

### GENERAL DESCRIPTION

The SGM2031 is a low power and low dropout voltage RF linear regulator. It is capable of supplying 250mA output current with typical dropout voltage of only 230mV. The operating input voltage range is from 2.5V to 5.5V. The fixed output voltage range is from 1.2V to 3.3V.

Other features include logic-controlled shutdown mode, output current limit and thermal shutdown protection.

The SGM2031 is available in a Green UTDFN-1×1-4L package. It operates over an operating temperature range of -40°C to +85°C.

### FEATURES

- **Operating Input Voltage Range: 2.5V to 5.5V**
- **Fixed Output Voltages:**  
1.2V, 1.5V, 1.8V, 2.5V, 2.6V, 2.8V, 2.85V, 3.0V and 3.3V
- **Output Voltage Accuracy: ±3% at +25°C**
- **Low Output Noise: 140µV<sub>RMS</sub> (TYP)**
- **Low Dropout Voltage: 230mV (TYP) at 250mA**
- **High PSRR: 72dB (TYP) at 1kHz**
- **Low No Load Supply Current: 95µA (TYP)**
- **Thermal Shutdown Protection**
- **Output Current Limit**
- **Shutdown Current: 0.01µA (TYP)**
- **-40°C to +85°C Operating Temperature Range**
- **Available in a Green UTDFN-1×1-4L Package**

### APPLICATIONS

Modems  
MP3 Players  
Cellular Telephones  
PCMCIA Cards  
Palmtop Computers  
Portable Electronics

### TYPICAL APPLICATION

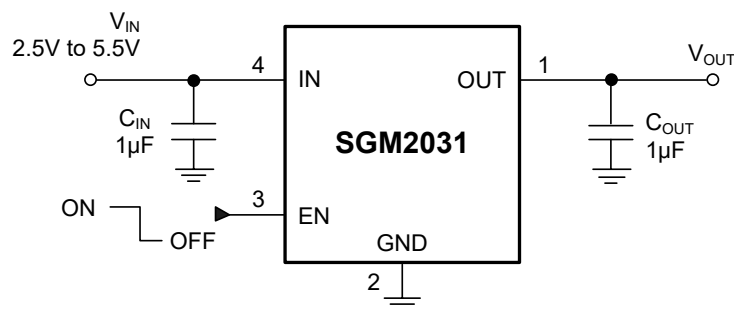


Figure 1. Typical Application Circuit

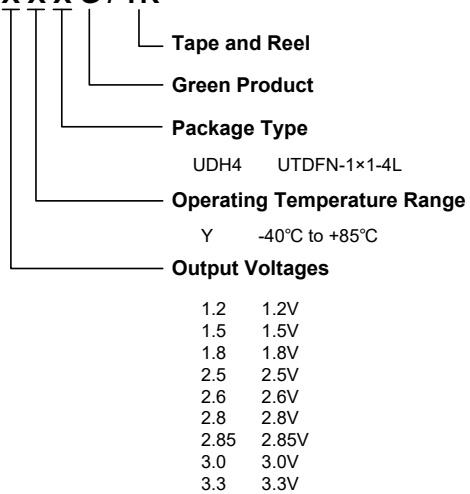
**PACKAGE/ORDERING INFORMATION**

MODEL	V <sub>OUT</sub> (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2031-1.2	1.2	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-1.2YUDH4G/TR	64	Tape and Reel, 10000
SGM2031-1.5	1.5	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-1.5YUDH4G/TR	9F	Tape and Reel, 10000
SGM2031-1.8	1.8	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-1.8YUDH4G/TR	51	Tape and Reel, 10000
SGM2031-2.5	2.5	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-2.5YUDH4G/TR	A0	Tape and Reel, 10000
SGM2031-2.6	2.6	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-2.6YUDH4G/TR	B8	Tape and Reel, 10000
SGM2031-2.8	2.8	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-2.8YUDH4G/TR	52	Tape and Reel, 10000
SGM2031-2.85	2.85	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-2.85YUDH4G/TR	B9	Tape and Reel, 10000
SGM2031-3.0	3.0	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-3.0YUDH4G/TR	53	Tape and Reel, 10000
SGM2031-3.3	3.3	UTDFN-1×1-4L	-40°C to +85°C	SGM2031-3.3YUDH4G/TR	57	Tape and Reel, 10000

