KIC552

3U CompactPCI Serial PCI Express Switchboard

User Manual

August 2016

Version 1.1

Product Title: **KIC552**
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Manual version: **1.1**

Revision Record

This User Manual covers KIC552 and KIC552RC.

Revision No.	Brief description of changes	Board index	Revision date
1.0	Initial version	KIC552	November 2015
1.1	Compliance assessment	KIC552	August 2016

Contact Information

	Fastwel Co. Ltd	**Fastwel Corporation US**
Address:	108 Profsoyuznaya st.,	6108 Avenida Encinas,
	Moscow 117437,	Suite B, Carlsbad,
	Russian Federation	CA92011, USA
Tel.:	+7 (495) 232-1681	Tel.: **+1 (858) 488-3663**
Fax:	+7 (495) 232-1654	
E-mail:	info@fastwel.com	Email: info@fastwel.com
Web:	http://www.fastwel.com/	

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Notation Conventions

Warning! ESD Sensitive Device!

This symbol draws your attention to the information related to electro static sensitivity of your product and its components. To keep product safety and operability it is necessary to handle it with care and follow the ESD safety directions.

Warning! Hot surface!

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!

Warning!

Information marked by this symbol is essential for human and equipment safety.
Read this information attentively, be watchful.

Note

This symbol and title marks important information to be read attentively for your own benefit.

Safety requirements

This product is designed and tested for the purpose of ensuring compliance with the electric safety requirements. Its design guarantees long-term failsafe operation. Life cycle of the device can be sufficiently reduced due to improper handling during unpacking and installation. Therefore, for your own safety and in order to ensure the proper operation of the device, you should observe the below recommendations.

BOARD HANDLING INSTRUCTIONS

ESD Sensitive Device!

Electronic boards and their components are sensible to static electricity. This is why you should give special attention to handling with these devices in order to ensure their integrity and working efficiency.

- ◼   - Do not leave the board without protective packaging, when it is not operated.
- ◼   - When applicable, always operate the board at the workplace equipped with protection against static electricity. If it is impossible, the user should remove a static discharge before touching the device by hand or using tools. The best way to do it is touch a metal part of system enclosure.

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 to 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 6 Transportation, unpacking and storage.

MANUFACTURER'S WARRANTIES

Warranty liabilities

The Manufacturer hereby guarantees the product KIC552 conforms to the requirements of the IMES.469555.001TU technical conditions and KIC552RC – to IMES.469555.002TU 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 obligations

The above warranty obligations 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.

Procedure of device returning for repairs

Sequence of activities when returning the products for repairs:

– Apply to Fastwel company or to any of the Fastwel's official representatives for the Product Return Authorization;
– 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;
– Carefully package the product in the antistatic bag and carton box, in which the product had been supplied. Then package the product in a safe container for shipping. Failure to package in antistatic material will VOID all warranties.
– The customer pays for shipping the product to Fastwel or to an official Fastwel representative or dealer.

1 Introduction

KIC552 interface module is designed for the use as part of CompactPCI Serial 3U embedded computing systems. The device represents PCI Express GEN3 Switch and is used for connecting PCI Express devices to the system via a high-speed electric or optical cable connection.

The high-speed electric cable connection corresponds to the PCI Express External Cabling standard and is designed for connecting devices in PCIe GEN2 (GEN3) x8 mode. The interface makes it possible to use Active Optical Cable (AOC).

The high-speed optical cable connection is implemented on the basis of PPOD (Avago) optical transmitters/receivers and enables connecting devices in the PCIe GEN2 (GEN3) x8 mode. The devices are connected via a standard multimode optical cable QSFP (8 Fiber, 50um MMF, MTP/MPO).

Using optical cable connection compared to the electrical cable connection, increases reliability, connection distance, reduces the level of radiated interference and improves resistance to external electromagnetic interference.

The module has a following structure of input-output channels:

- CompactPCI Serial interface;
- PCI Express External Cabling interface;
- PCI Express Fiber Optics interface.

This time the module is manufactured as KIC552 (with forced air cooling) and KIC552RC (with conduction cooling versions). Information contained in this User Manual covers both of the versions.

1.1 Module technical features

■ **CompactPCI Serial:**
- PCIe x8 GEN1 (2,5 Gb/sec) / GEN2 (5 Gb/sec);
- Data and clock frequency redrivers;

■ **PCI Express External Cabling:**
- PCIe x8 GEN1 (2,5 Gb/sec) / GEN2 (5 Gb/sec);
- Data and clock frequency redrivers;
- Support of AOL (Active Optical Link);
- Switchable operating modes of PCI Express port: Upstream, Downstream, NTB;
- Switchable clocking mode: SSC, CFC;
- Indication of connection and its speed on the front panel;
- ESD protection 8 kW (air) / 4 kW (contact).

■ **PCI Express Fiber Optics:**
- PCIe x8 GEN1 (2,5 Gb/sec) / GEN2 (5 Gb/sec);
- Switchable operating modes of PCI Express port: Upstream, Downstream, NTB;
- Cable connection QSFP (8 Fiber, 50um MMF, MTP/MPO) with a length up to 50 m;
- Indication of connection and its speed on the front panel.

■ **Power supply:**
- Supply voltage: +12 V ± 10%;
- Maximum current – no more than 4 A;

- power consumption: no more than 50 W.
- ■ **Operating temperature range:**
  - commercial version KIC552 / KIC552RC: 0 … +70 °C;
  - Industrial version KIC552: - 40 … +70 °C;
  - Industrial version KIC552RC: - 50 … +80 °C.
- ■ **Module weight:**
  - KIC552 – no more than 600 g;
  - KIC552RC – no more than 800 g.
- ■ **Software compatibility:**
  - Linux Debian 7.0 32 bit;
  - Astra Linux 64 bit.
- ■ **Compatibility with PICMG/VITA standards:**
  - PICMG CPCI-S 1.0 D0.70.
- ■ **MTBF:**
  - no less than 100 000 hours.
- ■ **Module corresponds to RoHS.**

1.2   Versions

Table 1-1.: Versions of KIC552 module

Module version*	Technical features
KIC552-01	Commercial version: operating temperature range from 0 to +70 °C
KIC552-02	Industrial version: operating temperature range from – 40 to +70 °°C

* - where \COATED means conformal coating.

Example of ordering information:

KIC552-02\COATED   -   Interface module KIC552, industrial temperature range (-40 … +70 °C).

Table 1-2.: Versions of KIC552RC module

Module version*	Technical features
KIC552RC-01	Commercial version: operating temperature range from 0 to +70 °C
KIC552RC-02	Industrial version: operating temperature range from – 50 to +80 °C

* - where \COATED means conformal coating.

Example of ordering information:

KIC552RC-02\COATED - Interface module KIC552RC, industrial temperature range (-50 … +80 °C).

1.3   Module delivery checklist

- KIC552 or KIC552RC module.

- Certificate.

- _

- Packaging.

1.4   Packaging information

KIC552 and KIC552RC modules are placed in boxes with the following overall dimensions: 350 x 260 x 70 mm.

Table 1-3.: Packaging information

Weight of packaged modules, in kg, no more than	KIC552	0.65
	KIC552RC	0.9

Note

Retain the original antistatic and consumer packages of the module till the end of the guarantee service life period.

1.5   External view and location of components

The below figures will help you identify components, their configuration and functions.

1.5.1   Module external view

Fig. 1-1: External view of KIC552 module
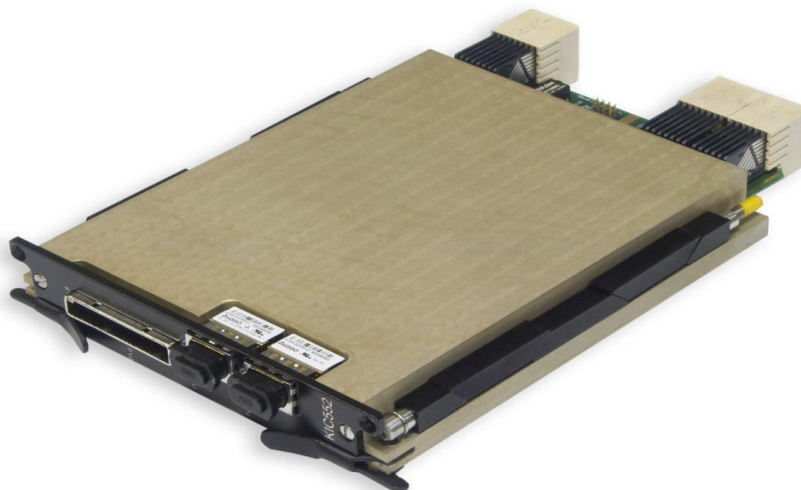
Fig. 1-2: External view of KIC552RC module

