SY7071

0.7V Minimum Input and 100mA Maximum Output Current Synchronous Boost

General Description

The SY7071 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.

Features

- 0.7V Minimum Input Voltage
- 5 µA Typical Quiescent Current
- Input Under-voltage Lockout
- Pass-through Function During Shutdown
- Low $R_{DS(ON)}$ (Main Switch/Synchronous Switch) at Output: 0.5/0.7Ω
- Typical 350mA Peak Current Limit
- RoHS Compliant and Halogen Free
- Compact SOT-363(SC70) Package

Ordering Information

SY7071 □(□□)□

- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY7071AHC	SOT-363	

Applications

- Battery Powered Applications
- Consumer And Portable Medical Products
- Personal Care Products
- Smartphones
- White or Status LEDs

Typical Applications

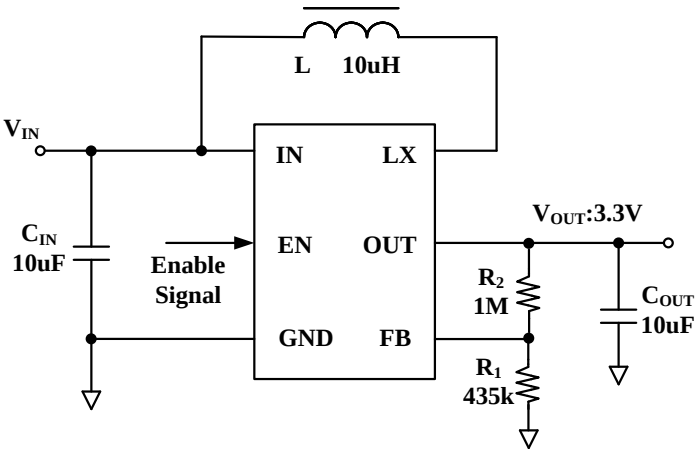


Figure 1. Schematic Diagram

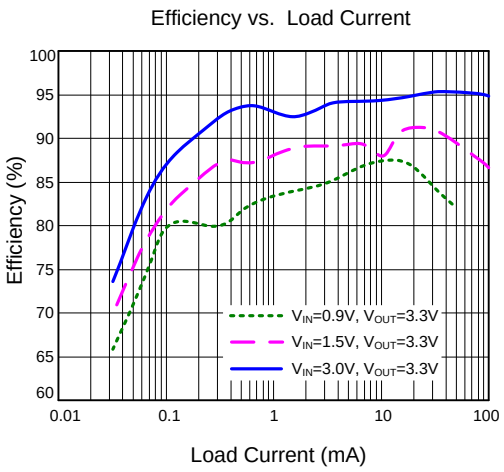
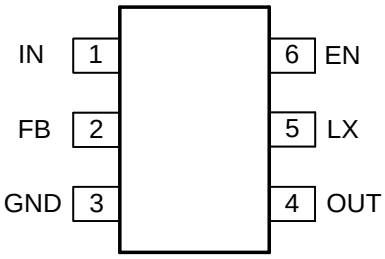


Figure 2. Efficiency vs. Load Current

Pinout (top view)

