



Mini-Circuits

SURFACE MOUNT

Power Splitter/Combiner

SP-2L+

2 Way-0° 50Ω 2700 to 4000 MHz

FEATURES

- Low insertion loss, 0.75 dB typ.
- Good isolation, 18 dB typ.
- Good output VSWR, 1.3:1 typ.
- Excellent power handling, 1.5W
- Small size
- Aqueous washable



Generic photo used for illustration purposes only

CASE STYLE: CA531

+RoHS Compliant

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

APPLICATIONS

- WIMAX
- WIMAX local oscillator

ELECTRICAL SPECIFICATIONS AT 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range		2700		4000	MHz
Insertion Loss (above 3.0 dB)	2700-4000	—	0.75	14	dB
Isolation	2700-4000	10	18	—	dB
Amplitude Unbalance	2700-4000	—	—	0.3	dB
Phase Unbalance	2700-4000	—	—	8	deg.
VSWR (Port S)	2700-4000	—	1.5	—	:1
VSWR (Port 1)	2700-4000	—	1.3	—	:1
VSWR (Port 2)	2700-4000	—	1.3	—	:1

MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-40 °C to +85 °C
Storage Temperature	-65 °C to +150 °C
Input Power (as a splitter)	0.75 W max.
Internal Dissipation	0.375W max.

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

ELECTRICAL SCHEMATIC



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www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

REV. C
ECO-014964
SP-2L+
RS/LC/CP/AM
220912

PAGE 1 OF 3



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Power Splitter/Combiner

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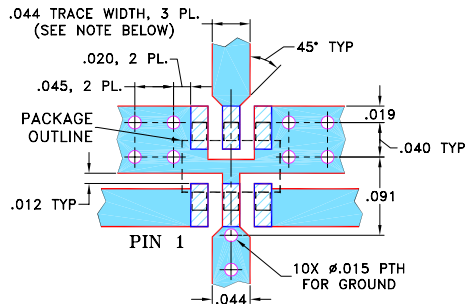
2 Way-0° 50Ω 2700 to 4000 MHz

PIN CONNECTIONS

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

PRODUCT MARKING: N/A

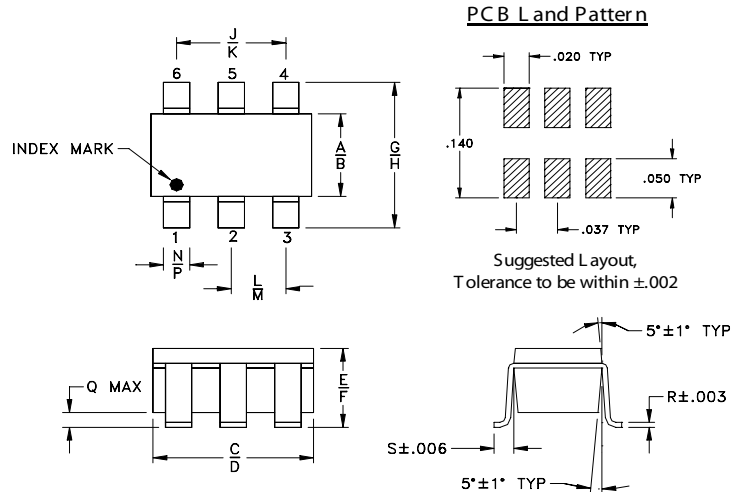
DEMOBOARD MCL P/N: TB-374
SUGGESTED PCB LAYOUT (PL-232)



- NOTES:**
1. 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.
 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

OUTLINE DRAWING



OUTLINE DIMENSIONS (Inch mm)

A	B	C	D	E	F	G	H	J
.052	.067	.106	.122	.035	.064	.087	.118	.067
1.32	1.70	2.69	3.10	0.89	1.63	2.21	3.00	1.70
K	L	M	N	P	Q	R	S	wt
.083	.033	.042	.012	.020	.012	.006	.018	grams
2.11	0.84	1.07	0.30	0.51	0.30	0.15	0.46	0.020

