



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

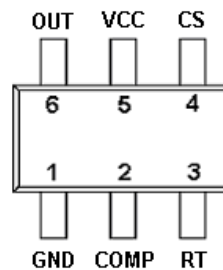
- High-Voltage BiCMOS Process
- Very Low Startup Current (<20μA)
- Under Voltage Lockout (UVLO)
- Current Mode Control
- Non-audible-noise Green Mode Control
- Current Limiting
- LEB (Leading-Edge Blanking) on CS Pin
- OLP (Over Load Protection)
- OVP (Over Voltage Protection) on Vcc Pin
- Leading-Edge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

APPLICATIONS

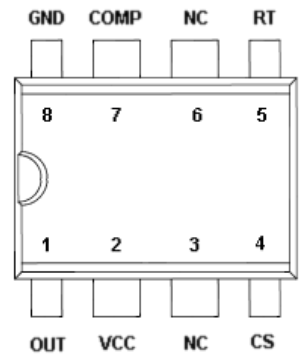
- AC/DC Switching Power Adaptor
- Battery Charger
- PC 5V Standby Power.
- Open-Frame Switching Power Supply

PIN CONFIGURATION

SOT-23-6L

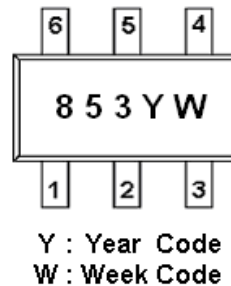


DIP-8P

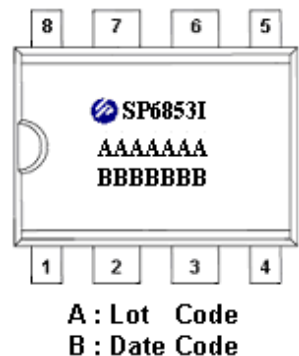


PART MARKING

SOT-23-6L



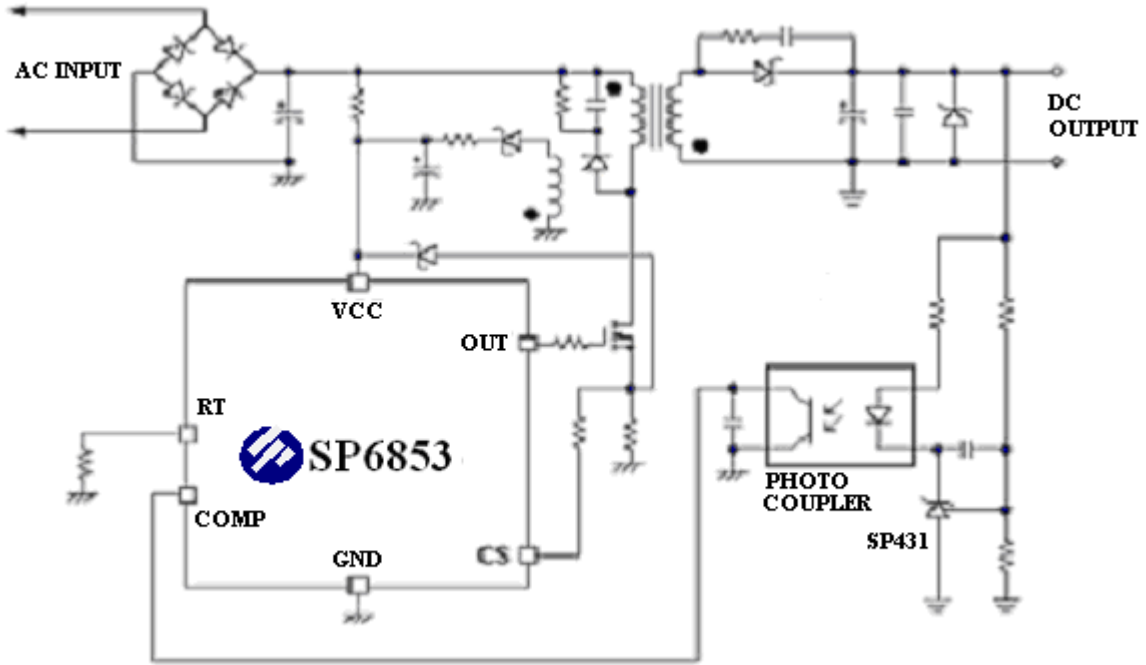
DIP-8P



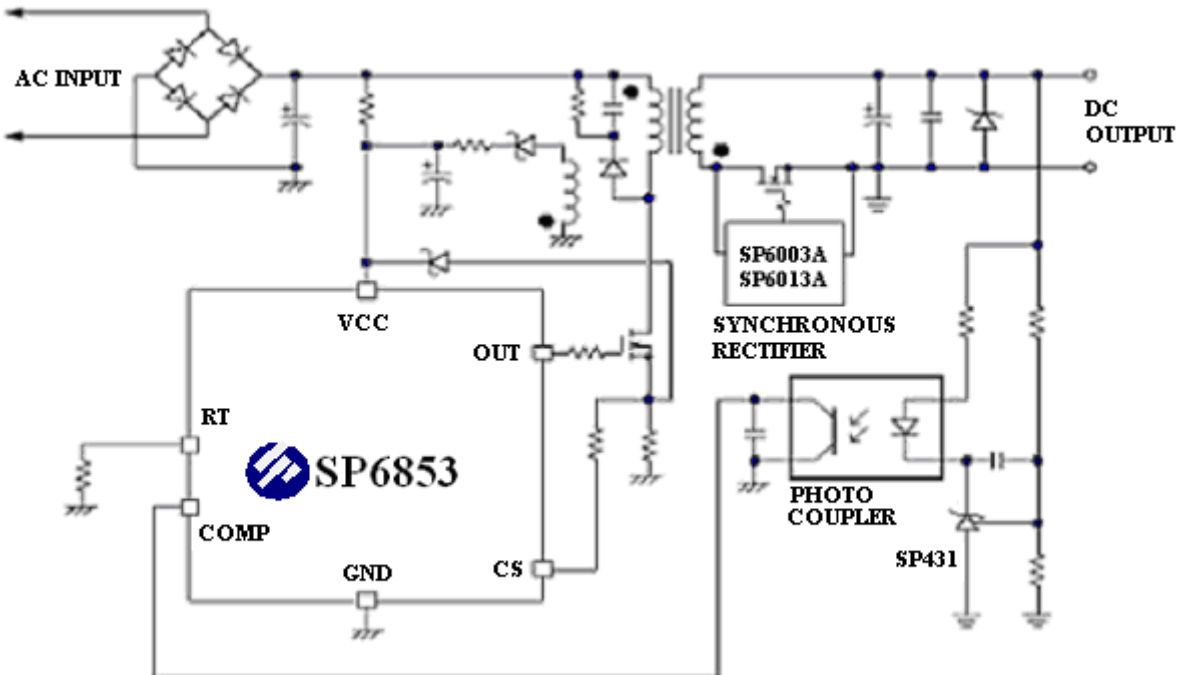


SP6853 Green-Mode PWM Controller

TYPICAL APPLICATION CIRCUIT



TYPICAL APPLICATION CIRCUIT (High Efficiency SMPS + Synchronous Rectifier)





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PIN DESCRIPTION

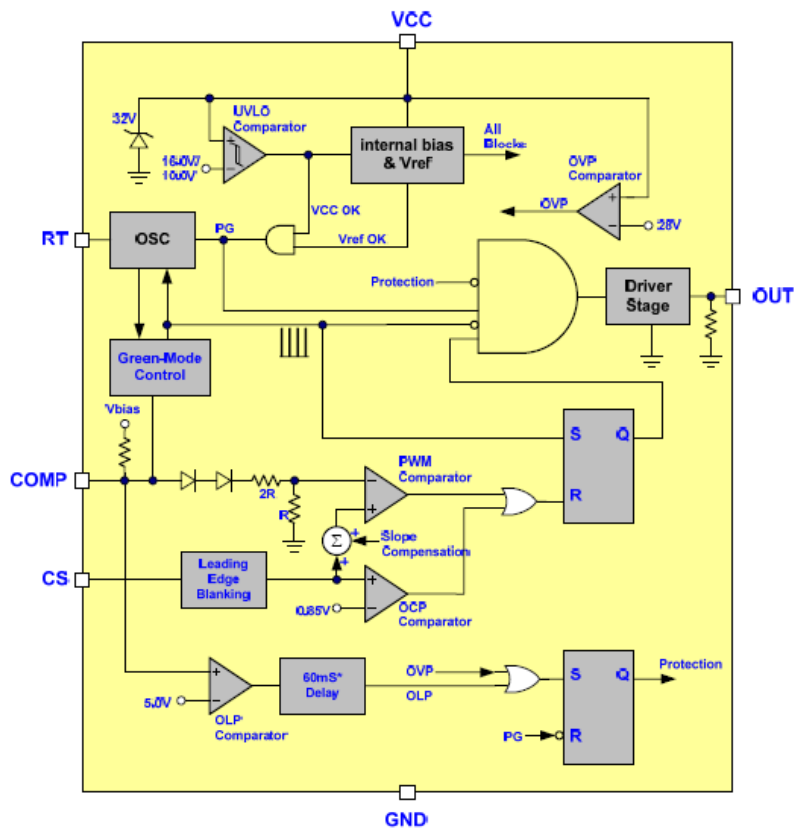
SP6853D8TG

| 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





SP6853

Green-Mode PWM Controller

ORDERING INFORMATION

| Part Number | Package | Part Marking |
|--------------|-----------|--------------|
| SP6853D8TGB | DIP-8P | SP6853I |
| SP6853S26RGB | SOT-23-6L | 853YW |

※ SP6853D8TGB : Tube ; Pb – Free ; Halogen-Free

※ SP6853S26RGB : Tape Reel ; 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 |
| 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 |
| R _{θJC} | 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.



SP6853

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 |
|---------------------------------------|--|---|------|------|------|------------|
| 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 | | 24 | 26 | 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 | 75.0 | 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-25V) | | | 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 |
| Gate Driver Output (OUT Pin) | | | | | | |
| DC (Max) | Maximum Duty Cycle | | 70 | 75 | 80 | % |
| DC (Min) | Minimum Duty Cycle | | | 0 | | % |
| V _{OL} | Output Low Level | V _{CC} =15V, I _o =20mA | | | 1 | V |
| V _{OH} | Output High Level | V _{CC} =15V, I _o =20mA | 8 | | | V |
| T _r | Rising Time | Load Cap=1000pF | | 50 | 200 | nS |
| T _f | Falling Time | Load Cap=1000pF | | 30 | 120 | nS |
| OLP (Over Load Protection) | | | | | | |
| T _{LLOLP} | 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.)

