



## 1A Low Dropout Positive Adjustable or Fixed-Mode Regulator

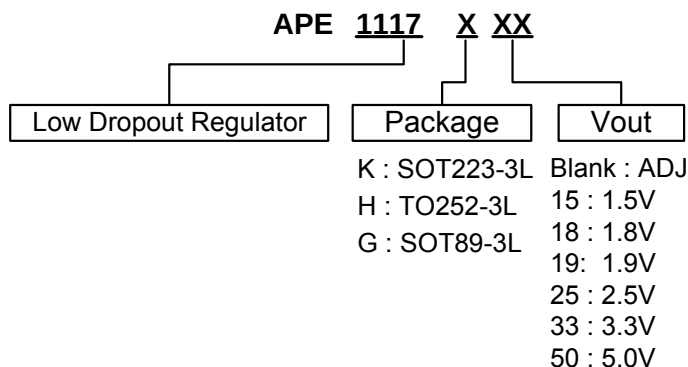
### ■ Features

- 1.4V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Packages: SOT223, TO252, SOT89,
- Good noise rejection
- 3-Terminal Adjustable or Fixed 1.5V, 1.8V, 1.9V, 2.5V, 3.3V, 5.0V
- RoHS Compliant

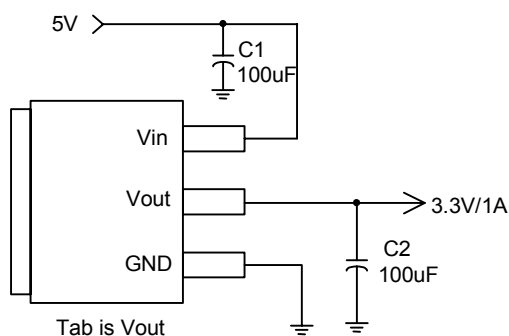
### ■ Applications

- PC peripheral
- Communication

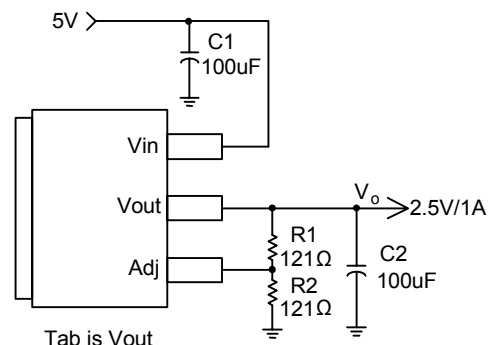
### ■ Ordering Information



### ■ Typical Circuit



( 5V/3.3V fixed output )



( 5V/2.5V ADJ output )

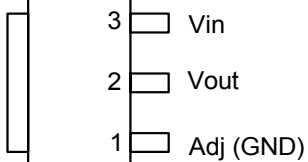
Note:  $V_o = V_{REF} * (1 + \frac{R_2}{R_1})$



## ■ Connection Diagram

3 PIN SOT223

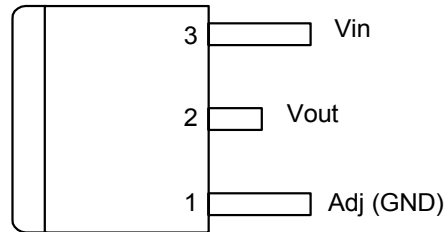
( Top View )



Tab is Vout

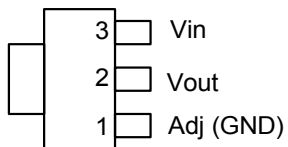
3 PIN TO252

( Top View )



