SGM8774-1
High Voltage, High Precision, Single Differential Comparator

GENERAL DESCRIPTION

The SGM8774-1 is a single, high precision 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 SGM8774-1 has an open-drain output structure that needs external pull-up resistor.

The SGM8774-1 features low input offset voltage of 2.8mV (MAX). It is suitable for applications requiring precision.

The SGM8774-1 is available in a Green SOT-23-5 package. It is rated over the -40℃ to +125℃ operating temperature range.

FEATURES

- **Wide Supply Ranges**
  Single Supply: 2.8V to 36V
  Dual Supplies: ±1.4V to ±18V
- **Low Supply Current: 240μA (TYP)**
- **Low Input Offset Voltage: 2.8mV (MAX)**
- **Low Input Bias Current: ±20pA (TYP)**
- **Open-Drain Output Structure**
- **Supports CMOS or TTL Logic**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOT-23-5 Package**

APPLICATIONS

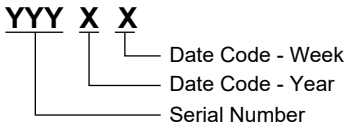
Power System Monitor
Medical Equipment
Industrial Application
Battery Management System

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8774A-1	SOT-23-5	-40℃ to +125℃	SGM8774A-1XN5G/TR	OP6XX	Tape and Reel, 3000
SGM8774B-1	SOT-23-5	-40℃ to +125℃	SGM8774B-1XN5G/TR	OP7XX	Tape and Reel, 3000
SGM8774C-1	SOT-23-5	-40℃ to +125℃	SGM8774C-1XN5G/TR	OP8XX	Tape and Reel, 3000
SGM8774D-1	SOT-23-5	-40℃ to +125℃	SGM8774D-1XN5G/TR	RCBXX	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

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..... 3000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range ..... -40℃ to +125℃
Power Supply Range ..... 2.8V to 36V

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

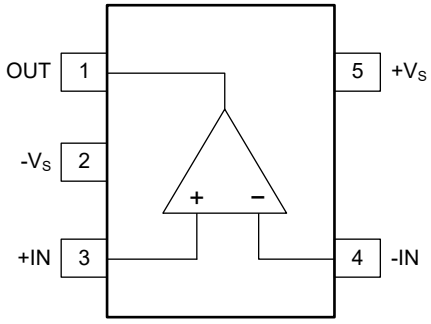
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

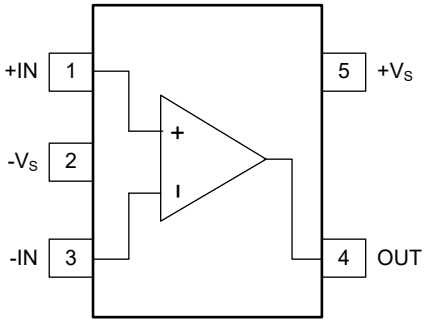
PIN CONFIGURATIONS

SGM8774A-1 (TOP VIEW)



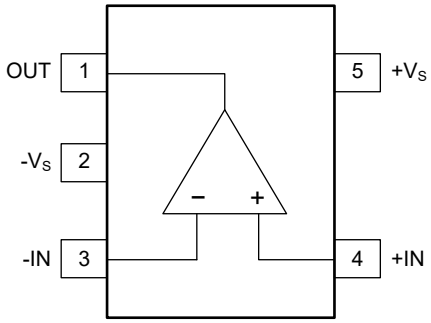
SOT-23-5

SGM8774B-1 (TOP VIEW)



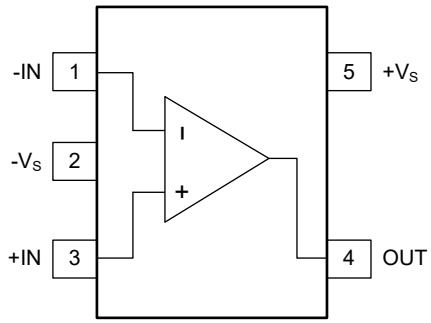
SOT-23-5

SGM8774C-1 (TOP VIEW)



SOT-23-5

SGM8774D-1 (TOP VIEW)



