# Single Stage Buck PFC Controller for LED Lighting

## Description

The GP8510 is a single stage Buck PFC controller targeting at LED lighting applications. It drives the Buck converter in the quasi-resonant mode to achieve higher efficiency. It keeps the Buck converter in constant on time operation to achieve high power factor. GP8510 is offered in SOT23-6 package.

## Features

- Valley turn-on of the MOSFET to achieve low switching losses.
- 0.3V current sense reference voltage leads to a lower sense resistance thus a lower conduction loss.
- Internal high current MOSFET driver: 0.25A sourcing and 0.5A sinking
- Low start up current: 12μA typical
- Reliable short LED and Open LED protection
- Power factor >0.9 with single-stage conversion.

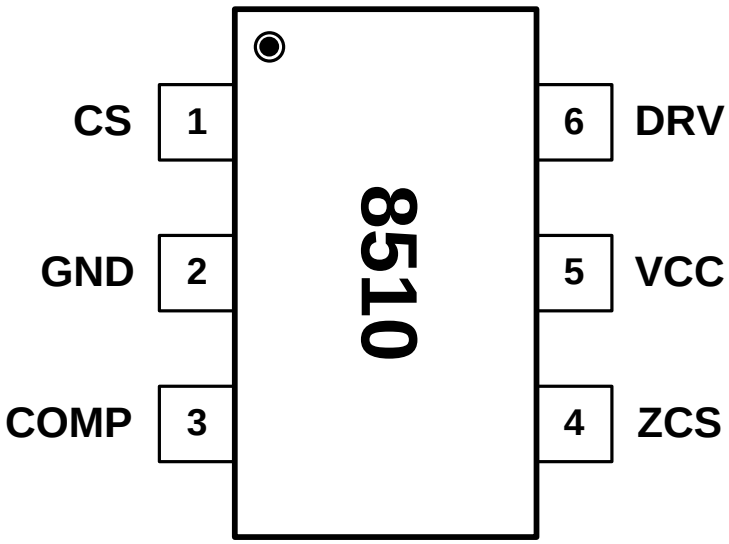
## Application

- LED lighting
- Down light
- Tube lamp
- PAR lamp
- Bulb lamp

## Ordering Information

| Device | Marking | Package |
|---|---|---|
| GP8510 | 8510 | SOT23-6 |

## Pin Assignment

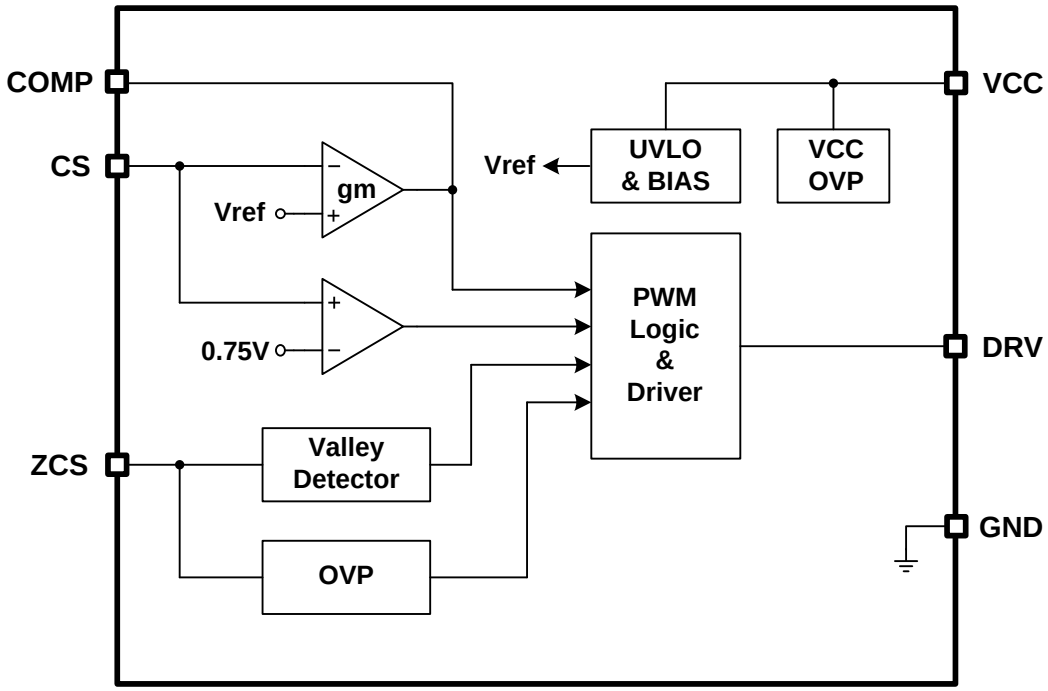



**(PKG: SOT23-6)**

## Pin Description

| No. | Pin Name | Pin Function Description |
|---|---|---|
| 1 | CS | Current Sense Input |
| 2 | GND | Ground |
| 3 | COMP | Feedback Compensation Output |
| 4 | ZCS | Zero Current Sense Input |
| 5 | VCC | Power Supply Input |
| 6 | DRV | Gate Driver Output |

