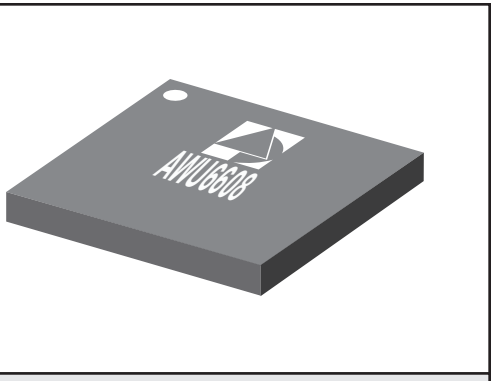
AWU6608

HELP3™ Band 8/WCDMA 3.4 V/28.5 dBm Linear PA Module

ADVANCED PRODUCT INFORMATION - Rev 0.2

FEATURES

- HSPA Compliant
- InGaP HBT Technology
- High Efficiency: (R99 waveform)
  40 % @ P_{OUT} = +28.5 dBm
  20 % @ P_{OUT} = +17 dBm
- Low Quiescent Current: 8 mA
- Low Leakage Current in Shutdown Mode: <1 μA
- Internal Voltage Regulator
- Integrated "daisy chainable" directional couplers with CPL_{IN} and CPL_{OUT} Ports
- Optimized for a 50 Ω System
- Low Profile Miniature Surface Mount Package
- RoHS Compliant Package, 260 °C MSL-3



M45 Package
10 Pin 3 mm x 3 mm x 1 mm
Surface Mount Module

APPLICATIONS

- WCDMA/HSPA 900 MHz Band Wireless Handsets and Data Devices

PRODUCT DESCRIPTION

The AWU6608 HELP3™ PA is a 3rd generation WCDMA product for UMTS handsets. This PA incorporates ANADIGICS' HELP3™ technology to provide low power consumption without the need for an external voltage regulator. A "daisy chainable" directional coupler is integrated in the module thus eliminating the need of external couplers. The device is manufactured on an advanced InGaP HBT MMIC technology offering state-of-the-art reliability, temperature stability, and ruggedness. There are two selectable bias modes that optimize efficiency for different output power levels, and a shutdown mode with low leakage current, which increases handset talk and standby time. The self-contained 3 mm x 3 mm x 1 mm surface mount package incorporates matching networks optimized for output power, efficiency, and linearity in a 50 Ω system.