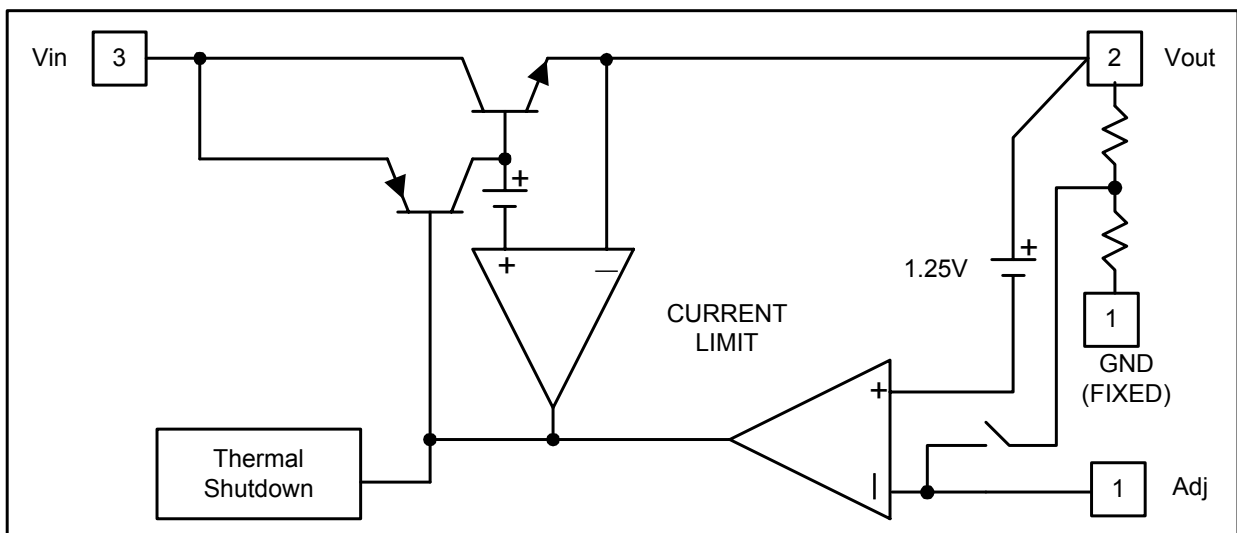
Tab is Vout

3 PIN SOT89



Tab is Vout

## ■ Block Diagram





## ■ Pin Descriptions

| NAME      | I/O | PIN # | FUNCTION                                                                                                                                                                                                                                                                                                                                                            |
|-----------|-----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adj (GND) | I   | 1     | A resistor divider from this pin to the Vout pin and ground sets the output voltage. (Ground only for Fixed-Mode)                                                                                                                                                                                                                                                   |
| Vout      | O   | 2     | The output of the regulator. A minimum of 10uF capacitor ( $0.15\Omega \leq \text{ESR} \leq 20\Omega$ ) must be connected from this pin to ground to insure stability.                                                                                                                                                                                              |
| Vin       | I   | 3     | The input pin of regulator. Typically a large storage capacitor ( $0.15\Omega \leq \text{ESR} \leq 20\Omega$ ) is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3V higher than Vout in order for the device to regulate properly. |

## ■ Absolute Maximum Ratings

| Symbol                         | Parameter                            | Rating             | Unit |
|--------------------------------|--------------------------------------|--------------------|------|
| Vin                            | DC Supply Voltage                    | -0.3 to 12         | V    |
| <a href="#">P<sub>D</sub></a>  | Power Dissipation                    | Internally Limited |      |
| <a href="#">T<sub>ST</sub></a> | Storage Temperature                  | -65 to +150        | °C   |
| T <sub>OP</sub>                | Operating Junction Temperature Range | 0 to +150          | °C   |



