

## Stereo 290mW 8Ω Speaker Driver

### Features

- **Operating Voltage**
  - Single Supply from 3V to 7V
  - Dual Supply from ±1.5V to ± 3.5V
- **High Signal-to-Noise Ratio 100dB**
- **High Slew Rate 5V/ ms**
- **Low Distortion -65dB**
- **Output Power at 10% THD+N**
  - into 8W 290mW
  - into 16W190mW
- **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**
- **Lead Free and Green Devices Available (RoHS Compliant)**

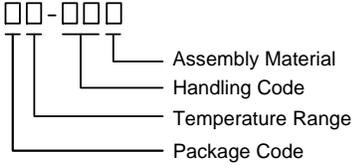
### General Description

The APA4800 is an integrated class AB stereo headphone amplifier contained in an SOP-8 or a DIP-8 plastic package. The APA4800 is capable of delivering 290mW of maximum output power to an 8Ω load with less than 10% (THD+N) from a 5V power supply. The device has been primarily developed for portable digital audio applications.

### Applications

- **Portable Digital Audio**
- **Personal Computers**
- **Microphone Preamplifier**

### Ordering and Marking Information

<p>APA4800</p> 	<p>Package Code                  J : DIP-8      K : SOP-8                  Operating Ambient Temperature Range                  I : - 40 to 85 °C                  Handling Code                  TU : Tube      TR : Tape &amp; Reel                  Assembly Material                  L : Lead Free Device      G : Halogen and Lead Free Device</p>
<p>APA4800 J :</p> 	<p>XXXXX - Date Code</p>
<p>APA4800 K :</p> 	<p>XXXXX - Date Code</p>

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. ANPEC lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020C for MSL classification at lead-free peak reflow temperature. ANPEC defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

**Absolute Maximum Ratings** (Note 1)

Symbol	Parameter	Rating	Unit
V <sub>DD</sub>	Supply Voltage	5	V
T <sub>SC(O)</sub>	Output Short-Circuit Duration, at T <sub>A</sub> =25°C, P <sub>tot</sub> =1W	20	S
T <sub>A</sub>	Operating Ambient Temperature Range	-40 to 85	°C
T <sub>J</sub>	Maximum Junction Temperature	150	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
T <sub>S</sub>	Maximum Lead Soldering Temperature, 10 Seconds	260	°C

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Thermal Characteristics**

Symbol	Parameter	Typical Value	Unit
θ <sub>JA</sub>	Thermal Resistance from Junction to Ambient in Free Air <sup>(Note 2)</sup>		
	DIP-8	109	°C/W
	SOP-8	210	

Note 2: θ<sub>JA</sub> is measured with the component mounted on a high effective thermal conductivity test board in free air.

**Electrical Characteristics**

T<sub>A</sub>=25°C, f<sub>in</sub>=1kHz( unless otherwise noted)

Symbol	Parameter	Test Conditions	APA4800			Unit
			Min.	Typ.	Max.	
V <sub>DD</sub>	Power Supply Voltage		2.7	-	5.5	V
<b>V<sub>DD</sub>=5V</b>						
I <sub>DD</sub>	Supply Current	No Load	-	2.5	-	mA
V <sub>OS</sub>	Output Offset Voltage		-	5	50	mV
<b>AC CHARACTERISTICS</b>						
THD+N	Total Harmonic Distortion Plus Noise to Signal Ratio	P <sub>O</sub> =200mW, R <sub>L</sub> =8Ω, f <sub>in</sub> =1kHz P <sub>O</sub> =120mW, R <sub>L</sub> =16Ω, f <sub>in</sub> =1kHz	-	0.1 0.05	-	%
S/N	Signal to Noise Ratio	THD+N=0.2%, f <sub>in</sub> =1kHz R <sub>L</sub> =8Ω R <sub>L</sub> =16Ω	-	210 140	-	mW
P <sub>O</sub>	Output Power	THD+N=10%, f <sub>in</sub> =1kHz R <sub>L</sub> =8Ω R <sub>L</sub> =16Ω	-	290 190	-	mW
PSRR	Power Supply Rejection Ratio	C <sub>B</sub> =2.2μF, V <sub>RIPPLE</sub> =200mVrms, f <sub>in</sub> =120Hz	-	55	-	dB
V <sub>n</sub>	Noise Floor	R <sub>L</sub> =8Ω	-	20	-	μVrms

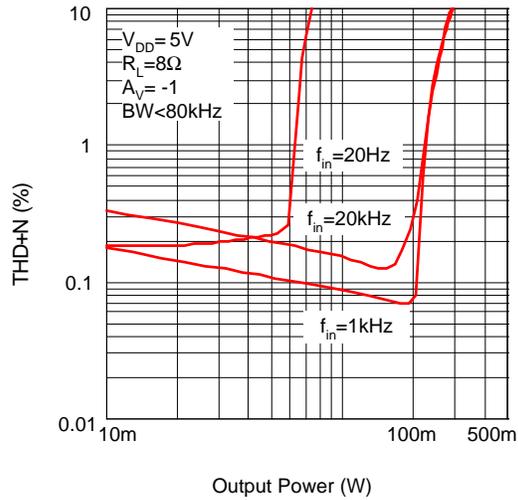
## Electrical Characteristics (Cont.)

