Stereo 330mW 8Ω Speak Driver With Mute

Features

- Operating Voltage
  - Single Supply 3V to 7V
  - Dual Supply ±1.5V to ± 3.5V
- Depop Circuitry Integrated.
- High Signal-to-Noise Ratio 100dB
- High Slew Rate 5.5V/ms
- Low Distortion -66dB
- Output Power at 10% THD+N
  - into 8Ω 330mW
  - into 16Ω 200mW
- 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, TSSOP, MSOP or PDIP Package
- Lead Free Available (RoHS Compliant)

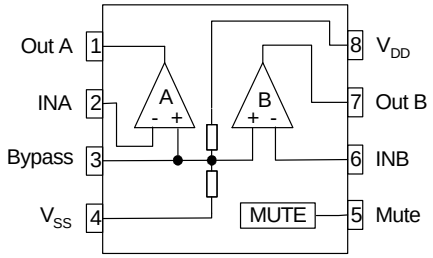
Applications

- Portable Digital Audio
- Personal Computers
- Microphone Preamplifier
- CD ROM Player
- Headphone Amplifier

Gereral Description

The APA4880 is an integrated class AB stereo headphone amplifier contained in SOP-8, TSSOP-8, MSOP-8 or DIP-8 plastic package. The APA4880 is capable of delivering 330mW of max. 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. Both of the depop circuitry and mute circuitry are integrated in the APA4880, that reduces pops and clicks noise during power up and when using the mute mode (high active).

Pin Description



APA4880

Ordering and Marking Information

APA4880 □□-□□□ Lead Free Code Handling Code Temp. Range Package Code	Package Code J : PDIP - 8 K : SOP - 8 O : TSSOP-8 X : MSOP-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
APA4880 J :  XXXXX - Date Code	APA4880 X :  XXXXX - Date Code
APA4880 K/O :  XXXXX - Date Code	

Note: ANPEC lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS and compatible with both SnPb and lead-free soldiering operations. 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.

Pin Function Description

Pin Name	No	I/O	Description
OUTA	1	O	Channel A output pin
INA	2	I	Audio input channel A
Bypass	3	I	Connect to voltage divider for internal mid_supply bias
VSS	4		Ground or negative supply voltage connection for circuitry.
Mute	5	I	mute mode control signal input, place entire IC in mute mode when held high, Imute=140µA
INB	6	I	Audio input channel B
OUTB	7	O	Channel B output pin
VDD	8		Supply voltage input pin

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{DD}	Supply Voltage	5	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.

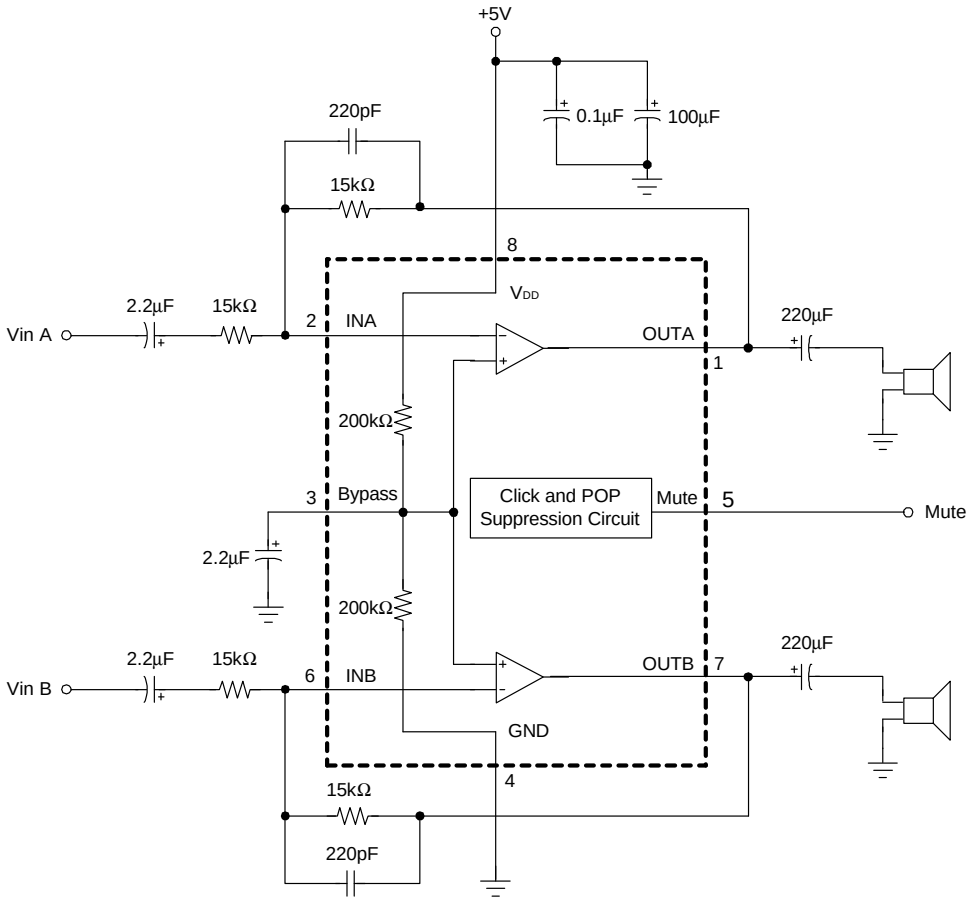
Thermal Characteristics

Symbol	Parameter	Value	Unit
R_{THJA}	Thermal Resistance from Junction to Ambient in Free Air		
	SO-8	210	K/W
	TSSOP-8	220	
	PDIP-8	109	
	MSOP-8	210	

