

## 450mA Low Dropout Linear Regulator of Adjustable and Fixed Voltages

### Features

- Low Dropout Voltage of 1.3V at 450mA
- Output Voltage Accuracy  $\pm 2.0\%$
- Line Regulation - 3mV (typ.)
- Load Regulation - 13mV (typ.)
- Input Voltage Range up to 9V
- Internal Current Limiting and Thermal Shutdown Protections
- Available Output Voltages -ADJ, 1.8V, 2.5V, 2.6V, 2.7V, 2.8V, 3.3V
- Various SOT-89 and TO-92 Packages Available

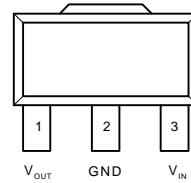
### Applications

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

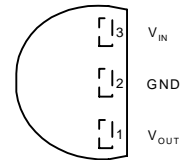
### General Description

The APL5835 is a 3-pin low dropout linear regulator with 2.0% accuracy of output voltage over line, load and temperature variations. Dropout voltage at 450mA output current is less than 1.3V. Both output current limiting and thermal shutdown are built in to provide maximal protection to the APL5835 against fault conditions. The over current and thermal shutdown circuits become active when the current exceed 450mA, or the junction temperature reach 150°C. Normal operation is recovered when junction temperature drops below 130°C.

### Pin Description

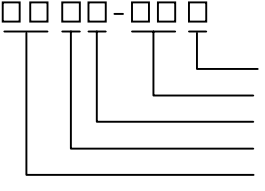


SOT-89 (Top View)

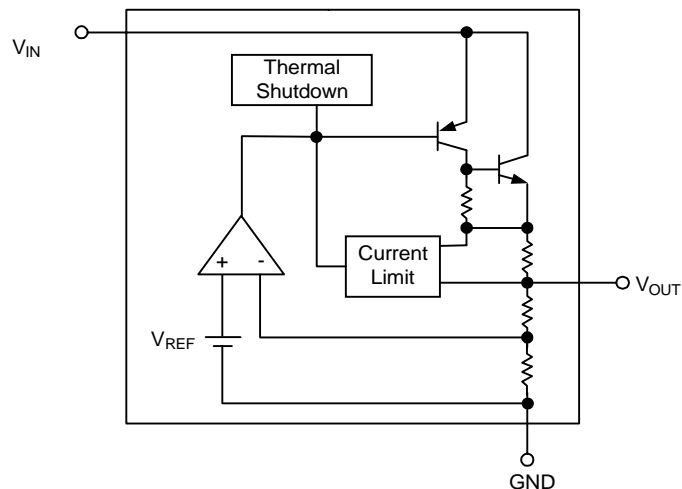


TO-92 (Top View)

## Ordering and Marking Information

<p>APL5835 - □□□□-□□□□</p>  <p>Lead Free Code Handling Code Temp. Range Package Code Voltage Code</p>	<p>Package Code D : SOT-89      E : TO-92 Temp. Range C : 0 to 70°C Handling Code TU : Tube      TR : Tape &amp; Reel Voltage Code 18 : 1.8V      25 : 2.5V      26 : 2.6V      27 : 2.7V 28 : 2.8V      33 : 3.3V      Blank : Adjustable Version Lead Free Code L : Lead Free Device      Blank : Original Device</p>
<p>APL5835 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX</span>      XXXXX - Date Code</p>	<p>APL5835 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX</span>      XXXXX - Date Code</p>
<p>APL5835 -18 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX18</span>      XXXXX - Date Code</p>	<p>APL5835 -18 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX18</span>      XXXXX - Date Code</p>
<p>APL5835 -25 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX25</span>      XXXXX - Date Code</p>	<p>APL5835 -25 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX25</span>      XXXXX - Date Code</p>
<p>APL5835 -26 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX26</span>      XXXXX - Date Code</p>	<p>APL5835 -26 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX26</span>      XXXXX - Date Code</p>
<p>APL5835 -27 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX27</span>      XXXXX - Date Code</p>	<p>APL5835 -27 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX27</span>      XXXXX - Date Code</p>
<p>APL5835 -28 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX28</span>      XXXXX - Date Code</p>	<p>APL5835 -28 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX28</span>      XXXXX - Date Code</p>
<p>APL5835 -33 D : <span style="border: 1px solid black; padding: 2px;">APL5835 XXXXX33</span>      XXXXX - Date Code</p>	<p>APL5835 -33 E : <span style="border: 1px solid black; padding: 2px;">APL 5835 XXXXX33</span>      XXXXX - Date Code</p>

