

Coaxial Voltage Variable Attenuator

ZX73-2500+

50Ω 10 to 2500 MHz



FEMALE SMA shown
CASE STYLE: GD958

Maximum Ratings

Operating Temperature	-55°C to 85°C
Storage Temperature	-55°C to 85°C
Absolute Max. Supply Voltage (V+)	12V
Absolute Max. Control Voltage (Vctrl)	20V
Absolute Max. RF Input Level	+20 dBm
Permanent damage may occur if any of these limits are exceeded.	

Features

- Broadband, 10-2500 MHz
- IP3, +43 dBm typ.
- 40 dB attenuation @ 1500 MHz
- Good VSWR at in /out ports over attenuation range
- No external bias and RF matching network required
- Shielded case
- Protected by US Patent 6,790,049

SMA	Connectors	Model	Case
INPUT	OUTPUT		
FEMALE	FEMALE	ZX73-2500-S+	GD958
MALE	FEMALE	ZX73-2500M-S+	GD1163

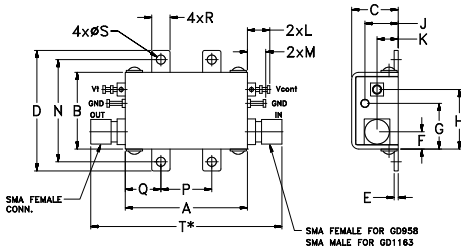
Applications

- Variable gain amplifier
- Power level control
- Feed-forward amplifiers
- ALC circuits

+RoHS Compliant

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

Outline Drawing (GD958)



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

FREQ. (MHz)	MIN. INSERTION LOSS, dB (+15V)		MAX. ATTENUATION dB (0V)		INPUT POWER (dBm)		CONTROL Voltage Current (V) (mA)		IP3 (dBm)	RETURN LOSS ¹ (dB)	POWER SUPPLY Voltage Current (V) (mA)	
	Min.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.			Typ.	Typ.
10	500	3.0	4.6	55	41	+20	0 - 17	30	43	20	+3 to +5	5
500	1500	3.3	5.0	40	30	+20	0 - 17	30	43	20	+3 to +5	5
1500	2500	4.0	6.2	37	25	+20	0 - 17	30	44	20	+3 to +5	5

Notes:

Rise/Fall time: 14μSec/25μSec Typ.
Switching Time, turn on/off: 14μSec/25μSec Typ.

¹ Improved R. Loss in/out performance can be achieved at certain frequencies by choosing a V+ between +3V to +5V



NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminals. See Application Note [AN-40-10](#).

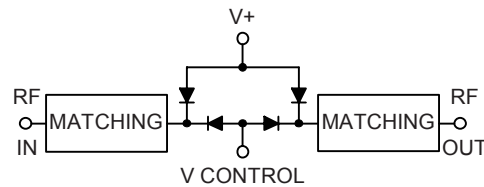
Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	
1.20	.75	.46	1.18	.04	.17	.45	.59	.33	
30.48	19.05	11.68	29.97	1.02	4.32	11.43	14.99	8.38	
K	L	M	N	P	Q	R	S	T	wt.
.21	.22	.18	1.00	.50	.35	.18	.106	1.88	grams
5.33	5.59	4.57	25.40	12.70	8.89	4.57	2.69	47.75	35.0

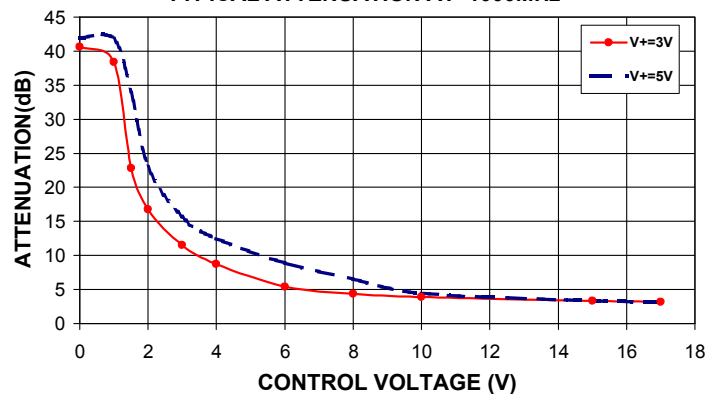
Note:

* T dimension is 2.05 inch (52.07 mm) for GD1163 Case Style.

