SY8286

High Efficiency Fast Response, 6A, 23V Input Synchronous Step Down Regulator

General Description

The SY8286 develops a high efficiency synchronous step-down DC/DC regulator capable of delivering 6A continuous, 12A peak current. The device integrates main switch and synchronous switch with very low $R_{DS(ON)}$ to minimize the conduction loss. SY8286 also integrates a bypass switch which allows the IC to be powered by external DC source.

The SY8286 operates over a wide input voltage range from 4V to 23V. The DC-DC regulator adopts the instant PWM architecture to achieve fast transient responses for high step down applications and high efficiency at light loads. In addition, it operates at pseudo-constant frequency of 500kHz under heavy load conditions to minimize the size of inductor and capacitor. SY8286 is optimized for lower than 2.5V_{OUT} application

Ordering Information

SY8286 □(□□)□
- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY8286RAC	QFN3×3-20	--

Features

- Low $R_{DS(ON)}$ for Internal Switches (Top/Bottom): 38/19 mΩ
- Wide Input Voltage Range: 4-23V
- Output Voltage Range: 0.6~2.5V
- External Bypass Input
- Instant PWM Architecture to Achieve Fast Transient Responses
- Internal 400μs Soft-start Limits the Inrush Current
- Pseudo-constant Frequency: 500kHz
- 6A Continuous/12A Peak Output Current Capability
- ±1.0% 0.6V Reference
- Programmable Valley Current Limit
- Power Good Indicator
- Output Discharge Function
- Short Circuit Latch Off Protection
- Over Voltage Latch Off Protection
- Thermal Shutdown
- Input UVLO
- RoHS Compliant and Halogen Free
- Compact package: QFN3×3-20

Applications

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

Typical Applications

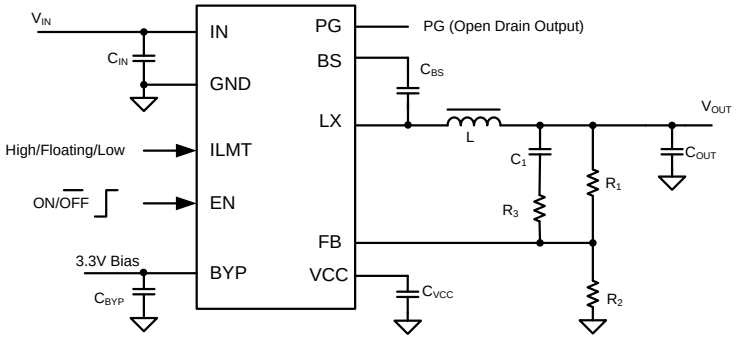
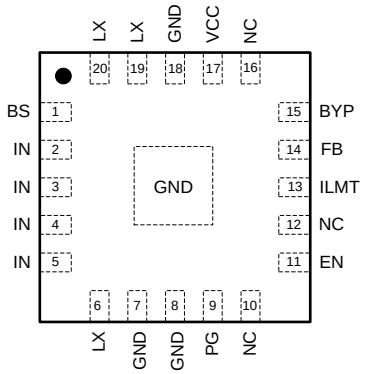


Figure1 Schematic

Pinout (top view)



(QFN3×3-20)

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

Pin Name	Pin Number	Pin Description
BS	1	Boot-strap pin. Supply high side gate driver. Decouple this pin to the LX pin with a 0.1μF ceramic capacitor.
IN	2,3,4,5	Input pin. Decouple this pin to the GND pin with at least a 10μF ceramic capacitor.
LX	6,19,20	Inductor pin. Connect this pin to the switching node of the inductor.
GND	7,8,18,EP	Ground pin.
PG	9	Power good Indicator. Open drain output when the output voltage is within 90% to 120% of regulation point.
EN	11	Enable pin. Pull this pin high to turn on the IC. Do not leave this pin floating.
NC	10,12,16	Not connected.
ILMT	13	Output current limit threshold selection.
FB	14	Output feedback pin. Connect to the center point of the resistor divider.
BYP	15	External 3.3V bypass power supply input. Decouple this pin to GND with a 1μF ceramic capacitor. Leave this pin floating if it is not used.
VCC	17	Internal 3.3V LDO output. Power supply for internal analog circuits and driving circuit. Decouple this pin to GND with a 2.2μF ceramic capacitor.

