# SP6850
## Green-Mode PWM Controller

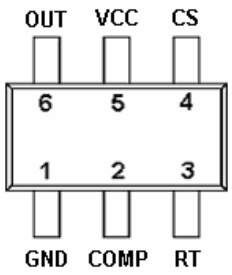
### DESCRIPTION
The SP6850 is the current mode PWM controller with green-mode power-saving operation, to meet the low standby-power needs of low-power SMPS. This green-mode function enables the power supply to easily meet even the strictest power conservation requirements. The functions such as the leading-edge 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

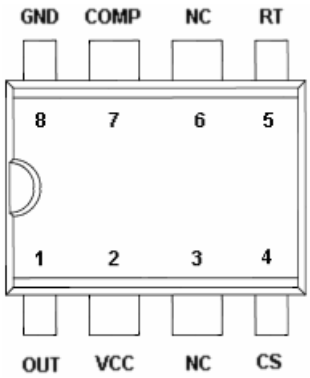
### FEATURES
- High-Voltage BiCMOS Process
- Very Low Startup Current (Typ ~ 8μA)
- Under Voltage Lockout (UVLO )
- Current Mode Control with Cycle Peak
- Current Limiting
- Leading-Edge Blanking
- Programmable Switching Frequency
- Internal Slope Compensation
- Green-Mode Control for Power Saving
-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