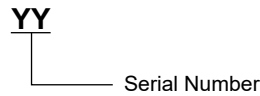
Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**ORDER NUMBER**

**SGM2031 - X X X G / TR**



**MARKING INFORMATION**



### ABSOLUTE MAXIMUM RATINGS

IN to GND .....	-0.3V to 6V
Output Short-Circuit Duration.....	Infinite
EN to GND.....	-0.3V to $V_{IN}$
OUT to GND .....	-0.3V to $(V_{IN} + 0.3V)$
Power Dissipation, $P_D$ @ $T_A = +25^\circ C$	
UTDFN-1×1-4L .....	400mW
Package Thermal Resistance	
UTDFN-1×1-4L, $\theta_{JA}$ .....	280°C/W
Junction Temperature .....	+150°C
Storage Temperature Range .....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	+260°C
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

### RECOMMENDED OPERATING CONDITIONS

Input Voltage Range .....	2.5V to 5.5V
Operating Temperature Range .....	-40°C to +85°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.

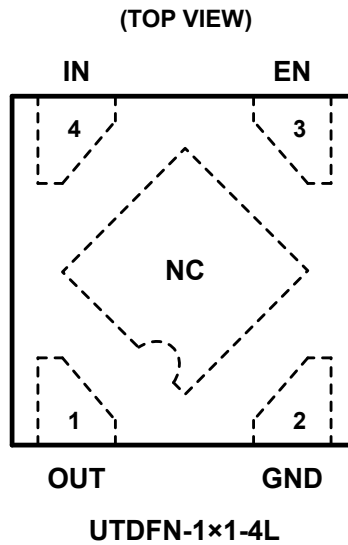
### ESD SENSITIVITY CAUTION

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	OUT	Regulator Output Pin. It is recommended to use 1 $\mu$ F or larger ceramic output capacitor from OUT pin to ground. The capacitor should be located very close to this pin.
2	GND	Ground.
3	EN	Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.
4	IN	Input Voltage Supply Pin. It is recommended to use a 1 $\mu$ F or larger ceramic capacitor from IN pin to ground.
Exposed Pad	NC	No Connection.

**ELECTRICAL CHARACTERISTICS**(V<sub>IN</sub> = V<sub>OUT (NOMINAL)</sub> + 0.5V<sup>(1)</sup>, Full = -40°C to +85°C, unless otherwise noted.)

