

Surface Mount

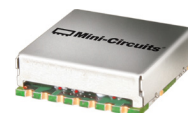
# Phase Shifter

SCPHS-180+

50Ω 360° Voltage Variable 90 to 180 MHz

## The Big Deal

- Low insertion loss, 2.2 dB typ.
- Wide phase shift, 360°
- Low frequency and small size



CASE STYLE: HU1371

## Product Overview

Mini-Circuits' SCPHS-180+ is a voltage variable phase shifter providing 360° phase control from 90 to 180 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 +10V. 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, 2.2 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.
Low frequency operation and tiny size, 0.87 x 0.80 x 0.25"	Typically, lower frequency phase shifters are large, connectorized designs. SCPHS-180+ 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](http://www.minicircuits.com/MCLStore/terms.jsp)



# Surface Mount Phase Shifter

50Ω 360° Voltage Variable 90 to 180 MHz

## SCPHS-180+



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

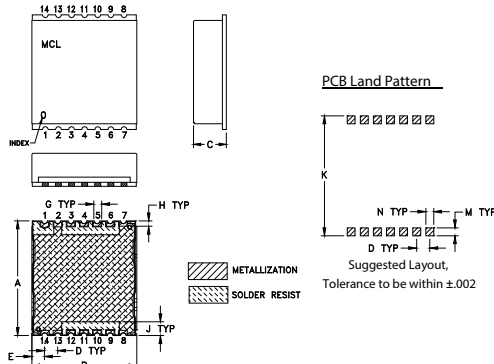
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power	24 dBm max.
Control Voltage	15V
Permanent damage may occur if any of these limits are exceeded.	

### 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.

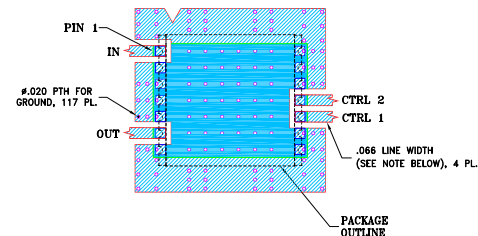
### Outline Drawing



### 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 .0302-.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, 2.2 dB typ.
- wide phase shift, 360°
- aqueous washable

### Applications

- FM Broadcast
- Aircraft Communication
- VHF

### Electrical Specifications at 25°C

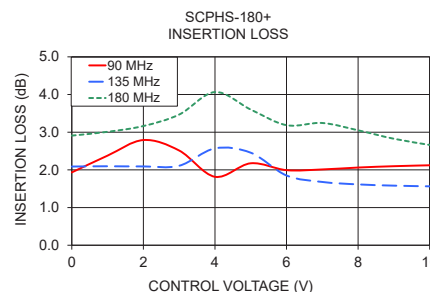
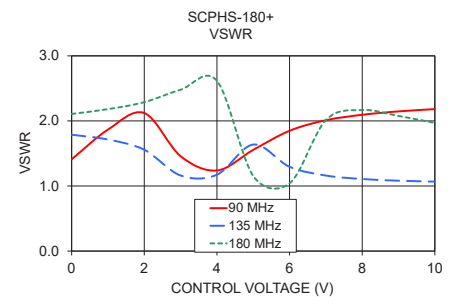
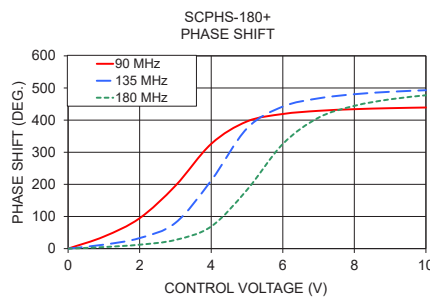
Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		90		180	MHz
Phase Range	90-180	360	—	—	Degrees
Insertion Loss	90-180	—	2.2	5	dB
Control Voltage	90-180	—	0-10	—	V
Control Bandwidth	90-180	—	DC-30	—	kHz
VSWR	90-180	—	1.7	—	:1

DC input resistance at Control port: 1460 ohms typ.