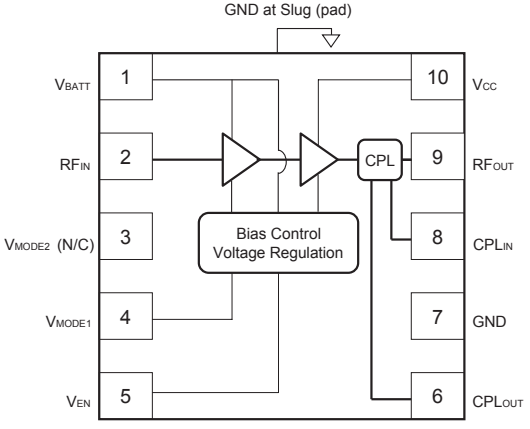


Figure 1: Block Diagram

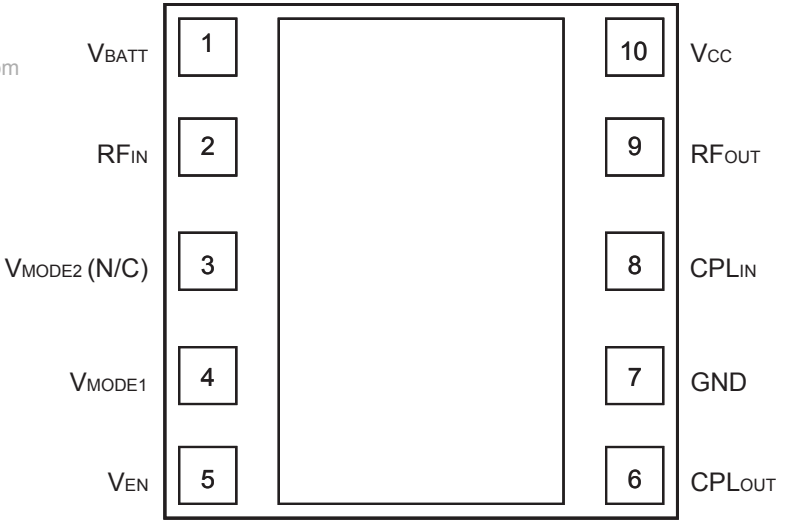


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

PIN	NAME	DESCRIPTION
1	V_{BATT}	Battery Voltage
2	RF_{IN}	RF Input
3	V_{MODE2} (N/C)	No Connection
4	V_{MODE1}	Mode Control Voltage 1
5	V_{EN}	PA Enable Voltage
6	CPL_{OUT}	Coupler Output
7	GND	Ground
8	CPL_{IN}	Coupler Input
9	RF_{OUT}	RF Output
10	V_{CC}	Supply Voltage

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT
Supply Voltage (V_{CC})	0	+5	V
Battery Voltage (V_{BATT})	0	+6	V
Control Voltages (V_{MODE1}, V_{ENABLE})	0	+3.5	V
RF Input Power (P_{IN})	-	+10	dBm
Storage Temperature (T_{STG})	-40	+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: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (f)	880	-	915	MHz	
Supply Voltage (V_{CC})	+3.2	+3.4	+4.2	V	$P_{OUT} \leq$ +28.5 dBm
Enable Voltage (V_{ENABLE})	+2.15 0	+2.4 -	+3.1 +0.5	V	PA "on" PA "shut down"
Mode Control Voltage (V_{MODE1})	+2.15 0	+2.4 -	+3.1 +0.5	V	Low Bias Mode High Bias Mode
RF Output Power (P_{OUT}) R99 WCDMA, HPM HSPA (MPR=0), HPM R99 WCDMA, LPM HSPA (MPR=0), LPM	 28.0(1) 27.0(1) 16.5(1) 15.5(1)	 28.5 27.5 17 16	 28.5 27.5 17 16	dBm	3GPP TS 34.121-1, Rel 7 Table C.11.1.3
Case Temperature (T_C)	-30	-	+90	°C	

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

Notes:
(1) For operation at V_{CC} = +3.2 V, P_{OUT} is derated by 0.5 dB.

Table 4: Electrical Specifications
(T_C = +25 °C, V_{CC} = +3.4 V, V_{BATT} = +3.4 V, V_{ENABLE} = +2.4 V, 50 Ω system, R99 waveform)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS	
					P_{OUT}	V_{MODE1}
Gain	- -	27 15	- -	dB	+28.5 dBm +17 dBm	0 V 2.4 V
ACLR1 at 5 MHz offset (1)	- -	-41 -42	-38 -38	dBc	+28.5 dBm +17 dBm	0 V 2.4 V
ACLR2 at 10 MHz offset	- -	-55 -55	-48 -48	dBc	+28.5 dBm +17 dBm	0 V 2.4 V
Power-Added Efficiency (1)	- -	40 20	- -	%	+28.5 dBm +17 dBm	0 V 2.4 V
Quiescent Current (Icq) Low Bias Mode	-	8	-	mA	V_{MODE1} = +2.4 V	
Mode Control Current	-	0.3	-	mA	through V_{MODE} pin, V_{MODE1} = +2.4 V	
Enable Current	-	0.3	-	mA	through V_{ENABLE} pin	
BATT Current	-	3.0	-	mA	through V_{BATT} pin, V_{MODE1} = +2.4 V	
Leakage Current	-	<1	-	µA	V_{BATT} = +4.2 V, V_{CC} = +4.2 V, V_{ENABLE} = 0 V, V_{MODE1} = 0 V	
Noise in Receive Band(2)	-	-135	-	dBm/Hz	$P_{OUT} \leq$ +28.5 dBm, V_{MODE1} = 0V	
	-	-143	-	dBm/Hz	$P_{OUT} \leq$ 17 dBm, V_{MODE1} = +2.4 V	
Harmonics 2fo 3fo, 4fo	- -	-42 -50	- -	dBc	$P_{OUT} \leq$ +28.5 dBm	
Input Impedance	-	-	-	VSWR		
Coupling Factor	-	20	-	dB		
Directivity	-	20	-	dB		
Spurious Output Level (all spurious outputs)	-	-	-70	dBc	$P_{OUT} \leq$ +28.5 dBm In-band load VSWR < 5:1 Out-of-band load VSWR < 10:1 Applies over all operating conditions	
Load mismatch stress with no permanent degradation or failure	8:1	-	-	VSWR	Applies over full operating range	

Notes:
(1) ACLR and Efficiency measured at 897.5 MHz.
(2) Noise measured at 925 MHz to 960 MHz.

