

### GENERAL DESCRIPTION

The SGM3133 is a current-regulated white LED driver with integrated low dropout current sources and a high efficiency charge pump. The charge pump has automatically selectable 1×/1.5× fractional operation modes. The SGM3133 is well suited for white LED applications powered by a Li-Ion battery due to small equivalent open-loop resistance in 1× mode. The supply voltage operates from 2.7V to 5.5V.

The SGM3133 contains a 4-bit digital-to-analog converter for 16-step LED current control. The LED current can be set between 1.25mA and 20mA by a serial pulse input signal into the EN/SET pin. Built-in soft-start circuitry avoids excessive inrush current during startup and mode transition.

The SGM3133 is available in a Green TQFN-3×3-16L package. It is specified over an ambient temperature range of -40°C to +85°C.

### FEATURES

- **Input Voltage Range: 2.7V to 5.5V**
- **Support up to 4 LEDs at 20mA Each**
- **16-Step LED Brightness Control through One-Wire Interface**
- **1× and 1.5× Charge Pump for High Conversion Efficiency**
- **Automatic Charge Pump Mode Conversion**
- **Switching Frequency: 1MHz**
- **1% Regulated LED Current Matching**
- **Built-in Soft-Start for Reducing Inrush Current**
- **Low Noise and Low EMI**
- **Protection Features**
  - ♦ **Over-Current Protection**
  - ♦ **Under-Voltage Lockout**
  - ♦ **Thermal Shutdown**
- **Operating Temperature Range: -40°C to +85°C**
- **Available in a Green TQFN-3×3-16L Package**

### APPLICATIONS

White LED Backlighting  
 Mobile Phones, MP3s  
 Digital Still Cameras  
 LCD Displays

### TYPICAL APPLICATION

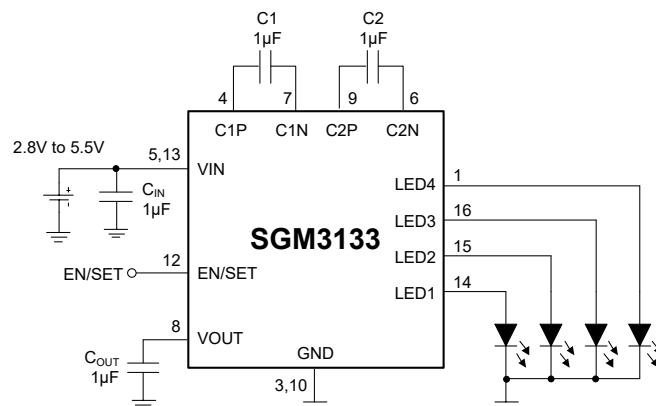


Figure 1. Typical Application Circuit

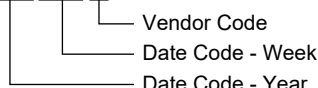
**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3133	TQFN-3×3-16L	-40°C to +85°C	SGM3133YTQ16G/TR	3133TQ XXXXX	Tape and Reel, 3000

**MARKING INFORMATION**

NOTE: XXXXX = Date Code and Vendor Code.

**XXXXX**



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**

VIN to GND.....	-0.3V to 6V
The Other Pins to GND.....	-0.3V to 6V
Package Thermal Resistance	
TQFN-3×3-16L, $\theta_{JA}$ .....	68°C/W
Operating Temperature Range.....	-40°C to +85°C
Junction Temperature.....	+150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s).....	+260°C
ESD Susceptibility	
HBM.....	2000V
MM.....	200V

