1A Low Dropout Positive Regulator

FEATURES

- Dropout Voltage 1.3V at 1A 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

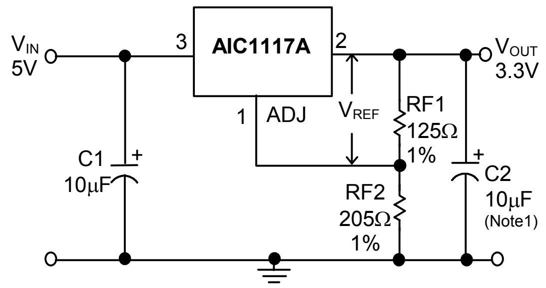
- Active SCSI Terminators.
- Post Regulators for Switching Supplies.
- Battery Chargers.
- PC Add-On Card.

DESCRIPTION

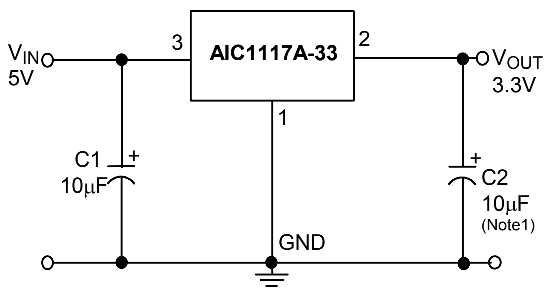
The AIC1117A is a low dropout, three terminals regulator designed to provide output current up to 1A. The device is available in an adjustable version and fixed output voltage of 1.8V, 2.5V, 2.85V, 3.3V and 5V. Dropout voltage of maximum of 1.5V is guaranteed at 1A output current. The quality of low dropout voltage and fast transient response make this device ideal for low voltage microprocessor applications.

The AIC1117A requires output capacitance of a minimum of 10μF for stability. Built-in output current limiting and thermal limiting provide maximal protection to the AIC1117A against fault conditions.

TYPICAL APPLICATION CIRCUIT



Adjustable Voltage Regulator



Fixed Voltage Regulator

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

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

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

(1) C1 needed if device is far away from filter capacitors.

(2) C2 required for stability.

ORDERING INFORMATION

AIC1117A-XXXXXX

- 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
- 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: AIC1117A-25GETR

→ 2.5V version in TO-252 Green Package & Taping & Reel Packing Type

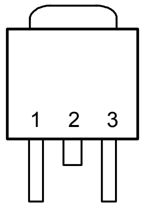
AIC1117A-25PYTR

→ 2.5V version in SOT-223 Lead Free Package & Taping & Reel Packing Type

PIN CONFIGURATION

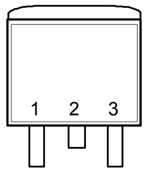
TO-252
TOP VIEW

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



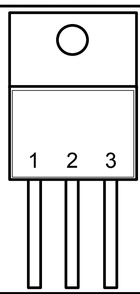
TO-263
TOP VIEW

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



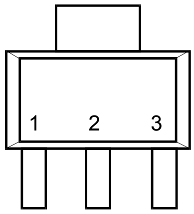
TO-220
FRONT VIEW

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



SOT-223
TOP VIEW

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



- **SOT-223 Marking**

Part No.	PY	GY
AIC1117A	BS17P	BS17G
AIC1117A-18	BS18P	BS18G
AIC1117A-25	BS25P	BS25G
AIC1117A-28	BS28P	BS28G
AIC1117A-33	BS33P	BS33G
AIC1117A-50	BS50P	BS50G

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-220 .... 3°C /W

TO-263 .... 3°C /W

SOT-223 .... 15°C /W

TO-252 .... 12.5°C /W

Thermal Resistance (Junction to Ambient) TO-220 .... 50°C/W

(Assume no ambient airflow, no heatsink) TO-263 .... 60°C/W

SOT-223 .... 155°C/W

TO-252 .... 100°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_A=25°C, I_O=10mA, unless otherwise specified) (Note2)

