



SGM05FB4D2

Femto-Farad Capacitance 4-Channel ESD Protection

GENERAL DESCRIPTION

The SGM05FB4D2 is a femto-farad capacitance ESD protection device. As a new generation TVS, it is applied to protect circuits from electrostatic discharge.

FEATURES

- **High ESD Withstand Voltage:**
IEC 61000-4-2: $\pm 17\text{kV}$ (Air)
IEC 61000-4-2: $\pm 15\text{kV}$ (Contact)
- **Low Profile Package:** UTDFN-2.5 $\times$ 1-10AL
- **Working Voltage:** 5V and Below
- **Rated Peak Pulse Current:** 2.4A
- **Channel Input Capacitance:** 0.3pF (TYP)

APPLICATIONS

HDMI
USB3.0
DisplayPort Interface
IEEE 1394
10/100Mbit/s Ethernet
Desktop and Notebooks

ABSOLUTE MAXIMUM RATINGS

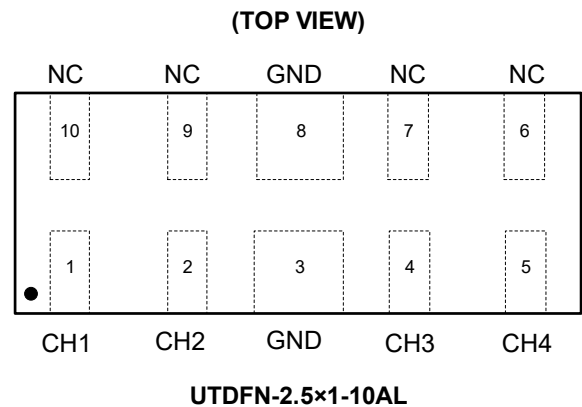
PARAMETER	SYMBOL	VALUE	UNITS
Peak Pulse Current (t_p : 8/20 μs)	I_{PPM}	2.4	A
ESD IEC 61000-4-2 (Air)	V_{ESD}	± 17	kV
ESD IEC 61000-4-2 (Contact)		± 15	
Operating Temperature Range	T_{OP}	-40 to +125	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10s)		+260	$^{\circ}\text{C}$

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.

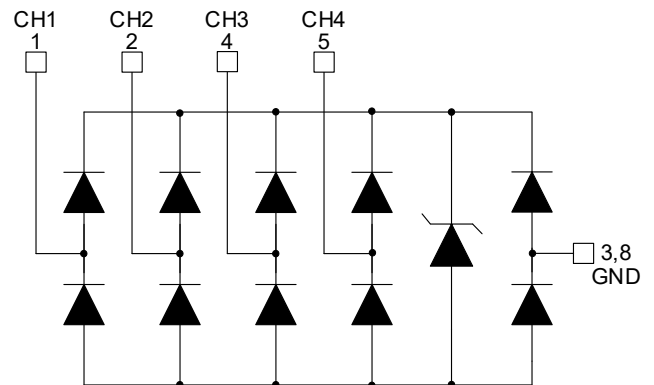
PRODUCT SUMMARY

V_{RWM} (MAX)	I_{PPM} (MAX)	C_{IN} (TYP)
5V	2.4A	0.3pF

PIN CONFIGURATION



EQUIVALENT CIRCUIT



PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM05FB4D2	UTDFN-2.5×1-10AL	-40°C to +125°C	SGM05FB4D2XUGX10G/TR	09ZXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.

YYY X X

Date Code - Week

Date Code - Year

Serial Number

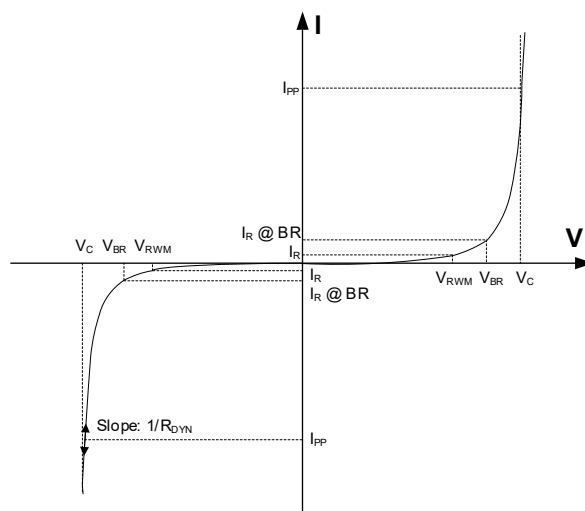
Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

