

Class AB Stereo Headphone Driver

Features

- Operating Voltage
 - Single Supply 3V to 6V
 - Dual Supply $\pm 1.5V$ to $\pm 3.0V$
- High Signal-to-Noise Ratio 100dB
- 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 ,DIP or TSSOP Package

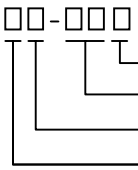
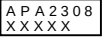
Applications

- Portable Digital Audio

General Description

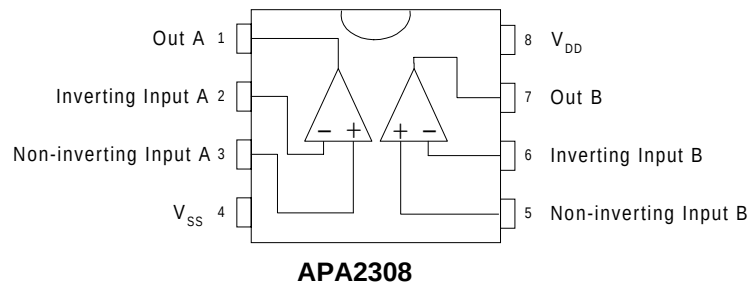
The APA2308 is an integrated class AB stereo headphone driver contained in an SO-8, a DIP-8 or a TSSOP-8 plastic package. The APA2308 is capable of delivering 280mW of max. Output power to an 8 Ω load or 110mW to a 32 Ω load with less than 10% (THD+N) from a 5V power supply. The device is fabricated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

Ordering and Marking Information

APA2308  Lead Free Code Handling Code Temp. Range Package Code	Package Code J : PDIP - 8 K : SOP - 8 O : TSSOP - 8 Temp. Range I : - 40 to 85 °C Handling Code TU : Tube TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device
APA2308 J : 	XXXXX - Date Code
APA2308 K : 	XXXXX - Date Code
APA2308 O : 	XXXXX - Date Code

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.

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{DD}	Supply Voltage	7	V
$T_{SC(O)}$	Output Short-circuit Duration, at $T_A=25^{\circ}\text{C}$, $P_{TOT}=1\text{W}$	20	S
T_A	Operating Ambient Temperature range	-40 to 85	$^{\circ}\text{C}$
T_J	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-65 to +150	$^{\circ}\text{C}$
T_S	Soldering Temperature , 10 seconds	260	$^{\circ}\text{C}$
V_{ESD}	Electrostatic Discharge	-3000 to 3000*1	V

Note : *1. Human body model : $C=100\text{pF}$, $R=1500\Omega$, 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

$V_{DD}=5\text{V}$, $V_{SS}=0\text{V}$, $T_A=25^{\circ}\text{C}$, $f_i=1\text{kHz}$, $R_L=32\Omega$ (unless otherwise noted)

Symbol	Parameter	Test Condition	APA2308			Unit
			Min.	Typ.	Max	
Supply						
V _{DD}	Supply Voltage					V
	Single		3.0	5.0	6.0	
	Dual		±1.5	±2.5	±3.0	
V _{SS}	Negative Supply Voltage		-1.5	-2.5	-3.0	V
I _{DD}	Supply Current	No Load		2.5	5	mA
P _{TOT}	Total Power Dissipation	No Load		12.5	25	mW

Electrical Characteristics Cont.