### ■ Electrical Characteristics (Under Operating Conditions)

| PARAMETER                                                                             | CONDITIONS                                                                                                                                |                                                                                                             | MIN   | TYP              | MAX   | UNIT                 |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------|------------------|-------|----------------------|
| Reference Voltage                                                                     | APE1117-ADJ                                                                                                                               | $T_J = 25^{\circ}\text{C}, (V_{IN} - V_{OUT}) = 1.5\text{V}$<br>$I_O = 10\text{mA}$                         | 1.225 | 1.250            | 1.275 | V                    |
| Output Voltage                                                                        | APE1117-1.5                                                                                                                               | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$3\text{V} \leq V_{IN} \leq 12\text{V}$               | 1.470 | 1.500            | 1.530 | V                    |
|                                                                                       | APE1117-1.8                                                                                                                               | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$3.3\text{V} \leq V_{IN} \leq 12\text{V}$             | 1.764 | 1.800            | 1.836 | V                    |
|                                                                                       | APE1117-1.9                                                                                                                               | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$3.3\text{V} \leq V_{IN} \leq 12\text{V}$             | 1.862 | 1.900            | 1.938 | V                    |
|                                                                                       | APE1117-2.5                                                                                                                               | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$4\text{V} \leq V_{IN} \leq 12\text{V}$               | 2.450 | 2.500            | 2.550 | V                    |
|                                                                                       | APE1117-3.3                                                                                                                               | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$4.8\text{V} \leq V_{IN} \leq 12\text{V}$             | 3.235 | 3.300            | 3.365 | V                    |
|                                                                                       | APE1117-5.0                                                                                                                               | $I_{OUT} = 10\text{mA}, T_J = 25^{\circ}\text{C},$<br>$6.5\text{V} \leq V_{IN} \leq 12\text{V}$             | 4.900 | 5.000            | 5.100 | V                    |
| Line Regulation                                                                       | APE1117-XXX                                                                                                                               | $I_O = 10\text{mA}, V_{OUT} + 1.5\text{V} < V_{IN} < 12\text{V},$<br>$T_J = 25^{\circ}\text{C}$             |       |                  | 0.2   | %                    |
| Load Regulation                                                                       | APE1117-ADJ                                                                                                                               | $V_{IN} = 3.3\text{V}, V_{adj} = 0, 0\text{mA} < I_O < 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2) |       |                  | 1     | %                    |
|                                                                                       | APE1117-1.5                                                                                                                               | $V_{IN} = 3\text{V}, 0\text{mA} < I_O < 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2)                |       | 12               | 15    | mV                   |
|                                                                                       | APE1117-1.8                                                                                                                               | $V_{IN} = 3.3\text{V}, 0\text{mA} < I_O < 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2)              |       | 15               | 18    | mV                   |
|                                                                                       | APE1117-1.9                                                                                                                               | $V_{IN} = 3.3\text{V}, 0\text{mA} < I_O < 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2)              |       | 16               | 19    | mV                   |
|                                                                                       | APE1117-2.5                                                                                                                               | $V_{IN} = 4\text{V}, 0\text{mA} < I_O < 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2)                |       | 20               | 25    | mV                   |
|                                                                                       | APE1117-3.3                                                                                                                               | $V_{IN} = 5\text{V}, 0 \leq I_{OUT} \leq 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2)               |       | 26               | 33    | mV                   |
|                                                                                       | APE1117-5.0                                                                                                                               | $V_{IN} = 8\text{V}, 0 \leq I_{OUT} \leq 1\text{A},$<br>$T_J = 25^{\circ}\text{C}$ (Note 1,2)               |       | 40               | 50    | mV                   |
| Dropout Voltage<br>( $V_{IN} - V_{OUT}$ )                                             | APE1117-ADJ/1.5/1.8<br>/1.9/2.5/3.3/5.0                                                                                                   | $I_{OUT} = 1\text{A}, \Delta V_{OUT} = 0.1\% V_{OUT}$                                                       |       | 1.3              | 1.4   | V                    |
| Current Limit                                                                         | APE1117-ADJ/1.5/1.8<br>/1.9/2.5/3.3/5.0                                                                                                   | $(V_{IN} - V_{OUT}) = 5\text{V}$                                                                            | 1.1   |                  |       | A                    |
| Minimum Load Current                                                                  | APE1117-XXX                                                                                                                               | $0^{\circ}\text{C} \leq T_J \leq 125^{\circ}\text{C}$                                                       |       | 5                | 10    | mA                   |
| Thermal Regulation                                                                    | $T_A = 25^{\circ}\text{C}, 30\text{ms pulse}$                                                                                             |                                                                                                             |       | 0.008            | 0.04  | %/W                  |
| Ripple Rejection                                                                      | $F = 120\text{Hz}, C_{OUT} = 25\mu\text{F Tantalum}, I_{OUT} = 1\text{A}$                                                                 |                                                                                                             |       |                  |       |                      |
|                                                                                       | APE1117-XXX                                                                                                                               | $V_{IN} = V_{OUT} + 3\text{V}$                                                                              |       | 60               | 70    | dB                   |
| Temperature Stability                                                                 | $I_O = 10\text{mA}$                                                                                                                       |                                                                                                             |       | 0.5              |       | %                    |
| $\theta_{JA}$ Thermal Resistance<br>Junction-to-Ambient(No<br>heat sink ;No air flow) | SOT89<br>SOT-223<br>TO-252                                                                                                                |                                                                                                             |       | 300<br>117<br>92 |       | $^{\circ}\text{C/W}$ |
| $\theta_{JC}$ Thermal Resistance<br>Junction-to-Case                                  | SOT89 : Control Circuitry/Power Transistor<br>SOT-223 : Control Circuitry/Power Transistor<br>TO-252 : Control Circuitry/Power Transistor |                                                                                                             |       | 100<br>15<br>10  |       | $^{\circ}\text{C/W}$ |