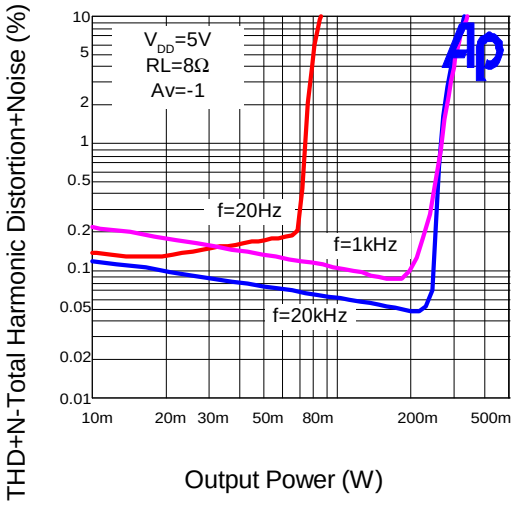
Electrical Characteristics T_A=25°C, V_{DD}=5V, V_{SS}=0V, f=1kHz (unless otherwise noted)

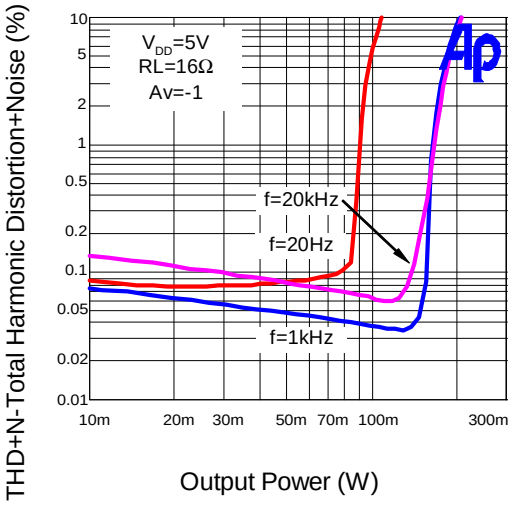
Symbol	Parameter	Test Conditions	APA4880			Unit
			Min.	Typ.	Max.	
I_{DD}	Supply Current	No Load		3.0		mA
I_{MUTE}	Mute Current	V_{PINS}		140		uA
$V_{I(OS)}$	Input Offset Voltage			5		mV
AC Characteristics						
(THD+N)/S	Total Harmonic Distortion plus Noise to Signal Ratio	P_O=200mW, R_L=8Ω, f=1kHz P_O=120mW, R_L=16Ω, f=1kHz P_O=75mW, R_L=32Ω, f=1kHz		0.05 0.04 0.03		%
Po	Output Power	(THD+N)/S=0.1%, f=1kHz R_L=8Ω R_L=16Ω R_L=32Ω (THD+N)/S=10%, f=1kHz R_L=8Ω R_L=16Ω R_L=32Ω		 240 150 85 330 200 110		mW
PSRR	Power Supply Rejection Ratio	C_S=2.2uF, V_{RIPPLE}=200mV_{RMS}, f=120Hz		50		dB
ATT	Mute attenuation	Vin=1Vrms, R_L=8Ω		85		dB
Xtalk	Channel Separation	P_O=200mV, R_L=8Ω, Cb=2.2μF		85		dB
Gv	Open Loop Gain			100		dB
Fg	Unity Gain Frequency			7		MHz
SR	Slew Rate			5.5		V/us
S/N	Signal to Noise Ratio	Vin=1Vrms , R_L=8Ω		20		uVrms

Test And Application Circuits



Typical Characteristics





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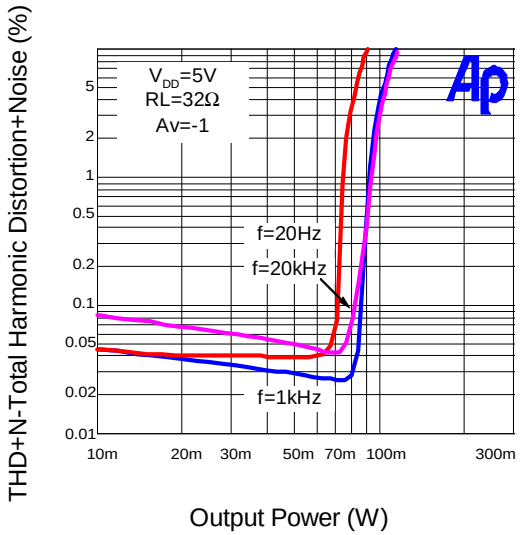

