

1A Load Switch with Reverse Current Blocking

Features

- Input voltage range: 1.5V ~ 5.5V
- Low on-resistance: typical 90mΩ
- Reverse Current Blocking When device is reverse bias.
- Low Quiescent current: 4μA.
- Output Discharge.
- Thermal Shutdown
- Robust ESD immunity capability
 - HBM > ±2KV
 - CDM > ±1KV
- Package
 - Tiny 4-bumps WLCSP 0.67mm x 0.67mm
 - 5 Pin SOT23

Applications

- Notebook and Tablet Computers.
- Smartphone, Wearable device.
- Electronic Toys.

Typical Application

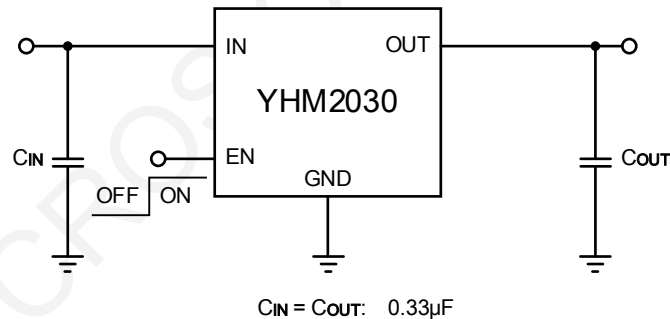


Figure 1. Application Diagram

General Description

YHM2030 is a 1A load switch. Its working voltage range is from 1.5V to 5.5V. When YHM2030 is forward biased and enabled, it has as little as 90mV of voltage drop while carrying currents as high as 1A. Typical voltage drop is 45mV at 500mA, with the voltage drop increasing linearly at higher currents.

YHM2030 has thermal protection and open switch to protect downstream circuit when temperature becomes too high.

When YHM2030 is disabled(EN=0), it blocks both directions up to 6V. And it is very suitable for portable device.

The YHM2030 is available in a tiny, 0.67mm X 0.67mm, 4-bump wafer-level package (WLP), with a 0.35mm bump pitch and 5-pin SOT-23 package. The YHM2030 operates over the extended -40°C to +85°C temperature range.