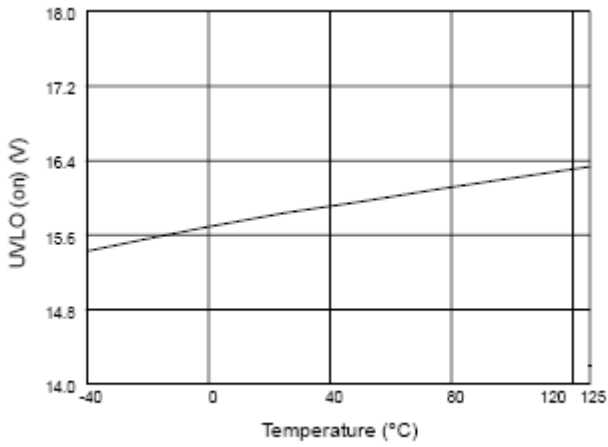


Fig. 1 UVLO (on) vs. Temperature

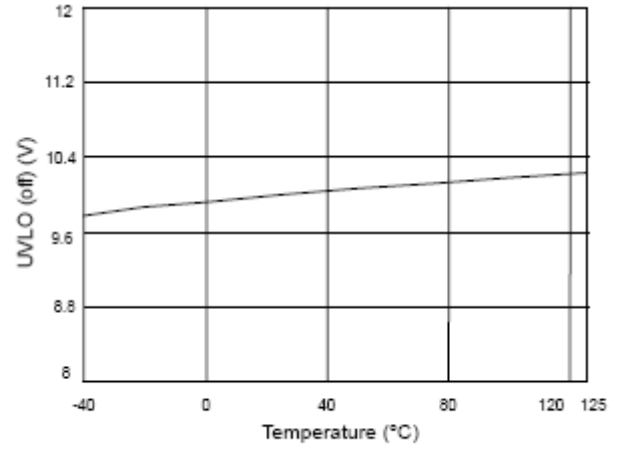


Fig. 2 UVLO (off) vs. Temperature

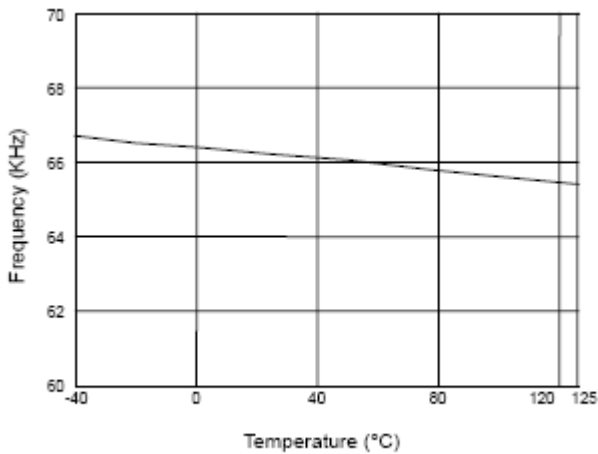


Fig. 3 Frequency vs. Temperature

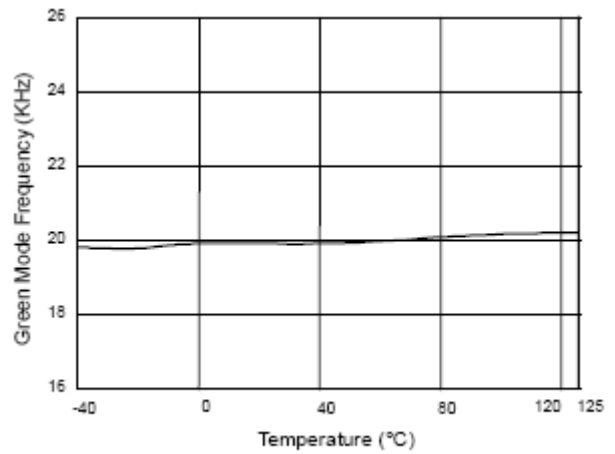


Fig. 4 Green Mode Frequency vs. Temperature

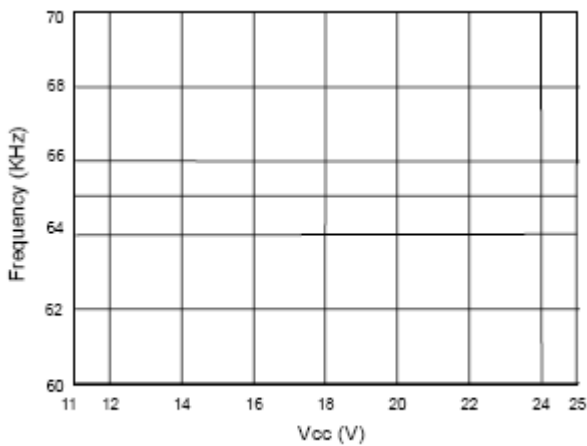


Fig. 5 Frequency vs. Vcc

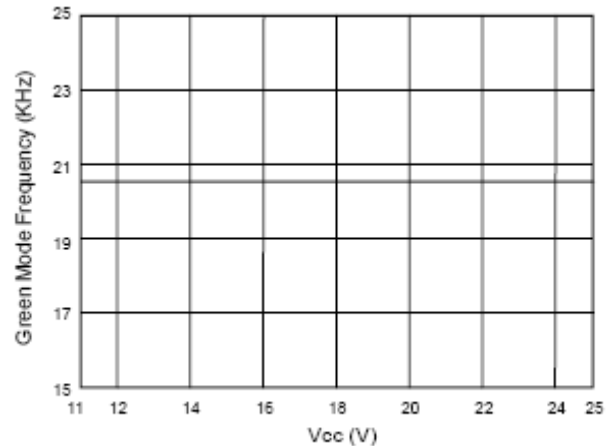


Fig. 6 Green Mode Frequency vs. Vcc



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

