

# APL5522



Dual-Channel, 3.3V/500mA and 2.5V/500mA Linear Regulator

## Features

- Fixed Output Voltage :  
 $V_{OUT1}=3.3V/500mA$  (within maximum power dissipation)  
 $V_{OUT2}=2.5V/500mA$  (within maximum power dissipation)
- Low Dropout Voltage (defined as the minimum input/output voltage difference):  
Output 1 Dropout Voltage : 550mV (at 500mA)  
Output 2 Dropout Voltage : 630mV (at 500mA)
- Stable with 4.7uF Output Capacitor(at  $V_{OUT1}$ )  
Stable with 4.7uF Output Capacitor(at  $V_{OUT2}$ )
- No Protection Diodes Needed
- Built in Thermal Protection
- Built in Current Limit Protection
- Fast transient Response
- Short Setting Time
- SOP-8 and SOP-8-P Packages Available

## Applications

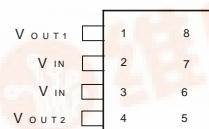
- Desktop Computer
- Networking Systems
- Optical Data Storage Systems

## General Description

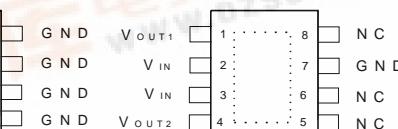
The APL5522 is a dual low dropout regulator with output 1 with 3.3V/0.5A and output2 with 2.5V/0.5A output capability. In order to obtain lower dropout voltage and faster transient response, which is critical for low voltage applications, the APL5222 has been optimized.  $V_{OUT1}$  typical dropout voltage is 550mV at 500mA loading and  $V_{OUT2}$  typical dropout voltage is 630mV at 500mA loading. Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal limiting provides protection against any combination of overload that would create excessive junction temperatures. The APL5522 regulator comes in a SOP-8 and SOP-8-P packages.

## Pin Configuration

SOP-8 Top View



SOP-8-P Top View



= Thermal Pad

(The thermal pad of SOP-8-P has to be connected to GND plane to get better heat dissipation than SOP-8.)

## Ordering and Marking Information

APL5522	□□-□□□	Lead Free Code Handling Code Temp. Range Package Code	Package Code K : SOP-8 KA : SOP-8-P Operating Junction Temp. Range C : 0 to 70°C Handling Code TU : Tube TR : Tape & Reel Lead Free Code L : Lead Free Device Blank : Original Device
APL5522 K /KA:	APL5522 XXXXX	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.

## Pin Description

PIN		I/O	Description
No.	Name		
1	V <sub>OUT1</sub>	O	V <sub>OUT1</sub> output Voltage 3.3V. sources up to 500 mA.
2	V <sub>IN</sub>	I	Supply Voltage. Voltage can range from 4V to 6V
3	V <sub>IN</sub>	I	Supply Voltage. Voltage can range from 4V to 6V
4	V <sub>OUT2</sub>	O	V <sub>OUT2</sub> output Voltage 2.5V. sources up to 500 mA.
5	GND		
6	GND		
7	GND		Ground also functions as a heatsink. Solder to the ground plane to maximize thermal dissipation
8	GND		

## Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V <sub>IN</sub> , V <sub>OUT</sub>	Input Voltage or Out Voltage	6	V
R <sub>TH,JA</sub>	Thermal Resistance – Junction to Ambient SOP-8 SOP-8-P	120 65	°C/W
R <sub>TH,JC</sub>	Thermal Resistance – Junction to Case SOP-8 SOP-8-P	30 5	°C/W
PD	Power Dissipation	Internally Limited	W
T <sub>J</sub>	Operating Junction Temperature	0 to 150	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C
TL	Lead Temperature (Soldering, 10 second)	260	°C

## Electrical Characteristics

Unless otherwise noted these specifications apply over full temperature, C<sub>IN</sub>=1μF, C<sub>OUT1</sub>=C<sub>OUT2</sub>=4.7μF, T<sub>J</sub>=0 to 150°C. Typical values refer to T<sub>J</sub>=25°C.

