SGM2013
300mA, Low Power, Low Dropout 3-Terminal, Linear Regulators

GENERAL DESCRIPTIO

The SGM2013 low-power, low-dropout, CMOS linear voltage regulators operate from a 2.5V to 5.5V input and deliver up to 300mA. They are perfect choice for low voltage, low power applications. An ultra low ground current (200μA at 300mA output) makes them attractive for battery operated power systems. The SGM2013 series also offer ultra low dropout voltage (300mV at 300mA output) to prolong battery life in portable electronics

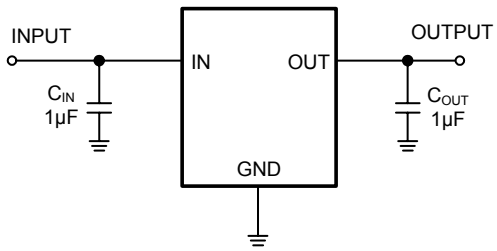
The output voltage is preset to voltages in the range of 1.8V to 3.3V. Other features include foldback current limit and thermal shut-down protection.

SGM2013 come in 3-pin SOT23 and 3-pin SOT89 packages.

APPLICATIONS

Cellular Telephones
Digital Cameras
MP3、MP4
USB 2.0
Modems
PC Cameras
Hand-Held Instruments
Electronic Dictionarys
Portable/Battery-Powered Equipment

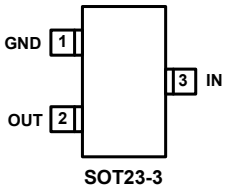
TYPICAL OPERATION CIRCUIT



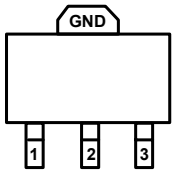
FEATURES

- **Ultra-Low Dropout Voltage:**
  300mV at 300mA Output
- **Low 77μA No-Load Supply Current**
- **Low 200μA Operating Supply Current**
  at 300mA Output
- **High PSRR**
- **Thermal-Overload Protection**
- **Output Current Limit**
- **Output Voltage:**
  Available in Fixed Outputs 1.8V, 2.5V, 2.7V, 2.8V, 2.9V, 3.0V and 3.3V

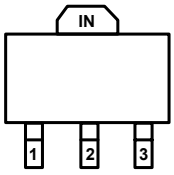
PIN CONFIGURATIONS (TOP VIEW)



SOT23-3



SOT89-3



SOT89-3(L-Type)

PIN DESCRIPTION

NAME	FUNCTION
IN	Regulator Input. Supply voltage can range from 2.5V to 5.5V.
GND	Ground.
OUT	Regulator Output.

PACKAGE/ORDERING INFORMATION

MODEL	V_{OUT} (V)	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM2013-1.8	1.8V	SOT23-3	- 40℃ to +125℃	SGM2013-1.8XN3/TR	XD18	Tape and Reel, 3000
		SOT89-3		SGM2013-1.8XK3/TR	SGM2013-1.8XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-1.8XK3L/TR	SGM2013-1.8XK3L	Tape and Reel, 1000
SGM2013-2.5	2.5V	SOT23-3	- 40℃ to +125℃	SGM2013-2.5XN3/TR	XD25	Tape and Reel, 3000
		SOT89-3		SGM2013-2.5XK3/TR	SGM2013-2.5XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-2.5XK3L/TR	SGM2013-2.5XK3L	Tape and Reel, 1000
SGM2013-2.7	2.7V	SOT23-3	- 40℃ to +125℃	SGM2013-2. 7XN3/TR	XD27	Tape and Reel, 3000
		SOT89-3		SGM2013-2. 7XK3/TR	SGM2013-2. 7XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-2. 7XK3L/TR	SGM2013-2. 7XK3L	Tape and Reel, 1000
SGM2013-2.8	2.8V	SOT23-3	- 40℃ to +125℃	SGM2013-2.8XN3/TR	XD28	Tape and Reel, 3000
		SOT89-3		SGM2013-2.8XK3/TR	SGM2013-2.8XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-2.8XK3L/TR	SGM2013-2.8XK3L	Tape and Reel, 1000
SGM2013-2.9	2.9V	SOT23-3	- 40℃ to +125℃	SGM2013-2.9XN3/TR	XD29	Tape and Reel, 3000
		SOT89-3		SGM2013-2.9XK3/TR	SGM2013-2.9XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-2.9XK3L/TR	SGM2013-2.9XK3L	Tape and Reel, 1000
SGM2013-3.0	3.0V	SOT23-3	- 40℃ to +125℃	SGM2013-3.0XN3/TR	XD30	Tape and Reel, 3000
		SOT89-3		SGM2013-3.0XK3/TR	SGM2013-3.0XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-3.0XK3L/TR	SGM2013-3.0XK3L	Tape and Reel, 1000
SGM2013-3.3	3.3V	SOT23-3	- 40℃ to +125℃	SGM2013-3.3XN3/TR	XD33	Tape and Reel, 3000
		SOT89-3		SGM2013-3.3XK3/TR	SGM2013-3.3XK3	Tape and Reel, 1000
		SOT89-3(L-Type)		SGM2013-3.3XK3L/TR	SGM2013-3.3XK3L	Tape and Reel, 1000

