AWT6621

HELP4™ UMTS2100 (Band 1)
WCDMA/CDMA Linear PAM
Data Sheet - Rev 2.4

FEATURES

- Mixed-Mode (HSPA, EV-DO) Compliant
- 4th Generation HELP™ technology
- High Efficiency (R99 waveform):
  - 41 % @ POUT = +28.2 dBm
  - 34 % @ POUT = +17.5 dBm
  - 21 % @ POUT = +13.5 dBm
  - 27 % @ POUT = +9 dBm
  - 13 % @ POUT = +3.5 dBm
- Low Quiescent Current: 2 mA
- Low Leakage Current in Shutdown Mode: <2 μA
- Internal Voltage Regulator
- Integrated "daisy chainable" directional coupler with CPLIN and CPLOUT port.
- Optimized for a 50 Ω System
- 1.8V Control Logic
- RoHS Compliant Package, 260 °C MSL-3

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

APPLICATIONS

- Band 1 (IMT) WCDMA/HSPA Wireless Devices
- Band Class 6 CDMA/EVDO Wireless Devices
- Band Class 6 EVDO Rev. B Wireless Devices

PRODUCT DESCRIPTION

The AWT6621 HELP4™ PA is a 4th generation HELP™ product for WCDMA devices operating in UMTS2100 (Band 1) and for CDMA devices operating in Band Class 6. This PA incorporates ANADIGICS' HELP4™ technology to deliver exceptional efficiency at low power levels and low quiescent current without the need for external voltage regulators or converters. The device is manufactured using advanced InGaP-*Plus*™ HBT technology offering state-of-the-art reliability, temperature stability, and ruggedness. Three selectable bias modes that optimize efficiency for different output power levels and a shutdown mode with low leakage current increase handset talk and standby time. A "daisy chainable" directional coupler is integrated in the module, thus eliminating the need of an external coupler. 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.

