

Mux Switch for USB Type-C with Protection Functions

Features

- Power supply: VCC 2.7V to 5.5V
- USB2.0 High Speed(480Mbps) Switch
 - -3dB bandwidth: 920MHz
 - USB path Ron: 3Ω (Typ.)
- Audio switch
 - Negative rail capability: -3.5V to +3.5V
 - Audio path RON = 0.42Ω (Typ.) at 3.3V
 - THD+N = -114dB; 1VRMS, 32Ω Load; f = 20Hz~20kHz with A-weighted filter
- AGND switch with 50mΩ(typ.) Ron
- Moisture or Impedance detection support over DPR/DNL/CCx/SBUx
- OVLO threshold programmable to 3.4V,4.0V,4.5V or 5.0V for USB/Audio/GSBU/SBU Path
- 100us or 1ms version DPR/DNL connection recovery time after DPR/DNL OVP Off event
- DET/nRESET Default Floating after POR.
- I_{OFF} Supports Power down Mode
- Typical device disabled current I_{ccz}=1uA
- Typical Supply current I_{cc}=60uA with full functions
- +/-21V DC protection on Type-C connector side pins: CC input pins, DPR, DNL, SBU1, SBU2, GSBU1 and GSBU2
- High ESD Protected USB Type-C Contacts
 - IEC 61000-4-2 System 15KV Air Gap and 8KV Contact

Applications

- Mobile Phone, Tablet, Notebook, PC, Game Box, Smart TV, AR/VR Glasses etc.

General Description

YHM1003 is a high performance USB Type-C multi-function switch which supports diverse analog or digital accessories including Type-C digital headset. The YHM1003 allows the sharing of a common USB Type-C port to pass USB2.0 signal, positive-to-negative analog audio, sideband use signal and analog audio microphone signal.

YHM1003 support high voltage on CC, SBU1&2, GSBU1&2 and USB2.0 port.

The devices can monitor CC pin to turn off MIC and AGND switches and discharge port side SBU port to eliminate pop noise while an audio accessory is detached.

The devices include one configurable watch dog output pin which can Reset other device or continue turning off direct charge power path.

YHM1003 supports 3:1 switches including 1: one high speed USB path, 2: one general digital path for fast charge MCU GPIOs/UART comm or AP&5G modem UART comm (TXD&RXD or two TXD support two UART output log channels) or another USB2.0 comm, 3: Ground center audio signals path.

The general digital path also may cross switching to GSUB1/GSBU2 port in order to support USB/UART signal same time or other manufacturing or test modes.

But UART to GSBU1/2 cross switches may turn off if CC keep low logic after POR for better audio performance.

May set CC toggle debounce to prevent DET/nRESET wrong output.

The YHM1003 comes in a 5x5 array, 25-bump, 0.4mm pitch, 2.08mmx2.08mm wafer-level package (WLP).

