Class AB Stereo Headphone Driver

Features

- Operating Voltage
  - Single Supply 3V to 7V
  - Dual Supply ±1.5V to ± 3.5V
- High Signal-to-Noise Ratio 100dB
- High Slew Rate 5V/ μs
- Low Distortion -65dB
- Large Output Voltage Swing
- Excellent Power Supply Ripple Rejection
- Low Power Consumption
- Short-circuit Elimination
- Wide Temperature Range
- No Switch ON/OFF Clicks
- Available in 8 pin SOP or DIP Package

Applications

- Portable Digital Audio

Gereral Description

The APA2308 is an integrated class AB stereo headphone driver contained in an SO-8 or a DIP-8 plastic package. The APA2308 is capable of delivering 280mW of max. output power to an 8Ω load or 110mW to a 32Ω load with less than 10% (THD+N) from a 5V power supply. The device is fabricated in a CMOS process and has been primarily developed for portable digital audio applications.

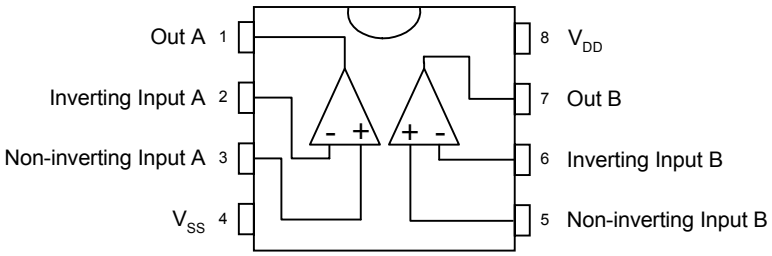
Ordering Information

APA2308 □□-□□

- Handling Code
- Temp. Range
- Package Code

Package Code
J : PDIP - 8
K : SOP - 8
Temp. Range
I : - 40 to 85°C
Handling Code
TU : Tube
TR : Tape & Reel

Block Diagram



APA2308

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{DD}	Supply Voltage	8	V
$T_{SC\ (O)}$	Output Short-circuit Duration, at T_A=25°C, P_{TOT}=1W	20	S
T_A	Operating Ambient Temperature range	-40 to 85	°C
T_J	Maximum Junction Temperature	150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_S	Soldering Temperature,10 seconds	260	°C
V_{ESD}	Electrostatic Discharge	-3000 to 3000 *1	V

Note: *1. Human body model : C=100pF, R=1500Ω, 3 positive pulses plus 3 negative pulses

Thermal Characteristics

Symbol	Parameter	Value	Unit
R_{THJA}	Thermal Resistance from Junction to Ambient in Free Air		
	DIP-8	109	K/W
	SO-8	210	K/W

Electrical Characteristics

V_{DD}=5V, V_{SS}=0V, T_A=25°C, f_i=1kHz, R_L=32Ω (unless otherwise noted)

Symbol	Parameter	Test Conditions	APA2308			Unit
			Min.	Typ.	Max.	
Supply						
V_{DD}	Supply Voltage					V
	Single		3.0	5.0	7.0	
	Dual		1.5	2.5	3.5	
V_{SS}	Negative Supply Voltage		-1.5	-2.5	-3.5	V
I_{DD}	Supply Current	No Load		2.5	5	mA
P_{TOT}	Total Power Dissipation	No Load		12.5	25	mW
DC Characteristics						
$V_{I(OS)}$	Input Offset Voltage			5		mV
I_{BIAS}	Input Bias Current			10		pA
V_{CM}	Common Mode Voltage		0		3.5	V
G_V	Open-loop Voltage Gain	R_L=5kΩ		75		dB
I_O	Max. Output Current	(THD+N)/S<0.1%		140		mA
R_O	Output Resistance			0.25		Ω
V_O	Output Voltage Swing	R_L=32Ω*1	0.25		4.75	V
		R_L=16Ω*1	0.5		4.5	
PSRR	Power Supply Rejection Ratio	f_i=100Hz $V_{RIPPLE(P-P)}$=100mV		65		dB
α_{CS}	Channel Separation	R_L=32Ω		95		dB
C_L	Load Capacitance				200	pF

