SGM6611C
12.6V, 7A Fully-Integrated Synchronous Boost Converter

GENERAL DESCRIPTION

The SGM6611C is a fully-integrated synchronous boost converter. The 2.7V to 12V operating input voltage is suitable for single-cell or two-cell Li-Ion/Polymer batteries. This device is capable to provide 7A continuous switch current and an output voltage range of 4.5V to 12.6V.

The SGM6611C has two operation modes, the pulse width modulation (PWM) mode and pulse frequency modulation (PFM). The PWM mode is applied at moderate to heavy load. The PFM mode is applied at light load to improve the efficiency. The protection features include output over-voltage protection at 13.2V, cycle-by-cycle over-current protection and thermal shutdown. The device also involves the functions of 4ms built-in soft-start and adjustable switch peak current limit.

The SGM6611C is available in a Green TQFN-2×2.5-11L package.

FEATURES

- **2.7V to 12V Input Voltage Range**
- **4.5V to 12.6V Output Voltage Range**
- **Up to 90% Efficiency (V_{IN} = 3.3V, V_{OUT} = 9V and I_{OUT} = 1.5A)**
- **Adjustable Peak Current Limit up to 9.5A for High Pulse Current**
- **1.1MHz Fixed Switching Frequency (PWM Mode)**
- **4ms Built-in Soft-Start**
- **PFM Operation Mode at Light Load**
- **13.2V Internal Output Over-Voltage Protection**
- **Cycle-by-Cycle Over-Current Protection**
- **Thermal Shutdown**
- **Available in a Green TQFN-2×2.5-11L Package**

APPLICATIONS

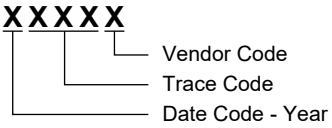
Portable POS Machine
Bluetooth Speaker
E-Cigarette
Fast-Charging Power Bank

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM6611C	TQFN-2×2.5-11L	-40℃ to +85℃	SGM6611CYTQV11G/TR	6611C XXXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor 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

BOOT Voltage ..... -0.3V to V_{SW} + 6V
VIN, SW, VOUT Voltages..... -0.3V to 14.5V
EN, VCC, COMP, ILIM, FB Voltages..... -0.3V to 6V
Package Thermal Resistance
TQFN-2×2.5-11L, θ_{JA}..... 60℃/W
Junction Temperature .....+150℃
Storage Temperature Range.....-65℃ to +150℃
Lead Temperature (Soldering, 10s) .....+260℃
ESD Susceptibility
HBM.....1500V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range .....2.7V to 12V
Output Voltage Range .....4.5V to 12.6V
Inductance, Effective Value, L..... 0.47μH to 2.2μH
Input Capacitance, Effective Value, C_{IN} ..... 10μF (MIN)
Output Capacitance, Effective Value, C_{OUT} ... 10μF to 1000μF
Operating Junction Temperature Range .....-40℃ to +125℃
Operating Ambient Temperature Range.....-40℃ to +85℃

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.

