



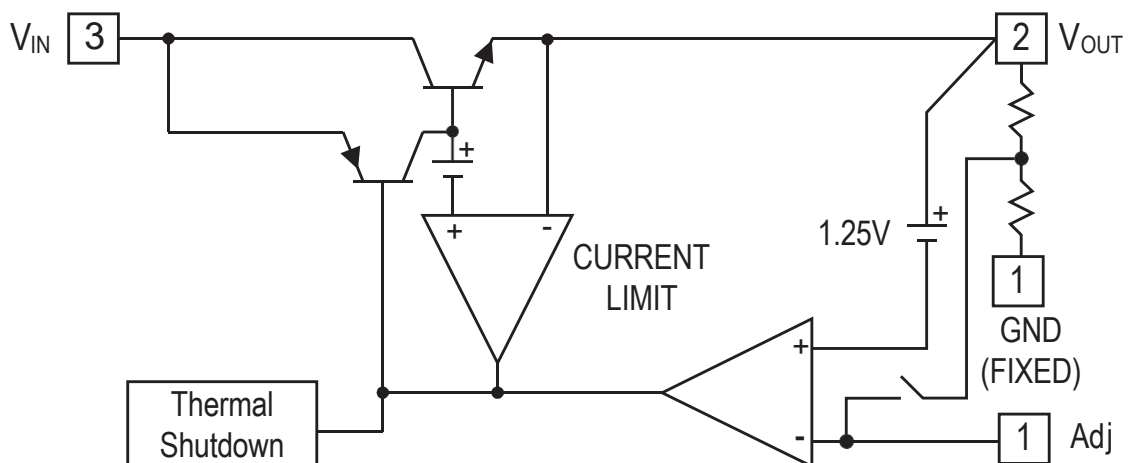
### ❖ GENERAL DESCRIPTION

AMS1117 is a low dropout positive adjustable or fixed-mode regulator with minimum of 1A output current capability. The product is specifically designed to provide well-regulated supply for low voltage IC applications such as high-speed bus termination and low current 3.3V logic supply. AMS1117 is also well suited for other applications such as VGA cards. AMS1117 is guaranteed to have lower than 1.4V dropout at full load current making it ideal to provide well-regulated outputs of 1.25 to 5.0 with  $V_{OUT}+1.4V$  to 12V input supply VOLTAGE.

### ❖ FEATURES

- 1.4V maximum dropout at full load current
- Fast transient response
- Output current limiting
- Built-in thermal shutdown
- Good noise rejection
- MLCC Capacitors are available.
- 3-Terminal Adjustable or Fixed 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5.0V
- Green (RoHS)
- Packages: SOT223, TO252 and SOT89.

### ❖ BLOCK DIAGRAM

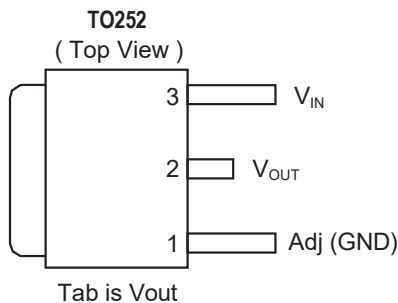
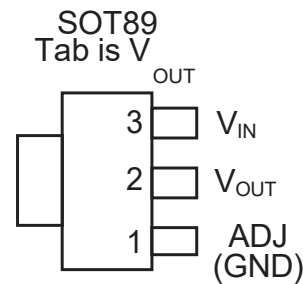
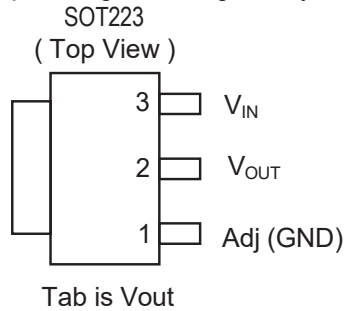




# 1A Low Dropout Linear Regulator

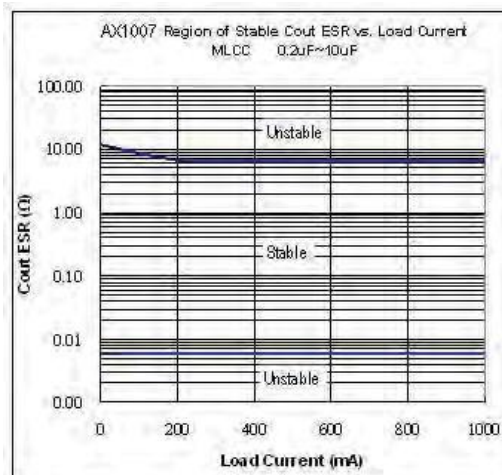
## ❖ PIN ASSIGNMENT

The packages of AMS1117 are SOT223-3L, TO252-3L and SOT89-3L;  
the pin assignment is given by:



| Name      | Description                                                                                                                                                                                                                                                                                                                              |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adj (GND) | A resistor divider from this pin to the $V_{OUT}$ pin and ground sets the output voltage. (Ground only for Fixed-Mode)                                                                                                                                                                                                                   |
| $V_{OUT}$ | The output of the regulator. <b>(Note1,2)</b>                                                                                                                                                                                                                                                                                            |
| $V_{IN}$  | The input pin of regulator. Typically a large storage capacitor 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 1.5V higher than $V_{OUT}$ in order for the device to regulate properly. <b>(Note1)</b> |

Note1: To prevent oscillation, a 0.2 $\mu$ F minimum X7R or X5R dielectric is strongly recommended if ceramics are used as output capacitors.



Note2: A minimum of 3.3 $\mu$ F EL capacitor to 100 $\mu$ F (10m $\Omega$   $\leq$  ESR  $\leq$  1 $\Omega$ ) must be connected from this pin to ground to insure stability.



