



SP6851

Green-Mode Power Switch

DESCRIPTION

The SP6851 is a low cost, low startup current, current mode PWM controller with green-mode power-saving operation. Built-in 650V MOSFET provides simple design for adapter. 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 SP6851 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.

SP6851 is available in DIP-8P package.

FEATURES

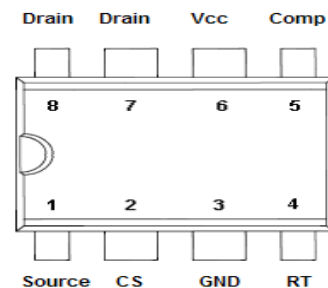
- High-Voltage BiCMOS Process
- Very Low Startup Current (<20 μ A)
- Under Voltage Lockout (UVLO)
- Current Mode Control
- Non-audible-noise Green Mode Control
- Current Limiting
- OLP (Over Load Protection)
- OVP (Over Voltage Protection) on Vcc Pin
- Leading-Edge Blanking
- Programmable Switching Frequency
- Internal Slope Compensation
- Green-Mode Control for Power Saving
- Building in 650V MOSFET

APPLICATIONS

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

PIN CONFIGURATION

DIP-8P



PART MARKING

DIP-8P



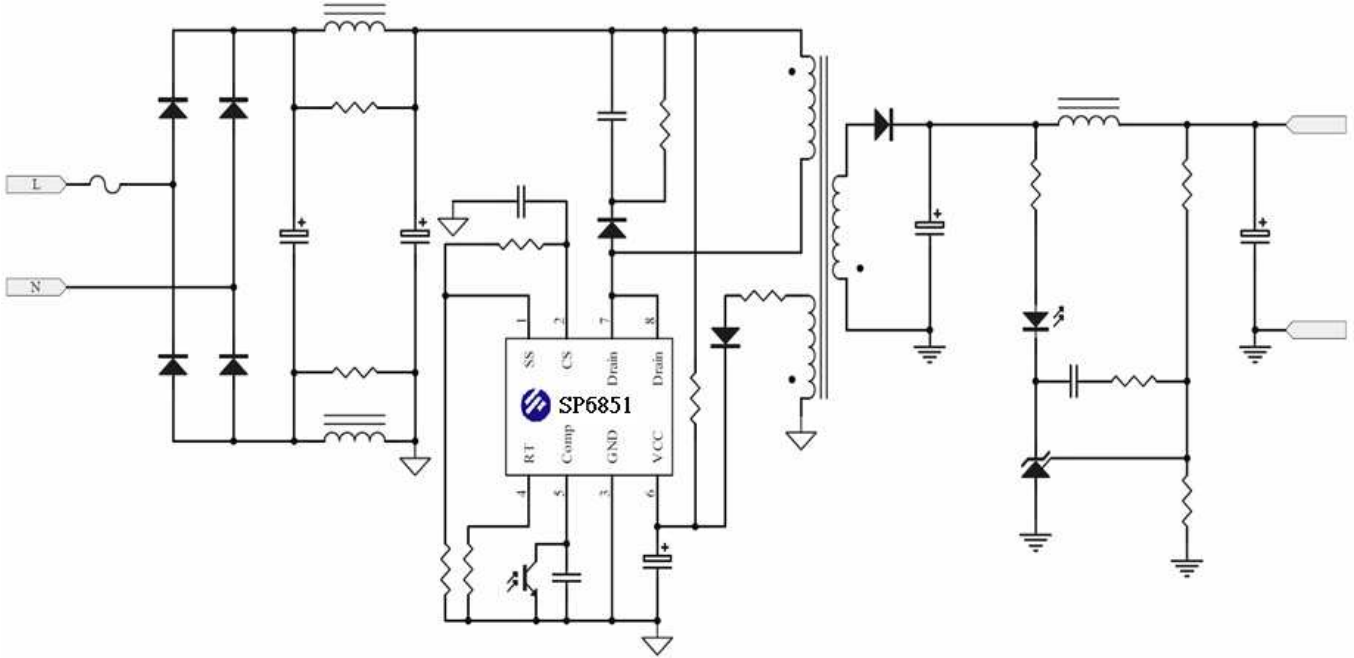
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B : Date Code

