

## GENERAL DESCRIPTION

The SGM61410 is a high frequency, synchronous step-down converter with integrated switches. It can deliver up to 600mA to the output over a wide input voltage range of 5V to 42V. It is specified for various industrial or automotive applications with high input voltage requirements. It is also suitable for power conditioning from unregulated sources. Moreover, the low 14 $\mu$ A quiescent current and ultra-low shutdown current of only 0.6 $\mu$ A make it a suitable choice for battery-powered applications.

SGM61410 features high efficiency over a wide load range achieved by scaling down the switching frequency at light loads to reduce switching and gate driving losses. Other features include internal compensation, internal monotonic soft-start even with pre-biased output and fast loop response thanks to the peak-current mode controller. Switching at 1.2MHz, the SGM61410 can prevent EMI noise problems, such as the ones found in AM radio, ADSL and PLC applications.

Protection features include current limiting and short-circuit protection, thermal shutdown with auto recovery and output over-voltage protection. Frequency fold-back helps prevent inductor current runaway during startup.

SGM61410 is available in a Green SOT-23-6 package. It operates over a wide ambient temperature range of -40°C to +125°C.

## FEATURES

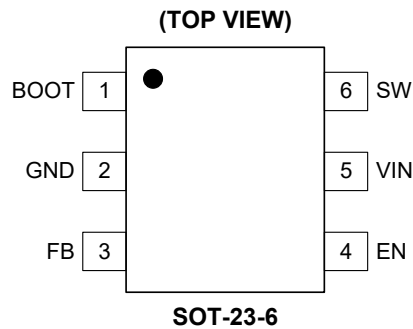
- **Wide 5V to 42V Operating Input Voltage Range**
- **0.8V Internal Reference**
- **Low Quiescent Current: 14 $\mu$ A (TYP)**
- **Shutdown Current: 0.6 $\mu$ A (TYP)**
- **Current Output up to 600mA**
- **1.2MHz Switching Frequency**
- **Internal Compensation and Soft-Start**
- **Simple Design and Minimal External Components**
- **Up to 95% Efficiency at 12V/400mA**
- **0.8V to 20V Adjustable Output Voltage**
- **Current Limit and Short-Circuit Protection**
- **Output Over-Voltage Protection and Thermal Shutdown**
- **Power-Save Mode and PWM Mode Operation**
- **Monotonic Startup with Pre-biased Output**
- **90% Maximum Duty Cycle**
- **Available in a Green SOT-23-6 Package**
- **-40°C to +125°C Operating Temperature Range**

## APPLICATIONS

High Voltage Power Conversions  
Automotive Systems  
Industrial Power Systems  
Distributed Power Systems  
Battery Powered Systems  
Power Meters



