

Constant Impedance

Voltage Variable Attenuator

HVA-73+

50Ω 5500 to 7000 MHz

The Big Deal

- Termination insensitive
- Low Insertion Loss: 1.6 dB
- Large attenuation range: 27 dB



CASE STYLE: CZ682

Product Overview

The Mini-Circuits HVA series, surface mount, constant impedance voltage variable attenuators provide excellent attenuation and linearity performance while maintaining constant RF impedance across the attenuation range. Built using Mini-Circuits proven shielded module construction technology, these models integrate dual pin diodes along with internal 90 degree hybrids. This termination insensitive approach allows more flexibility so designers can locate the attenuators anywhere in their lineup, including cascading VVAs for true attenuation addition without VSWR interaction degrading the usable attenuation range.

Key Features

Feature	Advantages
Constant Impedance (Termination insensitive)	The HVA series VVA incorporates 90° hybrids to buffer internal circuits from source and load mismatch. This unique feature enables the HVA series to maintain performance independent of source and load impedance, and allows units to be cascaded with true additive attenuation.
Excellent flatness	Typical attenuation flatness less than 1 dB typ. across the full band from 0 to 25 dB attenuation is great for feed forward applications.
Return Loss	17 dB typ return loss across frequency and control voltage ranges provides an excellent match under all operating conditions allowing straightforward cascading.
High IP3	High +43 dBm IP3 typ. at min attenuation and +35 dBm typ. up to 1.0V allows flexibility to locate VVA in lineup where attenuation is required the most without degrading system linearity.

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

Voltage Variable Attenuator

50Ω 5500 to 7000 MHz

Maximum Ratings

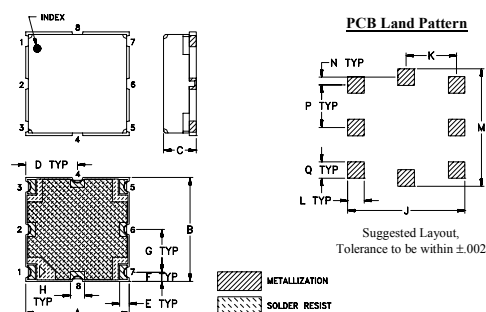
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Absolute Max. Control Current	10 mA
Absolute Max. RF Input Level	+15 dBm

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

Pin Connections

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

Outline Drawing

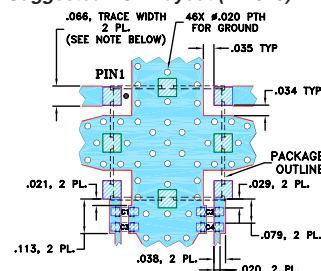


Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H
.375	.375	.131	.188	.035	.033	.154	.050
9.52	9.52	3.33	4.77	0.89	0.84	3.91	1.27

J	K	L	M	N	P	Q	wt
.425	.183	.060	.425	.028	.154	.060	grams
10.80	4.65	1.52	10.80	0.71	3.91	1.52	0.60

Demo Board MCL P/N: TB-511+
Suggested PCB Layout (PL-323)



CAPACITORS C1, C2: 1000 pF, 0603 SIZE;
C3, C4: 68 μ F, 0603 SIZE

NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS $0.030" \pm 0.002"$; 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.

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

Notes

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



Generic photo used for illustration purposes only

CASE STYLE: CZ682

Features

- low insertion loss, 1.6 dB typ.
- high attenuation, 27 dB typ.
- good return loss, 17 dB typ.

Applications

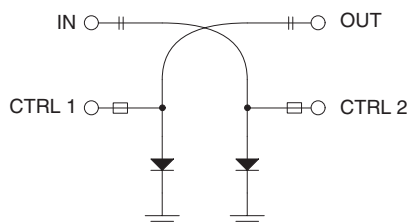
- variable gain amplifier
- feed forward amps
- ALC circuits

Electrical Specifications

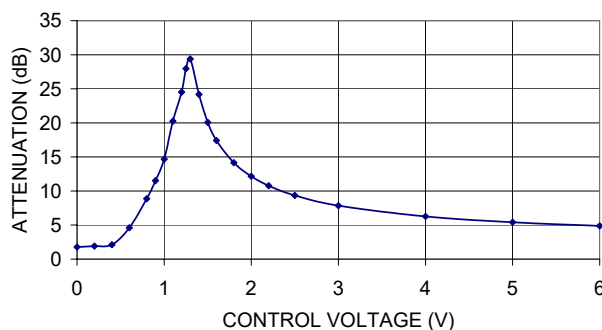
Parameter	Condition	Min.	Typ.	Max.	Units
Frequency Range		5500	—	7000	MHz
Insertion Loss	at 0V Control Voltage	—	1.6	2.3	dB
Attenuation		22	27	—	dB
IP3 ¹	at 0V Control Voltage	40	48	—	dBm
Input Return Loss		—	17	—	dB
Output Return Loss		—	17	—	dB
Control Voltage		0-6			V

