PX32WB5MMG BLE MESH

Module Datasheet

Feature	Specification
BLE Module	PX32WB5MMG
Bluetooh Version	BLE 5.4 with Mesh support
Mesh Model Supported	OnOff, Light Lightness, CTL, HSL
Channels	Up to 4 (LL & OnOff), 2 (CTL), 1 (HSL)
Package dimensions (mm)	7.3 x 11 x 1.382 x 0.450 pitch
Packaging	1800/Per Reel
Sample Packaging	20/Cut Tape

Key Features

- **No Coding Required**
- **Ready-to-use Bluetooth Mesh solution tailored for lighting applications**
- **No Bluetooth Mesh expertise required** – simply design your PCB and start delivering value 😊
- **Supports all standard mesh models**: OnOff, Light Lightness, Color Temperature, Hue, Saturation, Lightness (RGB)
- **Flicker-free performance** with high-frequency PWM control

Overview

The devices uses STMicroelectronics STM32WB5MMG Bluetooth® Low Energy 5.4 module (see details in datasheet here).

And STM's BLE full stack stm32wb5x_BLE_Stack_full_fw.bin .

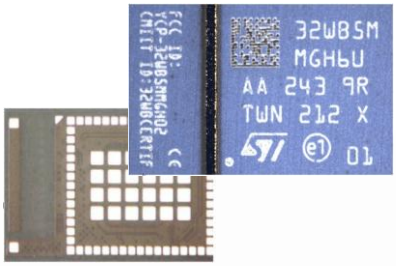
MESH firmware made by PROX and serves NLC (Network Lightness Control) application. The FW includes the following BLE MESH:

Server:

- OnOff Server (1 to 4 channels)
- LL (Light Lightness) Server (1 to 4 channels)
- CTL (Colour Temperature Lightness) Server (1 to 2 channels)
- HSL (Hue, Saturation, Lightness) Server (1 channel).

Client:

- OnOff Client (1 to 4 channels)
- LL (Light Lightness) Client (1 to 4 channels)
- CTL (Colour Temperature Lightness) Client (1 to 2 channels)



*These pictures are not contractual

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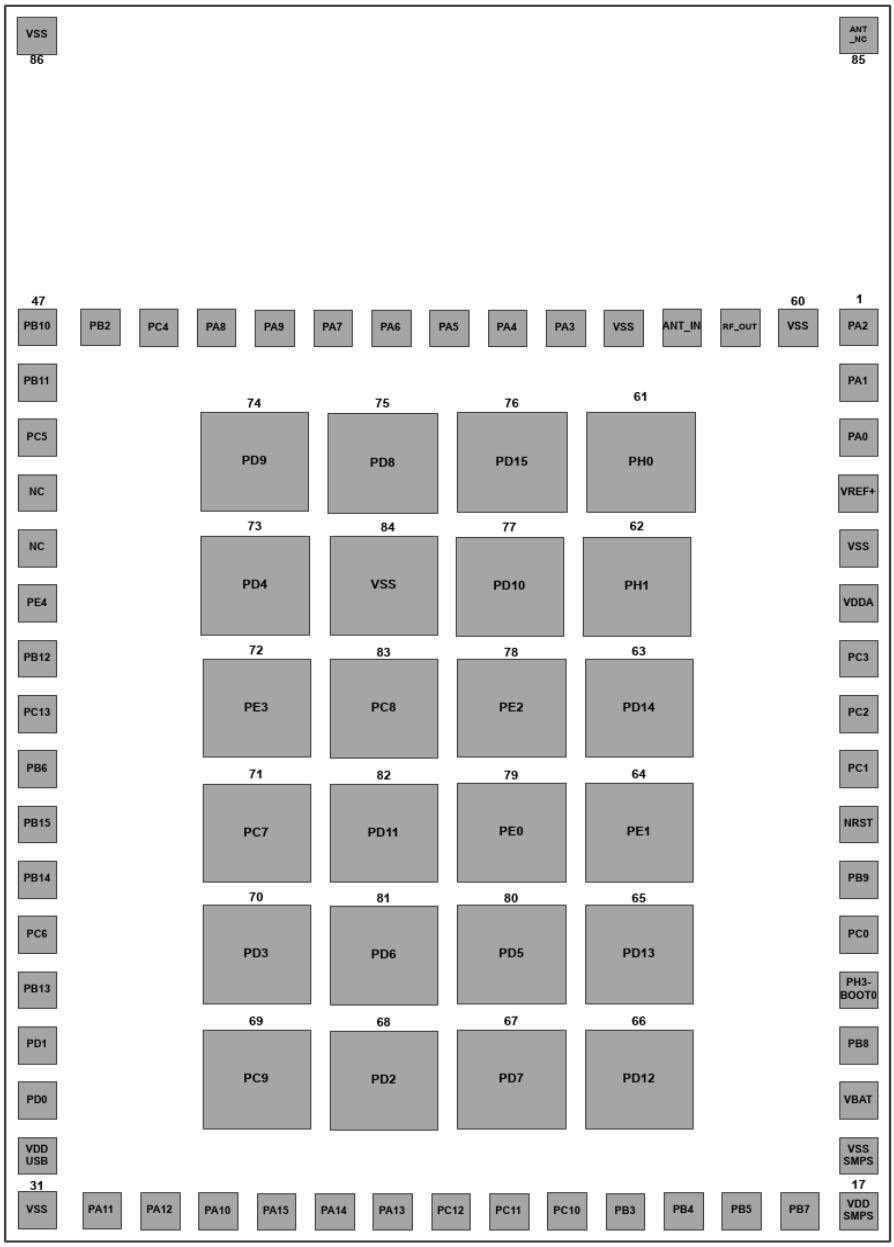
Contents