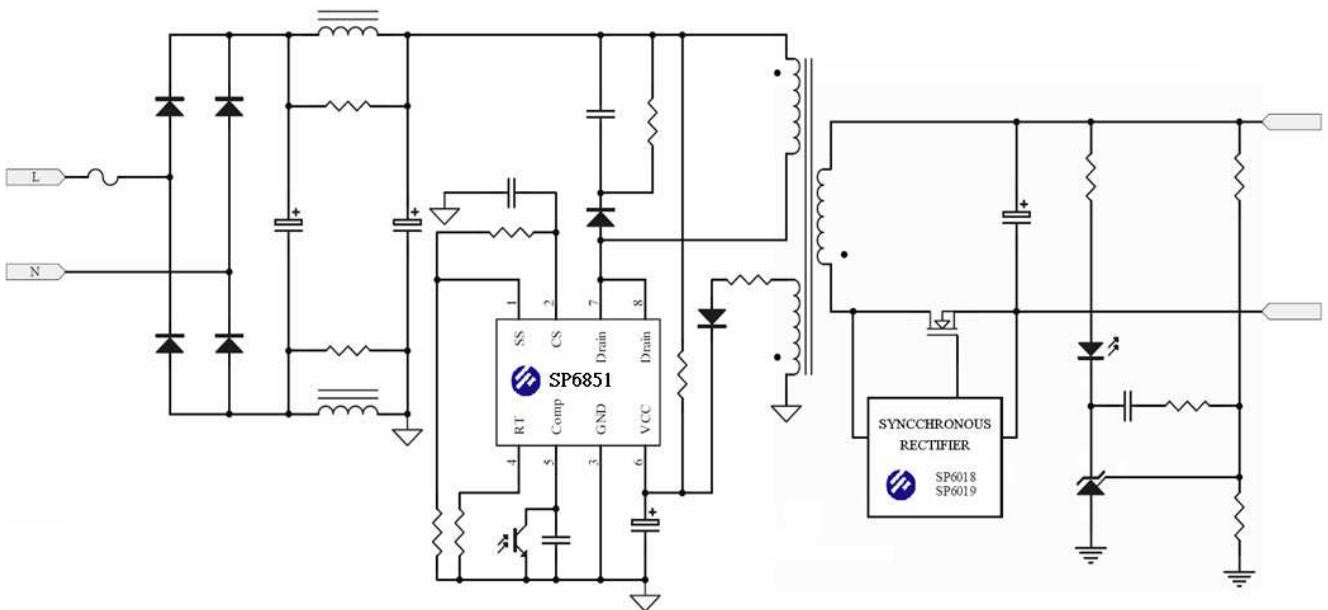


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TYPICAL APPLICATION CIRCUIT



TYPICAL APPLICATION CIRCUIT for HIGH EFFICIENCY SMPS





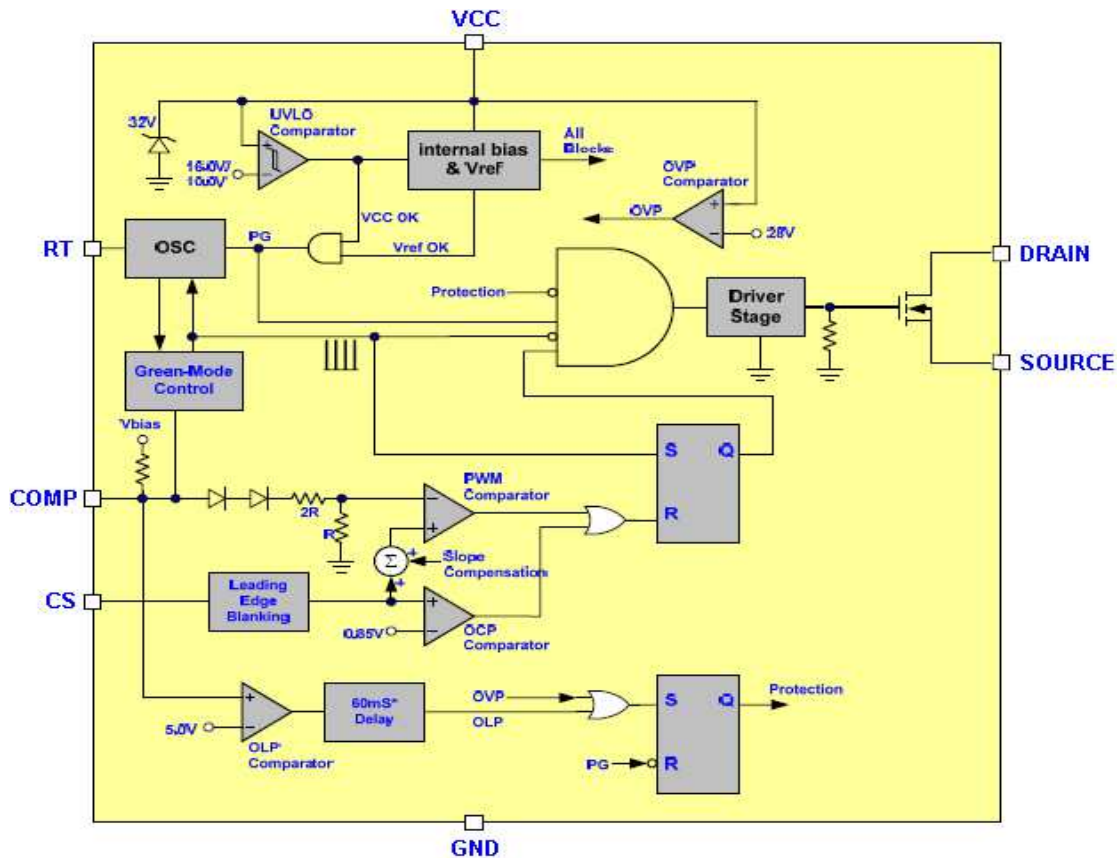
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PIN DESCRIPTION

Pin	Symbol	Description
1	Source	Power MOSFET Source
2	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.
3	GND	Ground
4	RT	This current is used to charge an internal capacitor, to determine the switching frequency.
5	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.
6	VCC	Supply Voltage in
7	Drain	Power MOSFET Drain
8	Drain	Power MOSFET Drain

BLOCK DIAGRAM





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ORDERING INFORMATION

Part Number	Package	Part Marking
SP6851D8TG	DIP-8P	SP6851I
SP6851D8TGB	DIP-8P	SP6851I

※ SP6851D8TG : Tube ; Pb – Free

※ SP6851D8TGB : Tube ; Pb – Free ; Halogen – Free

ABSOLUTE 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
V _{DS}	MOSFET Breakdown Voltage	650	V
P _D	Power Dissipation @ T _A =85°C (*)	0.3	W
ESD	Human Body Model	4	KV
	Machine Model	300	V
EAS	Single Pulse Avalanche Energy	49	mJ
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
R _{θJC}	Thermal Resistance Junction – Case (*)	95	°C/W

