GS7533

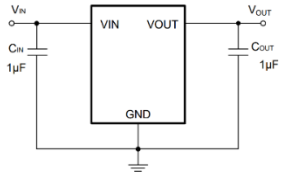
Low Power Consumption High Voltage CMOS LDO Regulator

GENERAL DESCRIPTION

The GS7533 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 series only 2μA (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



FEATURES

- Low Quiescent Current IQ: 2μA Typical at Light Loads
- 150mA Nominal Output Current
- Low Dropout Voltage
- Low Temperature Coefficient
- High Input Voltage (up to 36V)
- Output Voltage Accuracy: ±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 Computers

ORDERING INFORMATION:

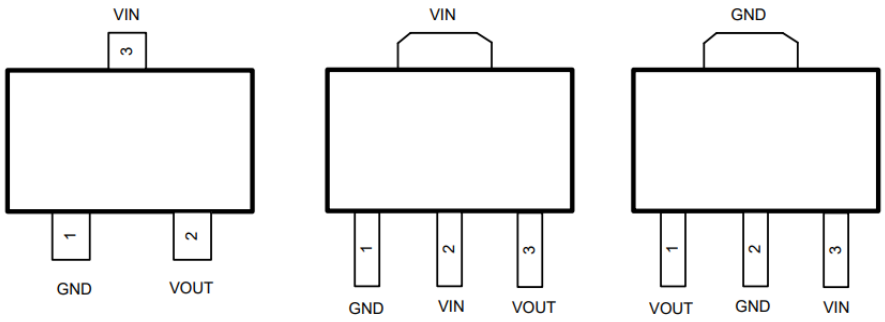
Part Number	Package	Ordering Number	Packing Option
GS7533	SOT23-3	GS7533-XXTR3	Tape and Real，3000
	SOT89-3L(Pin2-VIN)	GS7533-XXSTR3	Tape and Real，3000
	SOT89-3L(Pin2-GND)	GS7533Y-XXSTR3	

Note： “xx”represents the type of voltage value.

Order Information:

Pin			Name	Function
SOT23-3	SOT89-3L (Pin2-VIN)	SOT89-3L (Pin2-GND)		
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.

Pin description:



SOT23-3 SOT89-3L(Pin2-VIN) SOT89-3L(Pin2-GND)

ABSOLUTE MAXIMUM RATINGS：

Parameter	Symbol	Min	Max	Unit
VIN to GND	V_{IN}	-0.3	40	V
Junction Temperature	T_J	-40	150	℃
Power Dissipation @T_A=25℃	P_D	Internally Limited		W
Storage Temperature Range	T_{STG}	-65	150	℃

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.

RECOMMANDED 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	℃

THERMAL INFORMATION:

Thermal Metric	Symbol	Min	Max	Unit
Junction-to-ambient thermal resistance	$R_{\theta JA}$	185.6	165	℃/W
Junction-to-case(top)thermal resistance	$R_{\theta JC(top)}$	104.3	88.5	℃/W
Junction-to-board thermal resistance	$R_{\theta JB}$	54.5	39.6	℃/W
Junction-to-top characterization parameter	Ψ_{JT}	31	26.5	℃/W
Junction-to-board characterization parameter	Ψ_{JB}	54.5	49.7	℃/W
Junction-to-case(bottom)thermal resistance	$R_{\theta JC(bot)}$	N/A	77.7	℃/W

ELECTRICAL CHARACTERISTICS(3.3V):

(V_{OUT}=3.3V,V_{IN}=V_{OUT}+2V, C_{IN}= C_{OUT}=1uF, T_A =25℃, unless otherwise specified.)