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Reference Voltage	T_J=25°C	1.238	1.25	1.262	V
	0°C≤T_J≤125°C 2.65V≤V_{IN}≤7V 10mA≤I_O≤1A	1.225	1.25	1.275	
Output Voltage	AIC1117A-18, V_{IN}=3.3V	1.78	1.80	1.82	V
	AIC1117A-25, V_{IN}=5V	2.47	2.50	2.53	
	AIC1117A-28, V_{IN}=5V	2.82	2.85	2.88	
	AIC1117A-33, V_{IN}=5V	3.26	3.30	3.33	
	AIC1117A-50, V_{IN}=7V	4.95	5.00	5.05	
	AIC1117A 0°C≤T_J≤125°C 2.65V≤V_{IN}≤7V 10mA≤I_O≤1A	0.98V_{OUT}	V_{OUT}	1.02V_{OUT}	

ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Line Regulation	$2.65 \le V_{IN} \le 7V$, $T_J=25°C$		0.015	0.2	$\%V_{OUT}$
	$0°C \le T_J \le 125°C$		0.035	0.2	
Load Regulation	$T_J=25°C$, $I_O=10mA \sim 1A$		0.1	0.3	$\%V_{OUT}$
	$0°C \le T_J \le 125°C$		0.2	0.4	
Dropout Voltage	ΔV_{OUT}, $\Delta V_{REF}=1\%$, $I_O=1A$		1.3	1.5	V
Current Limit		1			A
Adjusted Pin Current (I_{ADJ})	$2.65 \le V_{IN} \le 7V$ $10mA \le I_O \le 1A$		55	120	μA
Adjusted Pin Current Change (ΔI_{ADJ})	$2.65 \le V_{IN} \le 7V$ $10mA \le I_O \le 1A$		0.2	5	μA
Temperature Stability	$I_O=0.5A$ $0°C \le T_J \le 125°C$		0.5		% V_{OUT}
Minimum Load Current (Adj.)			5	10	mA
Quiescent Current (Fixed Version)			10	14	mA
RMS Output Noise (% of V_{OUT})	$10Hz \le f \le 10KHz$		0.003		$\%V_{OUT}$
Ripple Rejection Ratio	120Hz input ripple $C_{OUT}=25\mu F$	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).

TYPICAL PERFORMANCE CHARACTERISTICS

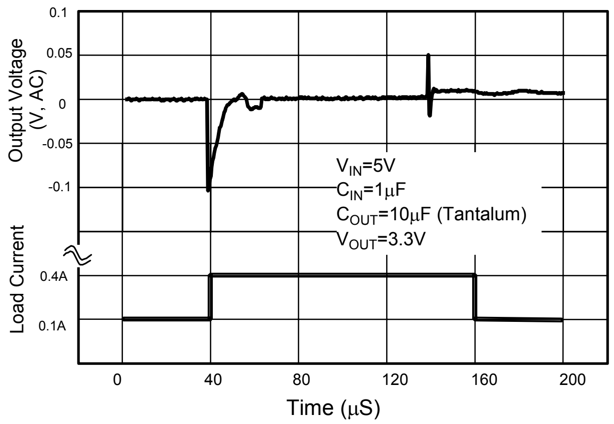


Fig. 1 Load Transient Response

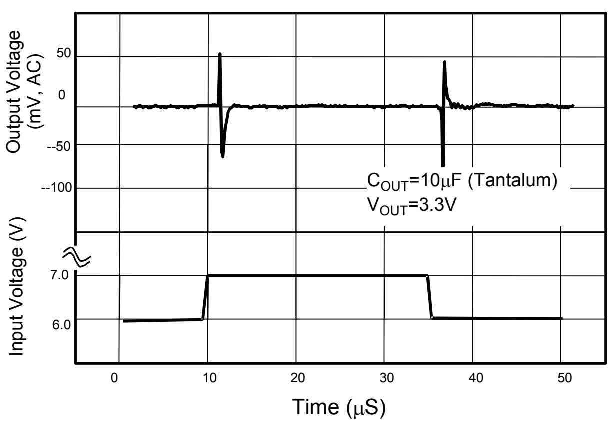


Fig. 2 Line Transient Response

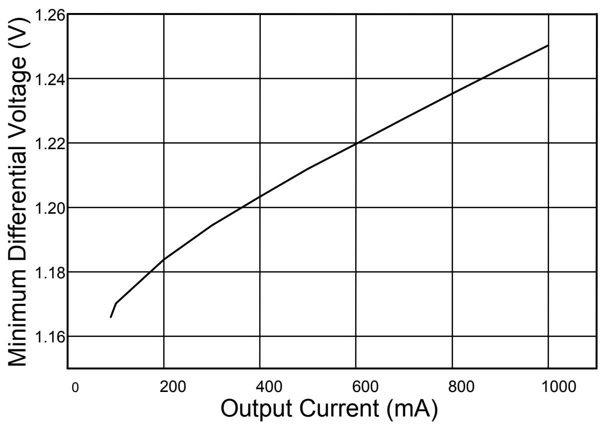


Fig. 3 Dropout Voltage (V_{OUT}=3.3V)

