High IP3

Voltage Variable Attenuator

MVA-1000+

50Ω 50 to 1000 MHz

Maximum Ratings

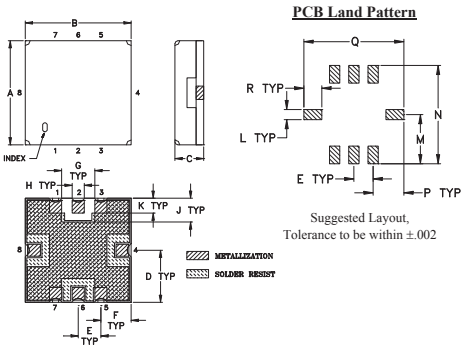
Operating Temperature	-55°C to 85°C
Storage Temperature	-55°C to 85°C
Absolute Max. Supply Voltage(V+)	7V
Absolute Max. Control Voltage(Vctrl)	6V
Absolute Max. RF Input Level	+20 dBm

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

Pin Connections

RF IN	6
RF OUT	2
V CONTROL	4
V+	8
GROUND	1,3,5,7

Outline Drawing

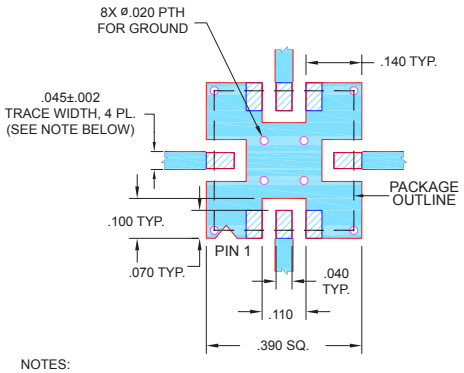


Outline Dimensions (inch / mm)

A	B	C	D	E	F	G	H	J
.350	.350	.150	.175	.075	.100	.110	.040	.080
8.89	8.89	3.81	4.45	1.93	2.54	2.79	1.02	2.03

K	L	M	N	P	Q	R	wt.
.050	.040	.195	.390	.120	.390	.070	grams
1.27	1.02	4.95	9.91	3.05	9.91	1.78	0.50

Demo Board MCL P/N: TB-286
Suggested PCB Layout (PL-154)



NOTES:
1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025" ± .002"; 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)

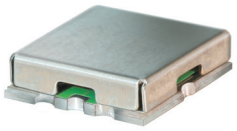
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Features

- Frequency range, 50-1000 MHz
- High linearity, 3 dB/V typ. at Vcont from 1V to 5V
- High IP3, +52 dBm typ.
- Small phase deviation over attenuation range
- No external bias and RF matching network required
- Shielded case
- Aqueous washable

Applications

- CATV
- Power level control
- Feed forward amplifiers
- Public safety radio



CASE STYLE: GP1212

+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"	10, 20, 50, 100, 200
13"	500,1000

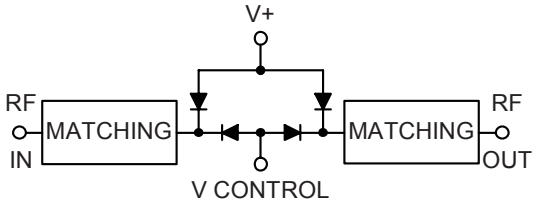
Electrical Specifications (T_{AMB}= 25°C)

FREQ. (MHz)		MIN. INSERTION LOSS, dB (+5V)		MAX. ATTENUATION dB (0V)		INPUT POWER (dBm)	CONTROL Voltage (V)	CONTROL Current (mA)	IP3 (dBm)	RETURN LOSS (dB)	POWER SUPPLY Voltage (V)	POWER SUPPLY Current (mA)
Min.	Max.	Typ.	Max.	Typ.	Min.	Max.		Max.	Typ.	Typ.		Max.
50	- 1000	3.6	4.7	13.0	11.5	+20	0 - 5	15	52	20	+5	3

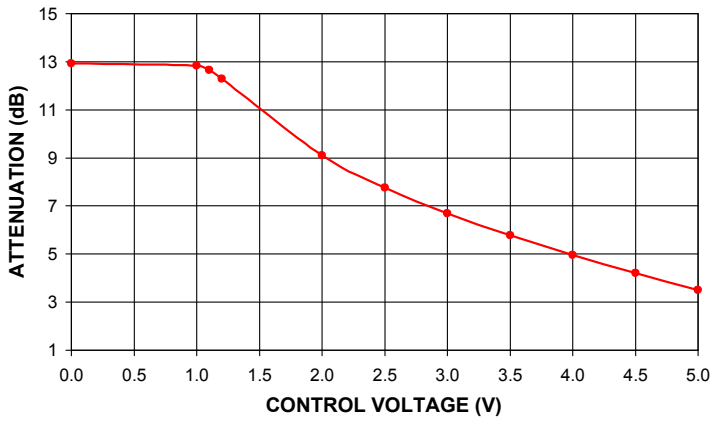
Notes:

Rise/Fall time: 20 μSec/60μSec Typ.
Switching Time, turn on/off: 50μSec Typ.