## Block Diagram



## Absolute Maximum Ratings

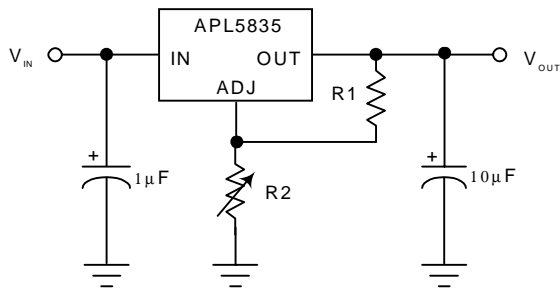
Symbol	Parameter	Rating	Unit
$V_{IN}$	Input Voltage	9	V
$I_{OUT}$	Output Current	450	mA
$T_A$	Operating Ambient Temperature Range	0 to 70	°C
$T_J$	Operating Ambient Temperature Range	-40 to +150	°C
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$P_D$	Power Dissipation Package	Interanal Limited	
$\theta_{JA}$	Thermal Resistance	SOT-89	180
		TO-92	180

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

Symbol	Parameter	Test Condition	APL5835			Unit
			Min.	Typ.	Max.	
$V_N$	Input Voltage		$V_{OUT} + 1.45V$		8	V
$V_{OUT}$	Output Voltage	$I_{OUT}=10mA$	$0.9 V_{OUT}$		$1.02 V_{OUT}$	V
$I_{OUT}$	Output Current Capability	$\Delta V_{OUT}=2\%$	450			mA
$I_{SC}$	Short Circuit Current	$V_{OUT}<0.4V$		600		mA
$I_Q$	Quiescent Current	$V_N=5V$ , No Load		6	10	mA
$REG_{LINE}$	Line Regulation APL5835 APL5835-18 APL5835-25 APL5835-26 APL5835-27 APL5835-28 APL5835-33	$T_J=0\sim 125^\circ\text{C}$ $I_{OUT}=10mA, V_{OUT}+1.7V\leq V_{IN}\leq 8V$				mV
		$I_{OUT}=0A, 3.5V\leq V_{IN}\leq 8V$		3	6	
		$I_{OUT}=0A, 4.2V\leq V_{IN}\leq 8V$				
		$I_{OUT}=0A, 4.3V\leq V_{IN}\leq 8V$				
		$I_{OUT}=0A, 4.4V\leq V_{IN}\leq 8V$				
		$I_{OUT}=0A, 4.5V\leq V_{IN}\leq 8V$				
		$I_{OUT}=0A, 5V\leq V_{IN}\leq 8V$				
$REG_{LOAD}$	Load Regulation APL5835 APL5835-18 APL5835-25 APL5835-26 APL5835-27 APL5835-28 APL5835-33	$T_J=0\sim 125^\circ\text{C}$ $(V_{IN}-V_{OUT})=1.7V, 0\leq I_{OUT}\leq 0.45A$				mV
		$V_{IN}=3.5V, 0\leq I_{OUT}\leq 0.45A$		13	20	
		$V_{IN}=4.2V, 0\leq I_{OUT}\leq 0.45A$				
		$V_{IN}=4.5V, 0\leq I_{OUT}\leq 0.45A$				
		$V_{IN}=4.4V, 0\leq I_{OUT}\leq 0.45A$				
		$V_{IN}=4.5V, 0\leq I_{OUT}\leq 0.45A$				
		$V_{IN}=5V, 0\leq I_{OUT}\leq 0.45A$				
$V_{DROPOUT}$	Dropout Voltage	$I_{OUT}=450mA, \Delta V_{OUT}=1\%$		1300	1450	mV
PSRR	Power Supply Rejection Ratio	at 1kHz		55		dB
OTS	Over Temperature Shutdown			150		°C
$E_N$	Output Noise			100		$\mu\text{Vrms}$
TC	Output Voltage Temperature Coefficient			100		ppm/°C