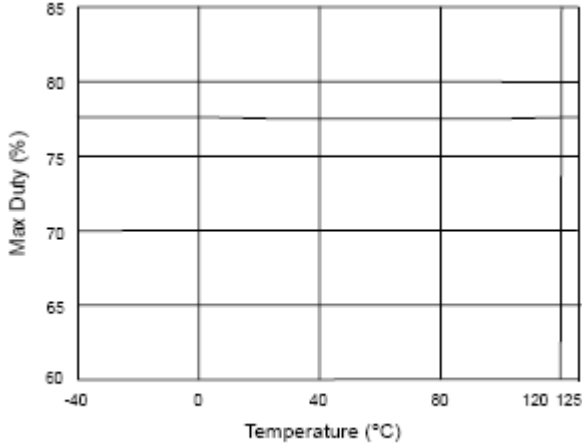


Fig. 7 Max Duty vs. Temperature

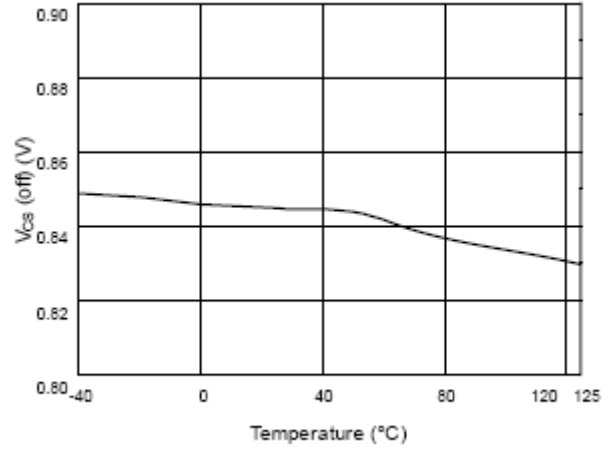


Fig. 8 $V_{CS}(\text{off})$ vs. Temperature

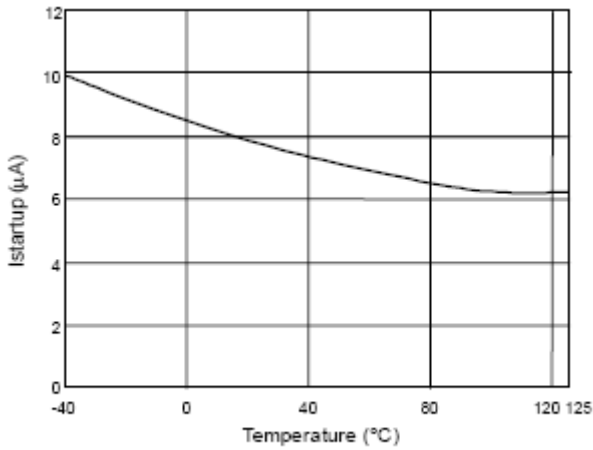


Fig. 9 Startup Current (I_{startup}) vs. Temperature

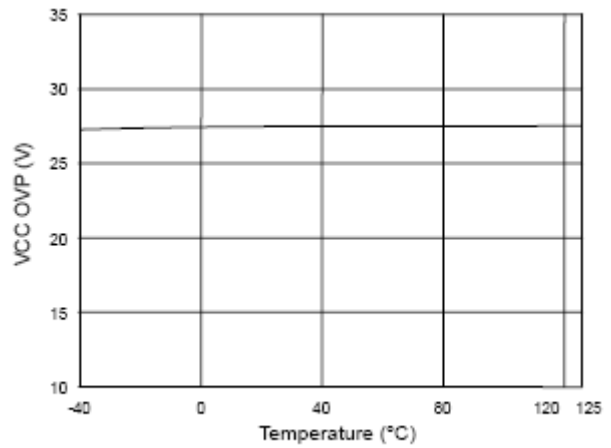


Fig. 10 VCC OVP vs. Temperature

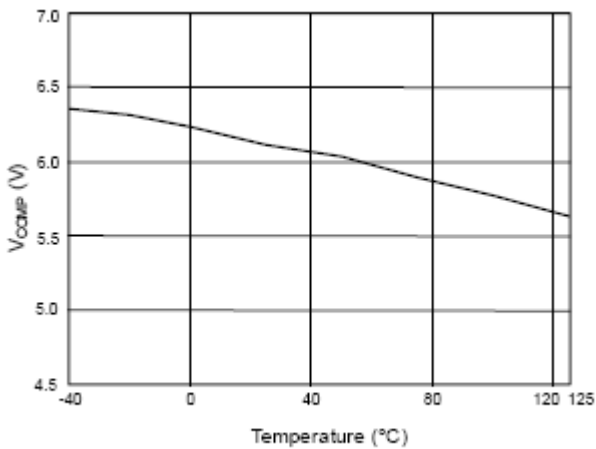


Fig. 11 V_{COMP} open loop voltage vs. Temperature

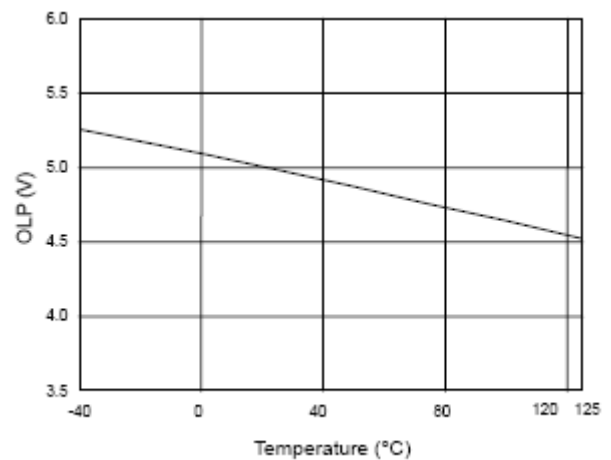
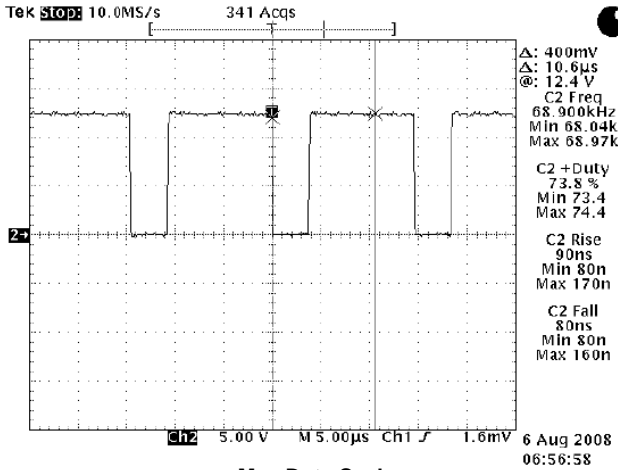


