SGM804
Low-Power, SOT µP Reset Circuit with Capacitor-Adjustable Reset Timeout Delay

GENERAL DESCRIPTION

The SGM804 low-power micro-processor supervisor circuit monitors system voltages from 1.6V to 5V. This device performs a single function: it asserts a reset signal whenever the V_{CC} supply voltage falls below its reset threshold. The reset output remains asserted for the reset timeout period after V_{CC} rises above the reset threshold. The reset timeout is externally set by a capacitor to provide more flexibility.

The SGM804 has an active-low, push-pull reset output. It is available in Green SOT-23-5 package and is specified over an ambient temperature range of -40℃ to +85℃.

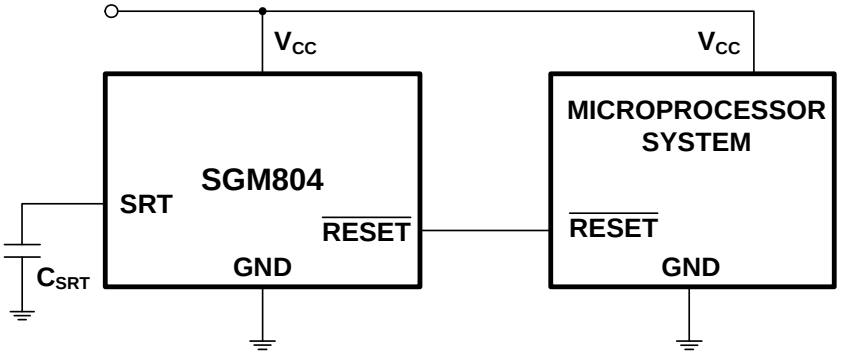
FEATURES

- **Monitor System Voltages from 1.6V to 5V**
- **Capacitor-Adjustable Reset Timeout Period**
- **Low Quiescent Current (3µA TYP)**
- **Push-Pull $\overline{\text{RESET}}$ Output Option**
- **Guaranteed $\overline{\text{RESET}}$ Valid to V_{CC} = 1V**
- **Immune to Short V_{CC} Transients**
- **Available in Green SOT-23-5 Package**

APPLICATIONS

Portable Equipment
Battery-Powered Computers/Controllers
Automotive
Medical Equipment
Intelligent Instruments
Embedded Controllers
Critical µP Monitoring
Set-Top Boxes
Computers

TYPICAL APPLICATION



PACKAGE/ORDERING INFORMATION

MODEL	PIN-PACKAGE	RESET THRESHOLD (TYP)	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM804	SOT-23-5	1.63V	SGM804-1.63YN5G/TR	S82XX	Tape and Reel, 3000
		2.32V	SGM804-2.32YN5G/TR	S83XX	Tape and Reel, 3000
		2.63V	SGM804-2.63YN5G/TR	S84XX	Tape and Reel, 3000
		2.93V	SGM804-2.93YN5G/TR	S85XX	Tape and Reel, 3000

NOTE: Order number and package marking are defined as the follow:

ORDER NUMBER

SGM804 - X X X G / TR

- **Tape and Reel**
- **Green product**
- **Package Type**
  - N5 SOT-23-5
- **Operating Temperature Range**
  - Y -40℃ to +85℃
- **Reset Threshold**
  - 1.63 1.63V
  - 2.32 2.32V
  - 2.63 2.63V
  - 2.93 2.93V

MARKING INFORMATION

SYY X X

- Date code - Month ("A" = Jan. "B" = Feb. ⋯ "L" = Dec.)
- Date code - Year ("A" = 2010, "B" = 2011 ⋯)
- Chip I.D.

For example: S82BA (2011, January)

ABSOLUTE MAXIMUM RATINGS

All Voltages Referenced to GND

V_{CC}.....-0.3V to 6V

SRT, $\overline{RESET}$ (push-pull).....-0.3V to (V_{CC} + 0.3V)

Input Current (all pins).....20mA

Output Current ($\overline{RESET}$) 20mA

Operating Temperature Range .....-40℃ to +85℃

Storage Temperature Range .....-65℃ to +150℃

Junction Temperature.....150℃

Lead Temperature (Soldering, 10s) .....260℃

ESD Susceptibility

HBM..... 3000V

MM.....300V

NOTE:

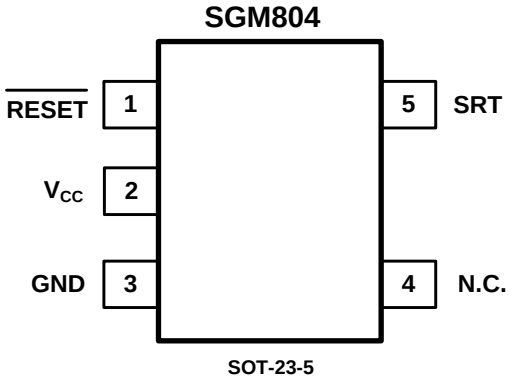
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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 very small parametric changes could cause the device not to meet its published specifications.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ changes from high to low whenever V_{CC} drops below the selected reset threshold voltage. $\overline{\text{RESET}}$ remains low for the reset timeout period after V_{CC} exceeds the reset threshold.
2	V_{CC}	Supply Voltage and Reset Threshold Monitor Input.
3	GND	Ground.
4	N.C.	Not Internally Connected. Can be connected to GND.
5	SRT	Set Reset Timeout Input. Connect a capacitor between SRT and ground to set the timeout period. Determine the period as follows: $t_{RP} = 2.6 \times 10^6 \times C_{SRT} + 340 \times 10^{-6}$ with t_{RP} in seconds and C_{SRT} in farads.

ELECTRICAL CHARACTERISTICS

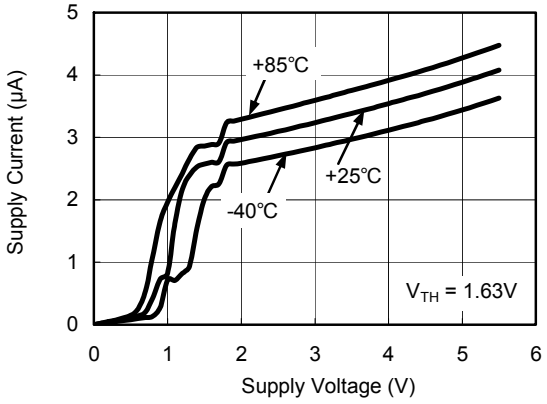
(V_{CC} = 1V to 5.5V, T_A = -40℃ to +85℃, typical values are at V_{CC} = 5V and T_A = +25℃, unless otherwise specified.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage Range	V_{CC}		1.0		5.5	V
Supply Current	I_{CC}	V_{CC} ≤ 5.0V		3.9	7.0	µA
		V_{CC} ≤ 3.3V		3.4	5.5	
		V_{CC} ≤ 2.0V		3.0	4.8	
V_{CC} Reset Threshold Accuracy	V_{TH}	T_A = +25℃	V_{TH} - 2.5%		V_{TH} + 2.5%	V
		T_A = -40℃ to +85℃	V_{TH} - 3.5%		V_{TH} + 3.5%	
Hysteresis	V_{HYST}			4 × V_{TH}		mV
V_{CC} to Reset Delay	t_{RD}	V_{CC} falling at 1mV/µs		80		µs
Reset Timeout Period	t_{RP}	C_{SRT} = 1500pF	3.00	4.25	5.75	ms
		C_{SRT} = 0		0.34		
V_{SRT} Ramp Current	I_{RAMP}	V_{SRT} = 0 to 0.65V, V_{CC} = 1.6V to 5V		210		nA
V_{SRT} Ramp Threshold	$V_{TH-RAMP}$	V_{CC} = 1.6V to 5V (V_{RAMP} rising)		0.6		V
$\overline{RESET}$ Output Voltage Low	V_{OL}	V_{CC} ≥ 1.0V, I_{SINK} = 50µA			0.3	V
		V_{CC} ≥ 2.7V, I_{SINK} = 1.2mA			0.3	
		V_{CC} ≥ 4.5V, I_{SINK} = 3.2mA			0.4	
$\overline{RESET}$ Output Voltage High, Push-Pull	V_{OH}	V_{CC} ≥ 1.8V, I_{SOURCE} = 200µA	0.8 × V_{CC}			V
		V_{CC} ≥ 2.25V, I_{SOURCE} = 500µA	0.8 × V_{CC}			
		V_{CC} ≥ 4.5V, I_{SOURCE} = 800µA	0.8 × V_{CC}			

