CPC1311

CPU MODULE

User Manual

Revision 1.02

June 2016

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

Product Title: **CPC1311**
Document name: **CPC1311 User Manual**
Manual version: 1.02

Revision Record

Revision No.	Brief description of changes	Board index	Revision date
1.00	Initial version of CPC1311 User Manual	CPC1311	January 2016
1.01	Sequence of BIOS update (subsection 6.1) was introduced; text adjustment in subsections 1.3, 3.3, 5.1.	CPC1311	February 2016
1.02	Adjustments 1.2 and 2.2 with regard to temperature control were made. Adjustment of module's weight value was made. Fig. 2-1 was added.	CPC1311	February 2016

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TABLE OF CONTENTS

List of tables

List of Figures

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Ownership Rights

General Board Operation Rules

- To keep the warranty, the product should not be altered or revised in any way. Any alterations or improvements not authorized by Fastwel LLC, except for those specified in this document or obtained from the technical support department of Fastwel LLC as a set of instructions for their implementation, cancel the warranty.
- This device should be installed and connected only to the systems, meeting all the necessary technical and climatic requirements. This above is also true of the operating temperature range of a particular version of the board.
- While performing all the required operations for installation and adjustment, please follow the instructions specified only in this document.
- Keep the original package for subsequent storage of the device and transportation in the warranty event. If it is necessary to transport or store the board, please pack it the same way as it was packed upon delivery.
- Exercise special care when unpacking and handling the device. Act in accordance with the instructions given in the paragraph above.

TRANSPORTATION, UNPACKING AND STORAGE

Transportation

The module should be transported in a separate packaging box (transport packaging) of the manufacturing facility, which consists of 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 GOST standard 15150-69 (IEC 721-2-1 standard) or in storage conditions 3 during sea transportation.

It is possible to transport modules, packaged in individual antistatic packages, in multiple packaging (transport packaging) of the manufacturing facility.

The packaged modules should be transported in accordance with the shipping rules, operating with 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 packaged modules 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 GOST standard 15150-69 (IEC 721-2-1 standard).

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

While unpacking, it is required to comply with all safety precautions, which ensure its safety, as well as marketable condition of consumer packaging of the manufacturing company.

At the time of unpacking it is required to check the module that it has no external mechanical damages after transportation.

Storage

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

MANUFACTURER'S WAARRANTY

Warranty Liabilities

- The Manufacturer hereby guarantees the product conformity with the requirements of the ТУ 4013-006-52415667-05 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 LLC is 36 months since the sale date (unless otherwise provided by the supply contract).

- The warranty period for the custom-made products is 60 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. Carefully package the product in the antistatic bag, in which the product had been supplied. Failure to package in antistatic material will VOID all warranties. Then package the product in a safe container for shipping.
4. The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer

1 INTRODUCTION

1.1 Purpose

CPC1311 CPU Module is implemented in COM Express ® mini standard, Type 10.55 x 84 mm based on the Intel Atom E3845/ E3825 CPU and is designed for building high-performance embedded compact power-efficiency systems.
CPC1311 corresponds to the "PICMG ® COM.0 COM Express ® Module Base Specification Revision 2.1"
The User Manual contains indications on a proper and safe installation, switching-on, configuration and operation of CPC1311.

1.2 Technical specifications

Intel Atom CPU
E3845: 1.91 GHz, 4 cores (version CPC1311-01)
E3825: 1.33 GHz, 2 cores (version CPC1311-02)

- Support of IA 64-bit/32-bit architecture;
- L1-Cache (32 KB instructions, 24 KB data);
- L2-Cache 1024 KB;
- Support of Intel Streaming SIMD Extension 4.1 & 4.2 (SSE4.1 and SSE4.2);
- Intel VT-x;
- Intel Digital Random Number Generator;
- Support of Intel SpeedStep Technology;
- Support of Deep Power Down Technology (C7);
- Support of Intel Burst Technology.

RAM

- DDR3L-1066/1333 SDRAM up to 4 GB with ECC support;
- 64-bit data bus.

FLASH BIOS

- 64 Mb SPI-Flash;
- Modifiable within the system.

eMMC SATA Flash-drive: 8 GB (for CPC1311-01)

FRAM 8 KB (I2C port) for storing configuration
COM-Express COM.0 Type 10 connector

- 3(4)x PCIe x1 ports (PCIe Base Spec. Rev 2.0), 5 GT/s;
- 4xUSB 2.0 (host), 1xUSB 2.0 (client), 1xUSB 3.0 SuperSpeed (host);
- 2xSATA II (3-Gbps Gen. II);
- 1xGbit Ethernet;
- 1xSPI (External Boot);
- 1xLVDS/eDP; Digital Display Interface DDI0 2560x1600 @ 50 Hz;
- 1xLPC (Specification Rev. 1.1);
- SMBus buses, I2C;
- HD Audio, Speaker Out;
- SDIO (compatible with GPIO ports);

- 1xRS-232 (TTL, 64 bytes FIFO, up to 4 Mbps), 1xRS-232 (TTL, 64 bytes FIFO, up to 1 Mbps) / CAN 2.0 B (TTL, up to 1 Mbps);
- RTC battery.

Real-Time Clock

Monitor of 7 power supply voltages on SMBUS

Watchdog timer
- 1.2 sec …10 min.

Console I/O via serial ports (COM1 / COM2)

MTBF: 200000 hours

Operating temperature range
- From - 40ºC up to + 85ºC (temperature control is carried out on a heat-spreader plate, see subsection 2.2).

Power supply
- From COM-Express connector with extended range (4.75 V … 20 V);
- The input is equipped with a protection against overvoltage and pulse jamming.

Consumed power
- CPC1311-01 ~15 W;
- CPC1311-02 ~12 W.

Program compatibility with OS
- Linux 3.8.0;
- QNX 6.6;
- Microsoft Windows Embedded Standard 8;
- Microsoft Windows Embedded Standard 7.

1.3 Versions, ordering information

Module's versions and their ordering names (ordering information) are as follows:

Table 1-1: Ordering information

	Version	CPU	RAM	eMMC|
1	CPC1311-01	Intel Atom E3845 1.91 GHz 4C 10W	4 GB 1333DDR3L	+
2	CPC1311-02	Intel Atom E3825 1.33 GHz 2C 6W	2 GB 1066 DDR3L	-

Description of delivered configurations:
CPC1311-01 – CPC1311 CPU-module, Intel Atom E3845 1.9 GHz 4 Cores, 4 GB DDR3L SDRAM, onboard eMMC 8 GB
CPC1311-02– CPC1311 CPU-module, Intel Atom E3825 1.33 GHz 2 Core, 2 GB DDR3L SDRAM
Other configurations are available upon request.

Options for ordering CPC1311 are given in the table below:

Table 1-2: Available options for CPC1311

Preinstalled operating system (only for CPC1311-01)	
\LNX	Linux 3.8.0
\WIN7E	Windows Embedded Standard 7
Conformal coating	
\COATED	Conformal coating

1.4 Delivery checklist

The delivery checklist for all module types contains the following elements:

- CPC1311-xx assembled with a heat-spreader plate and racks (4 pcs);
- Set of mounting parts:
- racks with the height of 8mm – 4 pcs;
- washers and screws for the racks (for fixing the module on the carrier-board) – per 4 pcs;
- jumper – 1 pcs;
- Packaging.

