AWT6146R

GSM850/GSM900/DCS/PCS
Quad Band Power Amplifier Module
With Integrated Power Control

PRELIMINARY DATA SHEET - Rev 1.1

FEATURES

- InGaP HBT Technology
- Integrated Power Control (CMOS)
- Quad Band Applications
- ESD Protection on All Pins (2.5 kV)
- +35 dBm GSM Output Power at 3.5 V
- +33 dBm DCS/PCS Output Power at 3.5 V
- 57% GSM900 PAE
- 51% DCS PAE
- Small Footprint 7 mm x 7 mm
- Low Profile 1.3 mm
- Power Control Range >50 dB
- GPRS Capable (class 12)
- RoHS Compliant Package, 250 °C MSL-3

APPLICATIONS

- GSM850/GSM900/DCS/PCS Handsets
- Dual/Tri/Quad Band PDA

M11 Package
18 Pin 7 mm x 7 mm x 1.3 mm
Surface Mount Module

PRODUCT DESCRIPTION

This quad band power amplifier module is designed to support dual, tri and quad band applications. The module includes an integrated power control scheme that facilitates fast and easy production calibration and reduces the number of external components required to complete a power control function.

The amplifier's power control range is typically 55 dB, with the output power set by applying an analog voltage to V_{RAMP}. The logical control inputs, TX_EN and BS, are both 1.8 V and 3 V logic compliant. The TX_EN is used to enable the amplifier typically with the TX burst. The BS is used to select which amplifier is enabled.

There are two amplifier chains, one to support GSM850/900 bands, the other for DCS/PCS bands. All of the RF ports for this device are internally matched to 50 Ω. Internal DC blocks are provided at the RF ports.

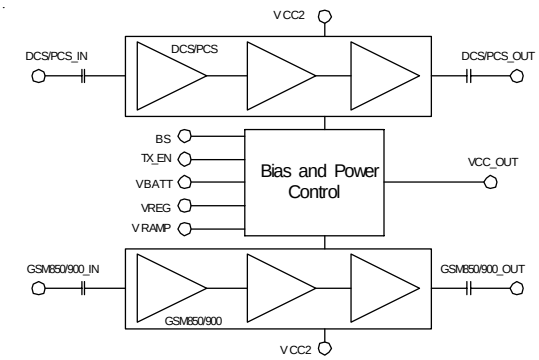


Figure 1: Block Diagram

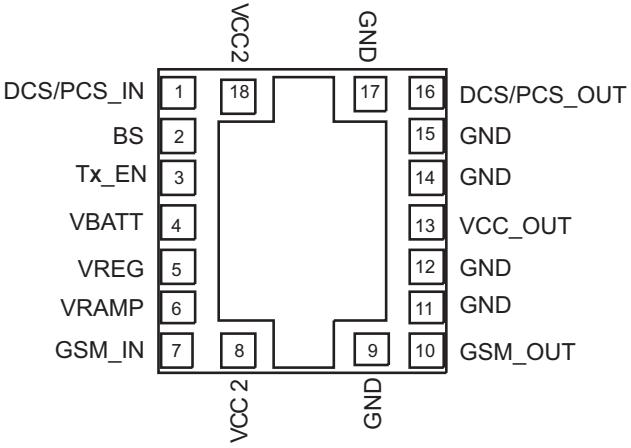


Figure 2: Pinout (X- ray Top View)

Table 1: Pin Description

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	DCS/PCS_IN	DCS/PCS RF Input	10	GSM_OUT	GSM850/900 RF Output
2	BS	Band Select Logic Input	11	GND	Ground
3	TX_EN	TX Enable Logic Input	12	GND	Ground
4	VBATT	Battery Supply Connection	13	VCC_OUT	Control Voltage Output which must be connected to VCC2, no decoupling
5	VREG	Regulated Supply Connection	14	GND	Ground
6	VRAMP	Analog Signal used to control the output power	15	GND	Ground
7	GSM_IN	GSM850/900 RF Input	16	DCS/PCS_OUT	DCS/PCS RF Output
8	VCC2	VCC Control Input for GSM850/900 Pre-amplifier	17	GND	Ground
9	GND	Ground	18	VCC2	VCC Control Input for DCS/PCS Pre-amplifier