Pin Description

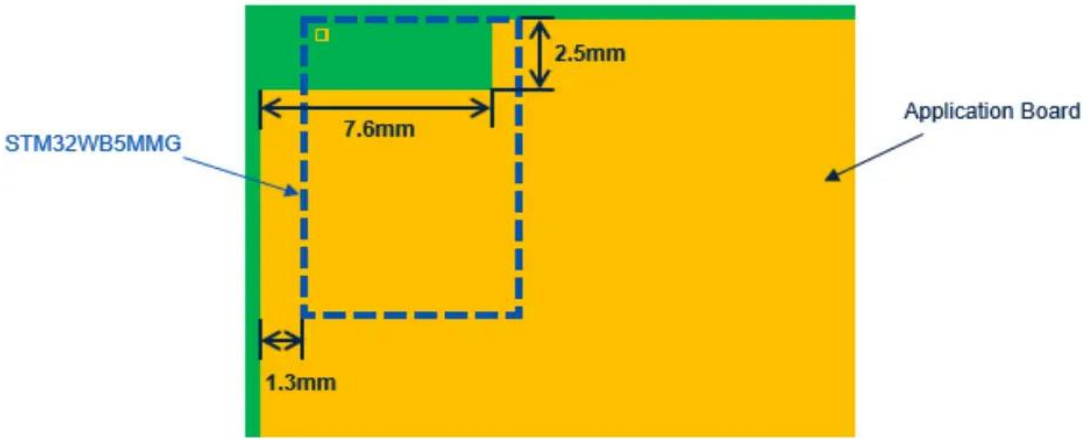
The following figure shows the module pinout package bottom view



For more information on Pin Descriptionm refer to Section 5 of STM32WB5MMG datasheet

Layout recommendations

STM32WB5MMG placement the embedded antenna manufacturer of the STM32WB5MMG recommends placing the module on the application board as shown below. This position allows the antenna to work to its maximum performance. If it cannot be placed as recommended above, the application board performance will be reduced. This does



For more information on Layout recommendations, refer to section 6.2 of STM32WB5MMG datasheet

