DESCRIPTION

The RM6203 is a current mode PWM switching power supply controller that specifically designed for AC/DC converter with high performance versus cost ratio. 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 RM6203 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, RM6203 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 RM6203 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 RM6203 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.

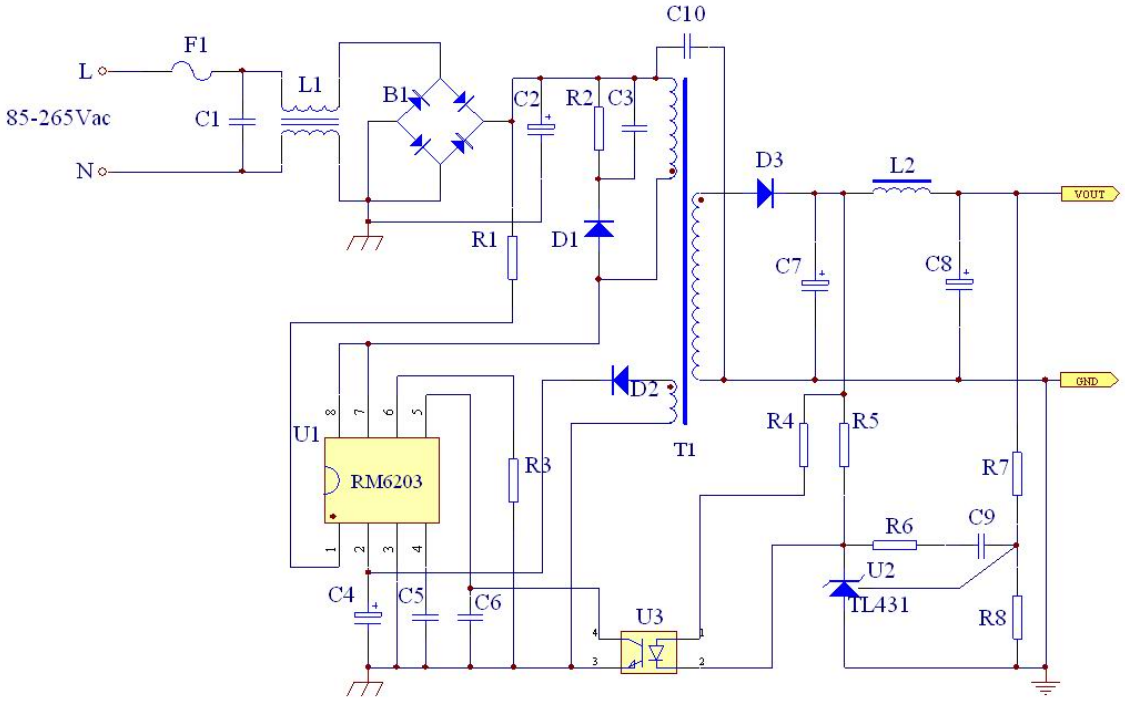
FEATURES

- Built-in 700V 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 5W and narrow voltage output power up to 8W

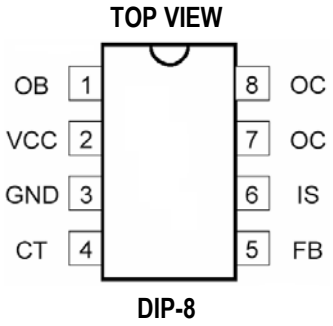
Applications

- 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



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..... -0.3-700V
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			I_{OC}=10mA	700			V
Saturation Voltage		V_{SAT}	Ioc=250mA			1	V
Output Rise Time		T_R	CL=1nF			75	ns
Output Fall Time		T_F	CL=1nF			75	ns
Output Limiting Current			Tj=0-100℃	250	270	290	mA
Reference Section							
Reference Output Voltage		V_{REF}	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	59	66	73	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		mA
Start-up voltage				7.6	7.8	8.0	V
Oscillator Turn-off Voltage				4.2	4.4	4.6	V