## Block Diagram




## Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| Vcc | Supply Voltage | 18 | V |
| Vdrv | DRV Output Voltage | -0.3 ~ 18 | V |
| Vzcs | ZCS Input Voltage | -0.3 ~ Vcc+0.3 | V |
| Vin | Input Voltage (CS, COMP) | 7 | V |
| $T_j$ | Operating Junction Temperature | 150 | ℃ |
| Ta | Operating Ambient Temperature Range | -20 ~ 85 | ℃ |
| Tstg | Storage Temperature Range | - 55 ~ 150 | ℃ |
| *θja* | Package Thermal Resistance (SOT23-6) | 170 | ℃/W |
| Pd | Power dissipation (SOT23-6) | 0.6 | W |

## Electrical Characteristics

* Vcc=15V, Ta=25°C, unless otherwise specified.

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **SUPPLY VOLTAGE SECTION** | | | | | | |
| Vcc | VCC Operating Range | | 8 | | 15.5 | V |
| Von | UVLO High Threshold Voltage | Vcc Increasing | 15.5 | 16.5 | 17.5 | V |
| Voff | UVLO Low Threshold Voltage | Vcc Decreasing | 6 | 7 | 8 | V |
| Vccovp | VCC OVP Voltage | Vcc Increasing | 17.6 | 18.8 | 20 | V |
| Ist | Start-up Current | Vcc Increasing | 4 | 12 | 25 | uA |
| Icc | Dynamic Operating Current | Co=100pF,fsw=15KHz | 0.5 | 1 | 2 | mA |
| Iovp | OVP Sink Current | Vcc > Vccovp | | 2 | | mA |
| **ERRAMP SECTION** | | | | | | |
| Vref | Reference Voltage | | 294 | 300 | 306 | mV |
| Vclamp | Erramp Output Clamp Voltage | | 294 | 300 | 306 | mV |
| Ieo | Erramp Output Source Current | | | -4.2 | | uA |
| | Erramp Output Sink Current | | | 7.4 | | uA |
| **CURRENT SENSING SECTION** | | | | | | |
| Vlimit | Current Limit Threshold Voltage | | | 0.75 | | V |
| **ZERO CURRENT SENSE SECTION** | | | | | | |
| Vzcsovp | ZCS OVP Protection Voltage | | | 1.45 | | V |
| **GATE DRIVER SECTION** | | | | | | |
| Vhigh | DRV Output High Voltage | Isource=10mA | | 12 | | V |
| Vlow | DRV Output Low Voltage | Isink=10mA | | 0.5 | | V |
| Vouv | DRV Output Voltage at UV | Vcc=5V, Io=1mA | | 0.2 | 1 | V |

