Not Recommend for New Design
Recommend SGM2019

SGM2006/A
Low Power, Low Dropout, 150mA, RF - Linear Regulators

GENERAL DESCRIPTION

The SGM2006/A series low-power, low-noise, low-dropout, CMOS linear voltage regulators operate from a 2.5V to 5.5V input and deliver up to 150mA. They are the perfect choice for low voltage, low power applications. An ultra low ground current (150μA at 150mA output) makes this part attractive for battery operated power systems. The SGM2006/A series also offer ultra low dropout voltage (150mV at 150mA output) to prolong battery life in portable electronics. Systems requiring a quiet voltage source, such as RF applications, will benefit from the SGM2006/A series' ultra low output noise ($30\mu V_{RMS}$) and high PSRR. An external noise bypass capacitor connected to the device's BP pin can further reduce the noise level.

The output voltage is preset to voltages in the range of 1.5V to 5.0V. Other features include a 10nA logic-controlled shutdown mode, foldback current limit and thermal shut- down protection.

Devices come in Green SOT-23-5 package.

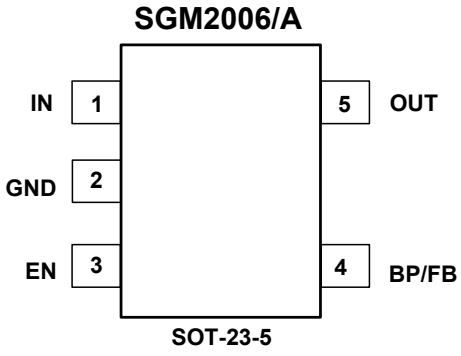
APPLICATIONS

Cellular Telephones
Cordless Telephones
PHS Telephones
PCMCIA Cards
Modems
MP3 Player
Hand-Held Instruments
Palmtop Computers
Electronic Planners
Portable/Battery-Powered Equipment

FEATURES

- **Low Output Noise: $30\mu V_{RMS}$ TYP (10Hz to 100kHz)**
- **Ultra-Low Dropout Voltage:**
  150mV at 150mA Output
- **Low 77μA No-Load Supply Current**
- **Low 150μA Operating Supply Current**
  at 150mA Output
- **High PSRR: 73dB at 1kHz**
- **Thermal-Overload Protection**
- **Output Current Limit**
- **Preset Output Voltages (±2.7% Accuracy)**
- **10nA Logic-Controlled Shutdown**
- **Available in Multiple Output Voltage Versions**
  Fixed Outputs of 1.8V, 2.5V, 2.7V, 2.8V, 2.85V, 2.9V, 3.0V, 3.3Vand 3.6V
  Adjustable Output from 1.5V to 5.0V

PIN CONFIGURATION (TOP VIEW)



PACKAGE/ORDERING INFORMATION

MODEL	V_{OUT}(V)	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM2006-1.8	1.8V	SOT-23-5	-40℃ to +125℃	SGM2006-1.8XN5/TR	X618	Tape and Reel, 3000
SGM2006-2.5	2.5V	SOT-23-5	-40℃ to +125℃	SGM2006-2.5XN5/TR	X625	Tape and Reel, 3000
SGM2006-2.7	2.7V	SOT-23-5	-40℃ to +125℃	SGM2006-2.7XN5/TR	X627	Tape and Reel, 3000
SGM2006-2.8	2.8V	SOT-23-5	-40℃ to +125℃	SGM2006-2.8XN5/TR	X628	Tape and Reel, 3000
SGM2006-2.85	2.85V	SOT-23-5	-40℃ to +125℃	SGM2006-2.85XN5/TR	X62J	Tape and Reel, 3000
SGM2006-2.9	2.9V	SOT-23-5	-40℃ to +125℃	SGM2006-2.9XN5/TR	X629	Tape and Reel, 3000
SGM2006-3.0	3.0V	SOT-23-5	-40℃ to +125℃	SGM2006-3.0XN5/TR	X630	Tape and Reel, 3000
SGM2006-3.3	3.3V	SOT-23-5	-40℃ to +125℃	SGM2006-3.3XN5/TR	X633	Tape and Reel, 3000
SGM2006-3.6	3.6V	SOT-23-5	-40℃ to +125℃	SGM2006-3.6XN5/TR	X636	Tape and Reel, 3000
SGM2006A	adjustable	SOT-23-5	-40℃ to +125℃	SGM2006-XN5/TR	X6AA	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

