SGM8770XMS8G
High Voltage, High Precision, Dual Differential Comparator

GENERAL DESCRIPTION

The SGM8770XMS8G is a dual, high precision differential voltage comparator optimized for high voltage operation. The device can operate from 2.8V to 36V single supply or from ±1.4V to ±18V dual power supplies. It consumes low supply current without being affected by the supply voltage. Input common mode voltage is 1.5V lower than $+V_S$. The SGM8770XMS8G has an open-drain output structure that needs external pull-up resistor.

The SGM8770XMS8G is available in a Green MSOP-8 package. It is specified over the extended -40℃ to +125℃ temperature range.

FEATURES

- **Wide Supply Ranges**
  Single Supply: 2.8V to 36V
  Dual Supplies: ±1.4V to ±18V
- **Low Supply Current: 330μA (TYP)**
- **Low Input Offset Voltage: 2.4mV (MAX)**
- **Low Input Bias Current: ±20pA (TYP)**
- **Minimum Input Common Mode Voltage: $-V_S$**
- **Maximum Differential Input Voltage: +36V/-36V**
- **Open-Drain Output Structure**
- **Low Output Saturation Voltage**
- **Supports CMOS or TTL Logic**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green MSOP-8 Package**

APPLICATIONS

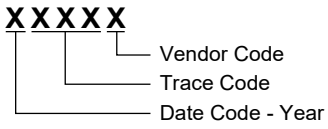
Power System Monitor
Medical Equipment
Industrial Application
Battery Management System

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8770XMS8G	MSOP-8	-40℃ to +125℃	SGM8770XMS8G/TR	SGM8770 XMS8 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor 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

Supply Voltage, $+V_S$ to $-V_S$ 40V
Differential Input Voltage, $|V_{ID}|$ 40V
Input/Output Voltage Range ..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 2500V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating 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

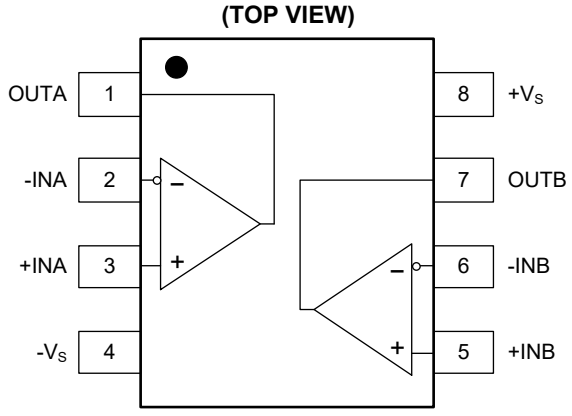
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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

(TOP VIEW)



MSOP-8

ELECTRICAL CHARACTERISTICS

(V_S = ±1.4V to ±18V, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{OS}	V_{CM} = 0V	+25℃		0.6	2.4	mV
			Full			2.8	
Input Bias Current	I_B	V_{CM} = 0V	+25℃		±20	±320	pA
Input Offset Current	I_{OS}	V_{CM} = 0V	+25℃		±20	±320	pA
Maximum Input Difference Bias Current	$\|I_{ID}\|$	V_S = ±18V, V_{ID} = ±18V	+25℃		2.2	3	μA
			Full			5	
Input Common Mode Voltage Range (1)	V_{CM}		Full	$-V_S$		$(+V_S)$ - 1.5	V
Common Mode Rejection Ratio	CMRR	V_S = ±18V, V_{CM} = $-V_S$ to $(+V_S)$ - 1.5V	+25℃	96	116		dB
			Full	80			
Power Supply Rejection Ratio	PSRR	V_S = 2.8V to 36V	+25℃	98	116		dB
			Full	95			
Large-Signal Differential Voltage Amplification	A_{VD}	V_S = 36V, V_{OUT} = 0.1V to 28.8V, R_L = 120kΩ to V_S	+25℃	90	100		dB
			Full	87			
Output Voltage Swing from Rail	V_{OL}	I_{SINK} = 8mA, V_{ID} = -0.2V	+25℃		200	280	mV
			Full			410	
Output Short-Circuit Current	I_{SINK}	V_{OL} = $(-V_S)$ + 1.5V, V_{ID} = -0.2V	+25℃	24	36		mA
High-Level Output Current	I_{OH}	V_{OH} = 2.8V, V_{ID} = 0.2V	+25℃		0.4	0.8	μA
			Full			1	
		V_{OH} = 36V, V_{ID} = 0.2V	+25℃		6	15	μA
			Full			80	
Total Supply Current	I_S	I_{OUT} = 0mA	+25℃		330	400	μA
			Full			450	

