

High Power

Bi-Directional Coupler

BDCN-20-13+

50Ω 20 dB Coupling 360 to 1000 MHz



CASE STYLE: FV1206-1

The Big Deal

- High Power handling (15W)
- Industry leading combination of size/bandwidth

Product Overview

Mini-Circuits new Bi-directional coupler BDCN-20-13+ offers an industry leading combination of operating bandwidth and size; The low insertion loss makes this component a versatile building block for use in a variety of systems and sub-system designs.

Feature	Advantages
Small Size	Offered in the FV1206-1 package size, the BDCN-20-13+ offers an industry leading combination of size, bandwidth and frequency. The small footprint (3.2mm x1.6mm) allows for reduced parasitics in systems with improved performance and simplified layout.
Low Loss	The .15 dB typical insertion loss make this design ideal for power monitoring, signal conditioning, and open circuit, fault protection circuits.
High Power handling	Capable of operating up to 15W, the LTCC construction of the BDCN-20-13+ makes this bi-directional coupler a robust, rugged product that can be used effectively in either the transmit or receive paths.

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



Bi-Directional Coupler

50Ω 20 dB Coupling 360 to 1000 MHz

Maximum Ratings

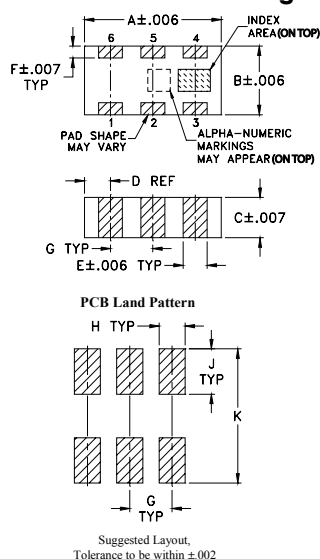
Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
DC Current	0.5A

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

Pin Connections

INPUT	1
OUTPUT	4
COUPLED (forward)	6
COUPLED (reverse)	3
GROUND	2.5

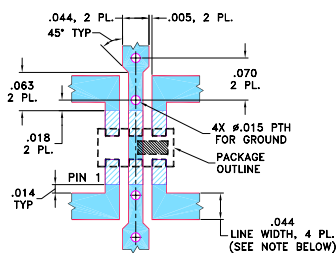
Outline Drawing



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		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)



TES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" $\pm$ 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 LAYER MASK OVER BARE COPPER

 MASK OVER BARE COPPER)

 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

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.

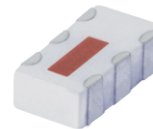
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCStore/terms.

Features

- four-port coupler
- excellent VSWR, 1.2:1 typ., all ports
- ultra small size, hermetically sealed
- minimal variation with temperature variation
- protected by US Patent 7,049,905
- DC current through input to output 0.5A Max. at 1.0 watt RF input power

Applications

- UHF communication



Generic photo used for illustration purposes only

CASE STYLE: FV1206-1

+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

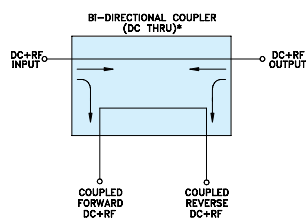
Reel Size	Devices/Reel
7"	20, 50, 100, 200, 500, 1000, 3000

Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		360	—	1000	MHz
Mainline Loss (above theoretical 0.03 dB)	360-470	—	0.15	0.25	dB
	470-550	—	0.17	0.30	
	550-700	—	0.20	0.35	
	700-900	—	0.25	0.40	
	900-1000	—	0.25	0.40	
Coupling	360-470	22.5	24.0	25.6	dB
	470-550	21.2	22.3	23.5	
	550-700	19.2	20.7	22.2	
	700-900	17.4	19.0	20.2	
	900-1000	16.5	17.5	18.5	
Coupling Flatness(±)	360-470	—	1.1	1.3	dB
	470-550	—	0.7	1.0	
	550-700	—	1.0	1.2	
	700-900	—	1.0	1.2	
	900-1000	—	0.4	0.6	
Directivity	360-470	10	12	—	dB
	470-550	10	12	—	
	550-700	10	12	—	
	700-900	10	12	—	
	900-1000	11	13	—	
Return Loss (Input)	360-470	25	33	—	dB
	470-550	25	31	—	
	550-700	22	30	—	
	700-900	20	27	—	
	900-1000	20	26	—	
Return Loss (Output)	360-470	25	31	—	dB
	470-550	25	30	—	
	550-700	22	28	—	
	700-900	20	26	—	
	900-1000	20	25	—	
Return Loss (Coupling)	360-470	25	35	—	dB
	470-550	25	34	—	
	550-700	25	33	—	
	700-900	20	31	—	
	900-1000	20	30	—	
Input Power ¹	300-1000	—	—	16	W