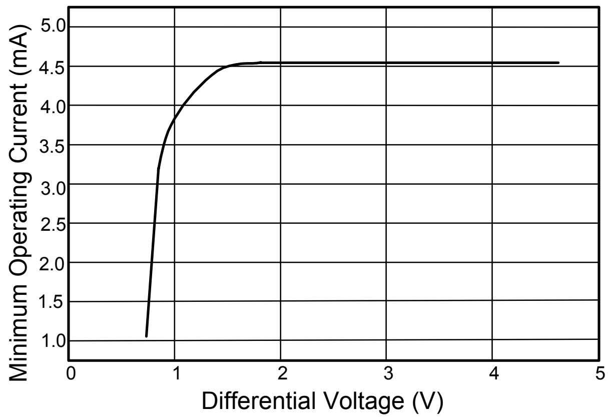


Fig. 4 Minimum Operating Current

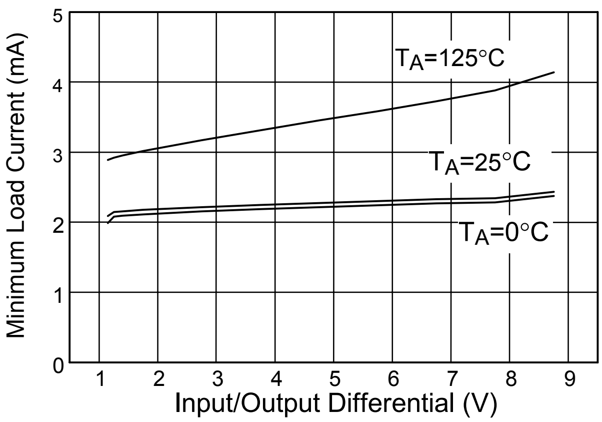
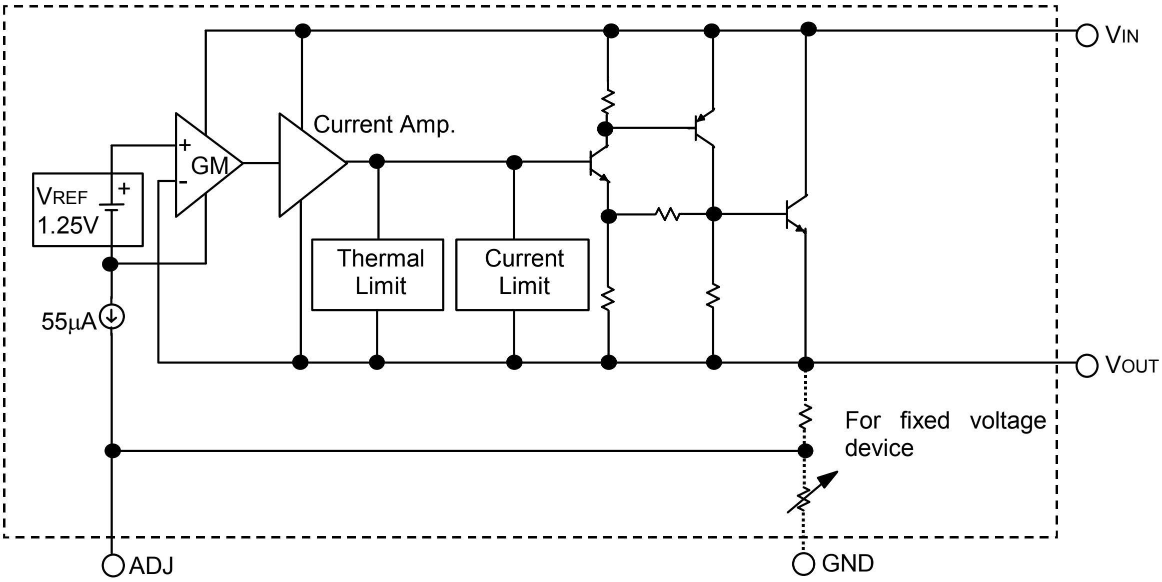


Fig. 5 Minimum Load Current (Adjustable Version)

