1.9W Class-D Audio Amplifier with Integrated Boost Converter and Battery Tracking AGC

PAM8905

Description

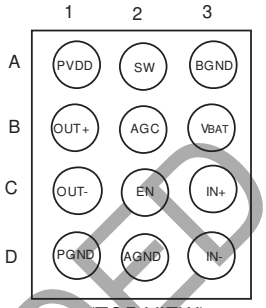
The PAM8905 is a high efficiency Class-D audio power amplifier with an integrated boost converter. It drives up to 1.9W (1% THD+N) into an 8Ω speaker. With 85% typical efficiency, the PAM8905 helps extend battery life when playing audio.

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 PAM8905 features battery tracking AGC function which adjusts the Class-D gain to limit battery current at lower battery voltage.

PAM8905 features DC input protection and all outputs are fully protected against output-to-output shorts. The PAM8905 is available in U-WLB1520-12 package.

Pin Assignments



(TOP VIEW)

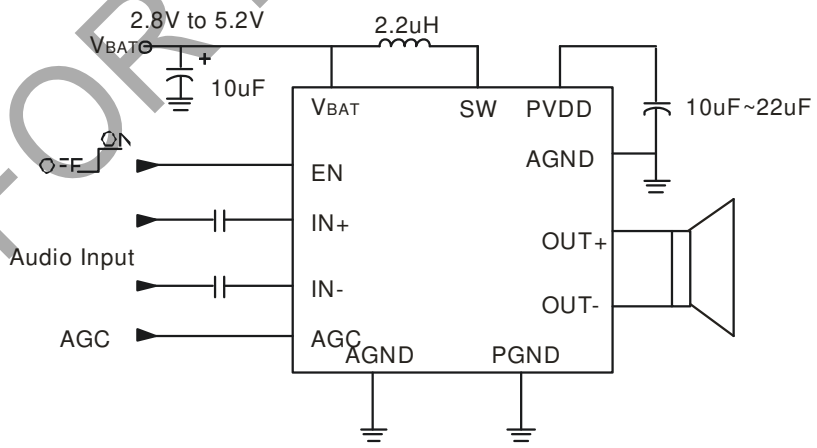
Features

- Built-In Battery Tracking Automatic Gain Control (AGC)
- High Efficiency Integrated Boost Converter Over 85%
- 1.9W into an 8Ω Load from a 3.6V Supply
- Operates from 2.8V to 5.2V
- Efficient Class-D 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 U-WLB1520-12 Package

