



SGM6031

400nA Ultra-Low Power, Buck Converter with 200mA Output Current

GENERAL DESCRIPTION

The SGM6031 family is a 200mA, 1.4MHz synchronous buck DC/DC converter with 400nA ultra-low quiescent current, which is ideal for powering special needs of ultra-low power applications and long battery life.

The SGM6031 operation voltage range is from 1.8V to 5.5V allowing the use of a regulated 5V input. The SGM6031 is available in both adjustable and fixed output voltage versions. The output voltage of SGM6031 can be programmed by an external resistor divider in adjustable version.

The SGM6031 delivers an output current of 200mA with a peak inductor current of 430mA. Besides, the SGM6031 series has UVLO function. It is disabled when the voltage on VIN reaches the UVLO condition. The SGM6031's UVLO level is continuously monitored.

Only inductor, C_{IN} and C_{OUT} capacitors are needed as external components to make a buck DC/DC converter solution. The SGM6031 is available in a Green UTDFN-1.5×2-6L package. It is rated over the -40°C to +85°C temperature range.

FEATURES

- **High Efficiency at Low Output Currents:**
Up to 90% with I_{OUT} = 0.1mA
- **Ultra-Low Power Buck Converters**
- **200mA Maximum Output Current**
- **Output Voltage Programmable in Operation**
- **1.8V to 5.5V Input Voltage Range**
- **Fixed Output Voltages: 1.0V, 1.2V, 1.5V, 1.8V, 2.5V, 2.8V, 3.0V and 3.3V**
- **Output Adjustable from 1.0V to 3.3V**
- **400nA (TYP) Quiescent Current**
- **100% Duty Cycle (Pass Mode)**
- **Available in a Green UTDFN-1.5×2-6L Package**
- **-40°C to +85°C Operating Temperature Range**

APPLICATIONS

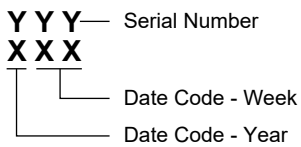
Energy Harvest Devices
Ultra-Low Power Applications
Low-Power Wireless Monitoring
Backup Power Supply Circuits
2-Cell and 3-Cell Alkaline-Powered Systems
Portable Game Consoles
Wearable Devices
Thermal Electric Generator Harvesting
Wireless Sensor Networks
Smart Building Controls
Environmental Monitoring

PACKAGE/ORDERING INFORMATION

MODEL	V _{OUT} (V)	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM6031-1.0	1.0	UTDFN-1.5×2-6L	SGM6031-1.0YUDT6G/TR	GJC XXX	Tape and Reel, 3000
SGM6031-1.2	1.2	UTDFN-1.5×2-6L	SGM6031-1.2YUDT6G/TR	GJD XXX	Tape and Reel, 3000
SGM6031-1.5	1.5	UTDFN-1.5×2-6L	SGM6031-1.5YUDT6G/TR	GJE XXX	Tape and Reel, 3000
SGM6031-1.8	1.8	UTDFN-1.5×2-6L	SGM6031-1.8YUDT6G/TR	GJF XXX	Tape and Reel, 3000
SGM6031-2.5	2.5	UTDFN-1.5×2-6L	SGM6031-2.5YUDT6G/TR	GK0 XXX	Tape and Reel, 3000
SGM6031-2.8	2.8	UTDFN-1.5×2-6L	SGM6031-2.8YUDT6G/TR	GK1 XXX	Tape and Reel, 3000
SGM6031-3.0	3.0	UTDFN-1.5×2-6L	SGM6031-3.0YUDT6G/TR	GX0 XXX	Tape and Reel, 3000
SGM6031-3.3	3.3	UTDFN-1.5×2-6L	SGM6031-3.3YUDT6G/TR	GK2 XXX	Tape and Reel, 3000
SGM6031-ADJ	ADJ	UTDFN-1.5×2-6L	SGM6031-ADJYUDT6G/TR	GLF XXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXX = Date Code.