**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.

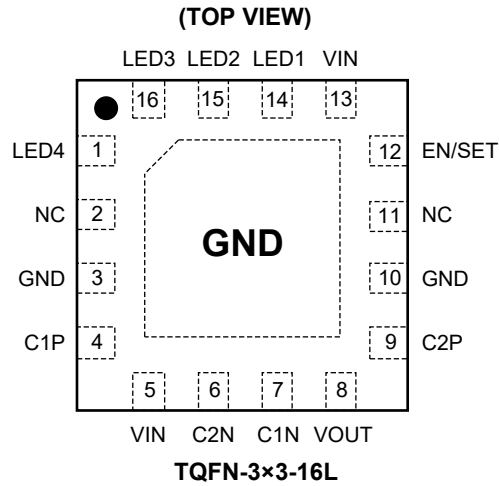
**ESD SENSITIVITY CAUTION**

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

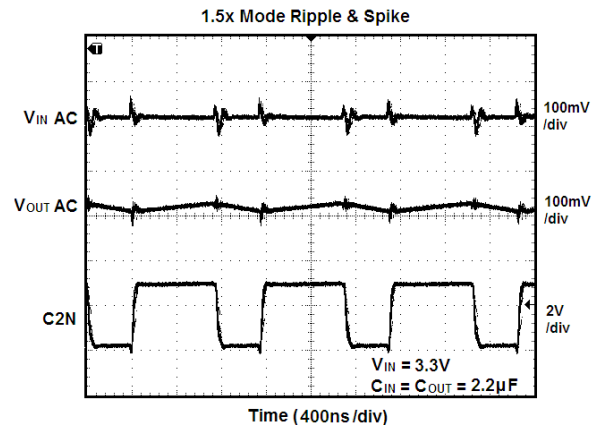
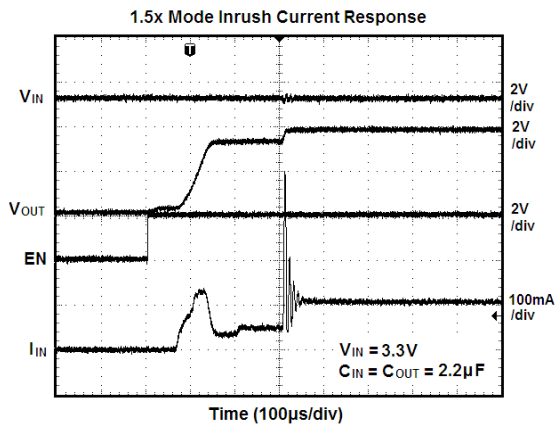
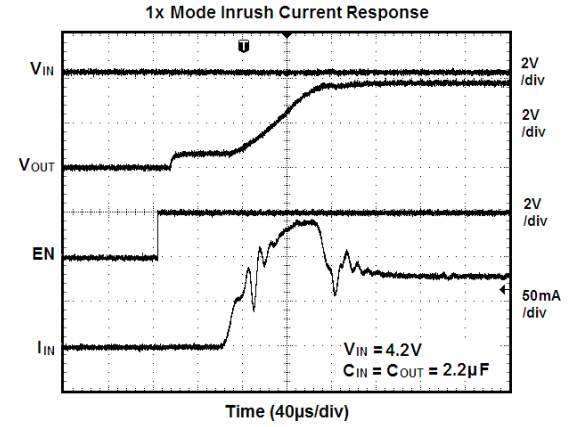
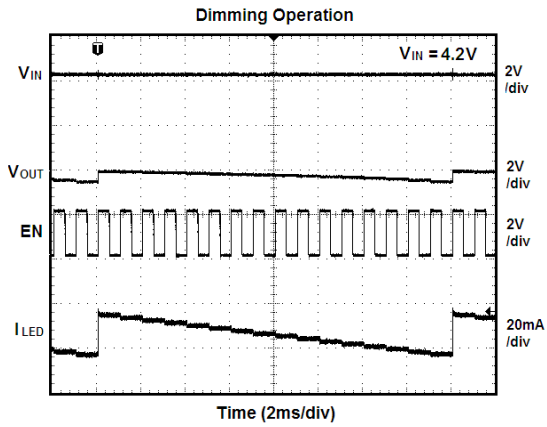
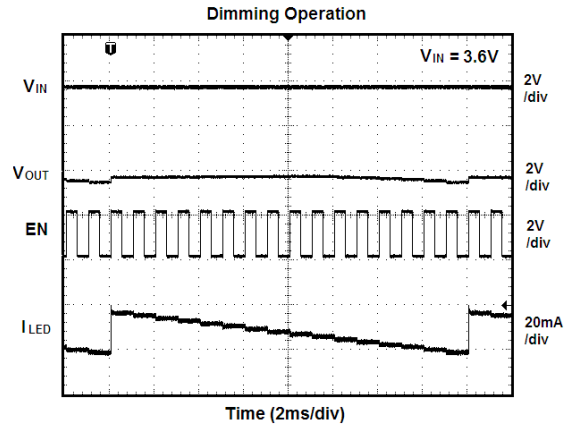
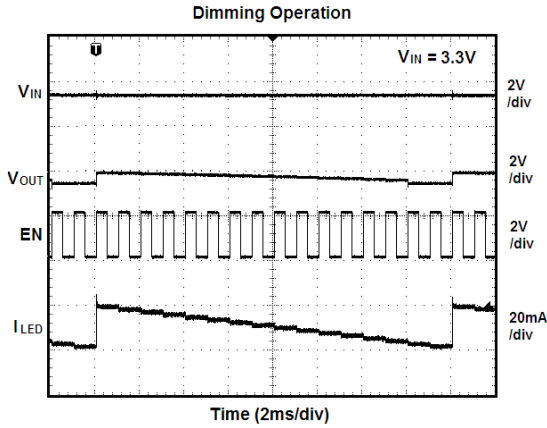
PIN	NAME	FUNCTION
1	LED4	Current Source 4.
2, 11	NC	No Connection.
3, 10	GND	Ground Pin.
4	C1P	Positive Terminal of the Flying Capacitor 1. Connect a 1μF ceramic capacitor close to the device.
5, 13	VIN	Input Supply Pin.
6	C2N	Negative Terminal of the Flying Capacitor 2. Connect a 1μF ceramic capacitor close to the device.
7	C1N	Negative Terminal of the Flying Capacitor 1. Connect a 1μF ceramic capacitor close to the device.
8	VOUT	Output Voltage Source.
9	C2P	Positive Terminal of the Flying Capacitor 2. Connect a 1μF ceramic capacitor close to the device.
12	EN/SET	Active-High Enable Pin and Dimming Control.
14	LED1	Current Source 1.
15	LED2	Current Source 2.
16	LED3	Current Source 3.
Exposed Pad	GND	Exposed Pad. It should be soldered to PCB board and connected to GND.