Pin definition – Common for both Server and Client mode

Pad #	Port name (for ref)	Pin type	Pin name	Pin function	If not in use
4	VREF+	S	VDD	Connect to +3.3V supply	
6	VDDA	S	VDD	Connect to +3.3V supply, connect 10u+100n capacitors to VSS.	
10	NRST	RST	RST	Reset, connect 100n capacitor to VSS for filtering purpose.	
15	VBAT	S	VDD	Connect to +3.3V supply	
17	VDD	S	VDD	Connect to +3.3V supply	
22	PC10	O	LED	Status LEDs: connect Green LED with series resistor to VSS, and Red LED with series resistor to +3.3V.	Floating
24	PC12	I	FR	Factory Reset. Connect a normal open momentary switch to VSS.	Floating
25	SWDIO	I/O	SWDIO	SWD interface.	Floating
26	SWCLK	I	SWCLK	SWD interface.	Floating
31	VSS	S	VSS	Connect to GND.	
39	PB6	O	TX	RFU, Do Not Connect.	DNC
65	PD3	I	S/C	Server/Client selector. VSS – Server, Floating - Client	
68,69	PD2,PC9	I	N0,N1	Number of channels selection (1, 2, 3, 4), see Table 2 for details.	
85	ANT_NC	O	DNC	Do Not Connect.	DNC

Power pins

Connect VSS pin to system ground (GND).

Connect all VDD pins (VREF+, VDDA, VBAT, VDD) to power supply +3.3V. Use bulk 10u capacitor together with decoupling 100n to filter the source.

Reset pin (RST)

Connect 100n capacitor to VSS for filtering purpose.

LED pin (Status LED)

Use the LED output to display operation modes: connect Green LED with series resistor to VSS, and Red LED with series resistor to +3.3V. Resistors 10k are good enough to use with ultra-bright LEDs.

LED	Device status
RED steady	Factory default, ready for provisioning
RED blinking	The device is going to Factory Reset, keep holding FR input to VSS to confirm Factory Reset, or release FR input to terminate the reset process.
GREEN steady	Provisioned

FR pin (Factory Reset)

Factory reset deletes all configured MESH network information and device settings, that makes the device ready for provisioning again.

To perform the Factory Reset, pull FR input down to VSS (GND) and hold for about 5 sec, the red LED will be blinking to warn the devise is going to Factory Reset. Keep holding FR pin to VSS (GND) until the red LED turn ON steady. The device is back to factory default state.

SWD, TX pins

Leave SWDIO, SWCLK and TX pins floating. Do Not Connect to ground.

S/C pin

This pin switches module to Server or Client mode: tie it to VSS for Server, or leave floating for Client.

N0,N1 pins

Number of channels selection (1, 2, 3, 4), see Table 2 for details.

Pin definition – Servers

To select the Servers mode connect S/C input (pad 65) to VSS (GND).

In Server mode module provides up to 4 PWM outputs to support BLE MESH Servers OnOff, LL, CTL or HSL

Pad #	Port name (for ref)	Pin type	Pin name	Pin function	If not in use
4	VREF+	S	VDD	Connect to +3.3V supply	
6	VDDA	S	VDD	Connect to +3.3V supply, connect 10u+100n capacitors to VSS.	
10	NRST	RST	RST	Reset, connect 100n capacitor to VSS for filtering purpose.	
14	PB8	O	PWM4	PWM4 output channel 4, 20mA max.	Floating
15	VBAT	S	VDD	Connect to +3.3V supply	
17	VDD	S	VDD	Connect to +3.3V supply	
22	PC10	O	LED	Status LEDs: connect Green LED with series resistor to VSS, and Red LED with series resistor to +3.3V.	Floating
24	PC12	I	FR	Factory reset. Connect a normal open momentary switch to VSS.	Floating
25	SWDIO	I/O	SWDIO	SWD interface.	Floating
26	SWCLK	I	SWCLK	SWD interface.	Floating
28	PA10	O	PWM3	PWM3 output, channel 3 (Blue channel in HSL), 20mA max.	Floating
30	PA11	O	PWM1	PWM1 output, channel 1 (Green channel in HSL), 20mA max.	Floating
31	VSS	S	VSS	Connect to GND.	
35	PB13	O	PWM2	PWM2 output, channel 2 (Red channel in HSL), 20mA max.	Floating
39	PB6	O	TX	RFU, Do Not Connect.	DNC
65	PD3	I	S/C	Server/Client selector. VSS – Server, Floating - Client	
66,67	PD12,PD7	I	S0,S1	Server selection (LL, OnOff, CTL, HSL), see Table 1 for details.	
68,69	PD2,PC9	I	N0,N1	Number of channels selection (1, 2, 3, 4)? see Table 2 for details.	
85	ANT_NC	O	DNC	Do Not Connect.	DNC

