LR8341A series Low-power Linear Regulator

1 Features

- Low power consumption
- Low voltage drop
- High input voltage (up to 40V)
- Quiescent current 2.0 uA
- Output voltage accuracy: tolerance ±2%
- Integrated short circuit protection

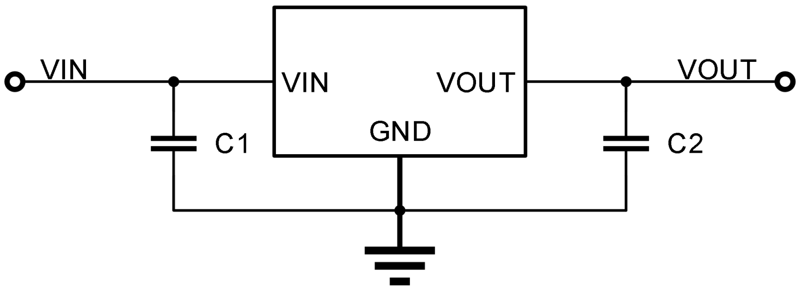
2 Applications

- Intelligent lighting equipment
- Battery-powered equipment
- Auxiliary power supply
- Communication equipment

3 General Description

The LR8341 series is a set of three-terminal low power high voltage implemented in CMOS technology. They allow an input voltage as high as 40V,CMOS technology ensures low voltage drop and low quiescent current.They are available with several fixed output voltages ranging from 2.5V to 5.0V.

LR8341 can deliver 100mA output current and still maintain a good regulation.These devices are especially suitable for computers,consumer products and industrial equipment thanks to the low dropout between input and output and the low quiescent current.



4 Selection Table

Part No.	Output Voltage	Package	Marking
LR8341A-T25/-M25	2.5V	SOT23-3L/SOT89-3	LR25A 8341
LR8341A-T27/-M27	2.7V	SOT23-3L/SOT89-3	LR27A 8341
LR8341A-T30/-M30	3.0V	SOT23-3L/SOT89-3	LR30A 8341
LR8341A-T33/-M33	3.3V	SOT23-3L/SOT89-3	LR33A 8341

LR8341A-T36/-M36	3.6V	SOT23-3L/SOT89-3	LR36A 8341
LR8341A-T40/-M40	4.0V	SOT23-3L/SOT89-3	LR40A 8341
LR8341A-T44/-M44	4.4V	SOT23-3L/SOT89-3	LR44A 8341
LR8341A-T50/-M50	5.0V	SOT23-3L/SOT89-3	LR50A 8341

5 Revision History

New Revision P (Feb 2022)

- Changed document status from advance information to production data. . . . . 1−10

New Revision A (Jun 2022)

- Changed document status from advance information to production data. . . . . 1−11

New Revision B (Jul 2022)

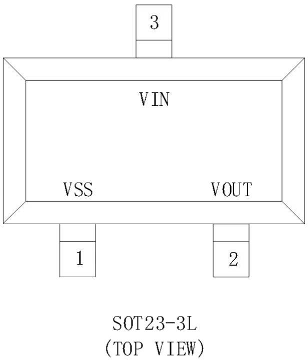
- Changed document status from advance information to production data. . . . . 1−11

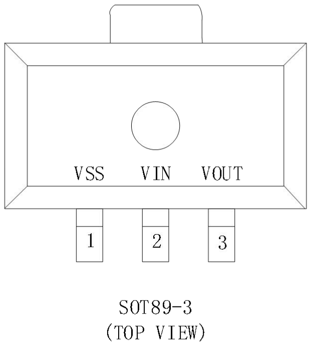
New Revision C (Oct 2022)

- Changed document status from advance information to production data. . . . . 1−13