Symbol	Parameter	Test Conditions	APL5522			Unit
			Min.	Typ.	Max.	
V <sub>IN</sub>	Input Voltage		2.7		6	V
I <sub>SHORT</sub>	Short Current	V <sub>OUT</sub> =0V		50		mA
PSRR	Ripple Rejection	F≤1kHz, 1Vpp at V <sub>IN</sub> = V <sub>OUT</sub> +1.0V	45	55		dB
OTS	Over Temperature Shutdown			150		°C
	Over Temperature Shutdown Hysteresis	Hysteresis		30		°C
TC	Output Voltage Temperature Coefficient			50		ppm/°C

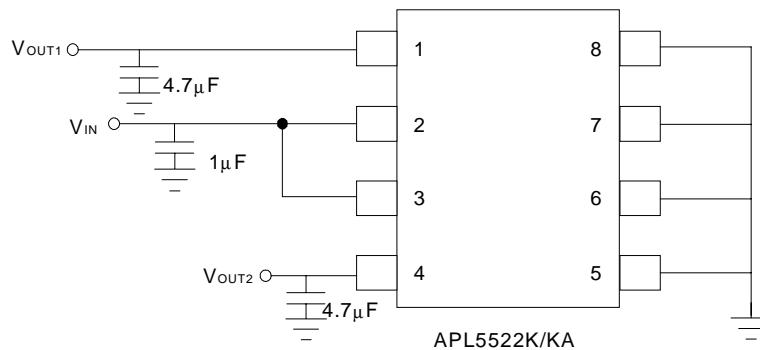
## Electrical Characteristics (Cont.)

Unless otherwise noted these specifications apply over full temperature,  $C_{IN}=1\mu F$ ,  $C_{OUT1}=C_{OUT2}=4.7\mu F$ ,  $T_J=0$  to  $150^{\circ}C$ . Typical values refer to  $T_J=25^{\circ}C$ .