Applications

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

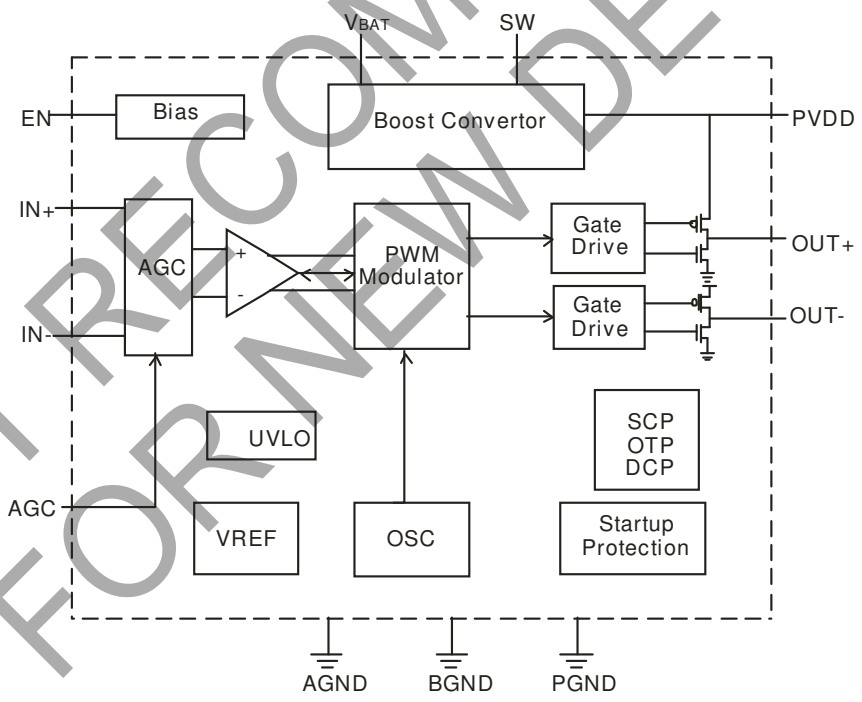
Typical Applications Circuit



Pin Descriptions

Pin Name	Pin Number	Description
PVDD	A1	Boost Converter Output and Class D Amplifier Power Supply
OUT+	B1	Amplifier Positive Audio Output
OUT-	C1	Amplifier Negative Audio Output
PGND	D1	Class-D Power Ground
SW	A2	Boost Convertor Switching
AGC	B2	AGC Inflection Point Select Connect to VBAT, GND or Float. Voltage at AGC pin is only read at device power-up. A power cycle is required to change inflection points.
EN	C2	Device Enable Set to logic high to enable
AGND	D2	Analog Ground
BGND	A3	Boost Converter Power Ground
VBAT	B3	Supply Voltage
IN+	C3	Positive Audio Input
IN-	D3	Negative Audio Input

Block Diagram



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

		VALUE	UNIT
VBAT	Supply voltage	–0.3 to 6.0	V
V_I	Input voltage, EN, IN+, IN–, AGC	–0.3 to VBAT + 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.)

			MIN	MAX	UNIT
VBAT	Supply voltage		2.8	5.2	V
V_{IH}	High-level input voltage	EN	1.3	VBAT	V
V_{IL}	Low-level input voltage	EN	GND	0.6	V
T_A	Operating free-air temperature		–40	85	°C

Thermal Information

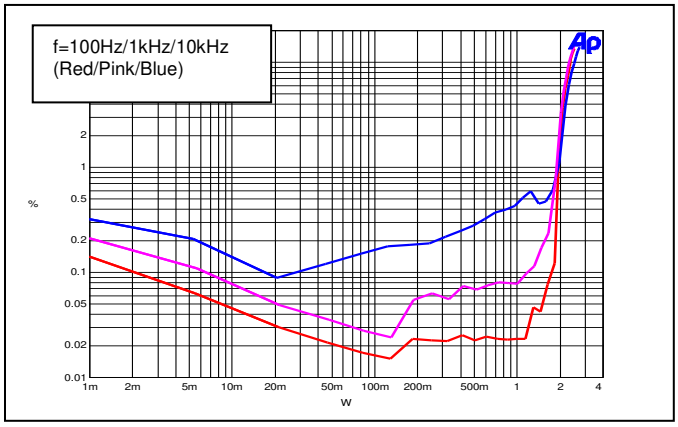
Parameter	Symbol	Package	Maximum	Unit
Thermal Resistance (Junction to Ambient)	θ_{JA}	U-WLB1520-12	85	°C/W

Electrical Characteristics (@VBAT=3.6V, AGC=GND, T_A = +25°C, RL=8Ω+33μH, unless otherwise specified.)