1. Derate linearly 8W at 100°C

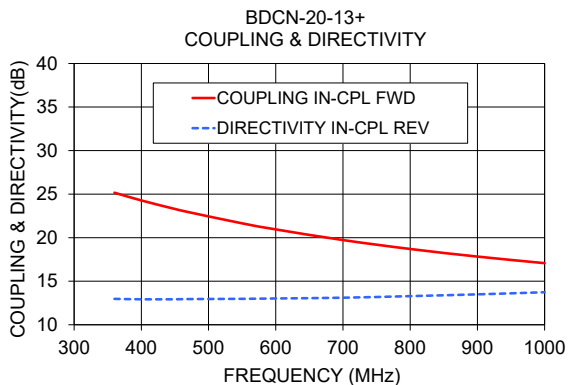
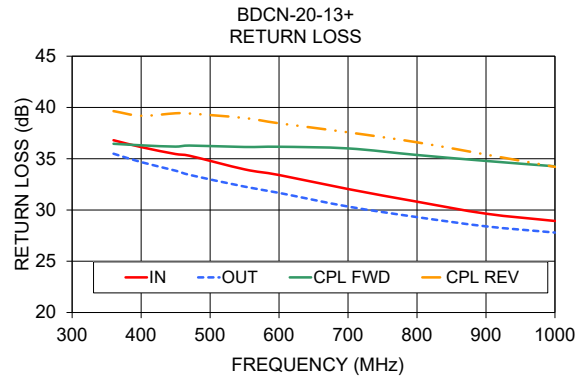
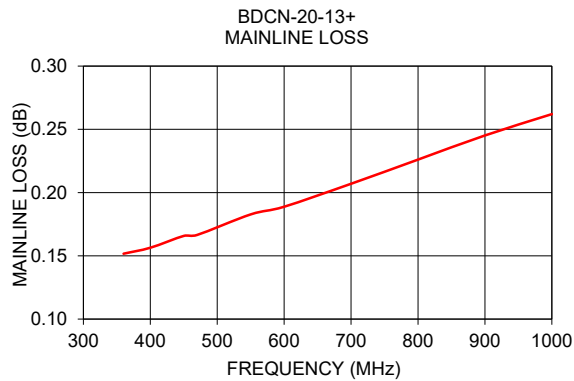
Electrical Schematic



* ELECTRICAL SCHEMATIC IS FOR BI-DIRECTIONAL COUPLER WITHOUT INTERNAL TRANSFORMERS AND RESISTORS

Typical Performance Data

Frequency (MHz)	Mainline Loss (dB)		Coupling (dB)		Directivity (dB)		Return Loss (dB)		
	In-Out	In-Cpl Fwd	Out-Cpl Rev	Out-Cpl Fwd	In-Cpl Rev	In	Out	Cpl Fwd	Cpl Rev
360.00	0.15	25.16	25.16	12.97	13.02	36.80	35.49	36.46	39.64
400.00	0.16	24.27	24.27	12.92	12.98	36.14	34.67	36.31	39.19
450.00	0.17	23.29	23.29	12.93	13.03	35.46	33.83	36.18	39.43
470.00	0.17	22.94	22.94	12.95	13.03	35.29	33.43	36.28	39.41
550.00	0.18	21.64	21.66	12.98	13.07	33.96	32.28	36.14	38.97
600.00	0.19	20.95	20.94	13.02	13.10	33.41	31.67	36.17	38.45
700.00	0.21	19.73	19.72	13.11	13.25	32.04	30.33	36.01	37.58
800.00	0.23	18.70	18.70	13.29	13.45	30.81	29.31	35.36	36.60
900.00	0.25	17.83	17.83	13.49	13.69	29.64	28.40	34.78	35.40
1000.00	0.26	17.07	17.07	13.73	13.96	28.93	27.80	34.26	34.20



