

Ultra-Small Ceramic Power Splitter/Combiner

QCN-7

2 Way-90° 50Ω 425 to 675 MHz

Maximum Ratings

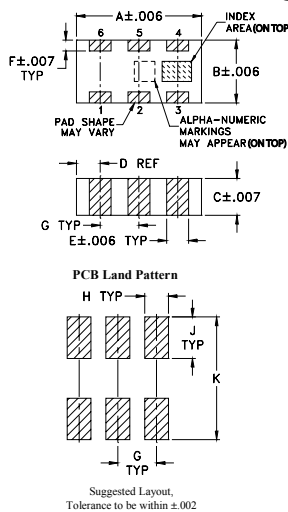
Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
Power Input (as a splitter)	15W* max.
* Derate linearly to 7W at 100°C ambient. Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

SUM PORT	1
PORT 1 (0°)	4
PORT 2 (+90°)	6
GROUND	2,5
50 OHM TERM EXTERNAL	3

Product Marking: D

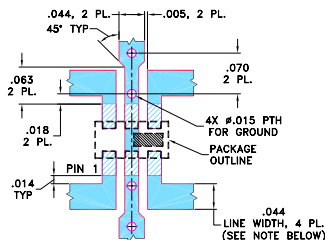
Outline Drawing



Outline Dimensions (inch)

A	B	C	D	E	F
.126	.063	.035	.024	.022	.011
3.20	1.60	0.89	0.61	0.56	0.28
G	H	J	K	L	wt
.039	.024	.042	.123		grams
0.99	0.61	1.07	3.12		.020

Demo Board MCL P/N: TB-255+ Suggested PCB Layout (PL-131)



NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; 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.
3. DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
4. 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-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

Features

- low insertion loss, 0.4 dB typ.
- wrap-around terminal for excellent solderability
- ultra small, 0.12"X0.06"X0.035"

Applications

- UHF
- balanced amplifiers
- modulators

Generic photo used for illustration purposes only
CASE STYLE: FV1206-1

Available Tape and Reel at no extra cost	
Reel Size	Devices/Reel
7"	20, 50, 100, 200, 500, 1000, 3000

Electrical Specifications

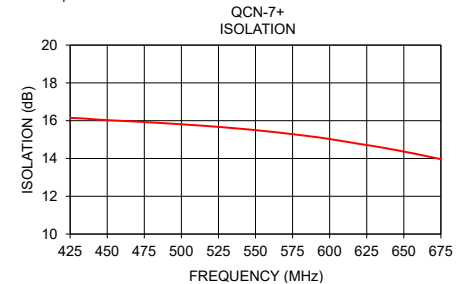
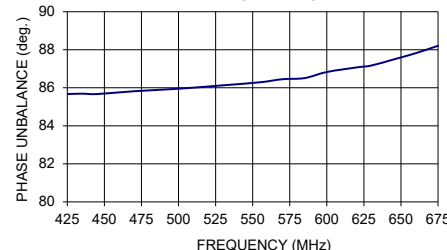
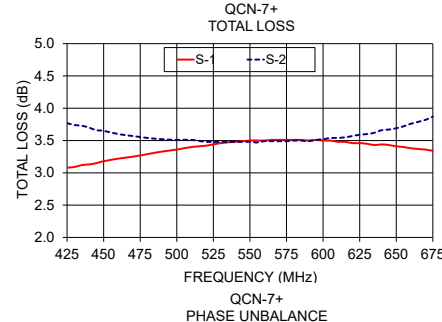
FREQ. RANGE (MHz)	ISOLATION (dB)	INSERTION LOSS (dB) Avg. of Coupled Outputs ABOVE 3 dB	PHASE UNBALANCE (Degrees)	AMPLITUDE UNBALANCE (dB)	VSWR (:1)
$f_L - f_U$	Typ. Min.	Typ. Max.	Typ. Max.	Typ. Max.	Typ.
425-675					
425-550	17 13	0.4 0.7	2 8	0.5 1.0	1.3
550-675	17 11	0.6 1.1	4 8	0.5 1.0	1.4

1. For applications requiring DC voltage to be applied to the RF ports, add suffix letter "D" to part no.
DC resistance to ground is 100 Mohms min.