TAPE & REEL INFORMATION: F31



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SURFACE MOUNT

Power Splitter/Combiner

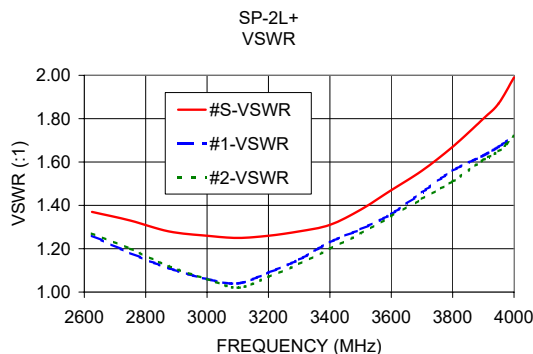
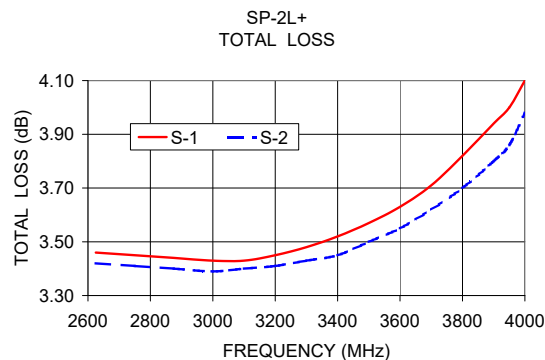
SP-2L+

2 Way-0° 50Ω 2700 to 4000 MHz

TYPICAL PERFORMANCE DATA AND CHARTS

Frequency (MHz)	Total Loss ¹ (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR (:1)		
	S-1	S-2				S	1	2
2625.00	3.46	3.42	0.03	11.91	0.85	1.37	1.26	1.27
2750.00	3.45	3.41	0.04	13.55	0.95	1.33	1.18	1.20
2875.00	3.44	3.40	0.04	15.61	0.96	1.28	1.11	1.12
3000.00	3.43	3.39	0.03	18.28	0.93	1.26	1.06	1.06
3100.00	3.43	3.40	0.02	21.21	1.01	1.25	1.04	1.02
3200.00	3.45	3.41	0.04	25.31	1.07	1.26	1.09	1.07
3300.00	3.48	3.43	0.05	30.74	1.11	1.28	1.15	1.13
3400.00	3.52	3.45	0.06	29.40	1.11	1.31	1.23	1.20
3500.00	3.57	3.50	0.07	24.32	1.15	1.38	1.29	1.27
3600.00	3.63	3.55	0.08	20.79	1.26	1.47	1.36	1.35
3700.00	3.71	3.62	0.10	18.28	1.33	1.56	1.46	1.43
3800.00	3.82	3.70	0.12	16.33	1.25	1.67	1.56	1.51
3900.00	3.94	3.80	0.14	14.76	1.12	1.80	1.63	1.61
3950.00	4.00	3.86	0.13	14.06	0.97	1.87	1.67	1.65
4000.00	4.10	3.98	0.13	13.43	0.99	1.99	1.72	1.72

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



ESD Rating

Human Body Model (HBM): Class 1A (250 v to <500 v) in accordance with ANSI/ESD STM 5.1 - 2001
Machine Model (MM): Class M1 (< 100 v) in accordance with ANSI/ESD STM 5.2 - 1999 (pass 50V)