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



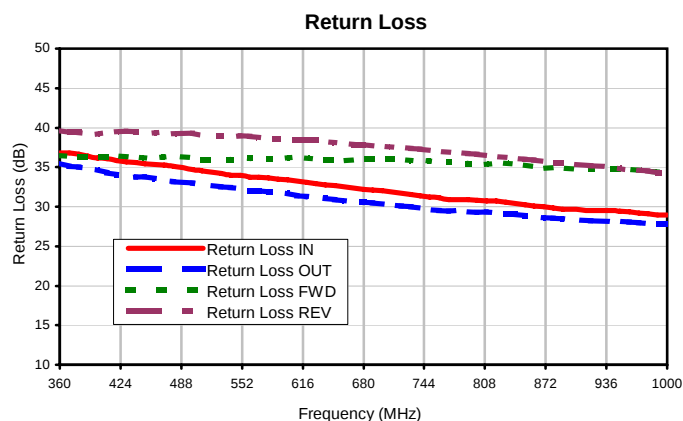
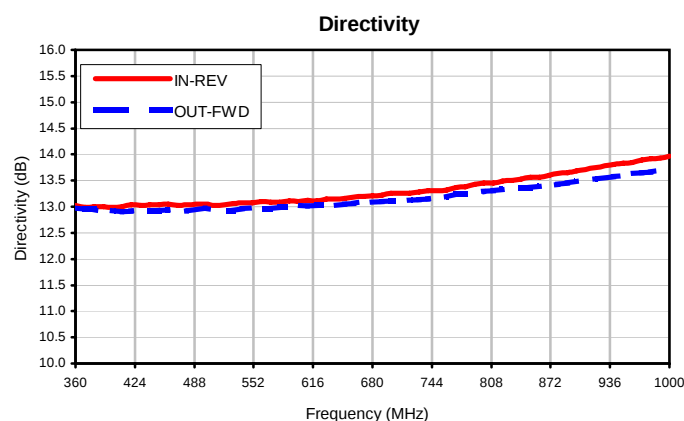
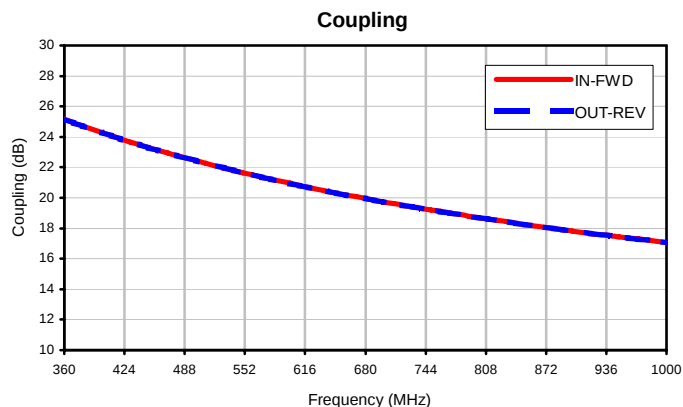
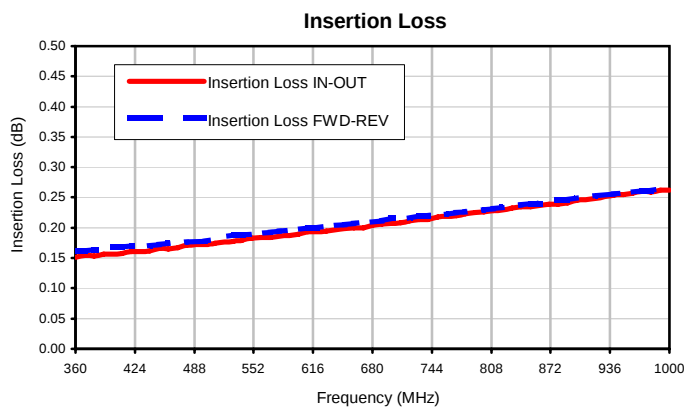
Typical Performance Data

