SY8368L

High Efficiency Fast Response
8A Continuous, 16A Peak, 28V Input
Synchronous Step Down Regulator

General Description

The SY8368L is a high-efficiency synchronous step-down DC/DC regulator featuring internal power and synchronous rectifier switches capable of delivering 8A of continuous output current and up to 16A peak output current over a wide input voltage ranging from 4.5V to 28V.

Silergy's proprietary Instant-PWM™ fast-response, constant-on-time (COT) PWM control method supports high input/output voltage ratios (low duty cycles), and fast transient response while maintaining a near constant operating frequency over line, load and output voltage ranges. This control method provides stable operation without complex compensation and even with low ESR ceramic capacitors.

Internal 20mΩ power and 10mΩ synchronous rectifier switches provide excellent efficiency over a range of applications, especially for low output voltages and low duty cycles. Cycle-by-cycle current limit, input under voltage lock-out, internal soft-start, output under and over voltage protection, and over temperature protection provide safe operation in all operating conditions.

The SY8368L is available in a compact QFN3×3-12 package.

Ordering Information

SY8368 □(□□)□
- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY8368LQQC	QFN3×3-12	--

Features

- Fast Transient Response
- Wide Input Voltage Range: 4.5-28V
- Low $R_{DS(ON)}$ for Internal Switches（Top FET/Bottom FET）:20mΩ/10mΩ
- 8A Continuous/16A Peak Output Current Capability
- Accurate Feedback Reference Voltage: 0.6V ±1%
- Pseudo-constant 500kHz Operating Frequency
- Internal 600μs Soft-start Limits Inrush Current
- PSM/FCCM Selectable Light Load Operation Mode
- Power Good Indicator
- Cycle-by-Cycle Current Limit
- Latch Off Mode Output Under Voltage and Over Voltage Protection
- Over Temperature Protection with Auto Recovery
- Compact Package: QFN3×3-12

Applications

- LCD-TV/Net-TV/3DTV
- Set Top Box
- Notebook
- High Power AP

Typical Applications

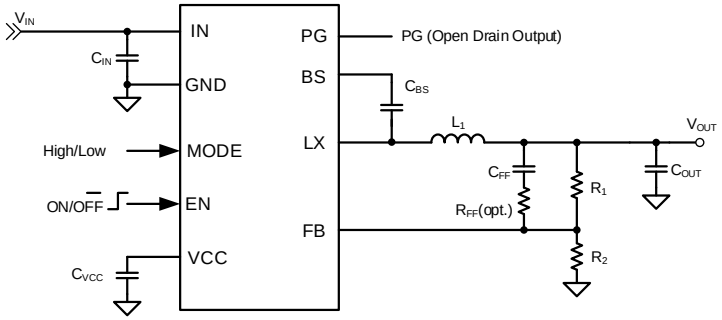


Figure1. Schematic

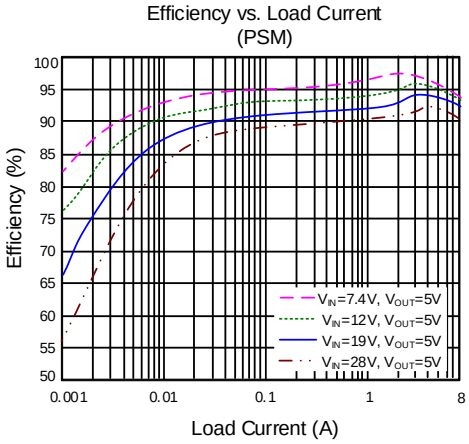
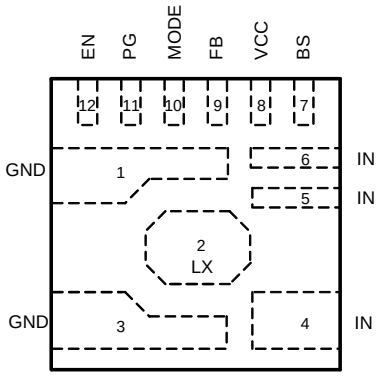


