

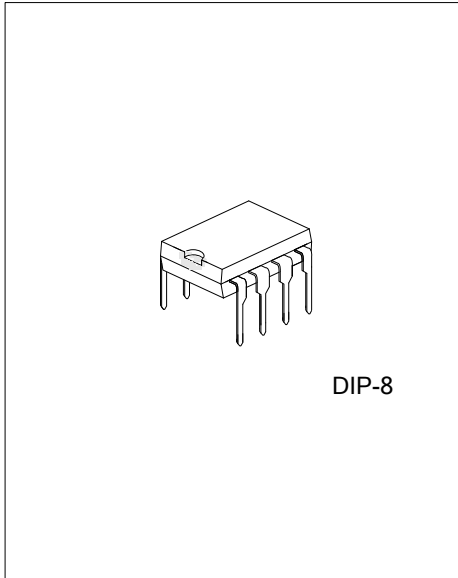


US3835

Preliminary

CMOS IC

HIGH PERFORMANCE CURRENT MODE POWER SWITCH



DESCRIPTION

The UTC **US3835** is an integrated PWM controller and Power MOSFET specifically designed for current mode operation with minimal external components. The UTC US3835 is designed to provide several special enhancements to satisfy the needs, for example, Frequency Hopping , Constant Output Power Limiting , Over Current Protection (OCP), Over Voltage Protection (OVP), Under Voltage Lock Out (UVLO), and Over Temperature Protection (OTP) etc. IC will be shutdown or can auto-restart in certain situations.

FEATURES

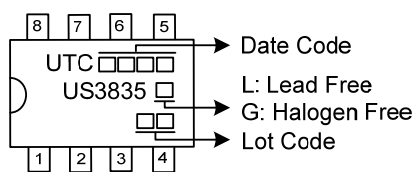
- * Internal High Voltage Start-up Circuit
- * Internal 150V Power MOSFET
- * Over temperature protection
- * Over voltage protection
- * Leading edge blanking
- * Cycle-by-Cycle current limiting
- * Under Voltage Lock Out

ORDERING INFORMATION

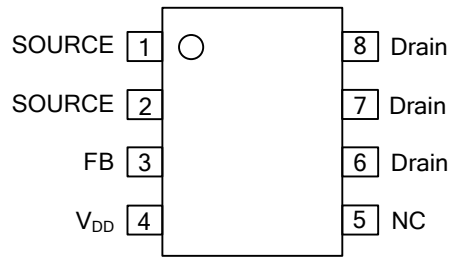
| Ordering Number | | Package | Packing |
|-----------------|---------------|---------|---------|
| Lead Free | Halogen Free | | |
| US3835L-D08-T | US3835G-D08-T | DIP-8 | Tube |

| | |
|--|--|
| <p>US3835G-D08-T</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package | <ul style="list-style-type: none"> (1) T: Tube (2) D08: DIP-8 (3) G: Halogen Free and Lead Free, L: Lead Free |
|--|--|

