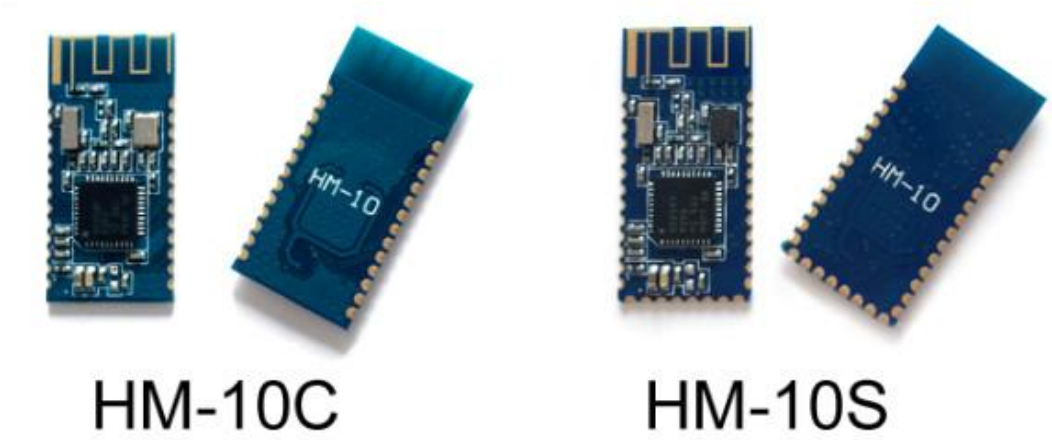
HM-10 BLE 4.0 Bluetooth Module

Introduction

The HM-10 is a small 3.3v SMD Bluetooth 4.0 BLE module based on the TI CC2540 or CC2541 Bluetooth SOC (System On Chip). The HM-10 is made by Jinan Huamao and is one of many Bluetooth devices they produce including the HM-11 which is operationally the same as the HM-10 but has a smaller footprint with fewer pins broken out.

There are 2 versions of the HM-10; the HM-10C and the HM-10S



The HM-10C does not have the pads along the bottom (the USB connections) and has 26 pads instead of 34 which makes it a little cheaper to produce. There may be other differences (such as the type of crystal used) due to the date of manufacture. Operationally the two are the same though.

HM-10 Basic specs

- +2.5v to +3.3v
- Requires up to 50mA
- Uses around 9mA when in an active state
- Use 50-200uA when asleep
- RF power: -23dbm, -6dbm, 0dbm, 6dbm
- Bluetooth version 4.0 BLE
- Default baud rate for the serial connection is 9600
- Default PIN is 000000
- Default name is HMSoft
- Based on the CC2540 or the CC2541 chip

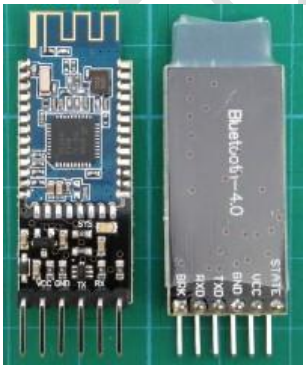
The latest HM-10s all appear to the the CC2541 chip. This is the same as the CC2540 except it is lower power and has a shorter range. The CC254x is based on the 8051 and runs at 32MHz.

The HM-10 is has become a very popular Bluetooth 4 BLE module for use with the Arduino. In part due to the standard UART serial connection that makes it fairly straight forward to connect to an Arduino. The UART layer is a good thing and a bad thing, it allows ease of use but it hides the BLE layer so you have no control over the actual BLE side of things. The HM-10 is Bluetooth version 4.0 only. This means it cannot connect to Bluetooth 2/2.1 modules such as the HC-06 and HC-05.

The HM-10 is controlled via AT commands which are sent over the serial UART connection. There are a host of commands, some simple, some more complex, and these are covered later.

HM-10 on a breakout board

The HM-10 is also available mounted to a breakout board that exposes the power and UART connections to breadboard friendly male pins. The breakout board includes a 3.3v power regulator that makes them 5V compatible. This makes them ideal for hobbyists like me. You should note that the RX pin is is still 3.3v and when using a 5v Arduino you should covert the Arduino's 5v TX to 3.3v for the HM-10 RX.



Pin	Description
STATE	Connection status LOW when not connected. HIGH when connected
VCC	Power in. 3.6v to 6v
GND	Common ground
TXD	Serial UART transmit
RXD	Serial UART receive
BRK	Break pin. When there is an active connection, bringing the BRK pin LOW breaks the connection

On board LED

- The on board LED blinks when waiting for connection. It blinks half a second on, half a second off.
- The LED becomes solid on when a connection is made and returns to blinking when the connection is broken.
- The LED changes to solid on when pairing. After pairing it returns to flashing. It basically makes a connection to pair and so turns on the LED to show the connection status.
- After pairing is completed the connection is closed and the LED is turned off.
- The behavior of the LED can be changed using the PIO1 command.
- "AT+PIO10″ – Default setting. When not connected the LED blinks 500ms on, 500ms off. When connected the LED is solid on.
- "AT+PIO11″ – When not connected the LED is off. When connected the LED is solid on.

STATE Pin

The STATE pin is LOW when this is connection and goes HIGH when a connections is established.

BRK Pin

The BRK pin allows you to cancel a connection. When there is an active connection, bringing the BRK pin momentarily LOW breaks the connection. When there is no connection making the BRK HIGH or LOW has no effect. Although not strictly required, pulling the BRK pin HIGH for normal use will stop the pin floating.