

3A Low Dropout Positive Regulator

FEATURES

- Dropout Voltage 1.3V at 3A Output Current.
- Fast Transient Response.
- Extremely Tight Line and Load Regulation.
- Current Limiting and Thermal Protection.
- Adjustable Output Voltage or Fixed 1.8V, 2.5V and 3.3V.
- Standard 3-Pin Power Packages.

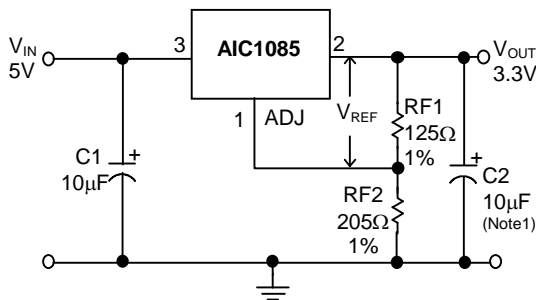
APPLICATIONS

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

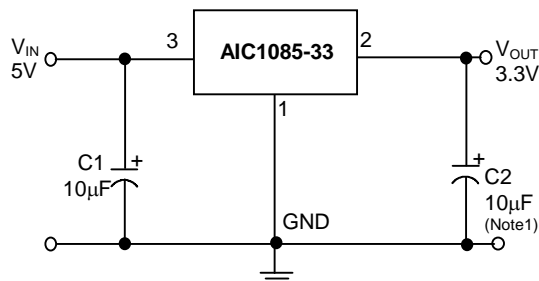
DESCRIPTION

The AIC1085 is a low dropout three terminal regulator with 3A output current capability. The output voltage is adjustable with the use of a resistor divider or fixed 1.8V, 2.5V and 3.3V. Dropout voltage is guaranteed to be at a maximum of 1.4V with the maximum output current. Its low dropout voltage and fast transient response make it ideal for low voltage microprocessor applications. Current limiting and thermal protection provides protection against any overload condition that would create excessive junction temperatures.

TYPICAL APPLICATION CIRCUIT



Adjustable Voltage Regulator



Fixed Voltage Regulator

$$V_{REF} = V_{OUT} - V_{ADJ} = 1.25V \text{ (typ.)}$$

$$V_{OUT} = V_{REF} \times \left(1 + \frac{RF2}{RF1}\right) + I_{ADJ} \times RF2$$

$$I_{ADJ} = 55\mu A \text{ (typ.)}$$

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

ORDERING INFORMATION

AIC1085-XXXXXX

PACKING TYPE
TR: TAPE & REEL
TB: TUBE

PACKAGING TYPE
E: TO-252
M: TO-263
T: TO-220

C: COMMERCIAL
P: LEAD FREE COMMERCIAL
G: GREEN PACKAGE

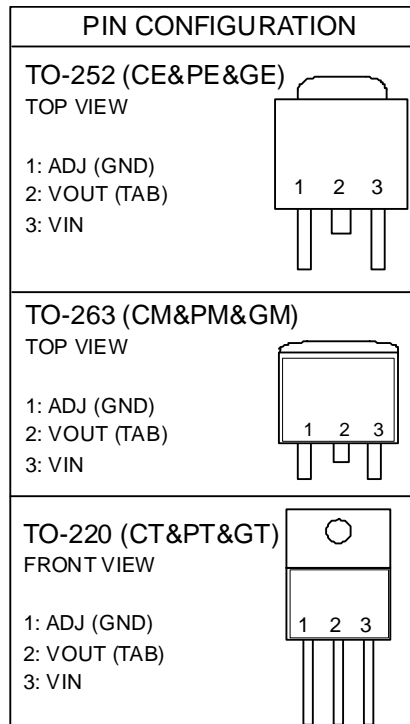
OUTPUT VOLTAGE
DEFAULT: ADJUSTABLE
18: 1.8V
25: 2.5V
33: 3.3V

Example: AIC1085-18GETR

→ 1.8V version in TO-252 Green
Package & Taping & Reel Packing
Type

AIC1085-18GMTR

→ 1.8V version in TO-263 Green
Package & Taping & Reel Packing



ABSOLUTE MAXIMUM RATINGS

| | |
|--|---|
| VIN pin to ADJ/ GND pin | 7V |
| Operating Temperature Range | -40°C to 85°C |
| Storage Temperature Range | -65°C to 150°C |
| Maximum Junction Temperature | 125°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