ELECTRICAL PARAMETERS

SYMBOL	PARAMETER
V_{RWM}	Reverse Stand-Off Voltage
V_{BR}	Reverse Breakdown Voltage
I_R	Reverse Leakage Current
$I_R @ BR$	Reverse Leakage Current @ Breakdown
V_C	Clamping Voltage @ I_{PP}
I_{PP}	Peak Pulse Current
R_{DYN}	Dynamic Resistance



ELECTRICAL CHARACTERISTICS

(T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Reverse Stand-Off Voltage	V _{RWM}	Pin 1, 2, 4, 5 to pin 3, 8 = GND			5	V
Reverse Breakdown Voltage	V _{BR}	I _R = 1mA, pin 1, 2, 4, 5 to pin 3, 8 = GND	6	7.2	8.5	V
Reverse Leakage Current	I _R	V _{P1,P2,P4,P5} = 5V, V _{P3,P8} = GND			500	nA
Channel Input Capacitance	C _{IN}	V _R = 0V, f = 1MHz, I/O to GND		0.3	0.4	pF
Channel to Channel Capacitance	C _{XTALK}	V _R = 0V, f = 1MHz, I/O to I/O		0.3		pF
Surge Clamping Voltage ⁽¹⁾	V _{C-SURGE}	I _{PPM} = 2.4A		11.6		V
ESD Clamping Voltage ⁽²⁾	V _C	I _{TLP} = 8A (Equivalent IEC61000-4-2 Contact + 4kV)		15.4		V
		I _{TLP} = 16A (Equivalent IEC61000-4-2 Contact + 8kV)		22.5		V
Dynamic Resistance ⁽²⁾	R _{DYN}	t _p = 100ns		0.89		Ω

NOTES:

1. Non-repetitive current pulse 8/20μs exponential decay waveform according to IEC 61000-4-5, 2Ω source impedance.
2. Non-repetitive current pulse, transmission line pulse (TLP) t_p = 100ns; square pulse.

Positive 8kV:

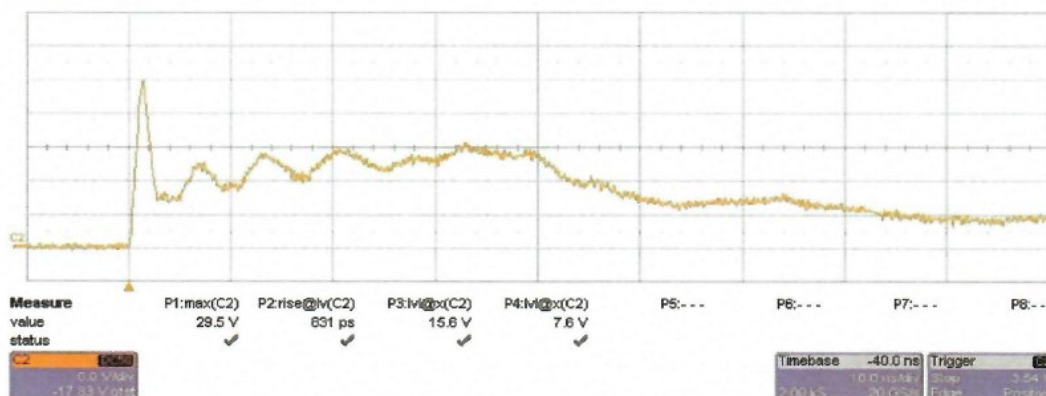


Figure 1. Typical Pulses ESD 8kV Contact per IEC 61000-4-2

Negative 8kV:

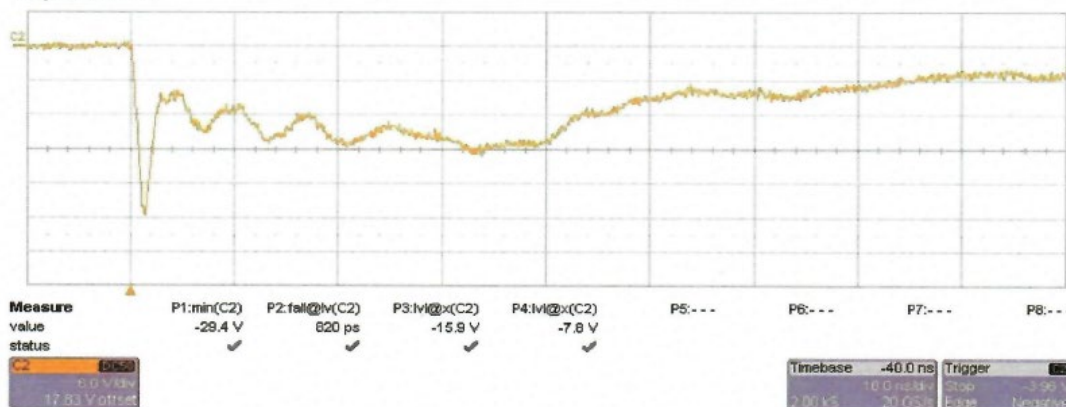
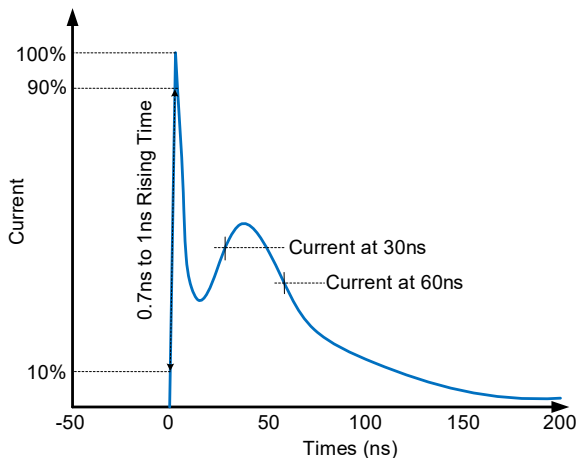


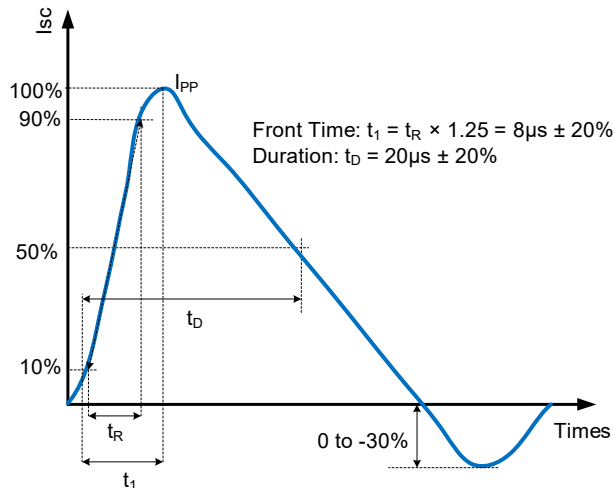
Figure 2. Typical Pulses ESD -8kV Contact per IEC 61000-4-2