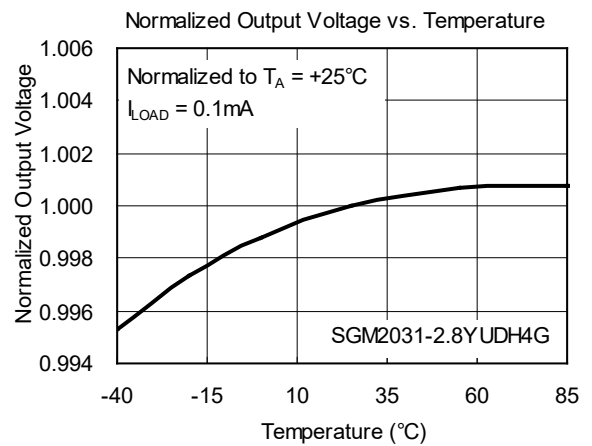
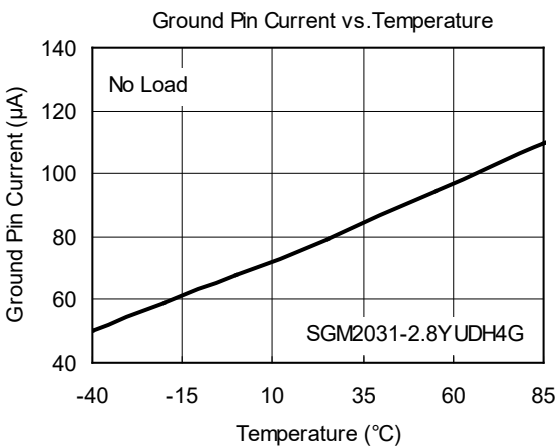
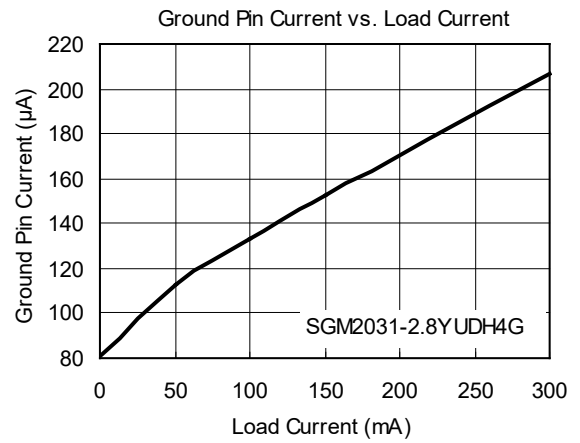
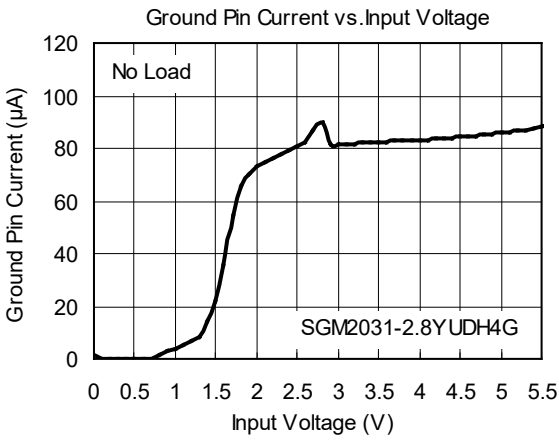
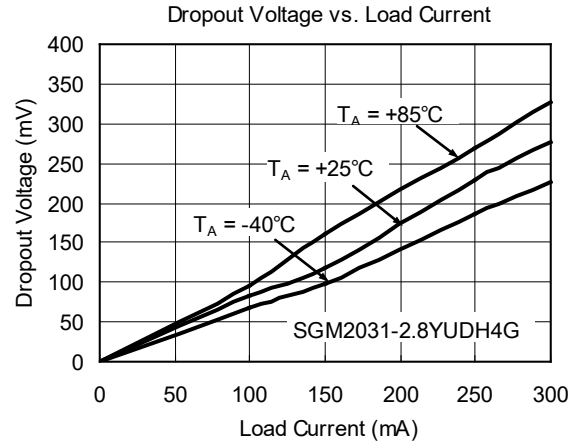
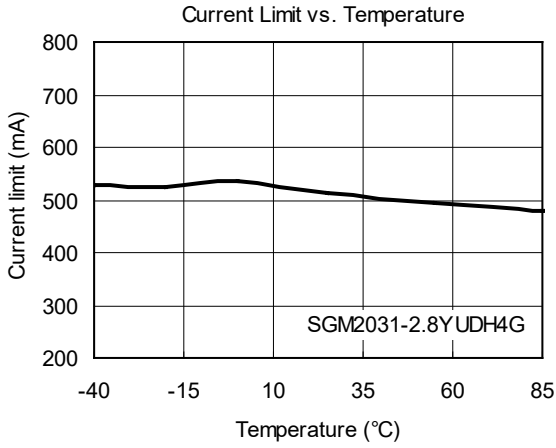
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
Input Voltage	V <sub>IN</sub>		+25°C	2.5		5.5	V	
Output Voltage Accuracy <sup>(1)</sup>		I <sub>OUT</sub> = 0.1mA	+25°C	-3		+3	%	
Maximum Output Current <sup>(1)</sup>			+25°C	250			mA	
Output Current Limit <sup>(1)</sup>	I <sub>LIMIT</sub>		+25°C	260			mA	
Ground Pin Current	I <sub>Q</sub>	No Load, EN = 2V	+25°C		95	200	μA	
Dropout Voltage <sup>(2)</sup>		I <sub>OUT</sub> = 1mA	+25°C		0.9		mV	
		I <sub>OUT</sub> = 250mA			230	400		
Line Regulation <sup>(1)</sup>	ΔV <sub>LNR</sub>	V <sub>IN</sub> = 2.5V or (V <sub>OUT</sub> + 0.5V) to 5.5V, I <sub>OUT</sub> = 1mA	+25°C		0.02	0.05	%/V	
Load Regulation	ΔV <sub>LDR</sub>	I <sub>OUT</sub> = 0.1mA to 250mA, C <sub>OUT</sub> = 1μF, V <sub>OUT</sub> > 2V	+25°C		0.002	0.005	%mA	
