DESCRIPTION

The RM6203 is a kind of progressive overload and saturation current to prevent the function of switching power supply. It provides continuous output power up to 12W in the broad voltage range of 85V – 265V.Its optimized and highly reasonable circuit design has made it possible to minimize the total cost of the product. This power supply controller could be used in typical flyback circuit topology to constitute simple AC/DC converter. The internal initiating circuit of 6203 has been designed with a unique means of current sink to complete the startup using the amplifying function of the power switching tube. This will significantly reduce the power consumption of the start-up resistor; and when the output power becomes smaller, 6203 will automatically lower its operating frequency to enable very low standby power consumption.

When the power tube stops, the internal circuit will turn the power tube reverse bias to greatly raise the voltage resistant capacity of OC pin. This will ensure the safety of the power tube. The internal design of the 6203 is also provided with over-load and saturation preventive function capable of preventing disorders such as overload, transformer saturation and output short-circuit, so as to increase the reliability of the power supply. A voltage reference of 2.5V is also integrated in the 6203 to provide accurate power supply to the clock circuit, and the clock frequency may be set by external timing capacitance. Presently, standard DIP8 package and environmental friendly lead-free package in compliance with European standard can be supplied.

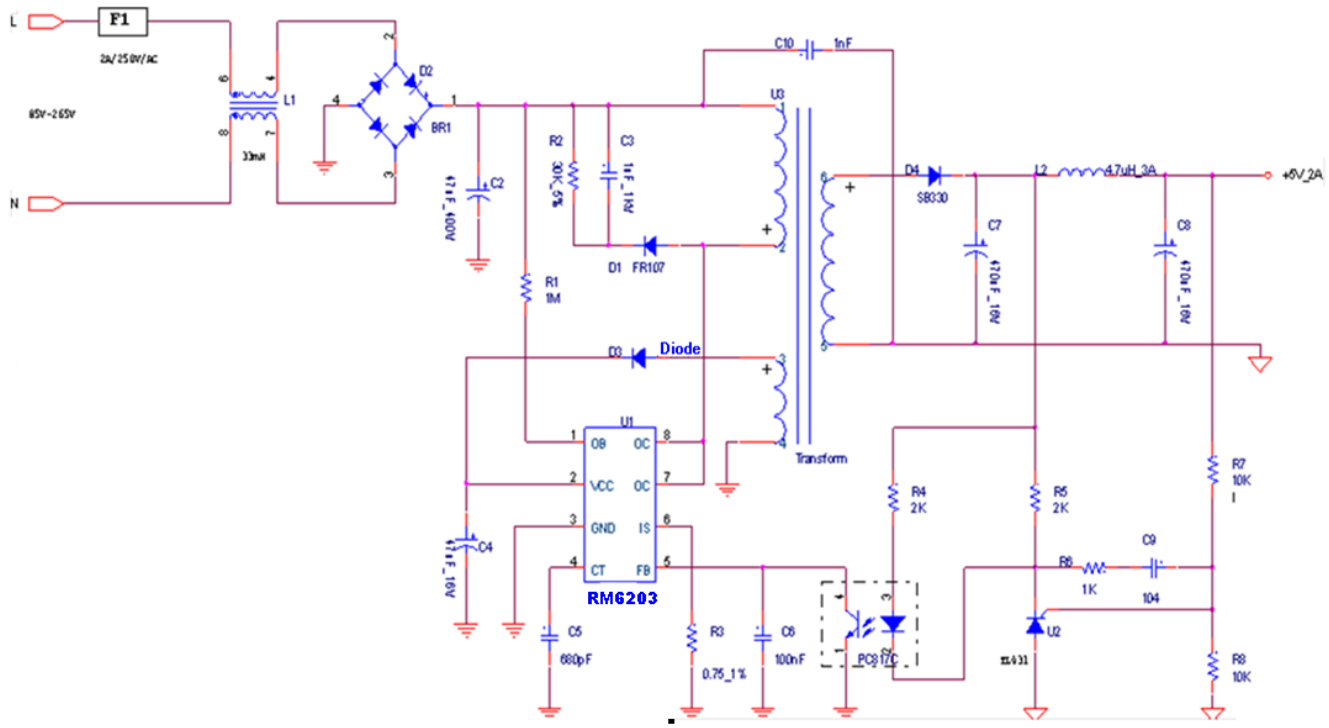
FEATURES

- Built-in 800V high voltage power switching tube with minimal external parts count
- Latched PWM and pulse-by-pulse current limiting inspection
- Reduced frequency at low output with standby power consumption below 0.25W
- Built-in slope and feedback compensation function
- Separate upper limit current inspection controller to handle timely the over-current and overload of the controller
- Turn off periodic bias output of the emitter to improve the voltage resistance of the power tube
- Built-in thermal protective circuit
- Complete start-up using amplification of the switching power tube to reduce the power consumption of the start-up resistor more than ten times
- Automatic VCC over-voltage limit
- Broad voltage output power up to 12W and narrow voltage output power up to 18W

Applications

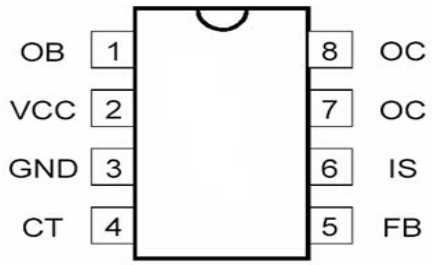
