# Current Mode PWM Power Switch

## GENERAL DESCRIPTION

BL8851 combines a dedicated current mode PWM controller. It is optimized for high performance, low standby power, and cost effective off- line flyback converter applications in 40W~60W range.

BL8851 offers complete protection coverage with automatic self-recovery feature including Cycle- by-Cycle current limiting (OCP),CS short protection, CS floating protection, over load protection (OLP), and VDD under voltage lockout (UVLO), over temperature protection (OTP), over voltage(fixed or adjustable) protection (OVP).

The tone energy at below 20KHZ is minimized in the design and audio noise is eliminated during operation..

BL8851 is offered in SOT23-6 package.

## FEATURES

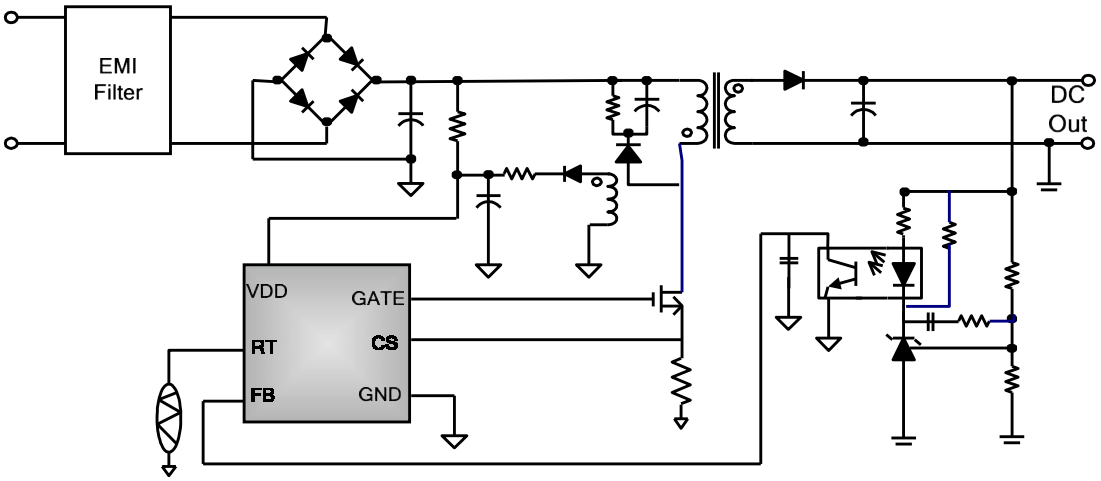
- Power on Soft Start Reducing MOSFET Vds Stress
- Frequency shuffling for EMI
- Extended Burst Mode Control For Improved Efficiency and Minimum Standby Power Design
- Audio Noise Free Operation
- Fixed 65KHZ Switching Frequency
- Internal Synchronized Slope Compensation
- Leading Edge Blanking on Current Sense Input
- Good Protection Coverage With Auto Self Recovery
  - VDD Under Voltage Lockout with Hysteresis(UVLO)
  - Over Temperature Protection (OTP) with auto-recovery
  - Cycle-by-cycle over current threshold setting for constant output power limiting over universal input voltage range
  - Overload Protection (OLP) with auto- recovery
  - Over voltage Protection(OVP) with auto-recovery
  - Adjustable OVP through external Zener

## APPLICATIONS

Offline AC/DC flyback converter for

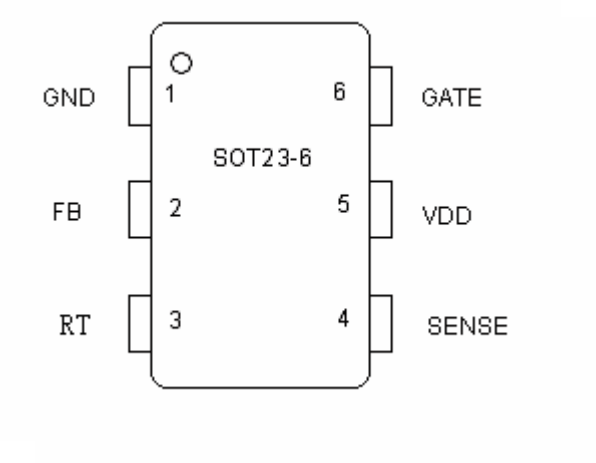
- AC/DC adapter
- PDA power supplies
- Digital Cameras and Camcorder Adapter
- VCR, SVR, STB, DVD&DVCD Player SMPS
- Set-Top Box Power
- Auxiliary Power Supply for PC and Server
- Open-frame SMPS

