SGM2526SF/SGM2526SO Programmable Current Limit Switches with Output Voltage Clamping

GENERAL DESCRIPTION

The SGM2526SF and SGM2526SO family is a compact electronic fuse (eFuse), which can operate from 2.7V to 22V single supply. A 25mΩ low R_{DSON} N-MOSFET is integrated. For SGM2526SO, the clamping output threshold voltages can be programmed through VCP pin. The clamping voltage protection function can ensure the safe operation of surge events in any state. For SGM2526SF, it has fault event indicator pin (nFAULT). If under-voltage or thermal shutdown event occurs, the SGM2526SF sinks current from nFAULT, pulling the pin down to alert the host.

The soft-start time can be adjusted by setting an additional capacitor to the SS pin. The thermal shutdown threshold is +150℃ and auto-retry with 20℃ hysteresis.

The SGM2526SF and SGM2526SO are available in a Green TDFN-3×3-10L package and operate over a temperature range of -40℃ to +125℃.

FEATURES

- **Wide Input Voltage Range from 2.7V to 22V with Surge up to 30V**
- **On-Resistance: 25mΩ**
- **Adjustable Input UVLO Threshold and Clamping Output Voltage Threshold (SGM2526SO Only)**
- **Protection Features**
  - **Programmable Soft-Start Time**
  - **Thermal Shutdown Protection & Auto-Retry**
- **Programmable Current Limit: 5A (MAX)**
- **Enable Interface Pin**
- **Options:**
  - **SGM2526SF: Fault Indication**
  - **SGM2526SO: Over-Voltage Clamping**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green TDFN-3×3-10L Package**

APPLICATIONS

Service PC
Notebook PC
iPad Mini

TYPICAL APPLICATION

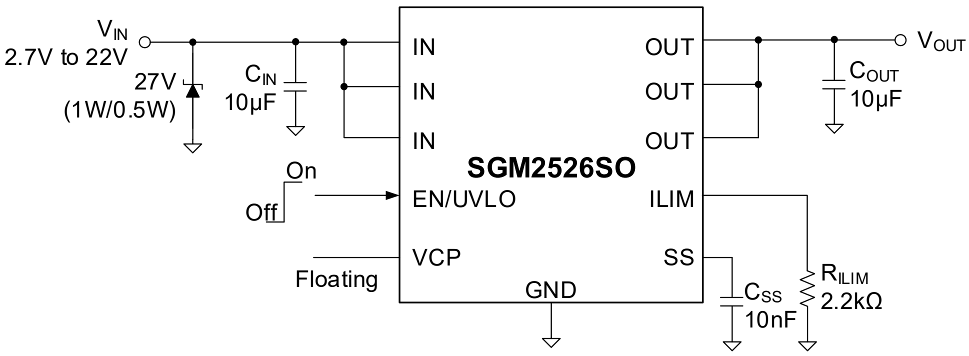


Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2526SF	TDFN-3×3-10L	-40℃ to +125℃	SGM2526SFXTD10G/TR	SGM 1DOD XXXXX	Tape and Reel, 4000
SGM2526SO	TDFN-3×3-10L	-40℃ to +125℃	SGM2526SOXTD10G/TR	SGM 1DND XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.

XXXXX
- Vendor Code
- Trace Code
- Date Code - Year

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, OUT, EN/UVLO, VCP, nFAULT to GND ...... -0.3V to 26V
ILIM, SS to GND .... -0.3V to 6V
Package Thermal Resistance
TDFN-3×3-10L, θ_{JA} .... 44.6℃/W
TDFN-3×3-10L, θ_{JB} .... 18.6℃/W
TDFN-3×3-10L, $\theta_{JC\ (TOP)}$ .... 43.8℃/W
TDFN-3×3-10L, $\theta_{JC\ (BOT)}$ .... 7.5℃/W
Junction Temperature ....+150℃
Storage Temperature Range........................-65℃ to +150℃
Lead Temperature (Soldering, 10s) ....+260℃
ESD Susceptibility (1) (2)
HBM...±4000V
CDM ....±1000V

NOTES:
1. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
2. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

Supply Input Voltage...2.7V to 22V
Operating Junction Temperature Range......-40℃ to +125℃

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

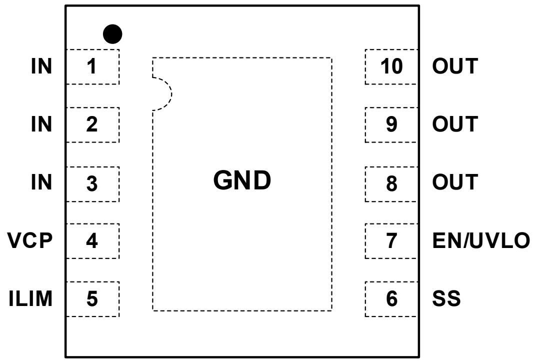
This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

DISCLAIMER

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

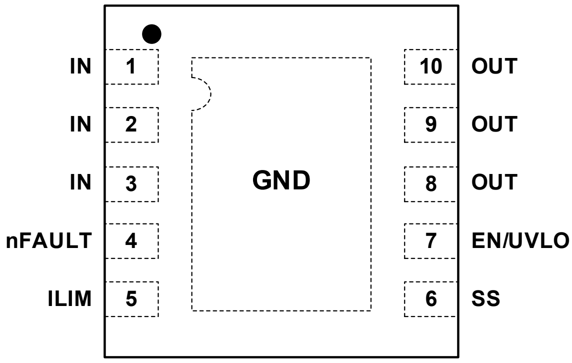
PIN CONFIGURATION

SGM2526SO (TOP VIEW)



TDFN-3×3-10L

SGM2526SF (TOP VIEW)



TDFN-3×3-10L

PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 2, 3	IN	Power Input Pin. Place a decoupling ceramic capacitor of at least 0.1μF between this pin and GND.
4	VCP	Output Clamp Voltage Selection Pin (SGM2526SO only). Different clamp voltages can be selected according to the V_{IN} voltage.
	nFAULT	Fault Event Indicator Pin (SGM2526SF Only). Go low to indicate fault condition due to over-current, under-voltage or thermal shutdown event.
5	ILIM	Programming Current Limit Pin. A resistor between ILIM and GND will set the current limit value.
6	SS	Soft-Start Time Program Pin. The capacitor between SS and GND pins will set the slew rate according to the application requirements.
7	EN/UVLO	Enable Interface and Under-Voltage Lockout Pin. Pull it high to enable the IC.
8, 9, 10	OUT	Output of the Device.
Exposed Pad	GND	Ground.

