

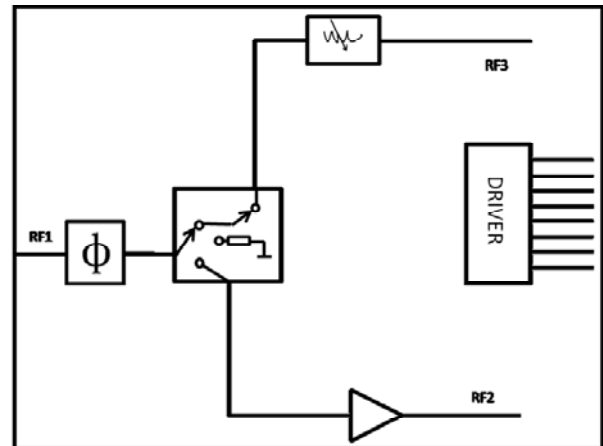
Features

Frequency: 2.7~3.5GHz
 Transmit Path Linear Gain: 2.5dB
 Receive Path Linear Gain: -8.7dB
 Phase Shift Step: 5.625°
 Phase Shift Bit: 6
 RMS Phase Error: 1.5°
 Attenuation Step: 0.5 dB
 Attenuation Bit: 6
 RMS of Attenuation Accuracy: 1dB
 Supply Voltage: ±5V
 Supply Current: 70mA/-20mA
 Control Voltage: 0/+5V
 Chip Size: 4.5mm×3.5mm×0.1mm

General Description

The HG143NA is a multi-function GaAs pHEMT chip which is operating between 2.7 and 3.5 GHz. It includes a 6-bit digital phase shifter, 6-bit digital attenuator, amplifier, driver, switch and so on.

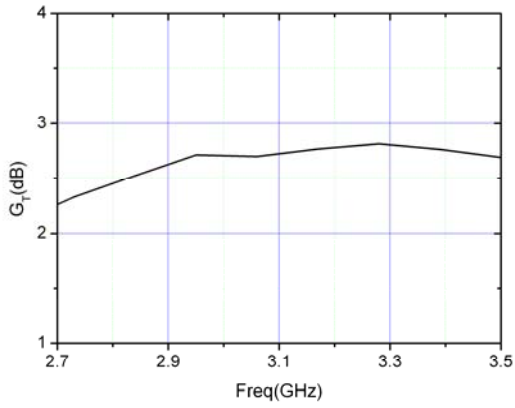
Functional Diagram



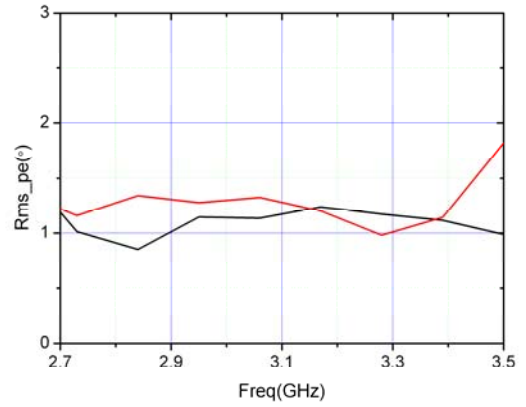
Electrical Specifications($T_A=25\text{ }^\circ\text{C}$, $V_{dd}=\pm 5\text{V}$, $V_{ctl}=0/+5\text{V}$)

Parameter	Symbol	Unit	Min.	Typ.	Max
Frequency (GHz)	f	GHz	2.7~3.5		
Transmit Gain	G_T	dB	—	2.5	—
Transmit Gain Flatness	ΔG_T	dB	—	±0.2	—
Transmit Output Power	$P_{out}(T)$	dBm	18	—	—
Receive Gain	G_R	dB	—	-8.7	—
Receive Gain Flatness	ΔG_R	dB	—	±0.2	—
Receive Output Power for 1dB Compression	$P_{1dB}(R)$	dBm	25	—	—
RMS Phase Error	Rms_pe	°	—	1.5	—
Phase Amplitude Variation	ΔA	dB	—	±0.5	—
RMS of Attenuation Accuracy	Rms_att	dB	—	1	—
Attenuator Phase Variation	$\Delta \phi$	°	—	±6	—
Input/Output VSWR	VSWR	-	—	1.5	—
Transmit/Receive Isolation	ISO	dB	50	—	—

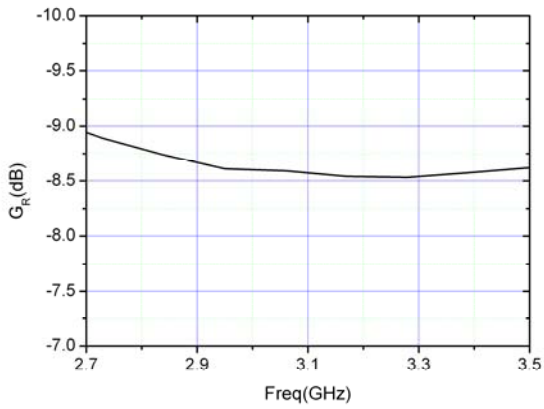
Transmit Gain



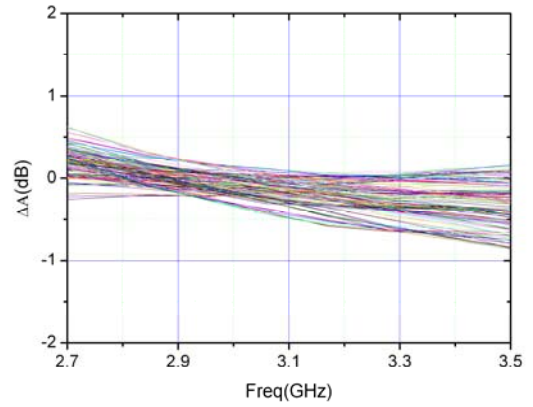
RMS Phase Error



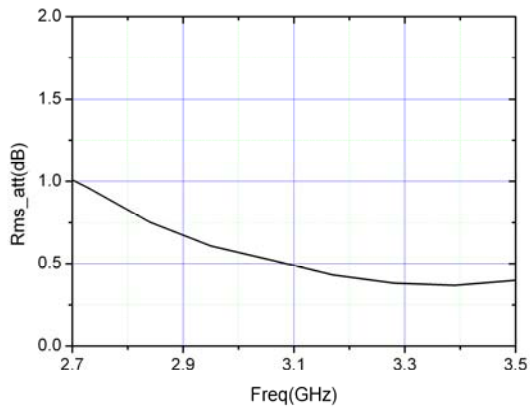
Receive Gain



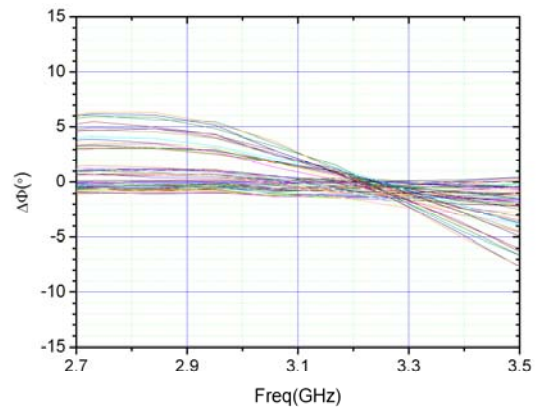
Phase Amplitude Variation



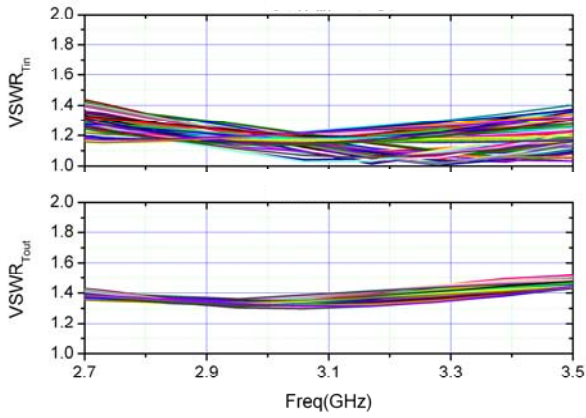
RMS Attenuation Error



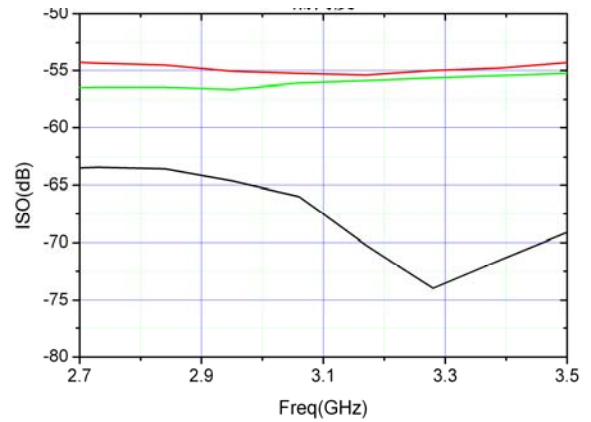
Attenuation Phase Variation



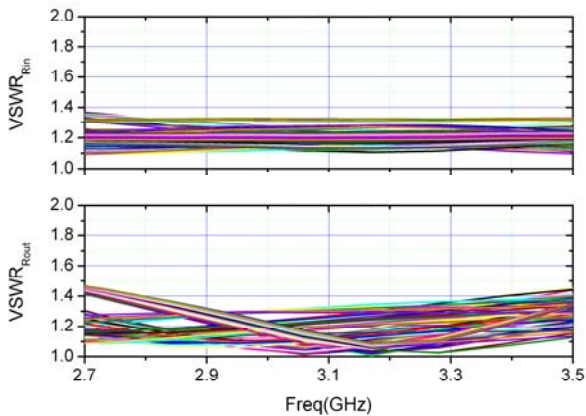
Transmit VSWR



Isolation



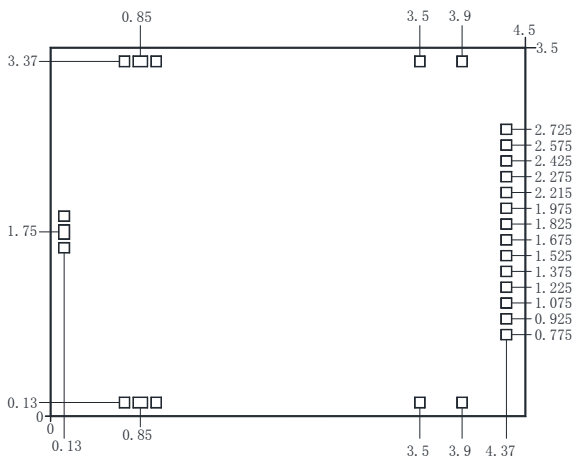
Receive VSWR



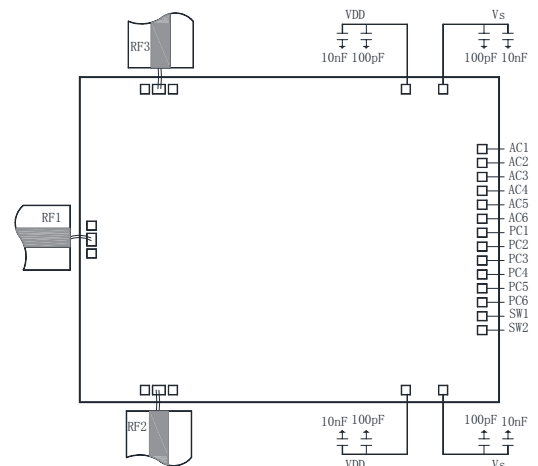
Ports Description

RF Ports	RF1	Transmit/Receive Common Ports
	RF2	Transmit RF output
	RF3	Receive RF input
Voltage	VDD	+5V
	Vs	-5V
Control	PC1-PC6	6-bit digital Phase shift Control ports
	AC1-AC6	6-bit digital Attenuation Control ports
	SW1-SW2	Switch Control Ports

Outline Drawing (mm)



Assembly Diagram



Phase Shift Truth Table(0: 0V, 1: +5V)

State	PC1	PC2	PC3	PC4	PC5	PC6
0	0	0	0	0	0	0
-5.625°	1	0	0	0	0	0
-11.25°	0	1	0	0	0	0
-22.5°	0	0	1	0	0	0
-45°	0	0	0	1	0	0
-90°	0	0	0	0	1	0
-180°	0	0	0	0	0	1
-354.375°	1	1	1	1	1	1

Attenuation Truth Table(0: 0V, 1: +5V)

State	AC1	AC2	AC3	AC4	AC5	AC6
0	0	0	0	0	0	0
-0.5dB	1	0	0	0	0	0
-1dB	0	1	0	0	0	0
-2dB	0	0	1	0	0	0
-4dB	0	0	0	1	0	0
-8dB	0	0	0	0	1	0
-16dB	0	0	0	0	0	1
-31.5 dB	1	1	1	1	1	1

Switch Truth Table(0: 0V, 1: +5V)

SW1	SW2	RF1-RF2	RF3-RF1	RF1-Load
0	0	OFF	OFF	ON
0	1	OFF	ON	OFF
1	0	ON	OFF	OFF
1	1	ON	OFF	OFF

Absolute Maximum Ratings

Supply Voltage	±5.5V	
RF Input Power	+25dBm	
Control Voltage	Low Level: 0 ~ 0.5V	High Level: 3.7 ~ 5V
Operating Temperature	-55°C ~ 125°C	
Storage Temperature	-65°C ~ 150°C	

Notes:

1. The chip should be stored in a dry and nitrogen environment, and used in a clean environment.
2. GaAs material is brittle, can not touch the surface of the chip, must be careful when using.
3. The chip is welding with conductive adhesive or alloy (alloy temperature should not exceed 300°C, and no more than 30 sec.), and should make it fully grounded.
4. The chip microwave port and substrate gap is not exceeding 0.05mm, with Φ25μm double gold wire bonding, suggested length of gold wire 250~400μm.
5. Chip microwave port without DC blocking capacitor except RF2.
6. The chip is sensitive to static electricity, and should be protected against static electricity during storage and use.