### PIN CONFIGURATION

**SOT-23-6L**

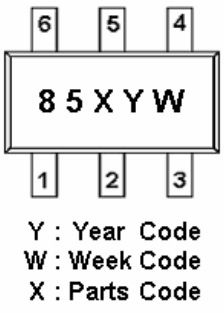



**DIP-8P**



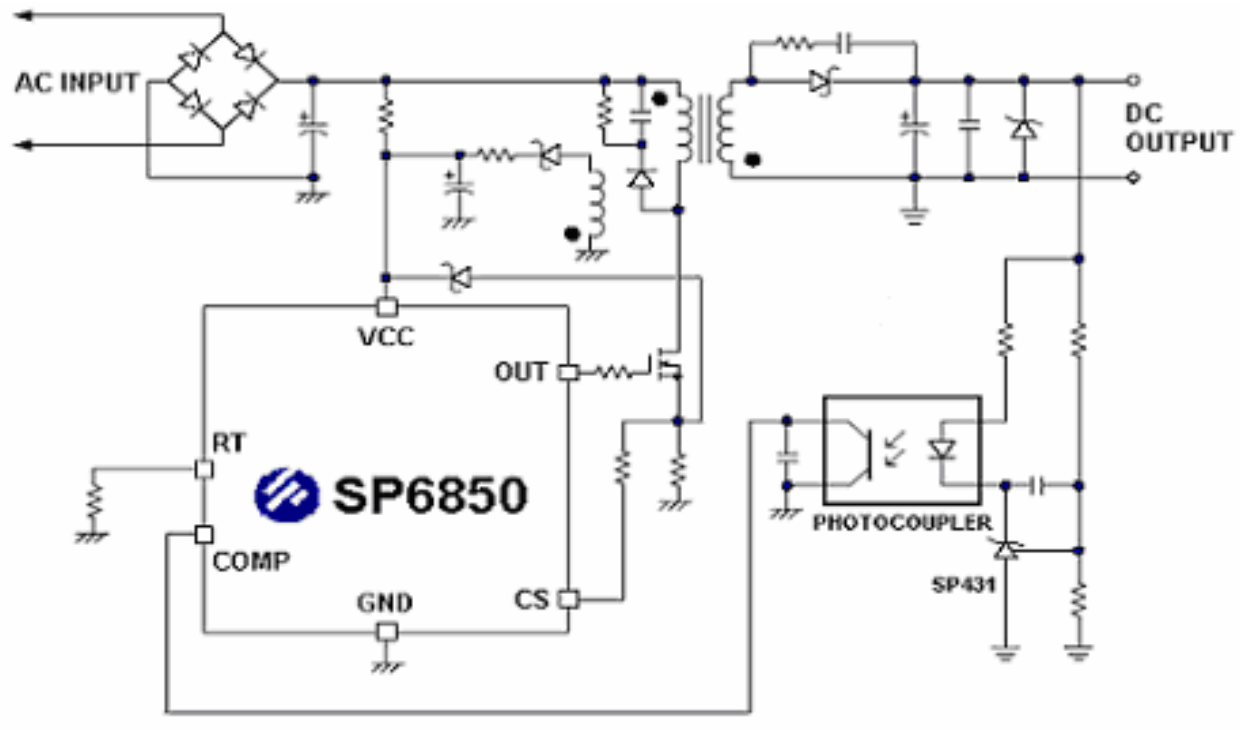

### PART MARKING

**SOT-23-6L**

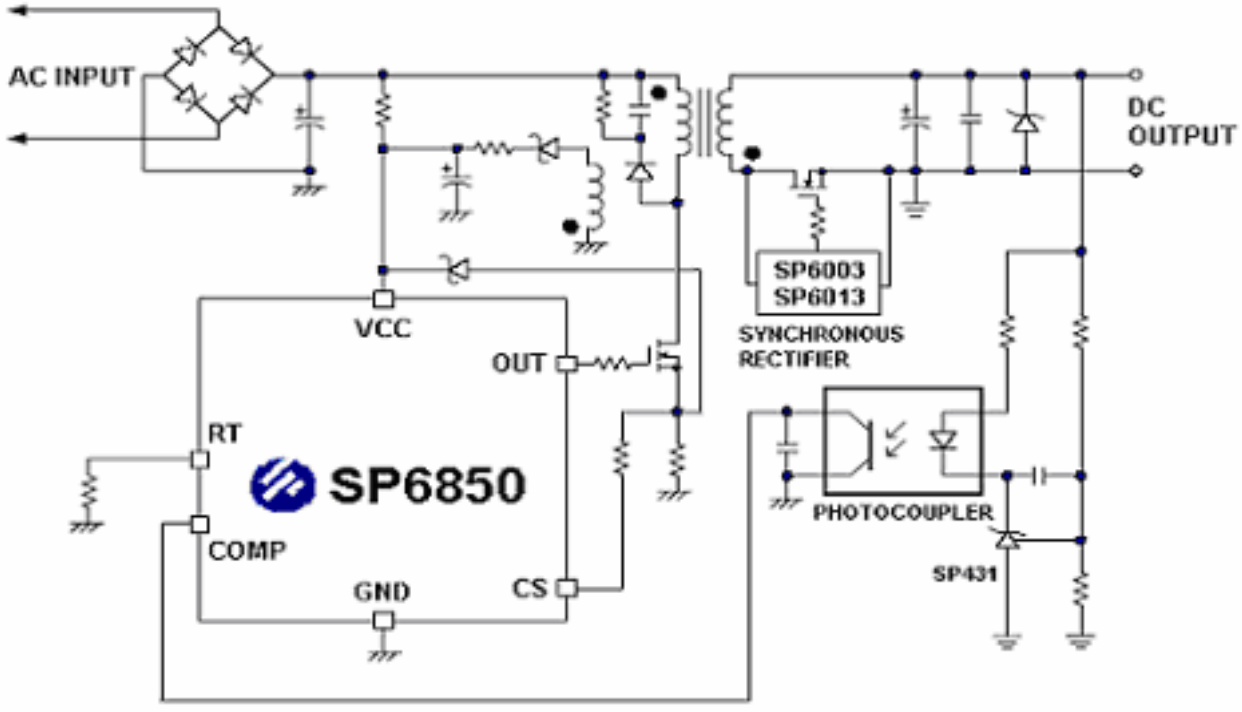



**DIP-8P**

**TYPICAL APPLCATION CIRCUIT**




**TYPICAL APPLCATION CIRCUIT ( High Efficiency SMPS + Synchronous Rectifier )**



## PIN DESCRIPTION

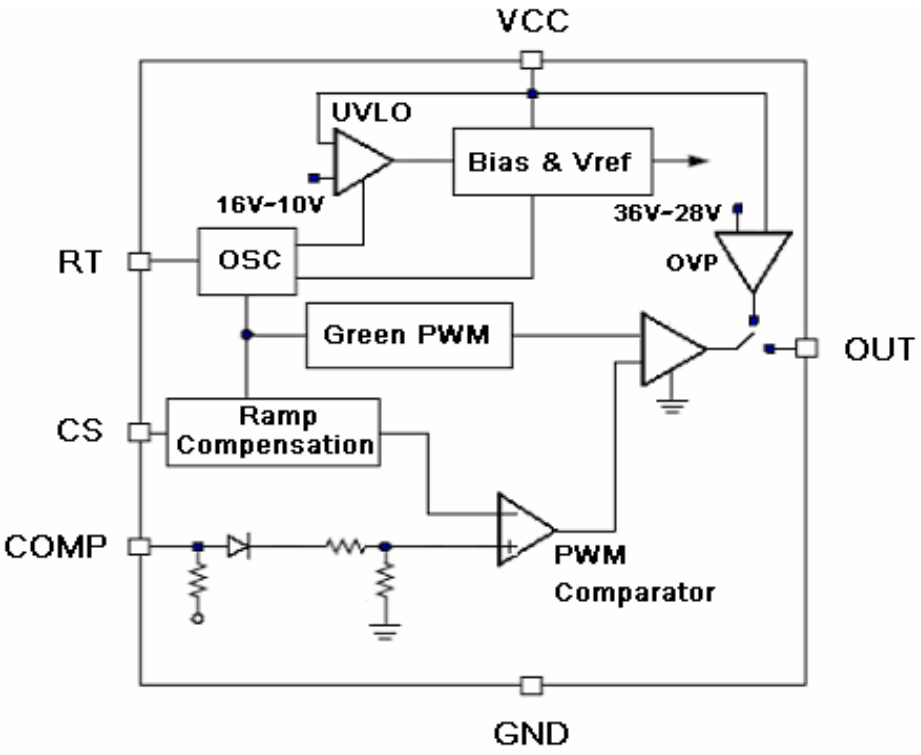
**SP6850D8TG**

| 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



**ORDERING INFORMATION**

| Part Number | Package | Part Marking |
|---|---|---|
| SP6850AD8TG | DIP-8P | SP6850**I** |
| SP6850BD8TG | DIP-8P | SP6850**I** |
| SP6850AS26RG | SOT-23-6L | 85AYW |
| SP6850BS26RG | SOT-23-6L | 850YW |

※ SP6850AD8TG / SP6850BD8TG : Tube ; Pb – Free