		I <sub>OUT</sub> = 0.1mA to 250mA, C <sub>OUT</sub> = 1μF, V <sub>OUT</sub> ≤ 2V			0.004	0.008		
Output Voltage Noise	e <sub>n</sub>	f = 10Hz to 100kHz, C <sub>OUT</sub> = 10μF	+25°C		140		μV <sub>RMS</sub>	
Power Supply Rejection Ratio	PSRR	I <sub>OUT</sub> = 50mA, C <sub>OUT</sub> = 1μF, V <sub>IN</sub> = V <sub>OUT</sub> + 1V	f = 217Hz	+25°C		72		dB
			f = 1kHz	+25°C		72		dB
<b>Shutdown<sup>(3)</sup></b>								
EN Input Threshold	V <sub>IH</sub>	V <sub>IN</sub> = 2.5V to 5.5V, V <sub>EN</sub> = -0.3V to V <sub>IN</sub>	Full		1.5		V	
	V <sub>IL</sub>		Full			0.3		
EN Input Bias Current	I <sub>B(SHDN)</sub>	EN = 0V and EN = 5.5V	+25°C		0.01	1	μA	
			Full		0.01			
Shutdown Supply Current	I <sub>Q(SHDN)</sub>	EN = 0.4V	+25°C		0.01	1	μA	
			Full		0.01			
Shutdown Exit Delay <sup>(4)</sup>		C <sub>OUT</sub> = 1μF, No Load	+25°C		10		μs	
<b>Thermal Protection</b>								
Thermal Shutdown Temperature	T <sub>SHDN</sub>				150		°C	
Thermal Shutdown Hysteresis	ΔT <sub>SHDN</sub>				15		°C	