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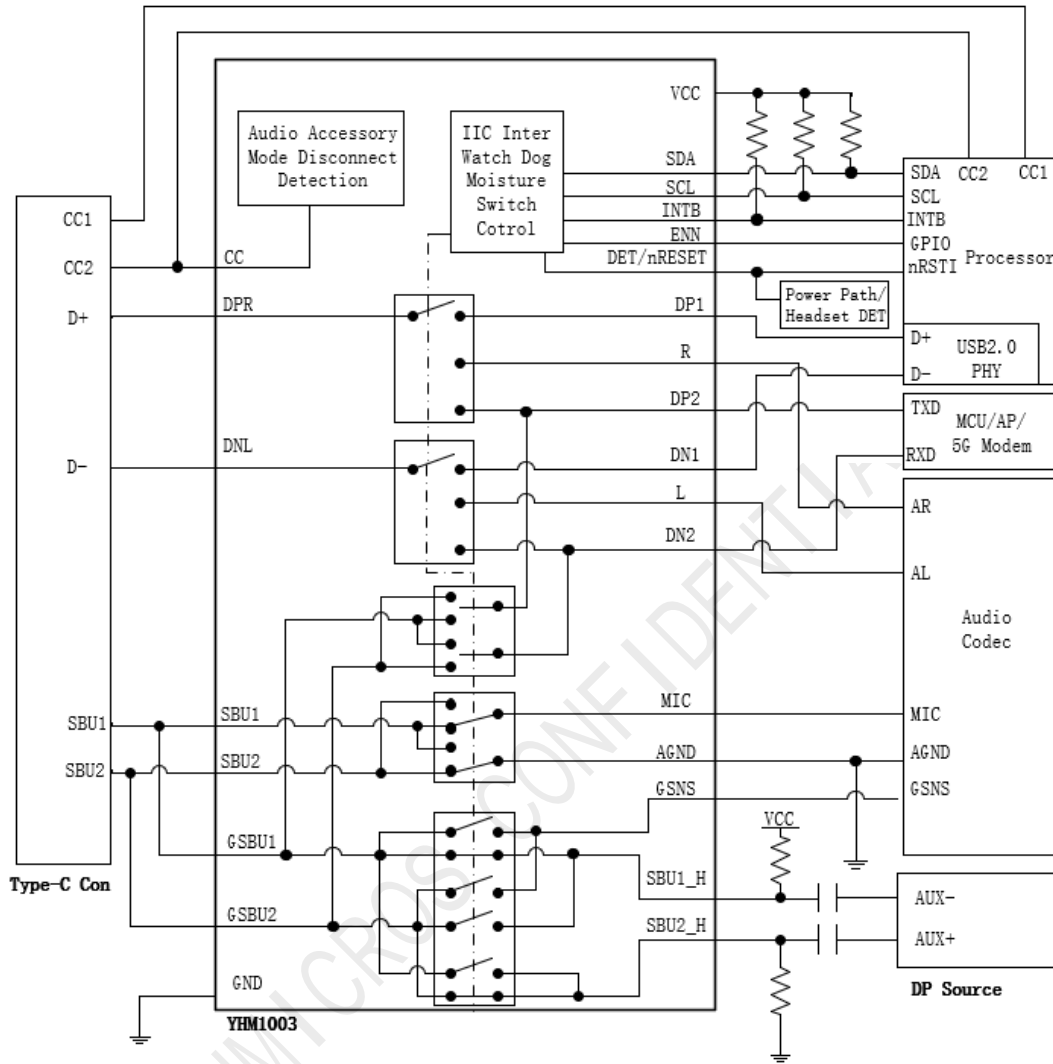


Fig 1. YHM1003 Block Diagram/Typical Application

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YHM1003 Pin Configurations

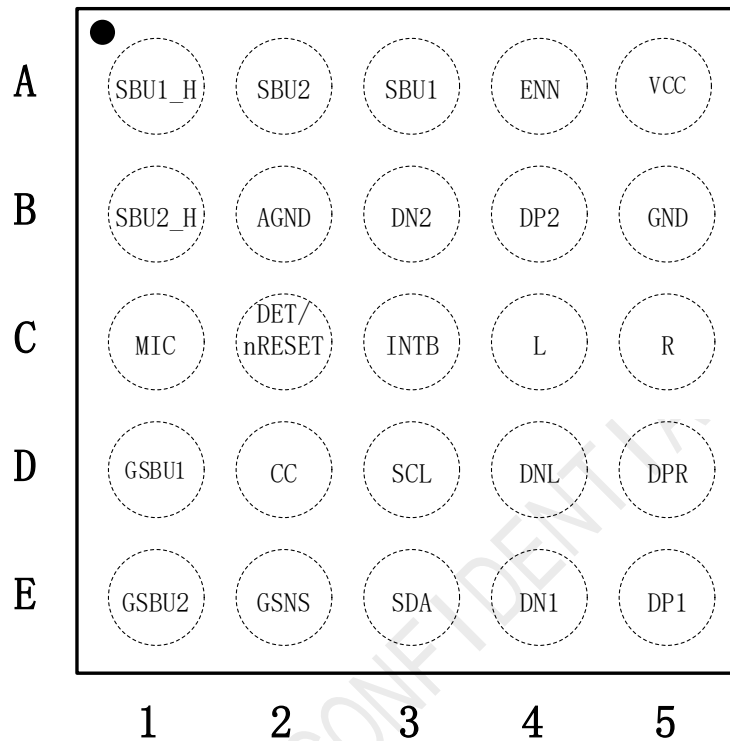


Fig 2. YHM1003 Pin Assignment (Top Through View)

