

## 500mA Low Dropout Linear Regulator of Adjustable and Fixed Voltages

### Features

- Low Dropout Voltage of 1.3V at 500mA
- 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, 3.3V
- Various SOT-89 and TO-92 Packages Available

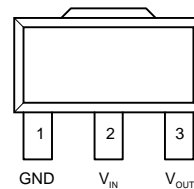
### General Description

The APL5885 is a 3-pin low dropout linear regulator with 2.0% accuracy of output voltage over line, load and temperature variations. Dropout voltage at 500mA output current is less than 1.3V. Both output current limiting and thermal shutdown are built in to provide maximal protection to the APL5885 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.

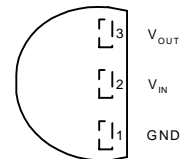
### Applications

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

### Pin Configuration

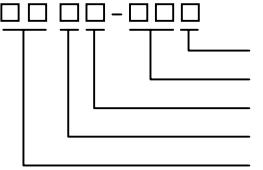


SOT-89 (Top View)



TO-92 (Top View)

### Ordering and Marking Information

|  |   |
|--|---|
| <p>APL5885-□□□□-□□□□</p>  <p>Lead Free Code<br/>Handling Code<br/>Temp. Range<br/>Package Code<br/>Voltage Code</p> | <p>Package Code<br/>D : SOT-89      E : TO-92<br/>Temp. Range<br/>C : 0 to 70 °C<br/>Handling Code<br/>TU : Tube      TR : Tape &amp; Reel<br/>Voltage Code<br/>18 : 1.8V      25 : 2.5V<br/>33 : 3.3V      Blank : Adjustable Version<br/>Lead Free Code<br/>L : Lead Free Device      Blank : Original Device</p> |
| <p>APL5885 D : <span style="border: 1px solid black; padding: 2px;">APL5885<br/>XXXXX</span> XXXXX - Date Code</p>   | <p>APL5885 E : <span style="border: 1px solid black; padding: 2px;">APL<br/>5885<br/>XXXXX</span> XXXXX - Date Code</p>   |
| <p>APL5885 -18 D : <span style="border: 1px solid black; padding: 2px;">APL5885<br/>XXXXX18</span> XXXXX - Date Code</p>   | <p>APL5885 -18 E : <span style="border: 1px solid black; padding: 2px;">APL<br/>5885<br/>XXXXX18</span> XXXXX - Date Code</p>   |
| <p>APL5885 -25 D : <span style="border: 1px solid black; padding: 2px;">APL5885<br/>XXXXX25</span> XXXXX - Date Code</p>   | <p>APL5885 -25 E : <span style="border: 1px solid black; padding: 2px;">APL<br/>5885<br/>XXXXX25</span> XXXXX - Date Code</p>   |
| <p>APL5885 -33 D : <span style="border: 1px solid black; padding: 2px;">APL5885<br/>XXXXX33</span> XXXXX - Date Code</p>   | <p>APL5885 -33 E : <span style="border: 1px solid black; padding: 2px;">APL<br/>5885<br/>XXXXX33</span> XXXXX - Date Code</p>   |

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.

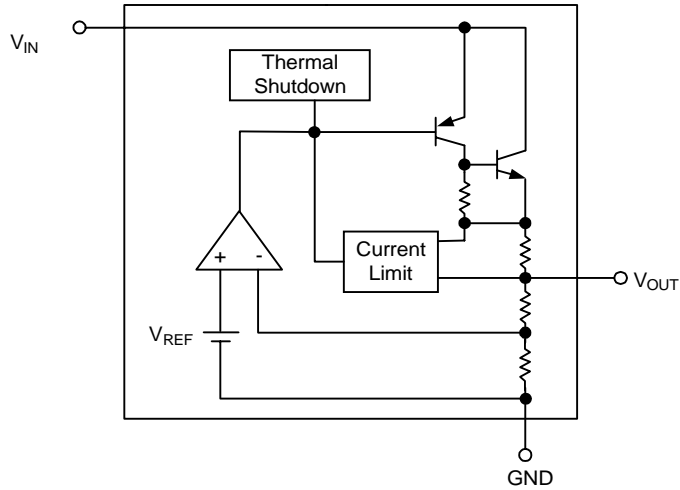
## Absolute Maximum Ratings

| Symbol        | Parameter                           | Rating            | Unit |        |
|---------------|-------------------------------------|-------------------|------|--------|
| $V_{IN}$      | Input Voltage                       | 9                 | V    |        |
| $I_{OUT}$     | Output Current                      | 500               | 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  | °C / W |
|               |                                     | TO-92             | 180  |        |