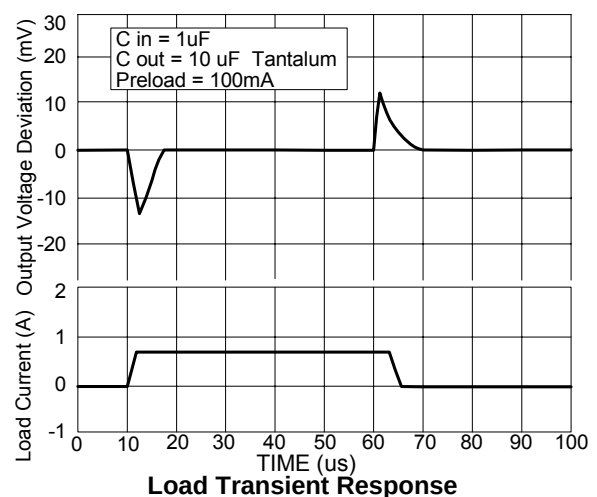
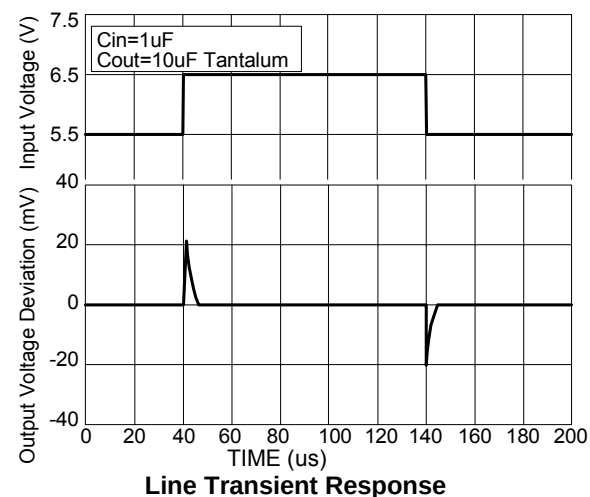
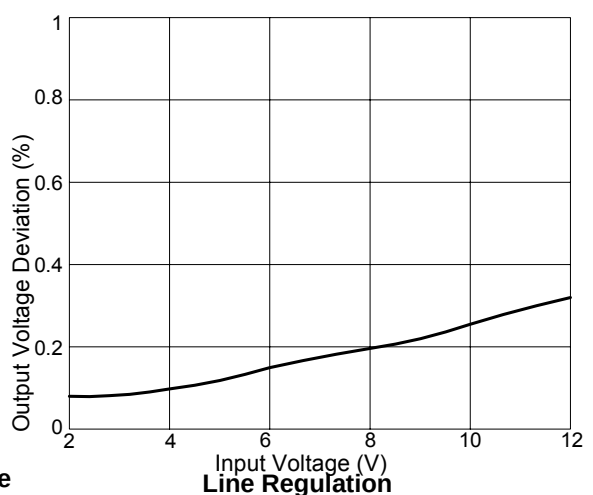
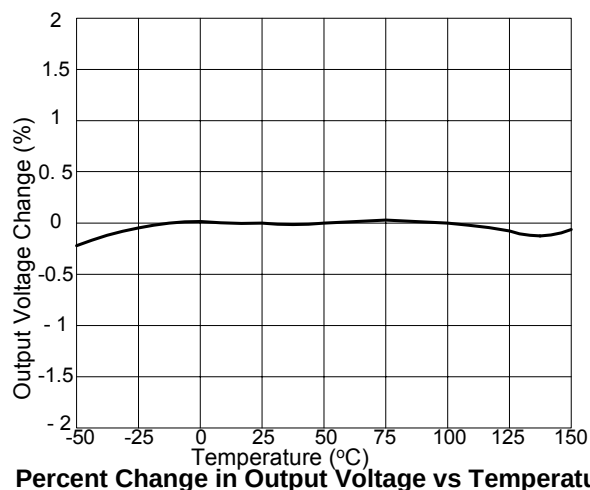
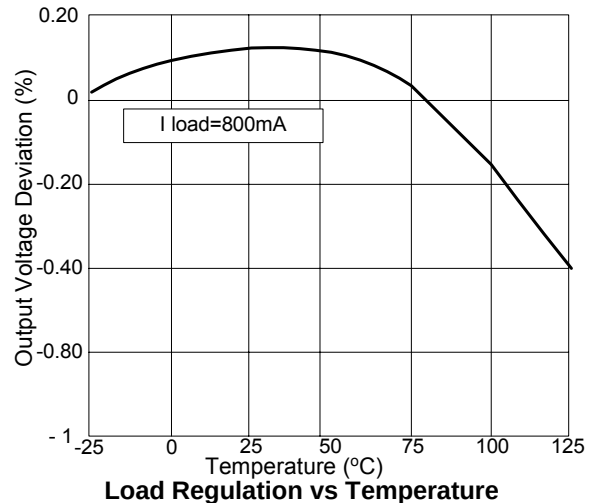
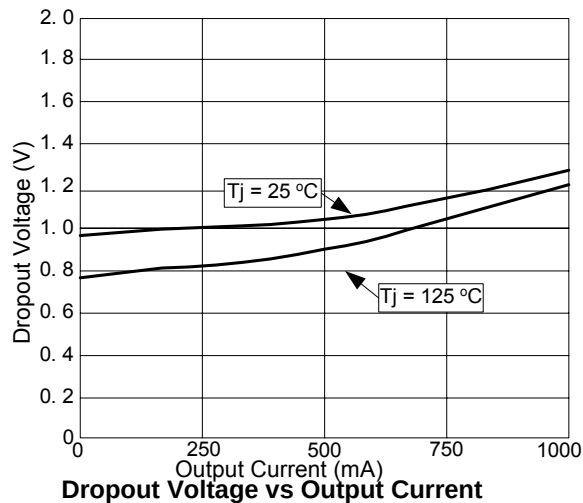
Note1: See thermal regulation specifications for changes in output voltage due to heating effects. Line and load regulation are measured at a constant junction temperature by low duty cycle pulse testing. Load regulation is measured at the output load = 1/18" from the package.

