

Surface Mount Voltage Variable Attenuator

EVA-2-75+

75Ω 50 to 2000 MHz

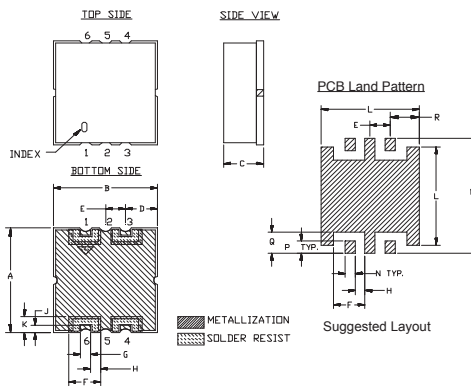
Maximum Ratings

Operating Temperature	-45°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage(V+)	7V
Absolute Max. Control Voltage(Vctrl)	9V
Absolute Max. RF Input Level	+22 dBm
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

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

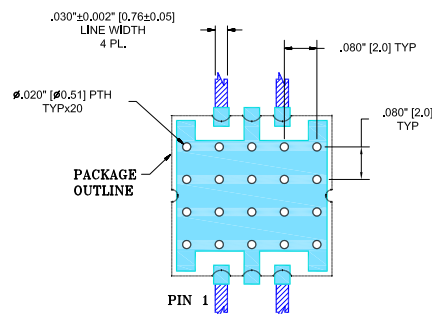
Outline Drawing



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	
.394	.394	.150	.122	.075	.120	.038	.037	
10.01	10.01	3.81	3.10	1.90	3.05	0.97	0.94	
J	K	L	M	N	P	Q	R	wt.
.026	.061	.370	.434	.038	.046	.081	.110	grams
0.66	1.55	9.40	11.02	0.97	1.17	2.06	2.79	0.7

Demo Board MCL P/N: TB-381 Suggested PCB Layout (PL-238)



NOTE:

1. TRACE WIDTH IS SHOWN FOR R04350 WITH DIELECTRIC THICKNESS. .030"±.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 SOLDERMASK

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

Features

- Frequency range, 50-2000 MHz
- IP3, 50 dBm typ.
- Maximum attenuation at minimum current
- No external bias and RF matching network required
- Small size, shielded case
- Aqueous washable

Applications

- CATV
- Variable gain amplifiers
- Feed forward amplifiers
- ALC circuits



CASE STYLE: HE1135

+RoHS Compliant

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

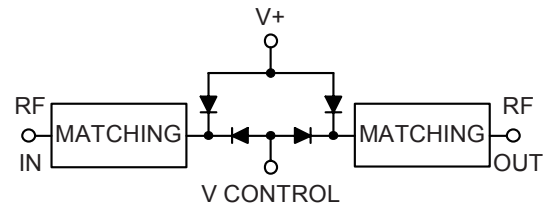
Electrical Specifications (T_{AMB} = 25°C)

FREQ. (MHz)		MIN. INSERTION LOSS, dB (+8V)		MAX. ATTENUATION dB (0V)		INPUT POWER (dBm)	CONTROL Voltage Current (V) (mA)		IP3 (dBm)	RETURN LOSS (dB)	POWER SUPPLY Voltage Current (V) (mA)	
Min.	Max.	Typ.	Max.	Typ.	Min.	Max.		Max.	Typ.	Typ.		Max.
50 - 1000		2.5	3.5	40	25	+22	0 - 8	40	48	27	+5	3
1000 - 2000		3.0	4.7	24	20	+22	0 - 8	40	51	20	+5	3

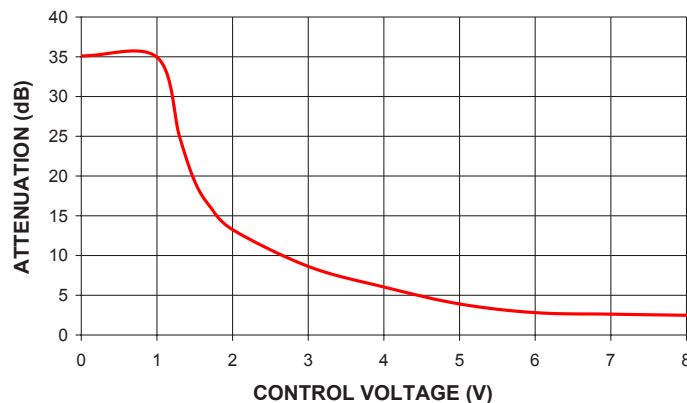
Notes:

- Rise/Fall time: 15μSec/36μSec Typ.
Switching Time, turn on/off: 40μSec. Typ.