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

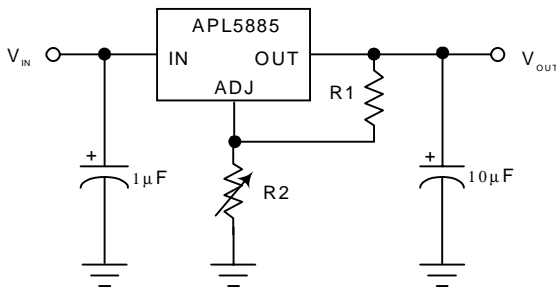
| Symbol        | Parameter                              | Test Condition   | APL5885         |      |                | Unit             |
|---------------|--|--|-----------------|------|----------------|------------------|
|               |  |  | Min.            | Typ. | Max.           |                  |
| $V_N$         | Input Voltage                          |  | $V_{OUT}+1.45V$ |      | 8              | V                |
| $V_{OUT}$     | Output Voltage                         | $I_{OUT}=10\text{mA}$  | $0.9 V_{OUT}$   |      | $1.02 V_{OUT}$ | V                |
| $I_{OUT}$     | Output Current Capability              | $\Delta V_{OUT}=2\%$   | 500             |      |                | mA               |
| $I_{SC}$      | Short Circuit Current                  | $V_{OUT}<0.4V$   |                 | 800  |                | mA               |
| $I_Q$         | Quiescent Current                      | $V_N=5V$ , No Load   |                 | 6    | 10             | mA               |
| $REG_{LINE}$  | Line Regulation                        | $T_J=0\sim 125^\circ\text{C}$                                    |                 |      |                | mV               |
|               |  | APL5885 $I_{OUT}=10\text{mA}$ , $V_{OUT}+1.7V\leq V_{IN}\leq 8V$ |                 | 3    | 6              |                  |
|               |  | APL5885-18 $I_{OUT}=0A$ , $3.5V\leq V_{IN}\leq 8V$               |                 |      |                |                  |
|               |  | APL5885-25 $I_{OUT}=0A$ , $4.2V\leq V_{IN}\leq 8V$               |                 |      |                |                  |
| $REG_{LOAD}$  | Load Regulation                        | $T_J=0\sim 125^\circ\text{C}$                                    |                 |      |                | %                |
|               |  | APL5885 $(V_{IN}-V_{OUT})=1.7V$ , $0\leq I_{OUT}\leq 0.5A$       |                 | 0.4  | 0.6            |                  |
|               |  | APL5885-18 $V_{IN}=3.5V$ , $0\leq I_{OUT}\leq 0.5A$              |                 |      |                |                  |
|               |  | APL5885-25 $V_{IN}=4.2V$ , $0\leq I_{OUT}\leq 0.5A$              |                 |      |                |                  |
| $V_{DROPOUT}$ | Dropout Voltage                        | $I_{OUT}=500\text{mA}$ , $\Delta V_{OUT}=1\%$                    |                 | 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           |

