



SGM3144

6-Channel PWM Dimming Charge Pump White LED Driver

GENERAL DESCRIPTION

The SGM3144 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 SGM3144 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 SGM3144 supports up to 6 LEDs for 27mA maximum current per string. The LED reference current is set through an internal resistor. PWM dimming interface allows programmable LED current levels from 0mA to 27mA for brightness control. If the EN pin is logic low, the SGM3144 enters shutdown mode. Built-in soft-start circuitry avoids excessive inrush current during startup and mode transition.

The SGM3144 is available in a Green TQFN-3×3-16L package and is rated over the -40°C to +85°C temperature range.

FEATURES

- **Input Voltage Range: 2.7V to 5.5V**
- **Support to 6 LEDs at 27mA Each**
- **PWM Dimming Interface**
- **1× and 1.5× Charge Pump for High Conversion Efficiency**
- **Switching Frequency: 0.93MHz**
- **±4.8% Regulated LED Current Matching**
- **Built-in Soft-Start for Reducing Inrush Current**
- **Low Input Ripple 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

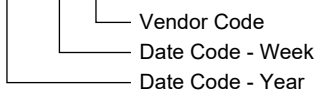
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3144	TQFN-3x3-16L	-40°C to +85°C	SGM3144YTQ16G/TR	3144TQ 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

- V_{IN} to GND -0.3V to 6V
- The Other Pins to GND.....-0.3V to V_{IN}
- Power Dissipation, P_D @ T_A = +25°C
- TQFN-3x3-16L..... 1.47W
- Junction Temperature.....+150°C
- Storage Temperature Range-65°C to +150°C
- Lead Temperature Range (Soldering, 10s).....+260°C
- ESD Susceptibility
- HBM.....2000V
- MM.....200V

RECOMMENDED OPERATING CONDITIONS

- Operating Temperature Range -40°C to +85°C

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.

