

## 500mA Low Dropout Linear Regulator

### Features

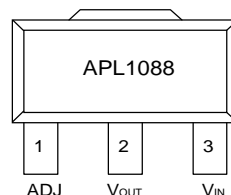
- Output Voltage Accuracy  $\pm 2.0\%$
- Line Regulation - 1mV (typ.)
- Load Regulation - 6mV (typ.)
- Input Voltage Range up to 9V
- Internal Current Limiting and Thermal Shutdown Protections
- SOT-89 and TO-92 Packages Available

### General Description

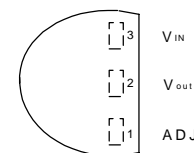
The APL1088 is a 3-pin low dropout linear regulator with 2.0% accuracy of output voltage over line, load and temperature variations. The output current capability of APL1088 is over 500mA. Dropout voltage at 500mA output current is less than 1.5V(max). Both output current limiting and thermal shutdown are built in to provide maximal protection to the APL1088 against fault conditions. The over current and thermal shutdown circuits become active when the current exceed 500mA, or the junction temperature reach 150°C. Normal operation is recovered when junction temperature drops below 130°C.

### Applications

- Voltage Regulator for CD-ROM Drivers
- Voltage Regulator for LAN Cards
- Voltage Regulator for mother Boards
- Wireless Communication Systems
- Portable Instrument
- Portable Consumer Equipment
- Low Voltage Systems



SOT-89 (Top View)



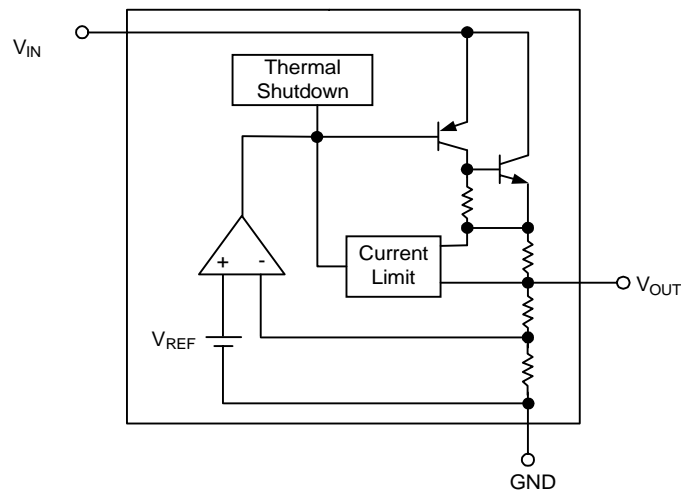
TO-92 (Top View)

### Ordering Information

<p>APL1088    □□-□□□</p> <div style="margin-left: 40px;"> <p>└─ Lead Free Code</p> <p>└─ Handling Code</p> <p>└─ Temp. Range</p> <p>└─ Package Code</p> </div>	<p>Package Code D : SOT-89    E : TO-92</p> <p>Temp. Range C : 0 to 70 °C</p> <p>Handling Code TR : Tape &amp; Reel    PB : Plastic Bag</p> <p>Lead Free Code L : Lead Free Device    Blank : Original Device</p>
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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
$V_{IN}$	Input Voltage	9	V
$I_{OUT}$	Output Current	0.75	A
$T_A$	Operating Ambient Temperature Range	0 to 70	°C
$T_J$	Operating Junction Temperature Range	-40 to +150	°C
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$P_D$	Power Dissipation	Internal limited	mW
$\theta_{JA}$	Thermal Resistance Junction to Ambient	180	°C / W