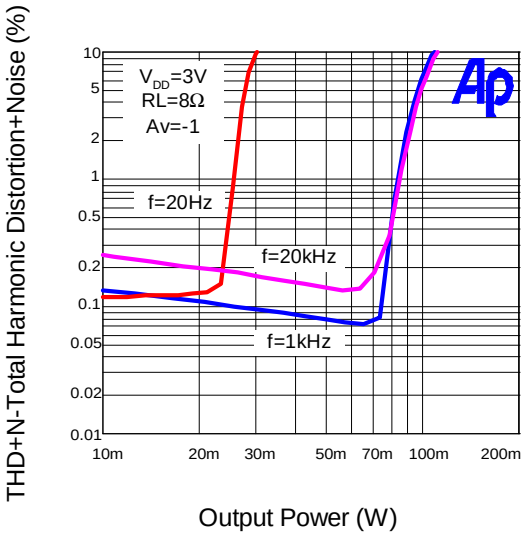

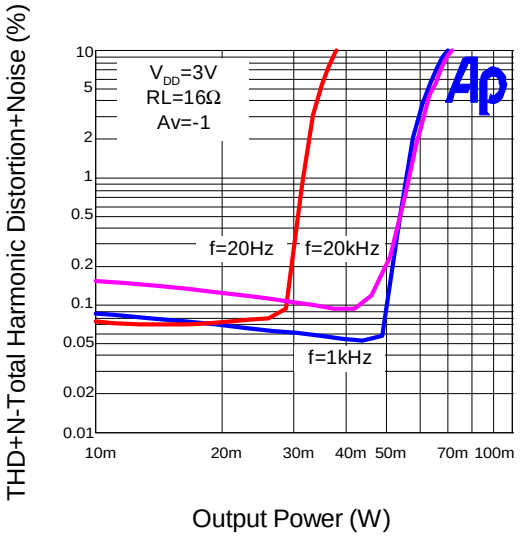

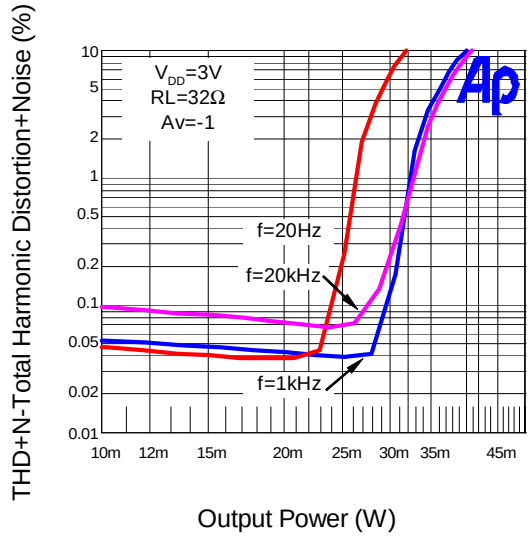

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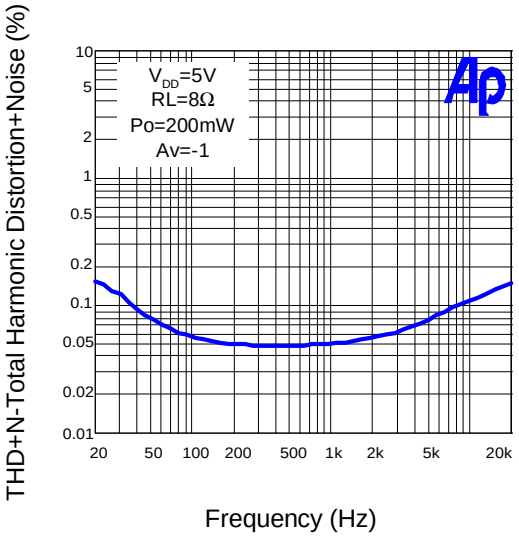