## PIN CONFIGURATION



## PIN DESCRIPTION

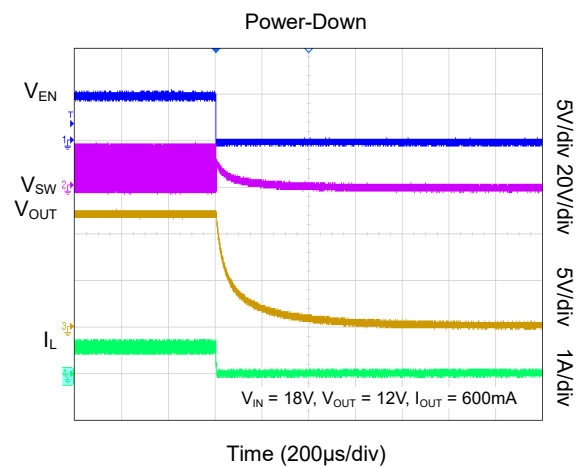
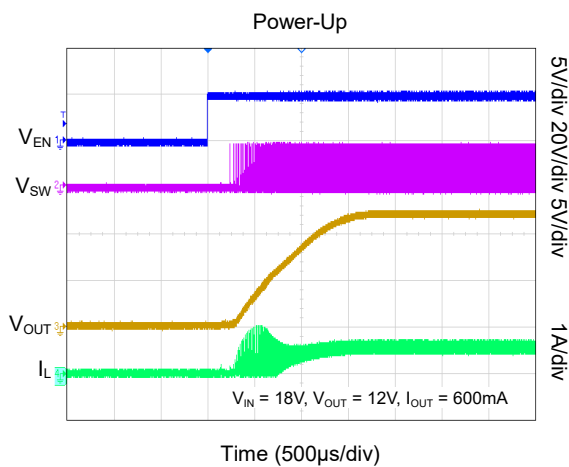
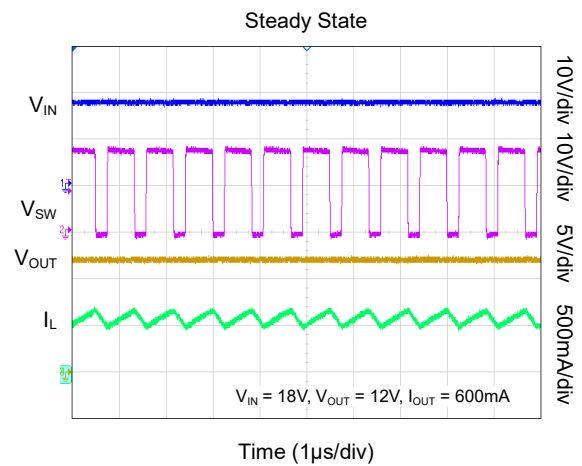
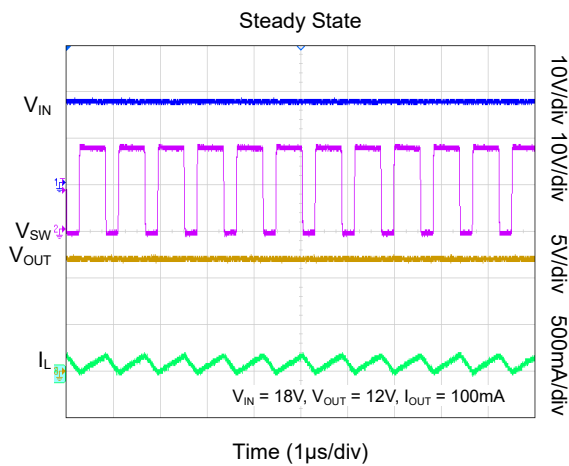
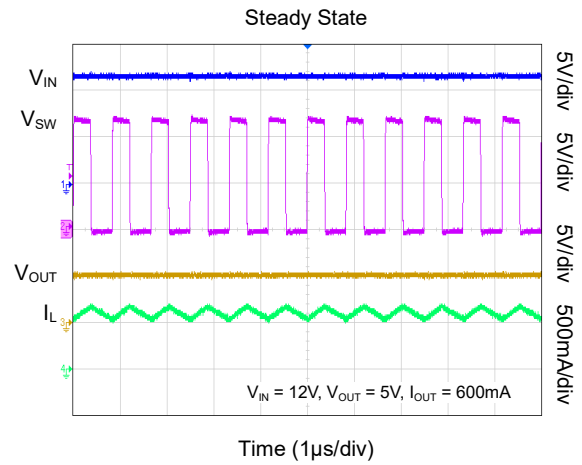
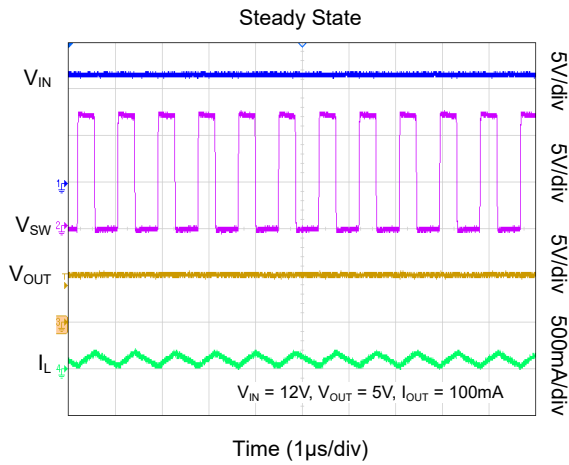
PIN	NAME	FUNCTION
1	BOOT	Bootstrap pin is used to provide a drive voltage, higher than the input voltage, to the topline power switch. Place a 0.47 $\mu$ F boost capacitor ( $C_{BOOT}$ ) as close as possible to the IC between this pin and SW pin. Do not place a resistor in series with this pin.
2	GND	Ground pin is the reference for input and the regulated output voltages. Special layout considerations are required.
3	FB	Feedback pin for programming the output voltage. The SGM61410 regulates the FB pin to 0.8V. Connect the feedback resistor divider tap to this pin. If the FB voltage exceeds 110% of 0.8V, over-voltage protection (OVP) will stop all PWM switching.
4	EN	Enable pin should not be left open and it should not be driven above $V_{IN} + 0.3V$ . Device will operate when the EN pin is high and shut down when the EN pin is low. EN can be tied to VIN pin via a resistor if the shutdown feature is not required or to a logic input for controlling shutdown.
5	VIN	VIN pin is connected to the input supply voltage and powers the internal control circuitry. This voltage is monitored by a UVLO lockout comparator. VIN is also connected to the drain of the converter top switch. Due to power switching, this pin has high di/dt transition edges and must be decoupled to the GND by input capacitors as close as possible to the GND pin to minimize the parasitic inductances.
6	SW	Switching node pin is the output of the internal power converter and should be connect to the output inductor. Bootstrap capacitor also connects to this pin. This node should be kept small on the PCB to minimize capacitive coupling, noise coupling and radiation.

**ELECTRICAL CHARACTERISTICS**(V<sub>IN</sub> = 18V, T<sub>J</sub> = -40°C to +125°C, typical values are at T<sub>J</sub> = +25°C, unless otherwise noted.)

