



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

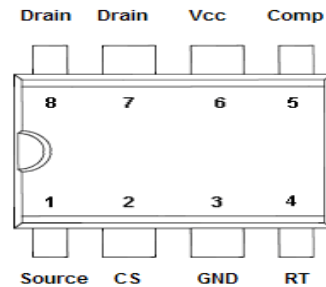
- High-Voltage BiCMOS Process
- Very Low Startup Current (<20μA)
- Under Voltage Lockout (UVLO)
- Current Mode Control
- Non-audible-noise Green Mode Control
- Current Limiting
- OLP (Over Load Protection)
- OVP (Over Voltage Protection) on Vcc Pin
- Leading-Edge Blanking
- Programmable Switching Frequency
- 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

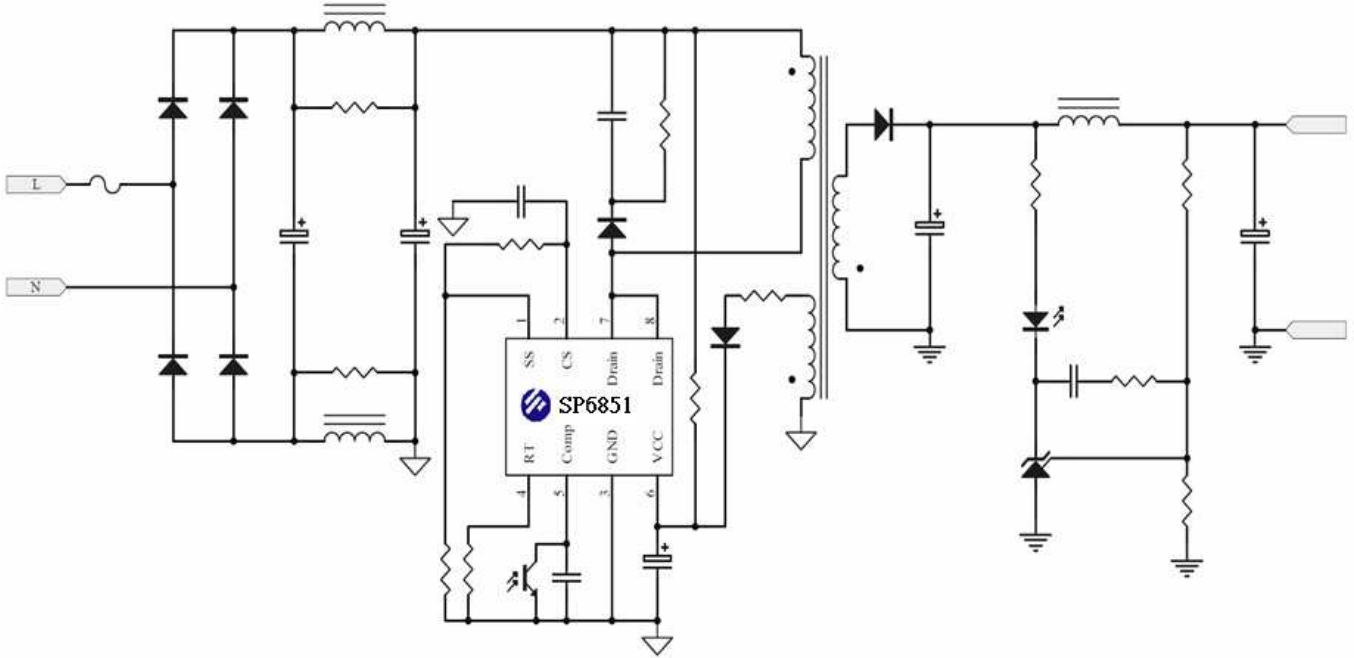


