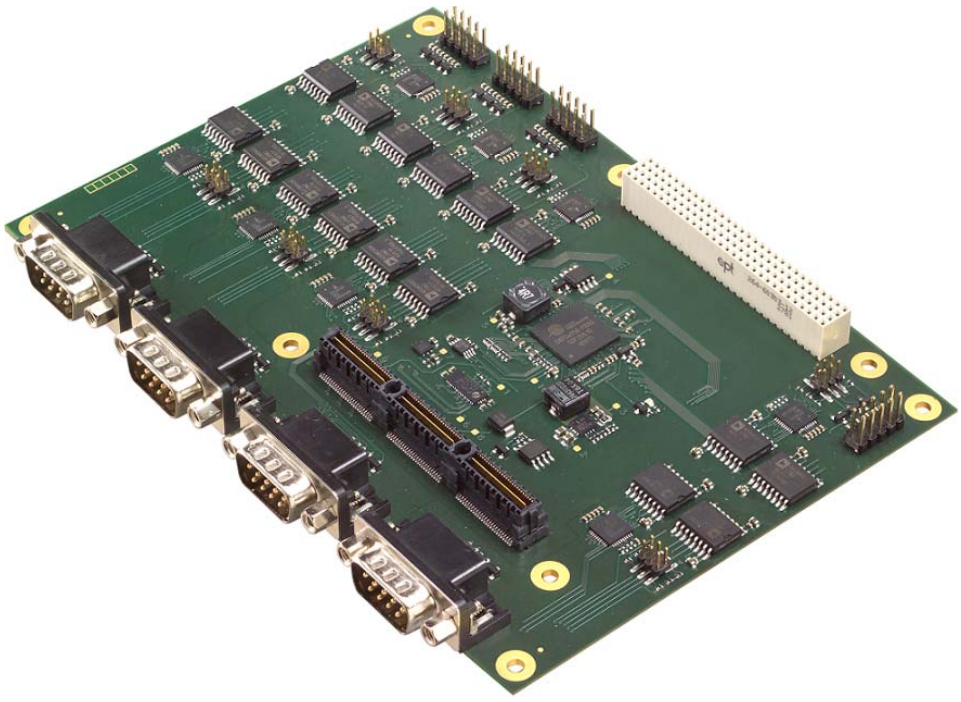
EXP-ISO-COM8

EPIC Express™ Add-on-Board

Technical Manual



TME-EXP-ISO-COM8-R1V0
Revision 1.0 / February 14
©LiPPERT Adlink Technology GmbH
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Technical Manual EXP-ISO-COM8

LiPPERT Document: TME-EXP-ISO-COM8-R1V0 Revision 1.0

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Table of Contents

1 Overview 1

1.1 Introduction 1

Features 1

Block Diagram 2

1.2 Ordering Information 3

EXP-ISO-COM8 Models 3

Cable Sets and Accessories 3

1.3 Specifications 4

Electrical Specifications 4

Environmental Specifications 4

Mean Time Between Failures 4

Mechanical 5

Getting Started 8

1.4 Connector Locations 8

Top 8

Bottom 9

1.5 Jumper Locations 11

1.6 LED indicators 12

1.7 Hardware Setup 13

1.8 Software Setup 14

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2 Module Description 15

2.1 OXPCIe958 15

Serial Ports 15

DSUB-9 Connectors 15

IDC10 Connectors 15

RS485-Selection and Termination Jumpers 17

2.2 PC/104-Plus Bus Connector 18

2.3 PCI/104 Express Bus Interface 20

Top PCI/104-Express Connector 20

Bottom PCI/104-Express Connector 22

2.4 Port Isolation 24

Appendix A, Contact Information A

Appendix B, Additional Information B

Appendix C, Getting Help C

Appendix D, Revision History D

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Acronyms

CTS	Clear To Send
DCD	Data Carrier Detect
DSR	Data Set Ready
DTR	Data Terminal Ready
FIFO	First In First Out
GND	Ground
ISO-GND	Isolated Ground
MSI-Extend	Message Signaled Interrupts - Extend
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
RI	Ring Indicator
RTS	Request To Send
RxD	Received Data
SerDes	Serializer/Deserializer
TxD	Transmitted Data
USB	Universal Serial Bus

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1 Overview

1.1 Introduction

The EXP-ISO-COM8 is an Add-on Module conforming to the EPIC Express Specification. It comprises eight independent serial ports with RS232 / RS422 / RS485 standards.

Especially for the embedded market all interfaces are galvanic isolated that external distortions cannot damage the whole Module as well as the CPU board. The galvanic isolation is a good solution for potential differences with interconnections.

The EXP-ISO-COM8 supports Stack-up and Stack-down to a CPU Module.

The different modes RS232/RS485 for the serial transceivers can be selected by setting a 2.00 mm jumper close to each interface. The same can be done with termination resistors for RS422 / RS485 mode. Four serial ports can be found at the front in form of DSUB-9 connectors. The other four are available on IDC10 pin headers.

Furthermore the EXP-ISO-COM8 runs out of a single 5 Volts power supply coming from the PCI/104 Express connector. All other voltages are generated on the board itself.

The EXP-ISO-COM8 runs with Linux and Windows XP operation systems.

