

Surface Mount Voltage Variable Attenuator

EVA-23-75+

75Ω 5 to 2000 MHz

Maximum Ratings

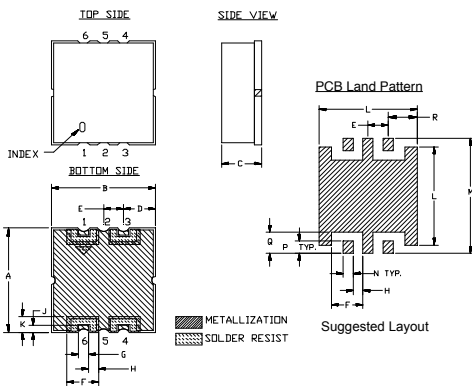
Operating Temperature	-45°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Supply Voltage(V+)	6V
Absolute Max. Control Voltage(Vctrl)	10V
Absolute Max. RF Input Level	+22dBm

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

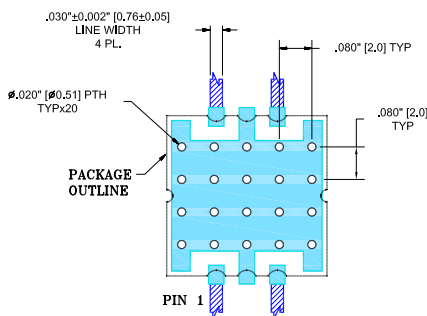
Outline Drawing



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:
- 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.
 - 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

Features

- Frequency range, 5-2000 MHz
- High IP3, 50 dBm typ.
- Maximum attenuation at minimum current
- No external bias and RF matching network required
- Small size, shielded case
- Aqueous washable



CASE STYLE: HE1135

Applications

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

+RoHS Compliant

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

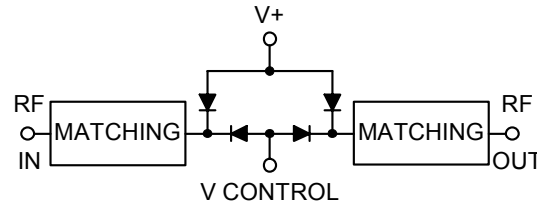
Electrical Specifications (T_{AMB} = 25°C)

FREQ. (MHz)	MIN. INSERTION LOSS, dB (+8V)		MAX. ATTENUATION dB (0V)		INPUT POWER (dBm)	CONTROL Voltage Current		IP3 ¹ (dBm)	RETURN LOSS (dB)	POWER SUPPLY Voltage Current	
	Min.	Max.	Typ.	Max.		Min.	Max.			Typ.	Typ.
5 - 1000	4.5	5.5	40	25	+22	0 - 8	15	48	19	+3	4
1000 - 2000	5.0	6.0	27	18	+22	0 - 8	15	52	14	+3	4

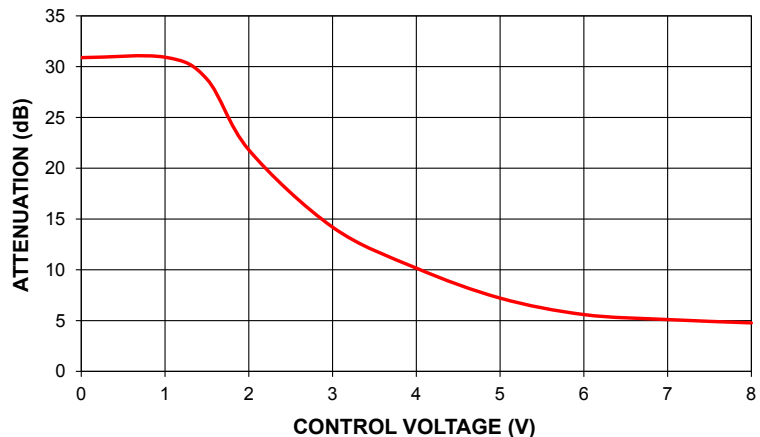
Notes:

- IP3 may degrade below 100 MHz
- Rise/Fall time: 15μSec Typ. Switching Time, turn on/off: 20μSec. Typ.