ELECTRICAL CHARACTERISTICS

(T_J = -40℃ to +125℃, V_{IN} = 5V, R_{ILIM} = 10kΩ, C_{SS} = 10nF, C_{IN} = 10μF and C_{OUT} = 10μF, typical values are measured at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage and Internal Under-Voltage Lockout						
Input Voltage Range	V_{IN}		2.7		22	V
Input UVLO Threshold Voltage	V_{UVLO}	VCP = GND	2.4	2.5	2.6	V
		VCP = high	3.5	3.62	3.75	
		VCP = floating	8.3	8.56	8.85	
UVLO Hysteresis	V_{UVHYS}	VCP = GND		0.1		V
		VCP = high		0.11		
		VCP = floating		0.17		
Quiescent Current	I_Q	$V_{EN/UVLO}$ = 2V, V_{IN} = 3.3V, VCP = GND		160	230	μA
		$V_{EN/UVLO}$ = 2V, V_{IN} = 5V, VCP = high		180	250	
		$V_{EN/UVLO}$ = 2V, V_{IN} = 12V, VCP = floating		185	260	
Shutdown Current	I_{SD}	$V_{EN/UVLO}$ = 0V		1	5	μA
Over-Voltage Clamping (VCP): SGM2526SO						
Clamping Output Voltage	V_{CLP}	VCP = GND, V_{IN} = 4V, I_{OUT} = 10mA	3.5	3.63	3.76	V
		VCP = high, V_{IN} = 6V, I_{OUT} = 10mA	5.56	5.76	5.96	V
		VCP = floating, V_{IN} = 14V, I_{OUT} = 10mA	12.76	13.2	13.68	V
Enable and Under-Voltage Lockout (EN/UVLO)						
EN/UVLO Turn-On Threshold Voltage	V_{ENR}		1.16	1.2	1.24	V
EN/UVLO Hysteresis	V_{ENHYS}		80	110	130	mV
EN/UVLO Threshold Voltage for Low I_Q Shutdown, Falling	V_{SHUTF}		0.4	0.7		V
EN/UVLO Hysteresis for Low IQ Shutdown, Hysteresis	$V_{SHUTFHYS}$			50		mV
EN/UVLO Input Leakage Current	I_{EN}	0 ≤ $V_{EN/UVLO}$ ≤ 22V	-300	10	300	nA
MOSFET Power Switch						
FET On-Resistance	R_{DSON}	I_{OUT} = 1A		25	48	mΩ
Pass FET Output (OUT)						
OUT Bias Current in Off-State	I_{LKG_OUT}	$V_{EN/UVLO}$ = 0V, V_{OUT} = 0V (sourcing)		10		nA
	I_{SINK_OUT}	$V_{EN/UVLO}$ = 0V, V_{OUT} = 300mV (sinking)		100		nA
Current Limit Programming (ILIM)						
Current Limit	I_{LIMIT}	R_{ILIM} = 11kΩ, T_J = +25℃	0.94	1	1.06	A
		R_{ILIM} = 11kΩ, T_J = -40℃ to +125℃	0.9		1.1	
		R_{ILIM} = 5.5kΩ, T_J = +25℃	1.82	2	2.15	
		R_{ILIM} = 5.5kΩ, T_J = -40℃ to +125℃	1.75		2.2	
		R_{ILIM} = 3.7kΩ, T_J = +25℃	2.75	3	3.2	
		R_{ILIM} = 3.7kΩ, T_J = -40℃ to +125℃	2.63		3.3	
		R_{ILIM} = 2.8Ω, T_J = +25℃	3.68	4	4.22	
		R_{ILIM} = 2.8Ω, T_J = -40℃ to +125℃	3.5		4.4	
		R_{ILIM} = 2.2kΩ, T_J = +25℃	4.71	5	5.29	
		R_{ILIM} = 2.2kΩ, T_J = -40℃ to +125℃	4.5		5.5	
		R_{ILIM} = open		0.2		
		R_{ILIM} = short to GND		0.8		
Fast-Trip Comparator Threshold	$I_{FAST-TRIP}$			1.6 × I_{LIMIT}		A
Short-Circuit Current	I_{SC}			65%I_{LIMIT}		

ELECTRICAL CHARACTERISTICS (continued)

(T_J = -40℃ to +125℃, V_{IN} = 5V, R_{ILIM} = 10kΩ, C_{SS} = 10nF, C_{IN} = 10μF and C_{OUT} = 10μF, typical values are measured at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Soft-Start (SS)						
SS Charging Current	I_{SS}	V_{SS} = 0V	1.9	2.2	2.6	μA
SS Discharging Resistance	R_{SS}	$V_{EN/UVLO}$ = 0V, I_{SS} = 10mA sinking		40		Ω
SS Maximum Capacitor Voltage	V_{SSMAX}			5		V
Fault (nFAULT) Indication: SGM2526SF						
nFAULT Leakage Current	$I_{nFAULTLKG}$			0.2	0.5	μA
nFAULT Pull-Down Resistance	R_{nFAULT}			110	160	Ω
Thermal Shutdown (TSD)						
Thermal Shutdown Temperature	T_{SD}			150		℃
Thermal Shutdown Hysteresis	T_{HYS}			20		℃