## ❖ ORDER/MARKING INFORMATION

| Order Information |             |                |
|-------------------|-------------|----------------|
| AMS111Z X XX X    |             |                |
| Package           | Vout        | Packing        |
| E : SOT223-3L     | Blank : ADJ | Blank: Tube    |
| D : TO252-3L      | 12: 1.2V    | A: Tape & Reel |
| F : SOT89-3L      | 15 : 1.5V   |                |
|                   | 18 : 1.8V   |                |
|                   | 25 : 2.5V   |                |
|                   | 33 : 3.3V   |                |
|                   | 50 : 5.0V   |                |

| Part name      | Packing   | Quantity<br>Per Reel |
|----------------|-----------|----------------------|
| <b>AMS1117</b> | SOT223-3L | 3000                 |
|                | SOT89-3L  | 3000                 |
|                | SOT252-3L | 1000                 |

## ❖ ABSOLUT MAXIMUM RATINGS

| Characteristics                                                                         |         | Symbol   | Rating      | Unit |
|-----------------------------------------------------------------------------------------|---------|----------|-------------|------|
| DC Supply Voltage                                                                       |         | $V_{IN}$ | -0.3 to 15  | V    |
| Operating Junction Temperature Range                                                    |         | $T_{op}$ | -40 to +125 | °C   |
| Maximum junction Temperature                                                            |         | $T_{MJ}$ | 150         | °C   |
| Power Dissipation (Heat sink area 5mm*5mm.)<br>$T_A=25^{\circ}C$ , $T_J=125^{\circ}C$   | SOT-223 | $P_D$    | 1300        | mW   |
|                                                                                         | TO-252  |          | 2200        |      |
|                                                                                         | SOT89   |          | 620         |      |
| Power Dissipation (No heat sink ;No air flow)<br>$T_A=25^{\circ}C$ , $T_J=125^{\circ}C$ | SOT-223 | $P_D$    | 850         | mW   |
|                                                                                         | TO-252  |          | 1050        |      |
|                                                                                         | SOT89   |          | 330         |      |
| Storage Temperature                                                                     |         | $T_{ST}$ | -65 to 150  | °C   |

**❖ ELECTRICAL CHARACTERISTICS**(T<sub>A</sub>=25°C, Under Operating Conditions)

| Characteristics         | Conditions  |                                                                                                                | Min   | Typ   | Max   | Units |
|-------------------------|-------------|----------------------------------------------------------------------------------------------------------------|-------|-------|-------|-------|
| Operation Input Voltage |             |                                                                                                                | 2.7   | -     | 12    | V     |
| Reference Voltage       | AMS1117EA   | I <sub>OUT</sub> = 10mA,<br>T <sub>J</sub> =25°C,<br>(V <sub>IN-OUT</sub> )=1.5V                               | 1.225 | 1.250 | 1.275 | V     |
| Output Voltage          | AMS1117-1.2 | I <sub>OUT</sub> =10mA,<br>T <sub>J</sub> = 25°C,<br>2.7V≤V <sub>IN</sub> ≤12V                                 | 1.176 | 1.200 | 1.224 | V     |
|                         | AMS1117-1.5 | I <sub>OUT</sub> = 10mA,<br>T <sub>J</sub> = 25°C,<br>3V≤V <sub>IN</sub> ≤12V                                  | 1.470 | 1.500 | 1.530 | V     |
|                         | AMS1117-1.8 | I <sub>OUT</sub> = 10mA,<br>T <sub>J</sub> = 25°C,<br>3.3V≤V <sub>IN</sub> ≤12V                                | 1.764 | 1.800 | 1.836 | V     |
|                         | AMS1117-2.5 | I <sub>OUT</sub> = 10mA,<br>T <sub>J</sub> = 25°C,<br>4V≤V <sub>IN</sub> ≤12V                                  | 2.450 | 2.500 | 2.550 | V     |
|                         | AMS1117-3.3 | I <sub>OUT</sub> = 10mA,<br>T <sub>J</sub> = 25°C,<br>4.8V≤V <sub>IN</sub> ≤12V                                | 3.235 | 3.300 | 3.365 | V     |
|                         | AMS1117-5.0 | I <sub>OUT</sub> = 10mA,<br>T <sub>J</sub> = 25°C,<br>6.5V≤V <sub>IN</sub> ≤12V                                | 4.900 | 5.000 | 5.100 | V     |
| Line Regulation         | AMS1117-XXX | I <sub>OUT</sub> =10mA,<br>V <sub>OUT</sub> +1.5V<<br>V <sub>IN</sub> <12V, T <sub>J</sub> =25°C<br>(Note 1,2) | -     | 0.2   | 0.5   | %     |
| Load Regulation         | AMS1117-ADJ | V <sub>IN</sub> =2.7V, 10mA≤I <sub>OUT</sub><br>≤1A, T <sub>J</sub> =25°C<br>(Note 1,2)                        | -     | 0.4   | 1     | %     |
|                         | AMS1117-1.2 | V <sub>IN</sub> =2.7V,<br>10mA≤I <sub>OUT</sub> ≤1A,,<br>T <sub>J</sub> =25°C (Note 1,2)                       | -     | 10    | 12    | mV    |
|                         | AMS1117-1.5 | V <sub>IN</sub> =3V,<br>10mA≤I <sub>OUT</sub> ≤1A,,<br>T <sub>J</sub> =25°C (Note 1,2)                         | -     | 12    | 15    | mV    |
|                         | AMS1117-1.8 | V <sub>IN</sub> =3.3V,<br>0mA≤I <sub>OUT</sub> ≤1A,<br>T <sub>J</sub> =25°C (Note 1,2)                         | -     | 15    | 18    | mV    |
|                         | AMS1117-2.5 | V <sub>IN</sub> =4V,<br>10mA≤I <sub>OUT</sub> ≤1A,<br>T <sub>J</sub> =25°C (Note 1,2)                          | -     | 20    | 25    | mV    |