IN to GND.....-0.3V to 6V

Output Short-Circuit Duration .....Infinite

EN to GND.....-0.3V to V_{IN}

OUT, BP/FB to GND.....-0.3V to (V_{IN} + 0.3V)

Power Dissipation, P_D @ T_A = 25℃

SOT-23-5 .....0.4W

Package Thermal Resistance

SOT-23-5, θ_{JA}..... 250℃/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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the last datasheet.

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	IN	Regulator Input. Supply voltage can range from 2.5V to 5.5V. Bypass with a 1μF capacitor to GND.
2	GND	Ground.
3	EN	Shutdown Input. A logic low reduces the supply current to 10nA. Connect to IN for normal operation.
4	BP	Reference-Noise Bypass (fixed voltage version only). Bypass with a low-leakage 0.01μF ceramic capacitor for reduced noise at the output.
4	FB	Adjustable voltage version only—this is used to set the output voltage of the device.
5	OUT	Regulator Output.

ELECTRICAL CHARACTERISTICS

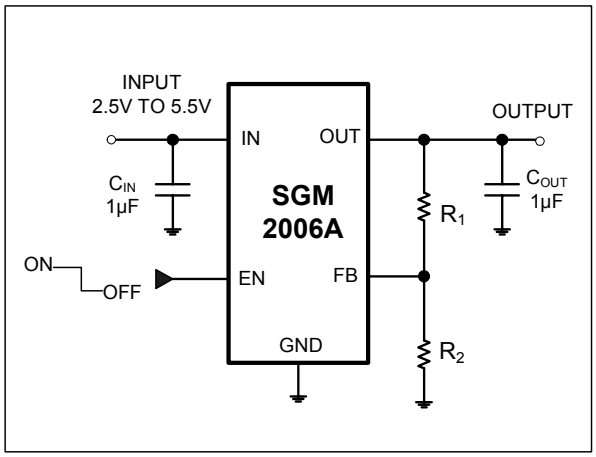
(V_{IN} = $V_{OUT\ (NOMINAL)}$ + 0.5V [1], T_A = -40℃ to +125℃. Typical values are at T_A = + 25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			2.5		5.5	V
Output Voltage Accuracy [1]		I_{OUT} =1mA to 150mA, T_A = +25℃ V_{OUT} + 0.5V ≤ V_{IN} ≤ 5.5V		-2.7		+2.7	%
Maximum Output Current				150			mA
Current Limit	I_{LIM}			160	600		mA
Ground Pin Current	I_Q	No load, EN = 2V			77	145	μA
		I_{OUT} = 150mA, EN = 2V			150		
Dropout Voltage [2]		I_{OUT} = 1mA			1		mV
		I_{OUT} = 150mA			150	190	
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 150mA, C_{OUT} = 1μF			0.0008	0.002	%/mA
Output Voltage Noise	e_n	f = 10Hz to 100kHz, C_{BP} = 0.01μF, C_{OUT} = 10μF			30		μV_{RMS}
Power Supply Rejection Rate	PSRR	C_{BP} = 0.1μF, I_{LOAD} = 50mA, C_{OUT} = 1μF	f = 100Hz		78		dB
			f = 1kHz		73		dB
SHUTDOWN							
EN Input Threshold	V_{IH}	V_{IN} = 2.5V to 5.5V		2.0			V
	V_{IL}					0.4	
EN Input Bias Current	$I_{B(SHDN)}$	EN = 0V and EN = 5.5V	T_A = +25℃		0.01	1	μA
			T_A = +125℃		0.01		
Shutdown Supply Current	$I_{Q(SHDN)}$	EN = 0.4V	T_A = +25℃		0.01	1	μA
			T_A = +125℃		0.01		
Shutdown Exit Delay [3]		C_{BP} = 0.01μF C_{OUT} = 1μF, No load	T_A = +25℃		30		μs
THERMAL PROTECTION							
Thermal Shutdown Temperature	T_{SHDN}				160		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}				15		℃

