SY2A27357G

40V 150mA LDO

General Description

The SY2A27357G 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.

Ordering Information

SY2A27357 □(□□)□
└ Temperature Code
Package Code
Optional Spec Code

Ordering Number	Package type	Note
SY2A27357GFAA	SO8	

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

Applications

- Automotive LED Lighting ECU
- Automotive Body Modules

Typical Applications

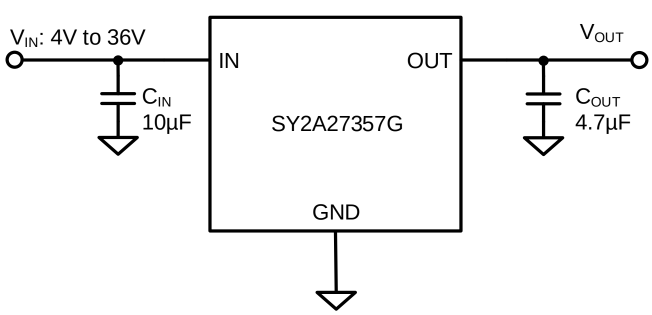


Figure 1. Schematic Diagram

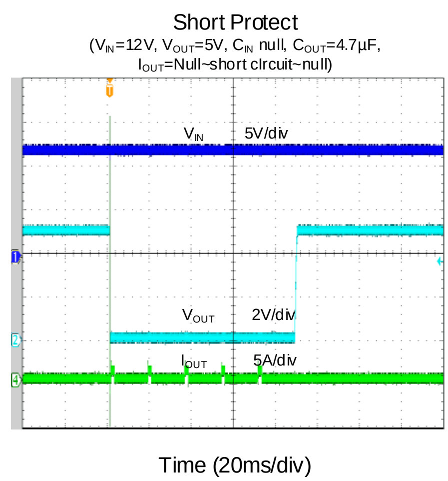
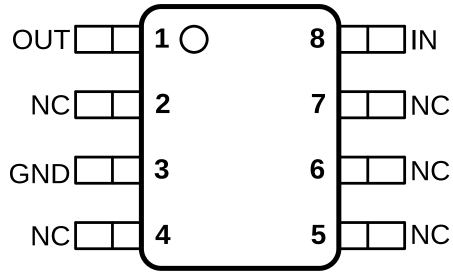


