GENERAL DESCRIPTION

The SGM4064 is designed for front-end protection of Li-Ion battery charger.

The SGM4064 works like a linear regulator, and constantly monitors the input voltage and battery voltage to maintain an output voltage of 5.1V, and the input voltages reach the input over-voltage threshold (V_{OVP} = 6.8V).

The SGM4064 has temperature monitoring function. When the temperature exceeds 145℃, the device will switch off. The SGM4064 provides a fault status indication when it is controlled by the processor.

The SGM4064 is available in a Green TDFN-2×2-8L package and is rated over the -40℃ to +85℃ temperature range.

FEATURES

- **Input Over-Voltage Protection**
- **Battery Over-Voltage Protection**
- **Up to 18V Input Voltage**
- **Up to 1.5A Load Current Capability**
- **Soft-Start and Soft-Stop Function**
  - **Prevent Inrush Currents and Voltage Spikes**
- **Thermal Shutdown Protection**
- **Enable Function**
- **Fault Status Indication**
- **Available in a Green TDFN-2×2-8L Package**

APPLICATIONS

Portable Internet Devices and Accessory

Mobile Phones and PDAs

Handheld Equipment

MP3 Players

TYPICAL APPLICATION
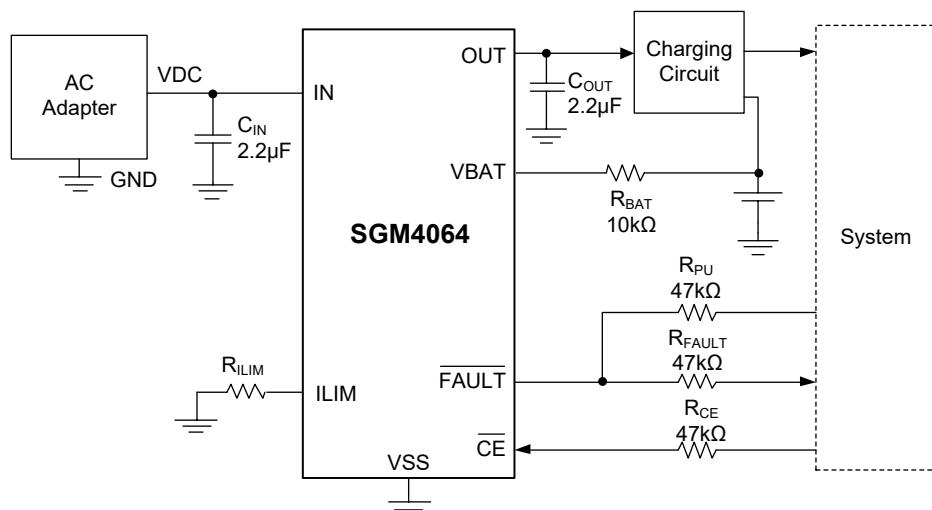
Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4064	TDFN-2×2-8L	-40℃ to +85℃	SGM4064YDE8G/TR	4064 XXXX	Tape and Reel, 3000

NOTE: XXXX = 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

Voltage Range (with Respect to VSS)

IN .... -0.3V to 28V

OUT .... -0.3V to MIN (V_{IN} + 0.3V, 6V)

ILIM, $\overline{FAULT}$, $\overline{CE}$, VBAT .... -0.3V to 6V

Output Source Current (OUT Pin)....................................2A

Output Sink Current ($\overline{FAULT}$ Pin)................................ 15mA

Package Thermal Resistance

TDFN-2×2-8L, θ_{JA} .... 75℃/W

Junction Temperature..+150℃

Storage Temperature Range ....-65℃ to +150℃

Lead Temperature (Soldering, 10s)...........................+260℃

ESD Susceptibility

HBM..4000V

MM...200V

RECOMMENDED OPERATING CONDITIONS

IN Voltage Range, V_I ....3.3V to 18V

Current, OUT Pin, I_O ....1.5A (MAX)

OCP Programming Resistor, R_{ILIM} .... 92kΩ to 640kΩ

Operating 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

(TOP VIEW)

