

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.

Ordering Information

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

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

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

Figure 1: Typical Application Circuit

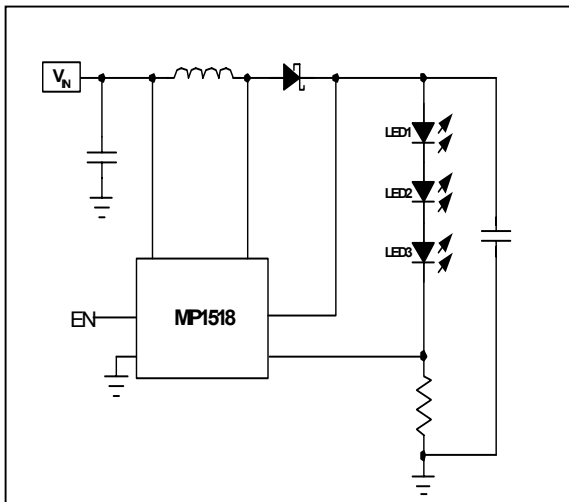
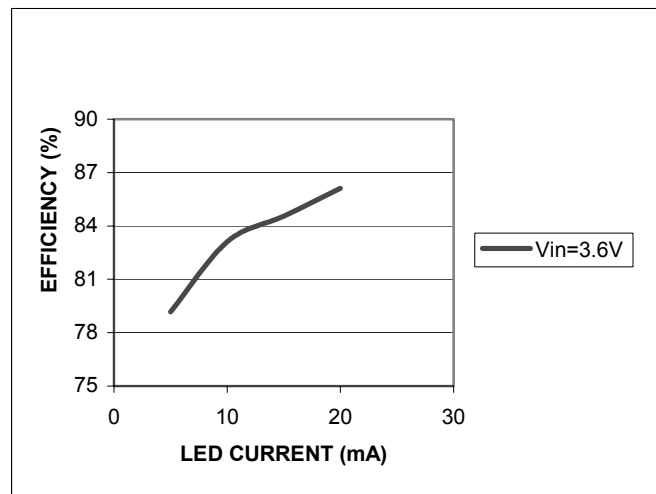


Figure 2: Efficiency vs LED Current



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 ($V_{IN}=V_{EN}=5V$, $T_A = 25^\circ\text{C}$ 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 | | $^\circ\text{C}$ |

Notes:

1. Guaranteed by design

Pin Description

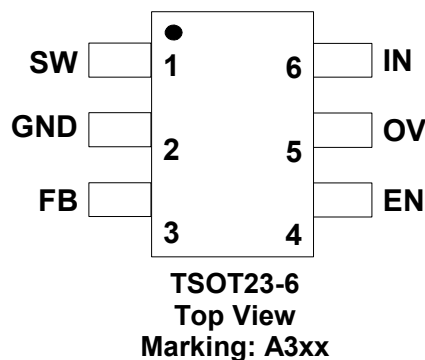


Table 1: Pin Designator

| 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

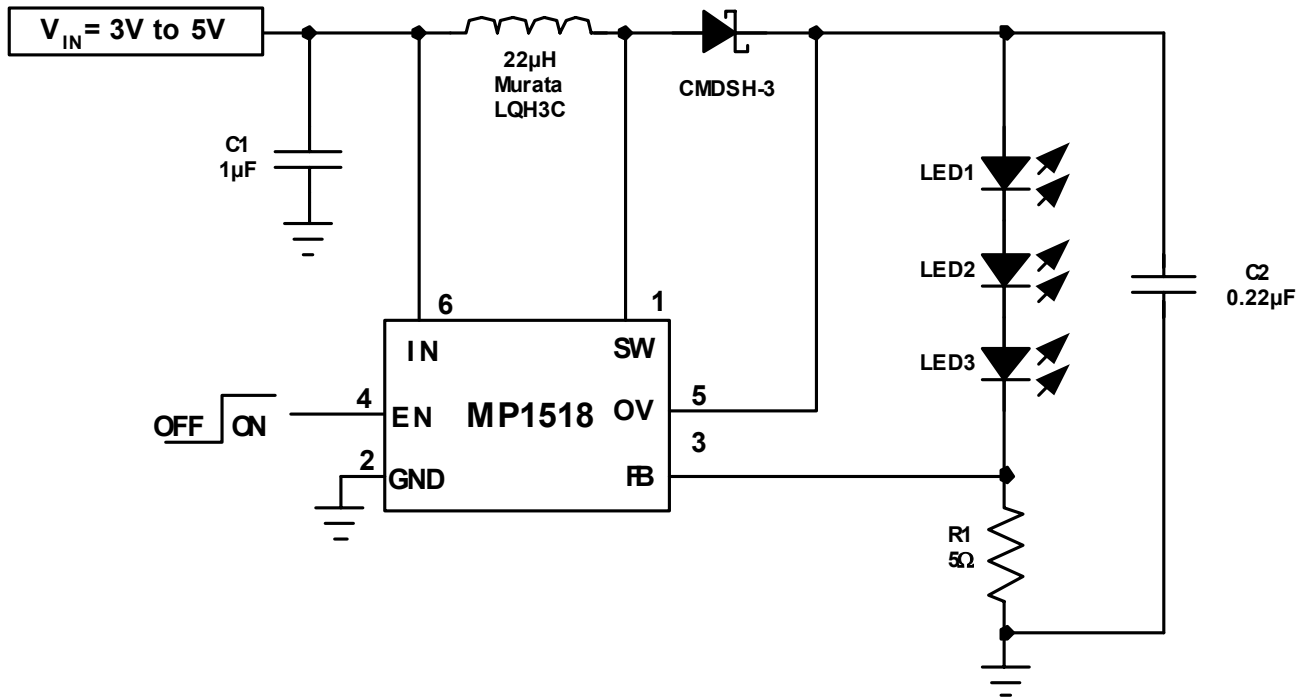


Figure 4: Analog Dimming Control

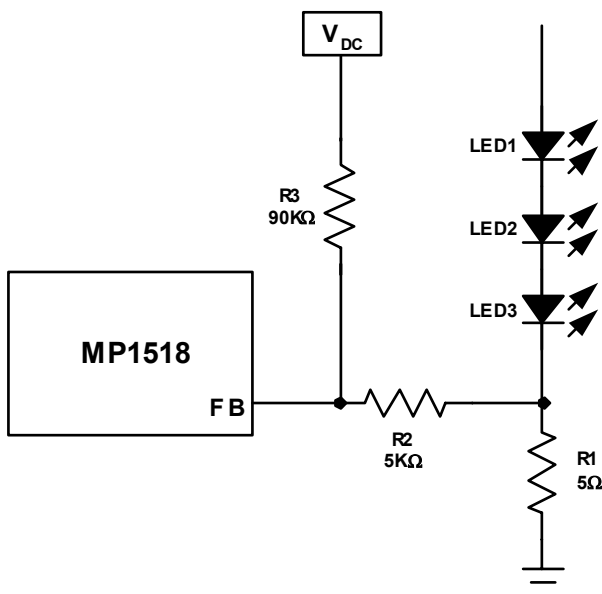


Figure 5: Steady-state operation
 $V_{IN}=3.6V$, 3 LEDs, 20mA
 CH1: SW
 CH2: Output Voltage Ripple (AC coupled)
 CH4: Inductor Current (100mA/div)

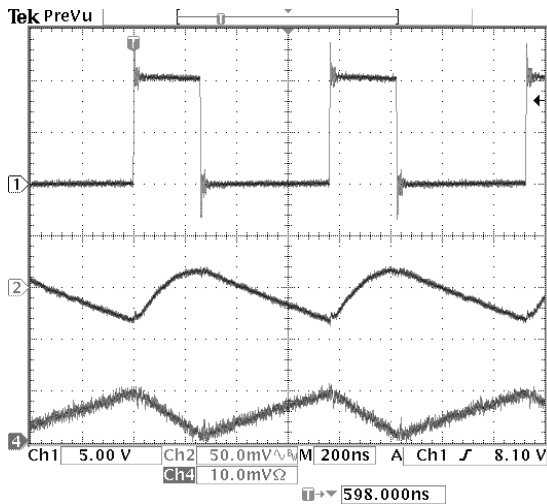


Figure 6: Startup waveforms
 $V_{IN}=3.6V$, 3 LEDs, 20mA (1 μF input capacitor)
 CH1: EN
 CH2: OV
 CH4: Input Current (100mA/div)