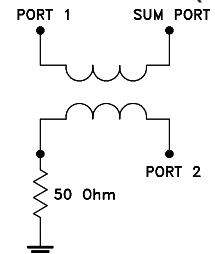
Typical Performance Data

Frequency (MHz)	Total Loss ¹ (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
425.00	3.08	3.77	0.69	16.15	85.67	1.32	1.30	1.26
435.00	3.12	3.73	0.60	16.11	85.69	1.32	1.30	1.26
445.00	3.15	3.66	0.51	16.05	85.67	1.32	1.29	1.26
470.00	3.25	3.57	0.31	15.95	85.82	1.32	1.29	1.26
500.00	3.36	3.51	0.15	15.81	85.95	1.32	1.28	1.26
530.00	3.46	3.48	0.02	15.64	86.13	1.32	1.28	1.26
555.00	3.50	3.47	0.03	15.46	86.29	1.33	1.29	1.27
570.00	3.51	3.49	0.02	15.33	86.45	1.34	1.29	1.27
585.00	3.51	3.50	0.00	15.19	86.51	1.35	1.29	1.28
600.00	3.50	3.52	0.02	15.03	86.83	1.35	1.30	1.29
620.00	3.46	3.57	0.11	14.77	87.07	1.37	1.31	1.30
630.00	3.45	3.60	0.15	14.65	87.17	1.38	1.32	1.31
645.00	3.43	3.67	0.24	14.44	87.49	1.40	1.33	1.33
660.00	3.38	3.76	0.38	14.21	87.82	1.42	1.34	1.35
675.00	3.34	3.87	0.53	13.96	88.21	1.44	1.36	1.37

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



electrical schematic (Note 1)



2 Way-90° Power Splitter/Combiner

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Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +25°C

FREQ. (MHz)	TOTAL LOSS ¹ (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB) 1-2	VSWR (:1)		
	S-1	S-2				S	1	2
150	0.94	8.51	7.57	2.99	20.51	1.24	1.25	1.22
200	1.41	6.73	5.32	3.50	19.06	1.29	1.30	1.26
250	1.88	5.56	3.68	3.85	18.27	1.32	1.33	1.29
300	2.32	4.75	2.43	4.07	17.80	1.33	1.34	1.30
325	2.52	4.46	1.94	4.15	17.67	1.33	1.34	1.30
350	2.69	4.20	1.50	4.17	17.57	1.32	1.34	1.30
375	2.86	3.98	1.12	4.20	17.48	1.32	1.34	1.30
400	3.01	3.80	0.79	4.20	17.41	1.32	1.34	1.30
425	3.15	3.66	0.51	4.16	17.34	1.31	1.33	1.30
450	3.26	3.54	0.28	4.12	17.26	1.31	1.33	1.30
475	3.36	3.46	0.10	4.05	17.21	1.30	1.33	1.31
500	3.43	3.39	0.04	3.95	17.13	1.30	1.33	1.31
525	3.49	3.36	0.13	3.82	17.03	1.30	1.34	1.32
550	3.52	3.35	0.17	3.67	16.90	1.30	1.34	1.33
575	3.53	3.38	0.15	3.44	16.75	1.31	1.35	1.35
600	3.52	3.43	0.09	3.15	16.55	1.32	1.37	1.38
625	3.50	3.52	0.02	2.76	16.31	1.33	1.39	1.41
650	3.44	3.65	0.21	2.25	16.01	1.36	1.42	1.45
675	3.37	3.84	0.47	1.59	15.64	1.39	1.46	1.50
700	3.28	4.08	0.80	0.68	15.21	1.43	1.51	1.56
725	3.18	4.40	1.21	0.55	14.72	1.48	1.57	1.65
750	3.08	4.80	1.72	2.27	14.16	1.56	1.65	1.75
775	2.98	5.33	2.34	4.71	13.53	1.65	1.76	1.88
800	2.91	5.97	3.07	8.21	12.86	1.76	1.88	2.04

