



**BandLuxe™**

**M250 Series HSUPA Module**

**User Manual**



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*BandRich M250*

*Datasheet*

Document Number: M250-D-001

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# Section 1 Introduction

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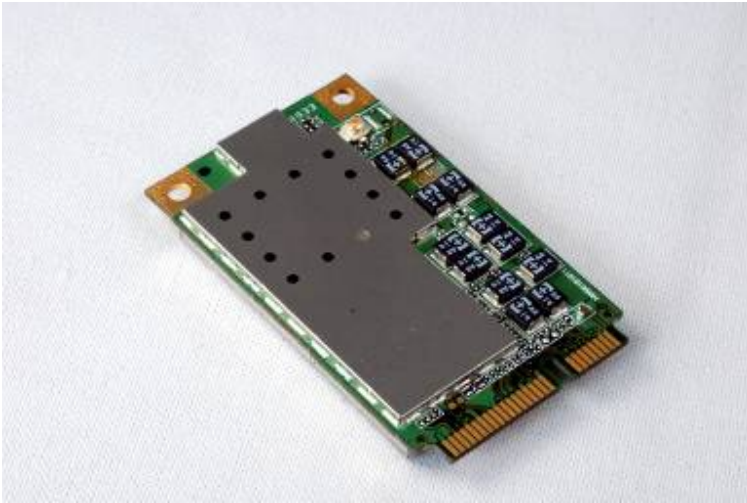
## 1.1 General Description

The M250 module series is PCI Express Mini Card providing WWAN (HSUPA, HSDPA, WCDMA, EGPRS, and GPS) connectivity to laptops or any other device equipped with a PCI Express Mini Card slot.

Figure 1-1 Top View



Figure 1-2 Bottom View



## 1.2 Features

### 1.2.1 WCDMA

- FDD 850/1900/2100 MHz
- Power Class 3 (+24dBm)
- WCDMA 384/384 kbps downlink/uplink modem operation
- HSUPA 2Mbps uplink modem operation (SW upgradable to 5.7Mbps)
- HSDPA 7.2Mbps downlink modem operation
- Supports UL and DL Compressed Modes
- Supports Circuit and Packet-Switched Data
- M250V supports 3G voice call via PCM interface

### 1.2.2 E-GPRS

- 850/900/1800/1900 MHz
- GSM Power Class 4 (2W) for 850/900 bands
- GSM Power Class 1 (1W) for 1800/1900 bands
- EDGE class E2 (+27 dBm in 850/900 bands, +26 dBm in 1800/1900 bands)
- GPRS/EGPRS Multislot Class 12 (4 slots Rx, 4 slots Tx, 5 slots active max)
- GPRS/EGPRS Class B Type 1 MT
- GPRS CS1-CS4; EGPRS MCS1-MCS9
- Circuit Switched Data: 14.4 and 9.6 kbps
- M250V supports GSM voice call via PCM interface

### 1.2.3 GPS

- High-sensitivity GPS that integrated in Qualcomm gpsOne solution.
- High availability that is enabled by using both satellite and network information.
- The GPS RF path is shared with the UMTS Receive Diversity RF path. When the GPS functionality is enabled, the UMTS Receive Diversity will be disabled.

### 1.2.4 Baseband Functionality

The M250 module interfaces with host device through PCI Express Mini Card interface. The interface equips with USB2.0 interface, USIM interface, LED control signal, Wake# signal to request host device return from sleep/suspended state, and W\_Disable# signal to disable radio operation. There are several GPIO pins (2.6V compatible) reserved for customized applications, please contact BandRich for discussion. Besides the above mentioned interfaces, M250V also provides PCM interfaces reserved for voice applications. The M250-LC features low power consumption but requires higher input voltage than PCI standard.

### 1.2.5 Software Functionality

M250 module series is supplied with device driver of Microsoft Windows Vista 32/64, Windows XP SP2 above, Windows 2000 SP4 above, Mac OSX 10.4 above, and Linux Fedora 8, Ubuntu 7, Open SuSE 10.

## 1.3 M250 PCI-Express Mini Card Interface

### 1.3.1 Pin Description

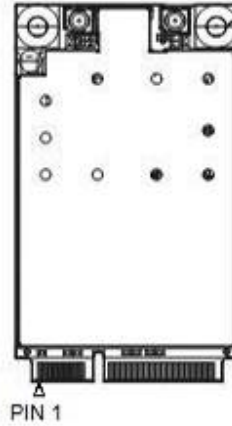
Table 1-1 M250 Module Series Connector Pin-out

Pin No.	Name	Pin No.	Name
1	WAKE#/GPIO1 (optional)	2	Vaux
3	PCM_DOUT (M250V only)	4	GND
5	PCM_DIN (M250V only)	6	N.C./GPIO2 (optional)
7	N.C.	8	UIM_PWR
9	GND	10	UIM_DATA
11	PCM_SYNC (M250V only)	12	UIM_CLK
13	PCM_CLK (M250V only)	14	UIM_RESET
15	GND	16	N.C.
17	N.C.	18	GND
19	N.C.	20	W_DISABLE#
21	GND	22	HW_RST#
23	N.C./GPIO3 (optional)	24	Vaux
25	N.C.	26	GND
27	GND	28	N.C.
29	GND	30	N.C.
31	N.C.	32	N.C.
33	N.C.	34	GND
35	GND	36	USB_D-
37	GND	38	USB_D+
39	Vaux	40	GND
41	Vaux	42	LED_WWAN# *
43	GND	44	N.C.
45	N.C.	46	N. C.
47	N.C.	48	N.C.
49	N.C.	50	GND
51	N.C.	52	Vaux



For more information, please refer to PCI-SIG, PCI Express Mini Card Electromechanical Specification 1.2. <http://www.pcisig.com/home>

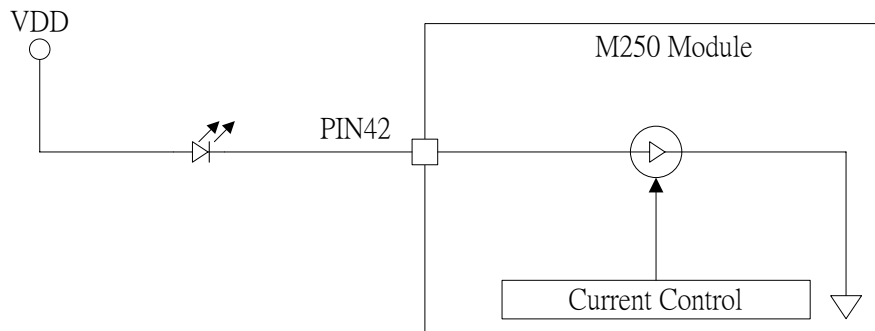
**Figure 1-3 Pin-out information of M250 series (Top View)**



## 1.4 Network LED indicate device

The Network LED indicated device is ground-referenced current sink. The host drives the device to provide a current path and an appropriate voltage for LED at PIN 42 of M250 module. Figure 2-2 shows the block diagram of the current drivers. Table 2-3 describes the LED output characteristics in different states.

**Figure 1-4 LED Current Driver Example**



**Table 1-2 LED Output**

LED State	Module Status Description	LED Characteristics
OFF	Module is not powered.	LED is OFF.
ON	Module is powered and camped on network, but not transmitting or receiving.	LED is continuously ON.
Slow blink	Module is powered and searching for network (not yet registered on network).	LED is flashing at a steady slow speed. 250ms±5% ON period and 750ms±5% OFF period

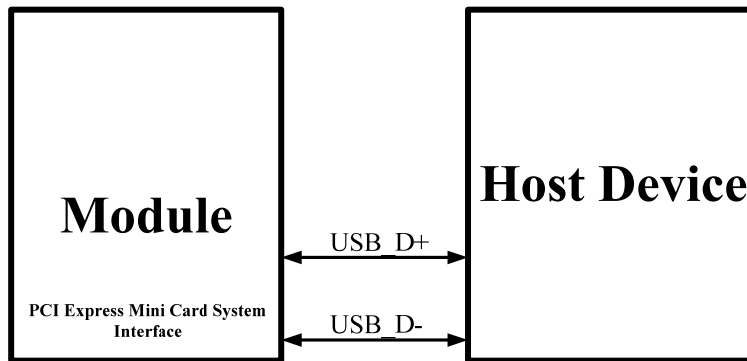


LED State	Module Status Description	LED Characteristics
Intermittent blink	Module is transmitting or receiving	LED is flashing intermittently during data transfer activity. 50ms±5% ON period and 250ms±5% OFF period

## USB Interface

M250, M250V and M250-LC module are compliant with USB2.0 in all three modes (Low speed, Full speed, and high speed). When two devices are connected via a USB interface, one of the devices must act as a host, and the other device must act as a peripheral. The host is responsible for initiating and controlling traffic on the bus. For example, the USB specification requires PCs to act as hosts, and other devices such as M250 to act as devices.

Figure 1-5 USB Interface



## 1.5 USIM Interface

The universal subscriber identification module (USIM) is a smart card for UMTS/GSM cellular applications. The USIM provides the required subscription information to allow the mobile equipment to attach to a GSM or UMTS network. The USIM also provides the subscriber's verification procedures as well as authentication methods for network authentication during the network registration procedures. Upon power-up or after a soft-reset, the clock and data lines to the USIM will be active through the initialization process. Figure 2-3 shows the SIM card pin definition. It's recommended to implement hardware USIM detection mechanism or complete avoiding USIM hot-plug through mechanical design. The reference design for hardware USIM detection is provided in the "Application Note for BandLuxe Module USIM Detection Recommendation".

Table 1-3 SIM Card Pin Definition

	Pin No.	Description
<p>(Bottom view)</p>	1	Vcc
	2	RST
	3	CLK
	4	GND
	5	Vpp
	6	I/O

- USIM\_CLK and USIM\_RST signal, include 33pF filter capacitors is required to be placed near the SIM connector.
- Route all USIM signals carefully – isolate them from sensitive analog and RF signals.
- External ESD diodes are necessary to protect the chip on the module; the ESD diodes should be placed near the connector.
- Refer to the reference circuits below:

## 1.6 Figure 1-6 Antenna Guidelines and RF Connection

This section describes general guidelines for the design of multi-band antenna required for the M250 module series.

### 1.6.1 Antenna specifications

#### Frequency range

- GSM850 (824-894 MHz)
- EGSM900 (880-960 MHz)
- DCS1800 (1710-1880 MHz)
- PCS1900 (1850-1990 MHz)
- WCDMA 850/1900/2100 (824-894 / 1850-1990 / 1920-2170 MHz)
- GPS (1575.42MHz±1.023MHz)

**Maximum permitted peak gain: -5.8dBi at 850MHz and -0.31dBi at 1850MHz**

#### Maximum VSWR

- < 2.5:1 with 50 reference impedance

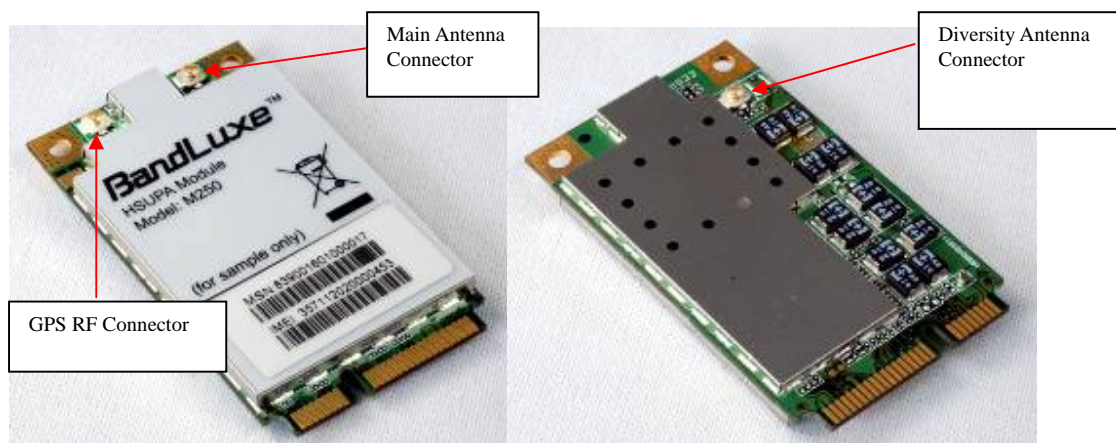
#### Polarization

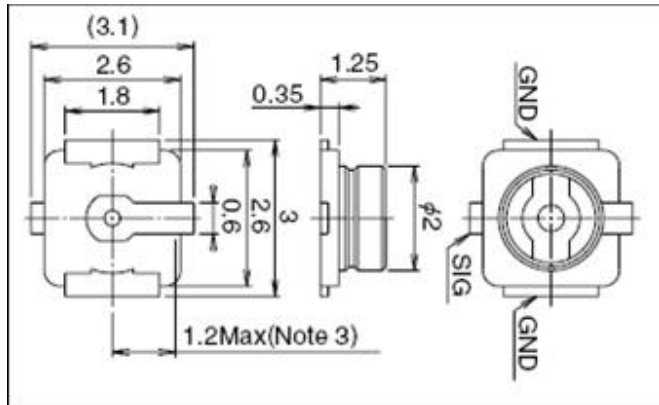
- Linear

### 1.6.2 Antenna connector

The antenna connector type used is a U.FL microwave coaxial connector. It is also can be used for testing purpose.

**Figure 1-7 Antenna Connector Position and Type**





	U.FL-LP-040	U.FL-LP-066	U.FL-LP(V)-040	U.FL-LP-062	U.FL-LP-088
Part No.					
Mated Height	2.5mm Max. (2.4mm Nom.)	2.5mm Max. (2.4mm Nom.)	2.0mm Max. (1.9mm Nom.)	2.4mm Max. (2.3mm Nom.)	2.4mm Max. (2.3mm Nom.)
Applicable cable	Dia. 0.81mm Coaxial cable	Dia. 1.13mm and Dia. 1.32mm Coaxial cable	Dia. 0.81mm Coaxial cable	Dia. 1mm Coaxial cable	Dia. 1.37mm Coaxial cable
Weight (mg)	53.7	59.1	34.8	45.5	71.7

## Section 2 Device Driver Interface

Basically the module will manifest itself as a composite USB device which creates stubs which the other higher level drivers hook into and provide their respective function. The composite USB device could be modem, NDIS interface, AT command interface or diagnostics interface. All device drivers used by OS have been created for Microsoft Windows Vista 32/64, Windows XP SP2 above, Windows 2000 SP4 above, Mac OSX 10.4 above, and Linux Fedora 8, Ubuntu 7, Open SuSE 10.

Either the modem or the NDIS interface can be used to transfer data; and AT command interface or diagnostic interface could be used to send/receive information of the module via the Connection Manager (CM) application. For more information about supporting AT commands please refer to section 3.

## Section 3 AT Command Set Reference

Table B-1 lists the standard AT command that are implemented in BandLuxe M250 module series. For detail command usage and possible response, please check 3GPP TS 27.007, AT command set for User Equipment (UE).

**Table B-1 Abbreviations and Acronyms Table**

<b>BandLuxe HSPA Modem AT Command Interface API Serial Port Name: BandLuxe AT CMD Interface</b>		
<b>AT Command</b>	<b>Command description</b>	<b>Command Format</b>
AT&F	Set all current parameters to manufacturer defaults	AT&F[<mode>]
AT&V	Display current configuration	AT&V[<mode>]
ATE	Enable command echo	ATE
ATI	Display product identification information	ATI
ATQ	Set result code presentation mode	ATQ[<value>]
ATV	Set result code format mode	ATV[<value>]
ATZ	Set all current parameters to user defined profile	ATZ[<mode>]
ATS3	Write command line termination character	S3=<n> S3? S3=?
ATS4	Set response formatting character	S4=<n> S4? S4=?
ATS5	Write command line editing character	S5=<n> S5? S5=?
AT+GMI	Request manufacturer identification	AT+GMI
AT+GMM	Request model identification	AT+GMM
AT+GMR	Request revision identification of software status	AT+GMR
AT+GSN	Request serial number identification	AT+GSN
AT+GCAP	Request complete TA capabilities list	AT+GCAP AT+GCAP?
AT+CBST	Select bearer service type	AT+CBST=[<speed>[, <name>[, <ce>]]] AT+CBST? AT+CBST=?
AT+CRLP	Select radio link protocol param	AT+CRLP=[<iws>[, <mws>[, <T1>[, <N2>]]]] AT+CRLP? AT+CRLP=?
AT+CREG	Network registration	AT+CREG=[<n>] AT+CREG? AT+CREG=?
AT+CGREG	GPRS network registration status	AT+CGREG=[<n>] AT+CGREG? AT+CGREG=?

AT Command	Command description	Command Format
AT+CFUN	Full functionality mode	AT+CFUN=<mode>[,<rst>] AT+CFUN? AT+CFUN=?
AT+GCAP	Request complete TA capabilities list	AT+GCAP AT+GCAP=?
AT+CSCS	Used Character Set	AT+CSCS=[<chset>] AT+CSCS? AT+CSCS=?
AT+CEER	Cause Location ID for the extended error report	AT+CEER
AT+CMEE	Report Mobile Terminal Error	AT+CMEE=[<n>] AT+CMEE? AT+CMEE=?
AT+CGDCONT	Define PDP Context	AT+CGDCONT=[<cid> [,<PDP_type> [,<APN> [,<PDP_addr> [,<d_comp> ,<h_comp>]]]]] AT+CGDCONT? AT+CGDCONT=?
AT+CGDSCONT	Define Secondary PDP Context	AT+CGDSCONT=[<cid>,<p_cid>[,<d_comp>[,<h_comp>]]] AT+CGDSCONT? AT+CGDSCONT=?
AT+CGTFT	Traffic Flow Template	AT+CGTFT=[<cid>, [<packet filter identifier>, <evaluation precedence index> [,<source address and subnet mask> [,<protocol number (ipv4) / next header (ipv6)> [,<destination port range> [,<source port range> [,<ipsec security parameter index (spi)> [,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask [,<flow label (ipv6)> ]]]]]]]] AT+CGTFT? AT+CGTFT=?
AT+CGEQREQ	3G Quality of Service Profile (Requested)	AT+CGEQREQ=[<cid> [,<Traffic class> [,<Maximum bitrate UL> [,<Maximum bitrate DL> [,<Guaranteed bitrate UL> [,<Guaranteed bitrate DL> [,<Delivery order> [,<Maximum SDU size> [,<SDU error ratio> [,<Residual bit error ratio> [,<Delivery of erroneous SDUs> [,<Transfer delay> [,<Traffic handling priority> [,<Source statistics descriptor> [,<Signalling indication>]]]]]]]]]]]]] AT+CGEQREQ? AT+CGEQREQ=?



AT Command	Command description	Command Format
AT+CSQ	Request signal strength	AT+CSQ AT+CSQ=?
AT+CPIN	Check PIN Status	AT+CPIN=<pin>[,<newpin>] AT+CPIN? AT+CPIN=?
AT+CGATT	PS attach / detach	AT+CGATT= [<state>] AT+CGATT? AT+CGATT=?
AT+CGACT	PDP context activate or deactivate	AT+CGACT=[<state> [,<cid>[,<cid>[,...]]]] AT+CGACT? AT+CGACT=?
AT+CGCMOD	PDP Context Modify	AT+CGCMOD=[<cid>[,<cid>[,...]]] AT+CGCMOD=?
AT+CPBS	Select phone book memory storage	AT+CPBS=<storage> AT+CPBS? AT+CPBS=?
AT+CPBR	Read Phonebook Memory entries	AT+CPBR=<index1>[,<index2>] AT+CPBR?
AT+CPBF	Find Phonebook Memory entries	AT+CPBF=<findtext> AT+CPBF=?
AT+CPBW	Write phone book entry	AT+CPBW=[<index>][, <number>[, <type>[, <text>]]] AT+CPBW=?
AT+CPMS	Preferred Message Storage	AT+CPMS=<mem1>[, <mem2>[, <mem3>]] AT+CPMS? AT+CPMS=?
AT+CNMI	New Message Indications to TE	AT+CNMI=[<mode>[, <mt>[, <bm>[, <ds>[, <bfr>]]]]] AT+CNMI? AT+CNMI=?
AT+CMGL	List Messages	AT+CMGL=[<stat>] AT+CMGL=?
AT+CMGR	Read Message	AT+CMGR=<index> AT+CMGR=?
AT+CMGS	Send SMS message	AT+CMGS=<da>[, <toda>] AT+CMGS=?
AT+CMGD	Delete SMS message	AT+CMGD=<index> AT+CMGD=?
AT+CNMA	New SMS message acknowledge to ME/TE	AT+CNMA AT+CNMA=?
AT+COPS	Operator selection	AT+COPS=[<mode>[, <format>[, <oper>]]] AT+COPS? AT+COPS=?
AT+CLCK	Facility lock	AT+CLCK=<fac>[, <mode>[, <passwd>[, <class>]]] AT+CLCK=?



AT Command	Command description	Command Format
AT+CPWD	Change password	AT+CPWD=<fac>,<oldpwd>,<newpwd> AT+CPWD=?
AT+CUSD	Unstructured supplementary service data	AT+CUSD=[<n>[,<str>[,<dc>]]] AT+CUSD? AT+CUSD=?
AT+CIMI	Read IMSI	AT+CIMI AT+CIMI=?
AT+CGMI	Request manufacturer identification	AT+CGMI
AT+CGMM	Request model identification	AT+CGMM
AT+CGMR	Request revision identification	AT+CGMR
AT+CGSN	Request product serial number identification	AT+CGSN
AT+CNUM	Subscriber number	AT+CNUM AT+CNUM=?
AT+CSIM	Generic SIM access	+COLP=[<n>]
AT+CRSM	Restricted SIM access	AT+CRSM=<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data>]]] AT+CRSM=?
AT+COPN	Read operator names	AT+COPN AT+COPN=?
AT+CPOL	Preferred PLMN list	AT+CPOL=[<index>][,<format>[,<oper>]] AT+CPOL? AT+CPOL=?
AT+CPLS	Selection of preferred PLMN list	AT+CPLS=<list> AT+CPLS? AT+CPLS=?
AT+CTZR	Time Zone Reporting	AT+CTZR=<onoff> AT+CTZR? AT+CTZR=?
AT+CPINC	The retries count of PIN1, PIN2, PUK1 or PUK2	AT+CPINC AT+CPINC=?

## **Section 4 Section 4 Federal Communications Commission (FCC) Statement**

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You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

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

### **FCC RF Radiation Exposure Statement:**

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. RF category "Portable" installation of this module is prohibited, and that should OEM integrators desire to install the antenna closer than 20cm to all persons, a new ID and SAR testing will be required

**Note:** The end product shall has the words "Contains Transmitter Module FCC ID:UZI-M250"

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