Description

D80213A is a high precision off-line on-isolation LED constant current switch chip, which suitable for high precision of constant current non-isolation buck LED constant Current drive power.

D80213A uses a patented zero current detection method, critical quasi-resonant Technology mode to realize the high efficiency. Can use smaller size of inductance, no freewheeling diode reverse recovery problem, without any compensation circuit, built-in line voltage compensation, without increasing the current compensation circuit can meet the current accuracy of full input voltage range (± 3%).

D80213A built-in 650 withstand voltage tube, can reduce the cost of system. The D80213 can easily meet the demand of EPA2.0 energy efficiency with very low start-up current.

The D80213A also integrates several protection features for increasing the stability of system: under voltage lockout, LEB, LED open circuit protection, over current protection, loop open-circuit protection, LED short circuit protection. Adopt DIP-8 package.

D80213A offer DIP-8 package.

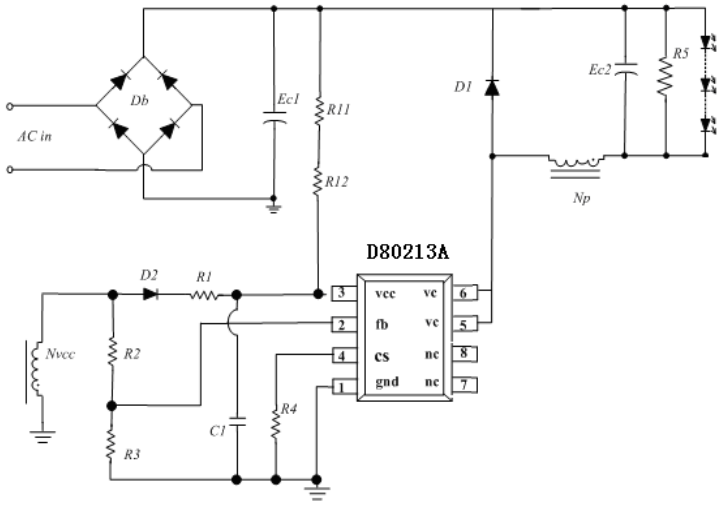
Feature

- High efficiency critical operating
- Patented zero current detection method
- without freewheeling diode reverse recovery problem
- ±3%constant current precision, single chip ±1% precision
- Built-in power tube
- Very low start-up current(15uA)
- Built-in cable compensation, wide input voltage
- Built-in cycle-by-cycle current limiting and LEB
- LED open/short circuit protection
- LED over voltage protection
- Without compensation circuit

Application

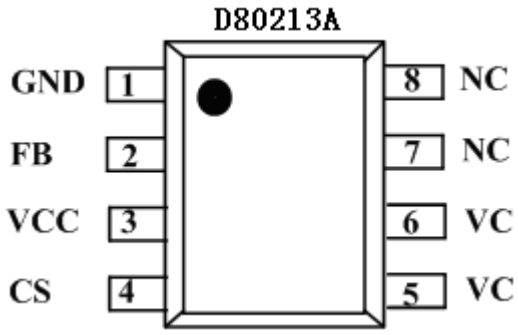
- LED panel light ,down light, tube light
- Other LED light

Typical Application



Picture 1 D80213A typical application schematic

Pin Package



Pin Description

Pin No.	Pin Name	Description
1	Gnd	Signal and power ground
2	Fb	Output voltage feedback Pin
3	Vcc	IC power
4	Cs	Primary –side current sense Pin
5，6	Vc	The higher voltage input pin of internal Mos
7，8	Nc	without connect

Order Information

Part number	Print	Package type
D80213A	D80213A XXYY	Tube 50pcs /Tube

Application Limiting Parameter (Note 1)

Parameter	**Range**
VCC – GND	-0.3V ~ 30V
FB - GND	-0.3V ~ 9V
VC- GND	0.3V ~ 650V
CS - GND	0.3V ~ 9V
Operating temperature range	.-40℃ to +125℃
Junction temperature range	-40℃ to +150℃
Storage temperature range	-60℃ to +150℃
Electronic protect human mode	2000V (Note2)
Electronic protect machine mode	500V

Note1: Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Note2: Human mode, 00PF capacitor discharge through the 1.5Kohm resistance.

