

GENERAL DESCRIPTION

The SGM4541 is a low I_Q I²C bus over-voltage protector. When the voltage at SCLA or SDAA pin exceeds V_{CC} + 0.69V, the switches (S1 and S2) between SCLA and SCLB, or SDAA and SDAB will be turned off. When the voltage at SCLA or SDAA pin is less than V_{CC} + 0.69V, the switches (S1 and S2) will be turned on automatically. SCLA and SDAA I/O signals can endure continuous 22V high voltage without any damage. These pins can endure continuous 24V high voltage without any damage for 3 hours.

The SGM4541 is available in a Green UTDFN-1.45×1-6AL package.

FEATURES

- SCLA & SDAA No Damage for 22V High Voltage
- SCLA & SDAA No Damage for 24V High Voltage for 3 Hours
- Threshold for OVP: V_{TH} = V_{CC} + 0.69V
- Quick OVP Response Time (t_{OVP}): < 5μs
- I²C Bus Speed: Up to 1Mbps
- V_{CC} Range: 1.62V to 1.98V (V_{CC} = 1.8V in Application)
- Low Quiescent Current: 2.5μA (TYP)
- Low C_{ON}: C_{ON} < 30pF
- Operating Temperature Range: -40°C to +125°C
- Available in a Green UTDFN-1.45×1-6AL Package

APPLICATIONS

- I²C Bus/PMBus
- Smart Phone
- Tablets, XPAD, eBooks
- Notebook and Docking

TYPICAL APPLICATION

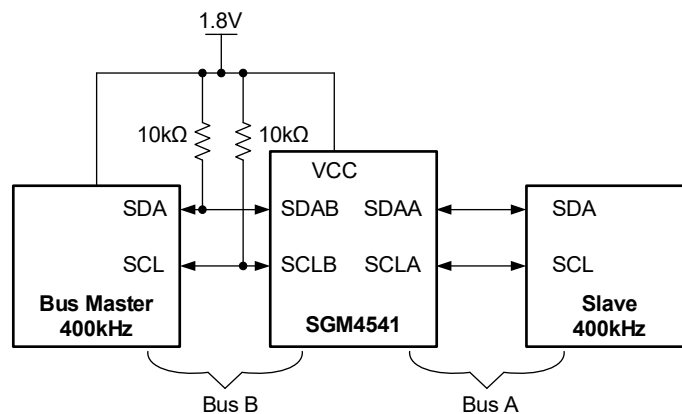


Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4541	UTDFN-1.45×1-6AL	-40°C to +125°C	SGM4541XUDL6G/TR	08X	Tape and Reel, 5000

MARKING INFORMATION

NOTE: X = Date Code.

YY X

— Date Code - Quarter
 — 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.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage Range, V_{CC} -0.3V to 2.2V
 SCLA and SDAA, DC..... -0.3V to 22V
 SCLA and SDAA, DC (3 Hours)..... -0.3V to 24V
 SCLB and SDAB..... -0.3V to 6V
 Power Dissipation, P_D @ T_A = +25°C
 UTDFN-1.45×1-6AL..... 0.51W
 Package Thermal Resistance
 UTDFN-1.45×1-6AL, θ_{JA} 241°C/W
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10s) +260°C
 ESD Susceptibility
 HBM..... 4000V
 CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Supply Input Voltage Range, V_{CC} 1.62V to 1.98V
 SCLA, SCLB, SDAA and SDAB 0V to V_{CC}
 Operating Junction Temperature Range..... -40°C to +125°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.

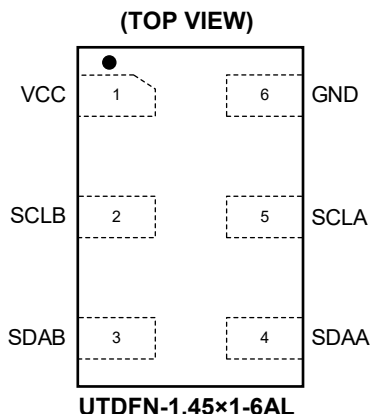
ESD SENSITIVITY CAUTION

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	FUNCTION
1	VCC	Power Supply.
2	SCLB	Input/Output Signal at B Side for SCL.
3	SDAB	Input/Output Signal at B Side for SDA.
4	SDAA	Input/Output Signal at A Side for SDA.
5	SCLA	Input/Output Signal at A Side for SCL.
6	GND	Ground.

