

# Surface Mount Voltage Variable Attenuator

## RVA-800+

50Ω 50 to 800 MHz

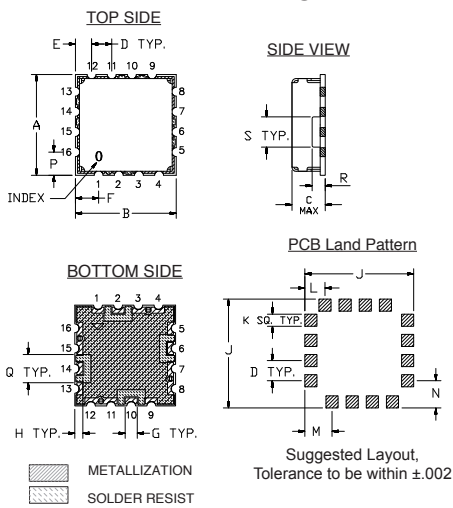
### Maximum Ratings

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)	7V
Absolute Max. RF Input Level	+18 dBm
Permanent damage may occur if any of these limits are exceeded.	

### Pin Connections

RF IN	2
RF OUT	10
V CONTROL	6
V+	14
GROUND	1,3,4,5,7,8,9,11,12,13,15,16

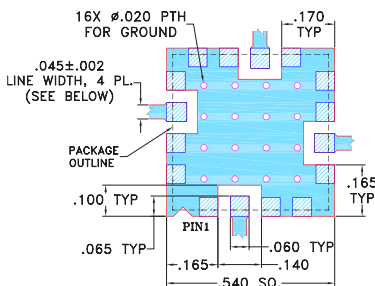
### Outline Drawing



### Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J
.500	.500	.195	.100	.080	.115	.060	.040	.540
12.70	12.70	4.95	2.54	2.03	2.92	1.52	1.02	13.72
K	L	M	N	P	Q	R	S	wt.
.060	.100	.135	.135	.115	.140	.070	.150	grams
1.52	2.54	3.43	3.43	2.92	3.56	1.78	3.81	1.0

### Demo Board MCL P/N: TB-163 Suggested PCB Layout (PL-040)



- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS 0.025" ± 0.0025"; 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.
- Legend:  
 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

### Features

- Frequency range, 50-800 MHz
- Low Insertion Loss, 1.5dB Typ.
- IP3, +45 dBm Typ.
- Minimal phase deviation over attenuation range
- No external bias and RF matching network required
- Shielded case
- Aqueous washable



CASE STYLE: DV874

### Applications

- Video Modulator
- Power level control
- Feed forward amplifiers
- CATV

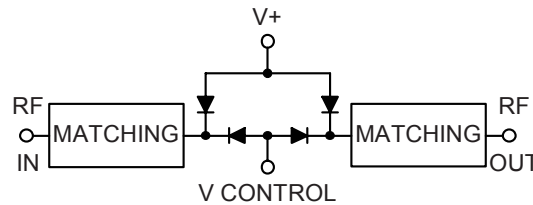
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 The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

### Electrical Specifications (T<sub>AMB</sub> = 25°C)

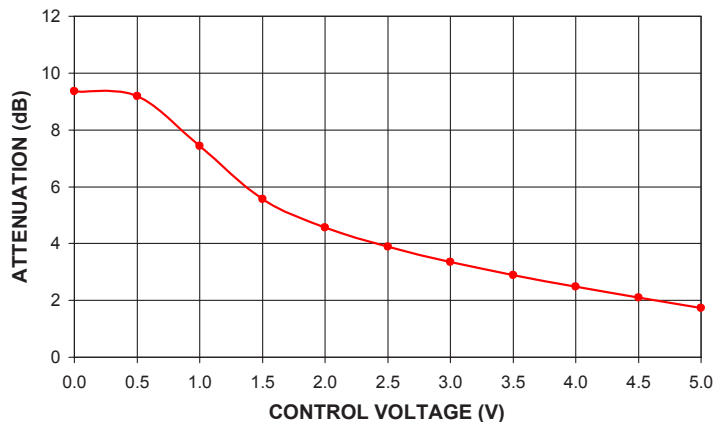
FREQ. (MHz)	MIN. INSERTION LOSS, dB (+5V)		MAX. ATTENUATION dB (0V)		INPUT POWER (dBm)	CONTROL Voltage Current (V) (mA)		IP3 (dBm)	RETURN LOSS (dB)	POWER SUPPLY Voltage Current (V) (mA)	
	Min.	Max.	Typ.	Max.		Min.	Max.			Typ.	Max.
50 - 800	1.5	3.0	9	7.5	+18	0 - 5	17	45	23	+5	4

Notes:  
 Rise/Fall time: 10µSec / 20 µSec Typ.  
 Switching Time, turn on/off: 25 µSec. Typ.