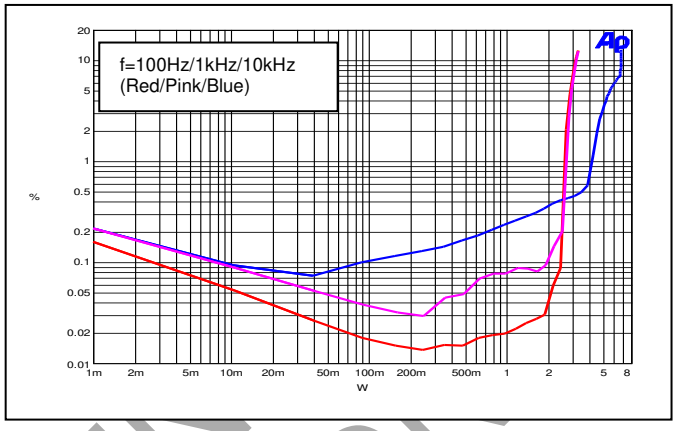
Symbol	Parameter	Test Conditions		MIN	TYP	MAX	UNIT
VBAT	Supply Voltage			2.8	—	5.2	V
Po	Output Power	THD+N=1%,f=1kHz	VBAT=3.6V	—	1900	—	mW
			VBAT=3.0V	—	1750	—	
			VBAT=2.8V	—	1600	—	
THD+N	Total Harmonic Distortion Plus Noise	Po=1.0W,RL=8Ω	f=1kHz	—	0.07	—	%
		Po=2W,RL=4Ω		—	0.15	—	
PSRR	Power Supply Ripple Rejection	VBAT=3.6V, Inputs AC-Grounded with C=1μF	f=217Hz	—	-70	—	dB
			f=1kHz	—	-70	—	
SNR	Signal-to-Noise Ratio	A-Weighting	THD+N=1%	—	95	—	dB
Vop	Peak Output Voltage	VBAT=3.6V	f=1kHz	—	5.75	—	V
Vo_TH	Boost Convertor Auto-Pass Through Threshold	—	—	—	2	—	Vpk
Vn	Output Noise	Inputs AC-Grounded	No A-Weighting	—	100	—	μV
			A-Weighting	—	60	—	
η	Efficiency	VBAT=4.2V, Po=1.5W	f=1kHz	—	85	—	%
IQ	Quiescent Current	VBAT=3.6V	No Load	—	4	—	mA
Isd	Shutdown Current	VBAT=2.8V to 5.2V	EN=0V	—	—	1	μA
Rdson	Static Drain-to Source On-State Resistor	High Side PMOS,I=500mA	VBAT=5V	—	260	—	mΩ
		Low Side NMOS,I=500mA	VBAT=5V	—	160	—	mΩ
fsw	Switching Frequency	VBAT=2.8V to 5.2V	Boost	—	1200	—	kHz
			Class D	—	300	—	
Gv	Closed-Loop Gain	—	—	—	20	—	dB
RIN	Input Impedance	Av=20dB	—	—	24	—	KΩ
Vos	Output Offset Voltage	Input AC-Ground	—	—	—	10	mV
Ipeak	Convertor SW Peak Current	VBAT=3.6V	—	—	2	—	A
Ton	Start-up Time From EN	—	—	—	6	—	mS
VIH	EN Input High Voltage	VBAT=5V	—	1.3	—	—	V
VIL	EN Input Low Voltage	VBAT=5V	—	—	—	0.6	

Performance Characteristics (@VBAT=3.6V, AGC=GND, T_A = +25°C, RL=8Ω+33μH, unless otherwise specified.)

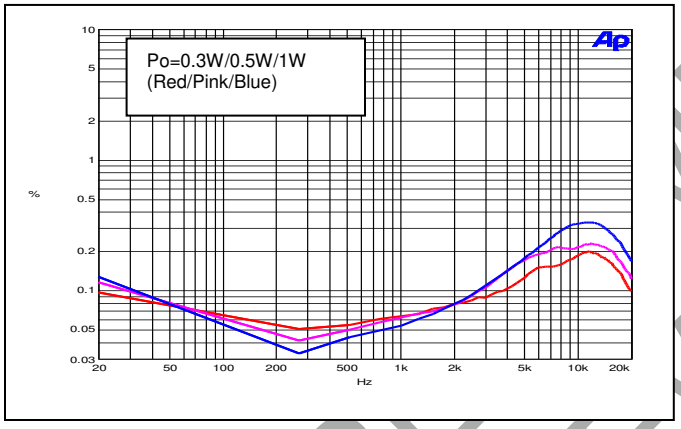
THD+N Vs. Output Power (RL=8Ω)



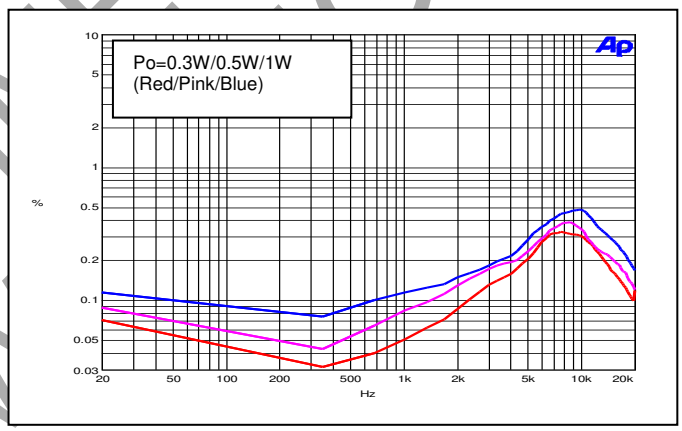
THD+N Vs. Output Power (RL=4Ω)



