1.5A Low Dropout Positive Regulator

FEATURES

- Dropout Voltage 1.3V at 1.5A Output Current.
- Fast Transient Response.
- Line Regulation, typical at 0.015%.
- Load Regulation, typical at 0.1%.
- Current Limiting and Thermal Protection.
- Adjustable Output Voltage or Fixed at 1.8V, 2.5V, 2.85V, 3.3V, and 5V.
- Standard 3-Pin Power Packages.

APPLICATIONS

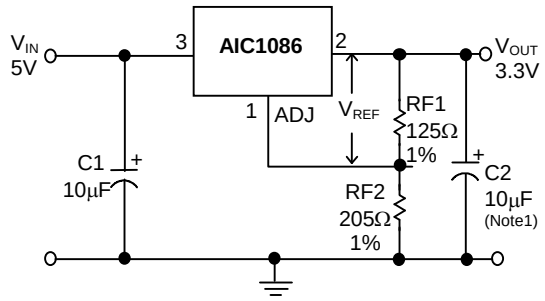
- Post Regulator for Switching Supply.
- Battery Chargers.
- PC Add-On Card.

DESCRIPTION

The AIC1086 is a low dropout three-terminal regulator designed to provide output current up to 1.5A. The device is available in an adjustable version and fixed output voltage of 1.8V, 2.5V, 2.85V, 3.3V and 5V. Dropout voltage of maximum of 1.5V is guaranteed at 1.5A output current. The quality of low dropout voltage and fast transient response make this device ideal for low voltage microprocessor applications.

The AIC1086 requires output capacitance of a minimum of 10μF for stability. Built-in output current limiting and thermal limiting provide maximal protection to the AIC1086 against fault conditions.

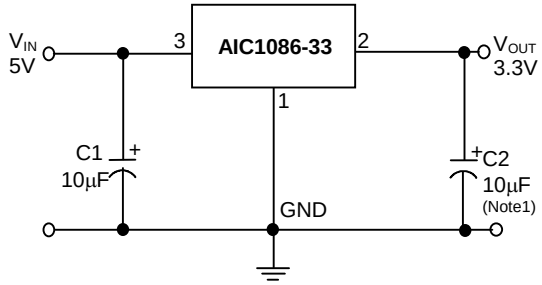
TYPICAL APPLICATION CIRCUIT



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}=55μA (typ.)

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



Fixed Voltage Regulator

ORDERING INFORMATION

AIC1086-XX XX XX

- PACKING TYPE
  - TR: TAPE & REEL
  - TB: TUBE
  - BG: BAG (for SOT-223)
- PACKAGING TYPE
  - E: TO-252
  - M: TO-263
  - T: TO-220
  - Y: SOT-223
- C: COMMERCIAL
  P: LEAD FREE COMMERCIAL
  G: GREEN PACKAGE
- OUTPUT VOLTAGE
  DEFAULT: ADJUSTABLE
  - 18: 1.8V
  - 25: 2.5V
  - 28: 2.85V
  - 33: 3.3V
  - 50: 5.0V

Example: AIC1086-28CETR

→ 2.85V version in TO-252 Package & Taping & Reel Packing Type

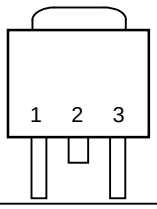
AIC1086-28PMTR

→ 2.85V version in TO-263 Lead Free Package & Taping & Reel Packing Type

PIN CONFIGURATION

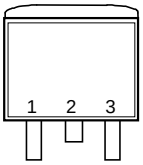
TO-252 (CE&PE)
TOP VIEW

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



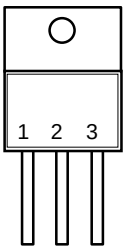
TO-263 (CM&PM)
TOP VIEW

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



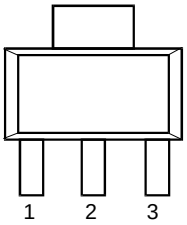
TO-220
(CT&PT)
FRONT VIEW

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



SOT-223
(CY&PY)
TOP VIEW

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



- **SOT-223 Marking**

Part No.	CY	PY	GY
AIC1086	1086	1086P	1086G
AIC1086-18XY	AX18	AX18P	AX18G
AIC1086-25XY	AX25	AX25P	AX25G
AIC1086-28XY	AX28	AX28P	AX28G
AIC1086-33XY	AX33	AX33P	AX33G
AIC1086-50XY	AX50	AX50P	AX50G

