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 SPQ: 3,000/Reel	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

FEATURES

● Proprietary Frequency Jitter for EMI

● Green Mode Control

● Audio Noise Free

● Internal Slope Compensation

● Owning soft start-up function

● Good Protection Coverage With Auto Self-Recovery
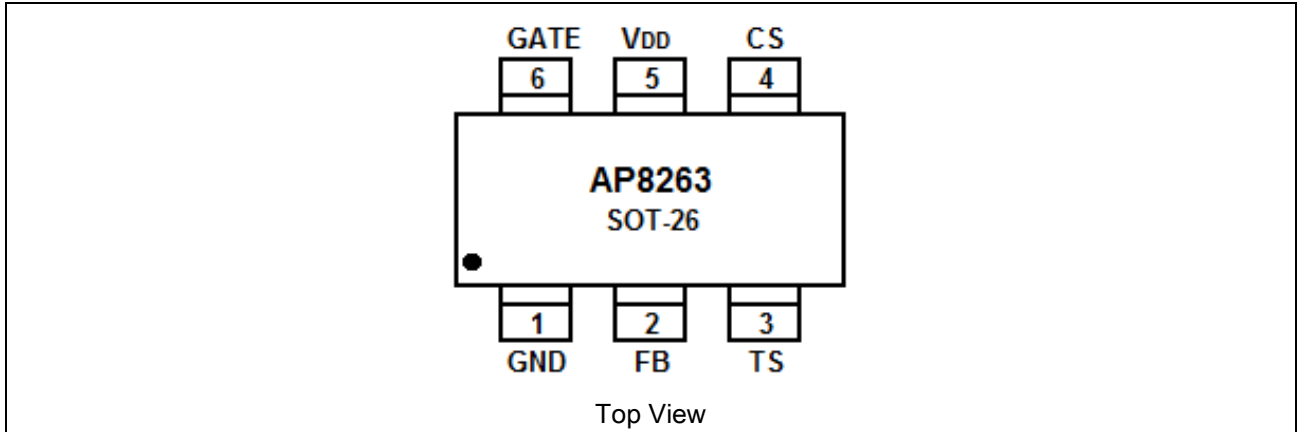
● Available in SOT-26 Package

APPLICATION

● DVB Power Supplies

● Power Adapter

● Battery Charger

● Open-frame SMPS

TYPICAL APPLICATION

PIN DESCRIPTION

Top View
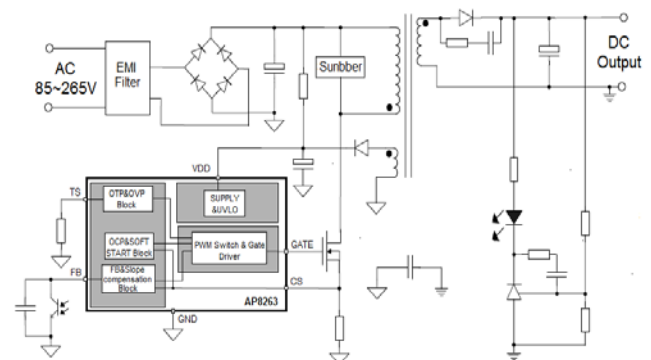
Pin #	Symbol	Function
1	GND	Ground
2	FB	Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and CS pin input.
3	TS	Over temperature sense pin. Connected through a NTC resistor to ground.
4	CS	Current sense input pin. Connected to MOSFET current sensing resistor node.
5	V_{DD}	Power supply pin.
6	GATE	Totem-pole gate drive output for the power MOSFET.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage Pin V_{DD}	-0.3V ~ 28V
FB Input Voltage	-0.3V ~ 7V
SENSE Input Voltage	-0.3V ~ 7V
TS Input Voltage	-0.3V ~ 7V
V_{DD} Clamp Current	10mA
V_{DD} Clamp Voltage	32V
Electrostatic Discharge Human Body Mode (HBM, ESDA/JEDEC JDS-001-2014)	2000V
Electrostatic Discharge Machine Mode	200V
Junction Temperature	-40℃~ 150℃
Storage Temperature Range	-55℃~ 150℃
Lead Temperature (Soldering, 10secs)	260℃

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_{DD} Voltage	12	25	V
Operating Ambient Temperature	-20	85	℃