ABSOLUTE MAXIMUM RATINGS

IN to GND.....- 0.3V to 6V
Output Short-Circuit Duration.....Infinite
OUT to GND.....- 0.3V to (V_{IN} + 0.3V)
Power Dissipation, P_D @ T_A = 25℃
SOT23-3 .....0.4W
SOT89-3 .....0.571W
Package Thermal Resistance
SOT23-3, θ_{JA}..... 250℃/W
SOT89-3, θ_{JA}.....175℃/W

Operating Temperature Range.....- 40℃ to +125℃
Junction Temperature.....150℃
Storage Temperature.....- 65℃ to +150℃
Lead Temperature (soldering, 10s).....260℃
ESD Susceptibility
HBM.....4000V
MM.....400V

Stresses beyond 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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

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.

ELECTRICAL CHARACTERISTICS

(V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V [1], T_A = - 40℃ to +125℃. Typical values are at T_A = + 25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			2.5		5.5	V
Output Voltage Accuracy [1]		I_{OUT} =1mA to 300mA, T_A = +25℃ V_{OUT} + 0.5V ≤ V_{IN} ≤ 5.5V		-3		+3	%
Maximum Output Current				300			mA
Current Limit	I_{LIM}			310	750		mA
Ground Pin Current	I_Q	No load			77	220	μA
		I_{OUT} = 300mA			200		
Dropout Voltage [2]		I_{OUT} = 1mA			0.8		mV
		I_{OUT} = 300mA			300	380	
Line Regulation [1]	ΔV_{LNR}	V_{IN} = 2.5V or (V_{OUT} + 0.5V) to 5.5V, I_{OUT} = 1mA			0.03	0.15	%/V
Load Regulation	ΔV_{LDR}	I_{OUT} = 0.1mA to 300mA, C_{OUT} = 1μF			0.0008	0.002	%/mA
Power Supply Rejection Rate	PSRR	I_{LOAD} = 50mA, C_{OUT} = 1μF	f = 100Hz		75		dB
			f = 1kHz		53		dB
THERMAL PROTECTION							
Thermal Shutdown Temperature	T_{SHDN}				160		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}				15		℃

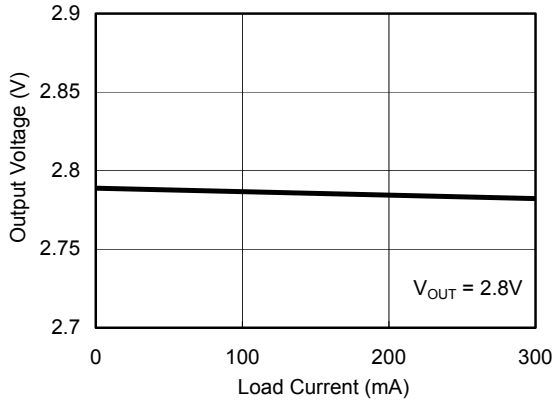
Specifications subject to change without notice.

