DONGWOON ANATECH

DW8400

30mA White-LED Driver IC (Up to 10 LEDs)

Descriptions

The DW8400 is a step-up DC/DC converter designed for driving up to 10 white LEDs in series from a single cell Lithium-Ion battery.
Output voltage is changeable according to the LED Vf and quantity of the connected series LEDs, driving up to 40V. LED currents are set by the internal 0.3V reference voltage and the external resister R_{SET} connected to FB pin and drives up to 30mA.
Operates at a fixed switching frequency of 1.6MHz and offers internal soft-start, over-voltage detection and thermal shutdown functions.
LED dimming can be done by a pulse width modulation (PWM) or controls current in 16steps. 1-wire dimming control is controlled by using the EN pin which shutdowns the system so, additional pin is not necessary.
The DW8400 is available in a tiny 8 pin 2mm x 2mm x 0.5mm UDFN package.

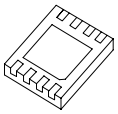
Ordering Information

Device	Marking	Package	Operating Temp
DW8400	E00	8 UDFN	-35°C ~ +85°C

Features

- LED Configuration : Up to 10 LEDs
- LED Current : Up to 30mA
- LED Current Control : 1-Wire Digital (16 Level) or PWM
- Input Voltage : 2.7V ~ 5.5V
- Output Voltage : Up to 40V
- Shut Down Current : Max.1uA
- Switching Frequency : 1.6MHz
- Protection Functions : Soft Start, OVP, TSD

