

# HM-100

## Overview

HM-100 is a serial port BLE module. It is based on TI's CC2541 BLE chip. With it you can transfer data wirelessly and do remote control. It can replace HC-05, HC-06, HC-07 and HM-10. It supports both central mode and peripheral mode on one module. And It supports remote control to the other side which is connected, like GPIO control and ADC. You can use custom commands when you combine it with other devices. And of course without complex PCB layout or deep knowledge about BLE, you can easily put it in your own SOCs.

Note:

- The serial interface is 3.3V, not the typical 5V as on many Arduino boards - anyone using an alternative to the Foca board must take note not to risk damage.

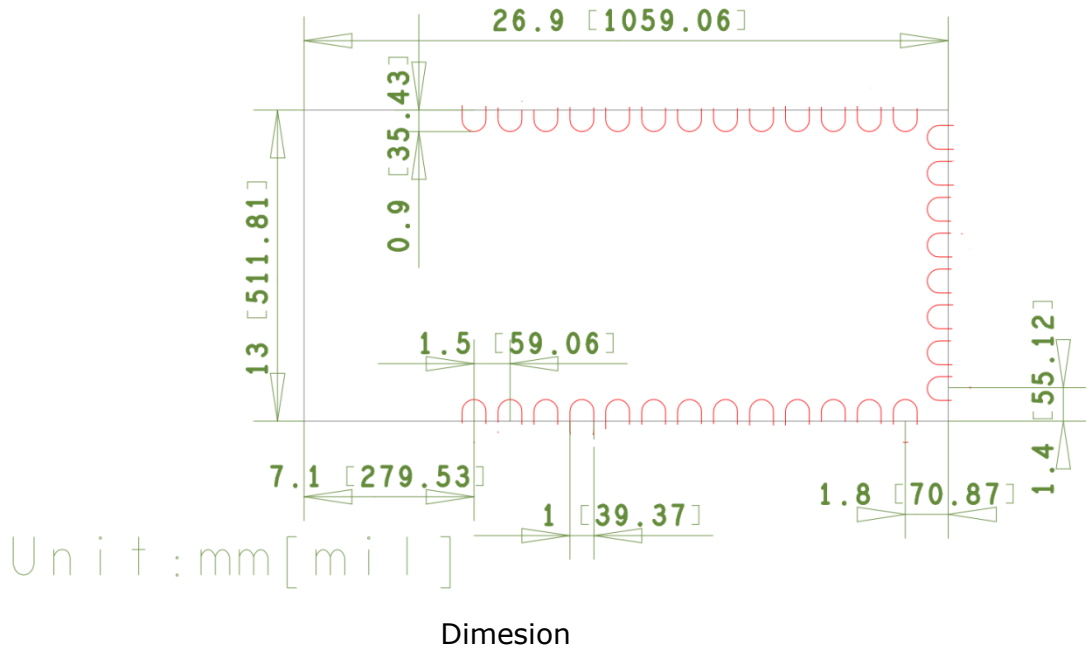
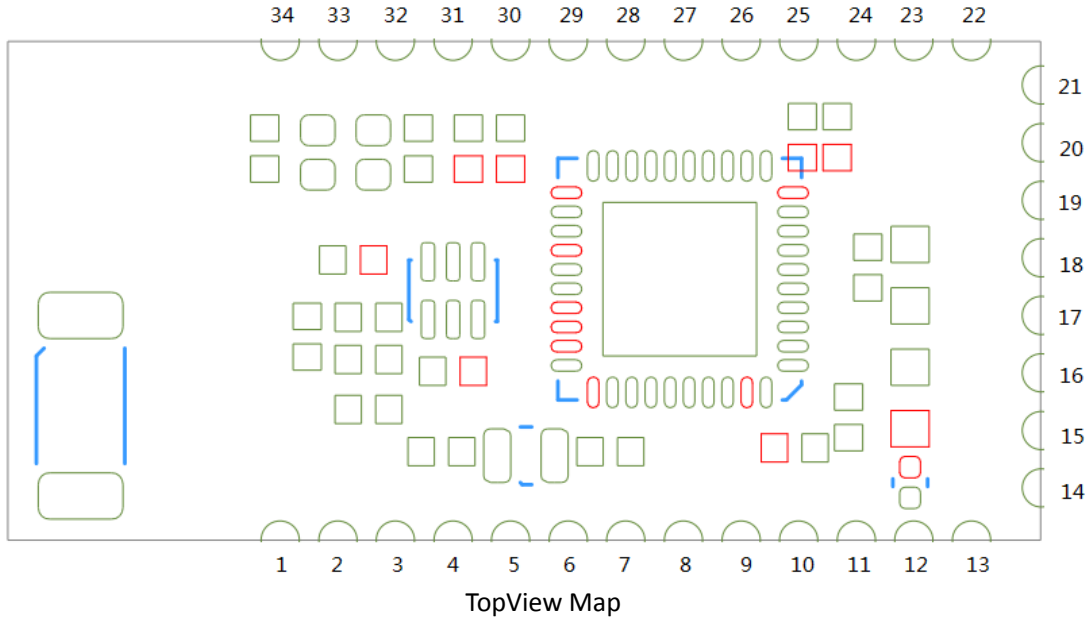
## Specifications