$T_A=25^{\circ}\text{C}$ ,  $f_{in}=1\text{kHz}$ ( unless otherwise noted)

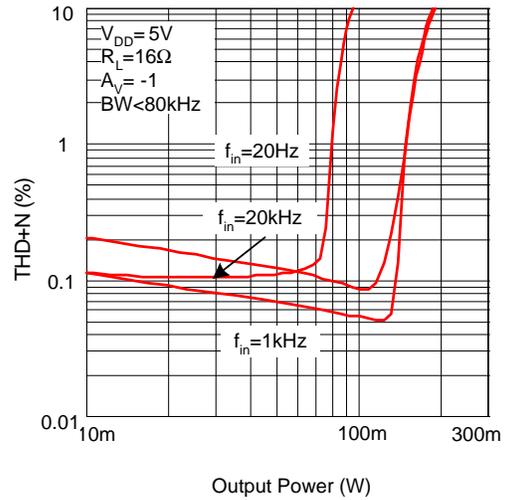
Symbol	Parameter	Test Conditions	APA4800			Unit
			Min.	Typ.	Max.	
<b><math>V_{DD}=3\text{V}</math></b>						
$I_{DD}$	Supply Current	No Load	-	2.2	-	mA
$V_{OS}$	Output Offset Voltage		-	5	-	mV
<b>AC CHARACTERISTICS</b>						
THD+N	Total Harmonic Distortion Plus Noise to Signal Ratio	$P_O=50\text{mW}$ , $R_L=8\Omega$ , $f_{in}=1\text{kHz}$ $P_O=40\text{mW}$ , $R_L=16\Omega$ , $f_{in}=1\text{kHz}$	-	0.15	-	%
$P_O$	Output Power	THD+N=0.2%, $f_{in}=1\text{kHz}$ $R_L=8\Omega$ $R_L=16\Omega$	-	60 45	-	mW
$P_O$	Output Power	THD+N=10%, $f_{in}=1\text{kHz}$ $R_L=8\Omega$ $R_L=16\Omega$	-	90 65	-	mW

