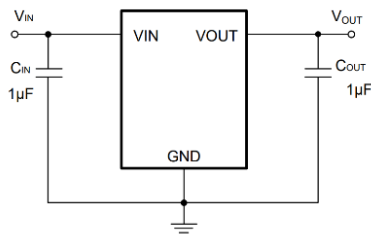


GENERAL DESCRIPTION

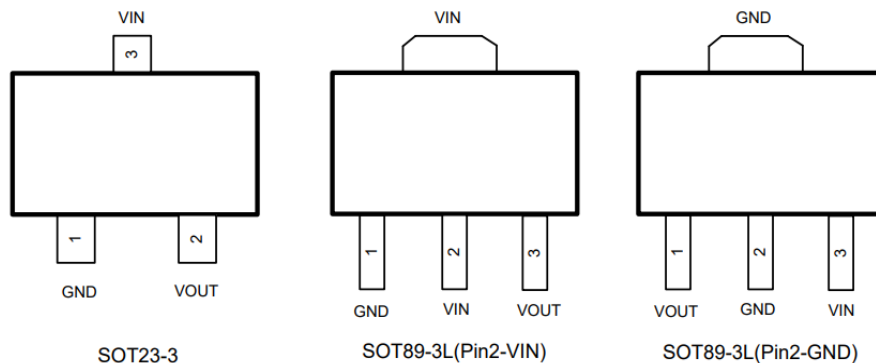
The GS7533/GS7533S series is a set of low power high voltage regulators implemented in CMOS technology. Which can provide 150mA output current. The device allows input voltage as high as 36V. It is very suitable for multi-cell battery systems, bus voltage power supply systems and other high DC voltage systems. Wide input voltage can make it well withstand the impact of surge voltage and ensure the stability of output voltage.

The GS7533/GS7533S series only 2 μ A (typical) current is consumed by itself, which is especially important in multi-battery power supply systems and can reduce the standby power consumption of the whole system.

TYPICAL APPLICATION



PIN Description



FEATURES

- Low Quiescent Current IQ:
2 μ A Typical at Light Loads
- 150mA Nominal Output Current
- Low Dropout Voltage
- Low Temperature Coefficient
- High Input Voltage (up to 36V)
- Output Voltage Accuracy: $\pm 2\%$
- Output voltage range is adjustable from 1.2V to 5V, and the step size is 0.1V
- Over temperature Protection
- Short Circuit Protection
- Packages: SOT23-3 and SOT89-3L

APPLICATIONS

- Audio/Video Equipment
- Communication Equipment
- Battery-Powered Equipment
- Automotive Head Unit
- Laptop, Palmtops, Notebook Computer

Order Information

Pin			Name	Function
SOT23-3	SOT89-3L	SOT89-3L		
3	2	3	VIN	Input Supply Voltage Pin. It is recommended to use a 1μF or larger ceramic capacitor from VIN pin to ground. This ceramic capacitor should be placed as close as possible to IN pin.
1	1	2	GND	Ground.
2	3	1	VOUT	Regulator Output Pin. It is recommended to use an output capacitor with effective capacitance in the range of 1μF to 10μF. The capacitor should be located very close to this pin.

ORDERING INFORMATION:

Part Number	V _{OUT} (V)	Package	Ordering Number	Packing Option
GS7533	2.5	SOT23-3	GS7533-25TR3	Tape and Real, 3000
		SOT89-3L(Pin2-VIN)	GS7533-25STR3	Tape and Real, 1000
		SOT89-3L(Pin2-GND)	GS7533Y-25STR3	
	3.0	SOT23-3	GS7533-30TR3	Tape and Real, 3000
		SOT89-3L(Pin2-VIN)	GS7533-30STR3	Tape and Real, 1000
		SOT89-3L(Pin2-GND)	GS7533Y-30STR3	
	3.3	SOT23-3	GS7533-33TR3	Tape and Real, 3000
		SOT89-3L(Pin2-VIN)	GS7533-33STR3	Tape and Real, 1000
		SOT89-3L(Pin2-GND)	GS7533Y-33STR3	
	3.6	SOT23-3	GS7533-36TR3	Tape and Real, 3000
		SOT89-3L(Pin2-VIN)	GS7533-36STR3	Tape and Real, 1000
		SOT89-3L(Pin2-GND)	GS7533Y-36STR3	
GS7533S	5.0	SOT23-3	GS7533-50TR3	Tape and Real, 3000
		SOT89-3L(Pin2-VIN)	GS7533-50STR3	Tape and Real, 1000
		SOT89-3L(Pin2-GND)	GS7533Y-50STR3	
GS7533S	5.0	SOT23-3	GS7533S-50TR3	Tape and Real, 3000

