



# SP6850

## Green-Mode PWM Controller

### 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

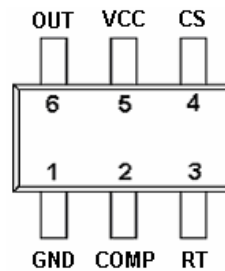
- AC/DC Switching Power Adaptor
- Battery Charger
- PC 5V Standby Power.
- Open-Frame Switching Power Supply

### FEATURES

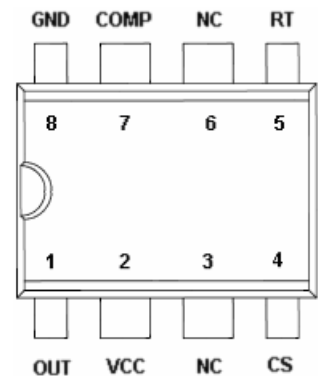
- High-Voltage BiCMOS Process
- Very Low Startup Current (Typ  $\equiv$  8 $\mu$ A)
- Under Voltage Lockout (UVLO )
- Current Mode Control with Cycle Peak
- Current Limiting
- Leading-Edge Blanking
- Programmable Switching Frequency
- Internal Slope Compensation
- Green-Mode Control for Power Saving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

### PIN CONFIGURATION

#### SOT-23-6L

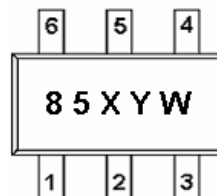


#### DIP-8P



### PART MARKING

#### SOT-23-6L



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

#### DIP-8P

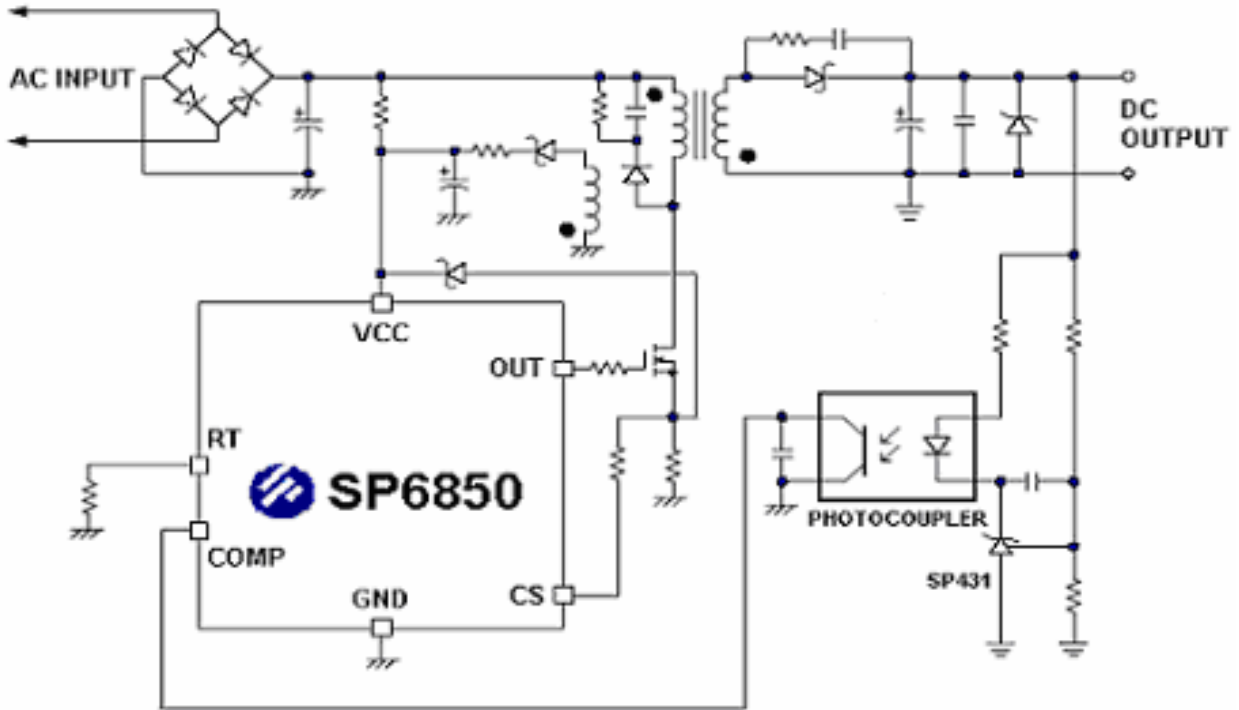


A : Lot Code  
B : Date Code

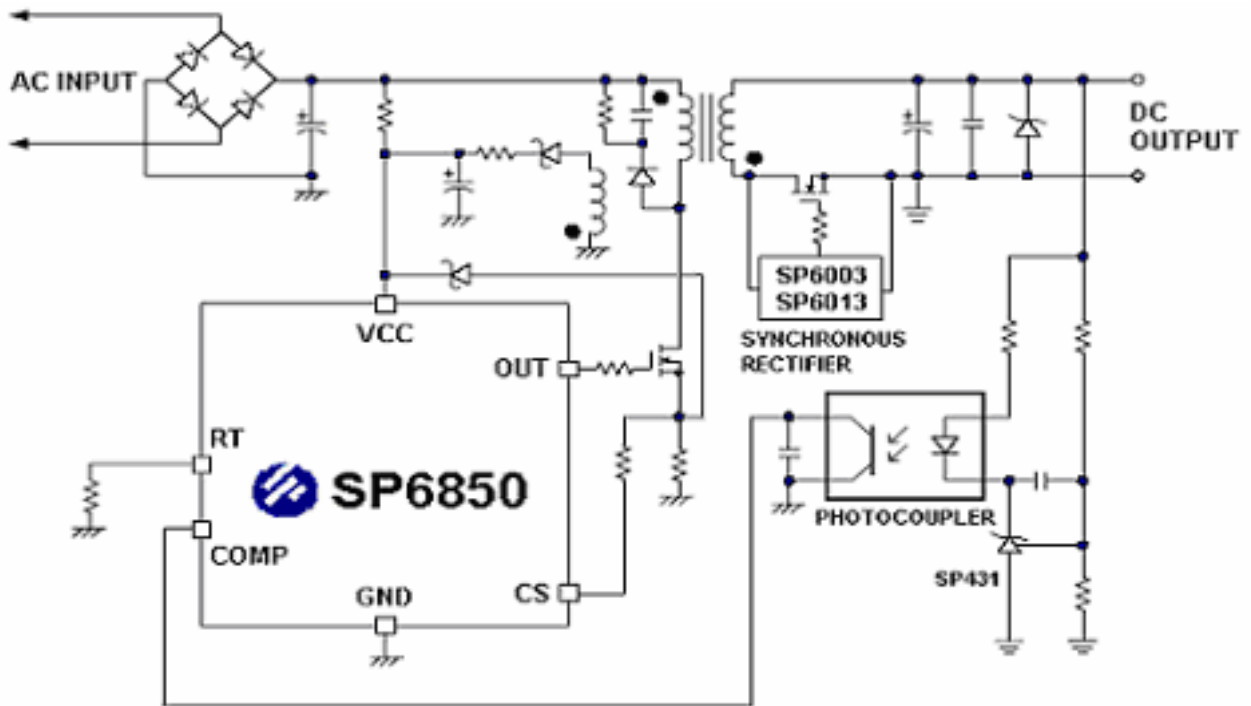


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## TYPICAL APPLICATION CIRCUIT