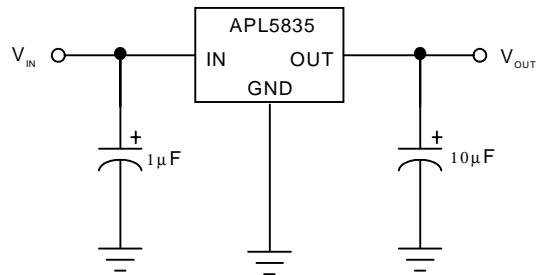
## Application Schematic

1.25V to 7V Adjustable Regulator



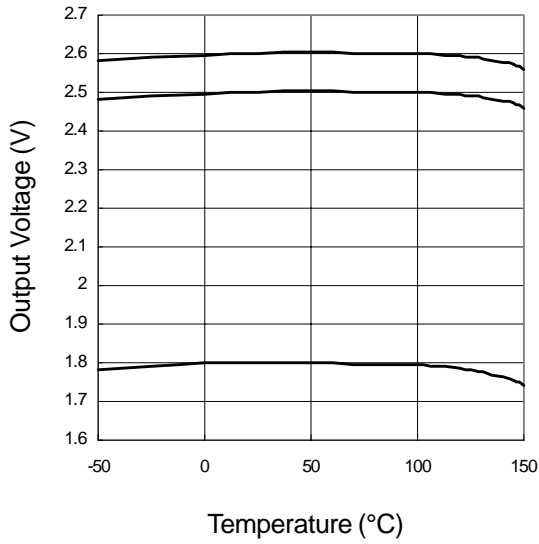
$$V_{OUT} = 1.250V \times \frac{R1+R2}{R1}$$