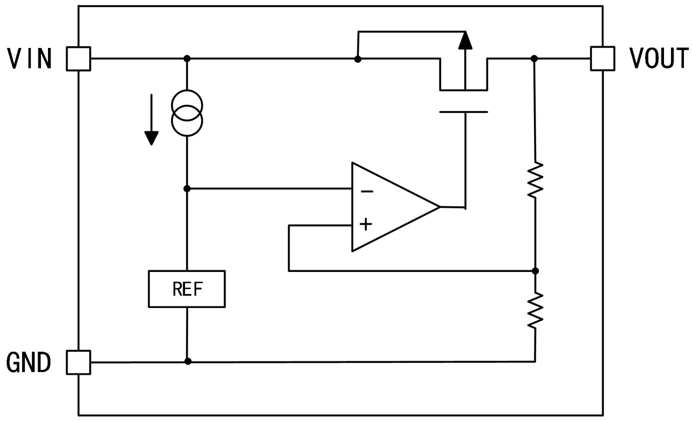
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

6 Pin Assignment





7 Block Diagram



8 Electrical parameters

8.1 Absolute Maximum Ratings

Test at room temperature (unless otherwise specified)(1)

Name	Min		Max	Unit
Maximum Input Voltage	VIN		55	V
Maximum Output Voltage	I_{OUT}		160	mA
Power Dissipation	P_D	SOT23-3L	250	mW
		SOT89-3	500	
Operating Temperature	T_{OPR}		−40～+105	℃
Storage Temperature	T_{STG}		−40～+125	℃

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltage values are corresponding to GND unless otherwise specified.