1.4.1 Additional accessories

In addition, the user can acquire heat removal accessories (see subsection 4.2):

Table 1-3: Additional accessories

Heat removal system	
ACS30075	Heat-spreader
ACS30075-01	Heat-spreader + fan

1.4.2 Carrier-board for CPC1311

CPC1311 module is installed on Fastwel KIB1400 carrier-board.
The carrier-board is to be purchased separately.

2 Specifications

2.1 Power supply and consumption current

2.1.1. Power supply requirements

As a main power supply voltage, the board uses the voltage +12 V from COM-Express connector with extended range (4.75 V … 20 V).
The input is protected against overvoltage and pulse interferences.
Load capacity and parameters of input power supply voltage are in accordance with the PICMG COM.0 Rev2.0 specification (pin-out Type 10).

2.1.2 CPC1311 consumption currents

Table 2-1: CPC1311 consumption currents

Module	Voltage	Average current (A)	Peak current (A)
CPC1311-01	5V	2.7	2.8
	12V	1.14	1.31
	20V	0.73	0.87
CPC1311-02	5V	1.56	1.88
	12V	0.7	1
	20V	0.45	0.7
CPC1311-01, CPC1311-02	+5V_STBY	0.2	-
CPC1311-01, CPC1311-02	VCC_RTC	10 µA	-

Note: average current under synthetic tests load.

2.2 Resistance to climatic effects

CPC1311 modules of industrial temperature range are resistant to changes of temperature within the range from - 40 to +85°C at a relative humidity up to 80 % without moisture condensation, in accordance with the GOST standard 28209. Temperature control is carried out a heat-spreader plate, in accordance with the Fig. 2-1.

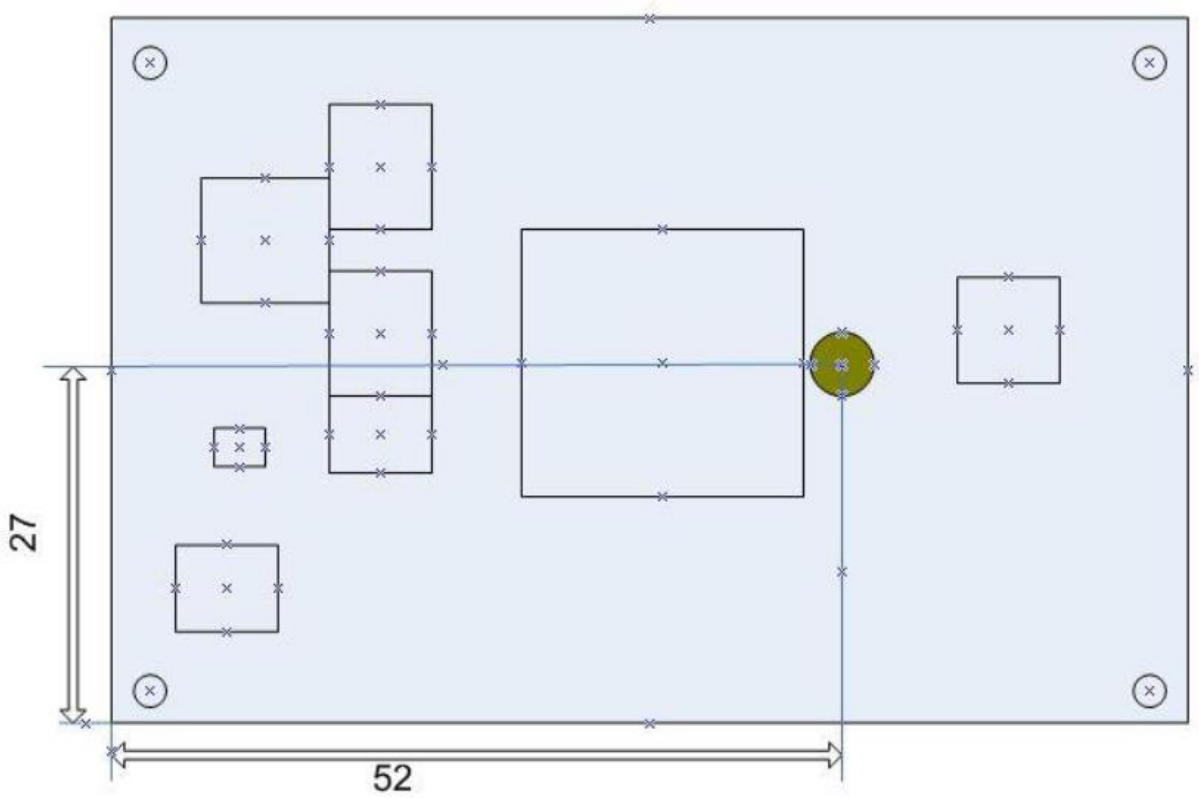


Fig. 2-1: Location of an area for measuring temperature on the plate (top view to the plate side, looking towards the module)

CPC1311 modules are resistant to the effects of cyclic damp heat at the ambient temperature of + (55 ± 2)◦C, relative humidity (93 ± 3)% (for lacquer-coated modules) in accordance with the GOST standard 28216.

2.3 Resistance to mechanical stress

CPC1311 modules are resistant to the effects of sinusoidal vibrations for the frequencies from 10 to 500 Hz with acceleration of 5g, in accordance with the GOST standard 28203.
The modules are resistant to single shocks with a peak acceleration of 100 g, in accordance with the GOST standard 28213.
The modules are resistant to multiple shocks (where the number of shocks is 1000), with a peak acceleration of 50 g, in accordance with the GOST standard 28215.

2.4 Weight and dimensions

Weight and dimension values are specified in the table below.

Table 2-2: Module's weight and dimensions

Module	Weight in kg, no more than	Overall dimensions in mm, no more than
CPC1311	0.15	55.0 × 84.0 × 18,0

Overall and mounting dimensions of the module are specified in the figures below.

