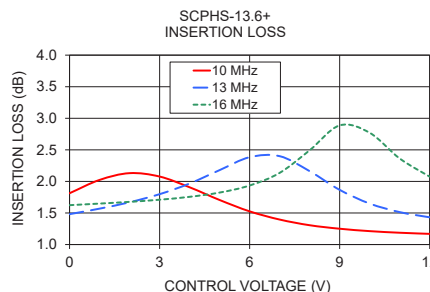
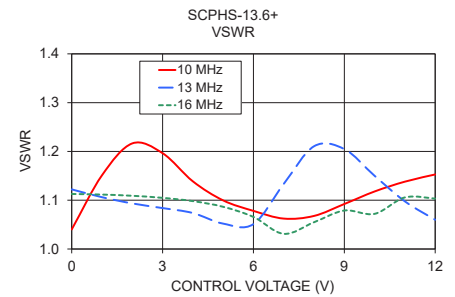
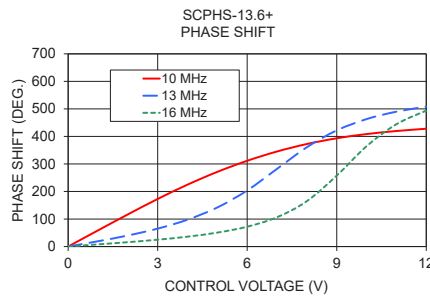
Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		10		16	MHz
Phase Range	10 - 16	360	—	—	Degrees
Insertion Loss	10 - 16	—	2	3.5	dB
Control Voltage	10 - 16	—	0-12	—	V
Control Bandwidth	10 - 16	—	DC-30	—	kHz
VSWR	10 - 16	—	1.2	1.6	:1

DC input resistance at Control port: 1750 ohms typ.

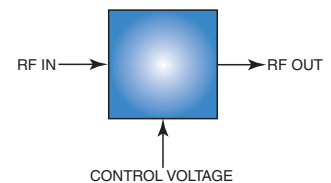
Typical Performance Data

Control Voltage (V)	Phase Shift* (Degrees)			VSWR (:1)			Insertion Loss (dB)		
	10 MHz	13 MHz	16 MHz	10 MHz	13 MHz	16 MHz	10 MHz	13 MHz	16 MHz
0.00	0.07	0.08	0.07	1.04	1.12	1.11	1.81	1.48	1.62
1.00	58.74	19.34	7.98	1.15	1.11	1.11	2.02	1.57	1.65
2.00	116.79	40.19	15.96	1.22	1.09	1.11	2.13	1.67	1.68
3.00	172.84	65.21	24.94	1.20	1.08	1.10	2.08	1.80	1.71
4.00	224.93	97.66	36.01	1.14	1.07	1.10	1.91	1.97	1.76
5.00	271.40	142.07	50.72	1.10	1.05	1.09	1.71	2.18	1.82
6.00	311.60	203.85	72.22	1.08	1.05	1.07	1.53	2.38	1.94
7.00	345.37	282.31	106.64	1.06	1.13	1.03	1.40	2.40	2.14
8.00	372.53	360.90	164.94	1.07	1.21	1.05	1.31	2.16	2.49
9.00	393.29	421.96	257.78	1.09	1.20	1.08	1.25	1.87	2.89
10.00	408.59	463.04	364.48	1.12	1.15	1.07	1.21	1.65	2.77
11.00	419.70	489.97	444.42	1.14	1.10	1.11	1.19	1.51	2.36
12.00	427.99	508.08	493.77	1.15	1.06	1.10	1.17	1.43	2.08

* Normalized at control voltage = 0V



Electrical Schematic



Notes

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REV. OR
ECO-004003
SCPHS-13.6+
AG/CP/AM
200908