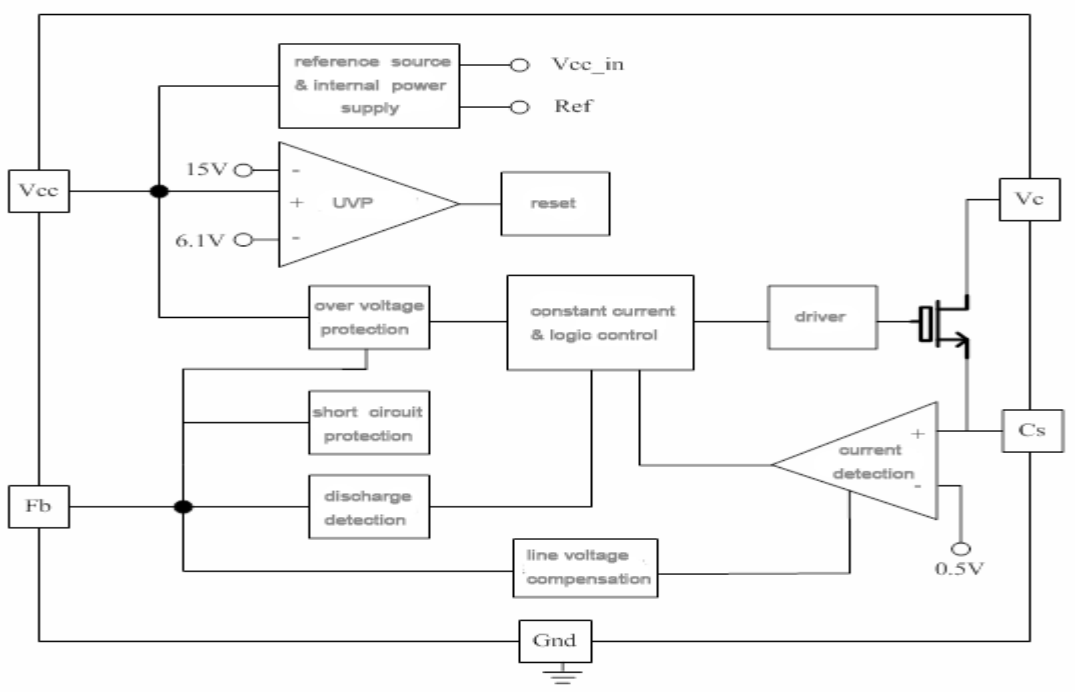
Electrical Characteristics

(VCC=12V,Ta=25℃, unless otherwise specified.)

Description	**Symbol**	**Min.**	**Typ.**	**Max.**	**Unit.**
FB Pin					
FB over voltage protection	FB_ovp	3	3.15	3.3	V
FB maximum output current	IFB_max		5		mA
FB minimum output current	IFB_min		25		uA
CS pin					
Over current limit voltage	Vcs	0.445	0.450	0.445	V
Leading edge blanking time	LEB		570		nS
OUT Pin					
Pull-up output current	Isource		50		mA

Pull-down output current	Isink	100			mA
VCC Pin					
Start-up current	Istart		15	35	uA
VCC start-up voltage	Vcc(on)	14	15	16	V
VCC turn-off voltage	Vcc(off)	5.5	6.1	6.6	V
VCC static operating current	Iccq		0.45		mA
VCC over voltage protection	Vcc(ovp)	22	24.5	26.5	V
Recommended VCC operating range	Vcc_op	6.8		21	V
Power tube					
Power on resistor	Rds_on			6	ohm
Breakdown voltage	Bvd_SS	650			V

Functional Block Diagram



Picture 3 Internal Structure Diagram

D80213A is a constant current switch chip for LED lighting, can achieve higher precision constant current with a patented zero current sense method and critical conduction mode. Built-in cable compensation, lower system cost, only need little periphery component can achieve excellent constant current index.

1、Start-up circuit

When the system power on , as the picture 4，the input voltage Vcap to charge C_1 through the start-up resistance R_1. When the capacitor voltage VCC achieve to start-up voltage Vcc (on), the internal control circuit of chip begin to work. VCC is supplied by the auxiliary winding after system start-up.

