SGM3139
6-Channel 1-Wire Dimming LED Driver with Ultra Low Dropout Current Source

GENERAL DESCRIPTION

The SGM3139 is a 6-channel ultra low dropout constant source parallel LED driver. The SGM3139 uses an internal resistor to set the bias current for six LEDs, which are matched to ±3%.

The SGM3139 incorporates a single wire interface to program the output current at 16 continuous steps. It has an internal deglitch circuit for filtering the noise of the EN input.

The SGM3139 requires only a 35mV dropout voltage at a 20mA load. The feature makes SGM3139 ideal for battery-operated systems, such as personal digital assistants.

The SGM3139 is available in Green TQFN-3×3-16L and TDFN-3×3-10L packages and is specified over an ambient temperature range of -40℃ to +85℃.

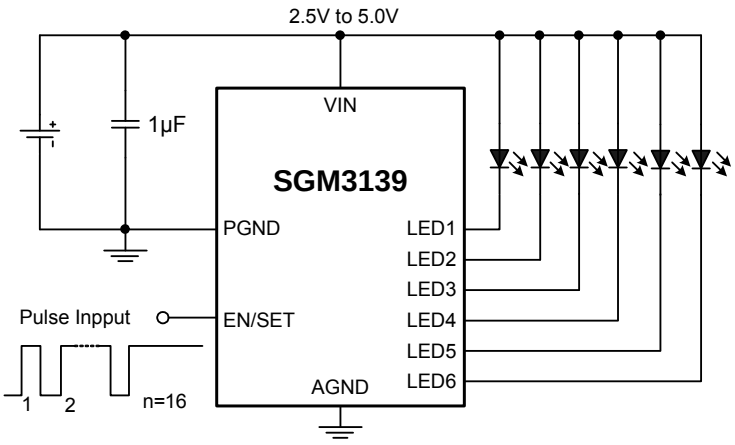
APPLICATIONS

Wireless Handsets
MP3, MP4, and PMP
Cellular Phones
Portable Communication Devices
Digital Cameras, Camcorders
PDAs, Palmtops, and Handy Terminals
Battery-Powered Equipment

FEATURES

- **Ultra Low Dropout: 35mV/20mA**
- **Support up to 6 LEDs**
- **LED Sink Current 20mA**
- **±3% LED Current Matching**
- **Deglitch Circuit**
- **Thermal Shutdown Protection**
- **16-Step Brightness Control**
- **No EMI and Switch Noise**
- **Operating Temperature Range: -40℃ to +85℃**
- **Available in Green TQFN-3×3-16L and TDFN-3×3-10L Packages**

TYPICAL APPLICATION



PACKAGE/ORDERING INFORMATION

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	MARKING INFORMATION	PACKAGE OPTION
SGM3139	SGM3139YTQ16G/TR	TQFN-3×3-16L	-40°C to +85°C	3139TQ	Tape and Reel, 3000
	SGM3139YD10G/TR	TDFN-3×3-10L	-40°C to +85°C	SGM3139D	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

V_{IN} to GND……-0.3V to 6V
The Other Pins to GND …….…….... -0.3V to 6V
Power Dissipation, P_D @ T_A = 25℃
TQFN-3×3-16L……1.47W
TDFN-3×3-10L……...1.67W
Storage Temperature Range……..…-40℃ to +150℃
Junction Temperature..…….……...…...150℃
Operating Temperature Range…….……..…….-40℃ to +85℃
Lead Temperature (Soldering 10 sec)
…….…….. 260℃
ESD Susceptibility
HBM……..…….……4000V
MM……..…….……...……400V

NOTES:
1. The thermal resistance figures are for general reference only. Actual thermal characteristics may vary with the PCB layout, size of metal trace, the thermal conduction path between metal layers and the environment of the system.

