Low Power, Low Dropout, 300mA, RF - Linear Regulators

GENERAL DESCRIPTION

The SGM2017 series low-power, low-noise, low-dropout, CMOS linear voltage regulators operate from a 2.5V to 5.5V input and deliver up to 300mA. They are the perfect choice for low voltage, low power applications. An ultra low ground current（200μA at 300mA output) makes these part attractive for battery operated power systems. The SGM2017 series also offer ultra low dropout voltage (300mV at 300mA output) to prolong battery life in portable electronics. Systems requiring a quiet voltage source, such as RF applications, will benefit from the SGM2017 series' ultra low output noise (30μVRMS) 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 3.3V. Other features include a 10nA logic-controlled shutdown mode, foldback current limit and thermal shut-down protection.

Devices come in 5-pin SOT23 package.

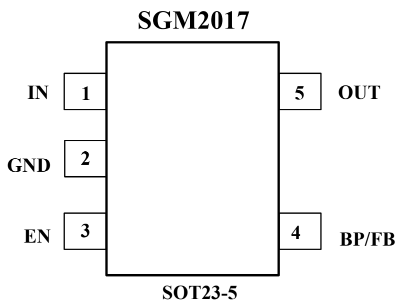
APPLICATIONS

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

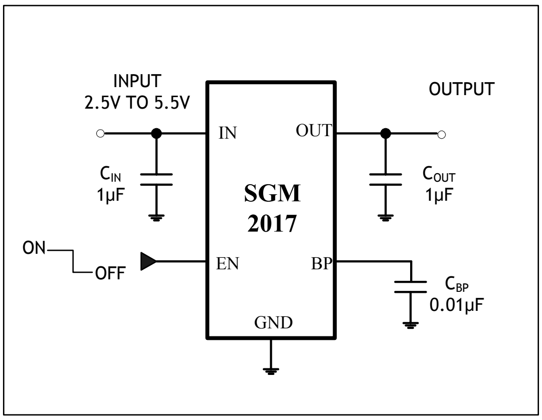
FEATURES

- **Low Output Noise: 30μVRMS typ(10Hz to 100KHz)**
- **Ultra-Low Dropout Voltage:**
  300mV at 300mA output
- **Low 77μA No-Load Supply Current**
- **Low 200μA Operating Supply Current**
  at 300mA Output
- **High PSRR (73dB at 1KHz)**
- **Thermal-Overload Protection**
- **Output Current Limit**
- **10nA Logic-Controlled Shutdown**
- **Available in Multiple Output Voltage Versions**
  Fixed Outputs of 1.8V, 2.5V, 2.8V, 3.0V and 3.3V

PIN CONFIGURATIONS（TOP VIEW）



TYPICAL OPERATION CIRCUIT



ORDERING INFORMATION

MODEL	V_{OUT}(V)	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM2017-1.8	1.8V	SOT23-5	- 40°C to +125°C	SGM2017-1.8XN5/TR	X718	Tape and Reel, 3000
SGM2017-2.5	2.5V	SOT23-5	- 40°C to +125°C	SGM2017-2.5XN5/TR	X725	Tape and Reel, 3000
SGM2017-2.8	2.8V	SOT23-5	- 40°C to +125°C	SGM2017-2.8XN5/TR	X728	Tape and Reel, 3000
SGM2017-3.0	3.0V	SOT23-5	- 40°C to +125°C	SGM2017-3.0XN5/TR	X730	Tape and Reel, 3000
SGM2017-3.3	3.3V	SOT23-5	- 40°C to +125°C	SGM2017-3.3XN5/TR	X733	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 +6V
OUT, BP/FB to GND.....................................- 0.3V to (V_{IN} + 0.3V)
Power Dissipation, P_D @ T_A = 25℃
SOT23-5 ....0.4W
Package Thermal Resistance
SOT23-5, θ_{JA}.. 250℃/W

Operating Temperature Range...........................- 40°C to +125°C
Junction Temperature..+150°C
Storage Temperature...- 65°C to +150°C
Lead Temperature (soldering, 10s).......................................260°C
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.

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°C to +125°C, unless otherwise noted. Typical values are at T_A = + 25°C.)

