# 5A Low Dropout Positive Regulator

## FEATURES

- Dropout Voltage 1.5V at 5A Output Current.
- Fast Transient Response.
- Extremely Tight Line and Load Regulation.
- Current Limiting and Thermal Protection.
- Adjustable Output Voltage or Fixed 1.5V, 1.8V, 2.5V, 3.3V.
- Standard 3-Pin Power Packages.

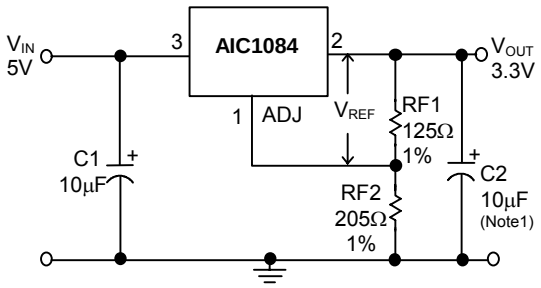
## APPLICATIONS

- Mother Board I/O Power Supplies.
- Microprocessor Power Supplies.
- High Current Regulator.
- Post Regulator for Switching Supply.

## DESCRIPTION

The AIC1084 is a low dropout three terminal regulator with 5A output current capability. The output voltage is adjustable with the use of a resistor divider or fixed 1.5V, 1.8V, 2.5V and 3.3V. Dropout voltage is guaranteed to be at maximum of 1.5V with the maximum output current. Its low dropout voltage and fast transient response make it ideal for low voltage microprocessor applications. Current limit and thermal protection provide protection against any overload condition that would create excessive junction temperatures.

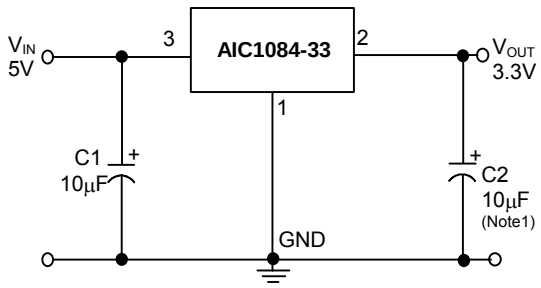
## TYPICAL APPLICATION CIRCUIT




**Adjustable Voltage Regulator**

$V_{REF}=V_{OUT}$ $-V_{ADJ}=1.25V$ (typ.)
$V_{OUT}=V_{REF}$ x (1+RF2/RF1)+ $I_{ADJ}$ x RF2
$I_{ADJ}=55\mu A$ (typ.)

(1) C1 needed if device is far away from filter capacitors.
(2) C2 required for stability.




**Fixed Voltage Regulator**

## ORDERING INFORMATION

AIC1084-XXXXXX

- PACKING TYPE
  - TB: TUBE
  - TR: TAPING & REEL
- PACKAGING TYPE
  - E: TO-252
  - M: TO-263
  - T: TO-220
- C: COMMERCIAL
  P: LEAD FREE COMMERCIAL
  G: GREEN PACKAGE
- OUTPUT VOLTAGE
  DEFAULT: ADJUSTABLE
  - 15: 1.5V
  - 18: 1.8V
  - 25: 2.5V
  - 33: 3.3V

(1.5V version is available under request)

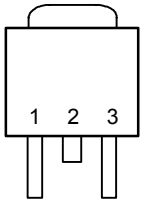
Example: AIC1084-18CETR
→ 1.8V version in TO-252 Package & Taping & Reel Packing Type

Example: AIC1084-18PMTR
→ 1.8V version in TO-263 Lead Free Package & Taping & Reel Packing Type