1.5.2   Overall and mounting dimensions, location of main components

130,6

212,4

213,3
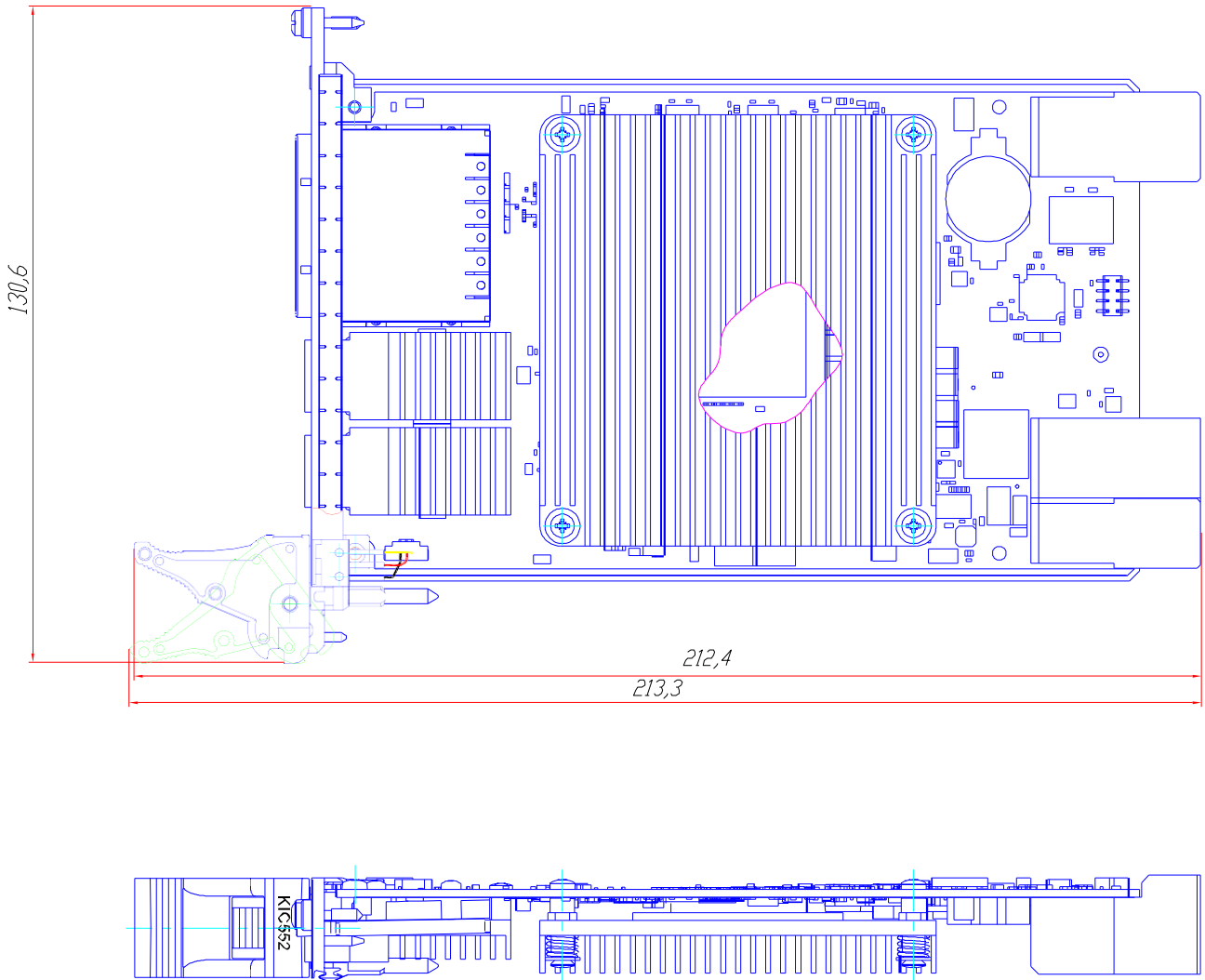
Fig. 1-3: Overall dimensions of KIC552 module

