500mA Low Dropout Linear Regulator

FEATURES

- Low Dropout Voltage of 650mV at 500mA Output Current (3V Output Version).
- Guaranteed 500mA Output Current.
- Low Ground Current at 65μA.
- 2% Accuracy Output Voltage of 1.8V/ 2.0V /2.5V /2.7V/ 3.0V/ 3.3V/ 3.5V/ 3.7V/ 3.8V/ 5.0V/ 5.2V.
- Only needs 4.7μF Output Capacitor for Stability.
- Current and Thermal Limiting.

APPLICATIONS

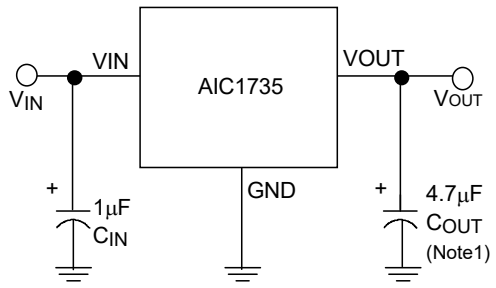
- CD-ROM Drivers.
- LAN Cards.
- Microprocessor.
- RAM Module.
- Wireless Communication Systems.
- Battery Powered Systems.

DESCRIPTION

The AIC1735 is a 3-pin low dropout linear regulator. The superior characteristics of the AIC1735 include zero base current loss, very low dropout voltage, and 2% accuracy output voltage. Typical ground current remains approximately 65μA, for loading ranging from zero to maximum. Dropout voltage turns substantially low when output current is 100mA. Built-in output current limiting and thermal limiting provide maximal protection to the AIC1735 against fault conditions.

The AIC1735 are available in popular SOT23-3, SOT223-3, SOT89-3 and TO252-3 packages.

TYPICAL APPLICATION CIRCUIT



Low Dropout Linear Regulator

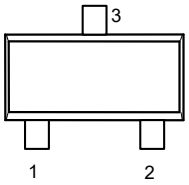
ORDERING INFORMATION

AIC1735-XXXX XX

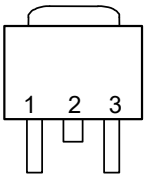
- PACKING TYPE
  - TR: TAPE & REEL
  - TB: TUBE
- PACKAGE TYPE
  - E: TO252-3
  - U: SOT23-3
  - X: SOT89-3
  - Y: SOT223-3
- G: Green Package
- OUTPUT VOLTAGE
  - 18: 1.8V
  - 20: 2.0V
  - 25: 2.5V
  - 27: 2.7V
  - 30: 3.0V
  - 33: 3.3V
  - 35: 3.5V
  - 37: 3.7V
  - 38: 3.8V
  - 50: 5.0V
  - 52: 5.2V

PIN CONFIGURATION

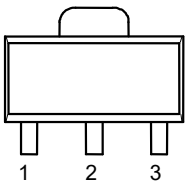
SOT23-3
TOP VIEW
1: GND
2: VOUT
3: VIN



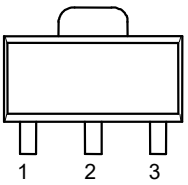
TO252-3
TOP VIEW
1: VOUT
2. GND
3. VIN



SOT89-3
TOP VIEW
1: GND
2. VIN
3. VOUT



SOT223-3
TOP VIEW
1: VOUT
2. GND
3. VIN



Example: AIC1735-18GETR

→ 1.8V Version, in TO252-3 Green Package & Tape & Reel Packing Type

AIC1735-18GYTR

→ 1.8V Version, in SOT223-3 Green Package& Tape & Reel Packing Type

- **SOT23-3 MARKING**

Part No.	Marking	Part No.	Marking
AIC1735-18GU	CE18G	AIC1735-35GU	CE35G
AIC1735-20GU	CE20G	AIC1735-37GU	CE37G
AIC1735-25GU	CE25G	AIC1735-38GU	CE38G
AIC1735-27GU	CE27G	AIC1735-50GU	CE50G
AIC1735-30GU	CE30G	AIC1735-52GU	CE52G
AIC1735-33GU	CE33G		

