SGM823
Microprocessor Supervisory Circuit with Watchdog Timer and Manual Reset

GENERAL DESCRIPTION

The SGM823 is an integrated microprocessor supervisory device with watchdog and manual reset functions. Compared with the design using a single IC or discrete components, this integration design has the advantage of improving system stability and accuracy. The special design on SGM823 can ignore the fast transients on V_{CC}.

The SGM823 has four fixed reset threshold voltages of 4.63V, 3.08V, 2.93V and 2.63V. When V_{CC} is as low as 1V, the reset output can still operate. And it also has a low-level active manual reset nMR function.

The SGM823 is available in a Green SOT-23-5 package. It operates over an ambient temperature range of -40℃ to +125℃.

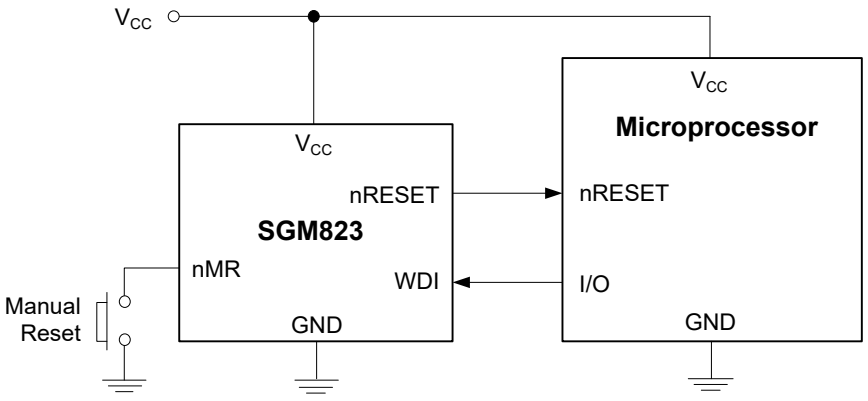
FEATURES

- **Ultra-Low Supply Current: < 1μA (TYP)**
- **Precision Supply-Voltage Monitor**
  - **4.63V for SGM823-L**
  - **3.08V for SGM823-T**
  - **2.93V for SGM823-S**
  - **2.63V for SGM823-R**
- **Guaranteed nRESET Valid at V_{CC} = 1V**
- **Push-Pull nRESET Output**
- **Reset Pulse Width: 200ms (TYP)**
- **Debounced TTL/CMOS-Compatible**
- **Manual Reset Input**
- **Watchdog Timer with 1.6s (TYP) Timeout**
- **Fully Specified over Temperature**
- **Power-Supply Transient Immunity**
- **Without External Components**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOT-23-5 Package**

APPLICATIONS

Computers
Portable Equipment
Automotive Equipment
Intelligent Instruments
Critical μP Power Monitoring

TYPICAL APPLICATION

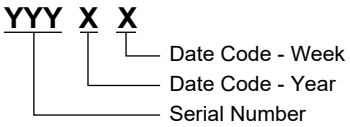


PACKAGE/ORDERING INFORMATION

MODEL	RESET THRESHOLD (V)	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM823	4.63	SOT-23-5	SGM823-LXN5G/TR	MNFXX	Tape and Reel, 3000
	3.08	SOT-23-5	SGM823-TXN5G/TR	MG6XX	Tape and Reel, 3000
	2.93	SOT-23-5	SGM823-SXN5G/TR	MG7XX	Tape and Reel, 3000
	2.63	SOT-23-5	SGM823-RXN5G/TR	MG8XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date 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

Terminal Voltage (with Respect to GND)
- V_{CC} ..... -0.3V to 6.0V
- All Other Inputs ..... -0.3V to (V_{CC} + 0.3V)

Input Current
- V_{CC} 20mA
- GND 20mA

Output Current
- All Outputs 20mA

Package Thermal Resistance
SOT-23-5, θ_{JA} ..... 234℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
MM 400V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Ambient 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.

