

0.7V Minimum Input, Fixed Output 100mA Maximum Output Current Synchronous Boost

General Description

The SY7070B is a high efficiency, synchronous, current hysteresis control; step-up boost converter designed for single-cell or dual-cell alkaline, NiMH, or NiCd battery-powered applications. It can convert down to 0.7V input voltage. It adopts NMOS for the main switch and PMOS for the synchronous switch.

The SY7070B is available in a compact SOT23-5 package.

Features

- 0.7V Minimum Input Voltage
- Fixed Output Voltage: 2.8V
- Low $R_{DS(ON)}$ (Main Switch/Synchronous Switch) at Output: 0.5Ω/0.7Ω
- 5.5μA Typical Quiescent Current
- Typical 350mA Peak Current Limit
- Input Under-Voltage Lockout
- Bypass Function During Shutdown
- Moisture Sensitivity Level (MSL): 1
- Compact Package SOT23-5

Applications

- Battery powered applications
- Consumer and portable medical products
- Personal care products
- Smartphones
- White or status LEDs

Typical Application

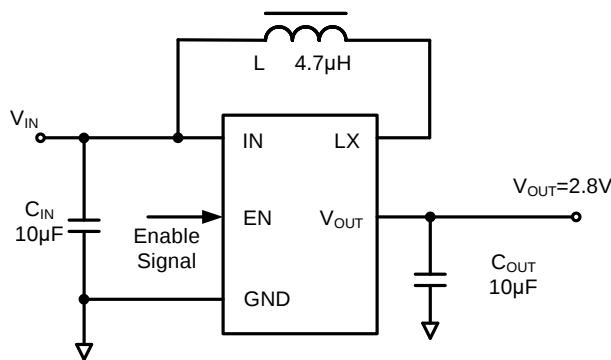


Figure 1. Schematic Diagram

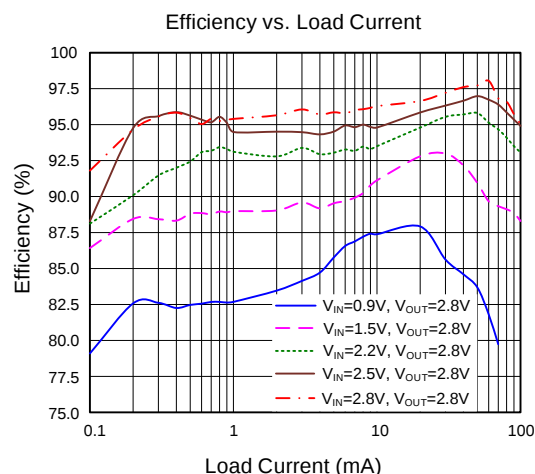


Figure 2. Efficiency vs. Load Current

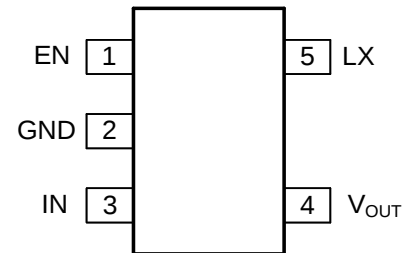
Ordering Information

Ordering Part Number	Package Type	Top Mark
SY7070BAAT	SOT23-5 RoHS-Compliant and Halogen-Free	LALxyz

Device code: LAL

x = year code, y = week code, z = lot number code

Pinout (top view)



Pin Description

Name	Number	Description
EN	1	Enable pin. Pull it high to turn on or pull it low to shut down the part. Do not leave it floating.
GND	2	Ground pin.
IN	3	Input pin. Decouple this pin to GND pin with a 10 μ F ceramic capacitor.
V _{OUT}	4	Output pin. Decouple this pin to GND pin with a minimum of 10 μ F ceramic capacitor.
LX	5	Inductor node. Connect an inductor between the IN pin and the LX pin.

