MK 307

Box PC

User Manual

Revision 1.3

The product described in this manual is compliant with all related CE standards.

Product Title: MK307
Document name: MK 307 User Manual
Manual version: 1.3
Reference document: IMEC. 421459.037

Revision Record

Revision No.	Brief description of changes	Board index	Revision date
1.0	Initial version	MK307	September 2011
1.01	Amendments to the Table 2.1 “Requirements to the power supply parameters” Diagrams from the Annex A were adjested	MK307	October 2011
1.2	Information on the weigh and dimensions in the package was added. Datasheet was added to the delivery checklist. Installation kit content was described. Contact information and Copyright sections were added. Section 2.1 (description of CNM350) was adjusted.	MK307	February 2012
	Electric circuit diagram (Fig.3.4) was adjusted due to the revision of CPC307 module (ver.1.3).	MK307	May 2012

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Copyright

TRANSPORTATION, UNPACKING AND STORAGE

Transportation

The device should be transported in original manufacturer's separate packaging (transport packaging), which contains an individual antistatic bag and a cardboard box, in the closed transport (automobile, railway, air transportation in heated and pressurized compartments) in storage conditions 5 defined in the IEC 721-2-1 standard (GOST standard 15150-69) or in storage conditions 3 during sea transportation.

The packaged modules should be transported in accordance with the shipping rules, specified for this particular type of transport.

During handling and transportation operations, the packaged modules should not undergo sharp pounding, falls, shocks and exposure to atmospheric precipitation. The goods should be stored in a carrier vehicle in such a manner which will prevent their moving.

Unpacking

Prior to unpacking, before transportation at subzero temperature of ambient air the modules should be kept within 6 hours under storage conditions 1 defined in the IEC 721-2-1 standard (GOST standard 15150-69).

It is prohibited to place the packaged module close to the heat source, prior to unpacking.

Retain all original packaging at least until the warranty period is over. You may need it for shipments or for storage of the product.

After unpacking the product, you should inspect it for visible damage that could have occurred during shipping or unpacking. If damage is observed (usually in the form of bent component leads or loose socketed components), contact Fastwel's official distributor from which you have purchased the product for additional instructions.

Storage

Module storage conditions for group 1 are defined in the IEC 721-2-1 standard (GOST standard 15150-69).

INSTRUCTIONS FOR APPLICATION AND USE

This device should be used in the modes and under conditions specified in this User Manual and technical specifications 4013-025-72782511-09.

The device should be powered from an external dc power supply with 10,5-36 V.

External devices should not be connected (disconnected) when switched on.

The external devices should be connected to the Box PC in accordance with this User Manual.

MANUFACTURER'S WARRANTY

Warranty Liabilities

The Manufacturer hereby guarantees the product conformity with the requirements of the 4013-025-72782511-09 technical conditions provided that the Consumer complies with the operating, storage, transportation and installation conditions and procedures, specified by the accompanying documents.
The Manufacturer hereby guarantees that the products supplied thereby are free from defects in workmanship and materials, provided operation and maintenance norms were observed during the currently established warranty period. The Manufacturer's obligation under this warranty is to repair or replace free of charge any defective electronic component being a part of a returned product.
Products that broke down through the Manufacturer's fault during the warranty period will be repaired free of charge. Otherwise the Consumer will be invoiced as per the current labor remuneration rates and expendable materials cost

Liability Limitation Right

The Manufacturer shall not be liable for the damage inflicted to the Consumer's property because of the product breakdown in the process of its utilization.

Warranty Period

The warranty period for the products made by Fastwel Group is 24 months since the sale date (unless otherwise provided by the supply contract).
The warranty period for the custom-made products is 36 months since the sale date (unless otherwise provided by the supply contract.

Limitation of warranty liabilities

The above warranty liabilities shall not be applied:
To the products (including software), which were repaired or were amended by the employees, that do not represent the manufacturer. Exceptions are the cases where the customer has made repairs or made amendments to the devices in the strict compliance with instructions, preliminary agreed and approved by the manufacturer in writing;
To the products, broken down due to unacceptable polarity reversal (to the opposite sign) of the power supply, improper operation, transportation, storage, installation, mounting or accident.

Returning a product for repair

1. Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization.
2. Attach a failure inspection report with a product to be returned in the form, accepted by the Manufacturer, with a description of the failure circumstances and symptoms.
3. Place the product in the consumer packaging (antistatic bag) and cardboard box, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties of the Customer on a unilateral basis.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer

1. INTRODUCTION

1.1. Device purpose

This User Manual is intended to provide information on the device, its operation principle and general requirements for the commissioning, proper use and servicing of MK307 Box PC (hereinafter referred to as **MK307**).
The MK307 is designed for use in process automation systems.
The Box PC is based on the following modules:
1. CPU Module CPC307, Fastwel.
2. Communication and Navigation Module CNM350, Fastwel.
3. Graphics Controller Module VIM301, Fastwel.
4. Power Supply Module PS351, Fastwel.

The User Manual provides regulations for proper and safe installation, switching-on and configuration of the product, its connection and interaction with external devices.
While examining the structure, it is necessary to refer to the following documents:
1. CPU Module CPC307, User Manual.
2. Graphics Controller Module VIM301, User Manual.
3. Power supply module PS351, User Manual.

For product catalogs please visit Fastwel website at: www.fastwel.com.

1.2. Hardware configurations, delivery checklist, ordering information

1.2.1. Hardware configurations, ordering information

Table 1.1 contains description of all the configurations of MK307 available for order.

Table 1.1 Description of MK307 hardware configurations

Name	Product name	Part number	Description
Box PC MK307	MK 307	MK307-01	Vortex 86DX 600 MHz, 2xRS232, 2xRS485/422, LAN 10/100 Mbit/s, 2xUSB 2.0, 2xCAN with opto-isolation, PS/2 Keyboard/ Mouse, GSM GPRS/EDGE-modem Q2687 and GPS/GLONASS-MNP-M7 receiver; 24 channels of L1 GPS/GLONASS range signals, GSM 850 / 900 / 1800 / 1900 MHz, GPRS class 10, EDGE class 10, VGA, power supply voltage 10,5-36 V.
		MK307-02	Vortex 86DX 600 MHz, 2xRS232, 2xRS485/422, LAN 10/100 Mbit/s, 2xUSB 2.0, 2xCAN with opto-isolation, PS/2 Keyboard/ Mouse, VGA, power supply voltage 10,5-36 V.

Please note: The difference between MK307-01 and MK307-02 hardware configurations is that MK307-02 has no communication-navigation module CNM350.

1.2.2. Delivery checklist and additional equipment

Table 1.2 Description of MK307 delivery checklist

Name	Description
MK307	Box PC MK307
Installation kit	Kit of counterparts for the front panel connectors (Cable outlet LTW): – LTWCB-6BFFA-SL7001 – 1pcs. – LTWBD-8BFFA-SL7001 - 1pcs. – LTWBu-10BFFA-SL7001 - 1pcs. – LTWBu-12BFFA-LL7001 - 1pcs. – LTWBu-12BFFA-SL7001 - 1pcs. – LTWDD-18BFFA-LL7001 –3 pcs. – LTWDu-20BFFA-SL7001 - 1pcs. – LTWDu-21BFFA-SL7001 - 1pcs. – LTWDu-22BFFA-SL7001 - 1pcs. – LTWRJ-00BMMA-SL7005 1pcs.
Technical certificate	Technical certificate

* Box PC — fully configurable and can be customized according to the specific demands of your application

Table 1.3 contains a list of MK307 accessories not included in the delivery checklist. They can be acquired separately.

Table 1.3 Additional equipment for MK307

Part number	Description
ACS20058	GSM/GPS/GLONASS aerial
ACS30059	Platform for fast installation of MK307
ACS10060	Set of adaptor cables, from LTW to standard connectors: VGA, USB, PS/2, ATX

2 TECHNICAL CHARACTERISTICS

2.1 General information on MK307 functions

MK307 functionality is determined by features of the modules included.

Module CPC307-04:

Vortex86DX.

Processor (600 MHz):

- 32 bit x 86 compatible core;
- Math coprocessor;
- 32 KB L1 cash;
- 256 KB L2 cash;
- 6-stage pipeline;
- 16-bit memory bus.

RAM: DDR2 SDRAM 256 MB.

Port for connection of storage carrier and DVD/CD drive:

- capability to connect an IDE-device (1 Primary channel);
- support for Ultra-DMA 100 mode.

SD-controller: connection up to 2x micro SD memory cards, capacity up to 4 GB.

PS/2 connector for keyboard and mouse.

USB port:

- USB 1.1, USB 2.0 support;
- connection of two devices.

Ethernet controller 10/100 Mb, isolation voltage: no less than 500 V.

Serial ports:

- COM3, COM4: RS-232, up to 115.2 kBd, universal;
- COM5, COM6: RS-422/485, up to 3.6 MBd, channel-by-channel isolation, isolation voltage: no less than 500 V;
- Console operation via COM3 – COM4

2x CAN 2.0b interfaces, SJA1000T controller, data transfer rate: up to 1 Mb/s,
Channel-by-channel isolation, isolation voltage: no less than 500 V.

PCI104 bus (PCI).

PC104 bus (ISA).

Redundant system support.

3 watchdog timers:

- 2 x with a possibility of programmed control, integrated into the Vortex86DX CPU;
- 1 x hardware timer with a fixed timeout interval of 1,6 s.

FLASH BIOS:

- 256 KB, integrated into the controller (redundant BIOS);
- 512 KB, soldered on the module (main BIOS);
- can be modified within the system;
- automatic booting from the redundant BIOS if it is impossible to use the main BIOS.

Real-time clock.

CMOS memory and nonvolatile memory FRAM with 64 Kbit capacity to store the configuration settings.

Compatibility with operating systems: FDOS 6.22, MS DOS 6.22, Linux 2.6, QNX 6.4.

Communications and navigation module CNM350:
Interface PC/104+
Interface controller for communicating with Module's devices – 4 x channel PCI -UART XR17D154 of the EXAR Corp.:
– 32-bit/33MHz Bus Target;
– Universal interface 3.3V/5V;
– General interruption request from all the UART- channels;
– FIFO 64 bytes for each UART- channel and transmit directions;
– 8 GPIO-ports used for the Module devices control;
– Compatibility with 16C550.
Correspondence to PCI Local Bus Specification, revision 2.3;
Correspondence to PC/104-Plus Specification, version 2.2;
Module does not use ISA bus, but bus connectors are installed for compatibility.

GSM-modem
Sierra Wireless GSM-modem Q2687 for operation at GSM frequency ranges 850/900/1800/1900MHz:
– GPRS class 10;
– EDGE class 10;
– Control with the help of AT commands;
– Connection with the CPU-module is carried out via 2 UART-channels at speed up to 921.6 kBps with speed auto-detection option;
– built-in protocol stack TCP/IP;
– Firm-integrated development environment Sierra Wireless for creating and debugging of user C- and Lua-applications (available on manufacturer's website: http://www.sierrawireless.com/);
Connection of external GPS/GLONASS-aerial - via cross-over cable included into the delivery kit from MMCX/RA plug on the module board to the SMA-F plug installed on the board.
Audio interface – BH2-10/RA for connection:
– loud speaker, resistance of no less than 8 Ohm;
– electret microphone with a buffer field transistor (modem provides supply current of about 0.5mA);
Interface for two SIM-cards, software-based selection of an active card; SIM-card holders are equipped with press-button ejectors. You don't have to remove the Module from the PC/104+ stack to replace the card.

GPS/GLONASS-receiver
MNP-M7 GPS/GLONASS navigation receiver manufactured by Izhevsk radio plant:
Technical characteristics are specified in the User Manual for the MNP-M7 Navigation receiver.
Connection of external GPS/GLONASS-aerial - via cross-over cable included into the delivery kit from MMCX/RA plug on the module board to the SMA-F plug installed on the board.

Module VIM301-01:
Lynx3DM8 graphics processor + (SM722G8)
– 32-bit video core;
– 128-bit Drawing Engine (100 MHz);
– 200 MHz RAMDAC;
RAM:
– SDRAM 8 MB, 100 MHz, 64 bit;
Video BIOS:
– Compatible with ACPI 1.0;
VGA-interface:
– Display resolution 640x480, 800x600, 1024x768, 1280x1024;

Power supply unit PS351-03:
– Input voltage from 10,5 to 36 V, direct current;
– Overvoltage protection;
– Polarity reversal protection.

2.2 Power supply connection

MK307 should be supplied from an external DC source with an output voltage of 10,5…36V and a capacity of no less than 20W. The power supply unit is connected to PWR and is described in paragraph 3.
This unit should provide starting current of 5A within 1,0 ms.
When selecting the power supply unit, consideration should be given to the starting current and additional equipment connected (USB, PS/2 etc.).

2.3 Operation conditions

– Operating temperature range: from -40ºC to +70ºC;
– Relative air humidity: from 5% to 80%, at the temperature of + 25ºC, non-condensing;
– Storage conditions 1 as defined in the IEC 721-2-1 standard (GOST standard 15150-69).

2.4 Mechanical characteristics

– Vibration resistance at the frequencies from 10 to 500 HZ – acceleration 6 g;
– Single shock resistance, peak acceleration – 100 g;
– Multiple shock resistance, peak acceleration - 50 g.

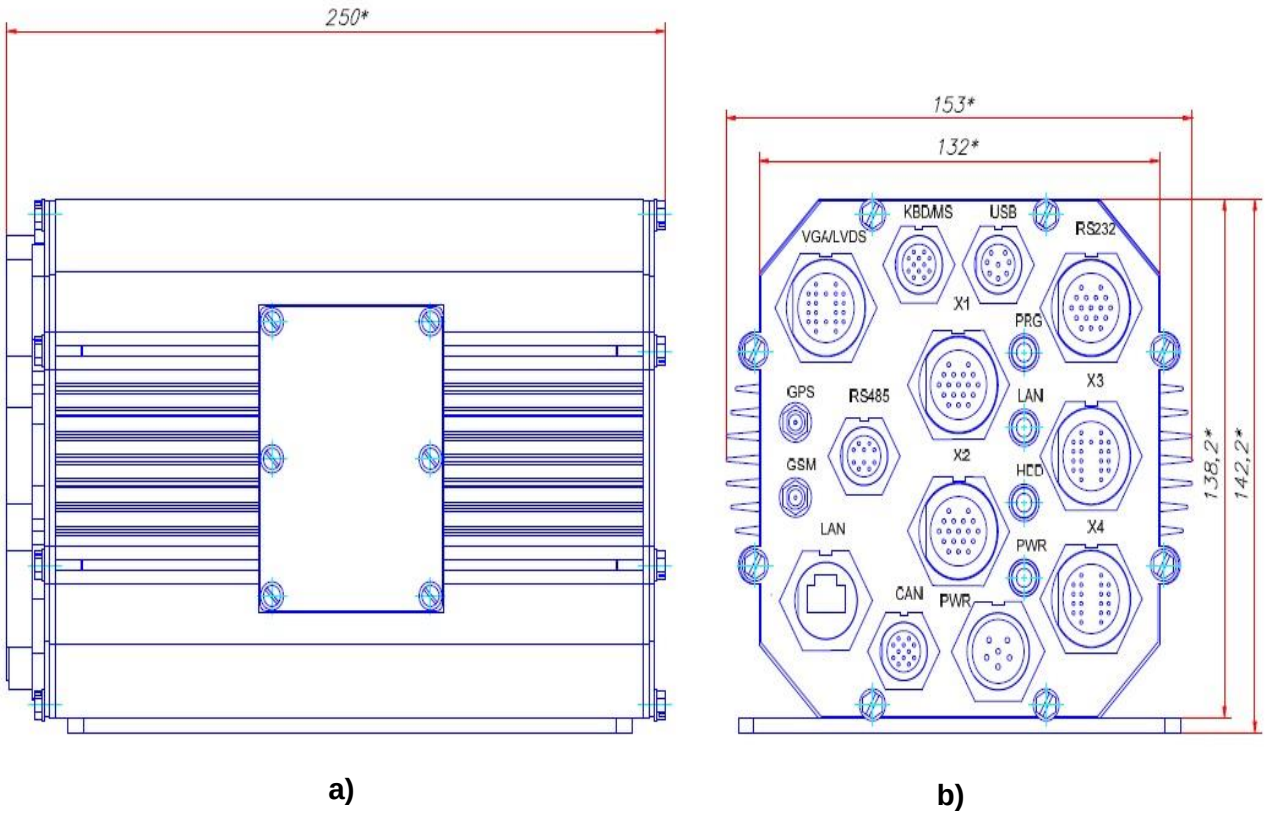
2.5 Module dimensions

Weight of MK307 should not exceed the values specified in table 2.1.

Table 2.1 Weight of MK307

Part number	Net weight in kg, no more than	Gross weight in kg, no more than
MK307-01	3,3	3,5
MK307-02	3,2	3,4

Dimensions of MK307 are shown on Figure 2.1:



a) **b)**

Figure 2.1 – Dimensions of MK307

2.6. MTBF

The MTBF value for MK307 is 40000 h.

The value is calculated according to the Telcordia Issue 1 model Method 1 Case 3, for continuous operation at surface location and under conditions corresponding to the Moderately Cold Climate of the IEC 721-2-1 standard (GOST standard 15150-69) at the ambient temperature of +30ºC.

3. INTENDED USE OF THE DEVICES

3.1. Connection of peripherals

The required devices are connected to MK307 in accordance with connector markings on the front panel.

For starting and verifying its performance, MK307 requires the following devices:

- Power supply unit connected to PWR (power supply);
- To display the required information, it is possible to use a display with RGB analog interface (or LVDS panel) connected to VGA LVDS.
- Keyboard/mouse connected to KBD MS can be used for entering information.
- It is also possible to use console I/O to display information on MK307. One of the RS232 interfaces can be used as the console port (this requires selecting a relevant console port in the BIOS Setup menu).

Connection of external devices is carried out via adapter cables from LTW to the standard connectors (ACS10060 kit can be used). Adapter cable diagrams are specified in the Annex A. Pin-out of the MK307 front panel connectors is provided in the annex B.

3.2. Connection of external power supply

The external power supply source should be connected to PWR (Figure 3.5).

Requirements for the power supply source are specified in table 2.1.

The MK307 is equipped with LTWCB-6PMMS-SC7001 (Plug with 6 contacts).

Purpose of the connector's contacts is provided in Table 3.1.

Connector contacts numbering is shown on Figure 3.1.

Table 3.1. Connector for PWR (J1):

J1

Circuit	Cont
V_IN	1
NC	2
GND/F	3
ON/OFF	4
0V	5
0V	6

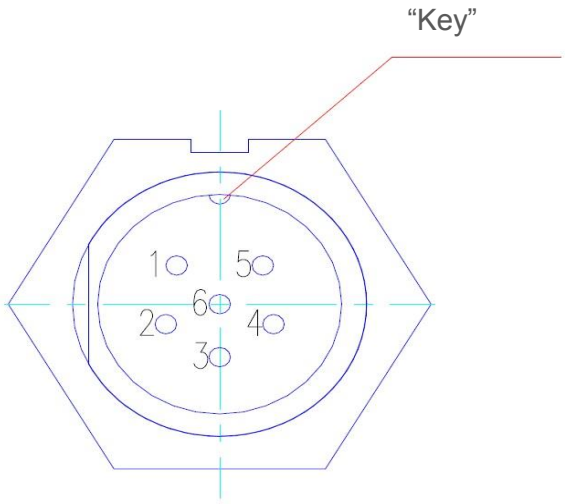


Figure 3.1. Numbering of PWR contacts.

3.3 Connection of external visual display unit

The external visual display unit should be connected to VGA/LVDS (Figure 3.5).
MK307 is equipped with the LTWDu-22PMMS-SC7001 connector (Plug with 22 contacts).
Purpose of the connector's contacts is provided in Table 3.2.
Numbering of the connector's contacts is shown on Figure 3.2.

Table 3.2. Connector for VGA/LVDS (J1):

J1

Circuit	Cont
RED	1
GND	2
GREEN	3
GND	4
BLUE	5
GND	6
HSYNC	7
VSYNC	8
TXOUT0_L	9
TXOUT0_H	10
TXOUT2_L	11
GND	12
TXOUT1_L	13
TXOUT1_H	14
GND	15
TXOUT2_H	16
GND	17
TXCLK0_L	18
TXCLK0_H	19
GND	20
VCC	21
VCC	22

Attention: Default VCC power supply voltage: 3.3V.

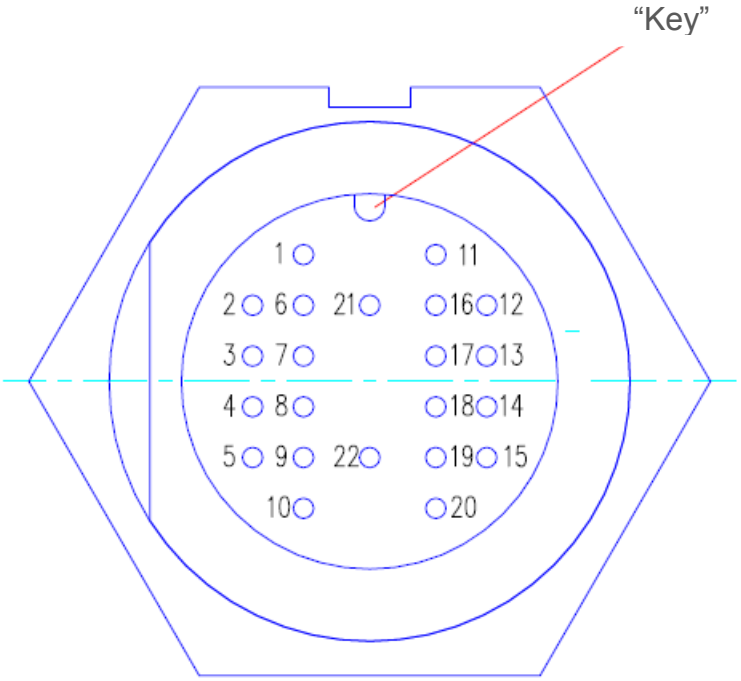


Figure 3.2. Numbering of VGA/LVDS connector contacts.

To configure MK307 for a particular type of LVDS-panel, refer to the document "Graphics processor module VIM301. User Manual".

3.4 Connection of external input devices

Keyboard and mouse should be connected to KBD/MS (Figure 3.5).
MK307 is equipped with LTWBu-12PMMS-LC7001 (Plug with 12 contacts).
Purpose of the connector's contacts is provided in Table 3.3.
Numbering of the connector's contacts is shown on Figure 3.3.

Table 3. 3. Connector for KBD/MS (J1):

J1

Circuit	Cont
KB_CLK	1
KB_DAT	2
MS_CLK	3
GND	4
+5V	5
MS_DAT	6
GND	7
MIC_P	8
MIC_N	9
SPK_P	10
SPK_N	11
NC	12

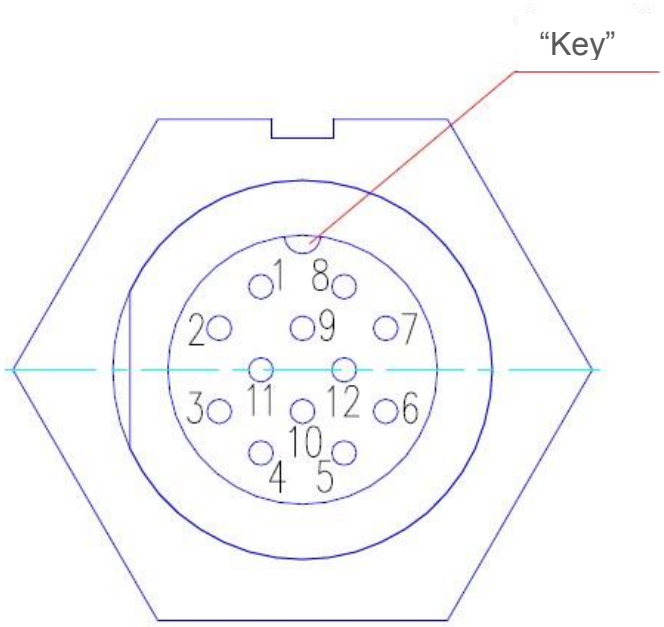


Figure 3.3. Numbering of KBD/MS contacts

3.5 Connector for memory cards

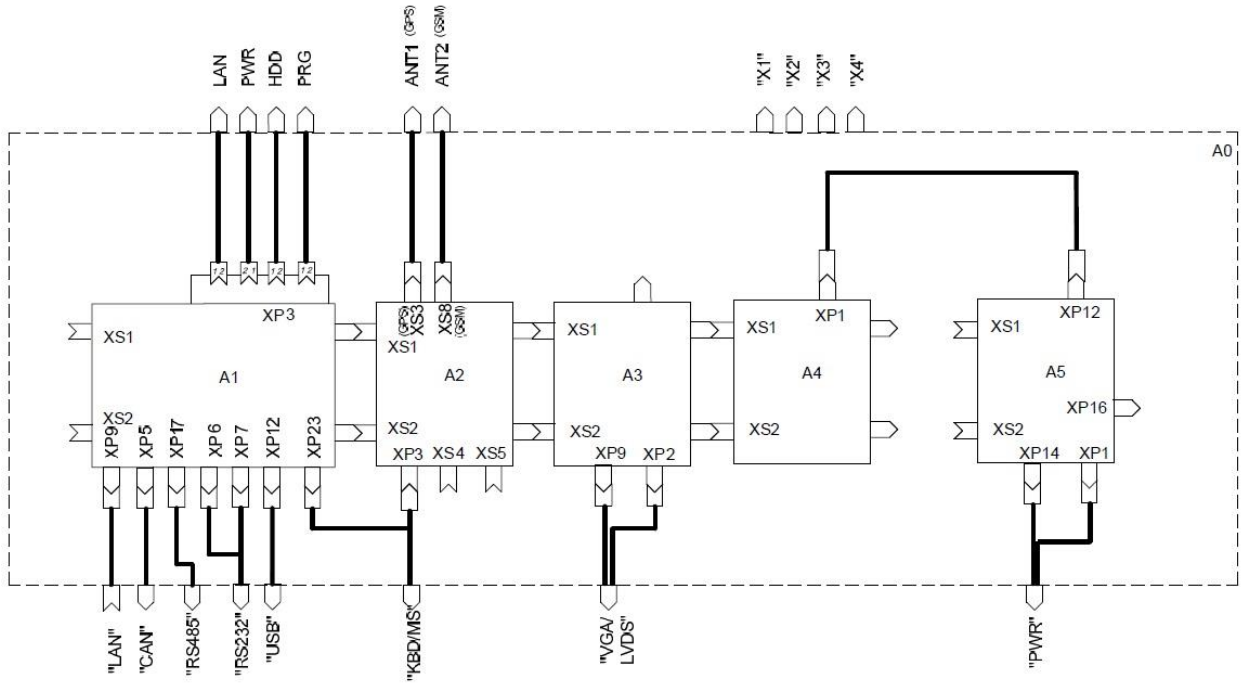
MicroSD memory card is connected to CPC307 via a port on the sidewall of MK307 enclosure (Fig.2.1 a). XS3 and XS4 contacts for the connection of PCP307 microSD cards are described in CPC307 User Manual.

Purpose of LAN, CAN, RS485, RS232 and USB connectors' contacts is provided in the Annex B.

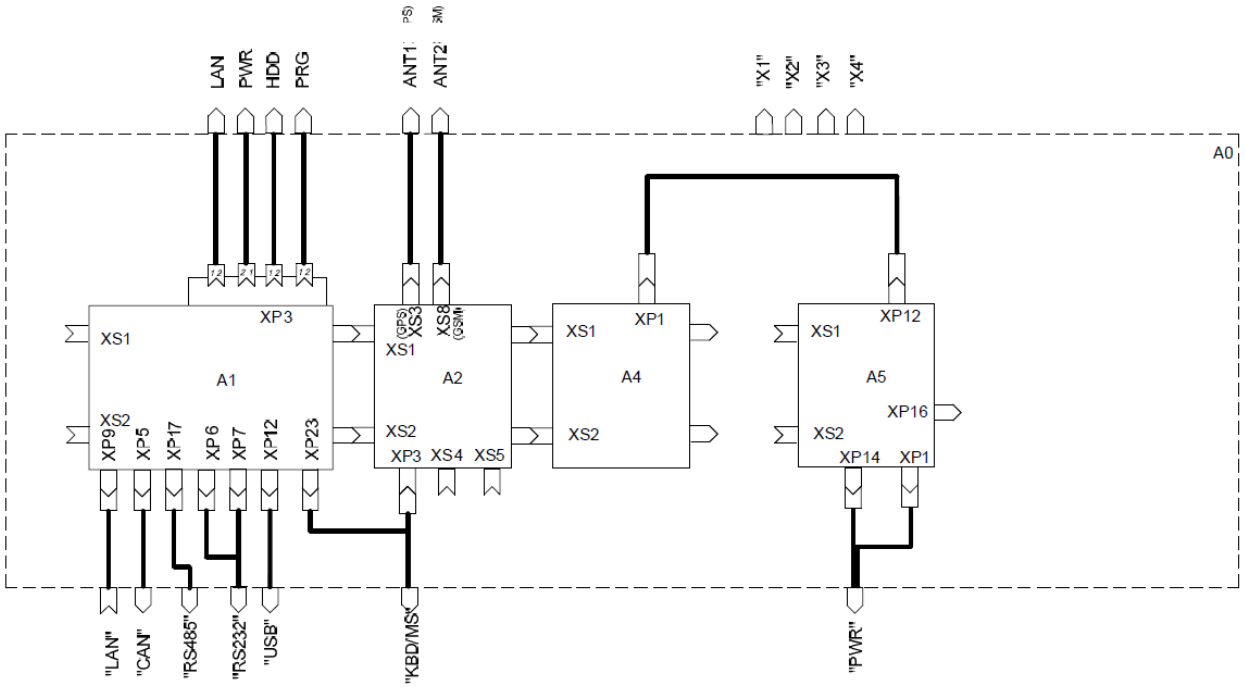
3.6 Device structure and operation

3.6.1 MK307 Structure

Wiring diagram of MK307 is specified on Figure 3.4.



a)



b)

Figure 3.4. Wiring diagram a) MK307-01 b) MK307-02

MK307 contains the following functional elements:
– Enclosure (A0)
– CPU module CPC307-04 (A1)
– Communications and navigation module CNM350-01 (A2) (for MK307-01)
– Graphics processor module VIM301-01 (A3)
– Power supply module PS351-03 (A5)
For more information on the structure of separate functional units please refer to the relevant instruction manuals.

3.6.2 MK307 interface connectors and LEDs

Figure 3.5 (a, b) shows the location and notation of MK307-01 and MK307-02 interface connectors.

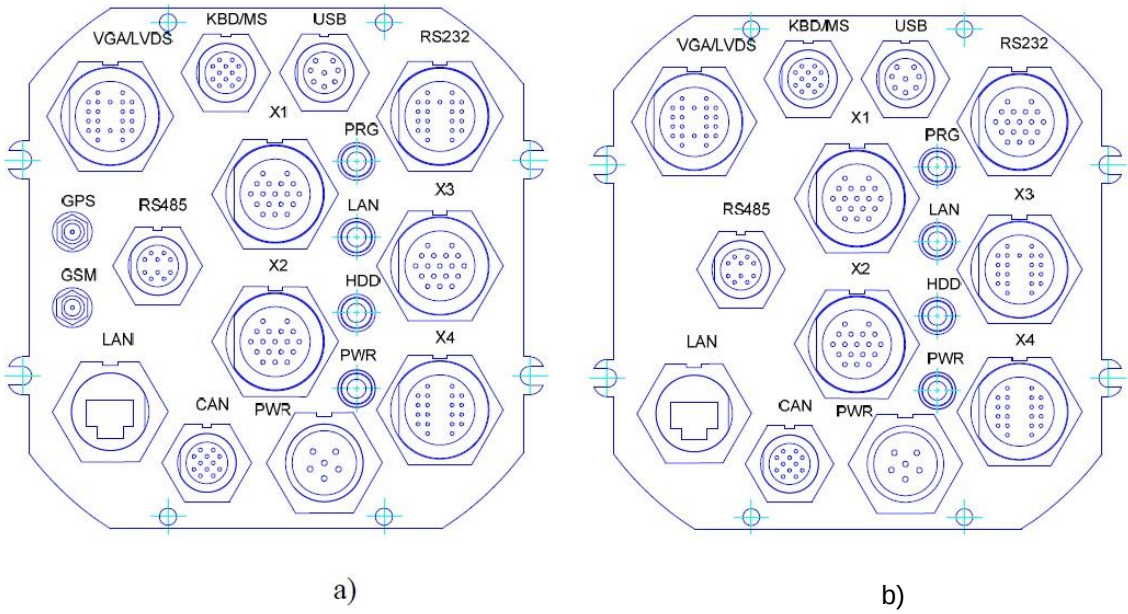


Figure 3.5. Location of interface connectors and LEDs on the front panel of MK307-1 (a), MK307-2 (b).

Table 3.4 contains the description of connectors used as well as recommended counterparts for the connection to MK307 (included into the installation kit, except for GPS, GSM).
MK307 LEDs are described in Table 3.5.

Table 3.4. Description of MK307 connectors

Item No.	Front Panel Connectors	Functional Purpose	Counterparts (cable parts)	Amount	Accessories for Front Panel Connectors
1	LTWCB-6PMMSSC7001	POWER (10,5-36V)	LTWCB-6BFFASL7001	1	Cover: LTWCAPWACPMSC1
2	LTWBD-8PMMSSC7001	2xUSB	LTWBD-8BFFASL7001	1	Cover: LTWCAPWABPMSC1
3	LTWBu-10PMMSSC7001	COM5, COM6 (RS485)	LTWBu-10BFFASL7001	1	Cover: LTWCAPWABPMSC1
4	LTWBu-12PMMSLC7001	KBD/MS ...Mic, Speaker	LTWBu-12BFFALL7001	1	Cover: LTWCAPWABPMLC1
5	LTWBu-12PMMSSC7001	CAN1, CAN2	LTWBu-12BFFASL7001	1	Cover: LTWCAPWABPMSC1
6	LTWDD-18PMMSLC7001	Redundancy (X1…X3)	LTWDD-18BFFALL7001	3	Cover: LTWCAPWADPMLC1
7	LTWDu-20PMMSSC7001	Redundancy (X4)	LTWDu-20BFFASL7001	1	Cover: LTWCAPWADPMSC1
8	LTWDu-21PMMSSC7001	COM3, COM4 (RS232)	LTWDu-21BFFASL7001	1	Cover: LTWCAPWADPMSC1
9	LTWDu-22PMMSSC7001	VGA/LVDS	LTWDu-22BFFASL7001	1	Cover: LTWCAPWADPMSC1
10	LTWRJ - 5EPFFD-SC7001	LAN	LTWRJ-00BMMASL7005	1	Cover: LTWCAPWACPMSC1
11	Cable 15cm CLEC MMCXM/ SMA-F KY3EJW3	GSM , GPS	Aerial with SMA-male connector	2	

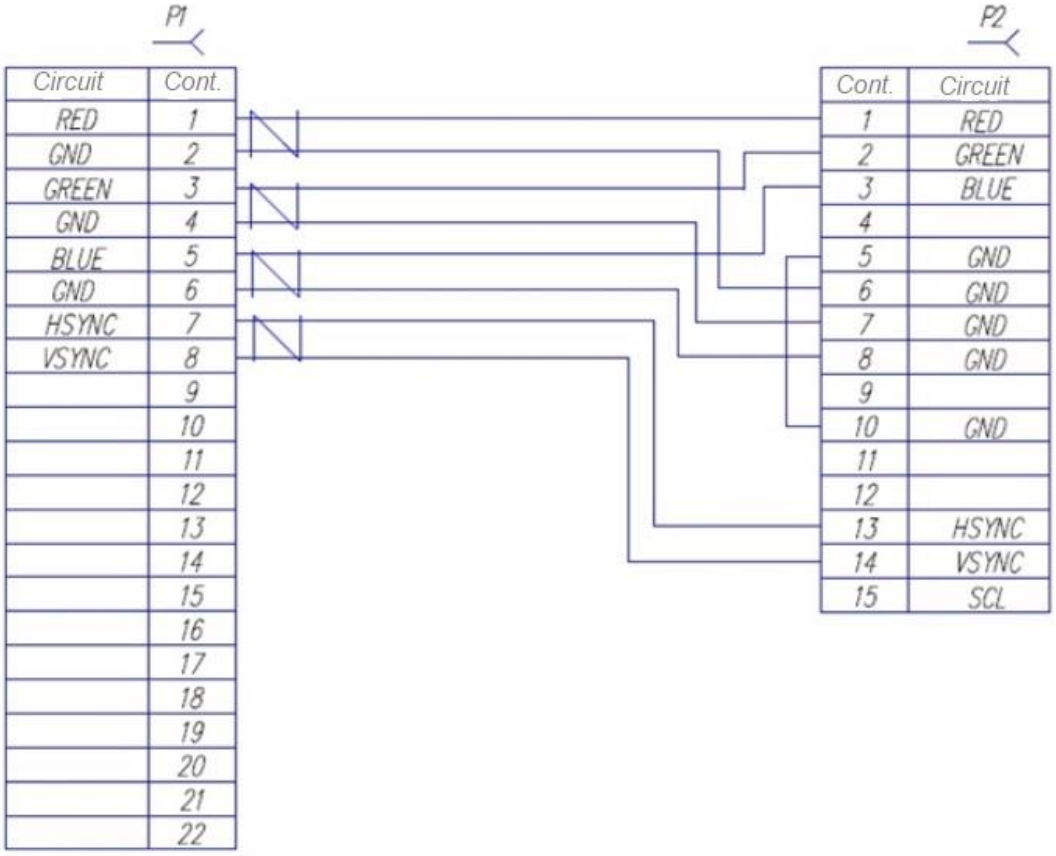
Table 3.5. LEDs of MK307

MK307, Front Panel	LED Functional Purpose	Color
LAN	LAN Active. Indication of LAN-port data transfer	Green
PWR	Power indication, secondary power supply units are switched on.	Green
HDD	HDD Active. Interaction with IDE-devices.	Yellow
PRG	Programmable. User LED.	Green

For more detailed information on the purpose of LEDs see CPC307 CPU Module User Manual.

ANNEX A
(for reference)

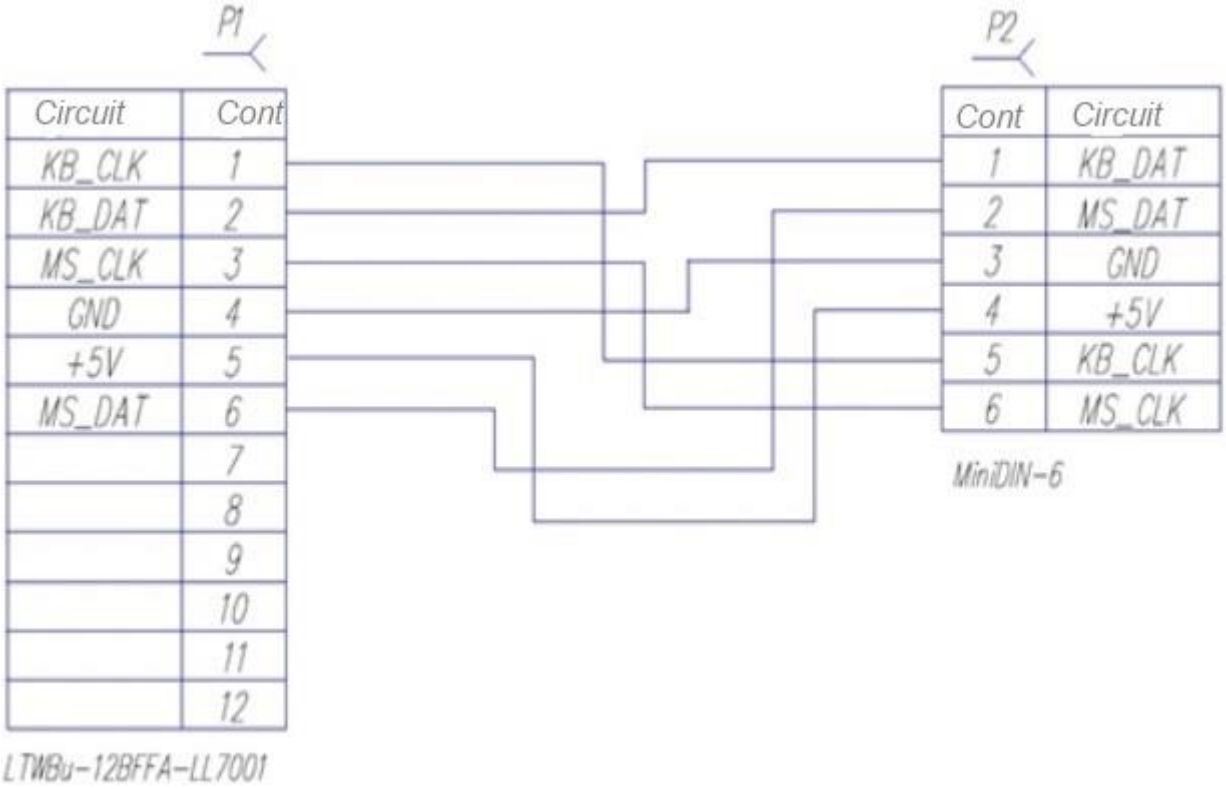
VGA adaptor cable diagram:



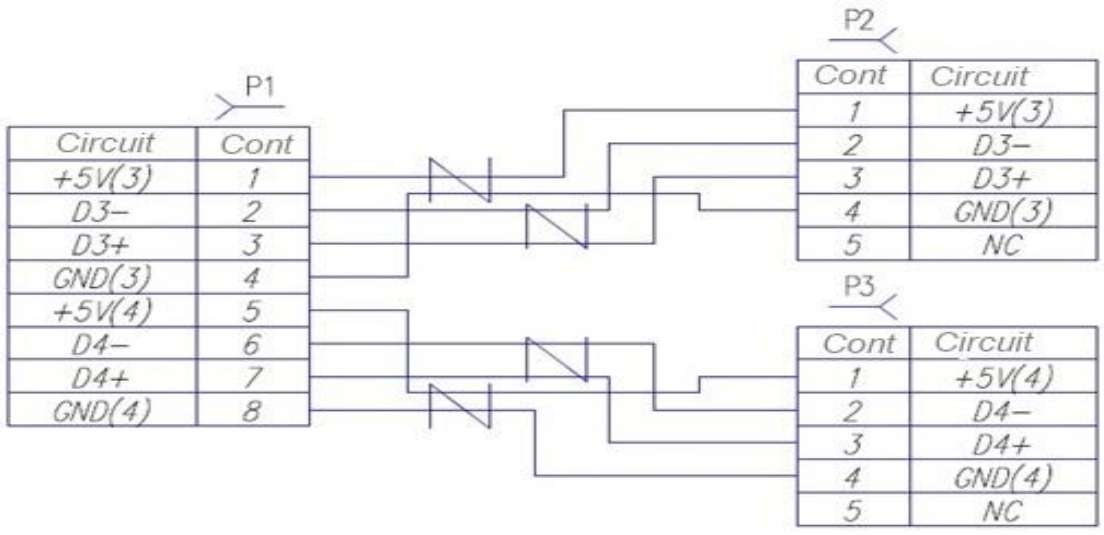
P1: LTWDu-22BFFA-SL7001 (LTW Technology)

P2: DHD-15F (DSUB socket, 15 contacts, VGA, crimp contacts)

KBD/MS adaptor cable diagram:



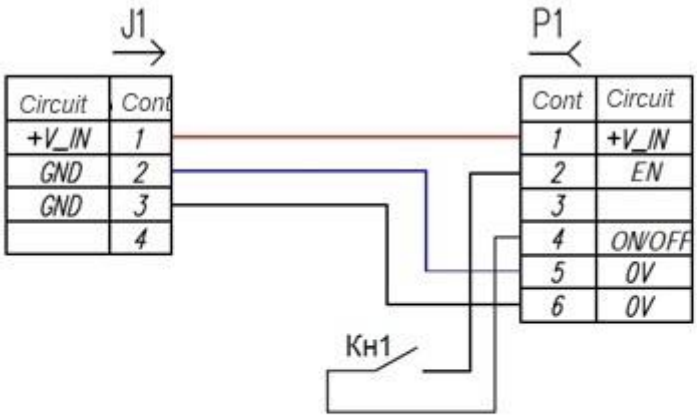
USB adaptor cable diagram:



P1: **LTWBD-8BFFA-SL7001**

P2,P3: **4 pin USB A**

PWR adaptor cable diagram:

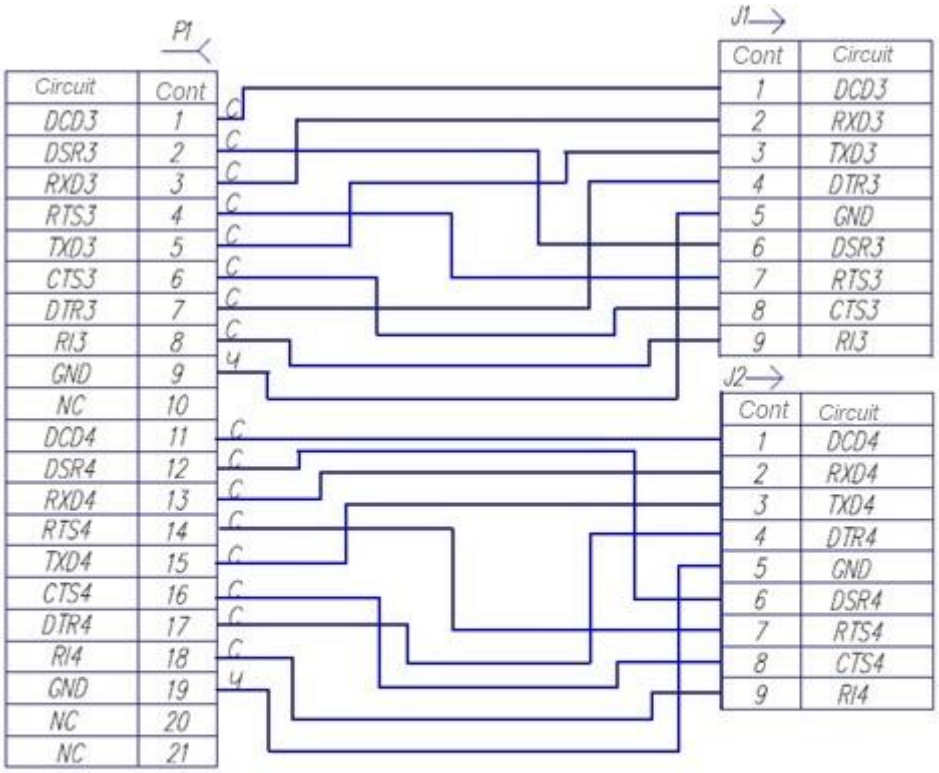


P1: LTWCB-6BFFA-SL7001 (LTW Technology)

J1: TH-4 M power connector 4 pins to HDD, disc (Brown Bear)

Kn1: SWR-21R switch

RS232 adaptor cable diagram:



P1: Socket LTWDu-21BFFA-SL7001

J1, J2: Plug DSUB-9M

ANNEX B
(for reference)

Pin-out of MK307 front panel connectors

LAN (LTWRJ -5EPFFD-SC7001)

Circuit	Cont
ETX1_TX+	1
ETX1_TX-	2
ETX1_RX+	3
NC	4
NC	5
ETX1_RX-	6
NC	7
NC	8

RS485 (LTWBu-10PMMS-SC7001)

Circuit	Cont
TX5+	1
TX5-	2
RX5+	3
RX5-	4
GND5	5
TX6+	6
TX6-	7
RX6+	8
RX6-	9
GND6	10

CAN (LTWBu-12PMMS-SC7001)

Circuit	Cont
CAN H 1	1
CAN L 1	2
GND 1	3
NC	4
NC	5
NC	6
NC	7
CAN H 2	8
CAN L 2	9
GND 2	10
NC	11
NC	12

RS232 (LTWDu-21PMMS-SC7001)

Circuit	Cont
DCD3	1
DSR3	2
RXD3	3
RTS3	4
TXD3	5
CTS3	6
DTR3	7
RI3	8
GND	9
NC	10
DCD4	11
DSR4	12
RXD4	13
RTS4	14
TXD4	15
CTS4	16
DTR4	17
RI4	18
GND	19
NC	20
NC	21

VGA/LVDS (LTWDu-22PMMS-SC7001)

Circuit	Cont
RED	1
GND	2
GREEN	3
GND	4
BLUE	5
GND	6
HSYNC	7
VSYNC	8
TXOUT0_L	9
TXOUT0_H	10
TXOUT2_L	11
GND	12
TXOUT1_L	13
TXOUT1_H	14
GND	15
TXOUT2_H	16
GND	17
TXCLK0_L	18
TXCLK0_H	19
GND	20
VCC	21
VCC	22

USB (LTWBD-8PMMS-SC7001)

Circuit	Cont
+5V(3)	1
D3-	2
D3+	3
GND(3)	4
+5V(4)	5
D4-	6
D4+	7
GND(4)	8

REVISION RECORD

Revision record									
Change	Number of sheets (pages)				Total number of sheets (pages) of the document	No. of document	Reference number of the supporting document and date	Signature	Da
	Changed	Replaced	New	Cancelled					
1.1.	10,24,25				27			Khalichev	26
1.2.	All				27			Khalichev	06
1.3.	4,16				27			Khalichev	30