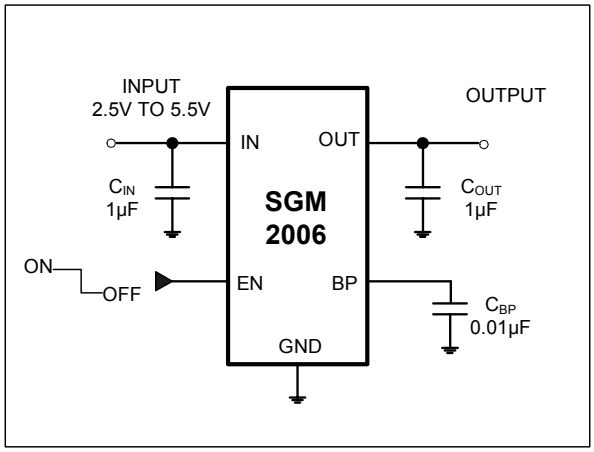
NOTES:

1. V_{IN} = $V_{OUT(NOMINAL)}$ + 0.5V or 2.5V, whichever is greater.
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.)
3. Time needed for V_{OUT} to reach 95% of final value.

TYPICAL OPERATION CIRCUIT



Adjustable Voltage Version



Fixed Voltage Version

Standard 1% Resistor Values for Common Output Voltages of Adjustable Voltage Version

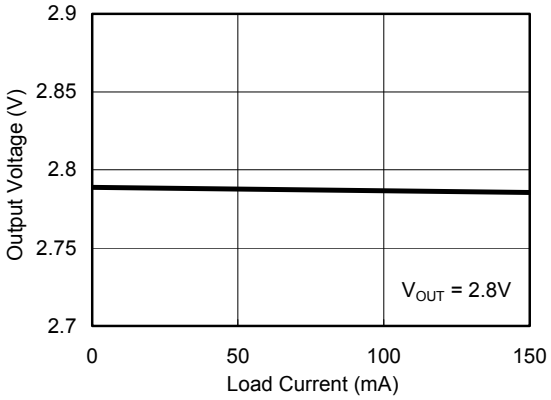
V_{OUT} (V)	R_1 (kΩ)	R_2 (kΩ)
1.5	13	61.9
1.8	28	61.9
2.5	63.4	61.9
2.7	56	47
2.8	78.7	61.9
2.85	80.6	61.9
2.9	75	56
3.0	88.7	61.9
3.3	95.3	57.6
3.6	130	68

NOTE: $V_{OUT} = (R_1 + R_2)/ R_2 \times 1.233$

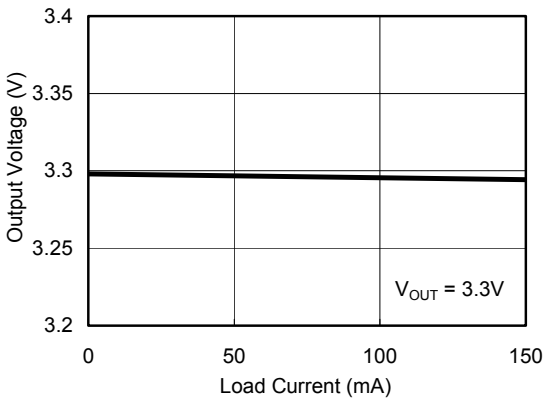
TYPICAL OPERATING CHARACTERISTICS

V_{IN} = $V_{OUT(NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, T_A = +25℃, unless otherwise noted.