## TYPICAL APPLICATION




## Pin Configuration

The BL8851 is offered in SOT23-6 package, shown as below.




| Pin Name | I/O | Description |
|---|---|---|
| GND | P | Ground |
| FB | I | Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and the current-sense signal at Pin 3. |
| RT | I | Dual function pin. Either connected through a NTC resistor to ground for over temperature shutdown/latch control or connected through Zener to VDD for adjustable over voltage protection |
| CS | I | Current sense input |
| VDD | P | Power Supply |
| Gate | O | Totem-pole gate driver output for power Mosfet |

## RECOMMENDED OPERATING CONDITION

| Symbol | Parameter | Min/Max | Unit |
|---|---|---|---|
| VDD | VDD Supply Voltage | 10 to 30 | V |
| $T_A$ | Operating Ambient Temperature | -20 to 85 | ℃ |

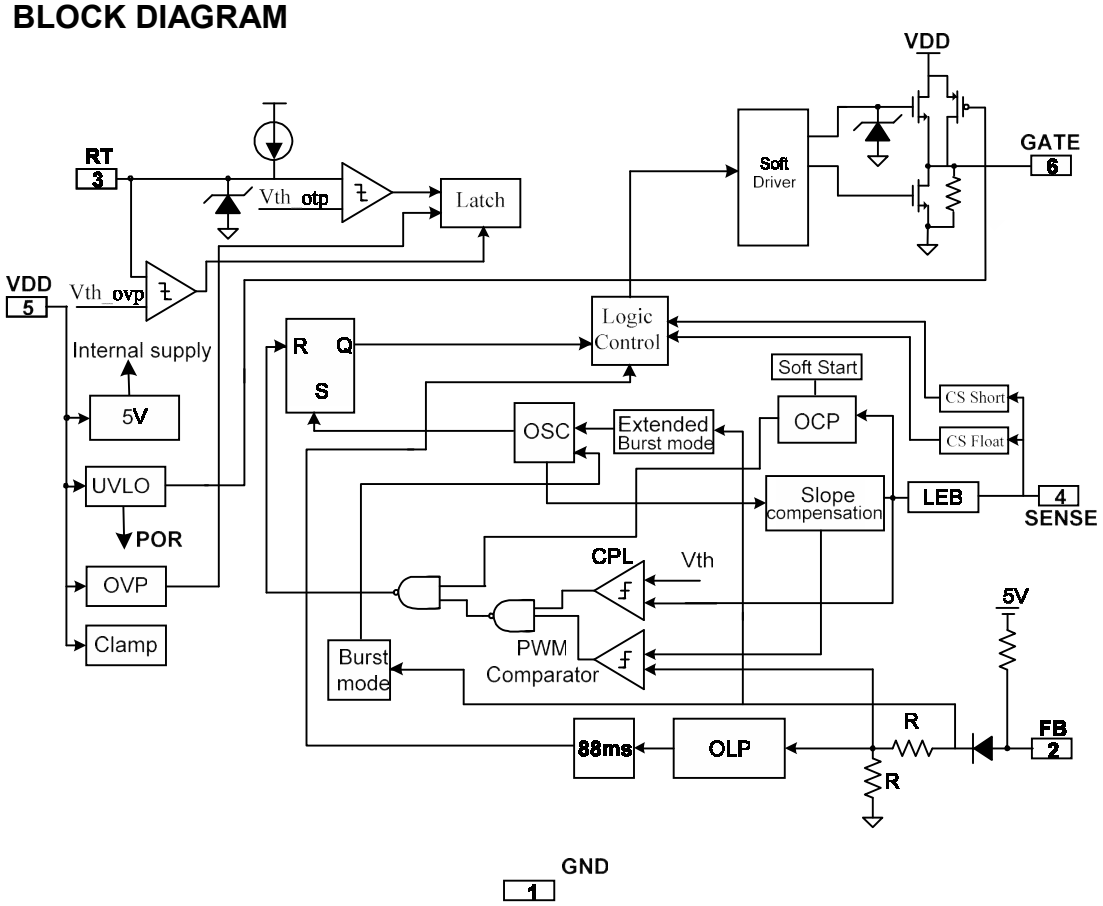
## Absolute Maximum Ratings

| Parameter | Value |
|---|---|
| VDD DC Supply Voltage | 40 V |
| VDD Zener Clamp Voltage[Note] | VDD_Clamp+0.1V |
| VDD DC Clamp Current | 10 mA |
| FB Input Voltage | -0.3 to 7V |
| Sense Input Voltage | -0.3 to 7V |
| RT Input Voltage | -0.3 to 7V |
| Min/Max Operating Junction Temperature TJ | -20 to 150 oC |
| Min/Max Storage Temperature Tstg | -55 to 160 oC |

