

General Description

The SY81103x is high efficiency synchronous buck converter operates over a wide input voltage range of 4.5V to 18V, and can deliver an output current up to 3A. It integrates a top MOSFET and a bottom MOSFET with very low $R_{DS(ON)}$ to minimize conduction loss. The 500kHz or 1200kHz high pseudo-constant switching frequency enables using small external inductor and capacitor values.

The device uses 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 SY81103x is available in a compact SOT23-6 package.

Part Number	Frequency	Mode
SY81103ABT	500kHz	PFM
SY81103EABT	500kHz	FCCM
SY81103CABT	1200kHz	PFM
SY81103BABT	1200kHz	FCCM

Features

- Low $R_{DS(ON)}$ for Internal MOSFETs: 80mΩ Top, 40mΩ Bottom
- Wide Input Voltage Range: 4.5V ~ 18V
- Up to 3A Output Current
- $\pm 1.5\%$ 0.6V Reference
- Precise EN Threshold
- Pulse-Frequency Modulation (PFM) Mode Operation for SY81103 and SY81103C
- Forced Continuous Conduction Mode (FCCM) Operation for SY81103E and SY81103B
- Internal Soft-Start Limits the Inrush Current
- Support Smooth Startup with Pre-Biased Output
- 500kHz Switching Frequency Minimizes the External Components for SY81103 and SY81103E
- 1200kHz Switching Frequency Minimizes the External Components for SY81103C and SY81103B
- Constant On-time and Ripple-Based Control to Achieve Fast Transient Responses
- Stable with 10μF C_{OUT}
- 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 Camera
- Networking

Typical Application

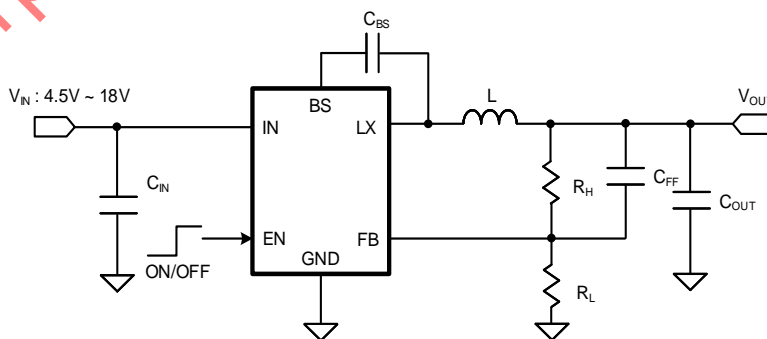


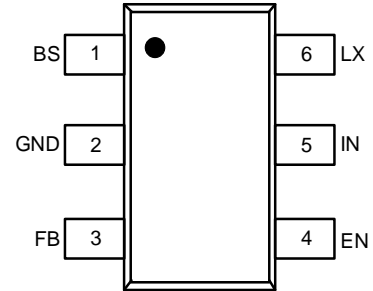
Figure 1. Schematic Diagram

Ordering Information

Ordering Part Number	Package type	Top Mark
SY81103ABT	SOT23-6 RoHS Compliant and Halogen Free	HJLxyz
SY81103EABT	SOT23-6 RoHS Compliant and Halogen Free	HRLxyz
SY81103CABT	SOT23-6 RoHS Compliant and Halogen Free	HYXxyz
SY81103BABT	SOT23-6 RoHS Compliant and Halogen Free	KABxyz

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

Pinout (top view)



Pin Description

Pin No	Pin Name	Pin Description
1	BS	Bootstrap pin. Supply top MOSFET gate driver. Connect a 0.1μF ceramic capacitor between the BS and the LX pin.
2	GND	Ground pin.
3	FB	Output feedback pin. Connect this pin to the center point of the output resistor divider as shown in Figure 1. $V_{OUT} = 0.6 \times (1 + R_H/R_L)$.
4	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.
5	IN	Input pin. Decouple this pin from the GND pin with at least a 10μF ceramic capacitor.
6	LX	Inductor pin. Connect this pin to the switching node of inductor.