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

Input Voltage Range on VIN, EN, VOUT, FB, SW	-0.3V to 6V
Peak Currents VIN, VOUT	510mA
Typical Thermal Resistance	
UTDFN-1.5×2-6L, θ_{JA}	130°C/W
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM	7000V
MM	400V
CDM	1000V

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range	1.8V to 5.5V
Input Capacitance, C _{IN}	22µF (MIN)
Output Capacitance, C _{OUT}	10µF (MIN), 22µF (TYP)
Inductance, L	4.7µH (MIN)
Operating Ambient Temperature Range	-40°C to +85°C
Operating Junction 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.

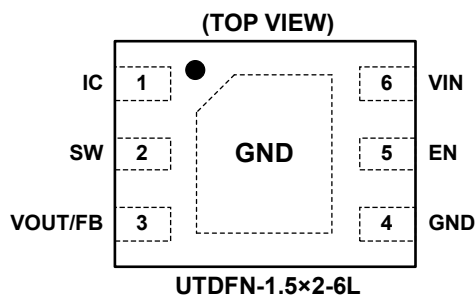
ESD SENSITIVITY CAUTION

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

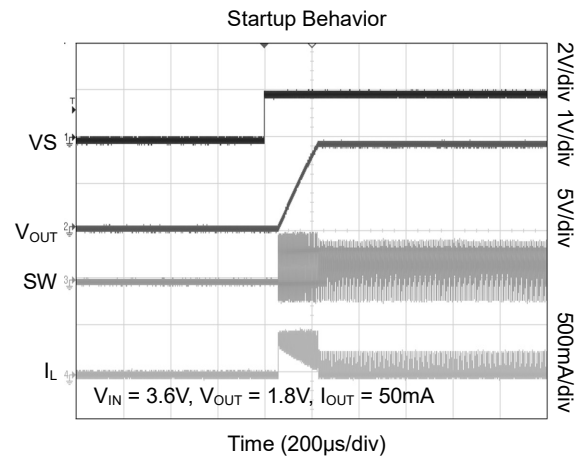
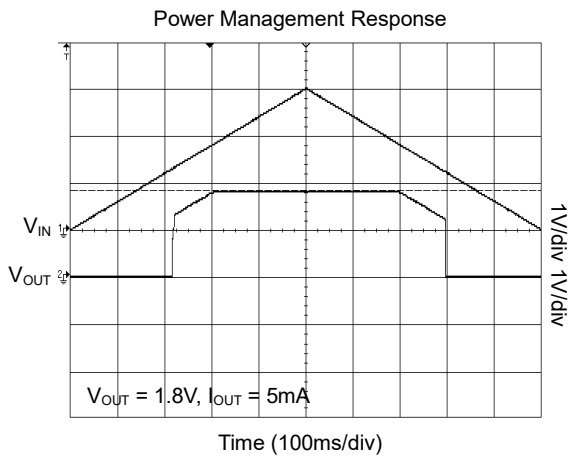