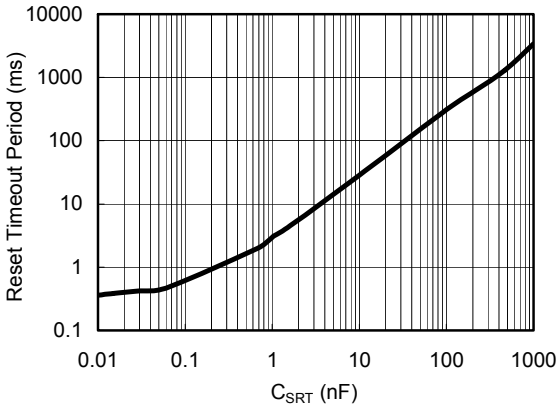
TYPICAL PERFORMANCE CHARACTERISTICS

V_{CC} = 5V, C_{SRT} = 1500pF, T_A = +25℃, unless otherwise noted.

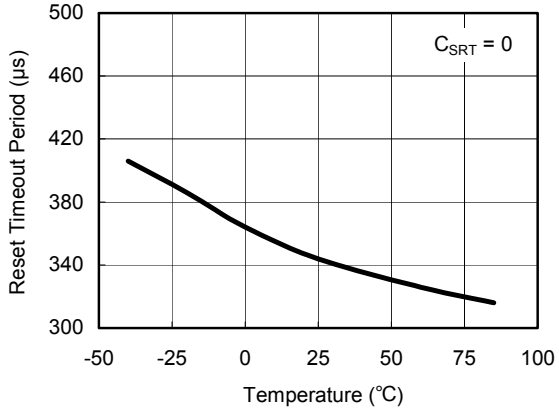
Supply Current vs. Supply Voltage



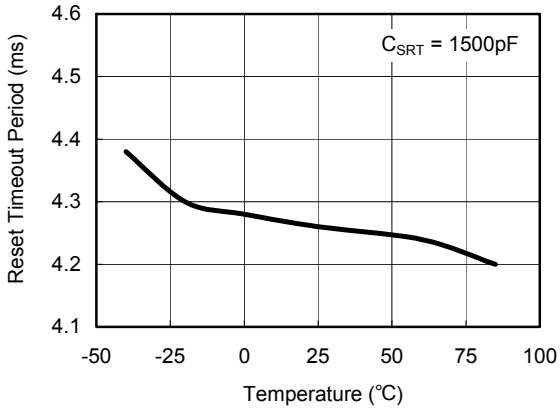
Reset Timeout Period vs. C_{SRT}



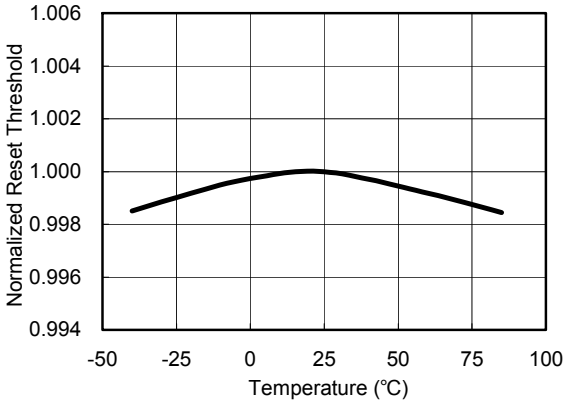
Reset Timeout Period vs. Temperature



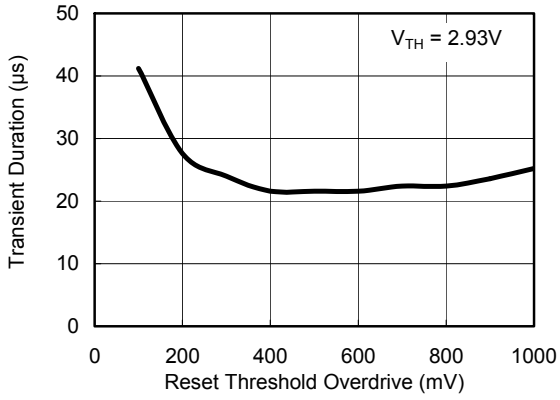
Reset Timeout Period vs. Temperature



Normalized Reset Threshold vs. Temperature



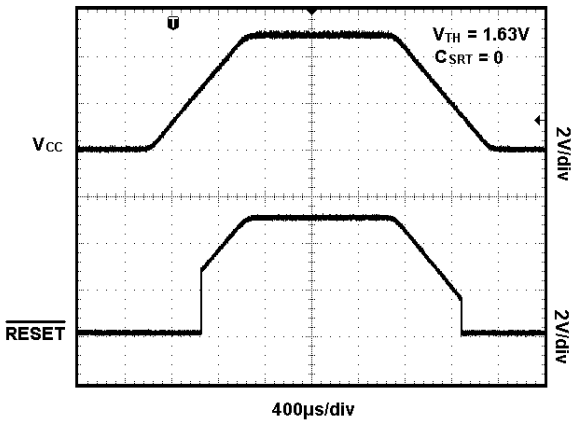
Maximum Transient Duration vs. Reset Threshold Overdrive