ELECTRICAL CHARACTERISTICS

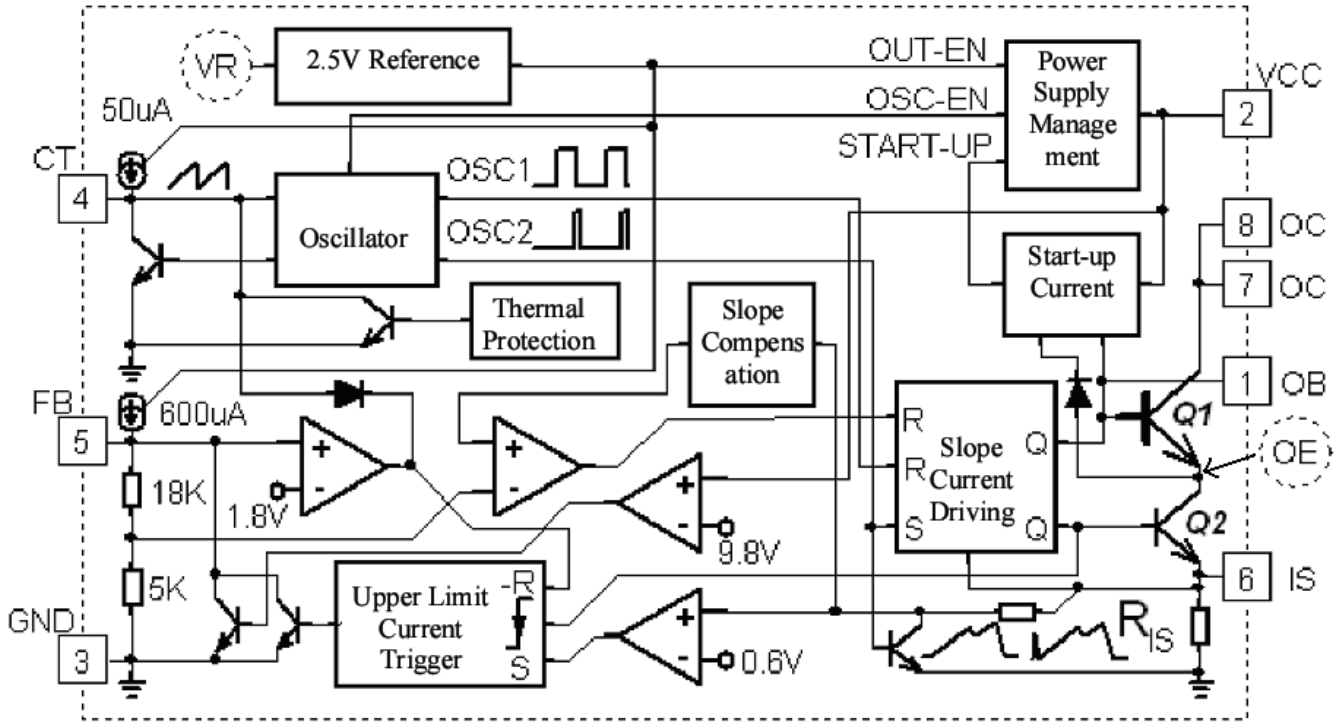
The specifications are applied at T=25℃, VCC=5.5-7.5V, Ct=680PF, RS=1Ω, unless otherwise noted.(Note 2)(continued)

Re-enabling voltage				3.8		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: TheRM6203 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)