## TYPICAL APPLICATION CIRCUIT ( High Efficiency SMPS + Synchronous Rectifier )





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### PIN DESCRIPTION

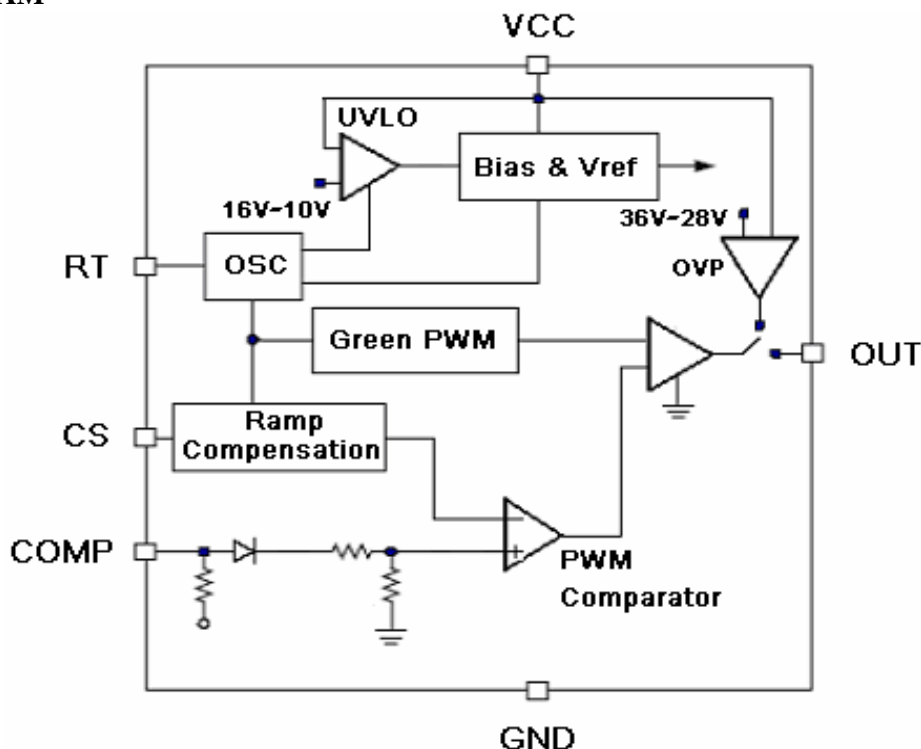
#### SP6850D8TG

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 pin also 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





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## Green-Mode PWM Controller

### ORDERING INFORMATION

Part Number	Package	Part Marking
SP6850AD8TG	DIP-8P	SP6850I
SP6850BD8TG	DIP-8P	SP6850I
SP6850AS26RG	SOT-23-6L	85AYW
SP6850BS26RG	SOT-23-6L	850YW

※ SP6850AD8TG / SP6850BD8TG : Tube ; Pb – Free

※ SP6850AS26RG / SP6850BS26RG : Tape Reel ; Pb – Free

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25°C, unless otherwise specified.)

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

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage	36	V
V <sub>COMP/RT/CS</sub>	SYNC Voltage	-0.3 ~ 7.0	V
P <sub>D</sub>	Power Dissipation @ T <sub>A</sub> =85°C (*)	0.3	W
ESD	Human Body Model	4	KV
	Machine Model	300	V
T <sub>J</sub>	Operating Junction Temperature Range	-40 ~ 125	°C
T <sub>STG</sub>	Storage Temperature Range	-55 ~ 150	°C
T <sub>LEAD</sub>	Pb-Free Lead Soldering Temperature for 5 sec.	260	°C
R <sub>θJC</sub>	Thermal Resistance Junction – Case (*)	SOT-23-6L	210
		DIP-8P	95

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



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## Green-Mode PWM Controller

### ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}\text{C}$ ,  $V_{CC}=15\text{V}$ , unless otherwise specified.)

