

The Big Deal

- Adjustable attenuation slope
- IP3 +45 dBm typical
- Minimal deviation from linear loss, ± 0.4 dB



CASE STYLE: HE1354

Product Overview

The VAEQ-1000+ is a 50Ω Voltage Variable Equalizer built into a shielded case.(size of .394"x.394"x.150") This model offers excellent performance over a wide frequency range of 50 to 1000 MHz with the variable slope providing great flexibility in a small 10mm package.

The VAEQ-1000+ is often used to compensate RF chain gain flatness or cable loss versus frequency.

Key Features

Feature	Advantages
Low power consumption: • Supply voltage +5V _{DC} at max 4mA • Control voltage 0-10V at max 40mA	Allows for high layout density of circuit boards, while minimizing affects of parasitics.
Adjustable attenuation slope (Control voltage of 0V to 10V)	Allows adjusting the slope to compensate for the precise losses encountered.
High linearity (IP3 +45 dBm typ.)	Low distortion enabling improved system performance.
Minimal deviation from linear loss over frequency range: ± 0.4 dB	Provides low signal distortion over the passband.

Notes

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Voltage Variable Equalizer

VAEQ-1000+

50Ω 50 to 1000 MHz

Features

- Wide bandwidth
- Low insertion loss
- Low deviation from linear loss, ± 0.4 dB typ.
- High IP3 +45 dBm typ.
- Shielded case
- Aqueous washable



CASE STYLE: HE1354

Applications

- Cable loss compensation
- Instrumentation

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

Electrical Specifications at 25°C, V+=5V_{DC} unless otherwise noted

Parameter	Condition	Min.	Typ.	Max.	Units
Frequency Range		50		1000	MHz
Insertion Loss	50 MHz, Control Voltage, 0 - 10V		15.2 - 2.2		dB
	1000 MHz, Control Voltage, 0 - 10V		1.7 - 1.6		
Deviation from Linear Loss	50 - 1000 MHz, Control Voltage 0 - 10V		± 0.4		dB
IP3	50 - 1000 MHz, Control Voltage, 1 - 10V	+33	+45		dBm
1 dB Compression	50 - 1000 MHz, Control Voltage, 0 - 10V		+30		dBm
Input Return Loss ¹	50 - 1000 MHz, Control Voltage, 0 - 10V		17.5		dB
Output Return Loss ¹	50 - 1000 MHz, Control Voltage, 0 - 10V		17.5		dB
Supply Voltage (V+) ¹	50 - 1000 MHz, Control Voltage, 0 - 10V	3.5	5	5.5	V
Supply Current	50 - 1000 MHz, Control Voltage 10V,		0		mA
	50 - 1000 MHz, Control Voltage 0V,		2	4	
Control Current	50 - 1000 MHz, Control Voltage 10V		32	40	mA
	50 - 1000 MHz, Control Voltage 1V		0		

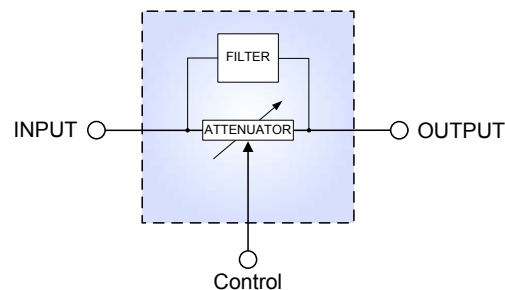
¹ Return Loss may degrade at V+ under 5V .

Maximum Ratings

Parameter	Ratings
Operating Temperature	0°C to 85°C
Storage Temperature	-55°C to 100°C
Input Power	+23 dBm
Control voltage	11 V
Supply Voltage (V+)	7 V