FUNCTIONAL BLOCK DIAGRAM

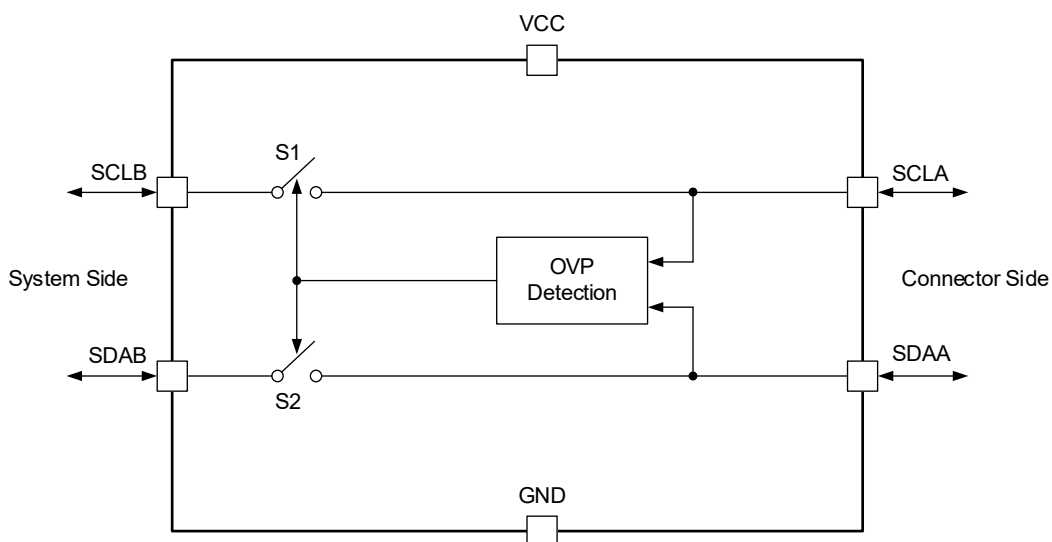
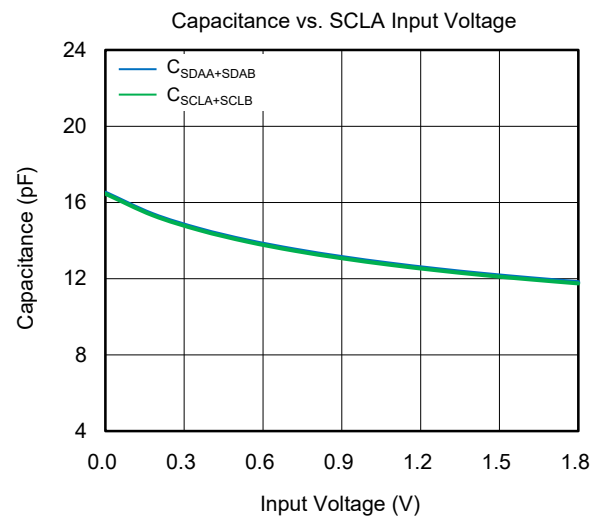
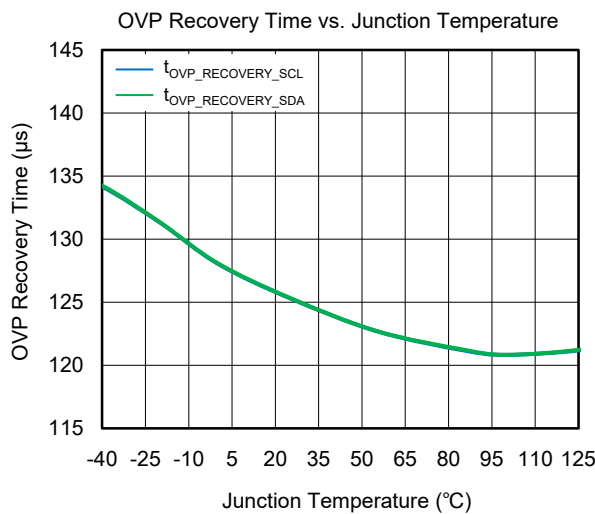
