

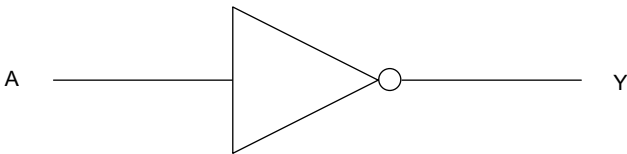
GENERAL DESCRIPTION

The SGM7SZ04 is a single inverter with the advanced CMOS technology. The supply voltage pin of this device accepts any voltage from 1.65V to 5.5V. The input can tolerate the maximum of 6V, regardless of the supply voltage range. When V_{CC} is 0V, the input and output are in the high-impedance state.

This device can achieve ultra-high speed operation with high output drive, meanwhile, the low static power dissipation is maintained over the wide supply voltage operating range.

The SGM7SZ04 is available in Green UTDFN-1.45×1-6L, SC70-5 and SOT-23-5 packages. It operates over an ambient temperature range of -40°C to +125°C.

LOGIC SYMBOL



FEATURES

- **Wide Supply Voltage Range: 1.65V to 5.5V**
- **Inputs Over-Voltage Tolerance Makes 5V to 3V Translation Available**
- **+24mA/-24mA Output Current at $V_{CC} = 3V$**
- **Ultra-High Speed: t_{PD} of 4.2ns (TYP) into 50pF at $V_{CC} = 3.3V$**
- **Support LCX Performance at $V_{CC} = 3.3V$**
- **Power Down High-Impedance Input/Output**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green UTDFN-1.45×1-6L, SC70-5 and SOT-23-5 Packages**

FUNCTION TABLE

| INPUT | OUTPUT |
|-------|--------|
| A | Y |
| L | H |
| H | L |

$$Y = \bar{A}$$

H = High Voltage Level

L = Low Voltage Level

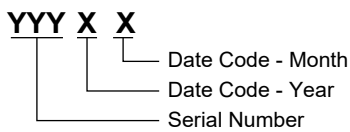
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|----------|---------------------|-----------------------------|-------------------|-----------------|---------------------|
| SGM7SZ04 | SC70-5 | -40°C to +125°C | SGM7SZ04XC5G/TR | SF3XX | Tape and Reel, 3000 |
| | SOT-23-5 | -40°C to +125°C | SGM7SZ04XN5G/TR | SF4XX | Tape and Reel, 3000 |
| | UTDFN-1.45×1-6L | -40°C to +125°C | SGM7SZ04XUDL6G/TR | TCX | Tape and Reel, 5000 |

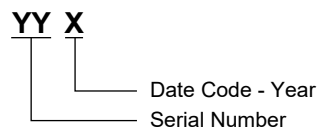
MARKING INFORMATION

NOTE: X = Date Code. XX = Date Code.

SC70-5/SOT-23-5



UTDFN-1.45×1-6L



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} -0.5V to 6V
- DC Input Voltage Range, V_{IN} -0.5V to 6V
- DC Output Voltage Range, V_{OUT} -0.5V to 6V
- DC Input Diode Current, I_{IK} ($V_{IN} < -0.5V$) -50mA
- DC Output Diode Current, I_{OK} ($V_{OUT} < -0.5V$)..... -50mA
- DC Output Current, I_{OUT} $\pm 50mA$
- DC V_{CC} or Ground Current, I_{CC} or I_{GND} $\pm 50mA$
- Package Thermal Resistance
- SC70-5, θ_{JA} 373°C/W
- SOT-23-5, θ_{JA} 376°C/W
- UTDFN-1.45×1-6L, θ_{JA} 332°C/W
- Junction Temperature..... +150°C
- Storage Temperature Range -65°C to +150°C
- Lead Temperature (Soldering, 10s)..... +260°C
- ESD Susceptibility
- HBM..... 8000V
- MM..... 400V

RECOMMENDED OPERATING CONDITIONS

- Operating 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.