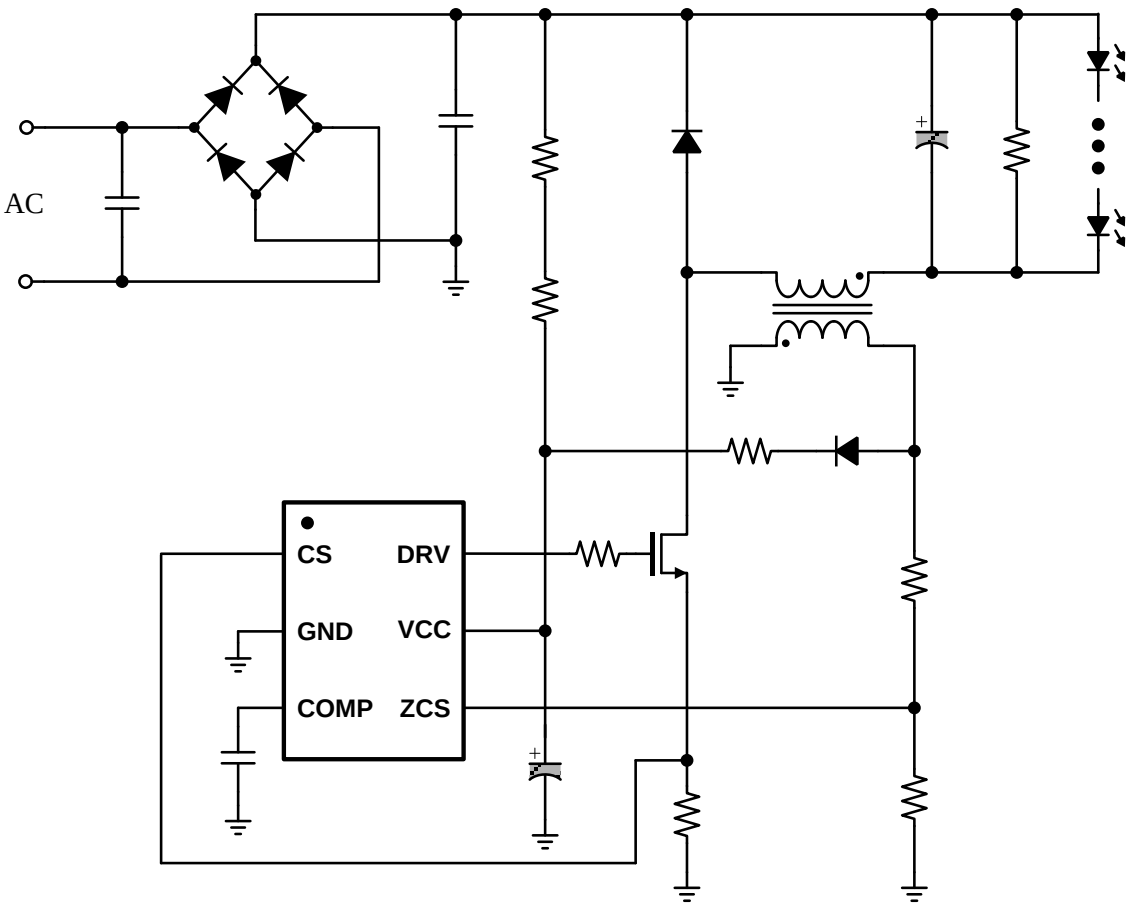
## Electrical Characteristics

* Vcc=15V, Ta=25°C, unless otherwise specified.

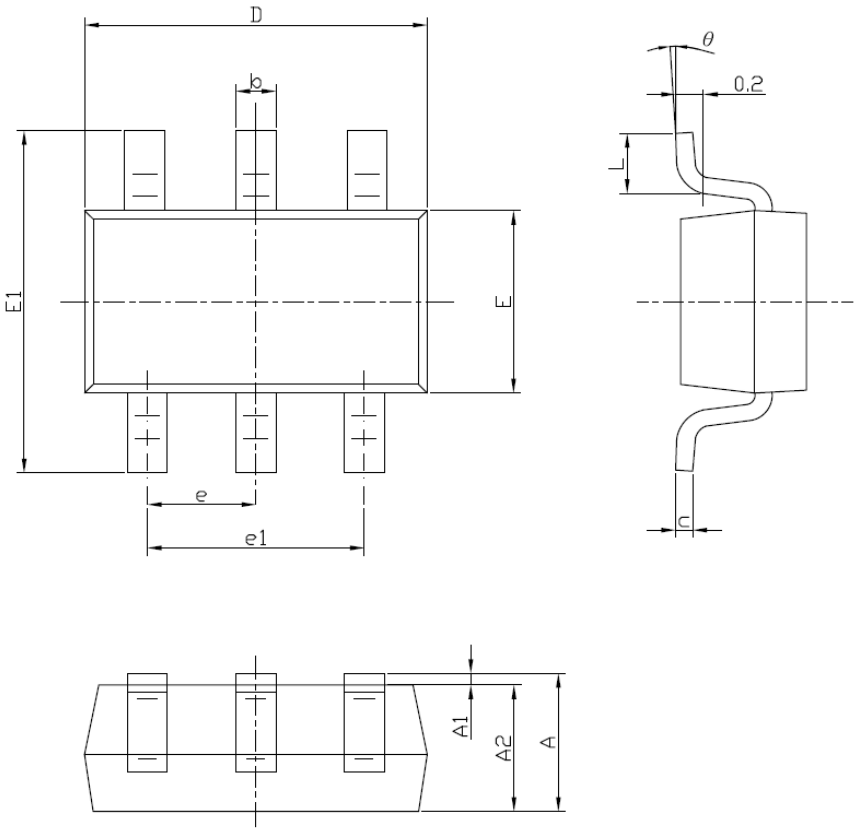
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **SWITCHING TIMING SECTION** | | | | | | |
| Tonmax | Maximum On Time | | | 16 | | us |
| Tonmin | Minimum On Time | | | 400 | | ns |
| Toffmax | Maximum Off Time | | | 69 | | us |
| Toffmin | Minimum Off Time | | | 2 | | us |
| fmax | Maximum Switching Frequency | | | 200 | | KHz |
| **THERMAL SHUTDOWN PROTECTION SECTION** | | | | | | |
| Ttsd | Thermal Shutdown Temperature | (Note1) | | 150 | | ℃ |
| Thys | TSD Hysteresis | (Note2) | | 25 | | ℃ |

* Note1,2 : Parameters are guaranteed by design, but not tested in production.

## Typical Application Circuit



## PACKAGE DIMENSION




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.111 | 0.119 |
| E | 1.500 | 1.700 | 0.059 | 0.067 |
| E1 | 2.650 | 2.950 | 0.104 | 0.116 |
| e | 0.950(BSC) | | 0.037(BSC) | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| $\theta$ | 0° | 8° | 0° | 8° |

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