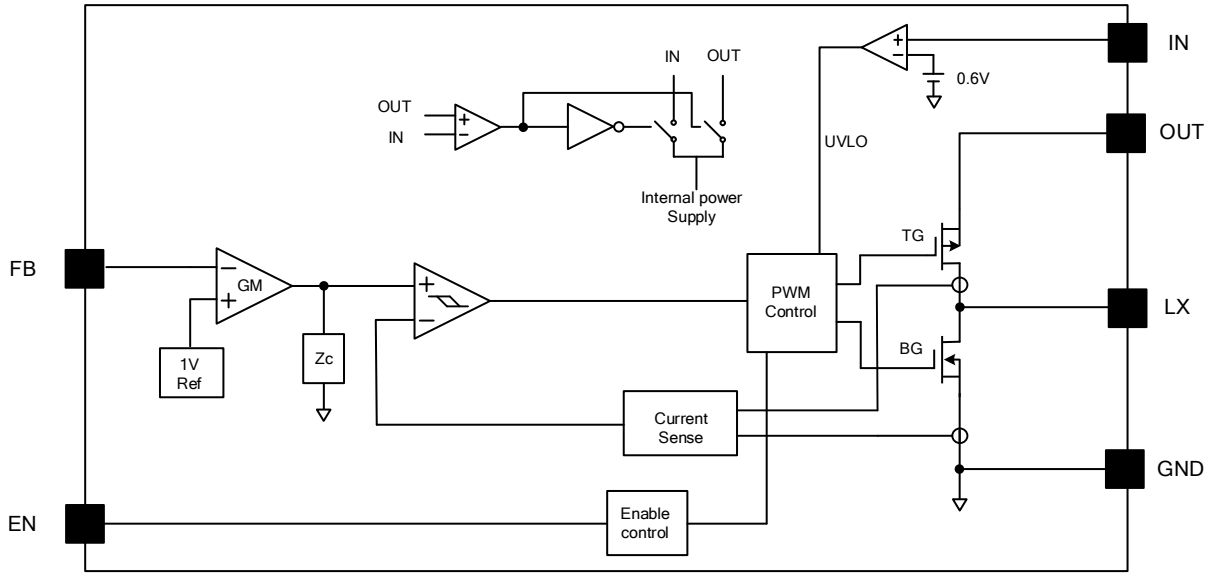


(SOT-363)

Top mark: **ME*xyz*** (Device code: ME, ***x=year code, y=week code, z= lot number code***)

Name	Number	Description
IN	1	Input pin. Decouple this pin to the GND pin with a 10μF ceramic capacitor.
FB	2	Feedback pin. Connect a resistor R_1 between OUT and FB, and a resistor R_2 between FB and GND to program the output voltage. $V_{OUT}=1.0V\times(R_2/R_1+1)$
GND	3	Ground pin.
OUT	4	Output pin. Decouple this pin to the GND pin with a minimum of 10μF ceramic capacitor.
LX	5	Inductor node. Connect an inductor between the IN pin and the LX pin.
EN	6	Enable pin. Pull it high to turn on or pull it low to shut down the part. Do not leave it floating.

Block Diagram



Absolute Maximum Ratings (Note 1)

All Pins to GND---------- 6V
Power Dissipation, P_D @ T_A = 25°C SOT-363---------- 0.6W
Package Thermal Resistance (Note 2)
θ_{JA} ---------- 161°C/W
θ_{JC} ---------- 130°C/W
Junction Temperature Range ---------- 150°C
Lead Temperature (Soldering, 10 sec.) ---------- 260°C
Storage Temperature Range ---------- -65°C to 150°C

Recommended Operating Conditions (Note 3)

IN ---------- 0.7V to 5.0V
EN ---------- 0V to V_{OUT}+0.3V
All other pins ---------- 0-5.0V
Junction Temperature Range ---------- -40°C to 125°C
Ambient Temperature Range ---------- -40°C to 85°C

Electrical Characteristics

(V_{IN} =1.2V, V_{OUT}=3.3V, I_{OUT}=10mA, T_A = 25°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
Output Voltage Range		V_{OUT}		1.8		5.25	V
Quiescent Current	V_{IN}	IQ	Io=0mA,V_{EN}=V_{IN}=1.2V,		0.5		µA
	V_{OUT}		V_{OUT}=3.4V		5		
Shut Down Current		I_{SHDN}	V_{EN}=0V, V_{IN}=3.0V			1	µA
EN Rising Threshold		V_{ENH}	V_{IN}≤1.6	0.75xV_{IN}			V
			1.6<V_{IN}<5.0	1.2			V
EN Falling Threshold		V_{ENL}	V_{IN}≤1.6			0.2×V_{IN}	V
			1.6<V_{IN}<5.0			0.32	V
Low Side Main FET R_{ON}		$R_{DS(ON)1}$	V_{OUT}=3.3V		0.5		Ω
Synchronous FET R_{ON}		$R_{DS(ON)2}$	V_{OUT}=3.3V		0.7		Ω
Main FET Current Limit		I_{LIM}		300	350		mA
Reference Voltage		V_{REF}		0.97	1.0	1.03	V
Output Over Voltage Protection		V_{OVP}			5.8	6	V
Thermal Shutdown Temperature		T_{SD}			150		°C
Thermal Shutdown Hysteresis		T_{HYS}			20		°C
Under Voltage Lockout For Turn off Protection		V_{UVLO}	V_{IN} decreasing		0.6		V