## NOTES:

- V<sub>IN</sub> = V<sub>OUT (NOMINAL)</sub> + 0.5V or 2.5V, whichever is greater.
- The dropout voltage is defined as V<sub>IN</sub> - V<sub>OUT</sub>, when V<sub>OUT</sub> is 100mV below the value of V<sub>OUT</sub> for V<sub>IN</sub> = V<sub>OUT</sub> + 0.5V. (Only applicable for V<sub>OUT</sub> = +2.5V to +5.0V.)
- V<sub>EN</sub> = -0.3V to V<sub>IN</sub>
- Time needed for V<sub>OUT</sub> to reach 90% of final value.

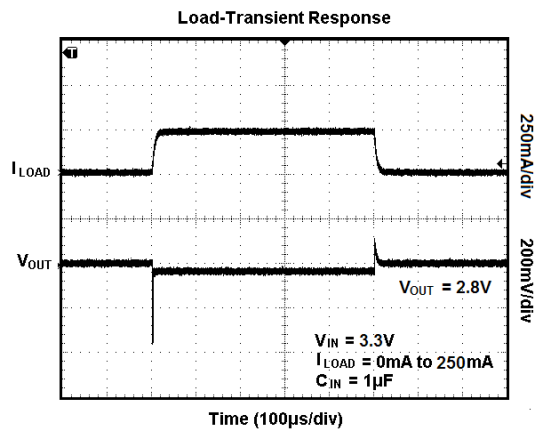
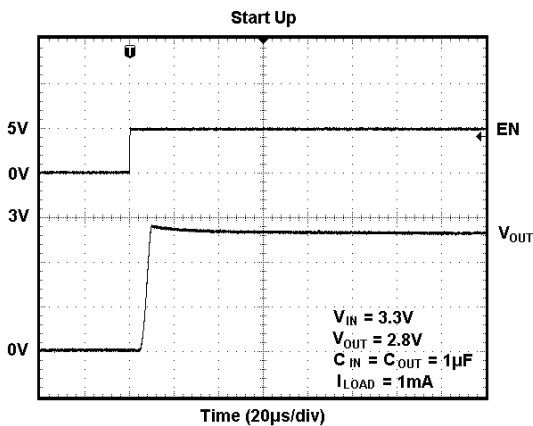
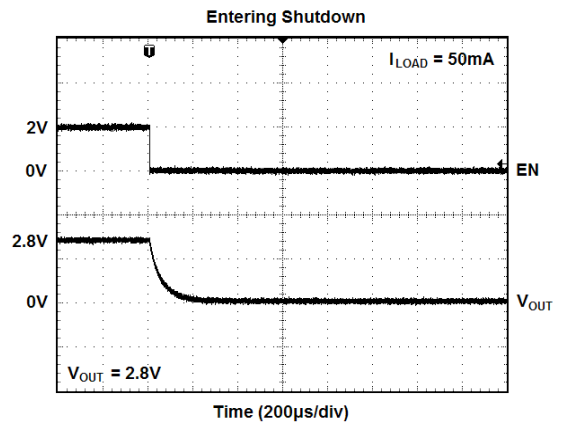
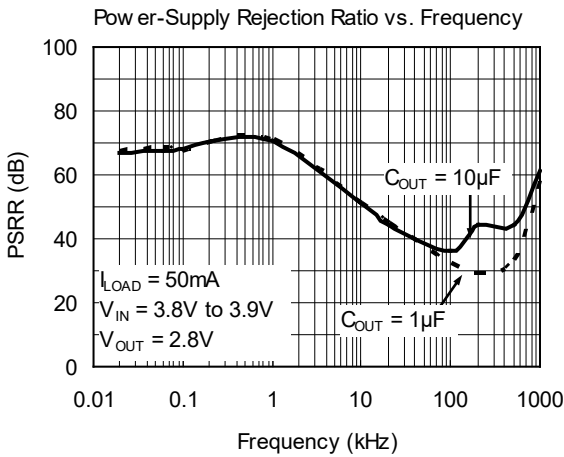
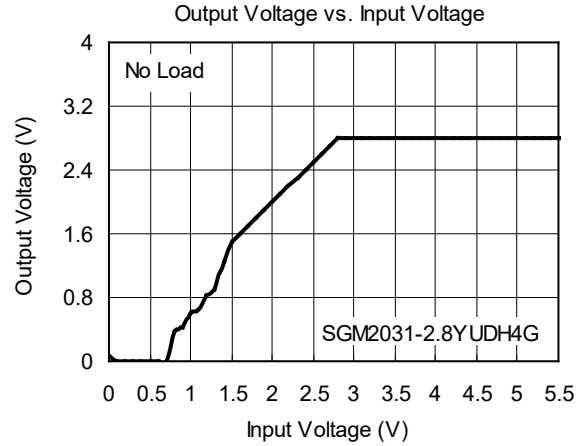
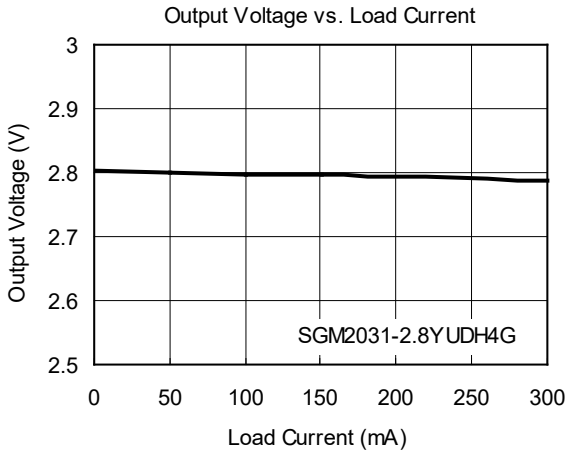
TYPICAL PERFORMANCE CHARACTERISTICS