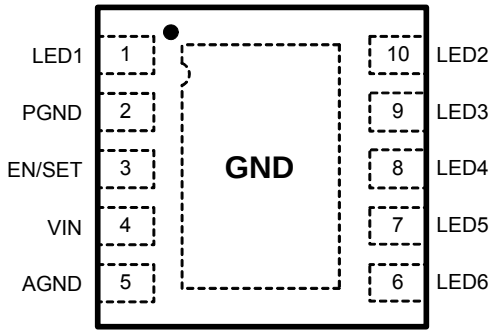
2. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

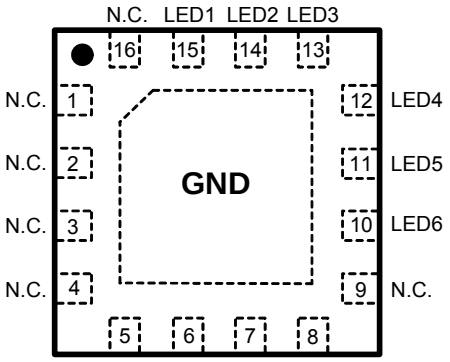
This integrated circuit can be damaged by ESD if you don’t pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN CONFIGURATIONS (TOP VIEW)



TDFN-3×3-10L



TQFN-3×3-16L

PIN DESCRIPTION

PIN NUMBER		PIN NAME	PIN FUNCTION
TQFN-3×3-16L	TDFN-3×3-10L		
5	5	AGND	Analog Ground.
6	2	PGND	Power Ground.
7	4	VIN	Power Input Voltage.
8	3	EN/SET	Enable Input (Active High). One wire interface for LED Dimming connects to GPIO pin of MCU.
1, 2, 3, 4, 16	—	N.C.	No Internal Connection.
10	6	LED6	Current Sink for LED6. Connect to cathode of external white LED.
11	7	LED5	Current Sink for LED5. Connect to cathode of external white LED.
12	8	LED4	Current Sink for LED4. Connect to cathode of external white LED.
13	9	LED3	Current Sink for LED3. Connect to cathode of external white LED.
14	10	LED2	Current Sink for LED2. Connect to cathode of external white LED.
15	1	LED1	Current Sink for LED1. Connect to cathode of external white LED.
GND	GND	Exposed Pad	Exposed pad should be soldered to PCB board and connected to GND.

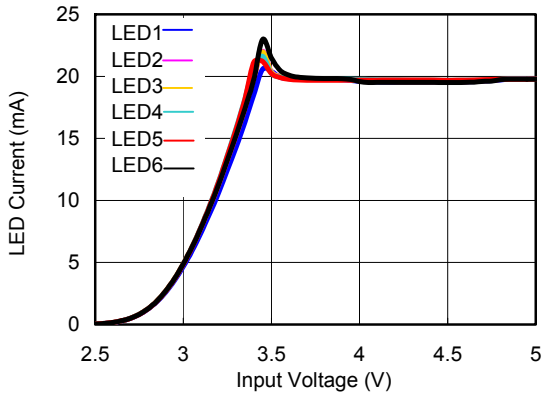
ELECTRICAL CHARACTERISTICS

(V_{IN} = 3.6V, C_{IN} = 1μF, T_A = +25℃, unless otherwise noted.)

