Current Mode PWM Controller

Product Description

WT3322 is a current mode PWM controller with built-in high-voltage MOSFET for switching power supplies.

WT3322 has a built-in high-voltage starting circuit. Under light load, it will enter hiccup mode, effectively reducing the standby power consumption of the system. It has a frequency reduction function to further optimize the conversion efficiency under light load conditions. Equipped with frequency jitter function, it can improve EMI characteristics. It has a soft start function, which can reduce the stress on the device and prevent transformer saturation. It has VDD hiccup function, which not only prevents VDD under-voltage restart, but also effectively reduces standby power consumption.

WT3322 also integrates various protection functions for abnormal states, including VDD under-voltage protection, VDD over-voltage protection, leading edge blanking, output short circuit protection, over-current protection, over temperature protection, etc. After triggering the protection, the circuit will continuously restart automatically until the system works normally.

WT3322 adopts SOP-8 package.

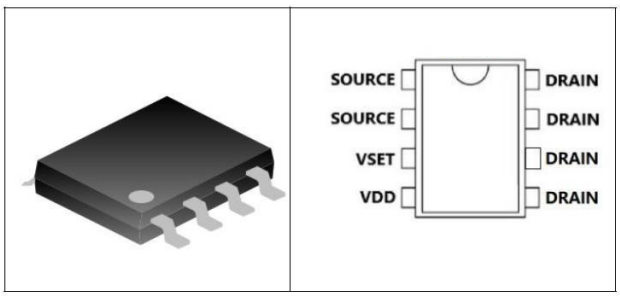
Product Feature

- High voltage startup
- Hiccup under light load
- Frequency reduction
- Soft start
- 12V, 15V, 18V output voltage adjustable in three levels
- VDD under voltage protection
- VDD over-voltage protection
- Leading edge blanking
- Output short circuit protection
- Over-current protection
- Over temperature protection

Applications

- Offline Switching Power Supply
- Small household appliances
- Non isolated auxiliary power supply

PINS



Pins Function

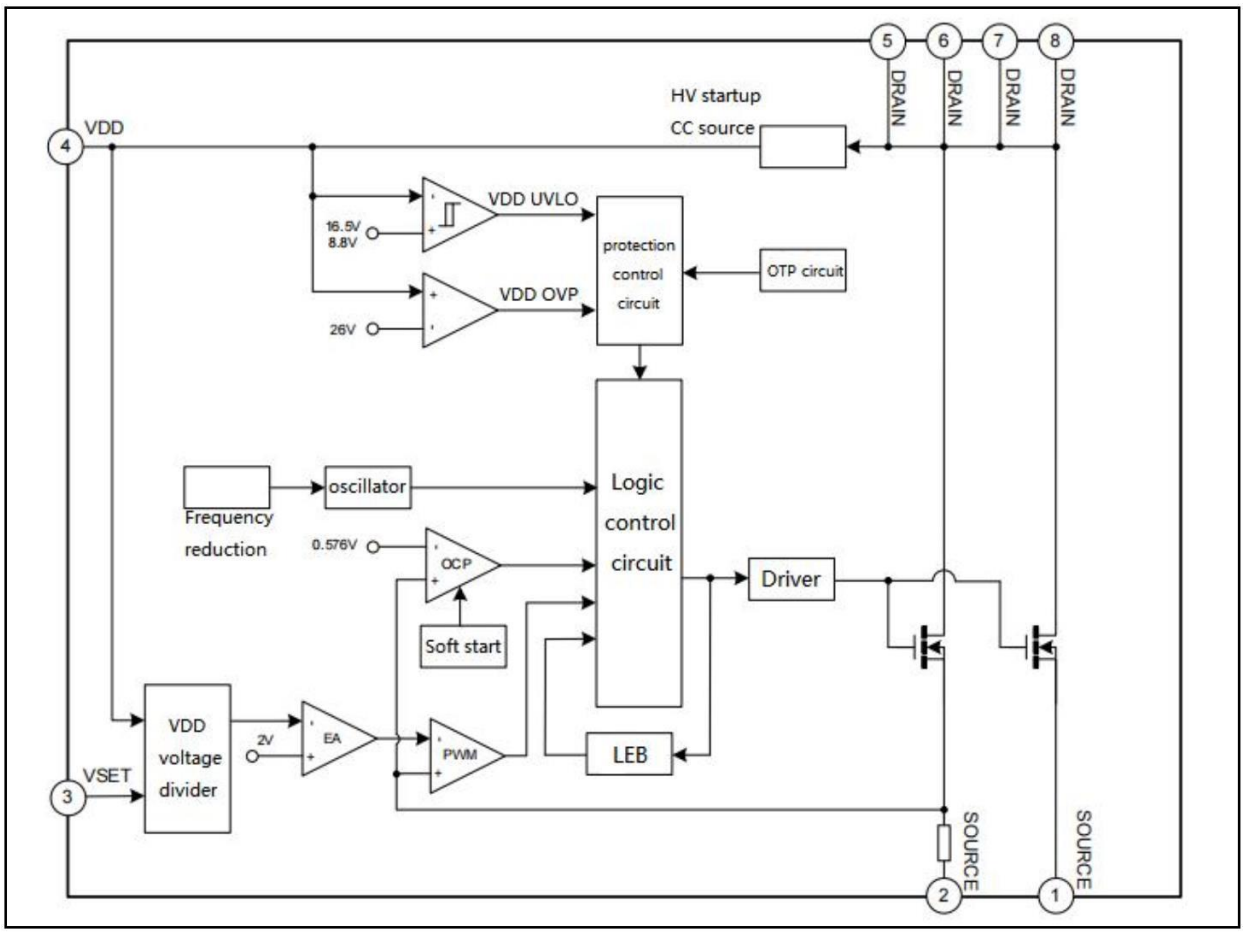
No.	Name	Description
1,2	SOURCE	Power MOSFET source and reference ground for control circuits
3	VSET	Used to set different output voltages, outputting 12V when suspended, 18V when grounded, and 15V when connected to a 51K resistor to ground
4	VDD	Power supply for control circuits
5,6,7,8	DRAIN	Power MOSFET drain