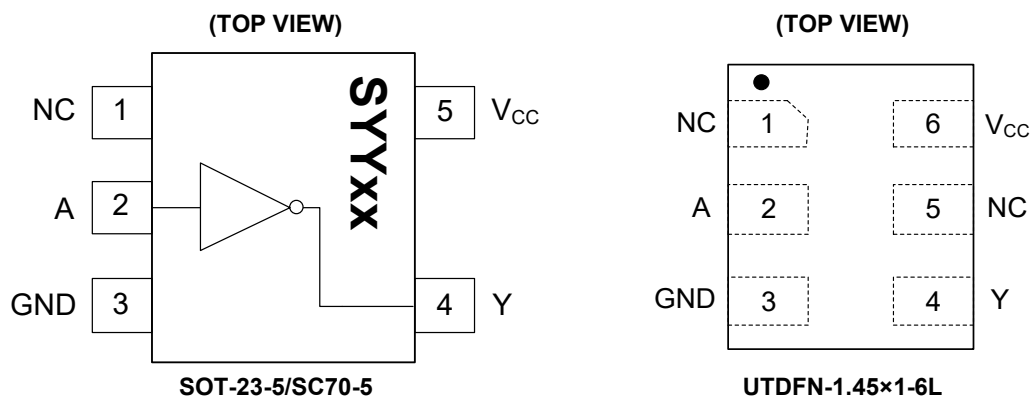
ESD SENSITIVITY CAUTION

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 CONFIGURATIONS



PIN DESCRIPTION

| PIN | | NAME | FUNCTION |
|-----------------|-----------------|-----------------|--|
| SOT-23-5/SC70-5 | UTDFN-1.45x1-6L | | |
| 1 | 1, 5 | NC | No Connection. |
| 2 | 2 | A | Data Input. Unused input must be held high or low. It may not float. |
| 3 | 3 | GND | Ground. |
| 4 | 4 | Y | Data Output. |
| 5 | 6 | V _{CC} | Power Supply. |

ELECTRICAL CHARACTERISTICS

(Full = -40°C to +125°C, typical values are at T_A = +25°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | | V _{CC} (V) | MIN | TYP | MAX | UNITS |
|-------------------------------|---------------------------------|--|--------------------------|---------------------|------------------------|-------|------------------------|-------|
| General | | | | | | | | |
| Power Supply Range | V _{CC} | | | | 1.65 | | 5.50 | V |
| Supply Voltage Data Retention | | | | | 1.50 | | 5.50 | |
| Input Voltage | V _{IN} | | | | 0.00 | | 5.50 | V |
| Output Voltage | V _{OUT} | | | | 0.00 | | V _{CC} | V |
| Input Rise and Fall Times | t _R , t _F | | | 1.8, 2.5 ± 0.2 | 0 | | 20 | ns/V |
| | | | | 3.3 ± 0.3 | 0 | | 10 | |
| | | | | 5.0 ± 0.5 | 0 | | 5 | |
| DC Performance | | | | | | | | |
| High-Level Input Voltage | V _{IH} | | | 1.65 to 5.5 | 0.75 × V _{CC} | | | V |
| Low-Level Input Voltage | V _{IL} | | | 1.65 to 5.5 | | | 0.20 × V _{CC} | V |
| High-Level Output Voltage | V _{OH} | V _{IN} = V _{IL} | I _{OH} = -100μA | 1.65 | 1.62 | 1.65 | | V |
| | | | | 1.80 | 1.77 | 1.80 | | |
| | | | | 2.30 | 2.27 | 2.30 | | |
| | | | | 3.00 | 2.97 | 3.00 | | |
| | | | | 4.50 | 4.47 | 4.50 | | |
| | | | I _{OH} = -4mA | 1.65 | 1.46 | 1.55 | | |
| | | | I _{OH} = -8mA | 2.30 | 2.01 | 2.18 | | |
| | | | I _{OH} = -16mA | 3.00 | 2.49 | 2.81 | | |
| | | | I _{OH} = -24mA | 3.00 | 2.30 | 2.70 | | |
| Low-Level Output Voltage | V _{OL} | V _{IN} = V _{IH} | I _{OL} = 100μA | 1.65 | | 0.00 | 0.02 | V |
| | | | | 1.80 | | 0.00 | 0.02 | |
| | | | | 2.30 | | 0.00 | 0.02 | |
| | | | | 3.00 | | 0.00 | 0.02 | |
| | | | | 4.50 | | 0.00 | 0.02 | |
| | | | I _{OL} = 4mA | 1.65 | | 0.06 | 0.12 | |
| | | | I _{OL} = 8mA | 2.30 | | 0.09 | 0.18 | |
| | | | I _{OL} = 16mA | 3.00 | | 0.16 | 0.33 | |
| | | | I _{OL} = 24mA | 3.00 | | 0.24 | 0.51 | |
| | | | I _{OL} = 32mA | 4.50 | | 0.29 | 0.58 | |
| Input Leakage Current | I _{IN} | V _{IN} = 5.5V, GND | | 0 to 5.5 | | ±0.10 | ±5 | μA |
| Power-Off Leakage Current | I _{OFF} | V _{IN} or V _{OUT} = 5.5V | | 0 | | 0.10 | 5 | μA |
| Quiescent Supply Current | I _{CC} | V _{IN} = 5.5V, GND | | 1.65 to 5.5 | | 0.10 | 10 | μA |

