

## Cascode Structure Buck Converter for HB LED Driving

### Features

- Input voltage range from 5V to 450V
- Cascode topology for lower switching loss and surge voltage
- Constant off time control
- Line compensation of output current
- Enable pin
- Switch/PWM/Linear/SOTP dimming function
- Leading-edge blanking
- Frequency modulation in short circuit protection and low output voltage condition
- Over-temperature protection
- Over-current protection
- SOP-8 package, with few external components needed

### Application

- DC/DC or AC/DC LED driver application
- LED T Bar lighting
- Cabin light in car
- Both non-isolation and isolation lighting in high input voltage

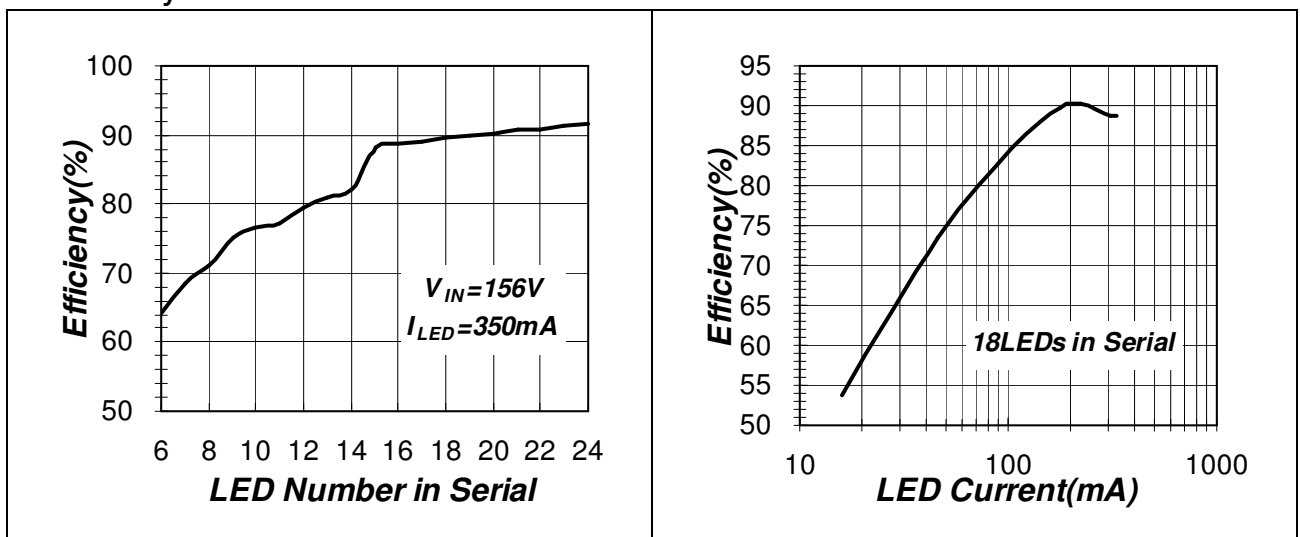
### General Description

The GR8210 is a high brightness LED driver with the cascode topology that patented by Grenergy. A high voltage power NMOSFET,  $BV_{DSS}$  is 600V, as the high side device and the power NMOSFET inside the GR8210 as the low side device in this cascode topology. A Zener voltage, was generated by ST pin of the GR8210, turn on the high side device all the time by connected to the gate terminal of the high side device. The source terminal and the drain terminal of the high side device are connected to the DRN pin of the GR8210 and the input voltage rail respectively to absorb the very large voltage potential. The current peak value was decided by the sensing resistor in the CS pin, the low side device was turned off by the current peak detection then delay a fixed off time that set by the resistor in the RT pin of GR8210.

