BMduino-Shield
Slide+4-Key Capacitive Touch

BMK54T004
User Guide

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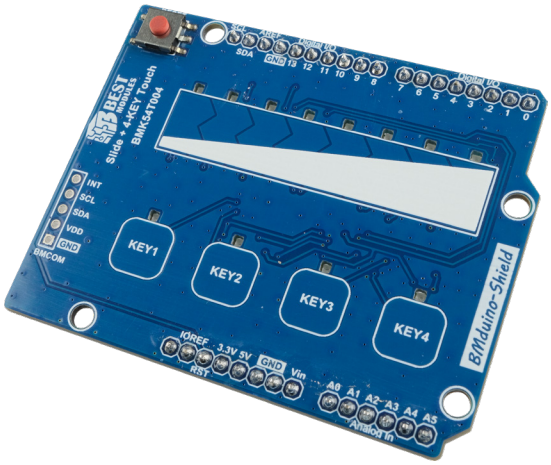
www.bestmodulescorp.com

Contents

Introduction

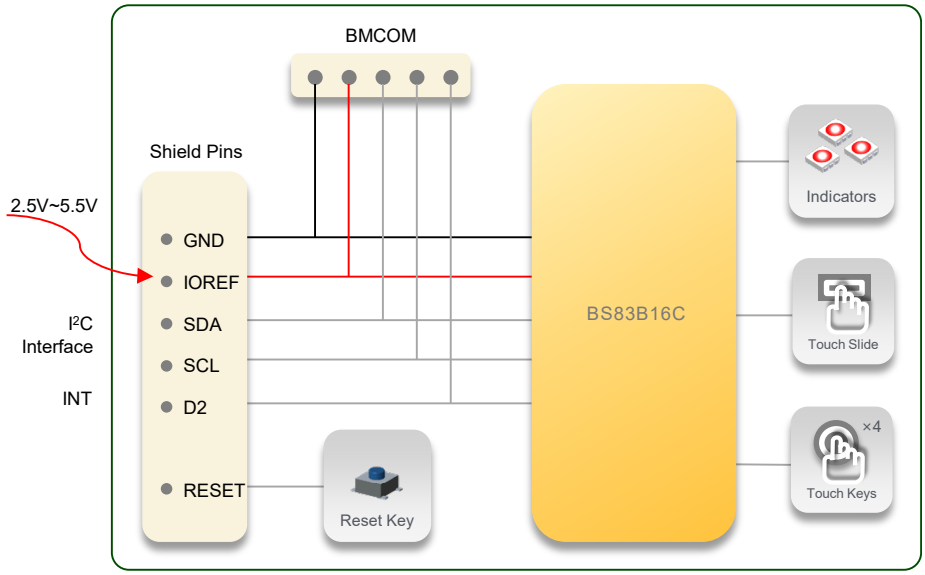
The Best Modules BMK54T004 is a shield board for slide+4-key capacitive touch function, which is developed using an MCU, the BS83B16C. Its principle is capacitive touch, using keys and slide in parallel layout. When a touch action occurs, the corresponding LED will be illuminated. The shield has the 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 I²C communication method. The shield is suidable for use in applications such as smart table lamps and touch keyboards.



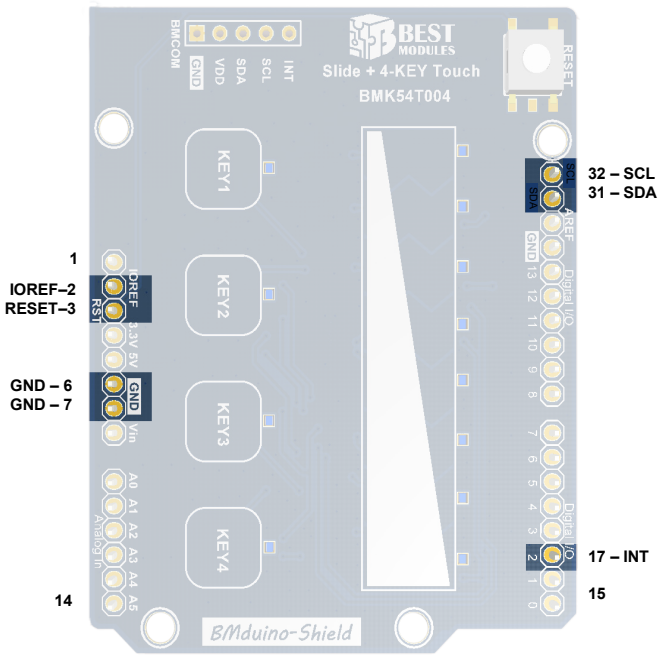
Features

- Operating voltage: 2.5V~5.5V
- Operating current: 4mA @ 5V
- Standby current: < 30μA @ 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×1 (INT, SCL, SDA, VDD, GND)
  - ♦ Communication method: I²C (address: 0x72)
- Provides Arduino Library support
- Board size: 67.0mm×53.34mm×11.43mm

Block Diagram



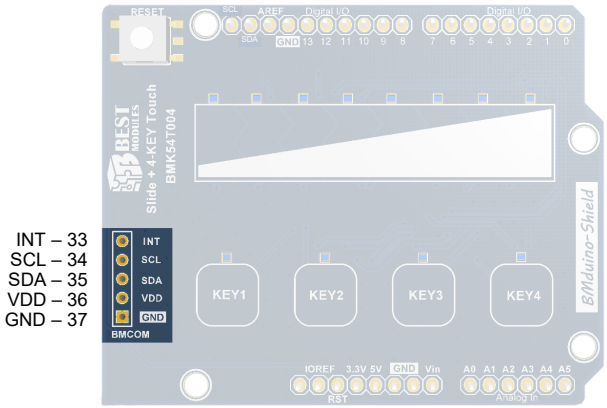
Pin Description



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	I²C clock line
31	SDA	A4/D18/SDA	I²C 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	I²C clock line
35	SDA	I²C 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

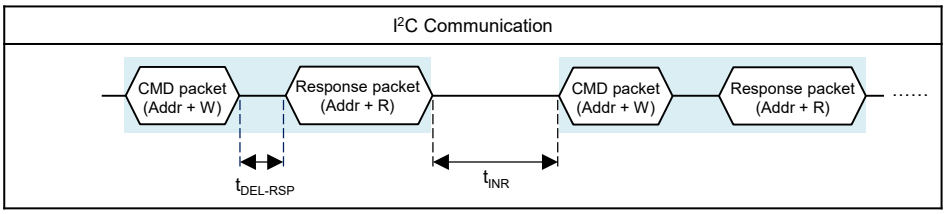
Ta=25°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Operating Voltage	—	2.5	—	5.5	V
I_{DD}	Operating Current	V_{DD}=5V	—	4	—	mA
I_{STB}	Standby Current	V_{DD}=5V	—	—	30	μA
	Standby Time for No Operation	V_{DD}=5V	—	8	—	s

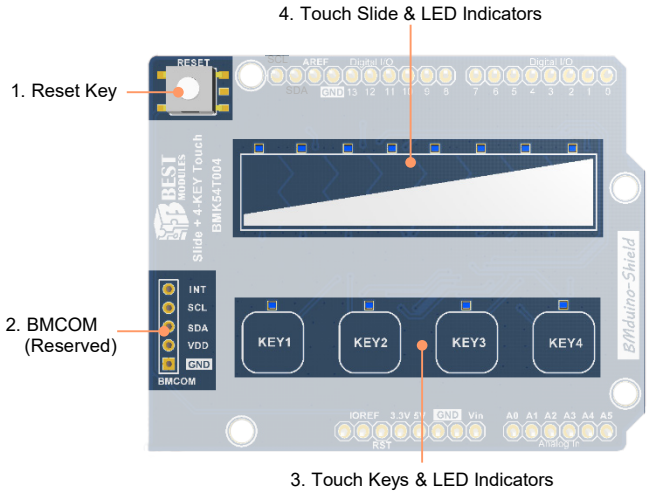
Timing Specification

Ta=25°C

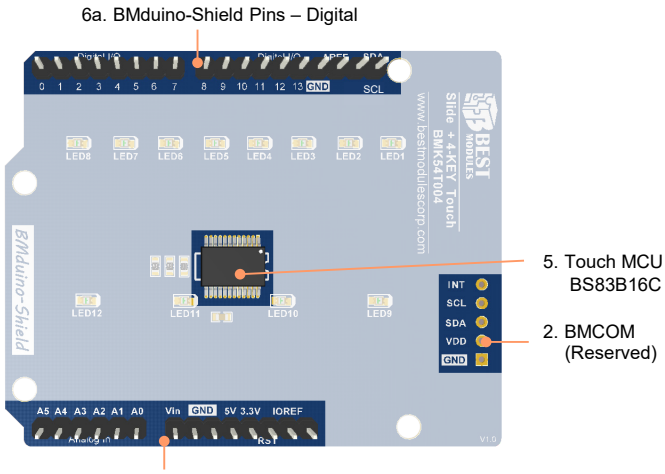
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{DEL-RSP}$	Response Delay Time	V_{DD}=3.3V	—	5	—	ms
t_{INR}	Interval Time	V_{DD}=3.3V	10	—	—	ms



Hardware Overview

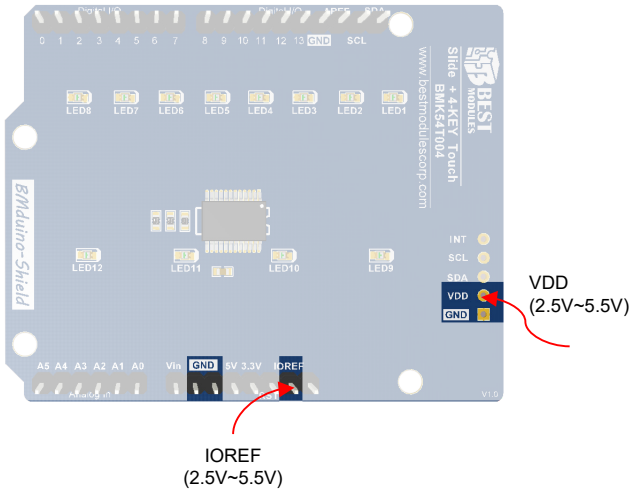


PCBA Front View



PCBA Back View

Power Supply

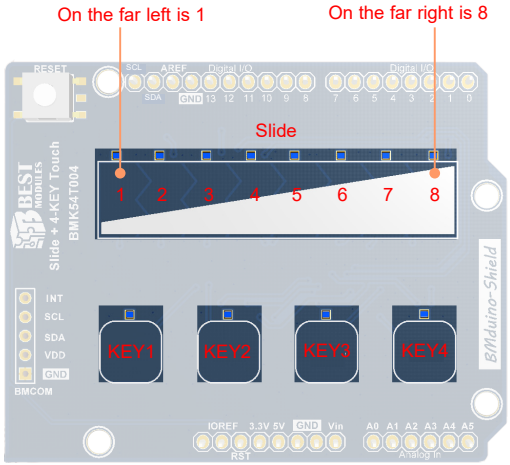


- BMduino-Shield pin: provided by the IOREF input, 2.5V~5.5V
- BMCOM pin: provided by the VDD input, 2.5V~5.5V

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: I²C
- I²C address: 0x72
  I²C 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

- I²C 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_1~D_N)	Stop Signal
1-bit	1-byte	1-byte	N-byte	1-bit

Frame content introduction:

- Start Signal: Start bit signal
- Address (Addr+W): I^2C address write
- Command (CMD): Each command code corresponds to a different function
- Data (D_1~D_N): Data
- Stop Signal: Stop bit signal

• Data read instruction frame

Start Signal	Address (Addr+W)	Command (CMD)	Start Signal	Address (Addr+R)	Data (D_1~D_N)	Stop Signal
1-bit	1-byte	1-byte	1-bit	1-byte	N-byte	1-bit

Frame content introduction:

- Address (Addr+R): I^2C address read

• Data Write Instruction Set

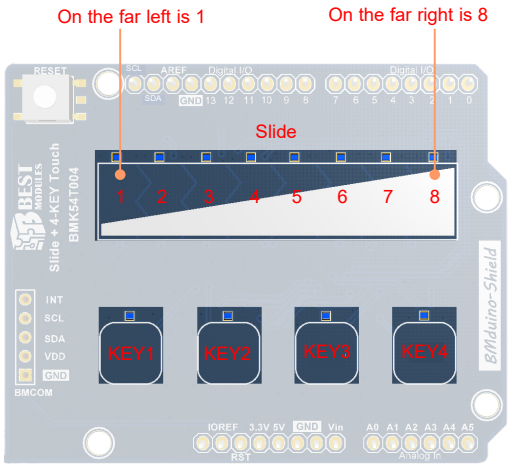
No.	Function Description	Command (CMD)	Data (D_1~D_N)	Note
1	Set the touch threshold	0xD8	D_1~D_8: Slide position 1~8 touch threshold D_9~D_{12}: KEY1~KEY4 touch threshold D_{13}: checksum=sum of D_1~D_{12}	The smaller the touch threshold value, the higher the sensitivity, range: 10~64

• Data Read Instruction Set

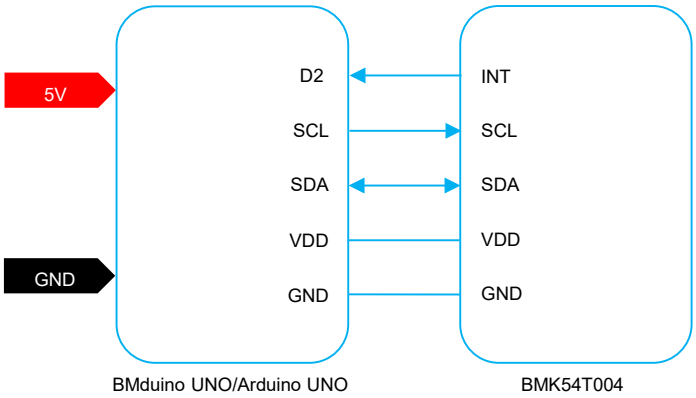
No.	Function Description	Command (CMD)	Response Data (D_1~D_N)	Note
1	Obtain the touch threshold	0xD8	D_1~D_8: Slide position 1~8 touch threshold D_9~D_{12}: KEY1~KEY4 touch threshold	
2	Obtain the touch key status	0x0E	D_1: KEY1~KEY4 touch status (bit0~bit3 correspond to KEY1~KEY4) bit=0: no key pressed bit=1: key pressed bit4~bit7: reserved	
3	Obtain the touch slide status	0x0D	D_1: 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:

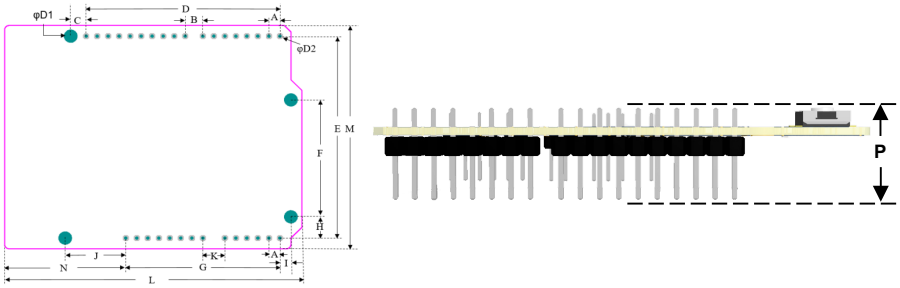


Application Circuit



Connection Diagram

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