(3) The following conditions may reduce the overall equipment life

*High temperature storage for a long-term

*High temperature using for a long-term

8.2 ESD

Mode	Name	Max	Unit
H.B.M	POS/NEG	±3000	V

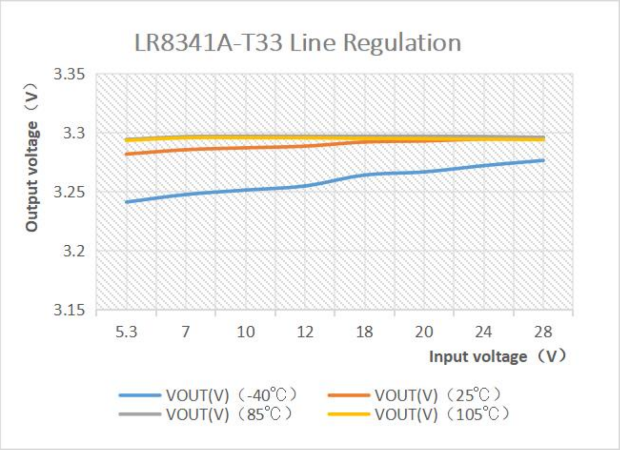
8.3 Electrical Characteristics

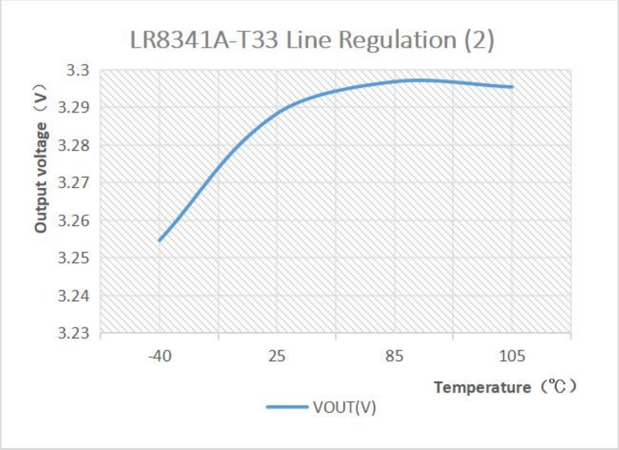
T_J = 25°C（Unless otherwise specified）

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage	VIN	ISS=5uA	—	—	40	V
Output Voltage	VOUT	VIN=VOUT+2V，I_{OUT}=10mA	V_{OUT}*0.99	VOUT	V_{OUT}*1.01	V
Output Current	IOUT	VIN= VOUT+2V	—	100	—	mA
Line Regulation	△VOUT	VOUT+2V≤VIN≤40V，I_{OUT}=5mA	-30	—	30	mV
Load Regulation	△VOUT	VIN= VOUT+2V，1mA≤I_{OUT}≤100mA	-50	—	50	mV
Dropout Voltage	V_{Drop}	I_{OUT}=50mA，△VOUT=±2%*VOUT	320	390	450	mV
		I_{OUT}=100mA，△VOUT=±2%*VOUT	600	750	900	
Power Supply Rejection Ratio	PSRR	VIN= VOUT+1V, IOUT=10mA	f=100Hz	—	75	—
			f=1kHz	—	60	—
			f=10kHz	—	45	—
Quiescent Current	I_{SS}	VIN= VOUT+2V	—	2	5	uA
Short-circuit Current	I_{SCP}	VOUT=GND	—	15	—	mA
Temperature Coefficient	△VOUT/(△Ta*VOUT)	VIN= VOUT+1V，IOUT=10mA, -40℃≤Ta≤85℃	—	±50	±100	ppm/℃

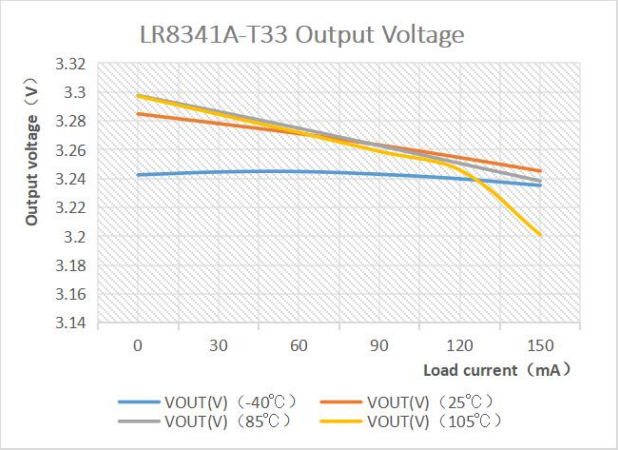
9 Temperature characteristic curves (unless specified CIN=COUT=1uF)

9.1 Output voltage linear temperature characteristics

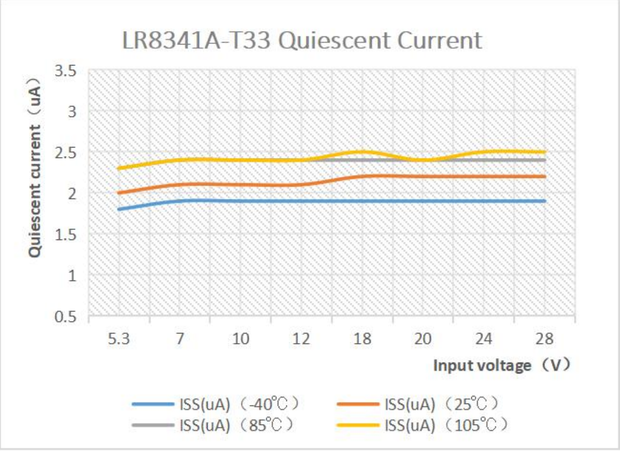




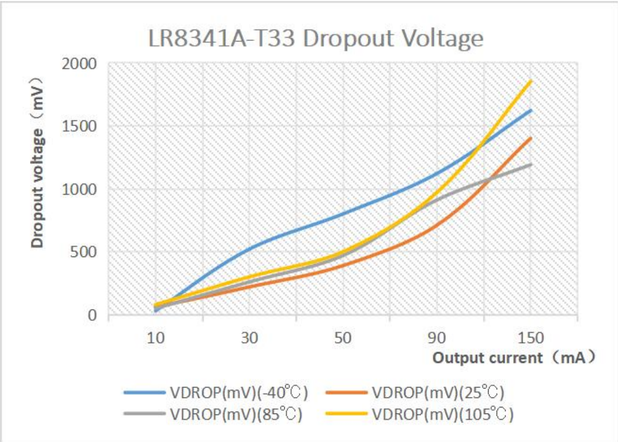
9.2 Output voltage load temperature characteristics