SWITCHING CHARACTERISTICS

(V_S = ±2.5V, C_L = 15pF (2), typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Propagation Delay (High to Low)	t_{PHL}	Overdrive = 10mV	+25℃		75		ns
		Overdrive = 100mV	+25℃		45		ns
Fall Time	t_{FALL}	Overdrive = 10mV	+25℃		15		ns
		Overdrive = 100mV	+25℃		15		ns

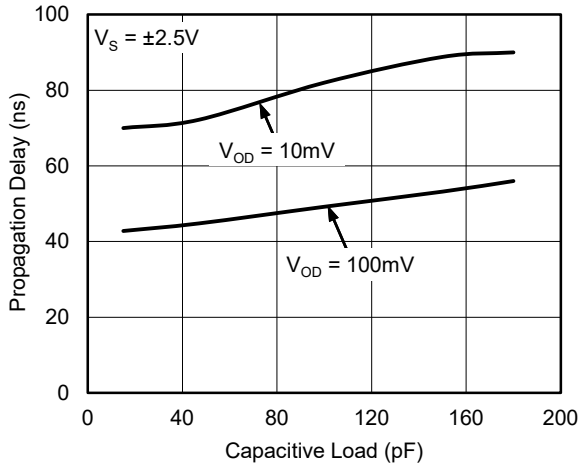
NOTES:

1. Any input voltage should not be lower than $(-V_S)$ - 0.3V. The maximum input common mode voltage is $(+V_S)$ - 1.5V, but it will not be damaged when the upper limit of the input voltage reaches 36V.
2. C_L: Load capacitance (jig and probe included).

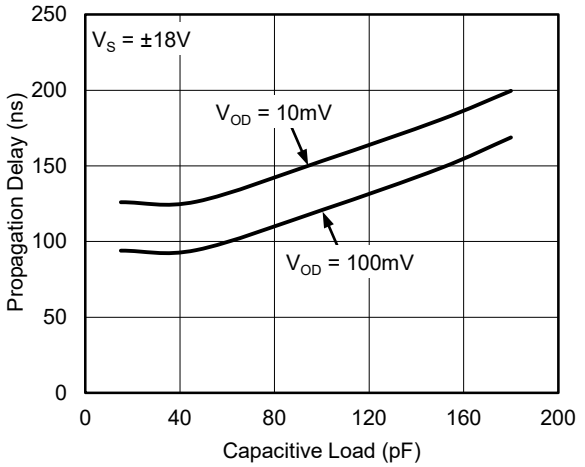
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = ±18V and C_L = 15pF, unless otherwise noted.

