



**SILERGY**

# SY8089I

## High Efficiency, 1.5MHz, 2A Synchronous Step Down Regulator

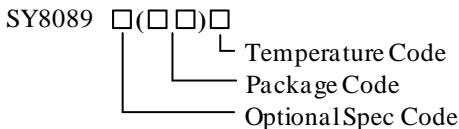
### General Description

The SY8089I is a high efficiency 1.5MHz synchronous step down DC/DC regulator, which is capable of delivering up to 2A output current. It can operate over a wide input voltage range from 2.5V to 5.5V and integrate main switch and synchronous switch with very low  $R_{DS(ON)}$  to minimize the conduction loss.

The SY8089I integrates reliable latch off function when output over voltage, output short or thermal shutdown happens.

The low output voltage ripple, the small external inductor and the capacitor sizes are achieved with 1.5MHz switching frequency.

### Ordering Information



Ordering Number	Package type	Note
SY8089IAAC	SOT23-5	--

### Features

- 2.5V to 5.5V Input Voltage Range
- 50 $\mu$ A Low Quiescent Current
- Low  $R_{DS(ON)}$  for Internal Switches (Top/Bottom) 130m $\Omega$ /85m $\Omega$
- High Switching Frequency 1.5MHz Minimizes the External Components
- Internal Soft-start Limits the Inrush Current
- 100% Dropout Operation
- Reliable Latch off Function When:
  - Output Short
  - Thermal Shutdown
  - Output Voltage > 120% of Regulated Voltage
- Output Auto Discharge Function
- RoHS Compliant and Halogen Free
- Compact Package: SOT23-5

### Applications

- Set Top Box
- USB Dongle
- Media Player
- Smart phone

### Typical Applications

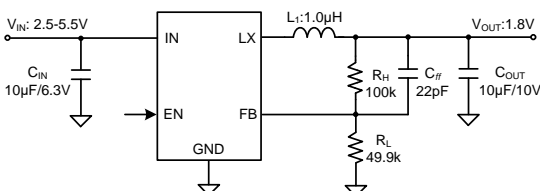


Figure1. Schematic Diagram

Inductor and C<sub>OUT</sub> Selection Table

V <sub>OUT</sub> [V]	L [ $\mu$ H]	C <sub>OUT</sub> [ $\mu$ F]			
		4.7	10	22	2 $\times$ 22
1.2/ 1.8 /3.3	0.47		✓	✓	✓
	1.0		☆	✓	✓
	2.2			✓	✓

Note: '☆' means recommended for most applications.

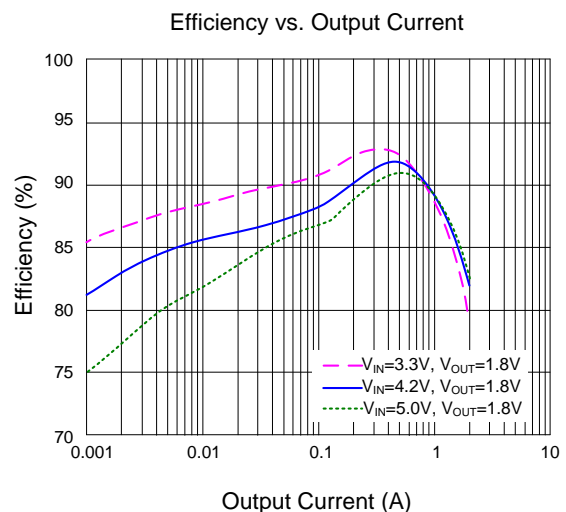
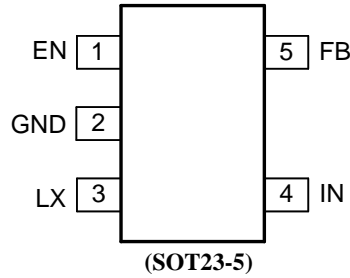


Figure2. Efficiency vs. Output Current

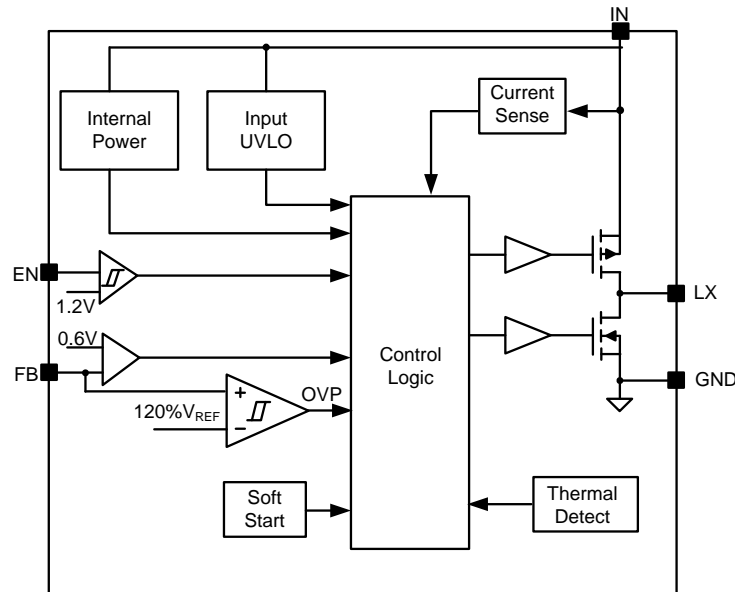
## Pinout (Top View)