**ELECTRICAL CHARACTERISTICS**(V<sub>IN</sub> = 2.7V to 5.5V, C<sub>IN</sub> = C<sub>OUT</sub> = C1 = C2 = 1μF, T<sub>A</sub> = +25°C, unless otherwise specification.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Input</b>						
Input Supply Voltage	V <sub>IN</sub>		2.7		5.5	V
Under-Voltage Lockout Threshold		V <sub>IN</sub> Rising	1.8	2.2	2.5	V
Under-Voltage Lockout Hysteresis				100		mV
Quiescent Power Supply Current	I <sub>Q</sub>	1× Mode, V <sub>IN</sub> = 4V		0.3	1	mA
	I <sub>Q</sub>	1.5× Mode, V <sub>IN</sub> = 3.3V		1	2	mA
Shutdown Current	I <sub>SHDN</sub>	V <sub>EN</sub> = 0.4V		0.1	10	μA
1× Mode to 1.5× Mode Transition Voltage (V <sub>IN</sub> falling)	V <sub>TS_x1.5</sub>	V <sub>F</sub> = 3.25V, I <sub>OUT</sub> = 80mA, I <sub>LEDx</sub> = 20mA		3.45		V
Hysteresis of Mode Transition				250		mV
<b>Output</b>						
Output Current	I <sub>LEDx</sub>	V <sub>IN</sub> = 3.5V, 100% Setting	18	20	22	mA
Current Matching		V <sub>IN</sub> = 3.5V, 100% Setting	-3	1	3	%
<b>EN/SET Logic</b>						
Threshold	Logic-High Voltage	V <sub>IH</sub>	1.5			V
	Logic-Low Voltage	V <sub>IL</sub>			0.4	V
Low Time for Dimming	T <sub>LO</sub>		0.5		500	μs
High Time for Dimming	T <sub>HI</sub>		0.5			μs
EN/SET Current	High Current	I <sub>IH</sub>	V <sub>IH</sub> = V <sub>IN</sub>	0.01	1	μA
	Low Current	I <sub>IL</sub>	V <sub>IL</sub> = GND	0.01	1	μA
Low Time for Shutdown	T <sub>SHDN</sub>	PWM Dimming		1.5		ms
<b>Frequency</b>						
Oscillator Frequency	f <sub>OSC</sub>			1000		kHz

