YHM2019B

High Voltage Over Current Protection Switch

Features

- Input voltage range: 2.5V ~ 28V
- Both IN and ISNS may supply the chip
- Low Quiescent current: 20uA
- Low on-resistance: typical 120mΩ
- Programmable Over Current Protection
- 10Mbps bit rate communication
- Output Discharge
- Thermal Shutdown
- Robust ESD capability
  HBM > ±6500V
  CDM > ±2000V
- 2mm x 2mm 8-pin DFN

Applications

Consumer, IOT, Industrial.

General Description

YHM2019B over current protection device features a low 120mΩ (TYP) on-resistance integrated MOSFET which actively protect over current condition.

YHM2019B device enters hiccup mode when the output load exceeds the over current threshold. The over current threshold is programed by R_{SNS}.

The device also features 10Mbps bit rate and it supports digital signal communication when the chip is powered by ISNS pin.

YHM2019B is available in 2mm x 2mm 8-pin DFN with 0.5 pitch, and operates over an ambient temperature range of -40°C to +85°C.

Typical Application

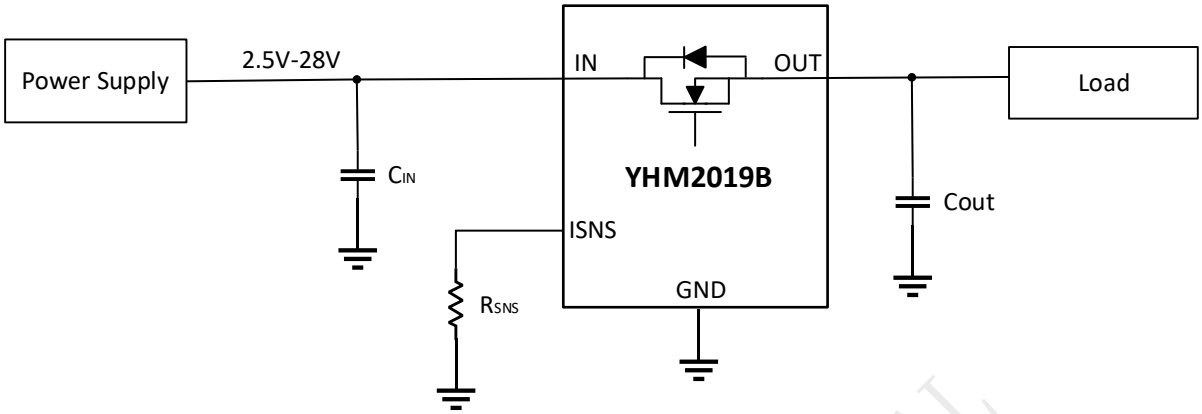


Fig 1. High Voltage OCP Switch Application Diagram

Internal Block Diagram

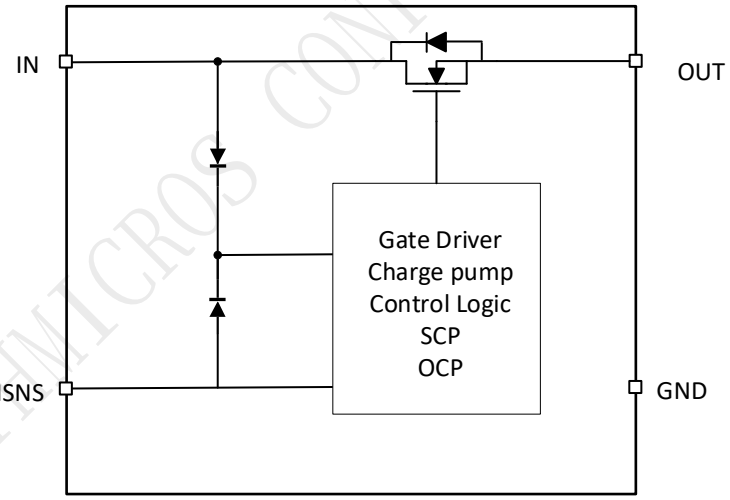


Fig 2. YHM2019B Functional Block Diagram

Pin Configurations

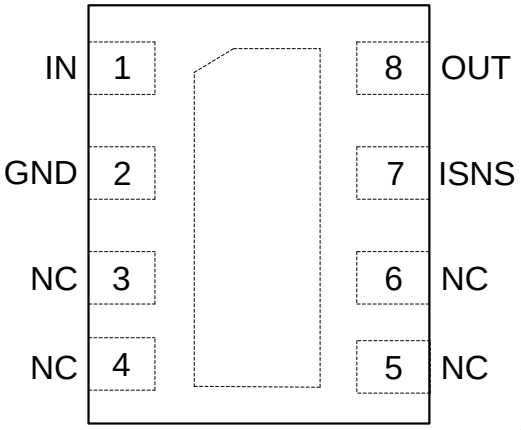


Fig 4. YHM2019B DFN-8 Pin Assignment (Top Through View）

YHM2019B DFN Pin Descriptions

Bump	Name	Description
1	IN	Power Input.
2	GND	Device Ground.
3	NC	Floating or connect to ground.
4	NC	Floating or connect to ground.
5	NC	Floating or connect to ground.
6	NC	Floating or connect to ground.
7	ISNS	Resistor connected to program over current threshold. Or connect to >1.6V GPIO for communication function.
8	OUT	Power Output.

1. Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V_{IN}	IN to GND		-0.3	29	V
V_{OUT}	OUT to GND		-0.3	V_{IN}+0.3	V
V_{ISNS}	ISNS to GND		-0.3	6.0	V
I_{IN}	Input Current (Continuous)			2.0	A
I_{OUT}	Output Current			2.0	A
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Maximum Junction Temperature			+150	°C