YHM2030

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Internal Block Diagram

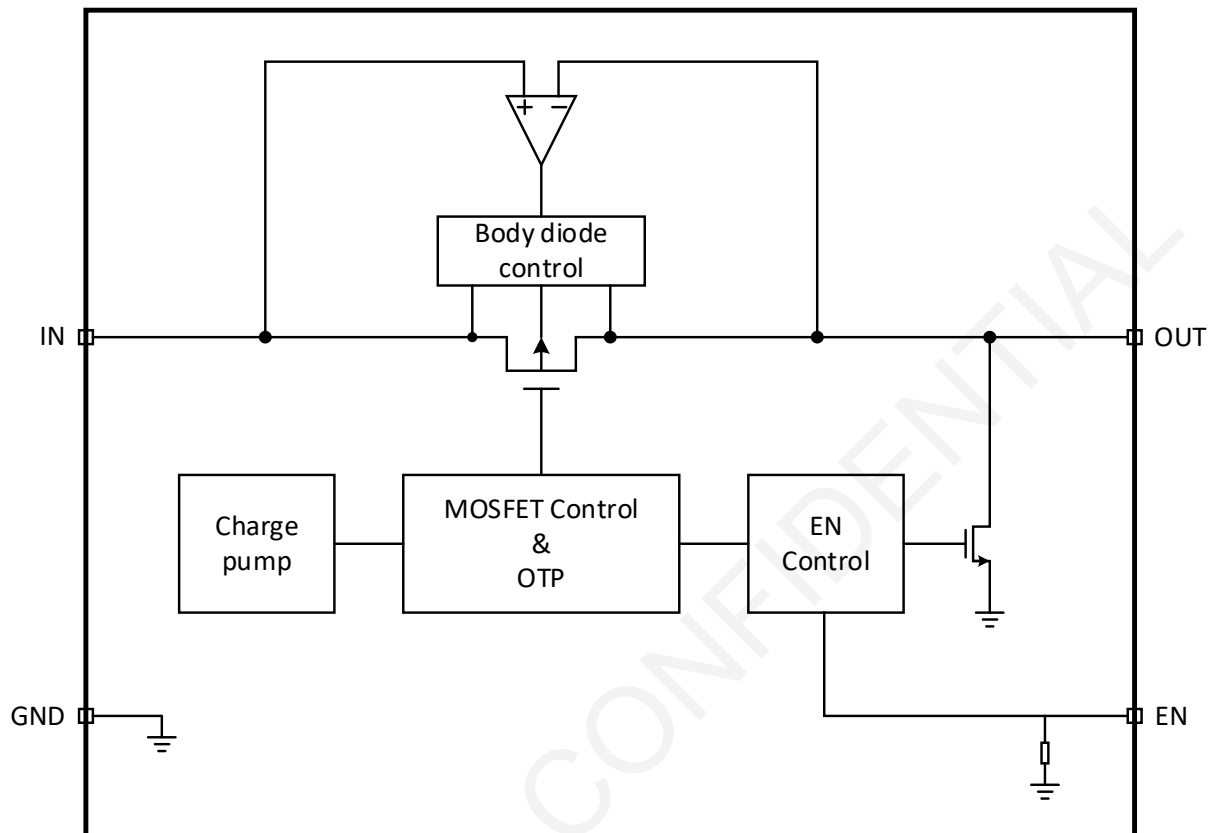


Figure 2. YHM2030 Functional Block Diagram

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Pin Configurations

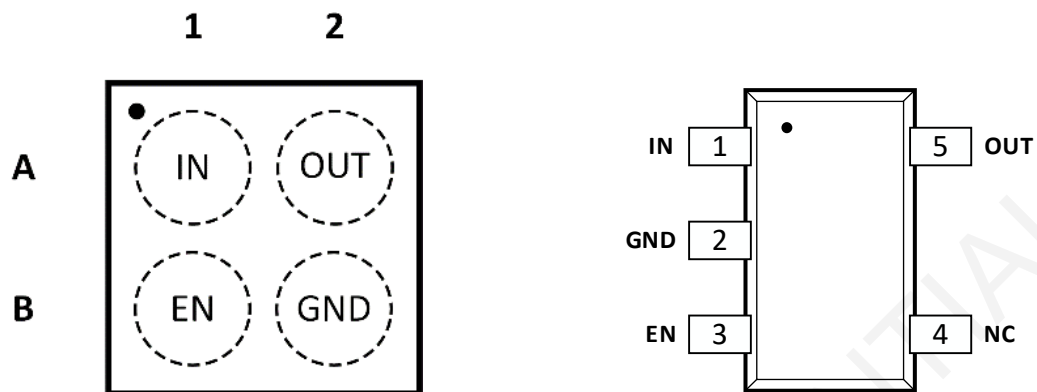


Figure 3 YHM2030 Pin Assignment (Top View)

YHM2030 Pin Descriptions

WLP	SOT23-5	Name	Description
A1	1	IN	Power Input.
A2	5	OUT	Power Output.
B1	3	EN	Enable control. Device is active when EN=1.
B2	2	GND	Ground Connection.
-	4	NC	Not Connect.

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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	6	V
V _{OUT}	OUT to GND		-0.3	6	V
V _{EN}	EN to GND		-0.3	6	V
I _{IN}	Input Current (Continuous)			1.5	A
I _{OUT}	Output Current			1.5	A
P _D	Total Power Dissipation at TA = 25°C (WLP)			1.3	W
T _{STG}	Storage Temperature Range		-65	+150	°C
T _J	Maximum Junction Temperature			+150	°C
θ _{JA}	Thermal Resistance, Junction-to-Ambient (WLP)			95	°C/W
ESD	Human Body Model, ANSI/ESDA/JEDEC JS-001-2012	All Pins	2		KV
	Charged Device Model, JESD22-C101	All Pins	1		

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
Input Voltage: V_{IN}	1.5	5.5	V
Operating Ambient Temperature Range	-40	85	°C

3 Electrical Characteristics

Condition: $V_{IN} = 5V$, $I_{LOUT} = 1mA$, $T_A = -40^{\circ}C \sim 85^{\circ}C$, unless otherwise noted. Typical value at $T_A = +25^{\circ}C$ and $V_{IN} = 5V$

