AXP8130

3A, 18V Synchronous Step-Down Converter

DESCRIPTION

The AXP8130 is a current mode monolithic buck voltage converter. Operating with an input range of 4.5-18V, the AXP8130 delivers 3A of continuous output current with two integrated N-Channel MOSFETs. At light loads, regulators operate in low frequency to maintain high efficiency and low output ripple.

The AXP8130 guarantees robustness with over current protection, thermal protection, start-up current run-away protection, and input under voltage lockout.

The AXP8130 is available in a 6-pin TSOT23-6 package, which provides a compact solution with minimal external components.

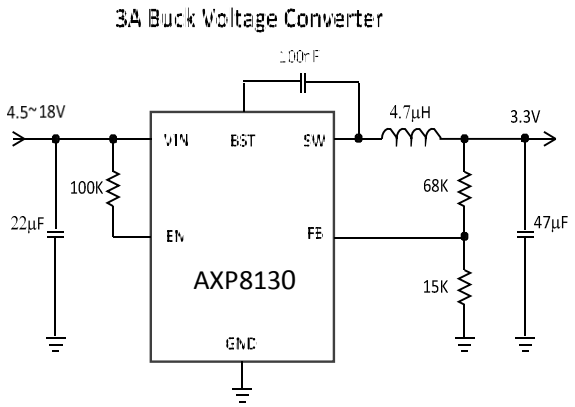
FEATURES

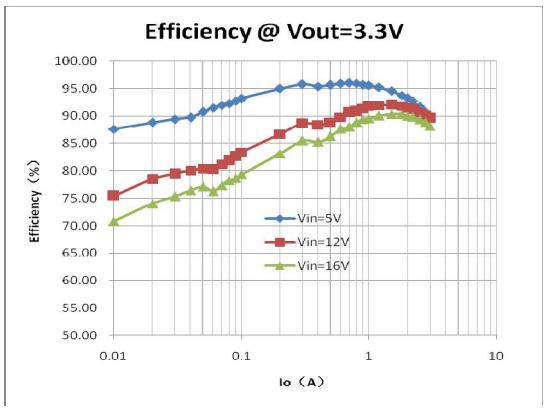
- 4.5V to 18V operating input range
- 3A output current
- Up to 95% efficiency
- High efficiency at light load
- Fixed 420kHz Switching frequency
- Input under voltage lockout
- Start-up current run-away protection
- Over current protection and Hiccup
- Thermal protection
- Available in TSOT23-6 package

APPLICATIONS

- Distributed Power Systems
- Networking Systems
- FPGA, DSP, ASIC Power Supplies
- Green Electronics/ Appliances
- Notebook Computers

TYPICAL APPLICATION



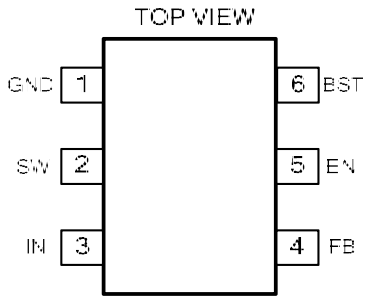


ORDER INFORMATION

LEAD FREE FINISH	TAPE AND REEL	PACKAGE	TOP MARKING
AXP8130DJ	AXP8130DJ	TSOT23-6	

Note:
D:-40C~85C
J:TSOT23

PIN CONFIGURATION



TSOT23-6

ABSOLUTE MAXIMUM RATING[1)]

VIN, EN, SW PIN .....-0.3V to 19V
BST PIN .....SW-0.3V to SW+5V
All other pins .....-0.3V to 6V
JunctionTemperature[2)3)].....150ºC
Lead Temperature.....150ºC
Storage Temperature..... -65ºC to +150ºC

RECOMMENDED OPERATING CONDITIONS

Input Voltage VIN.....4.5V to 18V

Output voltage Vout .....0.8V to 16.2V

Junction Temperature (TJ).....-40ºC to 125ºC

THERMAL PERFORMANCE

	θ_{JA}	θ_{JC}
TSOT23-6	110	55°C/W

Note:

1) Exceeding these ratings may damage the device.
2) The AXP8130 guarantees robust performance from -40°C to 150°C junction temperature. The junction temperature range specification is assured by design, characterization and correlation with statistical process controls.
3) The AXP8130 includes thermal protection that is intended to protect the device in overload conditions. Thermal protection is active when junction temperature exceeds the maximum operating junction temperature. Continuous operation over the specified absolute maximum operating junction temperature may damage the device.

.

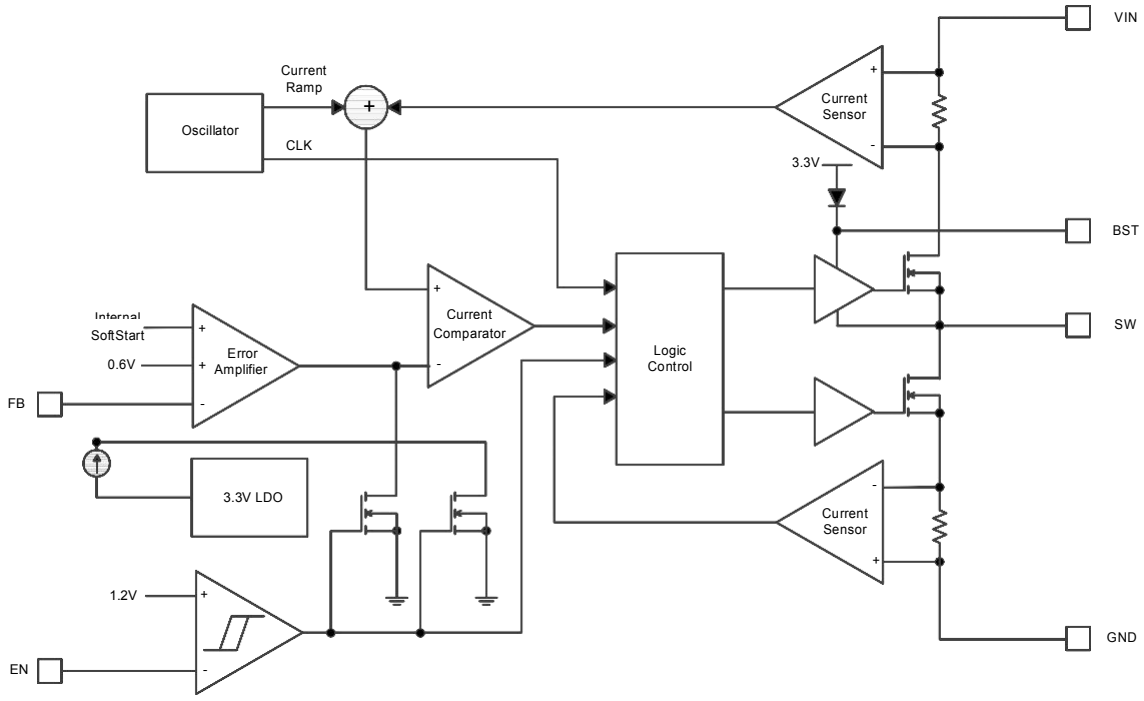
ELECTRICAL CHARACTERISTICS

VIN=12V, T_A=25 unless otherwise stated.						
Item	Symbol	Condition	Min.	Typ.	Max.	Units
V_{IN} Undervoltage Lockout Threshold	V_{IN_MIN}	V_{IN} falling		3.9	4.1	V
V_{IN} Undervoltage Lockout Hysteresis	$V_{IN\_MIN\_HYST}$	V_{IN} rising		250		mV
Shutdown Supply Current	I_{SD}	V_{EN}=0V		0.2	0.3	μA
Supply Current	I_Q	V_{EN}=5V, V_{FB}=2V		80	100	μA
Feedback Voltage	V_{FB}		588	600	612	mV
Top Switch Resistance	$R_{DS(ON)T}$			115		mΩ
Bottom Switch Resistance	$R_{DS(ON)B}$			71		mΩ
Top Switch Leakage Current	I_{LEAK_TOP}	V_{IN}=16V, V_{EN}=0V, V_{SW}=0V			0.5	uA
Bottom Switch Leakage Current	I_{LEAK_BOT}	V_{IN}=16V, V_{EN}=0V, V_{SW}=0V			0.5	uA
Top Switch Current Limit	I_{LIM_TOP}	Minimum Duty Cycle		5.5		A
Switch Frequency	F_{SW}			420		kHz
Minimum On Time	T_{ON_MIN}			100		ns
Minimum Off Time	T_{OFF_MIN}	V_{FB}=0.7V		130		ns
EN shut down threshold voltage	V_{EN_TH}	V_{EN} falling, FB=0V		1.2		V
EN shut down hysteresis	V_{EN_HYST}	V_{EN} rising, FB=0V		100		mV
Thermal Shutdown	T_{TSD}			145		
Temperature Hysteresis	T_{HYS}			20		

PIN DESCRIPTION

Pin No.	Name	Description
1	GND	Power ground pin.
2	SW	SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load.
3	IN	Input voltage pin. VIN supplies power to the IC. Connect a 4.5V to 18V supply to VIN and bypass VIN to GND with a suitably large capacitor to eliminate noise on the input to the IC.
4	BST	Boostrap pin for top switch. A 0.1uF or larger capacitor should be connected between this pin and the SW pin to supply current to the top switch and top switch driver.
5	EN	Drive EN pin high to turn on the regulator and low to turn off the regulator.
6	FB	Output feedback pin. FB senses the output voltage and is regulated by the control loop to 0.8V. Connect a resistive divider at FB.

BLOCK DIAGRAM

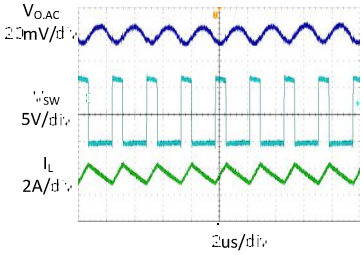


TYPICAL PERFORMANCE CHARACTERISTICS

Vin =12V, Vout = 3.3V, L = 4.7μH, Cout = 47μF, TA = +25°C, unless otherwise noted

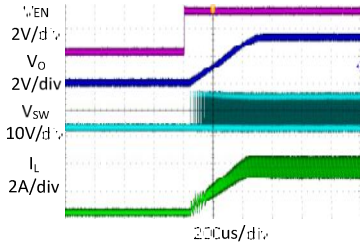
Steady State Test

VIN=12V, Vout=3.3V
Iout=3A



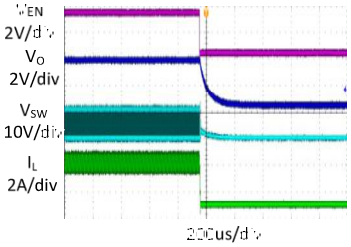
Startup through Enable

VIN=12V, Vout=3.3V
Iout=3A(Resistive load)



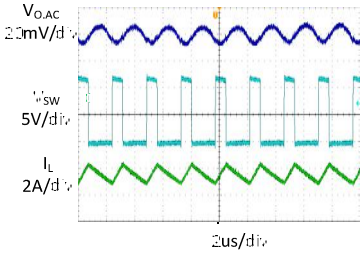
Shutdown through Enable

VIN=12V, Vout=3.3V
Iout=3A(Resistive load)



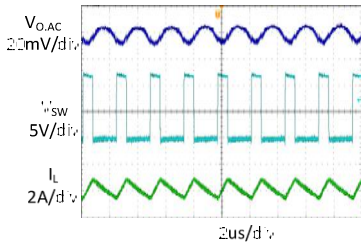
Heavy Load Operation

2A LOAD



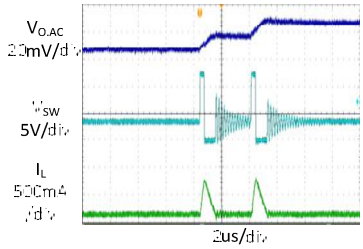
Medium Load Operation

1A LOAD



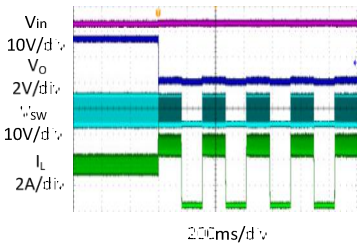
Light Load Operation

0 A LOAD



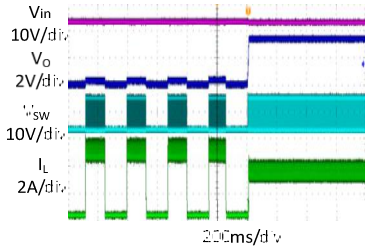
Short Circuit Protection

VIN=12V, Vout=3.3V
Iout=3A- Short



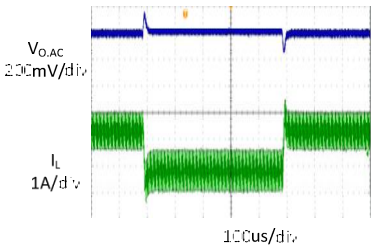
Short Circuit Recovery

VIN=12V, Vout=3.3V
Iout= Short-3A



Load Transient

1.5A LOAD 3A LOAD 1.5A LOAD



FUNCTIONAL DESCRIPTION

The AXP8130 is a synchronous, buck voltage converter.

Current-Mode Control

The AXP8130 utilizes current-mode control to regulate the FB voltage. Voltage at the FB pin is regulated at 0.6V so that by connecting an appropriate resistor divider between VOUT and GND, designed output voltage can be achieved.

PFM Mode

The AXP8130 operates in PFM mode at light load. In PFM mode, switch frequency is continuously controlled in proportion to the load current, i.e. switch frequency is decreased when load current drops to boost power efficiency at light load by reducing switch-loss, while switch frequency is increased when load current rises, minimizing both load current and output voltage ripples.

Internal Soft-Start.

Soft-Start makes output voltage rising smoothly follow an internal SS voltage until SS voltage is higher than the internal reference voltage. It can provide overshoot of output voltage when startup.

Power Switch

N-Channel MOSFET switches are integrated on the AXP8130 to down convert the input voltage to the regulated output voltage. Since the top MOSFET needs a gate voltage greater than the input voltage, a boost capacitor connected between BST and SW pins is required to drive the gate of the top switch. The boost capacitor is charged by the internal 3.3V rail when SW is low.

Vin Under-Voltage Protection

A resistive divider can be connected between Vin and ground, with the central tap connected to EN, so that when Vin drops to the pre-set value, EN drops below 1.2V to trigger input under voltage lockout protection.

Output Current Run-Away Protection

At start-up, due to the high voltage at input and low voltage at output, current inertia of the output inductance can be easily built up, resulting in a large start-up output current. A valley current limit is designed in the AXP8130 so that only when output current drops below the valley current limit can the bottom power switch be turned off. By such control mechanism, the output current at start-up is well controlled.

Over Current Protection and Hiccup

AXP8130 has a cycle-by-cycle current limit. When the inductor current triggers current limit, AXP8130 enters hiccup mode and periodically restart the chip. AXP8130 will exit hiccup mode while not triggering current limit.

Short Circuit Protection

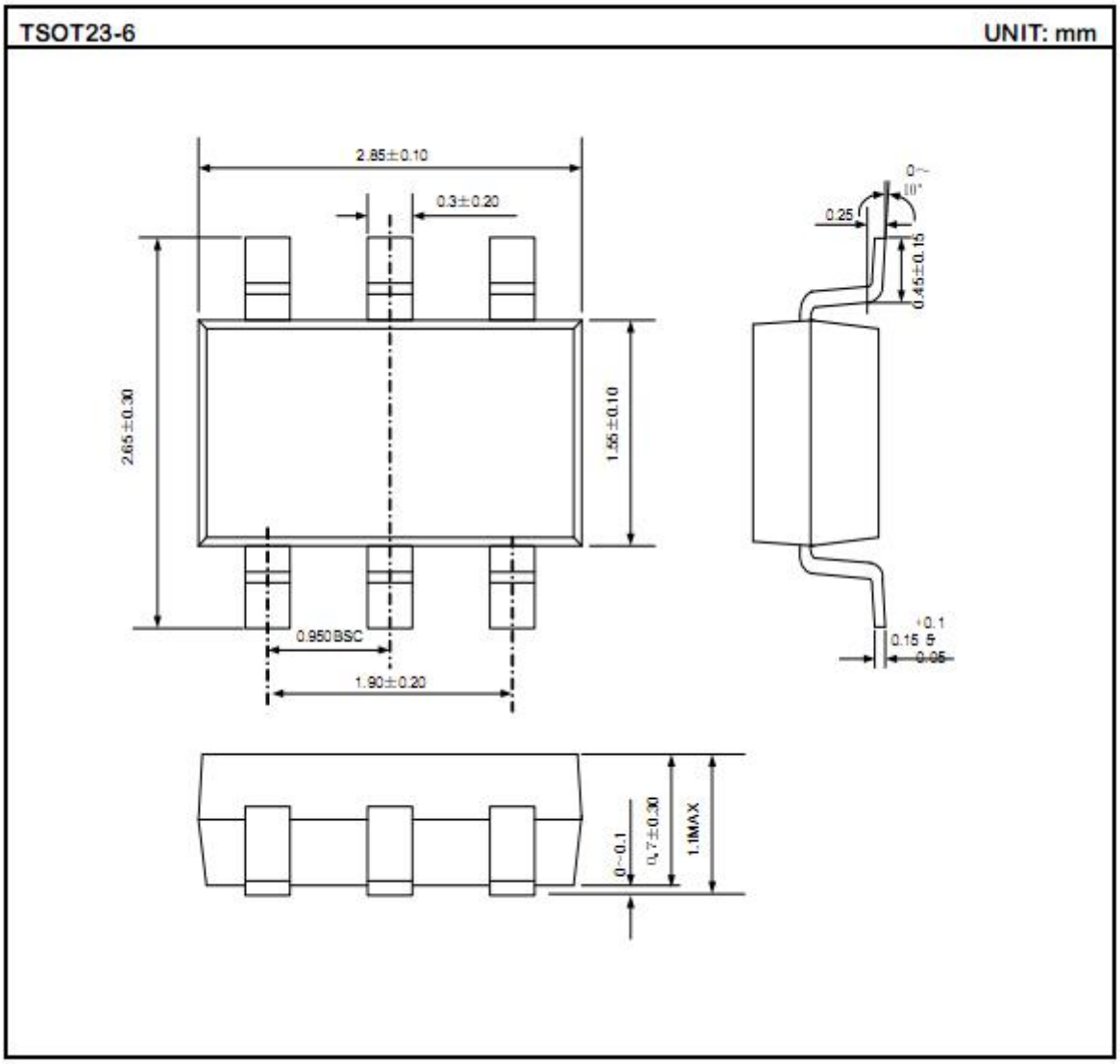
If a current higher than 7A is detected through TOP FET when it's on, we consider SW is shorted to GND. The chip stops switching for few cycles and switch once to check whether SW is still shorted to GND. This cycle will be repeated until SW is not shorted to GND.

Thermal Protection

When the temperature of the AXP8130 rises above 145°C, it is forced into thermal shut-down.

Only when core temperature drops below 125°C can the regulator becomes active again.

PACKAGE OUTLINE



IMPORTANT NOTICE

- **X-Powers Technology Inc. Reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein.**
- **Any unauthorized redistribution or copy of this document for any purpose is strictly forbidden.**
- **X-Powers Technology Inc. does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.**