ABSOLUTE MAXIMUM RATINGS

VIN pin to ADJ/ GND pin 7V

Operating Temperature Range .....-40°C to 85°C

Operating Junction Temperature Range .....0°C ~ 125°C

Storage Temperature Range .....-65°C ~ 150°C

Maximum Junction Temperature .....125°C

Lead Temperature (Soldering, 10 sec) .....260°C

Thermal Resistance (Junction to Case)	TO-220	.....3°C /W
	TO-252	.....12.5°C /W
	SOT-223	.....15°C /W
	TO-263	.....3°C /W
Thermal Resistance Junction to Ambient	TO-252	.....100°C/W
(Assume no ambient airflow, no heatsink)	TO-263	.....60°C /W
	SOT-223	.....155°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	AIC1086 (ADJ), T_J=25°C	1.238	1.25	1.262	V
	0°C≤T_J≤125°C	1.225	1.25	1.275	
Output Voltage	AIC1086-18, V_{IN}=3.3V	1.78	1.80	1.82	V
	AIC1086-25, V_{IN}=5V	2.47	2.50	2.53	
	AIC1086-28, V_{IN}=5V	2.82	2.85	2.88	
	AIC1086-33, V_{IN}=5V	3.26	3.30	3.33	
	AIC1086-50, V_{IN}=7V	4.95	5.00	5.05	
Line Regulation	2.75≤V_{IN}≤7V, V_{OUT}=1.25V T_J=25°C		0.015	0.2	%
	0°C≤TJ≤125°C		0.035	0.2	
Load Regulation	T_J=25°C, I_O=10mA ~1.5A		0.1	0.3	%
	0°C≤T_J≤125°C		0.2	0.4	
Dropout Voltage	ΔV_{OUT}, ΔV_{REF}=1%, I_O=1.5A 0°C≤T_J≤125°C		1.3	1.5	V
Current Limit	0°C≤T_J≤125°C	1.5	2.0		A
Adjusted Pin Current (I_{ADJ})	2.75≤V_{IN}≤7V, 10mA≤I_O≤ 1.5A 0°C≤T_J≤125°C		55	120	μA
Adjusted Pin Current Change (ΔI_{ADJ})	2.75≤V_{IN}≤7V, 10mA≤I_O≤1.5A 0°C≤T_J≤125°C		0.2	5	μA
Temperature Stability	I_O=0.5A, 0°C≤T_J≤125°C		0.5		%
GND Current	2.65≤V_{IN}≤7V		10	14	mA
Minimum Load Current	0°C≤T_J≤125°C		5	10	mA
RMS Output Noise (% of V_{OUT})	10Hz≤f≤10KHz		0.003		%
Ripple Rejection Ratio	120Hz input ripple,C_{OUT}=25μF	60	72		dB

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: Regulation is measured at constant junction temperature, using pulse testing with a low ON time.

Note 4: Current limit is measured by pulsing a short time.

Note 5: Dropout voltage is defined as the input to output differential at which the output voltage drops 100mV below the value measured with a 1V differential.

TYPICAL PERFORMANCE CHARACTERISTICS

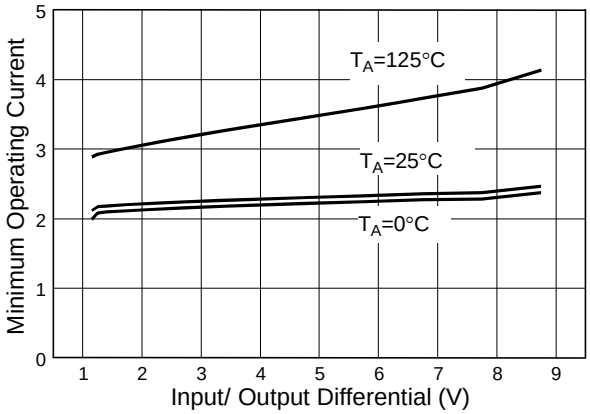


Fig. 1 AIC1086 Min. Load Current (Adjustable Version)