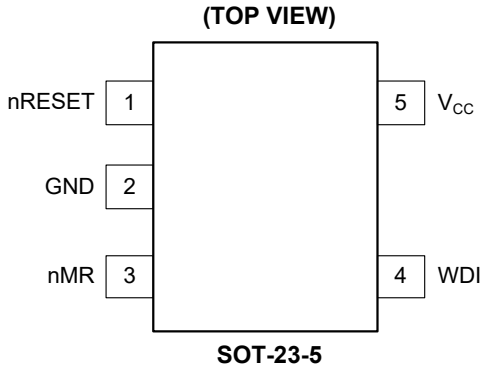
ESD SENSITIVITY CAUTION

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	nRESET	Active-Low Reset Output Pin. It delivers a 200ms (TYP) low pulse when activated. nRESET remains low if V_{CC} is below the reset threshold or nMR is logic low. It goes (or remains) low for 200ms after any of the following events: V_{CC} rises above the reset threshold, a watchdog expiry triggers a reset, or the nMR input goes from low to high.
2	GND	Ground.
3	nMR	Manual Reset Input Pin. nRESET keeps low when nMR is low. When nMR is high, nRESET becomes high after a 200ms timeout period. It is an active-low reset input with an internal 59kΩ pull-up resistor. nMR can be driven by a CMOS logic or by a switch shorting to GND. If not used, leave it open or connect it to V_{CC}.
4	WDI	Watchdog Input Pin. If the high or low state of WDI exceeds the watchdog timeout period, the internal watchdog timer is expired and a reset is triggered. The internal watchdog timer is clear while a reset is asserted. The timer is also cleared if the WDI input is changed (on rising or falling edges). The watchdog feature is disabled if the WDI is left open or if it is connected to a three-stated buffer output.
5	V_{CC}	Supply Voltage Pin.

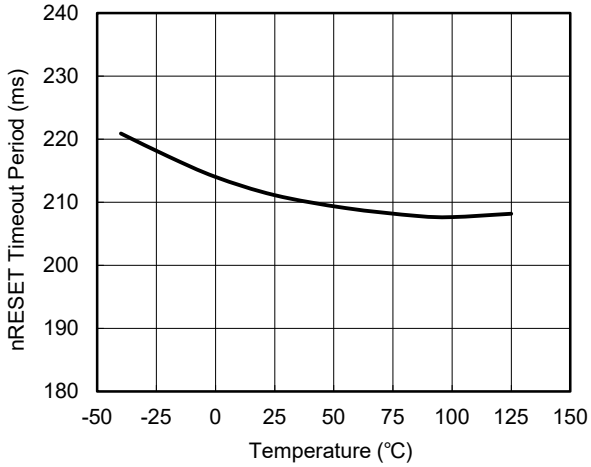
ELECTRICAL CHARACTERISTICS

(T_A = +25℃, V_{CC} = 4.73V to 5.5V for SGM823-L, V_{CC} = 3.14V to 5.5V for SGM823-T, V_{CC} = 2.99V to 5.5V for SGM823-S, V_{CC} = 2.68V to 5.5V for SGM823-R, Full = -40℃ to +125℃, unless otherwise noted.)