Fixed 1.8V, 2.5V, 2.6V, 2.7V, 2.8V and 3.3V Regulator

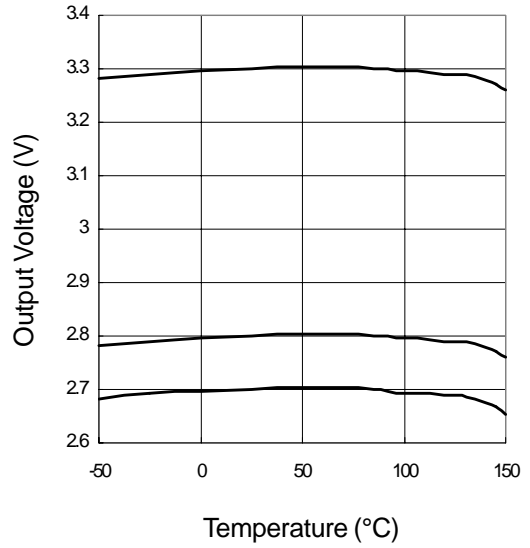


## Typical Characteristics

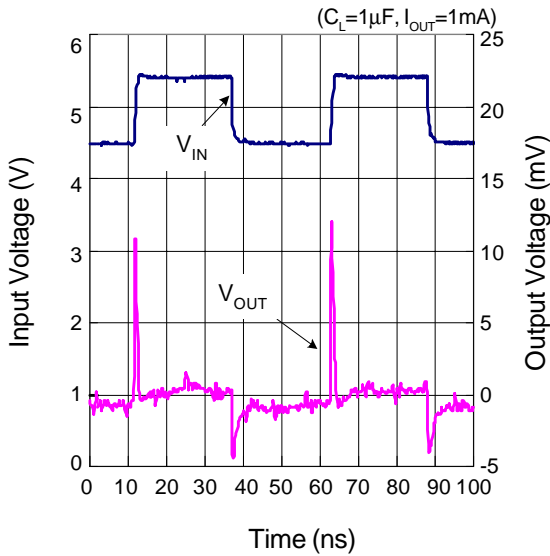
Output Voltage vs. Temperature



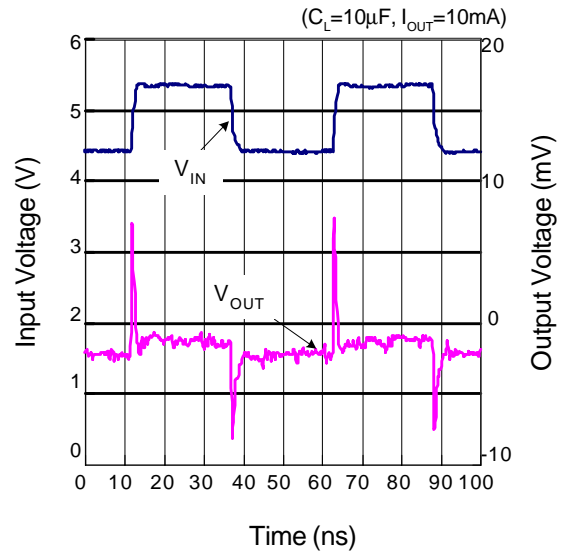
Output Voltage vs. Temperature



Line Transient Response

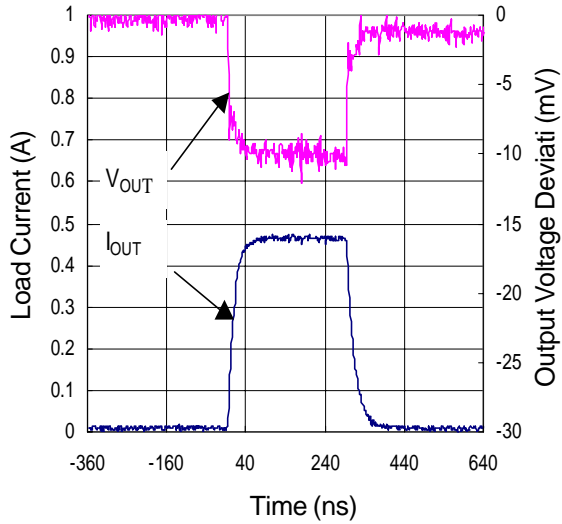


Line Transient Response