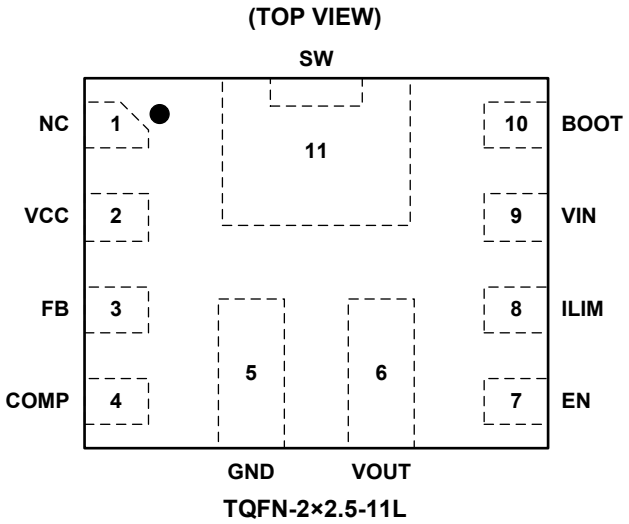
ESD SENSITIVITY CAUTION

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



TQFN-2×2.5-11L

PIN DESCRIPTION

PIN	NAME	I/O	FUNCTION
1	NC	I	No Connection.
2	VCC	O	Output of the Internal Regulator. The VCC pin connects a ceramic capacitor (> 1.0μF) to ground.
3	FB	I	Output Voltage Feedback.
4	COMP	O	Output of the Internal Error Amplifier. Connect a loop compensation network between this pin and the GND pin.
5	GND	-	Ground.
6	VOUT	O	Boost Converter Output.
7	EN	I	Enable Logic Input. Logic high makes the circuit enabled, and logic low makes it disabled and the device enters shutdown mode.
8	ILIM	O	Adjustable Switch Peak Current Limit. Connect an external resistor between this pin and the GND pin.
9	VIN	I	IC Power Supply Input.
10	BOOT	O	Power Supply for High-side MOSFET Gate Driver. Strongly recommend to connect a capacitor between this pin and the SW pin.
11	SW	I	The Switching Node Pin of the Converter. Connect to the drain of the internal low-side power MOSFET and the source of the internal high-side power MOSFET.

NOTE: I = input, O = output.

ELECTRICAL CHARACTERISTICS

(V_{IN} = 2.7V to 5.5V, V_{OUT} = 9V, Full = -40℃ to +85℃, typical values are at T_J = +25℃, unless otherwise noted.)

PARAMETER		SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Power Supply								
Input Voltage Range		V_{IN}		Full	2.7		12	V
VIN Under-Voltage Lockout Threshold		V_{IN_UVLO}	V_{IN} rising	+25℃		2.5	2.62	V
				Full		2.5	2.7	
			V_{IN} falling	+25℃		2.4		
VIN Under-Voltage Lockout Hysteresis		V_{IN_HYS}		+25℃		100		mV
VCC Regulation		V_{CC}	I_{CC} = 5mA, V_{IN} = 8V	+25℃		5		V
VCC Under-Voltage Lockout Threshold		V_{CC_UVLO}	V_{CC} falling	+25℃		2.1		V
Operating Quiescent Current	VIN Pin	I_Q	IC enabled, no load, V_{FB} = 1.3V, V_{OUT} = 12V	+25℃		0.23	0.4	μA
				Full		0.23	0.5	
	VOUT Pin			+25℃		90	130	
				Full		90	160	
Shutdown Current into the VIN Pin		I_{SHDN}	V_{IN} = 3.6V, IC disabled	+25℃		0.6	1.1	μA
				Full		0.6	1.5	
Output								
Output Voltage Range		V_{OUT}		Full	4.5		12.6	V
Reference Voltage at the FB Pin		V_{REF}	PWM mode	Full	1.181	1.205	1.229	V
			PFM mode	+25℃		1.207		
Leakage Current into the FB Pin		I_{FB_LKG}	V_{FB} = 1.2V	+25℃		10	100	nA
Output Over-Voltage Protection Threshold		V_{OVP}	V_{OUT} rising	Full	12.95	13.2	13.55	V
Output Over-Voltage Protection Hysteresis		V_{OVP_HYS}	V_{OUT} falling below V_{OVP}	+25℃		0.15		V
Soft Startup Time		t_{SS}	C_{OUT} (effective) = 47μF, I_{OUT} = 0A	+25℃		4		ms
Error Amplifier								
COMP Pin Sink Current		I_{SINK}	V_{FB} = V_{REF} + 100mV, V_{COMP} = 1.2V	+25℃		120		μA
COMP Pin Source Current		I_{SOURCE}	V_{FB} = V_{REF} - 100mV, V_{COMP} = 1.2V	+25℃		15		μA
High Clamp Voltage at the COMP Pin		V_{CCLPH}	V_{FB} = 1.1V, R_{ILIM} = 127kΩ	+25℃		2		V
Low Clamp Voltage at the COMP Pin		V_{CCLPL}	V_{FB} = 1.3V, R_{ILIM} = 127kΩ	+25℃		0.4		V
Error Amplifier Transconductance		G_{EA}	V_{COMP} = 1.2V	+25℃		135		μS
Power Switch								
High-side MOSFET On-Resistance		$R_{DS(ON)}$	V_{CC} = 5V	+25℃		27	34	mΩ
				Full		27	44	
Low-side MOSFET On-Resistance			V_{CC} = 5V	+25℃		15	20	mΩ
				Full		15	26	
Switching Frequency								
Switching Frequency		f_{SW}		+25℃	980	1100	1270	kHz
				Full	930	1100	1320	
Minimum On-Time		t_{ON_MIN}	V_{CC} = 5V	+25℃		120		ns
Current Limit								
Switch Peak Current Limit		I_{LIM}	R_{ILIM} = 127kΩ	+25℃	8.5	9.5	10.8	A
Reference Voltage at the ILIM Pin		V_{ILIM}		+25℃		1.205		V