MARKING



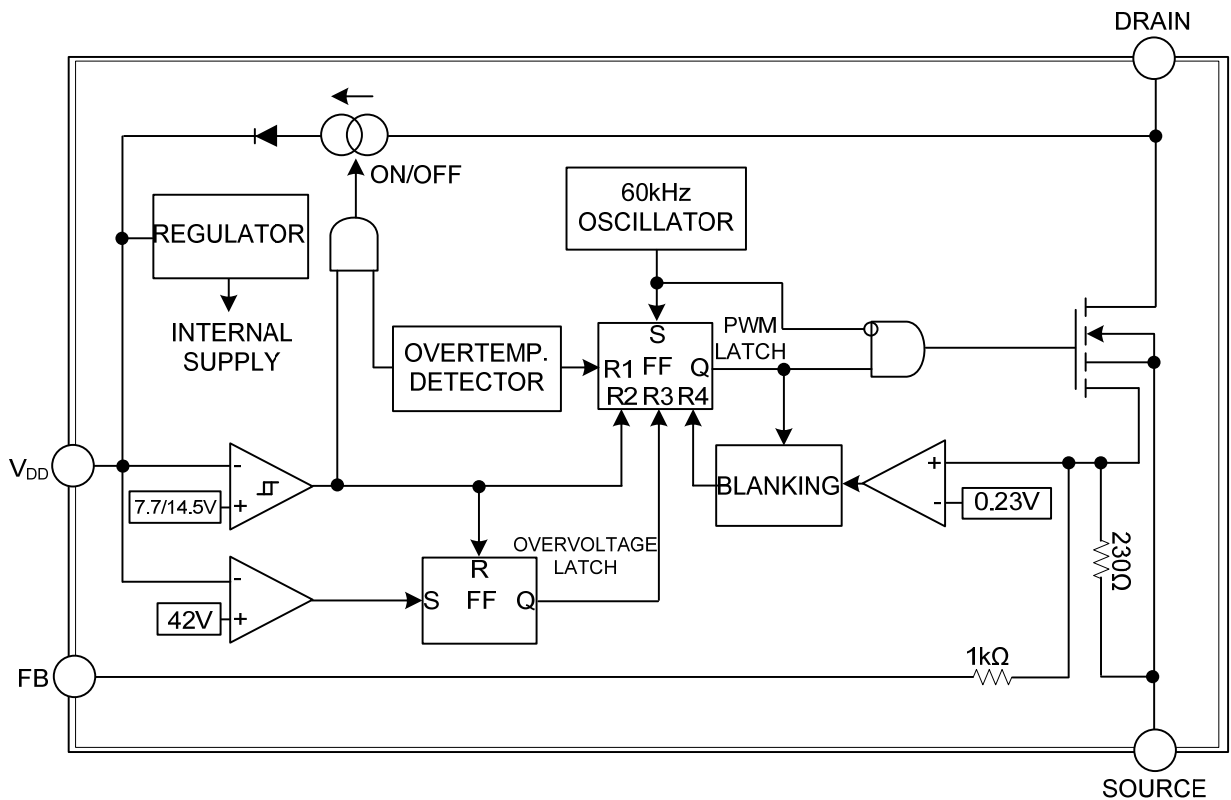
■ PIN CONFIGURATION



■ PIN DESCRIPTION

| PIN NO. | PIN NAME | DESCRIPTION |
|---------|-----------------|---|
| 1 | SOURCE | Signal ground |
| 2 | SOURCE | Power MOSFET ground |
| 3 | FB | Feedback. The DC output voltage is defined by the threshold value of the zener connected in series with FB. |
| 4 | V _{DD} | Supply voltage |
| 5 | NC | No Connected |
| 6, 7, 8 | Drain | Power MOSFET drain |

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|--------------------------------|--------------|---------|--------------------|
| Switching Drain Source Voltage | $V_{DS(SW)}$ | 150 | V |
| Supply Voltage | V_{DD} | 46 | V |
| Junction Temperature | T_J | +150 | $^{\circ}\text{C}$ |
| Operating Temperature | T_{OPR} | +85 | $^{\circ}\text{C}$ |
| Storage Temperature | T_{STG} | +150 | $^{\circ}\text{C}$ |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