- Power Adaptors(traveling chargers ,stand-alone power set)
- Internal power supply for Energy-Saving Appliances (such as electromagnetic oven, microwave oven and etc.)

TYPICAL APPLICATION



PACKAGE INFORMATION

TOP VIEW



DIP-8

Y:Year Code;
M:Month Code (1-12);
D:DIP;
X:Package Factory;

PIN FUNCTIONS

Pin	Symbol	Function Description
1	OB	Base Pin of the Power Tube.(Enabling current input and connect to initiating resistance)
2	VCC	Power Supply Pin
3	GND	Ground Pin
4	CT	Oscillation Capacitance Pin.(Connect to timing capacitance)
5	FB	Feedback Pin
6	IS	Current Inspection Pin
7、8	OC	Output Pin(Connect to switching transformer)

ABSOLUTE MAXIMUM RATINGS(Note 1)

Supply Voltage VCC..... 18V
OC Voltage..... -0.3-800V
Total Dissipation Power..... 1000mW
Storage Temperature Range..... -40 - 150℃
Pin Input Voltage..... VCC+0.3V
Switching Current..... 800mA
Operating Temperature Range.....0-75℃
Welding Temperature..... +260℃，10S

ELECTRICAL CHARACTERISTICS

The specifications are applied at T=25℃, VCC=5.5-7.5V, Ct=680PF, RS=1Ω, unless otherwise noted.(Note 2)

Parameter		Symbol	Conditions	Min	Typ	Max	Units
Output Section							
Max. Withstanding Voltage of the Switching Tube			IOC=10mA	800			V
Saturation Voltage		V_{SAT}	Ioc=250mA			1	V
Output Rise Time		TR	CL=1nF			75	ns
Output Fall Time		TF	CL=1nF			75	ns
Output Limiting Current			Tj=0-100℃	250	270	290	mA
Reference Section							
Reference Output Voltage		VREF	Io=1.0mA	2.4	2.5	2.6	V
Line Regulation			Vcc=5.5-9V		2	20	mV
Load Regulation			Io=0.1-1.2mA			3	%
Temperature Stability					0.2		mV/℃
Output Noise Voltage			F=10Hz-10KHz			50	uV
Long Term Stability			1000 hours@85℃		5		mV
Oscillator Section							
Oscillating Frequency		F_{OSC}	Ct=680PF	56	61	67	KHz
Voltage Stability			Vcc=5.5-9V			1	%
Temperature Stability			Ta=0-85℃			1	%
Oscillator Amplitude (Vp-p)					2.2		V
Feedback Section							
Input Impedance	Pull-up Current		FB=2.5V, IS=0V	0.55	0.6	0.65	mA
	Pull-Down Resistor				30		KΩ
Power Supply Suppression Ratio			Vcc=5.5-9V		60	70	dB
Current Sampling Section							
Current Sampling Threshold		V_{CS}		0.55	0.60	0.65	V
Anti-Upper Limit Current		I_L		0.25	0.27	0.29	A
Power Supply Suppression Ratio					60	70	dB
PWM Section							
Maximum Duty Ratio		D_{MAX}		53	57	61	%
Minimum Duty Ratio		D_{MIN}				3.5	%
Power Supply Current Section							
Initiating Reception Current				1.6	2.4	3.2	mA
Initiating Static Current					55	80	uA
Static Current		I_Q	Vcc=8V	2.8	3.0	3.2	mA
Start-up voltage				8.6	8.8	9.0	V
Oscillator Turn-off Voltage				4.4	4.6	4.8	V