Typical Power

Product Model	Input Voltage	Typical Power	Vds	Rds_on
WT3322	**85-265VAC**	**12V/15V/18V 0.25A**	**650V**	**18Ω**

Remark: Test typical power in closed environment @45℃ ambient temperature. The system output rated current is recommended not to exceed the recommended current.

Functional Structure Diagram



Absolute Maximum Rating

Parameter	Symbol	Conditions	Unit
Drain gate voltage (RGS=1M)	V_{DGR}	650	V
Gate source (ground) voltage	V_{GS}	±30	V
Drain current pulse*	I_{DM}	2.8	A
Continuous drain current (Tamb=25 ℃)	I_D	0.8	A
Signal pulse avalanche energy**	EAS	30	mJ
High voltage input	$V_{HV(MAX)}$	650	V
VDD Supply voltage	$V_{DD(MAX)}$	30	V
Feedback current	I_{FB}	3	mA
Junction operating temperature	T_J	+150	℃
Storage temperature range	T_{STG}	-55~+150	℃

Note: The pulse width is determined by the maximum junction temperature** L=51mH, TJ=25 ℃ (initial)

Electrical Characteristics (unless specified, V_{DD}=18V,T_A= 25℃)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operating Voltage						
Operating voltage range	V_{DD}	After start up	10		24	V
Current without switch	I_{DD0}			0.3		mA
Current in switch state	I_{DD1}			0.9		mA
Current below VDD UVLO point	$I_{DD(OFF)}$			0.15		mA
VDD startup voltage	$V_{DD(on)}$		15.2	16.5	17.8	V
VDD under-voltage lock out point	$V_{DD(OFF)}$		8.1	8.8	9.5	V
VDD OVP voltage	$V_{DD(OVP)}$		24	26	28	V
VDD clamping voltage	$V_{DD(CLAMP)}$		28	30	32	V
High voltage start						
Charging current	I_{HVC}	V_{DD}=0V,V_{DRAIN}=100V		1.2		mA
Turn off leakage current	I_{HVS}	V_{DD}=18V, V_{DRAIN}=700V		3		μA
Feedback						
Normal operating switch frequency	f_{SW1}		54	60	66	KHz
Frequency jitter range	FD			±5		%
Maximum duty cycle	D_{MAX}		75	80	85	%
Minimum switching frequency	f_{SW2}			20		KHz
Peak current limiting						