PHASE SHIFTER

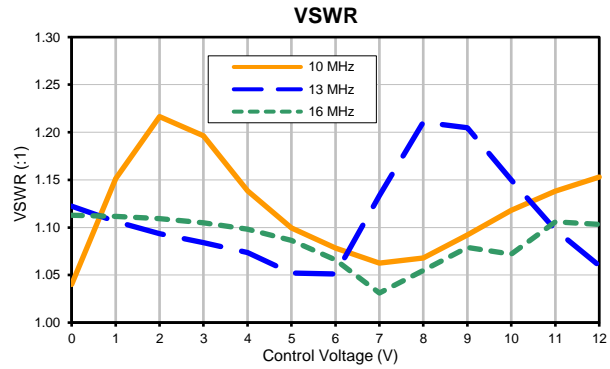
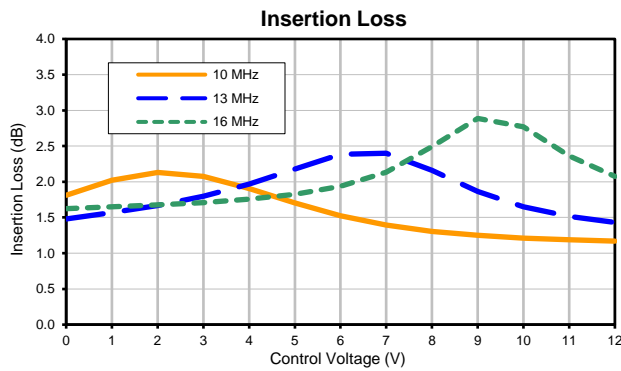
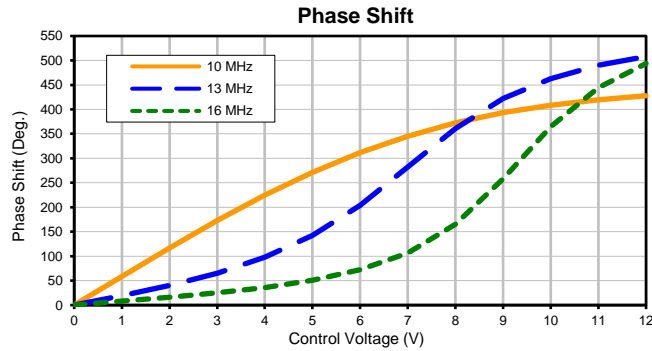
SCPHS-13.6+

Typical Performance Data

CONTROL VOLTAGE (V)	PHASE SHIFT*			VSWR			INSERTION LOSS		
	(Deg.)			(:1)			(dB)		
	10 MHz	13 MHz	16 MHz	10 MHz	13 MHz	16 MHz	10 MHz	13 MHz	16 MHz
0	0.07	0.08	0.07	1.04	1.12	1.11	1.81	1.48	1.62
1	58.74	19.34	7.98	1.15	1.11	1.11	2.02	1.57	1.65
2	116.79	40.19	15.96	1.22	1.09	1.11	2.13	1.67	1.68
3	172.84	65.21	24.94	1.20	1.08	1.10	2.08	1.80	1.71
4	224.93	97.66	36.01	1.14	1.07	1.10	1.91	1.97	1.76
5	271.40	142.07	50.72	1.10	1.05	1.09	1.71	2.18	1.82
6	311.60	203.85	72.22	1.08	1.05	1.07	1.53	2.38	1.94
7	345.37	282.31	106.64	1.06	1.13	1.03	1.40	2.40	2.14
8	372.53	360.90	164.94	1.07	1.21	1.05	1.31	2.16	2.49
9	393.29	421.96	257.78	1.09	1.20	1.08	1.25	1.87	2.89
10	408.59	463.04	364.48	1.12	1.15	1.07	1.21	1.65	2.77
11	419.70	489.97	444.42	1.14	1.10	1.11	1.19	1.51	2.36
12	427.99	508.08	493.77	1.15	1.06	1.10	1.17	1.43	2.08

