GENERAL DESCRIPTION

OB2105 is a wide input voltage, high-efficiency, high performance synchronous-rectified buck converter.

OB2105 utilizes soft driving technology to achieve good EMI performance.

OB2105 also provide soft-start, V_{IN}/V_{OUT} over voltage protection, over temperature protection, and output short circuit protection with hiccup mode. The built-in multi-stage detection scheme effectively protects the device and system when the output hard short to ground.

OB2105 is available in SOP-8 and SOT23-5 packages and required very few external components for operation.

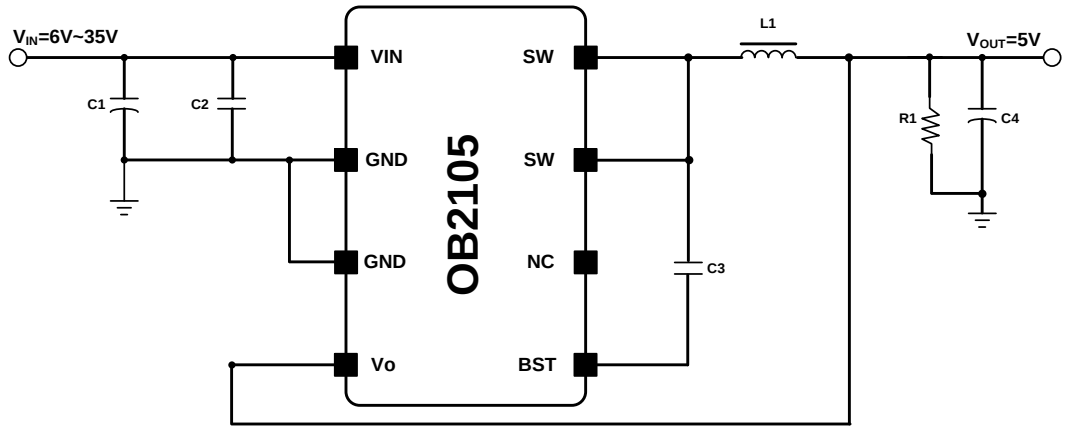
FEATURES

- Wide 6V to 35V Operating Input Range
- Synchronous Operating without External Schottky Diode.
- Simplified External Device Requirement.
- 90.5% efficiency at V_{OUT} 5.0V 1A, V_{IN} 12V.
- Fixed 160KHz Frequency.
- Multi-Stage Short Circuit Protection and Hiccup Mode.
- V_{IN}/V_{OUT} Over Voltage Protection and Over Temperature Protection.
- Good EMI Performance.

APPLICATIONS

- Home Appliances
- White Goods
- Stand-By Power Supply

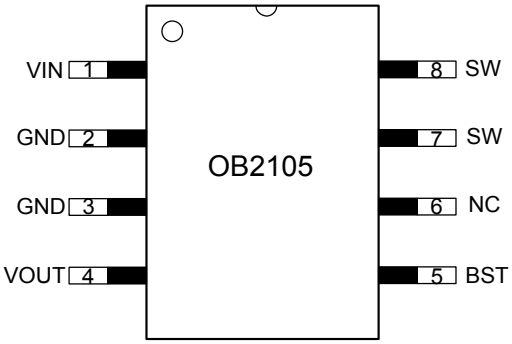
TYPICAL APPLICATION



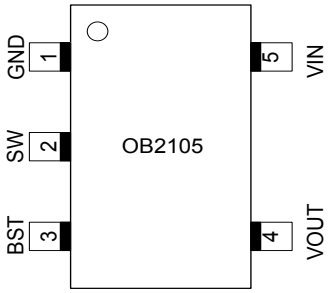
GENERAL INFORMATION

Pin Configuration

SOP8



SOT23-5



Ordering Information

Part Number	Description
OB2105CP	SOP8, Halogen-free in Tube
OB2105CPA	SOP8, Halogen-free in T&R
OB2105MEP	SOT23-5,Halogen-free in T&R

ESD Rating

HBM (Human Body Mode) ±4KV
MM (Machine Mode) ±200V

Output Power Table

Package	6-24Vdc (open frame)	6-35Vdc (open frame)
SOP8	1.2A	1.1A
SOT23-5	1A	0.9A

Note: Maximum continuous power with drain pattern connected 20mm*27.5mm PCB copper clad, at 40℃ ambient.