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/terms/viewterm.html



2 Way-0° Power Splitter/Combiner

SP-2L+

Typical Performance Data

FREQ. (MHz)	TOTAL LOSS ¹ (dB)		AMP. UNBAL. (dB)	ISOLATION (dB)	PHASE UNBAL. (deg.)	FREQ. (MHz)	VSWR (:1)		
	S-1	S-2					S	1	2
500.0	3.65	3.63	0.02	3.84	0.22	500.0	1.91	1.89	1.89
750.0	3.66	3.62	0.03	4.03	0.34	750.0	1.89	1.87	1.87
1000.0	3.67	3.63	0.04	4.30	0.58	1000.0	1.85	1.85	1.84
1250.0	3.65	3.61	0.04	4.68	0.74	1250.0	1.82	1.82	1.81
1500.0	3.64	3.59	0.05	5.19	0.78	1500.0	1.77	1.78	1.75
1750.0	3.63	3.56	0.06	5.88	0.73	1750.0	1.71	1.70	1.67
2000.0	3.60	3.51	0.09	6.84	0.83	2000.0	1.64	1.61	1.57
2250.0	3.58	3.47	0.11	8.25	0.86	2250.0	1.55	1.49	1.45
2500.0	3.53	3.43	0.10	10.29	0.90	2500.0	1.46	1.36	1.31
2625.0	3.52	3.42	0.09	11.65	0.85	2625.0	1.41	1.28	1.25
2750.0	3.49	3.42	0.07	13.34	0.95	2750.0	1.36	1.21	1.19
2875.0	3.48	3.41	0.06	15.42	0.81	2875.0	1.31	1.14	1.12
3000.0	3.46	3.42	0.04	18.17	0.75	3000.0	1.28	1.07	1.09
3050.0	3.45	3.42	0.04	19.53	0.83	3050.0	1.25	1.06	1.08
3100.0	3.46	3.43	0.03	20.99	1.02	3100.0	1.25	1.04	1.09
3150.0	3.45	3.43	0.02	22.75	1.10	3150.0	1.23	1.04	1.09
3200.0	3.46	3.45	0.02	24.47	1.16	3200.0	1.24	1.07	1.11
3250.0	3.46	3.45	0.01	26.07	1.23	3250.0	1.23	1.08	1.12
3300.0	3.46	3.46	0.01	26.94	1.29	3300.0	1.24	1.12	1.15
3350.0	3.46	3.46	0.00	26.36	1.40	3350.0	1.26	1.14	1.17
3400.0	3.47	3.47	0.01	24.92	1.48	3400.0	1.26	1.18	1.19
3450.0	3.49	3.49	0.00	23.24	1.56	3450.0	1.30	1.20	1.22
3500.0	3.51	3.50	0.01	21.54	1.66	3500.0	1.31	1.24	1.24
3550.0	3.53	3.53	0.00	20.15	1.71	3550.0	1.35	1.27	1.27
3600.0	3.56	3.55	0.01	18.84	1.80	3600.0	1.37	1.31	1.30
3650.0	3.59	3.58	0.01	17.72	1.81	3650.0	1.43	1.33	1.33
3700.0	3.63	3.62	0.01	16.69	1.92	3700.0	1.46	1.37	1.35
3750.0	3.66	3.65	0.01	15.79	1.97	3750.0	1.52	1.40	1.39
3800.0	3.72	3.70	0.02	14.99	2.02	3800.0	1.57	1.44	1.41
3850.0	3.77	3.75	0.02	14.20	2.13	3850.0	1.65	1.48	1.45
3900.0	3.83	3.80	0.03	13.53	2.21	3900.0	1.70	1.52	1.48
3925.0	3.86	3.83	0.03	13.17	2.19	3925.0	1.76	1.53	1.49
3950.0	3.90	3.86	0.03	12.85	2.17	3950.0	1.80	1.56	1.52
3975.0	3.93	3.90	0.03	12.57	2.18	3975.0	1.81	1.58	1.53
4000.0	3.97	3.94	0.03	12.29	2.22	4000.0	1.86	1.60	1.55
4050.0	4.05	4.01	0.03	11.70	2.35	4050.0	1.97	1.65	1.59
4100.0	4.13	4.09	0.04	11.20	2.44	4100.0	2.05	1.68	1.62
4150.0	4.23	4.18	0.05	10.69	2.46	4150.0	2.19	1.73	1.67
4200.0	4.35	4.28	0.07	10.24	2.50	4200.0	2.28	1.76	1.69
4250.0	4.48	4.41	0.07	9.78	2.51	4250.0	2.43	1.82	1.75
4300.0	4.61	4.52	0.08	9.34	2.55	4300.0	2.55	1.84	1.77
4350.0	4.76	4.67	0.09	8.94	2.52	4350.0	2.73	1.90	1.83
4400.0	4.91	4.81	0.10	8.53	2.45	4400.0	2.89	1.92	1.85
4450.0	5.09	4.98	0.11	8.17	2.48	4450.0	3.09	1.99	1.91
4500.0	5.27	5.16	0.11	7.80	2.46	4500.0	3.30	2.01	1.94
4550.0	5.48	5.36	0.12	7.47	2.40	4550.0	3.52	2.07	2.00
4600.0	5.69	5.58	0.11	7.13	2.32	4600.0	3.79	2.09	2.03
4650.0	5.93	5.81	0.12	6.83	2.36	4650.0	4.05	2.14	2.08
4700.0	6.17	6.06	0.11	6.52	2.37	4700.0	4.37	2.19	2.12
4750.0	6.43	6.31	0.12	6.25	2.30	4750.0	4.71	2.23	2.17
4800.0	6.71	6.60	0.11	5.98	2.25	4800.0	5.09	2.27	2.20
4850.0	6.99	6.89	0.10	5.72	2.25	4850.0	5.55	2.30	2.25
4900.0	7.32	7.22	0.10	5.47	2.17	4900.0	5.98	2.34	2.30
4950.0	7.65	7.56	0.09	5.23	2.10	4950.0	6.54	2.36	2.34
5000.0	8.03	7.95	0.09	5.01	2.00	5000.0	6.98	2.40	2.38