PIN CONFIGURATION

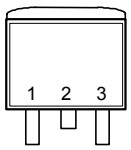
TO-252
TOP VIEW

1: ADJ (GND)
2: VOUT (TAB)
3: VIN



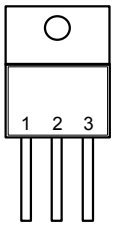

TO-263
TOP VIEW

1: ADJ (GND)
2: VOUT (TAB)
3: VIN




TO-220
FRONT VIEW

1: ADJ (GND)
2: VOUT (TAB)
3: VIN




## ABSOLUTE MAXIMUM RATINGS

| | | |
|---|---|---|
| VIN pin to ADJ/GND pin | | 7V |
| Ambient Temperature Range | | –40°C to 85°C |
| Maximum Junction Temperature | | 125°C |
| Storage Temperature Range | | –65°C ~ 150°C |
| Lead Temperature (Soldering) 10 sec. | | 260°C |
| Thermal Resistance Junction to Case | TO-252 | 12.5°C/W |
| | TO-263, TO-220 | 3°C/W |
| Thermal Resistance Junction to Ambient | TO-252 | 100°C/W |
| (Assume no ambient airflow, no heatsink) | TO-263 | 60°C/W |
| | TO-220 | 50°C/W |

**Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.**

## TEST CIRCUIT

Refer to TYPICAL APPLICATION CIRCUIT.

## ELECTRICAL CHARACTERISTICS

**($V_{IN}$=5V, $T_J$=25°C, $I_O$=10mA, unless otherwise specified) (Note2)**

| PARAMETER | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| Reference Voltage | AIC1084 (ADJ) | 1.225 | 1.25 | 1.275 | V |
| Output Voltage | AIC1084-15, $V_{IN}$=5V<br>AIC1084-18, $V_{IN}$=5V<br>AIC1084-25, $V_{IN}$=5V<br>AIC1084-33, $V_{IN}$=5V | 1.47<br>1.76<br>2.45<br>3.23 | 1.50<br>1.80<br>2.50<br>3.30 | 1.53<br>1.84<br>2.55<br>3.37 | V |
| Line Regulation | ADJ : 2.75V≤ $V_{IN}$ ≤7V<br>$V_{OUT}$=1.25V | | 0.015 | 0.2 | % |
| | Fix : $V_{OUT}$+1.5V≤ $V_{IN}$ ≤7V | | | | |
| Load Regulation | 10mA < $I_O$ < 5A | | | 0.6 | % |
| Dropout Voltage | $\Delta V_{OUT}$, $\Delta V_{REF}$=1%<br>10mA ≤ $I_O$ ≤ 5A | | 1.4 | 1.5 | V |
| Current Limit | | 5 | 6 | | A |
| GND Current (Fix) | $V_{OUT}$+1.5V ≤ $V_{IN}$ ≤ 7V | | 11.5 | 14 | mA |
| Adjusted Pin Current | 2.75V ≤ $V_{IN}$ ≤ 7V | | 55 | 120 | μA |
| Adjusted Pin Current Change ($\Delta I_{ADJ}$) | 2.75V ≤ $V_{IN}$ ≤ 7V | | 0.2 | 5 | μA |
| Temperature Stability | $I_O$=0.5A | | 0.5 | | % |
| Minimum Load Current | | | 5 | 10 | mA |
| RMS Output Noise (% of $V_{OUT}$) | 10Hz ≤ f ≤ 10KHz | | 0.003 | | % |
| Ripple Rejection Ratio | 120Hz input ripple<br>$C_{OUT}$=25μF<br>($V_{IN}$ -$V_{OUT}$)=3V | 60 | 72 | | dB |
| Thermal Shutdown Temperature | Note 3 | | 165 | | °C |

**Note 1:** To avoid output oscillation, aluminum electrolytic output capacitor is recommended and ceramic capacitor is not suggested.

