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 1.8V, 2.5V, 3.3V
- Standard 3-Pin Power Packages

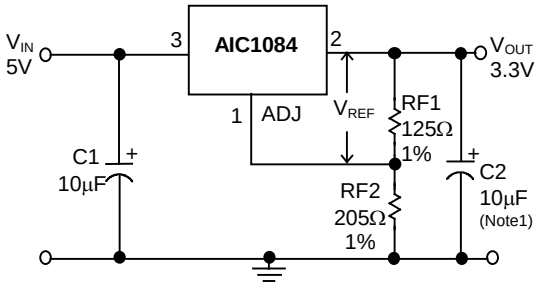
APPLICATIONS

- 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 1.8V, 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.

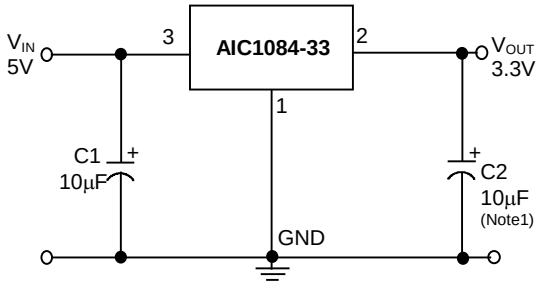
TYPICAL APPLICATION CIRCUIT



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: TO252-3
  - M: TO263-3
  - T: TO220-3
- G: GREEN PACKAGE
- OUTPUT VOLTAGE
  - DEFAULT: ADJUSTABLE
  - 18: 1.8V
  - 25: 2.5V
  - 33: 3.3V

Example: AIC1084-18GETR

→ 1.8V version in TO252-3 Green Package & Taping & Reel Packing Type

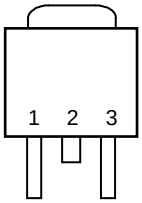
Example: AIC1084-18GMTR

→ 1.8V version in TO263-3 Green Package & Taping & Reel Packing

PIN CONFIGURATION

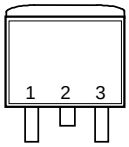
TO252-3
TOP VIEW

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



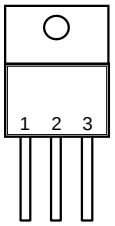
TO263-3
TOP VIEW

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



TO220-3
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	TO252-3	12.5°C/W
	TO263-3, TO220-3	3°C/W
Thermal Resistance Junction to Ambient	TO252-3	100°C/W
(Assume no ambient airflow, no heatsink)	TO263-3	60°C/W
	TO220-3	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	AIC1084-18, V_{IN}=5V AIC1084-25, V_{IN}=5V AIC1084-33, V_{IN}=5V	1.76 2.45 3.23	1.80 2.50 3.30	1.84 2.55 3.37	V
Line Regulation	ADJ : 2.75V≤ V_{IN} ≤7V V_{OUT}=1.25V Fix : V_{OUT}+1.5V≤ V_{IN} ≤7V		0.015	0.2	%
Load Regulation	10mA < I_O < 5A			0.6	%
Dropout Voltage	ΔV_{OUT}, ΔV_{REF}=1% 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 (ΔI_{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 C_{OUT}=25μF (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