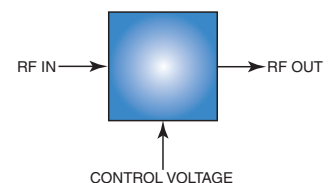
### Typical Performance Data

Control Voltage (V)	Phase Shift* (Degrees)			VSWR (:1)			Insertion Loss (dB)		
	90 MHz	135 MHz	180 MHz	90 MHz	135 MHz	180 MHz	90 MHz	135 MHz	180 MHz
0	0.0	0.0	0.0	1.4	1.8	2.1	1.9	2.1	2.9
1	37.5	12.4	4.9	1.9	1.7	2.2	2.4	2.1	3.0
2	94.8	32.8	12.3	2.1	1.6	2.3	2.8	2.1	3.2
3	195.8	80.3	27.1	1.5	1.2	2.5	2.5	2.1	3.5
4	326.1	212.1	69.0	1.2	1.2	2.6	1.8	2.6	4.1
5	395.9	374.3	182.8	1.6	1.6	1.2	2.2	2.5	3.6
6	419.0	442.1	325.7	1.8	1.3	1.0	2.0	1.9	3.2
7	428.9	467.8	407.7	2.0	1.2	2.0	2.0	1.7	3.2
8	434.1	480.6	444.4	2.1	1.1	2.2	2.1	1.6	3.0
9	437.2	488.2	464.7	2.1	1.1	2.1	2.1	1.6	2.8
10	439.2	493.1	477.3	2.2	1.1	2.0	2.1	1.6	2.7

\* Normalized at control voltage = 0V



### Electrical Schematic



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REV. OR  
ECO-006945  
SCPHS-180+  
ZL/CP/AM  
210419

# PHASE SHIFTER

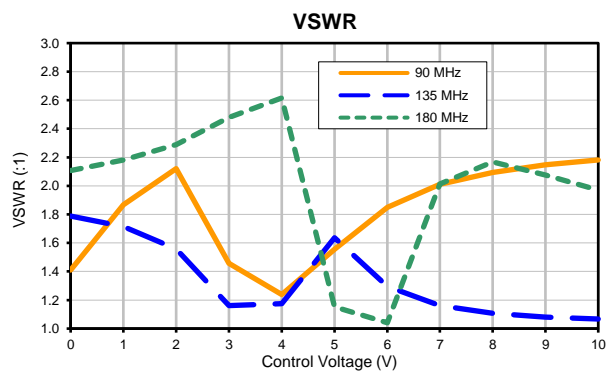
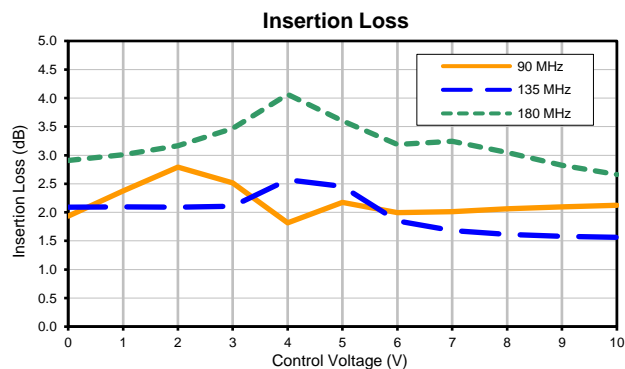
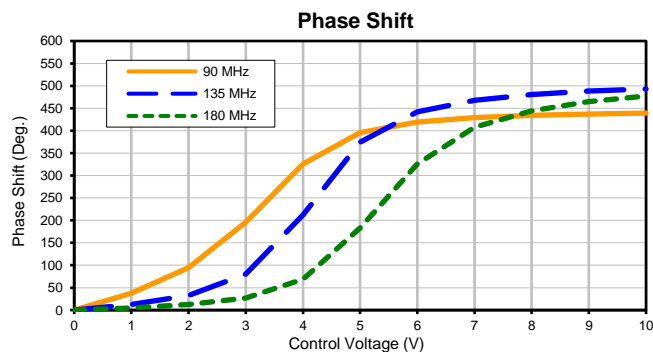
# SCPHS-180+

## Typical Performance Data

CONTROL VOLTAGE (V)	PHASE SHIFT*			VSWR			INSERTION LOSS		
	(Deg.)			(:1)			(dB)		
	90 MHz	135 MHz	180 MHz	90 MHz	135 MHz	180 MHz	90 MHz	135 MHz	180 MHz
0	0.00	0.00	0.00	1.41	1.79	2.11	1.93	2.09	2.91
1	37.50	12.41	4.89	1.87	1.71	2.18	2.38	2.10	3.01
2	94.76	32.84	12.26	2.12	1.56	2.29	2.79	2.09	3.16
3	195.76	80.28	27.10	1.46	1.16	2.48	2.51	2.11	3.47
4	326.11	212.07	68.99	1.24	1.17	2.62	1.82	2.57	4.07
5	395.90	374.31	182.81	1.56	1.64	1.15	2.17	2.46	3.60
6	419.04	442.14	325.70	1.85	1.30	1.04	1.99	1.85	3.19
7	428.93	467.80	407.67	2.01	1.16	2.01	2.01	1.68	3.24
8	434.06	480.58	444.42	2.09	1.11	2.17	2.06	1.61	3.05
9	437.19	488.17	464.75	2.15	1.08	2.08	2.10	1.58	2.83
10	439.25	493.08	477.35	2.18	1.07	1.97	2.12	1.56	2.66

