

General Description

The SY82802 high efficiency 600kHz synchronous buck converter operates over a wide input voltage range of 4.5V to 30V, and can deliver an output current up to 2A. It integrates a top MOSFET and a bottom MOSFET with very low $R_{DS(ON)}$ to minimize conduction loss. The 600kHz pseudo-constant switching frequency enables using small external inductor and capacitor values.

The SY82802 uses advanced constant on-time and ripple-based control strategy to achieve fast transient response for applications with high step-down ratios, and high efficiency at light loads. It also provides cycle-by-cycle current limit protection, output under voltage protection and over temperature protection.

Only the input and output capacitors, inductor, feedback resistor divider and feedforward capacitor need to be selected for the targeted application specifications.

The SY82802 is available in a compact SOT23-6 package.

Features

- Low $R_{DS(ON)}$ for Internal MOSFETs: 150mΩ Top, 115mΩ Bottom
- Wide Input Voltage Range: 4.5V ~ 30V
- Up to 2A Output Current
- $\pm 1\%$ 0.6V Reference over Temperature from -40°C to 125°C
- Precise EN Threshold
- PFM Light Load Operation for High Efficiency
- Internal Soft-Start Limits the Inrush Current
- Support Smooth Startup with Pre-Biased Output
- 600kHz Switching Frequency Minimizes the External Components
- Advanced Constant On-time and Ripple-Based Control to Achieve Fast Transient Responses
- Cycle-by-Cycle Valley and Peak Current Limit Protection
- Hic-Cup Mode Output Under Voltage Protection
- Auto-Recovery Mode Over Temperature Protection
- Input Under Voltage Lockout (UVLO)
- RoHS-Compliant and Halogen-Free
- Compact Package: SOT23-6

Applications

- Set Top Box
- Portable TV
- DSL Modem
- LCD TV
- IP CAM
- Networking

Typical Application

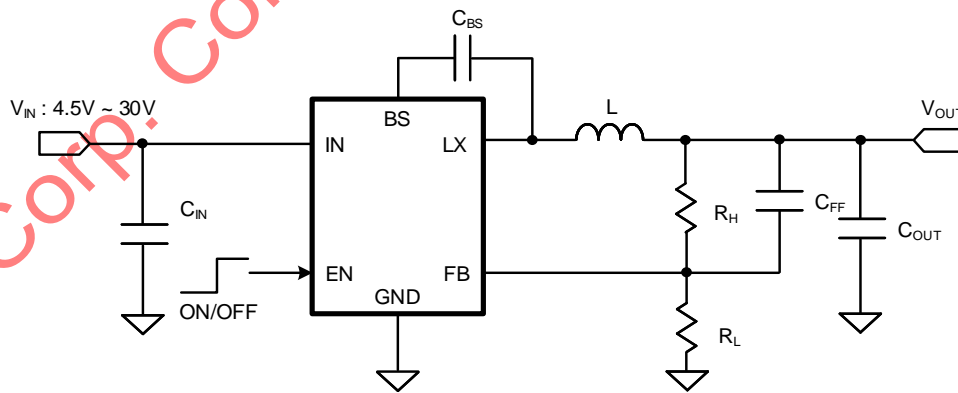


Figure 1. Schematic Diagram

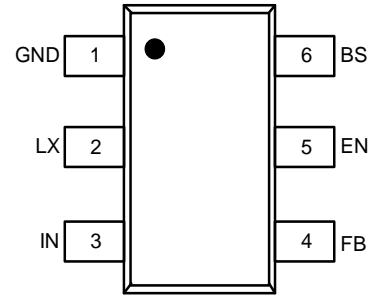


Ordering Information

Ordering Part Number	Package Type	Top Mark
SY82802ABT	SOT23-6 RoHS Compliant and Halogen Free	n2xyz

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

Pinout (top view)



Pin No	Pin Name	Pin Description
1	GND	Ground pin.
2	LX	Inductor pin. Connect this pin to the switching node of inductor.
3	IN	Input pin. Decouple this pin from the GND pin with at least a 10μF ceramic capacitor.
4	FB	Output feedback pin. Connect this pin to the center point of the output resistor divider as shown in Figure 1. $V_{OUT} = 0.6 \times (1 + R_H/R_L)$.
5	EN	Enable pin. Pull this pin higher than EN rising threshold to turn on the device and pull this pin lower than EN falling threshold to turn off the device. Do not leave this pin floating.
6	BS	Bootstrap pin. Supply top MOSFET gate driver. Connect a 0.1μF ceramic capacitor between BS and LX pin.