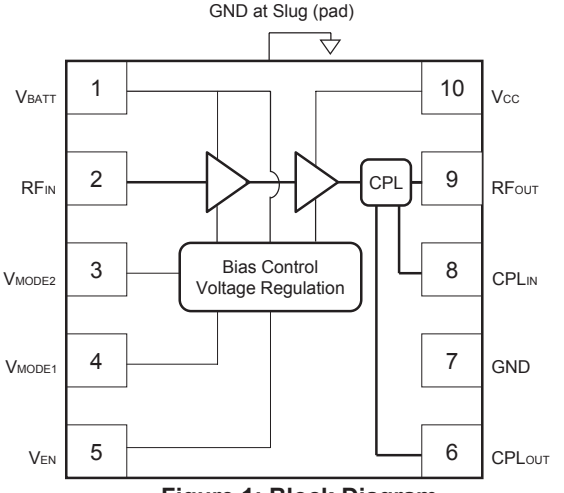


Figure 1: Block Diagram

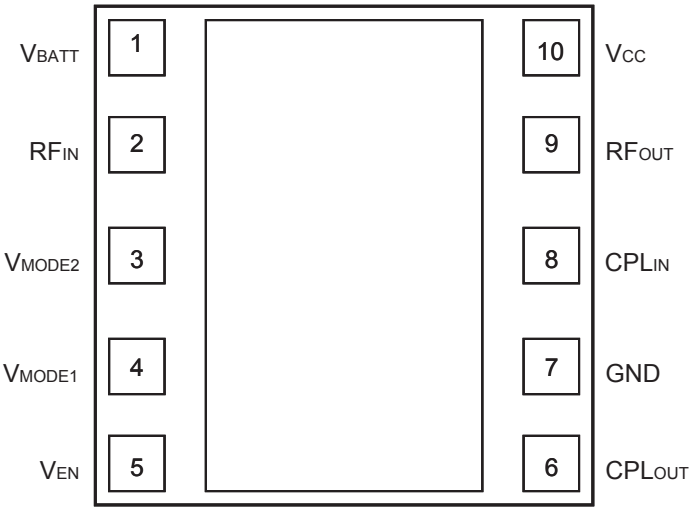


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

PIN	NAME	DESCRIPTION
1	V_{BATT}	Battery Voltage
2	RF_{IN}	RF Input
3	V_{MODE2}	Mode Control Voltage 2
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_{MODE2}, V_{EN})	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)	1920	-	1980	MHz	
Supply Voltage (V_{CC})	+3.2	+3.4	+4.2	V	$P_{OUT} \leq$ +28.2 dBm
Enable Voltage (V_{EN})	+1.35 0	+1.8 -	+3.1 +0.5	V	PA "on" PA "shut down"
Mode Control Voltage (V_{MODE1},V_{MODE2})	+1.35 0	+1.8 -	+3.1 +0.5	V	Low Bias Mode High Bias Mode
WCDMA Output Power (UMTS) R99, HPM HSPA (MPR=0), HPM R99, MPM HSPA (MPR=0), MPM R99, LPM HSPA (MPR=0), LPM	 27.7(1) 26.7(1) 17 16 9 8	 28.2 27.2 17.5 16.5 9 8	 - - - - - -	dBm	3GPP TS 34.121-1, Rel 8 Table C.11.1.3 for WCDMA SUBTEST 1
CDMA Output Power CDMA2000, HPM CDMA2000, MPM CDMA2000, LPM EVDO Rev. B, HPM	 27.0(1) 16 8 -	 27.5 16.5 8 18	 - - - -	dBm	CDMA2000-RC1 3GPP2 C.S0033-B V1.0 5X Waveform
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 3.2 V, P_{OUT} is derated by 0.5 dB.

Table 4: Electrical Specifications - WCDMA Operation (R99 waveform)
(T_C = +25 °C, V_{CC} = +3.4 V, V_{BATT} = +3.4 V, V_{EN} = +1.8 V, 50 Ω system)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS		
					P_{OUT}	V_{MODE1}	V_{MODE2}
Gain	24 15 7	26.5 18 9.5	29 21 12	dB	+28.2 dBm +17.5 dBm +9 dBm	0 V 1.8 V 1.8 V	0 V 0 V 1.8 V
ACLR1 at 5 MHz offset (1)	- - -	-41 -41 -42	-37.5 -37.5 -37.5	dBc	+28.2 dBm +17.5 dBm +9 dBm	0 V 1.8 V 1.8 V	0 V 0 V 1.8 V
ACLR2 at 10 MHz offset	- - -	-54 -56 -56	-48 -48 -48	dBc	+28.2 dBm +17.5 dBm +9 dBm	0 V 1.8 V 1.8 V	0 V 0 V 1.8 V
Power-Added Efficiency (1)	36 28 - 22 -	41 34 21 27 13	- - - - -	% 	+28.2 dBm +17.5 dBm +13.5 dBm +9 dBm +3.5 dBm	0 V 1.8 V 1.8 V 1.8 V 1.8 V	0 V 0 V 0 V 1.8 V 1.8 V
Quiescent Current (Icq) Low Bias Mode	-	2	3.5	mA	through V_{CC} pin	1.8 V	1.8 V
Mode Control Current	-	0.08	0.15	mA	through V_{MODE} pins, $V_{MODE1,2}$ = +1.8 V		
Enable Current	-	0.04	0.1	mA	through V_{EN} pin, V_{EN} = 1.8 V		
BATT Current	-	0.8	1.5	mA	through V_{BATT} pin, $V_{MODE1,2}$ = +1.8 V		
Leakage Current	-	<5	8	µA	V_{BATT} = +4.2 V, V_{CC} = +4.2 V, V_{EN} = 0 V, $V_{MODE1,2}$ = 0 V		
Noise Power	- - -	-135 -138 -144	-133 -136 -141	dBm/Hz	2110 MHz to 2170 MHz GPS Band ISM Band		
Harmonics 2fo 3fo, 4fo	 - -	 -43 -46	 -35 -38	 dBc	 $P_{OUT} \leq$ +28.2 dBm		
Coupling Factor	-	19.5	-	dB			
Directivity	-	20	-	dB			
Coupler IN_OUT Daisy Chain Insertion Loss	-	<0.25	-	dB	698 MHz through 2620 MHz PIN 8 through 9 SHUTDOWN mode		
Spurious Output Level (all spurious outputs)	-	-	-70	dBc	$P_{OUT} \leq$ +28.2 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 1950 MHz.

