

# FB23 and FB38 LTE Modems

4G LTE CAT 1 / CAT 4, Verizon Wireless End-device Certified



## Overview

InHand Networks FB23 (CAT 1) and FB38 (CAT 4) Verizon Wireless end-device certified modems are specially designed to help OEMs integrate LTE connectivity and conduct rapid development. Featuring low power consumption, low cost, and high performance, the FB23 and FB38 modems are also ideal alternatives to the aging 3G/2G.

With ultra-small size and the compact connector interface, the FB23 and FB38 can be easily integrated into customers' devices and are perfect for IoT and M2M applications including retail, ATM/POS, digital signage, remote monitoring, smart metering, healthcare and more.

## Features

- Small footprint
- Low power consumption and low cost
- Wide Voltage Range
- 2 U.FL antenna connectors
- 4FF SIM card slot
- Supported Bands LTE B4, LTE B13
- SIM signals on the PIN
- FCC and IC certified
- Verizon End-device certified
- RoHS Compliant

## Specifications

|                         |                             | FB23   | FB38   |
|-------------------------|-----------------------------|--|--|
| Network                 | LTE Category                | LTE CAT 1  | LTE CAT 4  |
|                         | Frequency Bands             | LTE B4, B13  | LTE B2, B4, B5, B13, B17<br>UMTS 850, 1900   |
|                         | Speeds                      | Download: 10Mbps<br>Upload: 5Mbps  | Download: 100Mbps<br>Upload: 50Mbps  |
| Interface               | DIP connector               | 2x12pins 2mm DIP connectors  | 2x12pins 2mm DIP connectors  |
|                         | Power Supply <sup>(1)</sup> | Normal operating range:<br>3.3V to 4.4V<br>Extended operating range:<br>3.0V to 4.5V | Normal operating range:<br>3.4V to 4.35V<br>Extended operating range:<br>3.2V to 4.35V |
|                         | Serial Port(TTL)            | TXD, RXD, CTS, RTS, and GND  |  |
|                         | USB port                    | USB D+, USB D-, VUSB, and GND  |  |
|                         | SIM Holder                  | 4FF Nano SIM card holder   |  |
|                         | Antenna Connector           | 2 U.FL antenna connectors  |  |
| Mechanical Features     | Dimension (mm)              | 46mm x 30mm x 10.4mm   |  |
|                         | Installation (mm)           | 2 x $\phi$ 2.6 hole  |  |
| Power Consumption       | Idle-mode                   | 1.1 mA   | 1.3 mA   |
|                         | Active-Mode                 | 29.5 mA  | 48 mA  |
|                         | LTE Connected Mode          | 540 mA Maximum   | 660 mA Maximum   |
| Environment Temperature | Humidity                    | 5~95% relative humidity (noncondensing)  |  |
|                         | Storage Temp                | -40~85°C   |  |
|                         | Working Temp                | -40~85°C   |  |
| Certification           | FCC, IC, Verizon Wireless   |  |  |
| Warranty                | 3 years                     |  |  |

## FB23 Pins Definition

| Pin (FB23) | Name      | Direction         | Description   | Min                | Typical | Max                      | If not used   |
|------------|-----------|-------------------|---|--------------------|---------|--------------------------|---|
| J1-1       | VCC       | Input             | Main power supply   | 3.3V               | 3.8V    | 4.4V                     | Must be implement   |
| J1-2       | DOUT      | Output(w/ 10K PU) | UART data out, I/O level tied to VREF   | VOL: GND to 0.55V  |         | VOH: VREF x 0.7 to VREF  | Must be implemented if USB not used, No connection  |
| J1-3       | DIN       | Input(w/ 10K PU)  | UART data in, I/O level tied to VREF  | VIL: GND to 0.55V  |         | VIH: VREF x 0.75 to VREF | Must be implemented if USB not used, No connection  |
| J1-4       | GND       | Input             | Ground Pin  |                    | 0       |                          | Must be implement   |
| J1-5       | RESET_nIN | Input(w/ 10K PU)  | Controls RESET_N input on u-blox, tie low for 50mS to reset the module. Internally pulled up to VCC. Drive with open collector output. The current parameter settings are not saved in the module's non-volatile memory and a proper network detach is not performed during hardware reset. | VIL: GND to 0.55V  | VCC     | 5.5V                     | Must be implemented if no other method of resetting the modem is available. Drive with open collector output such as a N-Channel Mosfet |
| J1-6       | VUSB      | Input             | VBUS USB detect input   | VIL: -0.15 to 0.4V | 5V      | VIH: 1.5V to 5.25V       | No connection.  |
| J1-7       | USB_D+    | I/O               | USB differential Data + signal  |                    |         |                          | No connection   |
| J1-8       | USB_D-    | I/O               | USB differential Data - signal  |                    |         |                          | No connection   |
| J1-9       | DTR       | Input(w/ 10K PD)  | Modem Data Terminal Ready input   | VIL: GND to 0.55V  |         | VIH: VREF x 0.75 to VREF | No connection   |
| J1-10      | GND       | Input             | Ground pin  |                    | 0       |                          | Must be implement   |
| J2-10      | GND       | Input             | Ground Pin  |                    | 0       |                          | Must be implement   |
| J2-9       | CTS       | Output(w/ 10K PD) | Modem Clear to Send hardware flow control output  | VOL: GND to 0.55V  |         | VOH: VREF x 0.7 to VREF  | No connection   |
| J2-8       | ON/nSLEEP | Output            | Signal drives the onboard LED indicating network status(registered home network, registered roaming,  | VOL: GND to 0.55V  |         | 5.5V                     | No connection   |

|       |         |                  |   |   |              |                                       |   |
|-------|---------|------------------|---|---|--------------|---------------------------------------|---|
|       |         |                  | data transmission, no service). Active-low open drain output at GPIO1. See Ublox manual for additional information.   |   |              |                                       |   |
| J2-7  | VREF    | Input            | Voltage reference for offboard I/O signals. This signal drives the input voltage side of an onboard buffer which converts all external I/O voltage from VREF range to 1.8V range to drive the onboard u-blox modem module.          | 1.65V                                   | 1.8V or 3.3V | 5.5V                                  | Must be implemented   |
| J2-6  | GND     | Input            | Ground Pin  |   | 0            |                                       | Must be implemented   |
| J2-5  | RTS     | Input(w/ 10K PD) | Modem Request to Send hardware flow control input   | VIL: GND to 0.55V                       |              | VIH: VREF x 0.75 to VREF              | No connection   |
| J2-4  | DIO3    | I/O              | Programmable GPIO3 on u-blox  | VIL: -0.2 to 0.36V<br>VOL: GND to 0.35V |              | VOL:1.17 to 2.1V<br>VOL: 1.45 to 1.8V | No connection   |
| J2-3  | DIO2    | I/O              | Programmable GPIO2 on u-blox  | VIL: -0.2 to 0.36V<br>VOL: GND to 0.45V |              | VOL:1.26 to 2V<br>VOL: 1.35 to 1.8V   | No connection   |
| J2-2  | ADC1    |                  | not supported   |   |              |                                       | No connection   |
| J2-1  | ON_OFF  | Input(w/ 10K PU) | Modem On/Off signal. Tie low for 50uS to switch-on the module, tie low for 1S to switch-off the module. Drive with open collector output. Internally pulled up to internal I/O rail with pull up. Do not use any external pull ups. | VIL: GND to 0.55V                       | VCC          | 5.5V                                  | No connection. Modem switch after at valid VCC rising edge.   |
| J1-11 | SIM_CLK | Output           | SIM card clock  |   | 1.8V or 3V   |                                       | Must be implemented if SIM Card not used in U5, No connection |

|       |         |        |                |  |            |  |   |
|-------|---------|--------|----------------|--|------------|--|---|
| J1-12 | VSIM    | Output | SIM card power |  | 1.8V or 3V |  | Must be implemented if SIM Card not used in U5, No connection |
| J2-11 | SIM_IO  | I/O    | SIM card data  |  | 1.8V or 3V |  | Must be implemented if SIM Card not used in U5, No connection |
| J2-12 | SIM_RST | Output | SIM card reset |  | 1.8V or 3V |  | Must be implemented if SIM Card not used in U5, No connection |

## FB38 Pins Definition

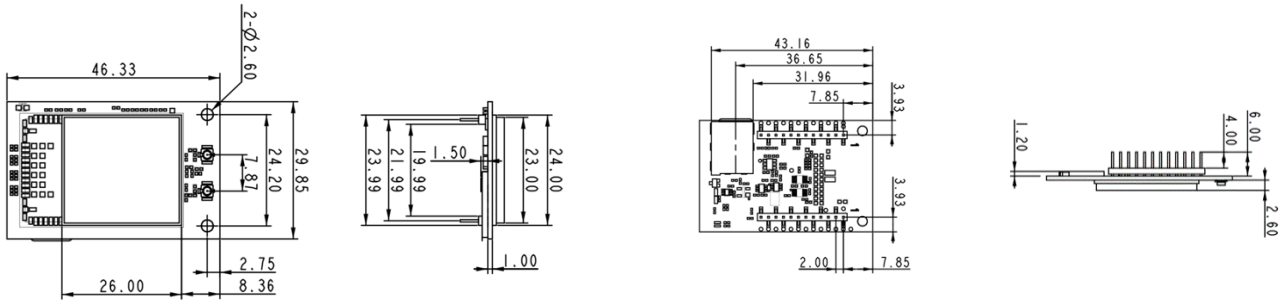
| Pin (FB38) | Name      | Direction         | Description  | Min               | Typical | Max                      | If not used   |
|------------|-----------|-------------------|--|-------------------|---------|--------------------------|---|
| J1-1       | VCC       | Input             | Main power supply  | 3.4V              | 3.8V    | 4.35V                    | Must be implement   |
| J1-2       | DOUT      | Output(w/ 10K PU) | UART data out, I/O level tied to VREF  | VOL: GND to 0.55V |         | VOH: VREF x 0.7 to VREF  | Must be implemented if USB not used, No connection  |
| J1-3       | DIN       | Input(w/ 10K PU)  | UART data in, I/O level tied to VREF   | VIL: GND to 0.55V |         | VIH: VREF x 0.75 to VREF | Must be implemented if USB not used, No connection  |
| J1-4       | GND       | Input             | Ground Pin   |                   | 0       |                          | Must be implement   |
| J1-5       | RESET_nIN | Input(w/ 10K PU)  | Controls RESET_N input on u-blox, tie low for 18~800mS to switch-on the module, tie low for 2.1~15S to reset the module, tie low for 16S to switch-off the module. Internally pulled up to VCC. Drive with open collector output. The current parameter settings are not saved in the module's non-volatile memory and a proper network detach is not performed during hardware reset. | VIL: GND to 0.55V | VCC     | 5.5V                     | Must be implemented if no other method of resetting the modem is available. Drive with open collector output such as a N-Channel Mosfet |

|       |           |                   |  |   |              |                                       |  |
|-------|-----------|-------------------|--|---|--------------|---------------------------------------|--|
| J1-6  | VUSB      |                   | not supported  |   |              |                                       | No connection. It should not be driven high by any external device |
| J1-7  | USB_D+    | I/O               | USB differential Data + signal   |   |              |                                       | No connection  |
| J1-8  | USB_D-    | I/O               | USB differential Data - signal   |   |              |                                       | No connection  |
| J1-9  | DTR       | Input(w/ 10K PD)  | Modem Data Terminal Ready input  | VIL: GND to 0.55V                       |              | VIH: VREF x 0.75 to VREF              | No connection  |
| J1-10 | GND       | Input             | Ground pin   |   | 0            |                                       | Must be implement  |
| J2-10 | GND       | Input             | Ground Pin   |   | 0            |                                       | Must be implement  |
| J2-9  | CTS       | Output(w/ 10K PD) | Modem Clear to Send hardware flow control output   | VOL: GND to 0.55V                       |              | VOH: VREF x 0.7 to VREF               | No connection  |
| J2-8  | ON/nSLEEP | Output            | Signal drives the onboard LED indicating network status(registered home network, registered roaming, data transmission, no service). Active-low open drain output at GPIO1. See ublox manual for additional information.   | VOL: GND to 0.55V                       |              | 5.5V                                  | No connection  |
| J2-7  | VREF      | Input             | Voltage reference for offboard I/O signals. This signal drives the input voltage side of an onboard buffer which converts all external I/O voltage from VREF range to 1.8V range to drive the onboard u-blox modem module. | 1.65V                                   | 1.8V or 3.3V | 5.5V                                  | Must be implemented  |
| J2-6  | GND       | Input             | Ground Pin   |   | 0            |                                       | Must be implemented  |
| J2-5  | RTS       | Input(w/ 10K PD)  | Modem Request to Send hardware flow control input  | VIL: GND to 0.55V                       |              | VIH: VREF x 0.75 to VREF              | No connection  |
| J2-4  | DIO3      | I/O               | Programmable GPIO3 on u-blox   | VIL: -0.2 to 0.63V<br>VOL: GND to 0.45V |              | VOL:1.17 to 2.1V<br>VOL: 1.35 to 1.8V | No connection  |

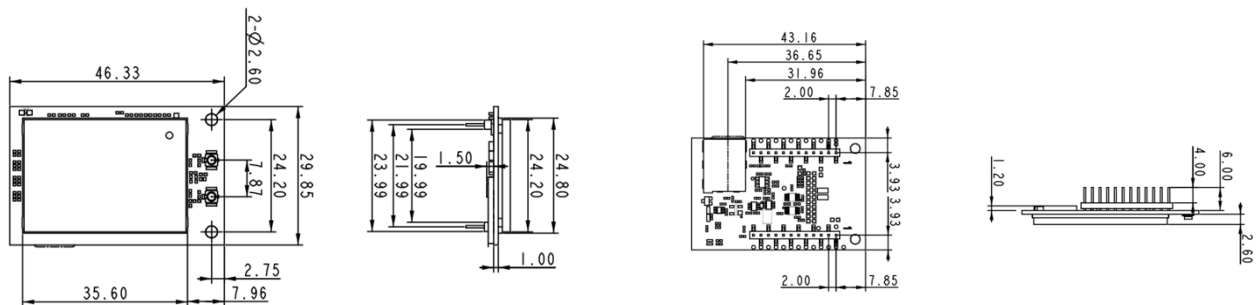
|       |         |                  |  |   |            |                                       |   |
|-------|---------|------------------|--|---|------------|---------------------------------------|---|
| J2-3  | DIO2    | I/O              | Programmable GPIO2 on u-blox   | VIL: -0.2 to 0.63V<br>VOL: GND to 0.45V |            | VOL:1.17 to 2.1V<br>VOL: 1.35 to 1.8V | No connection   |
| J2-2  | ADC1    |                  | not supported  |   |            |                                       | No connection   |
| J2-1  | ON_OFF  | Input(w/ 10K PU) | Modem On/Off signal. Assert low for at least 5 ms and then release to activate start sequence. Drive with open collector output. Internally pulled up to internal I/O rail with pull up. Do not use any external pull ups. | VIL: GND to 0.55V                       | VCC        | 5.5V                                  | No connection. Modem switch after at valid VCC rising edge.   |
| J1-11 | SIM_CLK | Output           | SIM card clock   |   | 1.8V or 3V |                                       | Must be implemented if SIM Card not used in U5, No connection |
| J1-12 | VSIM    | Output           | SIM card power   |   | 1.8V or 3V |                                       | Must be implemented if SIM Card not used in U5, No connection |
| J2-11 | SIM_IO  | I/O              | SIM card data  |   | 1.8V or 3V |                                       | Must be implemented if SIM Card not used in U5, No connection |
| J2-12 | SIM_RST | Output           | SIM card reset   |   | 1.8V or 3V |                                       | Must be implemented if SIM Card not used in U5, No connection |

## Dimensions (mm)

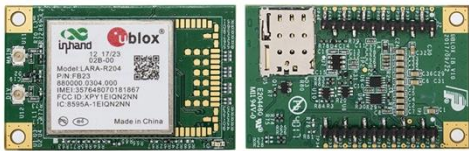

### FB23 LTE CAT 1 Modem



### FB38 LTE CAT 4 Modem



## Ordering

| Part Number | Picture   | LTE Category | Band                                       |
|-------------|---|--------------|--|
| FB23        |  | CAT 1        | LTE B4, B13                                |
| FB38        |  | CAT 4        | LTE B2, B4, B5, B13, B17<br>UMTS 850, 1900 |



### InHand Networks

Founded in 2001, InHand Networks is now a global leader of Industrial IoT with more than 330,000 products shipped globally.

InHand serves world-class partners and customers with industrial M2M routers, gateways, industrial Ethernet switches, rugged computers and IoT management platforms. We provide IoT solutions for various vertical markets including Smart Grid, Industrial Automation, Remote Machine Monitoring, Smart Vending, Smart City, Retail and more.



Collaborative Automation by



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