Typical Operating Characteristics

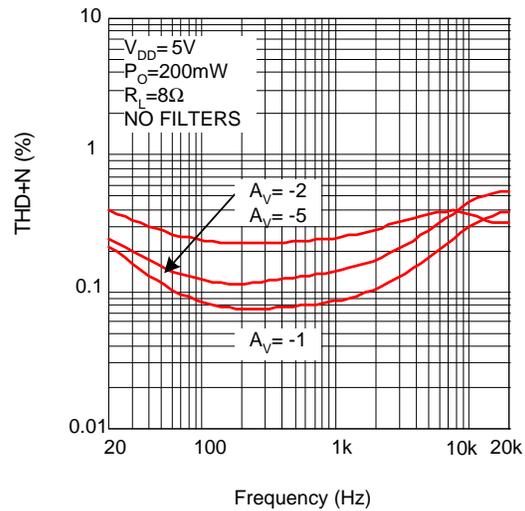
THD+N vs Output Power



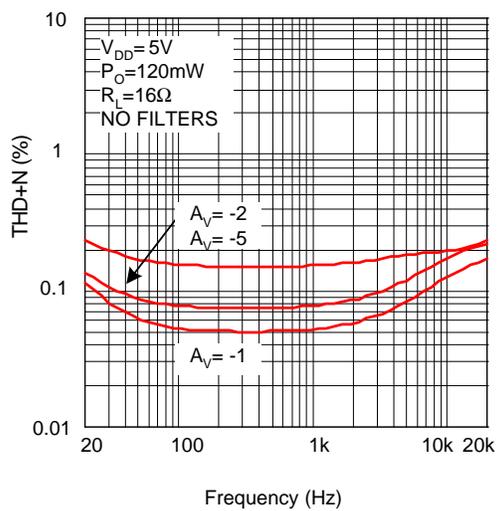
THD+N vs Output Power



THD+N vs Frequency

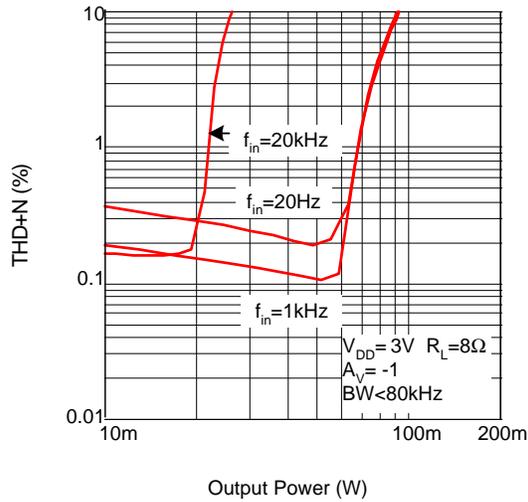


THD+N vs Frequency

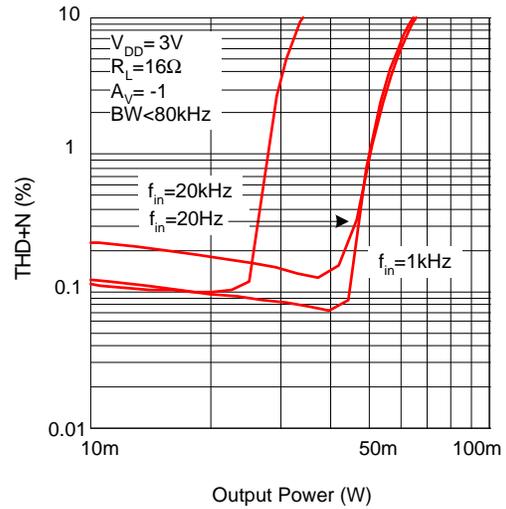


Typical Operating Characteristics (Cont.)

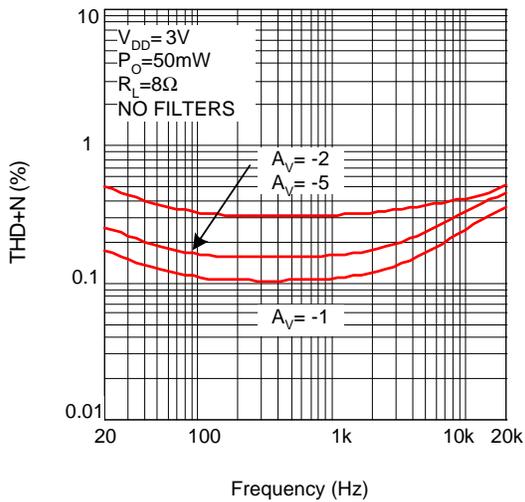
THD+N vs Output Power



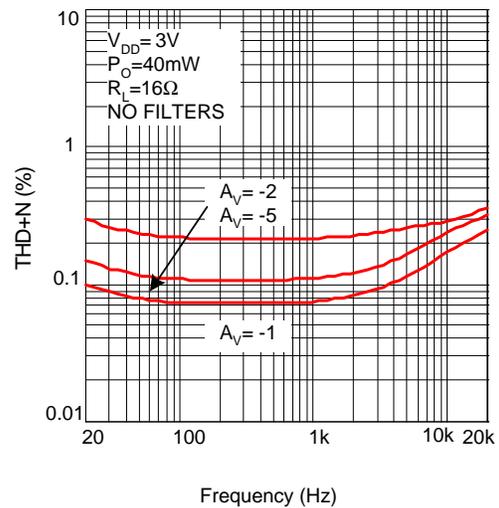
THD+N vs Output Power



THD+N vs Frequency

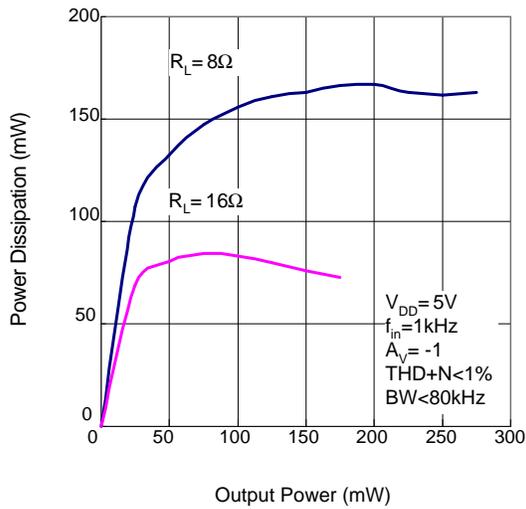


THD+N vs Frequency

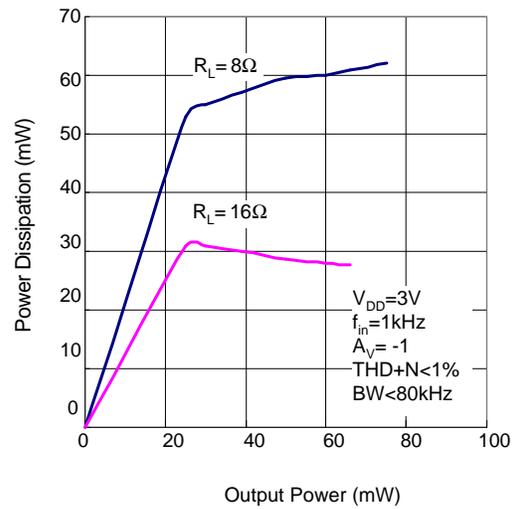


Typical Operating Characteristics (Cont.)