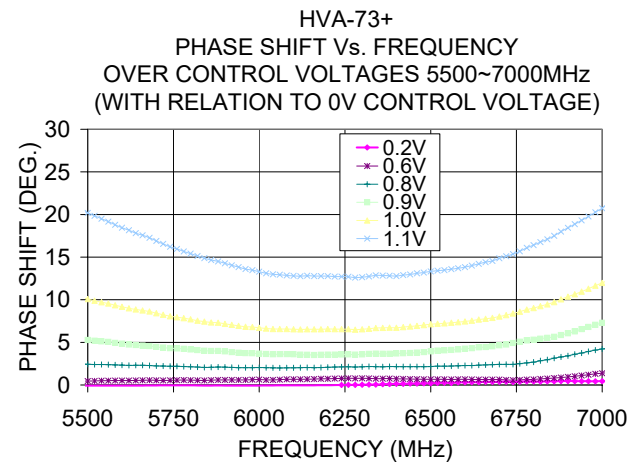
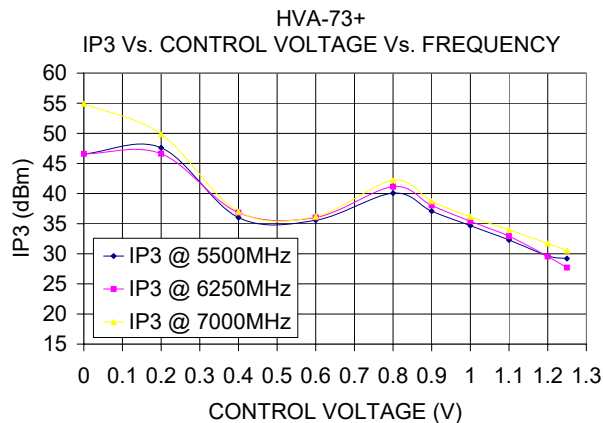
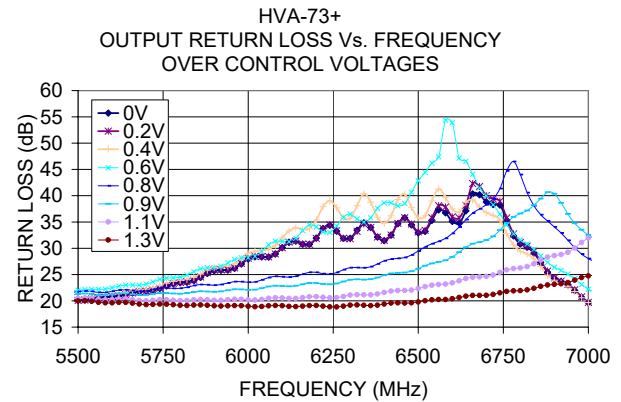
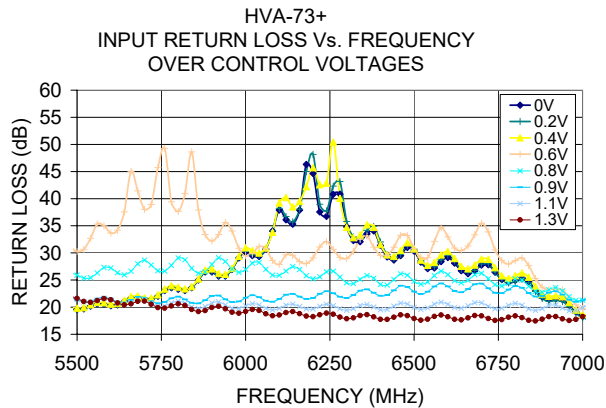
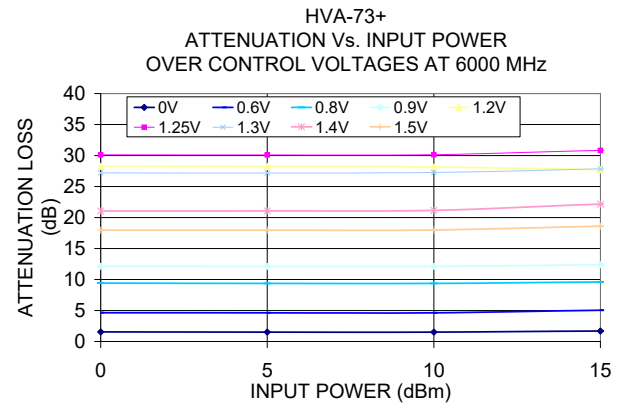
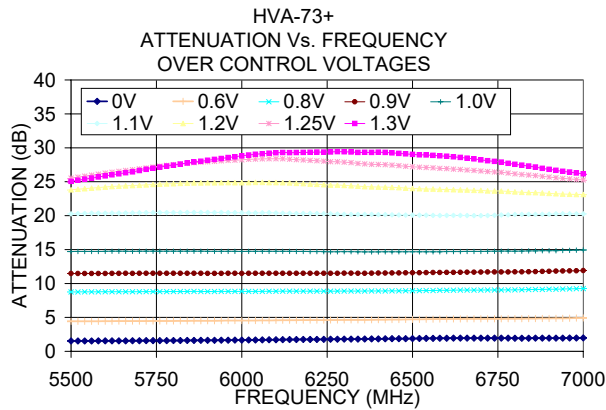
1. Input IP3 tested with two tones separated by 0.1 MHz at 0 dBm each and 0V control voltage.

Equivalent Schematic of DUT



HVA-73+
TYPICAL ATTENUATION at 6260 MHz





Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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



Voltage Variable Attenuator

HVA-73+

Typical Performance Data

V CTRL (V)	ATTENUATION (dB) @ 6260 MHz
0.00	1.78
0.20	1.91
0.40	2.12
0.60	4.61
0.80	8.86
0.90	11.51
1.00	14.68
1.10	20.25
1.20	24.51
1.25	27.95
1.30	29.38
1.40	24.18
1.50	20.08
1.60	17.41
1.80	14.15
2.00	12.16
2.20	10.78
2.50	9.35
3.00	7.85
4.00	6.27
5.00	5.41
6.00	4.88

V CTRL (V)	INPUT IP3 vs. V CTRL (dB)		
	IP3 @ 5500MHz	IP3 @ 6250MHz	IP3 @ 7000MHz
0.00	46.58	46.59	54.93
0.20	47.59	46.62	49.86
0.40	36.02	36.84	36.99
0.60	35.57	36.03	36.18
0.80	40.07	41.15	42.20
0.90	37.08	38.02	38.73
1.00	34.67	35.39	36.16
1.10	32.30	32.92	33.98
1.20	29.67	29.55	31.71
1.25	29.20	27.71	30.53
1.30	30.32	28.62	31.10
1.40	32.81	32.28	33.67
1.50	34.38	34.61	35.84
1.60	35.99	35.93	37.18

ATTENUATION VS. INPUT POWER @ 6000 MHz										
Input Power (dBm)	@V Ctrl 0V	@V Ctrl 0.4V	@V Ctrl 0.6V	@V Ctrl 0.8V	@V Ctrl 0.9V	@V Ctrl 1.2V	@V Ctrl 1.25V	@V Ctrl 1.3V	@V Ctrl 1.4V	@V Ctrl 1.5V
0.0	1.55	1.85	4.64	9.42	12.13	28.28	30.11	27.20	21.04	17.96
5.0	1.52	1.83	4.62	9.38	12.11	28.22	30.10	27.19	21.07	17.95
10.0	1.51	1.84	4.63	9.38	12.11	28.15	30.14	27.27	21.15	17.98
15.0	1.69	2.26	5.04	9.60	12.38	27.71	30.83	27.87	22.15	18.60