Table 5: Electrical Specifications - CDMA Operation (CDMA2000, RC-1)
(T_C = +25 °C, V_{BATT} = V_{CC} = +3.4 V, V_{ENABLE} = +1.8 V, 50 Ω system)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS		
					P_{OUT}	V_{MODE1}	V_{MODE2}
Gain	24 15 7	26.5 18 9	29 21 12	dB	+27.5 dBm +16.5 dBm +8 dBm	0 V 1.8 V 1.8 V	0 V 0 V 1.8 V
Adjacent Channel Power at ±1.25 MHz offset Primary Channel BW - 1.23 MHz Adjacent Channel BW = 30 kHz	 - - -	 -50 -53 -55	 -46.5 -46.5 -46.5	 dBc	 +27.5 dBm +16.5 dBm +8 dBm	 0 V 1.8 V 1.8 V	 0 V 0 V 1.8 V
Adjacent Channel Power at +1.98 MHz Primary Channel BW=1.23 MHz Adjacent Channel BW=30 kHz	 - - -	 -55 -59 -58	 -53 -53 -53	 dBc	 +27.5 dBm +16.5 dBm +8 dBm	 0 V 1.8 V 1.8 V	 0 V 0 V 1.8 V
Power-Added Efficiency (1)	34 27 20	38 31 24	- - -	%	+27.5 dBm +16.5 dBm +8 dBm	0 V 1.8 V 1.8 V	0 V 0 V 1.8 V
Spurious Output Level (all spurious outputs)	-	-	-70	dBc	See Note 2		
Load mismatch stress with no permanent degradation or failure	8:1	-	-	VSWR	Applies over full operating range		

Notes:
(1) ACLR and Efficiency measured at 1950 MHz.
(2) P_{OUT} < +27.5 dBm, In-Band VSWR < 5:1, Out-Of-Band VSWR < 10:1. Applies to all operating conditions.

Table 6: Electrical Specifications - EVDO Rev. B Operation
(T_C = +25 °C, V_{BATT} = V_{CC} = +3.4 V, V_{ENABLE} = +1.8 V, 50 Ω system, [10001] or [10101] Waveform)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS		
					P_{OUT}	V_{MODE1}	V_{MODE2}
Spurious in PHS Band (1884.5 - 1919.6 MHz)	-	-45	-41	dBm/300KHz	+18 dBm	0 V	0V
Intermodulation IM3	-	-23	-13	dBm/MHz	+18 dBm	0 V	0V

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_{EN}, V_{MODE1} and V_{MODE2} voltages.

Bias Modes

The power amplifier may be placed in either Low, Medium or High Bias modes by applying the appropriate logic level (see Operating Ranges table) to the V_{MODE} pins. The Bias Control table below lists the recommended modes of operation for various applications.

Three operating modes are recommended to optimize current consumption. High Bias/High Power operating mode is for P_{OUT} levels $\geq$ 16 dBm. At ~17 dBm - 8 dBm, the PA could be switched to Medium Power Mode. For P_{OUT} levels $\leq$ ~8 dBm, the PA could be switched to Low Power Mode for extremely low current consumption.