Symbol	Parameter	Conditions		Min	TYP	Max	Unit
V_{IN}	Input Voltage[1]	V_{OUT}=3.3V				36	V
V_{OUT}	Output Voltage Accuracy	I_{OUT}= 10mA		-2	0	+2	%
I_Q	Ground Pin Current[2]	No Load			2	3	μA
I_{LIM}	Current Limit	V_{IN}= V_{OUT}+2V			150		mA
V_{DROP}	Dropout Voltage[3]	I_{OUT}=50mA， ΔV_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			254	373	mV
PSRR	Power Supply Rejection Ratio	I_{OUT}=10 mA	f=217Hz		50		dB
			f=1KHz		40		
T_C	Output Voltage Temperature Coefficient[4]	I_{OUT}=10mA, T_A=-40~120℃			100		ppm/℃
T_{SD}	Thermal Shutdown Temperature	Shutdown, temperature increasing			150		℃

Note:

1. V_{in}>=V_{out},whichever is greater.
2. 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}.
3. The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =95%*$V_{OUT(NOW)}$.
4. Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.

TYPICAL OPERATING CHARACTERISTICS:

（V_{in}=5.3V,V_{OUT}=3.3V,C_{IN}=C_{OUT}=1μF, Tested under T_J =25°C, unless otherwise specified）