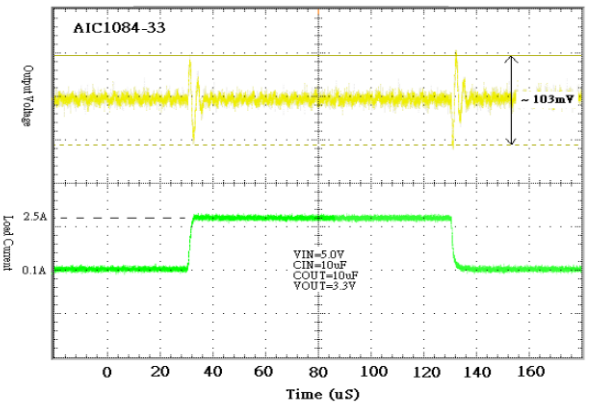


Fig. 1 Load Transient Response

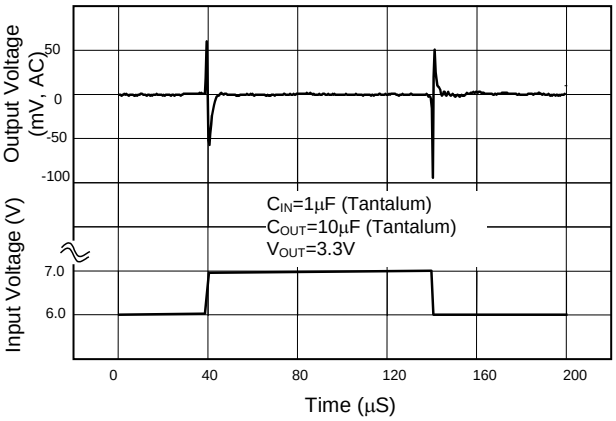


Fig. 2 Line Transient Response

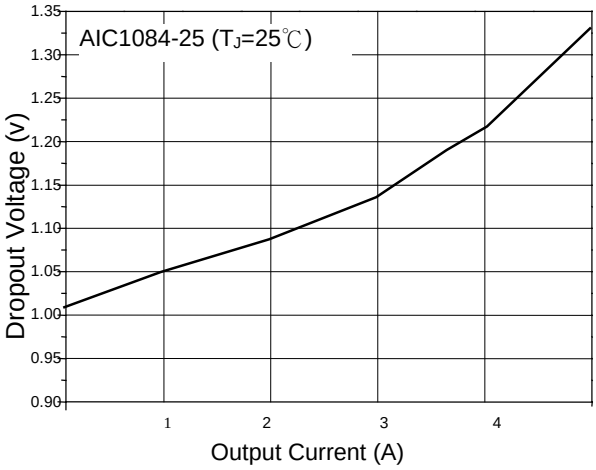


Fig. 3 Dropout Voltage (V_{OUT}=2.5)

