

## GENERAL DESCRIPTION

OB2100E is a High voltage hysteresis mode Buck converter. The input voltage can be as high as 70V and the output voltage is programmable by external resistor divider. It delivers up to 60mA load current with excellent line and load transient response. With On-Bright patented control scheme, OB2100E works with a wide input and output range with a minimum number of external components.

OB2100E automatically adjusts the switching frequency based on the output power. It provides output short circuit protection, over temperature protection, under voltage lock-out and cycle by cycle over current protection. When output short circuit happens, OB2100E enters hiccup mode until short circuit condition is released, which greatly saves the energy loss and avoid the chip overheating. OB2100E provides soft startup control to avoid inrush output current.

OB2100E is provided with SOT23-6 package.

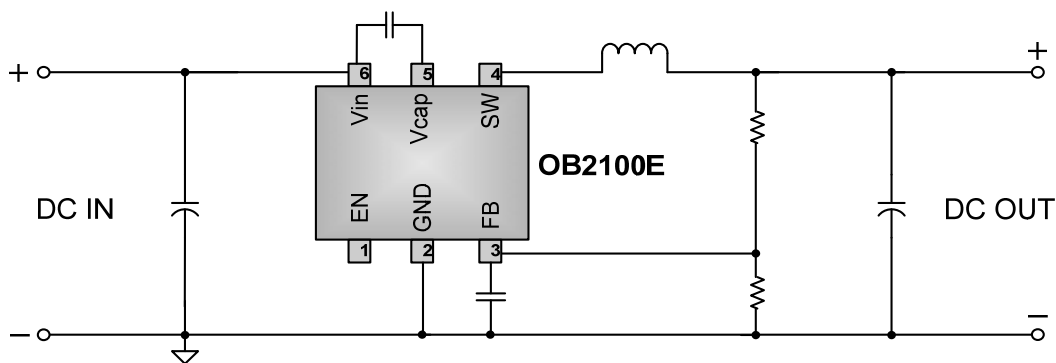
## FEATURES

- Enable control
- Wide input voltage range (5V to 70V)
- Wide output voltage range (programmable by external resistor divider)
- Up to 60mA output current
- Excellent line and load transient response
- Minimum number of external components
- Output short-Circuit protection
- Over temperature protection
- Cycle-by-cycle over current protection
- Under voltage lock-out

## APPLICATIONS

- LED lighting
- Portable device
- Motor driver

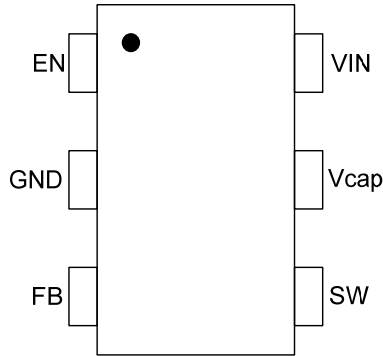
## TYPICAL APPLICATION



### GENERAL INFORMATION

#### Pin Configuration

The pin map of OB2100E in SOT-23-6 package is shown as below.



#### Ordering Information

Part Number	Description
OB2100EMP	SOT23-6 , Halogen-free in T&R

#### Package Dissipation Rating

Package	R $\theta$ JA (°C/W)
SOT23-6	200

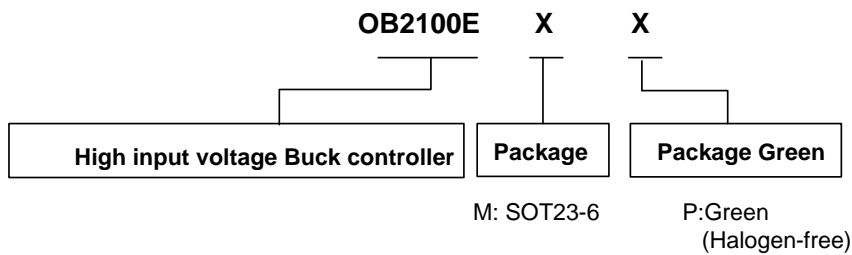
#### Absolute Maximum Ratings

Parameter	Value
VIN Voltage (room temperature)	-0.3V to 70V
Vcap Voltage	-0.3V to (VIN-5V)
SW Voltage	-3V to VIN
EN, FB Voltage	-0.3 to 8V
Min/Max Operating Junction Temperature TJ	-40 to 150 °C
Operating Ambient Temperature TA	-40 to 85 °C
Min/Max Storage Temperature Tstg	-55 to 150 °C
Lead Temperature (Soldering, 10secs)	260 °C