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

REV. OR
HVA-73+
2/26/2013
Page 1 of 5

Voltage Variable Attenuator

HVA-73+

Typical Performance Data

Frequency (MHz)	ATTENUATION vs. FREQUENCY OVER V CTRL (dB)										
	@V Ctrl 0V	@V Ctrl 0.2V	@V Ctrl 0.4V	@V Ctrl 0.6V	@V Ctrl 0.8V	@V Ctrl 0.9V	@V Ctrl 1.0V	@V Ctrl 1.1V	@V Ctrl 1.2V	@V Ctrl 1.25V	@V Ctrl 1.3V
5500	1.53	1.60	1.89	4.42	8.76	11.47	14.71	20.26	23.81	25.53	25.06
5540	1.53	1.60	1.90	4.43	8.77	11.48	14.72	20.32	23.98	25.83	25.38
5580	1.54	1.61	1.91	4.43	8.77	11.48	14.73	20.35	24.13	26.12	25.70
5620	1.55	1.61	1.92	4.44	8.79	11.49	14.75	20.37	24.29	26.40	26.02
5660	1.55	1.62	1.92	4.45	8.79	11.50	14.75	20.39	24.40	26.66	26.33
5700	1.56	1.63	1.93	4.46	8.79	11.50	14.75	20.42	24.48	26.90	26.64
5740	1.57	1.64	1.94	4.47	8.80	11.50	14.75	20.43	24.60	27.18	26.99
5780	1.58	1.66	1.95	4.48	8.80	11.50	14.75	20.45	24.68	27.42	27.30
5820	1.60	1.67	1.97	4.49	8.81	11.50	14.75	20.45	24.76	27.62	27.60
5860	1.61	1.68	1.98	4.50	8.83	11.50	14.75	20.47	24.83	27.81	27.90
5900	1.62	1.71	1.99	4.50	8.82	11.49	14.74	20.46	24.84	27.94	28.15
5940	1.64	1.72	2.00	4.52	8.83	11.49	14.74	20.46	24.86	28.07	28.42
5980	1.65	1.75	2.01	4.53	8.83	11.50	14.74	20.44	24.86	28.18	28.67
6020	1.67	1.77	2.03	4.54	8.83	11.50	14.74	20.41	24.87	28.30	28.93
6060	1.69	1.79	2.05	4.56	8.84	11.51	14.74	20.42	24.90	28.37	29.12
6100	1.71	1.82	2.06	4.57	8.85	11.51	14.74	20.39	24.87	28.38	29.27
6140	1.73	1.84	2.08	4.58	8.86	11.51	14.74	20.34	24.83	28.32	29.29
6180	1.75	1.87	2.10	4.60	8.86	11.51	14.72	20.32	24.73	28.21	29.32
6220	1.76	1.90	2.11	4.60	8.86	11.51	14.70	20.31	24.61	28.10	29.36
6260	1.78	1.91	2.12	4.61	8.86	11.51	14.68	20.25	24.51	27.95	29.38
6280	1.79	1.92	2.13	4.62	8.87	11.51	14.68	20.23	24.50	27.95	29.43
6320	1.80	1.95	2.15	4.63	8.88	11.52	14.69	20.18	24.41	27.82	29.38
6360	1.82	1.99	2.16	4.64	8.88	11.51	14.66	20.17	24.28	27.63	29.33
6400	1.84	2.04	2.18	4.67	8.90	11.54	14.66	20.15	24.21	27.55	29.35
6440	1.86	2.07	2.20	4.68	8.91	11.55	14.67	20.11	24.16	27.45	29.25
6480	1.87	2.10	2.22	4.70	8.93	11.57	14.67	20.08	24.06	27.28	29.10
6520	1.90	2.11	2.24	4.72	8.95	11.59	14.67	20.07	23.97	27.15	28.97
6560	1.92	2.11	2.27	4.74	8.97	11.61	14.68	20.03	23.92	27.04	28.88
6600	1.93	2.10	2.29	4.77	9.00	11.63	14.70	20.04	23.86	26.94	28.76
6640	1.95	2.10	2.30	4.78	9.02	11.65	14.71	20.04	23.80	26.80	28.58
6680	1.95	2.11	2.31	4.79	9.03	11.67	14.72	20.00	23.74	26.66	28.36
6720	1.94	2.13	2.31	4.79	9.04	11.69	14.74	20.01	23.66	26.50	28.10
6760	1.94	2.16	2.31	4.80	9.05	11.70	14.77	20.09	23.62	26.39	27.89
6800	1.93	2.16	2.31	4.81	9.06	11.71	14.76	20.16	23.50	26.17	27.57
6840	1.93	2.18	2.32	4.82	9.10	11.73	14.80	20.19	23.41	25.99	27.30
6880	1.94	2.18	2.33	4.84	9.13	11.78	14.83	20.19	23.35	25.80	26.97
6920	1.94	2.18	2.34	4.86	9.16	11.82	14.84	20.26	23.23	25.58	26.68
6960	1.96	2.19	2.36	4.88	9.21	11.86	14.89	20.28	23.16	25.42	26.42
7000	1.98	2.20	2.38	4.92	9.25	11.90	14.93	20.26	23.12	25.26	26.17