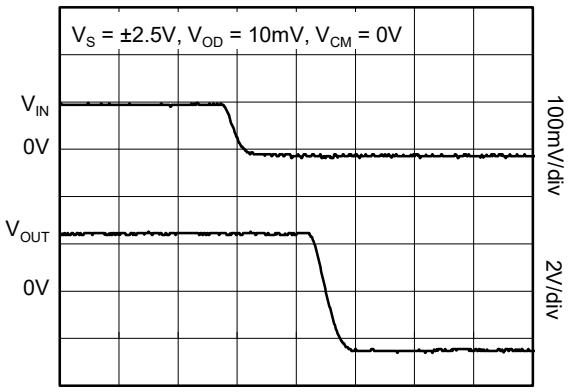
Propagation Delay vs. Capacitive Load



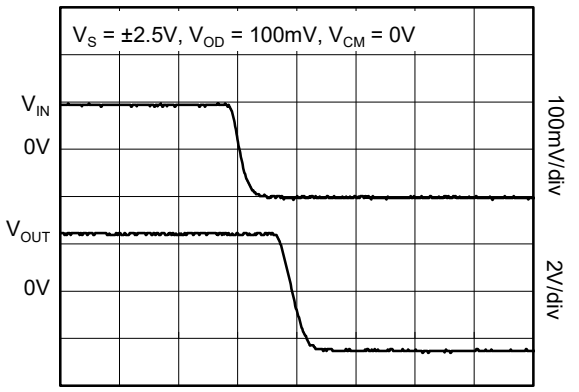
Propagation Delay vs. Capacitive Load



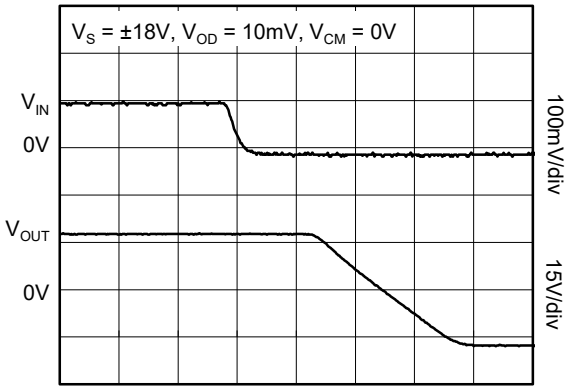
Propagation Delay (H-L)



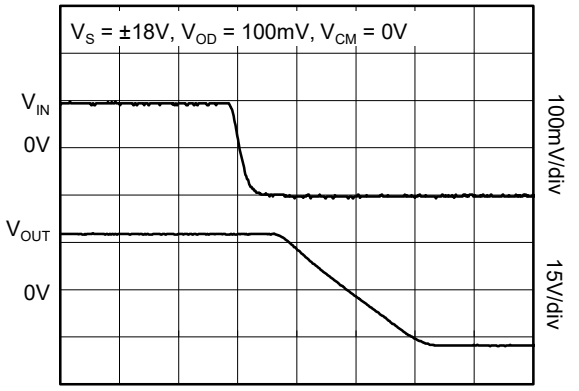
Propagation Delay (H-L)



Propagation Delay (H-L)



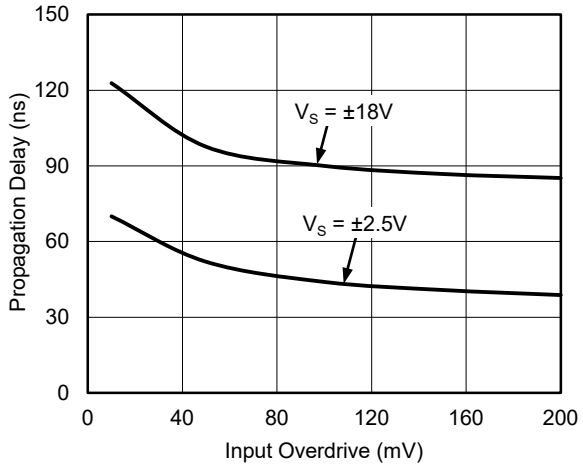
Propagation Delay (H-L)



