



DW8520

High Power LED Driver

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CONTENTS

1. GENERAL DESCRIPTION	1
■ Features.....	1
■ Typical Application Circuit	1
2. BLOCK DIAGRAM	2
3. PIN INFORMATION	3
■ Pin placement and IC dimension	3
■ Pin Description	3
4. ABSOLUTE MAXIMUM RATINGS	3
5. RECOMMENDED OPERATING CONDITION	3
6. ELECTRICAL SPECIFICATION.....	4
7. DETAILED DESCRIPTIONS.....	5
7.1. Detailed Descriptions (Continued).....	6
8. APPLICATION INFORMATION.....	7
9. PACKAGE DIMENSION	8

1. General Description

The DW8520 is ideally suited for buck converter topology LED driver IC.

It includes an 9V~16V linear regulator which allows it to work from a wide range of input voltages without the need for an external low voltage supply.

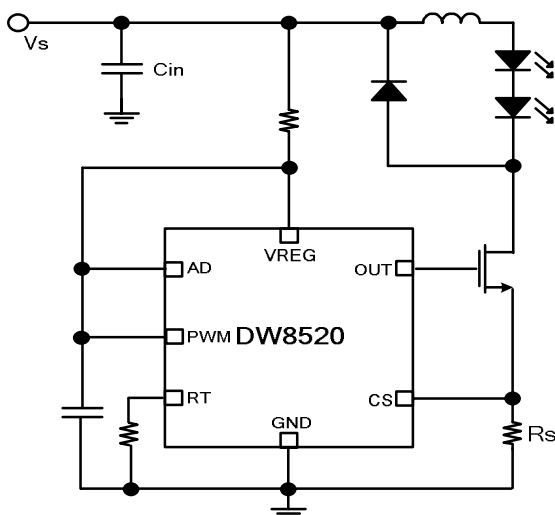
The DW8520 includes a PWM dimming input that can accept an external control signal with a duty ratio of 0-100% and a frequency of up to a few kilohertz.

The DW8520 is available in a thermally enhanced 8 pin SOIC package.

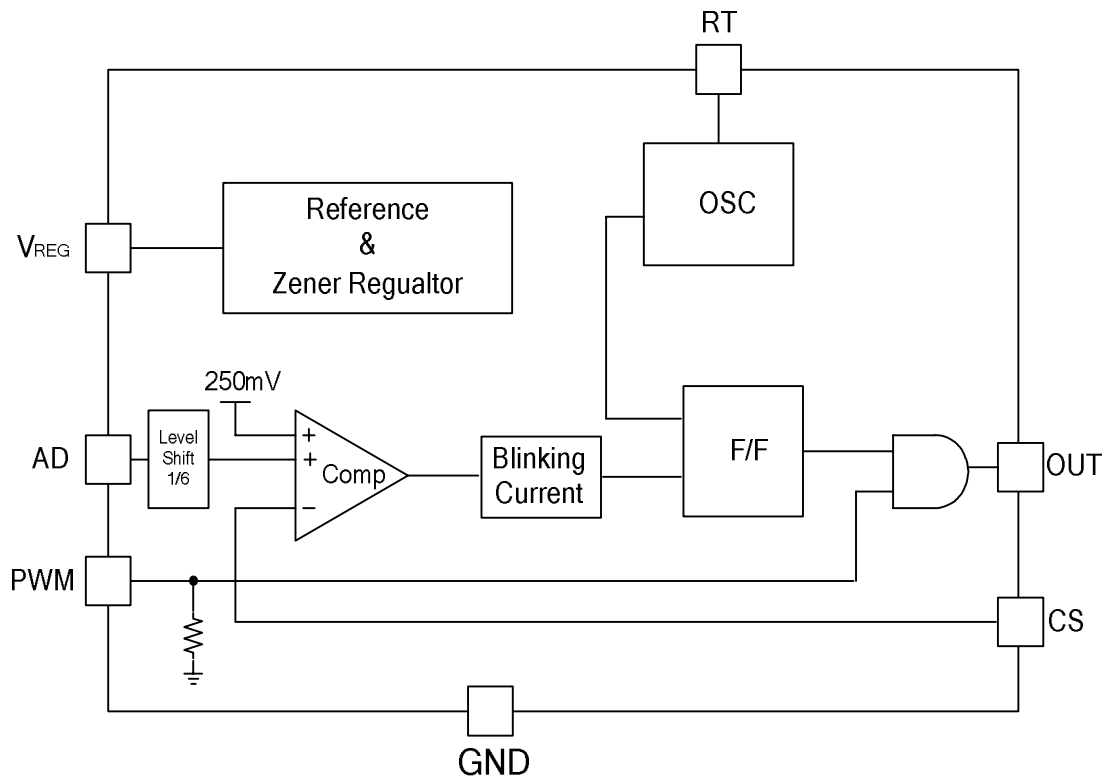
■ Features

- Buck converter topology LED drivers
- Internal Zener regulator
- Constant frequency or constant off-time operation
- Linear and PWM dimming capability
- Open loop peak current controller
- High efficiency up to 90%
- Power down to 1mA maximum
- Thermally enhanced 8-lead SOIC package
- Wide Temperature range : -40°C ~ 125°C

