

General Description

The SA21345D is an automotive grade, 150mA high current capacity linear regulator. It fixed the output voltage at 5V, which features ultra-low ground current and low drop out voltage. The device offers protection features includes over current limit, output short protection and over temperature protection.

The SA21345D is available in a compact SOT23-5 package.

Features

- Wide Input Voltage Range: 4V to 36V
- 150mA Maximum Load Current
- Low Dropout Voltage (150mV @ 150mA)
- Ultra-low Quiescent Current (15 μ A typ.)
- Stability with Tantalum or Ceramic Capacitors
- Excellent Load and Line Regulation
- Over Current Protection
- Thermal Shutdown
- Compact SOT23-5 Package
- Automotive AEC- Q100 Grade 1 Qualified

Applications

- Note Book
- Cell Phone
- Automotive LED Lighting ECU
- Automotive Body Modules

Typical Application

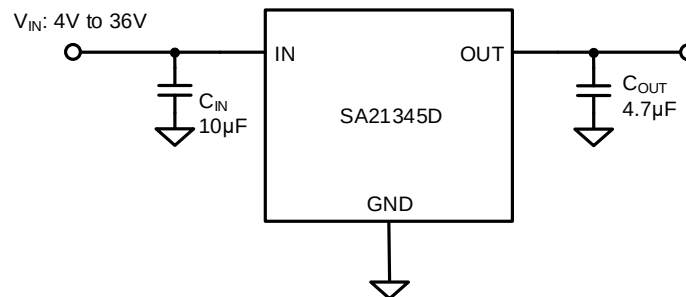


Figure 1 Schematic Diagram

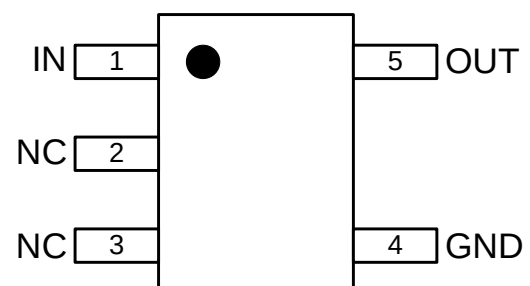
Ordering Information

Ordering Part Number	Package Type	Top Mark
SA21345DAAA	SOT23-5 RoHS Compliant and Halogen Free	H3xyz

Device code: H3

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

Pinout (top view)



Pin Description

Pin Name	Pin number	Pin Description
IN	1	Input pin, decoupled with at least 1 μ F MLCC capacitor to GND.
GND	4	Ground pin
OUT	5	Output pin, decoupled with a 4.7 μ F MLCC capacitor to GND.
NC	2,3	Not connected.

Block Diagram

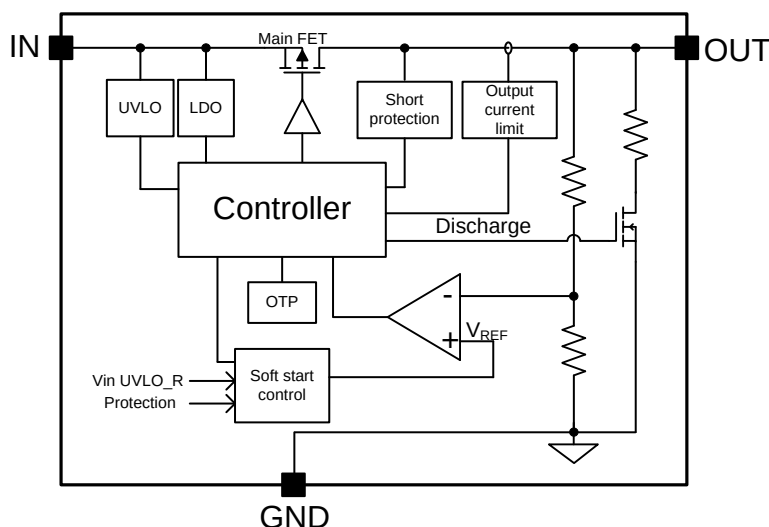


Figure 2. Block Diagram

Absolute Maximum Ratings

Parameter (Note1)	Min	Max	Unit
IN to GND	-0.3	40	V
OUT to GND	-0.3	8	
Lead Temperature (Soldering, 10 sec.)		260	°C
Junction Temperature, Operating	-40	150	
Storage Temperature	-65	150	