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

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|-------------------|--|-----|------|-----|--------------------|
| SUPPLY SECTION | | | | | | |
| Start Up Charge Current | I_{CH} | $V_{DS}=100\text{V}$, $V_{CC}=0\sim V_{CCON}$ | | -1 | | mA |
| Start Up Current | I_{ST} | $V_{CC} = V_{CCON}-0.2\text{V}$ | | 1 | 5 | μA |
| Supply Current with switch | I_{OP} | $I_{FB}=0.25\text{mA}$ | | 0.8 | 1.8 | mA |
| UNDER-VOLTAGE LOCKOUT SECTION | | | | | | |
| Start Threshold Voltage | V_{CCON} | | 13 | 14.5 | 16 | V |
| Min. Operating Voltage | V_{CCOFF} | | 6.5 | 7.5 | 8.5 | V |
| INTERNAL VOLTAGE REFERENCE | | | | | | |
| CONTROL SECTION | | | | | | |
| FB Pin Input Impedance | R_{FB} | | | 3 | | k Ω |
| FB Pin Shutdown Voltage | V_{FB_SD} | | | 1.08 | | V |
| Normal initial Switching frequency | $F_{(SW)}$ | $I_{FB}=0.3\text{mA}$ | 56 | 60 | 64 | kHz |
| Frequency Jittering | $\Delta F_{(SW)}$ | | -9 | | +9 | % |
| PROTECTION SECTION | | | | | | |
| OVP threshold | V_{OVP} | $I_{FB}=0.3\text{mA}$ | 38 | 42 | 46 | V |
| OTP threshold | $T_{(THR)}$ | $I_{FB}=0.3\text{mA}$ | | 150 | | $^{\circ}\text{C}$ |
| CURRENT LIMITING SECTION | | | | | | |
| Peak Current Limitation | I_{LIM} | $I_{FB}=0$ | | 0.4 | | A |
| POWER MOSFET SECTION | | | | | | |
| Drain-Source Breakdown Voltage | V_{DSS} | $V_{FB}=2\text{V}$, $I_D=250\mu\text{A}$ | 150 | | | V |
| Off State Drain Current | I_{DSS} | $V_{DS}=150\text{V}$, $V_{FB}=2\text{V}$ | | | 100 | μA |
| Static Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}=10\text{V}$, $I_D=0.4\text{A}$ | | 1.1 | | Ω |

Notes: 1. Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$.

2. Essentially independent of operating temperature.

■ FUNCTIONAL DESCRIPTION

The internal reference voltages and bias circuit work at $V_{CC} > V_{THD(ON)}$, and shutdown at $V_{CC} < V_{CC(MIN)}$.

High Voltage Start up switch Circuit

At startup, an internal high-voltage current source supplies the internal bias and charges the external capacitor connected to the V_{CC} pin. When V_{CC} reaches $V_{THD(ON)}$, the IC begins switching and the internal high-voltage current source is disabled. The IC continues its normal switching operation and the power is supplied from the auxiliary transformer winding unless V_{CC} goes below the stop voltage of $V_{CC(MIN)}$.

Switching Frequency Limit

The UTC **US3835** have a constant switching frequency of 60kHz.

Protection section

The IC takes on more protection functions such as OVP and OTP etc. In case of those failure modes for continual blanking time, the driver is shut down. At the same time, IC enters auto-restart, V_{CC} power on and driver is reset after V_{CC} power on again.

OVP

OVP will shutdown the switching of the power MOSFET whenever $V_{CC} > V_{OVP}$. The OVP case as followed Fig. 1 the test circuit as followed Fig. 2.

