Synchronous Boost DC/DC Regulator

Features

- Up to 93% Efficiency
- Low Voltage Start-up: 2V
- Up to 3A Load Current
- Shut-down Current: 3μA
- Input Voltage: 2V ～ 4.5V
- Output Voltage: 2.5V ～ 5.5V
- 400kHz Fixed Frequency Switching
- Available in SOP8/PP Package

Applications

- Digital cameras and MP3
- Palmtop computers / PDAs
- Cellular phones
- Wireless handsets and DSL modems
- PC cards
- Portable media players

Description

The JTMH3018C is high efficiency synchronous, PWM step-up DC/DC converters optimized to provide a high efficient solution to medium power systems. The devices work under the input voltage between 2V and 4.5V with a 400kHz fixed frequency switching. These features minimize overall solution footprint by allowing the use of tiny, low profile inductors and ceramic capacitors.

The JTMH3018C is capable of supplying an output voltage between 2.5V and 5.5V, the internal synchronous switch is desired to provide high efficiency without Schottky.

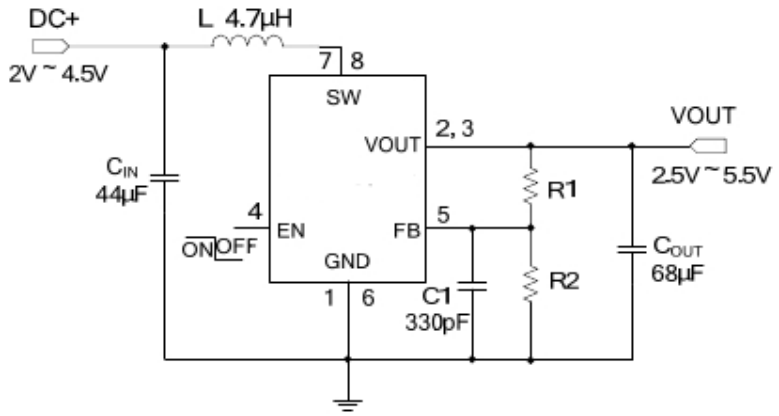
The JTMH3018C regulators are available in the industry standard SOP8/PP power packages.

Order Information

JTMH3018C - ① ②:

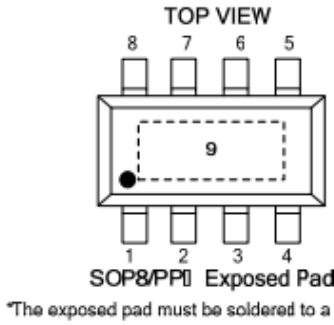
SYMBOL	DESCRIPTION
①	Denotes Output voltage: A : Adjustable Output
②	Denotes Package Types: P: SOP8/PP

Typical Application



* The output voltage is adjustable and set by R1 and R2: $V_{OUT} = 1.2V \cdot [1 + (R1/R2)]$.

Pin Assignment and Description



PIN	NAME	DESCRIPTION
1, 6, 9	GND	Ground
2, 3	VOUT	Output Pin
4	EN	ON/OFF Control(High Enable)
5	FB	Feedback
7, 8	SW	Switch Output

Absolute Maximum Ratings (Note 1)

- V_{OUT}……..……..……...-0.3V ～ 6.5V
- V_{SW} ……..……..……-0.3V ～ 6.5V
- V_{EN}……..……..……-0.3V ～ 6.5V
- Operating Temperature Range (Note 2)……..……-40℃ ～ +85℃
- Storage Temperature Range ……..……..-65℃ ～ +150℃
- Lead Temperature (Soldering 10 sec.) ……..……+265℃

Note 1: Stresses listed as the above “Absolute Maximum Ratings” may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2: The JTMH3018C are guaranteed to meet performance specifications from 0°C to 70°C. Specifications over the – 40°C to 85°C operating temperature range are assured by design, characterization and correlation with statistical process controls.

Electrical Characteristics

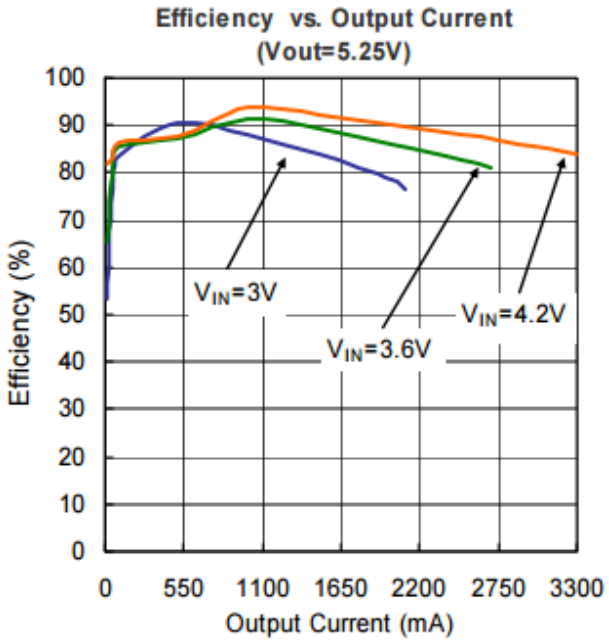
Operating Conditions: TA=25℃, R1=1M, R2=300k, C1=330pF, C_{IN} =44μF, C_{OUT} =68μF, L=4.7μH, unless otherwise noted.

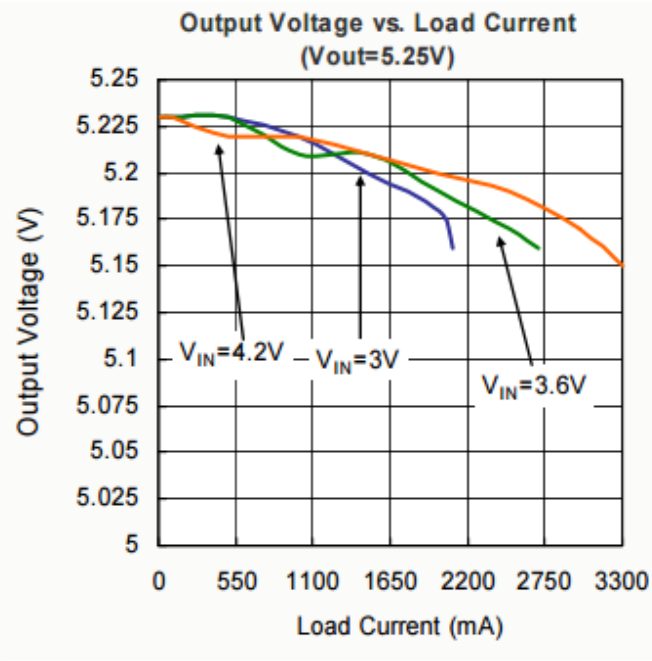
SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OUT}	Output Voltage Range (Adj.)		2.5		5.5	V
V_{START}	Minimum Start-up Voltage (Note 3)	I_{LOAD} = 0mA		2		V
I_Q	Quiescent Current	V_{IN}=4.2V ,I_{LOAD}=0mA		600		μA
I_{SHDN}	Shutdown Current	V_{EN}=0V, Including Switch Leakage		3		μA
V_{FB}	Feedback Voltage		1.176	1.2	1.224	V
f_{OSC}	Switching Frequency			400		kHz
R_{NFET}	NMOS Switch On Resistance	V_{OUT}=4.2V, I_{LOAD}=1A		0.1		Ω
R_{PFET}	PMOS Switch On Resistance	V_{OUT}=4.2V, I_{LOAD}=1A		0.22		Ω
V_{ENH}	En Input High		1.5			V
V_{ENL}	En Input Low				0.5	V
EFFI	Efficiency	V_{IN}=V_{EN}=4.2V,V_{OUT}= 5.25V, I_{OUT}=1A		93		%

Note 3: Minimum V_{IN} operation after start-up is only limited by the battery's ability to provide the necessary power as it enters a deeply discharged state.

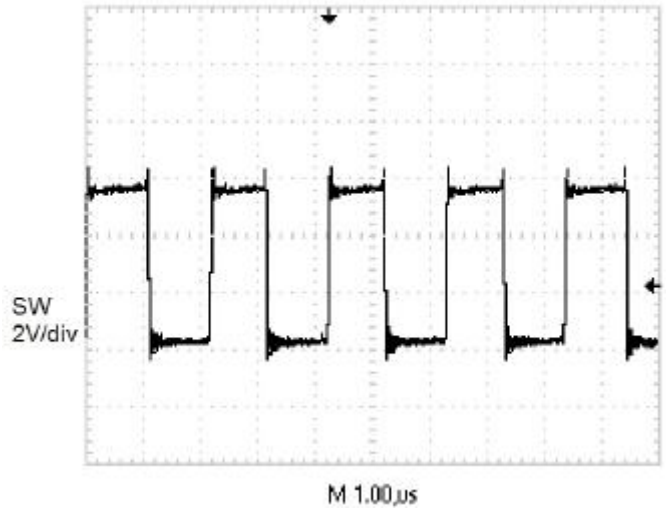
Typical Performance Characteristics

Operating Conditions: TA=25℃, R1=1M, R2=300k, C1=330pF, C_{IN} =44μF, C_{OUT} =68μF, L=4.7μH, unless otherwise noted.

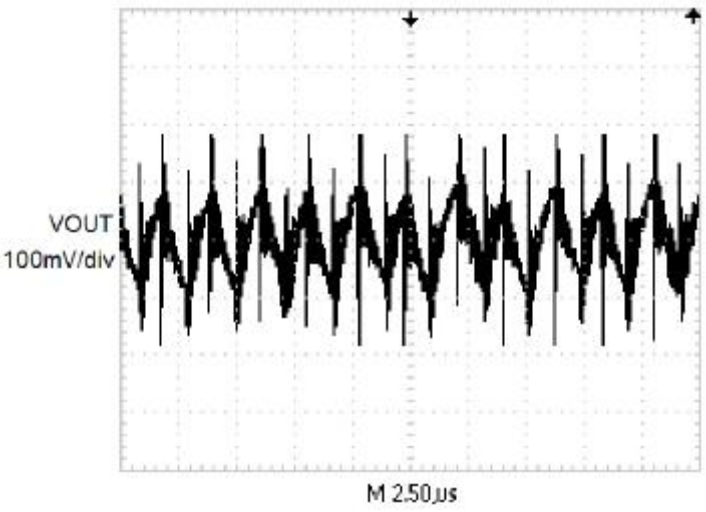




Output Noise（V_{IN}=3.6V, V_{OUT}=5.25V, I_{LOAD}=2.5A）



SW（V_{IN}=3.6V, V_{OUT}=5.25V, I_{LOAD}=2.5A）



Pin Functions

GND (Pin 1, 6, 9): Signal and Power Ground. Provide a short direct PCB path between GND and the (–) side of the output capacitor(s).

VOUT (Pin 2, 3): Output Voltage Pin. PCB trace length from V_{OUT} to the output filter capacitor(s) should be as short and wide as possible.

EN (Pin 4): Logic Controlled Shutdown Input. EN = High: Normal free running operation. EN = Low: Shutdown. Do not leave EN floating.

FB (Pin 5): Feedback Input to the g_m Error Amplifier. Connect resistor divider tap to this pin. The output voltage can be adjusted from 2.5V to 5.5V by: $V_{OUT} = 1.2V \cdot [1 + (R1/R2)]$

SW (Pin 7, 8): Switch Pin. Connect inductor between SW and V_{IN}. Keep these PCB trace lengths as short and wide as possible to reduce EMI and voltage overshoot.

Application Information

Inductor Selection

The JTMH3018C can utilize small surface mount and chip inductors. A minimum inductance value of 3.3μH is necessary for 3.6V and lower voltage applications and 4.7μH for output voltages greater than 3.6V. Larger values by reducing the inductor ripple current. Increasing the inductance above 10μH will increase size while providing little improvement in output current capability.

The inductor current ripple is typically set for 20% to 40% of the maximum inductor current (I_P). High frequency ferrite core inductor materials reduce frequency dependent power losses compared to cheaper powdered iron types, improving efficiency. The inductor should have low ESR (series resistance of the windings) to reduce the I^2R power losses, and must be able to handle the peak inductor current without saturating. Molded chokes and some chip inductors usually do not have enough core to support the peak inductor currents of the JTMH3018C. To minimize radiated noise, use a toroid, pot core or shielded bobbin inductor.

Output and Input Capacitor Selection

Low ESR (equivalent series resistance) capacitors should be used to minimize the output voltage ripple. Multilayer ceramic capacitors are an excellent choice as they have extremely low ESR and are available in small footprints. A 68μF output capacitor is sufficient for most applications. Larger values may be used to obtain extremely low output voltage ripple and improve transient response. An additional phase lead capacitor may be required with output capacitors larger than 68μF to maintain acceptable phase margin. X5R and X7R dielectric materials are preferred for their ability to maintain capacitance over wide voltage and temperature ranges.

Low ESR input capacitors reduce input switching noise and reduce the peak current drawn from the battery. It follows that ceramic capacitors are also a good choice for input decoupling and should be located as close as possible to the device. A 44μF input capacitor is sufficient for virtually any application. Larger values may be used without limitations.

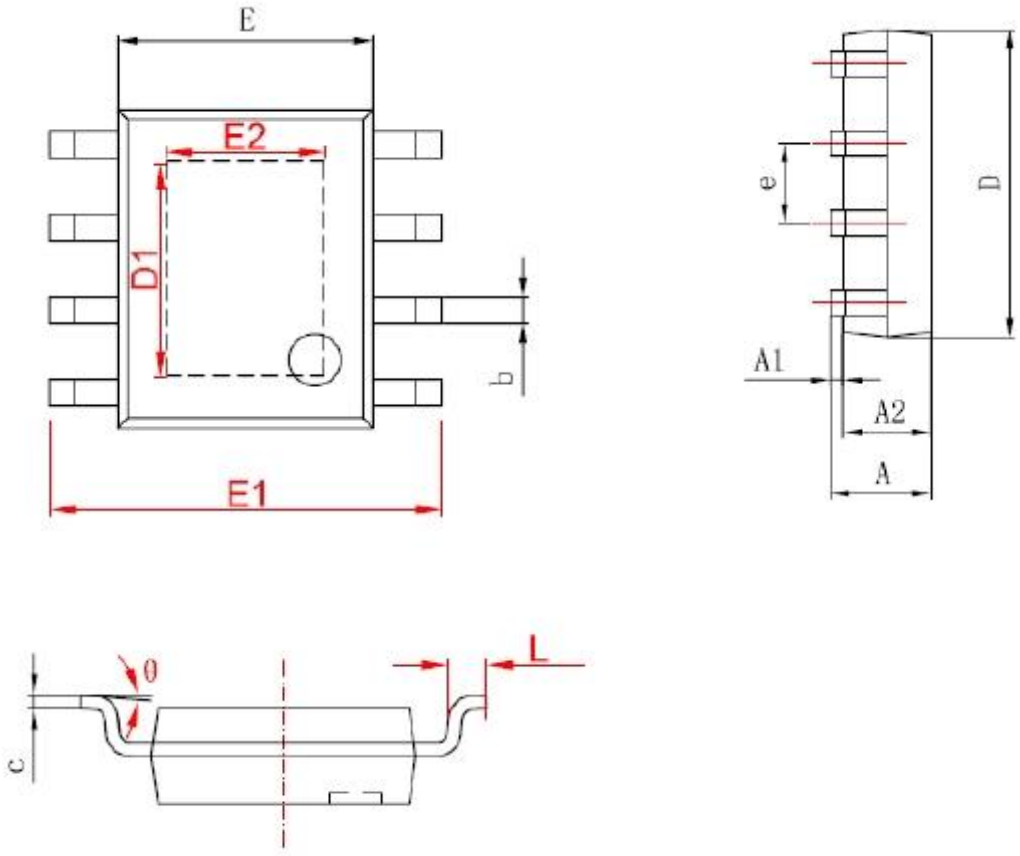
PCB Layout Guidelines

The high speed operation of the JTMH3018C demands careful attention to board layout. You will not get advertised performance with careless layout. A large ground pin copper area will help to lower the chip temperature. A multilayer board with a separate ground plane is ideal, but not absolutely necessary.

Recommended component placement: traces carrying high current are direct. Trace area at FB pin is small. Lead length to battery is short.

Packaging Information

SOP8/PP (EXP PAD) Package Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.150	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
D1	3.202	3.402	0.126	0.134
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
E2	2.313	2.513	0.091	0.099
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°