## Electrical Characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise noted)

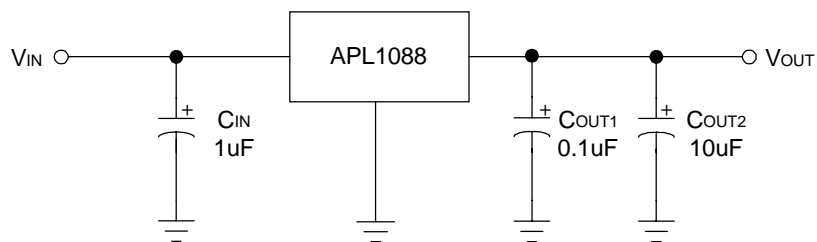
Symbol	Parameter	Test Conditions	APL1088			Unit
			Min.	Typ.	Max.	
$V_{IN}$	Input Voltage		2.75		9	V
$V_{OUT}$	Output Voltage	$I_{OUT}=10\text{mA}$	1.225	1.250	1.275	V
$I_{OUT}$	Output Current Capability	$V_{OUT}=3.3\text{V}, \Delta V_{OUT}=2\%$	500			mA
$I_{SC}$	Short Circuit Current	$V_{OUT} < 0.4\text{V}$		1.0		A
$I_{ADJ}$	Adjustable Pin Current	$V_{IN}=5\text{V}$ , No Load		60	120	uA
$I_{LMIN}$	Minimum Load Current	$2.75\text{V} \leq V_{IN} \leq 9.00\text{V}$ ,		2	10	mA
$REG_{LINE}$	Line Regulation	$I_{OUT}=10\text{mA}$ , $V_{IN}=5\text{V}$ to 9V		1	6	mV
$REG_{LOAD}$	Load Regulation	$I_{OUT}=1\text{mA}\sim 500\text{mA}$		6	12	mV

## Electrical Characteristics cont. ( $T_A=25^{\circ}\text{C}$ , unless otherwise noted)

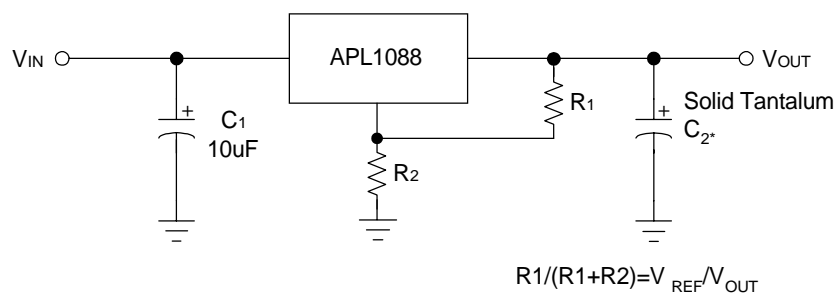
Symbol	Parameter	Test Conditions	APL1088			Unit
			Min.	Typ.	Max.	
$V_{\text{DROPOUT}}$	Dropout Voltage	$I_{\text{OUT}}=500\text{mA}$ , $\Delta V_{\text{OUT}}=1\%$			1500	mV
PSRR	Power Supply Rejection Ratio	at 1kHz		55		dB
OTS	Over Temperature Shutdown			150		$^{\circ}\text{C}$
$E_N$	Output Noise			100		$\mu\text{Vrms}$
TC	Output Voltage Temperature Coefficient			100		ppm/ $^{\circ}\text{C}$

## Application Schematic

### Fixed 1.250V Output



### Programmable Output setting by External Resistors(R1 and R2)

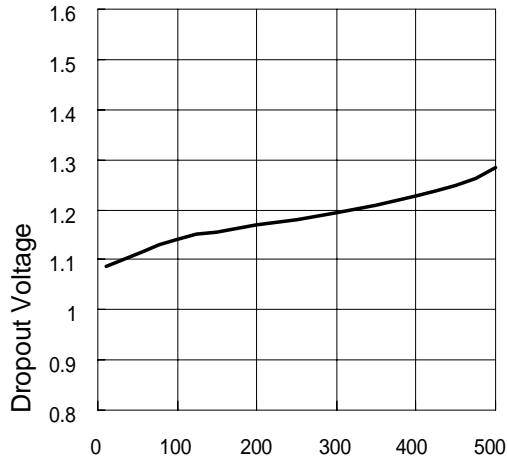


\* Required for stability, APL1088 : $C_2=10\mu\text{F}$

\* R1 is typically in range of  $100\Omega$  to  $120\Omega$  to meet  $I_{\text{min}}$  requirement.