Note 1: V_{IN} = $V_{OUT(NOMINAL)}$ + 0.5V or 2.5V, whichever is greater.
Note 2: The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} is 100mV below the value of V_{OUT} for V_{IN} = V_{OUT} + 0.5V. (Only applicable for V_{OUT} = +2.5V to +5.0V.)

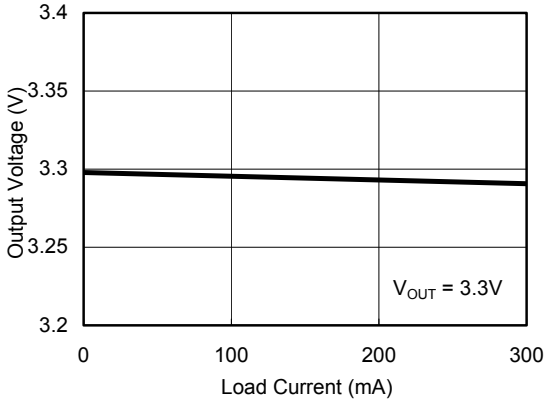
TYPICAL OPERATING CHARACTERISTICS

V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, T_A = +25℃, unless otherwise noted.

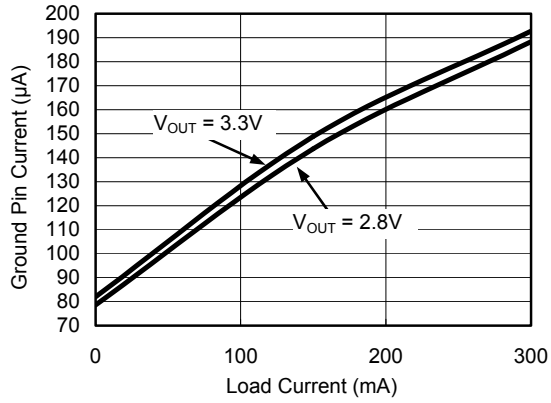
Output Voltage vs. Load Current



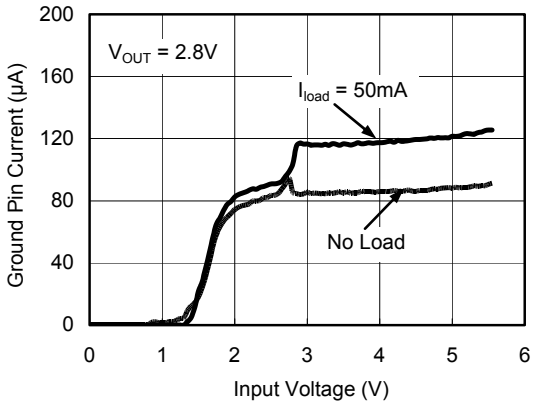
Output Voltage vs. Load Current



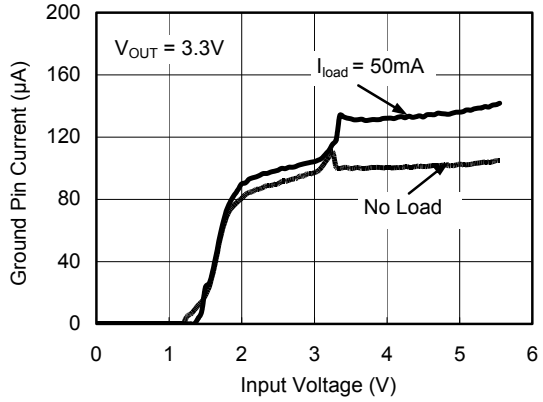
Ground Pin Current vs. Load Current



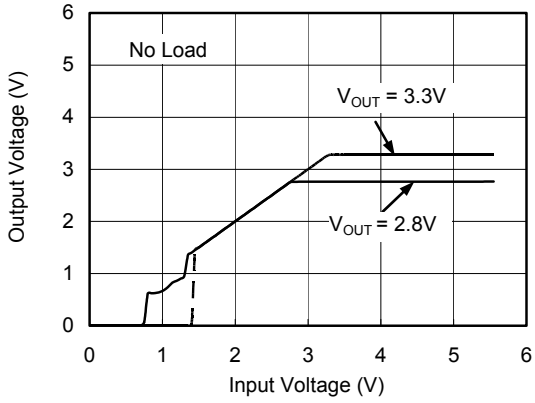
Ground Pin Current vs. Input Voltage



Ground Pin Current vs. Input Voltage



Output Voltage vs. Input Voltage



TYPICAL OPERATING CHARACTERISTICS

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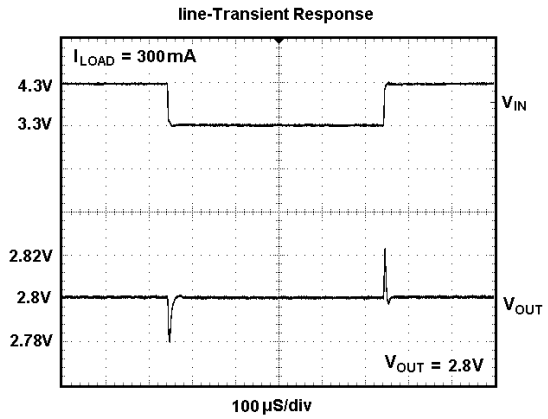