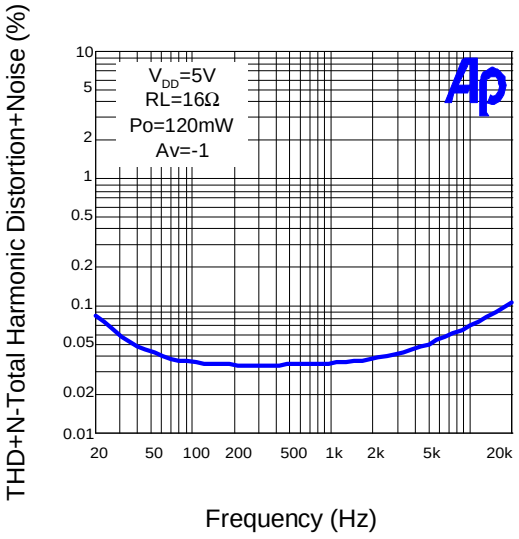

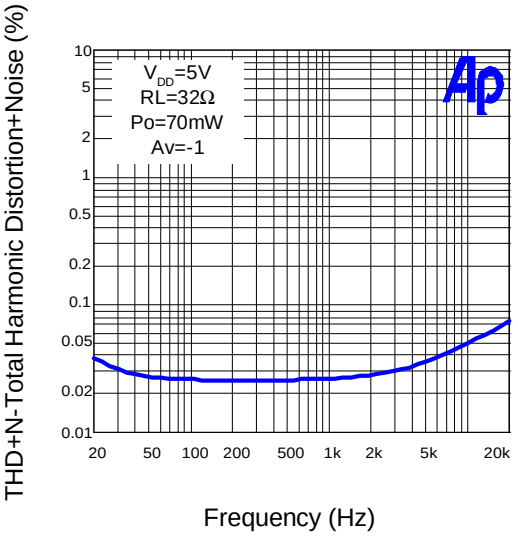

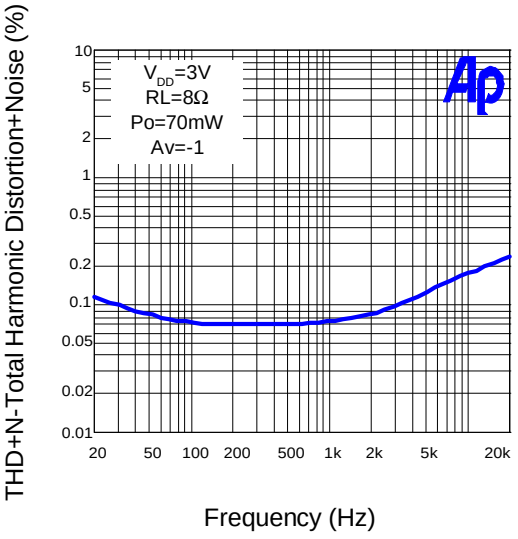

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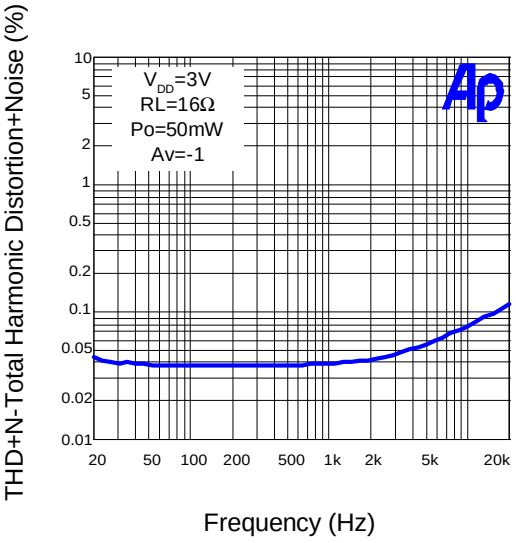

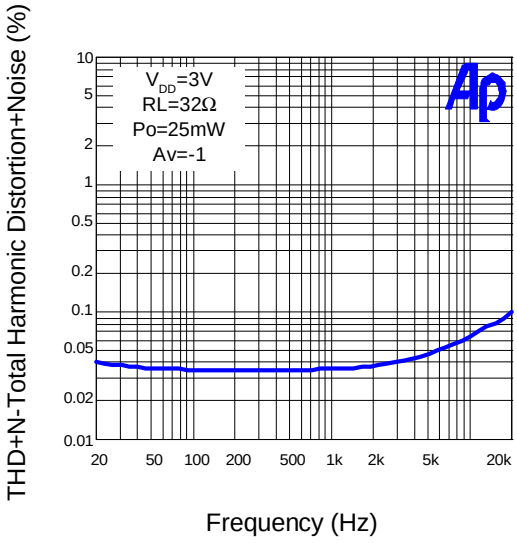

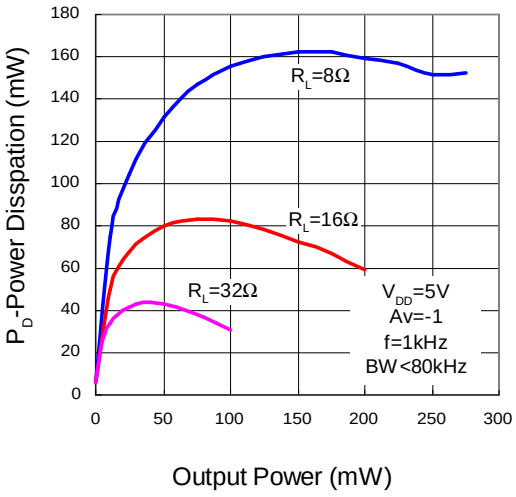

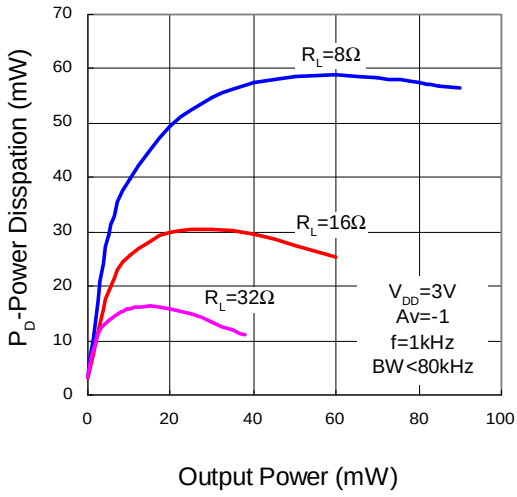

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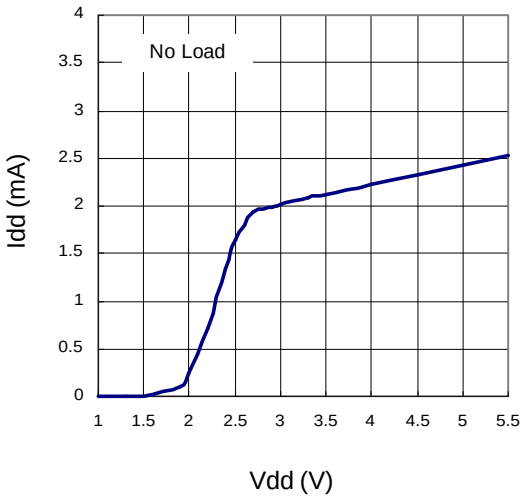