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

Simplified Functional Diagram



Pad Connections

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

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

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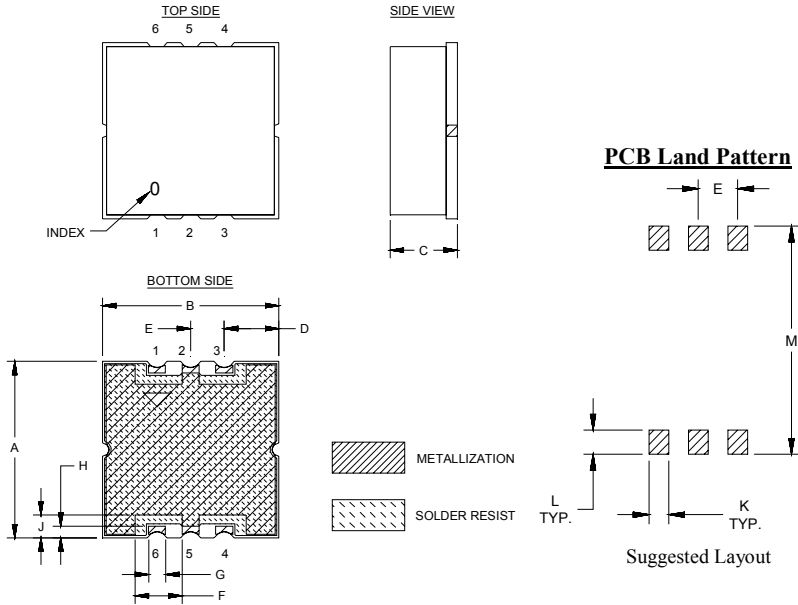
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REV. B
M151108
VAEQ-1000+
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RAV
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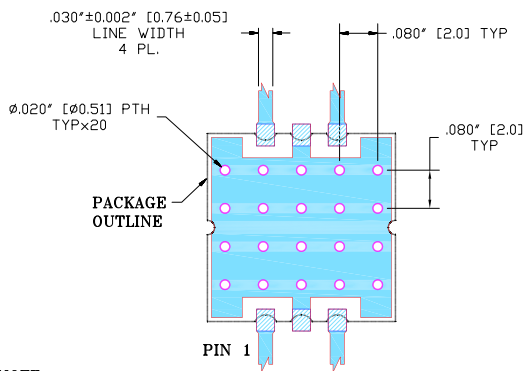
Outline Drawing



Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	K	L	M	wt. grams
.394	.394	.150	.122	.075	.098	.038	.026	.051	.038	.046	.434	0.7
10.01	10.01	3.81	3.10	1.90	2.49	0.97	0.66	1.29	0.97	1.17	11.02	

Demo Board MCL P/N: TB-474+ Suggested PCB Layout (PL-285)



NOTE:

- TRACE WIDTH IS SHOWN FOR R04350 WITH DIELECTRIC THICKNESS. $.030 \pm 0.002$ ". 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

