



SGM61133

17V, 3A, High Efficiency Synchronous Step-Down Converter

GENERAL DESCRIPTION

SGM61133 is a wide input range, high-efficiency and high frequency DC/DC step-down switching regulator, capable of delivering up to 3A of output current. It adopts an adaptive COT control scheme that enables very fast transient response and provides a very smooth transition when the output varies from light load to heavy load. During light load, SGM61133 goes into a PFM mode that saves switching loss achieving high efficiency. The adaptive COT control also maintains a constant switching frequency across line and load. An OVP function protects the IC itself and its downstream system against input voltage surges. With this OVP function, the IC can stand off input voltage as high as 25V, making it an ideal solution for industrial applications such as LCD TV, Set Top Box, Portable TV, etc.

The SGM61133 is available in a Green SOT-563-6 package.

FEATURES

- Wide Input Range: 4.5V to 17V
- Adaptive COT Control
- Ultra-Fast Load Transient Response
- High Efficiency PFM Mode at Light Load
- High Efficiency Synchronous Operation
- 200 μ A No Load I_Q
- Low $R_{DS(ON)}$ Internal Power FETs
- Capable of Delivering 3A
- No External Compensation Needed
- Thermal Shutdown and UVLO
- Available in a Green SOT-563-6 Package

APPLICATIONS

LCD TV
Set Top Box
xDSL Modem

TYPICAL APPLICATION

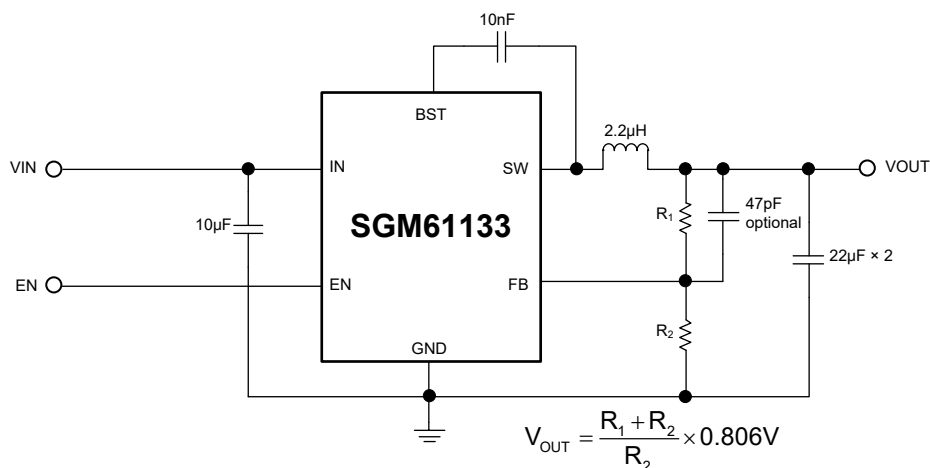


Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM61133	SOT-563-6	-40°C to +125°C	SGM61133XKB6G/TR	1AXX	Tape and Reel, 5000

MARKING INFORMATION

NOTE: XX = Date Code.

YY X X

Date Code - Week

Date Code - Year

Serial Number

Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

IN, SW, EN Voltage	-0.3V to 19V
BST Voltage.....	-0.3V to SW + 6V
FB Voltage	-0.3V to 6V
Package Thermal Resistance	
SOT-563-6, θ_{JA}	TBD°C/W
Junction Temperature.....	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s).....	+260°C
ESD Susceptibility	
HBM.....	TBDV
CDM	TBDV

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range	4.5V to 17V
Operating Temperature Range	-40°C to +125°C

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

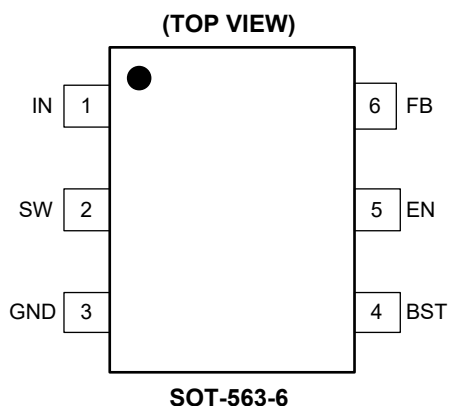
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. 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 even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION



PIN DESCRIPTION

PIN	NAME	DESCRIPTION
1	IN	Supply Voltage. Bypass with a 10 μ F ceramic capacitor to GND.
2	SW	Inductor Connection. Connect an inductor Between SW and the regulator output.
3	GND	Ground.
4	BST	Bootstrap Pin. Connect a 10nF capacitor from this pin to SW.
5	EN	Enable Pin for the IC. Drive this pin high to enable the part, low or floating to disable.
6	FB	Feedback Input. Connect an external resistor divider from the output to FB and GND to set V_{OUT} .

ELECTRICAL CHARACTERISTICS(V_{IN} = 12V, V_{OUT} = 3.3V, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		4.5		17	V
Input UVLO	Rising, Hysteresis = 450mV		4.05		V
Input OVP	Rising, Hysteresis = 0.9V		18.4		V
Input Supply Current	V _{FB} = 0.85V, no switching		200		μA
Input Shutdown Current			7		μA
FB Voltage			0.806		V
FB Input Current			0		μA
Switching Frequency			700		kHz
Maximum Duty Cycle			87		%
Short Circuit Hiccup Time	On Time		1.4		ms
	Off Time		4.2		ms
FB Hiccup Threshold			0.6		V
High Side Switch On Resistance			85		mΩ
Low Side Switch On Resistance			38		mΩ
High Side Current Limit			4.5		A
SW Leakage Current	V _{IN} = V _{SW} = 12V		10		μA
EN Rising Threshold	Rising		1.2		V
EN Falling Threshold	Falling		1.1		V
EN Input Current	V _{EN} = 2V		2		μA
Thermal Shutdown	Rising, Hysteresis = +36°C		150		°C