Electrical Characteristics

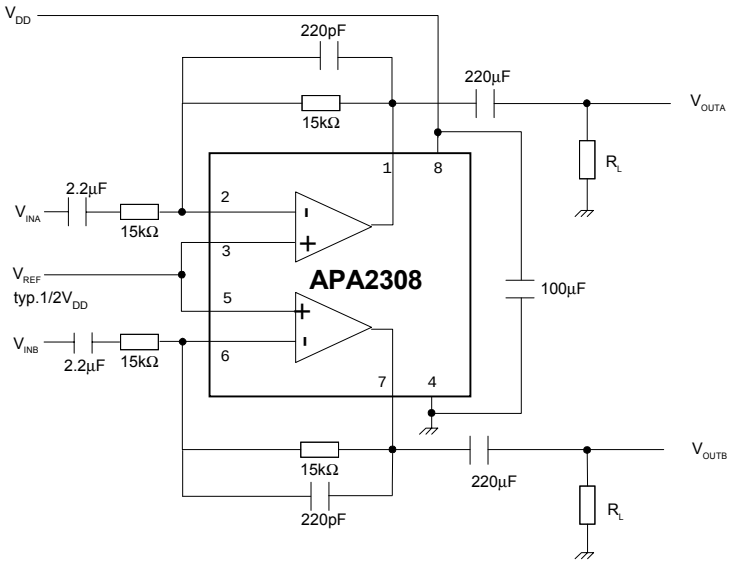
V_{DD}=5V, V_{SS}=0V, T_A=25°C, f_i=1kHz, R_L=32Ω (unless otherwise noted)

Symbol	Parameter	Test Conditions	APA2308			Unit
			Min.	Typ.	Max.	
AC Characteristics						
(THD+N)/S	Total Harmonic Distortion plus Noise to Signal Ratio	R_L=32Ω*2		-65	-60	dB
				0.05	0.1	%
S/N	Signal to Noise Ratio		90	100		dB
f_G	Unity Gain Frequency	Open-loop, R_L=5kΩ		5		MHz
P_O	Max. Output Power	(THD+N)/S < 0.1%		84		mW
C_I	Input Capacitance			3		pF
SR	Slew Rate	Unity Gain Inverting		5		V/μs
B	Power Bandwidth	Unity Gain Inverting		20		kHz

Notes : *1 : Values are proportional to V_{DD} ; (THD+N)/S < 0.1%

*2 : V_{DD}=5.0V ; $V_{O(p-p)}$=3.5V (at 0 dB)

Test And Application Circuits



Typical Characteristics

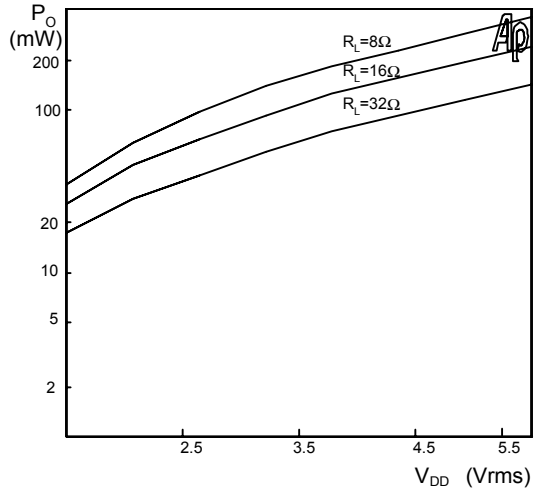


Fig. 1 Output power as a function of supply voltage

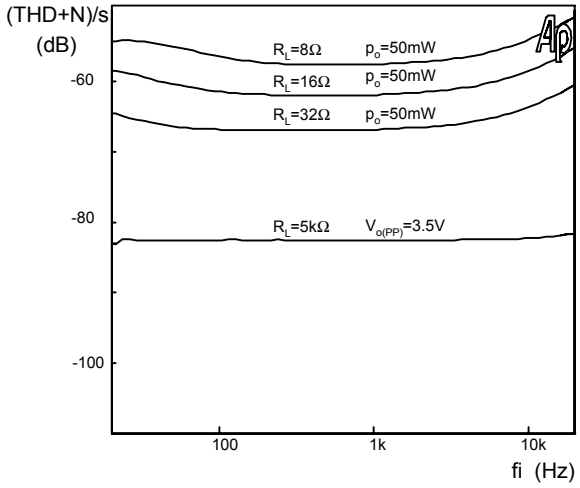


Fig. 2 Total harmonic distortion plus noise-to-signal ratio as a function of input frequency

