

High Voltage Green-Mode PWM Controller with OTP Function

GENERAL DESCRIPTION

SI8016H is a highly integrated current mode PWM control for flyback converter, optimized for high performance, low standby power consumption and cost effective offline flyback converter applications.

The SI8016H built-in multiple protection with VCC under voltage lockout (UVLO), VCC over voltage protection (OVP), high voltage startup circuit, VCC clamp, GATE clamp, cycle-by-cycle current limiting (OCP), over load protection (OLP), and leading-edge blanking (LEB) of the current sensing to prevent circuit damage occurred under abnormal conditions.

The SI8016H also has an X-cap discharge function to discharge the X-cap when the input is unplugged and Brown-out protection function.

The SI8016H is available in an SOP-7L package and require very few external devices for operation.

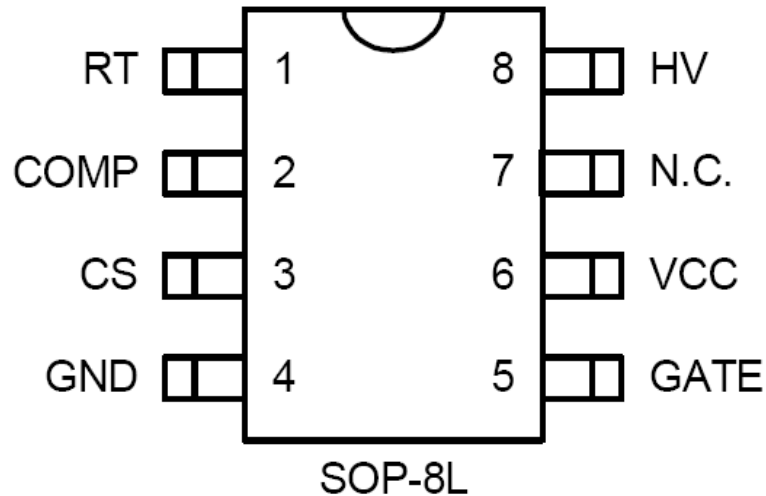
FEATURES

- High Voltage Startup Circuit
- VCC Under Voltage Lockout (UVLO)
- VCC Over voltage Protection (OVP)
- Cycle-by-Cycle Current Limiting (OCP)
- Over Load Protection (OLP)
- Connection of an NTC for Over Temperature Protection (OTP)
- Leading Edge Blanking (LEB)
- X-CAP Discharge Function
- Brown-out Protection
- VCC & Gate Voltage Clamp
- 500mA Source/500mA Sink Gate Driver
- 100kHz Switching Frequency with Frequency Hopping for Reducing EMI
- Available with SOP-8 Package

APPLICATIONS

- AC/DC Switching Power Adaptor
- Battery Charger
- Open Frame Switching Power Supply

Pin Configuration



Pin Description

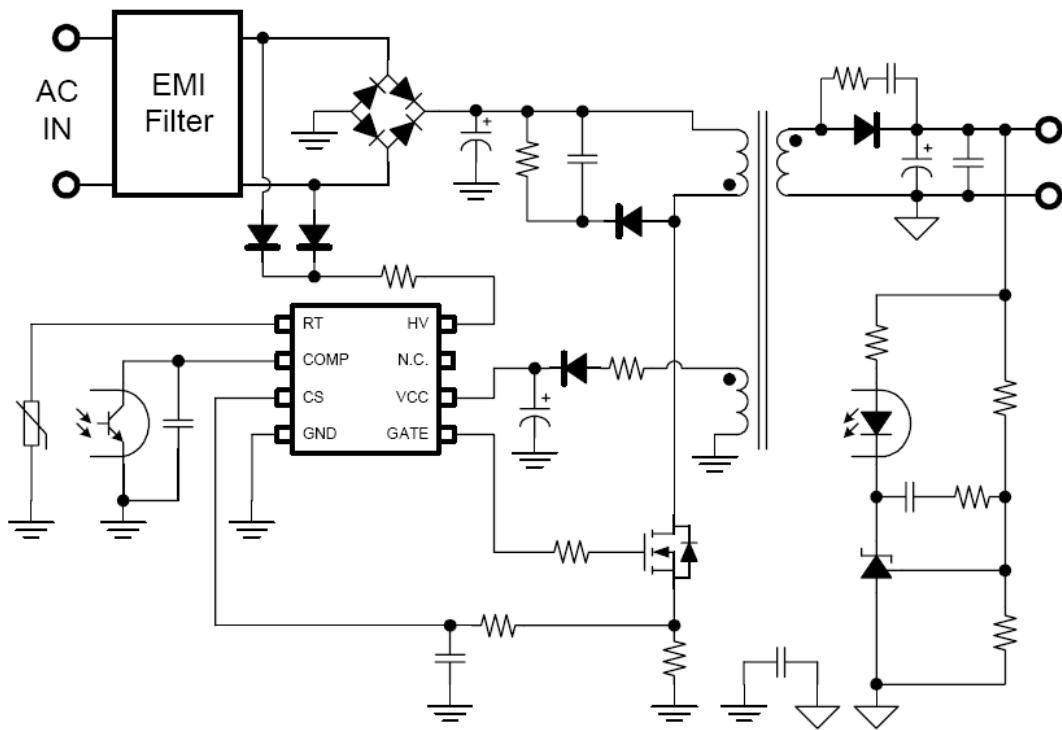
Pin No.	Pin Name	Description
1	RT	Temperature Detection. An internal current source allows the direct connection of an NTC for over temperature detection.
2	COMP	Voltage Feedback. This pin connecting an opto-coupler to monitor output for regulation control loop.
3	CS	Current Sense. This pin sense primary MOSFET current.
4	GND	Ground.
5	GATE	PWM Signal Output. This pin output to drive the external power MOSFET
6	VCC	Power Supply.
7	N.C.	No Connection.
8	HV	High Voltage. This pin connecting to X-cap capacitor via resistors to be a high voltage Brown in/out detection.start-up current source, and to implement X-cap discharge and