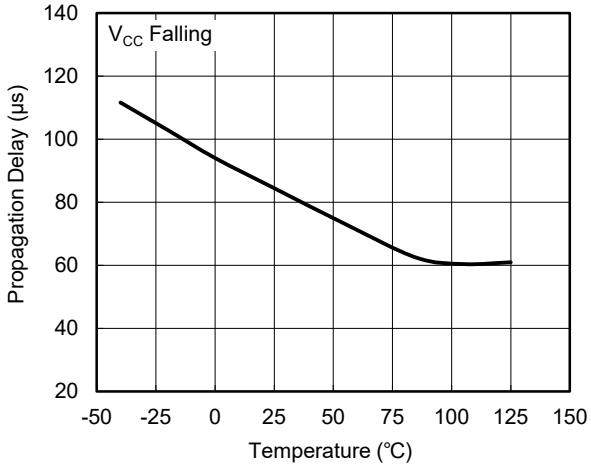
PARAMETER		CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Operating Voltage Range (V_{CC})			Full	1		5.5	V
Supply Current (I_{SUPPLY})		V_{CC} = 3.6V	Full		0.5	1.2	μA
		V_{CC} = 5.5V	Full		0.7	1.4	
nRESET Threshold (V_{nRST})		SGM823-L	+25℃	4.55	4.63	4.70	V
			Full	4.54	4.63	4.73	
		SGM823-T	+25℃	3.03	3.08	3.13	
			Full	3.02	3.08	3.14	
		SGM823-S	+25℃	2.88	2.93	2.98	
			Full	2.87	2.93	2.99	
		SGM823-R	+25℃	2.59	2.63	2.67	
			Full	2.58	2.63	2.68	
nRESET Threshold Hysteresis (V_{HYS})		SGM823-L	+25℃		20		mV
		SGM823-T	+25℃		14		
		SGM823-S	+25℃		13		
		SGM823-R	+25℃		12		
nRESET Threshold Temperature Coefficient			Full		20		ppm/℃
nRESET Pulse Width (t_{RP})			Full	140	200	290	ms
nRESET Output Voltage	V_{OH}	SGM823-L, V_{CC} = $V_{nRST(MAX)}$, I_{SOURCE} = 120μA	Full	V_{CC} - 1.5			V
		SGM823-T/S/R, V_{CC} = $V_{nRST(MAX)}$, I_{SOURCE} = 30μA	Full	0.8 × V_{CC}			
	V_{OL}	SGM823-L, V_{CC} = $V_{nRST(MIN)}$, I_{SINK} = 3.2mA	Full			0.4	
		SGM823-T/S/R, V_{CC} = $V_{nRST(MIN)}$, I_{SINK} = 1.2mA	Full			0.3	
		V_{CC} = 1V, V_{CC} falling, I_{SINK} = 50μA	Full			0.3	
nRESET Output Short-Circuit Current (I_{SOURCE})		SGM823-L, nRESET = 0V, V_{CC} = 5.5V	Full			460	μA
		SGM823-T/S/R, nRESET = 0V, V_{CC} = 3.6V	Full			430	
V_{CC} to Reset Delay (t_{RD})		V_{nRST} - V_{CC} = 100mV	+25℃		84		μs
Watchdog Timeout Period (t_{WD})			Full	1.1	1.6	2.4	sec
WDI Pulse Width (t_{WP})		V_{IL} = 0V, V_{IH} = V_{CC}	Full	90			ns
WDI Input Threshold	Low	V_{CC} = 5V	Full			0.8	V
	High	V_{CC} = 5V	Full	3.5			
	Low	$V_{nRST(MAX)}$ < V_{CC} < 3.6V	Full			0.8	
	High	$V_{nRST(MAX)}$ < V_{CC} < 3.6V	Full	0.7 × V_{CC}			
WDI Input Current		WDI = V_{CC}, time average	Full		0.02	0.5	μA
		WDI = 0V, time average	Full	-0.5	-0.01		
nMR Input Voltage	V_{IL}		Full			0.8	V
	V_{IH}		Full	2			
nMR Pulse Width (t_{MR})			Full	300			ns
nMR Noise Immunity (Pulse width with no reset)			+25℃		130		ns
nMR to nRESET Out Delay (t_{MD})			Full			470	ns
nMR Pull-Up Resistance (Internal)			Full	44	59	78	kΩ