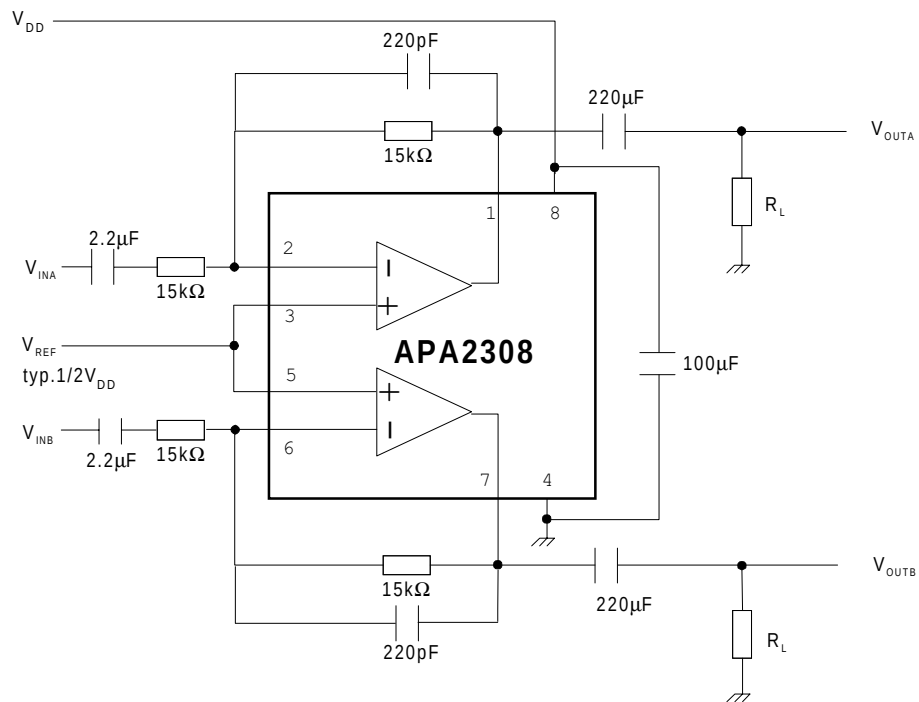
$V_{DD}=5V$, $V_{SS}=0V$, $T_A=25^{\circ}C$, $f_i=1kHz$, $R_L=32\Omega$ (unless otherwise noted)

Symbol	Parameter	Test Condition	APA2308			Unit
			Min.	Typ.	Max	
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
AC Characteristics						
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
c _s	Channel Separation	R _L =32Ω		95		dB
C _L	Load Capacitance				200	pF
(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	R _L =5kΩ		5		MHz
P _O	Max. Output Power	(THD+N)/S<0.1%		84		mW
C _I	Input Capacitance			3		pF
B	Power Bandwidth	Unity Gain Inverting		20		kHz

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

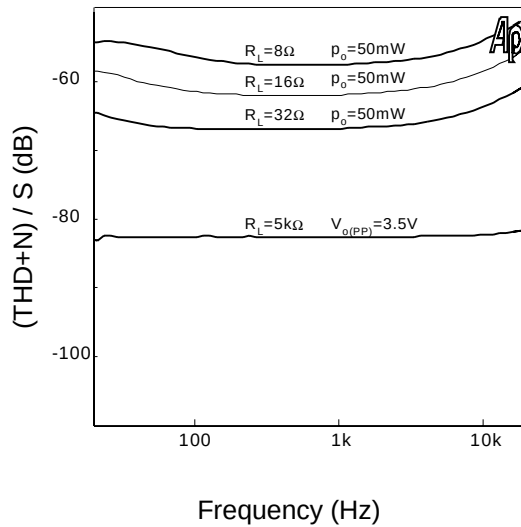
*2 : $V_{DD}=5.0V$; $V_{O(P-P)}=3.5V$ (at 0 dB)