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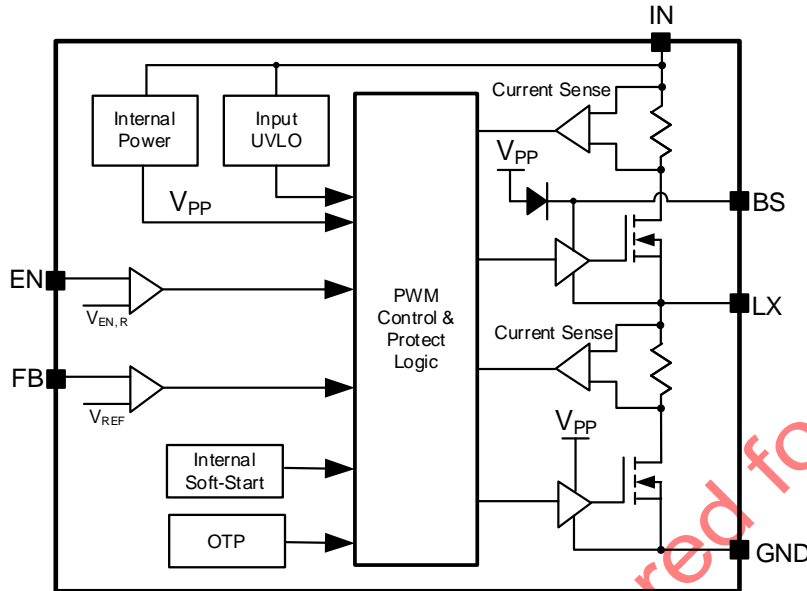
Block Diagram


Figure3. Block Diagram

Absolute Maximum Ratings

Parameter (Note 1)	Min	Max	Unit
IN	-0.3	32	V
EN, LX	-0.3	IN + 0.3	
FB, BS-LX	-0.3	4	
LX, 10ns Duration	-5	IN + 3	
Junction Temperature, Operating	-40	150	°C
Lead Temperature (Soldering, 10s)		260	
Storage Temperature	-65	150	

Thermal Information

Parameter (Note 2)	Typ	Unit
θ_{JA} Junction-to-Ambient Thermal Resistance	58	°C/W
θ_{JC} Junction-to-Case Thermal Resistance	4.7	
P_D Power Dissipation $T_A = 25^\circ\text{C}$	1.72	W

Recommended Operating Conditions

Parameter (Note 3)	Min	Max	Unit
Input Voltage	4.5	30	V
Output Voltage	0.6	12.5	
Continuous Output Current		2	A
Junction Temperature, Operating	-40	125	°C
Ambient Temperature	-40	85	