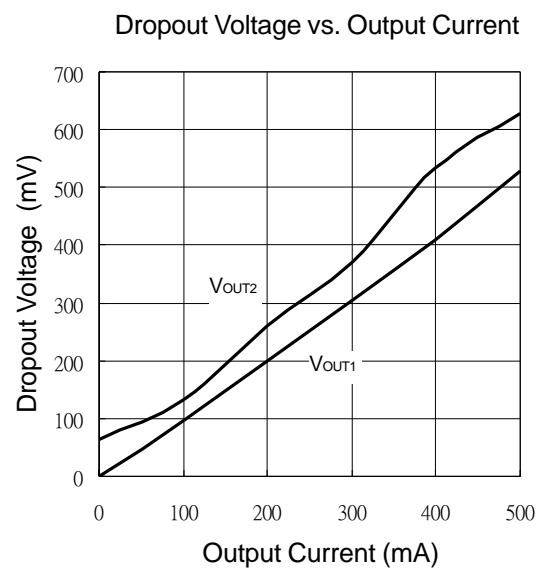
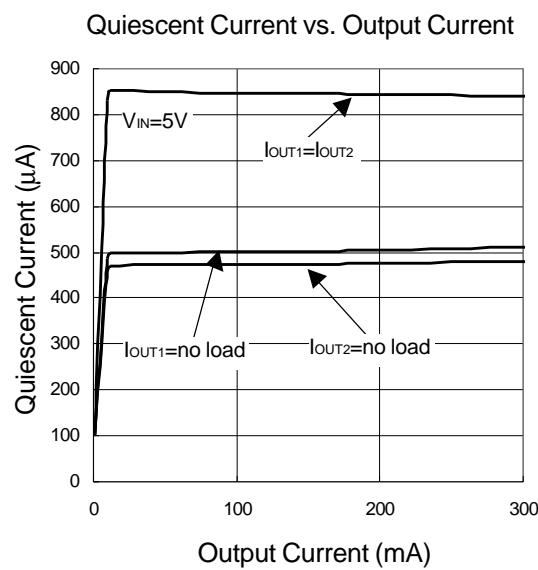
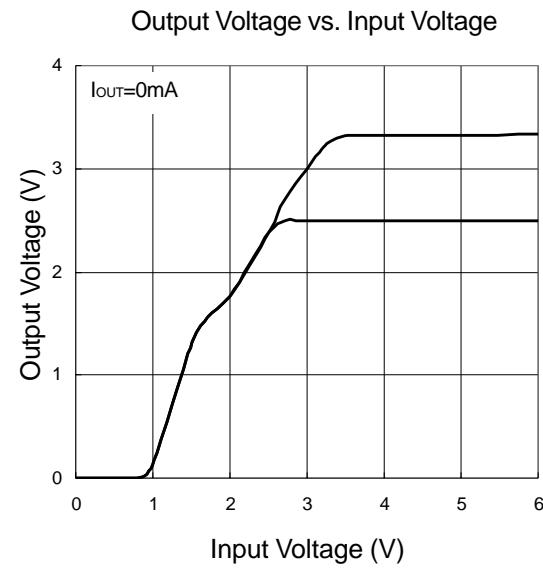
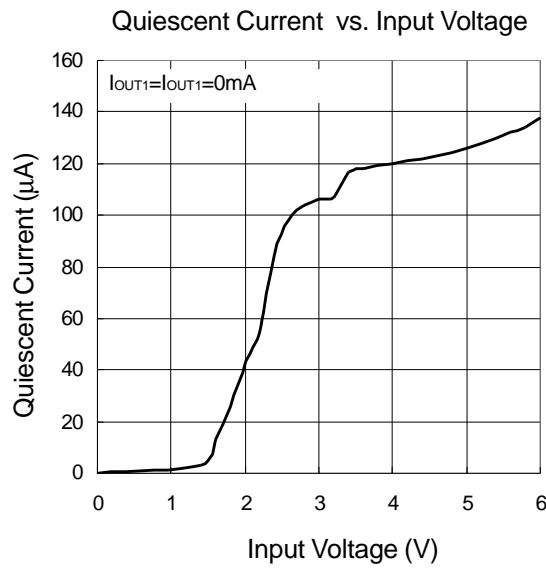
Symbol	Parameter	Test Conditions	APL5522			Unit
			Min.	Typ.	Max.	
$I_Q$	Quiescent Current	$I_{OUT1}=300mA$ , $I_{OUT2}=300mA$		900	1000	$\mu A$
		$I_{OUT1}=0mA$ , $I_{OUT2}=0mA$		100	200	
<b>Output1 (500mA)</b>						
$V_{OUT}$	Output Voltage	$V_{OUT}+1.0V < V_{CC} < 6.0V$ , $0mA < I_{OUT} < I_{MAX}$	$V_{OUT}-2\%$	3.3	$V_{OUT}+2\%$	V
$I_{LIMIT}$	Circuit Current Limit	$V_{IN}=V_{OUT}+1V$		800		mA
$I_{OUT}$	Load Current	$V_{IN}=V_{OUT}+1V$	500			mA
$REG_{LINE}$	Line Regulation	$V_{OUT}+1V < V_{CC} < 6.0V$ , $I_{OUT}=1mA$		4	10	mV
$REG_{LOAD}$	Load Regulation	$V_{IN}=V_{OUT}+1V$ , $0mA < I_{OUT} < I_{MAX}$		26	40	mV
	Load Transient	$V_{IN}=V_{OUT}+1V$ , $I_{OUT}=1mA-500mA$ in $1\mu s$		150	250	mV
$V_{DROP}$	Dropout Voltage <sup>(Note3)</sup>	$I_{OUT}=500mA$		0.6	0.7	V
$C_{OUT}$	Output Capacitor			4.7		$\mu F$
	ESR		0.01	0.1	1	Ohm
<b>Output2 (500mA)</b>						
$V_{OUT}$	Output Voltage	$V_{OUT}+1.0V < V_{CC} < 6.0V$ , $0mA < I_{OUT} < I_{MAX}$	$V_{OUT}-2\%$	2.5	$V_{OUT}+2\%$	V
$I_{LIMIT}$	Circuit Current Limit	$V_{IN}=V_{OUT}+1V$		800		mA
$I_{OUT}$	Load Current	$V_{IN}=V_{OUT}+1V$	500			mA
$REG_{LINE}$	Line Regulation	$V_{OUT}+1V < V_{CC} < 6.0V$ , $I_{OUT}=1mA$		4	10	mV
$REG_{LOAD}$	Load Regulation	$V_{IN}=V_{OUT}+1V$ , $0mA < I_{OUT} < I_{MAX}$		26	40	mV
	Load Transient	$V_{IN}=V_{OUT}+1V$ , $I_{OUT}=1mA-500mA$ in $1\mu s$		150	250	mV
$V_{DROP}$	Dropout Voltage <sup>(Note3)</sup>	$I_{OUT}=500mA$		0.6	0.7	V
$C_{OUT}$	Output Capacitor			4.7		$\mu F$
	ESR		0.01	0.1	1	Ohm

