

GaAs IC 3 Bit Digital Attenuator

4 dB LSB Positive Control 0.75–2 GHz



AA239-12
(Previously AD239-12)*

Features

- Attenuation in 4 dB Steps to 28 dB with High Accuracy
- Single Positive Control Voltage for Each Bit
- +3 V to +5 V Operation
- Small Low Cost SOIC-8 Plastic Package

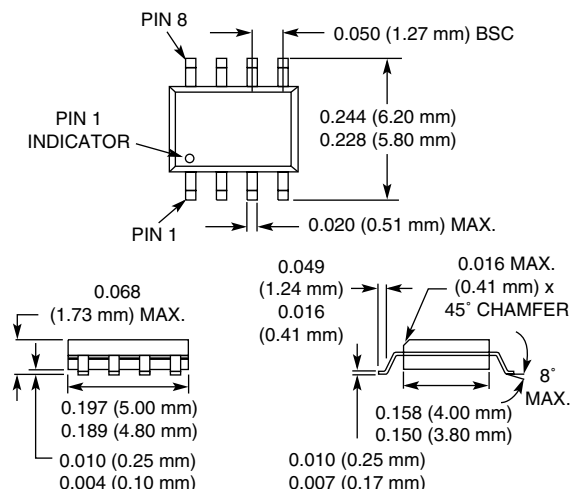
Description

The AA239-12 is a 3 bit, single positive control, 4 dB step GaAs IC FET digital attenuator in a low cost SOIC-8 plastic package. For positive operation external DC blocking capacitors are required on all RF ports.

The AA239-12 is particularly suited where high attenuation accuracy, low insertion loss and low intermodulation products are required.

Typical applications include cellular, radio, wireless data, wireless local loop and other gain level control circuits.

SOIC-8



Electrical Specifications at 25°C (0, +3 V)

Parameter ¹	Frequency ²	Min.	Typ.	Max.	Unit
Insertion Loss ²	0.75–2.0 GHz		1.8	2.1	dB
Attenuation Range	0.75–2.0 GHz		28		dB
Attenuation Accuracy ³	0.75–1.0 GHz	± (0.2 + 3% of Attenuation Setting in dB)			dB
	0.75–2.0 GHz	± (0.3 + 3% of Attenuation Setting in dB)			dB
VSWR (I/O)	0.75–2.0 GHz		1.5:1	2.0:1	

Operating Characteristics at 25°C (0, +3 V)

Parameter	Condition	Frequency	Min.	Typ.	Max.	Unit
Switching Characteristics ⁴	Rise, Fall (10/90% or 90/10% RF)			0.7		μs
	On, Off (50% CTL to 90/10% RF)			1.0		μs
	Video Feedthru			50		mV
Input Power for 1 dB Compression	V _S = +3 V	0.75–2.0 GHz		+20		dBm
	V _S = +5 V	0.75–2.0 GHz		+26		dBm
Intermodulation Intercept Point (IP3)	For Two-tone Input Power +10 dBm					
	V _S = +3 V	0.75–2.0 GHz		+32		dBm
Control Voltages	V _S = +5 V	0.75–2.0 GHz		+45		dBm
	V _{Low} = 0 to 0.2 V @ 20 μA Max. V _{High} = +3 V @ 100 μA Max. to +5 V @ 200 μA Max. V _S = V _{High} ± 0.2 V					

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

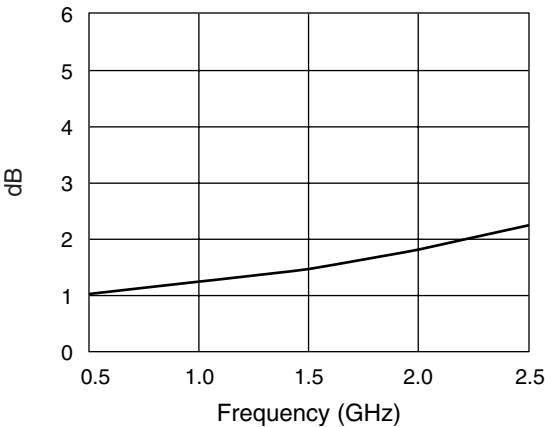
2. Insertion loss changes by 0.003 dB/°C.

