SA21345G

40V 150mA LDO

General Description

The SA21345G 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 operation.

Features

- Wide Input Voltage Range: 4V to 36V
- Low Dropout Voltage (150mV @ 150mA)
- Ultra-low Quiescent Current
- Stability with Tantalum or Ceramic Capacitors
- Excellent Load And Line Regulation
- 150mA Maximum Load Current for SO8
- Over Current Protection
- Thermal Shutdown Protection
- Compact SO8 Package
- RoHS Compliant and Halogen Free
- Automotive AEC- Q100 Grade 1 Certified

Ordering Information

SA21345 □(□□)□

- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SA21345GFAA	SO8	

Applications

- Automotive LED Lighting ECU
- Automotive Body Modules

Typical Applications

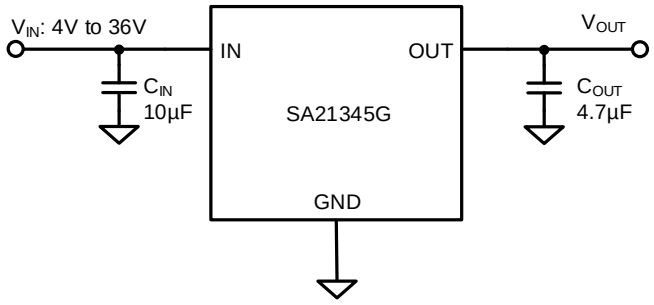


Figure 1. Schematic Diagram

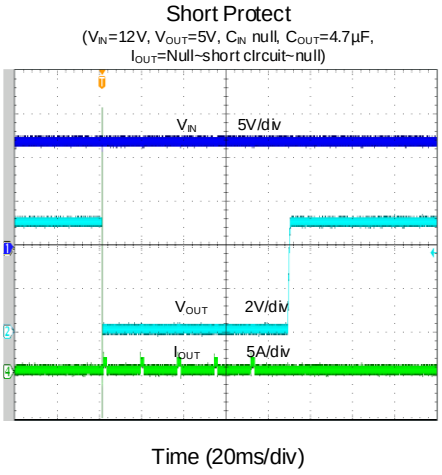
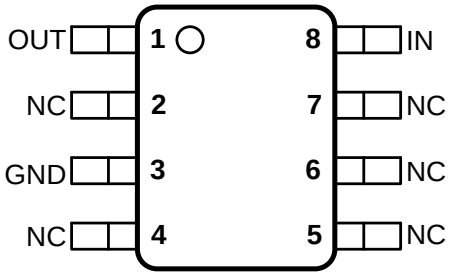


Figure 2. Dropout Characteristics

Pinout (top view)



(SO8)

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

Pin Name	Pin number	Pin Description
OUT	1	Output pin, decoupled with a 4.7μF MLCC capacitor to GND.
NC	2, 4, 5, 6, 7	No Connection.
GND	3	Ground pin.
IN	8	Input pin, decoupled with at least a 10μF MLCC capacitor to GND.

Function Block

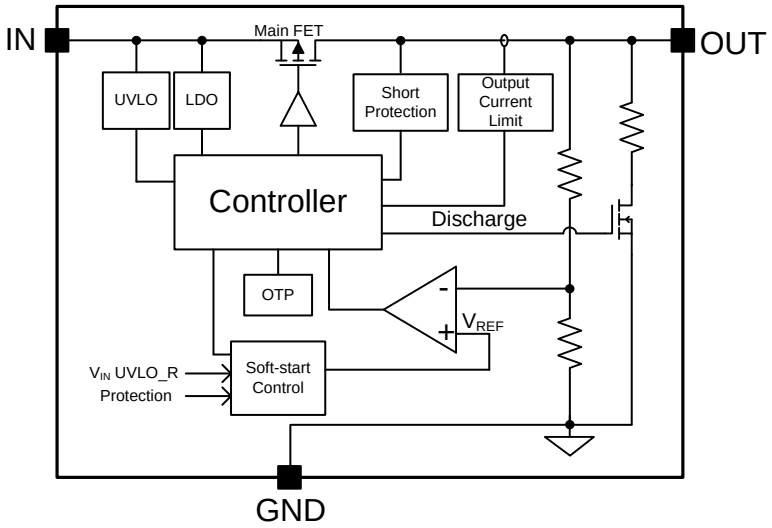


Figure3. Block Diagram

Absolute Maximum Ratings (Note 1)