133

174

182

183
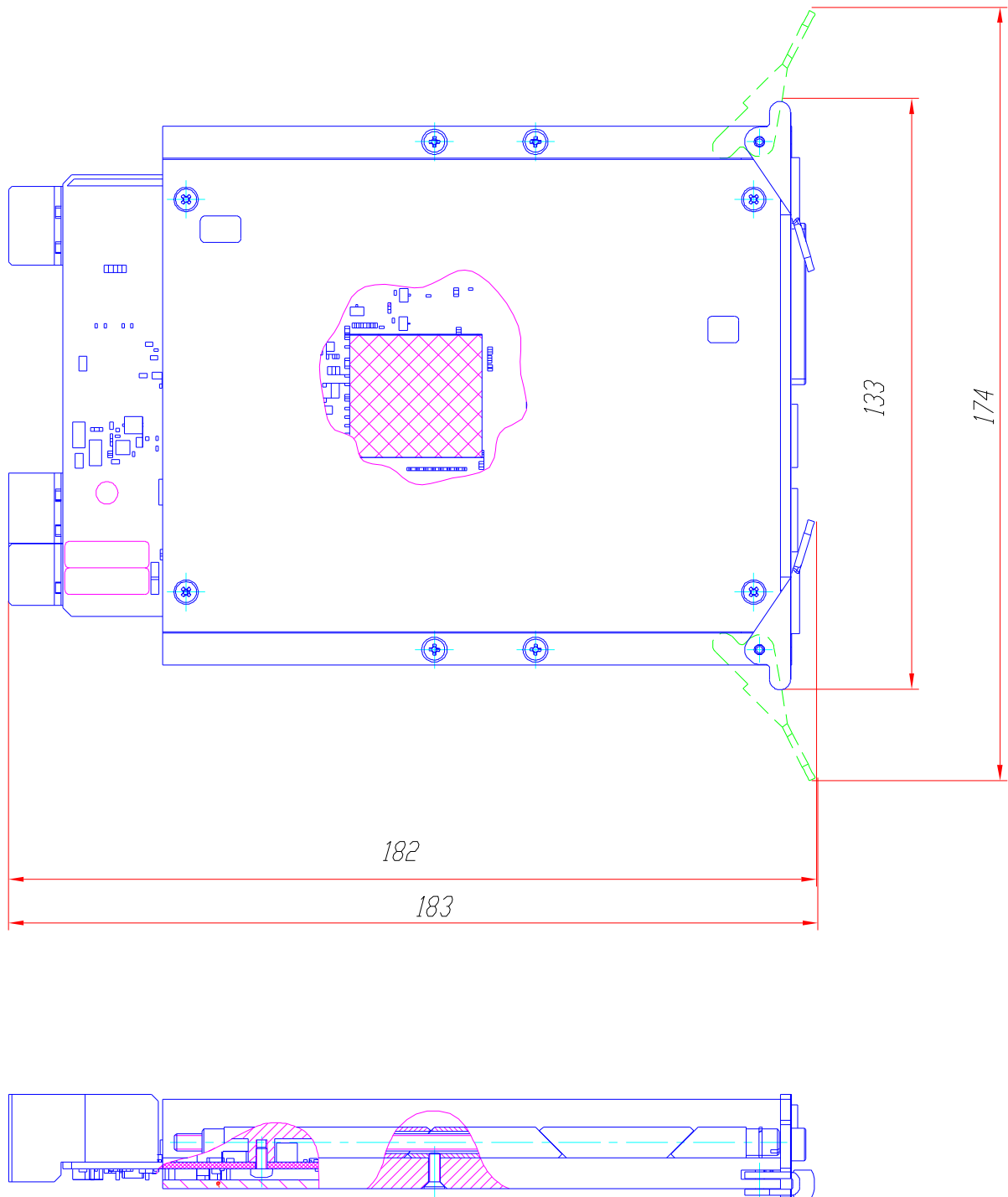
Fig. 1-4: Overall dimensions of KIC552RC module
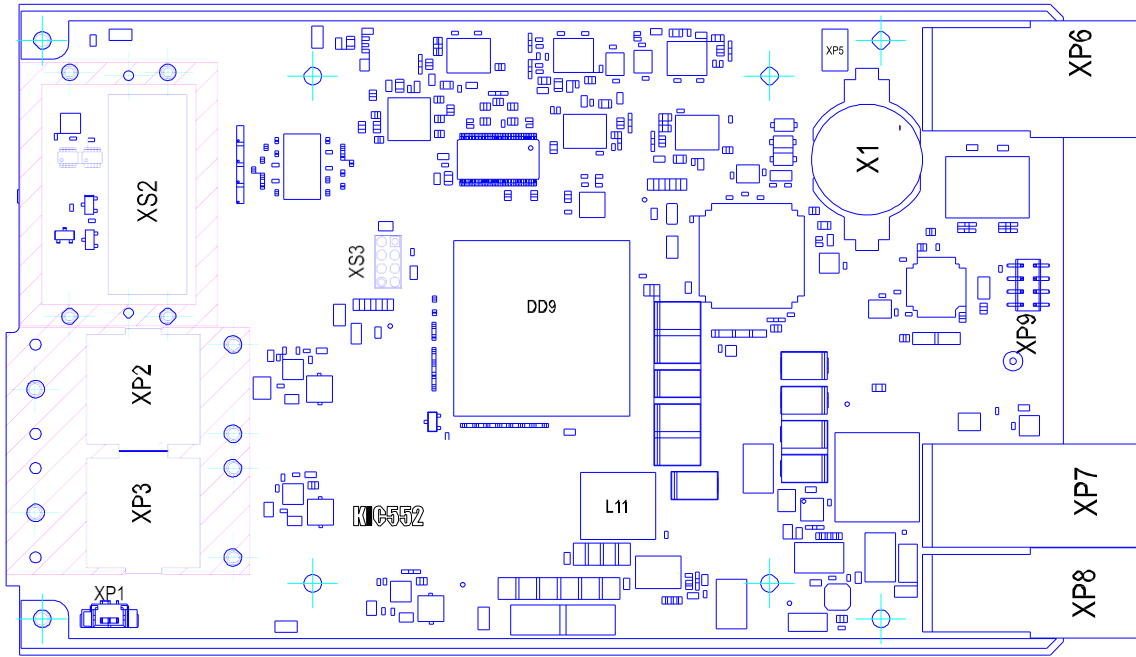
Fig. 1-5: Location of main components of KIC552 and KIC552RC components units, top view
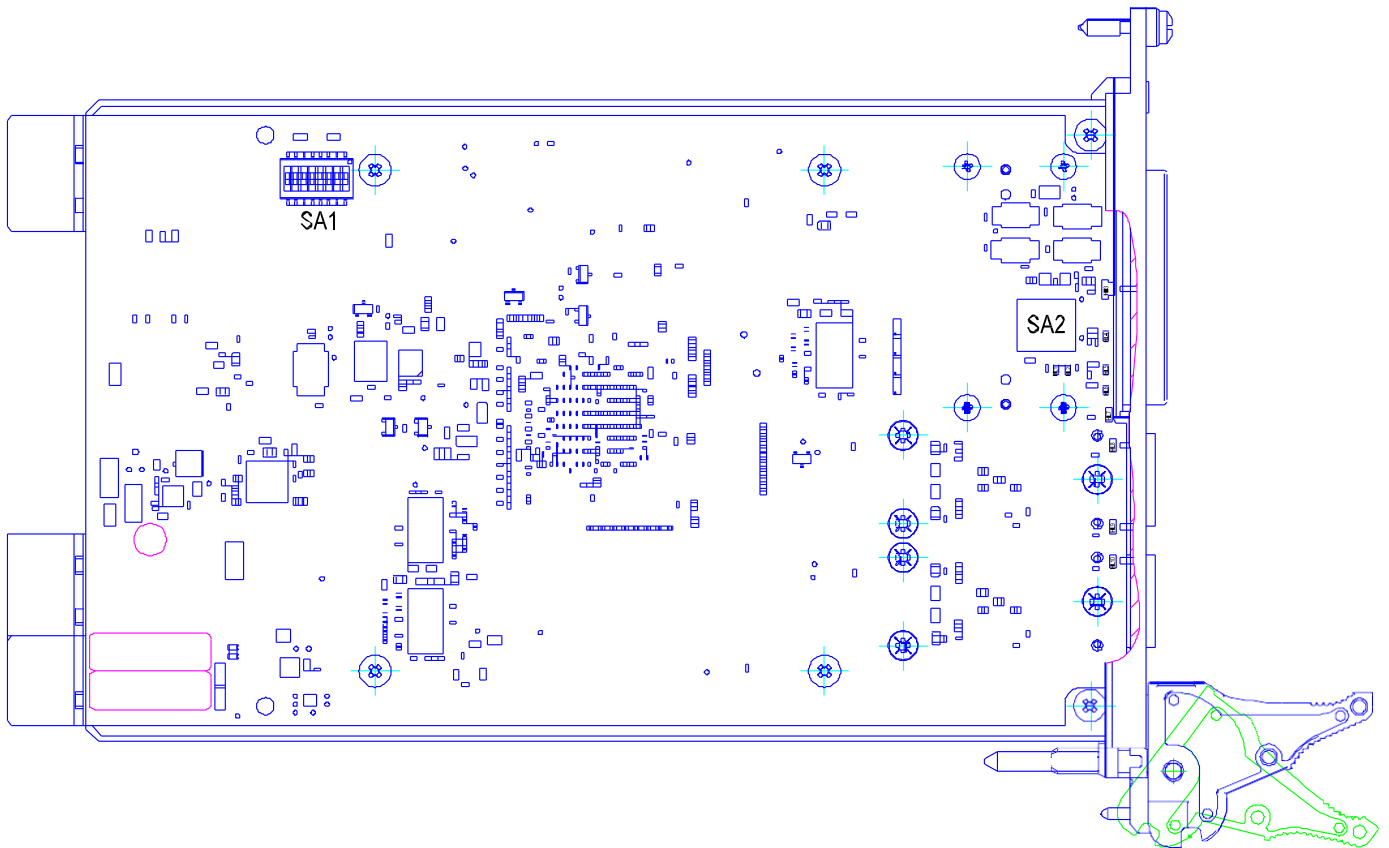
Fig. 1-6: Location of main components, bottom view

