SG2012

400mA , Low Power, Low Dropout, Linear Regulators

GENERAL DESCRIPTION

The SG2012 low-power, low-dropout, CMOS linear voltage regulators operate from a 2.5V to 5.5V input and deliver up to 400mA. They are perfect choice for low voltage, low power applications. An ultra low ground current (120μA at 400mA output) makes them attractive for battery operated power systems. The SG2012 series also offer ultra low dropout voltage (280mV at 400mA output) to prolong battery life in portable electronics.

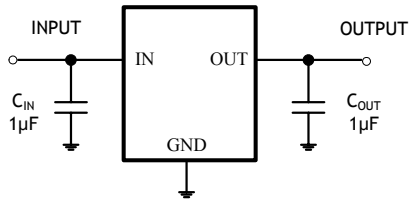
The output voltage is preset to voltages in the range of 1.5V to 4.5V. Other features include foldback current limit and thermal shut-down protection.

SG2012 comes in 3-pin SOT223 package.

APPLICATIONS

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

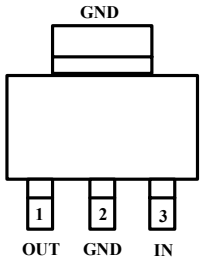
TYPICAL OPERATION CIRCUIT



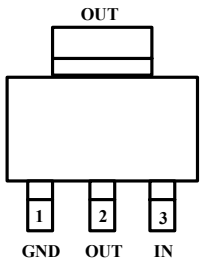
FEATURES

- **Ultra-Low Dropout Voltage:**
  280mV at 400mA output
- **Low 80μA No-Load Supply Current**
- **Low 120μA Operating Supply Current**
  at 400mA Output
- **Thermal-Overload Protection**
- **Output Current Limit**
- **Preset Output Voltages (±1.8% Accuracy)**
- **Output Voltage:**
  Available in Fixed Outputs of 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, and 3.3V

PIN CONFIGURATIONS（TOP VIEW）



SOT223-3



SOT223-3(R-Type)

ORDERING INFORMATION

MODEL	V_{OUT} (V)	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SG2012-1.5	1.5V	SOT223-3	- 40°C to +125°C	SG2012-1.5XKC3/TR	SG2012-1.5XKC3	Tape and Reel, 2500
		SOT223-3(R-Type)		SG2012-1.5XKC3R/TR	SG2012-1.5XKC3R	
SG2012-1.8	1.8V	SOT223-3	- 40°C to +125°C	SG2012-1.8XKC3/TR	SG2012-1.8XKC3	Tape and Reel, 2500
		SOT223-3(R-Type)		SG2012-1.8XKC3R/TR	SG2012-1.8XKC3R	
SG2012-2.5	2.5V	SOT223-3	- 40°C to +125°C	SG2012-2.5XKC3/TR	SG2012-2.5XKC3	Tape and Reel, 2500
		SOT223-3(R-Type)		SG2012-2.5XKC3R/TR	SG2012-2.5XKC3R	
SG2012-2.8	2.8V	SOT223-3	- 40°C to +125°C	SG2012-2.8XKC3/TR	SG2012-2.8XKC3	Tape and Reel, 2500
		SOT223-3(R-Type)		SG2012-2.8XKC3R/TR	SG2012-2.8XKC3R	
SG2012-3.0	3.0V	SOT223-3	- 40°C to +125°C	SG2012-3.0XKC3/TR	SG2012-3.0XKC3	Tape and Reel, 2500
		SOT223-3(R-Type)		SG2012-3.0XKC3R/TR	SG2012-3.0XKC3R	
SG2012-3.3	3.3V	SOT223-3	- 40°C to +125°C	SG2012-3.3XKC3/TR	SG2012-3.3XKC3	Tape and Reel, 2500
		SOT223-3(R-Type)		SG2012-3.3XKC3R/TR	SG2012-3.3XKC3R	

