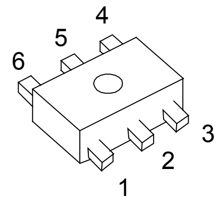
WHITE LED STEP-UP CONVERTER



*Pb-free plating product number: L5101L

■ DESCRIPTION

The UTC **L5101** is a fixed frequency step-up PWM DC/DC converter and designed for white LEDS driving with a constant current to provide backlight in handheld devices. The device switches at a high frequency 1.2MHz by an internal N-channel MOSFET switch to be capable of minimum external components using.

The UTC **L5101** can drive up to 5 LEDs in series by a Li-Ion cell. Series connection of LEDS provides identical LED currents resulting in uniform brightness without ballast resistors. The low 95mV feedback voltage minimizes power loss in the current setting resistor can have better efficiency.

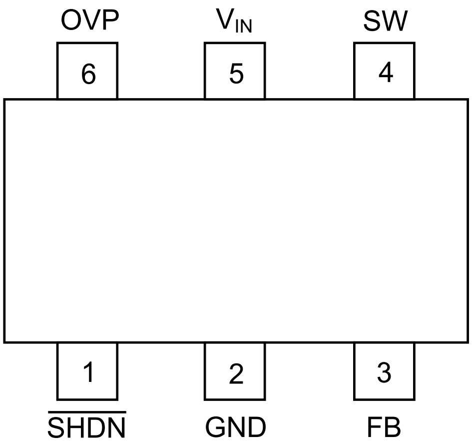
■ FEATURES

* Built-In Open Circuit Protection
* Built-In Over Voltage Protection
* High Efficiency(Up to 84% at V_{IN}=4.2V, 3 LEDs, I_{LED}=20mA)
* 1.2MHz fixed switching frequency
* Low supply current: 70μA
* Matches LED current
* Requires tiny inductor and capacitors

■ ORDERING INFORMATION

Order Number		Package	Packing
Normal	Lead Free Plating		
L5101-AG6-R	L5101L-AG6-R	SOT-26	Tape Reel