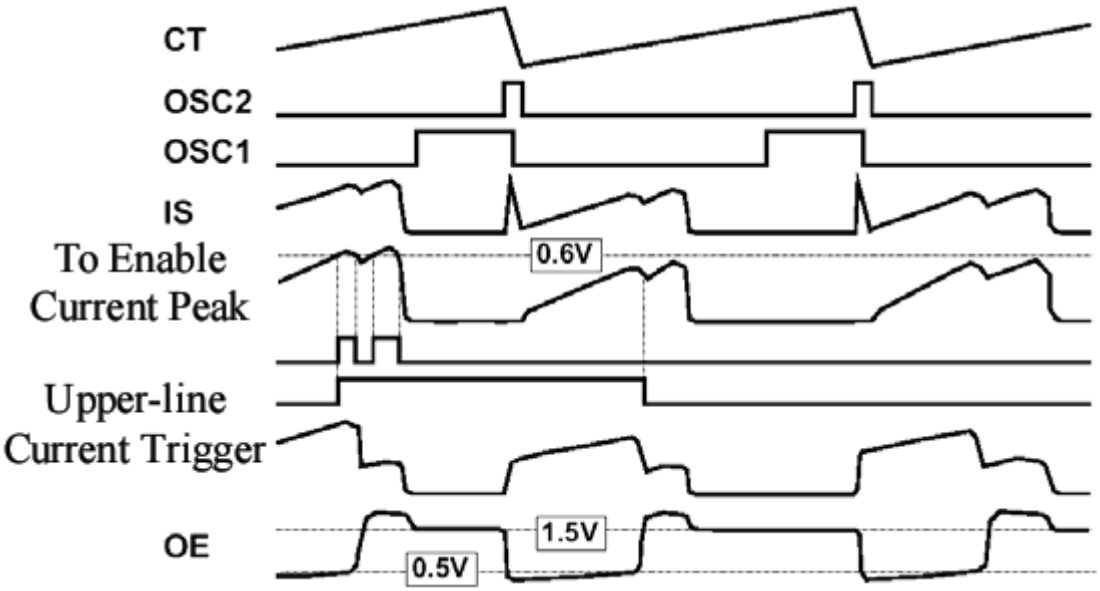
In the enabling stage, when power is on, VR is closed; the pull-up current source FB is closed; OE inputs enabling current from power tube to VCC; OB controls the base current of the power tube, limits the collector current of the power tube (i.e. RM6203 initiates the reception current), so as to ensure the safety of the power tube; when VCC voltage raises up to 7.8 V, the enabling stage ends and it goes into the normal stage.

In the normal stage, VCC voltage should be maintained at 4.8V to 9.0V, VR outputs 2.5V reference; FB pull-up current source is opened; the oscillator output OSC1 decides the maximum duty ratio, output OSC2 tries to trigger the power into open period, and the screened power tube turns on the current peak; if FB is below 1.8V (approximately between 1.2V and 1.8V), the oscillator period will then be increased, the smaller the FB is, the wider the oscillator period will be, until the stop of the oscillator (this feature will lower the stand-by power consumption of the switch power source); if the external feedback intends to make VCC higher than 10V, the internal circuit feedback to FB will stabilize VCC at 9.8V (with this feature, the internal circuit rather than the external feedback circuit will be used to stabilize the output voltage, but the stabilizing accuracy may be low); in the open period, OB supplies base current to power tube, OE pulls down the emitter of the power tube to IS, and the OB uses the slope current driving (i.e. the OB open current is the function of IS, when IS = 0V, OB open current is approximately 40mA, then the OB