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

Typical Performance Data

Frequency (MHz)	INPUT RETURN LOSS vs. FREQUENCY OVER V CTRL (dB)										
	@V Ctrl 0V	@V Ctrl 0.2V	@V Ctrl 0.4V	@V Ctrl 0.6V	@V Ctrl 0.8V	@V Ctrl 0.9V	@V Ctrl 1.0V	@V Ctrl 1.1V	@V Ctrl 1.2V	@V Ctrl 1.25V	@V Ctrl 1.3V
5500	19.55	19.56	19.82	30.28	25.91	21.33	21.38	21.45	21.62	21.57	21.61
5540	20.18	20.18	20.44	32.70	25.43	21.06	20.96	20.91	20.93	20.89	20.90
5580	20.51	20.52	20.82	34.98	27.33	21.83	21.71	21.64	21.76	21.58	21.58
5620	20.42	20.41	20.68	34.20	26.35	20.95	20.86	20.80	21.39	20.76	20.77
5660	21.64	21.65	21.95	45.03	26.63	21.33	21.08	20.87	21.00	20.65	20.61
5700	21.40	21.43	21.75	38.02	28.66	21.74	21.52	21.35	22.02	21.16	21.13
5740	22.02	22.08	22.28	45.72	26.71	20.71	20.41	20.19	21.10	19.96	19.92
5780	23.58	23.66	23.97	39.43	27.71	21.62	21.13	20.75	21.18	20.34	20.23
5820	23.05	23.12	23.37	40.94	28.72	21.43	21.03	20.73	21.84	20.38	20.30
5860	25.01	25.05	25.21	37.92	26.24	20.69	20.16	19.76	20.48	19.30	19.18
5900	26.49	26.54	27.06	32.20	27.88	22.06	21.34	20.78	21.07	20.13	19.94
5940	25.74	25.74	26.06	35.62	28.43	21.45	20.88	20.41	21.43	19.85	19.69
5980	29.08	29.15	29.38	30.86	26.41	21.06	20.35	19.77	20.36	19.07	18.88
6020	29.49	29.62	30.44	29.86	28.12	22.19	21.34	20.65	21.16	19.81	19.57
6060	30.66	30.76	30.92	30.76	26.97	21.18	20.42	19.79	20.63	19.02	18.79
6100	37.90	38.23	39.22	27.90	25.85	21.51	20.55	19.78	20.06	18.84	18.55
6140	35.29	35.73	38.49	29.55	27.49	22.45	21.41	20.55	20.89	19.50	19.18
6180	46.32	45.01	42.21	28.06	25.79	21.51	20.49	19.67	20.00	18.66	18.35
6220	37.56	38.97	42.58	31.10	25.60	22.44	21.14	20.15	20.03	18.94	18.59
6260	40.81	42.31	50.44	30.63	26.63	22.57	21.28	20.28	20.43	19.07	18.70
6280	40.85	43.16	40.07	29.16	25.53	21.91	20.67	19.71	19.84	18.53	18.18
6320	32.28	32.94	32.82	30.27	24.35	22.23	20.81	19.74	19.33	18.42	18.03
6360	33.51	34.16	35.20	33.11	25.84	23.28	21.69	20.49	20.07	19.04	18.61
6400	31.37	32.02	31.53	29.53	24.20	22.09	20.66	19.54	19.06	18.17	17.76
6440	28.69	29.04	29.36	31.04	25.10	23.10	21.46	20.18	19.09	18.61	18.16
6480	31.00	31.33	31.88	33.20	25.87	23.72	21.96	20.57	19.55	18.91	18.44
6520	28.29	28.58	28.68	29.20	24.23	22.43	20.87	19.60	18.50	18.04	17.60
6560	27.22	27.43	28.25	32.13	25.82	23.81	22.04	20.56	19.32	18.79	18.30
6600	29.15	29.57	30.28	32.95	26.01	23.83	22.03	20.53	19.27	18.73	18.23
6640	26.71	26.96	27.55	30.43	24.47	22.74	21.19	19.80	18.64	18.12	17.67
6680	26.68	26.79	27.76	33.35	25.98	24.22	22.42	20.82	19.53	18.95	18.46
6720	27.81	28.00	28.83	33.87	25.25	23.48	21.70	20.17	18.94	18.38	17.90
6760	25.09	25.09	25.79	28.59	23.90	22.58	21.13	19.79	18.67	18.15	17.70
6800	24.96	24.70	25.80	28.59	25.21	23.89	22.21	20.70	19.46	18.89	18.40
6840	24.77	24.51	25.54	27.66	23.85	22.60	21.06	19.69	18.56	18.04	17.59
6880	21.90	21.61	22.43	23.71	22.74	22.05	20.88	19.73	18.71	18.23	17.79
6920	21.58	21.23	22.10	23.42	23.61	22.94	21.66	20.39	19.26	18.75	18.27
6960	20.41	20.10	20.85	21.85	21.94	21.37	20.39	19.35	18.40	17.96	17.54
7000	18.30	18.05	18.65	19.73	21.29	21.26	20.71	19.91	19.08	18.66	18.27

Typical Performance Data

Frequency (MHz)	OUTPUT RETURN LOSS vs. FREQUENCY OVER V CTRL (dB)										
	@V Ctrl 0V	@V Ctrl 0.2V	@V Ctrl 0.4V	@V Ctrl 0.6V	@V Ctrl 0.8V	@V Ctrl 0.9V	@V Ctrl 1.0V	@V Ctrl 1.1V	@V Ctrl 1.2V	@V Ctrl 1.25V	@V Ctrl 1.3V
5500	20.13	20.09	20.51	22.03	21.77	21.29	20.85	20.49	20.20	20.07	19.97
5540	20.40	20.37	20.78	22.20	21.78	21.28	20.82	20.45	20.16	20.03	19.92
5580	20.74	20.72	21.09	22.24	21.60	21.07	20.58	20.19	19.87	19.74	19.62
5620	20.95	20.93	21.37	22.81	22.05	21.38	20.81	20.36	20.00	19.85	19.70
5660	21.52	21.50	21.90	23.00	21.95	21.26	20.68	20.23	19.86	19.71	19.56
5700	21.85	21.85	22.23	23.18	21.89	21.12	20.49	20.00	19.62	19.45	19.29
5740	22.36	22.39	22.86	24.08	22.42	21.47	20.77	20.21	19.76	19.57	19.39
5780	23.22	23.29	23.71	24.38	22.36	21.38	20.67	20.10	19.64	19.44	19.26
5820	23.55	23.63	24.10	24.94	22.58	21.48	20.68	20.06	19.54	19.33	19.11
5860	24.44	24.55	25.10	26.10	23.09	21.81	20.94	20.25	19.69	19.45	19.22
5900	25.74	25.85	26.32	26.32	22.97	21.70	20.81	20.11	19.54	19.29	19.05
5940	25.83	25.92	26.61	27.22	23.40	22.00	20.98	20.21	19.57	19.31	19.05
5980	26.99	27.13	27.98	28.18	23.65	22.18	21.10	20.29	19.63	19.34	19.07
6020	28.37	28.47	29.41	28.47	23.60	22.13	21.00	20.15	19.46	19.17	18.87
6060	28.33	28.37	29.82	30.65	24.43	22.72	21.44	20.48	19.69	19.37	19.04
6100	30.11	30.09	31.98	31.29	24.58	22.83	21.53	20.54	19.74	19.40	19.06
6140	31.38	31.39	33.87	31.90	24.67	22.86	21.49	20.46	19.62	19.27	18.91
6180	30.76	30.76	33.73	34.44	25.42	23.39	21.89	20.78	19.86	19.48	19.10
6220	33.74	33.76	37.90	33.09	25.17	23.21	21.78	20.68	19.76	19.37	18.99
6260	33.23	33.32	37.69	34.20	25.39	23.29	21.77	20.61	19.65	19.24	18.84
6280	31.88	31.92	35.79	35.90	25.92	23.67	22.06	20.83	19.83	19.39	18.98
6320	33.43	33.21	38.08	35.58	26.33	24.09	22.46	21.18	20.12	19.66	19.22
6360	33.96	33.96	38.76	35.82	26.49	24.10	22.45	21.13	20.02	19.55	19.09
6400	31.44	31.48	34.78	38.63	27.60	24.87	23.06	21.60	20.39	19.87	19.39
6440	34.68	34.73	39.28	38.09	28.07	25.31	23.49	21.95	20.68	20.13	19.61
6480	34.44	34.61	37.79	40.66	28.73	25.63	23.69	22.05	20.71	20.13	19.61
6520	33.21	33.44	36.19	44.44	30.27	26.69	24.53	22.69	21.22	20.58	20.02
6560	37.29	38.11	41.28	47.41	31.33	27.39	25.08	23.10	21.53	20.85	20.25
6600	35.12	35.98	37.47	53.88	32.81	28.35	25.59	23.41	21.73	21.01	20.39
6640	37.13	38.18	38.75	46.55	35.46	30.18	26.72	24.23	22.36	21.56	20.89
6680	40.18	41.77	37.83	41.53	37.51	31.16	27.25	24.56	22.59	21.73	21.04
6720	38.32	39.37	36.26	38.27	39.39	32.26	27.83	24.92	22.84	21.93	21.23
6760	35.33	35.78	32.80	34.48	44.71	34.85	29.24	25.88	23.55	22.55	21.78
6800	30.82	31.12	29.44	31.59	44.01	36.62	29.94	26.26	23.78	22.74	21.94
6840	29.08	29.42	27.96	29.81	38.11	38.19	31.10	27.04	24.35	23.23	22.37
6880	25.44	25.66	24.90	27.31	35.17	40.66	33.25	28.32	25.21	23.98	23.02
6920	23.67	23.76	23.40	25.77	32.91	38.63	34.02	28.81	25.52	24.24	23.24
6960	21.96	22.10	21.78	24.17	30.09	34.76	34.99	30.06	26.45	25.08	23.94
7000	19.68	19.70	19.69	22.23	28.03	32.53	36.68	31.95	27.62	26.08	24.74

Voltage Variable Attenuator

HVA-73+

Typical Performance Data

Frequency (MHz)	PHASE SHIFT VS. FREQUENCY OVER V CTRL (Deg.)						
	@V Ctrl 0.2V	@V Ctrl 0.4V	@V Ctrl 0.6V	@V Ctrl 0.8V	@V Ctrl 0.9V	@V Ctrl 1.0V	@V Ctrl 1.1V
5500.0	-0.07	0.02	0.46	2.43	5.28	10.08	20.19
5540.0	-0.07	0.02	0.50	2.40	5.11	9.71	19.50
5580.0	-0.08	0.00	0.52	2.36	4.94	9.35	18.80
5620.0	-0.08	0.03	0.52	2.30	4.74	9.00	18.15
5660.0	-0.07	0.05	0.55	2.31	4.62	8.75	17.56
5700.0	-0.06	0.04	0.55	2.24	4.46	8.42	16.89
5740.0	-0.05	0.05	0.55	2.20	4.32	8.07	16.21
5780.0	-0.05	0.05	0.58	2.17	4.24	7.84	15.67
5820.0	-0.06	0.04	0.55	2.10	4.09	7.55	15.13
5860.0	-0.07	0.06	0.56	2.08	3.98	7.33	14.66
5900.0	-0.07	0.07	0.59	2.09	3.94	7.18	14.28
5940.0	-0.08	0.07	0.59	2.03	3.78	6.94	13.83
5980.0	-0.08	0.07	0.62	2.03	3.72	6.80	13.48
6020.0	-0.06	0.06	0.60	2.03	3.63	6.63	13.10
6060.0	-0.05	0.08	0.62	2.00	3.61	6.57	12.94
6100.0	-0.05	0.09	0.67	2.02	3.60	6.54	12.81
6140.0	-0.04	0.10	0.68	2.04	3.54	6.54	12.82
6180.0	-0.03	0.10	0.72	2.05	3.54	6.54	12.78
6220.0	-0.01	0.13	0.75	2.10	3.56	6.55	12.72
6260.0	0.02	0.12	0.78	2.13	3.59	6.55	12.70
6280.0	0.02	0.12	0.77	2.11	3.55	6.49	12.60
6320.0	0.05	0.11	0.77	2.16	3.64	6.60	12.73
6360.0	0.09	0.11	0.74	2.14	3.66	6.70	12.83
6400.0	0.13	0.09	0.72	2.15	3.69	6.72	12.78
6440.0	0.16	0.08	0.70	2.15	3.75	6.86	12.97
6480.0	0.20	0.07	0.67	2.15	3.86	7.02	13.19
6520.0	0.23	0.08	0.67	2.21	4.03	7.19	13.41
6560.0	0.24	0.07	0.65	2.22	4.10	7.30	13.59
6600.0	0.31	0.05	0.67	2.28	4.26	7.45	13.83
6640.0	0.32	0.09	0.64	2.32	4.41	7.68	14.21
6680.0	0.36	0.10	0.63	2.39	4.54	7.87	14.56
6720.0	0.38	0.07	0.59	2.41	4.75	8.19	15.10
6760.0	0.38	0.05	0.60	2.50	5.07	8.59	15.68
6800.0	0.41	0.07	0.65	2.69	5.30	9.03	16.41
6840.0	0.43	0.09	0.75	2.97	5.53	9.46	17.09
6880.0	0.46	0.09	0.88	3.29	5.85	10.05	17.99
6920.0	0.45	0.11	1.03	3.60	6.29	10.64	18.87
6960.0	0.44	0.12	1.20	3.93	6.80	11.29	19.77
7000.0	0.44	0.13	1.38	4.23	7.29	11.97	20.73



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

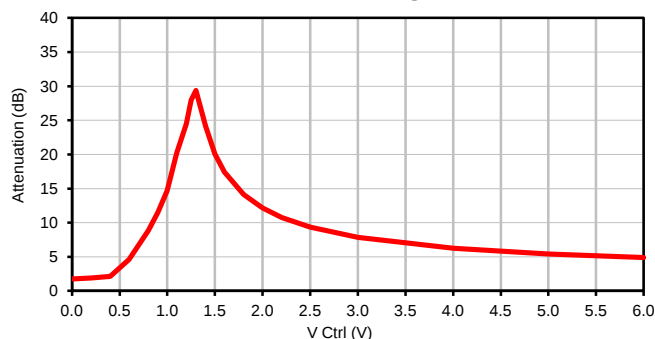


The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

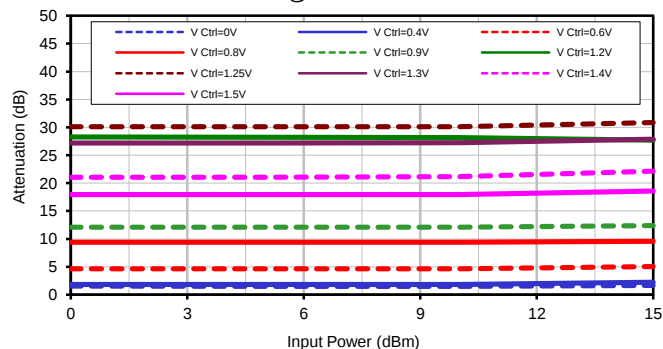
IF/RF MICROWAVE COMPONENTS

Typical Performance Curves

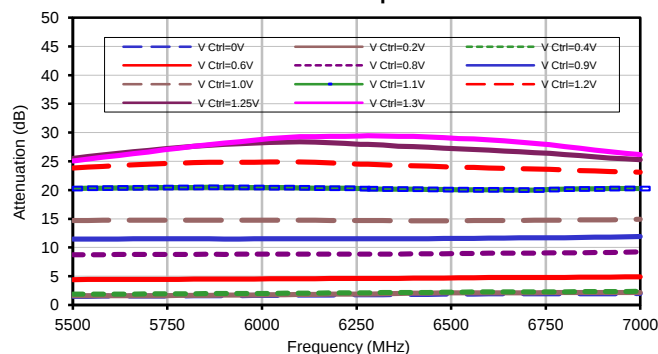
Attenuation Vs. V Ctrl @ 6260 MHz



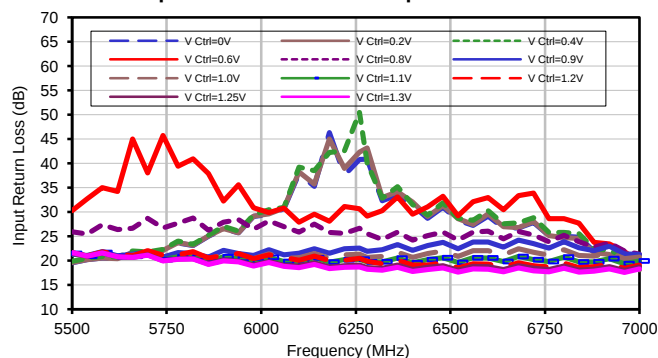
Attenuation Vs. Input Power over V Ctrl @ 6000 MHz



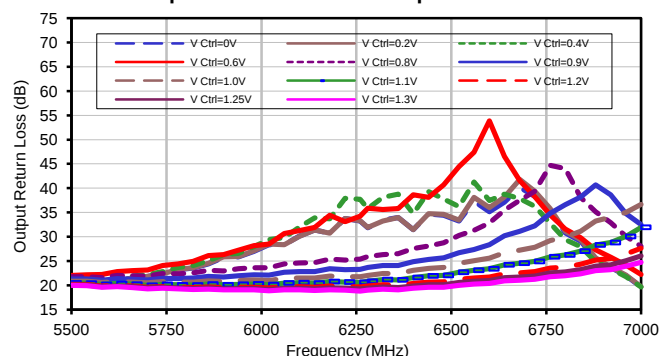
Attenuation Vs. Freq over V Ctrl



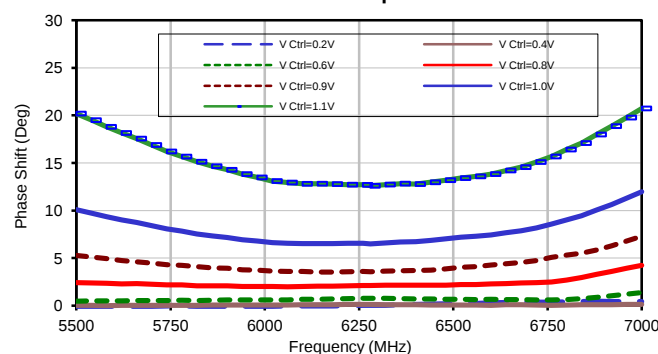
Input Return Loss Vs. Freq over V Ctrl



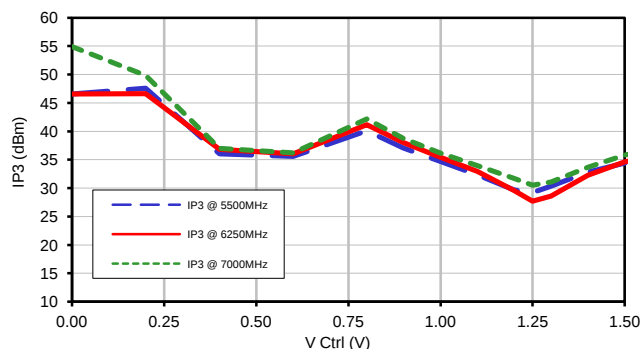
Output Return Loss Vs. Freq over V Ctrl



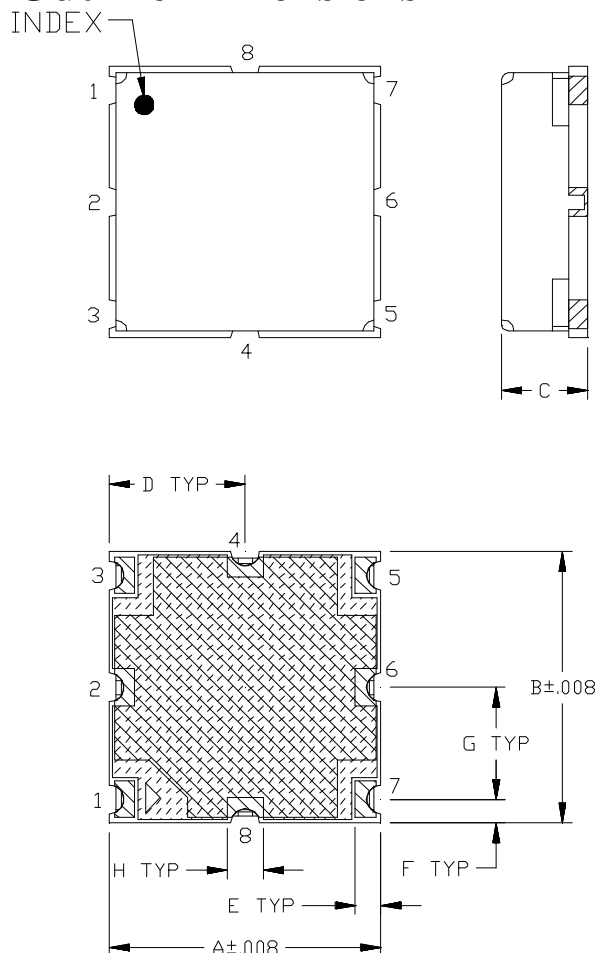
Phase Shift Vs. Freq over V Ctrl



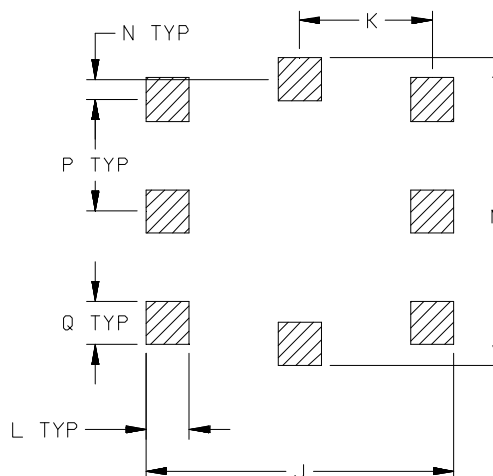
IP3 Vs. V Ctrl Vs. Frequency



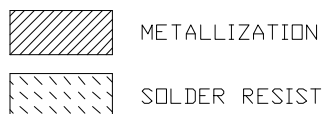
Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm.002$



CASE #	A	B	C	D	E	F	G	H	J	K
CZ682	.375 (9.52)	.375 (9.52)	.131 (3.33)	.188 (4.77)	.035 (0.89)	.033 (0.84)	.154 (3.91)	.050 (1.27)	.425 (10.80)	.183 (4.65)

CASE #	L	M	N	P	Q	WT. GRAM
CZ682	.060 (1.52)	.425 (10.80)	.028 (0.71)	.154 (3.91)	.060 (1.52)	.60

Dimensions are in inches (mm). Tolerances: 2Pl. $\pm .03$; 3Pl. $\pm .010$

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.

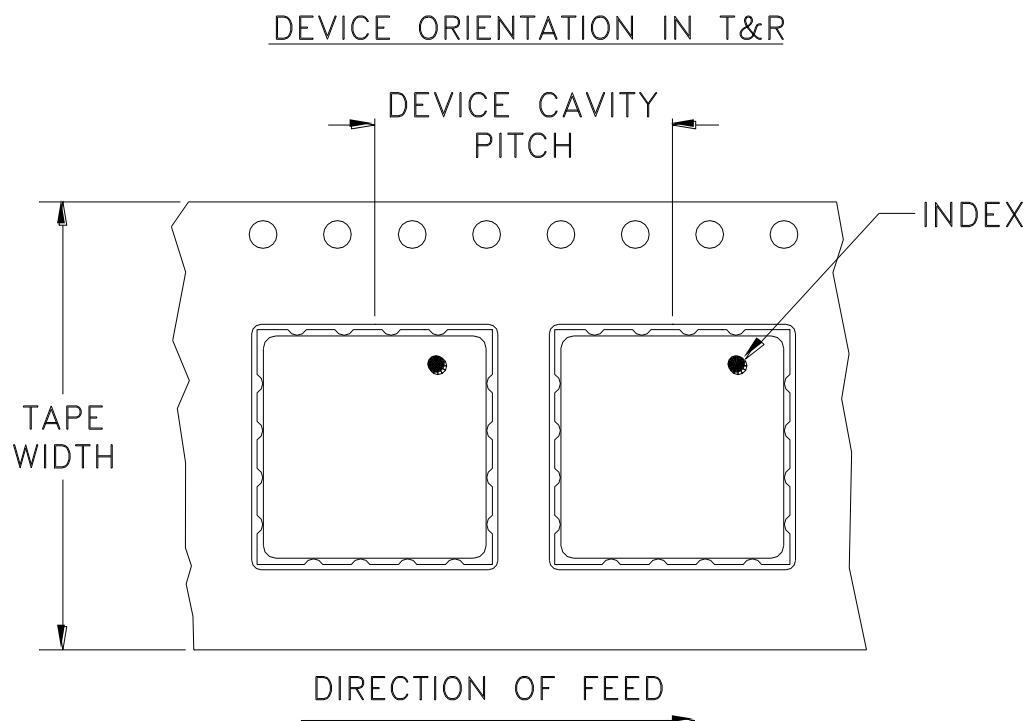


INTERNET <http://www.minicircuits.com>

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

Tape & Reel Packaging TR-F60



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
				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



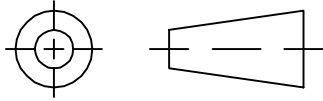
INTERNET <http://www.minicircuits.com>

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

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

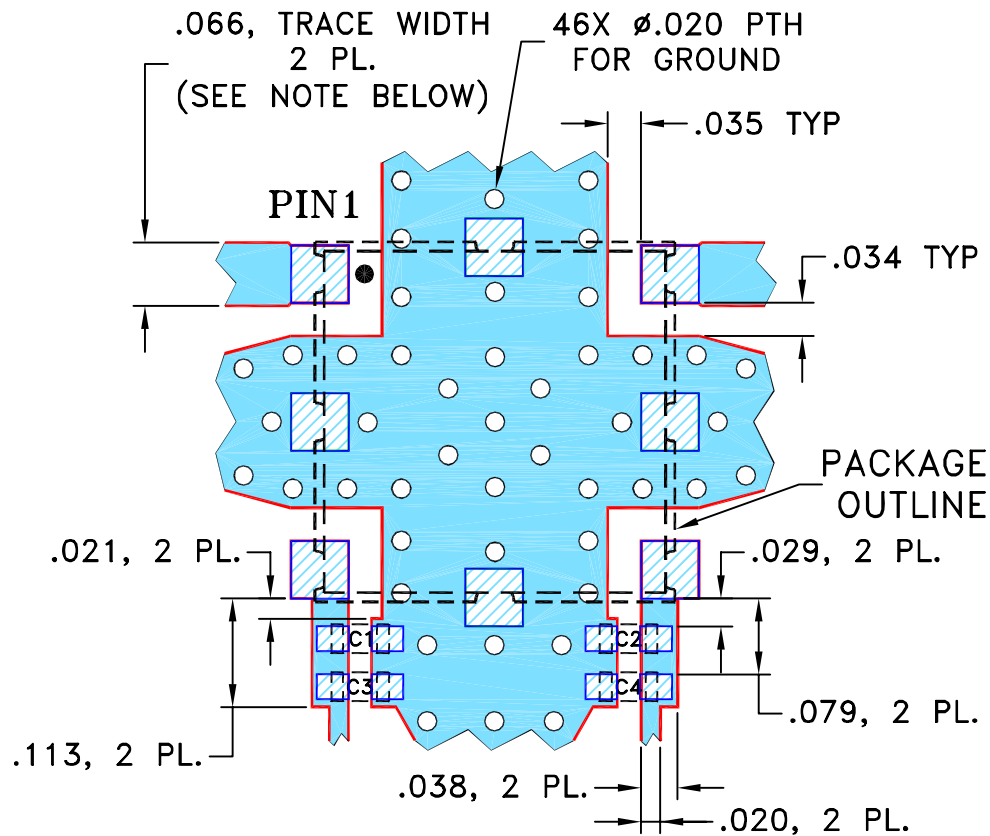
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M125690	NEW RELEASE	12/14/09	AV	DJ

SUGGESTED MOUNTING CONFIGURATION FOR CZ682 CASE STYLE, "08AV03" PIN CODE

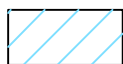


CAPACITORS C1, C2: 1000 pF, 0603 SIZE;
C3, C4: 68 pF, 0603 SIZE.

- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS 0.030" $\pm$ 0.002"; 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

AV

12/11/09

TOLERANCES ON:

CHECKED

IL

12/14/09

2 PL DECIMALS $\pm$.005

APPROVED

DJ

12/14/09

ANGLES $\pm$ FRACTIONS $\pm$

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



Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, 08AV03, CZ682, TB-511+

SIZE
A

CODE IDENT
15542

DRAWING NO:

98-PL-323

REV:

OR

FILE: 98PL323

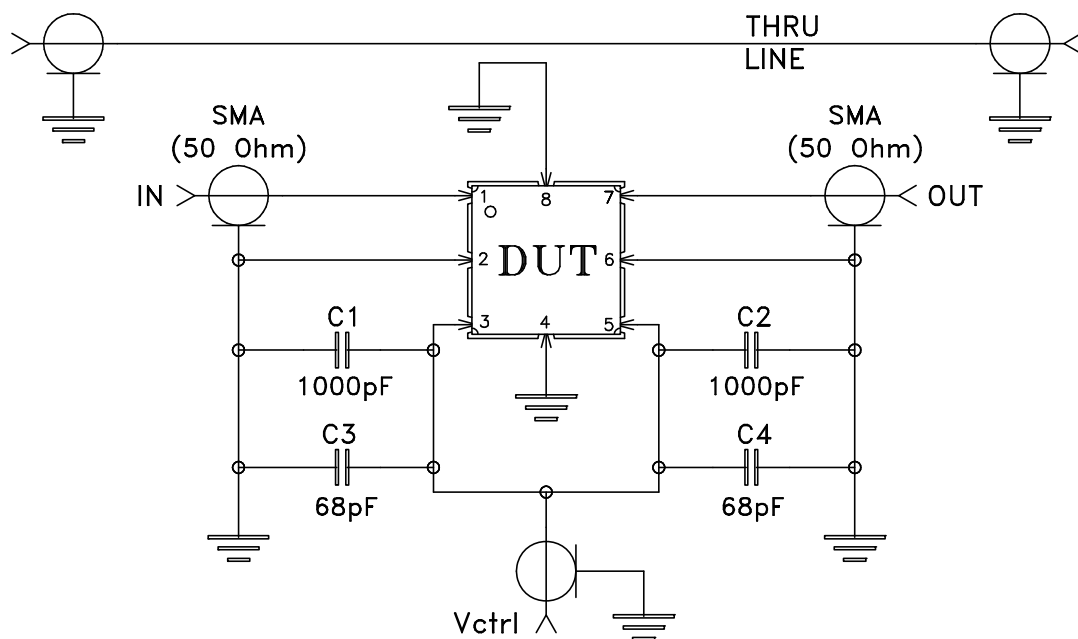
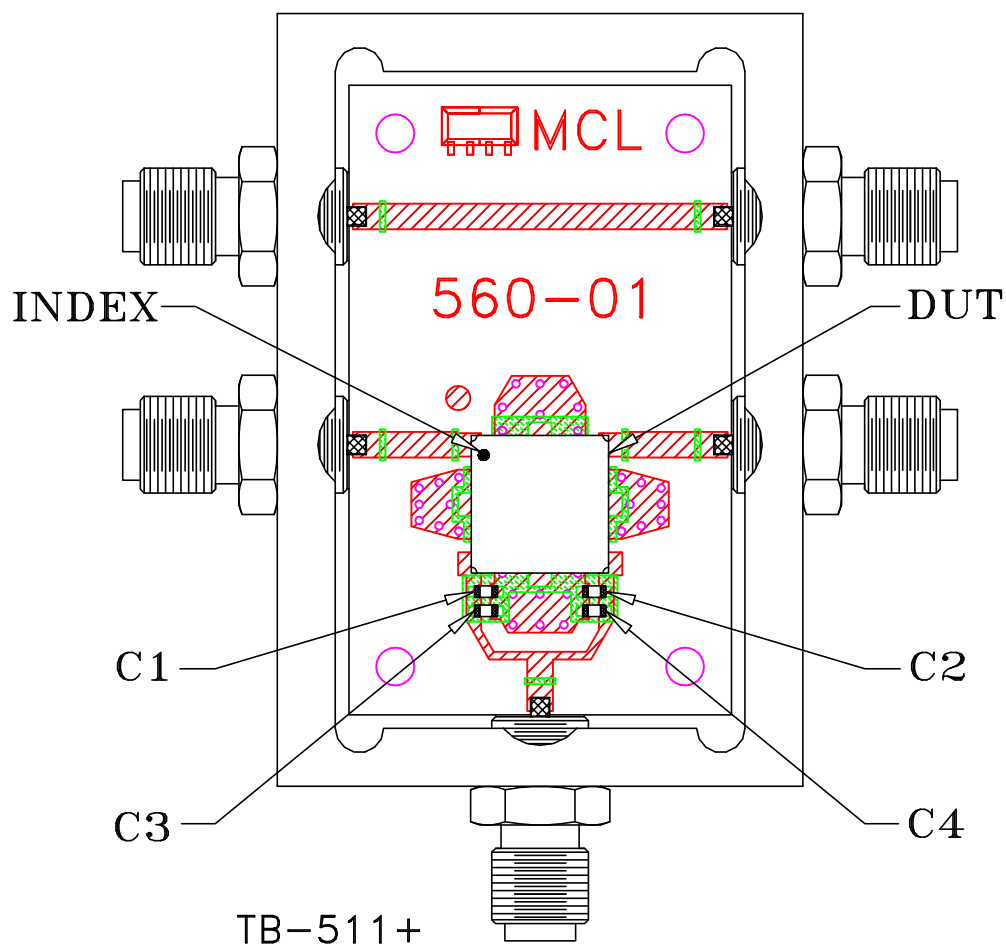
SCALE:

5:1

SHEET:

1 OF 1

Evaluation Board and Circuit



Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: RO4350 or equivalent,
Dielectric Constant=3.5, 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	-55° to 85°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° 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