



# ***MP1521***

## **High Efficiency White LED Driver**

## General Description

The MP1521 is a constant-current Boost Regulator. This IC has three individual current-sensing feedbacks, which are ideal for driving multiple strings of series connected LEDs. The OLS pin is designed for detecting loose or open LED connections.

The IC uses a peak current, constant minimum off-time architecture. The feedback pins measure voltage across sense resistors in series with the LED strings. When supplying a bias current of 20mA, the voltage drop across the sense resistor is only 0.4V to minimize power loss. Either a DC voltage or a PWM signal at the BRT/PWM input can control the LED brightness.

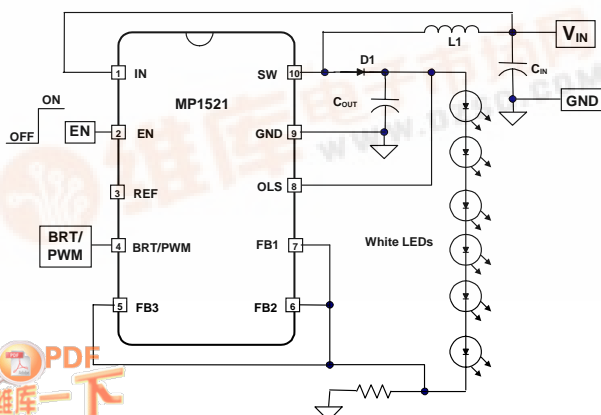
The MP1521 has an on board power MOSFET switch that is protected by current limit, open load shutdown, thermal shutdown, and under voltage lockout.

## Ordering Information

Part Number *	Package	Temperature
MP1521EK	MSOP10	-20° to +85°C
MP1521EQ	QFN16 (3x3)	-20° to +85°C
EV0005	MP1521EK Evaluation Board	
EV0021	MP1521EQ Evaluation Board	

\* For Tape & Reel, add suffix -Z (i.e., MP1521EK-Z)  
For Lead Free, add suffix -LF (i.e., MP1521EK-LF-Z)

### Typical Application Circuit (One String of Six (6) LEDs)



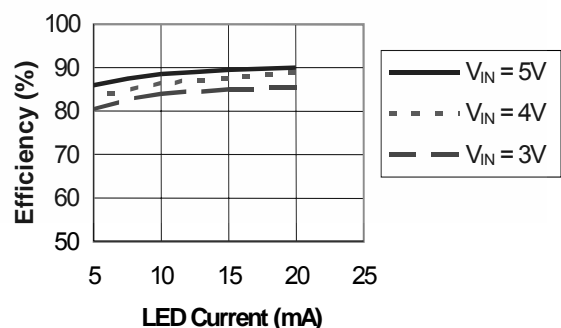
## Features

- On Board Power MOSFET
- Drive 9 White LEDs from 2.7V Input
- Drive 15 White LEDs from 5V Input
- Up to 90% Efficiency
- Over 80mA Output Current Capacity
- Open Load Shutdown
- Low Current Sensing Feedback Voltage
- Up to 3 String Current Sensing Feedback
- Analog and Digital PWM Brightness Control
- UVLO, Thermal Shutdown
- Soft Start
- Internal Current Limit
- Available in Compact MSOP10 and Tiny **3 mm x 3 mm** QFN16 Package
- **Evaluation Boards Available**

## Applications

- Handheld Computers, Cell phones, PDAs, Digital and Video Cameras, Small LCD Displays
- Li Ion and NiMH Battery Applications

### Efficiency vs LED current, 1 string of 6 Using Toko D62CB 47 $\mu$ H Inductor





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### Absolute Maximum Ratings

Supply Voltage ( $V_{IN}$ )	28V
Switch Voltage to GND	-0.5V to 28V
$V_{EN}$ , $V_{REF}$ , $V_{BRT}$ , $V_{FB1}$ , $V_{FB2}$ , $V_{FB3}$	-0.3V to 6V
Storage Temperature	-55°C to +150°C

### Recommended Operating Conditions

Supply Voltage ( $V_{IN}$ )	2.7V to 25V
Operating Temperature	-20°C to +85°C
Switch Voltage to GND	-0.5V to 25V

### Package Thermal Characteristics

Thermal Resistance, $\Theta_{JA}$ (MSOP10)	150°C/W
Thermal Resistance, $\Theta_{JA}$ (QFN16)	60°C/W

### Electrical Characteristics ( $V_{IN} = 5.0V$ , $T_A = 25^\circ C$ unless specified otherwise)

Parameters	Symbol	Condition	Min	Typ	Max	Units
Supply Current (shutdown)	$I_{IN(OFF)}$	$V_{EN} < 0.4V$		1	3	$\mu A$
Supply Current (quiescent)	$I_{IN(ON)}$	$V_{EN} > 1.5V$ , $V_{BRT} = 0V$ , $V_{FB} = 0V$		550	700	$\mu A$
Minimum Off Time, normal operation	$t_{OFF(NORMAL)}$	$V_{EN} > 1.5V$ , $V_{BRT} = 0.6V$ , $V_{FB} = 0$	400	500	700	nS
Minimum Off Time, start-up (Note 1)	$t_{OFF(START)}$	$V_{EN} > 1.5V$ , $V_{BRT} = 0.6V$ , $V_{FB} = 0V$	1.5		2.4	$\mu S$
<b>UVLO</b>						
Under Voltage Lockout		$V_{IN}$ RISING	2.1		2.6	V
		$V_{IN}$ FALLING	1.9		2.4	V
<b>Enable</b>						
Threshold			0.8	1.0	2.0	V
Hysteresis				60		mV
Leakage Current		$V_{EN} = 3V$			1	$\mu A$
<b>Open Load Shutdown</b>						
Threshold		Measured at OLS Pin	26		29	V
Leakage Current		$V_{OLS} = 15V$			1	$\mu A$
		$V_{OLS} = 25V$		45	70	$\mu A$
<b>Reference</b>						
Output Voltage		$I_{REF} = 0A$	1.20	1.235	1.27	V
Load Regulation		$I_{REF} = 0$ to $100\mu A$		2.5	5	mV
Line Regulation		$V_{IN} = 3$ to $15V$ , $I_{REF} = 0A$		2.5	5	mV
<b>Feedback Comparator</b>						
Threshold		$V_{BRT} = 1.2V$	380	400	420	mV
Hysteresis (Note 2)		$V_{BRT} = 1.2V$		30		mV
FB Input Bias Current		$V_{FB} = 0.2V$	-150	-50	0	nA
<b>PWM Mode</b>						
Output-Off Threshold			0.18		0.26	V
BRT Input Bias		$V_{BRT} = 0.6V$	-100	-30	0	nA
BRT Full Scale Threshold (Note 3)					1.2	V
<b>Output Switch</b>						
Switch On Resistance (Note 2)	$R_{ON}$	$V_{IN} = 5.0V$		0.5	0.6	$\Omega$
Switch Current Limit			300	400		mA
Leakage Current		$V_{SW} = 25V$			5	$\mu A$
Thermal Shutdown (Note 2)				160		$^\circ C$

Notes:

1) First 64 pulses after EN switches high.

2) Guaranteed by design.

3) The output current is off when BRT is driven below the output-off threshold and full-scale when driven above the full-scale threshold. To PWM the output drive BRT above and below these thresholds.