



## DESCRIPTION

The AP8263 includes all necessary function to build an easy and cost effective solution for low power supplies to meet the international power conservation requirements. AP8263 offers complete protection coverage with automatic self-recovery feature including Cycle-by-Cycle current limiting (OCP), over voltage protection (OVP), over temperature protection (OTP), soft-start and Burst mode operation. Excellent EMI performance is achieved with frequency modulation. The device provides an advanced platform well suited for low standby-power and cost-effective flyback converters.

The AP8263 is available in SOT-26 package

## ORDERING INFORMATION

Package Type	Part Number	
SOT-26	E6	AP8263E6R
		AP8263E6VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

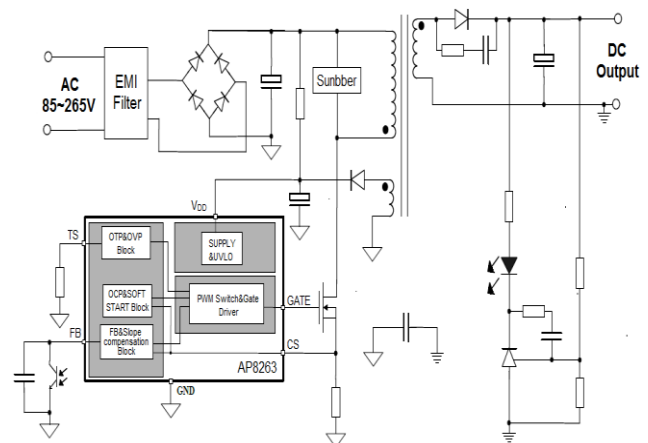
## FEATURES

- Proprietary Frequency Jitter for EMI
- PFM Mode Control
- Audio Noise Free
- Internal Slope Compensation
- Owing soft start-up function
- Good Protection Coverage With Auto Self-Recovery
- Available in SOT-26 Package

## APPLICATION

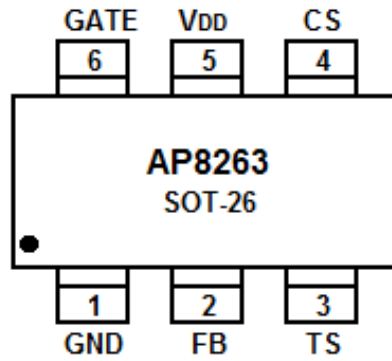
- DVB Power Supplies
- Power Adapter
- Battery Charger
- Open-frame SMPS

## TYPICAL APPLICATION





## PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	GND	Ground
2	FB	Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and CS pin input.
3	TS	Over temperature sense pin. Connected through a NTC resistor to ground.
4	CS	Current sense input pin. Connected to MOSFET current sensing resistor node.
5	V <sub>DD</sub>	Power supply pin.
6	GATE	Totem-pole drive output connected to the Gate of power MOSFET.



## ABSOLUTE MAXIMUM RATINGS

Supply Voltage Pin V <sub>DD</sub>	-0.3V ~28V
FB Input Voltage	-0.3V~7V
CS Input Voltage	-0.3V~7V
TS Input Voltage	-0.3V~7V
V <sub>DD</sub> Clamp Current	10mA
V <sub>DD</sub> Clamp Voltage	32V
Electrostatic Discharge Human Body Mode	2000V
Electrostatic Discharge Machine Mode	200V
Junction Temperature	-40°C~150°C
Storage Temperature Range	-55°C~150°C
Lead Temperature (Soldering, 10secs)	260°C

Stress beyond above listed "Absolute Maximum Ratings" may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## RECOMMENDED OPERATING CONDITIONS

Parameter	MIN	MAX	Units
V <sub>DD</sub> Voltage	12	25	V
Operating Ambient Temperature	-20	85	°C