|                                                                       |                                                                             |                                                                                |     |     |     |               |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----|-----|-----|---------------|
|                                                                       | AMS1117-3.3                                                                 | $V_{IN}=5V, 10mA \leq I_{OUT} \leq 1A, T_J=25^{\circ}C$<br><b>(Note 1,2)</b>   | -   | 26  | 33  | mV            |
|                                                                       | AMS1117-5.0                                                                 | $V_{IN}=6.5V, 10mA \leq I_{OUT} \leq 1A, T_J=25^{\circ}C$<br><b>(Note 1,2)</b> | -   | 40  | 50  | mV            |
| Dropout Voltage<br>( $V_{IN}-V_{OUT}$ )                               | AMS1117-ADJ<br>/1.2/1.5/1.8<br>/2.5/3.3/5.0                                 | $I_{OUT} = 1A,$<br>$\Delta V_{OUT}=1\%V_{OUT}$                                 | -   | 1.2 | 1.4 | V             |
| Current Limit                                                         | AMS1117-ADJ/1.2/<br>1.5/1.8/2.5/3.3/5.0                                     | $(V_{IN}-V_{OUT}) = 1.5V$                                                      | 1.0 |     | 1.8 | A             |
| Minimum Load Current                                                  | AMS1117-XXX                                                                 | $0^{\circ}C \leq T_J \leq 125^{\circ}C$                                        | -   | 5   | 7   | mA            |
| Adjust pin current                                                    | AMS1117-ADJ                                                                 | $(V_{IN}-V_{OUT}) = 1.5V,$<br>$I_{OUT}=10mA$                                   | -   | 50  | 100 | uA            |
| Ripple Rejection                                                      | F=120Hz, $C_{OUT}=10\mu f, 0.2\mu f$<br>AMS1117-XX, $(V_{IN}-V_{OUT}) = 1.$ |                                                                                | 50  | 60  | 70  | dB            |
| Temperature Stability                                                 | 5V $I_{OUT}=10mA$                                                           |                                                                                | -   | 0.5 | -   | %             |
| Thermal shutdown Temp (Over temperature protect)                      |                                                                             |                                                                                | -   | 145 | -   | $^{\circ}C$   |
| Thermal Shutdown Hysteresis                                           |                                                                             |                                                                                | -   | 40  | -   | $^{\circ}C$   |
| Lead Temperature                                                      |                                                                             |                                                                                | -   | 260 | -   | $^{\circ}C$   |
| $\theta_{JA}$ Thermal Resistance Junction-to-Ambient <b>(Note4)</b>   |                                                                             | SOT-223                                                                        | -   | 75  |     | $^{\circ}C/W$ |
|                                                                       |                                                                             | TO-252                                                                         | -   | 45  | -   |               |
|                                                                       |                                                                             | SOT89                                                                          | -   | 160 | -   |               |
| Thermal Resistance Junction-to-Ambient<br>(No heat sink ;No air flow) |                                                                             | SOT-223                                                                        | -   | 117 | -   | $^{\circ}C/W$ |
|                                                                       |                                                                             | TO-252                                                                         | -   | 92  | -   |               |
|                                                                       |                                                                             | SOT89                                                                          | -   | 300 | -   |               |
| $\theta_{JC}$ Thermal Resistance Junction-to-Case                     |                                                                             | SOT-223                                                                        | -   | 15  | -   | $^{\circ}C/W$ |
|                                                                       |                                                                             | TO-252                                                                         | -   | 10  | -   |               |
|                                                                       |                                                                             | SOT89                                                                          | -   | 100 | -   |               |

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 lead = 1/18" from the package.

Note2: Line and load regulation are guaranteed up to the maximum power dissipation of 6W. 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.

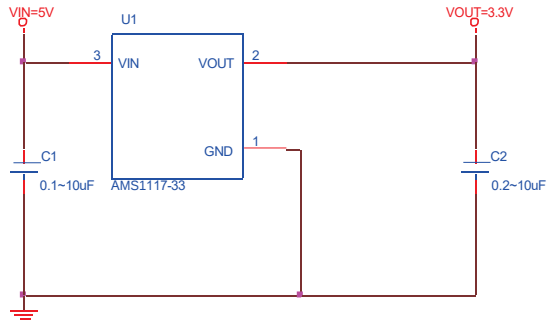
Note4: Tab is connected to the multi-layer PCB copper area 5mm\*5mm.



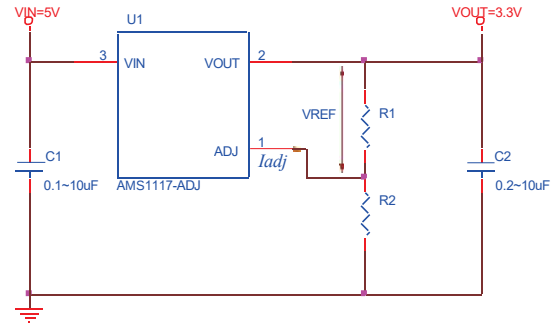
## ❖ APPLICATION CIRCUIT

## (1) Using Multilayer Ceramic Capacitor (MLCC)

Fixed Output



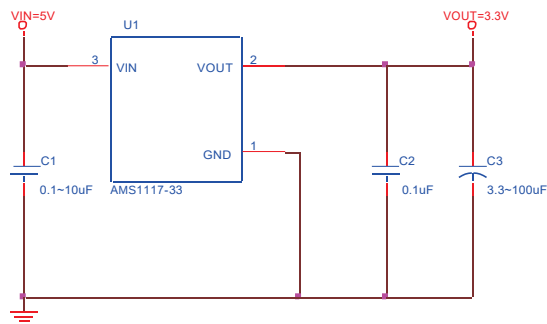
ADJ Output



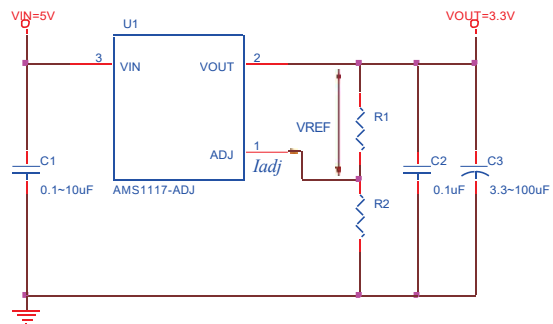
$$V_{OUT} = V_{REF} \times \left(1 + \frac{R2}{R1}\right) + I_{adj} \times R2$$