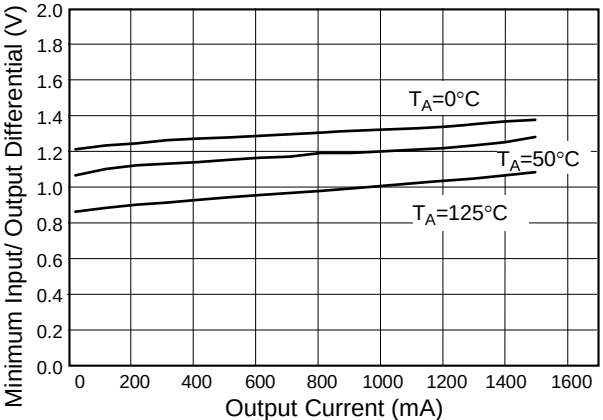


Fig. 2 AIC1086 Dropout Voltage

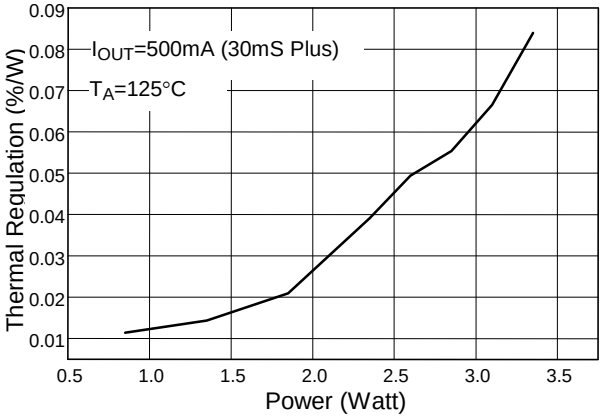


Fig. 3 AIC1086 (ADJ) Power vs. Thermal Regulation

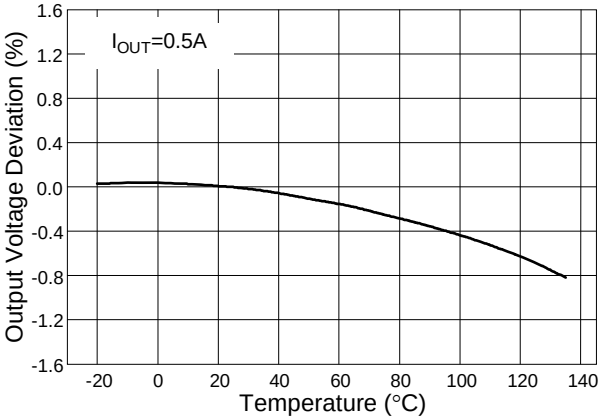


Fig. 4 AIC1086 (ADJ) Temperature Stability

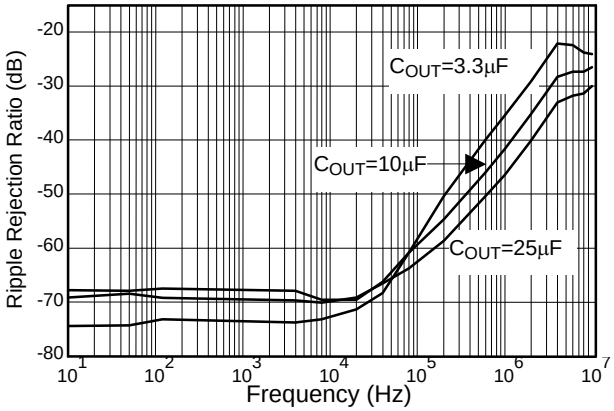


Fig. 5 AIC1086 (ADJ) Ripple Rejection Ratio (dB)