## ELECTRICAL CHARACTERISTICS

T<sub>J</sub>=25°C, V<sub>DD</sub>=18V, unless otherwise specified

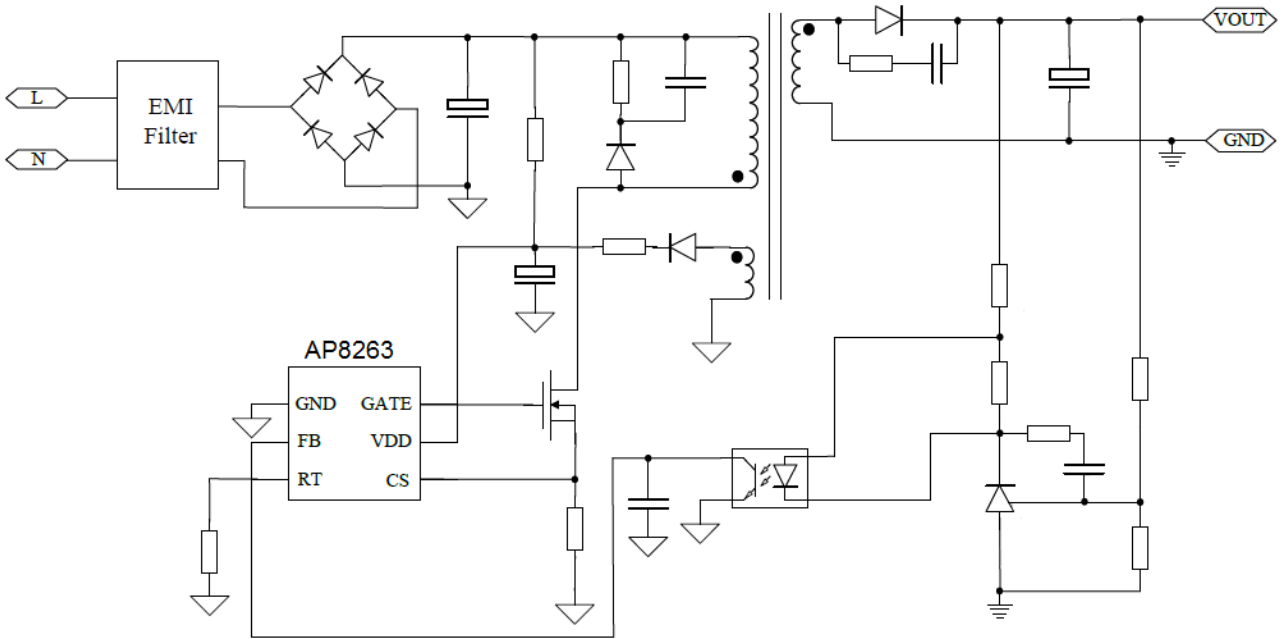
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>OSCILLATOR section</b>						
Normal Oscillation Frequency	F <sub>OSC</sub>	V <sub>DD</sub> =14V, FB=3V, CS=0V	60	65	70	KHz
Frequency Temperature Stability	Δf_Temp			1		%
Frequency Voltage Stability	Δf_V <sub>DD</sub>			1		%
Burst Mode Base Frequency	F <sub>OSC_BM</sub>			25		KHz
Frequency Modulation range /Base frequency	Δf_OSC			±4		%
Jitter Frequency	f_jitter			32		Hz
<b>FB section</b>						
PWM Input Gain	A <sub>VCS</sub>	ΔV <sub>FB</sub> / ΔV <sub>CS</sub>		1.8		V/V
V <sub>FB</sub> Open Loop Voltage	V <sub>FB_Open</sub>			4.1		V
FB Pin Short Circuit Current	I <sub>FB_Short</sub>	Short FB pin to GND and measure current		0.4		mA
The Threshold Enter Green Mode	V <sub>REF_Green</sub>			1.95		V
The Threshold Exit Burst Mode	V <sub>REF_Burst_H</sub>			1.2		V
The Threshold Enter Burst Mode	V <sub>REF_Burst_L</sub>			1.1		V
Power Limiting FB Threshold Voltage	V <sub>TH_OLP</sub>			3.6		V
Power limiting Debounce Time	T <sub>D_OLP</sub>		80	88	96	mSec
Input Impedance	Z <sub>FB_IN</sub>			16		KΩ
Maximum Duty Cycle	DC_MAX	V <sub>DD</sub> =14V, FB=3V, CS=0V	75	80	85	%
<b>CS section</b>						
Leading edge blanking time	T <sub>LEB</sub>			270		ns
Input Impedance	Z <sub>CS_IN</sub>			40		KΩ
Over Current Detection and Control Delay	T <sub>D_OC</sub>			120		nSec
Over Current Threshold Voltage at zero Duty Cycle	V <sub>TH_OC</sub>			0.75		V
Soft-start up time	t <sub>ss</sub>			8		ms



Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>GATE section</b>						
Output Low Level	VOL	$V_{DD} = 14V, I_o = 5mA$			0.5	V
Output High Level	VOH	$V_{DD} = 14V, I_o = 20mA$	9.5			V
Output Clamp Voltage Level	V_Clamp			15		V
Output Rising Time	Trise	CL = 1nf		160		nSec
Output Falling Time	Tfall	CL = 1nf		90		nSec
<b>SUPPLY section</b>						
V <sub>DD</sub> Start up Current	I_V <sub>DD</sub> _Start	V <sub>DD</sub> =14.5V, Measure leakage current into V <sub>DD</sub>		5	20	uA
Operation Current	I_V <sub>DD</sub> _Op	V <sub>FB</sub> =3V		1.8		mA
V <sub>DD</sub> Under Voltage Lockout Enter	V <sub>DD</sub> off		8	9	10	V
V <sub>DD</sub> Under Voltage Lockout Exit (Recovery)	V <sub>DD</sub> on		14.5	15.5	16.5	V
V <sub>DD</sub> Zener Clamp Voltage	V <sub>DD</sub> _Clamp	I <sub>V<sub>DD</sub></sub> = 10mA	30	32	34	V
Over Voltage Protection Voltage	V <sub>DD</sub> _OVP	CS=0V,FB=3V, Ramp up V <sub>DD</sub> until gate clock is off	26	28	30	V
Pull-up PMOS active	V <sub>DD</sub> _Pull			13		V
<b>TS section</b>						
Output Current of TS Pin	I <sub>TS</sub>		95	100	105	uA
Threshold Voltage for OTP	V <sub>TH</sub> _OTP		0.95	1	1.05	V
OTP Debounce Time	T <sub>D</sub> _OTP			6		cycle
Float Voltage at TS Pin	V <sub>TS</sub> _Open			2.65		V
External OVP Threshold Voltage	V <sub>TH</sub> _OVP			4		V



**TYPICAL CIRCUIT**





## DETAILED INFORMATION

### Overview description

The AP8263 includes all necessary function to build an easy and cost effective solution for low power supplies to meet the international power conservation requirements.

### Start-up current

Startup current of AP8263 is designed to be very low so that  $V_{DD}$  could be charged up above UVLO (up) threshold level and device starts up quickly. Also a large value startup resistor can be used to minimize the power loss.

### Green Mode Operation

At light load or no load condition, the switch loss become the major loss of the power supply, to reduce the power wasted in such conditions, based on a special designed voltage controlled oscillator, green mode operation of the power supply can be achieved by using AP8263. The controller will judge the load condition base on the voltage of FB pin. In light load the FB voltage will decrease, when  $V_{FB}$  is lower than a set threshold voltage, the operating frequency of the power supply begin to decrease, the minimum frequency is set to above 25kHz to avoid audio noise.

When  $V_{FB}$  decrease further, the power supply will enter into burst mode operation to decrease the power consumed at no load condition.

### Built-in Slope Compensation

The sensed voltage across the CS resistor is used for PWM control, and pulse by pulse current limit, Built-in slope compensation circuit adds a voltage ramp onto the current sense input voltage. This greatly improves the close loop stability and prevents the sub-harmonic oscillation of peak current mode operation.