## Block Diagram



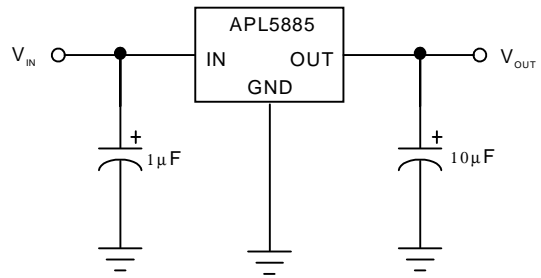
## Application Schematic

1.25V to 7V Adjustable Regulator

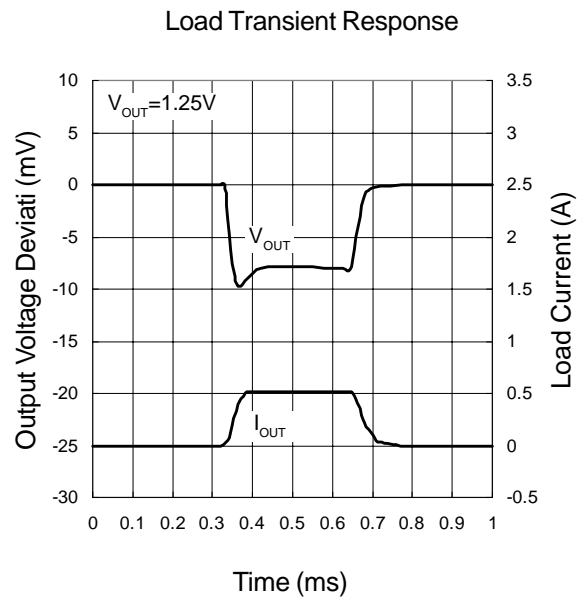
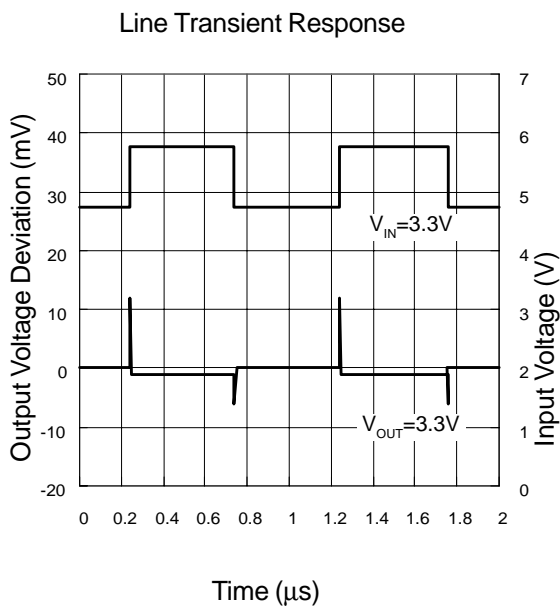
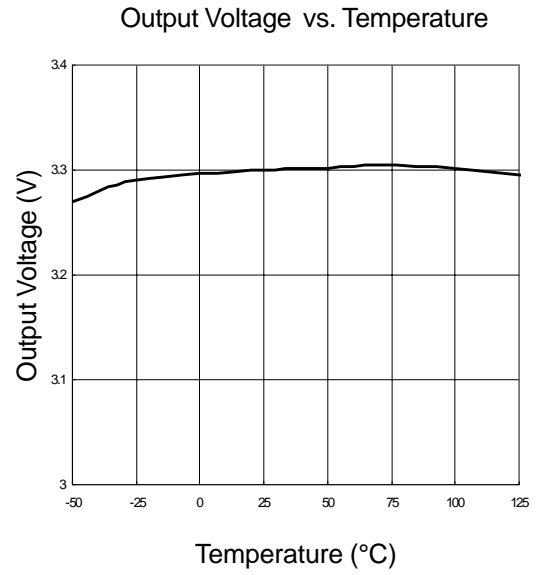
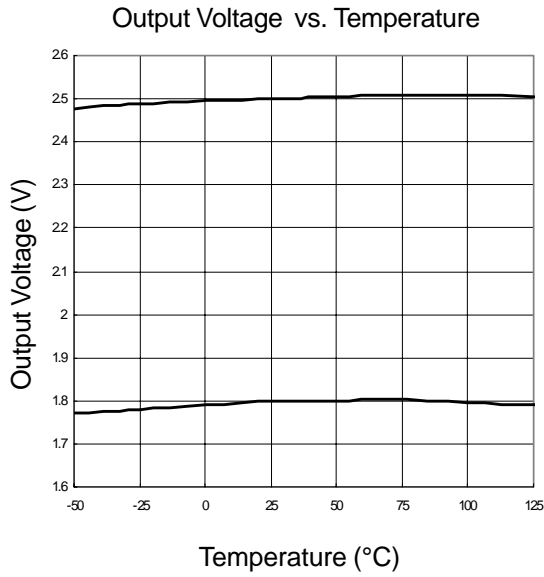