**Top Mark: qYxyz** (device code: qY, x=year code, y=week code, z=lot number code)

Pin Name	Pin Number	Pin Description
EN	1	Enable control. Pull high to turn on. Do not leave it floating.
GND	2	Ground pin.
LX	3	Inductor pin. Connect this pin to the switching node of the inductor.
IN	4	Input pin. Decouple this pin to the GND pin with at least a 10 $\mu$ F ceramic capacitor.
FB	5	Output feedback pin. Connect this pin to the center point of the output resistor divider (as shown in Figure 1) to program the output voltage: $V_{OUT}=0.6 \times (1+R_H/R_L)$ .

## Block Diagram



**Figure3. Block Diagram**



## Absolute Maximum Ratings (Note 1)

Supply Input Voltage	-0.3V to 6.0V
FB, EN Voltage	-0.3V to $V_{IN}+0.6V$
LX Voltage	-0.3V <sup>(*1)</sup> to 6.0V <sup>(*2)</sup>
Power Dissipation, $P_D$ @ $T_A = 25\text{ }^\circ\text{C}$	0.83W
Package Thermal Resistance (Note 2)	
$\theta_{JA}$	120 $^\circ\text{C/W}$
$\theta_{JC}$	20 $^\circ\text{C/W}$
Junction Temperature Range	-40 $^\circ\text{C}$ to 150 $^\circ\text{C}$
Lead Temperature (Soldering, 10 sec.)	260 $^\circ\text{C}$
Storage Temperature Range	-65 $^\circ\text{C}$ to 150 $^\circ\text{C}$

(\*1) LX Voltage Tested Down to -3V<40ns  
(\*2) LX Voltage Tested Up to +7V<40ns

## Recommended Operating Conditions (Note 3)

Supply Input Voltage	2.5V to 5.5V
Junction Temperature Range	-40 $^\circ\text{C}$ to 125 $^\circ\text{C}$
Ambient Temperature Range	-40 $^\circ\text{C}$ to 85 $^\circ\text{C}$



## Electrical Characteristics

( $V_{IN} = 5V$ ,  $V_{OUT} = 1.8V$ ,  $L = 1.0\mu H$ ,  $C_{OUT} = 10\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

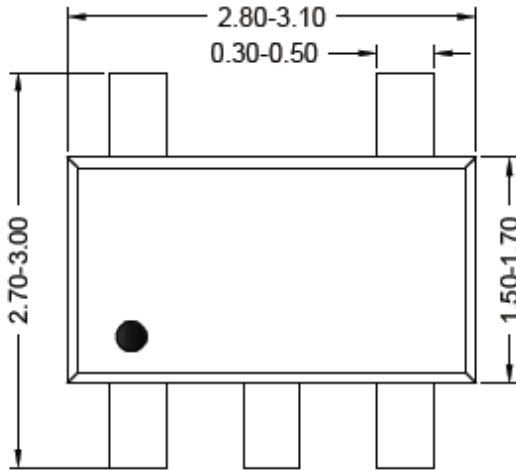
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	$V_{IN}$		2.5		5.5	V
Input UVLO Threshold	$V_{UVLO}$				2.5	V
Input UVLO Hysteresis	$V_{HYS}$			150		mV
Quiescent Current	$I_Q$	$V_{FB} = V_{REF} \times 105\%$		50	70	$\mu A$
Shutdown Current	$I_{SHDN}$	$V_{EN} = 0V$		0.1	1	$\mu A$
Feedback Reference Voltage	$V_{REF}$	$I_{OUT} = 0.5A$ , CCM	591	600	609	mV
LX Node Discharge Resistance	$R_{DIS}$			50		$\Omega$
Top FET $R_{ON}$	$R_{DS(ON)1}$			130		m $\Omega$
Bottom FET $R_{ON}$	$R_{DS(ON)2}$			85		m $\Omega$
EN Input Voltage High	$V_{EN,H}$		1.2			V
EN Input Voltage Low	$V_{EN,L}$				0.4	V
Min on Time	$t_{ON,MIN}$			60		ns
Maximum Duty Cycle	$D_{MAX}$		100			%
Turn on Delay	$t_{ON,DLY}$	from EN high to LX start switching		0.5		ms
Soft-start Time	$t_{SS}$	$V_{OUT}$ from 0% to 100%		1		ms
Switching Frequency	$f_{SW}$	$I_{OUT} = 0.5A$ , CCM		1.5		MHz
Top FET Current Limit	$I_{LMT, TOP}$		3.5			A
Thermal Shutdown Temperature	$T_{SD}$			160		$^\circ C$

**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 for extended periods may affect device reliability.

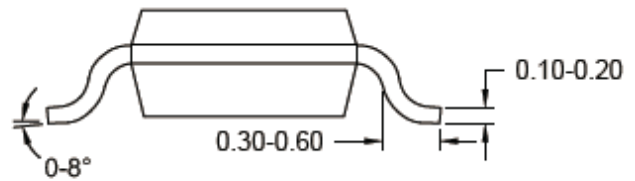
**Note 2:**  $\Theta_{JA}$  of SY8089I is measured in the natural convection at  $T_A = 25^\circ C$  on a 2OZ two-layer Silergy evaluation board. Pin 3 is the case position for  $\Theta_{JC}$  measurement.