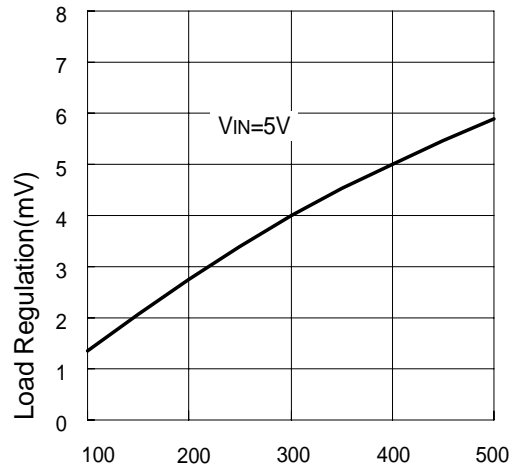
## Typical Characteristics

$I_{out}$  vs. Dropout Voltage



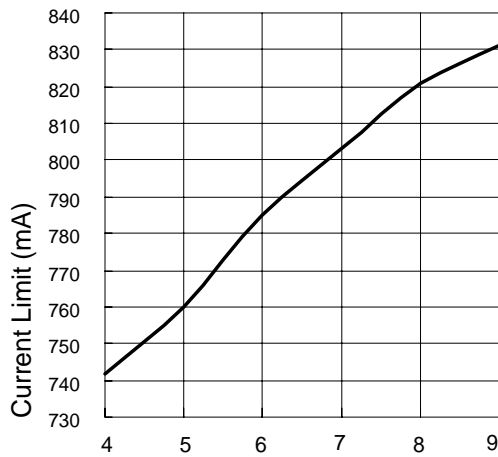
Output Current

$I_{out}$  vs. Load Regulation



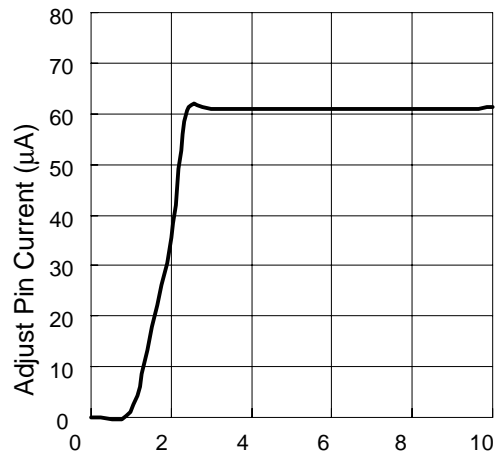
Output Current

Input Voltage vs. Current limit



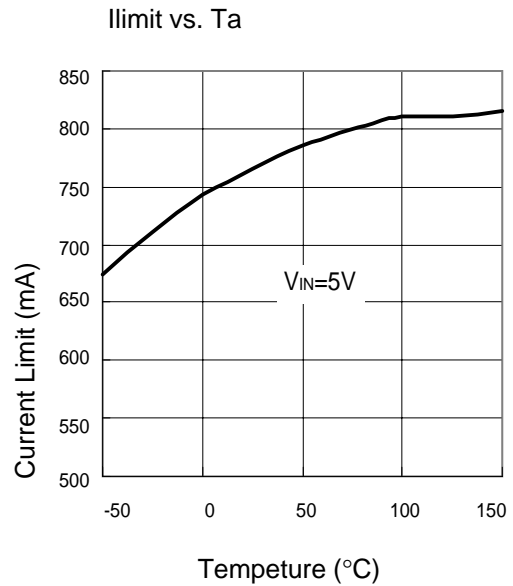
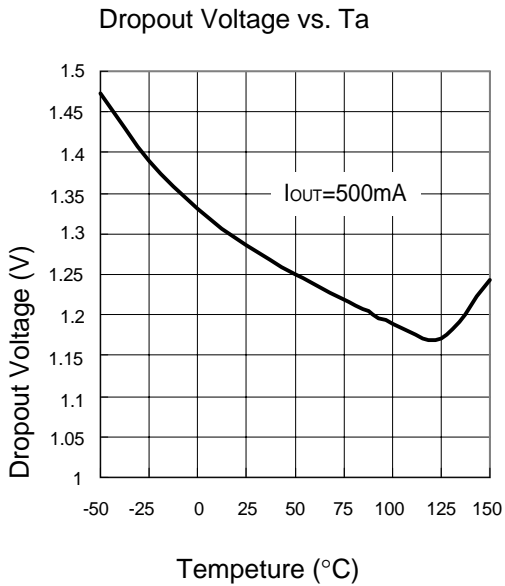
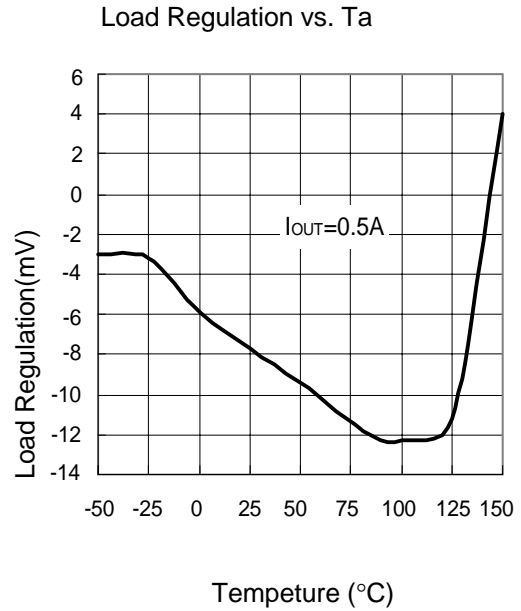
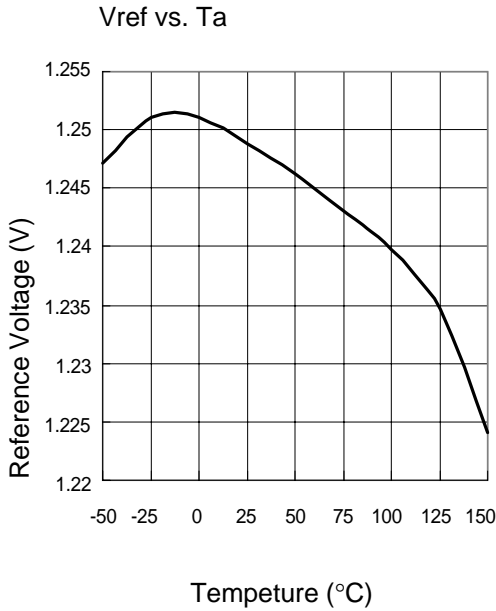
Input Voltage (V)