TYPICAL PERFORMANCE CHARACTERISTICS

V_{CC} = 5V, C_{SRT} = 1500pF, T_A = +25℃, unless otherwise noted.

Power-up/Power-down Characteristic



DETAILED DESCRIPTION

Reset Output

The reset output is typically connected to the reset input of a µP. A µP's reset input starts or restarts the µP in a known state. The SGM804 µP supervisory circuit provides the reset logic to prevent code-execution errors during power-up, power-down, and brownout conditions.

$\overline{RESET}$ changes from high to low whenever V_{CC} drops below the threshold voltage. Once V_{CC} exceeds the threshold voltage, $\overline{RESET}$ remains low for the capacitor-adjustable reset timeout period.

This device output is guaranteed valid for V_{CC} > 1V.

Operating as a Voltage Detector

The SGM804 can be operated in a voltage detector mode by floating the SRT pin. The reset delay times for V_{CC} rising above or falling below the threshold are not significantly different. The reset output is deasserted smoothly without false pulses.

Selecting a Reset Capacitor

The reset timeout period is adjustable to accommodate a variety of µP applications. Adjust the reset timeout period (t_{RP}) by connecting a capacitor (C_{SRT}) between SRT and ground. Calculate the reset timeout capacitor as follows:

$$C_{SRT} = (t_{RP} - 340 \times 10^{-6}) / (2.6 \times 10^{6})$$

where t_{RP} is in seconds and C_{SRT} is in farads.

The reset delay time is set by a current/capacitor-controlled ramp compared to an internal 0.6V reference. An internal 210nA ramp current source charges the external capacitor. The charge to the capacitor is cleared when a reset condition is detected. Once the reset condition is removed, the voltage on the capacitor ramps according to the formula: dV/dt = I/C. The C_{SRT} capacitor must ramp to 0.6V to deassert the reset. C_{SRT} must be a low-leakage (<10nA) type capacitor; ceramic is recommended.

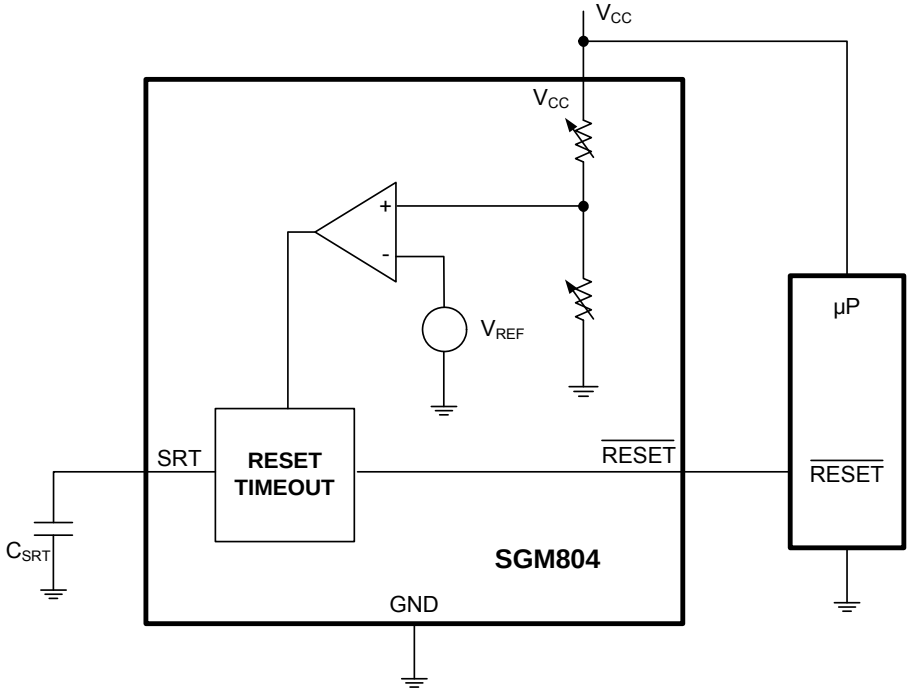


Figure 1. Typical Operating Circuit

APPLICATIONS INFORMATION

Negative-Going V_{CC} Transients

In addition to issuing a reset to the µP during power-up, power-down, and brownout conditions, this supervisor is relatively immune to short-duration negative-going transients (glitches). The graph Maximum Transient Duration vs. Reset Threshold Overdrive in the Typical Performance Characteristics shows this relationship.