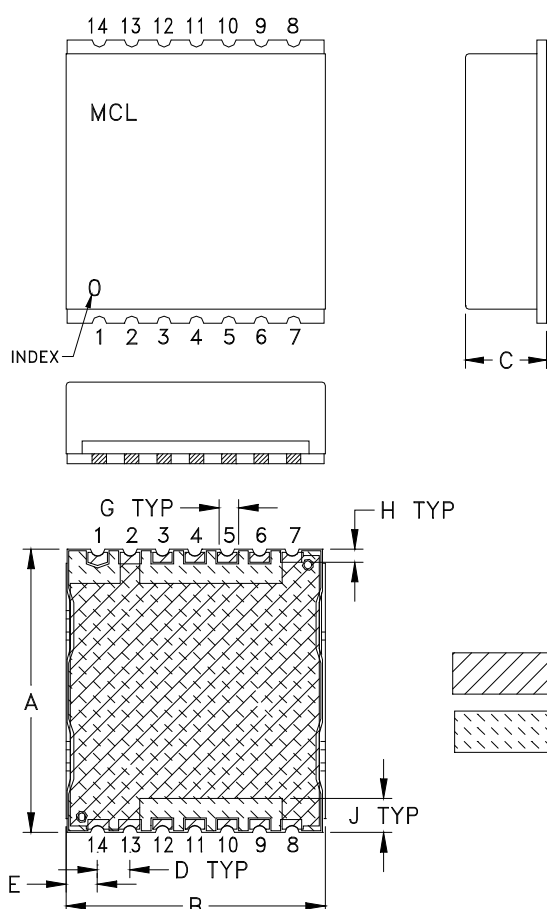
\*Normalized at control voltage = 0V

## Typical Performance Curves

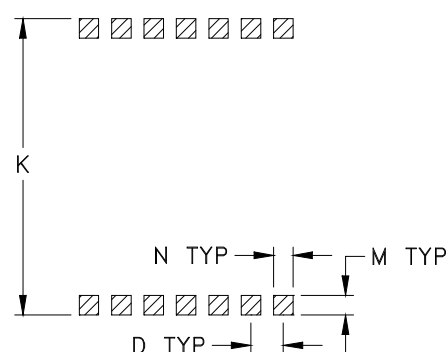


## Outline Dimensions

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  $\mu$  inch (.05-.13 microns) Gold over .120-.240  $\mu$  inch (3.05-6.10 microns) Nickel plate. All models (+) suffix.



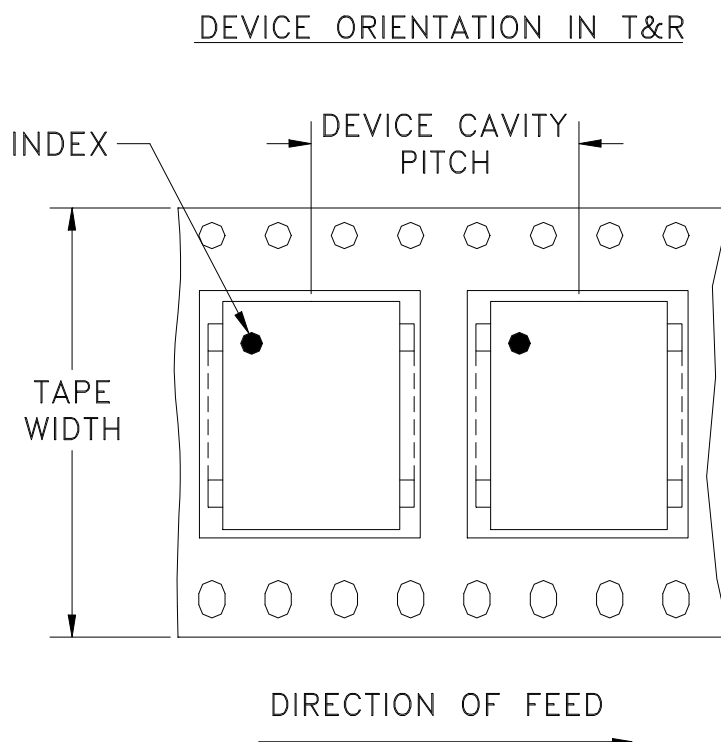
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