ELECTRICAL CHARACTERISTICS

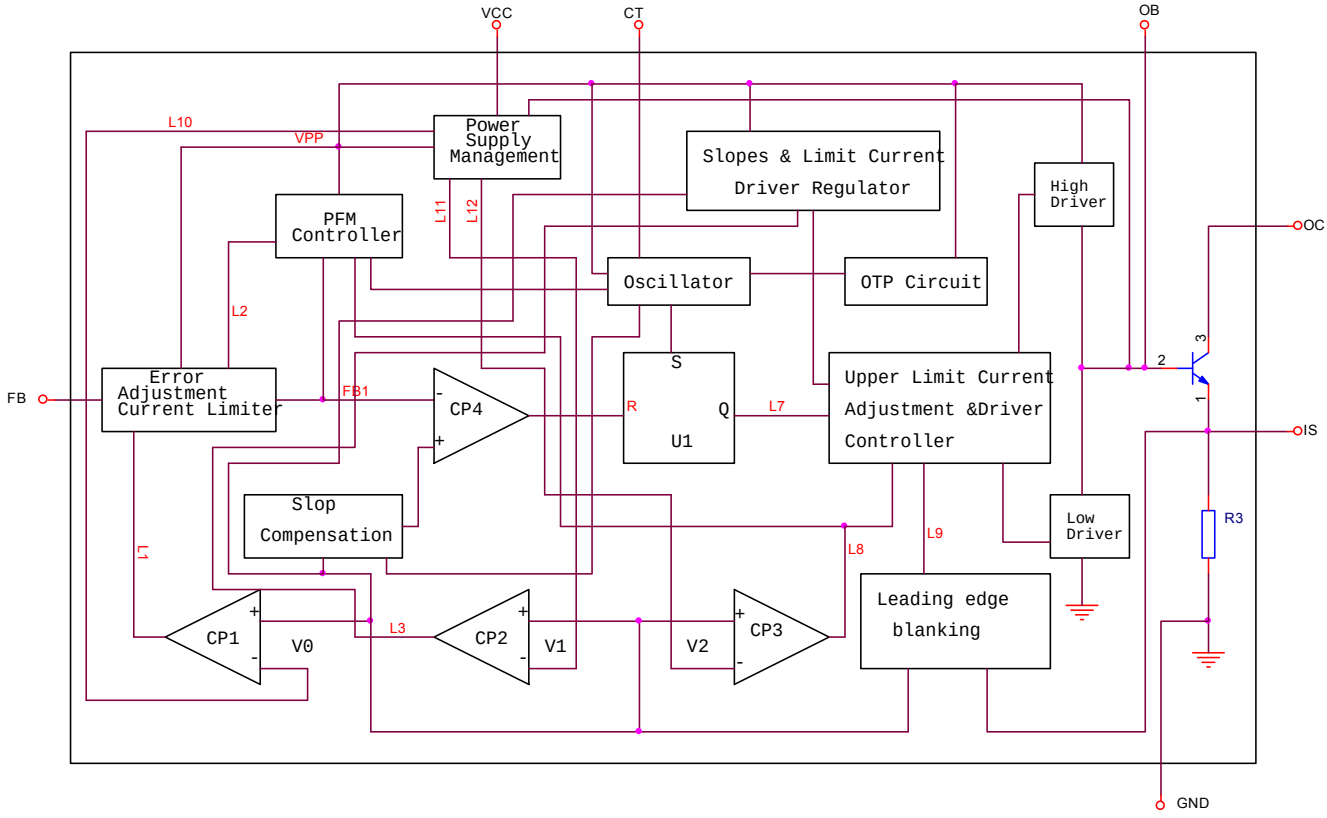
The specifications are applied at T=25℃, VCC=5.5-7.5V, Ct=680PF, RS=1Ω, unless otherwise noted.(Note 2)(continued)

