AMT1311
14 - 18GHz Multi-Function Chip

Key Features :

- Frequency range : 14 – 18GHz
- Receiver gain : 5.5dB
- Transmitter gain : 5.5dB
- Receive, transmit at P-1 : 10.5/11dBm
- 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 ±5°
- Input/output standing wave : 1.6
- Operating voltage VDD/VDN: 5V
- Operation voltage VSN : -5V
- Control method : TTL
- Chip dimensions : 4.5mm x 2.8mm x 0.1mm
- Applications : wireless communication, transceiver module, radio telecommunication etc.

Description :

AMT1311 is a multi-function chip incorporating with amplifier, switch, 6-digit attenuator, 6-digit phase shifter, control driver etc. functions Ku band MMIC, it is designed by Gallium Arsenide (GaAs) pHEMT process. The chip uses +5V/-5V voltage operation, control level is TTL, with serial 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
V_{CLK}/V_{CLR}/V_{CS}/V_{LE}/$V_{T/R}$/V_{DIN}	Control voltage	+6V	
VDD	Operation voltage	+7V	
VSN	Operation voltage	-6V	
Pin	Max. Input Signal Power	+20dBm	
Tch	Operation 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.

1

### Electrical Characteristics (Ta = 25°C)

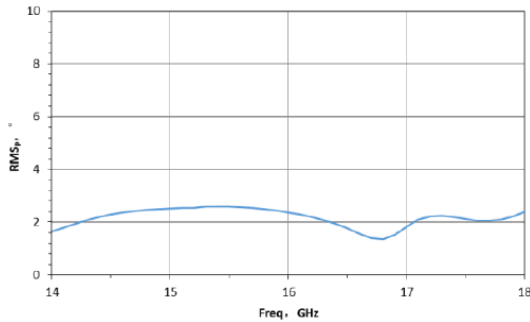| Symbol	Parameter	Value			Unit	Remark
		Min	Typical	Max		
F	Frequency		14 ~ 18		GHz	
G_R	Receiver gain	-	5.5	-	dB	
P_{-1R}	Receiver output at P-1 point	-	10.5	-	dBm	
NF	Noise figure	-	11	-	dB	
G_T	Transmitter gain	-	5.5	-	dB	
P_{-1T}	Transmitter output at P-1 point	-	11	-	dBm	
PS	Phase shift range	5.625 – 354.375 (6 bits phase shift)			°	
Δat	Phase shift additive attenuation variation	-	± 1	-	dB	
RMS_P	Phase shift RMS	-	2.5	-	°	
ATT	Attenuation range	0.5 – 31.5 (6 bits attenuation)			dB	
Δps	Attenuation additive phase shift variation	-	± 5	-	°	
RMS_A	Attenuation RMS	-	0.3	-	dB	
VSWR	Input Output Standing Wave	-	1.6	-		
I_d	Operation current Id	-	73	-	mA	
I_s	Operation current Is	-	18	-	mA	
I_{dn}	Operation current Idn	-	2	-	mA	

Typical Performance

Receiver Gain Curve
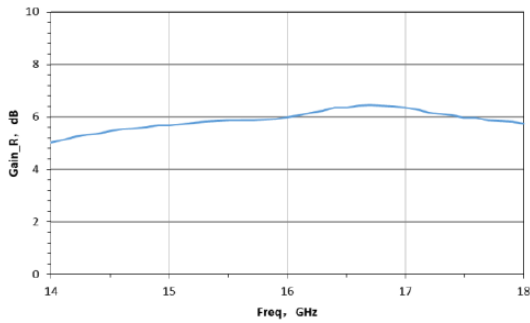
Receiver P-1 Curve
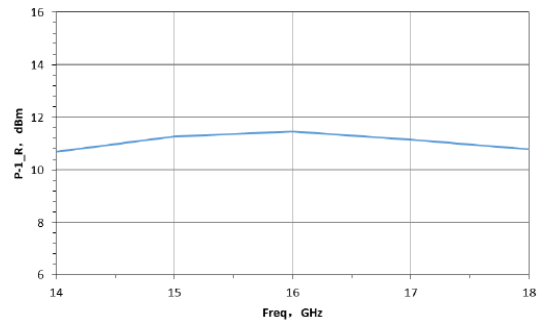
Receiver Phase Shift RMS Curve