Fig. 12 OLP-Trip Level vs. Temperature

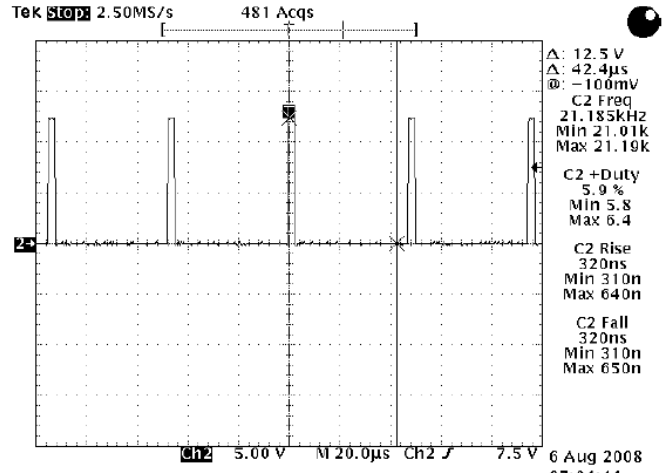


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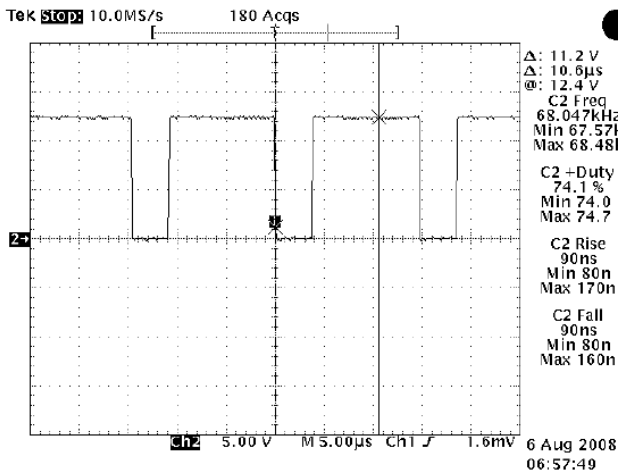
PERFORMANCE CHARACTERISTICS (T_A=25°C, unless otherwise specified.)



