



# SP6853

## Green-Mode PWM Controller

### DESCRIPTION

The SP6853 is a low cost , low startup current , current mode PWM controller with green-mode power-saving operation. The integrated functions include the leading-edge blanking of the current sensing, internal slope compensation. It would provide the users a superior AC/DC power application of higher efficiency, low external component counts, and lower cost solution for applications.

The SP6853 features more protections or functions for the following characteristics :

※Add OLP (Over Load Protection) function to provide better protection performance for fault conditions like short circuit or over load.

※Modify the OVP (Over Voltage Protection) mechanism from the cycle-by-cycle mode to the hiccup mode.

SP6853 is available by SOT-23-6L / DIP-8P packages.

### FEATURES

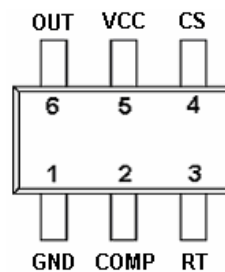
- High-Voltage BiCMOS Process
- Very Low Startup Current (<math><20\mu\text{A}</math>)
- Under Voltage Lockout (UVLO )
- Current Mode Control
- Non-audible-noise Green Mode Control
- Current Limiting
- LEB (Leading-Edge Blanking) on CS Pin
- OLP (Over Load Protection)
- OVP (Over Voltage Protection) on Vcc Pin
- Leading-Edge Blanking
- Programmable Switching Frequency
- Internal Slope Compensation
- Green-Mode Control for Power Saving
- 300mA Driving Capability
- 

### APPLICATIONS

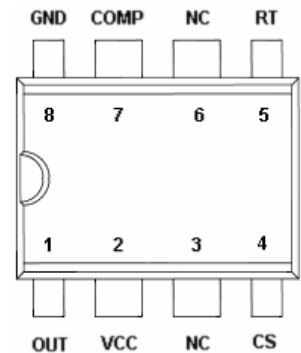
- AC/DC Switching Power Adaptor
- Battery Charger
- PC 5V Standby Power.
- Open-Frame Switching Power Supply

