YHM2018

OVP and OCP Switch with Negative Voltage Protection

Features

- Input Voltage Rating:
  -30V ~ 22V with Surge up to 28V
- Low Quiescent current: 20uA
- Low on-resistance: typical 165mΩ
- Over voltage protection: Default 6V
- Programmable Over Current Protection
- Output Discharge
- Thermal Shutdown
- Robust ESD and surge immunity capability
  HBM > ±2KV
  CDM > ±1kV
- 2mm x 2mm 8-pin DFN

Applications

- TWS, AR/VR Device, Smart Band/Watch, Smart IOT etc.

General Description

YHM2018 over-voltage and over current protection device features a 165mΩ (TYP) on-resistance integrated MOSFET which actively protect low-voltage systems against voltage supply faults up to +22VDC and down to -30VDC. An input voltage exceeding the over-voltage threshold will cause the internal MOSFET to turn off, preventing excessive voltage from damaging downstream devices. The internal MOSFET will be also turn off if input voltage is a negative voltage.

The over-voltage protection threshold is default 6V. There are other versions for 11V/16V and no OVP. YHM2018 device enters hiccup mode when the output load exceeds the over current threshold. The over current threshold is programed by R_{SNS}.

YHM2018 is available 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

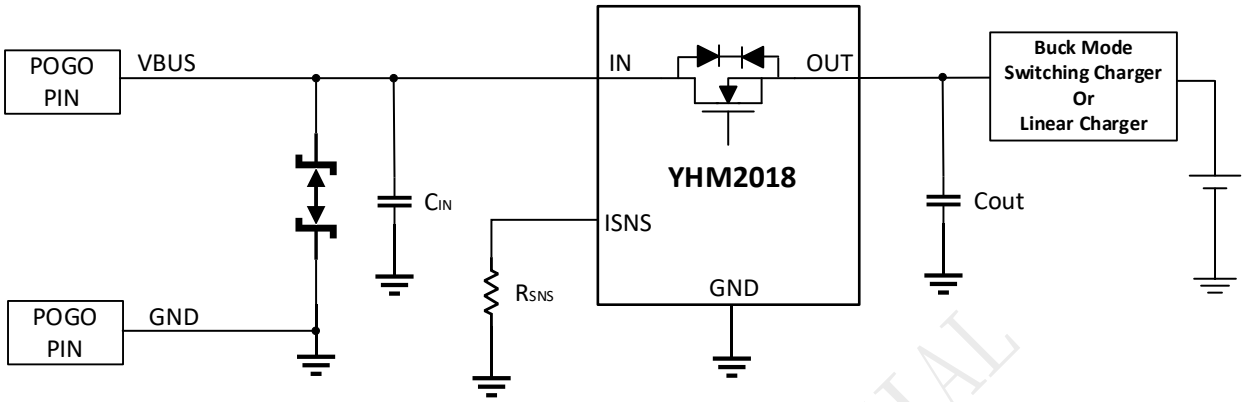


Fig 1. VBUS OVP/OCP with Negative Voltage Protection

Internal Block Diagram

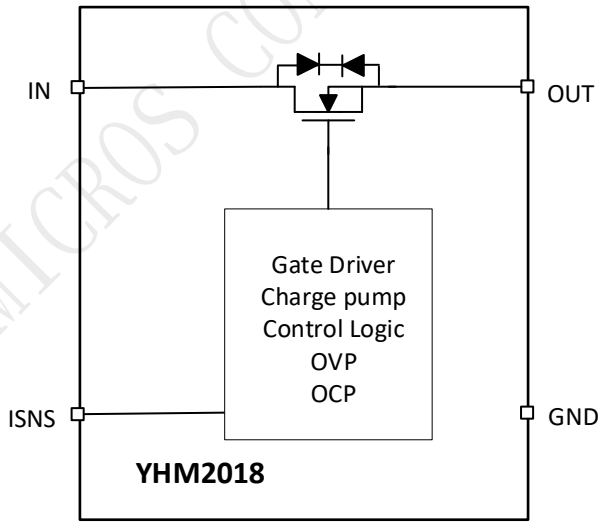


Fig 2. YHM2018 Functional Block Diagram

Pin Configurations

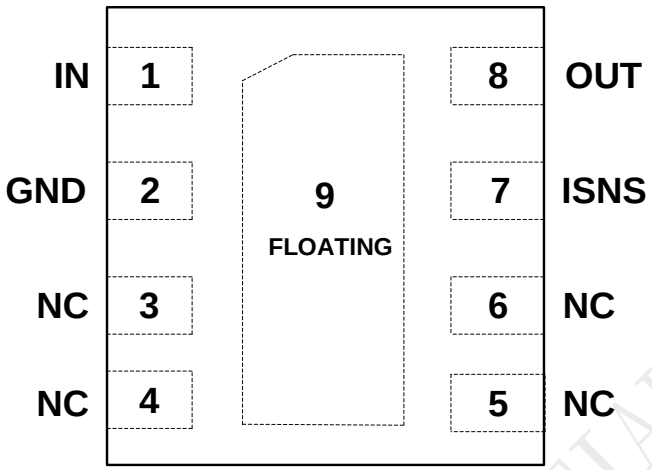


Fig 4. YHM2018 DFN-8 Pin Assignment (Top Through View）

YHM2018 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.
8	OUT	Power Output.
9	FLOATING	Internal use pin, must be floating.

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		-30	22	V
V_{IN}	IN to GND (Transient < 100μs)		-30	28	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	2.0		kV
	Charged Device Model, JESD22-C101	All Pins	1.0		

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	20	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 20V, 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		20	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