■ Typical Application Circuit

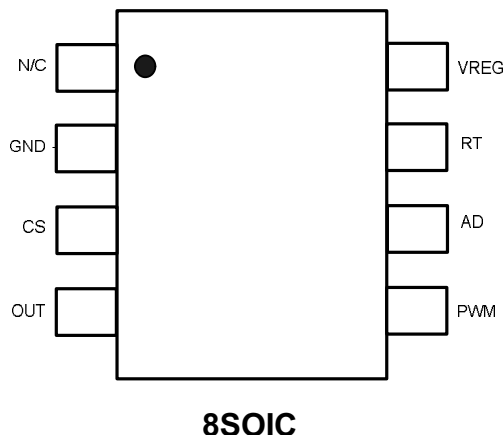


2. Block Diagram



3. Pin Information

■ Pin placement and IC dimension



■ Pin Description

No.	Pin Name	Description	Note
1	NC	No connection	
2	GND	Ground	
3	CS	Current Sense Pin. The Maximum current is sensed by a resistor and the resulting voltage is applied to this pin	
4	OUT	This is the output gate driver for external MOSFET	
5	PWM	PWM Dimming control Pin, Active high operates the device, If PWM function not used the pin must connect to VREG, When open the pin, The device dis-able by internal pull down resistor	
6	AD	This pin sets the analog dimming (0~1.5V)	
7	RT	This pin sets the oscillator frequency	
8	VREG	This is input supply for all internal circuits	

4. Absolute Maximum Ratings

Symbol	Parameter	Ratings
-	V_{REG} , to GND	17V
-	CS, AD, PWM, OUT, RT	-0.3 to ($V_{REG}+0.3V$) V
T_{OPR}	Junction Temperature	-35 ~ 85 °C
T_{STG}	Storage Temperature	-55 ~ 150 °C

5. Recommended Operating Condition

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{REG}	Input Voltage Range	9		16	V

6. Electrical Specification

($V_{REG}=14V$, unless otherwise noted. Typical values are at $T_A=+25^{\circ}C$.)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Input supply voltage	V_{IN}	-	9	-	16	V
Shutdown Current	I_{SD}	PWM=0V, $V_{REG}=7V$	-	0.5	1	mA
Reference voltage	VRT	$V_{REG}=12V$	1.178	1.24	1.34	V
Voltage Level shift ratio in AD Pin	α_{AD}	$V_{REG}=12V$	-	6	-	
Zener Regulator						
Zener Regulation Voltage	V_{REG}	$I_{REG}=1mA$	9	9.5	10.0	V
Maximum Compliance Current	$I_{REG\ max}$		-	-	10	mA
V_{REG} under voltage Lockout Threshold	UVLO	V_{REG} rising	8.0	8.5	9.0	V
ΔV_{REG} under voltage Lockout Threshold	$\Delta UVLO$	V_{REG} falling	-	500	-	mV
PWM Dimming						
Pin PWM Input Low Voltage	$V_{EN(L)}$	$V_{REG}=9V$ to 16V	-	-	1.0	V
Pin PWM Input High Voltage	$V_{EN(H)}$	$V_{REG}=9V$ to 16V	2.4	-	-	V
Pin PWM Pull-down Resistance	R_{EN}	$V_{PWM}=5.0V$	50	100	150	K Ω
Current sense Comparator						
Current Sense Pull-in Threshold Voltage	$V_{CS,TH}$	$T_A = +25^{\circ}C$	288	320	352	mV
Offset Voltage for V_{CON} Comparator	V_{OFFSET}	-	-12	-	12	mV
Current Sense Blanking Interval	T_{BLANK}	-	150	215	280	ns
Delay to Output	T_{DELAY}	$AD=V_{REG}$ $V_{CS}=V_{CS,TH}+50mV$ after T_{BLANK}	-	80	-	ns
Oscillator						
Oscillator Frequency	f_{OSC}	$R_T=84k\Omega$	207	232	253	KHz
Gate Driver						
Gate Sourcing Current	I_{SOURCE}	$V_{GATE}=0V$	0.165	-	-	A
Gate Sinking Current	I_{SINK}	$V_{GATE}=V_{REG}$	0.165	-	-	A
Gate output rise time	t_{RISE}	$C_{GATE}=500pF$	-	30	-	ns
Gate outt fall time	t_{FALL}	$C_{GATE}=500pF$	-	30	-	ns

7. Detailed Descriptions

DW8520 is DCDC converter made for 'Buck Converter Topology' (sensing open loop peak current). It can be able to use not only for AC lighting application but also DC lighting application on 24V, 48V, 110V and 220V.

Dimming control

DW8520 is available for analog and PWM dimming as well.

Analog dimming can be controlled by means of AD pin or input voltage. (0V~1.5V)

Even input voltage is 0V, output current does not become 0A when it comes to AD.