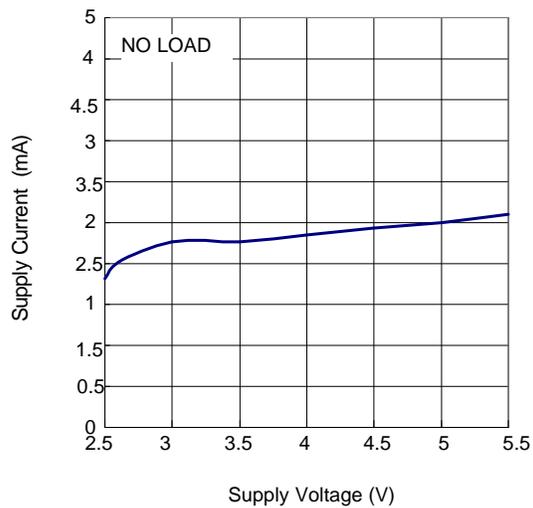
Power Dissipation vs Output Power



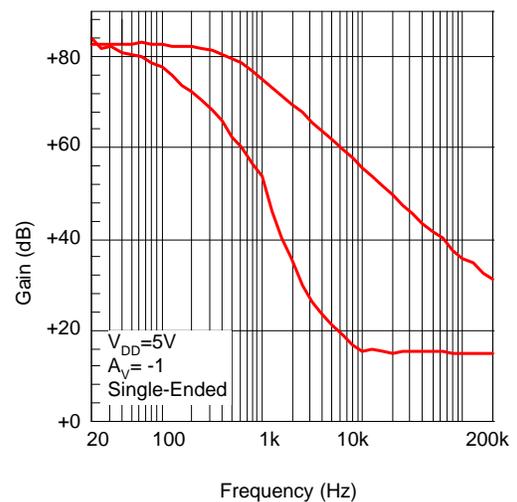
Power Dissipation vs Output Power



Supply Current vs Supply Voltage

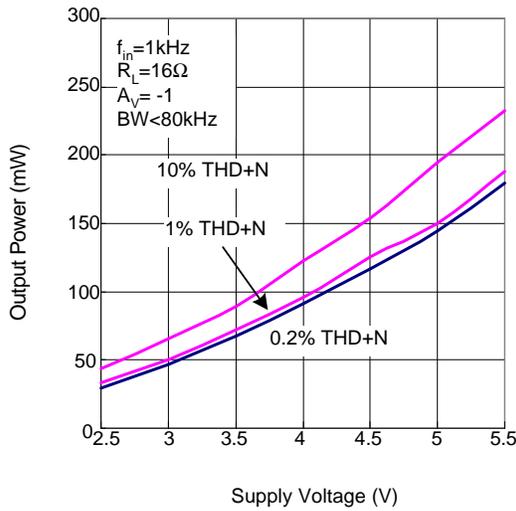


Open Loop Frequency Response

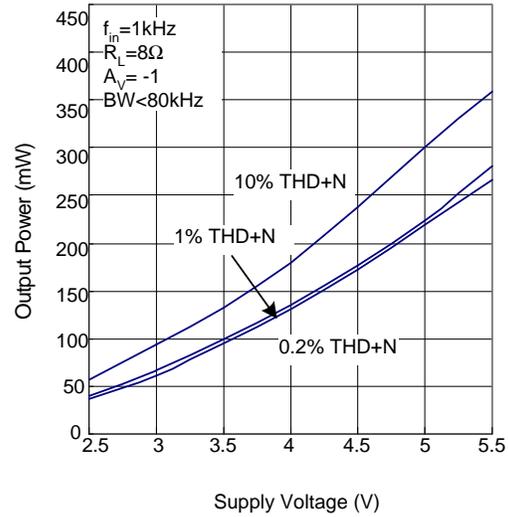


Typical Operating Characteristics (Cont.)