TIMING REQUIREMENTS

(T_J = -40℃ to +125℃, V_{IN} = 5V, R_{ILIM} = 10kΩ, C_{SS} = 10nF, C_{IN} = 10μF and C_{OUT} = 10μF, typical values are measured at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Enable and Under-Voltage Lockout (EN/UVLO) Input						
Turn-On Delay	t_{ON_DLY}	EN/UVLO↑ to V_{OUT} = 1V, C_{SS} = open		350		μs
Turn-Off Delay	t_{OFF_DLY}	EN/UVLO↓ to V_{OUT}↓		6		μs
Over-Voltage Clamping (VCP): SGM2526SO						
Output Clamp Response Time	t_{OVC}	V_{IN} ≥ V_{OVC}, I_{OUT} = 100mA		15		μs
Soft-Start: Output Ramp Control (SS)						
Output Ramp Time	t_{SS}	V_{IN} = 3.3V, 10%V_{OUT} to 90%V_{OUT}, with C_{SS} = open		0.3		ms
		V_{IN} = 3.3V, 10%V_{OUT} to 90%V_{OUT}, with C_{SS} = 10nF	1.3	1.8	2.2	
		V_{IN} = 5V, 10%V_{OUT} to 90%V_{OUT}, with C_{SS} = open		0.5		
		V_{IN} = 5V, 10%V_{OUT} to 90%V_{OUT}, with C_{SS} = 10nF	2.0	2.5	3.2	
		V_{IN} = 12V, 10%V_{OUT} to 90%V_{OUT}, with C_{SS} = open		1.0		
		V_{IN} = 12V, 10%V_{OUT} to 90%V_{OUT}, with C_{SS} = 10nF	4.9	6.0	6.7	
Current Limit Programming (ILIM)						
Current limit Response Time	t_{LIM}	I_{OUT} > 1.2 × I_{LIM} settling to within 5 % of I_{LIM}		50		μs
Fast-Trip Comparator Delay	$t_{FAST\text{-}TRIP\_DLY}$	I_{OUT} > $I_{FAST\text{-}TRIP}$		650		ns
Over-Current Blanking Time	t_{OC}	The delay time for the nFAULT to flip when entering or exiting the over-current condition. SGM2526SF only.		10		ms
Thermal Shutdown (TSD)						
Retry Delay after Thermal Shutdown Recovery, T_J < [T_{SD} - 20℃]	t_{SD_DLY}			100		ms

FUNCTIONAL BLOCK DIAGRAMS

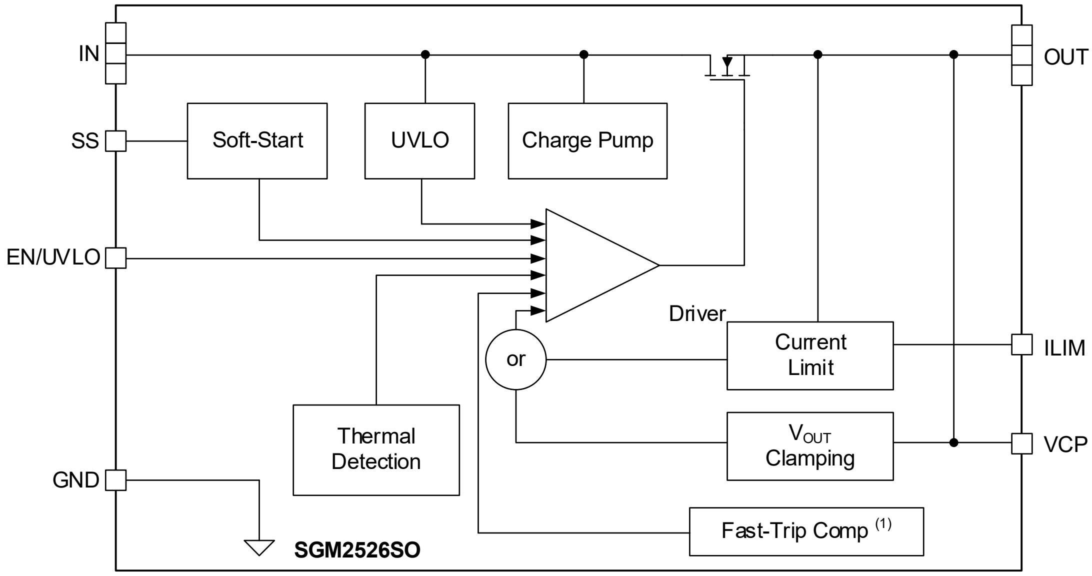


Figure 2. SGM2526SO Block Diagram

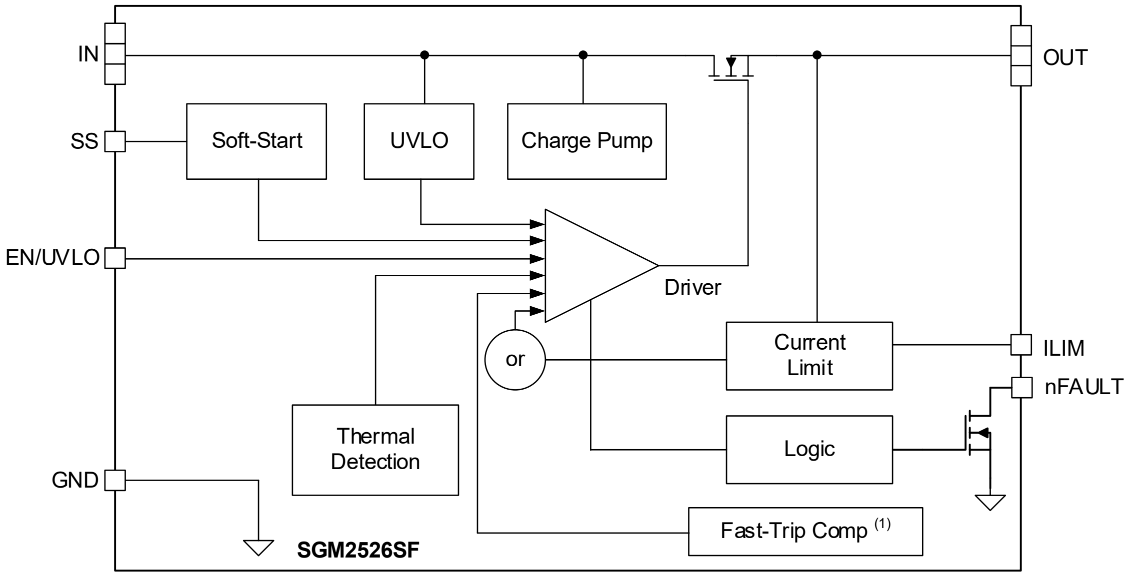
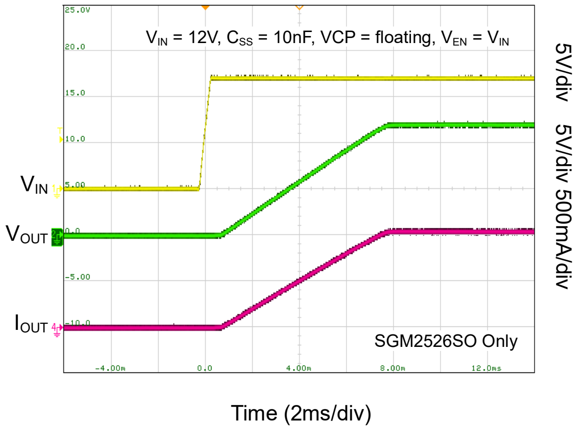