TYPICAL PERFORMANCE CHARACTERISTICS

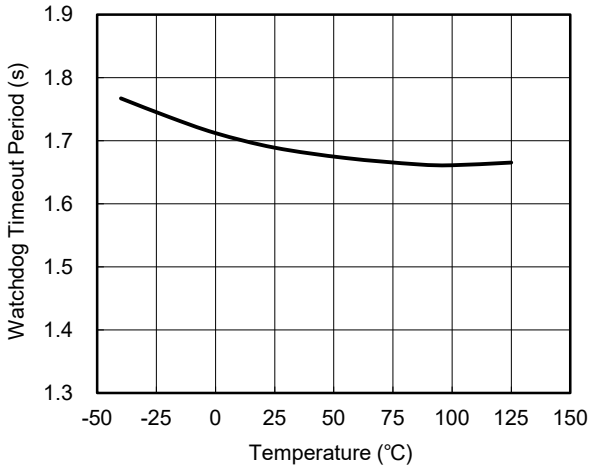
nRESET Timeout Period vs. Temperature



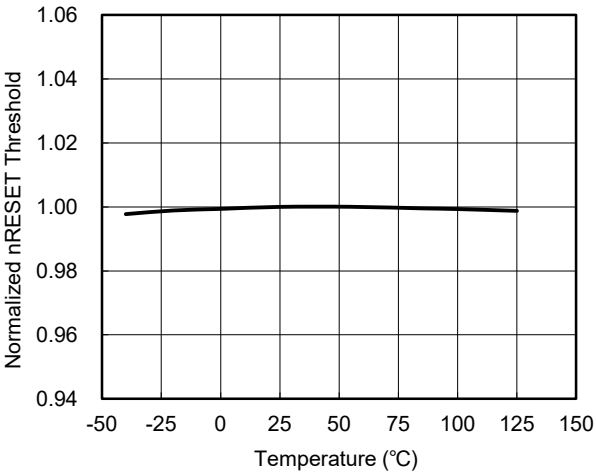
nRESET Comparator Propagation Delay vs. Temperature