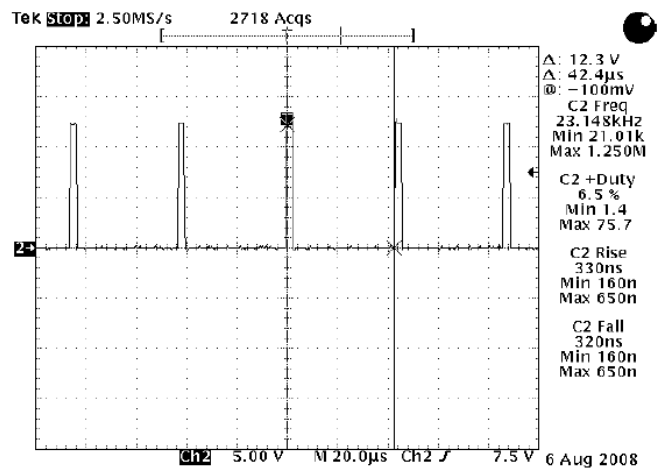
Max Duty Cycle



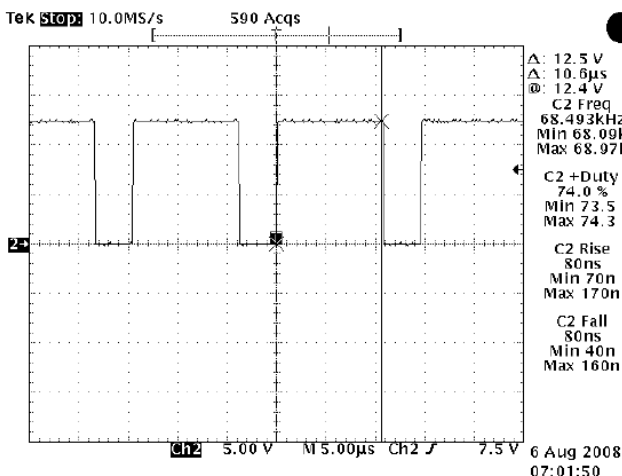
Min Duty Cycle



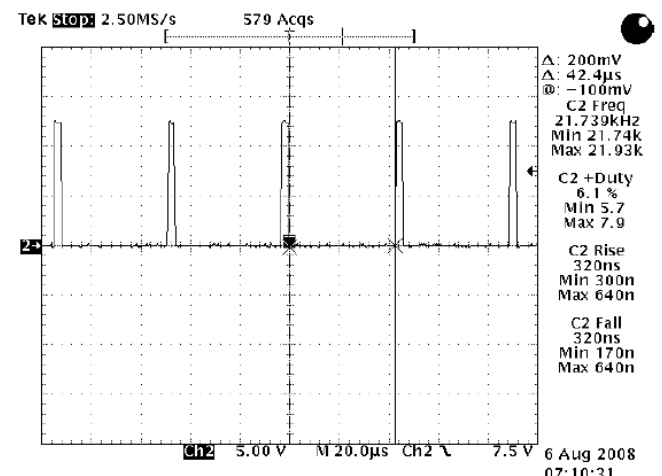
Max Duty Cycle



Min Duty Cycle



Max Duty Cycle

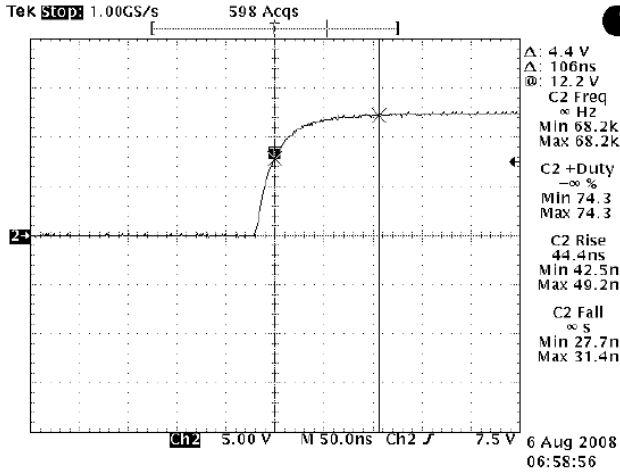


Min Duty Cycle

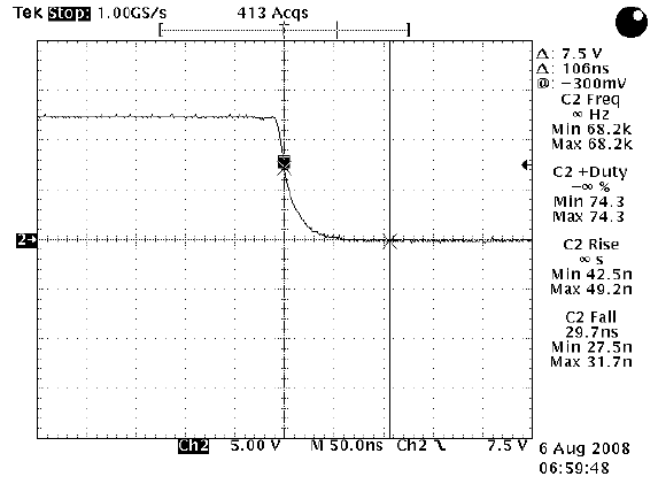


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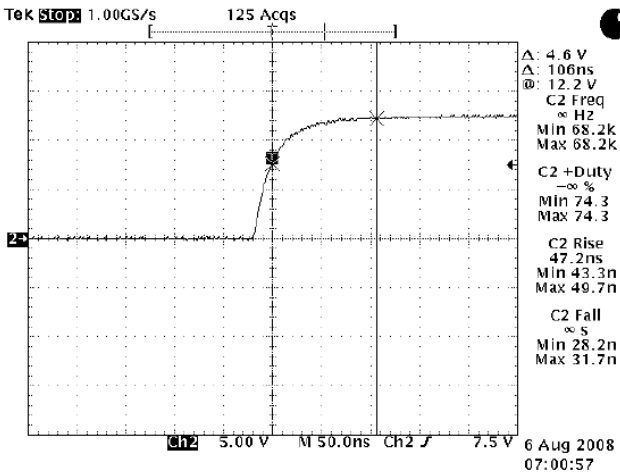
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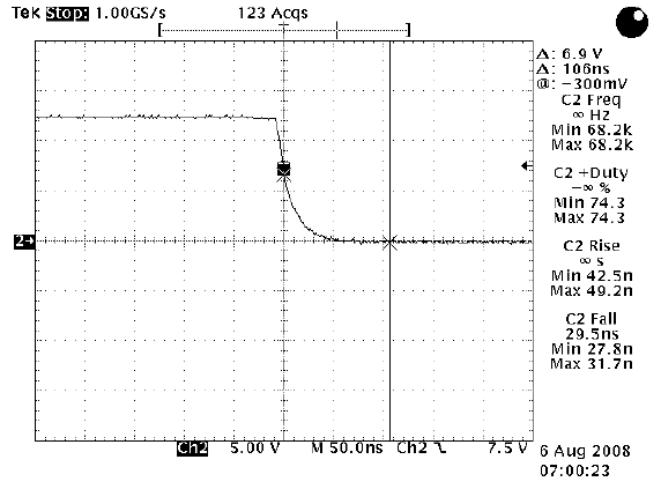
Rising Time Load