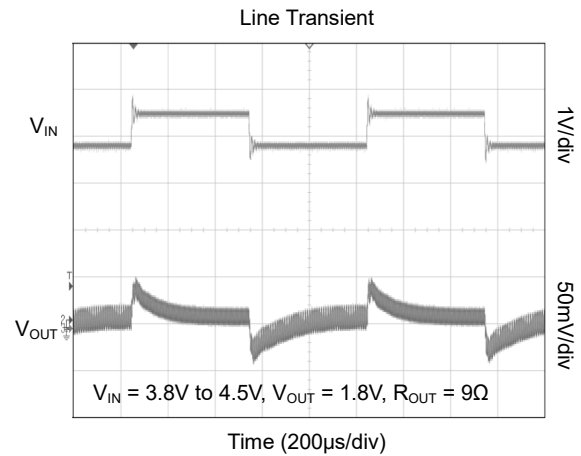
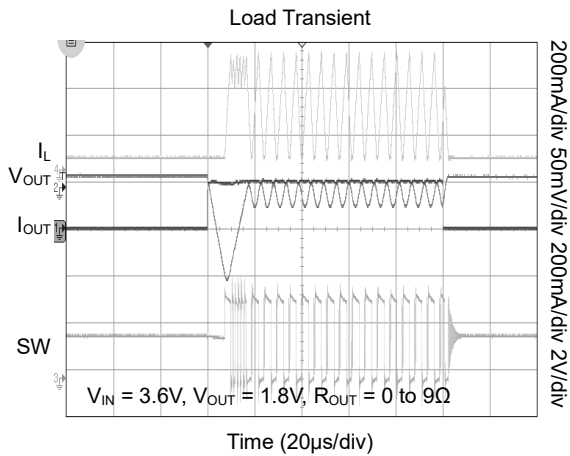
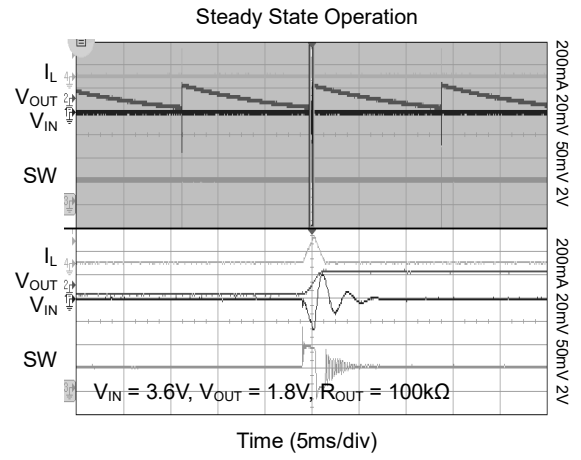
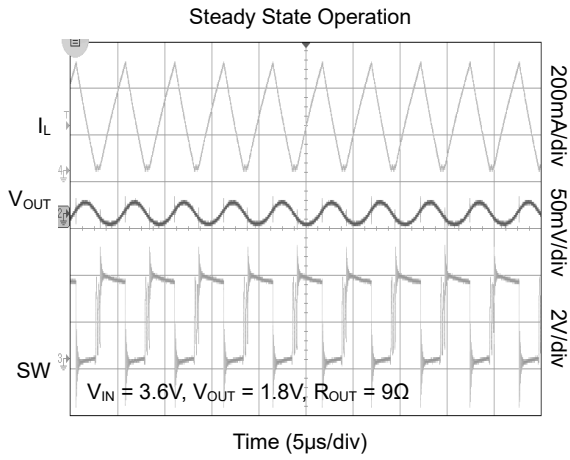
PIN	NAME	FUNCTION
1	IC	For Internal Connection.
2	SW	Switching Node. Connect to output inductor.
3	VOUT	Step-Down Regulator Output.
	FB	Feedback Input (adjustable voltage version only). The voltage at this pin is regulated to 1.0V. Connect to the resistor divider between output and ground to set output voltage.
4	GND	Ground. Power and IC ground. All signals are referenced to this pin.
5	EN	Enable Input. Input logic high to enable this circuit and logic low to shut down. Do not leave this pin unconnected. EN is recommended to be effective 10ms later than VIN.
6	VIN	Input Voltage. Connect to input power source.
Exposed Pad	GND	Connect to GND.