Figure 3. SGM2526SF Block Diagram

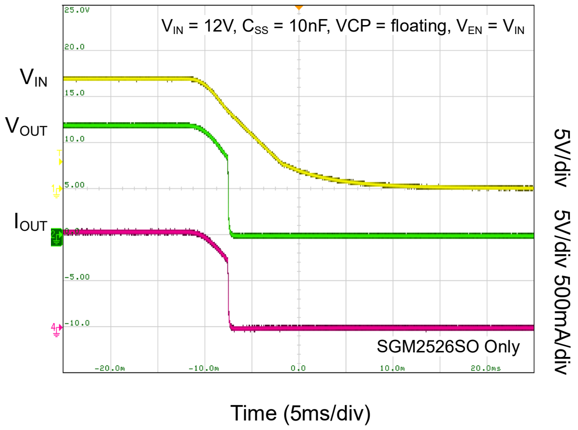
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, unless otherwise noted.

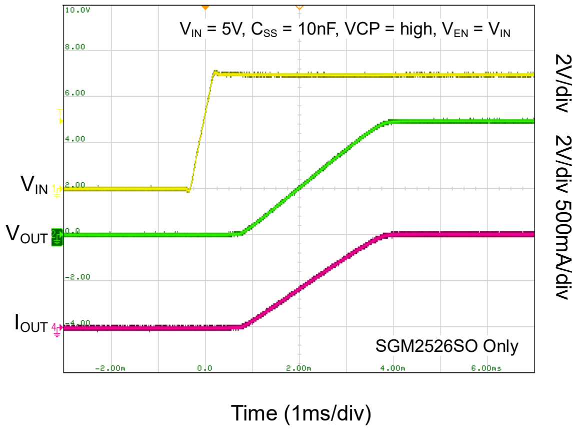
Programmable Soft-Start Time



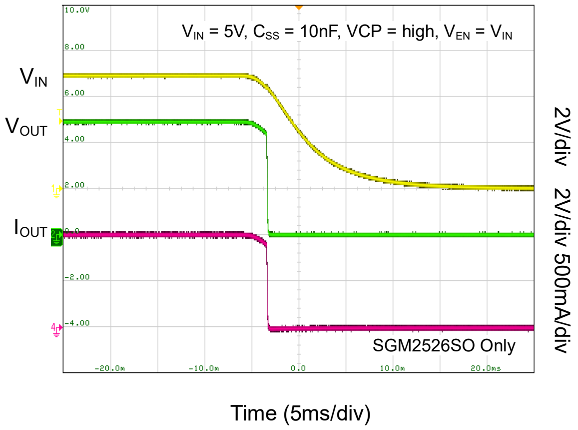
Power-Off



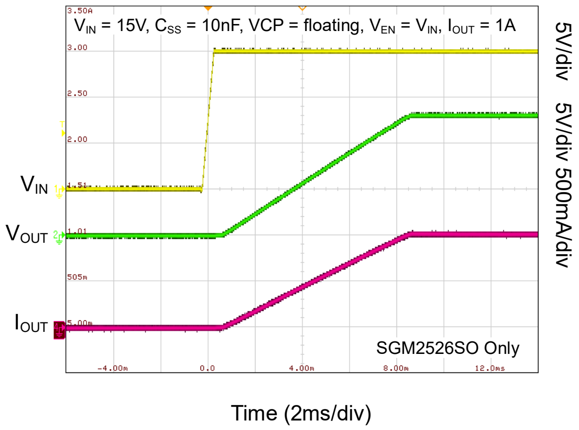
Programmable Soft-Start Time



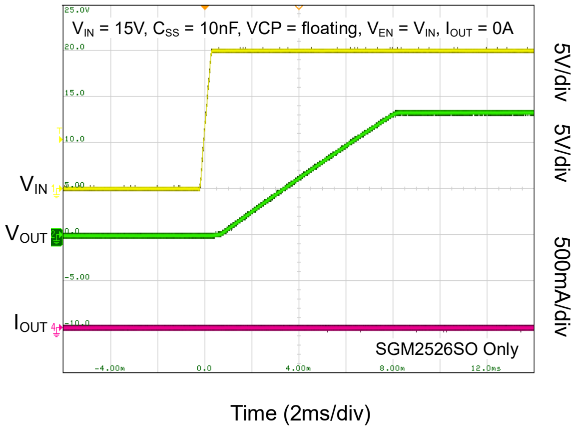
Power-Off



Output Voltage Clamping



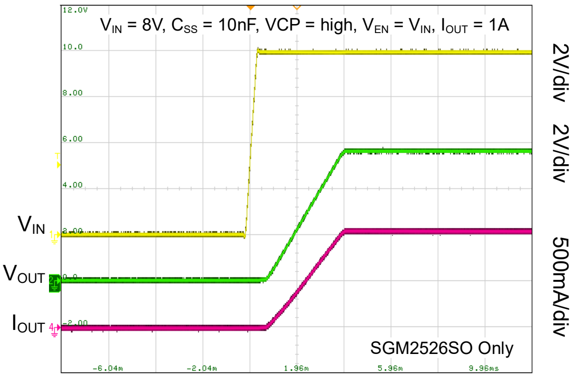
Output Voltage Clamping



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

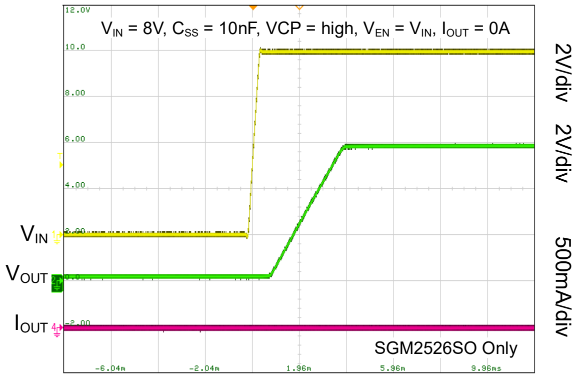
T_J = +25℃, unless otherwise noted.