PARAMETER		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Input Voltage		V <sub>IN</sub>		5		42	V
Under-Voltage Lockout Threshold		V <sub>UVLO</sub>		4.45	4.7	4.95	V
Under-Voltage Lockout Threshold Hysteresis		V <sub>UVLO_HYS</sub>			370		mV
VIN Quiescent Current	Shutdown	I <sub>Q</sub>	V <sub>EN</sub> = 0V		0.6	1.2	μA
	Sleep Mode		V <sub>EN</sub> = 2V, Not Switching, V <sub>IN</sub> ≤ 36V		14	20	
Feedback Reference Voltage		V <sub>FB</sub>	V <sub>IN</sub> = 6V	0.777	0.800	0.823	V
Feedback Pin Input Current		I <sub>FB</sub>	V <sub>FB</sub> = 1V		0.1	1	μA
Minimum High-side Switch On-Time		t <sub>ON_MIN</sub>	I <sub>LOAD</sub> = 600mA		100		ns
Minimum High-side Switch Off-Time		t <sub>OFF_MIN</sub>			100		ns
Switching Frequency		f <sub>SW</sub>		0.85	1.2	1.5	MHz
Switch Leakage Current		I <sub>SW_H</sub>	V <sub>SW</sub> = 42V		0.1	1	μA
		I <sub>SW_L</sub>	V <sub>SW</sub> = 0V		0.1	1	μA
Top Power NMOS Current Limit		I <sub>LIM</sub>	T <sub>J</sub> = +25°C	0.9	1.2	1.5	A
Top Power NMOS On-Resistance		R <sub>DSON</sub>	I <sub>LOAD</sub> = 0.1A		700		mΩ
Bottom Power NMOS On-Resistance			I <sub>LOAD</sub> = 0.1A		300		mΩ
EN Input High Voltage		V <sub>IH</sub>		1.2			V
EN Input Low Voltage		V <sub>IL</sub>				0.5	V
EN Threshold, Hysteresis		V <sub>EN_HYS</sub>			120		mV
Enable Leakage Current		I <sub>EN</sub>	V <sub>EN</sub> = 5V		0.1	1	μA
Output Over-Voltage Threshold		V <sub>OUT_OV</sub>	OVP Rising	0.84	0.89	0.95	V
			OVP Falling	0.80	0.85	0.90	
Thermal Shutdown		T <sub>SHDN</sub>			150		°C
Thermal Shutdown Hysteresis		T <sub>HYS</sub>			20		°C

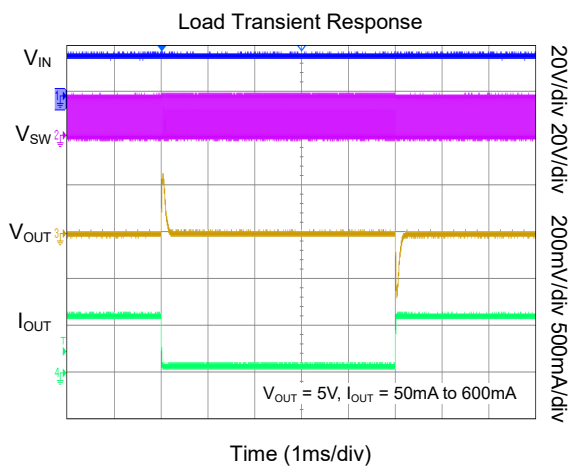
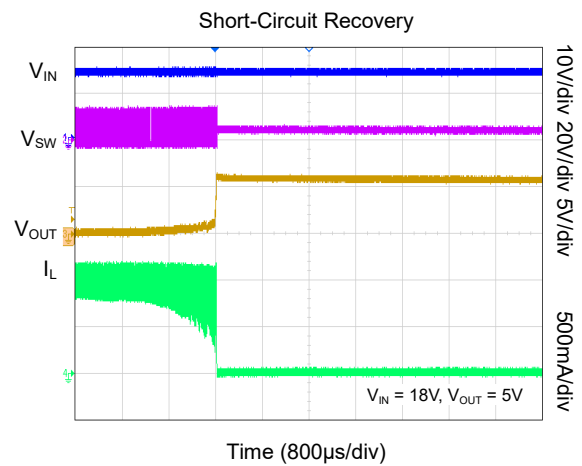
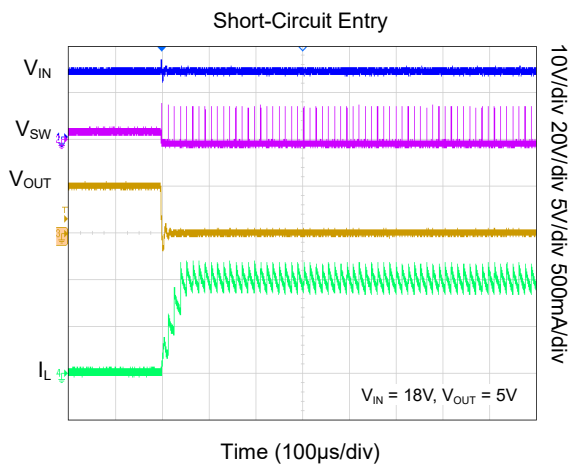
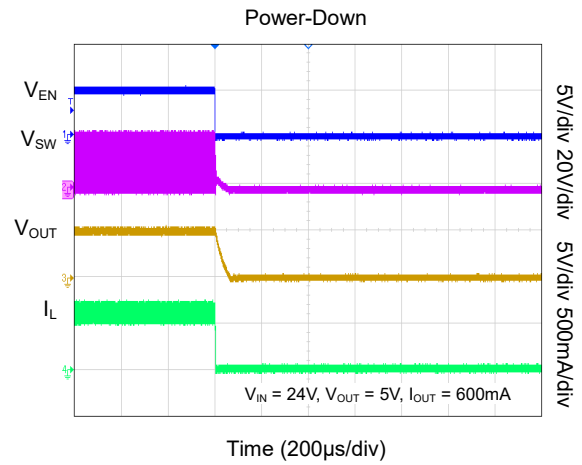
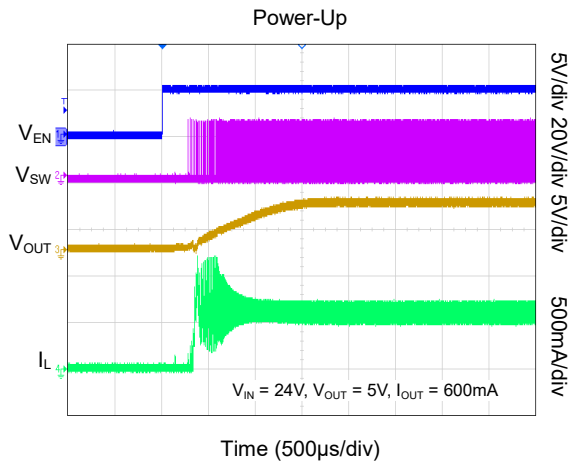
TYPICAL PERFORMANCE CHARACTERISTICS

