

**Button-LED Module**

# **BMK22M131 User Guide**

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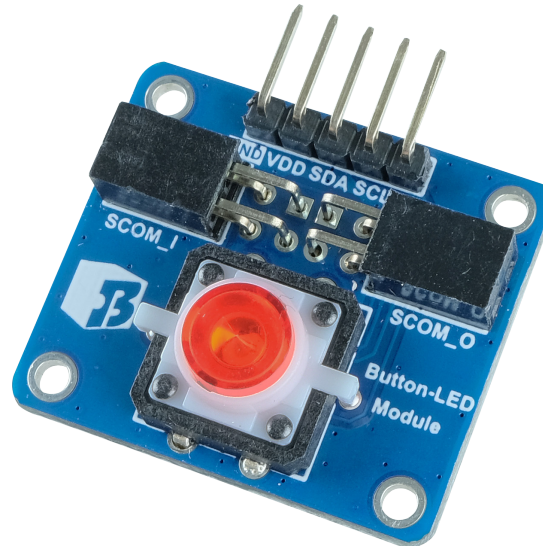
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## Introduction

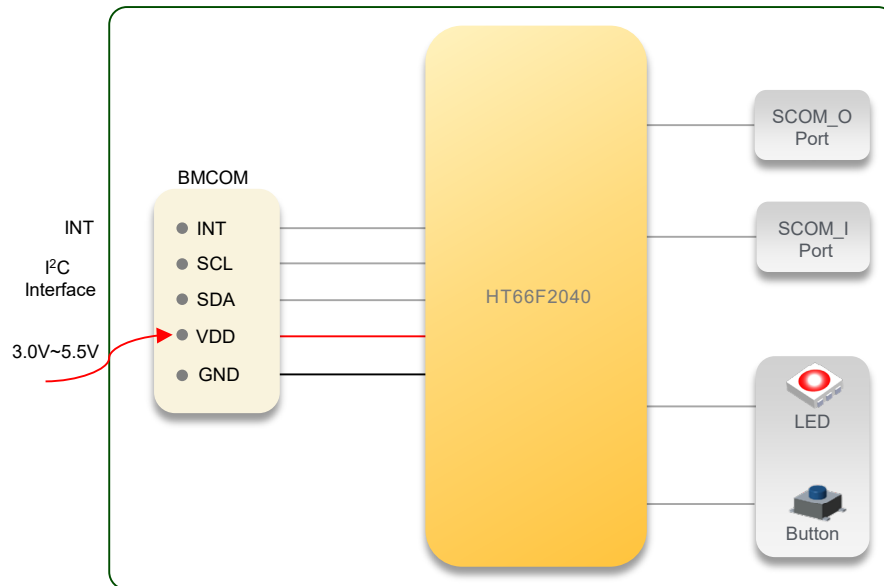
The BMK22M131 is a button-LED module from Best Modules, which is developed using an MCU, the HT66F2040. The module has an on-board LED touch button, which can identify the long/short press action. The LED supports button control mode and instruction control mode. The module can implement the button status reading, LED brightness control and other functions using the I<sup>2</sup>C communication method via the BCOM interface. The module is suitable for use in electronic products, etc. The module is suitable for use in leisure products, electronic products, etc.