FREQ. (MHz)	INSERTION LOSS		COUPLING		DIRECTIVITY		RETURN LOSS			
	(dB)		(dB)		(dB)		(dB)			
	IN-OUT	FWD-REV	IN-FWD	OUT-REV	IN-REV	OUT-FWD	IN	OUT	FWD	REV
360.0	0.15	0.16	25.16	25.16	13.02	12.97	36.80	35.49	36.46	39.64
370.0	0.15	0.16	24.93	24.93	12.99	12.95	36.79	35.13	36.32	39.42
380.0	0.15	0.16	24.70	24.71	13.00	12.96	36.65	35.06	36.26	39.38
390.0	0.16	0.16	24.49	24.48	13.00	12.91	36.37	34.79	36.24	39.17
400.0	0.16	0.17	24.27	24.27	12.98	12.92	36.14	34.67	36.31	39.19
410.0	0.16	0.17	24.07	24.07	13.00	12.90	36.03	34.31	36.32	39.37
420.0	0.16	0.17	23.87	23.86	13.03	12.91	35.79	34.05	36.42	39.50
430.0	0.16	0.17	23.67	23.68	13.02	12.95	35.66	34.08	36.30	39.54
440.0	0.16	0.17	23.48	23.48	13.04	12.93	35.56	33.71	36.23	39.48
450.0	0.17	0.17	23.29	23.29	13.03	12.93	35.46	33.83	36.18	39.43
460.0	0.16	0.17	23.12	23.12	13.05	12.94	35.38	33.58	36.19	39.29
470.0	0.17	0.17	22.94	22.94	13.03	12.95	35.29	33.43	36.28	39.41
480.0	0.17	0.18	22.77	22.76	13.03	12.92	35.07	33.13	36.30	39.25
500.0	0.17	0.18	22.43	22.43	13.05	12.98	34.72	32.99	36.24	39.35
510.0	0.17	0.18	22.27	22.27	13.03	12.93	34.55	32.75	35.95	38.97
530.0	0.18	0.19	21.95	21.96	13.06	12.93	34.20	32.52	35.89	38.91
540.0	0.18	0.19	21.79	21.79	13.08	12.96	34.01	32.46	35.95	38.86
550.0	0.18	0.19	21.64	21.66	13.07	12.98	33.96	32.28	36.14	38.97
560.0	0.18	0.19	21.50	21.50	13.09	12.96	33.73	32.05	36.16	38.89
570.0	0.18	0.19	21.36	21.36	13.09	12.97	33.70	32.01	36.01	38.71
580.0	0.19	0.19	21.22	21.22	13.08	12.99	33.61	31.82	36.08	38.55
590.0	0.19	0.20	21.08	21.08	13.12	12.99	33.46	31.77	36.02	38.58
600.0	0.19	0.20	20.95	20.94	13.10	13.02	33.41	31.67	36.17	38.45
610.0	0.19	0.20	20.82	20.81	13.12	13.02	33.20	31.42	36.22	38.44
620.0	0.19	0.20	20.69	20.69	13.11	13.03	33.06	31.31	36.14	38.39
630.0	0.19	0.20	20.56	20.56	13.14	13.02	32.90	31.03	36.07	38.43
640.0	0.20	0.20	20.43	20.43	13.15	13.03	32.73	31.03	35.95	38.28
650.0	0.20	0.20	20.31	20.31	13.16	13.05	32.65	30.88	35.93	38.12
660.0	0.20	0.21	20.19	20.18	13.19	13.06	32.47	30.70	35.85	37.98
670.0	0.20	0.21	20.07	20.07	13.20	13.10	32.34	30.65	35.89	37.87
680.0	0.20	0.21	19.96	19.95	13.21	13.09	32.20	30.54	36.09	37.84
690.0	0.21	0.21	19.84	19.84	13.22	13.10	32.13	30.46	36.08	37.67
700.0	0.21	0.22	19.73	19.72	13.25	13.11	32.04	30.33	36.01	37.58
710.0	0.21	0.22	19.62	19.62	13.26	13.10	31.87	30.21	35.99	37.52
720.0	0.21	0.22	19.51	19.51	13.26	13.13	31.70	30.09	35.95	37.46
730.0	0.21	0.22	19.40	19.40	13.28	13.14	31.55	30.03	35.84	37.41
740.0	0.21	0.22	19.30	19.30	13.31	13.15	31.40	29.84	35.95	37.33
750.0	0.22	0.22	19.20	19.19	13.30	13.18	31.20	29.65	35.79	37.13
760.0	0.22	0.22	19.10	19.09	13.32	13.19	31.10	29.53	35.71	36.99
770.0	0.22	0.23	18.99	18.99	13.37	13.24	30.93	29.44	35.63	36.87
780.0	0.22	0.23	18.90	18.89	13.38	13.25	30.91	29.47	35.56	36.76
790.0	0.23	0.23	18.80	18.79	13.43	13.26	30.92	29.37	35.42	36.72
800.0	0.23	0.23	18.70	18.70	13.45	13.29	30.81	29.31	35.36	36.60
810.0	0.23	0.23	18.61	18.60	13.46	13.30	30.73	29.31	35.32	36.48
820.0	0.23	0.23	18.52	18.51	13.49	13.33	30.70	29.25	35.41	36.36
830.0	0.23	0.24	18.43	18.42	13.50	13.35	30.58	29.04	35.51	36.24
840.0	0.23	0.24	18.33	18.33	13.52	13.36	30.43	29.00	35.41	36.10
850.0	0.24	0.24	18.25	18.24	13.56	13.37	30.27	28.84	35.25	36.00
860.0	0.24	0.24	18.16	18.16	13.56	13.39	30.10	28.76	35.05	35.94
870.0	0.24	0.24	18.07	18.07	13.59	13.41	29.96	28.61	34.89	35.66
880.0	0.24	0.25	17.99	17.99	13.64	13.43	29.80	28.51	34.96	35.53
890.0	0.24	0.25	17.91	17.90	13.65	13.46	29.71	28.43	34.94	35.52
900.0	0.25	0.25	17.83	17.83	13.69	13.49	29.64	28.40	34.78	35.40
920.0	0.25	0.25	17.67	17.66	13.74	13.53	29.49	28.25	34.81	35.17
940.0	0.25	0.26	17.51	17.51	13.81	13.58	29.52	28.17	34.74	35.03
950.0	0.25	0.26	17.44	17.43	13.84	13.60	29.40	28.17	34.82	34.90
960.0	0.26	0.26	17.36	17.35	13.85	13.64	29.36	28.10	34.72	34.65
970.0	0.26	0.26	17.29	17.28	13.90	13.65	29.17	28.00	34.60	34.63
980.0	0.26	0.26	17.22	17.21	13.92	13.66	29.10	27.86	34.50	34.54
990.0	0.26	0.26	17.15	17.14	13.93	13.70	28.97	27.84	34.36	34.31
1000.0	0.26	0.27	17.07	17.07	13.96	13.73	28.93	27.80	34.26	34.20