Note2: Line and load regulation are guaranteed up to the maximum power dissipation of 15W. Power dissipation is determined by the difference between input and output differential and the output current. Guaranteed maximum power dissipation will not be available over the full input/output range.

Note3: Quiescent current is defined as the minimum output current required in maintaining regulation. At 12V input/output differential the device is guaranteed to regulate if the output current is greater than 10mA.



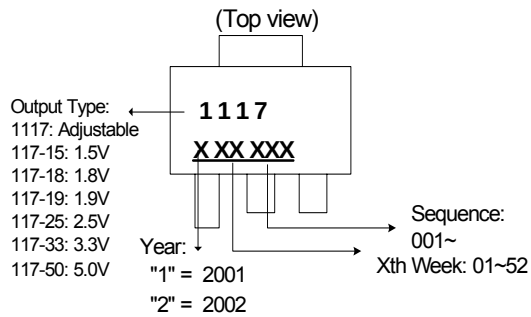
#### ■ Typical Performance Characteristics



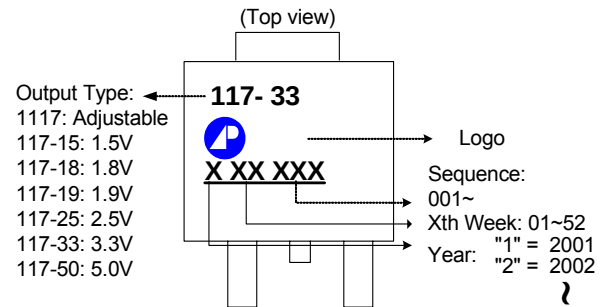


#### ■ Marking Information

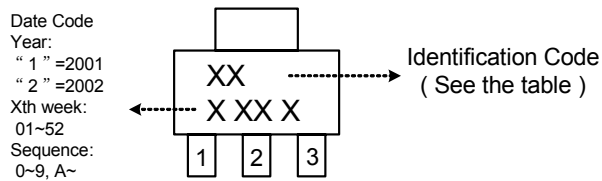
##### (1) SOT223-3L



##### (2) TO252-3L



##### (3) SOT89-3L

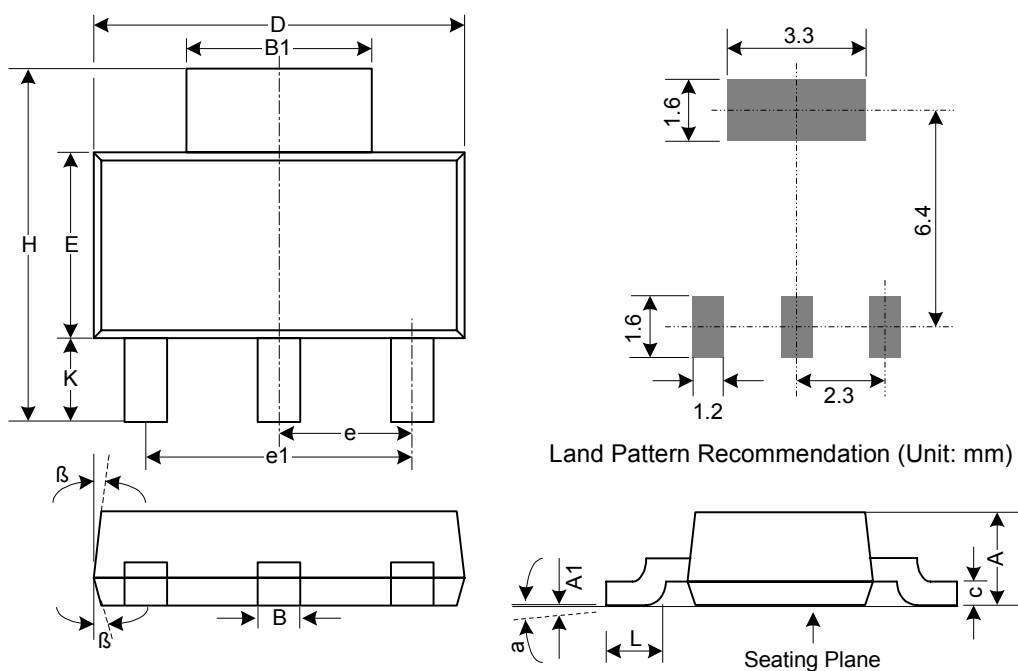


| Identification code | Output version |
|---------------------|----------------|
| EA                  | APE1117-ADJ    |
| EB                  | APE1117-1.5V   |
| EC                  | APE1117-1.8V   |
| EG                  | APE1117-1.9V   |
| ED                  | APE1117-2.5V   |
| EE                  | APE1117-3.3V   |
| EF                  | APE1117-5.0V   |