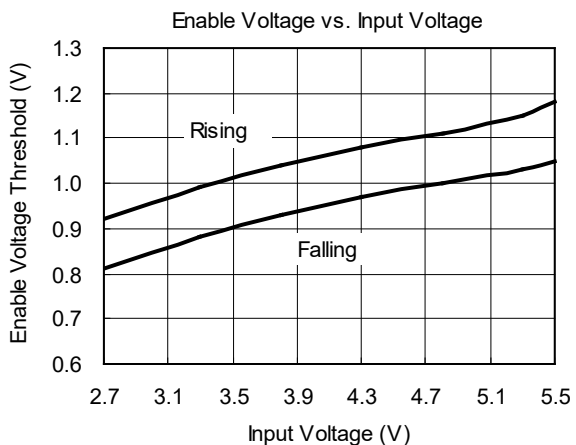
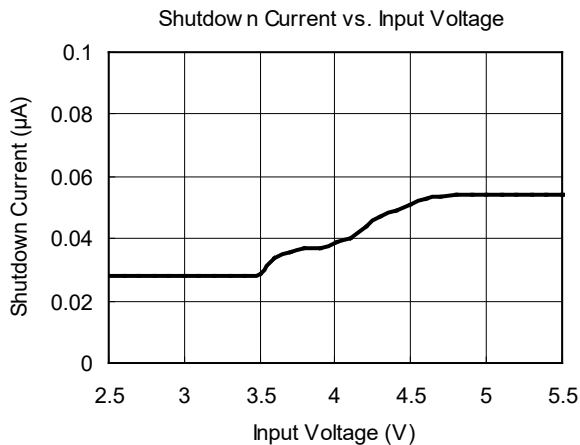
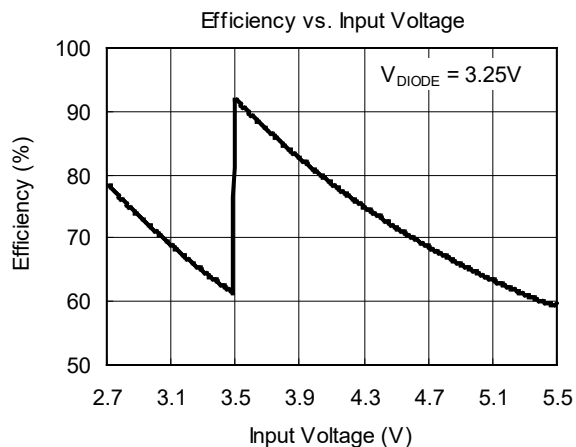
TYPICAL PERFORMANCE CHARACTERISTICS

$C_{IN} = C_{OUT} = C_1 = C_2 = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

C<sub>IN</sub> = C<sub>OUT</sub> = C1 = C2 = 1μF, T<sub>A</sub> = +25°C, unless otherwise noted.