T_L	Lead Temperature (Soldering, 10 Seconds)			+260	°C
θ_{JA}	Thermal Resistance, Junction-to-Ambient (1-in. Pad of 2-oz. Copper)			TBD	°C/W
ESD	Human Body Model, ANSI/ESDA/JEDEC JS-001-2012	All Pins	6.5		kV
	Charged Device Model, JESD22-C101	All Pins	2.0		

Note 1. Refer to JEDEC JESD51-7, use a 4-layerboard

2. Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance.

Parameters	Min.	Max.	Unit
Supply Voltage: V_{IN}	2.5	28	V
Supply Voltage: V_{ISNS}	1.6	5.5	V
Ambient Operating Temperature, T_A	-40	85	°C
V_{IN} Capacitor (No capacitor for communication function)	0.1		μF
V_{OUT} Load Capacitor (No capacitor for communication function)	1	100	μF
Operating Temperature Range	-40	85	°C

3. Detailed Electrical Characteristics

V_{IN} = 2.5V to 28V, C_{IN} = 0.1μF, T_A = -40°C to +85°C, typical values are at V_{IN} = 5V, I_{IN} ≤ 2A, T_A = +25°C, unless otherwise noted.

PARAMETER	SYMBO	CONDITION	MIN	TYP	MAX	UNIT
INPUT OPERATION						
Input Voltage Range	V_{IN}		2.5		28	V
Input Supply Current	I_{INQ}	V_{IN} = 5V, ISNS Floating		20		μA
Under-Voltage Lockout	V_{IN_UVLO}	V_{IN} rising		2.35		V
Under-Voltage Lockout Hysteresis	V_{IN_HYS}			0.1		V
Switch On-Resistance	R_{ON}	V_{IN} = 5V, I_{OUT} = 0.2A, T_A = 25°C		120		mΩ
ISNS Supply Current	I_{VDDQ}	V_{ISNS} = 1.8V		15		μA
OVER-CURRENT PROTECTION						
OCP Threshold	I_{OCP}	R_{SNS}=25KΩ, T_A= 25°C		1		A
		Accuracy, T_A = 0°C to +65°C	-10%		10%	
OCP Response Time	t_{OCP}			45		us
OCP Auto-restart Time	t_{OCP_RST}			130		ms
TIMING CHARACTERISTICS						
Debounce Time	t_{DEB}	Time from V_{IN} > V_{IN_UVLO} to the time V_{OUT} starts rising		10		ms
Switch Turn-On Time	t_{ON}	V_{IN} = 5V, R_L = 100Ω, C_{LOAD} = 100uF, V_{OUT} from 0.1 × V_{IN} to 0.9 × V_{IN}		0.5		ms
Switch Turn-Off Time	t_{OFF}	V_{IN} > V_{IN_OVLO} to V_{OUT} = 0.1 × V_{IN}, R_L = 100Ω, V_{IN} rising at 2V/μs		50		ns
THERMAL SHUTDOWN (1)						
Thermal Shutdown				150		°C
Thermal Shutdown Hysteresis				20		°C

Note 1: This parameter is guaranteed by design and characterization; not production tested.