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	V_{IN}		1.5		5.5	V
EN Logic Voltage	V_{ENH}^{NOTE1}		1.1		5	V
	V_{ENL}				0.3	
EN Pull Down Resistor	R_{ENPD}	$V_{EN} = 5V$		10		MΩ
Output Discharge Resistor	R_{DIS}			150		Ω
Thermal Shutdown Threshold	T_{SD}			150		°C
Thermal Hysteresis	T_{HYS}			20		°C
Switch On-Resistance (WLP)	R_{ON}	$I_{LOUT} = 1A$, $V_{IN} = 1.5V$.		90	180	mΩ
Switch On-Resistance (SOT23)	R_{ON}	$I_{LOUT} = 1A$, $V_{IN} = 1.5V$.		165		mΩ
Switch Output Current	I_{LOUT}				1	A
Quiescent Current	I_{LQ}	$I_{LOUT} = 0A$, $EN = 1$;		4	15	μA
		$EN = 0$;		0.35	1.2	
Reverse Turn off Threshold	V_{TF}	Voltage between V_{OUT} and V_{IN}		20		mV
Reverse Turn off time	t_{TF}	$EN = 1$, $V_{OUT} - V_{IN} > V_{TF}$		20		μs
Reverse Turn off release Threshold	V_{TFR}	$V_{IN} - V_{OUT}$		0		mV
Reverse Current OUT leakage	I_{OUT_LEAK}	Current Draw from OUT, $V_{OUT} - V_{IN} = 0.1V$		0.1		μA
IN Current During Reverse Current Blocking	I_{IN_LEAK}	Current Draw from IN, $V_{OUT} - V_{IN} = 0.1V$		4	15	μA

Note 1: If the voltage that applied on EN pin higher than 5V, need add one 2Mohm resistor between 5V to EN in series.

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4 Typical Operating Characteristics

Condition: VIN=5V, CIN=COU=0.33μF, ILOUT = 0mA. Otherwise noted.

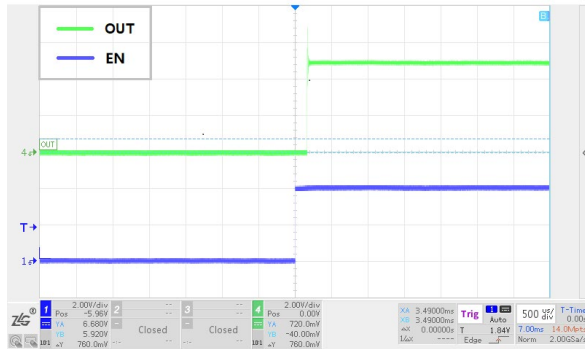


Figure 4 Device Start Up Waveform

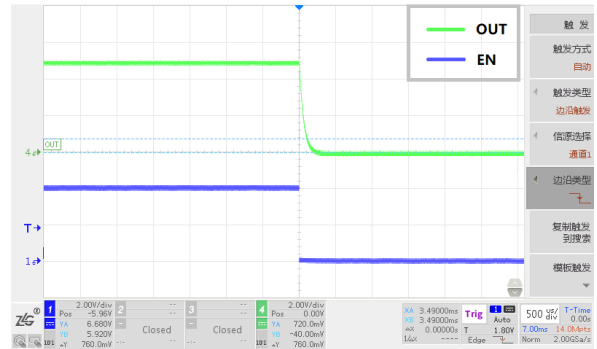


Figure 5. Device Shut Down Waveform.