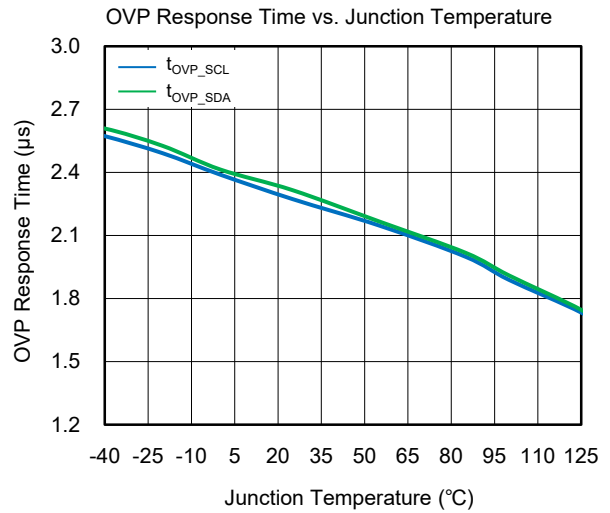
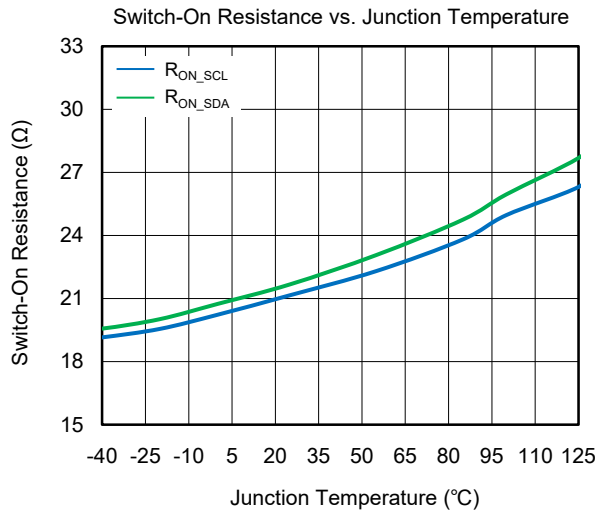
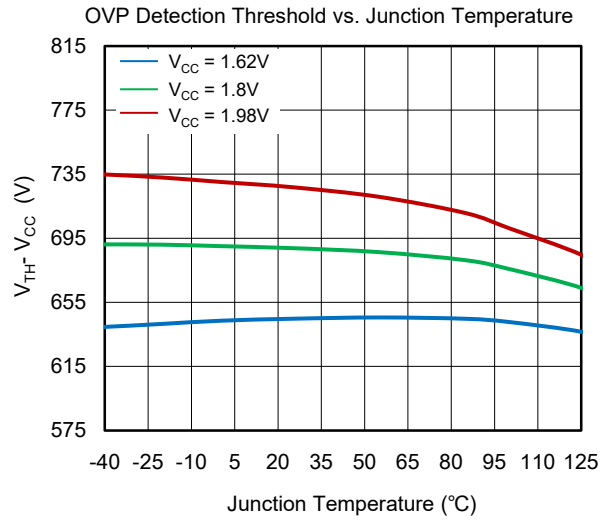
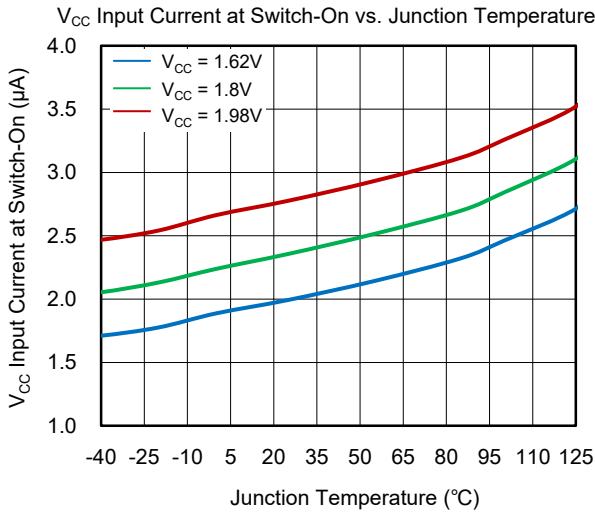