Pad Connections

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

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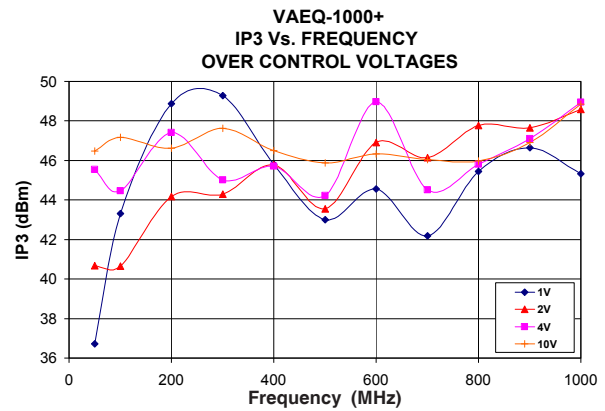
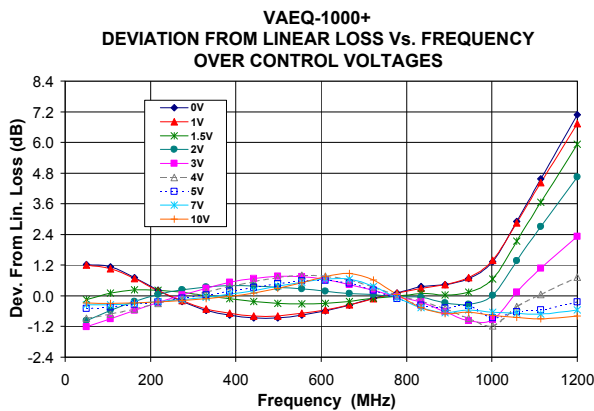
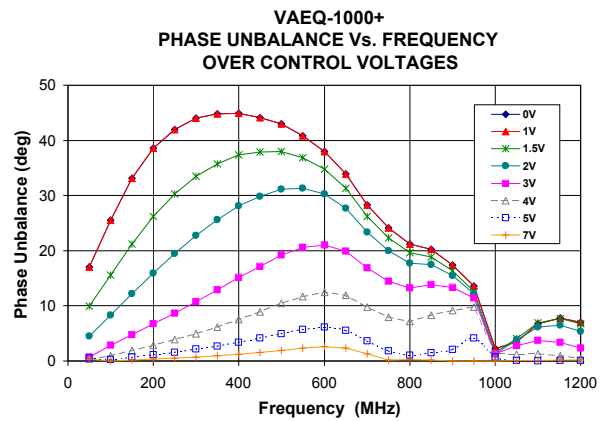
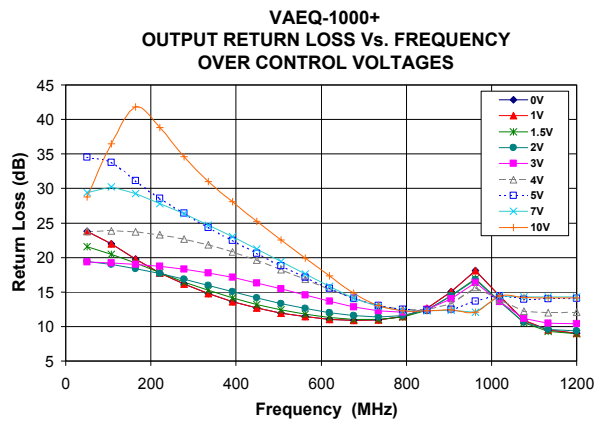
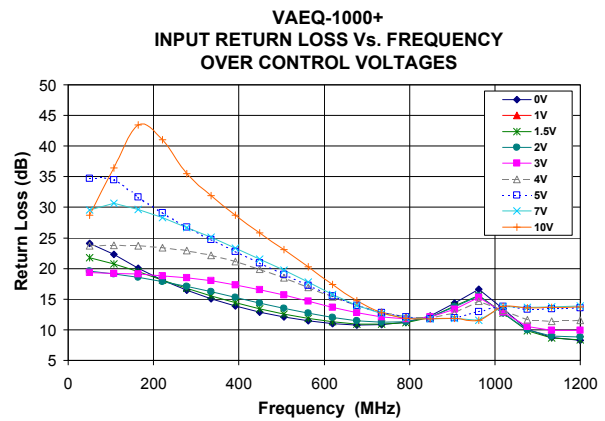
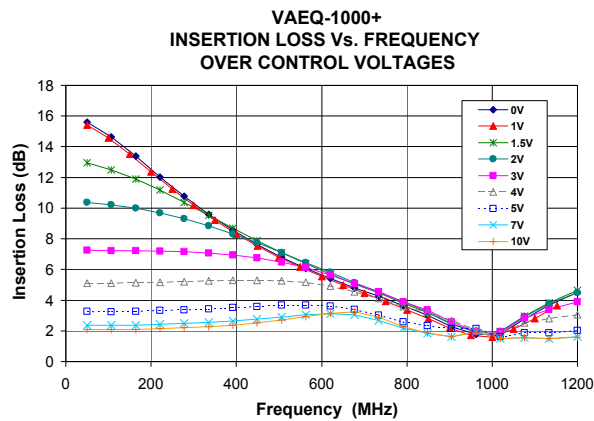
Frequency (MHz)	Insertion Loss (dB)		Input Return Loss (dB)		Output Return Loss (dB)		Deviation from Linear Loss (dB)		Insertion Phase (deg)		Input IP3 (dBm)	
	Vcontrol		Vcontrol		Vcontrol		Vcontrol		Vcontrol		Vcontrol	
	1V	4V	1V	4V	1V	4V	1V	4V	1V	4V	1V	4V
50	15.41	5.11	23.76	23.75	23.68	23.80	0.94	0.89	12.99	-3.65	36.73	45.55
100	14.57	5.11	22.02	23.81	21.89	23.88	0.55	0.73	11.96	-10.63	43.32	44.47
150	13.50	5.13	19.86	23.77	19.68	23.77	0.14	0.55	11.01	-16.83	-	-
200	12.35	5.15	18.02	23.54	17.84	23.49	0.21	0.37	8.33	-22.77	48.87	47.40
250	11.23	5.19	16.44	23.14	16.29	22.99	0.50	0.17	3.88	-28.56	-	-
300	10.17	5.22	15.18	22.65	15.05	22.37	0.66	-0.02	-1.74	-34.16	49.29	45.01
350	9.21	5.26	14.12	21.92	13.97	21.61	0.78	-0.22	-8.58	-39.66	-	-
400	8.33	5.29	13.25	21.00	13.14	20.66	0.78	-0.40	-15.85	-44.83	45.80	45.70
450	7.54	5.30	12.55	19.89	12.41	19.58	0.76	-0.57	-24.03	-49.90	-	-
500	6.80	5.27	12.01	18.65	11.86	18.42	0.63	-0.71	-32.20	-54.56	43.01	44.22
550	6.16	5.19	11.59	17.30	11.46	17.19	0.50	-0.78	-41.09	-59.11	-	-
600	5.54	5.02	11.34	15.93	11.19	15.92	0.30	-0.77	-49.87	-63.47	44.56	48.98
650	4.98	4.75	11.22	14.61	11.14	14.69	0.10	-0.67	-59.08	-68.00	-	-
700	4.44	4.36	11.31	13.45	11.21	13.63	0.10	-0.43	-68.37	-73.10	42.19	44.52
750	3.91	3.96	11.60	12.56	11.64	12.84	0.28	-0.20	-77.81	-78.85	-	-
800	3.37	3.51	12.27	12.05	12.32	12.42	0.40	0.10	-87.66	-85.55	45.44	45.81
850	2.79	3.19	13.42	11.98	13.61	12.46	0.58	0.26	-98.04	-92.48	-	-
900	2.18	2.72	15.28	12.60	15.87	13.20	1.00	0.57	-109.81	-99.58	46.64	47.10
1000	1.60	1.77	14.51	14.10	15.74	14.96	0.00	1.20	-138.90	-119.98	45.32	48.95

