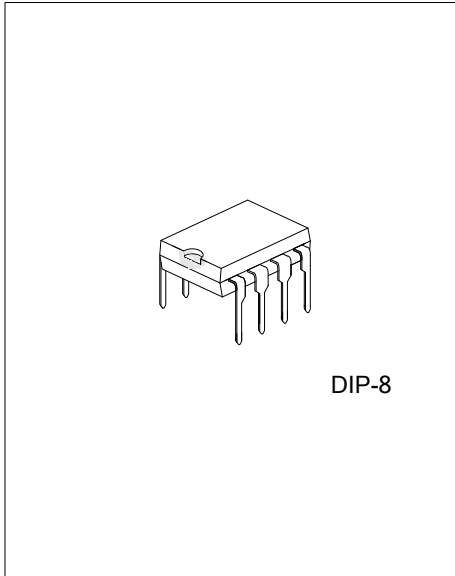




HIGH PERFORMANCE CURRENT MODE POWER SWITCH

DESCRIPTION

The UTC **US3822** is an integrated PWM controller and Power MOSFET specifically designed for current mode operation with minimal external components. The UTC US3822 is designed to provide several special enhancements to satisfy the needs, for example, Power-Saving mode for low standby power (<0.1W), 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

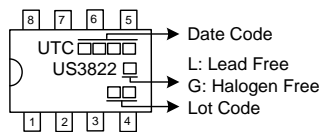
- * Internal High Voltage Start-up Circuit
- * Internal 650V Power MOSFET
- * Lower than 0.1W Standby Power Design
- * Gate Output Maximum Voltage Clamp(15V)
- * Over temperature protection
- * Over voltage protection
- * Leading edge blanking
- * Cycle-by-Cycle current limiting
- * Under Voltage Lock Out

ORDERING INFORMATION

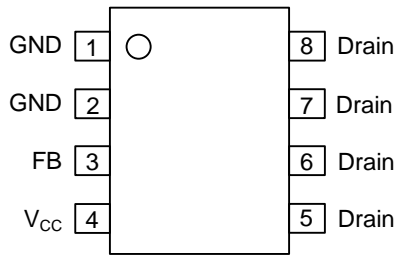
Ordering Number		Package	Packing
Lead Free	Halogen Free		
US3822L-D08-T	US3822G-D08-T	DIP-8	Tube

<p>US3822G-D08-T</p> <p>(1)Packing Type</p> <p>(2)Package Type</p> <p>(3)Green Package</p>	<p>(1) T: Tube</p> <p>(2) D08: DIP-8</p> <p>(3) G: Halogen Free and Lead Free, L: Lead Free</p>
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MARKING



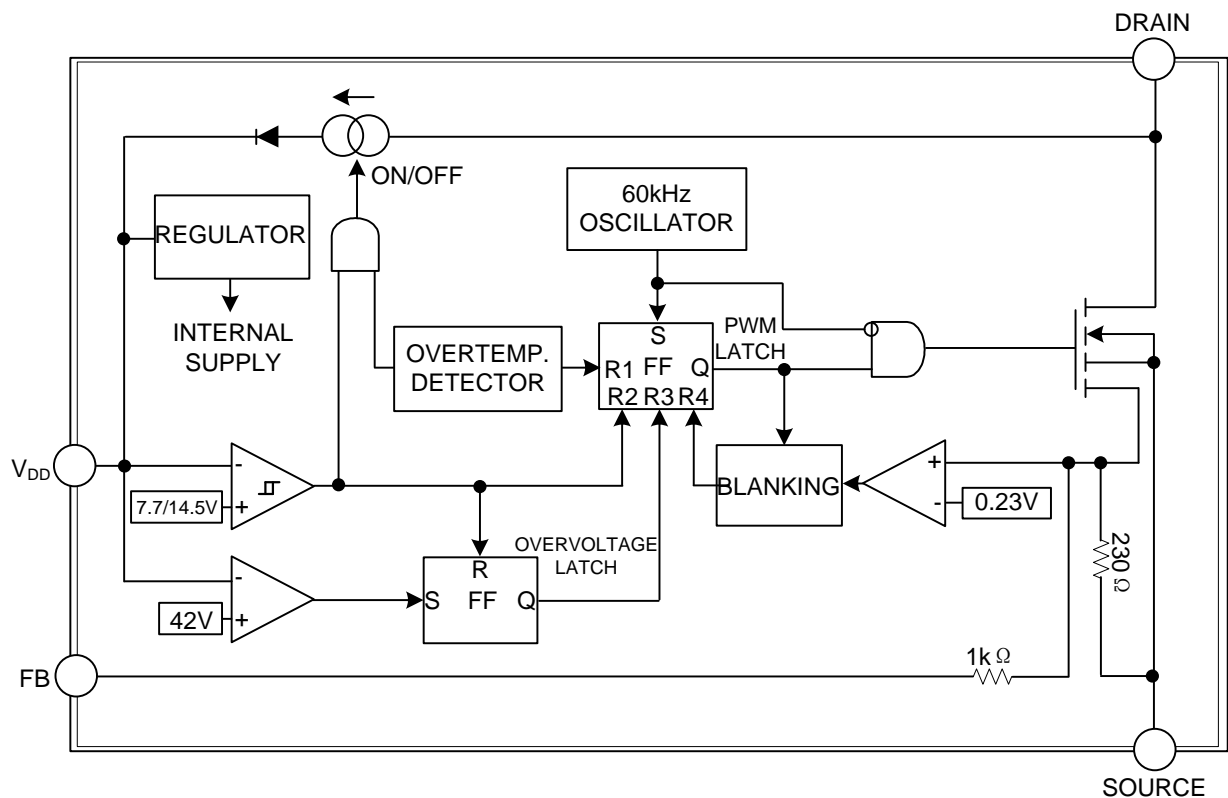
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1, 2	GND	Ground
3	FB	Feedback
4	V _{CC}	Supply voltage
5, 6, 7, 8	Drain	Power MOSFET drain

