4-Digit Digital Tube Module

BMD11M134
User Guide

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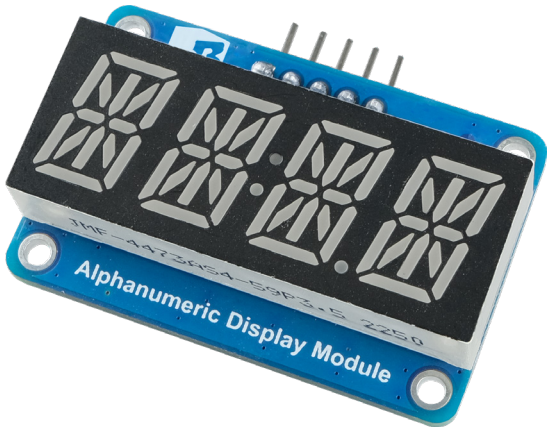
www.bestmodulescorp.com

Contents

Introduction

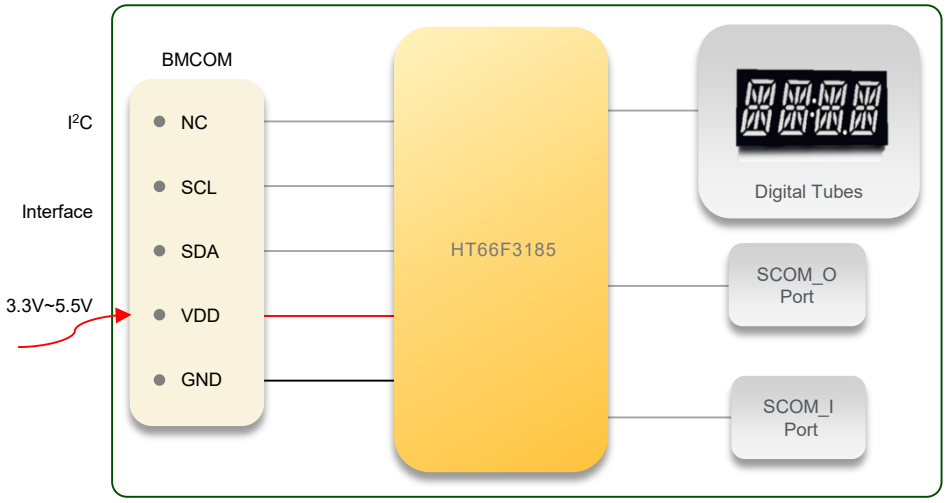
The Best Modules BMD11M134 is a 4-digit digital tube module, which is developed by using an MCU, the HT66F3185. This module can display numbers, most of the letters and some special characters. In addition, multiple modules can be cascaded. It uses the I²C communication method through the BMCOM interface to implement digital tube display function, etc. It is suitable for use in applications such as electronic counting and counters.



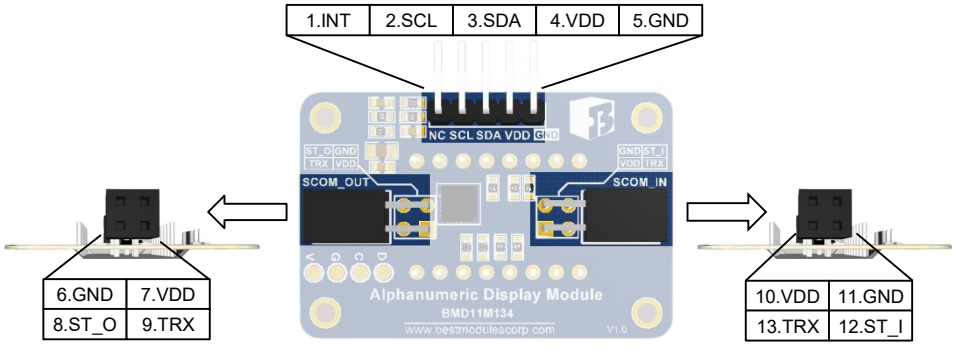
Features

- Operating voltage: 3.3V~5.5V
- Operating current: 24.6mA @ 3.3V (All digital tubes will be illuminated)
- MCU: HT66F3185
- Digital tube:
  - 4-digit " " shaped digital tube with a decimal point and a colon
  - Displays numbers, most of the letters and some special characters
- Cascade interface:
  - SCOM_I×1 (GND, VDD, ST_I, TRX)
  - SCOM_O×1 (GND, VDD, ST_O, TRX)
  - Cascade maximum number: 4
- Communication interface:
  - BMCOM×1 (NC, SCL, SDA, VDD, GND)
  - Communication method: I²C (Address: 0x2C)
- Provides Arduino Library support
- Module size: 40.47mm×26.61mm×14.92mm