※ SP6850AS26RG / SP6850BS26RG : Tape Reel ; Pb – Free

**ABSOULTE MAXIMUM RATINGS** ($T_A$=25℃, 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℃ (*) | | 0.3 | W |
| ESD | Human Body Model | | 4 | KV |
| | Machine Model | | 300 | V |
| $T_{ope}$ | Operating Ambient Temperature | | -40 ~ 85 | ℃ |
| $T_J$ | Operating Junction Temperature Range | | -40 ~ 150 | ℃ |
| $T_{STG}$ | Storage Temperature Range | | -40 ~ 150 | ℃ |
| $T_{LEAD}$ | Pb-Free Lead Soldering Temperature for 5 sec. | | 260 | ℃ |
| $R_{\Theta JC}$ | Thermal Resistance Junction – Case (*) | SOT-23-6L | 210 | ℃/W |
| | | DIP-8P | 95 | |

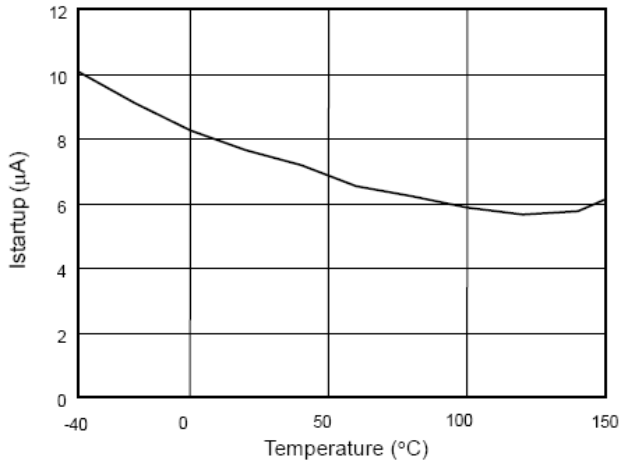
(*) The power dissipation and thermal resistance are evaluated under copper board mounted with free air conditions.