Equivalent Schematic



ZX73-2500+ TYPICAL ATTENUATION AT 1000MHz

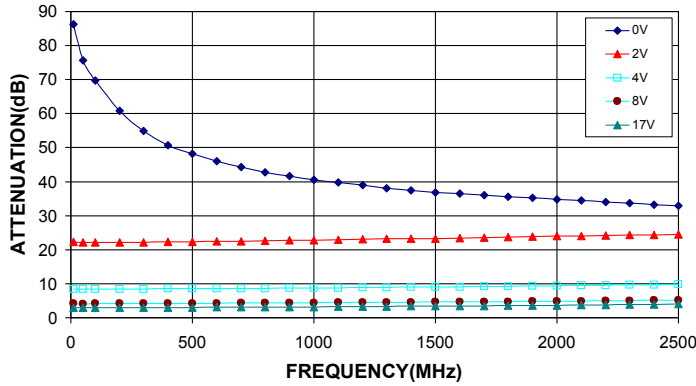


Notes

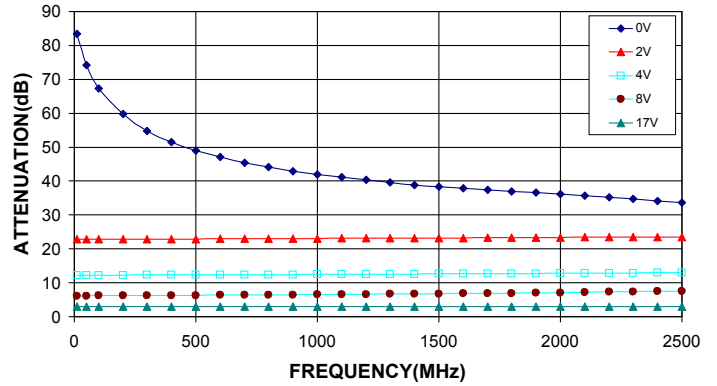
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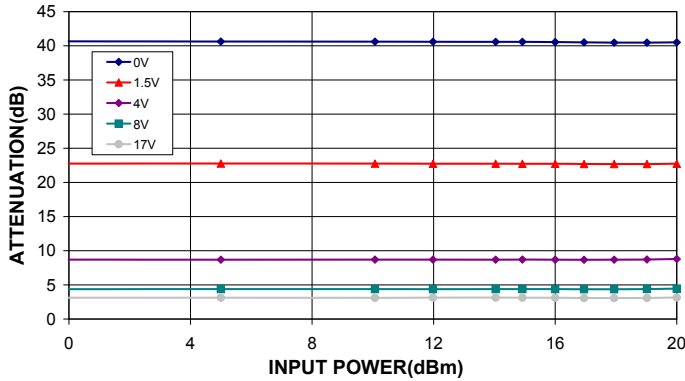
ZX73-2500+
ATTENUATION Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=3V



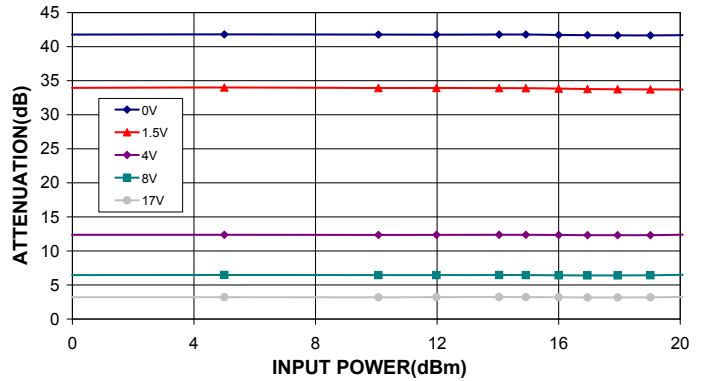
ZX73-2500+
ATTENUATION Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=5V



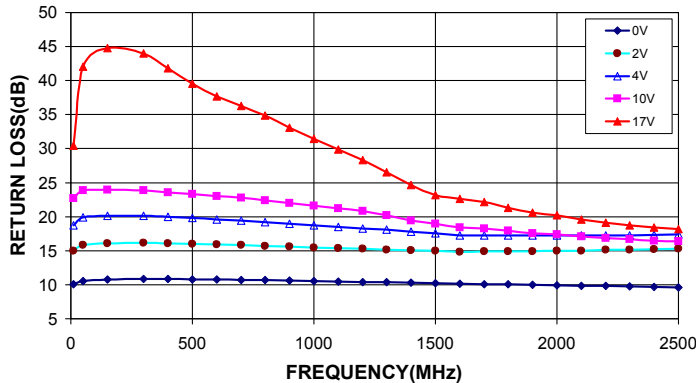
ZX73-2500+
ATTENUATION Vs. INPUT POWER
OVER CONTROL VOLTAGES AT 1000MHz @ V+=3V



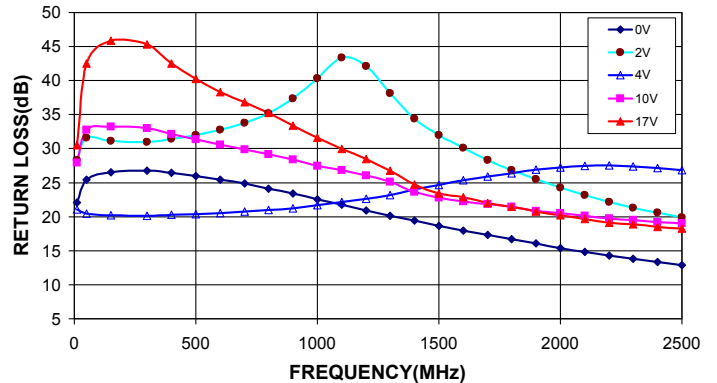
ZX73-2500+
ATTENUATION Vs. INPUT POWER
OVER CONTROL VOLTAGES AT 1000MHz @ V+=5V