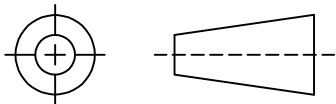
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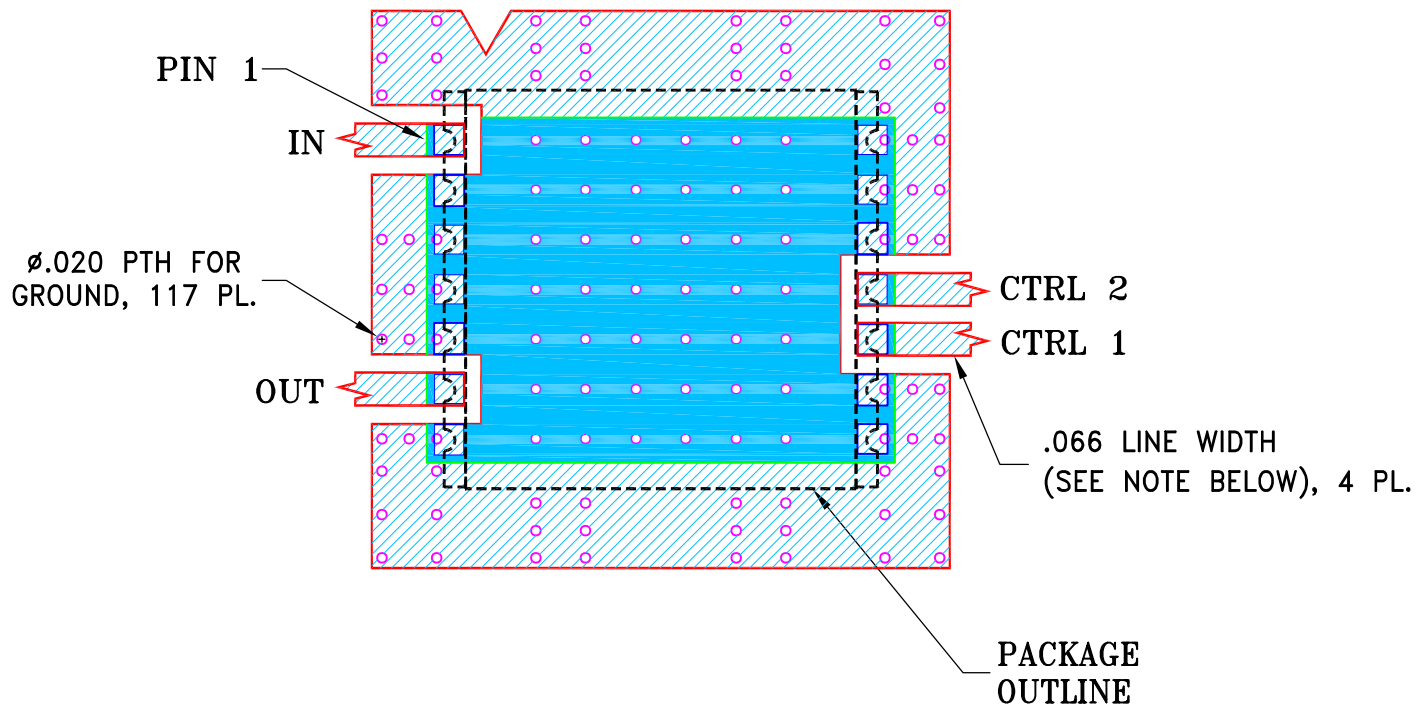
## THIRD ANGLE PROJECTION



## REVISIONS

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

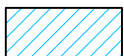
**SUGGESTED MOUNTING CONFIGURATION FOR  
HU1371 CASE STYLE**