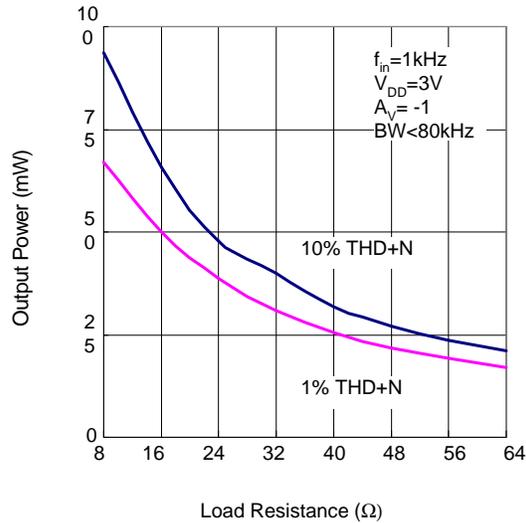
Output Power vs Supply Voltage



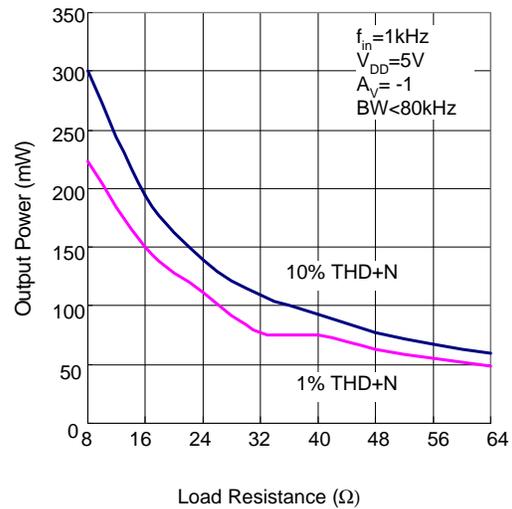
Output Power vs Supply Voltage



Output Power vs Load Resistance

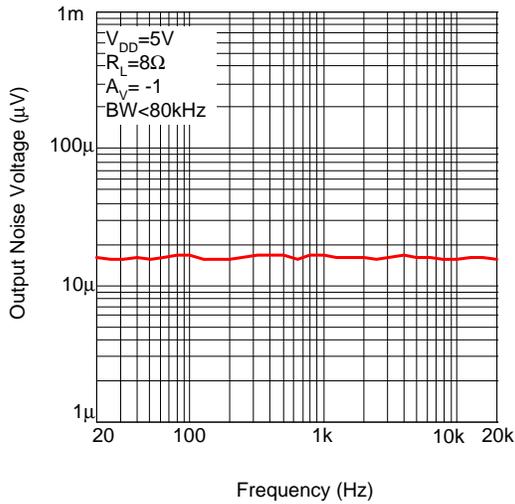


Output Power vs Load Resistance

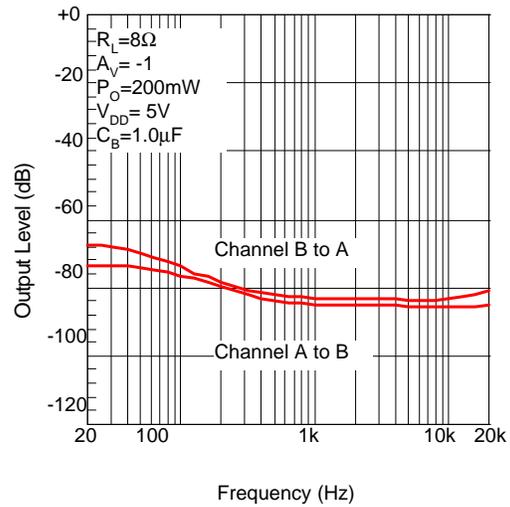


Typical Operating Characteristics (Cont.)

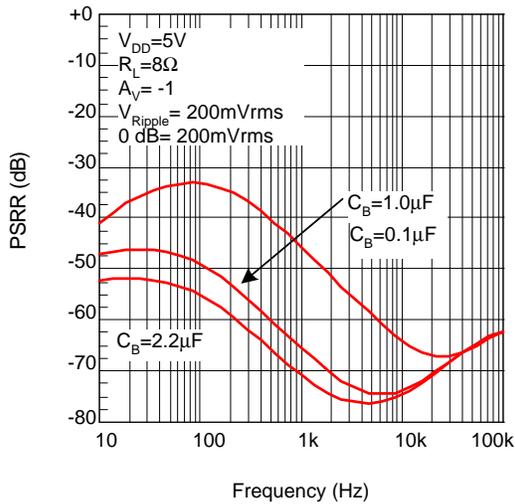
Noise Floor



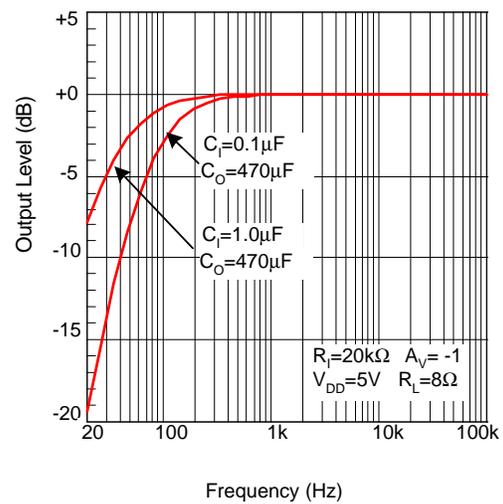
Channel Separation



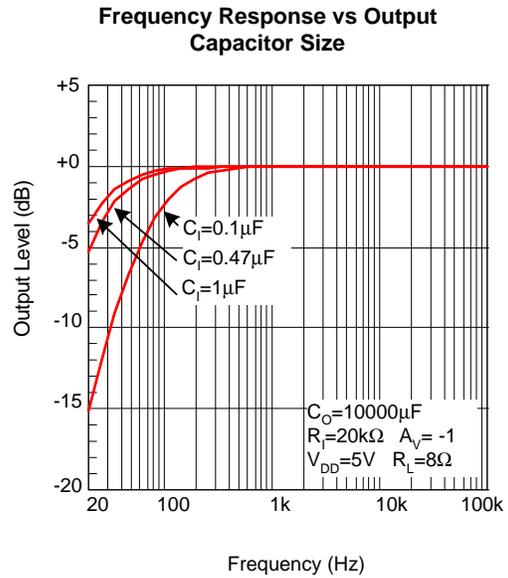
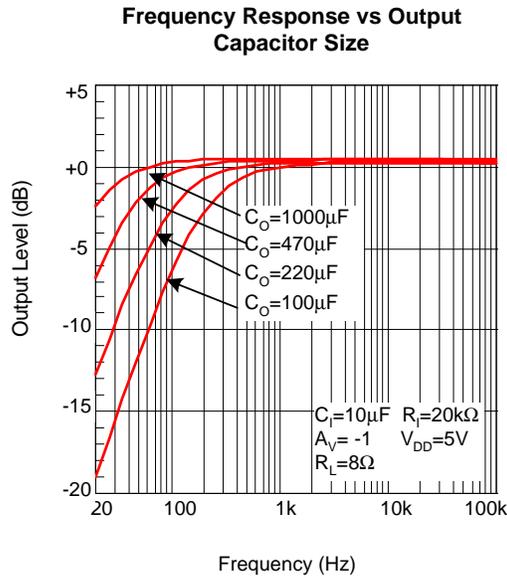
Power Supply Rejection Ratio