Equivalent Schematic

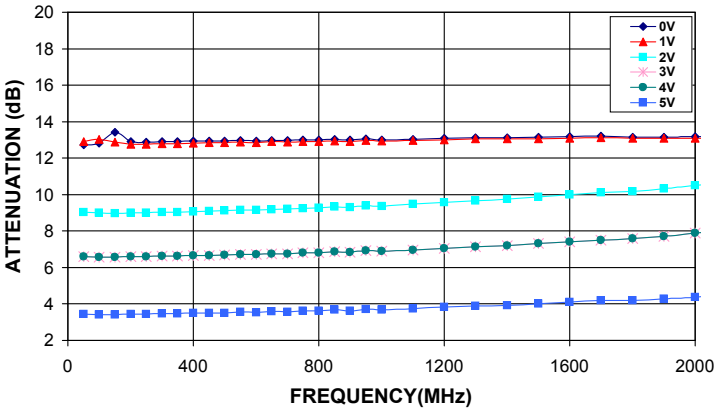


MVA-1000+
TYPICAL ATTENUATION AT 500MHz

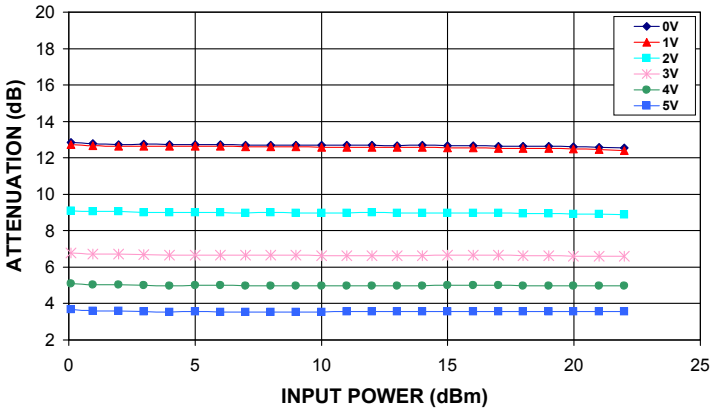


Notes
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

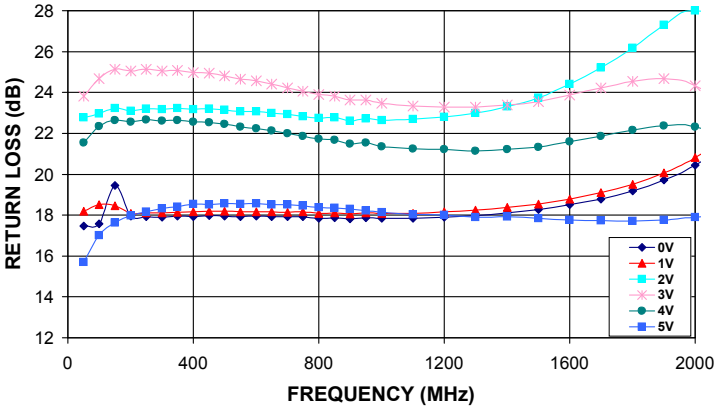
MVA-1000+
ATTENUATION Vs. FREQUENCY
OVER CONTROL VOLTAGES



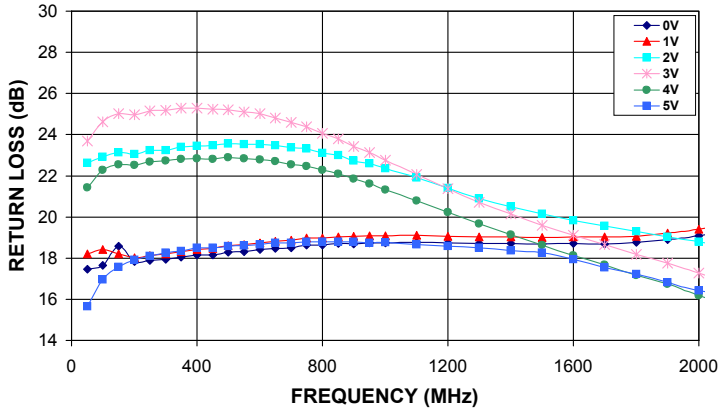
MVA-1000+
ATTENUATION Vs. INPUT POWER
OVER CONTROL VOLTAGES AT 500MHz



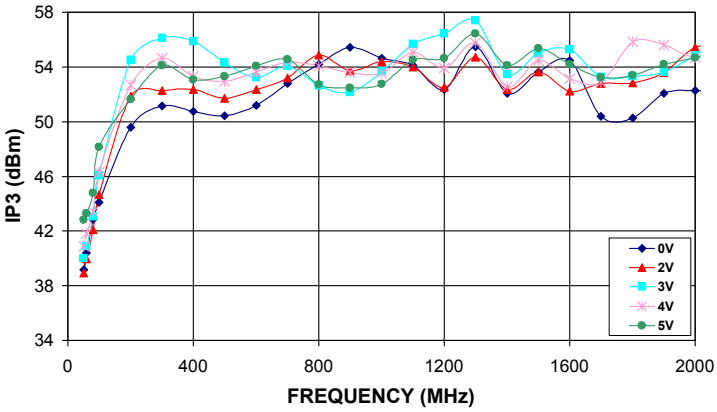
MVA-1000+
INPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES



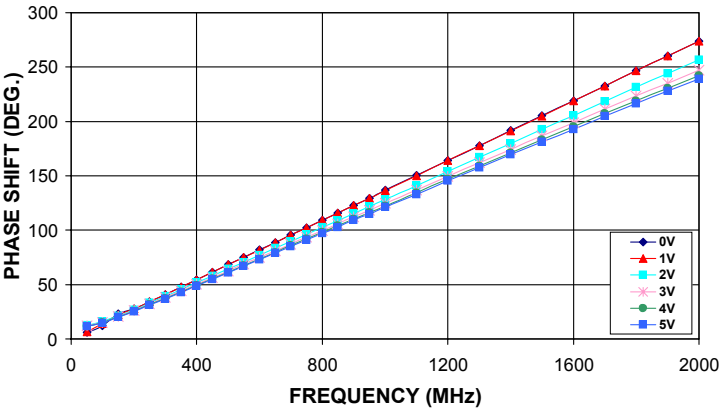
MVA-1000+
OUTPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES



MVA-1000+
IP3 Vs. FREQUENCY
OVER CONTROL VOLTAGES



MVA-1000+
PHASE SHIFT Vs. FREQUENCY
Vs. CONTROL VOLTAGE



Voltage Variable Attenuator MVA-1000+

Typical Performance Data

V CONTROL (V)	ATTENUATION @ 500 MHz (dB) @V+=5V
0.0	12.93
1.0	12.84
1.1	12.65
1.2	12.28
2.0	9.11
2.5	7.76
3.0	6.69
3.5	5.78
4.0	4.96
4.5	4.21
5.0	3.50

FREQ. (MHz)	ATTENUATION Vs. V CONTROL @ V+=5V (dB)					
	@V Control=0V	@V Control=1V	@V Control=2V	@V Control=3V	@V Control=4V	@V Control=5V
50	12.74	12.92	9.04	6.59	4.88	3.44
100	12.83	13.04	8.99	6.58	4.87	3.42
150	13.43	12.88	8.98	6.57	4.87	3.42
200	12.91	12.76	9.00	6.59	4.88	3.44
250	12.89	12.77	9.01	6.60	4.90	3.44
300	12.91	12.79	9.04	6.62	4.91	3.47
350	12.90	12.80	9.04	6.63	4.91	3.46
400	12.93	12.83	9.06	6.66	4.93	3.49
450	12.94	12.85	9.10	6.67	4.95	3.50
500	12.93	12.84	9.11	6.69	4.96	3.50
550	12.96	12.88	9.14	6.71	4.99	3.55
600	12.95	12.86	9.15	6.73	5.00	3.54
650	12.98	12.90	9.19	6.76	5.03	3.58
700	12.96	12.88	9.20	6.76	5.04	3.57
750	13.00	12.91	9.25	6.81	5.08	3.62
800	13.00	12.91	9.26	6.80	5.07	3.61
850	13.03	12.94	9.32	6.87	5.14	3.67
900	12.99	12.91	9.30	6.85	5.10	3.62
950	13.06	12.96	9.40	6.93	5.19	3.72
1000	12.99	12.93	9.37	6.90	5.15	3.67
1100	13.04	12.96	9.47	6.97	5.22	3.74
1200	13.09	13.01	9.58	7.06	5.31	3.83
1300	13.13	13.05	9.67	7.14	5.38	3.90
1400	13.12	13.05	9.75	7.20	5.43	3.93
1500	13.15	13.06	9.87	7.31	5.52	4.01
1600	13.17	13.09	9.98	7.41	5.62	4.09
1700	13.20	13.12	10.10	7.51	5.71	4.18
1800	13.15	13.09	10.16	7.58	5.75	4.19
1900	13.15	13.08	10.32	7.72	5.85	4.27
2000	13.17	13.10	10.49	7.90	6.02	4.38

Typical Performance Data

FREQ. (MHz)	INPUT RETURN LOSS Vs. V CONTROL @ V+=5V (dB)					
	@V Control=0V	@V Control=1V	@V Control=2V	@V Control=3V	@V Control=4V	@V Control=5V
50	17.48	18.20	22.77	23.81	21.53	15.69
100	17.58	18.52	22.95	24.69	22.34	17.00
150	19.44	18.46	23.22	25.12	22.63	17.64
200	17.94	18.09	23.10	25.06	22.56	17.98
250	17.93	18.10	23.20	25.14	22.67	18.17
300	17.90	18.10	23.17	25.06	22.60	18.32
350	17.95	18.14	23.22	25.08	22.63	18.41
400	17.91	18.16	23.18	24.97	22.55	18.53
450	17.97	18.18	23.21	24.94	22.54	18.50
500	17.95	18.19	23.15	24.81	22.44	18.56
550	17.92	18.16	23.07	24.65	22.31	18.55
600	17.96	18.17	23.08	24.57	22.25	18.56
650	17.93	18.17	22.98	24.40	22.13	18.50
700	17.92	18.15	22.93	24.23	22.01	18.51
750	17.91	18.16	22.83	24.07	21.86	18.47
800	17.84	18.09	22.75	23.89	21.72	18.38
850	17.87	18.12	22.77	23.82	21.68	18.35
900	17.82	18.05	22.60	23.62	21.50	18.29
950	17.86	18.10	22.72	23.62	21.53	18.22
1000	17.83	18.08	22.64	23.47	21.36	18.14
1100	17.84	18.09	22.70	23.33	21.25	18.04
1200	17.90	18.17	22.80	23.28	21.21	18.01
1300	17.98	18.25	23.00	23.28	21.15	17.90
1400	18.10	18.39	23.31	23.38	21.21	17.91
1500	18.28	18.53	23.75	23.56	21.34	17.84
1600	18.52	18.78	24.40	23.88	21.59	17.75
1700	18.77	19.10	25.22	24.23	21.87	17.73
1800	19.17	19.51	26.19	24.55	22.16	17.71
1900	19.72	20.07	27.31	24.67	22.37	17.77
2000	20.44	20.83	28.00	24.32	22.33	17.89