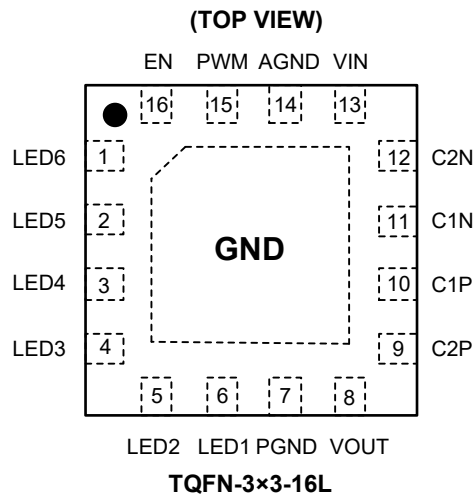
ESD SENSITIVITY CAUTION

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



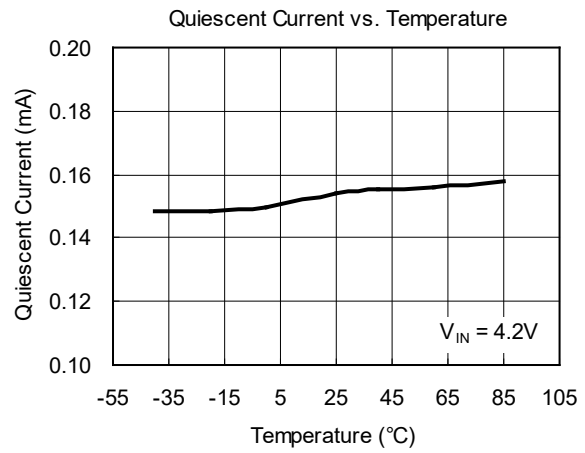
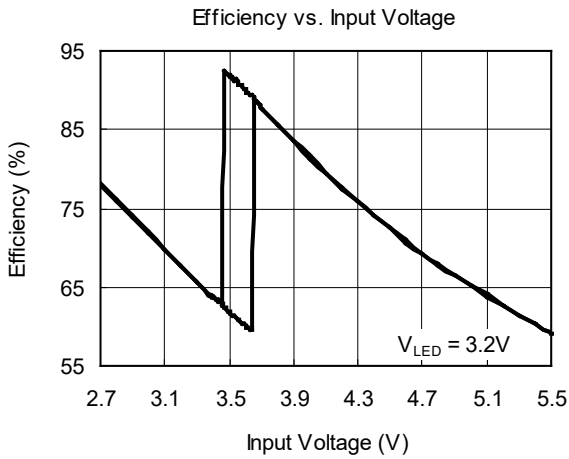
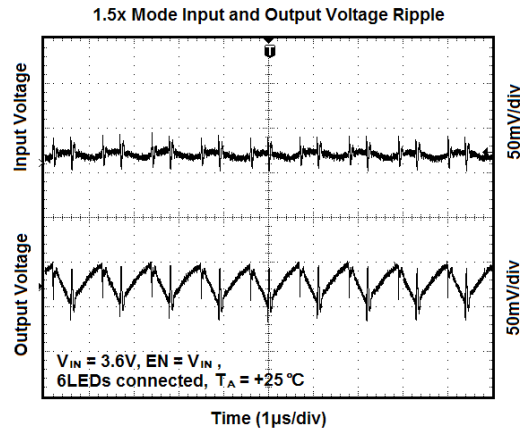
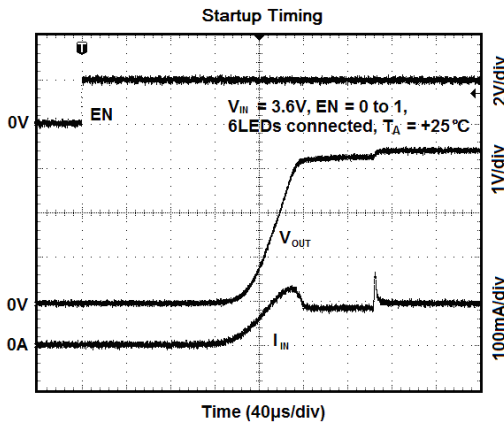
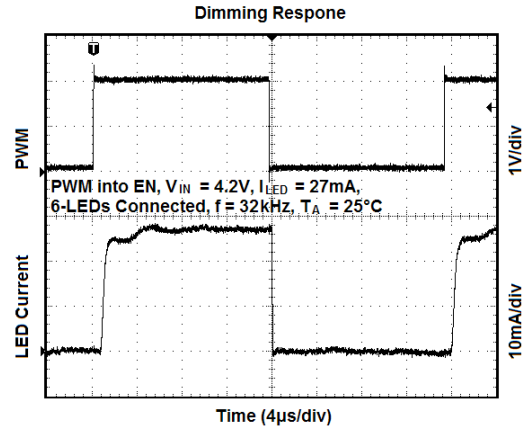
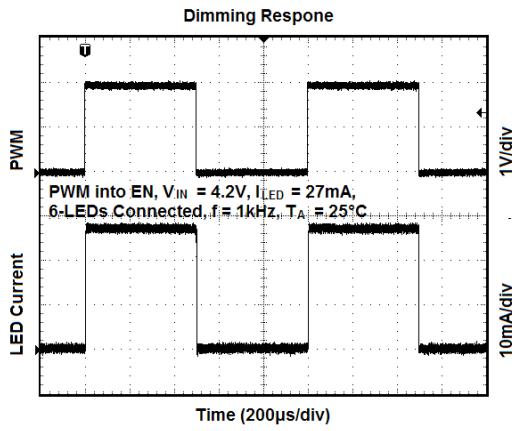
PIN DESCRIPTION

PIN	NAME	I/O	FUNCTION
1 - 6	LED6 - LED1	I	Current Sink Input. Connect to the cathode of the corresponding LED.
7	PGND	-	Power Ground Pin.
8	VOUT	O	Output Voltage Source. Connect to the output capacitor and the anodes of the LEDs.
9	C2P	-	Positive Terminal of the Flying Capacitor 2.
10	C1P	-	Positive Terminal of the Flying Capacitor 1.
11	C1N	-	Negative Terminal of the Flying Capacitor 1.
12	C2N	-	Negative Terminal of the Flying Capacitor 2.
13	VIN	I	Input Supply Pin.
14	AGND	-	Analog Ground Pin.
15	PWM	I	PWM Dimming Input. Duty cycle = 0%, $I_{OUT} = 0\text{mA}$; duty cycle = 100%, $I_{OUT} = 27\text{mA}$.
16	EN	I	Active-High Enable Pin. Pull EN high to enable the device, and pull EN low to disable the device. In normal operation if V_{IN} ramp-up is slow, it is recommended to connect EN/SET to VIN only after V_{IN} has settled.
Exposed Pad	GND	-	Exposed Pad. It should be soldered to PCB board and connected to GND.