## ELECTRICAL CHARACTERISTICS

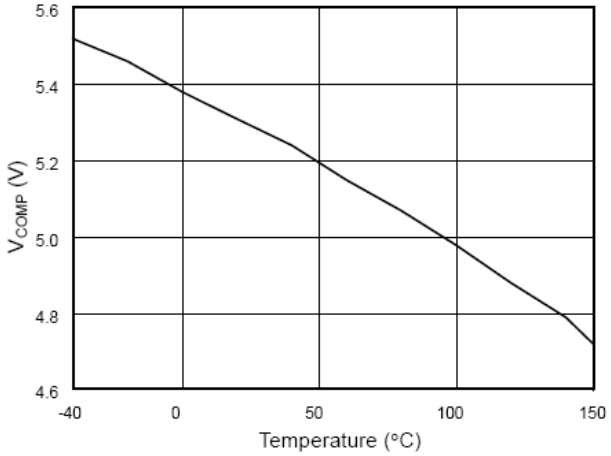
($T_A$=25℃, $V_{CC}$=15V, unless otherwise specified.)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Supply Voltage ( Vcc Pin )** | | | | | | |
| Istt | Startup Current | | | 8 | 20 | uA |
| Iop | Operating Current | VCOMP = 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 |
| **Voltage Feedback ( Comp Pin )** | | | | | | |
| Isc | Short Circuit Current | | | 2.2 | 3.0 | mA |
| Vop | Open Loop Voltage | | | 5.0 | | V |
| VTH(GM) | Green Mode Threshold VCOMP | | | 2.35 | | V |
| **Oscillator ( RT Pin )** | | | | | | |
| FOSC | Frequency | RT=100KΩ | 60.0 | 65.0 | 75.0 | KHz |
| FOSC(GM) | Green Mode Frequency | Fs=65.0KHz | | 20 | | KHz |
| Fdt | Frequency Variation versus Temp. Deviation | (-40°C ~105°C) | | | 3 | % |
| Fdv | Frequency Variation versus VCC Deviation | (VCC=11V-25V) | | | 1 | % |
| **Current Sensing ( CS Pin )** | | | | | | |
| Vcs(off) | Maximum Input Voltage | SP6850BD8TG<br>SP6850BS26RG | 0.8 | 0.85 | 0.9 | V |
| | | SP6850AD8TG<br>SP6850AS26RG | 0.7 | 0.75 | 0.8 | |
| Zcs | Input impedance | | | 50 | | KΩ |
| TPD | Delay to Output | | | 150 | | nS |
| **Gate Driver Output ( OUT Pin )** | | | | | | |
| DC (Max) | Maximum Duty Cycle | | 70 | 75 | 80 | % |
| DC (Min) | Minimum Duty Cycle | | | 0 | | % |
| VOL | Output Low Level | VCC=15V,<br>Io=20mA | | | 1 | V |
| VOH | Output High Level | VCC=15V,<br>Io=20mA | 8 | | | V |
| Tr | Rising Time | Load Cap=1000pF | | 50 | 200 | nS |
| Tf | Falling Time | Load Cap=1000pF | | 30 | 120 | nS |

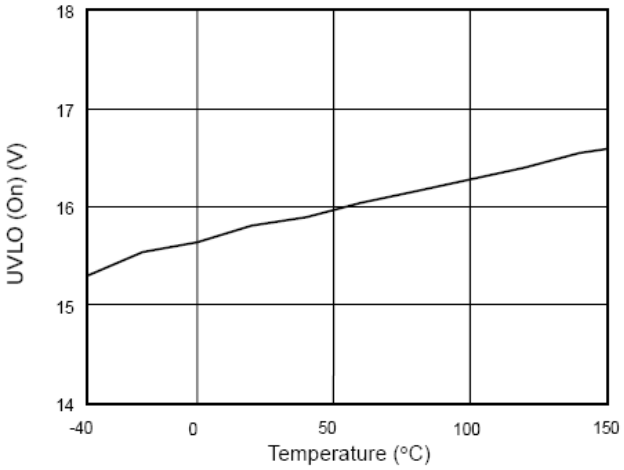
**PERFORMANCE CHARACTERISTICS** ($T_A$=25℃, unless otherwise specified.)