All other pads should be connected to VSS (GND).

S/C pin (Server)

Tie S/C pin to VSS for Server.

S0,S1 pins (Server selection)

Server	66 PD12	67 PD7
LL	VSS	VSS
OnOff	VSS	Floating
CTL	Floating	VSS
HSL	Floating	Floating

CH	68 PD2	69 PC9	Restrictions
1ch	VSS	Floating	HSL: that's the only option, shall be set
2ch	Floating	VSS	Invalid for HSL, it will be forced to 1ch
3ch	Floating	Floating	Invalid for HSL and CTL, HSL will be forced to 1ch, and CTL to 2ch
4ch	VSS	VSS	Invalid for HSL and CTL, HSL will be forced to 1ch, and CTL to 2ch

PWM outputs

PWM can be used as switches (for OnOff Server) or PWM outputs (for LL, CTL and HSL Servers). High-frequency PWM (about 32kHz) provides flicker-free experience for eyes and video cameras.

Due to low current capability (20mA max) module can't drive any load directly, use a gate driver and MOSFETs to power your LED lights..

Also, PWM output can be used together with low-pass filter and operational amplifier to provide standard 0..10V analog dimming output.

PWM frequency	32kHz
PWM duty cycle	0…100%
PWM duty cycle resolution	0.1%
PWM output current capability	20mA max

PWM Outputs allocation

Server CH \	OnOff 1ch	OnOff 2ch	Onoff 3ch	OnOff 4ch	LL 1ch	LL 2ch	LL 3ch	LL 4ch	CTL 1ch	CTL 2ch	HSL
PWM1	Switch	Switch	Switch	Switch	PWM	PWM	PWM	PWM	CW1	CW1	Green
PWM2	n/a	Switch	Switch	Switch	n/a	PWM	PWM	PWM	WW1	WW1	Red
PWM3	n/a	n/a	Switch	Switch	n/a	n/a	PWM	PWM	n/a	CW2	Blue
PWM4	n/a	n/a	n/a	Switch	n/a	n/a	n/a	PWM	n/a	WW2	n/a

BLE MESH visibility

Device will be visible in BLE MESH according to the Server and Number of channels selection as follows:

PROX LL Server Xch, where X – number of channels, example: PROX LL Server 4ch

PROX OnOff Server Xch, where X – number of channels, example: PROX OnOff Server 4ch

PROX CTL Server Xch, where X – number of channels, example: PROX CTL Server 2ch

PROX HSL Server Xch, where X – number of channels, example: PROX HSL Server 1ch

NOTE: the device will display selected number of channels, even it's invalid (for HSL or CTL).

Pin definition – Clients

To select the Clients mode leave S/C input (pad 65) floating..

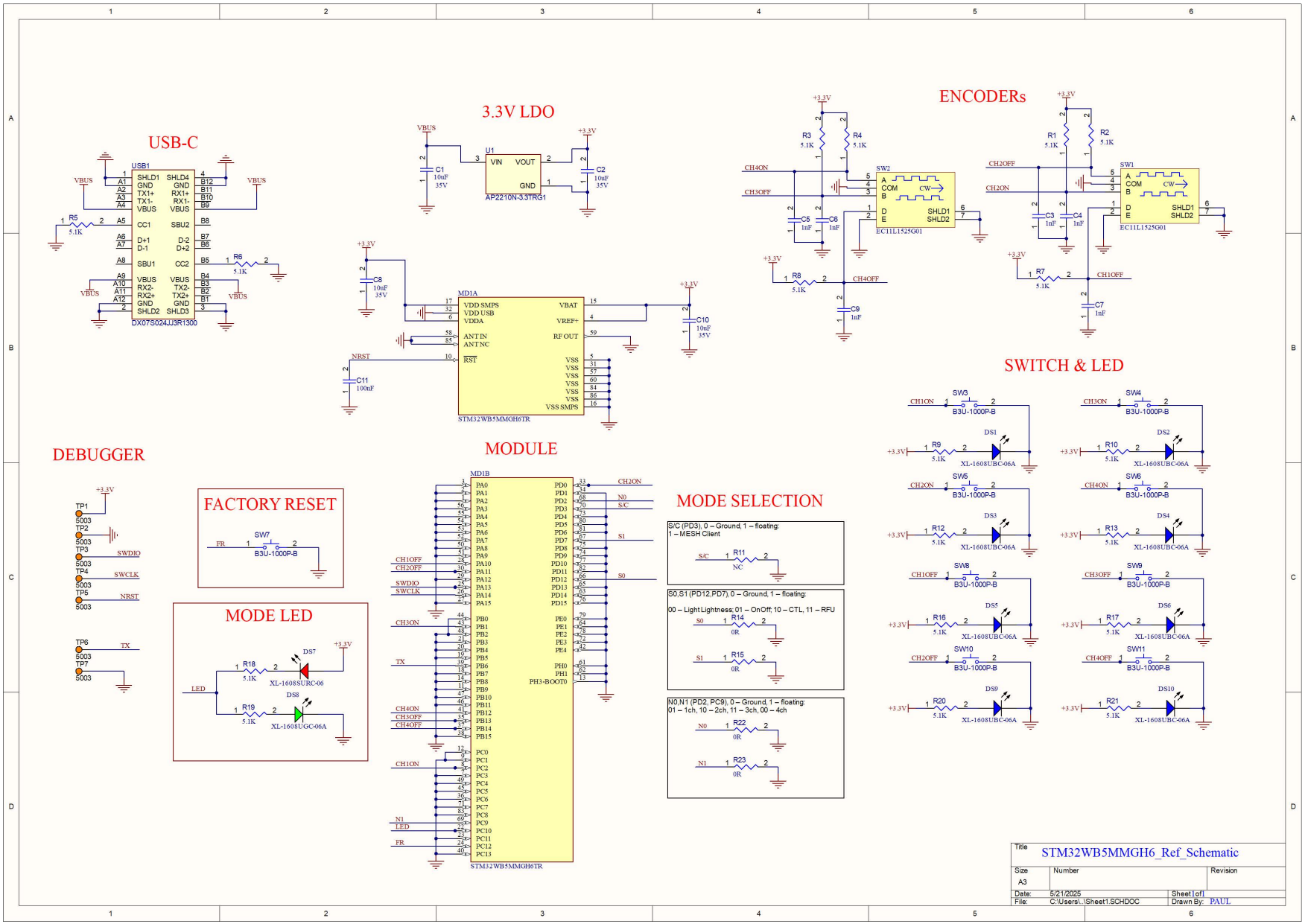
In Client mode module provides up to 4 channels (8 inputs) to support BLE MESH Clients OnOff, or up to 2 channels for encoders (with a button) to support BLE MESH LL or CTL Clients.

Pad #	Port name (for ref)	Pin type	Pin name	Pin function	If not in use
4	VREF+	S	VDD	Connect to +3.3V supply	
6	VDDA	S	VDD	Connect to +3.3V supply, connect 10u+100n capacitors to VSS.	
8	PC2	I	Ch1On	Button 1On.	Floating
10	NRST	RST	RST	Reset, connect 100n capacitor to VSS for filtering purpose.	
15	VBAT	S	VDD	Connect to +3.3V supply	
17	VDD	S	VDD	Connect to +3.3V supply	
22	PC10	O	LED	Status LEDs: connect Green LED with series resistor to VSS, and Red LED with series resistor to +3.3V.	Floating
24	PC12	I	FR	Factory reset. Connect a normal open momentary switch to VSS.	Floating
25	SWDIO	I/O	SWDIO	SWD interface.	Floating
26	SWCLK	I	SWCLK	SWD interface.	Floating
28	PA10	I	Ch1Off	Button I 1Off / Encoder 1button.	Floating
30	PA11	I	Ch2Off	Button 2Off / Encoder1 terminal A.	Floating
31	VSS	S	VSS	Connect to GND.	
33	PD0	I	Ch2On	Button 2On / Encoder1 terminal B.	Floating
35	PB13	I	Ch3Off	Button 3Off / Encoder2 terminal B.	Floating
37	PB14	I	Ch4Off	Button 4Off / Encoder 2button.	Floating
39	PB6	O	TX	RFU, Do Not Connect.	DNC
41	PB12	I	Ch4On	Button 4On / Encoder2 terminal A.	Floating
43	PB1	I	CH3On	Button 3On.	Floating
65	PD3	I	S/C	Server/Client selector. Leave it Floating for Client.	
66,67	PD12,PD7	I	S0,S1	Client selection, see Table 3 for details.	
68,69	PD2,PC9	I	N0,N1	Number of channels selection (1, 2, 3, 4)? see Table 2 for details.	
85	ANT_NC	O	DNC	Do Not Connect.	DNC

All other pads should be connected to VSS (GND).

PX32WB5MMGH6TR Client

Reference Schematic



S/C pin (Client)

Leave S/C pin floating for Client.

S0,S1 pins (Client selection)

Client	66 PD12	67 PD7
LL	VSS	VSS
OnOff	VSS	Floating
CTL	Floating	VSS

Device will be visible in BLE MESH according to the Client and Number of channels selection as follows:

PROX LL Client Xch, where X – number of channels, example: PROX LL Client 2ch

PROX OnOff Client Xch, where X – number of channels, example: PROX OnOff Client 4ch

PROX CTL Client Xch, where X – number of channels, example: PROX CTL Client 2ch

NOTE: the device will display selected number of channels, even it's invalid (for LL or CTL).

N0,N1 pins, Client: Number of channels selection

CH	68 PD2	69 PC9	Restrictions
1ch	VSS	Floating	
2ch	Floating	VSS	
3ch	Floating	Floating	Invalid for LL and CTL, will be forced to 2ch
4ch	VSS	VSS	Invalid for LL and CTL, will be forced to 2ch

Client: OnOff

OnOff Client (1 to 4 channels) is very straightforward: ChXOn – ChXOff responsible for switching Channel X On and Off respectively:

CH	Input	Pad #	Function
1ch	Ch1On	8	Sends message On for channel 1
	Ch1Off	28	Sends message Off for channel 1
2ch	Ch2On	33	Sends message On for channel 2
	Ch2Off	30	Sends message Off for channel 2
3ch	Ch3On	43	Sends message On for channel 3
	Ch3Off	35	Sends message Off for channel 3
4ch	Ch4On	41	Sends message On for channel 4
	Ch4Off	37	Sends message Off for channel 4

Client: LL (dimmer)

CH	Input	Pad #	Function
1ch	Ch2Off	30	Encoder1 terminal A
	Ch2On	33	Encoder1 terminal B
	Ch1Off	28	Encoder1 button , push and release: sends On and Off message after every push (On/Off toggle).
2ch	Ch4On	41	Encoder2 terminal A
	Ch3Off	35	Encoder2 terminal B
	Ch4Off	37	Encoder2 button , push and release: sends On and Off message after every push (On/Off toggle).

Client: LL (toggle button)

LL Client mode can be used without encoder(s) to set toggle button(s) these will change messages sent after every push.

CH	Input	Pad #	Function
1ch	Ch1Off	28	Button1 push and release: sends On and Off message after every push (On/Off toggle).
2ch	Ch4Off	37	Button2 push and release: sends On and Off message after every push (On/Off toggle).

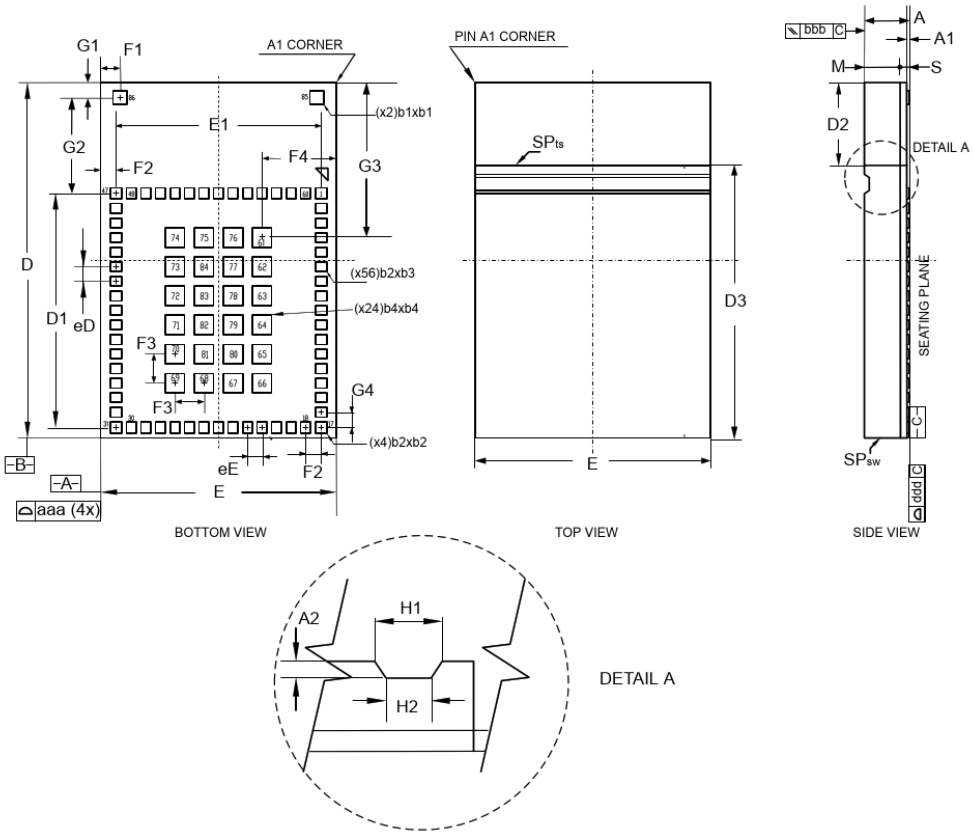
Channels with and without encoder can be combined.

Client: CTL

CH	Input	Pad #	Function
1ch	Ch2Off	30	Encoder1 terminal A
	Ch2On	33	Encoder1 terminal B
	Ch1Off	28	Encoder1, button. Push and release: sends On and Off message after every push (On/Off toggle). Push and hold: turns encoder to adjust colour temperature. Release when finished.
2ch	Ch4On	41	Encoder2 terminal A
	Ch3Off	35	Encoder2 terminal B
	Ch4Off	37	Encoder1, button. Push and release: sends On and Off message after every push (On/Off toggle). Push and hold: turns encoder to adjust colour temperature. Release when finished.

SiP-LGA86 package information

This SiP-LGA is a 86 pin, 7.3 x 11mm, system in package land grid array package.



1. Drawing is not to scale.

For more information on SiP-LGA86 package information, refer to section 9 of STM32WB5MMG datasheet.

Package information

Refer to section 9 Package information of STM32WB5MMG datasheet.

Certification

Refer to section 11 Certification of STM32WB5MMG datasheet