### PIN CONFIGURATION

#### SOT-23-6L

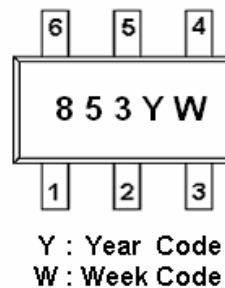


#### DIP-8P



### PART MARKING

#### SOT-23-6L



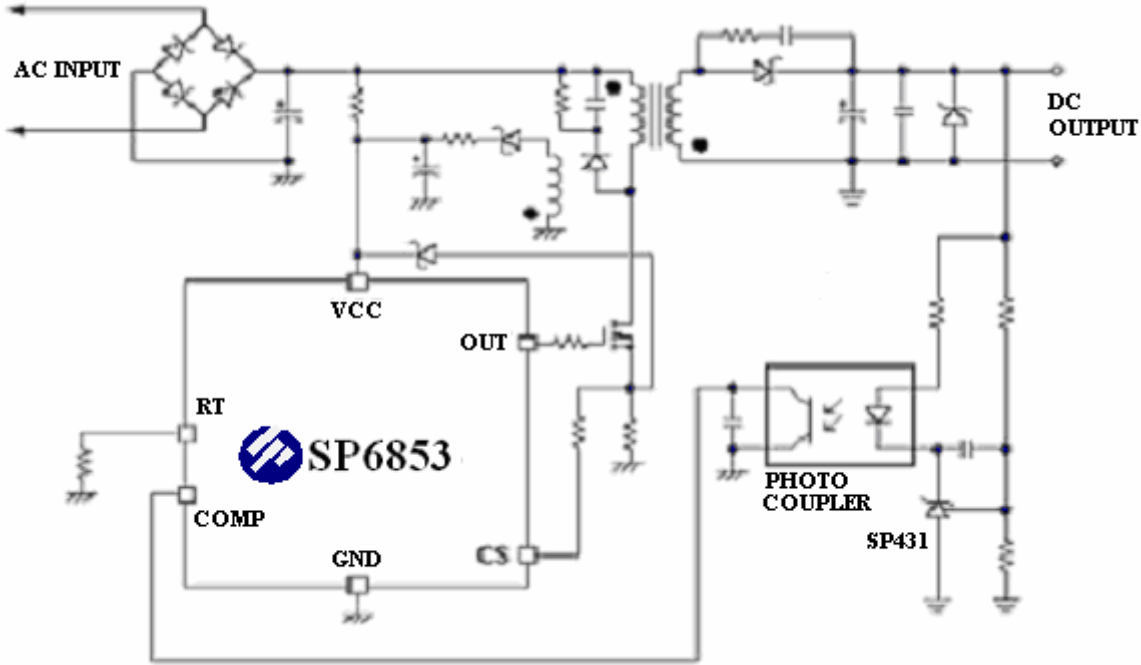
#### DIP-8P



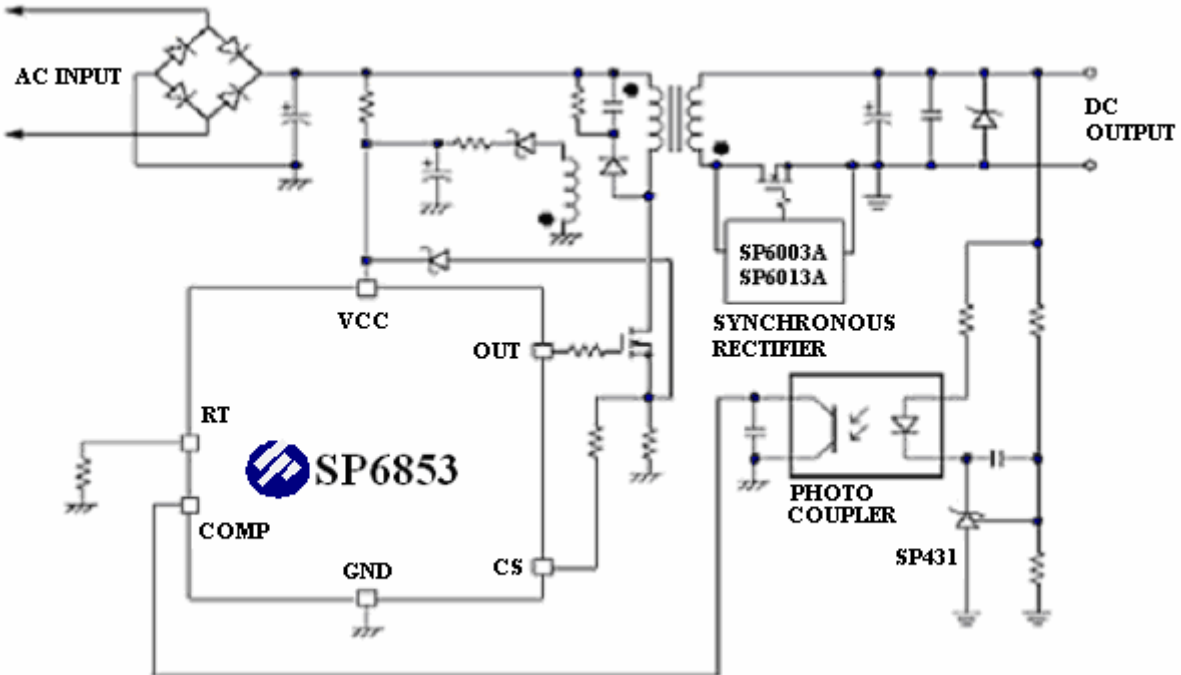


# SP6853 Green-Mode PWM Controller

## TYPICAL APPLICATION CIRCUIT



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





# SP6853

## Green-Mode PWM Controller

### PIN DESCRIPTION

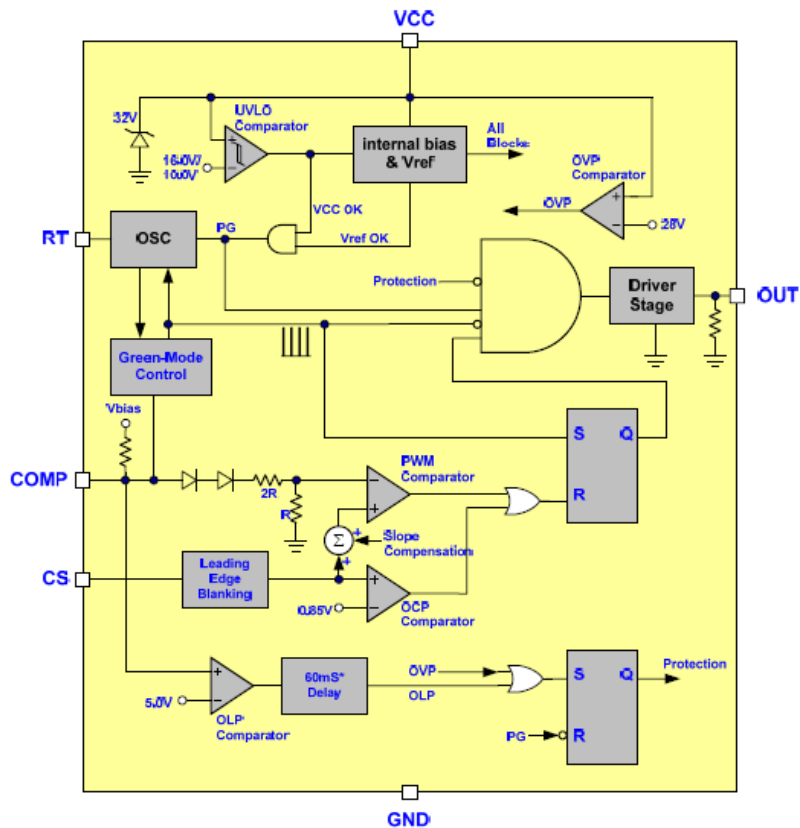
#### SP6853D8TG

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

#### SP6853S26RG

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
SP6853D8TGB	DIP-8P	SP6853I
SP6853S26RGB	SOT-23-6L	853YW

※ SP6853D8TG : Tube ; Pb – Free ; Halogen-Free

※ SP6853S26RG : Tape Reel ; Pb – Free ; Halogen-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>	COMP / RT / CS 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>ope</sub>	Operating Ambient Temperature	-40 ~ 85	°C
T <sub>J</sub>	Operating Junction Temperature Range	-40 ~ 150	°C
T <sub>STG</sub>	Storage Temperature Range	-40 ~ 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			10	20	uA
I <sub>op</sub>	Operating Current	V <sub>COMP</sub> = 0V		2.7	4	mA
		V <sub>COMP</sub> = 3V		2.4		mA
		Protection tripped (OLP, OVP)		1.0		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		24	26	29.5	V
<b>Voltage Feedback ( Comp Pin )</b>						
I <sub>sc</sub>	Short Circuit Current			1.25	2.2	mA
V <sub>op</sub>	Open Loop Voltage			6		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	68.0	75.0	KHz
F <sub>osc(GM)</sub>	Green Mode Frequency	F <sub>s</sub> =65.0KHz		22		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		0.8	0.85	0.9	V
T <sub>LEDD</sub>	Leading Edge Blanking Time			280		nS
Z <sub>cs</sub>	Input impedance		1			M $\Omega$
T <sub>PD</sub>	Delay to Output			100		nS
<b>Gate Driver Output ( OUT Pin )</b>						
DC (Max)	Maximum Duty Cycle		70	75	80	%
DC (Min)	Minimum Duty Cycle			0		%
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
<b>OLP ( Over Load Protection )</b>						
T <sub>LOLP</sub>	OLP Trip Level			5.0		V
T <sub>DOLP</sub>	OLP Delay Time (note)			60		mS

Note: The OLP delay time is proportional to the period of switching cycle. So that, the lower RT value will set the higher switching frequency and the shorter OLP delay time.