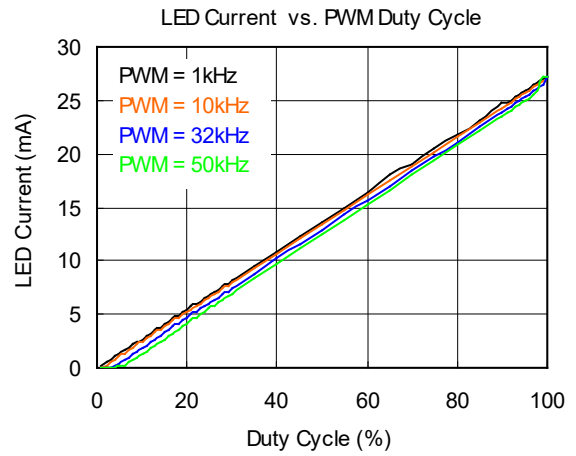
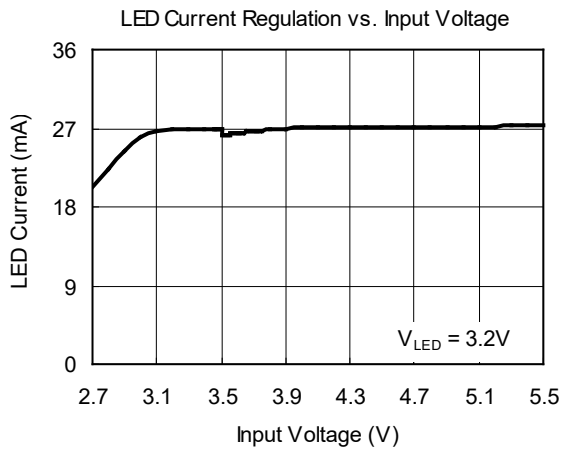
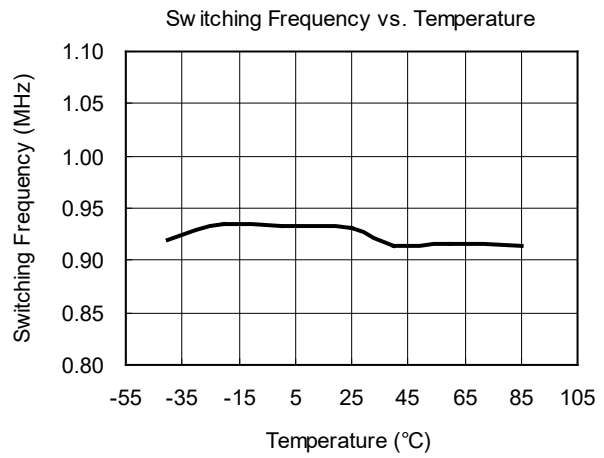
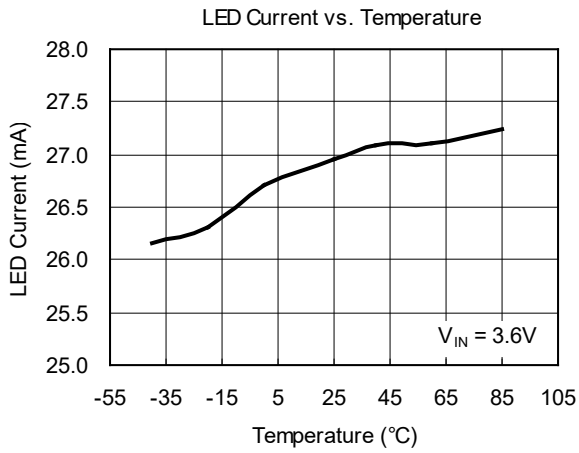
ELECTRICAL CHARACTERISTICS(V_{IN} = 3.6V, EN = V_{IN}, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage and Current						
Input Voltage Range	V _{IN}		2.7		5.5	V
Quiescent Power Supply Current	I _Q	V _{IN} = 4.2V, 1× Mode, I _{LEDx} = 0mA		155	240	μA
	I _Q	1.5× Mode, I _{LEDx} = 0mA		1.35		mA
Shutdown Supply Current	I _{SHDN}	EN = GND, V _{IN} = 4.2V		0.01	2.5	μA
Charge Pump Stage						
Over-Voltage Limit	V _{OUT}			5.4		V
Start-Up Time		C _{OUT} = 1μF, I _{LEDx} ≥ 0.9 × I _{LEDx-set}		280		μs
Soft-Start Duration				150		μs
Switching Frequency	f		0.7	0.93	1.25	MHz
Efficiency	η	At 1× Mode before switching to 1.5× Mode		90		%
Shutdown Temperature		Temperature rising		140		°C
Shutdown Temperature Hysteresis				10		°C
Input Current Limit				300		mA
Current Sinks						
Recommended Maximum Current per Current Sink	I _{LEDx}	3.2V ≤ V _{IN} ≤ 5.5V	24	27	30	mA
Current Matching between Any Two Outputs		V _{LEDx} = 3.2V, I _{LEDx} = 27mA	-4.8	1	4.8	%
Line Regulation		3.3V < V _{IN} < 5.5V, V _{LEDx} = 3.2V		1.4		%
Voltage at LED _x to GND	V _{SOURCE}	V _{IN} = 4.2V		550		mV
PWM and EN Logic						
PWM Low Time for Dimming	t _{LO}		0.5			μs
PWM High Time for Dimming	t _{HI}		4			μs
Threshold	Logic-High Voltage	V _{IH}	1.2			V
	Logic-Low Voltage	V _{IL}			0.4	V
Threshold of Switching between 1× and 1.5× Mode						
1× Mode to 1.5× Mode		V _{LEDx} = 3.2V		3.48		V
1.5× Mode to 1× Mode		V _{LEDx} = 3.2V		3.65		V

TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS (continued)



TYPICAL APPLICATION

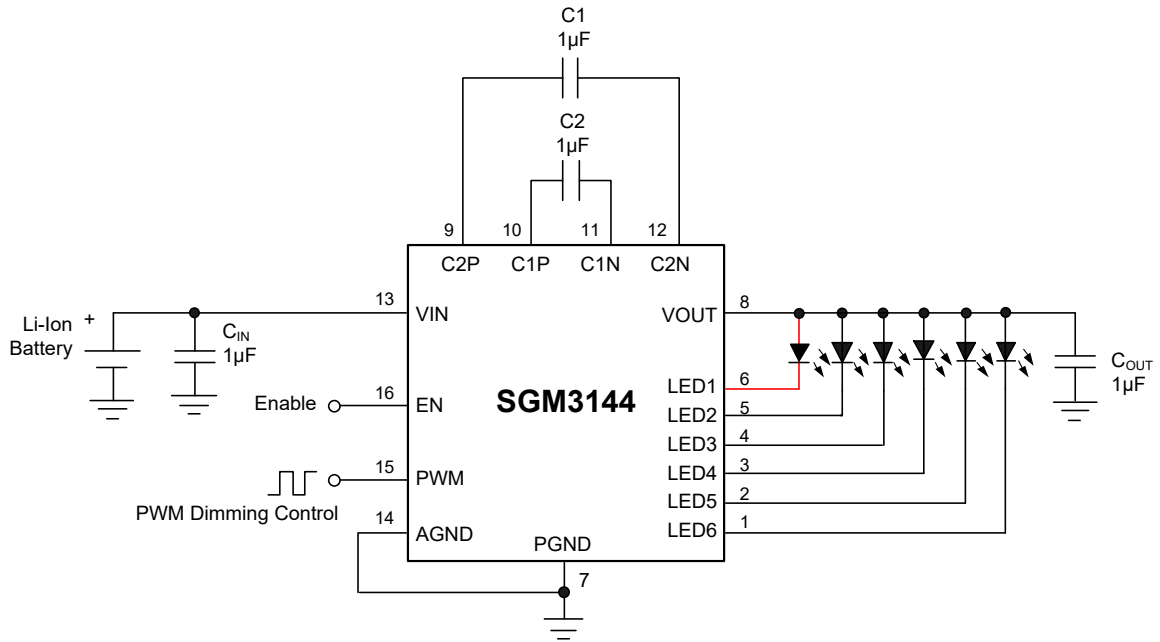


Figure 1. For 6-WLEDs Application Circuit

REVISION HISTORY

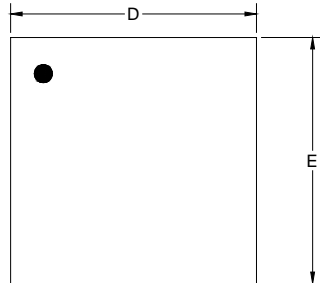
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

JANUARY 2013 – REV.A to REV.A.1	Page
Added Tape and Reel Information section.....	12, 13
Changes from Original (MAY 2012) to REV.A	Page
Changed from product preview to production data.....	All

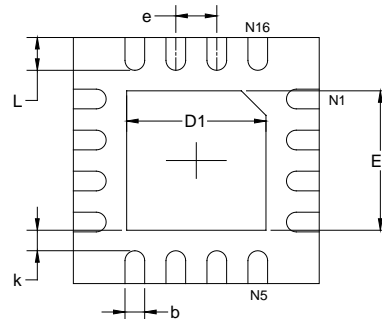
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