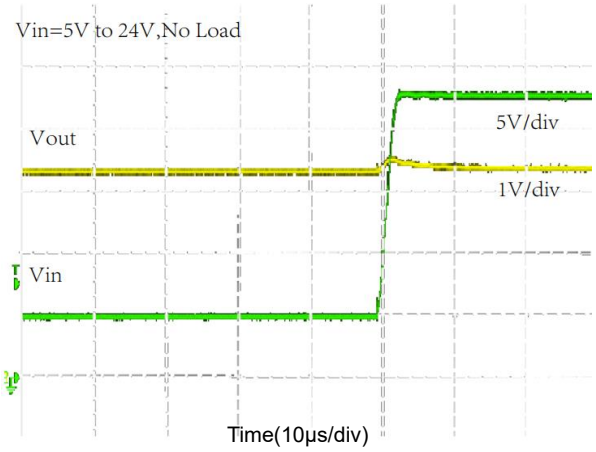


Figure 1 Line-Transient Response

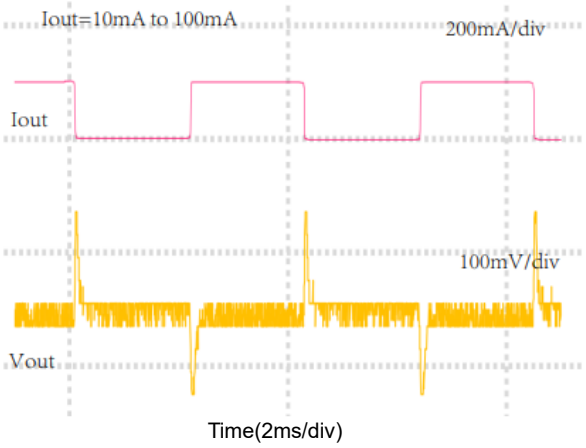


Figure 2 Load-Transient Response

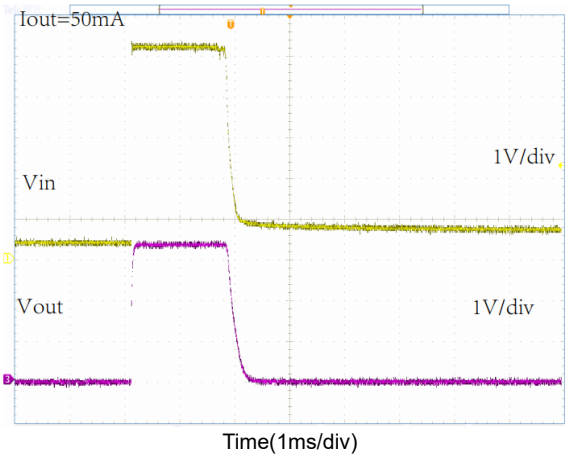


Figure 3 Power-Up/Power-Down Output Waveform

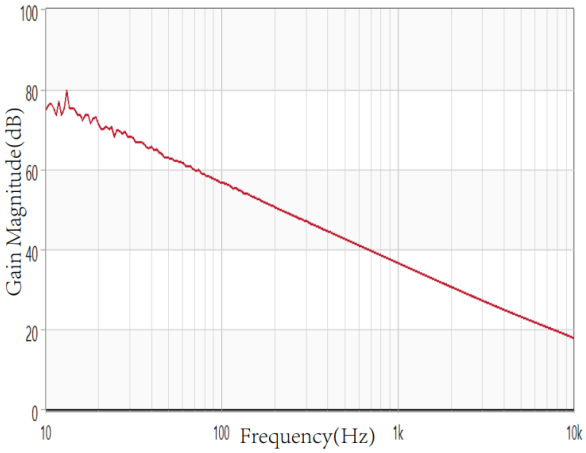


Figure 4 PSRR

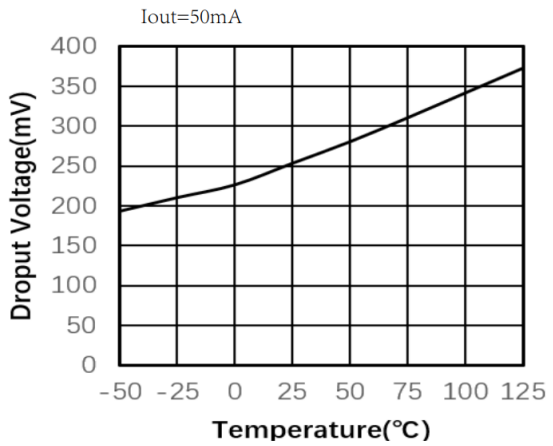


Figure 5 Dropout Voltage vs Temperature

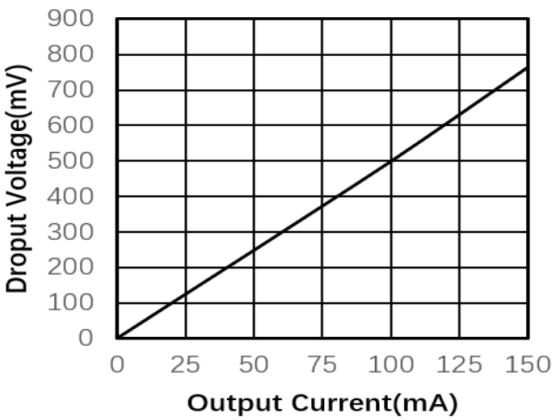


Figure 6 Dropout Voltage vs Output Current

TYPICAL OPERATING CHARACTERISTICS:

（V_{in}=5.3V,V_{OUT}=3.3V,C_{IN}=C_{OUT}=1μF, Tested under T_J =25°C, unless otherwise specified）