Figure2. Efficiency

Pinout (top view)



(QFN3×3-12)

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

Pin Name	Pin Number	Pin Description
GND	1,3	Ground pin
LX	2	Inductor pin. Connect this pin to the switching node of inductor
IN	4,5,6	Input pin. Decouple this pin to GND pin with at least 10μF ceramic cap
BS	7	Boot-Strap pin. Supply high side gate driver. Decouple this pin to LX pin with 0.1μF ceramic cap.
VCC	8	Internal 3.3V LDO output. Power supply for internal analog circuits and driving circuit. Bypass this pin to GND with a 2.2μF ceramic capacitor..
FB	9	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: $V_{SET}=0.6\times(1+R_1/R_2)$
MODE	10	Light load operation mode selection pin. Pull this pin low for PSM operation, and pull this pin high for FCCM operation. Do not leave this pin floating.
PG	11	Power good indicator. Open drain output when the output voltage is within 92.5% to 120% of regulation point.
EN	12	Enable control. Pull this pin high to enable the IC. Do not leave this pin floating.

Block Diagram

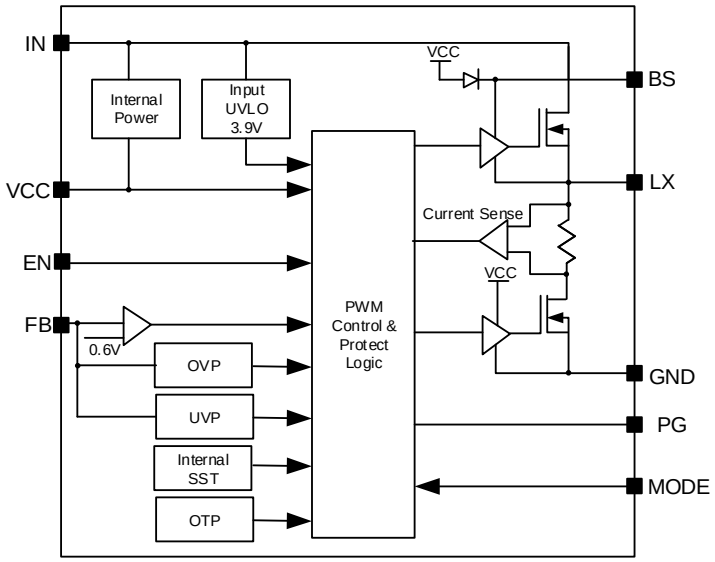


Figure3. Block Diagram

Absolute Maximum Ratings (Note 1)

IN, LX, PG, EN ---------- 30V
BS-LX, FB, MODE, VCC---------- 4V
Maximum Power Dissipation, $P_{D,MAX}$ @ T_A = 25°C QFN3×3-12 ----------3.33W
Package Thermal Resistance (Note 2)
θ_{JA} ----------30°C/W
θ_{JC} ---------- 4°C/W
Junction Temperature Range ---------- 150°C
Lead Temperature (Soldering, 10 sec.) ---------- 260°C
Storage Temperature Range ---------- -65°C to 150°C
Dynamic LX voltage in 50ns duration ---------- IN+3V to GND-4V

Recommended Operating Conditions (Note 3)

Supply Input Voltage ---------- 4.5V to 28V
Junction Temperature Range ---------- -40°C to 125°C
Ambient Temperature Range ---------- -40°C to 85°C

Electrical Characteristics

(V_{IN} = 12V, V_{OUT} =5V, C_{OUT} = 100µF, T_A = 25°C, I_{OUT} = 2A, unless otherwise specified)