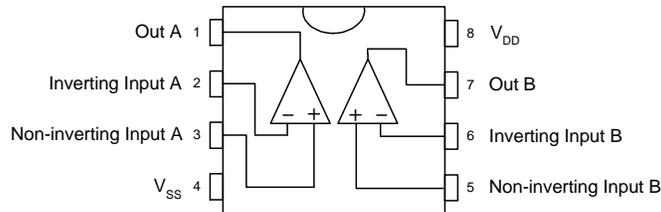
Typical Application Frequency Response



Typical Operating Characteristics (Cont.)

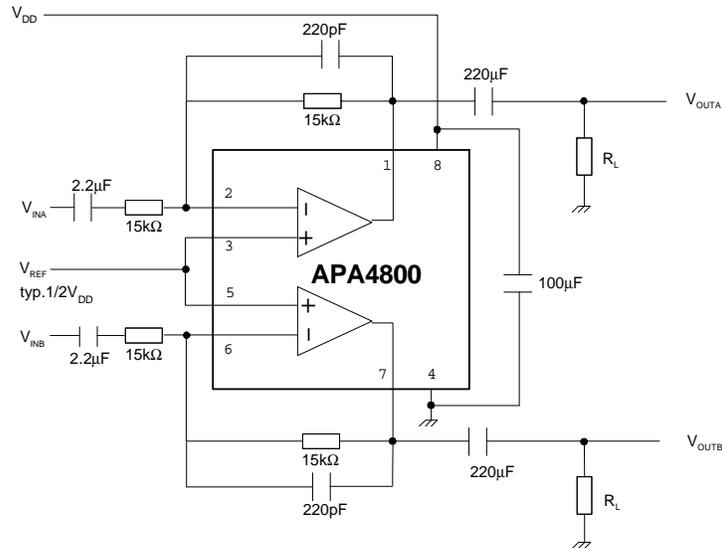


Block Diagram



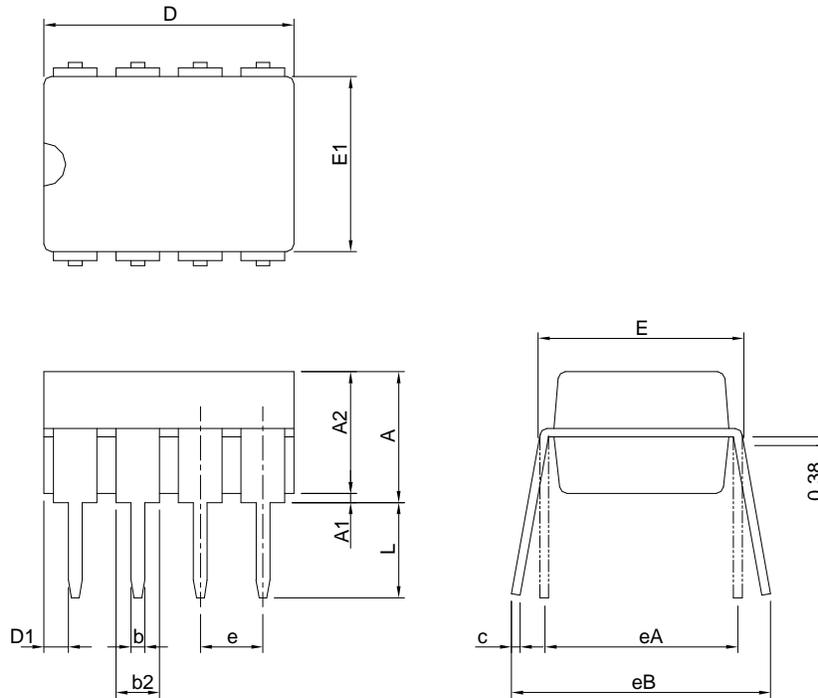
APA4800

## Typical Application Circuit



Package Information

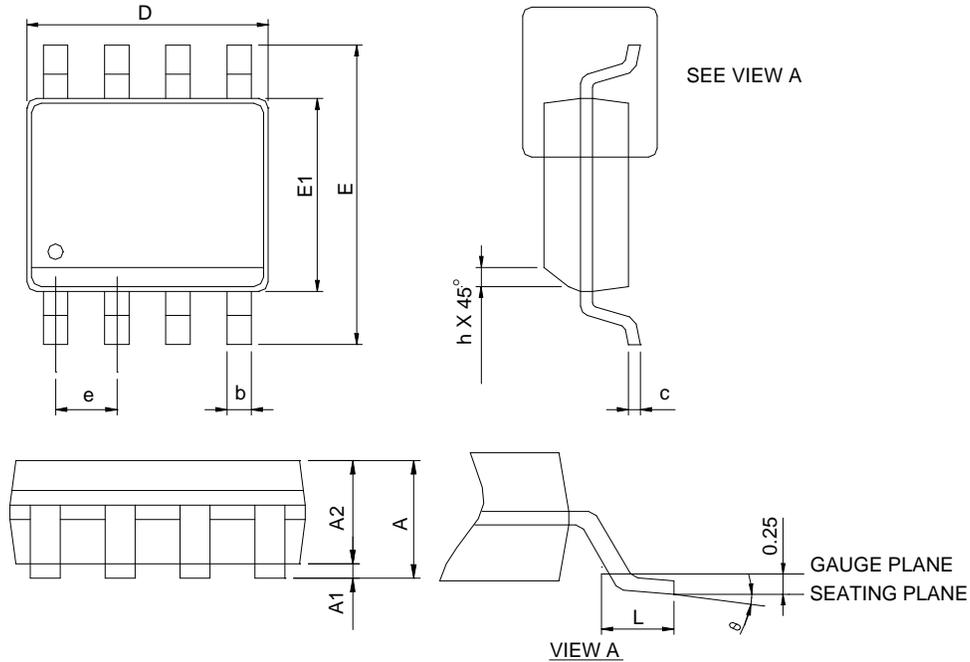
DIP-8



SYMBOL	DIP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		5.33		0.210
A1	0.38		0.015	
A2	2.92	4.95	0.115	0.195
b	0.36	0.56	0.014	0.022
b2	1.14	1.78	0.045	0.070
c	0.20	0.35	0.008	0.014
D	9.01	10.16	0.355	0.400
D1	0.13		0.005	