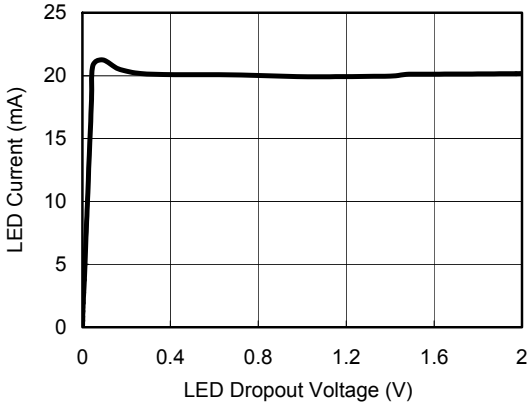
PARAMETER		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operation Voltage Range		V_{IN}		2.5		5.0	V
EN/SET Pull Low Current			$V_{EN/SET}$ = 1.8V		0.01		μA
Quiescent Power Supply Current		I_Q	V_{IN} = 5.0V, LED OFF		0.72		mA
Shutdown Current		I_{SHDN}	$V_{EN/SET}$ = 0V, V_{IN} = 5.0V		0.1	5	μA
I_{LEDx} Accuracy		$I_{LED-ERR}$		-10		+10	%
LED Current Deviation Matching		D_{LED}		-3		+3	%
LED Dropout Voltage		V_{LED}	I_{LEDx} = 20mA, V_{LED} @ I_{LEDx} = 90% × I_{LED}		35		mV
EN/SET Low Time for Shutdown		T_{SHDN}			1.6		ms
EN/SET Low Time for Dimming		T_{LO}		0.5		500	μs
EN/SET High Time for Dimming		T_{HI}		0.5			μs
EN/SET Threshold	Logic-High Voltage	V_{IH}	V_{EN} > V_{IH} for Enable IH	1.2			V
	Logic-Low Voltage	V_{IL}	V_{EN} < V_{IL} for Disable IL			0.5	V
Thermal Shutdown Temperature					145		℃
Hysteresis Temperature					10		℃