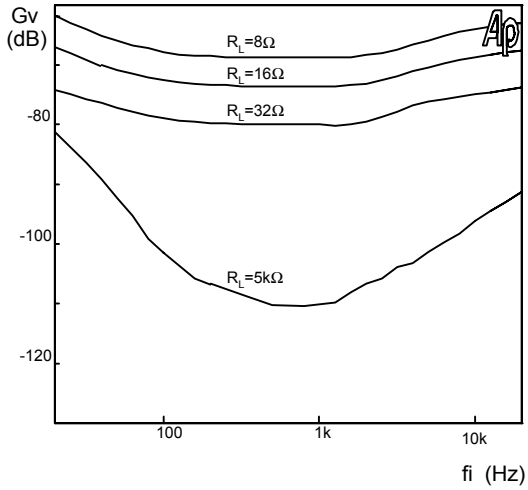


Fig. 3 Crosstalk as a function of input frequency

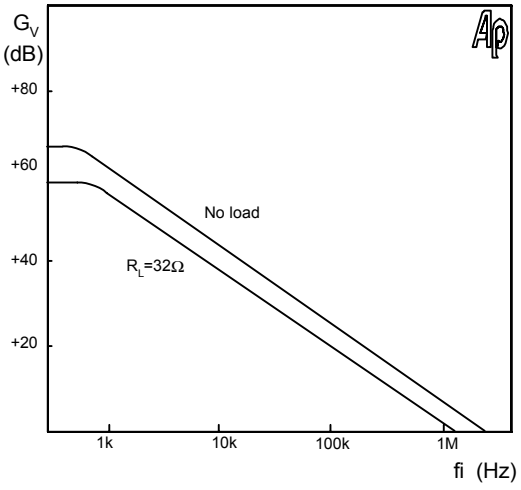


Fig. 4 Open loop gain as a function of Input frequency

Typical Characteristics (Cont.)

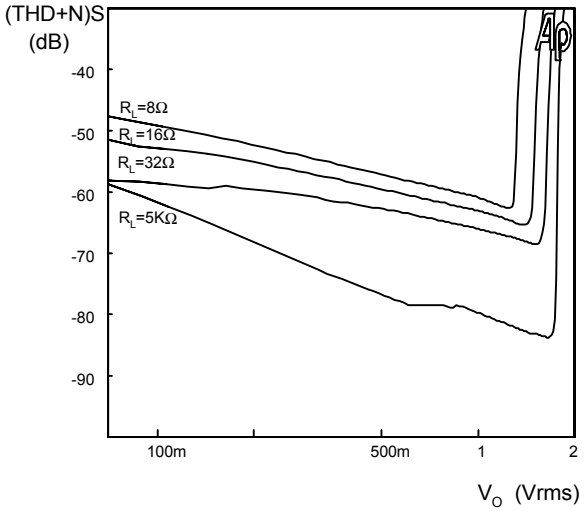


Fig. 5 Total harmonic distortion plus noise-to-signal ratio as a function of output voltage

Customer Service

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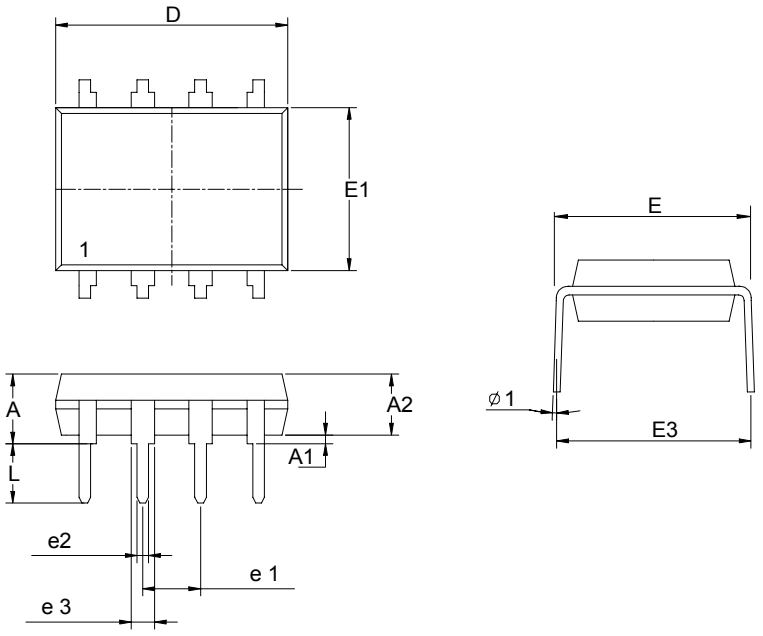
Packaging Information