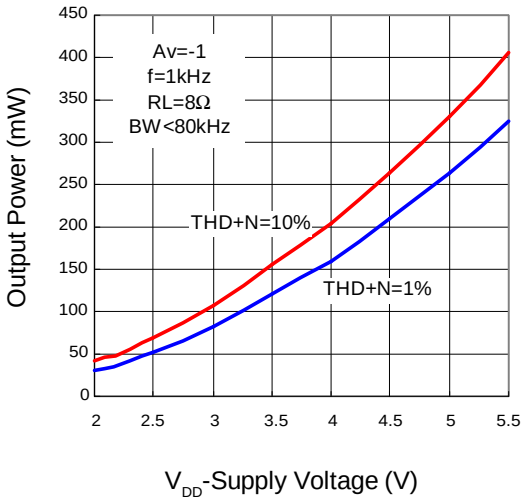

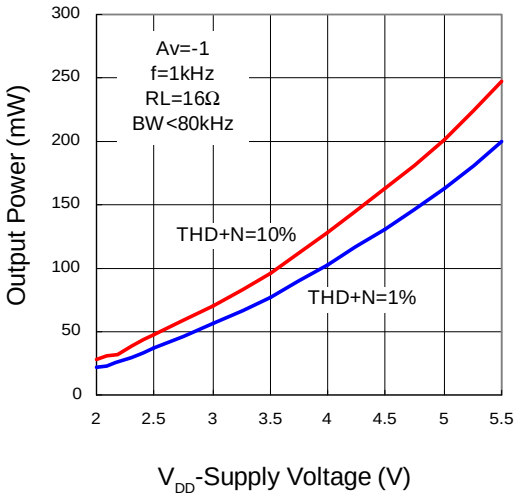

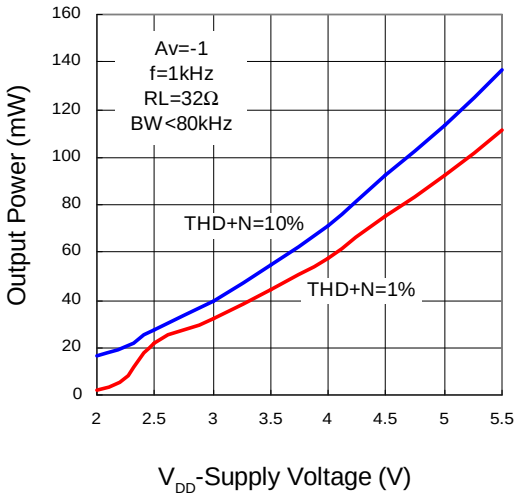

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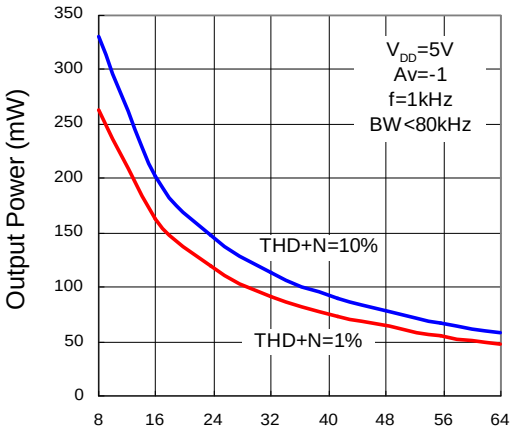