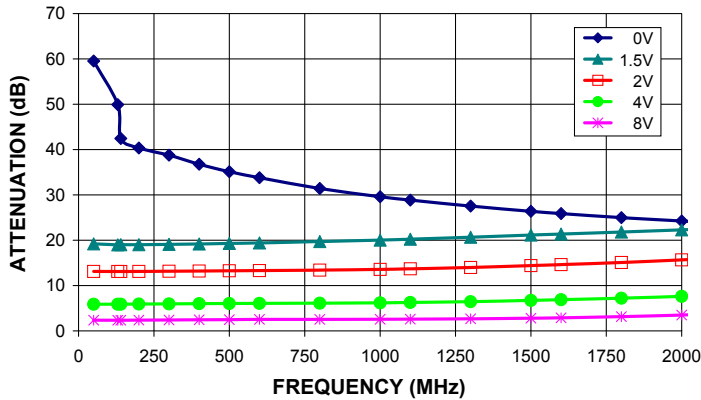
Equivalent Schematic



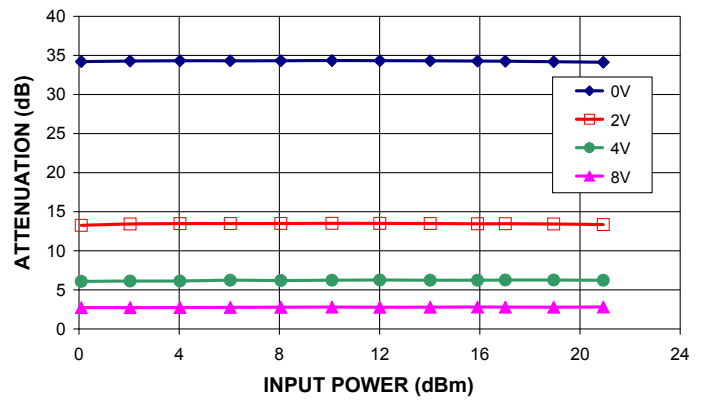
EVA-2-75+ TYPICAL ATTENUATION AT 500 MHz



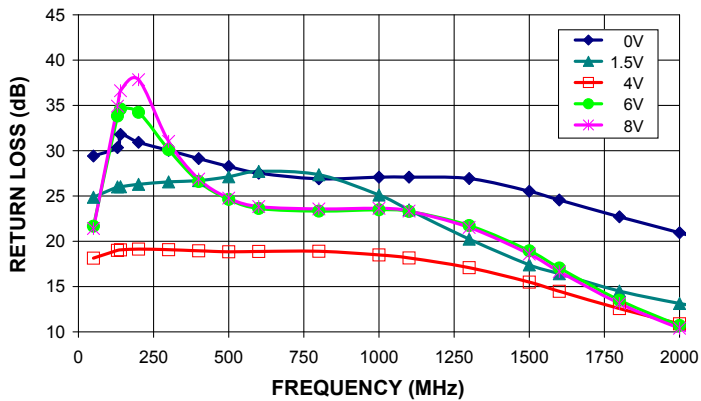
**EVA-2-75+
ATTENUATION Vs. FREQUENCY
OVER CONTROL VOLTAGES**



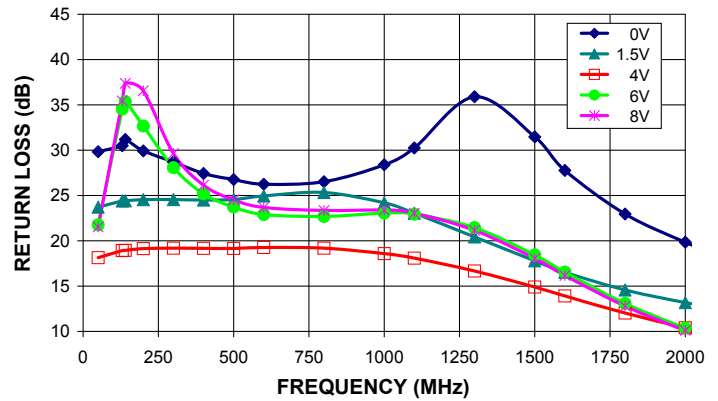
**EVA-2-75+
ATTENUATION Vs. INPUT POWER
OVER CONTROL VOLTAGES AT 500 MHz**