¹ Total Loss = Insertion Loss+ 3dB Splitter Loss

REV. X2

SP-2L+

100627

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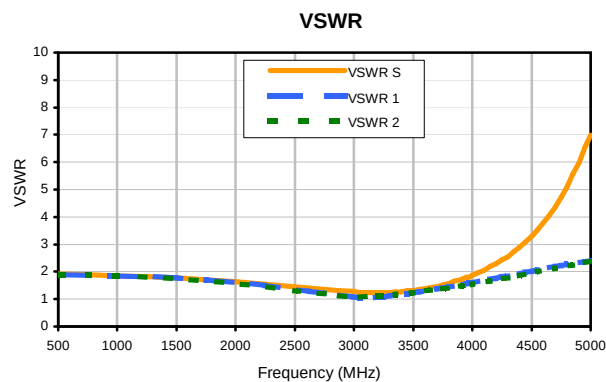
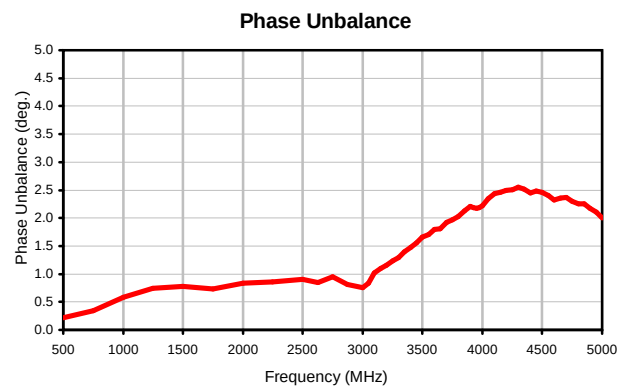
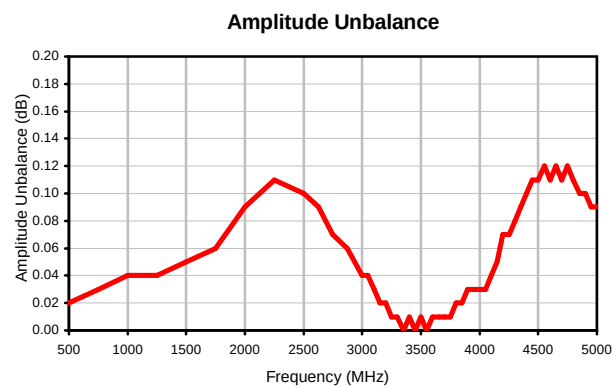
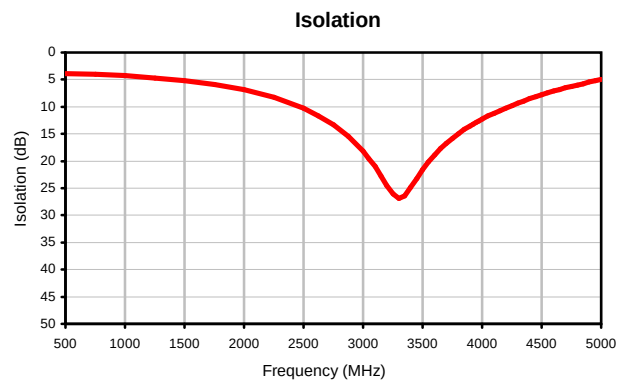
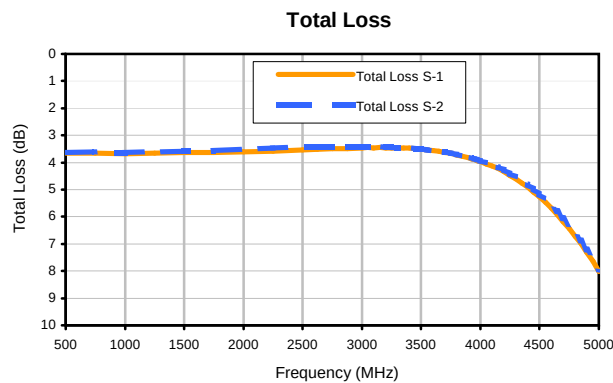
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2 Way-0° Power Splitter/Combiner