A : Lot Code
B : Date Code

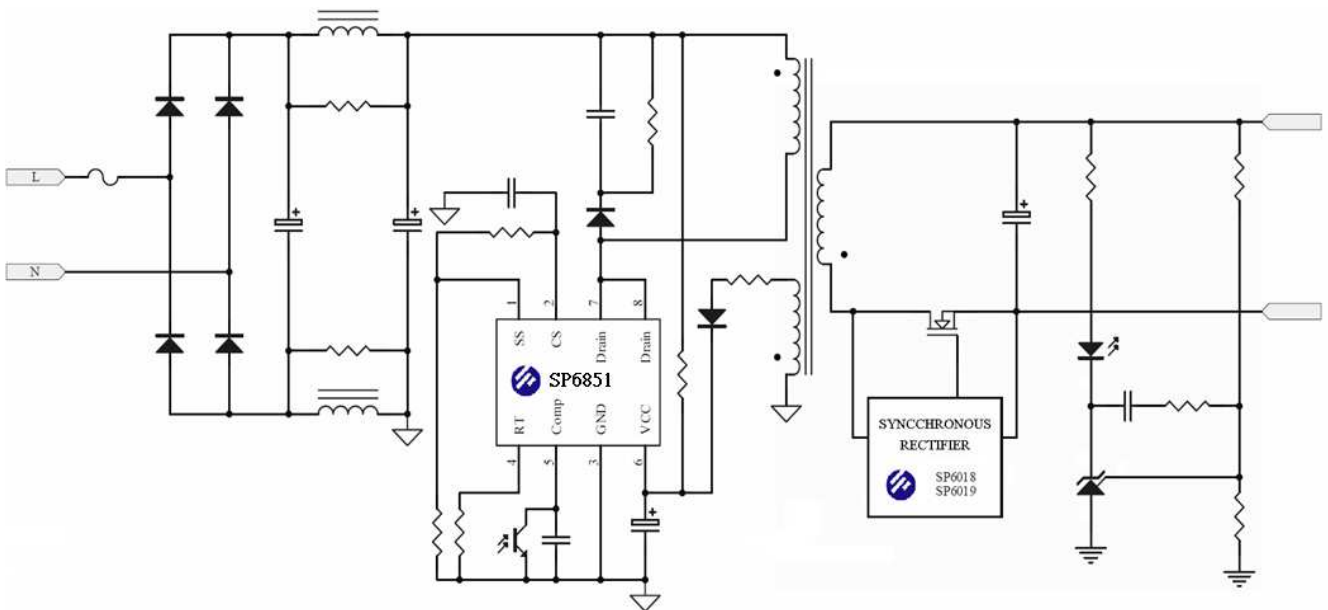


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TYPICAL APPLICATION CIRCUIT



TYPICAL APPLICATION CIRCUIT for HIGH EFFICIENCY SMPS





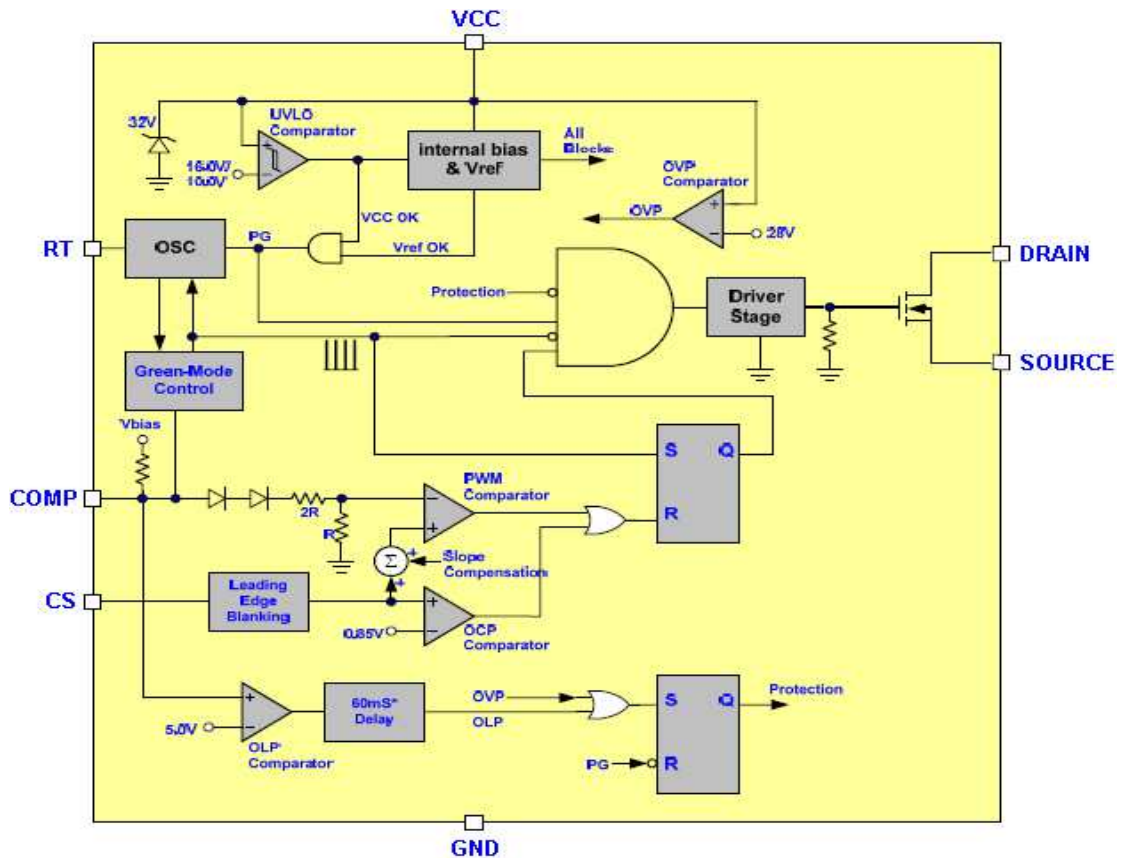
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PIN DESCRIPTION

| 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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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.)