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

| PARAMETER | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--|--|-------|-------|-------|-------------|
| Reference Voltage ($V_{OUT}-V_{ADJ}$) | AIC1085 (ADJ) | 1.238 | 1.25 | 1.262 | V |
| Output Voltage | AIC1085-18, $V_{IN}=5V$ | 1.78 | 1.80 | 1.82 | V |
| | AIC1085-25, $V_{IN}=5V$ | 2.47 | 2.50 | 2.53 | |
| | AIC1085-33, $V_{IN}=5V$ | 3.26 | 3.30 | 3.34 | |
| Line Regulation | ADJ: $2.65V \leq V_{IN} \leq 7V$, $V_{OUT}=1.25V$ | | 0.015 | 0.2 | % |
| | Fix : $V_{OUT}+1.4V \leq V_{IN} \leq 7V$ | | | | |
| Load Regulation | $10mA < I_O < 3A$ | | | 0.6 | % |
| Dropout Voltage | $\Delta V_{OUT}, \Delta V_{REF}=1\%$ $10mA \leq I_O \leq 3A$ | | 1.3 | 1.4 | V |
| Current Limit | | 3 | 4 | | A |
| GND Current (Fix) | $2.65V \leq V_{IN} \leq 7V$ | | 11.5 | 14 | mA |
| Adjusted Pin Current (I_{ADJ}) | $2.65V \leq V_{IN} \leq 7V$ | | 55 | 120 | μA |
| Adjusted Pin Current Change (ΔI_{ADJ}) | $2.65V \leq V_{IN} \leq 7V$ | | 0.2 | 5 | μA |
| Temperature Stability | $I_O=0.5A$ | | 0.5 | | % |
| Minimum Load Current | | | 5 | 10 | mA |
| RMS Output Noise (% of V_{OUT}) | $10Hz \leq f \leq 10KHz$ | | 0.003 | | % |
| Ripple Rejection Ratio | 120Hz input ripple $C_{OUT}=25\mu F$ $(V_{IN}-V_{OUT})=3V$ | 60 | 72 | | dB |
| Thermal Shutdown Temperature | Note 3 | | 165 | | $^{\circ}C$ |

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 $T_A=25^{\circ}C$. Specifications over the $-40^{\circ}C$ to $85^{\circ}C$ operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 3: Guarantee by design.