**Note 2:** Specifications are production tested at $T_A$=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

**Note 3:** Guarantee by design.

## TYPICAL PERFORMANCE CHARACTERISTICS

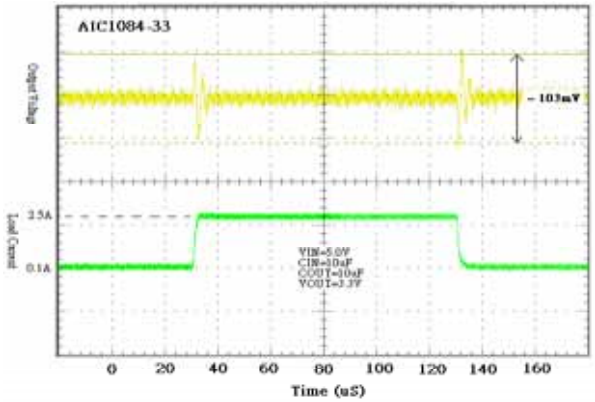



Fig. 1 Load Transient Response

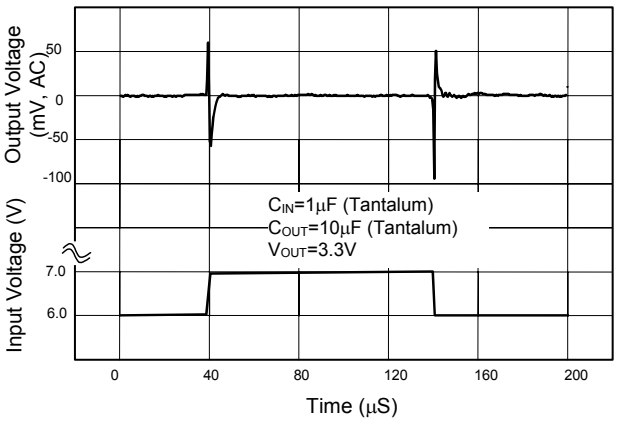



Fig. 2 Line Transient Response

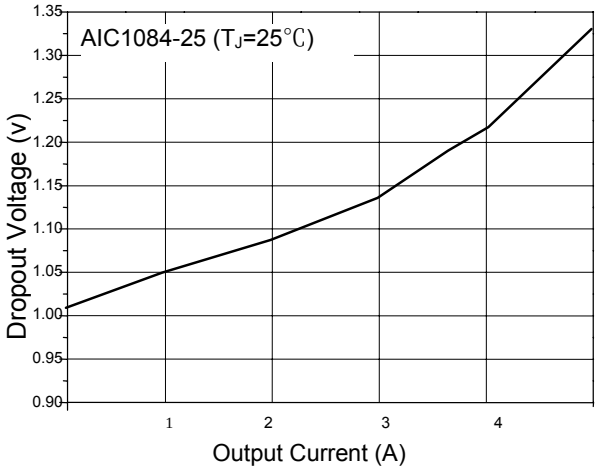



Fig. 3 Dropout Voltage ($V_{OUT}$=2.5)