Re-enabling voltage			3.6	3.8	4.0	V
Over-Voltage Limiting Threshold			9.5	10	10.5	V

Note1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note2: The 6203 is guaranteed to meet performance specifications from 0℃ to 70℃. Specifications over the -40℃ to 85℃ operating temperature range are assured by design, characterization and correlation with statistical process controls.

BLOCK DIAGRAM



OPERATION (Refer to Block Diagram)

When RM6203 is surpplied with the rectified AC power, it does not work at once but go to start-sup state. the start-up current of RM6203 depends on the start-up resistor whose unit is Mohm, then the capactor connected between the VCC pin and GND pin is charged by this start-up current. when the capacitor voltage rise to 8.8V and equal to the RM6203 start-up voltage, the RM6203 begin to work. In the next cycle,the VCC pin voltage or the capacitor voltage of RM6203 is surpplied by the second-side feedback winding of transformer. the start-up time is decided by the value of resistor and capacitor.

As RM6203 work, low-point 、sub-high-point and high-point current sampling circuit will respectively real-time sample the current of the power tansistor Q0,

when the current or VRS is lower than 0.55V, the output VL1 signal of the CP1 op-amplifier is low, which

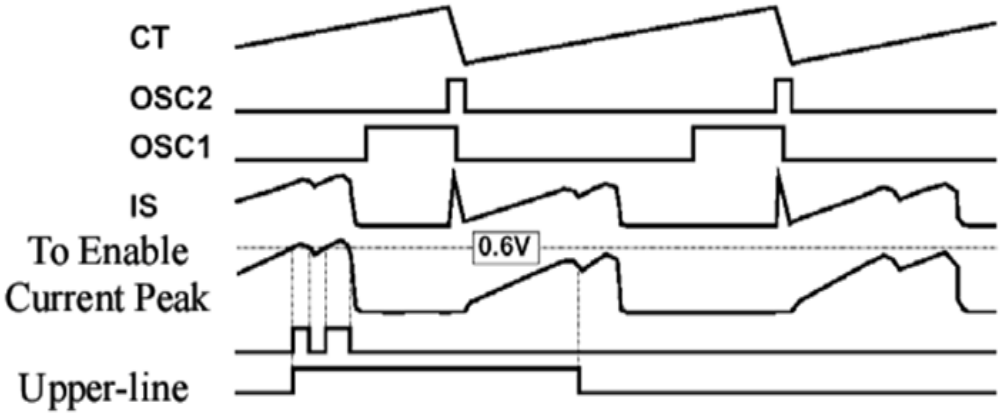
can not enable the error-adjustment-limiter to wo

when the VRS rise to more than 0.55V,the op-amplifier will be enabled and with the VRS rise the output VL1 signal will be increased too, meanwhile, the signal VL1 is send to control VFB1 inverse-proportionaly by adjust-control-module， so VFB1 becomes smaller and the duty cycle of modulated-wave is reduced. the signal VL2 from PFM controller has the same action as VL1. so the duty cycle of modulated-wave is Comprehensive regulated by VFB, VL1 and VL2.