Package Dissipation Rating

Package	RθJA (℃/W)
SOP8	150
SOT23-5	200

Recommended Operating Condition

Symbol	Parameter	Range
VIN	VIN Supply Voltage	6 to 35V

Absolute Maximum Ratings

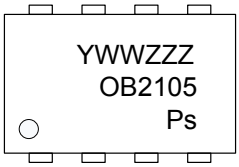
Parameter	Value
Supply Input Voltage, VIN	-0.3 to +40V
EN Pin Voltage	-0.3 to VIN
SW Voltage to GND	-0.3 to (VIN-0.3V)
VOUT Pin Voltage	-0.3 to +14V
BST to GND	V_{SW}-0.3V to V_{SW}+6V
Min/Max Operating Junction Temperature T_J	-40 to 150 ℃
Min/Max Storage Temperature T_{stg}	-55 to 150 ℃
Lead Temperature (Soldering, 10secs)	260 ℃

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.

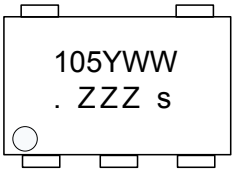
Marking Information

OB2105 X X X

- **High Performance CC/CV Synchronous Buck Converter**
- **Package**: C:SOP8, ME:SOT23-5
- **Green Package**: P : Halogen-free
- **SOP8 Packing**: Blank:Tube, A:Tape&Reel



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



Y:Year Code
WW:Week Code(01-52)
ZZZ: Lot Code
s: Internal Code(Optional)

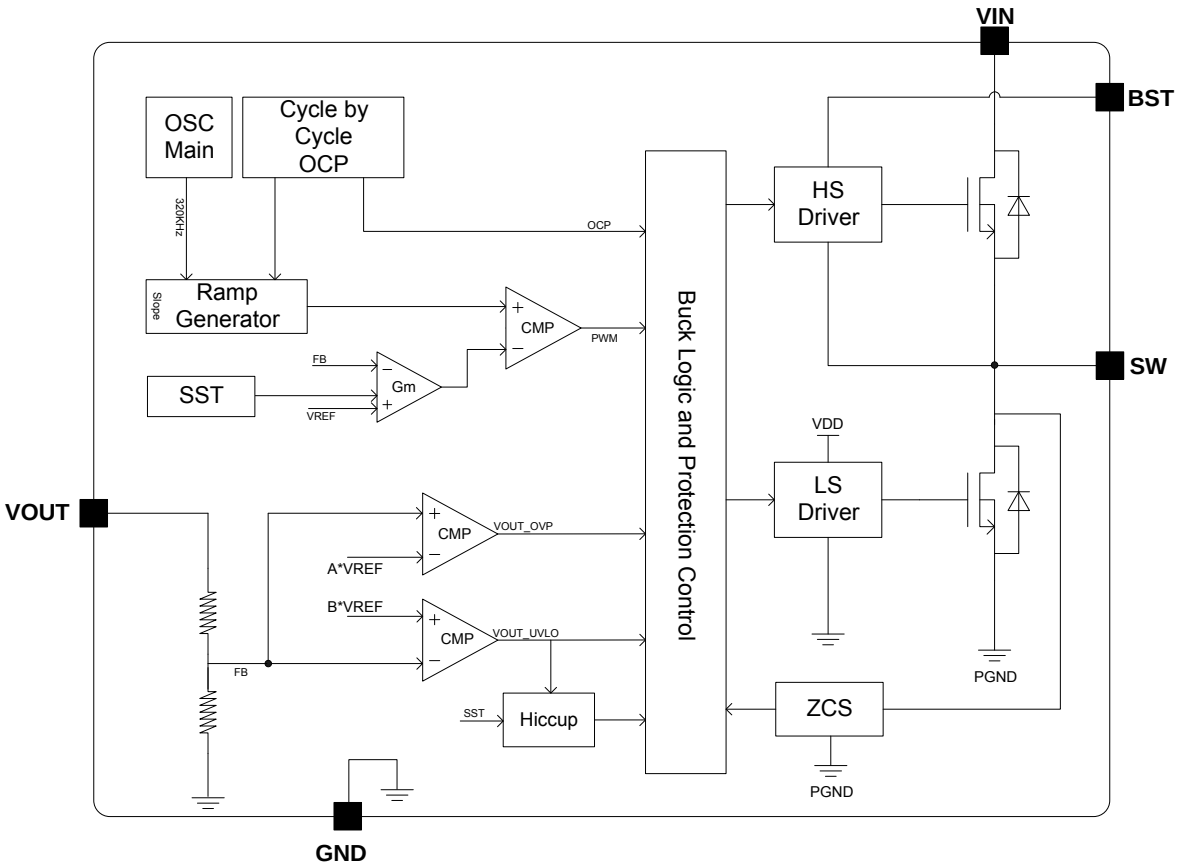
TERMINAL ASSIGNMENTS for SOP8

Pin Num	Pin Name	I/O	Description
1	VIN	P	Power Supply Input. Input voltage that supplies current to the output voltage and powers the internal control circuit. Bypass the input voltage with a minimum 0.1uF ceramic capacitor to GND, placed as close to the IC as possible.
2, 3	GND	P	Ground. Ground of the device.
4	VOUT	I	Output Pin.
5	BST	P	Bootstrap Supply for High Side MOSFET gate driver.
6	NC		No Connect
7,8	SW	P	Power Switching to External Inductor.