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)
Operating Temperature Range.....- 40°C to +125°C
Junction Temperature.....+150°C
Storage Temperature.....- 65°C to +150°C
Power Dissipation, P_D @ T_A = 25℃
SOT223-3.....0.74W
Package Thermal Resistance
SOT223-3, θ_{JA}.....135°C/W
Lead Temperature (soldering, 10s).....+260°C
ESD Susceptibility
HBM.....7000V
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

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

ELECTRICAL CHARACTERISTICS

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

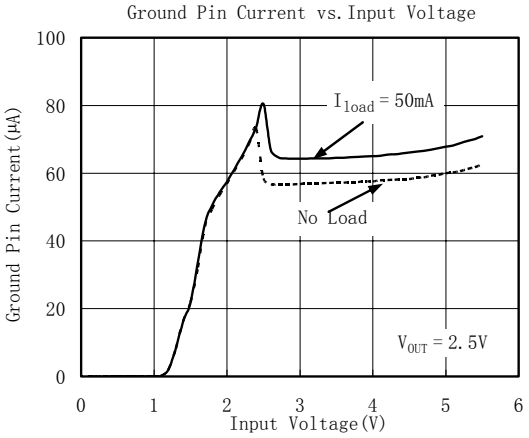
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			2.5		5.5	V
Output Voltage Accuracy		I_{OUT} = 0.1mA, T_A = +25°C		-1.8		1.8	%
		I_{OUT} = 0.1mA to 400mA, T_A = 0°C to +70°C				2.6	
		I_{OUT} = 0.1mA to 400mA, T_A = - 40°C to +125°C				3.1	
Output Current				400			mA
Current Limit	I_{LIM}			410	750		mA
Ground Pin Current	I_Q	No load			80	130	µA
		I_{OUT} = 400mA			120		
Dropout Voltage(Note1)		I_{OUT} = 1mA			0.8		mV
		I_{OUT} = 400mA			280	440	
Line Regulation	ΔV_{LNR}	V_{IN} = 2.5V or (V_{OUT} + 0.1V) to 5.5V, I_{OUT} = 1mA			0.004	0.15	%/V
Load Regulation	ΔV_{LDR}	I_{OUT} = 0.1mA to 400mA, C_{OUT} = 1µF			0.0005	0.002	%/mA
Output Voltage Noise	e_n	f = 10Hz to 100KHz, C_{OUT} = 10µF			120		µVRMS
Power Supply Rejection Rate	PSRR	I_{LOAD} = 50mA, C_{OUT} = 1µF	f = 100Hz,		74		dB
			f = 1KHz,		54		dB
THERMAL PROTECTION							
Thermal Shutdown Temperature	T_{SHDN}				160		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}				15		℃

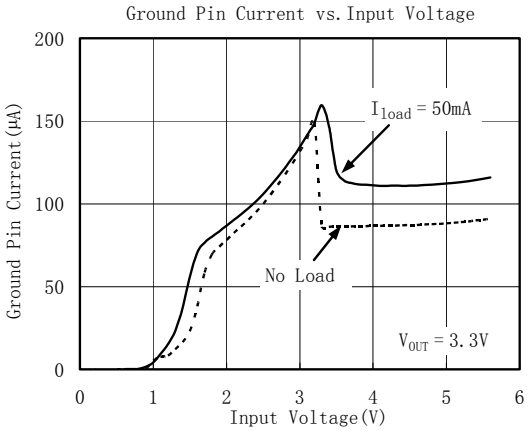
Specifications subject to change without notice.

