Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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4.0W CLASS-G AUDIO AMPLIFIER WITH INTEGRATED BOOST CONVERTER AND BATTERY TRACKING AGC

Description

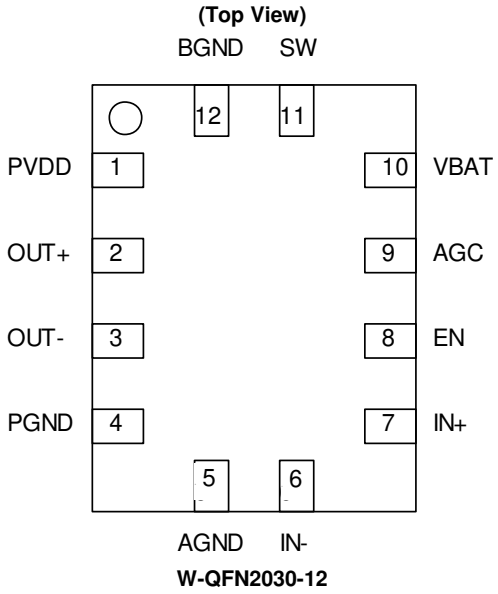
The PAM8945 is a high-efficiency Class-G audio power amplifier with an integrated boost converter. It drives up to 4.0W (10% THD+N) into a 4Ω speaker. With 85% typical efficiency, the PAM8945 helps extend battery life when playing audio.

The built-in boost converter generates the voltage rail for the output stage. This provides a louder audio output than a stand-alone amplifier connected directly to the battery. It also maintains a consistent loudness, regardless of battery voltage.

The PAM8945 features battery tracking AGC function which adjusts the amplifier gain to limit battery current at lower battery voltage.

The PAM8945 features DC input protection and all outputs are fully protected against output-to-output shorts. The PAM8945 is available in tiny W-QFN2030-12 package.

Pin Assignments



W-QFN2030-12

Features

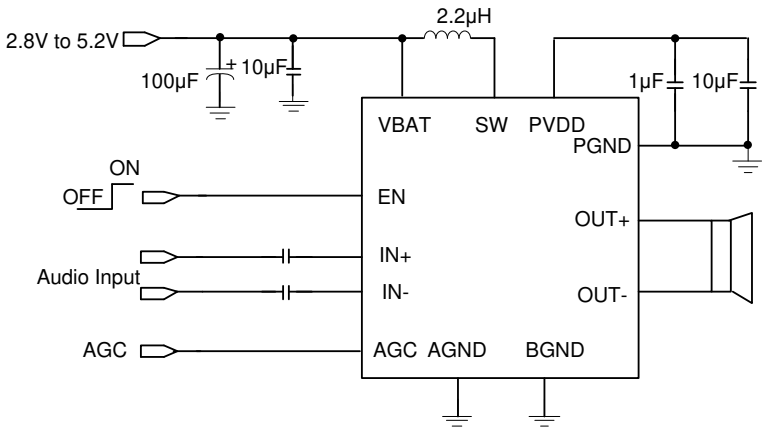
- Built-in Battery Tracking Automatic Gain Control (AGC)
- High-Efficiency Integrated Boost Converter Over 85%
- 4.0W into a 4Ω Load at 10% THD
- 3.2W into a 4Ω Load at 1% THD
- Operates from 2.8V to 5.2V
- Efficient Class-G Prolongs Battery Life
- Minimized ON/OFF Pop Noise
- Superior Low Noise
- High PSRR
- DC Input Protection
- Auto-Recovery Short-Circuit Protection
- Thermal Shutdown
- Available in 2.0mm x 3.0mm 12L W-QFN Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Applications