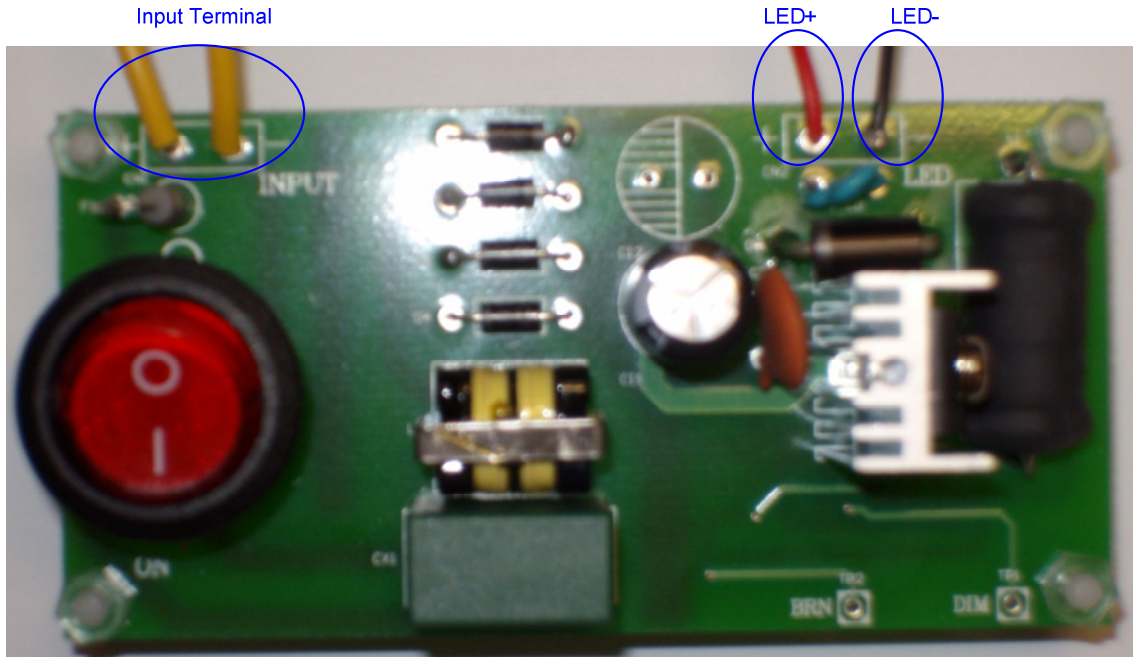
There are PWM and liner dimming in the GR8210 to adjust the LED brightness. In the abnormal operation, the inner OTP function and the external OTP by the NTC resistor could protect the IC damage.

\*\* Switching dimming and system over-temperature dimming are option functions.

### Efficiency



## Terminals Definition



## Symbol Definitions

$V_{INPUT}$ : The voltage applied in the input terminals.

$V_{LED}$ : The voltage from LED+ terminal to LED- terminal.

$I_{IN}$ : The input current flows into one of input terminals.

$I_{LED}$ : The current flows out of the LED+ terminal and into the LED- terminal.