Features

Serial Ports

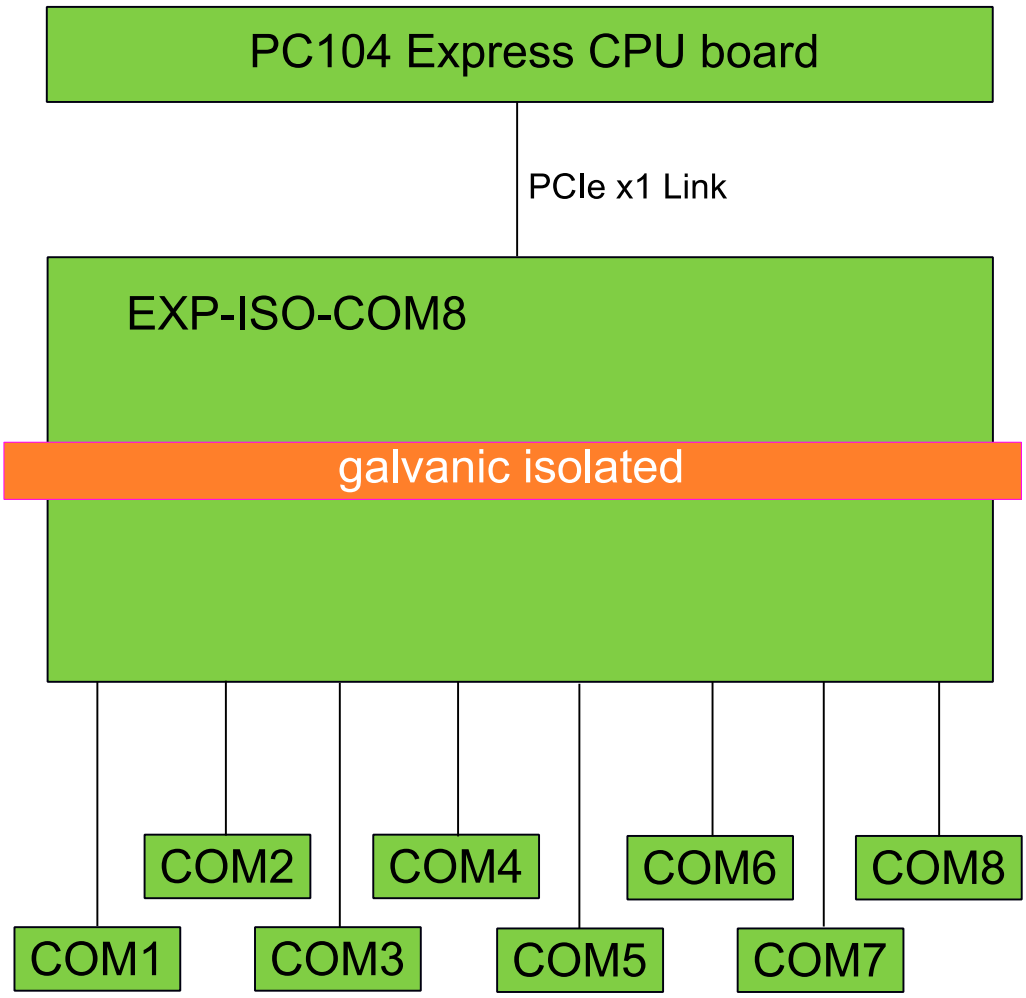
- High-performance Oxford Semiconductor 950 UARTs
- Asynchronous baud rate
  up to 4Mbps in RS485 mode
  up to 460 Kbps in RS232 mode
- 128-byte deep transmit/receive FIFOs
- 9, 8, 7, 6 & 5- bit data framing
- Flexible clock prescaler from 1 to 31.875
- Automated in-band, Xon/Xoff flow control
- Automated hardware flow control
- Advanced FIFO fill management
- RS232, RS422, RS485 operation
- Programmable RS485 turn-around delay
- 450 through 950 software compatibility

PCI Express

- Single lane with integrated SerDes
- PCI Express bas spec 1.1 compliant
- PCI Power Management 1.2 compliant
- MSI/MSI-X compatible
- DMA/bus mastering facility for all UARTs
- ASPM (L0S, L1) Link power management

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Block Diagram



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1.2 Ordering Information

EXP-ISO-COM8 Models

Order number	Description
714-0002-10	EXP-ISO-COM8 with galvanic isolated serial ports Commercial operating temp. range: 0°C...+60°C
814-0002-10	EXP-ISO-COM8 with galvanic isolated serial ports Industrial operating temp. range: -20°C...+60°C
914-0002-10	EXP-ISO-COM8 with galvanic isolated serial ports Extended operating temp. range: -40°C...+85°C

Cable Sets and Accessories

There are some options offered for the EXP-ISO-COM8.

Order number	Description
862-0007-10	Adapter Cable, IDC10 (2.54mm) to DSUB9 (COM), 200mm length

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1.3 Specifications

Electrical Specifications

Supply voltage	+5 V DC
Rise time	< 10 ms
Supply voltage tolerance	± 5% *
Supply current	maximal 0,5 A (with transfer on all 8 ports at the same time) typical 0,4 A (with transfer on 4 ports at the same time) minimal 0,36 A (with no transfer)

Environmental Specifications

Operating:

Temperature range	0 ... 60 °C (commercial version)
	-20 ... 60 °C (industrial version)
	-40 ... 85 °C (extended version)
Temperature change	max. 10K / 30 minutes
Humidity (relative)	10 ... 90 % (non-condensing)
Pressure	450 ... 1100 hPa

Non-Operating/Storage/Transport:

Temperature range	-40 ... 85 °C
Temperature change	max. 10K / 30 minutes
Humidity (relative)	5 ... 95 % (non-condensing)
Pressure	450 ... 1100 hPa

Mean Time Between Failures

MTBF at 25°C	713.269 hours

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Mechanical

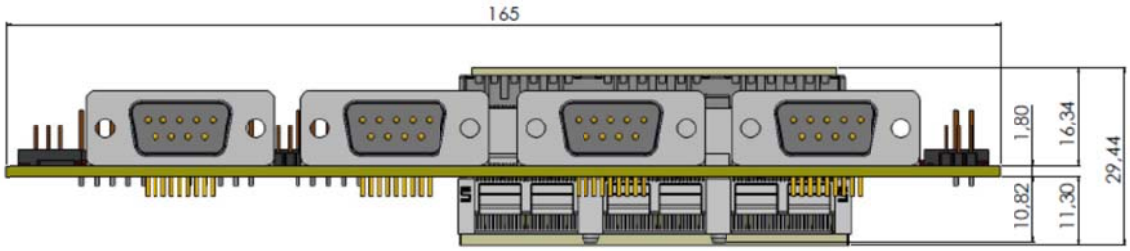
Dimensions (L x W)	165 mm x 115 mm
Height	max. 17 mm on top side above PCB max. 12 mm on bottom side above PCB
Weight	168 g
Mounting	4 mounting holes
Board-to-Board Stacking height	22 mm

Note: *It is strongly recommend using plastic spacers instead of metal spacers to mount the board. With metal spacers, there is a possible danger to create a short circuit with the components located around the mounting holes.*
This can damage the board!