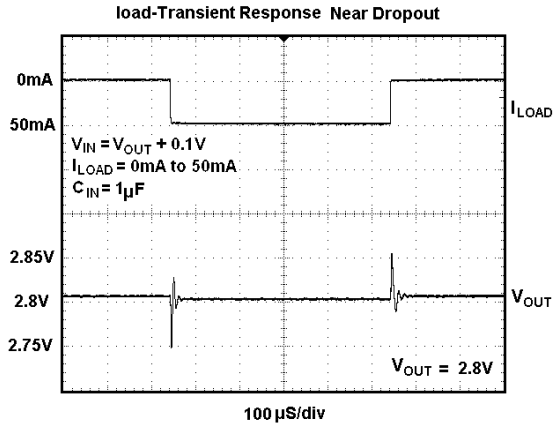

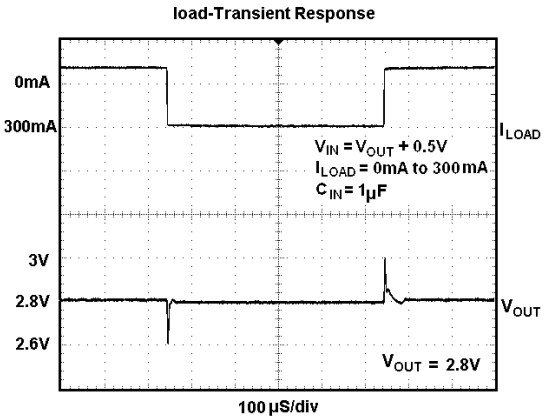

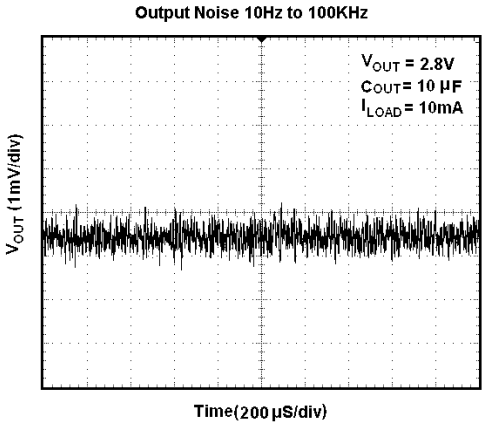

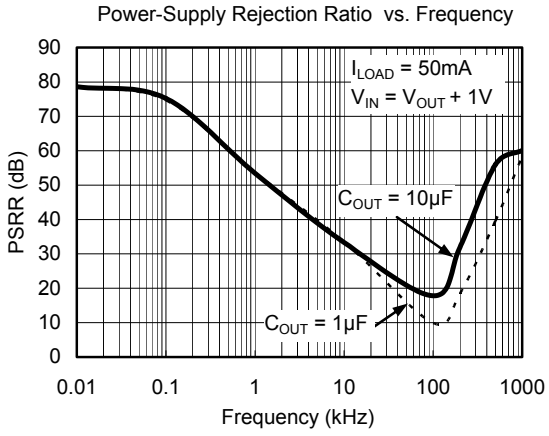

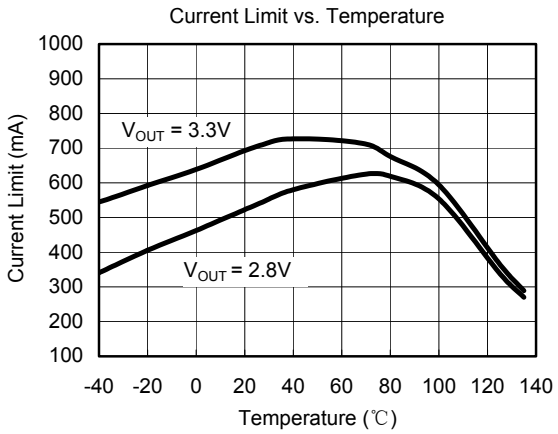

