DIO8810

High Integrated, Single Stage Buck & PFC controller for LED Lighting

Features

- Valley turn-on of the MOSFET to achieve low switching losses
- No auxiliary winding and VCC capacitor
- 0.2 V current sense reference voltage leads to a lower sense resistance thus a lower conduction loss
- Reliable short LED and Open LED protection
- Power factor > 0.9
- Compact package: SOT23-5

Applications

- Tube lamp & PAR lamp
- Down light & Bulb lamp

Descriptions

The DIO8810 is a single stage Buck PFC controller, specifically designed for a high performance non-isolated converter with minimal external components targeting at LED lighting applications.

The DIO8810 drives the Buck converter in the quasi-resonant mode to achieve higher efficiency and keeps the Buck converter in constant on time operation to achieve high power factor.

This chip adopts special design to achieve reliable protection for safety requirement.

Block Diagram

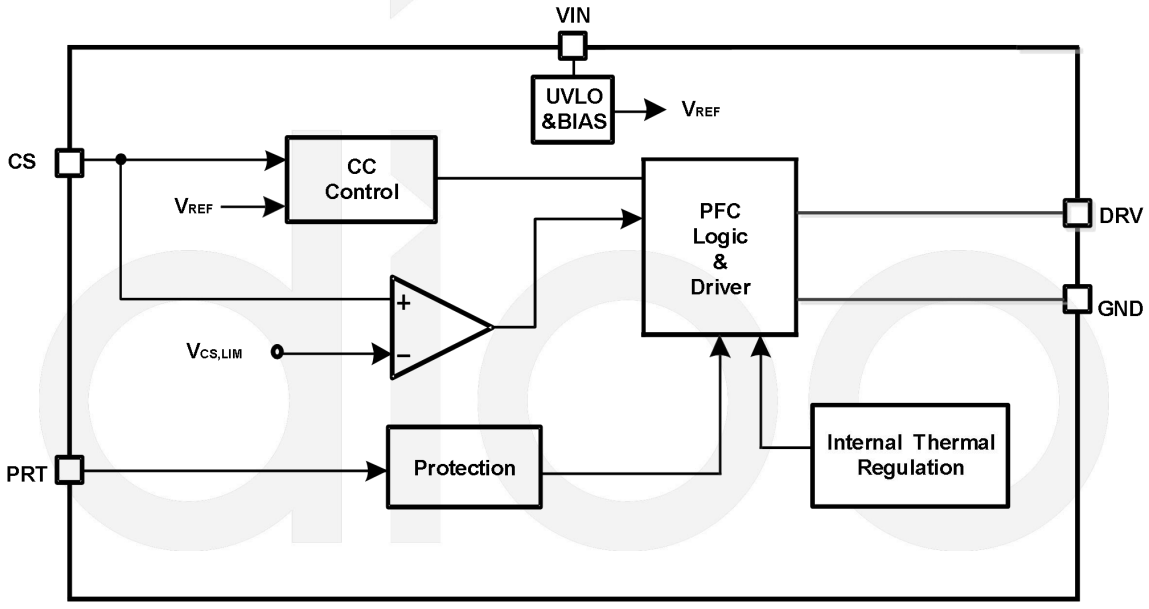


Figure1 Block Diagram

Ordering Information

Order Part Number	Top Marking	RoHS	T_A	Package	
DIO8810ST5	YWHHK	Green	-40 to 85°C	SOT23-5	Tape & Reel, 3000

Pin Assignment

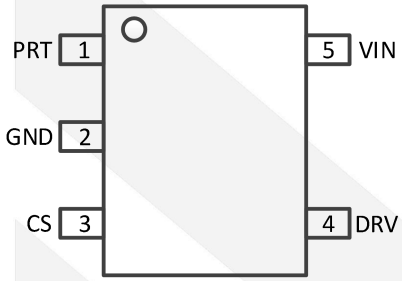


Figure 1 Top View

Pin Descriptions

Pin No.	Name	Description
1	PRT	Protection pin. Set OVP threshold with three gears.
2	GND	Ground pin.
3	CS	Current sense pin. Connect this pin to the source of the primary switch. Connect the sense resistor across the source of the primary switch and the GND pin.
4	DRV	Gate driver pin.
5	VIN	Power supply pin.

Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter		Rating	Unit
VIN		700	V
Supply current I_{VIN}		15	mA
CS, PRT, DRV		-0.3 to 7.5	V
Power dissipation, P_D @ T_A = 25°C, SOT23-5		0.6	W
Package thermal resistance, SOT23-5	Θ_{JA}	170	°C/W
	Θ_{JC}	130	
Storage temperature range		-65 to 150	°C
Junction temperature range		150	°C
Lead temperature range		260	°C

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended Operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not Recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min	Typ	Max	Unit
V_{IN}	VIN voltage	30		500	V
T_J	Operating junction temperature	–40		125	°C

Electrical Characteristics

T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN_ON}	VIN start-up voltage		7	8.5	10	V
I_Q	Quiescent current	No switching	150		300	μA
I_{VINO}	Operation current	C_L = 100 pF, f = 15 kHz	200		450	μA
Constant Current Section						
V_{REF}	Internal reference voltage		0.194	0.2	0.206	V
Protection Section						
V_{OUT_OVP}	Output OVP voltage threshold	R_{PRT} = 470 kΩ		72		V
I_{PRT}	PRT pin source current			4		μA
Current Sense Section(Source PIN of integrated MOSFET)						
$V_{CS.LMT}$	Current limit reference voltage			1.2		V
PWM Section						
$T_{ON.MAX}$	Maximum on time			25		μs
$T_{ON.MIN}$	Minimum on time			1.2		μs
$T_{OFF,MAX}$	Maximum off time			68		μs
T_{OFF_MIN}	Minimum off time			2		μs
f_{MAX}	Maximum switching frequency			85		kHz
Gate Driver						
V_{GATE_CLAMP}	Output clamp voltage	V_{CC} = 20 V		12		V
T_{RISING}	Rising time from 10% to 90%	C_{LOAD} = 1 nF		210		ns
$T_{FALLING}$	Falling time from 90% to 10%	C_{LOAD} = 1 nF		40		ns
Thermal Section						
T_{SD}	Thermal shutdown temperature			150		°C