Equivalent Schematic



EVA-23-75+ TYPICAL ATTENUATION AT 1000 MHz



Notes

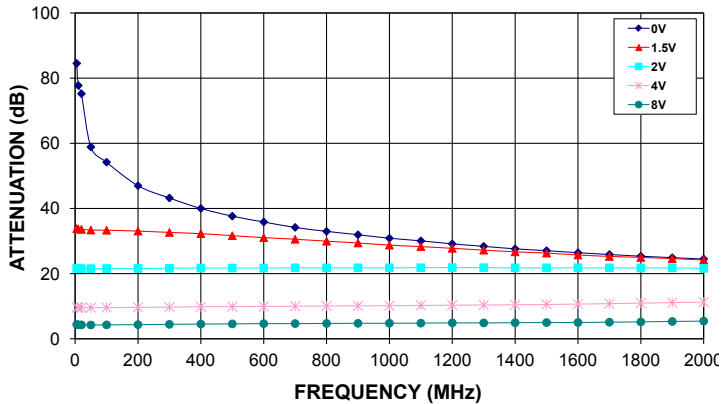
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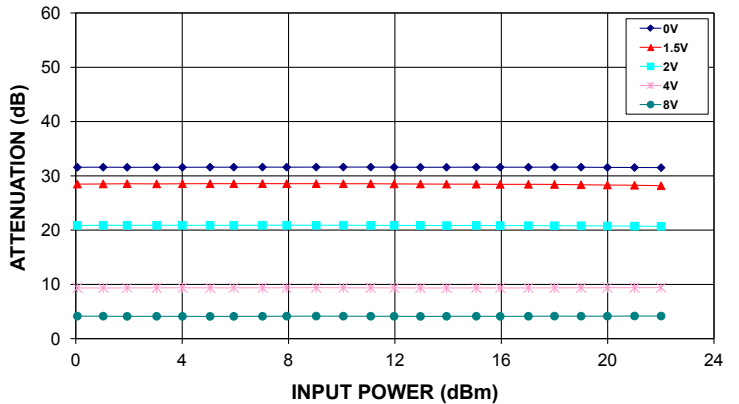
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REV. A
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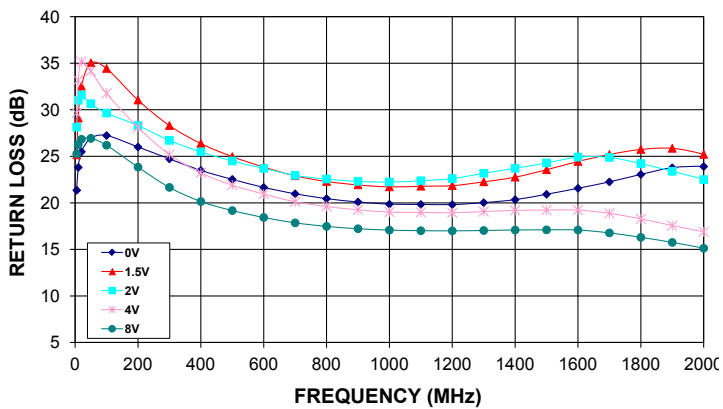
EVA-23-75+
ATTENUATION Vs. FREQUENCY
OVER CONTROL VOLTAGES



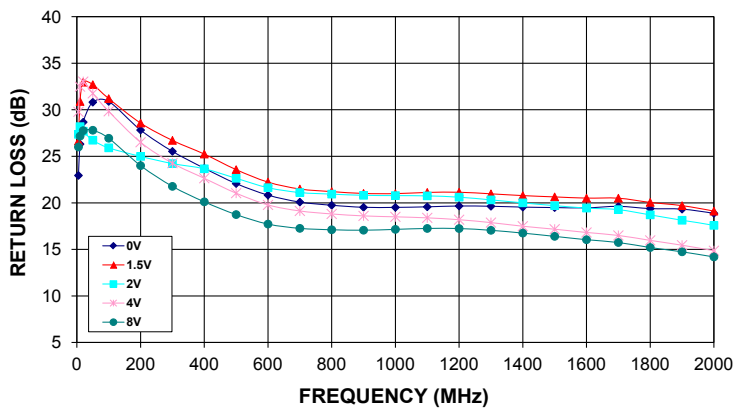
EVA-23-75+
ATTENUATION Vs. INPUT POWER
OVER CONTROL VOLTAGES AT 1000MHz