Thermal Information

Parameter (Note2)	Typ	Unit
θ_{JA} Junction-to-ambient Thermal Resistance	210	°C/W
θ_{JC} Junction-to-case Thermal Resistance	38.4	
P_D Power Dissipation $T_A=25^{\circ}\text{C}$	0.47	W

ESD Susceptibility

Parameter	Min	Max	Unit
HBM (Human Body Mode)		2	kV
CDM (Charged Device Mode)		500	V

Recommended Operating Conditions

Parameter (Note3)	Min	Max	Unit
IN	4	36	V
OUT	0	8	
Ambient Temperature	-40	125	°C

Electrical Characteristics

($V_{IN} = 12V$, $T_J = -40^{\circ}C \sim 125^{\circ}C$, unless otherwise specified, the values are guaranteed by test design or statistical correlation.)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage	V_{IN}		4		36	V
Input Voltage UVLO Threshold	V_{ULVO}	V_{IN} rising	2.9	3.3	4	V
UVLO Hysteresis	V_{UVLO_HYS}			200		mV
Output Voltage	V_{OUT}	$T_J = -40^{\circ}C \sim 125^{\circ}C$	4.9	5	5.1	V
		$T_J = 25^{\circ}C$	4.95	5	5.05	V
Line Regulation	ΔV_{LNR}	$I_{OUT} = 10mA$, $5.5V \leq V_{IN} \leq 36V$		1	1.5	mV/V
Load Regulation	ΔV_{LDR}	$V_{IN} = 6V$, $10mA \leq I_{OUT} \leq 0.15V$		0.25	0.5	%
Dropout Voltage	ΔV_{DROP}	$I_{OUT} = 10mA$		10	20	mV
		$I_{OUT} = 150mA$		150	300	mV
Quiescent Current	I_Q	$I_{OUT} = 0mA$ $V_{IN} = (V_{OUT} + 1V) \sim 36V$		15	22	μA
Current Limit	I_{LMT}	Force $V_{OUT} = 4.5V$	600			mA
Output Short Protection Threshold	V_{SHORT}	Force V_{OUT} from 5V to 0V	0.4	0.8	1.5	V
Output Short Off Time	t_{SHORT_OFF}			16		ms
Power Supply Rejection Ratio (Note 4)	PSRR	Frequency = 100Hz, $C_{OUT} = 4.7\mu F$, $I_{OUT} = 10mA$, $T_A = 25^{\circ}C$		60		dB
		Frequency = 100kHz, $C_{OUT} = 4.7\mu F$, $I_{OUT} = 10mA$, $T_A = 25^{\circ}C$		35		dB
Output Discharge Resistor	R_{DIS}	$V_{IN} = 3V$, $V_{OUT} = 2V$		500		Ω
Soft-start Time	t_{SS}			1		ms
Thermal Shutdown Temperature (Note 4)	T_{SD}			150		°C
Thermal Shutdown Hysteresis (Note 4)	T_{HYS}			20		°C