Table 7: Bias Control

APPLICATION	P_{OUT} LEVELS	BIAS MODE	V_{EN}	V_{MODE1}	V_{MODE2}	V_{CC}	V_{BATT}
Low power (Low Bias Mode)	$\leq$ +9 dBm	Low	+1.8 V	+1.8 V	+1.8 V	3.2 - 4.2 V	$\geq$ 3.2 V
Med power (Medium Bias Mode)	> 8 dBm < + 17.5 dBm	Low	+1.8 V	+1.8 V	0 V	3.2 - 4.2 V	$\geq$ 3.2 V
High power (High Bias Mode)	> +16 dBm	High	+1.8 V	0 V	0 V	3.2 - 4.2 V	$\geq$ 3.2 V
Shutdown	-	Shutdown	0 V	0 V	0 V	3.2 - 4.2 V	$\geq$ 3.2 V

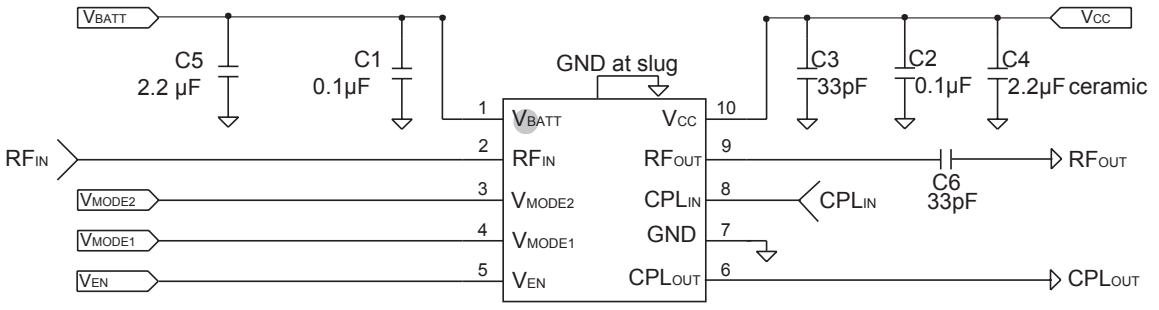


Figure 3: Evaluation Board Schematic

PERFORMANCE DATA PLOTS:
(R99 Waveform at 1950 MHz and 50 Ω system)

Figure 4: WCDMA Gain (dB) over Temperature (V_{batt} = V_{CC} = 3.4 V)

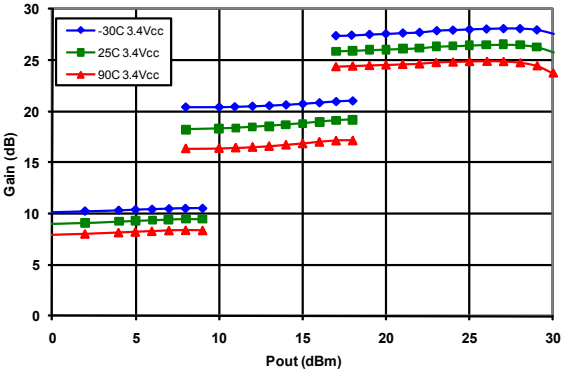


Figure 5: WCDMA Gain (dB) over Voltage (T_C = 25 °C)

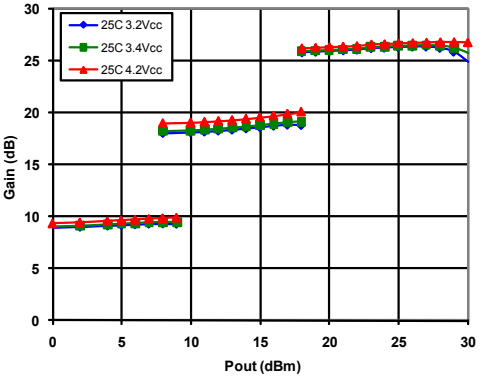


Figure 6: WCDMA PAE (%) over Temperature (V_{batt} = V_{CC} = 3.4 V)

