



**BMduino-Shield  
Slide+4-Key Capacitive Touch**

# **BMK54T004 User Guide**

Revision: V1.10 Date: October 11, 2023

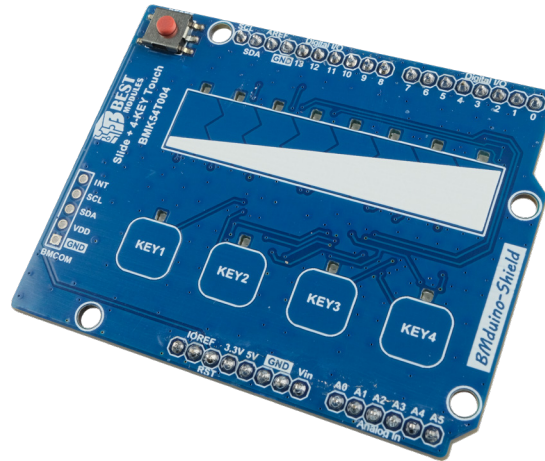
[www.bestmodulescorp.com](http://www.bestmodulescorp.com)

## Contents

<b>Introduction</b> .....	<b>3</b>
<b>Features</b> .....	<b>3</b>
<b>Block Diagram</b> .....	<b>4</b>
<b>Pin Description</b> .....	<b>4</b>
<b>Technical Specifications</b> .....	<b>6</b>
Recommended Operation Conditions .....	6
Timing Specification .....	6
<b>Hardware Overview</b> .....	<b>6</b>
Power Supply .....	7
INT Pin .....	7
Touch and LED Indicators .....	8
Communication Interface .....	8
Communication Protocol .....	9
<b>Application Circuit</b> .....	<b>10</b>
<b>Dimensions</b> .....	<b>11</b>

## Introduction

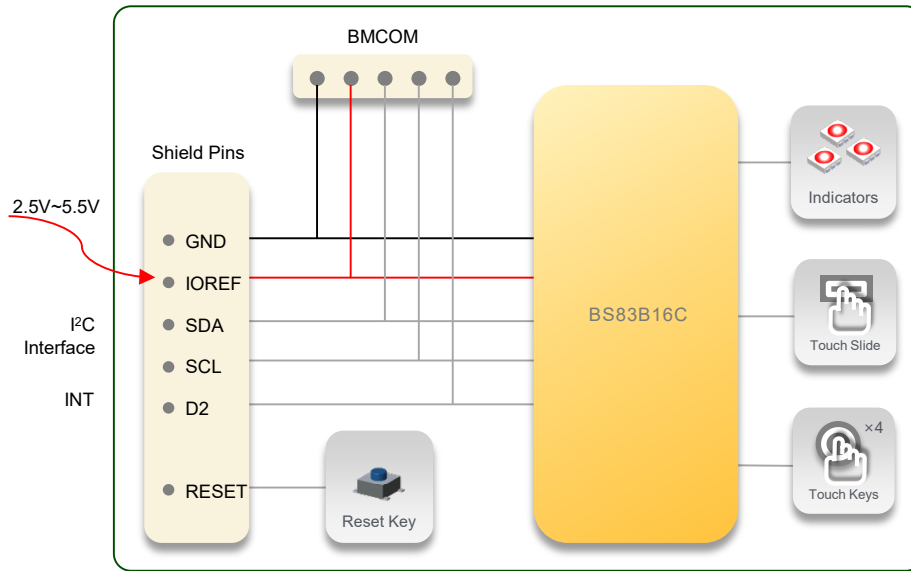
The Best Modules BMK54T004 is a shield board for slide+4-key capacitive touch function, which is developed using an MCU, the BS83B16C. Its principle is capacitive touch, using keys and slide in parallel layout. When a touch action occurs, the corresponding LED will be illuminated. The shield has the power saving function, which will automatically enter standby detection mode when no touch action occurs for a while. The shield can be directly plugged in-and-out of the BMduino UNO development board, to implement the touch sensitivity setting and reading, touch status reading as well as other functions using the I<sup>2</sup>C communication method. The shield is suitable for use in applications such as smart table lamps and touch keyboards.