ELECTRICAL CHARACTERISTICS (continued)

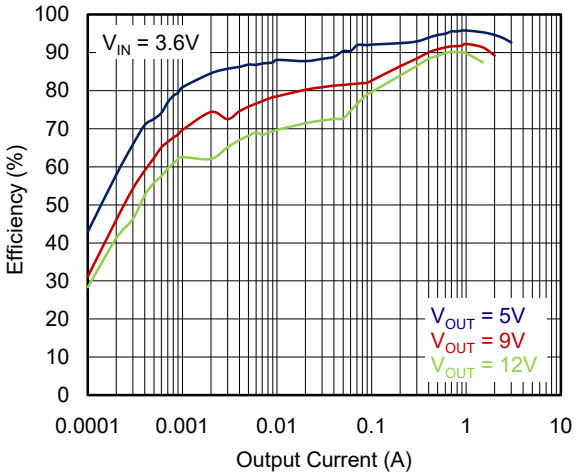
(V_{IN} = 2.7V to 5.5V, V_{OUT} = 9V, Full = -40℃ to +85℃, typical values are at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
EN Logic Input							
EN Logic High Threshold	V_{ENH}		Full	1.2			V
EN Logic Low Threshold	V_{ENL}		Full			0.4	V
EN Pull-Down Resistor	R_{EN}		+25℃		800		kΩ
Thermal Shutdown							
Thermal Shutdown Threshold	T_{SD}	T_J rising			160		℃
Thermal Shutdown Hysteresis	T_{SD_HYS}	T_J falling below T_{SD}			20		℃

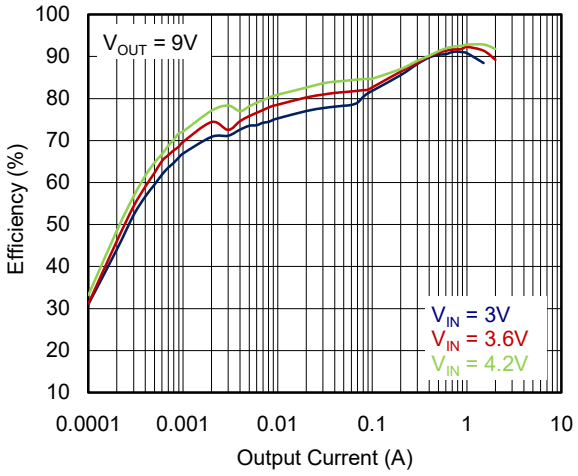
TYPICAL PERFORMANCE CHARACTERISTICS

At T_J = +25℃, V_{IN} = 3.6V, V_{OUT} = 9V, unless otherwise noted.