Bi-Directional Coupler

Typical Performance Curves

BDCN-20-13+



Mini-Circuits®
ISO 9001 ISO 14001 AS 9100 CERTIFIED

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

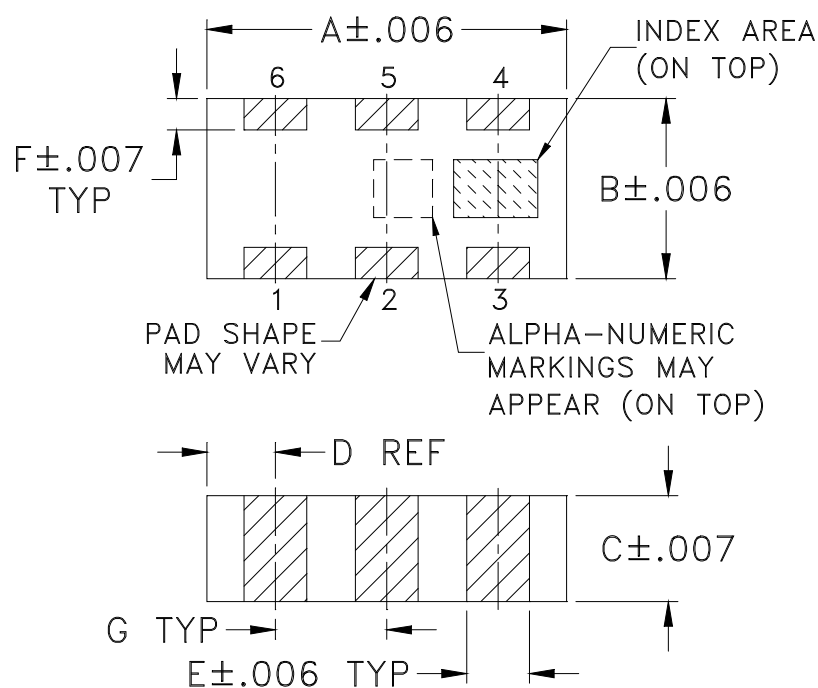


IF/RF MICROWAVE COMPONENTS

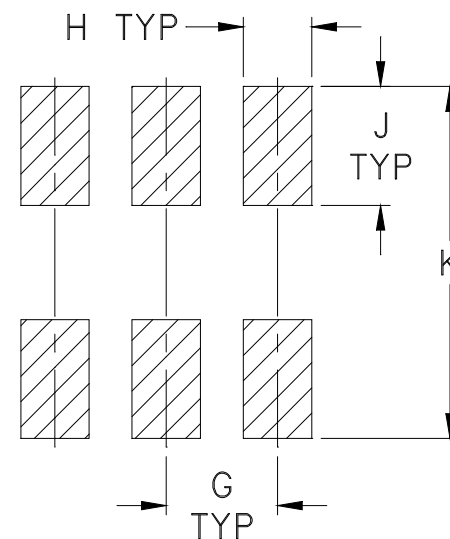
minicircuits.com

REV. X1
BDCN-20-13+
8/1/2011
Page 1 of 1

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.



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

RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging

TR-F75

DEVICE ORIENTATION IN T&R

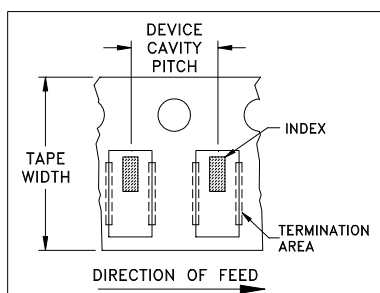


ILLUSTRATION 1

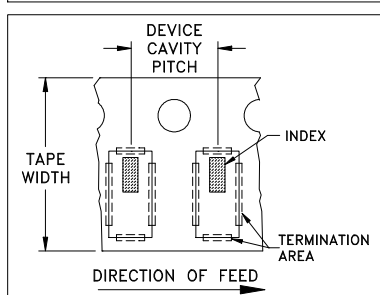