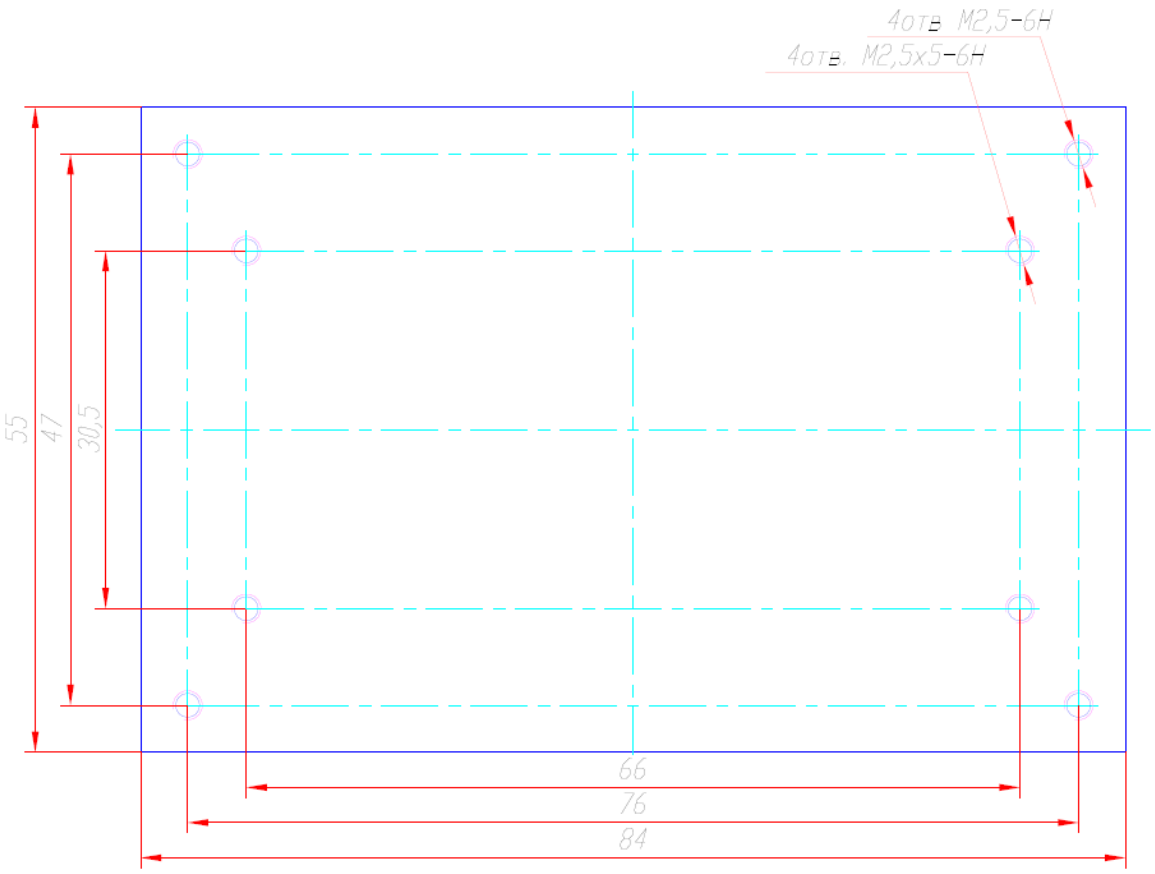
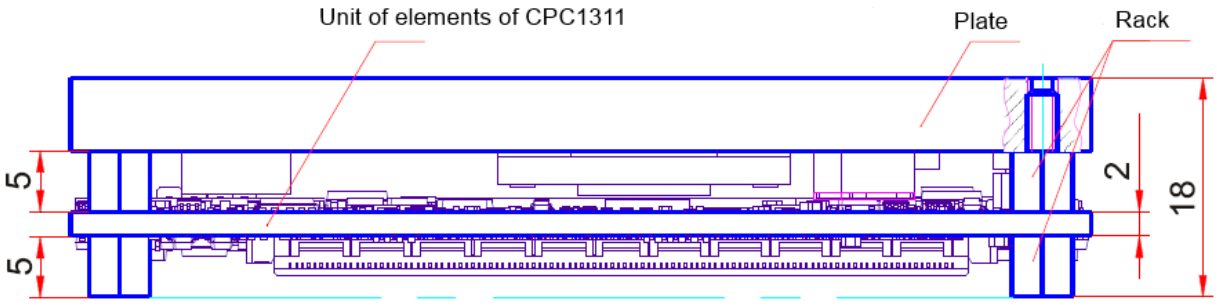


Fig. 2-2: Overall and mounting dimensions of the module (top view)

Fig. 2-3: Overall dimensions of the module (top view)



2.5 MTBF

MTBF of CPC1311 modules for the ambient temperature is +30°C corresponds to the value, specified in the table below:

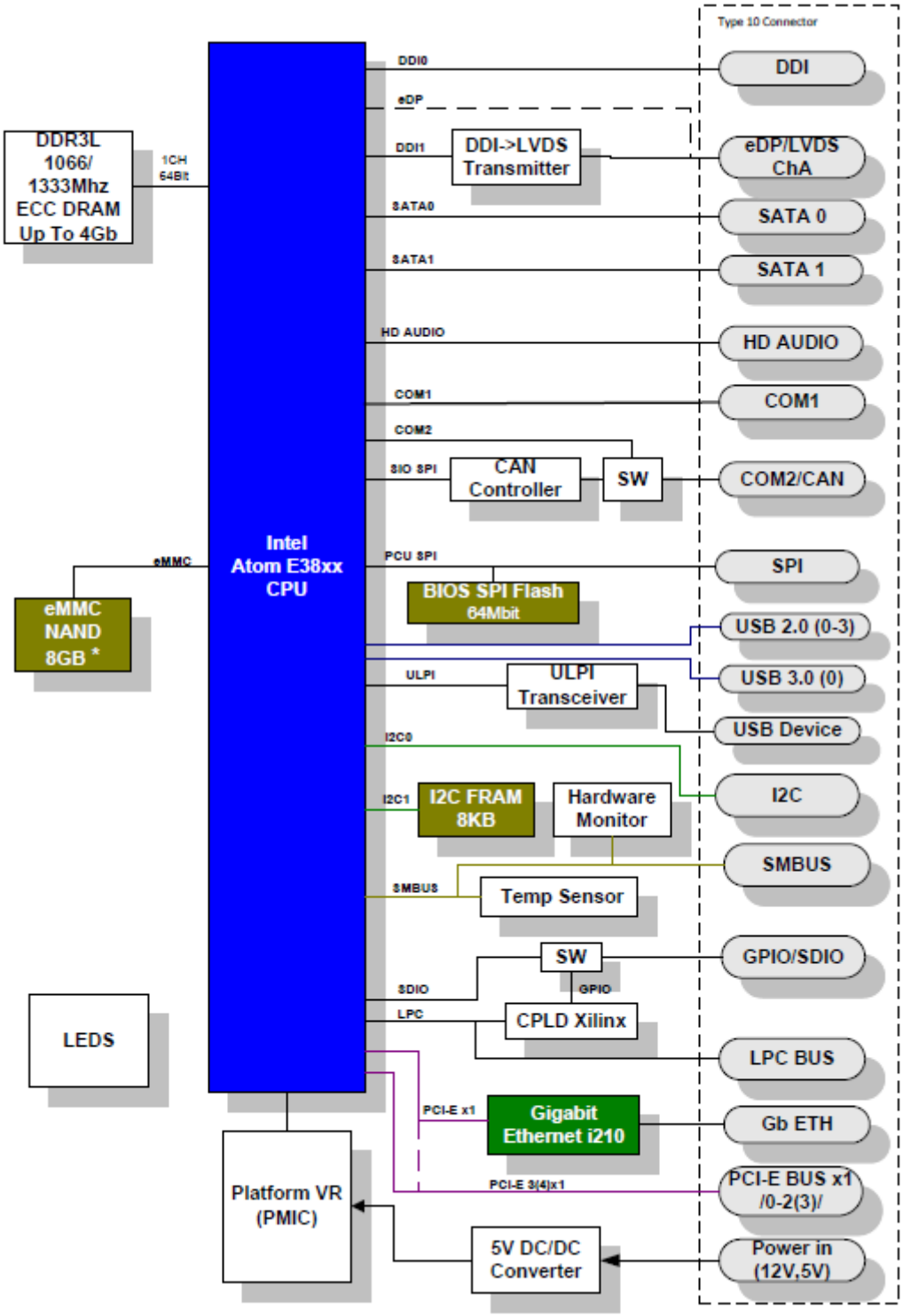
Table 2-3: MTBF

Module type	MTBF, in hours, no less than
CPC1311	200 000
Note – MTBF values are calculated in accordance with the Telcordia Issue 1 calculation method (Method I Case 3) for continuous use in case of surface mounting and under conditions, corresponding to the climatic category Moderately Cold Climate 4, according to the GOST standard 15150, at the ambient temperature of + 30°C.	