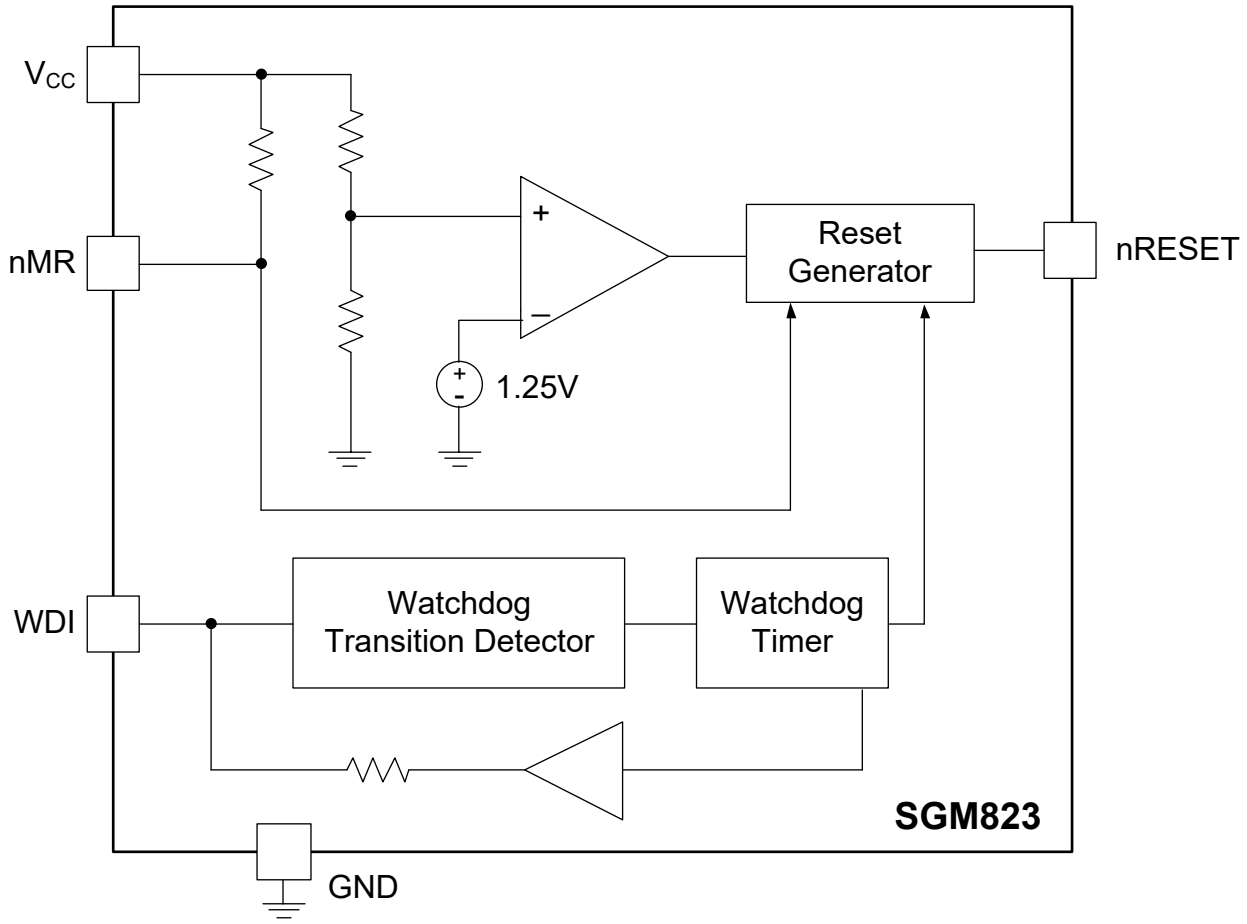
Watchdog Timeout Period vs. Temperature



Normalized nRESET Threshold Voltage vs. Temperature



FUNCTIONAL BLOCK DIAGRAM



REVISION HISTORY

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

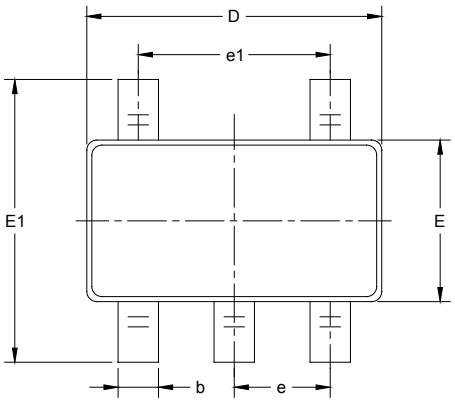
JULY 2020 – REV.A.1 to REV.A.2	Page
Updated Features section	1
Changed Detailed Description section	7

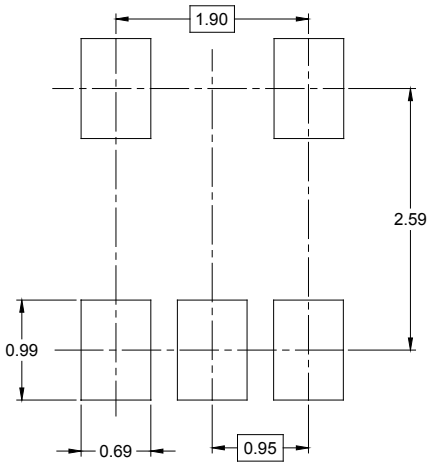
JANUARY 2020 – REV.A to REV.A.1	Page
Changed Electrical Characteristics section	4
Changed Typical Performance Characteristics section	5
Changed Figure 1	7

Changes from Original (DECEMBER 2018) to REV.A	Page
Changed from product preview to production data	All