TYPICAL PERFORMANCE CHARACTERISTICS

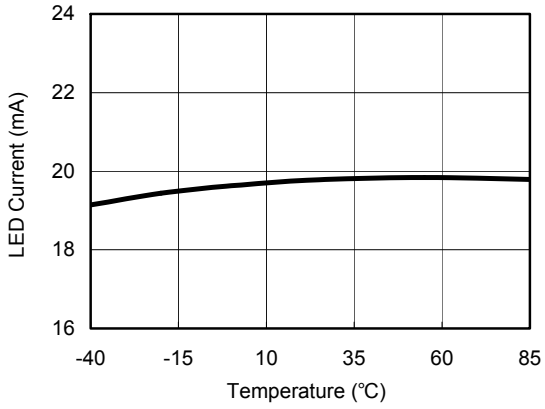
LED Current vs. Input Voltage



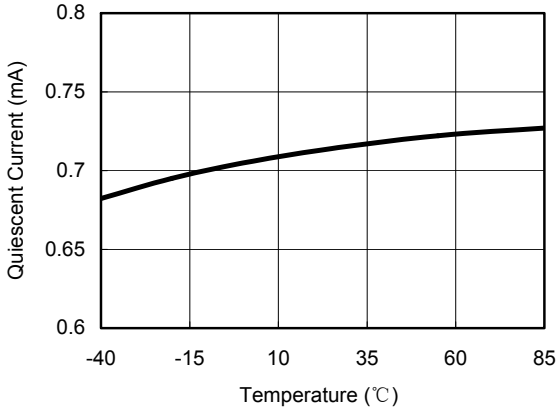
LED Current vs. LED Dropout Voltage



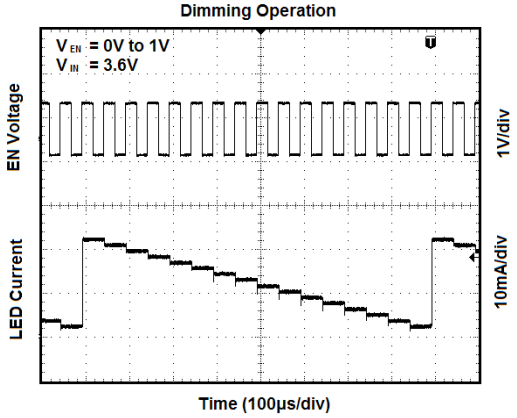
LED Current vs. Temperature



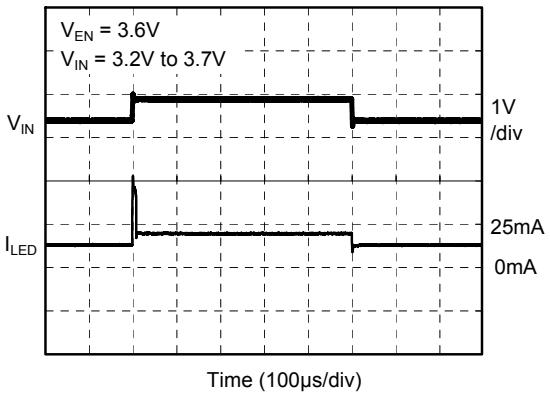
Quiescent Current vs. Temperature



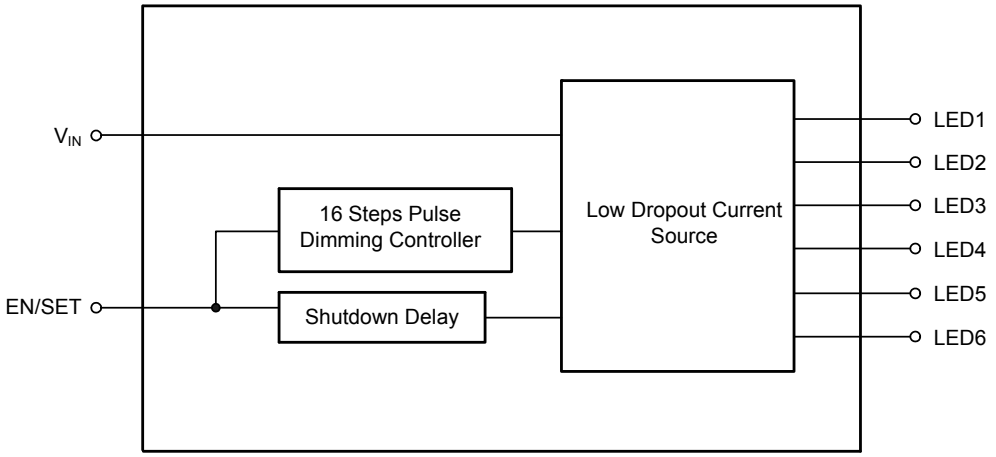
Dimming Operation



Line Transient Response



FUNCTION BLOCK DIAGRAM



APPLICATION INFORMATION

LED Connection

The SGM3139 supports up to 6 white LEDs. The six LEDs are connected from VIN to TQFN-3×3-16L package's pin 10, 11, 12, 13, 14 and 15 respectively. For TDFN-3×3-10L package, cathodes of white LEDs are connected to pin1, 6, 7, 8, 9, and 10. The LED pins can be left floating if the white LEDs are not used.

Brightness Control

The SGM3139 implements a pulse dimming method to control the brightness of white LEDs. Users can easily configure the LED current from 1.25mA to 20mA by a serial pulse. The dimming of white LEDs' current can be achieved by applying a pulse signal to the EN/SET pin. There are totally 16 steps of current that could be set by users. The detail operation of brightness dimming is showed in the Figure 1.

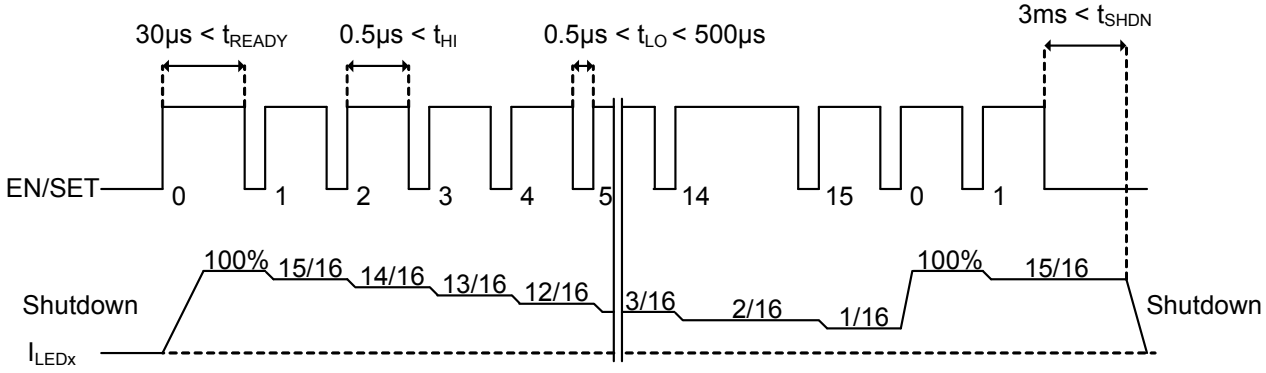
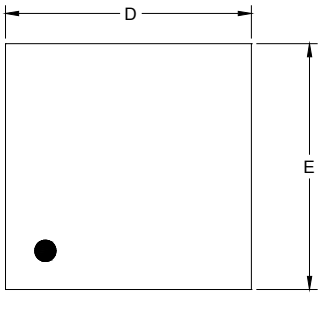