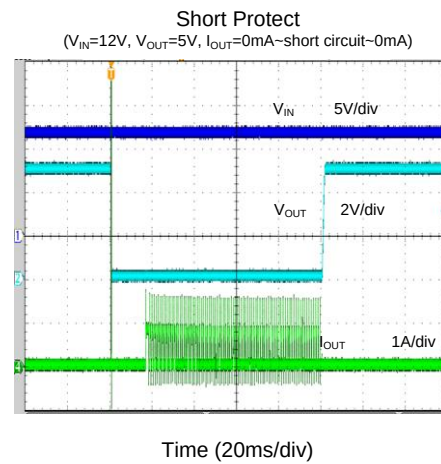
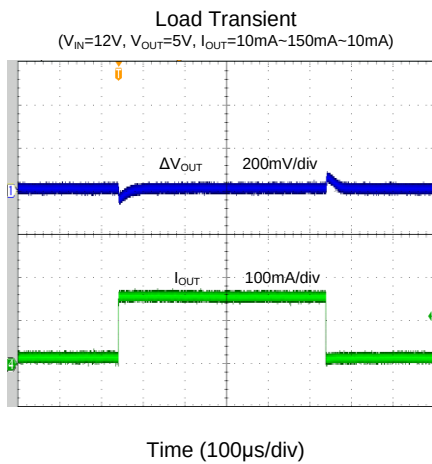
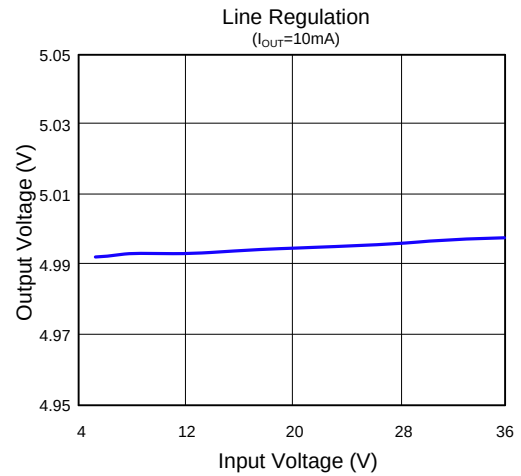
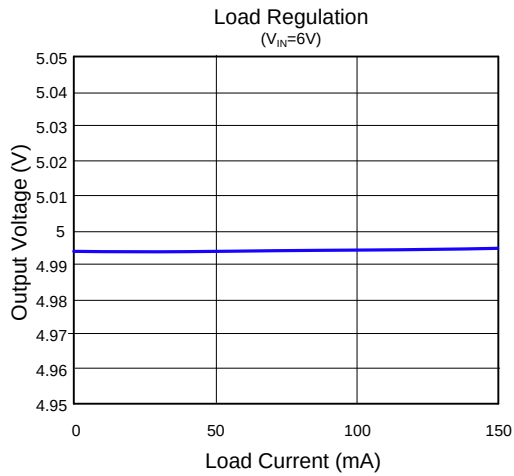
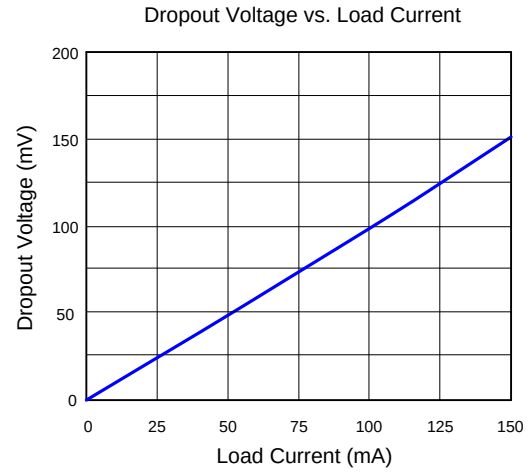
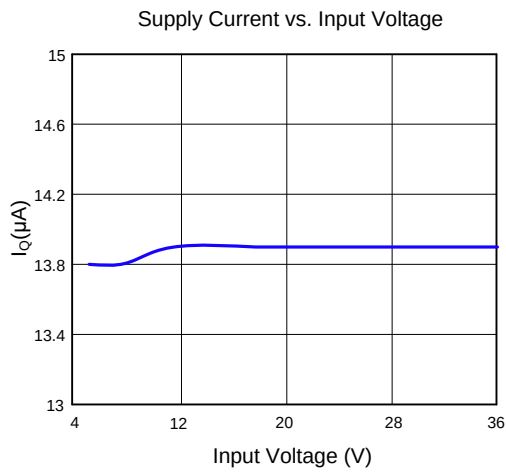
Note 1: Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute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

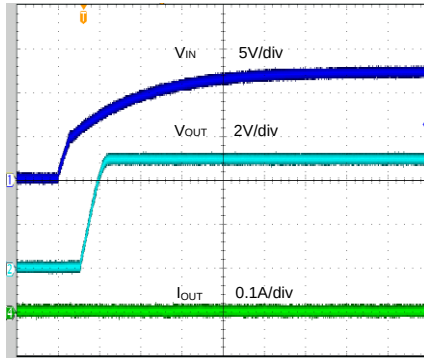
Note 3: The device is not guaranteed to function outside its operating conditions.