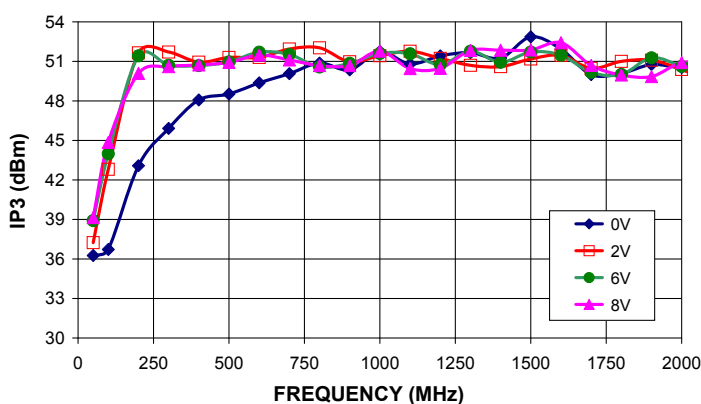
**EVA-2-75+
INPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES**



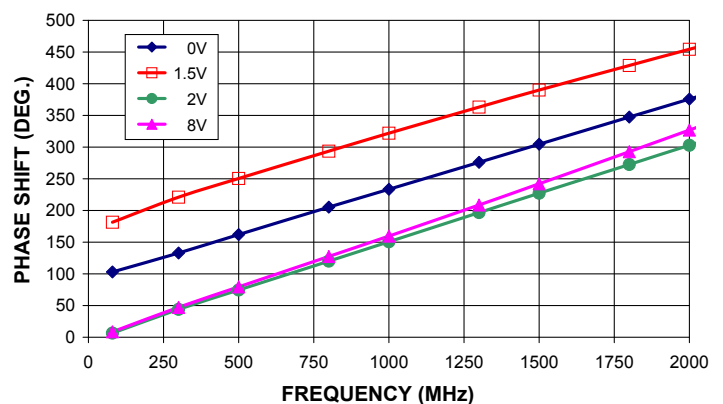
**EVA-2-75+
OUTPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES**



**EVA-2-75+
IP3 Vs. FREQUENCY
OVER CONTROL VOLTAGES**



**EVA-2-75+
PHASE SHIFT Vs. FREQUENCY
OVER CONTROL VOLTAGES**



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Voltage Variable Attenuator

EVA-2-75+

Typical Performance Data

V CONTROL (V)	ATTENUATION @ 500 MHz (dB) @V+=5V
0.0	35.11
1.0	34.95
1.3	24.91
1.5	19.31
1.7	16.18
2.0	13.26
3.0	8.63
4.0	6.04
5.0	3.90
6.0	2.81
7.0	2.62
8.0	2.48

FREQ. (MHz)	ATTENUATION Vs. V CONTROL @ V+=5V (dB)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
50	59.54	19.20	13.11	5.88	2.36
100	58.22	19.00	13.07	5.90	2.34
130	49.92	18.99	13.10	5.89	2.35
140	42.45	19.01	13.10	5.88	2.35
200	40.35	19.02	13.11	5.93	2.37
250	39.87	19.06	13.14	5.96	2.40
300	38.77	19.09	13.16	5.96	2.40
350	37.75	19.13	13.18	5.98	2.42
400	36.77	19.18	13.21	6.01	2.45
500	35.11	19.31	13.26	6.04	2.48
600	33.79	19.41	13.31	6.07	2.53
700	32.50	19.57	13.35	6.09	2.54
800	31.42	19.71	13.41	6.11	2.54
900	30.46	19.86	13.48	6.13	2.57
1000	29.59	20.03	13.57	6.19	2.57
1100	28.85	20.23	13.70	6.28	2.60
1200	28.12	20.45	13.83	6.33	2.63
1300	27.53	20.67	13.98	6.45	2.67
1400	26.90	20.91	14.18	6.56	2.71
1500	26.38	21.15	14.41	6.72	2.79
1600	25.89	21.36	14.63	6.88	2.88
1700	25.43	21.62	14.85	7.03	3.00
1800	24.98	21.81	15.09	7.22	3.14
1900	24.60	22.07	15.38	7.42	3.32
2000	24.24	22.29	15.66	7.63	3.50

REV. X1
EVA-2-75+
070705
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The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