Test And Application Circuits

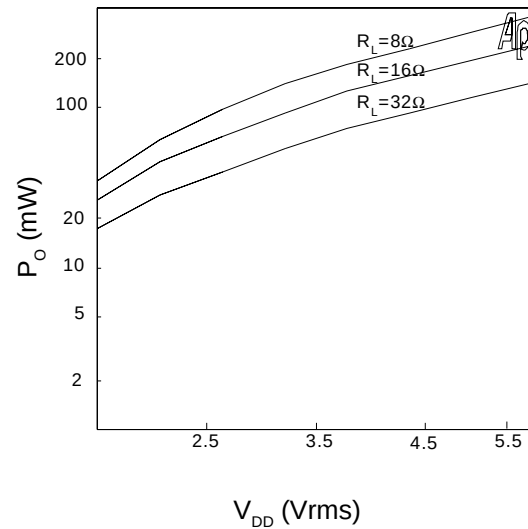


Typical Characteristics

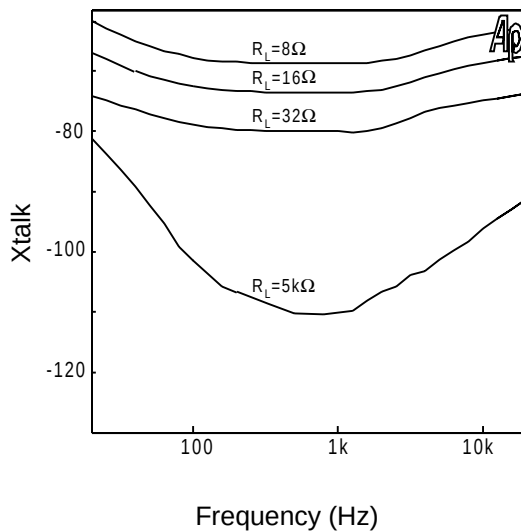
Total Harmonic Distortion Plus Noise-to-Signal Ratio as a Function of Input Frequency



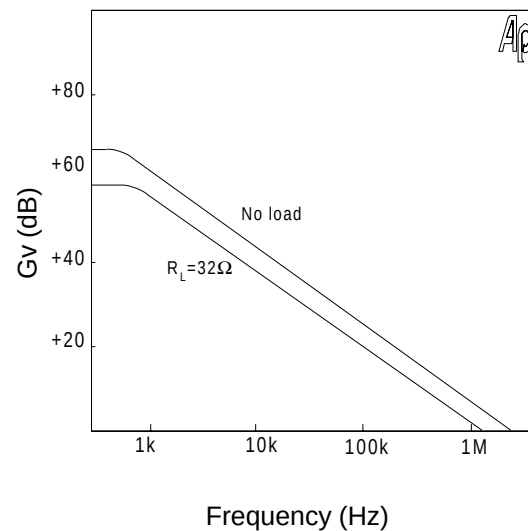
Output Power as a Function of Supply Voltage



Crosstalk as a Function of Input Frequency

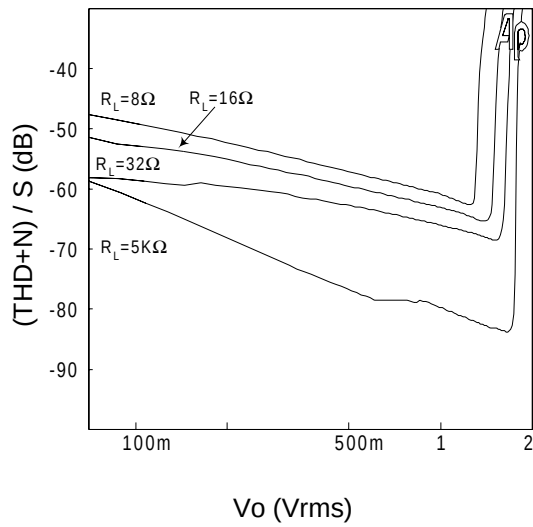


Open Loop Gain as a Function of Input Frequency



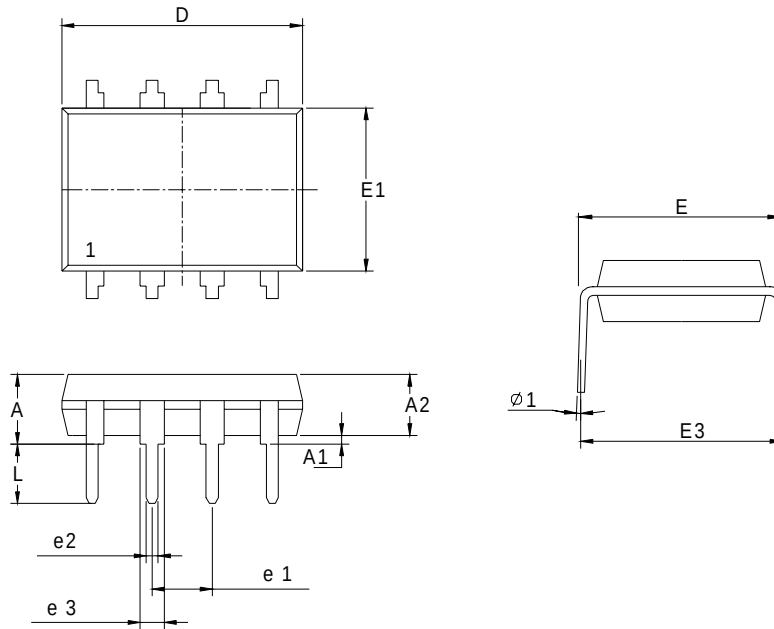
Typical Characteristics Cont.