SP-2L+

Typical Performance Curves



REV. X2

SP-2L+

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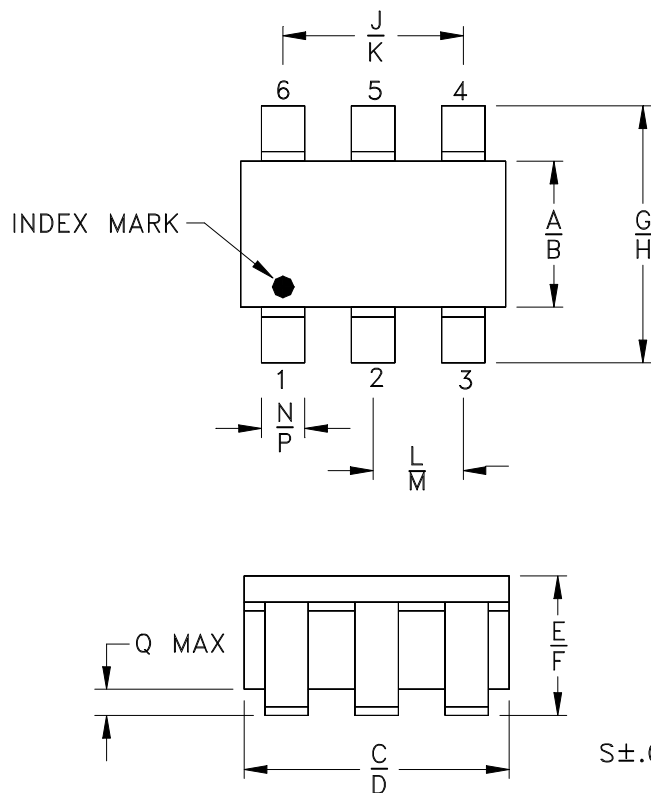
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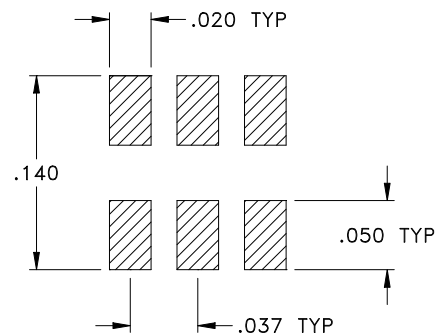
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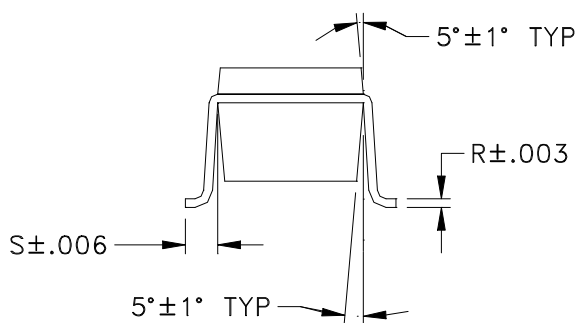
Outline Dimensions