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

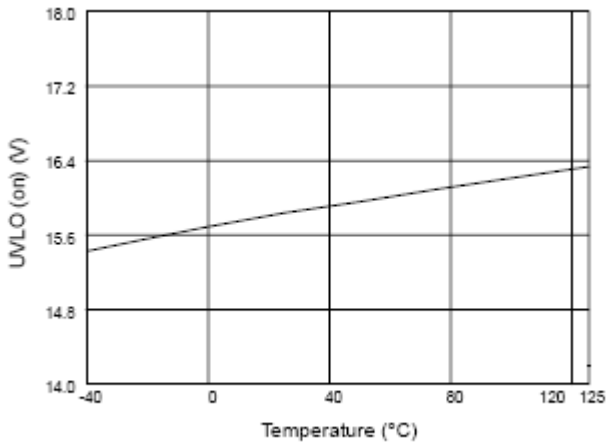


Fig. 1 UVLO (on) vs. Temperature

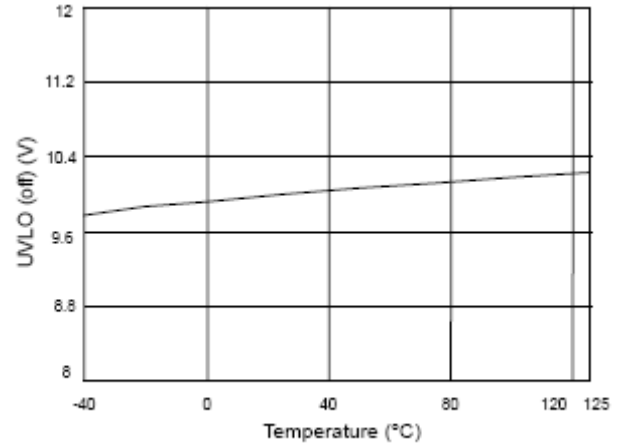


Fig. 2 UVLO (off) vs. Temperature

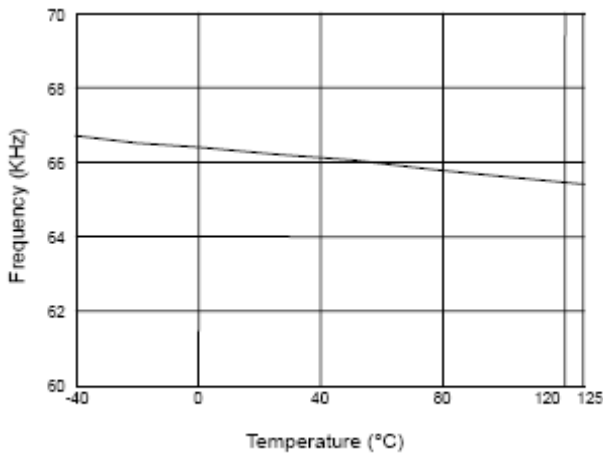


Fig. 3 Frequency vs. Temperature

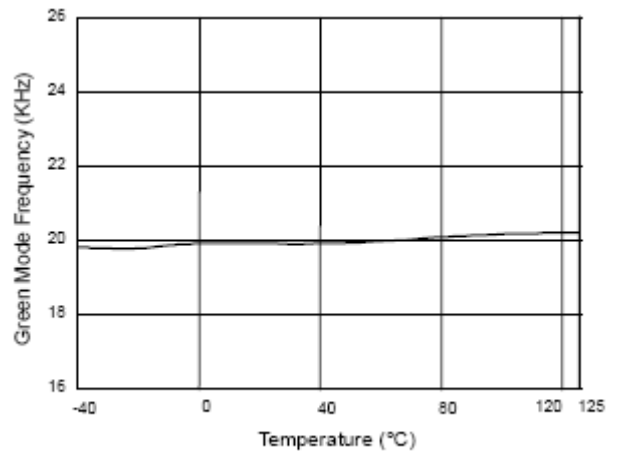


Fig. 4 Green Mode Frequency vs. Temperature

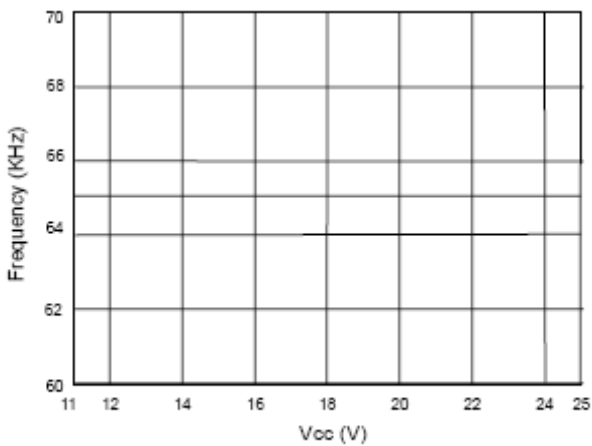


Fig. 5 Frequency vs. Vcc

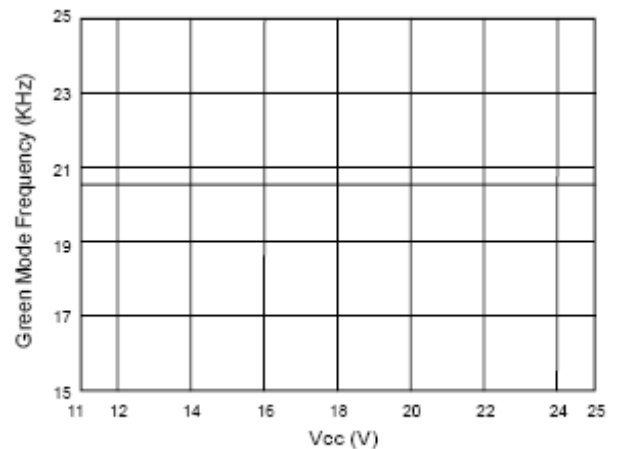


Fig. 6 Green Mode Frequency vs. Vcc



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## Green-Mode PWM Controller