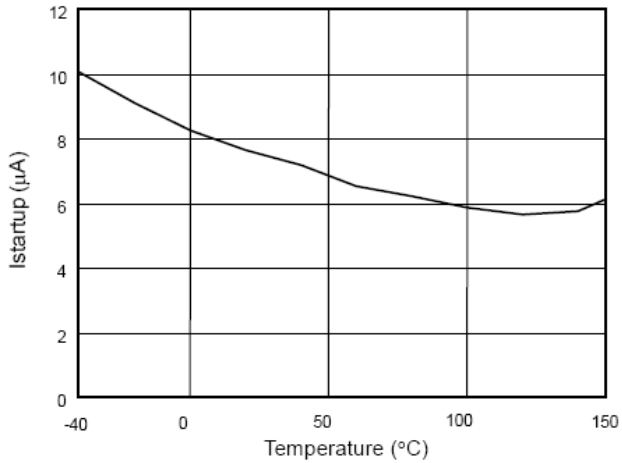
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Supply Voltage ( Vcc Pin )</b>						
I <sub>stt</sub>	Startup Current			8	20	uA
I <sub>op</sub>	Operating Current	V <sub>COMP</sub> = 3V		2	4	mA
UVLO (off)	Min. Operating Voltage		9.0	10.0	11.0	V
UVLO (on)	Start Threshold Voltage		15.0	16.0	17.0	V
OVP Level	Over Voltage Protection		28		36	V
<b>Voltage Feedback ( Comp Pin )</b>						
I <sub>sc</sub>	Short Circuit Current			2.2	3.0	mA
V <sub>op</sub>	Open Loop Voltage			5.0		V
V <sub>TH(GM)</sub>	Green Mode Threshold V <sub>COMP</sub>			2.35		V
<b>Oscillator ( RT Pin )</b>						
F <sub>osc</sub>	Frequency	R <sub>T</sub> =100K $\Omega$	60.0	65.0	75.0	KHz
F <sub>osc(GM)</sub>	Green Mode Frequency	F <sub>s</sub> =65.0KHz		20		KHz
F <sub>dt</sub>	Frequency Variation versus Temp. Deviation	(-40 $^{\circ}\text{C}$ ~105 $^{\circ}\text{C}$ )			3	%
F <sub>dv</sub>	Frequency Variation versus V <sub>CC</sub> Deviation	(V <sub>CC</sub> =11V-25V)			1	%
<b>Current Sensing ( CS Pin )</b>						
V <sub>cs(off)</sub>	Maximum Input Voltage	SP6850BD8TG SP6850BS26RG	0.8	0.85	0.9	V
		SP6850AD8TG SP6850AS26RG	0.7	0.75	0.8	
Z <sub>cs</sub>	Input impedance			50		K $\Omega$
T <sub>PD</sub>	Delay to Output			150		nS
<b>Gate Driver Output ( OUT Pin )</b>						
V <sub>OL</sub>	Output Low Level	V <sub>CC</sub> =15V, I <sub>o</sub> =20mA			1	V
V <sub>OH</sub>	Output High Level	V <sub>CC</sub> =15V, I <sub>o</sub> =20mA	8			V
T <sub>r</sub>	Rising Time	Load Cap=1000pF		50	200	nS
T <sub>f</sub>	Falling Time	Load Cap=1000pF		30	120	nS



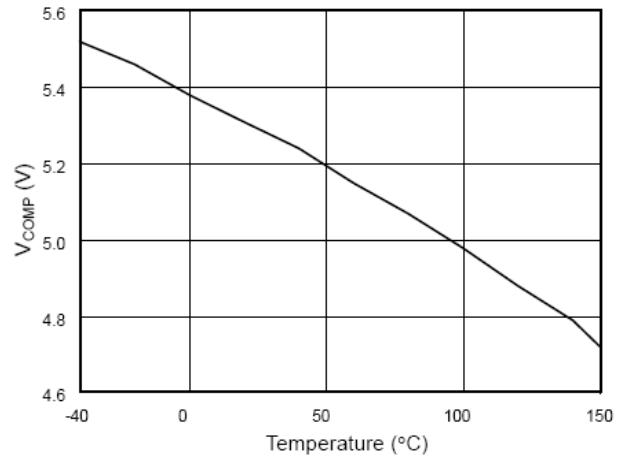
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## Green-Mode PWM Controller

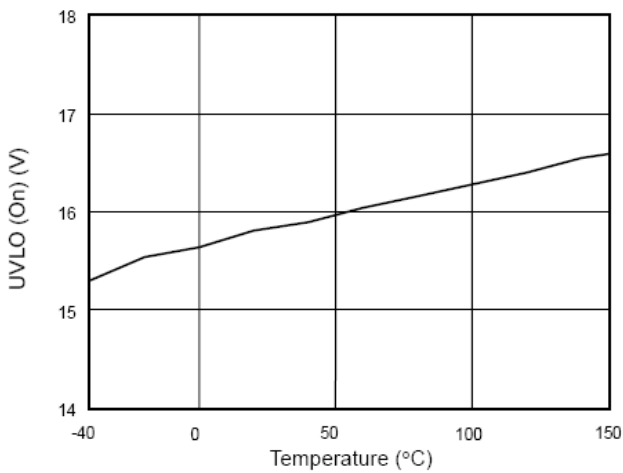
PERFORMANCE CHARACTERISTICS ( $T_A=25^\circ\text{C}$ , unless otherwise specified.)