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT
Supply Voltage (V_{BATT})	-	+7	V
RF Input Power (RF_{IN})	-	11	dBm
Control Voltages (V_{RAMP})	-0.3	1.8	V
Storage Temperature (T_{STG})	- 55	150	°C

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Table 3: Digital Inputs

PARAMETER	MIN	TYP	MAX	UNIT
Logic High Voltage (V_{IH})	1.2	-	V_{REG}	V
Logic Low Voltage (V_{IL})	-	-	0.5	V
Logic High Current (I_{IH})	-	-	30	µA
Logic Low Current (I_{IL})	-	-	30	µA

Table 4: Control Logic Table

MODE	Tx_EN	BS
PA Enable	HIGH	X
GSM850/900 Mode	HIGH	LOW
DCS/PCS Mode	HIGH	HIGH
PA Disable	LOW	X

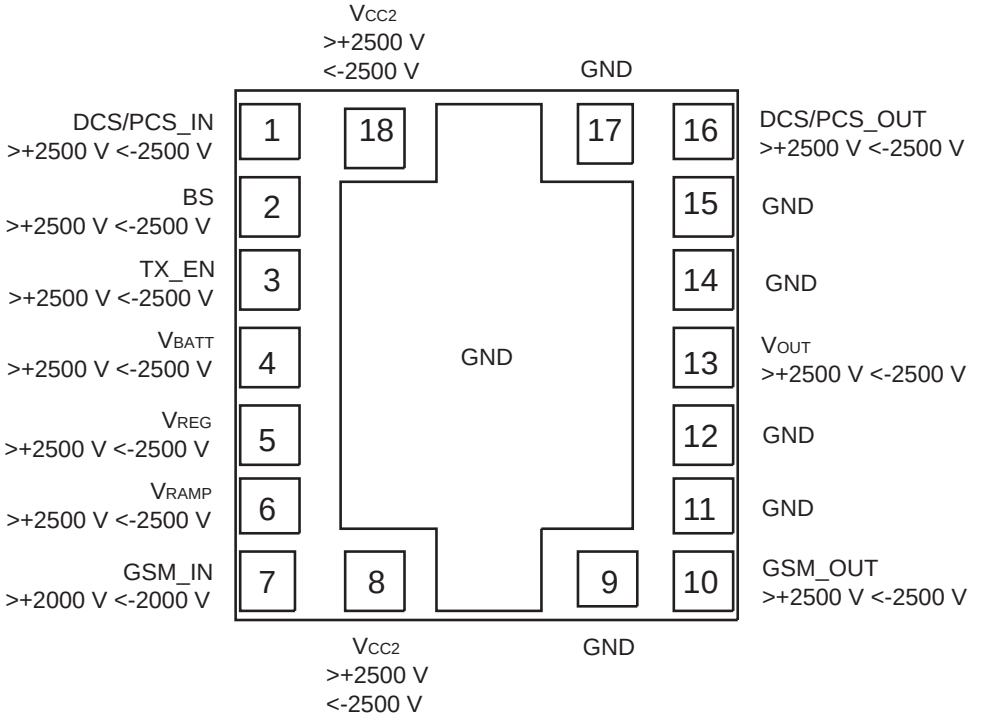


Figure 3: ESD Pin Rating

ELECTROSTATIC DISCHARGE SENSITIVITY

The AWT6146R part was tested to determine the ESD sensitivity of each package pin with respect to ground. All the package pins were subjected to an ESD pulse event using the Human Body Model outlined in MIL-STD-883E Method 3015.7 in either polarity with respect to ground. The pre and post test I-V characteristics of each pin are recorded. The ratings on each pin require that it sustain the ESD event and show no degradation.