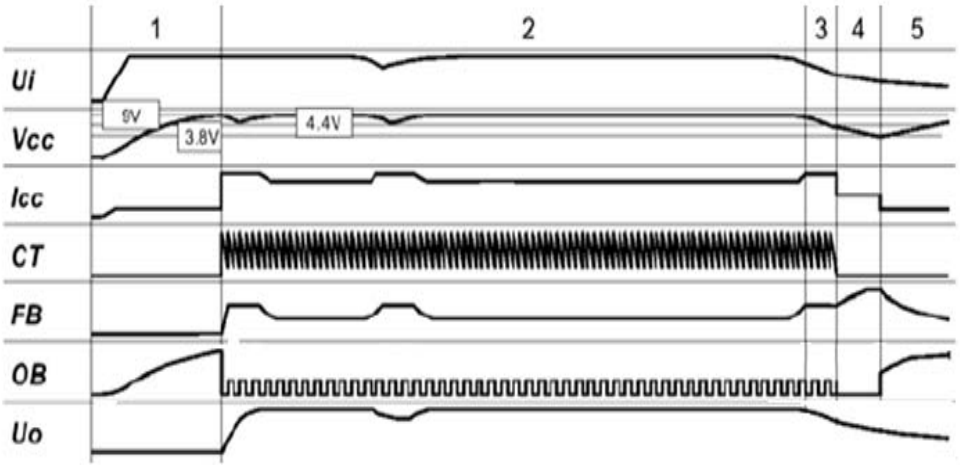
When VRS is more than 0.58V, the output VL3 signal -current-driver regulator and the base driver current of Q0 is reduced.

When VRS is morn than 0.6V, the output signal VL8 of CP3 op-amplifier will be high and the signal reset the RS flip-plop and at the same time switch the upper-limit-current-adjustment and driver controller, the high-driver is off and the low-driver is on. Q0 is turned off quickly.Whether to enter the PFM mode is decided by the The signal VL8 and VFB1, PFM will adjust the frequency of oscillator according to the different case.

Normal Stage Switching Cycle Oscillogram



Global Oscillogram



Electric Parameter Definitions

- Start-up receives current: The current of OC when there's a 0.5mA pull down current of OB in the start-up period.
- Start-up static current: The minimum current sourcing current which can enable VCC surging when VCC is connected to a filter capacitor and an adjustable current sourcing, CT is connected to a 680pF capacitor, and other pins with no connection.
- Start-up voltage: The maximum of VCC above.
- Re-start-up voltage: The minimum of VCC above.
- Oscillator shut-down voltage: The negative -edge of VCC above; the value of VCC which can stop the oscillator.
- Static current: The VCC power supply current in normal period when FB is connected to the ground by a 1.0KΩ resistance.
- Oscillator pull up/pull down current: The pull up/pull down current of CT when FB=2.5V and CT=1.25V in normal period.
- FB pull up current: which occurs in normal period, when FB=2.5V, and IS=0A.
- FB upper current protection: The pull down current of FB when FB=6V and IS=0.6A in normal period.
- Inside feedback power supply: The value of VCC when there is no feedback circuit of RM6203 in normal period.
- OC upper limit current: If FB=6V, the minimum OC current when there is pull down current in FB.
- Oscillator cycle: Which is the function of the capacitor connected to CT, about CT*25400 seconds.

Power Supply Design Points (Refer to Application Example)

- Current control switching power supply with flyback design, discontinuous current operation mode.
- The power supply start-up current is 0.5-2mA which is alternative. The magnification of power transistor Q1 can be supposed as 10. Then the alternation of the start-up resistance must assure the current of the power transistor's base is between 0.05mA to 0.2mA. Therefore, the power of the output resistance can reduce to 1/10, which reduces the power in idle state.
- In diagram 3, C3=680pF, the maximum operation frequency is about 67KHz.
- The reference winding rectifier output is 4.8~9.0V (6V is recommended) of the Switching transformer (T1 in diagram 3), which provide operation power for RM6203.
- The maximum primary peak current of the switching transformer is 0.6A. When at wide voltage or 110V Vac, or 85V magnetism dissipation voltage, the maximum output power can achieve more than 12W.
- The OC (Pin 7, 8) of RM6203 is in high voltage, and IS (Pin 6, for current sense resister) is connected. Therefore, it is easy to open a divider between pin 6 and 7 to meet the requirement of the safe regulation.
- Although there is over-temperature protection, when high-power output is needed without considering PCB heat dissipation, the output power and voltage may fall.