Typical Performance Data

FREQ. (MHz)	OUTPUT RETURN LOSS Vs. V CONTROL @ V+=5V (dB)					
	@V Control=0V	@V Control=1V	@V Control=2V	@V Control=3V	@V Control=4V	@V Control=5V
50	17.47	18.21	22.63	23.69	21.44	15.65
100	17.64	18.42	22.93	24.63	22.27	16.96
150	18.57	18.21	23.12	25.03	22.55	17.57
200	17.83	18.01	23.05	24.97	22.53	17.91
250	17.90	18.12	23.23	25.15	22.68	18.09
300	17.93	18.21	23.24	25.17	22.72	18.25
350	18.04	18.30	23.39	25.29	22.82	18.34
400	18.14	18.43	23.46	25.28	22.85	18.51
450	18.16	18.46	23.47	25.24	22.82	18.49
500	18.28	18.60	23.56	25.22	22.88	18.59
550	18.30	18.65	23.52	25.09	22.83	18.61
600	18.42	18.74	23.54	25.01	22.78	18.67
650	18.48	18.83	23.49	24.82	22.71	18.74
700	18.50	18.86	23.36	24.59	22.55	18.75
750	18.62	18.97	23.32	24.38	22.47	18.78
800	18.63	18.97	23.11	24.06	22.27	18.80
850	18.72	19.03	23.01	23.79	22.08	18.80
900	18.69	19.05	22.74	23.42	21.85	18.80
950	18.73	19.08	22.60	23.13	21.62	18.75
1000	18.73	19.08	22.35	22.77	21.33	18.77
1100	18.76	19.11	21.91	22.07	20.79	18.65
1200	18.73	19.07	21.39	21.38	20.24	18.58
1300	18.71	19.02	20.90	20.72	19.66	18.50
1400	18.70	19.02	20.49	20.15	19.15	18.36
1500	18.69	19.00	20.14	19.58	18.62	18.25
1600	18.71	19.03	19.82	19.11	18.13	17.94
1700	18.69	19.03	19.56	18.65	17.67	17.55
1800	18.77	19.07	19.30	18.19	17.17	17.21
1900	18.89	19.21	19.03	17.76	16.73	16.83
2000	19.08	19.41	18.79	17.28	16.18	16.43

Typical Performance Data

FREQ. (MHz)	INPUT IP3 Vs. V CONTROL @ V+=5V (dBm)				
	@V Control=0V	@V Control=2V	@V Control=3V	@V Control=4V	@V Control=5V
50	39.17	38.94	40.00	40.88	42.82
60	40.41	39.95	40.91	41.82	43.31
80	42.85	42.08	43.05	43.41	44.77
100	44.08	44.64	46.05	46.29	48.14
200	49.58	51.85	54.50	52.68	51.63
300	51.13	52.29	56.11	54.62	54.13
400	50.74	52.34	55.87	53.32	53.08
500	50.43	51.70	54.31	52.97	53.30
600	51.19	52.35	53.25	53.62	54.08
700	52.78	53.19	54.06	54.35	54.55
800	54.20	54.87	52.65	54.09	52.70
900	55.43	53.70	52.14	53.60	52.46
1000	54.63	54.38	53.69	53.57	52.74
1100	54.12	53.98	55.66	55.09	54.53
1200	52.37	52.52	56.43	53.93	54.64
1300	55.49	54.73	57.38	55.77	56.44
1400	52.07	52.36	53.46	52.54	54.10
1500	53.65	53.64	55.03	54.48	55.35
1600	54.47	52.23	55.27	53.14	54.21
1700	50.38	52.81	53.28	52.88	53.23
1800	50.25	52.85	53.30	55.85	53.39
1900	52.09	53.59	53.65	55.58	54.19
2000	52.27	55.44	54.83	54.67	54.68