## (2) Using Aluminum Electrolytic Capacitor (AL)

Fixed Output



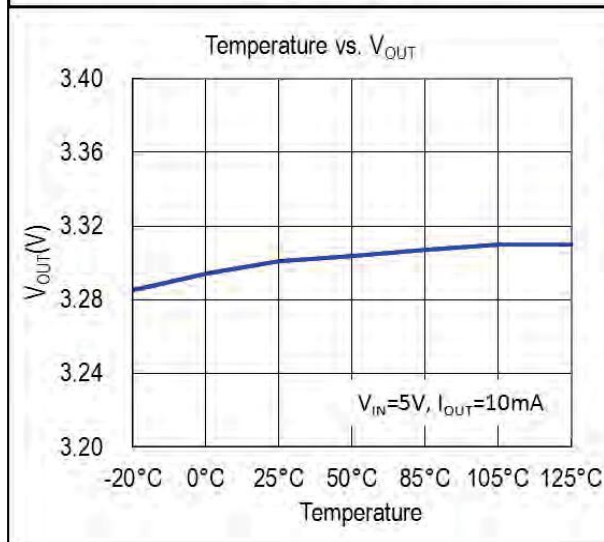
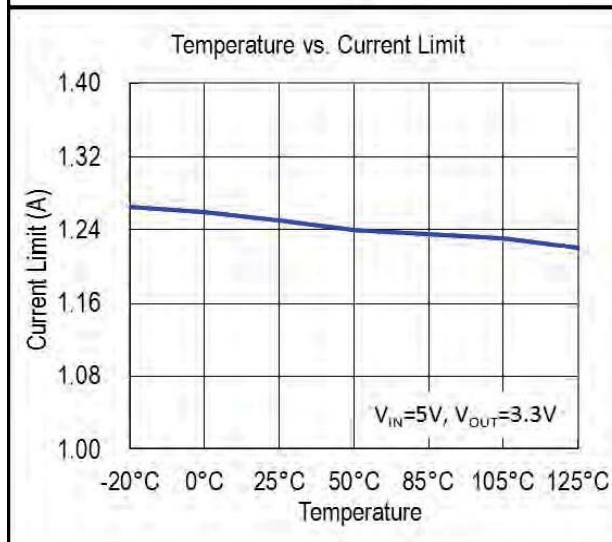
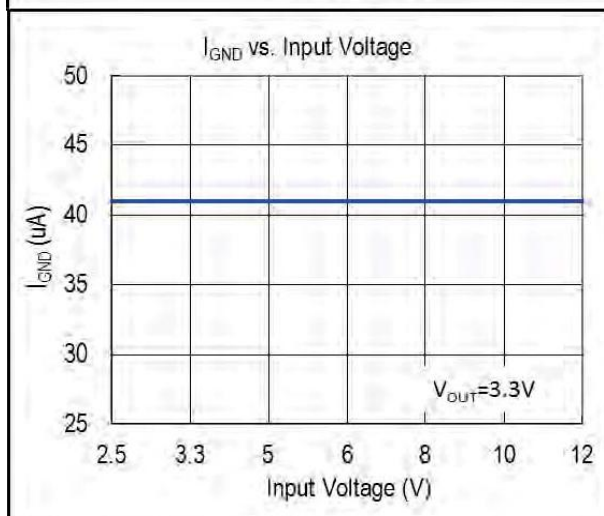
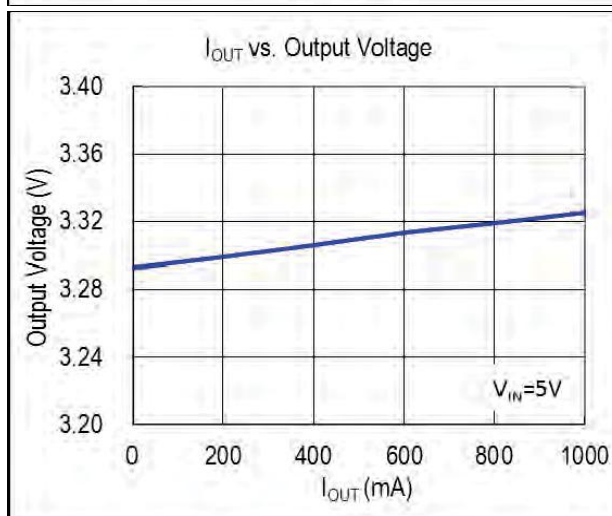
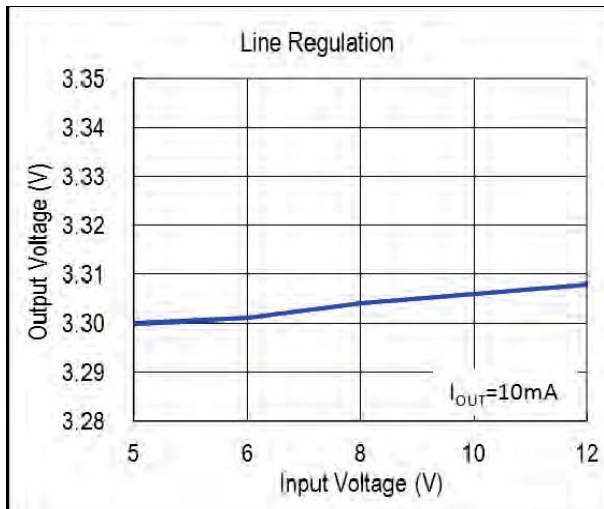
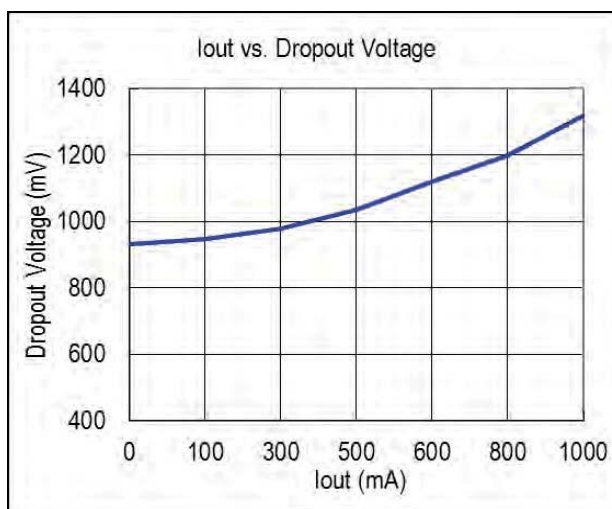
ADJ Output