Note 4: Guaranteed by design.

Typical Performance Characteristics

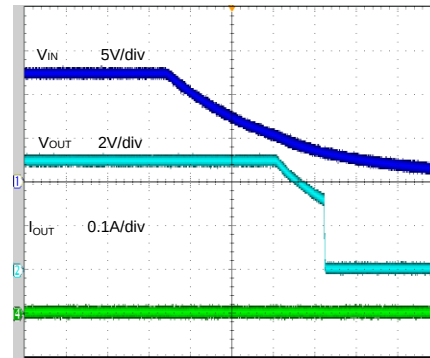


Startup from V_{IN}
($V_{IN}=12V$, $V_{OUT}=5V$, $I_{OUT}=0mA$)



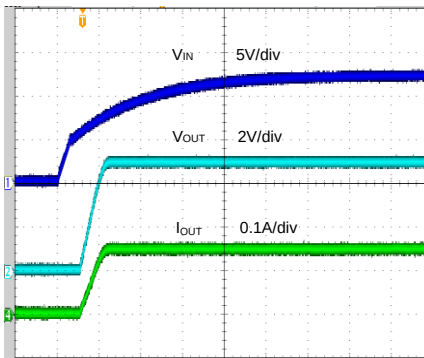
Time (2ms/div)

Shutdown from V_{IN}
($V_{IN}=12V$, $V_{OUT}=5V$, $I_{OUT}=0mA$)



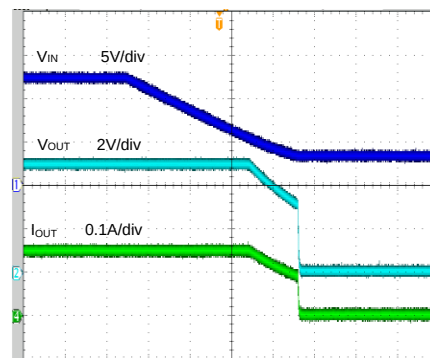
Time (400ms/div)

Startup from V_{IN}
($V_{IN}=12V$, $V_{OUT}=5V$, $I_{OUT}=150mA$)



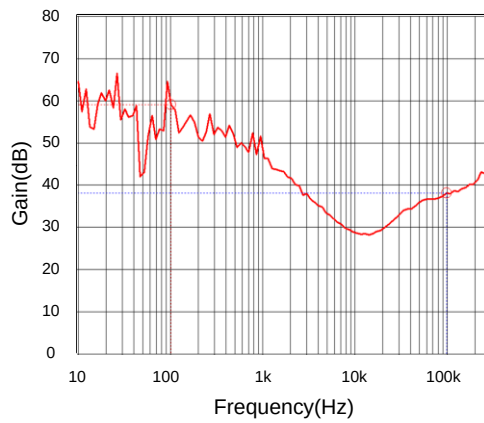
Time (2ms/div)

Shutdown from V_{IN}
($V_{IN}=12V$, $V_{OUT}=5V$, $I_{OUT}=150mA$)



Time (10ms/div)

PSRR
($V_{IN}=8V$, $V_{OUT}=5V$, $C_{OUT}=4.7\mu F$, 10mA Load)



Applications Information

The SA21345D is a 150mA high current capacity linear regulator. It fixed the output voltage at 5V, which features ultra-low ground current and low drop out voltage. The device with fully protection includes over current limit, output short protection and over temperature protection.

Over Temperature Protection (OTP)

The SA21345D includes over-temperature protection (OTP) circuitry to prevent overheating due to excessive power dissipation. This will turn off the device when the junction temperature exceeds 150°C. Once the junction temperature cools down by approximately 20°C the IC will resume normal operation

Output Short Circuit Protect

If V_{OUT} drop below than 0.8V, the short circuit protection mode will be initiated, and the device will be shut down for approximately 16ms. The device will

then restart with a complete soft-start cycle. If the short circuit condition remains another 'hiccup' cycle of shutdown and restart will continue indefinitely unless the OTP threshold is reached.