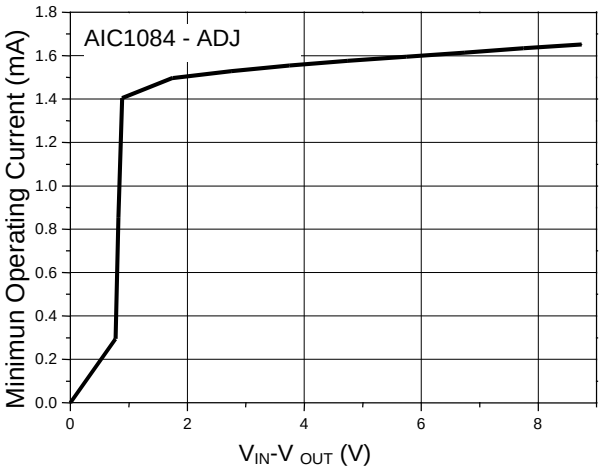


Fig. 4 Minimum Operating Current

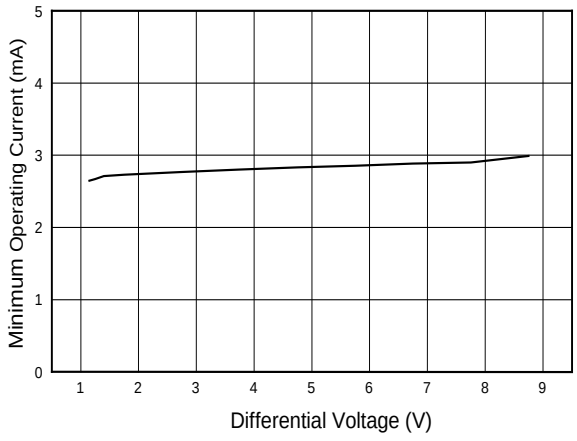


Fig. 5 Minimum Operating Current

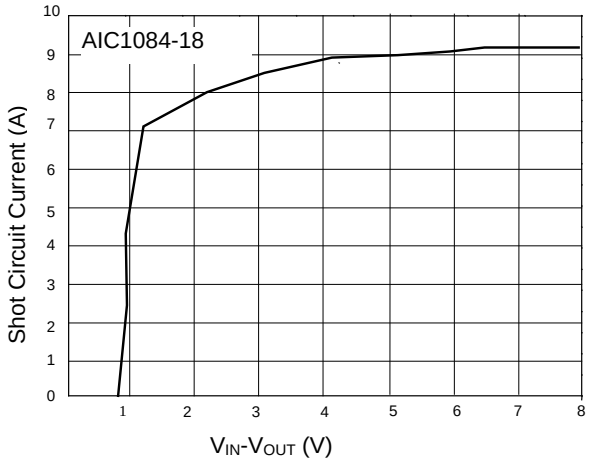


Fig. 6 AIC1084 (1.8) Short Circuit Current

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

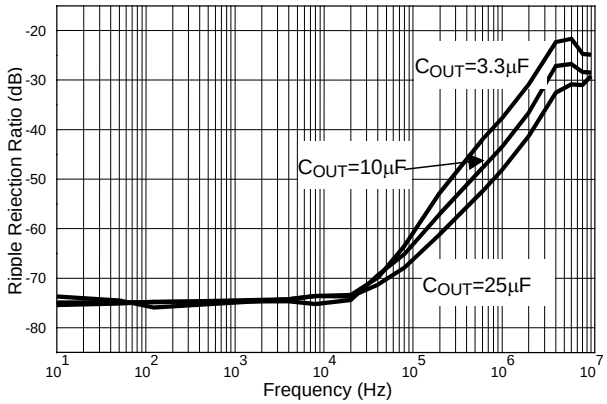
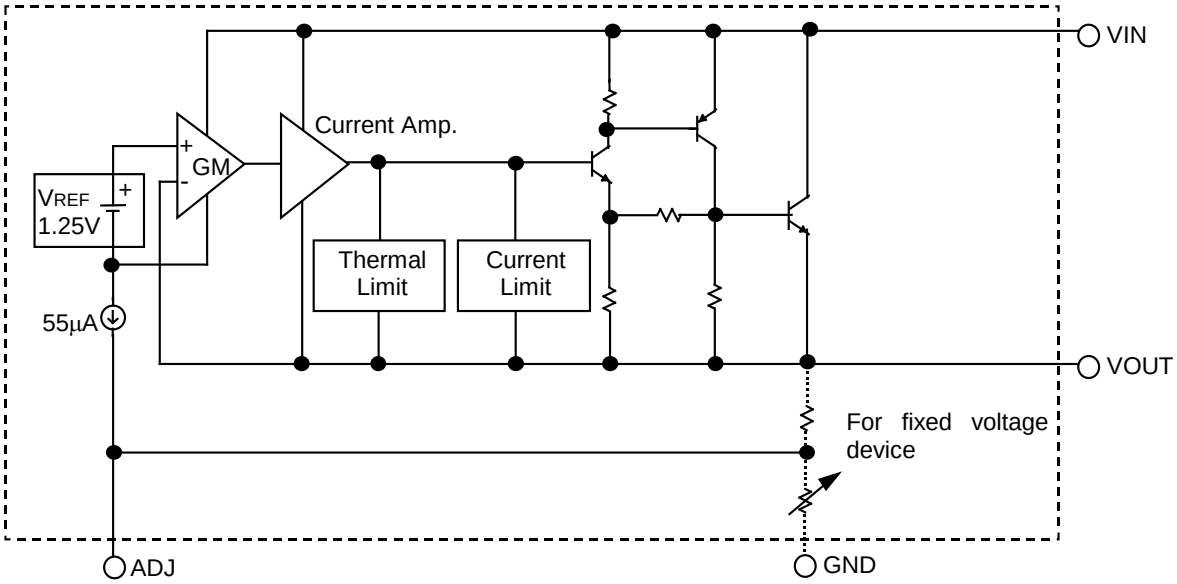