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

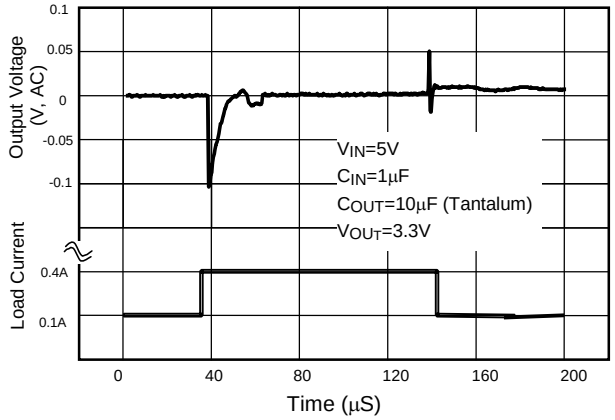


Fig. 6 Load Transient Response

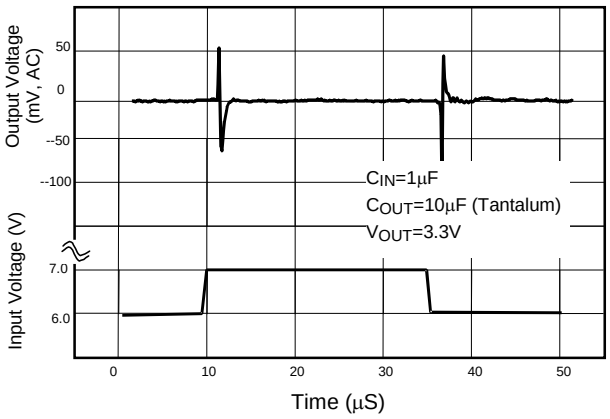
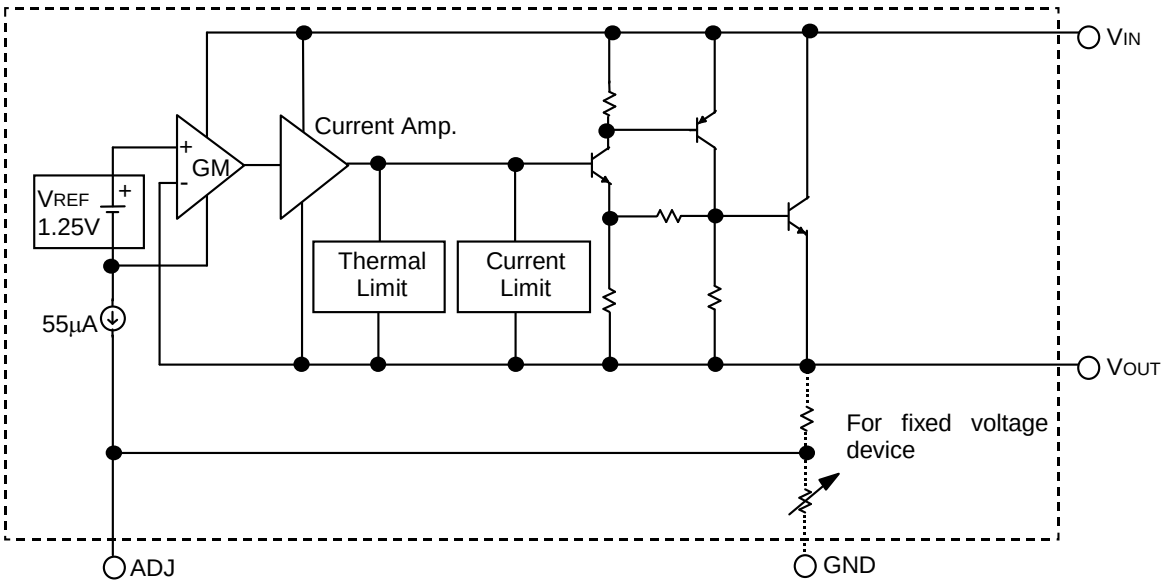


Fig. 7 Line Transient Response

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 AIC1086 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 AIC1086 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