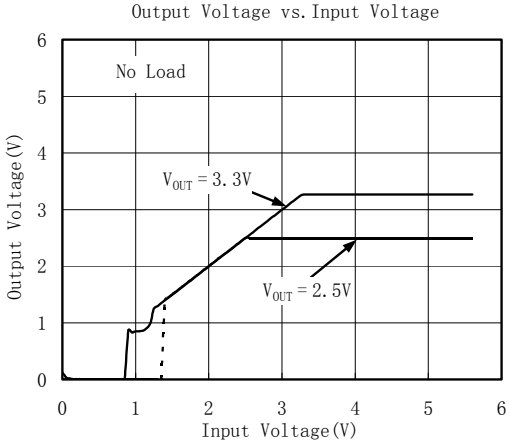
Note 1: The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} is 100mV below the value of V_{OUT} for V_{IN} = V_{OUT} + 1V. (Only applicable for V_{OUT} = +2.5V to +4.5V)

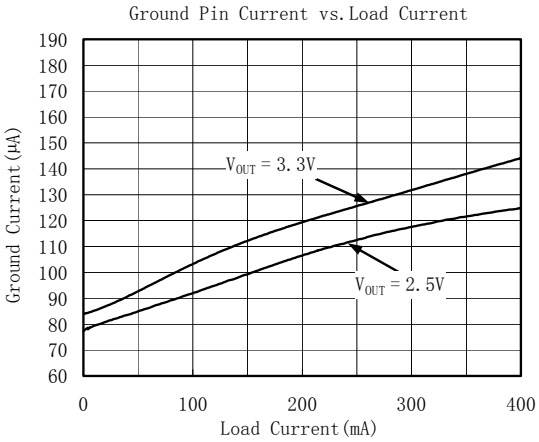
TYPICAL OPERATING CHARACTERISTICS

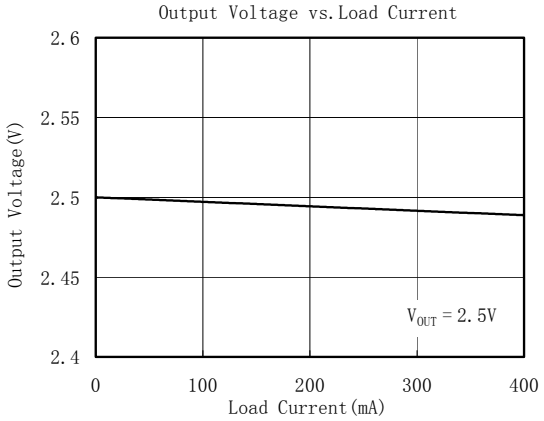
$V_{IN} = V_{OUT\,(NOMINAL)} + 1V$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $T_A = +25℃$, unless otherwise noted.