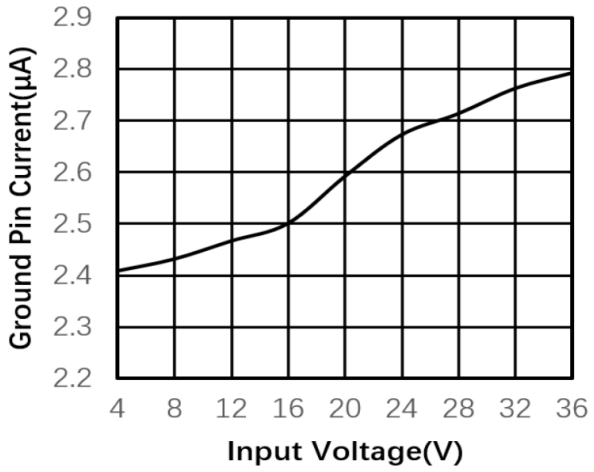


Figure 7 Ground Pin Current vs Input Voltage

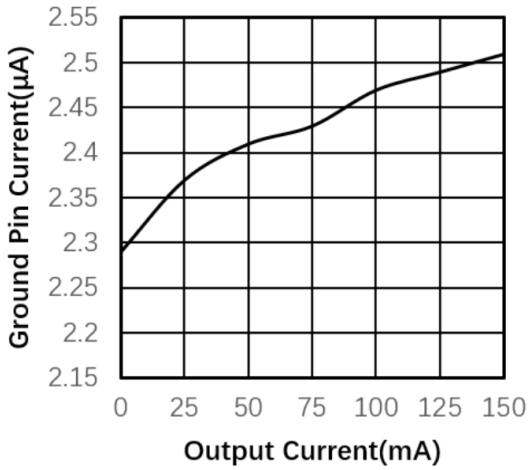


Figure 8 Ground Pin Current vs output curent

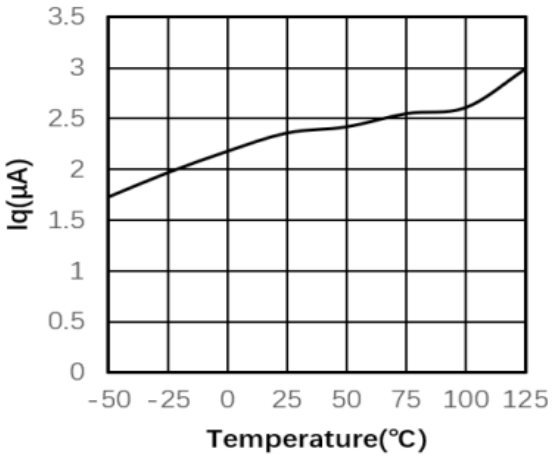


Figure 9 Iq vs Temperature

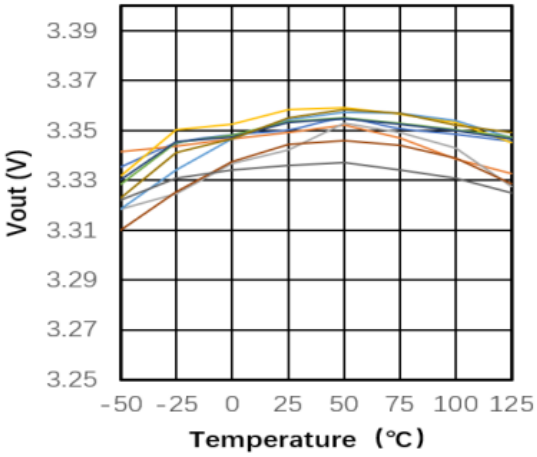


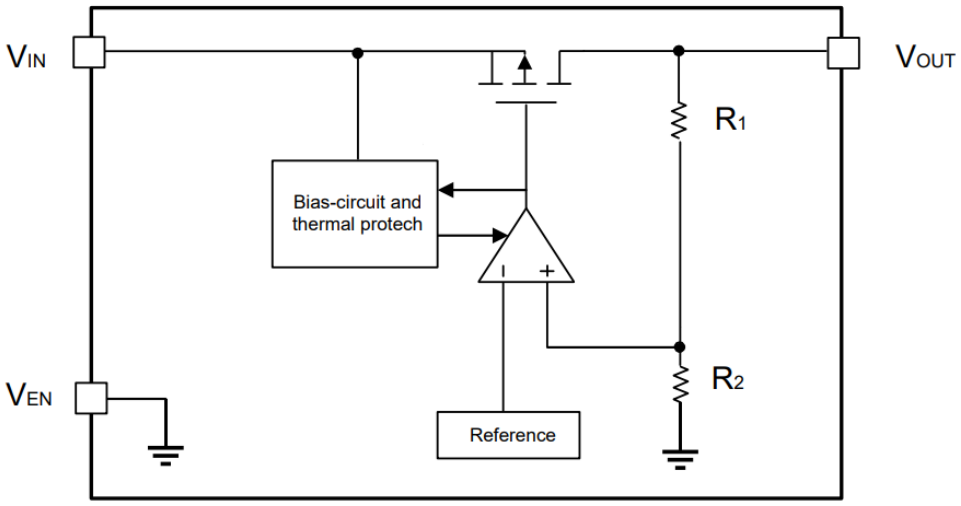
Figure 10 Vout vs Temperature

DETAILED DESCRIPTION:

Overview

The GS7533 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.

