AMT1306

7 - 13GHz Multi-Function Chip

Key Features :

- Frequency range : 7 – 13GHz
- Receiver gain : 13dB
- Transmitter small signal gain : 26dB
- Receiver output power P-1 : 12dBm
- Transmitter saturated output power : 24dBm
- Receiver noise figure : 8dB
- Phase shift bit : 6 bits
- Phase shift step : 5.625°
- Phase shift RMS : 2.5°, Phase shift additive attenuation ±1dB
- Attenuation bit : 6 bits
- Attenuation step : 0.5dB
- Attenuation RMS : 0.3dB, Attenuation additive phase shift ±4°
- Receiver Input/Output standing wave : 1.4
- Transmitter Input/Output standing wave : 1.5
- Operating voltage : +5V/+5V/-5V
- Static current : 80mA (transmitting) / 77mA (public) / 13mA (-5V)
- Control method : TTL parallel control
- Chip dimensions : 4.5mm x 3.5mm x 0.1mm
- Applications : wireless communication, transceiver module, radio telecommunication etc.

Description :

AMT1306 is a multi-function chip incorporating with amplifier, switch, 6-digit attenuator, 6-digit phase shifter, control driver etc. X band MMIC, it uses Gallium Arsenide (GaAs) pHEMT process. The chip uses +5V/-5V operation voltage, control level is TTL, with parallel control for phase shift and attenuation. This chip is designed with ground through metal vias on the back technology. All chip products p are 100% RF tested.

Absolute Maximum Ratings (Ta = 25°C)

Symbol	Parameter	Value	Remark
P1~P6, A1~A6, S1, S2	Control voltage	+6V	
VD1, VD2	Operating voltage	+6V	
VS	Operating voltage	-6V	
Pin	Input Power	+20dBm	
Tch	Operating Temperature	150°C	
Tm	Sintering Temperature	310°C	30s, N_2 protection
Tstg	Storage Temperature	-65 ~ +150°C	

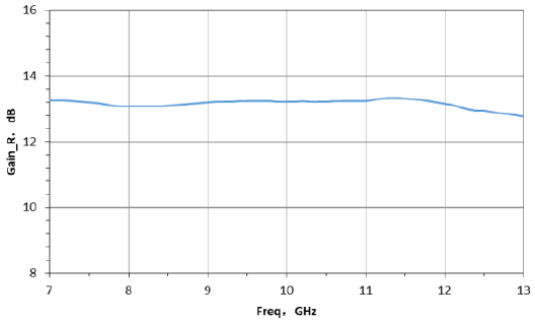
[1] Operation outside any of the Absolute Maximum Ratings may cause permanent device damage.

Electrical Characteristics (Ta = 25°C)

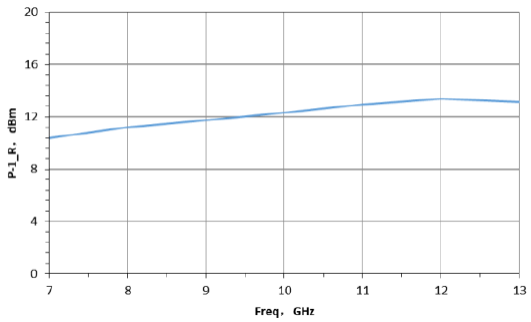
Symbol	Parameter	Value			Unit	Remark
		Min	Typical	Max		
F	Frequency		7 ~ 13		GHz	
Gain_R	Receiver gain	12.5	13	13.5	dB	
P-1_R	Receiver output at P-1 point	10	12	13	dBm	
NF_R	Noise figure	-	8	-	dB	
Gain_T	Transmitter small signal gain	24	26	30	dB	
Psat_T	Transmitter saturated output power	-	24	-	dBm	
PS	Phase shift range	5.625 – 354.375 (6 bits phase shift)			°	
Δps	Phase shift additive attenuation variation	-1	-	+1	dB	
RMSps	Phase shift RMS	-	2.5	3.5	°	
ATT	Attenuation range	0.5 – 31.5 (6 bits attenuation)			dB	
Δat	Attenuation additive phase shift variation	-4	-	+4	°	
RMS_{AT}	Attenuation RMS	-	0.3	0.4	dB	
VSWR_R	Receiver Input/Output standing wave	-	1.4	-		
VSWR_T	Transmittter Input/Output standing wave	-	1.5	-		
Id2	+5V (transmitting) current	-	80	-	mA	
Id1	+5V (public) current	-	77	-	mA	
Is	-5V current	-	13	-	mA	