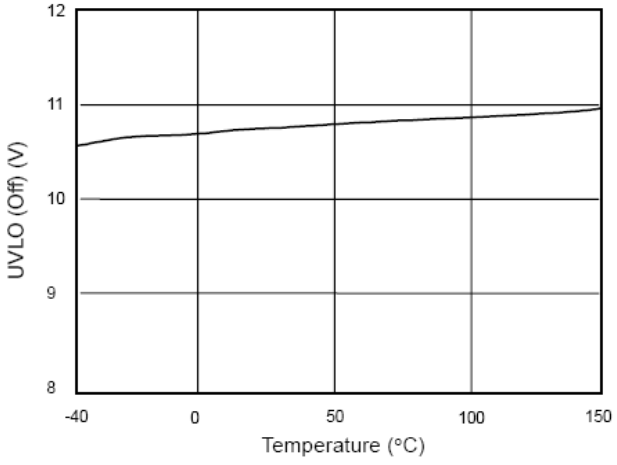

Startup Current (Istartup) vs. Temperature




$V_{COMP}$ open loop voltage v.s. Temperature

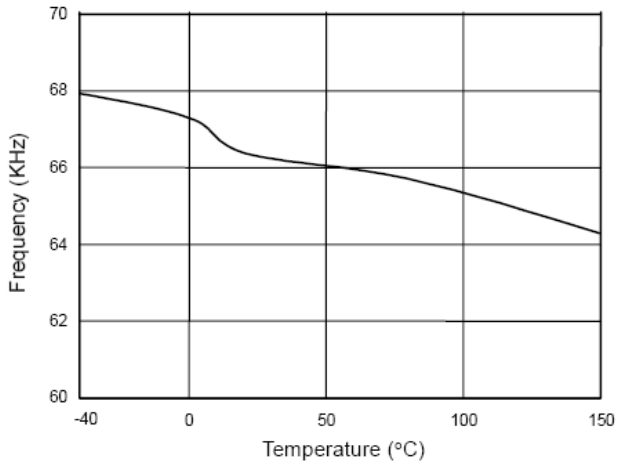



UVLO (On) vs. Temperature

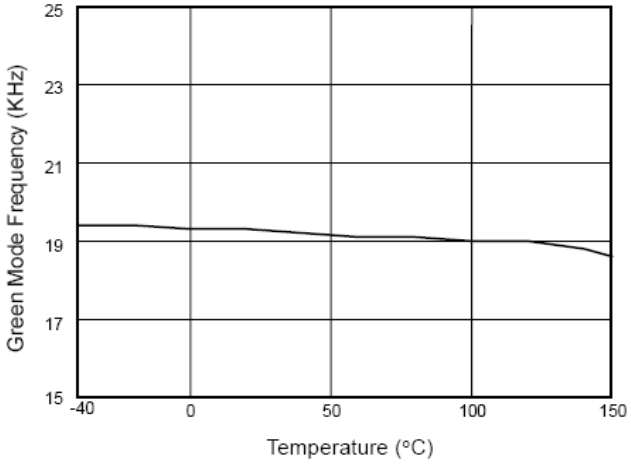



UVLO Off v.s. Temperature

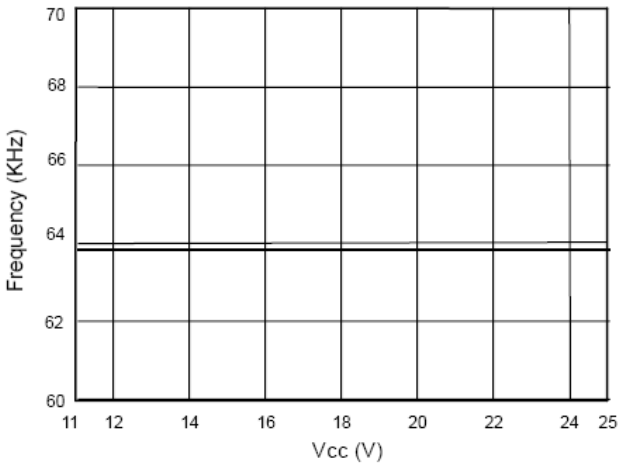
**PERFORMANCE CHARACTERISTICS** ($T_A$=25℃, unless otherwise specified.)