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

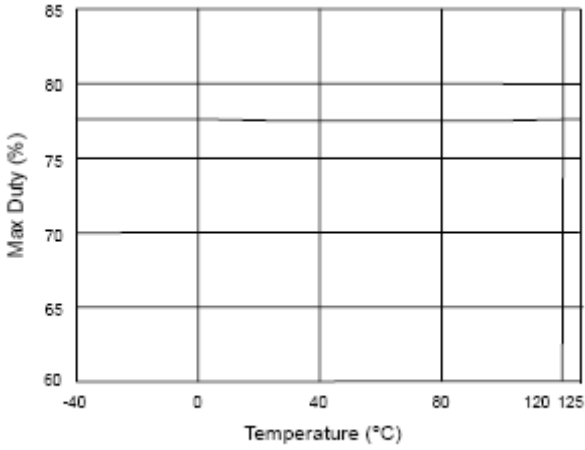


Fig. 7 Max Duty vs. Temperature

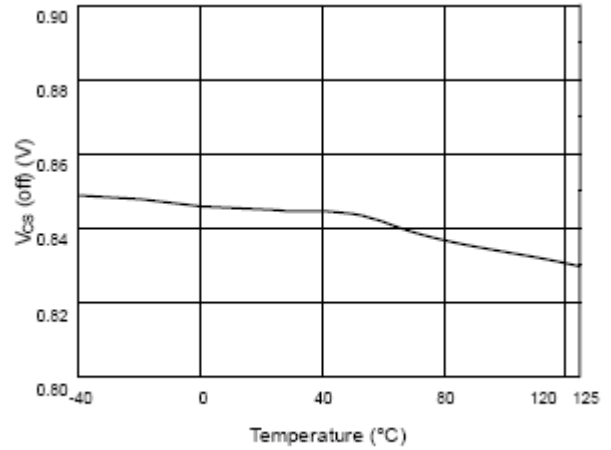


Fig. 8  $V_{CS(off)}$  vs. Temperature

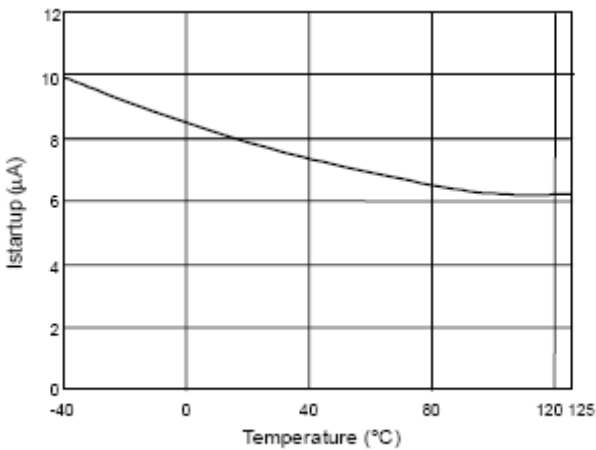


Fig. 9 Startup Current ( $I_{startup}$ ) vs. Temperature

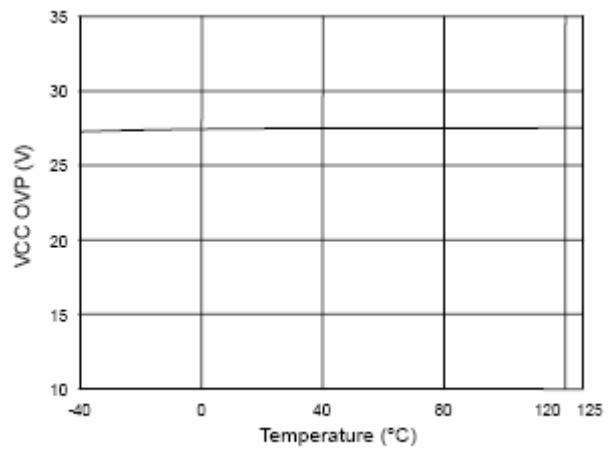


Fig. 10 VCC OVP vs. Temperature

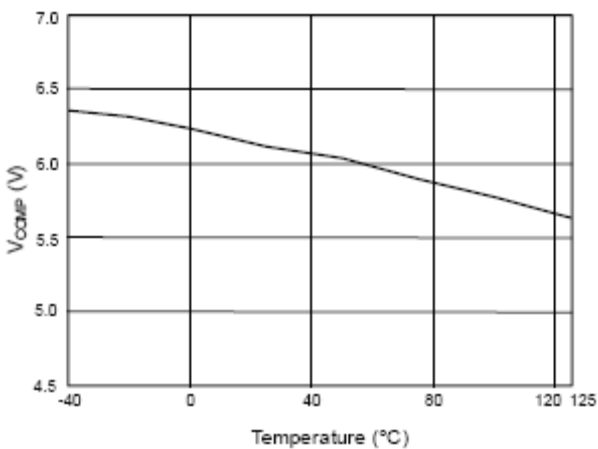


Fig. 11  $V_{comp}$  open loop voltage vs. Temperature

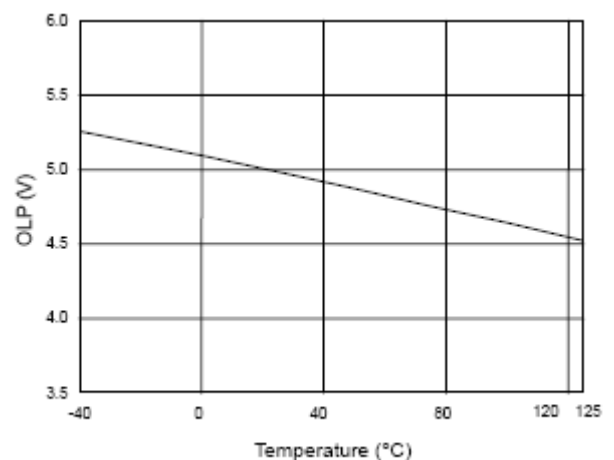
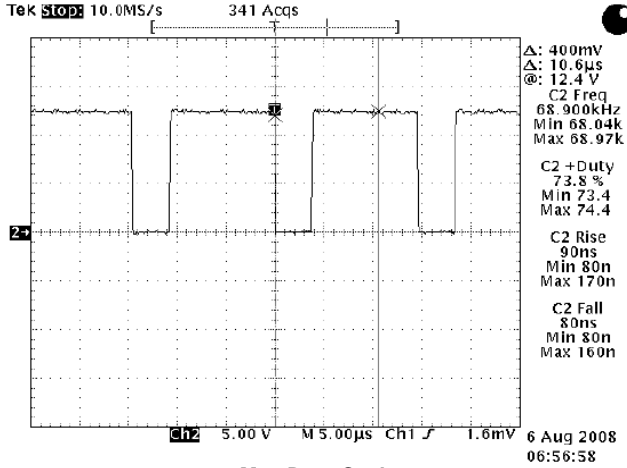