### Equivalent Schematic



### RVA-800+ TYPICAL ATTENUATION AT 500MHz

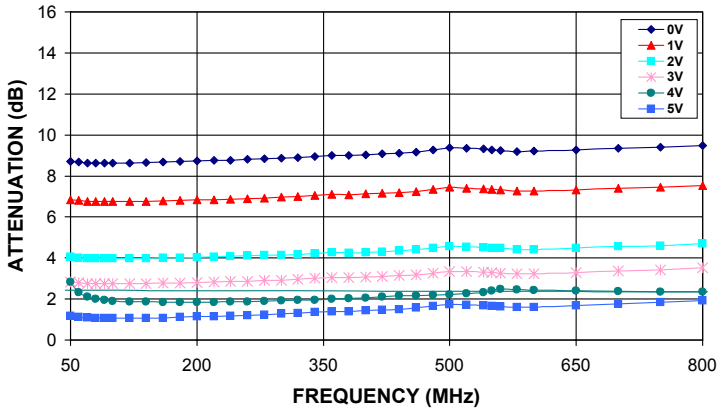


### Notes

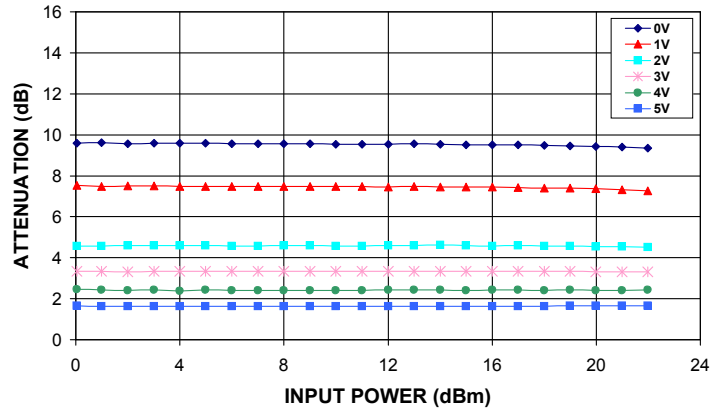
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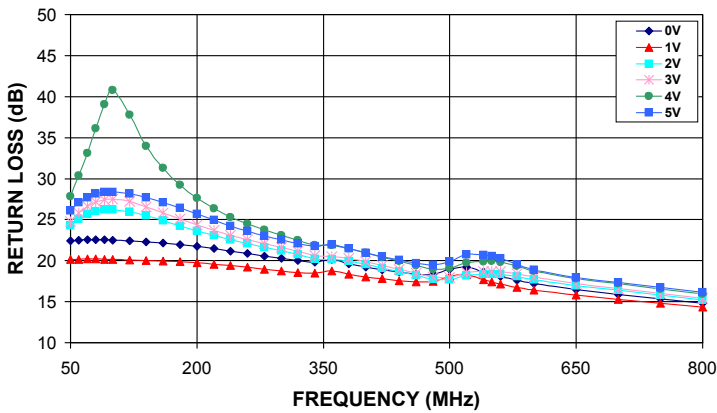
**RVA-800+**  
**ATTENUATION Vs. FREQUENCY**  
**OVER CONTROL VOLTAGES**



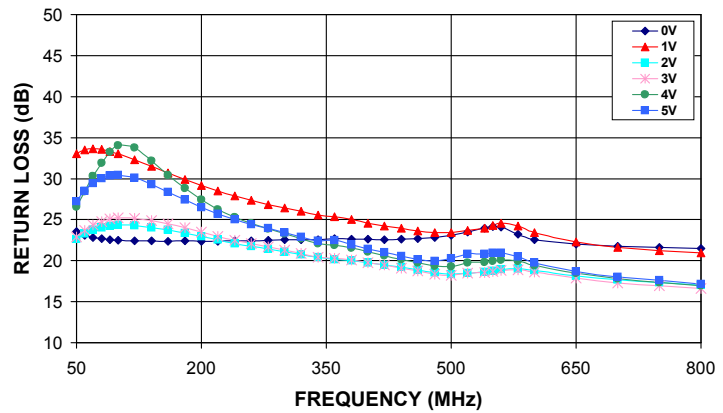
**RVA-800+**  
**ATTENUATION Vs. INPUT POWER**  
**OVER CONTROL VOLTAGES AT 500MHz**



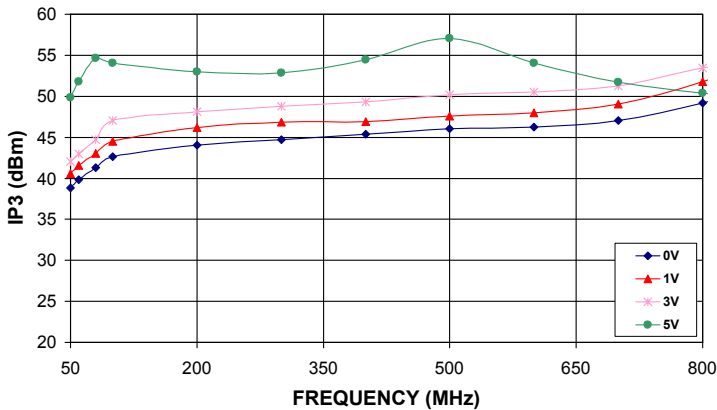
**RVA-800+**  
**INPUT RETURN LOSS Vs. FREQUENCY**  
**OVER CONTROL VOLTAGES**