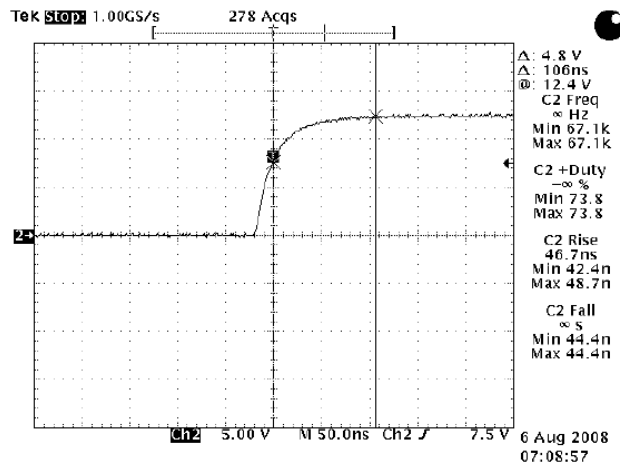
Falling Time Load



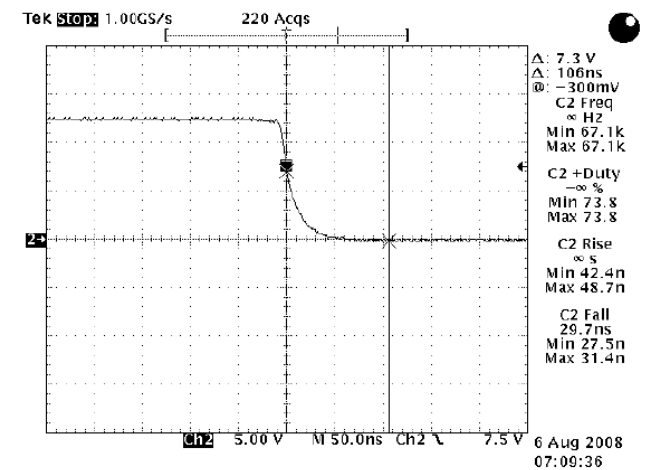
Rising Time Load



Falling Time Load



Rising Time Load

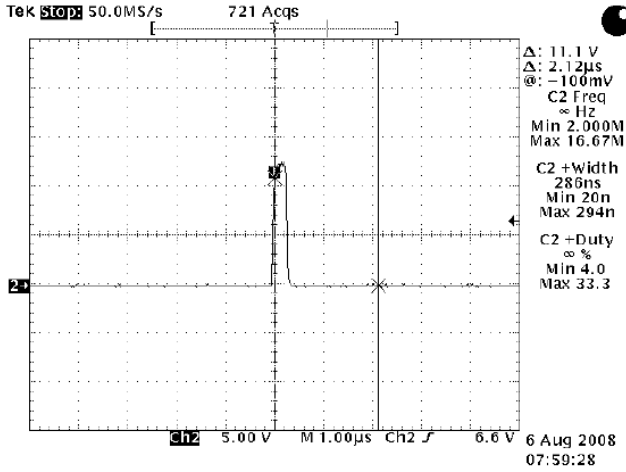


Falling Time Load

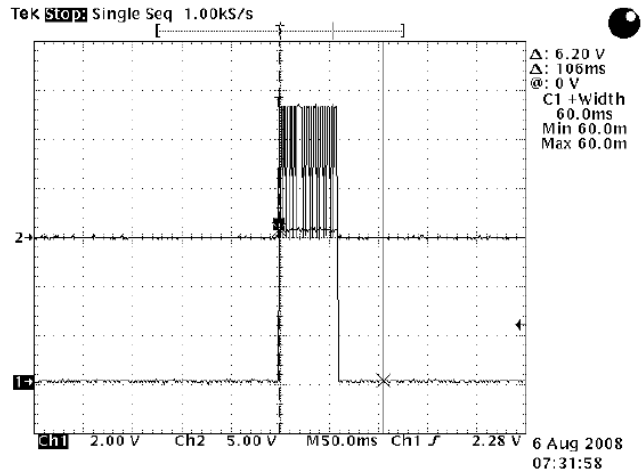


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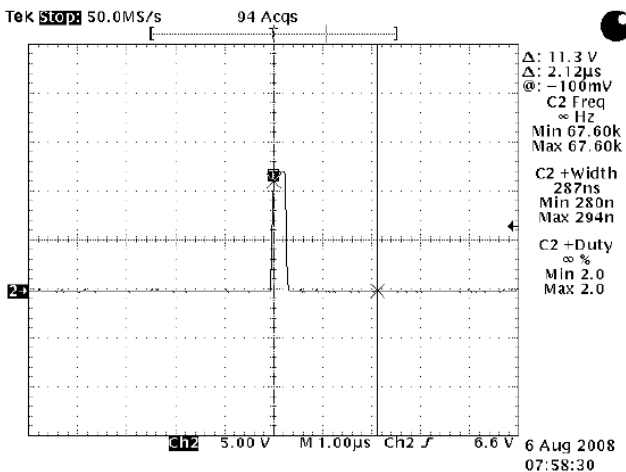
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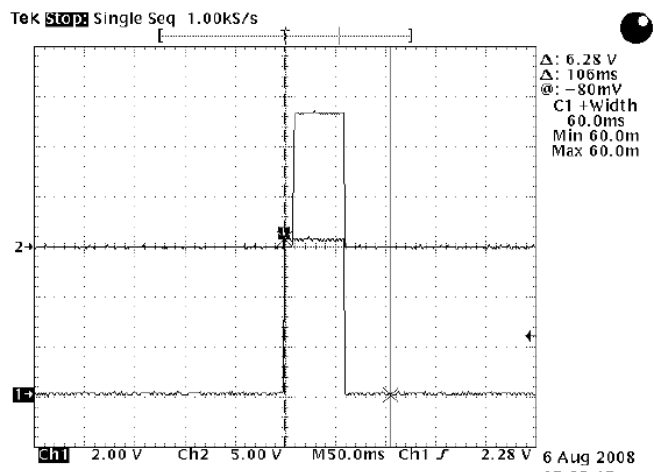
Leading Edge Blanking Time