Functional Block Diagram

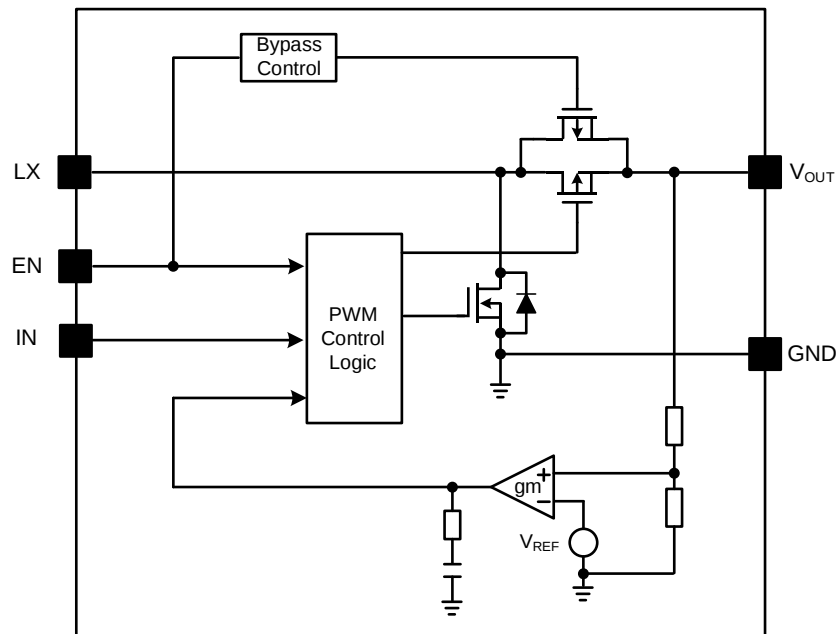


Figure 3. Block Diagram

Absolute Maximum Ratings

Parameter (Note 1)	Min	Max	Unit
All Pins to GND		6	V
Lead Temperature (Soldering, 10s)		260	°C
Junction Temperature, Operating	-40	150	
Storage Temperature	-65	150	

Thermal Information

Parameter (Note 2)	Typ	Unit
θ_{JA} Junction-to-Ambient Thermal Resistance	161	°C/W
θ_{JC} Junction-to-Case Thermal Resistance	130	
P_D Power Dissipation $T_A = 25^\circ\text{C}$	0.6	W

Recommended Operating Conditions

Parameter (Note 3)	Min	Max	Unit
IN	0.7	5.0	V
EN	0	$V_{OUT}+0.3$	
LX, V_{OUT}	0	5.0	
Junction Temperature, Operating	-40	125	°C
Ambient Temperature	-40	85	

Electrical Characteristics

($V_{IN}=1.2V$, $V_{OUT}=2.8V$, $I_{OUT}=10mA$, $T_A = 25^{\circ}C$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage	V_{IN}		0.7		5.0	V
Minimum V_{IN} at start-up	V_{START}			0.75		V
Under Voltage Lockout For Turn Off Protection	V_{UVLO}	V_{IN} decreasing		0.6		V
Quiescent Current	V_{IN}	$I_o=0mA, V_{EN}=V_{IN}=1.2V, V_{OUT}=3.0V$		0.5	1	μA
	V_{OUT}			5.5	8	
Shut Down Current	I_{SHDN}	$V_{EN}=0V, V_{IN}=3.0V$			1	μA
EN Rising Threshold	V_{ENH}	$V_{IN} \leq 1.6V$	$0.75 \times V_{IN}$			V
		$1.6V < V_{IN} < 5.0V$	1.2			V
EN Falling Threshold	V_{ENL}	$V_{IN} \leq 1.6V$			$0.2 \times V_{IN}$	V
		$1.6V < V_{IN} < 5.0V$			0.32	V
Low Side Main FET R_{ON}	$R_{DS(ON)1}$	$V_{OUT}=2.8V$		0.5		Ω
Synchronous FET R_{ON}	$R_{DS(ON)2}$	$V_{OUT}=2.8V$		0.7		Ω
Main FET Current Limit	I_{LIM}		300	350		mA
Output Voltage	V_{OUT}		2.716	2.8	2.884	V
Thermal Shutdown Temperature	T_{SD}			150		$^{\circ}C$
Thermal Shutdown Hysteresis	T_{HYS}			20		$^{\circ}C$

