Switch-Mode High-Brightness LED Driver CN5610

General Description:

The CN5610 is a PFM high efficiency LED driver control IC. It allows efficient operation of high brightness LED from input voltage ranging from 3V to 450V. The CN5610 controls an external N channel MOSFET or NPN transistor at the frequency up to 300KHz. The LED string is driven at constant current rather than constant voltage, thus providing constant light output and enhanced reliability. The output current can be programmed from 30mA to 1.2A with an external resistor. The other features include soft start circuit, inductor current limit circuit, etc.

The CN5610 is available in a 8-pin SOP package.

Applications:

- LED Lighting
- DC-DC or AC-DC LED Driver Application
- Back Lighting of Flat Panel Displays
- RGB Back Lighting LED Driver

Features:

- Operating Supply Voltage Range: 3V to 6V
- Programmable Inductor Current Limit Level
- Soft Start Circuit
- Driving up to hundreds of LEDs
- Adjustable Output Current up to 1.2A
- Operating Temperature Range: - 40 to 85
- Available in 8-pin SOP Packages
- Pb-free

Pin Assignment



Typical Application Circuit

Input Supply Voltage 6V to 450V



Figure 1 Typical Application Circuit

In Figure 1,

- L1 is the inductor, generally the inductance may be around 1mH.
- D1 is zener diode whose breakdown voltage is around 6V
- D2 is rectifier diode, shottky diode is better for higher efficiency
- Q1 and Q2 are PNP transistors, many part number such as A94 can be used
- M1 is N channel MOSFET, for 400V voltage rating, IRF840 or IRF740 can be used
- R2 should be chosen so that Q2's collector current is about 100uA
- R4 should be chosen so that Q1's collector current is as close as possible to Q2's collector current Q1's collector current = 1.22/R4

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- R1,R3 and R4 functions together to determine the LED current •
 - The voltage across R1 is determined by:

 $V_{R1} = 1.22 \times (R3/R4)$

So, the LED current is determine by:

ILED = V_{R1} ÷R1

- ulletR5 is used to set the maximum inductor current level. The maximum inductor current level is equal to 910/R5.
- R6's value should be chosen so that the current through itself should be greater than 650uA •
- C1 is a capacitor, the pole formed by R4 and C1 should be around 700Hz
- C2 is a capacitor, whose value is 1uF at least
- C3 is a capacitor, whose value is around 1uF •

Pin Description

Pin No.	Name	Function Description		
1	VDD	Positive Supply Voltage. V _{DD} is the power supply to the internal circuit.		
2	GND	Ground Terminal.		
3	CL	Inductor Current Limit Sense Pin. During the on time of external N channel		
		MOSFET or NPN transistor, once the inductor current reaches the level set by		
		the resistor at CLSET pin, the external N channel MOSFET or NPN transistor		
		will be turned off.		
4	NC	No Connection.		
5	NC	No Connection.		
б	CLSET	Inductor Current Limit Set Pin. The maximum inductor current is set by connecting a resistor R_{CLSET} from this pin to VDD. When the inductor current reaches the current level set by R_{CLSET} , the external N channel MOSFET or NPN transistor will be turned off. The maximum inductor current level is determined by the following equation: Iind = 910V / RCLSET Where, Iind is in ampere(A) RCLSET is in ohm()		
7	DRV	External MOSFET or NPN Transistor Drive Pin. Connect this pin to the		
		gate of external N channel MOSFET, or to the base of external NPN transistor.		
8	CS	LED Current Sense Pin.		

Absolute Maximum Ratings

CS Pin Voltage 0.3	V to 20V
The Other Pin Voltage 0.3	V to 6.5V
Operating Temperature 40	to 85
Thermal Resistance(Junction to Case)	190 /W

Maximum Junction Temperature.....150 Storage Temperature..... - 65 to 150 Lead Temperature(Soldering)......300

Stresses beyond those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above 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.

Electrical Characteristics

Parameters	Symbol	Test Conditions	Min	Тур	Max	Unit
Input Supply Voltage	VDD		3		6	V
Operating Current	I _{VDD}	R _{ISET} =10K ohm		335		uA
CS Regulation Voltage	V _{CS}	Normal Current Regulation		1.22		V
CS Pin Input Current	I _{CS}				1	uA
DRV Pin Rise Time	tr	C _{DRV} = 500pF		30		nS
DRV Pin Fall Time	tf	C _{DRV} = 500pF		50		nS

(VIN=5V, $T_A=25$, unless otherwise noted)

Board Layout Considerations

During the on time of external N channel MOSFET or NPN transistor, the inductor current flows back to GND via CL pin, so the metal line to CL pin and GND pin should be as wide as possible.

Package Information



Cumb al	Dimensions I	n Millimeters	Dimensions In Inches		
Symbol	Min	Max	Min	Max	
A	1.350	1.750	0.053	0.069	
A1	0.100	0.250	0.004	0.010	
A2	1.350	1.550	0.053	0.061	
В	0.330	0.510	0.013	0.020	
C	0.190	0.250	0.007	0.010	
D	4.780	5.000	0.188	0.197	
E	3.800	4.000	0.150	0.157	
E1	5.800	6.300	0.228	0.248	
e	1.270(TYP)		0.050(TYP)		
L	0.400	1.270	0.016	0.050	
θ	0°	8°	0°	8°	

Consonance reserves the right to change the circuitry and specifications without notice at any time.