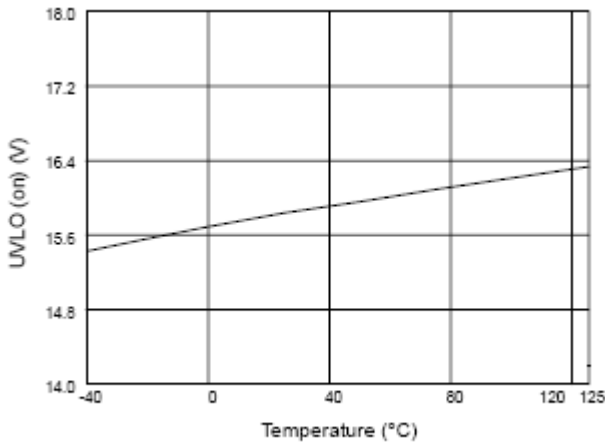


Fig. 1 UVLO (on) vs. Temperature

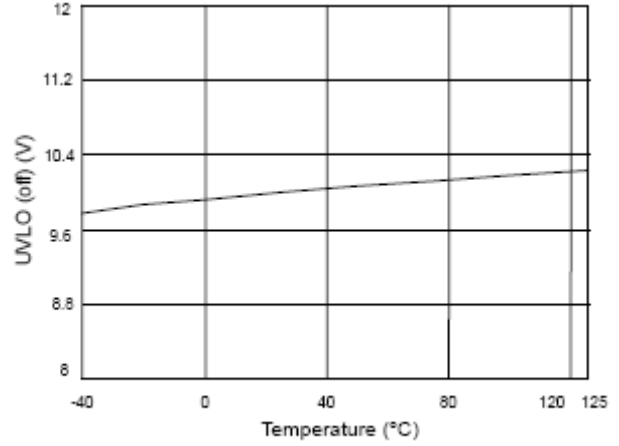


Fig. 2 UVLO (off) vs. Temperature

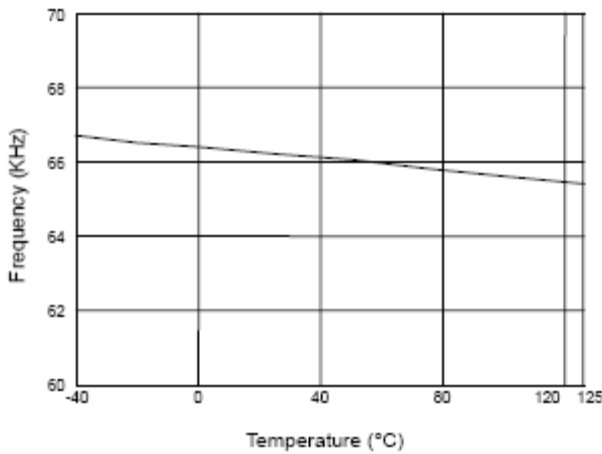


Fig. 3 Frequency vs. Temperature

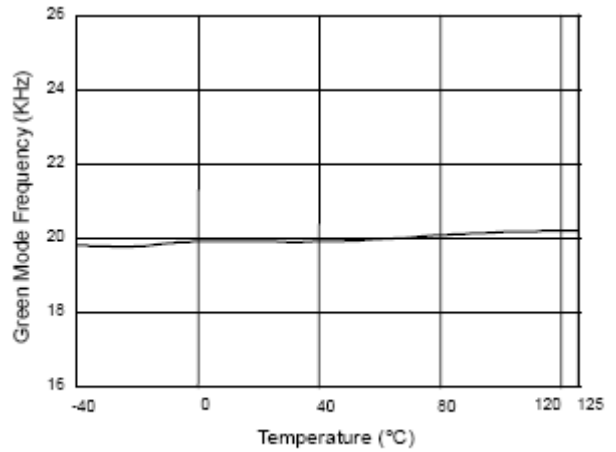


Fig. 4 Green Mode Frequency vs. Temperature

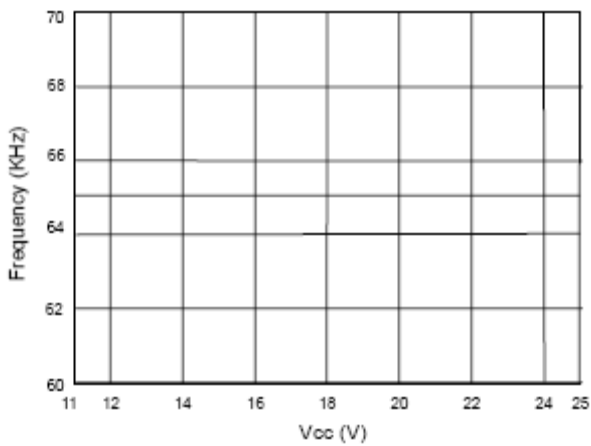


Fig. 5 Frequency vs. Vcc

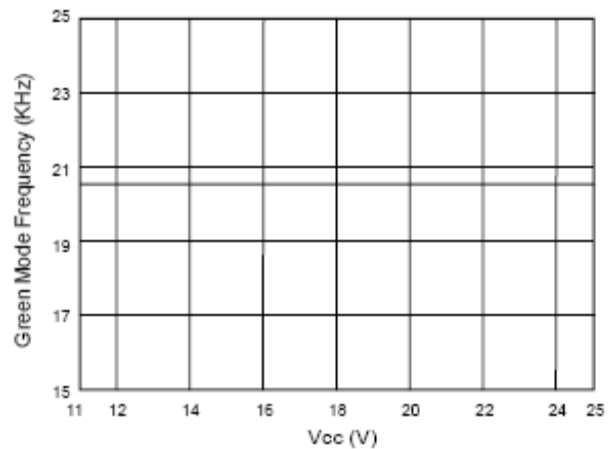


Fig. 6 Green Mode Frequency vs. Vcc



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