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°C 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, EN = 2V			77	145	μA
		I_{OUT} = 300mA, EN = 2V			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
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°C		0.01	1	μA
			T_A = +125°C		0.01		
Shutdown Supply Current	$I_{Q(SHDN)}$	EN = 0.4V	T_A = +25°C		0.01	1	μA
			T_A = +125°C		0.01		
Shutdown Exit Delay[3]		C_{BP} = 0.01μF C_{OUT} = 1μF, No load	T_A = +25°C		30		μs
THERMAL PROTECTION							
Thermal Shutdown Temperature	T_{SHDN}				160		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}				15		℃

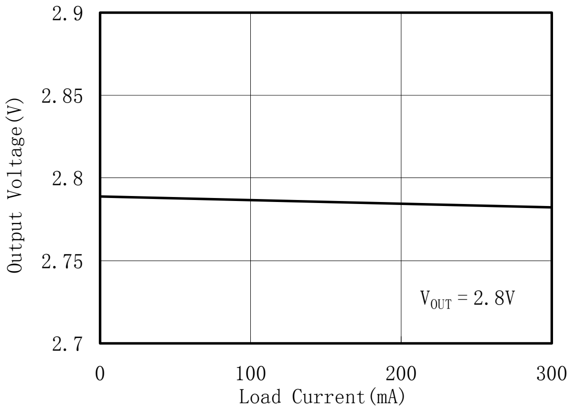
Specifications subject to change without notice.

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.)
Note 3: Time needed for VOUT to reach 95% of final value.