1.5.3   Front panel

Board start indicator /
Hot Swap indicator

Upper fixing element

PCI Express External Cabling

Activity indicator of
PCI Express External Cabling

Activity indicator of
PCI Express Fiber Optics

PCI Express Fiber Optics

Ejector handle

Lower fixing element
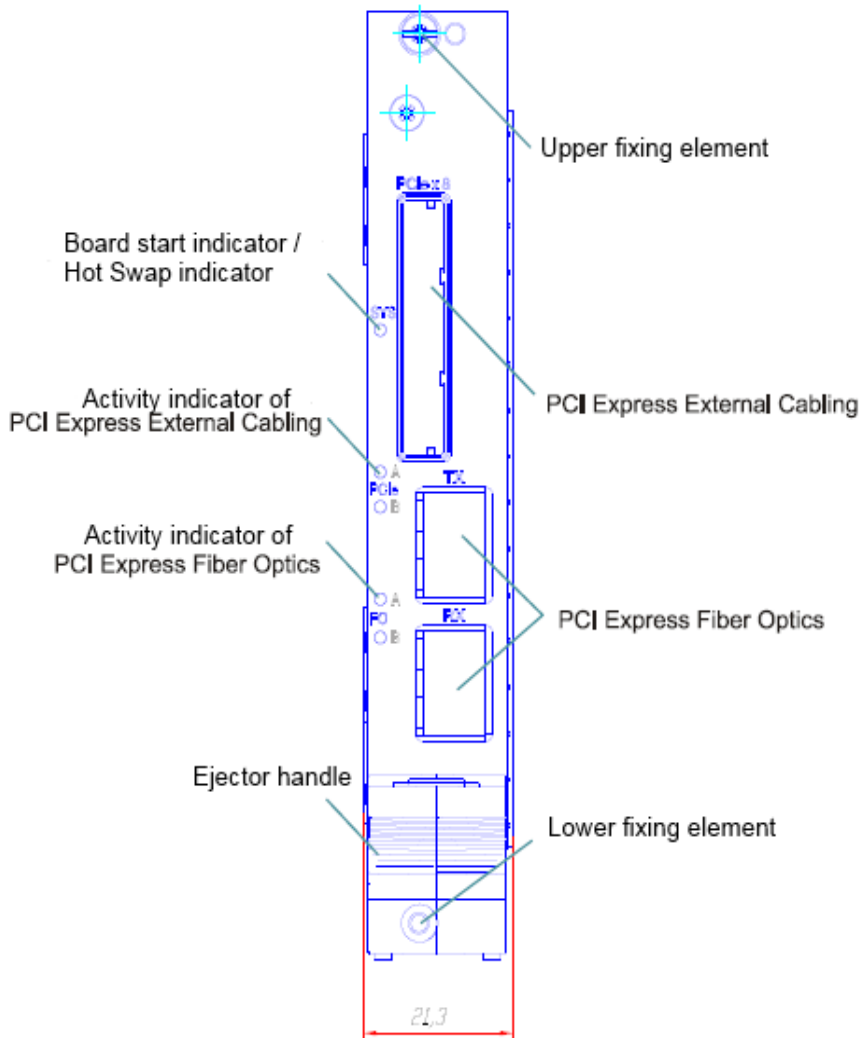
Fig. 1-7: Front panel of KIC552 module
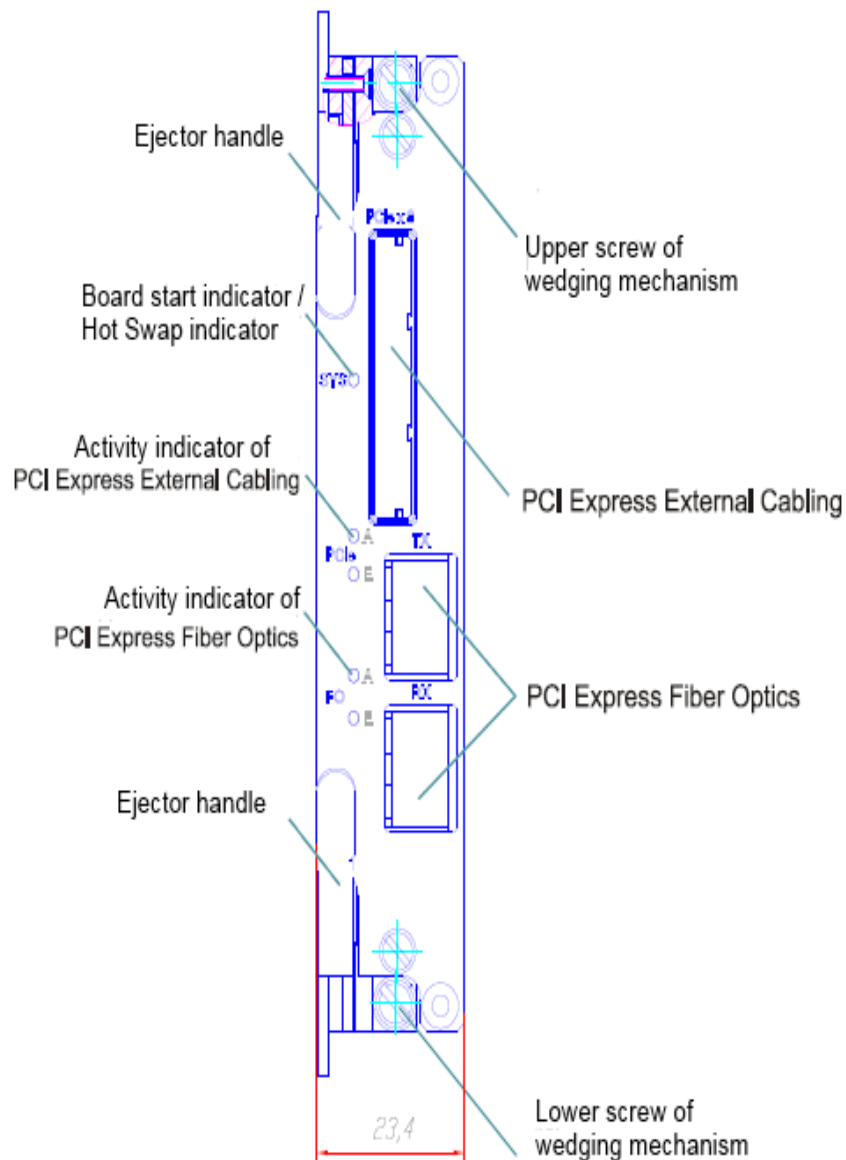
Fig. 1-8: Front panel of KIC552RC module

Note
External view of module versions could slightly differ from the one shown in the Figures.

2   Functional description

2.1   Board layout
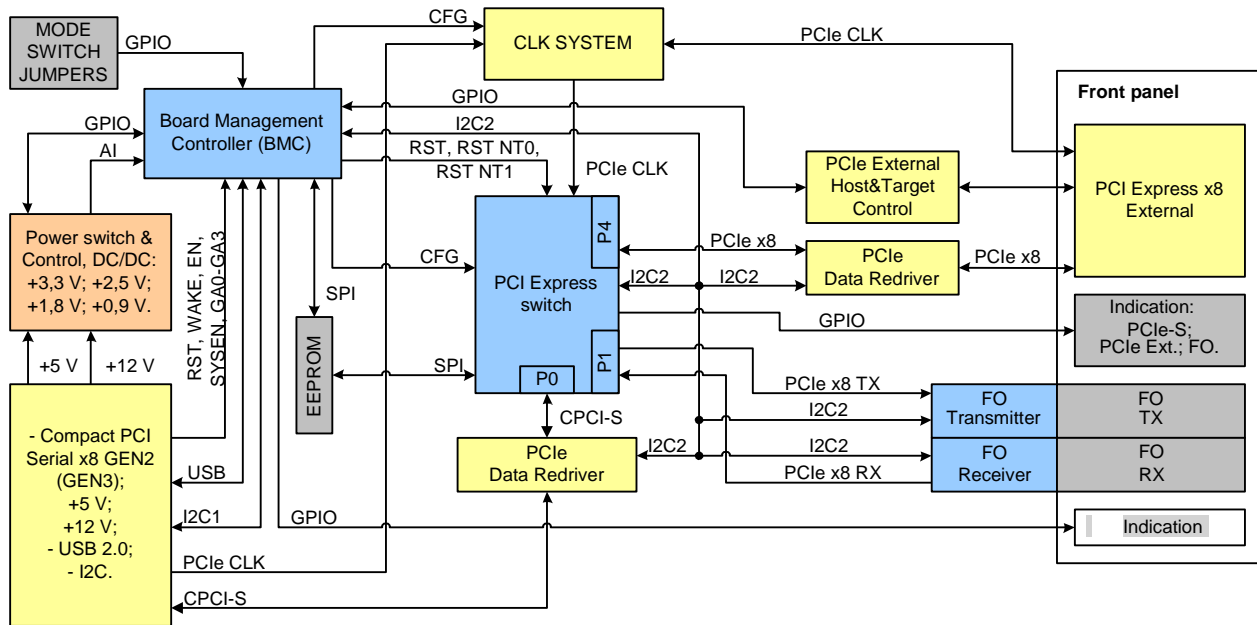
Fig. 2-1: Block diagram of KIC552, KIC552RC

2.2   Specifics of functional nodes operation

■ **CompactPCI Serial interface**

- Uses 8 links with a maximum speed of 5 Gb/sec (PCIe GEN2) for data exchange with the system.
- In order to enhance reliability of CompactPCI Serial interface, the circuit uses redrivers of data signals and clock frequency (PCIe Data Redriver).
- For implementing diagnostics tasks, the module uses BMC connection via USB 2.0 interface within the frames of CompactPCI Serial.

■ **Board Management Controller (BMC):**

- Configures module's nodes in accordance with user settings (**MODE SWITCH JUMPERS**).
- Ensures safe removal and installation of the module on the switched-on system (signals: **RST, WAKE, EN, SYSEN**).
- Ensures launch delay at "geographical" address for reducing the load to the power supply source (signals: **GA0-GA1**).
- Indicates activity and module errors conditions.
- Limits the consumption current in order to prevent module's breakdown in case of malfunctions with nodes operation.
- Controls the start of module's nodes.

- Collects and analyzes data on module nodes temperature in order to prevent module's breakdown due to violation of operating conditions (overheating).
- Performs continuous control and diagnostics of module's nodes with output of diagnostics information upon user's request using virtual COM-port (USB 2.0) or indication means on the front panel.

■ Power switch & Control, DC/DC:

- Generates power supply voltages of module's nodes (+3,3 V; +2,5 V; +1,8 V; +0,9 V), using internal voltage +12 V.
- Operates under BMC control (signals: AI, GPIO). **AI, GPIO**).

■ PCI Express switch

- Implements 3x ports PCI Express in GEN2 / GEN3 x 8 mode.
- For all the ports supports the following modes: Upstream, Downstream, NTB;
- Port conditions are indicated on the front panel.
- Operation modes of PCI Express switch and its ports are set by the BMC (signals: **CFG**).

■ EEPROM

- Contains configuration data that determine operation of PCI Express switch.
- Is programmed by the means of PCI Express switch or BMC.

■ PCI Express x8 External

- PCI Express External Cabling interface on the front panel of the module.
- For improving reliability of CompactPCI Serial interface communication redrivers of data signals (**PCIe Data Redriver**) are used.
- PCIe External Host&Target Control node ensures generation of interface control signals in accordance with the PCI Express External Cabling specification.
- Indication of operation mode on the front panel of the module is implemented by way of LEDs.

■ FO Transmitter, FO Receiver

- These nodes shape PCI Express Fiber Optics interface.
- Operation modes are set by BMC (I2C2 signals).
- Indication of operation mode on the front panel of the module is implemented by way of LEDs.