Figure 2. Dropout Characteristics

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

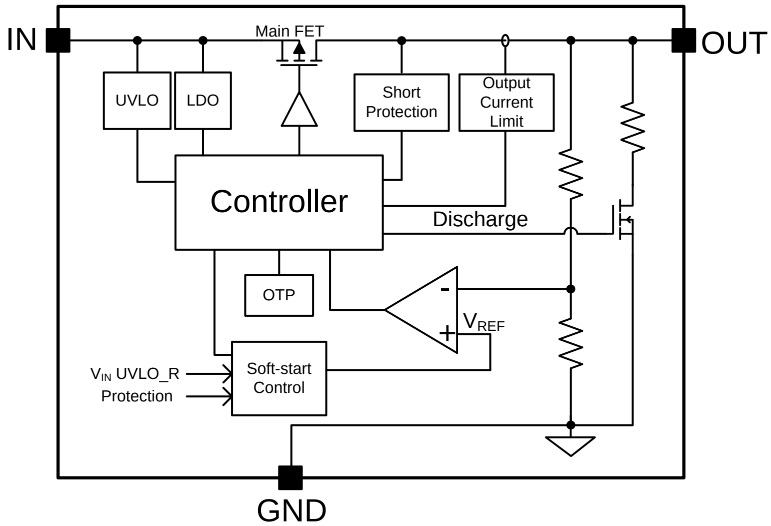


Figure3. Block Diagram

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

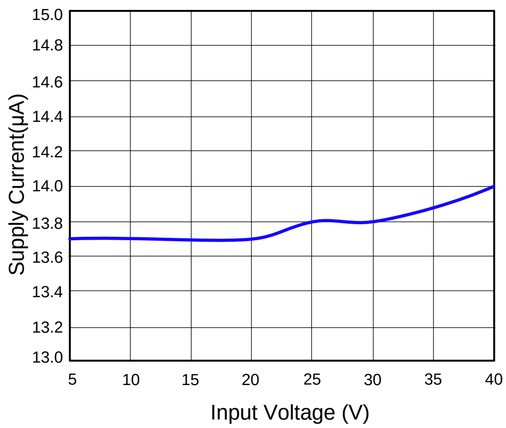
Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute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

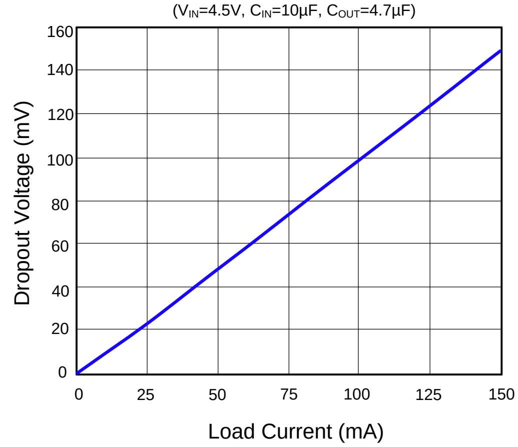
Note 3: The device is not guaranteed to function outside its operating conditions.

Typical Performance Characteristics

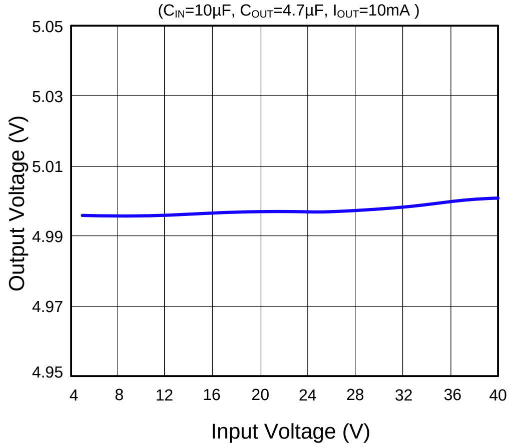
Supply Current vs. Input Voltage
(C_{IN}=10µF, C_{OUT}=4.7µF)



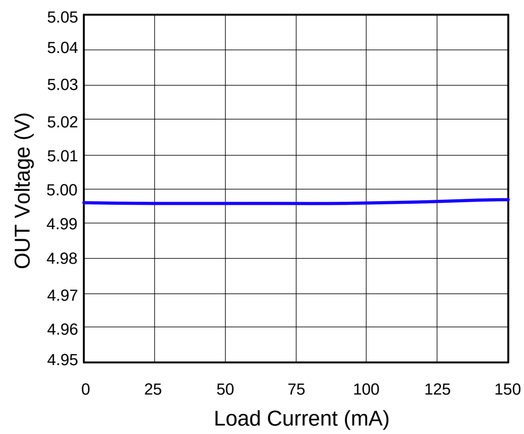
Dropout Voltage vs. Load Current
(V_{IN}=4.5V, C_{IN}=10µF, C_{OUT}=4.7µF)



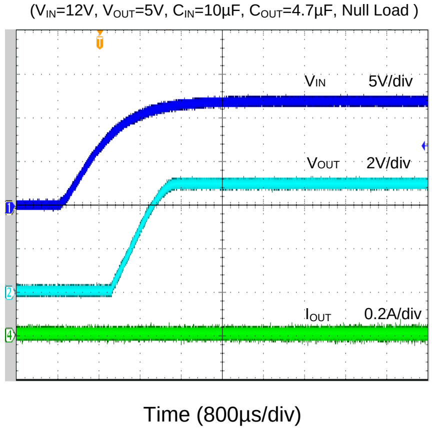
Output Voltage vs. Input Voltage
(C_{IN}=10µF, C_{OUT}=4.7µF, I_{OUT}=10mA)