Block Diagram

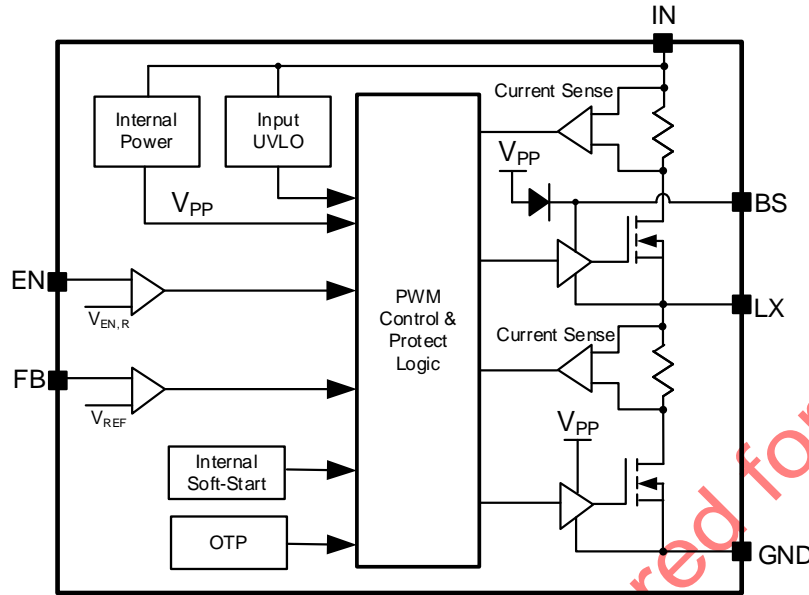


Figure3. Block Diagram

Absolute Maximum Ratings

Parameter (Note 1)	Min	Max	Unit
IN	-0.3	19	V
EN, LX	-0.3	IN + 0.3	
LX, 10ns duration	-5	IN + 3	
BS-LX, FB	-0.3	4	
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	55	°C/W
θ_{JC} Junction-to-Case Thermal Resistance	6.5	
P_D Power Dissipation $T_A = 25^\circ\text{C}$	1.8	W

Recommended Operating Conditions

Parameter (Note 3)	Min	Max	Unit
Input Voltage	4.5	18	V
Output Voltage	0.6	9.2	
Continuous Output Current		3	A
Ambient Temperature	-40	85	°C
Junction Temperature	-40	125	



SY81103, SY81103E, SY81103C, SY81103B

Electrical Characteristics

($V_{IN} = 12V$, $V_{OUT} = 3.3V$, $L = 4.7\mu H$, $C_{OUT} = 10\mu F$, $T_J = 25^\circ C$, $I_{OUT} = 1A$ unless otherwise specified (Note4))

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Input	Voltage Range	V_{IN}	4.5		18	V	
	UVLO Rising Threshold	$V_{IN,UVLO}$			4.45		
	UVLO Hysteresis	$V_{IN,HYS}$		0.3			
	Quiescent Current	I_Q	$I_{OUT} = 0A$, $V_{FB} = V_{REF} \times 105\%$, only for SY81103, SY81103C		200	280	μA
	Shutdown Current	I_{SHDN}	$V_{EN} = 0V$		5	10	
Output	Voltage Range	V_{SET}	0.6		9.2	V	
	FB Reference Voltage	V_{REF}	0.591	0.6	0.609		
	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 5)		180		μs
	Soft-Start Time	t_{SS}	V_{OUT} from 0% to 100% V_{SET}	0.5	1	1.55	ms
	UVP Threshold	V_{UVP}			33		$\%V_{REF}$
	UVP Delay Time	$t_{UVP,DLY}$			100		μs
	UVP Hiccup On-Time	$t_{HICCUP,ON}$			1.5		ms
	UVP Hiccup Off-Time	$t_{HICCUP,OFF}$			4.5		
Enable (EN)	Rising Threshold	$V_{EN,R}$	1.08	1.2	1.32	V	
	Falling Threshold	$V_{EN,F}$	0.9	1.0	1.1		
	Input Current	I_{EN}	$V_{EN} = 3.3V$		0		μA
MOSFET	Top MOSFET $R_{DS(ON)}$	$R_{DS(ON),TOP}$		80	120	$m\Omega$	
	Bottom MOSFET $R_{DS(ON)}$	$R_{DS(ON),BOT}$		40	60		
	Top MOSFET Current Limit Threshold	$I_{LMT,TOP}$		4		A	
	Bottom MOSFET Current Limit Threshold	$I_{LMT,BOT}$		3			
	Bottom MOSFET Reverse Current Limit Threshold	$I_{LMT,RVS}$	Only for SY81103E, SY81103B	1.3			
Frequency	Switching Frequency	f_{sw}	$I_{OUT} = 1A$, CCM, only for SY81103, SY81103E		500	kHz	
			$I_{OUT} = 1A$, CCM, only for SY81103B, SY81103C		1200		
	Minimum On-Time	$t_{ON,MIN}$			50	ns	
	Minimum Off-Time	$t_{OFF,MIN}$			100		
OTP	Temperature	T_{OTP}	(Note 5)		150	$^\circ C$	
	Temperature Hysteresis	T_{HYS}	(Note 5)		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. Case temperature θ_{JC} is measured at Pin 6.

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



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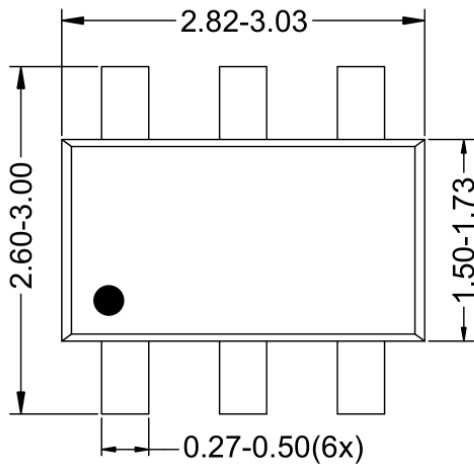
Note 4: Unless otherwise stated, limits are 100% production tested under pulsed load conditions such that $T_A \cong T_J = 25^\circ\text{C}$. Limits over the operating temperature range (See recommended operating conditions) and relevant voltage range(s) are guaranteed by design, test, or statistical correlation.