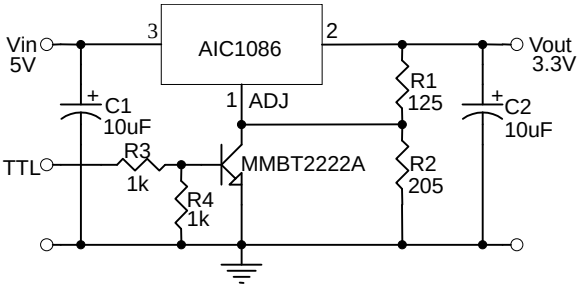


Fig. 8 V_{OUT}=3.3V with Shutdown

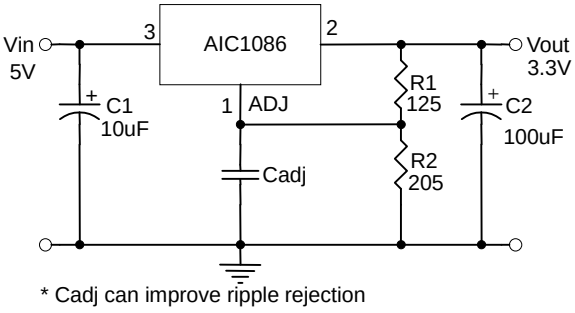


Fig. 9 Improving Ripple Rejection

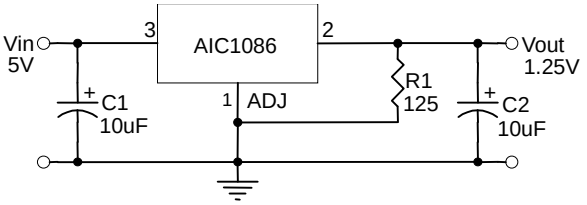


Fig. 10 V_{OUT}=1.25V Application Circuit

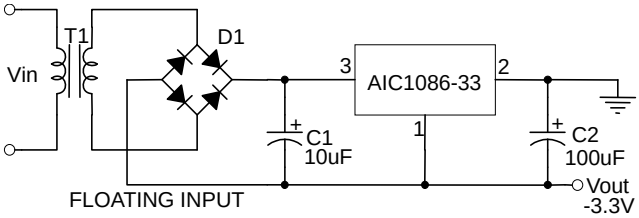
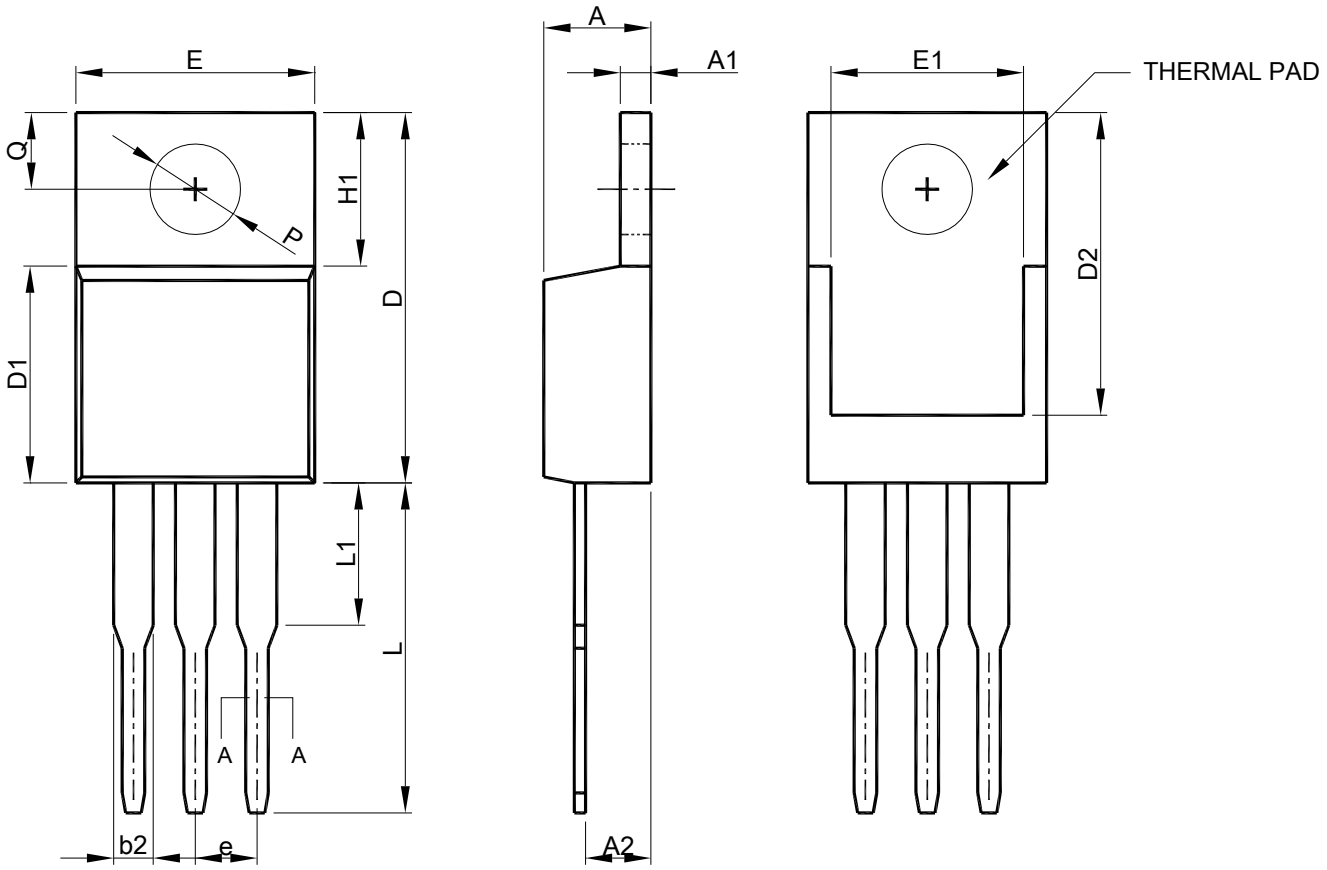
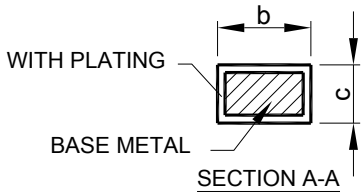