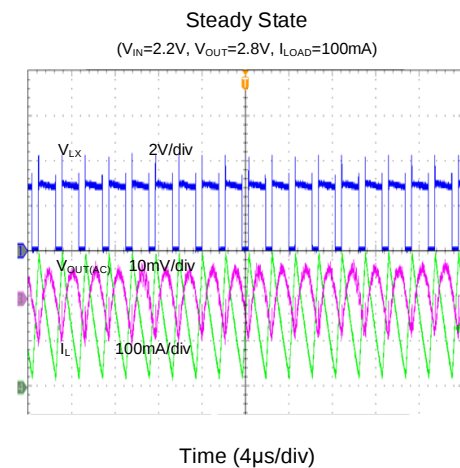
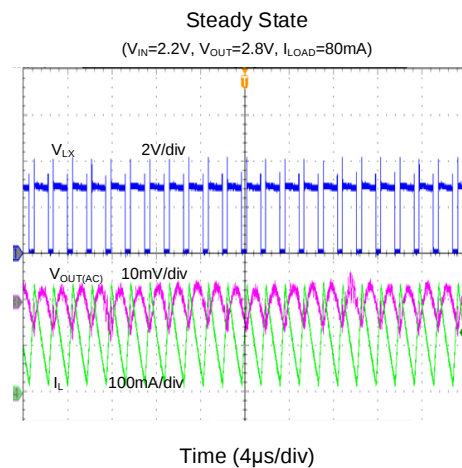
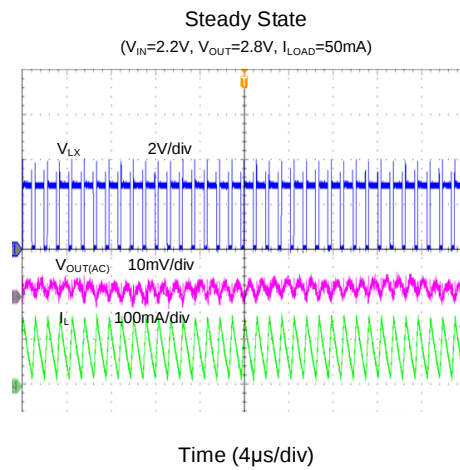
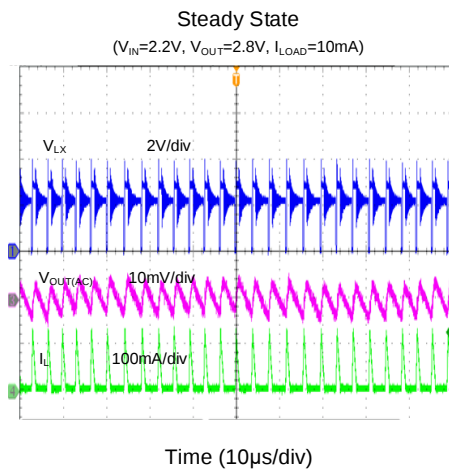
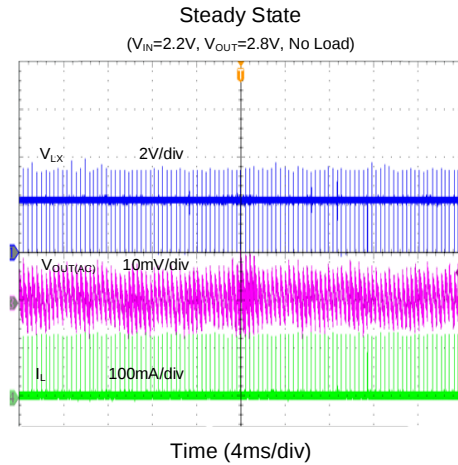
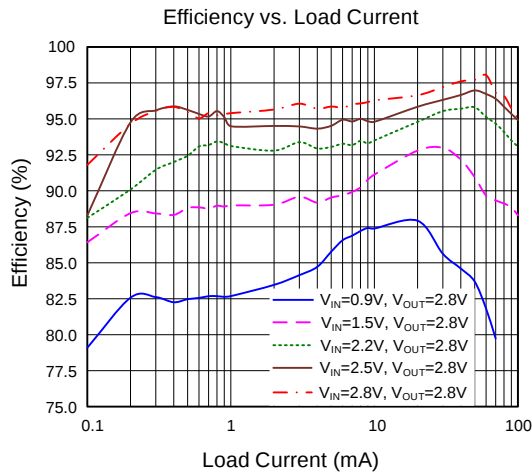
Note 1: Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

Note 2: θ_{JA} is measured in the natural convection at $T_A = 25^{\circ}C$ on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard. Test condition: Device mounted on 2" x 2" FR-4 substrate PCB, 2oz copper, with minimum recommended pad on top layer and thermal vias to bottom layer ground plane.