$$V_{OUT} = 1.250V \times \frac{R1 + R2}{R1}$$

Fixed 1.8V, 2.5V and 3.3V Regulator

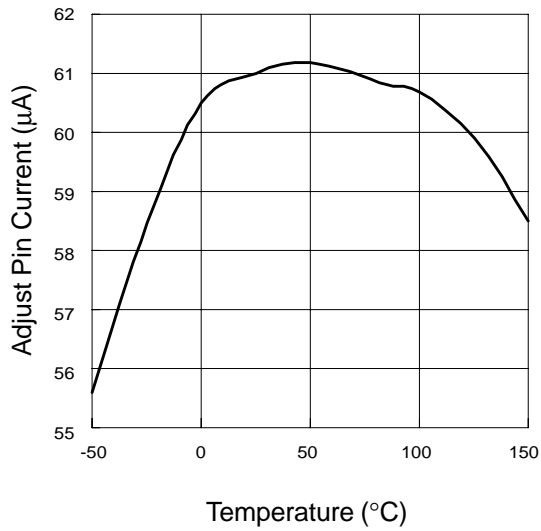


## Typical Characteristics

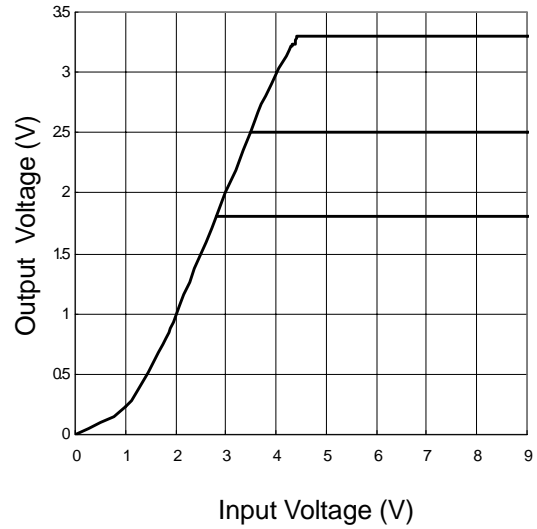


Typical Characteristics (Cont.)