Switching frequency

RT sets internal switching frequency which changes according to resistance.

$$Frequency[kHz] = \frac{25}{RT(kohm) + 22} \times 1000 \quad (\text{Equation 1})$$

$$Tosc[us] = \frac{RT(kohm) + 22}{25} \quad (\text{Equation 2})$$

DW8520 can be operated on constant frequency if resistance is connected between RT and GND. Otherwise it is operated on constant off time when resistance is connected between RT and MOSFET GATE.

It is suitable as duty is over than 50% between input voltage and output voltage to operate constant off time.

Moreover, the off time can be stable through changing of LED or input voltage whilst frequency would be changed.

Rs

When Rs is connected between CS and GND, it can restrict the output current.

Equation Rs is as below;

$$Rs = \frac{320mV}{I_{aver} + \frac{I_{peak}}{2}} \quad (\text{Equation 3})$$

For example; in maximum current 500mA

The current ripple can be estimated 30% and Rs might be about 0.556ohm.

On time (under Duty 50%)

Equation Ton is as below;

$$Ton = \frac{D}{fosc} \quad (\text{Equation 4})$$

D is the ratio between Input voltage and output voltage.

If the input voltage is 17V with 1 LED, D could be 0.188.

$$D = \frac{V_{LED}}{V_{in}} = \frac{3.2}{17} = 0.188 \quad (\text{Equation 5})$$

7.1. Detailed Descriptions (Continued)

When 'fosc' is 100 kHz, Ton is as below;

$$T_{on} = \frac{0.188}{100k} = 1.88us$$

Off time (Above Duty 50%)

Toff is as below;

$$T_{off} = \frac{1-D}{fosc} \quad (\text{Equation 6})$$

When 'fosc' is 100 kHz, Toff is as below;

$$T_{off} = \frac{1-0.188}{100k} = 8.12us$$

L (Inductor)

An inductor is the part of essential elements for DC/DC converter.

On time

$$L = \frac{(V_{in} - V_{LED}) \times T_{on}}{I_{peak}} = \frac{(17V - 3.2V) \times 1.88us}{0.5A \times 0.3} \approx 172uH \quad (\text{Equation 8})$$

Off time

$$L = \frac{(V_{LED} + V_d) \times T_{off}}{I_{peak}} = \frac{(3.2V + 0.4V) \times 8.12us}{0.5A \times 0.3} \approx 194uH \quad (\text{Equation 9})$$

Where VLED : LED Vf, Vd : SBD forward voltage, Ipeak : inductor current peak to peak

Rs (start resistance)

DW8520 is in need of current 0.5mA~3mA for internal zener regulator.

The available voltage is 9V~10V for internal zener regulator to operate MOSFET GATE.

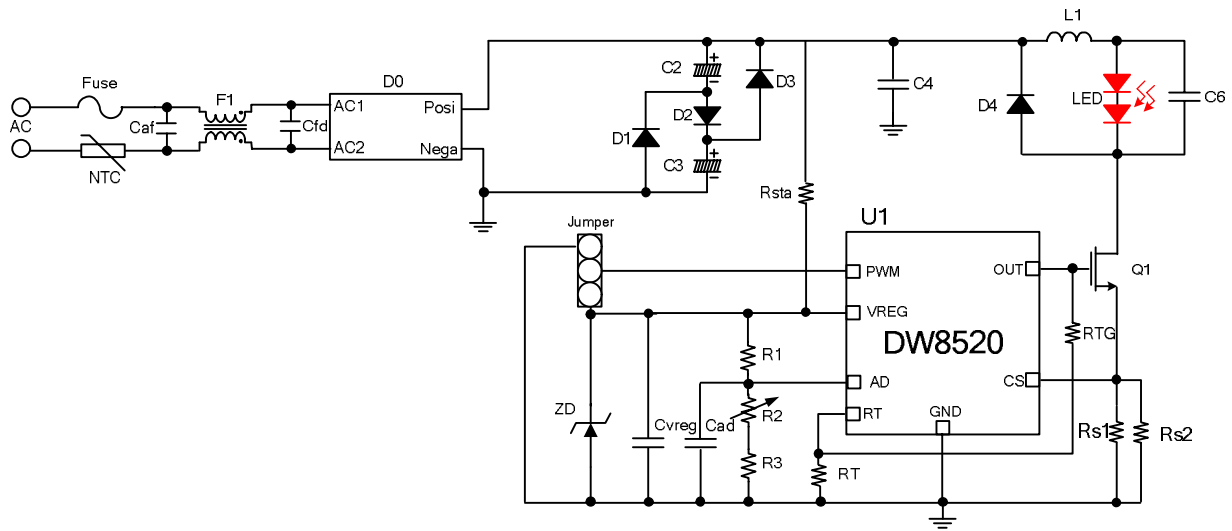
Equation Rs is as below;

$$R_{sta} = \frac{V_{in} - V_{zener}}{I} \quad (\text{Equation 10})$$

Where Vin : Supply voltage [V]

8. Application Information

Typical Application guide



9. Package Dimension

Package Dimension

- Package Name : 8 SOIC
- Package Size : 4.9mm * 6.0mm, Thickness : 1.52mm
- Pin Pitch : 1.27mm

(Unit : mm)