Total Harmonic Distortion Plus Noise-to-Signal Ratio as a Function of output Voltage



Packaging Information

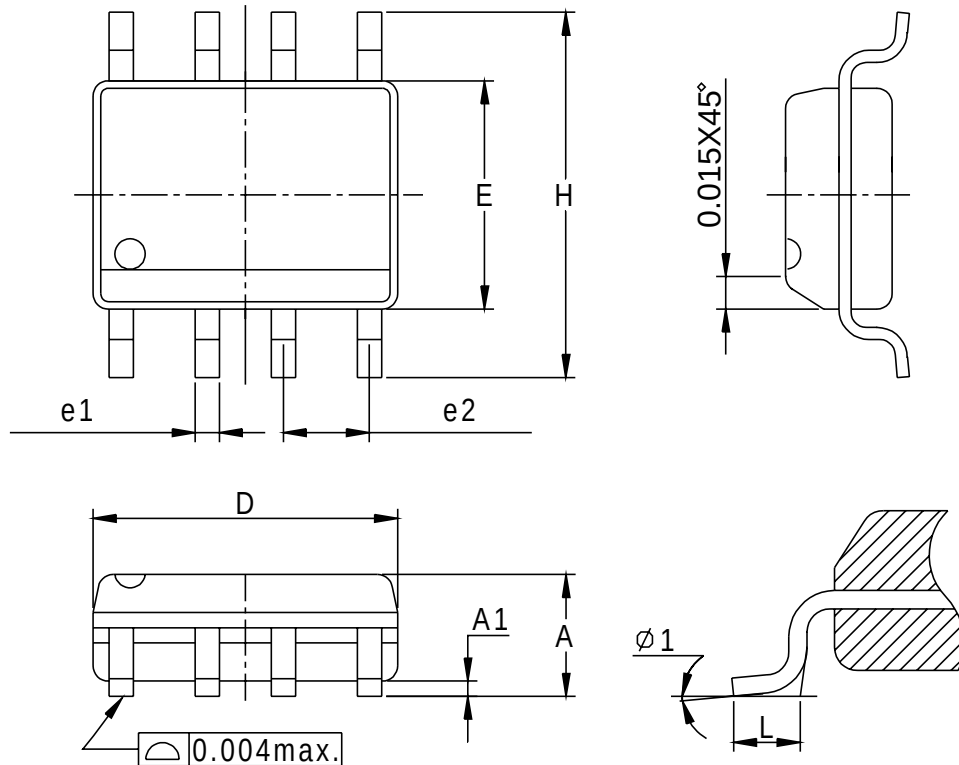
PDIP-8 pin (Reference JEDEC Registration MS-001)



