BM816 Coperation manual_V1.2

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1. Introduction

BM816 EVB use for testing the function and performance of BM816 module, and provide relevant assessment to help customer develop application.

1.1 Purpose

This document detailed describes the basic function of BM816 and point out the main feature is data transmission.

1.2 General view

Chapter 2, Main introduction the Development environment and list of equipment for BM816

Chapter 3, in detail describe the construct of software environment for BM816

Chapter 4, in detail describe the methods of data transmission and common business for BM816

2. Brief Introduction

BM816 EVB is development and evaluation board that for customer to test the performance and function of BM816 modul. This EVB board is module adapter PCBA board, it has USB interface, SIM card interface, MINI PCI-E port 3 ports.

2.1 Necessary equipment

The chart 1 detailed describe the necessary equipment for testing environment BM816. Chart 1: EVB Kit List

Equipment	EVB kit whether or not	Description
	Include	
EVB Board	Yes	Use for BM816test
USB Cable	Yes	Standard USB
Antenna	Yes	Antenna has two parts:
		1) diversity antenna and
		main antenna 2) antenna
		patch cord
BM816 Board	Not	
SIM/USIM	Not	Need a SIM/USIM Card
		have balance

2.2 Feature

●3GPPnetwork mode	
FDD-LTE/HSPA+/HSUPA/H	SDPA/UMTS/EDGE/GPRS/GSM
 Band Frequency 	
LTE-FDD: B2/B4/B5/B12/E	513/B17
UMTS : B2/B4/B5	
GSM : B2/B5	
 Transmit Power(Max) 	
LTE-FDD/UMTS: class 3	
GSM B2: class 1	
GSM B5: class 4	
EDGE B2/B5: class E2	
 Peak rate 	
FDD-LTE: 150 Mbps DL, 50 N	Abps UL
DC-HSDPA: 42Mbps DL	
HSUPA: 5.76Mbps UL	
WCDMA: 384Kbps DL, 384K	bps UL
EDGE: 296 Kbps DL, 236.8K	ops UL
GPRS: 107 Kbps DL, 85.6Kbp	os UL
 Telecom Service 	
SMS/PS/voice	
 Consumption 	
Shut-down Leakage current:	<20µA
Standby:	<5mA
Voice call:	<300mA
Data transfer:	<800mA
 Qualcomm platform 	
MDM9607(MDM9628)+WT	R2965
 Package&Size 	
LGA 35.8mm *37.8mm *2.	8mm

2.3 Parameter

• Working Frequency

	B2: UL(1850-1910MHz),
	DL(1930-1990MHz)
	B4: UL(1710-1755MHz),
Worling Frequency	DL(2110-2155MHz)
working Frequency	B5: UL(824-849MHz), DL(869-894MHz)
	B12: UL(699-716MHz), DL(729-746MHz)
	B13: UL(777-787MHz), DL(746-756MHz)
	B17: UL(704-716MHz), DL(734-746MHz)

• Max Output Power

		B2	24 <u>+</u> 1
		B4	23 <u>+</u> 2
	LTE	B5	23 <u>+</u> 2
	LIE	B12 2	
		B13	22 <u>+</u> 1
TX Max Power(dBm)		B17	23+1
		B2	23 <u>+</u> 1
	WCDMA	B4	23 <u>+</u> 2
		B5	22 <u>+</u> 2
	CCM	B2	29.0 <u>+</u> 1.0
	GSM	B5	32.0 <u>+</u> 1.0

- Antenna Type External 2 Antenna: Main/DRX Antenna
- Antenna Gain(Max)

Frequency (MHz)	Gain (DBi)
791	1.14
824	0.91
896	0.78
960	0.14
1710	1.70
1805	2.30
1880	3.25
1950	3.10
2150	2.28
2300	1.30
2400	1.78
2500	2.04
2690	0.94

- Working Voltage 3.3~4.2V, TYP:3.6V
- Working Temperature -75~25℃, TYP: 25℃
- Limit operating Temperature -40~-30℃, 75~85℃
- Storage Temperature -40~95



2.5 RF Interface

BM816 provide 2 RF connector, Main/Diversity Antenna. The customer antenna needs to be distributed on the periphery of the main board, and is connected with the antenna pad of the module through the 50ohm impedance microstrip line. line-losses between antenna and RF connector on module must follow indicator as below. ● B2/B4/B5/B12/B13/B17<1dBm

3. Set up and Install

EVB construct divide by hardware environment and software environment: 1) The Construct of Hardware Environment How put in or out SIM/USIM card How to link module How to link main antenna How to link diversity antenna How to link USB cable How to power on

How to power off

2) The Construct of Software Environment How to install driver How to upgrade firmware

3.1The Construct of Hardware Environment

3.1.1. How put in or out SIM/USIM card

Need a SIM/USIM Card havebalance. The step for put in SIM/USIM:

1) Put EVB upwards, hold the yellow button, and pull out the SIM Card slot. See Picture 1 and 2.



Picture 1



2) Put SIM Card into the slot, make sure SIM chip upwards, put into the SIM slot on EVB Boar. See Picture 3 and 4.



Picture 3



3.1.2. How to link module

Put module into development board after finish install SIM card: 1) Put EVB Board right side up, and put module into Mini PCI-E connector. See Picture $5 \\ 6$ and 7.



Picture 5



Picture 7

3.1.3. How to link main antenna Before the link antenna, need finish put in SIM card and Module.

1) Antenna interface located on top right of module.

2) Spike RF Patch cord into module connector smoothly. See Picture 8 $_{\circ}$



Picture 8

3) Tightening antenna SMA contact and RF patch cord SMA contact. See Picture 9 $_{\circ}$



3.1.4. How to link diversity antenna

Before link diversity antenna, need finish put SIM Card and module in, and link the main antenna

1) The antenna interface is located on the top left of module .

2) Spike RF Patch cord into module connector smoothly. See Picture 10.



Picture 10

3) Tightening antenna SMA contact and RF patch cord SMA contact. See Picture 11



Picture 11

3.1.5. How to link USB cable

Follow the step to link USB cable: BM816 1)Put EVB Board into the USB interface of PC.See Picture12.



Picture12

3.1.6. How to power on

BM816 only support electrify power on, all need just put the USB cable into PC, and module will auto power on.

3.1.7. How to power off

BM816 support outage shutdown, module will shut down when VBAT blackout.

3.2 The Construct of Software Environment

3.2.1. How to install driver

1) First use USB cable to connect PC and module, power module on, Windows will popup new equipment window, choose"No, not this time", then click"Next"

Hardware Update Wizard	
	Welcome to the Hardware Update Wizard Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission). Online privacy information
	Can Windows connect to Windows Update to search for software? Yes, this time only Yes, now and every time I connect a device No, not this time
	Click Next to continue.
	< Back Next > Cancel

Picture 13: find new hardware

2) Choose "Install from a list or specific location (Advanced)", click"Next"



Picture 14: choose the method for install driver

BM816 choose the path that driver file is located, and click "Yes"; 3) Click "Next"

Please cho	ose your search and installation options.
⊙ <u>S</u> ear	ch for the best driver in these locations.
Use t paths	he check boxes below to limit or expand the default search, which includes local and removable media. The best driver found will be installed.
] Search removable media (floppy, CD-ROM)
	Include this location in the search:
	F:\BMC_P520A_04BD_4402_V1.0.1.0_160722_V0 V Browse
O Don'i	search. I will choose the driver to install.
Choo the d	se this option to select the device driver from a list. Windows does not guarantee the
(iie u	inter you choose will be the beschicken for your hardware.
	<pre></pre>

Picture 15: Choose driver file path 2 in XP

4) The driver is installing



Picture 16: driver install

5) Wait for notes "Completing hardware Upgrade wizard", click "Finish "finish the install.

Hardware Update Wizard	
	Completing the Hardware Update Wizard The wizard has finished installing the software for: Network Connect HS-USB Diagnostics
	Click Finish to close the wizard.

Picture 17: Finish the driver install

6) Operation system will popup 4 new equipments, please repeat step 1 to 6. After finish install, you will see them in device manager. See below Picture 18.



Picture 18: module appear in device manager

3.2.2. How to upgrade firmware

BM816 provide 1key upgrade tool for Windows, step of upgrade firmware:

1) Use USB cable to connect PC and BM816, double-click "GUI_dl" when the device manager recognize com port. See Picture 19:

R▼ 國打开 新建文件夫					ii • 🛄	1
🗼 public 🔨	名称	修改日期	後型	大小		
🍰 cadence 16.6箇份	Driver	2018/12/5 16:12	文任本			
▶ NV警告文件	image	2018/12/5 19:15	文件来			
🎍 tools	adb	2014/4/28 13:04	应用程序	491 KB		
🍌 測试工具	AdbWinApi.dll	2014/4/28 13:04	应用程序扩展	94 KB		
🍶 产品定义和需求	AdbWinUsbApi.dll	2014/4/28 13:04	应用程序扩展	60 KB		
▲ 基础baseline	back	2018/12/5 17:30	配置设置	2 KB		
→ 临时版本验证	DSwitch	2016/12/30 16:42	配置设置	1 KB		
MDM9X07	CDToBootloaderFor9x15	2018/6/20 21:14	应用程序	57 KB		
A M100A	CDToDiagFor9x15	2018/6/20 21:14	应用程序	56 KB		
M100D	S DownLoad	2016/12/29 20:24	Windows 批处理	2 KB		
MIDDE	fastboot	2014/4/28 13:04	应用程序	160 KB		
P700A	💰 GUI_dI	2018/7/11 15:02	应用程序	1,284 KB		
07014	@_ GuiSetup	2018/6/28 13:53	配置设置	1 KB		
0701A	MDM9x07_download_EFS_only	2018/6/20 21:15	应用程序	1,378 KB		
2 P7010	NVRAM_Backup	2018/6/20 21:15	应用程序	172 KB		
P703A	QuickDownLoad	2016/12/29 20:24	Windows 孤怨壇…	2 KB		
J P706A						
2 P706D						
4 P706E						
A P750A						
BMC_P750A_0CM0_B327 (BMC_P750A_0CM						
BMC_P750A_0ER0_3226						
BMC_P750A_0ER0_3226_V1.0.0.0_190320						
RCSN0_P750A_0CL0_B328						
RCSN0_P750A_0CL0_B328_V1.0.0.0_181205						
🕌 EFS						
🗼 mdm9x07_elf						
RCSN0_P750A_0CL0_B328_V1.0.0.0_1812(
Kelease_notes						

Picture 19: the window of firmware upgrades 1

 $2\,)$ $\,$ Follow the note to press "Download", start to upgrade. See Picture 20 $\,$



Picture 20: Firmware is upgrading

3) There is note "Success to upgrade" when it all finished.



Picture 21: Finish firmware upgrade

4) Do not remove USB cable from PC during the upgrade process, whole process cost 2-3 minutes.

Warning: Cannot outage during upgrade process, please make sure stabilization power supply, otherwise will damage module.

Warning: Cannot outage during upgrade process, please make sure stabilization power supply, otherwise will damage module.

4. Debugging and Testing

The EVB through USB to communicate, can use for phone call, connect internet, this chapter will discuss in detail.

4.1 How to use USB cable to communicate

1) The communication methods for PC and BM816 is AT command, to test whether PC successfully communicate BM816 by sending AT command.

2) Open HyperTerminal, choose AT port.

Connect To	? 🛛
RyperTe	rminalasdasd
Enter details for	the phone number that you want to dial:
Country/region:	United States (1)
Enter the area c	ode without the long-distance prefix
Ar <u>e</u> a code:	021
Phone number:	
Co <u>n</u> nect using:	COM8
□ <u>D</u> etect Carrie ☑ Use country □ <u>R</u> edial on bu	Network Connect HS-USB Modem #2 COM1 COM5 COM7 COM8 COM9 TCP/IP (Winsock)
	OK Cancel

Picture 22: Choose the port for HyperTerminal

 $3\,)$ $\,$ Choose baud rate 9600, choose none for flow control, other setting default. See Picture 23 $\,$

SHyperTerminalasdasd - HyperTerr File Edit View Call Transfer Help	ninal	
0 ☞ @ 》 ◎		
	COMB Properties	
	Bits per second: 9600	
	Parity: None.	
	Flow control None	-
	Restore Defaults OK Cancel	
Disconnected Auto detect	9600 8-N-1 SCROLL CAPS NUM Capture Print-echo	

Picture 23: ConfigurationHyperTerminal

1)	Sonding AT	chock it is or isn	'teommunicated So	o Dicturo 24
4/	Senaing AT,	CHECK IT IS OF ISH	icommunicated. Se	e Picture 24



Picture 24: UsingHyperTerminal sending at

4.2 How to make data connection

Put SIM/USIM card that support data traffic into EVB board, connect antenna right, though USB cable to connect PC and power on module.

1) through NDIS to dial.

a) type "at\$qcrmcall=1,1", create network connection.



Picture 25: using HyperTerminal to send AT command to NDIS dial b) Type"at\$qcrmcall=0,1", to disconnect Network connection.

- 2) through MODEM to dial
- A) open Network Connections to choose to connect Internet and click "Next"

New Connection Wizard				
Network Connection Type What do you want to do?				
• Connect to the Internet				
Connect to the Internet so you can browse the Web and read email.				
Connect to the network at my workplace				
Connect to a business network (using dial-up or VPN) so you can work from home, a field office, or another location.				
Set up a home or small office network				
Connect to an existing home or small office network or set up a new one.				
O Set up an advanced connection				
Connect directly to another computer using your serial, parallel, or infrared port, or set up this computer so that other computers can connect to it.				
<pre>< Back Next > Cancel</pre>				

Picture 26: Choose Network Connection

B) Choose "Set up my Connection manually", click "Next"



Picture 27: Create new Network connection C) Choose "Connect using a dial-up modem"

New Connection Wizard
Internet Connection How do you want to connect to the Internet?
 Connect using a dial-up modem This type of connection uses a modem and a regular or ISDN phone line. Connect using a broadband connection that requires a user name and password This is a high-speed connection using either a DSL or cable modem. Your ISP may refer to this type of connection as PPPoE. Connect using a broadband connection that is always on This is a high-speed connection using either a cable modem, DSL or LAN connection. It is always active, and doesn't require you to sign in.
< <u>B</u> ack <u>N</u> ext > Cancel

Picture 28: Choose Modem to Dial

 $D\,)\,$ type the number u want to dial, the user and password need according different carriers. For example, the user and password for

China Union 3G and 4G is empty (not type any character) the number is *99#, then

choose "连接 Connect".

Internet Account Info You will need an acc	r mation ount name and password to sign in to your Internet account.
Type an ISP account safe place. (If you hav	name and password, then write down this information and store it in a /e forgotten an existing account name or password, contact your ISP.
User name:	*99#
Password:	
Confirm password:	
Use this account this computer	name and password when anyone connects to the Internet from
Make this the def	ault Internet connection

Picture 29: Configuration Network Connection

E) there is a note after Network Connection is successful.

Connec	ting adasd.		
3	Dialing	Cancel	

Picture 30: Dial success

4.3 How to make voice call out

A. Put SIM/USIM card which support voice service into EVB board.

B. Open the HyperTerminal, configuration same as Picture 19 and 20.

C. The AT command for dial phone call is "ATDXXX;". For example, we make a call to 10010, type "ATD10010;"



Picture 31: Using HyperTerminal dial number D. The AT Command for Hang up is "AT+CHUP".

🍣 asdasd - HyperTerminal						
File Edit View Call Transfer Help						
atd10010; OK						
RING_BACK						
CONNECT						
at+chup OK						
+DISC:2,0,0,16,"10010	",129, ""					
-						
Connected 0:01:26 Auto detect	9600 8-N-1	SCROLL (APS NUM	Capture	Print echo	

Picture 32: Hand up phone call

4.4 How to check module information and SIM card status

- A. Put SIM/USIM Card which supports voice service into EVB board.
- a) Open the HyperTerminal, configuration same as Picture 19 and 20.
- B. Type "ATI", shows module information; type "AT+CPIN?" shows SIM Card Status.



Picture 33: Show module information and SIM Status

Warning: SIM Card shows "Ready" indicate SIM status is normal, if it shows other, it means unmoral, please make sure your SIM is whether or not valid, or has pin.

4.5 How to set airplane mode

A. Type ATCommad"AT+CFUN=4", enter into airpalne mode. (at+cfun=1 is normal mode; at+cfun=0 turn off RF, SIM card cannot register; default is equal 1; at+cfun? shows current status)



Picture 34 : Setting airplane mode

Compliance Information

FCC Compliance Statement: This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

Additional testing, Part 15 Subpart B disclaimer

The module only complies with the FCC CFR 47 Parts 2, 22, 24, 27. If the module is installed in the host device, the host manufacturer is responsible for the compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. For example, if the host manufacturer markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the host manufacturer shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

FCC Caution:

(1)Exposure to Radio Frequency Radiation. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

(2) Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

(3) This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

(4) the modules FCC ID is not visible when installed in the host, or(5) if the host is marketed so that end users do not have straight forward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: Contains Transmitter Module FCC ID: 2AON8-BM816.