ILLUSTRATION 2

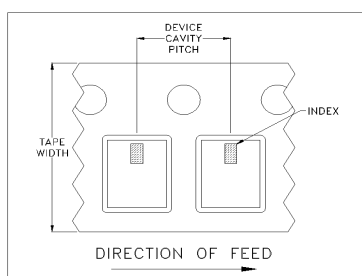


ILLUSTRATION 3

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.

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

Mini-Circuits ISO 9001 & ISO 14001 Certified

Mini-Circuits®

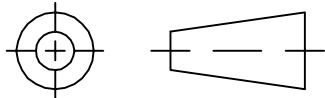
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

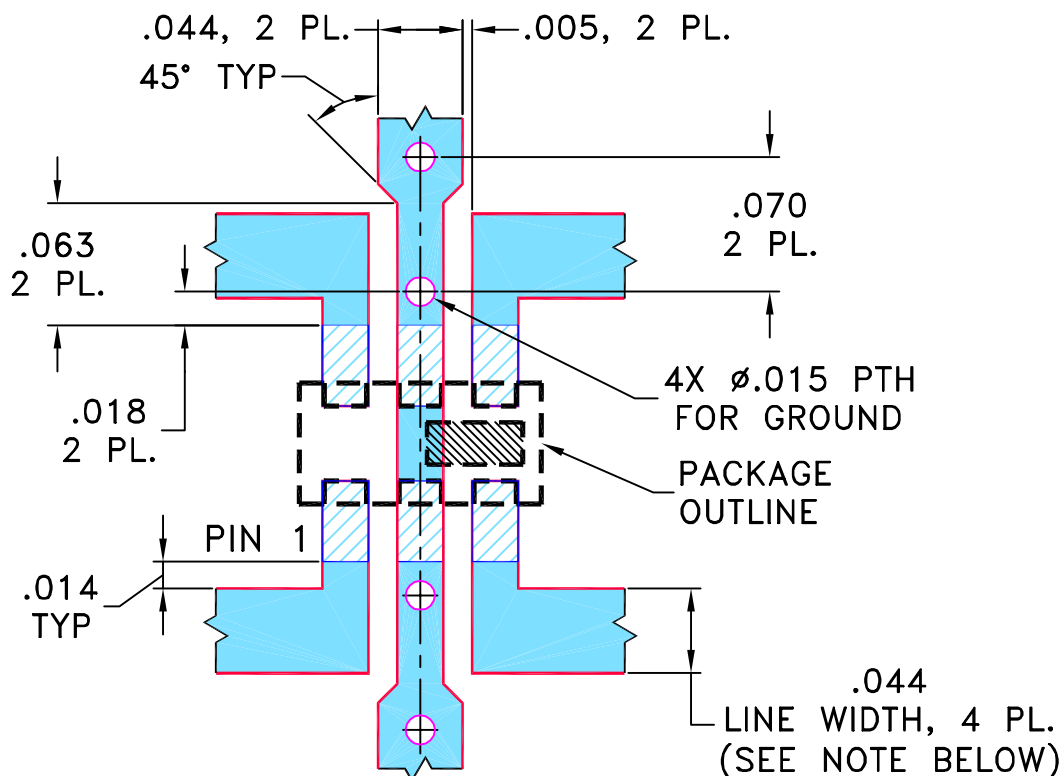
THIRD ANGLE PROJECTION



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

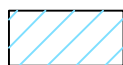


NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.020" $\pm$ 0.0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.