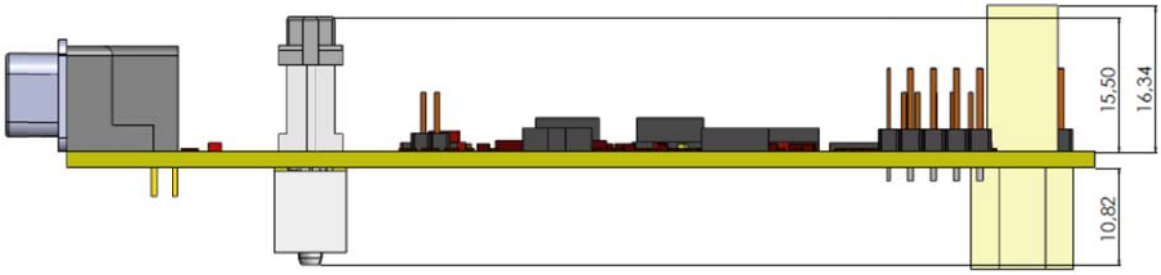
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Mechanical view

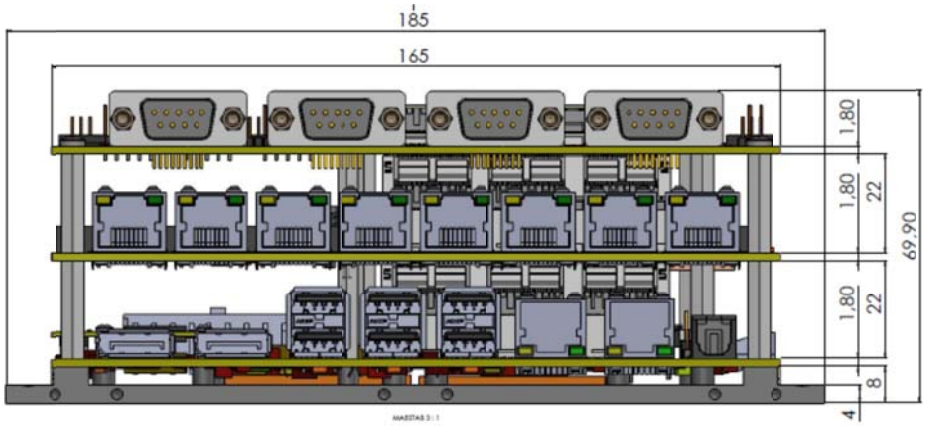
Front view

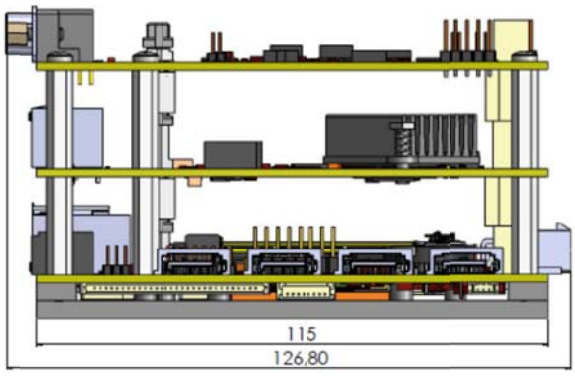


Side view



System stack-up view with Hurricane-QM57 and heat spreader