SOT-23-5

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℃		0.8	2.8	mV
			Full			3	
Input Bias Current	I_B	V_{CM} = 0V	+25℃		±20	±200	pA
Input Bias Current	I_{OS}	V_{CM} = 0V	+25℃		±20	±200	pA
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℃	84	100		dB
			Full	78			
Power Supply Rejection Ratio	PSRR		+25℃	102	120		dB
			Full	99			
Large-Signal Differential Voltage Amplification	A_{VD}	V_S = 36V, V_{OUT} = 0.1V to 28.8V, R_L = 120kΩ to V_S	+25℃	100	110		dB
			Full	97			
Low-Level Output Voltage	V_{OL}	I_{OL} = -8mA, V_{ID} = -0.2V	+25℃		230	300	mV
			Full			400	
Output Short-Circuit Current	I_{SINK}	V_{OL} = $(-V_S)$ + 1.5V, V_{ID} = -0.2V	+25℃	29	36		mA
High-Level Output Current	I_{OH}	V_{OH} - $(-V_S)$ = 2.8V, V_{ID} = 0.2V	+25℃		0.7	1	μA
			Full			3	
		V_{OH} - $(-V_S)$ = 36V, V_{ID} = 0.2V	+25℃		4	12	
			Full			22	
Supply Current	I_S	I_{OUT} = 0A	+25℃		240	290	μA
			Full			320	

SWITCHING CHARACTERISTICS

(At T_A = +25℃, V_S = ±2.5V, V_{CM} = 0V, C_L = 15pF (2), unless otherwise specified.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Propagation Delay (High to Low)	t_{PHL}	Overdrive = 10mV	+25℃		90		ns
		Overdrive = 100mV	+25℃		50		
Fall Time	t_{FALL}	Overdrive = 10mV	+25℃		20		ns
		Overdrive = 100mV	+25℃		20		

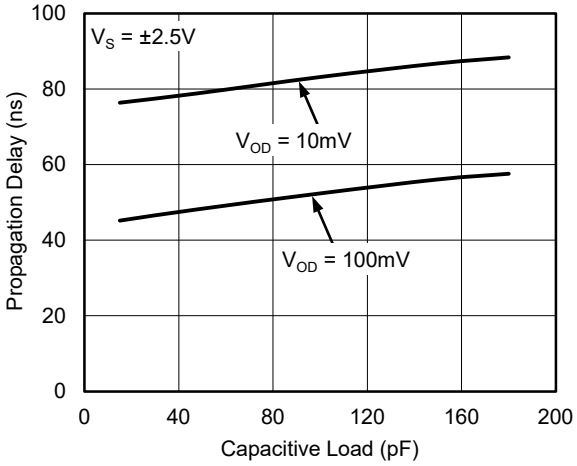
NOTES:

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).

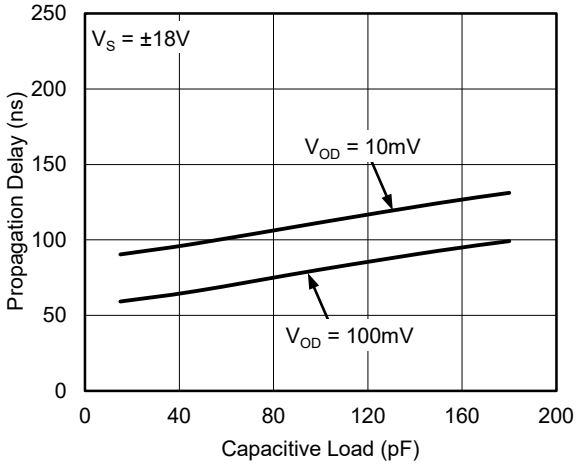
TYPICAL PERFORMANCE CHARACTERISTICS

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

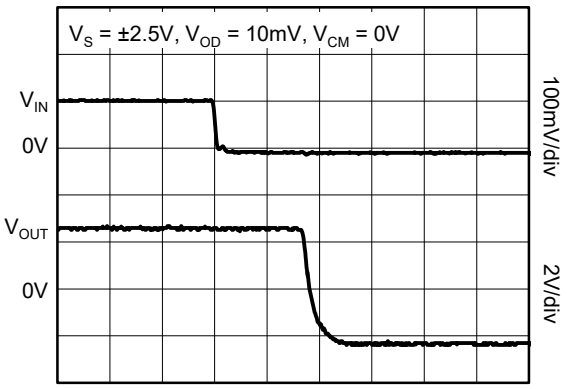
Propagation Delay vs. Capacitive Load



Propagation Delay vs. Capacitive Load

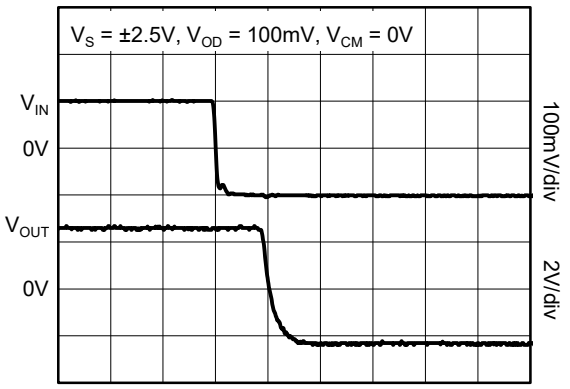


Propagation Delay (H-L)