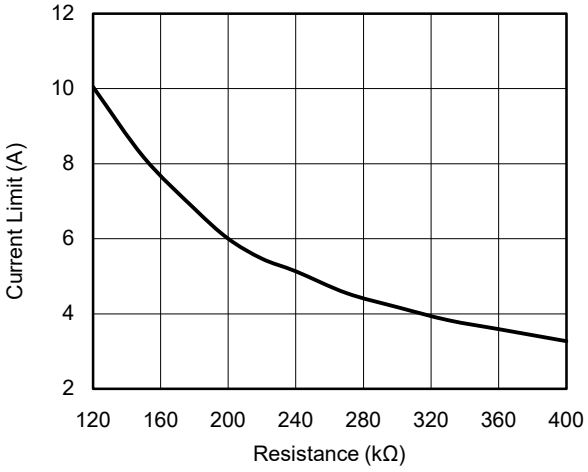
Efficiency vs. Output Current



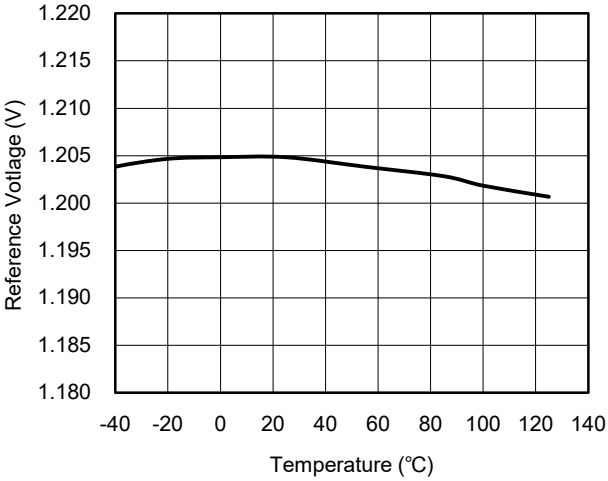
Efficiency vs. Output Current



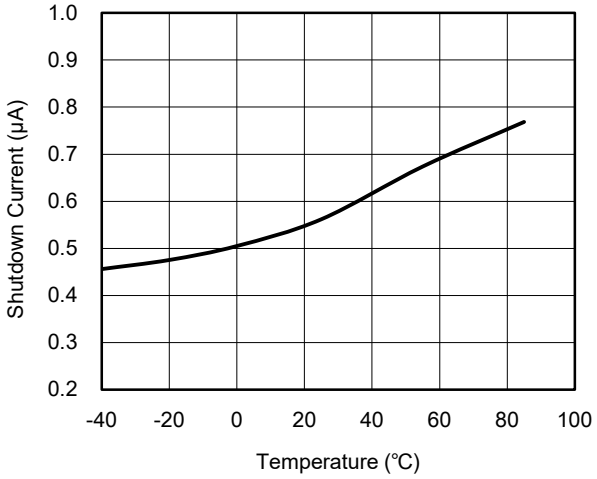
Current Limit vs. Setting Resistance



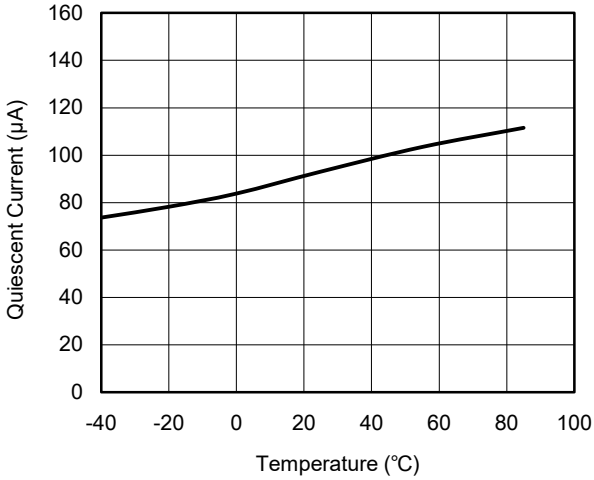
Reference Voltage vs. Temperature



Shutdown Current vs. Temperature



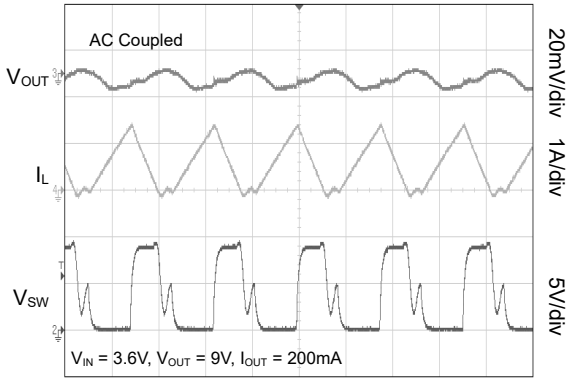
Quiescent Current vs. Temperature