ZX73-2500+
INPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=3V



ZX73-2500+
INPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=5V

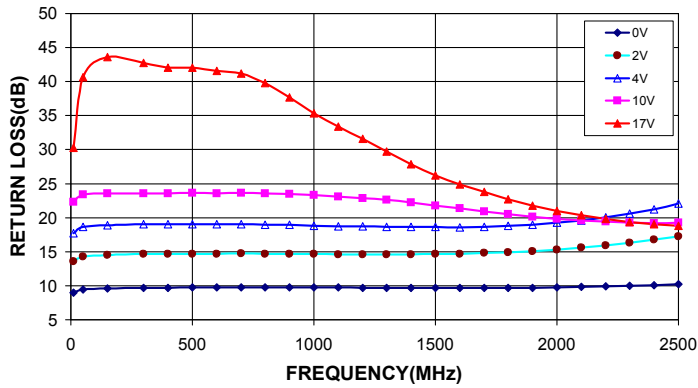


Notes

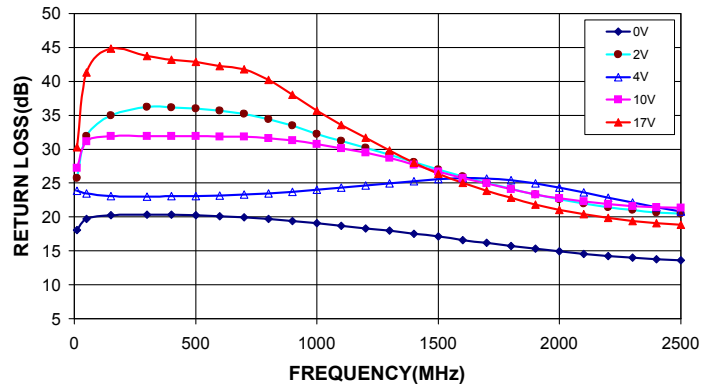
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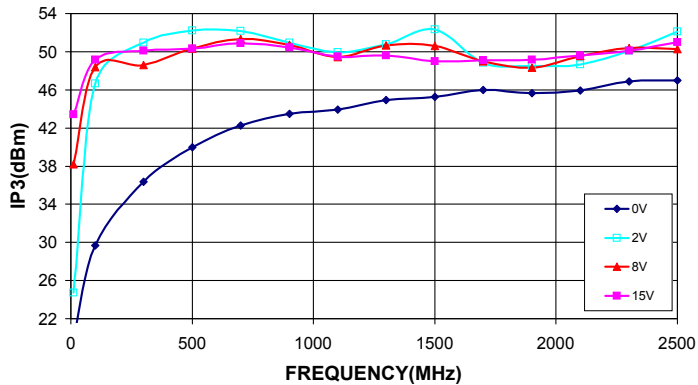
ZX73-2500+
OUTPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=3V



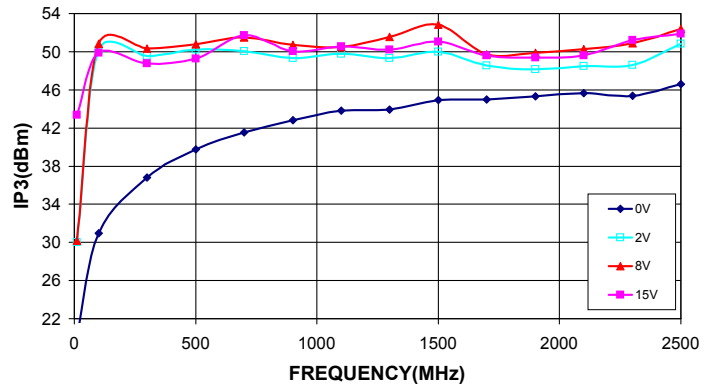
ZX73-2500+
OUTPUT RETURN LOSS Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=5V



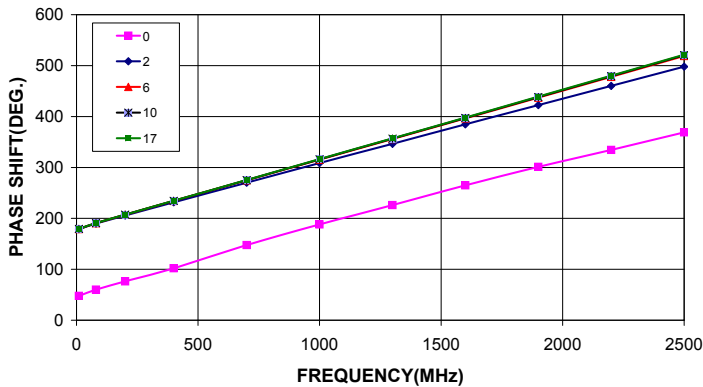
ZX73-2500+
IP3 Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=3V



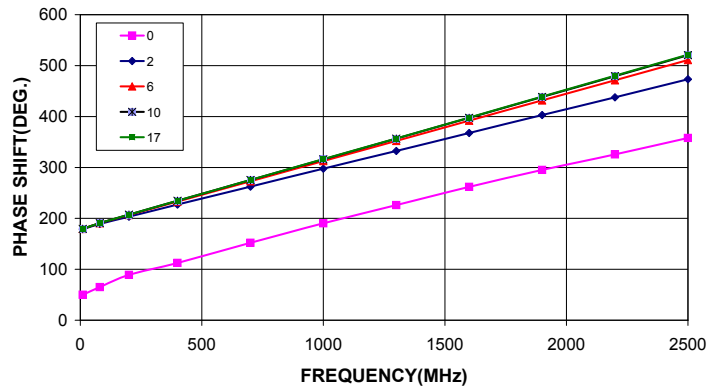
ZX73-2500+
IP3 Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=5V



ZX73-2500+
PHASE SHIFT Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=3V



ZX73-2500+
PHASE SHIFT Vs. FREQUENCY
OVER CONTROL VOLTAGES @ V+=5V



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Voltage Variable Attenuator

ZX73-2500+

Typical Performance Data

V CONTROL (V)	ATTENUATION @ 1000 MHz (dB)	
	@V+=3V	@V+=5V
	0.0	40.61
1.0	38.40	41.83
1.5	22.81	33.91
2.0	16.78	23.06
3.0	11.50	15.69
4.0	8.74	12.46
6.0	5.42	8.90
8.0	4.40	6.50
10.0	3.93	4.48
15.0	3.33	3.34
17.0	3.19	3.18