## ■ Package Dimension

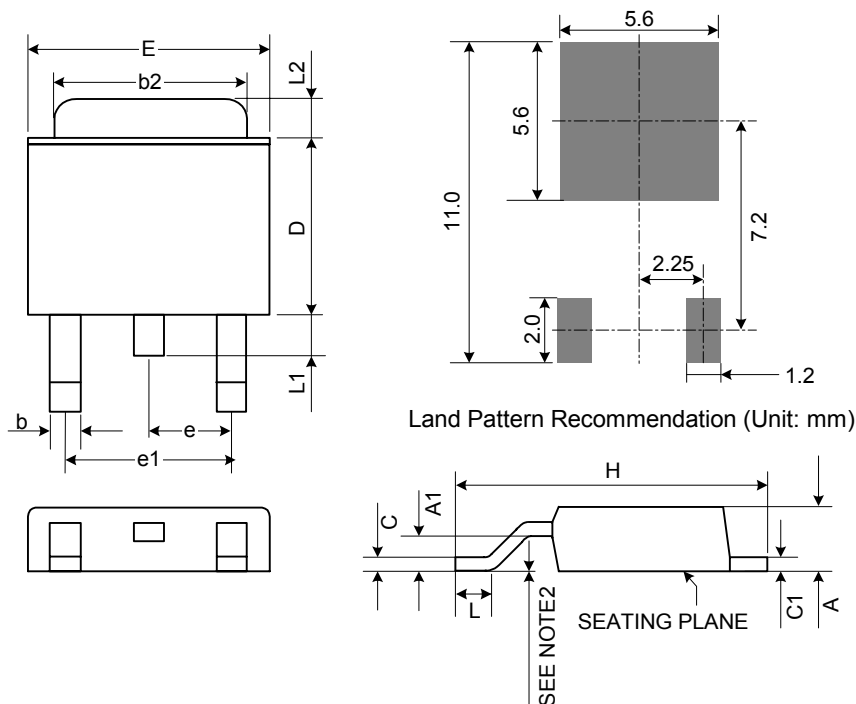
(1) SOT223



| Symbol   | Dimensions In Millimeters |      |            | Dimensions In Inches |       |             |
|----------|---------------------------|------|------------|----------------------|-------|-------------|
|          | Min.                      | Nom. | Max.       | Min.                 | Nom.  | Max.        |
| A        | 1.50                      | 1.65 | 1.80       | 0.059                | 0.065 | 0.071       |
| A1       | 0.02                      | 0.05 | 0.08       | 0.001                | 0.002 | 0.003       |
| B        | 0.60                      | 0.70 | 0.80       | 0.024                | 0.028 | 0.031       |
| B1       | 2.90                      | -    | 3.15(Ref.) | 0.114                | -     | 0.124(Ref.) |
| c        | 0.28                      | 0.30 | 0.32       | 0.011                | 0.012 | 0.013       |
| D        | 6.30                      | 6.50 | 6.70       | 0.248                | 0.256 | 0.264       |
