User's Manual

飞凌嵌入式 FORLINX EMBEDDED

OKMX6UL-C3

ARM Cortex-A7

Hardware Manual

Rev. 1.3

2017/03/07

Forlinx Embedded Technology Co. Ltd. www.forlinx.net

Address: 2699 Xiangyang North Avenue, Baoding, Hebei, China. TEL:0312-3102663 FAX:0312-3112651

ATTENTIONS

Working Voltage: DC5V ±10%

Operating Temp.: -0～70 ℃

Humidity: 10%~90% (none condensing)

Attentions:

- Hot-plug of core board and peripheral modules is strictly prohibited.
- Please follow all the warnings and instructions marked on the product.
- Please always keep the product dry. Once it is splashed or immersed by any liquid, cut off the power and dry it out immediately.
- Please store and operate the product in ventilating conditions to avoid damages brought by overhigh temperature.
- Please do not use or store the product in dusty or untidy conditions.
- Please do not use or store the product in alternate cold and hot conditions to avoid condensing which will damage components.
- Please do not treat the product rudely. Any falling-off, knocking and violate shaking may cause destruction to circuit and components.
- Please do not clean the product with organic solvents or corrodible liquids.
- Please do not dismantle or repair the product by yourself. Contact us when the product malfunctions.
- Please do not modify the product by yourself or use accessories unauthorized by us. Otherwise, the damage caused by that will be on your part and not included in guarantee terms.

Contact Forlinx Technical Support if you have any questions.

Note

Below marks may be helpful to you to read this manual

- Means parallel options

this mark is for the file path

ls this is for Linux PC command. Users need input the command after the # mark.

root@freescale ~$ is hyper terminal command, and users need input command after $

 : needs your attention

Copyright Announcement

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Version-updating Record

Time	Version	Details
Dec.21, 2016	V1.4	Added supporting to NAND Flash
Sep.24, 2016	V1.3	Added supporting to audio and WIFI&BT
July.20, 2016	V1.2	1. improve super-capacitor protection circuit 2. improve bug with USB OTG can not be used as a host device 3. added supporting to 3G/4G module, share SIM card slot with GPRS module
June.4, 2016	V1.1	First edition for OKMX6UL-C3 with 4G eMMC

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Technical Support and Updating

1. Technical Support

1.1 Information about our company's software and hardware
1.2 Problems related to our software and hardware manuals
1.3 After-sale technical support for OEM and ODM
1.4 Requirement of source code and other info which is lost or updated
1.5 Malfunction diagnose and other after-sale services

2. Range of Technical Discussion (non-compulsory)

2.1 Modification and comprehension of source code
2.2 How to port OS
2.3 Software and hardware problems occured in self-modifying and programming

3. Accesses to Technical Support

3.1 Tel (non-instant messenger): 0312-3119192
3.2 Email address (non-instant messenger) :
3.2.1. About Linux: linux@forlinx.com
3.2.2. About WinCE: wince@forlinx.com
3.2.3. About Android: android@forlinx.com
3.3 Forum (non-instant): http://bbs.witech.com.cn

4. Timetable for Technical Support

9:00am to 11:30am, 13:30pm to 17:00pm, Monday to Friday
Support will not be available on public holidays. Please send your questions to the email addresses above or Column Technical Support in forum. We'll reply as soon as we are back.

5. Accesses to Materials

Log in "bbs.witech.com.cn". Click "*materials for development board*" and download whatever you need.

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Chapter 1 Overview

OKMX6UL-C3 is a main control unit designed by Forlinx based on NXP ARM Cortex-A7 featuring i.MX6UL processor. This item is integrated with industrial grade components on board. It has below features:

- Designed based on NXP i.MX6UltraLite processor, high performance, power efficient and excellent performance
- CPU module components are all industrial grade with temp ranges from -40℃ to +85℃
- CPU native supporting to ISO7816 available for ESAM / PSAM module
- Built in super-capacitor to allow the unit continue to run for 15 seconds at least to avoid data losing because of power failure
- 4x DI, 4x DO, 2x RS485, 2x CAN, all are with electronical protection design
- Users could finish system upgrading by SD card but no need open the enclosure
- Wide voltage range to allow the system to run stably rom 9V to 15V
- Aluminium alloy enclosure with dimensions of 147x 103x 42mm
- 7'' LVDS display is supported
- LED indicators design for system running, network communication and interface connection detection
- Communication types: fast Ethernet, WIFI&BT, GPRS/4G modules are all supported
- Standard DB9 connectors for debug port
- Standard SD card slot available for SD/SDHC/SDXC card up to 64G for memory expand
- Standard stereo earphone jack with 3.5mm, built in micphone, and also supports expanded with 1Wx 2 speaker or 3.5mm single channel micphone

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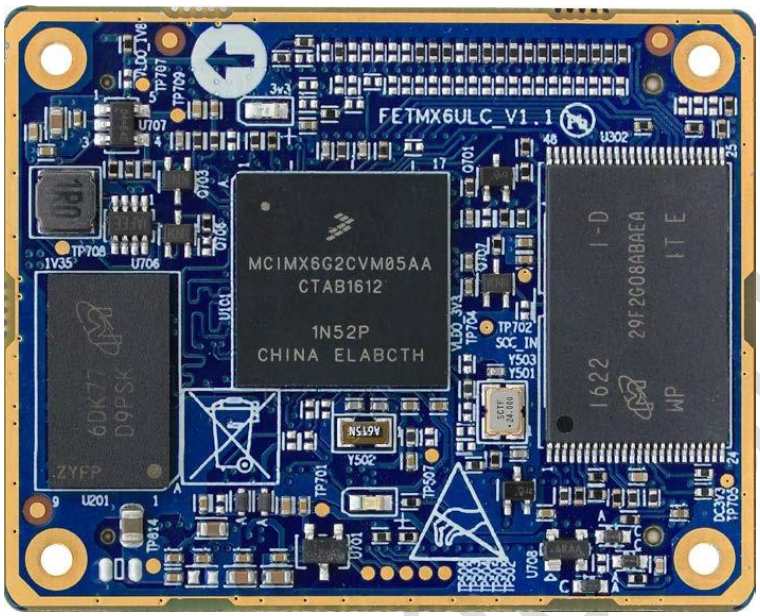
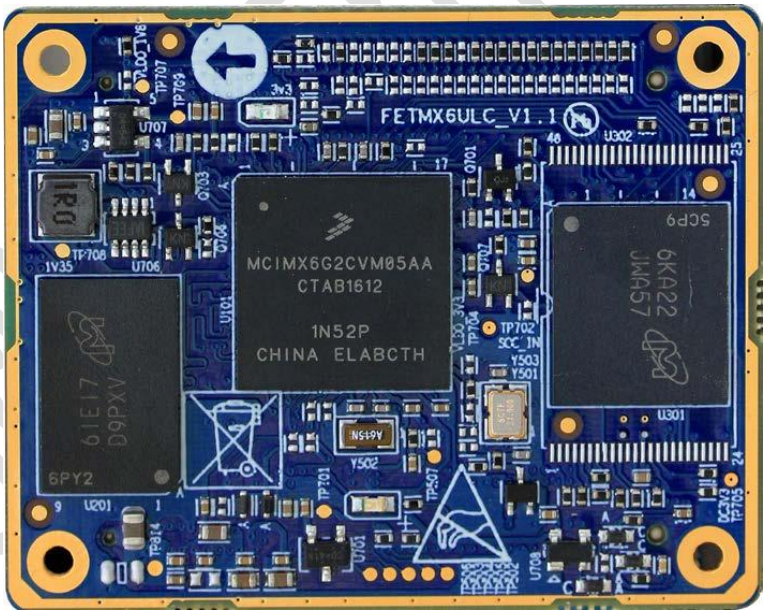
Chapter 2 About CPU Module

2.1 Appearance of CPU Module

NAND Flash version



eMMC version



2.2 CPU Module Structure

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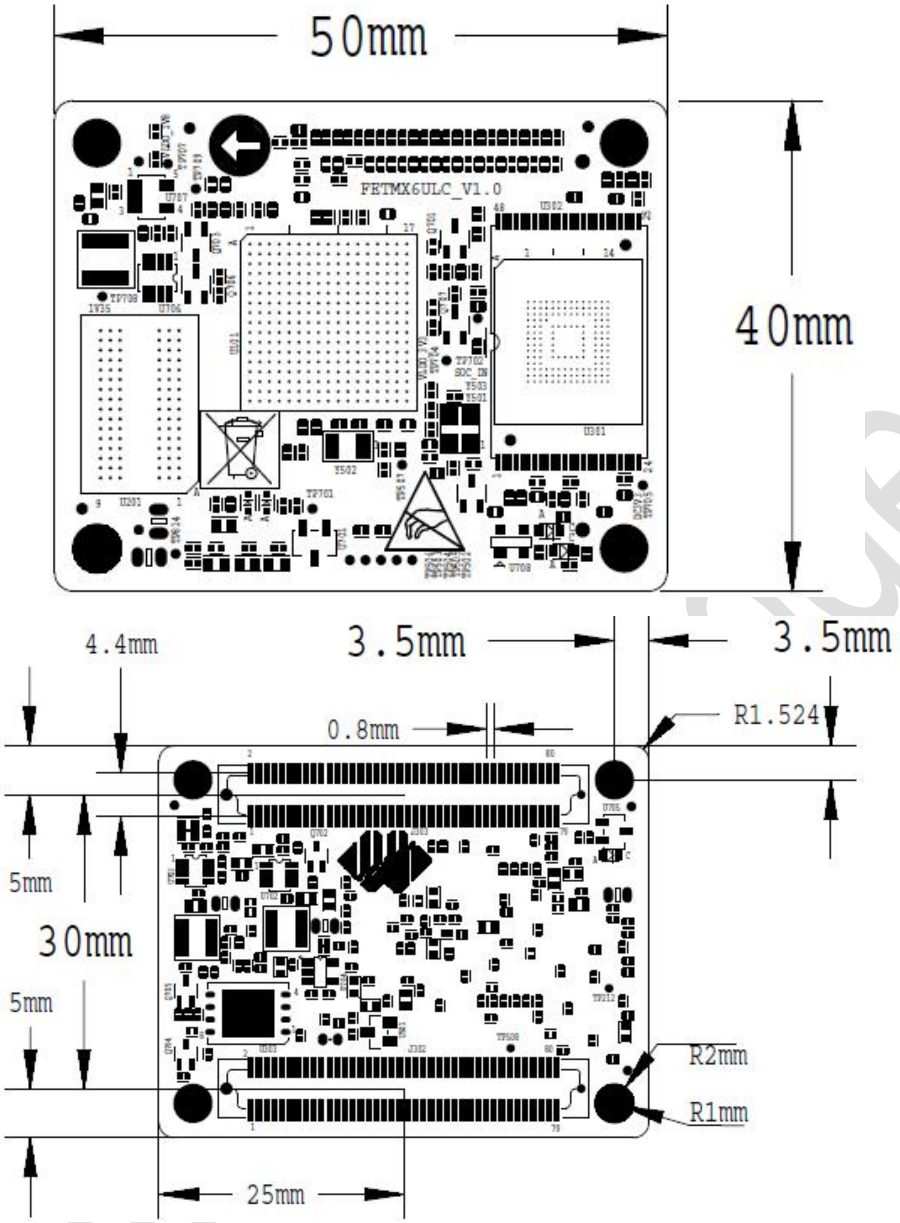

Structure: 40 x 50mm, dimension tolerance±0.15mm
PCB: 1.15mm, 6-layer EIG PCB
Connector: dual row connectors with pitch of 0.8mm, 80 pins,
CPU module connector model is ENG_CD_5177983

2.3 Specification of CPU Module

Expanding the i.MX 6 series, the i.MX 6UltraLite is a high performance, ultra-efficient processor family featuring an advanced implementation of a single ARM® Cortex®-A7 core, which operates at speeds up to 528 MHz. The CPU module is with 160 pins that 129 pins are multiplexed. The CPU module size is only 40x 50mm connected with carrier board with ultra thin connectors to compact dimensions of the whole unit.

The i.MX 6UltraLite applications processor includes an integrated power management module that reduces the complexity of external power supply and simplifies power sequencing. Each processor

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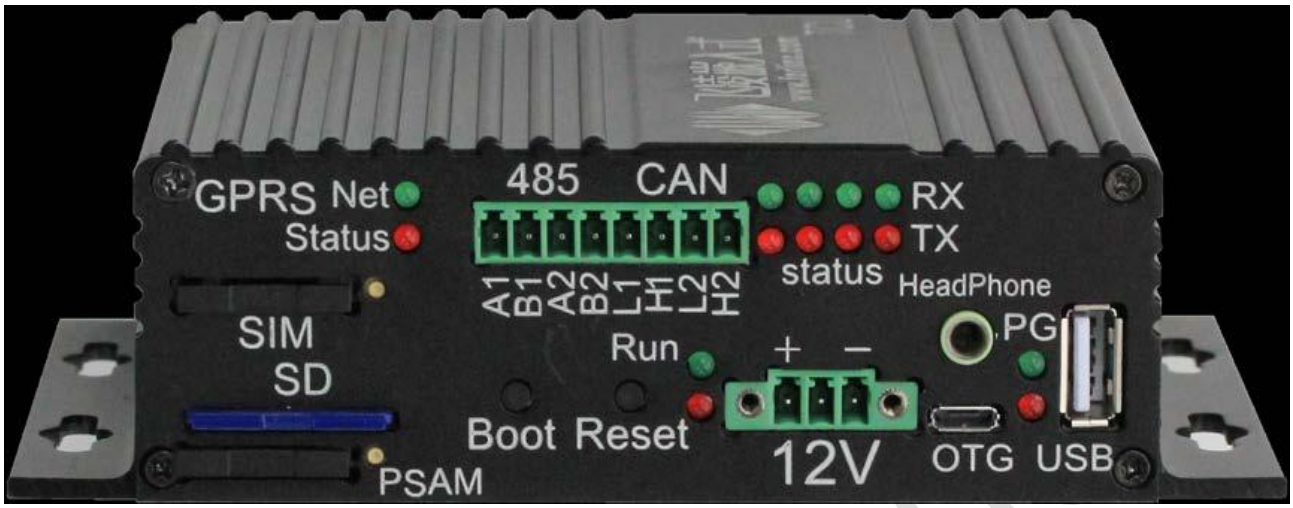
in this family provides various memory interfaces, including 16-bit LPDDR2, DDR3, DDR3L, raw and managed NAND flash, NOR flash, eMMC, Quad SPI and a wide range of other interfaces for connecting peripherals such as WLAN, Bluetooth™, GPS, displays and camera sensors.

FETMX6UL-C System on Module Features			
CPU	Freescale i.MX6Ultra Lite	**CAN**	2-ch
Architecture	ARM Cortex-A7	**USB**	2-ch
Main Frequency	528MHz	**SD/MMC/SDIO**	2-ch
RAM	512MLvDDR3 (commercial grade) 256MLvDDR3 (industrial grade)	**Ethernet**	2-ch, 10/100M adaptive
Flash	4GeMMC (commercial grade) 256MNAND Flash (NAND Flash)	**UART/IrDA**	8-ch
Working Voltage	5V	**EINT/GPIO**	supported
GPU	PXP	**Video Codec**	software codec
Dimensions	50mm*40mm	**EBI**	supported
Connection Type	board-to-board connection	**JTAG**	supported
OS	Linux 3.14.38	**Camera**	1-ch, 5.0M Megapixel parallel interface
LCD	RGB 888	**PWM**	8-ch
Audio	3-ch	**ADC**	10-ch
IIC	4-ch	**ISO7816-3**	2-ch
SPI	4-ch	**KeypadPort**	8*8
QSPI	1-ch	**SPDIF**	1-ch

Chapter 3 On-board Connectors



- left up corner is the indicator LED of 4G/GPRS
- 8-bit green terminals for 4 ports with pitch of 3.81mm, from left to right, they are RS-485-1, RS-485-2, CAN1, CAN2, all of them are electronical isolated with CPU, each terminal is marked with its functional interface.

A1 and B1 are for A and B of the first RS485

L1 and H1 are for L and H of the first CAN port

- there are two rows of LED indicators on up right, the four green indicators are for data receiving mode, and the four red are for data sending mode indicators.
- on the left, there are two drawer style mini SIM card slot, the above one is for 4G/GPRS card, and the below one is PSAM card slit, press the yellow icon to open the slot.
- this item supports users to update system by SD card: insert SD card to slot, keep pressing boot key, and meanwhile press reset key, then release boot key to start the system from SD card, keep patient until finishing system updating.
- the 12V power jack is a 3-bit green terminals with pitch of 3.81mm, the left one is 12V+ and the right one is 12V-, and middle loft.
- on the left of the power socket, it is system running mode indicator, green lighting indicates system running normally, while red lighting indicates failure. The two indicators are controlled by IO of CPU, users could define it according to their real condition.
- USB OTG port is a standard Micro USB port.
- on the above of Micro USB, it is a 3.5mm standard earphone jack.
- the USB port is a standard A type USB socket.
- in the middle of the two USB ports, there are power indicators, PG is short for Power Good, when power input voltage is above 8V, the green indicator will be shinning, otherwise, the green indicator will be off, and CPU will be indicated with power failure. The red indicator will be lightened when the unit is supplied with power by internal super-capacitor, it indicates external power failure.

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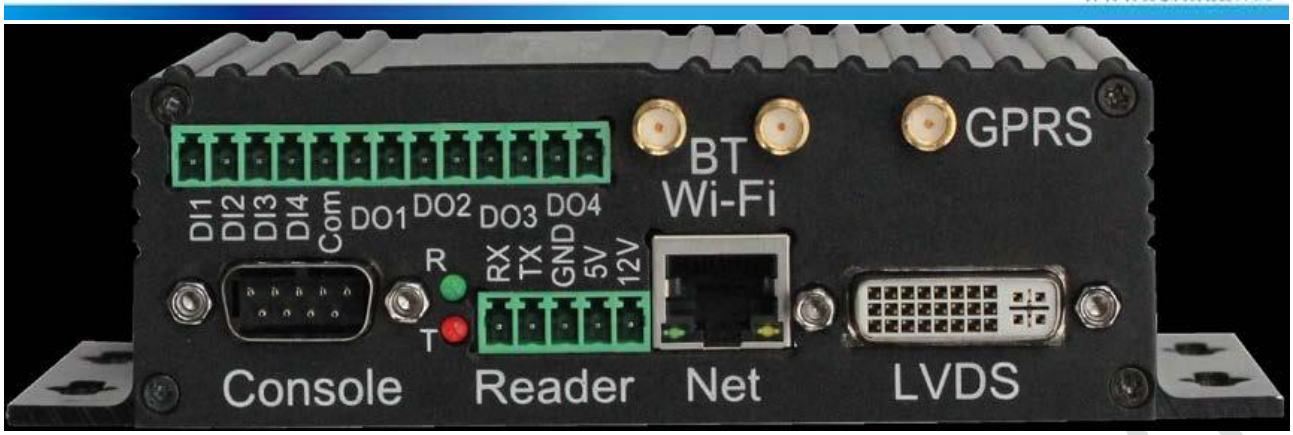

● on the up right of the above image, there are 13-bit green terminals with pitch of 3.81mm, four digital input and four digital output. From left to right, they are DigitalInput 1 to 4, and DigitalInput commen, DigitalOutput 1 to 4. the input terminals are workable with power voltage within 24V, 3V and above are high level, while 1V and below 1V are low level. The input ports are compatible, users could also configure it to 5V internal power supply and external dry contact only.

● if the unit is GPRS version, there are three antenna connectors, the left two are WIFI&BT connectors, and the right one is for GPRS.

● while if the unit is 4G version, there should be four antenna connectors, the left two are WIFI&BT shared antennas, the right two are main antenna and aux antenna of 4G.. the main antenna is mandatory, while the aux antenna is for enhance signal receiving performance, it is not mandatory but recommend.

● on the left below connector is a 3-wire debug port which is a standard DB9 male connector with RS232 level, without electronical isolation.

● in the middle, it is a standard RJ45 Ethernet connector with 10M/100M adaptive.

● the 5-bit green terminals with pitch of 3.81mm are for connection of reader module, one 3-wire of RS232 port, one 5V and one 12V power connector.

● on the right below connector, there is an LVDS connector for Topway brand 7'' LMT070DICFWD-AKA display, definition of this connector is as below.

3.1 K1 Terminal （ DVI Right angle connector）

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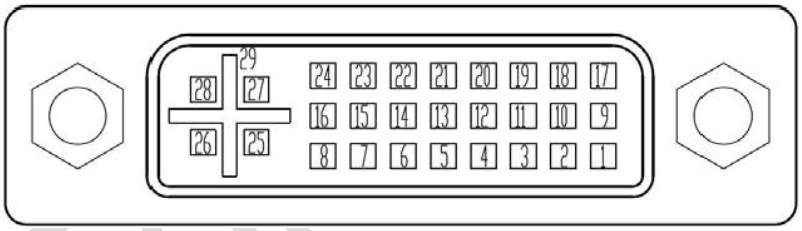
Pin No.	Pin Name	IO	Descriptions
1	RX2-	Input	LVDS receiver negative signal channel 2
2	RX2+	Input	LVDS receiver positive signal channel 2
3	GND	Power	Ground
4	BL_PWM	Input	Backlight dimming control(High actives) PWM may be used to adjust the output brightness
5	NC	-	No connection
6	VDD	Power	Positive Power Supply(5.0V)
7	VDD	Power	Positive Power Supply(5.0V)
8	VDD	Power	Positive Power Supply(5.0V)
9	RX1-	Input	LVDS receiver negative signal channel 1
10	RX1+	Input	LVDS receiver positive signal channel 1
11	GND	Power	Ground
12	RX3-	Input	LVDS receiver negative signal channel 3
13	RX3+	Input	LVDS receiver positive signal channel 3
14	VDD	Power	Positive Power Supply(5.0V)
15	GND	Power	Ground
16	GND	Power	Ground
17	RX0-	Input	LVDS receiver negative signal channel 0
18	RX0+	Input	LVDS receiver positive signal channel 0
19	GND	Power	Ground
20	USB_DM	I/O	USB D- signal
21	USB_DP	I/O	USB D+ signal
22	GND	Power	Ground
23	RXCLK+	Input	LVDS receiver positive signal clock
24	RXCLK-	Input	LVDS receiver negative signal clock
25	VDD	Power	Positive Power Supply(5.0V)
26	VDD	Power	Positive Power Supply(5.0V)
27	NC	-	No connection
28	NC	-	No connection
29	GND	Power	Ground



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Chapter 4 Hardware Features

Item	Spec
CPU	NXP i.MX6UltraLite, ARM Cortex-A7, 528MHz frequency
RAM	512MB LvDDR3
Flash	eMMC or NAND Flash
Expand memory	SD socket compatible with SD, SDHC and SDXC card, supporting capability up to 64G (SDXC)
Mobile communication	SIM800A module (China Mobile or China Union GPRS) MINI SIM card slot (marked with 'SIM-GPRS"
ESAM	ESAM chip complies with ISO7816, Forlinx can provide driver, but the chip should be bought by users
PSAM	PSAM card, the mini SIM card slot is marked as "SIM", Forlinx kindly provide driver and card should be bought by users from PSAM suppliers
Power input	4-ch, with electromagnetic relay isolation, contact rating: 1A 30VDC/0.5A 125VAC/0.3A 60VDC, connector: green terminals with pitch of 3.81mm
Power output	4-ch, with optical coupling isolation, green connectors with pitch of 3.81mm, default configuration is direct current input, high level is from 3V to 24VDC, and below 1VDC will be low level. Users could also configure it as internal power supply with isolated 5V and external dry contact only.
Display connector	DV1-1, Topway brand display LMT070DICFWD-AKA is supported by default
Power failure solution	The CPU is with 1x GPIO specially for external power supply mode detection, when external power supply voltage is above 8V, this IO will be high level, and green LED PG will be shinning on the enclosure, otherwise, PG green indicator will be off. Once external power supply is cut off, system will auto switch to built in super-capacitor power supplying mode, PG red LED will be shinning. The super-capacitor could keep system running at least for 15 seconds and meanwhile detects the internal 5V main power voltage, when the voltage drops more than 10%, the whole unit will be power off to avoid system error because of low voltage
Serial interface (contains RS485)	UART1: 3-wire debug port, DB9 connector, without isolation, on enclosure marked as Console UART2: for card reader, 3-wire, green terminal, without isolation UART3: for internal connection of GPRS, without drawn out UART4: internal converted to RS485-1, green terminal, with electronical isolation UART5: internal converted to RS485-2, green terminal, with electronical isolation
USB	1x USB OTG, standard Mincro USB connector

	1x USB host, standard USB A style connector
CAN bus	CAN1: CAN2.0 B, 1Mbps, with electronical isolation, communicate with charging controller CAN2: CAN2.0 B, 1Mbpsm with electronical isolation, for backup
Ethernet	Net1: standard RJ45 connector, 10M/100M adaptive, for connection with upper system Net2: standard RJ45 connector, 10M/100M adaptive, backup
WIFI&BT	RL-UM02WBS-8723BU-V1.2 module, IEEE 802.11b/g/n 1T1R WLAN and Bluetooth 2.1/3.0/4.0
RTC	Chipset RX8010SJ, on-board CR2032 battery
Audio	3.5mm standard earphone jack, built in single channel micphone, could be expanded with 1Wx2 speaker jack or 3.5mm single channel micphone connector (PCB is preserved with connector)
Power and consumption	Rated voltage: 12V, workable from 9V to 15V, it is designed with inversed polarity protection, when the unit connected with Topway LMT070DICFWD-AKA display, the power consumption is lower than 5W.
Dimensions	147mm x 103mm x 42mm
Mounting hole	4xΦ4mm
Working environment	Working temp: -10℃～70℃, storage temp: -40℃～85℃, Humidity: 5%～95% none condensing

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