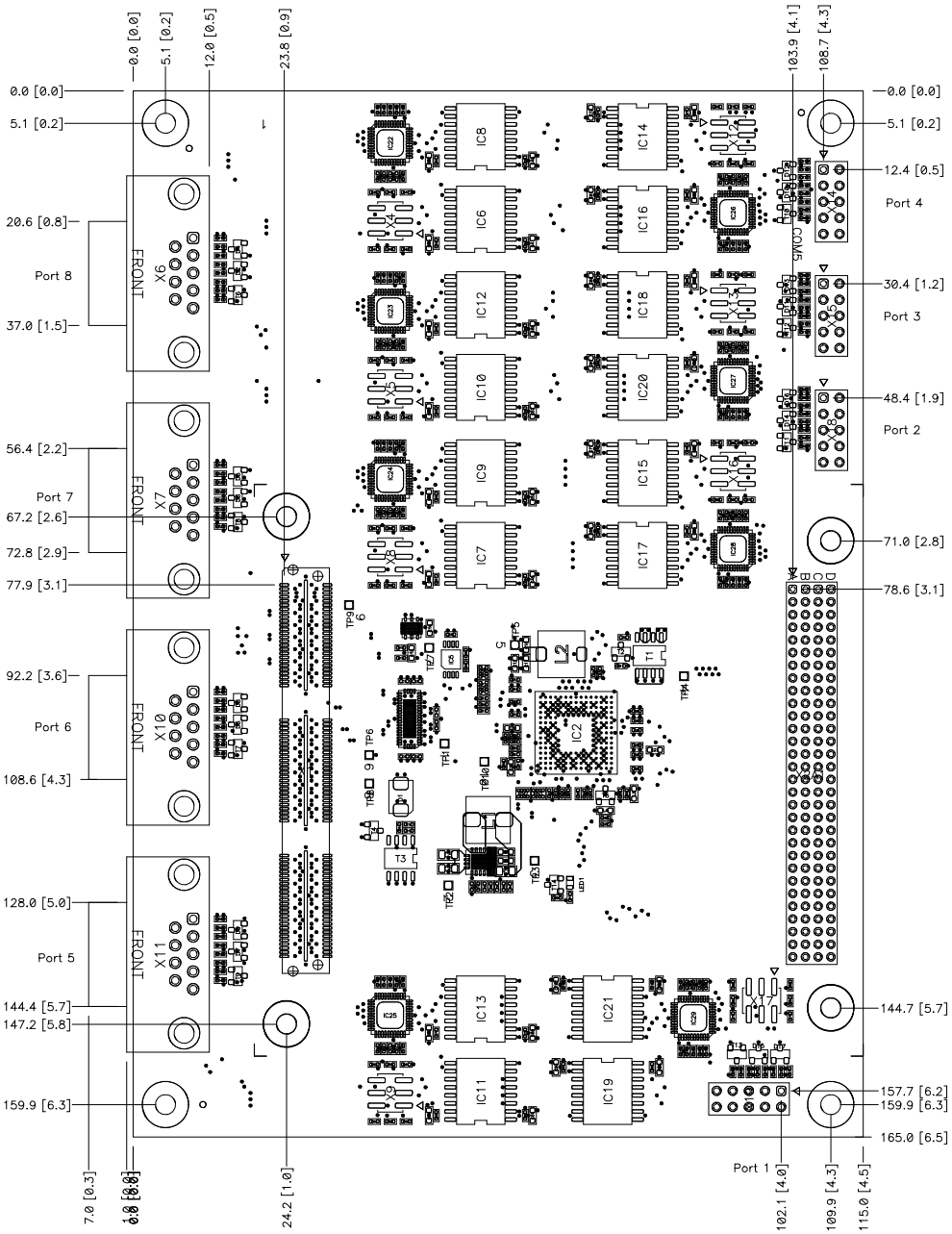




Note *For detailed mechanical drawings or step files please contact our support department.*

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Metrics on Top

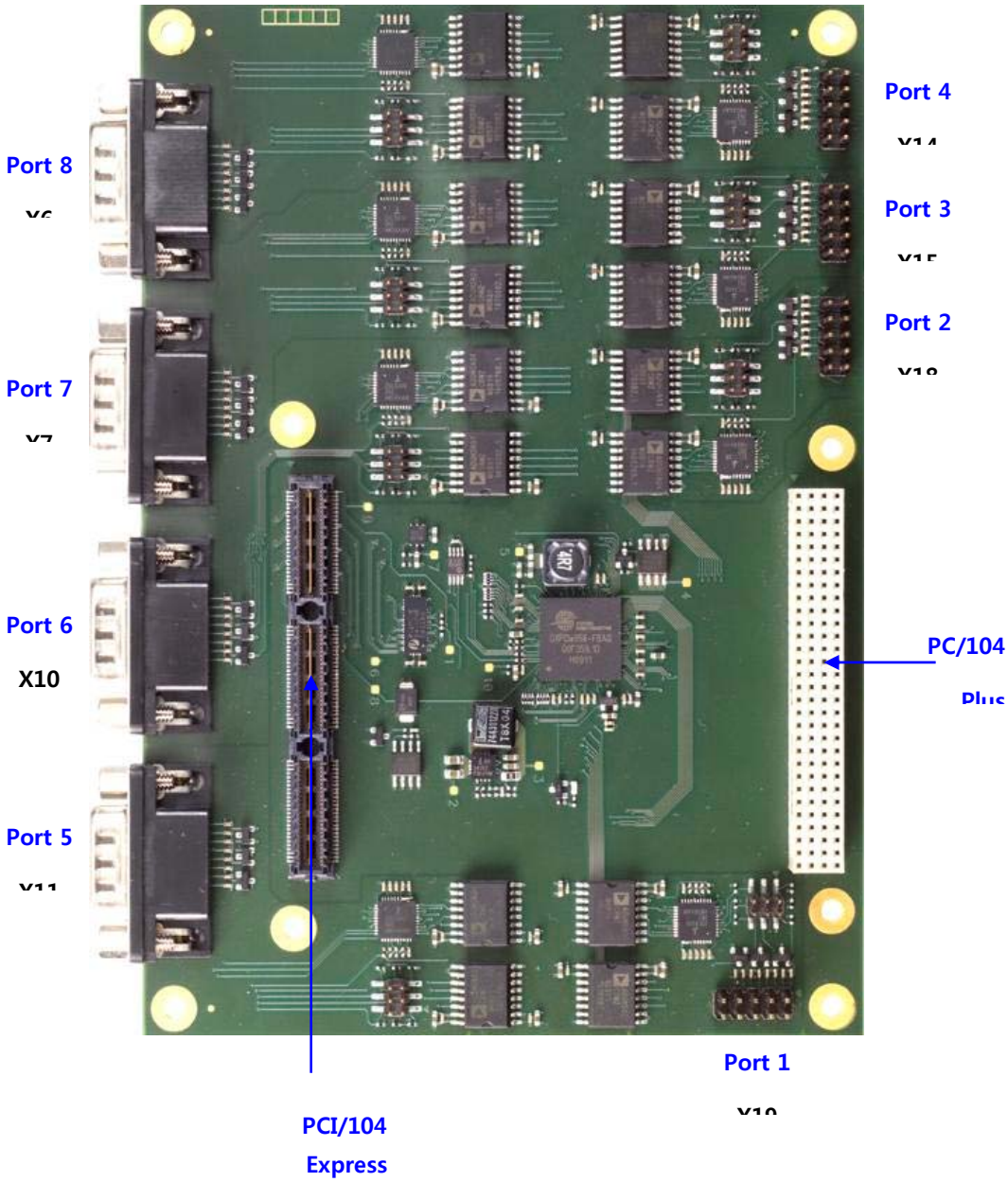


The connectors' pin 1 is marked with an arrow.