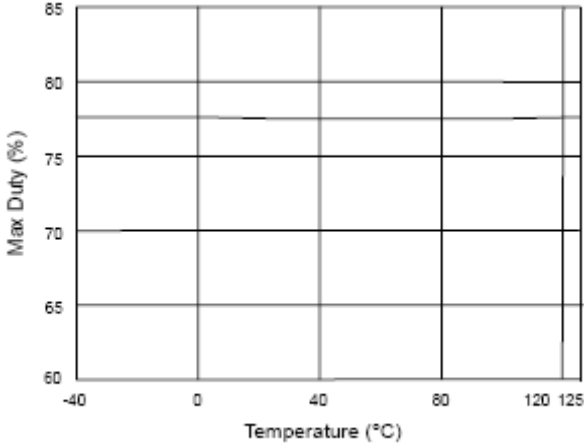


Fig. 7 Max Duty vs. Temperature

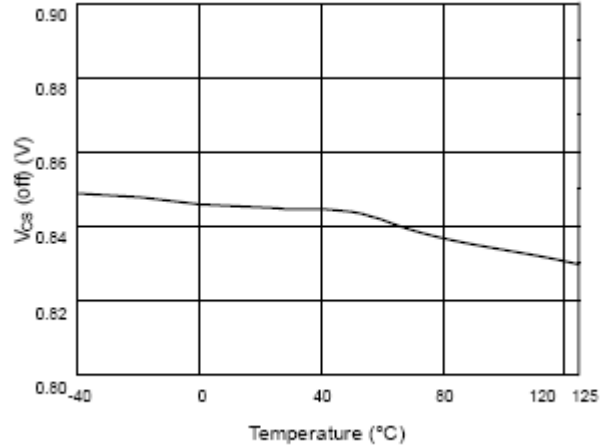


Fig. 8 $V_{CS(off)}$ vs. Temperature

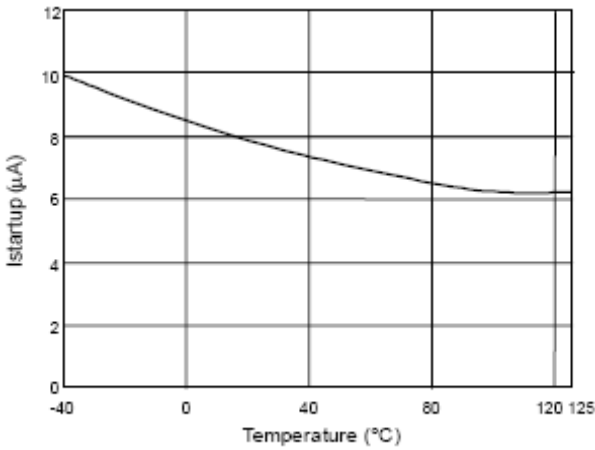


Fig. 9 Startup Current ($I_{startup}$) vs. Temperature

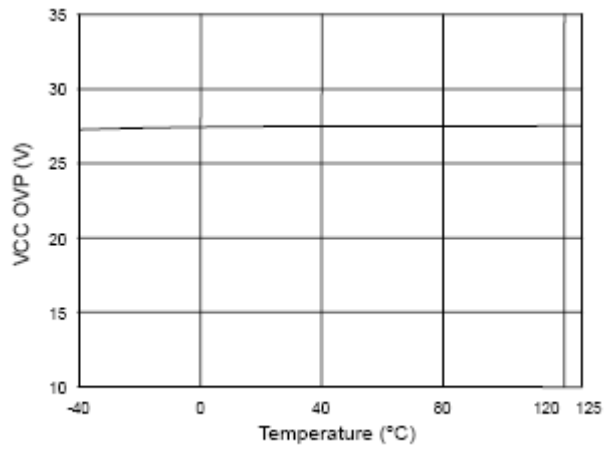


Fig. 10 VCC OVP vs. Temperature

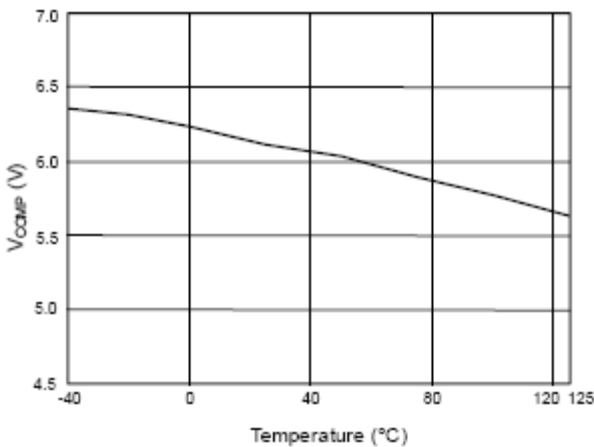


Fig. 11 V_{comp} open loop voltage vs. Temperature

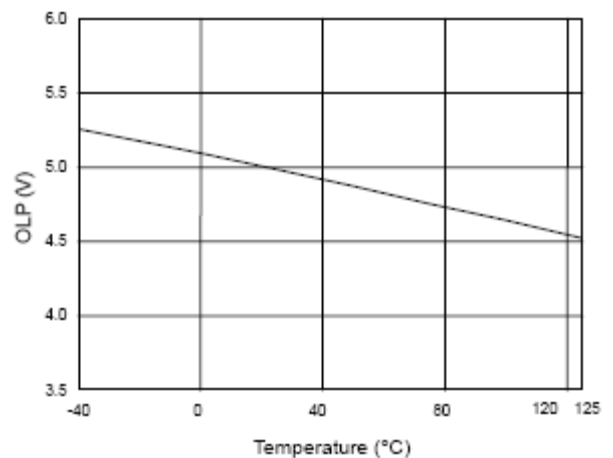
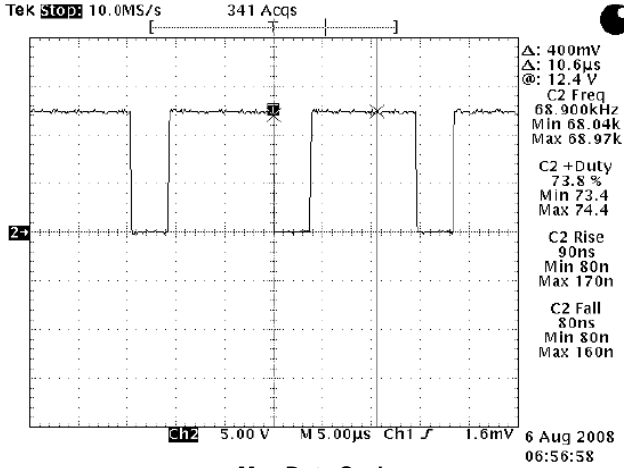