Electrical Characteristics

($V_{IN} = 12V$, $V_{OUT} = 3.3V$, $L = 6.8\mu H$, $C_{OUT} = 22\mu F$, $T_J = 25^\circ C$, $I_{OUT} = 1A$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Input	Voltage Range	V_{IN}	4.5		30	V	
	UVLO Rising Threshold	$V_{IN,UVLO}$	V_{IN} rising		4.45		
	UVLO Hysteresis	$V_{IN,HYS}$		0.3			
	Shutdown Current	I_{SHDN}	$V_{EN} = 0V$		8	12	μA
	Quiescent Current	I_Q	$I_{OUT} = 0A$, $V_{FB} = V_{REF} \times 105\%$		250		
Output	Voltage Range	V_{SET}	0.6		12.5	V	
	FB Reference Voltage	V_{REF}	$T_J = -40^\circ C \sim 125^\circ C$	0.594	0.6	0.606	
	FB Input Current	I_{FB}	$V_{FB} = 1V$	-50		50	nA
	Turn On Delay Time	$t_{ON,DLY}$	From EN high to LX starts switching (Note 4)		180		μs
	Soft-Start Time	t_{SS}	V_{OUT} from 0% to 100% V_{SET}		1		ms
	UVP Threshold	V_{UVP}			33		$\%V_{REF}$
	UVP Delay Time	$t_{UVP,DLY}$			150		μs
	UVP Hiccup On-Time	$t_{UVP,ON}$			1.4		ms
	UVP Hiccup Off-Time	$t_{UVP,OFF}$			9.8		
Enable (EN)	Rising Threshold	$V_{EN,R}$	1.12	1.2	1.28	V	
	Falling Threshold	$V_{EN,F}$	0.95	1.0	1.05		
	Input Current	I_{EN}	$V_{EN} = 3.3V$		0		μA
MOSFET	Top MOSFET $R_{DS(ON)}$	$R_{DS(ON),TOP}$		150		m Ω	
	Bottom MOSFET $R_{DS(ON)}$	$R_{DS(ON),BOT}$		115			
	Top MOSFET Current Limit Threshold	$I_{LMT,TOP}$		3	4.5	A	
	Bottom MOSFET Current Limit Threshold	$I_{LMT,BOT}$		2	3		
Frequency	Switching Frequency	f_{SW}	$I_{OUT} = 1A$, CCM		600		kHz
	Minimum On-Time	$t_{ON,MIN}$			40		ns
	Minimum Off-Time	$t_{OFF,MIN}$			120		
OTP	Temperature	T_{OTP}	(Note 4)		160		$^\circ C$
	Temperature Hysteresis	T_{HYS}	(Note 4)		15		

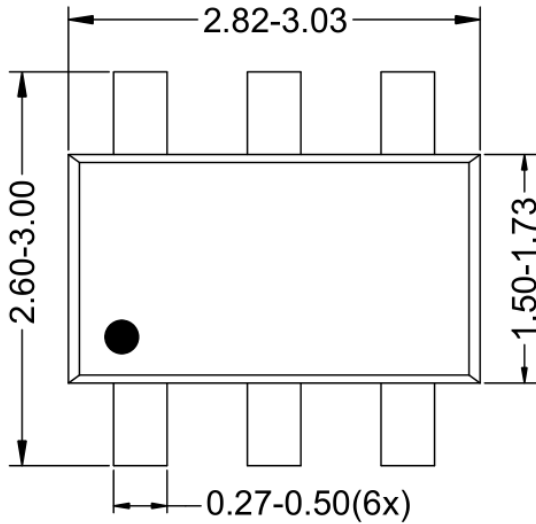
Note 1: Stresses beyond the “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute 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 6cmx6cm size, two-layer Silergy Evaluation Board with 2-oz copper. Pin 2 of SOT23-6 package is the case position for θ_{JC} measurement.

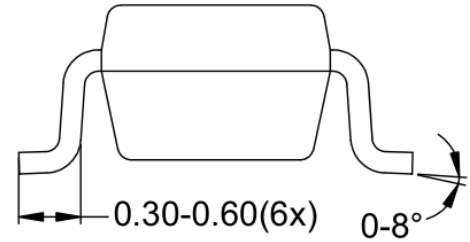
Note 3: The device is not guaranteed to function outside its operating conditions.

Note 4: Guaranteed by design.