3 Operation of main components

3.1 Module functional description

The block diagram of the module is shown in the figure below:



** eMMC SATA Flash-drive: 8 GB for the version CPC1311-01)*

Fig. 3-1: Block diagram of the module

- **Intel Atom E38xx**

32-bit Intel CPU: manufactured with support of 22 nm process technology, low power consumption (TDP <6 W for dual core, <10 W for quad-core); industrial operating temperature range (-40 … +85ºC).
Represents a single-crystal solution combining up to four improved cores Intel Atom, 64-bit memory controller DDR3L SDRAM (up to 4GB, 1066/1333) with ECC support, up-to-date graphics subsystem with 2D/3D acceleration Gen7 (video processor frequency up to 700 MHz), I/O subsystem (PCI-E, USB, SATA) and a set of standard hardware support of platform (RTC, UART, Timers, GPIO etc.). The processor is equipped with a hardware support of video coding (MPEG-2 / H.263 / H.264), as well as a hardware acceleration of video decoding (H.264 / MPEG2 / MPEG4 / VC1 / WMV9).
The processor is implemented in the enclosure FCBGA-1170, 25 x 27 mm, 0.6 mm ball pitch.

- **DDR3L SDRAM**

The board can be equipped with installed (soldered) 9 microchips DDR3L 1066/1333 SDRAM with a total volume up to 4 GB. Operation mode – single-channel, with ECC support.

- **BIOS**

For storage of main (operating) BIOS copy, SPI-Flash 64 Mb microchip is used.
Booting from an external carrier is supported (SPI interface on COM-Express connector). By default, booting is carried out from SPI Flash soldered on the module. Switching to the booting from an external SPI Flash (COM-Express) or LPC bus is possible.

- **RTC, CMOS**

The real-time clock is built in the processor. If the power is switched off, RTC operability is ensured via "RTC battery" port of COM-Express connector, from the carrier-board. CMOS settings are stored in the FRAM nonvolatile memory.

- **I2C FRAM**

Nonvolatile memory 8 Kbyte (Ramtron, FM24CL64, SMBus) required for storing BIOS SETUP settings.

- **PCI-E 2.0 ports**

COM-Express connector has 3 routed PCI-E Gen2 ports with the bandwidth up to 5GT/sec. Output of the 4th port is possible, in this case Ethernet-controller is not installed.

- **SATA ports**

COM-Express has 2 routed SATA ports. Support of SATA I, SATA II specifications (up to 3 Gbit/sec) is ensured.

- **eMMC Flash Disk** (for CPC1311-01)

As an option, the board can be equipped with Micron eMMC Flash Disk with a total capacity of 8 GB. Distinctive features: eMMC 4.51 (Read up to 120 MB/s, write up to 24 MB/s), support of ECC, extensive temperature range (-40… + 85 ºC). Enclosure TBGA -100 14x18 mm.

- **USB 2.0 port (host)**

COM-Express connector has 6 routed USB 2.0 ports (host), protected against short circuit.

- **USB 2.0 port (device)**

COM-Express connector has 1 routed USB 2.0 port (client) via ULPI TUSB1210 transceiver.

- **USB 3.0 port**

COM-Express connector has 1 routed USB 3.0 port (Super Speed). Can be combined with any port from among 6 USB 2.0 ports.

- **Gbit Ethernet port**

The board has 1 Gbit Ethernet channel. An external Gigabit Ethernet I210 controller is used connected to one of the PCI-E ports.

- **COM1/COM2 ports**

COM1 – 2-wire interface RS-232 (TTL), rate up to 4 Mb/sec. Can be used as a console I/O port. Routed to COM-Express connector. Protection against overvoltage 14 V (conditioned by the requirements of COM-Express Type 1 and Type 10 compatibility).
COM2 – 2-wire interface RS-232, rate up to 4 Mb/sec. (or CAN 2.0 B). Port configuration is software-selected. RS-232 port can be used as a console I/O port. Routed to COM-Express connector. Protection against overvoltage 14 V (conditioned by the requirements of COM-Express Type 1 and Type 10 compatibility. CAN v2.0 interface (1 Mb/s) is implemented in Microchip MCP2515 controller, connected to SPI bus.

- **Video ports**

For connection of LCD (TFT) – panels, DDI and eDP interfaces are used, which are routed to COM-Express connector. Maximum resolution: 2560x1600 @ 50Hz. Independent operation of two displays is supported. Support of single-channels LVDS-interface is implemented on NXP PTN3460 microchip (112 Mpixel/sec). Maximum resolution: 1600x1200 @ 50 Hz. 18/24 bpp.

- **Audio port**

For connection of audio devices, COM-Express is equipped with a routed High Definition Audio interface.

- **SDIO/GPIO port (8 I/O channels)**

SDCard port in PCU and GPIO ports in CPLD are sued. Designed for input of 4 and output of 4 logic signals. Port configuration is software selectable. LVCMOS, 3V Tolerant level.

- **Sensors**

- Digital sensor of CPU temperature (integrated into CPU), LM95235 two-wire temperature sensor connected to SMBUS.
- Monitor of 7 power supply voltages (12V, 5V, 3.3V, 1.8V, 1.35V, VGFX,VCPU) AMC80AIPW connected to SMBUS.

- **CPLD Xilinx CoolRunner-II XC2C256**

Used for implementing interruption and control of CAN controller, diagnostics/start LED indicator, GPIO ports.

- **WDT**

The modules uses 1 watchdog timer: hardware watchdog timer, with variable actuation interval from 1 μs to 10 minutes, integrated into CPU microchip.

- **Power supply reset and monitoring**

Microprocessor reset signal is generated from the following sources:

- from supervisor at startup;
- from “Reset” key;
- from watchdog timer;
- from an external reset signal.

3.2 Location of main components

Location of main components of CPC1311 for top and bottom view is shown in Fig. 3-2 and Fig. 3-3.
Location of switched is described in Section 5 Configuration.