T<sub>A</sub> = +25°C, V<sub>IN</sub> = 18V, L = 22µH and C<sub>OUT</sub> = 10µF, unless otherwise noted.



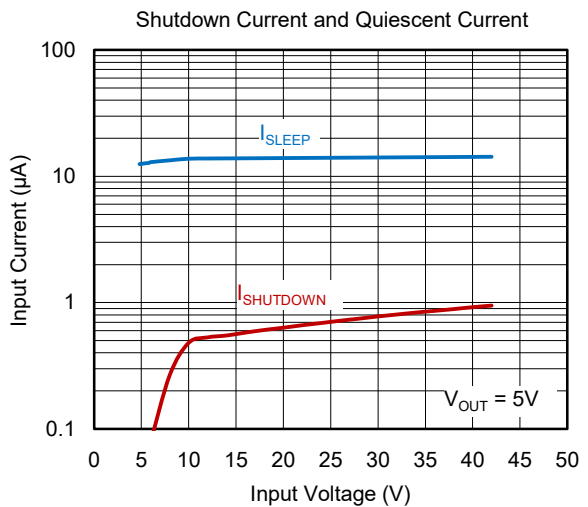
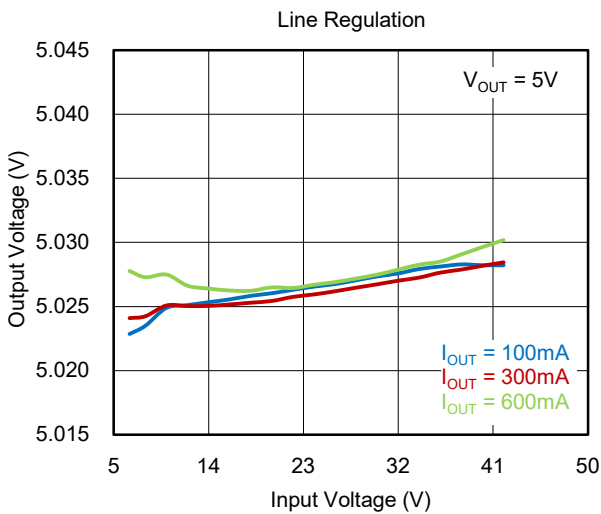
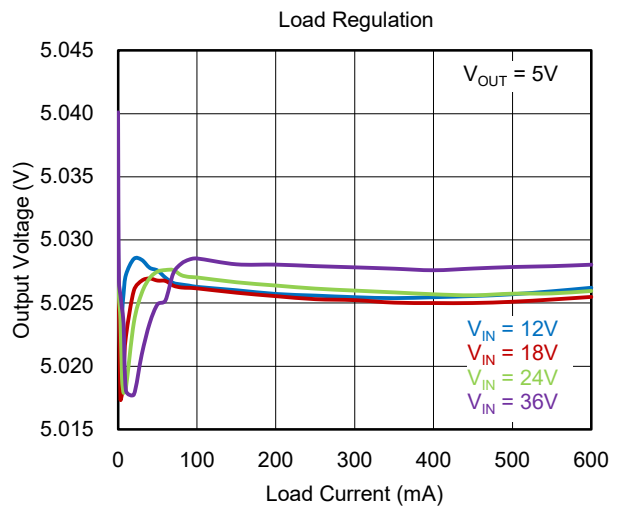
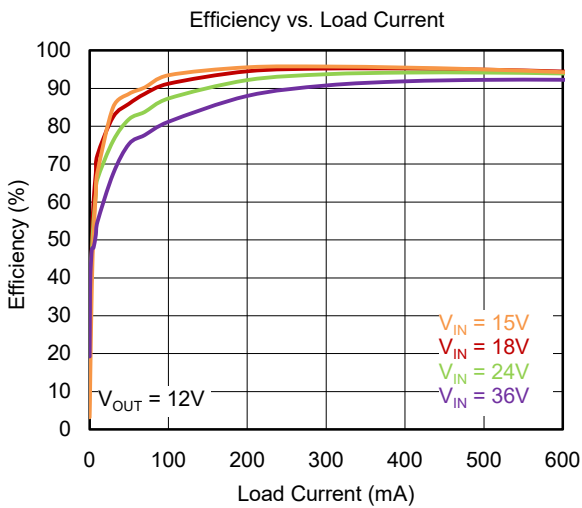
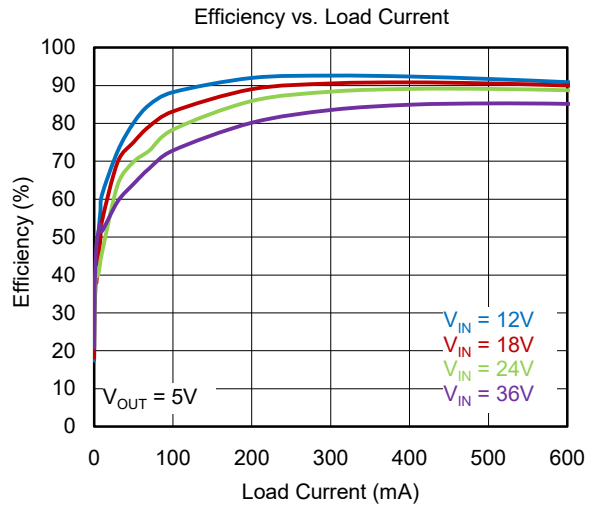
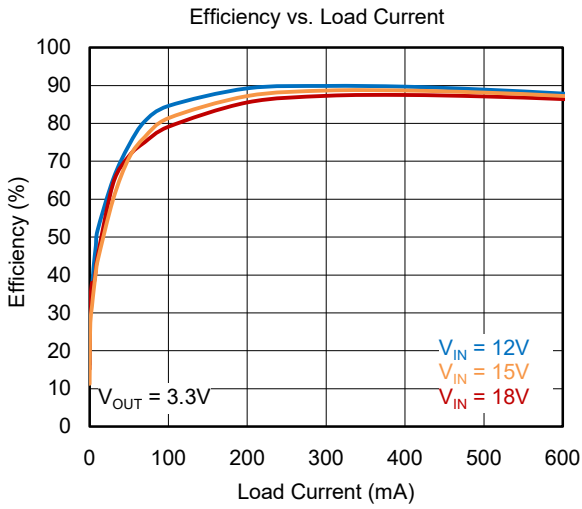
**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

