Koolmesh™
TAILOR MAKE YOUR SOLUTION

Bluetooth 5.0 Module KMB01

KMB01 is ideally to be integrated into LED drivers, all kinds of dimmers, including relay output dimmer, 0/1-10V dimmer, DALI dimmer, PWM dimmer and different lighting control applications. It is designed based on Bluetooth low energy SoC nRF52832, which is the most widely-used Bluetooth chip to send and receive signal. The signal covers up to 50m in the open air, and the module can work as both a transmitter or a receiver.

KMB01 controls smart device to organize wireless mesh network via Bluetooth, enabling a large number of lighting fixtures to be controlled and commissioned by a same App. By working with gateway HBGW01, KMB01 enabled luminaires can be controlling remotely.

Five variants available for KMB01 at present. By using its 19 general purpose I/O pins, user can interface the module with different external components, such as LED drivers, PIR sensors, dimmers and DALI controls.

❈ Bluetooth®

Applications

• LED drivers
• Dimmers (relay, 0/1-10V, DALI, PWM output)
• PIR sensors (1-10V output)

Koolmesh Lighting Control System

• Wirelessly controllable with a Bluetooth smart device
• Easy-to-operation mesh network
• Device firmware can be updated over-the-air
• Koolmesh cloud service available
• App development service available
• Koolmesh pro app for professional on-site installation
• Koolmesh web platform for design, management and maintenance

Product Dimension (mm)

10.5mm 1.5mm 2mm 1.7mm 1.5mm 19.2mm 9mm 1.5mm 2mm 1.6mm 12.7mm

Product Features

• Bluetooth 5.0 module with compact size
• Nordic nRF52832 Bluetooth low energy SoC
• 64 MHz ARM Cortex-M4F Processor
• 2.4GHz ultra low-power wireless communication
• 19 pins for general-purpose input/output
• Wide supply-voltage range(1.7V to 3.6V)
• Range up to 50m in the open air
• Easy-to-use with greater flexibility
• Programmable peripheral interface
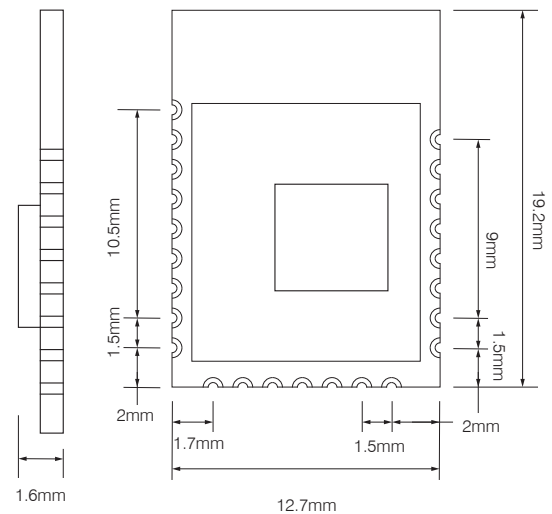
General Description

Pin	Name	Type	Description
H0	VSS	Power	Ground
H1	P0.28 AIN4	Digital I/O Analog input	General-purpose I/O2 SAADC/COMP/LPCOMP input
H2	P0.29 AIN5	Digital I/O Analog input	General-purpose I/O2 SAADC/COMP/LPCOMP input
H3	P0.30 AIN6	Digital I/O Analog input	General-purpose I/O2 SAADC/COMP/LPCOMP input
H4	P0.31 AIN7	Digital I/O Analog input	General-purpose I/O2 SAADC/COMP/LPCOMP input
H5	VDD	Power	Power supply
H6	SWDCLK	Digital input	Serial wire debug clock input for debug and programming
H7	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
H8	VSS	Power	
H9	NFC1 P0.09	NFC input Digital I/O	NFC antenna connection General-purpose I/O1
H10	NFC2 P0.10	NFC input Digital I/O	NFC antenna connection General-purpose I/O1
H11	P0.11	Digital I/O	General-purpose I/O
H12	P0.12	Digital I/O	General-purpose I/O
H13	P0.13	Digital I/O	General-purpose I/O
H14	P0.14 TRACEDATA[3]	Digital I/O	General-purpose I/O Trace port output
H15	P0.15 TRACEDATA[2]	Digital I/O	General-purpose I/O Trace port output
H16	P0.16 TRACEDATA[1]	Digital I/O	General-purpose I/O Trace port output
V1	P0.00 XL1	Digital I/O Analog input	General-purpose I/O Connection for 32.768 kHz crystal (LFXO)
V2	P0.01 XL2	Digital I/O Analog input	General-purpose I/O Connection for 32.768 kHz crystal (LFXO)
V3	P0.02 AIN0	Digital I/O Analog input	General-purpose I/O SAADC/COMP/LPCOMP input
V4	P0.03 AIN1	Digital I/O Analog input	General-purpose I/O SAADC/COMP/LPCOMP input
V5	P0.04 AIN2	Digital I/O Analog input	General-purpose I/O SAADC/COMP/LPCOMP input
V6	P0.05 AIN3	Digital I/O Analog input	General-purpose I/O SAADC/COMP/LPCOMP input
V7	P0.08	Digital I/O	General-purpose I/O