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



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Green-Mode Power Switch

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage (Vcc Pin)						
I _{stt}	Startup Current			10	20	uA
I _{op}	Operating Current	V _{COMP} = 0V		2.7	4	mA
		V _{COMP} = 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		26	27	29.5	V
Voltage Feedback (Comp Pin)						
I _{sc}	Short Circuit Current			1.25	2.2	mA
V _{op}	Open Loop Voltage			6		V
V _{TH(GM)}	Green Mode Threshold V _{COMP}			2.35		V
Oscillator (RT Pin)						
F _{osc}	Frequency	R _T =100K Ω	60.0	68.0	70.0	KHz
F _{osc(GM)}	Green Mode Frequency	F _s =65.0KHz		22		KHz
F _{dt}	Frequency Variation versus Temp. Deviation	(-40 $^{\circ}\text{C}$ ~105 $^{\circ}\text{C}$)			3	%
F _{dv}	Frequency Variation versus V _{CC} Deviation	(V _{CC} =11V~22V)			1	%
Current Sensing (CS Pin)						
V _{cs(off)}	Maximum Input Voltage		0.8	0.85	0.9	V
T _{LEDD}	Leading Edge Blanking Time			280		nS
Z _{cs}	Input impedance		1			M Ω
T _{PD}	Delay to Output			100		nS
MOSFET						
DC (Max)	Maximum Duty Cycle		70	75	80	%
DC (Min)	Minimum Duty Cycle			0		%
V _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	650			V
I _{DSS}	Drain-Source Leakage Current	V _{GS} =0V, V _{DS} =550V			10	uA
R _{DS(ON)}	On-State Resistance	V _{GS} =10V, I _D =1A			4.95	Ω
V _{SD}	Forward On Voltage	V _{GS} =0V, I _S =1.4A			1.5	V
C _o	Output capacitance	V _{GS} =0V, V _{DS} =25V, f=1.0MHz		27		pF
T _r	Rising Time			50	200	nS
T _f	Falling Time			30	120	nS
OLP (Over Load Protection)						
T _{LOLP}	OLP Trip Level			5.0		V
T _{DOLP}	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.)