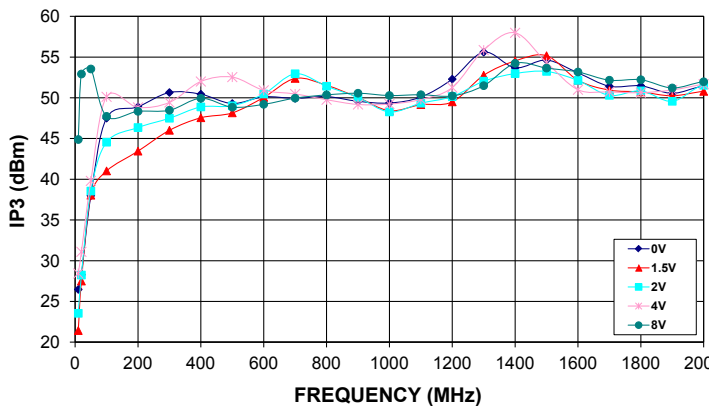
EVA-23-75+
INPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES



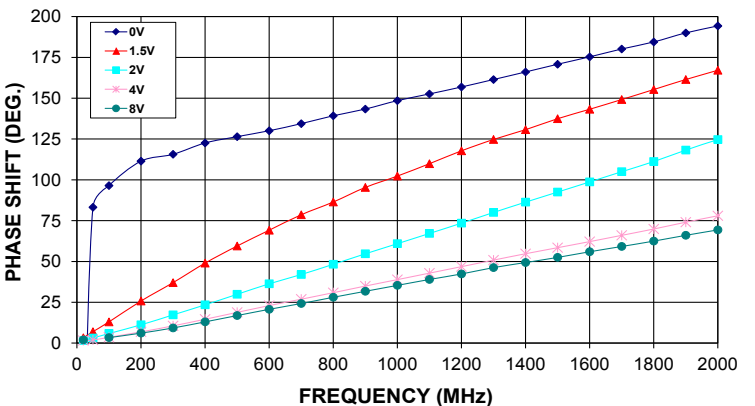
EVA-23-75+
OUTPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES



EVA-23-75+
IP3 Vs. FREQUENCY
OVER CONTROL VOLTAGES



EVA-23-75+
PHASE SHIFT Vs. FREQUENCY
OVER CONTROL VOLTAGES



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Voltage Variable Attenuator

EVA-23-75+

Typical Performance Data

V CONTROL (V)	ATTENUATION @ 1000 MHz (dB) @V+=3V
0.0	30.88
1.0	30.92
1.5	28.76
2.0	21.80
3.0	14.20
4.0	10.17
5.0	7.22
6.0	5.60
7.0	5.11
8.0	4.78

FREQ. (MHz)	ATTENUATION Vs. V CONTROL @ V+=3V (dB)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
10	77.76	33.70	21.61	9.58	4.30
20	75.22	33.60	21.54	9.57	4.27
50	58.88	33.37	21.54	9.56	4.25
100	54.22	33.33	21.58	9.59	4.28
200	47.00	33.07	21.60	9.66	4.35
300	43.23	32.66	21.65	9.74	4.43
400	40.02	32.28	21.73	9.84	4.52
500	37.65	31.66	21.73	9.89	4.58
600	35.87	31.06	21.73	9.94	4.65
700	34.19	30.57	21.80	10.01	4.67
800	32.99	29.97	21.78	10.07	4.71
900	31.95	29.42	21.80	10.12	4.75
1000	30.88	28.76	21.80	10.17	4.78
1100	30.08	28.30	21.83	10.25	4.81
1200	29.14	27.78	21.87	10.34	4.89
1300	28.39	27.22	21.84	10.38	4.88
1400	27.62	26.70	21.78	10.45	4.94
1500	27.06	26.31	21.77	10.55	4.99
1600	26.43	25.74	21.79	10.66	5.01
1700	25.88	25.29	21.77	10.81	5.10
1800	25.36	24.99	21.76	10.96	5.19
1900	24.92	24.63	21.78	11.11	5.32
2000	24.49	24.19	21.64	11.28	5.43