TYPICAL PERFORMANCE CHARACTERISTICS

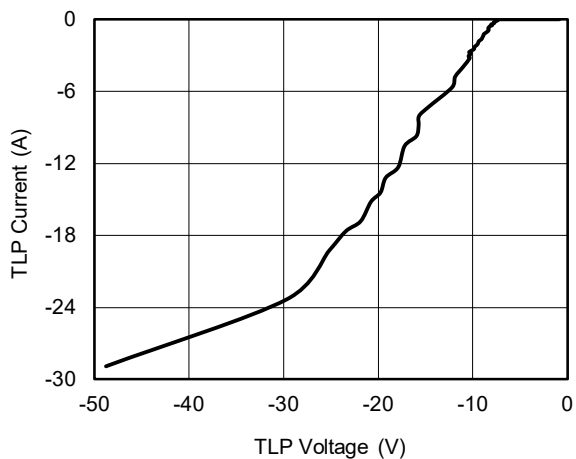
ESD Pulse Waveform per IEC 61000-4-2



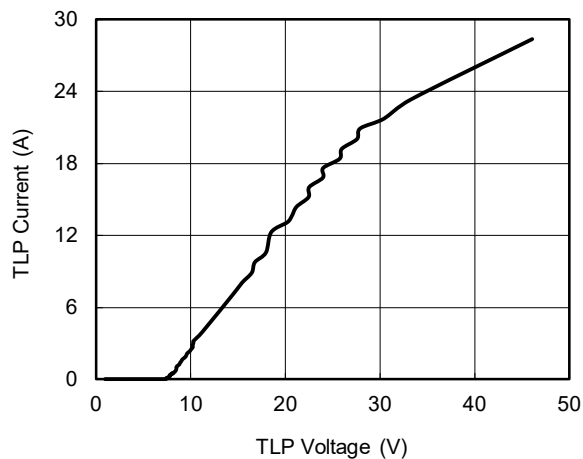
8/20μs Waveform per IEC 61000-4-5



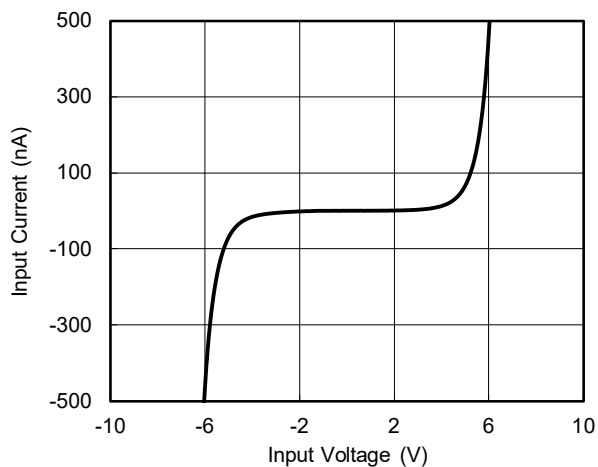
TLP_ I/O Pin (-) to GND Pin (+)



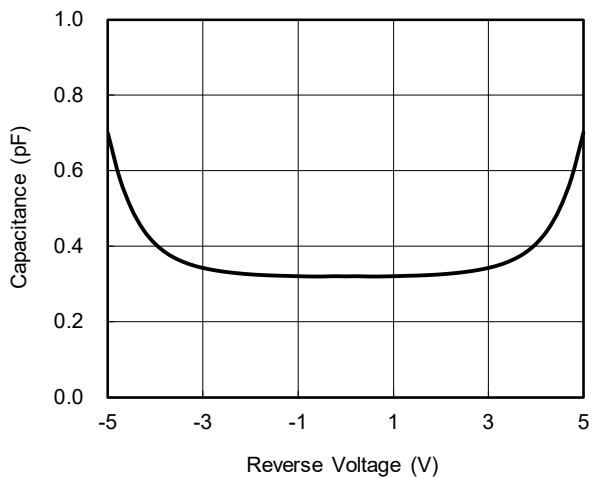
TLP_ I/O Pin (+) to GND Pin (-)



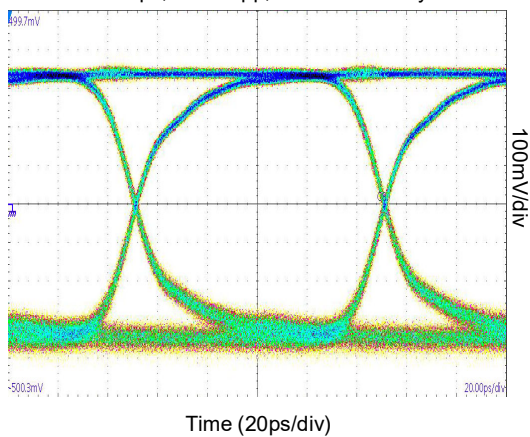
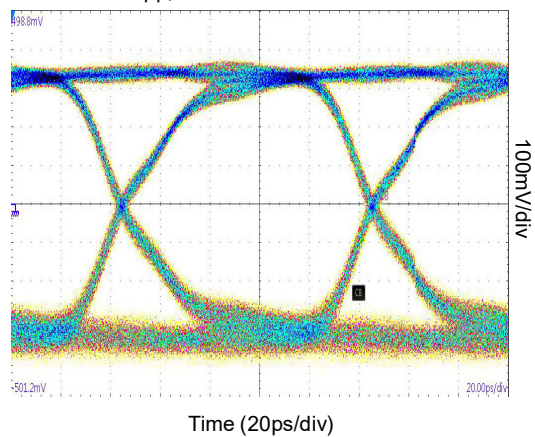
IV Curve