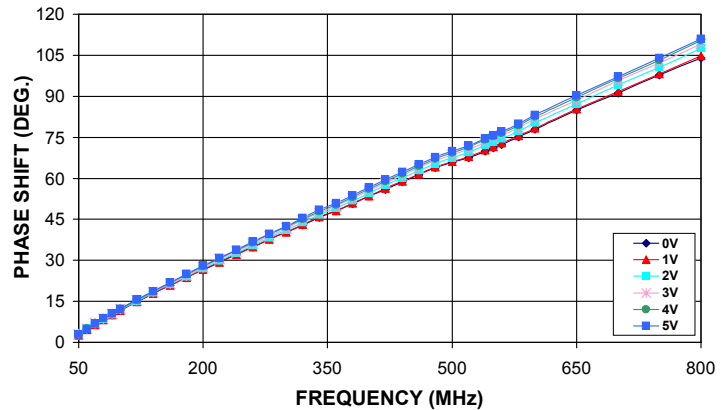
**RVA-800+**  
**OUTPUT RETURN LOSS Vs. FREQUENCY**  
**OVER CONTROL VOLTAGES**



**RVA-800+**  
**IP3 Vs. FREQUENCY**  
**OVER CONTROL VOLTAGES**



**RVA-800+**  
**PHASE SHIFT Vs. FREQUENCY**  
**OVER CONTROL VOLTAGES**



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# Voltage Variable Attenuator

# RVA-800+

## Typical Performance Data

V CONTROL (V)	ATTENUATION @ 500 MHz (dB) @V+=5V
0.0	9.37
0.5	9.19
1.0	7.44
1.5	5.57
2.0	4.57
2.5	3.90
3.0	3.35
3.5	2.89
4.0	2.48
4.5	2.09
5.0	1.74

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	8.71	6.85	4.06	2.84	1.95	1.17
60	8.68	6.81	4.02	2.80	1.90	1.12
70	8.64	6.77	3.99	2.76	1.86	1.09
80	8.64	6.77	3.98	2.76	1.86	1.08
90	8.63	6.75	3.97	2.74	1.83	1.06
100	8.64	6.75	3.97	2.74	1.83	1.06
120	8.64	6.77	3.98	2.75	1.84	1.07
140	8.66	6.77	3.99	2.76	1.85	1.08
160	8.69	6.78	4.01	2.77	1.87	1.08
180	8.70	6.81	4.02	2.78	1.88	1.11
200	8.73	6.83	4.03	2.80	1.90	1.14
220	8.75	6.85	4.05	2.82	1.93	1.16
240	8.77	6.87	4.08	2.86	1.95	1.18
260	8.81	6.90	4.11	2.87	1.96	1.20
280	8.85	6.93	4.13	2.90	2.00	1.23
300	8.87	6.96	4.14	2.92	2.03	1.27
320	8.90	7.00	4.18	2.96	2.07	1.30
340	8.96	7.05	4.23	3.01	2.12	1.36
360	9.01	7.10	4.27	3.05	2.17	1.40
380	9.00	7.08	4.26	3.04	2.16	1.40
400	9.03	7.13	4.28	3.07	2.18	1.43
420	9.08	7.16	4.31	3.10	2.22	1.46
440	9.11	7.19	4.36	3.14	2.26	1.50
460	9.17	7.25	4.41	3.19	2.32	1.57
480	9.27	7.35	4.49	3.27	2.40	1.65
500	9.37	7.44	4.57	3.35	2.48	1.74
520	9.34	7.41	4.54	3.33	2.47	1.71
540	9.31	7.37	4.52	3.31	2.44	1.69
550	9.28	7.34	4.49	3.28	2.41	1.66
560	9.25	7.32	4.48	3.26	2.38	1.64
580	9.20	7.27	4.41	3.22	2.34	1.59
600	9.21	7.26	4.42	3.22	2.35	1.61
650	9.27	7.33	4.48	3.29	2.43	1.69
700	9.34	7.40	4.56	3.37	2.50	1.76
750	9.41	7.46	4.60	3.41	2.55	1.83
800	9.47	7.54	4.71	3.52	2.66	1.93



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# Voltage Variable Attenuator