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Voltage Variable Attenuator

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Typical Performance Data

FREQ. (MHz)	INPUT RETURN LOSS Vs. V CONTROL @ V+=3V				
	(dB)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
10	23.81	29.11	31.02	33.18	26.25
20	25.49	32.53	31.60	35.18	26.83
50	26.92	35.05	30.65	34.16	26.93
100	27.23	34.44	29.65	31.76	26.19
200	26.00	31.05	28.31	28.11	23.84
300	24.72	28.31	26.71	25.19	21.66
400	23.48	26.38	25.48	23.22	20.14
500	22.52	24.97	24.50	21.90	19.17
600	21.66	23.85	23.71	20.95	18.43
700	20.97	22.91	22.96	20.12	17.85
800	20.45	22.30	22.56	19.61	17.47
900	20.09	21.93	22.31	19.26	17.22
1000	19.86	21.72	22.24	19.01	17.07
1100	19.83	21.79	22.38	18.98	17.01
1200	19.81	21.85	22.61	18.94	16.99
1300	20.02	22.26	23.18	19.07	17.03
1400	20.34	22.76	23.72	19.19	17.08
1500	20.92	23.56	24.29	19.23	17.10
1600	21.56	24.45	24.92	19.23	17.08
1700	22.25	25.20	24.88	18.88	16.77
1800	23.05	25.74	24.22	18.29	16.29
1900	23.77	25.86	23.39	17.56	15.75
2000	23.90	25.21	22.50	16.89	15.12

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Typical Performance Data

FREQ. (MHz)	OUTPUT RETURN LOSS Vs. V CONTROL @ V+=3V				
	(dB)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
10	26.31	30.89	28.19	32.48	27.17
20	28.67	32.96	27.70	33.03	27.76
50	30.81	32.70	26.73	31.76	27.80
100	30.89	31.20	25.91	29.83	26.94
200	27.82	28.57	24.99	26.51	24.00
300	25.53	26.71	24.22	24.26	21.77
400	23.72	25.24	23.66	22.64	20.11
500	22.07	23.57	22.64	21.04	18.74
600	20.83	22.23	21.63	19.78	17.72
700	20.08	21.49	21.11	19.13	17.26
800	19.74	21.21	20.94	18.81	17.11
900	19.52	21.01	20.81	18.60	17.06
1000	19.51	20.99	20.78	18.50	17.15
1100	19.57	21.12	20.75	18.39	17.25
1200	19.66	21.14	20.61	18.19	17.24
1300	19.63	20.97	20.32	17.88	17.05
1400	19.54	20.78	20.00	17.49	16.75
1500	19.49	20.64	19.70	17.17	16.40
1600	19.46	20.51	19.44	16.82	16.04
1700	19.62	20.50	19.27	16.50	15.74
1800	19.38	20.05	18.71	15.97	15.20
1900	19.32	19.70	18.13	15.45	14.74
2000	18.87	19.11	17.58	14.86	14.19

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Voltage Variable Attenuator

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Typical Performance Data

FREQ. (MHz)	INPUT IP3 Vs. V CONTROL @ V+=3V (dBm)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
10	26.47	21.42	23.54	28.43	44.88
20	28.28	27.50	28.24	31.09	52.92
50	37.99	38.04	38.55	39.80	53.54
100	47.50	41.02	44.55	50.12	47.72
200	48.89	43.45	46.35	48.82	48.34
300	50.65	46.01	47.49	49.43	48.47
400	50.44	47.55	48.88	52.00	49.94
500	49.30	48.15	49.02	52.54	48.85
600	50.12	50.05	50.47	50.92	49.20
700	49.93	52.38	52.95	50.47	49.96
800	50.15	51.54	51.42	49.76	50.36
900	49.57	50.05	50.05	49.18	50.56
1000	49.36	48.42	48.27	49.23	50.28
1100	50.09	49.16	49.34	49.79	50.38
1200	52.29	49.50	50.16	51.26	50.23
1300	55.60	52.77	52.04	55.86	51.49
1400	53.69	54.53	52.98	57.98	54.23
1500	54.63	55.17	53.24	54.32	53.65
1600	53.06	52.16	52.13	50.99	53.17
1700	51.42	50.95	50.30	50.72	52.16
1800	51.47	50.72	50.85	50.63	52.22
1900	50.55	50.25	49.57	50.96	51.21
2000	51.42	50.79	51.54	51.67	51.97