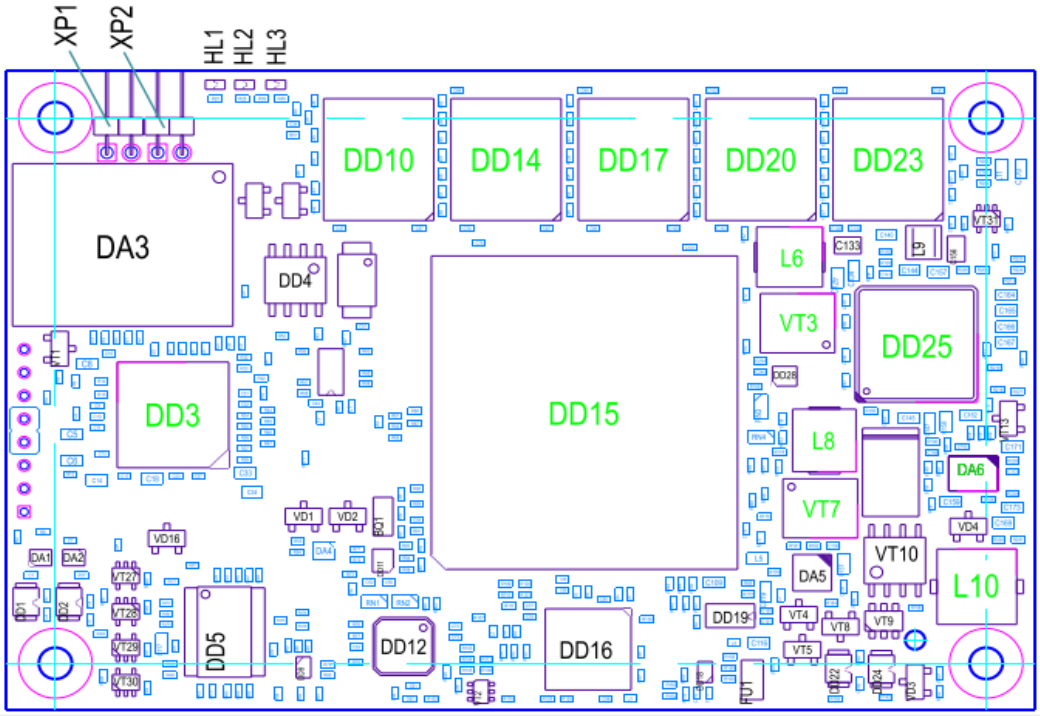


Fig. 3-2: Location of connectors and main components (top view)

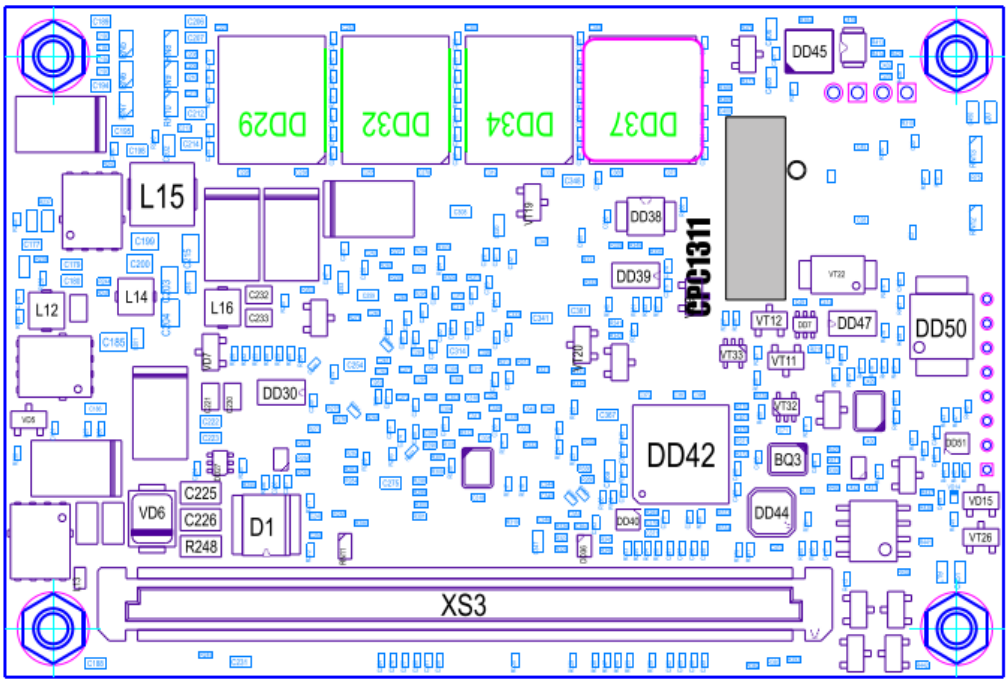


Fig. 3-3: Location of main components (bottom view)

3.3 COM Express connector

CPC1311 is equipped with a standard COM Express connector (see Fig.3-3: Location of main components (bottom view)), which is used for connecting CPC1311 with the carrier-board. Information on the purpose of contacts for each of the connectors is given in the tables below.

Table 3-1: Purpose of XS3 connector's outputs

Contact	Description	Note
A1	GND	
A2	GBE0_MDI3-	
A3	GBE0_MDI3+	
A4	GBE0_LINK100#	OD, 330oHm
A5	GBE0_LINK1000#	OD, 330oHm
A6	GBE0_MDI2-	
A7	GBE0_MDI2+	
A8	GBE0_LINK#	OD, 330oHm
A9	GBE0_MDI1-	
A10	GBE0_MDI1+	
A11	GND	
A12	GBE0_MDI0-	
A13	GBE0_MDI0+	
A14	NC	
A15	SUS_S3#	PD 10K
A16	SATA0_TX+	
A17	SATA0_TX-	
A18	SUS_S4#	PD 10K
A19	SATA0_RX+	
A20	SATA0_RX-	
A21	GND	
A22	USB3_SSRX0-	
A23	USB3_SSRX+	
A24	SUS_S5#	PD 10K
A25	NC	
A26	NC	
A27	BATLOW#	PU 10K 3.3V_STBY
A28	(S)ATA_ACT#	OD, 3.3V
A29	AC/HDA_SYNC	LP BIDIR
A30	AC/HDA_RST#	LP BIDIR
A31	GND	
A32	AC/HDA_BITCLK	LP BIDIR
A33	AC/HDA_SDOUT	LP BIDIR
A34	BIOS_DIS0#	PU 10K 3.3V_STBY
A35	THRMTRIP#	PU 4.7K 3.3V
A36	NC	

Contact	Description	Note
A37	NC	
A38	NC	
A39	NC	
A40	NC	
A41	GND	
A42	USB2-	
A43	USB2+	
A44	USB_2_3_OC#	PU 10K 3.3V_STBY
A45	USB0-	
A46	USB0+	
A47	VCC_RTC	
A48	EXCD0_PERST#	PP 3.3V
A49	EXCD0_CPPE#	PP 3.3V
A50	LPC_SERIRQ	LP BIDIR
A51	GND	
A52	NC	
A53	NC	
A54	GPI0/SD0	PP 3.3V
A55	NC	
A56	NC	
A57	GND	
A58	PCIE_TX3+	
A59	PCIE_TX3-	
A60	GND	
A61	PCIE_TX2+	
A62	PCIE_TX2-	
A63	GPI1/SD1	PP 3.3V
A64	PCIE_TX1+	
A65	PCIE_TX1-	
A66	GND	
A67	GPI2/SD2	PP 3.3V
A68	PCIE_TX0+	
A69	PCIE_TX0-	
A70	GND	
A71	LVDS_A0+	
A72	LVDS_A0-	
A73	LVDS_A1+	
A74	LVDS_A1-	
A75	LVDS_A2+	
A76	LVDS_A2-	
A77	LVDS_VDD_EN	PP 3.3V
A78	LVDS_A3+	
A79	LVDS_A3-	
A80	GND	