- **SOT89-3 MARKING**

Part No.	Marking	Part No.	Marking
AIC1735-18GX	CF18G	AIC1735-35GX	CF35G
AIC1735-20GX	CF20G	AIC1735-37GX	CF37G
AIC1735-25GX	CF25G	AIC1735-38GX	CF38G
AIC1735-27GX	CF27G	AIC1735-50GX	CF50G
AIC1735-30GX	CF30G	AIC1735-52GX	CF52G
AIC1735-33GX	CF33G		

- **SOT223-3 MARKING**

Part No.	Marking	Part No.	Marking
AIC1735-18GY	CC18G	AIC1735-35GY	CC35G
AIC1735-20GY	CC20G	AIC1735-37GY	CC37G
AIC1735-25GY	CC25G	AIC1735-38GY	CC38G
AIC1735-27GY	CC27G	AIC1735-50GY	CC50G
AIC1735-30GY	CC30G	AIC1735-52GY	CC52G
AIC1735-33GY	CC33G		

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage		-0.3~12V
Operating Temperature Range		-40°C~ 85°C
Maximum Junction Temperature		150°C
Storage Temperature Range		-65°C~150°C
Lead Temperature (Soldering) 10 sec.		260°C
Thermal Resistance Junction to Case	SOT23-3 Package	130°C/W
	TO252-3 Package	12.5°C/W
	SOT89-3 Package	100°C/W
	SOT223-3 Package	15°C/W
Thermal Resistance Junction to Ambient	SOT23-3 Package	180°C/W
(Assume no Ambient Airflow, no Heatsink)	TO252-3 Package	100°C/W
	SOT89-3 Package	160°C/W
	SOT223-3 Package	130°C/W

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

TEST CIRCUIT

Refer to the TYPICAL APPLICATION CIRCUIT

ELECTRICAL CHARACTERISTICS (T_A=25°C, C_{IN}=1μF, C_{OUT}=4.7μF, unless otherwise specified.) (Note2)

PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage	No Load					V
	AIC1735-52	V_{IN}=5.5~12V	5.100	5.200	5.300	
	AIC1735-50	V_{IN}=5.5~12V	4.900	5.000	5.100	
	AIC1735-38	V_{IN}=4.7~12V	3.725	3.800	3.875	
	AIC1735-37	V_{IN}=4.7~12V	3.625	3.700	3.775	
	AIC1735-35	V_{IN}=4.7~12V	3.430	3.500	3.570	
	AIC1735-33	V_{IN}=4.7~12V	3.235	3.300	3.365	
	AIC1735-30	V_{IN}=4.0~12V	2.940	3.000	3.060	
	AIC1735-27	V_{IN}=4.0~12V	2.646	2.700	2.754	
	AIC1735-25	V_{IN}=4.0~12V	2.450	2.500	2.550	
	AIC1735-20	V_{IN}=4.0~12V	1.960	2.000	2.040	
	AIC1735-18	V_{IN}=4.0~12V	1.764	1.800	1.836	
Output Voltage Temperature Coefficiency	(Note 3)			50		PPM/°C
Line Regulation	I_L=1mA,					mV
	1.4V≤V_{OUT}≤3.2V	V_{IN}=4V~12V		3	10	
	3.3V≤V_{OUT}≤5.2V	V_{IN}=5.5V~12V		3	10	
Load Regulation (Note 4)	I_L=0.1~500mA					mV
	1.4V≤V_{OUT}≤3.9V	V_{IN}=5V		10	30	
	4.0V≤V_{OUT}≤5.2V	V_{IN}=7V		20	50	
Current Limit (Note 5)	V_{IN}=7V, V_{OUT}=0V		500			mA
Dropout Voltage (Note 6)	I_L=500mA	4.0V≤V_{OUT}≤5.2V		510	710	mV
		3.0V≤V_{OUT}≤3.9V		650	850	
		2.5V≤V_{OUT}≤2.9V		780	980	
		2.0V≤V_{OUT}≤2.4V		1100	1300	
		1.4V≤V_{OUT}≤1.9V		1400	1600	
Ground Current	I_O=0.1mA~I_{MAX}					μA
	1.4V≤V_{OUT}≤3.9V	V_{IN}=5~12V		65	90	
	4.0V≤V_{OUT}≤5.2V	V_{IN}=7~12V		65	90	

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: Guaranteed by design.

Note 4: Regulation is measured at constant junction temperature, using pulse testing with a low ON time.

Note 5: Current limit is measured by pulsing a short time.