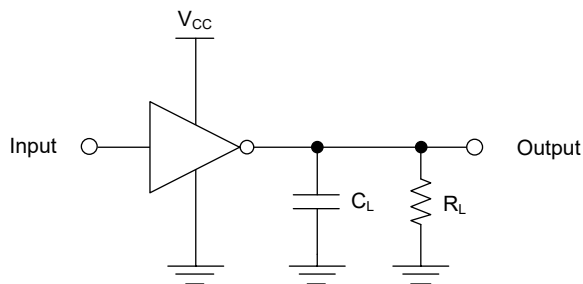
ELECTRICAL CHARACTERISTICS (continued)(Full = -40°C to +125°C, typical values are at T_A = +25°C, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|--|-------------------------------------|---------------------------------|---|--|------|-------|
| AC Performance | | | | | | |
| Propagation Delay | t _{PHL} , t _{PLH} | V _{CC} = 1.65V | C _L = 15pF, R _L = 1MΩ, Figure 1, Figure 2 | | 9.6 | ns |
| | | V _{CC} = 1.80V | | | 7.9 | |
| | | V _{CC} = 2.50V ± 0.20V | | | 4.9 | |
| | | V _{CC} = 3.30V ± 0.30V | | | 3.7 | |
| | | V _{CC} = 5.00V ± 0.50V | | | 2.8 | |
| | | V _{CC} = 3.30V ± 0.30V | | C _L = 50pF, R _L = 500Ω, Figure 1, Figure 2 | | |
| | | V _{CC} = 5.00V ± 0.50V | | | 3.2 | |
| Input Capacitance | C _{IN} | V _{CC} = 0V | | 4.0 | | pF |
| Power Dissipation Capacitance ⁽²⁾ | C _{PD} | V _{CC} = 3.30V | Figure 3 | | 16.0 | pF |
| | | V _{CC} = 5.00V | | | 19.0 | |

NOTES:

- Unused input must be held high or low. It may not float.
- C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle (see Figure 3). C_{PD} is related to dynamic operating current I_{CCD} by the expression: I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CC,Static}).

TEST CIRCUITS



NOTE:
 R_L : Load resistance.
 C_L : Load and stray capacitance.
 Input PRR = 1.0MHz; t_w = 500ns.

Figure 1. AC Test Circuit

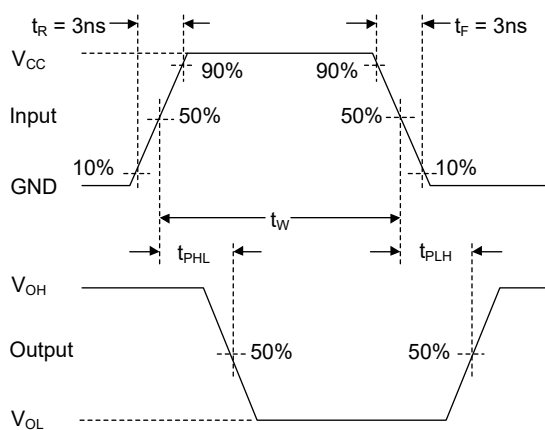
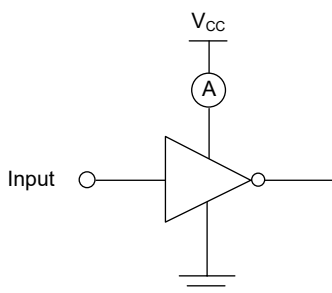


Figure 2. AC Waveforms



NOTE:
 Input = AC Waveform; $t_r = t_f = 1.8ns$; PRR = 10MHz; Duty Cycle = 50%.