ELECTRICAL CHARACTERISTICS(V_{IN} = 3.6V, V_{OUT} = 1.2V, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Quiescent Current							
Buck Enabled State	I _Q	V _{IN} = 1.8V, no load, no switching	+25°C		400	700	nA
Output							
Feedback Voltage	V _{FB}		+25°C	0.98	1.0	1.02	V
Output Accuracy			+25°C	-2		2	%
			Full	-3		3	
Output Line Regulation		V _{IN} = 1.8V to 5.5V, I _{OUT} = 100μA	+25°C		0.3		%/V
Output Load Regulation		I _{OUT} = 100μA to 200mA	+25°C		0.002		%/mA
Output Ripple		I _{OUT} = 1mA	+25°C		15		mV _{PP}
Power Switch							
High-side Switch On-Resistance	R _{DSON}		+25°C		510	620	mΩ
Low-side Switch On-Resistance			+25°C		530		
Cycle-by-Cycle Current Limit	I _{LIM}		+25°C	300	430	510	mA
Maximum Switching Frequency	f _{SW}		+25°C		1.4		MHz
Input							
Input Under Voltage Protection	V _{IN_UVLO}	V _{IN} falling	+25°C	1.19	1.3		V
EN							
Voltage for EN High Setting	V _{IH}		Full	1.1			V
Voltage for EN Low Setting	V _{IL}		Full			0.4	
Thermal Shutdown							
Thermal Shutdown	T _{TSD}				160		°C
Thermal Shutdown Hysteresis	T _{HYS}				20		°C