Note 6: 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

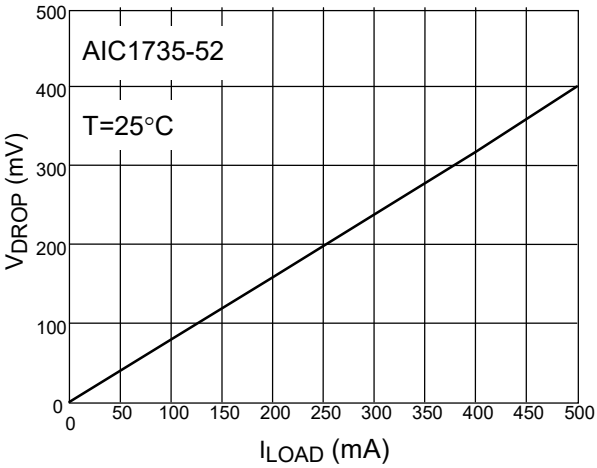


Fig. 1 V_{DROP} vs. I_{LOAD}

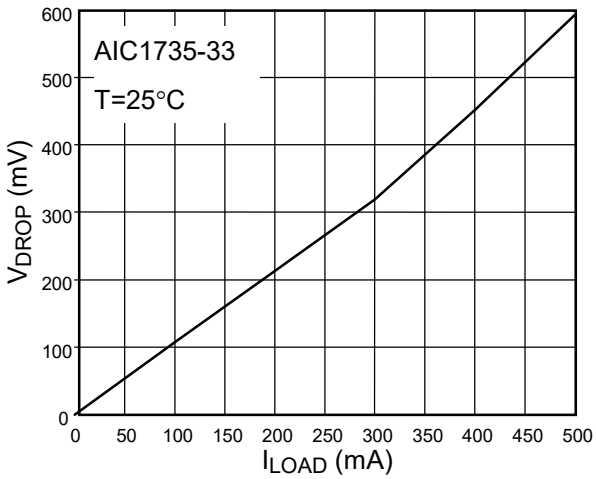


Fig. 2 V_{DROP} vs. I_{LOAD}

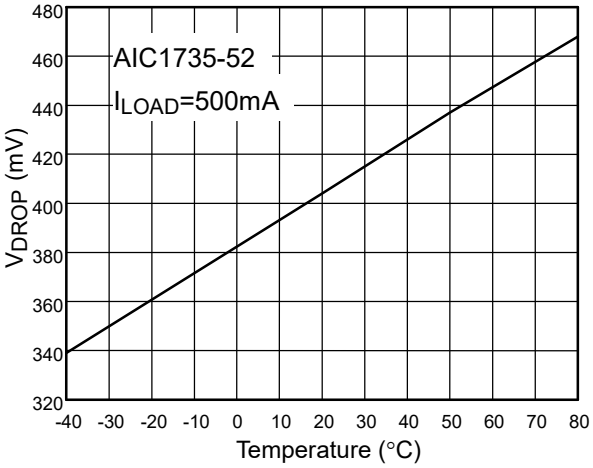


Fig. 3 V_{DROP} vs. Temperature

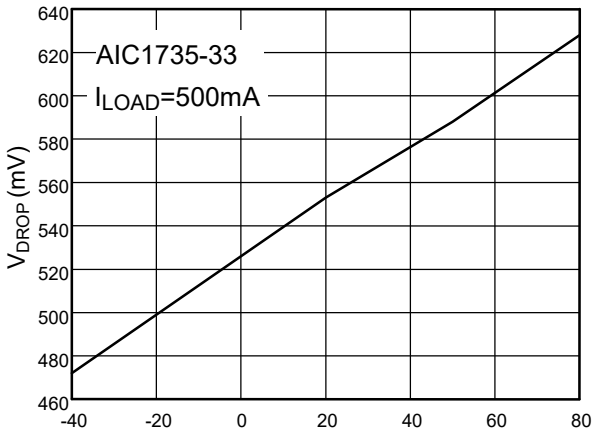


Fig. 4 V_{DROP} vs. Temperature