E	7.62	8.26	0.300	0.325
E1	6.10	7.11	0.240	0.280
e	2.54 BSC		0.100 BSC	
eA	7.62 BSC		0.300 BSC	
eB		10.92		0.430
L	2.92	3.81	0.115	0.150

Package Information

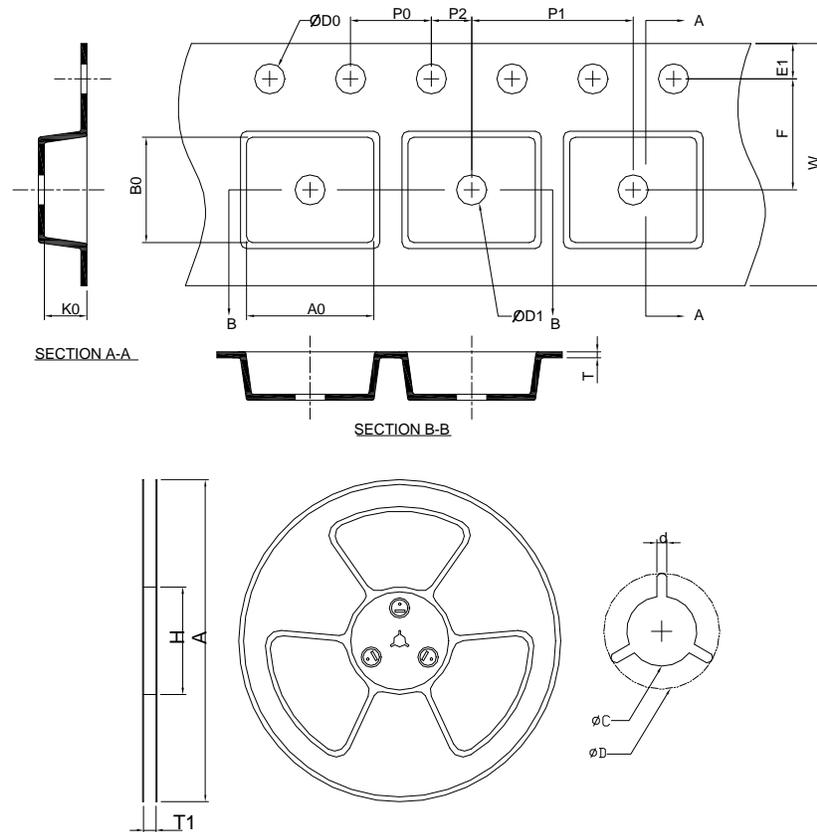
SOP-8



SYMBOL	SOP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.75		0.069
A1	0.10	0.25	0.004	0.010
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

- Note: 1. Follow JEDEC MS-012 AA.  
 2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.  
 3. Dimension "E" does not include inter-lead flash or protrusions. Inter-lead flash and protrusions shall not exceed 10 mil per side.