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



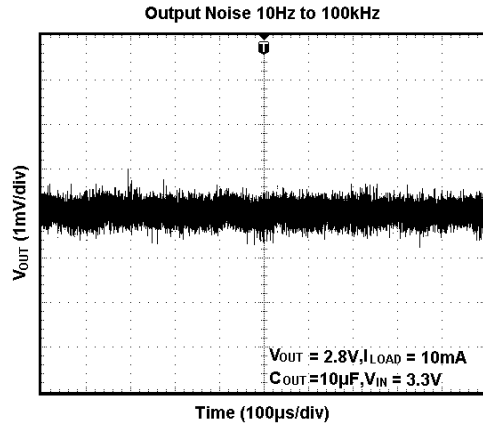
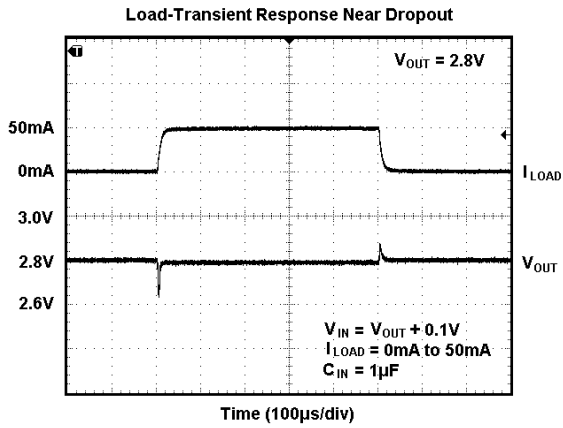
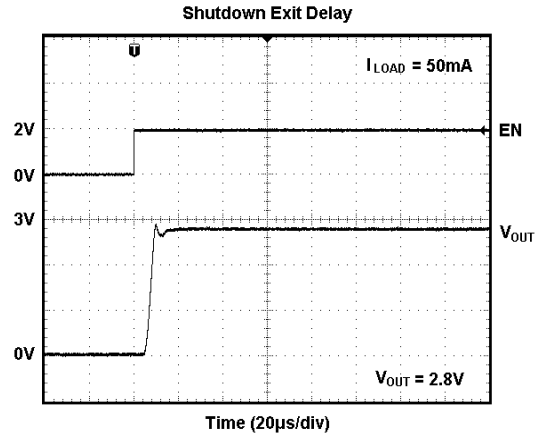
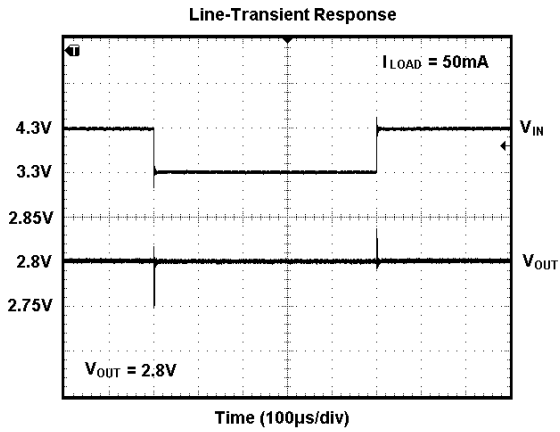
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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



**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

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





### APPLICATION INFORMATION

The SGM2031 is a low power and low dropout LDO and provides 250mA output current. These features make the device a reliable solution to solve many challenging problems in the generation of clean and accurate power supply. The high performance also makes the SGM2031 useful in a variety of applications. The SGM2031 provides protection functions for output overload, output short-circuit condition and overheating.

#### Input Capacitor Selection ( $C_{IN}$ )

The input decoupling capacitor is necessary to be connected as close as possible to the IN pin for ensuring the device stability. 1 $\mu$ F or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance.

When  $V_{IN}$  is required to provide large current instantaneously, a large effective input capacitor is required. Multiple input capacitors can limit the input tracking inductance. Adding more input capacitors is available to restrict the ringing and to keep it below the device absolute maximum ratings.

#### Output Capacitor Selection ( $C_{OUT}$ )

The output decoupling capacitor should be located as close as possible to the OUT pin. 1 $\mu$ F or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance. The minimum effective capacitance of  $C_{OUT}$  that SGM2031 can remain stable is 0.5 $\mu$ F. For ceramic capacitor, temperature, DC bias and package size will change the effective capacitance, so enough margin of  $C_{OUT}$  must be considered in design. Larger capacitance and lower ESR  $C_{OUT}$  will help improve the load transient response and increase the high

frequency PSRR.