PCB Land Pattern



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



CASE #	A	B	C	D	E	F	G	H	J	K
CA531	.052 (1.32)	.067 (1.70)	.106 (2.69)	.122 (3.10)	.035 (0.89)	.064 (1.63)	.087 (2.21)	.118 (3.00)	.067 (1.70)	.083 (2.11)

CASE #	L	M	N	P	Q	R	S	WT. GRAM
CA531	.033 (0.84)	.042 (1.07)	.012 (0.30)	.020 (0.51)	.012 (0.30)	.006 (0.15)	.018 (0.46)	.020

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

Notes:

- Case material: Plastic.
- Termination finish:
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier.
(Unless stated otherwise on Data sheet).



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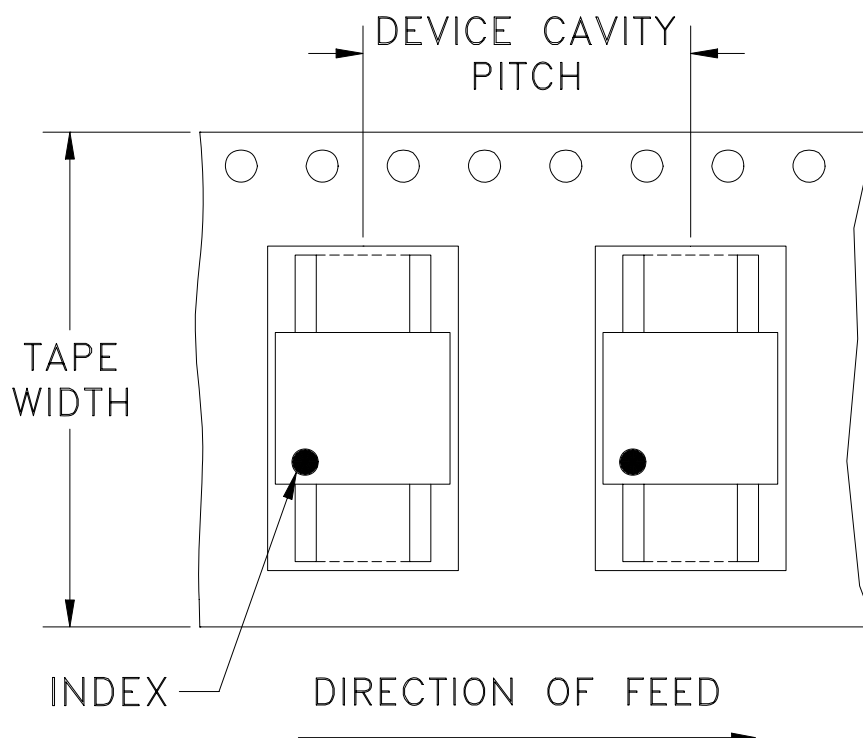
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Tape & Reel Packaging TR-F31

DEVICE ORIENTATION IN T&R



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
8	4	7	Small quantity standards (see note)	20
				50
				100
				200
				500
			Standard	1000

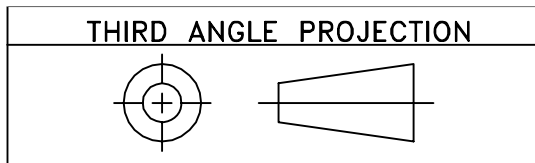
Note: Please Consult individual model data sheet to determine device per reel availability