PIN			
IN	1	8	OUT
VSS	2	7	ILIM
NC	3	6	VBAT
FAULT	4	5	CE

GND

TDFN-2×2-8L
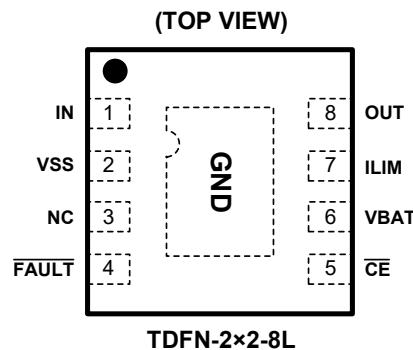
PIN DESCRIPTION

PIN	NAME	FUNCTION
1	IN	Power Input Pin. Connect a ceramic capacitor (1µF MIN) between IN and VSS.
2	VSS	Ground Terminal. Connect to the thermal pad and to the ground.
3	NC	No Connection.
4	$\overline{\text{FAULT}}$	Open-Drain Device Status Output Pin.
5	$\overline{\text{CE}}$	Active-Low Chip Enable Input Pin.
6	VBAT	Battery Voltage Sense Input Pin. Connect a 10kΩ resistor to pack positive terminal.
7	ILIM	Overload Current Protection Programming Pin. Connect a resistor to VSS to set the overload current protection threshold: $I_{OCP} = 200/(25 + R_{ILIM})$ (current in A, resistance in kΩ)
8	OUT	Output Terminal to the Charging System. Connect a ceramic capacitor (2.2µF MIN) between OUT and VSS.
Exposed Pad	GND	Exposed Pad. The exposed pad is electrically connected to VSS internally. The exposed pad must be connected to the same potential as the VSS pin on the printed circuit board. Do not use the exposed pad as the primary ground input for the device. VSS pin must be connected to ground at all times.

ELECTRICAL CHARACTERISTICS

(T_A = +25℃, R_{ILIM} = 100kΩ, $\overline{CE}$ = LOW, unless otherwise noted.)

| PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input						
Under-Voltage Lockout, Input Power Detected Threshold	UVLO	V_{IN} = 0V to 3V	2.5	2.65	2.8	V
Hysteresis on UVLO	$V_{hys(UVLO)}$	V_{IN} = 3V to 0V		225		mV
Deglitch Time, Input Power Detected Status	$t_{DGL(PGOOD)}$	Time measured from V_{IN} = 0V to 5V, 1µs rise-time		9		ms
Operating Current	I_{DD}	V_{IN} = 5V, no load on OUT pin		185	260	µA
Standby Current	I_{STDBY}	$\overline{CE}$ = HIGH, V_{IN} = 5.5V		0.5	2	µA
Input-to-Output Characteristics						
Q1 Off-State Leakage Current	I_{OFF}	$\overline{CE}$ = HIGH, V_{IN} = 5.5V			5	µA
Dropout Voltage IN to OUT	V_{DO}	V_{IN} = 5V, I_{OUT} = 0.5A		120	170	mV
Input Over-Voltage Protection						
Output Voltage	$V_{O(REG)}$	V_{IN} = 5.5 to V_{OVP} - $V_{hys(OVP)}$, no load on OUT pin	4.9	5.1	5.3	V
Input Over-Voltage Protection Threshold	V_{OVP}		6.35	6.8	7.05	V
Hysteresis on OVP	$V_{hys(OVP)}$		50	120	280	mV
Input Over-Voltage Protection Propagation Delay [1]	$t_{PD(OVP)}$	V_{IN} = 6V to 9V		200		ns
Recovery Time from Input Over-Voltage Condition	$t_{REC(OVP)}$	Time measured from V_{IN} = 9V to 6V, 1µs fall-time		9		ms
Battery Over-Voltage Protection						
Battery Over-Voltage Protection Threshold	BV_{OVP}	V_{OVP} - $V_{hys(OVP)}$ > V_{IN} > 4.5V	4.275	4.35	4.41	V
Hysteresis on BV_{OVP}	$V_{hys(BVovp)}$	V_{OVP} - $V_{hys(OVP)}$ > V_{IN} > 4.5V	190	255	320	mV
Input Bias Current on VBAT Pin	I_{VBAT}			20	180	nA
Deglitch Time, Battery Over-Voltage Detected	$t_{DGL(BVovp)}$	V_{IN} > 4.5V, time measured from V_{VBAT} rising from 4.1V to 4.5V to $\overline{FAULT}$ going low		180		µs
Thermal Protection						
Thermal Shutdown Temperature	$T_{J(OFF)}$			145		℃
Thermal Shutdown Hysteresis	$T_{J(OFF-HYS)}$			15		℃
Logic Levels on $\overline{CE}$						
Logic LOW Input Voltage	V_{IL}				0.4	V
Logic HIGH Input Voltage	V_{IH}		1.4			V
Input LOW Current	I_{IL}			0.3	1.5	µA
Input HIGH Current	I_{IH}	$V_{\overline{CE}}$ = 1.8V		9	15	µA
Logic Levels on $\overline{FAULT}$						
Output LOW Voltage	V_{OL}	I_{SINK} = 5mA		0.14	0.3	V
Off-State Leakage Current, HI-Z	I_{lkg}	$V_{\overline{FAULT}}$ = 5V		0.01	25	µA

