

# » User Guide «

## **XMC401**

### **Dual SFP+ 10 Gigabit Ethernet XMC Module**

Doc. ID: 1032-4582, Rev. 1.0  
November 18, 2009



## Revision History

Publication Title:		XMC401: Dual SFP+ 10 Gigabit Ethernet XMC Module
Doc. ID:		1032-4582
Rev.	Brief Description of Changes	Date of Issue
1.0	Initial issue	18-Nov-2009

## Imprint

Kontron Modular Computers GmbH may be contacted via the following:

**MAILING ADDRESS**

Kontron Modular Computers GmbH  
Sudetenstraße 7  
D - 87600 Kaufbeuren Germany

**TELEPHONE AND E-MAIL**

+49 (0) 800-SALESKONTRON  
sales@kontron.com

For further information about other Kontron products, please visit our Internet web site:  
[www.kontron.com](http://www.kontron.com).

## Disclaimer

Copyright © 2009 Kontron AG. All rights reserved. All data is for information purposes only and not guaranteed for legal purposes. Information has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies. Kontron and the Kontron logo and all other trademarks or registered trademarks are the property of their respective owners and are recognized. Specifications are subject to change without notice.





## Table of Contents

<i>Revision History</i> .....	<i>ii</i>
<i>Imprint</i> .....	<i>ii</i>
<i>Disclaimer</i> .....	<i>ii</i>
<i>Table of Contents</i> .....	<i>iii</i>
<i>List of Tables</i> .....	<i>v</i>
<i>List of Figures</i> .....	<i>vii</i>
<i>Proprietary Note</i> .....	<i>ix</i>
<i>Trademarks</i> .....	<i>ix</i>
<i>Environmental Protection Statement</i> .....	<i>ix</i>
<i>Explanation of Symbols</i> .....	<i>x</i>
<i>For Your Safety</i> .....	<i>xi</i>
<i>High Voltage Safety Instructions</i> .....	<i>xi</i>
<i>Special Handling and Unpacking Instructions</i> .....	<i>xi</i>
<i>General Instructions on Usage</i> .....	<i>xii</i>
<i>Two Year Warranty</i> .....	<i>xiii</i>
<b>1. Introduction</b> .....	<b>1 - 3</b>
1.1 <i>Board Overview</i> .....	1 - 3
1.2 <i>Board Diagrams</i> .....	1 - 3
1.2.1 <i>Functional Block Diagram</i> .....	1 - 3
1.2.2 <i>Front Panel</i> .....	1 - 4
1.2.3 <i>Board Layout</i> .....	1 - 4
1.3 <i>Technical Specification</i> .....	1 - 5
1.4 <i>Standards</i> .....	1 - 6
1.5 <i>Related Publications</i> .....	1 - 7
<b>2. Functional Description</b> .....	<b>2 - 3</b>
2.1 <i>10 Gigabit Ethernet Controller</i> .....	2 - 3
2.2 <i>Memory</i> .....	2 - 3
2.2.1 <i>Configuration EEPROM</i> .....	2 - 3
2.2.2 <i>Flash</i> .....	2 - 3
2.2.3 <i>FRU EEPROM</i> .....	2 - 3
2.3 <i>Board Interfaces</i> .....	2 - 4
2.3.1 <i>SFP+ Interfaces</i> .....	2 - 4



---

2.3.2	<i>XMC Interface</i>	2 - 6
<b>3.</b>	<b><i>Installation</i></b>	<b>3 - 3</b>
3.1	<i>Hardware Installation</i>	3 - 3
3.1.1	<i>Safety Requirements</i>	3 - 3
3.1.2	<i>Installation Procedures</i>	3 - 4
3.1.3	<i>Removal Procedures</i>	3 - 6
3.2	<i>Installation/Removal of SFP+ Devices</i>	3 - 6
<b>4.</b>	<b><i>Configuration</i></b>	<b>4 - 3</b>
<b>5.</b>	<b><i>Power Considerations</i></b>	<b>5 - 3</b>
5.1	<i>Carrier Power Supply</i>	5 - 3
5.1.1	<i>Start-Up Requirement</i>	5 - 3
5.1.2	<i>Power-Up Sequence</i>	5 - 3
5.1.3	<i>Tolerance</i>	5 - 3
5.1.4	<i>Regulation</i>	5 - 4
5.2	<i>Power Consumption</i>	5 - 5