ABSOLUTE MAXIMUM RATINGS :

Parameter	SYMBOL	Min	Max	UNIT
VIN to GND	V _{IN}	-0.3	40	V
Junction Temperature	T _J	-40	150	°C
Power Dissipation @T _A =25°C	P _D	Internally Limited		W
Storage Temperature Range	T _{STG}	-65	150	°C

Note:

Stress greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

ESD RATINGS:

Parameter	SYMBOL		Max	UNIT
Electrostatic discharge	I _{ESD}	Latch up current	±500	mA
	V _{ESD}	Human-body model (HBM)	±8000	V
		Charge device model (CDM)	±2000	



ESD SENSITIVITY CAUTION

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

RECOMMENDED OPERATING RANGE:

Parameter	Symbol	Min	Max	UNIT
Supply Voltage	V _{IN}	2.5	36	V
Output current	I _{OUT}	0	150	mA
Operating Temperature	T _{OPT}	-40	85	°C

Thermal Information

Thermal Metric	Symbol	Min	Max	UNIT
Junction-to-ambient thermal resistance	R _{θJA}	185.6	165	°C/W
Junction-to-case(top)thermal resistance	R _{θJC(top)}	104.3	88.5	°C/W
Junction-to-board thermal resistance	R _{θJB}	54.5	39.6	°C/W
Junction-to-top characterization parameter	ψ _{JT}	31	26.5	°C/W
Junction-to-board characterization parameter	ψ _{JB}	54.5	49.7	°C/W
Junction-to-case(bottom)thermal resistance	R _{θJC(bot)}	N/A	77.7	°C/W

ELECTRICAL CHARACTERISTICS(3.3V):

($V_{OUT}=3.3V, V_{IN}=V_{OUT}+2V, C_{IN}=C_{OUT}=1\mu F, T_A=25^{\circ}C$, unless otherwise specified.)

Symbol	Parameter	Conditions	MIN	TYP	MAX	Units
V_{IN}	Input Voltage	$V_{OUT}=3.3V$			36	V
V_{OUT}	Output Voltage Accuracy	$I_{OUT}=10mA$	-2		+2	%
I_Q	Ground Pin Current	No Load				
I_{LIM}	Current Limit	$V_{IN}=V_{OUT}+2V$		150		mA
V_{DROP}	Dropout Voltage ⁽¹⁾	$I_{OUT}=50mA, \Delta V_O=5\%$		254		mV
S_{LINE}	Line Regulation	$V_{IN}=V_{OUT}+2V$ to 36V, $I_{OUT}=1mA$	0.04	0.08	0.2	%/V
S_{LOAD}	Load Regulation	$V_{IN}=V_{OUT}+2V$, $I_{OUT}=1mA$ to 150mA		14	33	mV
PSRR	Power Supply Rejection Ratio	$I_{OUT}=10mA$ $f=217Hz$		50		dB
		$f=1KHz$		40		
T_C	Output Voltage Temperature Coefficient	$I_{OUT}=10mA, T_A=-40\sim 120^{\circ}C$		100		ppm/ $^{\circ}C$
T_{SD}	Thermal Shutdown Temperature	Shutdown, temperature increasing		150		$^{\circ}C$

Note:

- $V_{IN} \geq V_{OUT}$, whichever is greater.
- Maximum output current is affected the PCB layout, size of metal trace, the thermal conduction path between metal layers, ambient temperature and other environment factors of system. Attention should be paid to dropout voltage when $V_{IN} < V_{OUT} + V_{DROP}$.
- The dropout voltage is defined as $V_{IN} - V_{OUT}$, when $V_{OUT} = 95\% \cdot V_{OUT}(NOW)$.
- Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature rang.