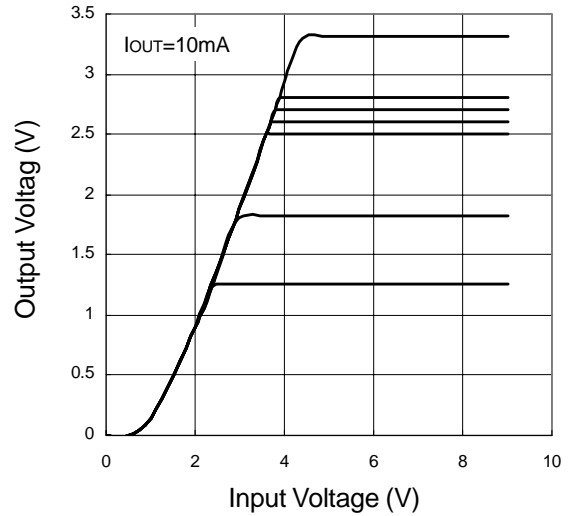


## Typical Characteristics

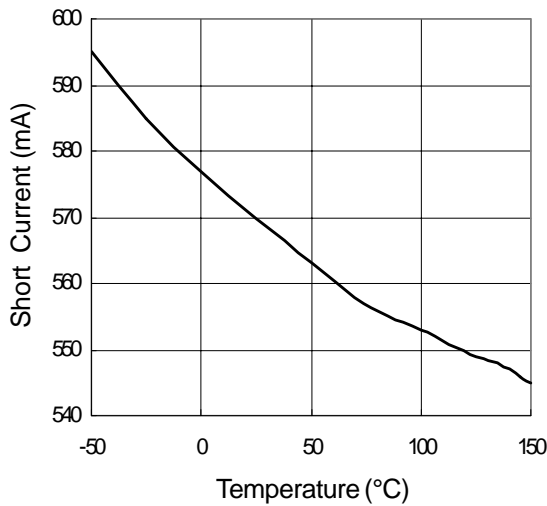
Load Transient Response



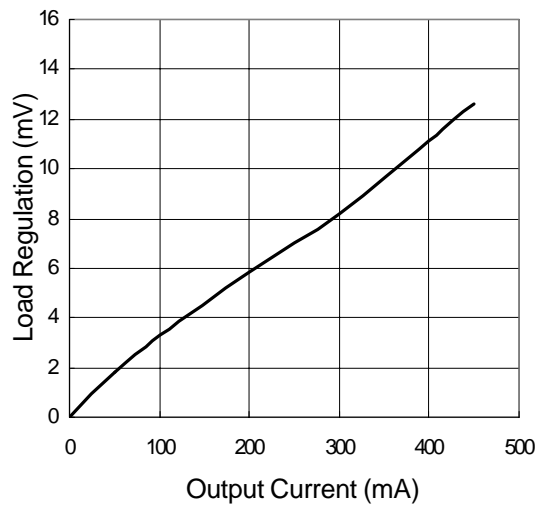
Output Voltage vs. Input Voltage



Short Current vs. Temperature

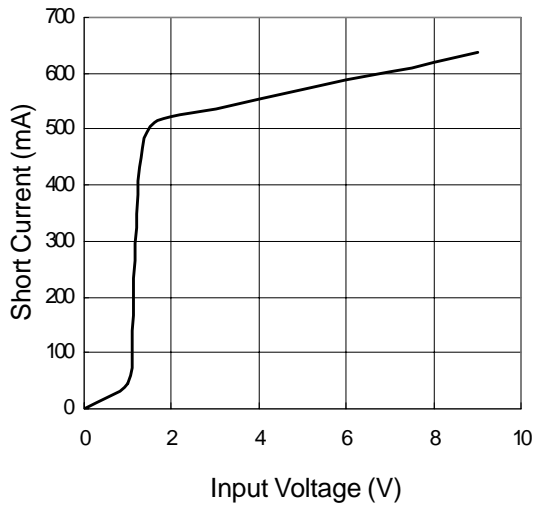


Output Current vs. Load Regulation

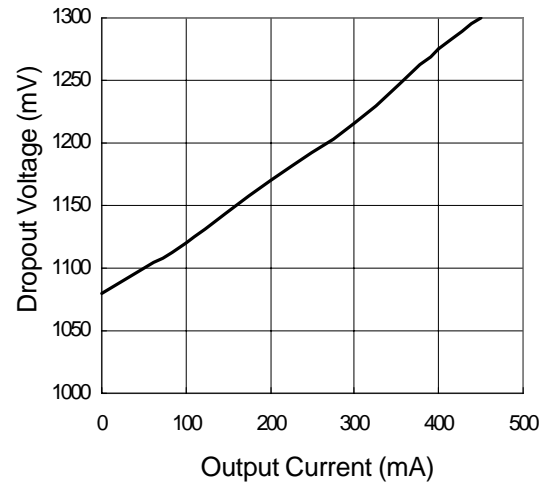