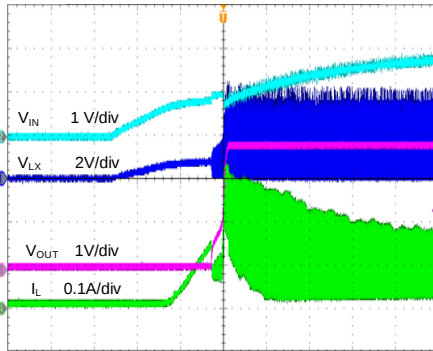
Note 3: The device is not guaranteed to function outside its operating conditions.

Typical Performance Characteristics

($T_A = 25^\circ\text{C}$, $V_{IN} = 2.2\text{V}$, $V_{OUT} = 2.8\text{V}$, $L = 4.7\mu\text{H}$, $C_{OUT} = 10\mu\text{F}$, unless otherwise specified.)

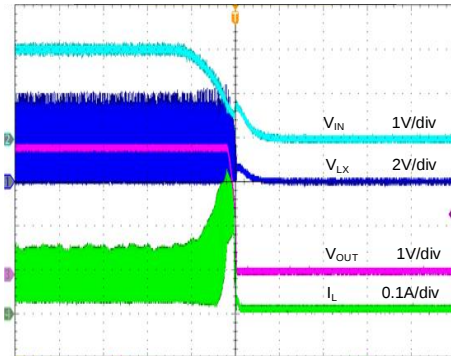


Startup from V_{IN}
($V_{IN}=2.2V$, $V_{OUT}=2.8V$, $I_{LOAD}=50mA$)



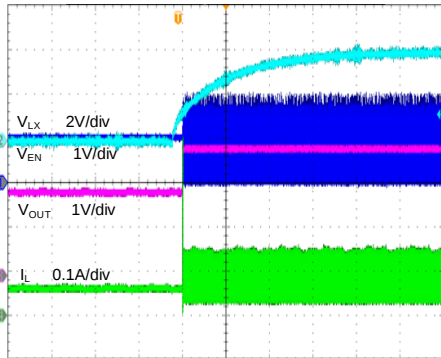
Time (20ms/div)

Shutdown from V_{IN}
($V_{IN}=2.2V$, $V_{OUT}=2.8V$, $I_{LOAD}=50mA$)



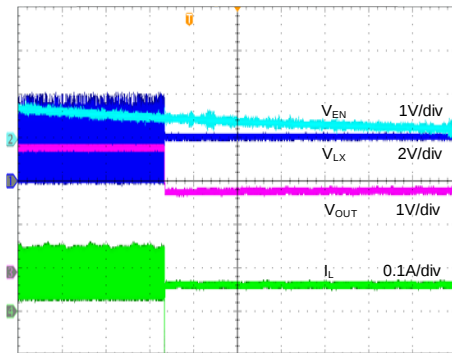
Time (20ms/div)

Startup from Enable
($V_{IN}=2.2V$, $V_{OUT}=2.8V$, $I_{LOAD}=50mA$)



Time (20ms/div)

Shutdown from Enable
($V_{IN}=2.2V$, $V_{OUT}=2.8V$, $I_{LOAD}=50mA$)



Time (20ms/div)

Application Information

The SY7070B is a high efficiency, low input voltage, step-up synchronous boost converter designed for single-cell or dual-cell alkaline, NiMH, or NiCd battery-powered applications. It adopts NMOS for the main switch and PMOS for the synchronous switch.

Input capacitor C_{IN}:

To minimize the potential noise problem, place a typical X5R or better grade ceramic capacitor really close to the IN and GND pins. Care should be taken to minimize the loop area formed by C_{IN}, and IN/GND pins. In this case, a 10μF low ESR ceramic capacitor is recommended to improve transient behavior of the regulator and EMI behavior of the total power supply circuit.

Output capacitor C_{OUT}:

The output capacitor is selected to handle the output ripple noise requirements. Both steady state ripple and transient requirements must be taken into consideration when selecting this capacitor. For the best performance, it is recommended to use an X5R or better grade ceramic capacitor with 6.3V rating and greater than 10μF capacitance.

Inductor L:

A proper inductor must be connected between Pin IN and Pin LX for the SY7070B stable operation. 4.7μH inductor value is strongly recommended.