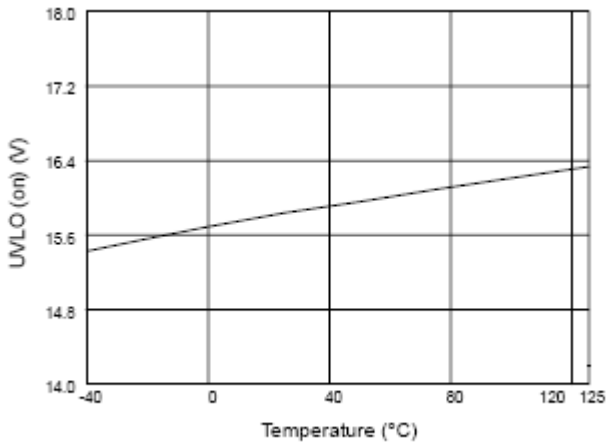


Fig. 1 UVLO (on) vs. Temperature

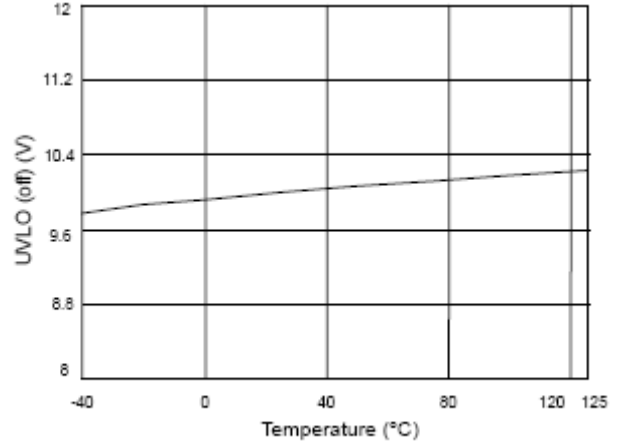


Fig. 2 UVLO (off) vs. Temperature

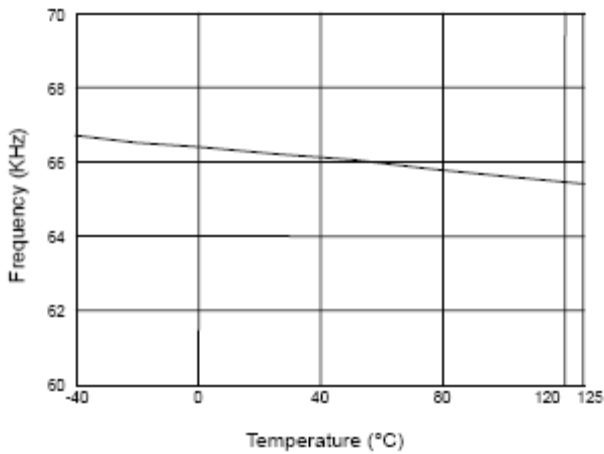


Fig. 3 Frequency vs. Temperature

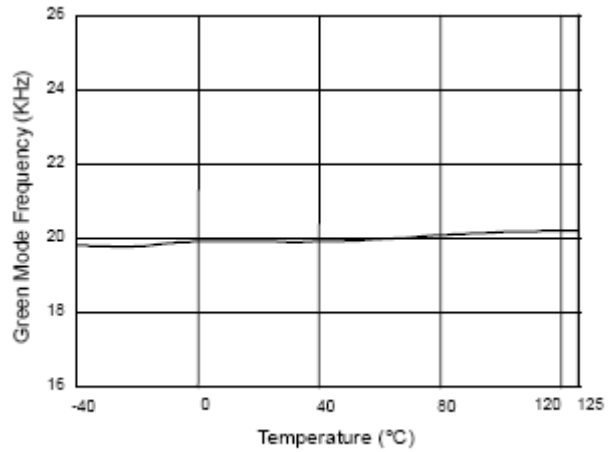


Fig. 4 Green Mode Frequency vs. Temperature

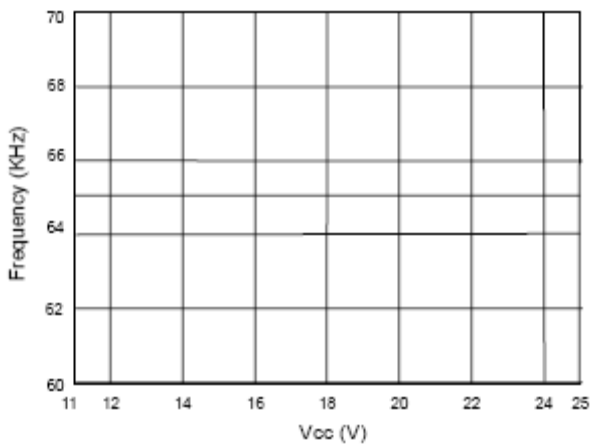


Fig. 5 Frequency vs. Vcc

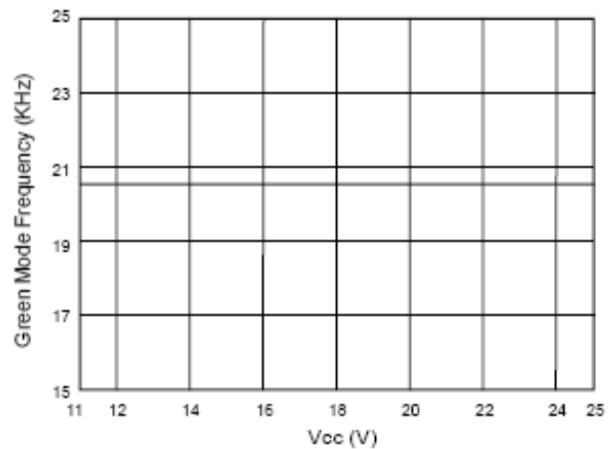


Fig. 6 Green Mode Frequency vs. Vcc



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

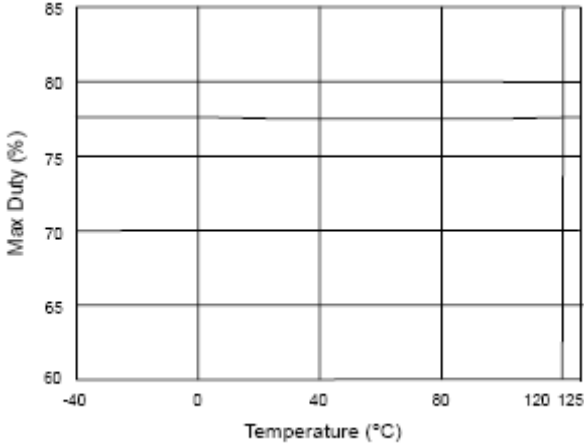


Fig. 7 Max Duty vs. Temperature

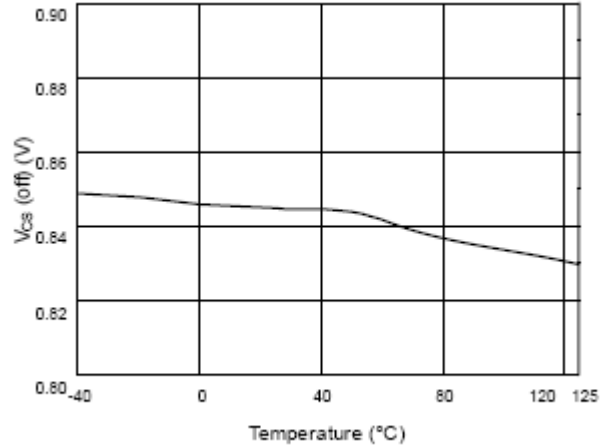