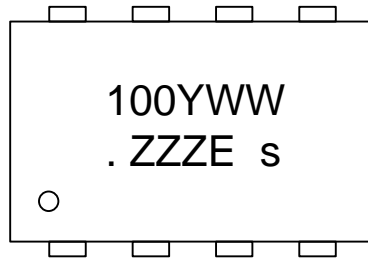
**Note:** Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure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

#### Recommended Operating Condition

Symbol	Parameter	Min	Max	Unit
VIN	Input Voltage	5.5	70	V



### Marking Information

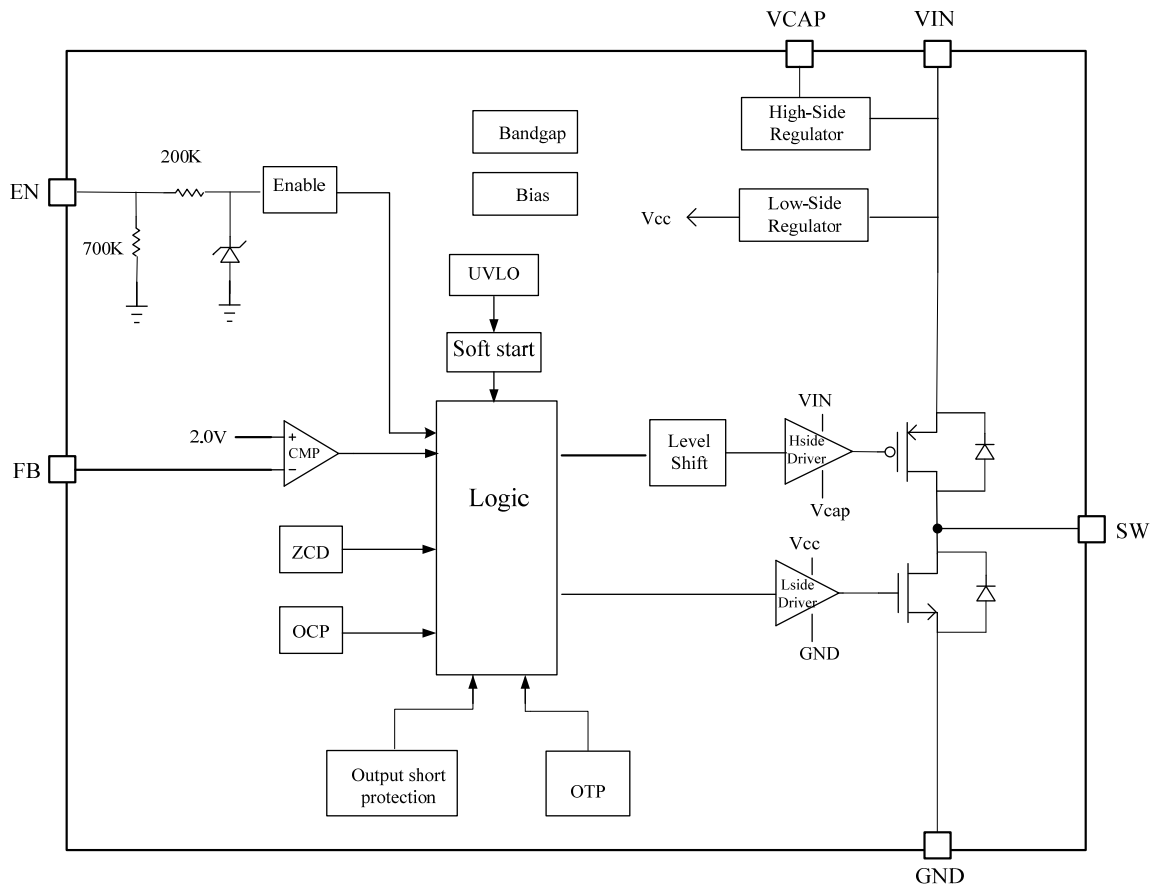


Y:Year Code  
 WW:Week Code(01-52)  
 ZZZ:Lot Code  
 E:Character Code  
 S:Internal Code

### TERMINAL ASSIGNMENTS

Pin Num	Pin Name	I/O	Description
1	EN	I	Enable control Pin.
2	GND	P	Ground pin of the IC
3	FB	I	Output voltage feedback pin. A 100pF capacitor close to the IC is recommended to be placed between this pin and pin GND.
4	SW	O	Power switch output Pin. Connect an inductor to this pin.
5	Vcap	O	High side regulator output pin. A 100nf capacitor close to the IC is recommended to be placed between this pin and pin VIN.
6	VIN	I	External power supply input pin.