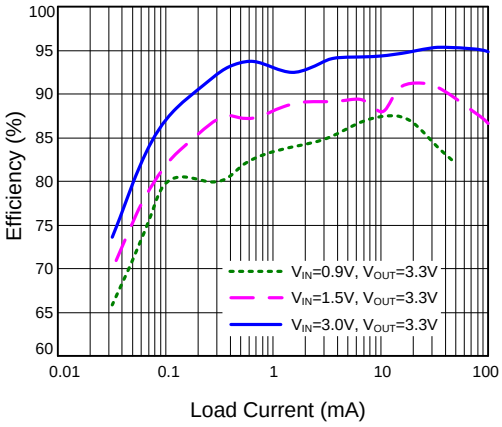
Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute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

Note 2: θ_{JA} is measured in the natural convection at T_A = 25°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.

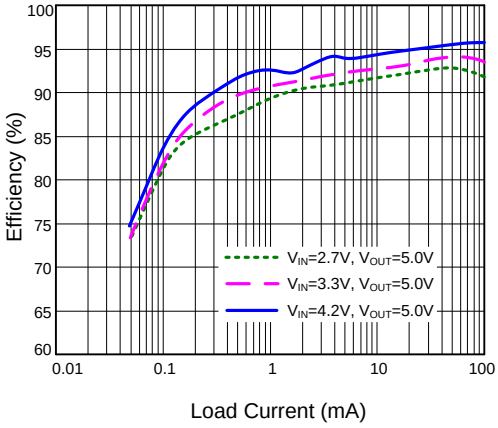
Note 3: The device is not guaranteed to function outside its operating conditions.

Typical Performance Characteristics

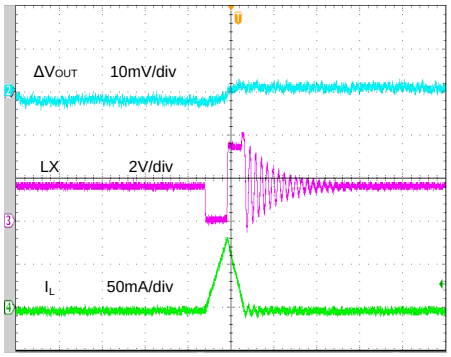
Efficiency vs. Load Current



Efficiency vs. Load Current

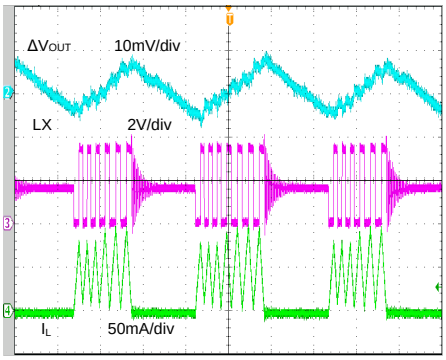


Output Ripple
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=0A)



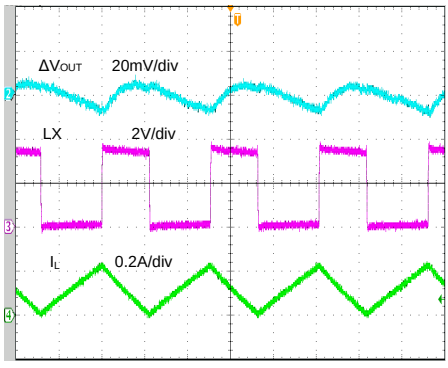
Time (1μs/div)

