

DESCRIPTION

The SP6850 is the current mode PWM controller with green-mode power-saving operation, to meet the low standby-power needs of low-power SMPS. This green-mode function enables the power supply to easily meet even the strictest power conservation requirements. The functions such as the leading-edge blanking of the current sensing, internal slope compensation and the small package provide the high efficiency / low cost for SMPS power applications. SP6850 is processed by BiCMOS fabrication, that enables reducing the start-up current and the operating current. SP6850 is available by SOT-23-6L / DIP-8P packages.

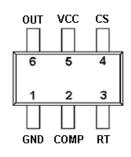
APPLICATIONS

- AC/DC Switching Power Adaptor
- Battery Charger
- PC 5V Standby Power.
- Open-Frame Switching Power Supply

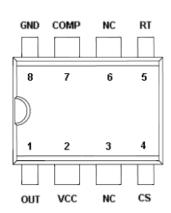
FEATURES

- High-Voltage BiCMOS Process
- Very Low Startup Current (Typ ~ 8μA)
- Under Voltage Lockout (UVLO)
- Current Mode Control with Cycle Peak
- Current Limiting
- Leading-Edge Blanking
- Programmable Switching Frequency
- Internal Slope Compensation
- Green-Mode Control for Power Saving
- Non-audible-noise Green Mode Control
- 300mA Driving Capability
- OVP (Over Voltage Protection) on Vcc Pin

PIN CONFIGURATION SOT-23-6L



DIP-8P



PART MARKING SOT-23-6L

6 5 4 8 5 X Y W 1 2 3 Y : Year Code

Y: Year Code W: Week Code X: Parts Code

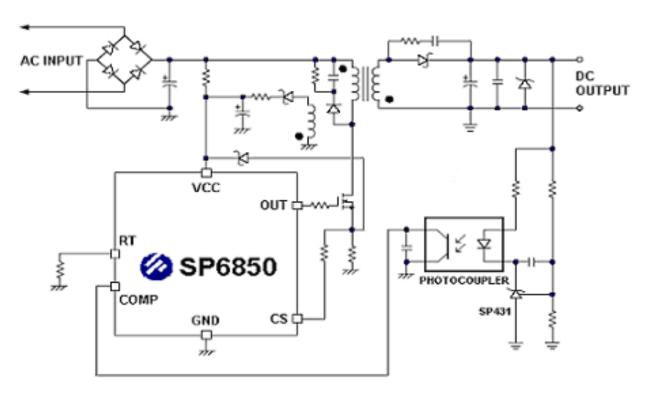
DIP-8P



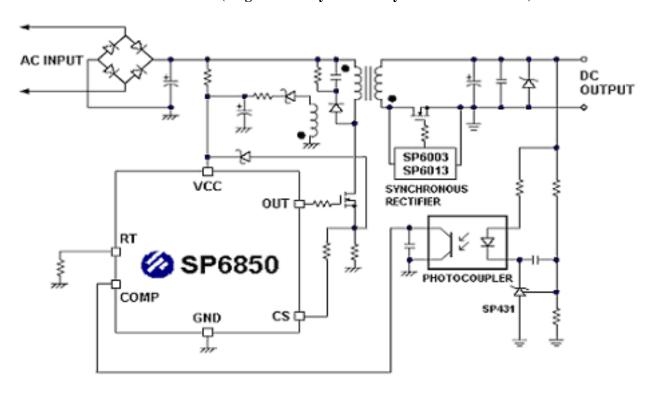
A:Lot Code B:Date Code



TYPICAL APPLCATION CIRCUIT



TYPICAL APPLCATION CIRCUIT (High Efficiency SMPS + Synchronous Rectifier)



PIN DESCRIPTION

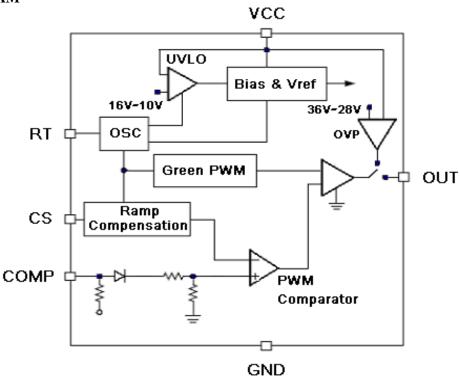
SP6850D8TG

Pin	Symbol	Description
1	OUT	Gate driver output to drive the external MOSFET
2	VCC	Supply Voltage in
3	NC	Unconnected pin
4	CS	Current sense. This pin senses the voltage across a resistor, to control PWM output. This pin also provides current amplitude information for current-mode control.
5	RT	This current is used to charge an internal capacitor, to determine the switching frequency.
6	NC	Unconnected pin
7	COMP	Voltage feedback. The pin provides the output voltage regulation signal., it provides feedback to the internal PWM comparator, so that the PWM comparator can control the duty cycle.
8	GND	Ground