Input Voltage vs. Adjust Current

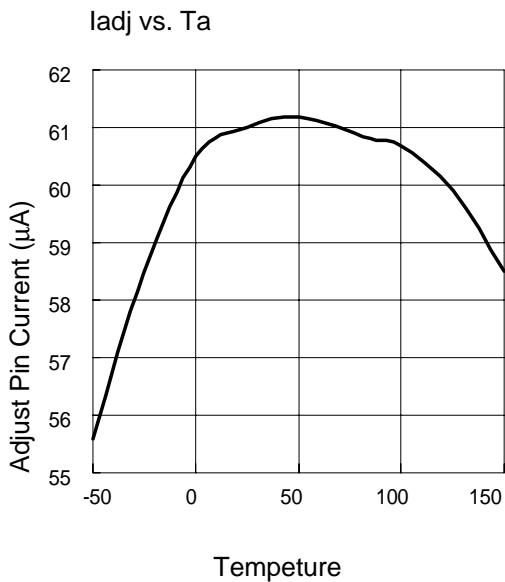
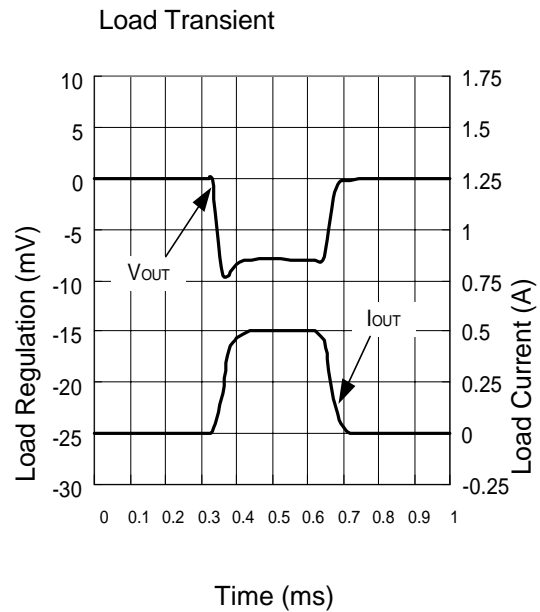
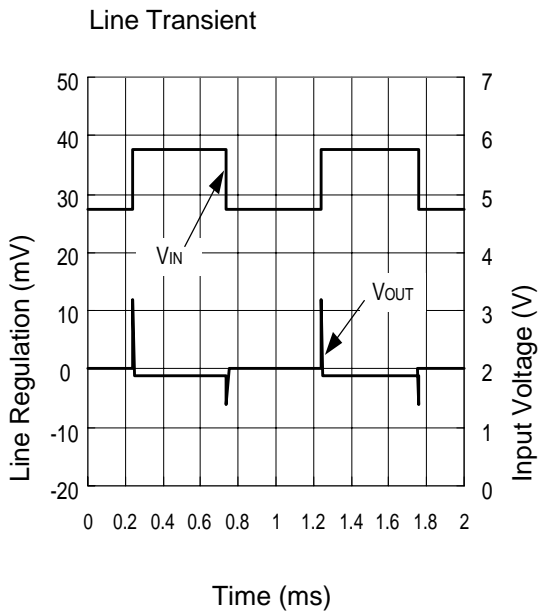