# RVA-800+

## 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	22.42	25.69	25.27	24.77	27.86	26.08
60	22.50	25.98	26.14	25.83	30.37	27.07
70	22.56	26.07	26.73	26.63	33.10	27.71
80	22.54	26.08	27.04	27.13	36.10	28.14
90	22.54	26.01	27.16	27.40	39.08	28.34
100	22.50	25.91	27.12	27.49	40.78	28.35
120	22.40	25.65	26.74	27.20	37.80	28.15
140	22.31	25.31	26.14	26.59	34.00	27.70
160	22.18	24.94	25.44	25.84	31.27	27.12
180	21.96	24.48	24.73	25.08	29.22	26.43
200	21.73	23.97	24.07	24.36	27.62	25.66
220	21.47	23.48	23.46	23.68	26.35	24.94
240	21.18	22.96	22.90	23.09	25.31	24.23
260	20.88	22.47	22.40	22.56	24.46	23.59
280	20.56	21.97	21.92	22.08	23.73	23.03
300	20.28	21.50	21.48	21.62	23.10	22.54
320	20.02	21.11	20.99	21.15	22.50	22.11
340	19.83	20.80	20.44	20.60	21.88	21.73
360	20.13	21.01	20.36	20.46	21.88	21.98
380	19.61	20.43	20.14	20.26	21.49	21.47
400	19.24	19.94	19.70	19.85	20.94	20.96
420	18.89	19.49	19.24	19.39	20.42	20.50
440	18.59	19.10	18.81	18.94	19.93	20.10
460	18.35	18.73	18.33	18.49	19.42	19.69
480	18.33	18.55	17.87	18.02	18.95	19.46
500	18.92	19.03	17.80	17.94	19.05	19.91
520	19.22	19.48	18.34	18.52	19.76	20.72
540	18.62	18.98	18.44	18.68	19.91	20.66
550	18.34	18.72	18.43	18.71	19.93	20.55
560	18.08	18.45	18.34	18.68	19.82	20.30
580	17.60	17.94	18.05	18.39	19.33	19.54
600	17.20	17.49	17.68	17.99	18.77	18.87
650	16.49	16.65	16.90	17.18	17.84	17.93
700	15.90	16.02	16.29	16.60	17.21	17.32
750	15.36	15.40	15.70	16.00	16.56	16.73
800	14.82	14.82	15.10	15.42	15.96	16.15

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## 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	23.55	33.05	22.59	22.88	26.53	27.24
60	23.12	33.51	23.26	23.72	28.45	28.48
70	22.82	33.64	23.73	24.35	30.28	29.41
80	22.67	33.55	24.05	24.78	31.92	30.06
90	22.53	33.31	24.25	25.06	33.27	30.40
100	22.46	33.05	24.33	25.21	34.03	30.46
120	22.40	32.30	24.28	25.17	33.76	30.12
140	22.40	31.52	24.04	24.91	32.18	29.32
160	22.33	30.72	23.74	24.52	30.41	28.37
180	22.39	29.92	23.36	24.04	28.80	27.40
200	22.36	29.16	22.95	23.51	27.41	26.51
220	22.38	28.49	22.53	22.98	26.26	25.71
240	22.39	27.88	22.11	22.49	25.30	25.04
260	22.44	27.34	21.76	22.06	24.53	24.45
280	22.47	26.85	21.43	21.66	23.86	23.93
300	22.53	26.43	21.11	21.29	23.28	23.42
320	22.54	26.00	20.77	20.89	22.67	22.90
340	22.58	25.59	20.39	20.44	22.06	22.43
360	22.67	25.36	20.18	20.26	21.87	22.46
380	22.63	25.00	20.04	20.07	21.53	21.94
400	22.59	24.59	19.76	19.76	21.07	21.43
420	22.58	24.25	19.48	19.45	20.62	20.99
440	22.61	23.93	19.20	19.10	20.15	20.55
460	22.68	23.63	18.85	18.72	19.72	20.17
480	22.80	23.40	18.53	18.36	19.32	19.94
500	23.11	23.41	18.36	18.20	19.29	20.26
520	23.51	23.67	18.51	18.45	19.73	20.82
540	23.96	23.98	18.63	18.57	19.81	20.84
550	24.15	24.31	18.74	18.70	19.94	20.94
560	24.06	24.55	18.92	18.83	20.06	20.96
580	23.21	24.20	19.03	18.91	19.94	20.46
600	22.56	23.43	18.79	18.60	19.43	19.78
650	22.01	22.30	18.14	17.89	18.48	18.71
700	21.74	21.63	17.66	17.30	17.78	17.98
750	21.62	21.24	17.33	16.94	17.35	17.58
800	21.49	20.92	17.03	16.60	16.93	17.15

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## Typical Performance Data

FREQ. (MHz)	INPUT IP3 Vs. V CONTROL @ V+=5V (dBm)			
	@V Control=0V	@V Control=1V	@V Control=3V	@V Control=5V
50	38.84	40.58	42.02	49.87
60	39.80	41.58	42.98	51.79
80	41.30	43.06	44.72	54.69
100	42.62	44.51	47.02	54.08
200	44.02	46.21	48.09	53.02
300	44.70	46.84	48.78	52.87
400	45.39	46.92	49.31	54.43
500	46.05	47.61	50.19	57.07
600	46.24	47.99	50.52	54.03
700	47.06	49.02	51.25	51.70
800	49.18	51.76	53.44	50.38