PACKAGE INFORMATION

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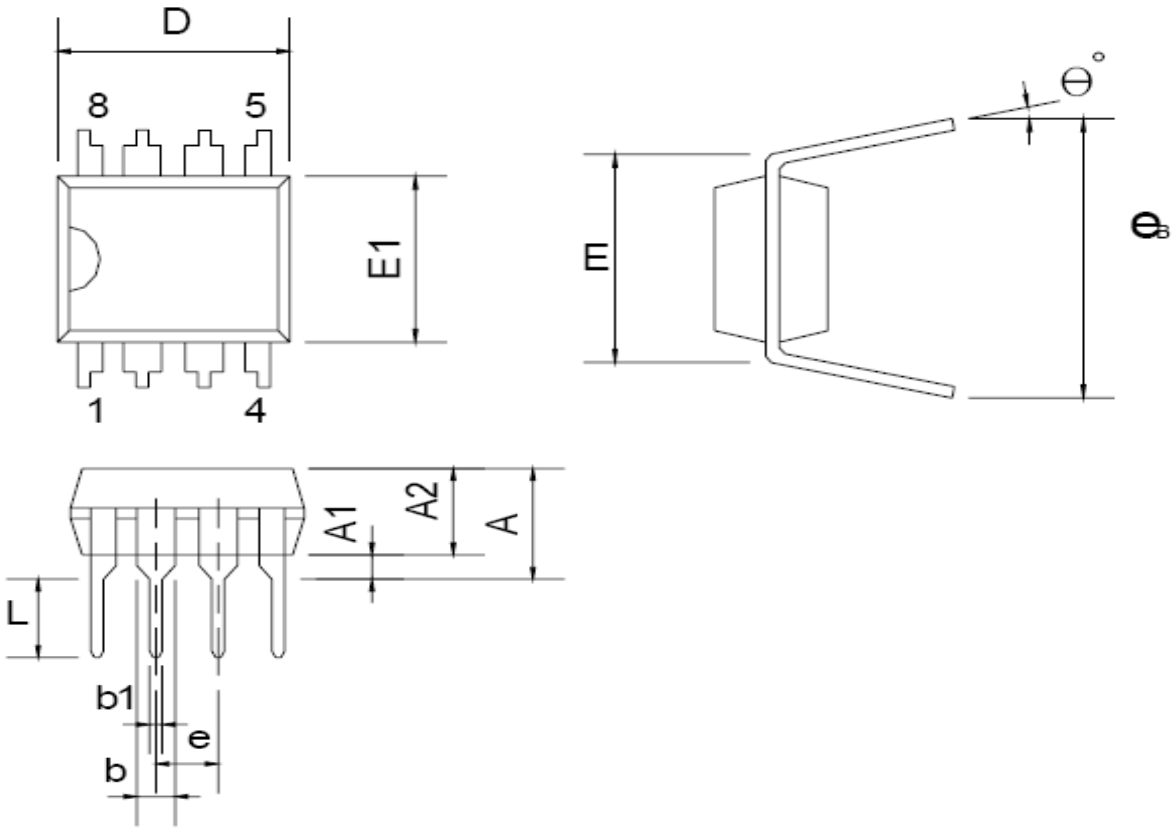

Dimensions

Symbol	Millimeter			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.334			0.210
A1	0.381			0.015		
A2	3.175	3.302	3.429	0.125	0.130	0.135
b		1.524			0.060	
b1		0.457			0.018	
D	9.017	9.271	10.160	0.355	0.365	0.400
E		7.620			0.300	
E1	6.223	6.350	6.477	0.245	0.250	0.255
E		2.540			0.100	
L	2.921	3.302	3.810	0.115	0.130	0.150
e_B	8.509	9.017	9.525	0.335	0.355	0.375
θ°	0°	7°	15°	0°	7°	15°

Thermal Impedence

DIP-8 Package Thermal Rsistance(Reference)
θ_{JC}^{note1} Junction to case ……30℃/W
θ_{JA}^{note2} Junction to Ambient ……70℃/W
Note:1.all items are tested with the standards JESD 51-2. 2.Free-standing,with no heat-sink, under natural convection. 3. Pin 7 & 8 connected to 200 mm^2 PCB copper clad.