Table 5: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Case Temperature (T_C)	-20	-	85	°C	
Supply Voltage (V_{BATT})	3.0	3.5	4.8	V	
Regulated Voltage (V_{REG})	2.7	2.8	2.9	V	
Regulated Current (I_{REG})	-	6	9	mA	TX_EN = HIGH
Regulated Current (I_{REG})	-	10	30	µA	TX_EN = LOW
Control Voltage for Maximum Power (V_{RAMP_MAX})	-	-	1.6	V	
Control Voltage for Minimum Power (V_{RAMP_MIN})	-	0.2	0.25	V	
Power Supply Leakage Current	-	1	10	µA	V_{BATT} = 4.8 V, V_{REG} = 0 V, V_{RAMP} = 0 V, TX_EN = LOW, No RF applied
V_{RAMP} Input Capacitance	-	3	-	pF	
V_{RAMP} Input Current	-	-	10	µA	
Turn ON/OFF Time	-	1	2	µs	V_{RAMP} = 0.2 V to V_{RAMP_MAX}
Duty Cycle	-	-	50	%	

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

Table 6: Electrical Characteristics for GSM850

(V_{BATT} = 3.5 V, V_{REG} = 2.8 V, P_{IN} = 3.0 dBm, Pulse Width =1154 µs, Duty 25%, Z_{IN} = Z_{OUT} = 50 Ω, T_C = 25 °C, V_{RAMP} = 1.6 V, BS = LOW, TX_EN = HIGH)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (F_O)	824	-	849	MHz	
Input Power	0	3.0	5	dBm	
Output Power, P_{MAX}	34.5	36	-	dBm	Freq = 824 to 849 MHz
Degraded Output Power	32.3	33.5	-	dBm	V_{BATT} = 3.0 V, T_C = 85 °C, P_{IN} = 0 dBm
PAE @ P_{MAX}	50	56	-	%	Freq = 824 to 849 MHz
Forward Isolation 1	-	-35	-30	dBm	TX_EN = LOW, P_{IN} = 5 dBm
Forward Isolation 2	-	-25	-15	dBm	TX_EN = HIGH, V_{RAMP} = 0.2 V, P_{IN} = 5 dBm
Cross Isolation ($2F_O$ @ DCS/PCS port)	-	-30	-20	dBm	V_{RAMP} = 0.2 V to V_{RAMP_MAX}
Harmonics 2fo 3fo	 - -	 -14 -30	 -5 -20	dBm	Over all output power levels
Stability	VSWR = 8:1 All Phases, $P_{OUT} \leq$ 34.5 dBm				
	-	-	-36	dBm	F_{OUT} < 1 GHz
	-	-	-30	dBm	F_{OUT} > 1 GHz
Ruggedness	-	-	10:1		All load phases, $P_{OUT} \leq$ 34.5 dBm
RX Noise Power	-	-86	-83	dBm	F_{TX} = 849 MHz, RBW = 100 kHz, F_{RX} = 869 to 894 MHz, $P_{OUT} \leq$ 34.5 dBm
Input VSWR	-	1.5:1	2.5:1		Over all output power levels

Table 7: Electrical Characteristics for GSM900

(V_{BATT} = 3.5 V, V_{REG} = 2.8 V, P_{IN} = 3.0 dBm, Pulse Width =1154 µs, Duty 25%, Z_{IN} = Z_{OUT} = 50 Ω, T_C = 25 °C, V_{RAMP} = 1.6 V, BS = LOW, TX_EN = HIGH)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (F_O)	880	-	915	MHz	
Input Power	0	3.0	5	dBm	
Output Power, P_{MAX}	34.5	35.5	-	dBm	Freq = 880 to 915 MHz
Degraded Output Power	32.3	33.5	-	dBm	V_{BATT} = 3.0 V, T_C = 85 °C, P_{IN} = 0 dBm
PAE @ P_{MAX}	50	57	-	%	Freq = 880 to 915 MHz
Forward Isolation 1	-	-35	-30	dBm	TX_EN = LOW, P_{IN} = 5 dBm
Forward Isolation 2	-	-25	-15	dBm	TX_EN = HIGH, V_{RAMP} = 0.2 V, P_{IN} = 5 dBm
Cross Isolation ($2F_O$ @ DCS/PCS port)	-	-30	-20	dBm	V_{RAMP} = 0.2 V to V_{RAMP_MAX}
Harmonics 2fo 3fo	 - -	 -17 -30	 -5 -20	dBm	Over all output power levels
Stability	VSWR = 8:1 All Phases, P_{OUT} ≤ 34.5 dBm				
	-	-	-36	dBm	F_{OUT} < 1 GHz
	-	-	-30	dBm	F_{OUT} > 1 GHz
Ruggedness	-	-	10:1		All load phases, P_{OUT} ≤ 34.5 dBm
RX Noise Power	-	-81	-77	dBm	F_{TX} = 915 MHz, RBW = 100 kHz, F_{RX} = 925 to 935 MHz, P_{OUT} ≤ 34.5 dBm
	-	-86	-83	dBm	F_{TX} = 915 MHz, RBW = 100 kHz, F_{RX} = 935 to 960 MHz, P_{OUT} ≤ 34.5 dBm
Input VSWR	-	-	2.5:1		Over all output power levels