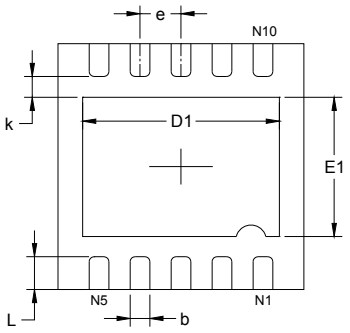
Figure 1. Brightness Control by Pulse Dimming

PACKAGE OUTLINE DIMENSIONS

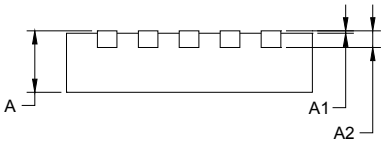
TDFN-3×3-10L



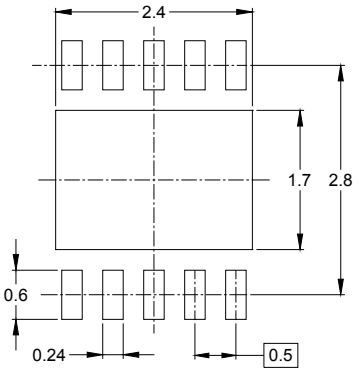
TOP VIEW



BOTTOM VIEW



SIDE VIEW

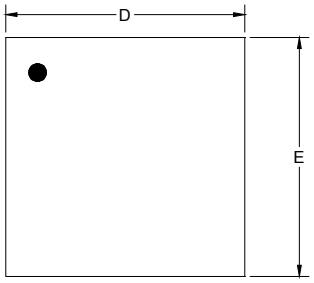


RECOMMENDED LAND PATTERN (Unit: mm)

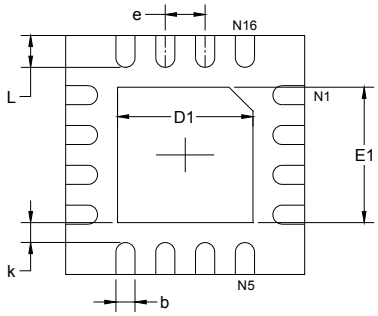
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.103
E	2.900	3.100	0.114	0.122
E1	1.500	1.800	0.059	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007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

