MP1518

Fixed Frequency White LED Driver

Monolithic Power Systems

PRELIMINARY

General Description

The MP1518 is a 6 pin thin SOT23 step up converter designed for driving up to 6 series white LEDs from a single cell Lithium Ion battery. The MP1518 uses current mode, fixed frequency architecture to regulate the LED current, which is measured through an external current sense resistor. It's low 100mV feedback voltage reduces power loss and improves efficiency. To prevent damage due to an open circuit condition, the OV pin monitors the output voltage and turns off the converter if an over-voltage condition is present.

The MP1518 includes under-voltage lockout, current limiting and thermal overload protection preventing damage in the event of an output overload. The MP1518 is available in a small 6 lead TSOT23 package.

Features

- On Board Power MOSFET
- Drives up to 6 Series White LEDs
- Up to 86% Efficiency
- Over 1MHz Fixed Switching Frequency
- Open Load Shutdown
- Low 100mV Feedback Voltage
- Soft Start/PWM Dimming
- UVLO, Thermal Shutdown
- Internal Current Limit
- Available in TSOT23-6 Package

Applications

- Cell Phones
- Handheld Computers and PDAs
- Digital Still and Video Cameras
- Small LCD Displays

Ordering Information

Part Number*	Package	Temperature
MP1518DJ	TSOT23-6	-40° to +85°C

* For Tape & Reel use suffix - Z (e.g. MP1518DJ-Z)

Figure 1: Typical Application Circuit

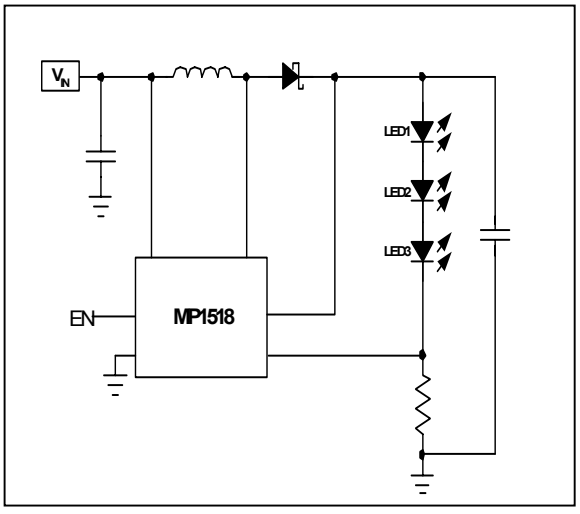
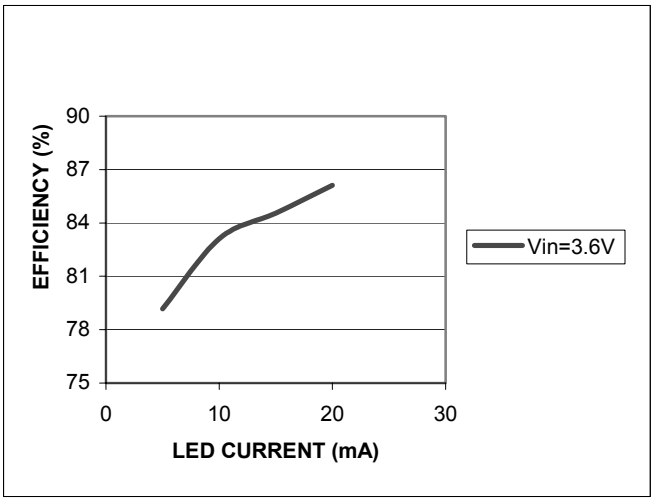


Figure 2: Efficiency vs LED Current



Absolute Maximum Ratings

OV	-0.3V to 28V
SW	-0.5V to 28V
All Other Pins	-0.3V to 6.5V
Storage Temperature	-55°C to 150°C

Recommended Operating Conditions

IN Supply Voltage	2.5V to 6V
Output Voltage	V_{IN} to 25V
Operating Temperature	-40°C to +85°C

Thermal Resistance

Thermal Resistance Θ_{JA} (TSOT23-6)	220°C/W

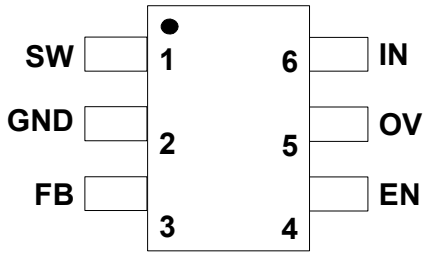
Electrical Characteristics (V_{IN}=V_{EN}=5V, T_A = 25°C unless specified otherwise)