FREQ. (MHz)	ATTENUATION Vs. V CONTROL Vs. V+									
	(dB)									
	@V Control=0V		@V Control=2V		@V Control=4V		@V Control=8V		@V Control=17V	
	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V
10	86.30	83.44	22.30	22.87	8.47	12.20	4.18	6.16	2.93	2.92
50	75.64	74.19	22.17	22.82	8.42	12.21	4.13	6.18	2.92	2.91
80	73.13	69.95	22.14	22.81	8.42	12.22	4.14	6.19	2.93	2.92
100	69.73	67.24	22.14	22.79	8.43	12.23	4.14	6.20	2.94	2.93
150	64.77	63.05	22.14	22.83	8.44	12.25	4.16	6.21	2.95	2.95
200	60.87	59.86	22.19	22.83	8.45	12.27	4.16	6.23	2.96	2.95
250	57.26	57.26	22.21	22.85	8.47	12.28	4.18	6.25	2.99	2.97
300	54.92	54.85	22.17	22.81	8.48	12.29	4.18	6.25	2.99	2.98
400	50.72	51.56	22.25	22.87	8.51	12.30	4.21	6.28	3.01	3.00
500	48.14	49.03	22.36	22.90	8.54	12.33	4.24	6.32	3.04	3.03
600	45.98	47.07	22.45	22.94	8.56	12.36	4.26	6.34	3.07	3.06
700	44.23	45.44	22.51	22.98	8.62	12.39	4.30	6.39	3.10	3.09
800	42.76	44.16	22.61	23.01	8.65	12.41	4.34	6.42	3.12	3.11
900	41.64	42.92	22.73	23.04	8.71	12.43	4.37	6.46	3.16	3.14
1000	40.61	41.94	22.81	23.06	8.74	12.46	4.40	6.50	3.19	3.18
1100	39.71	41.10	22.95	23.11	8.80	12.49	4.45	6.56	3.23	3.22
1200	38.96	40.33	23.09	23.17	8.87	12.54	4.49	6.61	3.28	3.26
1300	38.13	39.62	23.20	23.20	8.92	12.58	4.54	6.68	3.32	3.31
1400	37.48	38.89	23.28	23.18	8.99	12.60	4.59	6.73	3.36	3.34
1500	36.80	38.35	23.31	23.22	9.04	12.61	4.61	6.78	3.39	3.37
1600	36.43	37.89	23.43	23.22	9.06	12.63	4.63	6.81	3.42	3.41
1700	36.04	37.44	23.63	23.27	9.14	12.67	4.70	6.89	3.47	3.46
1800	35.60	37.01	23.75	23.33	9.22	12.71	4.74	6.96	3.53	3.51
1900	35.21	36.58	23.88	23.35	9.31	12.73	4.81	7.04	3.59	3.56
2000	34.83	36.20	23.96	23.40	9.38	12.77	4.86	7.12	3.65	3.62
2100	34.47	35.73	24.09	23.43	9.45	12.83	4.91	7.20	3.70	3.69
2200	34.07	35.25	24.16	23.45	9.54	12.85	4.98	7.29	3.77	3.74
2300	33.68	34.72	24.27	23.49	9.61	12.88	5.04	7.38	3.84	3.82
2400	33.26	34.19	24.34	23.50	9.69	12.92	5.09	7.46	3.89	3.87
2500	32.90	33.62	24.44	23.54	9.79	12.96	5.17	7.55	3.98	3.95

REV. X1

ZX73-2500+

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Voltage Variable Attenuator

ZX73-2500+

Typical Performance Data

FREQ. (MHz)	INPUT RETURN LOSS Vs. V CONTROL Vs. V+									
	(dB)									
	@V Control=0V		@V Control=2V		@V Control=4V		@V Control=10V		@V Control=17V	
	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V
10	10.05	22.08	14.97	28.31	18.73	21.04	22.68	27.96	30.43	30.47
50	10.57	25.44	15.81	31.59	19.86	20.44	23.88	32.76	42.04	42.49
80	10.68	26.15	16.00	31.15	20.07	20.22	24.08	33.57	46.04	46.93
100	10.71	26.45	16.08	30.85	20.17	20.13	24.10	33.75	46.16	47.13
150	10.75	26.53	16.08	31.09	20.13	20.20	23.94	33.23	44.74	45.88
200	10.80	26.85	16.16	30.74	20.22	20.09	24.01	33.57	46.12	47.67
250	10.79	26.67	16.12	31.02	20.14	20.17	23.84	32.96	43.58	44.69
300	10.82	26.76	16.15	30.99	20.15	20.13	23.84	32.98	44.00	45.31
400	10.82	26.43	16.09	31.47	20.00	20.26	23.60	32.17	41.81	42.52
500	10.79	25.97	16.03	31.97	19.81	20.37	23.34	31.39	39.57	40.26
600	10.77	25.46	15.91	32.78	19.59	20.53	23.01	30.60	37.64	38.31
700	10.73	24.85	15.82	33.79	19.41	20.72	22.75	29.86	36.31	36.84
800	10.68	24.14	15.70	35.21	19.21	20.95	22.43	29.19	34.86	35.26
900	10.63	23.37	15.59	37.38	18.95	21.26	22.02	28.42	33.09	33.42
1000	10.54	22.56	15.47	40.34	18.69	21.71	21.61	27.50	31.40	31.61
1100	10.48	21.74	15.35	43.39	18.49	22.13	21.20	26.85	29.84	29.95
1200	10.42	20.94	15.26	42.13	18.29	22.60	20.81	26.06	28.35	28.44
1300	10.36	20.16	15.15	38.13	18.07	23.18	20.21	25.15	26.55	26.75
1400	10.29	19.40	15.06	34.44	17.82	24.01	19.40	23.64	24.62	24.76
1500	10.21	18.66	14.97	31.95	17.58	24.67	18.93	22.82	23.14	23.43
1600	10.15	17.97	14.86	30.11	17.26	25.38	18.40	22.21	22.65	22.85
1700	10.10	17.29	14.87	28.35	17.25	25.88	18.26	21.85	22.14	22.01
1800	10.04	16.67	14.90	26.86	17.21	26.37	17.96	21.42	21.29	21.45
1900	10.02	16.06	14.94	25.50	17.22	26.94	17.58	20.83	20.61	20.77
2000	9.92	15.41	15.00	24.27	17.22	27.26	17.38	20.51	20.18	20.19
2100	9.86	14.86	15.01	23.18	17.21	27.44	17.12	20.16	19.60	19.68
2200	9.80	14.30	15.11	22.18	17.28	27.52	16.85	19.74	19.13	19.15
2300	9.74	13.81	15.12	21.33	17.27	27.40	16.67	19.48	18.76	18.85
2400	9.67	13.32	15.18	20.56	17.33	27.16	16.47	19.21	18.39	18.5
2500	9.61	12.90	15.26	19.92	17.42	26.83	16.37	19.01	18.15	18.25