Figure 2. SGM4541 Block Diagram

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	
Input Supply							
VCC Input Voltage Range	V _{CC}		1.62	1.8	1.98	V	
VCC Input Current at Switch-On	I _{ON}	SCLA = SDAA = 1.8V	T _A = +25°C	2.5	4.0	μA	
			T _A = -40°C to +125°C		5.0		
Charge Pump Setup Time	t _{SETUP}	V _{CC} = 1.8V	T _A = +25°C	3.0	4.5	ms	
			T _A = -40°C to +125°C		5.0		
S1/S2 Switch-Off							
OVP Detection Threshold	V _{TH}	OVP threshold on SCLA and SDAA pins, V _{CC} = 1.62V	T _A = +25°C	V _{CC} + 0.57	V _{CC} + 0.65	V _{CC} + 0.78	V
			T _A = -40°C to +125°C	V _{CC} + 0.55		V _{CC} + 0.8	
		OVP threshold on SCLA and SDAA pins, V _{CC} = 1.8V	T _A = +25°C	V _{CC} + 0.57	V _{CC} + 0.69	V _{CC} + 0.78	
			T _A = -40°C to +125°C	V _{CC} + 0.55		V _{CC} + 0.8	
OVP threshold on SCLA and SDAA pins, V _{CC} = 1.98V	T _A = +25°C	V _{CC} + 0.57	V _{CC} + 0.72	V _{CC} + 0.78			
	T _A = -40°C to +125°C	V _{CC} + 0.55		V _{CC} + 0.8			
OVP Response Time	t _{OVP}	S1/S2-On to S1/S2-Off response time	T _A = +25°C	2.1	4.5	μs	
			T _A = -40°C to +125°C				5.0
S1/S2 Switch-On							
Switch-On Capacitance	C _{ON}	SCLA, SCLB, SDAA or SDAB to GND at switch-on		14		pF	
Switch-On Resistance	R _{ON_S1}	SCLA-to-SCLB or SDAA-to-SDAB	T _A = +25°C	22	30	Ω	
			T _A = -40°C to +125°C				35
OVP Recovery Time	t _{OVP_RECOVERY}	S1/S2-Off to S1/S2-On recovery time	T _A = +25°C	125	170	μs	
			T _A = -40°C to +125°C				180

TYPICAL PERFORMANCE CHARACTERISTICS



APPLICATION INFORMATION

I²C SCLA or SDAA Input Over-Voltage Protection

The SGM4541 monitors SCLA or SDAA input voltage to prevent the input voltage from causing output system failures. When the SCLA or SDAA voltage exceeds the threshold, the SGM4541 outputs a logic signal to turn off the internal MOSFET within t_{OVP} to prevent the high input voltage from damaging the electronics in the low voltage system. When the input voltage returns to normal operating voltage range, the SGM4541 re-enables the MOSFET.