Output Ripple
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=10mA)



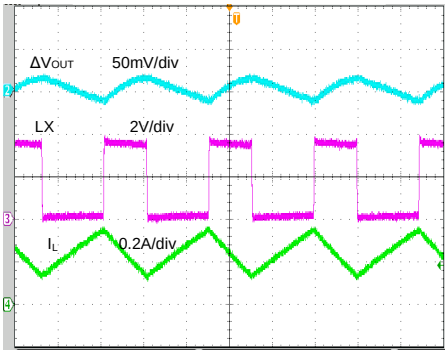
Time (4μs/div)

Output Ripple
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=50mA)



Time (1μs/div)

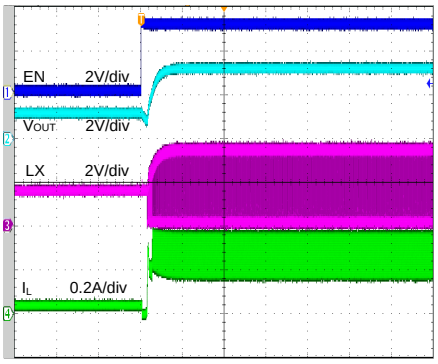
Output Ripple
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=100mA)



Time (1μs/div)

Startup from Enable

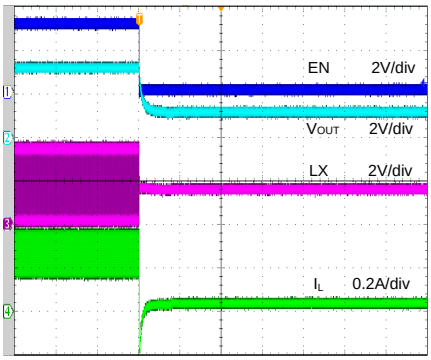
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=100mA)



Time (800μs/div)

Shutdown from Enable

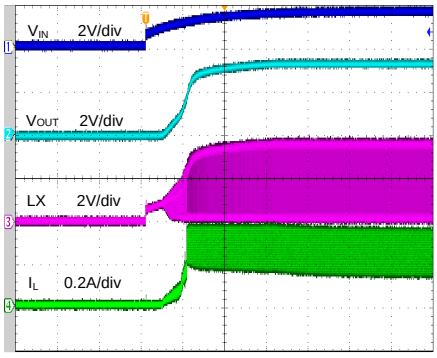
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=100mA)



Time (800μs/div)

Startup from V_{IN}

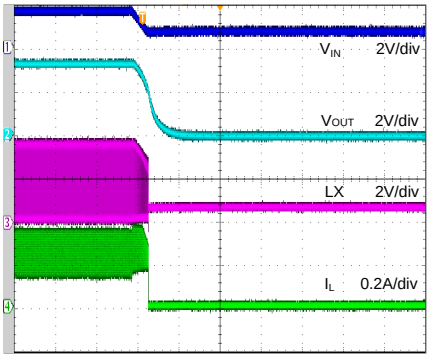
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=100mA)



Time (2ms/div)

Shutdown from V_{IN}

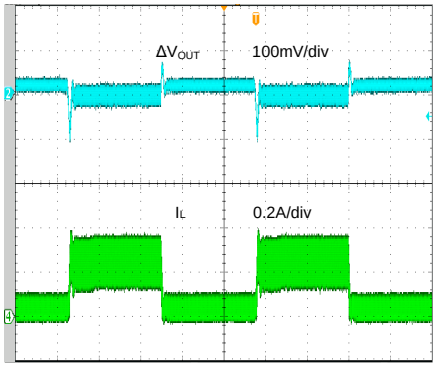
(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=100mA)



Time (2ms/div)

Load Transient

(V_{IN}=1.5V, V_{OUT}=3.3V, I_{OUT}=10mA ~ 100mA)



Time (800μs/div)

Applications Information

The SY7071 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.