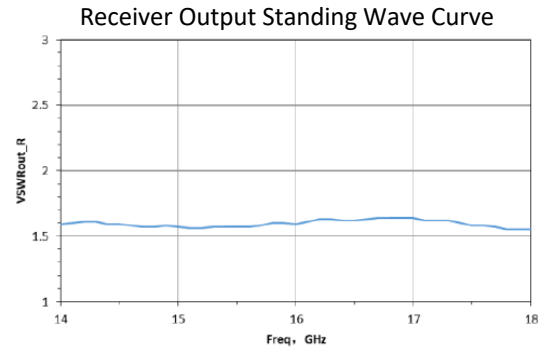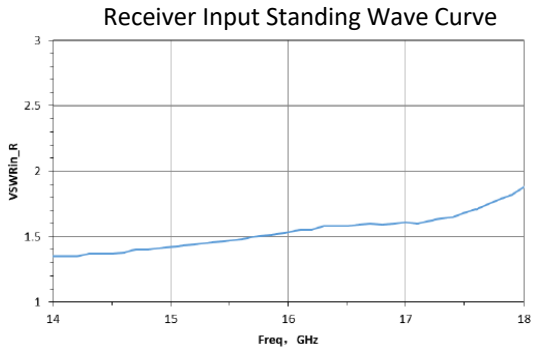Receiver Phase Shift Additive Attenuation Curve