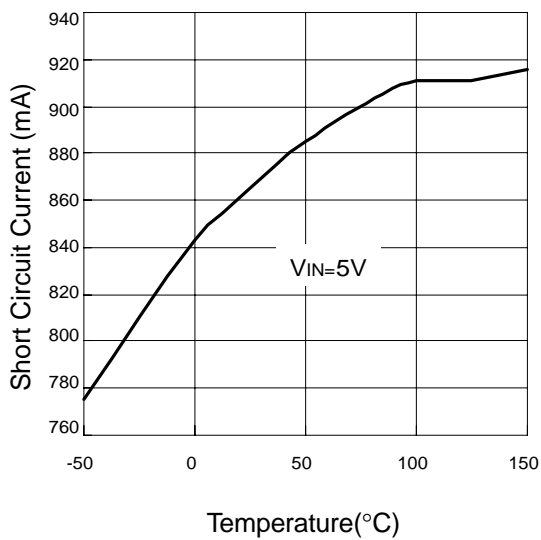
Adjust Pin Current vs. Temperature



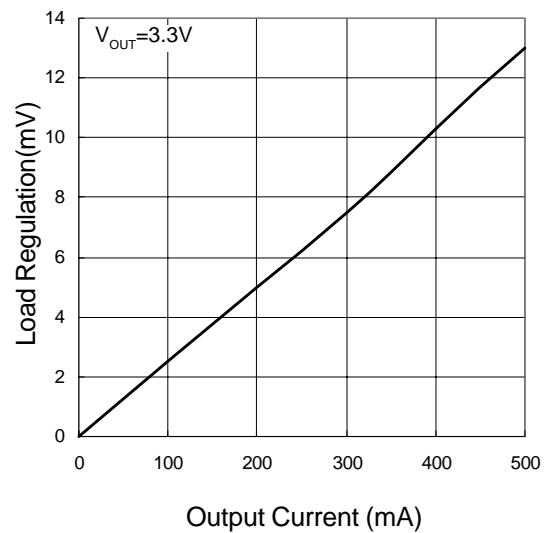
Output Voltage vs. Input Voltage



Short Circuit Current vs. Temperature

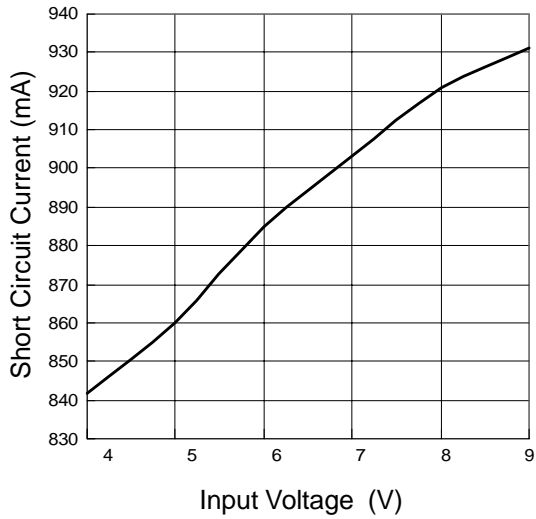


Load Regulation vs. Output Current

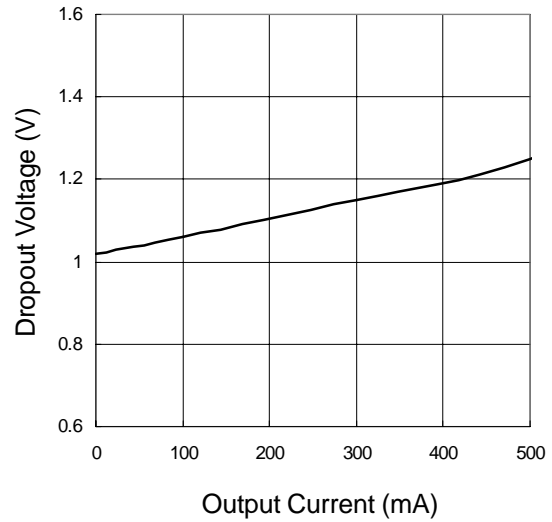


Typical Characteristics (Cont.)