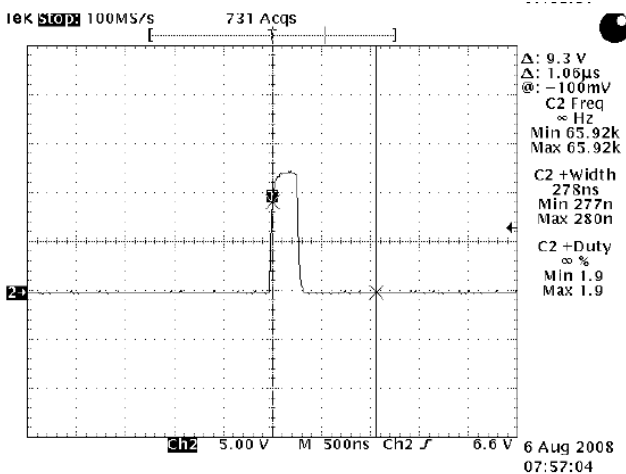
OLP Delay Time



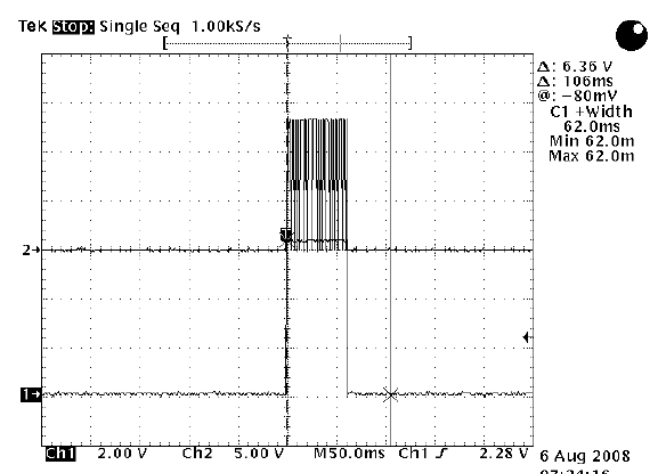
Leading Edge Blanking Time



OLP Delay Time



Leading Edge Blanking Time



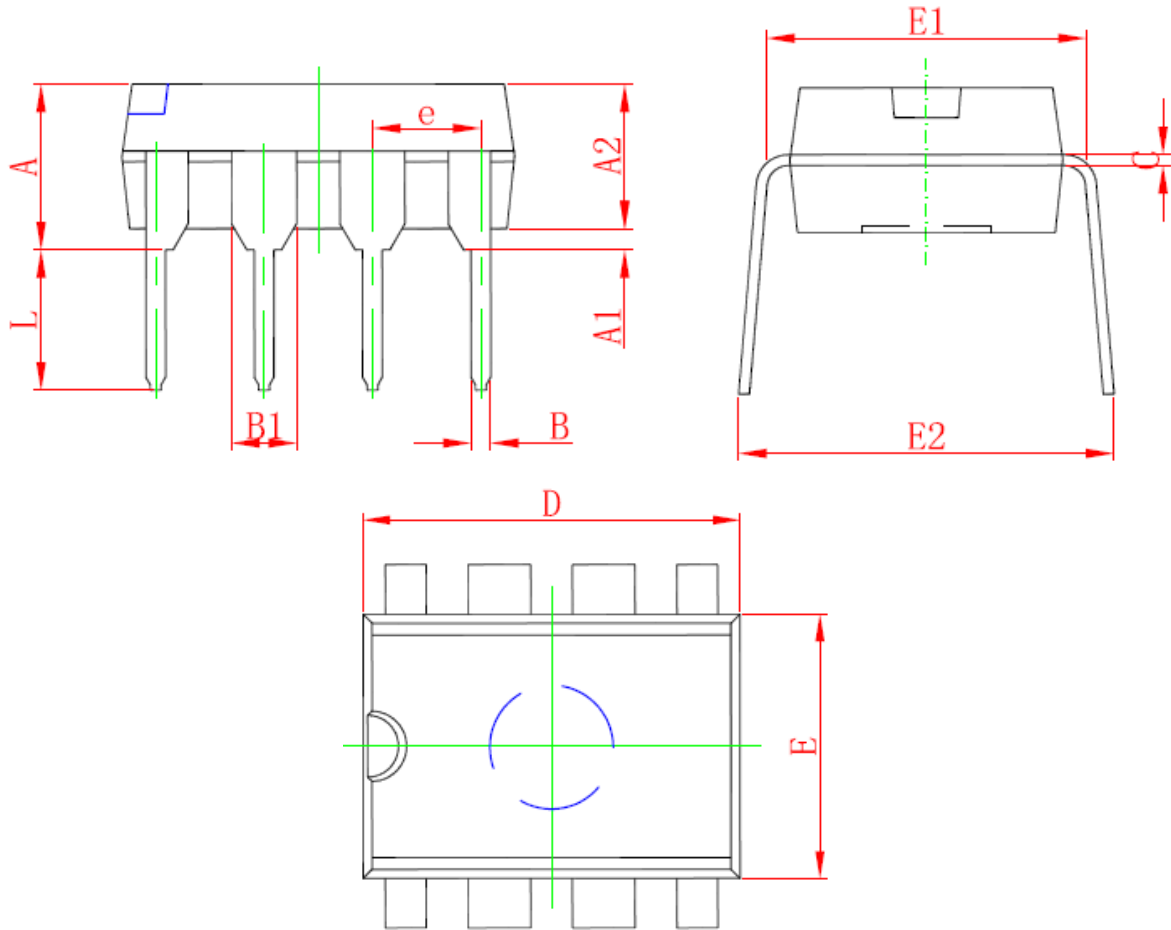
OLP Delay Time



SP6853

Green-Mode PWM Controller

DIP- 8P PACKAGE OUTLINE



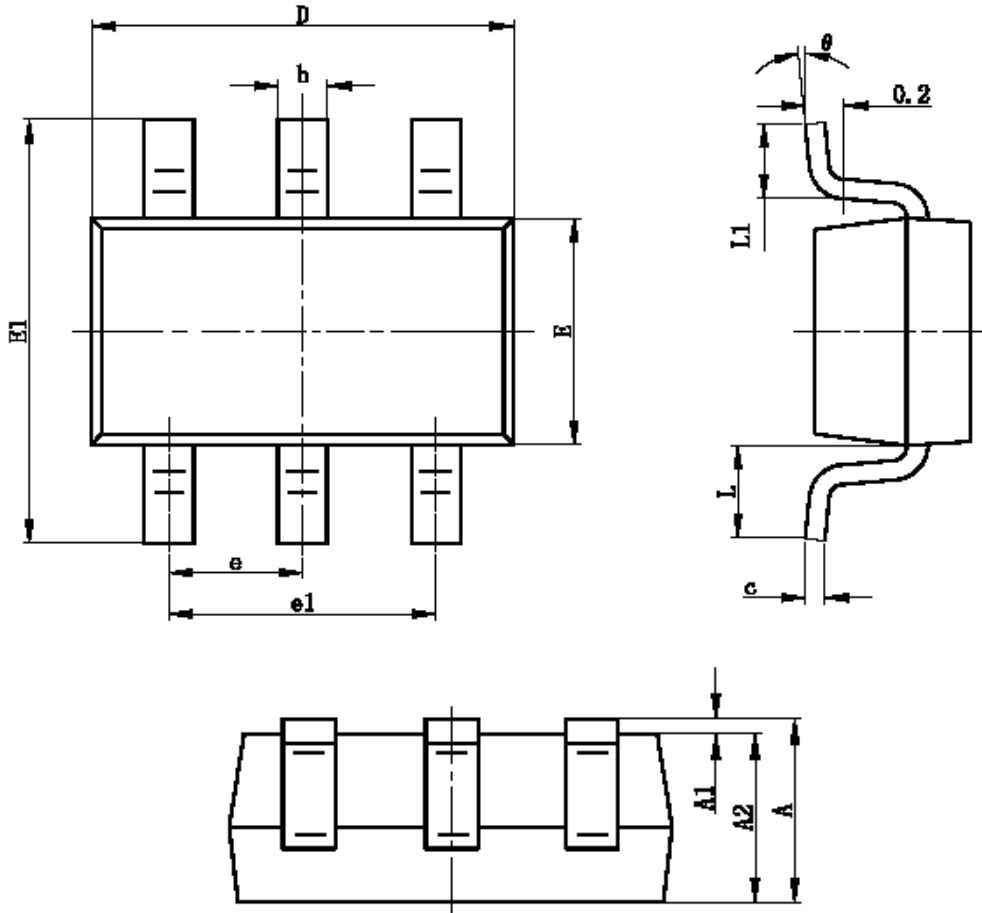
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 3.710 | 4.310 | 0.146 | 0.170 |
| A1 | 0.510 | | 0.020 | |
| A2 | 3.200 | 3.600 | 0.126 | 0.142 |
| B | 0.380 | 0.570 | 0.015 | 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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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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SYNC Power Corporation

7F-2, No.3-1, Park Street

NanKang District (NKSP), Taipei, Taiwan, 115, R.O.C

Phone: 886-2-2655-8178

Fax: 886-2-2655-8468

<http://www.syncpower.com>