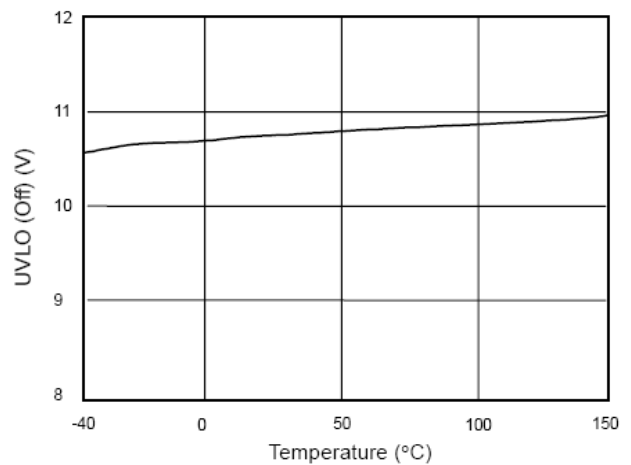
Startup Current (I<sub>startup</sub>) vs. Temperature



V<sub>COMP</sub> open loop voltage v.s. Temperature



UVLO (On) vs. Temperature



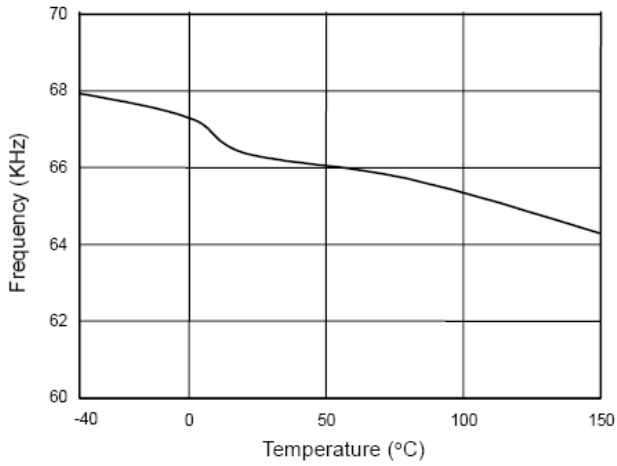
UVLO Off v.s. Temperature



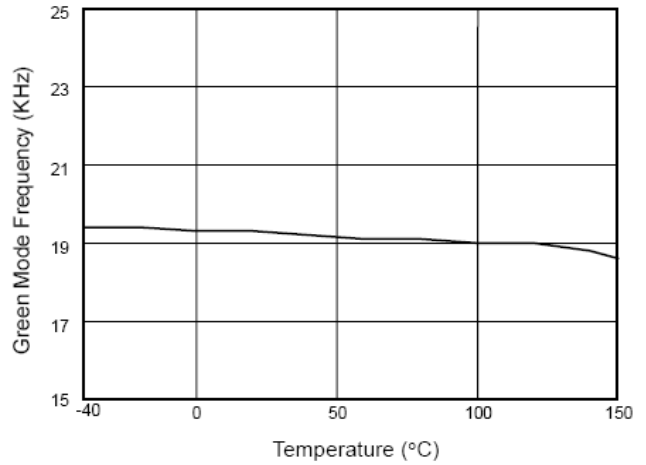
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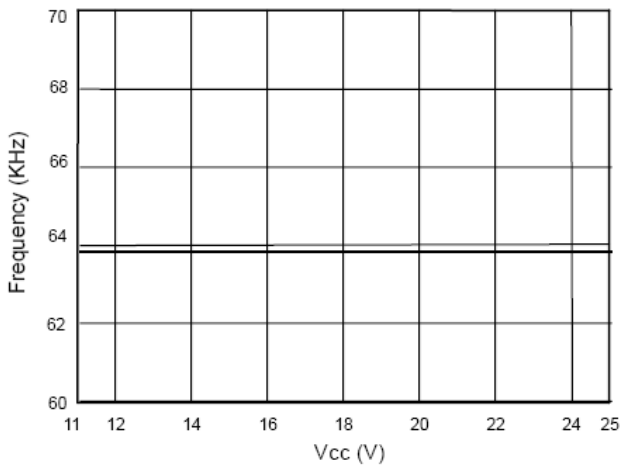
PERFORMANCE CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified.)