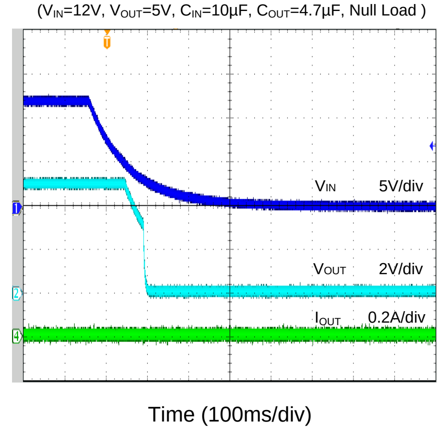
OUT Voltage vs. Load Current
(C_{IN}=10µF, C_{OUT}=4.7µF)



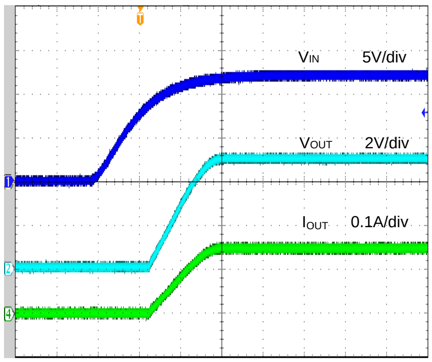
Startup from V_{IN}
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10µF, C_{OUT}=4.7µF, Null Load)



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

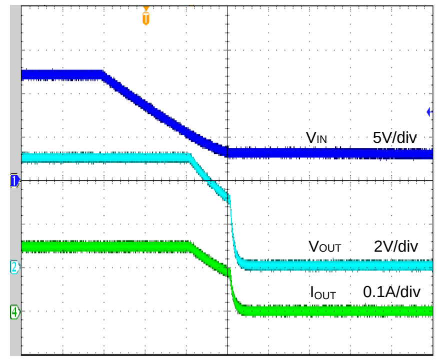


Startup from V_{IN}
(V_{IN}=12V, V_{OUT}=5V, C_{IN}=10μF, C_{OUT}=4.7μF, I_{OUT}=150mA)



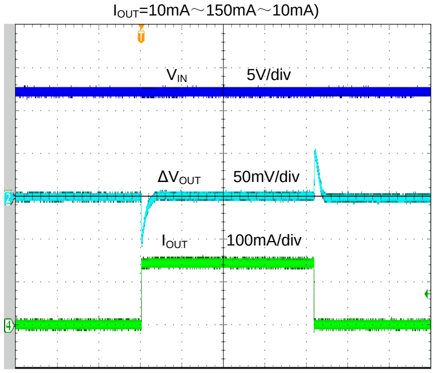
Time (800μs/div)

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



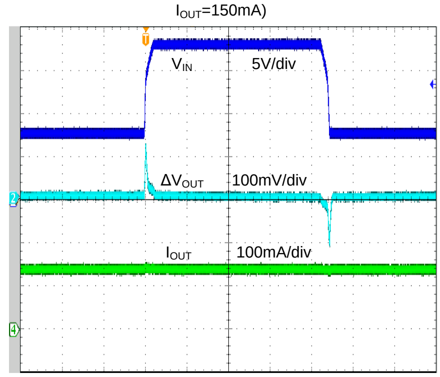
Time (2ms/div)

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



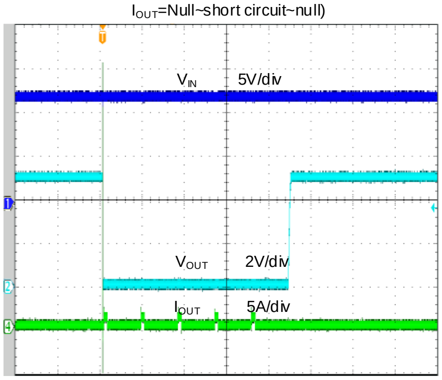
Time (200μs/div)