■ CLK SYSTEM

- Shapes clock frequencies for PCI Express ports.
- Each port enable to select a clocking source and mode (CFC / SSC).
- Is controlled by BMC (CFG signals).

■   Indication

- LED indicating the board start, combined with the Hot Swap indicator.
- LEDs indicating activity of PCI Express External Cabling and PCI Express Fiber Optics interfaces.

2.3   Module interfaces

2.3.1   CompactPCI Serial

KIC552 / KIC552RC is developed in accordance with the CompactPCI Serial bus architecture. The module uses two connectors of CompactPCI Serial interface: P1 and P2. The interface supports data exchange at a speed up to 5 Gb/sec. (GEN2).

In accordance with the standard, KIC552 has the size of 3U/4HP, KIC552RC – 3U/5HP.

2.3.2   PCI Express External Cabling

The PCI Express External Cabling interface on the front panel of the module is designed for the connecting PCI Express devices to the system using a high-speed electric connection.

The high-speed electric cable connection corresponds to the PCI Express External Cabling standard and is designed for connecting devices in PCIe GEN2 x8 mode. The interface makes it possible to connect devices using Active Optical Cable (AOC).

Purpose of interface connector's contacts (XS2, Fig. 1-5) is described in the PCI Express Cabling 1.0 (PCISIG) specification.

Note

In accordance with tolerances in the PCI Express Cabling 1.0 specification, the module does not support:

- galvanic isolation;

- signal of WAKE interface.

2.3.3   PCI Express Fiber Optics

High-speed optical cable connection is not standardized, but is implemented by way of optical cables of QSFP standard - MTP 12 Fiber 50um MMF and replaceable modules of SNAP12 (PPOD) standard. Using this optical connection improves reliability and distance of the connection, reduces electromagnetic interference level, enhances resistance to external electromagnetic interference and mechanical effects. Maximum length of FO cable – 50 m.

2.4 LEDs

The front panel of KIC552 (see Fig. 1-7) and KIC552RC (see Fig. 1-8) contains LEDs described in the table below:

Table 2-1.: Designation and functions of LEDs on the front panel of KIC552 and KIC552RC

Designation on the front panel	Description
SYS	**Blue:** **flashes** – module prepares for removal procedure, do not remove it until power shutdown; **steady light** – module can be removed; **light is off** – do not remove the module until power shutdown. **Red:** **flashes** – hardware failure. The number of flashes is determined by error code (see subsection 5.4 of this User Manual); **steady light** – unknown hardware failure of the module; **light is off** – module operation without errors.
PCIe	**Green:** **steady light** – connection is established at a speed of 8 Gb/sec. (GEN3); **flashes** – connection is established at a speed of 5 Gb/sec (GEN2).
FO	**Green:** **steady light** – connection is established at a speed of 8 Gb/sec. (GEN3); **flashes** – connection is established at a speed of 5 Gb/sec (GEN2).

2.5 Device geographical addressing

In accordance with the Compact PCI Serial standard, module interface contains signals, which determine its geographical address – position in the system slot (crate): GA0 – GA3.

Geographical address is used for the following functions:

- Module launch delay (for reducing the load to power supply source);
- module identification during installation of several devices into a single system (crate).

After power is on, the module determines its geographical address and records its value to the configuration EEPROM PCI Express Switch. Geographical address value can be acquired by reading the register 104h (Station 0, Port 0, Transparent mode, Serial Number, Lower DW). Register structure is described in the Table 2-2.

Table 2-2.: Information structure of the 104h Serial Number (Lower DW) register

Bit	Value
0…3	Geographical address of the device on Compact PCI Serial bus, value of signals GA0 – GA3
4…7	Reserved
8…31	MAC-address of the port (low-order 24 bits)

2.6   MAC-addresses of PCI Express ports

For device's driver operation, each PCI Express port in NTB (NT-Virtual port, NT-Link Port) mode should be assigned with a unique MAC-address.

MAC-addresses of the ports are recorded into configuration EPROM PCI Express Switch during device manufacturing stage. They are recorded into 104h (Serial Number, Lower DW) and 108h (Serial Number, Upper DW) registers of the ports: NT0-Virtual port, NT0Link Port.

Registers structure is described in the tables Table 2-2 and Table 2-3.

Table 2-3.: Information structure of the 108h Serial Number (Upper DW) register

Bit	Value
0…7	Reserved
8…31	MAC-address of the port (high-order 24 bits)