Contact	Description	Note
A81	LVDS_A_CK+	
A82	LVDS_A_CK-	
A83	LVDS_I2C_CK	4.6K PU 3.3V
A84	LVDS_I2C_DAT	4.6K PU 3.3V
A85	GPI3/SDI3	PP 3.3V
A86	NC	
A87	NC	
A88	PCIE0_CK_REF+	
A89	PCIE0_CK_REF-	
A90	GND	
A91	SPI_POWER	PP +3.3V_STBY, 0.16A
A92	SPI_MISO	PP +3.3V_STBY
A93	GPO0/SDCLK	PP 3.3V
A94	SPI_CLK	PP +3.3V_STBY
A95	SPI_MOSI	PP +3.3V_STBY
A96	PP_TPM	PU 10K 3.3V
A97	TYPE10#	PD 47K
A98	RS1_TX	PP 3.3V
A99	RS1_RX	PP 3.3V
A100	GND	
A101	RS2CAN_TX	PP 3.3V
A102	RS2CAN_RX	PP 3.3V
A103	NC	
A104	VCC_12V	
A105	VCC_12V	
A106	VCC_12V	
A107	VCC_12V	
A108	VCC_12V	
A109	VCC_12V	
A110	GND	
B1	GND	
B2	GBE0_ACT#	OD, 330oHm
B3	LPC_FRAME#	PP 3.3V
B4	LPC_AD0	PP 3.3V
B5	LPC_AD1	PP 3.3V
B6	LPC_AD2	PP 3.3V
B7	LPC_AD3	PP 3.3V
B8	LPC_DRQ0#	NU, PU 10K to +3.3V
B9	LPC_DRQ1#	NU, PU 10K to +3.3V
B10	LPC_CLK	PP 3.3V
B11	GND	
B12	PWRBTN#	PU 10K, +3.3V_STBY
B13	SMB_CK	4.6K PU 3.3V
B14	SMB_DAT	4.6K PU 3.3V

Contact	Description	Note
B15	SMB_ALERT#	10K PU 3.3V
B16	SATA1_TX+	
B17	SATA1_TX-	
B18	SUS_STAT#	PP 3.3V_STBY
B19	SATA1_RX+	
B20	SATA1_RX-	
B21	GND	
B22	USB3_SSTX0-	
B23	USB3_SSTX0+	
B24	PWR_OK	10K PU 5V
B25	NC	
B26	NC	
B27	WDT	PP 3.3V
B28	NC	
B29	AC/HDA_SDIN1	100K PD, 3.3V
B30	AC/HDA_SDIN0	100K PD, 3.3V
B31	GND	
B32	SPKR	PP 3.3V
B33	I2C_CK	4.5K PU 3.3V
B34	I2C_DAT	4.5K PU 3.3V
B35	THRM#	10K PU 3.3V
B36	USB_DEV-	
B37	USB_DEV+	
B38	NC	
B39	NC	
B40	NC	
B41	GND	
B42	USB3-	
B43	USB3+	
B44	USB_0_1_OC#	10K PU +3.3V_STBY
B45	USB1-	
B46	USB1+	
B47	EXCD1_PERST#	PP 3.3V
B48	EXCD1_CPPE#	PP 3.3V
B49	SYS_RESET	10K PU 3.3V
B50	CB_RESET#	PP 3.3V, 33oHm series
B51	GND	
B52	NC	
B53	NC	
B54	GPO1/SD_CMD	PP 3.3V
B55	NC	
B56	NC	
B57	GPO2/SD_WP	PP 3.3V
B58	PCIE_RX3+	

Contact	Description	Note
B59	PCIE_RX3-	
B60	GND	
B61	PCIE_RX2+	
B62	PCIE_RX2-	
B63	GPO3/SD_CD#	PP 3.3V
B64	PCIE_RX1+	
B65	PCIE_RX1-	
B66	WAKE0#	PU 10K, +3.3V_STBY
B67	WAKE1#	PU 10K, +3.3V_STBY
B68	PCIE_RX0+	
B69	PCIE_RX0-	
B70	GND	
B71	DDI0_PAIR0+	
B72	DDI0_PAIR0-	
B73	DDI0_PAIR1+	
B74	DDI0_PAIR1-	
B75	DDI0_PAIR2+	
B76	DDI0_PAIR2-	
B77	NC	
B78	NC	
B79	LVDS_BKLT_EN	PP 3.3V
B80	GND	
B81	DDI0_PAIR3+	
B82	DDI0_PAIR3-	
B83	LVDS_BKLT_CTRL	PP 3.3V
B84	VCC_5V_SBY	
B85	VCC_5V_SBY	
B86	VCC_5V_SBY	
B87	VCC_5V_SBY	
B88	BIOS_DIS1#	PU 10K, +3.3V_STBY
B89	DDO_HPD	PD 100K
B90	GND	
B91	NC	
B92	NC	
B93	NC	
B94	NC	
B95	DDIO_DDC_AUX_SEL	PD 1M, 3.3V
B96	USB_HOST_PRSNT	PD 100K
B97	SPI_CS#	PU 100K, +3.3V_STBY
B98	DDIO_CTRLCLK_AUX+	
B99	DDIO_CTRLCLK_AUX-	
B100	GND	
B101	FAN_PWMOUT	PU 1K, +3.3V
B102	FAN_TACHIN	

Contact	Description	Note
B103	SLEEP#	PU 10K, +3.3V_STBY
B104	VCC_12V	
B105	VCC_12V	
B106	VCC_12V	
B107	VCC_12V	
B108	VCC_12V	
B109	VCC_12V	
B110	GND	

Explanation of designations:

OD – open stock PP

PD – powered down

PU – powered up

LP BIDIR - TXSB0104 bidirectional driver

PP – CMO push-pull output

Note

Limitations in functionality of test samples (device version 2.0)
Modules do not support GPO2 and GPO3 signals on COM-Express connector.

3.4 LED indication

LEDs are located in the top part of the module (see Fig. 3-2). LEDs names:
- HL1 – indicates power supply +5V_STBY
- HL2 – indicates SATA activity
- HL3 – indicates module diagnostics/start

Description of HL3 LED operation

1) Off – > module's main power supply is off

2) Flashes with the frequency of ~8 Hz -> CPU is launched for running BIOS

3) Flashed with the frequency of ~1 Hz -> CPU runs POST procedures

4) Flashes continuously -> POST is finished, OS booting is in process

5) Flashes with the frequency of ~2 Hz -> power supply malfunction

6) Flashes with the frequency of ~0.1 Hz -> power supply source overheating

3.5 Power supply reset and monitoring

Microprocessor signal reset is generated from the following sources:
- from supervisor, at startup;
- from the "RESET" key (from carrier-board);
- from watchdog timers.

3.6 Switches (jumpers)

The switches are described in Section 5 Configuration.

4 Installation

CPC1311 is installed into the carrier-board. Fastwel recommends performing system debugging based on Fastwel carrier-boards KIB1400. Carrier-boards of other manufacturers can also be used. However, in the event of their use Fastwel shall not be responsible for their performance.