■ 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 AIC1117A 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 AIC1117A 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

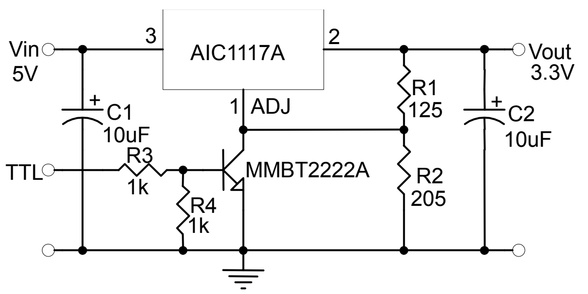
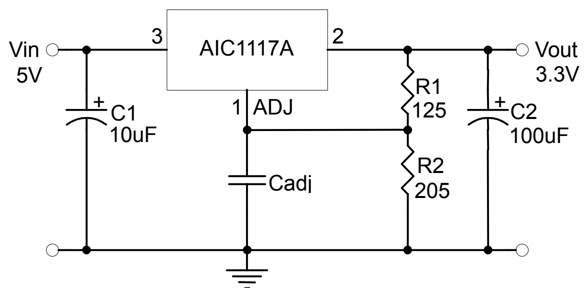


Fig. 6 V_{OUT}=3.3V with Shutdown



* Cadj can improve ripple rejection

Fig. 7 Improving Ripple Rejection

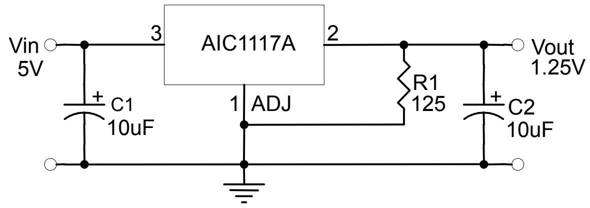


Fig. 8 V_{OUT}=1.25V Application Circuit

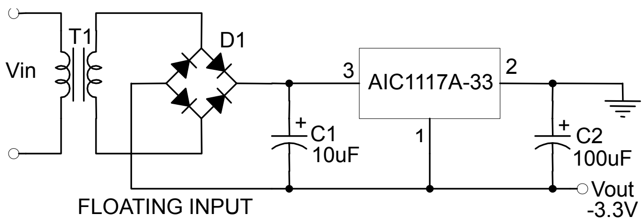
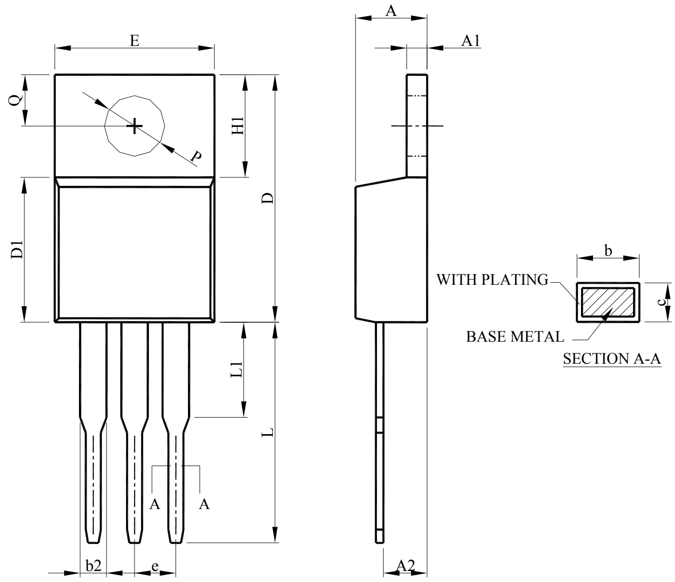


Fig. 9 Low Dropout Negative Supply

■ PHYSICAL DIMENSIONS (unit: mm)