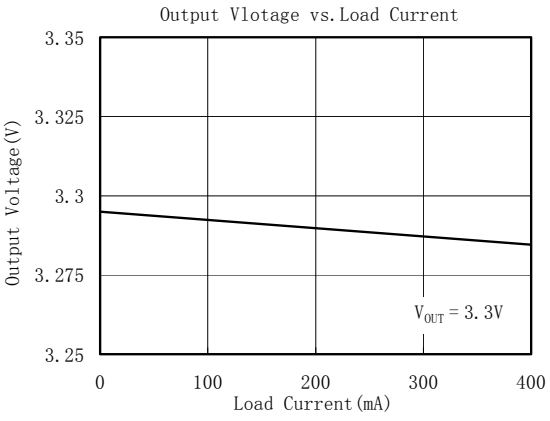








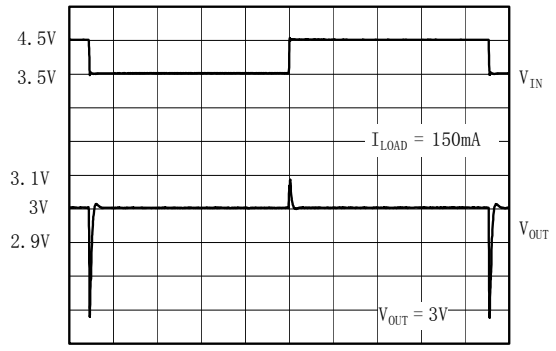




TYPICAL OPERATING CHARACTERISTICS

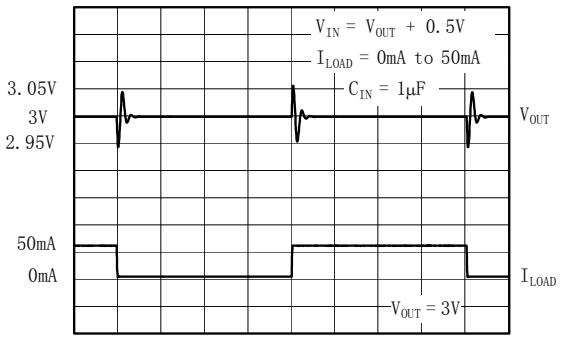
$V_{IN} = V_{OUT\,(NOMINAL)} + 1V$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $T_A = +25℃$, unless otherwise noted.

Line-Transient Response



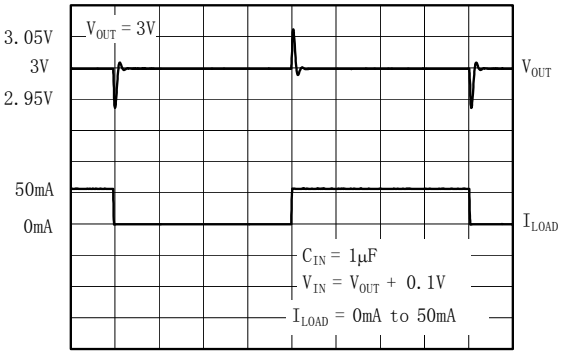
100μS/div

Load-Transient Response



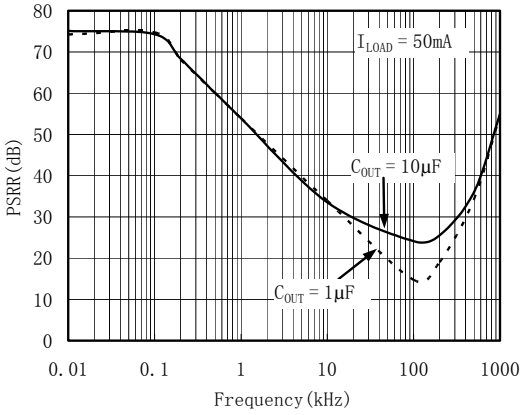
40μS/div

Load-Transient Response Near Dropout

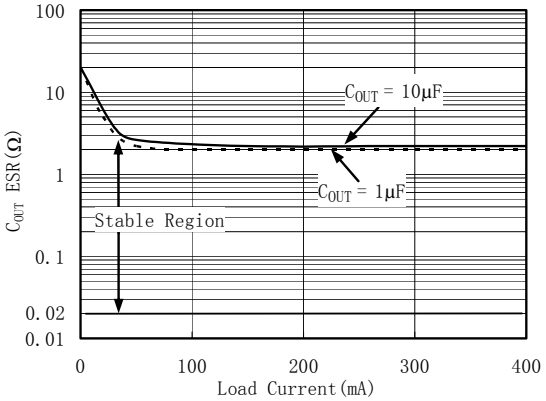


40μS/div

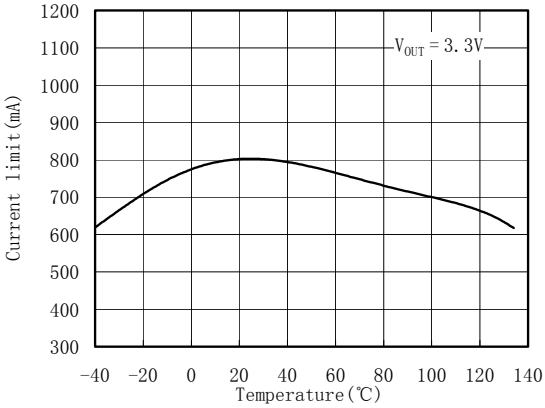
Power-Supply Rejection Ratio vs. Frequency