¹ Total Loss = Insertion Loss + 3dB Splitter Loss

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2 Way-90° Power Splitter/Combiner

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Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = -55°C

FREQ. (MHz)	TOTAL LOSS ¹ (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB) 1-2	VSWR (:1)		
	S-1	S-2				S	1	2
150	0.86	8.51	7.65	2.95	20.72	1.21	1.23	1.21
200	1.33	6.72	5.39	3.53	19.31	1.28	1.29	1.23
250	1.78	5.52	3.74	3.96	18.57	1.29	1.29	1.27
300	2.22	4.70	2.48	4.27	17.92	1.31	1.32	1.30
325	2.43	4.39	1.96	4.40	17.73	1.32	1.33	1.29
350	2.60	4.13	1.52	4.53	17.64	1.33	1.34	1.29
375	2.77	3.91	1.14	4.64	17.58	1.33	1.33	1.29
400	2.92	3.72	0.80	4.70	17.54	1.32	1.32	1.30
425	3.05	3.57	0.52	4.68	17.45	1.31	1.32	1.31
450	3.17	3.45	0.28	4.66	17.33	1.31	1.32	1.31
475	3.27	3.36	0.09	4.68	17.22	1.31	1.33	1.31
500	3.34	3.29	0.05	4.66	17.12	1.31	1.34	1.31
525	3.40	3.25	0.15	4.61	17.01	1.31	1.34	1.32
550	3.43	3.24	0.19	4.53	16.90	1.31	1.34	1.33
575	3.44	3.26	0.18	4.36	16.75	1.31	1.35	1.35
600	3.43	3.30	0.13	4.13	16.56	1.32	1.37	1.37
625	3.41	3.38	0.03	3.85	16.33	1.33	1.39	1.40
650	3.35	3.50	0.15	3.45	16.03	1.35	1.42	1.44
675	3.28	3.67	0.39	2.89	15.65	1.38	1.46	1.49
700	3.19	3.89	0.70	2.07	15.21	1.43	1.51	1.56
725	3.09	4.19	1.09	1.04	14.72	1.48	1.57	1.64
750	2.99	4.57	1.58	0.46	14.16	1.55	1.65	1.74
775	2.88	5.07	2.19	2.62	13.54	1.64	1.75	1.87
800	2.79	5.68	2.89	5.74	12.87	1.75	1.87	2.04

¹ Total Loss = Insertion Loss + 3dB Splitter Loss

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2 Way-90° Power Splitter/Combiner

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Typical Performance Data

TEST CONDITIONS: INPUT POWER = 0dBm @Temperature = +100°C

FREQ. (MHz)	TOTAL LOSS ¹ (dB)		AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB) 1-2	VSWR (:1)		
	S-1	S-2				S	1	2
150	0.99	8.49	7.50	3.08	20.20	1.27	1.29	1.23
200	1.47	6.73	5.26	3.53	18.70	1.30	1.31	1.29
250	1.96	5.59	3.63	3.83	17.80	1.35	1.37	1.32
300	2.39	4.80	2.41	3.94	17.48	1.36	1.38	1.30
325	2.59	4.50	1.91	3.97	17.44	1.35	1.37	1.31
350	2.75	4.24	1.48	3.93	17.39	1.33	1.36	1.32
375	2.92	4.03	1.11	3.87	17.30	1.32	1.35	1.33
400	3.07	3.85	0.79	3.76	17.20	1.32	1.36	1.32
425	3.20	3.72	0.52	3.66	17.13	1.32	1.36	1.31
450	3.32	3.60	0.29	3.55	17.08	1.32	1.36	1.31
475	3.40	3.52	0.11	3.44	17.08	1.31	1.35	1.31
500	3.47	3.45	0.02	3.27	17.06	1.30	1.34	1.33
525	3.52	3.43	0.09	3.04	17.00	1.29	1.34	1.34
550	3.55	3.43	0.12	2.76	16.88	1.29	1.34	1.36
575	3.57	3.46	0.11	2.44	16.71	1.30	1.36	1.37
600	3.56	3.52	0.04	2.05	16.49	1.32	1.38	1.39
625	3.54	3.62	0.08	1.60	16.26	1.34	1.40	1.42
650	3.48	3.76	0.28	0.99	15.96	1.36	1.43	1.47
675	3.41	3.96	0.55	0.18	15.61	1.39	1.46	1.52
700	3.32	4.21	0.89	0.93	15.16	1.43	1.51	1.59
725	3.23	4.54	1.31	2.34	14.69	1.49	1.58	1.67
750	3.13	4.97	1.84	4.27	14.11	1.56	1.66	1.77
775	3.04	5.51	2.47	6.95	13.48	1.65	1.76	1.89
800	2.97	6.18	3.21	10.80	12.80	1.76	1.88	2.05