## List of Tables

1-1	<i>XMC401 Main Specifications</i> .....	1 - 5
1-2	<i>Standards</i> .....	1 - 6
1-3	<i>Related Publications</i> .....	1 - 7
2-1	<i>SFP+ Cages J3 and J5 Pinout</i> .....	2 - 5
2-2	<i>RSO and RSI Rate Select Configuration</i> .....	2 - 5
2-3	<i>Ethernet Status LEDs Function</i> .....	2 - 5
2-4	<i>XMC Connector J1 Pinout</i> .....	2 - 6
5-1	<i>Input Voltage Characteristics</i> .....	5 - 3
5-2	<i>Power Consumption: XMC401 with Windows® 2003 Server</i> .....	5 - 5

## List of Figures

1-1	<i>XMC401 Functional Block Diagram</i> .....	1 - 3
1-2	<i>XMC401 Front Panel</i> .....	1 - 4
1-3	<i>XMC401 Board Layout (Top View)</i> .....	1 - 4
2-1	<i>SFP+ Cages J3 and J5</i> .....	2 - 4
2-2	<i>XMC Connector J1</i> .....	2 - 6
3-1	<i>XMC401 Installation / Removal Diagrams</i> .....	3 - 5
3-2	<i>SFP+ Optical Transceiver and SFP+ Direct Attach Copper Cable</i> .....	3 - 7
3-3	<i>SFP+ Devices Connected to the XMC401</i> .....	3 - 7



This page has been intentionally left blank.





---

## **Proprietary Note**

This document contains information proprietary to Kontron. It may not be copied or transmitted by any means, disclosed to others, or stored in any retrieval system or media without the prior written consent of Kontron or one of its authorized agents.

The information contained in this document is, to the best of our knowledge, entirely correct. However, Kontron cannot accept liability for any inaccuracies or the consequences thereof, or for any liability arising from the use or application of any circuit, product, or example shown in this document.

Kontron reserves the right to change, modify, or improve this document or the product described herein, as seen fit by Kontron without further notice.

## **Trademarks**

This document may include names, company logos and trademarks, which are registered trademarks and, therefore, proprietary to their respective owners.

## **Environmental Protection Statement**

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.



## Explanation of Symbols



### ***Caution, Electric Shock!***

This symbol and title warn of hazards due to electrical shocks (> 60V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.

Please refer also to the section “High Voltage Safety Instructions” on the following page.



### ***Warning, ESD Sensitive Device!***

This symbol and title inform that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section “Special Handling and Unpacking Instructions” on the following page.



### ***Warning!***

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and/or result in damage to your material.



### ***Note ...***

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.





## For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

### High Voltage Safety Instructions



#### **Warning!**

All operations on this device must be carried out by sufficiently skilled personnel only.



#### **Caution, Electric Shock!**

Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks.

Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

### Special Handling and Unpacking Instructions



#### **ESD Sensitive Device!**

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.



---

## General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.



## Two Year Warranty

Kontron grants the original purchaser of Kontron's products a ***TWO YEAR LIMITED HARDWARE WARRANTY*** as described in the following. However, no other warranties that may be granted or implied by anyone on behalf of Kontron are valid unless the consumer has the express written consent of Kontron.

Kontron warrants their own products, excluding software, to be free from manufacturing and material defects for a period of 24 consecutive months from the date of purchase. This warranty is not transferable nor extendible to cover any other users or long-term storage of the product. It does not cover products which have been modified, altered or repaired by any other party than Kontron or their authorized agents. Furthermore, any product which has been, or is suspected of being damaged as a result of negligence, improper use, incorrect handling, servicing or maintenance, or which has been damaged as a result of excessive current/voltage or temperature, or which has had its serial number(s), any other markings or parts thereof altered, defaced or removed will also be excluded from this warranty.

If the customer's eligibility for warranty has not been voided, in the event of any claim, he may return the product at the earliest possible convenience to the original place of purchase, together with a copy of the original document of purchase, a full description of the application the product is used on and a description of the defect. Pack the product in such a way as to ensure safe transportation (see our safety instructions).

