

GENERAL DESCRIPTION

OB2232xx is a PWM power switch for non-isolated buck application. It has high performance, high precision, low standby power consumption and low cost. It combines a dedicated current mode PWM controller with a high voltage power MOSFET in SOP8 package. Constant voltage regulation of 5V at universal AC input can be guaranteed. Frequency reduction control is implemented for high efficiency at light load. Good EMI performance is achieved with On-Bright proprietary frequency shuffling technique and soft gate driver design. Low startup current and low operating current contribute to a reliable power on startup and low standby power consumption with OB2232xx.

OB2232xx offers power on soft start control and protection coverage with auto-recovery features including cycle-by-cycle current limiting, output short circuit protection, on-chip over temperature protection (OTP), Over loading protection (OLP) and VDD under voltage lockout protection (UVLO).

The tone energy at below 20KHz is minimized in the design so that audio noise is eliminated during operation.

OB2232xx is offered in SOP8 package.

FEATURES

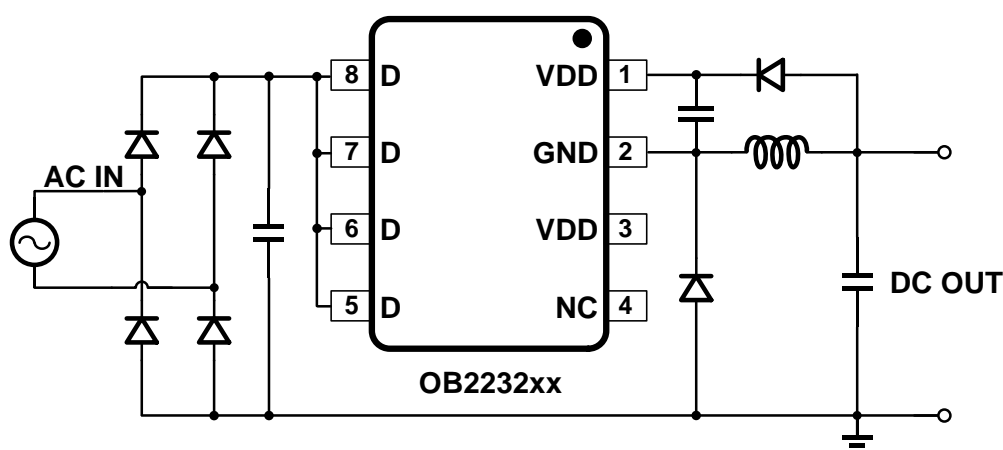
- Universal AC input range and 5V output voltage, accuracy $\pm 5\%$
- Low cost and less BOM for buck application
- Standby power consumption less than 50mw
- Built-in HV
- Frequency-reduction control for high efficiency
- Built-in load regulation compensation
- Frequency shuffling for EMI improvement
- Built-in soft-start
- Built-in leading edge blanking (LEB)
- Cycle-by-cycle current limiting
- Output short-circuit protection
- VDD under voltage lockout with hysteresis
- Over loading protection
- On-chip OTP

APPLICATIONS

Low power AC/DC offline SMPS for

- Home appliances
- Auxiliary power

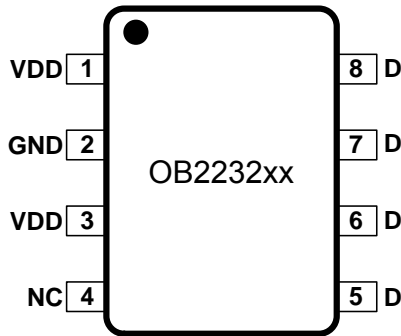
TYPICAL APPLICATION



GENERAL INFORMATION

Pin Configuration

The pin map is shown as below for SOP8



Ordering Information

Part Number	Description
OB2232EMCP-J	SOP8, Halogen-free, Tube
OB2232EMCPA-J	SOP8, Halogen-free, T&R
OB2232MNCP-H	SOP8, Halogen-free, Tube
OB2232MNCPA-H	SOP8, Halogen-free, T&R
OB2232LNCP-H	SOP8, Halogen-free, Tube
OB2232LNCPA-H	SOP8, Halogen-free, T&R
OB2232RPCP-H	SOP8, Halogen-free, Tube
OB2232RPCPA-H	SOP8, Halogen-free, T&R

Package Dissipation Rating

Package	RθJA (°C/W)
SOP8	85

Note: Drain Pin Connected 100mm² PCB copper clad.

