ULTRA-SMALL CERAMIC

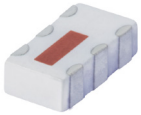
Power Splitter/Combiner

QCN-12AD+

2 Way-90° 50Ω 800 to 1250 MHz

FEATURES

- Low insertion loss, 0.4 dB typ.
- Wrap-around terminal for excellent solderability
- Ultra small, 0.12"X0.06"X0.035"



Generic photo used for illustration purposes only

CASE STYLE: FV1206-1

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

APPLICATIONS

- Cellular
- GSM
- Balanced amplifiers
- Modulators

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		800		1250	MHz
Average Insertion Loss, above 3.0 dB	800-1000 1000-1250		0.3 0.4	0.6 0.7	dB
Isolation	800-1000 1000-1250	15 13	17 16		dB
Phase Unbalance	800-1000 1000-1250		2.5 2.5	5.0 5.0	Degree
Amplitude Unbalance	800-1000 1000-1250		0.2 0.5	0.8 0.8	dB
VSWR	800-1000 1000-1250		1.2 1.2		(:1)

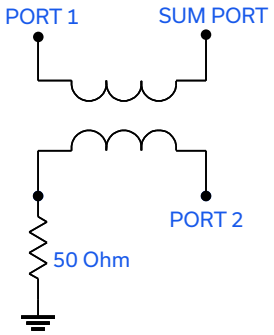
1. For applications requiring DC voltage to be applied to the RF ports. DC resistance to ground is 100 Mohms min.

ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	-55°C to +100°C
Storage Temperature	-55°C to +100°C
Power Input (as a splitter)	15 W* max.

* Derate linearly to 7 W at +100°C ambient.
Permanent damage may occur if any of these limits are exceeded.

ELECTRICAL SCHEMATIC (NOTE 1)



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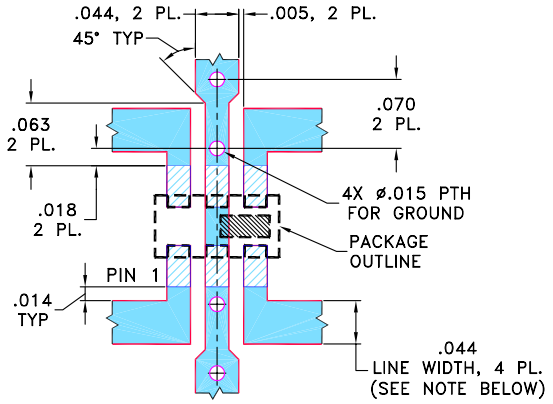
PIN CONNECTIONS

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

PRODUCT MARKING: P2

DEMO BOARD MCL P/N: TB-QCN-12AD+
SUGGESTED PCB LAYOUT (PL-131)

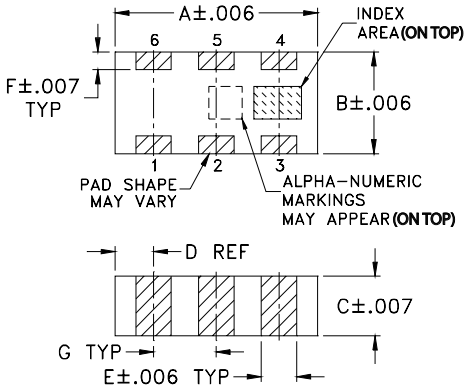


NOTES: 1.TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" ± 0.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2.BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

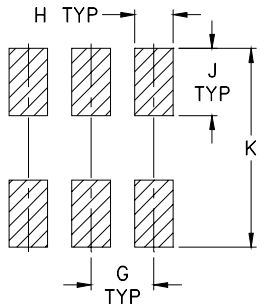
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

OUTLINE DRAWING



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

OUTLINE DIMENSIONS (Inches / mm)

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	wt
.039	.024	.042	.123	grams
0.99	0.61	1.07	3.12	.020