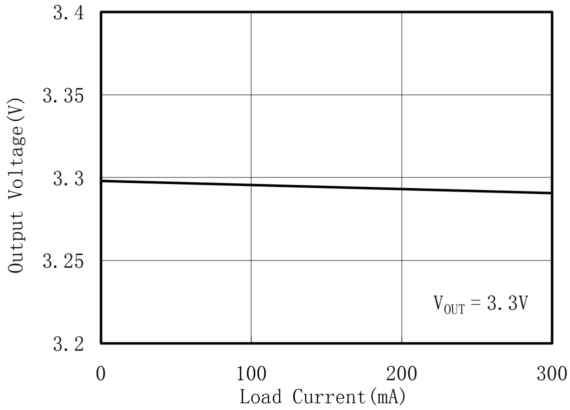
TYPICAL OPERATING CHARACTERISTICS

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

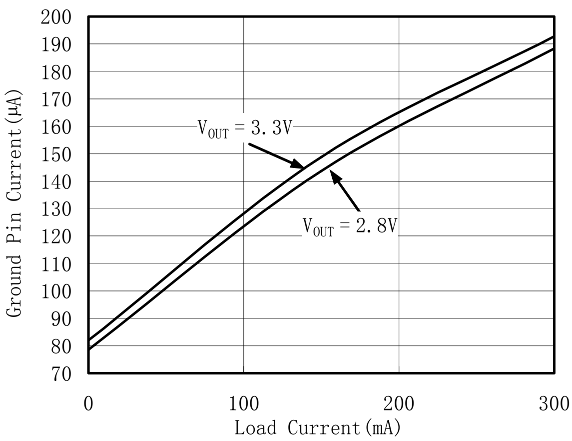
Output Voltage vs. Load Current



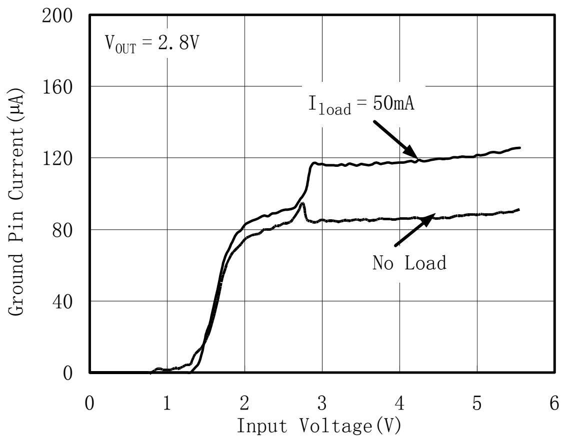
Output Voltage vs. Load Current



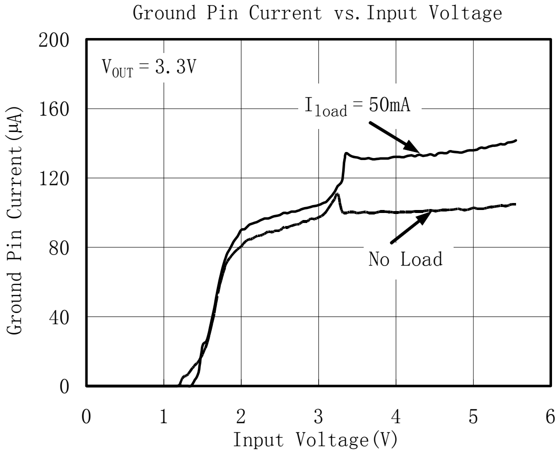
Ground Pin Current vs. Load Current



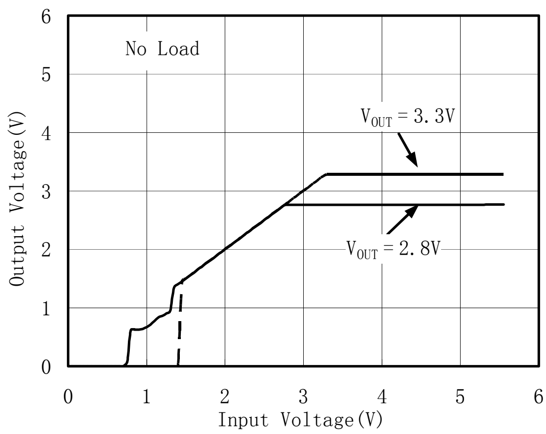
Ground Pin Current vs. Input Voltage



Ground Pin Current vs. Input Voltage



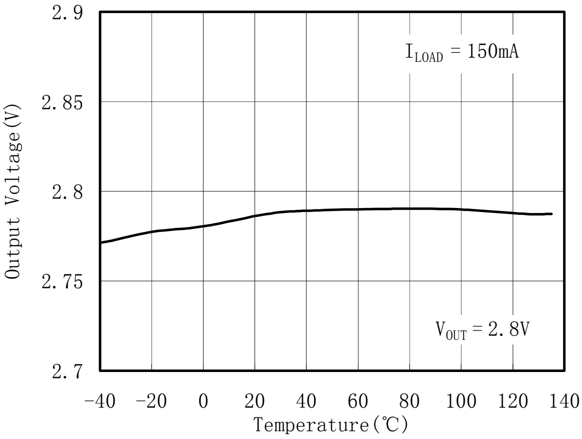
Output Voltage vs. Input Voltage



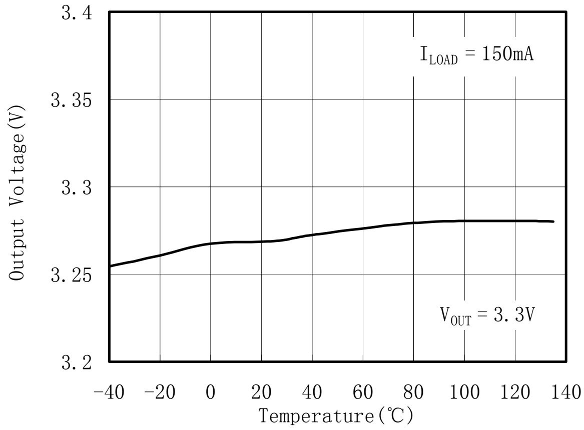
TYPICAL OPERATING CHARACTERISTICS

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