TYPICAL APPLICATION CIRCUITS

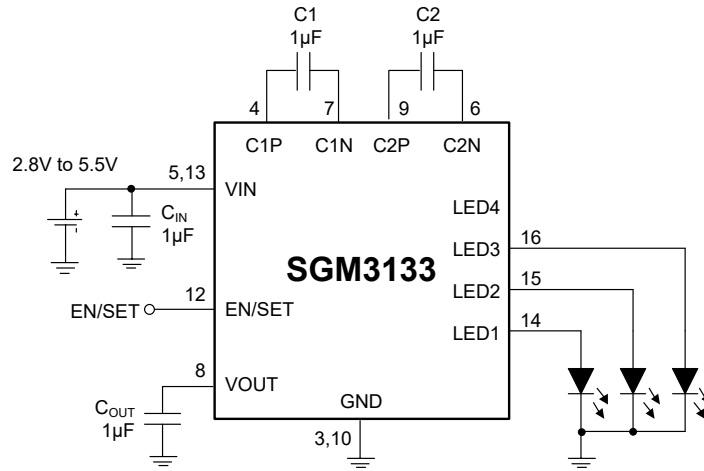


Figure 2. For 3-WLEDs Application Circuit

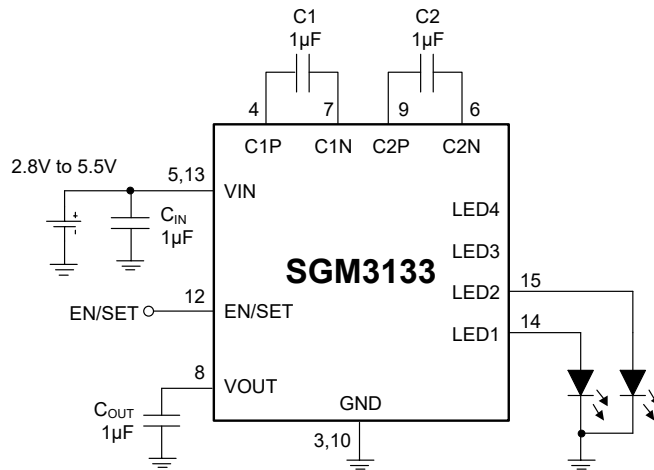


Figure 3. For 2-WLEDs Application Circuit

REVISION HISTORY

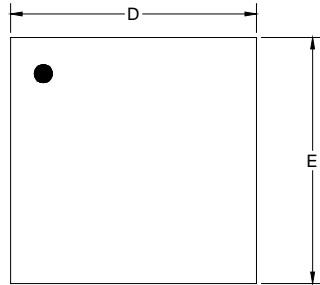
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

JANUARY 2013 – REV.A.1 to REV.A.2		Page
Added Recommended Land Pattern section.....		11
Added Tape and Reel Information section.....		12, 13
MAY 2011 – REV.A to REV.A.1		Page
Changed Package Description .....		All
Changes from Original (MAY 2010) to REV.A		Page
Changed from product preview to production data.....		All

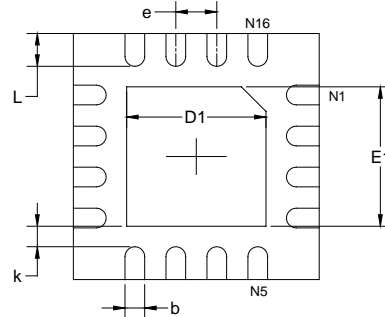
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