$T_A = +25^\circ\text{C}$ ,  $V_{IN} = 18\text{V}$ ,  $L = 22\mu\text{H}$  and  $C_{OUT} = 10\mu\text{F}$ , unless otherwise noted.



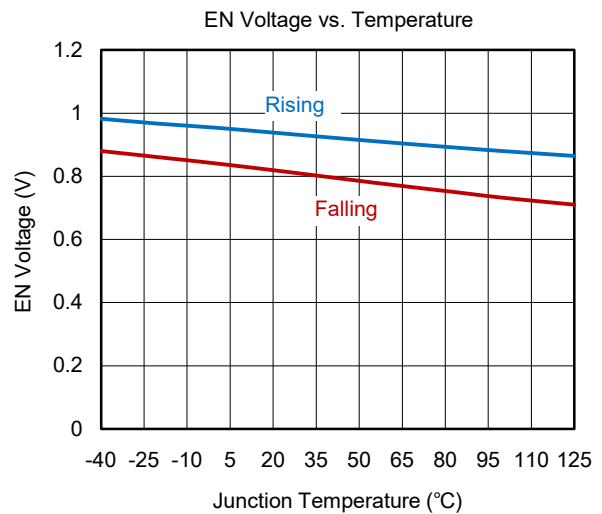
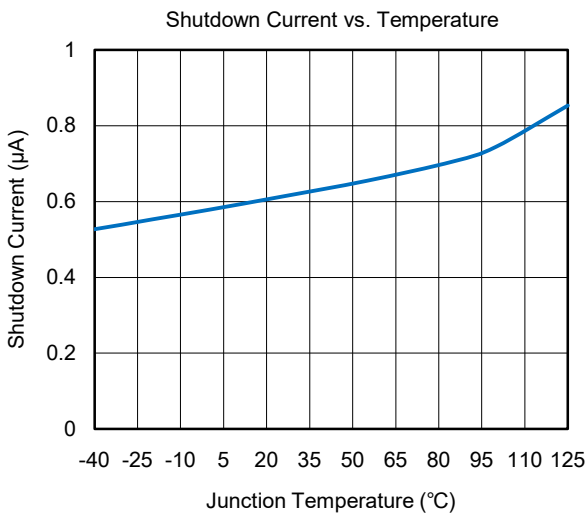
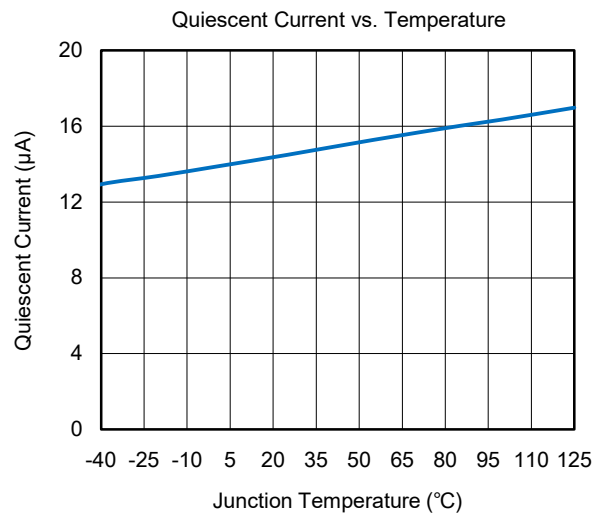
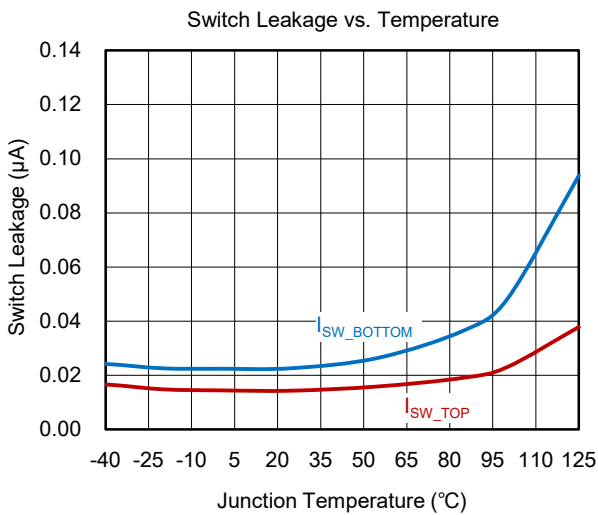
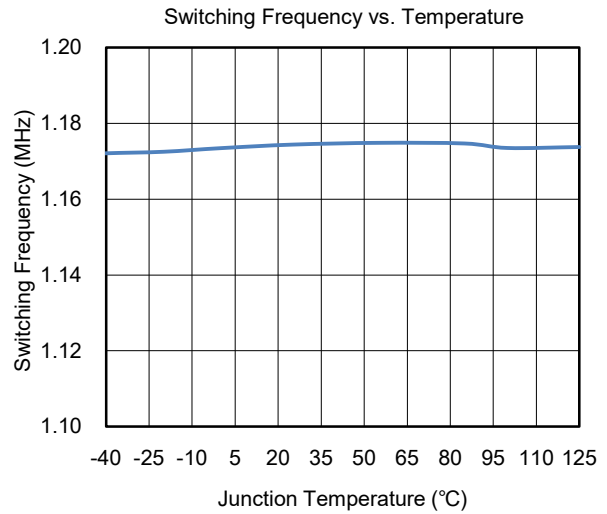
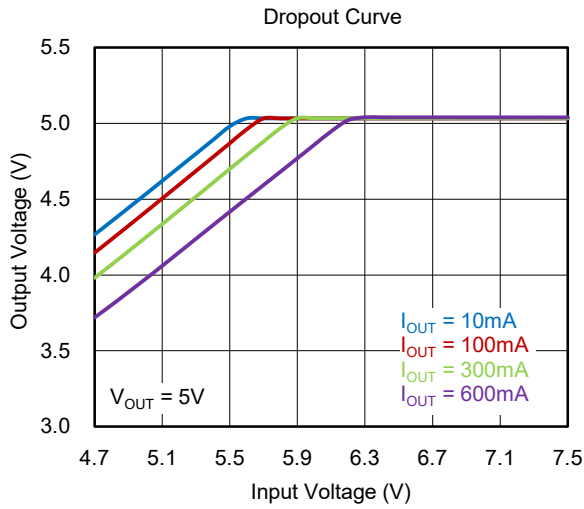
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T<sub>A</sub> = +25°C, V<sub>IN</sub> = 18V, L = 22μH and C<sub>OUT</sub> = 10μF, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