Typical Performance

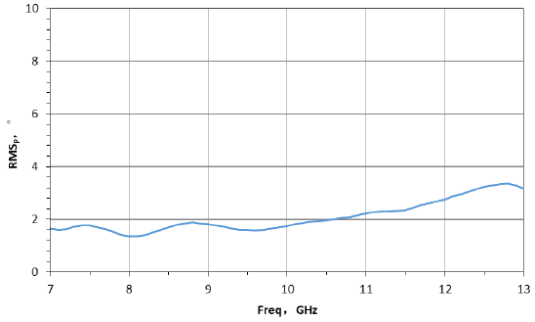
Receiver Gain Curve



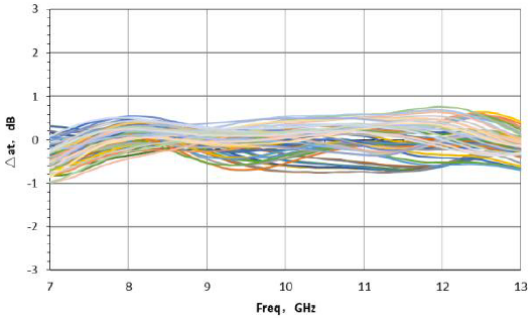
Receiver Output P-1 Curve



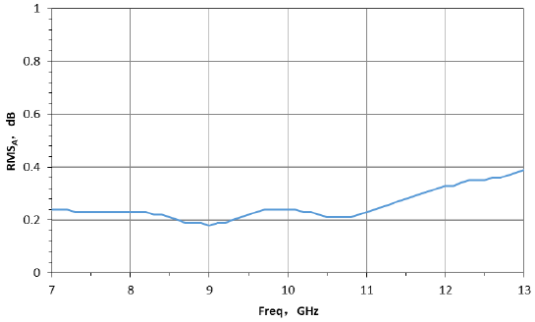
Receiver Phase Shift RMS Curve



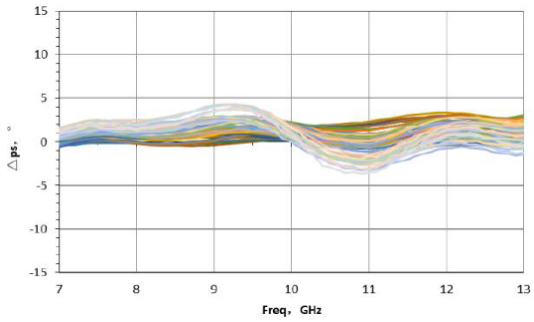
Receiver Phase Shift Additive Attenuation Curve



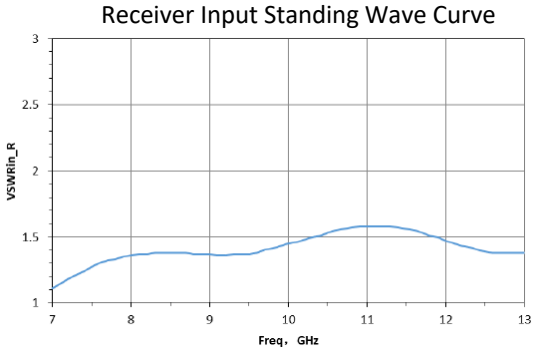
Receiver Attenuation RMS Curve



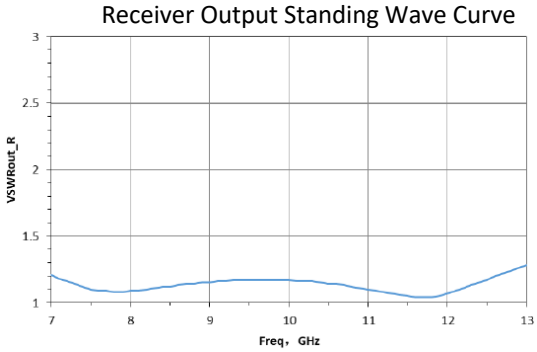
Receiver Attenuation Additive Phase Shift Curve