TYPICAL PERFORMANCE CHARACTERISTICS

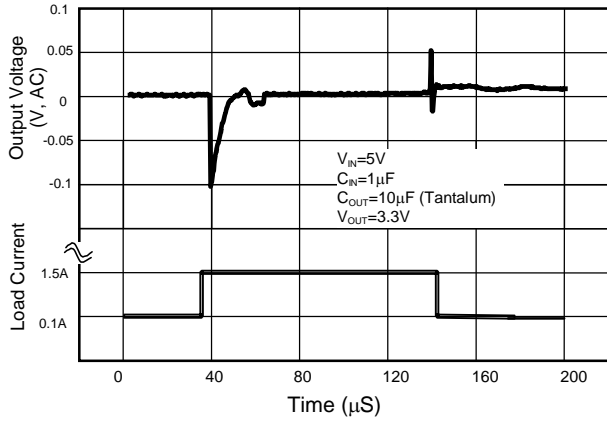


Fig. 1 Load Transient Response

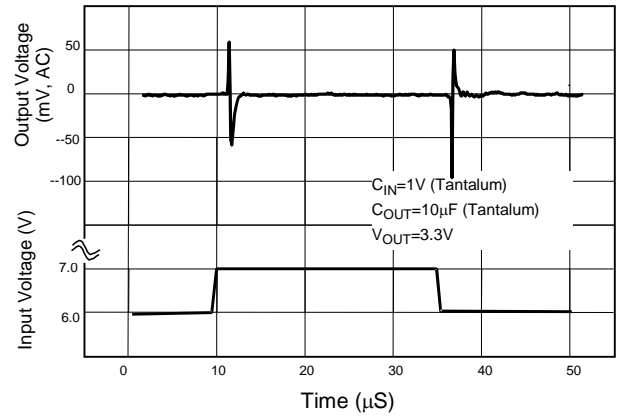


Fig. 2 Line Transient Response

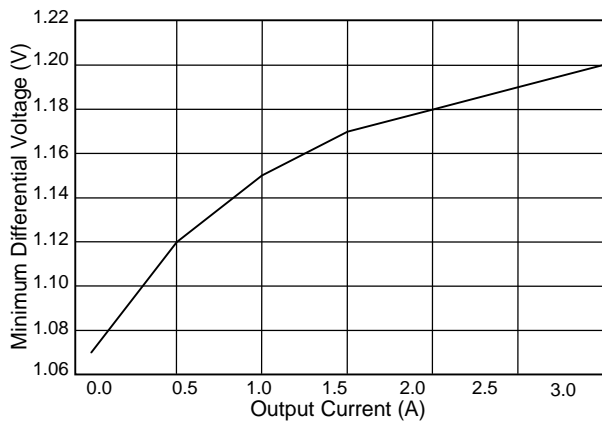


Fig. 3 Dropout Voltage ($V_{OUT}=3.3V$)

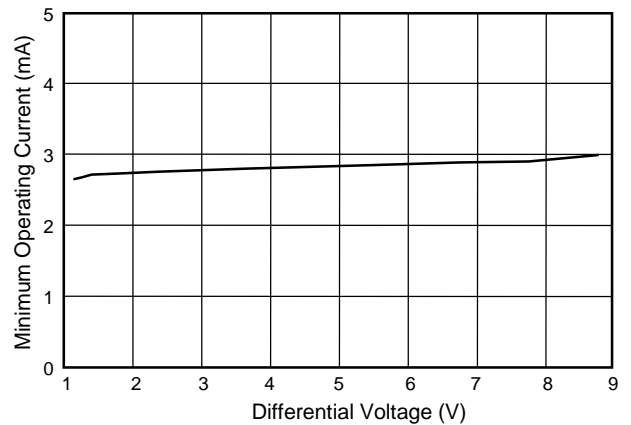


Fig. 4 Minimum Operating Current

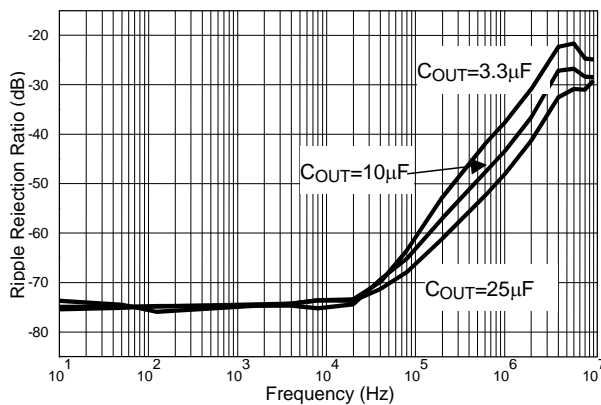
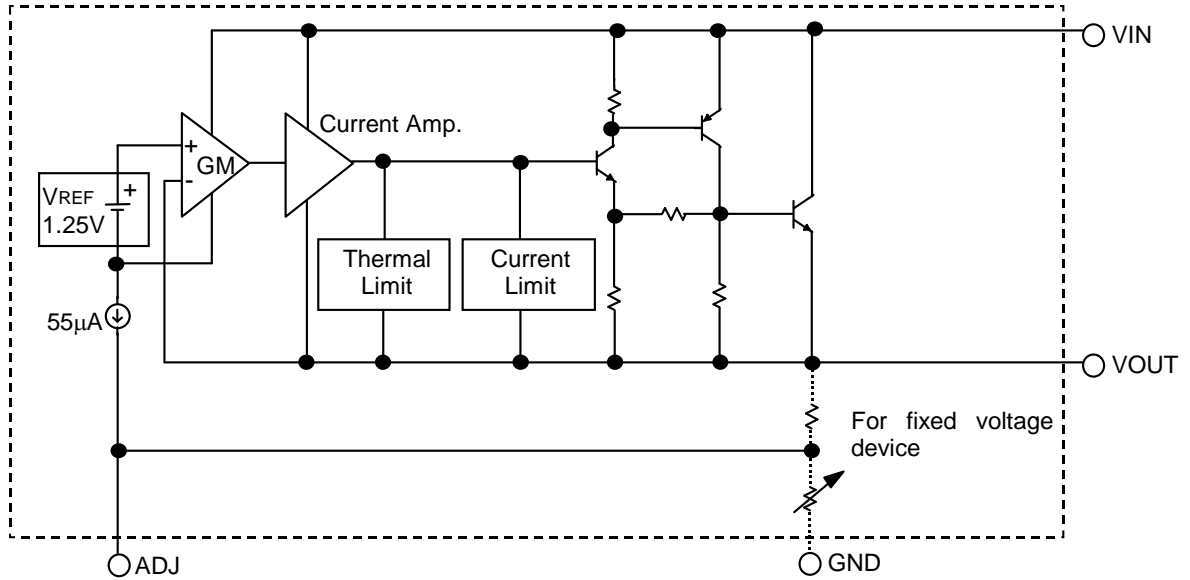


