Button-LED Module

BMK22M131
User Guide

Revision: V1.01   Date: September 14, 2023

Contents

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 I²C communication method via the BMCOM interface. The module is suitable for use in electronic products, etc. The module is suitable for use in leisure products, electronic products, etc.
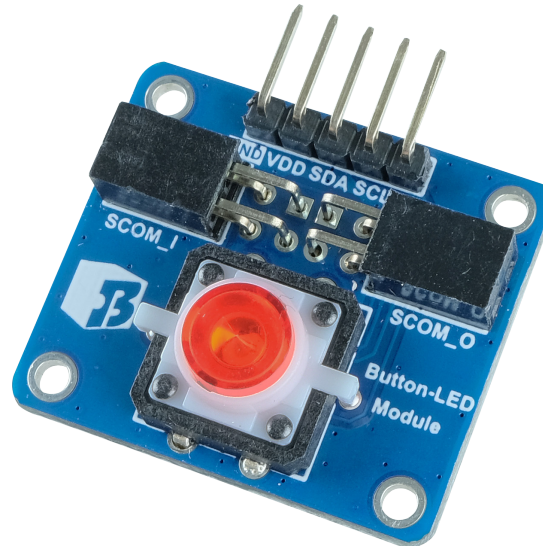

Features

- 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:
    ◆ BMCOM×1 (INT, SCL, SDA, VDD, GND)
    ◆ Communication method: I²C (address: 0x77)
- Arduino Lib application support
- Module size: 29.58mm×30.7mm×11.86mm

Block Diagram
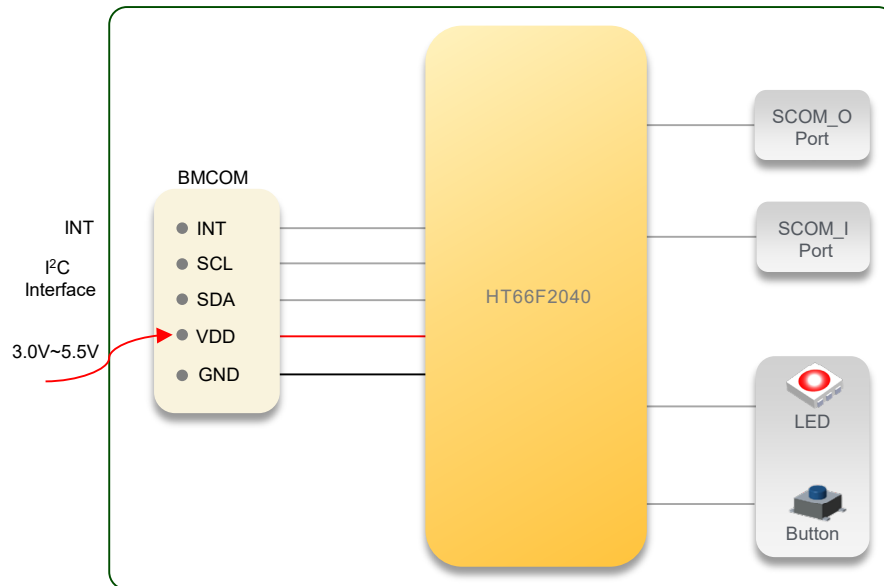
Pin Description
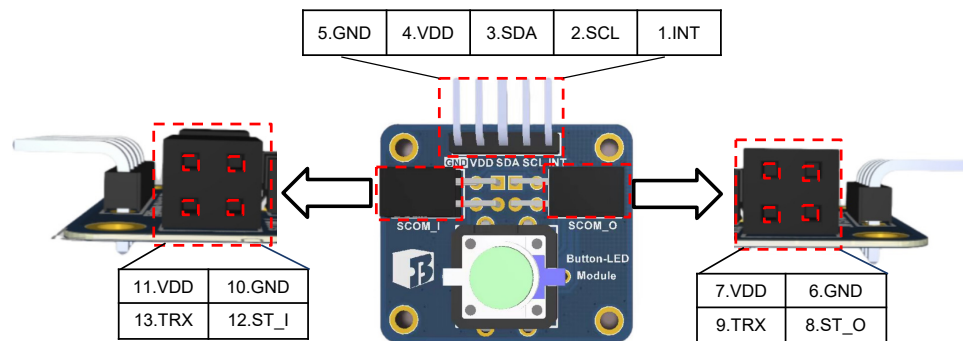
BMCOM pins:

Pin	Function	Description
1	INT	Interrupt pin
2	SCL	I²C clock line
3	SDA	I²C 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

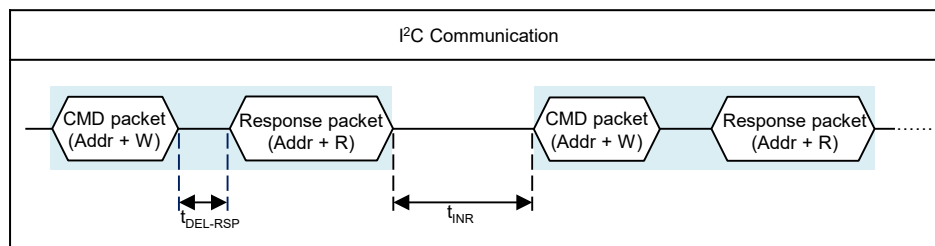# Technical Specifications

Recommended Operation Conditions

Ta=25°C

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

Timing Specification

Ta=25°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{DEL-RSP}$	Response Delay Time	V_{DD}=5V	—	7	—	ms
t_{INR}	Interval Time	V_{DD}=5V	—	2	—	ms

Hardware Overview

1. BMCOM
2. SOCM_I
3. Button&LED
4. SOCM_O

GND VDD SDA SCL INT

SCOM_I   SCOM_O

Button-LED Module

PCBA Front View

D C G V

6. Programming Port (Reserved)

5. MCU (HT66F2040)

Button-LED Module
BMK22M131
www.bestmodulescorp.com

PCBA Back View
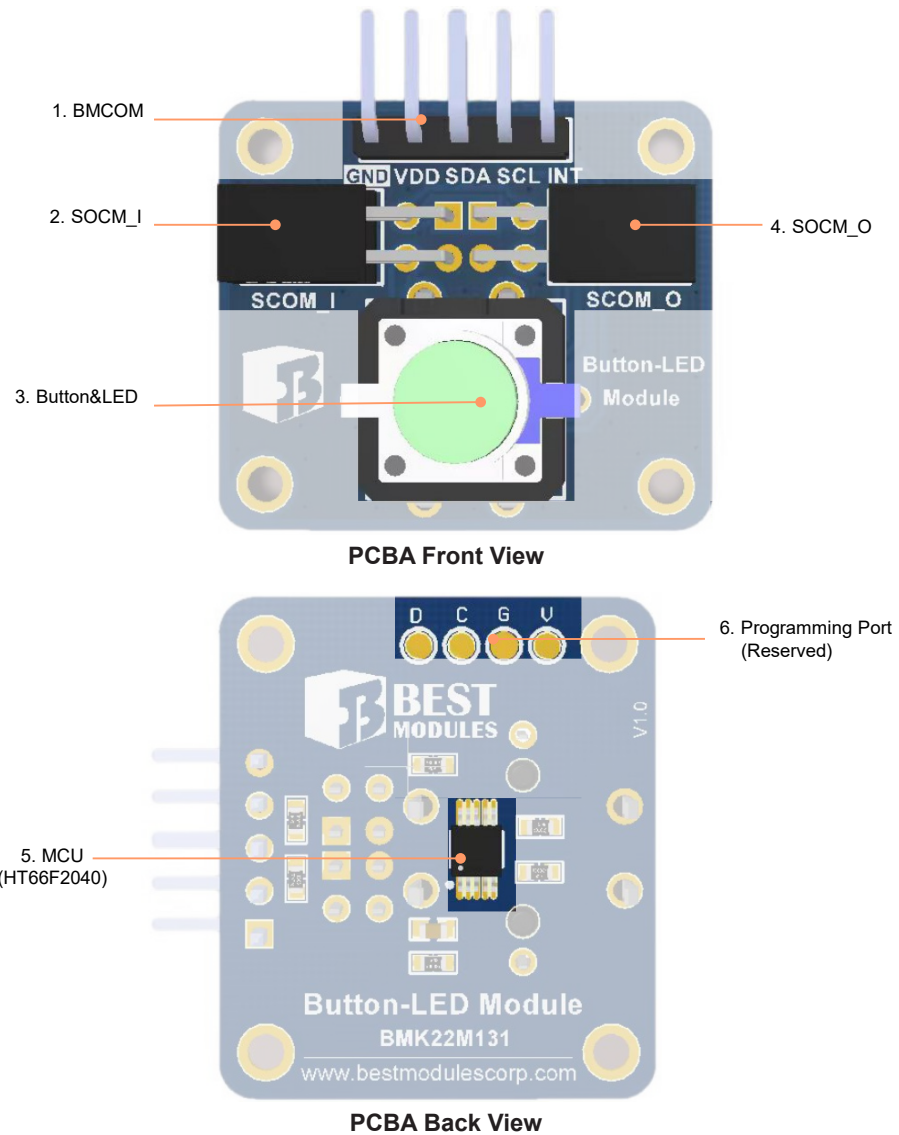
Power Supply
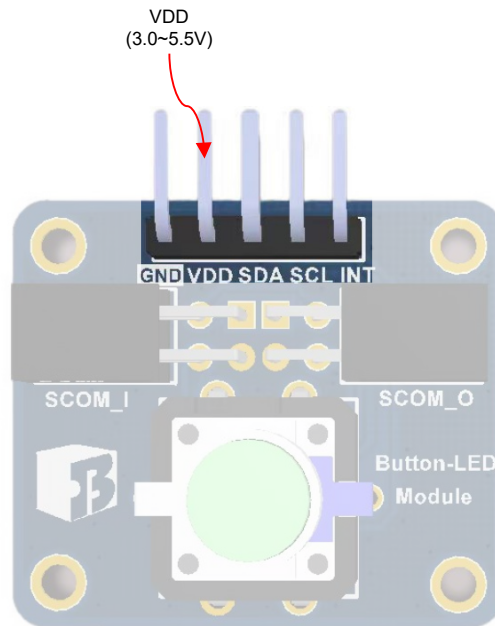
- BMCOM pin: Provided by the VDD input, 3.0V~5.5V

Communication Interface

- Communication method: I²C
- I²C address: 0x77

  I²C 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

- I²C communication rate: 5~100kHz
- Communication logic reference voltage: 3.0V~5.5V
- Module SCL/SDA pin with 4.7kΩ 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: I²C address read
- Addr+W: I²C 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≤N≤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_1: 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_1D_2: 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_1: Module number N D_2~D_{N+1}: Module 1~N button status 　0x00: No pressed 　0x01: Short press 　0x02: Long press	
	Get the N-th module button status		N	D_1: 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_1D_2: Long press recognition time, unit: ms	
4	Get the module cascade number	0x12	0	D_1: 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
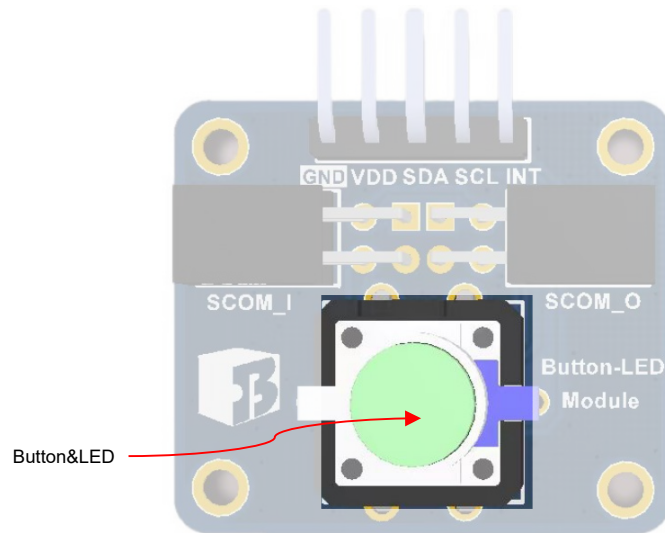
Button&LED

- 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

Connection Diagram
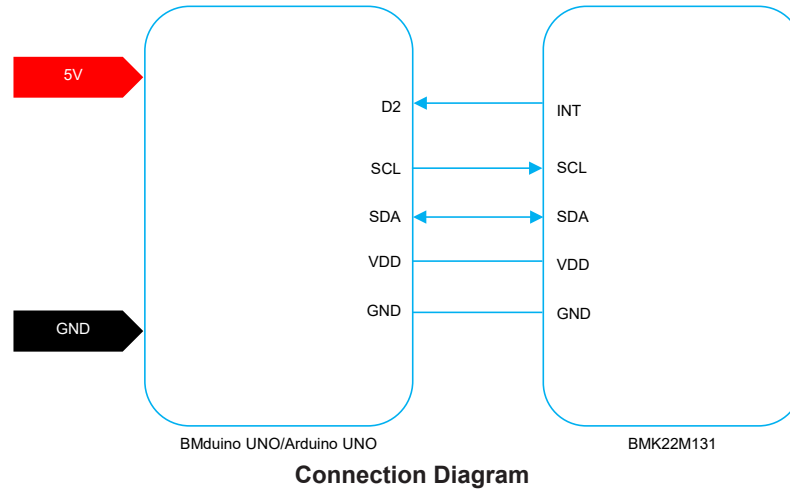
Multi-board Cascade

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:

Cascading Connection Diagram
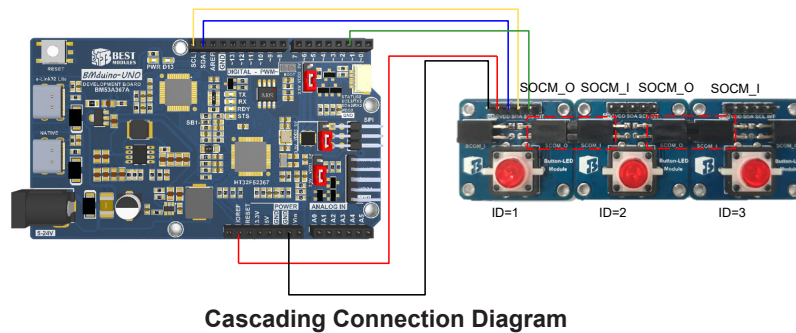
Note:

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
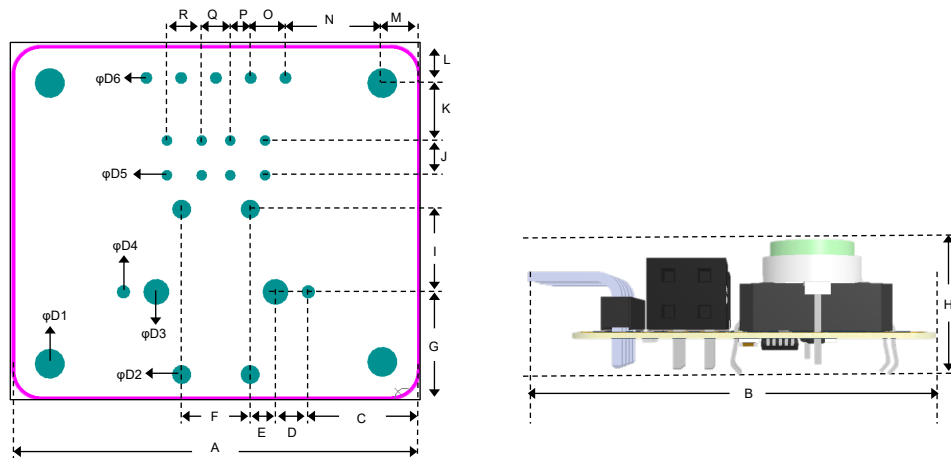
Dimension Information

Unit Symbol	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