GENERAL DESCRIPTION

FXS6063 is highly integrated current mode PWM control IC optimized for high performance, low standby power and cost effective offline flyback converter up to 60W output power system.

PWM switching frequency is internally fixed at 65kHz. At no load or light load condition, the IC operates in 'burst mode' to minimize switching dissipation. Therefore, lower standby power dissipation and higher conversion efficiency are achieved.

Due to very small startup current and low operating current, a big resistor can be used in the startup circuit to minimize standby power dissipation.

FXS6063 offers comprehensive protection functions, including Cycle-by-Cycle current limitation (OCP), over temperature protection (OTP), Over voltage clamp (OVP)and under voltage lockout (UVLO) on VDD. The Gate output is clamped up to 16V to protect the gate of the power MOSFET.

ORDER INFORMATION

CHIP	PACKAGE	QUANTITY
FXS6063	SOT23-6	3000pcs/tape

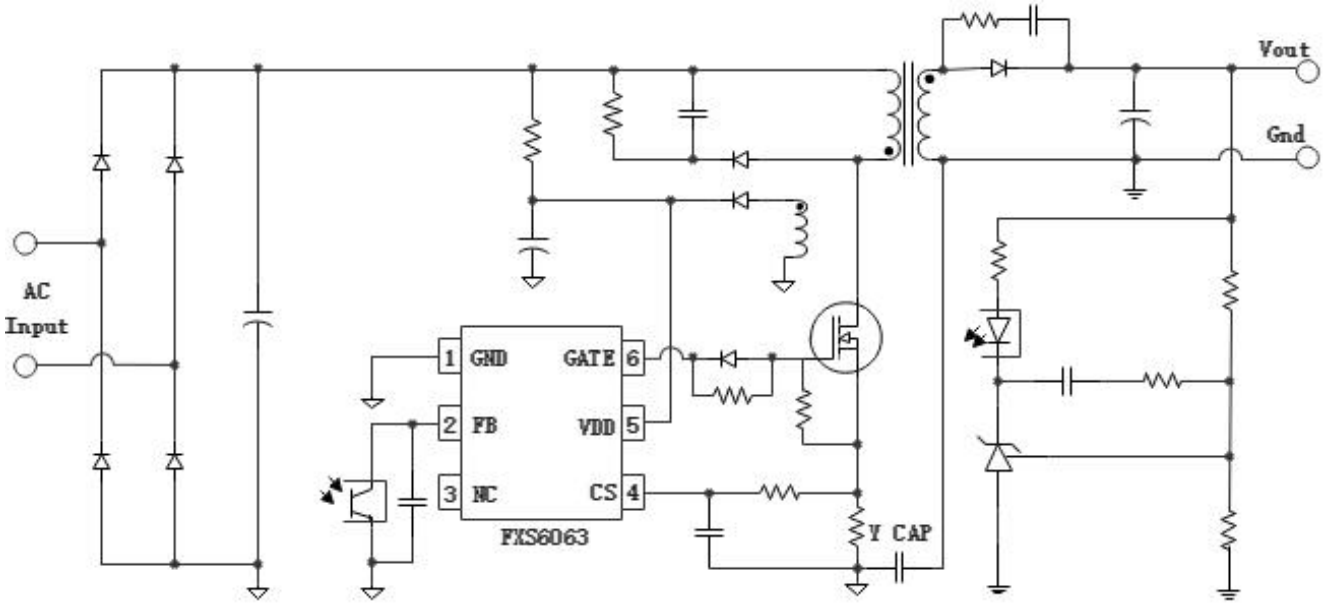
FEATURES

- Frequency shuffling for improved EMI
- Extended burst mode for improved efficiency and low standby power
- Slope compensation
- Soft-start to reduce MOSFET stress during power on
- VDD Under Voltage Lockout Protection(UVLO)
- Over voltage protection (OVP) on VDD
- Cycle-by-Cycle current limiting protection
- Current limitation compensation to obtain the same output current in universal ac line input
- Over load protection (OLP)
- Over temperature protection (OTP)
- 300mA drive capability