Fig. 5 AIC1085 (ADJ.) Ripple Rejection

■ BLOCK DIAGRAM



■ PIN DESCRIPTIONS

- ADJ PIN - Providing $V_{REF}=1.25V$ (typ.) for adjustable V_{OUT} . $V_{REF}=V_{OUT}-V_{ADJ}$ and $I_{ADJ}=55\mu A$ (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 10 μ F with a 10 μ F aluminum electrolytic output capacitor is recommended.

POWER DISSIPATION

The AIC1085 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 AIC1085 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:

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

Where T_{J-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

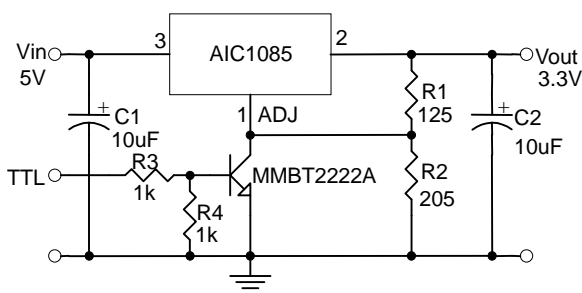


Fig. 5 $V_{OUT}=3.3V$ with Shutdown

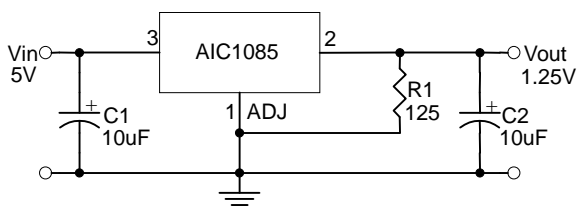
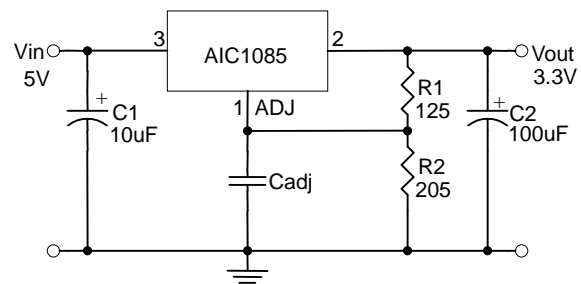


