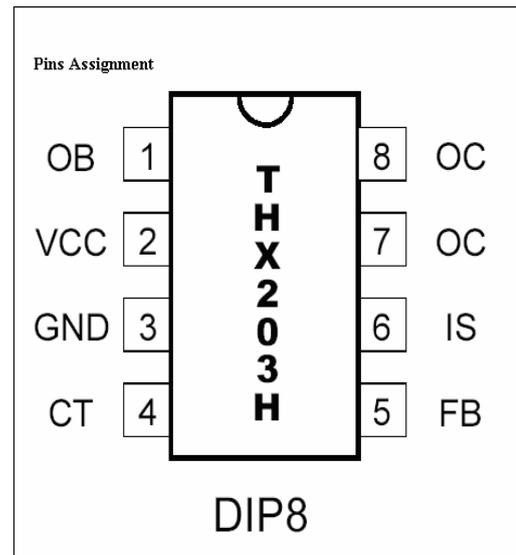


Introduction

PWM controller of high-performance current mode is specially designed for AC/DC transformer with high performance and price ratio, which supplies continuous output power of 12W within the range of wide-voltage between 85V and 265V, the output power of peak value can be up to 18W. The combination of optimized reasonable circuit design and bipolar faature technology with high performance and price ratio economizes the whole cost ultimately. The power controller can be applied to the typical flyback circuit topology so as to form a simple AC/DC transformer. The startup circuit inside IC is designed as a particular current inhalation way, so it can start up with the magnification function of the power switch tube itself, which lessens the power consumption for starting the resistance remarkably; when the output power is lower, IC will reduce the working frequency automatically, therefore, the standby power consumption becomes extremely low. When the power tube is closed, the interior circuit will bias it reversely, utilize the characteristic of high pressure resistance CB of bipolar transistor directly, and improve its pressure resistance capacity to the high voltage of 700V, which ensures the security of the power tube.



Meanwhile, the perfect function of overload and saturation prevention is provided inside of IC, which can keep away some abnormal status, such as overload, saturation of transformer, and output short circuit, so as to improve the reliability of the power supply. The current limit and clock frequency can be set up by exterior components.

Now the standard encapsulation and the environmental protection leadless encapsulation that meets European standard of DIP8 are supplied.

Characteristics

- Set-in high-voltage power switch tube of 700V and few peripheral components
- With the modulation of lock pulse width, the testing is according to the pulse limit current.
- With the function of output frequency reduction, the non-output power consumption can be less than 0.3W.
- Inner-built ramp and anti-feedback compensation function
- The independent upper-limit current testing controller deals with over-current and over-load of the controller real-timely.
- The period emission pole is turned off and it outputs by deflected voltage, and the pressure resistance of the power tube is improved.
- Set-in current limit resistance with temperature compensation, which makes the current limit precise
- Set-in heat protection circuit
- Startup is accomplished with the magnification function of the switch power tube, and the power consumption of startup resistance is reduced more than 10 times.
- Few peripheral components
- Low startup and operating current
- VCC over-voltage automatic limit
- Continuous wide-voltage output power reaches 12W, and the output power of peak value arrives at 18W.

Applied Field

- Adaptor (for example, travel charger, out power station)
- Open Frame (for example, DVD, DVB)