TAPE & REEL INFORMATION: F75

Power Splitter/Combiner QCN-12AD+

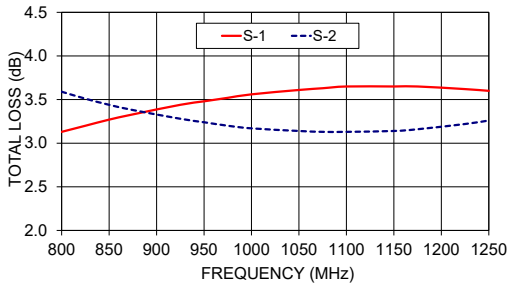
2 Way-90° 50Ω 800 to 1250 MHz

TYPICAL PERFORMANCE DATA

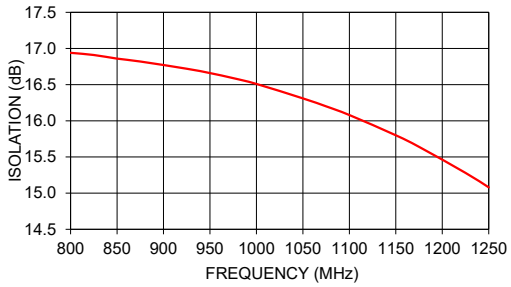
Frequency (MHz)	Total Loss[2] (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR (:1)		
	S-1	S-2				S	1	2
800	3.13	3.59	0.46	16.94	87.58	1.27	1.20	1.11
825	3.20	3.51	0.31	16.91	87.64	1.27	1.20	1.10
850	3.27	3.44	0.18	16.86	87.73	1.27	1.19	1.10
875	3.33	3.38	0.05	16.82	87.82	1.27	1.18	1.09
925	3.44	3.28	0.16	16.72	87.99	1.27	1.16	1.08
950	3.48	3.24	0.25	16.66	88.10	1.27	1.15	1.07
975	3.52	3.20	0.32	16.59	88.21	1.27	1.14	1.07
1000	3.56	3.17	0.39	16.51	88.35	1.27	1.13	1.07
1050	3.61	3.14	0.48	16.31	88.65	1.27	1.10	1.07
1075	3.63	3.13	0.50	16.20	88.81	1.28	1.09	1.07
1100	3.65	3.13	0.52	16.08	88.98	1.28	1.07	1.07
1150	3.65	3.14	0.51	15.80	89.40	1.29	1.05	1.09
1175	3.65	3.16	0.49	15.64	89.65	1.29	1.03	1.10
1225	3.62	3.22	0.40	15.28	90.21	1.30	1.01	1.12
1250	3.60	3.26	0.34	15.08	90.53	1.31	1.03	1.14

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

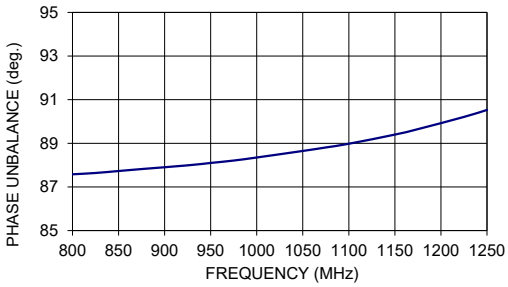
TOTAL LOSS[2]



ISOLATION



PHASE UNBALANCE



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-90° Power Splitter/Combiner QCN-12AD+

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)	VSWR (:1)		
	S-1	S-2			1-2	S	1	2
400	1.45	6.50	3.97	2.33	19.05	1.21	1.21	1.14
420	1.55	6.22	3.89	2.38	18.83	1.22	1.21	1.14
440	1.65	5.97	3.81	2.43	18.65	1.22	1.22	1.14
460	1.74	5.73	3.74	2.47	18.47	1.22	1.22	1.14
480	1.84	5.51	3.68	2.50	18.32	1.23	1.23	1.14
500	1.94	5.31	3.62	2.54	18.20	1.23	1.23	1.14
525	2.06	5.08	3.57	2.57	18.05	1.24	1.23	1.14
550	2.17	4.86	3.52	2.62	17.92	1.24	1.23	1.14
560	2.22	4.78	3.50	2.62	17.88	1.24	1.23	1.14
570	2.26	4.71	3.49	2.63	17.84	1.24	1.23	1.14
580	2.31	4.64	3.47	2.66	17.79	1.24	1.23	1.14
600	2.40	4.50	3.45	2.67	17.71	1.25	1.23	1.14
650	2.61	4.19	3.40	2.68	17.52	1.25	1.23	1.13
700	2.80	3.92	3.36	2.71	17.36	1.25	1.23	1.12
725	2.90	3.81	3.35	2.69	17.30	1.25	1.23	1.12
750	2.98	3.71	3.35	2.66	17.23	1.25	1.23	1.11
775	3.07	3.61	3.34	2.65	17.17	1.25	1.22	1.11
780	3.08	3.60	3.34	2.65	17.16	1.25	1.22	1.10
790	3.11	3.56	3.34	2.63	17.13	1.25	1.22	1.10
800	3.14	3.53	3.34	2.61	17.10	1.26	1.22	1.10
850	3.29	3.38	3.33	2.54	16.97	1.26	1.21	1.09
900	3.41	3.27	3.34	2.45	16.82	1.26	1.20	1.07
950	3.51	3.17	3.34	2.35	16.64	1.26	1.19	1.06
1000	3.59	3.11	3.35	2.18	16.45	1.27	1.17	1.05
1050	3.65	3.07	3.36	1.99	16.18	1.27	1.16	1.04
1100	3.68	3.06	3.37	1.73	15.91	1.28	1.14	1.03
1150	3.69	3.07	3.38	1.40	15.61	1.29	1.12	1.04
1200	3.67	3.11	3.39	1.03	15.24	1.30	1.09	1.05
1250	3.63	3.18	3.40	0.51	14.86	1.31	1.07	1.08
1300	3.57	3.28	3.42	0.08	14.42	1.33	1.05	1.11
1350	3.48	3.42	3.45	0.85	13.95	1.35	1.05	1.14
1375	3.43	3.51	3.47	1.34	13.70	1.37	1.06	1.16
1400	3.37	3.61	3.49	1.89	13.44	1.38	1.08	1.19
1450	3.25	3.85	3.55	3.21	12.89	1.41	1.14	1.24
1500	3.11	4.17	3.64	4.93	12.33	1.46	1.21	1.30
1550	2.97	4.56	3.76	7.20	11.73	1.51	1.29	1.38
1600	2.83	5.03	3.93	10.16	11.14	1.57	1.40	1.47