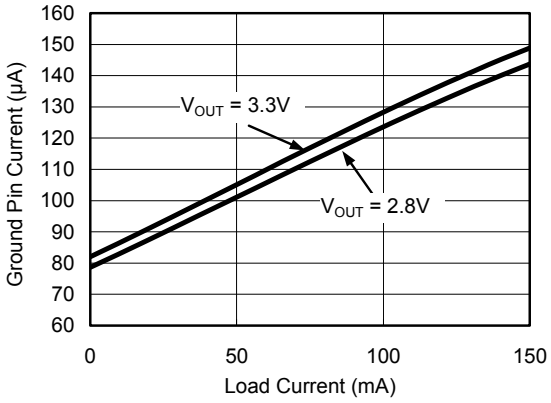
Output Voltage vs. Load Current



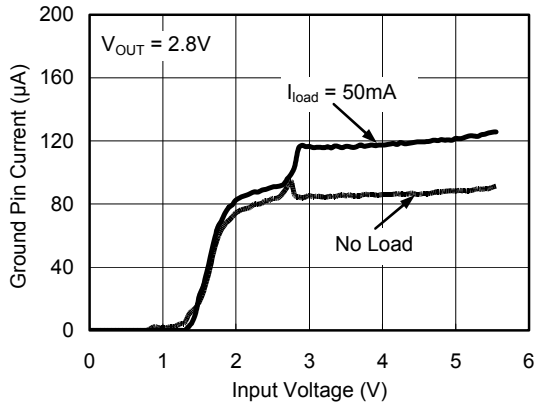
Output Voltage vs. Load Current



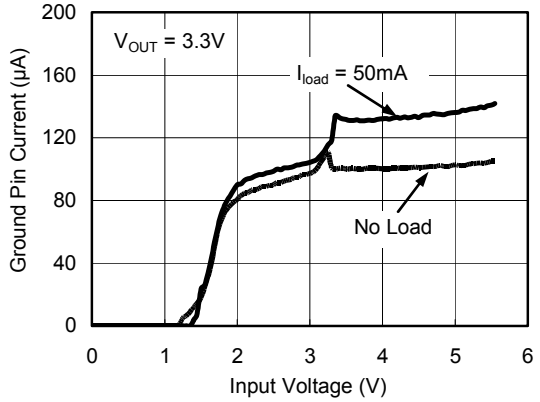
Ground Pin Current vs. Load Current



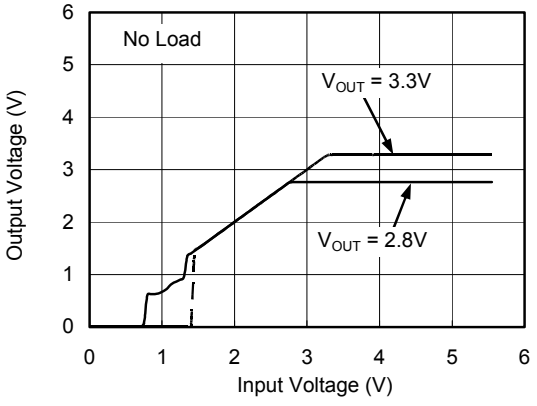
Ground Pin Current vs. Input Voltage



Ground Pin Current vs. Input Voltage



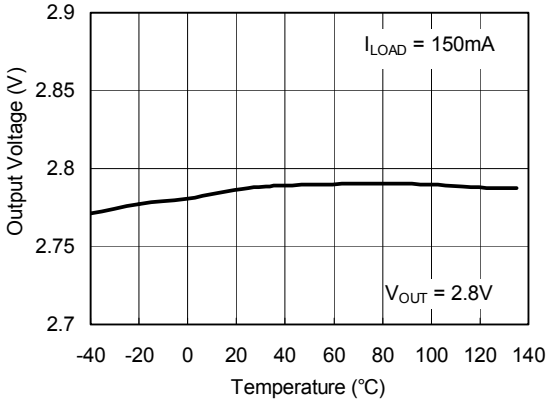
Output Voltage vs. Input Voltage



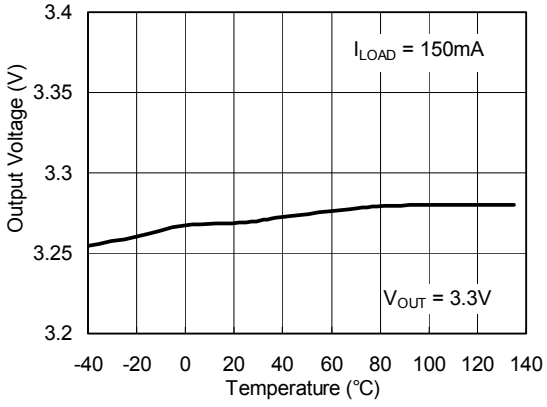
TYPICAL OPERATING CHARACTERISTICS

V_{IN} = $V_{OUT(NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, T_A = +25℃, unless otherwise noted.