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

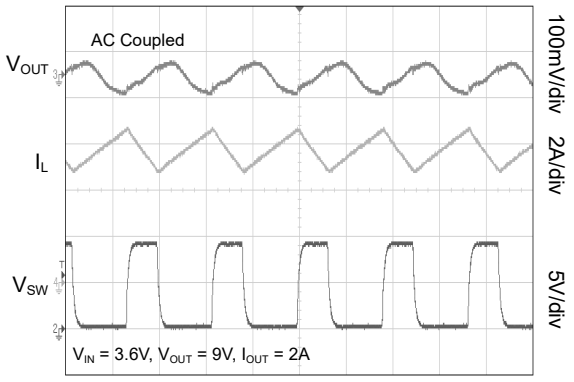
At T_J = +25℃, V_{IN} = 3.6V, V_{OUT} = 9V, unless otherwise noted.

Switching Waveforms in DCM



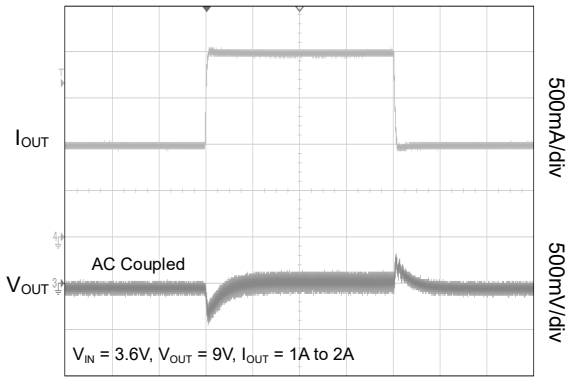
Time (500ns/div)

Switching Waveforms in CCM



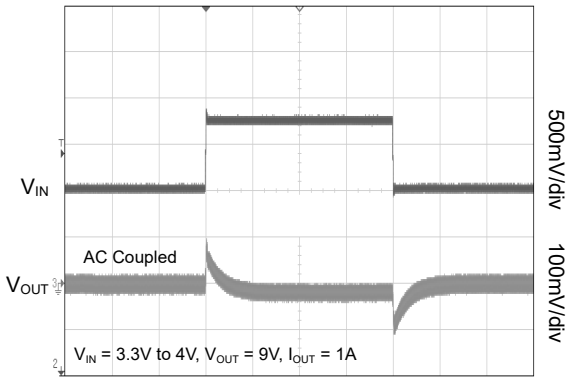
Time (500ns/div)

Load Transient Response



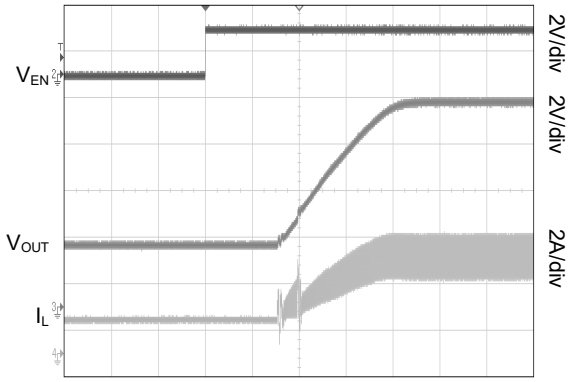
Time (500μs/div)