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Typical Performance Data

FREQ. (MHz)	PHASE SHIFT Vs. V CONTROL @ V+=3V				
	(deg)				
	@V Control=0V	@V Control=1.5V	@V Control=2V	@V Control=4V	@V Control=8V
20	83.18	6.99	3.12	1.94	1.86
100	96.47	12.97	5.89	3.57	3.36
200	111.44	25.77	11.22	6.89	6.12
300	115.63	37.03	17.30	10.59	9.29
400	122.57	48.99	23.45	14.63	13.02
500	126.44	59.47	29.91	18.84	16.89
600	130.06	69.14	36.34	22.99	20.70
700	134.41	78.61	42.03	26.91	24.27
800	139.23	86.43	48.29	30.89	28.08
900	143.34	95.35	54.72	34.97	31.74
1000	148.49	102.31	60.92	38.90	35.38
1100	152.60	109.88	67.18	42.88	38.99
1200	156.86	117.78	73.49	46.84	42.37
1300	161.42	124.73	80.04	50.85	46.26
1400	166.05	130.73	86.36	54.76	49.36
1500	170.78	137.45	92.53	58.46	52.51
1600	175.30	143.23	98.74	62.18	55.97
1700	180.13	149.19	105.01	66.02	59.21
1800	184.44	155.31	111.23	69.90	62.49
1900	189.99	161.46	118.24	74.07	66.04
2000	194.25	167.13	124.68	78.00	69.35

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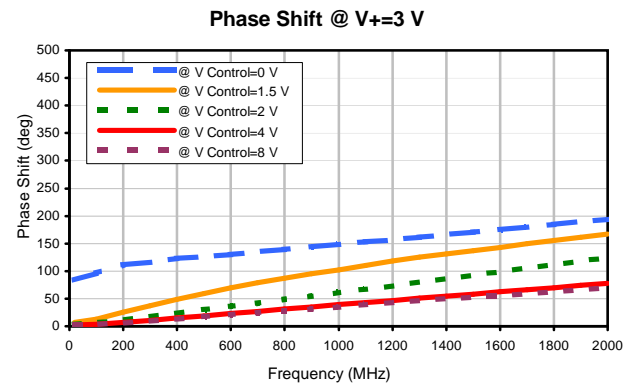
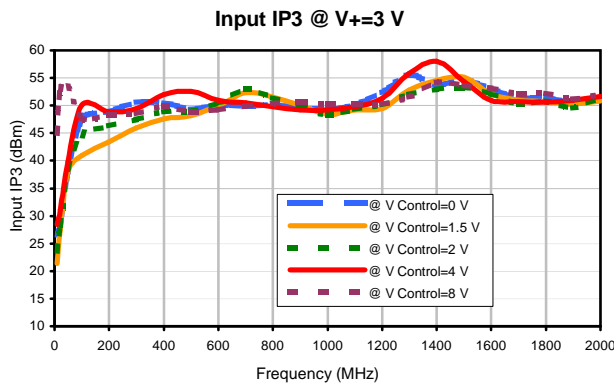
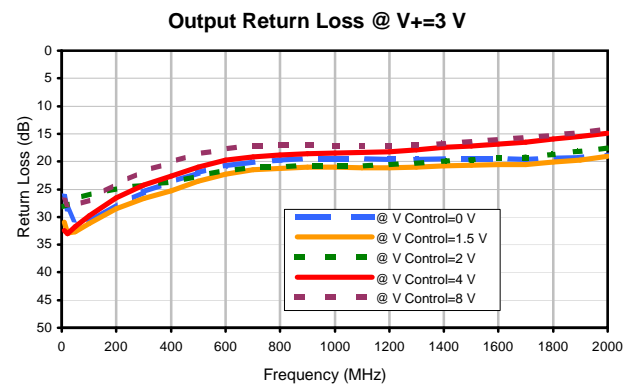
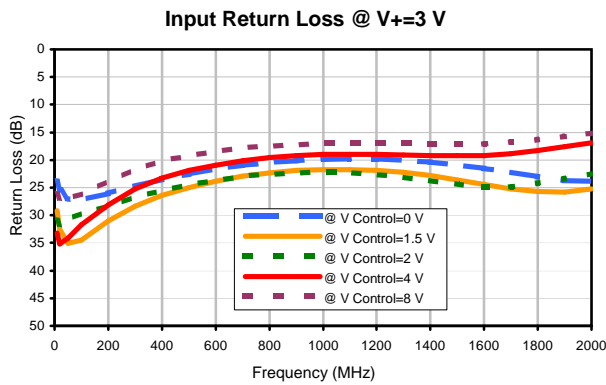
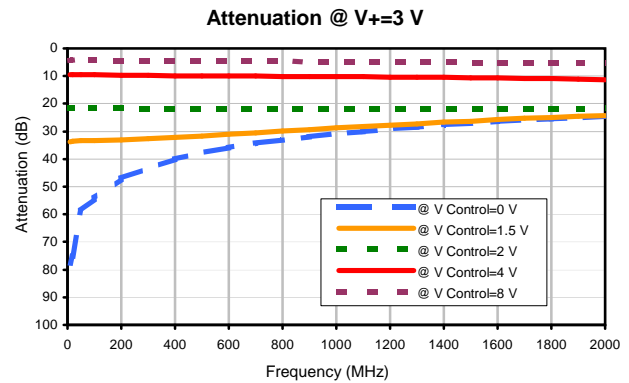
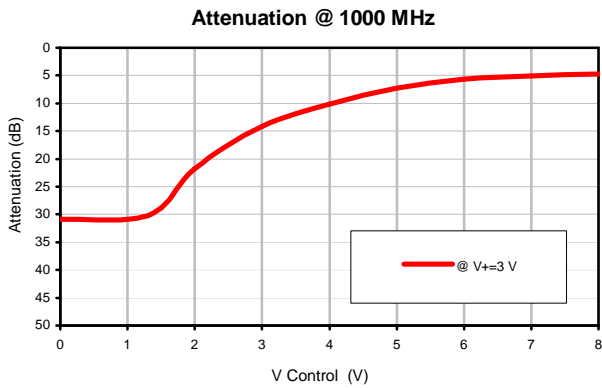
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Typical Performance Curves