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## 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	2.63	2.60	2.98	3.03	2.89	2.74
60	4.66	4.63	4.97	5.04	4.95	4.88
70	6.60	6.50	6.84	6.94	6.93	6.84
80	8.37	8.29	8.61	8.71	8.74	8.72
90	10.08	10.04	10.31	10.49	10.51	10.52
100	11.73	11.62	11.99	12.16	12.16	12.22
120	14.73	14.75	15.09	15.34	15.48	15.55
140	17.76	17.78	18.18	18.43	18.64	18.69
160	20.85	20.78	21.18	21.49	21.75	21.89
180	23.74	23.73	24.07	24.46	24.80	24.96
200	26.53	26.59	27.02	27.48	27.80	28.02
220	29.21	29.32	29.88	30.36	30.73	30.92
240	32.16	32.10	32.71	33.26	33.64	33.94
260	34.91	34.92	35.53	36.05	36.52	36.86
280	37.62	37.67	38.31	38.90	39.41	39.76
300	40.22	40.28	41.04	41.71	42.21	42.55
320	42.93	43.07	43.93	44.60	45.10	45.49
340	45.71	45.85	46.68	47.37	47.91	48.39
360	48.01	48.11	49.10	49.85	50.36	50.83
380	50.66	50.82	51.80	52.59	53.17	53.70
400	53.40	53.52	54.57	55.43	56.05	56.62
420	55.99	56.21	57.42	58.29	58.90	59.44
440	58.70	58.90	60.13	61.08	61.75	62.30
460	61.37	61.56	62.85	63.82	64.53	65.09
480	63.90	64.15	65.40	66.48	67.15	67.74
500	65.87	66.07	67.57	68.61	69.31	69.91
520	67.60	67.93	69.58	70.64	71.42	71.92
540	69.99	70.37	72.06	73.21	74.03	74.53
550	71.13	71.57	73.34	74.43	75.24	75.78
560	72.34	72.85	74.57	75.74	76.56	77.09
580	75.09	75.52	77.40	78.61	79.42	80.01
600	77.96	78.41	80.40	81.68	82.53	83.07
650	84.85	85.27	87.23	88.60	89.55	90.26
700	91.18	91.81	94.25	95.69	96.58	97.22
750	97.70	98.14	100.59	102.12	103.15	103.92
800	103.99	104.80	107.58	109.27	110.33	110.96

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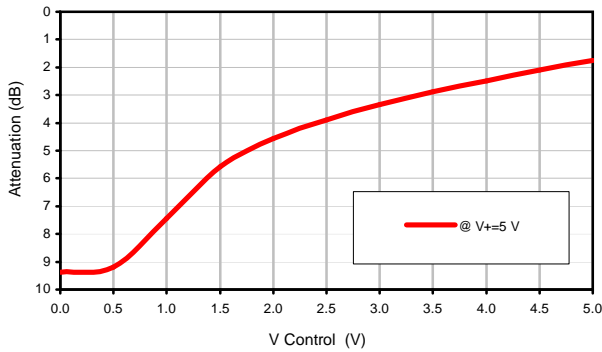


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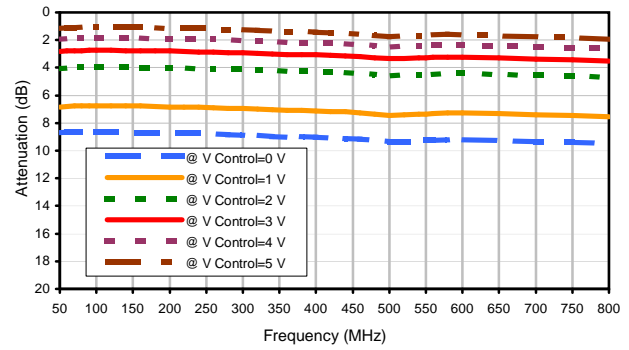
## Typical Performance Curves