#### Enable Control

The SGM2031 uses the EN pin to enable/disable its device.

When the EN pin voltage is lower than 0.3V, the device is in shutdown state.

When the EN pin voltage is higher than 1.5V, the device is in active state. The output voltage is regulated to expected value.

#### Output Current Limit and Short-Circuit Protection

When overload events happen, the output current is internally limited to 260mA (MIN). When the OUT pin is shorted to ground, the short-circuit protection will limit the output current.

#### Thermal Shutdown

The SGM2031 can detect the temperature of die. When the die temperature exceeds the threshold value of thermal shutdown, the SGM2031 will be in shutdown state and it will remain in this state until the die temperature decreases to +135°C.

#### Layout Guidelines

To get good PSRR, low output noise and high transient response performance, the input and output bypass capacitors must be placed as close as possible to the IN pin and OUT pin separately.  $V_{IN}$  and  $V_{OUT}$  had better use separate ground planes and these ground planes are single point connected to the GND pin.

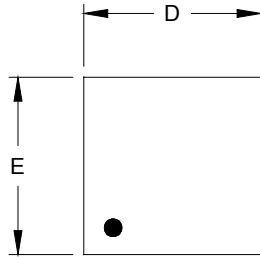
**REVISION HISTORY**

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

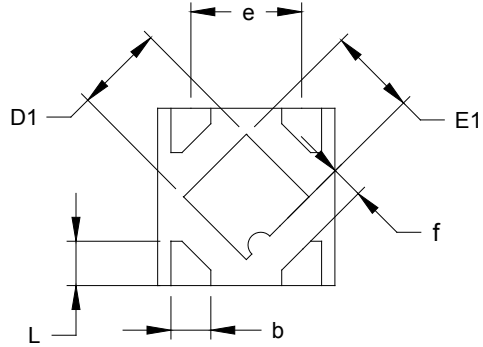
<b>MAY 2016 – REV.B.1 to REV.B.2</b> .....	<b>Page</b>
Changed Normalized Output Voltage vs. Temperature .....	6
<hr/>	
<b>OCTOBER 2014 – REV.B to REV.B.1</b> .....	<b>Page</b>
Changed Typical Performance Characteristics section.....	7
Changed entering shutdown as same as SGM2019.....	7
<hr/>	
<b>APRIL 2014 – REV.A.4 to REV.B</b> .....	<b>Page</b>
Changed Electrical Characteristics section .....	5
Changed Maximum Output Current .....	5
Added Absolute Maximum Ratings .....	3
Changed Package Thermal Resistance.....	3
Changed Electrical Characteristics section .....	5
Added note 5 .....	5

PACKAGE OUTLINE DIMENSIONS

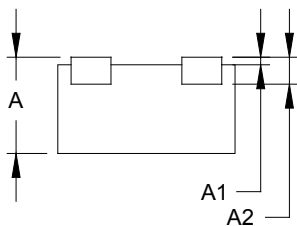
UTDFN-1×1-4L



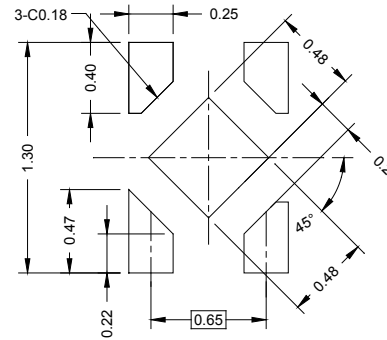
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.500	0.550	0.600
A1	0.000		0.050
A2	0.152 REF		
D	0.950	1.000	1.050
D1	0.450	0.500	0.550
E	0.950	1.000	1.050
E1	0.450	0.500	0.550
b	0.175	0.225	0.275
e	0.625 BSC		
f	0.195 REF		
L	0.200	0.250	0.300

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-1×1-4L	7"	9.0	1.20	1.20	0.60	4.0	2.0	2.0	8.0	Q1

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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

DD0002