ELECTRICAL CHARACTERISTICS

T_J=25°C, V_{DD}=18V, unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OSCILLATOR section						
Normal Oscillation Frequency	F_{OSC}	V_{DD}=18V, FB=5V, CS=0V	58	65	71	kHz
Frequency Temperature Stability	Δf_Temp			1		%
Frequency Voltage Stability	Δf_V_{DD}			1		%
Burst Mode Base Frequency	F_{OSC}_BM			25		kHz
Frequency Modulation range /Base frequency	Δf_OSC			±4		%
Jitter Frequency	f_jitter			32		Hz
FB section						
PWM Input Gain	A_{VCS}	ΔV_{FB} /ΔV_{CS}		1.8		V/V
V_{FB} Open Loop Voltage	V_{FB_Open}			4.1		V
FB pin shoTS circuit current	I_{FB_ShoTS}	Short FB pin to GND and measure current		0.4		mA
The Threshold Enter Green Mode	V_{REF_Green}			1.95		V
The Threshold Exit Burst Mode	$V_{REF\_Burst\_H}$			1.2		V
The Threshold Enter Burst Mode	$V_{REF\_Burst\_L}$			1.1		V
Power Limiting FB Threshold Voltage	V_{TH_PL}			3.6		V
Power limiting Debounce Time	T_{D_PL}		75	90	105	ms
Input Impedance	Z_{FB_IN}			16		kΩ
Maximum Duty Cycle	DC_MAX	V_{DD}=18V, FB=3V, CS=0V	70	80	90	%
CS section						
Leading Edge Blanking Time	$T\_blanking$		270		500	ns
Input Impedance	Z_{SENSE_IN}			40		kΩ
Over Current Detection and Control Delay	T_{D_OC}			120		ns
Over Current Threshold Voltage at zero Duty Cycle	V_{TH_OC}			0.75		V
Soft-Start up Time	t_{SS}			8		ms

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
GATE section						
Output Low Level	V_{OL}	$V_{DD} = 14V$, $I_O = 5mA$			0.5	V
Output High Level	V_{OH}	$V_{DD} = 14V$, $I_O = 20mA$	9.5			V
Output Clamp Voltage Level	$V_{\_Clamp}$			15		V
Output Rising Time	T_r	$V_{DD} = 12V$, $C_L = 1nf$		160		ns
Output Falling Time	T_f	$V_{DD} = 12V$, $C_L = 1nf$		90		ns
SUPPLY section						
V_{DD} Start up Current	$I\_V_{DD\_Start}$	$V_{DD} = 12V$, Measure Leakage current into V_{DD}		5	20	uA
Operation Current	$I\_V_{DD\_Ops}$	$V_{FB}=3V$		1.8		mA
V_{DD} Under Voltage Lockout Enter	UVLO (down)		8	9	9.5	V
V_{DD} Under Voltage Lockout Exit (Recovery)	UVLO (up)		14.3	15.5	16.3	V
V_{DD} Zener Clamp Voltage	V_{DD_Clamp}	$IV_{DD} = 5mA$	30			V
Over Voltage Protection Voltage	V_{DD_OVP}	CS=0V, FB=3V	26	28	30	V
Pull-up PMOS active	V_{DD_Pull}			13		V
TS section						
Output Current of TS Pin	I_{TS}		95	100	105	uA
Threshold Voltage for OTP	V_{TH_OTP}		0.96	1	1.04	V
OTP Debounce Time	T_{D_OTP}			6		cycle
Float Voltage at TS Pin	V_{TS_Open}			2.65		V
External OVP Threshold Voltage	V_{TS_OVP}			4		V