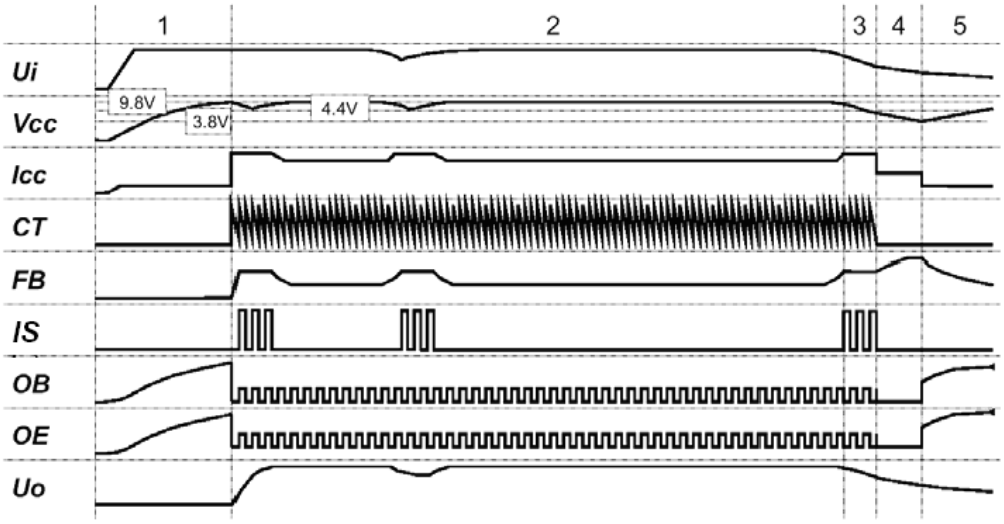
open current will increase along with IS linearly, when IS raises to 0.6V, the OB open current is approximately 100mA, this feature will effectively utilize the output current of OB and lower the power consumption of RM6203), if IS detects the specified current of FB, it goes into close period; in the close period, OB pulls down, the power tube may not be turned off immediately, but OE clamps on 2.0V (after the power tube turns off, the base will be reverse bias and the voltage withstanding capacity is increased); in the open or close period, if it detects the current exceeding upper limit of the power tube, then the upper limit flip-flop will be put at the preferential position, forcing FB to decrease and the duty ratio will turn smaller, so that the power tube and transformer will be protected; at the beginning of next close period edge or if FB is below 1.8V, the upper limit flip-flop will reset. Besides, the built-in heat protection of RM6203 will widen the oscillator period when the internal temperature is above 125℃ to ensure the temperature of RM6203 will not exceed 135℃; the built-in slope compensation will stabilize the open/close period when RM6203 is at high duty ratio or in continuous current mode.

When VCC lowers to about 4.4V, the oscillator will be closed, OSC1 and OSC2 will be at low level, and the power source will be maintained at close period; when VCC goes on lowering to about 3.8V, RM6203 will enter the enabling stage again.