Region of Stable C_{OUT} ESR vs. Load Current

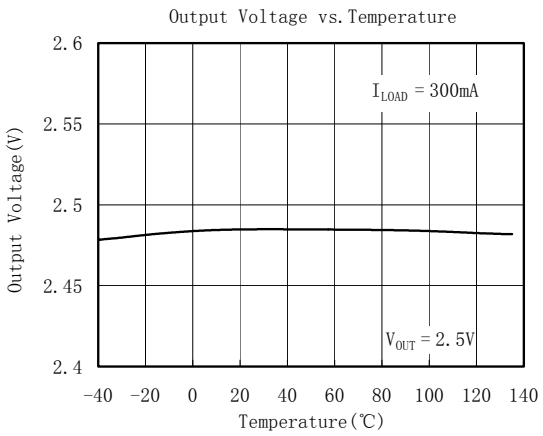


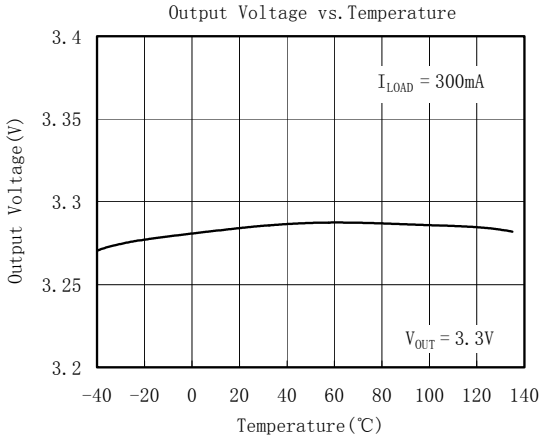
Current limit vs. Temperature

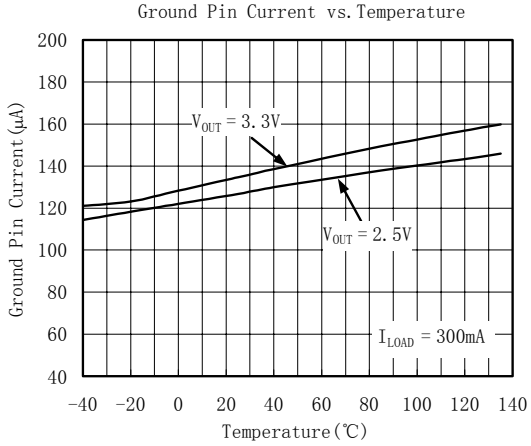


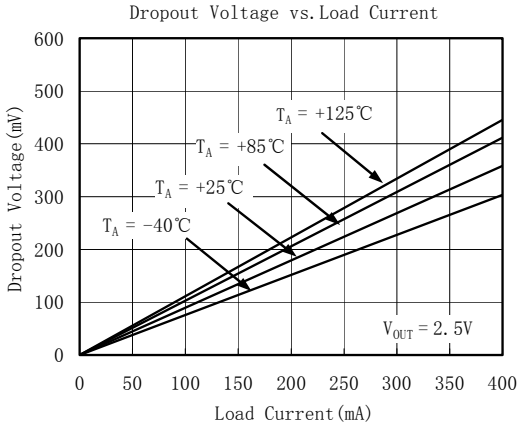
TYPICAL OPERATING CHARACTERISTICS

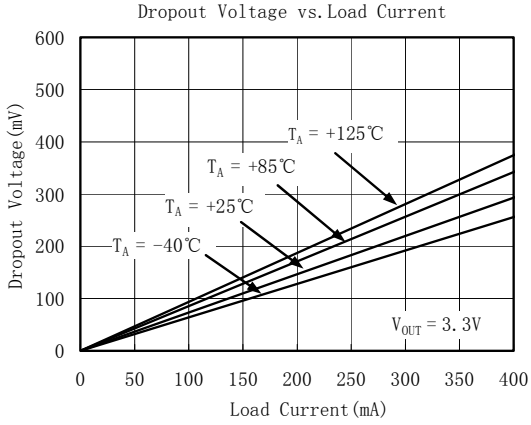
$V_{IN} = V_{OUT(NOMINAL)}$ +1V, C_{IN} = 1μF, C_{OUT} = 1μF, T_A = +25℃, unless otherwise noted.