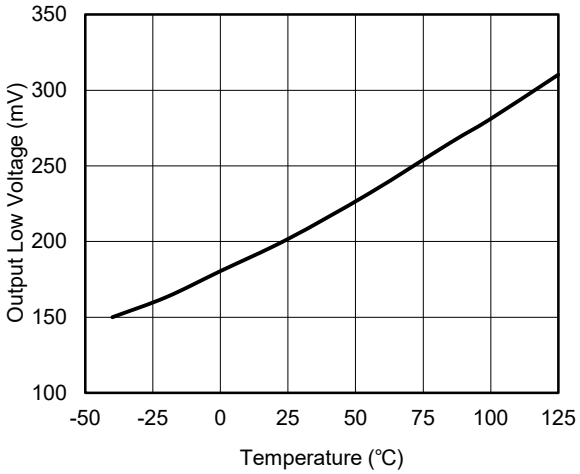
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = ±18V and C_L = 15pF, unless otherwise noted.

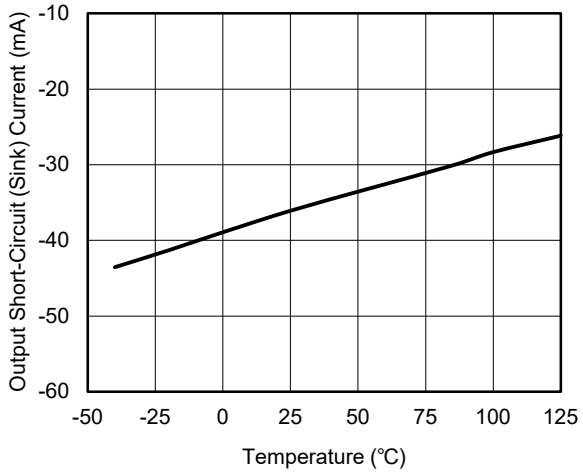
Propagation Delay (H-L) vs. Input Overdrive



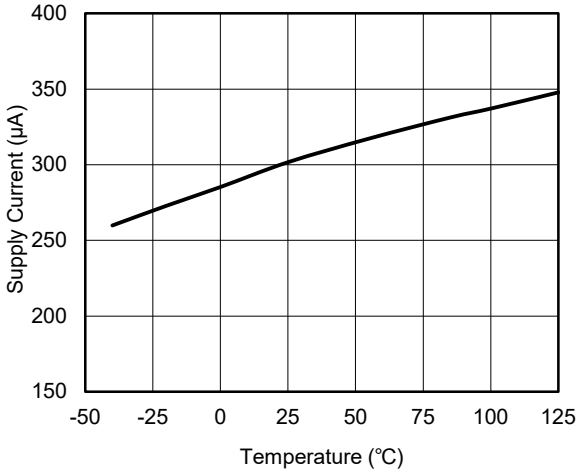
Output Low Voltage vs. Temperature



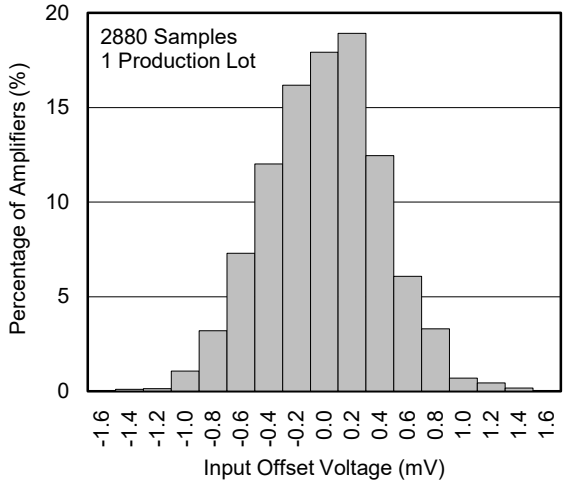
Output Short-Circuit (Sink) Current vs. Temperature



Supply Current vs. Temperature



Input Offset Voltage Production Distribution



DETAILED DESCRIPTION

The SGM8770XMS8G is a dual, high precision, low power comparator. The wide input voltage range and power supply range make the device a good choice for industrial equipment. Open-drain structure needs external pull-up resistor. The SGM8770XMS8G can be compatible with CMOS and TTL logics.