Protection Mode

Part Number	Switching Frequency	OLP	VCC OVP	RTLP	RTHP	Int. TSD
SI8016H	100kHz	Auto	Latch	Auto	Latch	Auto

Ordering and Marking Information

Order Number	Package	Top Marking
SI8016HSP8	SOP-8L	SI8016H

TYPICAL APPLICATION CIRCUIT

Thermal Characteristics

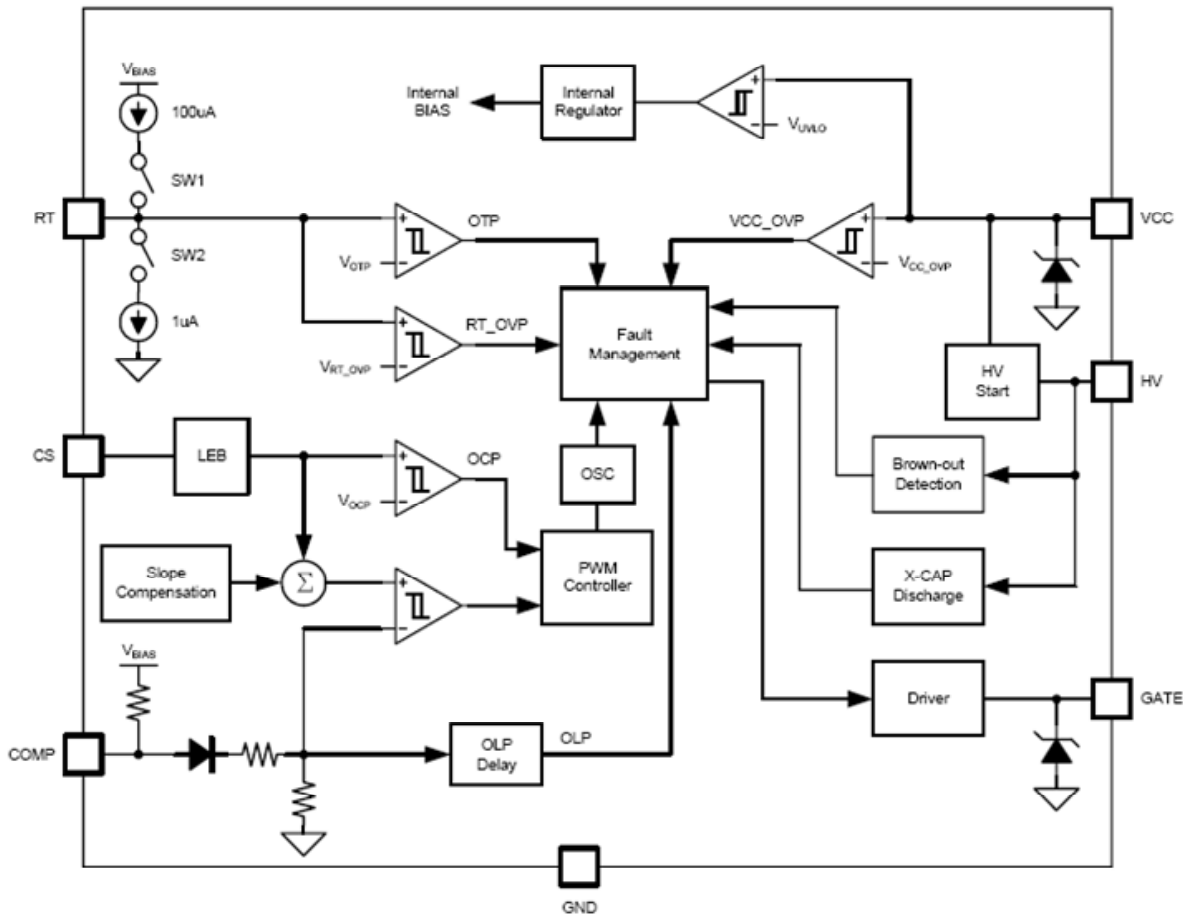
Package Thermal Resistance (Note3)