FUNCTIONAL BLOCK DIAGRAM

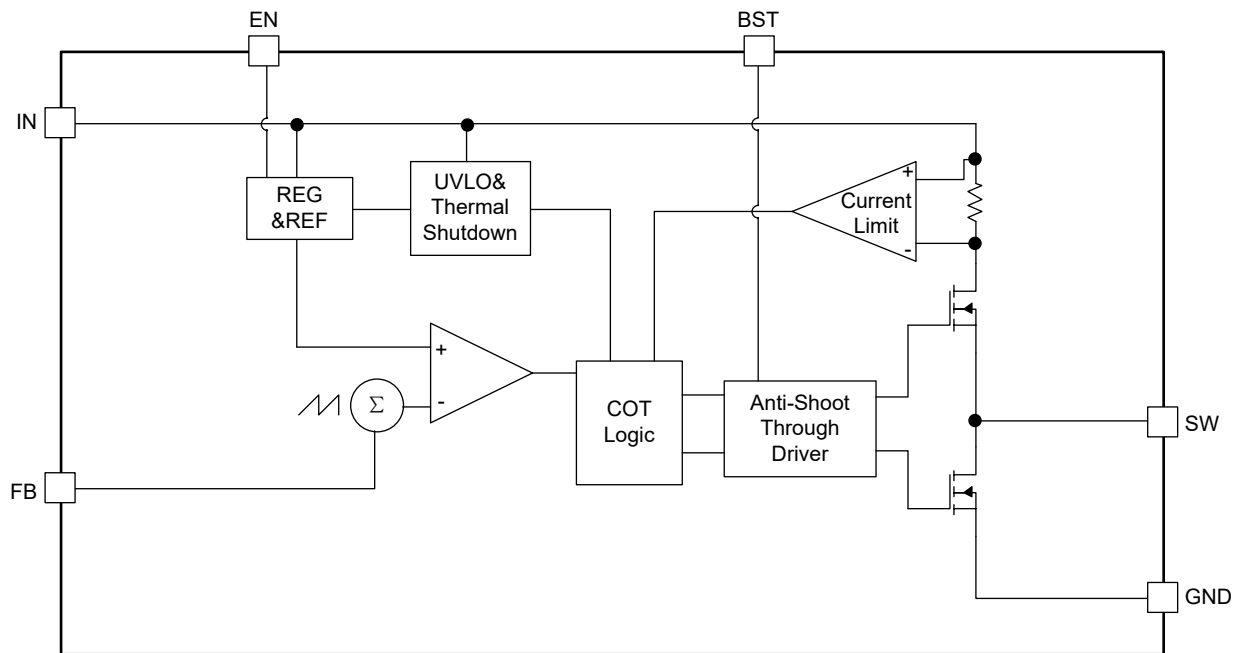


Figure 2. Block Diagram

DETAILED DESCRIPTION

The SGM61133 is a synchronous buck regulator ICs that integrates the adaptive COT control, top and bottom switches on the same die to minimize the switching transition loss and conduction loss.

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Light Load Operation

Traditionally, a fixed constant frequency PWM DC/DC regulator always switches even when the output load is small. When energy is shuffling back and forth through the power MOSFET, power is lost due to the finite $R_{DS(on)}$ of the MOSFET and parasitic capacitances. At light load, this loss is prominent and efficiency is therefore very low. SGM61133 goes into a power save mode during light load, thereby extending the range of high efficiency operation.

Enable

EN is a digital control pin that turns the SGM61133 on and off. Drive EN High to turn on the regulator, drive it

Low to turn it off. An internal $1M\Omega$ resistor from EN pin to GND allows EN to float to shut down the chip. Connecting the EN pin through a pull up resistor or shorted EN to IN will automatically turn on the chip whenever plug in IN.

Over-Current Protection and Hiccup

SGM61133 has a cycle-by-cycle over-current limit for when the inductor current peak value is over the set current limit threshold. When the output voltage drop until FB falls below UV threshold (0.6V), the SGM61133 will enter hiccup mode. It will turn off the chip immediately for 6ms. After that, it will try to re-start as normal for 2ms. After 2ms, if FB is still below UV threshold, then the chip enters hiccup mode again. If FB is higher than UV threshold, it will enter the normal mode.

Over-Temperature Protection

Thermal protection disables the output when the junction temperature rises to approximately 150°C , allowing the device to cool down. When the junction temperature cools to approximately 110°C , the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits regulator dissipation, protecting the device from damage as a result of overheating.

APPLICATION INFORMATION

External Output Voltage Setting

In external output voltage setting version selected, the SGM61133 regulator is programmed using an external resistor divider. The output voltage is calculated using below equation.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_1}{R_2} \right)$$

where: $V_{REF} = 0.806V$ typically (the internal reference voltage)

Resistors R_2 has to be between $1k\Omega$ to $20k\Omega$ and thus R_1 is calculated by following equation.

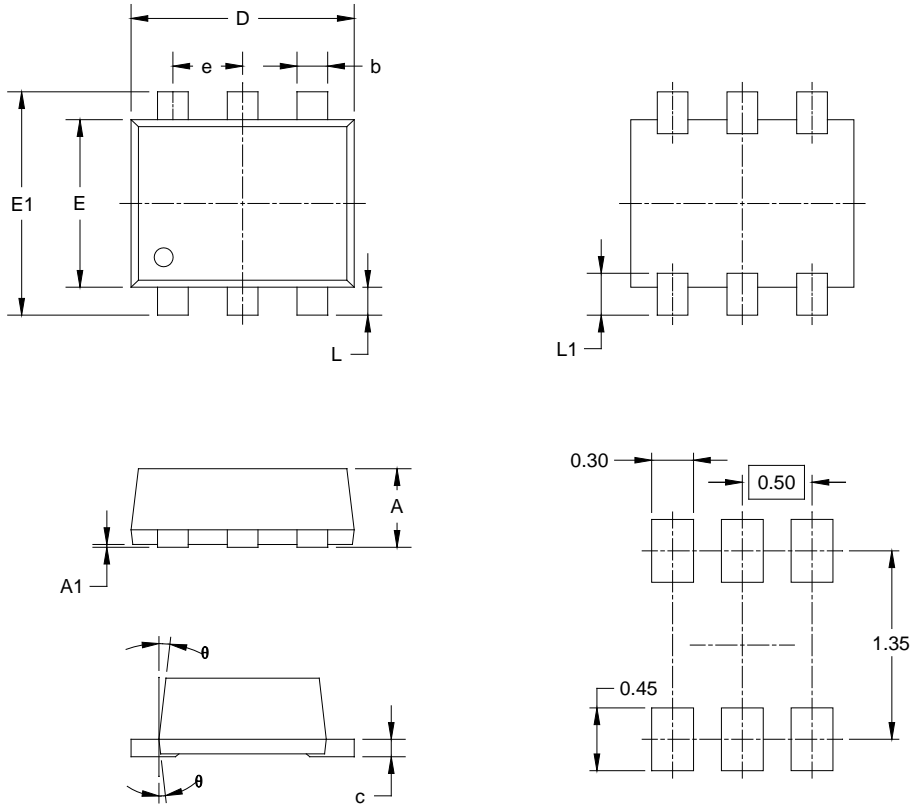
$$R_1 = \left(\frac{V_{OUT}}{V_{REF}} - 1 \right) \times R_2$$