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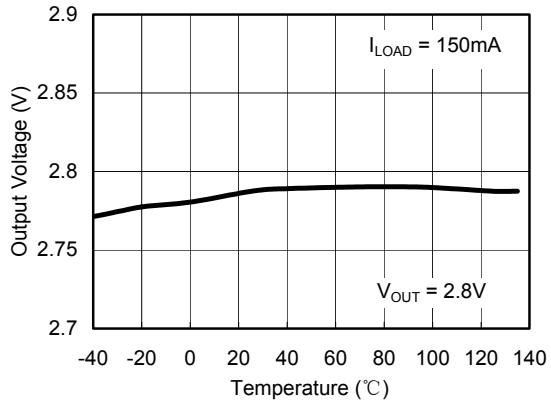
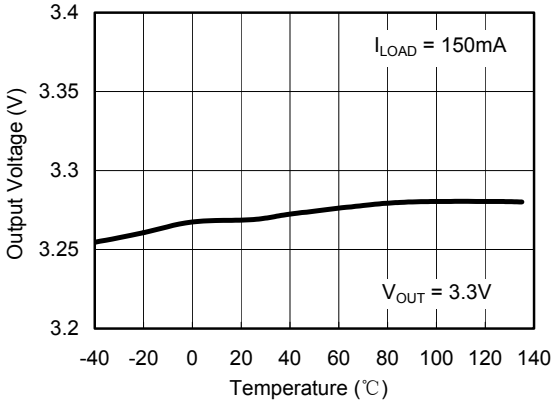
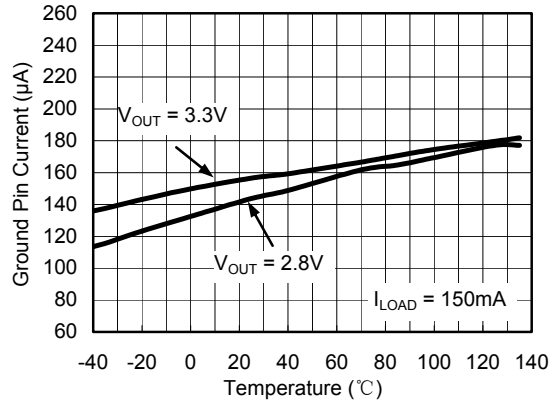
Output Voltage vs. Temperature