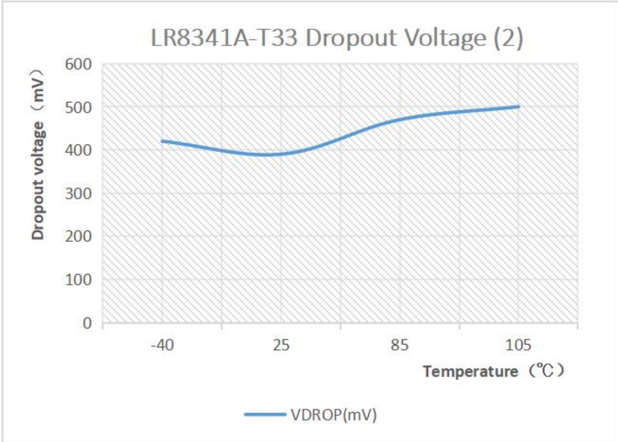


9.3 Quiescent current temperature characteristics



9.4 Dropout voltage temperature characteristics





10 Application Information

When using the LR8341A regulators,it is important that the following application points are noted if correct operation is to be achieved.

10.1 External Circuit

It is important that external capacitors are connected to both the input and output pins.For the input pin suitable bypass capacitors as shown in the application circuits should be connected especially in situations where a battery power source is used which may have a higher impedance.For the output pin,a suitable capacitor (1-10uF)should also be connected especially in situations where the load is of a transient nature,in which case larger capacitor values should be selected to limit any output transient voltages.

10.2 Thermal Considerations

The maximum power dissipation depends on the thermal resistance of the package,the PCB layout, the rate of the surrounding airflow and the difference between the junction and ambient temperature.The maximum power dissipation can be calculated using the following formula:

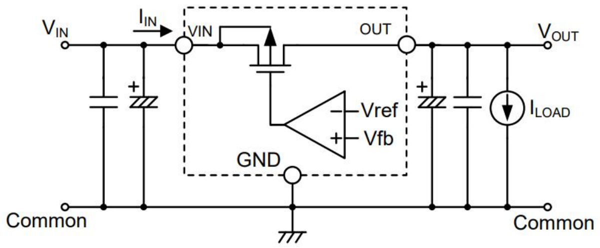
$$P_{D(MAX)} = (T_{J(MAX)} – T_a) / θ_{JA}$$

where $T_{J(MAX)}$ is the maximum junction temperature,Ta is the ambient temperature and $θ_{JA}$ is the junction- to-ambient thermal resistance of the IC package in degrees per watt. The following table shows the $θ_{JA}$ values for various package types.

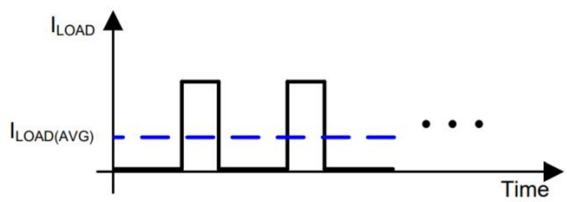
Package	$θ_{JA}$ (°C/W)
SOT89-3	200 °C/W
SOT23-3L	500 °C/W

10.3 Power Dissipation Calculation

In order to keep the device within its operating limits and to maintain a regulated output voltage, the power dissipation of the device, given by P_D, must not exceed the Maximum Power Dissipation, given by $P_{D(MAX)}$. Therefore $P_D \leqslant P_{D(MAX)}$. From the diagram it can be seen that almost all of this power is generated across the pass transistor which is acting like a variable resistor in series with the load to keep the output voltage constant. This generated power which will appear as heat, must never allow the device to exceed its maximum junction temperature.