**Note:** VDD_Clamp has a nominal value of 32V.

Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

## BLOCK DIAGRAM



## ELECTRICAL CHARACTERISTICS

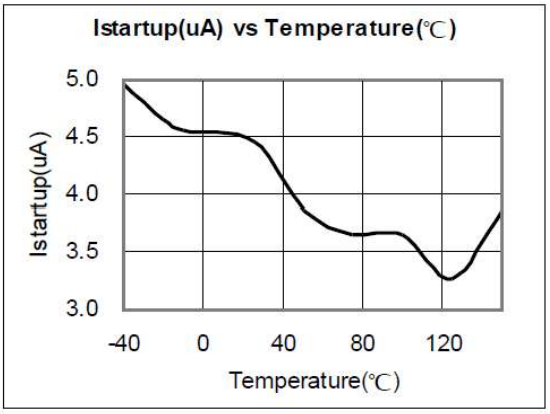
($T_A$ = 25℃, VDD=16V, unless otherwise noted)

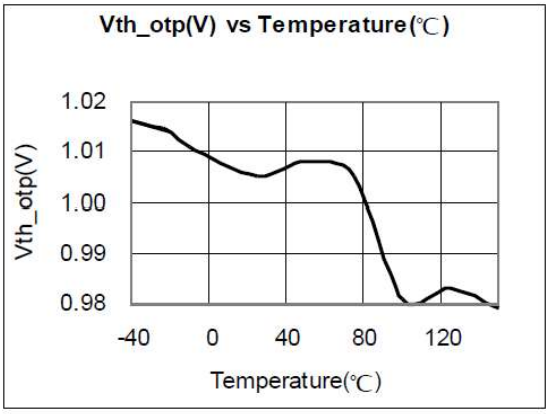
| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Supply Voltage (VDD)** | | | | | | |
| Istartup | VDD Start up Current | VDD=11V,Measure Leakage current into VDD | | 5 | 20 | uA |
| I_VDD_Operation | Operation Current | $V_{FB}$=3V | | 2 | | mA |
| UVLO(ON) | VDD Under Voltage Lockout Enter | | 8 | 9 | 10 | V |
| UVLO(OFF) | VDD Under Voltage Lockout Exit (Recovery) | | 14.3 | 15.3 | 16.3 | V |
| Vpull-up | Pull-up PMOS active | | | 13 | | V |
| Vdd_clamp | | Ivdd=10mA | 30 | 32 | 34 | V |
| OVP(ON) | Over voltage protection voltage | CS=0V,FB=3V Ramp up VDD until gate clock is off | 24 | 26 | 28 | V |
| Vlatch_release | Latch release voltage | | | 5 | | V |
| **Feedback Input Section(FB Pin)** | | | | | | |
| $V_{FB}$ Open | $V_{FB}$ Open Loop Voltage | | 3.9 | 4.2 | | V |
| Avcs | PWM input gain △VFB/△VCS | | | 2 | | V/V |
| Maximum duty cycle | Max duty cycle @ VDD=14V,VFB=3V,VCS=0V | | 75 | 80 | 85 | % |
| Vref_green | The threshold enter green mode | | | 2 | | V |
| Vref_burst_H | The threshold exit burst mode | | | 1.275 | | V |
| Vref_burst_L | The threshold enter burst mode | | | 1.175 | | V |
| $I_{FB}$_Short | FB pin short circuit current | Short FB pin to GND and measure current | | 0.4 | | mA |
| $V_{TH}$_PL | Power Limiting FB Threshold Voltage | | | 3.7 | | V |
| $T_D$_PL | Power limiting Debounce Time | | 80 | 88 | 96 | mSec |
| $Z_{FB}$_IN | Input Impedance | | | 4 | | Kohm |
| **Current Sense Input(Sense Pin)** | | | | | | |
| Soft start time | | | | 4 | | ms |
| T_blanking | Leading edge blanking time | | | 220 | | ns |
| $Z_{SENSE}$_IN | Input Impedance | | | 40 | | Kohm |
| $T_D$_OC | Over Current Detection and Control Delay | From Over Current Occurs till the Gatedrive output start to turn off | | 120 | | nSec |
| $V_{TH}$_OC | Internal Current Limiting Threshold Voltage | FB=3.3V | | 0.75 | | V |
| Vocp_clamper | CS voltage clamper | | | 0.9 | | V |
| **Oscillator** | | | | | | |
| $F_{OSC}$ | Normal Oscillation Frequency | VDD=14V, FB=3V, CS=0V | 60 | 65 | 70 | KHZ |
| △f_OSC | Frequency jittering | | | +/-4 | | % |
| F_shuffling | Shuffling frequency | | | 32 | | Hz |
| △f_Temp | Frequency Temperature Stability | | | 1 | | % |