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Switching Drain Source Voltage	V _{DS(SW)}	650	V
Supply Voltage	V _{CC}	46	V
Feedback Current	I _{FB}	3	mA
Junction Temperature	T _J	+150	°C
Operating Temperature	T _{OPR}	-40 ~ +85	°C
Storage Temperature	T _{STG}	-50 ~ +150	°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.

■ OPERATING RANGE (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{CC}	8.6 ~ 22	V

■ ELECTRICAL CHARACTERISTICS (V_{CC}=15V, T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
SUPPLY SECTION						
Start Up Charge Current	I _{CH}	V _{DS} =100V, V _{CC} =0~V _{CCON}		-2.5		mA
Start Up Current	I _{ST}	V _{CC} = V _{CCON} -0.2V		0.5	5	μA
Supply Current with switch	I _{OP}	I _{FB} =0.3mA		0.55	1.8	mA
UNDER-VOLTAGE LOCKOUT SECTION						
Start Threshold Voltage	V _{CCON}		13	14.5	16	V
Min. Operating Voltage	V _{CCOFF}		6.7	7.7	8.7	V
V _{CC} Zener Clamp Voltage	V _{CC(clamp)}	I _{VCC} =10mA	38	42	46	V
INTERNAL VOLTAGE REFERENCE						
CONTROL SECTION						
I _{FB} to I _D Current Gain	G _{FB-D}			320		
FB Pin Input Impedance	R _{FB}			0.3		kΩ
IFB Shutdown Current	I _{FB_SD}			0.32		mA
Normal initial Switching frequency	F _(SW)	I _{FB} =0.3mA	56	60	64	kHz
Frequency Jittering	ΔF _(SW)		-9		+9	%
Frequency Deviation VS V _{CC}	F _{DV}	V _{CC} =10 ~ 22V			10	%
Frequency Deviation VS Temperature	F _{DT}	T _A = -40 ~ 85°C			10	%
PROTECTION SECTION						
OVP threshold	V _{OVP}	I _{FB} =0.3mA	38	42	46	V
OTP threshold	T _(THR)	I _{FB} =0.3mA	130	150	170	°C
CURRENT LIMITING SECTION						
Peak Current Limitation	I _{LIM}	I _{FB} =0	0.32	0.4	0.48	A
Minimum Turn On Time	t _{ON(MIN)}			700		nS
POWER MOSFET SECTION						
Drain-Source Breakdown Voltage	V _{DSS}	V _{FB} =2V, I _D =250μA	650			V
Off State Drain Current	I _{DSS}	V _{DS} =650V, V _{FB} =2V			100	uA
Static Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =0.4A	2	3	4	Ω

Notes: 1. Pulse Test: Pulse width ≤ 300μs, Duty cycle ≤ 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 $V_{CC} < V_{CC(MIN)}$.

(1) 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 $V_{CC(MIN)}$.