PCB Layout Guide

Figure 3. PCB Layout

PACKAGE OUTLINE DIMENSIONS

SOT-563-6



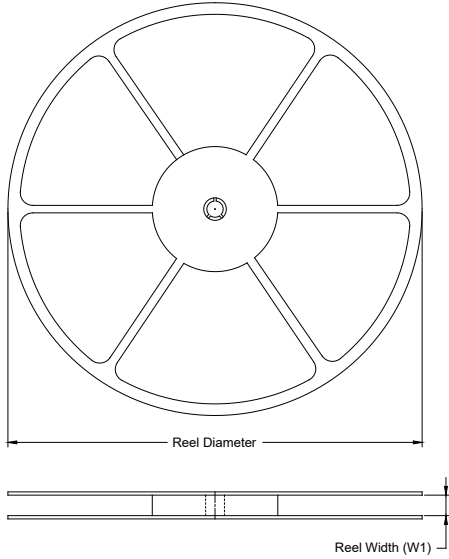
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.525	0.600	0.021	0.024
A1	0.000	0.050	0.000	0.002
b	0.170	0.270	0.007	0.011
c	0.090	0.180	0.004	0.007
D	1.500	1.700	0.059	0.067
E	1.100	1.300	0.043	0.051
E1	1.500	1.700	0.059	0.067
e	0.450	0.550	0.018	0.022
L	0.100	0.300	0.004	0.012
L1	0.200	0.400	0.008	0.016
θ	9° REF		9° REF	

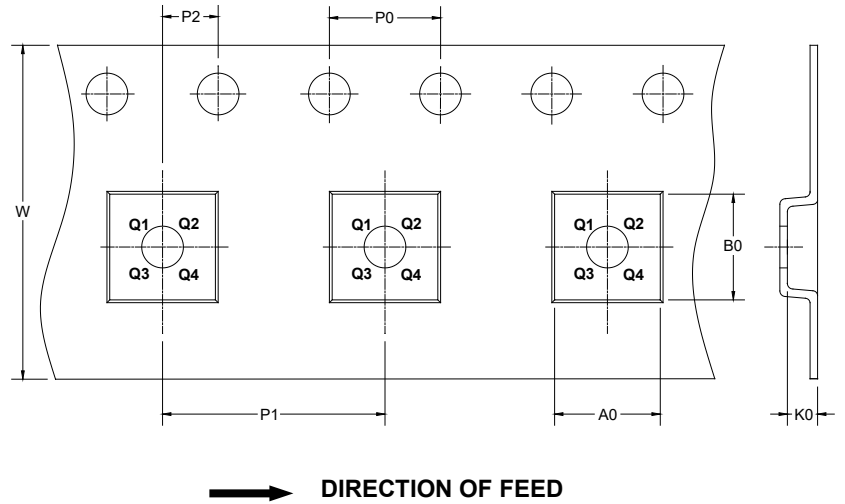
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-563-6	7"	9.5	1.78	1.78	0.69	4.0	4.0	2.0	8.0	Q3

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PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18

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