Reference Frame of Interior Circuit

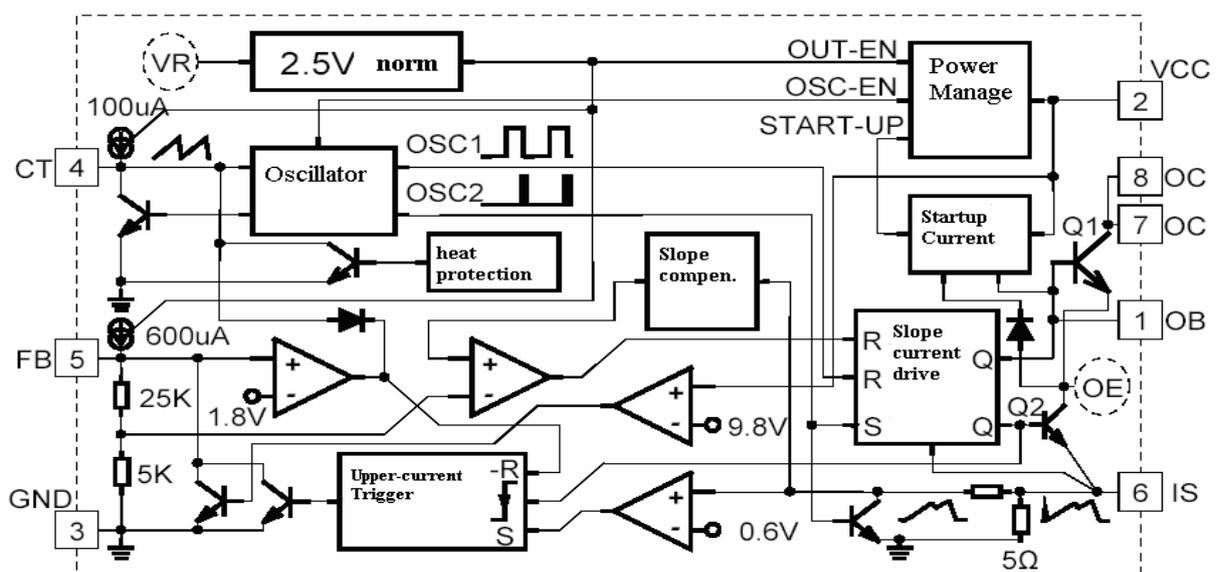


Figure 1. Frame of Interior Current

Description of Pins' function

Pins	Symbol	Pins Description
1	OB	base electrode of power tube, control terminal of start-up current, external startup resistance
2	VCC	supply electric pins
3	GND	meet grounding pins
4	CT	oscillate capacitance pins, external timing capacitance
5	FB	feedback pins
6	IS	switching current sampling and limit enactment, sampling resistance of external current
7,8	OC	output pins, meet switching transformer

*: During PCB layout, the security distance should be kept more than 1mm between Pin6 and Pin7, so as to avoid discharging.

Limit parameter

Power supply voltage VCC	16V
Startup input voltage	16V
Pins input voltage	VCC+0.3V
Endurance voltage of OC collector	-0.3-700V
Switching current of peak value	800mA
Total dissipation power	1000mW
Operating temperature range	0---+125℃
Deposit temperature range	-55---+150℃
Welding temperature	+260℃,10S

Recommended working condition

Item	Minimum	Typical	Maximum	Unit
Power supply voltage, VCC	4.8	5.5	9.0	V
Pins input voltage	-0.3	-	Vcc	V
Reverse voltage of peak value	-	-	520	V
Switching current of peak value	-	-	600	mA
Timing capacitance	650	680	920	PF
Oscillating frequency	45	61	65	KHz
Operating temperature	0		70	℃

Electric Parameter ($T_a=25^{\circ}\text{C}$, $V_{cc}=5.5\text{-}7.5\text{V}$, $C_t=680\text{PF}$, $R_S=1\Omega$)**Output**

Item	Testing condition	Minimum	Typical	Maximum	Unit
Maximum pressure resistance of switching tube	$I_{oc}=10\text{mA}$	700	-	-	V
on-saturation pressure drop	$I_{oc}=600\text{mA}$	-	-	1	V
Output rise-time	$C_L=1\text{nF}$	-	-	75	ns
Output fall-time	$C_L=1\text{nF}$	-	-	75	ns
Output limit current	$T_j=0\text{-}100^{\circ}\text{C}$	540	580	620	mA
OE clamp voltage	$O_E=0.001\text{-}0.60\text{A}$	-	1.5	-	V