- Cell Phones
- PDA
- GPS
- Portable Electronics
- Speakers

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

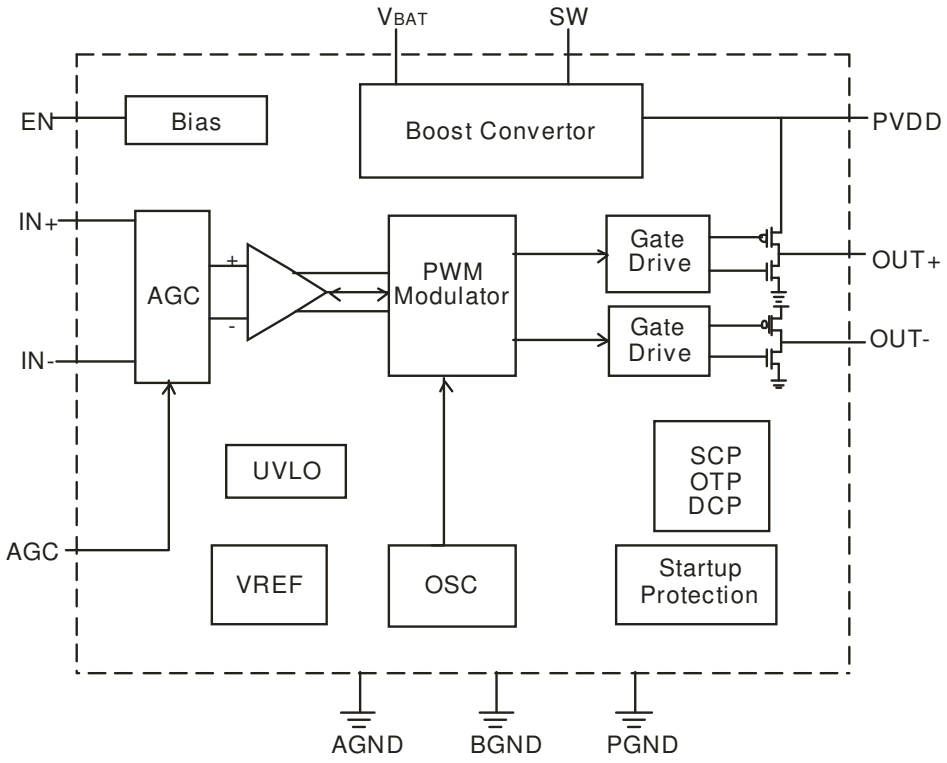
Typical Applications Circuit



Pin Descriptions

Pin Number	Pin Name	Description
1	PVDD	Boost Converter Output and Amplifier Power Supply
2	OUT+	Amplifier Positive Audio Output
3	OUT-	Amplifier Negative Audio Output
4	PGND	Power Ground
5	AGND	Analog Ground
6	IN-	Negative Audio Input
7	IN+	Positive Audio Input
8	EN	Shutdown Terminal for the Chip
9	AGC	AGC Setting Gain
10	VBAT	Supply Voltage
11	SW	Boost Convertor Switching
12	BGND	Power Ground

Functional Block Diagram



Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Value	Unit
V_{BAT}	Supply Voltage	-0.3 to 6.0	V
V_I	Input Voltage, EN, IN+, IN-, AGC	-0.3 to V_{BAT} + 0.3	V
T_A	Operating Free-air Temperature Range	-40 to +85	°C
T_J	Operating Junction Temperature Range	-40 to +150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C

Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter		Min	Max	Unit
V_{BAT}	Supply Voltage		2.8	5.2	V
V_{IH}	High-Level Input Voltage	EN	1.3	V_{BAT}	V
V_{IL}	Low-Level Input Voltage	EN	GND	0.6	V
T_A	Operating Free-Air Temperature		-40	+85	°C