 SOP-8L θ_{JA} 250°C/W

 SOP-8L θ_{JC} 140°C/W

Power Dissipation, PD @ TA = 25°C SOP-8L 400mW

Note: The products are compatible with the current IPC/JEDEC J-STD-020 requirement. They are halogen-free, RoHS compliant and 100% matte tin (Sn) plating that are suitable for use in SnPb or Pb-free soldering processes.

Block Diagram

Absolute Maximum Ratings (Note 1)

Supply Input Voltage, VCC	-----	-0.3V to +32V
High-Voltage Pin, HV	-----	-0.3V to +600V
RT, COMP, CS	-----	-0.3V to +7V
GATE	-----	-0.3V to +20V
Storage Temperature Range	-----	-65°C to +150°C
Junction Temperature	-----	-40°C to +150°C
Lead Temperature Range(Soldering 10sec)	-----	260°C
ESD Rating (Note2)		
HBM(Human Body Mode, Except HV Pin)	-----	4KV
HBM(Human Body Mode, HV Pin)	-----	1.5KV
MM(Mechine Mode)	-----	400V

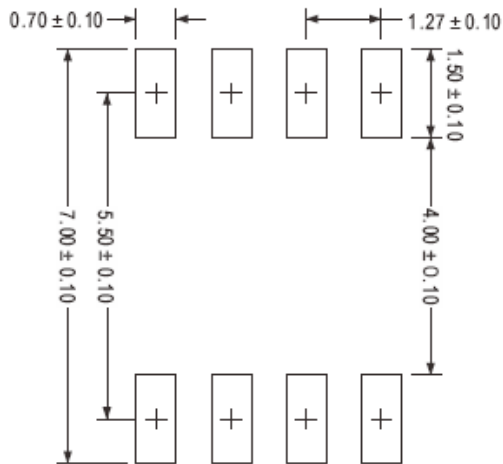
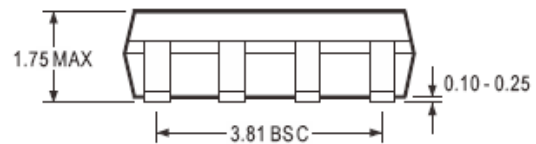
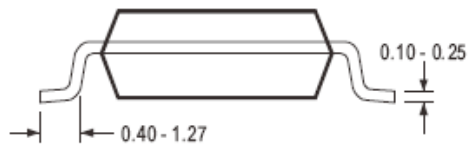
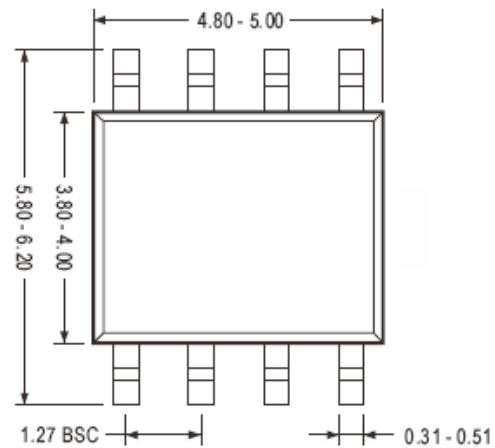
Electrical Characteristics (TA= 25°C, V_{CC}=12V, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
RT Pin Section						
Floating Voltage of RT	VRT_o	RT Open	2.1	2.3	2.5	V
RT Sourcing Current	IRT	RT < 1.5V	95	100	105	uA
RT High Level Protection	VRTTHP		3.325	3.5	3.67 5	V
RT Low Level Protection	VRTTLP		0.95	1	1.05	V
RT Low Protection Blanking Time after Brown In	tbk_rtlp			5.12		ms
TSD Section						
Internal Thermal Protection				140		°C
COMP Pin Section						
COMP Pull High Impedance	ZCOMP			20		kΩ
Open Loop Voltage	VCOMP_o	COMP Open		5		V
Over Load Protection Voltage	VCOMP_olp			4.4		V
Over Load Protection Debounce Time	Tdeb_olp			65		ms
Current Sense Section						
Delay to Output					100	ns
Leading Edge Blanking Time	t_leb	VCS>1.1V		350		ns
Minimum On Time	_minton			710		ns
CS Threshold at Max Duty	VCS_max	Fosc=Fosc_n	0.885	0.9	0.915	V
Input Impedance	ZCS		1			MΩ
Soft Start Time	tss			0.5		ms
GATE Section						
Maximum Duty Cycle	Dmax	Max Frequency	71	80	89	%
Output Voltage Low	Vol	VCC=15V, I _o =20mA Sinking		0.12	0.25	V
Output Voltage High	Voh	VCC=15V, I _o =20mA Sourcing	9	11		V
Rising Time	tr	CL=1nF, Vgate from 2V to 6V		88		ns
Falling Time	tf	CL=1nF, Vgate from 6V to 2V		10		ns
Gate Voltage Clamping	Vgate_clamp	VCC=27V	12	14	16	V

