General Description

The VS4101 is a step-up DC/DC converter designed for driving up to 8 white LEDs in series from a single cell Lithium Ion battery with constant current. Because it directly regulates output current, the VS4101 is ideal for driving light emitting diodes (LEDs) whose light intensity is proportional to the current passing through them, not the voltage across their terminals. A single external resistor sets LED current between 5mA and 20mA, which can then be easily adjusted using either a DC voltage or a pulse width modulated (PWM) signal. Its low 104mV feedback voltage reduces power loss and improves efficiency. The OV pin monitors the output voltage and turns off the converter if an over-voltage condition is present due to an open circuit condition. The PT4101 is available in SOT23-6 and QFN8 packages.

Features

- Driver Up to 5 series White LEDs from 2.5V
- Driver Up to 8 series White LEDs from 3.6V
- Up to 87% Efficiency
- Over 1.2MHz Fixed Switching Frequency
- Low 104mV Feedback Voltage
- Open Load Shutdown
- Soft-Start/PWM Dimming
- Internal Current Limit
- SOT23-6 and QFN8 Packages

Applications

- Cellular Phones
- Digital Cameras
- LCD modules
- PDAs, Handheld Computers

Typical Application

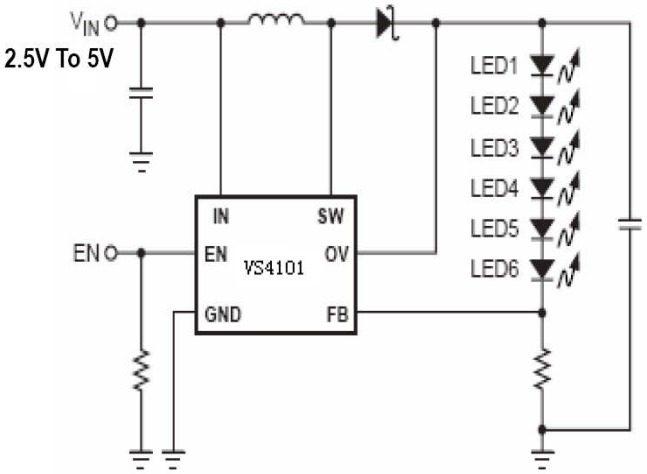
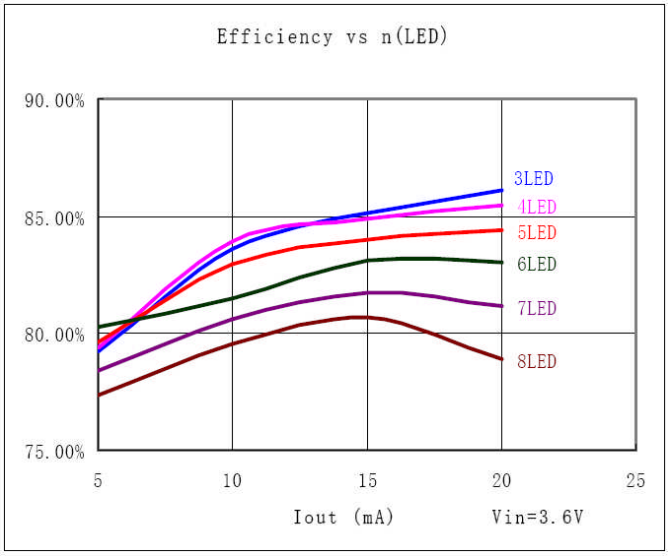


Figure 1. Li-Ion Driver for Six White LEDs



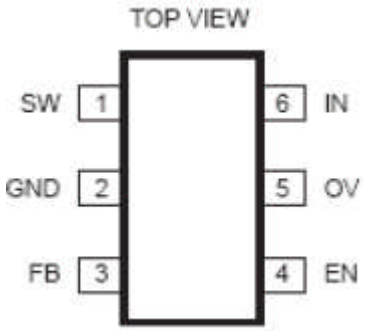
Gure 2. Efficiency vs Number of LEDs

Ordering Information

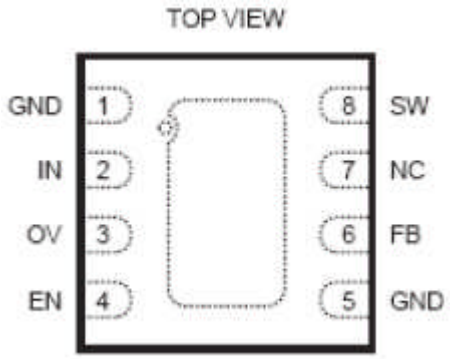
VS4101CPPP

- Package Type
  - 23F: SOT-23-6
  - QFN: QFN-8 2x2
- E: **Pb Free Package**

Package Reference



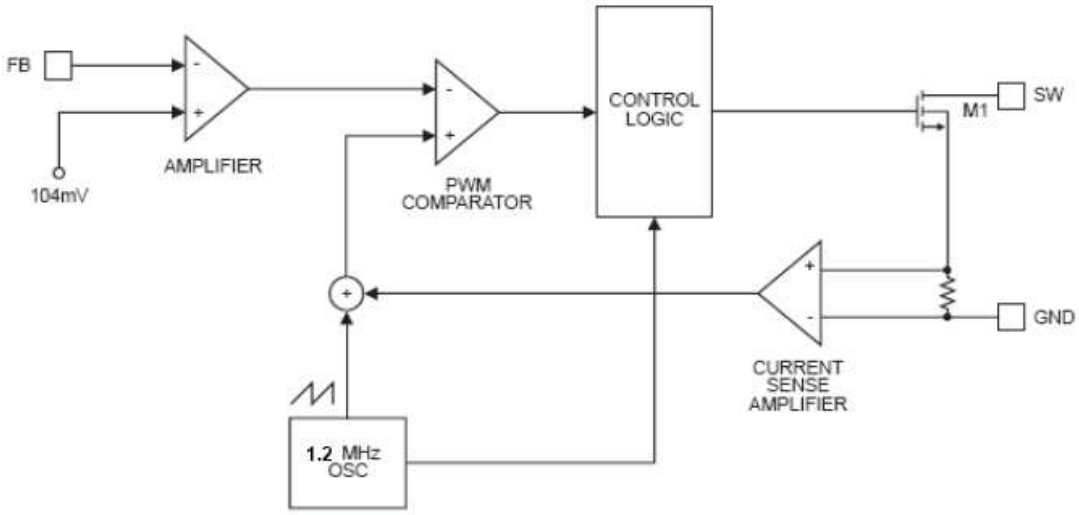
Package Reference



Pin Description

SOT23-6 Pin #	QFN8 Pin#	Pin Name	Function
1	8	SW	Power Switch Output.
2	1,5	GND	Ground
3	6	FB	Feedback Input.
4	4	EN	Regulator On/Off Control Input. A high input at EN turns on the converter, and a low input turns it off. When not used, connect EN to the input source for automatic startup. The EN pin cannot be left floating.
5	3	OV	Over Voltage Input. OV measures the output voltage for open circuit protection. Connect OV to the output at the top of the LED string.
6	2	V_{IN}	Input Supply Pin. Must be locally bypassed.

Functional Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3~6	V
SW Voltage	V_{SW}	-0.3~35	V
FB Voltage	V_{FB}	-0.3~VDD+0.3	V
EN Voltage	V_{EN}	-0.3~VDD+0.3	V
Thermal Resistance (Junction to Atmosphere, no Heat sink)	$R_{\theta JA}$	220	℃/W
Operating Junction Temperature	T_J	150	℃
Storage Temperature Range	T_{STG}	-55-150	℃
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	℃

Recommended Operating Range

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	2.5	6	V
Operating Temperature	T_{OP}	-40	85	℃
Output Voltage	V_{SW}	VIN	28	V

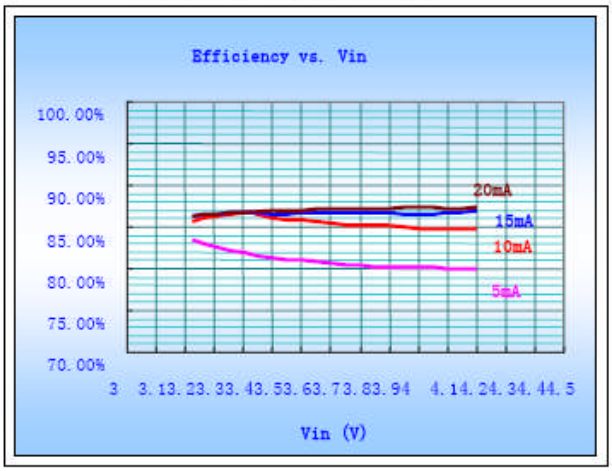
Electrical Characteristics

(V_{IN}=3V, V_{CTRL} =3V, T_A=25^{o}C, unless otherwise specified.)

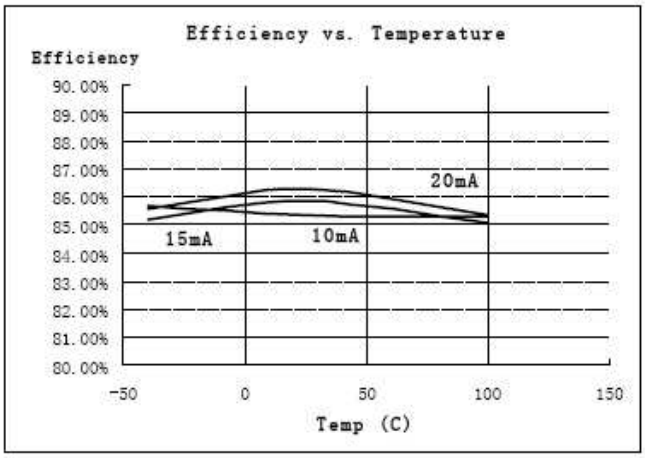
Parameter	Symbol	Conditions	Min	Type	Max	Unit
Minimum Operating Voltage	V_{IN}(min)		2.5			V
Maximum Operating Voltage	V_{IN}(max				6	
Feedback Voltage	V_{FB}	I_{OUT}=15mA, 4 LEDs, T_A=-40^{o}C to 85^{o}C	94	104	114	mV
FB Pin Bias Current	I_{FB}			0.05	1	uA
Supply Current	I_{CC}	V_{FB}=V_{IN}, Not Switching		100	350	uA
Supply Current	I_Q	V_{EN}=0V		0.1	1	μA
Switching Frequency	f		1.0	1.25	1.5	MHz
Maximum Duty Cycle	D_{MAX}		85	90		%
SW Current Limit	I_{LEAK}			400		mA
Switch Leakage Current		V_{SW}=5V		0.01	1	μA
EN Pin Voltage	V_{EN}	High	1.5			V
		Low			0.4	
Open Circuit Shutdown Threshold	V_{OV}	I_D=150mA		0.7		V
Soft Start Time	t			160		μs

Typical Performance Characteristics

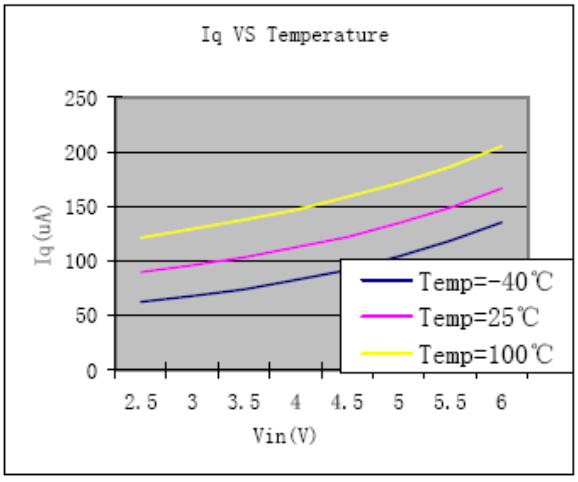
Efficiency vs Vin and I_{LED}



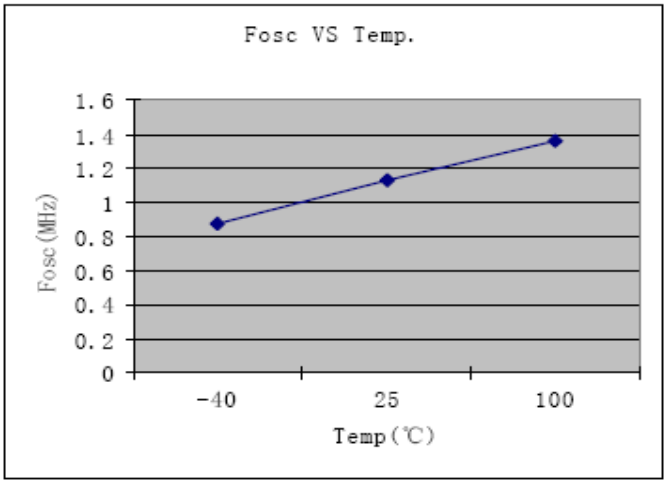
Efficiency vs Temperature



Quiescent Current vs V_{IN} and Temperature

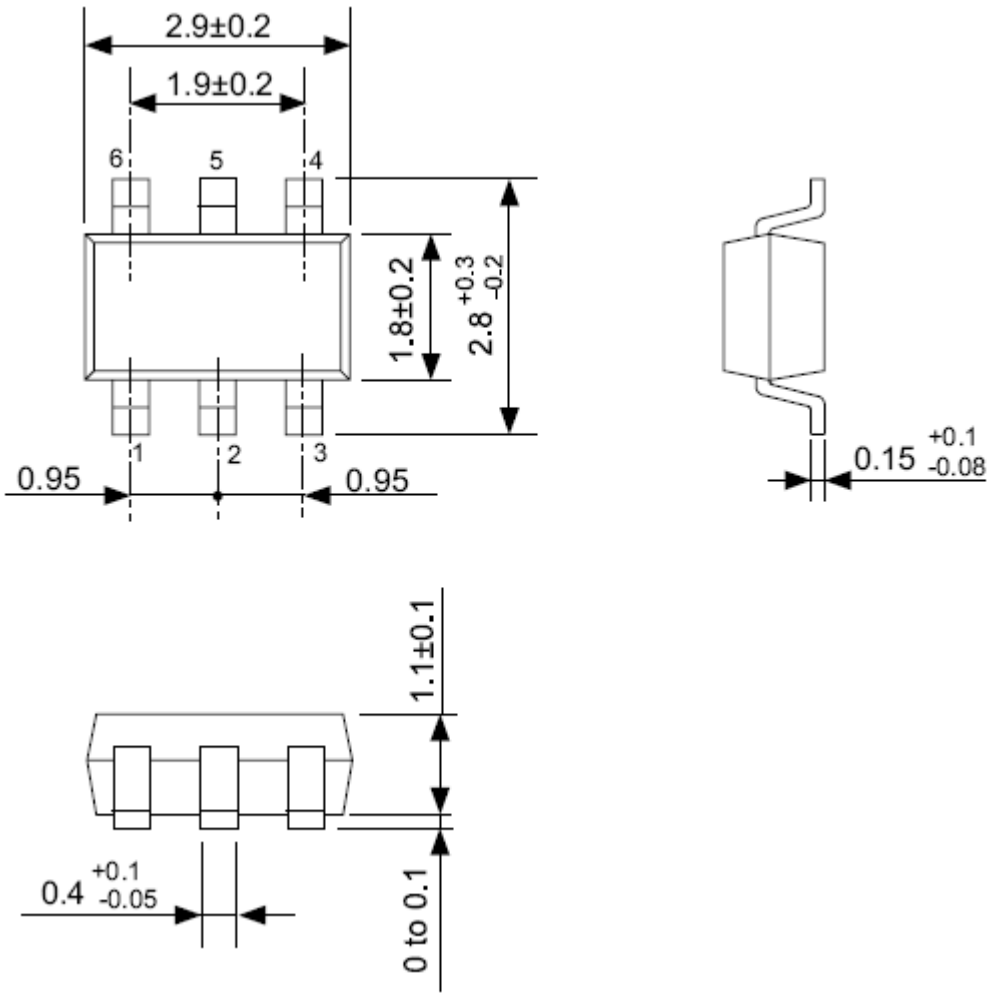


Switching Frequency vs Temperature



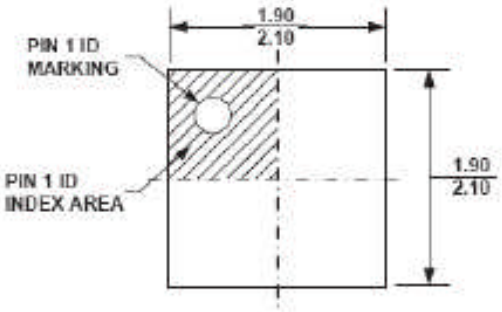
Mechanical Dimensions

SOT-23-6 **Unit: mm**

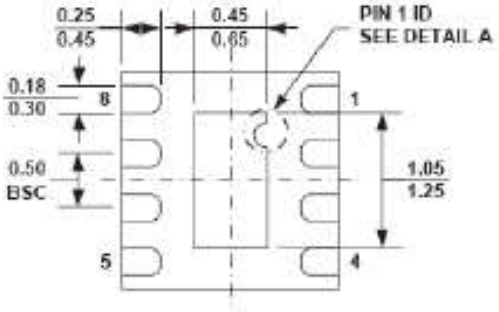


Mechanical Dimensions

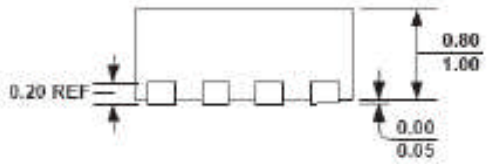
QFN8 **Unit: mm**



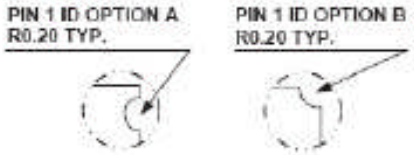
TOP VIEW



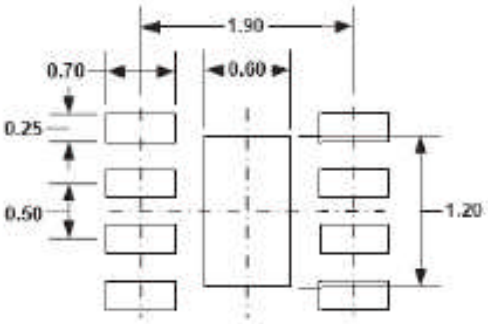
BOTTOM VIEW



SIDE VIEW



DETAIL A



RECOMMENDED LAND PATTERN

NOTE:

1) ALL DIMENSIONS ARE IN MILLIMETERS.
2) EXPOSED PADDLE SIZE DOES NOT INCLUDE MOLD FLASH.
3) LEAD COPLANARITY SHALL BE 0.10 MILLIMETER MAX.
4) DRAWING CONFORMS TO JEDEC MO-229, VARIATION VCCD-3.
5) DRAWING IS NOT TO SCALE.