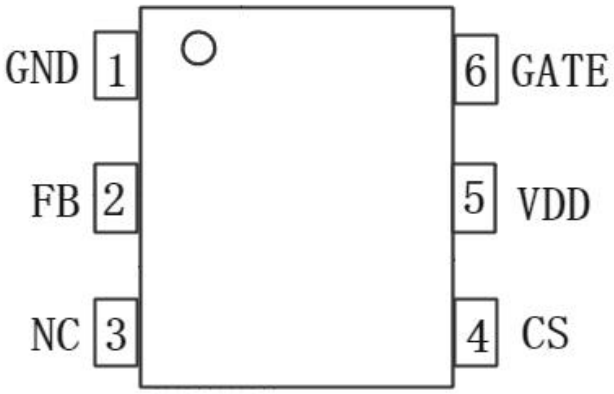
APPLICATIONS

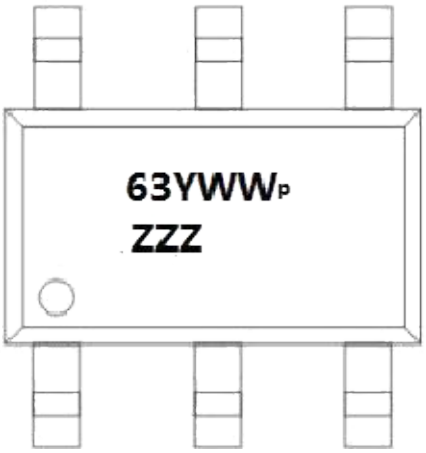
- Cell Phone Charger
- Battery Charger
- Digital Cameras and Camcorder Adapter
- Power adaptor

APPLICATION CIRCUIT



PIN ASSIGNMENT & MARKING INFORMATION





Y: Year code (2018=J)

WW: Week code (01-52)

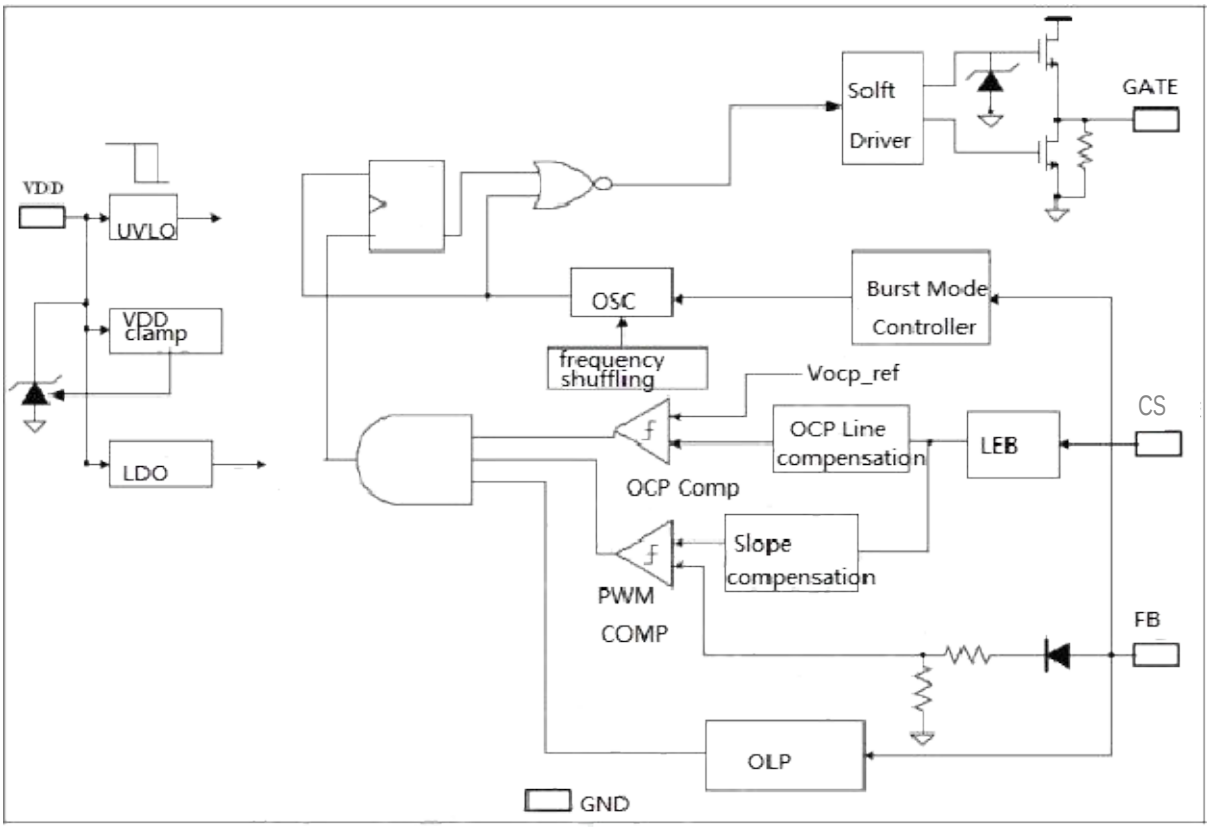
ZZZ: lot number

P: Fixed code

PIN DESCRIPTION

Pin Number	Pin Name	I/O	Description
1	GND	P	Ground
2	FB	I	Feedback input pin. The PWM duty cycle is determined by voltage level into this pin and the current-sense signal at Pin 4.
3	NC	NC	Not connect, let this pin floating
4	CS	I	Current sense input
5	VDD	P	IC DC power supply Input
6	GATE	O	Gate drive output for the power MOSFET