Fig. 12 OLP-Trip Level vs. Temperature

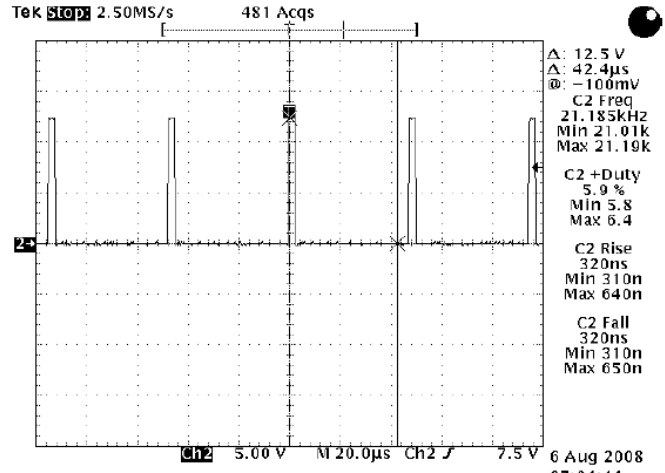


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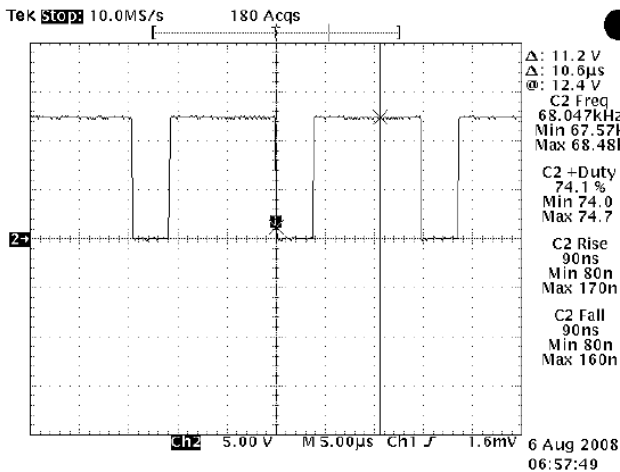
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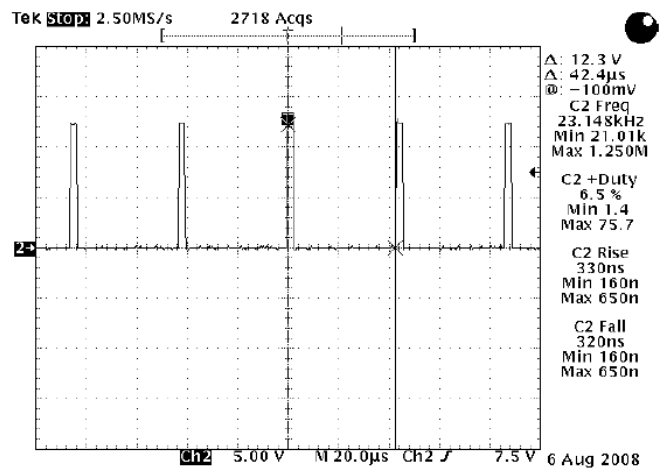
Max Duty Cycle