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

TOLERANCES ON:

2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$

DRAWN

MMG

05/14/03

CHECKED

AV

05/19/03

APPROVED

ABD

05/20/03



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

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

SIZE

CODE IDENT

DRAWING NO:

REV:

A

15542

98-PL-131

C

FILE:

98PL131

SCALE:

10:1

SHEET:

1 OF 1

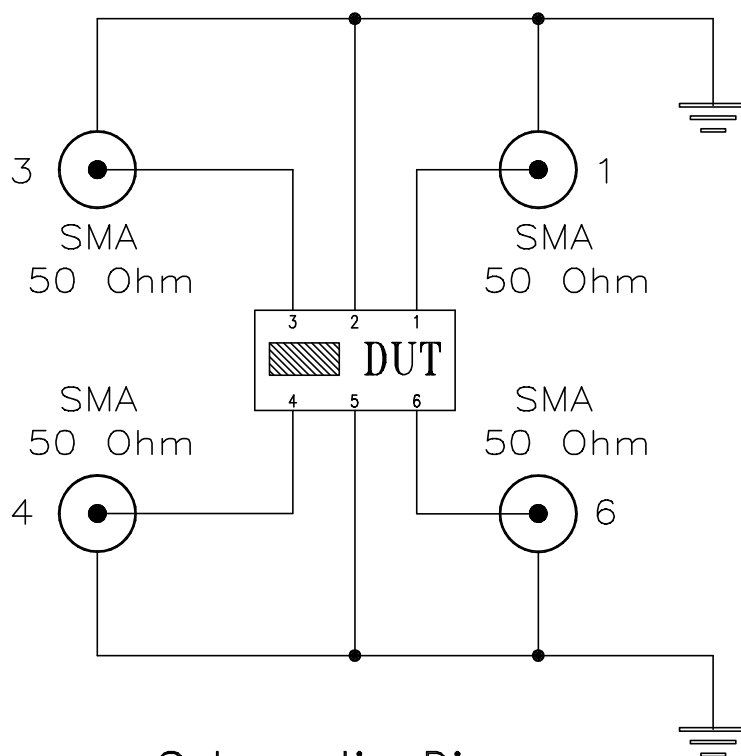
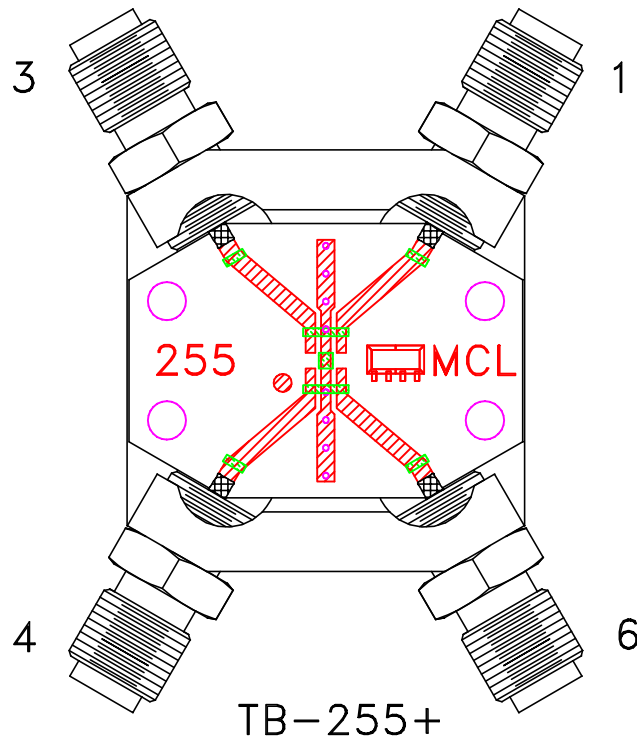
Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

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