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
$\phi 1$	15°		15°	

Packaging Information

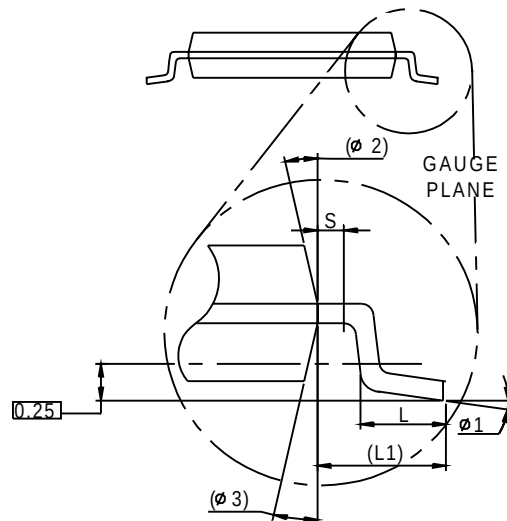
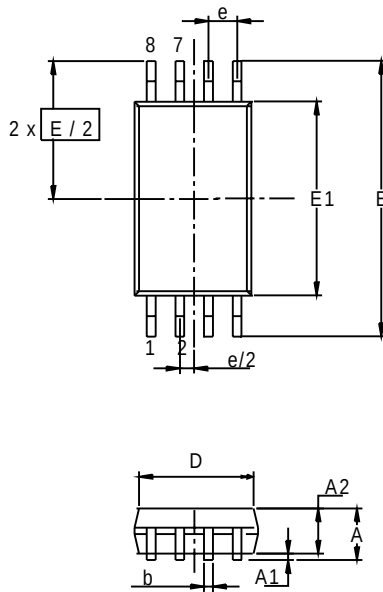
SOP-8 pin (Reference JEDEC Registration MS-012)



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	
$\phi 1$	8°		8°	

Packaging Information

TSSOP-8

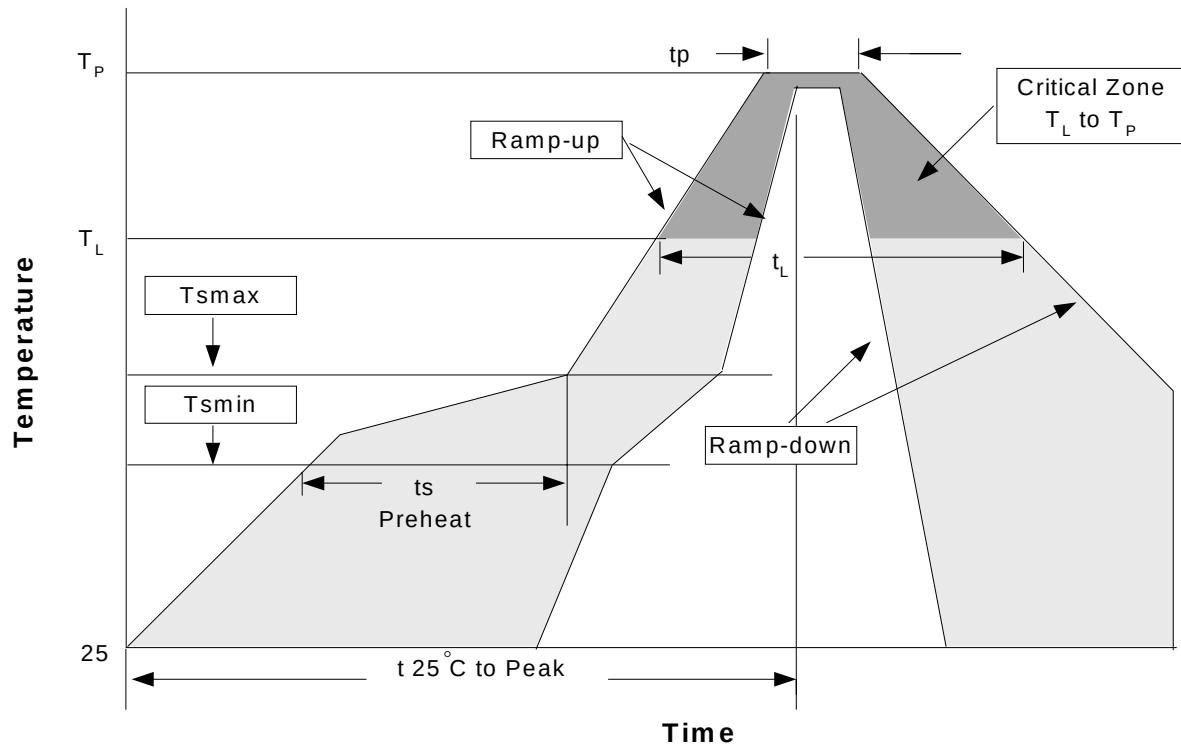


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		1.2		0.047
A1	0.00	0.15	0.000	0.006
A2	0.80	1.05	0.031	0.041
b	0.19	0.30	0.007	0.012
D	2.9	3.1	0.114	0.122
e	0.65 BSC		0.026 BSC	
E	6.40 BSC		0.252 BSC	
E1	4.30	4.50	0.169	0.177
L	0.45	0.75	0.018	0.030
L1	1.0 REF		0.039 REF	
R	0.09		0.004	
R1	0.09		0.004	
S	0.2		0.008	
Ø1	0°	8°	0°	8°
Ø2	12° REF		12° REF	
Ø3	12° REF		12° REF	