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1.4 Connector Locations

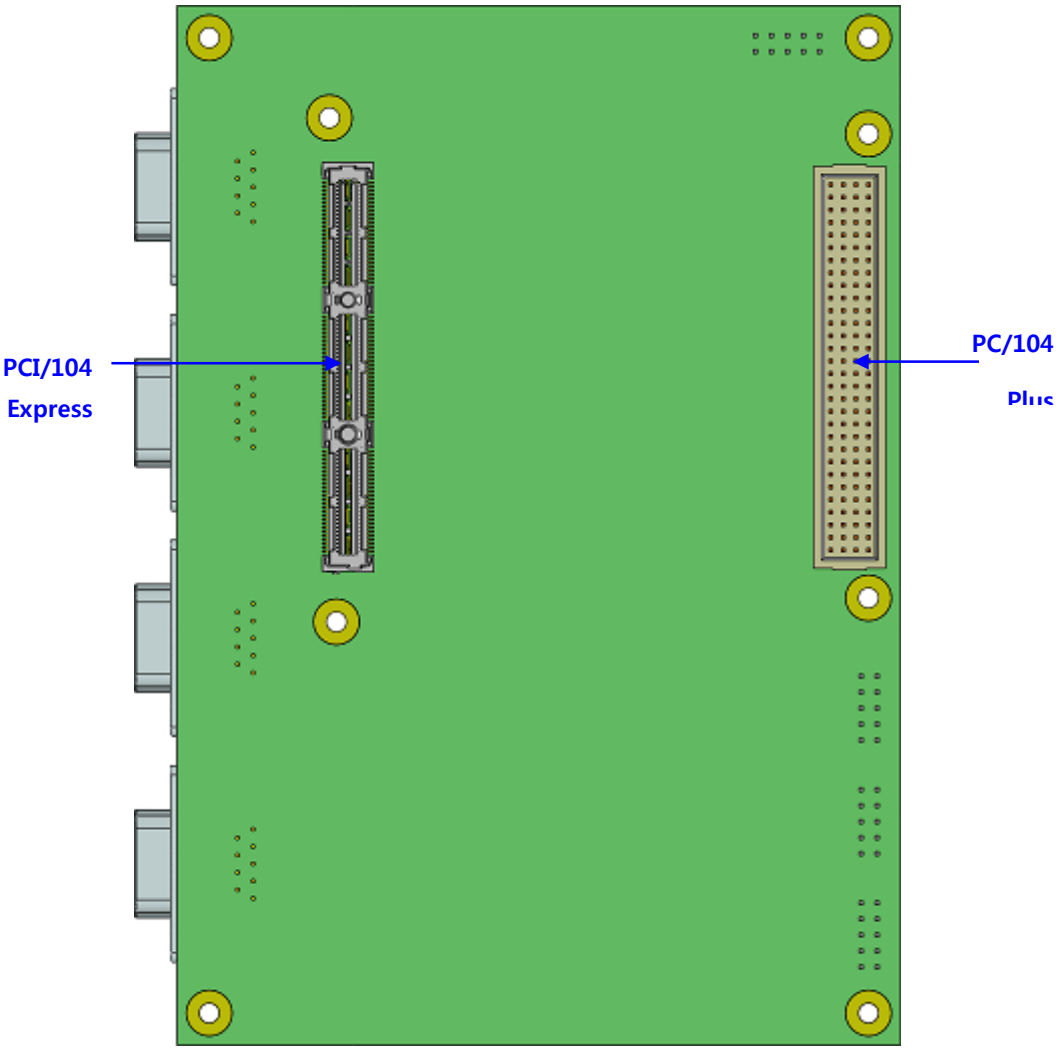
Top



The connectors' pin 1 is marked with an arrow.

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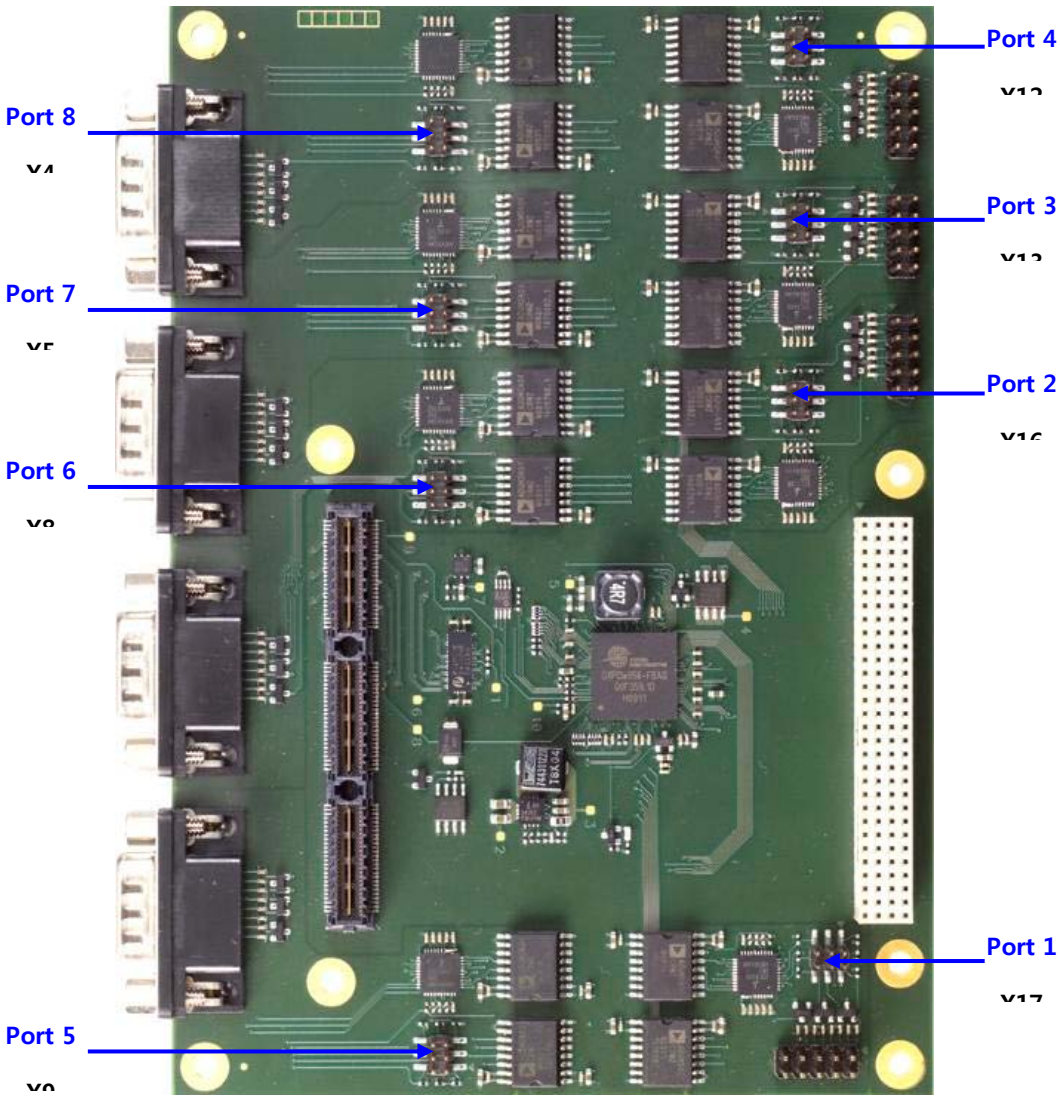
Bottom