Fig. 7 $V_{OUT}=1.25V$ Application Circuit



* Cadj can improve ripple rejection

Fig. 6 Improving Ripple Rejection

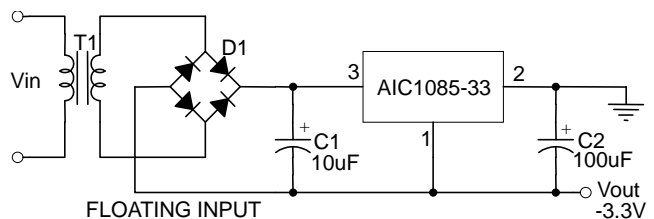
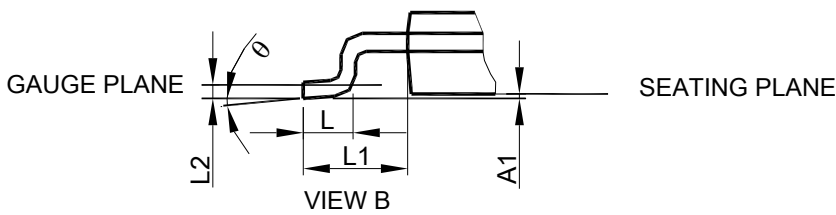
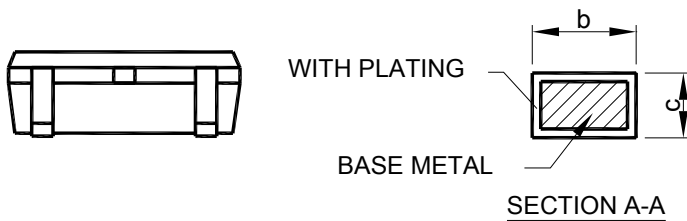
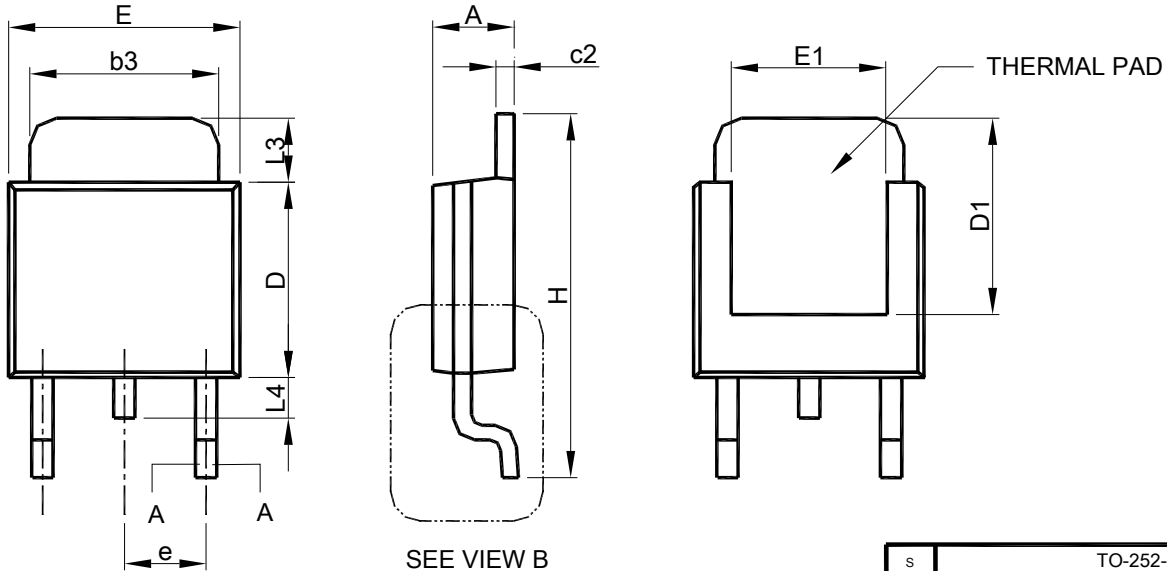