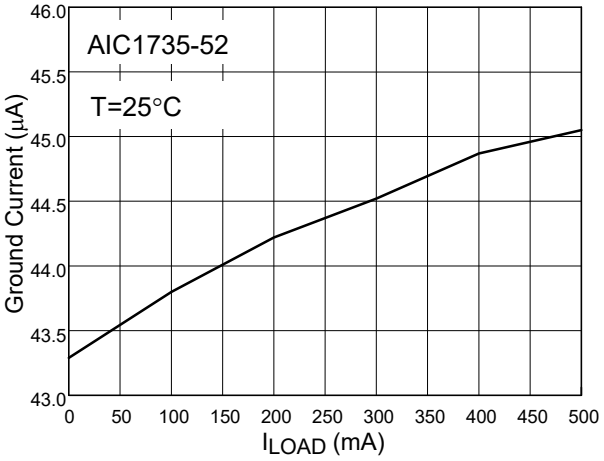


Fig. 5 Ground Current vs. I_{LOAD}

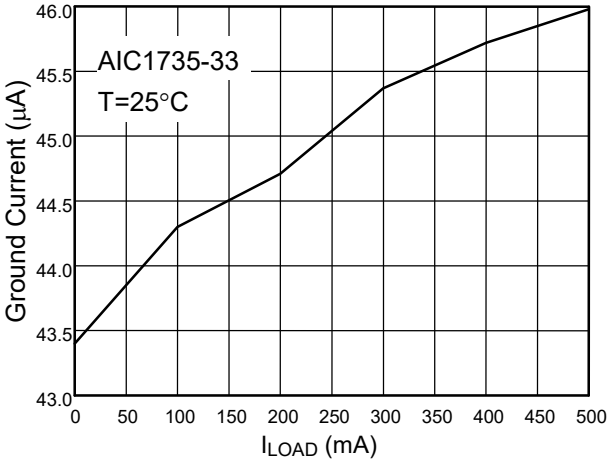


Fig. 6 Ground Current vs. I_{LOAD}

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

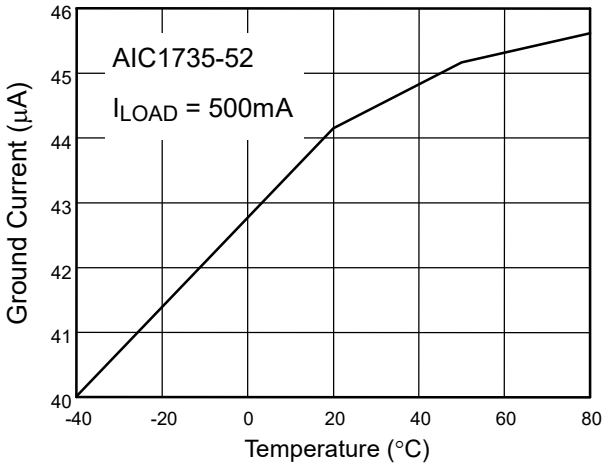


Fig. 7 Ground Current vs. Temperature

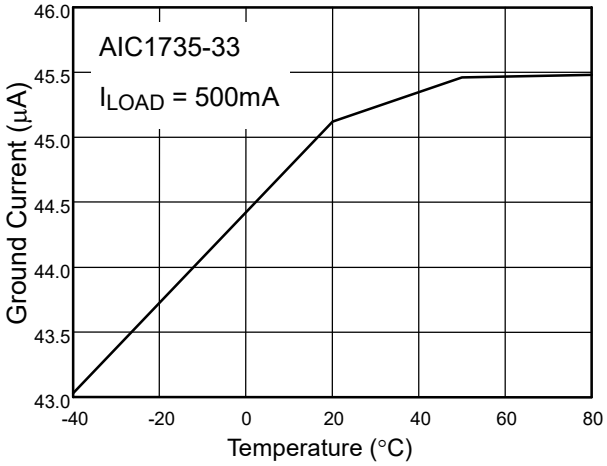


Fig. 8 Ground Current vs. Temperature