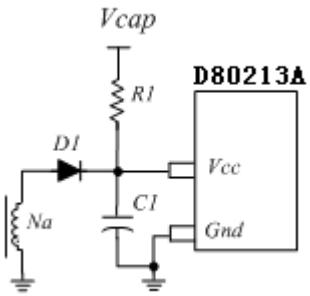
The delay time of power start–up (Tsd) is given by:

$T_{sd} = R_1 X C_1 X L_n (1- V_{cc(on)} / (V_{cap} - I_{start} X R_1))$

$V_{cc(on)}$ is starting voltage

I_{start} is starting current

V_{cap} is commutating voltage of AC

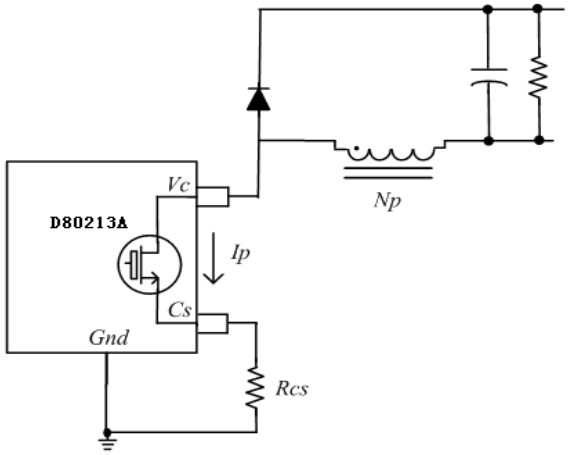


Picture 4 start-up schematic

Because the starting- current is very small (less than 30uA), the start-up resistor R1 can be made large. Calculate with R1 values is 1 M, VCC capacitor C1 value is 4.7uF, it can start within 1 seconds at AC 90V input.

2、Output constant current set

The chip adopts the cycle-by -cycle sense the peak current of inductance; CS is connected to the input point of peak current comparator, compared to internal reference voltage, so as to control the power switch.



Picture 5 Constant current set-up schematic

Chip operating in critical conduction mode

LED output current is given by :Iout = 1/2 *V_{cs} /R_{cs}

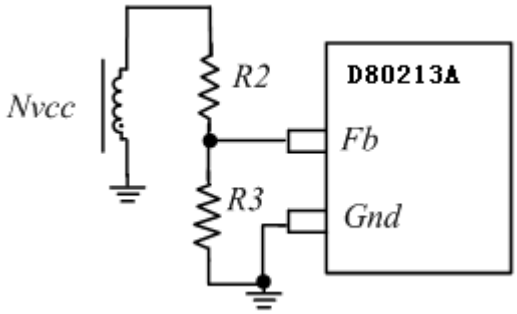
V_{cs} is internal current comparison threshold value

R_{cs} is current sense resistance value

The output current can be set according to the current sampling resistor. No relation with the inductance.

3、Output over voltage protection and open circuit protection

As the picture 6, the chip regular work, through the auxiliary winding R_1 and divided voltage resistance R_3 feedback the output voltage to FB pin, the chip make a stable current output through adjust the turn-off time, if the output voltage is over voltage, the input voltage of FB reach 3.15V and keep enough time, is regarded as the circuit output over voltage, the chip will close the out pin until the next start-up.



Picture 6 feedback circuit schematic

If the feedback circuit of R2 short circuit, the FB voltage quickly rushed up to output overvoltage condition, chips continue to restart, has been working in hiccup mode, R3 open circuit as the same as it; if the R2 open circuit (or auxiliary winding open circuit or short circuit) or R3 short circuit, FB voltage is 0, then the chip will close the OUT pin after start work in a period until the next start-up.

4、Feedback

As shown in the schematic, chip through the auxiliary winding, resistance R2 and R3 feedback the output current state to the FB, FB sense current threshold voltage is 0.1V. LED protection voltage can be calculated according to the picture 6.

5、Chip Driver

D80213A uses a characteristic multistage driving circuit, ensure the switch power is not too large, and not influence the system EMI, The chip can drive power transistor which more cost-effective than other, also drive power MOS tube, satisfy the requirements which require higher efficiency or greater power system.