TYPICAL OPERATING CHARACTERISTICS:

(Tested under $T_J = 25^{\circ}\text{C}$, unless otherwise specified)

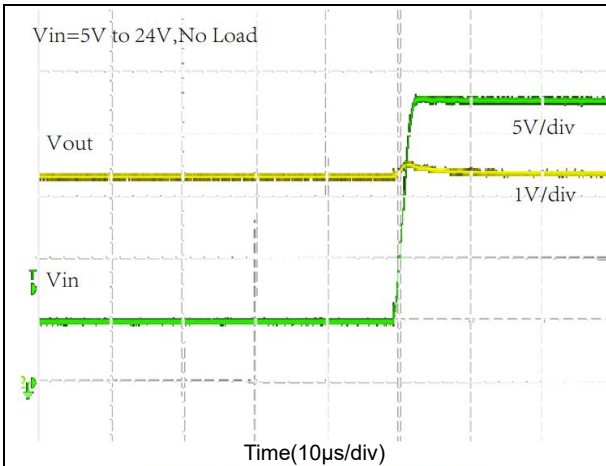


Figure 1 Line-Transient Response

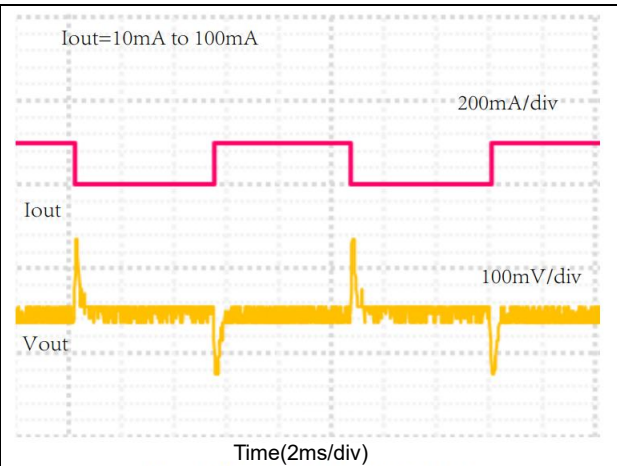


Figure 2 Load-Transient Response

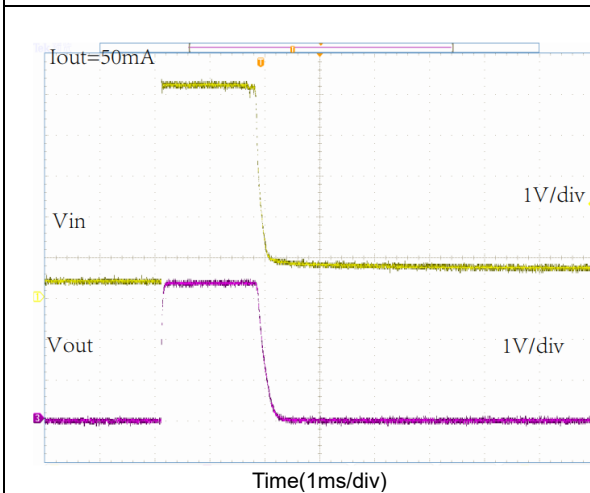


Figure 3 Power-Up/Power-Down Output Waveform

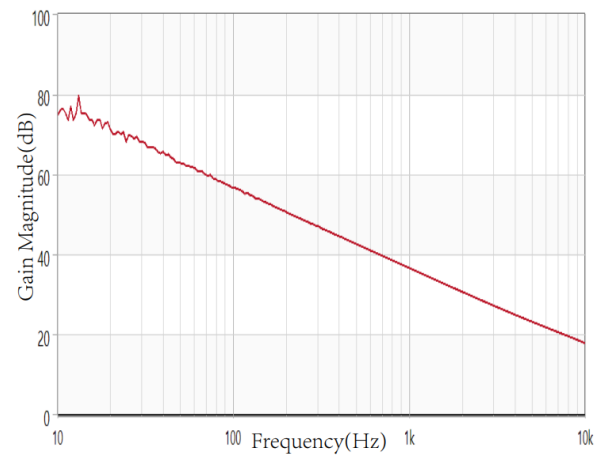


Figure 4 PSRR

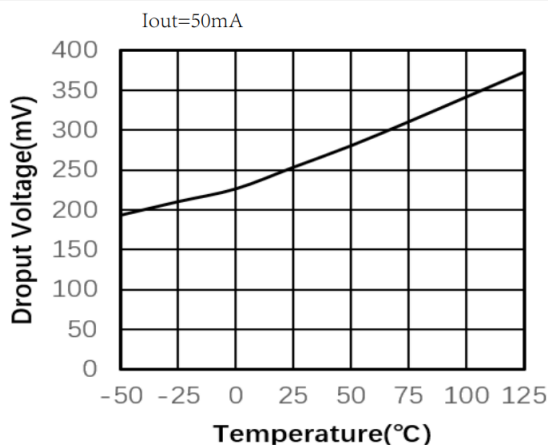


Figure 5 Dropout Voltage vs Temperature