Output Voltage Clamping



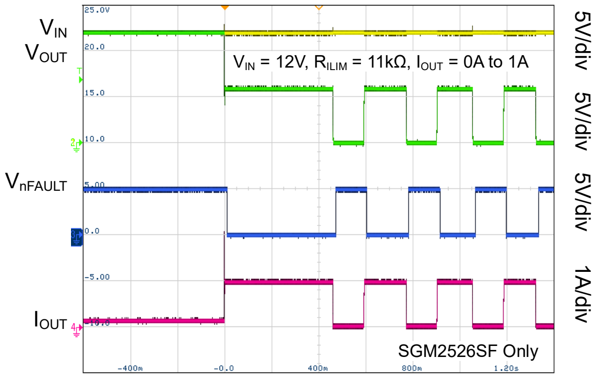
Time (2ms/div)

Output Voltage Clamping



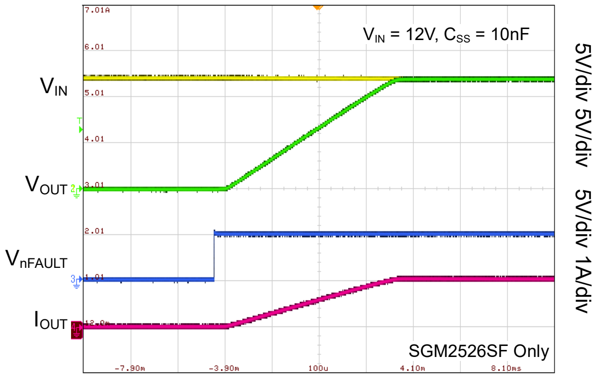
Time (2ms/div)

Over-Current Protection



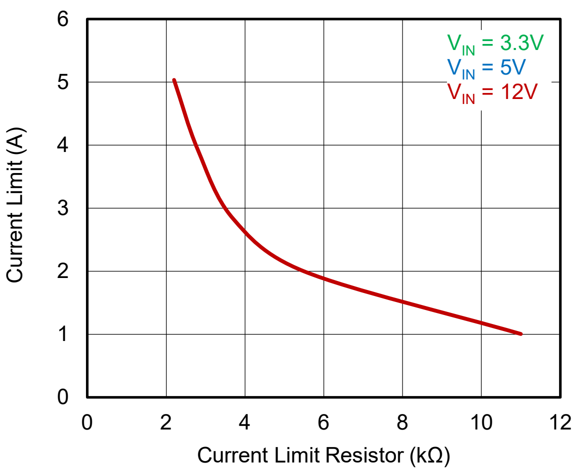
Time (200ms/div)

EN Power-On



Time (2ms/div)

Current Limit vs. Current Limit Resistor



DETAILED DESCRIPTION

Overview

The SGM2526SF and SGM2526SO are programmable current limit switches with input voltage range selection and output voltage clamping. Extremely low R_{DSON} of the integrated protection N-channel MOSFET helps to reduce power loss during the normal operation. Programmable soft-start time controls the slew rate of the output voltage during the start-up time. Independent enable control allows the complicated system sequencing control. It integrates the over-temperature protection shutdown and auto-retry with hysteresis.

There are two versions: SGM2526SO features an over-voltage clamping function, and VCP pin offers three distinct connection methods designed to accommodate various application scenarios. SGM2526SF includes a fault indication capability.

Enable and Adjusting Under-Voltage Lockout (UVLO)

The EN/UVLO pin controls the on/off state of the internal FET. A voltage V_{EN} < V_{ENF} on this pin turns off the internal FET, thus disconnecting IN from OUT. When the EN/UVLO voltage is lower than V_{ENF}, the entire FET is in the off state. When the EN/UVLO voltage is below V_{SHUTF}, the entire chip enters shutdown mode, all chip functions are disabled, and the input current drops to 1μA (TYP). There is a hysteresis between the rising threshold and falling threshold of EN/UVLO.

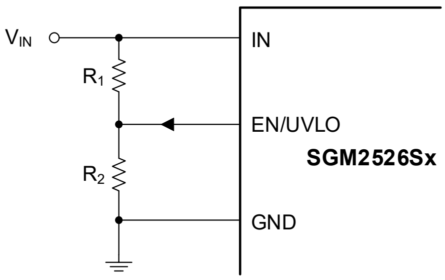


Figure 4. Under-Voltage Lockout

For the SGM2525SF/SGM2526SO, the UVLO comparator on the EN/UVLO pin can be used to set the user-adjustable under-voltage lockout threshold through the external resistance voltage divider. Figure 4 shows how to set the specific value of under-voltage lockout threshold using an external resistance voltage divider. If the under-voltage lockout function is not needed, the EN/UVLO pin should be connected to the IN terminal. The EN/UVLO terminal should not be left floating.

$$V_{SUPPLY} = \frac{V_{UVLO} \times (R_1 + R_2)}{R_2} \quad (1)$$

Output Clamp Voltage

The SGM2526SO device provides the output voltage clamp protection (VCP) function which continuously monitors the input voltage and ensures the output clamp voltage to V_{CLP} level within a very short time t_{OVC}, once the output voltage exceeds the over-voltage clamp threshold.

When the input voltage falls below the over-voltage clamp threshold, the clamp will release the output voltage, which can protect the safety of output device, and continuous output clamping condition usually results in thermal shutdown as shown in Figure 5. Once the junction temperature exceeds +150℃, the power MOSFET will be turned off by the thermal shutdown circuitry.