Voltage Variable Attenuator MVA-1000+

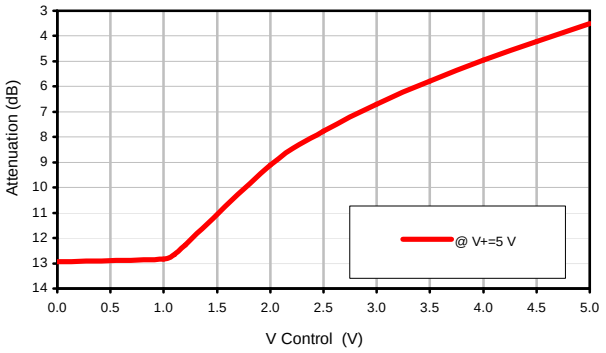
Typical Performance Data

FREQ. (MHz)	PHASE SHIFT Vs. V CONTROL @ V+=5V (deg)					
	@V Control=0V	@V Control=1V	@V Control=2V	@V Control=3V	@V Control=4V	@V Control=5V
50	5.96	6.37	12.73	11.88	11.60	11.66
100	11.89	13.94	15.86	15.18	14.89	14.81
150	23.00	21.95	21.09	20.39	20.03	19.91
200	27.89	27.91	26.83	26.05	25.61	25.35
250	34.35	34.42	32.97	32.02	31.47	31.18
300	40.99	41.00	39.05	38.06	37.37	36.98
350	47.70	47.74	45.29	44.12	43.34	42.92
400	54.61	54.54	51.66	50.32	49.48	48.98
450	61.23	61.17	57.90	56.36	55.37	54.74
500	68.23	68.29	64.29	62.63	61.57	60.96
550	74.79	74.79	70.56	68.72	67.55	66.78
600	81.82	81.71	76.95	74.91	73.66	72.90
650	88.50	88.46	83.35	81.19	79.78	78.88
700	95.53	95.42	89.67	87.33	85.86	84.92
750	102.09	102.09	96.05	93.55	91.93	90.88
800	109.28	109.22	102.57	99.84	98.14	97.14
850	115.66	115.60	108.81	105.92	104.03	102.74
900	122.96	122.91	115.31	112.19	110.26	109.17
950	129.30	129.23	121.60	118.30	116.19	114.76
1000	136.72	136.65	128.11	124.66	122.49	121.20
1100	150.26	150.08	140.91	137.03	134.56	133.08
1200	164.09	163.96	154.00	149.60	146.94	145.26
1300	177.88	177.78	167.04	162.08	159.20	157.43
1400	191.68	191.52	179.83	174.36	171.23	169.39
1500	205.32	205.07	192.57	186.61	183.18	181.12
1600	218.93	218.78	205.53	198.86	195.14	192.90
1700	232.68	232.52	218.49	211.17	207.24	204.79
1800	246.78	246.45	231.40	223.38	219.07	216.57
1900	260.32	260.04	244.16	235.25	230.51	227.81
2000	273.81	273.74	256.92	247.17	242.00	238.96