Kontron provides for repair or replacement of any part, assembly or sub-assembly at their own discretion, or to refund the original cost of purchase, if appropriate. In the event of repair, refunding or replacement of any part, the ownership of the removed or replaced parts reverts to Kontron, and the remaining part of the original guarantee, or any new guarantee to cover the repaired or replaced items, will be transferred to cover the new or repaired items. Any extensions to the original guarantee are considered gestures of goodwill, and will be defined in the "Repair Report" issued by Kontron with the repaired or replaced item.

Kontron will not accept liability for any further claims resulting directly or indirectly from any warranty claim, other than the above specified repair, replacement or refunding. In particular, all claims for damage to any system or process in which the product was employed, or any loss incurred as a result of the product not functioning at any given time, are excluded. The extent of Kontron liability to the customer shall not exceed the original purchase price of the item for which the claim exists.

Kontron issues no warranty or representation, either explicit or implicit, with respect to its products' reliability, fitness, quality, marketability or ability to fulfil any particular application or purpose. As a result, the products are sold "as is," and the responsibility to ensure their suitability for any given task remains that of the purchaser. In no event will Kontron be liable for direct, indirect or consequential damages resulting from the use of our hardware or software products, or documentation, even if Kontron were advised of the possibility of such claims prior to the purchase of the product or during any period since the date of its purchase.

Please remember that no Kontron employee, dealer or agent is authorized to make any modification or addition to the above specified terms, either verbally or in any other form, written or electronically transmitted, without the company's consent.



This page has been intentionally left blank.





---

*Chapter*

---

**1**

---

# Introduction

---



This page has been intentionally left blank.





# 1. Introduction

## 1.1 Board Overview

The XMC401 Dual SFP+ 10 Gigabit Ethernet module is an XMC mezzanine card designed for use with compliant carrier boards or CPU boards which support XMC modules with PCI Express 2.0 interconnection. The XMC401 incorporates a very flexible design which allows simple and easy integration of 10 Gigabit Ethernet functionality to any compliant system.

The XMC401 provides wire-speed, dual-port 10 Gigabit Ethernet throughput and is equipped with one dual-channel, 10 Gigabit Ethernet controller (Intel® 82599) and two SFP+ cages on the front panel for connection to SFP+ direct attach copper cables or SFP+ optical transceivers.

Carrier interfacing is provided by one XMC connector supporting PCI Express 2.0 (5 GT/s) with x8 lanes.

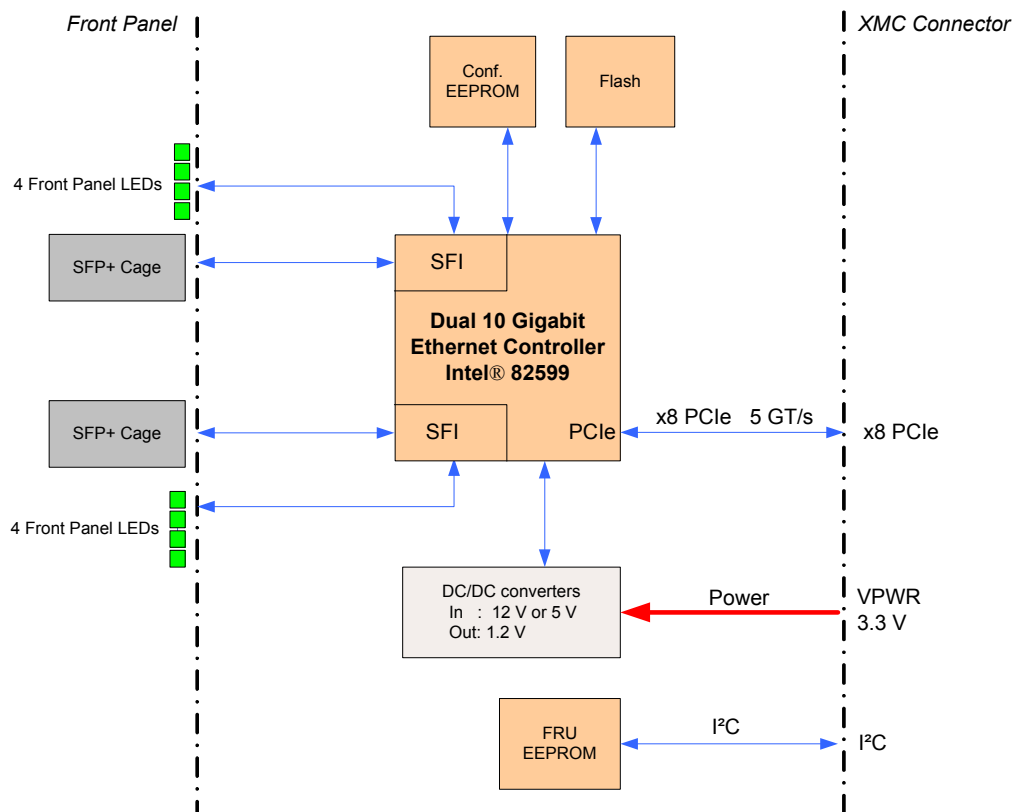
The XMC401 is supplied with two SFP+ cages as receptacles for direct attach copper cables or SFP+ optic transceivers. SFP+ direct attach copper cables or SFP+ optical transceivers are no part of this product.