### Gate Driver

The output stage of AP8263 is a fast totem pole gate driver. Dead time has been added to minimize heat dissipation, increases efficiency and enhances reliability. The output driver is clamped by an internal 15V Zener diode in order to protect power MOSFET transistors against undesirable gate over voltage. A soft driving waveform is implemented to minimize EMI.



### **Frequency Jitter**

The frequency jitter function is integrated in the controller, the jitter is modulated by a periodic signal, the modulate signal frequency is much smaller than the oscillator frequency, By this way , the EMI noise has a wider spectrum with lower amplitudes.

### **Over Temperature Protection**

A NTC resistor in series with a regular resistor should connect between TS and GND for temperature sensing and protection. NTC resistor value becomes lower when the ambient temperature rises. With the fixed internal current flowing through the resistors, the voltage at TS pin becomes lower at high temperature. The internal OTP circuit is triggered and shutdown the MOSFET when the sensed input voltage is lower than  $V_{TH\_OTP}$ .

### **Protection**

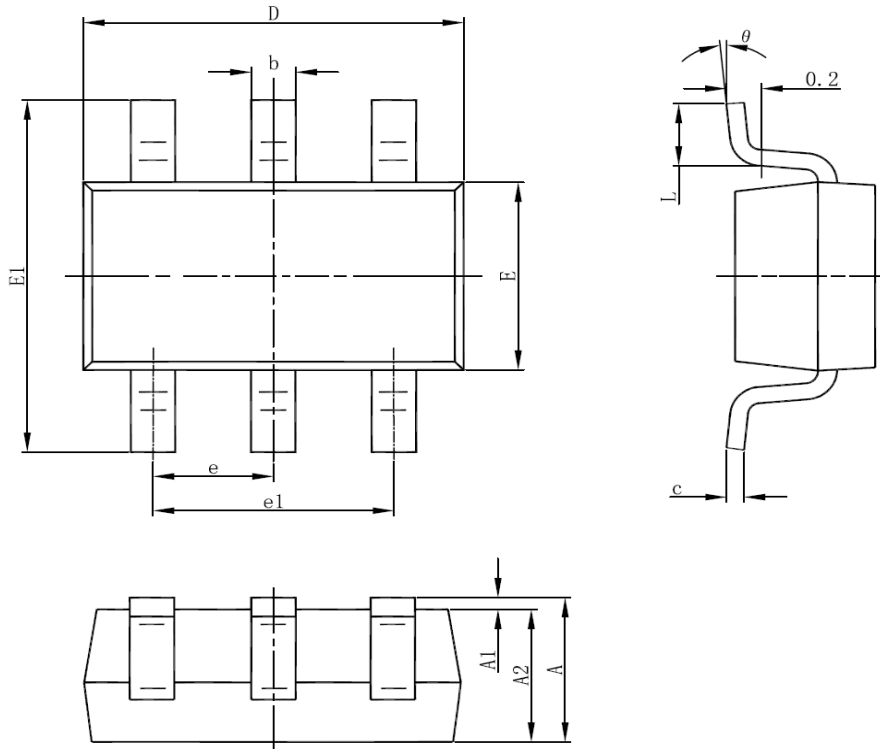
To increase the reliability of power supply system, many protection functions is integrated in this controller, including Cycle-by-Cycle current limiting (OCP), Over Load Protection (OLP) and over voltage clamp, Under Voltage Lockout on  $V_{DD}$  (UVLO). At overload condition when FB input voltage exceeds power limit threshold value for more than  $T_{D\_PL}$  (power limit debounce time), the controller reacts to shut down the output power MOSFET. Device restarts when  $V_{DD}$  voltage drops below UVLO limit.  $V_{DD}$  is supplied by transformer auxiliary winding output. It is clamped when  $V_{DD}$  is higher than threshold value. The power MOSFET is shut down when  $V_{DD}$  drops below UVLO limit and device enters power on start-up sequence thereafter.





## PACKAGE INFORMATION

Dimension in SOT-26 (Unit: mm)



Symbol	Min	Max
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.400
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950TYP	
e1	1.800	2.000
L	0.700REF	
L1	0.300	0.600
$\theta$	8°TYP	



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