2.7 Use of the device within a computing system

Module KIC552 / KIC52RC is used for building high-performance computing systems with high-speed communication channels based on the PCI Express interface for the connection of separate subsystems. The figures below show possible options of using KIC552 / KIC552RC within such systems.
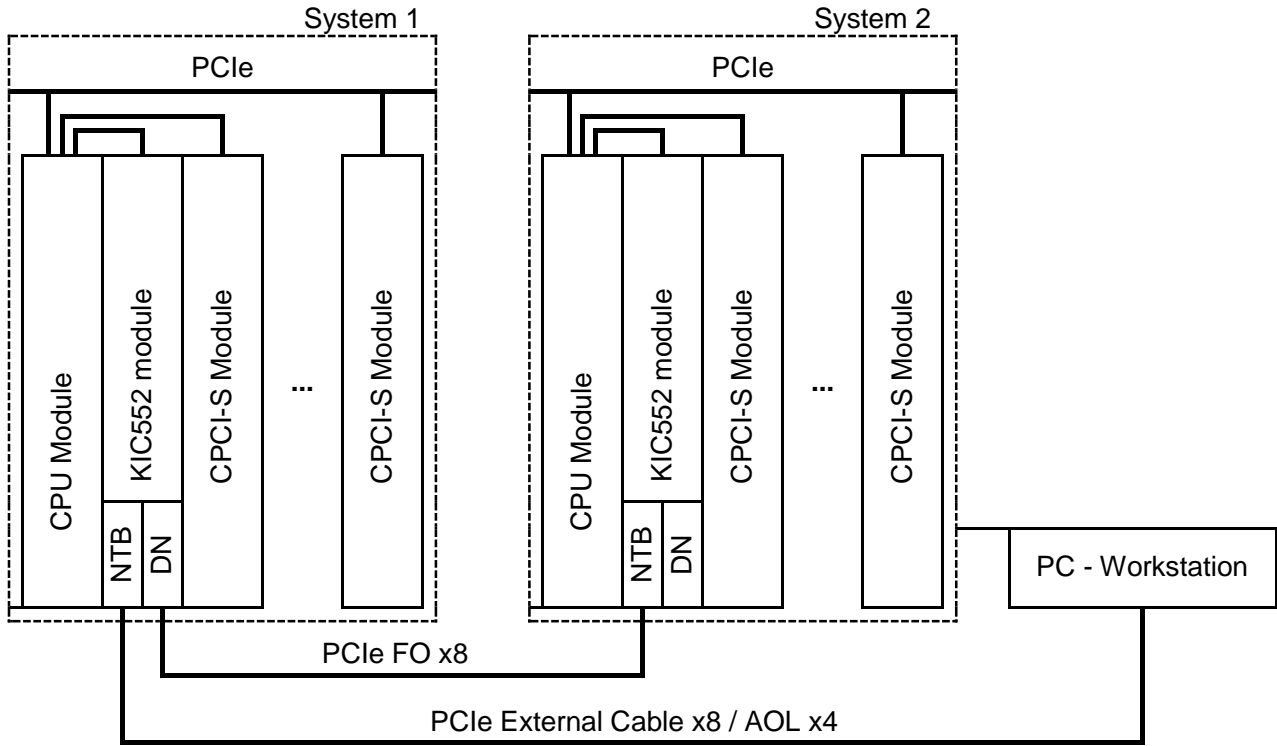
Fig. 2-2: Architecture of computing system – 1
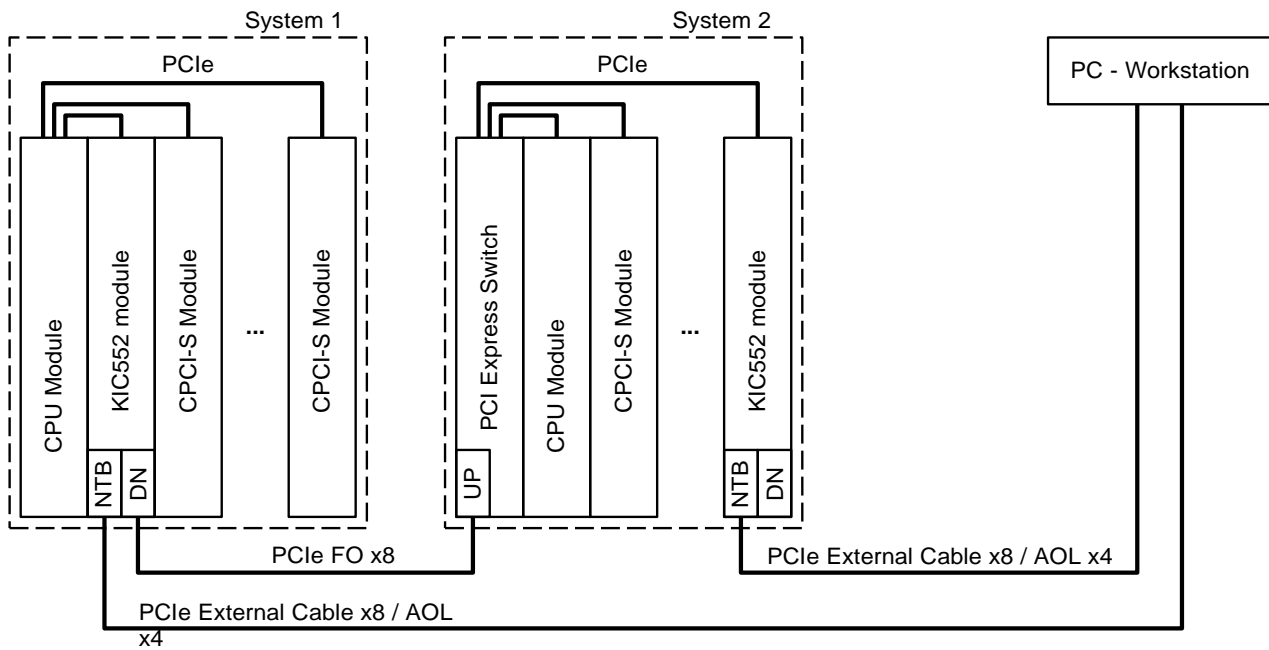
Fig. 2-3: Architecture of computing system – 2
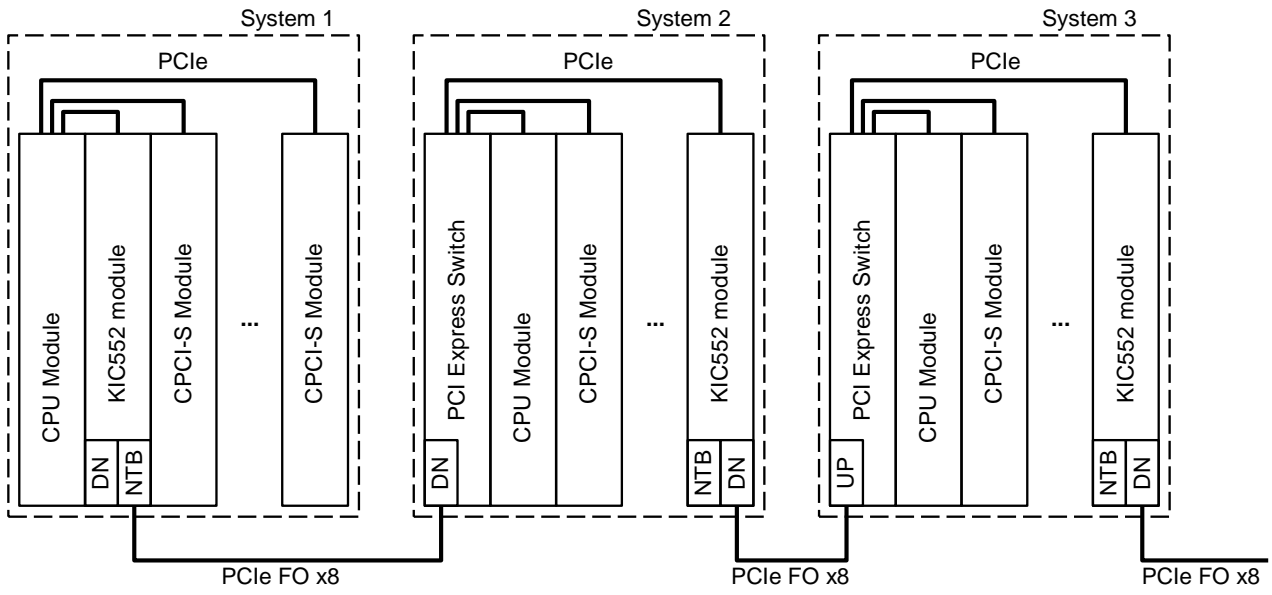
Fig. 2-4: Architecture of computing system – 3

3   Installation

For proper and safe installation of KIC552 / KIC552RC it is required to strictly follow the below rules, warnings and procedures.

3.1   Safety requirements

When handling KIC552 / KIC552RC strictly follow the below safety requirements. Manufacturer shall not be liable for any damages, arising out as a result of non-observance of such requirements.

Warning!

Be careful when handling the module, since the cooling heatsink can become too hot. Don't touch the hot heatsink with your bare hands. Use the gloves to protect your hands against burns or wait till the module cools down to safe temperature.

Do not place the module in any containers until the heatsink cools down to ambient temperature.

Warning!

Switch off the system power supply before installing the module into a free slot. Violation of this rule could lead to system or module damages.

If you need to put the module on a table, make sure that the module is placed with its heatsink faced downwards.

Electrostatic Sensitive Device (ESD)!

Module contains components sensible to static electricity. In order to prevent module damages, observe the following precaution measures:

- Before touching the module, discharge the static electricity from your clothes, as well as from the tools before using them.
- Do not touch electronic components and connector contacts.
- If you have a professional workplace equipped with antistatic protection, don't forget to use it.

3.2   Module installation procedure

Make sure that the safety requirements, listed in the previous chapter, have been met.

Before starting operations, make sure that system power supply is switched off. For module's installation, follow the procedures laid out in the sections below.

3.2.1   Installation of KIC552

■ Carefully insert the module into a necessary slot, moving it along the guide rails until it touches the backplane connector.

■ Using the handle on the front panel, push the module into the backplane connector. Do not apply force when module's connector into the backplane's connector.

■ Complete module installation by ways of moving the handle down by having it hooked by system enclosure frame and latching the connection. Make sure that the module is flush-mounted with the surface of other system modules or plugs. Fasten the module by two fixing screws (upper and lower ones) on the front panel.

■ Connect the required interface cables to the connectors of module front panel and make sure they are safely fixed.

The module is ready for operation.

3.2.2   Installation of KIC552RC

■ Loose the wedging mechanism by unscrewing the fastening screws with several rotations.

■ Carefully insert the module into a necessary slot, moving it along the guide rails until it touches the backplane connector.

■ Push the module in the backplane connector, by having the front panel slightly pressed. Make sure the module is flush-mounted with surfaces of other system modules.

■ Fix the module by using wedges, having both fastening screws tightened. Fix the module by two retention screws (upper and lower ones), if necessary.

■ Connect the required interface cables to the connectors of module front panel and make sure they are safely fixed.

The module is ready for operation.

3.3   Module removal procedure

Make sure that the safety requirements, listed in chapter 3.1 have been met.
Pay special attention to the warning related to heatsink temperature!

Before starting operations, make sure that system power supply is switched off.   For module's removal, follow the procedures laid out in the sections below.

3.3.1   Removal of KIC552

■   Disconnect all interface cables from the module.

■   Unscrew all the fastening screws (upper and lower ones) on the front panel.

■   Unblock the handle near the front panel by pressing the ejector handle button and moving it down, take the module out of the backplane's connector.

■   After the module has been taken out, pull it from the slot along the guide rails.

Module removal process is completed.

3.3.2   Removal of KIC552RC

■   Disconnect all interface cables from the module.

■   Unscrew the fastening screws (upper and lower ones) on the front panel, in case of any. Loose the wedging mechanism by unscrewing the both fastening screws with several rotations.

■   Pull the upper and lower ejector handles, which makes it possible to remove the module from the backplane connector.

■   After removing the module from the backplane connector, take it out of the slot.

 Module removal process is completed.

3.4   Connection of cable joints

Connection of cable joints to KIC552, KIC552RC modules should be performed only when the system power supply is OFF.