[1] Total Loss = Insertion Loss+ 3dB Splitter Loss

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2 Way-90° Power Splitter/Combiner QCN-12AD+

Typical Performance Data

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

FREQ. (MHz)	TOTAL LOSS[1] (dB) S-1	TOTAL LOSS[1] (dB) S-2	AMP. UNBAL. (dB)	PHASE UNBAL. From 90° (deg.)	ISOLATION (dB) 1-2	VSWR (:1) S	VSWR (:1) 1	VSWR (:1) 2
400	1.33	6.45	5.12	2.02	19.01	1.20	1.19	1.13
420	1.42	6.17	4.74	2.04	18.79	1.20	1.19	1.13
440	1.52	5.91	4.38	2.10	18.60	1.21	1.20	1.13
460	1.62	5.67	4.05	2.14	18.40	1.22	1.21	1.13
480	1.72	5.45	3.73	2.20	18.24	1.23	1.22	1.13
500	1.81	5.24	3.43	2.24	18.12	1.23	1.22	1.14
525	1.92	5.00	3.08	2.26	17.95	1.23	1.22	1.14
550	2.04	4.78	2.75	2.30	17.79	1.24	1.22	1.14
560	2.08	4.70	2.62	2.31	17.74	1.24	1.23	1.14
570	2.13	4.62	2.50	2.31	17.69	1.24	1.23	1.14
580	2.17	4.55	2.38	2.35	17.64	1.25	1.23	1.14
600	2.26	4.41	2.15	2.37	17.58	1.25	1.24	1.14
650	2.47	4.09	1.63	2.39	17.37	1.26	1.23	1.13
700	2.66	3.82	1.16	2.40	17.16	1.26	1.24	1.13
725	2.75	3.70	0.95	2.41	17.13	1.26	1.24	1.12
750	2.84	3.60	0.76	2.42	17.06	1.27	1.24	1.12
775	2.92	3.50	0.58	2.41	16.95	1.27	1.23	1.12
780	2.94	3.48	0.54	2.41	16.93	1.26	1.23	1.11
790	2.96	3.44	0.48	2.40	16.88	1.26	1.23	1.11
800	2.99	3.41	0.41	2.39	16.83	1.26	1.23	1.11
850	3.14	3.26	0.12	2.30	16.71	1.27	1.23	1.10
900	3.26	3.13	0.13	2.25	16.53	1.28	1.22	1.09
950	3.36	3.03	0.32	2.21	16.29	1.28	1.21	1.08
1000	3.44	2.97	0.47	2.06	16.14	1.30	1.19	1.06
1050	3.49	2.92	0.57	1.89	15.84	1.29	1.18	1.05
1100	3.52	2.89	0.63	1.71	15.65	1.30	1.17	1.05
1150	3.52	2.90	0.63	1.41	15.32	1.31	1.14	1.04
1200	3.51	2.93	0.58	1.07	14.92	1.33	1.12	1.05
1250	3.46	2.99	0.47	0.64	14.69	1.33	1.09	1.07
1300	3.39	3.07	0.32	0.09	14.32	1.34	1.05	1.10
1350	3.29	3.20	0.09	0.66	13.97	1.36	1.03	1.13
1375	3.24	3.28	0.04	1.09	13.76	1.37	1.04	1.16
1400	3.18	3.37	0.19	1.59	13.50	1.38	1.06	1.18
1450	3.05	3.60	0.55	2.77	12.98	1.42	1.11	1.23
1500	2.89	3.89	1.00	4.35	12.51	1.45	1.18	1.30
1550	2.73	4.26	1.53	6.47	11.95	1.50	1.28	1.38
1600	2.58	4.71	2.14	9.17	11.40	1.55	1.40	1.49