Thermal Information

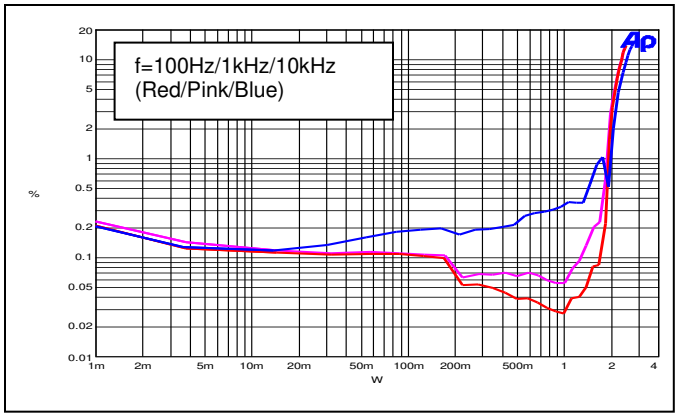
Symbol	Parameter	Package	Max	Unit
θ_{JA}	Thermal Resistance (Junction to Ambient)	W-QFN2030-12	62	°C/W
θ_{Jc}	Thermal Resistance (Junction to Case)	W-QFN2030-12	11	

Electrical Characteristics (@VBAT=3.6V, AGC=GND, T_A = +25°C, R_L=4Ω+33μH, unless otherwise specified.)

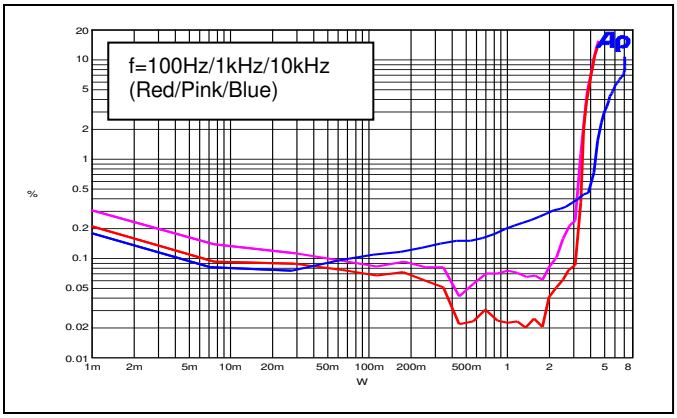
Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{BAT}	Supply Voltage	—		2.8	—	5.2	V
P_O	Output Power	THD+N=10%, f=1kHz	V_{BAT}=3.6V	—	4.0	—	W
		THD+N=1%, f=1kHz		—	3.2	—	W
THD+N	Total Harmonic Distortion Plus Noise	P_O=1.0W, R_L=8Ω	f=1kHz	—	0.07	—	%
		P_O=2W, R_L=4Ω		—	0.15	—	
PSRR	Power Supply Ripple Rejection	V_{BAT}=3.6V, Input AC - ground with C=1μF	f=217Hz	—	70	—	dB
			f=1kHz	—	70	—	
			f=10kHz	—	67	—	
SNR	Signal-To-Noise Ratio	A-weighting	THD+N=1%	—	95	—	dB
V_{OP}	Peak Output Voltage	V_{BAT}=3.6V	f=1kHz	—	5.75	—	V
V_{O_TH}	Boost Convertor Auto-Pass Through Threshold	—	—	—	2	—	V(PEAK)
V_N	Output Noise	Input AC-ground	No A-weighting	—	100	—	μV
			A-weighting	—	60	—	
η	Efficiency	R_L=8Ω, P_O=1W	f=1kHz	—	86	—	%
I_Q	Quiescent Current	V_{BAT}=3.6V	No Load	—	4	—	mA
I_{SD}	Shutdown Current	V_{BAT}=2.8V to 5.2V	EN=0V	—	—	1	μA
$R_{DS(ON)}$	Static Drain-to-Source On-State Resistor	High Side PMOS, I=500mA	V_{BAT}=5V	—	260	—	mΩ
		Low Side NMOS, I=500mA	V_{BAT}=5V	—	160	—	mΩ
f_{SW}	Switching Frequency	V_{BAT}=2.8V to 5.2V	Boost	—	1,200	—	kHz
			Class D	—	300	—	
G_V	Closed-Loop Gain	—	—	—	20	—	dB
R_{IN}	Input Impedance	A_v=20dB	—	—	24	—	KΩ
V_{OS}	Output Offset Voltage	Input AC-ground	—	—	—	20	mV
I_{PEAK}	Convertor SW Peak Current	V_{BAT}=3.6V	—	—	4	—	A
t_{ON}	Start-Up Time From EN	—	—	—	6	—	ms
V_{IH}	En Input High Voltage	V_{BAT}=5V	—	1.3	—	—	V
V_{IL}	En Input Low Voltage	V_{BAT}=5V	—	—	—	0.6	

Performance Characteristics (@V_{BAT}=3.6V, AGC=GND, T_A = +25°C, R_L=8Ω +33μH, unless otherwise specified.)