3.4.1   PCI Express External Cabling

For connecting the devices via PCI Express External Cabling interface a standardized cable is used, which ensures connection of KIC552 or KIC552RC in PCIe x8 mode (see Fig. 3-1 и Рис. 3-2).
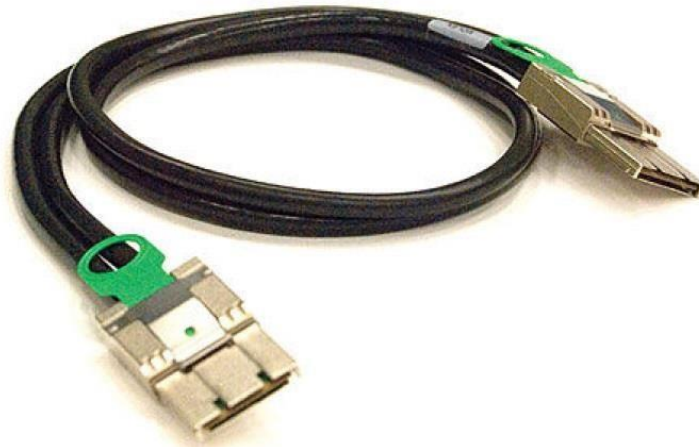
Fig. 3-1: Cable PCI Express External Cabling x8

Fig. 3-2: Cable PCI Express External Cabling x8, connected to KIC552 module

3.4.2   PCI Express Fiber Optics

For connecting devices via PCI Express Fiber Optics interface two QSFP cables (8 Fiber, 50um MMF, MTP/MPO) are used, which ensure the connection of KIC552, KIC552RC in PCIe x8 mode (see   Fig.   3-3). Maximum length of QSFP cable for the connection of KIC552, KIC552RC – 50 m.
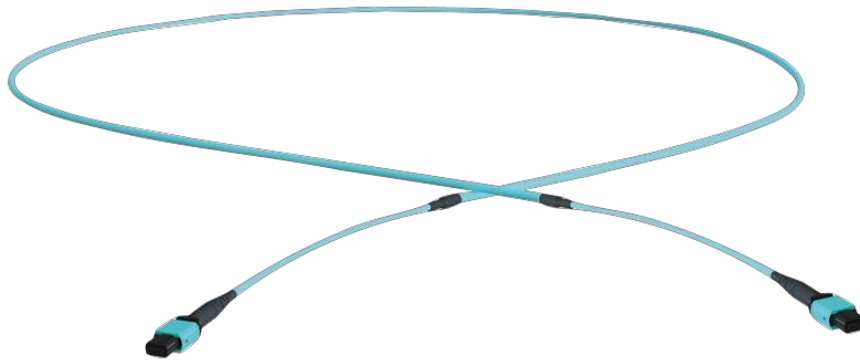
Fig. 3-3: QSFP cable

The ends of QSFP cable have MTP connectors with safety caps, protecting optical channels against damages and pollution (see Fig. 3-4 and Fig. 3-5).
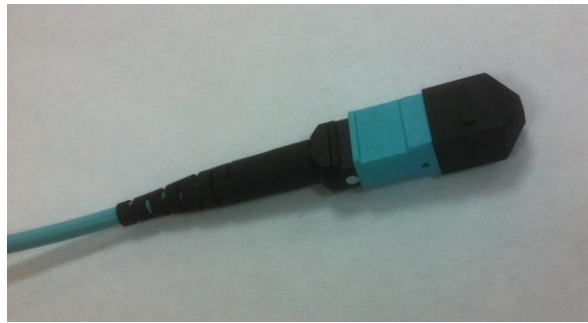
Fig. 3-4: MTP connector with safety cap

Fig. 3-5: MTP connector with the removed safety cap

In order to connect two devices via PCI Express Fiber Optics interface it is required to connect the output of TX optical channel of the first device with the input RX optical channel of the second device and vice versa:

■ immediately before connecting the cable to KIC552 / KIC552RC, remove the protective connector plugs for connection of optical cables (see Fig. 3-6 and Fig. 3-7);

■ remove the safety cap from MTP, connected to the optical cable connector (see Fig. 3-5);

■ install MTP until clicking into the connector for optical cable (see Fig. 3-8).

Fig. 3-6: Connectors for optical cables with the installed stopping plugs

Fig. 3-7: Connectors for optical cables with the removed stopping plugs

Fig. 3-8: Connection of QSFP optical cables

⚠️ **Warning!**

Remove safety caps and plugs immediately before cable connection to optical module

Retain safety caps and plugs, providing their cleanliness.   When disconnecting the cable from the device, place the safety cap on MTP connector and insert the safety plug into the oprical module.

3.5   Installation of software

All drivers and diagnostics software for KIC552 / KIC552RC can be found at FTP server. Procedure of module's drivers installation:

- ■ decide on the type of operating system you use (32/64 bit);

- ■ install software in accordance with peculiarities of the operating system you use;

- ■ restart the system.

4   Configuration of module's operating modes

4.1   Switching operation modes

The board of KIC552 / KIC552RC has installed switches of operation modes: SA1, SA2. When operation mode of PCI Express External Cabling or NTB interface is configured, the SA1 and SA2 switches (see Fig. 4-1) are used jointly.
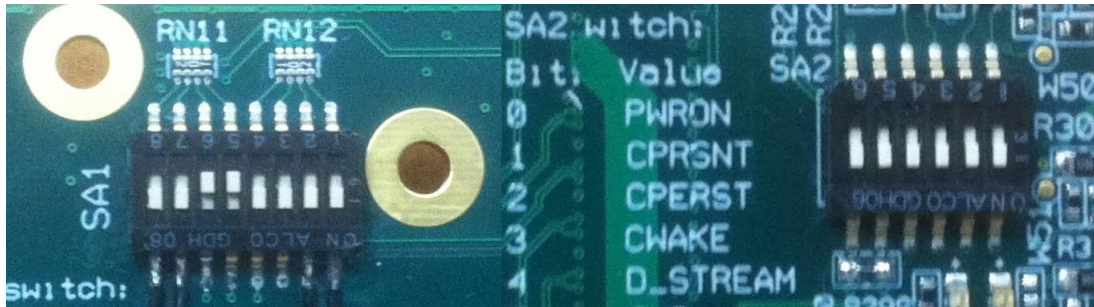
Fig. 4-1: Switches SA1 and SA2

Table 4-1.: Switch of SA1 operation modes

Switch number	Name	Position	Description
1	Hotplug disable	OFF	Hot Swap mechanism is ON For module operation, ejector's handle must be clicked. The module allows installation and removal on the system with its power is ON.
		ON	Hot Swap mechanism is OFF Installation and removal is allowed only on the system with its power OFF. The mode is used with KIC552RC.
2	Ext. Clk	OFF	Mode of clocking the PCI Express External Cabling interface - **SSC**.
		ON	Mode of clocking the PCI Express External Cabling interface - **CFC**.
3	GENx	OFF	Speed of PCI Express bus - **GEN3**
		ON	Speed of PCI Express bus - **GEN2**
4	PCIe Bkpl	OFF	Mode of port operation – **PCIe Downstream**
		ON	Mode of port operation – **PCIe Upstream**
5	PCIe FO	OFF	Mode of port operation – **PCIe Downstream**
		ON	Mode of port operation – **PCIe Upstream**
6	PCIe Ext.	OFF	Mode of port operation – **PCIe Downstream**
		ON	Mode of port operation – **PCIe Upstream**
7, 8	NTB	OFF, OFF	NTB – **PCIe Bkpl**
		ON, OFF	NTB – **PCIe FO**
		OFF, ON	NTB – **PCIe Ext.**
		ON, ON	NTB – **Disable**

Table 4-2.: Operation modes switch SA2

Switch number	Name	Position	Description
1… 6	System mode	OFF	PCI Express External Cabling - **Downstream System** (Upstream or NTB port).
		ON	PCI Express External Cabling - **Upstream System** (Downstream port).

4.2   Hot Swap mechanism

KIC552 allows removal and installation on the system with its power ON. Standard drivers from the delivery checklist do not support the Hot Swap mechanism. Therefore, the Hot Swap mechanism can be used in emergencu cases.

In order to activate this mode you'll need to move the SA1:1 switch to OFF position (see Fig. 4-1 and Table 4-1).

In order to remove the module from a powered system, the following procedure should be carried out:

- Disconnect all interface cables from the module.

- Unscrew all the fastening screws (upper and lower ones) on the front panel.

- Unblock the handle of the front panel by pressing the ejector's button.

- Wait until SYS LED will be continuously illuminated with blue light.

- Move ejector's handle downwards and take the module out of the backplane's connector.

- After the module has been taken out, pull it from the slot along the guide rails.

KIC552RC does not allow removal and installation on the system with its power ON. For device operation, the Hot Swap mode should be deactivated. In order to do so, move the SA1:1 switch to ON position (see Fig. 4-1 and Table 4-1).

4.3   Use of AOL cable

AOL cable is used for connection of the devices via PCI Express External Cabling interface. In this case, the interface provides AOL active nodes with power supply and clock frequency.

Parameters of the power, supplied to the PCI Express External Cabling interface of KIC552, KIC552RC corresponds to the appropriate standard.

Clock frequency of PCI Express (100 MHz), which is supplied to the PCI Express External Cabling interface of KIC552, KIC552RC, should not be SSC (Spread Spectrum Clock), i.e. CFC (Constant Frequency Clock) mode should be activated. In order to do so, move the switch SA1:2 to the position ON (see Fig. 4-1 and Table 4-1 and Table 4-2).

