Standard Circuit

GDA-0018-5B-PD

GaAs MMIC Digital Attenuator Chip, 0.1-18GHz

Performance characteristics

Frequency range: 0.1 - 18 GHz
Insertion loss : 1.2dB typ.
Attenuation range: 0.25~7.75dB
Bit Count: 5 bits
Attenuation accuracy (RMS): 0.15dB
50 Ohm input/output
Chip size: 1.25 x 1.30 x 0.1 mm

Product Introduction

GDA -0018-5B-PD is a GaAs MMIC 5-bit digital attenuator chip with a frequency range of 0.1 to 18 GHz , an insertion loss of 1.2dB, a switching speed of 25ns , an internal integrated driver, and a +5V power supply and 0/ + 5V control (compatible with +3.3V) .

Use restriction parameter 1	
Supply voltage range	+6V
Control voltage range	-0.5V~+5.5V
Maximum input power	+27 dBm
Operating temperature	-55 ~ +85°C
storage temperature	-65 ~ +150°C

【1】 Exceeding any of these maximum limits may cause permanent damage.

Electrical parameters (Ta=+25° C, VDD=+5V, 0/+5V control)

Index	Minimum	Typical Value	Maximum	unit
Frequency Range	0.1~18			GHz
Insertion loss	-	1.2	-	dB
Attenuation range	0.25-7.75			dB
Attenuation step	0.25			dB
Attenuation Bits	5			bite
Attenuation accuracy (full	-	-	± 0.4	dB
Attenuation accuracy RMS	-	0.15	-	dB
Additional Phase Shift	-	-	± 4.5	degree
Additive Phase Shift RMS	-	1.4	-	degree
Input return loss	-	22	-	dB
Output return loss	-	25	-	dB
Switching speed	-	25	-	ns
P- 1dB	-	23	-	dBm
Voltage	+3	+5	-	V
Supply Current	-	7		mA

Controlling high voltage	2.5	3.3	+5	V
Controlling low voltage	0	-	0.8	V
Control current position	-	-	1	m A

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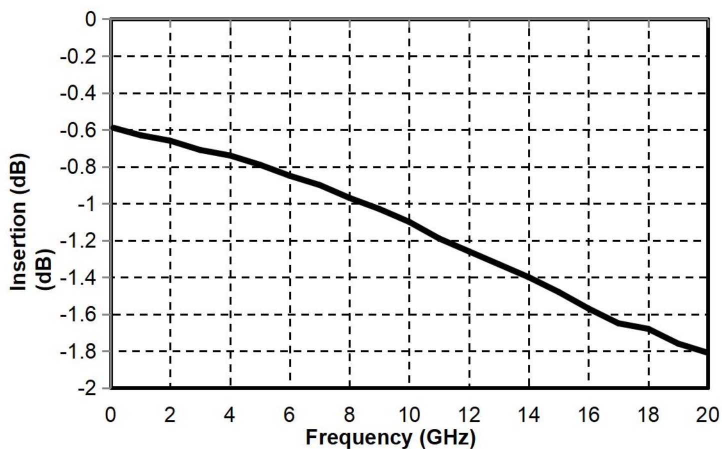
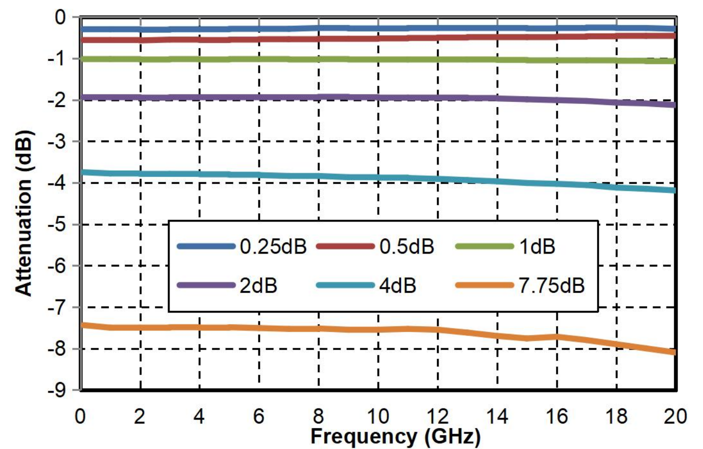
Main indicator testing curve

