

# YHM2001/2002

## Smart High Voltage Power Path with Special Features

### Features

- Input work voltage range: 2.8V ~ 28V
- Input negative voltage Protection (down to -5.5V)
- Both VIN and VDD may supply the chip
- Ultra-low On-resistance: typical 6.5mΩ, max 7.5mΩ
- Power Path On/Off and discharge control
- Max 10V capability Gate to drive external NMOS
- Adjustable OVP (Over Voltage Protection)  
Default: 5.9V ± 200mV (YHM2001)  
23V ± 200mV (YHM2002)
- Optional active low (YHM2001 default on after POR) or high (YHM2002 default off after POR) enable pin for power switch
- Super-fast OVP response time: maximum 50ns
- 10-bits ADC for current sensing through power path, additional impedance & passive load short detection(through ENB) and VIN voltage
- Cable impedance and contact quality detection
- Active Short protection or high accuracy OCP
- Reverse current detection and protection
- Watch dog time-out to turn off power path and monitor MCU or AP as well
- Basic circuits for BC1.2, Apple 12W and other fast charge protocols
- Cable plug-in detection comparator support
- OTP (Over Temperature Protection)
- Robust ESD capability
- 15kV air discharge & 8kV contact discharge under IEC 61000-4-2
- VIN tolerant to 35V clamping voltage during surge event.

### Applications

- Mobile Phone, Tablet , Notebook, AR/VR Device, TWS, Wearable, Power Bank, Car Charger, Travel Adapter and other power path, dual batteries and power monitor applications.

### General Description

YHM2001/YHM2002 are Max 29V/10A smart power path products with ADC and I<sup>2</sup>C support. The devices are super fast response OVP with ultra low resistance NMOS path.

YHM2001 active low default on to typically act as portable device input OVP function. YHM2002 active high default off to typically act as direct charge power path function.

YHM2001/2002 support negative voltage input protection which can help to avoid damage while VBUS and GND exchange or other bad cases.

YHM2001/2002 adopt special technology to measure the current through power path with high accuracy. It will help system to remove current detection resistance.

These chips integrate high side current source and lowside current source which will do VIN pin impedance or moisture detection, VIN side discharge while power path off, cable impedance between power supply and portable device detection and VOUT side load resistance detection while power path off.

These chips also support watch dog function, once MCU or AP crash, the power path will be forced off, even may re-use GATE pin to reset MCU or AP as well.

One enhanced driver through GATE pin to control external NMOS by I<sup>2</sup>C configuration.

Specially the YHM2001/2002 integrate small on-resistance switch between ENB and DNS for BC1.2 application, the two 2.7V voltage source for Apple 12W charger support and configurable comparators for other fast charge protocols.

With current source and comparator, the chips may support plug-in detection for Type C pre-toggle and plug-out detection for port protection.

The YHM2001/YHM2002 come in a 4x5 array,20-bump,0.4mm pitch, 2.139mmx1.834mm wafer-level package(WLP) and a 3.0mmx3.0mm,20-PIN, 0.4mm pitch FCQFN package.

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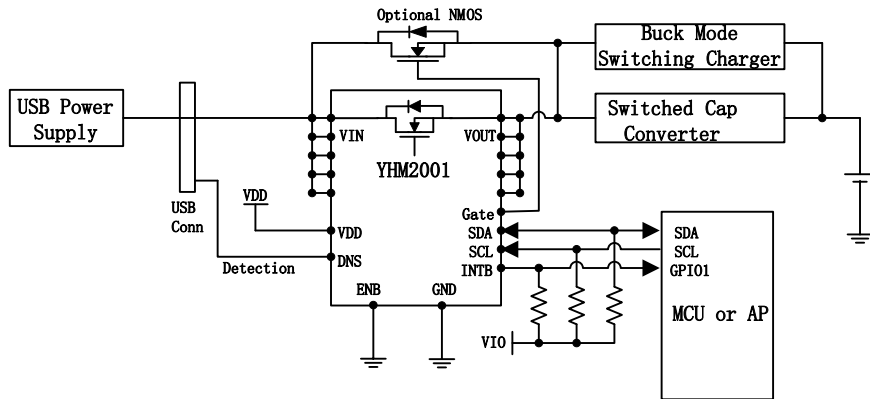