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YHM1003 Pin Descriptions

No.	Pin	Name	Description
1.	A5	VCC	Power Supply (2.7 to 5.5V)
2.	B5	GND	Chip ground
3.	D5	DPR	USB/USB or UART/Audio Common Connector
4.	D4	DNL	USB/USB or UART/Audio Common Connector
5.	E5	DP1	USB Data (Differential +)
6.	E4	DN1	USB Data (Differential -)
7.	C5	R	Audio Right Channel
8.	C4	L	Audio Left Channel
9.	B4	DP2	USB Data (Differential +) OR TXD Inner Configuration Channel
10.	B3	DN2	USB Data (Differential -) OR RXD OR TXD Inner Configuration Channel
11.	A3	SBU1	Sideband use wire 1
12.	A2	SBU2	Sideband use wire 2
13.	C1	MIC	Analog audio microphone
14.	B2	AGND	Audio ground
15.	E2	GSNS	Audio ground reference input from Conn to codec
16.	C3	INTB	I ² C Interrupt output, active low (open drain)
17.	D2	CC	Audio accessory attachment detection input, while CC higher than 1.5V mean Headset disconnect.
18.	D1	GSBU1	Audio sense path 1 to headset jack GND
19.	E1	GSBU2	Audio sense path 2 to headset jack GND
20.	D3	SCL	I ² C clock
21.	E3	SDA	I ² C data
22.	B1	SBU2_H	Host Side Sideband Use Wire 2
23.	A1	SBU1_H	Host Side Sideband Use Wire 1
24.	A4	ENN	Chip enable/disable input, active low
25.	C2	DET/nRESET	Watch Dog time out, go to reset AP, keep 10000ms-1000ms active low or high, or continuous high or low to control power path. Second function as audio accessory detection.

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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
VCC	Supply Voltage from VCC		-0.5	6.5	V
V _{CC}	V _{CC} to GND (CC Pin Voltage)		-0.5	21	V
V _{SW_C}	V _{DPR} to GND, V _{DNL} to GND		-5.5	21	V
V _{SW_USB}	V _{DP1/2} to GND, V _{DN1/2} to GND		-0.5	6.5	V
V _{SW_Audio}	V _L to GND, V _R to GND		-3.6	6.5	V
V _{V_SBU/GSBU}	V _{GSBU1} to GND, V _{GSBU2} to GND, V _{SBU1} to GND, V _{SBU2} to GND		-0.5	21	V
V _{VSBU_H}	V _{SBU1_H} to GND, V _{SBU2_H} to GND		-0.5	6.5	V
V _{I/O}	GSNS, MIC, ENN, INTB, DET/nREST to GND		-0.5	6.5	V
V _{CNTRL}	Control Input Voltage	SDA, SCL	-0.5	6.5	V
I _{SW_Audio}	Switch I/O Current, Audio path: R, L, DPR, DNL		-250	250	mA
I _{SW_USB}	Switch I/O Current, USB path: DP1&2 to DPR, DN1&2 to DNL			100	mA
I _{SW_MIC}	Switch I/O Current, MIC to SBU1 or SBU2			50	mA
I _{SW_SBU}	Switch I/O Current, SBUx to SBUx_H			50	mA
I _{SW_GSNS}	Switch I/O Current, GSNS to GSBU1 or GSBU2			100	mA
I _{SW_AGND}	Switch I/O Current, AGND to SBU1 or SBU2			500	mA
I _{IK}	DC Input Diode Current		-50		mA
ESD	Human Body Model, ANSI/ESDA/ JEDEC JS-001-2012	Connector side and power pins: VCC, SBU1, SBU2, DPR, DNL, GSBU1, GSBU2, CC	4		kV
		Host side pins: The rest pins	2		
	Charged Device Model, JEDEC: JESD22-C101		1		
	IEC 61000-4-2 System	Contact	8		
		Air Gap	15		
T _A	Absolute Maximum Operating Temperature		-40	+85	°C
T _{STG}	Storage Temperature		-65	+150	°C