IN to GND ---------- -0.3V to 40V
OUT to GND ---------- -0.3V to 8V
Power Dissipation, P_D @ T_A = 25°C SO8 ---------- 0.926W
Package Thermal Resistance (Note 2)
θ_{JA} ---------- 108°C/W
θ_{JC} ---------- 50°C/W
Junction Temperature---------- -40°C to 150°C
Lead Temperature (Soldering, 10 sec.) ---------- 260°C
Storage Temperature Range ---------- -65°C to 150°C

Recommended Operating Conditions (Note 3)

IN ---------- 4V to 36V
OUT ---------- 0V to 8V
Ambient Temperature Range ---------- -40°C to 125°C

Electrical Characteristics

(V_{IN} = V_{EN}=12V, T_J = -40°C~125°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		3.3	4	V
UVLO Hysteresis	$V_{UVLO,HYS}$			200		mV
Output Voltage	V_{OUT}	T_J= -40°C ~ 125°C	4.9	5	5.1	V
		T_J= 25°C	4.95	5	5.05	V
Line Regulation	ΔV_{LNR}	I_{OUT} = 10mA, 5.5V≤ V_{IN} ≤ 36V		1	1.5	mV/V
Load Regulation	ΔV_{LDR}	V_{IN}=6V, 10mA ≤ I_{OUT} ≤ 150mA		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) ~ 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	PSRR	Frequency = 100Hz, C_{OUT}=4.7μF, I_{OUT}=10mA, T_A=25°C		60		dB
		Frequency = 100kHz, C_{OUT}=4.7μF, I_{OUT}=10mA, T_A=25°C		35		dB
Soft-start Time	t_{SS}			1		ms
Thermal Shutdown Temperature	T_{SD}			150		°C
Thermal Shutdown Hysteresis	T_{HYS}			20		°C

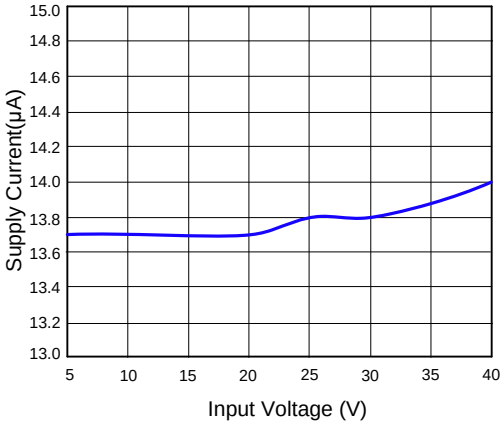
Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute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

Note 2: θ_{JA} is simulated in the natural convection at T_A=25° C on a Silergy evaluation board following JEDEC51-2 thermal measurement standard.

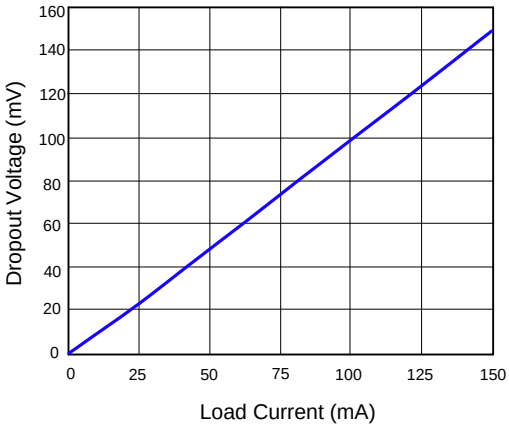
Note 3: The device is not guaranteed to function outside its operating conditions.