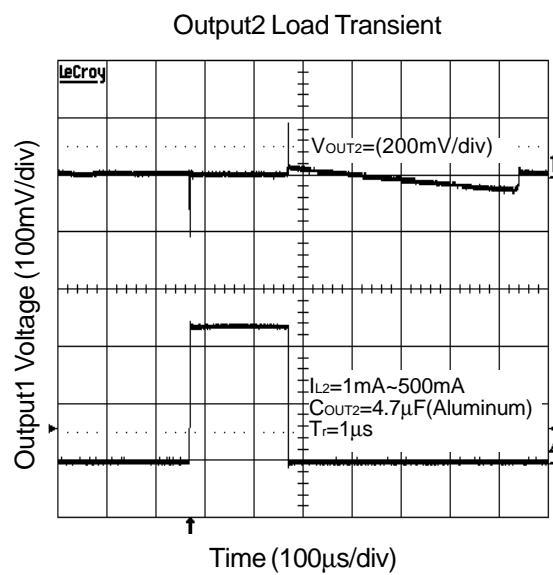
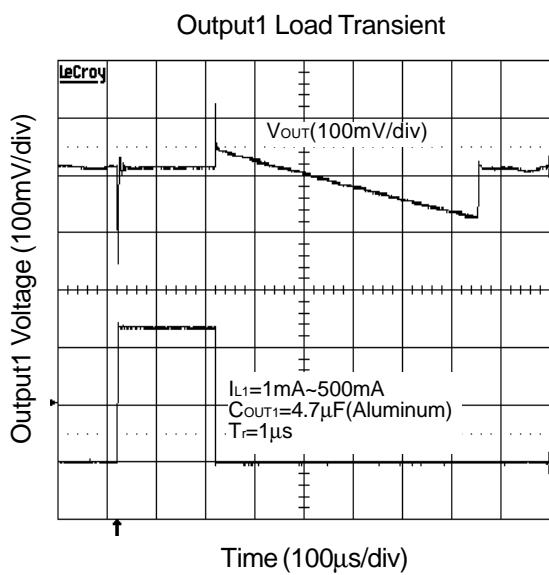
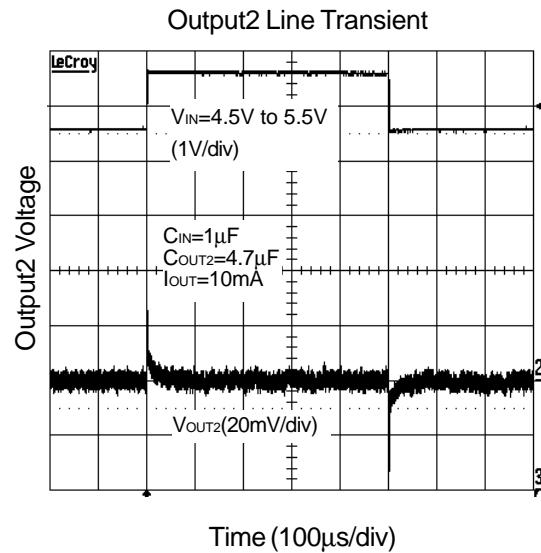
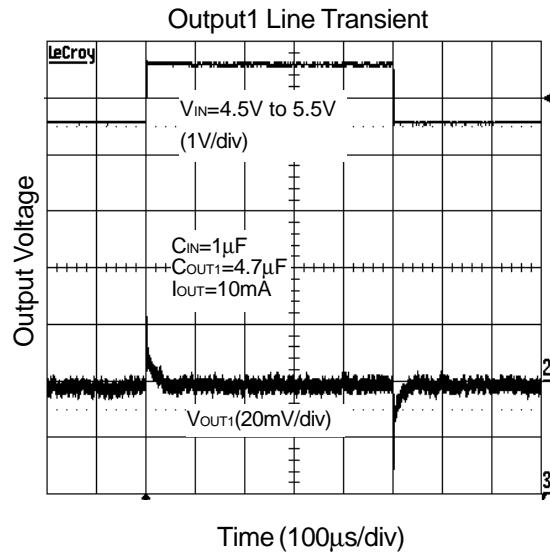
Note3 : Dropout voltage definition :  $V_{IN}-V_{OUT}$  when  $V_{OUT}$  is 2% below the value of  $V_{OUT}$  for  $V_{IN}=V_{OUT}+1V$