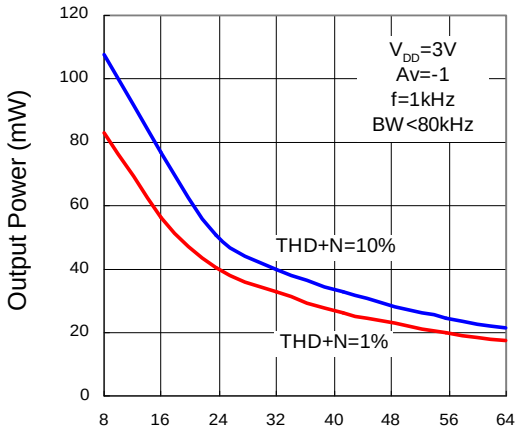

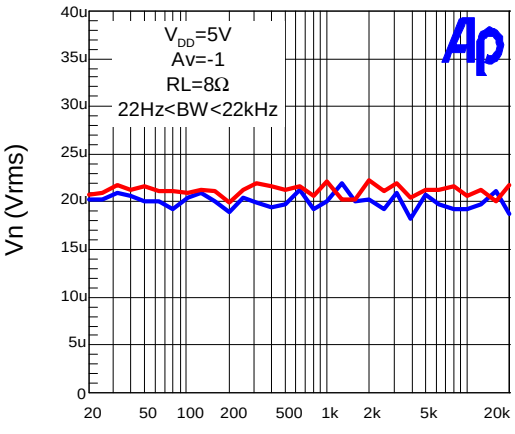

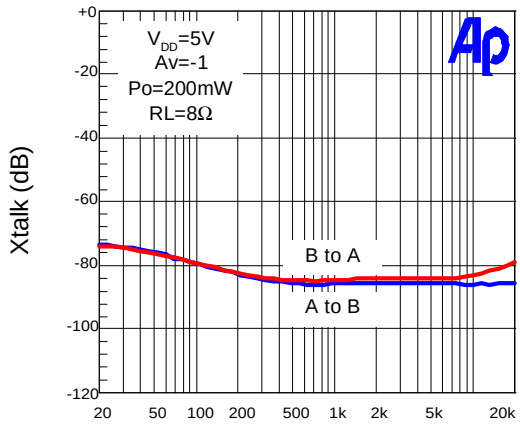

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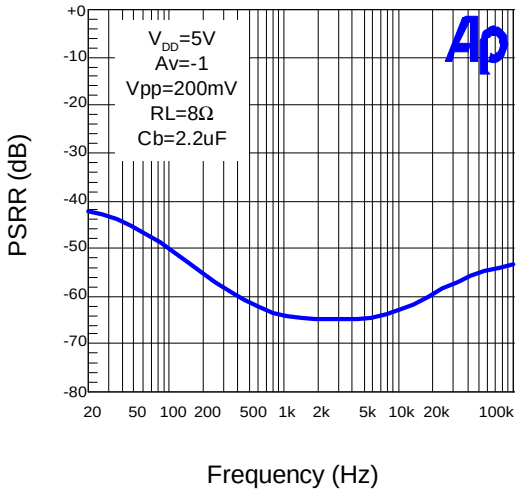
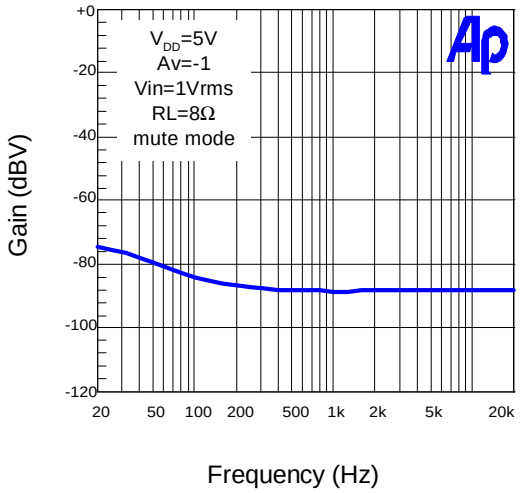
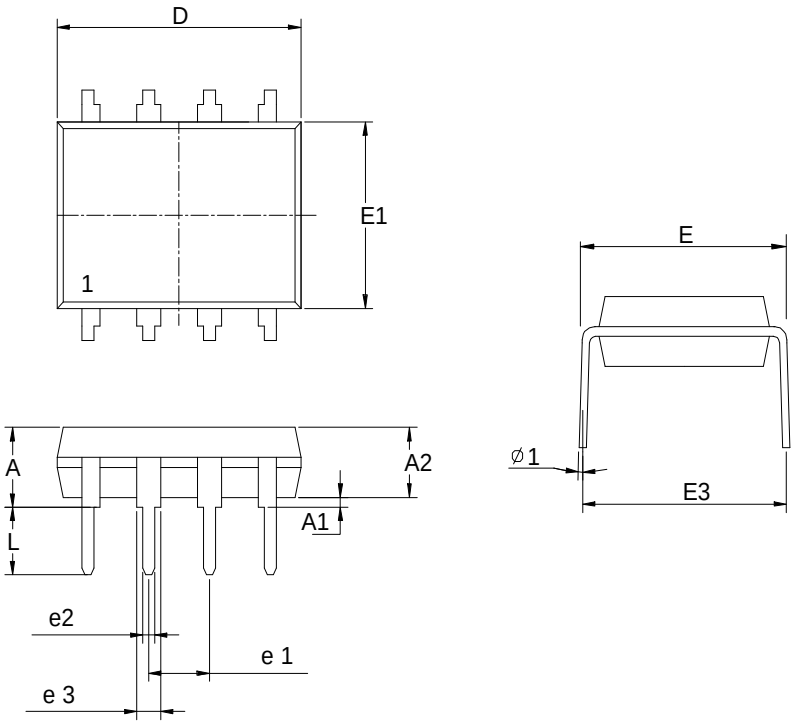




Packaging Information

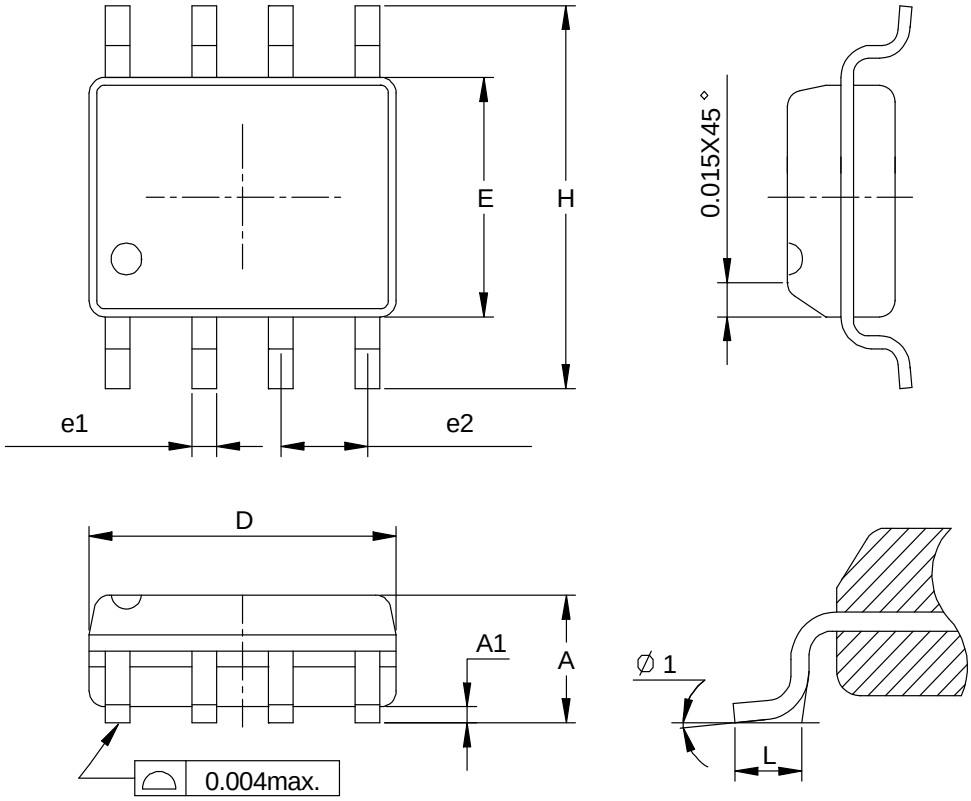
PDIP-8 pin (Reference JEDEC Registration MS-001)



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	2.54 BSC		0.100 BSC	
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
ϕ1	15° REF		15° REF	