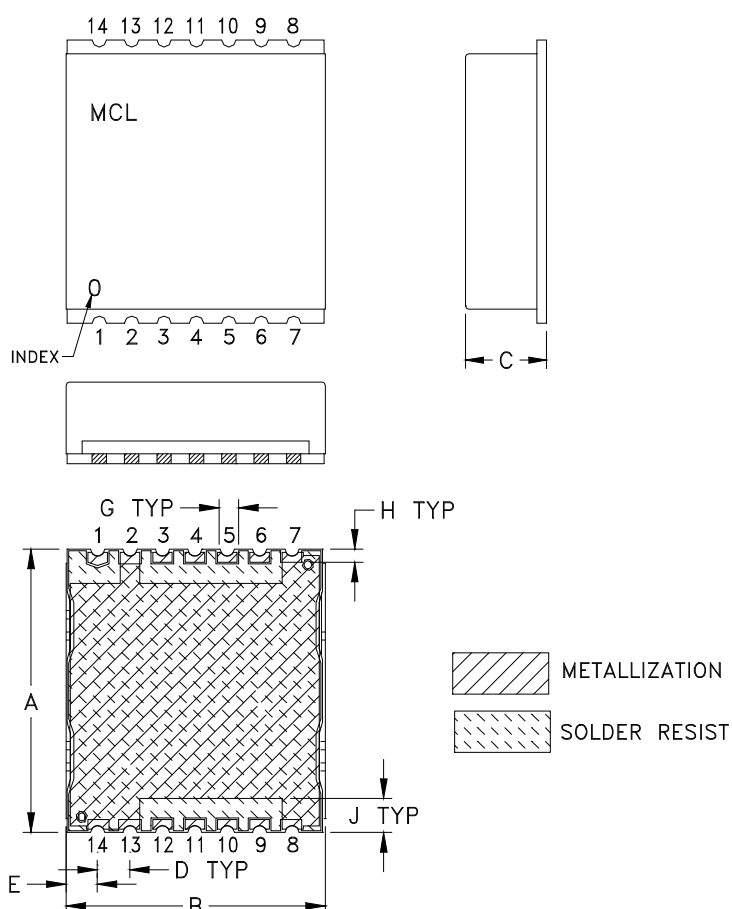
*Normalized at control voltage = 0V

Typical Performance Curves

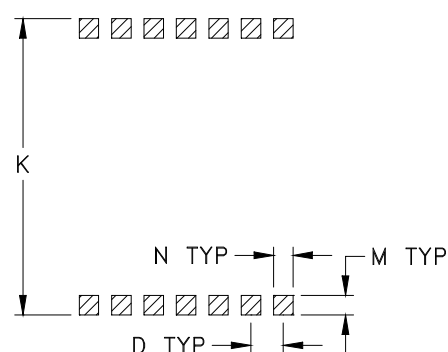


Outline Dimensions

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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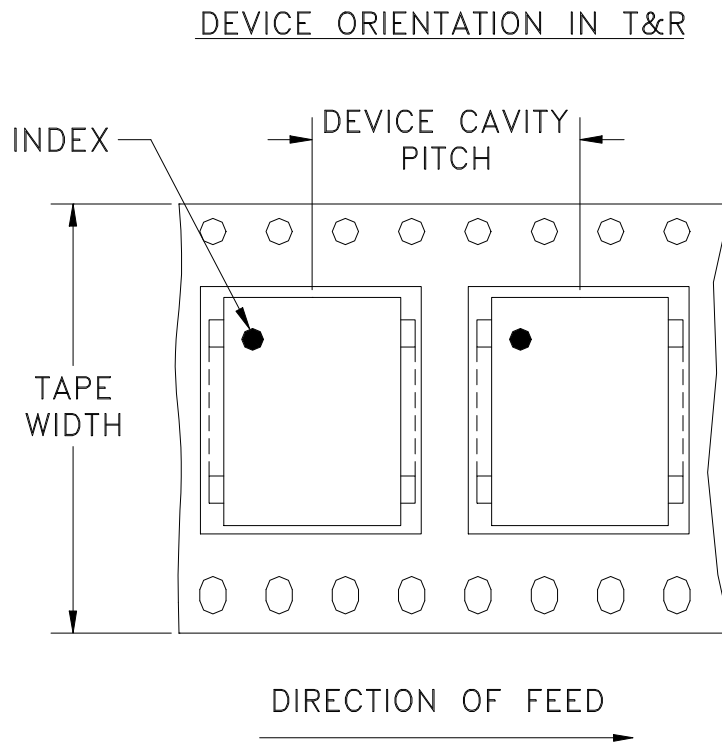
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RF/IF MICROWAVE COMPONENTS

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.