SP6850S26RG

Pin	Symbol	Description
1	GND	Ground
2	COMP	Voltage feedback. The pin provides the output voltage regulation signal., it provides feedback to the internal PWM comparator, so that the PWM comparator can control the duty cycle
3	RT	This current is used to charge an internal capacitor, to determine the switching frequency.
4	CS Current sense. This pin senses the voltage across a resistor, to control PWM output. This palso provides current amplitude information for current-mode control	
5	VCC	Supply Voltage in
6	OUT	Gate driver output to drive the external MOSFET

BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Part Marking
SP6850AD8TG	DIP-8P	SP6850 I
SP6850BD8TG	DIP-8P	SP6850 I
SP6850AS26RG	SOT-23-6L	85A
SP6850BS26RG	SOT-23-6L	850

※ SP6850AD8TG / SP6850BD8TG : Tube ; Pb − Free

% SP6850AS26RG / SP6850BS26RG : Tape Reel; Pb – Free

ABSOULTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

Symbol	Parameter		Value	Unit	
V_{CC}	DC Supply Voltage	36	V		
$V_{COMP/RT/CS}$	COMP / RT / CS Voltage		-0.3 ~ 7.0	V	
P_{D}	P_D Power Dissipation @ T_A =85°C (*)		0.3	W	
ESD	Human Body Model	4	KV		
	Machine Model	300	V		
T_{ope}	Operating Ambient Temperature		-40 ~ 85	°C	
T_{J}	Operating Junction Temperature Range		-40 ~ 150	°C	
T_{STG}	Storage Temperature Range		-40 ~ 150	°C	
T_{LEAD}	Pb-Free Lead Soldering Temperature for 5 sec.		260	°C	
D	Thermal Resistance Junction – Case (*)	SOT-23-6L	210	°C/W	
$R_{\Theta JC}$	Thermal Resistance Junction – Case (*)	DIP-8P	95	C/ VV	

^(*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

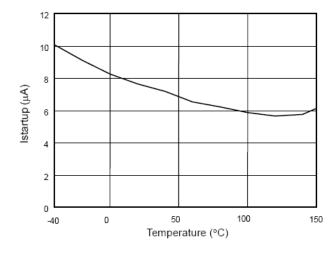


ELECTRICAL CHARACTERISTICS

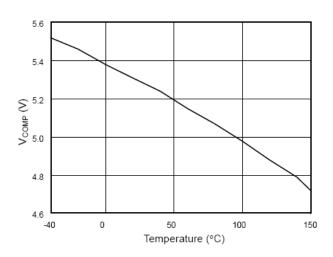
(T_A=25°C, V_{CC}=15V, unless otherwise specified.)