Voltage Variable Attenuator

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Typical Performance Data

FREQ. (MHz)	INPUT RETURN LOSS Vs. V CONTROL @ V+=5V				
	(dB)				
	@V Control=0V	@V Control=1.5V	@V Control=4V	@V Control=6V	@V Control=8V
50	29.41	24.86	18.14	21.67	21.41
100	30.18	25.86	18.84	29.76	29.65
130	30.34	26.01	19.00	33.83	34.92
140	31.80	26.02	19.05	34.61	36.62
200	30.93	26.29	19.14	34.24	37.84
250	29.83	26.57	19.27	31.25	33.59
300	30.04	26.56	19.07	30.12	31.03
350	29.68	26.60	18.93	27.94	28.21
400	29.13	26.70	18.95	26.60	26.87
500	28.27	27.12	18.84	24.63	24.77
600	27.52	27.72	18.88	23.62	23.83
700	27.14	27.38	18.88	23.27	23.48
800	26.90	27.35	18.90	23.33	23.57
900	26.92	26.51	18.77	23.49	23.69
1000	27.08	25.11	18.49	23.48	23.64
1100	27.08	23.47	18.16	23.30	23.33
1200	27.23	21.76	17.66	22.65	22.57
1300	26.93	20.24	17.09	21.74	21.53
1400	26.32	18.74	16.34	20.50	20.20
1500	25.52	17.40	15.49	18.95	18.59
1600	24.56	16.42	14.48	17.05	16.66
1700	23.64	15.42	13.47	15.15	14.78
1800	22.70	14.51	12.57	13.49	13.14
1900	21.75	13.81	11.68	11.98	11.65
2000	20.94	13.14	10.89	10.71	10.40

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Typical Performance Data

FREQ. (MHz)	OUTPUT RETURN LOSS Vs. V CONTROL @ V+=5V (dB)				
	@V Control=0V	@V Control=1.5V	@V Control=4V	@V Control=6V	@V Control=8V
50	29.83	23.72	18.14	21.76	21.53
100	30.50	24.35	18.82	30.12	30.09
130	30.50	24.40	18.92	34.54	35.44
140	31.18	24.41	18.95	35.36	37.38
200	29.92	24.54	19.14	32.67	36.56
250	28.97	24.73	19.25	29.61	32.11
300	28.71	24.55	19.19	28.07	29.64
350	28.00	24.38	19.11	26.27	27.37
400	27.43	24.50	19.17	25.18	26.14
500	26.76	24.56	19.16	23.73	24.52
600	26.25	24.95	19.26	22.90	23.68
700	26.21	25.15	19.21	22.56	23.25
800	26.52	25.33	19.19	22.69	23.35
900	27.26	24.97	18.95	22.98	23.50
1000	28.39	24.19	18.59	23.06	23.39
1100	30.25	23.05	18.09	22.94	23.05
1200	32.77	21.81	17.45	22.42	22.33
1300	35.90	20.43	16.67	21.45	21.15
1400	35.53	19.10	15.81	20.09	19.72
1500	31.47	17.79	14.90	18.44	18.06
1600	27.77	16.53	13.91	16.54	16.17
1700	25.13	15.49	12.96	14.75	14.41
1800	22.96	14.57	12.03	13.09	12.79
1900	21.22	13.82	11.17	11.62	11.33
2000	19.85	13.18	10.40	10.37	10.11

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Voltage Variable Attenuator

EVA-2-75+

Typical Performance Data

FREQ. (MHz)	INPUT IP3 Vs. V CONTROL @ V+=5V (dBm)				
	@V Control=0V	@V Control=2V	@V Control=4V	@V Control=6V	@V Control=8V
50	36.26	37.24	37.69	38.91	39.14
100	36.72	42.81	44.66	43.99	44.85
200	43.08	51.65	51.96	51.42	50.09
300	45.91	51.71	51.31	50.70	50.60
400	48.07	50.94	50.31	50.68	50.73
500	48.52	51.30	50.52	50.96	50.92
600	49.37	51.30	50.60	51.70	51.48
700	50.07	51.94	50.46	51.53	51.11
800	50.87	52.03	50.65	50.57	50.68
900	50.36	50.97	50.16	50.85	50.68
1000	51.75	51.43	50.34	51.60	51.78
1100	50.80	51.77	51.63	51.58	50.45
1200	51.42	51.23	51.80	50.75	50.47
1300	51.66	50.70	51.46	51.77	51.83
1400	51.25	50.60	51.93	50.93	51.85
1500	52.86	51.18	51.88	51.71	51.87
1600	51.93	51.46	53.10	51.47	52.42
1700	50.00	50.47	51.04	50.17	50.69
1800	50.09	51.00	51.66	50.01	49.97
1900	50.76	51.09	52.07	51.27	49.85
2000	50.53	50.39	51.25	50.62	50.91

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Typical Performance Data

FREQ. (MHz)	PHASE SHIFT Vs. V CONTROL @ V+=5V				
	(deg)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
80	103.00	181.43	6.51	8.81	8.64
300	132.94	221.05	43.96	46.57	47.17
500	162.04	250.56	74.53	78.45	79.50
800	205.32	293.63	120.06	125.93	127.47
1000	233.43	321.91	150.66	158.03	159.58
1300	275.94	363.15	196.72	206.54	208.68
1500	304.53	390.02	227.25	239.09	242.11
1800	347.42	428.77	272.59	287.93	292.76
2000	375.78	454.39	302.85	320.90	326.96