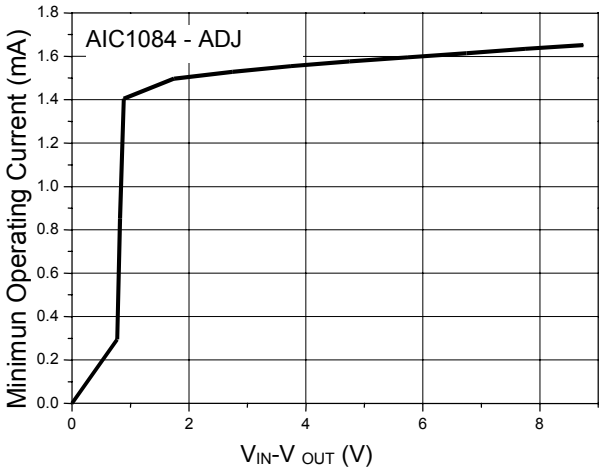



Fig. 4 Minimum Operating Current

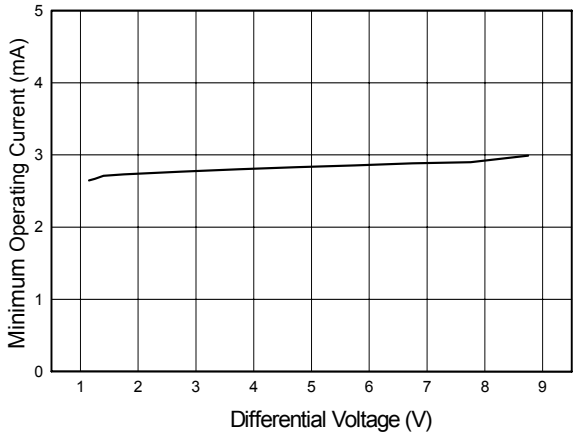



Fig. 5 Minimum Operating Current

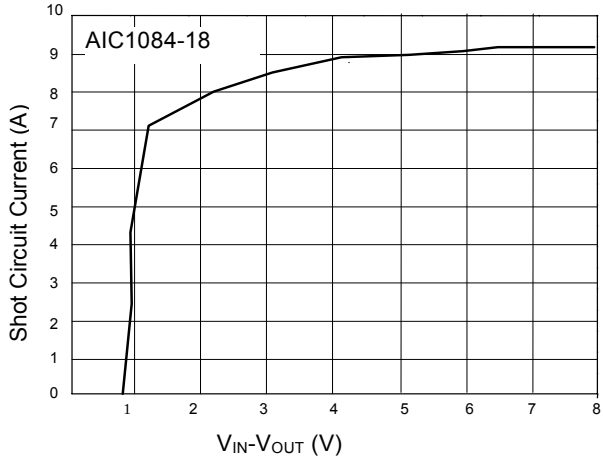



Fig. 6 AIC1084 (1.8) Short Circuit Current

## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

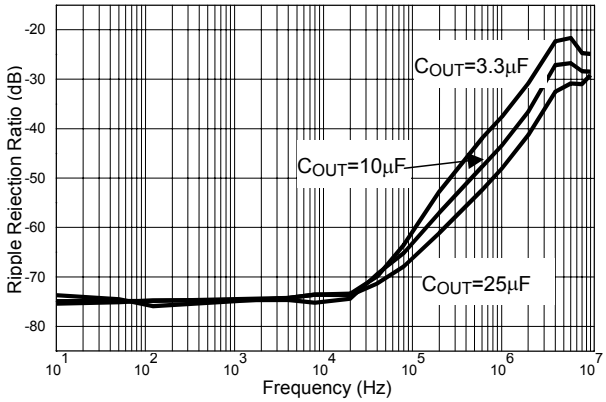
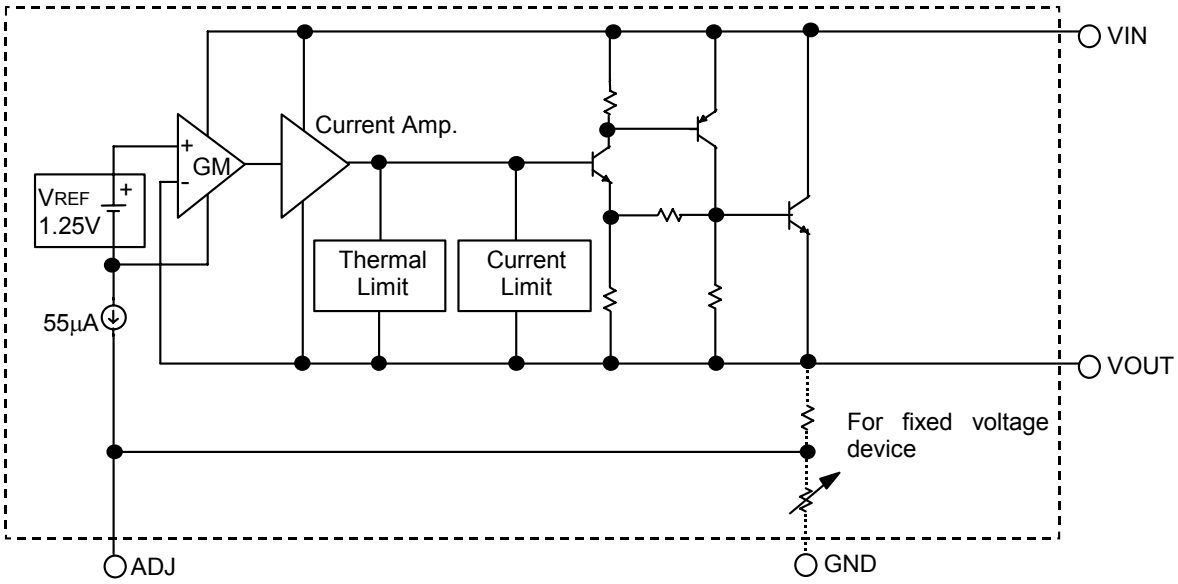