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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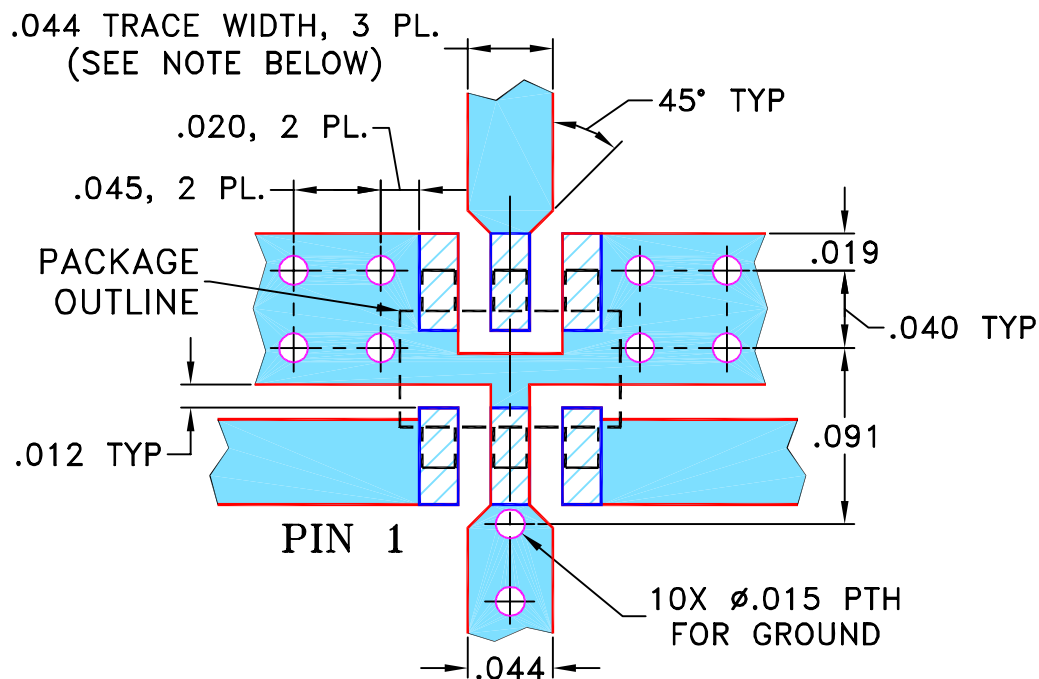


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REVISIONS					
REV OR	ECN No.	DESCRIPTION	DATE	DR	AUTH
	M102559	NEW RELEASE	02/23/06	MMG	HY

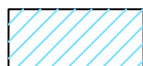
SUGGESTED MOUNTING CONFIGURATION FOR CA531 CASE STYLE, "jk" PIN CONNECTION



- NOTES:** 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" $\pm$.0015"; COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
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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 TOLERANCES ON: 2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$.005 ANGLES $\pm$ FRACTIONS $\pm$	DRAWN	MMG	02/22/06
	CHECKED	AV	02/23/06
	APPROVED	HY	02/23/06



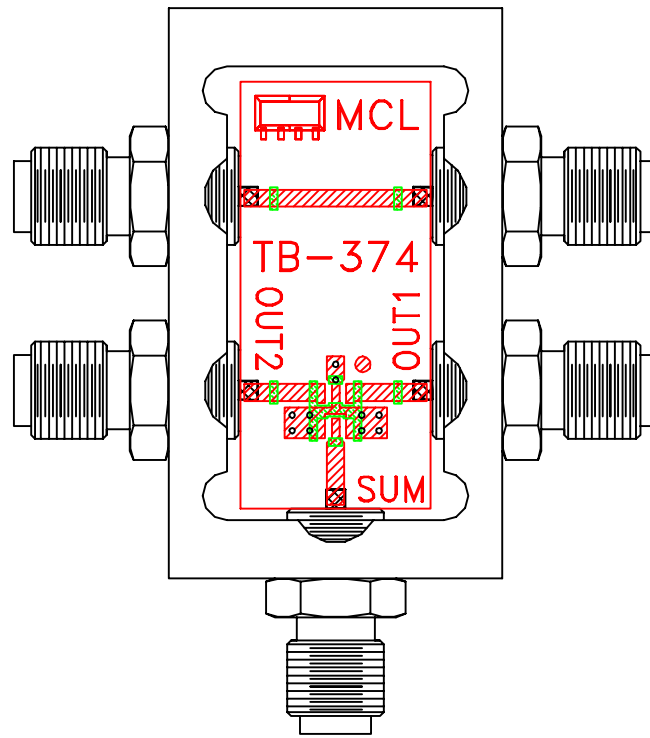
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PL, jk, CA531, SP-2C+ (P+, U+), TB-374