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATING

Parameter	Value	Unit
VDD supply voltage	27	V
VDD clamp voltage	29	V
VDD clamp current	10	mA
VFB input voltage	-0.3 to7	V
VCS input voltage to CS pin	-0.3 to7	V
Min/Max operating junction temperature	-55 to 150	℃
Operating ambient temperature	-20 to 85	℃
Thermal resistance, Junction to shell	250	℃/W

Note: Stresses above absolute maximum ratings may cause permanents damage to the device. Exposure to absolutely maximum-rated conditions for extended periods may affects device reliability

Recommended Operating Conditions

Symbol	Parameter	Min. Max.	Unit
VDD	Supply Voltage Vcc	9 to 25.5	V
T_{OA}	Operating Ambient Temperature	-20 to 85	℃
ESD-HM	Human Model	2	kV
ESD-MM	Machine Model	150	V

Electrical Characteristics(TA = 25 ℃, if not otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Supply Voltage(V_{dd} Pin)						
Idd_startup	VDD start up current	VDD=12.5V		3	15	uA
Idd	VDD operation current	VDD=16V, FB=3V			2.3	mA
UVLO(ON)	VDD under voltage lockout enter		6.8	7.8	8.2	V
UVLO(OFF)	VDD under voltage lockout exit		13	13.4	16.5	V
VDD_OVP	VDD over voltage protection		25.5		28	V
Voltage Feedback (FB Pin)						
AVCS	PWM input gain	ΔVFB/ΔVCS		2		V/V
VFB_open	VFB open loop voltage			5.7		V
IFB_short	FB pin short current	VFB=0V	0.6	0.8	1	mA
VFB_burst	Burst mode voltage			1.1		V
VTH_PL	Power limiting FB threshold voltage		2	3.7		V

TD_PL	Power limiting delay time			120		ms
DC_MAX	Maximum duty cycle	VDD=18V, FB=2.0V		75		%
Current Sensing (CS Pin)						
T_blanking	Leading-edge blanking time		120	250	750	ns
ZSENSE_IN	Input impedance			40		kΩ
VTH_OC	Over current threshold voltage	Duty=0	0.74	0.8	0.86	V
Oscillator						
FOSC	Normal oscillation frequency		62	68.5	75	kHz
Δf_temp	Frequency temperature stability	VDD=16V TA =-20℃ to 100℃		5		%
Δf_VDD	Frequency voltage stability	VDD=12V to 25V		5		%
FOSC_BM	Burst mode base frequency		17	20	28	kHz
Δf_OSC	Frequency modulation range /Base frequency		-5		+5	%
Gate Drive Output						
VOL	Output low level	VDD=16V, IO=-20mA			0.8	V
VOH	Output high level	VDD=16V, IO=20mA	10			V
V_Clamp	output clamp voltage level			16		V
T_r	Output rising time	VDD=16V, CL=1nF		220		ns
T_f	Output falling time	VDD=16V, CL=1nF		70		ns

OPERATION DESCRIPTION

- **General Description**

FXS6063 is a highly integrated PWM controller IC optimized for offline flyback converter up to 40W power system. The burst mode control greatly reduces the standby power consumption and helps the designer easily meet the international energy-saving requirements.

- **Startup Current and Start up Control**

Startup current of FXS6063 is designed to be very low so that VDD could be charged up above UVLO threshold level quickly. Therefore, a large value resistor can be used to minimize the power dissipation in application. For AC/DC adaptor within universal input range, a 2 MΩ, 1/2 W resistor could be connected to VDD capacitor to provide a fast startup and low power dissipation solution.

- **Operating Current**

The Operating current of FXS6063 is low at 2.3mA(typical). Good efficiency is achieved with FXS6063 low operating current together with the 'Extended burst mode' control features.

- **Soft Start**

FXS6063 features an internal 4ms (typical) soft start to soften the electrical stress occurring in the power supply during startup. It is activated during the power on sequence. As soon as VDD reaches UVLO(OFF), the peak current is gradually increased from nearly zero to the maximum level of 0.8V. Every restart up is followed by a soft start.

- **Frequency shuffling for EMI improvement**

The frequency Shuffling is implemented in FXS6063. The oscillation frequency is modulated with a random source so that the harmonic energy is spread out. The spread spectrum minimizes the conduction EMI and therefore reduces system design challenge.