In practical applications the regulator may be called upon to provide both steady state and transient currents due to the transient nature of the load. Although the device may be working well within its limits with its steady state current, care must be taken with transient loads which may cause the current to rise close to its maximum current value. Care must be taken with transient loads and currents as this will result in device junction temperature rises which must not exceed the maximum junction temperature. With both steady state and transient currents, the important current to consider is the average or more precisely the RMS current which is the value of current that will appear as heat generated in the device. The following diagram shows how the average current relates to the transient currents.



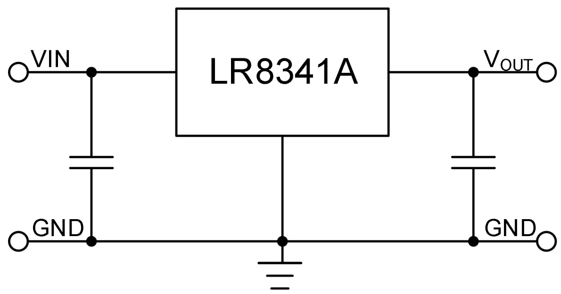
As the quiescent current of the device is very small it can generally be ignored and as a result the input current can be assumed to be equal to the output current. Therefore the power dissipation of the device, P_D, can be calculated as the voltage drop across the input and output multiplied by the current, given by the equation, P_D = (VIN – VOUT) × I_{IN}. As the input current is also equal to the load current the power dissipation P_D = (VIN – VOUT) × I_{LOAD}. However, with transient load currents, P_D = (VIN – VOUT) × $I_{LOAD(AVG)}$ as shown in the figure.

10.4 Current protection function

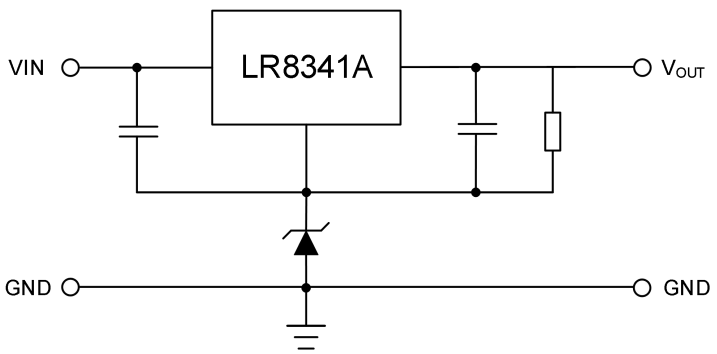
The LR8341A implements a short-circuit protection function, if the output voltage is less than 0.7V, the short-circuit protection function is in effect and the SCP current is set to 15mA. Once the output voltage is greater than 0.7V, the overcurrent protection function is turned off, preventing IC damage even if the output is shorted to ground. When the output is shorted to ground, the output current is clamped to I_{SCP}

