

GaAs IC 2 Bit Digital Attenuator With Driver

10 dB LSB 3–8 GHz



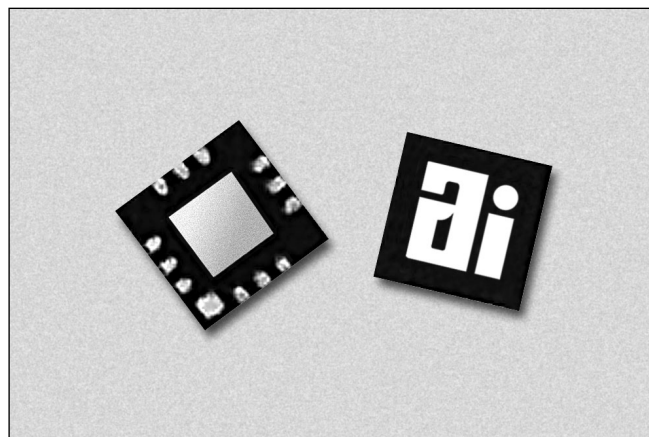
AA115-321

Features

- Ideal for Power Control IEEE 802.11a Wireless LAN Applications
- Single Positive Voltage Control for Each Bit
- +3 V to +5 V Operation
- QFN-12 3 x 3 mm Package
- Low Cost
- No External Components Needed

Description

The AA115-321 is a 2 bit 10 dB GaAs PHEMT digital step attenuator designed for 3 V wireless LAN applications. Operating from 3–8 GHz, the AA115-321 is ideally suited for any power control function of the 802.11a and 3.5 GHz fixed wireless LAN applications.



Absolute Maximum Ratings

Characteristic	Value
RF Input Power	1 W Max.
Control Voltage	-0.2 V, +6 V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

Electrical Specifications at 25°C (0, +5 V)

Parameter ¹	Frequency	Min.	Typ.	Max.	Unit
Insertion Loss	3–6 GHz		2.7	3.2	dB
	6–8 GHz		3.2	3.7	dB
Attenuation Range	3–4 GHz		28		dB
	4–6 GHz		30		dB
	6–8 GHz		29		dB
Attenuation Accuracy ²	3–4 GHz	-2 ± 20% (Of Attenuation Setting in dB)			dB
	4–6 GHz	±10% (Of Attenuation Setting in dB)			dB
	6–8 GHz	-1 ± 15% (Of Attenuation Setting in dB)			dB
VSWR (I/O)	3–8 GHz		1.6		

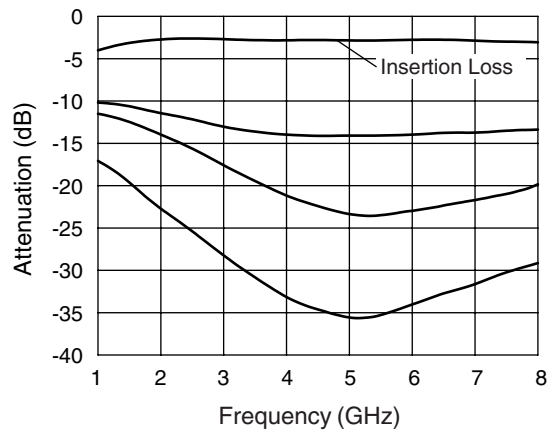
Operating Characteristics at 25°C (0, +5 V)

Parameter	Condition	Frequency	Min.	Typ.	Max.	Unit
Switching Characteristics	Rise, Fall (10/90% or 90/10% RF)			100		ns
	On, Off (50% CTL to 90/10% RF)			150		ns
	Video Feedthru			25		mV
Input Intermodulation Intercept Point (IIP3)	0/+3 V	3–8 GHz		38		dBm
Input Power for 1 dB Compression	0/+3 V	3–8 GHz		27		dBm
Control Voltages	V _{C1} or V _{C2} = "0"		0		0.5	V
	V _{C1} or V _{C2} = "1" with @ 200 μA Max.		3.0		5.0	V
Supply Voltage (V _S)			3.0		5.0	V

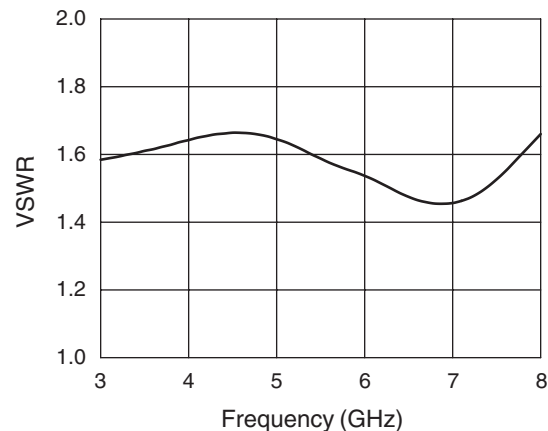
1. All measurements made in a 50 Ω system, unless otherwise specified.