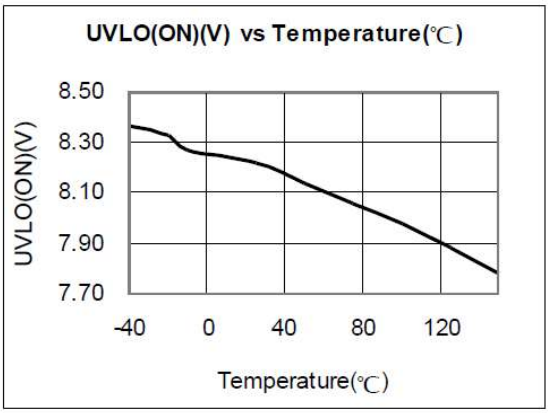
| | | | | | | |
|---|---|---|---|---|---|---|
| f_VDD | Frequency Voltage Stability | | | 1 | | % |
| F_Burst | Burst Mode Base Frequency | | | 22 | | KHZ |
| **Gate driver** | | | | | | |
| VOL | Ouput low level @ VDD=14V, Io=5mA | | | | 1 | V |
| VOH | Ouput high level @ VDD=14V, Io=20mA | | 6 | | | V |
| V_clamp | Output clamp voltage | | | 15 | | V |
| T_r | Output rising time 1V ~ 12V @ CL=1000pF | | | 175 | | nS |
| T_f | Output falling time 12V ~ 1V @ CL=500pF | | | 85 | | nS |
| **Over temperature protection** | | | | | | |
| IRT | Output current of RT pin | | 95 | 100 | 105 | uA |
| VOTP | Threshold voltage for OTP | | 0.95 | 1 | 1.05 | V |
| Td_OTP | OTP debounce time | | | 32 | | Cycle |
| VRT_FL | Float voltage at RT pin | | | 2.3 | | V |
| Vth_OVP | External OVP threshold voltage | | | 4 | | V |

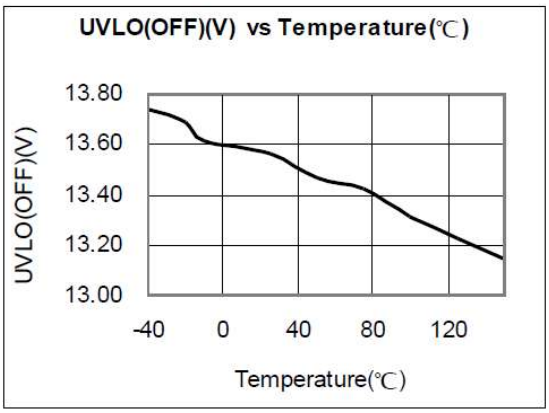
## CHARACTERIZATION PLOTS

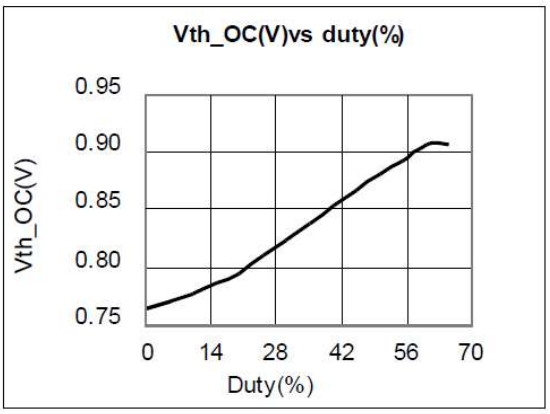
VDD = 18V, TA = 25℃ condition applies if not otherwise noted.

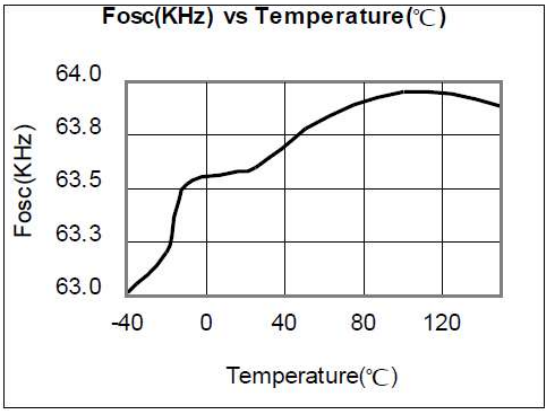


## OUTLINE DRAWING