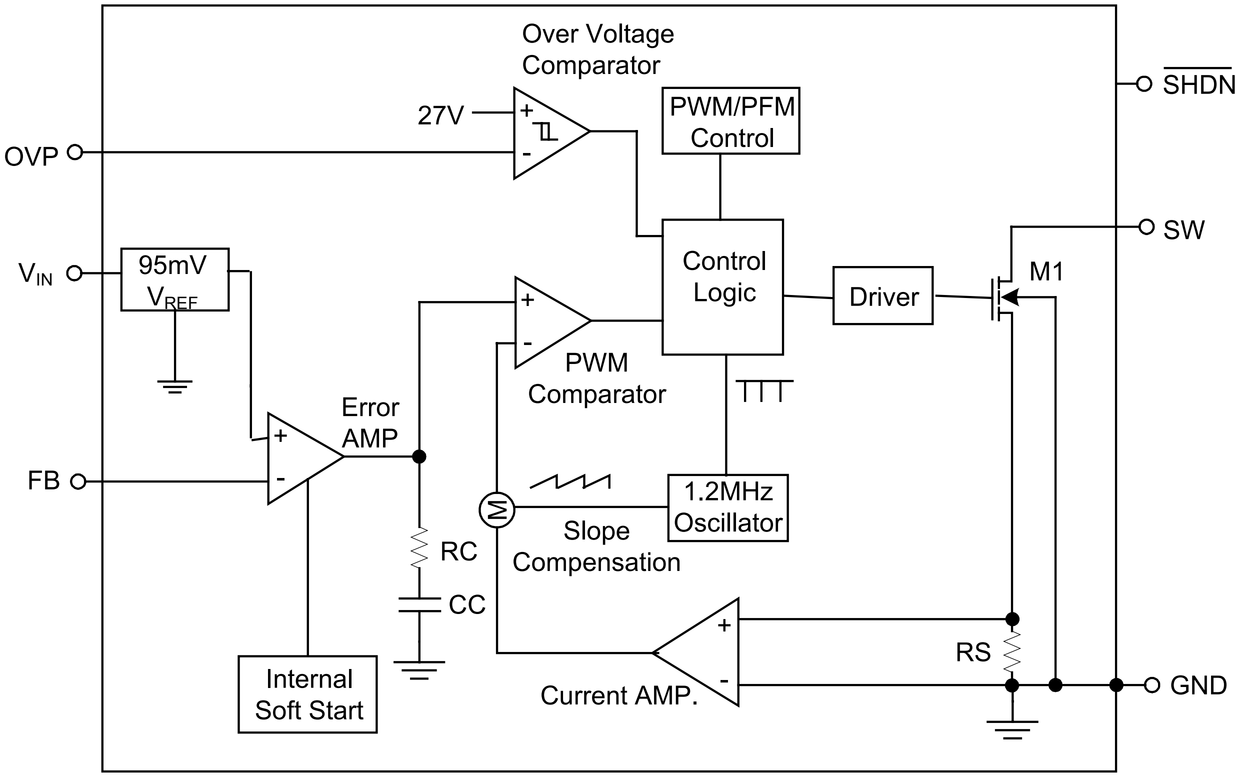
■ PIN CONFIGURATION



■ PIN DESCRIPTIONS

PIN NO.	PIN NAME	SYMBOL	DESCRIPTION
1	Shutdown	$\overline{SHDN}$	Tie to higher than 1.5V to enable device, 0.3V or less to disable device.
2	Ground	GND	
3	Feedback	FB	Reference voltage is 95mV. Connect cathode of lowest LED and resistor here. Calculation formula: R_{FB}=95mV/I_{LED}
4	Switch	SW	Connect inductor/diode here. Minimize trace area at this pin to reduce EMI.
5	Power input	V_{IN}	Bypass V_{IN} to GND with a capacitor sitting as close to V_{IN} as possible.
6	Overvoltage protection	OVP	The internal MOSFET will turn off when V_{OUT} >27V.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	6	V
SW Voltage	V_{SW}	33	V
FB Voltage	V_{FB}	6	V
$\overline{SHDN}$ Voltage	$V_{\overline{SHDN}}$	6	V
OVP Voltage	V_{OVP}	34	V
Junction Temperature	T_J	+125	℃
Operating Temperature Range	T_{OPR}	0 ~ +70	℃
Storage Temperature Range	T_{STG}	-40 ~ +150	℃

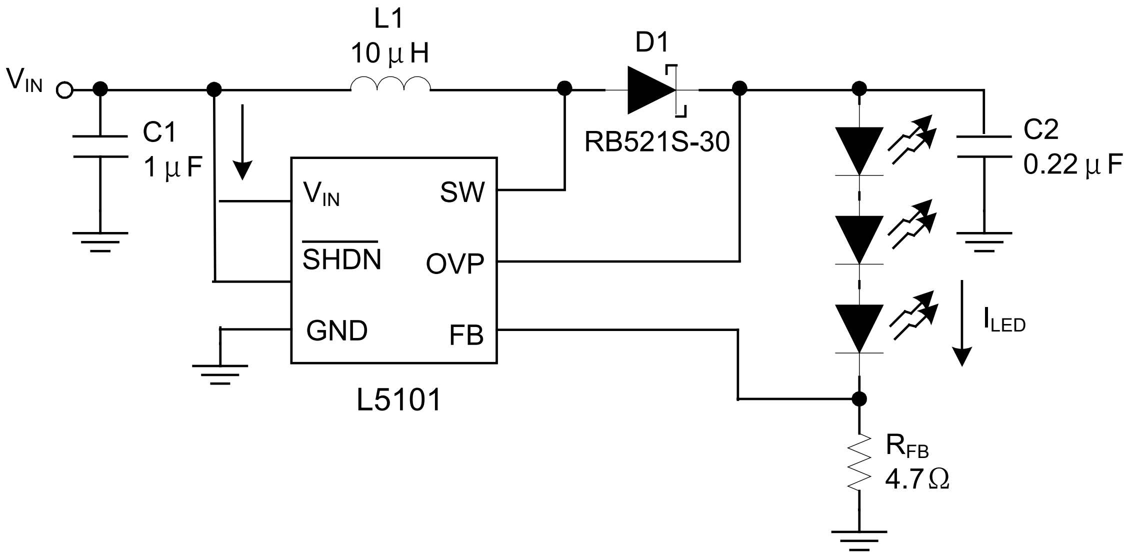
Note 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. The device is guaranteed to meet performance specification within 0℃ ~ +70℃ operating temperature range and assured by design from –20℃ ~ +85℃.

■ ELECTRICAL CHARACTERISTICS ($V_{\overline{SHDN}}$=3V, V_{IN}=3V, T_a=25°C, unless otherwise specified.)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage		V_{IN}		2.5		5.5	V
Supply Current		I_{IN}	Switching		1	5	mA
			Non switching		70	100	µA
			$V_{\overline{SHDN}}$=0V		0.1	1.0	µA
ERROR AMPLIFIER							
Feedback Voltage		V_{FB}		85	95	105	mV
FB Input Bias Current		I_{FB}	V_{FB}=95mV		1		nA
OSCILLATOR							
Switching Frequency		f_{SW}		0.8	1.2	1.6	MHz
Maximum Duty Cycle		DC		85	90		%
POWER SWITCH							
SW ON Resistance		$R_{ON(SW)}$			1.4	5	Ω
Switch Leakage Current		$I_{LEAK\,(SW)}$	V_{SW}=33V		0.1	1	µA
CONTROL INPUT							
Shutdown Voltage	High	$V_{IH(\overline{SHDN})}$	ON	1.5			V
	Low	$V_{IL(\overline{SHDN})}$	OFF			0.3	V
OVER VOLTAGE PROTECTION							
OVP Input Resistance		$R_{IN(OVP)}$		0.6	1.2	1.8	MΩ
OVP Threshold		$V_{THR(OVP)}$	1V Hysteresis typical	22	27	32	V

■ TEST CIRCUIT



■ APPLICATION INFORMATION

Recommended Component Selection

- **Inductor Selection:** A 10µH inductor is recommended for most applications.
- **Capacitor Selection:** The small size of ceramic capacitors (1µF input with 1µF output) are sufficient, X5R and X7R types are recommended
- **Diode Selection:** An Schottky diode rated at 100mA ~ 200mA is sufficient for most applications.

LED Current Control

A feedback resistor (precision 1% recommended) as feedback resistor control the LED current.(R_{FB} in Figure 1)

- Feedback reference voltage : 95mV.
- LED current is $95mV/R_{FB}$.
- The formula for R_{FB} selection : $R_{FB}=95mV/I_{LED}$

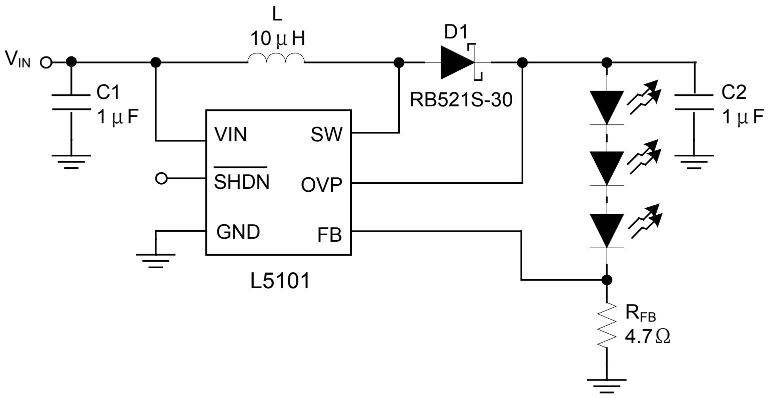


Fig.1 Dimming Control with a PWM Signal

Open-Circuit Protection

When a high output voltage exceeds maximum 33V, the built-in OVP (Over Voltage Protection) will be triggered to prevent the damage resulting from an open circuit condition.

Dimming Control

There are three different ways of dimming control circuits as follows:

1. Using a PWM signal

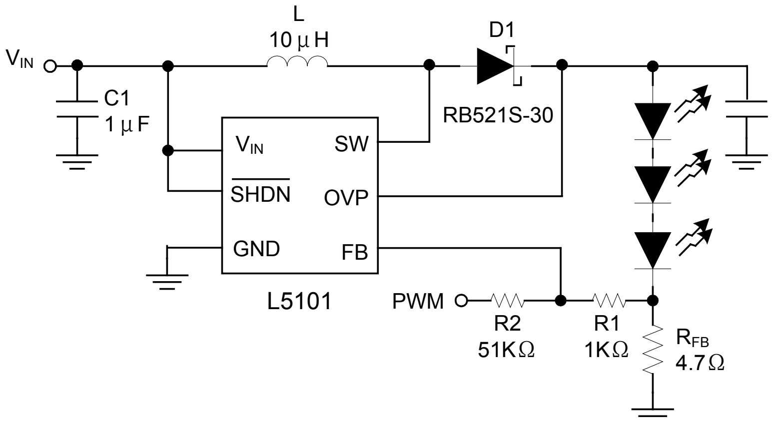


Fig.2 Dimming Control Using a PWM Signal

■ APPLICATION INFORMATION(Cont.)

2. Using a DC Voltage

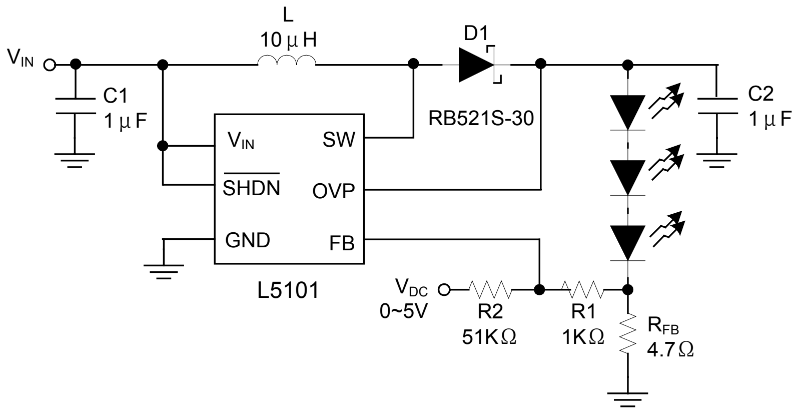


Fig.3 Dimming Control Using a DC Voltage

3. Using a Filtered PWM Signal

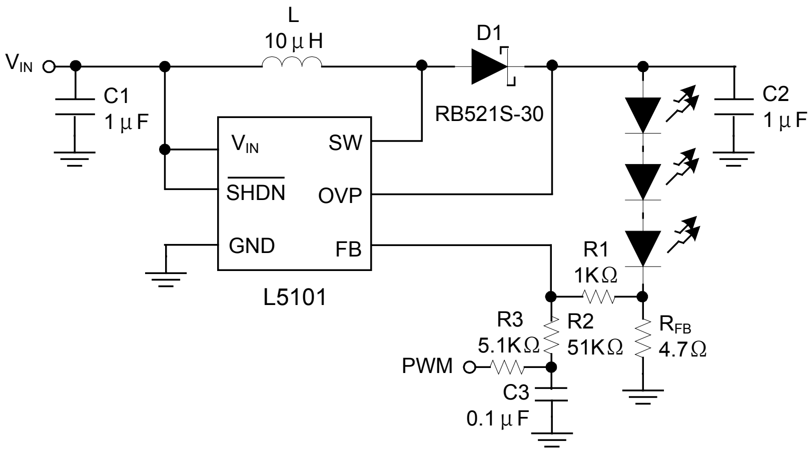
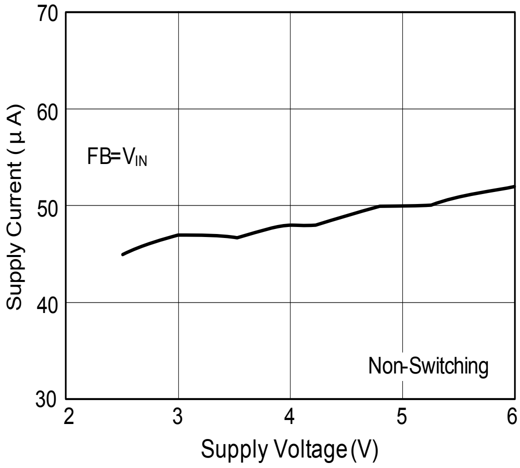


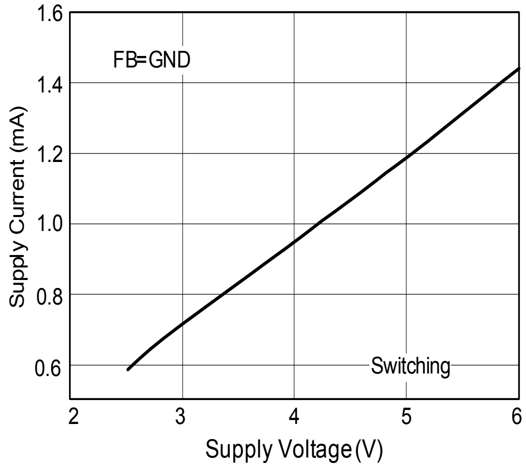
Fig.4 Dimming Control Using a Filter PWM Signal

■ TYPICAL CHARACTERISTICS

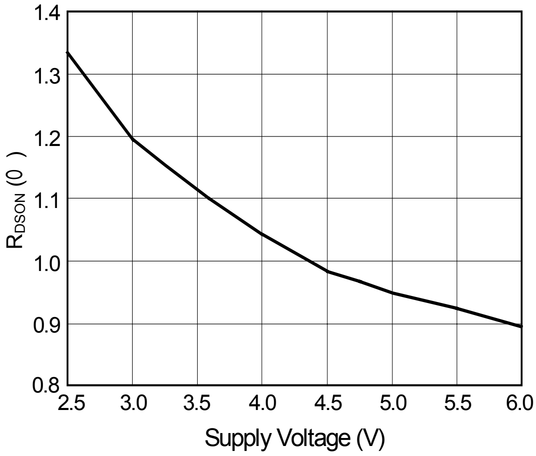
Supply Current vs. Supply Voltage (V)



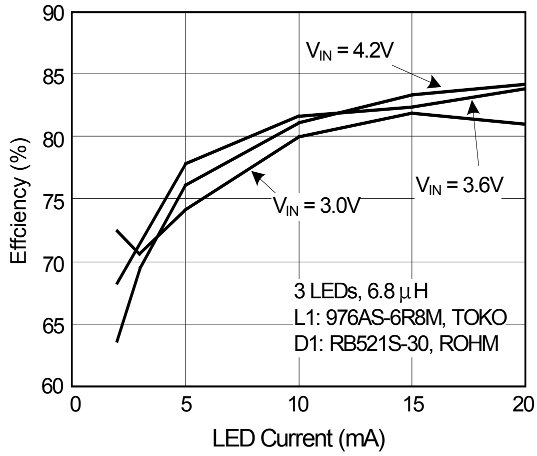
Supply Current vs. Supply Voltage (V)



$R_{DS\text{-}ON}$ vs. Supply Voltage (V)



3 LEDs Efficiency vs. LED Current



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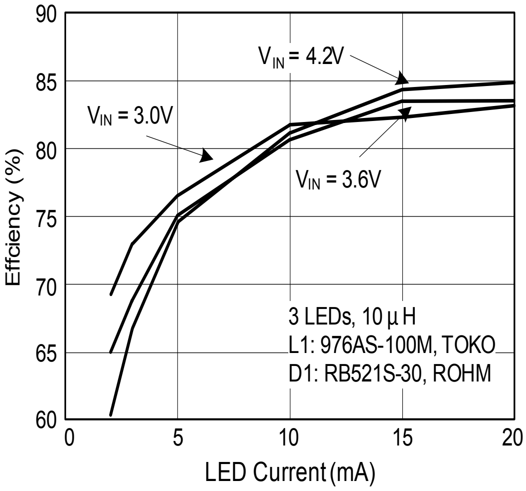
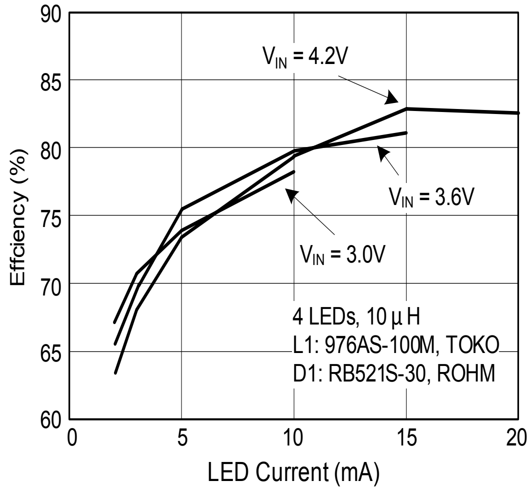


4 LEDs Efficiency vs. LED Current



■ TYPICAL CHARACTERISTICS(cont.)