Peak limit point	I_{PKLIM}		0.4	0.47	0.54	A
Current sampling shutdown delay	t_d	I_D=0.2A		200		ns
Leading edge blanking	t_{LEB}			300		ns
Minimum conduction time	$t_{ON(MIN)}$			500		ns
Soft start time	t_{SS}			16		ms
MOSFET						
Drain-source conduction resistance	R_{dson}	V_{GS}=10V, I_D=0.5A	15	18	21	Ω
Drain source breakdown voltage	BV_{DSS}	V_{GS}=0V,I_D=50μA	650			V
Over temperature protection						
Temperature protection detection point	T_{SD}			150		℃
Temperature protection hysteresis	T_{HYS}			20		℃

Operation Principle

WT3322 is a current mode PWM controller with built-in high voltage MOSFET for switching power supplies. It has a built-in high voltage starting circuit and enters hiccup mode under light load. It has functions such as frequency reduction, jittering, soft start, VDD hiccup, and integrates various protection functions for abnormal states such as VDD under-voltage lock out, VDD over-voltage protection, leading edge blanking, output short circuit protection, over-current protection, and over temperature protection.

High voltage startup and under voltage lock out(UVLO)

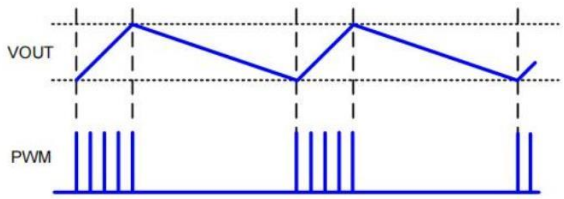
WT3322 has a built-in high-voltage starting circuit. At startup, the input voltage is charged from the DRAIN pin to the external capacitor of the VDD pin through the built-in high voltage starting constant current source, with a charging current of 1.2mA, causing the VDD voltage to rise. When it reaches the starting voltage of 16.5V, the high voltage starting constant current source is turned off, and the DRAIN pin stops charging the VDD pin. Instead, the inductor voltage is supplied to the VDD pin through a diode; If the VDD voltage drops to the under-voltage lock out point of 8.8V, the power MOS is turned off, the high voltage startup constant current source is turned back on, and the VDD pin is charged by the DRAIN pin, causing the VDD voltage to rise to the startup voltage of 16.5V.

Constant voltage control

WT3322 detects changes in VOUT through the VDD pin and internal error amplifier. When VOUT decreases, the EA output voltage rises, thereby increasing the output pulse width and causing VOUT to rise, keeping the output constant. The VOUT voltage is approximately equal to the voltage across VDD. The VSET pin is used to set different output voltages, with 12V output when suspended, 18V output when grounded, and 15V output when connected to a 51K resistor to ground.

Hiccup under light load

When under light load, if the output VOUT is too high, WT3322 will turn off the switch, causing VOUT to decrease; And when VOUT drops to a certain voltage, WT3322 turns on the switch again, causing VOUT to rise; Repeat the above process to enter hiccup mode, which will reduce the number of switches and effectively lower the standby power consumption of the system.



Soft start

WT3322 limits the maximum peak current at the DRAIN pin of the power transistor MOSFET within a soft start time of 16ms, gradually increasing it to greatly reduce the stress on the device and prevent transformer saturation.

Leading edge blanking

Due to parasitic capacitance at the DRAIN of WT3322, there is a significant peak current in the power MOSFET at the moment of turn-on. If this signal is sampled, the circuit will enter an over-current protection state. To prevent this false triggering, the IC is set to sample after the power transistor MOSFET is turned on for a LEB time(typically 300ns).

VDD over-voltage protection

WT3322 turns off the switch and locks the protection state when the VDD voltage reaches the overvoltage protection point of 26V, causing the VDD voltage to drop. After dropping to the VDD restart threshold of 6.5V, the circuit restarts.