4.4   Configuration of interface operating modes

KIC552 and KIC552RC function as PCIE Express Switch and have three independent ports:

■   Port 0 - PCI Express Serial;

■   Port 1 - PCI Express Fiber Optics;

■   Port 5 - PCI Express External Cabling.

Each of the specified ports supports three operation modes:

■   Downstream;

■   Upstream;

■   NTB (Not Transparent Bridging).

For PCIE Express Switch it is possible to set the port speed limitation:

■   5 Gb/sec (GEN2);

■   8 Gb/sec (GEN3).

Selection of operation mode depends on the specifics of system architecture, which is implemented by using KIC552 / KIC552RC module.   Port mode configuration is performed by way of the SA1 and SA2 switches (see Fig. 4-1, Table 4-1,).

5   Additional information

5.1   Power consumption

Regardless of the type, KIC552 and KIC552RC place the following demands on power supply:

Table 5-1.: Power supply requirements

Power supply voltage +12, V		Maximum consumption current, A
Minimum	**Maximum**	
10.8	13.2	4

Attention!

The table contains values of limit voltages on power supply lines, excessing which could lead to module damages or deteriorations of its performance. If power supply voltage exceeds the specified limits, module functionality is not guaranteed.

System backplane should ensure optimal allocation of power supply voltages among the connected devices.

Cable connection between a power supply source and the backplane should ensure minimum losses and guarantee stability of performance capabilities. Avoid long cable connections, light-section conductors and high-resistance connections.

When designing the power supply of your system, you should consider a total power consumption of all its components. Capacity of the power supply source should be selected with due consideration of reservers.

5.1.1   Starting and average consumption currents

During the tests of KIC552 and KIC552RC, maximum starting and average consumption current values were measured. The average consumption current was measured at maximum load of PCI Express ports at the connection speed of 5 Gb/sec (GEN2).

Table 5-2.: Maximum starting and average consumption currents

Module	Power supply	Starting consumption	Average consumption current, A
KIC552-01, KIC552-02, KIC552RC-01, KIC552RC-02	10.8	4.4	1.6
	13.2	4.2	1.3

5.2   Cable connections

KIC552 and KIC552RC modules were tested using the following cables (see Table 5-3).

Table 5-3.: Cable connections

Communications interface	Cable length, m	Cable brand	Manufacturer
PCI Express External Cabling	7	OSS-PCIe-CBL-x8-7M	One Stop Systems
	1	OSS-PCIe-CBL-x8-1M	One Stop Systems
PCI Express External Cabling (AOL)	10	OSS-PCIe-CBL-ACT-x8 (10m)	One Stop Systems
PCI Express Fiber Optics	10	106283-1010	Molex
	45	106283-1045	Molex

5.3   Cooling system requirements

High power consumed by the module (up to 40 W), requires the use of the forced cooling system. You should consider it at the time you design your system.

For KIC552RC versions, it is recommended to apply a thermal grease (e.g. Keratherm® KP12) to a joint between the module enclosure and system to reduce thermal losses.

Warning!

Manufacturer is not responsible for any damages to KIC552, KIC552RC and other equipment, caused as a result of its overheating. System developers and end users need to strictly follow module's operation conditions.

For controlling the temperature of module nodes and cooling system efficiency you can use USB diagnostics interface.

5.4   Diagnostics information

During operation of the device there might be conditions that could make it impossible to operate it in the normal mode:

- installation to the system slot;
- supply with the voltage that fails to meet the requirements imposed by the module;
- module overheating;
- mechanical or electrical damages due to module inappropriate handling.

In most cases module's improper functioning is accompanied with the relevant indication. For displaying information on non-standard situations or malfunctions, the front panel SYS indicator is used. Indicator can be steadily illuminated or can be flashing in accordance with the error code (see Fig. 5-1).
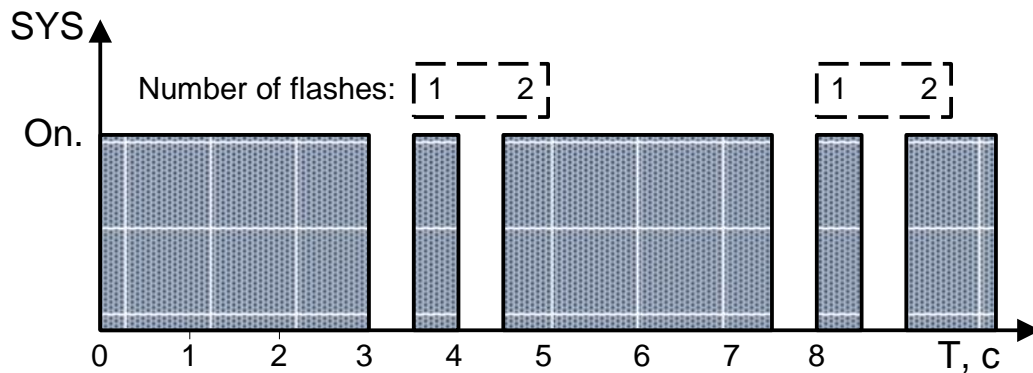
Fig. 5-1: Operation of SYS indicator

SYS indicator operates in two phases:

- a pause for 3 seconds;
- number of flashes in accordance with error code (see Table 5-4).

Table 5-4.: Error codes

Conventional designation	Code	Error description
ERROR_SUPPLY_FAULT	1	Error of module power supply (voltage is below the standard)
ERROR_PWRSW_FAULT	2	Reloading input power key
ERROR_DCDC_FAULT	3	Error of DC/DC launch
ERROR_I2C1_FAULT	4	Error of I2C1 initialization
ERROR_RDV1_FAULT	5	Error of redriver 1 initialization
ERROR_RDV2_FAULT	6	Error of redriver 2 initialization
ERROR_PLX_FAULT	7	Error of PCI Express Switch initialization
ERROR_PESYSEN_FAULT	8	Error of module installation (installation into the system slot)
ERROR_PLX_OVRH	9	PCI Express Switch overheating
ERROR_FOTX_OVRH	10	Overheating of module FO TX
ERROR_FORX_OVRH	11	Overheating of module FO RX

5.5   Compliance with safety requirements

KIC552 / KIC552RC corresponds to the general safety requirements imposed on IT equipment in accordance with the GOST R IEC 60950-2002 (for equipment, connected to the mains with the voltage up to 600 V).

5.6   Operation conditions

5.6.1   KIC552 operation conditions

KIC552 is resistant to the following external influencing factors:

Table 5-5.: External influencing factors for KIC552

Parameter		Value
Operating temperature of environment for device commercial versions	Reduced, °C	0
	Increased, °C	+ 70
Operating temperature of environment for device industrial versions	Reduced, °C	- 40
	Increased, °C	+ 70
Limit temperature	Reduced, °C	- 55
	Increased, °C	+ 85
Sinusoidal vibration	Amplitude (10..50 Hz), mm	0,15
	Acceleration (50..150 Hz), g	2
Single mechanical shock	Peak acceleration, g	50
	Duration, ms	11
Multiple mechanical shocks	Peak acceleration, g	25
	Duration, ms	6
Relative humidity (no condensation)	no more than %	80
Relative humidity (no condensation) for versions with COATED option	no more than %	98

5.6.2   KIC552RC operation conditions

KIC552RC is resistant to the following external influencing factors:

Table 5-6.: External influencing factors for KIC552RC

Parameter		Value
Operating temperature of environment for device commercial versions	Reduced, °C	0
	Increased, °C	+ 70
Operating temperature of environment for device industrial versions	Reduced, °C	- 50
	Increased, °C	+ 80
Limit temperature	Reduced, °C	- 65
	Increased, °C	+ 85
Sinusoidal vibration	Range, Hz	from 1 to 500
	Acceleration (50..150 Hz), g	6
Single mechanical shock	Peak acceleration, g	75
	Duration, ms	from 1 to 5
Multiple mechanical shocks	Peak acceleration, g	15
	Duration, ms	from 5 to 15
Relative humidity (no condensation)	no more than %	80
Relative humidity (no condensation) for versions with COATED option	no more than %	98

6   Transportation, unpacking and storage

6.1   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.

6.2   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.

6.3   Storage

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

Annex A

Table 6-1.: Useful abbreviations, acronyms and shortcuts

Term	Value
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESD	Electrostatically Sensitive Device . Electrostatic Discharge
TPD	Total Power Dissipation
AOL	Active Optical Link
FO	Fiber Optics
SSC	Spread Spectrum Clock
CFC	Constant Frequency Clock
DN	Downstream
NTB	Not Transparent Bridging
UP	Upstream
PCIe	PCI Express

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.