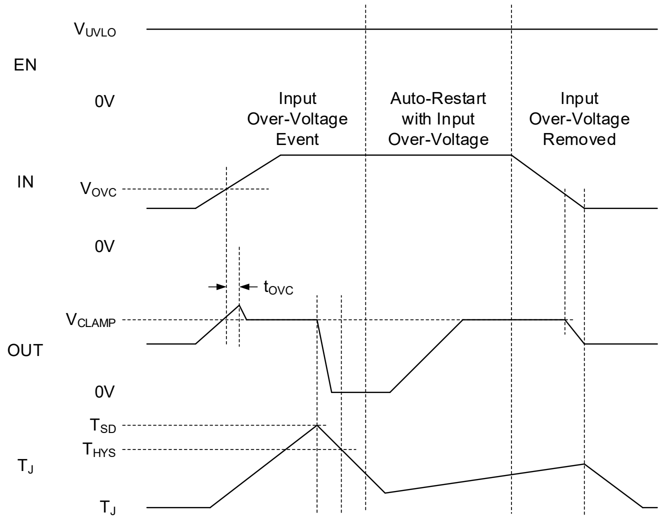


Figure 5. Over-Voltage Clamp Response (Auto-Retry)

The three connection options for VCP determine three selectable clamping voltage levels.

- Connect a resistor to the IN pin
- Connect a resistor to GND
- Leave it floating

This pin is used to select different input UVLO thresholds and output clamping thresholds.

Fault Indication (nFAULT)

The SGM2526SF device provides the nFAULT indication. This can be implemented by adding a 10kΩ to 100kΩ pull-up resistor to an external supply. Table 1 shows the protection response of equipment under different fault conditions.

DETAILED DESCRIPTION (continued)

Table 1. Fault Summary

Event/Fault	Protection Response	nFAULT Indication
Over-Temperature	Shutdown	Yes
Under-Voltage	Shutdown or UVLO	Yes
Over-Current	Current Limit	Yes
Short-Circuit	Current Limit	Yes
ILIM Pin Open	Current Limit	Yes
ILIM Pin Short	Current Limit	Current Limit Indication

Power-On, Over-Current and Short-Circuit Protections

SGM2526SF/SGM2526SO adopts three levels of forward over-current protection function:

- Adjust slew rate (SS) for inrush current protection.
- Adjust threshold (I_{LIMIT}) for over-current in steady state or start-up.
- Adjust threshold (I_{SC}) for severe over-current such as hard short-circuits in steady state or start-up.

SS

The SS pin is designed to regulate the output slew rate during start-up process. Place a capacitor between SS and GND pins will set the ramp-up time according to the application requirements. This pin can be float, and the output obtains the default value (minimum t_{SS}) under this condition. Equation 2 shows the calculation process.

$$\frac{dV_{OUT}}{dt} = \frac{I_{SS} \times GAIN_{SS}}{C_{SS}} \quad (2)$$

where:

dV_{OUT}/dt = Desired output slew rate
I_{SS} = 2.2μA (TYP)
$GAIN_{SS}$ = 7

Equation 3 shows how to calculate the total ramp time (t_{SS}) when the output rises from 0V to V_{IN}:

$$t_{SS} = 6.5 \times 10^4 \times V_{IN} \times C_{SS} \quad (3)$$

When C_{SS} is open, there is a 1.5nF capacitor inside.

Active Current Limit

The SGM2526SF/SGM2526SO will actively monitor the load current in both start-up and normal mode. When the load current rises to the over-current threshold I_{LIMIT} set by R_{ILIM}, the device adjusts the FET to restrict the load current to I_{LIMIT} in the time of t_{LIM}. When the load current falls below the current limit, the device exits the current limit. Given a desired current limit I_{LIMIT}, the value of R_{ILIM} can be calculated from Equation 4.

$$R_{ILIM} = \frac{11}{I_{LIMIT}} (k\Omega) \quad (4)$$

During the active current limit, there is more power dissipation on the device because the output voltage drops. If the internal temperature (T_J) of the device exceeds the thermal shutdown threshold (T_{SD}), the FET will be turned off, and the device will restarted automatically after a certain time interval.

Short-Circuit Protection

During the operation of SGM2526SF/SGM2526SO, its output may short to ground in some abnormal conditions. As a result, the current through the device increases very rapidly. The internal current limit amplifier provides the accurate current limit control while its bandwidth is limited. So it cannot respond quickly enough to this event. Therefore, the SGM2526SF/SGM2526SO offers a dedicated fast-trip comparator, which shuts down the pass device very quickly when $I_{OUT} > I_{FAST-TRIP}$ ($I_{FAST-TRIP} = 1.6 \times I_{LIM}$), and terminates the rapid short-circuit peak current. After the output short peak current has been terminated by the fast-trip comparator, the current limit amplifier smoothly regulates the output current to I_{LIMIT}.

After turning off internal power N-MOSFET for some microseconds, the device restarts to power on. The same applies to short-circuit power on condition, input current will be limited to I_{LIMIT} point.

When the switching voltage of SGM2526SF/ SGM2526SO is more than 15V, customer should add a no more than 27V (> 0.5W). A Zener diode is used to prevent input voltage spikes from damaging the device.

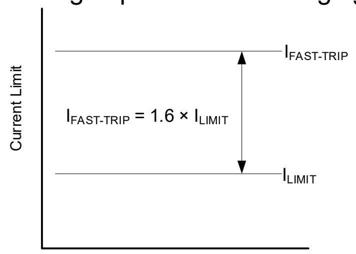


Figure 6. Fast-Trip Current

Over-Temperature Protection (OTP)

The SGM2526SF/SGM2526SO always monitors the temperature (T_J) of the internal die. Once the internal temperature exceeds the thermal shutdown threshold (T_{SD}), the device shuts down immediately. When SGM2526SF/SGM2526SO triggers the thermal shutdown, it remains in the shutdown state until the internal temperature of the equipment drops by T_{HYS}. After that, it will retry to turn on automatically after a t_{SD_DLY} delay time if it is still enabled.

APPLICATION INFORMATION

The SGM2526SF/SGM2526SO provides a complete set of protection functions for overload or inrush current. The wide operating voltage range (2.7V to 22V) is specifically designed for many popular DC buses, and the maximum load current of 5A can meet the power delivery requirements of many devices.