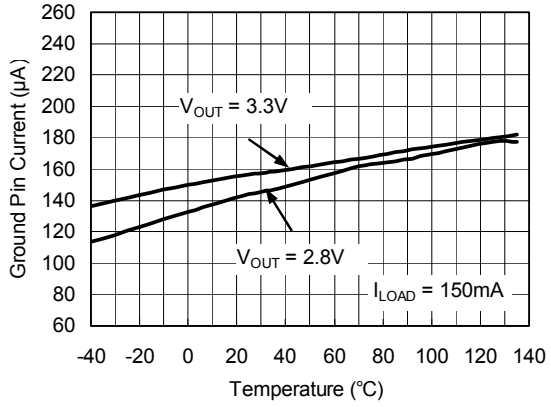
Output Voltage vs. Temperature



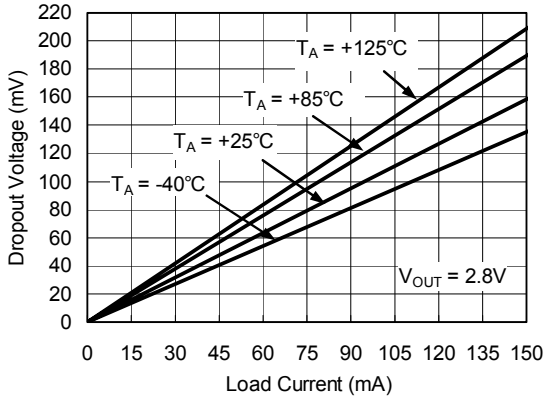
Output Voltage vs. Temperature



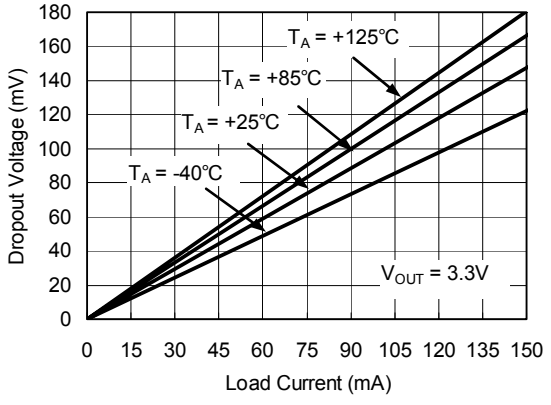
Ground Pin Current vs. Temperature



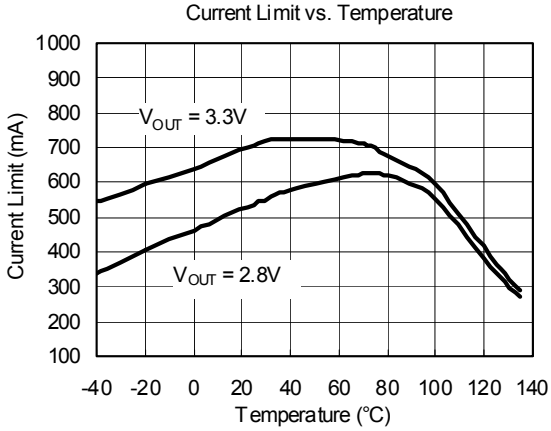
Dropout Voltage vs. Load Current



Dropout Voltage vs. Load Current



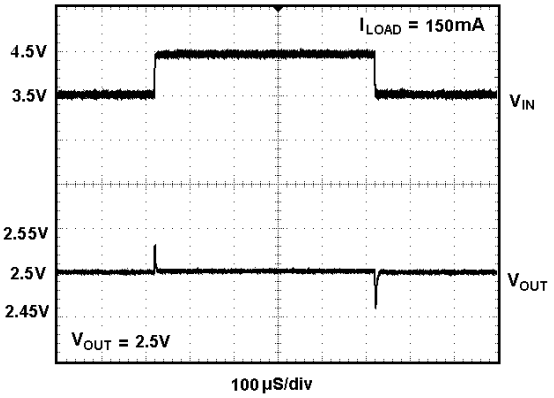
Current Limit vs. Temperature



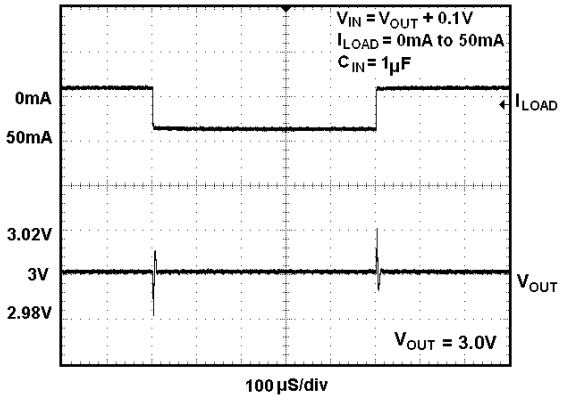
TYPICAL OPERATING CHARACTERISTICS

V_{IN} = $V_{OUT(NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, T_A = +25°C, unless otherwise noted.