NOTE:

1. Not tested. Specified by design.

TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, C_{IN} = C_{OUT} = 2.2μF, R_{ILIM} = 100kΩ, unless otherwise noted.

Normal Power-On Showing Soft-Start
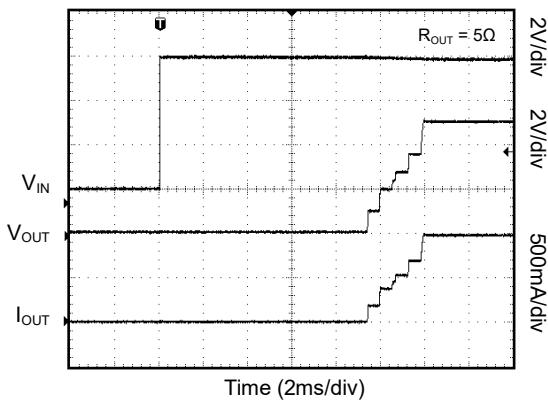
OVP at Power-On
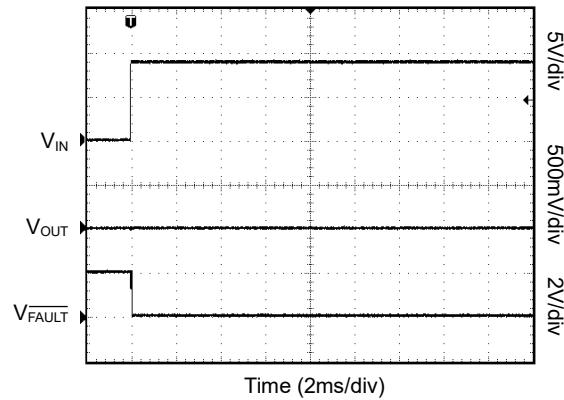
Recovery from OVP
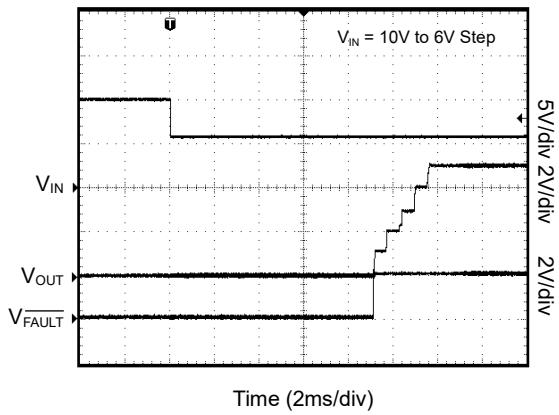
OVP Response for Input Step
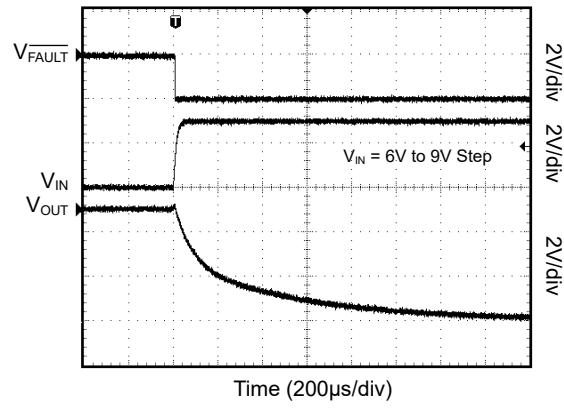
Slow Input Ramp into OVP Event
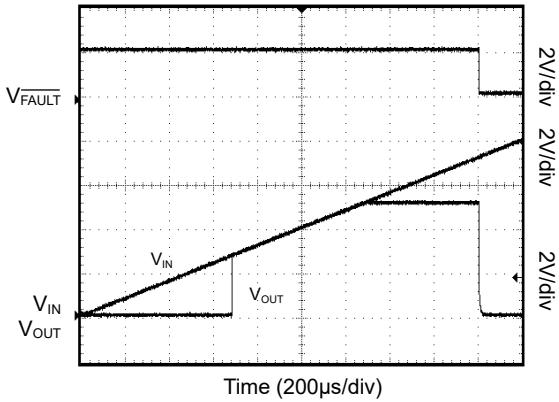
# TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, C_{IN} = C_{OUT} = 2.2µF, R_{ILIM} = 100kΩ, unless otherwise noted.