Fig. 8 $V_{CS(off)}$ vs. Temperature

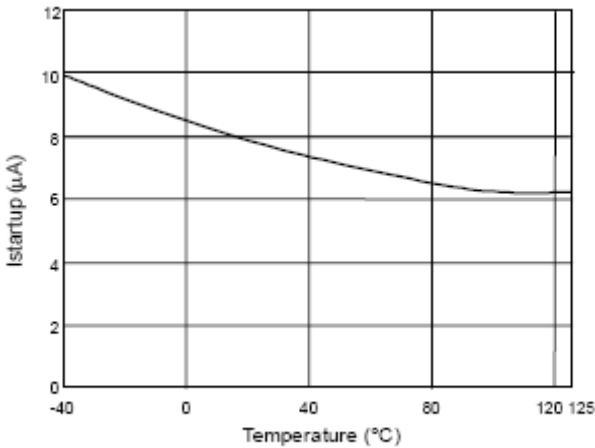


Fig. 9 Startup Current ($I_{startup}$) vs. Temperature

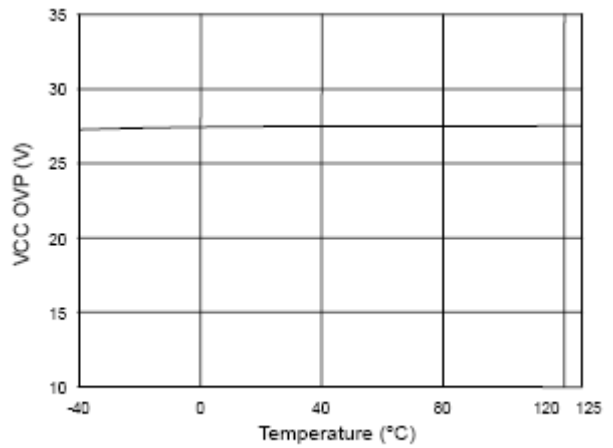


Fig. 10 VCC OVP vs. Temperature

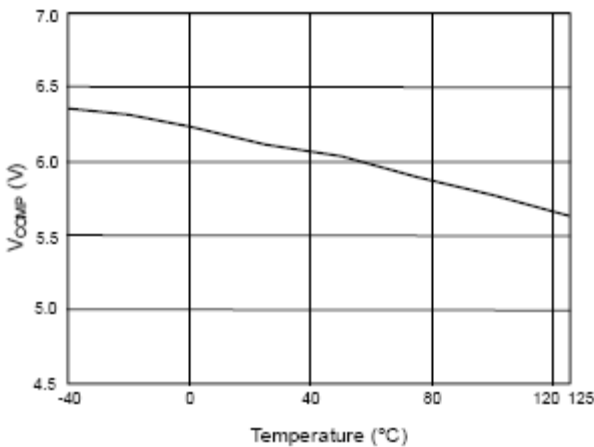


Fig. 11 V_{comp} open loop voltage vs. Temperature

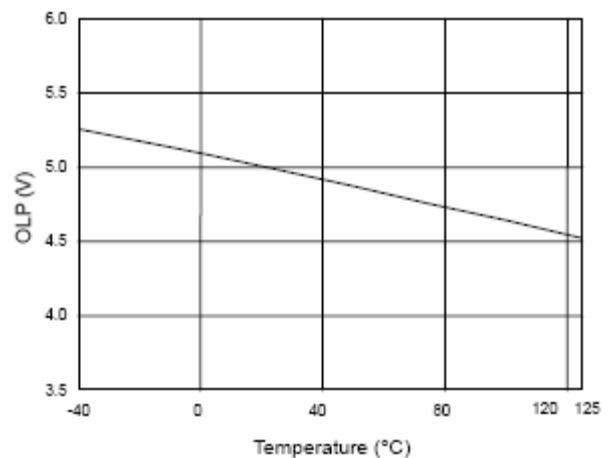
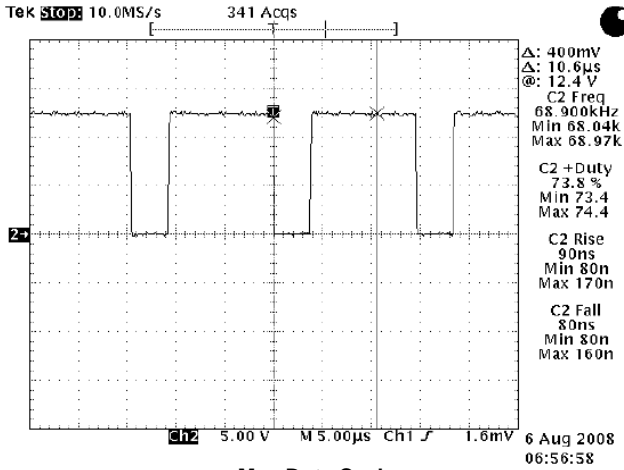


Fig. 12 OLP-Trip Level vs. Temperature

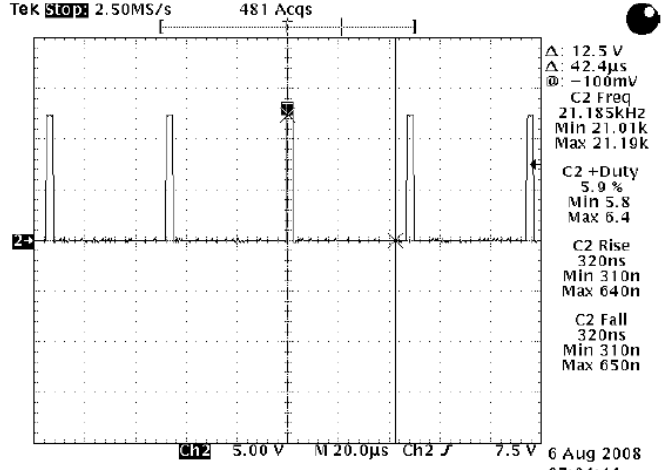


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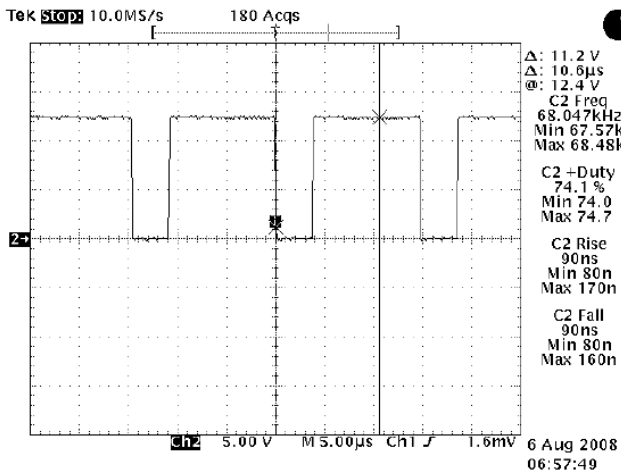
PERFORMANCE CHARACTERISTICS (T_A=25°C, unless otherwise specified.)