Typical Application

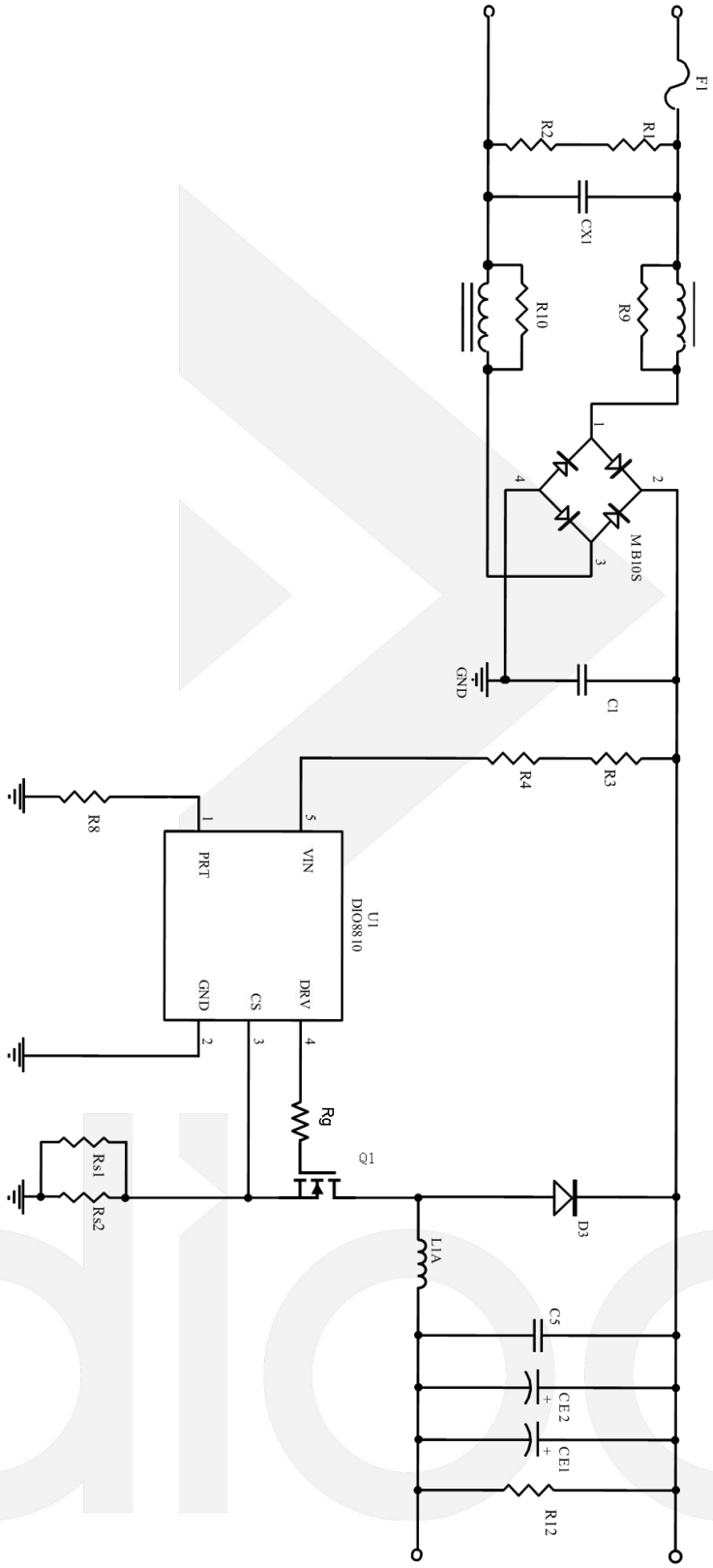


Figure 3 Typical Application

Application Information

The DIO8810 is a single stage Buck PFC controller, specifically designed for a high performance non-isolated converter with minimal external components targeting at LED lighting applications.

Start Up

After AC or DC supply is powered on, the internal power supply is increasing through HV JFET. Once V_{VIN} rises up to V_{IN_ON}, the internal blocks start to work and PWM output is enabled. Once VIN is lower than VIN under voltage lockout, DIO8810 series stops switching.

Shut down

After AC supply or DC BUS is powered off, the energy stored in the BUS capacitor will be discharged. Then internal power supply will drop down. Once V_{VIN} is below the threshold voltage, the IC will stop working.

Quasi-Resonant Operation

QR mode operation provides low turn-on switching losses for Buck converter.

LED Over Temperature Protection

When internal temperature of the chip exceeds 150°C, DIO8810 series decrease LED current to help the chip cooling.