¹ Total Loss = Insertion Loss + 3dB Splitter Loss

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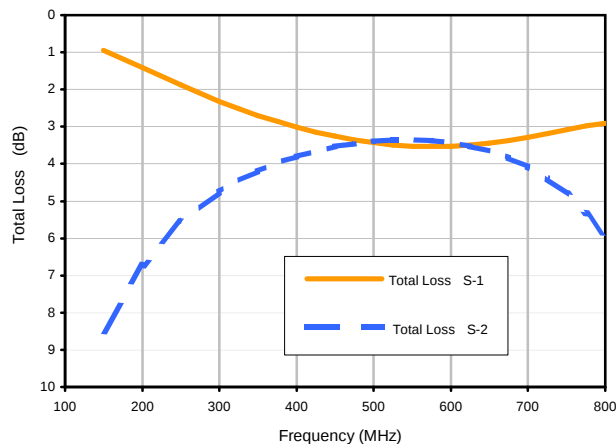


2 Way-90° Power Splitter/Combiner

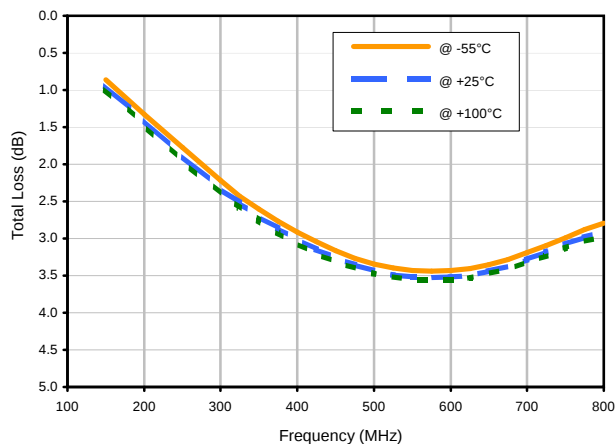
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Typical Performance Curves