Fig. 12 OLP-Trip Level vs. Temperature

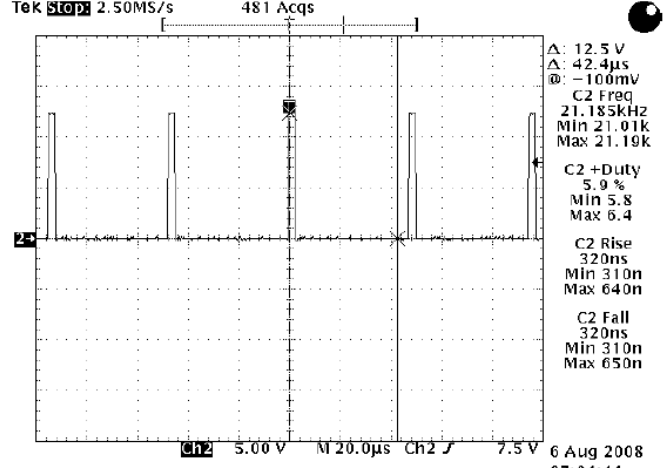


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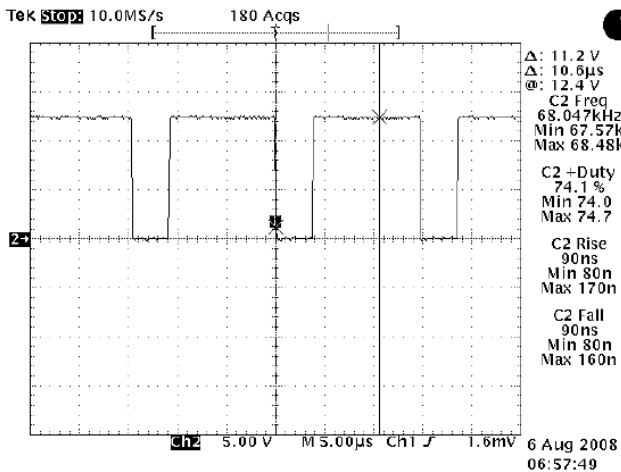
PERFORMANCE CHARACTERISTICS (T_A=25°C, unless otherwise specified.)