Normal Stage Switching Cycle Oscillogram



Global Oscillogram



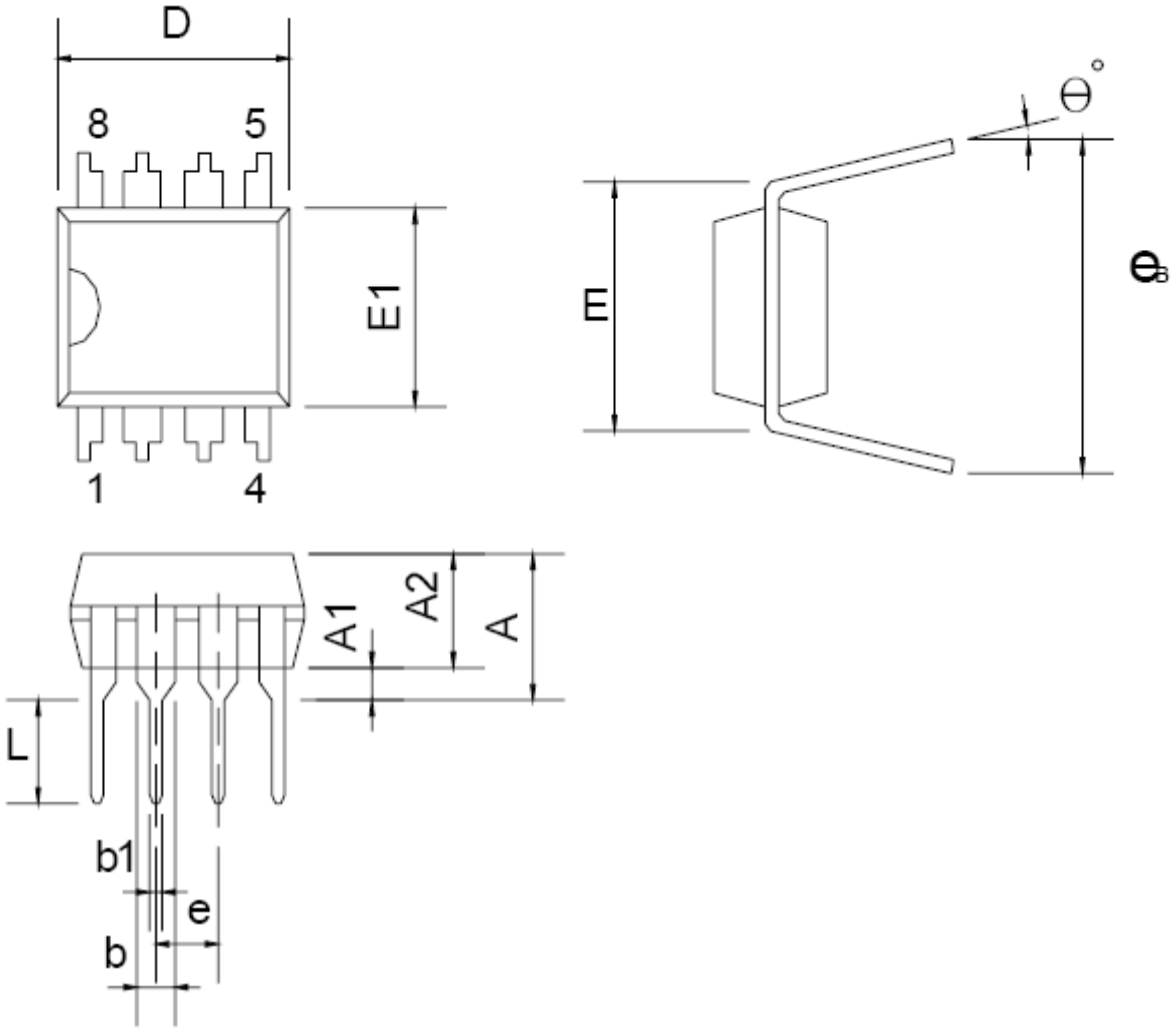
TEST DATA

RM6203(12V)

V_{IN} (V_{AC})	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (A)	V_{CC} (V)	V_{OR} (mVp-p)	P_{OUT} (W)	η (%)	OCP (A)	OPP (A)	Average η(%)	CEC Standerd η(%)
90Vac	0.1	12.1	0	5.36		0		1.07	1.36	79.05	
	3.2	12.1	0.2	6.64		2.4	75.0				
	7.6	12.1	0.5	6.64		6.1	80.3				
	12.0	12.1	0.8	6.64		9.7	80.8				
	15.1	12.1	1.0	6.64		12.1	80.1				
100Vac	0.1	12.1	0	5.28		0		1.13	1.45	80.35	
	3.1	12.1	0.2	6.70		2.4	77.4				
	7.5	12.1	0.5	6.70		6.1	81.3				
	11.9	12.1	0.8	6.70		9.7	81.5				
	14.9	12.1	1.0	6.70		12.1	81.2				
240Vac	0.1	12.1	0	4.96		0		1.69	2.13	82.95	
	3.0	12.1	0.2	6.96		2.4	80.0				
	7.3	12.1	0.5	6.96		6.1	83.5				
	11.5	12.1	0.8	6.96		9.7	84.3				
	14.4	12.1	1.0	6.96		12.1	84.0				
256Vac	0.1	12.1	0	4.88		0		1.72	2.17	82.35	
	3.0	12.1	0.2	7.04		2.4	80.0				
	7.4	12.1	0.5	7.04		6.1	82.4				
	11.6	12.1	0.8	7.04		9.7	83.6				
	14.5	12.1	1.0	7.04		12.1	83.4				

PACKAGE INFORMATION

DIP-8



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°