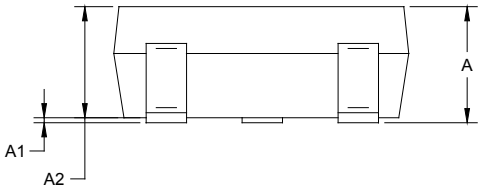
PACKAGE OUTLINE DIMENSIONS

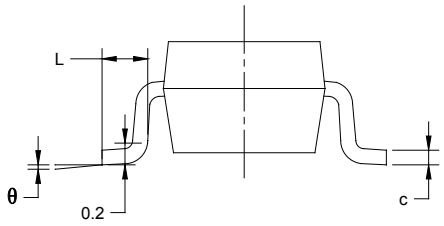
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

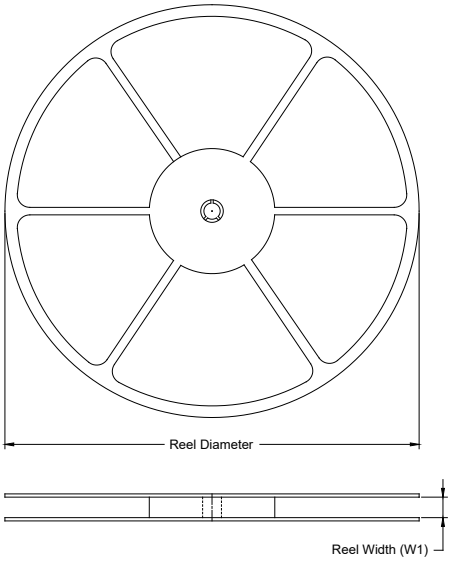




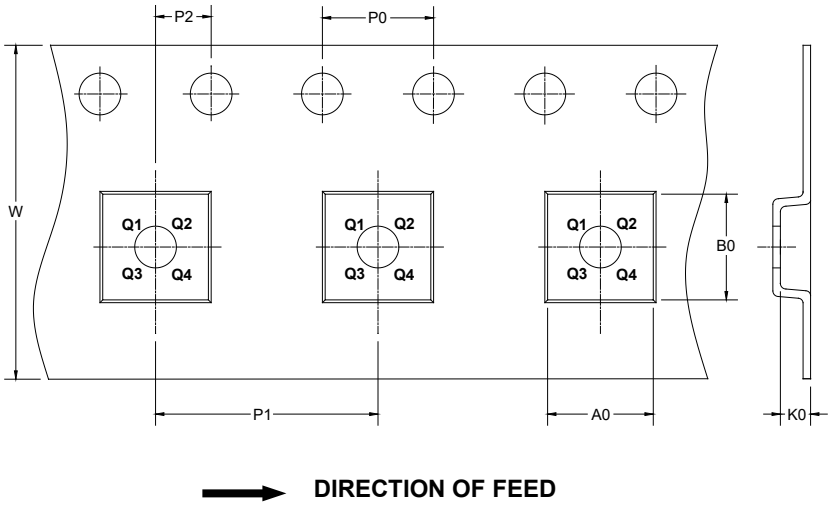
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



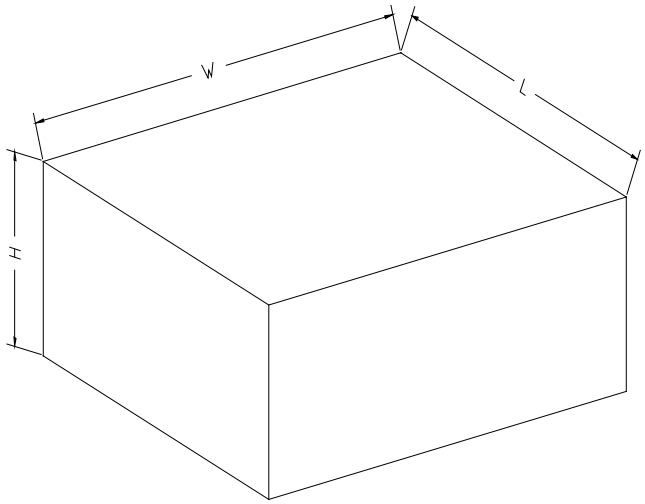
NOTE: The picture is only for reference. Please make the object as the standard.

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

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