Parameters	Symbol	Condition	Min	Typ	Max	Units
Operating Input Voltage	V_{IN}		2.5		6	V
Supply Current (shutdown)		V_{EN}=0V		0.1	1	μA
Supply Current (quiescent)		V_{FB}=0.15V		550		μA
Switching Frequency	f_{SW}		1	1.2	1.4	MHz
Maximum Duty Cycle		V_{FB}=0V	85	90		%
Undervoltage Lockout						
IN Under Voltage Lockout	UVLO	V_{IN} Rising		2.25		V
Open Lamp Shutdown Threshold	V_{OV}	V_{OV} Rising		28		V
Enable						
EN Threshold		V_{EN} Rising	0.8	1.1	2.0	V
EN Hysteresis				100		mV
EN Input Bias Current		V_{EN}=0V, 5V			1	μA
Feedback Comparator						
FB Voltage			90	100	110	mV
FB Input Bias Current		V_{FB}=0.05V	-150	-80		nA
Output Switch						
SW On-Resistance (Note 1)	R_{ON}			0.5		Ω
SW Current Limit				400		mA
Thermal Shutdown (Note 1)				160		°C

Notes:

1. Guaranteed by design

Pin Description



TSOT23-6
Top View
Marking: A3xx

Table 1: Pin Designator

Pin #	Pin Name	Pin Function
1	SW	Power Switch Output. SW is the drain of the internal MOSFET switch. Connect the power inductor and output rectifier to SW. SW can swing between GND and 25V.
2	GND	Ground
3	FB	Feedback Input. The MP1518 regulates the voltage across the current sense resistor between FB and GND. Connect a current sense resistor from the bottom of the LED string to GND. Connect the bottom of the LED string to FB. The regulation voltage is 100mV. Analog dimming can be achieved with a voltage divider on the FB pin as shown in Figure 5. With a V_{DC} from 0V to 2V, the resistor values shown for R2 and R3 can control the LED current from 0mA to 15mA.
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. PWM dimming can be obtained by toggling the EN with an external PWM signal.
5	OV	Internal Power Input. OV measures the output voltage for open circuit protection. Connect OV to the output voltage at the top of the LED string.
6	IN	Input Supply Pin. Must be locally bypassed.