Input Voltage (V)

## Typical Characteristics



## Typical Characteristics Cont.



## Customer Service

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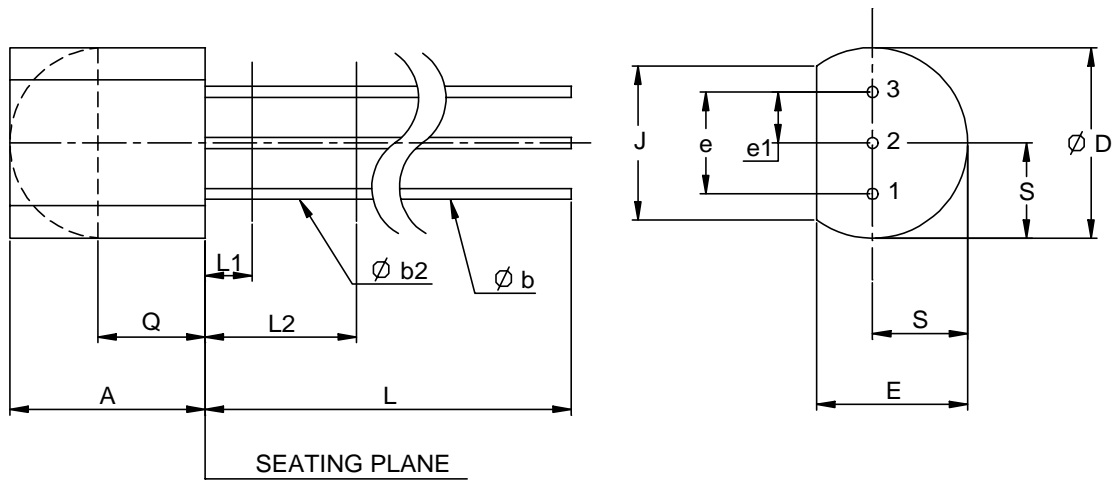
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Package Information

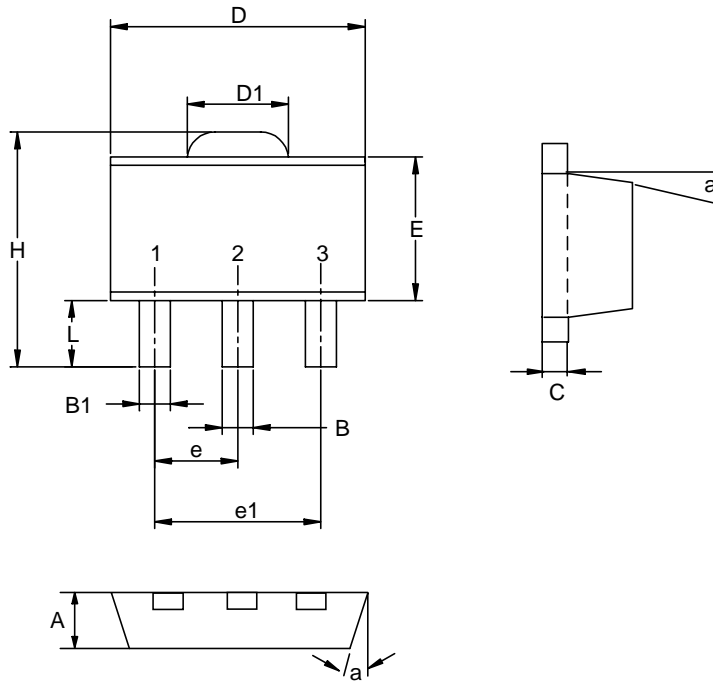
TO-92



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.58	5.33	0.170	0.210
φ b	0.41	0.53	0.160	0.021
φ b2	0.41	0.48	0.160	0.019
φ D	4.96	5.20	0.175	0.205
E	3.94	4.19	0.125	0.165
e	2.42	2.66	0.095	0.105
e1	1.15	1.39	0.045	0.055
J	3.43		0.135	
L	12.70		0.500	
L1		1.27		0.050
L2	6.35		0.250	
Q	2.93		0.115	
S	2.42	2.66	0.080	0.105