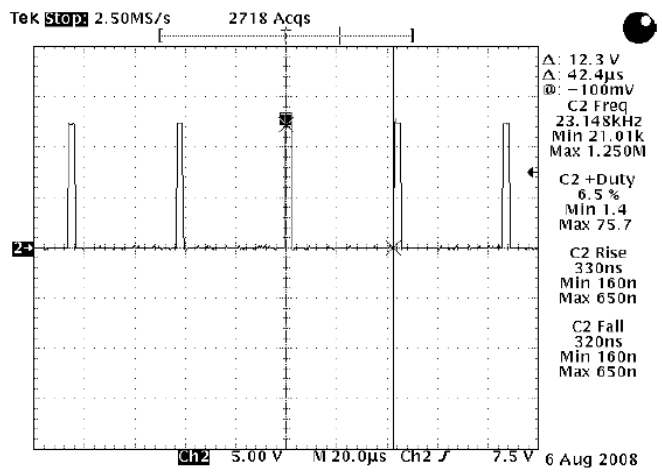
Max Duty Cycle



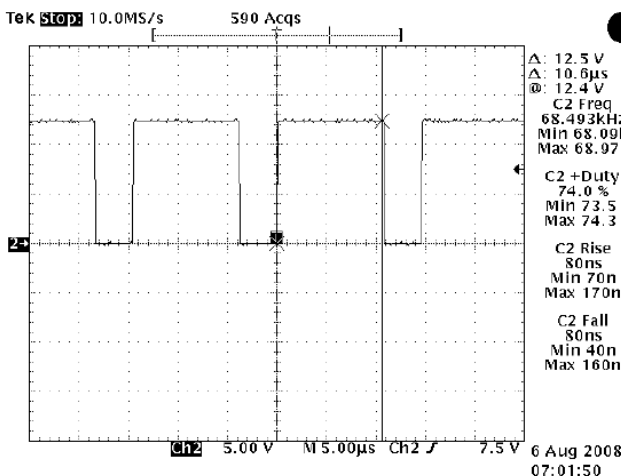
Min Duty Cycle



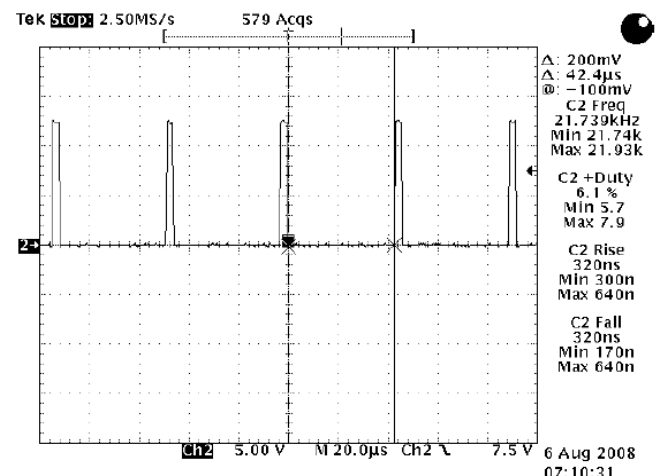
Max Duty Cycle



Min Duty Cycle



Max Duty Cycle

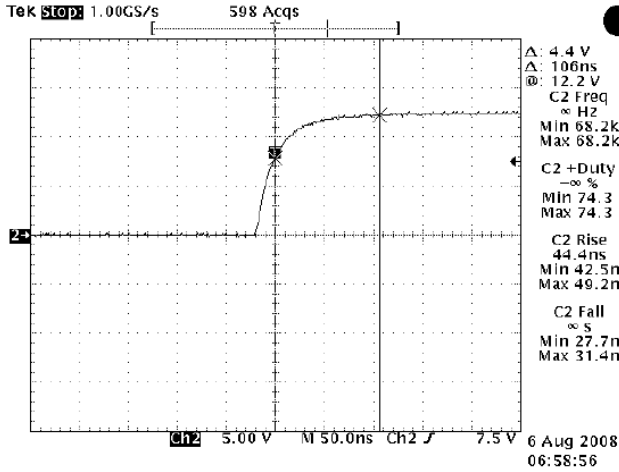


Min Duty Cycle

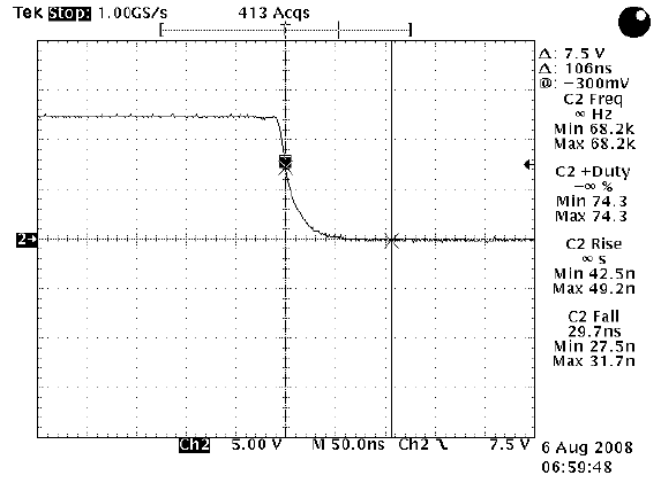


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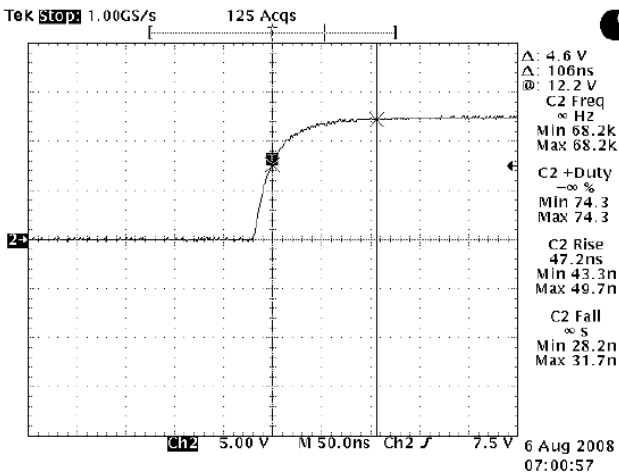
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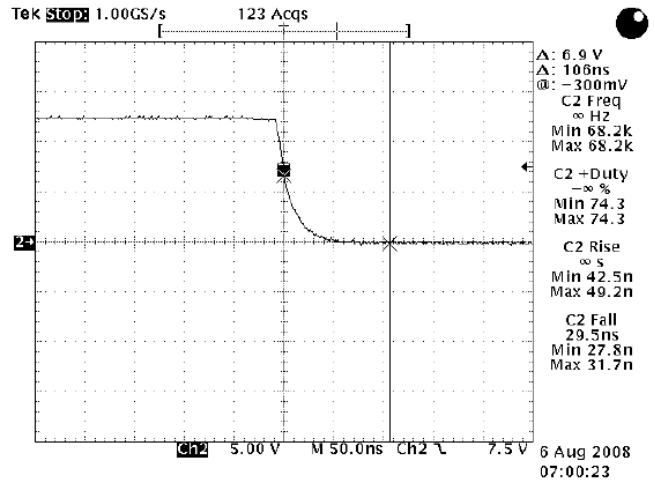
Rising Time Load