Output short circuit protection

When the output of WT3322 is short circuited and the VDD voltage is lower than the under-voltage lock out point, WT3322 enters the protection state and restarts. The restart time is determined by the VDD capacitor, and the larger the VDD capacitor, the longer the restart time.

Over-current protection

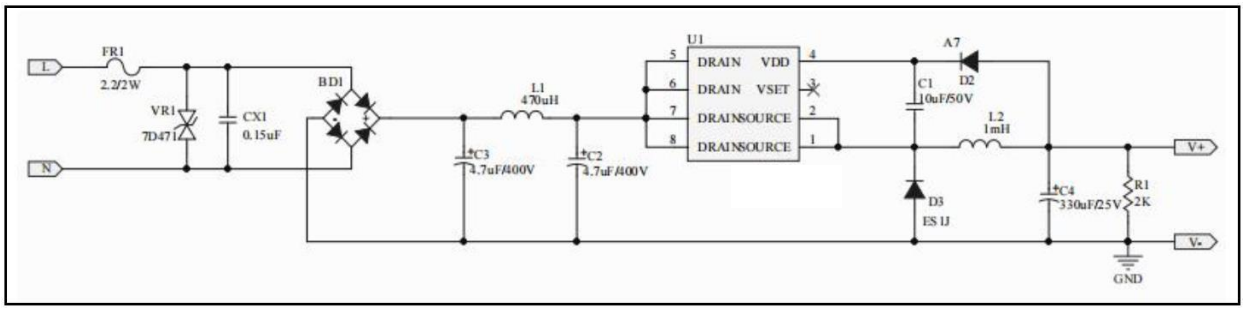
WT3322 detects the power transistor current cycle by cycle. When the power transistor current is detected to be greater than 0.47A, the cycle by cycle over-current protection will be triggered.

Over-temperature protection

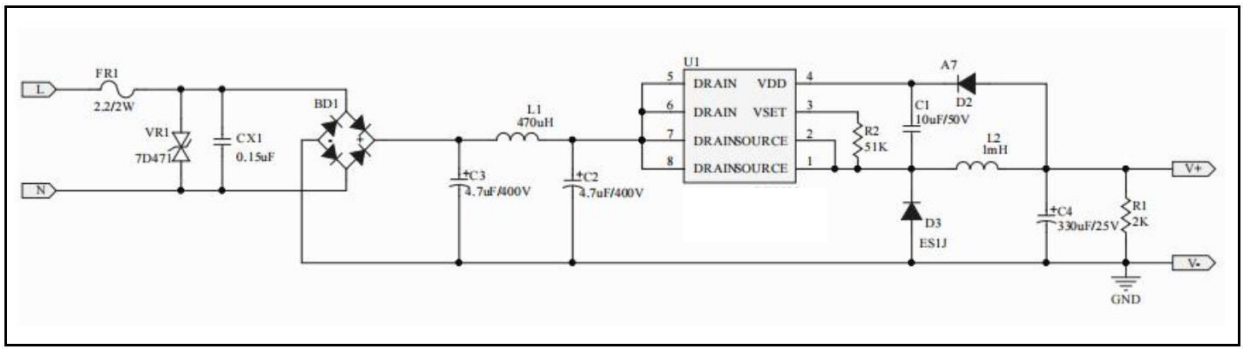
When WT3322 detects that the temperature has reached the over temperature protection point of 150℃, turn off the switch. When it detects that the temperature has dropped by 20℃, turn on the switch again.