3. Attenuation referenced to insertion loss.

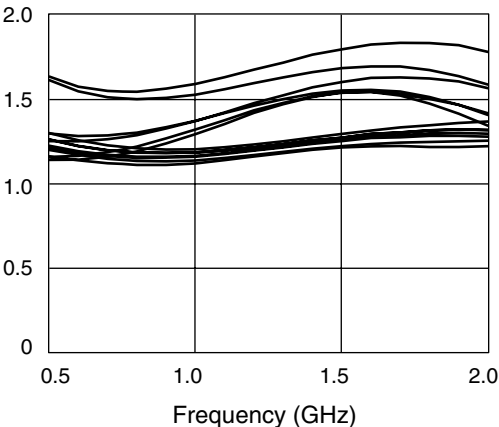
4. Video feedthru measured with 1 ns risetime pulse and 500 MHz bandwidth.

*Due to conflict with another company's product numbering system, Alpha's attenuator products starting with the letters "AD" are being changed to "AA".

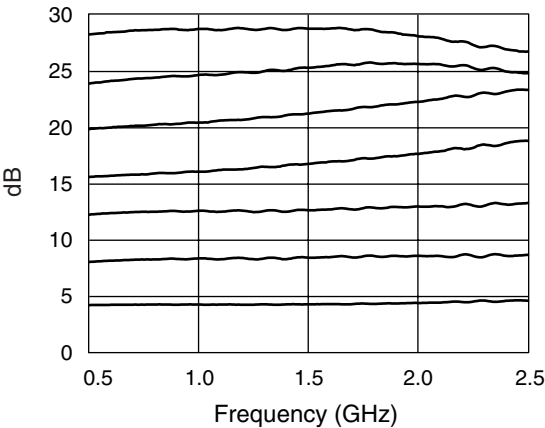
Typical Performance Data (0, +3 V)



Insertion Loss vs. Frequency



VSWR vs. Frequency (All States)



Attenuation vs. Frequency (All States)

Truth Table

V ₁	V ₂	V ₃	Attenuation
16 dB	4 dB	8 dB	J ₁ –J ₂
V _{High}	V _{High}	V _{High}	Ins. Loss
V _{High}	0	V _{High}	4 dB
V _{High}	V _{High}	0	8 dB
V _{High}	0	0	12 dB
0	V _{High}	V _{High}	16 dB
0	0	V _{High}	20 dB
0	V _{High}	0	24 dB
0	0	0	28 dB

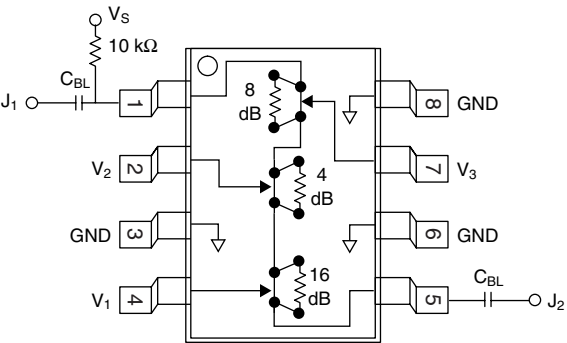
V_{High} = +3 to +5 V (V_S = V_{High} ± 0.2 V).

Absolute Maximum Ratings

Characteristic	Value
RF Input Power	1 W > 500 MHz 0/8 V 0.5 W @ 50 MHz 0/8 V
Supply Voltage	+8 V
Control Voltage	-0.2 V, +8 V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

Note: Exceeding these parameters may cause irreversible damage.

Pin Out



DC blocking capacitors (C_{BL}) and biasing resistor must be supplied externally for positive operation.
C_{BL} = 100 pF for operation >.75 GHz.