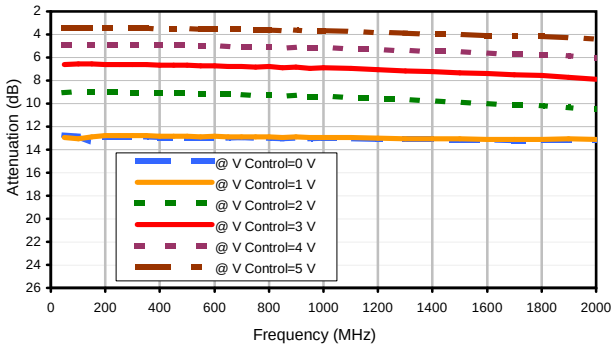
Voltage Variable Attenuator MVA-1000+

Typical Performance Curves

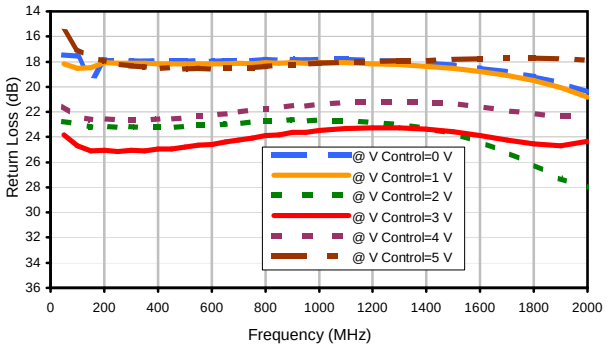
Attenuation @ 500 MHz



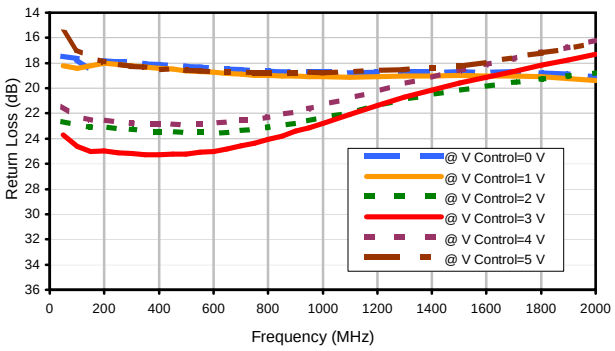
Attenuation @ V+=5 V



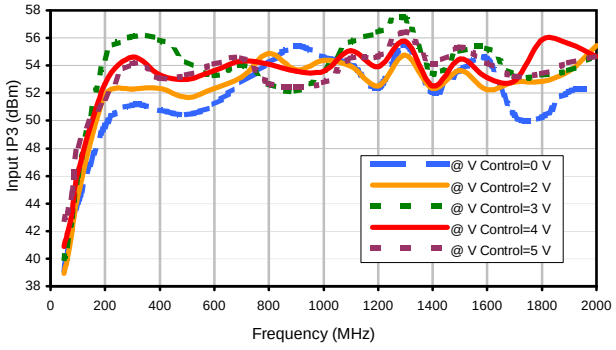
Input Return Loss @ V+=5 V



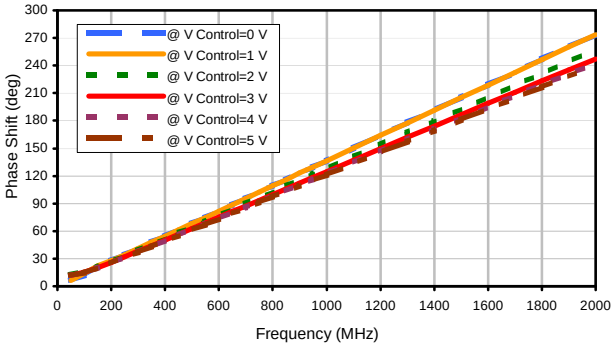
Output Return Loss @ V+=5 V



Input IP3 @ V+=5 V

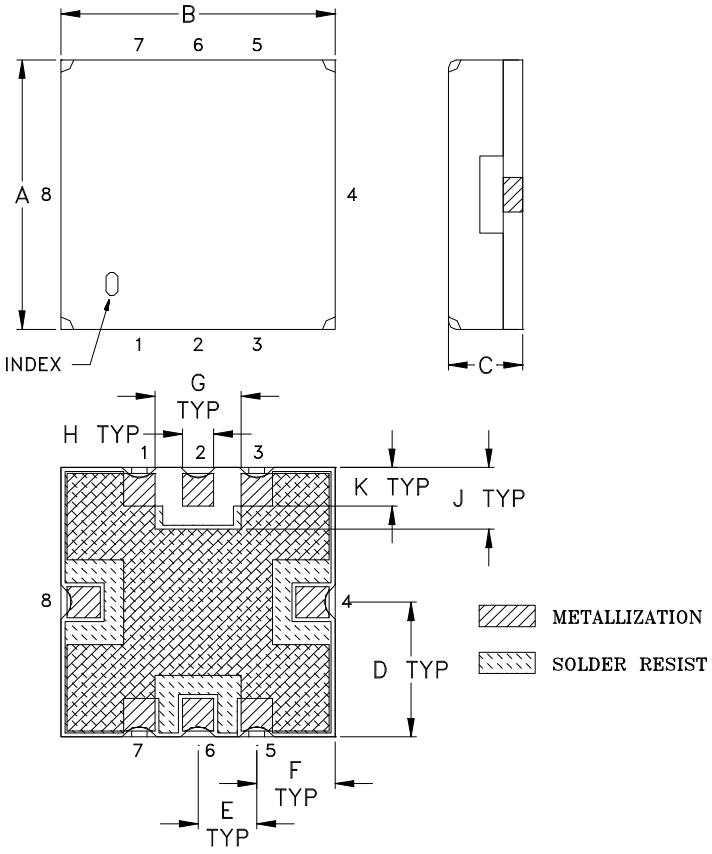


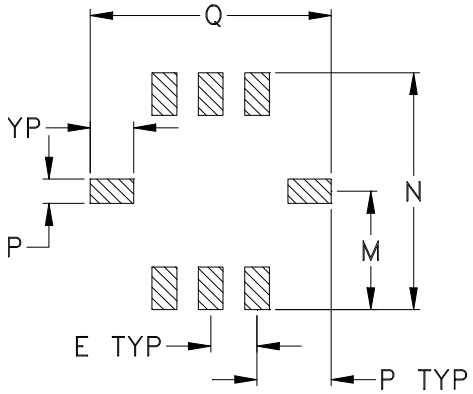
Phase Shift @ V+=5 V



Case Style GP

Outline Dimensions GP1212





CASE #	A	B	C	D	E	F	G	H	J	K	L	M
GP1212	.350 (8.89)	.350 (8.89)	.150 (3.81)	.175 (4.45)	.075 (1.91)	.100 (2.54)	.110 (2.79)	.040 (1.02)	.080 (2.03)	.050 (1.27)	.040 (1.02)	.195 (4.95)