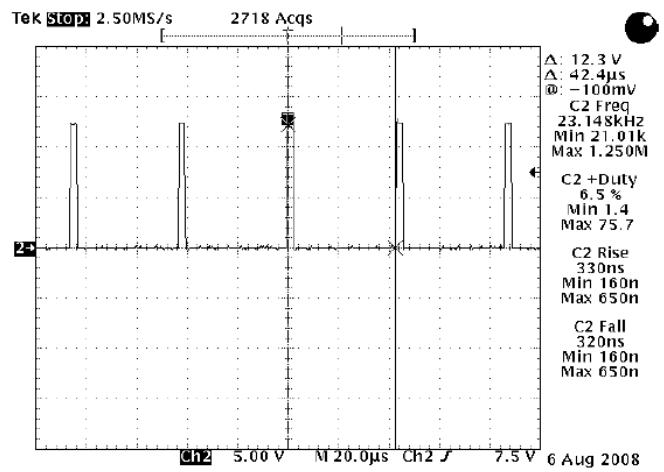
Max Duty Cycle



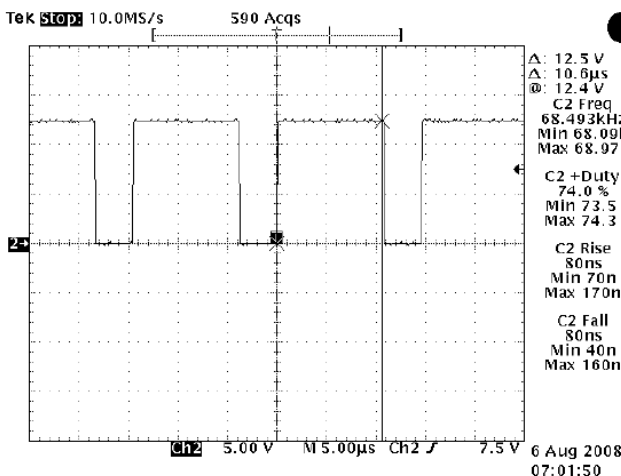
Min Duty Cycle



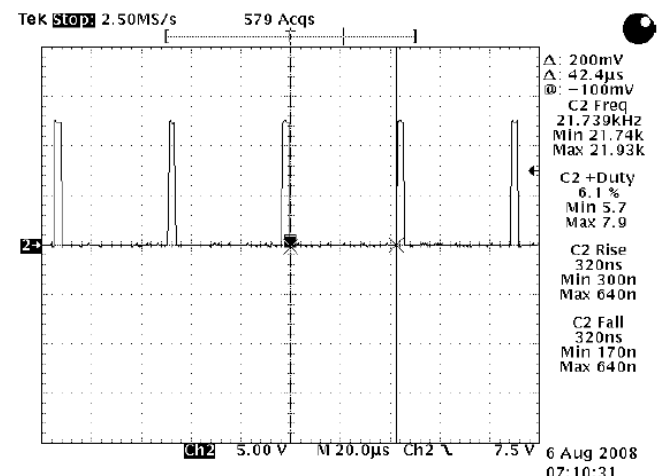
Max Duty Cycle



Min Duty Cycle



Max Duty Cycle

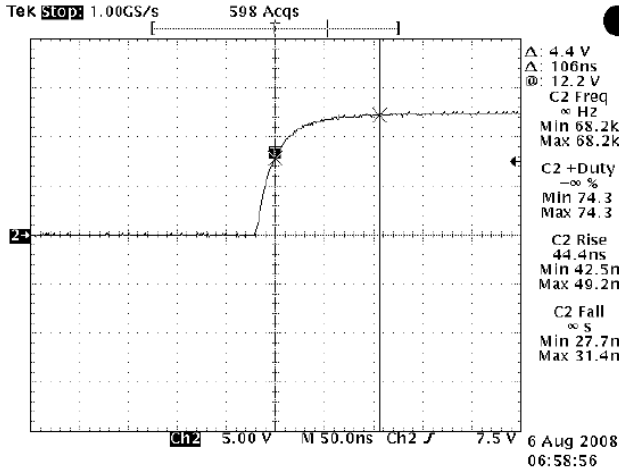


Min Duty Cycle

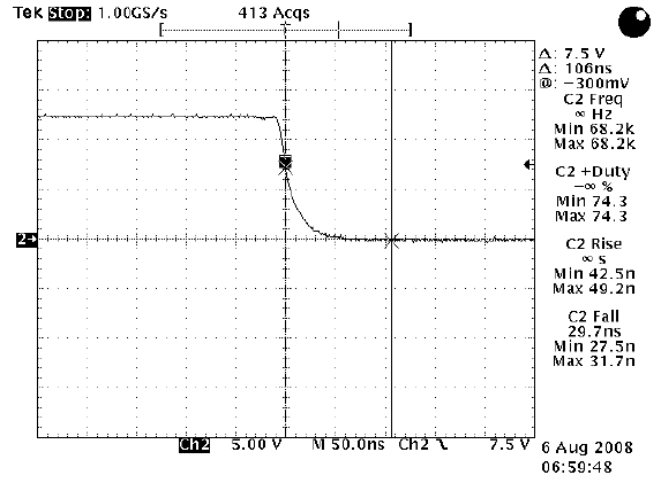


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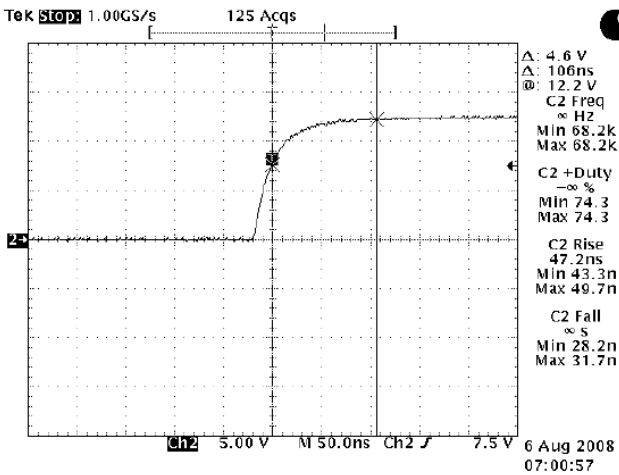
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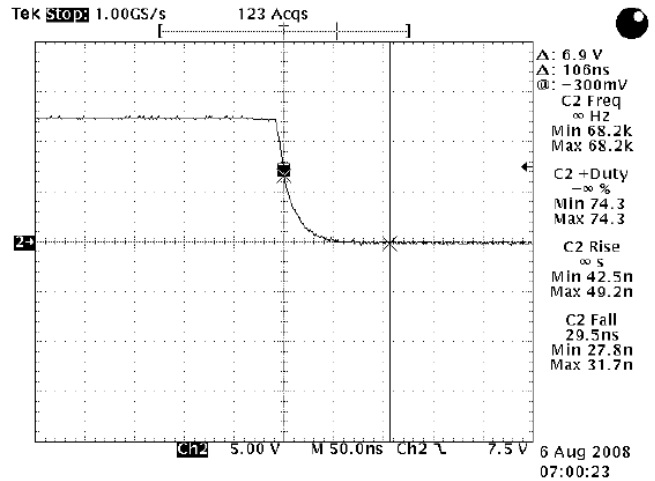
Rising Time Load