Choosing inductance values will affect the switching frequency f proportional to $1/L$ as show in below equation:

$$L = \frac{1}{f \times 200mA} \times \frac{V_{IN} \times (V_{OUT} - V_{IN})}{V_{OUT}}$$

Bypass switch:

The SY7070B internal integrates a Bypass Switch in parallel with the synchronous rectifying PMOS. When the IC is enabled, the Bypass Switch will be turned off to allow the IC to work as a standard boost regulator. When the IC is disabled, the Bypass Switch will be turned on to provide a direct, low impedance connection from the input voltage to the load. The Bypass Switch is not impacted by under-voltage lockout, overvoltage or thermal shutdown.

Recommended PCB Layout:

For the best efficiency and minimum noise problems, we should place the following components close to the IC: C_{IN}, C_{OUT}, L.

- 1) It is desirable to maximize the PCB copper area connecting to GND pin to achieve the best thermal and noise performance. If the board space allowed, a ground plane is highly desirable.
- 2) C_{OUT} must be close to Pins OUT and GND. The loop area formed by C_{OUT} and GND must be minimized.
- 3) The PCB copper area associated with LX pin must be minimized to avoid the potential noise problem.

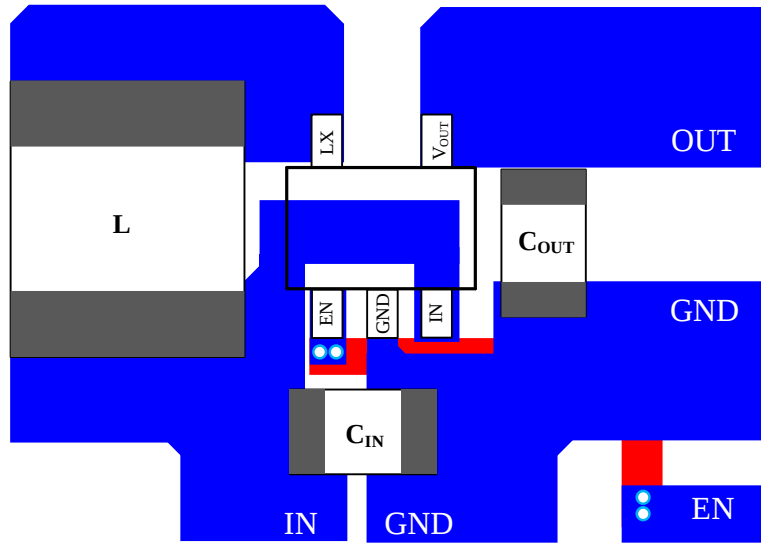
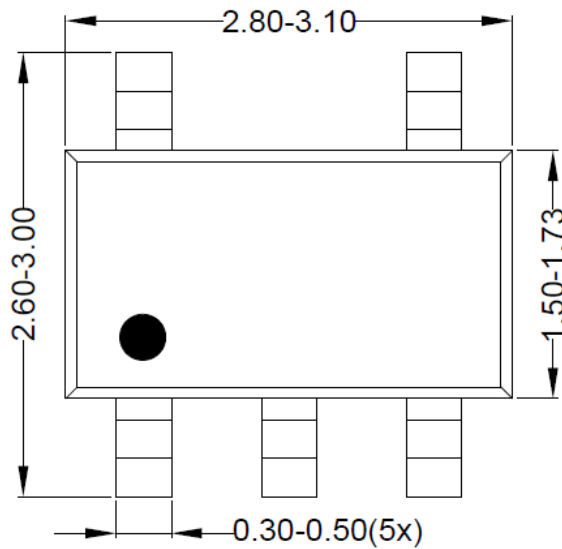
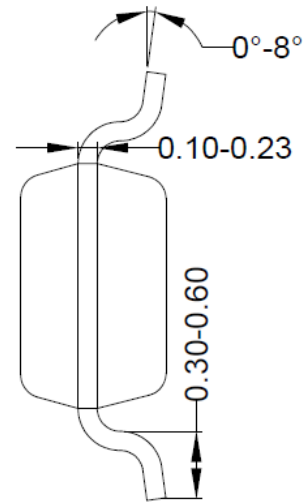