TERMINAL ASSIGNMENTS for SOT23-5

Pin Num	Pin Name	I/O	Description
1	GND	P	Ground. Ground of the device.
2	SW	P	Power Switching to External Inductor.
3	BST	P	Bootstrap Supply for High Side MOSFET gate driver.
4	VOUT	I	Output Pin.
5	VIN	P	Power Supply Input. Input voltage that supplies current to the output voltage and powers the internal control circuit. Bypass the input voltage with a minimum 0.1uF ceramic capacitor to GND, placed as close to the IC as possible.

BLOCK DIAGRAM

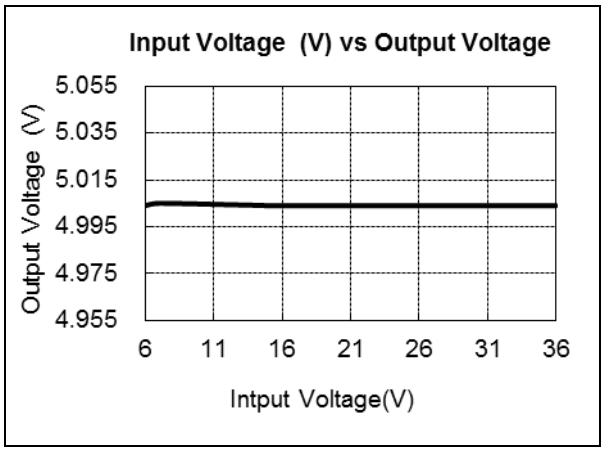


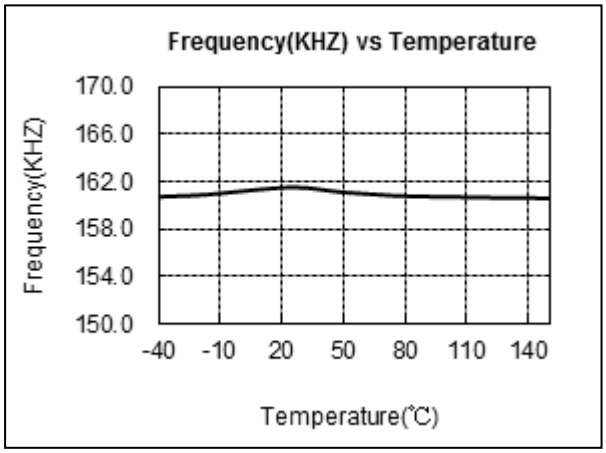
ELECTRICAL CHARACTERISTICS

(T_A = 25℃, V_{IN}=12V, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Supply Voltage (VIN)						
V_{IN}	Input Voltage Range		6	-	35	V
V_{IN_UVLO}	Input Under Voltage Lockout Threshold	VIN Rising	-	5.8	-	V
		VIN Falling	-	5.4	-	V
V_{IN_OVP}	Input Over Voltage Protection Threshold	VIN Rising	-	37	-	V
		VIN Falling	-	36.3	-	V
Supply Input Current						
I_Q	Input Quiescent Current	No Switching	-	1	-	mA
Power Switches						
R_{DSON_HS}	High Side Switch On Resistance		-	300	-	mΩ
R_{DSON_LS}	Low Side Switch On Resistance		-	200	-	mΩ
f_{SW}	Switching Frequency	V_{IN}-V_{OUT}>1V	148	160	172	KHz
D_{MAX}	Maximum Duty Cycle		-	97.5	-	%
Output Voltage and Soft Start						
$\triangle V_{OUT}$	Output Voltage Accuracy	V_{IN}=12V, V_{OUT}=5.0V	-1.5	-	+1.5	%
T_{SS}	Soft Start Time	V_{OUT} from 0V to 5V	-	5	-	ms
Protection						
V_{OUT_UVP}	Output Under Voltage Protection	Measure at VOUT	-	60	-	%
T_{SD}	Thermal Shutdown Temperature		-	160	-	℃
T_{SD_HYS}	Thermal Shutdown Hysteresis		-	25	-	℃

CHARACTERIZATION PLOTS





OPERATION DESCRIPTION

Cycle-by-Cycle Current Control

The conventional cycle-by-cycle peak current mode is implemented with high-side FET current sense.