Figure 3: Driving 3 White LEDs

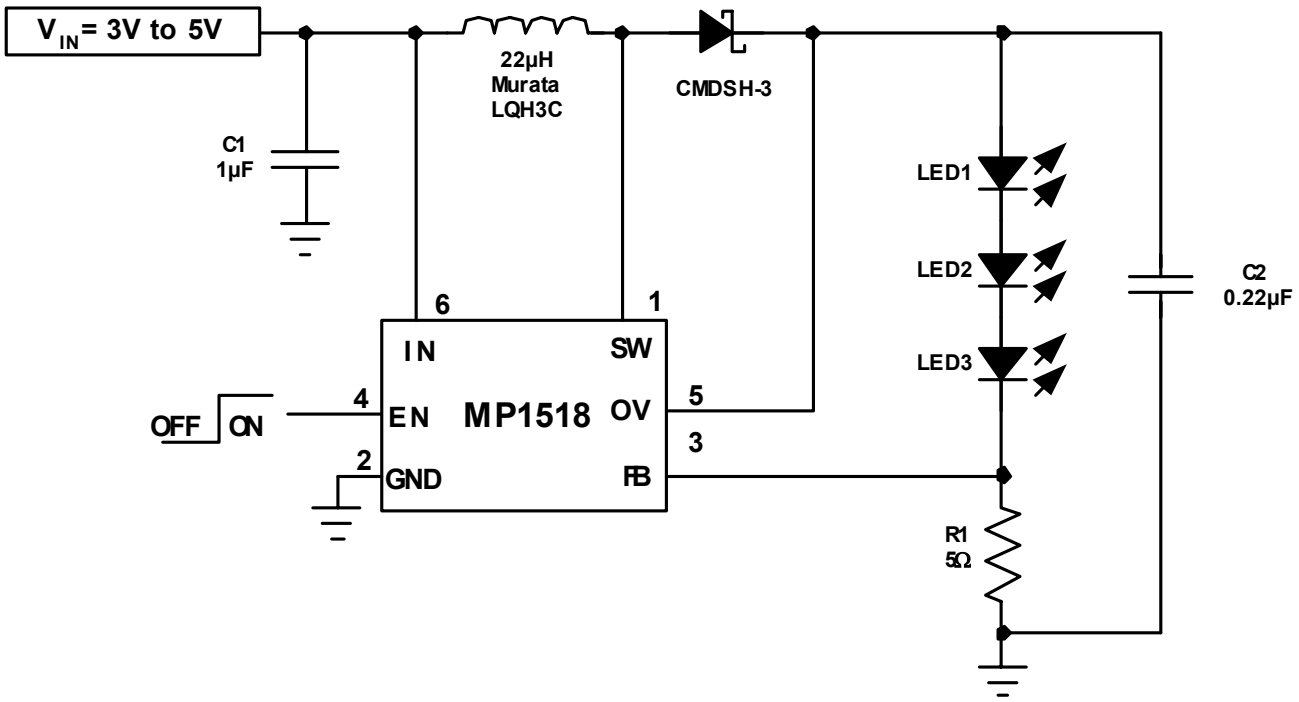


Figure 4: Analog Dimming Control

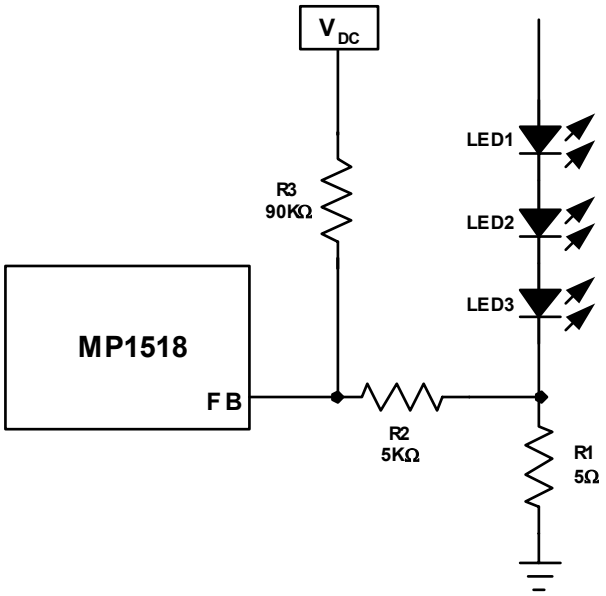


Figure 5: Steady-state operation
V_{IN}=3.6V, 3 LEDs, 20mA
CH1: SW
CH2: Output Voltage Ripple (AC coupled)
CH4: Inductor Current (100mA/div)

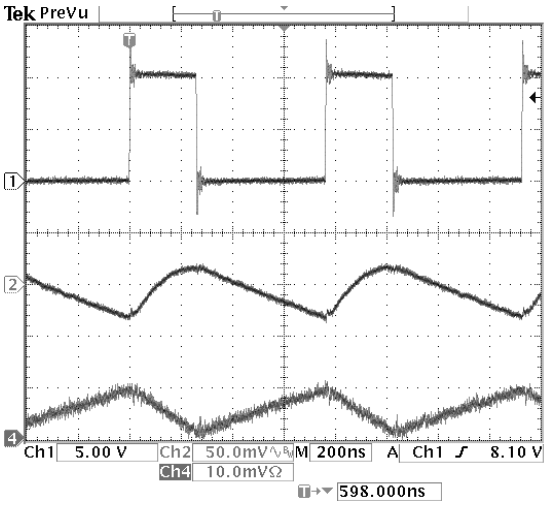


Figure 6: Startup waveforms
V_{IN}=3.6V, 3 LEDs, 20mA (1µF input capacitor)
CH1: EN
CH2: OV
CH4: Input Current (100mA/div)

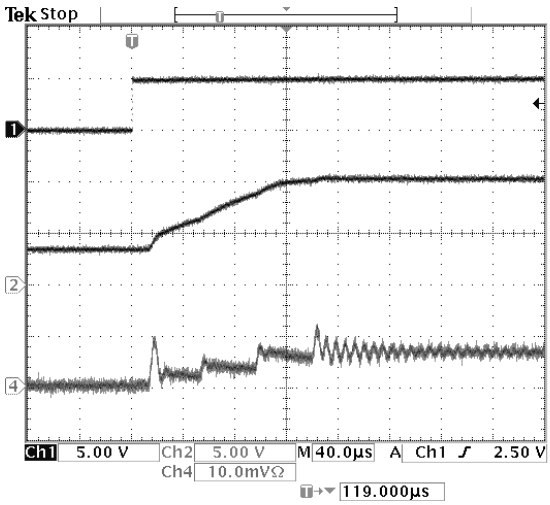
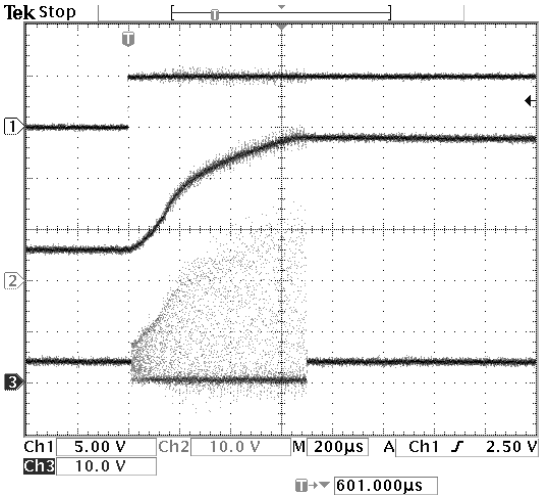
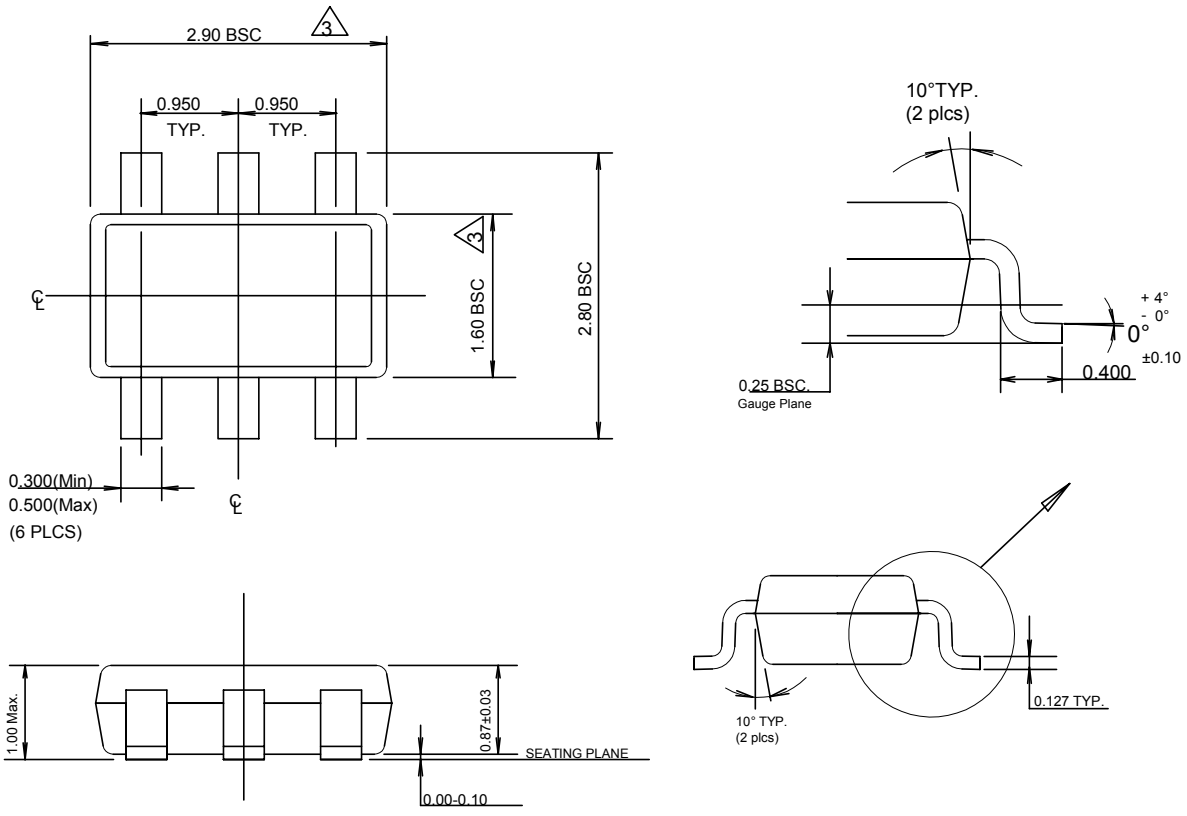


Figure 7: Startup waveforms into an open load
V_{IN}=3.6V
CH1: EN
CH2: OV
CH3: SW



Package Information

TSOT23-6



NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1994.
2. Die is facing up for mold. Die is facing down for trim/form, ie. reverse trim/form.
3. Dimensions are exclusive of mold flash and gate burr.
4. The footlength measuring is based on the gauge plane method.
5. All specification comply to Jedec Spec MO193 Issue C.