## Application Circuit

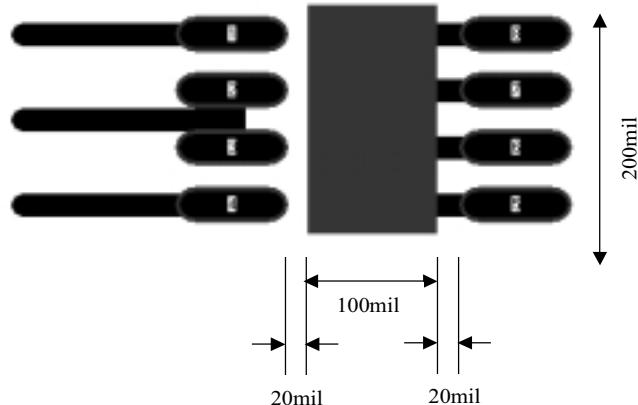
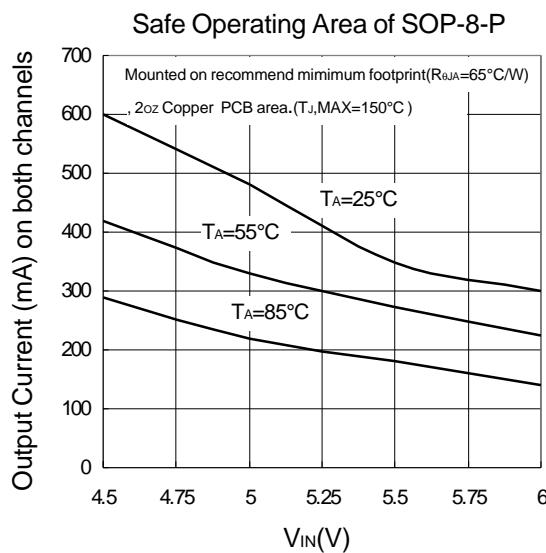
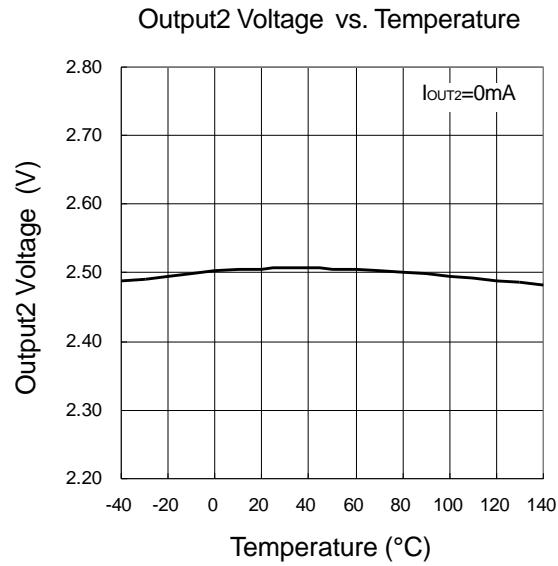
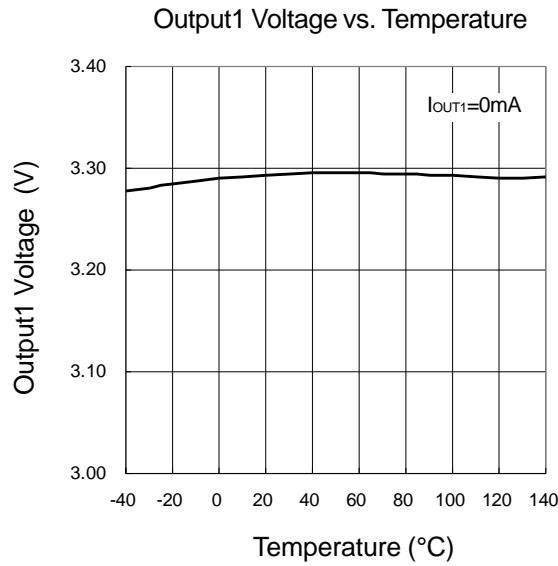