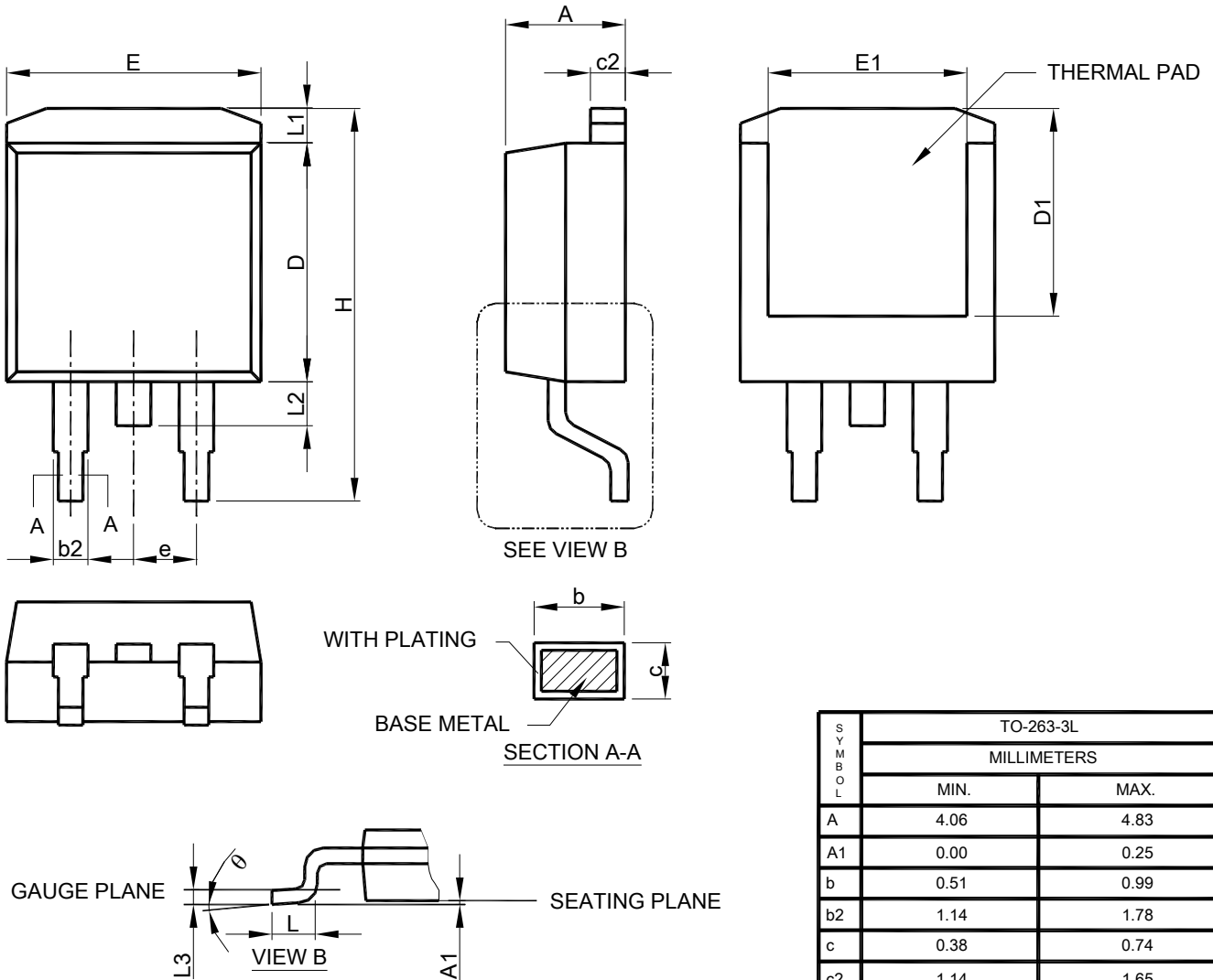
Fig. 8 Low Dropout Negative Supply

■ PHYSICAL DIMENSIONS
● 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 |
| D1 | 4.60 | 6.00 |
| E | 6.35 | 6.73 |
| E1 | 3.90 | 5.46 |
| 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 "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
 3. Dimension "D" does not include inter-lead flash or protrusions.
 4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

● TO-263 (unit: mm)