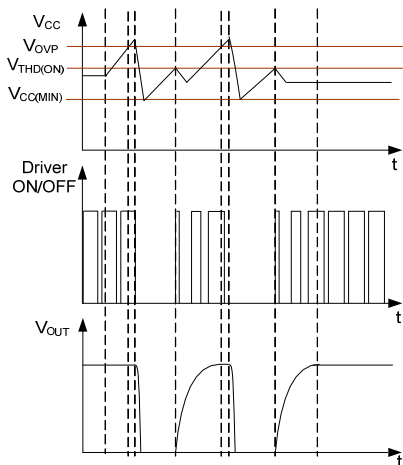


Fig.1 OVP case

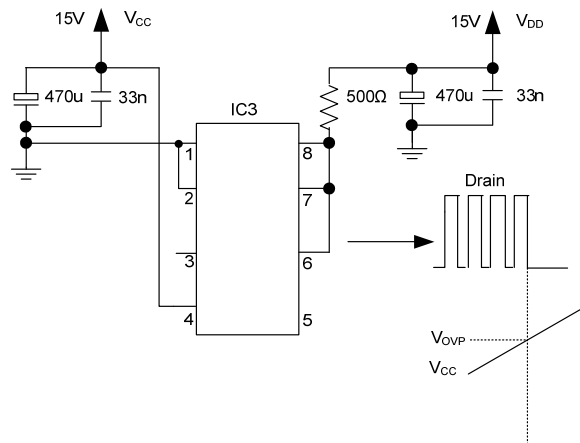


Fig.2 OVP test circuit

OTP

OTP will shut down driver and latch-off when junction temperature $T_J > T_{(THR)}$, and IC will be release on when temperature decreasing under $T_{(THR)} - 30$ and powering on again.

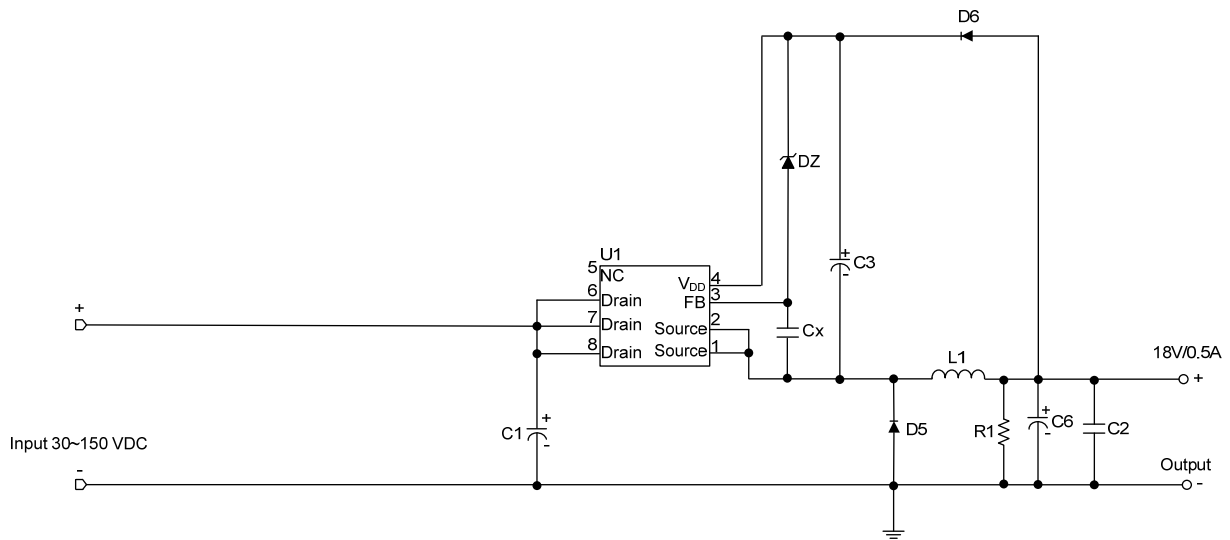
Driver Output Section

The driver-stage drives the gate of the MOSFET and is optimized to minimize EMI and to provide high circuit efficiency. This is done by reducing the switch on slope when reaching the MOSFET threshold. This is achieved by a slope control of the rising edge at the driver's output. The output driver is clamped by an internal 16V Zener diode in order to protect power MOSFET transistors against undesirable gate over voltage.

Inside Power MOSFET

Specific Power MOSFET parameter is as "Power MOSFET SECTION" in electrical characteristics table.

■ TYPICAL APPLICATION CIRCUIT



BOM

| Reference | Component | Reference | Component |
|-----------|------------------|-----------|-----------------------|
| U1 | US3835 | DZ | UTC UMMSZ5248 18V |
| Cx | 0.022uF/50V 0805 | D5 | UTC MBR2200G |
| C1 | EC 22F/200V | D6 | UTC 1N4148 |
| C2 | 0.1uF/50V 0805 | R1 | 10KΩ 5% 1206 |
| C3 | EC 4.7uF/50V | L1 | ADR0912-1102KBHA1 1mH |
| C6 | EC 47uF/50V | | |

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