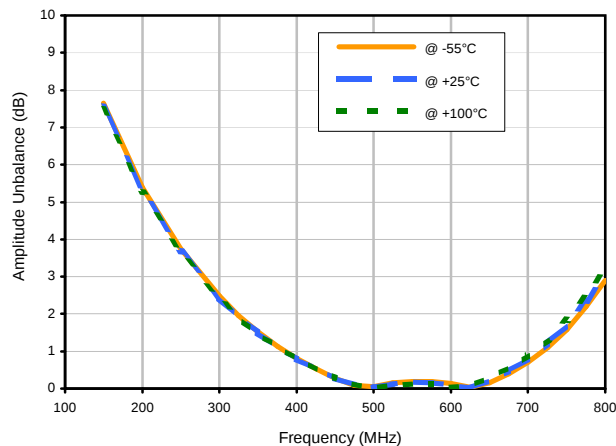
Total Loss



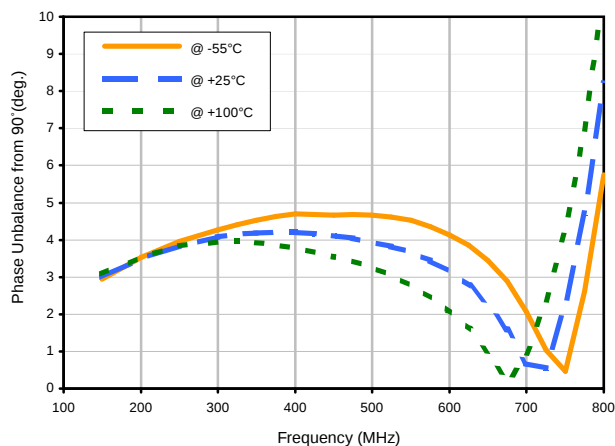
Total Loss S-1 vs. TEMPERATURE



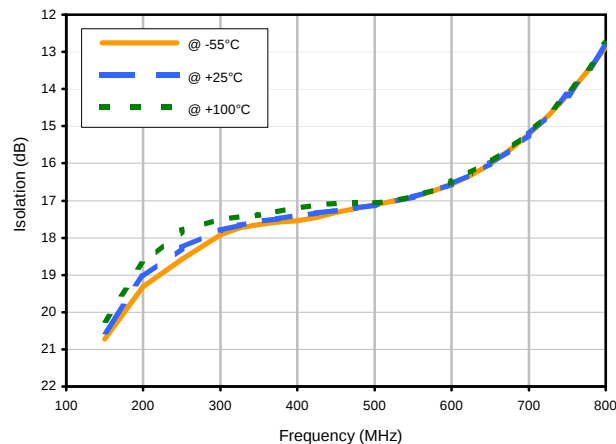
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



Isolation 1-2 vs. TEMPERATURE



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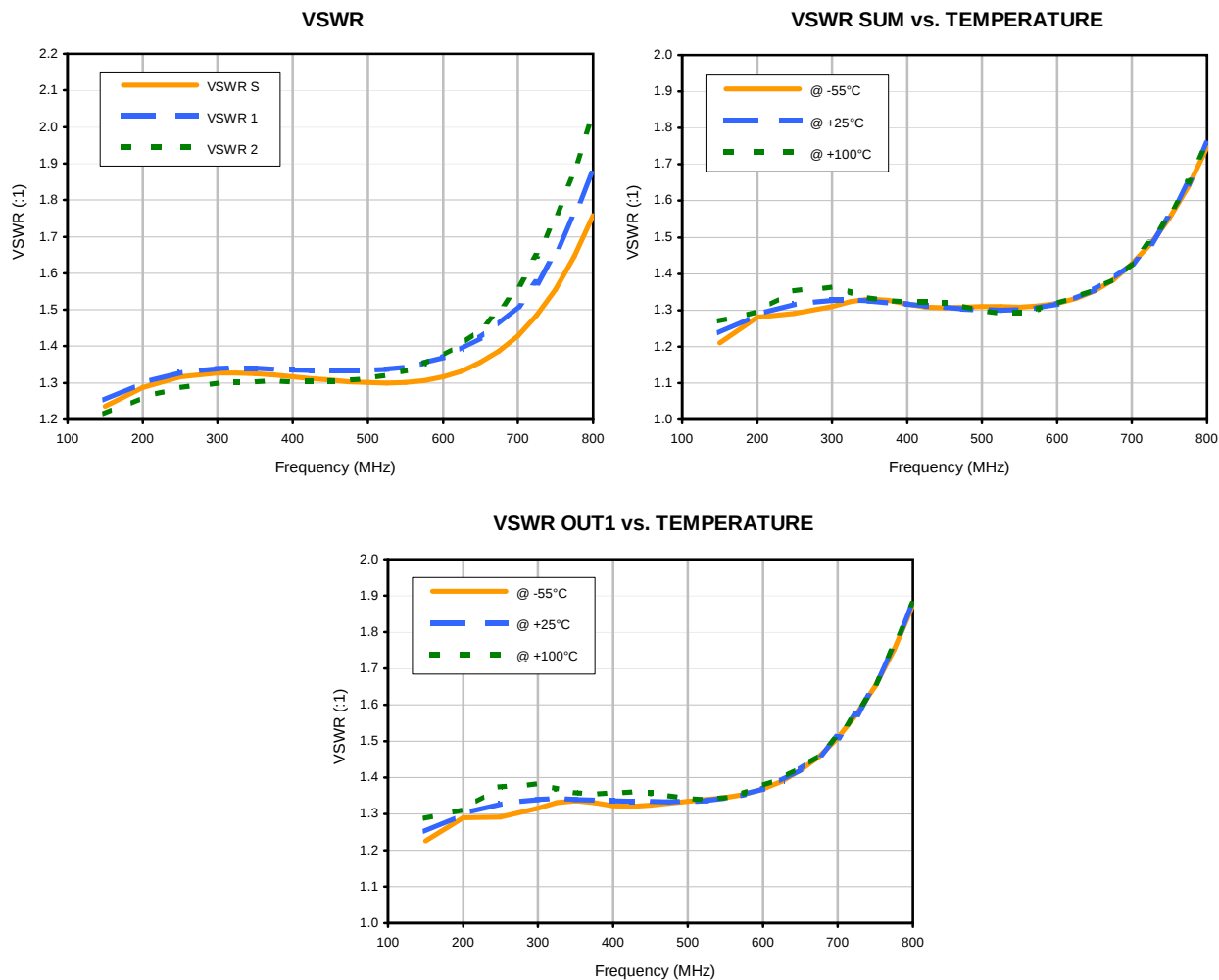
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Typical Performance Curves