The area below the curve of the graph is the region in which these devices typically do not generate a reset pulse. This graph was generated using a negative-going pulse applied to V_{CC}, starting above the actual reset threshold (V_{TH}) and ending below it by the magnitude indicated (reset-threshold overdrive). As the magnitude of the transient decreases (further below the reset threshold), the maximum allowable pulse width-decreases. Typically, a V_{CC} transient that goes 100mV below the reset threshold and lasts 50µs or less does not cause a reset pulse to be issued.

Ensuring a Valid $\overline{\text{RESET}}$ Down to V_{CC} = 0

When V_{CC} falls below 1V, $\overline{\text{RESET}}$ current-sinking (sourcing) capabilities decline drastically. In the case of the SGM804, high-impedance CMOS-logic inputs connected to $\overline{\text{RESET}}$ can drift to undetermined voltages. This presents no problems in most applications, since most µPs and other circuitry do not operate with V_{CC} below 1V.

In those applications where $\overline{\text{RESET}}$ must be valid down to zero, adding a pull down resistor between $\overline{\text{RESET}}$ and ground sinks any stray leakage currents, holding $\overline{\text{RESET}}$ low (Figure 2). The value of the pull down resistor is not critical; 100kΩ is large enough not to load $\overline{\text{RESET}}$ and small enough to pull $\overline{\text{RESET}}$ to ground.

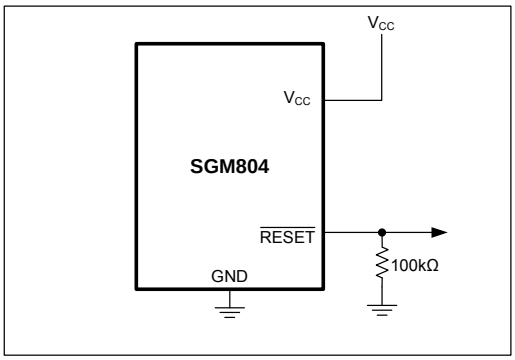


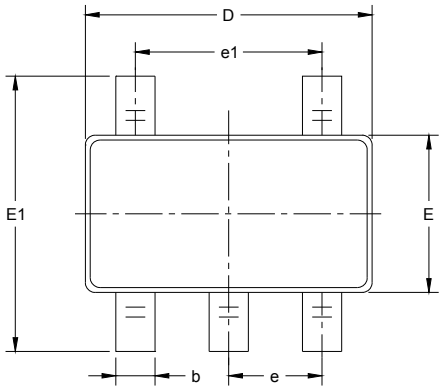
Figure 2. Ensuring $\overline{\text{RESET}}$ Valid to V_{CC} = 0

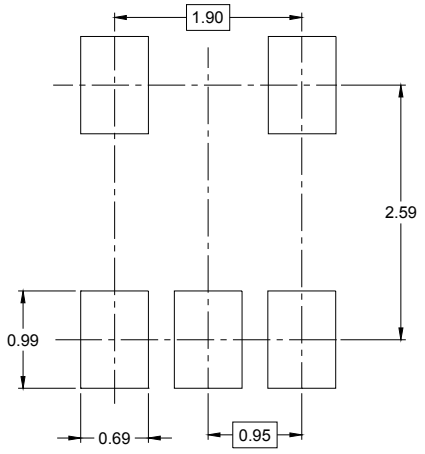
Layout Consideration

SRT is a precise current source. When developing the layout for the application, be careful to minimize board capacitance and leakage currents around this pin. Traces connected to SRT should be kept as short as possible. Traces carrying high-speed digital signals and traces with large voltage potentials should be routed as far from SRT as possible. Leakage current and stray capacitance (e.g., a scope probe) at this pin could cause errors in the reset timeout period. When evaluating these parts, use clean prototype boards to ensure accurate reset periods.