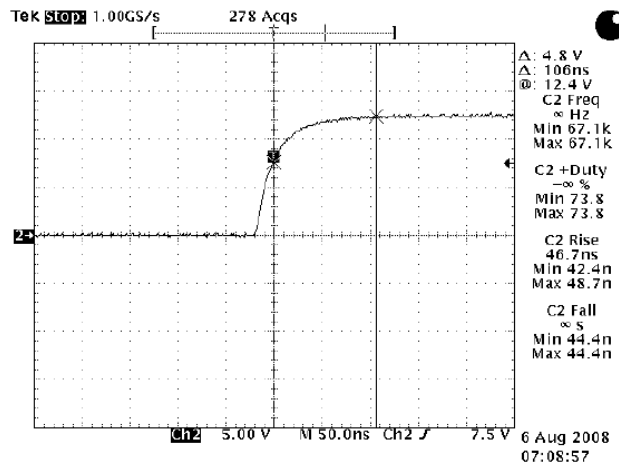
Falling Time Load



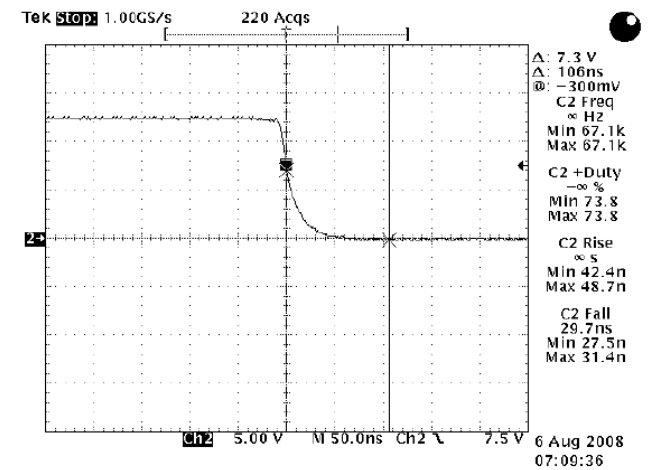
Rising Time Load



Falling Time Load



Rising Time Load

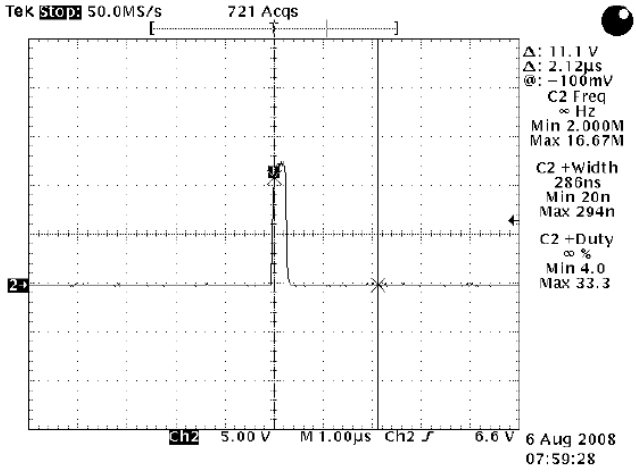


Falling Time Load

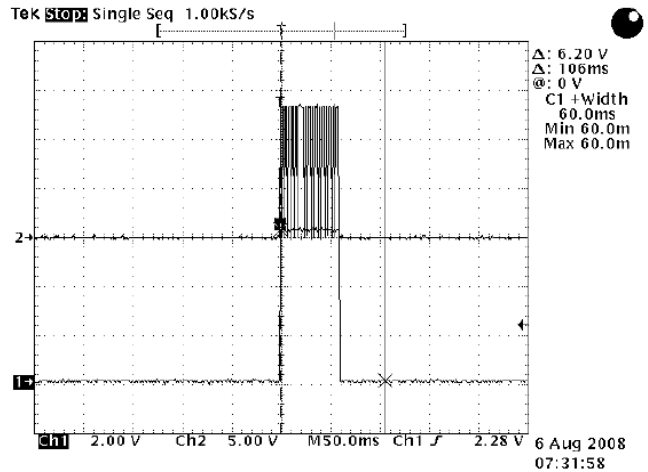


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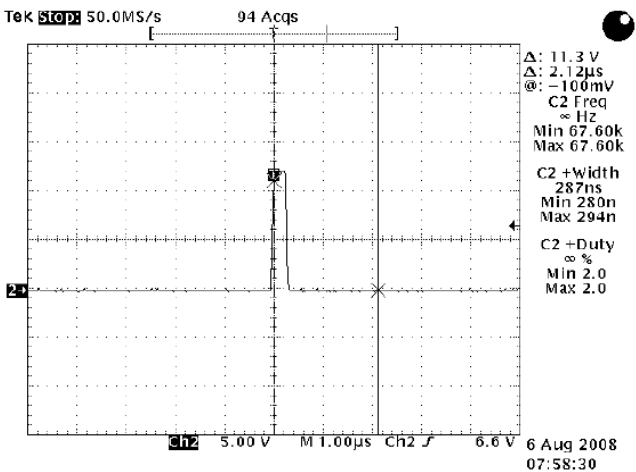
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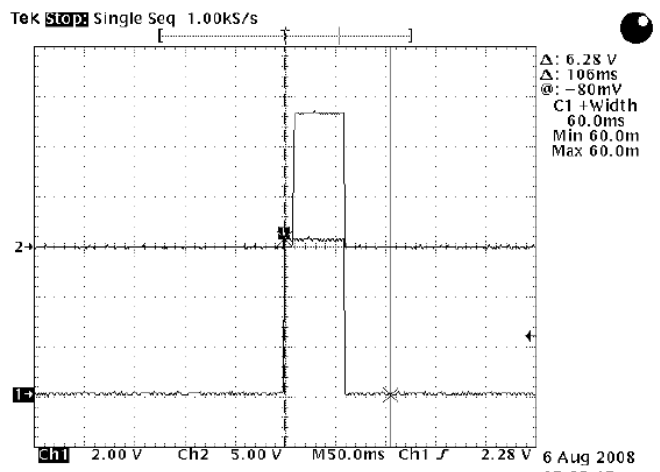
Leading Edge Blanking Time