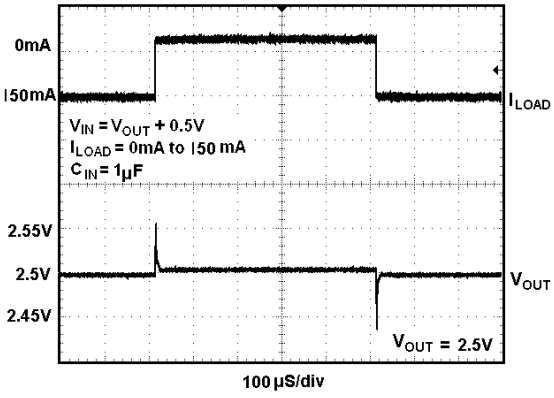
line-Transient Response



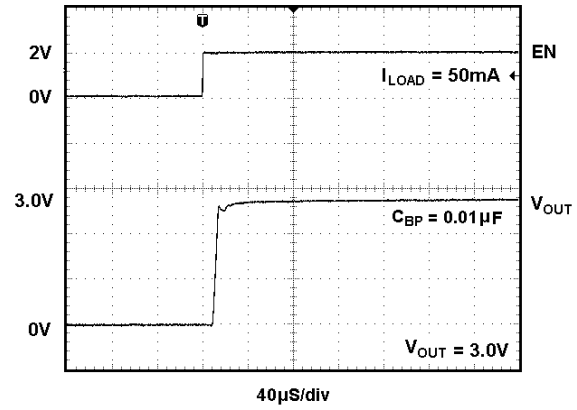
load-Transient Response Near Dropout



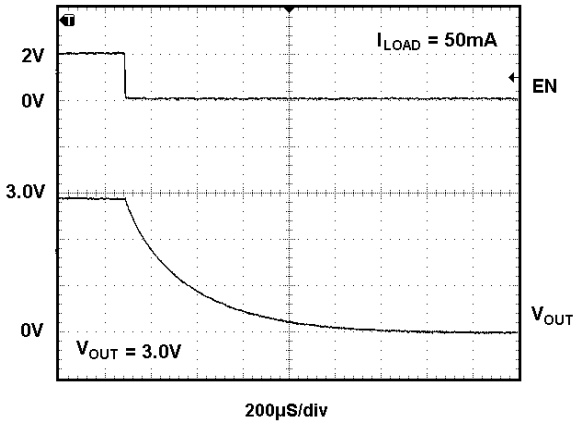
load-Transient Response



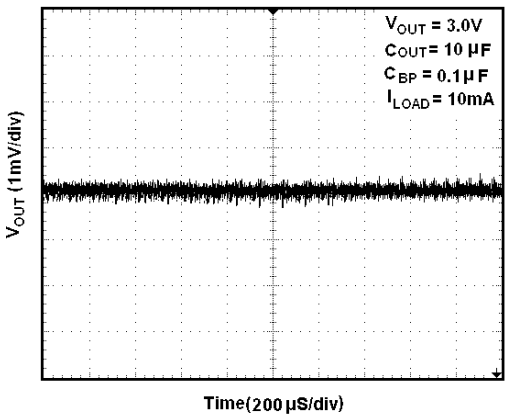
Shutdown Exit Delay



Entering Shutdown



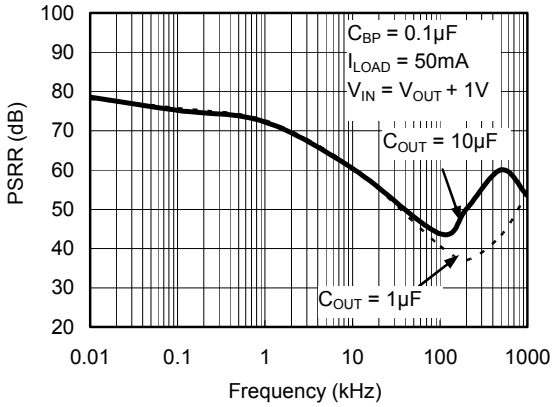
Output Noise 10Hz to 100KHz