## Typical Characteristics

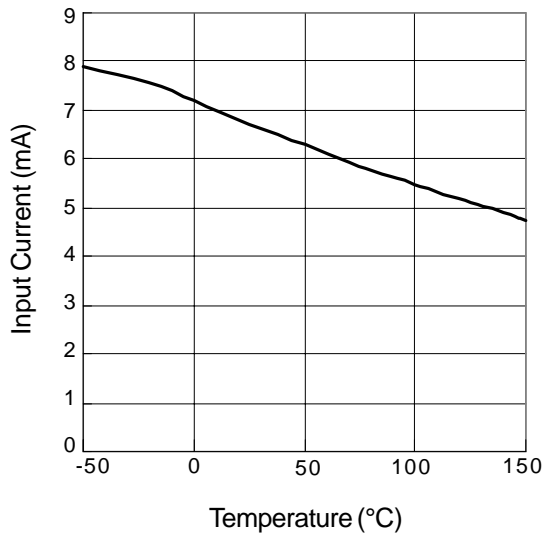
Short Current vs. Input Voltage



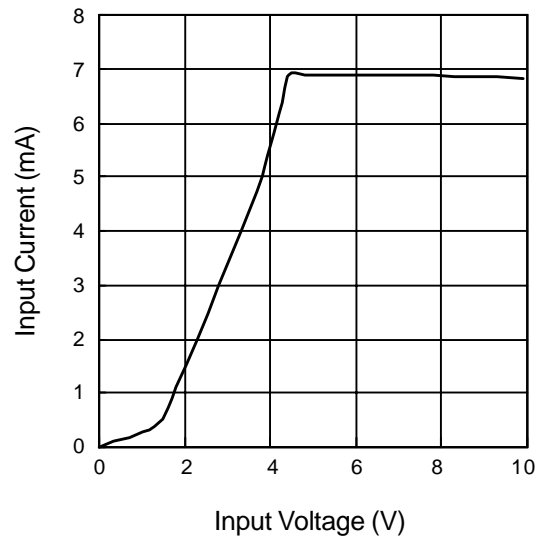
Output Current vs. Dropout Voltage



Input Current vs. Temperature

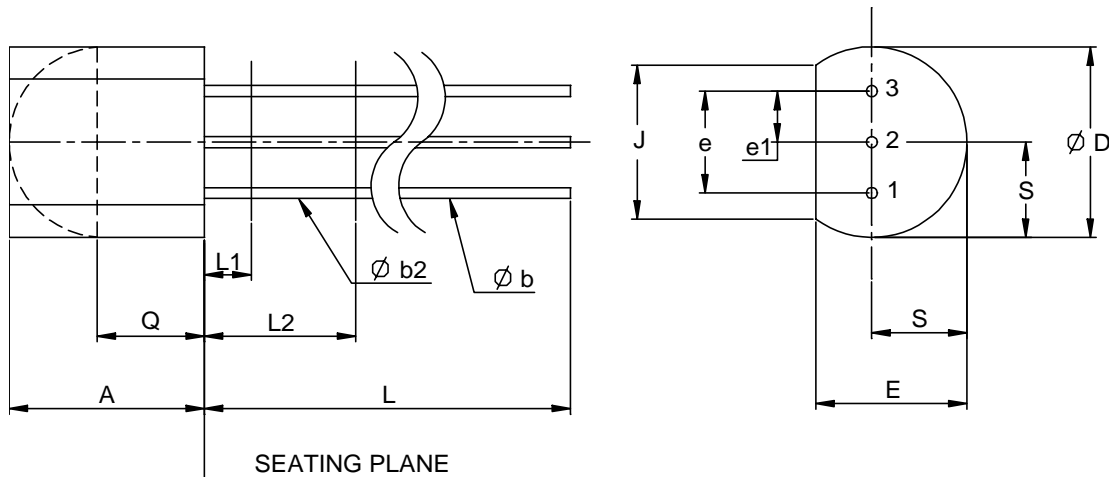


Input Current vs. Input Voltage



## Packaging Information

TO-92

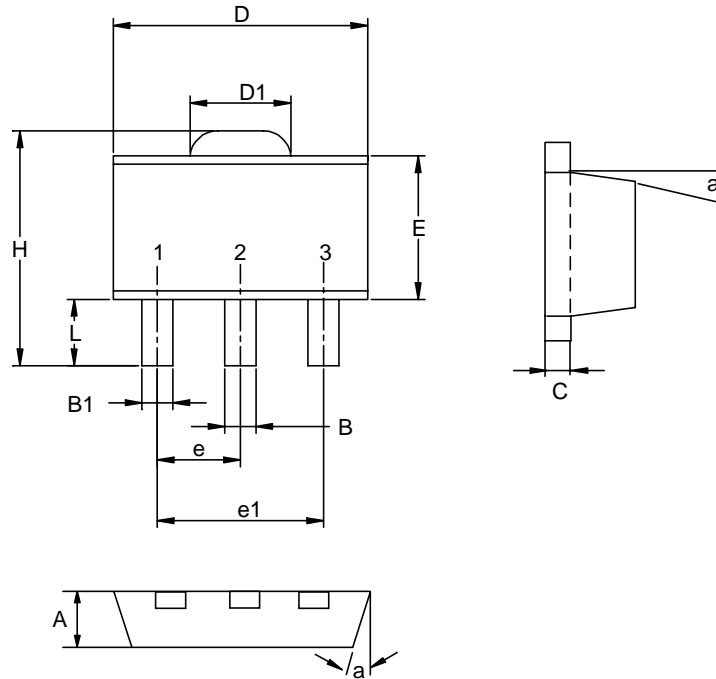


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.58	5.33	0.170	0.210
φ b	0.41	0.53	0.160	0.021
φ b2	0.41	0.48	0.160	0.019
φ D	4.96	5.20	0.175	0.205
E	3.94	4.19	0.125	0.165
e	2.42	2.66	0.095	0.105
e1	1.15	1.39	0.045	0.055
J	3.43		0.135	
L	12.70		0.500	
L1		1.27		0.050
L2	6.35		0.250	
Q	2.93		0.115	
S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