APPLICATION INFORMATION

To ensure proper performance, refer to all related Application Notes on the ANADIGICS web site: http://www.anadigics.com

Shutdown Mode

The power amplifier may be placed in a shutdown mode by applying logic low levels (see Operating Ranges table) to the V_{ENABLE} and V_{MODE1} voltages.

Bias Modes

The power amplifier may be placed in either a Low Bias mode or a High Bias mode by applying the appropriate logic level (see Operating Ranges table) to V_{MODE1}. The Bias Control table lists the recommended modes of operation for various applications. V_{MODE2} is not necessary for this PA.

Two operating modes are available to optimize current consumption. High Bias/High Power operating mode is for P_{OUT} levels $\geq$ 16 dBm. At around 17 dBm output power, the PA can be "Mode Switched" to Medium/ Low power mode for lowest quiescent current consumption.

Table 5: Bias Control (UMTS)

APPLICATION	P_{OUT} LEVELS	BIAS MODE	V_{ENABLE}	V_{MODE1}	V_{CC}	V_{BATT}
UMTS - med/low power (Low Bias Mode)	$\leq$ +17 dBm	Low	+2.4 V	+2.4 V	3.2 - 4.2 V	$\geq$ 3.2 V
UMTS - high power (High Bias Mode)	> +16 dBm	High	+2.4 V	0 V	3.2 - 4.2 V	$\geq$ 3.2 V
Optional lower V_{CC} in low power mode	$\leq$ +7 dBm	Low	+2.4 V	+2.4 V	1.5 V	$\geq$ 3.2 V
Shutdown	-	Shutdown	0 V	0 V	3.2 - 4.2 V	$\geq$ 3.2 V

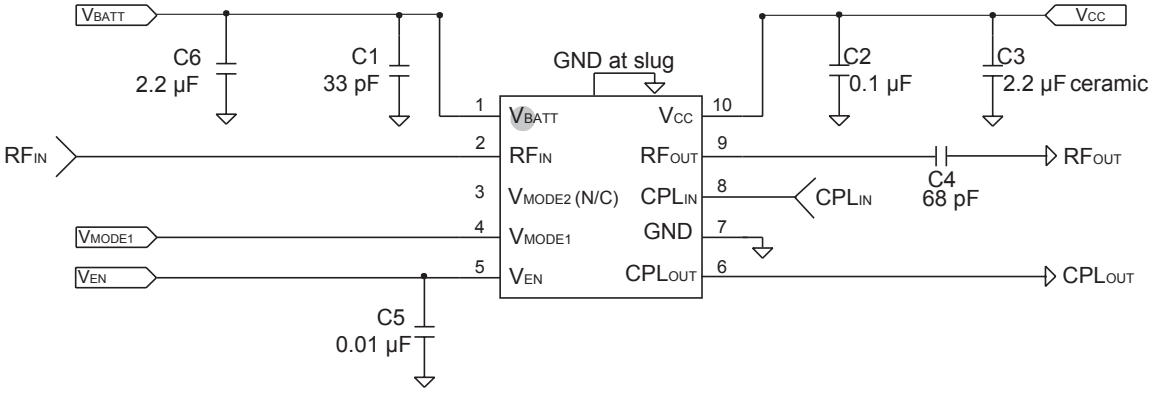
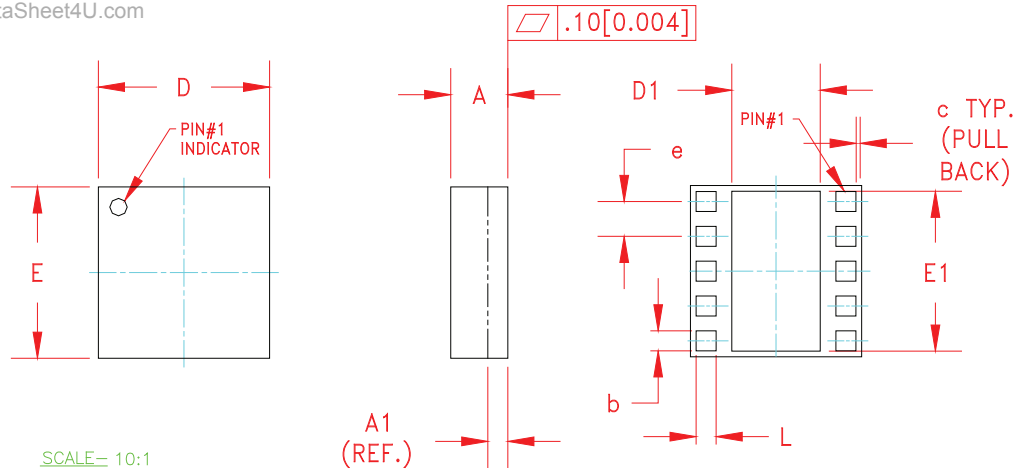