11 Application Circuits

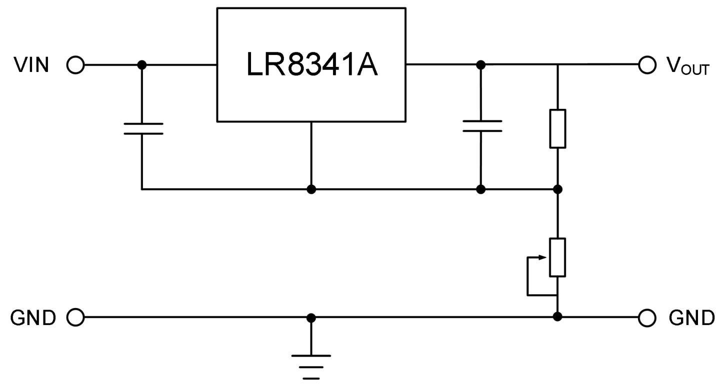
11.1 Basic Circuits



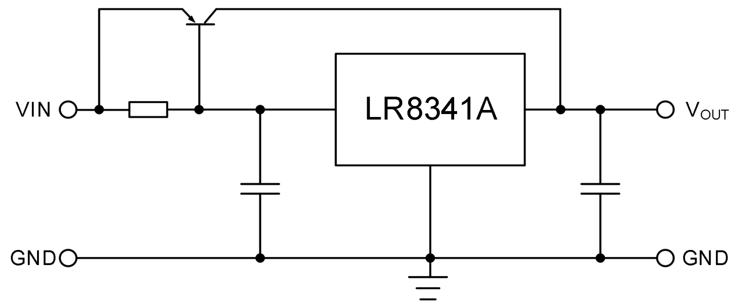
11.2 Circuit for Increasing Output Voltage



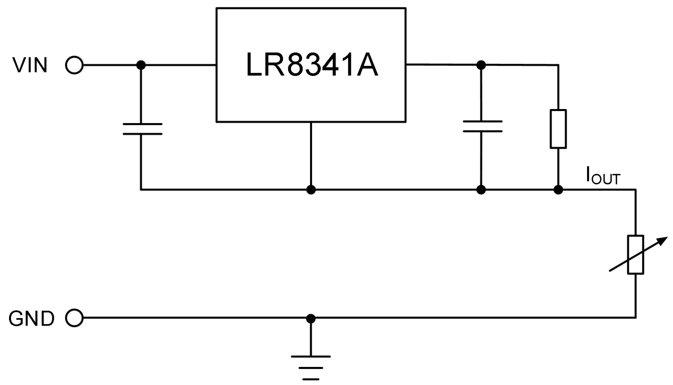
11.3 Circuit for Increasing Output Voltage



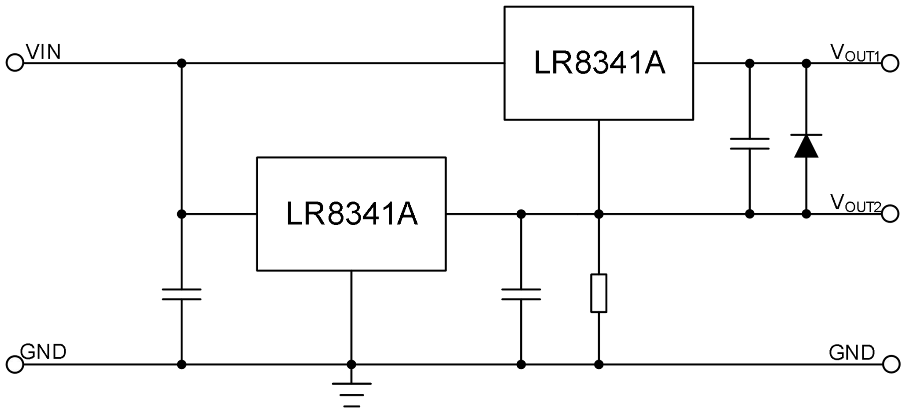
11.4 High Output Current Positive Voltage Regulator