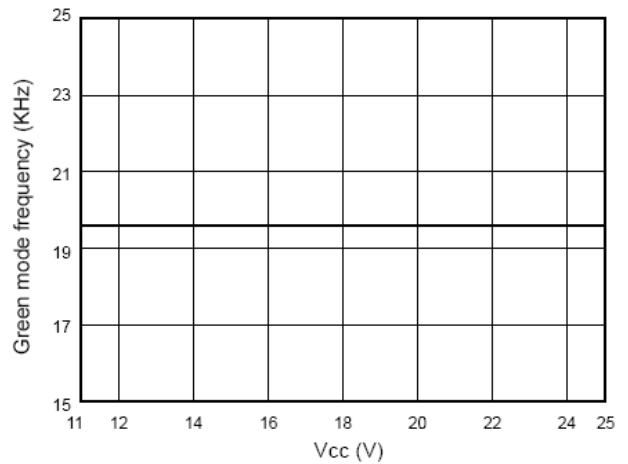
Frequency v.s. Temperature



Green Mode Frequency v.s. Temperature



Frequency v.s. Vcc



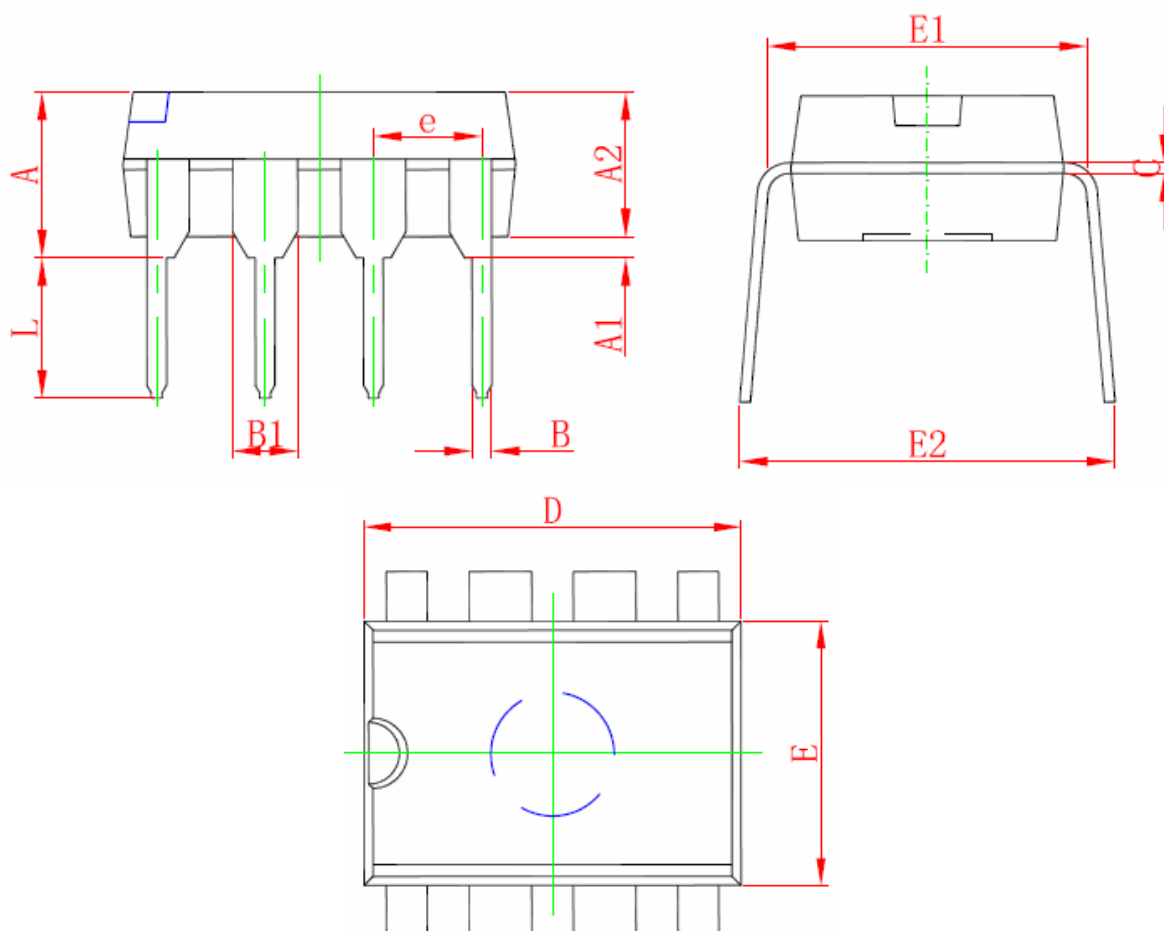
Green mode frequency v.s. Vcc



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## Green-Mode PWM Controller