Fig 1. YHM2001 Typical Application\_Smart Input Power Path

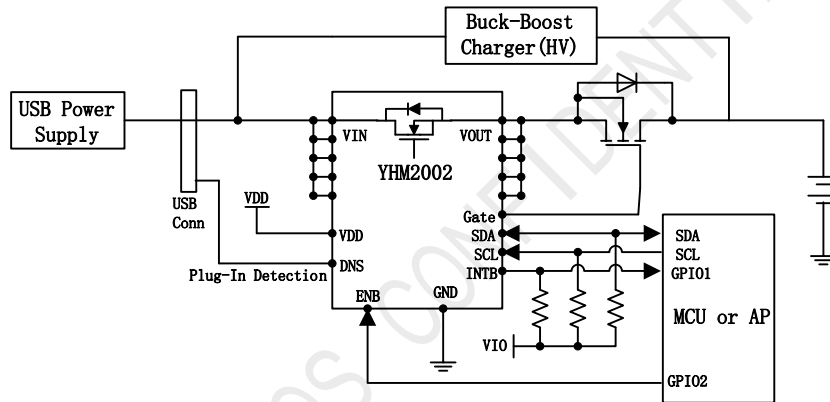
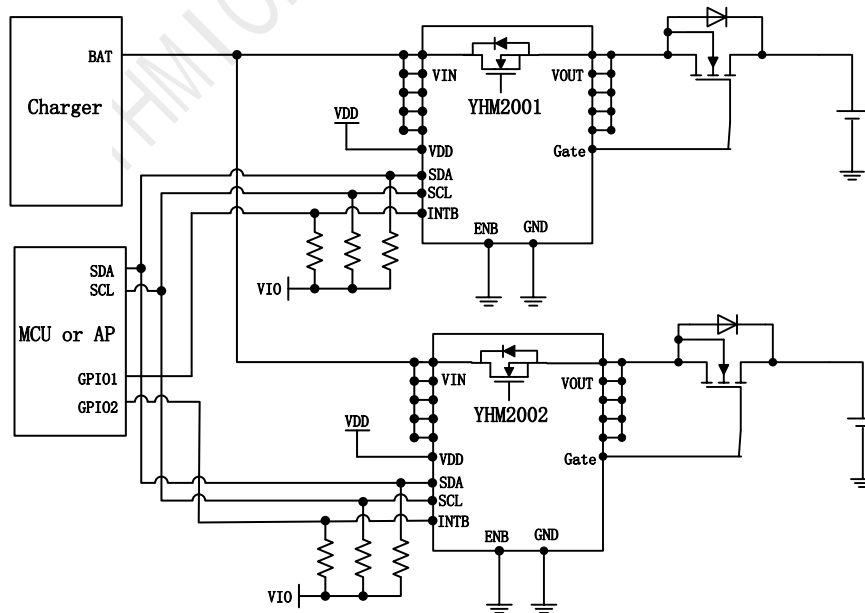