Fig. 7 AIC1084 (ADJ.) Ripple Rejection

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

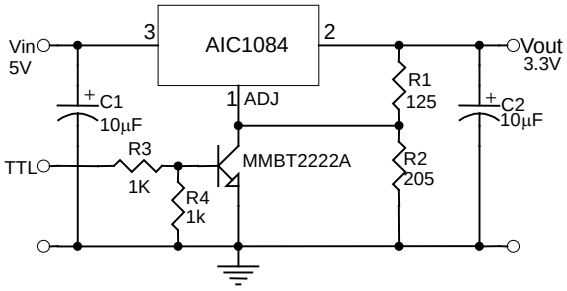


Fig. 8 V_{OUT}=3.3V with Shutdown

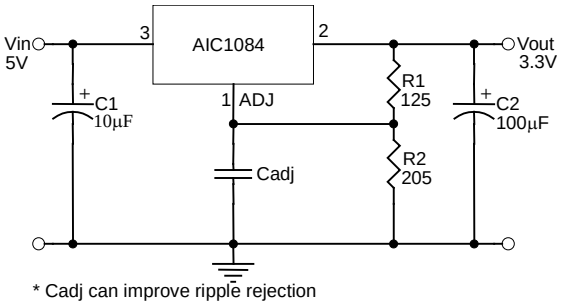


Fig. 9 Improving Ripple Rejection

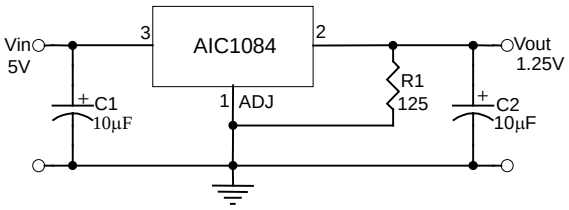


Fig. 10 V_{OUT}=1.25V Application Circuit

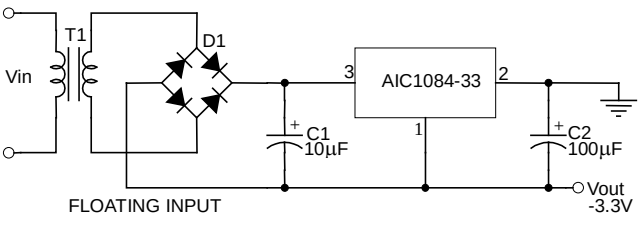
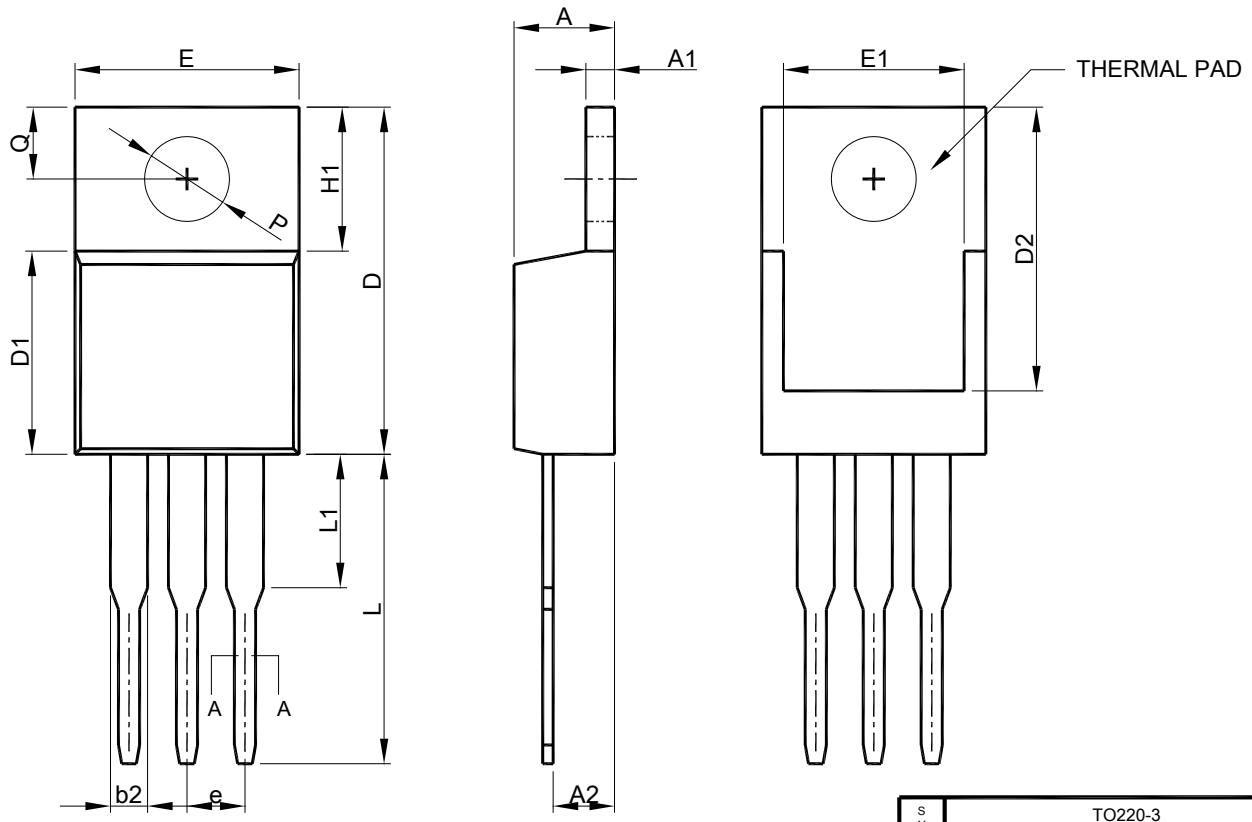