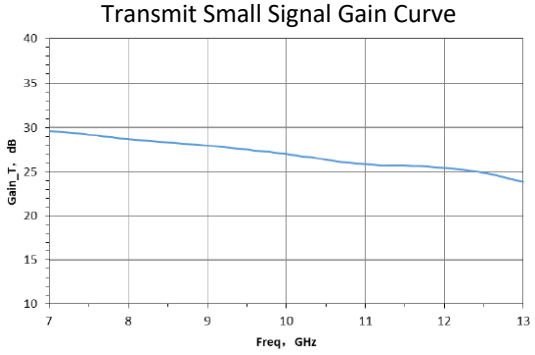
Receiver Input Standing Wave Curve



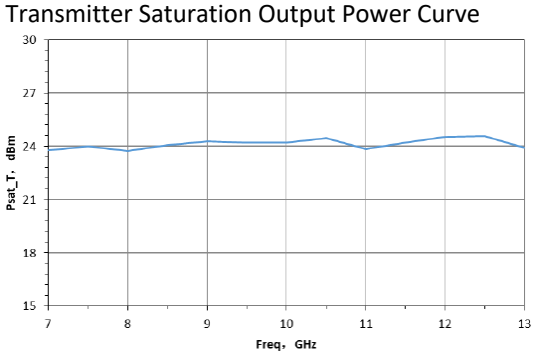
Receiver Output Standing Wave Curve



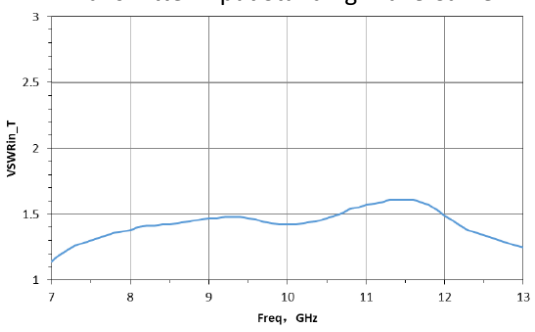
Transmit Small Signal Gain Curve



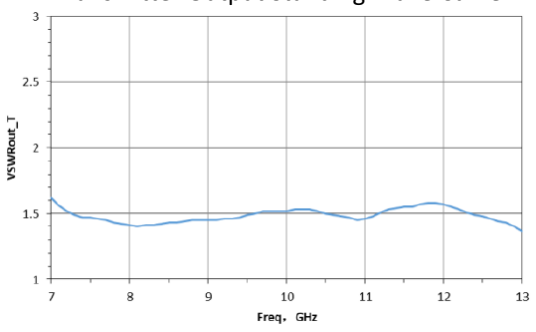
Transmitter Saturation Output Power Curve