Soft-Stop during OCP Event

Battery OVP Event

Leakage Current (VBAT Pin) vs. Temperature

Under-Voltage Lockout vs. Temperature

Battery Over-Voltage Protection Threshold vs. Temperature

Output Voltage Regulation vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, C_{IN} = C_{OUT} = 2.2µF, R_{ILIM} = 100kΩ, unless otherwise noted.

OVP Threshold vs. Temperature

Supply Current vs. Input Voltage
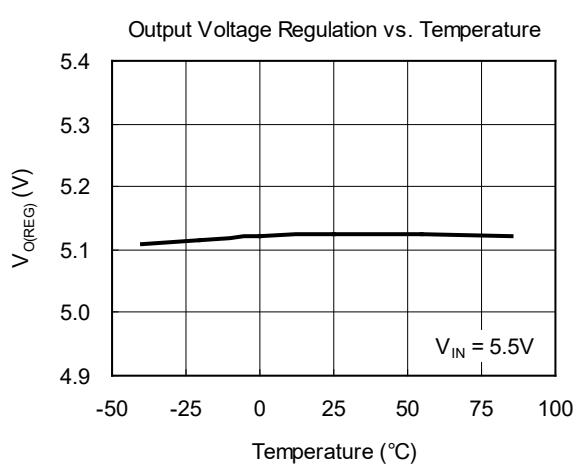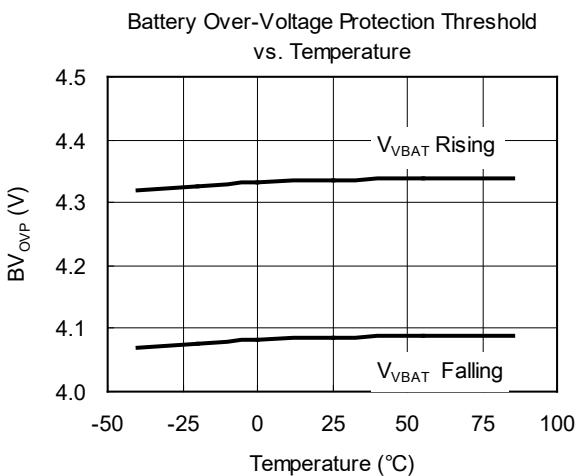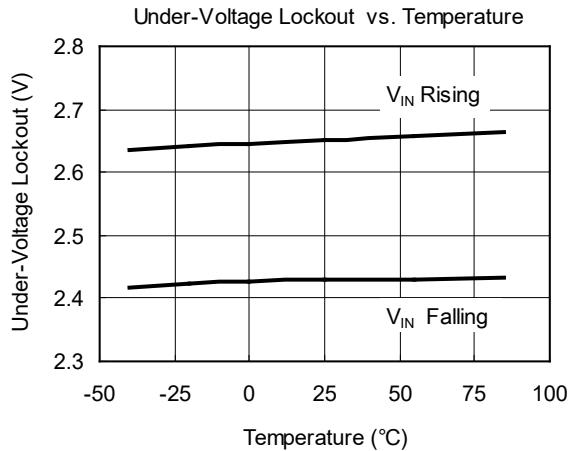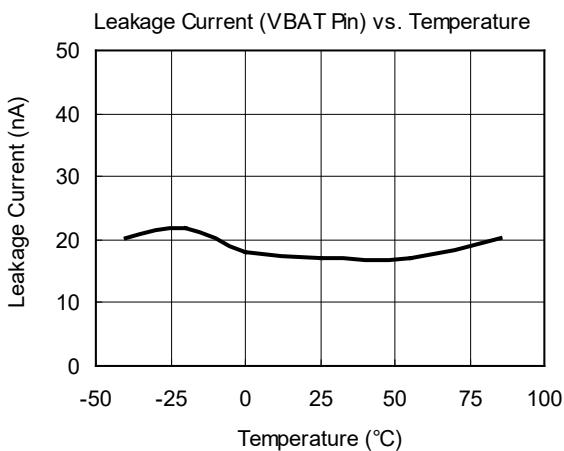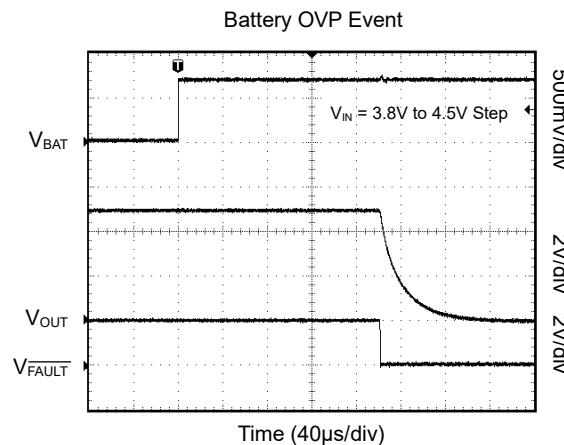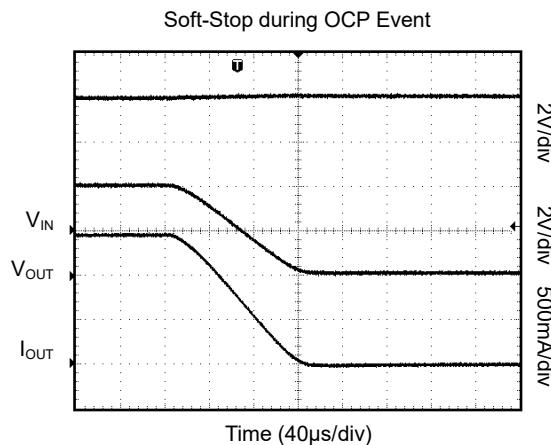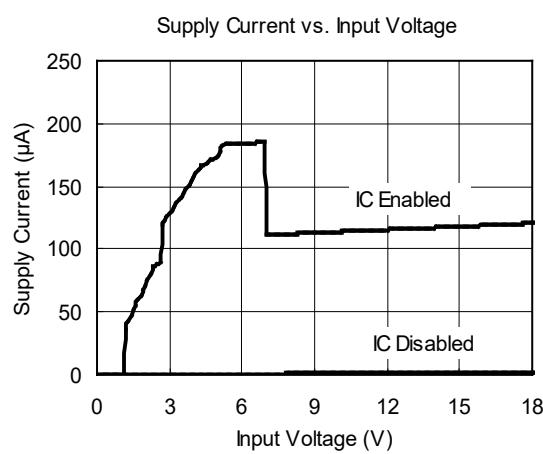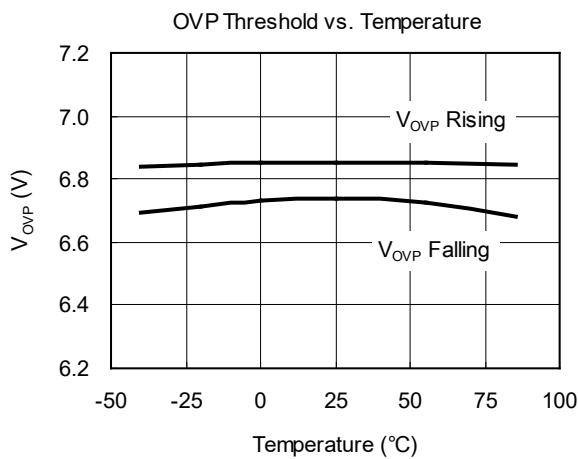
REVISION HISTORY