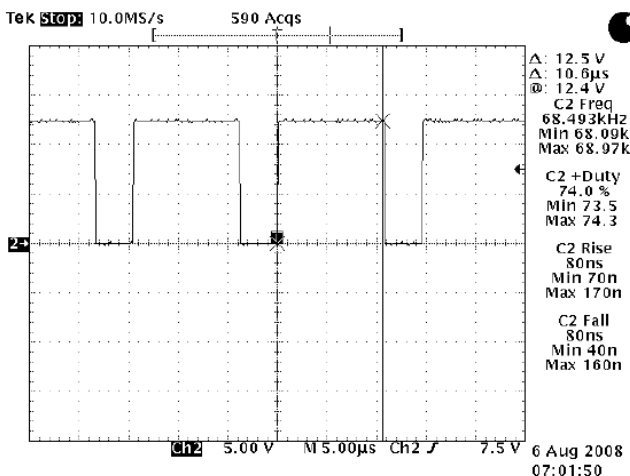
Min Duty Cycle



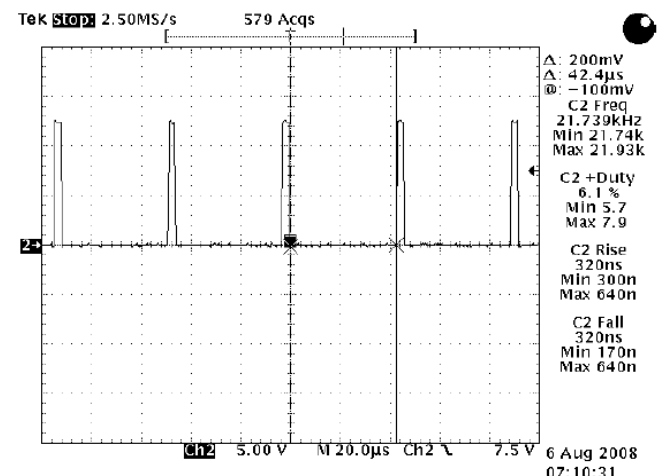
Max Duty Cycle



Min Duty Cycle



Max Duty Cycle



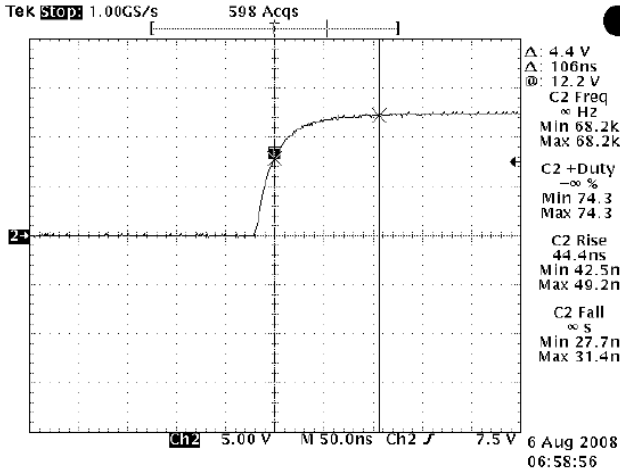
Min Duty Cycle



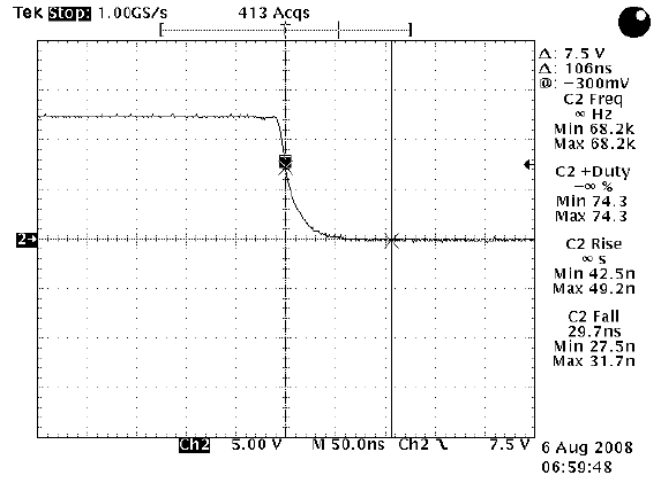


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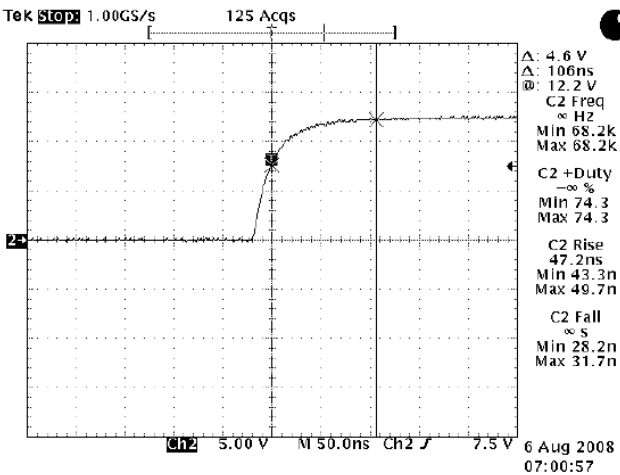
PERFORMANCE CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified.)