**BLOCK DIAGRAM**

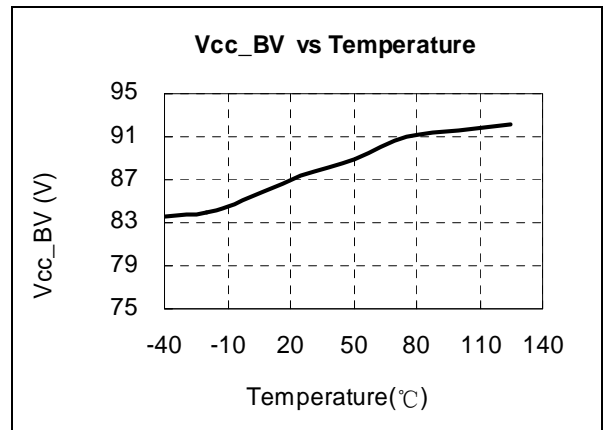
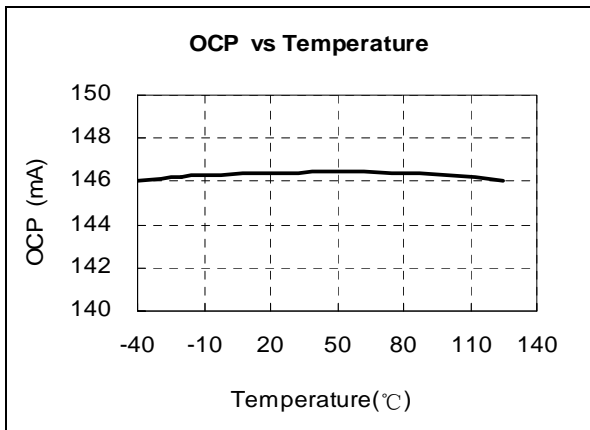
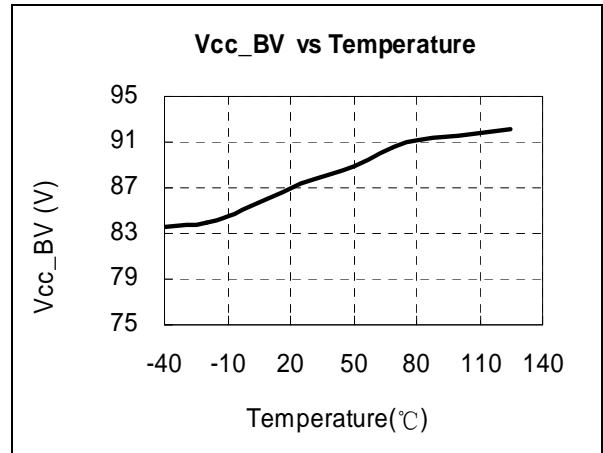
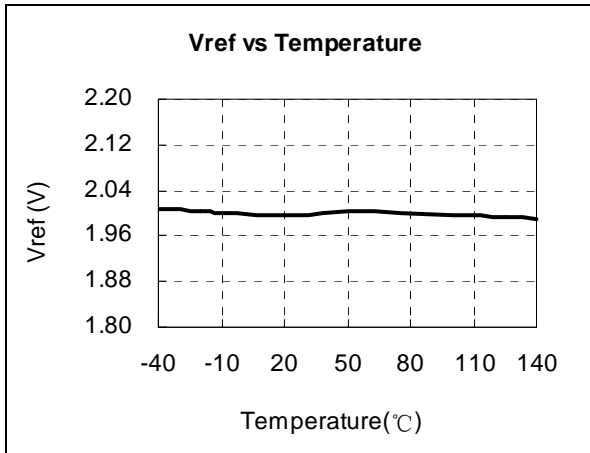


## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C, V<sub>IN</sub>=36V, if not otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>Supply Voltage Section</b>						
I <sub>q</sub>	Operation supply current	switching		550		uA
	Quiescent supply current	no switching		350		uA
	EN shut down current				1	uA
UVLO	Threshold of UVLO			4	5.5	V
V <sub>th_en_on</sub>	EN on threshold voltage	EN rising up	1.4			V
V <sub>th_en_off</sub>	EN off threshold voltage	EN falling down			0.4	V
OTP	Over temperature protection threshold			150		°C
OTP_HYS	Over temperature protection hysteresis			20		°C
<b>BUCK Section</b>						
V <sub>ref</sub>	Feedback compare reference voltage		1.9	2	2.1	V
I <sub>L_limit</sub>	Inductor peak current limit threshold		135	160	185	mA
T <sub>sst</sub>	Soft start time			4		ms
T <sub>hiccup</sub>	Hiccup time			400		ms
V <sub>th_short</sub>	FB threshold voltage for vout short protection			0.45		V
T <sub>max_on</sub>	The max high side turn on time		40	50	70	us
T <sub>deadtime</sub>	Dead time			60		ns
R <sub>dson_p</sub>	R <sub>dson</sub> of PMOS power transistor			10	20	Ohm
R <sub>dson_n</sub>	R <sub>dson</sub> of NMOS power transistor			5	10	Ohm

**CHARACTERIZATION PLOTS**



## OPERATION DESCRIPTION

OB2100E is a high voltage hysteresis mode Buck converter. It always works in DCM mode. When FB voltage becomes lower than reference voltage and the inductor current decreases to zero, the high side power transistor will turn on to provide current to the output. When the inductor current reaches the current limit threshold value of 160mA (typical), OB2100E turns off the high side power transistor and then turns on the low side power transistor. When the inductor current reaches zero, the OB2100E turns off the low side power transistor.

- **Enable control**

OB2100E can be switched to an ON or OFF state by a logic input at the EN pin. A voltage on this pin greater than  $V_{th\_en\_on}$  turns the device on, while a voltage less than  $V_{th\_en\_off}$  turns the device off. When the EN pin is low, the buck output is off and the device typically consumes less than 1uA (typical) current.

An internal 700k $\Omega$  (typical) pull-down resistor ties the EN input to ground, ensuring that the device remains off if the EN pin is left open circuit. A clamp circuit is also integrated at the EN pin for inrush voltage protection.

- **UVLO protection**

OB2100E integrated VIN under voltage lock-out protection (UVLO). When VIN rise up to above 4V (typical), OB2100E will start up and enter switching operation mode. When VIN decreases to under 4V (typical), OB2100 will stop switching operation.

- **Soft start**

OB2100E implements soft start function. During the start-up procedure, the output voltage and inductor current increases up gradually. The soft start time is 4ms (typical).

- **Short circuit protection**

At the end of soft startup, if output short circuit happens, the high side power transistor will not turn on after the last switching process finished. After around 400ms (typical), OB2100E resumes soft start procedure. The threshold for output short circuit detection is 0.5V (typical) for FB voltage.

- **Zero current detection (ZCD)**

OB2100E integrates Zero Current Detection (ZCD) function. During the low side power transistor turn-

on phase, ZCD module detects the inductor current by sensing the SW voltage. When it detects the inductor current decreases to zero, OB2100E turns off the low side power transistor.

- **Current limit protection**

OB2100E integrated current limit protection for preventing the inductor entering into saturation. After ZCD is detected the inductor current decreases to zero, if FB voltage is higher than the reference voltage of 2V (typical), both high side and low side power transistors are in off state. When FB voltage becomes lower than the reference voltage of 2V (typical), the high side power transistor turns on, and then the inductor current increases from zero. When and only when the inductor current increases to the peak current limit threshold of 160mA (typical), OB2100E turns off the high side power transistor, and then turns on the low side power transistor after 60ns (typical) dead time for sustaining the inductor current. Then the inductor current starts decreasing until to zero. The above procedure repeats.

- **Over temperature protection**

OB2100E turns off the switching operation mode when the IC junction temperature exceeds 150C (typical) and resumes the switching operation mode when the IC junction temperature drops to 130C (typical).