Note 5: Guaranteed by design or statistical correlation and not production tested.

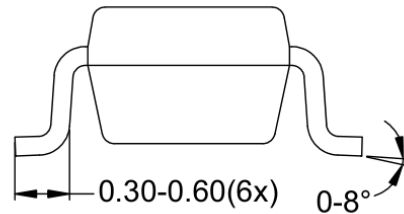
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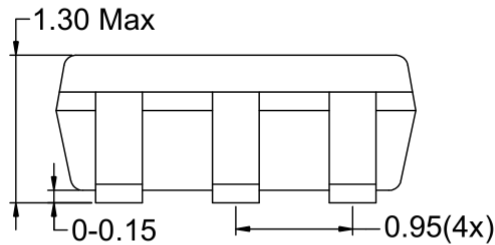
SOT23-6 Package Outline & PCB Layout



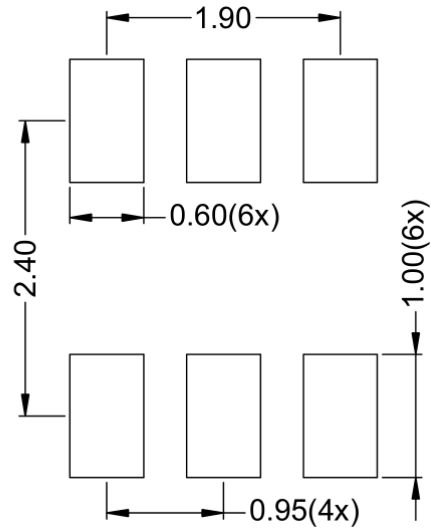
Top View



Side View



Front View



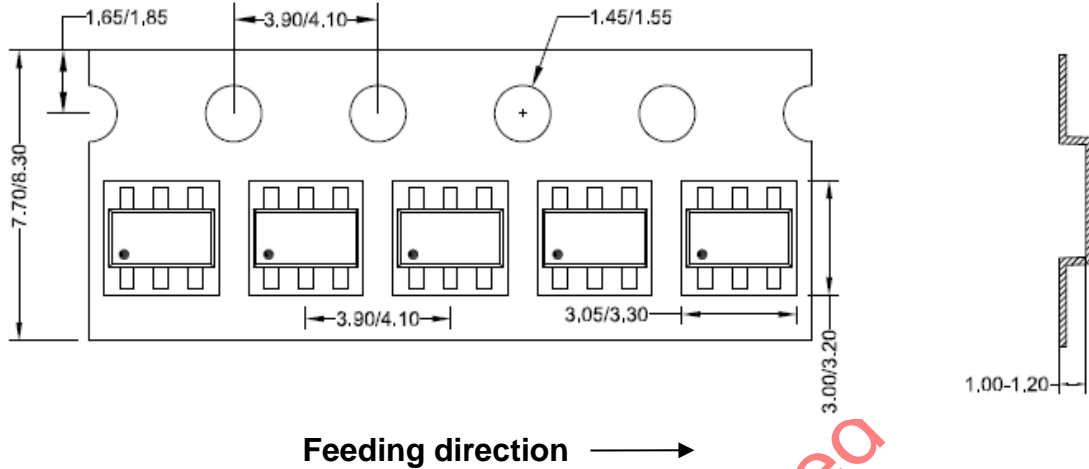
Recommended PCB Layout

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

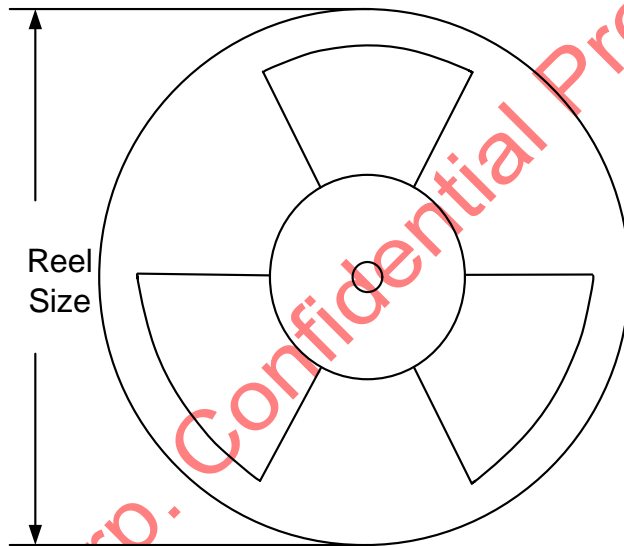
Taping & Reel Specification

1. Taping orientation

SOT23-6



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
SOT23-6	8	4	7	400	160	3000



SY81103, SY81103E, SY81103C, SY81103B

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