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1.5 Jumper Locations

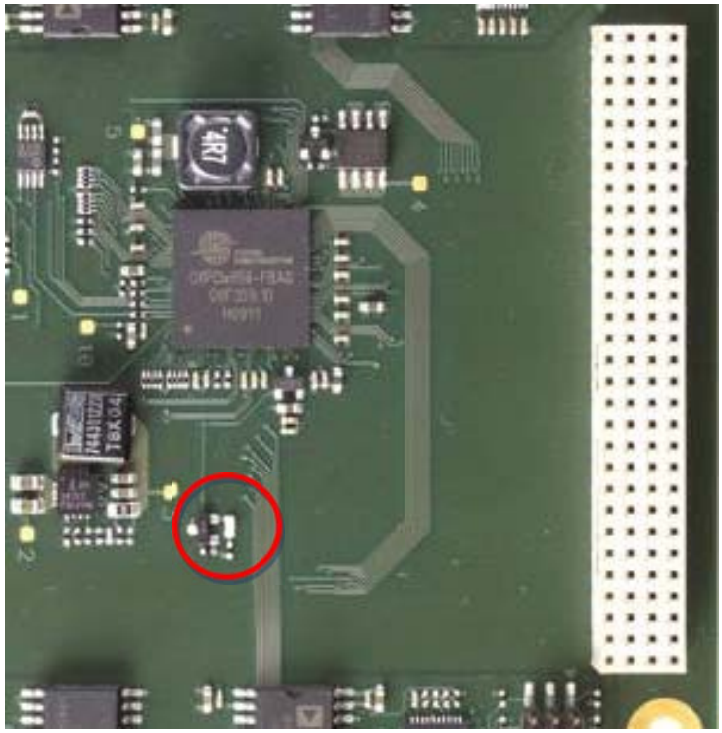


The connectors' pin 1 is marked with an arrow.

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1.6 LED indicators

Onboard there is a yellow LED that shows the working state of the OXPCIe chip.



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1.7 Hardware Setup



Caution Be sure to observe the EMC security measures. Make sure you are always at the same potential as the module.



Caution Do never connect or disconnect the EXP-ISO-COM8 Add-on Module with a CPU board while that is running.

Be sure that your power supply is able to provide enough current to your system. An insufficient power supply leads to an instable system.

The EXP-ISO-COM8 does not need any cooling devices.

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1.8 Software Setup

Driver packages are available for the following operating systems:

- Linux
- Windows XP

Please contact our support department support@lippertembedded.com or have a look at the website www.lippertmebedded.com for downloading the necessary drivers. Installation guide and all necessary information is provided in the driver package.

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2 Module Description

2.1 OXPCIe958

The device combines a fully integrated, single-lane PCI Express end-point controller and SerDes with eight high-performance 950 UART.

The OXPCIe958 achieves outstanding performance including 128 byte transmit and receive FIFOs of the 950 UART, with advanced system management features such as MSI/MSI-X interrupt handling and bus master DMA to maximize data throughput while substantially reducing CPU and system overheads. Each 950 UART has full modem interface and includes advanced features such as hardware-accelerated out-of-band and in-band flow control, readable FIFO levels and RS485 turnaround delay for further performance optimization, while the flexible clock prescaler provides scope for the widest-possible range of baud rates.

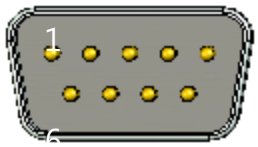
Serial Ports

Four serial ports are conducted to DSUB-9 connectors at the front side. The other four serial ports are available on IDC10 pin headers which can be used with the help of adapter cables provided by Lippert. All ports can either work in RS232 or in RS485 mode. That mode can be switched with jumpers at runtime, the location can be found in chapter jumper.

DSUB-9 Connectors

Connector type D-SUB9, male

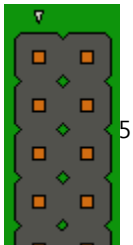
Pin	RS232	RS485	Pin	RS232	RS485
1	DCD	Not used	6	DSR	RXD+
2	RXD	RXD-	7	RTS	TXD+
3	TXD	TXD-	8	CTS	Not used
4	DTR	Not used	9	RI	Not used
5	ISOGND	ISOGND	Shield	Not used	Not used



IDC10 Connectors

Connector type IDC10 pin header 2.54 mm

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Pin	RS232	RS485	Pin	RS232	RS485
1	DCD	*Not used*	2	DSR	RXD+
3	RXD	RXD-	4	RTS	TXD+
5	TXD	TXD-	6	CTS	Not used
7	DTR	Not used	8	RI	Not used
9	ISOGND	ISOGND	10	Not used	Not used

Pin 1 is marked with a small arrow

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RS485-Selection and Termination Jumpers

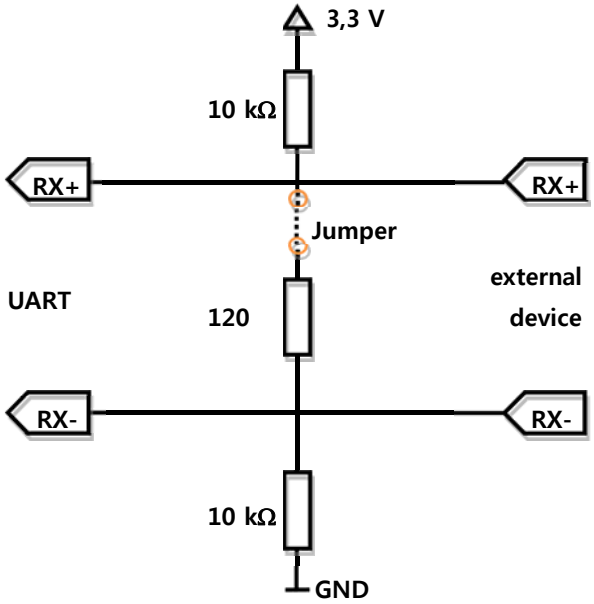
Connector type IDC6 pin header 2.00 mm

Use 2 mm jumpers to terminate lines correctly.