Frequency (MHz)	Insertion Loss (dB)		Input Return Loss (dB)		Output Return Loss (dB)		Deviation from Linear Loss (dB)		Insertion Phase (deg)		Input IP3 (dBm)	
	Vcontrol		Vcontrol		Vcontrol		Vcontrol		Vcontrol		Vcontrol	
	7V	10V	7V	10V	7V	10V	7V	10V	7V	10V	7V	10V
50	2.38	2.10	29.54	28.70	29.41	28.76	0.36	0.36	-3.66	-3.28	41.08	46.48
100	2.36	2.08	30.69	35.57	30.28	35.64	0.35	0.35	-11.56	-11.54	48.68	47.18
150	2.37	2.10	29.99	42.01	29.55	41.01	0.31	0.31	-18.55	-18.73	-	-
200	2.41	2.13	28.88	43.40	28.35	40.52	0.25	0.25	-25.27	-25.63	52.89	46.63
250	2.45	2.17	27.49	37.92	27.11	36.57	0.18	0.18	-31.89	-32.41	-	-
300	2.50	2.22	26.05	33.99	25.73	33.10	0.10	0.10	-38.39	-39.12	53.19	47.62
350	2.57	2.29	24.64	31.00	24.26	30.15	0.00	0.00	-44.83	-45.78	-	-
400	2.67	2.39	23.10	28.28	22.81	27.68	-0.12	-0.12	-51.11	-52.33	54.90	46.51
450	2.76	2.51	21.53	25.79	21.22	25.20	-0.24	-0.24	-57.22	-58.78	-	-
500	2.89	2.68	19.92	23.40	19.61	22.83	-0.40	-0.40	-63.06	-65.00	49.93	45.87
550	3.01	2.86	18.22	20.93	18.01	20.53	-0.54	-0.54	-68.49	-70.83	-	-
600	3.11	3.08	16.49	18.42	16.42	18.23	-0.67	-0.67	-73.32	-75.91	52.74	46.33
650	3.11	3.24	14.81	15.97	14.87	15.97	-0.70	-0.70	-77.60	-79.93	-	-
700	2.90	3.15	13.36	13.87	13.54	14.03	-0.52	-0.52	-81.58	-82.85	48.43	46.04
750	2.55	2.75	12.35	12.44	12.66	12.75	-0.19	-0.19	-86.62	-86.77	-	-
800	2.09	2.18	11.89	11.85	12.26	12.23	0.25	0.25	-93.01	-92.77	51.32	45.98
850	1.83	1.85	11.79	11.77	12.26	12.25	0.48	0.48	-100.90	-100.76	-	-
900	1.62	1.63	11.88	11.89	12.36	12.38	0.66	0.66	-108.80	-108.77	54.44	46.90
1000	1.64	1.64	13.74	13.72	14.42	14.40	0.59	0.59	-121.27	-121.24	51.88	48.86

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