Reference

Item	Testing condition	Minimum	Typical	Maximum	Unit
Reference output voltage	$I_o=1.0\text{mA}$	2.4	2.5	2.6	V
power adjustment ratio	$V_{cc}=5.5\text{-}9\text{V}$	-	2	20	mV
Load adjustment ratio	$I_o=0.1\text{-}1.2\text{mA}$	-	-	3	%
Temperature stability		-	0.2	-	mV/ $^{\circ}\text{C}$
Output noise voltage	$F=10\text{Hz}\text{-}10\text{KHz}$	-	-	50	μV
Long-term stability	Operate 1000h under the condition of $T=85^{\circ}\text{C}$	-	5	-	mV

Oscillator

Item	Testing condition	Minimum	Typical	Maximum	Unit
Oscillating frequency	$C_t=680\text{PF}$	55	61	67	KHz
Frequency change ratio with voltage	$V_{cc}=5.5\text{-}9\text{V}$	-	-	1	%
Frequency change rate with temperature	$T_a=0\text{-}85^{\circ}\text{C}$	-	-	1	%
Vibration amplitude of oscillator(V_{p-p})		-	2.5	-	V
Drop edge of oscillator	$C_t=330\text{PF}$	-	800	-	ns

Feedback

Item	Testing condition	Minimum	Typical	Maximum	Unit
Input impedance	Pull-up current	-	0.50	0.60	mA
	pull-down resistance	-	30	-	K Ω
Power supply rejection ratio	$V_{cc}=5.5\text{-}9\text{V}$	-	60	70	dB

Current sampling

Item	Testing condition	Minimum	Typical	Maximum	Unit
Current sampling limit		0.54	0.58	0.62	V
upper limit current prevention	RS=10	0.54	0.27	0.62	A
Power supply rejection ratio		-	60	70	dB
transmission delay		-	150	250	ns

Modulation of pulse width

Item	Testing condition	Minimum	Typical	Maximum	Unit
Maximum duty cycle		53	57	61	%
Minimum duty cycle		-	-	3.5	%

Power current

Item	Testing condition	Minimum	Typical	Maximum	Unit
Startup acceptance current		1.6	2.0	2.4	mA
Startup static current		-	55	80	μA
Static current	V _{cc} =8V	-	2.8	-	mA
Startup voltage		8.6	8.8	9.0	V
Close voltage of oscillator		4.0	4.3	4.5	V
Restart voltage		-	3.7	-	V
Over-voltage limit margin		9.2	9.6	10.0	V

Description of the Principle

- During start-up phase, VR is closed when electrified; FB pull-up power source is closed, the start-up current is input from power tube to VCC through OE; OB controls the base current of power tube and limits the current of power tube collector (namely, THX203H starts the acceptance current), accordingly, the security of the power tube is ensured; when VCC voltage goes up to 8.8V, the start-up phase is ended, and it comes into the normal phase.
- During normal phase, VCC voltage shall keep at 4.8~9.0V, VR outputs 2.5V benchmark; FB pull-up current source starts up; the oscillator output OSC1 decides the maximum duty cycle, output OSC2 tries to touch off the power supply to enter open cycle to enter the open cycle, and shield flashing peak current of the power tube ; if FB is less than 1.8V (about between 1.2-1.8V), the cycle of the oscillator will increase with it, the less FB is, the wider the cycle of the oscillator is, until the oscillation stops (This characteristic reduces the standby power consumption of the switching power.) ; if the peripheral feedback tries to make VCC more than 9.6V, the in-circuit is fed back to FB and makes VCC stabilize the voltage at 9.6V (According to this characteristic, we can may not adopt peripheral feedback circuit, and stabilize the output voltage by in-circuit, but the precision of stabilizing voltage is low); During the open cycle, OB supplies base