Block Diagram

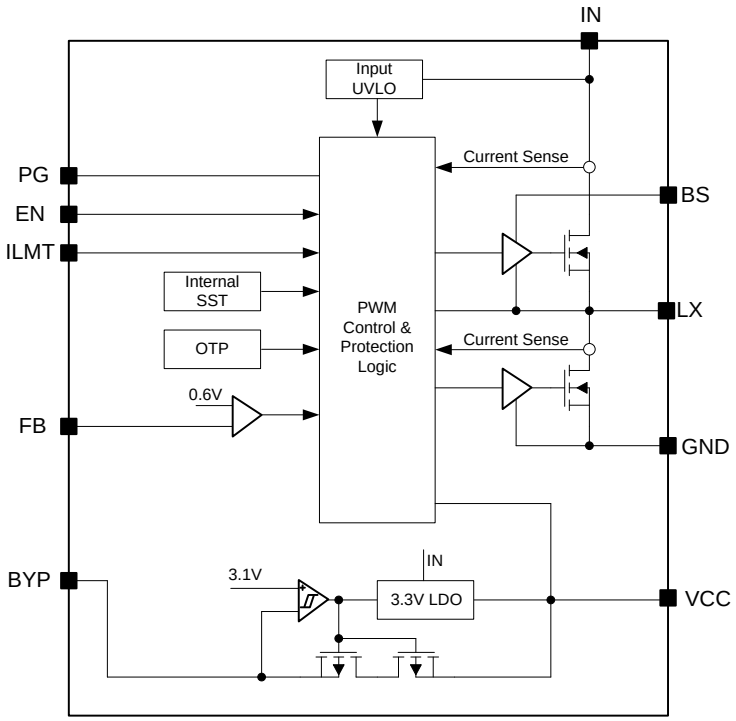


Figure2. Block Diagram

Absolute Maximum Ratings (Note 1)

IN, LX, PG ---------- 25V
BS-LX ---------- 4V
EN, ILMT ---------- 25V
FB, VCC ---------- 4V
BYP ---------- 6V
Power Dissipation,
P_D @ T_A = 25℃ QFN3×3-20 ---------- 3.3W
Package Thermal Resistance (Note 2)
θ_{JA}, QFN3×3-20 ---------- 30℃/W
θ_{JC}, QFN3×3-20 ---------- 4.5℃/W
Junction Temperature Range ---------- 150℃
Lead Temperature (Soldering, 10 sec.) ---------- 260℃
Storage Temperature Range ---------- -65℃ to 150℃
Dynamic LX voltage in 10ns duration ---------- IN+3V to GND-5V

Recommended Operating Conditions (Note 3)

Supply Input Voltage ---------- 4V to 23V
Junction Temperature Range ---------- -40℃ to 125℃
Ambient Temperature Range ---------- -40℃ to 85℃

Electrical Characteristics

(V_{IN} = 12V, C_{OUT} = 100uF, T_A = 25 ℃, I_{OUT} = 1A unless otherwise specified)

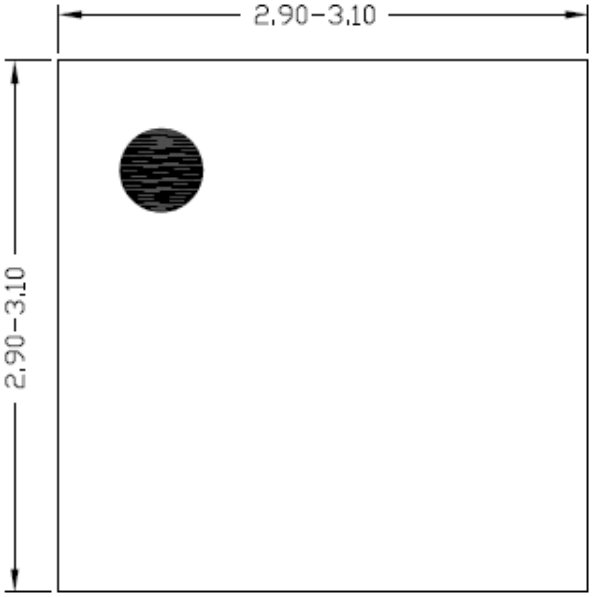
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range	V_{IN}		4.0		23	V
Quiescent Current	I_Q	I_{OUT}=0, V_{FB}=V_{REF}×105%		120	140	μA
Shutdown Current	I_{SHDN}	EN=0		6	10	μA
Feedback Reference Voltage	V_{REF}		0.594	0.6	0.606	V
FB Input Current	I_{FB}	V_{FB}=3.3V	-50		50	nA
Top FET R_{ON}	$R_{DS(ON)1}$			38		mΩ
Bottom FET R_{ON}	$R_{DS(ON)2}$			19		mΩ
Output Discharge Current	I_{DIS}			100		mA
Top FET Current Limit	$I_{LMT,TOP}$		18	20	22	A
Bottom FET Current Limit	$I_{LIM,BOT}$	ILMT='0'	6.5	7.5	8.5	A
		ILMT=Floating	9.5	10.5	11.5	
		ILMT='1'	12.5	13.5	14.5	
ILMT Rising Threshold	V_{ILMTH}		Vcc-0.8			V
ILMT Falling Threshold	V_{ILMTL}				0.8	V
Soft-start Time	t_{SS}			400		μs
EN Rising Threshold	V_{ENH}		0.8			V
EN Falling Threshold	V_{ENL}				0.4	V
Input UVLO Threshold	V_{UVLO}				3.9	V
UVLO Hysteresis	V_{HYS}			0.3		V
Oscillator Frequency	F_{OSC}		425	500	575	kHz
Min ON Time	$t_{ON,MIN}$	V_{IN}=V_{INMAX}		50		ns
Min OFF Time	$t_{OFF,MIN}$			200		ns
VCC Output	V_{CC}	V_{IN}=4V	3.2	3.3	3.4	V
Output Over Voltage Protection Threshold		V_{FB} Rising	115	120	125	%V_{REF}
Output Over Voltage Protection Hysteresis				5		%V_{REF}
Output OVP Delay				20		μs
Output Under Voltage Protection Threshold			55	60	65	%V_{REF}
Output UVP Delay				200		us
Power Good Threshold		V_{FB} Rising (Good)	88	90	92	%V_{REF}
Power Good Hysteresis				5		%V_{REF}
Power Good Delay		Low to high		200		μs
		High to low		10		μs
Bypass Switch R_{ON}	R_{BYP}			1		Ohm
Bypass Switch Turn-on Voltage	$V_{BYP,ON}$		2.97	3.1		V
Bypass Switch Switchover Hysteresis	$V_{BYP,HYS}$			0.2		V
Bypass Switch OVP				120		%V_{CC}
Thermal Shutdown Temperature	T_{SD}			150		℃
Thermal Shutdown Hysteresis	T_{HYS}			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

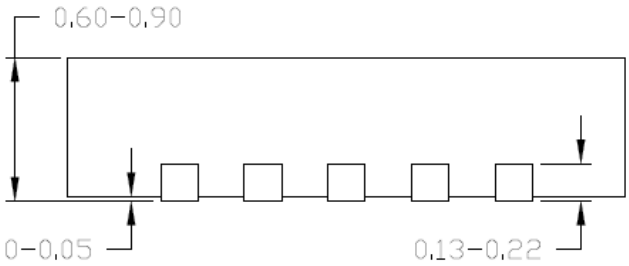
Note 2: θ_{JA} is measured in the natural convection at T_A = 25℃ on a low effective single layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

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

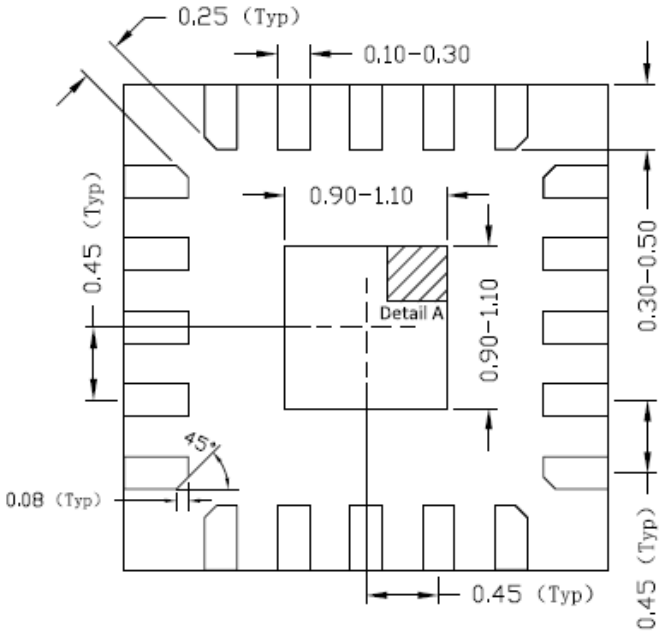
QFN3×3-20 Package Outline

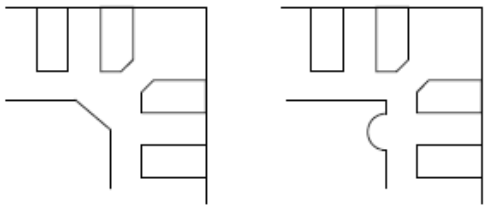


Top view



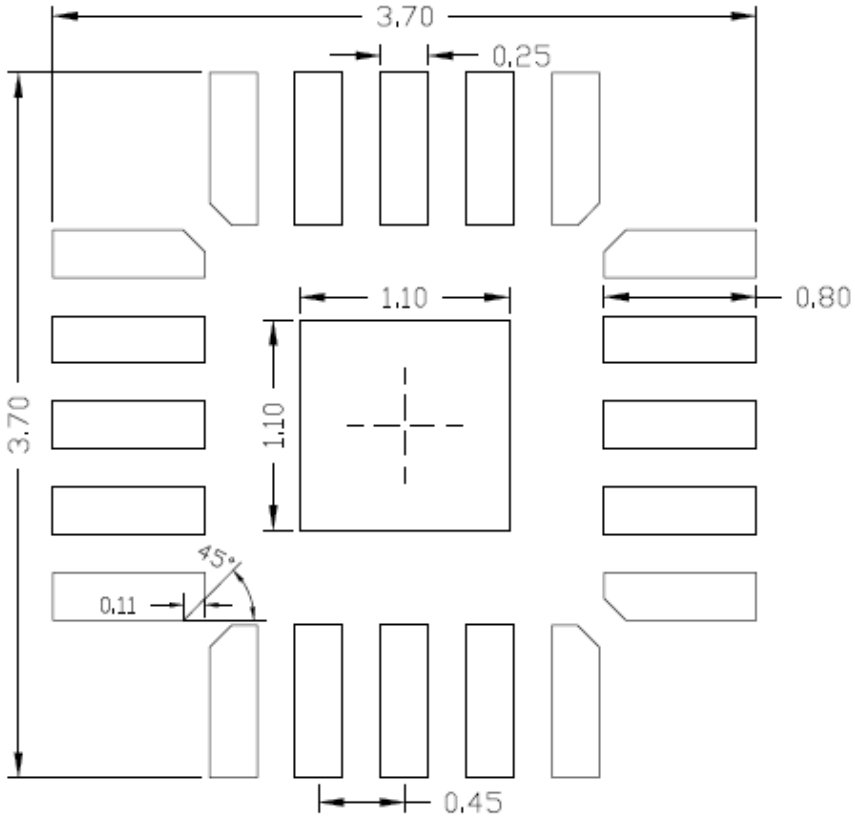
Side view





Detail A
Pin1 Identifier: two options

Bottom view

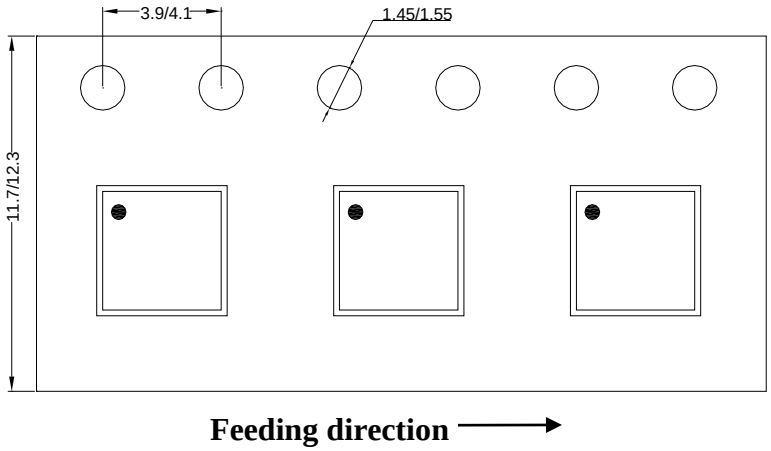


Recommended PCB layout
(Reference only)

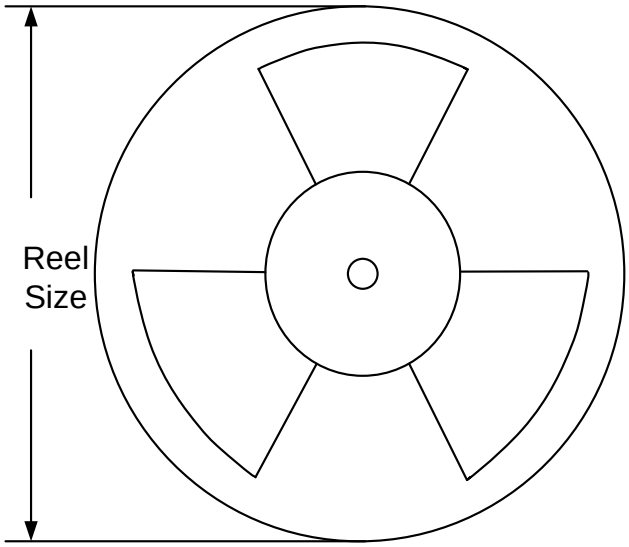
Notes: **All dimension in millimeter and exclude mold flash & metal burr.**

Taping & Reel Specification

1. QFN3×3-20 taping orientation



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