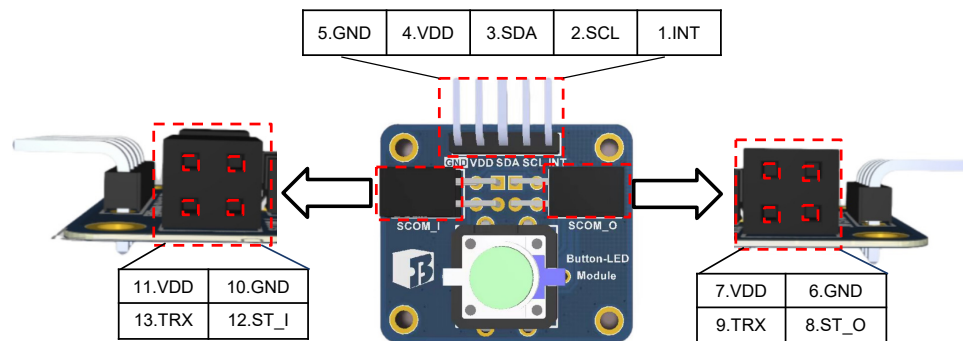
## Features

- Operating voltage: 3.0V~5.5V
- Operating current:
  - ◆ 2.5mA @ 5V (No button pressed)
  - ◆ 6.8mA @ 5V (Button pressed and LED On)
- MCU: HT66F2040
- Button:
  - ◆ Long press and short press recognition detection and interrupt signal feedback
- Internal debounce, programmable recognition time for long/short press
- LED: Support button control mode and instruction control mode
- Cascade interface:
  - ◆ SCOM\_Ix1 (GND, VDD, ST\_I, TRX)
  - ◆ SCOM\_Ox1 (GND, VDD, ST\_O, TRX)
  - ◆ Maximum cascade number: 16
- Communication interfaces:
  - ◆ BCOM×1 (INT, SCL, SDA, VDD, GND)
  - ◆ Communication method: I<sup>2</sup>C (address: 0x77)
- Arduino Lib application support
- Module size: 29.58mm×30.7mm×11.86mm

## Block Diagram



## Pin Description



BMCOM pins:

Pin	Function	Description
1	INT	Interrupt pin
2	SCL	I <sup>2</sup> C clock line
3	SDA	I <sup>2</sup> C data line
4	VDD	Positive power supply
5	GND	Negative power supply, ground

Cascade SCOM\_O pins:

Pin	Function	Description
6	GND	Negative power supply, ground
7	VDD	Positive power supply
8	ST_O	Cascade status output pin
9	TRX	Cascade single bus communication pin

Cascade SCOM\_I pins:

Pin	Function	Description
10	VDD	Positive power supply
11	GND	Negative power supply, ground
12	ST_I	Cascade status input pin
13	TRX	Cascade single bus communication pin

## Technical Specifications

### Recommended Operation Conditions

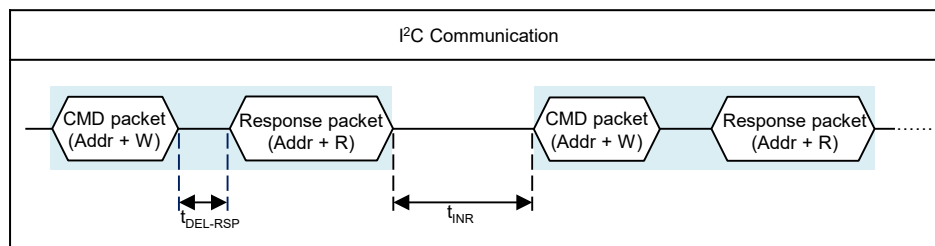
Ta=25°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Operating Voltage	—	3.0	—	5.5	V
I <sub>DD</sub>	Operating Current	V <sub>DD</sub> =5V, no button pressed	—	2.5	—	mA
		V <sub>DD</sub> =5V, button pressed and LED On	—	6.8	—	
	Long press button recognition time	V <sub>DD</sub> =5V	1	300	3000	ms
	Cascade Number	—	1	—	16	