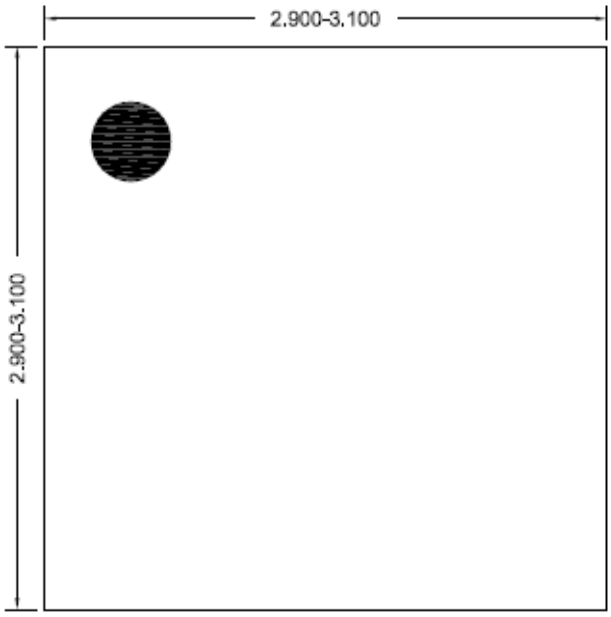
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		4.5		28	V
Quiescent Current	I_Q	EN=1,I_{OUT}=0, MODE=Low, V_{OUT}=V_{SET}×105%		100		µA
Shutdown Current	I_{SHDN}	EN=0		6	10	µA
Feedback Reference Voltage	V_{REF}		0.594	0.6	0.606	V
FB Input Current	I_{FB}	V_{FB}=4V	-50		50	nA
Top FET $R_{DS(ON)}$	$R_{DS(ON)1}$			20		mΩ
Bottom FET $R_{DS(ON)}$	$R_{DS(ON)2}$			10		mΩ
Bottom FET Current Limit	$I_{LIM,BOT}$		12			A
Bottom FET Reverse Current Limit	$I_{LMT,RVS}$			-2.75		A
Soft-start Time	t_{SS}	V_{OUT} from 0% to 100%V_{SET}		600		µs
EN/MODE Input Voltage High	$V_{EN,H}$		1.0			V
EN/MODE Input Voltage Low	$V_{EN,L}$				0.4	V
EN Leakage Current	I_{EN}		-1		1	µA
MODE Leakage Current	I_{MODE}		-1		1	µA
Input UVLO Threshold	V_{UVLO}				3.9	V
Input UVLO Hysteresis	V_{HYS}			0.3		V
Switching Frequency	F_{SW}	V_{OUT}=5V, CCM	425	500	575	kHz
Min ON Time	$t_{ON,MIN}$	V_{IN}=$V_{IN,MAX}$		50		ns
Min OFF Time	$t_{OFF,MIN}$			180		ns
VCC Output Voltage	V_{CC}	VCC with 1mA load	3.2	3.3	3.45	V
Output Under Voltage Threshold	V_{UVP}	V_{FB} falling		33.3		%V_{REF}
Output UVP Delay Time	$t_{UVP,DLY}$			10		µs
Output Over Voltage Threshold	V_{OVP}	V_{FB} rising		120		%V_{REF}
Output OVP Delay Time	$t_{OVP,DLY}$			12		µs
Power Good Threshold	V_{PG}	V_{FB} rising (good)		92.5		%V_{REF}
Power Good Hysteresis	$V_{PG,HYS}$			2		%V_{REF}
Power Good Delay Time	$t_{PG,R}$			2.5		µs
	$t_{PG,F,}$			15		µs
Thermal Shutdown Temperature	T_{SD}			150		°C
Thermal Shutdown Hysteresis	T_{HYS}			15		°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

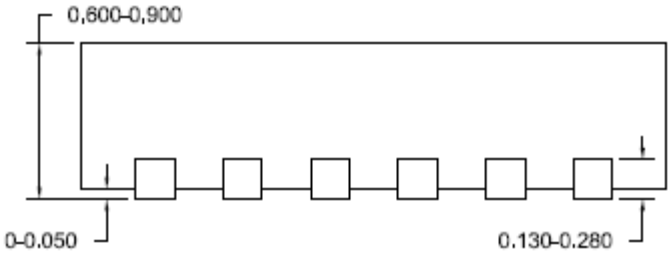
Note 2: Package thermal resistance is measured in the natural convection at T_A = 25°C on a four-layer Silergy Evaluation Board.