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Voltage Variable Attenuator

ZX73-2500+

Typical Performance Data

FREQ. (MHz)	OUTPUT RETURN LOSS Vs. V CONTROL Vs. V+									
	(dB)									
	@V Control=0V		@V Control=2V		@V Control=4V		@V Control=10V		@V Control=17V	
	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V
10	9.00	18.06	13.58	25.72	17.71	23.84	22.29	27.26	30.24	30.30
50	9.42	19.68	14.26	31.89	18.64	23.50	23.39	31.16	40.68	41.33
80	9.51	19.99	14.42	33.62	18.84	23.25	23.56	31.79	43.56	44.65
100	9.55	20.12	14.47	34.36	18.91	23.12	23.63	31.96	44.06	45.23
150	9.59	20.24	14.51	34.94	18.92	23.09	23.59	31.93	43.60	44.82
200	9.65	20.35	14.61	35.90	19.04	22.98	23.65	32.23	44.12	45.27
250	9.65	20.30	14.60	35.71	18.99	23.06	23.56	31.82	42.85	43.95
300	9.69	20.33	14.64	36.25	19.05	23.00	23.60	31.96	42.76	43.73
400	9.71	20.32	14.64	36.11	19.02	23.05	23.56	31.94	42.01	43.17
500	9.75	20.25	14.69	35.98	19.06	23.11	23.61	31.92	42.06	42.87
600	9.76	20.12	14.70	35.65	19.07	23.18	23.60	31.82	41.55	42.29
700	9.77	19.98	14.71	35.21	19.03	23.29	23.63	31.83	41.21	41.77
800	9.78	19.73	14.70	34.44	18.97	23.44	23.57	31.60	39.78	40.20
900	9.76	19.40	14.68	33.45	18.93	23.68	23.48	31.29	37.70	37.99
1000	9.74	19.08	14.65	32.25	18.82	24.02	23.30	30.76	35.33	35.68
1100	9.72	18.70	14.59	31.21	18.76	24.34	23.08	30.10	33.37	33.58
1200	9.70	18.34	14.60	30.20	18.70	24.68	22.88	29.48	31.56	31.71
1300	9.70	17.96	14.60	29.16	18.65	24.98	22.60	28.71	29.71	29.84
1400	9.69	17.55	14.63	28.09	18.64	25.30	22.24	27.68	27.87	27.97
1500	9.67	17.10	14.65	27.01	18.61	25.55	21.80	26.71	26.24	26.37
1600	9.66	16.62	14.68	26.00	18.57	25.73	21.34	25.76	24.91	25.04
1700	9.65	16.17	14.79	25.05	18.68	25.65	20.93	24.92	23.76	23.85
1800	9.66	15.72	14.91	24.17	18.77	25.41	20.53	24.11	22.70	22.81
1900	9.70	15.32	15.09	23.35	18.97	24.98	20.16	23.34	21.73	21.80
2000	9.75	14.93	15.30	22.62	19.25	24.36	19.84	22.80	20.98	21.03
2100	9.81	14.58	15.59	22.00	19.60	23.62	19.62	22.32	20.34	20.40
2200	9.88	14.25	15.91	21.45	20.06	22.84	19.40	21.91	19.79	19.84
2300	9.99	13.99	16.34	21.01	20.61	22.12	19.29	21.63	19.36	19.41
2400	10.09	13.76	16.77	20.66	21.24	21.42	19.23	21.43	19.02	19.07
2500	10.24	13.64	17.28	20.49	22.07	20.84	19.27	21.32	18.82	18.87