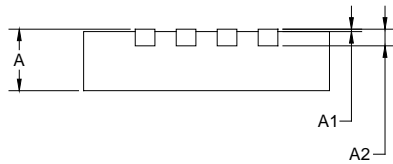
### TQFN-3x3-16L



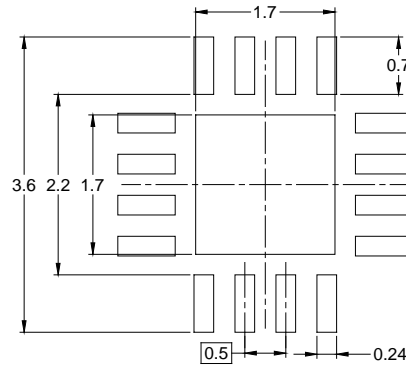
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

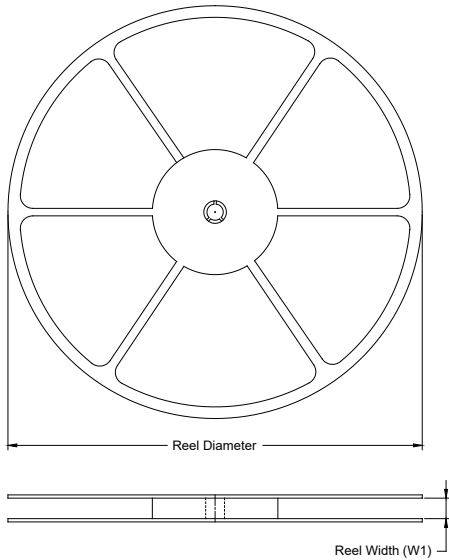
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020



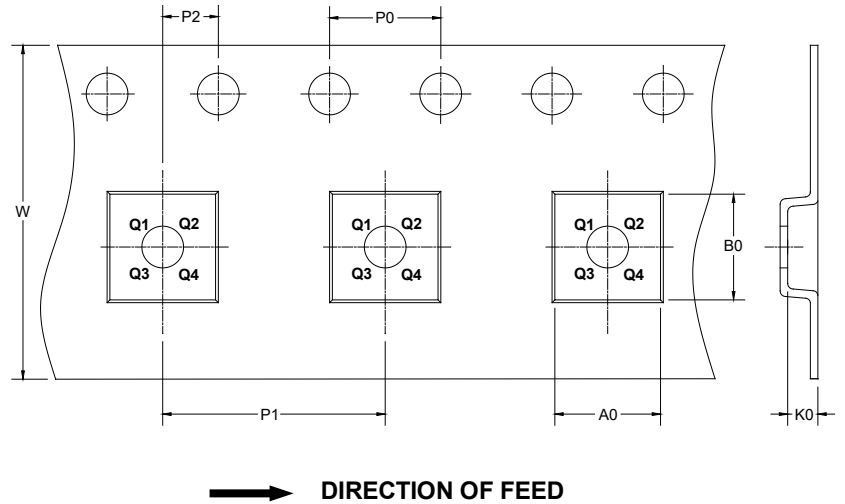
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

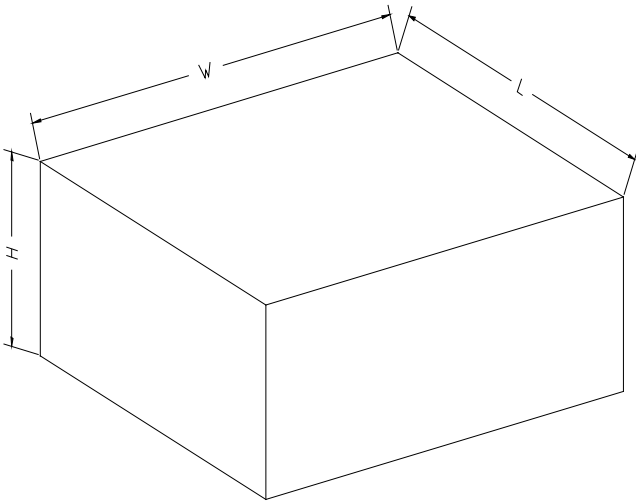
### KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TQFN-3×3-16L	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD0001

# 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
13"	386	280	370	5

DD0002