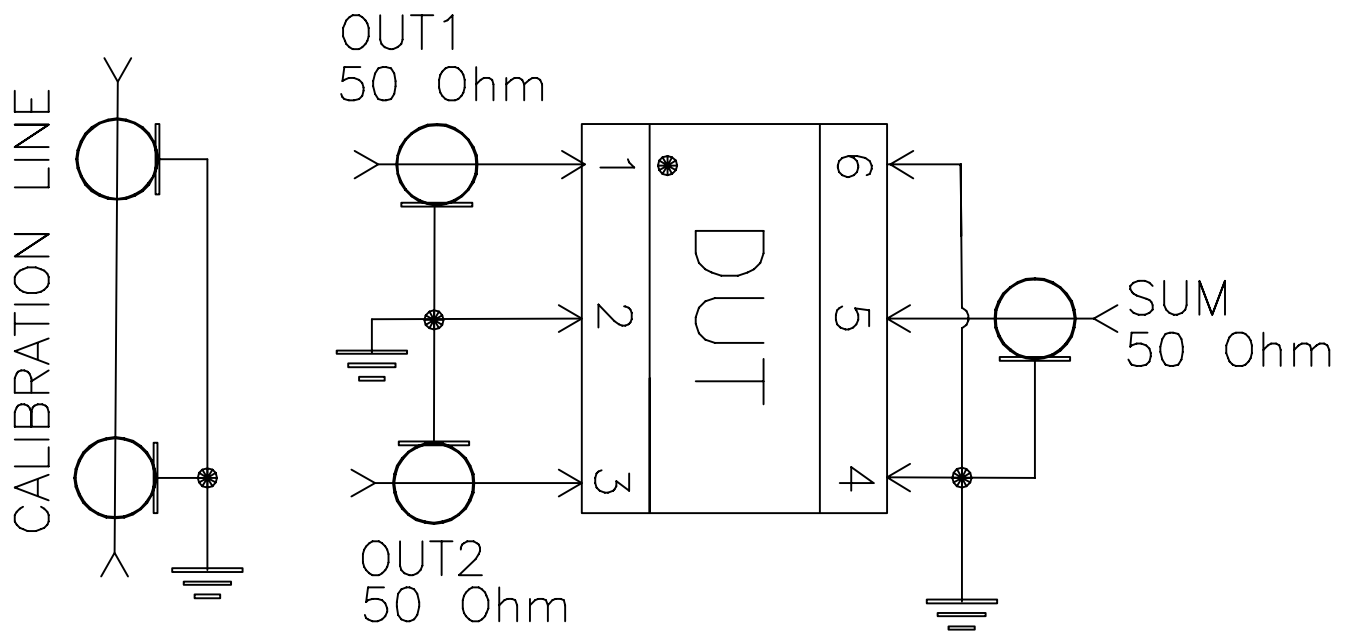
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ASHEETA1.DWG REV:A DATE:01/12/95			

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-232	OR
FILE:	98PL232	SCALE:	10:1
SHEET:		1 OF 1	

Evaluation Board and Circuit



TB-374



Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: Rogers R04350B or its equivalent, Dielectric Constant=3.5, Thickness=.020"

 **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	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Temperature Cycling	-65° to 150°C, 100 cycles	JESD22-A104
Temperature Humidity	85°C/ 85% RH, 168 hours	JESD22-113
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
Moisture Sensitivity: Level 1	Bake at 125°C for 24 hours Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 240°C peak (Non-RoHS) or 260°C (RoHS)	J-STD-020
Solderability	10X magnification, 95% coverage	JESD22-B102, Method 1: Dip and Look Test
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
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