Figure 3. I_{CCD} Test Circuit

REVISION HISTORY

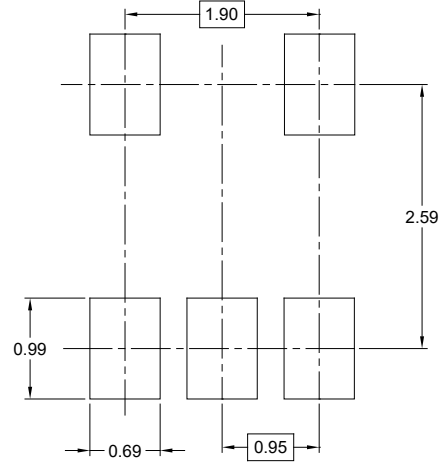
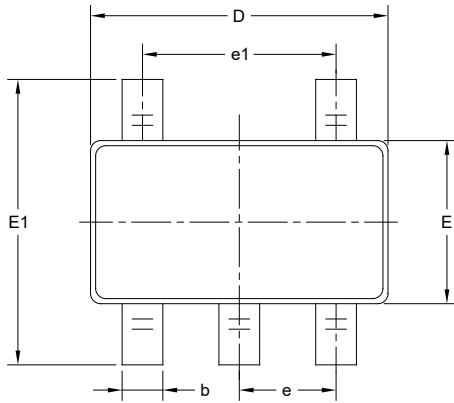
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| SEPTEMBER 2022 – REV.A.3 to REV.A.4 | Page |
|--|-------------|
| Updated Absolute Maximum Ratings section..... | 2 |
| SEPTEMBER 2021 – REV.A.2 to REV.A.3 | Page |
| Updated Package Outline Dimensions section | 8, 9 |
| FEBRUARY 2021 – REV.A.1 to REV.A.2 | Page |
| Changed operating temperature range | All |
| APRIL 2014 – REV.A to REV.A.1 | Page |
| Added UTDFN-1.45×1-6L package..... | All |
| Changes from Original (OCTOBER 2013) to REV.A | Page |
| Changed from product preview to production data..... | All |

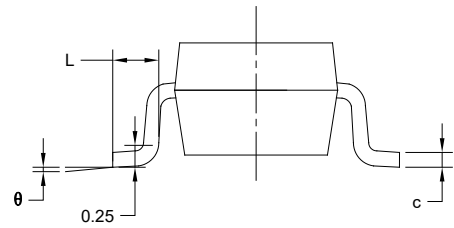
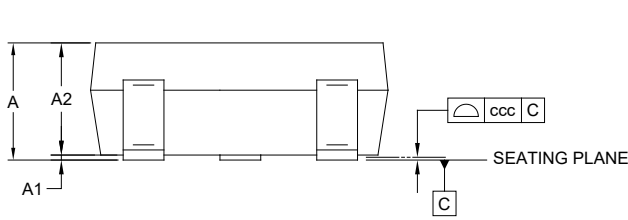
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



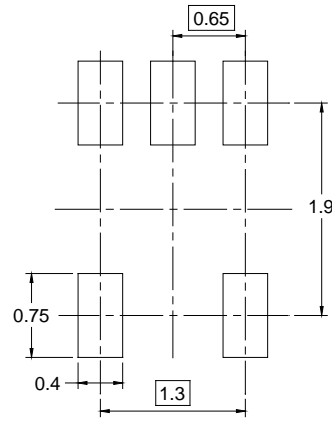
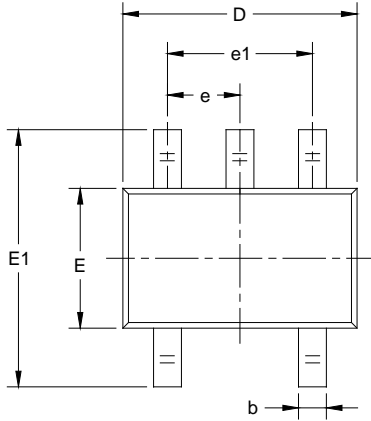
| Symbol | Dimensions In Millimeters | | |
|----------|---------------------------|-----|-------|
| | MIN | MOD | MAX |
| A | - | - | 1.450 |
| A1 | 0.000 | - | 0.150 |
| A2 | 0.900 | - | 1.300 |
| b | 0.300 | - | 0.500 |
| c | 0.080 | - | 0.220 |
| D | 2.750 | - | 3.050 |
| E | 1.450 | - | 1.750 |
| E1 | 2.600 | - | 3.000 |
| e | 0.950 BSC | | |
| e1 | 1.900 BSC | | |
| L | 0.300 | - | 0.600 |
| θ | 0° | - | 8° |
| ccc | 0.100 | | |