Typical Performance Characteristics

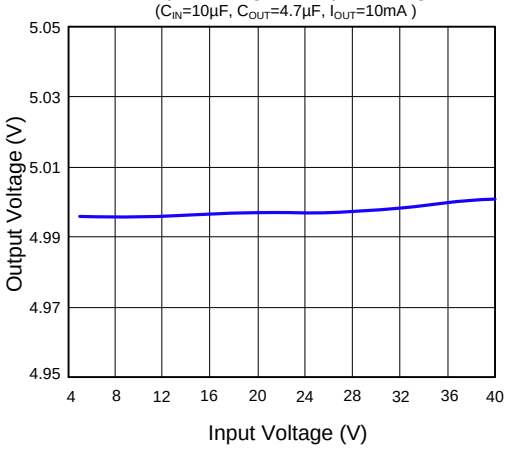
Supply Current vs. Input Voltage
(C_{IN}=10μF, C_{OUT}=4.7μF)



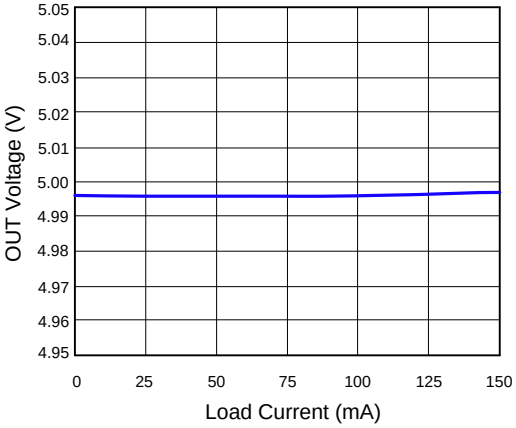
Dropout Voltage vs. Load Current
(V_{IN}=4.5V, C_{IN}=10μF, C_{OUT}=4.7μF)



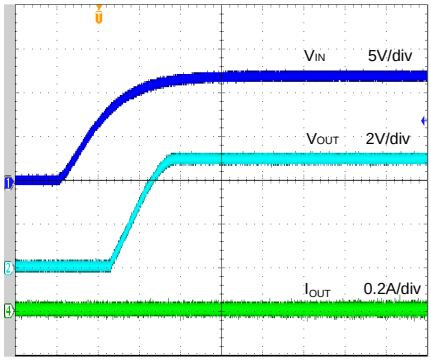
Output Voltage vs. Input Voltage
(C_{IN}=10μF, C_{OUT}=4.7μF, I_{OUT}=10mA)



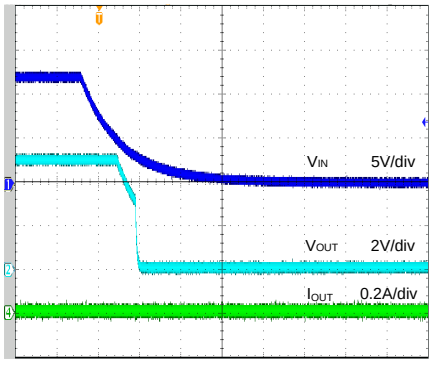
OUT Voltage vs. Load Current
(C_{IN}=10μF, C_{OUT}=4.7μF)



Startup from V_{IN}
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, Null Load)

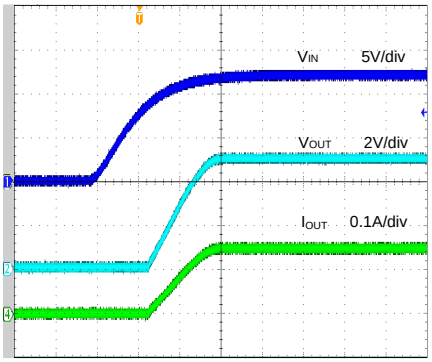


Shutdown from V_{IN}
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, Null Load)