# RVA-800+

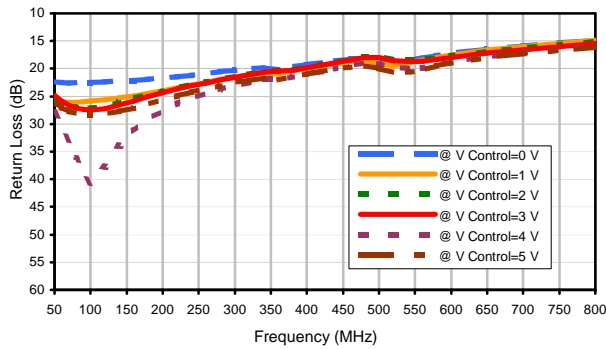
Attenuation @ 500 MHz



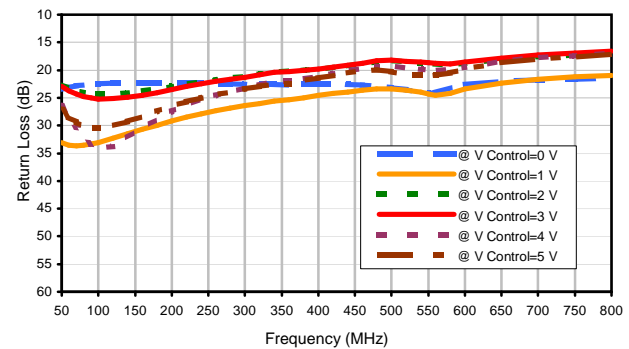
Attenuation @ V+=5 V



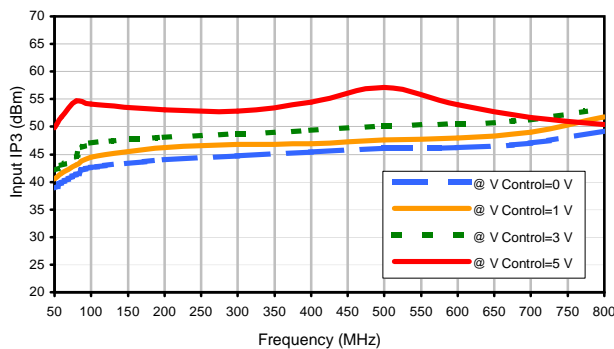
Input Return Loss @ V+=5 V



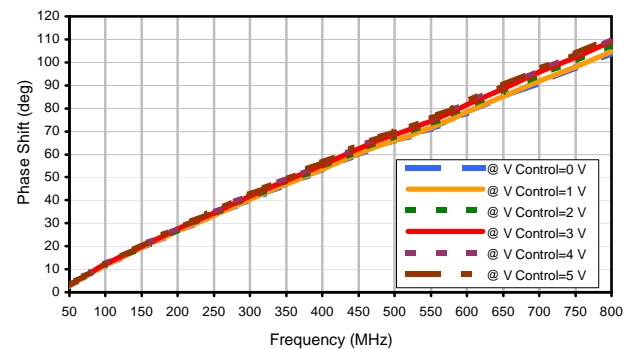
Output Return Loss @ V+=5 V



Input IP3 @ V+=5 V



Phase Shift @ V+=5 V



REV. X1  
RVA-800+  
070704  
Page 1 of 1



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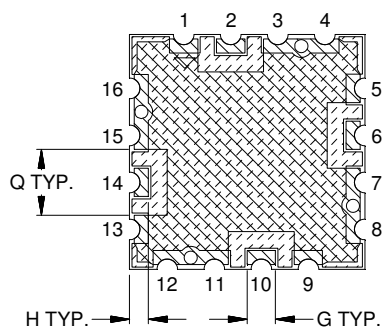
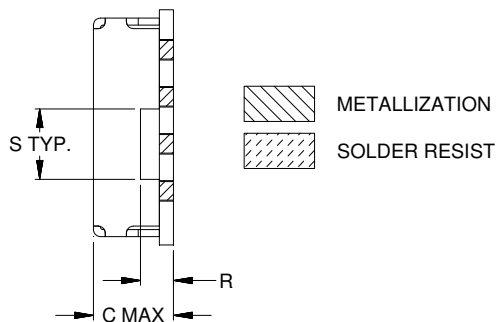
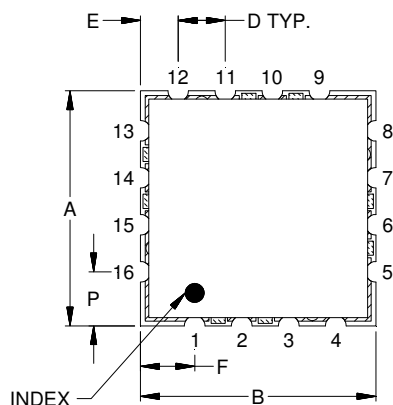
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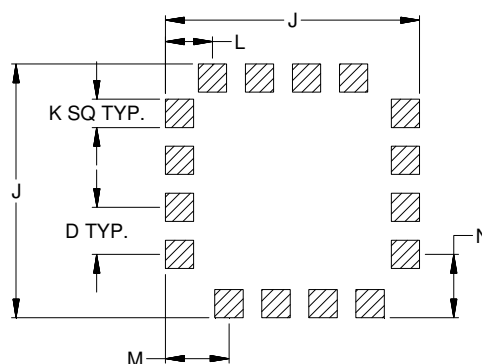


## Outline Dimensions

## DV874



PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.02$

CASE#	A	B	C	D	E	F	G	H	J	K	L	M
DV874	.500 (12.70)	.500 (12.70)	.195 (4.95)	.100 (2.54)	.080 (2.03)	.115 (2.92)	.060 (1.52)	.040 (1.02)	.540 (13.72)	.060 (1.52)	.100 (2.54)	.135 (3.43)

CASE#	N	P	Q	R	S	WT.GRAM
DV874	.135 (3.43)	.115 (2.92)	.140 (3.56)	.070 (1.78)	.150 (3.81)	1.0

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

### Notes:

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



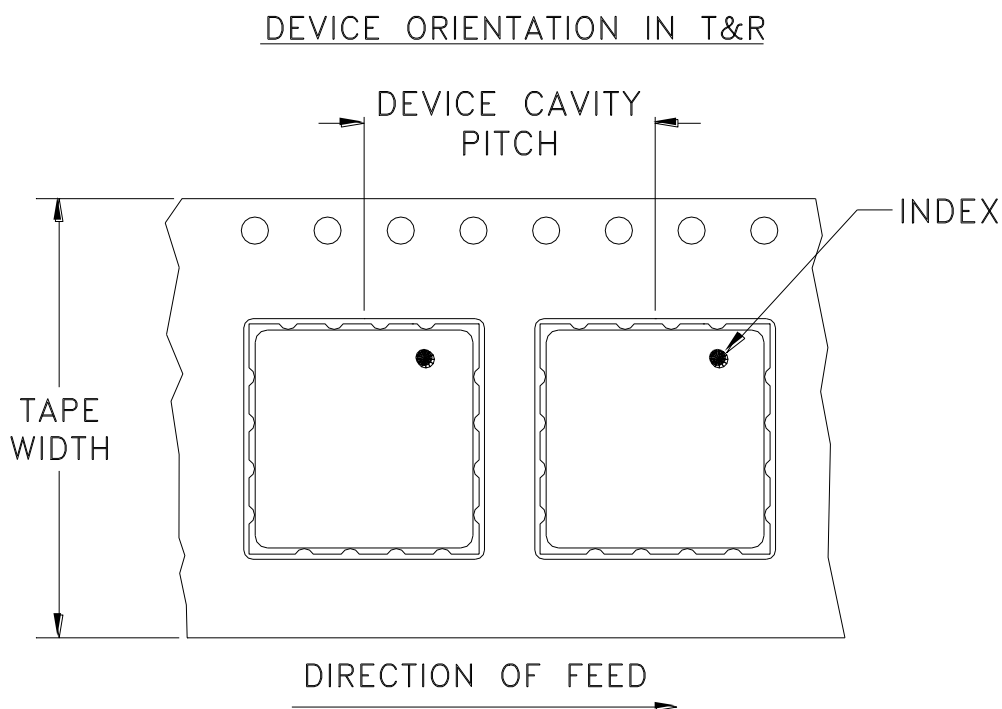
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RF/IF MICROWAVE COMPONENTS