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

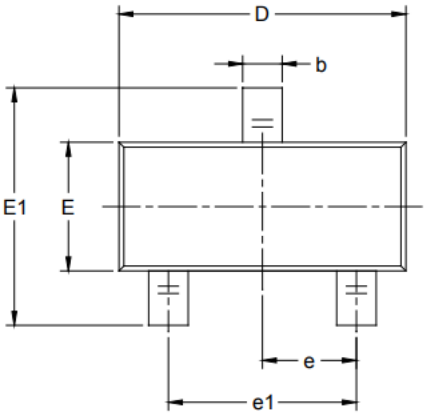
$$T_J = P_D \times R_{\theta JA} + T_A$$

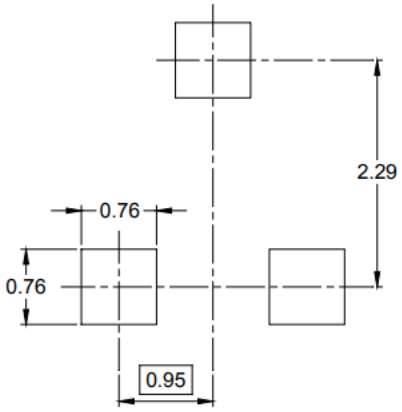
[4] When the input voltage VIN is greater than 2.5V, if V_{IN} is also higher than the output set value plus the device dropout voltage, V_{OUT} is equal to the set value. Otherwise, V_{OUT} is equal to V_{IN} minus the dropout voltage. If V_{IN} lower than 2.5V, the V_{OUT} is:

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

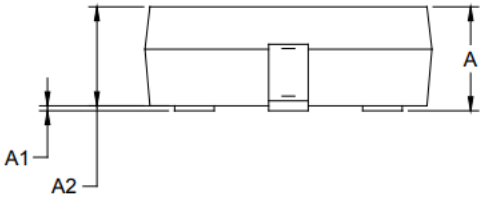
PACKAGE OUTLINE:

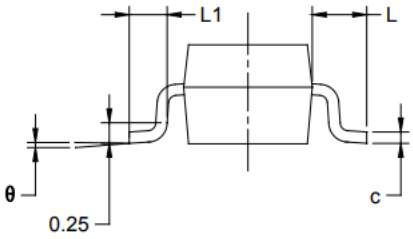
SOT23 Package





RECOMMENDED LAND PATTERN (Unit: mm)

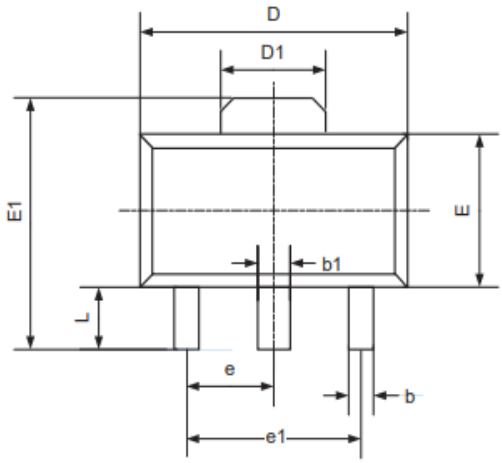


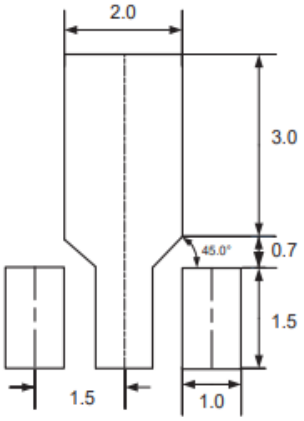


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

PACKAGE OUTLINE:

SOT89-3 Package





RECOMMENDED LAND PATTERN (Unit: mm)

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

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