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Typical Performance Data

FREQ. (MHz)	INPUT IP3 Vs. V CONTROL Vs. V+									
	(dBm)									
	@V Control=0V		@V Control=2V		@V Control=4V		@V Control=8V		@V Control=15V	
	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V
10	20.02	20.28	24.70	29.99	27.05	33.84	38.19	30.17	43.42	43.38
20	20.55	22.71	29.25	34.00	31.08	36.58	41.48	34.14	46.15	46.17
50	26.22	27.34	42.97	44.64	49.77	41.84	49.34	43.32	51.36	50.06
100	29.67	30.97	46.64	50.16	50.78	51.58	48.38	50.85	49.15	49.89
200	34.23	33.92	49.37	50.53	50.08	52.87	48.68	51.13	49.17	49.22
300	36.38	36.78	50.96	49.57	50.65	52.48	48.62	50.30	50.12	48.76
400	39.12	38.37	50.52	49.58	50.66	52.60	48.71	51.19	50.10	49.76
500	39.99	39.76	52.20	50.22	51.80	53.06	50.32	50.75	50.33	49.28
600	41.08	40.33	51.59	50.08	52.00	52.96	52.09	50.74	52.44	49.53
700	42.23	41.56	52.19	50.05	52.21	52.48	51.32	51.51	50.91	51.70
800	43.01	42.28	50.90	49.90	52.24	51.92	52.01	50.65	52.42	50.37
900	43.49	42.83	50.94	49.32	52.65	53.04	50.74	50.73	50.45	50.04
1000	44.08	43.56	50.43	50.37	50.32	50.06	50.05	50.02	50.09	50.12
1100	43.90	43.82	49.91	49.75	51.20	50.86	49.45	50.49	49.48	50.56
1200	44.80	43.90	51.03	49.81	51.21	52.67	51.28	51.35	50.15	50.11
1300	44.94	43.90	50.77	49.34	51.06	53.01	50.65	51.53	49.61	50.24
1400	45.68	44.01	52.09	49.31	50.88	50.16	51.23	51.33	49.62	51.48
1500	45.24	44.93	52.35	50.02	50.94	51.74	50.61	52.81	48.99	51.04
1600	45.88	45.65	48.56	48.27	48.22	48.00	49.14	50.05	49.19	49.37
1700	45.98	45.01	48.80	48.55	49.60	49.88	49.01	49.71	49.09	49.63
1800	45.11	44.90	49.46	49.36	48.54	48.00	48.16	49.46	48.01	49.07
1900	45.66	45.33	48.49	48.15	49.89	49.55	48.35	49.88	49.14	49.40
2000	46.32	46.01	49.74	48.09	48.46	49.49	48.93	49.55	48.92	49.51
2100	45.93	45.68	48.63	48.48	49.80	49.22	49.57	50.26	49.60	49.59
2200	46.80	46.31	48.90	48.59	50.03	49.55	48.76	50.32	49.44	49.61
2300	46.90	45.39	50.12	48.62	51.36	50.95	50.39	50.91	50.08	51.21
2400	47.02	46.52	50.07	51.47	51.34	51.68	50.65	52.51	51.80	51.30
2500	46.99	46.58	52.10	50.84	51.16	52.55	50.28	52.37	50.97	51.86

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Voltage Variable Attenuator

ZX73-2500+

Typical Performance Data

FREQ. (MHz)	PHASE SHIFT Vs. V CONTROL Vs. V+									
	(deg)									
	@V Control=0V		@V Control=2V		@V Control=6V		@V Control=10V		@V Control=17V	
	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V	@V+=3V	@V+=5V
10	47.67	50.00	178.89	178.76	179.15	179.37	179.23	179.23	179.25	179.24
80	60.00	65.00	189.79	189.14	190.55	190.56	190.66	190.65	190.71	190.75
200	76.34	89.00	205.57	203.39	207.06	206.63	207.22	207.26	207.33	207.30
400	101.98	112.52	231.57	227.08	234.31	233.21	234.47	234.48	234.64	234.67
700	147.55	152.13	270.21	262.47	274.91	272.83	275.19	275.25	275.48	275.45
1000	188.13	190.38	308.51	297.61	315.42	312.57	315.88	315.96	316.28	316.27
1300	226.19	225.97	346.49	332.37	355.83	352.17	356.53	356.61	357.07	357.01
1600	264.83	261.93	384.62	367.72	396.40	391.85	397.27	397.40	397.97	397.99
1900	301.06	295.08	422.50	402.89	437.17	431.60	438.22	438.41	439.11	439.09
2200	334.49	325.74	460.31	437.73	477.92	471.26	479.20	479.28	480.15	480.14
2500	368.94	357.86	498.03	473.13	518.95	511.05	520.40	520.35	521.47	521.41

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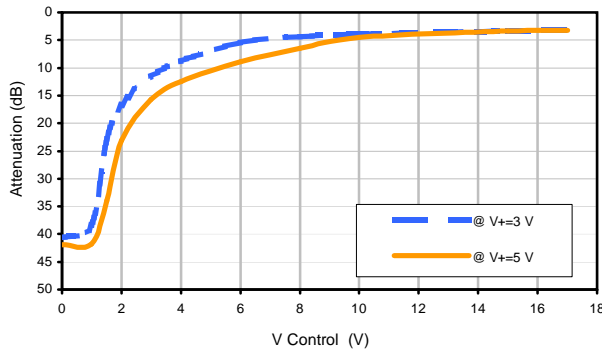