Output Under-Voltage Protection/Hiccup Mode

There is a under voltage protection (UVP) threshold. If the UVP threshold is triggered, the converter goes into hiccup mode by disabling the converter and restarts after hiccup waiting period. The multi-stage detection hiccup mode design effectively protects the device and system even if the output hard short to ground during the soft-start.

Input Capacitor Selection

The input capacitor needs to be carefully selected to maintain sufficiently low ripple and good EMI performance at the supply input of the converter. A 1μF ceramic capacitor or greater should be placed close to the VIN pin and GND pin for bypassing. A 100μF electrolytic capacitor also is recommended and placed close to VIN and GND pins. Low ESR capacitor is highly recommended. Since large current flows in and out of this capacitor during switching, its ESR also affects efficiency.

Output Capacitor Selection

The ESR of the output capacitor determines the output ripple voltage and the initial voltage drop following a high slew rate load transient edge. The output ripple voltage can be calculated as：

$$\Delta V_{OUT} = \Delta I_L \times \left(ESR + \frac{1}{8 \times f_{OSC} \times C_{OUT}} \right)$$

Where f_{OSC} is operating frequency, C_{OUT} is output capacitance. Ceramic capacitor with low ESR value provides the low output ripple and low size profile. Connect a 0.1μF ceramic capacitor at output CSN terminal for good performance and place output capacitors as close as possible to the device.

Output Inductor Selection

The inductor selection is usually based on the considerations of DC resistance (DCR), inductance, rated current value, peak current value, and size requirements.

The relationship between inductance and peak current can be estimated by,

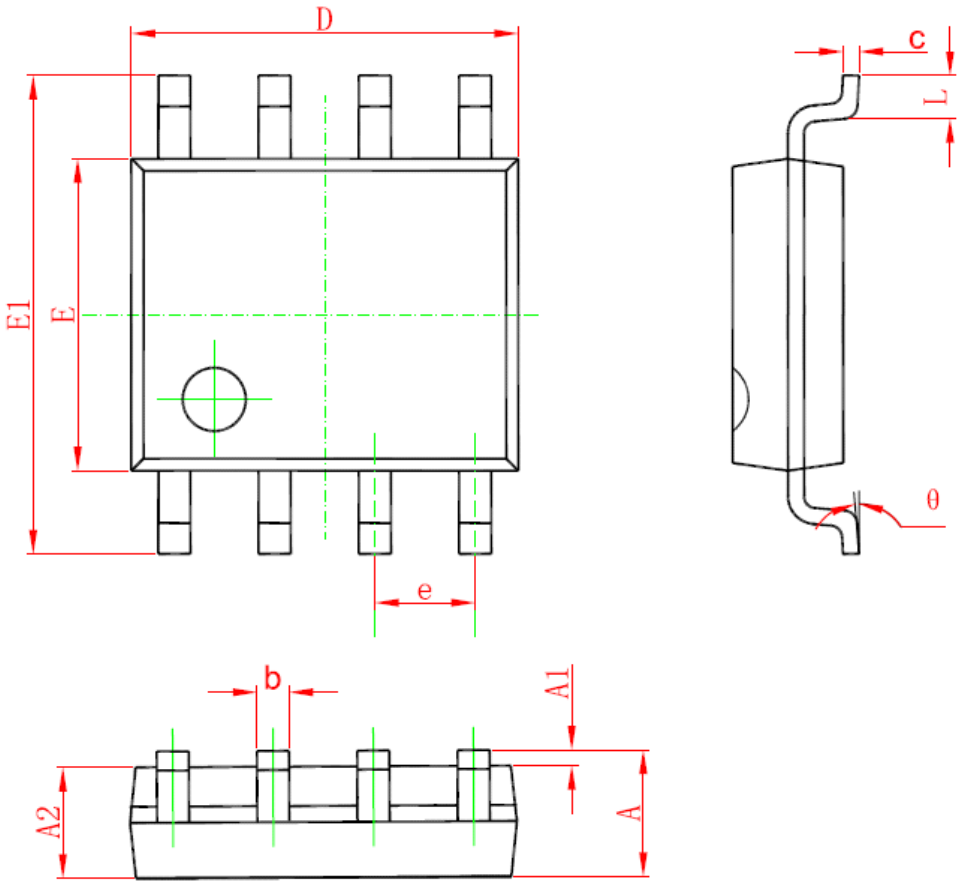
$$\Delta I_L = V_{OUT} \times \left(1 - \frac{V_{OUT}}{V_{IN}} \right) \times \frac{1}{f_{OSC} \times L}$$

Make sure there are enough margins between inductor saturation current and inductor operation current over the whole temperature range, input voltage range and output voltage range at maximum output current. 33μH inductor is suggested in OB2105 system.