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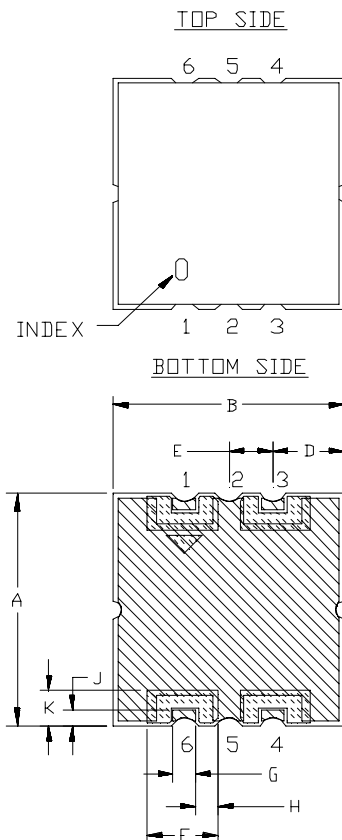


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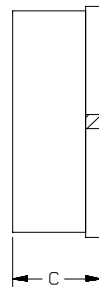


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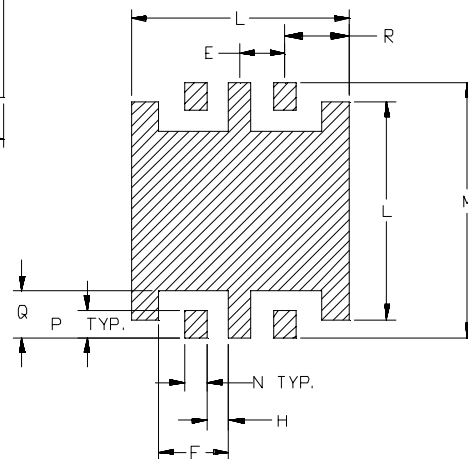
Outline Dimensions