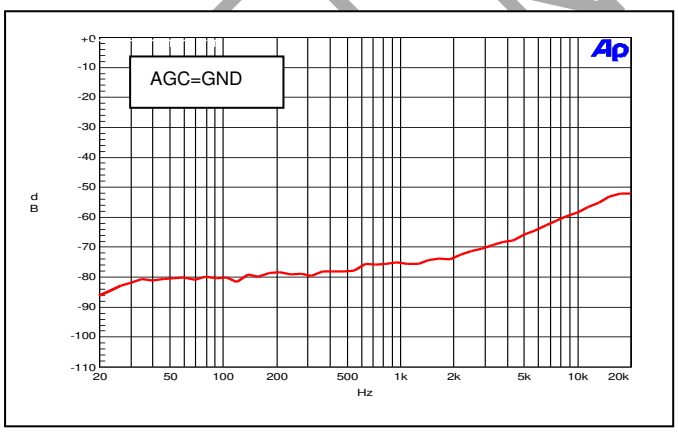
THD+N Vs. Frequency (RL=8Ω)



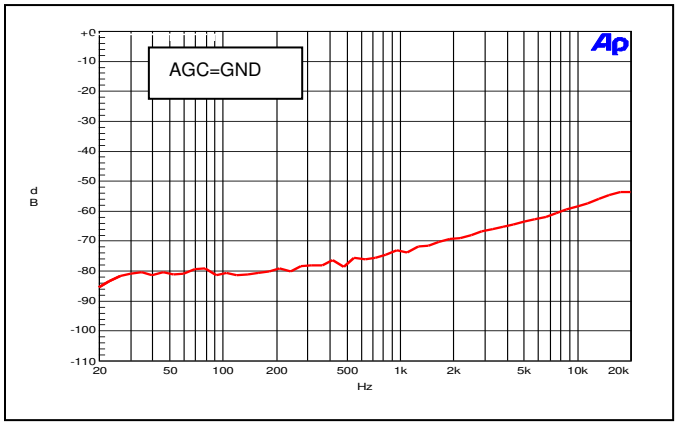
THD+N Vs. Frequency (RL=4Ω)



PSRR Vs. Frequency(RL=8Ω)

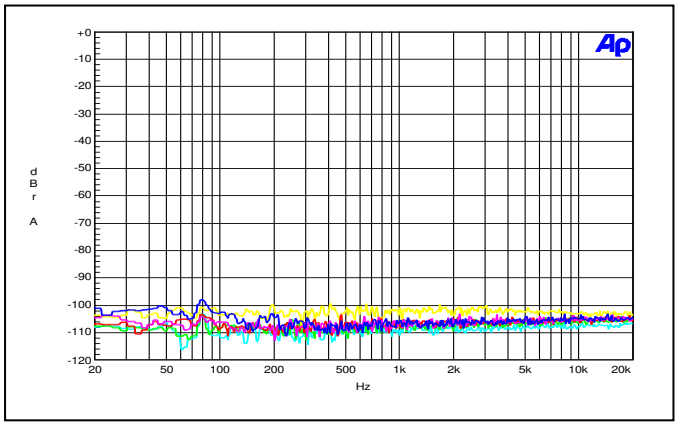


PSRR Vs. Frequency(RL=4Ω)

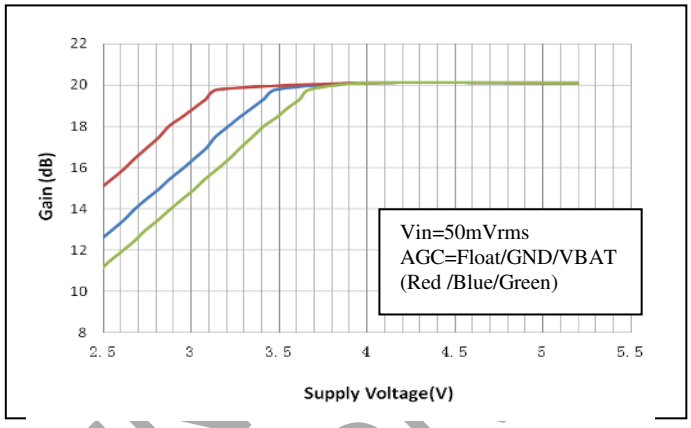


Performance Characteristics (@VBAT=3.6V, AGC=GND, T_A = +25°C, RL=8Ω+33uH, unless otherwise specified.)