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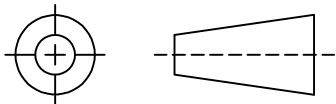
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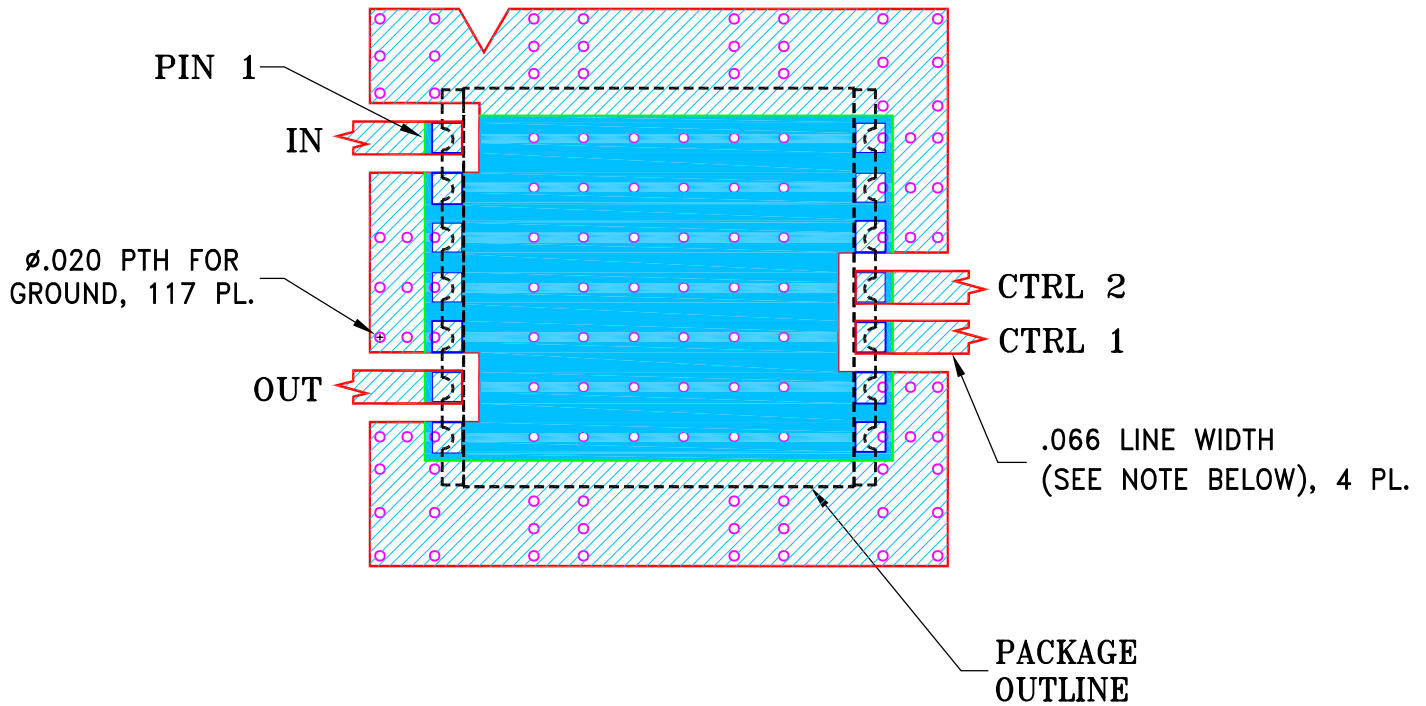
THIRD ANGLE PROJECTION



REVISIONS


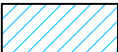
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	ECO-003790	NEW RELEASE	08/24/20	ITG	IL

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 ±	APPROVED IL	08/24/20
3 PL DECIMALS ± .005		
ANGLES ±		
FRACTIONS ±		



