2A, 23V, 850KHz Synchronous Step-Down Converter

General Description

The FC6811 is a high frequency synchronous rectified step-down switch mode converter with built in internal power MOSFETs. It offers a very compact solution to achieve 2A continuous output current over a wide input supply range with excellent load and line regulation. The FC6811 has synchronous mode operation forhigher efficiency over current load range. Current mode operation provides fast transient response and eases loop stabilization.
Full protection features include cycle-by-cycle current limit , UVLO , output over voltage protection and thermal shutdown.The adjustable soft-start function prevents inrush current at turn-on.
The FC6811 requires a minimum number of readily available standard external components and is available in a space saving 6-pin SOT-23 package.

Features

- Wide Input Range: 4.5V ~ 23V
- Output Adjustable From 0.6V ~ 8V
- Pseudo 850kHz Switching Frequency
- Proprietary Switching Loss Reduction Technique
- 2A Output Current
- Under Voltage Lockout
- Internal Soft Start
- Output Overvoltage Protection
- Over-Temperature Protection With Auto Recovery
- Compact Package: SOT-23-6 pins

Applications

- Chargers
- Digital Set Top Boxes
- Portable Products
- Notebook Systems and I/O Power

Typical Applications

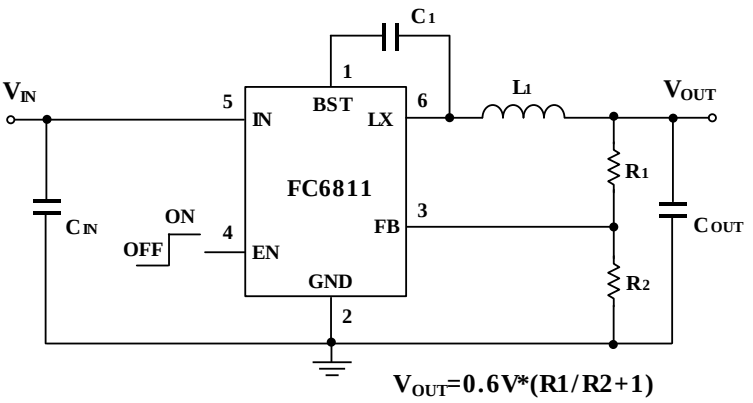


Figure 1 - Schematic Diagram

Function Block Diagram

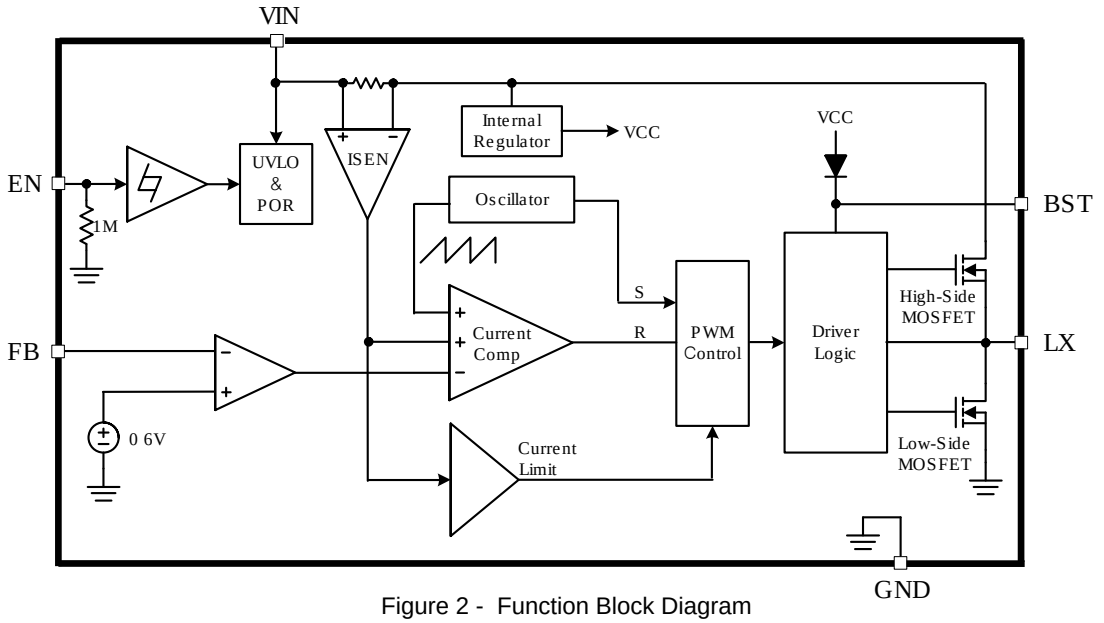
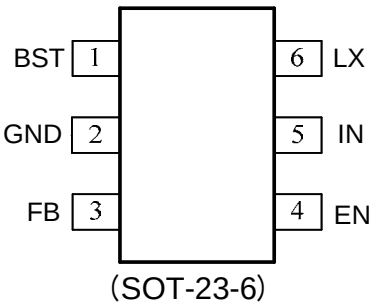


Figure 2 - Function Block Diagram

Pinout (top view)



(SOT-23-6)

Pin Name	Pin Number	Pin Description
BST	1	High Side Gate Drive Boost Pin. A 0.1uF - 1uF capacitor must be connected from this pin to LX. It can boost the gate drive to fully turn on the internal high side NMOS.
GND	2	Ground Pin.
FB	3	Feedback pin. Connect a resistor R1 between V_{OUT} and FB, and a resistor R2 between FB and GND to program the output voltage: V_{OUT} =0.6V*(R1/R2+1).
EN	4	Enable Input Pin. This pin is a digital control input that turns the converter on or off. Connect to VIN with a 100K resistor for self-startup.
IN	5	Power Supply Input Pin. Drive VIN pin by 4.5V to 23V voltage to power on the chip.
LX	6	Power Switching Output. LX is the output of the internal high side NMOS switch.

Ordering Information

Temperature Range: -40°C to 85°C

Part Number	Package type	MOQ	Description
FC6811	SOT-23-6	3000	Tape & Reel

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
IN Voltage	V_{IN}		-0.3		24	V
LX Voltage	V_{LX}		-0.3		V_{IN}+0.3	V
EN Voltage	V_{EN}		-0.3		24	V
BST Pin Voltage	V_{BST}		V_{LX} -0.3		V_{LX} +6V	V
All Other Pins Voltage			-0.3		+6V	V
Junction Temperature	T_J				+150	°C
Operating Temperature	T_{OP}		-40		+85	°C
Storage Temperature	T_{ST}		-56		+150	°C
Lead Temperature		(soldering, 10 sec)			+260	°C

Note1: Stresses beyond this listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	V_{IN}		4.5		23	V
Operating Temperature Range	T_A	Ambient Temperature	-40		+85	°C

DC Electrical Characteristics (V_{IN} =12V, T_A=25°C,unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
V_{IN} Input Supply Voltage	V_{IN}		4.5		24	V
V_{IN} Quiescent Current	I_{DDQ}	V_{EN}=2.0V, V_{FB}=1.0V		0.3		mA
V_{IN} Shutdown Supply Current	I_{SD}	V_{EN}=0V		1	10	μA
Feedback Voltage	V_{FB}	4.5V≦V_{IN}≦23V	0.591	0.6	0.609	V
Feedback Input Current	I_{FB}	V_{FB}=1V		0.01	0.1	μA
High-Side MOSFET R_{DS}(ON) (Note 2)	$R_{DS(ON)}$			140		mΩ
Low-Side MOSFET R_{DS}(ON) (Note 2)	$R_{DS(ON)}$			90		mΩ
High-Side MOSFET Leakage Current	$I_{LX(leak)}$	V_{EN}=0V, V_{LX}=0V			10	μA
Valley Current Limit (Note 2)	I_{LIMIT}			3		A
Internal Soft-Start Period (Note 2)	T_{SS}			1.5		mS
Minimum On Time (Note 2)	T_{ON}	V_{IN}=12V, V_{OUT}=1.05V		150		ns
Input UVLO Threshold	$V_{UVLO(Vth)}$	V_{IN} Rising		4.3		V
Under Voltage Lockout Threshold Hysteresis	$V_{UVLO(HYS)}$			350		mV
EN Input Low Voltage	$V_{EN\ (L)}$				0.5	V
EN Input High Voltage	$V_{EN\ (H)}$		1.5			V
EN Input Current	I_{EN}	V_{IN}=2V		2		μA
Thermal Shutdown Threshold (Note 2)	T_{SD}			160		°C

Note2: Guaranteed by design, not tested.

Typical Application

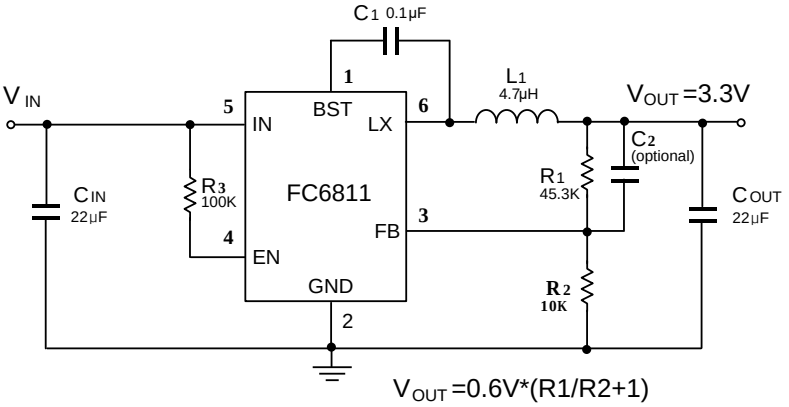


Figure 3 - CIN /COUT use Ceramic Capacitors Application Circuit

VIN=12V, the recommended BOM list is as below.

V_{OUT}	CIN	R1	R2	C2	L1	COUT
1.05V	22μF MLCC	7.5kΩ	10kΩ	5pF~220pF	1.5μH	22μF MLCC
1.2V	22μF MLCC	10kΩ	10kΩ	5pF~220pF	1.5μH	22μF MLCC
1.8V	22μF MLCC	20kΩ	10kΩ	5pF~220pF	2.2μH	22μF MLCC
2.5V	22μF MLCC	31.6kΩ	10kΩ	5pF~220pF	3.3μH	22μF MLCC
3.3V	22μF MLCC	45.3kΩ	10kΩ	5pF~220pF	4.7μH	22μF MLCC
5V	22μF MLCC	73.2kΩ	10kΩ	5pF~220pF	4.7μH	22μF MLCC

Typical Performance Curves (V_{IN} =12V, T_A=25℃,unless otherwise specified)

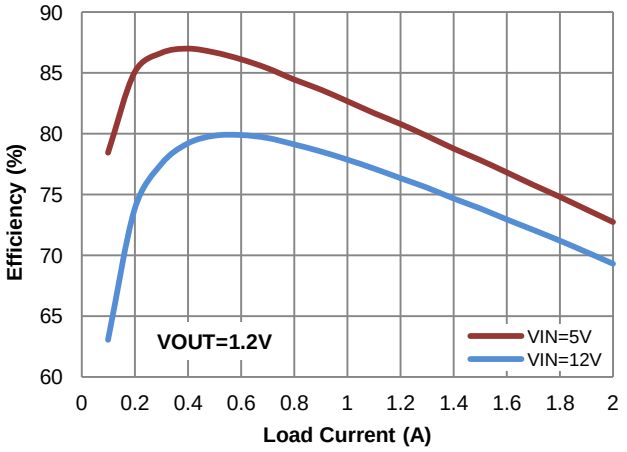


Figure 3 - Efficiency vs. Load Current

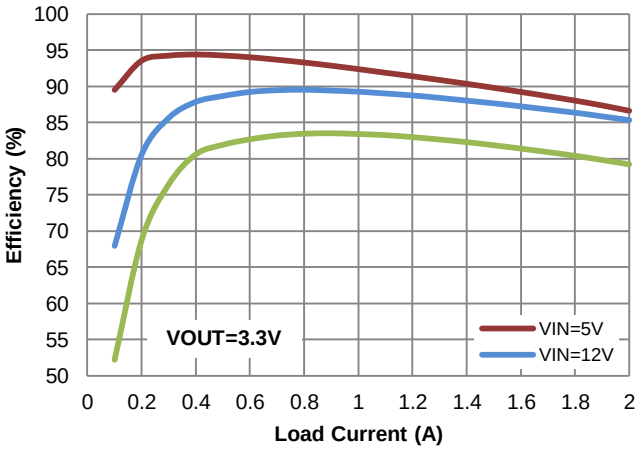


Figure 4 - Efficiency vs. Load Current

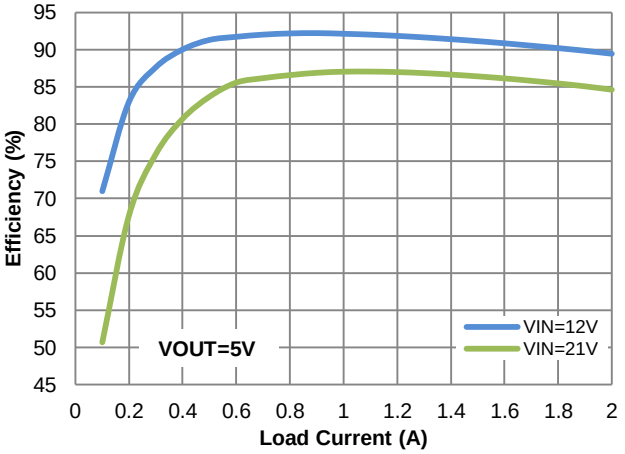
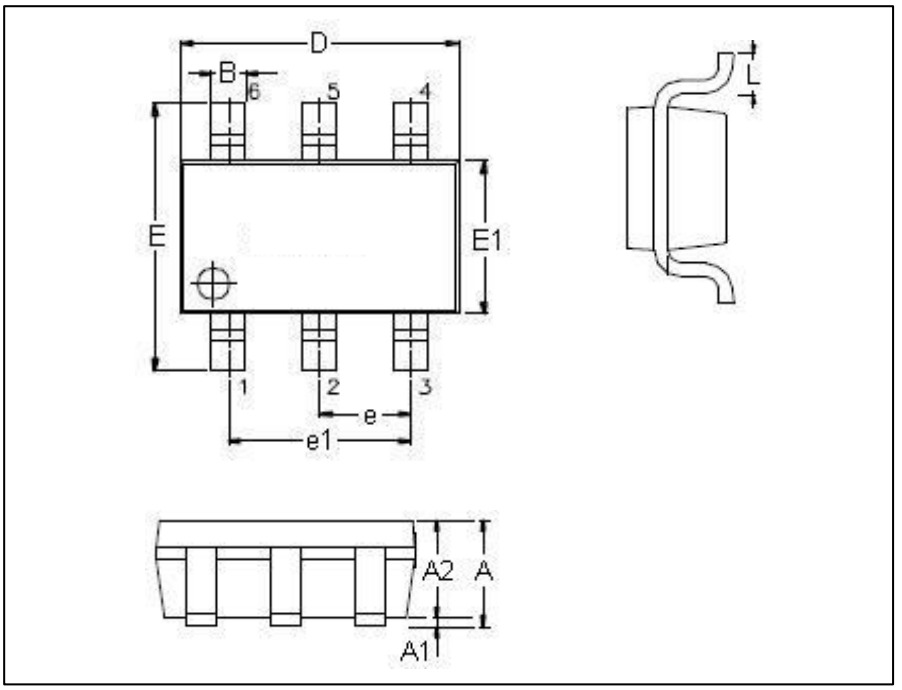


Figure 5 - Efficiency vs. Load Current

Package Outline

(SOT-23-6)



Unit: mm

Symbols	Min. (mm)	Max. (mm)
A	0.900	1.450
A1	0.050	0.150
A2	0.900	1.300
B	0.300	0.500
D	2.800	3.000
E	2.600	3.000
E1	1.500	1.700
e	0.900	1.000
e1	1.800	2.000
L	0.300	0.600

Note: 1. Note Followed From JEDEC MO-178-C.