Fig. 7 AIC1084 (ADJ.) Ripple Rejection

## BLOCK DIAGRAM




## PIN DESCRIPTIONS

ADJ PIN - Providing $V_{REF}$=1.25V (typ.) for adjustable $V_{OUT}$. $V_{REF}=V_{OUT}-V_{ADJ}$ and $I_{ADJ}$=55μA (typ.) (GND PIN- Power ground.)

VOUT PIN - Adjustable output voltage.

VIN PIN - Power Input.

## APPLICATION INFORMATION

**INPUT-OUTPUT CAPACITORS**

Linear regulators require input and output capacitors to maintain stability. Input capacitor at 10μF with a 10μF aluminum electrolytic output capacitor is recommended.

**POWER DISSIPATION**

The AIC1084 obtains thermal-limiting circuitry, which is designed to protect the device against overload condition. For continuous load condition, maximum rating of junction temperature must not be exceeded. It is important to pay more attention in thermal resistance. It includes junction to case, junction to ambient. The maximum power dissipation of AIC1084 depends on the thermal resistance of its case and circuit board, the temperature difference between the die junction and ambient air, and the rate of airflow. The rate of temperature rise is greatly affected by the mounting pad configuration on the PCB, the board material, and the ambient temperature. When the IC mounting with good thermal conductivity is used, the junction temperature will be low even when large power dissipation applies.

The power dissipation across the device is

$P = I_{OUT} (V_{IN}-V_{OUT})$.

The maximum power dissipation is:

$$P_{MAX} = \frac{(T_{J\text{-}max} - T_A)}{R\theta_{JA}}$$

Where $T_{J\text{-}max}$ is the maximum allowable junction temperature (125°C), and $T_A$ is the ambient temperature suitable in application.

As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature.