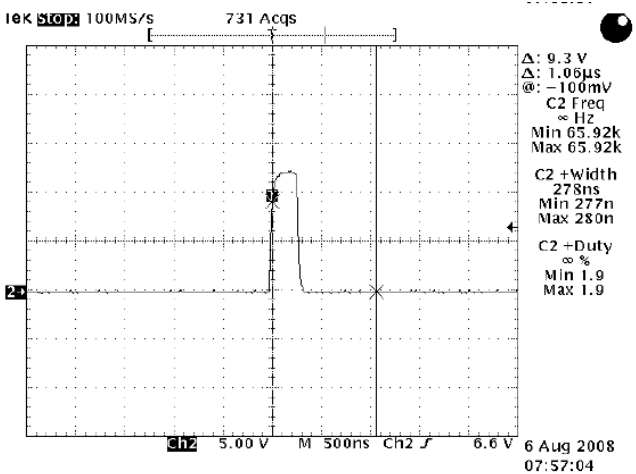
OLP Delay Time



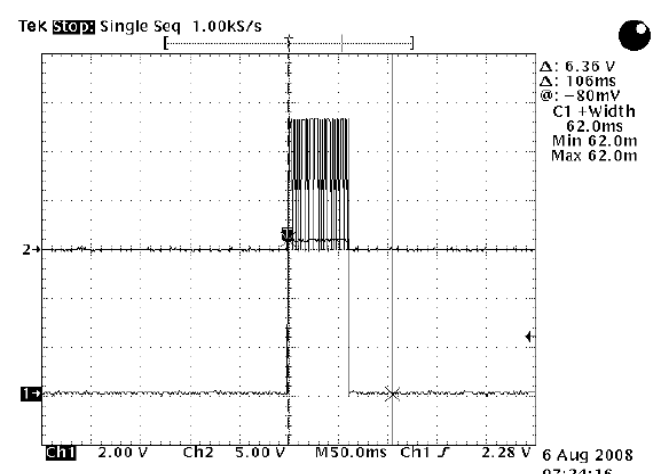
Leading Edge Blanking Time



OLP Delay Time



Leading Edge Blanking Time



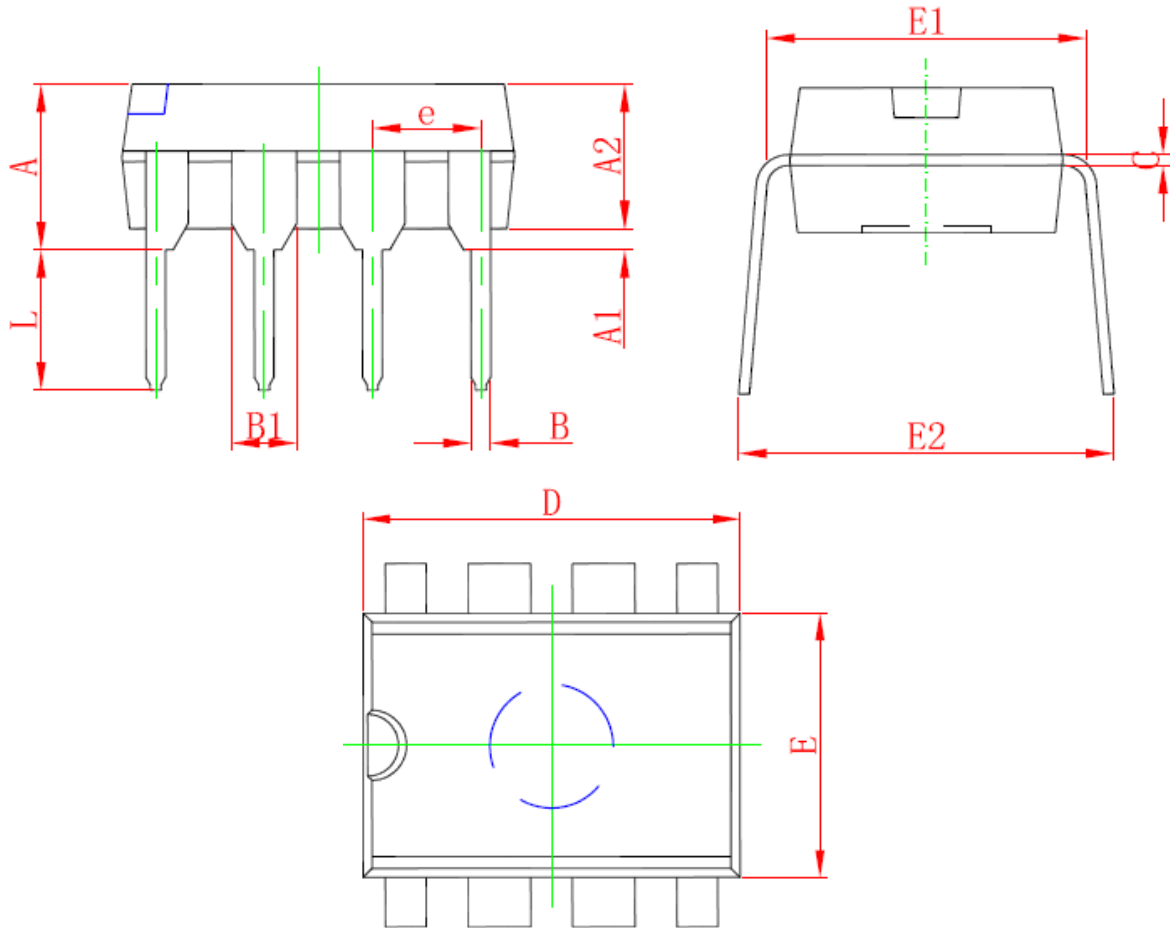
OLP Delay Time



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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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