$$V_{OUT} = V_{REF} \times \left(1 + \frac{R2}{R1}\right) + I_{adj} \times R2$$

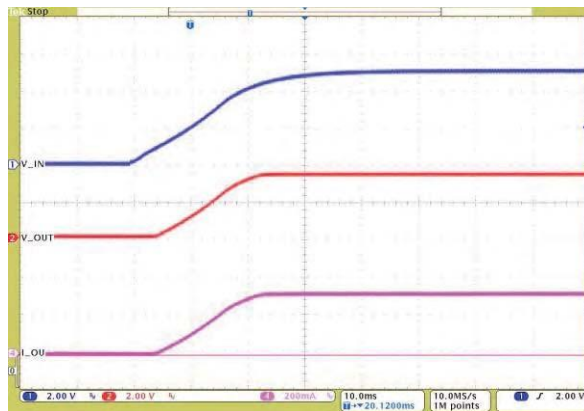
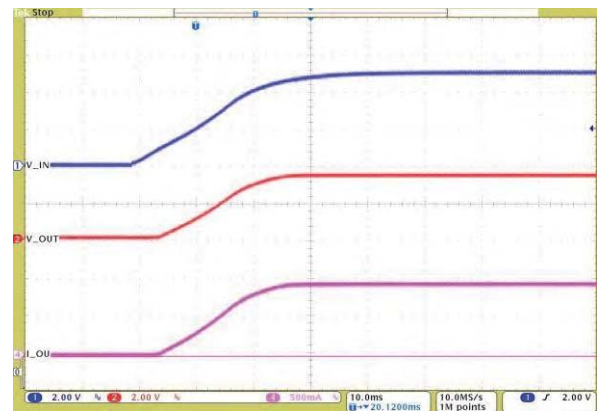
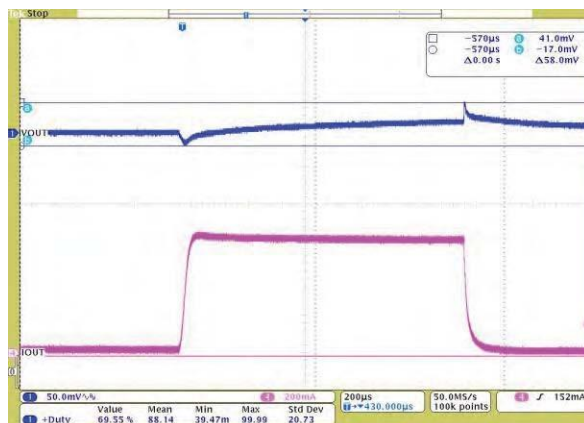


## ❖ TYPICAL CHARACTERISTICS



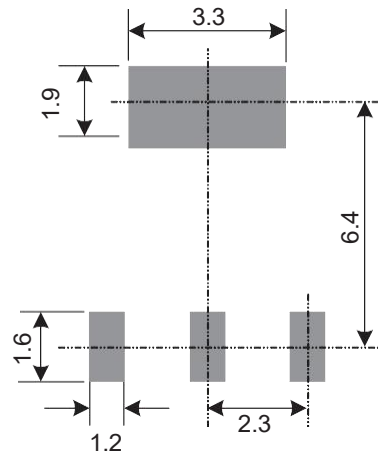
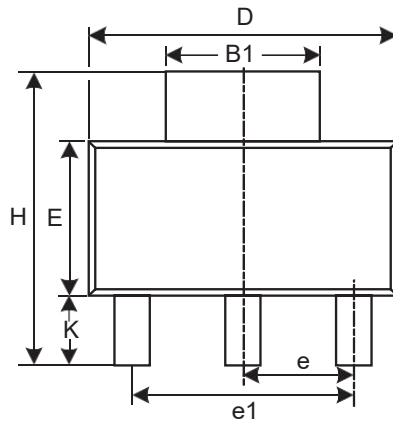