Startup from V_{IN}

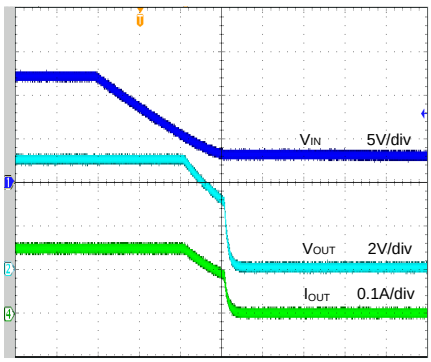
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, I_{OUT}=150mA)



Time (800μs/div)

Shutdown from V_{IN}

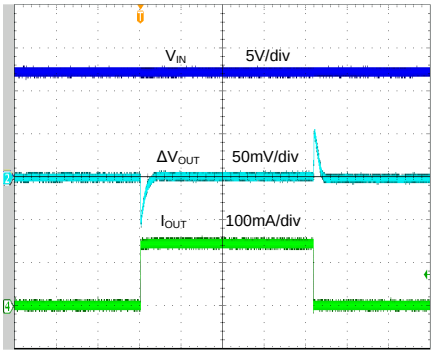
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, I_{OUT}=150mA)



Time (2ms/div)

Load Transient

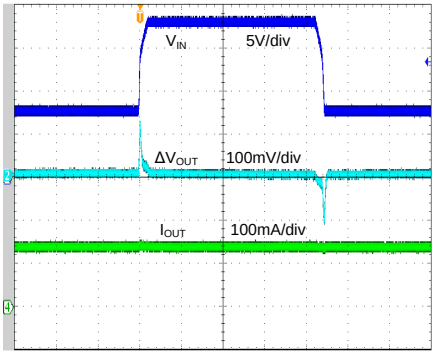
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, I_{OUT}=10mA~150mA~10mA)



Time (200μs/div)

Line Transient

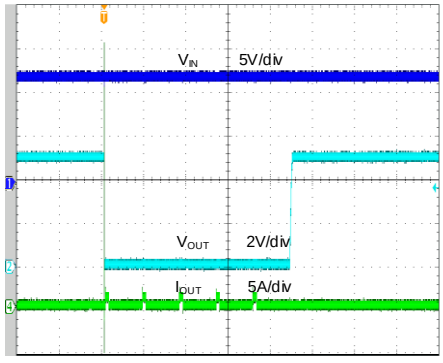
(V_{IN}=8V~18V~8V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, I_{OUT}=150mA)



Time (800μs/div)

Short Protect

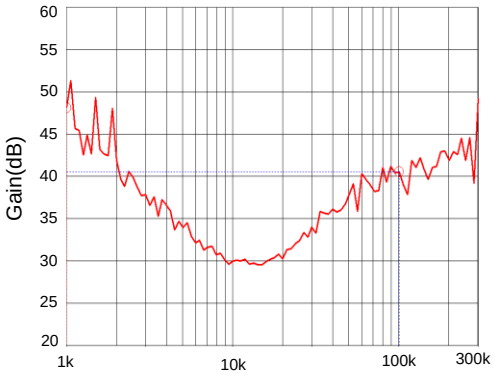
(V_{IN}=12V, V_{OUT}=5V, C_{IN} null, C_{OUT}=4.7μF, I_{OUT}=Null~short circuit~null)



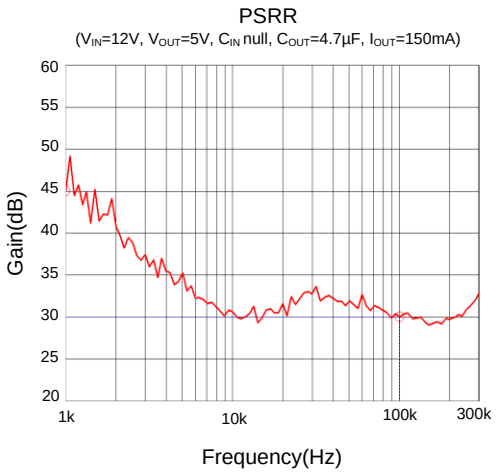
Time (20ms/div)

PSRR

(V_{IN}=12V, V_{OUT}=5V, C_{IN} null, C_{OUT}=4.7μF, I_{OUT}=10mA)



Frequency(Hz)



Operation

The SA21345G 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.