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



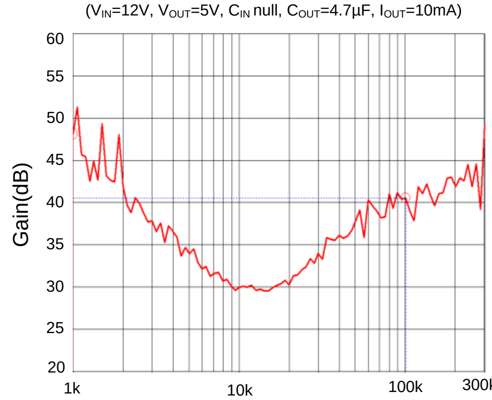
Time (800μs/div)

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

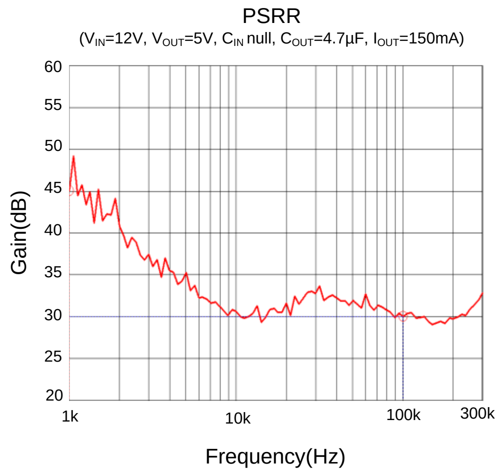


Time (20ms/div)

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



Frequency(Hz)


PSRR
(VIN=12V, VOUT=5V, CIN null, COUT=4.7µF, IOUT=150mA)
Gain(dB)
60
55
50
45
40
35
30
25
20
1k
10k
100k
300k
Frequency(Hz)

Operation

The SY2A27357G 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 SY2A27357G 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 SY2A27357G, 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.

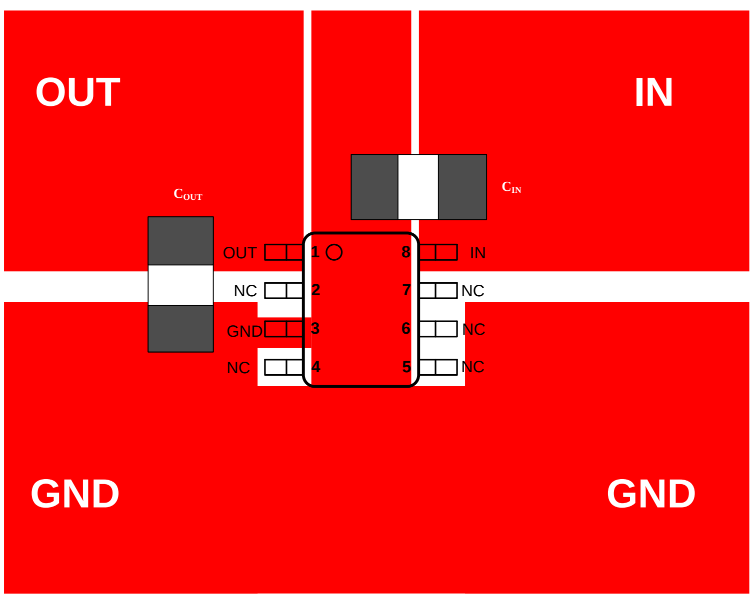
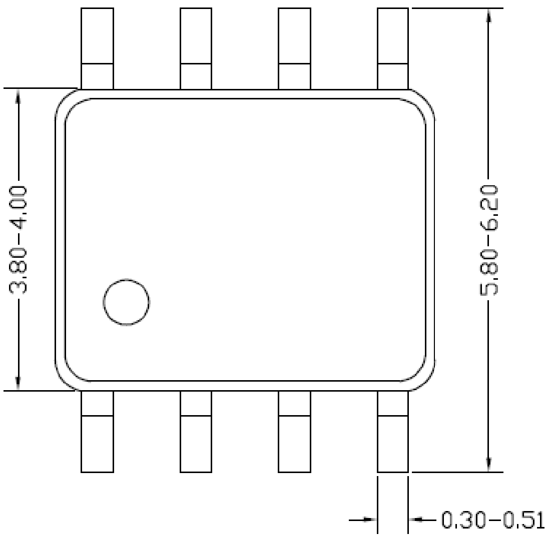
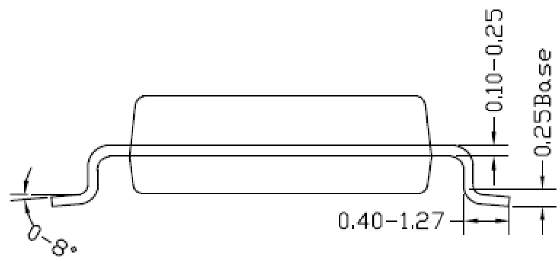