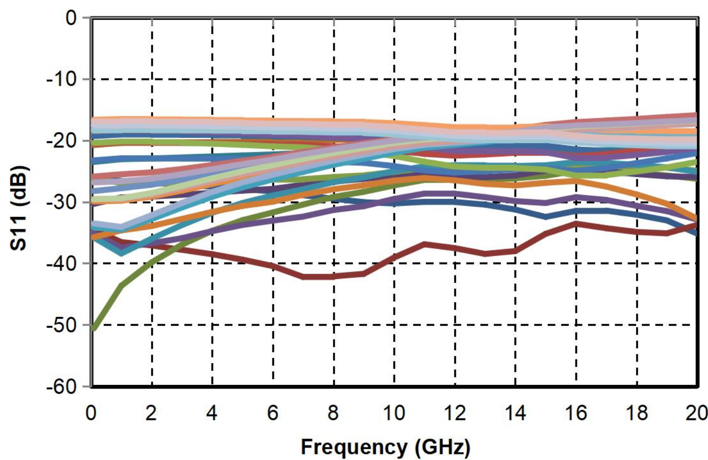
Insertion loss vs. frequency



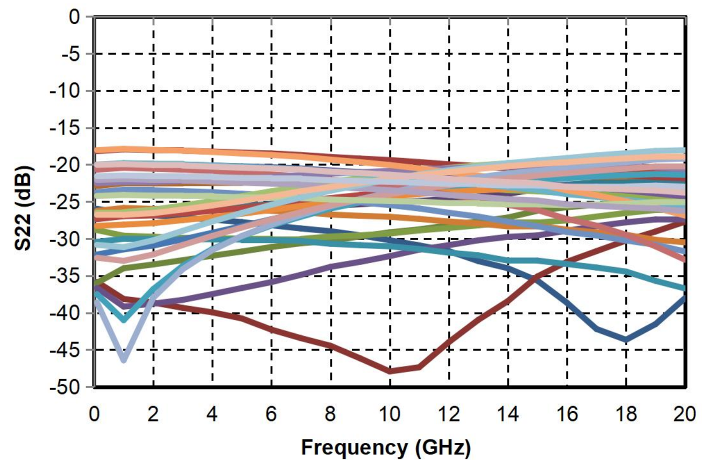
Reference decay state vs. frequency



Input echo vs. Frequency

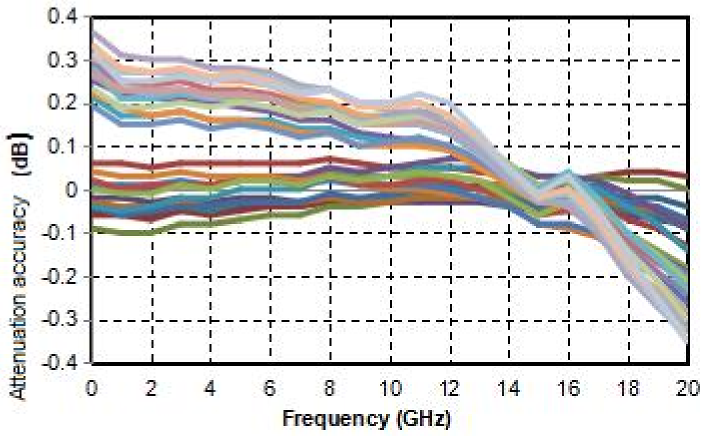


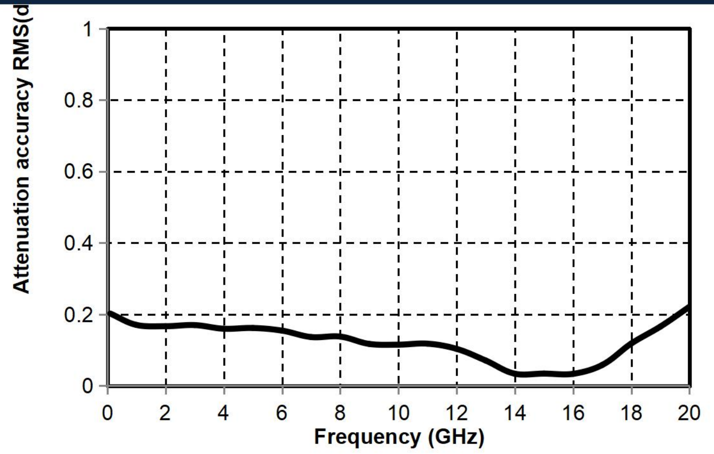
Output echo vs. Frequency



Attenuation accuracy vs. Frequency

Attenuation Accuracy RMS vs. Frequency