## ❖ TYPICAL CHARACTERISTICS (CONTINUOUS)

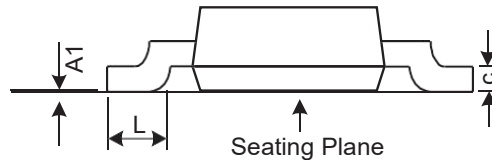
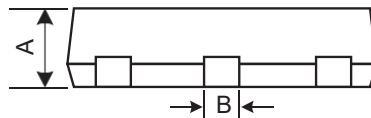
5→3.3V ( $I_{OUT}=300mA$ )5→3.3V ( $I_{OUT}=1A$ ) $V_{IN}=5V$ ,  $V_{OUT}=2.5V$ ,  $I_{OUT}=0\sim600mA$   
 $C_{IN}=0.1\mu$ ,  $C_{OUT}=0.2\mu$  MLCC $V_{IN}=5V$ ,  $V_{OUT}=3.3V$ ,  $I_{OUT}=100mA\sim1A$ ,  
 $C_{IN}=0.1\mu$ ,  $C_{OUT}=0.2\mu$  MLCC



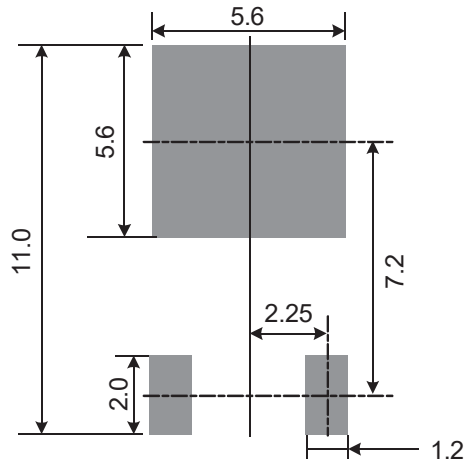
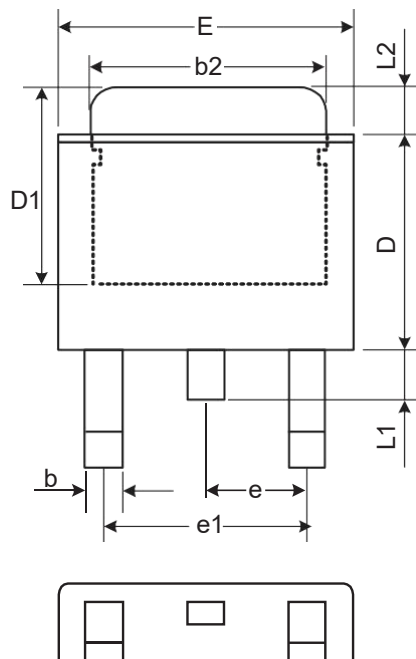
## ❖ PACKAGE OUTLINES

(1) SOT223-3L  
MSL-3

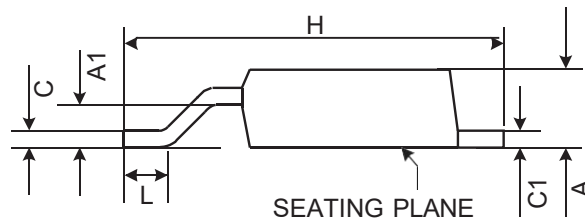
Land Pattern Recommendation (Unit: mm)



| Symbol | Dimensions in Millimeters |       |      | Dimensions in Inches |       |       |
|--------|---------------------------|-------|------|----------------------|-------|-------|
|        | Min.                      | Nom.  | Max. | Min.                 | Nom.  | Max.  |
| A      | -                         | -     | 1.8  | -                    | -     | 0.071 |
| A1     | 0.02                      | 0.06  | 0.1  | 0.001                | 0.002 | 0.004 |
| B      | 0.66                      | 0.75  | 0.84 | 0.026                | 0.03  | 0.033 |
| B1     | 2.9                       | 3     | 3.1  | 0.114                | 0.118 | 0.122 |
| C      | 0.23                      | 0.315 | 0.35 | 0.009                | 0.012 | 0.014 |
| D      | 6.3                       | 6.5   | 6.7  | 0.248                | 0.256 | 0.264 |
| E      | 3.3                       | 3.5   | 3.7  | 0.13                 | 0.138 | 0.146 |
| H      | 6.7                       | 7     | 7.3  | 0.264                | 0.278 | 0.287 |
| L      | 0.75                      | -     | -    | 0.03                 | -     | -     |
| K      | 1.5                       | 1.75  | 2    | 0.059                | 0.069 | 0.079 |
| e      | 2.3 Basic                 |       |      | 0.091 Basic          |       |       |
| e1     | 4.6 Basic                 |       |      | 0.181 Basic          |       |       |

**(2) TO252-3L  
MSL-3**

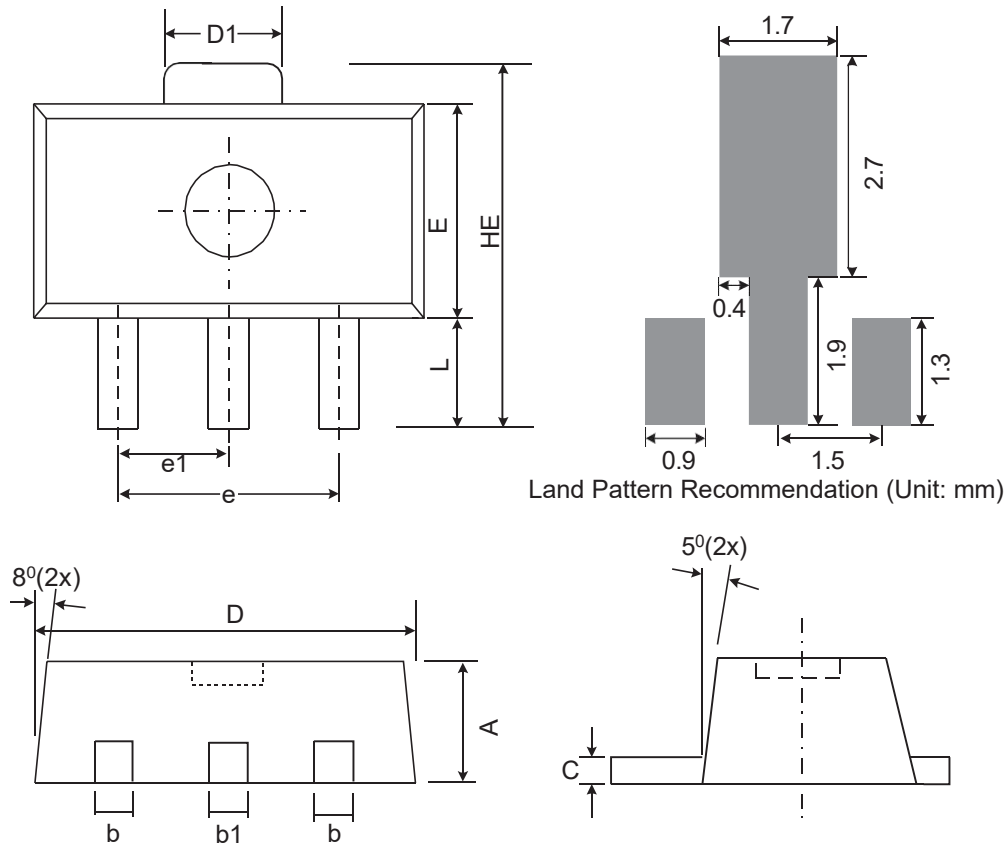
Land Pattern Recommendation (Unit: mm)