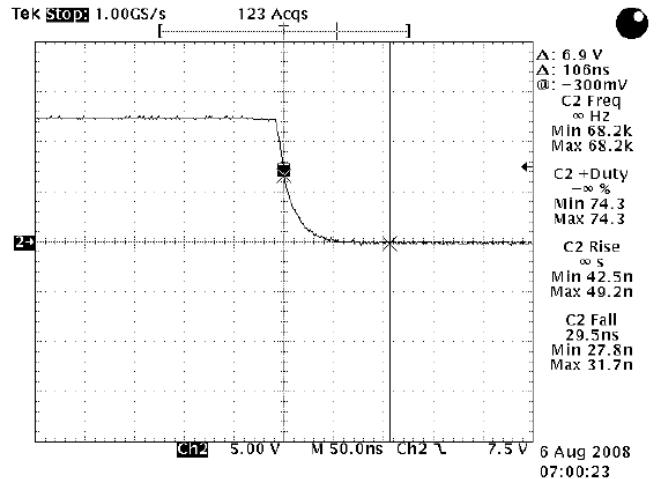
Rising Time Load



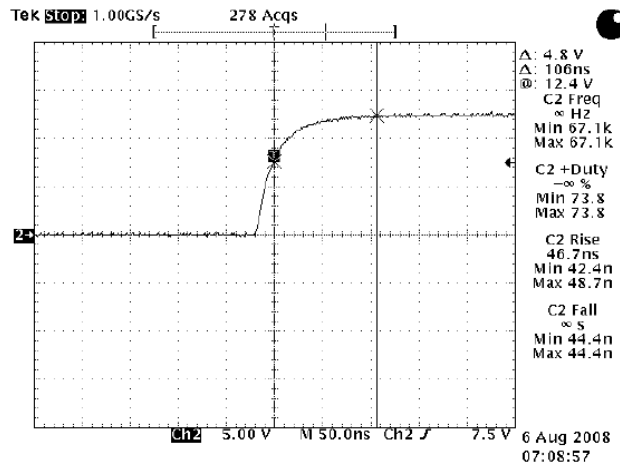
Falling Time Load



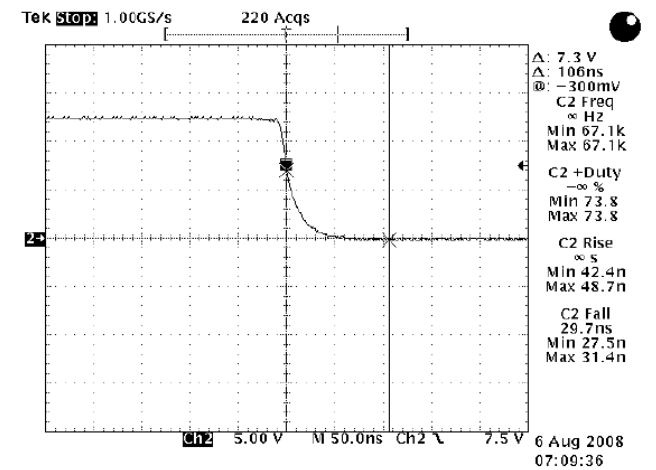
Rising Time Load



Falling Time Load



Rising Time Load

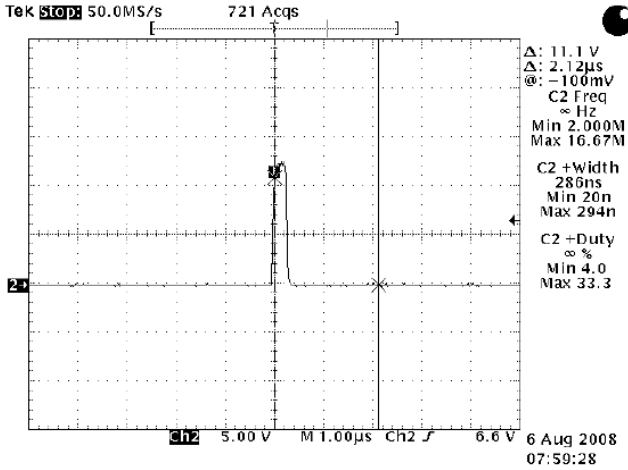


Falling Time Load

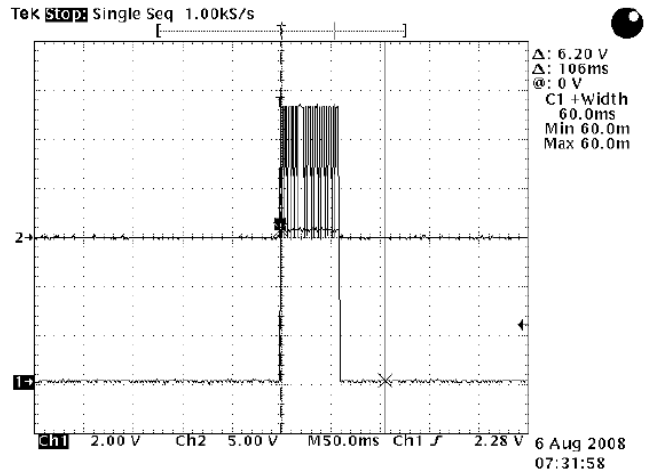


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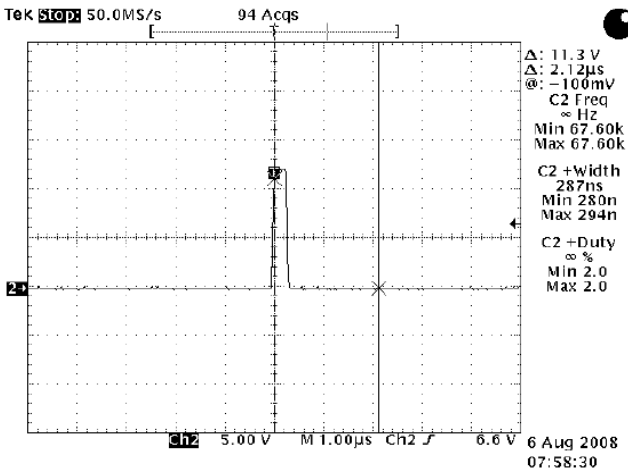
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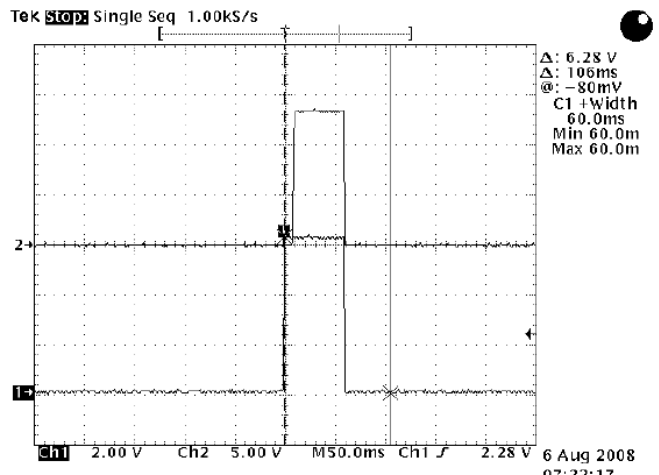
Leading Edge Blanking Time



