DESCRIPTION

The OB2263MP-CN is a highly integrated current mode PWN control IC optimized for high performance, low standby power and cost effective offline flyback converter applications in sub 30W range. PWM switching frequency at normal operation is externally programmable and trimmed to tight range. At no load or light load condition, the IC operates in extended ‘burst mode’ to minimize switching loss. Lower standby power and higher conversion efficiency is thus achieved. VDD low startup current and low operating current contribute to a reliable power on startup design with OB2263MP-CN. A large value resistor could thus be used in the startup circuit to minimize the standby power. The internal slope compensation improves system large signal stability and reduces the possible sub-harmonic oscillation at high PWM duty cycle output. Leading-edge blanking on current sense(CS) input removes the signal glitch due to snubber circuit diode reverse recovery and thus greatly reduces the external component count and system cost in the design.OB2263MP-CN offers complete protection coverage with automatic self-recovery feature including Cycle-by-Cycle current limiting (OCP), over load protection (OLP), VDD over voltage clamp and under voltage lockout (UVLO).

The Gate-drive output is clamped to maximum 18V to protect the power MOSFET. Excellent EMI performance is achieved with OnBright proprietary frequency shuffling technique together with soft switching control at the totem pole gate drive output.

The OB2263MP-CN is packaged in SOT23-6 .

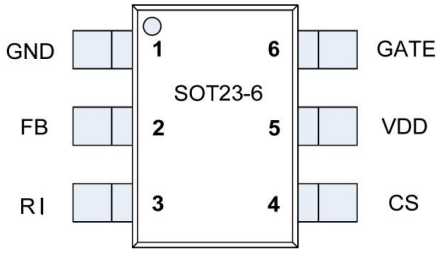
FEATURES

- Audio Noise Free Operation
- Low VDD Startup Current and Low Operating Current (1.4mA)
- External Programmable PWM Switching Frequency
- Good Protection Coverage With Auto Self-Recovery
- Extended Burst Mode Control For Improved Efficiency and Minimum Standby Power Design
- On-Bright Proprietary Frequency Shuffling Technology for Improved EMI Performance.

APPLICATIONS

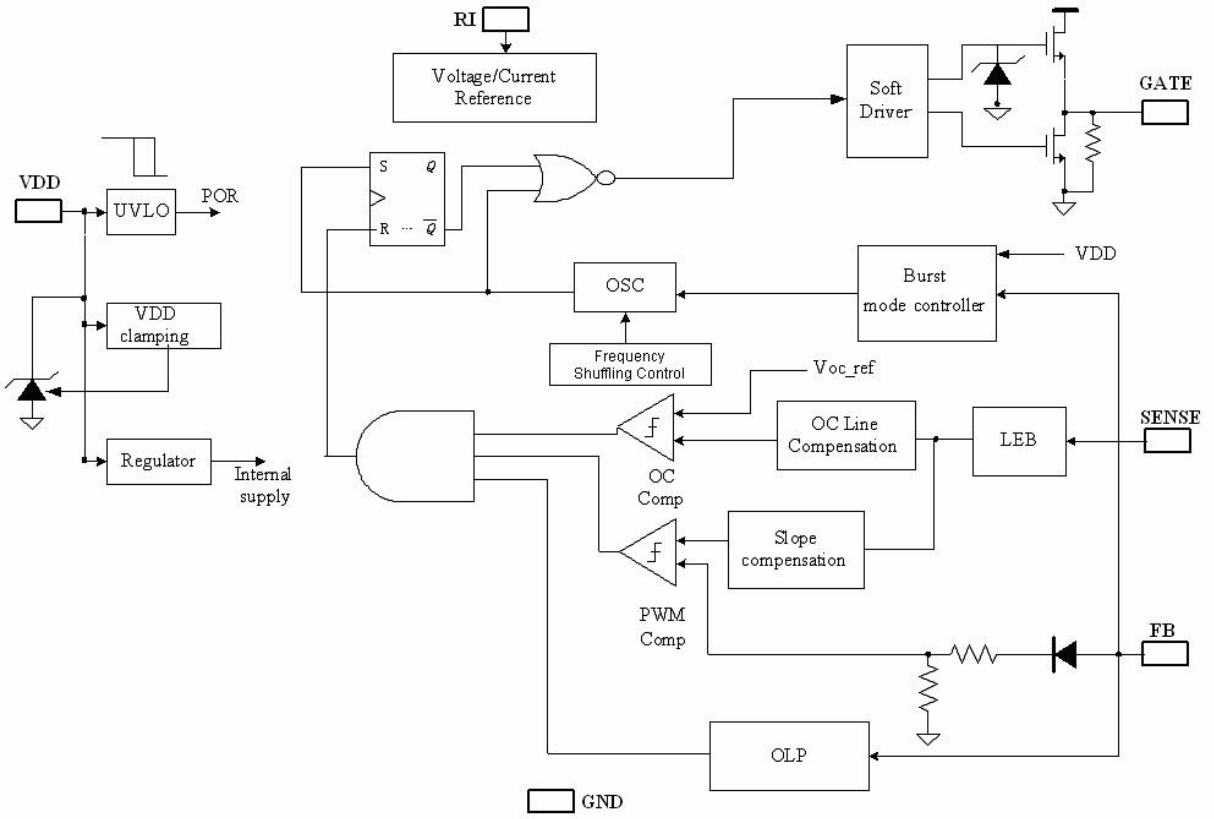
- Battery Charger
- Power Adaptor
- Set-Top Box Power Supplies
- Open-frame SMPS