Capacitance vs. Reverse voltage



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

USB3.x Eye Diagram without SGM05FB4D2
10Gbps, 800mVpp, Test Board OnlyUSB3.x Eye Diagram with SGM05FB4D2 10Gbps,
800mVpp, Test Board + SGM05FB4D2

APPLICATION INFORMATION

The SGM05FB4D2 is applied to keep four data lines protect from transient over-voltage like ESD stress pulse. The four protected data lines are connected to the protection pin 1, pin 2, pin 4 and pin 5. The pin 3 and pin 8 are the negative pins connect to GND.

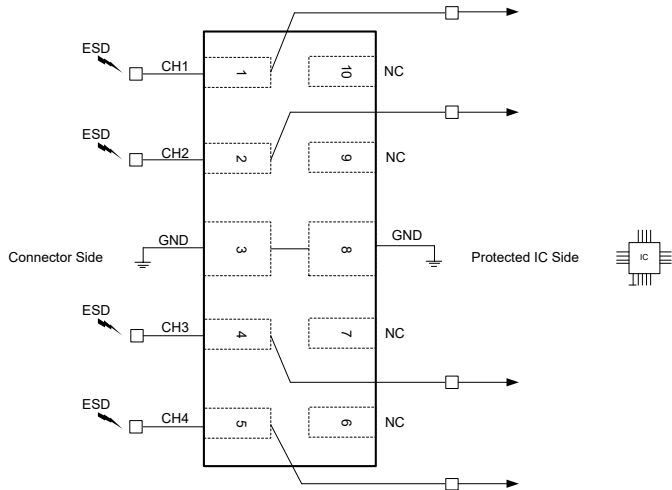


Figure 3. Application Diagram

The recommended guidelines are as follows:

1. TVS Placement

Place the TVS as close as possible to the input connector.

2. TVS's Trace Layout

Avoid running protected traces in parallel with unprotected traces.

Minimize the path length between the TVS and the protected line.

Minimize parallel signal path length.

Route the protected traces as straight as possible.

3. GND Layout

Avoid using a common ground point shared with the TVS transient return path.

Minimize the length of the TVS transient return path to ground.

Use ground vias as close as possible to the TVS transient return to ground.

REVISION HISTORY

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

FEBRUARY 2025 – REV.A to REV.A.1

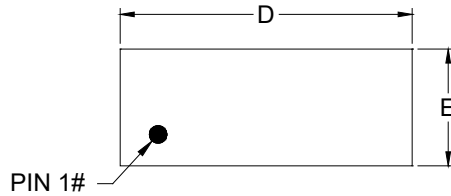
	Page
Updated product summary	1
Added typical performance characteristics figures	5

Changes from Original (APRIL 2024) to REV.A

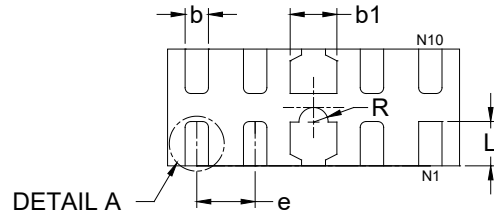
	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

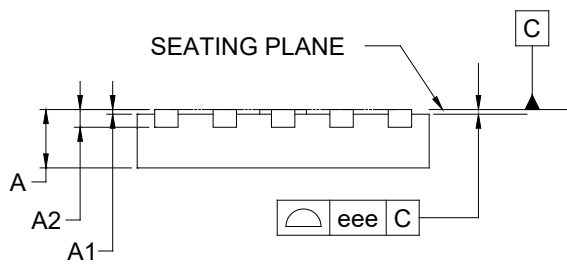
UTDFN-2.5×1-10AL



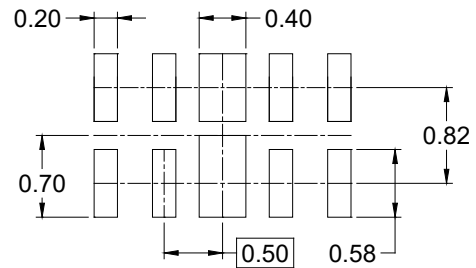
TOP VIEW



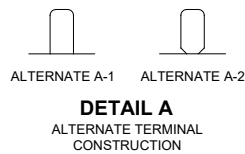
BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