Package Information

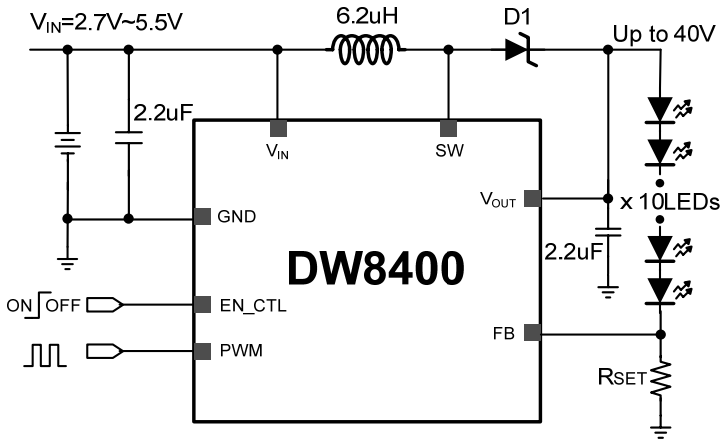


8 UDFN

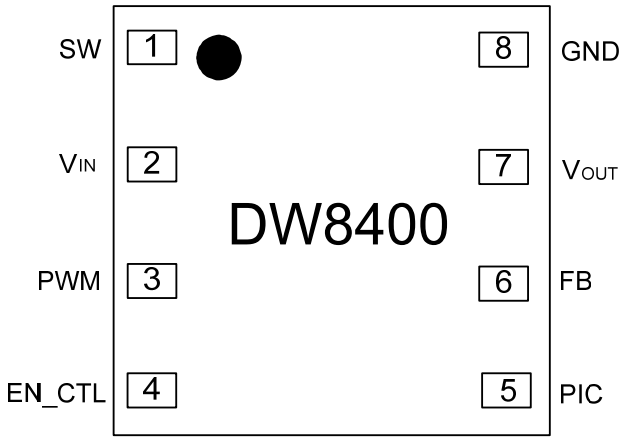
DW8400

Package	Size
8 UDFN	2x2x0.5

Typical Application Circuit



Pin Connection



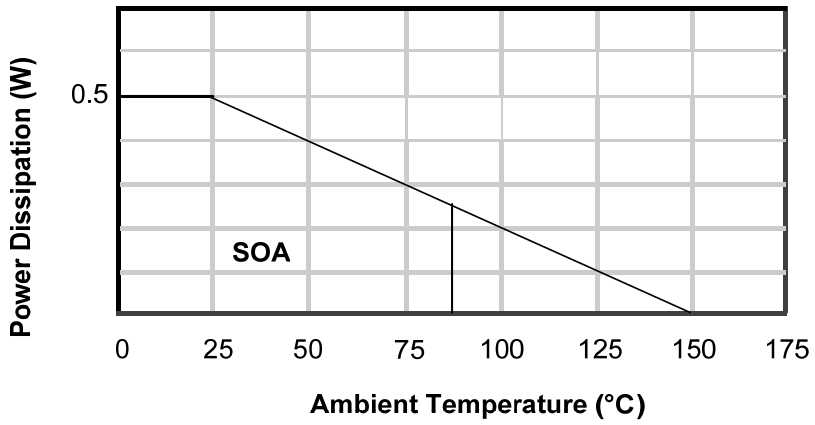
Pin Description

Pin No.	Symbol	I/O	Description
1	SW	I	Internal switch connection pin
2	V_{IN}	-	Input supply pin
3	PWM	I	PWM dimming control pin
4	EN_CTL	I	Enable & 1-wire 16 step digital dimming control pin
5	PIC	-	External compensation pin
6	FB	-	R_{SET} resistor connection pin
7	V_{OUT}	O	Boost output pin
8	GND	-	Ground pin

Absolute Maximum Ratings

Characteristics	Symbol	Value	Unit
V_{IN}, EN_CTL Voltage to GND	-	-3 to 6	V
V_{OUT}, V_{SW}	-	40	V
Lead Soldering Temperature	-	300	℃
Operating Junction Temperature	T_{OPR}	150	℃
Storage Temperature	T_{STG}	150	℃

Power Dissipation Curve



Recommended Operation Conditions

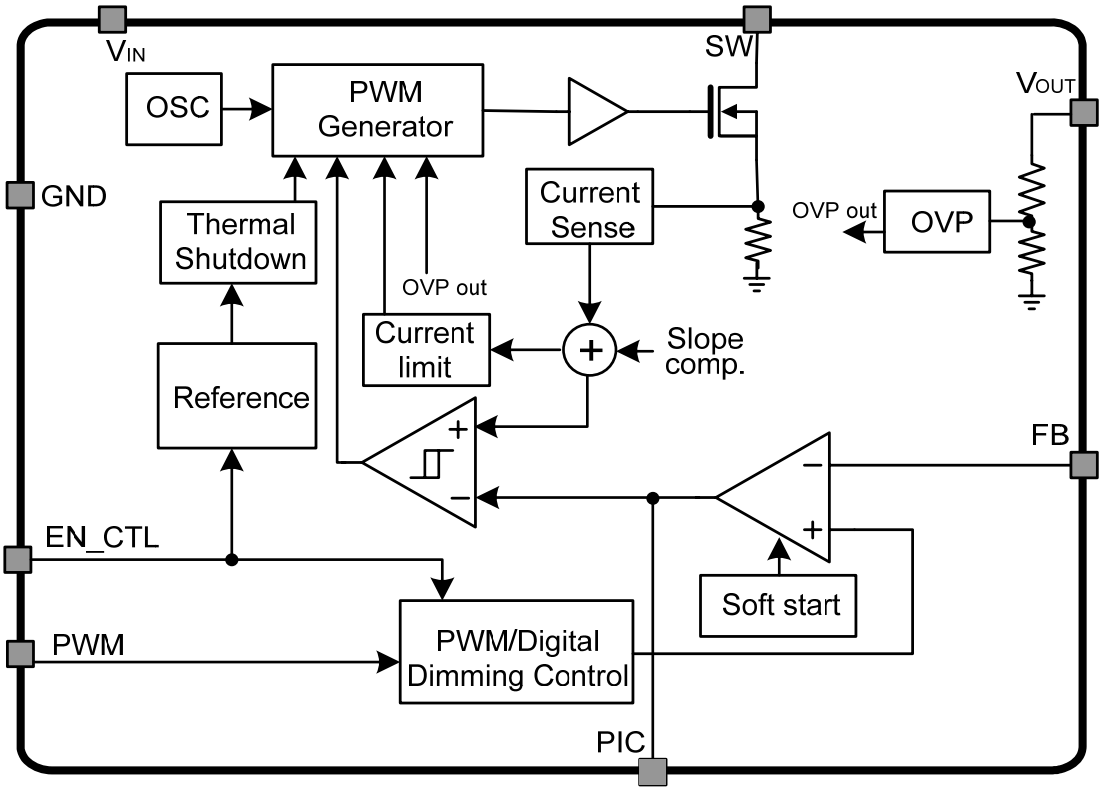
Characteristics	Symbol	Min.	Typ.	Max.	Unit
Input Voltage Range	V_{IN}	2.7	-	5.5	V
Operating Ambient Temperature Range	-	-35	25	85	℃

Electrical Characteristics

(V_{IN}=3.2V, EN_CTL=PWM=V_{IN}, R_{SET}=10ohm, L=6.2uH, C_{IN}=C_{OUT}=2.2uF, unless otherwise noted. Typical values are at Ta=+25℃.)