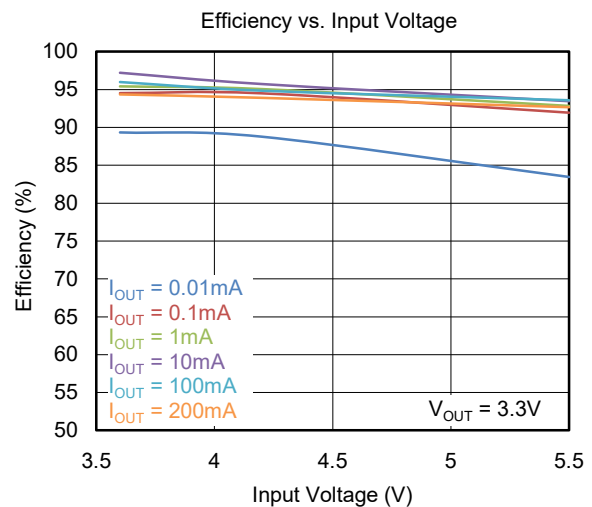
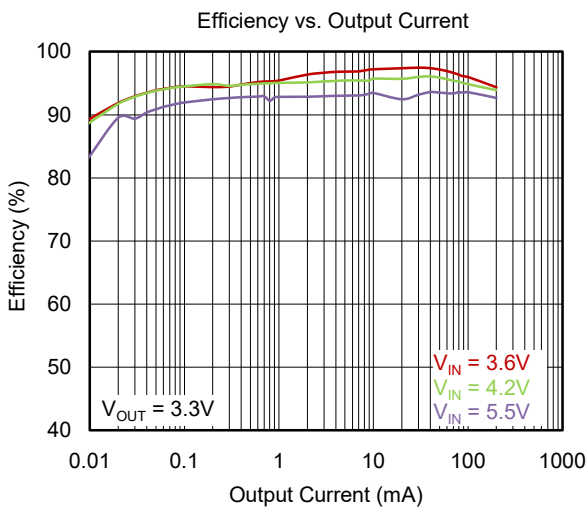
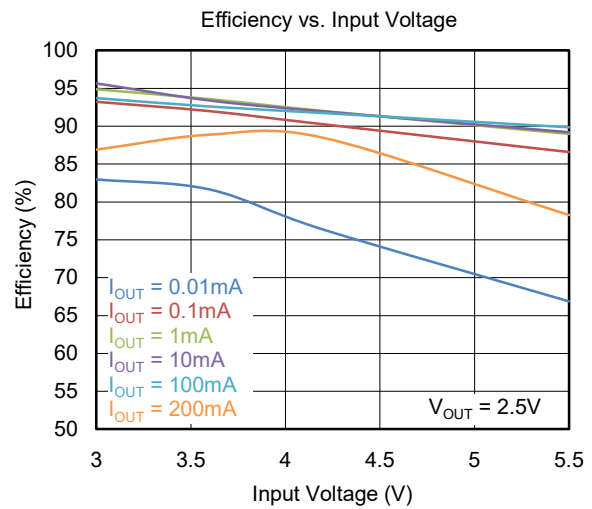
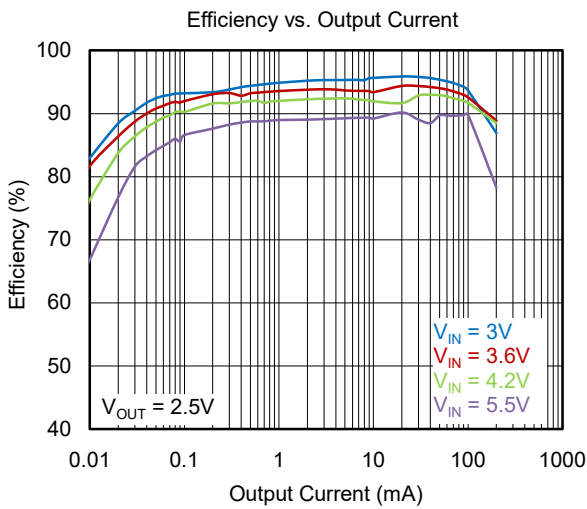
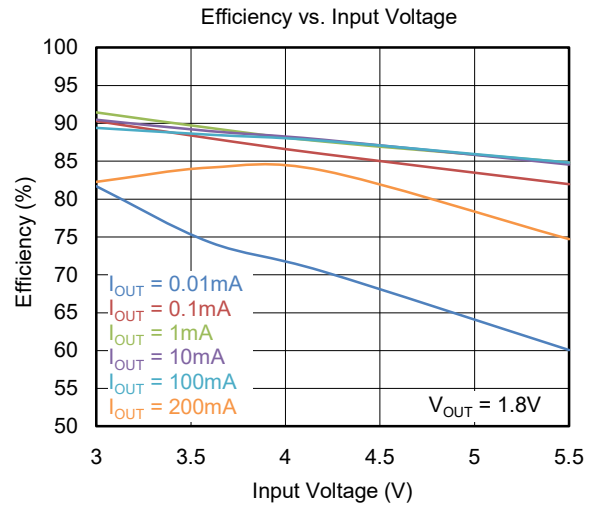
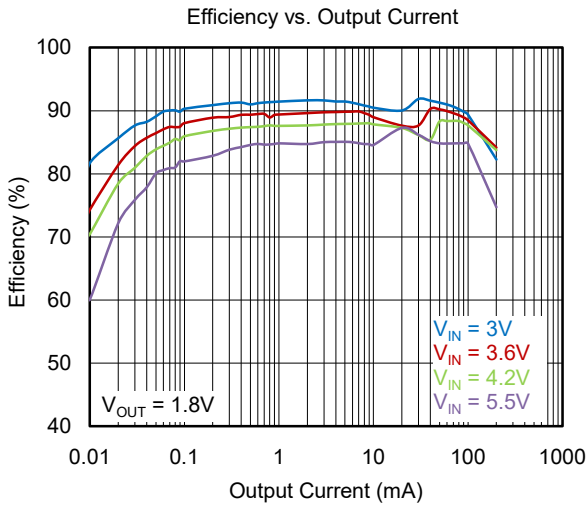
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25°C, unless otherwise noted.