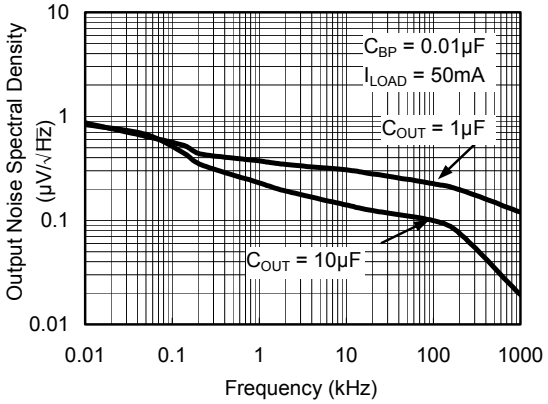
TYPICAL OPERATING CHARACTERISTICS

V_{IN} = $V_{OUT(NOMINAL)}$ + 0.5V or 2.5V (whichever is greater), C_{IN} = 1μF, C_{OUT} = 1μF, C_{BP} = 0.01μF, T_A = +25℃, unless otherwise noted.

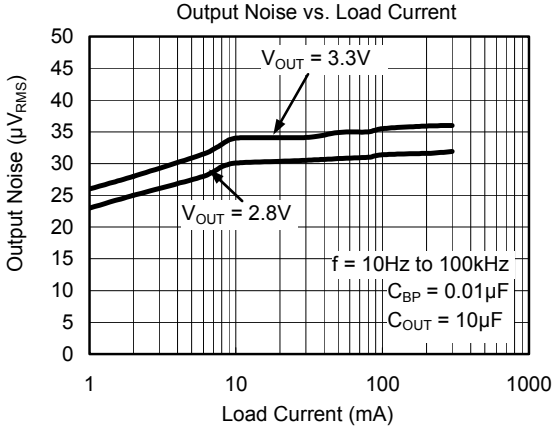
Power-Supply Rejection Ratio vs. Frequency



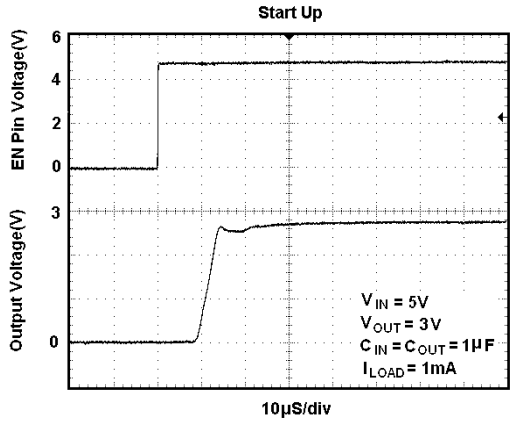
Output Noise Spectral Density vs. Frequency