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Supply Voltage	V_{IN}	-	2.7	-	5.5	V
Quiescent Current	I_Q	No Switching	-	0.7	1	mA
		Switching	-	1.5	2.5	
Shutdown Current	I_{SD}	EN_CTL=0V	-	0.1	1	uA
EN Input leakage current	-	-	-	-	1	uA
Feedback Voltage	V_{FB}	-	285	300	315	mV
Programmed LED Current	I_{LED}	R_{SET}=10Ω	28.5	30	31.5	mA
		R_{SET}=15Ω	19	20	21	
		R_{SET}=20Ω	14.25	15	15.75	
Switching Frequency	F_{SW}	-	1.2	1.6	2	MHz
Maximum Duty Cycle	DC	-	-	92	-	%
Switch Current Limit	I_{LIM}	-	-	1	-	A
Switch “On” Resistance	R_{SW}	-	-	TBD	-	Ohm
Switch Leakage Current	I_{LEAK}	Switch Off, V_{SW}=40V	-	-	1	uA
Over Voltage Protection	V_{OVP}	-	38	40	42	V
Over Voltage Protection Hysteresis	$V_{OVP.HYS}$	-	-	2	-	V
Logic High Level	V_{IH}	-	-	-	1.5	V
Logic Low Level	V_{IL}	-	0.4	-	-	V
Thermal Shut Down	TSD	-	-	155	-	℃
Thermal Shut Down Hysteresis	TSD	-	-	15	-	℃
Soft start time	-	V_{OUT}=30V	-	6	-	ms

Block Diagram



Application Information

Brightness control by pulse dimming

1. 1-wire 16 dimming control

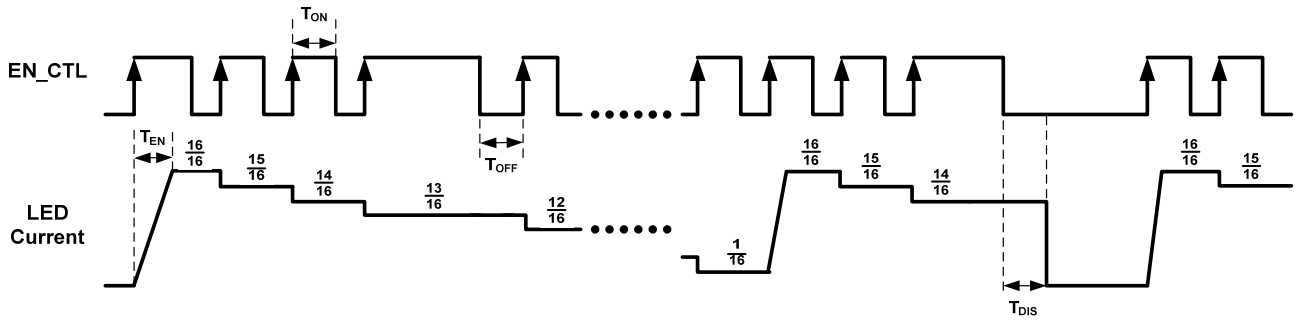
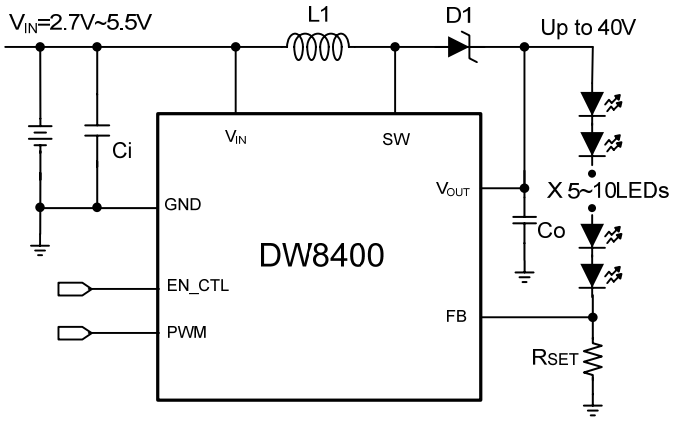