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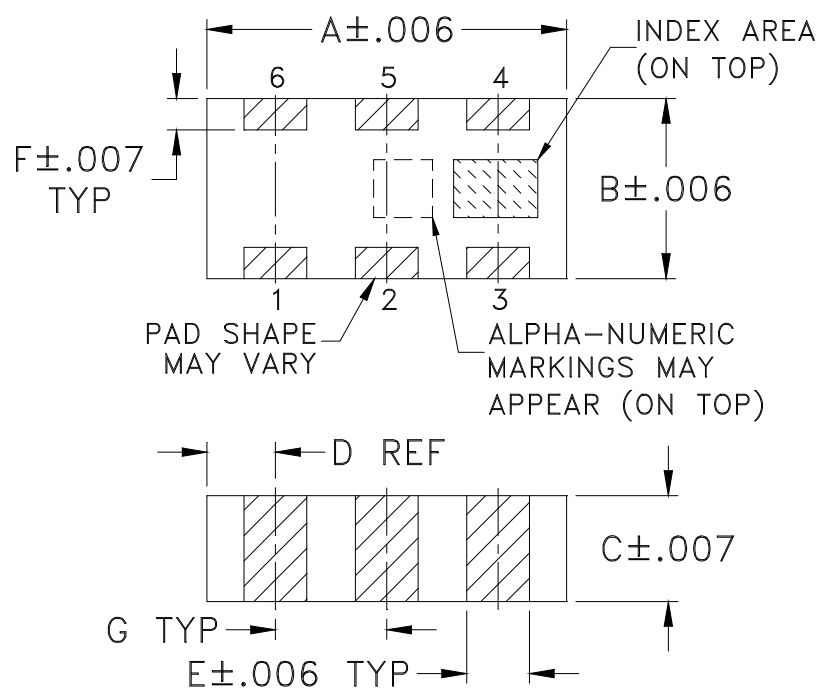
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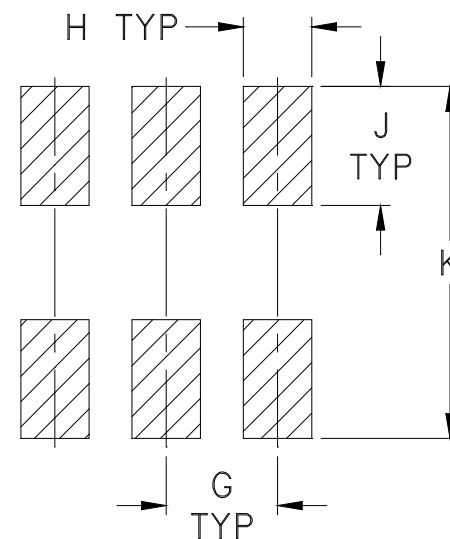
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Outline Dimensions