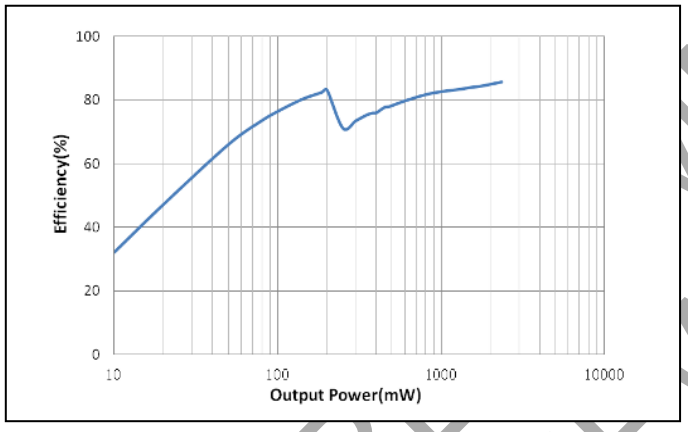
Noise Floor (RL=8Ω)



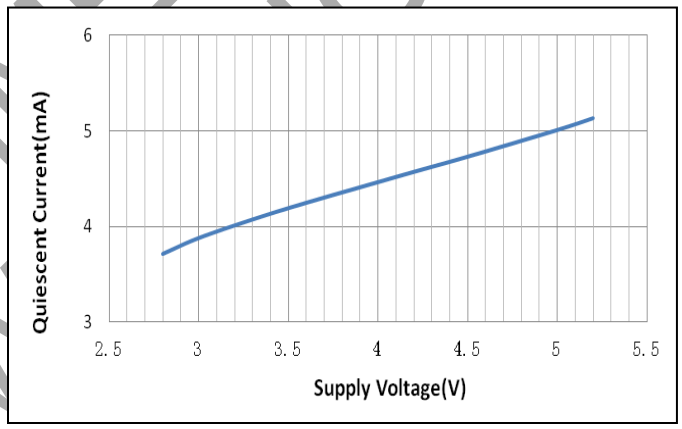
Gain Vs. Supply Voltage



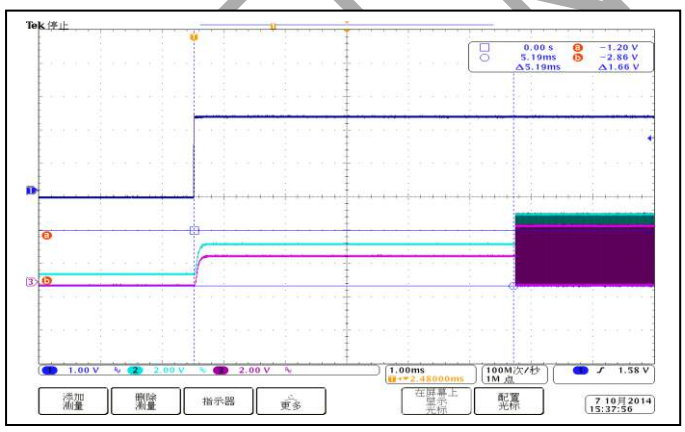
Efficiency Vs. Output Power (RL=8Ω)