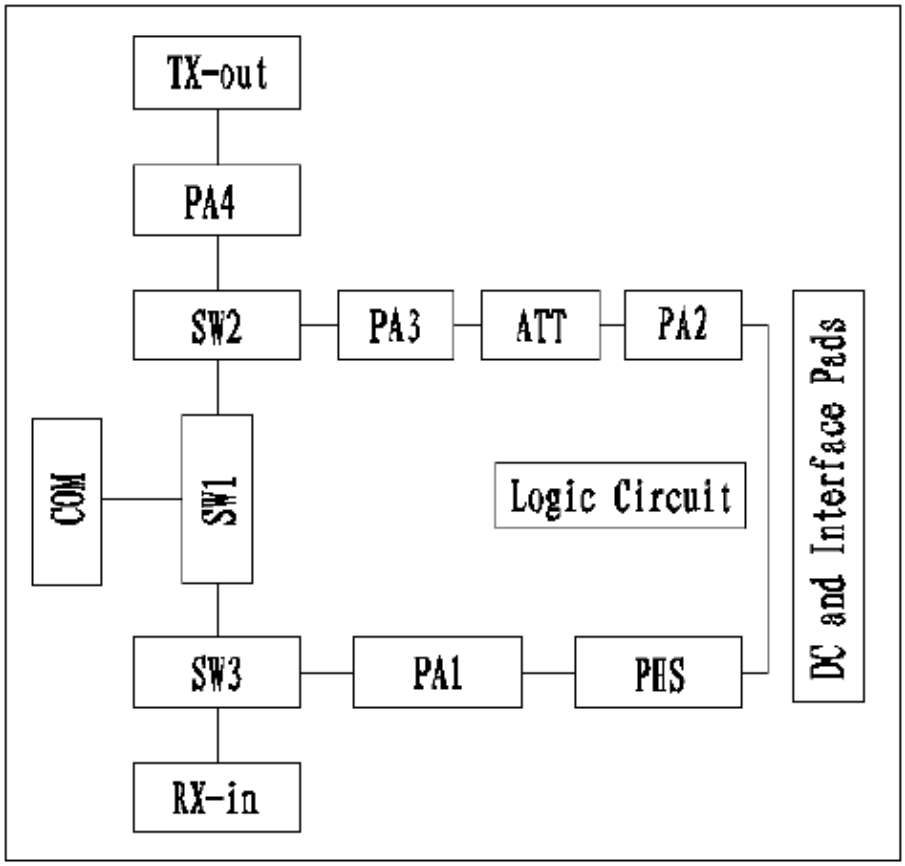
Transmitter Input Standing Wave Curve



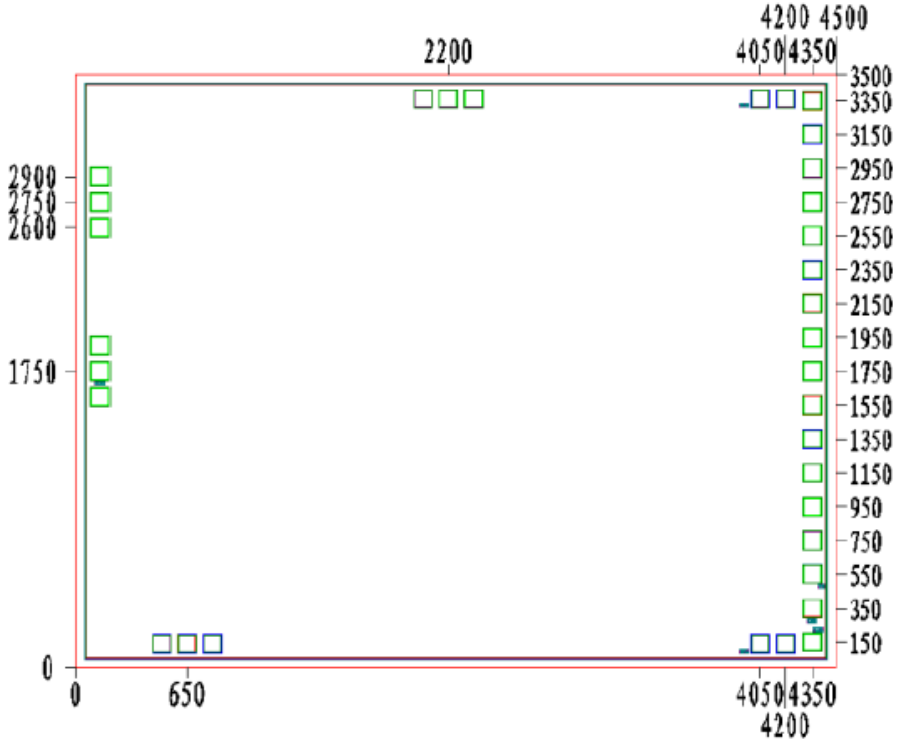
Transmitter Output Standing Wave Curve



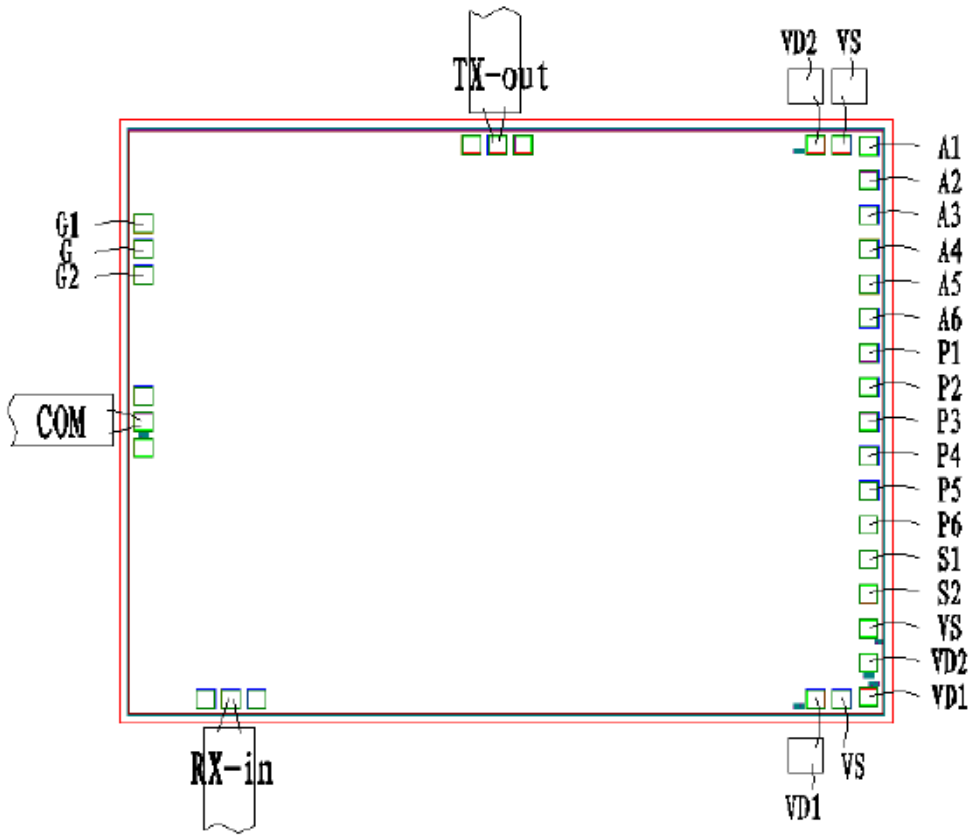
Internal Functional Block Diagram



Chip Dimensions (Unit : μm)



Chip Layout Diagram



Solder Pad Definition

Name	Dimension	Remark
RX_in/TX_out	100μm x 100μm	Receiver Input/Transmitter Output, receiver input port needs to connect to ground.
COM	100μm x 100μm	Receiver Output/Transmitter Input
VD1 / VD2 / VDS	100μm x 100μm	Supply pad : +5V(public)/+5V(transmit)/-5V
A1~A6, P1~P6	100μm x 100μm	TTL, attenuation phase shift control signal
S1, S2	100μm x 100μm	TTL, switch control signal
G1, G2	100μm x 100μm	1dB, 2dB gain adjust

Phase Shift Attenuation Truth Table

Phase Shift	5.625°	11.25°	22.5°	45°	90°	180°
	P1	P2	P3	P4	P5	P6
Initial	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
Attenuation	**0.5dB**	**1dB**	**2dB**	**4dB**	**8dB**	**16dB**
	A1	A2	A3	A4	A5	A6
Initial	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

Switch Truth Table

S1	S2	COM-TX_out	COM-RX_in	COM_Load
1	0	On	Off	Off
0	1	Off	On	Off
0	0	Off	Off	On
1	1	On	Off	Off

Please see Appendix A for details.