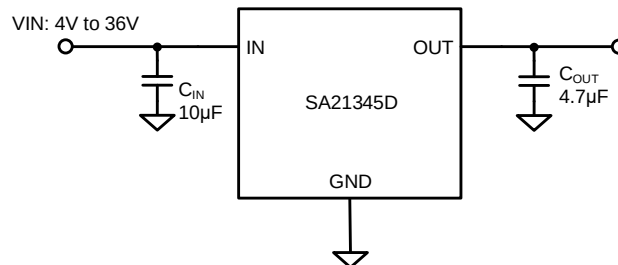
Input Capacitor C_{IN}

To minimize the potential noise problem and improve power-supply rejection(PSRR) and transient response, 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 4.7μF low ESR ceramic capacitor is recommended.

Output Capacitor C_{OUT}

For stable operation over the full temperature range, a 4.7μF low-ESR ceramic capacitor is recommended. Use larger output-capacitor values such as 22μF to reduce noise, improve load-transient response and PSRR. Some ceramic dielectrics exhibit large capacitance and ESR variations with temperature.

Schematic



BOM List

Designator	Description	Part Number	Manufacturer
C1	10μF/ 25V/ 1206		
C2	2.2μF/ 25V/ 1206		

PCB Layout Guide

For best performance of the SA21345D, the following guidelines must be strictly followed:

1. Keep all power trace as short and wide as possible. And it is desirable to use 2-layer or 4-layer board for

thermal performance and better capability of current flow.

2. Place input/output capacitor close to the IC for better transient performance.

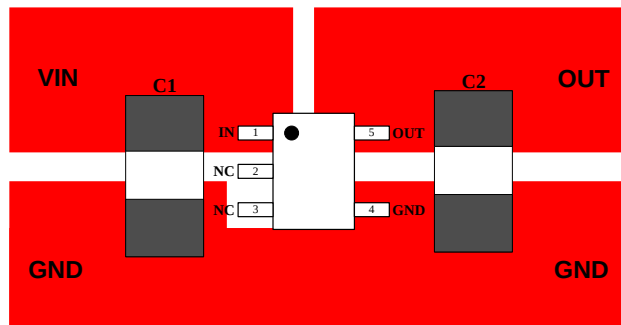
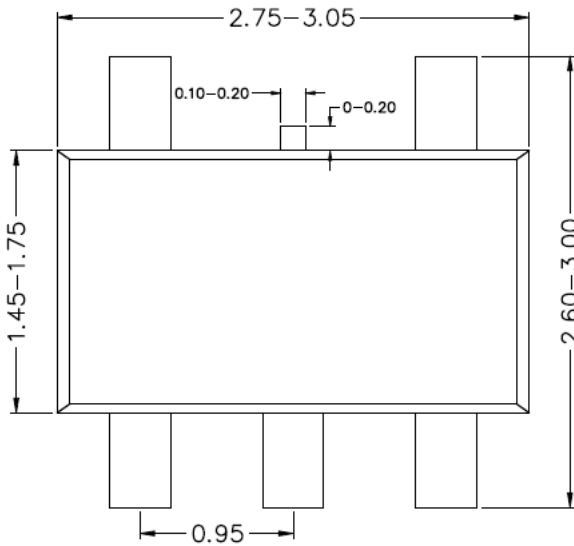
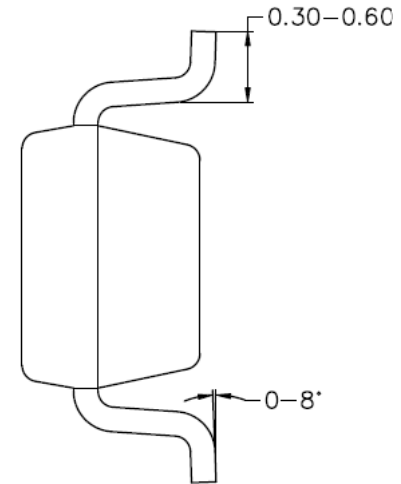