Figure1. LED Dimming Timing Diagram

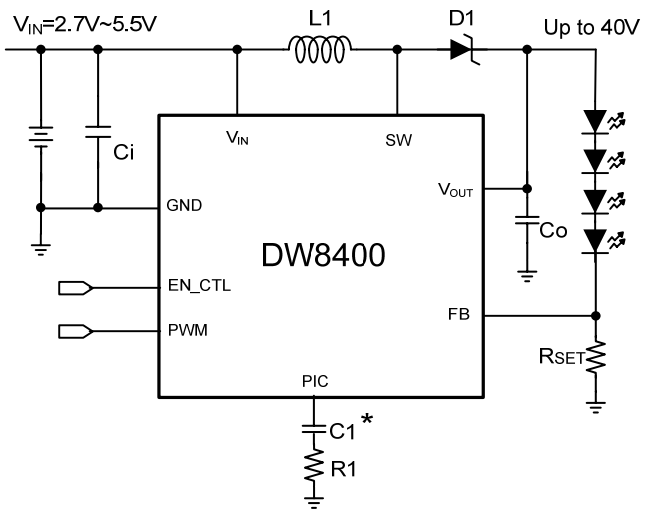
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
T_{EN}	Initial enable time			10		us
T_{ON}	Turn on time			1		
T_{OFF}	Turn off time			5	8	us
T_{DIS}	Disable hold time		20			us

EN_CTL pin is the enable and digital dimming control. Guaranteed both high logic and Low logic set at 1.5V and 0.4V respectively. The rising edge of the first pulse applied to EN_CTL set all LED current to their full scale of 20mA (R_{SET}=15Ω)
On each consecutive rising edge of the pulse applied to EN_CTL, the LED current is decreased by 1/16 step.

Application Information (Continued)



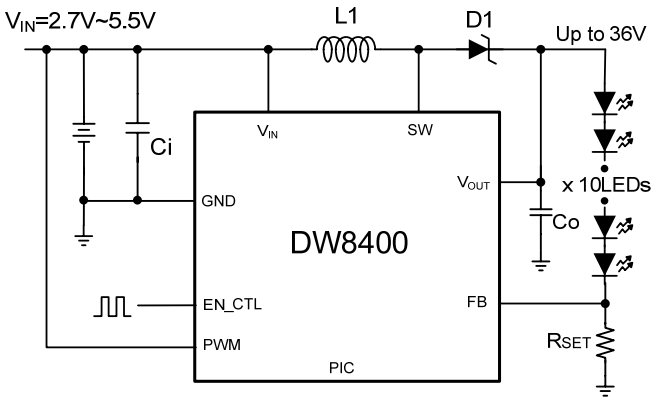
For 5~10 White LED



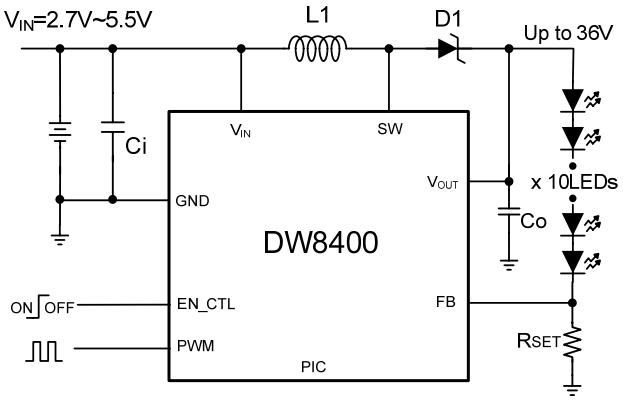
For under the 4 White LED

* For more stable system operating, connect the R1, C1 filter to the PIC pin.
(For example, R=1MΩ, C=6pF)
* RC filter recommend to drive less than 4 LEDs.

Application Information (Continued)



1-wire 16 dimming control



PWM dimming control

Package Dimension

8 UDFN Package (2x2x0.5)