- **Extended Burst Mode Operation**

At light load or zero load condition, most of the power dissipation in a switching mode power supply is from switching loss on the MOSFET, the core loss of the transformer and the loss on the snubber circuit. The magnitude of power loss is in proportion to the switching frequency. Lower switching frequency leads to the reduction on the power loss and thus conserves the energy. The switching frequency is internally adjusted at no load or light load condition. The switch frequency reduces at light/no load condition to improve the conversion efficiency. At light load or no load condition, the FB input drops below burst mode threshold level and device enters Burst Mode control. The gate drive output switches only when VDD voltage drops below a preset level and FB input is active to output an on state. Otherwise the gate drive remains at off state to minimize the switching loss and reduces the standby power consumption to the greatest extend. The switching frequency control also eliminates the audio noise at any loading conditions.

- **Oscillator Operation**

The switching frequency of FXS6063 is internally fixed at 65kHz. No external frequency setting components are required for PCB design simplification.

- **Current Sensing and Leading Edge Blanking**

Cycle-by-Cycle current limiting is offered in FXS6063 current mode PWM control. The switch current is detected by a sense resistor into the CS pin. An internal leading edge blanking circuit chops off the sensed voltage spike at initial internal power MOSFET on state due to snubber diode reverse recovery and surge gate current of internal power MOSFET so that the external RC filtering on CS input is no longer needed. The current limiting comparator is disabled and cannot turn off the internal power MOSFET during the blanking period. The PWM duty cycle is determined by the current sense input voltage and the FB input voltage.

- **Internal Synchronized Slope Compensation**

Slope compensation circuit adds voltage ramp onto the CS voltage according to PWM pulse width. This greatly improves the close loop stability at CCM and prevents the sub-harmonic oscillation and thus reduces the output ripple voltage. Slope compensation can help FXS6063 obtain the same output current in universal ac input voltage.

- **Gate Drive**

GATE pin of FXS6063 has 300mA drive current capability and the highest voltage is clamped at 16V. Therefore, the dissipation of conduction and switching in MOSFET is minimized.

- **Protection Controls**

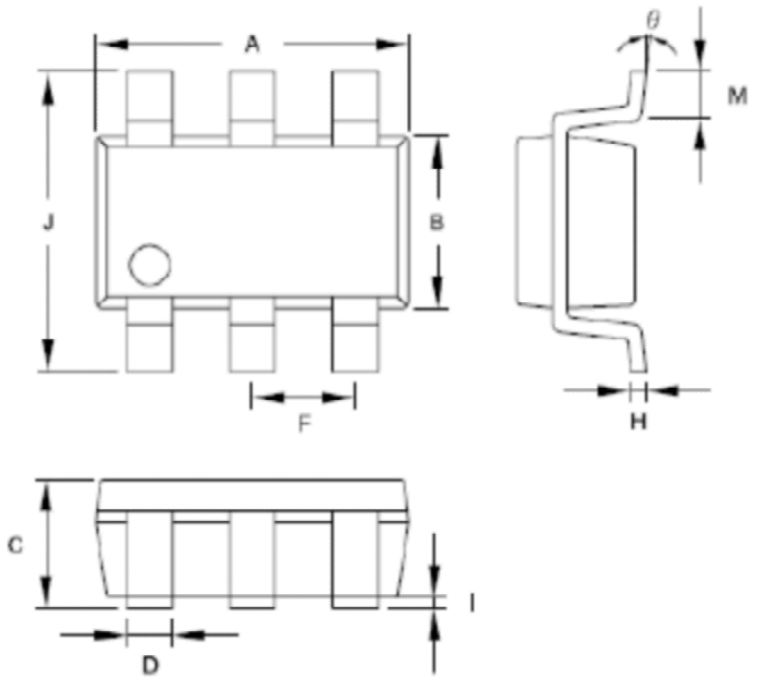
FXS6063 has comprehensive protection functions including Cycle-by- Cycle current limitation (OCP), Over Load Protection (OLP) and over voltage clamp, Under Voltage Lockout on VDD (UVLO), Over Temperature Protection (OTP).

- **Current limitation compensation**

To obtain the same output current capability, the OLP threshold voltage is compensated for the different input AC voltage. This function makes the current of OLP is in consistency whatever the AC input is (110V or 220V).

Package Information

SOT-23-6



Symbol	Dimension in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	2.692	3.099	0.106	0.122
B	1.397	1.803	0.055	0.071
C	-------	1.450	-------	0.058
D	0.300	0.550	0.012	0.022
F	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
I	0.050	0.150	0.002	0.006
J	2.600	3.000	0.102	0.118
M	0.300	0.600	0.012	0.024
θ	0°	10°	0°	10°

Note:

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