(2) Switching Frequency Limit

The UTC US3822 have a constant switching frequency of 60kHz.

(3) 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.

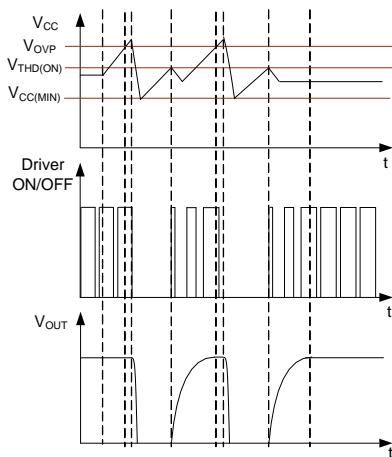


Fig.1 OVP case

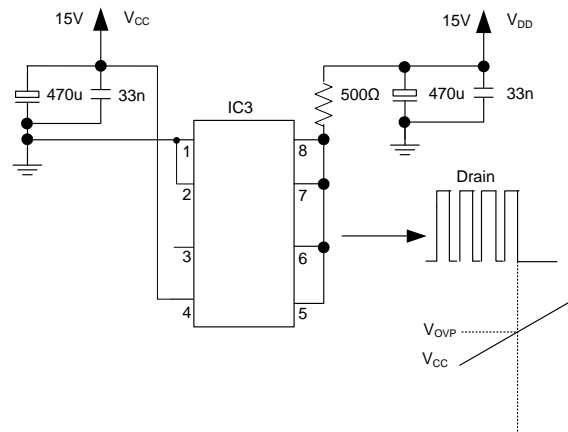


Fig.2 OVP test circuit

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.

(1) The Gain of FB pin to Drain Current Limiting

$$I_{LIM} = G_{FB-D} \times (0.526 - I_{FB}) \text{ mA}$$

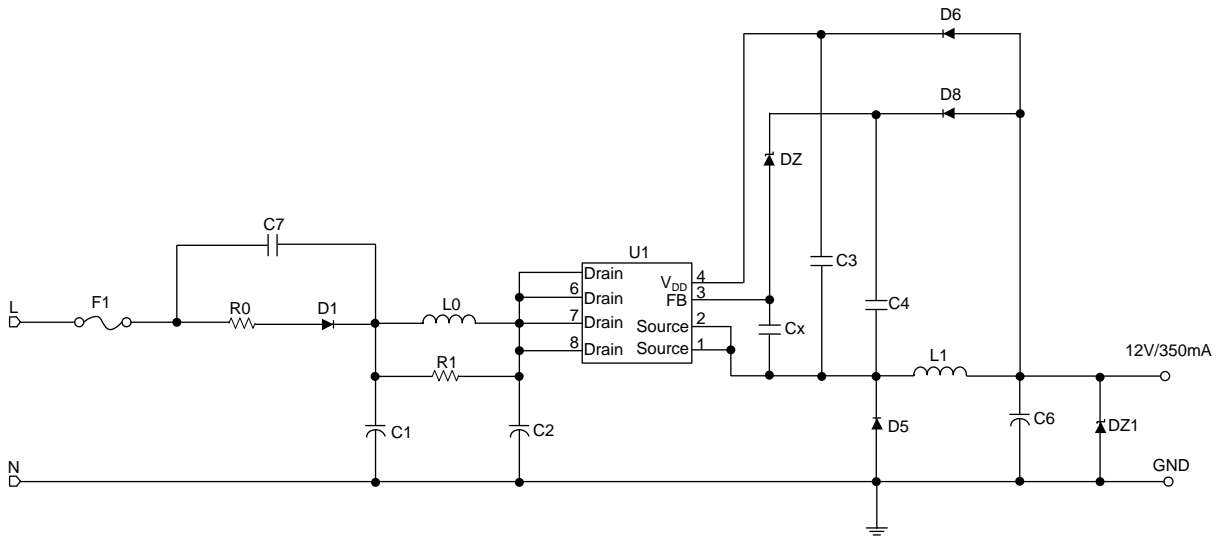
(2) Driver Output Section

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.

(3) 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	US3822	DZ	zener 12V
Cx	0.022uF/50V	DZ1	zener 16V
C1,C2	10uF/400V	D5	ES1J
C3	4.7uF/50V	F1	1A / 250V
C4	0.47uF/50V	R1	1KΩ
C6	47uF/50V	R0	10Ω
C7	0.1uF/1KV	L0	470mH
D1,D6,D8	RS1M	L1	1mH

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