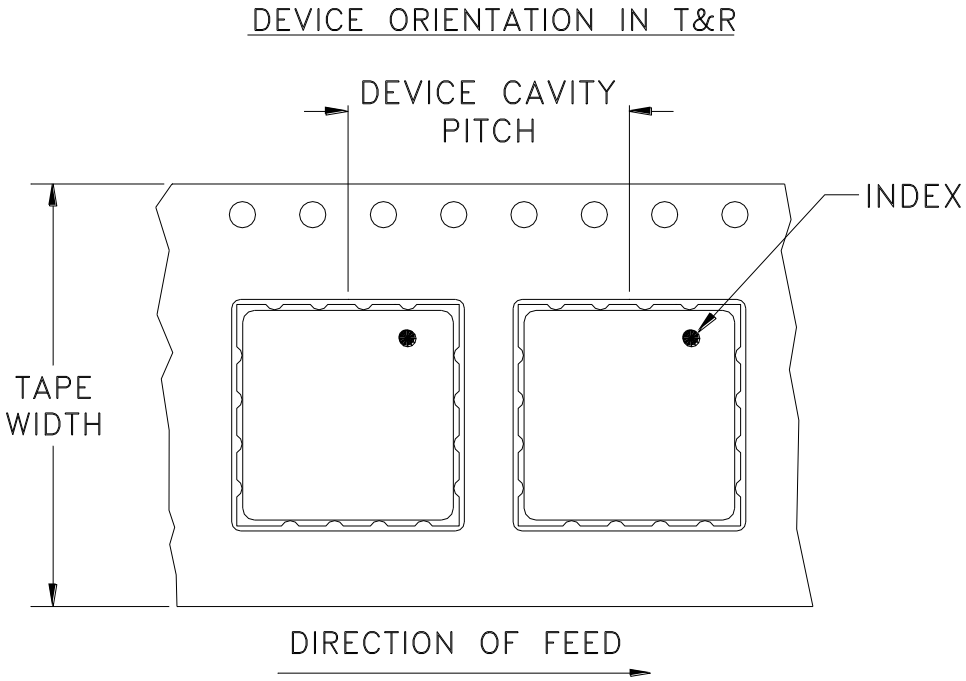
CASE #	N	P	Q	R	WT. GRAM	
GP1212	.390 (9.91)	.120 (3.05)	.390 (9.91)	.070 (1.78)	.5	+0.3
						-0.0

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3Pl. ± .015

Notes:

1. Case material: Nickel-Silver alloy.
2. Base: Printed wiring laminate.
3. Termination finish:
   For RoHS Case Styles: 3-5 µ inch (.08-.13 microns) Gold over 120-240 µ inch (3.05-6.10 microns) Nickel plate.
   For RoHS-5 Case Styles: Tin-Lead plate.

Tape & Reel Packaging TR-F78



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note
16	12	7	10
			20
			50
			100
			200
		13	500, 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.

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

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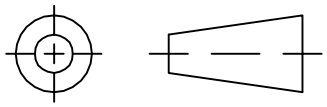
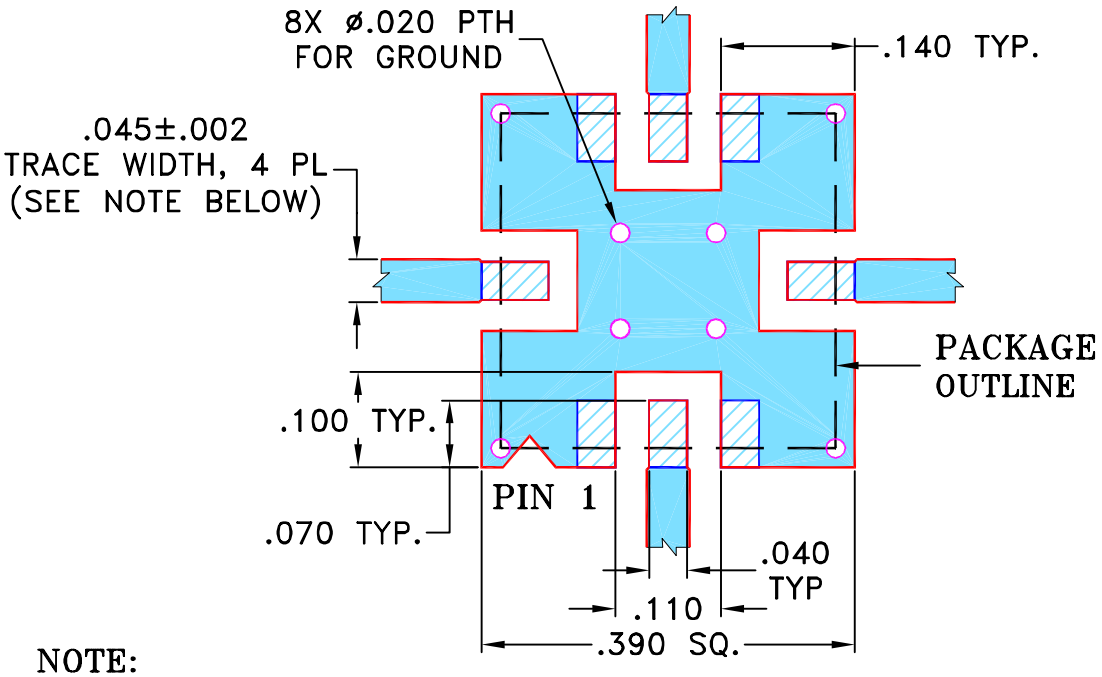
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M91524	NEW RELEASE (FROM RAVON)	08/04	RZ	HH
OR	R56458	NEW RELEASE (FROM RAVON)	08/04	RZ	HH
A	M102713	ADDED "...WITH SMOBC"	01/12/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION FOR GP731 CASE STYLE, pk PIN CONNECTION.