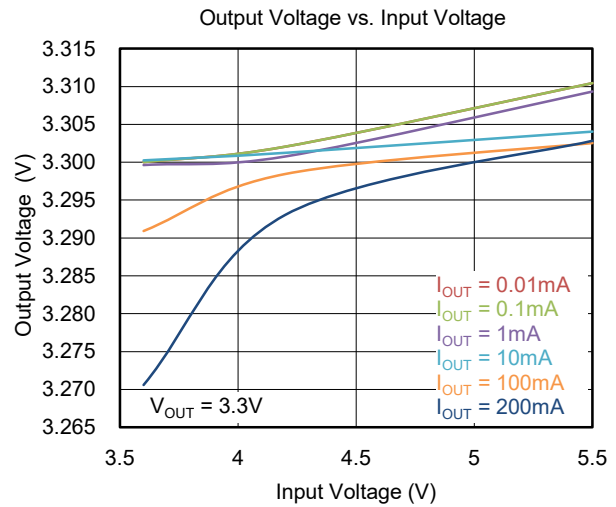
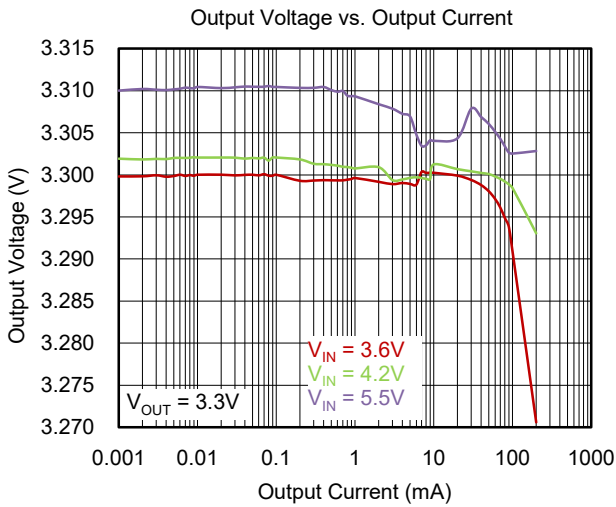
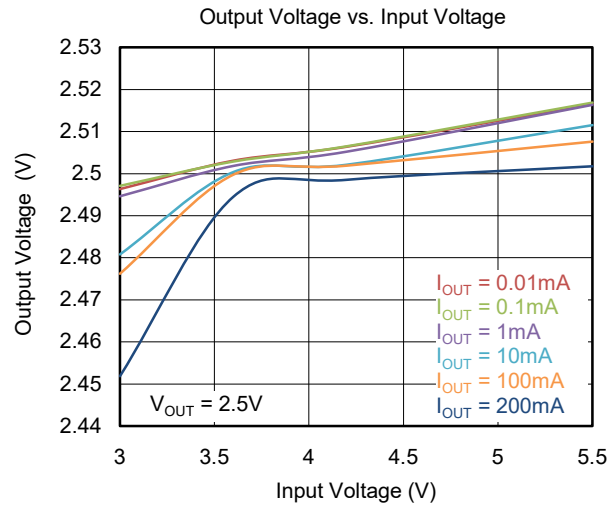
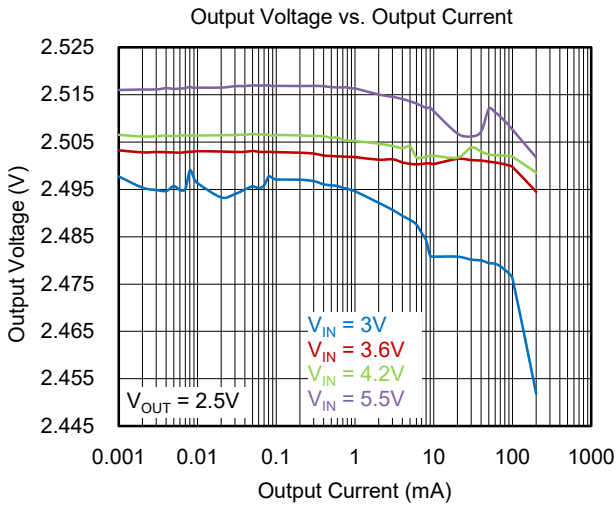
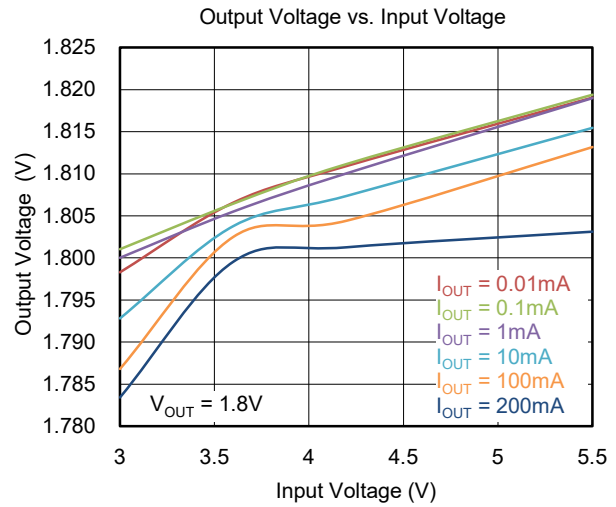
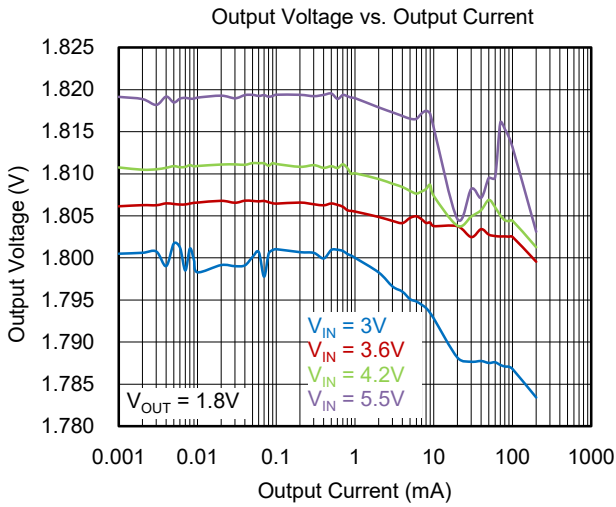
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, unless otherwise noted.