Table 8: Electrical Characteristics for DCS

(V_{BATT} = 3.5 V, V_{REG} = 2.8 V, P_{IN} = 3.0 dBm, Pulse Width =1154 µs, Duty 25%, Z_{IN} = Z_{OUT} = 50 Ω, T_C = 25 °C, V_{RAMP} = 1.6 V, BS = HIGH, TX_EN = HIGH)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	1710	-	1785	MHz	
Input Power	0	3.0	5	dBm	
Output Power, P_{MAX}	32	33	-	dBm	
Degraded Output Power	30	31.3	-	dBm	V_{BATT} = 3.0 V, T_C = 85 °C, P_{IN} = 0 dBm
PAE @ P_{MAX}	45	51	-	%	Freq = 1710 to 1785 MHz
Forward Isolation 1	-	-40	-30	dBm	TX_EN = LOW, V_{RAMP} = 0.2 V, P_{IN} = 5 dBm
Forward Isolation 2	-	-18	-12	dBm	TX_EN = HIGH, V_{RAMP} = 0.2 V, P_{IN} = 5 dBm
Harmonics 2fo 3fo	 - -	 -20 -30	 -8 -18	dBm	Over all output power levels
Stability	VSWR = 8:1 All Phases, P_{OUT} ≤ 32 dBm				
	-	-	-36	dBm	F_{OUT} < 1 GHz
	-	-	-30	dBm	F_{OUT} > 1 GHz
Ruggedness	-	-	10:1		All load phases, P_{OUT} ≤ 32 dBm
RX Noise Power	-	-86	-80	dBm	F_{TX} = 1785 MHz, RBW = 100 kHz, F_{RX} = 1805 to 1880 MHz, P_{OUT} ≤ 32 dBm
Input VSWR	-	1.5:1	2.5:1		Over all output power levels

Table 9: Electrical Characteristics for PCS

(V_{BATT} = 3.5 V, V_{REG} = 2.8 V, P_{IN} = 3.0 dBm, Pulse Width =1154 µs, Duty 25%, Z_{IN} = Z_{OUT} = 50 Ω, T_C = 25 °C, V_{RAMP} = 1.6 V, BS = HIGH, TX_EN = HIGH)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency	1850	-	1910	MHz	
Input Power	0	3.0	5	dBm	
Output Power, P_{MAX}	32	33	-	dBm	
Degraded Output Power	29.5	30.8	-	dBm	V_{BATT} = 3.0 V, T_C = 85 °C, P_{IN} = 0 dBm
PAE @ P_{MAX}	44	49	-	%	Freq = 1850 to 1910 MHz
Forward Isolation 1	-	-40	-30	dBm	TX_EN = LOW, V_{RAMP} = 0.2 V, P_{IN} = 5 dBm
Forward Isolation 2	-	-18	-12	dBm	TX_EN = HIGH, V_{RAMP} = 0.2 V, P_{IN} = 5 dBm
Harmonics 2fo 3fo	 - -	 -18 -38	 -8 -18	dBm	Over all output power levels
Stability	VSWR = 8:1 All Phases, P_{OUT} ≤ 32 dBm				
	-	-	-36	dBm	F_{OUT} < 1 GHz
	-	-	-30	dBm	F_{OUT} > 1 GHz
Ruggedness	-	-	10:1		All load phases, P_{OUT} ≤ 32 dBm
RX Noise Power	-	-86	-80	dBm	F_{TX} = 1910 MHz, RBW = 100 kHz, F_{RX} = 1930 to 1990 MHz, P_{OUT} ≤ 32 dBm
Input VSWR	-	-	2.5:1		Over all output power levels