Line Transient Response



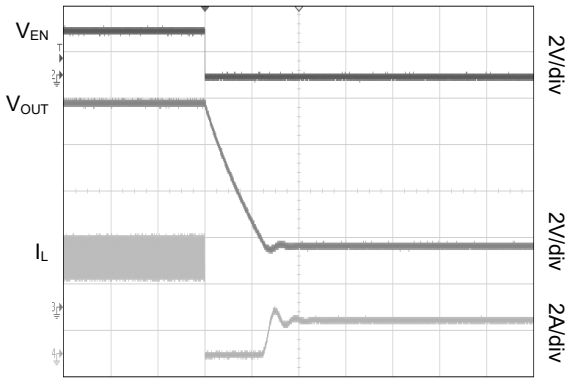
Time (500μs/div)

Startup Waveforms



Time (1ms/div)

Shutdown Waveforms

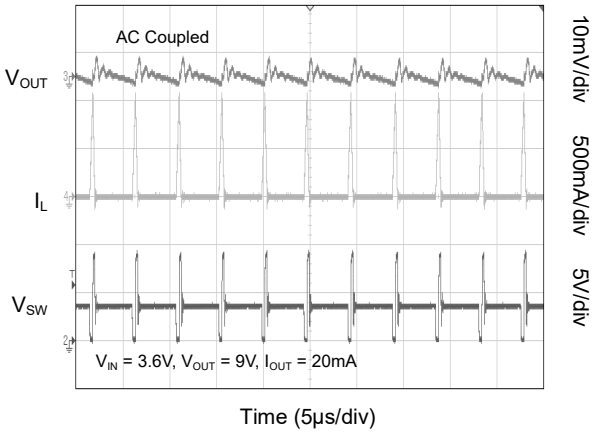


Time (200μs/div)

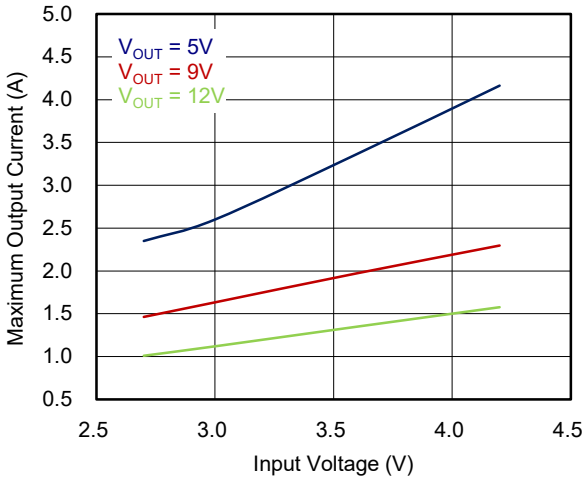
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_J = +25℃, V_{IN} = 3.6V, V_{OUT} = 9V, unless otherwise noted.