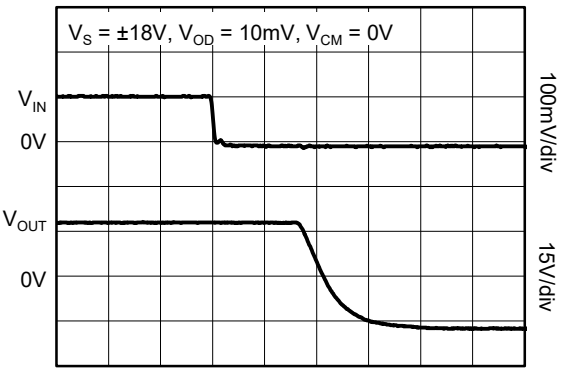
Time (50ns/div)

Propagation Delay (H-L)



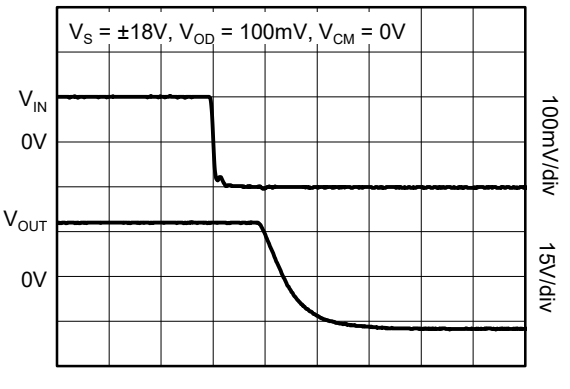
Time (50ns/div)

Propagation Delay (H-L)



Time (50ns/div)

Propagation Delay (H-L)

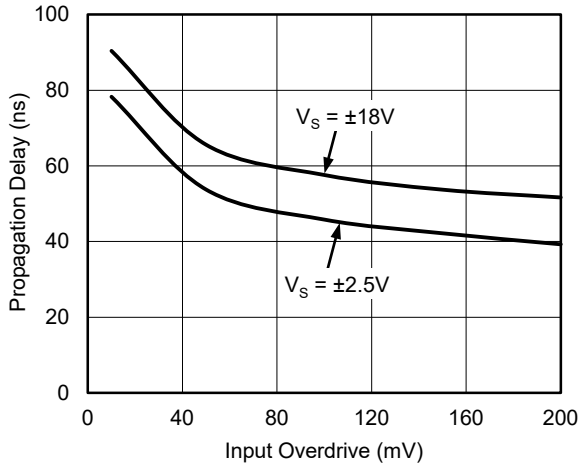


Time (50ns/div)

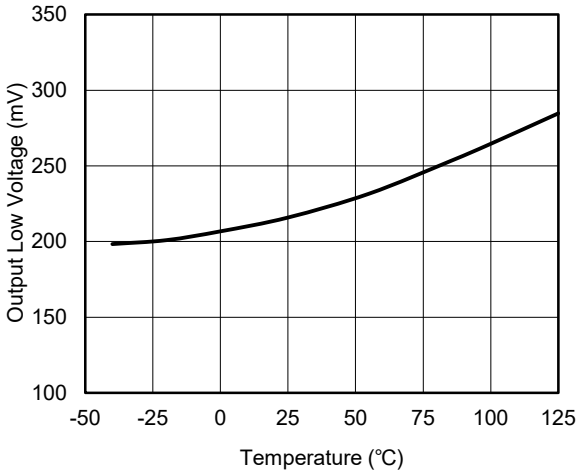
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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

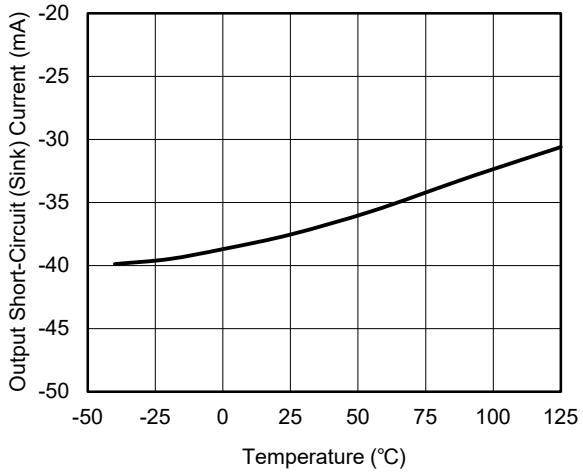
Propagation Delay (H-L) vs. Input Overdrive