Figure 3: Application Circuit Schematic

PACKAGE OUTLINE



SYMBOL	MILLIMETERS			INCHES			NOTE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
A	0.91	1.03	1.13	0.035	0.041	0.044	–
A1	PLEASE REFER TO LAMINATE CONTROL DRAWING						–
b	0.32	0.35	0.40	0.013	0.014	0.016	3
c	–	0.10	–	–	0.004	–	–
D	2.88	3.00	3.12	0.113	0.118	0.123	–
D1	1.45	1.50	1.57	0.057	0.059	0.062	3
E	2.88	3.00	3.12	0.113	0.118	0.123	–
E1	2.70	2.75	2.85	0.106	0.108	0.112	3
e		0.60			0.024		3
L	0.32	0.35	0.40	0.013	0.014	0.016	3

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.
4. UNLESS SPECIFIED DIMENSIONS ARE SYMMETRICAL ABOUT CENTER LINES SHOWN.
5. LAMINATE CONTROL DRAWING SPECIFIED BY PART NUMBER.

Figure 4: M45 Package Outline - 10 Pin 3 mm x 3 mm x 1 mm Surface Mount Module

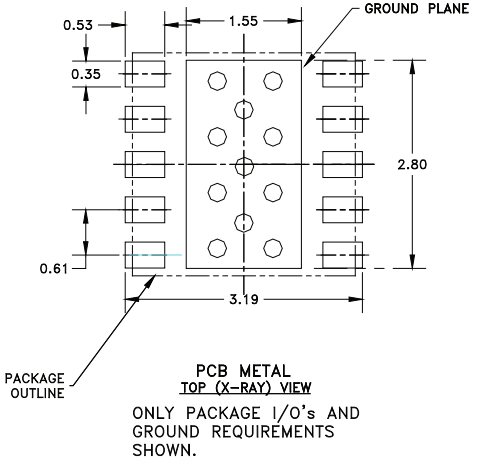
TOP BRAND

NOTES:

1. ANADIGICS LOGO SIZE: NONE
2. PART NUMBER: 6608R
3. WAFER LOT NUMBER: LLLL = FOUR DIGIT LOT NUMBER
   NN = TWO DIGIT WAFER NUMBER
4. PIN 1 INDICATOR: LASER DOT
5. B.O.M. # BBB
6. COUNTRY CODE: CC = TH -for- THAILAND, TW -for- TAIWAN, PH -for- PHILLIPINES, CH -for- CHINA, ID -for- INDONESIA, HK -for- HONG KONG
7. TYPE : ARIAL
   SIZE : 1.5-POINT
   COLOR : LASER

Figure 5: Branding Specification - M45 Package

PCB AND STENCIL DESIGN GUIDELINE



NOTES:

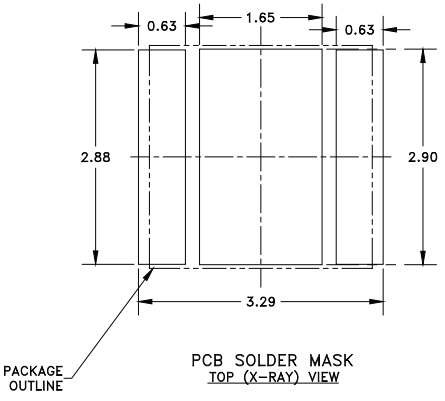
(1) OUTLINE DRAWING REFERENCE: P8002478_E

(2) UNLESS SPECIFIED DIMENSIONS ARE SYMMETRICAL ABOUT CENTER LINES SHOWN.