Switching Waveforms in PFM Mode



Maximum Output Current vs. Input Voltage



PCB LAYOUT

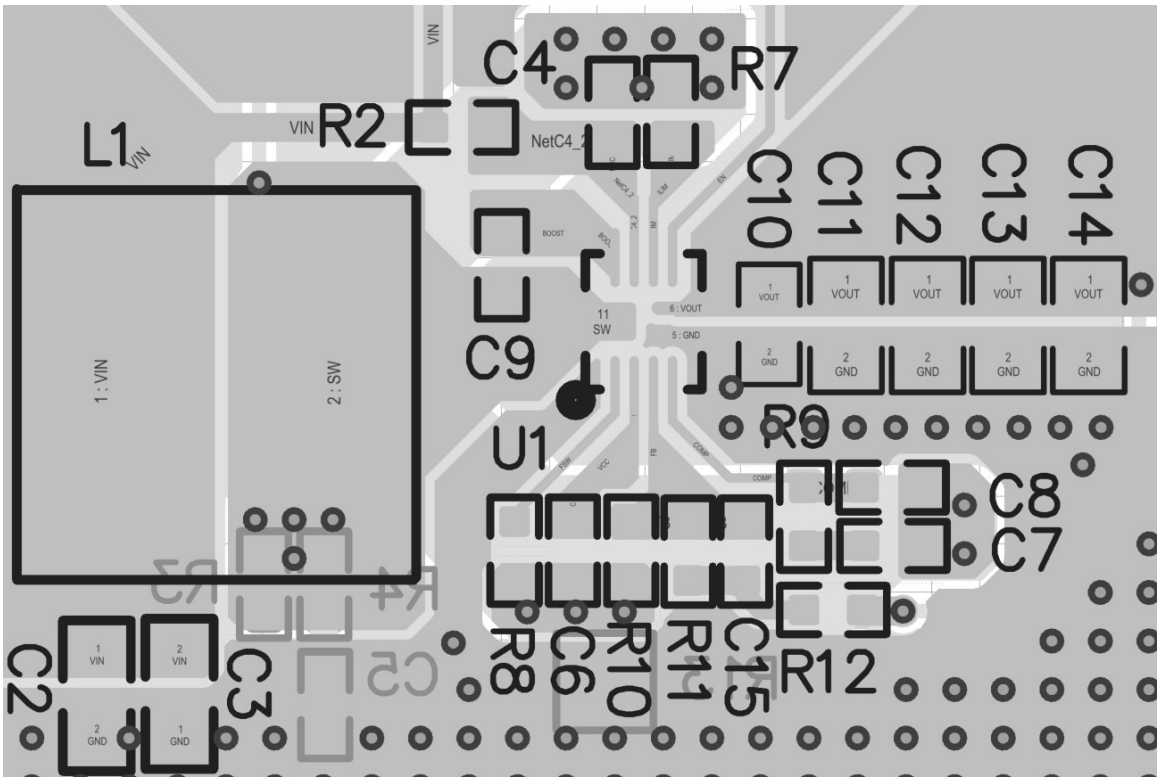


Figure 1. Layout Example

REVISION HISTORY

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

OCTOBER 2021 – REV.A.4 to REV.B	Page
Updated the Enable and Disable section	10
Added the Figure 1. Layout Example	16

APRIL 2021 – REV.A.3 to REV.A.4	Page
Updated Loop Stability section	15

MARCH 2021 – REV.A.2 to REV.A.3	Page
Updated Package Outline Dimensions section	17

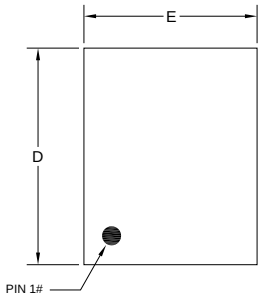
FEBRUARY 2021 – REV.A.1 to REV.A.2	Page
Updated Marking Information section	2

NOVEMBER 2019 – REV.A to REV.A.1	Page
Updated the curve of Output Current vs. Input Voltage	8

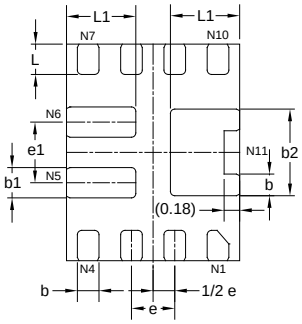
Changes from Original (AUGUST 2019) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