**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 $\pm$ .005			
ANGLES $\pm$			
FRACTIONS $\pm$			

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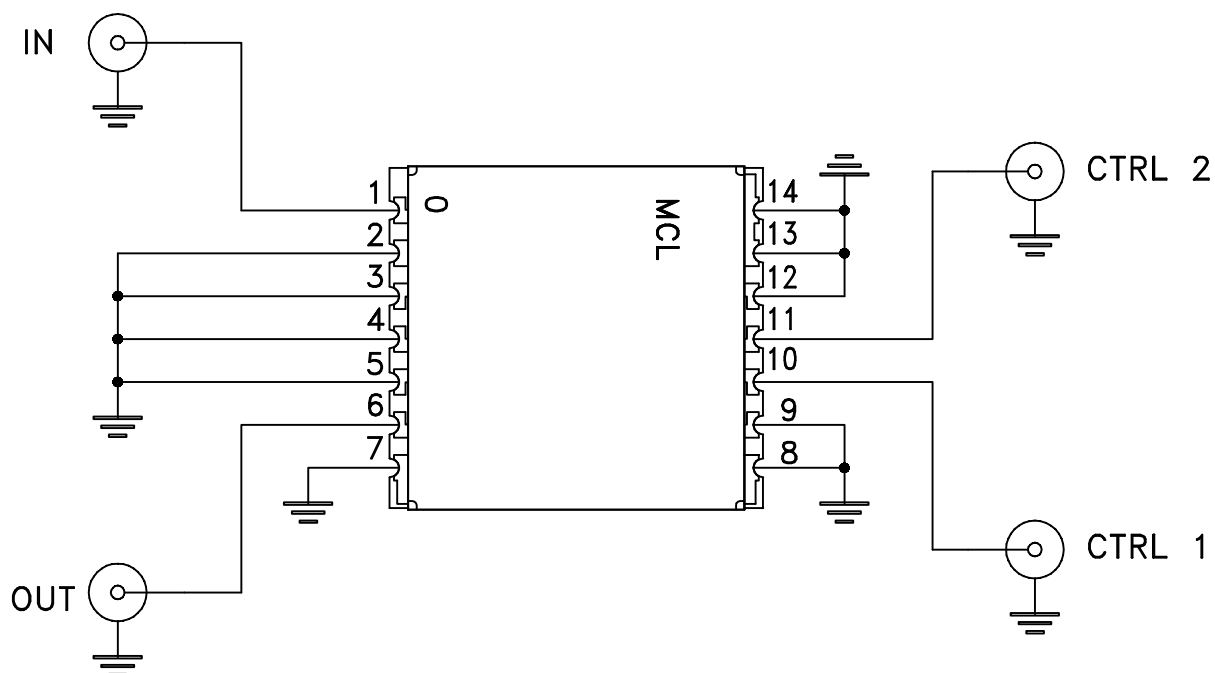
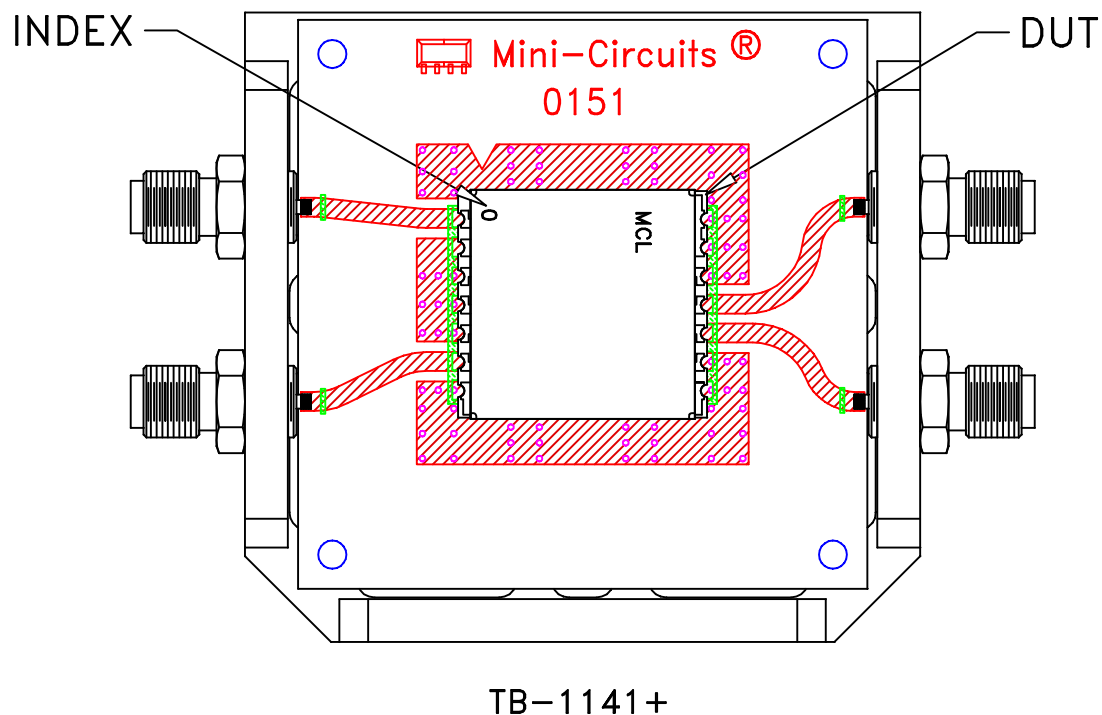
**Mini-Circuits®**

13 Neptune Avenue  
Brooklyn NY 11235

**PL, HU1371, TB-1141+**

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.

Mini-Circuits®





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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