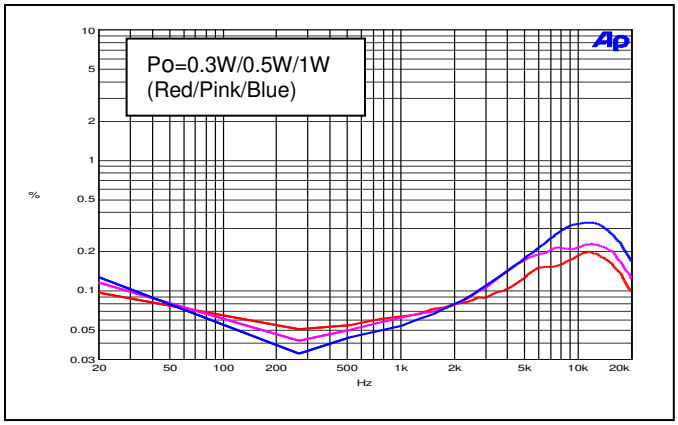
THD+N vs. Output Power (R_L= 8Ω)



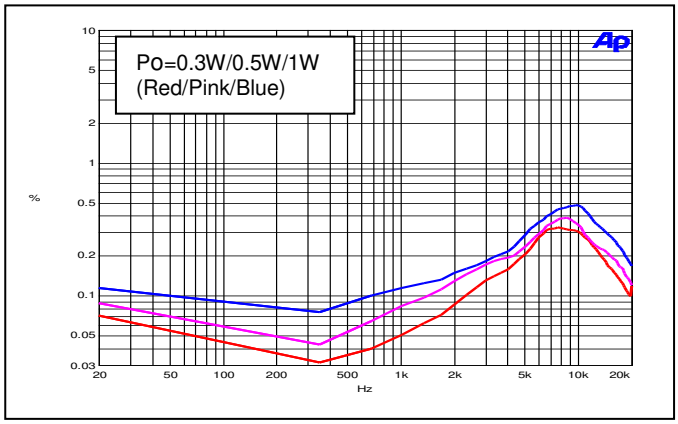
THD+N vs. Output Power (R_L = 4Ω)



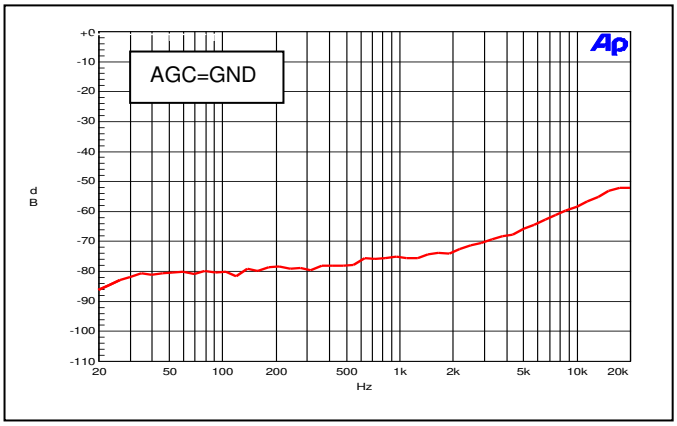
THD+N vs. Frequency (R_L = 8Ω)