Applications Information

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 CIN, and IN/GND pins. In this case, a 10μF 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.

Over Temperature Protection (OTP):

The SA21345G 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 'hic-cup' cycle of shutdown and restart will continue indefinitely unless the OTP threshold is reached.

PCB Layout Guide:

For best performance of the SA21345G, 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.

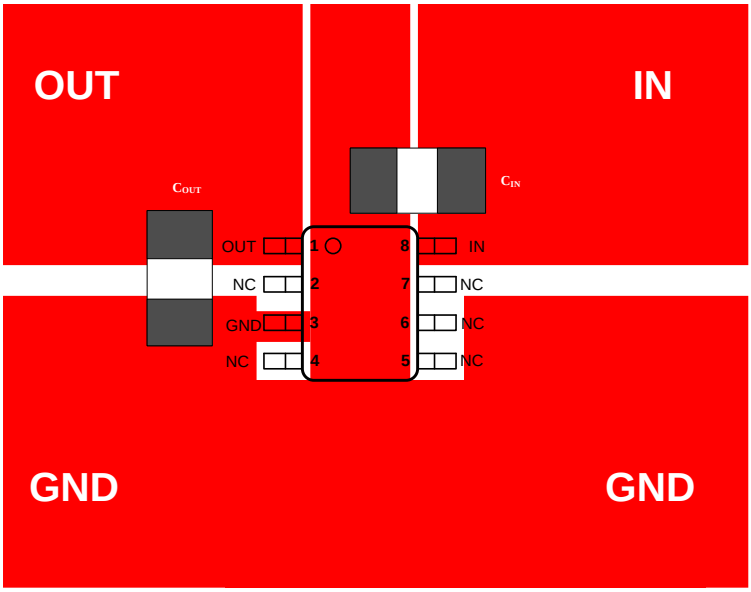
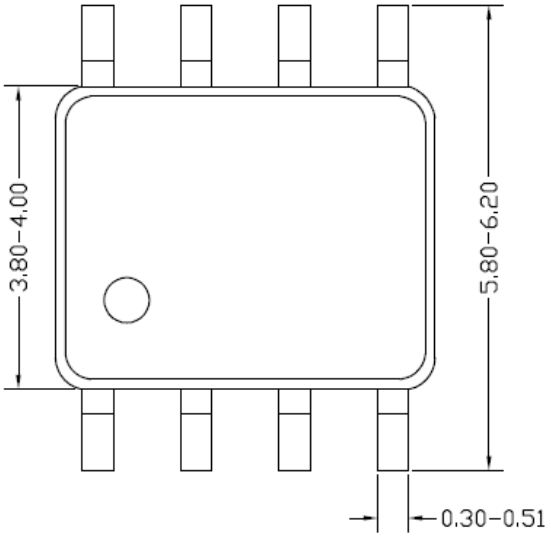
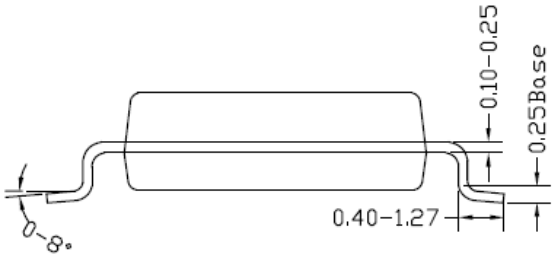