PACKAGE OUTLINE DIMENSIONS

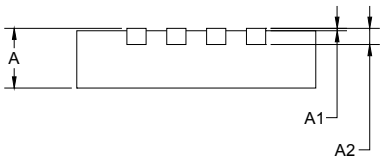
TQFN-3×3-16L



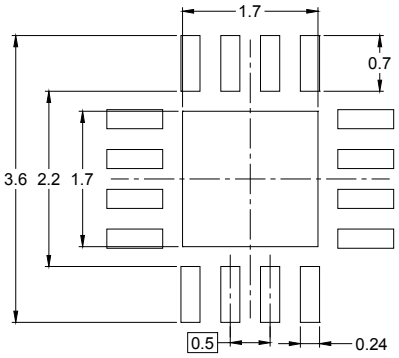
TOP VIEW



BOTTOM VIEW



SIDE VIEW

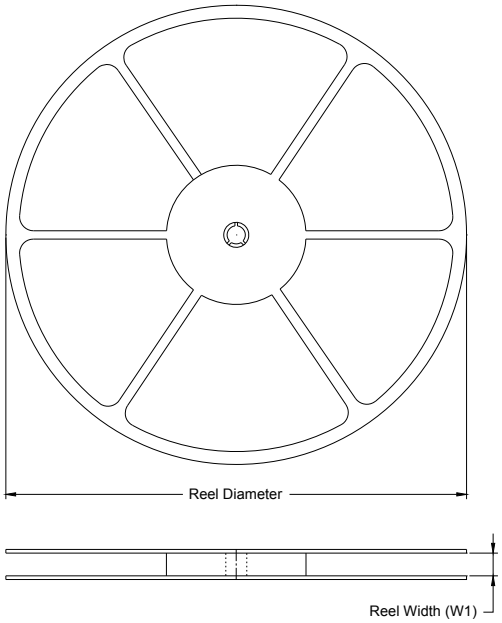


RECOMMENDED LAND PATTERN (Unit: mm)

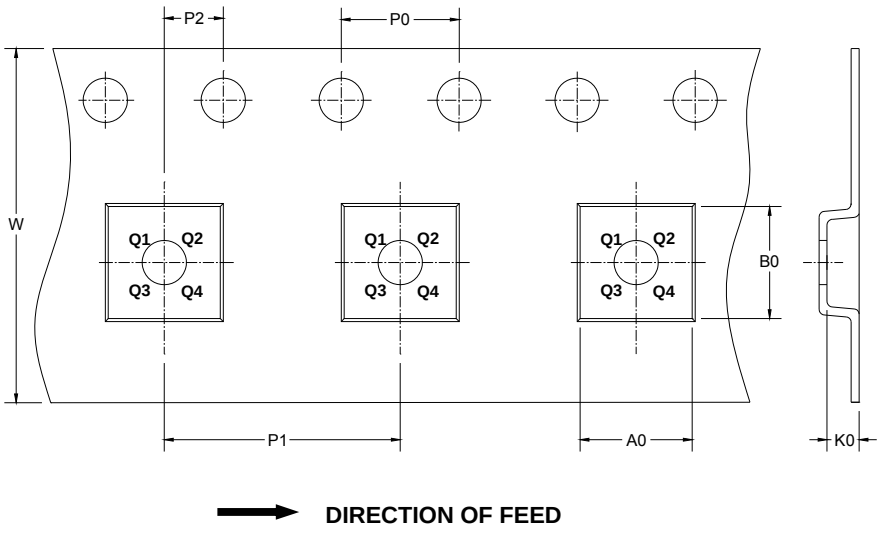
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	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

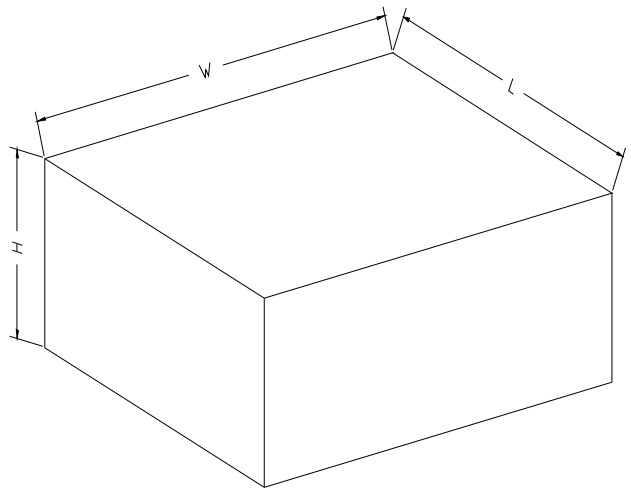


NOTE: The picture is only for reference. Please make the object as the standard.

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″	12.40	3.35	3.35	1.13	4.00	4.00	2.00	12.00	Q1
TDFN-3×3-10L	13″	12.4	3.35	3.35	1.13	4.00	8.00	2.00	12.00	Q1

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