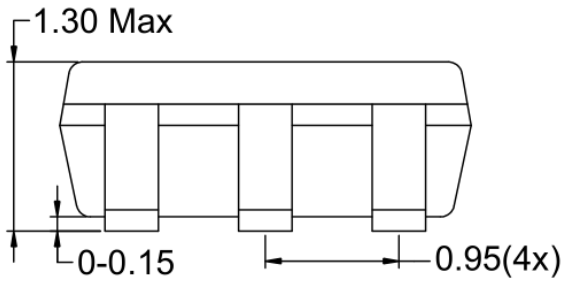
SOT23-6 Package Outline and PCB layout



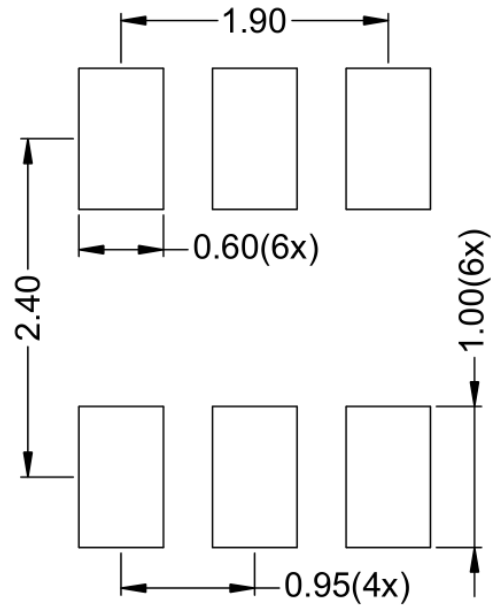
Top View



Side View



Side View



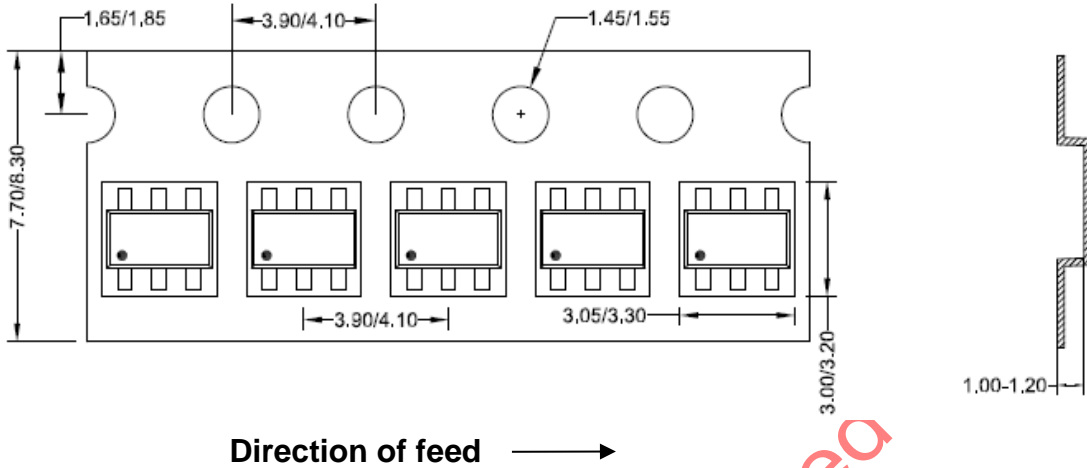
Recommended PCB Layout

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

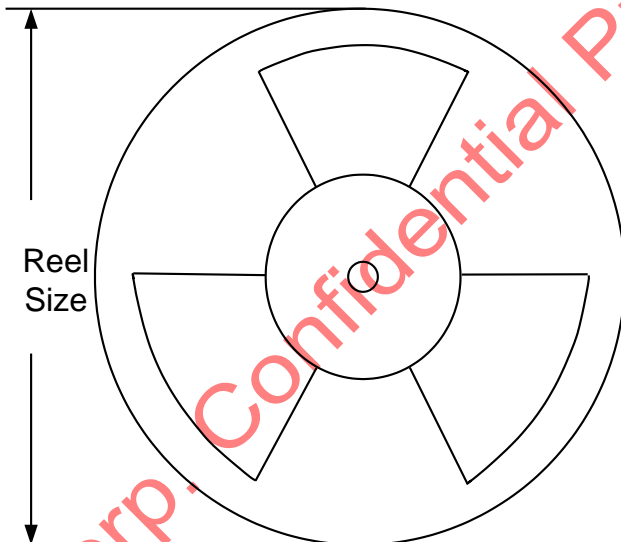
Tape and Reel Information

1. Tape dimensions and pin 1 orientation

SOT23-6



2. Reel dimensions



Package type	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer length(mm)	Leader length (mm)	Qty per reel
SOT23-6	8	4	7"	400	160	3000

3. Others: NA.

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