## Typical Characteristics



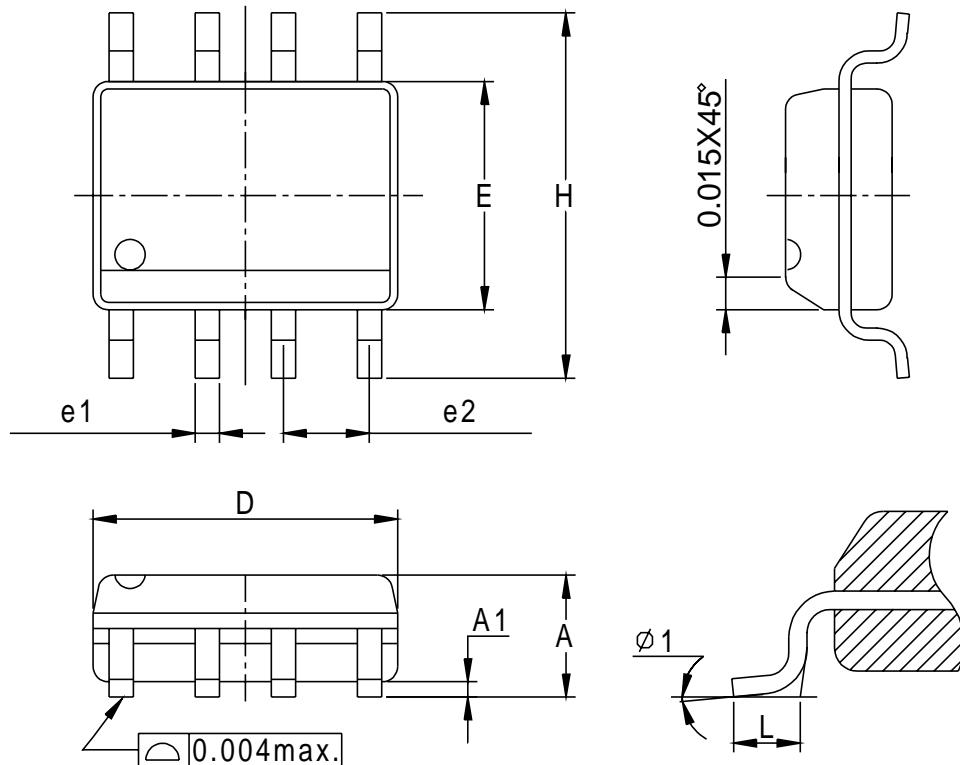
**Typical Characteristics (Cont.)**

## Typical Characteristics (Cont.)



## Packaging Information

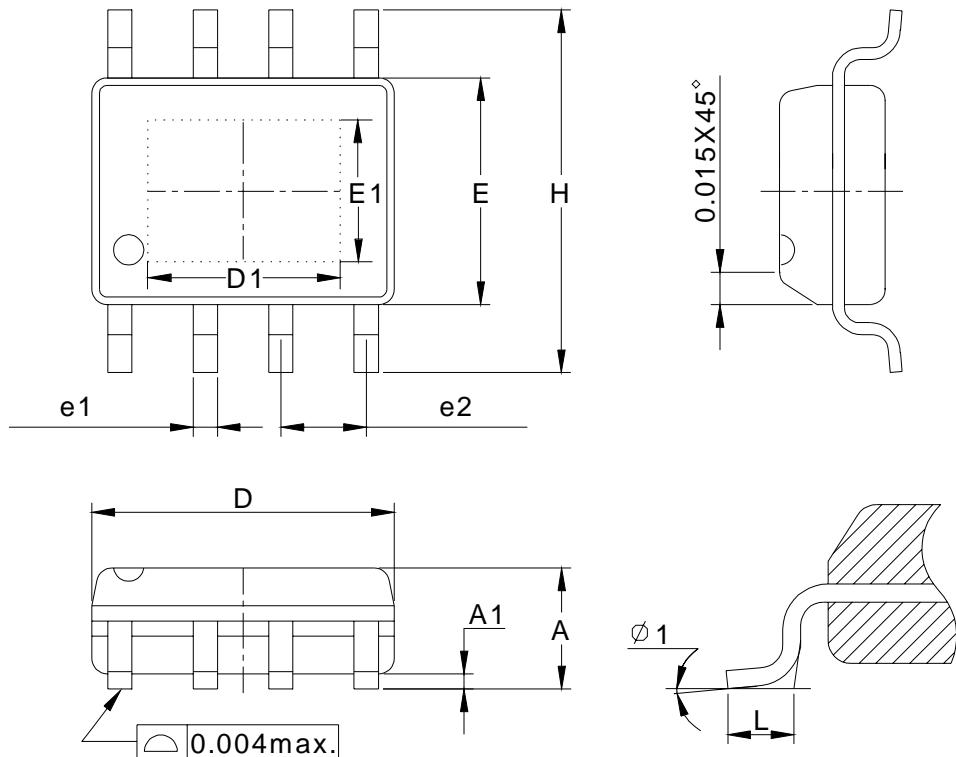
SOP-8 pin ( Reference JEDEC Registration MS-012)



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	8°		8°	