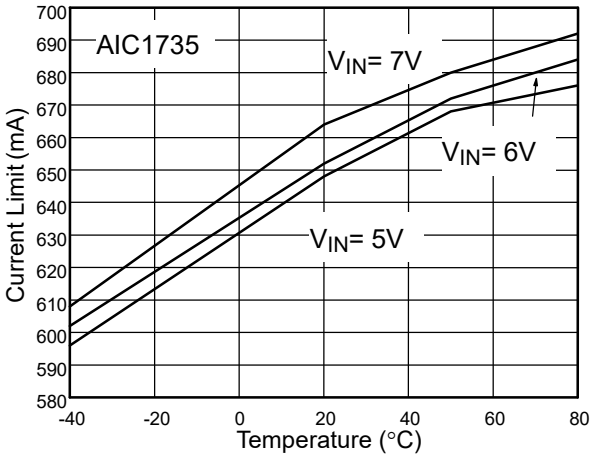


Fig. 9 Current Limit vs. Temperature

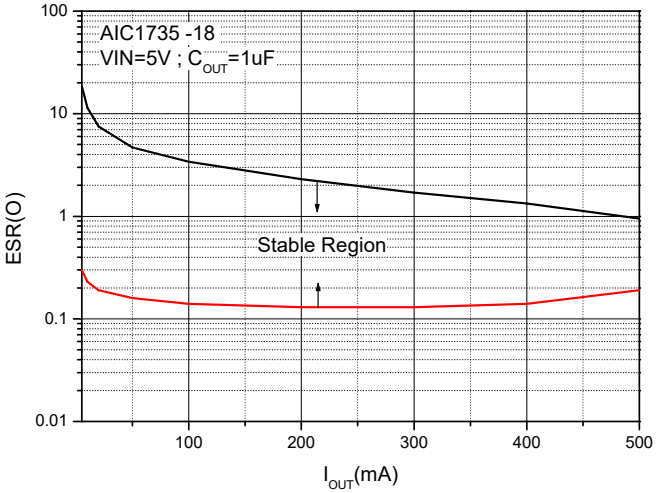


Fig. 10 Region of Stable COUT ESR vs. Load Current

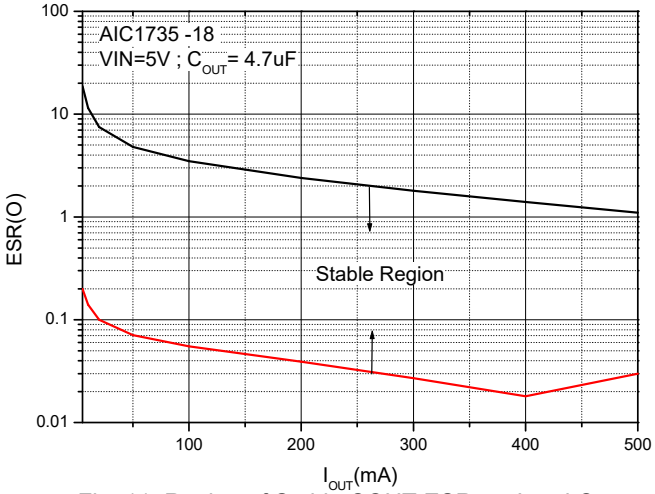


Fig. 11 Region of Stable COUT ESR vs. Load Current

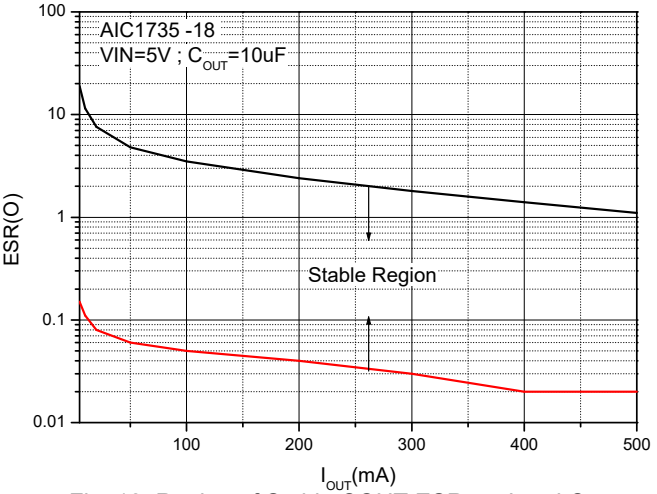
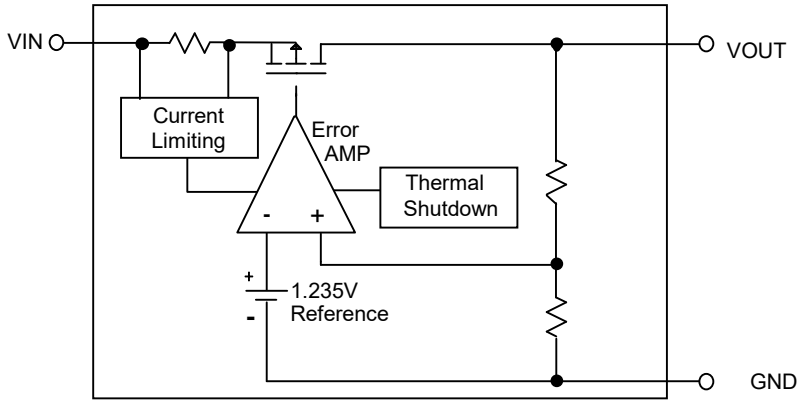