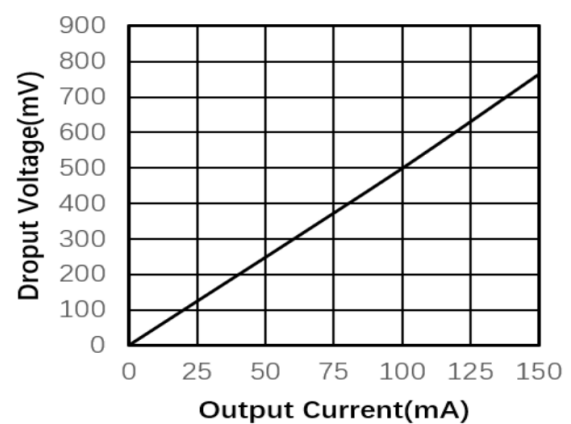


Figure 6 Dropout Voltage vs Output Current

TYPICAL OPERATING CHARACTERISTICS:

($V_{in}=5.3V, V_{OUT}=3.3V, C_{IN}=C_{OUT}=1\mu F$, Tested under $T_J = 25^\circ C$, unless otherwise specified)

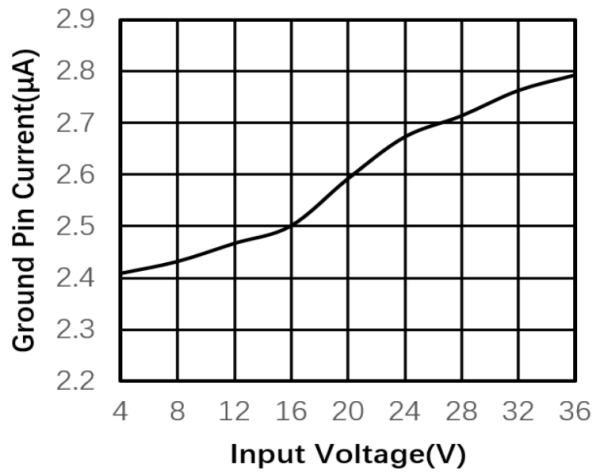


Figure 7 Ground Pin Current vs Input Voltage

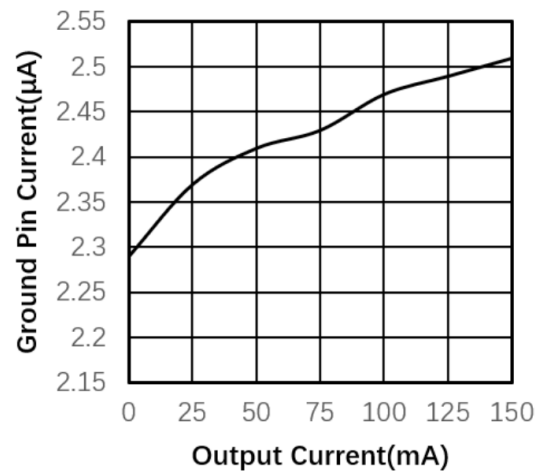
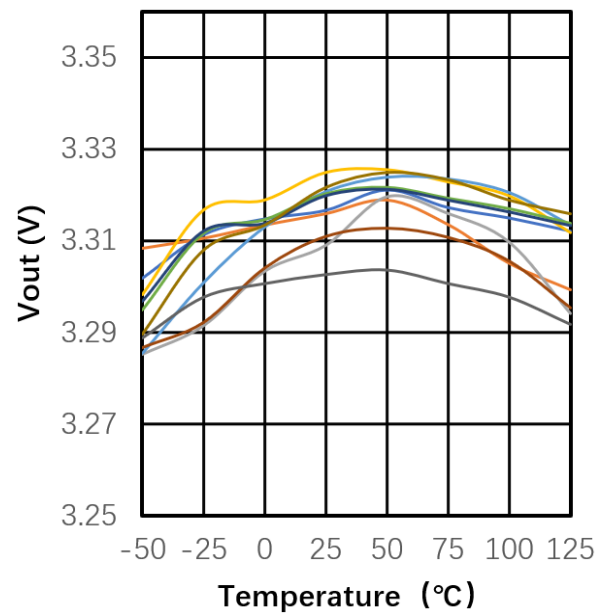
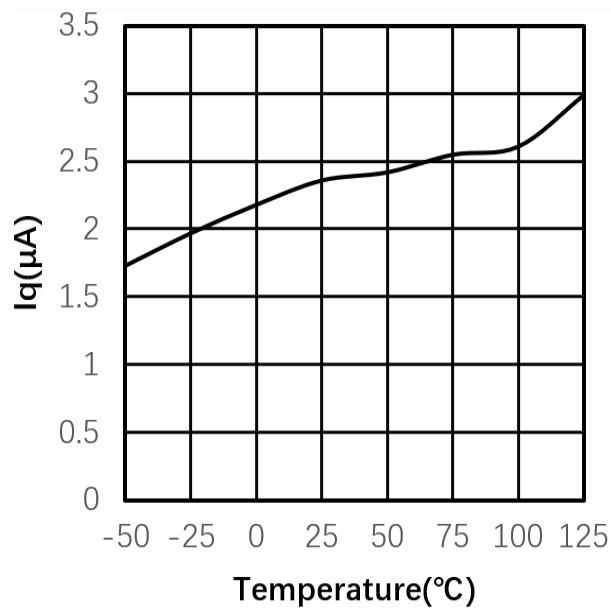


