YHM2020
High Voltage Load Switch with OVP/OCP

Features

- Input voltage range: 2.5V ~ 28V
- Quiescent current: 25µA
- Shutdown current: 5µA
- Low on-resistance: typical 120mΩ
- Over voltage protection: Default 23V
- Over Current Protection
- Output Discharge
- Thermal Shutdown
- Robust ESD and surge immunity capability

  HBM > ±2KV

  CDM > ±1kV
- Tiny 4-bumps WLCSP 0.83mm x 0.67mm

  or 2mm x 2mm 8-pin DFN

Applications

- Industrial Systems
- Set Top Box, Appliances, Output Protection

General Description

YHM2020 high voltage load switch features a low 120mΩ (TYP) on-resistance integrated MOSFET which actively protect systems against voltage supply faults up to +29VDC. 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 23V. There are other versions for 6V/11V/16V OVP and no OVP. YHM2020 device enters hiccup mode when the output load exceeds the over current threshold 1.65A.

YHM2020 is available in tiny 4-bumps WLCSP 0.83mm x 0.67mm with 0.35 pitch or 2mm x 2mm 8-pin DFN with 0.5 pitch, and operates over an ambient temperature range of -40°C to +85°C.

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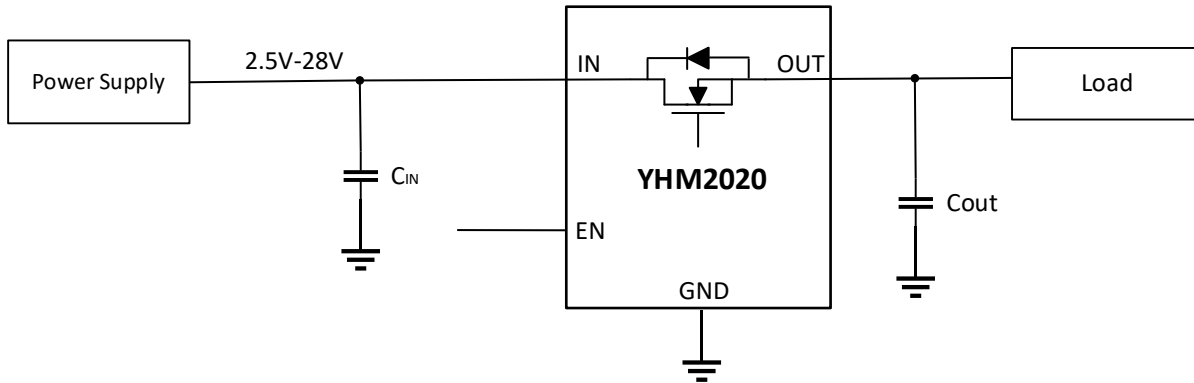
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Typical Application