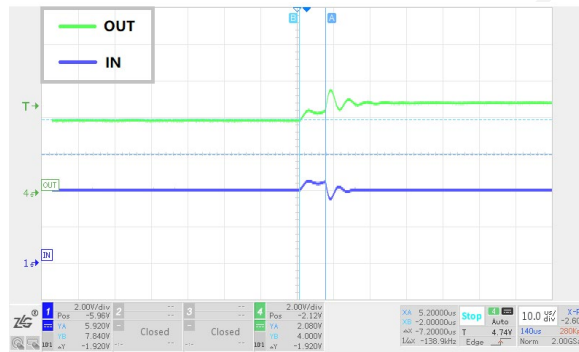


Figure 6 RCB Action

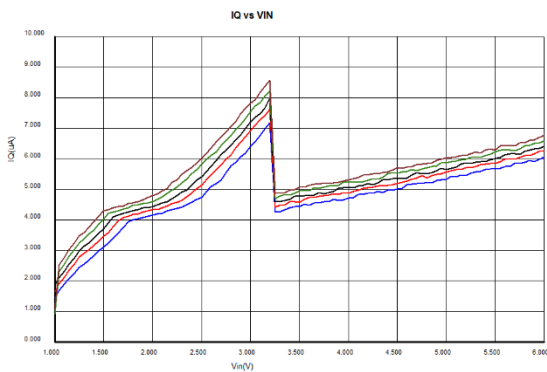


Figure 7. Device Quiescent Current (EN=1)

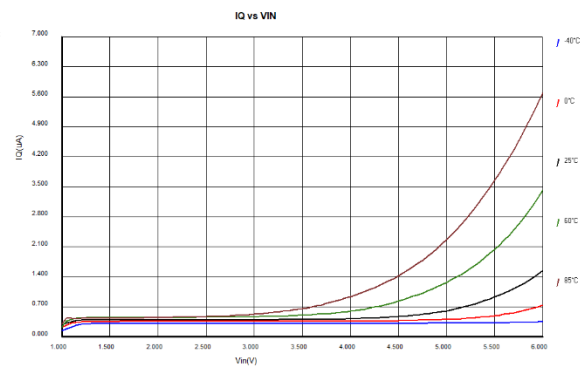


Figure 8. Device Quiescent Current (EN=0)

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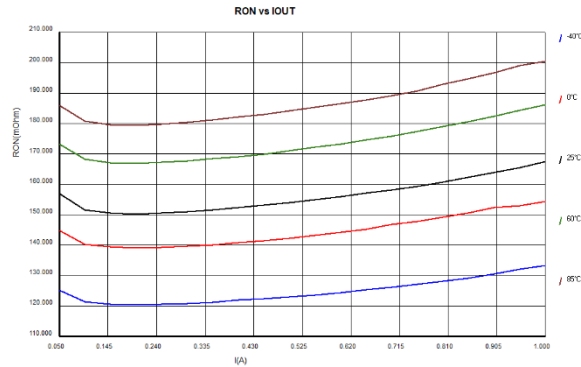


Figure 9. SOT23 ON-Resistance(VIN=1.5V)

5 Detailed Description

5.1 General Introduction

YHM2030 is 1A load switch with very low Rdson. YHM2030 has very low leakage current from both directions during disabled period and very low reverse leakage current from output in reverse bias status.

5.2 Thermal Shutdown

YHM2030 has thermal shutdown function. When the junction temperature exceeds T_{SD} , the device turns off internal MOSFET to protect itself. The device exits thermal shutdown after junction temperature cools down below $T_{SD}-T_{HYS}$. And then the device full works after a soft start period.

5.3 Output discharge

YHM2030 has output discharge function. The VOUT connects to GND with about 150ohm resistor when EN=0 or shutdown mode for 2ms and then disconnects this resistor.

5.4 work mode

YHM2030 has designed for current direction from IN to OUT. So when $V_{IN} > V_{OUT}$, the device is forward-biased. YHM2030's operation is like below:

- 1) The switch is on when YHM2030 is forward-biased.
- 2) The switch is off when YHM2030 is reverse-biased.
- 3) The switch is off when junction temperature is higher than thermal shutdown threshold.
- 4) The switch if off when EN=0.

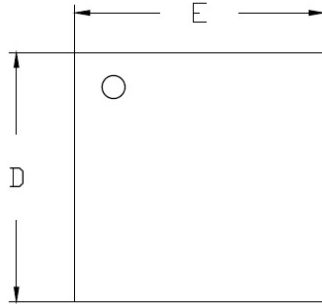
To ensure internal circuit work stable, need add 0.33uF capacitor at least at both OUT and IN pin.