Figure 8 Ground Pin Current vs output current

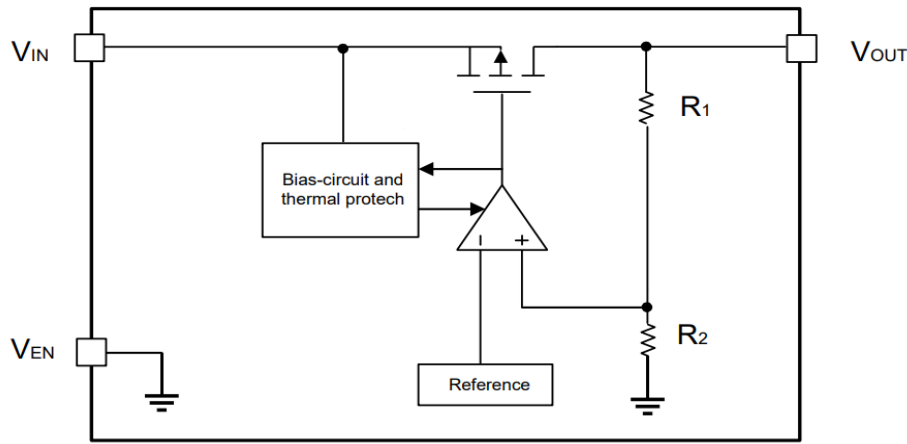


DETAILED DESCRIPTION:

Overview

The GS7533/GS7533S low-dropout regulators (LDO) consumes only 2μA of quiescent current at light load and delivers excellent line and load transient performance. These characteristics, combined with low noise and good PSRR with low dropout voltage, make this device ideal for portable consumer applications.

Functional Block Diagram



Thermal Considerations

When the junction temperature is too high, the thermal protection circuitry sends a signal to the control logic that will shut down the IC. The IC will restart when the temperature has sufficiently cooled down. The maximum power dissipation is dependent on the thermal resistance of the case and the circuit board, the temperature difference between the die junction and the ambient air, and the rate of air flow. The GND pin must be connected to the ground plane for proper dissipation.

Note:

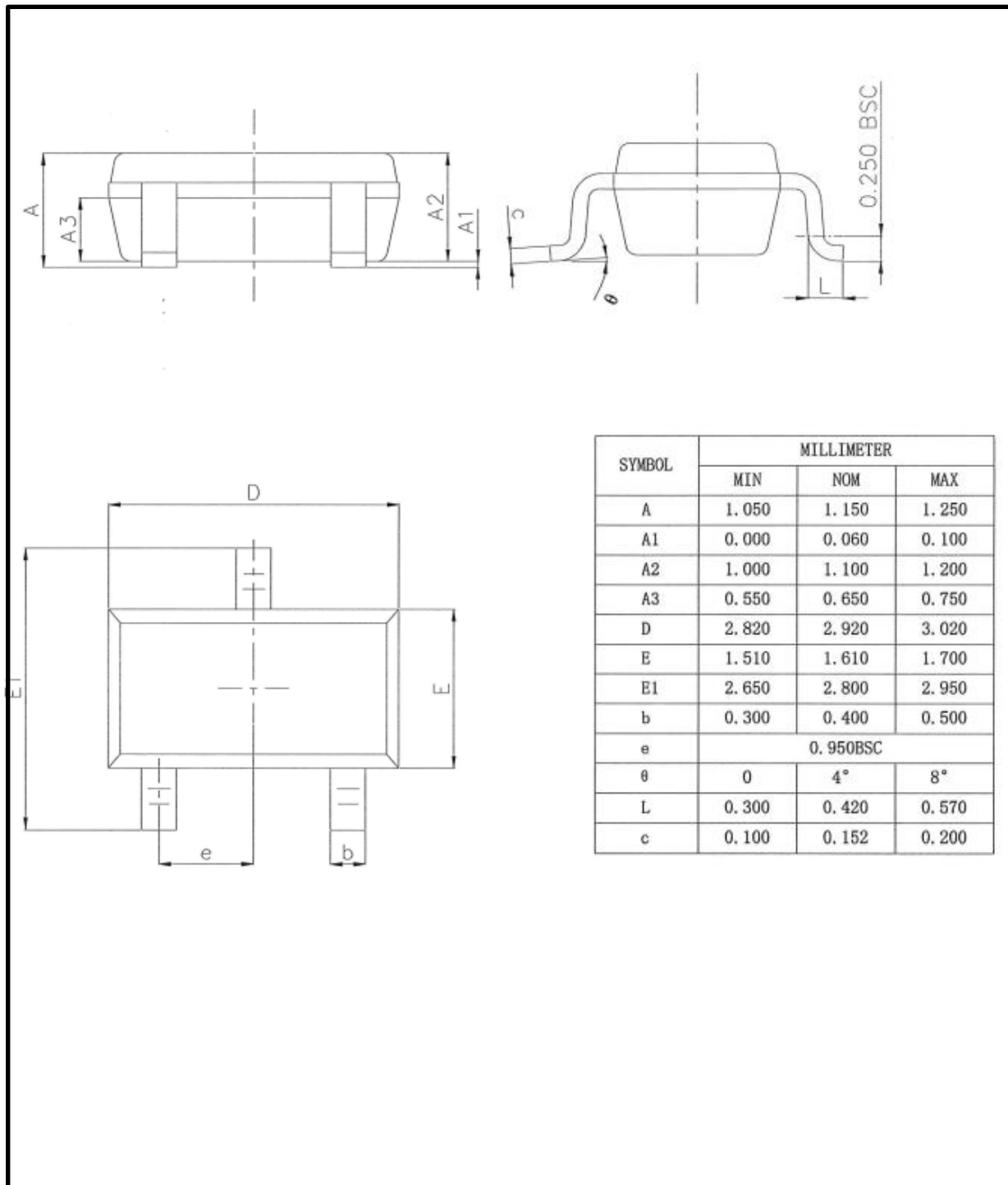
- [1] The phase compensation circuit and ESR of the output capacitor are used inside the circuit to compensate, so a capacitor larger than 1μF must be connected to the ground.
- [2] It is recommended to use 1μF polar capacitors for input and output, and to keep the capacitors as close to the V_{IN} and V_{OUT} pins of LDO as possible.
- [3] Pay attention to the use conditions of input and output voltages and load currents to avoid the power consumption (P_D) inside the IC exceeding the maximum power consumption allowed by the package.