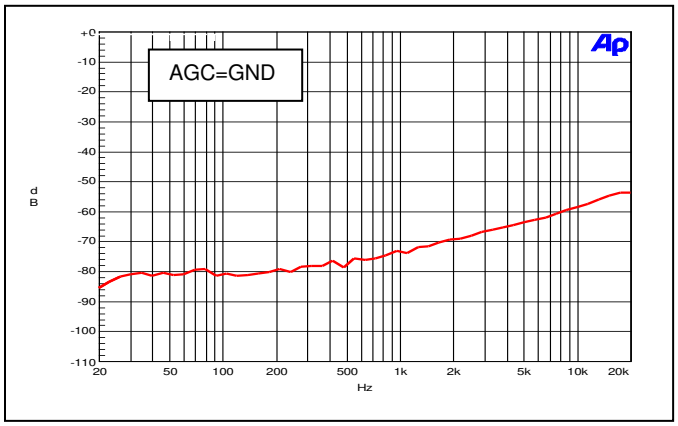
THD+N vs. Frequency (R_L = 4Ω)



PSRR vs. Frequency (R_L = 8Ω)

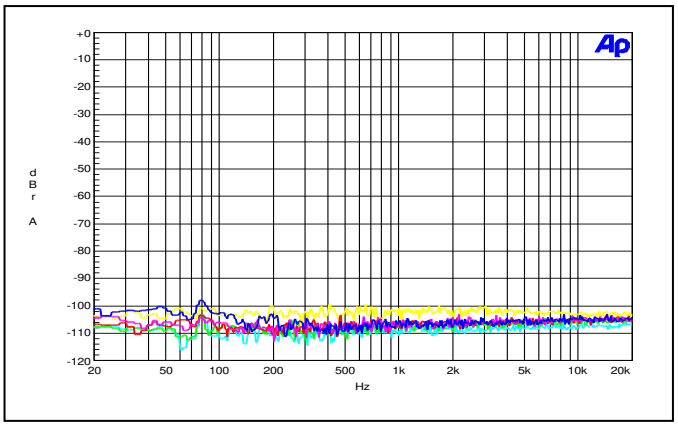


PSRR vs. Frequency (R_L = 4Ω)

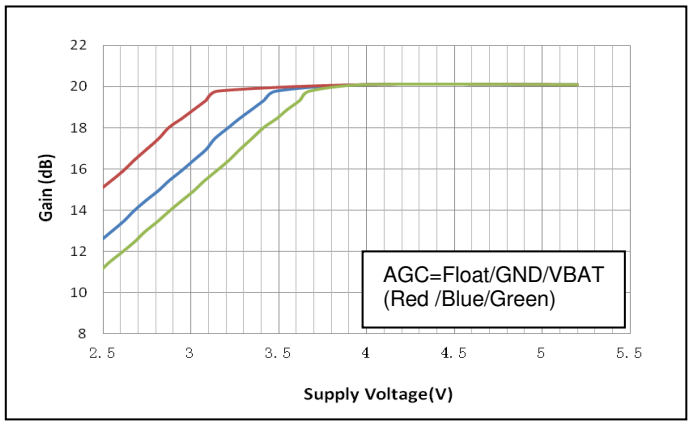


Performance Characteristics (@V_{BAT}=3.6V, AGC=GND, T_A = +25°C, R_L=8Ω+33μH, unless otherwise specified.)

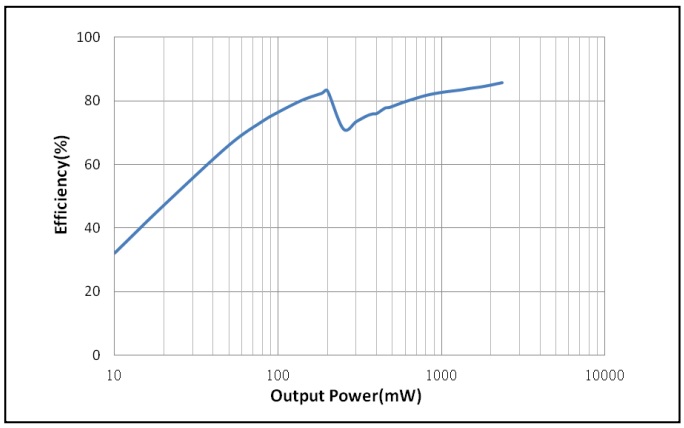
Noise Floor (R_L =8Ω)