Fig 2. YHM2002 Typical Application\_Smart Direct Charge



## Smart High Voltage Power Path with Special Features

Fig 3. YHM2001/2 Typical Application\_2P Battery System

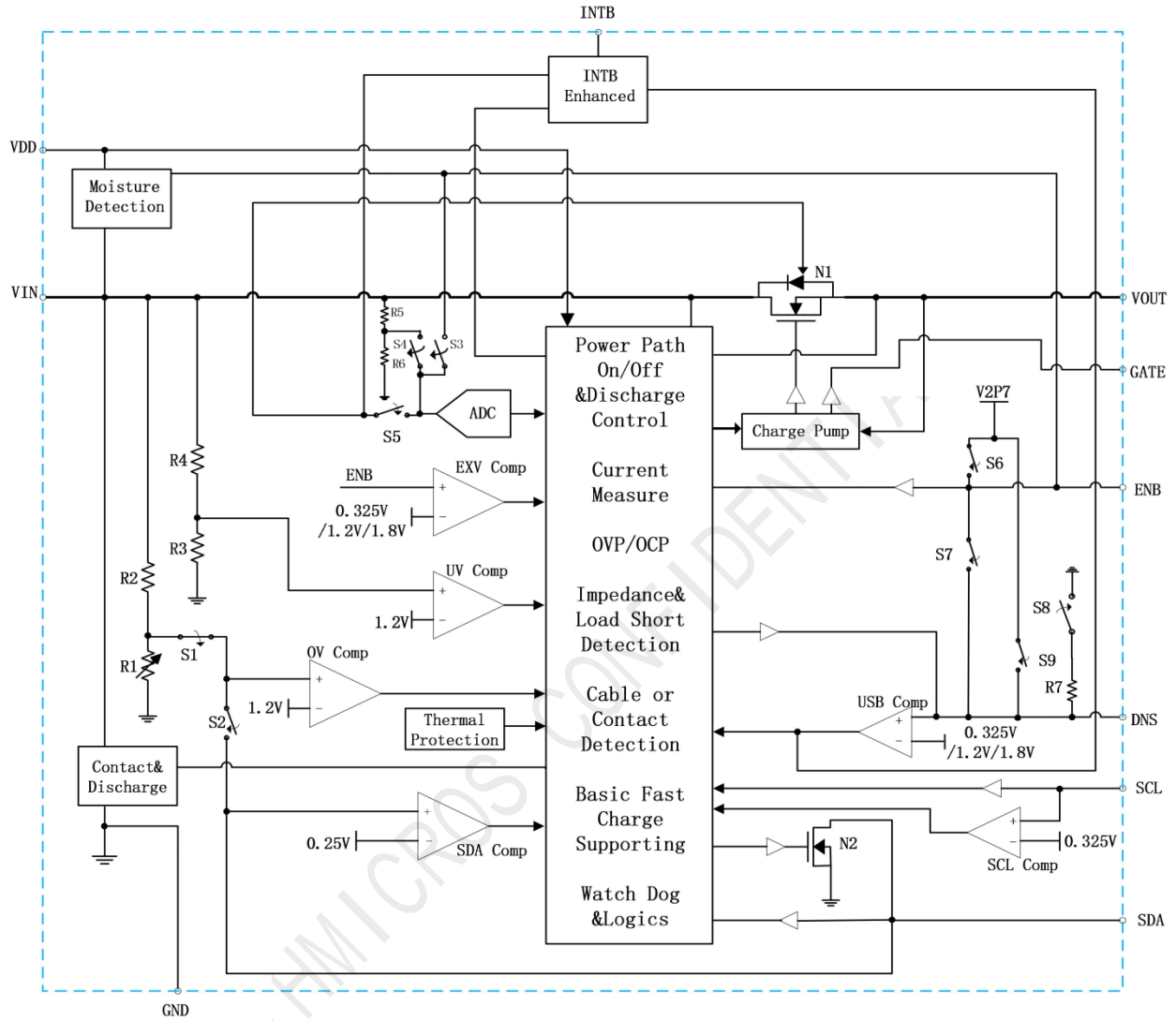


Fig 4. YHM2001/YHM2002 Internal Block Diagram

## Smart High Voltage Power Path with Special Features

### YHM2001 and YHM2002 Pin Configurations

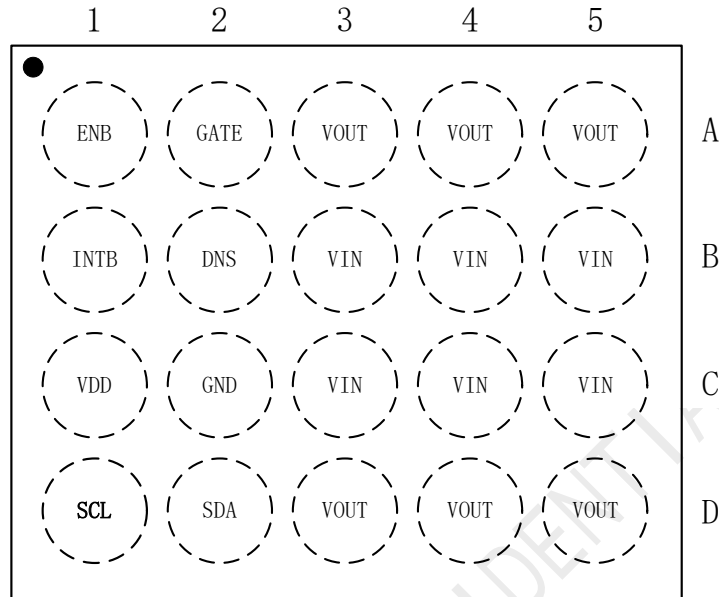


Fig 5. YHM2001/2002 WLP Pin Assignment (Top Through View)

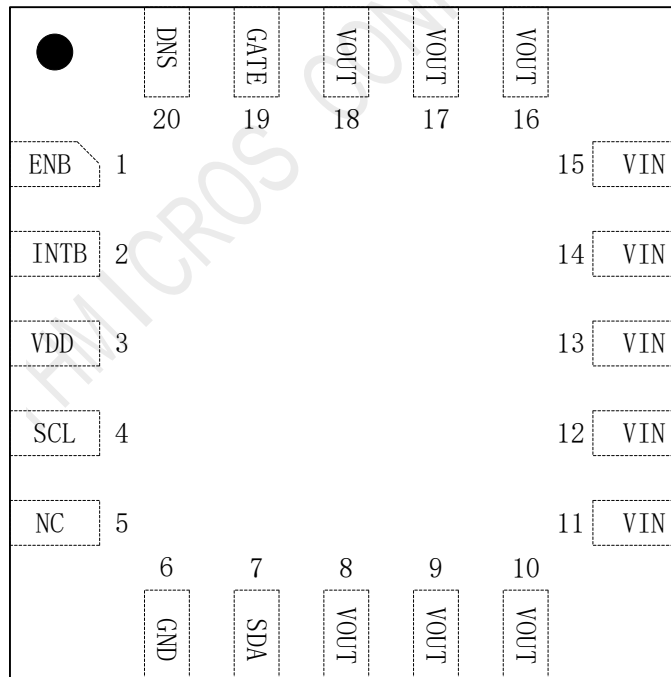


Fig 6. YHM2002 FCQFN Pin Assignment (Top Through View)

## Smart High Voltage Power Path with Special Features

### YHM2001/2002 FCQFN and WLP Pin Descriptions

FCQFN	WLP	Name	Description
1	A1	ENB	<b>Enable Input/Detection/DP:</b> Enable Active LOW/High by part number or optional Impedance Detection, or support BC1.2 DCP mode with DNS pin. Note: Enable Active Low: YHM2001, High: YHM2002
2	B1	INTB	<b>Current's Voltage/DNS Comp/Interruption output:</b> Current to voltage with amplifying analog output, or may set as DNS pin's comparator's output. Or Interruption viz Open-drain output Pull down to ground when any FLAG register alarms.
3	C1	VDD	Chip Supply while VIN less than VDD
4	D1	SCL	<b>Serial Clock Input:</b> Be used to synchronize data movement on the I <sup>2</sup> C serial interface, Tied GND for external OVP threshold set-up by SDA pin.
5		NC	
6	C2	GND	Ground
7	D2	SDA	<b>Serial Data Input/Output:</b> Input / Output pin for the 2-wire serial interface. Open-drain output and requires an external pull-up resistor, Adjustable OVP setting while SCL tied GND
8, 9, 10, 16 17, 18	A3, A4, A5 D3, D4, D5	VOUT	<b>Power Output:</b> Power Path Output to Load
11,12,13, 14,15	B3, B4, B5 C3, C4, C5	VIN	<b>Power Input:</b> Power Path Input and Chip Supply
19	A2	GATE	<b>Gate driver:</b> Charge-pump to drive external NMOS FET's Gate Independently or <b>Watch dog out to reset controller</b>
20	B2	DNS	<b>DNS:</b> Comparator's non-invert Input and also support BC1.2 DCP mode with ENB pin, Support additional Open drain output, Push-Pull, Weak pull up and pull down output, May force 2.7V in ENB and DNS each for Apple 12W charger simulation