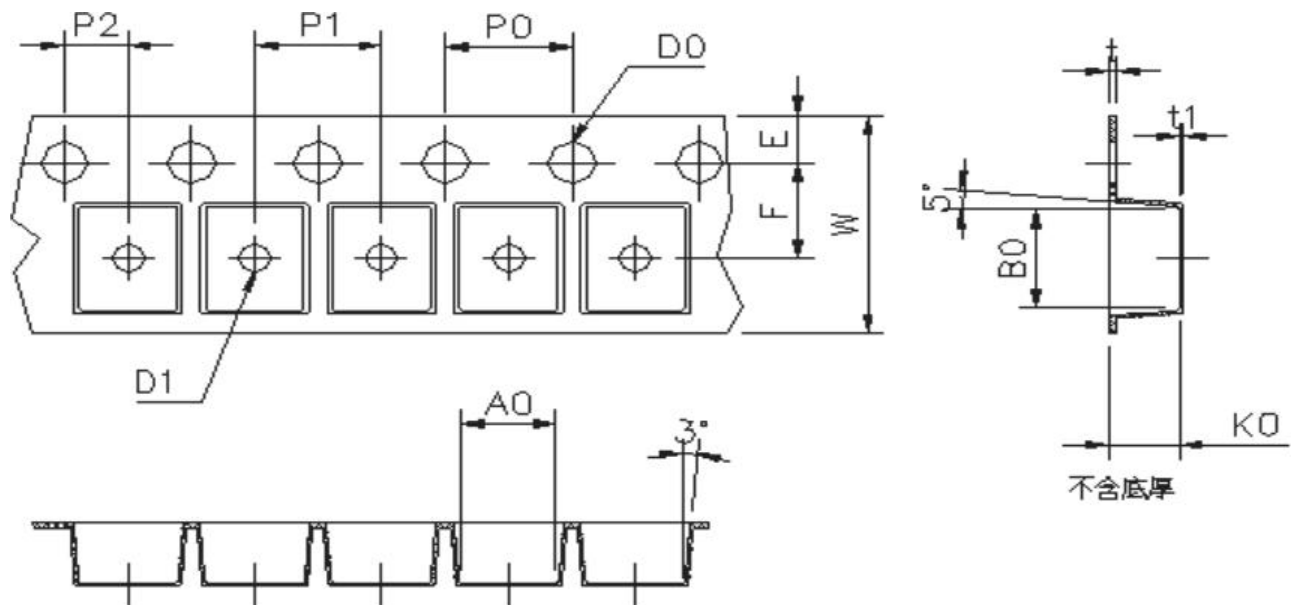
| Symbol | Dimensions in Millimeters |      |      | Dimensions in Inches |       |       |
|--------|---------------------------|------|------|----------------------|-------|-------|
|        | Min.                      | Nom. | Max. | Min.                 | Nom.  | Max.  |
| A      | 2.18                      | 2.29 | 2.39 | 0.086                | 0.09  | 0.094 |
| A1     | -                         | -    | 0.13 | -                    | -     | 0.005 |
| b      | 0.51                      | 0.71 | 0.89 | 0.02                 | 0.028 | 0.035 |
| b2     | 4.95                      | 5.21 | 5.46 | 0.195                | 0.205 | 0.215 |
| C      | 0.46                      | 0.53 | 0.61 | 0.018                | 0.021 | 0.024 |
| C1     | 0.46                      | 0.53 | 0.58 | 0.018                | 0.021 | 0.023 |
| D      | 5.33                      | 5.46 | 5.59 | 0.21                 | 0.215 | 0.22  |
| D1     | 4.57                      | -    | -    | 0.18                 | -     | -     |
| E      | 6.35                      | 6.55 | 6.73 | 0.25                 | 0.258 | 0.265 |
| e      | 2.29 BSC                  |      |      | 0.090 BSC.           |       |       |
| e1     | 4.58 BSC                  |      |      | 0.180 BSC.           |       |       |
| H      | 9.4                       | 9.7  | 10.4 | 0.37                 | 0.382 | 0.41  |
| L      | 1.4                       | 1.6  | 1.78 | 0.055                | 0.063 | 0.07  |
| L1     | -                         | -    | 1.02 | -                    | -     | 0.04  |
| L2     | 1.52                      | 1.78 | 2.03 | 0.06                 | 0.07  | 0.08  |