[1] Total Loss = Insertion Loss+ 3dB Splitter Loss

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2 Way-90° Power Splitter/Combiner QCN-12AD+

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)	VSWR (:1)		
	S-1	S-2			1-2	S	1	2
400	1.52	6.50	4.98	2.90	19.01	1.23	1.24	1.17
420	1.63	6.23	4.61	3.00	18.74	1.24	1.25	1.17
440	1.73	5.99	4.26	3.07	18.54	1.25	1.26	1.17
460	1.82	5.76	3.93	3.11	18.42	1.25	1.26	1.17
480	1.91	5.54	3.62	3.12	18.36	1.24	1.25	1.17
500	2.01	5.33	3.33	3.11	18.31	1.24	1.25	1.17
525	2.13	5.10	2.98	3.16	18.19	1.24	1.25	1.16
550	2.25	4.90	2.65	3.23	18.04	1.25	1.26	1.16
560	2.29	4.82	2.53	3.25	18.00	1.25	1.26	1.16
570	2.34	4.74	2.40	3.24	17.98	1.25	1.26	1.16
580	2.38	4.67	2.29	3.24	17.97	1.25	1.25	1.16
600	2.46	4.53	2.07	3.25	17.95	1.24	1.25	1.15
650	2.67	4.22	1.55	3.25	17.86	1.24	1.24	1.14
700	2.87	3.96	1.10	3.27	17.73	1.24	1.23	1.13
725	2.95	3.85	0.90	3.25	17.73	1.24	1.23	1.12
750	3.04	3.74	0.70	3.22	17.71	1.23	1.22	1.11
775	3.12	3.65	0.53	3.21	17.67	1.23	1.21	1.11
780	3.14	3.64	0.50	3.20	17.66	1.23	1.21	1.10
790	3.17	3.60	0.43	3.20	17.63	1.23	1.21	1.10
800	3.20	3.57	0.37	3.18	17.60	1.23	1.21	1.10
850	3.34	3.42	0.08	3.11	17.47	1.23	1.19	1.08
900	3.46	3.31	0.15	3.00	17.34	1.23	1.17	1.07
950	3.56	3.22	0.34	2.89	17.14	1.24	1.16	1.05
1000	3.64	3.16	0.48	2.75	16.93	1.24	1.14	1.05
1050	3.70	3.13	0.57	2.55	16.61	1.24	1.12	1.04
1100	3.74	3.13	0.61	2.27	16.28	1.26	1.10	1.05
1150	3.75	3.14	0.60	1.94	15.92	1.26	1.08	1.06
1200	3.74	3.19	0.54	1.51	15.48	1.28	1.06	1.08
1250	3.70	3.27	0.43	0.94	15.01	1.30	1.05	1.11
1300	3.64	3.39	0.26	0.26	14.48	1.32	1.06	1.14
1350	3.56	3.54	0.02	0.60	13.91	1.35	1.09	1.17
1375	3.51	3.64	0.12	1.11	13.63	1.36	1.11	1.19
1400	3.46	3.75	0.28	1.69	13.34	1.38	1.13	1.22
1450	3.35	4.00	0.66	3.12	12.75	1.42	1.19	1.26
1500	3.22	4.33	1.11	4.97	12.12	1.47	1.26	1.32
1550	3.09	4.74	1.64	7.40	11.50	1.53	1.34	1.39
1600	2.97	5.22	2.25	10.61	10.89	1.59	1.45	1.47