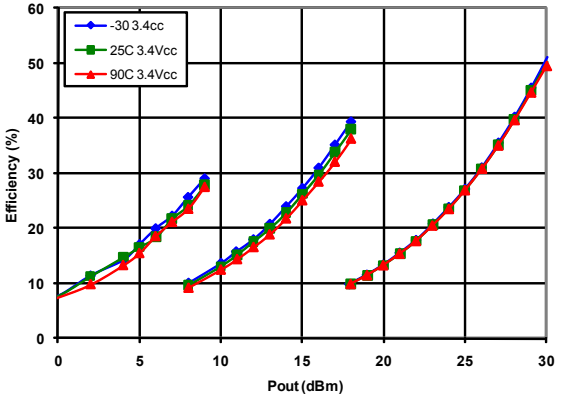


Figure 7: WCDMA PAE (%) over Voltage (T_C = 25 °C)

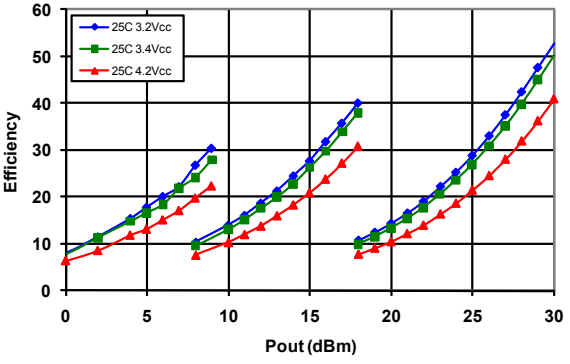


Figure 8: WCDMA ACRL1 (dBc) over Temperature (V_{batt} = V_{CC} = 3.4V)

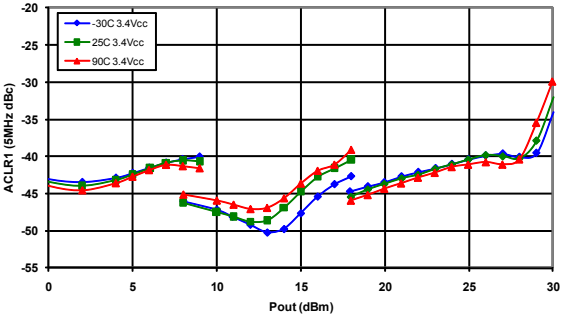
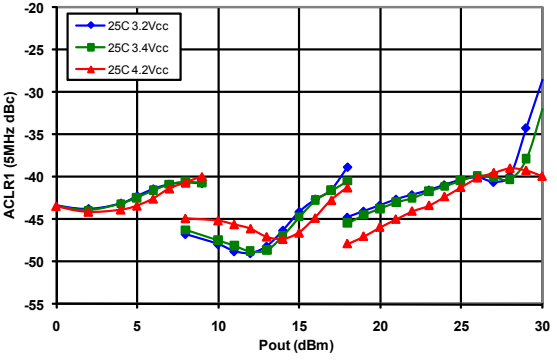
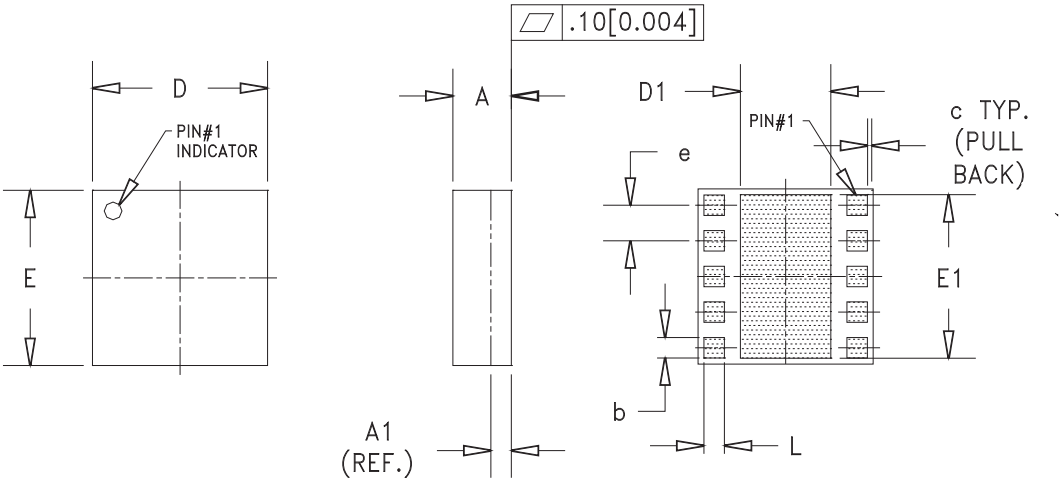