Supply Voltage (Vcc Pin)		C=15 v, unless otherwise specified.)	Conditions	Min	Ten	Mov	Unit
Start Startup Current VCOMP = 3V 2 4 mA	V VI						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	110	7			0	20	
UVLO (off) Min. Operating Voltage 9.0 10.0 11.0 V UVLO (on) Start Threshold Voltage 15.0 16.0 17.0 V V V V V V V V V			**				
UVLO (on Start Threshold Voltage		1 0	VCOMP = 3V				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$. ,	1 0 0					
Voltage Feedback (Comp Pin)					16.0		
Sc				28		36	V
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							
$ \begin{array}{ c c c c c c c c } \hline VTH(GM) & Green Mode Threshold VCOMP & 2.35 & V \\ \hline \textbf{Oscillator} (\textbf{RT Pin}) \\ \hline Fosc & Frequency & RT=100K\Omega & 60.0 & 65.0 & 75.0 & KHz \\ \hline Fosc(GM) & Green Mode Frequency & Fs=65.0KHz & 20 & KHz \\ \hline Fdt & Frequency Variation versus Temp. Deviation & (-40^{\circ}\text{C} \sim 105^{\circ}\text{C}) & 3 & \% \\ \hline Fdv & Frequency Variation versus Vcc Deviation & (Vcc=11V-25V) & 1 & \% \\ \hline \textbf{Current Sensing} (\textbf{CS Pin}) \\ \hline Vcs(off) & Maximum Input Voltage & SP6850BD8TG & 0.8 & 0.85 & 0.9 \\ \hline Zcs & Input impedance & SP6850AS26RG & 0.7 & 0.75 & 0.8 \\ \hline Zcs & Input impedance & 50 & K\Omega \\ \hline TPD & Delay to Output & 150 & nS \\ \hline \textbf{Gate Driver Output} (\textbf{OUT Pin}) \\ \hline DC (Max) & Maximum Duty Cycle & 70 & 75 & 80 & \% \\ \hline Vol & Output Low Level & Vcc=15V, & 0.20mA & 1 & V \\ \hline VOH & Output High Level & Vcc=15V, & 0.20mA & 1 & V \\ \hline Tr & Rising Time & Load Cap=1000pF & 50 & 200 & nS \\ \hline \end{array}$	Isc	Short Circuit Current			2.2	3.0	mA
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Vop	Open Loop Voltage			5.0		V
$ \begin{array}{ c c c c c c c } \hline Fosc & Frequency & RT=100K\Omega & 60.0 & 65.0 & 75.0 & KHz \\ \hline Fosc(GM) & Green Mode Frequency & Fs=65.0KHz & 20 & KHz \\ \hline Fdt & Frequency Variation versus Temp. Deviation & (-40^{\circ}\text{C} \sim 105^{\circ}\text{C}) & 3 & \% \\ \hline Fdv & Frequency Variation versus Vcc Deviation & (Vcc=11V-25V) & 1 & \% \\ \hline \hline Current Sensing (CS Pin) & & & & & & & & & & & & & & & & & & $	VTH(GM)	Green Mode Threshold VCOMP			2.35		V
Fosc(GM) Green Mode Frequency Fs=65.0KHz 20 KHz Fdt	Oscillator (RT Pin)					
Fdt Frequency Variation versus Temp. Deviation (-40°C ~105°C) 3 % Fdv Frequency Variation versus Vcc Deviation (Vcc=11V-25V) 1 % Current Sensing (CS Pin) Vcs(off) Maximum Input Voltage SP6850BD8TG SP6850BS26RG SP6850BS26RG 0.8 0.85 0.9 V Zcs Input impedance 50 KΩ 0.7 0.75 0.8 KΩ TpD Delay to Output 150 nS Gate Driver Output (OUT Pin) 0 nS Gate Driver Output (OUT Pin) 0 70 75 80 % DC (Max) Maximum Duty Cycle 70 75 80 % DC (Min) Minimum Duty Cycle 0 % Vol Output Low Level Vcc=15V, Io=20mA 1 V Voh Output High Level Vcc=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS	Fosc	Frequency	R _T =100KΩ	60.0	65.0	75.0	KHz
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fosc(gm)	Green Mode Frequency	Fs=65.0KHz		20		KHz
Current Sensing (CS Pin) Vcs(off) Maximum Input Voltage SP6850BD8TG SP6850BS26RG SP6850AS26RG 0.8 0.85 0.9 0.9 0.9 0.9 0.00 0.00 0.00 0.00 0.	Fdt	Frequency Variation versus Temp. Deviation	(-40°C ~105°C)			3	%
Current Sensing (CS Pin) Vcs(off) Maximum Input Voltage SP6850BD8TG SP6850BS26RG SP6850AS26RG 0.8 0.85 0.9 0.9 0.9 0.9 0.00 0.00 0.00 0.00 0.	Fdv	Frequency Variation versus Vcc Deviation	(Vcc=11V-25V)			1	%
$ Vcs(off) \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Current Ser	using (CS Pin)	,		l .	11	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Maximum Input Voltage	SP6850BD8TG	0.8	0.85	0.9	V
Vcs(off) Maximum Input Voltage SP6850AD8TG SP6850AS26RG O.7 O.75 O.8 V							
SP6850AS26RG O.7 O.75 O.8	Vcs(off)			0.7	0.75	0.8	
Zcs Input impedance 50 K Ω TPD Delay to Output 150 nS Gate Driver Output (OUT Pin) Strain of the property of the prope							
TPD Delay to Output 150 nS Gate Driver Output (OUT Pin) Standard Control of the control	7	I	SF 0630A320KG		50		IZ O
Gate Driver Output (OUT Pin) DC (Max) Maximum Duty Cycle 70 75 80 % DC (Min) Minimum Duty Cycle 0 % VOL Output Low Level Vcc=15V, Io=20mA 1 V VOH Output High Level Vcc=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS							
DC (Max) Maximum Duty Cycle 70 75 80 % DC (Min) Minimum Duty Cycle 0 % VOL Output Low Level VCC=15V, Io=20mA 1 V VOH Output High Level VCC=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS					150		nS
DC (Min) Minimum Duty Cycle 0 % Vol. Output Low Level Vcc=15V, Io=20mA 1 V Voh Output High Level Vcc=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS					I	T	
Vol. Output Low Level Vcc=15V, Io=20mA 1 V Voh Output High Level Vcc=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS		, , , , , , , , , , , , , , , , , , ,		70		80	
VOL Output Low Level Io=20mA I V VOH Output High Level VCC=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS	DC (Min)	Minimum Duty Cycle			0		%
VOH Output High Level Vcc=15V, Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS	Vol	Output Low Level	,			1	V
VoH Output High Level Io=20mA 8 V Tr Rising Time Load Cap=1000pF 50 200 nS			Io=20mA			1	•
Tr Rising Time Load Cap=1000pF 50 200 nS	Vон	1 6	Vcc=15V,	0			W
			Io=20mA	0			v
	Tr	Rising Time	Load Cap=1000pF		50	200	nS
T1 Falling Time	Tf	Falling Time	Load Cap=1000pF		30	120	nS