Inductor selection also affects EMI characteristics. Toroid or shielded pot cores in ferrite or Permalloy materials are small and don't radiate much energy, but generally cost more than powdered iron core inductors with similar electrical characteristics. The choice of which style inductor to use often depends on the price vs. size requirements and EMI requirements.

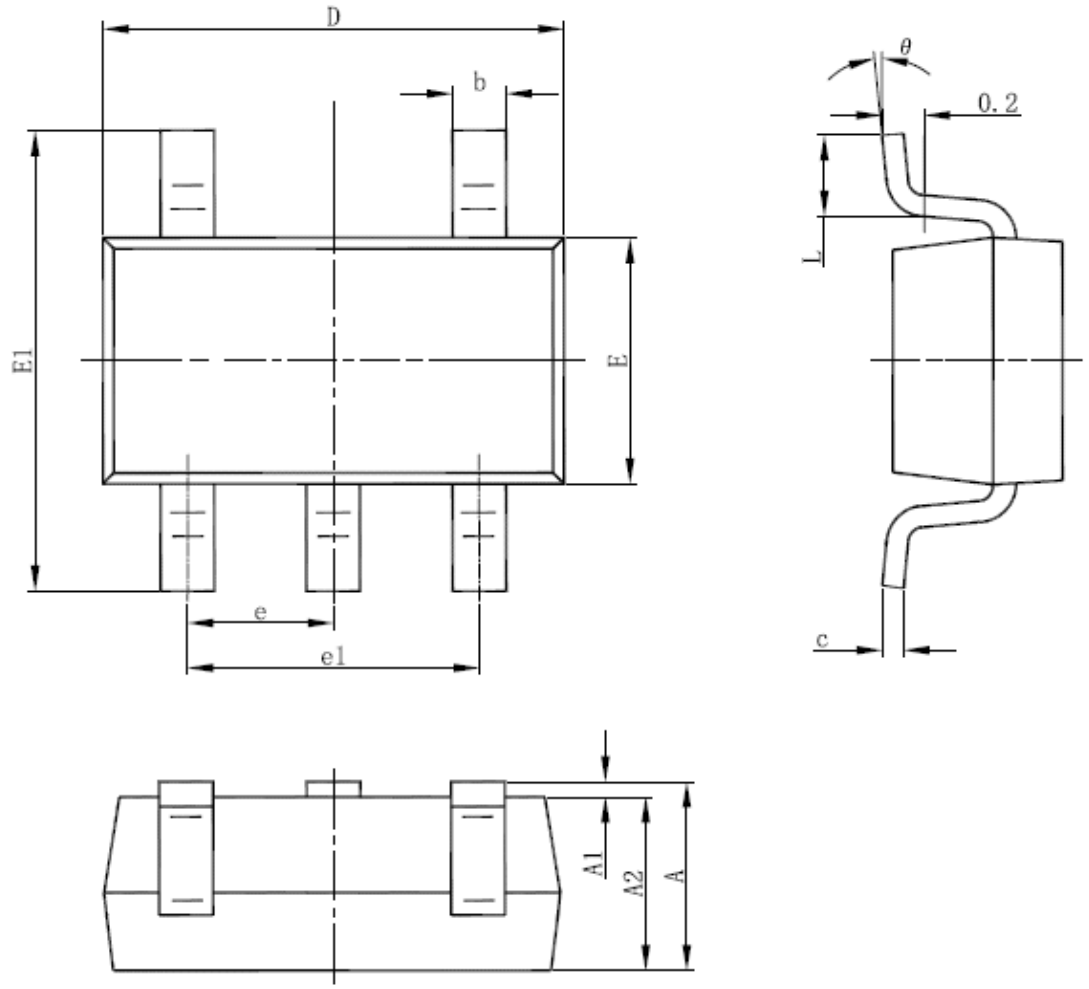
PACKAGE MECHANICAL DATA

SOP8 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max		Min
A	1.350	1.750	A	1.350
A1	0.050	0.250	A1	0.050
A2	1.250	1.650	A2	1.250
b	0.310	0.510	b	0.310
c	0.100	0.250	c	0.100
D	4.700	5.150	D	4.700
E	3.800	4.000	E	3.800
E1	5.800	6.200	E1	5.800
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	L	0.400
θ	0°	8°	θ	0°

SOT23-5 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
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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