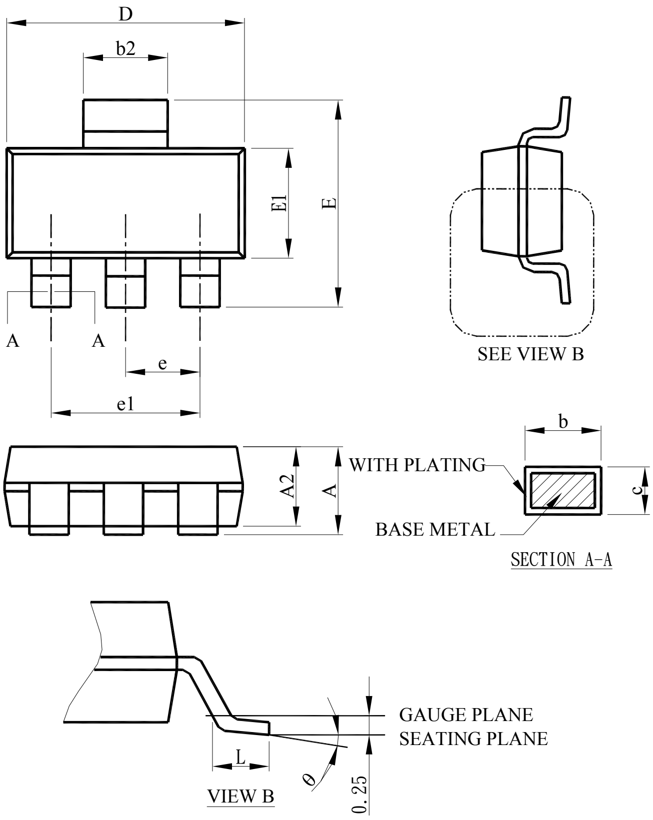
- **TO-220**



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.

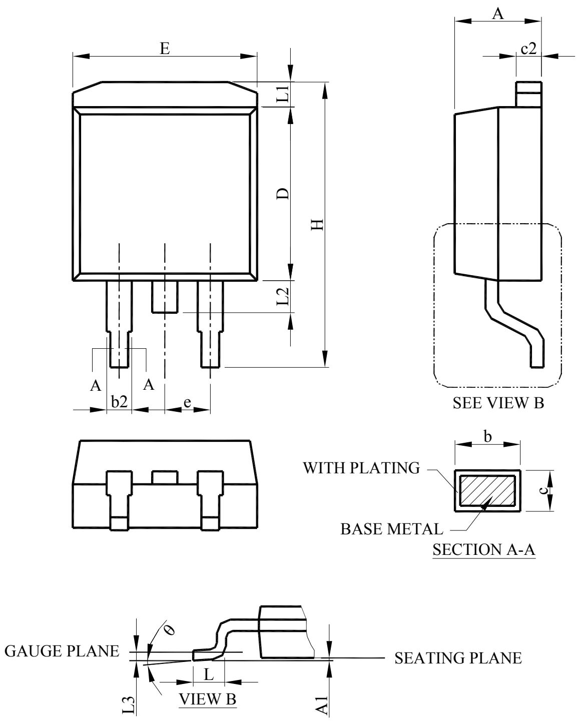
- **SOT-223**



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 and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs, and interlead flash, but including any mismatch between the top and bottom of the plastic body.
3.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

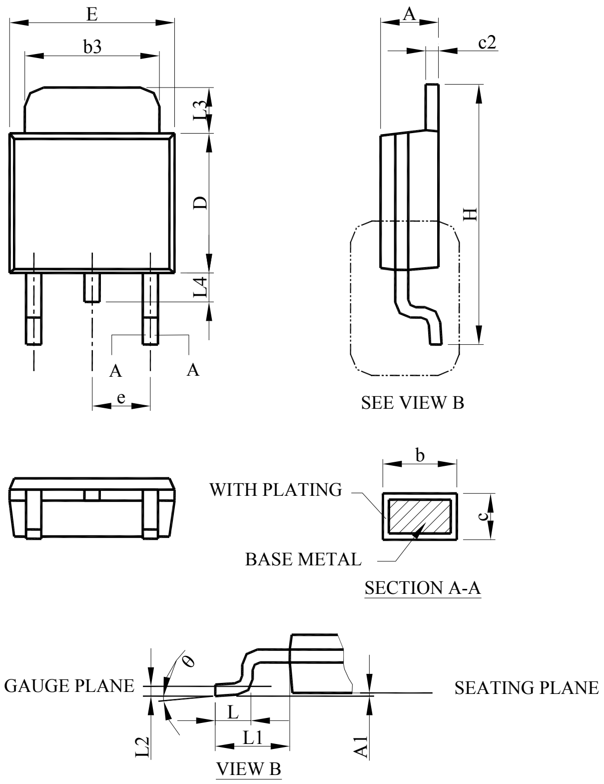
- **TO-263**



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.

- **TO-252**



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.

Note: