SGM813B
Small Package, High Precision Voltage Detector with Delay Circuit

GENERAL DESCRIPTION

The SGM813B is a low power consumption voltage detector with high accuracy detection. This miniature device is capable of monitoring 1.4V and has a fixed 22ms time delay. This device is ideal for use in power-supply sequencing and reset sequencing applications.

The VCC supply pin provides power and detection voltage, and allows the IC to monitor the power supply.

The VOUT pin is an N-channel open-drain output with active-low reset.

The SGM813B is available in a Green TDFN-2×2-6L package.

FEATURES

- **High Accuracy: ±1%**
- **Low Power Consumption: 0.6μA (TYP) at V_{CC} = 3V**
- **Detection Voltage: 1.4V**
- **Operating Voltage Range: 1V to 6V**
- **Detection Voltage Temperature Coefficient: ±40ppm/℃ (TYP)**
- **N-Channel Open-Drain Output**
- **Delay Time: 22ms (TYP)**
- **Available in a Green TDFN-2×2-6L Package**

APPLICATIONS

Notebook Computers
Digital Still Cameras
PDA and Cellular Phones
Video Equipment and Communication Devices
Microcomputers and Reset for CPUs
System Battery Life and Charge Voltage Monitors

TYPICAL APPLICATION

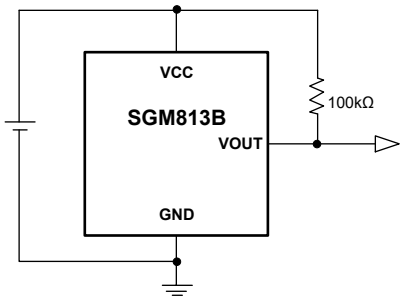


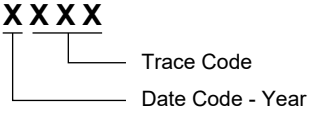
Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	DETECTION VOLTAGE (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM813B-1.4	1.4	TDFN-2×2-6L	-40℃ to +125℃	SGM813B-1.4XTDI6G/TR	813B XXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXX = Date Code and Trace 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

Input Voltage, V_{CC} 7V
Output Current 20mA
Output Voltage (NMOS), V_{OUT} ..... GND - 0.3V to 7V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Ambient Temperature Range ..... -40℃ to +125℃
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.

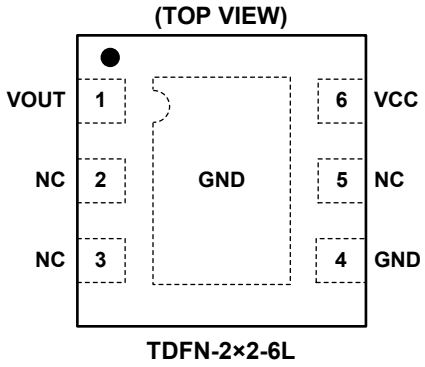
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged 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	VOUT	Output.
2, 3, 5	NC	No Connection.
4	GND	Ground.
6	VCC	Input Supply Voltage.

ELECTRICAL CHARACTERISTICS

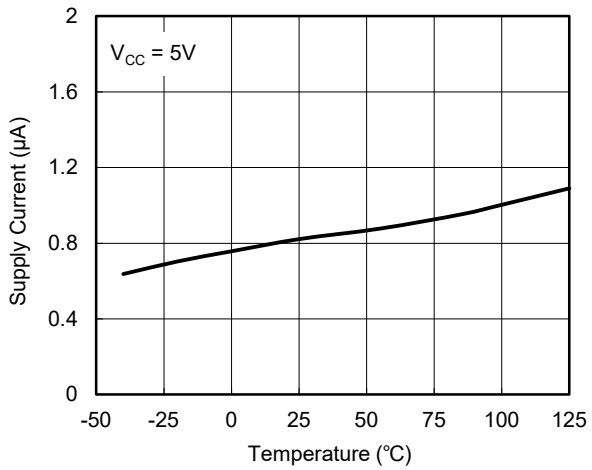
(V_{DET} = 1.4V ± 1%, typical values are at T_J = +25℃, Full = -40℃ to +125℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Operating Voltage	V_{CC}			Full	1		6	V
Detection Voltage	V_{DET}			+25℃	1.386	1.4	1.414	V
Hysteresis Range	V_{HYS}			+25℃	0.04	0.07	0.10	V
Supply Current	I_{CC}	V_{CC} = 1V		+25℃		0.4	0.8	μA
		V_{CC} = 3V		+25℃		0.6	1.2	
		V_{CC} = 6V		+25℃		1.0	1.6	
Output Current	I_{OUT}	V_{DS_NCH} = 0.5V	V_{CC} = 0.8V	+25℃	0.01	0.07		mA
			V_{CC} = 1V	+25℃	0.3	0.8		
			V_{CC} = 1.3V	+25℃	2	4		
Delay Time	t_D	V_{CC} = V_{DET} + 1V		+25℃	16	22	28	ms
Detection Voltage Temperature Coefficient	$\frac{\Delta V_{DET}}{\Delta T_J \times V_{DET}}$			Full		±40	±150	ppm/℃

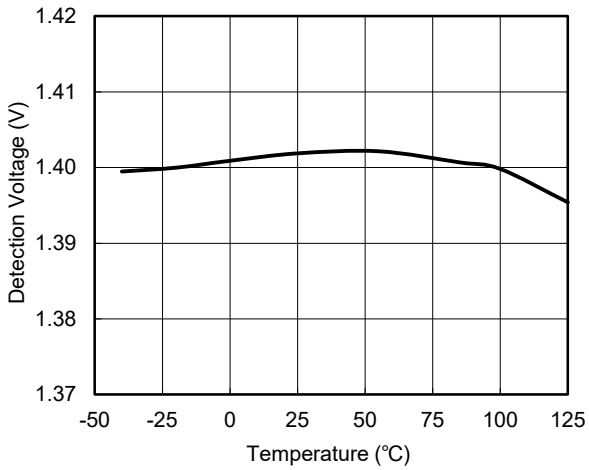
NOTE:
Release Voltage: $V_{RELEASE}$ = V_{DET} + V_{HYS}.

TYPICAL PERFORMANCE CHARACTERISTICS

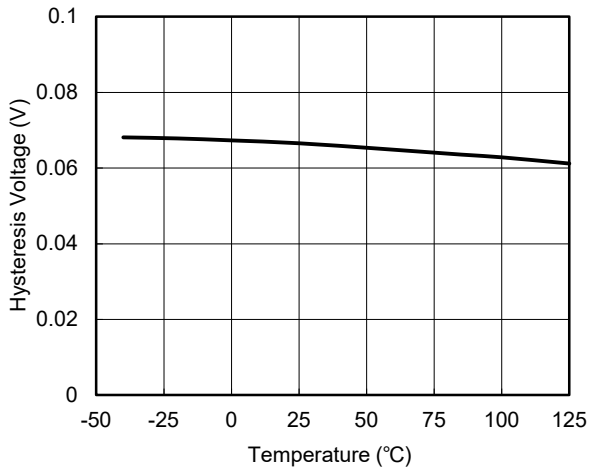
Supply Current vs. Temperature



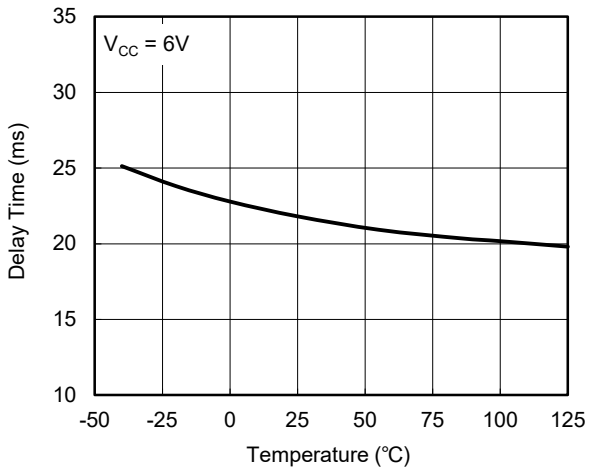
Detection Voltage vs. Temperature



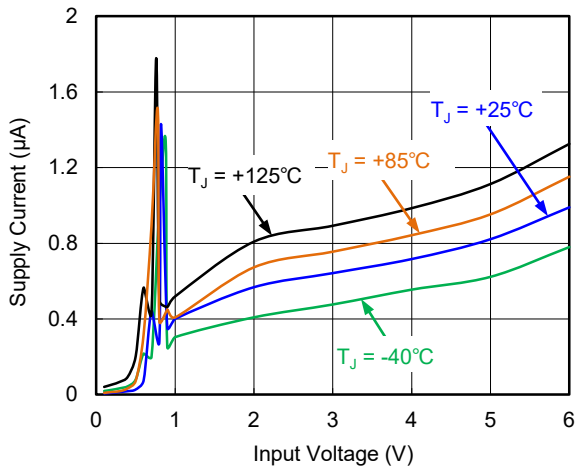
Hysteresis Voltage vs. Temperature



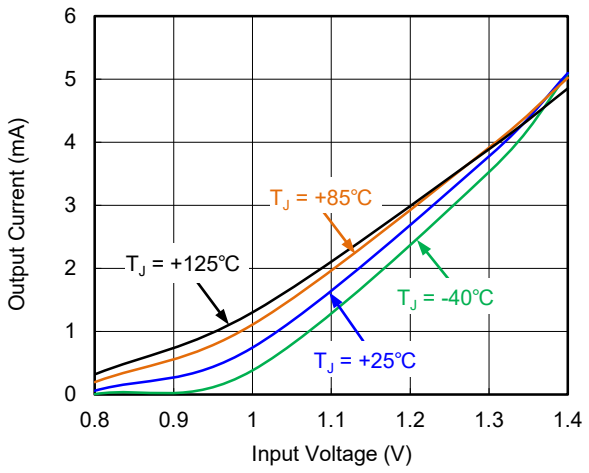
Delay Time vs. Temperature



Supply Current vs. Input Voltage



Output Current vs. Input Voltage



FUNCTIONAL BLOCK DIAGRAM

For the open-drain output (refer to Figure 2), the detection and release voltages are used as threshold voltages. When the voltage applied to the VCC pin reaches the appropriate threshold voltage, the VOUT pin voltage switches from either high to low or from low to high (with external pull-up). Please refer to the Figure 4 for information on hysteresis.

Since the SGM813B uses an open-drain output, it is necessary to connect a pull-up resistor to VCC or another power supply. The high level of output voltage (V_{OUT}) in this case will be the voltage that the pull-up resister is connected to.

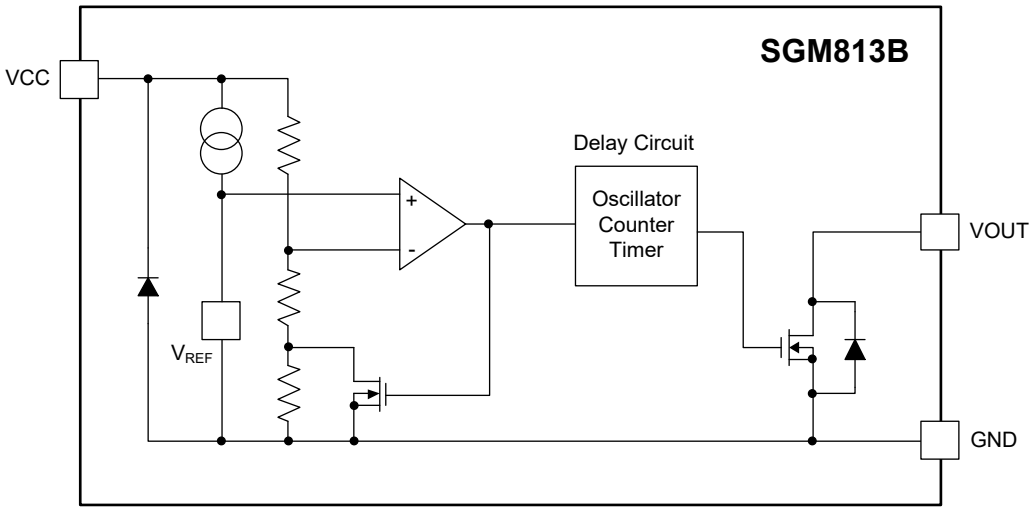


Figure 2. Block Diagram

DETAILED DESCRIPTION

Basic Operation: NMOS Output (Active Low)

When V_{CC} is higher than the release voltage (V_{DET} + V_{HYS}), the output is high and the N1 (NMOS transistor) in Figure 3 is turned off. Then the voltage to the comparator input is

$$\frac{(R_B + R_C) \times V_{CC}}{R_A + R_B + R_C}$$

When the power supply is powered down or when there is a power supply fluctuation, the output goes low if V_{CC} drops below the detection voltage (V_{DET}). Meanwhile, the N1 (NMOS transistor) in Figure 3 is turned on. Then the voltage to the comparator input is changed to

$$\frac{R_B \times V_{CC}}{R_A + R_B}$$

Once V_{CC} goes below the minimum operating voltage, the output becomes undefined, or rises to V_{CC} when the output is pulled up to V_{CC}.

The output becomes low when V_{CC} rises above the minimum operating voltage. The output still remains low even when V_{CC} surpasses the detection voltage (V_{DET}), as long as it does not exceed the release voltage (V_{DET} + V_{HYS}).

When V_{CC} rises above the release voltage (point B in Figure 4), the NMOS transistor is turned off to allow the output to be pulled up to V_{CC} after t_D.

Delay Circuit

When V_{CC} is powered up and exceeds the release voltage (V_{DET} + V_{HYS}), the output signal changes from low to high with a delay time t_D due to the delay circuit.

The delay time (t_D) is measured from when input voltage at the VCC pin exceeds the release voltage (V_{DET} + V_{HYS}) to the time at which the output voltage of the VOUT pin inverts.

The output signal is not delayed when V_{CC} falls below the detection voltage (point A in Figure 4). The delay time (t_D) is a fixed 22ms (TYP), and it is determined by a built-in oscillation circuit and a built-in counter.