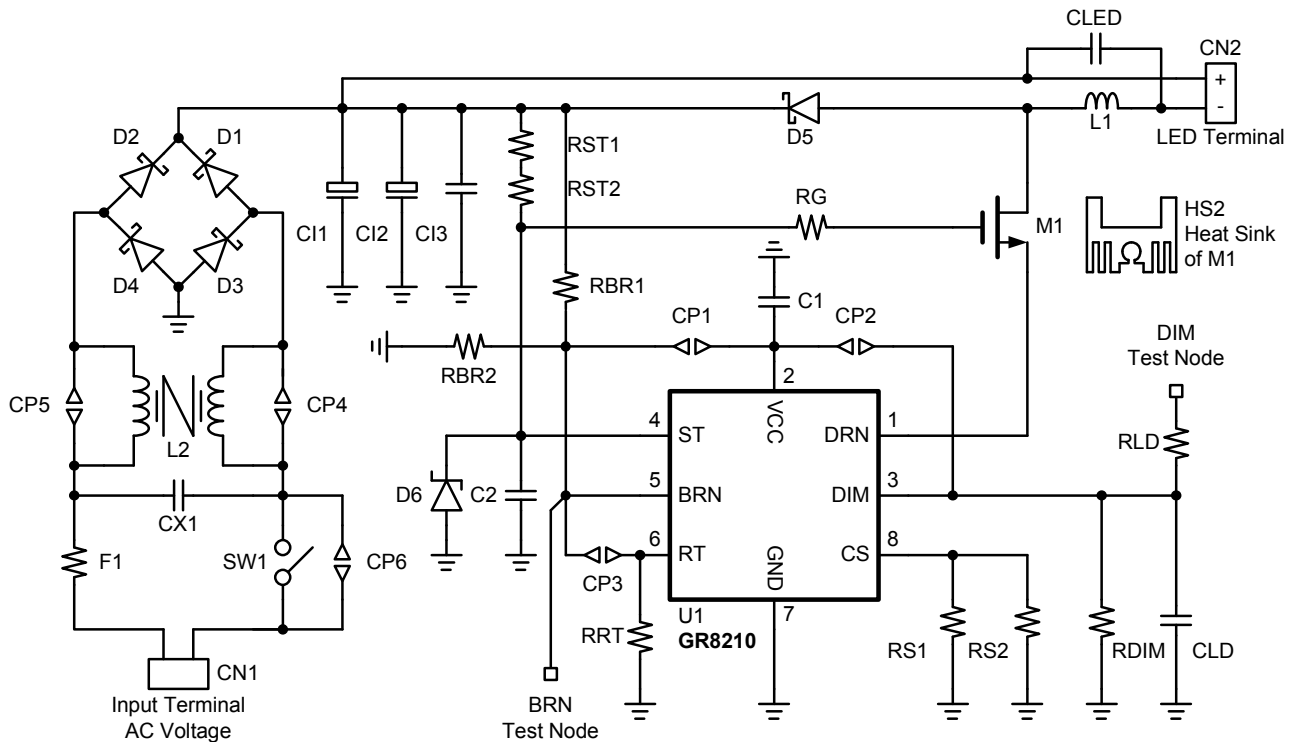
## Specifications

**Condition1: 12LEDs in serial.  $V_{LED} = 36V \sim 48V$**

Parameters	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
AC Input Voltage	$V_{INPUT}$	$I_{LED} = 0.25A.$	90	-	264	VAC <sup>*1</sup>
Input RMS Current	$I_{IN}$	$V_{INPUT} = 90VAC \sim 264VAC.$	130	-	260	mArms
Output Voltage	$V_{LED}$	$V_{INPUT} = 90VAC \sim 264VAC.$	36	42	48	V
Output Current	$I_{LED}$	$V_{INPUT} = 90VAC \sim 264VAC.$	230	250	285	mA
PFC		$V_{INPUT} = 90VAC \sim 264VAC.$	-	0.51	-	-