Fig. 11 Low Dropout Negative Supply

PHYSICAL DIMENSIONS

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

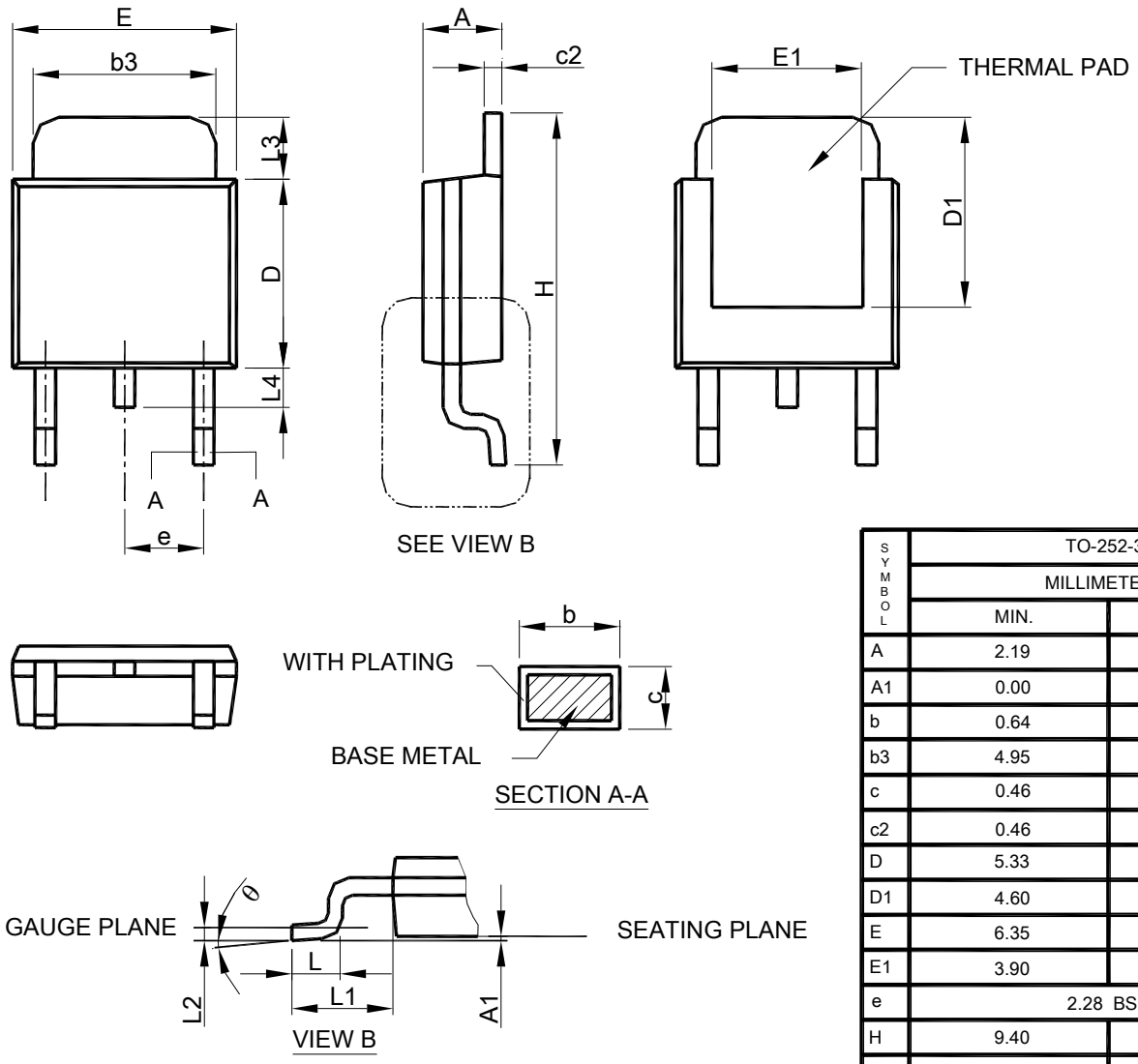




SYMBOL	TO-220	
	MILLIMETERS	
	MIN.	MAX.
A	3.56	4.82
A1	0.51	1.39
A2	2.04	2.92
b	0.38	1.01
b2	1.15	1.77
c	0.35	0.61
D	14.23	16.51
D1	8.38	9.02