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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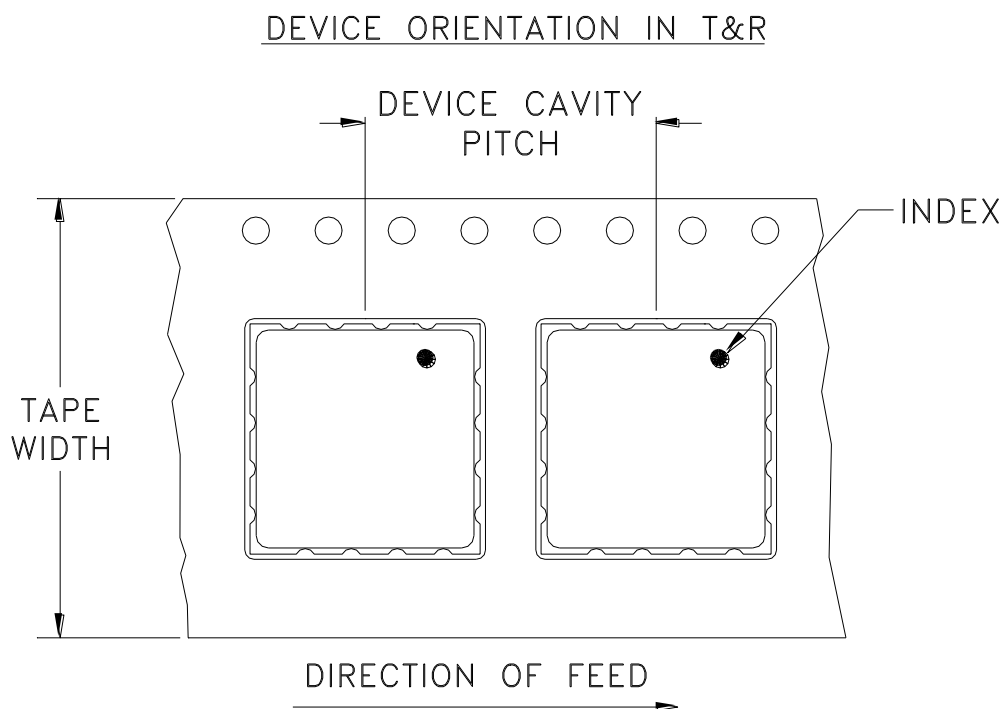
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RF/IF MICROWAVE COMPONENTS

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.

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



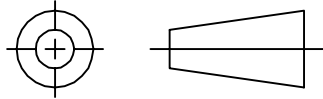
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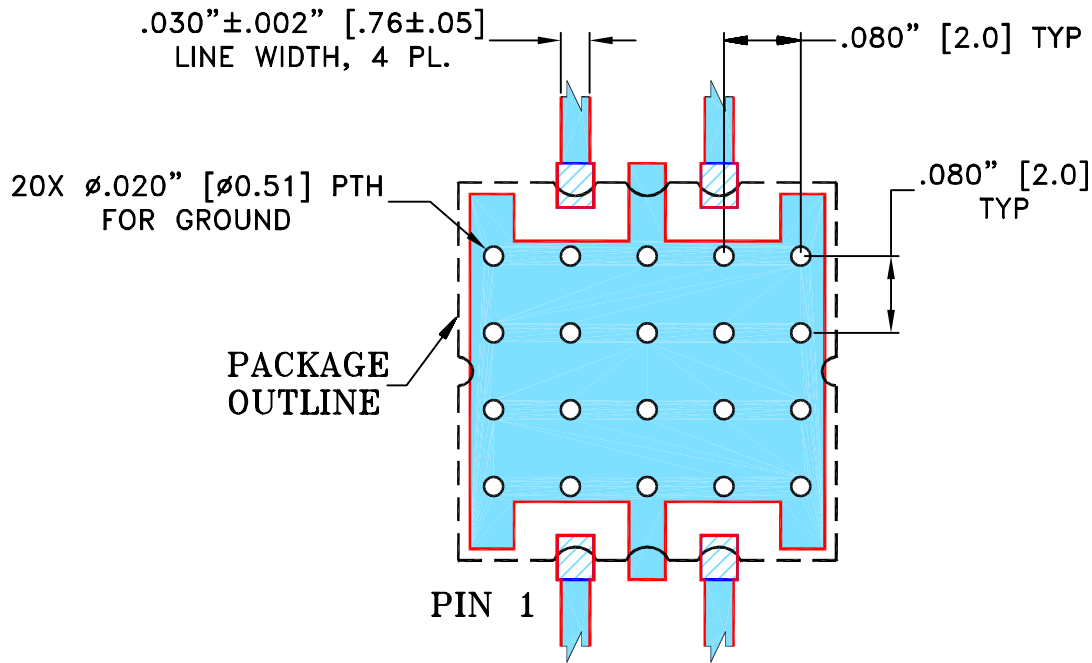
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	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 TOLERANCES ON: 2 PL DECIMALS ± 3 PL DECIMALS ± .005 ANGLES ± FRACTIONS ±	DRAWN	RZ (RAVON) 2 MAR 06
	CHECKED	RZ (RAVON) 2 MAR 06
	APPROVED	HH (RAVON) 2 MAR 06