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 CIN, 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 10V rating and greater than 10uF capacitance.

Inductor L:

A proper inductor must be connected between Pin VIN and Pin LX for SY7071 stable operation. 10uH inductor value is strongly recommended.

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

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

Recommended PCB Layout:

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

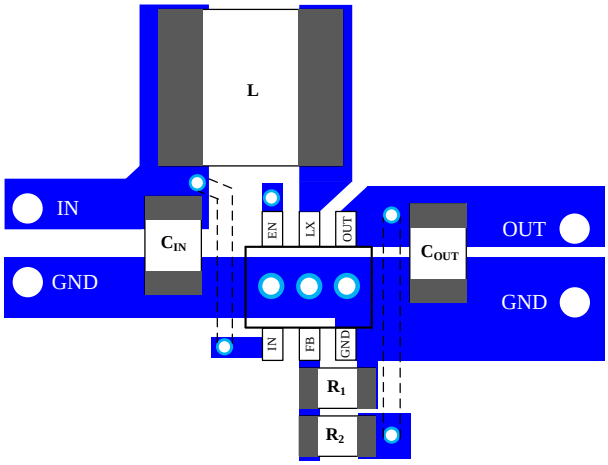
1) It is desirable to maximize the PCB copper area connecting to GND pin to achieve the best thermal and noise performance. If the board space allowed, a ground plane is highly desirable.

2) C_{OUT} must be close to Pins OUT and GND. The loop area formed by C_{OUT} and GND must be minimized.

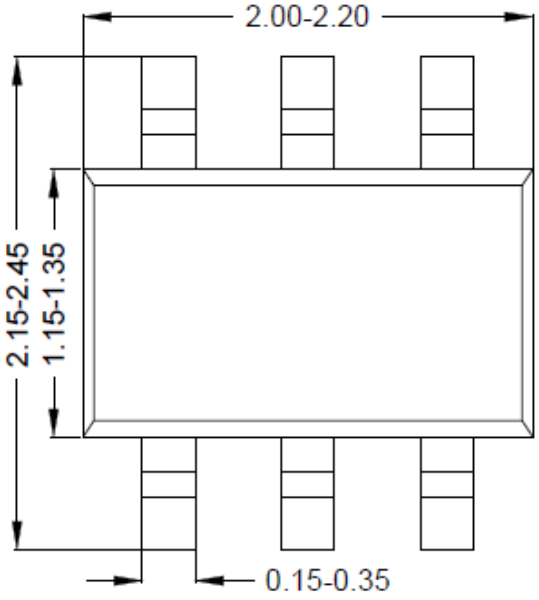
3) The PCB copper area associated with the LX pin must be minimized to avoid the potential noise problem.

4) The trace connecting to the FB pin must not be adjacent to the LX net on the PCB layout to avoid the noise problem.

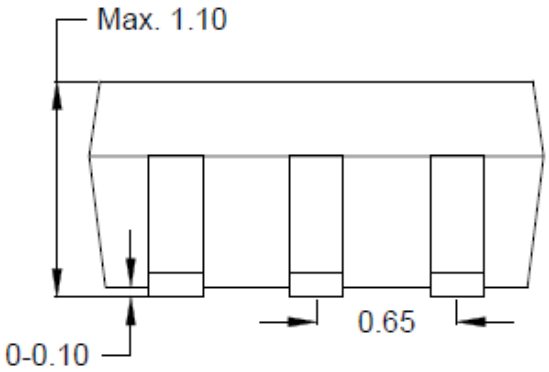
5) If the system chip interfacing with the EN pin has a high impedance state at shutdown mode and the IN pin is connected directly to a power source such as a Li-Ion battery, it is desirable to add a pull-down 1MΩ resistor between the EN and GND pins to prevent the noise from falsely turning on the regulator at shutdown mode.