| E        | 3.30                      | 3.50 | 3.70       | 0.130                | 0.138 | 0.146       |
| e        | 2.3 Basic                 |      |            | 0.091 Basic          |       |             |
| e1       | 4.6 Basic                 |      |            | 0.181 Basic          |       |             |
| H        | 6.70                      | 7.00 | 7.30       | 0.264                | 0.276 | 0.287       |
| L        | 0.91                      | 1.00 | 1.10       | 0.036                | 0.039 | 0.043       |
| K        | 1.50                      | 1.75 | 2.00       | 0.059                | 0.069 | 0.079       |
| $\alpha$ | 0°                        | 5°   | 10°        | 0°                   | 5°    | 10°         |
| $\beta$  | -                         | 13°  | -          | -                    | 13°   | -           |



(3) TO252



Notes:

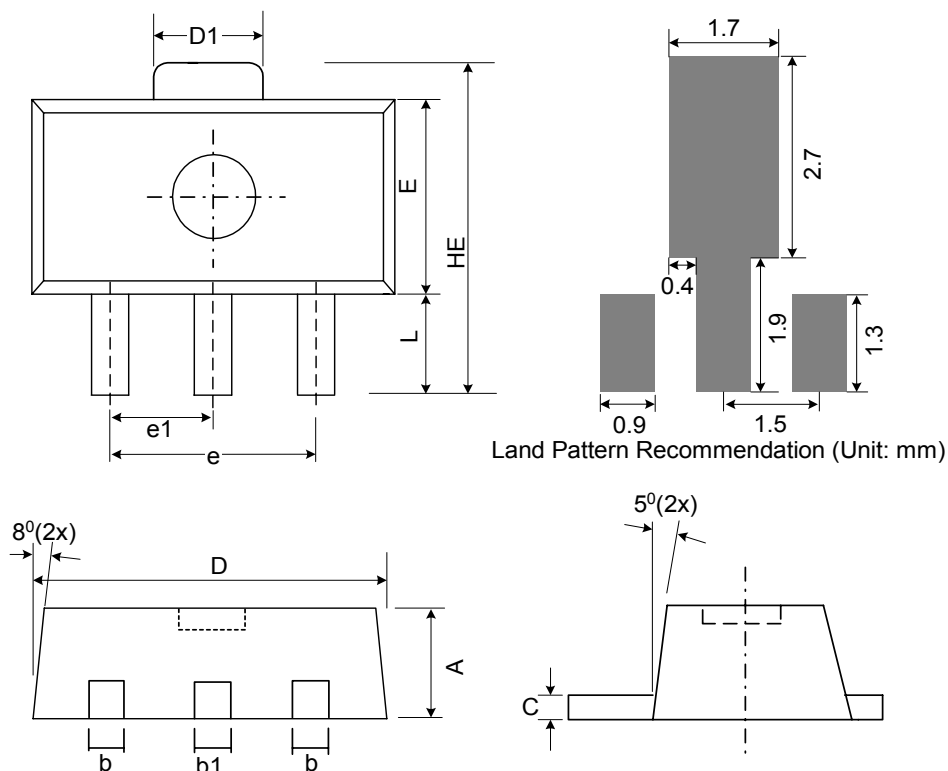
1. JEDEC Outline: TO-252 AB
2. Mils suggested for positive contact at mounting.