D2	11.75	12.88
E	9.66	10.66
E1	6.86	8.90
e	2.54 BSC	
H1	5.85	6.85
L	12.70	14.73
L1	--	6.35
P	3.54	4.08
Q	2.54	3.42

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.

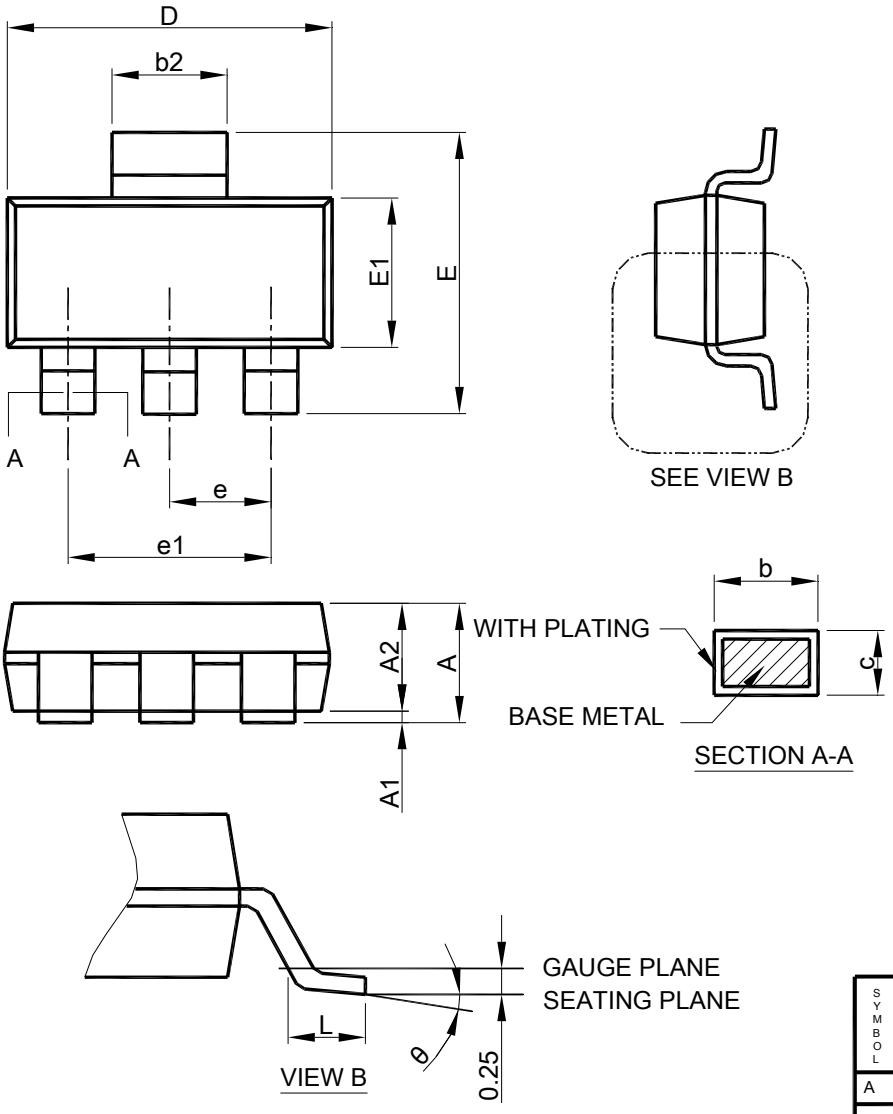
- **TO-252 (unit: mm)**



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.