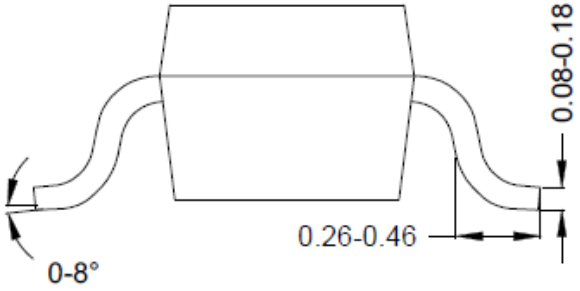
SOT-363 Package Outline Drawing



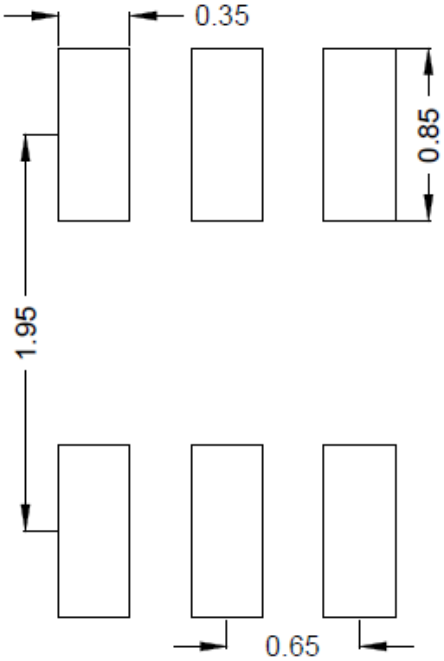
Top view



Side view A



Side view B

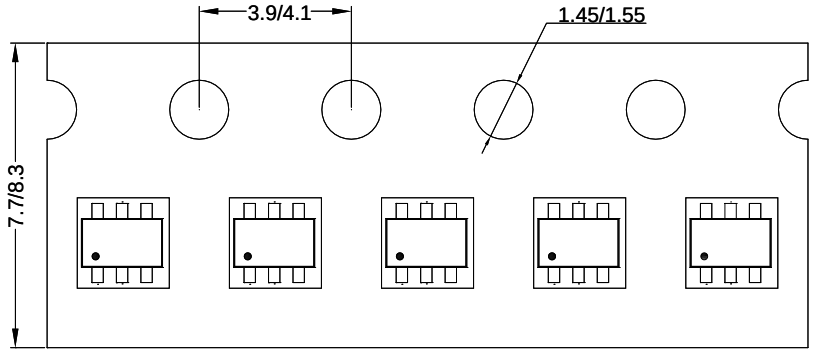


Recommended PCB layout (Reference only)

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

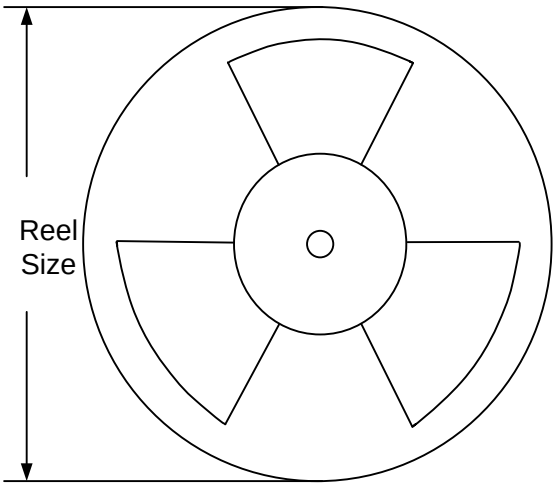
Taping & Reel Specification

1. SOT-363taping orientation



Feeding direction ⟶

2. Carrier Tape & Reel specification for packages



Package type	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel (pcs)
SOT363	8	4	7"	280	160	3000

3. Others: NA

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