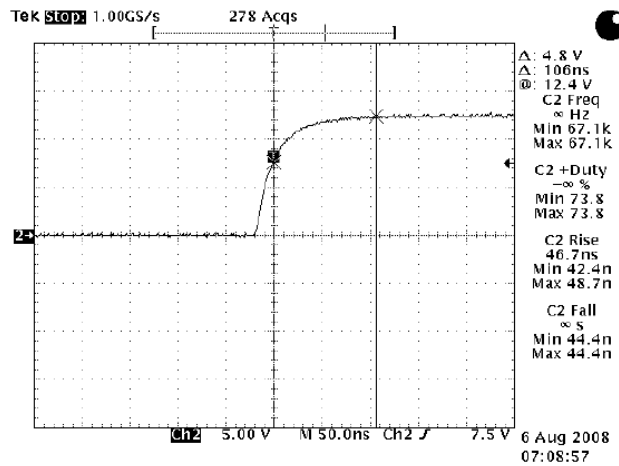
Falling Time Load



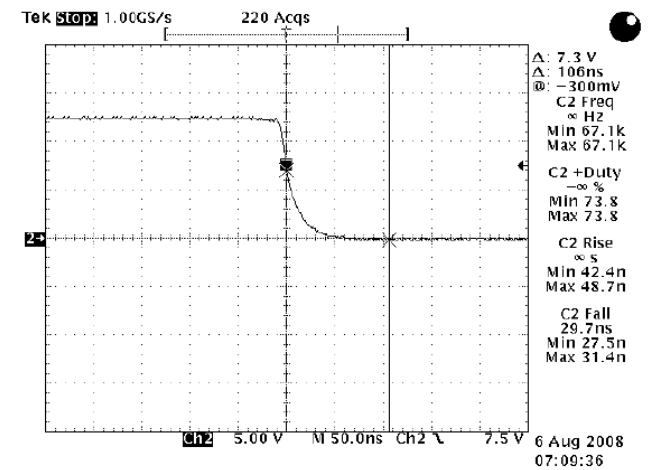
Rising Time Load



Falling Time Load



Rising Time Load

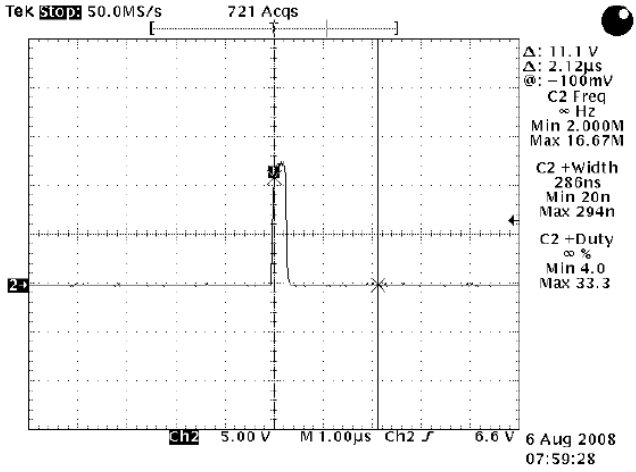


Falling Time Load

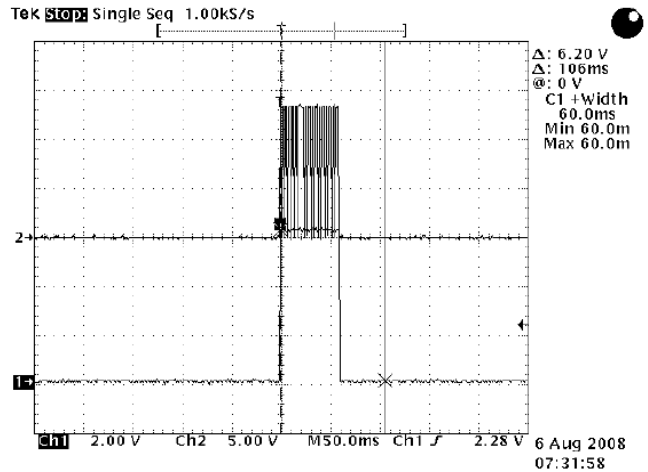


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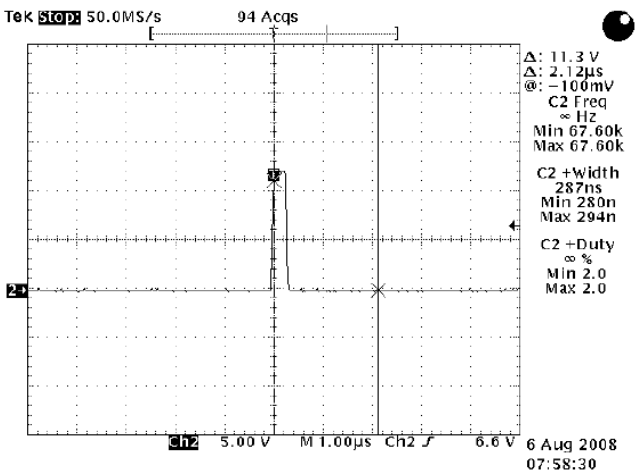
PERFORMANCE CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, unless otherwise specified.)