Mold flash shall not exceed 0.005inch per side

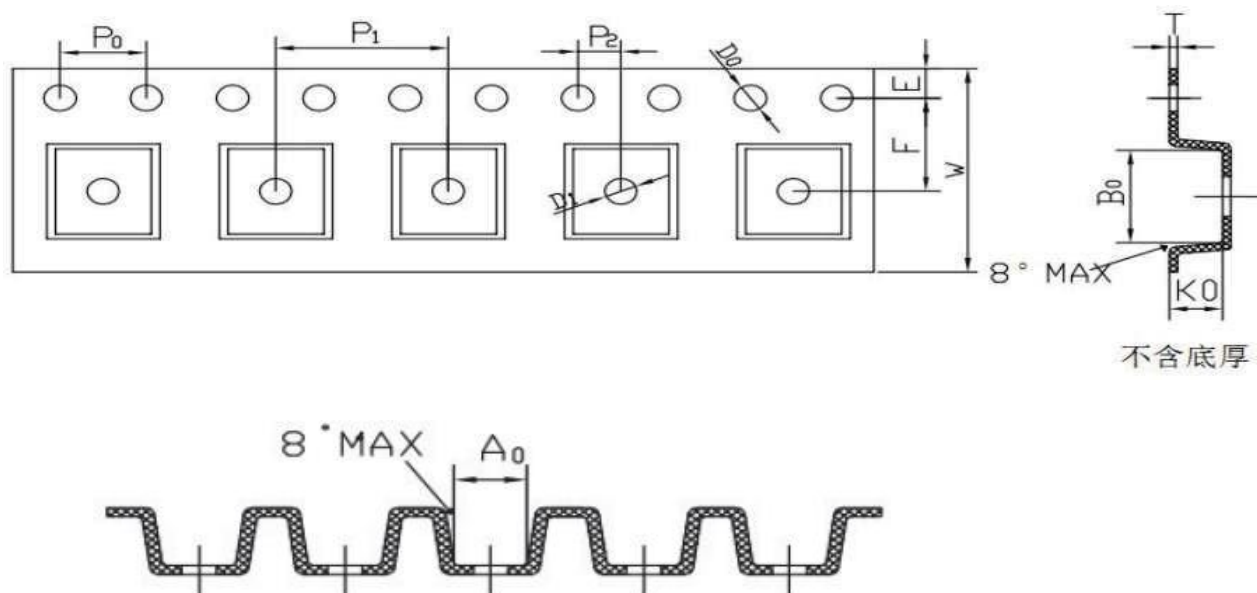
JEDEC outline: TO-252 AB

**(3) SOT89-3L**  
**MSL-3**

| 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                | 0.017 | 0.019 |
| b1     | 0.44                      | 0.50 | 0.56 | 0.017                | 0.02  | 0.022 |
| C      | 0.35                      | 0.40 | 0.44 | 0.014                | 0.016 | 0.017 |
| D      | 4.40                      | 4.50 | 4.60 | 0.173                | 0.177 | 0.181 |
| D1     | 1.35                      | 1.59 | 1.83 | 0.053                | 0.063 | 0.072 |
| e      | 3.0 BSC                   |      |      | 0.118 BSC            |       |       |
| e1     | 1.5 BSC                   |      |      | 0.059 BSC            |       |       |
| E      | 2.29                      | 2.45 | 2.60 | 0.09                 | 0.097 | 0.102 |
| HE     | 3.94                      | 4.10 | 4.25 | 0.155                | 0.161 | 0.167 |
| L      | 0.80                      | 1.00 | 1.20 | 0.031                | 0.04  | 0.047 |

**Carrier Dimensions****SOT223-3L**

| Symbol               | Spec             | Symbol                  | Spec       |
|----------------------|------------------|-------------------------|------------|
| <b>W</b>             | 12.00±0.10       | <b>A<sub>0</sub></b>    | 7.00±0.10  |
| <b>E</b>             | 1.75±0.10        | <b>B<sub>0</sub></b>    | 7.27±0.10  |
| <b>F</b>             | 5.50±0.10        | <b>K<sub>0</sub></b>    | 1.85±0.10  |
| <b>D<sub>0</sub></b> | 1.50 (+0.10; -0) | <b>10*p<sub>0</sub></b> | 40.00±0.20 |
| <b>D<sub>1</sub></b> | 1.50 (+0.10; -0) |                         |            |
| <b>P<sub>0</sub></b> | 4.00±0.10        |                         |            |
| <b>P<sub>1</sub></b> | 8.00±0.10        |                         |            |
| <b>P<sub>2</sub></b> | 2.00±0.10        |                         |            |
| <b>t</b>             | 0.25-0.28        |                         |            |
| <b>t<sub>1</sub></b> | 0.05以上           |                         |            |

**Carrier Dimensions****SOT89-3L**

| Symbol               | Spec             | Symbol               | Spec      |
|----------------------|------------------|----------------------|-----------|
| <b>W</b>             | 12.00±0.10       | <b>A<sub>0</sub></b> | 4.90±0.10 |
| <b>E</b>             | 1.75±0.10        | <b>B<sub>0</sub></b> | 4.50±0.10 |
| <b>F</b>             | 5.50±0.05        | <b>K<sub>0</sub></b> | 1.85±0.10 |
| <b>D<sub>0</sub></b> | 1.50 (+0.10, -0) |                      |           |
| <b>D<sub>1</sub></b> | 1.50 (+0.10, -0) |                      |           |
| <b>P<sub>0</sub></b> | 4.00±0.10        |                      |           |
| <b>P<sub>1</sub></b> | 8.00±0.10        |                      |           |
| <b>P<sub>2</sub></b> | 2.00±0.05        |                      |           |
| <b>t</b>             | 0.25-0.28        |                      |           |
| <b>t<sub>1</sub></b> | 0.05以上           |                      |           |