## Package Information

SOT-89 (Reference EIAJ ED-7500A Registration SC-62)



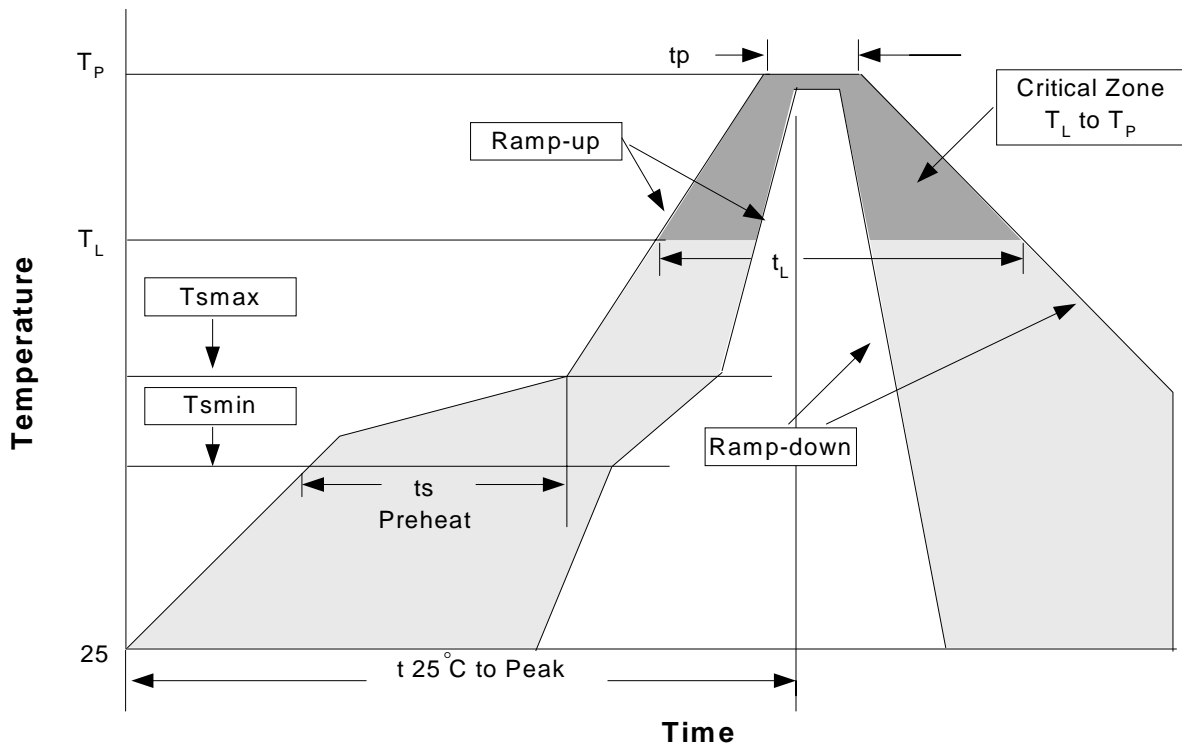
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.40	1.60	0.055	0.063
B	0.40	0.56	0.016	0.022
B1	0.35	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
E	2.29	2.60	0.090	0.102
H	3.75	4.25	0.148	0.167
L	0.80	1.20	0.031	0.047
α		10°		10°



## 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.
Packaging	1000 devices per reel for SOT-89

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



### Classification Reflow Profiles

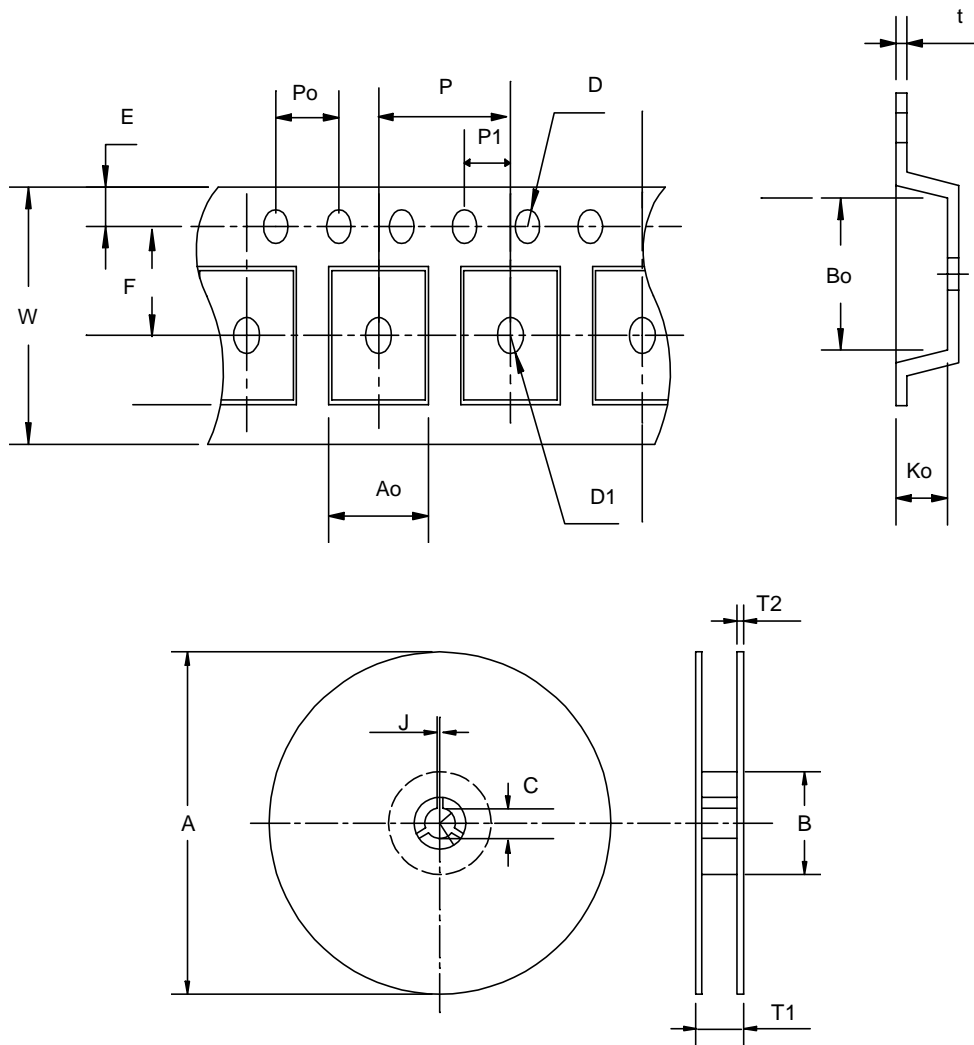
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min (T <sub>smin</sub> )	100°C		150°C	
- Temperature Mix (T <sub>smax</sub> )	150°C		200°C	
- Time (min to max)(t <sub>s</sub> )	60-120 seconds		60-180 seconds	
T <sub>smax</sub> to T <sub>L</sub>			3°C/second max	
- Ramp-up Rate				
T <sub>smax</sub> to T <sub>L</sub>				
- Temperature(T <sub>L</sub> )	183°C		217°C	
- Time (t <sub>L</sub> )	60-150 seconds		60-150 seconds	
Peak Temperature(T <sub>p</sub> )	225 +0/-5°C	240 +0/-5°C	245 +0/-5°C	250 +0/-5°C
Time within 5°C of actual Peak Temperature(t <sub>p</sub> )	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



## Carrier Tape & Reel Dimensions

Application	A	B	C	J	T1	T2	W	P	E
<b>SOT-89</b>	178 ±1	70 ± 2	13.5 ± 0.15	3 ± 0.15	14 ± 2	1.3 ± 0.3	12 + 0.3 12 - 0.1	8 ± 0.1	1.75 ± 0.1
Application	F	D	D1	Po	P1	Ao	Bo	Ko	t
<b>SOT-89</b>	5.5 ± 0.05	1.5 ± 0.1	1.5 ± 0.1	4.0 ± 0.1	2.0 ± 0.1	4.8 ± 0.1	4.5 ± 0.1	1.80 ± 0.1	0.3 ± 0.013

(mm)

## Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
<b>SOT- 89</b>	12	9.3	1000

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