current for the power tube, OE pulls down the emitter of the power tube to IS, and OB adopts the driving parameter of ramp current (it refers to that OB on-current is the parameter of IS, when IS is 0V, OB on-current is about 40mA, then OB on-current increases linearly with IS, when IS increases to 0.6V, OB on-current is about 120mA, this characteristic makes effective use of the output current of OB, decreases the power consumption of THX203H), if IS detects that the specified current FB, it will come into the close cycle; during the close cycle, OB pulls down, the power tube will not shut off immediately, but OE clamps 1.5V (after the power tube is shut off, the base will be biased reversely, which improves the voltage endurance); during open or close cycle, if the power tube is detected beyond the upper limit current, the trigger of the upper limit current will be placed preferentially and forces FB to drop, the duty cycle will become less so as to protect the power tube and transformer; at the beginning of next close cycle or when FB is less than 1.8V, the trigger of the upper limit current will reset. In addition, THX203H is installed over heat protection internally, when the internal temperature is higher than 140°C, it will broaden the cycle of the oscillator and makes the temperature of THX203H less than 150°C; The ramp compensation is also placed internally, when THX203H is in a big duty cycle or in the mode of constant current, it can stabilize the open/close cycle.

- If VCC declines to 4.3V or so, the oscillator will shut off, OSC1 and OSC2 are in the low level, and the power supply keeps at close cycle; when VCC goes on declining to 3.7V or so, THX203H will come into the start-up phase once again.