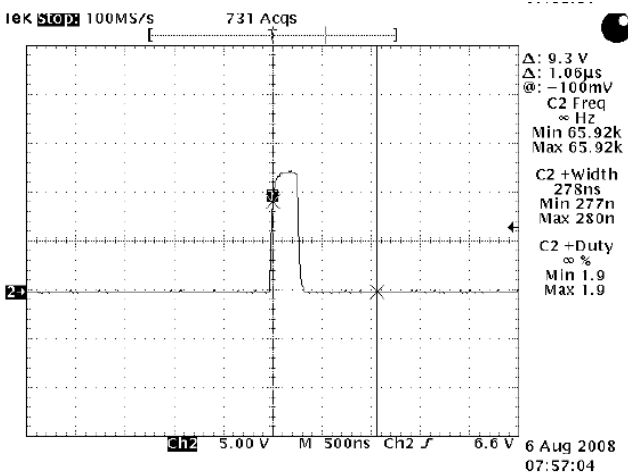
OLP Delay Time



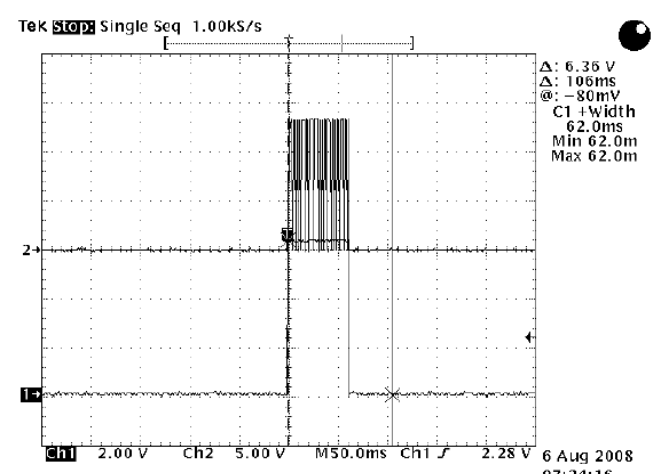
Leading Edge Blanking Time



OLP Delay Time



Leading Edge Blanking Time



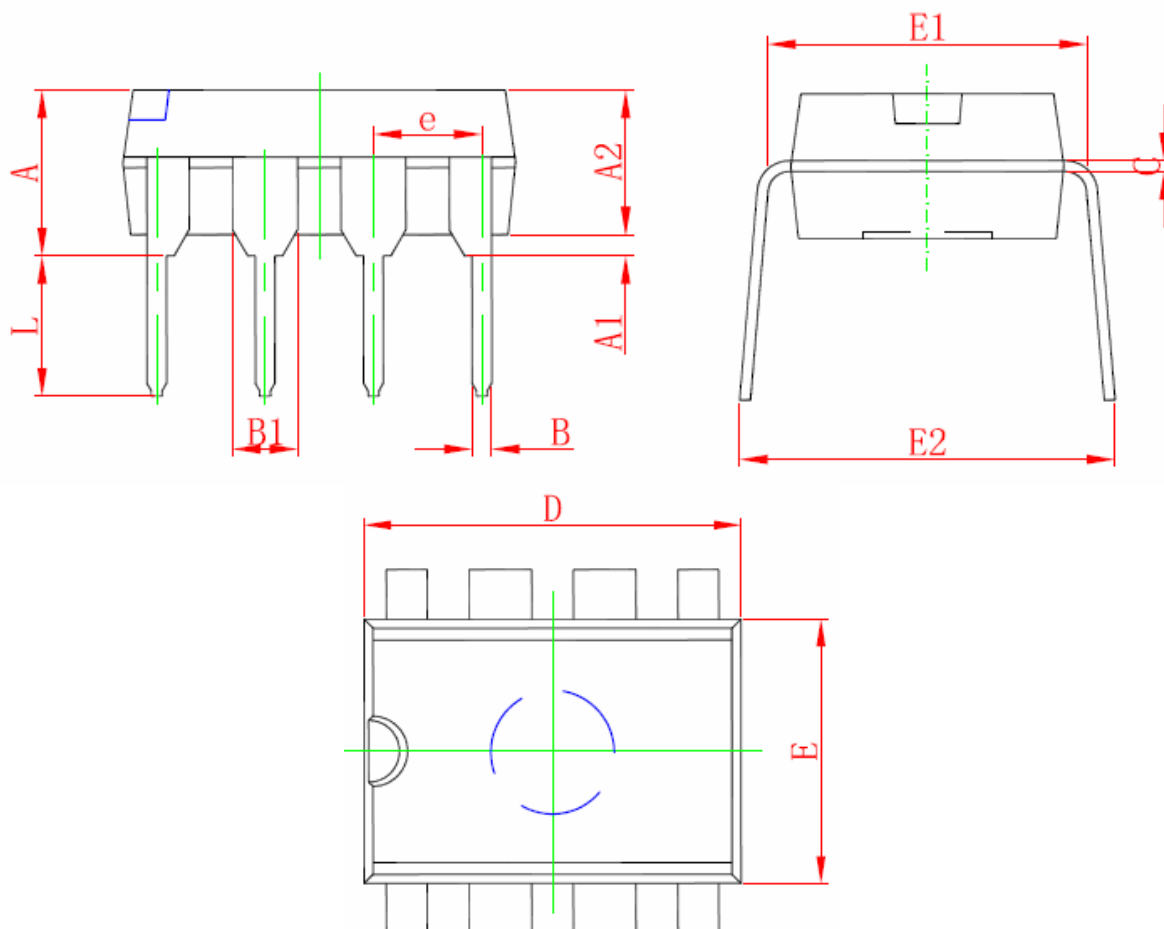
OLP Delay Time



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## Green-Mode PWM Controller

### DIP- 8P PACKAGE OUTLINE



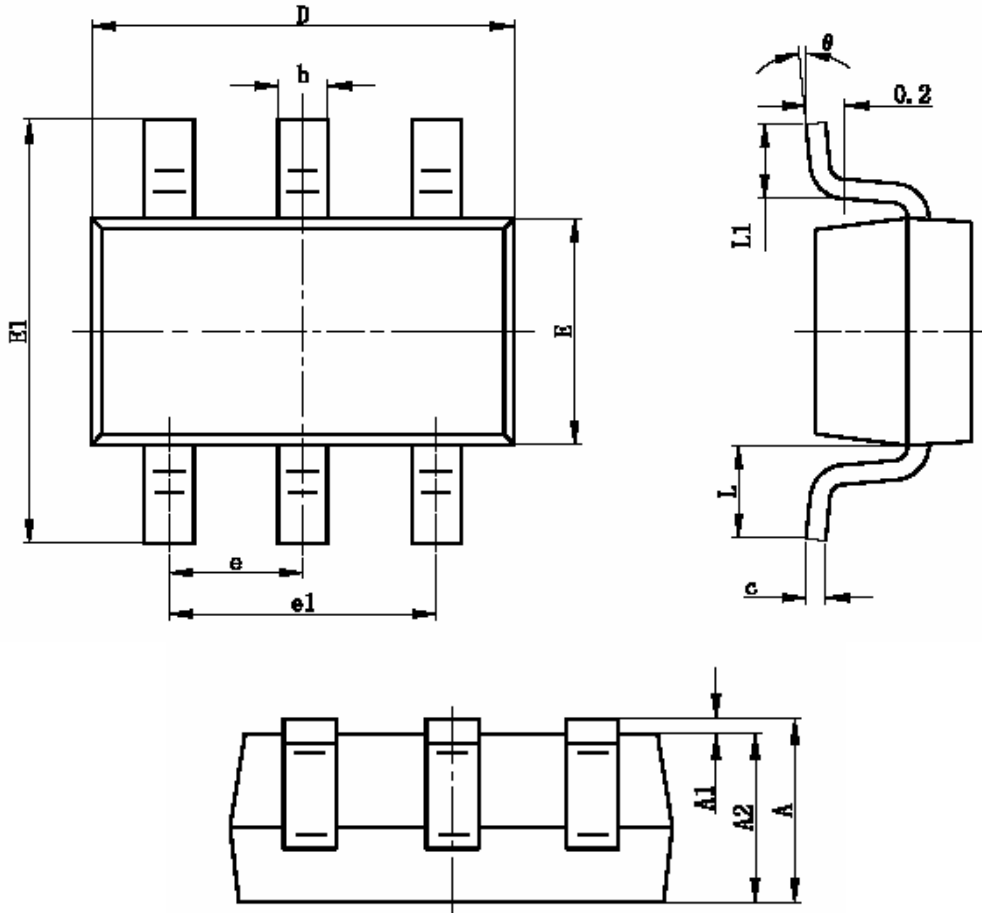
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.360	0.008	0.014
D	9.000	9.400	0.354	0.370
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
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
$\theta$	0°	8°	0°	8°



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