COMPONENT PACKAGING

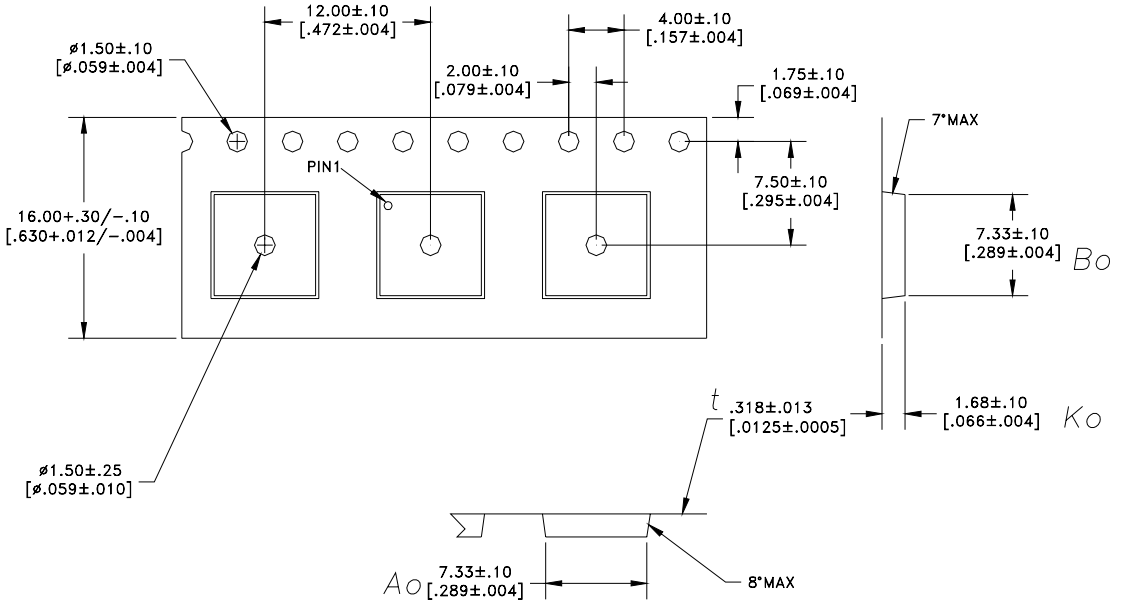
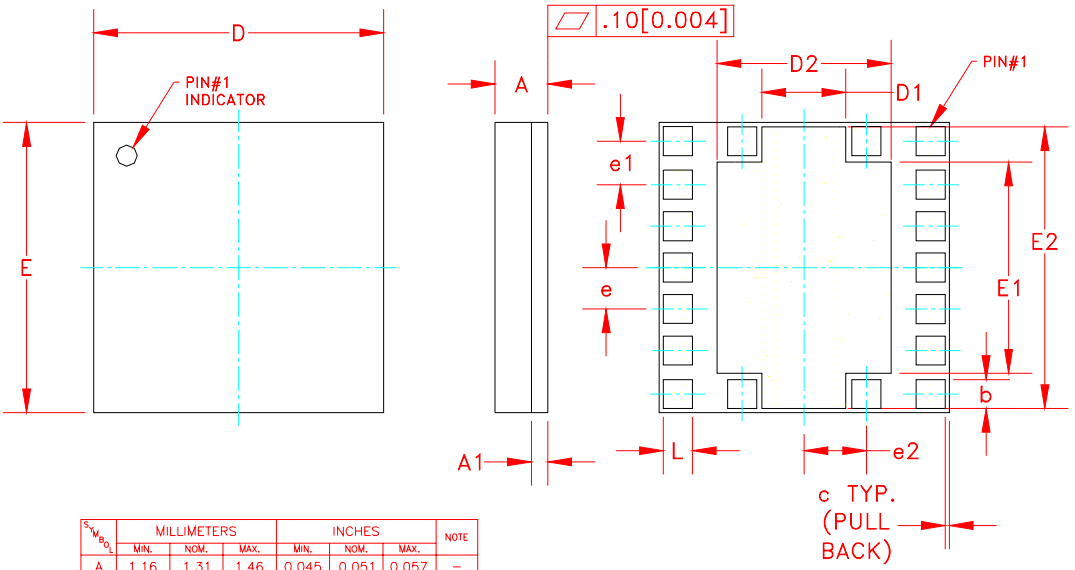