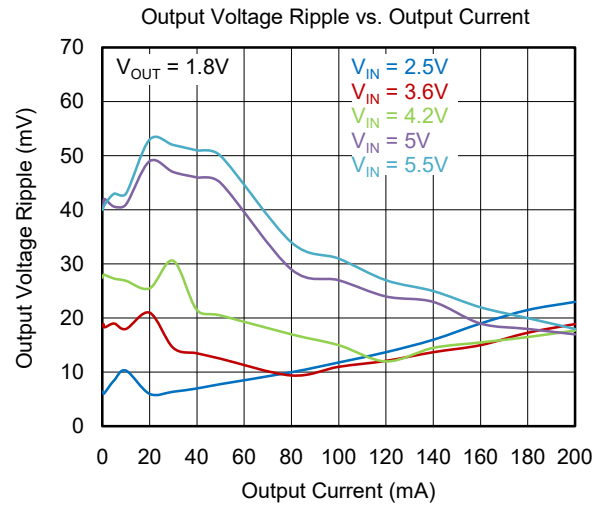
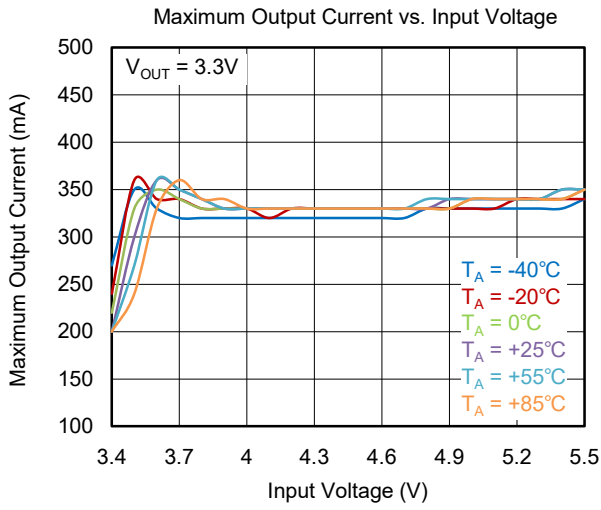
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