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

PACKAGE OUTLINE DIMENSIONS

TDFN-2×2-8L
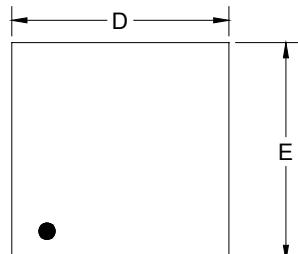
TOP VIEW
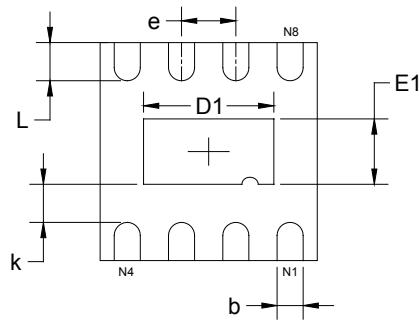
BOTTOM VIEW
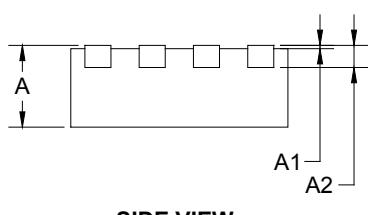
SIDE VIEW
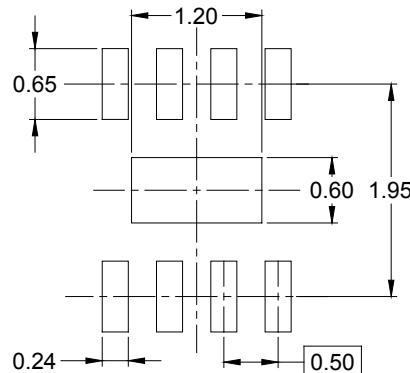
RECOMMENDED LAND PATTERN (Unit: mm)

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	1.900	2.100	0.075	0.083
D1	1.100	1.300	0.043	0.051
E	1.900	2.100	0.075	0.083
E1	0.500	0.700	0.020	0.028
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.250	0.450	0.010	0.018

TAPE AND REEL INFORMATION

REEL DIMENSIONS
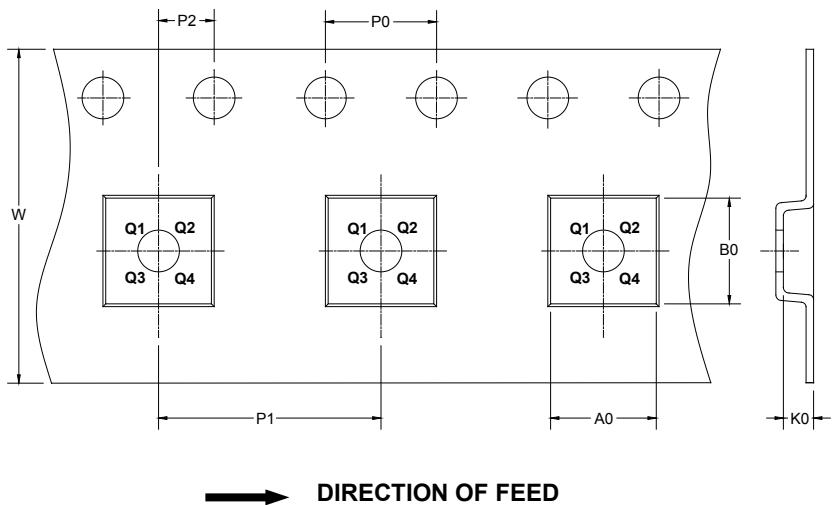
Reel Diameter

Reel Width (W1)

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
TDFN-2×2-8L	7″	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1

DD0001

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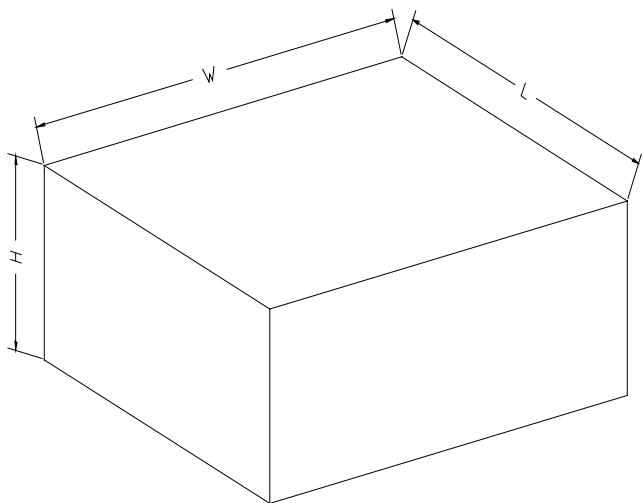
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002