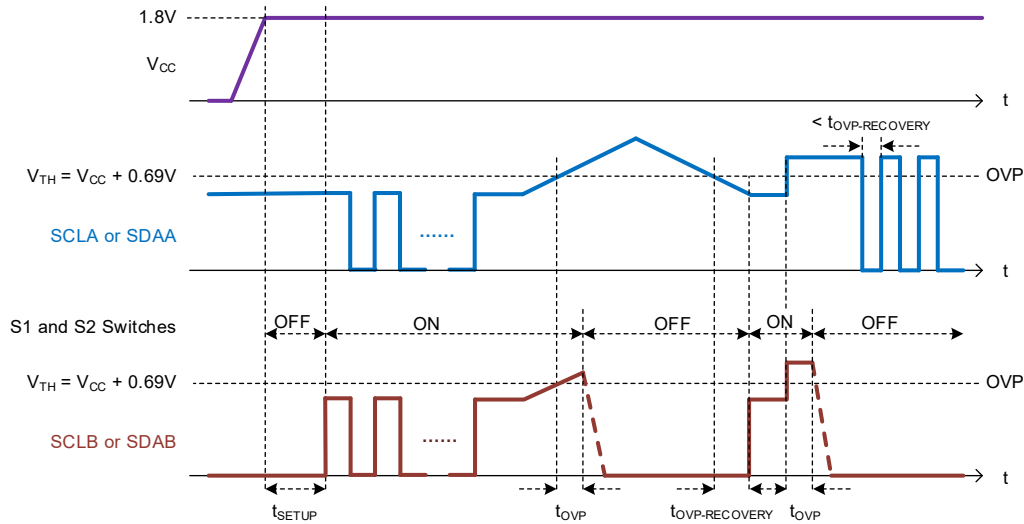


Figure 3. Timing Diagram for SGM4541

Table 1. $V_{TH} = V_{CC} + 0.69V$

V_{SCLA}	V_{SDAA}	Response Time	S1 Switch	S2 Switch
$> V_{TH}$	X ⁽¹⁾	$> t_{OVP}$	Turn Off	Turn Off
X ⁽¹⁾	$> V_{TH}$	$> t_{OVP}$	Turn Off	Turn Off
$< V_{TH}$	$< V_{TH}$	$> t_{OVP_RECOVERY}$	Turn On	Turn On

NOTE:

1. X = Don't Care.

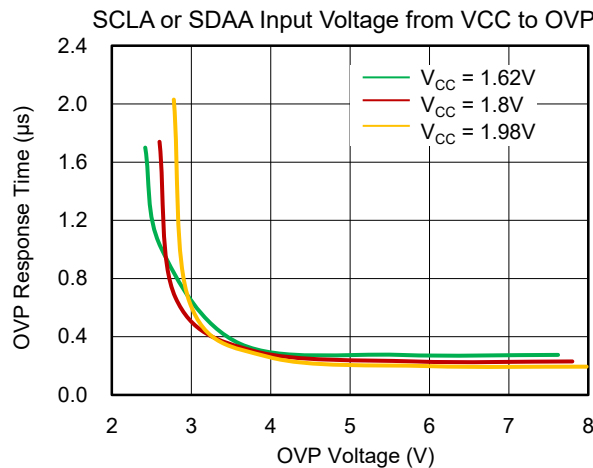


Figure 4. SGM4541 OVP Response Time vs. OVP Voltage

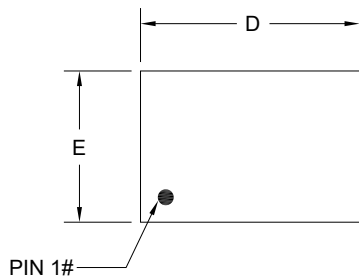
REVISION HISTORY

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

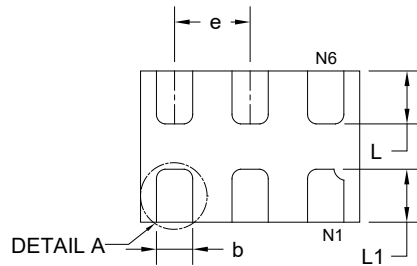
Changes from Original (JULY 2023) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

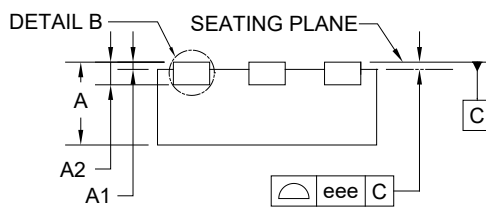
UTDFN-1.45×1-6AL



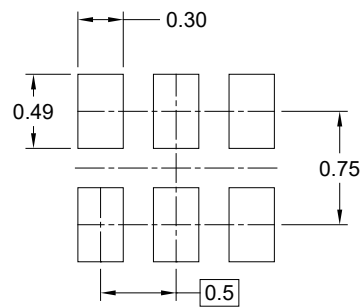
TOP VIEW



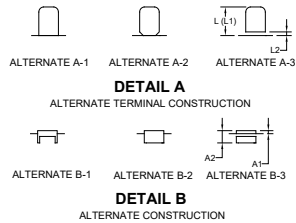
BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