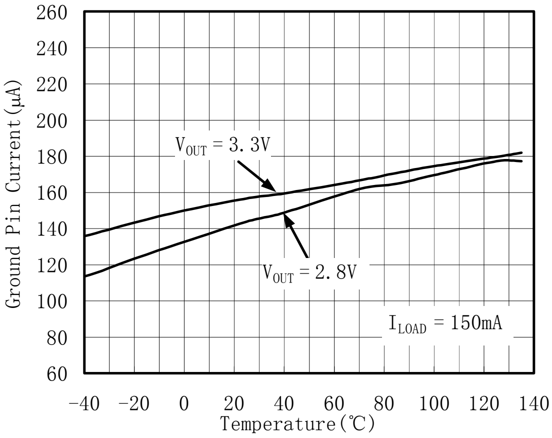
Output Voltage vs. Temperature



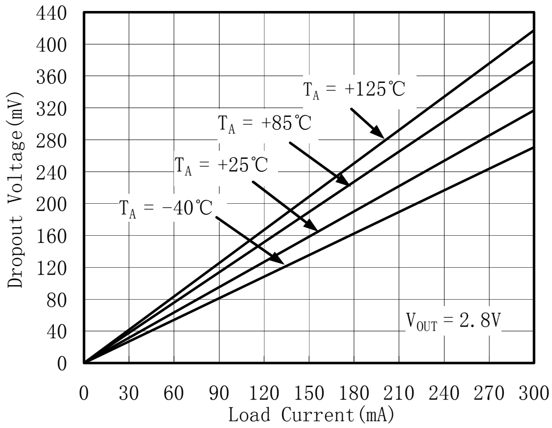
Output Voltage vs. Temperature



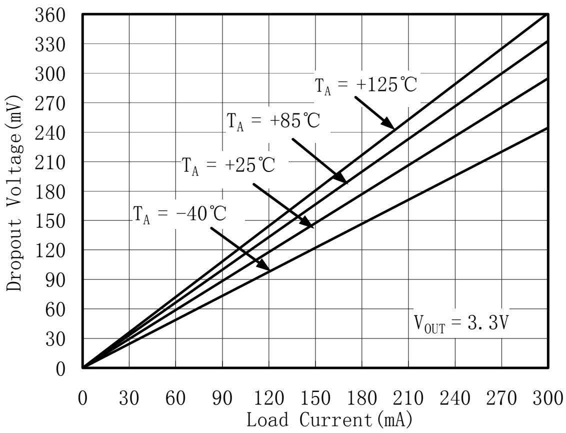
Ground Pin Current vs. Temperature



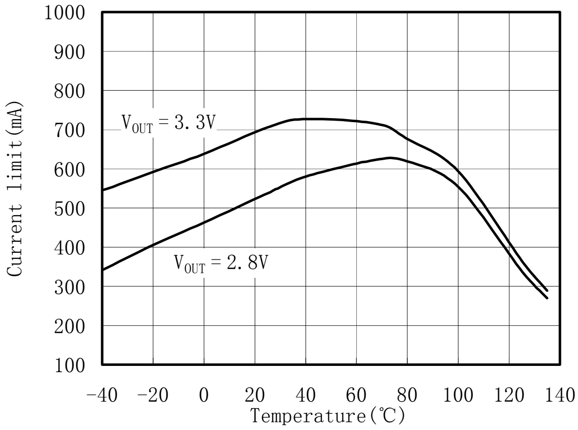
Dropout Voltage vs. Load Current



Dropout Voltage vs. Load Current



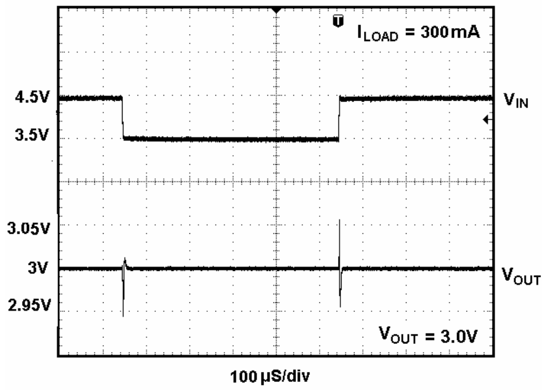
Current limit vs. Temperature



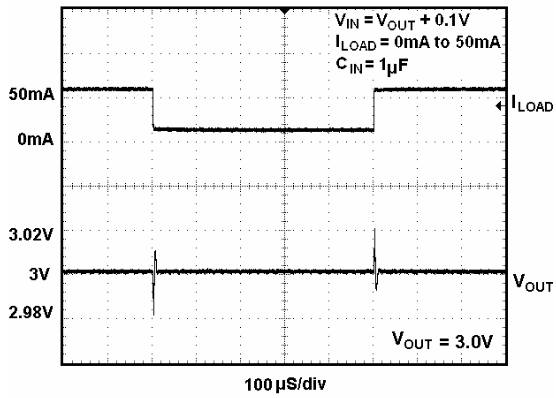
TYPICAL OPERATING CHARACTERISTICS

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

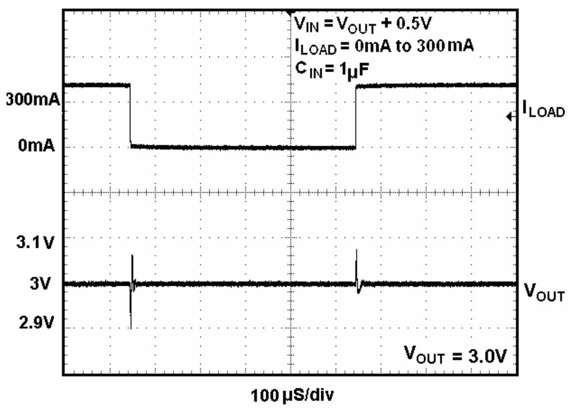
line-Transient Response



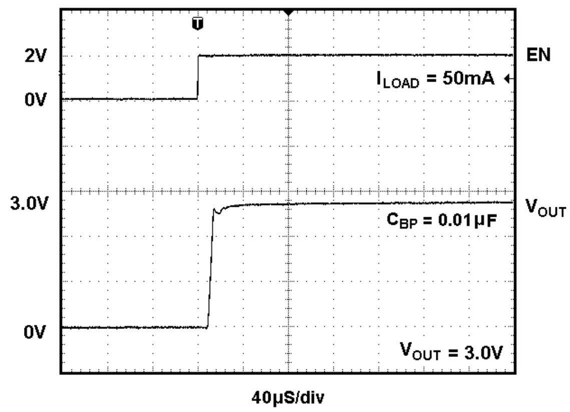
