4ZeroBox Mobile User Manual

For more details, visit: www.zerynth.com

Contents of the present documentation refers to products and technologies described within. All technical data contained in this document may be modified without prior notice The content of this documentation is subject to periodic revision.

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Overview

Easily monitor your assets and acquire data from industrial machines where Wi-Fi and Ethernet connectivity is not available through the integrated Cellular 2G and NB-IoT connectivity In addition to Wi-Fi capabilities.

The **4ZeroBox Mobile** is an Industrial data acquisition device that features Cellular 2G, NB-IOT and Wi-Fi connectivity and GPS capabilities. There are many onboard features like: a DIN-rail mountable case, industrial grade sensor channels, support for Wi-Fi, Relays, support for CAN protocols, RS485, RS232 interfaces.
The 4ZeroBox Mobile can be integrated with any of the Zerynth expansion boards. They can act in concert or individually as a prototype during the development stage, and as a core for industrial applications.

General Characteristics

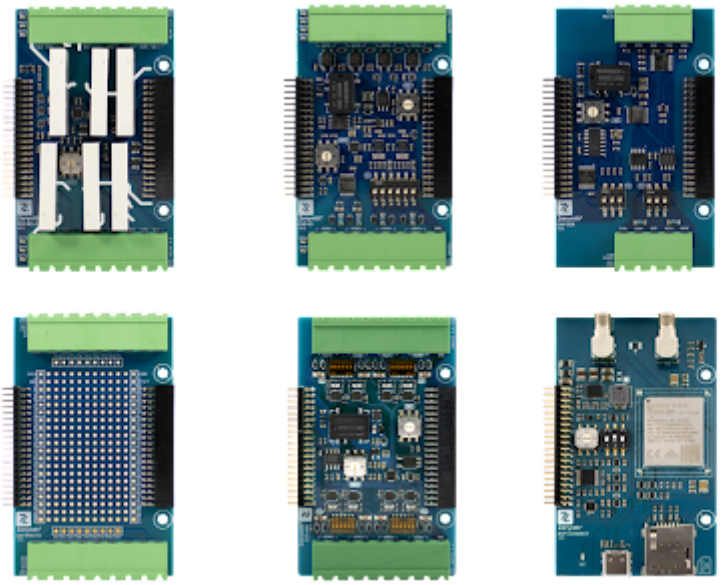
- ZM1 Module
    - 32-bit dual Core microcontroller based on the ESP32-WROOM-32SE.
    - Clock frequency up to 240 Mhz.
    - Embedded 16 MB SPI Flash memory
    - Integrates the ATECC608A crypto element to allow ultra-secure communication.
    - WiFi (Client and AP mode supported) and Bluetooth® Low-Energy Support
- 6 Analog channels that can measure (dependent on the dip switch configuration):
    - 4-20mA sensors (single ended or differential)
    - 0-10V sensors (single ended or differential)
    - current transformers (non-invasive)
    - resistive sensors (NTC, RTD, contact, proximity, etc.)
- 2 solid state relay channels
    - Max voltage (open circuit) = 36VDC
    - Max current (closed circuit) = 150mA
- RS232 and RS485 Interface.
- Supports CAN Protocol.
- Supports USB-C for PC communication and power.
- USB-C Slot for DEBUG/updating Firmware of BG95
- SMA Antenna for GSM/GPRS (SX) and GPS (DX)
- LiPo Battery support
- JTAG support

Modular Expansion System

Zerynth Development boards offer a game-changing way of connecting and adding functionalities to your application in a simple and easy way.
The development board offers a modular expansion system that adds expansion boards through the connectors on the board (zBUS).

Expansion boards vary in features and functionality. Currently, Zerynth offers :

- **EXP-AIN:** Expansion board with 8 Industrial analog input channels
- **EXP-CONNECT:** GSM-NB-IoT and GPS enabled expansion module.
- **EXP-IO:** Industrial input/output board with 4 solid-state relays, 2 analog channels (4-20mA/0-10V/NTC/current clamp) channels, 2 opto-isolated digital inputs
- **EXP-RELAY:** Expansion board with 6 Electromechanical power relays.
- **EXP-SER:** Serial Communication board with : CAN, RS232 and RS485 interfaces.
- **EXP-PROTO:** Prototyping board for connecting and testing different types of sensors and devices.