Fig. 12 Region of Stable COUT ESR vs. Load Current

BLOCK DIAGRAM



PIN DESCRIPTIONS

VOUT PIN - Output pin.
GND PIN - Power GND.
VIN PIN - Power Supply Input.

APPLICATION INFORMATION

INPUT-OUTPUT CAPACITORS

Linear regulators require input and output capacitors to maintain stability. A 1uF aluminum electrolytic input capacitor with a 4.7uF aluminum electrolytic output capacitor is recommended. To avoid oscillation, it is recommended to follow the figures of "Region of Stable C_{OUT} ESR vs. Load Current" to choose proper capacitor specifications.

POWER DISSIPATION

The AIC1735 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 AIC1735 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:

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

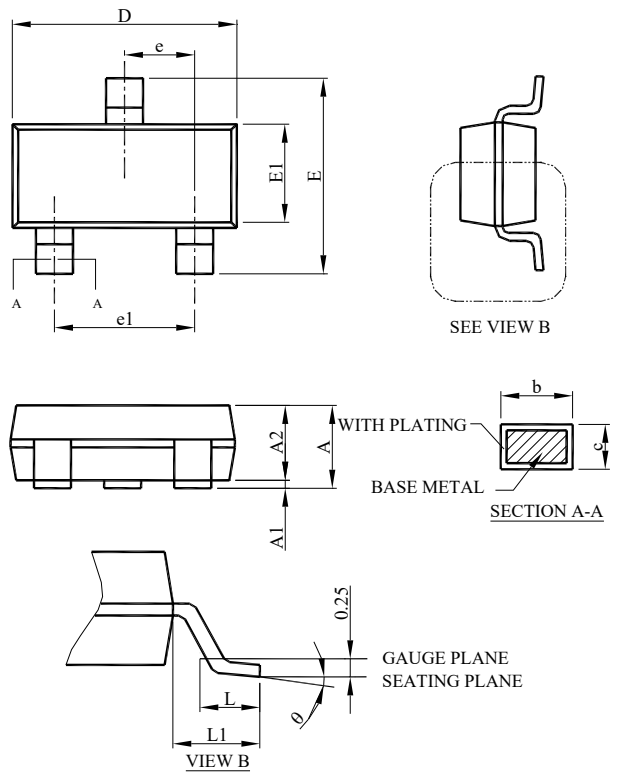
Where $T_{J\text{-}max}$ is the maximum allowable junction temperature (125°C), and T_A is the ambient temperature suitable in application.

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. GND pin performs a dual function for providing an electrical connection to ground and channeling heat away. Therefore, connecting the GND pin to ground with a large pad or ground plane would increase the power dissipation and reduce the device temperature.

PHYSICAL DIMENSIONS (unit: mm)