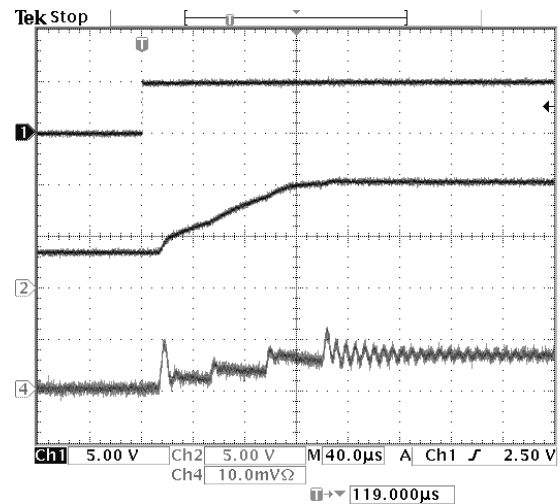
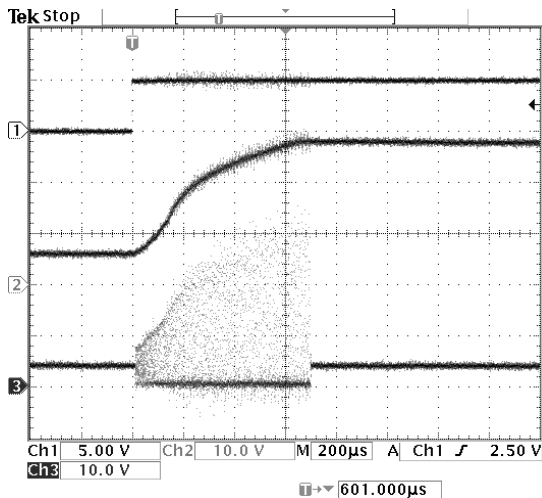
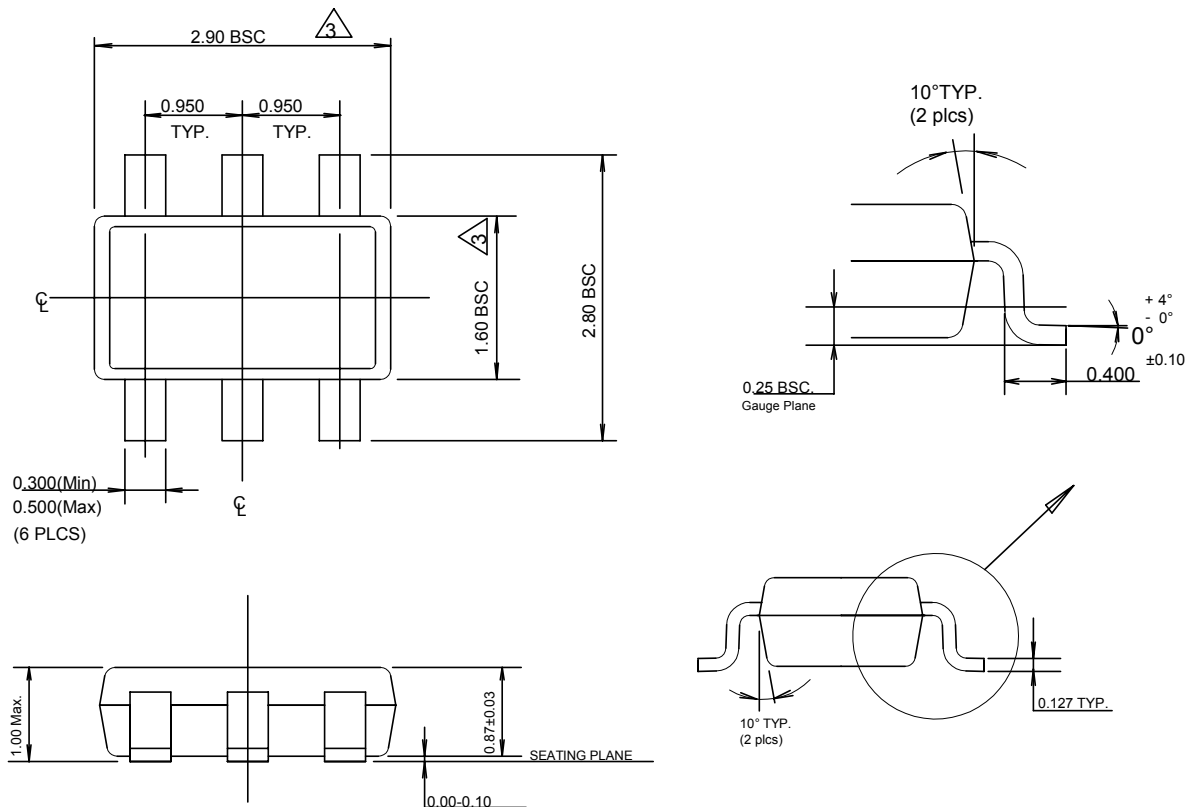


Figure 7: Startup waveforms into an open load
 $V_{IN}=3.6V$
 CH1: EN
 CH2: OV
 CH3: SW



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.

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