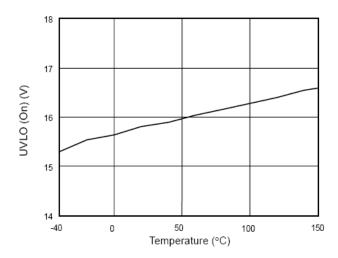
PERFORMANCE CHARACTERISTICS (T_A=25°C, unless otherwise specified.)



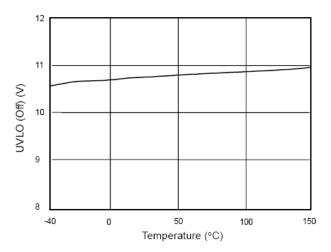
Startup Current (Istartup) vs. Temperature



V_{COMP} open loop voltage v.s. Temperature

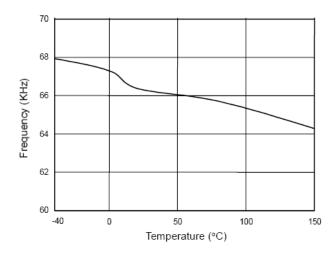


UVLO (On) vs. Temperature

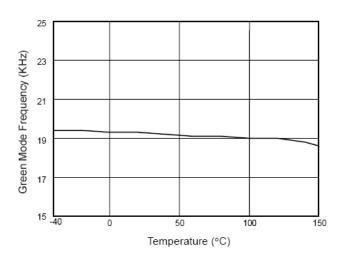


UVLO Off v.s. Temperature

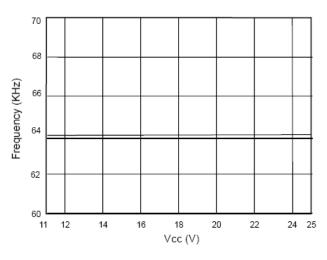
PERFORMANCE CHARACTERISTICS (T_A=25°C, unless otherwise specified.)



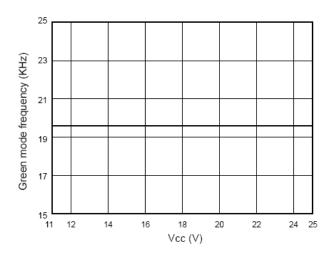
Frequency v.s. Temperature



Green Mode Frequency v.s. Temperature



Frequency v.s. Vcc



Green mode frequency v.s. Vcc

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