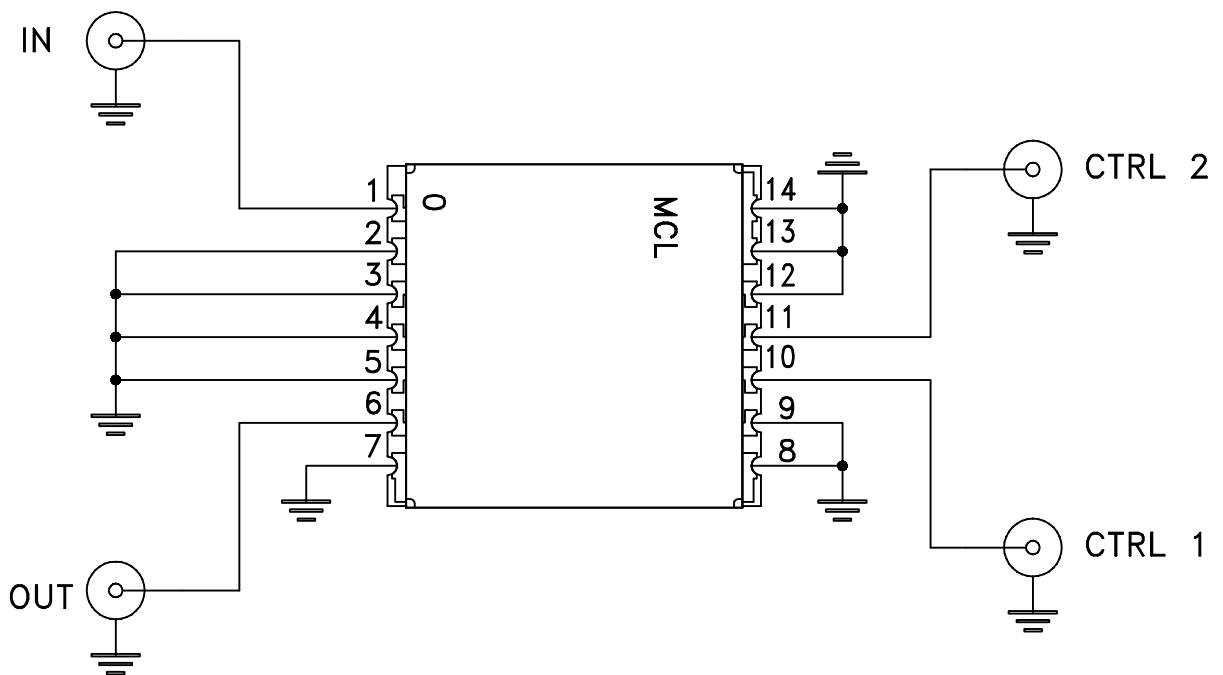
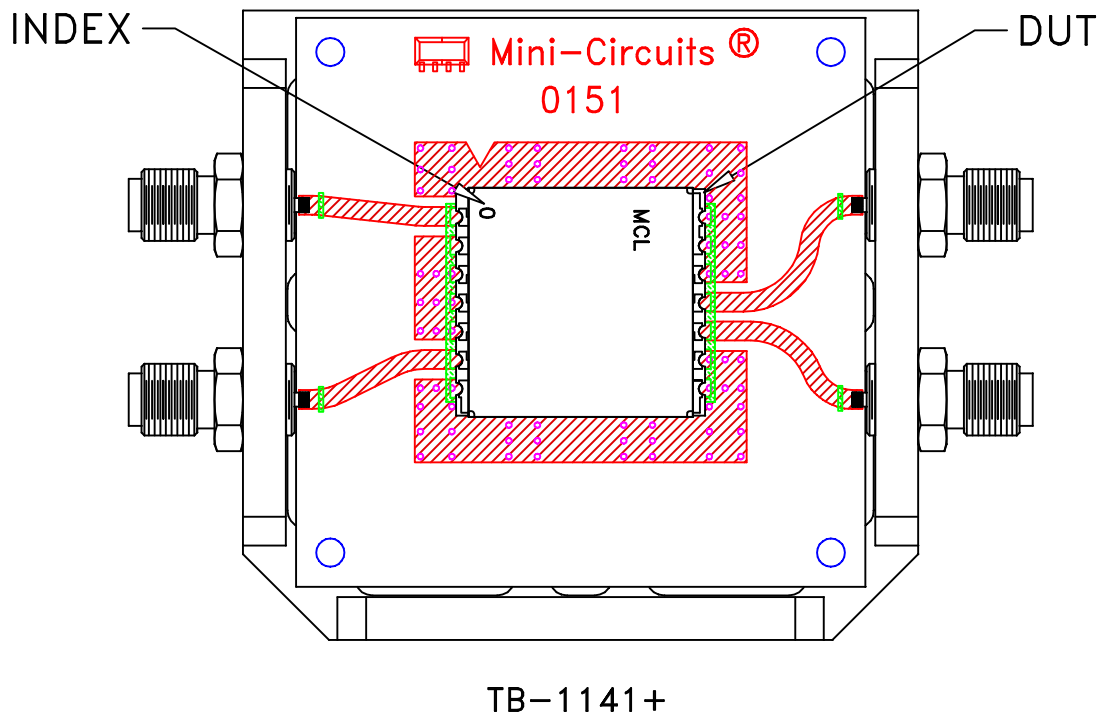
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PL, HU1371, TB-1141+

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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-690	OR
FILE:	98PL690	SCALE: 2.5:1	SHEET: 1 OF 1

Evaluation Board and Circuit



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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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