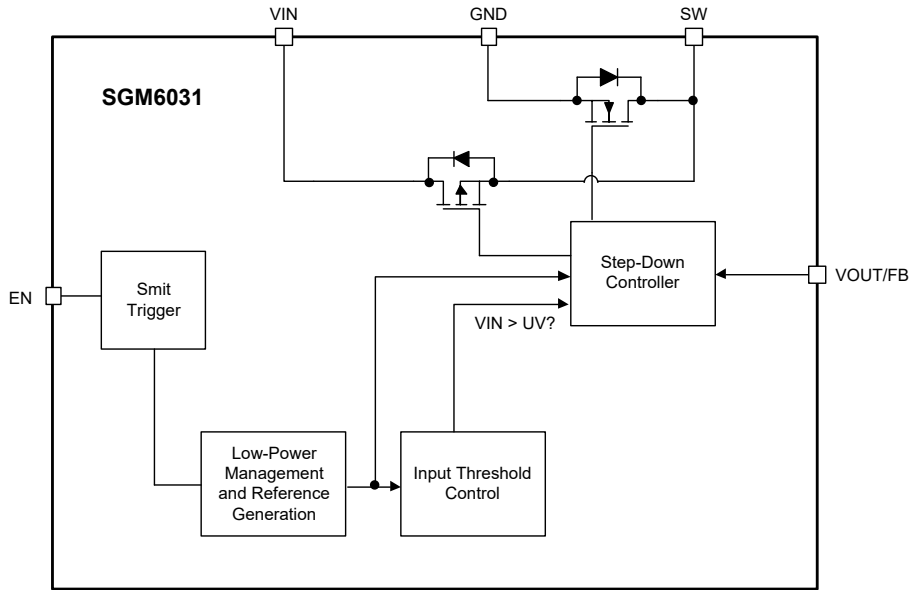


Figure 1. Block Diagram

TYPICAL APPLICATION CIRCUITS

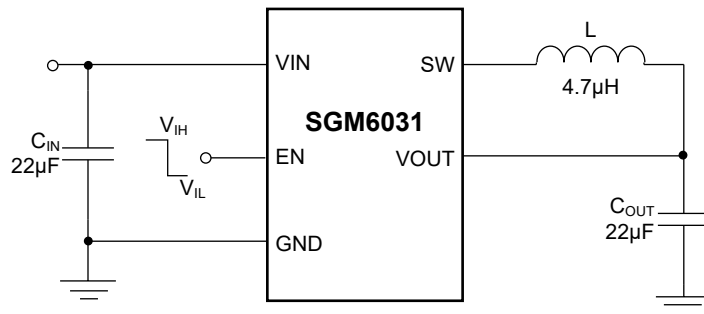


Figure 2. Fixed Voltage Typical Application Circuit

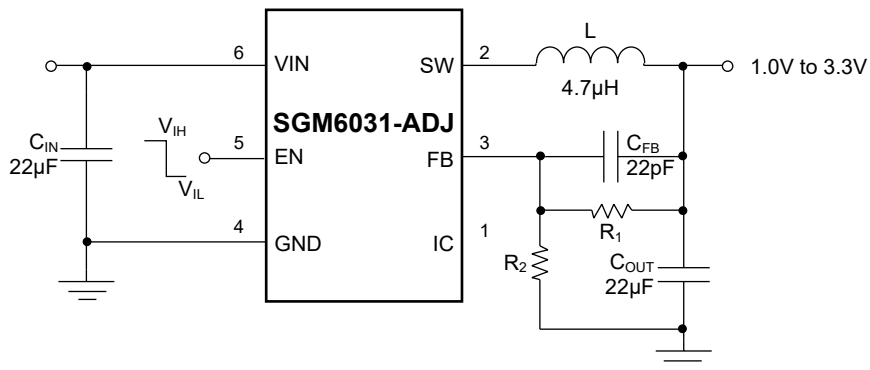


Figure 3. Adjustable Voltage Typical Application Circuit

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

OCTOBER 2021 – REV.A.3 to REV.A.4

Updated the Electrical Characteristics section 4

NOVEMBER 2017 – REV.A.2 to REV.A.3

Updated Figure 2..... 9

OCTOBER 2017 – REV.A.1 to REV.A.2

Changed the marking information for SGM6031-3.0YUDT6G..... 2

AUGUST 2017 – REV.A to REV.A.1

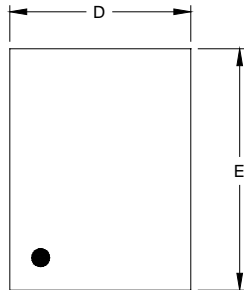
Changed SGM6031-3.0 STATUS from PREVIEW to ACTIVE 2

Changes from Original (JUNE 2017) to REV.A

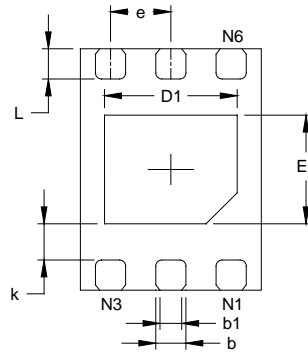
Changed from product preview to production data..... All

PACKAGE OUTLINE DIMENSIONS

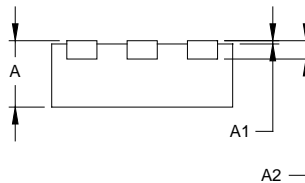
UTDFN-1.5x2-6L



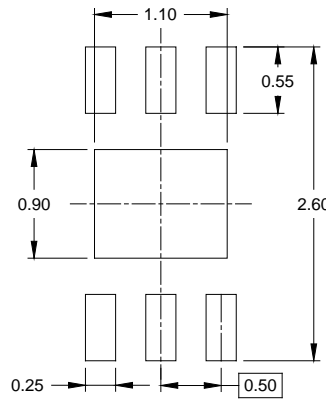
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A2	0.152 REF		0.006 REF	
D	1.400	1.600	0.055	0.063
D1	1.000	1.200	0.039	0.047
E	1.900	2.100	0.075	0.083
E1	0.800	1.000	0.031	0.039
k	0.300 REF		0.012 REF	
b	0.200	0.300	0.008	0.012
b1	0.180 REF		0.007 REF	
e	0.500 BSC		0.020 BSC	
L	0.200	0.300	0.008	0.012

NOTE: This drawing is subject to change without notice.

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
UTDFN-1.5×2-6L	7"	9.5	1.70	2.30	0.75	4.0	4.0	2.0	8.0	Q2

000001

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

DD0002