PCB Land Pattern



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

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WT. GRAM
FV1206-1	.126 (3.20)	.063 (1.60)	.035 (0.89)	.024 (0.61)	.022 (0.56)	.011 (0.28)	.039 (0.99)	.024 (0.61)	.042 (1.07)	.123 (3.12)	--	--	--	--	.020

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

Notes:

- Open style, ceramic base.
- Termination finish: **as shown below or indicated on Data Sheet.**
 For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
 For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.



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Tape & Reel Packaging

TR-F75

DEVICE ORIENTATION IN T&R

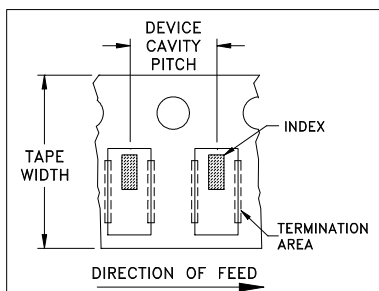


ILLUSTRATION 1

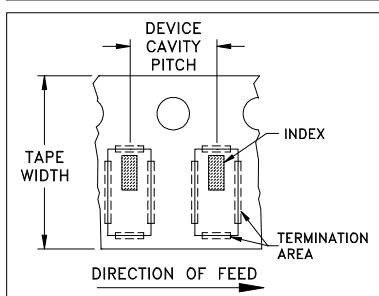


ILLUSTRATION 2

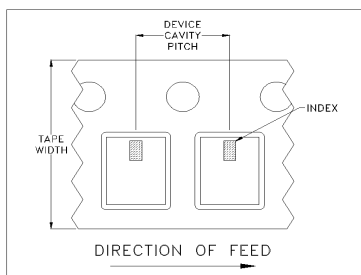


ILLUSTRATION 3

Applicable Case Styles
FV1206-1
FV1206-3

Applicable Case Styles
FV1206-4
FV1206-5
FV1206-6
FV1206-7
FV1206-9
JC0603C-1

Applicable Case Styles
NL1008C-6
FV1206-12
NL1008C-9
NL1008C-10

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
				1000
			Standard	3000

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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REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M87001	NEW RELEASE	05/20/03	MMG	ABD
A	M87231	CORRECTED DWG.	05/28/03	MMG	ABD
B	M91636	ADDED "pn" PIN CONNECTION	04/07/04	AV	ABD
C	M102713	ADDED "...WITH SMOBC"	01/16/06	GF	IL

Technical drawing of a cross-shaped PCB layout. The drawing includes the following dimensions and labels:

- Top horizontal bar:** .044, 2 PL. (left segment), .005, 2 PL. (right segment).
- Left vertical bar:** .063 2 PL. (top segment), .018 2 PL. (middle segment), .014 TYP (bottom segment).
- Right vertical bar:** .070 2 PL. (top segment).
- Bottom horizontal bar:** .044 LINE WIDTH, 4 PL. (SEE NOTE BELOW).
- Central area:** 4X ϕ .015 PTH FOR GROUND (four circular pads), PACKAGE OUTLINE (dashed rectangle), PIN 1 (pointing to the bottom-left corner of the package outline).
- Angles:** 45° TYP (indicated on the top and bottom vertical segments).