[1] Total Loss = Insertion Loss+ 3dB Splitter Loss

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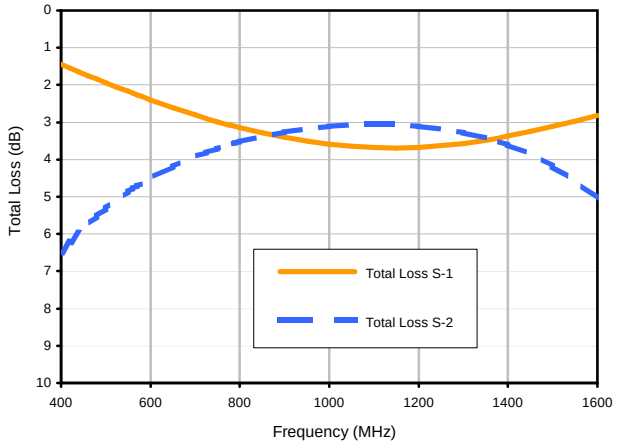
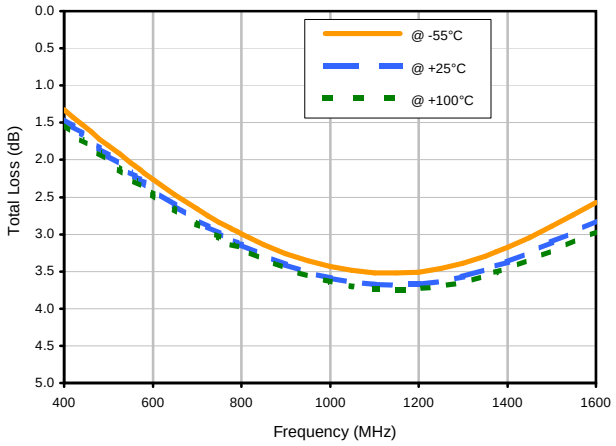
2 Way-90° Power Splitter/Combiner QCN-12AD+