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$$

$$T_J = P_D \times R_{\theta JA} + T_A$$

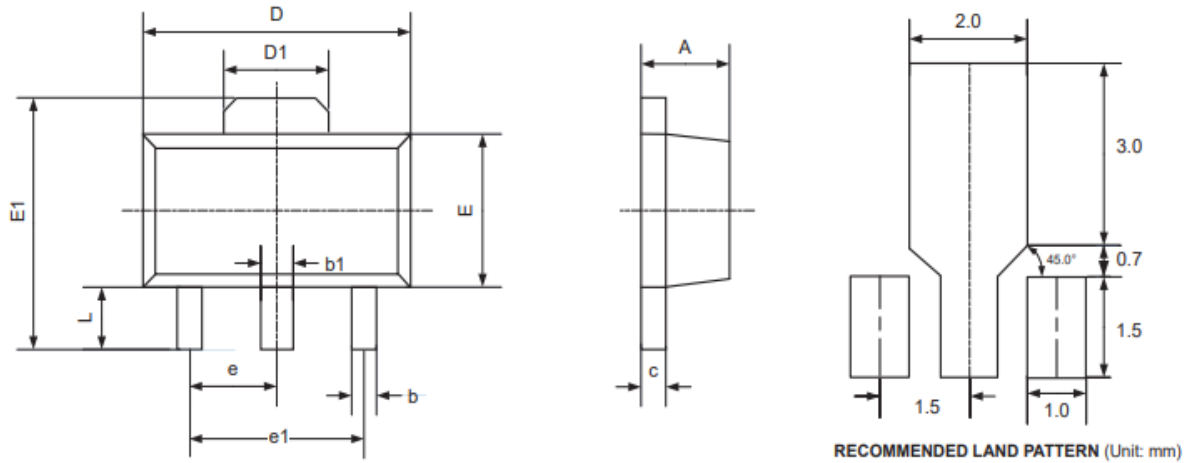
- [4] When the input voltage V_{IN} is greater than 2.5V, if V_{IN} is also higher than the output set value plus the device dropout voltage, V_{OUT} is equal to the set value. Otherwise, V_{OUT} is equal to V_{IN} minus the dropout voltage. If V_{IN} lower than 2.5V, the V_{OUT} is:

$$V_{OUT} = V_{IN} - V_{Dropout}$$

PACKAGE OUTLINE:
SOT23-3 Package


PACKAGE OUTLINE:

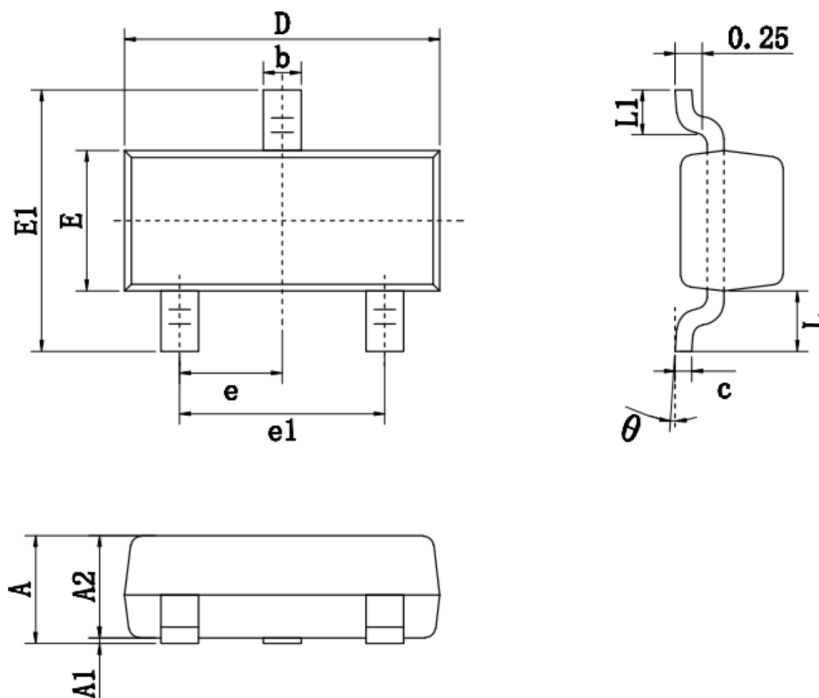
SOT89-3 Package



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TPY		0.060 TPY	
e1	3.000 TPY		0.118 TPY	
L	0.900	1.200	0.035	0.047

PACKAGE OUTLINE:

SOT23-3 Package (GS7533S)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.15
A1	0.00	—	0.10
A2	0.90	0.95	1.05
b	0.30	0.35	0.40
c	0.152 TYP		
D	2.85	2.90	2.95
E	1.25	1.30	1.35
E1	2.25	2.40	2.55
e	0.95 TYP.		
e1	1.80	1.90	2.00
L	0.55 REF.		
L1	0.30	—	0.50
θ	0°	—	8°