Output Structure

In Figure 1, the SGM8770XMS8G has an open-drain output stage. When output is changed from logic high to low, the changed sink current pulls output pin to logic low. Beginning this transition, larger sink current is used to create a high slew rate transit from high to low. Once the output voltage reaches V_{OL}, it will reduce the sink current to a just right value to maintain the V_{OL} static condition. This current-driven open-drain output stage will significantly reduce the power consumption in application system.

If low slew rate transition is needed in system design, adjusting the load capacitance will change the slew rate. The heavier capacitive load will slow down the output voltage transition. This feature will be used to reduce the interference generated by fast edge of transition between 1 and 0 in noise-sensitive system.

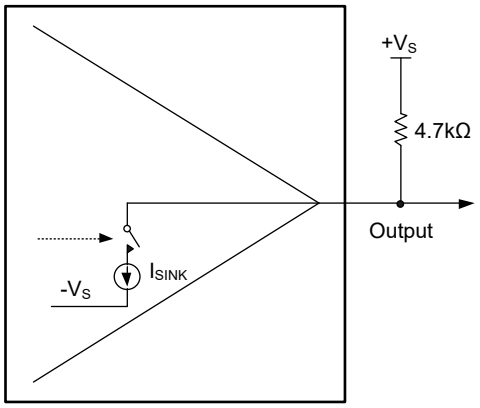


Figure 1. Open-Drain Output Structure

APPLICATION INFORMATION

Layout and Bypassing

Good power supply decoupling, layout and grounding are very important for SGM8770XMS8G to realize the full high-speed capabilities in system, following skills will be used:

◆ A 0.1μF to 4.7μF range ceramic capacitor is used to provide good power supply decoupling. This ceramic capacitor must be placed as close to $+V_S$ pin as possible.

◆ For grounding, unbroken and low-inductance ground plane is a good choice.

◆ For Layout, use short PCB trace to avoid unwanted parasitic feedback around the comparator. SGM8770XMS8G must be soldered directly to the PCB and the socket is not recommended.

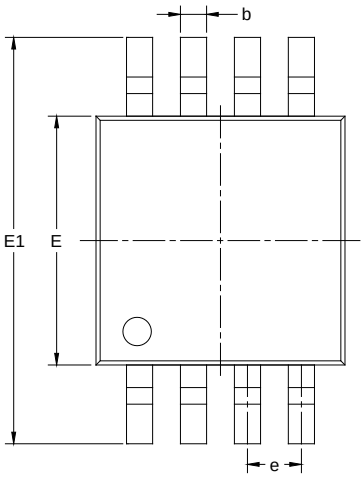
REVISION HISTORY

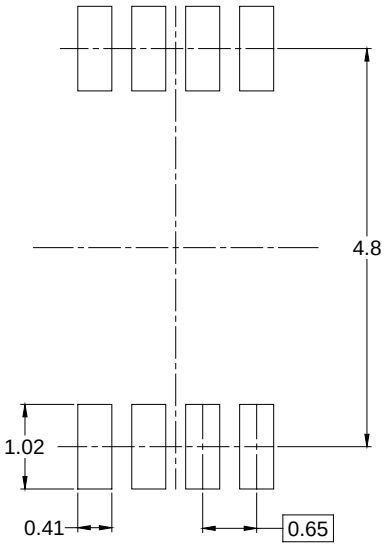
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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

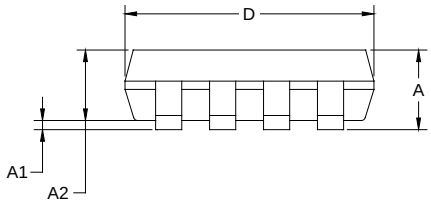
PACKAGE OUTLINE DIMENSIONS

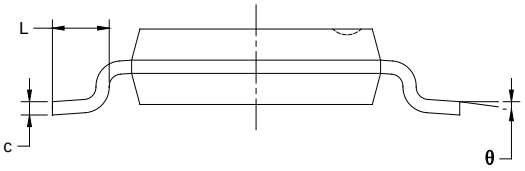
MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)