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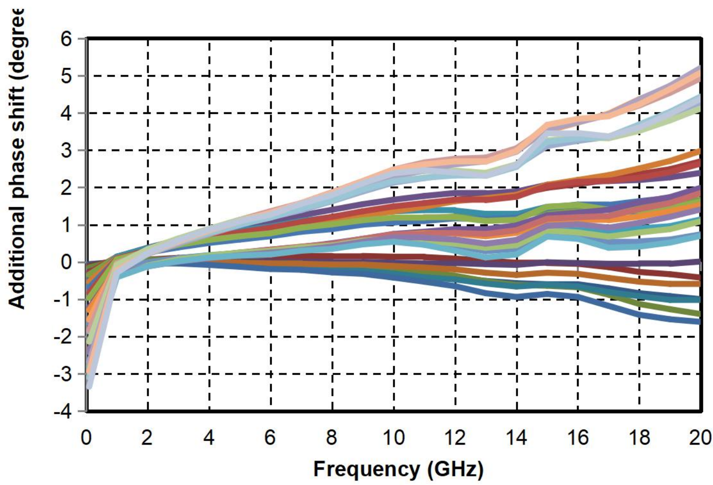
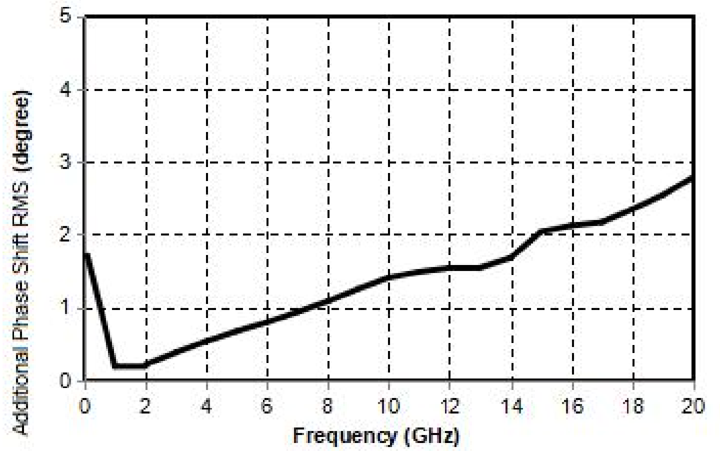
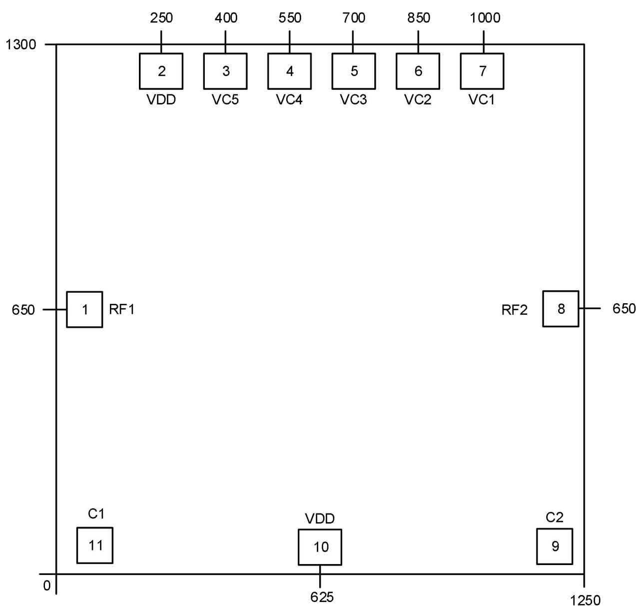
Additional Phase Shift vs. Frequency



Additional Phase Shift RMS vs. Frequency



External structure[2]



[2] The units in the figure are all micrometers. (Dimensional tolerance: ± 50um.)

Bonding point definition		
Bonding point number	Function Symbol	Functional Description
1	RF 1	The signal input terminal is connected to a 50 ohm circuit, and there is no DC blocking capacitor integrated into the chip.
8	RF 2	The signal output terminal is connected to a 50 ohm circuit, and there is no DC blocking capacitor integrated into the chip.
2.10	VDD	Chip power port, requires external 100pF capacitor
3~7	VC	Attenuation control pad, see the truth table for attenuation control
9, 11	C1, C2	External capacitors can be used to improve low-frequency characteristics
Chip bottom	GND	The bottom of the chip needs to be in good contact with the RF and DC grounds

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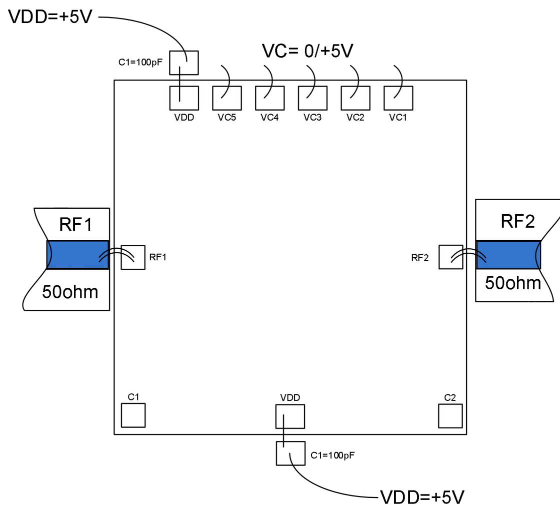
V C 1	V C 2	V C 3	V C 4	V C 5	VDD	Conductive path RF1-RF2
+5V	+5V	+5V	+5V	+5V	+5V	Initial state N=0 : attenuation is 0 dB
+5V	+5V	+5V	+5V	0 V		Attenuation state N = 1 : Attenuation is 0.25dB
+5V	+5V	+5V	0 V	+5V		Attenuation state N = 2 : Attenuation is 0.5dB
+5V	+5V	0V	+5V	+5V		Attenuation state N = 4 : Attenuation is 1dB
+5V	0 V	+5V	+5V	+5V		Attenuation state N = 8 : Attenuation is 2dB
0 V	+5V	+5V	+5V	+5V		Attenuation state N = 16 : Attenuation is 4dB
0V	0	0V	0V	0V		Attenuation state N = 31 : Attenuation is 7.75dB

Suggested assembly diagram



Connect the VDD on one side and control the solder pads without the need for external resistors.

Precautions for use

- The chip needs to be stored in an anti-static container and kept in a nitrogen environment.
- Do not attempt to clean the bare die surface using wet chemical methods.
- Please strictly follow the ESD protection requirements to avoid static damage to the bare chip.
- General operation: Please use precision pointed tweezers to pick up bare chips. Avoid touching the chip surface with tools or fingers during operation.
- Rack mounting operation suggestions: Bare chip mounting can be done by AuSn solder eutectic sintering or conductive adhesive bonding. The mounting surface must be clean and flat.
- Sintering process: It is recommended to use AuSn solder sheets with a gold-tin ratio of 80/20 . The working surface temperature reaches 255 ℃ and the tool (vacuum chuck) temperature reaches 265 ℃. When the high-temperature mixed gas (nitrogen-hydrogen ratio of 90/10) is blown to the chip, the temperature at the top of the tool should be raised to 290 ℃. Do not let the chip exceed 320 ℃ for more than 20 seconds. The friction time should not exceed 3 seconds.
- Bonding process: The amount of conductive glue dispensed should be as small as possible. After the chip is placed in the installation position , the conductive glue should be vaguely visible around it . For curing conditions, please follow the information provided by the conductive glue manufacturer.
- Bonding operation suggestions: Use Φ0.025mm (1mil) gold wire for both ball and wedge bonding. Thermo-ultrasonic bonding temperature is 150 ° C. The pressure of the wedge for ball bonding is 40~50gf , and the pressure of the wedge bonding is 18~22gf . Use the smallest possible ultrasonic energy. The bonding starts at the pressure point on the chip and ends at the package (or substrate) .