Pin Configuration



SOT23-6

Schematic Diagram



Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

PARAMETER	MIN	MAX	UNIT
VDD DC Supply Voltage	-	30	V
VDD Clamp Voltage	-	33	V
VDD DC Clamp Current	-	10	mA
V_{FB} Input Voltage	-0.3	7	V
V_{SENSE} Input Voltage to Sense Pin	-0.3	7	V
V_{RI} Input Voltage to RI Pin	-0.3	7	V
Maximum Junction Temperature	-	+150	℃
Operating Temperature	-20	+85	℃
Storage Temperature Range	-65	+150	℃
Lead Temperature(soldering, 10sec)	-	+260	℃

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

PARAMETER	MIN	TYP	MAX	UNIT
VDD DC Supply Voltage	+10	-	+30	V
RI Resistor Value	+50	-	+150	KΩ

Electrical Characteristics

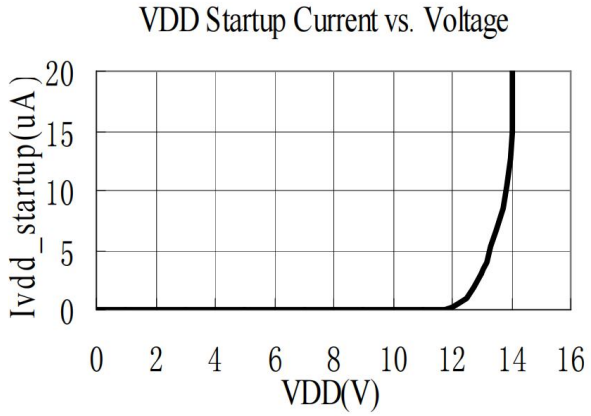
(At Tamb=25℃, VDD=16V, RI=100KΩ, unless otherwise noted)

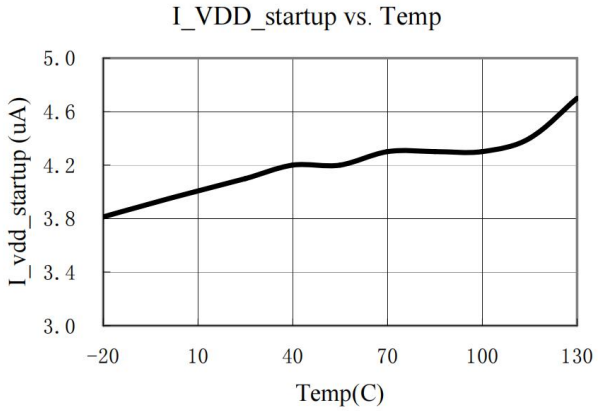
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage(VDD)						
VDD Start up Current	I_{ST}	VDD=15V	-	3	20	uA
Operation Current	I_{OP}	V_{FB}=3V	-	1.4	2	mA
VDD Under Voltage Lockout Enter	UVLO(Enter)		7.8	9.6	10.4	V
VDD Under Voltage Lockout Exit (Recovery)	UVLO(Exit)		13	15.2	16.5	V
VDD Zener Clamp Voltage	VDD_Clamp	I_{VDD}=5mA	-	33	-	V
Feedback Input Section(FB Pin)						
VFB Open Loop Voltage	V_{FB}_Open		-	5.1	-	V
PWM Input Gain	A_{VCS}	$\triangle V_{FB} / \triangle V_{CS}$	-	2.8	-	V/V
FB pin short circuit current	I_{FB}_Short	FB=GND	-	0.95	-	mA
Zero Duty Cycle FB Threshold Voltage	V_{TH}_0D		-	-	0.75	V
Burst Mode FB Threshold Voltage	V_{TH}_BM		-	1.7	-	V
Power Limiting FB Threshold Voltage	V_{TH}_PL		-	3.8	-	V
Power limiting Debounce Time	T_D_PL		-	60	-	ms
Current Sense Input(Sense Pin)						
Input Impedance	Z_{SENSE}_IN		-	40	-	KΩ
Leading edge blanking time	T_Blanking		-	300	-	ns
Over Current Threshold Voltage at zero Duty Cycle	V_{TH}_OC	I_{VIN}=0uA	0.70	0.75	0.80	V
Over Current Detection and Control Delay	T_D_OC	CL=1nf	-	75	-	ns
Oscillator						
Normal Oscillation Frequency	F_{OSC}		60	65	70	KHz
Frequency Temperature Stability	△f_Temp	Tamb=-20 ~ 100℃	-	5	-	%
Frequency Voltage Stability	△f_VDD	VDD=12~25V	-	5	-	%
Operating RI Range	RI_Range		50	100	150	KΩ
RI open load voltage	RI_Open		-	2	-	V
Burst Mode Base Frequency	F_BM		-	22	-	KHz
Duty Cycle Max	DC_Max		75	80	85	%
Duty Cycle Min	DC_Min		-	0	-	%
Gate Drive Output						
Output Low Level	VOL	Io=-20mA	-	0.8	-	V
Output High Level	VOH	Io=20mA	10	-	-	V
Output Clamp Voltage Level	VG_Clamp	VDD=20V	-	18	-	V
Output Rising Time	T_r	CL=1nf	-	220	-	ns