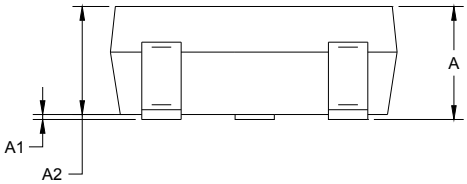
PACKAGE OUTLINE DIMENSIONS

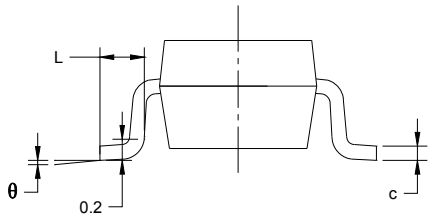
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

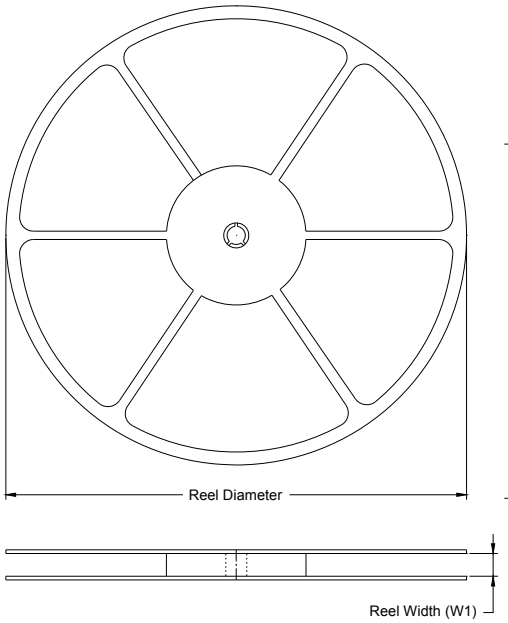




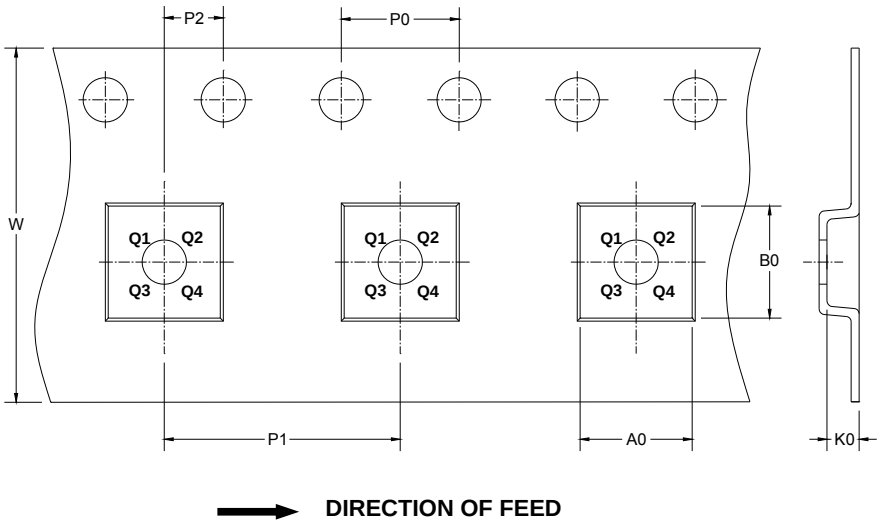
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

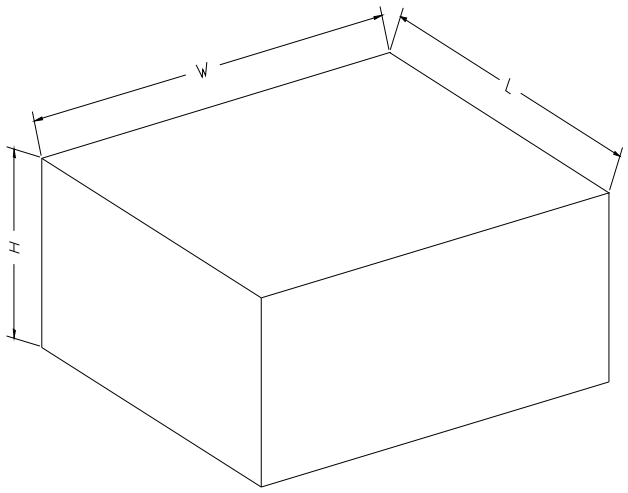


NOTE: The picture is only for reference. Please make the object as the standard.

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	3.2	3.2	1.4	4.0	4.0	2.0	8.0	Q3

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