Block Diagram



Pin Description



BMCOM pins:

Pin	Function	Description
1	NC	—
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

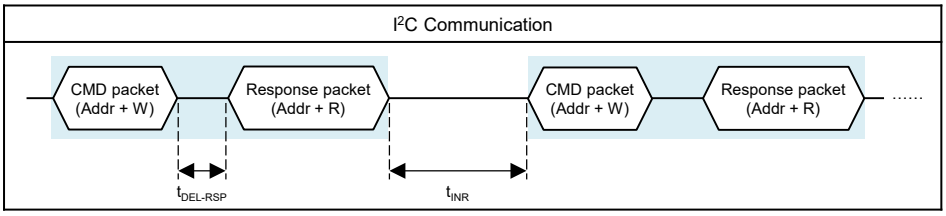
Ta=25°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Operating Voltage	—	3.3	5.0	5.5	V
I_{DD}	Operating Current	V_{DD}=3.3V, all digital tubes off	—	0.92	—	mA
		V_{DD}=3.3V, all digital tubes on	—	24.6	—	mA
	Cascade Number	—	1	—	4	

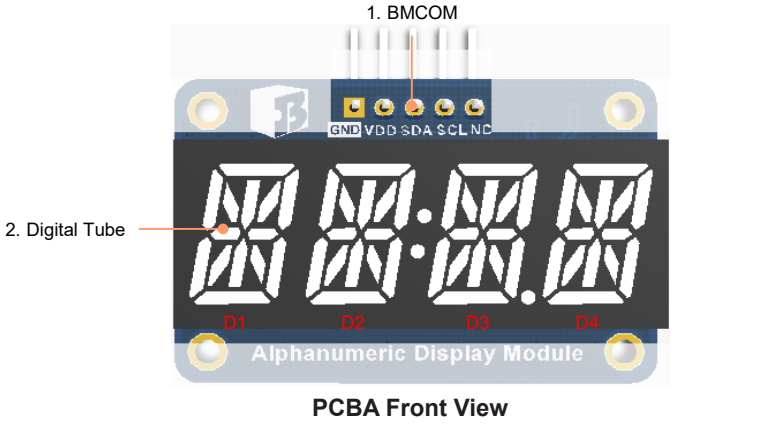
Timing Specification

Ta=25°C

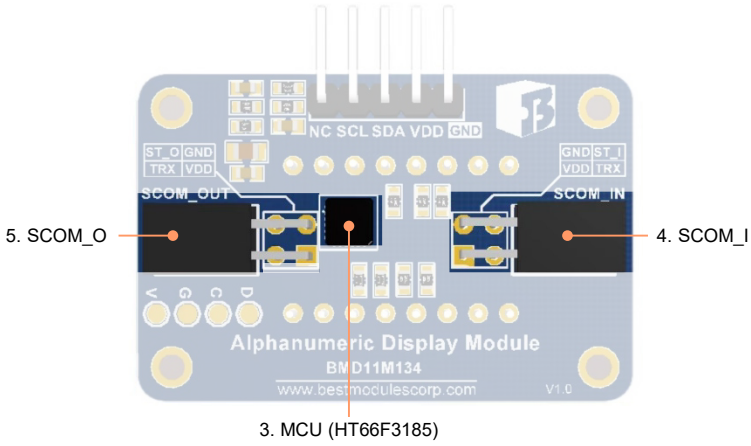
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{DEL-RSP}$	Response Delay Time	V_{DD}=5V	10	—	—	ms
t_{INR}	Interval Time	V_{DD}=5V	—	10	—	ms



Hardware Overview

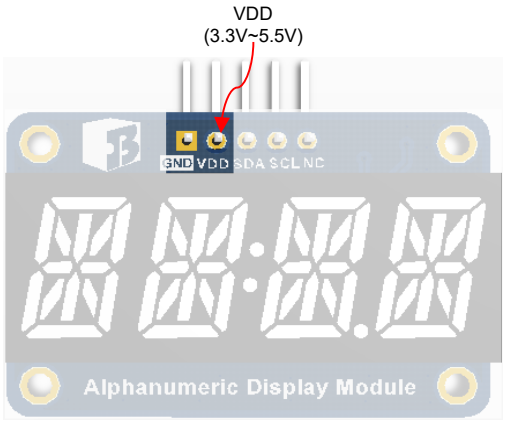


PCBA Front View



PCBA Back View

Power Supply



- BMCOM pin: Provided by the VDD input, 3.3~5.5V.