# 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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



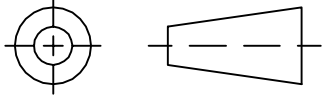
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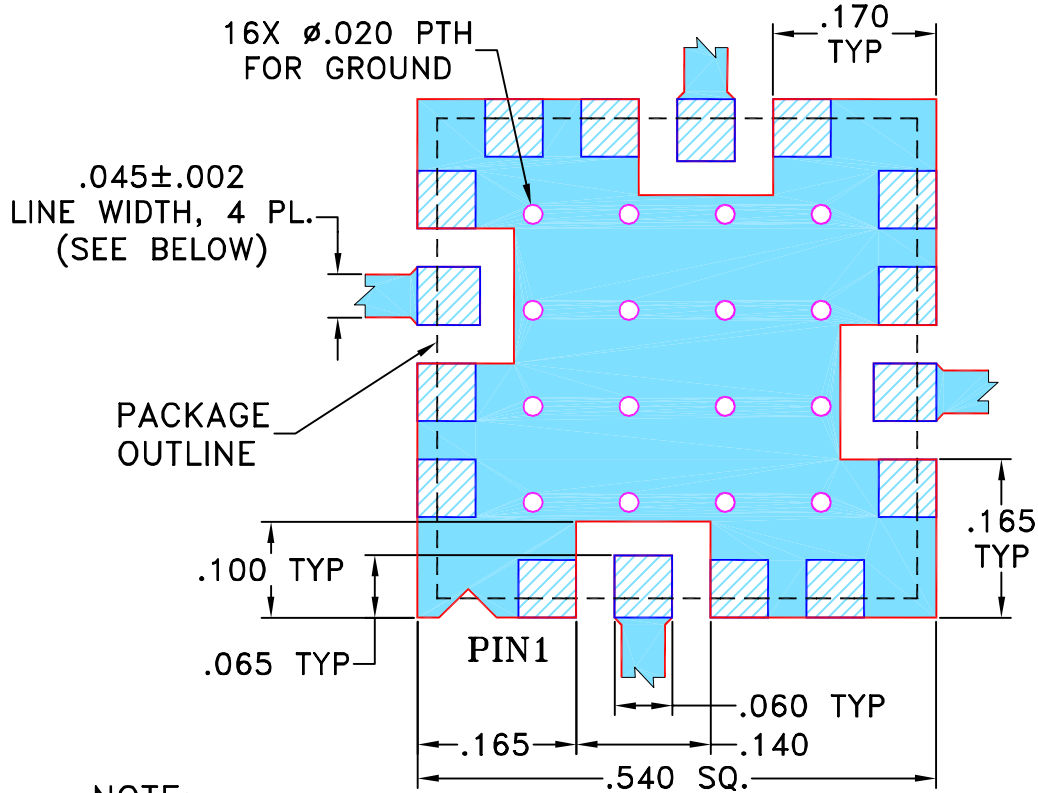
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
A	M94233	CHANGE LINE WIDTH	09/04	RZ	HH
B	M101567	ADD CS: DV874	10/05	DK	HH
B	R82061	ADD CS: DV874	10/05	DK	HH
C	M102713	ADDED "...WITH SMOBC"	01/12/06	GF	IL

SUGGESTED MOUNTING CONFIGURATION FOR DV894 & DV897 CASE STYLES, "np" PIN CONNECTION



NOTE:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS 0.025"  $\pm$  0.0025"; 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  $\pm$  .005  
ANGLES  $\pm$   
FRACTIONS  $\pm$