(3) DIMENSIONS IN MILLIMETERS.

(4) VIAS SHOWN IN PCB METAL VIEW ARE FOR REFERENCE ONLY. NUMBER & SIZE OF THERMAL VIAS REQUIRED DEPENDENT ON HEAT DISSIPATION REQUIREMENT AND THE PCB PROCESS CAPABILITY.

(5) RECOMMENDED STENCIL THICKNESS: APPROX. 0.150mm (6 Mils)



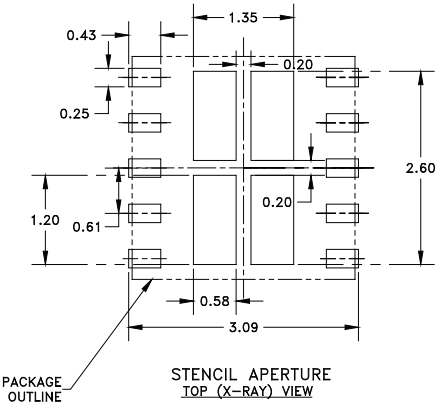
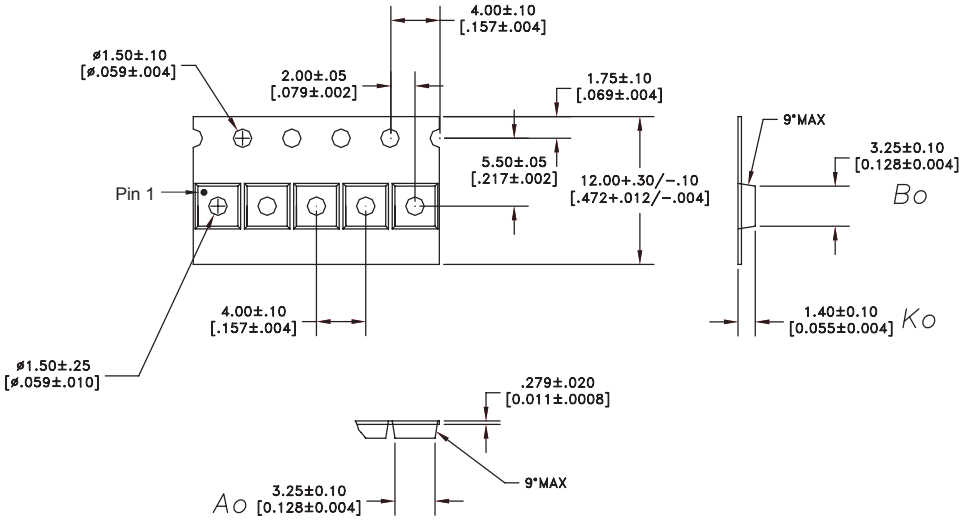


Figure 6: Recommended PCB Layout Information

COMPONENT PACKAGING



NOTES:

DIMENSIONS ARE IN MILLIMETERS [INCHES]

1. MATERIAL: 3000 (CARBON FILLED POLYCARBONATE)
100% RECYCLABLE.

DIMENSIONING AND TOLERANCING PER ASME Y14.5M–1994

Figure 6: Tape & Reel Packaging

Table 6: Tape & Reel Dimensions

PACKAGE TYPE	TAPE WIDTH	POCKET PITCH	REEL CAPACITY	MAX REEL DIA
3 mm x 3 mm x 1 mm	12 mm	4 mm	2500	7"

ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AWU6608RM45Q7	-30 °C to +90 °C	RoHS Compliant 10 Pin 3 mm x 3 mm x 1 mm Surface Mount Module	Tape and Reel, 2500 pieces per Reel
AWU6608RM45P9	-30 °C to +90 °C	RoHS Compliant 10 Pin 3 mm x 3 mm x 1 mm Surface Mount Module	Partial Tape and Reel

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