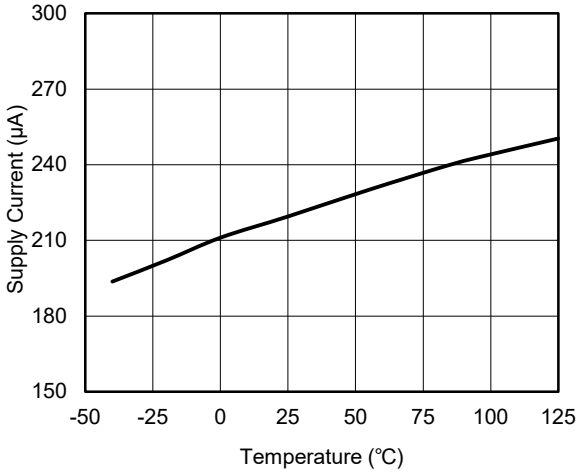
Output Low Voltage vs. Temperature



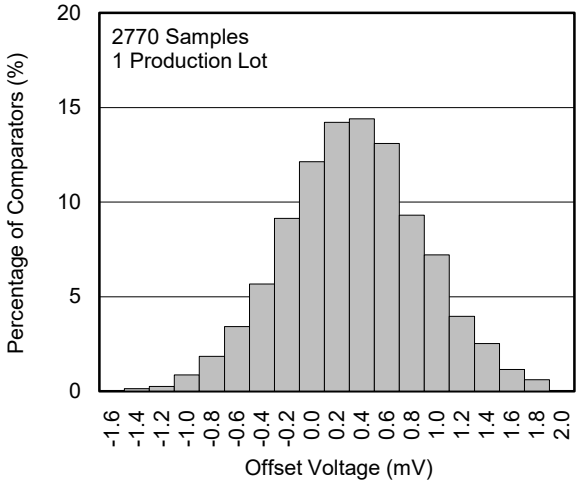
Output Short-Circuit (Sink) Current vs. Temperature



Supply Current vs. Temperature



Offset Voltage Production Distribution



DETAILED DESCRIPTION

The SGM8774-1 is a single, 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 SGM8774-1 can be compatible with CMOS and TTL logics.

Output Structure

In Figure 1, the SGM8774-1 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.

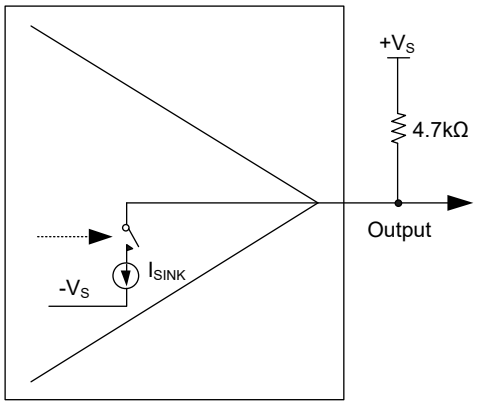


Figure 1. Open-Drain Output Structure

APPLICATION INFORMATION

Layout and Bypassing

Good power supply decoupling, layout and grounding are very important for SGM8774-1 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. SGM8774-1 must be soldered directly to the PCB and the socket is not recommended.

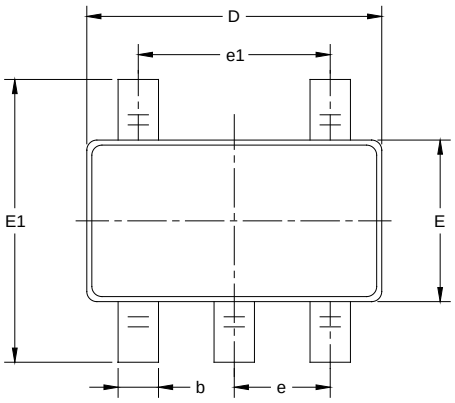
REVISION HISTORY

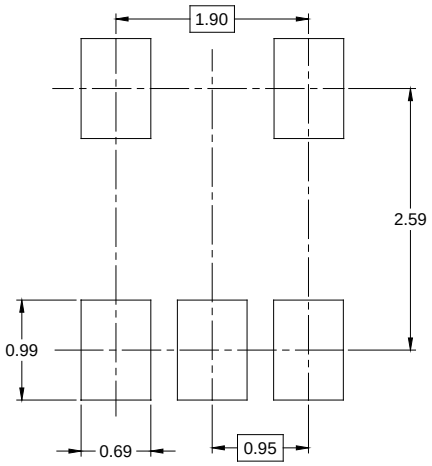
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (JANUARY 2022) to REV.A	Page
Changed from product preview to production data	All