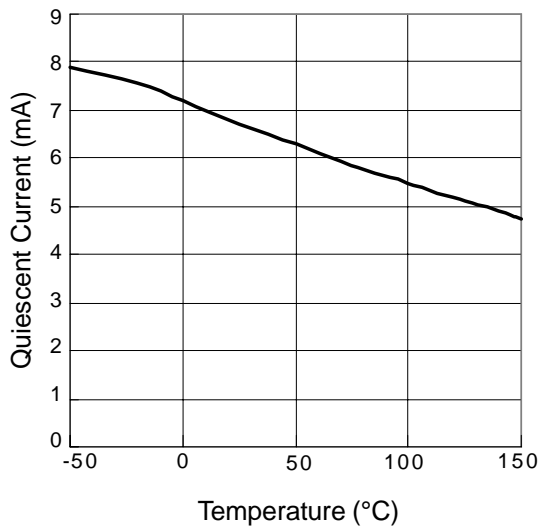
Short Circuit Current vs. Input Voltage



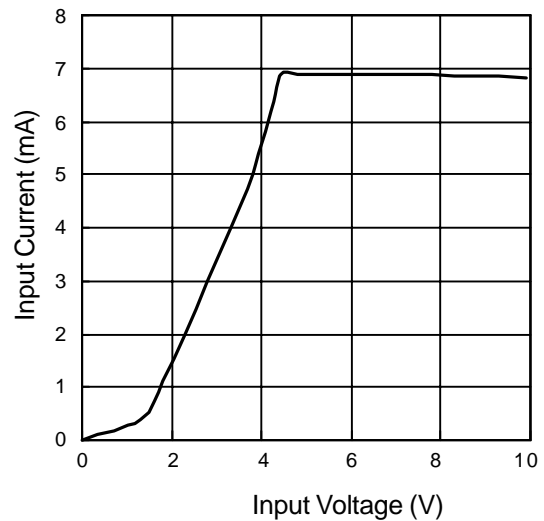
Output Current vs. Dropout Voltage



Quiescent Current vs. Temperature

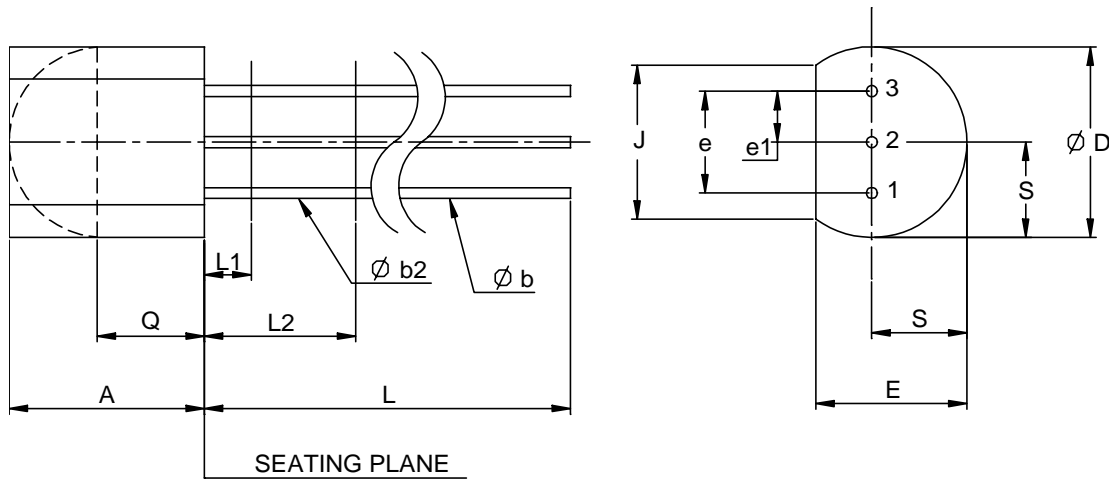


Input Current vs. Input Voltage



## Packaging Information

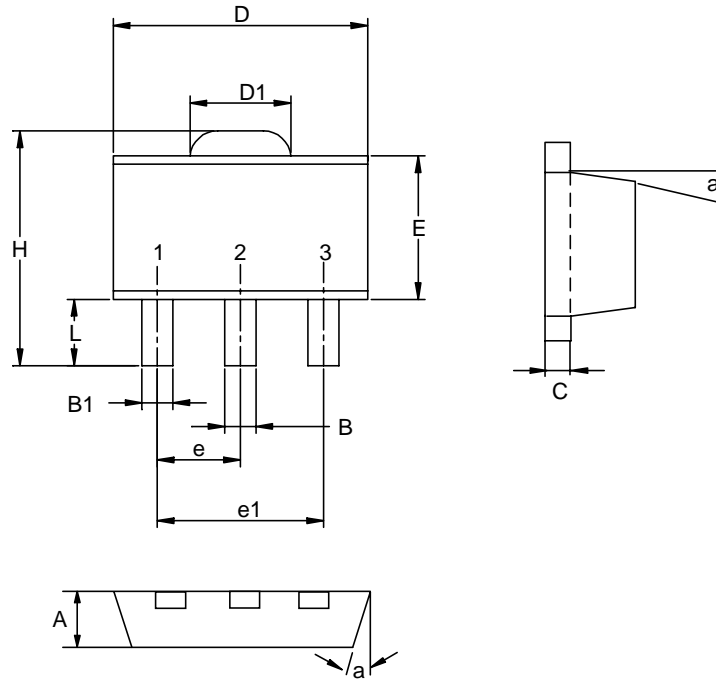
TO-92



| Dim       | Millimeters |      | Inches |       |
|-----------|-------------|------|--------|-------|
|           | Min.        | Max. | Min.   | Max.  |
| A         | 4.58        | 5.33 | 0.170  | 0.210 |
| $\phi b$  | 0.41        | 0.53 | 0.160  | 0.021 |
| $\phi b2$ | 0.41        | 0.48 | 0.160  | 0.019 |
| $\phi D$  | 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)