The RS485 termination jumpers are located at the top of the printed circuit board, see chapter 1.5

For selecting the RS485 mode the pins 5 and 6 at each port have to be shorted.

Pin	Signal	Pin	Signal
1	TX+	2	TX-
3	RX+	4	RX-
5	RS485 mode	6	VCC



When the jumper is set, the differential pairs are terminated with 120Ω between them. (e.g. RX+ and RX-)

Additionally, positive/negative receive lines are pulled up/down with 10 kΩ to 3,3 V/ GND in order to protect the transceivers of the EXP-ISO-COM8 from overvoltage.

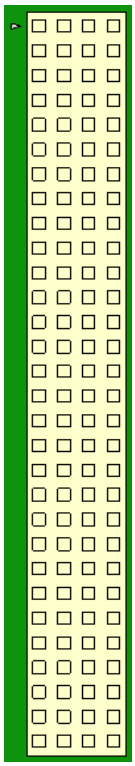
It is recommended to protect the ports of the external device in the same way!

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2.2 PC/104-Plus Bus Connector

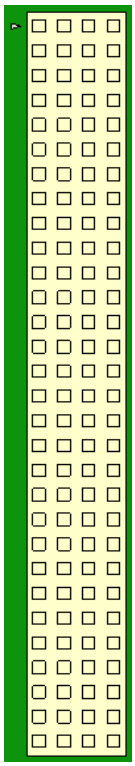
The PC/104-plus bus is not used on that module. The mounted connector forward the signal through.

Pin	A	B	C	D
1	GND	n.c.	n.c.	n.c.
2	n.c.	n.c.	n.c.	n.c.
3	n.c.	GND	n.c.	n.c.
4	n.c.	n.c.	GND	n.c.
5	GND	n.c.	n.c.	GND
6	n.c.	n.c.	n.c.	n.c.
7	n.c.	n.c.	GND	n.c.
8	n.c.	n.c.	n.c.	n.c.
9	n.c.	GND	n.c.	n.c.
10	GND	n.c.	n.c.	n.c.
11	n.c.	n.c.	n.c.	GND
12	n.c.	n.c.	GND	n.c.
13	n.c.	GND	n.c.	n.c.
14	GND	n.c.	n.c.	n.c.
15	n.c.	n.c.	n.c.	GND
16	n.c.	n.c.	GND	n.c.
17	n.c.	n.c.	n.c.	n.c.
18	n.c.	GND	n.c.	n.c.
19	n.c.	n.c.	n.c.	n.c.
20	GND	n.c.	n.c.	GND
21	n.c.	n.c.	n.c.	n.c.
22	n.c.	n.c.	GND	n.c.
23	n.c.	GND	n.c.	n.c.
24	GND	n.c.	n.c.	n.c.
25	n.c.	n.c.	n.c.	GND



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Pin	A	B	C	D
26	n.c.	n.c.	GND	n.c.
27	n.c.	n.c.	n.c.	GND
28	GND	n.c.	n.c.	n.c.
29	n.c.	n.c.	n.c.	n.c.
30	n.c.	n.c.	n.c.	GND



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2.3 PCI/104 Express Bus Interface

The EXP-ISO-COM8 uses x1 link of the PCI/104-Express bus. According to the EPIC Express specification it depends on the stacking position above or below the CPU board which link is used. On the module there is a PCI Express switch that detects the type of connection and forwards the other links according to the specification.

Top PCI/104-Express Connector

Connector Type: Samtec ASP-142781-05

PIN	Signal		PIN	Signal
1	USB_OC		2	PE_RST#
3	+3.3V		4	+3.3V
5	USB_1+		6	USB_0+
7	USB_1-		8	USB_0-
9	GND		10	GND
11	Pex1_1Tp		12	Pex1_0 Tp
13	Pex1_1Tn		14	Pex1_0 Tn
15	GND		16	GND
17	Pex1_2 Tp		18	**Pex1_3 Tp**
19	Pex1_2 Tn		20	**Pex1_3 Tn**
21	GND		22	GND
23	Pex1_1Rp		24	Pex1_0 Rp
25	Pex1_1Rn	+5V	26	Pex1_0 Rn
27	GND		28	GND
29	Pex1_2 Rp		30	**Pex1_3 Rp**
31	Pex1_2 Rn		32	**Pex1_3 Rn**
33	GND		34	GND
35	Pex1_1Clkp		36	Pex1_0Clkp
37	Pex1_1Clkn		38	Pex1_0Clkn
39	+5V_Always		40	+5V_Always
41	Pex1_2Clkp		42	**Pex1_3Clkp**
43	Pex1_2Clkn		44	**Pex1_3Clkn**
45	CPU_DIR		46	**PWRGOOD**
47	SMB_DAT		48	Pex16_Clkp
49	SMB_CLK		50	Pex16_Clkn
51	SMB_ALERT		52	PSON#



The blue highlighted signals are used by the OXPCIe958 chip, if the EXP-ISO-COM8 is stacked below the CPU (stacked-down).

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The following table shows the shifting of PCI Express links from top to bottom connector. The rest of not listed PCI/104 Express pins are directly forwarded.

PCI/104 Express	TOP	Bottom
OXPCIe958	3x1 link	-
shifted	2x1 link	3x1 link
shifted	1x1 link	2x1 link
shifted	1x0 link	1x1 link

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Bottom PCI/104-Express Connector