Packaging Information

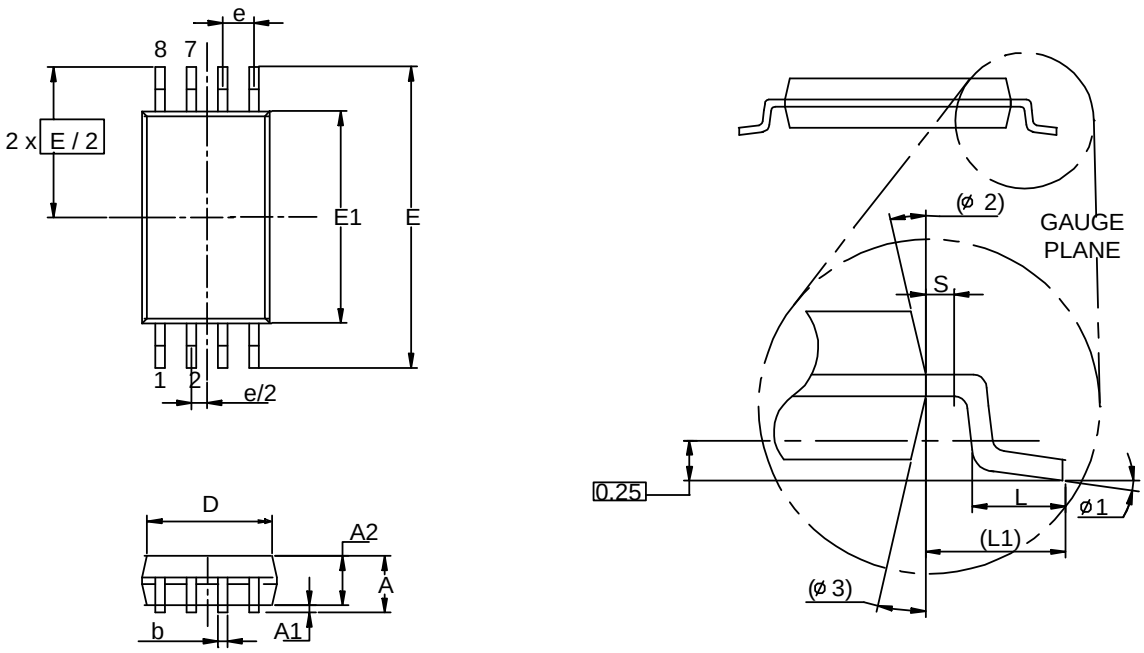
SOP-8 pin (Reference JEDEC Registration MS-012)



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°

Packaging Information

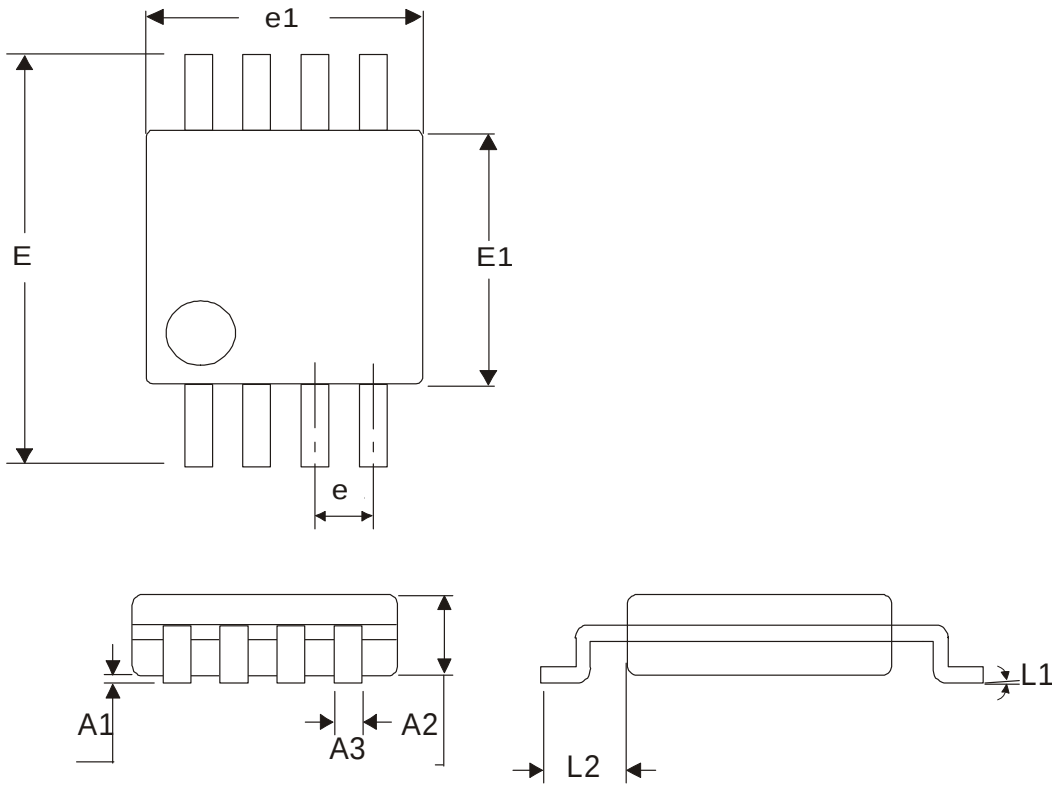
TSSOP-8



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		0.039REF	
R	0.09		0.004	
R1	0.09		0.004	
S	0.2		0.008	
ϕ1	0°	8°	0°	8°
ϕ2	12° REF		12° REF	
ϕ3	12° REF		12° REF	