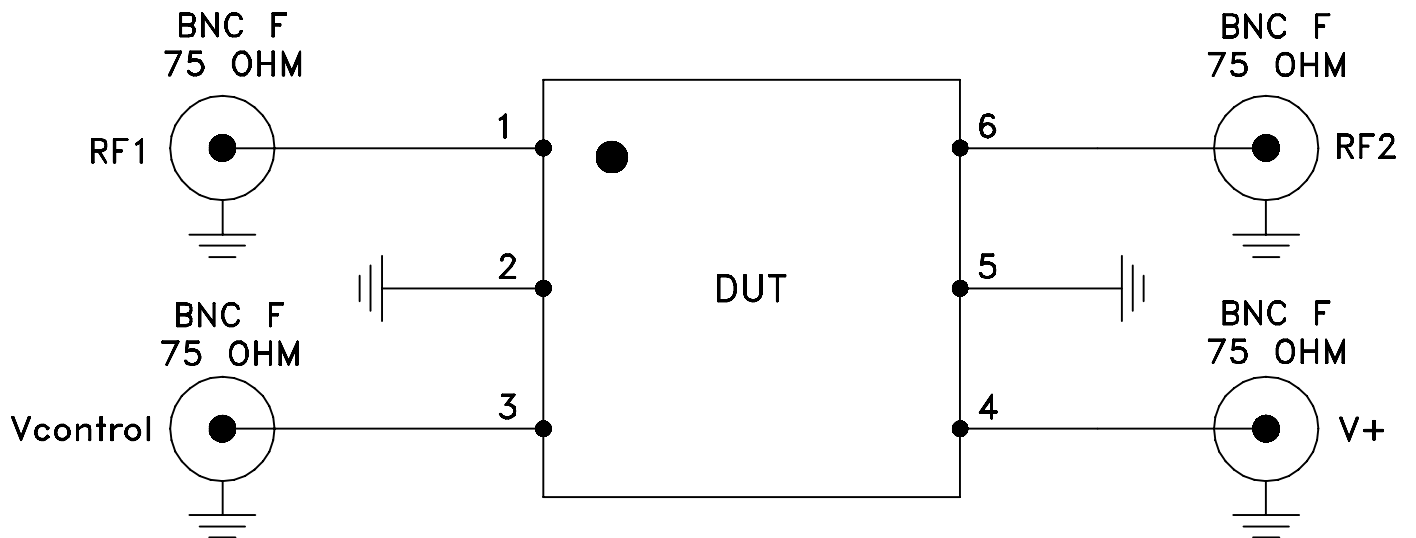
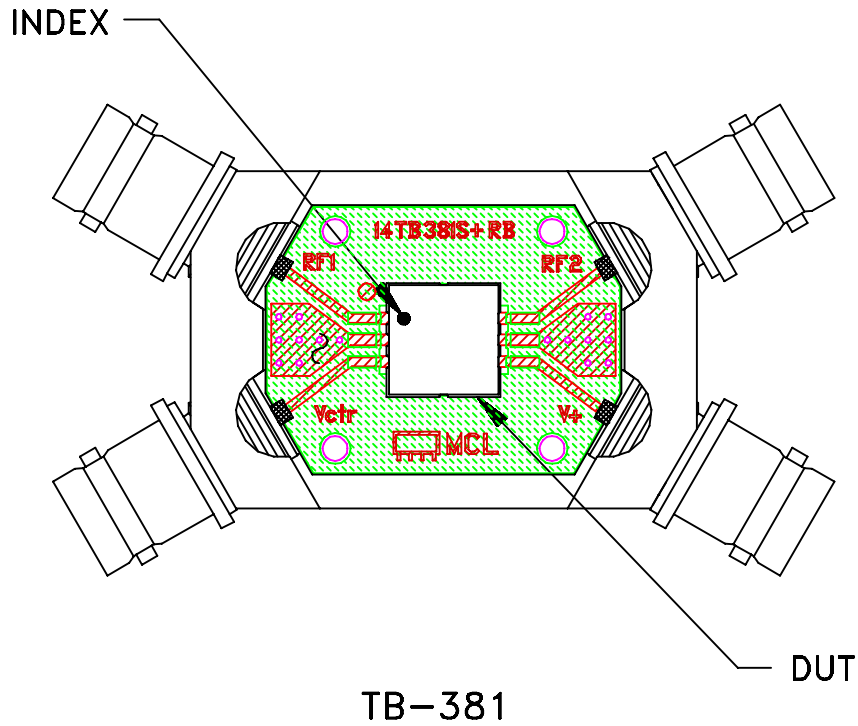
Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

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	

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


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