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 TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	MMG	05/14/03
	CHECKED	AV	05/19/03
	APPROVED	ABD	05/20/03

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



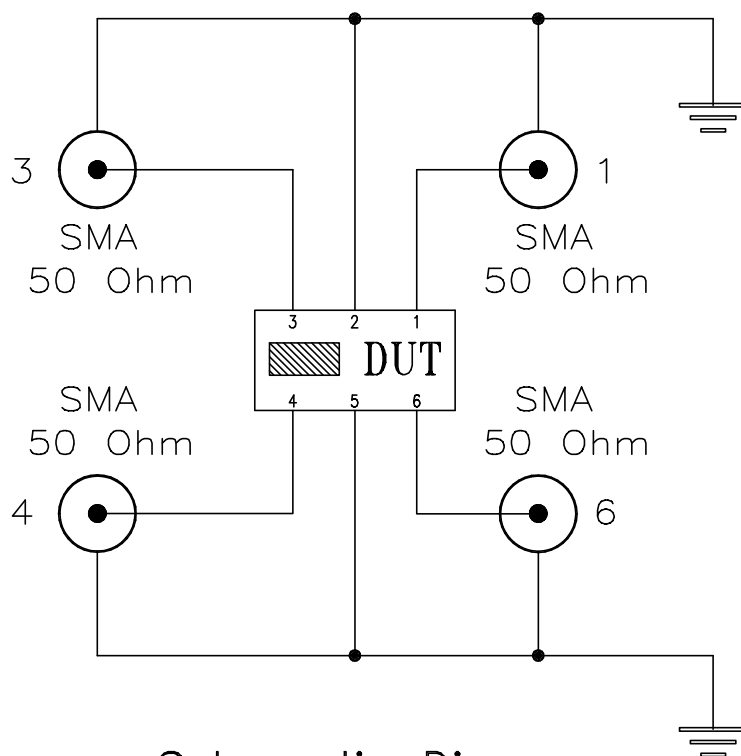
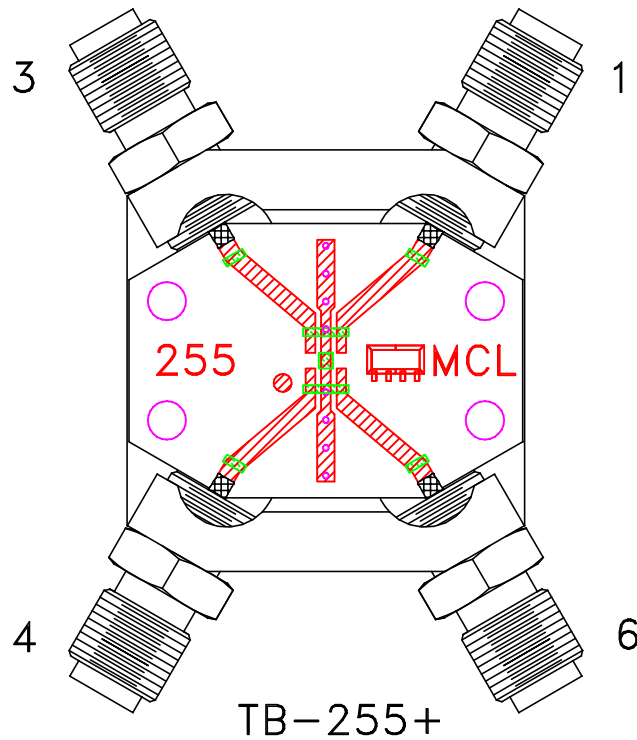
Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, pb/pn, FV1206-1, QCN/BDCN, TB-255

SIZE A	CODE IDENT 15542	DRAWING NO: 98-PL-131		REV: C
FILE: 98PL131		SCALE: 10:1	SHEET: 1 OF 1	

Evaluation Board and Circuit

For Pin Connections refer to Data Sheet of the DUT



Schematic Diagram

Notes:

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

 **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	-55° to 100°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
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, Para 4.2.5, Test S, 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