2. Attenuation referenced to insertion loss.

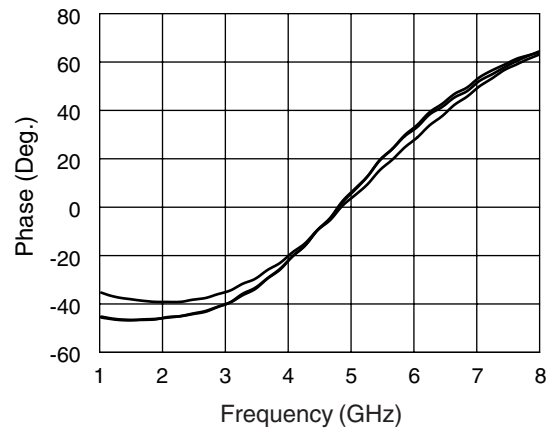
Typical Performance Data



Attenuation vs. Frequency



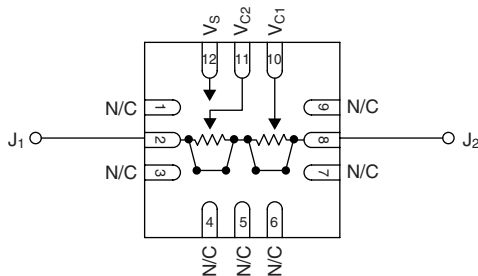
VSWR vs. Frequency (Worst Case)



Phase vs. Frequency All States

Phase referenced to insertion loss.

Pin Out

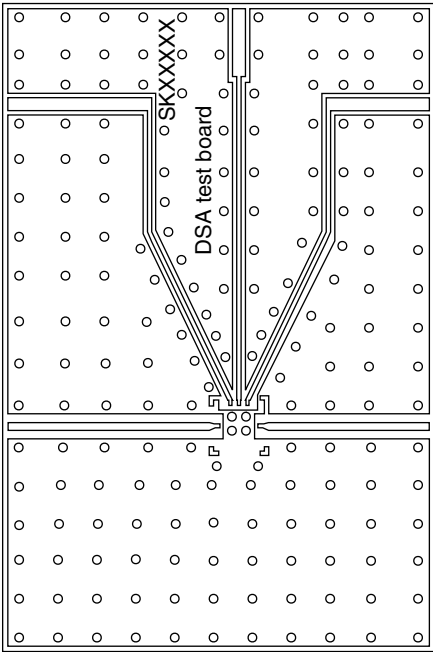


Ground is connected to paddle on bottom.

Truth Table

V _{C1}	V _{C2}	J ₁ –J ₂
0	0	Reference I.L.
0	1	10 dB
1	0	20 dB
1	1	30 dB

Evaluation Board Layout



Typical S-Parameters (Control Voltage 0/+5 V)

Insertion Loss State # GHz S DB R 50									10 dB Attenuation State # GHz S DB R 50							
Freq. (GHz)	S ₁₁	S _{11a}	S ₂₁	S _{21a}	S ₁₂	S _{12a}	S ₂₂	S _{22a}	S ₁₁	S _{11a}	S ₂₁	S _{21a}	S ₁₂	S _{12a}	S ₂₂	S _{22a}
1.00	-6.33	203.75	-4.07	-21.26	-4.07	-20.08	-6.41	224.90	-7.60	213.53	-10.24	-45.16	-10.24	-43.58	-6.29	233.34
1.50	-9.72	137.22	-3.07	-64.57	-3.07	-65.38	-9.72	173.02	-10.53	150.34	-10.45	-87.84	-10.45	-88.24	-8.38	180.22
2.00	-11.90	74.77	-2.85	259.09	-2.85	258.43	-12.09	122.94	-12.98	87.46	-11.61	238.10	-11.61	238.24	-10.32	125.42
2.50	-12.76	16.76	-2.58	223.32	-2.58	222.31	-12.91	74.43	-14.20	26.33	-12.12	206.56	-12.12	206.25	-11.42	73.52
3.00	-12.63	-40.83	-2.74	188.96	-2.74	191.19	-13.09	28.24	-14.75	-33.52	-13.15	176.69	-13.15	179.20	-12.15	22.47
3.50	-12.19	267.18	-2.72	158.36	-2.72	158.63	-12.23	-18.06	-14.72	-89.86	-13.57	151.61	-13.57	151.91	-12.26	-24.09
4.00	-11.91	216.40	-2.82	127.61	-2.82	126.72	-12.45	-61.83	-14.95	219.71	-13.95	127.07	-13.95	124.69	-13.20	-68.51
4.50	-11.51	168.66	-2.84	96.32	-2.84	95.91	-12.00	251.03	-14.79	174.60	-14.26	100.48	-14.26	99.00	-13.00	247.52
5.00	-11.78	122.74	-2.82	65.29	-2.82	65.09	-12.37	206.74	-15.57	131.33	-13.96	73.94	-13.96	74.81	-13.91	205.26
5.50	-12.45	76.42	-2.85	34.77	-2.85	34.27	-12.86	157.51	-17.07	94.11	-14.15	48.17	-14.15	47.56	-14.52	159.82
6.00	-14.09	24.00	-2.71	3.49	-2.71	3.89	-13.57	109.83	-20.28	52.86	-14.01	20.88	-14.01	21.19	-15.21	115.22
6.50	-15.26	-33.23	-2.74	-27.51	-2.74	-27.55	-14.44	64.33	-24.78	7.28	-13.80	-6.23	-13.80	-6.20	-15.36	69.65
7.00	-16.21	263.11	-2.87	-59.81	-2.87	-59.32	-14.88	16.25	-37.41	-45.26	-13.82	-34.22	-13.82	-33.55	-15.74	15.25
7.50	-15.70	199.39	-3.00	-89.80	-3.00	267.55	-13.66	-30.40	-33.23	115.39	-13.58	-60.90	-13.58	-63.39	-14.06	-33.54
8.00	-14.66	141.24	-3.04	236.75	-3.04	237.29	-12.04	-72.28	-26.29	74.91	-13.41	268.59	-13.41	268.45	-12.75	-79.28