Typical Application Circuit Diagram

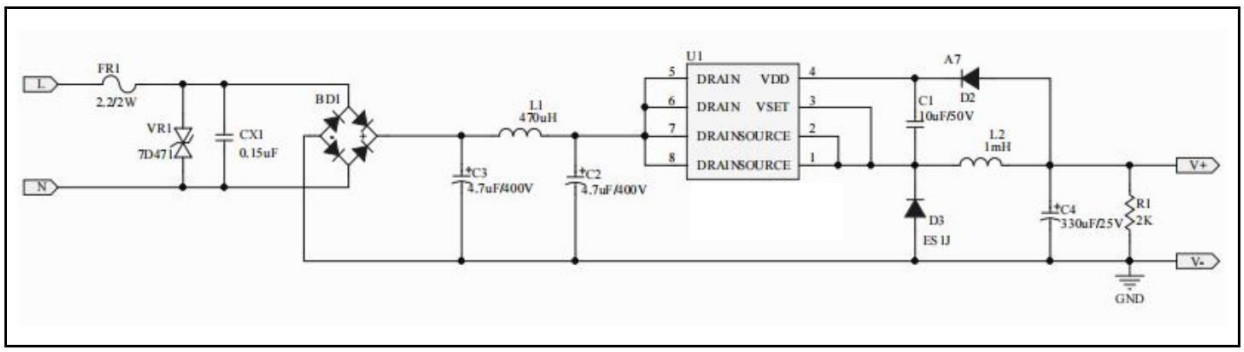
1. 12V output application



2. 15V output application

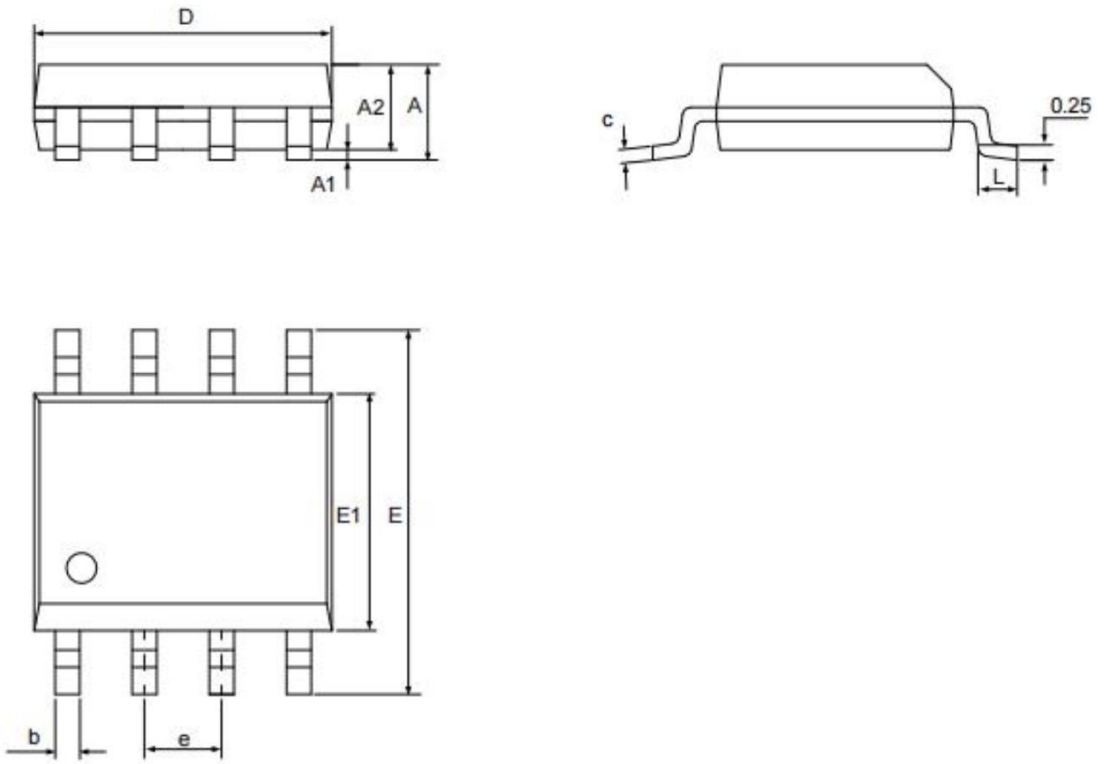


3. 18V output application



PACKAGE OUTLINE DIMENSIONS

SOP-8



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.05	0.15	0.25
A2	1.25	—	1.65
b	0.32	0.42	0.52
c	0.15	0.20	0.26
D	4.70	4.90	5.30
E	5.60	6.00	6.40
E1	3.60	3.90	4.20
e	1.27BSC		
L	0.30	—	1.27