### DIP- 8P PACKAGE OUTLINE



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

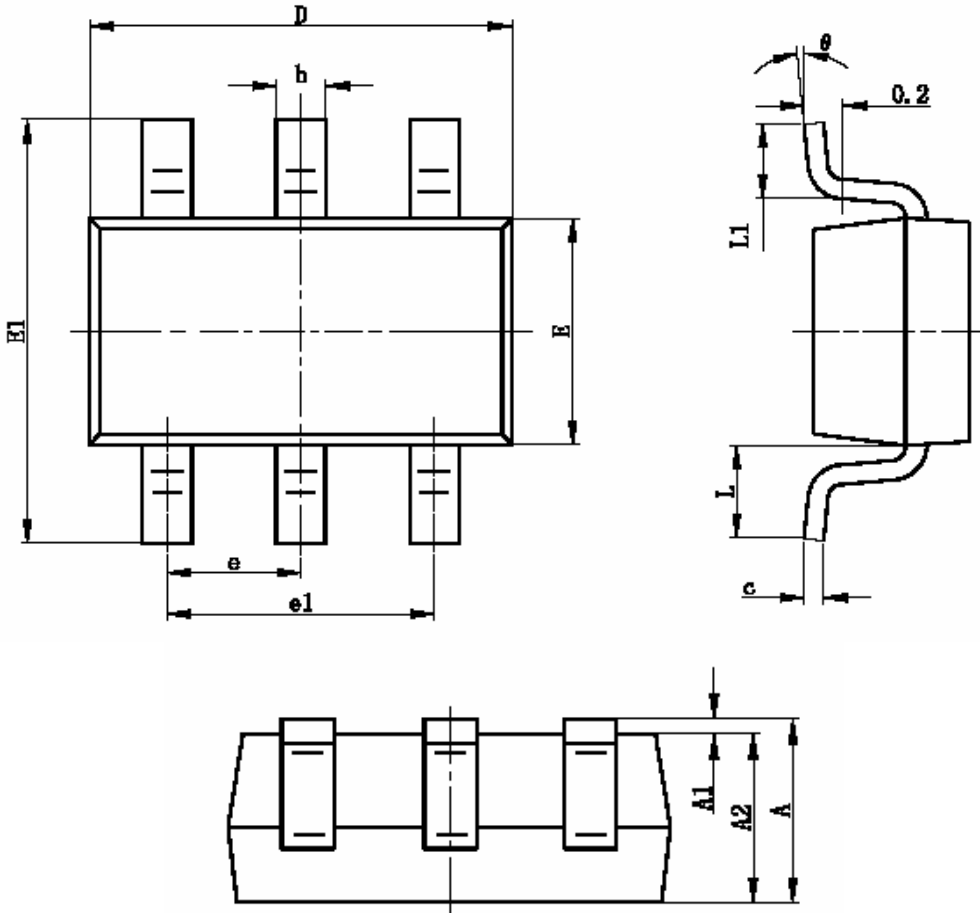




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## Green-Mode PWM Controller

### SOT-23-6L PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°



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