Packaging Information

MSOP-8

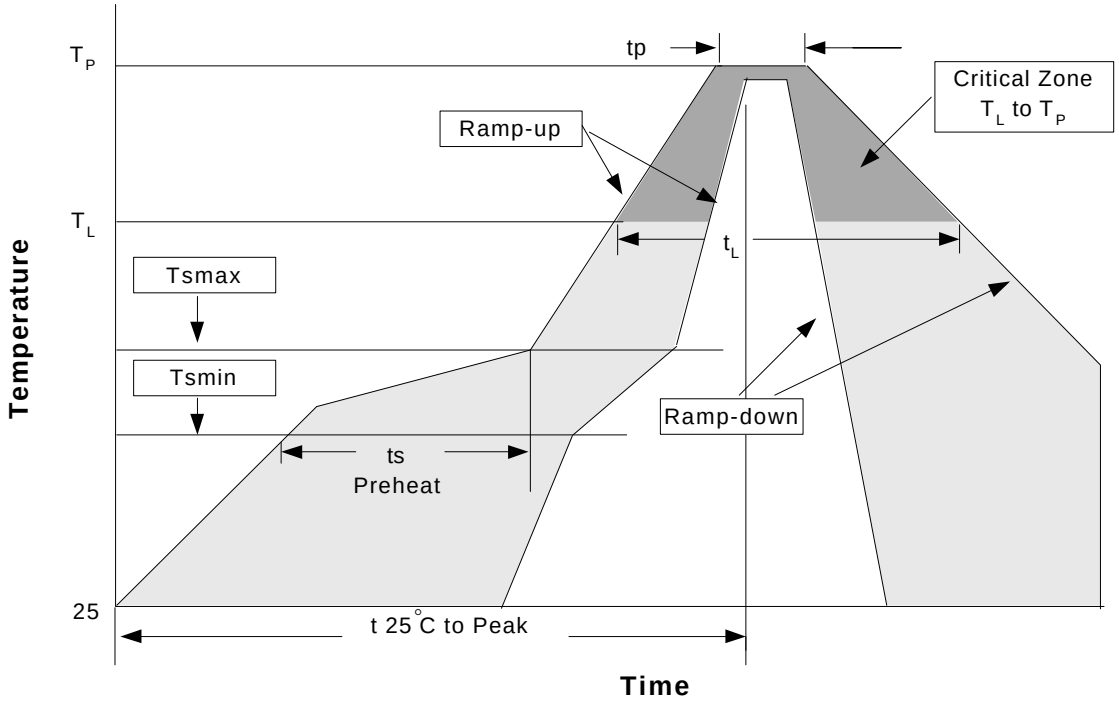


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	0.06	0.15	0.002	0.006
A2	0.86 TYP		0.34 TYP	
A3	0.25	0.4	0.01	0.0126
e	0.65 TYP		0.0256TYP	
e1	2.90	3.1	0.114	0.124
E	4.8	5.0	0.189	0.197
E1	2.90	3.1	0.169	0.177
L1	0.25 REF		0.039REF	
L2	0.0375 REF		0.953 REF	

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
Average ramp-up rate (T_L to T_P)	3°C/second max.	3°C/second max.
Preheat - Temperature Min (Tsmin) - Temperature Max (Tsmax) - Time (min to max) (ts)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: - Temperature (T_L) - Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak/Classificatioon Temperature (Tp)	See table 1	See table 2
Time within 5°C of actual Peak Temperature (tp)	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.

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

Classificatin Reflow Profiles(Cont.)

Table 1. SnPb Entectic Process – Package Peak Reflow Temperatures

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

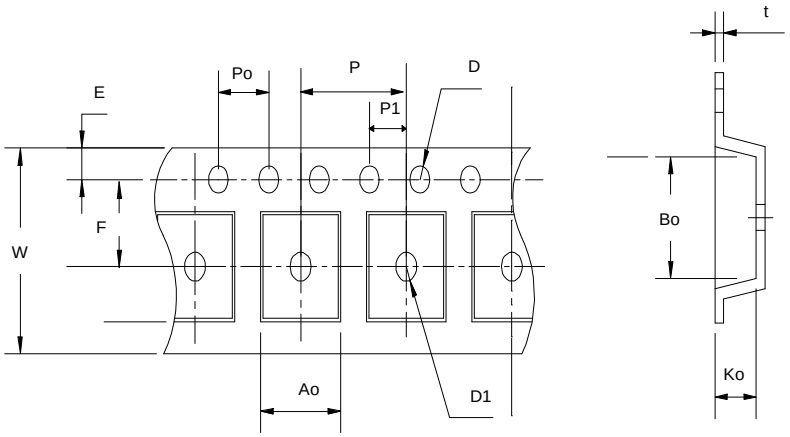
Table 2. Pb-free Process – Package Classification Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >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.			

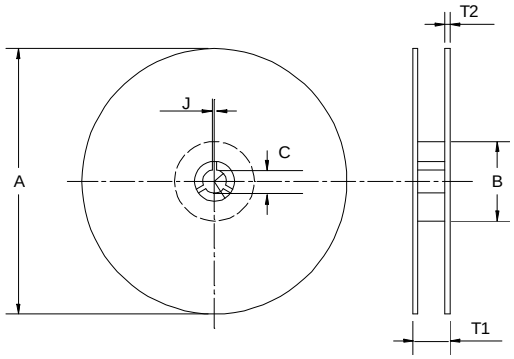
Reliability Test Program

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



Carrier Tape & Reel Dimensions(Cont.)



Application	A	B	C	J	T1	T2	W	P	E
M/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
MSOP- 8	12	9.3	3000

Customer Service

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Fax : 886-2-89191369