Figure 4. PCB Layout Suggestion

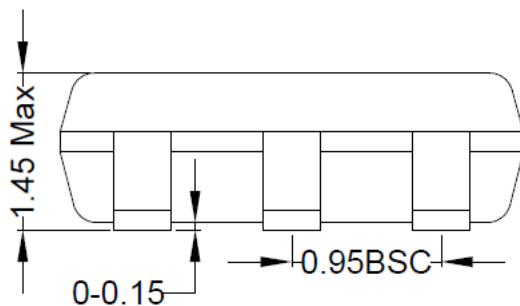
SOT23-5 Package Outline Drawing



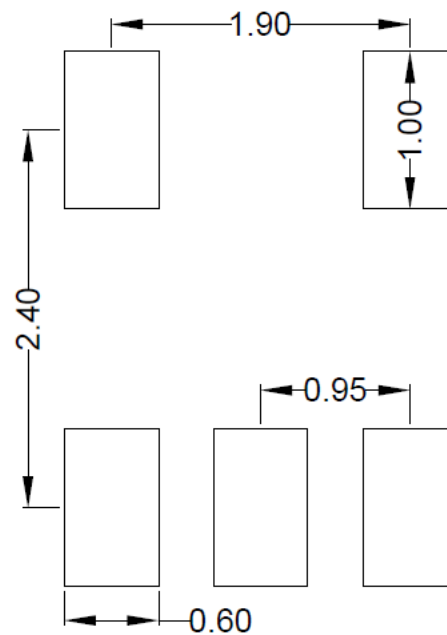
Top view



Side view



Front view



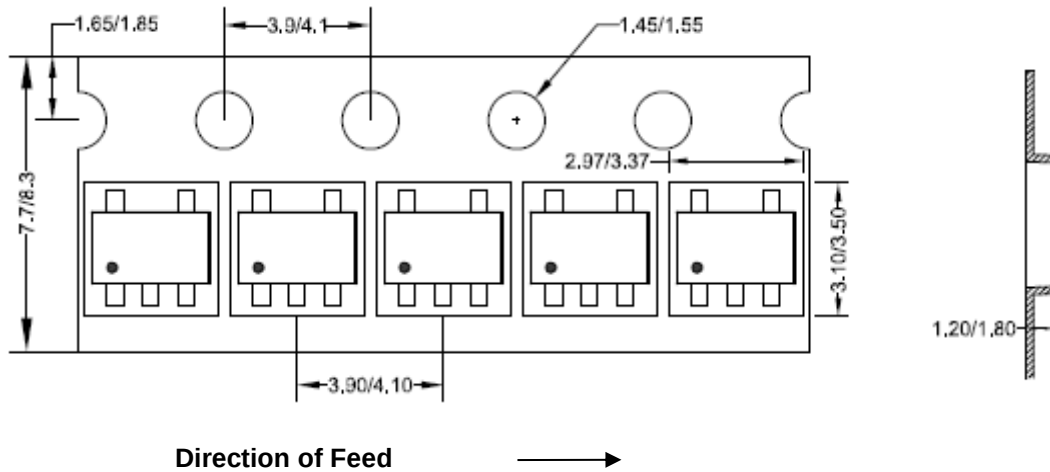
**Recommended PCB pad Layout
(Reference only)**

Notes: All dimension in millimeter and exclude mold flash & metal burr.

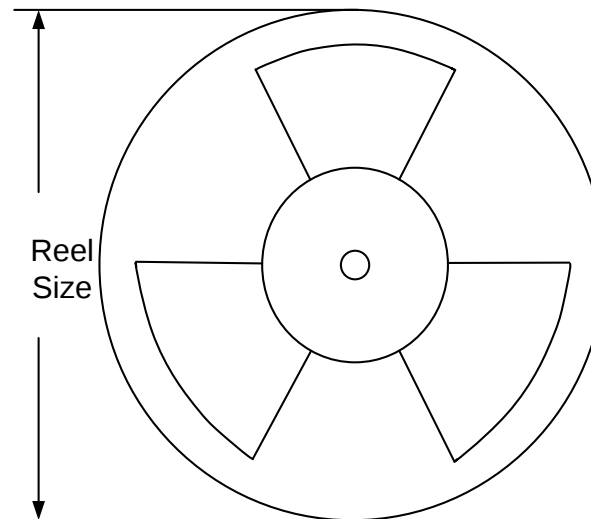
Tape and Reel Information

1. Tape Dimensions and Pin1 Orientation

SOT23-5



2. Reel Dimensions



Package type	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
SOT23-5	8	4	7"	280	160	3000



Revision History

The revision history provided is for informational purposes only and is believed to be accurate; however, not warranted. Please make sure that you have the latest revision.

Date	Revision	Change
Nov 18, 2025	Revision 1.0	Initial Release

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