■ General Information

Protocol:	Bluetooth 5.0
Chip model:	nRF52832
Processor:	64MHz ARM Cortex-M4F
RAM:	64KB
Flash:	512KB
GPIOs:	19 configurable
Frequency:	2404MHz ～ 2480MHz
Supply voltage:	1.7V ～ 3.6V; Recommended 3.3V
Power consumption:	<10mA (normal mode)
Operating temperature:	-20℃ ～ 70℃
Storage temperature:	-40℃ ～ 85℃
Compliance:	EN300328, EN62479

* Be cautious of handling electrostatic sensitive device.

Block Diagram
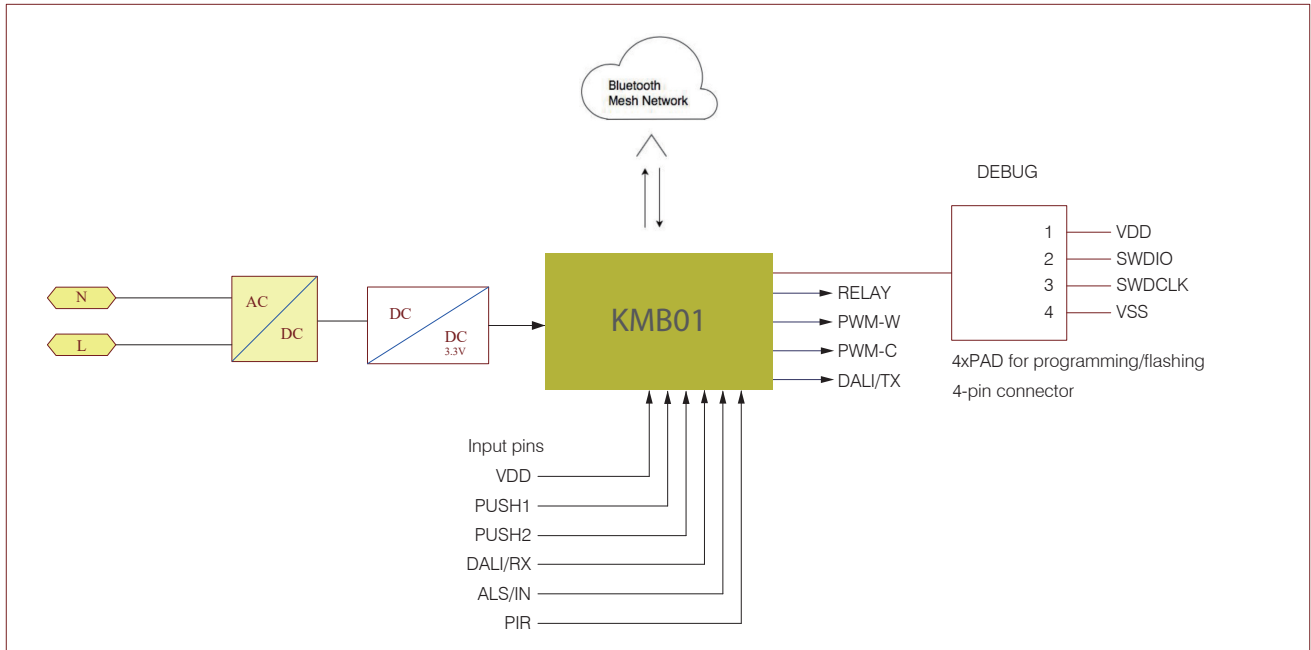
Pin Assignment

Pin assignments for each variant of the module as below.