NOTE:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .025"±.002"; 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	RZ (RAVON)	26 AUG 04
TOLERANCES ON:	CHECKED	RZ (RAVON)	26 AUG 04
2 PL DECIMALS ±	APPROVED	HH (RAVON)	26 AUG 04
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

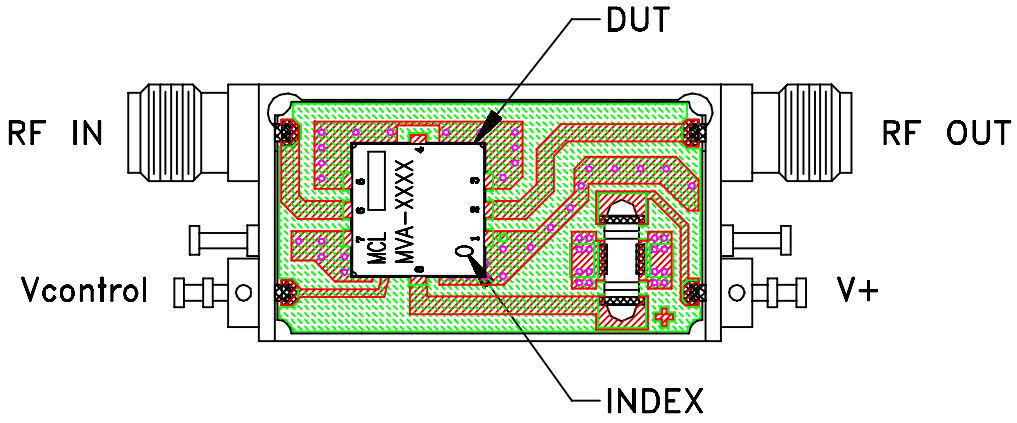
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, pk, GP731, MVA, TB-286

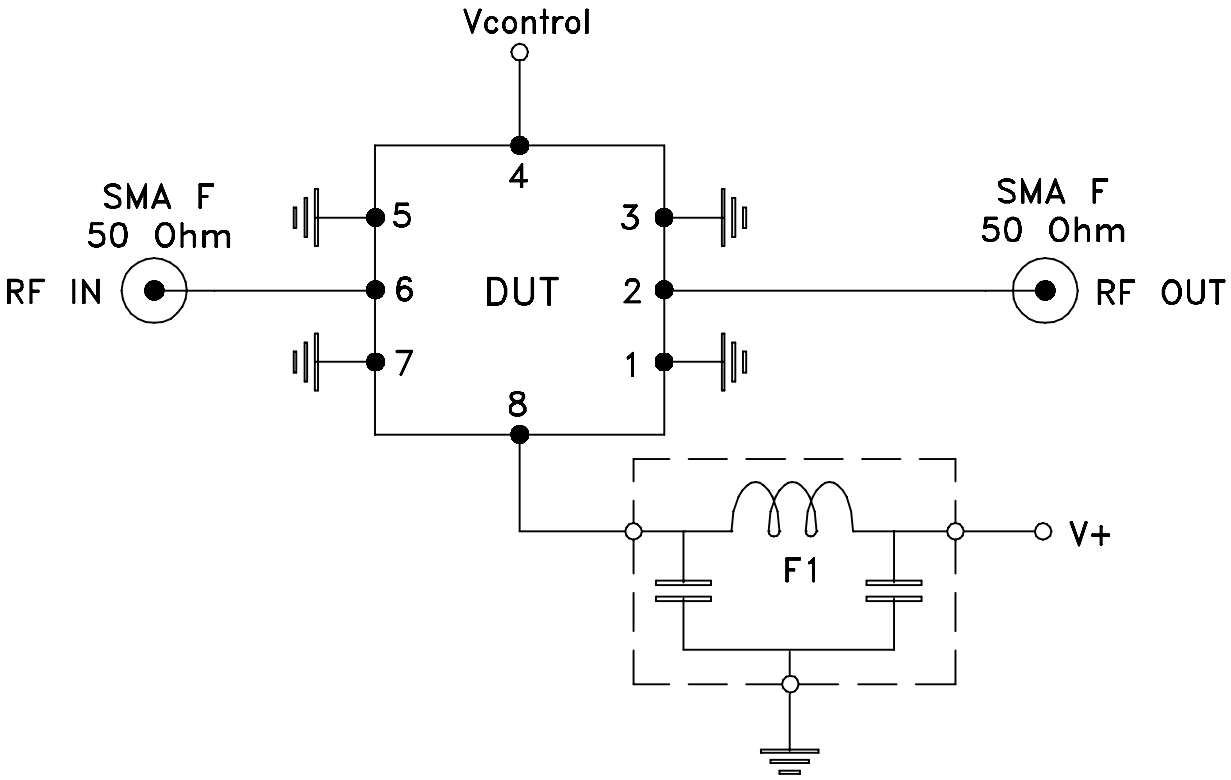
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-154	A

FILE:	SCALE:	SHEET:
98PL154	5:1	1 OF 1

Evaluation Board and Circuit



TB-286



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: FR4 GRADE IT-180TC (ITEQ CORPORATION)
   Dielectric Constant=4.5, Thickness=.025 inch.

Mini-Circuits®

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Environmental Specifications ENV03T3

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 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 85° C Ambient Environment	Individual Model Data Sheet
HAST	130°C, 85% RH, 96 hours	JESD22-A110
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 Eutectic Process: 225°C peak Pb-Free Process, 245°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, 20-2000 Hz, 4 times in each of three axes (total 12)	MIL-STD-883, Method 2007.3, Condition A
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