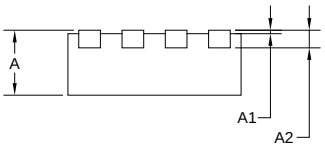
TQFN-2×2.5-11L



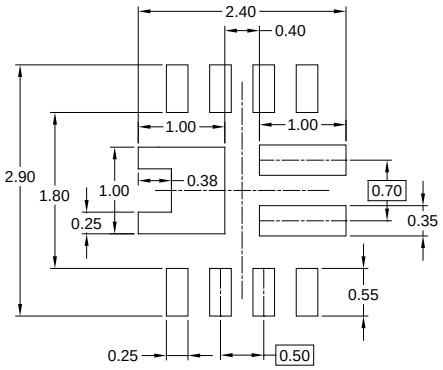
TOP VIEW



BOTTOM VIEW



SIDE VIEW



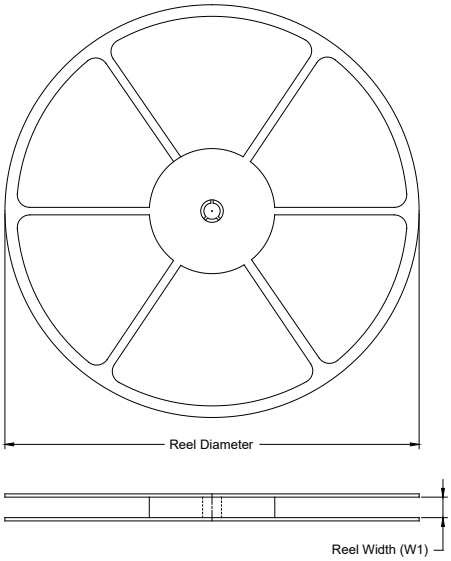
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.700	0.750	0.800
A1	0.000	0.020	0.050
A2	0.203 REF		
D	2.400	2.500	2.600
E	1.900	2.000	2.100
e	0.500 BSC		
e1	0.700 BSC		
b	0.200	0.250	0.300
b1	0.300	0.350	0.400
b2	0.950	1.000	1.050
L	0.300	0.350	0.400
L1	0.750	0.800	0.850

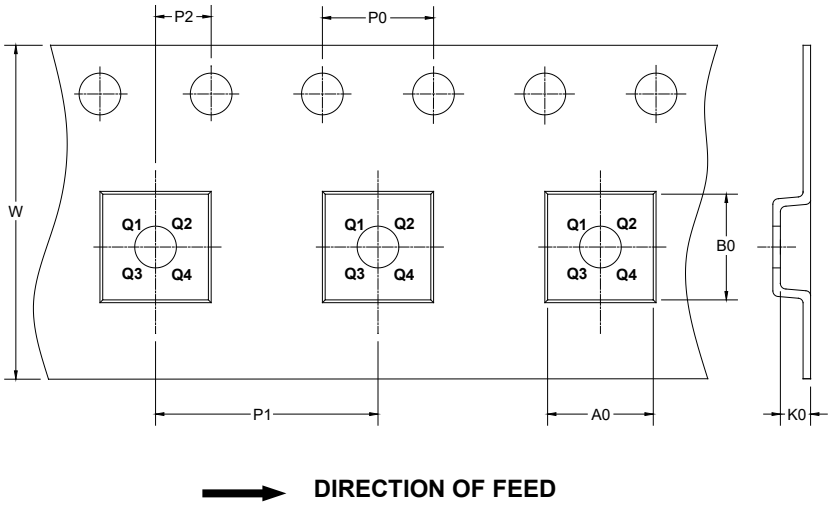
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

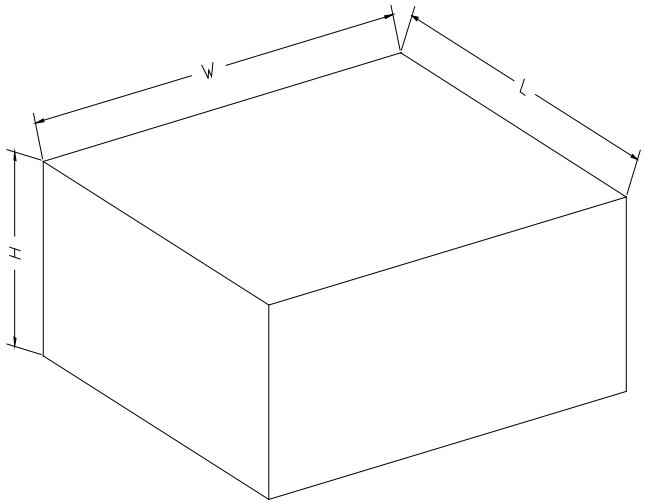
NOTE: The picture is only for reference. Please make the object as the standard.

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
TQFN-2×2.5-11L	7″	9.5	2.20	2.70	0.95	4.0	4.0	2.0	8.0	Q2

DD0001

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