Receive Attenuation RMS Curve

Receive Attenuation Additive Phase Shift Curve

Receiver Input Standing Wave Curve

Receiver Output Standing Wave Curve

Transmitter Gain Curve

Transmitter P-1 Curve

Transmitter Input Standing Wave Curve

Transmitter Output Standing Wave Curve

3
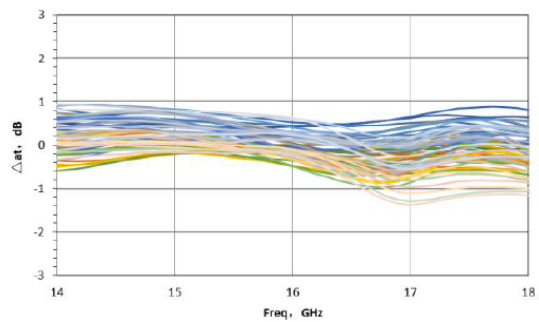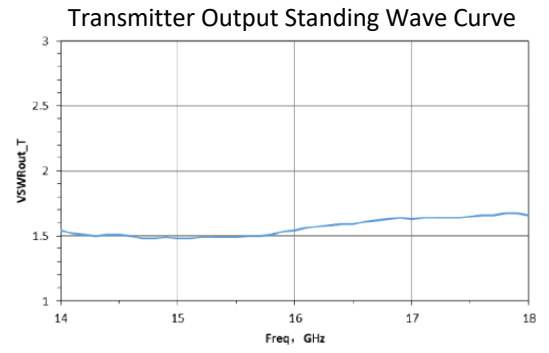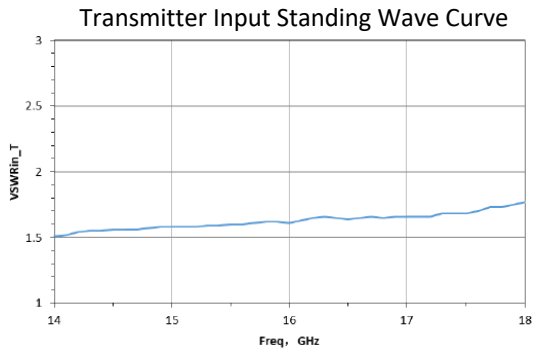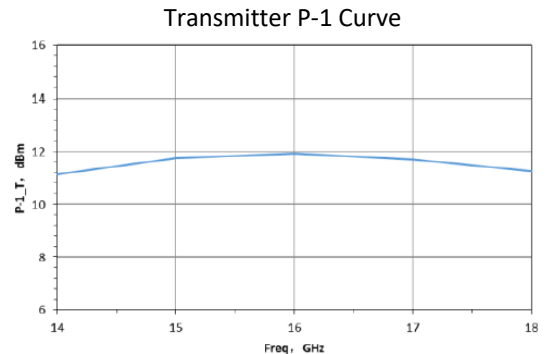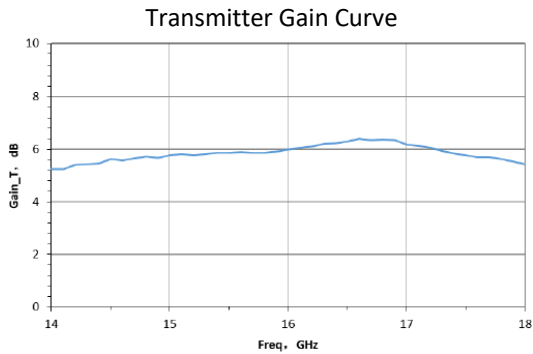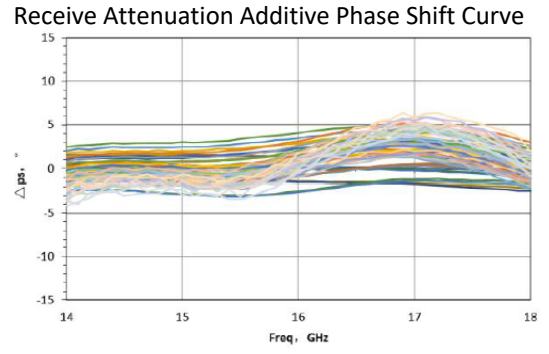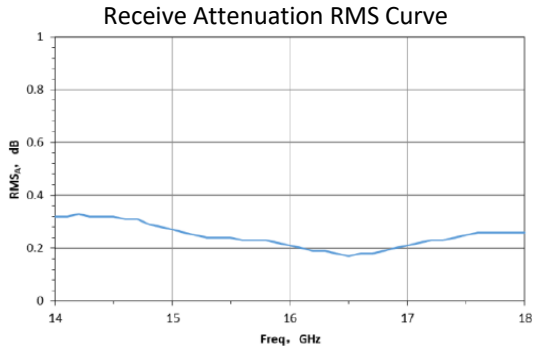
Internal Functional Block Diagram
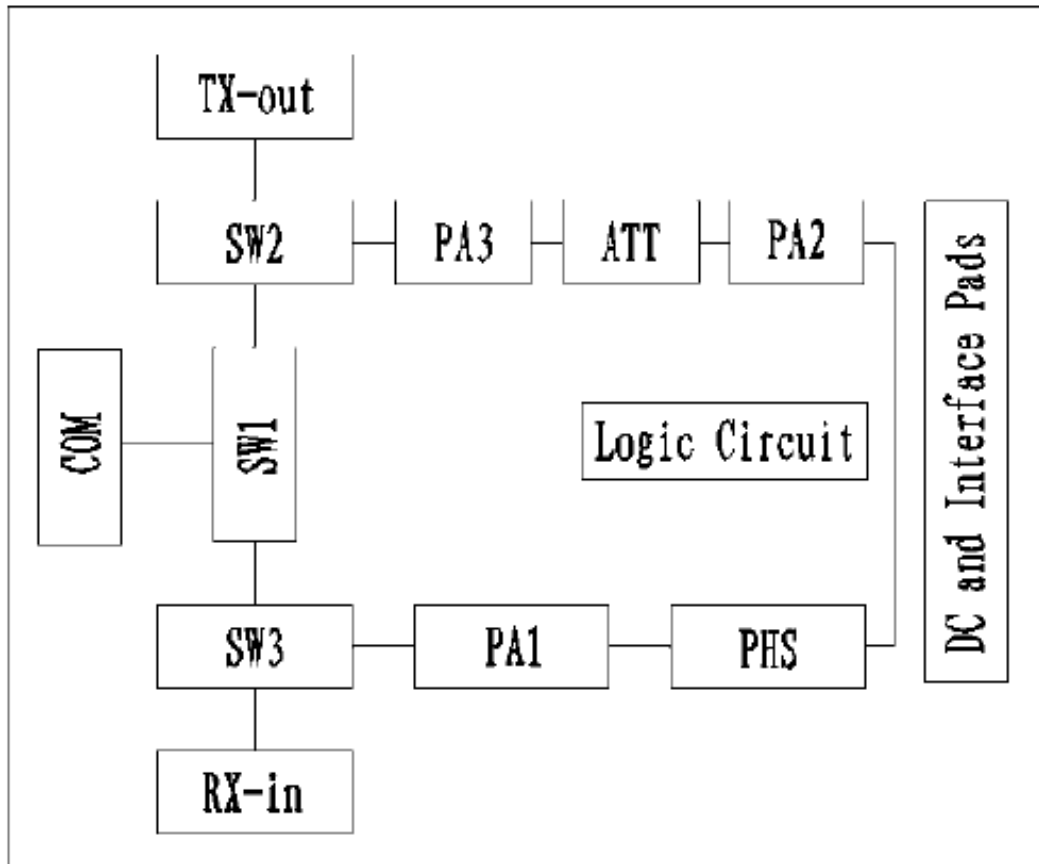
Chip Dimensions (Unit : μm)