# Smart High Voltage Power Path with Special Features

## 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	Parameters		Min.	Max.	Unit
V <sub>IN</sub>	VIN to GND		-5.5	29	V
V <sub>OUT</sub>	VOUT to GND		-0.3	V <sub>IN</sub> + 0.3	V
V <sub>GATE</sub>	GATE to GND		-5.5	29	V
V <sub>VDD</sub>	VDD to GND		-0.3	6.0	V
V <sub>IO</sub>	Maximum DC Voltage Allowed on ENB, DNS, SCL, SDA and INTB		-0.3	6.0	V
I <sub>IN</sub>	Switch I/O Current (Continuous)			11	A
t <sub>PD</sub>	Total Power Dissipation at T <sub>A</sub> =25°C			TBD	W
T <sub>STG</sub>	Storage Junction Temperature		-65	+150	°C
T <sub>J</sub>	Operating Junction Temperature			+150	°C
T <sub>L</sub>	Lead Temperature (Soldering, 10 Seconds)			+260	°C
Θ <sub>JA</sub>	Thermal Resistance, Junction-to-Ambient (645mm <sup>2</sup> pad of 1oz. copper)			36.5 <sup>(1)</sup>	°C/W
ESD	Electrostatic Discharge Capability	Human Body Model, EIA/JESD22-A114	Other pins	±2	kV
			VOUT pin	±1	
		Charged Device Model, JESD22-C101		±1	
	IEC61000-4-2 System Level	Air Discharge		±15	
Contact Discharge			±8		

Note 1. Measured using 2S2P JEDEC std. PCB

## 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 <sub>IN</sub>	2.8	28	V
Supply Voltage: V <sub>DD</sub>	3.0	5.5	V
GATE as NMOS Driver	-5.5	28	V
I <sup>2</sup> C: SD and SCL	1.5	5.5	V
I/O pins: ENB, DNS, SCL, SDA, INTB and GATE as WD OUTPUT	0	5.5	V
Ambient Operating Temperature, T <sub>A</sub>	-40	85	°C
VIN Capacitor	0.1		μF
VOUT Load Capacitor	0.1	1000	μF

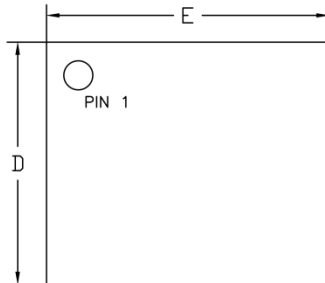
Unless otherwise noted, V<sub>IN</sub> = 2.5 to 28V, T<sub>A</sub> = -40 to 85°C; Typical values are at V<sub>IN</sub> = 5.0 V, I<sub>IN</sub> ≤ 3 A, C<sub>IN</sub> = 0.1 μF and T<sub>A</sub> = 25°C.

# YHM2001/2002

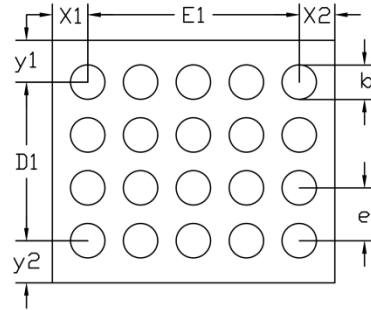
## Smart High Voltage Power Path with Special Features

### 6 Package Dimensions

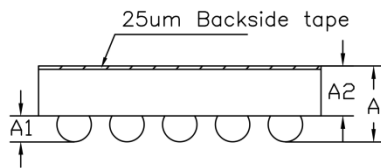
WLCSP-20 2.139x1.834x0.574



TOP VIEW  
(MARK SIDE)



BOTTOM VIEW  
(BALL SIDE)