Screw Description

Connector P1		
Screw Number	**Symbol**	**Description**
1	VIN	External Power Supply 9V-36V
2	GND	Ground pin for Power supply
3	CANH	High Channel for CAN Bus
4	CANL	Low Channel for CAN Bus
5	GND	Ground Pin
6	B/TX	Signal B of RS485 or TX of RS232
7	A/RX	Signal A of RS485 or RX of RS232
8	GND	Ground Pin

Connector P2		
Screw Number	**Symbol**	**Description**
9,10	OUT1	Screw Terminal of the relay #1 (OUT1 is normally open)
11,12	OUT2	Screw Terminal of the relay #2 (OUT2 is normally open)
13	GND	Ground Pin
14	AIN1	Analog Input Channel #1
15	AIN2	Analog Input Channel #2
16	AIN3	Analog Input Channel #3
17	GND	Ground Pin
18	AIN4	Analog Input Channel #4
19	AIN5	Analog Input Channel #5
20	AIN6	Analog Input Channel #6

The negative terminal of all analog channels are the GND pins.
GND of analog channels are connected to other GNDs on the board.

Technical Specifications

Power Supply	
Voltage	9 to 36 Vdc

Inputs / Outputs	
ADC Inputs Resolution	11 bit + sign.
4-20mA Channels - x6 (according to dip-switch positions)	Min supported input current 4 mA Max supported input current 20 mA
0-10V Channels - x6 (according to dip-switch positions)	Min supported input voltage 0 V Max supported input voltage 10 V
Resistive Channels x6 (according to dip-switch positions)	Min supported Resistor value 0 Ohm Max supported Resistor value 70 KOhm
Current Channels x6 (according to dip-switch positions)	Min supported input current -50 mA Max supported input current 50 mA
SolidState Relays	Max voltage (open circuit) = 36VDC Max current (closed circuit) = 150mA

Note: For each analog channel the user can choose **only one configuration.**

Environmental Conditions	
Recommended operating temperature	-20 to +60 °C
Humidity	Max 80% (not condensing)
Storage Temperature	-40 to +85 °C
Degree Protection	< IP40

IMPORTANT : operating the device at high temperature for a short period of time is allowed however we strongly recommend operating the device at the ***recommended operating temperature.***

Connectors	
Programming	USB-C Connector
SIM Card	Micro SIM Slot
Micro SD	Micro SD Slot
Power Supply, Sensors, RS485, RS232, CAN, Relays,	Screw Connectors 3mm pitch
Li-Po Battery	JST Connector

Categories	Items	Specifications
Certification	RF Certification	FCC/CE-RED
	Green Certification	RoHS/REACH
Test	Reliability	HTOL/HTSL/uHAST/TCT/ESD
Wi-Fi	Protocols	802.11 b/g/n (802.11n up to 150 Mbps)
		A-MPDU and A-MSDU aggregation and 0.4 μs guard interval support
	Frequency Range	2.4 ~ 2.5 GHz
Bluetooth	Protocols	Bluetooth v4.2 BR/EDR
	Radio	NZIF receiver with –97 dBm sensitivity
		NZIF receiver with –97 dBm sensitivity
		AFH

Components' Guide

- **Quectel BG95-M3 modem**: BG95 is a series of embedded IoT (LTE Cat M1, LTE Cat NB2 and EGPRS) wireless communication modules. It provides data connectivity on LTE-FDD and GPRS/EGPRS networks, and supports half-duplex operation on LTE networks. It also provides GNSS functionality to meet your specific application demands.

Frequency Bands and GNSS Types of BG95 Series Modules

Supported Bands LTE Bands	Power Class	GNSS
Cat M1: LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/ B18/B19/B20/B25/B26/B27/ B28/B66/B85 Cat NB2: LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/ B18/B19/B20/B25/B28/B66/B71/ B85 EGPRS: 850/900/1800/1900 MHz	Power Class 5 (21 dBm)	GPS, GLONASS, BeiDou, Galileo, QZSS.

Transmitting Power

LTE-FDD bands	GSM bands
Class 5 (21 dBm +1.7/-3 dB) Class 3 (23 dBm ±2 dB) Class 2* (26 dBm ±2 dB)	Class 4 (33 dBm ±2 dB) for GSM850 Class 4 (33 dBm ±2 dB) for EGSM900 Class 1 (30 dBm ±2 dB) for DCS1800 Class 1 (30 dBm ±2 dB) for PCS1900 Class E2 (27 dBm ±3 dB) for GSM850 8-PSK Class E2 (27 dBm ±3 dB) for EGSM900 8-PSK Class E2 (26 dBm ±3 dB) for DCS1800 8-PSK Class E2 (26 dBm ±3 dB) for PCS1900 8-PSK

Main Antenna Interface: Operating Frequency

3GPP Band	Transmit	Receive	Unit
LTE-FDD B1	1920–1980	2110–2170	Mhz
LTE-FDD B2, PCS1900	1850–1910	1930–1990	MHz
LTE-FDD B3, DCS1800	1710–1785	1805–1880	MHz
LTE-FDD B4	1710–1755	2110–2155	Mhz