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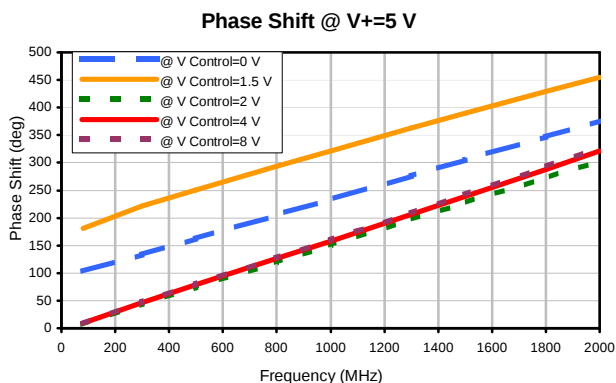
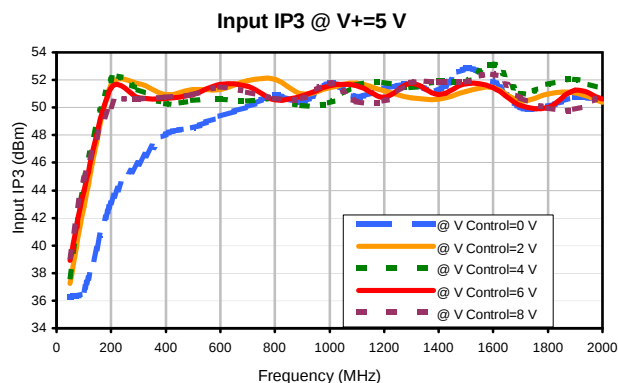
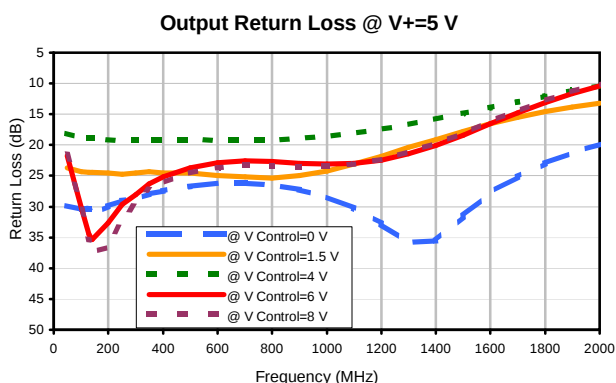
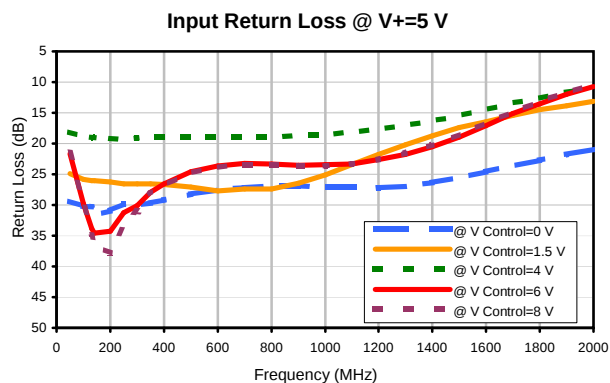
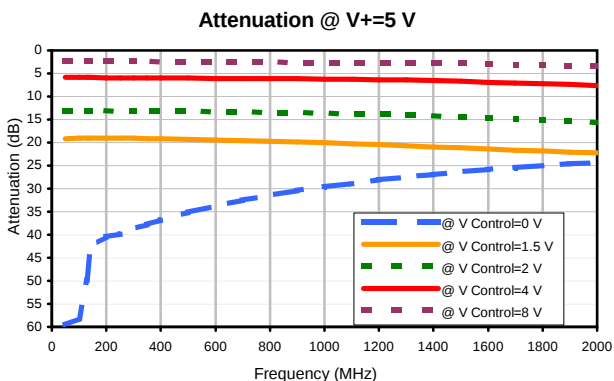
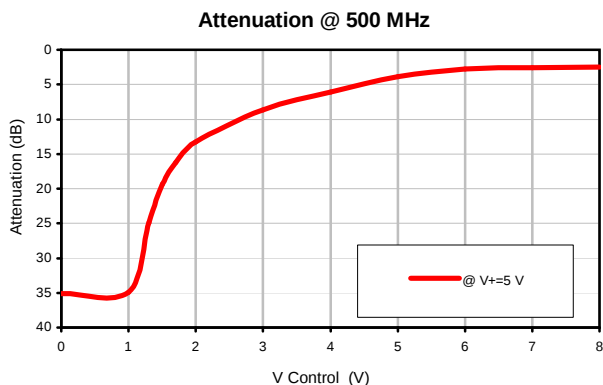
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Voltage Variable Attenuator