load-Transient Response Near Dropout



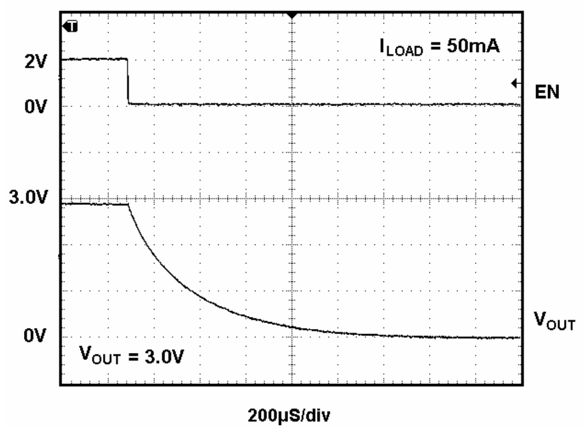
load-Transient Response



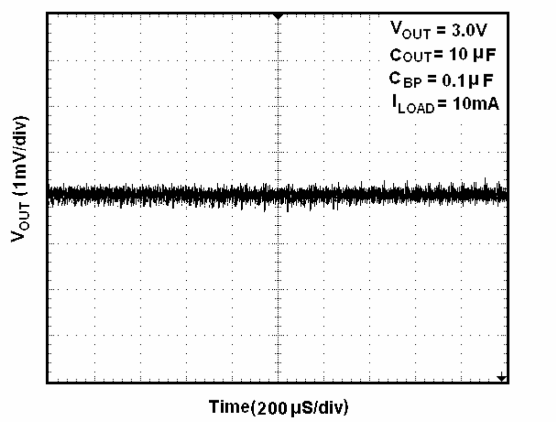
Shutdown Exit Delay



Entering Shutdown

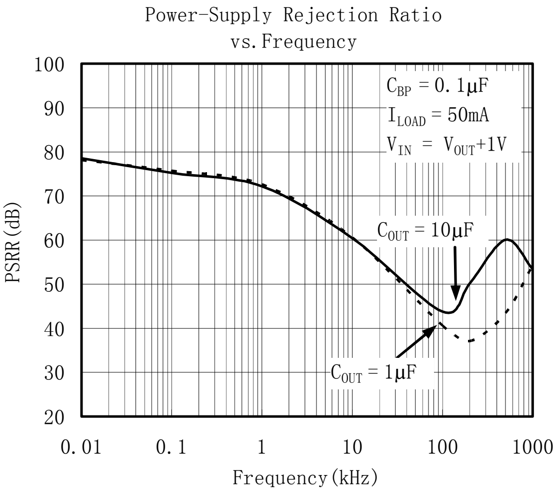


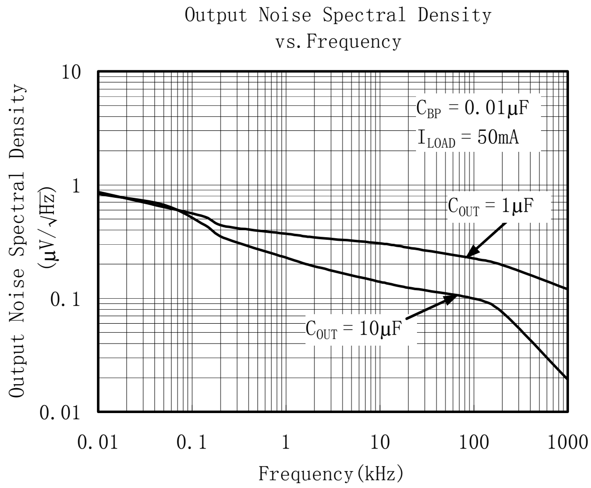
Output Noise 10Hz to 100KHz

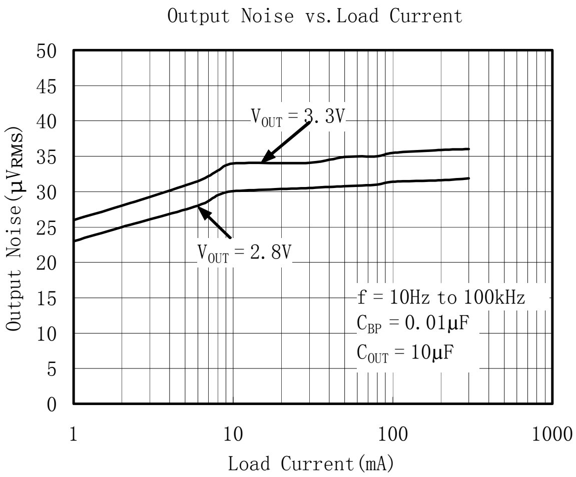


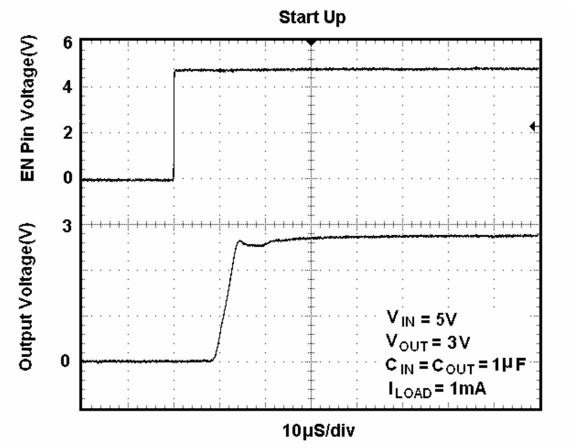
TYPICAL OPERATING CHARACTERISTICS

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



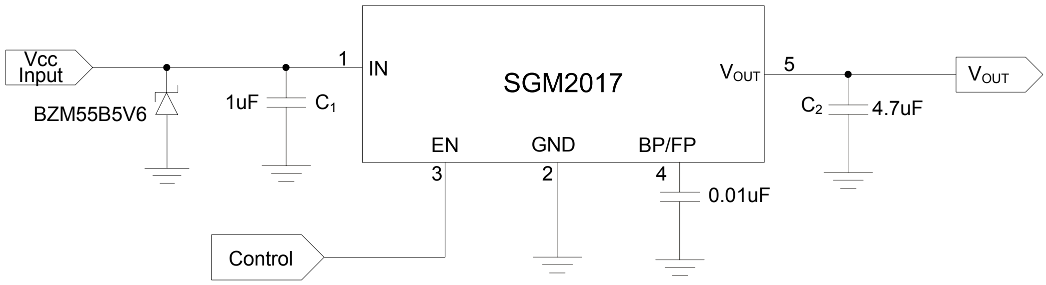






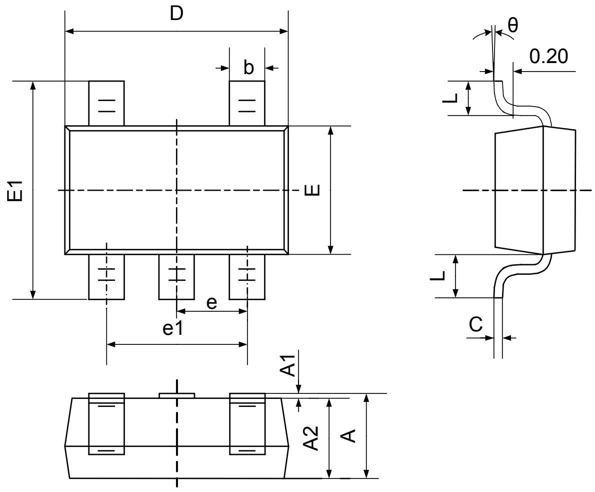
Application Notes

When LDO is used in handheld products, Attention must be paid to voltage spike which would damage SGM2017. In such applications, voltage spike will be generated at changer interface and V_{BUS} pin of USB interface when changer adapters and USB equipments are hot-inserted. Besides this, handheld products will be tested on the production line on the condition of no 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 spike will be generated at the battery connector. The voltage spike will be very high, 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 spike in cell phone design. The schematic is shown in below:



PACKAGE OUTLINE DIMENSIONS

SOT23-5



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	0.400	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°