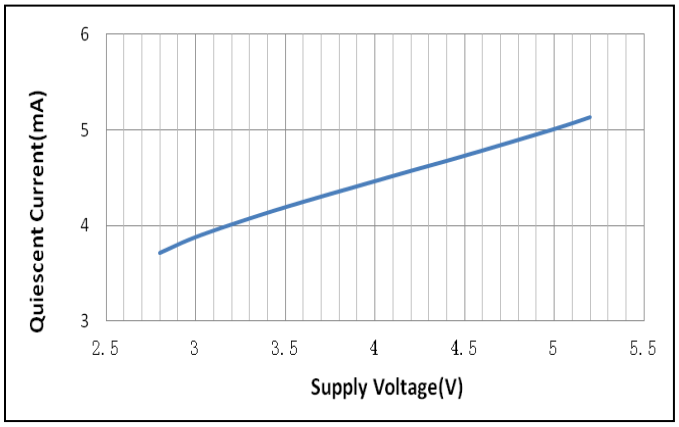
Gain vs. Supply Voltage



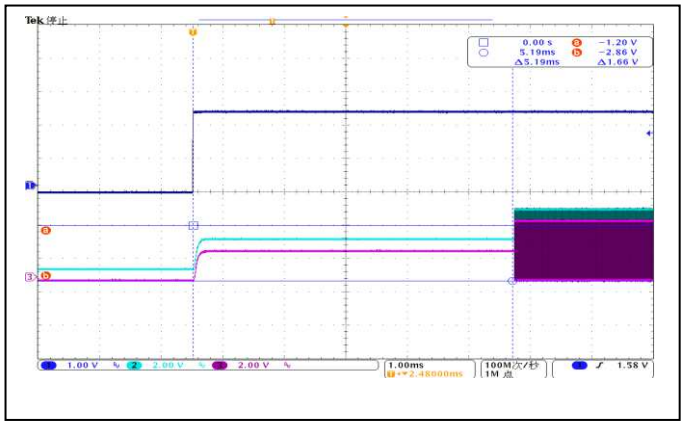
Efficiency vs. Output Power (R_L =8Ω)



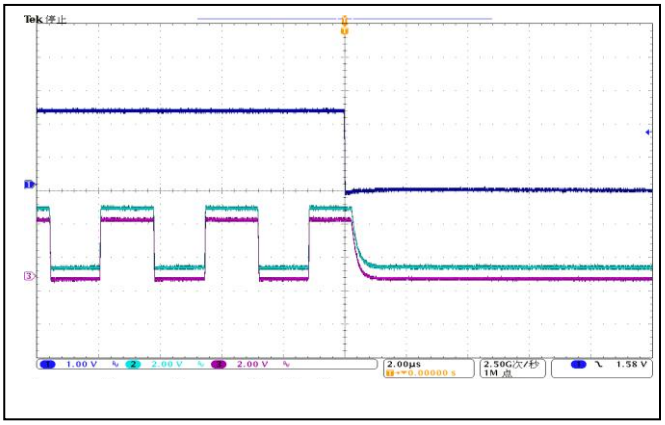
Quiescent Current vs. Supply Voltage



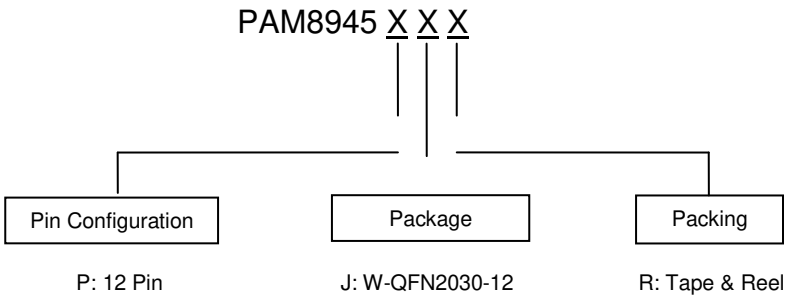
Start Up



Shutdown



Ordering Information (Note 4)