Recommended Operating Condition

Symbol	Parameter	Range
VDD	VDD Supply Voltage	4.5V~6V

Absolute Maximum Ratings

Parameter	Value
Drain Voltage(off state)	-0.3V to Bvdss
VDD Voltage	-0.3 to 6V
Min/Max Operating Junction Temperature T _J	-40 to 150 °C
Operating Ambient Temperature T _A	-40 to 85 °C
Min/Max Storage Temperature T _{stg}	-55 to 150 °C
Lead Temperature (Soldering, 10secs)	260 °C

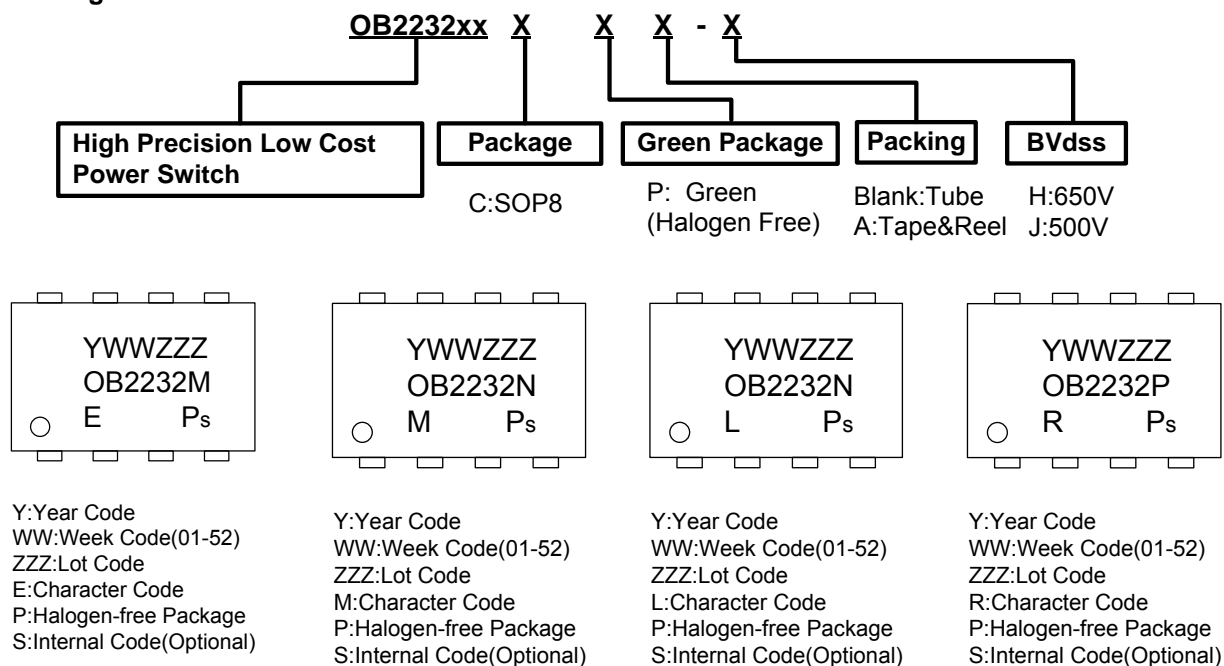
Note: Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability.

Output Power Table

Buck/Buck-Boost	90~264Vac (open frame)
OB2232EM	150mA
OB2232MN	250mA
OB2232LN	350mA (500mA peak load)
OB2232RP	500mA (800mA peak load)

Note: Maximum continuous power with drain pattern connected 100mm² PCB copper clad, at 85 °C ambient.