### Carrier Tape & Reel Dimensions



Application	A	H	T1	C	d	D	W	E1	F
SOP-8	330.0 ±0.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0 ±0.30	1.75 ±0.10	5.5 ±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0 ±0.10	8.0 ±0.10	2.0 ±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.40 ±0.20	5.20 ±0.20	2.10 ±0.20

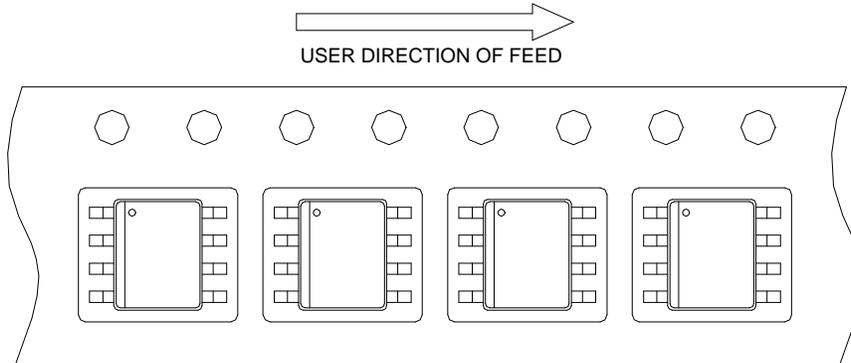
(mm)

### Devices Per Unit

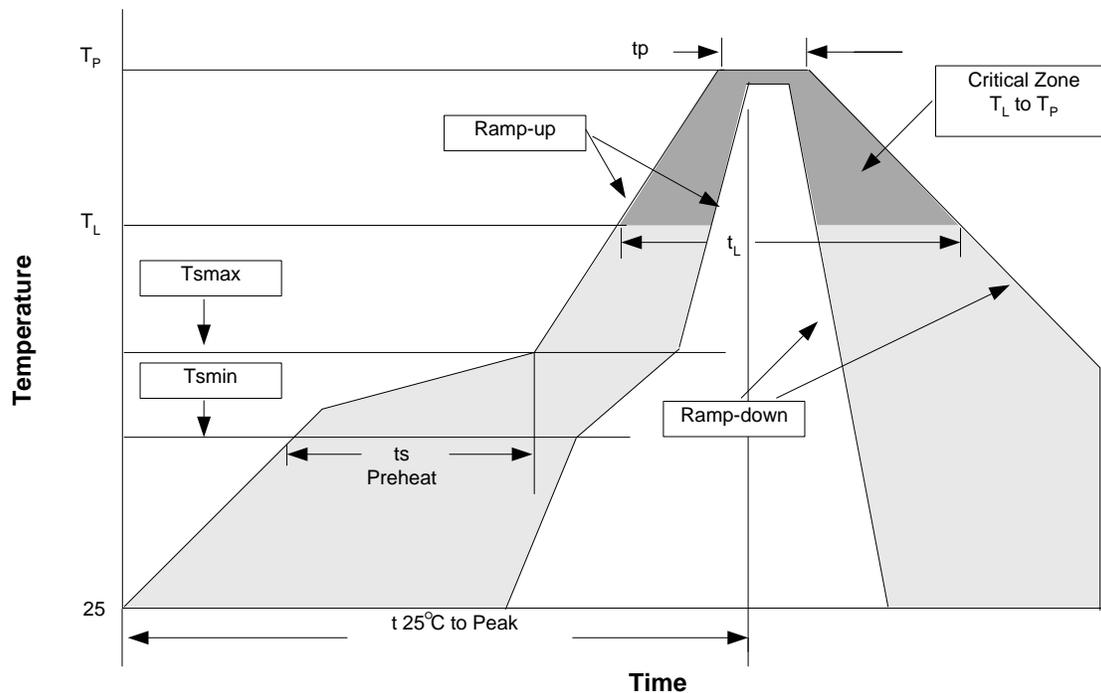
Package Type	Unit	Quantity
SOP-8	Tape & Reel	2500

## Taping Direction Information

SOP-8



## Reflow Condition (IR/Convection or VPR Reflow)



## 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, 1 <sub>tr</sub> > 100mA

### Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )	3°C/second max.	3°C/second max.
Preheat - Temperature Min (T <sub>smin</sub> ) - Temperature Max (T <sub>smax</sub> ) - Time (min to max) (t <sub>s</sub> )	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T <sub>L</sub> ) - Time (t <sub>L</sub> )	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classification Temperature (T <sub>p</sub> )	See table 1	See table 2
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Note: All temperatures refer to topside of the package. Measured on the body surface.

Table 1. SnPb Eutectic Process – Package Peak Reflow Temperatures

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> ≥350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 2. Pb-free Process – Package Classification Reflow Temperatures

Package Thickness	Volume mm <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >2000
<1.6 mm	260 +0°C*	260 +0°C*	260 +0°C*
1.6 mm – 2.5 mm	260 +0°C*	250 +0°C*	245 +0°C*
≥2.5 mm	250 +0°C*	245 +0°C*	245 +0°C*

\* Tolerance: The device manufacturer/supplier **shall** assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0°C. For example 260°C+0°C) at the rated MSL level.

### Customer Service

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