## Packaging Information

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

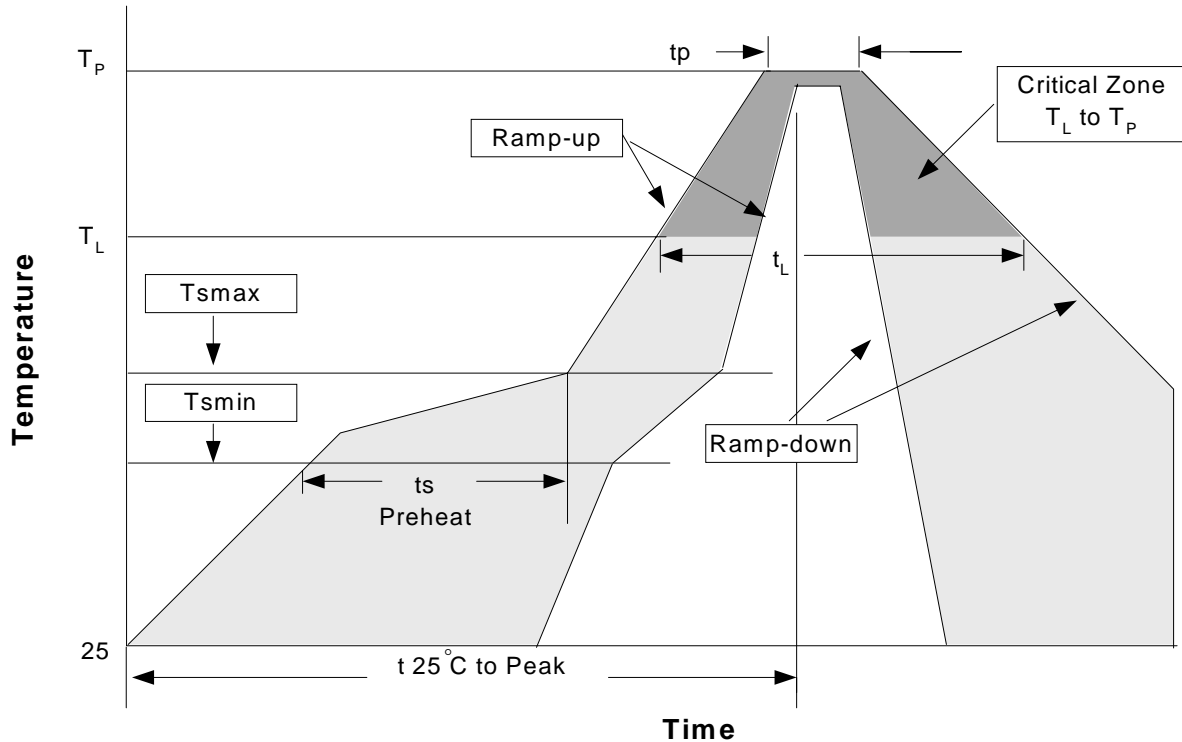


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.40	1.60	0.055	0.063
B	0.40	0.56	0.016	0.022
B1	0.35	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.35	1.83	0.053	0.072
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
E	2.29	2.60	0.090	0.102
H	3.75	4.25	0.148	0.167
L	0.80	1.20	0.031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

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



### Classification Reflow Profiles

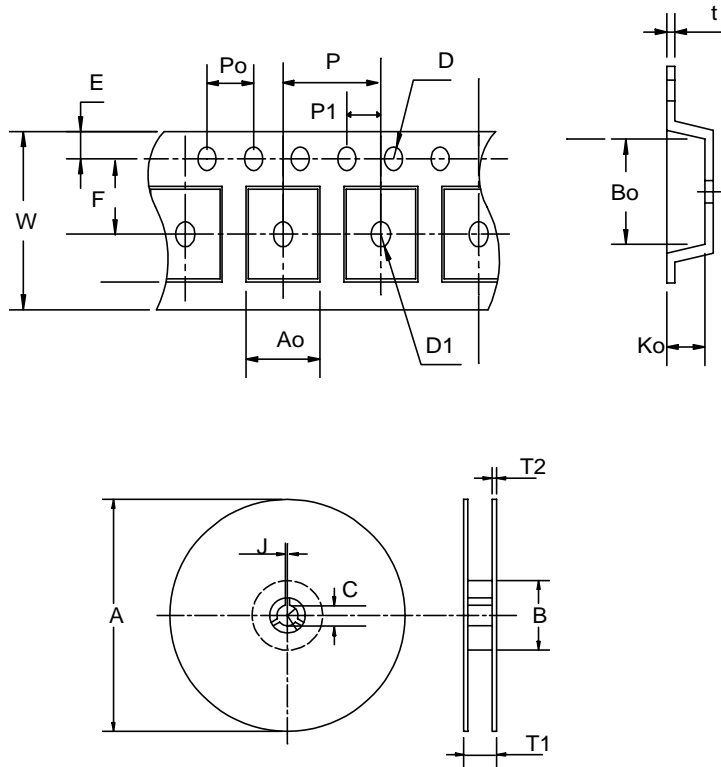
Profile Feature	Sn-Pb Eutectic Assembly		Pb-Free Assembly	
	Large Body	Small Body	Large Body	Small Body
Average ramp-up rate ( $T_L$ to $T_P$ )	3°C/second max.		3°C/second max.	
Preheat				
- Temperature Min ( $T_{smin}$ )	100°C		150°C	
- Temperature Mix ( $T_{smax}$ )	150°C		200°C	
- Time (min to max)( $t_s$ )	60-120 seconds		60-180 seconds	
$T_{smax}$ to $T_L$				
- Ramp-up Rate			3°C/second max	
$T_{smax}$ 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( $t_p$ )	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 , $I_{tr} > 100mA$

## Carrier Tape & Reel Dimensions



<b>Application</b>	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
<b>Application</b>	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
SOT- 89	12	9.3	1000

## Customer Service

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