TYPICAL CIRCUIT
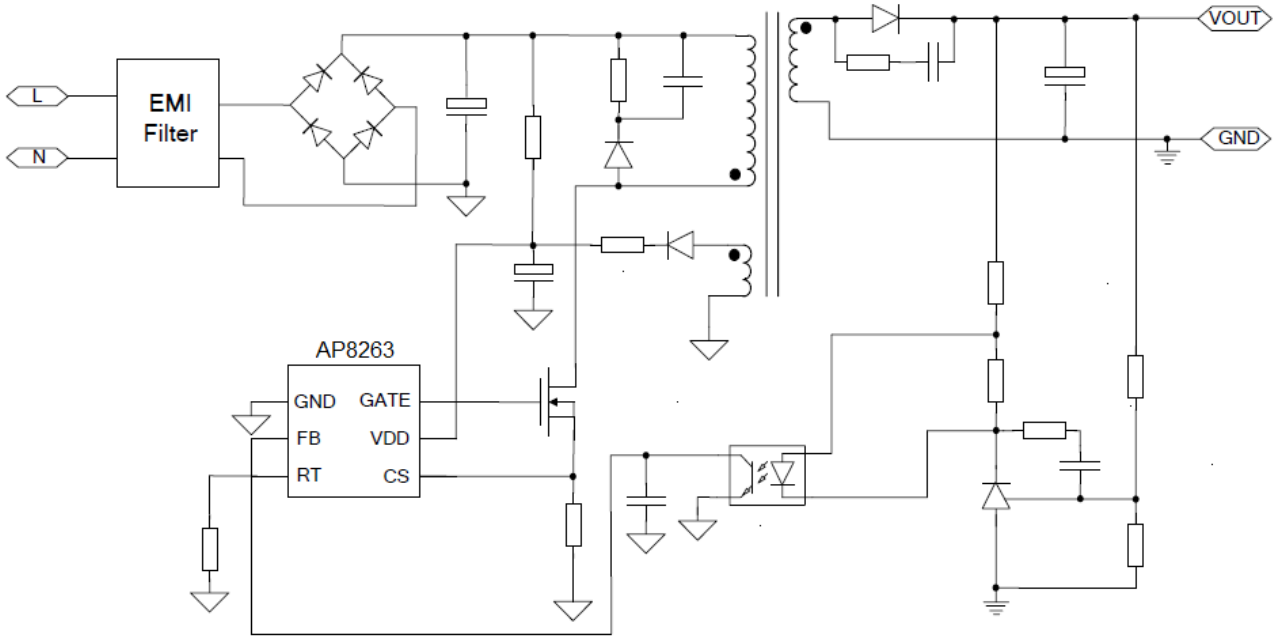
DETAILED INFORMATION

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 22kHz 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)
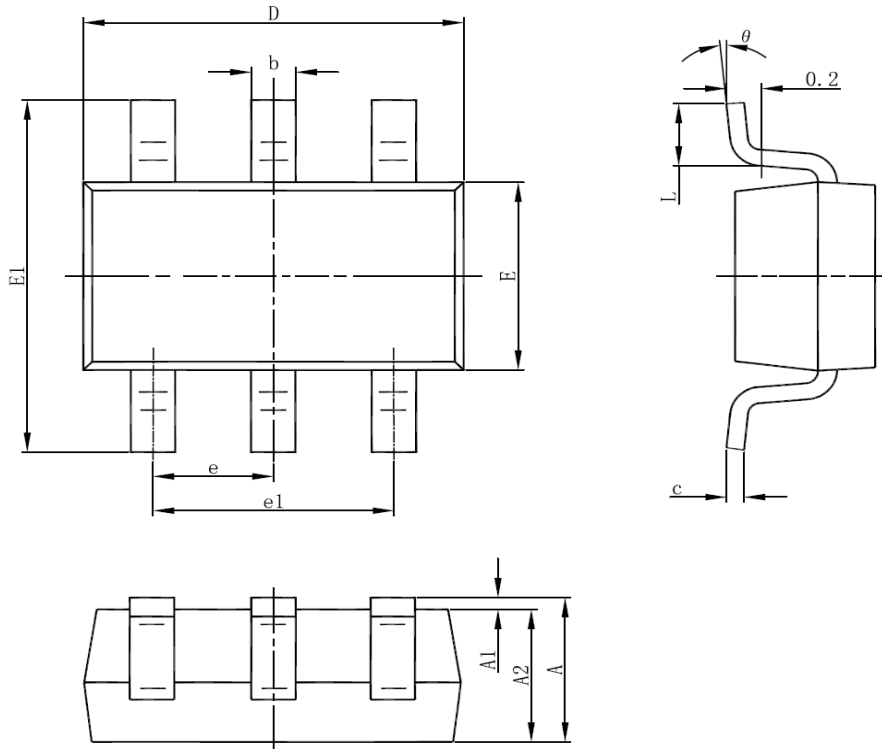
Symbol	Min	Max
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.400
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950TYP	
e1	1.800	2.000
L	0.700REF	
L1	0.300	0.600
θ	8°TYP	

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