Output Noise vs. Load Current

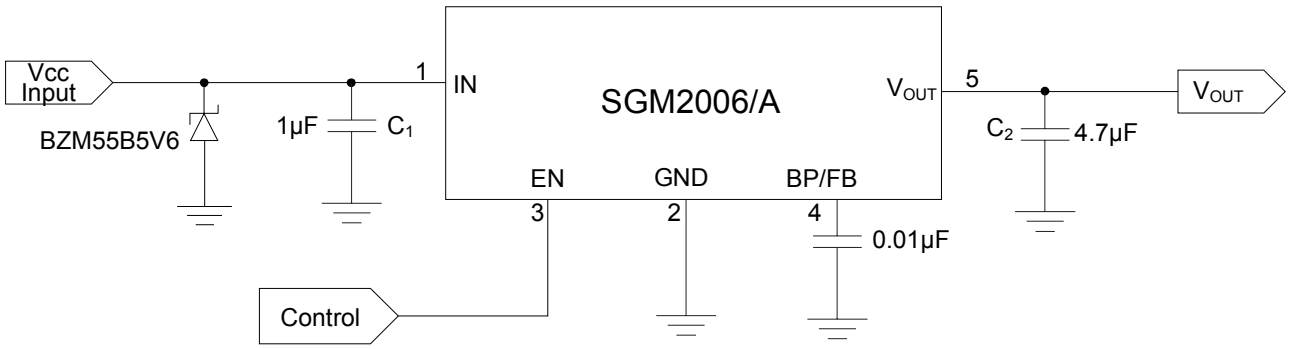


Start Up



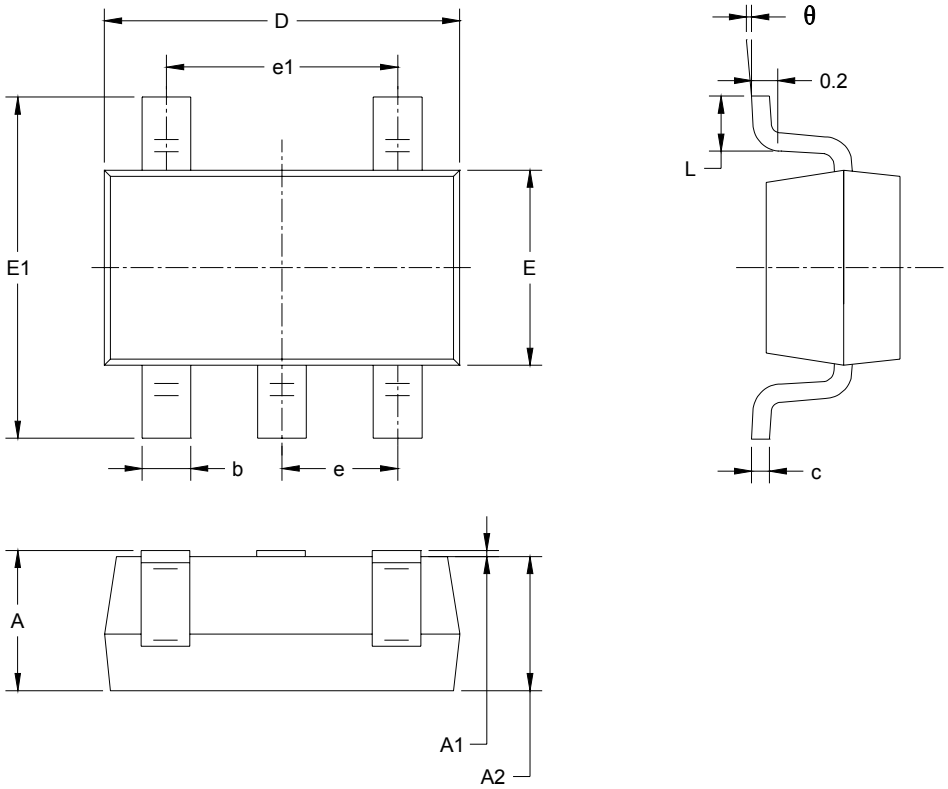
APPLICATION NOTES

When LDO is used in handheld products, attention must be paid to voltage spikes which could damage SGM2006/A. 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

SOT-23-5



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	0.500	0.012	0.020
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	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°