	INITIALS	DATE
DRAWN	DK (RAVON)	28 OCT 05
CHECKED	RZ (RAVON)	28 OCT 05
APPROVED	HH (RAVON)	28 OCT 05



Mini-Circuits®

13 Neptune Avenue  
Brooklyn NY 11235

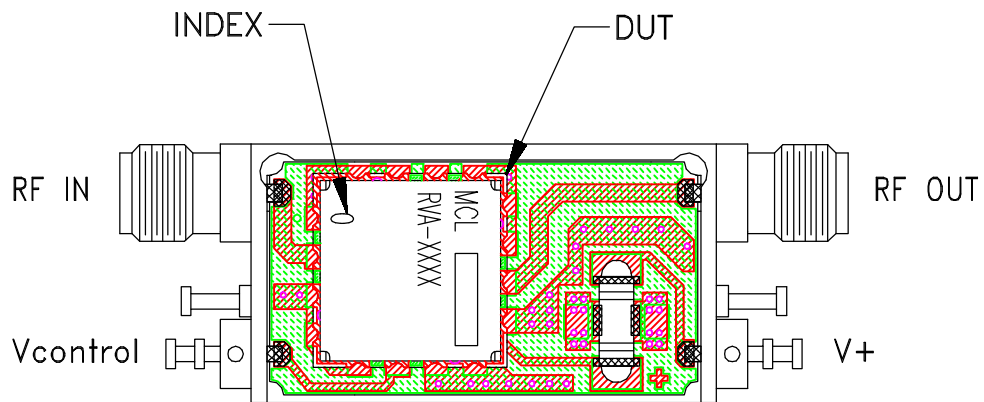
PL, np, DV894/897, RVA, TB-163

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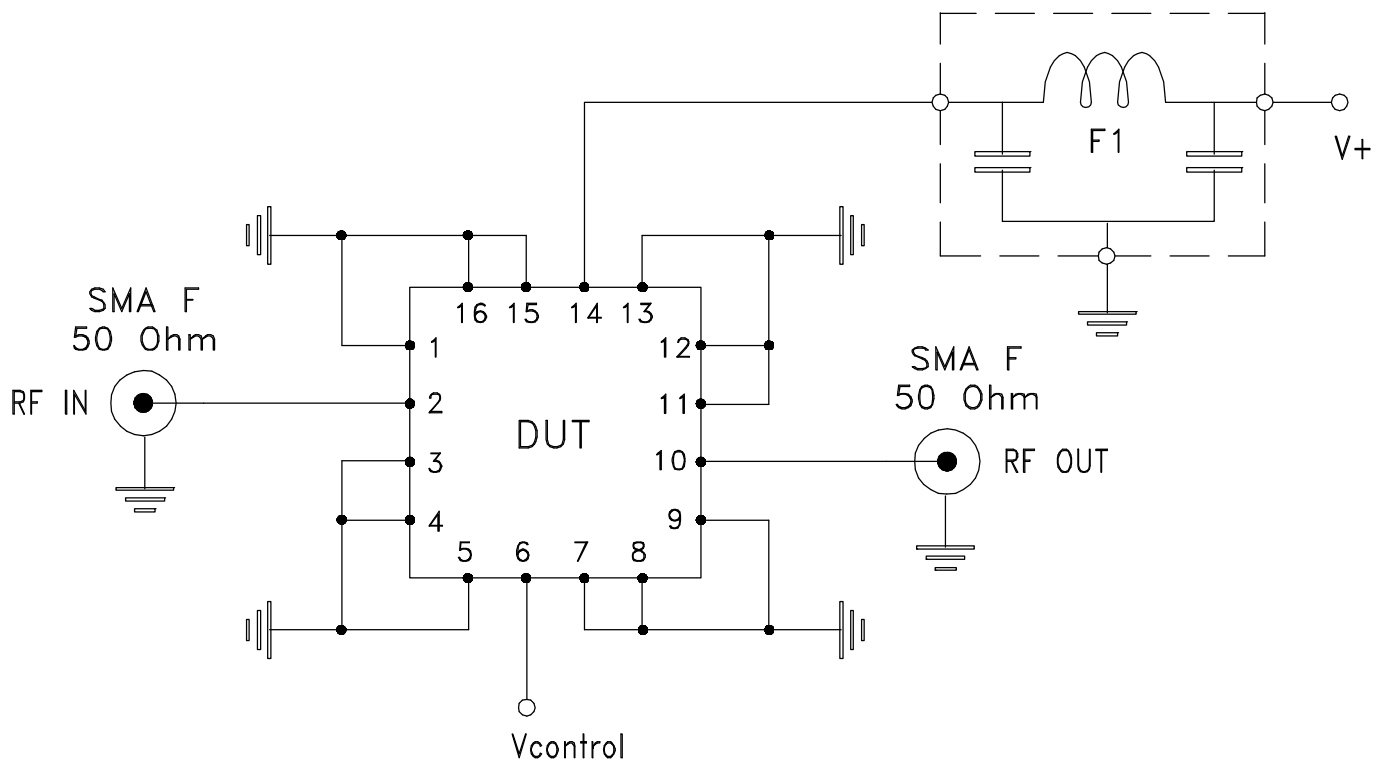
SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-040	C

FILE:	SCALE:	SHEET:
98PL040	5:1	1 OF 1

# Evaluation Board and Circuit



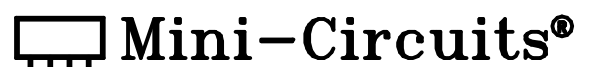
TB-163



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: ROGERS R04350B or equivalent, Dielectric Constant=4.5, Thickness=.020 inch.





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
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