Protection and Current Limit for AC/DC Power Supplies

In many small household appliances, portable devices, consumer products and other application scenarios, the primary-side power supplies and adapter are dominant.

- No secondary-side protection which can stop short-circuit and other key faults immediately.
- Cannot provide precision current limit for overload transients.
- Poor ability to regulate the output voltage during sudden fluctuation of the AC input voltage, when the output over-voltage condition is triggered.

Therefore, accurate current sensing and overload protection are required for the secondary side output port in the above applications. This requires the use of precision operational amplifiers for additional circuit implementation. It adds complexity to the solution and leads to a loss of sensing. The device which incorporates an N-MOSFET with low on-resistance, provides a simple and efficient solution. The typical application circuit of SGM2526SO is shown in Figure 7.

Precision Current Limit in Intrinsic Safety Applications

The safe operation of electrical and electronic equipment in dangerous area environment has a more and more urgent requirements for intensive safety (IS). IS requires that the total energy available during equipment operation is not enough to ignite the surrounding explosive environment by means of electric sparks or heat transfer. This requires precision current limits to ensure that the set current limits are not exceeded over a wide operating temperature range and variable environmental conditions. Applications such as gas analyzers, medical devices, portal industrial equipment, etc., need to meet these importance safety standards. As a simple over-voltage and over-load protection solution, the SGM2526SO is applicable to each power rail inside the system application. The typical implementation circuit of SGM2526SO is shown in Figure 8.

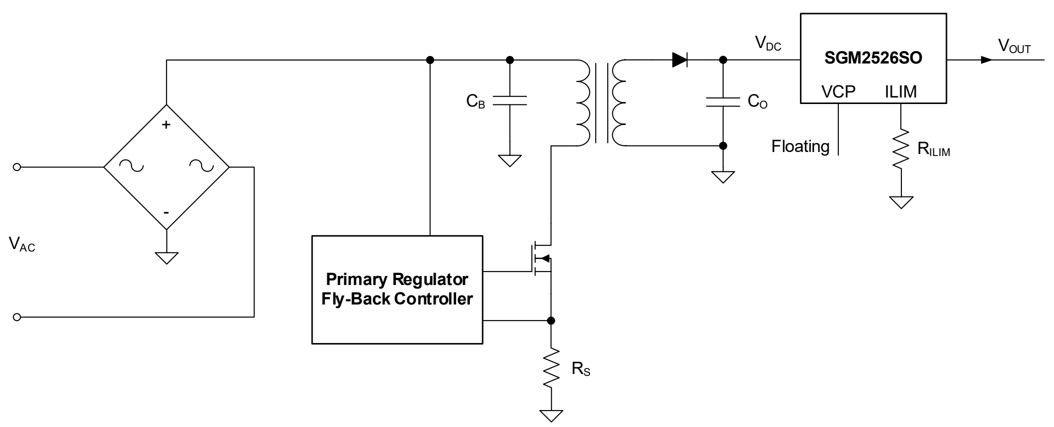


Figure 7. Current Limit and Protection for AC/DC Power Supplies

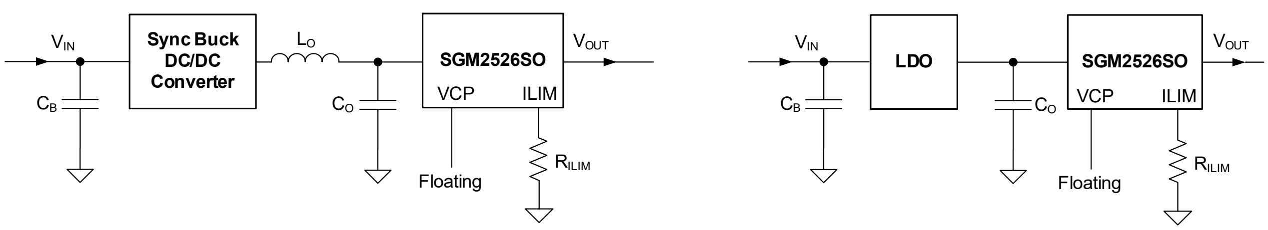


Figure 8. Precision Current Limit and Protection of Internal Rails

APPLICATION EXAMPLES (continued)

Smart Load Switch

The smart load switch is a series of MOSFETs used to switch the load (resistance or capacitance). It also provides protection in case of failure. Figure 9 shows a typical discrete implementation of load switch, which requires more components and more complex circuits to achieve fault protection. The SGM2526SF/ SGM2526SO can be used as a load switch for the applications whose operating range is from 2.7V to 22V. Programmable current limits, programmable soft-start, over-temperature protection, fault flag and under-voltage lockout are provided in the SGM2526SF/SGM2526SO.

Layout Guidelines

In any applications, it is recommended to connect a 0.1μF or greater decoupling capacitor between IN and GND. This decoupling capacitor should be as close as possible to the IN and GND pins to minimize the area of the IN-decoupling capacitor-GND loop.

The power path should be as wide and short as possible, with a current-carrying capacity of more than twice the device's current limit.

The GND pin of the device must be connected to PCB ground which is a copper plane or island as short as possible.

In order to achieve the accuracy of the load switch function, it is recommended to provide the load switch with a ground plane that does not flow through large currents. The ground plane of the device is connected to the ground plane of the system via a star connection.

External components of the device as follows should be placed as close to the corresponding pins as possible:

- R_{ILIM}
- C_{SS}
- Resistor dividers of EN/UVLO

The other end of these components is connected to ground via the shortest possible path. The ILIM pin should have a parasitic capacitance of less than 50pF, and the connection path of this pin should be away from the switching signal.

Protection components such as TVS, snubbers, capacitors or Schottky diodes should be connected to the device via a short path to avoid large line inductance. It is important to note that the loop area formed by the protection components should be as small as possible.

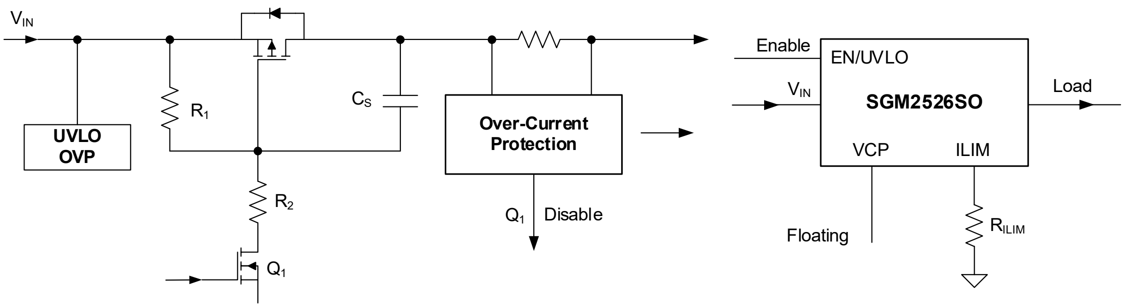


Figure 9. Smart Load Switch Implementation

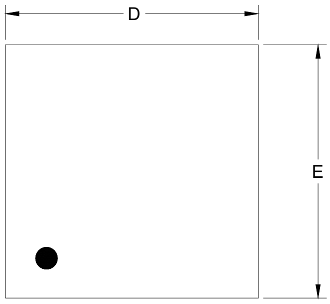
REVISION HISTORY

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

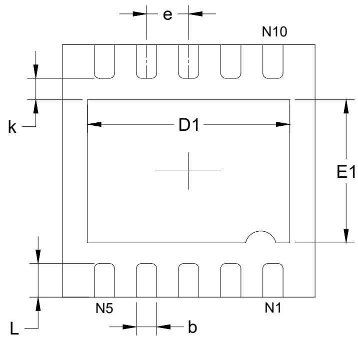
Changes from Original to REV.A (JUNE 2025)	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

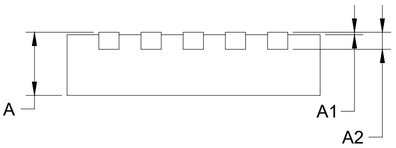
TDFN-3×3-10L



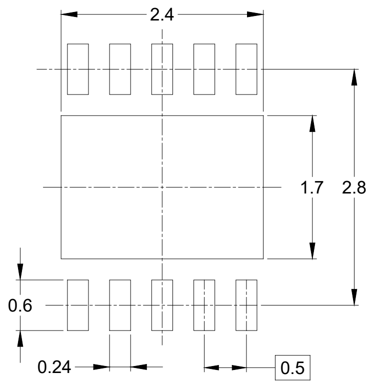
TOP VIEW



BOTTOM VIEW



SIDE VIEW



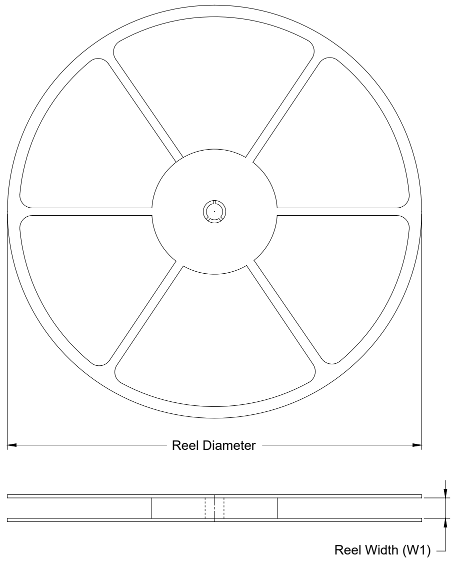
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.103
E	2.900	3.100	0.114	0.122
E1	1.500	1.800	0.059	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

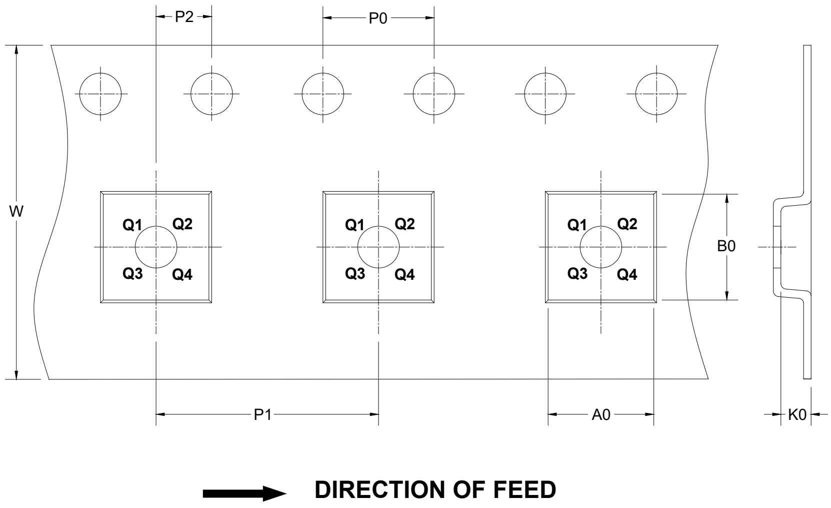
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



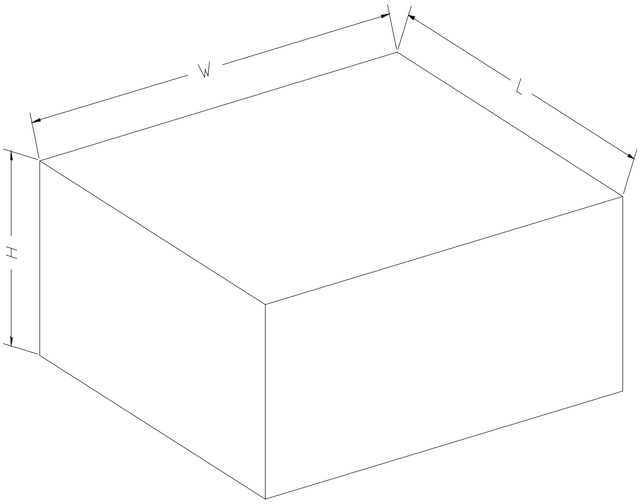
NOTE: The picture is only for reference. Please make the object as the standard.

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
TDFN-3×3-10L	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

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
13″	386	280	370	5

DD0002