| Symbol | Dimensions In Millimeters |      |       | Dimensions In Inches |       |       |
|--------|---------------------------|------|-------|----------------------|-------|-------|
|        | Min.                      | Nom. | Max.  | Min.                 | Nom.  | Max.  |
| A      | 2.18                      | 2.29 | 2.40  | 0.086                | 0.090 | 0.094 |
| A1     | 0.89                      | -    | 1.14  | 0.035                | -     | 0.045 |
| b      | 0.61 TYP.                 |      |       | 0.024 TYP.           |       |       |
| b2     | 5.20                      | 5.35 | 5.50  | 0.205                | 0.211 | 0.217 |
| C      | 0.45                      | 0.52 | 0.58  | 0.018                | 0.020 | 0.023 |
| C1     | 0.45                      | 0.52 | 0.58  | 0.018                | 0.020 | 0.023 |
| D      | 5.40                      | 5.57 | 6.20  | 0.213                | 0.219 | 0.244 |
| E      | 6.35                      | 6.58 | 6.80  | 0.250                | 0.259 | 0.268 |
| e      | 2.28 BSC.                 |      |       | 0.090 BSC.           |       |       |
| e1     | 4.57 BSC.                 |      |       | 0.180 BSC.           |       |       |
| H      | 9.00                      | 9.70 | 10.40 | 0.354                | 0.382 | 0.409 |
| L      | 0.51                      | -    | -     | 0.020                | -     | -     |
| L1     | 0.64                      | 0.83 | 1.02  | 0.025                | 0.033 | 0.040 |
| L2     | 0.88                      | -    | 1.27  | 0.035                | -     | 0.050 |





(5) SOT89



| Symbol | Dimensions In Millimeters |      |      | Dimensions In Inches |       |       |
|--------|---------------------------|------|------|----------------------|-------|-------|
|        | Min.                      | Nom. | Max. | Min.                 | Nom.  | Max.  |
| A      | 1.40                      | 1.50 | 1.60 | 0.055                | 0.059 | 0.063 |
| B      | 0.36                      | 0.42 | 0.48 | 0.014                | 0.016 | 0.018 |
| b1     | 0.41                      | 0.47 | 0.53 | 0.016                | 0.043 | 0.051 |
| C      | 0.35                      | 0.39 | 0.43 | 0.014                | 0.015 | 0.017 |
| D      | 4.40                      | 4.50 | 4.60 | 0.173                | 0.177 | 0.181 |
| D1     | 1.40                      | 1.60 | 1.75 | 0.055                | 0.062 | 0.069 |
| e      | 2.90                      | 3.00 | 3.10 | 0.114                | 0.118 | 0.122 |
| e1     | 1.45                      | 1.50 | 1.55 | 0.057                | 0.059 | 0.061 |
| E      | 2.35                      | 2.48 | 2.60 | 0.093                | 0.098 | 0.102 |
| HE     | 3.94                      | -    | 4.25 | 0.155                | -     | 0.167 |
| L      | 0.80                      | -    | 1.20 | 0.031                | -     | 0.047 |