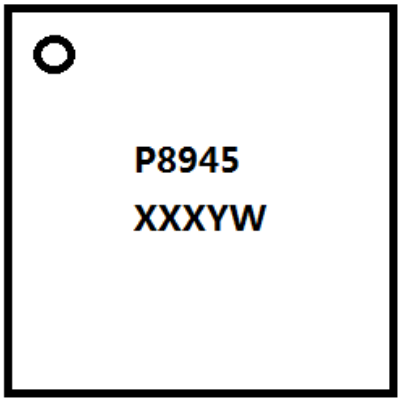
Part Number	Package	7" Tape and Reel	
		Quantity	Part Number Suffix
PAM8945PJR	W-QFN2030-12	3,000/Tape & Reel	-7

Note: 4. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

Marking Information

W-QFN2030-12

(Top View)

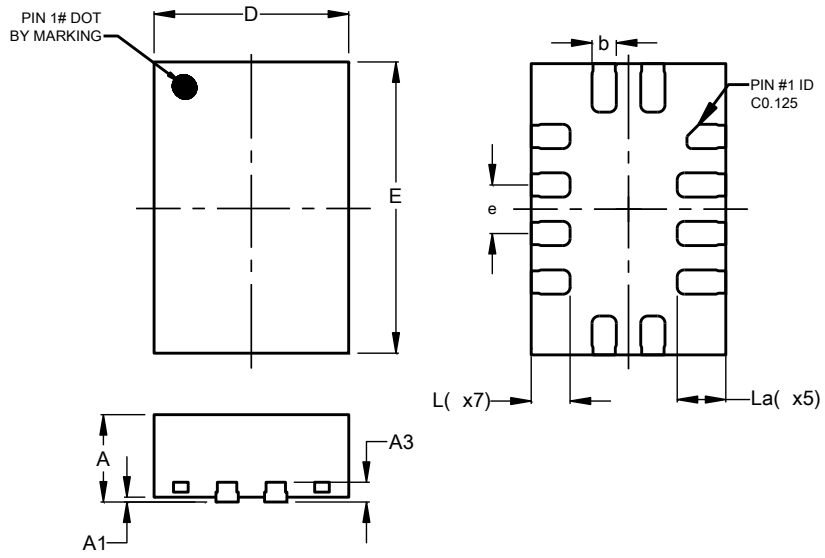


P8945: Product Code
X: Internal Code
Y: Year 0~9
W: Week: A~Z: 1~26 weeks;
a~z: 27~52 weeks; z
represents 52 and 53 weeks.

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

W-QFN2030-12

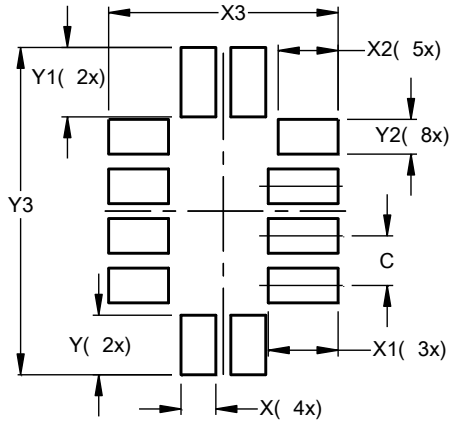


W-QFN2030-12			
Dim	**Min**	**Max**	**Typ**
A	0.700	0.800	0.750
A1	--	0.050	--
A3	0.203 REF		
b	0.200	0.300	0.250
D	1.950	2.050	2.000
E	2.950	3.050	3.000
e	0.500 BSC		
L	0.350	0.450	0.400
La	0.450	0.550	0.50
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

W-QFN2030-12



Dimensions	Value (in mm)
C	0.500
X	0.350
X1	0.700
X2	0.600
X3	2.300
Y	0.600
Y1	0.700
Y2	0.350
Y3	3.300

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

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