Note 1. Exceeding these limits may impair the life of the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.

Note 2. θ_{JA} is measured with the component mounted on a high effective thermal conductivity test board in free air. The exposed pad of the package is soldered directly on the PCB.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Input Section						
Operating Voltage			8		27	V
Power On Voltage	VCC_on		13.5	14	14.5	V
Holdup Voltage	VCC_hold	IHV>1Ma	8	8.5	9	V
Power Off Voltage	VCC_off		7	7.5	8	V
Reset Voltage	VCC_rst		6	6.5	7	V
Over Voltage Protection Voltage	VCC_ovp		27	28.5	30	V
Internal Zener Clamp	VCC_clamp	ICC>2*ICC_op		31		V
Startup Current	ICC_start		200	270	350	Ua
Normal Operating Current	ICC_op	C _L =1Nf		1.3		Ma
Burst Mode Operating Current	ICC_bs	VCMOP<VCMOP_bs		0.35		Ma
High Voltage Section						
High-Voltage Current	IHV_on	VCC>1V	2.5	3	3.5	Ma
Initial High-Voltage Current	IHV0_on	VCC=0V		0.67		Ma
High-Voltage Off Current	IHV_off	VHV=600V,VCC>VCC_on			20	Ua
Brown In Threshold			101	106	111	V
Brown In Delay Time				200		us
Brown Out Threshold			94	99	104	V
Brown Out Delay Time				90		ms
Xcap Discharge Current				2		Ma
Xcap Debounce Time				90		ms
Xcap Discharge Time				500		ms
HV Resister Range				20	40	kΩ
Oscillation Section						
Nominal Frequency	Fosc_n	VCOMP>VCOMP_f	94	100	106	kHz
Green Frequency	Fosc_gr	VCOMP_bs<VCOMP<VCOMP_gr		24		kHz
COMP Threshold for Frequency Reduction	VCOMP_f	Fosc<Fosc_n		2.2		V
COMP Voltage for Green Frequency	VCOMP_gr	Fosc=Fosc_gr		2		V
COMP Threshold for Zero Duty	VCOMP_bs			1.6		V
Frequency Hopping Range		Fosc=Fosc_n		+5		%
Fault Section						
Fault Recycle Time	tcyc_fault			1		s
Fault Debounce Time (Exclude OLP)	tdeb_fault			75		us

Package Dimension
SOP-8L

Recommended Solder Pad Layout

Note:
1. Package Outline Unit Description:

BSC: Basic. Represents theoretical exact dimension .

MAX: Maximum dimension specified.

MIN: Minimum dimension specified.

REF: Represents dimension for reference use only. The value is not the device specification.

TYP: Represents as a typical value. The value is not the device specification.

2. All linear dimensions are in Millimeters.

Important Notice:

- Si-Trend reserves the right to change all product、 product specifications and data without prior notice; Our customer Please confirm to place an order confirmation before make the integrity of information complete and up-to-date;
- Any semiconductor under specific conditions are possible to certain failure or malfunction rate;
- Customers are responsible in the use of Si-Trend products to system design and manufacturing in compliance with safety standards and adopting safety measures, To avoid the potential risk of failure may cause the personal safety and property loss;
- Si-Trend Always refine on to provide more excellent products;

Attachment:

Modify record:

Date	Version	Description	Pagination
20130709	1.0	Original	
20191009	1.1	Change format	