Fig 1. Load Switch Application Diagram

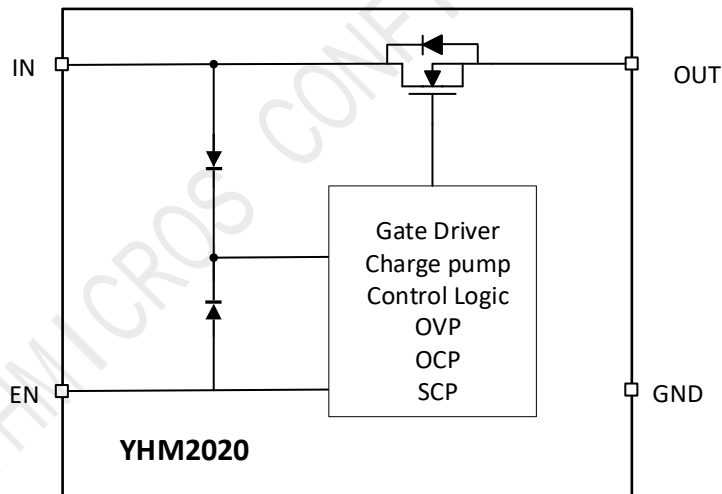## Internal Block Diagram

Fig 2. YHM2020 Functional Block Diagram

YHM2020
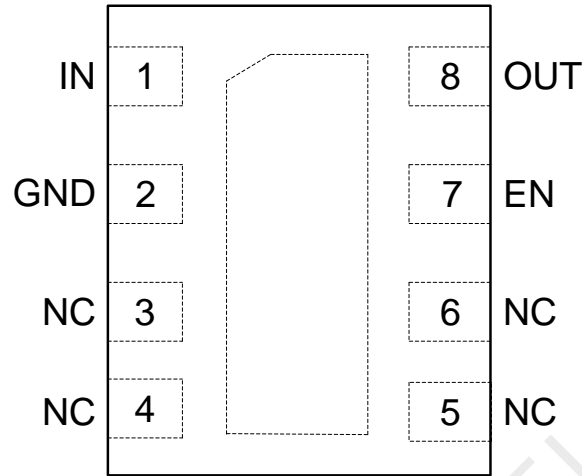## High Voltage Load Switch with OVP/OCP

DFN Pin Configurations

Fig 3. YHM2020 DFN-8 Pin Assignment (Top Through View）

YHM2020 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	EN	Enable Pin. Active High.
8	OUT	Power Output.

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WLP Pin Configurations
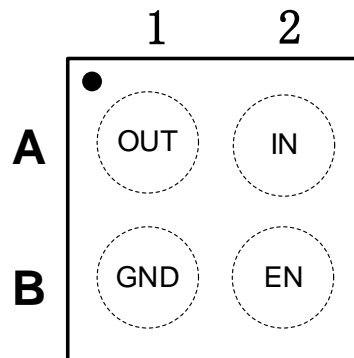
Fig 4. YHM2020 WLP-4 Pin Assignment (Top Through View）

YHM2019 WLP Pin Descriptions

Bump	Name	Description
A1	OUT	Power Output.
A2	IN	Power Input.
B1	GND	Device Ground.
B2	EN	Enable Pin. Active High.

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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_{EN}	EN 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)				°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

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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
Ambient Operating Temperature, T_A	-40	85	°C
V_{IN} Capacitor	0.1		µF
V_{OUT} Load Capacitor	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 Quiescent Current	I_{INQ}	V_{IN} = 5V, EN=High		25		µA
Shutdown Current	I_{SD}	EN=Low		5		µA
Under-Voltage Lockout	V_{IN_UVLO}	V_{IN} rising		2.35		V
Under-Voltage Lockout Hysteresis	V_{IN_HYS}			0.1		V
OVLO Threshold	V_{IN_OVLO}			23		V
Switch On-Resistance	R_{ON}	V_{IN} = 5V, I_{OUT} = 0.2A, T_A = 25°C		120		mΩ
OVER-CURRENT PROTECTION						
OCP Threshold	I_{OCP}	T_A= 25°C		1.65		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
LOGIC						
EN High Threshold Voltage	V_{EN_H}		1.6			V
EN Low Threshold Voltage	V_{EN-L}				0.4	V
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

YHM2020 is an over-voltage and over-current protection device with 120mΩ (TYP) on-resistance path, which can actively protect low-voltage systems against voltage supply faults up to +29VDC. 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.