Figure4. PCB Layout Suggestion

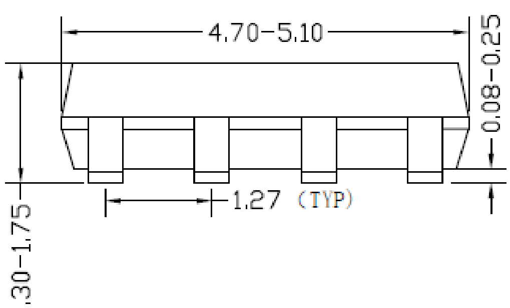
SO8 Package Outline & PCB Layout Design



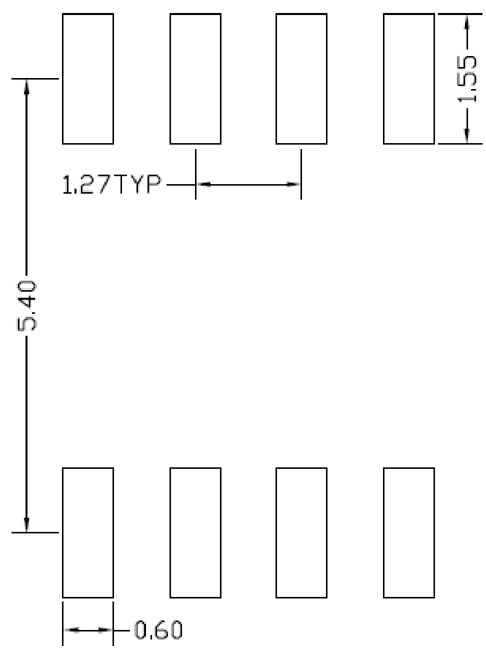
Top view



Side view



Front view

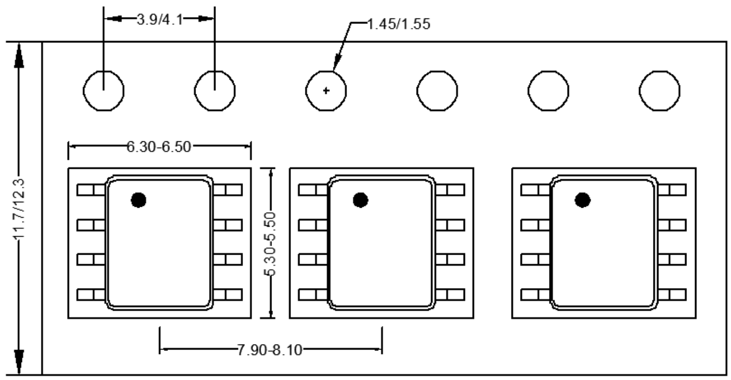


Recommended Pad Layout (Reference only)