## Packaging Information

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

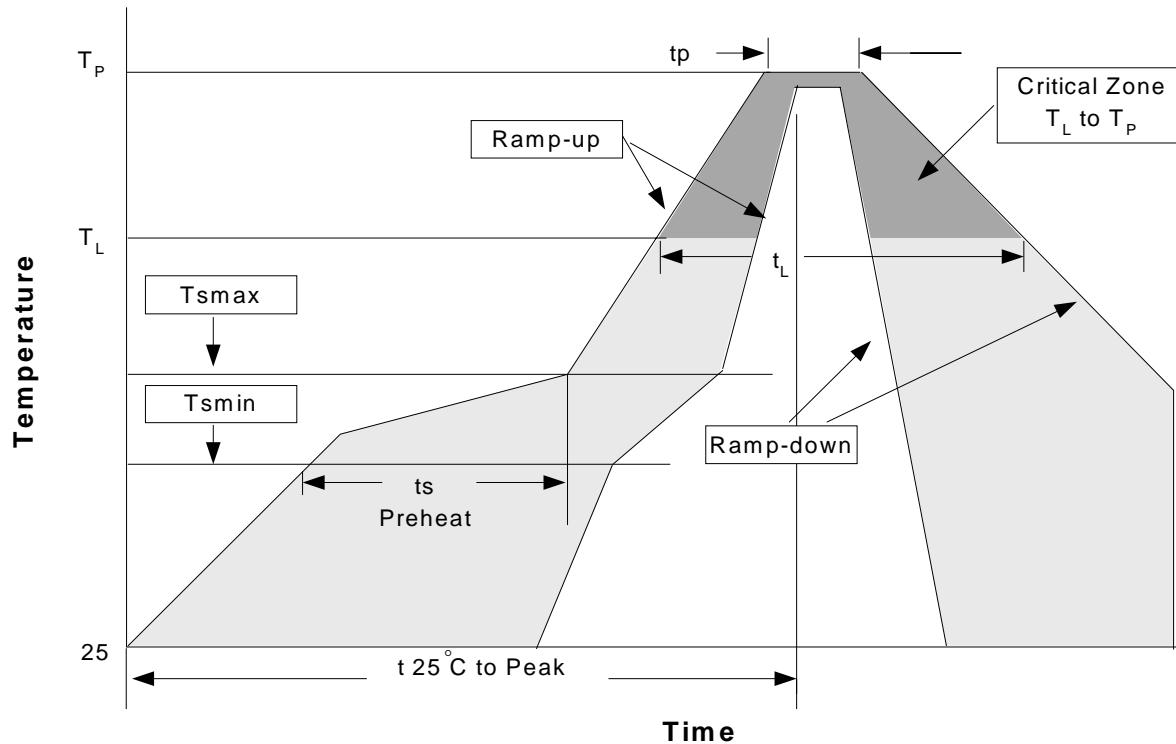


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
D1	3.00REF		0.118REF	
E	3.80	4.00	0.150	0.157
E1	2.60REF		0.102REF	
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
φ 1	8°		8°	