NOTES:

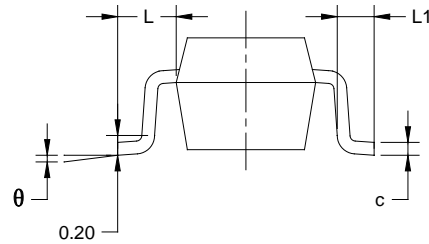
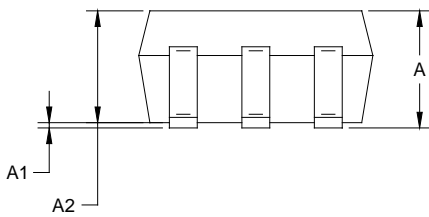
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

PACKAGE OUTLINE DIMENSIONS

SC70-5



RECOMMENDED LAND PATTERN (Unit: mm)



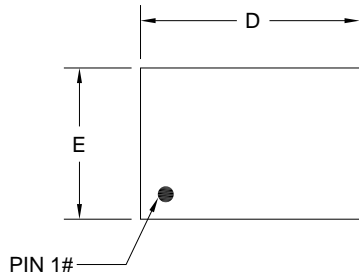
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.800 | 1.100 | 0.031 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.800 | 1.000 | 0.031 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| c | 0.080 | 0.220 | 0.003 | 0.009 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 1.150 | 1.350 | 0.045 | 0.053 |
| E1 | 2.150 | 2.450 | 0.085 | 0.096 |
| e | 0.65 TYP | | 0.026 TYP | |
| e1 | 1.300 BSC | | 0.051 BSC | |
| L | 0.525 REF | | 0.021 REF | |
| L1 | 0.260 | 0.460 | 0.010 | 0.018 |
| θ | 0° | 8° | 0° | 8° |

NOTES:

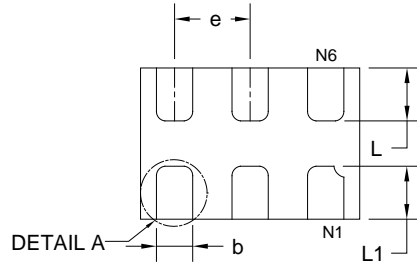
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

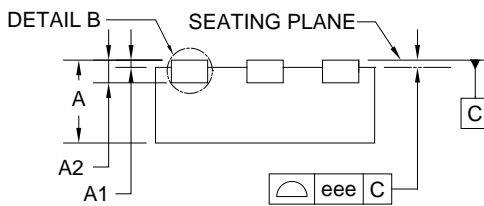
UTDFN-1.45x1-6L



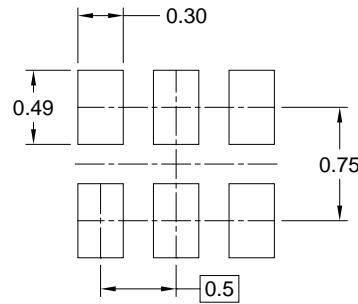
TOP VIEW



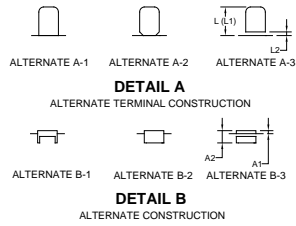
BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|------------------------------|-------|-------------------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.450 | 0.600 | 0.018 | 0.024 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A2 | 0.150 REF | | 0.006 REF | |
| D | 1.374 | 1.526 | 0.054 | 0.060 |
| E | 0.924 | 1.076 | 0.036 | 0.042 |
| b | 0.150 | 0.300 | 0.006 | 0.012 |
| e | 0.500 TYP | | 0.020 TYP | |
| eee | 0.050 | | 0.002 | |
| L | 0.250 | 0.450 | 0.010 | 0.018 |
| L1 | 0.250 | 0.500 | 0.010 | 0.020 |
| L2 | 0.000 | 0.100 | 0.000 | 0.004 |

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 |
|-----------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOT-23-5 | 7" | 9.5 | 3.20 | 3.20 | 1.40 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |
| SC70-5 | 7" | 9.5 | 2.25 | 2.55 | 1.20 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |
| UTDFN-1.45×1-6L | 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