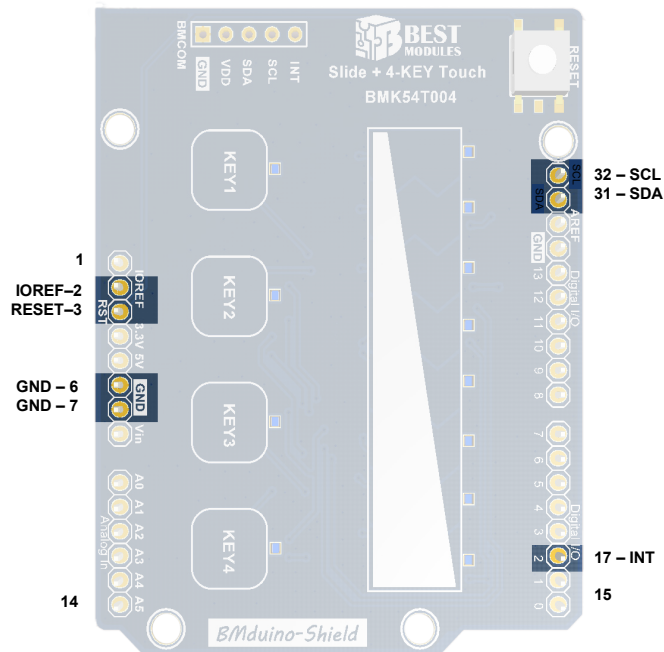
## Features

- Operating voltage: 2.5V~5.5V
- Operating current: 4mA @ 5V
- Standby current: < 30 $\mu$ A @ 5V
- MCU: BS83B16C
- Shield characteristics:
  - ◆ 4 touch keys, 1 slide, the corresponding LED is illuminated when a touch action occurs
  - ◆ 55-level adjustable touch key sensitivity (10~64), can be configured independently
  - ◆ RESET key to reset the BMduino UNO development board
- Communication interfaces:
  - ◆ BMduino interface can be plugged in-and-out of the BMduino UNO development board for use
  - ◆ BMCOM $\times$ 1 (INT, SCL, SDA, VDD, GND)
  - ◆ Communication method: I<sup>2</sup>C (address: 0x72)
- Provides Arduino Library support
- Board size: 67.0mm $\times$ 53.34mm $\times$ 11.43mm

## Block Diagram



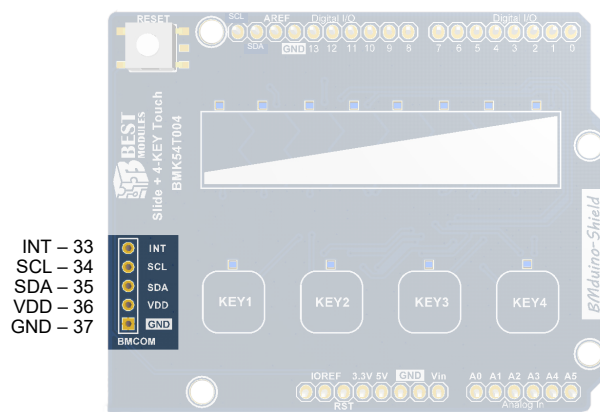
## Pin Description



BMduino-Shield Pins:

Pin	Function	BMduino Pin	Description
17	INT	D2	Interrupt pin High level: no touch action occurs Low level: touch action occurs
32	SCL	A5/D19/SCL	I <sup>2</sup> C clock line
31	SDA	A4/D18/SDA	I <sup>2</sup> C data line
2	VDD	IOREF	Positive power supply
3	RESET	RESET	Reset BMduino UNO development board
6 & 7	GND	GND	Negative power supply, ground

When the Shield is not directly plugged into the BMduino UNO development board, it can also be used as a module for communication via the BMCOM pins.



BMCOM Pins:

Pin	Function	Description
33	INT	Interrupt pin High level: no touch action occurs Low level: touch action occurs
34	SCL	I <sup>2</sup> C clock line
35	SDA	I <sup>2</sup> C data line
36	VDD	Positive power supply
37	GND	Negative power supply, ground

Note: The BMCOM pins are shared with the BMduino-Shield pins, both cannot be used simultaneously.

## Technical Specifications

### Recommended Operation Conditions

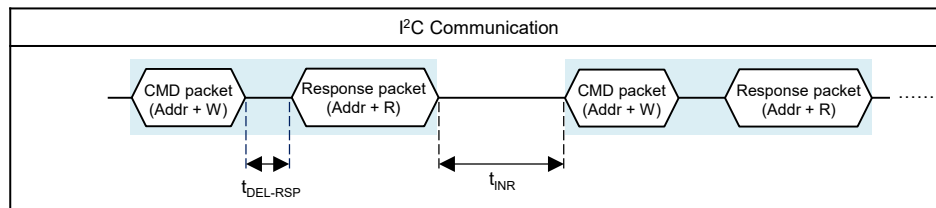
Ta=25°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	Operating Voltage	—	2.5	—	5.5	V
I <sub>DD</sub>	Operating Current	V <sub>DD</sub> =5V	—	4	—	mA
I <sub>STB</sub>	Standby Current	V <sub>DD</sub> =5V	—	—	30	μA
	Standby Time for No Operation	V <sub>DD</sub> =5V	—	8	—	s

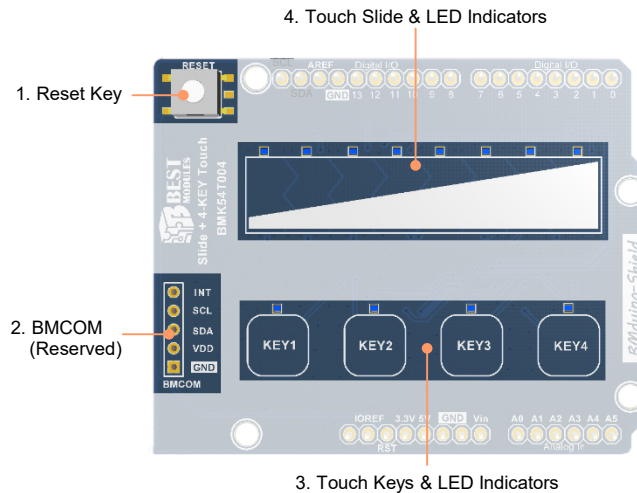
### Timing Specification

Ta=25°C

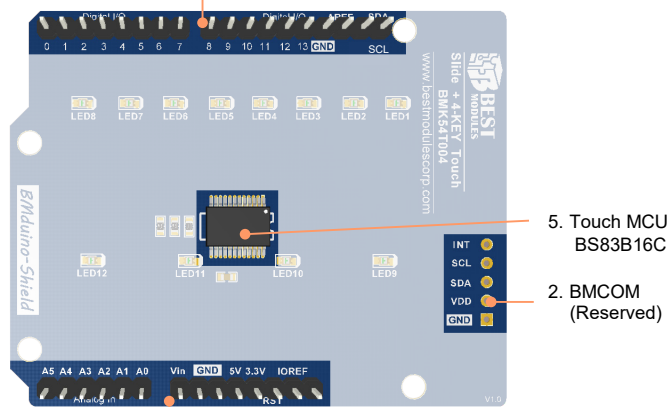
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
t <sub>DEL-RSP</sub>	Response Delay Time	V <sub>DD</sub> =3.3V	—	5	—	ms
t <sub>INR</sub>	Interval Time	V <sub>DD</sub> =3.3V	10	—	—	ms



## Hardware Overview

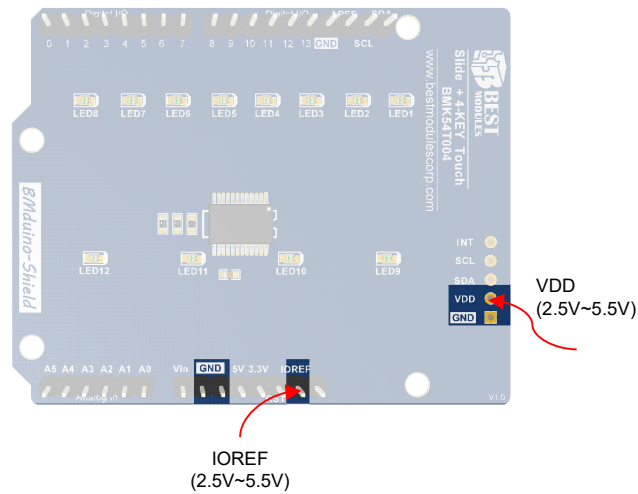


6a. BMduino-Shield Pins – Digital



6b. BMduino-Shield Pins – Power & Analog  
**PCBA Back View**

## Power Supply

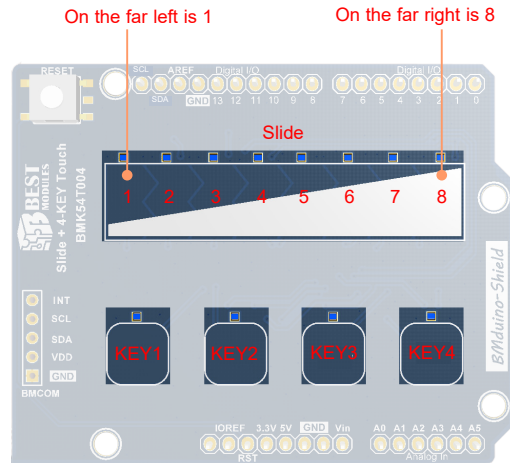


- BMduino-Shield pin: provided by the IOREF input, 2.5V~5.5V
- BCOM pin: provided by the VDD input, 2.5V~5.5V

## INT Pin

Shield	INT Level
No touch action occurs	High level
Touch action occurs	Low level

## Touch and LED Indicators



- When the shield board is powered on, it enters the standby mode. If a touch action occurs, the shield board will in the normal operation state. If no touch action occurs for 8s, the board will enter the standby detection mode again.
- KEY1~KEY4 touch keys correspond to LED9~LED12, touch slide position 1~8 correspond to LED1~LED8. When a touch action occurs, the corresponding LED will be illuminated.

	Corresponding LED	LED Status
Slide position 1~8	LED1~LED8	LED on when touch action occurs, otherwise LED off
KEY1~KEY4	LED9~LED12	

## Communication Interface

- Communication method: I<sup>2</sup>C
- I<sup>2</sup>C address: 0x72  
I<sup>2</sup>C address format:

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

Slave address (0x72)

Note: R/W = 1: Read direction  
= 0: Write direction

- I<sup>2</sup>C communication speed: ≤ 400kHz
- Communication logic reference voltage: 2.5V~5.5V
- Shield SCL/SDA pin uses MCU internal pull-up resistor

## Communication Protocol

There are two instruction frame formats, known as data write instruction frame and data read instruction frame.

### • Data write instruction frame

Start Signal	Address (Addr+W)	Command (CMD)	Data (D <sub>1</sub> ~D <sub>N</sub> )	Stop Signal
1-bit	1-byte	1-byte	N-byte	1-bit

Frame content introduction:

- ◆ Start Signal: Start bit signal
- ◆ Address (Addr+W): I<sup>2</sup>C address write
- ◆ Command (CMD): Each command code corresponds to a different function
- ◆ Data (D<sub>1</sub>~D<sub>N</sub>): Data
- ◆ Stop Signal: Stop bit signal

### • Data read instruction frame

Start Signal	Address (Addr+W)	Command (CMD)	Start Signal	Address (Addr+R)	Data (D <sub>1</sub> ~D <sub>N</sub> )	Stop Signal
1-bit	1-byte	1-byte	1-bit	1-byte	N-byte	1-bit

Frame content introduction:

- ◆ Address (Addr+R): I<sup>2</sup>C address read

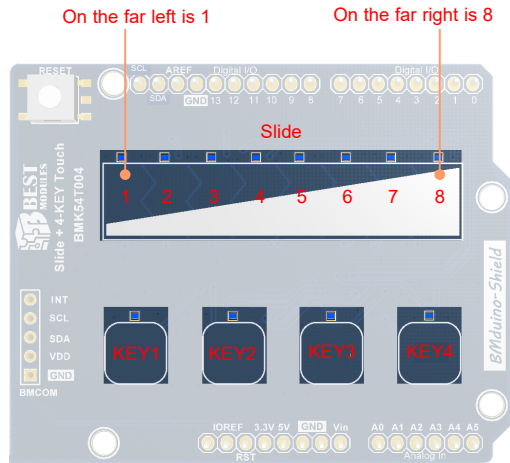
### • Data Write Instruction Set

No.	Function Description	Command (CMD)	Data (D <sub>1</sub> ~D <sub>N</sub> )	Note
1	Set the touch threshold	0xD8	D <sub>1</sub> ~D <sub>8</sub> : Slide position 1~8 touch threshold D <sub>9</sub> ~D <sub>12</sub> : KEY1~KEY4 touch threshold D <sub>13</sub> : checksum=sum of D <sub>1</sub> ~D <sub>12</sub>	The smaller the touch threshold value, the higher the sensitivity, range: 10~64

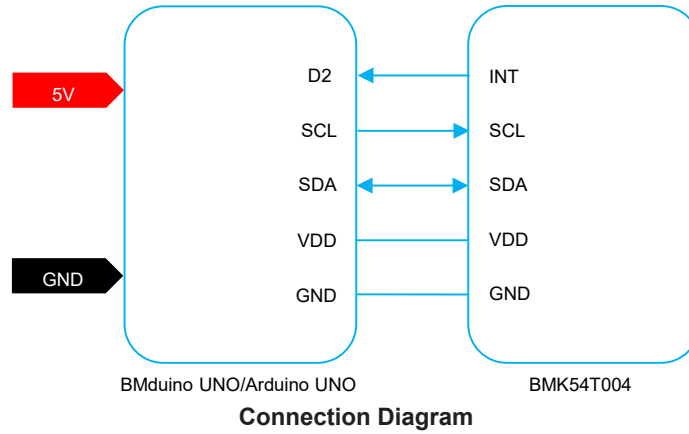
### • Data Read Instruction Set

No.	Function Description	Command (CMD)	Response Data (D <sub>1</sub> ~D <sub>N</sub> )	Note
1	Obtain the touch threshold	0xD8	D <sub>1</sub> ~D <sub>8</sub> : Slide position 1~8 touch threshold D <sub>9</sub> ~D <sub>12</sub> : KEY1~KEY4 touch threshold	
2	Obtain the touch key status	0x0E	D <sub>1</sub> : KEY1~KEY4 touch status (bit0~bit3 correspond to KEY1~KEY4) bit=0: no key pressed bit=1: key pressed bit4~bit7: reserved	
3	Obtain the touch slide status	0x0D	D <sub>1</sub> : Slide position 1~8 touch status (1~8 stand for slide position 1~8) 0: no slide pressed N: slide position N pressed	On the far left is slide position 1 On the far right is slide position 8

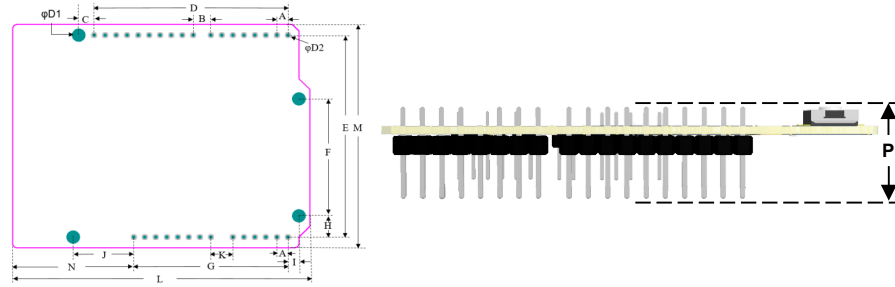
Note: 1. When setting the touch threshold, it should ensure that 12 touch thresholds and checksum (1-byte) must be continuously written.  
 2. The key and slide positions are shown below:



## Application Circuit



## Dimensions



**Dimension Information**

Symbol	Unit	mm	inch
A		2.540	0.100
B		4.064	0.160
C		3.556	0.140
D		44.70	1.760
E		48.26	1.900
F		27.94	1.100
G		35.56	1.400
H		5.080	0.200
I		2.540	0.100
J		13.97	0.550
K		5.080	0.200
L (Board Length)		67.00	2.638
M (Board Width)		53.34	2.100
N		26.40	1.039
D1		3.200	0.126
P		11.43	0.45

**Dimension List**

Copyright© 2023 by BEST MODULES CORP. All Rights Reserved.

The information provided in this document has been produced with reasonable care and attention before publication, however, BEST MODULES does not guarantee that the information is completely accurate. The information contained in this publication is provided for reference only and may be superseded by updates. BEST MODULES disclaims any expressed, implied or statutory warranties, including but not limited to suitability for commercialization, satisfactory quality, specifications, characteristics, functions, fitness for a particular purpose, and non-infringement of any third-party's rights. BEST MODULES disclaims all liability arising from the information and its application. In addition, BEST MODULES does not recommend the use of BEST MODULES' products where there is a risk of personal hazard due to malfunction or other reasons. BEST MODULES hereby declares that it does not authorise the use of these products in life-saving, life-sustaining or safety critical components. Any use of BEST MODULES' products in life-saving/sustaining or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold BEST MODULES harmless from any damages, claims, suits, or expenses resulting from such use. The information provided in this document, including but not limited to the content, data, examples, materials, graphs, and trademarks, is the intellectual property of BEST MODULES (and its licensors, where applicable) and is protected by copyright law and other intellectual property laws. No license, express or implied, to any intellectual property right, is granted by BEST MODULES herein. BEST MODULES reserves the right to revise the information described in the document at any time without prior notice. For the latest information, please contact us.