11.5 Constant Current Regulator



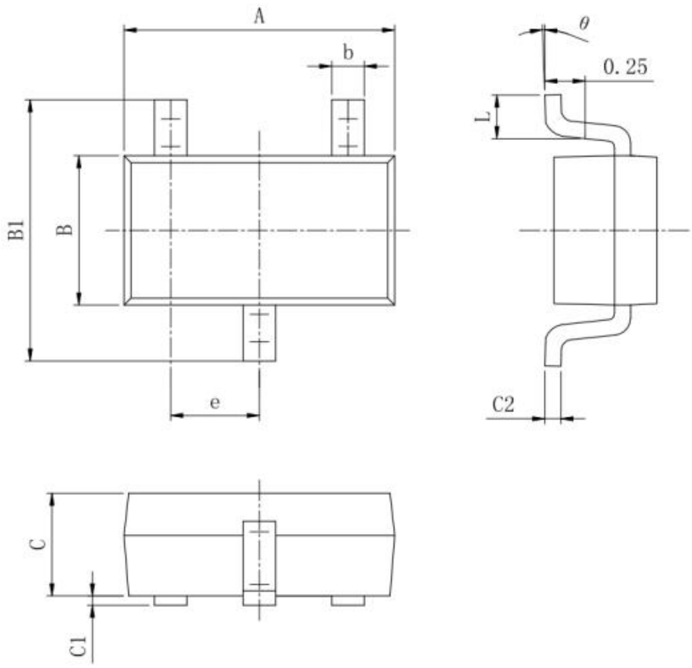
11.6 Dual Supply



12 Layout Guideline

1. C_{IN} and C_{OUT} are as close as possible to the LDO,it is generally recommended that C_{IN}=C_{OUT} =1uF-10uF, and you need to pay attention to the input capacitor withstand voltage value.
2. The LDO input is recommended to connect about 10Ω resistors in series to absorb the previous input spike voltage.
3. The floor area is as large as possible,which can improve the anti-interference and increase the heat dissipation performance of LDO.

13 Outline Dimensions (SOT23-3L)

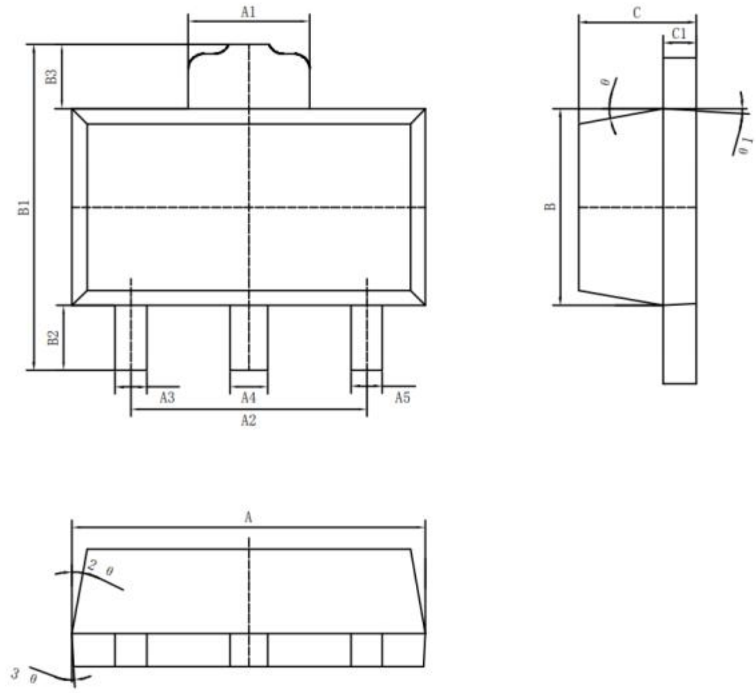


Symbol	Dimensions in mm		Symbol	Dimensions in inch	
	Min.	Max.		Min.	Max.
A	2. 28	3. 03	C	1. 05	1. 15
e	0. 95 (BSC)		C1	0. 03	0. 15
b	0. 28	0. 45	C2	0. 12	0. 23
B	1. 05	1. 7	L	0. 35	0. 55
B1	2. 6	3	θ	0°	8°

Notes:

1. LORY semiconductor reserves the right to alter its products without prior notification.

Outline Dimensions (SOT89-3)



Symbol	Dimensions in mm		Symbol	Dimensions in mm	
	Min.	Max.		Min.	Min.
A	4. 4	4. 6	B3	0. 82	0. 83
A1	1. 65	1. 75	C	1. 4	1. 6
A2	2. 95	3. 05	C1	0. 35	0. 45
A3	0. 35	0. 45	θ	6°	
A4	0. 43	0. 53	Θ1	3°	
A5	0. 35	0. 45	Θ2	6°	
B	2. 4	2. 6	Θ3	3°	
B1	4. 05	4. 250			
B2	0. 82	0. 83			

Notes:

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