YHM2020 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 23V, and there are other version for11V, 16V and no OVP.
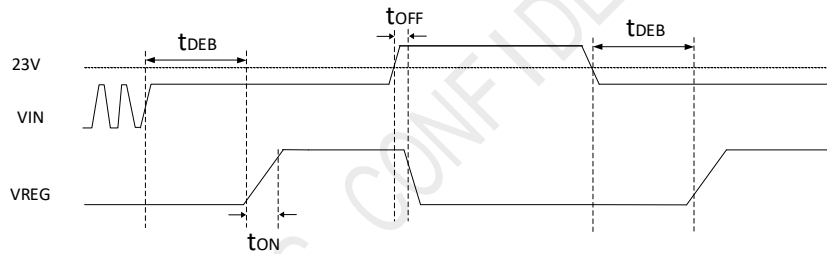

Fig 5. Timing for OVLO trip

4.4 OCP (Over Current Protection)

The chip enters hiccup mode when the output load exceeds the over current threshold 1.65A. .
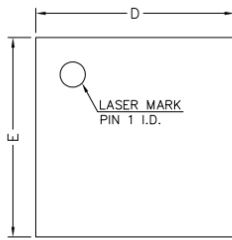
4.5 Thermal Protection

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).
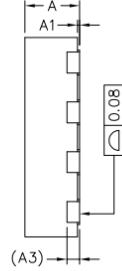
YHM2020
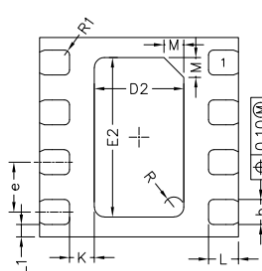## High Voltage Load Switch with OVP/OCP

Package Dimensions

DFN-8   2mm x 2mm x 0.55mm

TOP VIEW   SIDE VIEW   BOTTOM VIEW

SIDE 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	

NOTES:
ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSION.
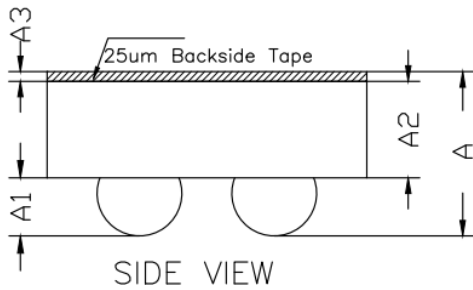
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WLCSP-4   0.83mm x 0.67mm x 0.425mm
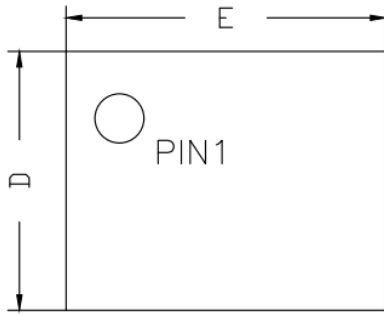
TOP VIEW
(MARK SIDE)
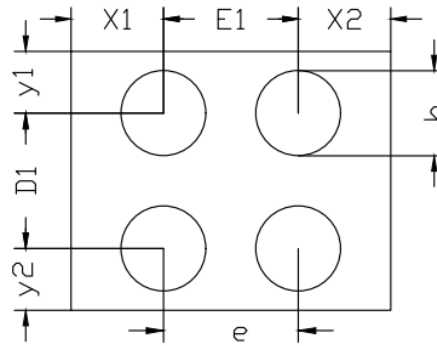
BOTTOM VIEW
(BALL SIDE)

25um Backside Tape

SIDE VIEW

COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
SYMBOL	MIN	NOM	MAX
A	0.380	0.425	0.470
A1	0.130	0.150	0.170
A2	0.225	0.250	0.275
A3		0.025	
D	0.650	0.670	0.690
D1		0.350BSC	
E	0.810	0.830	0.850
E1		0.350BSC	
b	0.200	0.220	0.240
e		0.350BSC	
x1		0.240 REF	
x2		0.240 REF	
y1		0.160 REF	
y2		0.160 REF	

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Ordering Information

Part Number	Temp Range	Pin Package	OVP Threshold	Top Mark	MOQ
YHM2020D8T	-40°C to 85°C	8 DFN	23V	Y2020 YYWW	4000
YHM2020W4T	-40°C to 85°C	4 WLCSP	23V	xx	5000

Top Mark
Y2020: YHM2020
YYWW: Date Code. YY = year, WW = week.

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