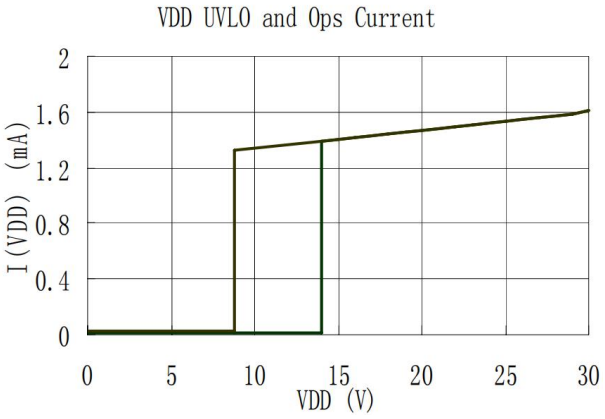
Output Falling Time	T_f	CL=1nf	-	70	-	ns
Frequency Shuffling						
Frequency Modulation range /Base frequency	△f_OSC	RI=100KΩ	-3	-	3	%

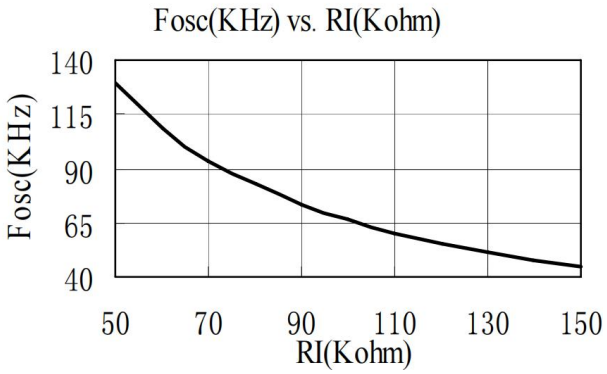
Characterization Plots

(At Tamb=25℃, VDD=16V, RI=100KΩ, unless otherwise noted)









Operation Description

The OB2263MP-CN is a highly integrated PWM controller IC optimized for offline flyback converter applications in sub 30W power range. The extended burst mode control greatly reduces the standby power consumption and helps the design easily meet the international power conservation requirements.

Startup Current and Start up Control

Startup current of OB2263MP-CN is designed to be very low so that VDD could be charged up above UVLO threshold level and device starts up quickly. A large value startup resistor can therefore be used to minimize the power loss yet provides reliable startup in application. For AC/DC adaptor with universal input range design, a 2 MΩ, 1/8 W startup resistor could be used together with a VDD capacitor to provide a fast startup and low power dissipation solution.

Operating Current

The Operating current of OB2263MP-CN is low at 1.4mA. Good efficiency is achieved with OB2263MP-CN low operating current together with extended burst mode control features.

Frequency shuffling for EMI improvement

The frequency Shuffling/jittering (switching frequency modulation) is implemented in OB2263MP-CN . The oscillation frequency is modulated with a random source so that the tone energy is spread out. The spread spectrum minimizes the conduction band EMI and therefore reduces system design challenge.

Extended Burst Mode Operation

At zero load or light load condition, majority of the power dissipation in a switching mode power supply is from switching loss on the MOSFET transistor, the core loss of the transformer and the loss on the snubber circuit. The magnitude of power loss is in proportion to the number of switching events within a fixed period of time. Reducing switching events leads to the reduction on the power loss and thus conserves the energy. OB2263MP-CN self adjusts the switching mode according to the loading condition. At from no load to light/medium load conditionthe FB input drops below burst mode threshold level. 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 frequency control also eliminates the audio noise at any loading conditions.

Oscillator Operation

A resistor connected between RI and GND sets the constant current source to charge/discharge the internal cap and thus the PWM oscillator frequency is determined. The relationship between RI and switching frequency follows the below equation within the specified RI in Kohm range at nominal loading operational condition.

$$F_{OSC} = \frac{6500}{RI(Kohm)}(Khz)$$

Current Sensing and Leading Edge Blanking

Cycle-by-Cycle current limiting is offered in OB2263MP-CN current mode PWM control. The switch currentis detected by a sense resistor into the sense pin. An internal leading edge blanking circuit chops off the sense voltage spike at initial MOSFET on state due to Snubber diode reverse recovery so that the external RC filtering on sense input is no longer required.The current limit comparator is disabled and thus cannot turn off the external MOSFET during the blanking period. PWM duty cycle is determined by the current sense input voltage and the FB input voltage.

Internal Synchronized Slope Compensation

Built-in slope compensation circuit adds voltage ramp onto the current sense input voltage for PWM generation. This greatly improves the close loop stability at CCM and prevents the sub-harmonic oscillation and thus reduces the output ripple voltage.

Gate Drive

OB2263MP-CN Gate is connected to an external MOSFET gate for power switch control .Too weak the gate drive strength results in higher conduction and switch loss of MOSFET while too strong gate drive output compromises the EMI. A good tradeoff is achieved through the built-in totem pole gate design with right output strength and dead time control.

The low idle loss and good EMI system design is easier to achieve with this dedicated control scheme. An internal 18V clamp is added for MOSFET gate protection at higher than expected VDD input.

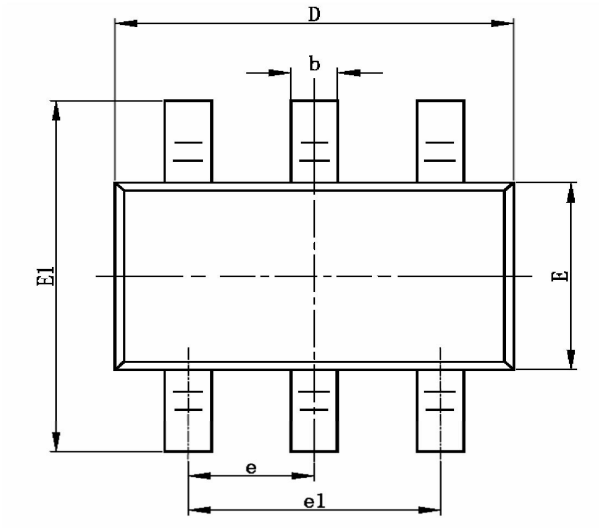
Protection Controls

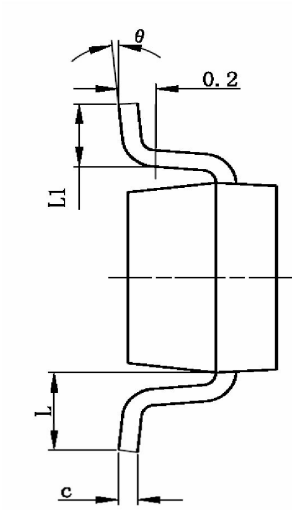
Good power supply system reliability is achieved with its rich protection features including Cycle-by-Cycle current limiting (OCP), Over Load Protection (OLP) and over voltage clamp, Under Voltage Lockout on VDD (UVLO). With On-Bright Proprietary technology, the OCP threshold tracks PWM Duty cycles and is line voltage compensated to achieve constant output power limit over the universal input voltage range with recommended reference design.

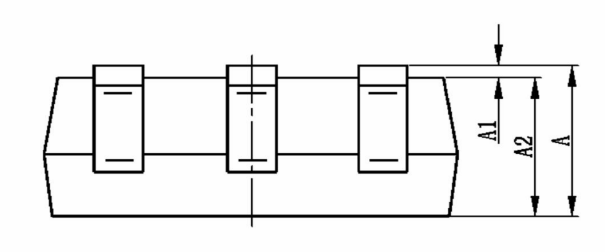
At overload condition when FB input voltage exceeds power limit threshold value for more than TD_PL, control circuit reacts to shut down the output power MOSFET. Device restarts when VDD voltage drops below UVLO limit. VDD is supplied by transformer auxiliary winding output. It is clamped when VDD is higher than threshold value. The power MOSFET is shut down when VDD drops below UVLO limit and device enters power on start-up sequence thereafter.

PACKAGE OUTLINE DIMENSIONS

SOT23-6







SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	1.050	-	1.250	E1	2.650	-	2.950
A1	0.000	-	0.001	e	0.950TYP		
A2	1.050	-	1.150	e1	1.800	-	2.000
b	0.300	-	0.400	L	0.700REF		
c	0.100	-	0.200	L1	0.300	-	0.600
D	2.820	-	3.020	θ	0	-	8°
E	1.500	-	1.700				

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