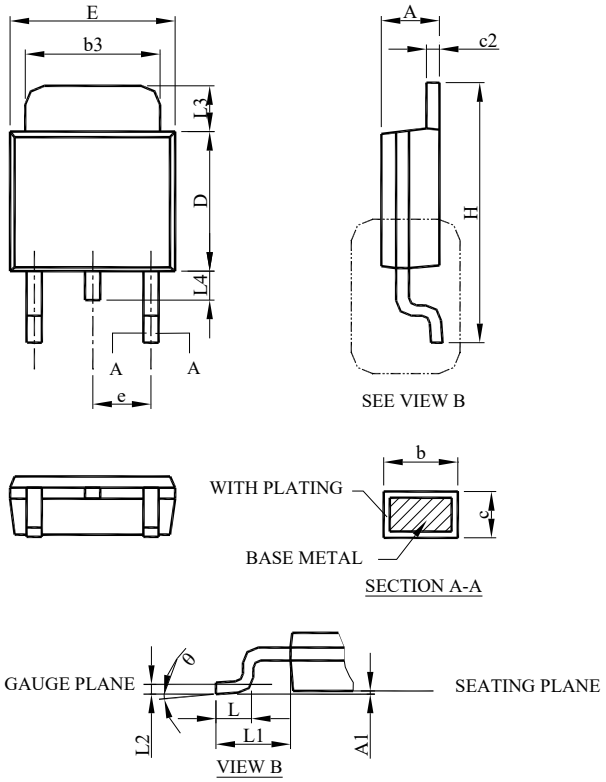
● SOT23-3



SYMBOL	SOT23-3	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.00	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
θ	0°	8°

Note: 1. Refer to JEDEC MO-178.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 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.

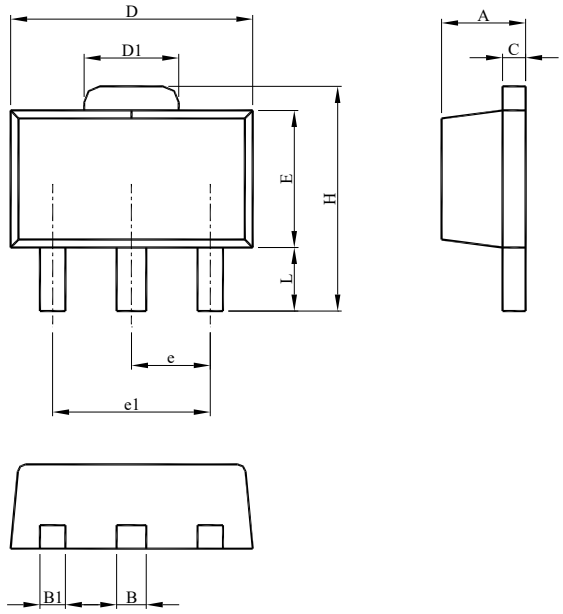
● **TO252-3**



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°

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.

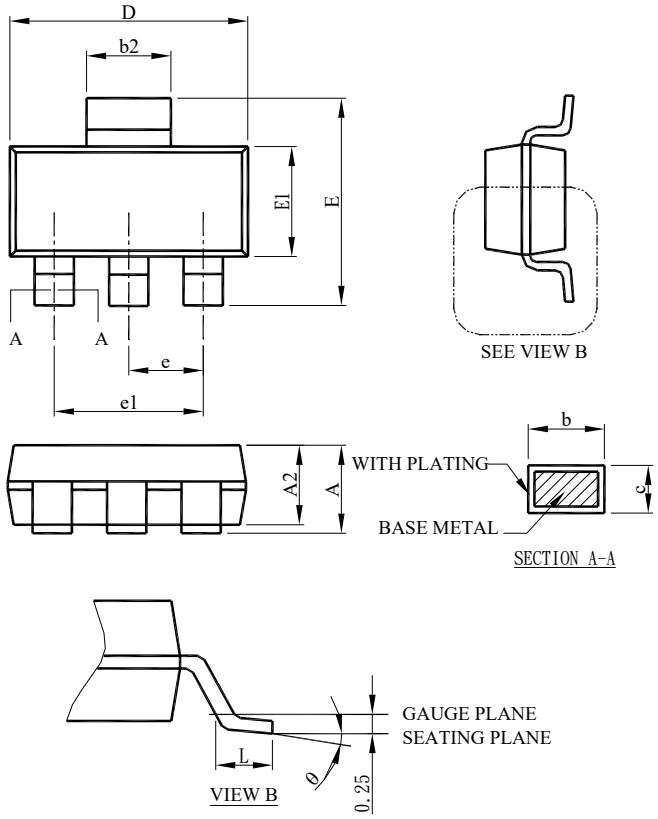
- **SOT89-3**



SYMBOL	SOT89-3	
	MILLIMETERS	
	MIN.	MAX.
A	1.40	1.60
B	0.44	0.56
B1	0.36	0.48
C	0.35	0.44
D	4.40	4.60
D1	1.50	1.83
E	2.29	2.60
e	1.50 BSC	
e1	3.00 BSC	
H	3.94	4.25
L	0.89	1.20

Note: 1. Refer to JEDEC TO-243AA.
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 "E" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

- **SOT223-3**



SYMBOL	SOT223-3	
	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.