Chip Layout Diagram

5

Solder Pad Definition

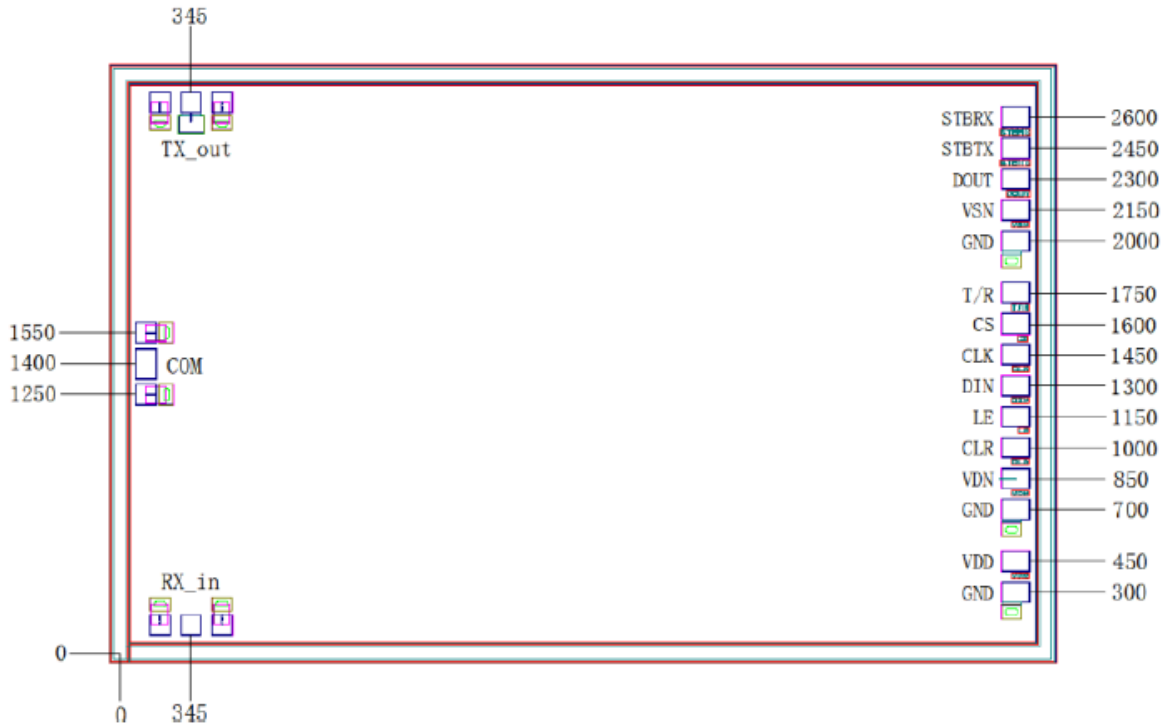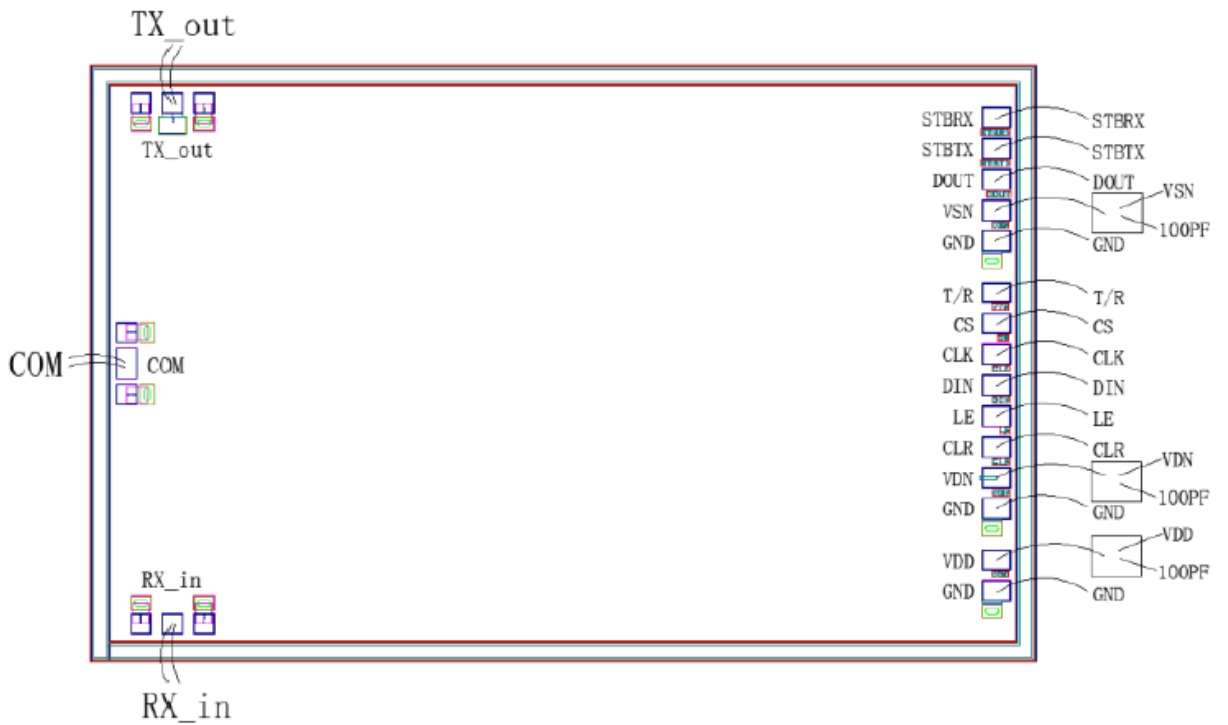| Name	Dimension	Remark
RX_in/TX_out	100μm x 100μm	Receiver Input/Transmitter Output
COM	150μm x 100μm	Receiver Output/Transmitter Input
STBRX/STBTX/DOUT	100μm x 140μm	TTL, Output : receive standby/transmit standby/serial control word
VSN/VDN/VDD	100μm x 140μm	Power Supply Pad : -5V/+5V/+5V
CS/CLK/DIN/LE/TR	100μm x 140μm	TTL, Control Signal Input, rate 40M
CLR	100μm x 140μm	TTL, reset signal input
GND	100μm x 140μm	Ground

Control Description

Signal Function Definition

No.	Signal		Level	Function		Remark
				"0"	"1"	
1	TR		Input (TTL Level)	Receive	Transmit	Transmit, receive control signal
2	CS		Input (TTL Level)	Load data	Hold data	Chip select signal, low active
3	CLK		Input (TTL Level)	-		Clock signal, falling edge active
4	LE		Input (TTL Level)	-		Data ready signal, rising edge active
5	DIN	Bit 0	Input (TTL Level)	Operate	Standby	Receive standby signal : operate means normal receiving status
		Bit 1 ~ Bit 24	Input (TTL Level)	Off	On	Phase shift attenuation control signal : ON means phase shifter and attenuator enable
			Input (TTL Level)			
		Bit 25	Input (TTL Level)	Operate	Standby	Transmit standby signal : operate means normal transmitting status
6	CLR		Input (TTL Level)	-		Reset signal : 100ms low level after power on, reset activates.
7	STBRX		Output (TTL Level)	-		Receive standby signal
8	STBTX		Output (TTL Level)	-		Transmit standby signal
9	DOUT		Output (TTL Level)	-		Output DIN control signal : when new serial control data input into the shift register, the original control data in the register will be output in sequence from DOUT port.