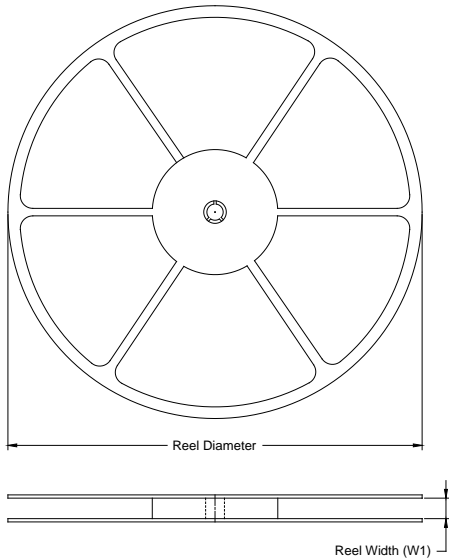


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.450	-	0.600
A1	-0.004	-	0.050
A2	0.150 REF		
b	0.150	-	0.300
D	1.374	-	1.526
E	0.924	-	1.076
e	0.500 BSC		
L	0.250	-	0.450
L1	0.250	-	0.500
L2	0.000	-	0.100
eee	0.050		

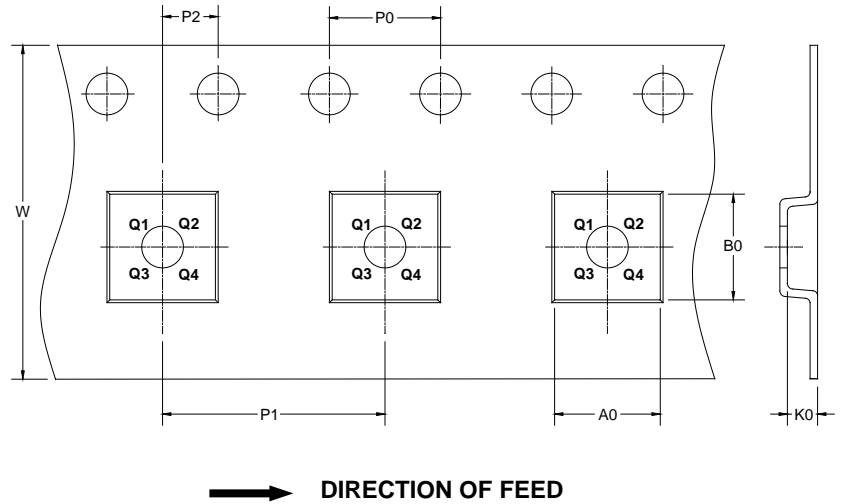
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

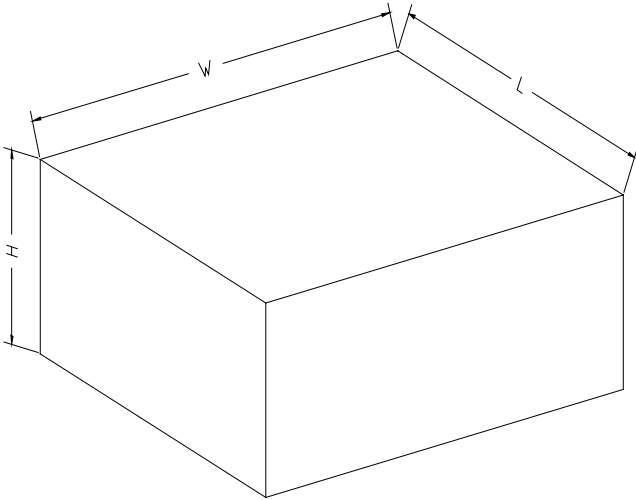
KEY PARAMETER LIST OF TAPE AND REEL

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-1.45x1-6AL	7"	9.5	1.15	1.60	0.75	4.0	4.0	2.0	8.0	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
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002