



CR6851

Novel Low Cost Green-Power PWM Controller With Soft Start & Frequency Jitter

Features

- Low Cost, PWM&PFM
- Low Start-up Current (about 4 μ A)
- Low Operating Current (about 2mA)
- Current Mode Operation
- Under Voltage Lockout (UVLO)
- Built-in Synchronized Slope Compensation
- Built-in soft start with 1ms
- Built-in Frequency jitter for better EMI Signature
- Programmable PWM Frequency
- Audio Noise Free Operation
- Leading edge Blanking on Sense input
- Constant output power limiting for universal AC input Range
- SOT-23-6L & DIP-8 Pb-Free Packaging
- Soft Clamped gate output voltage 16.5V
- VDD over voltage protect 25.5V
- Cycle-by-cycle current limiting
- Sense Fault Protection
- OTP (Over Temperature Protection)
- Output SCP (Short circuit Protection)
- Output OLP (Over Load Protection)
- High-Voltage CMOS Process with ESD
- Compatible with SG6848 and LD7535

Applications

- Switching AC/DC Adaptor
- Battery Charger
- Open Frame Switching Power Supply
- 384X Replacement

General Description

The CR6851 is a highly integrated low cost current mode PWM controller, which is ideal for small power current mode of offline AC-DC fly-back converter applications. Making use of external resistors, the IC changes the operating frequency and automatically enters the PFM under light-load or zero-load conditions. This can minimize standby power consumption, achieving power-saving functions. With a very low start-up current, the CR6851 could use a large value start-up resistor (2Mohms). Built-in synchronized slope compensation enhances the stability of the system and avoids sub-harmonic oscillation. Trapezoid form power limiting circuit minimizes output power change caused by delay time of the system over a universal AC input range (90VAC to 264VAC). Leading edge blanking circuit on current sense

(SENCE) input could remove the signal glitch due to snubber circuit diode reverse recovery and thus greatly reduces the external component count and system cost in the design. Pulse-by-pulse current limiting ensures safe operation even during short-circuit.

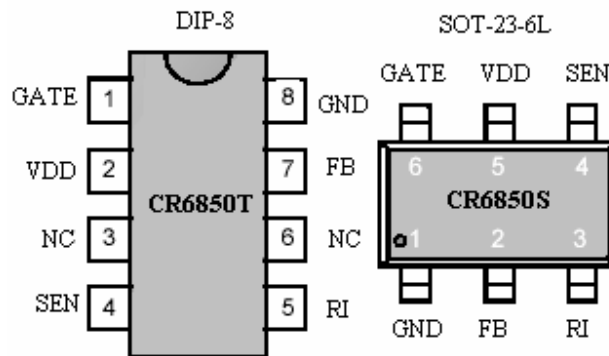
Excellent EMI performance is achieved built-in soft Start with 1ms, soft driver and frequency jitter.

The CR6851 offers perfect protection like OVP(Over Voltage Protection), OLP(Over Load Protection), SCP(Short circuit protection), OTP, Sense Fault Protection and OCP(Over current protection). The CR6851's output driver is soft clamped to maximum 16.5V to protect the power MOSFET. CR6851 is with both SOT-23-6L and DIP-8 package.

CR68XX Series

Part Number	PWM Frequency	Package	Description
CR6848	External Adjustable	DIP-8 SOT-23-6L	PWM&PFM, Current Mode, Slope Compensation Leading-edge Blanking , Gate Clamped , Over-voltage Protection, Over-current Protection, Soft Drive.
CR6850	External Adjustable	DIP-8 SOT-23-6L	With All Functions of CR6848, Gate soft Clamped
CR6851	External Adjustable	DIP-8 SOT-23-6L	With All Functions of CR6850, Frequency jitter, Soft start, Fault Protect, OLP, SCP, OTP