Communication interface

- Communication method: I²C
- I²C address: 0x2C
  I²C address format:

MSB LSB

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

Slave address (0x2C)

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

- Communication logic reference voltage: 3.3V~5.5V
- Module SCL/SDA pin with an interal 4.7kΩ pull-up resistor

Communication Protocol

There are two instruction frame formats: parameter setting instruction frame and parameter read instruction frame

Parameter Setting Instruction Frame

- **Master → Slave**

Start	Addr+W	MID	ID	LEN	CMD	Data	CheckSum	Stop
1-bit	1-byte	0x2C	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	0x2C	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, the MIDs of the different type modules are different. For this module, MID=0x2C
- ID: It is automatically assigned when the same modules are cascaded
  – ID=N: Cascade Nth module (1≤N≤4)
- LEN: Byte strength of CMD/Status, Data and CheckSum
- CMD: Command code, each command code corresponds to a different function
- Status: Command execution result
  – 0x00: Instruction is completed
  – 0x40: CheckSum error
  – 0x80: Instruction is not supported
  – 0x0A: Cascade slaves do not respond
- Data: Data
- CheckSum: CheckSum=MID+ID+LEN+CMD/Status+Data
- Stop: Stop bit signal

Parameter Read Instruction Frame

- **Master → Slave**

Start	Addr+W	MID	ID	LEN	CMD	CheckSum	Stop
1-bit	1-byte	0x2C	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	0x2C	1-byte	1-byte	1-byte	N-byte	1-byte	1-bit

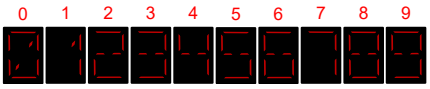
Parameter Setting Instruction Set

No.	Function Description	CMD	Data	Note
1	Update the digital tube display	0x02	D_1~D_4: ASCII codes (Note) displayed by the 4-digit digital tube D5: Decimal point and colon bit0: Display colon bit0=0: Do not display bit0=1: Display bit1: Display decimal point bit1=0: Do not display bit1=1: Display	
2	Set the brightness	0x03	D1: Brightness level parameter, ranging from 0 to 2 0: Level 1 (Darker) 1: Level 2 2: Level 3 (Lighter)	

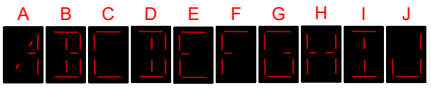
Note:

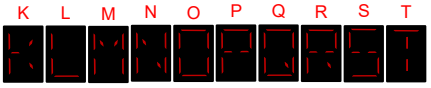
The following characters are supported to be displayed for this module:

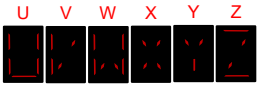
- Arabic numbers: 0~9



- All the English uppercase letters: A~Z

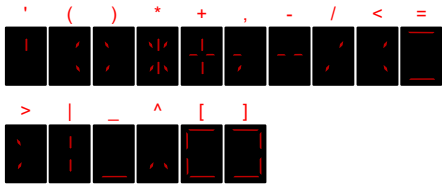






- Part of the English lowercase letters: a~e, g~i, m~o, u, w, y

- Some special characters: ' ( ) * + , - / < = > | _ ^ [ ]

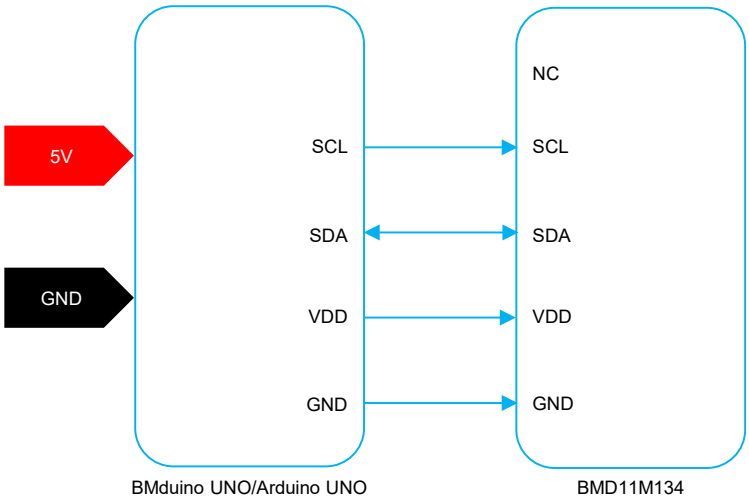


If other unidentifiable characters are input, all the digital tubes of this digit will be illuminated.

Parameter Obtain Instruction Set

No.	Function Description	CMD	Response Data	Note
1	Obtain the cascade module number	0x01	Cascade module number	ID=1
2	Obtain the module firmware version	0x04	Module firmware version	

Application Circuit



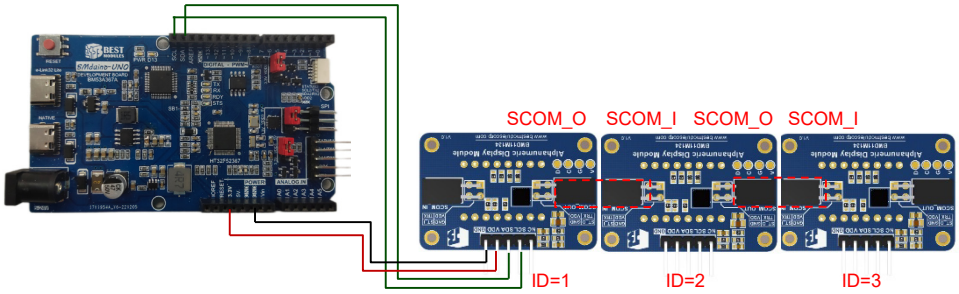
Connection Diagram

Multi-board Cascade

The cascade module number can be up to 4, the corresponding ID=1~4. The cascade ID value of the module connected directly to the BMduino UNO development board is one.

Multiple modules are cascaded by using a 2.54mm, double-row, 2P and male-to-male DuPont line or pin headers in series. The former module SCOM_O interface should be connected to the latter module SCOM_I interface.

Take the case of three modules cascading as an example:

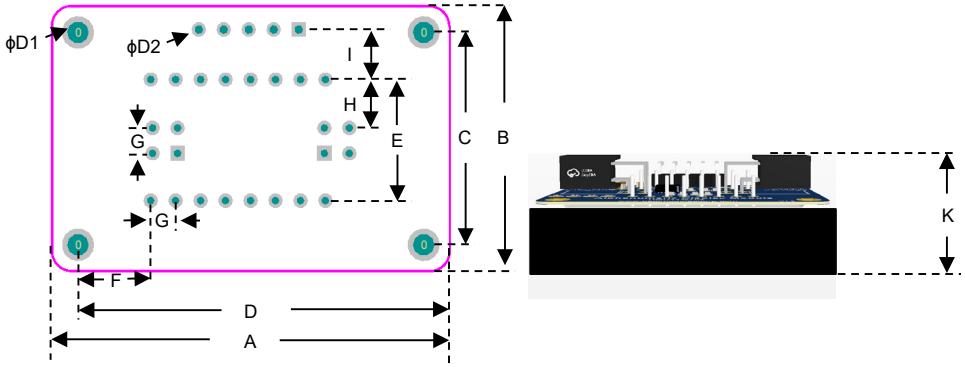


Cascade Diagram

Note:

1. The module ID is only assigned once when the overall modules are initially powered on, it should be ensured that the cascade module connection is completed before power-on, otherwise it will affect the module ID assignment. Modules cannot be plugged in and out during use.
2. When cascading multiple modules, the SCOM_I and SCOM_O interfaces should be connected. The module that is connected to the host has an ID of 1. This module SCOM_O interface should be connected to the next module SCOM_I interface. When connecting two modules, pay attention to the connection to ensure that there is no wrong connection.

Dimensions



Dimension Information

Symbol \ Unit	mm	inch
A	40.47	1.590
B	26.61	1.047
C	21.31	0.840
D	35.16	1.380
E	12.15	0.480
F	7.30	0.290
G	2.54	0.100
H	4.87	0.190
I	5.01	0.200
D1	2.20	0.0866
D2	1.50	0.059
K	14.92	0.587

Dimension List