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

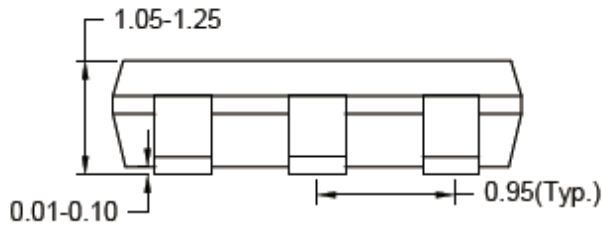
## SOT23-5 Package Outline & PCB layout



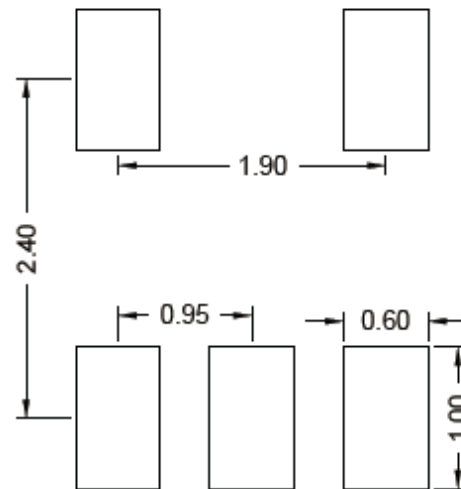
**Top view**



**Side view**



**Front view**



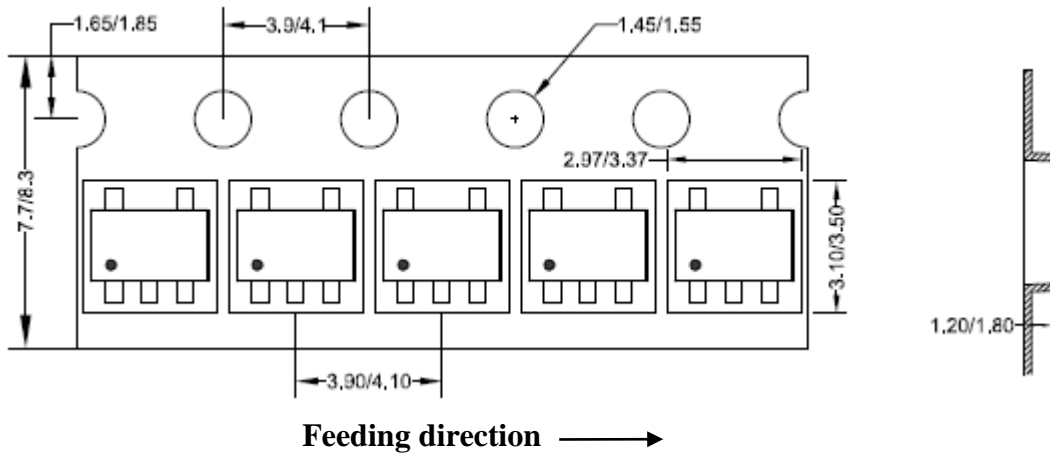
**Recommended Pad Layout**

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

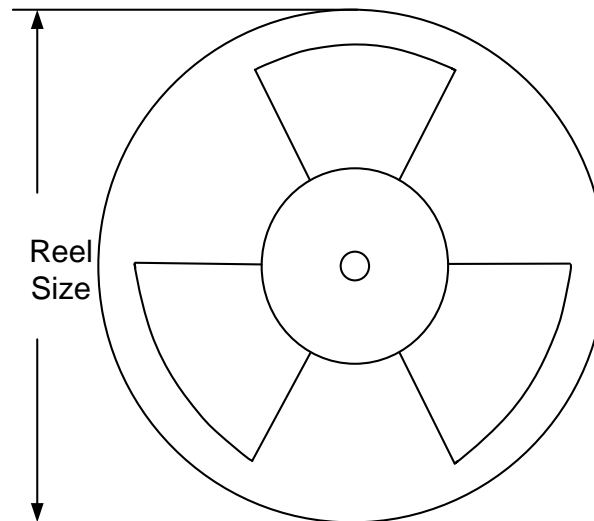
## Taping & Reel Specification

### 1. Taping orientation

SOT23-5



### 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
SOT23-5	8	4	7"	280	160	3000

### 3. Others: NA

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