Typical Performance Curves

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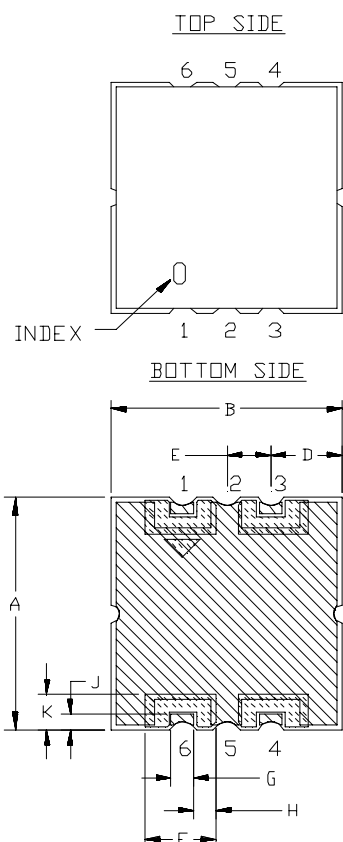
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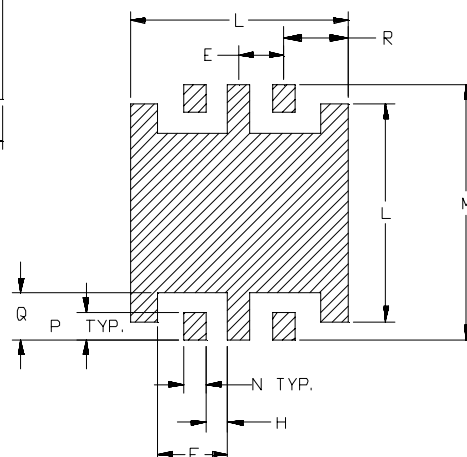


Outline Dimensions



SIDE VIEW

PCB Land Pattern



Suggested Layout

METALLIZATION
 SOLDER RESIST

CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N	P
HE1135	.394 (10.01)	.394 (10.01)	.150 (3.81)	.122 (3.10)	.075 (1.90)	.120 (3.05)	.038 (0.97)	.037 (0.94)	.026 (0.66)	.061 (1.55)	.370 (9.40)	.434 (11.02)	.038 (0.97)	.046 (1.17)

CASE #	Q	R	WT. GRAMS
HE1135	.081 (2.06)	.110 (2.79)	0.7

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

Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- 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.

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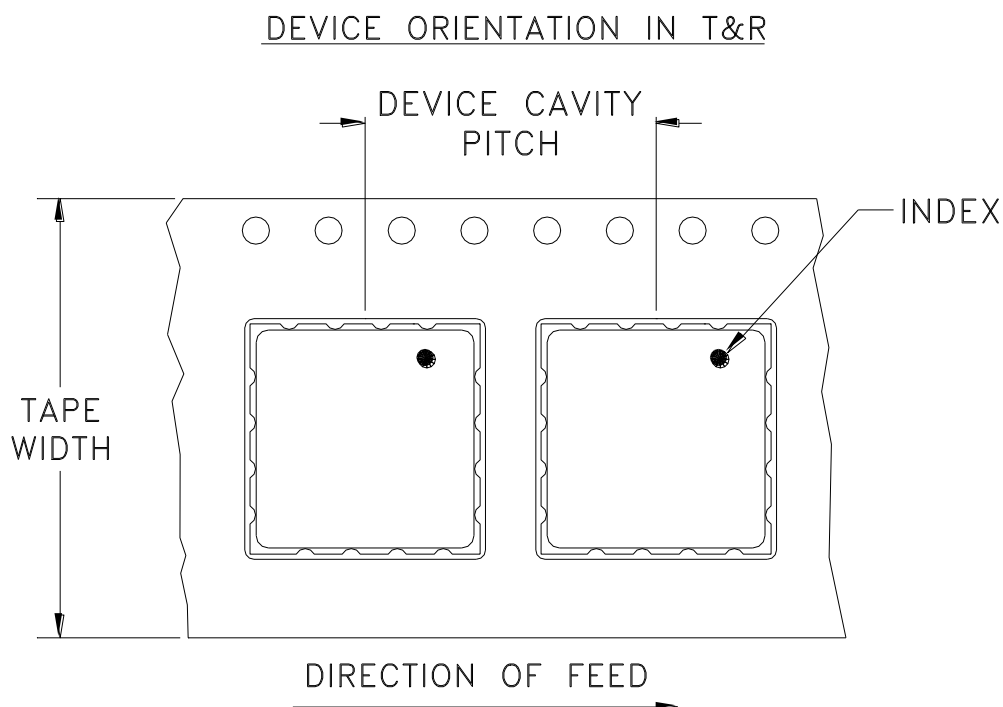