## 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)



## Classification Reflow Profiles

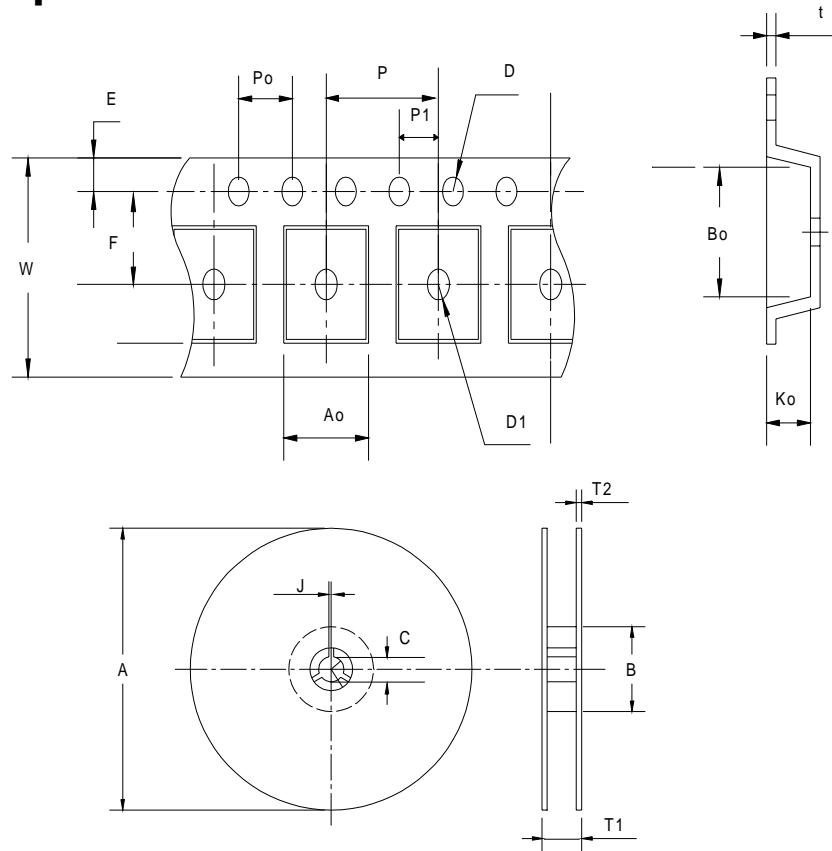
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )	3°C/second max.		3°C/second max.	
Preheat	- Temperature Min (Tsmin)	100°C	150°C	200°C
	- Temperature Mix (Tsmax)	150°C	60-120 seconds	60-180 seconds
	- Time (min to max)(ts)			
Tsmax to T <sub>L</sub>			3°C/second max	
- Ramp-up Rate				
Tsmax to T <sub>L</sub>	- Temperature(T <sub>L</sub> )		183°C	
	- Time (t <sub>L</sub> )		60-150 seconds	
Peak Temperature(Tp)	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 , I <sub>tr</sub> > 100mA

## Carrier Tape



Application	A	B	C	J	T1	T2	W	P	E
<b>SOP-8-P</b>	$330 \pm 1$	$62 \pm 1.5$	$12.75 + 0.15$	$2 + 0.5$	$12.4 +0.2$	$2 \pm 0.2$	$12 + 0.3 - 0.1$	$8 \pm 0.1$	$1.75 \pm 0.1$
Application	F	D	D1	Po	P1	Ao	Bo	Ko	t
<b>SOP-8/P</b>	$5.5 \pm 0.1$	$1.55 \pm 0.1$	$1.55 + 0.25$	$4.0 \pm 0.1$	$2.0 \pm 0.1$	$6.4 \pm 0.1$	$5.2 \pm 0.1$	$2.1 \pm 0.1$	$0.3 \pm 0.013$

(mm)

## Cover Tape Dimensions

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

## Customer Service

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