4. Detailed Description

4.1 General Introduction

YHM2019B over current protection device features a low 120mΩ (TYP) on-resistance integrated MOSFET which actively protect over current condition.

YHM2019B device enters hiccup mode when the output load exceeds the over current threshold. The over current threshold is programed by R_{SNS}.

4.2 UVLO (Under-Voltage Lockout)

The device has a built-in under-voltage lockout (UVLO) circuit. When VIN is rising, the output remains disconnected from the input until IN voltage is above 2.35V (TYP). This circuit has a 100mV hysteresis to provide noise immunity to transient conditions.

4.3 OCP (Over Current Protection)

The chip enters hiccup mode when the output load exceeds the over current threshold. The OCP threshold could be adjusted by single external resister R_{SNS} connected between ISNS and GND using the following equations:

$$R_{SNS} = 25K/I_{OCP}$$

Connect an ADC to ISNS pin to measure the voltage on R_{SNS} can get the current flow through the switch. When the output is short to ground, the chip limit the short current to protect the system from damage.

4.4 Communication Functionality

Both IN and ISNS may supply YHM2019B. YHM2019B would compare the voltage between IN and ISNS, and select the higher voltage to power the IC. By this, YHM2019B supports digital signal transmission through IN and OUT when the device is powered by ISNS. Typically, ISNS is recommended to be driven by GPIO typically. For example, V_{ISNS} = 1.8V would power YHM2019B even when V_{IN} = 0. It is necessary to remove input and output capacitor when communication is required.

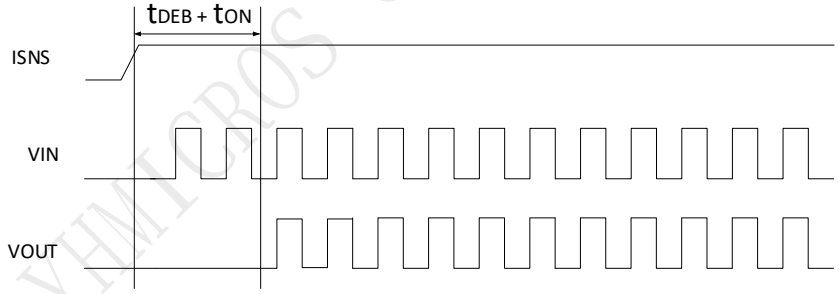


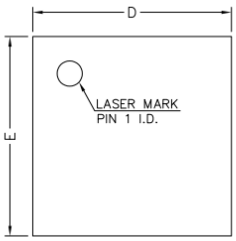
Fig 6. Timing for VIN communication

4.6 Thermal Protection

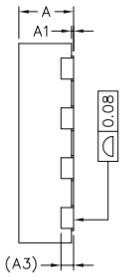
The internal FET turns off when the junction temperature exceeds +150°C (TYP). The device exits thermal shutdown after the junction temperature cools down by 20°C (TYP).

Package Dimensions

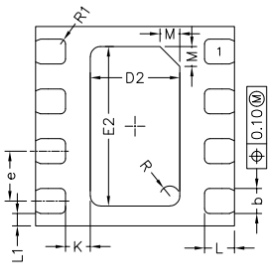
DFN-8 2mm x 2mm x 0.55mm



TOP VIEW



SIDE VIEW



BOTTOM VIEW

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A3		0.127REF	
b	0.20	0.25	0.30
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D2	0.80	0.90	1.00
E2	1.50	1.60	1.70
e	0.45	0.50	0.55
K	0.15	0.25	0.35
L	0.25	0.30	0.35
L1	0.075	0.125	0.175
M		0.20REF	
R		0.10REF	
R1		0.05REF	

SIDE VIEW

NOTES:
ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSION.

Ordering Information

Part Number	Temp Range	Pin Package	OVP Threshold	Top Mark	MOQ
YHM2019BD8T	-40°C to 85°C	8 DFN	NO	2019B YYWW	4000

Top Mark
Y2019: YHM2019B
YYWW: Date Code. YY = year, WW = week.

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