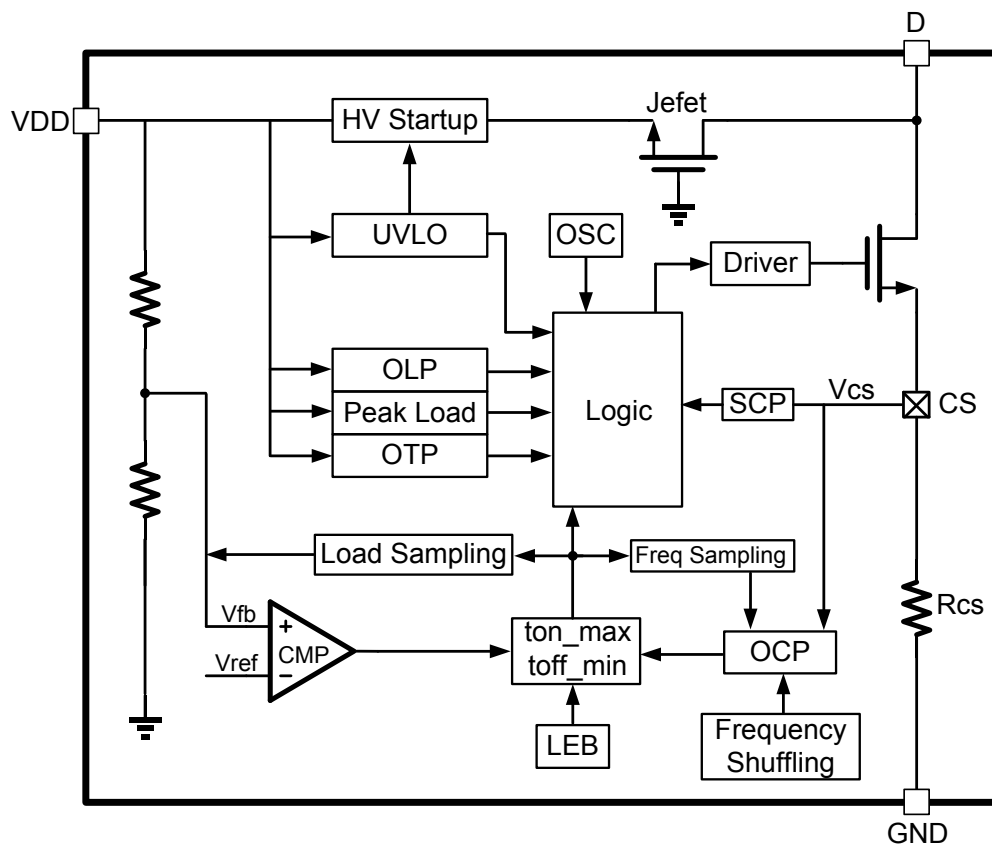
Marking Information



TERMINAL ASSIGNMENTS

Pin Num	Pin Name	I/O	Description
1/3	VDD	P	Power supply and output voltage feedback
2	GND	P	Ground
4	NC	NC	It should be floating or connect ground during normal operation state
5/6/7/8	D	I	Power MOS Drain pins.

BLOCK DIAGRAM

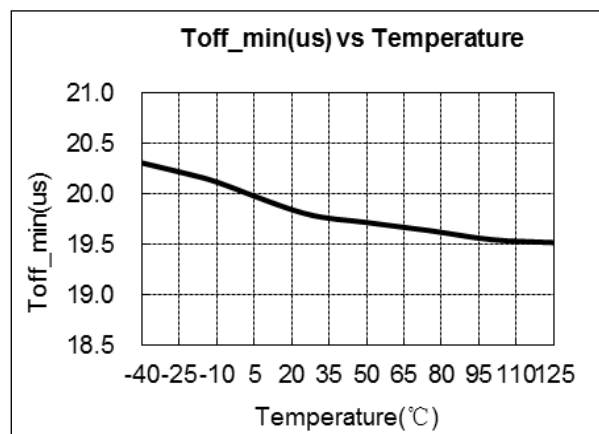
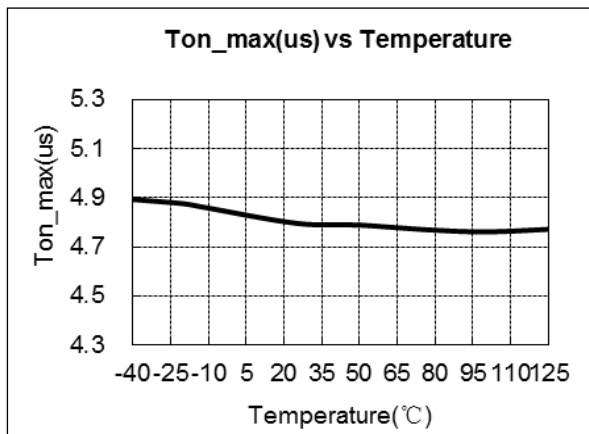
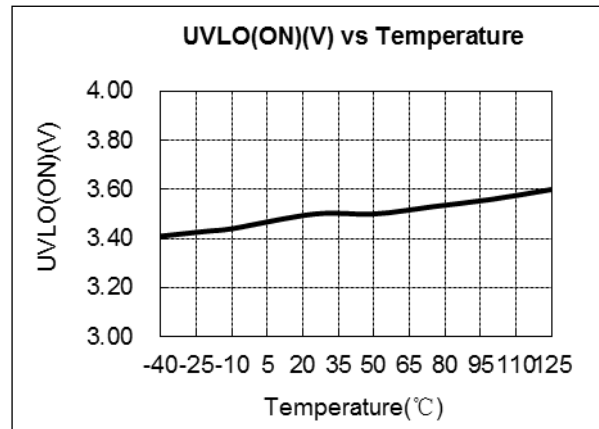
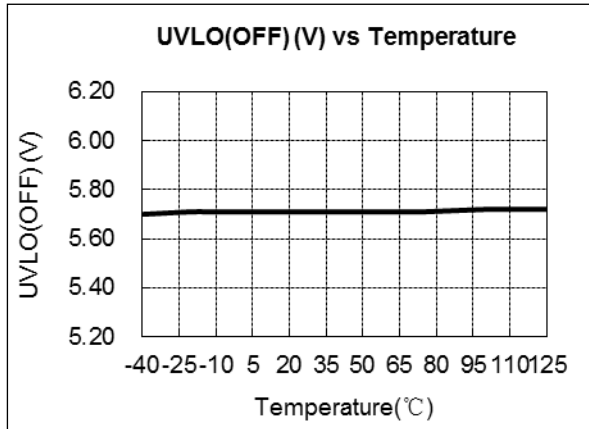


ELECTRICAL CHARACTERISTICS

 (T_A = 25°C, VDD=5.2V, if not otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
Supply Voltage (VDD) Section						
I_standby	Standby current	VDD=2.5V		20		uA
I_short	VDD short current	D=30V, VDD=0.1V		50		uA
I_operation	Operation current	VDD=5V		200		uA
UVLO_on	VDD under voltage lockout enter	VDD falling, gate disappear	3.4	3.6	3.8	V
UVLO_off	VDD under voltage lockout exit	VDD rising	5.5	5.7	5.9	V
VDD_reg	VDD regulation average voltage			5.2		V
Frequency Section						
Freq_Max	IC maximum frequency				40	KHz
Ton_max	Maximum on pulse width			4.8		us
Toff_min	Minimum off pulse width	OB2232EM OB2232MN OB2232LN		25		us
		OB2232RP		32		us
Δf/Freq	Frequency shuffling range		-8		+8	%
F_shuffling	Shuffling frequency			75		Hz
Protection Section						
Td_olp	Over loading debounce time			64		ms
OTP	Over temperature protection enter			150		°C
	Over temperature protection exit			120		°C
Current Sense Section						
Ith_oc	Over current detection threshold	OB2232EM		350		mA
		OB2232MN		550		mA
		OB2232LN		700		mA
		OB2232RP		1200		mA
Tleb	LEB time			375		ns
Power MOS Section						
BVdss	MOS drain-source breakdown voltage	OB2232EM	500			V
		OB2232MN	650			V
		OB2232LN	650			V
		OB2232RP	650			V
Rdson	On resistance	OB2232EM		25		Ω
		OB2232MN		20		Ω
		OB2232LN		10		Ω
		OB2232RP		4		Ω
Drain Peak Current	Id-Peak Pulse 1ms	OB2232EN		1.1		A
		OB2232MN		1.3		A
		OB2232LN		1.6		A
		OB2232RP		2.4		A

CHARACTERIZATION PLOTS



OPERATION DESCRIPTION

OB2232xx is a cost effective PWM power switch optimized for off-line non-isolated buck applications for small home appliances and linear regulator replacement. It operates in current mode and regulates 5V output voltage. High integration can afford low cost and component count solution.

Startup Current and Start up Control

Startup current of OB2232xx is designed to be very low so that VDD could be charged up above UVLO threshold and starts up quickly.

Operating Current

The Operating current of OB2232xx is as low as 200uA (typical). Good efficiency is achieved with the low operation current together with 'Multi-mode' control features.

PFM operation

The maximum switching frequency of OB2232xx is internally fixed at 45KHz (typical). No external frequency setting components are required for PCB design simplification.

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 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 frequency reduction and burst mode operation are implemented to achieve high efficiency at light load.

Frequency shuffling for EMI improvement

The frequency shuffling (switching frequency modulation) is implemented in OB2232xx. The oscillation frequency is modulated so that the tone energy is spread out. The spread spectrum

minimizes the conduction band EMI and therefore eases the system design.

Soft Start

OB2232xx features an two stage start, the first stage $lo_{cp_start1}=40\%*lo_{cp}$ with 10ms, the second stage $lo_{cp_start2}=100\%*lo_{cp}$ with 6ms. Soft start to soften the electrical stress occurring in the power supply during startup. It is activated during the power on sequence.

Current Sensing and Leading Edge Blanking

Cycle-by-Cycle current limiting is offered in OB2232xx current mode PFM control. The switch current is detected by a sense resistor within the OB2232xx. An internal leading edge blanking circuit chops off the sensed voltage spike at initial internal MOSFET on state. The PFM frequency is determined by the load of VOUT.

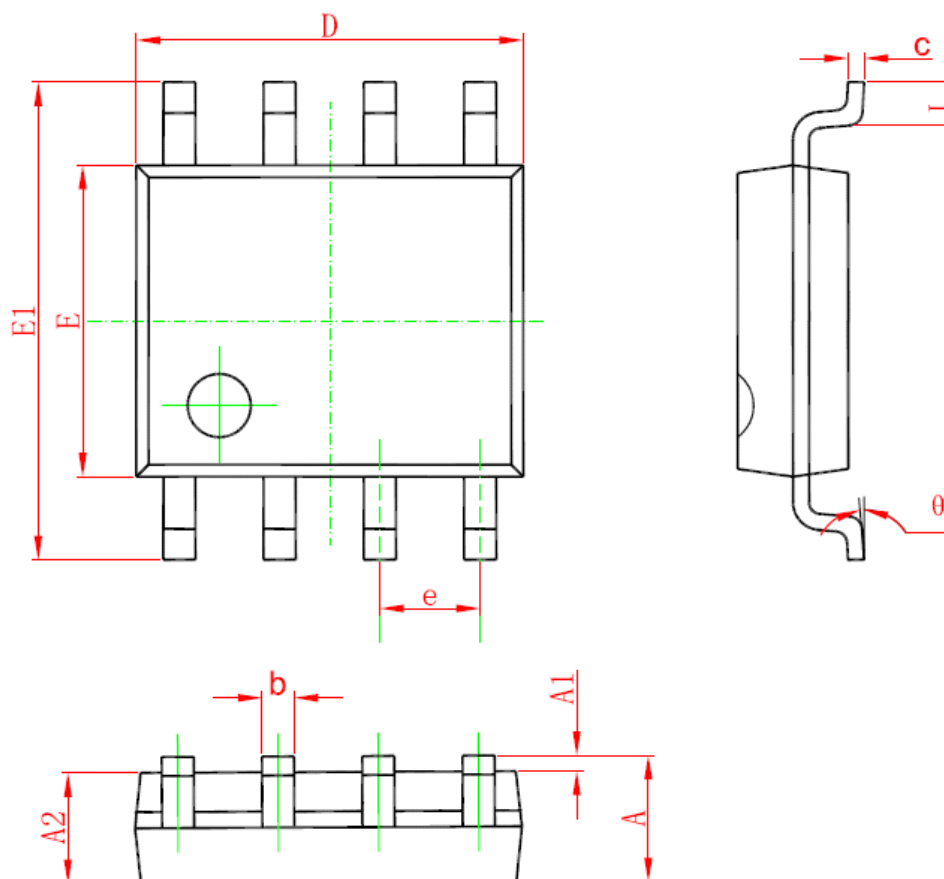
Gate Driver

The internal power MOSFET in OB2232xx is driven by a dedicated gate driver for power switch control. Too weak the gate drive strength results in higher conduction and switch loss of MOSFET while too strong gate drive compromises EMI.

A good tradeoff is achieved through the built-in totem pole gate design with right output strength control.

Protection Control

Good power supply system reliability is achieved with its rich protection features including cycle-by-cycle current limiting, Output Short Circuit Protection(SCP), on-chip Over Temperature Protection (OTP), Over Loading Protection(OLP) and VDD Under Voltage Lockout Protection (UVLO).

PACKAGE MECHANICAL DATA
SOP8 PACKAGE OUTLINE DIMENSIONS


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Min
A	1.350	1.750	0.053	0.069
A1	0.050	0.250	0.002	0.010
A2	1.250	1.650	0.049	0.065
b	0.310	0.510	0.012	0.020
c	0.100	0.250	0.004	0.010
D	4.700	5.150	0.185	0.203
E	3.700	4.100	0.146	0.161
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



IMPORTANT NOTICE

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