LED Open Protection

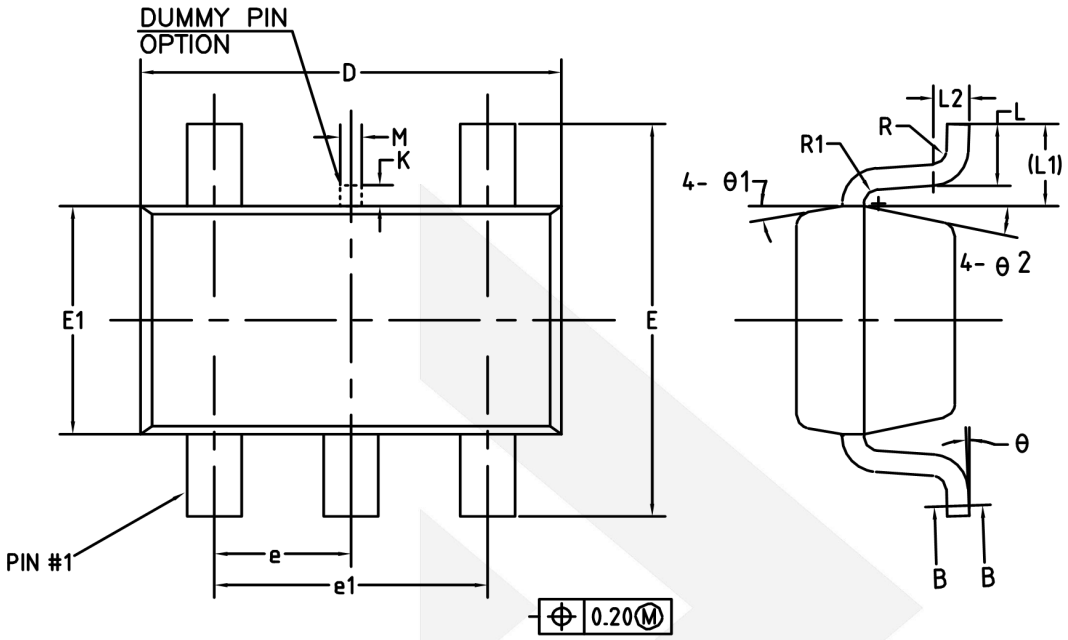
When the load is null or large transient happens, the output voltage will exceed the rated value. The output OVP threshold (V_{OUT_OVP}) is regulated by the PRT pin. When output voltage is higher than V_{OUT_OVP}, the over voltage protection is triggered and the chip stops switching for 850 ms. The system will operate in hiccup mode.

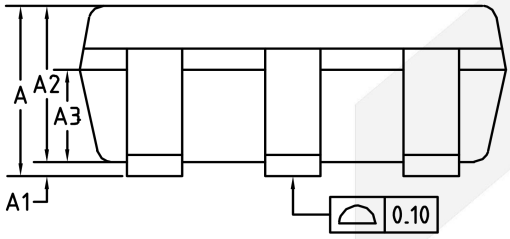
The selection of Rvin will have some impact on the open-circuit protection voltage. The recommended design guidelines for Rvin and OVP are shown in the following table:

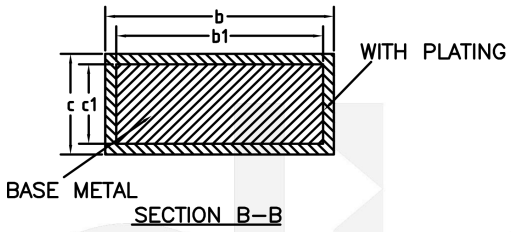
Vo_peak (V)	Recommended Rvin (Ω)	OVP
42-60	5.1 K	72 V (Typ)
60-100	10 K	112 V (Typ)
100-145	15 K	172 V (Typ)

Vo_peak (V) is the peak of the output voltage, considering the ripple of the output voltage.

Physical Dimensions: SOT23-5







Symbol	Dimensions in Millimeters		
	Min	Nom	Max
A	-	-	1.25
A1	0	-	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	-	0.45
b1	0.35	0.38	0.41
c	0.14	-	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e 1	1.80	1.90	2.00
K	0	-	0.25
L	0.30	0.40	0.60
L1		0.59 REF	
L2		0.25 BSC	
M	0.10	0.15	0.25
R	0.05	-	0.20
R1	0.05	-	0.20
Θ	0°	-	8°
Θ1	8°	10°	12°
Θ2	10°	12°	14°

CONTACT US

Dioo is a professional design and sales corporation for high-quality and performance analog semiconductors. The company focuses on industry markets, such as cell phones, handheld products, laptops, medical equipment, and so on. Dioo's product families include analog signal processing and amplifying, LED drivers, and charger ICs. Go to http://www.dioo.com for a complete list of Dioo product families.

For additional product information or full datasheet, please contact our sales department or representatives.