## 1.2 Board Diagrams

The following diagrams provide additional information concerning board functionality and component layout.

### 1.2.1 Functional Block Diagram

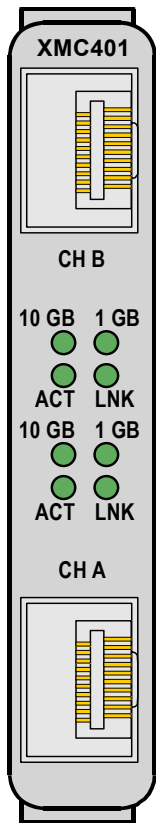
Figure 1-1: XMC401 Functional Block Diagram





### 1.2.2 Front Panel

Figure 1-2: XMC401 Front Panel



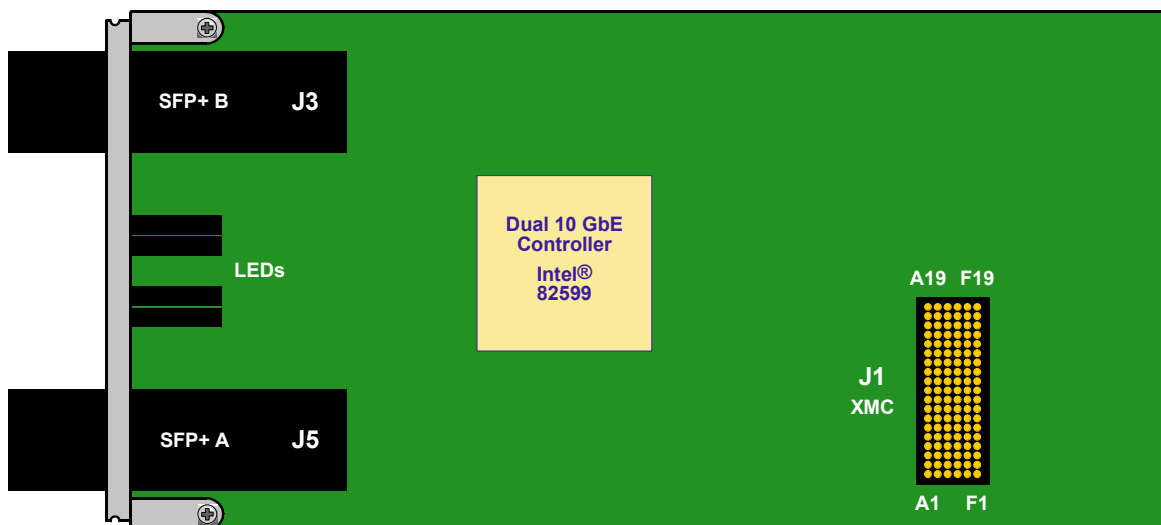
**LEGEND:**

**Ethernet Status LEDs:**

- ACT (green): Ethernet Activity
- LNK (green): Ethernet Link
- 10 GB (green): Ethernet Speed 10 Gigabit
- 1 GB (green): Ethernet Speed 1 Gigabit