PCB size	26.9mm X 13.0mm X 1.0mm
Power supply	3.0~3.3V DC
Microprocessor	CC2541

## Electrical Characteristics

Specification	Min	Type	Max	Unit
Power Voltage	3	-	3.3	VCC
Input Voltage VH   Target Voltage = 3.3V	3	3.3	3.3	V
Input Voltage VL:	-0.3	0	0.5	V
Current Consumption	-	-	15	mA

# Hardware



## pinmap

INDEX	NAME	FUCTION	DESCRIPTION
1	P1.6	UART_TX	UART interface
2	P1.7	UART_RX	UART interface
3	P1.4	UART_CTS	UART interface
4	P1.5	UART_RTS	UART interface
5	NC	NC	Not used
6	NC	NC	Not used
7	P2.2	GPIO/DEBUG	GPIO or Debug interface
8	P2.1	GPIO/DEBUG	GPIO or Debug interface
9	P2.0	GPIO	GPIO
10	NC	NC	Not used
11	RESET	RESET	Reset. Debug interface
12	3.3V	3.3V	Power supply
13	GND	GND	Ground
14	GND	GND	Ground
15	SDA	GPIO	GPIO
16	NC	NC	Not used
17	NC	NC	Not used
18	NC	NC	Not used
19	NC	NC	Not used
20	SCL	GPIO	GPIO
21	GND	GND	Ground
22	GND	GND	Ground
23	P1.3	GPIO	GPIO
24	P1.2	GPIO	GPIO
25	P1.1	GPIO	GPIO
26	P1.0	GPIO	GPIO
27	P0.7	GPIO/ADC	GPIO or ADC
28	P0.6	GPIO/ADC	GPIO or ADC
29	P0.5	GPIO/ADC	GPIO or ADC
30	P0.4	GPIO/ADC	GPIO or ADC
31	P0.3	GPIO/ADC	GPIO or ADC
32	P0.2	GPIO/ADC	GPIO or ADC
33	P0.1	GPIO/ADC	GPIO or ADC
34	P0.0	GPIO/ADC	GPIO or ADC

Note:

- HM-100 is pin-to-pin with HM-10. 100% compatible on hardware.
- The default uart interface is USART0's P1.7(RX) and P1.6 (TX).
- The debug interface can be used to re-program the CC2541 chip.
- Except uart, I2C and debug interface , other pins are default idle state.
- GPIO and ADC are supported with current software.

## Software

The current software supports central mode and peripheral mode. One HM-100 can only be in one mode at one time. This can be switched by AT commands.