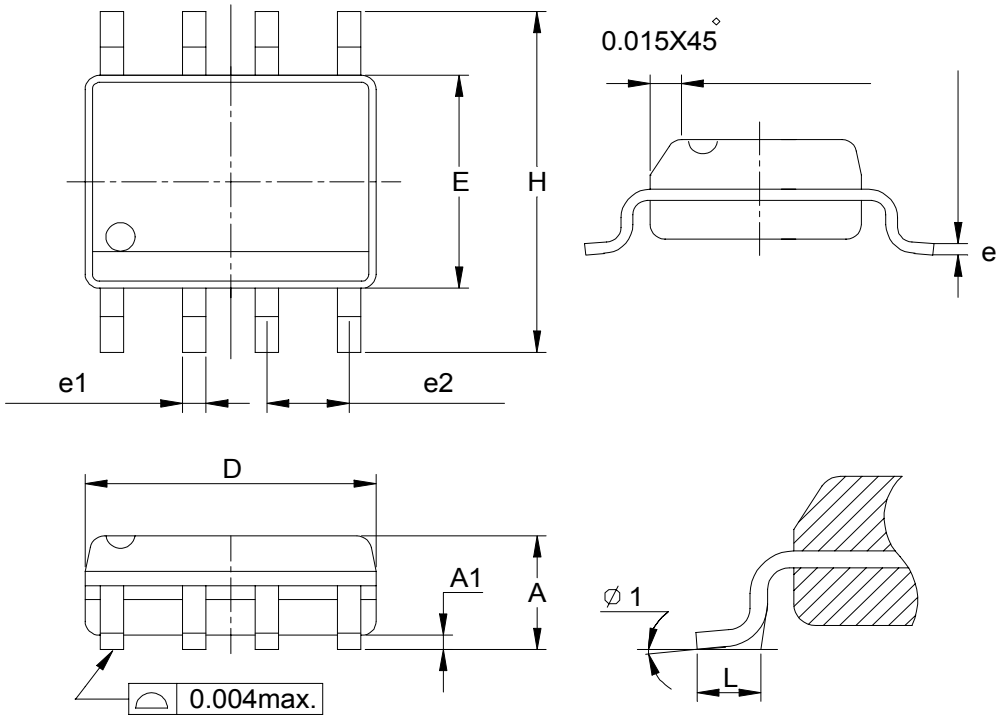
PDIP-8 pin (Reference JEDEC Registration MS-001)



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		5.33		0.210
A1	0.38		0.015	
A2	2.92	3.68	0.115	0.145
D	9.02	10.16	0.355	0.400
e1	2.54BSC		0.100BSC	
e2	0.36	0.56	0.014	0.022
e3	1.14	1.78	0.045	0.070
E	7.62 BSC		0.300 BSC	
E1	6.10	7.11	0.240	0.280
E3		10.92		0.430
L	2.92	3.81	0.115	0.150
ϕ 1	15°		15°	

Packaging Information

SOP-8 pin (Reference JEDEC Registration MS-012)



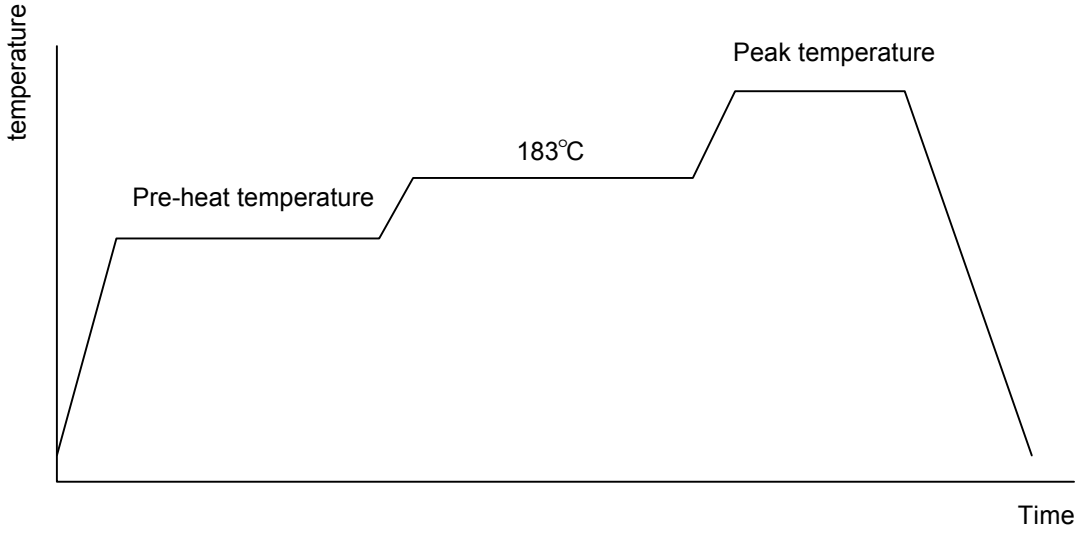
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
ϕ 1	0°	8°	0°	8°