Figure 4: Tape and Reel Packaging

Table 10: Tape and Reel Dimensions

PACKAGE TYPE	TAPE WIDTH	POCKET PITCH	REEL CAPACITY	MAX REEL DIA
7 mm x 7 mm x 1.3 mm	16 mm	12 mm	2500	22"

PACKAGE OUTLINE



SYMBOL	MILLIMETERS			INCHES			NOTE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
A	1.16	1.31	1.46	0.045	0.051	0.057	–
A1	–	0.30	–	–	0.012	–	–
b	0.67	–	0.73	0.026	–	0.028	–
c	–	0.10	–	–	0.004	–	–
D	6.88	7.00	7.12	0.270	0.275	0.280	–
D1	1.99	–	2.11	0.078	–	0.083	–
D2	4.14	–	4.26	0.163	–	0.168	–
E	6.88	7.00	7.12	0.270	0.275	0.280	–
E1	5.07	–	5.13	0.199	–	0.202	–
E2	6.74	–	6.86	0.265	–	0.270	–
e	–	1.00	–	–	0.039	–	8X
e1	–	1.05	–	–	0.041	–	4X
e2	–	1.50	–	–	0.059	–	4X
L	0.67	–	0.73	0.026	–	0.028	–

NOTES:

1. CONTROLLING DIMENSIONS: MILLIMETERS
2. UNLESS SPECIFIED TOLERANCE=±0.076[0.003].
3. PADS (INCLUDING CENTER) SHOWN UNIFORM SIZE FOR REFERENCE ONLY. ACTUAL PAD SIZE AND LOCATION WILL VARY WITHIN MIN. AND MAX. DIMENSIONS ACCORDING TO SPECIFIC LAMINATE DESIGN.

Figure 5: M11 RoHS Package Outline - 18 Pin 7 mm x 7 mm x 1.3 mm Surface Mount Module

1.	PIN 1 INDICATOR:	LASER MARK
2.	ANADIGICS LOGO SIZE:	X=0.040±0.010 Y=0.048±0.010
3.	TEXT:	TYPE: ELITE SIZE: AS LARGE AS POSSIBLE
4.	PART NUMBER:	AWT6146R
5.	YEAR AND WORK WEEK:	YYWW: YY = YEAR, WW = WORK WEEK
6.	WAFER LOT NUMBER: – WAFER ID:	LLLLL = WAFER LOT# –SS = WAFER I.D.
7.	BOM NUMBER:	021
8.	COUNTRY CODE:	CC = TH for THAILAND, TW for TAIWAN, PH for PHILIPPINES, CH for CHINA, ID for INDONESIA, HK for HONG KONG

Figure 6: RoHS Branding Specification

ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AWT6146RM11P8	-30 °C to +110 °C	RoHS Compliant 18 Pin 7 mm x 7 mm x 1.3 mm Surface Mount Module	Tape and Reel, 2500 pieces per reel
AWT6146RM11P9	-30 °C to +110 °C	RoHS Compliant 18 Pin 7 mm x 7 mm x 1.3 mm Surface Mount Module	Tape and Reel, Partial Reel

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