Figure 3. PCB Layout Suggestion

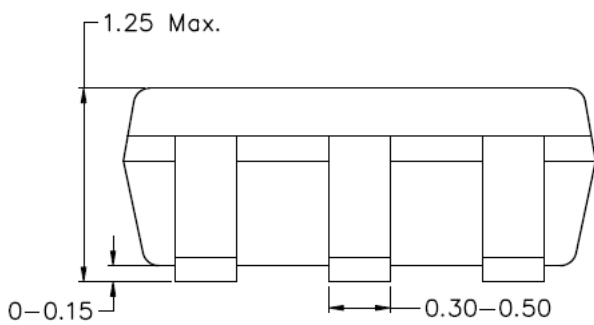
SOT23-5 Package Outline & PCB layout



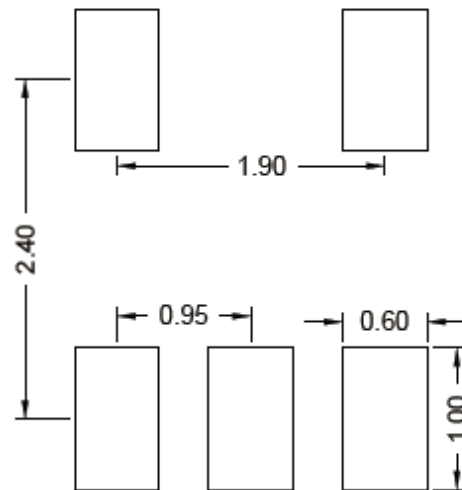
Top view



Side view



Front view



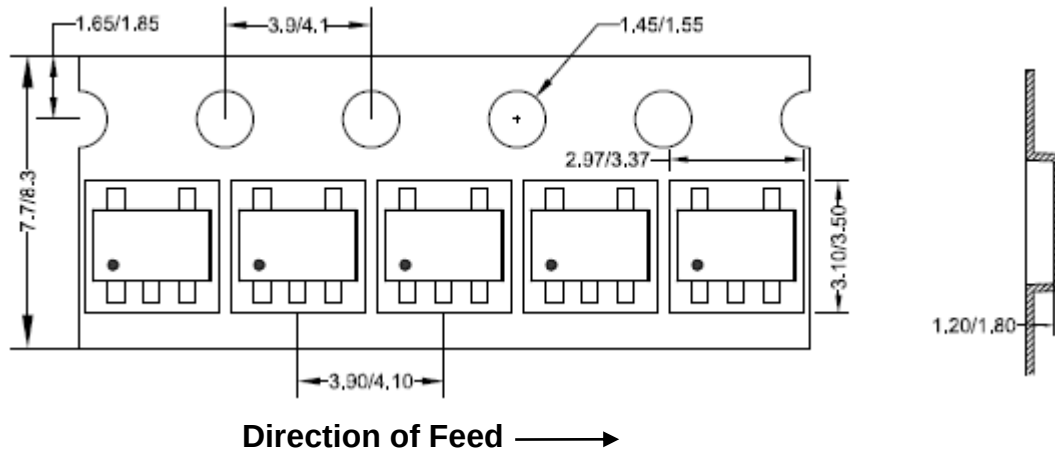
**Recommended PCB pad Layout
(Reference only)**

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

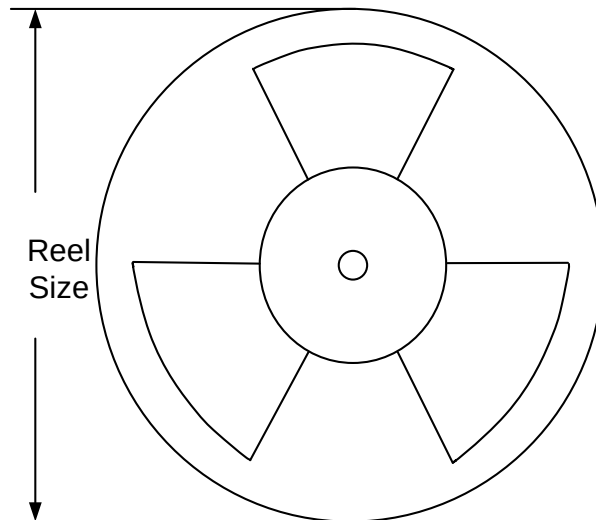
Tape and Reel Information

1. Tape Dimensions and Pin 1 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
Sep. 24, 2024	Revision 1.0	Initial Release

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