Timing
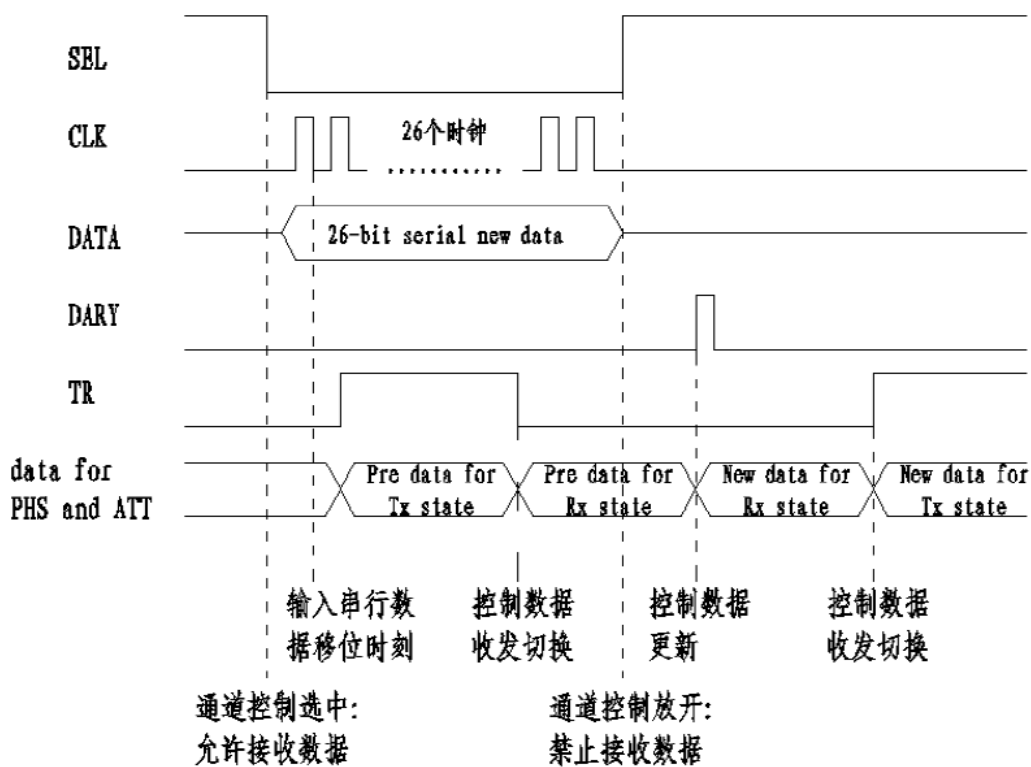
Serial Control Word Definition

BIT	Description	
BIT0	Receive standby	STBRX output
BIT1	5.625 °	Transmit phase shift
BIT2	11.25 °	
BIT3	22.5 °	
BIT4	45 °	
BIT5	90 °	
BIT6	180 °	
BIT7	5.625 °	Receive phase shift
BIT8	11.25 °	
BIT9	22.5 °	
BIT10	45 °	
BIT11	90 °	
BIT12	180 °	
BIT13	0.5 dB	Transmit attenuation
BIT14	1 dB	
BIT15	2 dB	
BIT16	4 dB	
BIT17	8 dB	
BIT18	16 dB	
BIT19	0.5 dB	Receive attenuation
BIT20	1 dB	
BIT21	2 dB	
BIT22	4 dB	
BIT23	8 dB	
BIT24	16 dB	
BIT25	Transmit standby	STBTX output

Please see appendix A for details.