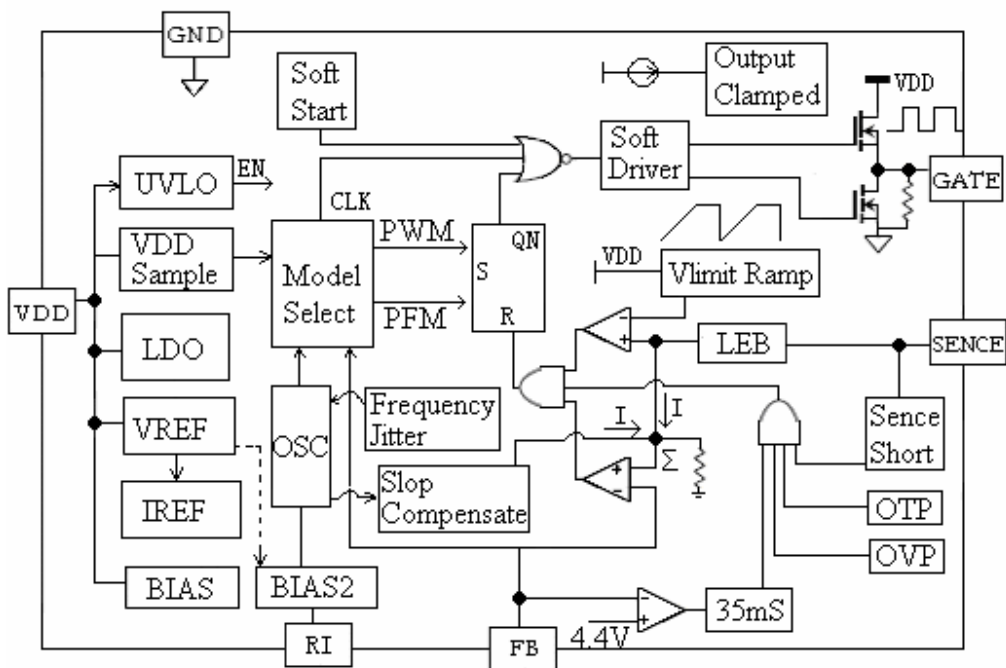
Pin Assignment



Pin Descriptions

Name	Description
GND	GND Pin
FB	Analog Input. Voltage feedback pin (same as the COMP pin in UC384X),
RI	This pin is to program the switching frequency. By connecting a resistor to ground to set the switching frequency.
SEN	Current sense pin, connect to sense the MOSFET current.
VDD	Supply voltage pin.
GATE	Gate drive output to drive the external MOSFET.

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
V _{DD}	Supply voltage Pin Voltage		40	V
V _{FB}	Input Voltage to FB Pin		-0.3 to 6V	V
V _{SEN}	Input Voltage to SEN Pin		-0.3 to 6V	V
P _D	Power Dissipation		300	mW
	ESD Capability, HBM Model		2500	V
	ESD Capability, Machine Model		300	V
T _L	Lead Temperature(Soldering)	SOT-23-6L (20sec)	220	
		DIP-8(10sec)	260	
T _{STG}	Storage Temperature Range		-55 to + 150	