LTE-FDD B5	GSM850	824–849	869–894
LTE-FDD B8	EGSM900	880–915	925–960
LTE-FDD	B12	699–716	729–746
LTE-FDD	B13	777–787	746–756
LTE-FDD	B18	815–830	860–875
LTE-FDD	B19	830–845	875–890
LTE-FDD	B20	832–862	791–821
LTE-FDD	B25	1850–1915	1930–1995
LTE-FDD	B26	814–849	859–894
LTE-FDD	B27	807–824	852–869
LTE-FDD	B28	703–748	758–803
LTE-FDD	B31	452.5–457.5	462.5–467.5
LTE-FDD	B66	1710–1780	2110–2180
LTE-FDD	B71	663–698	617–652
LTE-FDD	B71	663–698	617–652
LTE-FDD	B72	451–456	461–466
LTE-FDD	B73	450–455	460–465
LTE-FDD	B85	698–716	728–746

GNSS Antenna Interface: GNSS Operating Frequency

Type	Frequency	Unit
GPS	1575.42 ±1.023	MHz
GLONASS	1597.5–1605.8	MHz
Galileo	1575.42 ±2.046	MHz
BeiDou	1561.098 ±2.046	MHz
QZSS	1575.42 ±1.023	MHz

Antenna Requirements

Antenna Type	Requirements
GNSS	Frequency range: 1559–1609 MHz Polarization: RHCP or linear VSWR: < 2 (Typ.) Passive antenna gain: > 0 dBi Active antenna noise figure: < 1.5 dB Active antenna gain: > 0 dBi Active antenna embedded LNA gain: < 17 dB
LTE/GSM	VSWR: ≤ 2 Efficiency: > 30 % Max Input Power: 50 W Input Impedance: 50 Ω Cable Insertion Loss: < 1 dB (LTE B5/B8/B12/B13/B18/B19/B20/B26/B27/B28/B31/B71/B72/B73/B85, GSM850/EGSM900) Cable Insertion Loss: < 1.5 dB (LTE B1/B2/B3/B4/B25/B66, DCS1800/PCS1900)

Absolute Maximum Ratings

Absolute maximum ratings for power supply and voltage on digital and analog pins of the module are listed in the following table.

Parameter	Min.	Max.	Unit
VBAT_BB	-0.5	6.0	V
VBAT_RF	-0.3	6.0	V
USB_VBUS	-0.3	5.5	V
Voltage at Digital Pins	-0.3	2.09	V

Power Supply Ratings

Parameter	Description	Conditions	Min.	Typ.	Max.	Unit
VBAT	VBAT_BB/ VBAT_RF	The actual input voltages must be kept between the minimum and the maximum values.	3.3	3.8	4.3	V
IVBAT	Peak supply current (during transmission slot)	Maximum power control level on EGSM900	-	1.8	2.0	A
USB_VBUS	USB connection detection		-	5.0	-	V

BG95-M3 Current Consumption (3.8 V Power Supply, Room Temperature)

Description	Conditions	Average	Peak	Unit
Leakage*	Power-off @ USB and UART disconnected	12.99	-	µA
PSM**	Power Saving Mode	3.89	-	µA
Rock Bottom	AT+CFUN=0 @ Sleep mode	0.575	-	mA
Sleep Mode (USB disconnected)	LTE Cat M1 DRX = 1.28 s	1.89		mA
	LTE Cat NB1 DRX = 1.28 s	1.49	-	mA
	EGSM900 DRX = 5	1.21	-	mA
	DCS1800 DRX = 5	1.20	-	mA
	LTE Cat M1 e-I-DRX = 81.92 s @ PTW = 2.56 s, DRX = 1.28 s	0.63	-	mA
	LTE Cat NB1 e-I-DRX = 81.92 s @ PTW = 2.56 s, DRX = 1.28 s	0.67	-	mA
Idle Mode (USB disconnected)	LTE Cat M1 DRX = 1.28 s	18.9	-	mA
	LTE Cat NB1 DRX = 1.28 s	14.8	-	mA
	LTE Cat M1 e-I-DRX = 81.92 s @ PTW = 2.56 s, DRX = 1.28 s	18.2	-	mA
	LTE Cat NB1 e-I-DRX = 81.92 s @ PTW = 2.56 s, DRX = 1.28 s	14.3	-	mA
LTE Cat M1 data transfer (GNSS OFF)	B1 @ 21.29 dBm	193.65	491.42	mA
	B2 @ 20.73 dBm	190.76	477.7	mA
	B3 @ 20.67 dBm	185.89	462.63	mA
	B4 @ 20.85 dBm	185.14	456.71	mA
	B5 @ 21.02 dBm	194.99	487.59	mA
	B8 @ 21.02 dBm	197.31	497.83	mA

	B12 @ 20.96 dBm	189.54	467.22	mA
	B13 @ 20.99 dBm	198.75	510.51	mA
	B18 @ 21 dBm	195.07	490.61	mA
	B19 @ 20.95 dBm	197.63	502.55	mA
	B20 @ 20.92 dBm	197.33	498.89	mA
	B25 @ 21.08 dBm	190.67	481.36	mA
	B26 @ 20.98 dBm	195.96	493.02	mA
	B27 @ 20.69 dBm	192.07	486.82	mA
	B28A @ 20.87 dBm	192.04	482.44	mA
	B28B @ 21.03 dBm	197.39	501.64	mA
	B66 @ 21.11 dBm	188.1	471.7	mA
	B85 @ 20.87 dBm	185.3	453.97	mA
LTE Cat NB1 data transfer (GNSS OFF)	B1 @ 20.86 dBm	153.2	477.37	mA
	B2 @ 21.28 dBm	155.14	478.3	mA
	B3 @ 21.07 dBm	149.14	450.59	mA
	B4 @ 20.91 dBm	147.72	449.24	mA
	B5 @ 20.55 dBm	154.68	476.59	mA
	B8 @ 21.01 dBm	158.82	493.93	mA
	B12 @ 20.88 dBm	148.37	452.51	mA
	B13 @ 21.09 dBm	167.03	520.85	mA
	B18 @ 20.79 dBm	157.12	489.47	mA
	B19 @ 20.68 dBm	156.29	489.16	mA
	B20 @ 21.01 dBm	161.75	503.43	mA
	B25 @ 21.02 dBm	154.16	476.58	mA
	B28 @ 20.82 dBm	147.82	458.52	mA
	B66 @ 21 dBm	148.58	459.72	mA
	B71 @ 20.81 dBm	137.53	428.61	mA
	B85 @ 20.64 dBm	146.51	462.26	mA

GPRS data transfer (GNSS OFF)	GPRS GSM850 4UL/1DL @ 30.5 dBm	670.73	1535	mA
	GPRS GSM900 4UL/1DL @ 29.65 dBm	623.34	1442	mA
	GPRS DCS1800 4UL/1DL @ 26.24 dBm	408.25	836.38	mA
	GPRS PCS1900 4UL/1DL @ 26.43 dBm	423.12	885.95	mA
EDGE data transfer (GNSS OFF)	EDGE GSM850 4UL/1DL @ 22.97 dBm	519	1114	mA
	EDGE GSM900 4UL/1DL @ 22.51 dBm	517.59	1101	mA
	EDGE DCS1800 4UL/1DL @ 22.73 dBm	439.73	919.79	mA
	EDGE PCS1900 4UL/1DL @ 22.27 dBm	443.94	922.29	mA

*The current consumption of BG95 series in PSM is much lower than that in power-off mode, and this is due to the following two designs:

- More internal power supplies are powered off in PSM.
- Also, the internal clock frequency is reduced in PSM.

**The module's USB and UART are disconnected and GSM network (if available) does not support PSM.

GNSS Current Consumption of BG95-M3 (3.8 V Power Supply, Room Temperature)

Description	Conditions	Typ.	Unit
Searching (AT+CFUN=0)	Cold start @ Instrument	70.00	mA
	Host start @ Instrument	73.66	mA
	Warm start @ Instrument	72.54	mA
	Lost start @ Instrument	69.24	mA
Tracking (AT+CFUN=0)	Instrument Environment @ Passive Antenna	22.31	mA
	Open Sky @ Real network, Passive Antenna	21.792	mA
	Open Sky @ Real network, Active Antenna	22.357	mA

Note: JP1 jumper is dedicated for Quectel BG95 USB_BOOT signal (internal FW update via dedicated USB-C)

- **MAX3232EIPW:** 3-V to 5.5-V Multichannel RS-232 Line Driver and Receiver with ±15-kV IEC ESD Protection.

- **SN65HVD1786D:** Fault-Protected RS-485 Transceivers With Extended Common-Mode Range
    - The receive / transmit signal is the RTS of serial 1
- **MCP2518:** CAN FD Controller
    - driven in SPI - the chip select is the CTS of serial1
- **TDK InvenSense IIM-42351:** High-Performance 3-Axis SmartIndustrial™ MEMS Accelerometer for Industrial Applications. **With the following features:**
    - Digital-output X-, Y-, and Z-axis accelerometer with programmable full-scale range of ±2g, ±4g, ±8g and ±16g
    - Low Noise (LN) and Low Power (LP) power modes support
    - Wake-on-motion interrupt for low power operation of applications processor
    - Output data rate up to 8 kHz.
- **Port Expanders**
    - Primary Port expander **NXP PCAL6524** that enables driving D40 to D63 pins.
    - secondary Port expander **NXP PCAL6524** that enables driving D64 to D87 pins.
    - Analog Port expander **ADS7128** that enables driving D88 to D95 pins.
- **Power Supply:** The development board can be powered through the USB type-C connection, 9-36V Power Supply connector P1.
  The power circuit automatically detects and uses the available power source but the DC power supply has priority over the USB power supply,

Note: all I2C components are compatible with Fast Mode Plus (1 MHz clock frequency)

Dip-Switches

S1 Switch: Enables term resistors for CAN Bus.

PIN	OFF	ON
1	-	CANH and CANL are connected through 120ohm resistor
2	-	RS485A and RS485B are connected through 120ohm resistor
3	-	Connects RS485B terminal with B/TX terminal
4	-	Connects RS485A terminal with A/RX terminal
5	-	Connects RS232TX terminal with B/TX terminal
6	-	Connects RS232RX terminal with A/RX terminal

- **To expose RS485 on the outer screws:** set S1.PIN3 and S1.PIN4 ON
- **To expose RS232 on the outer screws:** set S1.PIN5 and S1.PIN6 ON
- **S1.PIN3 and S1.PIN5 can never be on at the same time**
- **S1.PIN4 and S1.PIN6 can never be on at the same time**

S2 Switch: Controls the serial ports connected to the quectel modem

PIN	OFF	ON
1	Connect TX1 to the zBUS	Connect TX1 to GPS of BG95
2	Connect TX1 to the zBUS	Connects TX1 with RS485/RS232
3	Connect RX1 to the zBUS	Connect RX1 to GPS of BG95
4	Connect RX1 to the zBUS	Connects RX1 with RS485/RS232
5	Connect CTS1 to the zBUS	Connects CTS1 with CS MCP2518
6	Connect RTS1 to the zBUS	Connects RTS1 with R/T enable RS485

Switch Configuration to Enable SERIAl1 for GPS or RS232/RS485

Dedicate SERIAL1 for GPS		Dedicate SERIAL1 for RS232 or RS485	
PIN	**State**	**PIN**	**State**
S2.1	ON	**S2.1**	OFF
S2.2	OFF	**S2.2**	ON
S2.3	ON	**S2.3**	OFF
S2.4	OFF	**S2.4**	ON
S2.5	-	**S2.5**	-
S2.6	-	**S2.6**	-

Note: If SERIAL1 is also dedicated to the GPS, no more serial ports will be available over the zBUS.

- **S2.PIN1 and S2.PIN2 can never be active at the same time**
- **S2.PIN3 and S2.PIN4 can never be active at the same time**
- **to use the onboard CAN:** Set S2.PIN5 ON
- **to use the RS485 onboard:** Set S2.PIN6 ON

Note: By default, the BG95-M3 uses SERIAL2 of the 4ZeroBox Mobile for communication with the modem, **Don't use it with other expansion boards.**

S3, S4, S5 Switch:

PIN	OFF	ON

1	Gain ADC AINx = 1	Gain ADC AINx = 5
2	AINx read as voltage	AINx read as Current
3	-	AINx read as resistive sensor
4	Gain ADC AINy = 1	Gain ADC AINy = 5
5	AINy read as voltage	AINy read as Current
6	-	AINy read as resistive sensor

Note: S3 Controls AIN1 and AIN2 channels.
S4 controls AIN3 and AIN4 channels.
S5 controls AIN5 and AIN6 channels.

For Voltage measurement - 0 10V standard industrial voltage sensor:

Switch pin	State
Sx.1	OFF
Sx.2	OFF
Sx.3	OFF

For Current measurement - 4-20 mA standard industrial sensor:

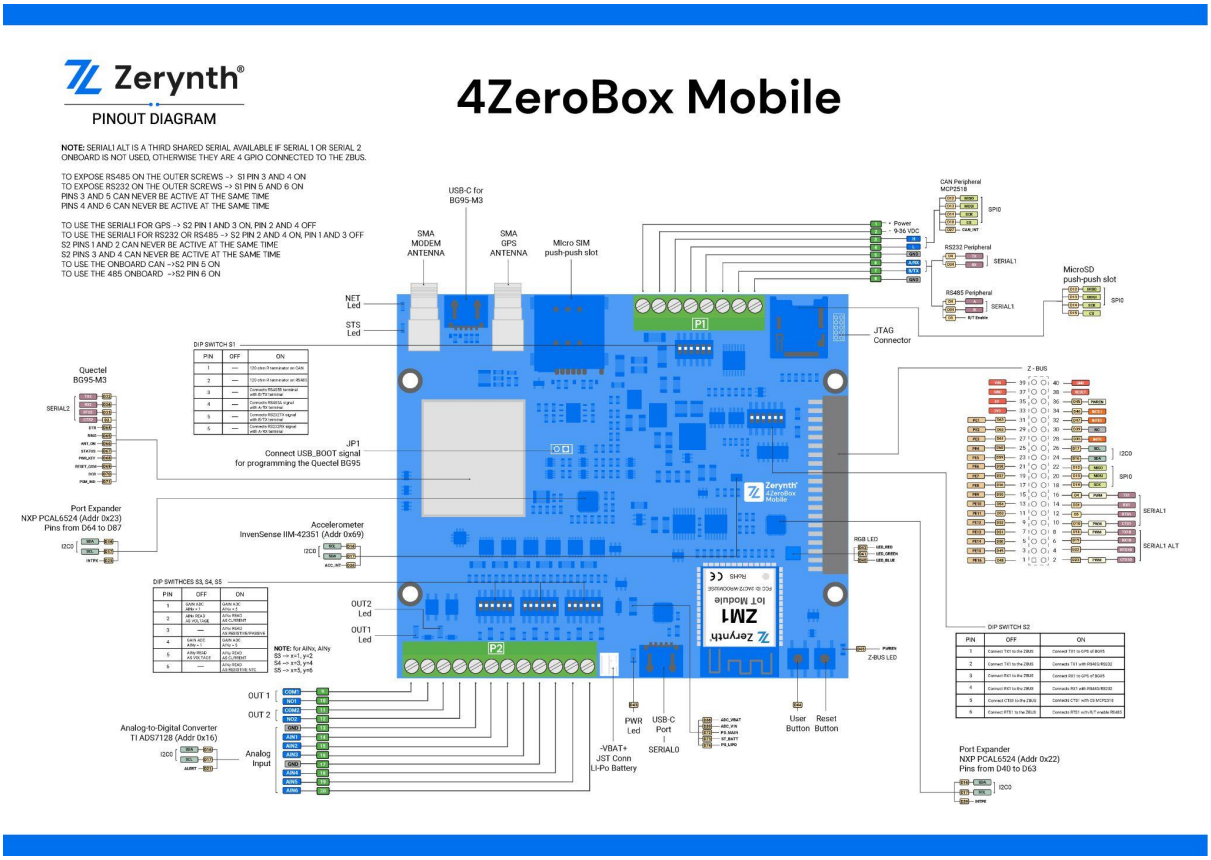
Switch pin	State
Sx.1	ON
Sx.2	ON
Sx.3	OFF

For Resistive passive industrial sensor:

Switch pin	State
Sx.1	ON
Sx.2	OFF
Sx.3	ON

NOTE: A Current Clamp (transformer) can be connected using the 4-20mA configuration of the DIP switches exploiting the full input range of ±20mA. That is ±2V across the on-board 100 Ohm resistor which cannot handle power dissipation required by ±10V.

Pin-Map



LEDs

- Power-on LED.
- zBUS Power-on: Power Supply of the connected expansion board.
- NET: Modem feedback
- STS: Status of BG95
- OUT1 and OUT2: Status of the corresponding relays.
- 3 RGB LEDs Configurable through application code.

Push-Buttons

- *RST* BTN for resetting the MCU
- USER *BTN* configurable through application code. (connected to D44)

Pin-Description

Pin-Name	Direction	Function	Connected to
D0	IN	BOOT	Bootstrap pin on ZM1
D1	OUT	TX0 (SERIAL0)	USB Serial port
D2	IN	Clear To Send SERIAL2 (CTS2)	CTS2
D3	IN	RX0 (SERIAL0)	USB Serial port
D4	OUT	TX1 (SERIAL1)	SERIAL1 Instance
D5	OUT	Ready To Send SERIAL1 (RTS1)	R/T enable of RS485 (according to dip-switch position) SERIAL1 Instance.
D10	IN/OUT	Clear To Send SERIAL1 (CTS1)	CS of MCP2518 (according to dip-switch position) SERIAL1 Instance.
D12	IN	MISO0 (SPI0)	SD Card
D13	OUT	MOSI0 (SPI0)	SD Card
D14	OUT	SCK0 (SPI0)	SD Card
D15	OUT	CS0	CS for MicroSD card
D16	IN/OUT	SDA0 (I2C0)	I2C0 Instance
D17	OUT	SCL0 (i2C0)	I2C0 Instance
D18	OUT	TX1B	SERIAL1 ALT Exposed on zBUS
D19	IN	RX1B	SERIAL1 ALT Exposed on zBUS
D21	IN	ALERT	Interrupt of ADS7128 (Analog Channels)
D22	OUT	RTS1B	SERIAL1 ALT Exposed on zBUS
D23	IN	CTS1B	SERIAL1 ALT Exposed on zBUS
D25	IN	INTPX	Interrupt pin of secondary port expander NXP PCAL6524 (BG95, DOUT, PWR Status)

D26	IN	ACC_INT	Interrupt pin of accelerometer IIM-42351
D27	IN	CAN_INT	Interrupt of CAN Controller MCP2518
D32	OUT	TX2	SERIAL2 Instance.
D33	OUT	Ready To Send SERIAL2 (RTS2)	SERIAL2 Instance.
D34	IN	RX1 (SERIAL1)	SERIAL1 Instance.
D35	IN	INTR	Interrupt pin Exposed on the zBUS (dedicated native interrupt for Expansion boards)
D36	IN	RX2 (SERIAL2)	SERIAL2 Instance.
D39	IN	INTPE	Interrupt pin of primary port expander NXP PCAL6524
D40	OUT	Blue LED	Turn on/off Led Blue
D41	OUT	Green LED	Turn on/off Led Green
D42	OUT	Red LED	Turn on/off Led Red
D43	OUT	LEDEN	Turn on/off Power Led.
D44	IN	USRBTN	User Button
D45	OUT	PWREN	Enables power supply to EXP boards and on-board components
D46	IN	INTE1	Interrupt pin Exposed on the zBUS (dedicated native interrupt for Expansion boards)
D47	IN	INTE2	Interrupt pin Exposed on the zBUS (dedicated native interrupt for Expansion boards)
D48	IN/OUT	General Purpose I/O	PE16
D49	IN/OUT	General Purpose I/O	PE15
D50	IN/OUT	General Purpose I/O	PE14

D51	IN/OUT	General Purpose I/O	PE13
D52	IN/OUT	General Purpose I/O	PE12
D53	IN/OUT	General Purpose I/O	PE11
D54	IN/OUT	General Purpose I/O	PE10
D55	IN/OUT	General Purpose I/O	PE9
D56	IN/OUT	General Purpose I/O	PE8
D57	IN/OUT	General Purpose I/O	PE7
D58	IN/OUT	General Purpose I/O	PE6
D59	IN/OUT	General Purpose I/O	PE5
D60	IN/OUT	General Purpose I/O	PE4
D61	IN/OUT	General Purpose I/O	PE3
D62	IN/OUT	General Purpose I/O	PE2
D63	IN/OUT	General Purpose I/O	PE1
D64	OUT	DTR	Switch from ppp mode to AT commands mode
D65	IN	RING	Interrupt pin of Modem BG95
D66	OUT	ANT_ON	Turn on/off GPS antenna
D67	IN	STATUS	Checks modem status
D68	OUT	PWR_KEY	Turn on/off the Modem BG95
D69	OUT	RESET_GSM	Reset the Modem BG95
D70	IN	DCD	Checks active connection
D71	IN	PSM_IND	Power Save Mode indicator
D72	IN	PS_MAIN	HIGH → power supply used is VEXT LOW →power is supplied from USB
D73	IN	ST_BATT	LOW →charging if the battery is connected

D74	IN	PS_LIPO	HIGH →Power supply from battery LOW →Power supply according to PS_MAIN
D80	OUT	DOUT1	Digital Output 1
D81	OUT	DOUT2	Digital Output 2
D88	IN	ADC_VBAT	Analog channel for battery level
D89	IN	ADC_VIN	Analog channel for External Voltage power supply
D90	IN	AIN1	Analog channel #1
D91	IN	AIN2	Analog channel #2
D92	IN	AIN3	Analog channel #3
D93	IN	AIN4	Analog channel #4
D94	IN	AIN5	Analog channel #5
D95	IN	AIN6	Analog channel #6

NOTE: Pins not explicitly mentioned in this table are reserved and cannot be used by the user.

NOTE: SERIAL1 alt is a third shared serial available if serial 1 or serial 2 onboard is not used; otherwise, they are 4 native pins connected from the ZM1 to the zBUS

NOTE: PCAL6524 primary Port Expander interrupt pin connected to **ZM1** pin D39 driven with I2C at address 0x22.
NOTE: PCAL6524 Secondary Port Expander interrupt pin connected to **ZM1** pin D25 driven with I2C at address 0x23.
NOTE: Texas Instruments ADS7128 Port Expander interrupt pin connected to **ZM1** pin D21 driven with I2C at address 0x16.

NOTE: Crypto Element Microchip ATECC608A driven in I2C at the address 0x35 with our libraries with 7 bit address or 0xC0 with the 8bit one

NOTE: Quectel BG95-M3 modem can only be powered with battery or USB.
NOTE: TDK InvenSense IIM-42351 accelerometer driven in I2C at address 0x69
NOTE: ST_BATT needs the internal pull-up to be able to read it, the other two signals PS_MAIN and PS_LIPO do not need to be pulled up, But it is advisable to do so.

zBUS Pin Description

PIN-Name	Description
VIN	External power supply voltage (9-36V)
RESET	Reset pin, Active low.
PWREN	enable/disable the power in the zBUS
5V	Regulated 5V power supply
INTE1	Configurarable interrupt for 4zerobox Mobile on-board port expander.
3V3	Regulated 3.3V power supply.
INTE2	interrupt for 4ZeroBox Mobile on-board port expander.
PE1-16	Digital I/O pins connected to the Port Expander
INTR	Native Interrupt: user configurable
SCL	I2C Serial Clock
SDA	I2C Serial Data
MISO	SPI Master Input Slave Output
MOSI	SPI Master Output Slave Input
SCK	SPI Serial Clock
TX1	UART/USART 1 Transmit Data
RX1	UART/USART 1 Receive Data
RTS1	UART/USART 1 Request To Send
CTS1	UART/USART 1 Clear To Send
TX1B	UART/USART 1 ALT Transmit Data
RX1B	UART/USART 1 ALT Receive Datal
RTS1B	UART/USART 1 ALT Request To Send
CTS1B	UART/USART 1 ALT Clear To Send

Software

Zerynth SDK provides software libraries for each board, alongside API documentation and examples. Please check the Hardware section for more information.
https://docs.zerynth.com/latest/hardware/

Zerynth SDK

Zerynth platform is designed to simplify and accelerate the development of IoT applications. Zerynth offers tools for developers, system integrators, and businesses to enable IoT for their products, rapidly in a secure and connected way.

Zerynth SDK is the official development framework for Zerynth hardware, It includes a compiler, device drivers and libraries drivers, In addition to simple tutorials, example codes, and application examples.

Zerynth SDK and all the required libraries can be installed on Windows, Linux and Mac using the Zerynth Installer (https://www.zerynth.com/zsdk).

Declaration of Conformity

IMPORTANT: KEEP THIS INFORMATION FOR FUTURE REFERENCE. FOR FULL SET UP AND INSTALLATION INSTRUCTIONS PLEASE VISIT docs.zerynth.com

Warnings

- All external power supplies used with Zerynth boards must comply with the relevant regulations and standards applicable in the country of use and must provide a voltage between 9 and 36 VDC.
- The manufacturer cannot guarantee compliance with the RED directive if the end user uses custom circuits other than those supplied by Zerynth (used in conformity tests).
- All boards that require CE marking have been tested and meet the essential requirements set by the Directives: 2014/53/EU (RED), 2014/35/EU (LVD), 2014/30/EU (EMC),2011/65/UE (RoHS). The declaration of conformity (DoC) can be downloaded from the website https://www.zerynth.com/download/26799/
- All Zerynth boards have undergone compliance testing for conducted and radiated emissions meeting the requirements of the following standards: FCC Part 15 B and IC ICES-003.
- Any device or component connected to one of the connectors of the 4ZeroBox Mobile must comply with the electrical characteristics defined in the specifications described in the complete manual to ensure that the performance and safety requirements are met.

- Each cable used to connect other devices or components to the Zerynth boards must be less than 300 cm long and must offer adequate insulation and operation so that the appropriate performance and safety requirements are met.

Instructions for safe use

- Do not expose this product to water or moisture and do not place it on a conductive surface while it is operating.
- Do not expose this product to excessive heat sources which could cause it to operate outside the permitted temperature range defined in the specifications (-40, +85 ° C).
- Be careful when handling the product to avoid mechanical or electrical damage to the printed circuit board and connectors.
- If a board looks damaged, do not use it.
- Do not touch the printed circuit board when it is powered on and never operate on live electrical parts.
- The printed circuit board must not come into contact with conductive objects when it is powered on.
- Discharge static electricity from your body and touch only the edges of the board to minimize the risk of damage from electrostatic discharge.

EN - Waste Electrical and Electronic Equipment (WEEE) Symbol

The use of the WEEE symbol indicates that this product/board may not be treated as household waste. By ensuring this product/board is disposed of correctly, you will help protect the environment. For more detailed information about recycling of this product/board, please contact your local authority, your household waste disposal service provider or the shop where you purchased it.