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RF/IF MICROWAVE COMPONENTS

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Tape & Reel Packaging TR-F37



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	16	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200
				500

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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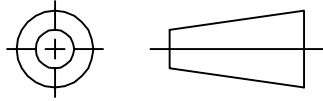
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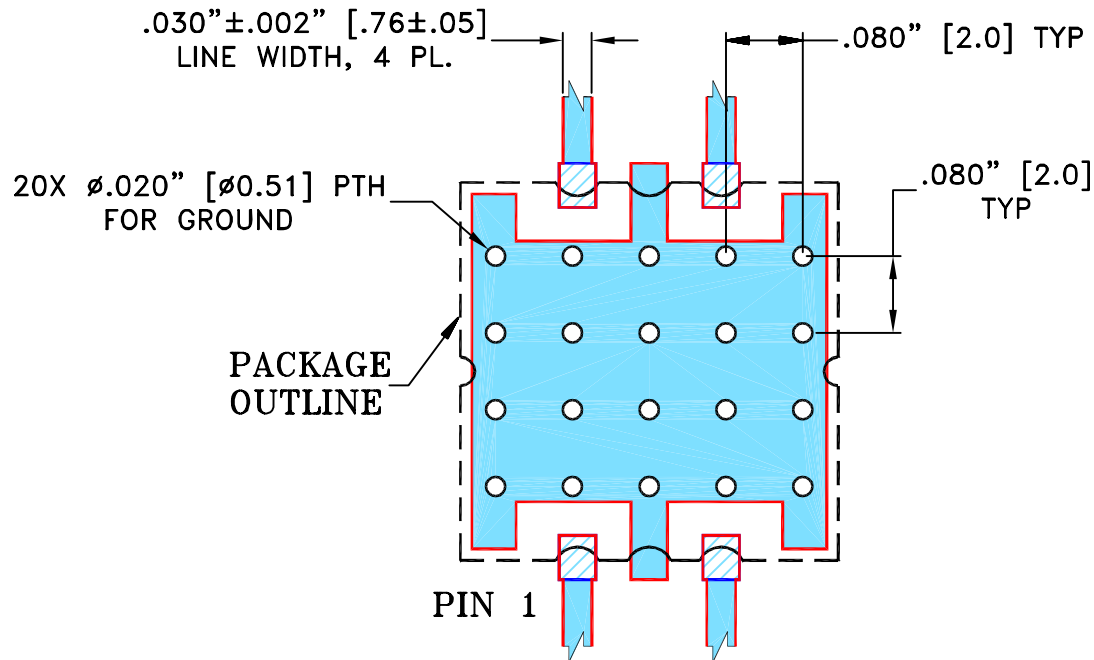
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M103787	NEW RELEASE (FROM RAVON)	03/06	RZ	HH
A	M121588	UPDATE GROUND PLANE	02/09	EM	KN
A	R75766	UPDATE GROUND PLANE	02/09	EM	KN

SUGGESTED MOUNTING CONFIGURATION
FOR HE1135 CASE STYLE, qg PIN CONNECTION, 75 OHM

**NOTE:**

1. TRACE WIDTH IS SHOWN FOR R04350 WITH DIELECTRIC THICKNESS. $.030'' \pm .002''$. 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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

RZ (RAVON)

2 MAR 06

TOLERANCES ON:

CHECKED

RZ (RAVON)

2 MAR 06

2 PL DECIMALS ± .005

APPROVED

HH (RAVON)

2 MAR 06

ANGLES ±

FRACTIONS ±

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



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, qg, HE1135, TB-381, 75 OHM

SIZE

A

CODE IDENT

15542

DRAWING NO:

98-PL-238

REV:

A

FILE: 98PL238

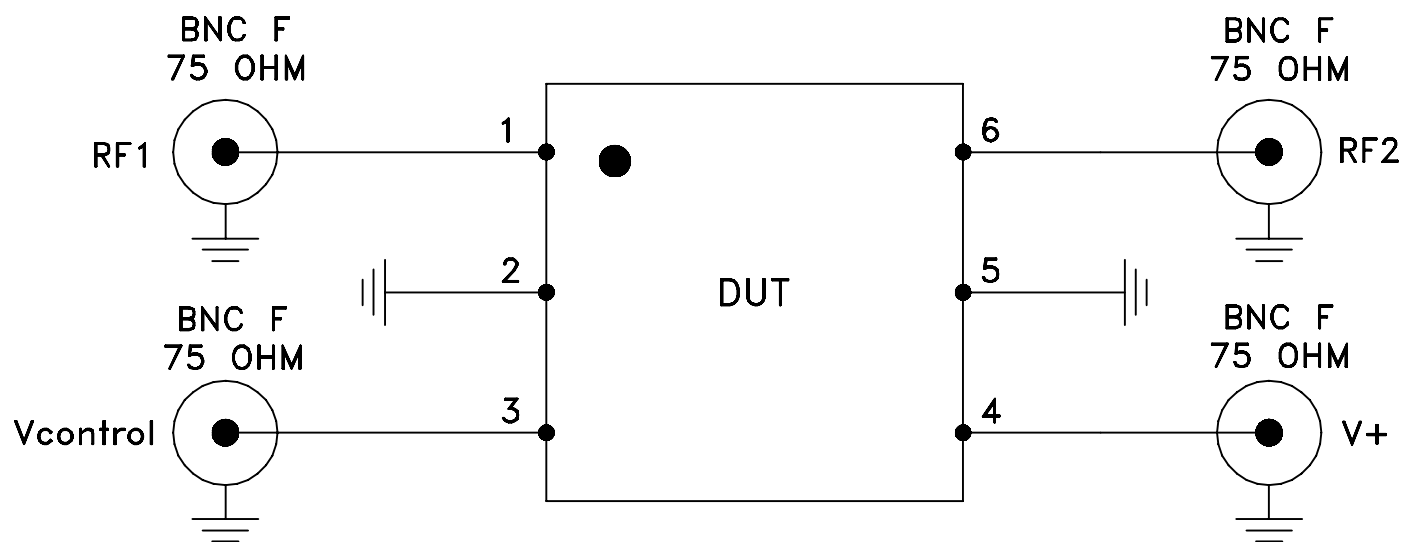
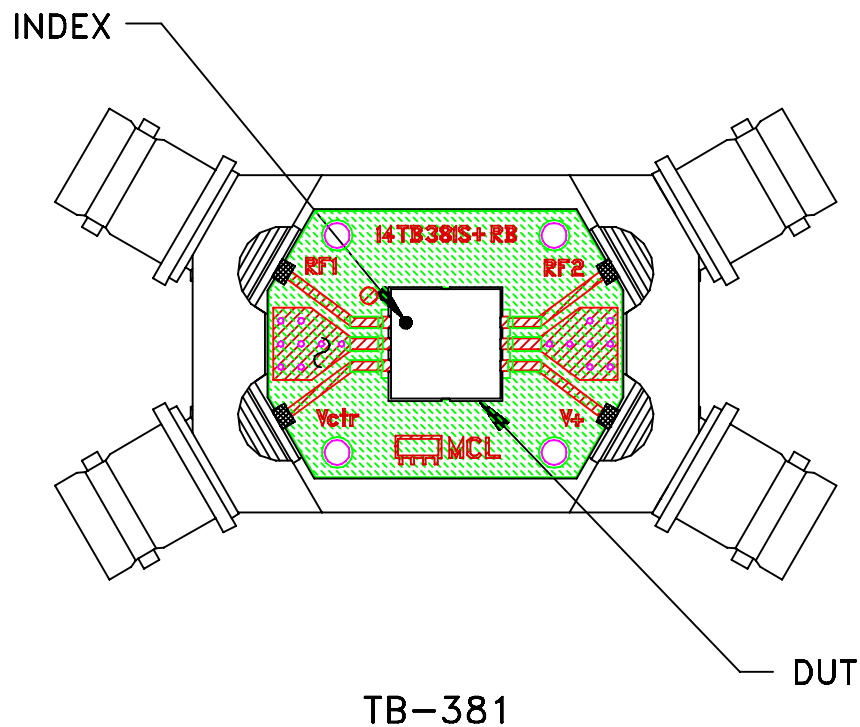
SCALE:

5:1

SHEET:

1 OF 1

Evaluation Board and Circuit



Schematic Diagram

Notes:

1. 75 Ohm BNC Female connectors.
2. PCB Material: ROGERS R04350 or equivalent,
Dielectric Constant=3.48, Thickness=.030 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	-45° to 85°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
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