20 dB Attenuation State # GHz S DB R 50									30 dB Attenuation State # GHz S DB R 50							
Freq. (GHz)	S ₁₁	S _{11a}	S ₂₁	S _{21a}	S ₁₂	S _{12a}	S ₂₂	S _{22a}	S ₁₁	S _{11a}	S ₂₁	S _{21a}	S ₁₂	S _{12a}	S ₂₂	S _{22a}
1.00	-6.00	213.20	-11.58	-55.81	-11.58	-54.25	-7.18	233.93	-7.14	214.58	-17.09	-78.28	-17.09	-77.99	-6.87	234.14
1.50	-8.05	145.89	-12.35	256.53	-12.35	255.56	-9.37	181.31	-10.05	149.13	-19.61	230.44	-19.61	229.46	-9.27	179.73
2.00	-9.67	78.72	-14.08	218.62	-14.08	218.18	-11.64	127.45	-12.55	85.43	-22.94	196.10	-22.94	196.01	-11.53	126.46
2.50	-10.52	14.53	-15.67	182.77	-15.67	182.21	-12.82	74.40	-13.97	23.72	-25.27	165.55	-25.27	164.54	-12.74	73.44
3.00	-10.87	-45.90	-17.58	153.85	-17.58	154.19	-13.67	23.07	-14.51	-37.20	-28.34	138.00	-28.34	139.26	-13.65	22.63
3.50	-10.91	256.72	-19.29	129.16	-19.29	127.05	-13.79	-25.12	-14.61	267.61	-30.72	119.05	-30.72	118.85	-13.86	-24.95
4.00	-11.16	204.81	-21.35	102.67	-21.35	102.45	-14.79	-68.84	-14.87	217.40	-33.48	103.32	-33.48	103.66	-14.79	-69.77
4.50	-11.43	157.03	-22.42	83.96	-22.42	83.44	-14.92	245.67	-14.86	172.61	-34.72	94.51	-34.72	90.73	-14.79	245.48
5.00	-12.25	109.28	-23.54	66.66	-23.54	68.28	-16.03	204.49	-15.65	129.64	-35.91	85.50	-35.91	84.25	-15.99	203.84
5.50	-13.78	61.51	-23.30	50.57	-23.30	51.49	-16.94	157.29	-17.47	91.30	-35.43	79.17	-35.43	79.82	-16.75	156.55
6.00	-16.05	5.53	-23.16	29.77	-23.16	32.42	-17.50	109.83	-20.70	49.20	-33.96	64.38	-33.96	64.01	-17.43	109.76
6.50	-17.76	-58.63	-22.04	12.04	-22.04	14.55	-17.80	63.80	-26.12	-1.02	-32.41	45.31	-32.41	44.82	-17.63	61.62
7.00	-18.59	229.39	-21.93	-7.20	-21.93	-9.17	-18.24	6.76	-39.76	-78.60	-31.61	27.44	-31.61	27.89	-17.81	4.65
7.50	-17.85	164.11	-21.21	-33.38	-21.21	-34.35	-15.81	-44.54	-29.41	127.64	-30.09	6.31	-30.09	4.56	-15.55	-45.76
8.00	-16.20	105.42	-20.02	-61.14	-20.02	-58.23	-14.10	269.40	-24.53	75.25	-29.12	-20.94	-29.12	-22.75	-14.11	268.80

Measured S-parameters include the evaluation board.

QFN-12