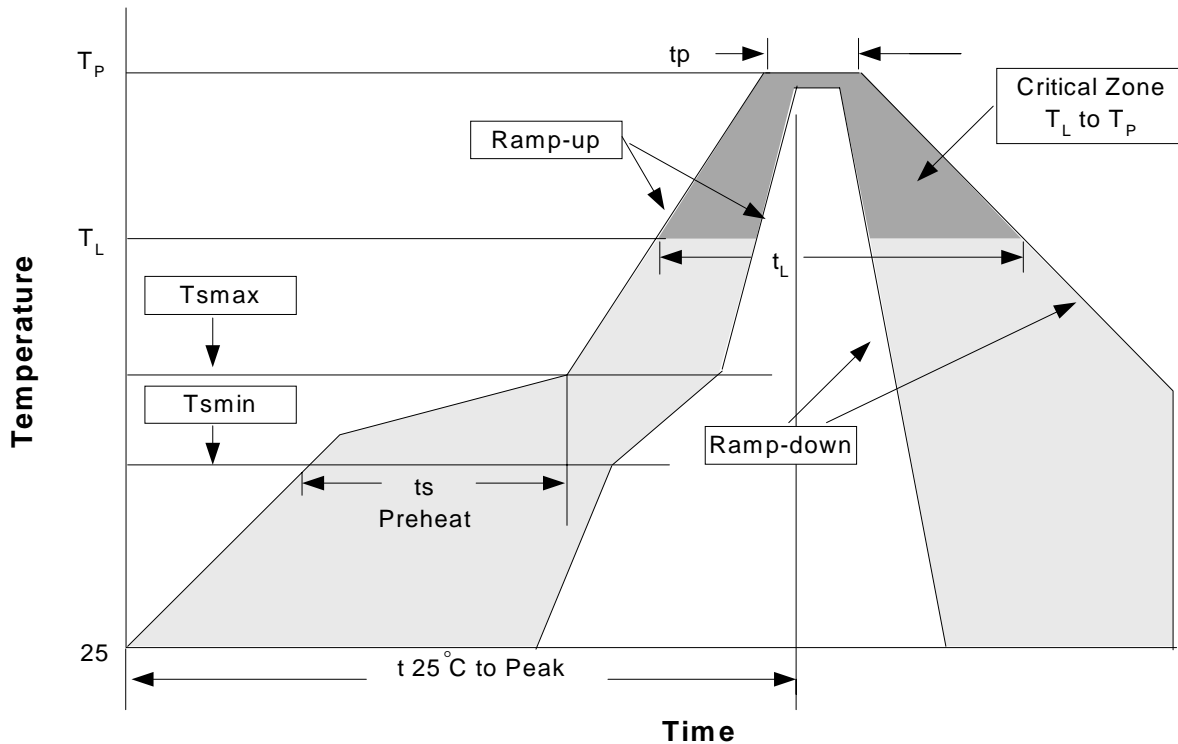
| Dim | Millimeters |      | Inches    |       |
|-----|-------------|------|-----------|-------|
|     | Min.        | Max. | Min.      | Max.  |
| A   | 1.40        | 1.60 | 0.055     | 0.063 |
| B   | 0.40        | 0.56 | 0.016     | 0.022 |
| B1  | 0.35        | 0.48 | 0.014     | 0.019 |
| C   | 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

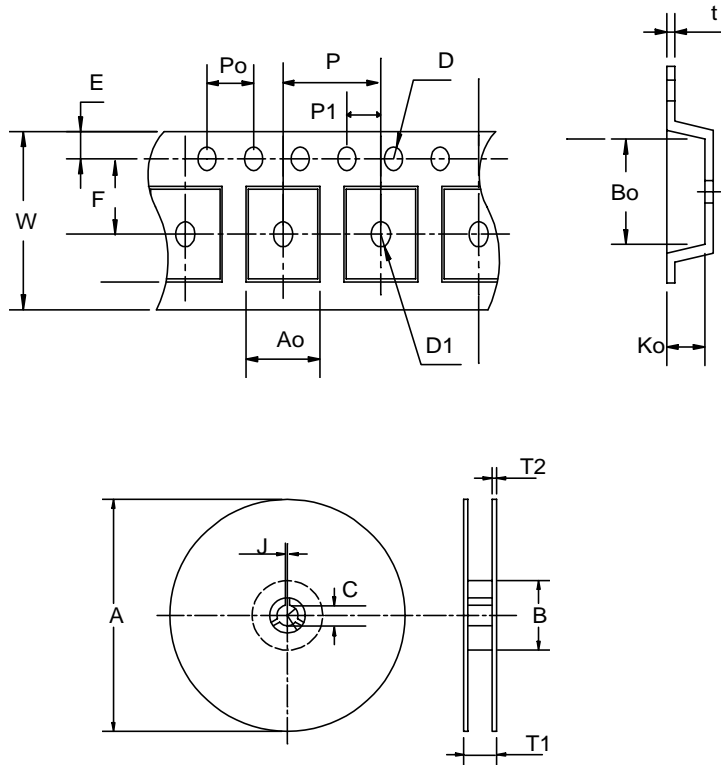
| Profile Feature                                     | Sn-Pb Eutectic Assembly |               | Pb-Free Assembly |               |
|---|-------------------------|---------------|------------------|---------------|
|   | Large Body              | Small Body    | Large Body       | Small Body    |
| 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 $T_L$                                 |                         |               | 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( $t_p$ ) | 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<br>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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