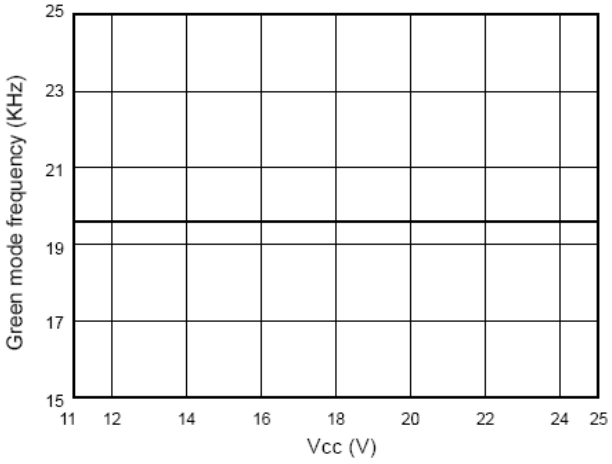

Frequency v.s. Temperature




Green Mode Frequency v.s. Temperature

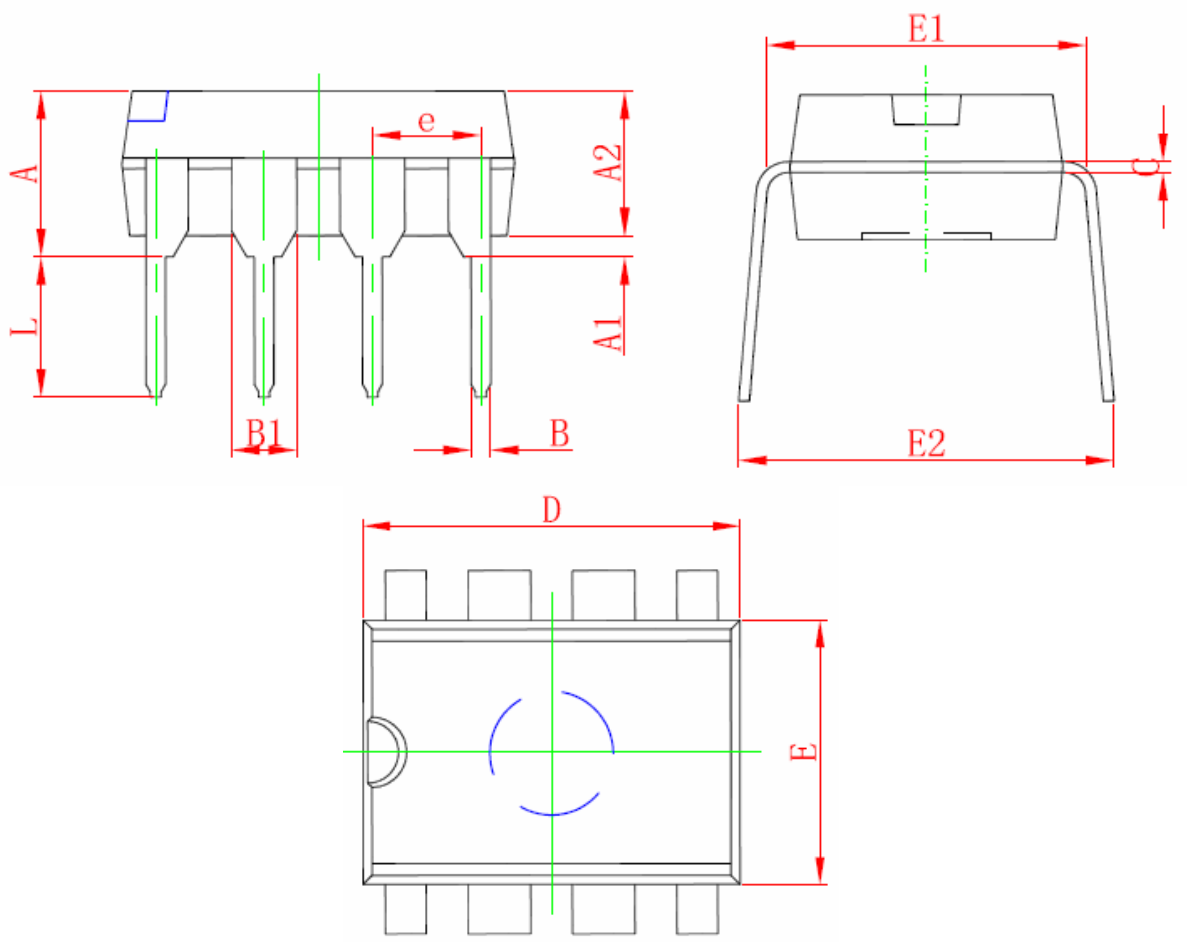



Frequency v.s. Vcc



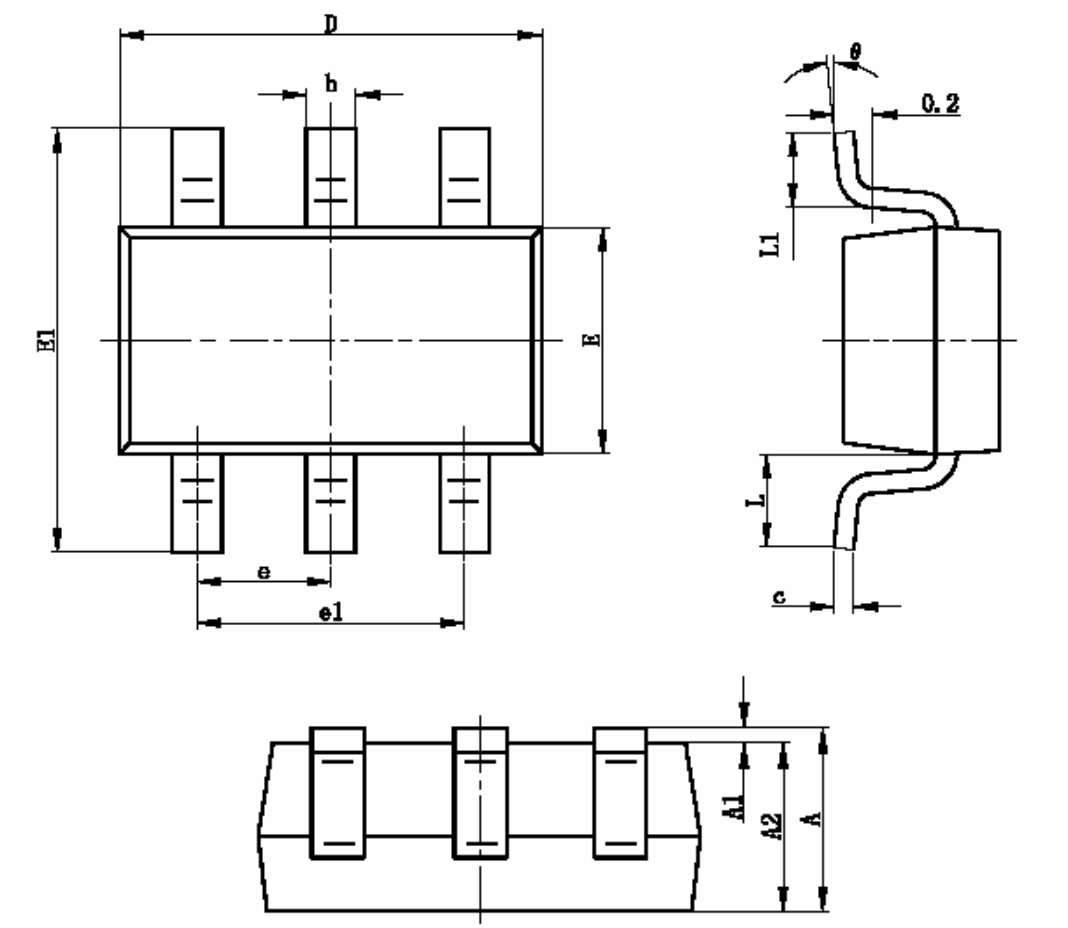

Green mode frequency v.s. Vcc

**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 |

**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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