Figure4. PCB Layout Suggestion

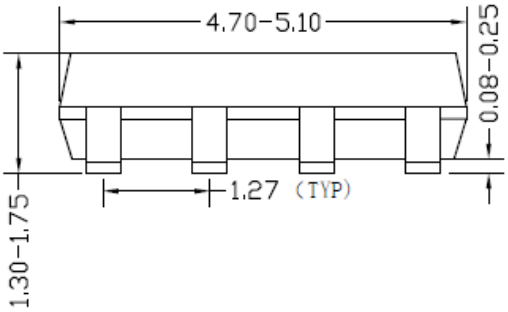
SO8 Package Outline & PCB Layout Design



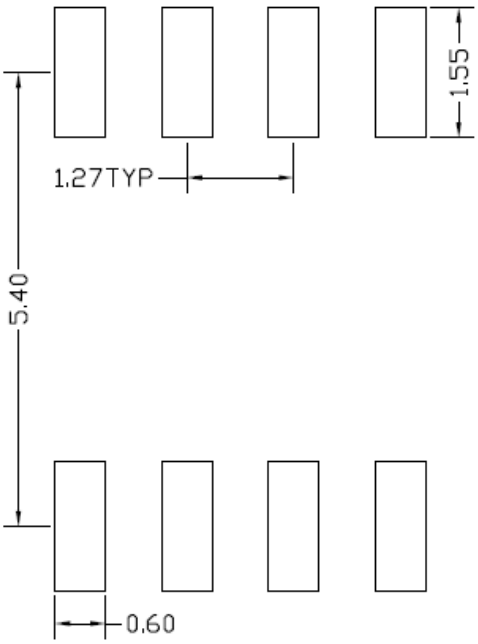
Top view



Side view



Front view

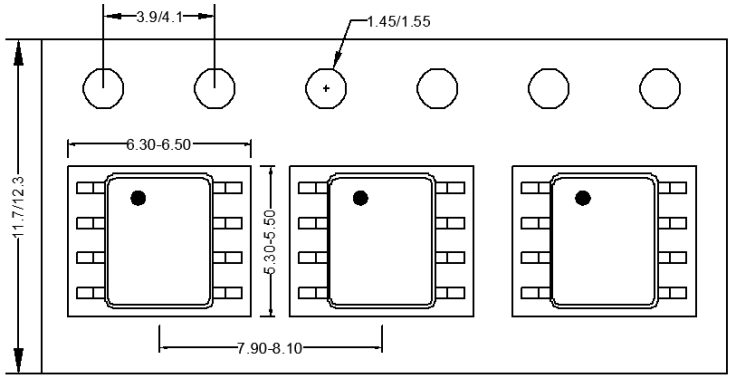


Recommended Pad Layout (Reference only)

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

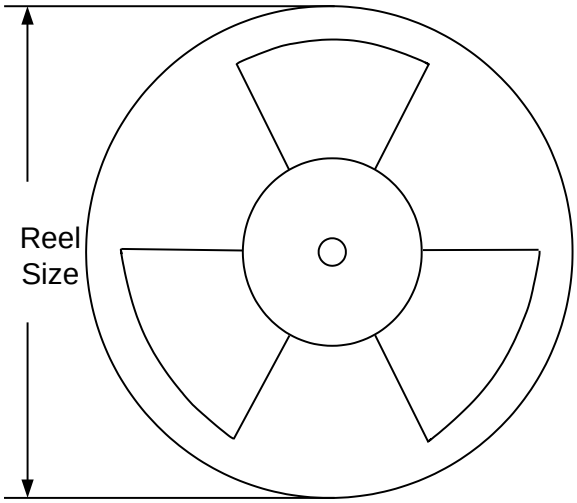
Taping & Reel Specification

1. Taping orientation for packages（SO8）



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
SO8	12	8	13"	400	400	2500

3. Others: NA

Revision History

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

Date	Revision	Change
May.31, 2022	Revision 0.9	Initial Release

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