RECOMMENDED OPERATION CONDITION

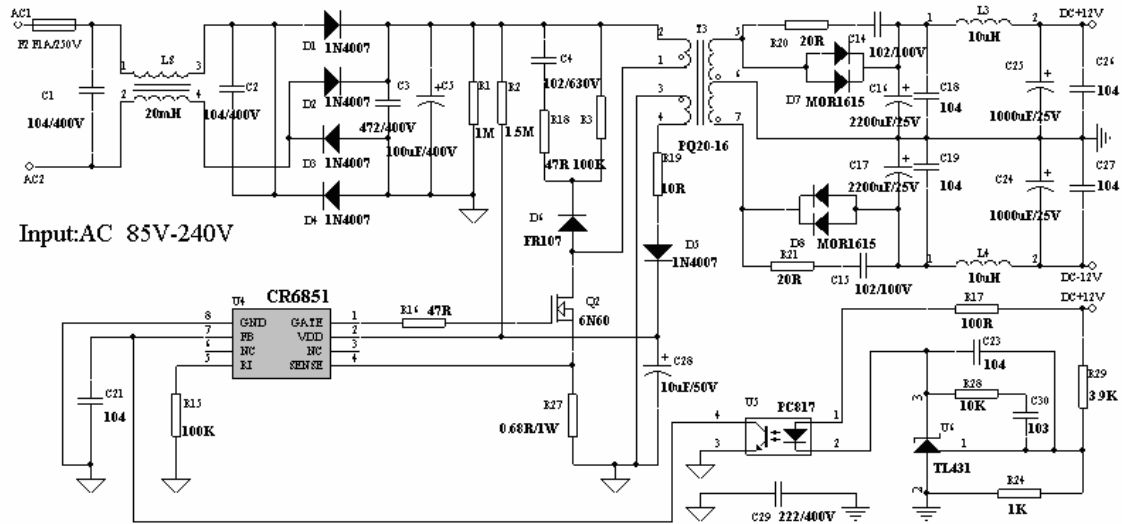
Symbol	Parameter	Min ~ Max	Unit
V _{DD}	VDD Supply Voltage	12~20	V
RI	RI PIN Resistor Value	100	K ohm

Electrical Characteristics (Ta=25°C unless otherwise noted, V_{DD} = 15V.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage (V_{DD} Pin)						
I _{ST}	Startup Current	--		4		μA
I _{SS}	Operating Current	V _{FB} =0V		3		mA
		V _{FB} =3V		2		mA
		V _{FB} =Open		0.7		mA
V _{DDON}	Turn-on Threshold Voltage			15.7		V
V _{DDOFF}	Turn-off Threshold Voltage			10.7		V
V _{DCLAMP}	VDD Clamp Voltage	I _{VDD} =20mA		25.5		V
Voltage Feedback (FB Pin)						
I _{FB}	Short Circuit Current	V _{FB} =0V		1.8		mA
V _{FB}	Open Loop Voltage	V _{FB} =Open		5.4		V
V _{PFM}	PFM Threshold V _{FB}			2.35		V
T _{SCP}	Short Circuit Protection Delay Time	RI=100K	30		45	mS
T _{OLP}	Over Load Protection Delay Time	RI=100K	30		45	mS
Current Sensing (SEN Pin)						
V _{TH}	Maximum Input Voltage			0.85		V
T _{PD}	Delay to Output			300		ns
R _{CS}	Input Impedance			50		KΩ
T _{CSFP}	Sense Short Protection Delay Time	RI=100K		2.2		mS
Oscillator (RI Pin)						
F _{OSC}	Normal Frequency	RI=100Kohm		65		KHz
F _{PFM}	PFM Frequency	RI=100Kohm		21		KHz
DC _{MAX}	Maximum Duty Cycle	RI=100Kohm		78		%
I _{PFM}	Enter PFM, FB current			1.0		mA
ΔF _{TEMP}	Frequency Temp. Stability	-30-85		5		%
T _{BLANK}	Leading-Edge Blanking Time			300		nS
T _{SOFT}	Built-in Soft Start Time	RI=100Kohm		1		mS
F _{JITTER}	Frequency Jitter		-4		+4	%
OTP _{ON}	Over Temp. Protection ON	RI=100Kohm		136		
OTP _{OFF}	Over Temp. Protection OFF	RI=100Kohm		116		
GATE Drive Output (GATE Pin)						
V _{OL}	Output Low Level	V _{DD} =15V, I _O =20mA			1	V
V _{OH}	Output High Level	V _{DD} =15V, I _O =20mA	8			V
T _R	Rising Time	C _L =1000pF		50	200	ns
T _F	Falling Time	C _L =1000pF		30	125	ns
V _{GCLAMP}	Output Clamp Voltage	V _{DD} =20V		16.5		V