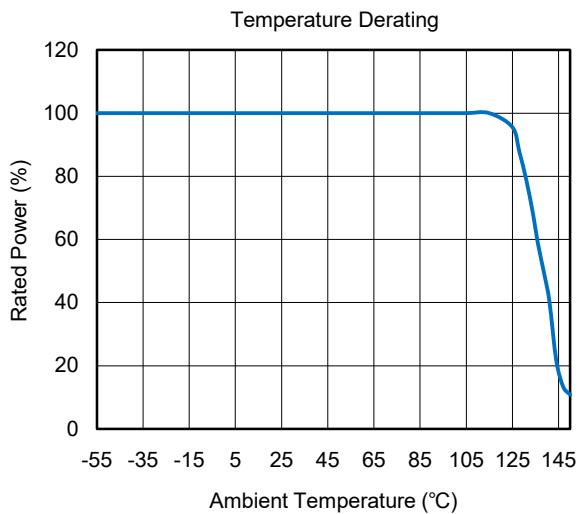
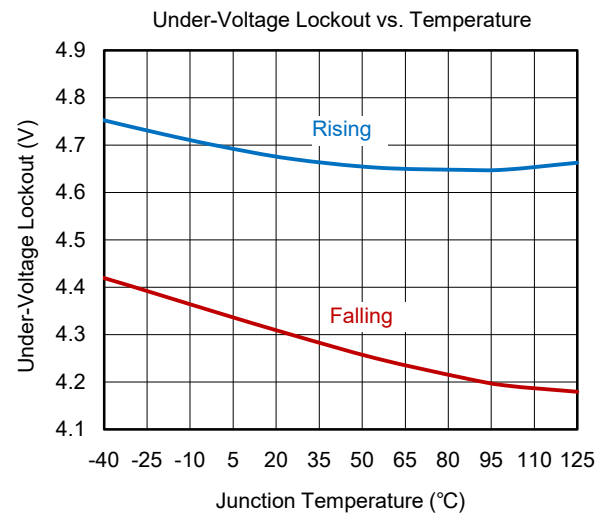
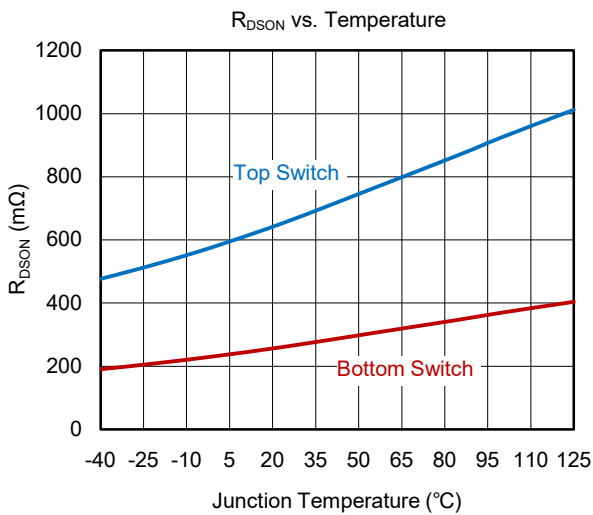
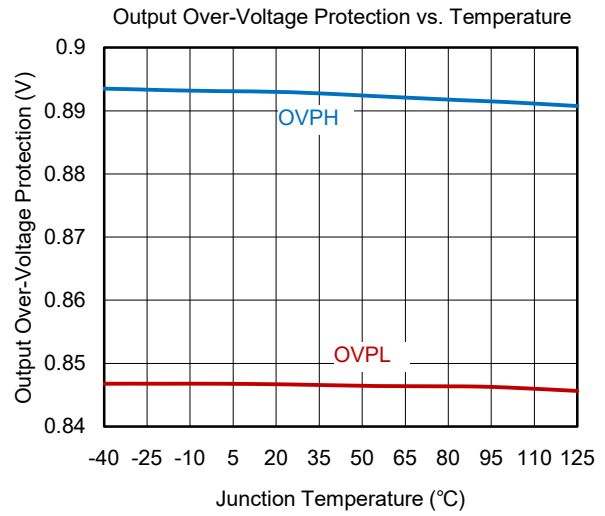
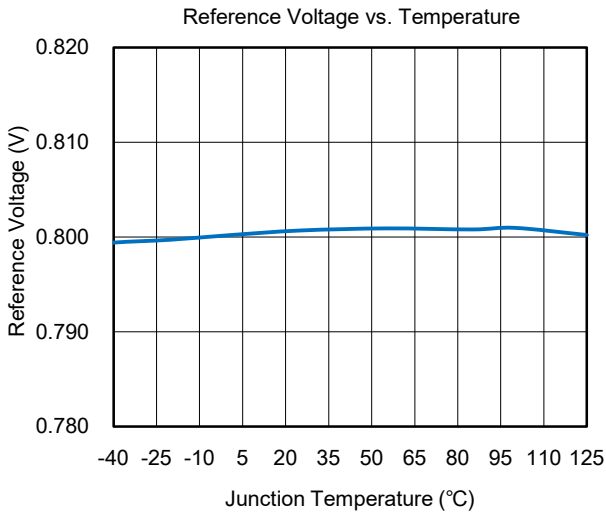
T<sub>A</sub> = +25°C, V<sub>IN</sub> = 18V, L = 22µH and C<sub>OUT</sub> = 10µF, unless otherwise noted.