Connector Type: Samtec ASP-129646-03

PIN	Signal		PIN	Signal
1	USB_OC		2	PE_RST#
3	+3.3V		4	+3.3V
5	USB_1+		6	USB_0+
7	USB_1-		8	USB_0-
9	GND		10	GND
11	Pex1_1Tp		12	**Pex1_0 Tp**
13	Pex1_1Tn		14	**Pex1_0 Tn**
15	GND		16	GND
17	Pex1_2 Tp		18	Pex1_3 Tp
19	Pex1_2 Tn		20	Pex1_3 Tn
21	GND		22	GND
23	Pex1_1Rp		24	**Pex1_0 Rp**
25	Pex1_1Rn	+5V	26	**Pex1_0 Rn**
27	GND		28	GND
29	Pex1_2 Rp		30	Pex1_3 Rp
31	Pex1_2 Rn		32	Pex1_3 Rn
33	GND		34	GND
35	Pex1_1Clkp		36	**Pex1_0Clkp**
37	Pex1_1Clkn		38	**Pex1_0Clkn**
39	+5V_Always		40	+5V_Always
41	Pex1_2Clkp		42	Pex1_3Clkp
43	Pex1_2Clkn		44	Pex1_3Clkn
45	CPU_DIR		46	**PWRGOOD**
47	SMB_DAT		48	Pex16_Clkp
49	SMB_CLK		50	Pex16_Clkn
51	SMB_ALERT		52	PSON#

The blue highlighted signals are used by the OXPCIe958 chip, if the EXP-ISO-COM8 is stacked above the CPU (stacked-up).
The following table shows the shifting of PCI Express links from bottom to top connector.
The rest of not listed PCI/104 Express pins are directly forwarded.

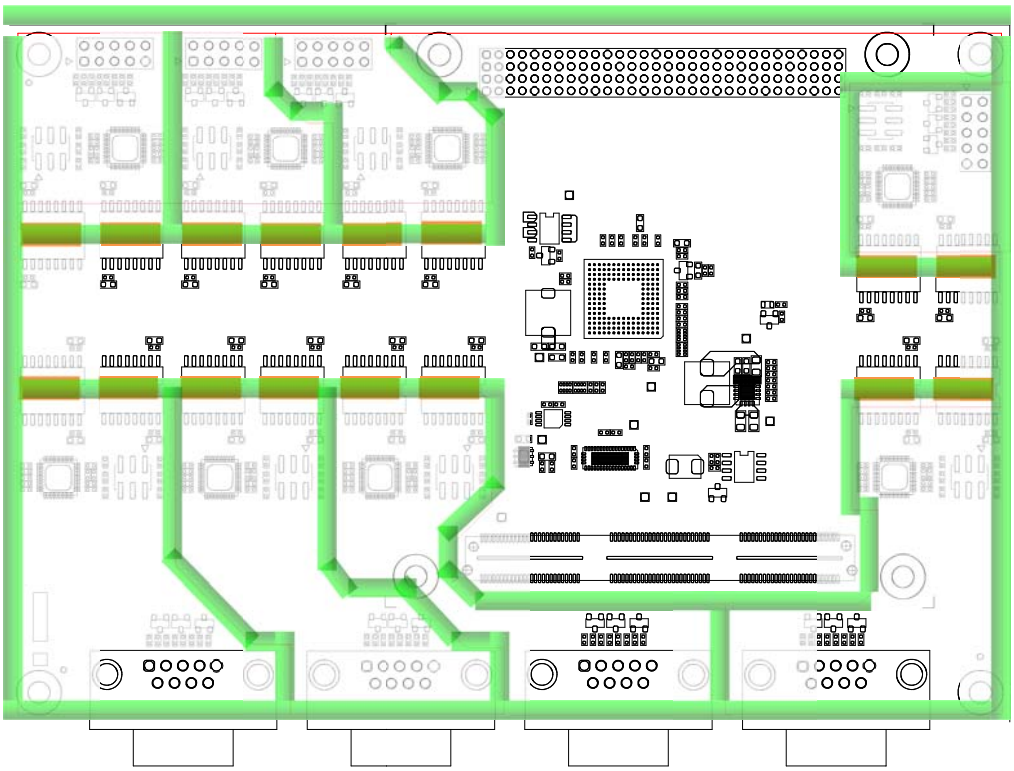
PCI/104-Express Connector	Bottom	TOP
OXPCIe958	0x1 link	-
shifted	1x1 link	0x1 link
shifted	2x1 link	1x1 link
shifted	3x1 link	2x1 link

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2.4 Port Isolation

Each serial port is extra isolated. Onboard there are two quad channel isolators for one COM port. With the ADuM5401 and ADuM5404 from Analog Devices the data channels are optical und the power supply is galvanic isolated. In conclusion there are eight separated zones with their own potential regarding to VCC, GND and Data.



Features

ADuM540x

- High common-mode transient immunity: > 25 kV/µs
- SOIC package with > 8.0 mm creepage
- 2500 V_s for 1 minute per UL1577
- V_{IORM} = 560 V peak

PCB

- separated I/O zones with > 3 mm creepage throughout all layers between each other and to the common interface

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Appendix A, Contact Information

Headquarters

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Appendix B, Additional Information

B.1 Additional Reading

Datasheet of the OXPCIe958 at http://www.plxtech.com

B.2 PCI/104 Express™

A copy of the latest PCI/104 Express and can be obtained from the PC/104 Consortium's website at www.pc104.org

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Appendix C, Getting Help

Should you have technical questions that are not covered by the respective manuals, please contact our support department at http://askanexpert.adlinktech.com .

Please allow one working day for an answer.

Returning Products for Repair

To return a product to ADLINK Technology GmbH for repair, you need to get a Return Material Authorization (RMA) number first.

Please print the RMA Request Form from http://www.adlinktech.com/lippert/rma.php
fill in the blanks and fax it to +49 621 4321430. We'll return it to you with the RMA number.

For further RMA requests use this RMA email: RMA.EMEA@adlinktech.com

Caution: Deliveries without a valid RMA number are returned to sender at his or her own cost.

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Appendix D, Revision History

Filename	Date	Edited by	Change
TME-EXP-ISO-COM8-R0V0.doc	2009-12-10	CS	Draft
TME-EXP-ISO-COM8-R0V1.doc	2010-04-12	MF	Some minor changes Driver section added
TME-EXP-ISO-COM8-R0V2.doc	2011-01-18	MF	Some minor changes MTBF value added
TME-EXP-ISO-COM8-R0V3.doc	2011-02-21	MF	Mechanical dimensions corrected part numbers 8xx, 9xx added Appendix A new US address
TME-EXP-ISO-COM8-R1V0.doc	2014-02-03	MF	Ch. 1.4 clarified stacking height 22m, mechanical view added Ch. 2.3 SAMTEC part number corrected

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