OVER-VOLTAGE PROTECTION						
OVLO Threshold	V_{IN_OVLO}			6		V
Switch On-Resistance	R_{ON}	V_{IN} = 5V, I_{OUT} = 0.2A, T_A = 25°C		165		mΩ
ISNS Supply Current	I_{VDDQ}	V_{ISNS} = 1.8V		15		uA
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						
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

YHM2018 is an over-voltage and over-current protection device with 165mΩ (TYP) on-resistance path, which can actively protect low-voltage systems against voltage supply faults up to +22VDC and down to -30VDC. An input voltage exceeding the over-voltage threshold will cause the internal MOSFET to turn off, preventing excessive voltage from damaging downstream devices. The over-voltage protection threshold is default 6V. The internal MOSFET will be also turn off if input voltage is a negative voltage.

YHM2018 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 OVLO (Over-Voltage Lockout)

When the voltage at the input exceeds OVLO threshold, the device immediately turns off the internal switch disconnecting the load from the abnormal voltage, preventing damage to downstream components. The OVLO threshold is default 6V, and there are other versions for 11V, 16V and no OVP.

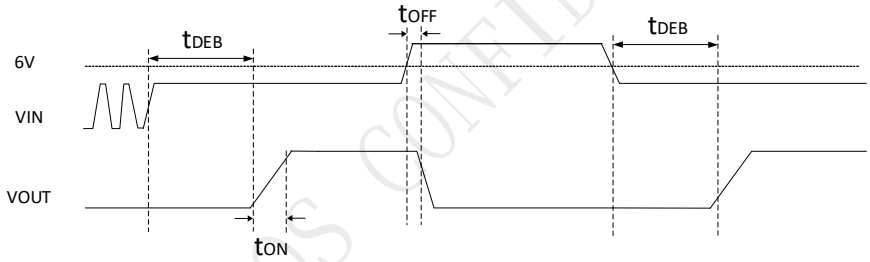


Fig 5. Timing for OVLO trip

4.4 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:

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

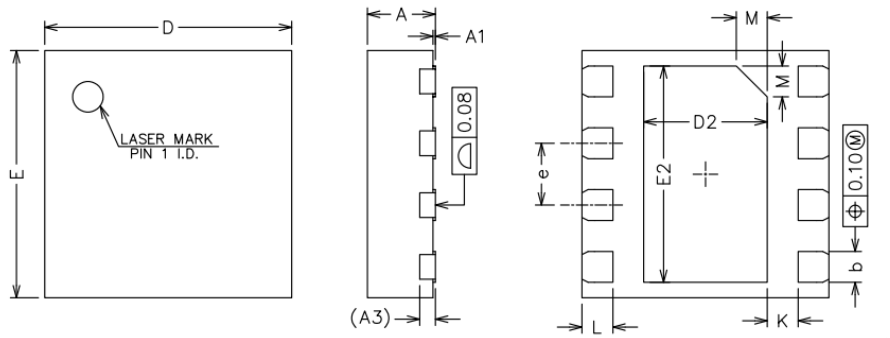
Connect an ADC to ISNS pin to measure the voltage on R_{SNS} can get the current flow through the switch.

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	0.15	0.25	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.90	1.00	1.10
E2	1.65	1.75	1.85
e	0.40	0.50	0.60
K		0.25REF	
L	0.15	0.25	0.35
M		0.25REF	

SIDE VIEW

Ordering Information

Part Number	Temp Range	Pin Package	OVP Threshold	Top Mark	MOQ
YHM2018D8T	-40°C to 85°C	8 DFN	6V	Y2018 YYWW	4000

Top Mark
T: YHM2018.
x: Data Code.
Y2018: YHM2018
YYWW: Date Code. YY = year, WW = week.

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