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.
Packaging	2500 devices per reel

Reflow Condition (IR/Convection or VPR Reflow)

Reference JEDEC Standard J-STD-020A APRIL 1999



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max	
Temperature maintained above 183°C	60 – 150 seconds	
Time within 5°C of actual peak temperature	10 –20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215-219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

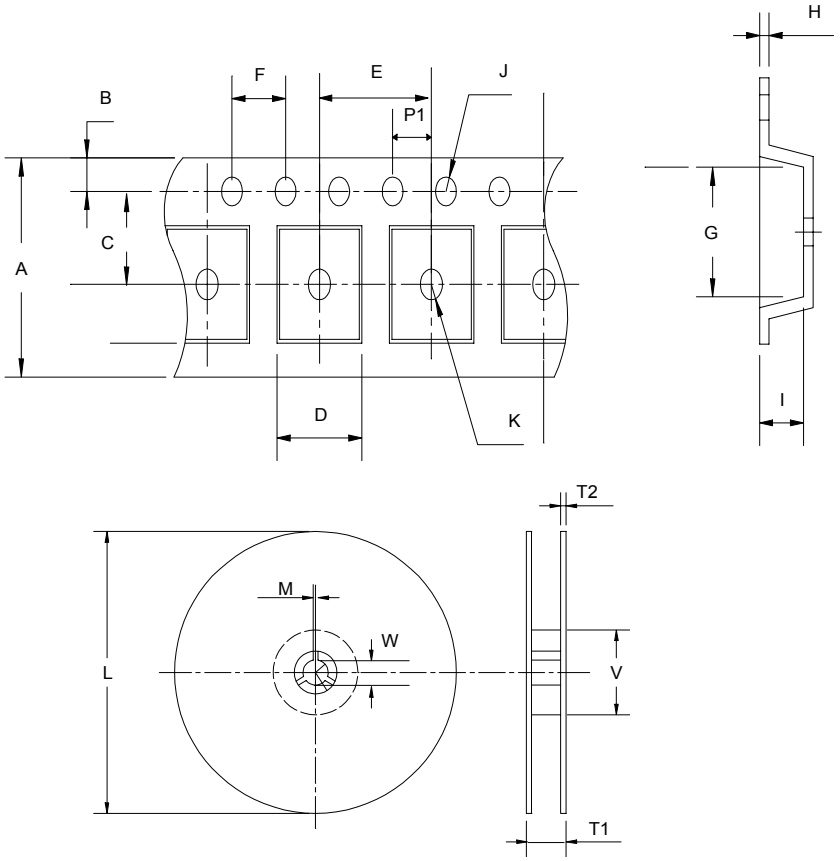
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm³	pkg. thickness < 2.5mm and pkg. volume < 350mm³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

Reliability test program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C , 5 SEC
HOLT	MIL-STD-883D-1005.7	1000 Hrs Bias @ 125 °C
PCT	JESD-22-B, A102	168 Hrs, 100 % RH , 121°C
TST	MIL-STD-883D-1011.9	-65°C ~ 150°C, 200 Cycles
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms , I_{tr} > 100mA

Carrier Tape & Reel Dimensions



Application	A	E	B	C	J	K	F	P1	D
SOP 8N	12 + 0.3 12 - 0.1	8.0 ± 0.1	1.75± 0.1	5.5± 0.1	1.55± 0.1	1.5± 0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1
Application	G	I	H	L	V	W	M	T1	T2
SOP 8N	5.2 ±0.1	2.1 ± 0.1	0.3±0.013	330±1	100±1	13+0.5 13 -0.1	2.2±0.1	12.5± 0.5	2.0 ± 0.2

(mm)

Cover Tape Dimensions

Carrier Width	12
Cover Tape Width	9.3

(mm)