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

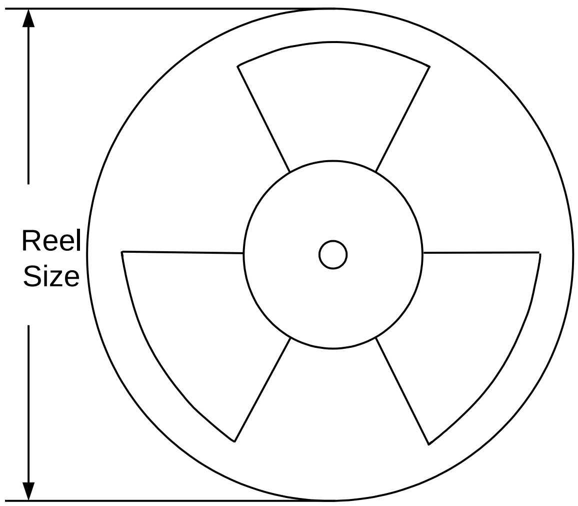
Taping & Reel Specification

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, 2023	Revision 1.0	Initial Production Release
May 31, 2022	Revision 0.9	Initial Release

IMPORTANT NOTICE

1. **Right to make changes.** Silergy and its subsidiaries (hereafter Silergy) reserve the right to change any information published in this document, including but not limited to circuitry, specification and/or product design, manufacturing or descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products are sold subject to Silergy's standard terms and conditions of sale.

2. **Applications.** Application examples that are described herein for any of these products are for illustrative purposes only. Silergy makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification. Buyers are responsible for the design and operation of their applications and products using Silergy products. Silergy or its subsidiaries assume no liability for any application assistance or designs of customer products. It is customer's sole responsibility to determine whether the Silergy product is suitable and fit for the customer's applications and products planned. To minimize the risks associated with customer's products and applications, customer should provide adequate design and operating safeguards. Customer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Silergy assumes no liability related to any default, damage, costs or problem in the customer's applications or products, or the application or use by customer's third-party buyers. Customer will fully indemnify Silergy, its subsidiaries, and their representatives against any damages arising out of the use of any Silergy components in safety-critical applications. It is also buyers' sole responsibility to warrant and guarantee that any intellectual property rights of a third party are not infringed upon when integrating Silergy products into any application. Silergy assumes no responsibility for any said applications or for any use of any circuitry other than circuitry entirely embodied in a Silergy product.

3. **Limited warranty and liability.** Information furnished by Silergy in this document is believed to be accurate and reliable. However, Silergy makes no representation or warranty, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. In no event shall Silergy be liable for any indirect, incidental, punitive, special or consequential damages, including but not limited to lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges, whether or not such damages are based on tort or negligence, warranty, breach of contract or any other legal theory. Notwithstanding any damages that customer might incur for any reason whatsoever, Silergy' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Standard Terms and Conditions of Sale of Silergy.

4. **Suitability for use.** Customer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of Silergy components in its applications, notwithstanding any applications-related information or support that may be provided by Silergy. Silergy products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Silergy product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Silergy assumes no liability for inclusion and/or use of Silergy products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

5. **Terms and conditions of commercial sale**. Silergy products are sold subject to the standard terms and conditions of commercial sale, as published at http://www.silergy.com/stdterms, unless otherwise agreed in a valid written individual agreement specifically agreed to in writing by an authorized officer of Silergy. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Silergy hereby expressly objects to and denies the application of any customer's general terms and conditions with regard to the purchase of Silergy products by the customer.

6. **No offer to sell or license**. Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights. Silergy makes no representation or warranty that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right. Information published by Silergy regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from Silergy under the patents or other intellectual property of Silergy.

For more information, please visit: www.silergy.com