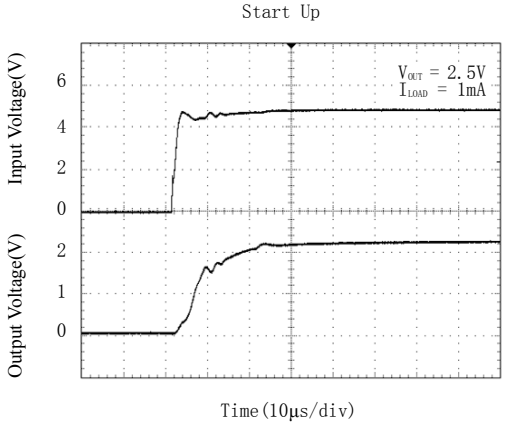






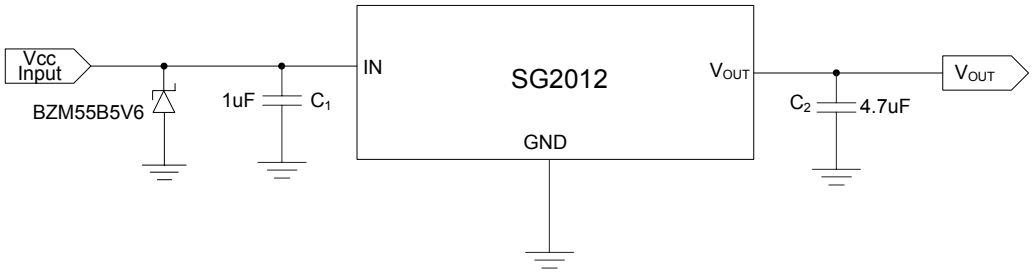






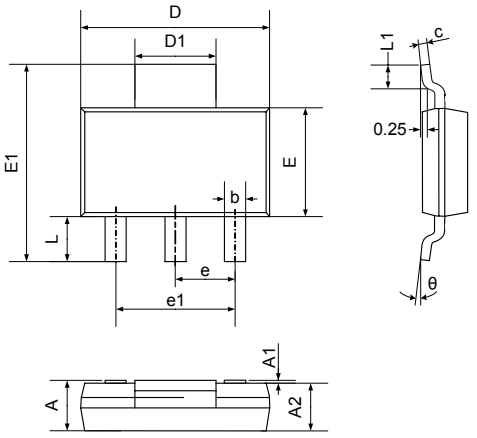
Application Notes

When LDO is used in handheld products, Attention must be paid to voltage spike which would damage SG2012. 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

SOT223-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.610	0.810	0.024	0.032
c	0.250	0.350	0.010	0.014
D	6.300	6.700	0.248	0.264
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.700	7.300	0.264	0.287
e	2.300TYP		0.091TYP	
e1	4.500	4.700	0.177	0.185
L	1.500REF		0.059REF	
L1	0.900		0.035	
θ	0°	10°	0°	10°

REVISION HISTORY

Location	Page

9/05— Data Sheet changed from preliminary to REV. A

12/06— Data Sheet changed from REV. A to REV. B

SGMICRO

SGMICRO is dedicated to provide high quality and high performance analog IC products to customers. All SGMICRO products meet the highest industry standards with strict and comprehensive test and quality control systems to achieve world-class consistency and reliability.

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