YHM2030

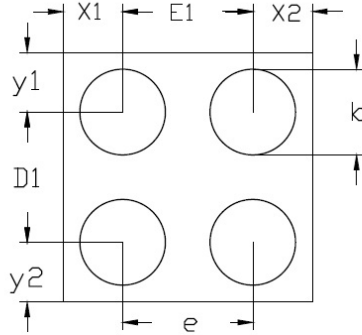
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6 Package Dimensions

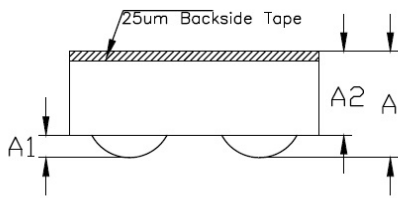
WLCSP-4



TOP VIEW
(MARK SIDE)



BOTTOM VIEW
(BALL SIDE)



SIDE VIEW

NOTES:
ALL WAFER ORIENTATION NOTCH DOWN

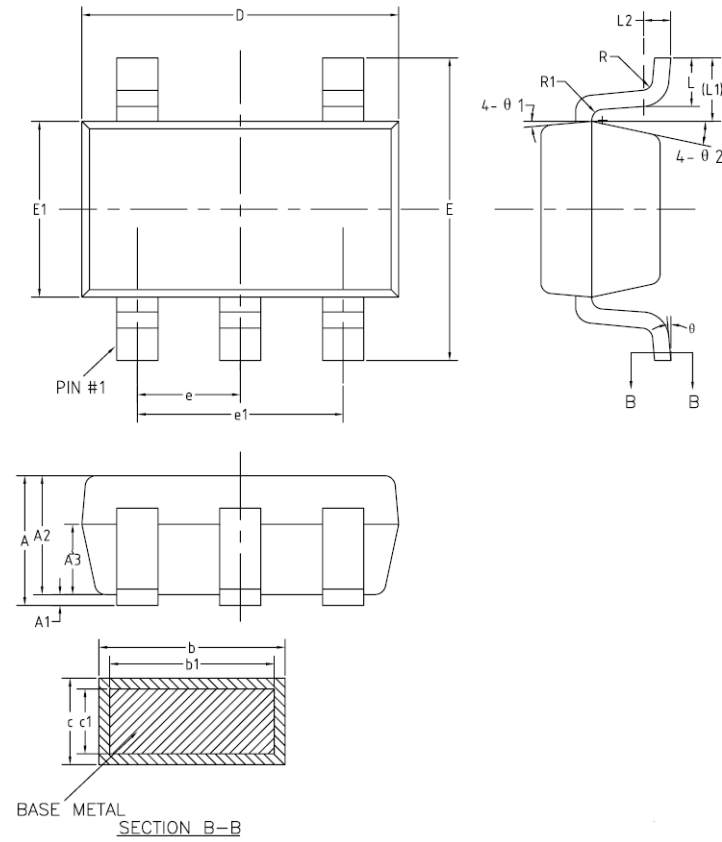
COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.240	0.285	0.330
A1	0.040	0.060	0.080
A2	0.200	0.225	0.250
D	0.650	0.670	0.690
D1	0.350BSC		
E	0.650	0.670	0.690
E1	0.350BSC		
b	0.180	0.200	0.220
e	0.350 BSC		
x1	0.160 REF		
x2	0.160 REF		
y1	0.160 REF		
y2	0.160 REF		

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SOT23-5



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	—	—	1.25
A1	0	—	0.15
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.36	—	0.50
b1	0.36	0.38	0.45
c	0.14	—	0.20
c1	0.14	0.15	0.16
D	2.826	2.926	3.026
E	2.60	2.80	3.00
E1	1.526	1.626	1.726
e	0.90	0.95	1.00
e1	1.80	1.90	2.00
L	0.35	0.45	0.60
L1	0.59REF		
L2	0.25BSC		
R	0.10	—	—
R1	0.10	—	0.25
θ	0°	—	8°
θ 1	3°	5°	7°
θ 2	6°	—	14°

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7 Ordering Information

T = Tape and reel.

Part Number	Package	Top Mark (Note 1)	MOQ
YHM2030W4T	4 WLCSP	xx	5000
YHM2030S5T	5 SOT23	Y2030 YYWW	3000

T = Tape and reel.

Note 1: Letter x is production date code. YY: Year, WW: Week.

YHM2030



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8 Datasheet Change History

Rev	Date	Changes
1.0	May. 2023	Initial Version