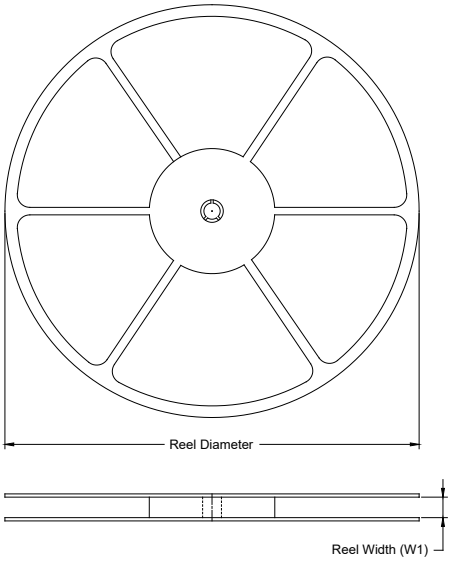


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

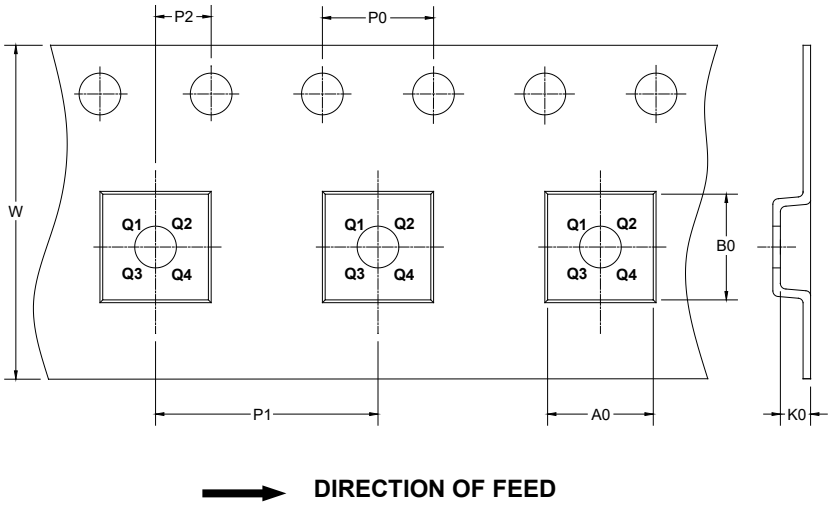
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

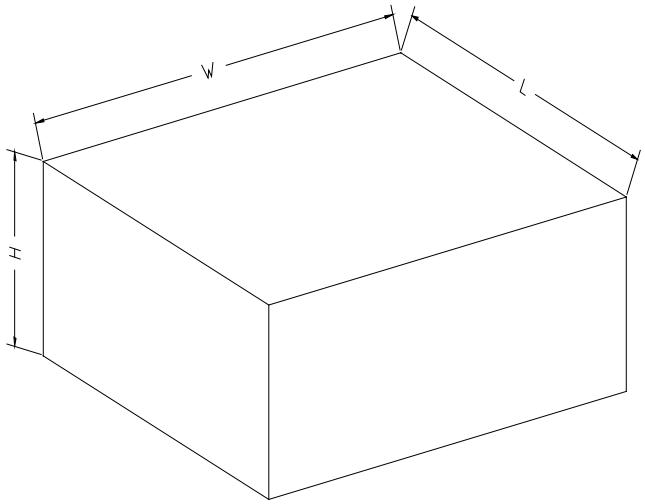
NOTE: The picture is only for reference. Please make the object as the standard.

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
MSOP-8	13″	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	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
13″	386	280	370	5

DD0002