Typical Performance Curves

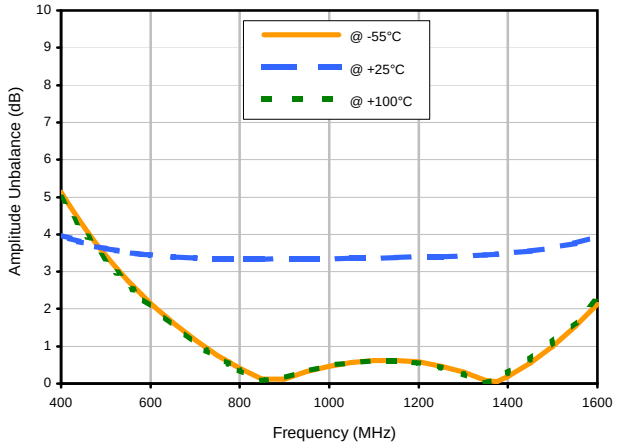
Total Loss



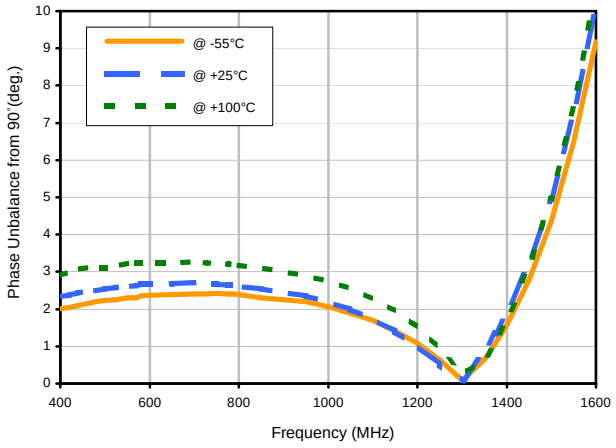
Total Loss S-1 vs. TEMPERATURE



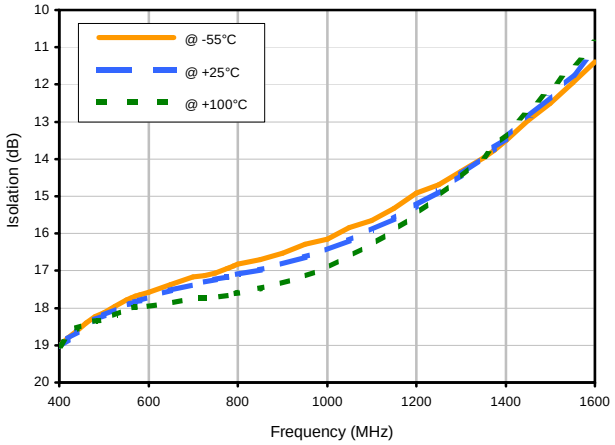
Amplitude Unbalance vs. TEMPERATURE



Phase Unbalance vs. TEMPERATURE



Isolation 1-2 vs. TEMPERATURE



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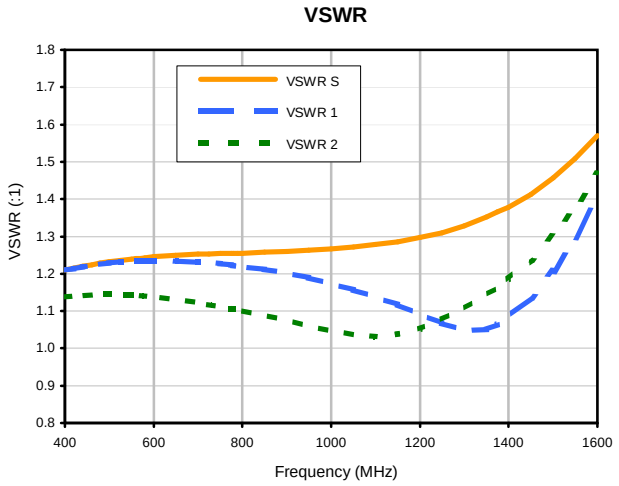
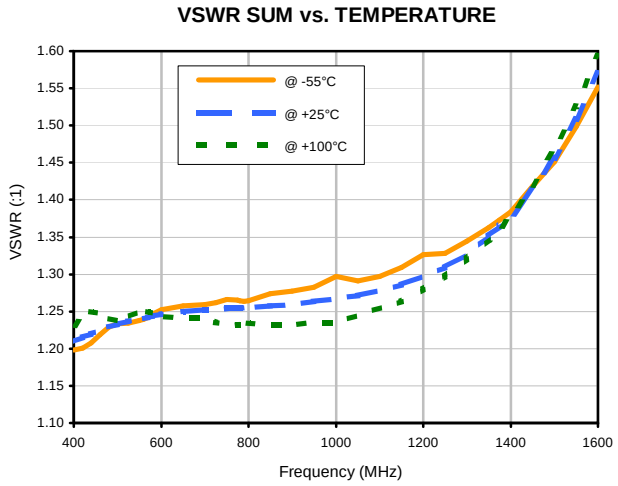
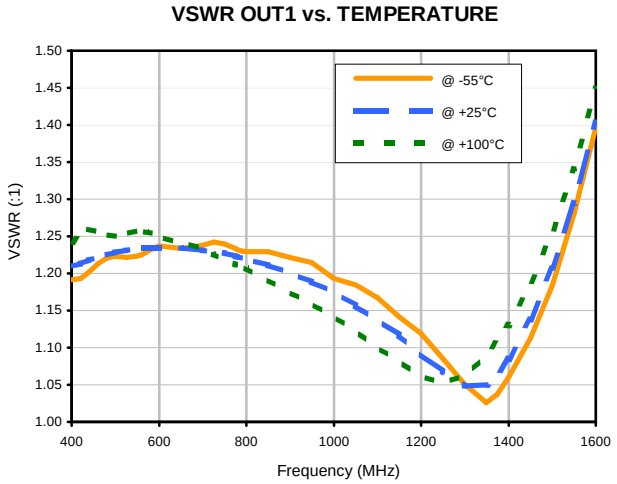
Typical Performance Curves







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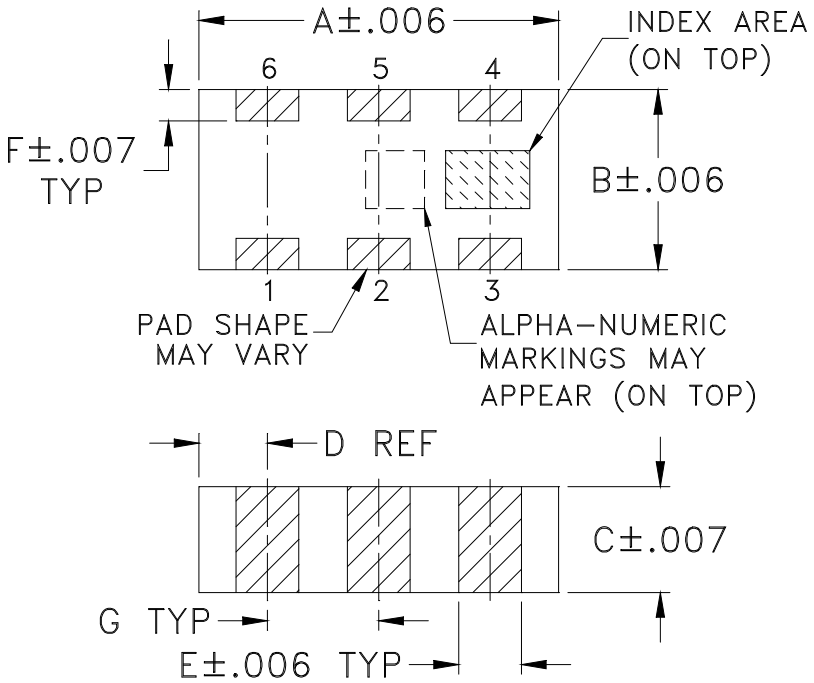
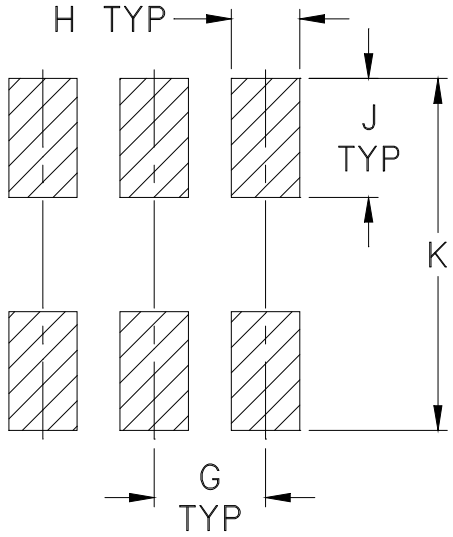
Case Style FV