**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

T<sub>A</sub> = +25°C, V<sub>IN</sub> = 18V, L = 22μH and C<sub>OUT</sub> = 10μF, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

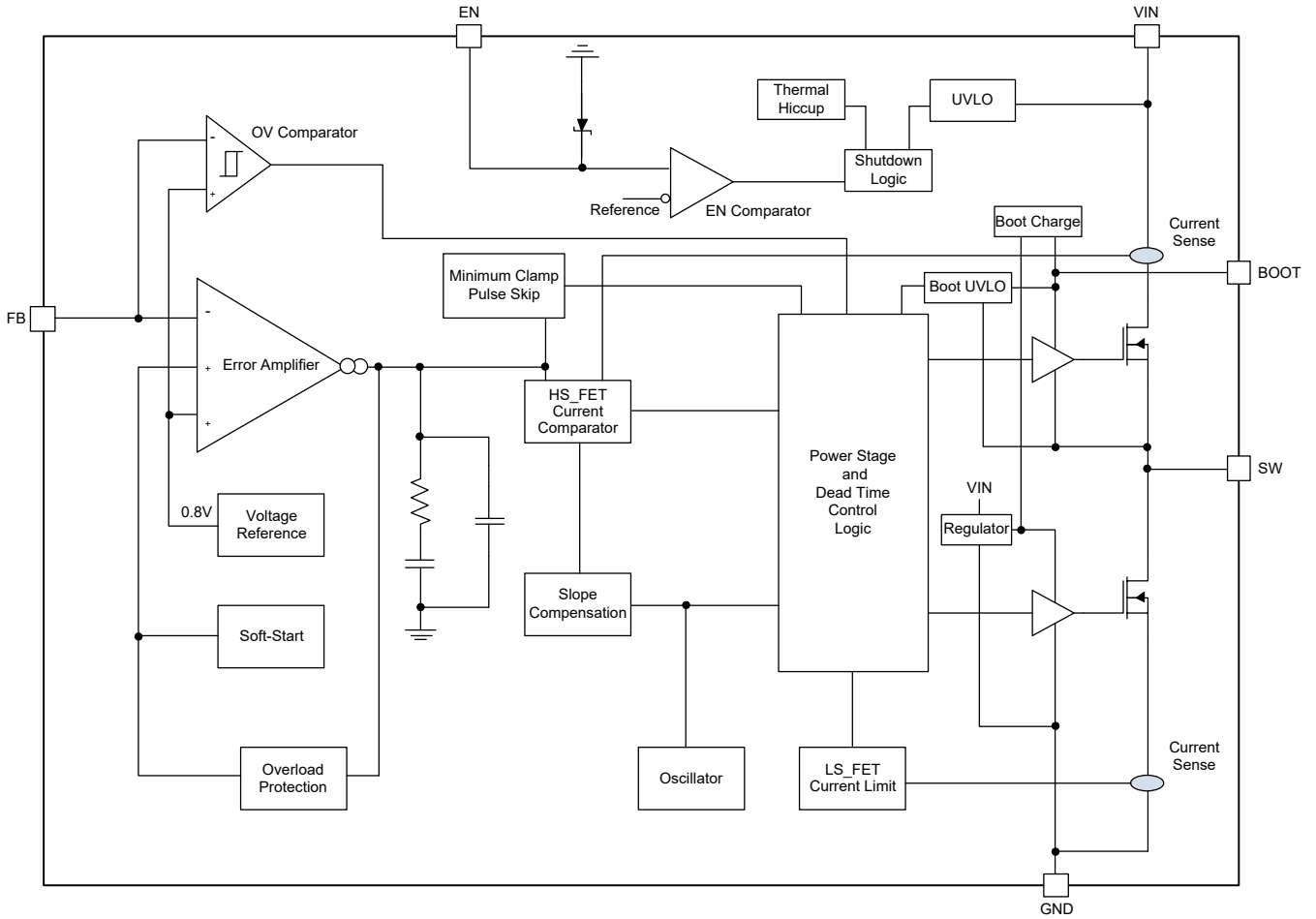


Figure 1. Functional Block Diagram

APPLICATION INFORMATION (continued)

PCB Layout

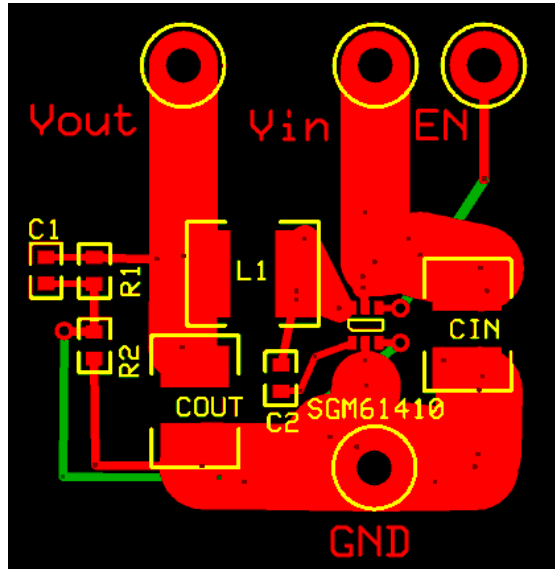


Figure 2. Suggested PCB

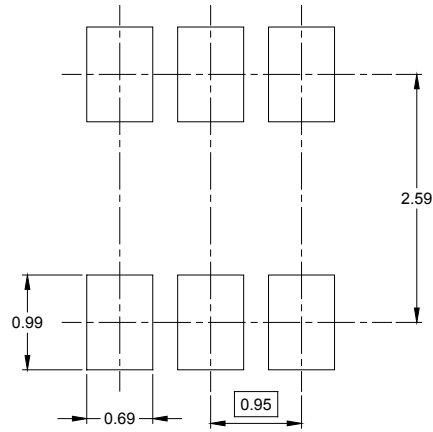
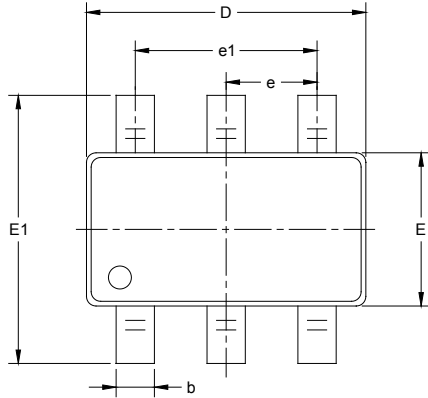
REVISION HISTORY

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

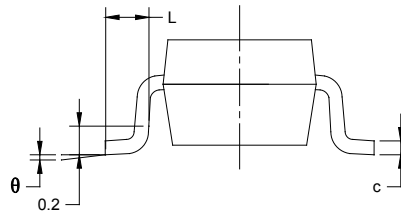
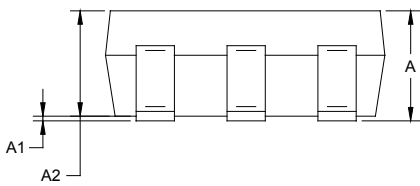
OCTOBER 2020 – REV.A to REV.A.1	Page
Updated operating input voltage range .....	All
Changes from Original (JUNE 2019) to REV.A	Page
Changed from product preview to production data .....	All

PACKAGE OUTLINE DIMENSIONS

SOT-23-6



RECOMMENDED LAND PATTERN (Unit: mm)



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	0.500	0.012	0.020
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	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

# 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-23-6	7"	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3

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