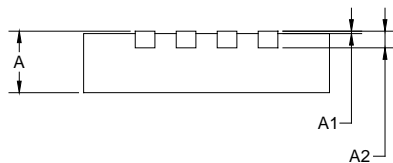
TQFN-3x3-16L



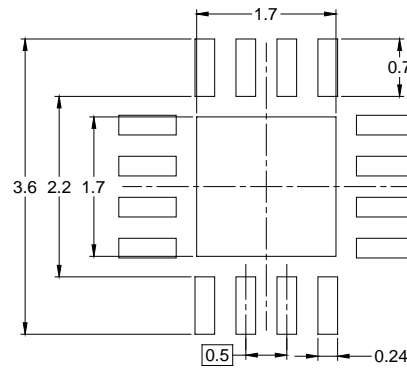
TOP VIEW



BOTTOM VIEW



SIDE VIEW



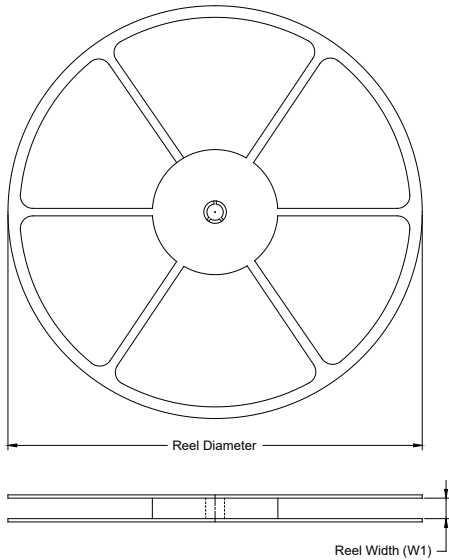
RECOMMENDED LAND PATTERN (Unit: mm)

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

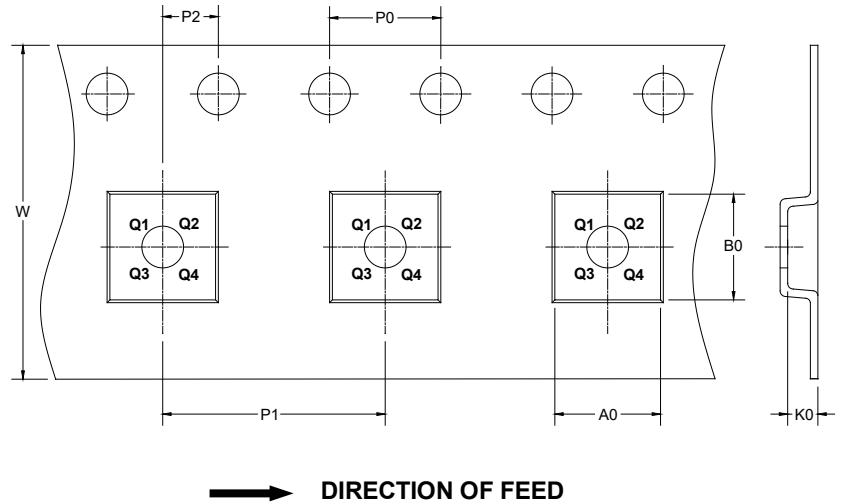
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

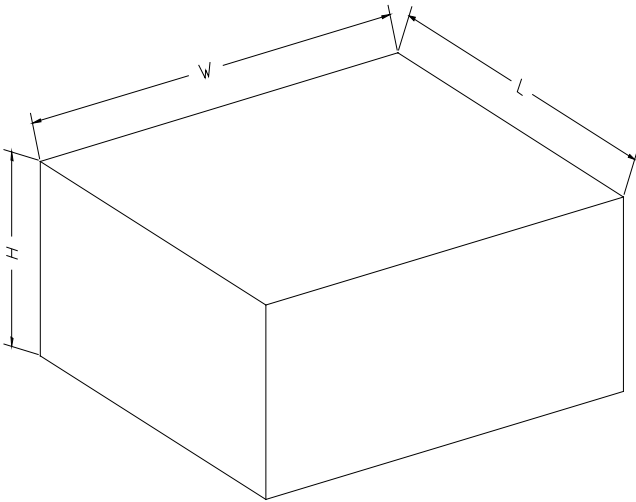
KEY PARAMETER LIST OF TAPE AND REEL

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