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb), 100%Sn
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)



Classificatin Reflow Profiles

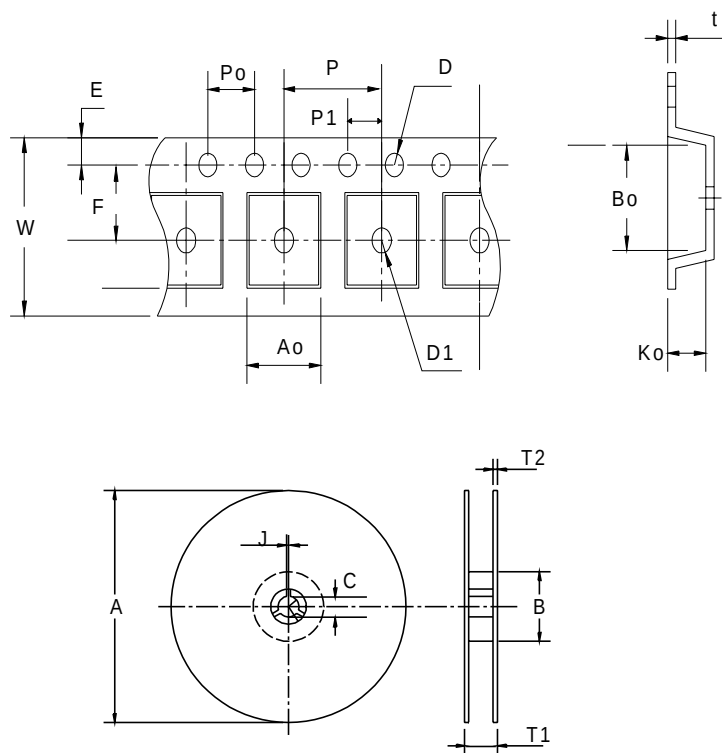
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T _L to T _P)	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min (T _{smin})	100°C		150°C	
- Temperature Mix (T _{smax})	150°C		200°C	
- Time (min to max)(ts)	60-120 seconds		60-180 seconds	
T _{smax} to T _L			3°C/second max	
- Ramp-up Rate				
T _{smax} to T _L				
- Temperature(T _L)	183°C		217°C	
- Time (t _L)	60-150 seconds		60-150 seconds	
Peak Temperature(T _p)	225 +0/-5°C	240 +0/-5°C	245 +0/-5°C	250 +0/-5°C
Time within 5°C of actual Peak Temperature(tp)	10-30 seconds	10-30 seconds	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.

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, $1_{tr} > 100mA$

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
SOP-8	330 ± 1	62 +1.5	12.75+ 0.15	2 ± 0.5	12.4 ± 0.2	2 ± 0.2	12± 0.3	8± 0.1	1.75±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5± 1	1.55 +0.1	1.55+ 0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1	5.2± 0.1	2.1± 0.1	0.3±0.013
Application	A	B	C	J	T1	T2	W	P	E
TSSOP-8	330 ± 1	62 +1.5	12.75+ 0.15	2 + 0.5	12.4 ± 0.2	2 ± 0.2	12± 0.3	8± 0.1	1.75±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5 ± 0.1	1.5 + 0.1	1.5 + 0.1	4.0 ± 0.1	2.0 ± 0.1	7.0 ± 0.1	3.6 ± 0.3	1.6 ± 0.1	0.3±0.013

(mm)

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP- 8	12	9.3	2500
TSSOP- 8	12	9.3	2500

Customer Service

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