Fig. 11 Low Dropout Negative Supply

PHYSICAL DIMENSIONS

- **TO220-3**



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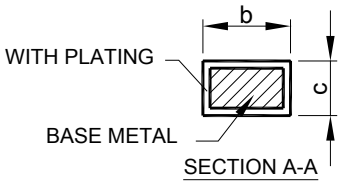
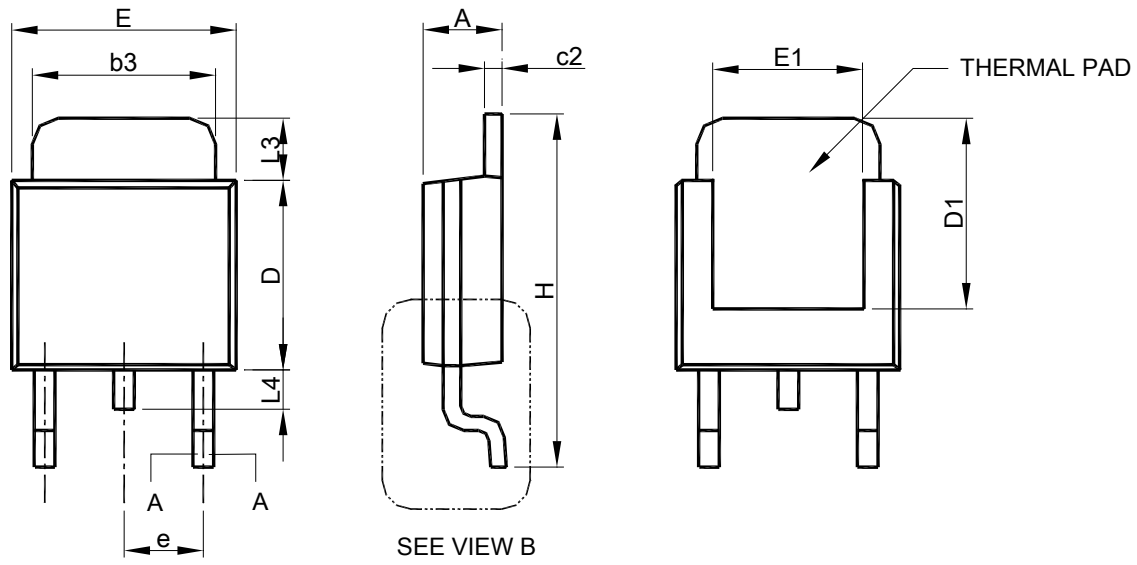
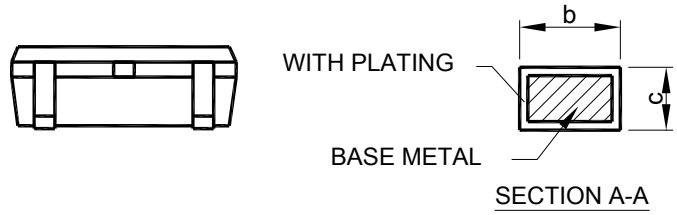


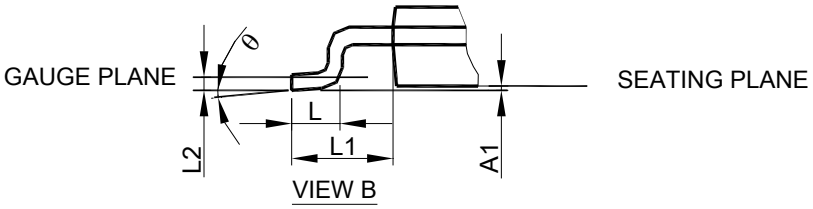
Note: 1. Refer to JEDEC TO-220AB.
2. Dimension "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "D1" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