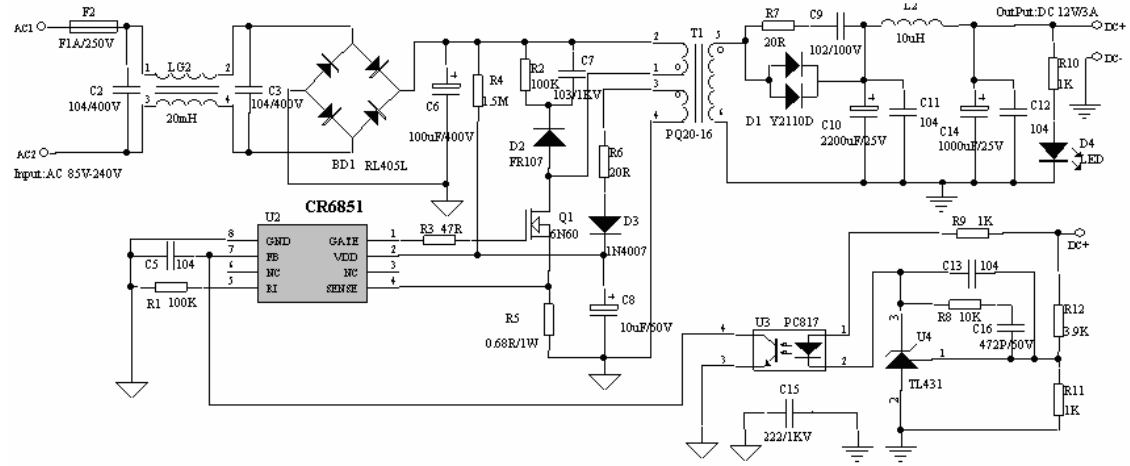
Typical Application Solution

-12V/+12V, 2.5A Power Supply



Quantity	Par Number	Description	Quantity	Par Number	Description
2	C1,C2	104/400V	2	R20,R21	20R
1	C3	472/400V	2	R16,R18	47R
1	C4	102/630V	1	R19	10R
2	C14,C15	102/100V	1	R27	0.68r
1	C5	100uF/400V	1	R28	10K
1	C30	103	1	R29	3.9K
8	C18,C19,C20,C21,C27,C26	104	5	D1,D2,D3,D4,D5	1N4007
2	C16,C17	2200uF/25V	1	D6	FR107
2	C24,C25	1000uF/25V	2	D7,D8	MOR1615
1	C28	10uF/50V	1	LS	20mH
1	C29	222/400V	2	L3,L4	10uH
5	R22,R23,R24	1K	1	Q2	2N60
1	R1	1M	1	T3	PQ20-16
1	R2	1.5M	1	F2	F1A/250V
2	R3,R15	100K	1	U4	CR6851
1	R17	100R	1	U5	PC817
			1	U6	TL431

12V /3A Power Supply



Quantity	Part Number	Description	Quantity	Part Number	Description
2	C2,C3	104/400V	3	R9,R10,R11	1K
4	C5, C11,C12,C13	104	1	R12	3.9K
1	C6	100uF/400V	1	D1	LED
1	C7	103/1KV	1	D2	FR107
1	C8	10uF/50V	1	D3	1N4007
1	C9	102/1KV	1	D4	LED
1	C10	2200uF/25V	1	BD1	RL405L
1	C14	1000uF/25V	1	Q1	2N60
1	C15	222/1KV	1	LG2	20mH
1	C16	472P/50V	1	L2	10uH
2	R1,R2	100K	1	T1	PQ20-16
1	R3	47R	1	F2	F1A/250V
1	R4	1.5M	1	U2	CR6851
1	R5	0.68R	1	U3	PC817
2	R6,R7	20R	1	U4	TL431
1	R8	10K			