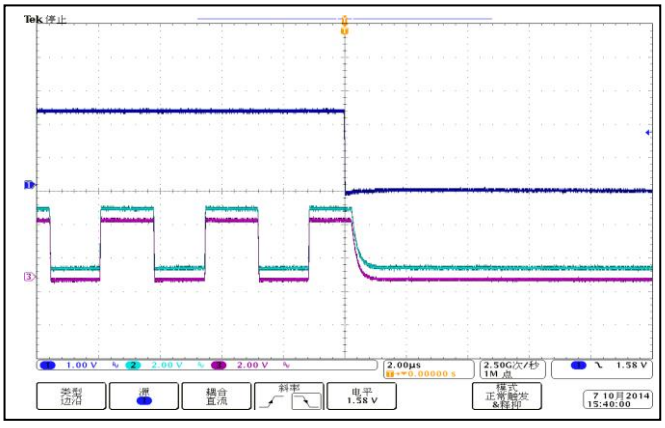
Quiescent Current Vs. Supply Voltage



Start-Up



Shutdown



Ordering Information

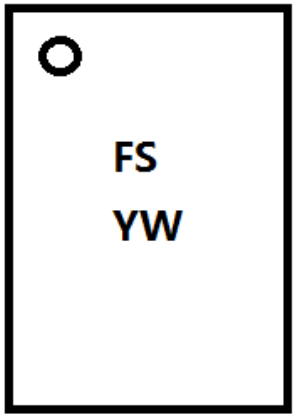
PAM8905 X X X

Pin Configuration	Package Type	Shipping Package
P: 12 Pin	Z: U-WLB1520-12	R: Tape & Real

Part Number	Package	Standard Package
PAM8905PZR	U-WLB1520-12	3,000Units/Tape & Reel

Marking Information

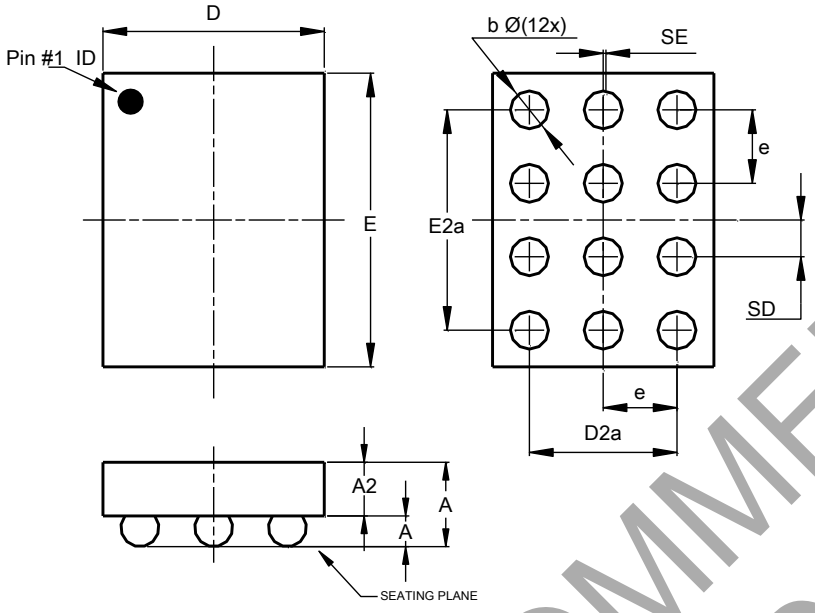
U-WLB1520-12



FS: Product Code
Y: Year
W: Week

Package Outline Dimensions (All dimensions in mm.)

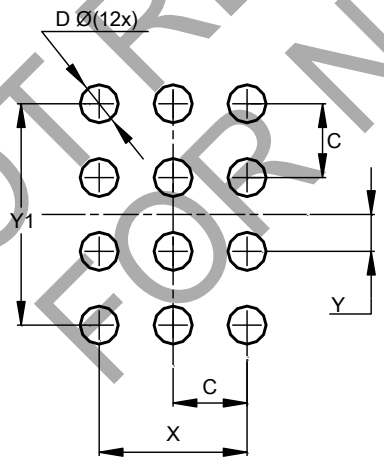
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.



U-WLB1520-12			
Dim	**Min**	**Max**	**Typ**
A	0.500	0.600	0.550
A1	0.185	0.235	0.210
A2	0.315	0.365	0.340
b	0.208	0.308	0.258
D	1.420	1.500	--
D2a	0.950	1.050	1.000
E	1.920	2.000	--
E2a	1.450	1.550	1.500
e	0.500 BSC		
SD	0.250 BSC		
SE	0.000 BSC		
All Dimensions in mm			

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



Dimensions	Value (in mm)
C	0.500
D	0.258
X	1.000
Y	0.250
Y1	1.500

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