Voltage Variable Attenuator

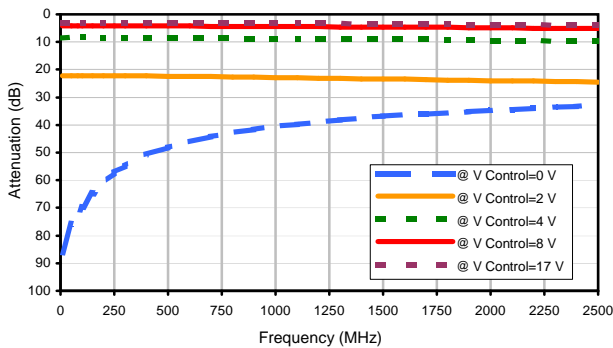
Typical Performance Curves

ZX73-2500+

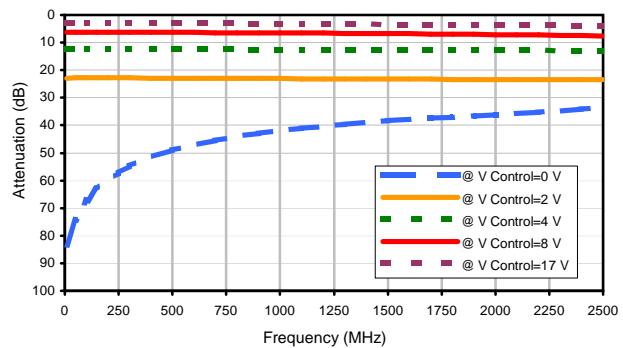
Attenuation @ 1000 MHz



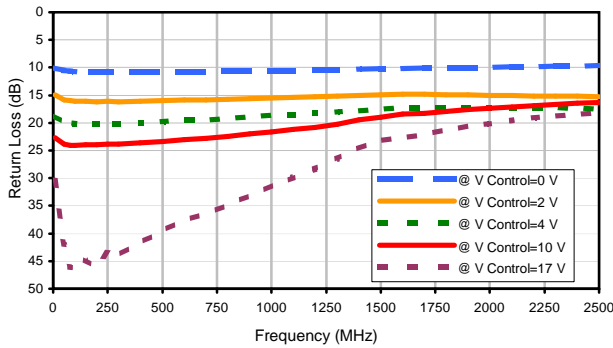
Attenuation @ V+=3 V



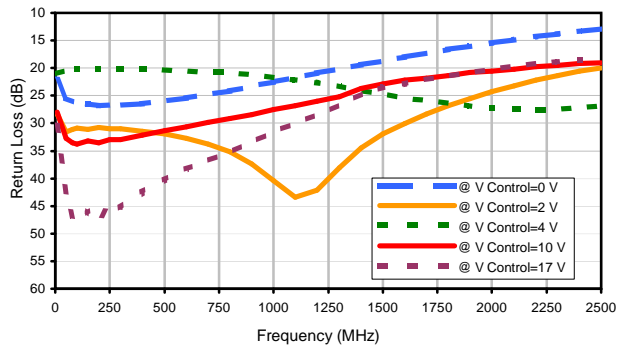
Attenuation @ V+=5 V



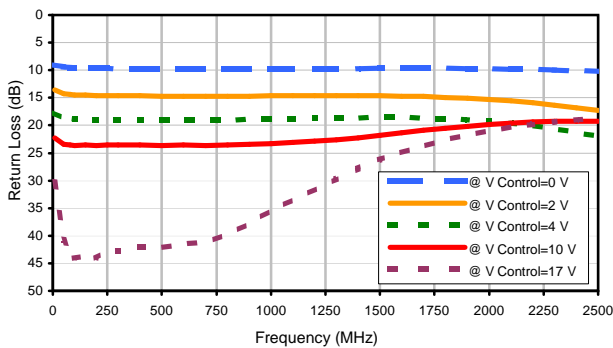
Input Return Loss @ V+=3 V



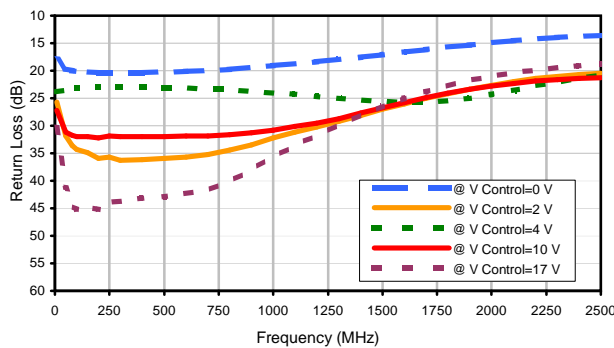
Input Return Loss @ V+=5 V



Output Return Loss @ V+=3 V



Output Return Loss @ V+=5 V



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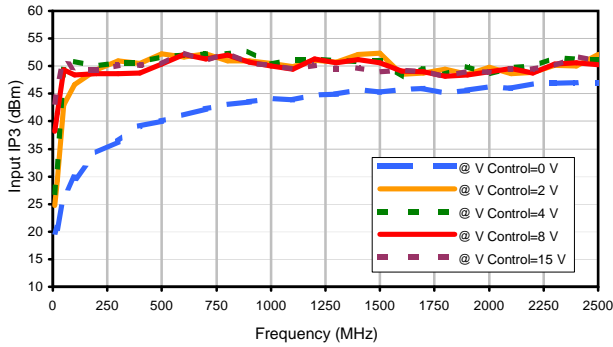