## APPLICATION EXAMPLES

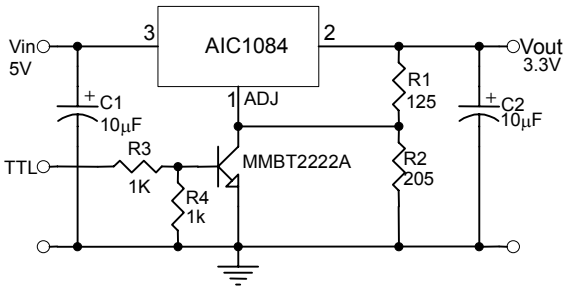



Fig. 8 $V_{OUT}$=3.3V with Shutdown

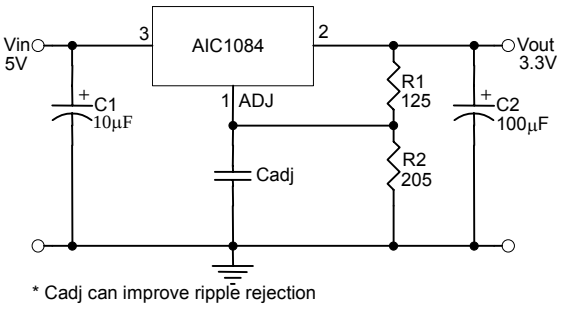



Fig. 9 Improving Ripple Rejection

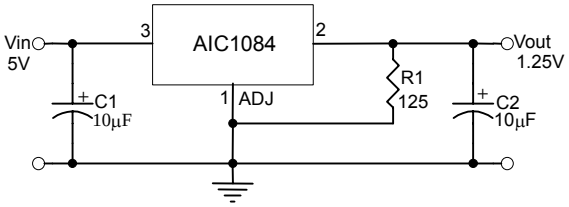



Fig. 10 $V_{OUT}$=1.25V Application Circuit

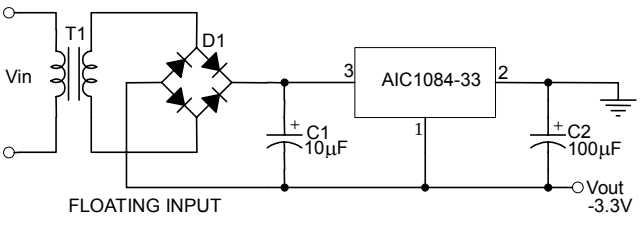
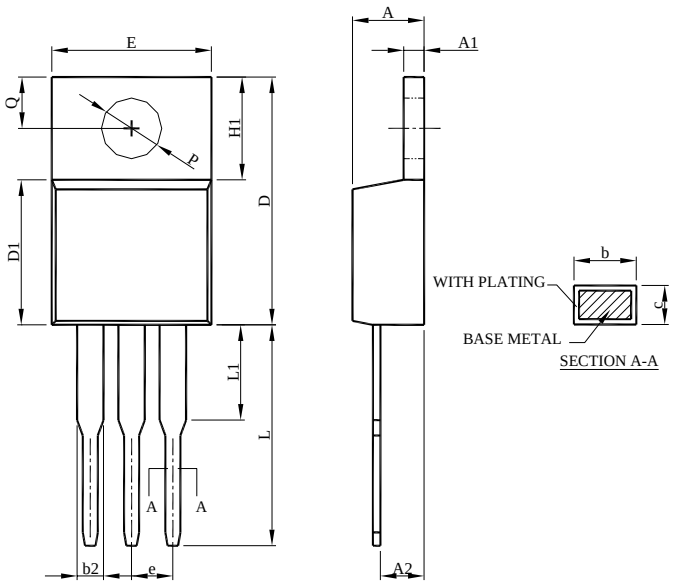