Figure 9: WCDMA ACLR1 (dBc) over Voltage (T_C = 25 °C)



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

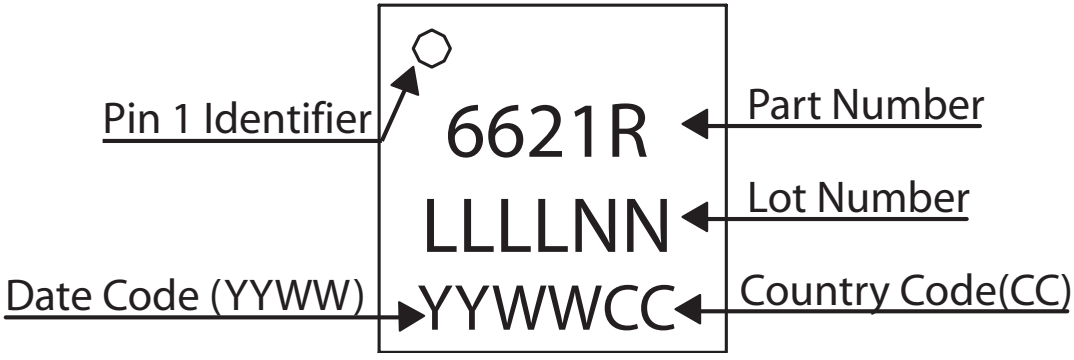
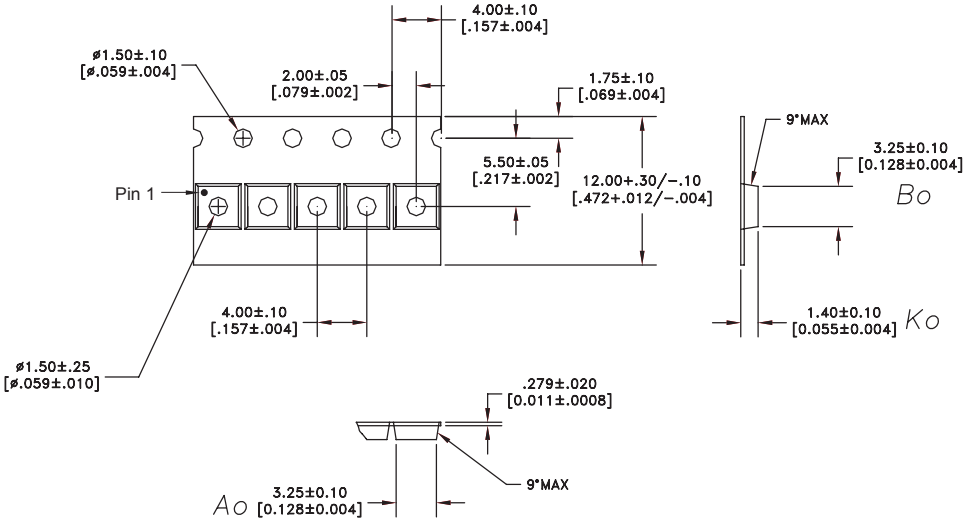


Figure 11: Branding Specification - M45 Package

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 12: Tape & Reel Packaging

Table 8: 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
AWT6621RM45Q7	-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
AWT6621RM45P9	-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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