Voltage Variable Attenuator

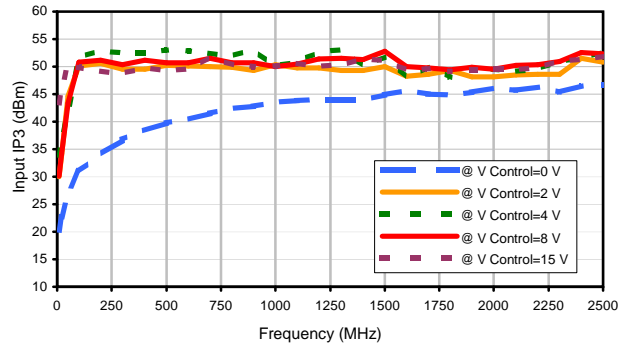
ZX73-2500+

Typical Performance Curves

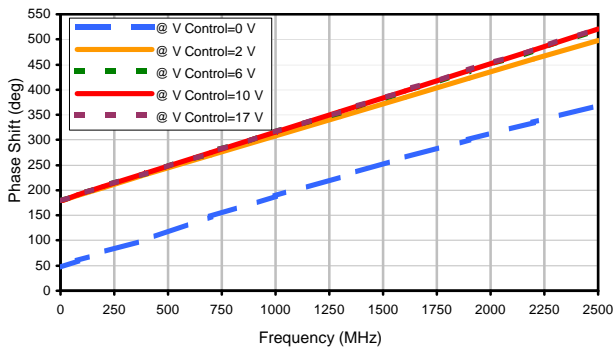
Input IP3 @ V+=3 V



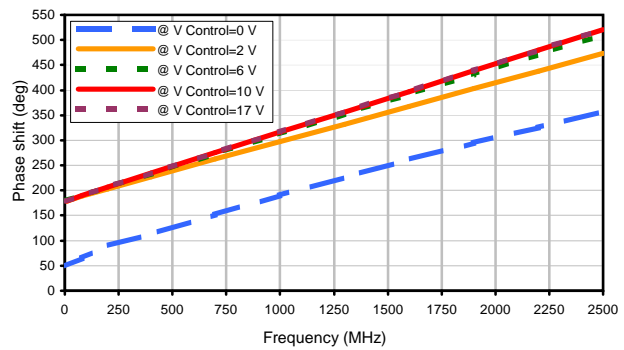
Input IP3 @ V+=5 V



Phase Shift @ V+=3 V



Phase Shift @ V+=5 V



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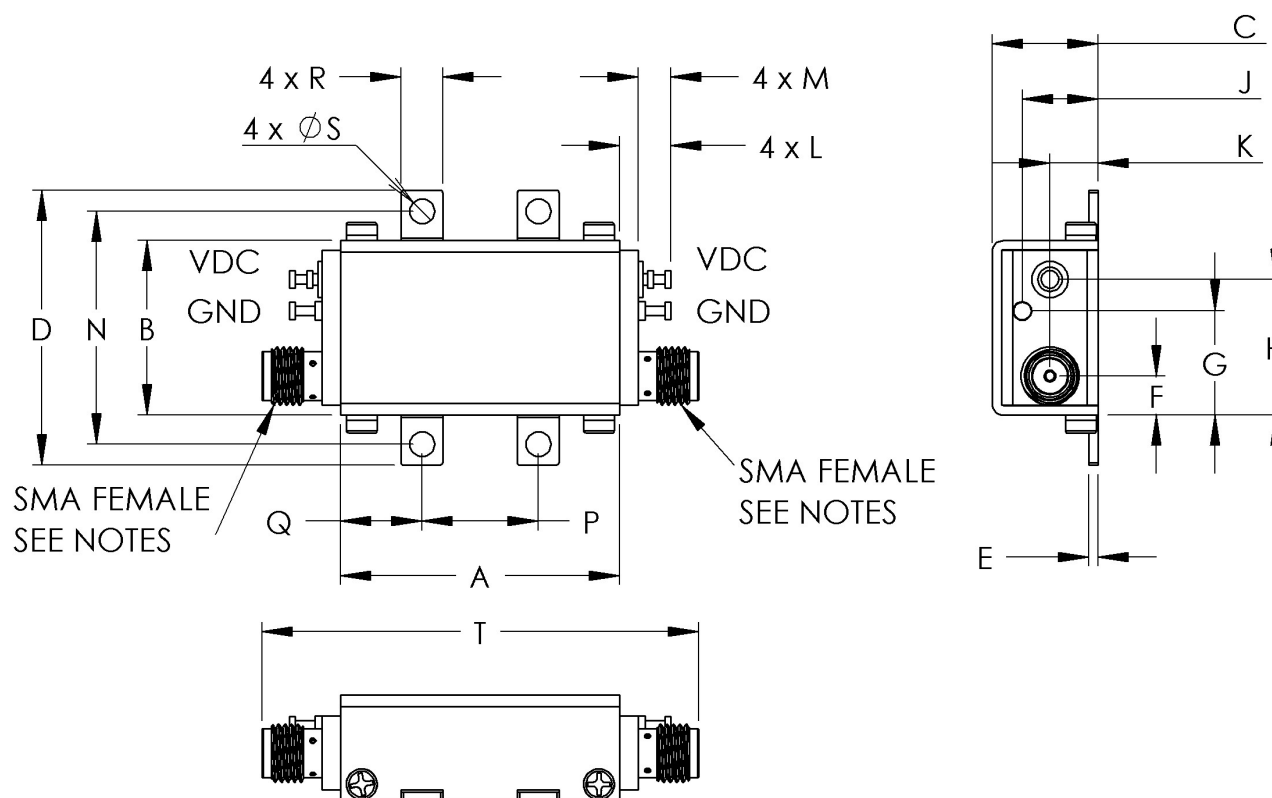


Case Style

GD

Outline Dimensions

GB958



CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
GD958	1.20 (30.48)	.75 (19.05)	.46 (11.61)	1.18 (29.97)	.04 (1.02)	.17 (4.27)	.45 (11.35)	.58 (14.81)	.33 (8.31)	.21 (5.28)	.22 (5.59)	.14 (3.56)	1.00 (25.40)

CASE #	P	Q	R	S	T	WT GRAMS
GD958	.50 (12.70)	.35 (8.89)	.18 (4.57)	.106 (2.69)	1.88 (47.70)	35

Dimensions are in inches (mm). Tolerances: 2Pl. $\pm .03$; 3Pl. $\pm .015$
Tolerance on hole size and interaxes dimensions to be $\pm .005$.

Note:

1. Case material: Brass
2. Case finish: Nickel plate
3. For RF Ports and DC voltages designation, refer to individual model data sheet.

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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
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D
Humidity	90% RH, 65°C Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103
Thermal Shock	-65° to 125°C, 5 cycles	MIL-STD-202, Method 107, Condition B
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition I