

### GENERAL DESCRIPTION

OB5622x is a high current precision, non-isolated power switch with HV startup for LED lighting application. It works under transition mode.

It simplifies the LED lighting system design by eliminating the auxiliary winding inductance and HV startup resistor. A 500V power switch is integrated in OB5622x. LED current can be adjusted by the external sense resistor connected between CS pin and ground.

OB5622x offers comprehensive protection coverage with auto-recovery features including cycle-by-cycle current limiting, built-in leading edge blanking, over voltage protection (OVP) and thermal fold back function to avoid device damage at extreme case.

OB5622x is offered in SOP7 package.

### TYPICALICAL APPLICATION

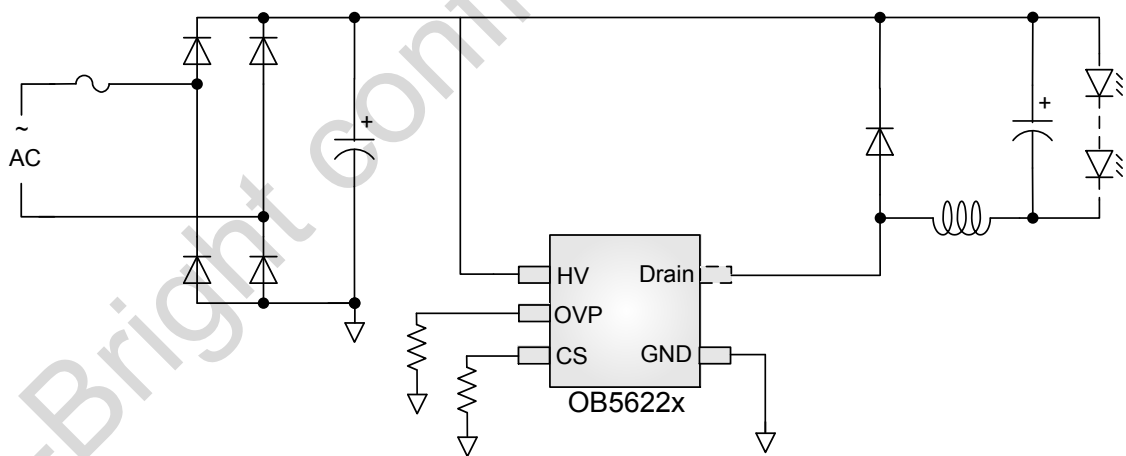


Figure1: OB5622x Typical Application Schematic

### FEATURES

- HV startup
- Sense and supply without auxiliary winding inductance
- Low System Cost and High Efficiency
- Low operation current
- Transition mode operation
- Cycle-by-Cycle Current Limiting
- Built-in Leading Edge Blanking (LEB)
- Over voltage protection (OVP)
- Thermal fold back current control

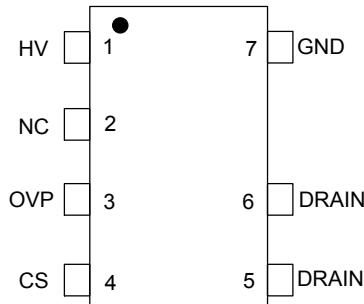
### APPLICATIONS

- LED lighting

## GENERAL INFORMATION

### Terminal Assignment

Pin Configuration  
SOP7



### Ordering Information

Part Number	Description
OB5622NJP-J	SOP7, Halogen-free in Tube
OB5622NJPA-J	SOP7, Halogen-free in T&R
OB5622PJP-J	SOP7, Halogen-free in Tube
OB5622PJPA-J	SOP7, Halogen-free in T&R
OB5622TJP-J	SOP7, Halogen-free in Tube
OB5622TJPA-J	SOP7, Halogen-free in T&R

### Package Thermal Characteristics

Package	RθJA (°C/W)
SOP7	95

### Absolute Maximum Ratings

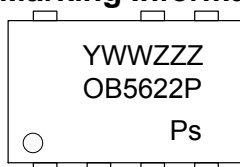
Parameter	Value
DRAIN Pin to GND	-0.3V to 500V
HV Pin to GND	-0.3V to 700V
CS pin to GND	-0.3V to 8V
OVP pin to GND	-0.3V to 8V
Operating Ambient Temp. T <sub>A</sub>	-40°C--85°C
Operating Junction Temp. T <sub>J</sub>	-40°C--150°C
Min/Max Storage Temp. T <sub>stg</sub>	-55°C--150°C
Lead Temp. (10 Sec)	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.

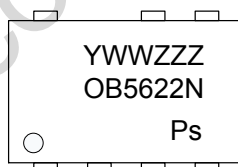
### Output Power Table

Product	Condition	175Vac~264Vac Input
OB5622NJP-J	I <sub>o</sub> ≤150mA	P <sub>o</sub> ≤16.5W
OB5622PJP-J	I <sub>o</sub> ≤250mA	P <sub>o</sub> ≤23W
OB5622TJP-J	I <sub>o</sub> ≤250mA	P <sub>o</sub> ≤30.5W

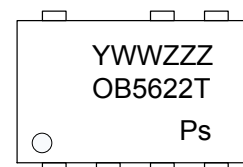
### Marking Information



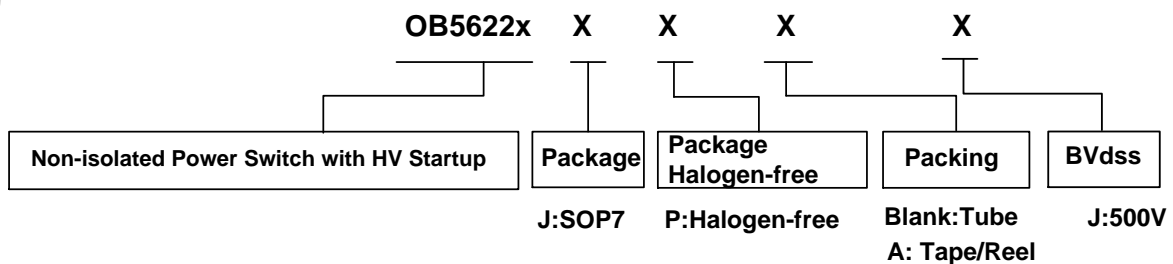
Y:Year Code  
WW:Week Code(01-52)  
ZZZ:Lot Code  
P:Halogen-free Package  
S:Internal Code(Optional)



Y:Year Code  
WW:Week Code(01-52)  
ZZZ:Lot Code  
P:Halogen-free Package  
S:Internal Code(Optional)



Y:Year Code  
WW:Week Code(01-52)  
ZZZ:Lot Code  
P:Halogen-free Package  
S:Internal Code(Optional)



### Terminal Assignment for OB5622x

No.	Name	I/O	Pin Function
1	HV	I	High voltage power supply input
2	NC		No connection
3	OVP	I/O	Over voltage protection setup pin
4	CS	I	Current sense pin
5	DRAIN	I	Drain of internal MOSFET
6	DRAIN	I	Drain of internal MOSFET
7	GND	P	Ground

### Functional Block Diagram

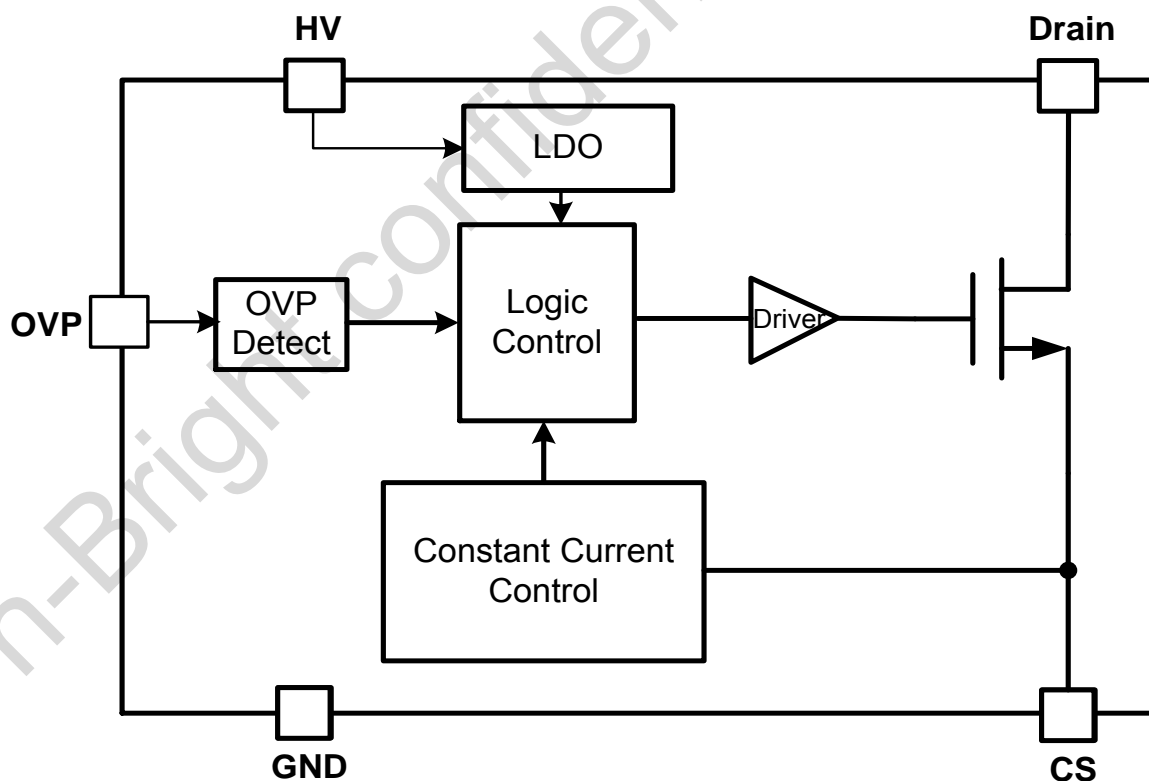


Figure2: OB5622x Functional Block Diagram

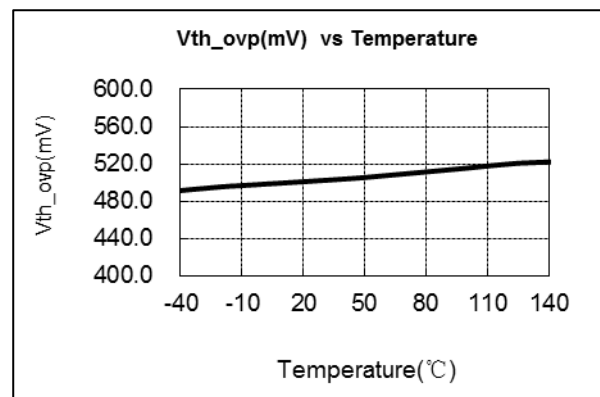
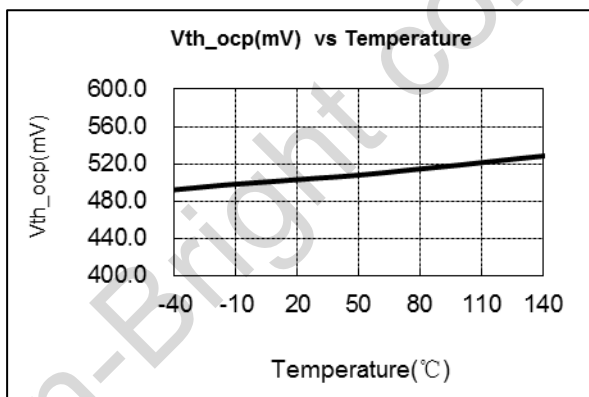
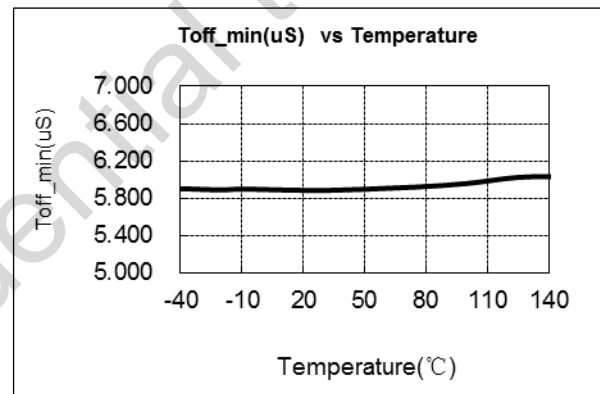
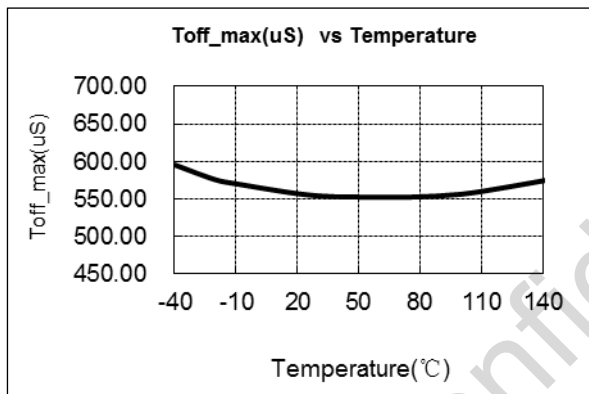
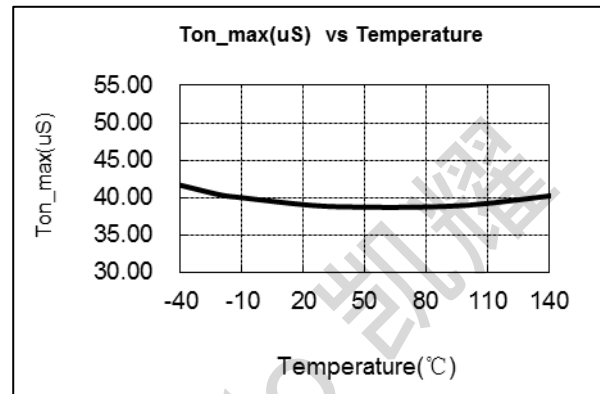
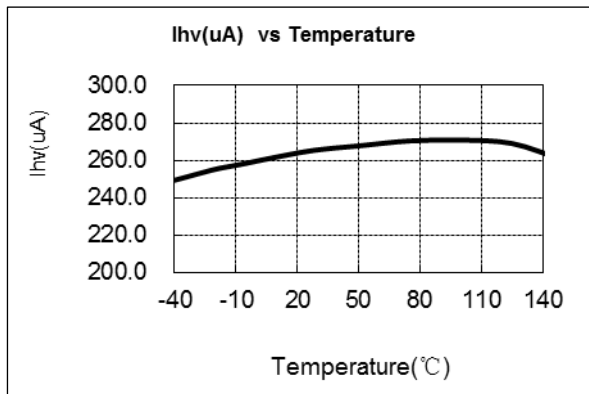
## Electrical Characteristics

T<sub>A</sub>=25°C, if not otherwise note

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Unit
<b>HV Section</b>						
I <sub>static</sub>	I <sub>hv</sub>	HV=60V		250	350	uA
<b>Constant Current Section</b>						
TLEB	Lead edge blanking time			500		ns
V <sub>th_ocp</sub>	Drain Current Limit		485	500	515	mV
V <sub>th_ovp</sub>				500		mV
T <sub>off_min</sub>	OVP detect time	R <sub>ovp</sub> =47K	5.2	5.8	6.4	uS
Max_Ton				35		us
Max_Toff				500		us
<b>Protection Section</b>						
T <sub>thermal</sub>	Thermal regulation threshold			140		°C

Product	Parameter	BV <sub>dss</sub> (V) MOSFET Drain-Source Breakdown Voltage		
		Min	Typ.	Max
OB5622NJP-J		500		
OB5622PJP-J		500		
OB5622TJP-J		500		

**TYPICAL PERFORMANCE CHART**



## OPERATION DESCRIPTION

### General Operation

OB5622X is a high current precision, non-isolated power switch for LED lighting. It significantly simplifies the LED lighting system design by eliminating the auxiliary winding inductance and power supply capacitors. A 500V power switch is integrated in OB5622X.

### Start up Control

At work state, no auxiliary winding inductance is necessary. OB5622X gets power supply directly from HV pin and regulates the supply voltage by internal startup circuits.

### Principle of Constant Current Operation

OB5622X operates in transition mode and buck topology, the peak current is sensed by the current sense circuits resistor connected at CS pin, and compared with internal current sense limit threshold. When the voltage on the current sense resistor reaches the limit threshold, the power switch will be turned off.

Refer to the equation 1, LED output current is

$$I_{LED} = \frac{1}{2} \times I_{pk} = \frac{1}{2} \times \frac{V_{th\_ocp}}{R_{cs}} \quad (1)$$

OB5622X works under transition mode and the on-time for power switch is

$$t_{on} = \frac{L \times I_{pk}}{V_{in} - V_{LED}} \quad (2)$$

Where L is the inductor of the inductor,  $V_{in}$  is line voltage after rectifying and  $V_{LED}$  is the voltage at LED.

When power switch turns off, the current flowing in the inductor will reduce to zero and the power switch will turn on after then. The off-time for power switch is

$$t_{off} = \frac{L \times I_{pk}}{V_{LED}} \quad (3)$$

The inductor could also be calculated by

$$L = \frac{V_{LED} \times (V_{in} - V_{LED})}{f \times I_{pk} \times V_{in}} \quad (4)$$

Where, f is the working frequency. The working frequency changes with input voltage. The lowest input voltage determines the lowest working

frequency and the highest input voltage determines the highest working frequency.

The minimum and maximum off-times are set in OB5622X. Therefore, the value of inductor should be carefully designed to achieve good LED output current, according to equation 4.

### Current Sensing and Leading Edge Blanking

Cycle-by-Cycle current limiting is offered in OB5622X. The switch current is detected by the internal current limit circuits. An internal leading edge blanking circuit chops off the sensed voltage spike at initial power MOSFET on state.

### LED Strings Short Protection

OB5622X detects the states of LED. When LED string short circuit occurs, the switching frequency is reduced to the switching frequency with maximum Toff time. OB5622X resumes normal operation after the fault condition is removed.

### Programmable LED Open Circuit Protection / OVP

The OB5622X provide programmable output over voltage protection when LED string are open. The threshold voltage of OVP is set by the minimum off time (Toff\_min), when the off time of OB5622X is less than the Toff\_min OB5622X stops switching and re-detect the LED string status after 150ms (typical). If the fault condition is removed, OB5622X resumes normal operation. Otherwise, the above operation is repeated. A resistor Rovp is connected between the OVP pin and ground. The minimum off time (Toff\_min) can be adjusting the resistance of Rovp, the relationship between the time and the resistance is

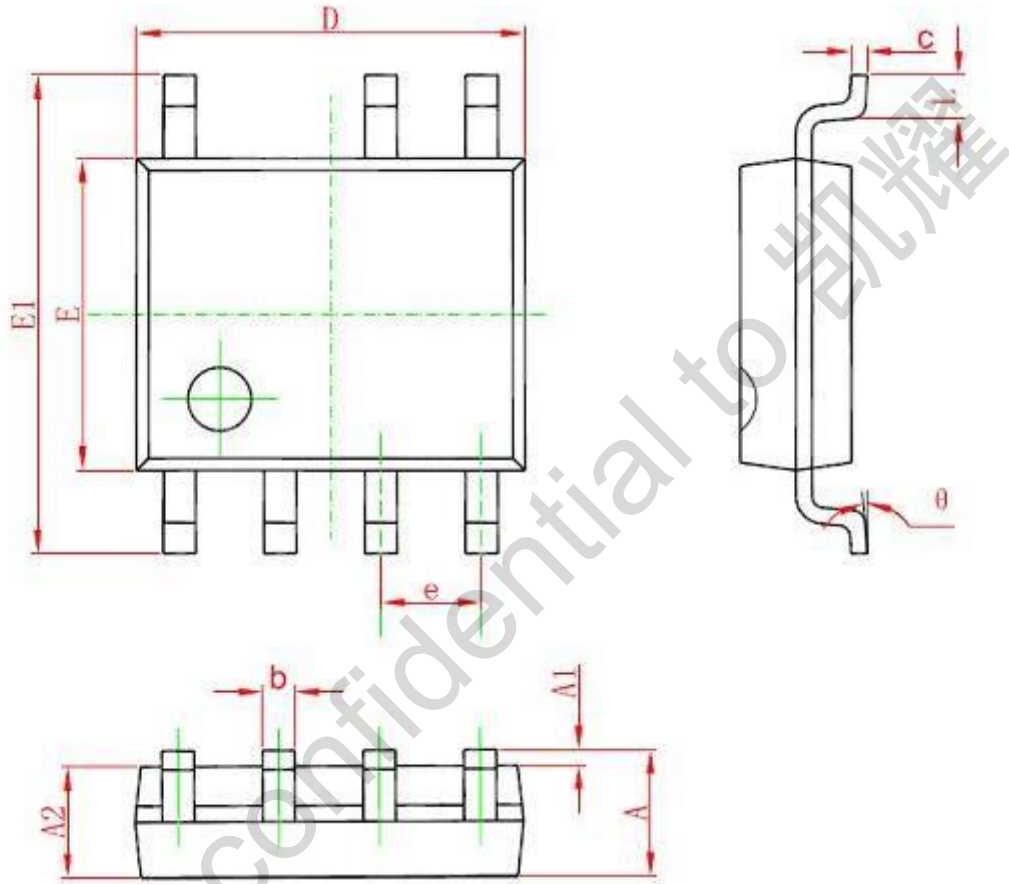
$$Toff_{min} = 123.4 \times 10^{-12} \times R_{OVP}$$

### Thermal foldback

OB5622X provides thermal foldback function to control LED output current. The LED current will reduce with the temperature rise up. When the temperature is over 140°C (typical), the output current follows the thermal foldback function scheme. When the temperature is below 140°C (typical), the output current returns to the full level.

**PACKAGE MECHANICAL DATA**

**SOP7**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
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	3.800	4.000	0.150	0.157
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°

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