4.1 Safety requirements

For proper installation of CPC1311 module it is required to strictly follow the below safety rules and requirements, in order to avoid damages to the device and eliminate human health risks. Fastwel shall not be responsible for any damages, arising out as a result of non-compliance with these requirements.

Warning!

This sign marks warnings about hot surfaces. The surface of the heatsink and some components can get very hot during operation. Take due care when handling, avoid touching hot surfaces! Do not place the module on any surfaces or put it in any transport packaging until both the module and heatsink cool down to the room temperature.

Attention!

Switch off the power supply before installing the module to the carrier-board. Noncompliance with this regulation could cause harm to your health, as well as lead to malfunctions of the module and the whole system.

Warning, ESD Sensitive Device!

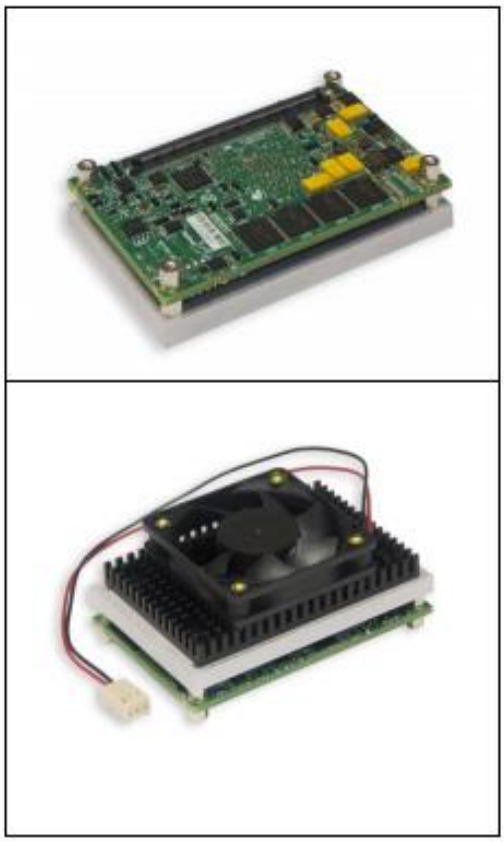
CPC1311 contains ESD sensitive elements. To keep product safety and operability it is necessary to handle it with care and follow the below ESD safety directions:

- Before touching the module, you should discharge the static electricity from your clothing, as well as from the tools before using them.
- Don’t touch electronic components and connector contacts.
- If your professional workplace is equipped with antistatic protection, don’t forget to use it.

Extreme caution should be exercised in cold and dry weather.

4.2 Possible heat removal options

Annex A contains technical requirements that should be considered by users when developing proprietary cooling system. Temperature control should be performed by means of a thermal sensor (digital CPU temperature sensor is integrated into the CPU, LM95235 two-wire temperature sensor is connected to SMBUS). Options of heat removal are shown in the figure below.



The top part of CPC1311 is equipped with a heat-spreading plate. Configuration of this type ensures heat dissipation by installing the unit directly onto the enclosure or chassis (enclosure acts as a large heatsink). Heat is removed from CPU using the heat-spreading plate and is transferred to the enclosure.

CPC1311 can additionally be equipped with the heatsink from among the ACS30075 kit (offered as an option) or user-made heatsink (see Annex A). In order to install the heatsink, apply heat grease (from ACS30075 kit) to the plate of CPC1311 module, after which fix the heatsink with screws contained in the delivery checklist of ACS30075.
In the same way, CPC1311 can be equipped with the ACS30075-01 kit with a fan.

Fig. 4-1: Heat removal options

4.3 Installation of CPC1311 to the carrier-board

In order to install CPC1311 to the carrier-board, follow the procedure below:

1. Make sure that all relevant safety requirements from Section 4.1. have been met.

Attention!

Noncompliance with the following rules can lead to module damages and system malfunctions.

2. Before installation, make sure that the module has configuration, which corresponds to application requirements. Information on CPC1311configuration is specified in Section 5 Configuration of this User Manual. In the event a heatsink (and fan) from ACS30075 kit (ACS30075-01) is used or manufactured by the user (see Annex A), the heatsink (and fan) should be preliminary installed, see subsection 4.2.

3. XS3 connector of CPC1311 module (see Fig. 3-3: Location of main components (bottom view)), should be installed into the relevant connector of the carrier-board. The module should be mounted on racks, fasten it on the carrier-board with screws from the installation kit (supplied to customer with the module), see subsection 1.4 Delivery checklist.

Attention!

It should be noted that the heat-spreading plate has electric connection with signal ground of CPC1311, therefore it is necessary to provide galvanic isolation between module and enclosure (chassis) a nonconductive material should be used.

4.4 Module removal procedure

In order to remove the module, the following procedures should be performed:

1. Make sure that all safety requirements from section 4.1 have been met. Special consideration should be given to the heatsink temperature warning!

2. Prior to the start, makes sure that system power is off.

3. Remove fastening nuts and extract the module from carrier-board connectors. Do not touch the heatsink, since it could get really hot during operation.

4. Do not place the module into a box or packaging, until the module and cooling radiators cool down to the room temperature.

5 Configuration

5.1 Installation of switches for CPC1311

User can configure CPC1311 using XP1 and XP2 switches (see Fig. 3-2).

- XP1 – Reset of BIOS Setup settings (In order to reset the settings, set the jumper and turn on the module)

- XP2 – Switching-on auto-start (when the jumper is set, during supplying power, the pulse is generated on an internal PWRBTN# signal).

5.2 CAN/GPIO configuration registers

INDEX	Address of I/O port	Type	HARD RESET	Configuration register
07h	-	R/W	--	LDN Select

CAN registers (logical device 3)

INDEX	Address of I/O port	Type	HARD RESET	Configuration register
30h	-	R/W		Activate
60h	-	R/W		Base[15:8] - I/O port base address bits[15:8]
61h	-	R/W		Base[7:3] - I/O port base address bits[7:3]. Base[2:0] – should be 0.
70h	-	R/W	00h	Write/Read: [3…0]: 00h – interrupt is OFF 01h..0Fh – IRQ1…IRQ15 [4] - IRQ Inversion (Из 2E,2F)
	Base+0	R/W	07h	CAN Control/Status [0][R/W] – TX0RTS# [1][R/W] – TX1RTS# [2] [R/W] - TX2RTS# [3] [RO] - RX0BF# [4] [RO] – RX1BF# [5] [RO] – SOF [6] [RW] – interrupt mask [7] [RO] – interrupt status
	[Base+3].[Base+2]	R	0	Irq latency timer 33.33 MHz. Resets and starts to count in the event of interrupt from MCP, stops at writing “1” to CAN_Control.[6], i.e. shows the time of system response to interrupt from MCP
	Base+4	R/W	x0h	[3:0] – GPO [7:4] - GPI

Programming CAN device

For operation with CAN, it is required to set the base address of the device and activate it (LDN=3). Further operation with CAN is carried out the I/O area with regard to the preset base address. Sequence of actions during device initialization:

- Enter the configuration mode

```
MOV  DX, 302H
MOV  AL, 46H
OUT  DX, AL
MOV  AL, 57H
OUT  DX, AL
```

- Write logical device number to the LDN register (CAN has a logical device number: 3)

```
MOV  DX, 302H
MOV  AL, 7
OUT  DX, AL
MOV  DX, 303H
MOV  AL, 3
OUT  DX, AL
```

- Set the base address of the device in I/O area (e.g. 310h):

```
MOV  DX, 302H
MOV  AL, 60H
OUT  DX, AL
MOV  DX, 303H
MOV  AL, 3H
OUT  DX, AL
MOV  DX, 302H
MOV  AL, 61H
OUT  DX, AL
MOV  DX, 303H
MOV  AL, 10H
OUT  DX, AL
```

- Set device interrupt (e.g. IRQ5)

```
MOV  DX, 302H
MOV  AL, 70H
OUT  DX, AL
MOV  DX, 303H
MOV  AL, 05h
OUT  DX, AL
```

- Activate the device:

```
MOV  DX, 302H
```

```
MOV  AL, 30H
OUT  DX, AL
MOV  DX, 303H
MOV  AL, 1H
OUT  DX, AL
```

• Exit configuration mode:

```
MOV  DX, 302H
MOV  AL, 57H
OUT  DX, AL
MOV  AL, 46H
OUT  DX, AL
```

All subsequent operations will be in the I/O field. GPIO will be available only during “GPIO” mode selection in BIOS Setup section.

6 AMI® BIOS

Your computer has an adapted version of AMI® BIOS, which is a standard system for IBM PC AT-compatible computers. It supports Intel®x86 and compatible CPUs, ensures a low-level support for processor, memory and I/O subsystems.
Using the BIOS Setup program you can change BIOS parameters and control special computer operation modes. It allows you to change main system setup parameters. These parameters are stored in FRAM non-volatile memory.

6.1 BIOS update

BIOS update is carried out using Flash Programming Tool (available on manufacturer's and official distributor's file servers).

Activities for BIOS update:

FTP stores 4 BIOS versions:

1. 1311-01_Vxxx.bin - BIOS for CPC1311, 01 version.

2. 1311-01_Vxxx_KIB1400.bin - BIOS for CPC1311, 01 version and operations together with KIB1400 carrier-board.

3. 1311-02_Vxxx.bin - BIOS for CPC1311, 01 version.

4. 1311-02_Vxxx_KIB1400.bin - BIOS for CPC1311, 02 version and operations together with KIB1400 carrier-board.
Below is the example of BIOS update via integrated UEFI SHELL:

1. Copy EFI64 utility to root directory of USB drive.

2. Copy the file, containing new BIOS to EFI64 directory.

3. Connect USB drive to CPC1311.

4. In BIOS SETUP select menu "Save & Exit -> Launch EFI Shell from filesystem device".
5. In the command line, type the following:

fs0:

cd efi64

fpt64.efi -f <file name>

6. Wait for completion of the update process and "FPT Operation Passed" message to appear on the screen.

7. Restart the system.

ANNEX A

A. Guidelines for cooling system development

This section contains guidelines, which should be considered by users while developing their own cooling systems. In order to ensure CPU operation with maximum performance without passing over to the lower-power mode and reducing its temperature, heat-spreader's temperature should not exceed Tcase_max values, specified below:

Module CPC1311 – 01 Tcase_max=89°C

Module CPC1311 – 02 Tcase_max=97°C

Therefore, if a cooler of the heat-spreader maintains its temperature at a level not exceeding the specified limit temperature, CPU will operate at its maximum capacity.
If heat-spreader's temperature exceeds the limit temperature value, CPU lacks sufficient cooling and passes to the reduced performance mode, which results in reduction of its operating clock speed, respectively.

ANNEX B DISCLAIMER

This Disclaimer contains special operating conditions of Fastwel in the following areas: intellectual property, warranty policy, conditions of the order and delivery.

1 INTELLECTUAL PRORETY

1.1 If any infraction, interference, improper use, illegitimate exploitation and/or violation of the industrial and/or intellectual property rights of any third party and/or property, exploitation during the use of Fastwel Embedded Module will take place – Fastwel does not guarantee to replace the materials, computer programs, procedures or equipment affected by the complaint and under no circumstances doesn't bear responsibility in any form for possible refusal in case of such a replacement.
1.2 Use of the Fastwel products as well as the objects of intellectual property containing in them, in the ways and for the purposes, not provided by the present user manual and datasheet isn't allowed without preliminary written approval of Fastwel.
1.3 Fastwel is not responsible for possible incidents and losses, related to the operation of end devices, in which the original Fastwel equipment is used.

2 WARRANTY POLICY

2.1 When the detected flaws in an element can be corrected without decreasing the foreseen technical features and functionality for it, User may demand Fastwel the urgent correction of the failures in additionally agreed period and an increasing of the period of the guarantee of the element equal as the time elapsed from the formal request to repair the failures, until the receipt of the repaired element. All costs associated to the correction of failures, included those of assembly, dismantle, transport, tests, etc, if they exist, shall be prosecuted according the Warranty Policy of Fastwel.

3 ORDER AND DELIVERY CONDITIONS

3.1 The general rule is that all Fastwel equipment prices are determined with due consideration of delivery under the EXW terms and conditions (Incoterms 2010). Delivery of the products under other terms and conditions should be preliminary agreed and stated in writing between the parties.
3.2 Unless otherwise expressly agreed with Fastwel, all the deliveries of Fastwel equipment will be carried out only after the official purchase order is obtained and provided that the ordered products have been prepaid in full. Other terms and conditions of cooperation should be made in writing.
3.3 Any delivery of Fastwel electronics is submitted with the right package in accordance with the current rules and standards in the Member States of the European Economic Area. The purchaser independently bears all risks regarding the compliance of package and marking of Fastwel products with legislation requirements being in effect at the place of purchased products destination (in the buyer's country). The specified condition excludes unequivocally any liability of Fastwel for possible non-compliance of package and marking of products with the requirements of legislation of the country of products destination.
3.4 In general, all components of the supply are properly protected with respect to freight, in order to avoid any damage to the supply, third parties, environmental damages or unrelated goods, as consequence of wrong packaging.
3.5 Each package unit is labeled on the exterior area with the indications of product's Part Number and Serial Number.
3.6 The support documents for the order should be made either in English or in Russian unless otherwise agreed between parties in writing.
3.7 Fastwel does not pay penalties and does not cover costs associated with delay in the delivery of the products caused by actions of the third parties, force-majeure etc. - Fastwel doesn't bear any responsibility for non-execution or inadequate execution of the obligations in a case when it is caused by actions of the third parties (for example producers or suppliers of accessories), force majeure etc.
3.8 Fastwel declares that independently and at any time without damage, it has an exclusive right to define and change functionality architecture, bill of materials of its products without any preliminary coordination and approvals of the third parties.

4 OTHER CONDITIONS

4.1 Fastwel has the obligation to respect the current Russian legislation (including, but not limited to environmental, labor, social laws) in each moment and to apply it to its embedded electronics considering all and each execution phase, that is to say, from the design until the commissioning and subsequent maintenance. In this regard Fastwel is not liable to the user or other persons in connection with possible changes of the company's rules (including, but not limited to warranty, ordering policy) caused by changes of the Russian legislation.
4.2 Unless otherwise expressly agreed in writing, Fastwel provides no training for assembly\installation\adjustment\operation of its equipment.