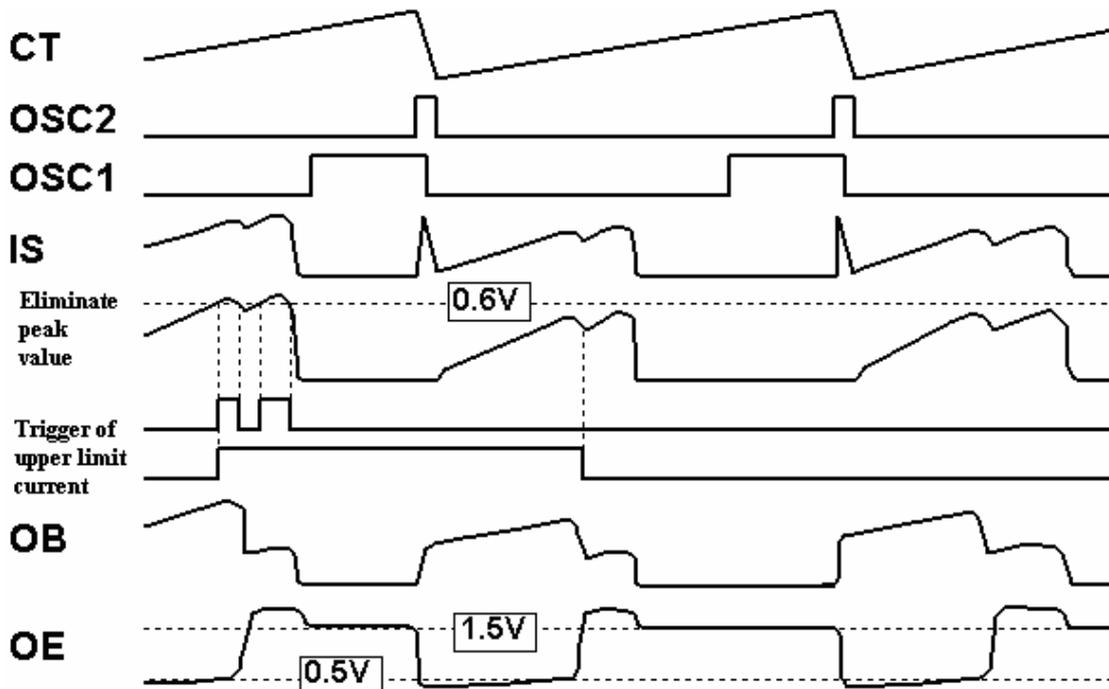


Fig.2 Waveform Graph of Open and Close Cycle at Normal Phase

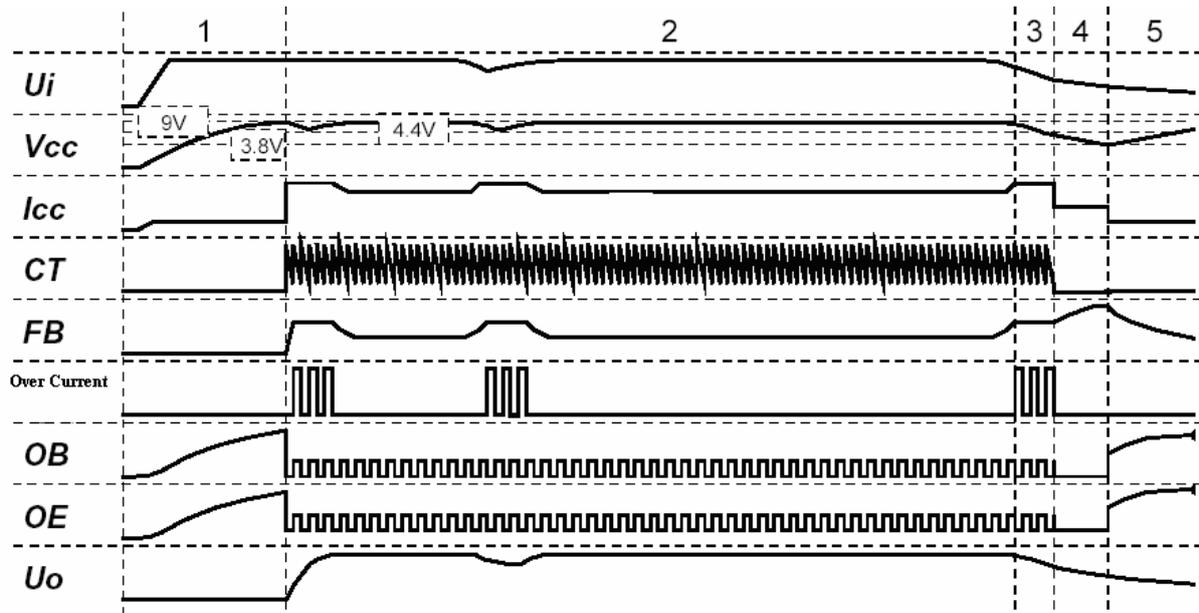


Fig.3 Overall Waveform Graph of THX203H

Definition of Electric Parameter

- Start-up acceptance current: the current on OC when OB inputs 0.5mA during the start-up phase
- Start-up Quiescent Current: the current of minimum current source that can make VCC oscillate (namely finish the start-up of THX203H) when VCC meets filter capacitance and adjustable current source, CT meets 680PF, and other pins hang in the air.
- Start-up Voltage: Maximum VCC value of above VCC oscillation.
- Re-start Voltage: Minimum VCC value of above VCC oscillation.
- Close Voltage of Oscillator: VCC value that makes RC oscillator stop oscillating when the above VCC oscillates the falling edge.
- Quiescent Current: VCC power current when FB is grounded with 1.0K of resistance at normal phase.
- Pull-up/pull-down Current of the Oscillator: at normal phase, FB is 2.5V, CT is 1.25V, and CT is in pull-up/pull-down current.
- FB Pull-up Current: Pull-up current on FB at normal phase when FB is 2.5V, IS is 0V.
- FB Upper Limit Current Prevention: The pull-down current on FB at normal phase when FB is 6V, IS is 0.3V.
- Internal Feedback Power Voltage: VCC value of THX203H power supply of the circuit without peripheral standby at normal phase
- OC Upper Limit Voltage: the minimum OC current of pull-down current on FB when FB is 6V
- Ramp current drive: it refers to the power tube base drive OB on-current is the function of IS, when IS is 0V, on-current OB is about 40mA, then on-current OB will increase linearly with IS, when IS is increased to 0.6V, on-current OE is about 120mA.