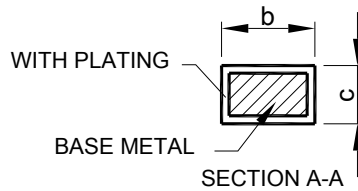
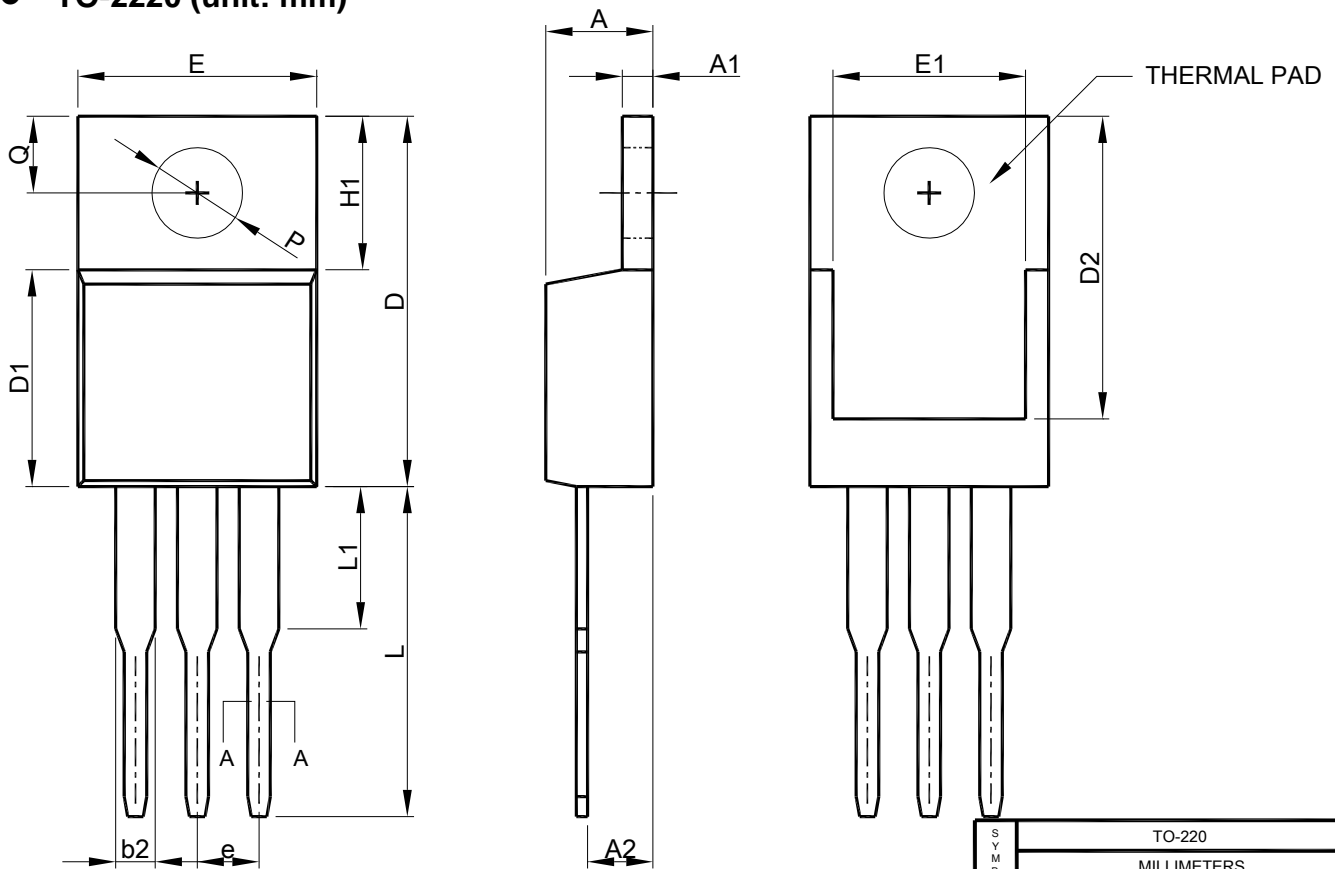


| SYMBOL | TO-263-3L | |
|----------|-------------|-------|
| | MILLIMETERS | |
| | MIN. | MAX. |
| A | 4.06 | 4.83 |
| A1 | 0.00 | 0.25 |
| b | 0.51 | 0.99 |
| b2 | 1.14 | 1.78 |
| c | 0.38 | 0.74 |
| c2 | 1.14 | 1.65 |
| D | 8.38 | 9.65 |
| D1 | 6.86 | -- |
| E | 9.65 | 10.67 |
| E1 | 6.23 | -- |
| 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. Dimension "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "D" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

● TO-2220 (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 |
| D2 | 11.75 | 12.88 |
| E | 9.66 | 10.66 |
| E1 | 6.86 | 8.90 |
| 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. Dimension "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
 3. Dimension "D1" does not include inter-lead flash or protrusions.
 4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Note:

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