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

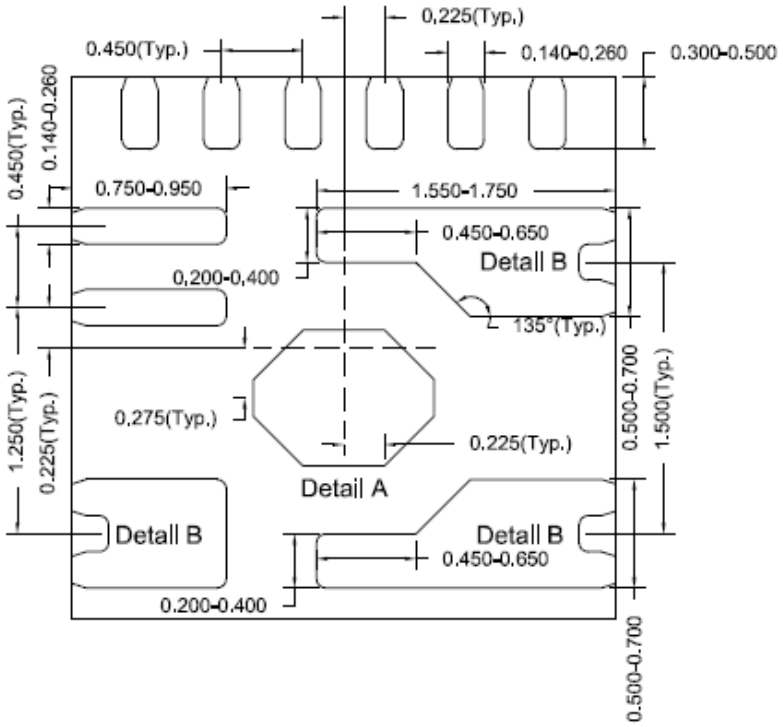
QFN3×3-12 Package Outline Drawing

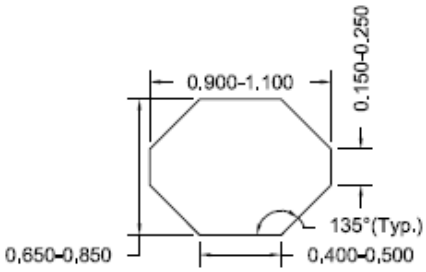


Top View

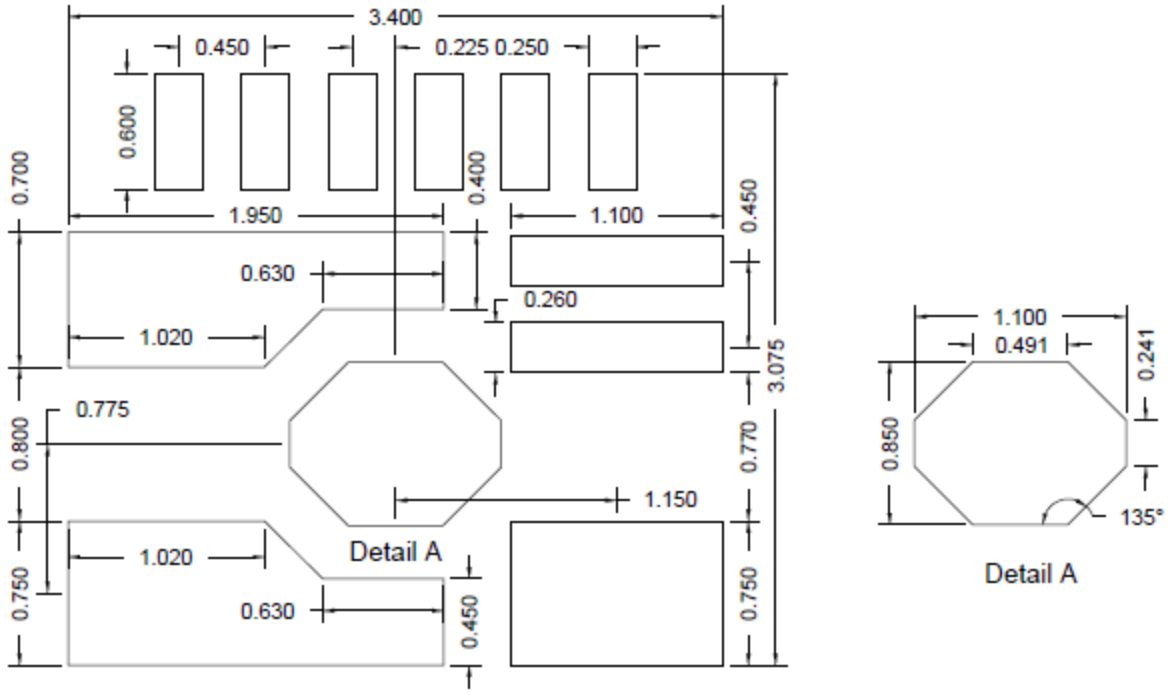


Side View





Bottom View



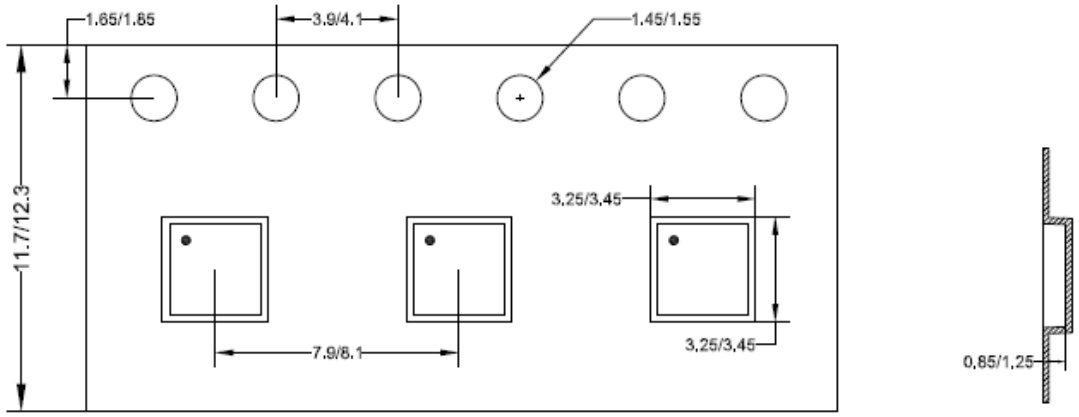
Recommended PCB layout
(Reference Only)

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

Taping & Reel Specification

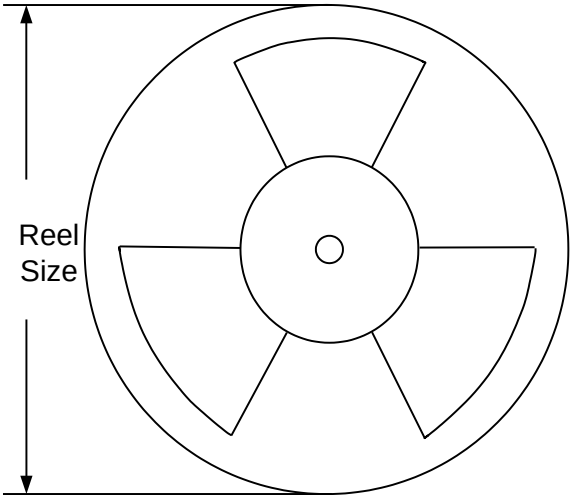
1. Taping orientation

QFN3×3



Feeding direction ⟶

2. Carrier Tape & Reel specification for packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
QFN3×3	12	8	13"	400	400	5000

3. Others: NA