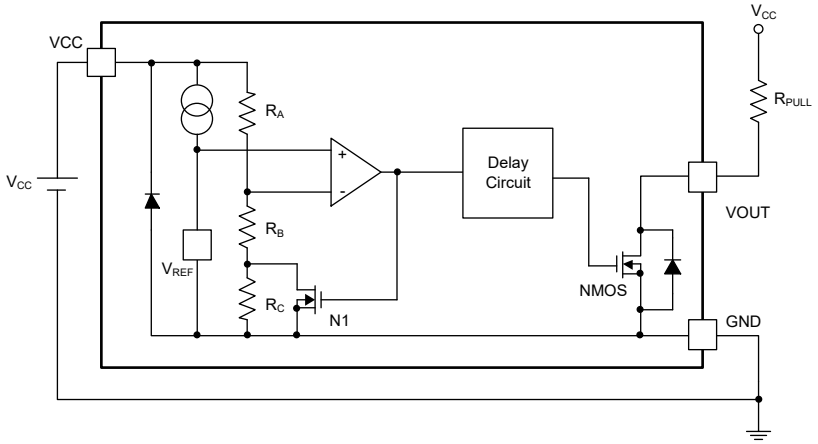


Figure 3. Typical Application Circuit Example of SGM813B

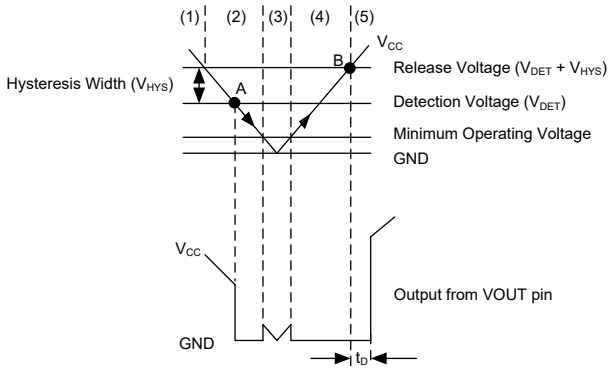
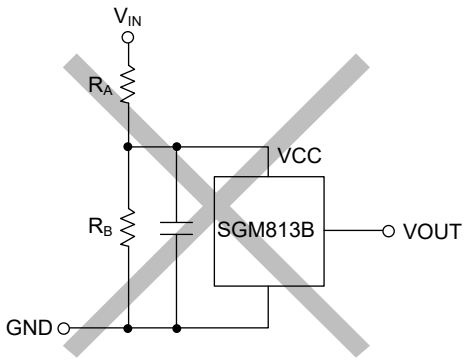


Figure 4. The Timing Chart of Figure 3

APPLICATION INFORMATION

1. When a resistor is connected between the input and the VCC pin, since the IC's supply current flows through the VCC pin, detection voltage and release voltage will increase.



2. Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.

3. Ensure that rise and fall times of VCC pin's input are more than several microseconds per volt. Otherwise the IC's operation is not stable.

Power Supply Recommendations

The device is designed to operate with input supplies from 1V to 6V. An input supply capacitor is recommended between the VCC pin and GND pin. If the voltage supply that provides power to V_{CC} is susceptible to any large voltage transient that can exceed V_{CC} maximum, the user must take additional precautions.

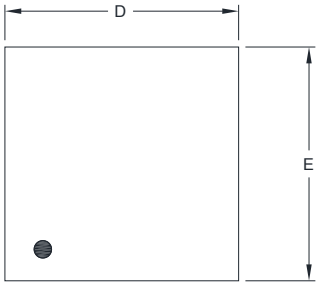
REVISION HISTORY

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

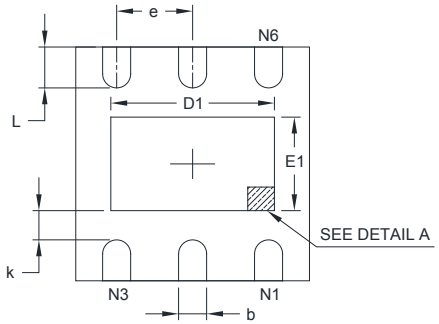
Changes from Original (DECEMBER 2019) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

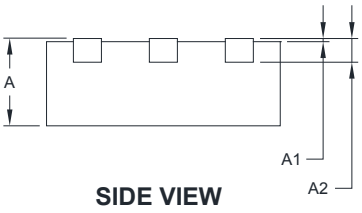
TDFN-2×2-6L



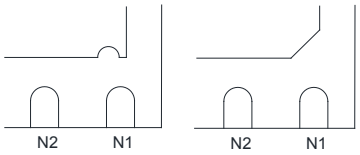
TOP VIEW



BOTTOM VIEW



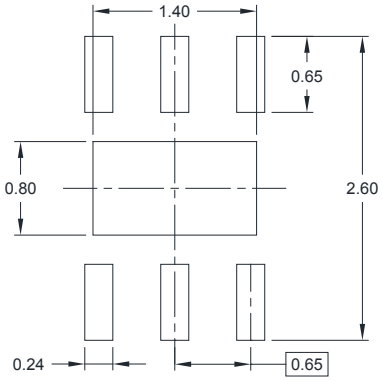
SIDE VIEW



DETAIL A

Pin #1 ID and Tie Bar Mark Options

NOTE: The configuration of the Pin #1 identifier is optional, but must be located within the zone indicated.