Fig. 11 Low Dropout Negative Supply

## PHYSICAL DIMENSIONS

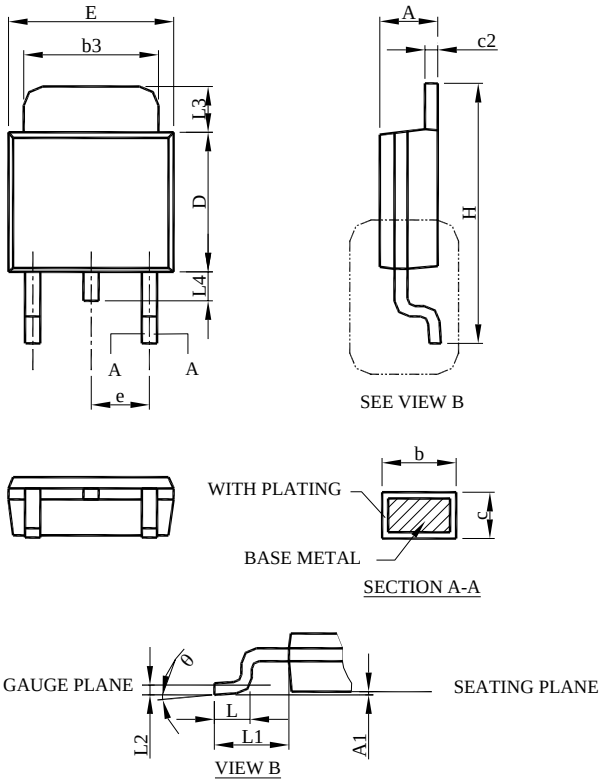
- **TO-220 (unit: mm)**




| SYMBOL | TO-220 | |
|---|---|---|
| | MILLIMETERS | |
| | MIN. | MAX. |
| A | 3.56 | 4.82 |
| A1 | 0.51 | 1.39 |
| A2 | 2.04 | 2.92 |
| b | 0.38 | 1.01 |
| b2 | 1.15 | 1.77 |
| c | 0.35 | 0.61 |
| D | 14.23 | 16.51 |
| D1 | 8.38 | 9.02 |
| E | 9.66 | 10.66 |
| e | 2.54 BSC | |
| H1 | 5.85 | 6.85 |
| L | 12.70 | 14.73 |
| L1 | -- | 6.35 |
| P | 3.54 | 4.08 |
| Q | 2.54 | 3.42 |

Note:
1.Refer to JEDEC TO-220AB.
2.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

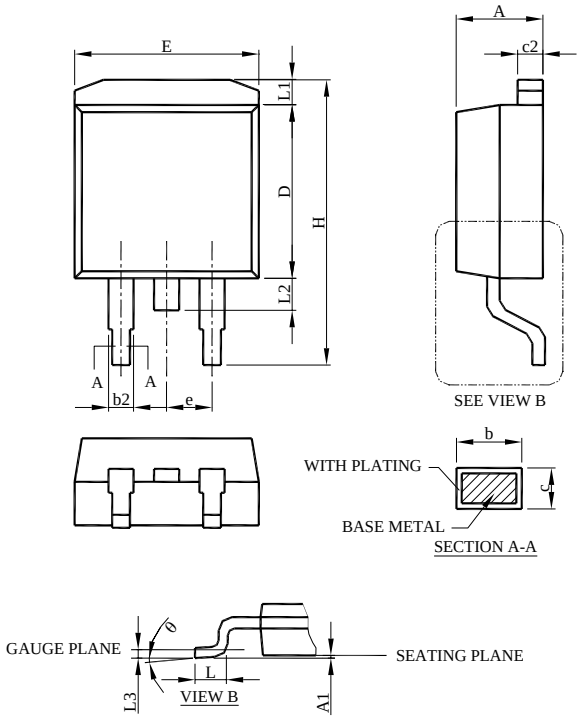
- **TO-252 (unit: mm)**




| SYMBOL | TO-252-3L | |
|---|---|---|
| | MILLIMETERS | |
| | MIN. | MAX. |
| A | 2.19 | 2.38 |
| A1 | 0.00 | 0.13 |
| b | 0.64 | 0.89 |
| b3 | 4.95 | 5.46 |
| c | 0.46 | 0.61 |
| c2 | 0.46 | 0.89 |
| D | 5.33 | 6.22 |
| E | 6.35 | 6.73 |
| e | 2.28 BSC | |
| H | 9.40 | 10.41 |
| L | 1.40 | 1.78 |
| L1 | 2.67 REF | |
| L2 | 0.51 BSC | |
| L3 | 0.89 | 2.03 |
| L4 | -- | 1.02 |
| θ | 0° | 8° |

Note:
1.Refer to JEDEC TO-252AA and AB.
2.Dimension D and E do not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
3.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

- **TO-263 (unit: mm)**




| SYMBOL | TO-263-3L | |
|---|---|---|
| | MILLIMETERS | |
| | MIN. | MAX. |
| A | 4.06 | 4.83 |
| A1 | 0.00 | 0.25 |
| b | 0.51 | 0.99 |
| b2 | 1.14 | 1.78 |
| c | 0.38 | 0.74 |
| c2 | 1.14 | 1.65 |
| D | 8.38 | 9.65 |
| E | 9.65 | 10.67 |
| e | 2.54 BSC | |
| H | 14.61 | 15.88 |
| L | 1.78 | 2.79 |
| L1 | -- | 1.68 |
| L2 | -- | 1.78 |
| L3 | 0.25 BSC | |
| θ | 0° | 8° |

Note:
1.Refer to JEDEC TO-263AB.
2.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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