Each HM-100 has two names. One is peripheral name. This name is used for peripheral device to advertise, telling that who it is. And this name can be scanned by a central device before a connection starts. The other name is connecting name. This name is used to match the peripheral name, when one HM-100 turns into central mode and starts a connection. This name is used by a central device, telling whom it will connect to. When the two names are matched, a connection can be build. At current time one central device can only connect one peripheral device.

Similarly, each HM-100 has two passcodes. One is peripheral passcode and the other is central passcode. A central device sends its central passcode to a peripheral device when the peripheral requests a connecting passcode. If the central passcode which a central sends matches the peripheral passcode which a peripheral has, the connection is build. Otherwise, the peripheral can terminate the connection. A peripheral does not request any passcode defaultly.

## AT COMMANDS

Factory default setting:

Peripheral Name: Itead

Central Name: Itead

Peripheral passcode: 0 (means that no passcode needed)

Uart: baudrate 9600, N, 8, 1,

ADC reference: 0 (1.25V)

AT commands' format:

Each command with its parameter is a string.

And every command must end with either '\r' or '\n'.

Command's parameter starts with a '='.

Command's return is also a string, which ends with '\0'.

For example: AT\n or AT\r

AT+DATA=1\n or AT+DATA=0\r

AT commands' mode:

AT MODE: Almost all the AT commands can be executed in this mode.

DATA MODE: The data inputted from uart is directly transported to the other side's uart.

Only one command can be executed to quit this DATA mode.

Commands:

1. Test command

send	receive	parameter
AT\n	OK\n\0	none

This command is used to test current local uart connection.

2. Show version command

send	receive	parameter
AT+VERSION\n	Version\n\0	none

This command is to show the current software version.

3. Restart command

send	receive	parameter
AT+RESTART\n	none	none

This command is for restarting the device.

4. Baudrate command

send	receive	parameter
AT+BAUD=	OK:0\n\0	0\n
	OK:1\n\0	1\n
	OK:2\n\0	2\n
	OK:3\n\0	3\n
	OK:4\n\0	4\n
	OK:B:baudrate\n\0	?\n

This command is to set baudrate :

- 0 ---- >baudrate 9600
- 1 ---- >baudrate 19200
- 2 ---- >baudrate 38400
- 3 ---- >baudrate 57600
- 4 ---- >baudrate 115200

## 5. Peripheral name command

send	receive	parameter
AT+PNAME=	OK\n\0	Name\n
	OK:name\n\0	?\n

This command is to set peripheral name.

A peripheral name is a string that has less than 20 char data.

This name can be always stored regardless of power on or not.

## 6. Central name command

send	receive	parameter
AT+CNAME=	OK\n\0	Name\n
	OK:name\n\0	?\n

This command is to set central name.

A central name is a string that has less than 20 char data.

This name can be always stored regardless of power on or not.

## 7. Peripheral passcode command

send	receive	parameter
AT+PPIN=	OK\n\0	Passcode\n
	OK\n\0	0\n
	OK:passcode\n\0	?\n

This name is to set peripheral passcode.

A peripheral passcode is a 6-char string made up with '0' ~ '9'.

For example: "012345"

When parameter is 0 , it means that there's no passcode request during connecting.

## 8. Central passcode command

send	receive	parameter
AT+PPIN=	OK\n\0	Passcode\n
	OK:passcode\n\0	?\n

This name is to set central passcode.

A central passcode is a 6-char string made up with '0' ~ '9'.

For example: "012345"

## 9. Central and peripheral switch command

send	receive	parameter
AT+ROLE=	ready\n\0	1\n
	OK\n\0	0\n

This command is to switch device to be central or peripheral.

- 1 --- > central
- 2 --- > peripheral

When a device turns to be a central, It will auto discovery peripheral devices and auto connect the one who's peripheral name matches its central name.

When a connection is build, both sides will receive string "ready\n\0".

## 10. Status command

send	receive	parameter
AT+STATUS=	N:name\n\0	N\n
	M:mode\n\0	M\n
	S:state\n\0	S\n
	B:baudrate\n\0	B\n
	N:name\n\0	\n
	M:mode\n\0	
	S:state\n\0	
	B:baudrate\n\0	

This command is used to show some information about the device:

- N --- > peripheral name
- M --- > peripheral or central
- S --- >current system state
- B --- >baudrate

This command can be for debug.

## 11. Peripheral advertise command

send	receive	parameter
AT+ADVER=	OK\n\0	1\n
	OK\n\0	0\n
	OK:1\n\0	?\n
	OK:0\n\0	

This command is used for peripheral to start or stop advertising.

- 1 --- > start to advertise
- 0 --- > stop adverting

When a peripheral stop advertising, it can not be scanned or searched.

## 12. Peripheral terminate command

send	receive	parameter
AT+PTERM\n	OK\n\0	none

This command is used for peripheral device to stop current connection.

### 13. Central RSSI command

send	receive	parameter
AT+RSSI=	OK\n\0	1\n
	OK\n\0	0\n

This command is used for central device to get RSSI.

1 --- > get RSSI. The RSSI will show to uart every second.

0 --- > stop getting RSSI.

### 14. AT mode send command

send	parameter	local receive	remote receive
AT+SEND=	AT\n	OK\n\0 AT+RECEIVE:OK\n	AT+RECEIVE:AT\n
	AT+VERSION\n	OK\n\0 AT+RECEIVE:version\n	AT+RECEIVE:AT+VERSION\n
	AT+BAUD=0\n	OK\n\0 AT+RECEIVE:B:0\n	AT+RECEIVE:AT+BAUD=0\n
	AT+BAUD=1\n	OK\n\0 AT+RECEIVE:B:1\n	AT+RECEIVE:AT+BAUD=1\n
	AT+BAUD=2\n	OK\n\0 AT+RECEIVE:B:2\n	AT+RECEIVE:AT+BAUD=2\n
	AT+BAUD=3\n	OK\n\0 AT+RECEIVE:B:3\n	AT+RECEIVE:AT+BAUD=3\n
	AT+BAUD=4\n	OK\n\0 AT+RECEIVE:B:4\n	AT+RECEIVE:AT+BAUD=4\n
	AT+BAUD=?\n	OK\n\0 AT+RECEIVE:B:baudrate\n	AT+RECEIVE:AT+BAUD=?\n
	AT+RESTART\n	OK\n\0	OK\n\0
	string\n	OK\n\0	AT+RECEIVE:string\n

This command is used to send command or string to the other side in AT mode.

Not all the AT commands which can be sent and executed are list above. Like GPIO and ADC.

Users can use this command to send custom string to the other side to execute user's own task.



## 15. AT mode and DATA mode switch command

send	parameter	local receive	remote receive
AT+DATA=	1\n	DT\n\0	AT+RECEIVE:AT+DATA on\n DT\n\0
	0\n	AT\n\0	AT+DATA=0\n AT\n\0

This command is used to switch to AT MODE or DATA MODE.

- 1 --- > enter DATA mode. This command can not be executed in DATA mode.
- 2 --- > enter AT mode. This command can only be used executed in DATA mode.

When two devices are connected, they can be switched into DATA mode.

Either the central or the peripheral enter to DATA mode, both devices will enter DATA mode.

Either the central or the peripheral enter to AT mode, both devices will enter AT mode.

In DATA mode , data from one side uartcan be transported directly to the other side's uart.

The "local" is that the side you input. The "remote" is the other side.

## 16. Debug command

send	receive	parameter
AT+DB=	OK\n\0	1\n
	OK\n\0	0\n
	OK:0\n\0	? \n
	OK:1\n\0	

This command is used to set flag to show debug information or not.

- 0 ---> show debug information.
- 1 --- > stop showing debug information

When 1 is set, more system debug information will show to uart.

## 17. GPIO SET command

send	receive	parameter
AT+GPIOSET=	OK\n\0	7\n
	OK\n\0	8\n
	OK\n\0	9\n
	OK\n\0	15\n
	OK\n\0	20\n
	OK\n\0	23\n
	OK\n\0	24\n
	OK\n\0	25\n
	OK\n\0	26\n
	OK\n\0	27\n
	OK\n\0	28\n
	OK\n\0	29\n

	OK\n\0	30\n
	OK\n\0	31\n
	OK\n\0	32\n
	OK\n\0	33\n
	OK\n\0	34\n

This command is used to set a pin to GPIO.

The parameter number is the pin index in pinmap.

This command must be used before AT+IOWRITE and AT+IOREAD.

Whenever a pin is set to GPIO, the pin can't be used as other functions.

#### 18. GPIO write command

send	receive	parameter
AT+GPIOWR=	OK\n\0	7,1\n
	OK\n\0	7,0\n
	OK\n\0	8,1\n
	OK\n\0	8,0\n
	OK\n\0	9,1\n
	OK\n\0	9,0\n
	OK\n\0	15,1\n
	OK\n\0	15,0\n
	OK\n\0	20,1\n
	OK\n\0	20,0\n
	OK\n\0	23,1\n
	OK\n\0	23,0\n
	OK\n\0	24,1\n
	OK\n\0	24,0\n
	OK\n\0	25,1\n
	OK\n\0	25,0\n
	OK\n\0	26,1\n
	OK\n\0	26,0\n
	OK\n\0	27,1\n
	OK\n\0	27,0\n
	OK\n\0	28,1\n
	OK\n\0	28,0\n
	OK\n\0	29,1\n
	OK\n\0	29,0\n
	OK\n\0	30,1\n
	OK\n\0	30,0\n
	OK\n\0	31,1\n
	OK\n\0	31,0\n
	OK\n\0	32,1\n
	OK\n\0	32,0\n

	OK\n\0	33,1\n
	OK\n\0	33,0\n
	OK\n\0	34,1\n
	OK\n\0	34,0\n

This command is used to set a GPIO to output high or low.

The first number of parameter is the pin index in pinmap, and the second number is :

1 ---> output high

0 ---> output low

This command must be used after AT+GPIOSET.

#### 19. GPIO read command

send	receive	parameter
AT+GPIORD=	OK:0\n\0	7\n
	OK:1\n\0	
	OK:0\n\0	8\n
	OK:1\n\0	
	OK:0\n\0	9\n
	OK:1\n\0	
	OK:0\n\0	15\n
	OK:1\n\0	
	OK:0\n\0	20\n
	OK:1\n\0	
	OK:0\n\0	23\n
	OK:1\n\0	
	OK:0\n\0	24\n
	OK:1\n\0	
	OK:0\n\0	25\n
	OK:1\n\0	
	OK:0\n\0	26\n
	OK:1\n\0	
	OK:0\n\0	27\n
	OK:1\n\0	
	OK:0\n\0	28\n
	OK:1\n\0	
	OK:0\n\0	29\n
	OK:1\n\0	
	OK:0\n\0	30\n
	OK:1\n\0	
	OK:0\n\0	31\n
	OK:1\n\0	

	OK:0\n\0	32\n
	OK:1\n\0	
	OK:0\n\0	33\n
	OK:1\n\0	
	OK:0\n\0	34\n
	OK:1\n\0	

This command is used to read a GPIO .

The number of parameter is the pin index in pinmap, and the return number is :

1 ---> high

0 ---> low

This command must be used after AT+GPIOSET.

## 20. ADC IO set command

send	receive	parameter
AT+ADSET=	OK\n\0	27\n
	OK\n\0	28\n
	OK\n\0	29\n
	OK\n\0	30\n
	OK\n\0	31\n
	OK\n\0	32\n
	OK\n\0	33\n
	OK\n\0	34\n

This command is used to set an io to ADC function .

The number of parameter is the pin index in pinmap :

27 ---> P0\_7 (A7)

28 ---> P0\_6 (A6)

29 ---> P0\_5 (A5)

30 ---> P0\_4 (A4)

31 ---> P0\_3 (A3)

32 ---> P0\_2 (A2)

33 ---> P0\_1 (A1)

34 ---> P0\_0 (A0)

This command must be used before AT+ADREAD.

## 21. ADC reference command

send	receive	parameter
AT+ADREF=	OK\n\0	0\n
	OK\n\0	1\n
	OK:0\n\0	? \n
	OK:1\n\0	

This command is used to set ADC reference voltage.

The number of parameter :

- 0 --->internally generated voltage (1.25V) ,default.
- 1 --->AVDD5 (3.3V)

This command must be used before AT+ADREAD. And this command is optional.

Be careful that the ADC input voltage must not be higher than the reference voltage.

## 22. ADC read command

send	receive	parameter
AT+ADREAD=	OK:0x <u>RESULT</u> \n\0	27\n
	OK:0x <u>RESULT</u> \n\0	28\n
	OK:0x <u>RESULT</u> \n\0	29\n
	OK:0x <u>RESULT</u> \n\0	30\n
	OK:0x <u>RESULT</u> \n\0	31\n
	OK:0x <u>RESULT</u> \n\0	32\n
	OK:0x <u>RESULT</u> \n\0	33\n
	OK:0x <u>RESULT</u> \n\0	34\n

This command is used to read an ADC channel.

The number of parameter is the pin index in pinmap :

- 27 ---> P0\_7 (A7)
- 28 ---> P0\_6 (A6)
- 29 ---> P0\_5 (A5)
- 30 ---> P0\_4 (A4)
- 31 ---> P0\_3 (A3)
- 32 ---> P0\_2 (A2)
- 33 ---> P0\_1 (A1)
- 34 ---> P0\_0 (A0)

This command must be used after AT+ADSET.

The ADC is 14-bit and this command gets the first 12-bit number.

The RESULT here is from 0~7FF in a string. For example ,”OK:0x7FF\n\0”“OK:0x0\n\0”.

That 0x0 means the 0V and 0x7FF means the reference voltage.

## Error Messages

Sometimes the commands above do not return correctly and show some messages in strings like "error:0x8A\n\0". It means something is wrong. Here are the error strings and their meanings for you to check.

Error string:	Message:
error:0x80\n\0	Unknow input source. (Neither uart nor air)
error:0x81\n\0	Unknown AT mode.(Neither AT nor DATA)
error:0x82\n\0	AT command buffer is over flowed.(Send "AT\n" to check)
error:0x83\n\0	Unknown AT command.
error:0x84\n\0	Unknown Uartbaudrate.
error:0x86\n\0	Unknown device's mode.(Neither central nor peripheral)
error:0x87\n\0	Input AT command's parameter is wrong.
error:0x88\n\0	Fail to read scanRspData.
error:0x89\n\0	Fail to read devicename.
error:0x8A\n\0	Input IO index is wrong.
error:0x8B\n\0	Input IO index has been used as other functions.

## HM-100 and HM-10

The hardware of HM-100 is almost same with HM-10, but the firmware is different. Here're some differences between them.

- All of HM-100 GPIOs can be used by users.HM-10 has PIO0 as key and PIO1 as state LED by default.
- The AT command of HM-100 has '\r' or '\n' as an end and '=' as a start of parameter. HM-10 does not need these.
- When an HM-100 becomes a central device, it will automatically search the peripheral which name is set before, and connect to it. HM-10 does not have this function.
- When an HM-100 peripheral receives wrong password sent by the central, it will automatically terminate the connection. HM-10 does not have this function.
- HM-100 sets the RF power to 0dbm by default. HM-10 has one command to let user to set the power.
- HM-100 does not have command to control UART stop-bit and parity-bit. HM-10 has commands to do it.
- HM-100 builds a connection only by device name which is set before a connection. HM-10 also uses address to build a connection.
- HM-100 has commands to control 8-channal ADC either by local or by remote. HM-10 does not have this function.

## Revision History

Rev.	Description	Release date
V0.1.1	Initial version	2015-07-06
V0.1.2	Add differences between HM-100 and HM-10	2015-07-15