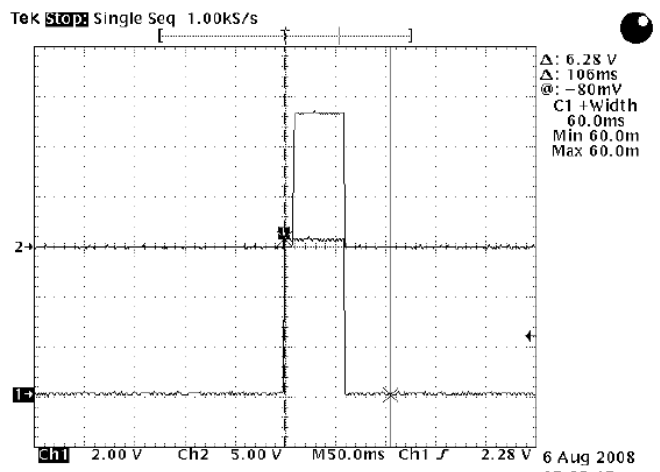
Leading Edge Blanking Time



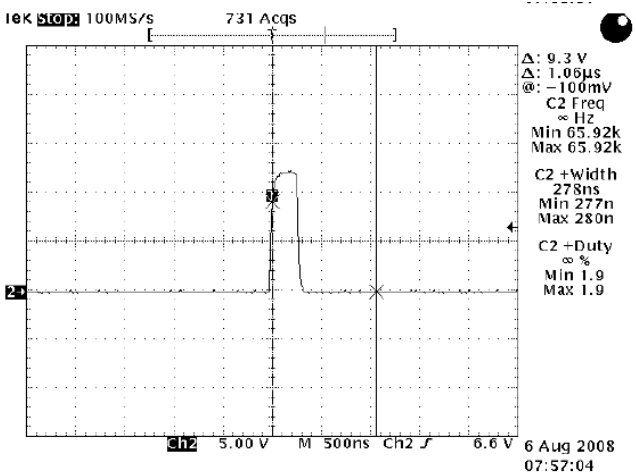
OLP Delay Time



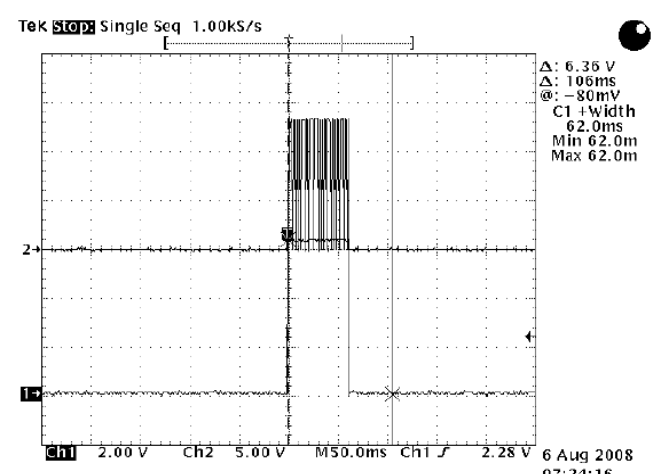
Leading Edge Blanking Time



OLP Delay Time



Leading Edge Blanking Time



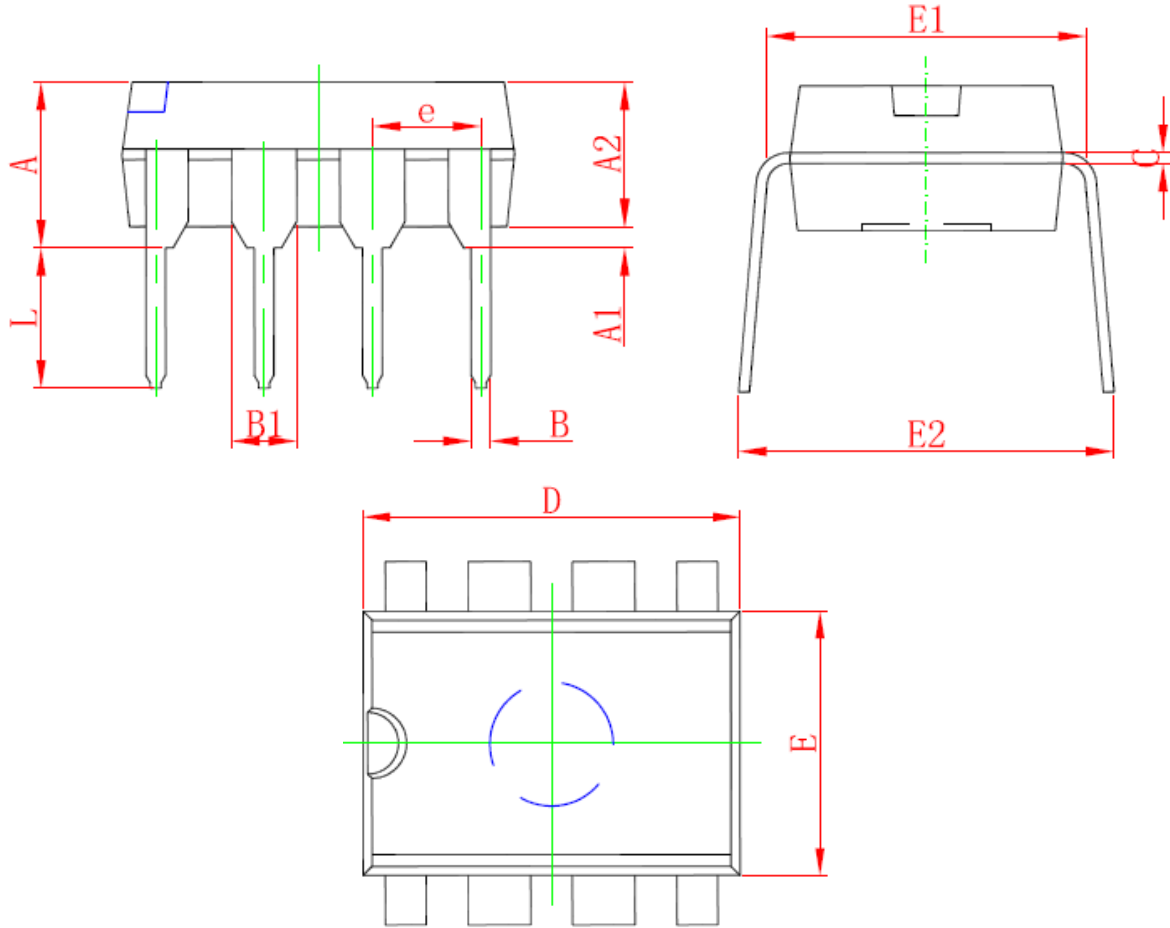
OLP Delay Time



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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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