KMB01-S

Pin	Name	Type	Description
H0	VSS	Power	Ground
H3	RELAY	Digital output	Digital output for on/off state change. ON: active at high level; OFF: active at low level
H5	VDD	Power	Power supply pin; VDD range: 1.7V-3.6V, recommended VDD=3.3V
H6	SWDCLK	Digital input	Serial wire debug clock input for debug and programming
H7	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
H8	VSS	Power	Ground
H12	PUSH1	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H14	PUSH2	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H15	AC Phase Detection	Digital input	To detect the frequency of the mains (50Hz/60Hz), support for the operation of zero-cross detection
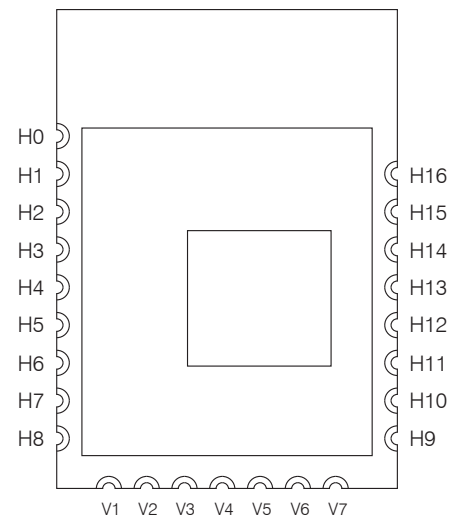
KMB01-DIM

Pin	Name	Type	Description
H0	VSS	Power	Ground
H3	PWM	Digital output	PWM dimming output for brightness
H5	VDD	Power	Power supply pin; VDD range: 1.7V-3.6V, recommended VDD=3.3V
H6	SWDCLK	Digital input	Serial wire debug clock input for debug and programming
H7	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
H8	VSS	Power	Ground
H11	PUSH2	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H13	PUSH1	Digital input	Optional; 50-60Hz square wave@3.3Vdc

KMB01-CCT

Pin	Name	Type	Description
H0	VSS	Power	Ground
H2	PWM-W	Digital output	PWM dimming output for brightness and CCT warm white
H3	PWM-C	Digital output	PWM dimming output for brightness and CCT cool white
H5	VDD	Power	Power supply pin; VDD range: 1.7V-3.6V, recommended VDD=3.3V
H6	SWDCLK	Digital input	Serial wire debug clock input for debug and programming
H7	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
H8	VSS	Power	Ground
H11	PUSH2	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H13	PUSH1	Digital input	Optional; 50-60Hz square wave@3.3Vdc

KMB01-DA

Pin	Name	Type	Description
H0	VSS	Power	Ground
H3	DALI/TX	Digital output	DALI broadcast output
H4	DALI/RX	Digital input	Reserved DALI intput
H5	VDD	Power	Power supply pin; VDD range: 1.7V-3.6V, recommended VDD=3.3V
H6	SWDCLK	Digital input	Serial wire debug clock input for debug and programming
H7	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
H8	VSS	Power	Ground
H12	PUSH1	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H14	PUSH2	Digital input	Optional; 50-60Hz square wave@3.3Vdc

KMB01-PIR

Pin	Name	Type	Description
H0	VSS	Power	Ground
H1	ALS_IN	Digital input	Analog input for Ambient Light Sensor. Voltage range see figure 2.
H5	VDD	Power	Power supply pin; VDD range: 1.7V-3.6V, recommended VDD=3.3V
H6	SWDCLK	Digital input	Serial wire debug clock input for debug and programming
H7	SWDIO	Digital I/O	Serial wire debug I/O for debug and programming
H8	VSS	Power	Ground
H11	PUSH2	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H12	PUSH1	Digital input	Optional; 50-60Hz square wave@3.3Vdc
H13	PIR	Digital input	Digital input of PIR sensor; active at high level
V3	AC Phase Detection	Digital input	To detect the frequency of the mains(50Hz/60Hz), support for the operation of zero-cross detection
V4	RELAY	Digital output	Digital output for on/off state change. ON: active at high level, occupancy detection; OFF: active at low level, absence detection
V6	PWM	Digital output	PWM dimming output for brightness, active at high level

| Lux	Voltage(mV)
2	70
5	82
10	95
50	200
100	355
200	600
300	850
400	1000
500	1300
600	1580
700	1750
800	1950
900	2200
1000	2450
1100	2680
1200	2910

Ambient Light Sensor (Applicable to KMB01-PIR)

When connecting the PIR sensor, please refer to figure 2 for lux corresponding to output voltage. It is used to convert the ambient light sensed into electricity for processing by microcontroller.

Figure 2 Lux corresponding to output voltage table

Zero-cross Relay (Applicable to KMB01-S, KMB01-PIR)

Phase detection can be used to detect the frequency of the mains(50Hz/60Hz), support the operation and release for zero-cross detection. Designed in the software, the module switches on/off the load right at the zero-cross point, to ensure that the in-rush current is minimised, enabling the maximum lifetime of the relay.
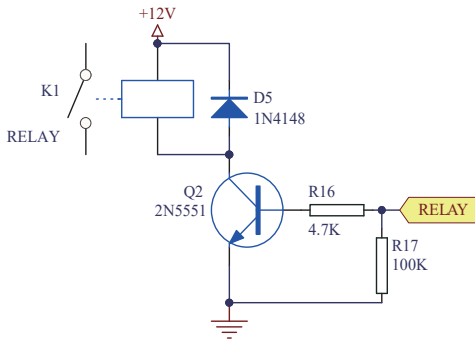
Reference circuit diagram for Relay output
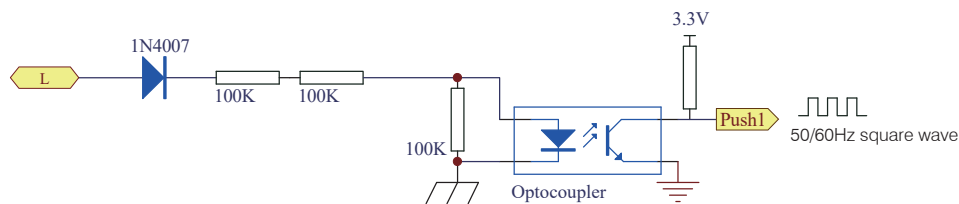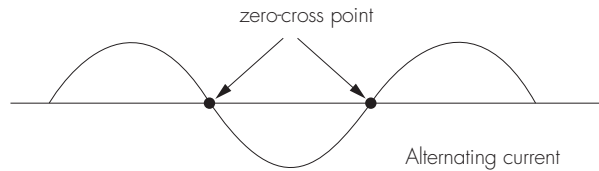
Reference circuit diagram for phase detection

## PWM Dimming (Applicable to KMB01-DIM, KMB01-CCT, KMB01-PIR)

The PWM frequency can be selected from the following options:

- 250Hz
- 500Hz
- 1000Hz - default
- 2000Hz
- 4000Hz
- 8000Hz

To avoid errant blinking of the lamp after a short power outage or initial power on, a pull-up or pull-down resistor should be used on the PWM pin:

- Pull-down when PWM polarization is positive
- Pull-up when PWM polarization is negative

This is caused by the output pin being in a transient state during firmware initialization, and placing the pull-up or pull-down external resistor helps maintain a steady output while the device initializes.

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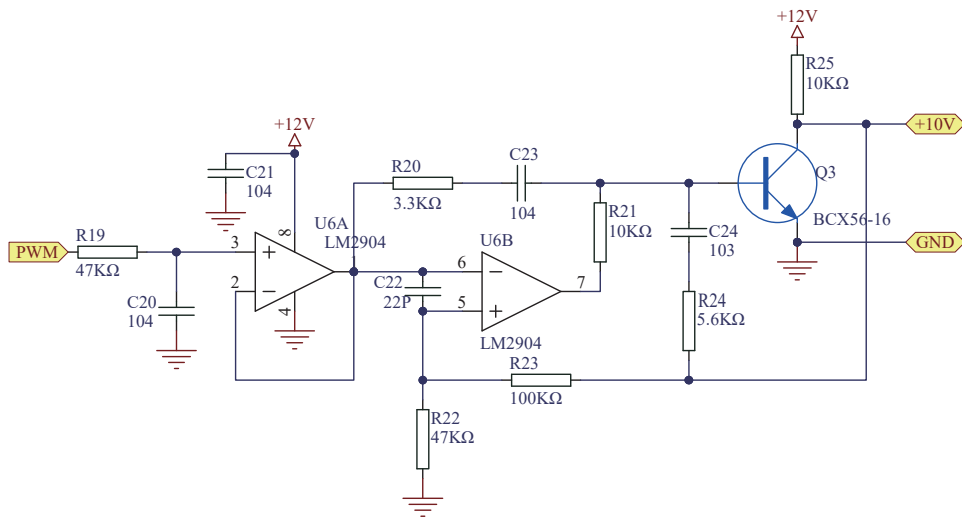
Reference circuit diagram for 1-10V dimmer

PUSH Function(optional)

The Switch-Dim interface allows a simple dimming method using commercially available non-latching (momentary) wall switches. This function enables three actions can be programmed via App: Short press, Long press, Double press. Users can customize push operation by the App. i.e. short press for toggle light on/off, long press for adjust brightness.
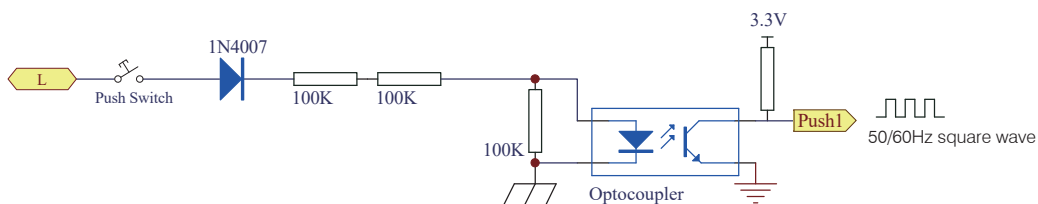
Switch Action

Short press: <1 second (Note: short press has to be longer than 0.1s, or it will be invalid.)
Long press: >1 second
Double press: short press 2 times within 1 second

* We recommend the number of drivers connected to a switch does not exceed 25 pieces. The maximum length of the wires from push to driver should be less than 20 meters.
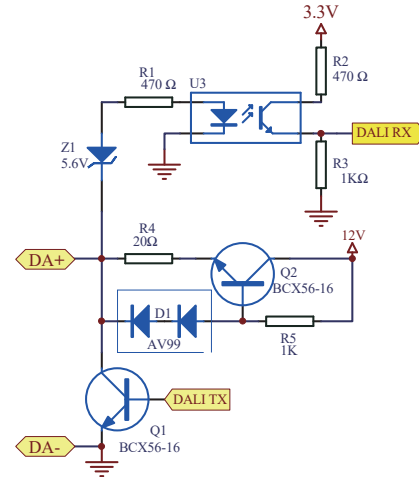

Reference circuit diagram for push interface

DALI Interface (Applicable to KMB01-DA)

The DALI interface uses two pins: DALI_RX and DALI_TX pins, as well as opto-isolators to translate signals between nRF52 and the DALI physical layer. It allows Internal DALI as DALI firmware connection type and delivers broadcast command. DALI interface reference schematic as below.

Internal DALI (DALI as comunication between MCUs)

- This connection type allows to use DALI as an internal communication interface (direct connection between the DALI firmware on nRF52 and an external device).
- Using direct connection RX <-> TX
- Internal DALI connection does not support feedback loop (it does not send the DALI loopback frame) , thus there is no detection of the DALI_BUS_SHORT fault
- Lack of checking of feedback when sending DALI frames.
- Idle state of DALI Pins for internal DALI:
  - DALI_TX - LOW
  - DALI_RX - HIGH

Reference circuit diagram for DALI interface

Reset Function

All versions of the Koolmesh Bluetooth firmware can be reset via the Koolmesh App.

This function allows a factory reset to be carried out in order to restore the software to the default factory settings through the Koolmesh App. A factory reset will change the state of the module in the mesh from Provisioned to Unprovisioned, i.e. all network settings will be lost. This functionality is required to allow reprovisioning a device after unexpected behavior in which control over the device is lost.

Two ways to reset the device:
1. Users can select the device which they would like to reset and slide to the left side to "reset" (see figure 1.1).
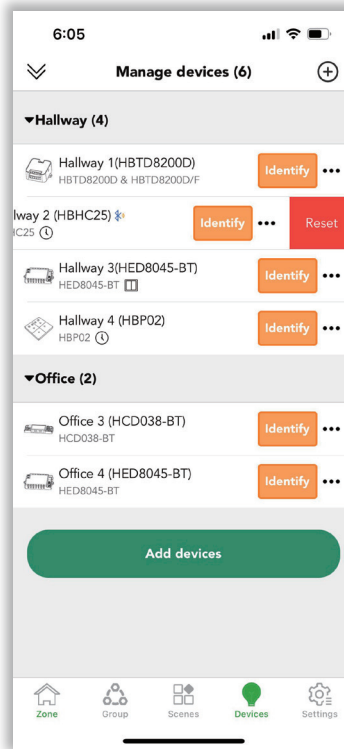2. Click ⋯ to reset, like "Hallway 2(HBHC25)" (see figure 1.2).
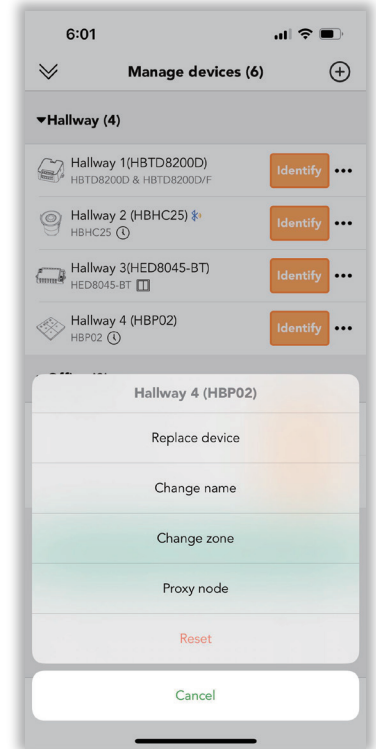
Figure 1.1 *Reset-1*

Figure 1.2 *Reset-2*

Supported mesh models

Element type	Device capability	Model function	Model type	Element	Model name	Note
Device element	Device time managemnt	Receive requests from other devices to obtain time messages, and transmit time messages to other devices.	Vendor	0	Time server	Vendor model. Not support SIG
		Set UTC time and time role settings for the device.	Vendor	0	Time setup server	
		Receive time messages from other devices and set as its own time	Vendor	0	Time client	
	Generic Default Transition Time	Set SIG general fade time and private global ON/OFF fade time	Time and Scenes /vendor	0	Default transition Time server	Time and scene partialy support SIG model, but have vendor part.
	Device setting	Set some public status of the device	Vendor	0	Device server	
Light (with CCT) element	ON/OFF control	On/off control of lights	Generic	1	On/Off server	
	Power on status setting	Get and return power-on status	Generic	1	Power On/Off server	
		Set power on status	Generic	1	Power On/Off setup Server	
	Brightness level modulation	Set and get the status of the device to be able to modulate the brightness level	Generic	1	Level server	
	Brightness control	Directly control of the brightness	Lighting	1	Light lightness server	
	Brightness parameter setting	Set the brightness parameters of the luminaires	Lighting	1	Light lightness setup server	
	Set and get the color temperature and power-on status	Get the CCT and power on status of the light	Lighting	1	Light CTL server	
		Set the CCT and power on status of the light	Lighting	1	Light CTL setup server	
	Sensor receiver	Receive and process sensor data	vendor	1	Sensor client	
	Scene configuration	Receive and process the "scene recall"	Time and Scenes	1	Scene server	Time and scene partialy support SIG model, but have vendor part.
		Set scene setting parameters	Time and Scenes/vendor	1	Scene setup server	Time and scene partialy support SIG model, but have vendor part.
	Schedule setup and execute	Recall schedule and execute	Time and Scenes/vendor	1	Scheduler server	Time and scene partialy support SIG model, but have vendor part.
		Schedule settings	Time and Scenes/vendor	1	Scheduler setup server	Time and scene partialy support SIG model, but have vendor part.
	Color temperature level modulation	Set and obtain the status of the device capable of color temperature level modulation, etc.	Generic	2	Level server	
	CCT control	Directly control of the color temperature	Generic	2	Light CTL temperature server	
Motion sensor element	Motion sensor	Motion sensor receive and process	Vendor	3	Sensor server	
		Motion sensor settings	Vendor	3	Sensor setup server	
Daylight sensor element	Daylight sensor	Daylight sensor receive and process	Vendor	4	Sensor server	
		Daylight sensor settings	Vendor	4	Sensor setup server	
Light (Push) element	ON/OFF control	On/off control of lights	Generic	5	Generic OnOff client	
	Brightness/CCT changes	Change brightness/CCT	Generic	5	Generic level client	
	Scene control	Recall scene	Generic	5	Scene client	
	Sumilate sensor	Sumilate sensor signal sending	Vendor	5	Sensor server	
	Push settings	Get Push settings	Vendor	5	Push server	
		Get Push settings	Vendor	5	Push setup server	
Push switch element	ON/OFF control	On/off control of lights	Generic	6	Generic OnOff client	
	Brightness control	Brightness level modulation	Generic	6	Generic level client	
	Scene control	Recall scene	Generic	6	Scene client	
	CCT control	CCT level modulation	Generic	7	Generic level client	