- **Switching frequency**

OB2100E works in DCM mode and the average inductor current equals to the load current. The switching frequency determined by the following equation:

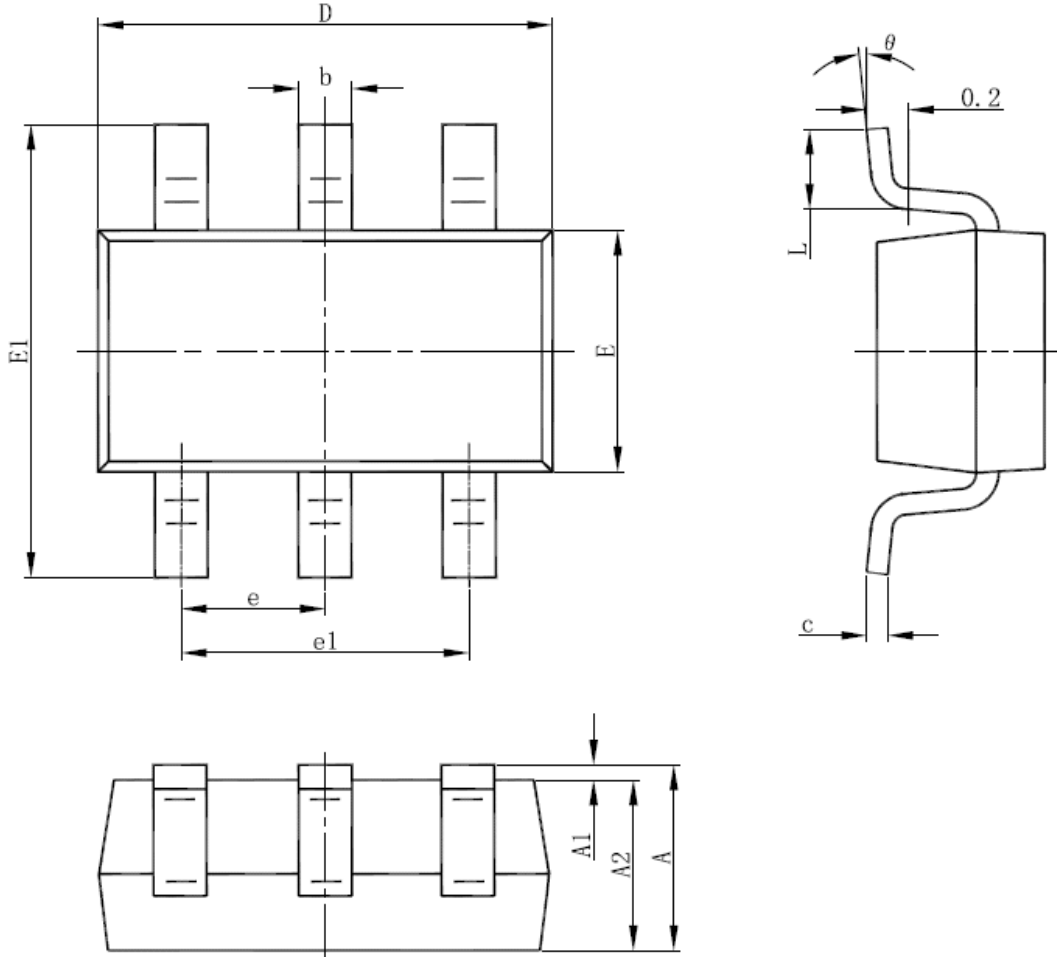
$$F = \frac{2I_{out}}{I_{limit} * L} * \frac{V_{out}(V_{in} - V_{out})}{V_{in}}$$

- **High side voltage regulator**

OB2100E integrates a high side voltage regulator to generate a 'VIN-5V' floating ground (at pin Vcap) voltage for high side power transistor. For Vin rising slope of faster than 8V/us, a greater than 200pF capacitor is recommended to be connected between pin VIN and pin Vcap.

**PACKAGE MECHANICAL DATA**

**SOT-23-6L PACKAGE OUTLINE DIMENSIONS**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.000	1.450	0.039	0.057
A1	0.000	0.150	0.000	0.006
A2	0.900	1.300	0.035	0.051
b	0.300	0.500	0.012	0.020
c	0.080	0.220	0.003	0.009
D	2.800	3.020	0.110	0.119
E	1.500	1.726	0.059	0.068
E1	2.600	3.000	0.102	0.118
e	0.950 (BSC)		0.037 (BSC)	
e1	1.800	2.000	0.071	0.079



## **IMPORTANT NOTICE**

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