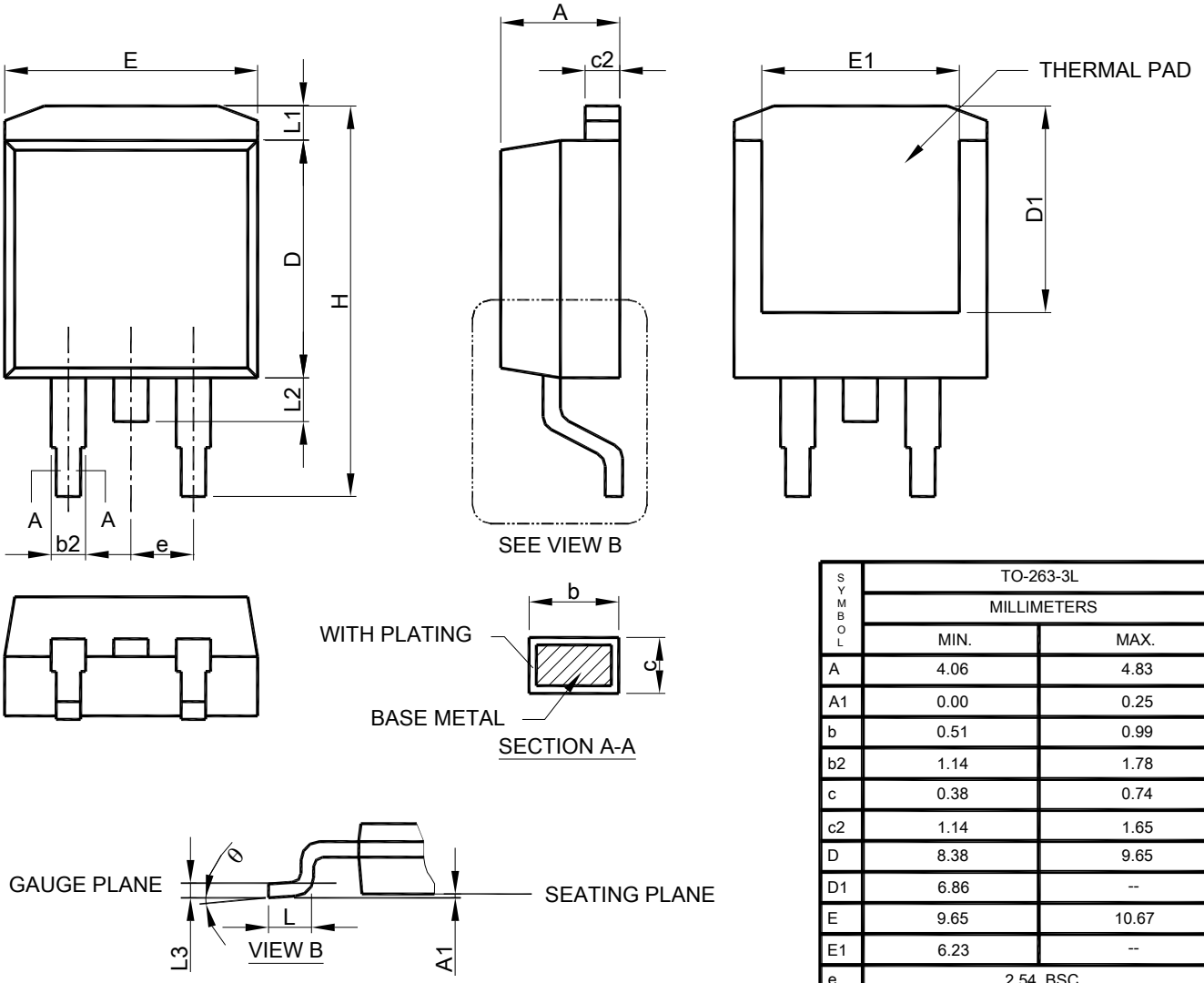
- **SOT-223(unit: mm)**



SYMBOL	SOT-223	
	MILLIMETERS	
	MIN.	MAX.
A		1.80
A1	0.02	0.10
A2	1.55	1.65
b	0.66	0.84
b2	2.90	3.10
c	0.23	0.33
D	6.30	6.70
E	6.70	7.30
E1	3.30	3.70
e	2.30 BSC	
e1	4.60 BSC	
L	0.90	
θ	0°	8°

Note: 1. Refer to JEDEC TO-261AA.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "E1" 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.

Note:

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