6、Working Frequently

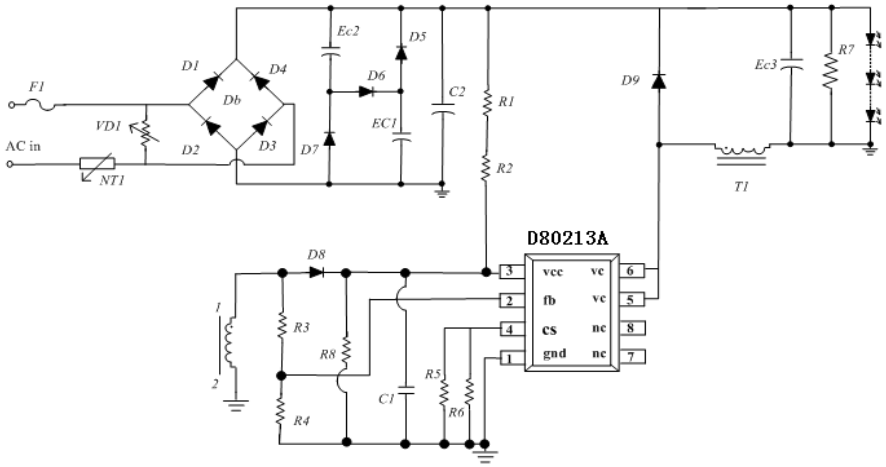
System operating in current and inductance critical conduction mode, without any loop compensation. Design the center working frequency of system is about 45Khz. suggested that the maximum operating frequency for 100Khz, the minimum frequency for 25Khz. Calculation formulas of frequency as bellow:

$F_{req} = I_p$
$2 * L_{m*\eta} / (2*V_{out} * I_{out})$
L_p is the peak current of inductance,
$V_{out,}$ I_{out} is the output voltage and current,
L_m: is the inductance,
ETA: the efficiency of the system

7、D80213A Design Tactic

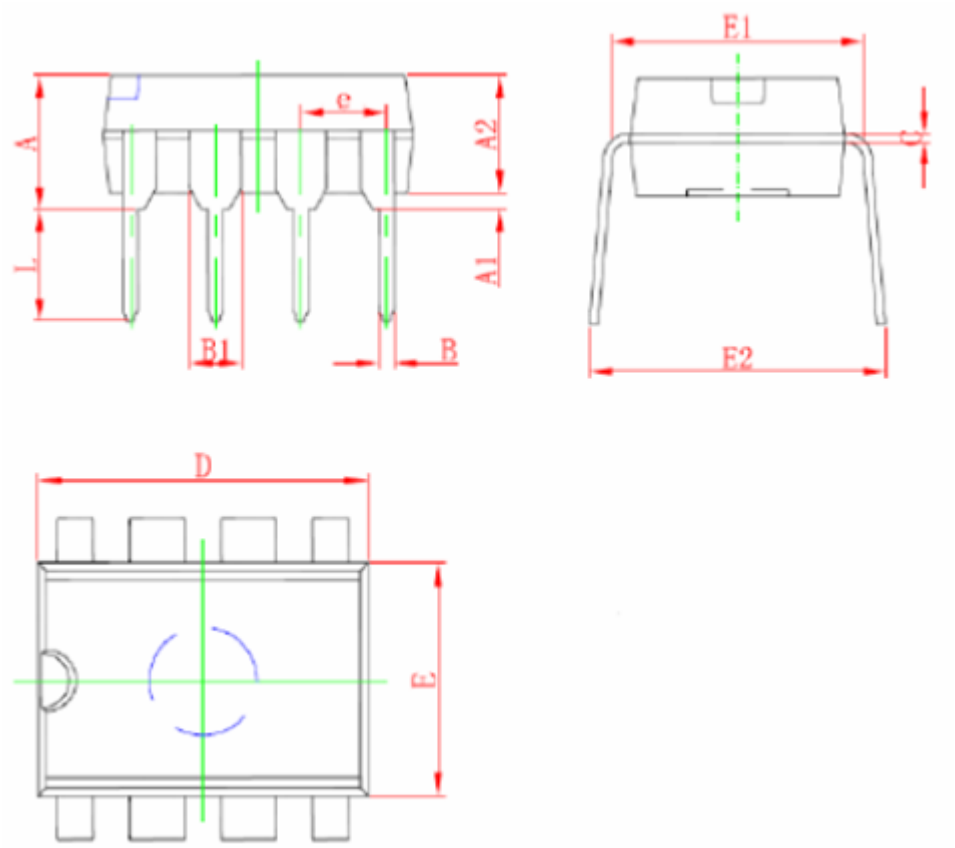
When design the PCB board, please take care as bellow:
VCC bypass capacitors should be as close to the chip VCC and GND pins. Reduce power loop area, such as the transformer primary, power tube and the loop area between feedback resistances can effectively reduce the EMI radiation. The ground of CS sampling resistance as close as possible to GND can effectively reduce the coupling noise, improve sampling accuracy.

Typically Application



Picture 7 With PPFC schematic

DIP-8 Package information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

日期 Date	版本 Version	说明 Description	制作人 producer	工程师 Engineer	状态 Status
2013-9-6	A0		J		
2014-4-12	A1		E		