SYMBOL	TO220-3	
	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

- **TO252-3**



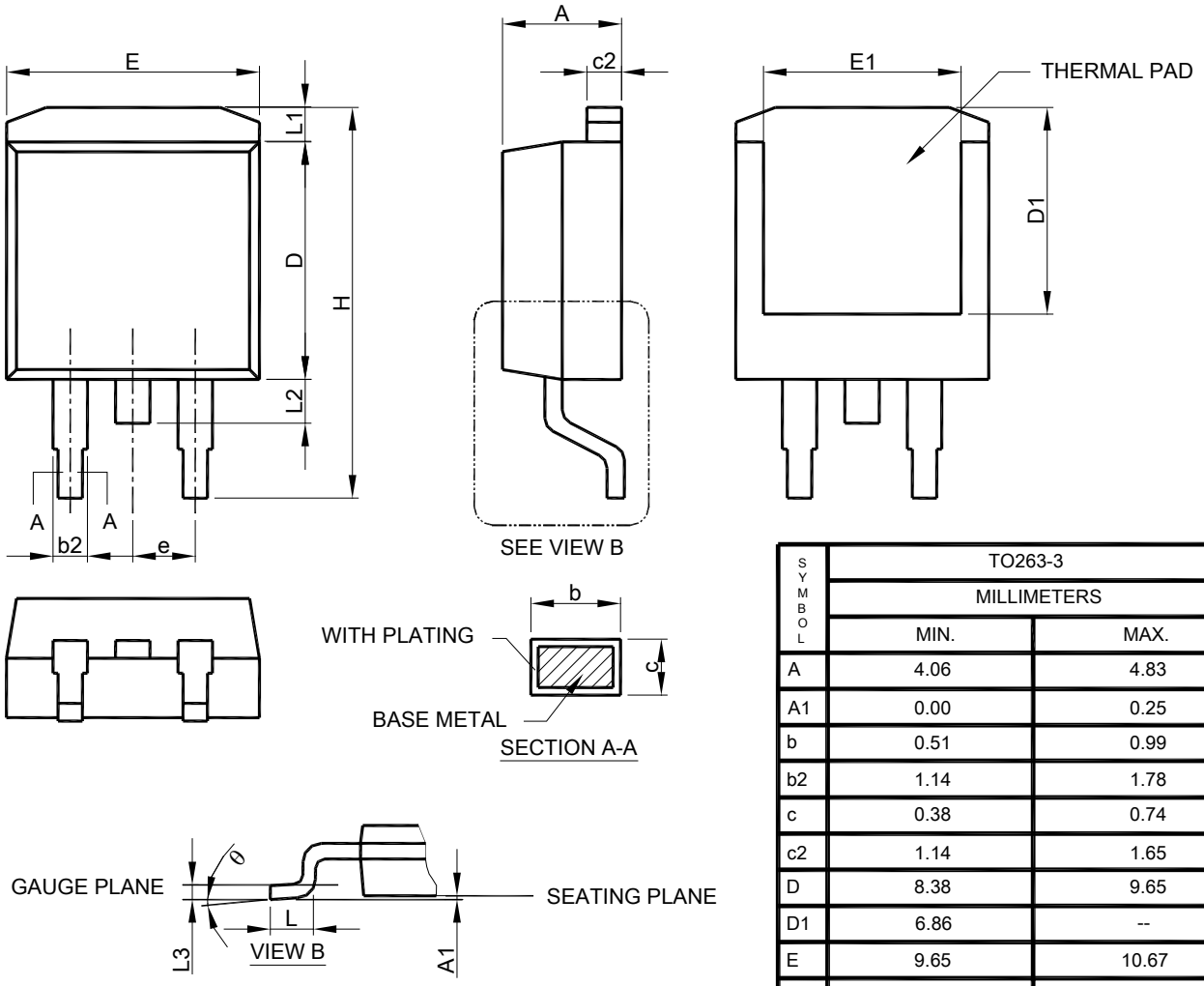




Note: 1. Refer to JEDEC TO-252AA and AB.
2. Dimension "E" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "D" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted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

SYMBOL	TO252-3	
	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°

- **TO263-3**



SYMBOL	TO263-3	
	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.

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