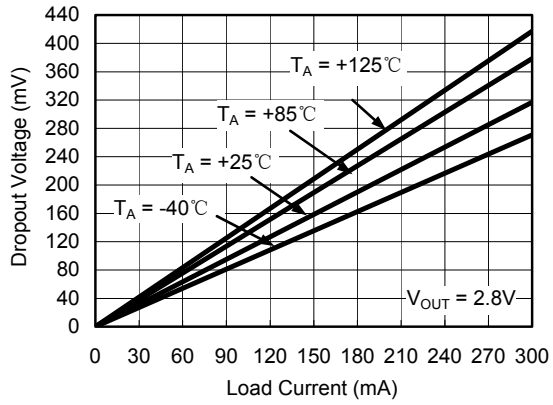
Output Voltage vs. Temperature



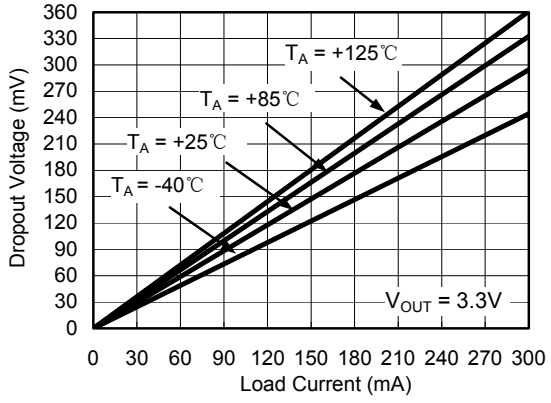
Ground Pin Current vs. Temperature



Dropout Voltage vs. Load Current

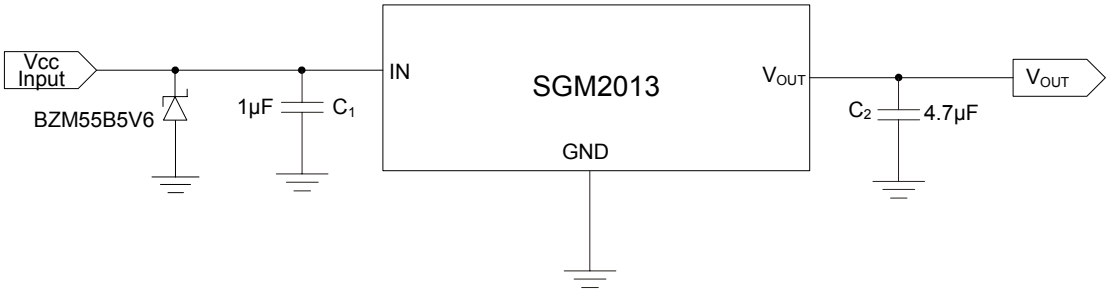


Dropout Voltage vs. Load Current



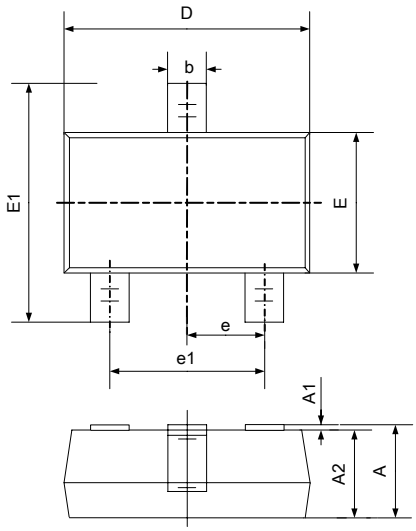
APPLICATION NOTES

When LDO is used in handheld products, attention must be paid to voltage spikes which could damage SGM2013. In such applications, voltage spikes will be generated at charger interface and V_{BUS} pin of USB interface when charger adapters and USB equipments are hot-plugged. Besides this, handheld products will be tested on the production line without battery. Test engineer will apply power from the connector pin which connects with positive pole of the battery. When external power supply is turned on suddenly, the voltage spikes will be generated at the battery connector. The voltage spikes will be very high, and it always exceeds the absolute maximum input voltage (6.0V) of LDO. In order to get robust design, design engineer needs to clear up this voltage spike. Zener diode is a cheap and effective solution to eliminate such voltage spike. For example, BZM55B5V6 is a 5.6V small package Zener diode which can be used to remove voltage spikes in cell phone designs. The schematic is shown below.



PACKAGE OUTLINE DIMENSIONS

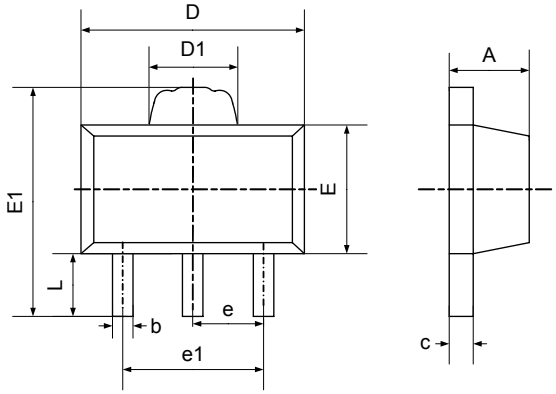
SOT23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

SOT89-3



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	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500TYP		0.060TYP	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043

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