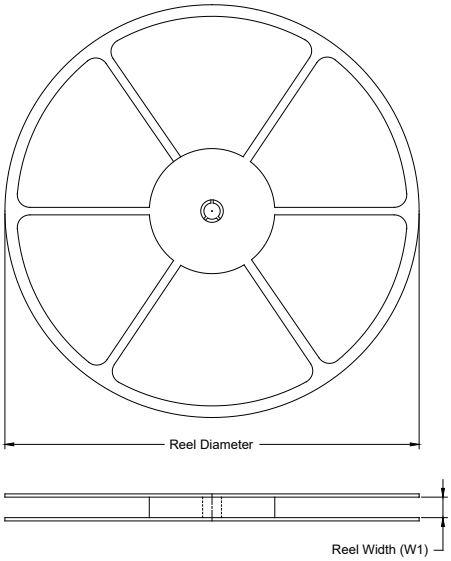


RECOMMENDED LAND PATTERN (Unit: mm)

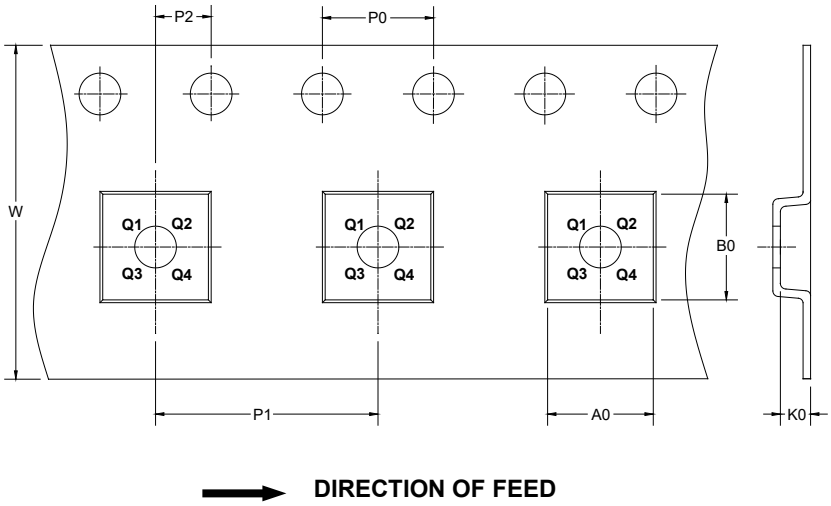
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.100	1.450	0.043	0.057
E	1.900	2.100	0.075	0.083
E1	0.600	0.850	0.024	0.034
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.250	0.450	0.010	0.018

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



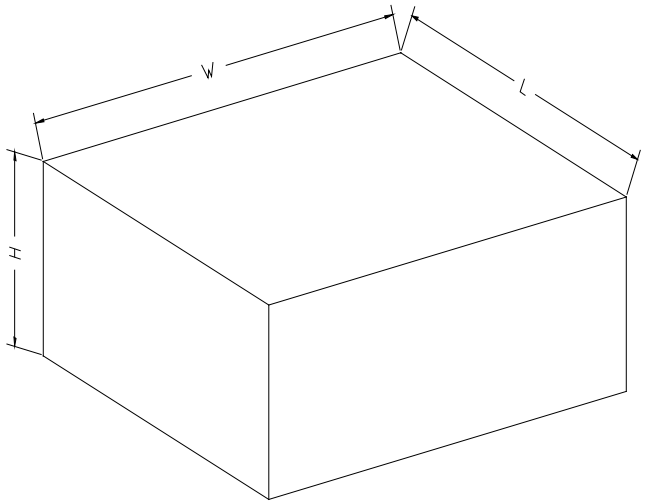
NOTE: The picture is only for reference. Please make the object as the standard.

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-2×2-6L	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