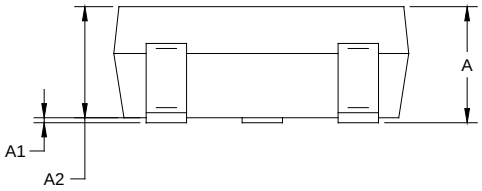
PACKAGE OUTLINE DIMENSIONS

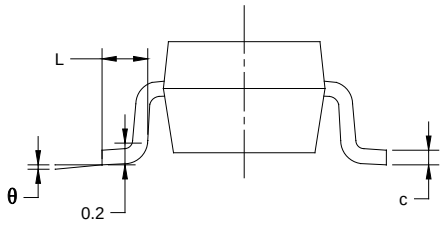
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)



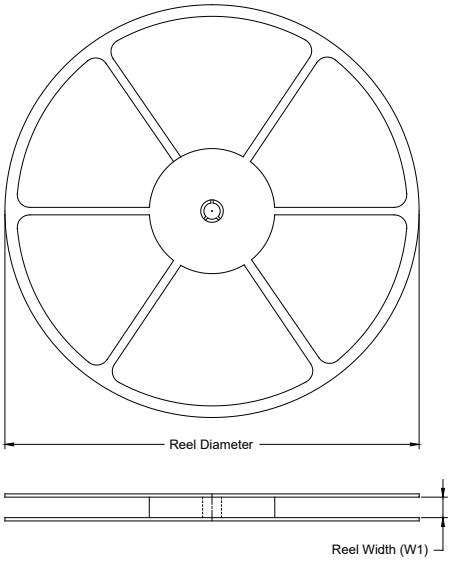


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

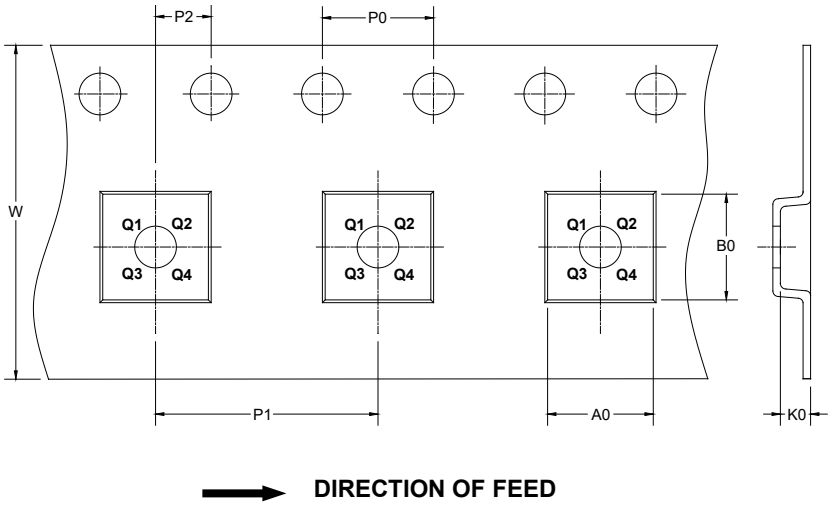
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



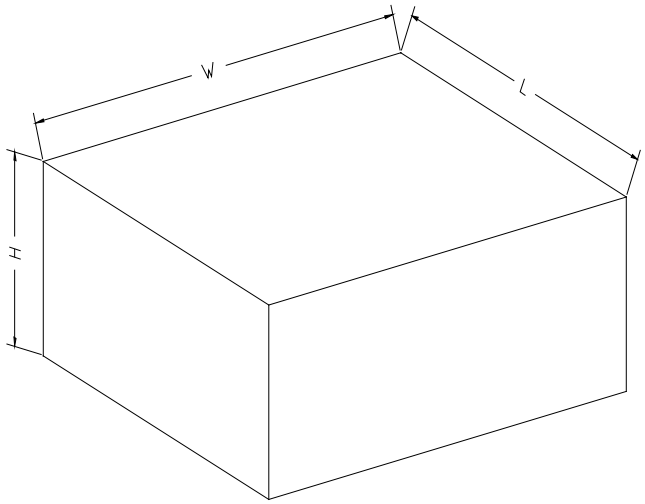
NOTE: The picture is only for reference. Please make the object as the standard.

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