SIDE VIEW

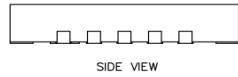
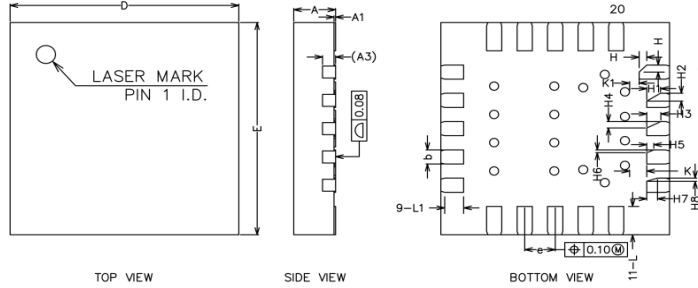
COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.529	0.574	0.619
A1	0.176	0.196	0.216
A2	0.353	0.378	0.403
D	1.814	1.834	1.854
D1	1.200BSC		
E	2.119	2.139	2.159
E1	1.600BSC		
b	0.240	0.260	0.280
e	0.400BSC		
x1	0.270 REF		
x2	0.270 REF		
y1	0.317 REF		
y2	0.317 REF		

# YHM2001/2002

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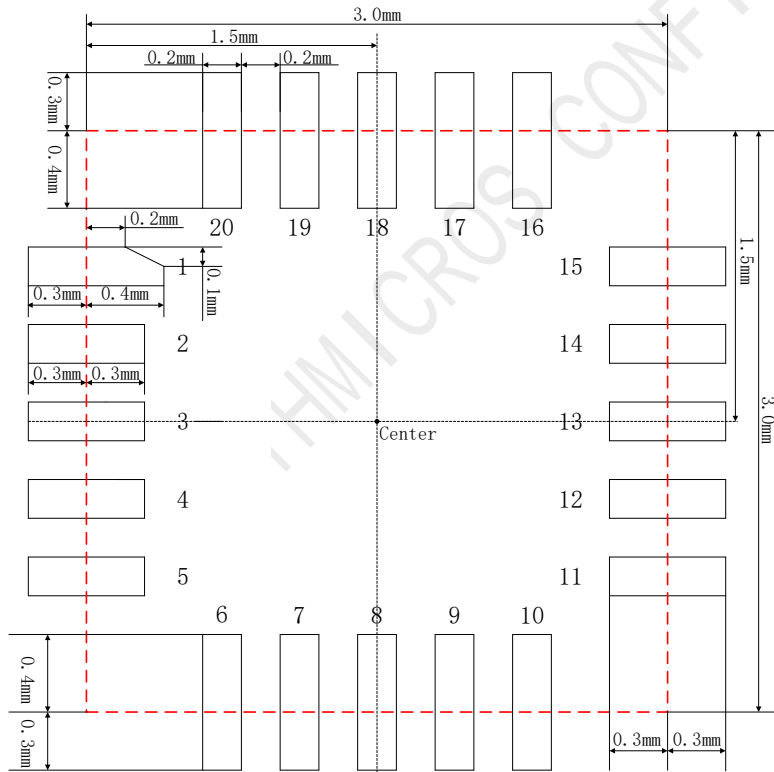
FCQFN-20 3.0x3.0x0.55



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	0.15REF		
b	0.15	0.20	0.25
D	2.90	3.00	3.10
E	2.90	3.00	3.10
e	0.30	0.40	0.50
H	0.10REF		
H1	0.18REF		
H2	0.11REF		
H3	0.18REF		
H4	0.09REF		
H5	0.09REF		
H6	0.04REF		
H7	0.14REF		
H8	0.05REF		
K	0.13	-	-
K1	0.05	-	-
L	0.30	0.40	0.50
L1	0.20	0.30	0.40

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



Note: Pin 2-5&11-15 same, 6-10&16-20 same

FCQFN-20 PCB Pattern Guidance(Don't Put Bare Pad in Center)



# YHM2001/2002



## Smart High Voltage Power Path with Special Features

### 7 Ordering Information

Part Number	Temp Range	Pin Package	Top Mark	MOQ
YHM2001WFT	-40°C to 85°C	20 WLCSP	YHM2001	3000
YHM2002FFT	-40°C to 85°C	20 FCQFN	YHM2002	3000

*T = Tape and reel.*

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