



# SP3406

## 600mA Buck Converter

### DESCRIPTION

SP3406 is a high efficiency monolithic synchronous buck regulator using a constant frequency, current mode architecture. The device is available in an adjustable version and fixed output voltages, such as 1.5V, 1.8V, etc. Supply current with no load is 30uA and drops to <1uA in shutdown. The 2.5 to 6.5V input voltage range makes the SP3406 ideally suitable for single Li-Ion, two to four AA battery-powered applications. In low dropout operation mode, the duty cycle can reach to 100%, extending battery life in portable systems. PWM pulse skipping mode operation provides very low output ripple voltage for noise sensitive applications. Switching frequency is internally set at 1.5MHz, allowing the use of small surface mount inductors and capacitors. The internal synchronous switch increases efficiency and eliminates the need for an external Schottky diode. Low output voltages are easily supported with the 0.6V feedback reference voltage. The SP 3406 is available in a small SOT-23-5 package.

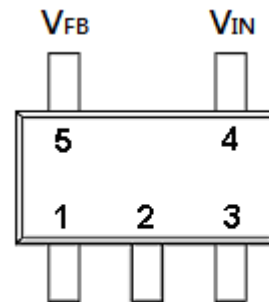
### FEATURES

- High Efficiency: Up to 96%;
- 1.5MHz Constant Switching Frequency;
- 600mA Output Current at  $V_{in}=3V$ ;
- Integrated Main Switch and Synchronous Rectifier, No Schottky Diode Required;
- 2.5 to 6.5V input voltage;
- Output Voltage as Low as 0.6V;
- 100% Duty Cycle in Dropout;
- Quiescent Current: 30uA(input<4.2V);
- Slope Compensated Current Mode Control for Excellent Line and Load Transient Response;
- Short Circuit Protection and Thermal Fault Protection;
- <1uA Shutdown Current;
- Soft Start;

### APPLICATIONS

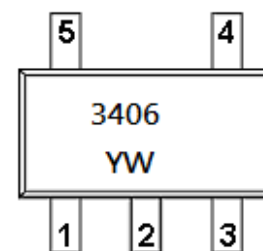
- Digital Camera
- PDA
- Hand Held Communication Equipment
- Wireless and DSL Modems
- Portable instrument
- Microprocessor and DSP Core Supplies
- MID or UPMC

### PIN CONFIGURATION ( SOT-23-5L)



RUN GND SW

### PART MARKING



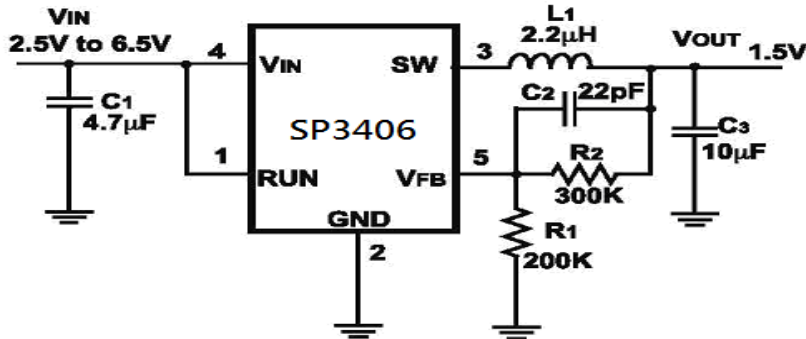
Y : Year Code  
W : Week Code



# SP3406

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### TYPICAL APPLICATION CIRCUIT

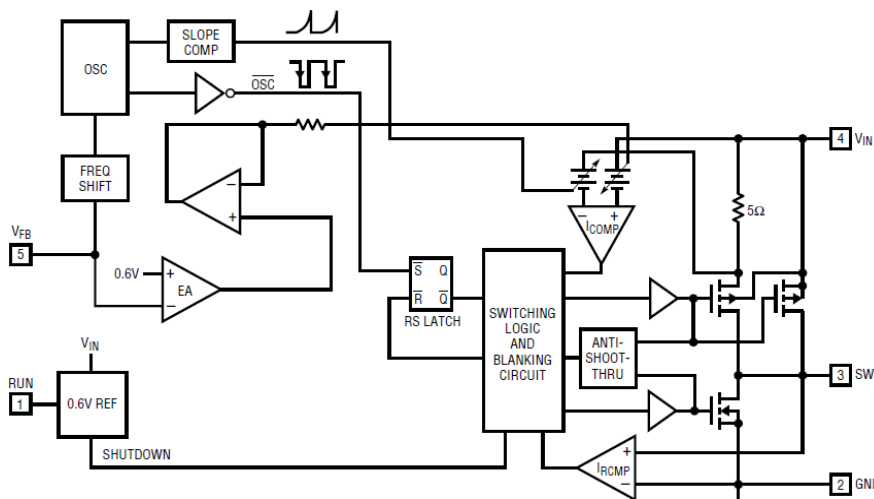


$$V_{out} = 0.6 \times \left(1 + \frac{R_2}{R_1}\right)$$

### PIN DESCRIPTION & ELECTRICAL CHARACTERISTICS

Pin	Symbol	Description	Operating Rating			
			Min.	Typ.	Max.	Unit
1	RUN	Control Input	-0.3		V <sub>IN</sub>	V
2	GND	Ground	-0.3		V <sub>IN</sub> +0.3	V
3	SW	Switch Node Connect to Inductor	-0.3		V <sub>IN</sub> +0.3	V
4	V <sub>IN</sub>	Supply Voltage	-0.3		6.5	V
5	V <sub>FB</sub>	Feedback	-0.3		V <sub>IN</sub>	V

### BLOCK DIAGRAM



### ORDERING INFORMATION

Part Number	Package	Part Marking
SP3406S25RGB	SOT-23-5L	3406

※ SP3406S25RGB : 7" Tape Reel; Pb – Free, Halogen-Free



# SP3406

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### ABSOLUTE MAXIMUM RATINGS (TA=25°C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V <sub>IN</sub>	DC Supply Voltage	-0.3 ~ 6.5	V
I <sub>OUT</sub>	SW Current, Source or Sink	1.3	A
T <sub>J</sub>	Operating Junction Temperature Range	125	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to 150	°C
T <sub>LEAD</sub>	Lead Soldering Temperature for 5 sec.	260	°C
T <sub>ope</sub>	Operation Temperature Range	-40 ~ 85	°C
R <sub>θJC</sub>	Thermal Resistance Junction – Case (*)	250	°C/W

### ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, these specifications apply T<sub>A</sub>=25°C; V<sub>IN</sub>=3.6V)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>SUPPLY</b>						
V <sub>IN</sub>	Supply Voltage		2.5		6.5	V
I <sub>IN</sub>	Input DC Bias Current Active mode	V <sub>FB</sub> = 0.5V or V <sub>OUT</sub> = 90%, I <sub>LOAD</sub> = 0A		300	400	uA
	Input DC Bias Current Sleep Mode	V <sub>FB</sub> = 0.62V or V <sub>OUT</sub> = 103%, I <sub>LOAD</sub> = 0A		20	35	uA
	Input DC Bias Current Shutdown Mode	V <sub>RUN</sub> < 0V, V <sub>IN</sub> = 4.2V		0.1	1	uA
V <sub>RUN</sub>	RUN Threshold		0.3	1	1.5	V
I <sub>RUN</sub>	RUN Leakage Current			0.01	1	uA
<b>FEEDBACK</b>						
V <sub>FB</sub>	Regulated Feedback Voltage		0.588	0.6	0.612	V
ΔV <sub>FB</sub>	Reference Voltage Line Regulation	V <sub>IN</sub> = 2.5V to 5.5V		0.04	0.4	%/V
I <sub>FB</sub>	Feedback Current				30	nA
V <sub>LOADREG</sub>	Output Voltage Load Regulation			0.5		%
I <sub>PEAK</sub>	Peak Induct Current	V <sub>IN</sub> = 3V, V <sub>FB</sub> = 0.5V, Duty Cycle < 35%	0.75	1	1.25	A
<b>SWITCHING REGULATOR</b>						
R <sub>PMOS</sub> *	R <sub>DS(on)</sub> for P MOSFET	I <sub>SW</sub> = 100mA		400	500	mΩ
R <sub>NMOS</sub> *	R <sub>DS(on)</sub> for N MOSFET	I <sub>SW</sub> = 100mA		350	450	mΩ
I <sub>LSW</sub>	SW Leakage Current	V <sub>RUN</sub> = 0V, V <sub>IN</sub> = 5V, V <sub>SW</sub> = 0V or 5V		0.01	1	uA
f <sub>osc</sub>	Oscillator Frequency	V <sub>FB</sub> = 0V or V <sub>OUT</sub> = 0V V <sub>FB</sub> =0.6V or V <sub>OUT</sub> =100%	1.2	1.5	1.8	MHz

\* Guaranteed by Design



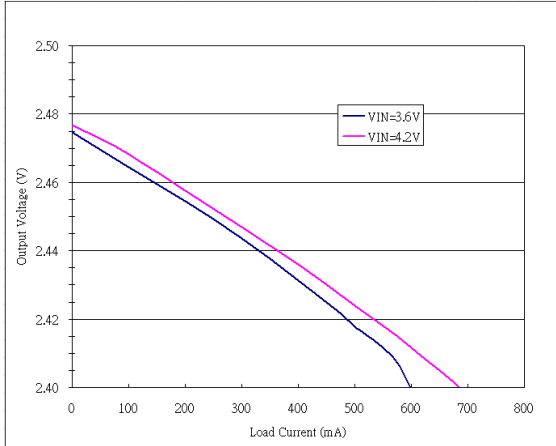
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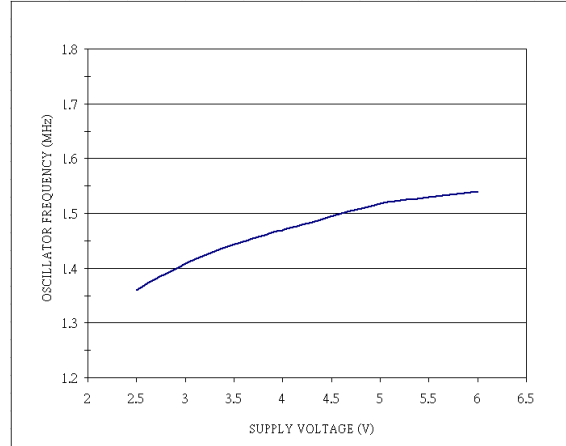
### TYPICAL PERFORMANCE CHARACTERISTICS

$T_A = +25^\circ\text{C}$ ; unless otherwise noted.

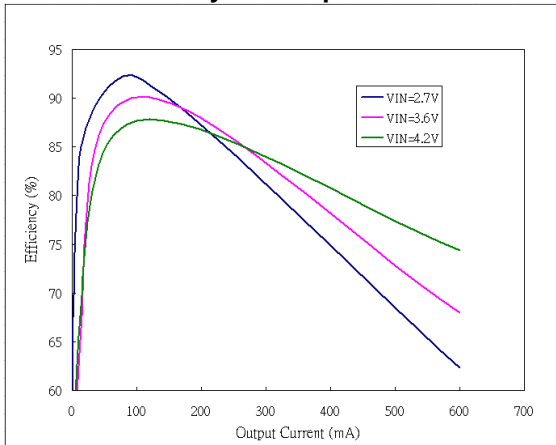
#### Output Voltage vs. Load Current



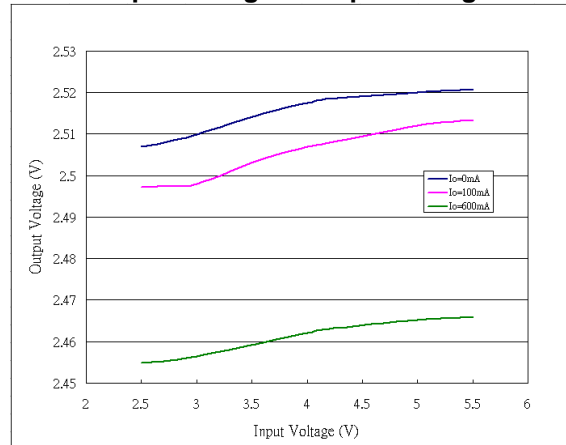
#### Oscillator Frequency vs. Supply Voltage



#### Efficiency vs. Output Current

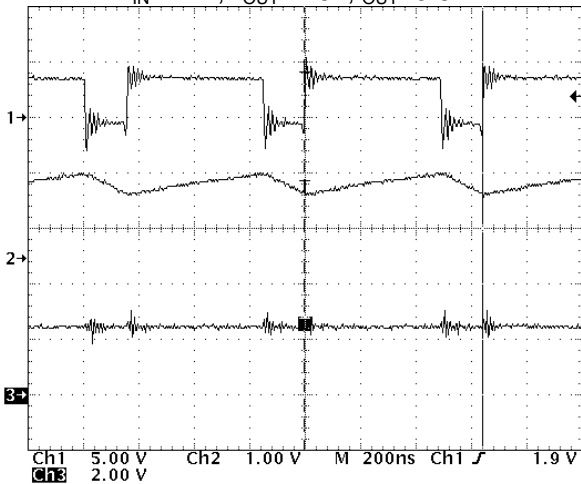


#### Output Voltage vs. Input Voltage



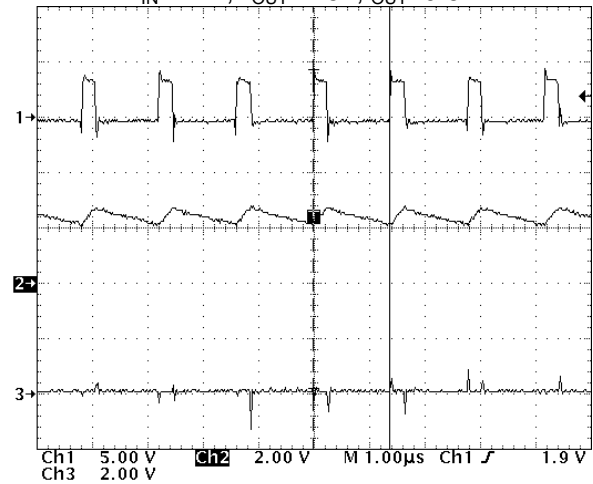
#### Normal Operating Waveforms

$V_{IN}=4.2\text{V}, V_{OUT}=2.5\text{V}, I_{OUT}=0.6\text{A}$



#### Short Circuit Protection Waveforms

$V_{IN}=4.2\text{V}, V_{OUT}=2.5\text{V}, I_{OUT}=0.6\text{A}$



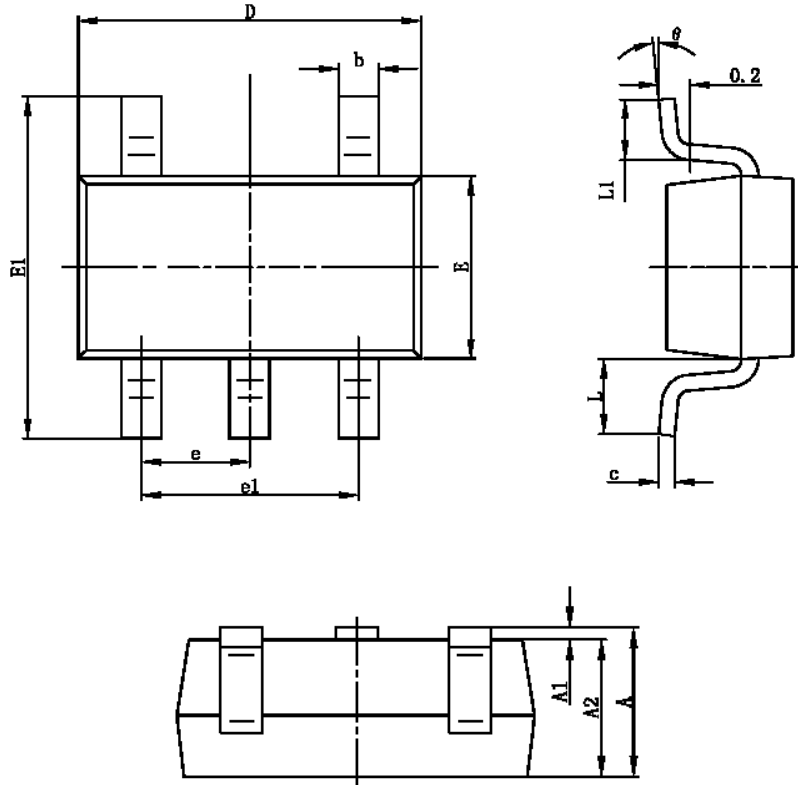
CH1 :  $V_{sw}$  , CH2 :  $I_L$  , CH3 :  $V_{out}$



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### SOT 23-5L PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°



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