\*1 1VAC=1.414V

## Schematic

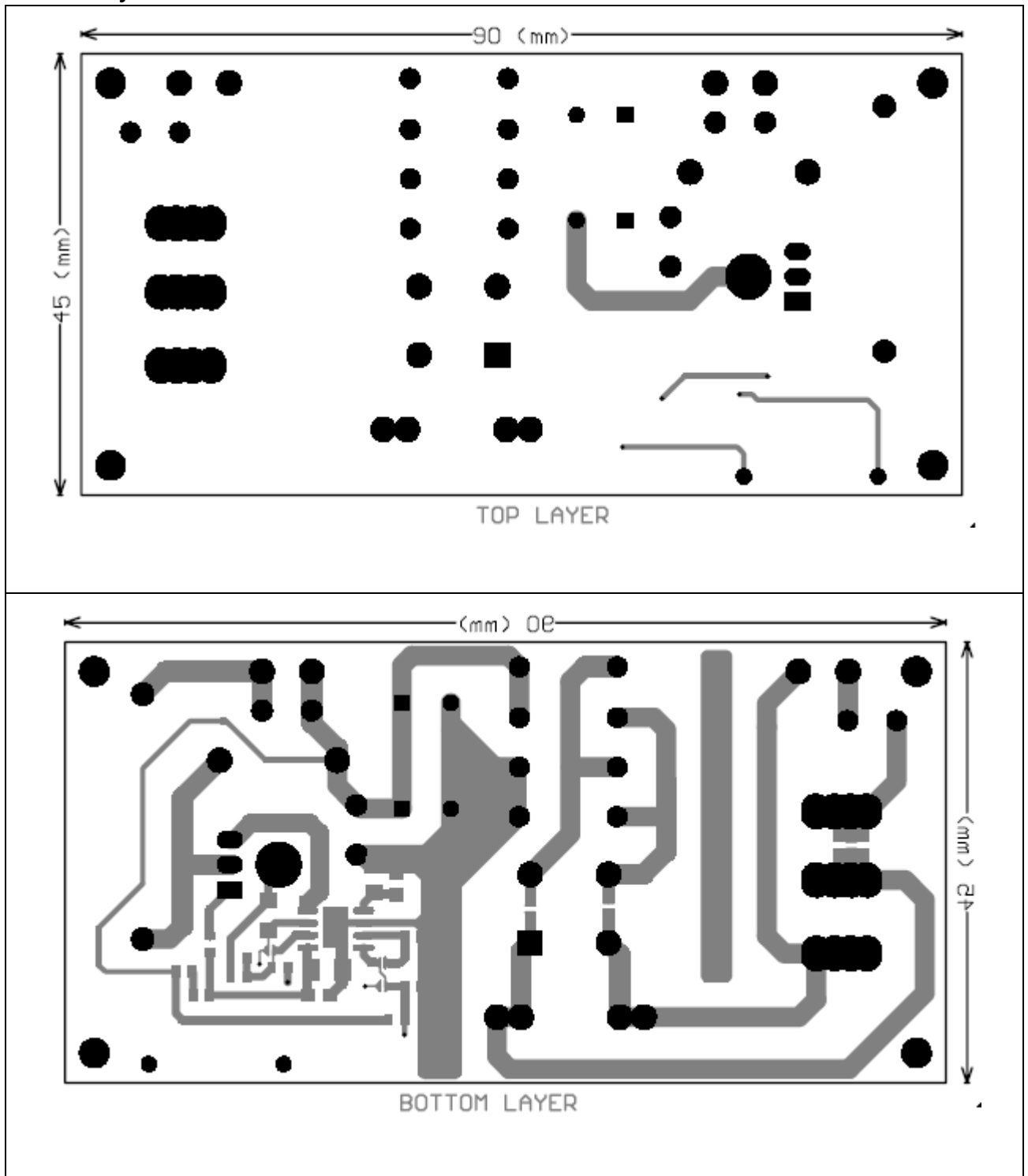


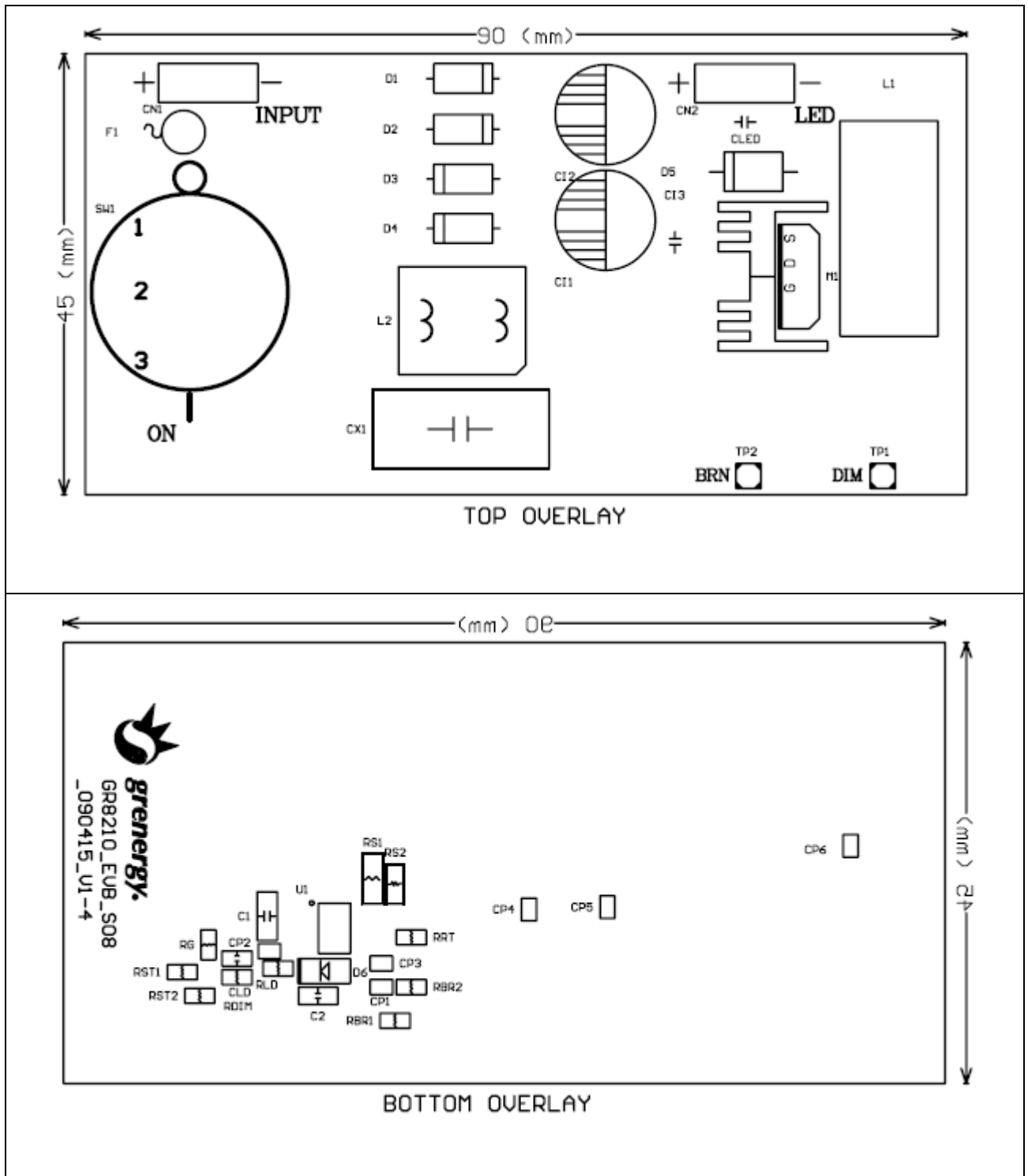
## Bill of Material

Designator	Qty.	Part Number	Description	Package	Manufacture
U1	1	GR8210	LED Driver IC	SOP-8	Grenergy
CI1	1	-	10 $\mu$ F/400V	10mm X 16mm	-
CI2	1	N/C	-	-	-
CI3	1	-	10nF/1KV	-	-
C1	1	-	10 $\mu$ F/25V	1210	-
C2	1	C3216JB1E475M	1.0 $\mu$ F/25V	1206	-
CX1	1	-	0.33 $\mu$ F/300V X1	17mmX16.5mmX9.5mm	-
CLED	1	-	1nF/1KV	-	-
CLD	1	N/C	-	-	-
F1	1	-	0.22 $\Omega$ $\pm$ 5%	-	-
RS1	1	-	0.60 $\Omega$ $\pm$ 1%	1206	-

Designator	Qty.	Part Number	Description	Package	Manufacture
RS2, RLD, RDIM, RBR1, RBR2	5	N/C	-	-	-
RRT	1	-	200K $\Omega$ $\pm$ 1%	0805	-
RST1, RST2	2	-	1M $\Omega$ $\pm$ 1%	0603	-
RG	1	-	560 $\Omega$ $\pm$ 1%	0603	-
D1, D2, D3, D4	4	1N4007	1A/700V	DO-41	-
D5	1	UF2006M	2A/800V	-	-
L1	1	-	3.5mH/ $\pm$ 10%	-	-
L2	1	-	27mH	-	-
M1	1	-	4A/600V	TO-220	-
HS2	1	-	Heat Sink	-	-
CP1, CP2	2	NA	Short	NA	NA
CP3, CP4, CP5, CP6	4	NA	Open	NA	NA

PCB Layout





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