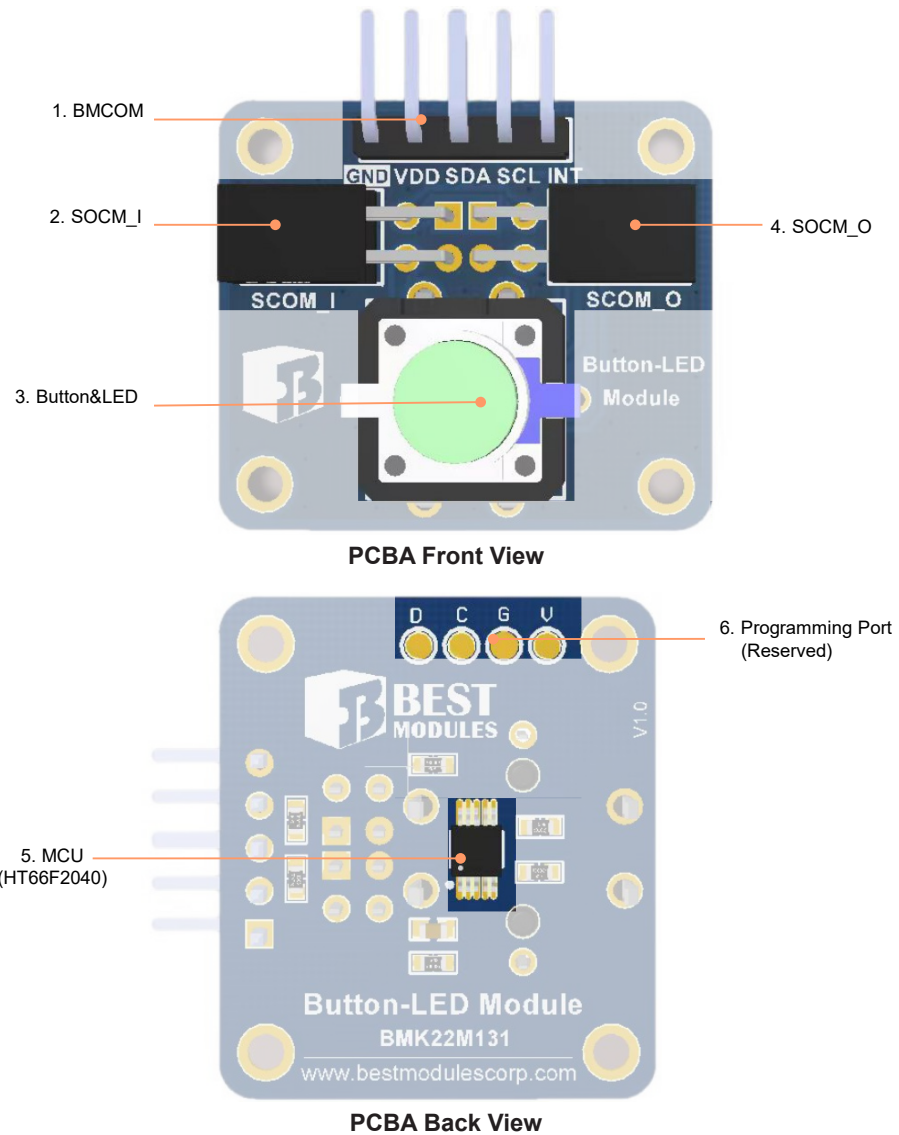
### Timing Specification

Ta=25°C

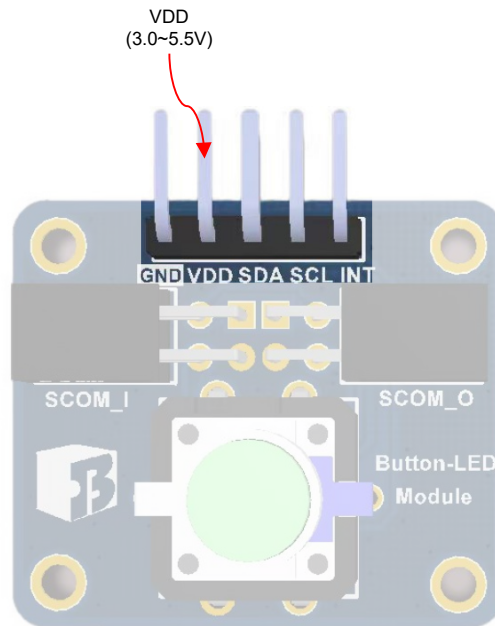
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t <sub>DEL-RSP</sub>	Response Delay Time	V <sub>DD</sub> =5V	—	7	—	ms
t <sub>INR</sub>	Interval Time	V <sub>DD</sub> =5V	—	2	—	ms



## Hardware Overview



## Power Supply



- BMCOM pin: Provided by the VDD input, 3.0V~5.5V

## Communication Interface

- Communication method: I<sup>2</sup>C
- I<sup>2</sup>C address: 0x77

I<sup>2</sup>C address format:

MSB							LSB
A6	A5	A4	A3	A2	A1	A0	R/W
1	1	1	0	1	1	1	


  
Slave address(0x77)

Note:

R/W = 1: Read

R/W = 0: write

- I<sup>2</sup>C communication rate: 5~100kHz
- Communication logic reference voltage: 3.0V~5.5V
- Module SCL/SDA pin with 4.7k $\Omega$  pull-up resistor

## Communication Protocol

There are three instruction frame formats, known as parameter setting instruction frame, parameter getting instruction frame and special instruction frame.

### Parameter setting instruction frame

#### • Master → Slave

Start	Addr+W	MID	ID	LEN	CMD	Data	Checksum	Stop
1-bit	1-byte	0x77	1-byte	1-byte	1-byte	N-byte	1-byte	1-bit

#### • Slave → Master

Start	Addr+R	MID	ID	LEN	Status	Checksum	Stop
1-bit	1-byte	0x77	1-byte	1-byte	1-byte	1-byte	1-bit

Frame content introduction:

- ◆ Start: Start bit signal
- ◆ Addr+R: I<sup>2</sup>C address read
- ◆ Addr+W: I<sup>2</sup>C address write
- ◆ MID: Module type ID, different types of the modules have different MIDs, the MID of this module is 0x77
- ◆ ID: The automatic assigned ID for cascading the same modules
  - ID=N: The N-th module to be cascaded ( $1 \leq N \leq 16$ )
  - ID=0: Broadcast command, applied to all cascaded modules
- ◆ LEN: Byte length of CMD/Status, Data and CheckSum
- ◆ CMD: Command code, each command code corresponds to a different function
- ◆ Status: Command execution status, 0x00: command sent successfully, 0x40: CheckSum error, 0x80: command not supported
- ◆ Data: Data
- ◆ Checksum = MID + ID + LEN + CMD/Status + Data
- ◆ Stop: Stop bit signal

### Parameter getting instruction frame

#### • Master → Slave

Start	Addr+W	MID	ID	LEN	CMD	Checksum	Stop
1-bit	1-byte	0x77	1-byte	1-byte	1-byte	1-byte	1-bit

#### • Slave → Master

Start	Addr+R	MID	ID	LEN	Status	Data	Checksum	Stop
1-bit	1-byte	0x77	1-byte	1-byte	1-byte	N-byte	1-byte	1-bit



## Special instruction frame

### • Master → Slave

Start	Addr+W	MID	ID	LEN	CMD	Checksum	Stop
1-bit	1-byte	0x77	1-byte	1-byte	1-byte	1-byte	1-bit

### • Slave → Master

Start	Addr+R	MID	ID	LEN	Status	Checksum	Stop
1-bit	1-byte	0x77	1-byte	1-byte	1-byte	1-byte	1-bit

## Parameter Setting Instruction Set

No.	Functional Description	CMD	ID	Data	Note
1	Set all the cascaded modules LED brightness	0x01	0	D <sub>1</sub> : LED brightness, ranging from 0~255	
	Set the N-th module LED brightness		N		
2	Set all the cascaded modules long press recognition time	0x04	0	D <sub>1</sub> D <sub>2</sub> : Long press recognition time, ranging from 1~3000, unit: ms Short press: Button pressed time < Long press recognition time Long press: Button pressed time ≥ Long press recognition time	
	Set the N-th module long press recognition time		N		

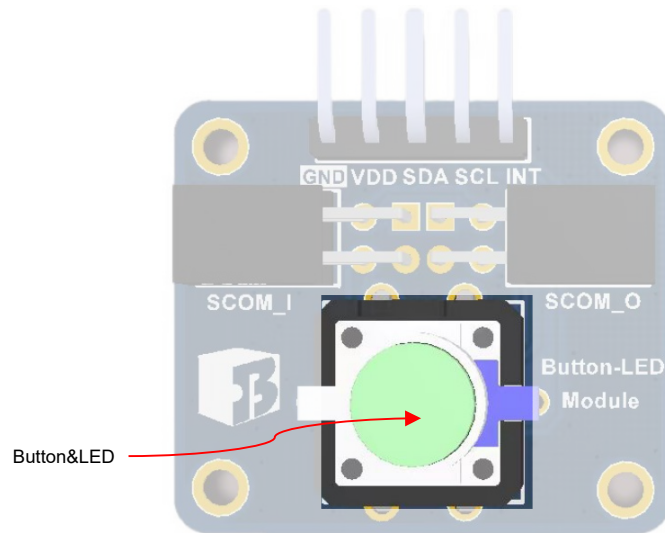
## Parameter Getting Instruction Frame

No.	Functional Description	CMD	ID	Response Data	Note
1	Get all the cascaded modules button status	0x03	0	D <sub>1</sub> : Module number N D <sub>2</sub> ~D <sub>N+1</sub> : Module 1~N button status 0x00: No pressed 0x01: Short press 0x02: Long press	
	Get the N-th module button status		N	D <sub>1</sub> : The N-th module button status 0x00: No pressed 0x01: Short press 0x02: Long press	
3	Read the long press recognition time	0x07	N	D <sub>1</sub> D <sub>2</sub> : Long press recognition time, unit: ms	
4	Get the module cascade number	0x12	0	D <sub>1</sub> : Module cascade number	

## Special Instruction Frame

No.	Functional Description	CMD	ID	Note
1	Enable all the cascade module LED operating mode to be button control mode	0x02	0	
	Enable the N-th module LED operating mode to be button control mode		N	
2	Query if the module is connected	0x13	0	

## Button&LED



- Button: Long press and short press detection

Button Pressed Time	Detection Result
< Long press recognition time	Short Press
≥ Long press recognition time	Long press

- LED: Two operating mode
  - ◆ Button control mode: When the button pressed, LED On; when the button released, LED Off
  - ◆ Instruction control mode: LED brightness 0~255 level adjustable (brightness=0 represents LED Off)

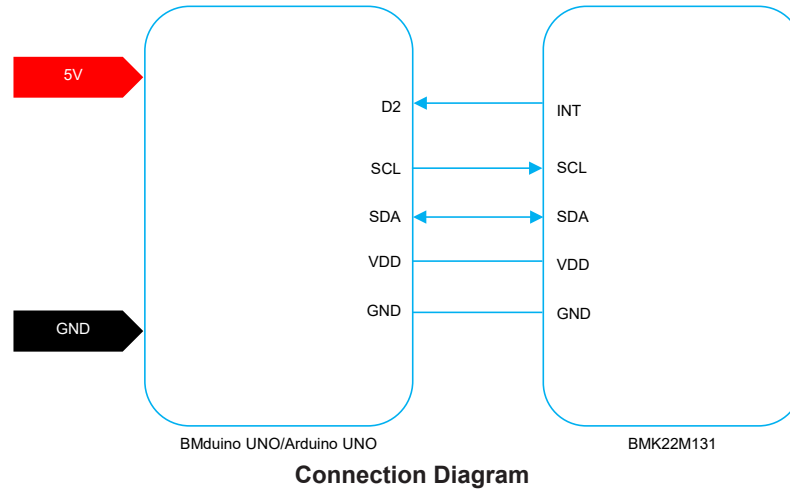
Switching between two operating modes:

1. Switching from the button control mode to the instruction control mode: Use the instruction (CMD=0x01) to set the brightness of the LED, and the LED can not be controlled by the button at this time
2. Switching from the instruction control mode to the button control mode: Use the instruction (CMD=0x02) to switch back to the button control mode

Applications:

1. The button control mode of LED is a relatively conventional usage, used to indicate whether the button is pressed/released
2. The LED instruction control mode is suitable for applications that require a separate LED indication. For example, when the Master receives an alarm, control the LED On and instructs the user to press a button to process the response plan; Used in low light environments to indicate the module position, etc.

## Application Circuits

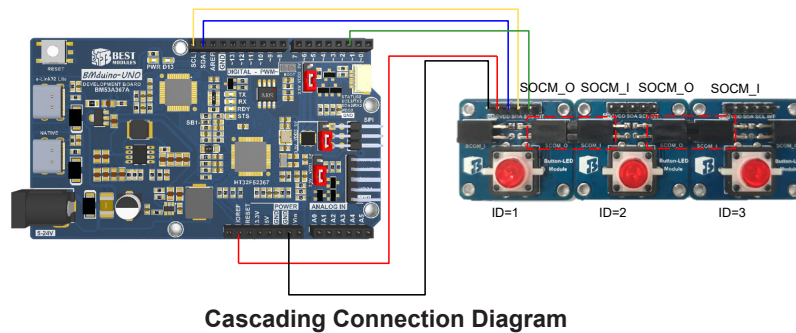


### Multi-board Cascade

For this module, the cascade number can be up to 16 (corresponding ID from 1~16). The module directly connected to the BMduino UNO development board will be assigned a cascading ID value of 1.

When cascading, please use a 2.54mm, double row, 2P, male to male Dupont wire or header for connection. The SCOM\_O interface of the previous module should be connected to the SCOM\_I interface of the subsequent module.

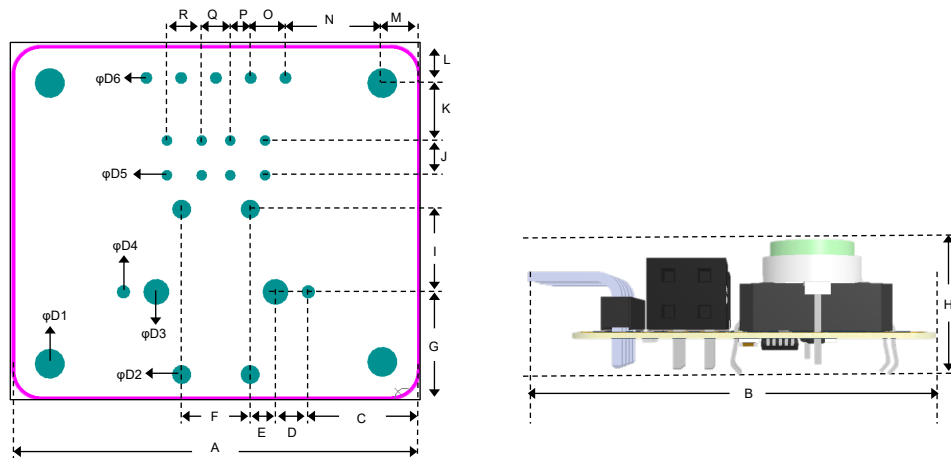
Take cascading three modules as an example:



**Note:**

1. The ID will only be assigned once when the entire module is initially powered on, so the module needs to be cascaded before power on, otherwise the module ID assignment will be affected. Plugging in/out will also not be allowed during use.
2. When cascading multiple boards, SCOM\_I should be connected to SCOM\_O. The module connected to the master (module ID=1) needs to be connected to the next module using SCOM\_O. When connecting two modules, attention should be paid to the connection of the wires to ensure that there are no errors in connection.
3. The command is a broadcast command when ID=0, which applies to all the cascaded modules. Refer to the Communication Protocol section for details.

## Dimensions



**Dimension Information**

Symbol	Unit	mm	inch
A		29.58	1.65
B		30.70	1.20
C		8.03	0.32
D		2.40	0.09
E		1.85	0.07
F		5.0	0.20
G		7.77	0.31
H		11.86	0.47
I		6.05	0.24
J		2.54	0.1
K		4.20	0.17
L		2.65	0.10
M		2.65	0.10
N		7.05	0.28
O		2.54	0.10
P		1.51	0.06
Q		2.08	0.08
R		2.54	0.10
D1		2.2	0.09
D2		1.4	0.06
D3		1.9	0.07
D4		1.0	0.04
D5		0.8	0.03
D6		0.9	0.04

**Dimension List**

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