Notes:

- Limits over the recommended temperature range (T_A = -40°C to +85°C) are correlated by statistical quality.
- Guaranteed by characterization, not production tested

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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.

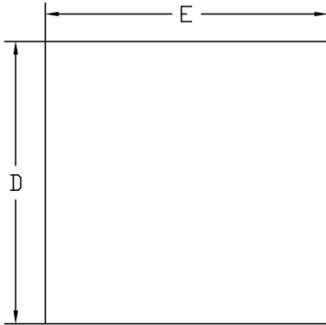
Symbol	Parameter	Min.	Typ.	Max.	Unit
Power					
VCC	Supply Voltage	2.7		5.5	V
USB Switch					
V _{SW_USB}	V _{DP1&2} to GND, V _{DN1&2} to GND, V _{DPR} to GND, V _{DNL} to GND	0		4.0	V
Audio Switch					
V _{SW_Audio}	V _{DPR} to GND, V _{DNL} to GND, V _L to GND, V _R to GND,	-3.5		+3.5	V
MIC Switch					
V _{VSBU_MIC}	V _{SBU1} to GND, V _{SBU2} to GND	0		3.5	V
GSNS Switch					
V _{VGSBU_GSNS}	V _{GSBU1} to GND, V _{GSBU2} to GND, V _{GSNS} to GND	0		3.5	V
SBU to SBUX_H Switch					
V _{VGSBU}	V _{SBU1} to GND, V _{SBU2} to GND, V _{SBU1_H} to GND, V _{SBU2_H} to GND,	0		3.5	V
CC input Pin					
V _{CC}	V _{CC} to GND,	0		5.5	V
Operating Temperature					
T _A	Ambient Operating Temperature	-40	25	+85	°C
Control Voltage (SCL, SDA, ENN)					
V _{IH}	Input Voltage High	1.3			V
V _{IL}	Input Voltage Low			0.5	V

YHM1003

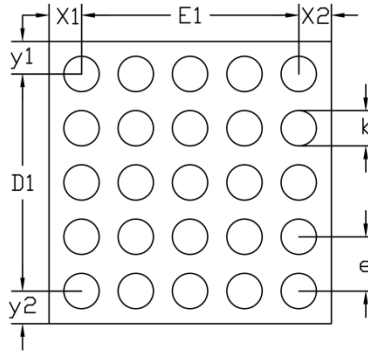
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Package Dimensions

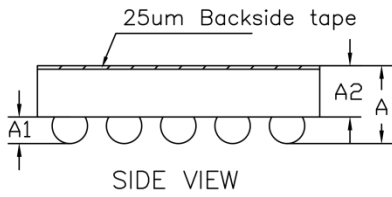
WLCSP-25 2.08x2.08x0.574



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	2.060	2.080	2.100
D1	1.600BSC		
E	2.060	2.080	2.100
E1	1.600BSC		
b	0.240	0.260	0.280
e	0.400BSC		
x1	0.240 REF		
x2	0.240 REF		
y1	0.240 REF		
y2	0.240 REF		

YHM1003



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Ordering Information

Part Number	Temp Range	Pin Package	Top Mark	MOQ
YHM1003WHT	-40°C to 85°C	25 WLCSP	YHM1003	3000

T = Tape and reel.

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Email Requests to: SALES@YHMICROS.COM

YHMicros Website: WWW.YHMICROS.COM