FV1206-1

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.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. ± .01; 3 Pl. ± .005

Notes:

1. Open style, ceramic base.
2. 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

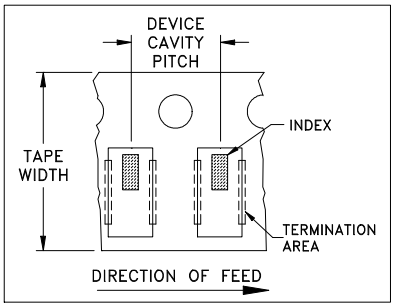

ILLUSTRATION 1

Applicable Case Styles
FV1206-1 FV1206-3

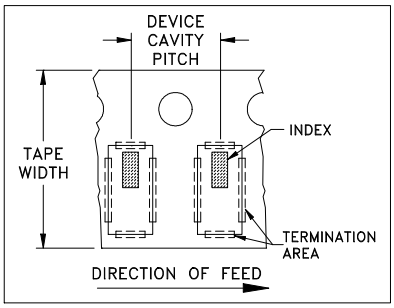

ILLUSTRATION 2

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

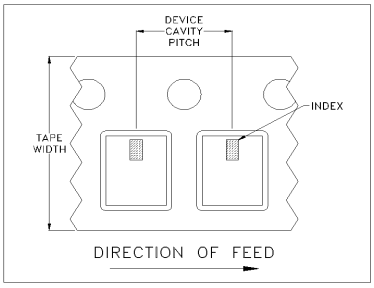

ILLUSTRATION 3

Applicable Case Styles
FV1206-11 FV1206-12 GE0805C-18 NL1008C-6 NL1008C-7 NL1008C-9 NL1008C-10 NL1008C-12

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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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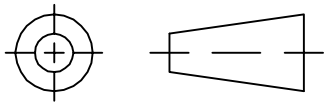
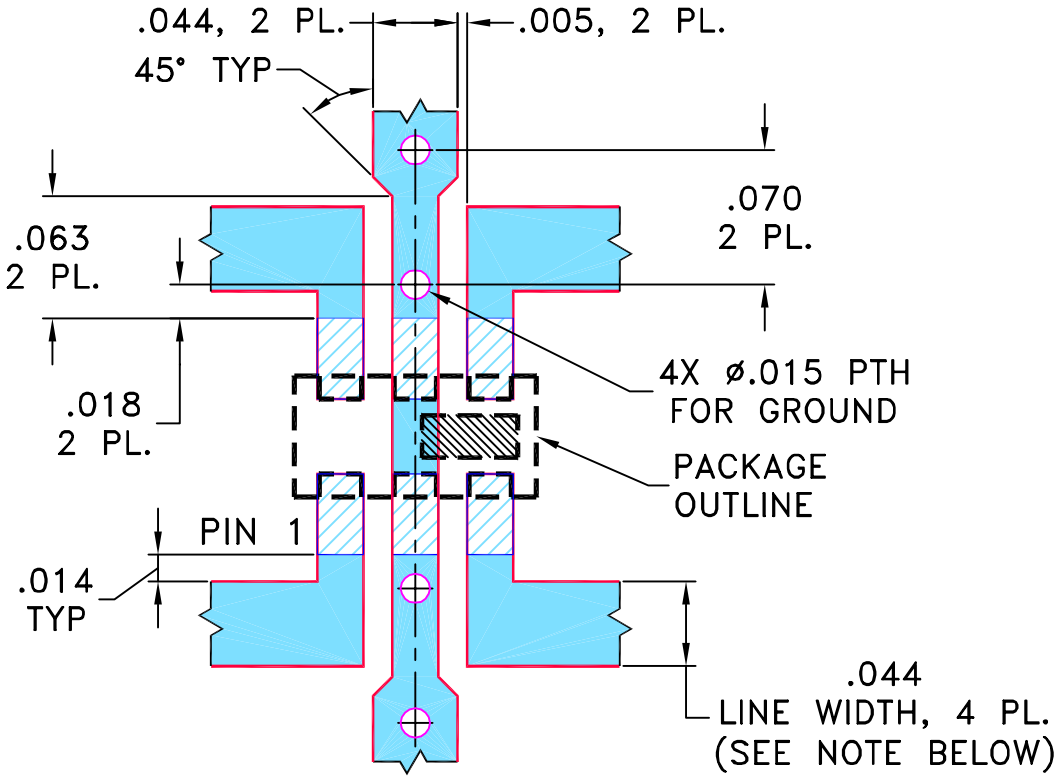
THIRD ANGLE PROJECTION



REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	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

SUGGESTED MOUNTING CONFIGURATION FOR FV1206-1 CASE STYLE, "pb/pn" PIN CONNECTIONS



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.

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

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

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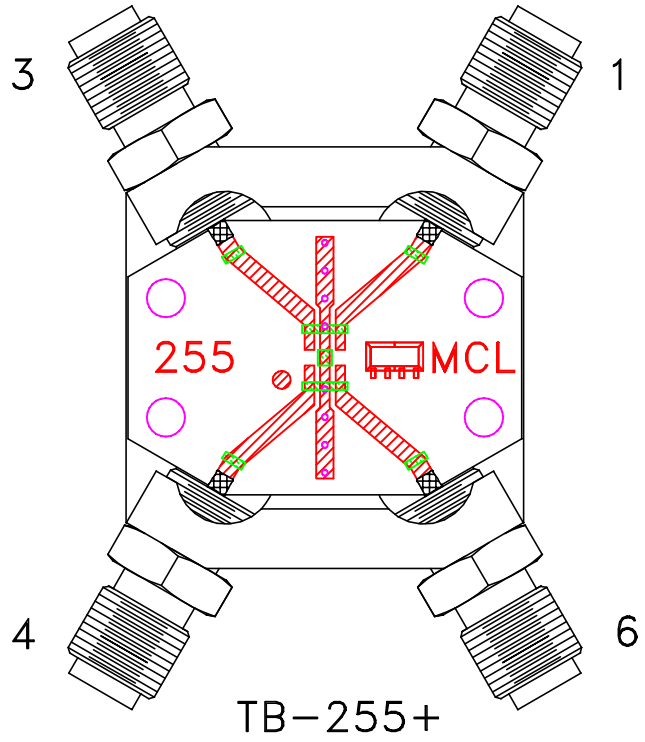
PL, pb/pn, FV1206-1, QCN/BDCN, TB-255

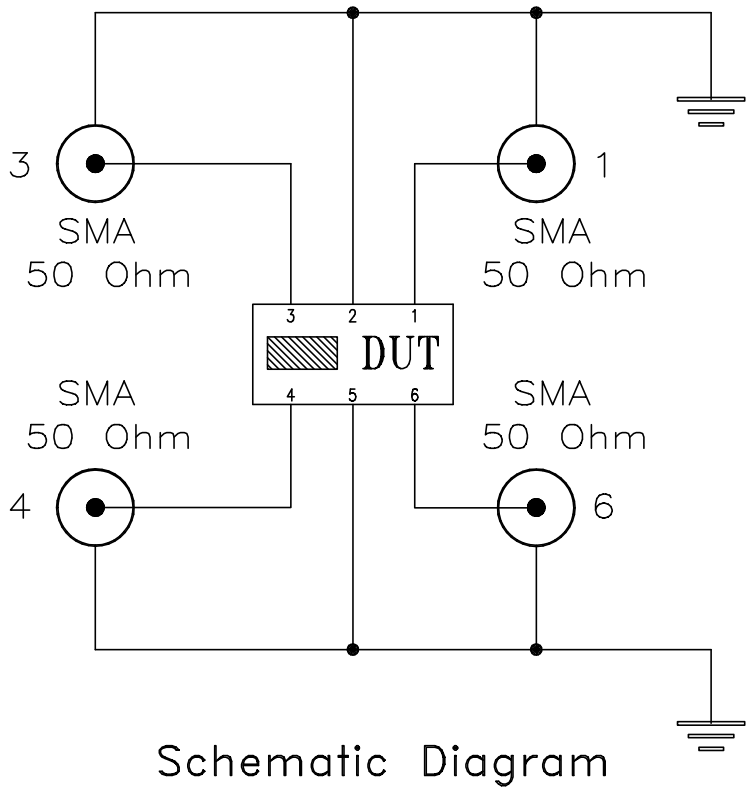
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-131	C

FILE:	SCALE:	SHEET:
98PL131	10:1	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 RO4350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.

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Environmental Specifications ENV06

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

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