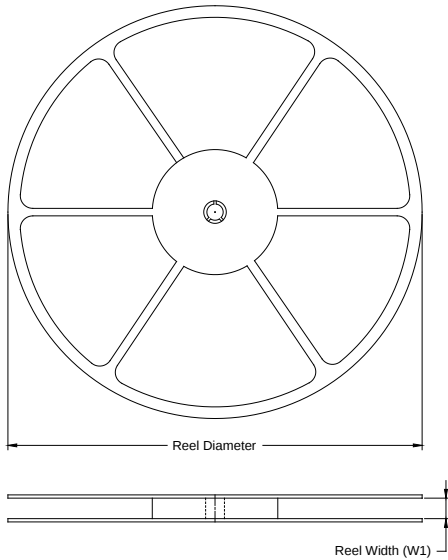
Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.450	-	0.550
A1	0.000	-	0.050
A2	0.150 REF		
b	0.150	-	0.250
b1	0.350	-	0.450
D	2.400	-	2.600
E	0.900	-	1.100
e	0.500 BSC		
L	0.280	-	0.480
R	0.075	-	0.175
eee	0.050		

NOTE: This drawing is subject to change without notice.

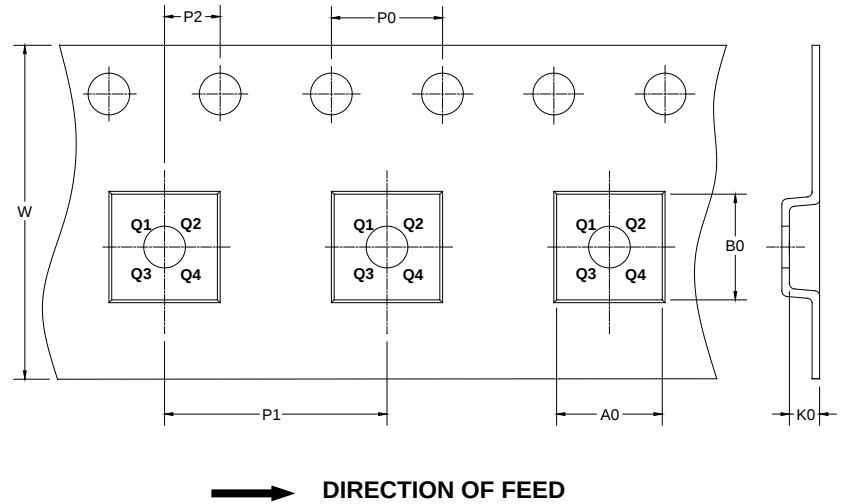
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

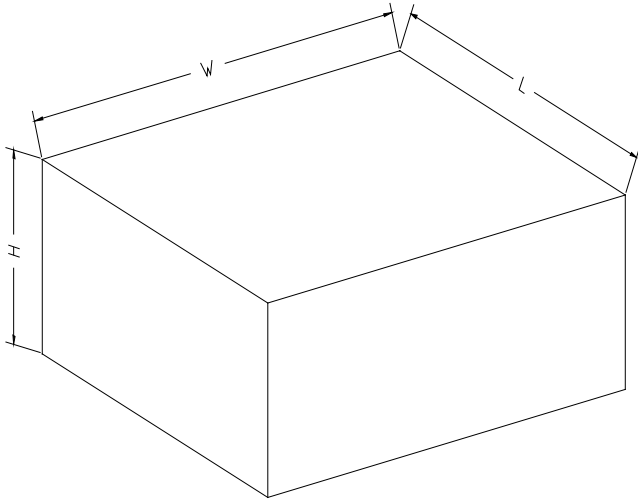
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
UTDFN-2.5×1-10AL	7"	8.6	1.25	2.70	0.70	4.0	4.0	2.0	8.0	Q1

020001

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
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002