### 1.2.3 Board Layout

Figure 1-3: XMC401 Board Layout (Top View)







### 1.3 Technical Specification

Table 1-1: XMC401 Main Specifications

XMC401		SPECIFICATIONS
Controller	Intel® 82599	Intel® 82599 10 Gigabit Ethernet controller with PCI Express 2.0 interface and two SFP+ ports
Memory	Configuration EEPROM	128 kbit EEPROM for Ethernet controller configuration
	Flash	8 Mbit of Flash memory for boot ROM
	FRU EEPROM	2 kbit EEPROM for storing IPMI serial EEPROM FRU data
Connectors	SFP+	Two front panel SFP+ cages for connection to SFP+ direct attach copper cables or SFP+ optical transceiver
	XMC	One onboard XMC connector supporting PCI Express 2.0 (5 GT/s) with x8 lanes for connection to a carrier board
LEDs	Ethernet Status LEDs	Four Ethernet Status LEDs per SFP+ port: <ul style="list-style-type: none"> <li>• ACT (green): Ethernet Activity</li> <li>• LNK (green): Ethernet Link</li> <li>• 10 GB (green): Ethernet Speed 10 Gigabit</li> <li>• 1 GB (green): Ethernet Speed 1 Gigabit</li> </ul>
Software	Operating Systems	There are various operating systems available for the XMC401. For information relating to the supported operating systems and the NetBoot feature, please refer to the Kontron web site or contact Kontron.
General	Mechanical	XMC-compliant form factor
	Power Consumption	See Chapter 5 for details.
	Temperature Range	Operational: 0°C to +55°C Storage: -55°C to +85°C
	Recommended Airflow	Volumetric Flow Rate: > 20 m³/h  Sufficient airflow must be provided to ensure optimal operation and long-term reliability of the XMC401. For further information, refer to the carrier's user guide.
	Climatic Humidity	93% RH at 40°C, non-condensing (acc. to IEC 60068-2-78)
	Dimensions	74 mm x 149 mm single-height XMC card
	Board Weight	90 grams

## 1.4 Standards

This product complies with the requirements of the following standards:

**Table 1-2: Standards**

TYPE	ASPECT	STANDARD	REMARKS
CE	Emission	EN55022 EN61000-6-3	
	Immission	EN55024 EN61000-6-2	
	Electrical Safety	EN60950-1	
Mechanical	Mechanical Dimensions	IEEE 1101.10	
Environmental	Vibration (Sinusoidal)	IEC60068-2-6	Test parameters: <ul style="list-style-type: none"> <li>• 10-300 (Hz) frequency range</li> <li>• 2 (g) acceleration</li> <li>• 1 (oct/min) sweep rate</li> <li>• 10 cycles/axis</li> <li>• 3 axis</li> </ul>
	Permanent Shock	IEC60068-2-29	Test parameters: <ul style="list-style-type: none"> <li>• 15 (g) acceleration</li> <li>• 11 (ms) pulse duration</li> <li>• 500 bumps per direction</li> <li>• 6 directions</li> <li>• 1 (s) recovery time</li> </ul>
	Single Shock	IEC60068-2-27	Test parameters: <ul style="list-style-type: none"> <li>• 30 (g) acceleration</li> <li>• 9 (ms) pulse duration</li> <li>• 3 shocks per direction</li> <li>• 6 directions</li> <li>• 5 (s) recovery time</li> </ul>
	Climatic Humidity	IEC60068-2-78	<b>see note below</b>
	WEEE	Directive 2002/96/EC	Waste electrical and electronic equipment
	RoHS	Directive 2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment



### Note ...

Kontron performs comprehensive environmental testing of its products in accordance with applicable standards.

Customers desiring to perform further environmental testing of Kontron products must contact Kontron for assistance prior to performing any such testing. This is necessary, as it is possible that environmental testing can be destructive when not performed in accordance with the applicable specifications.

In particular, for example, boards **without conformal coating** must not be exposed to a change of temperature exceeding 1K/minute, averaged over a period of not more than five minutes. Otherwise, condensation may cause irreversible damage, especially when the board is powered up again.

Kontron does not accept any responsibility for damage to products resulting from destructive environmental testing.



## 1.5 Related Publications

The following publications contain information relating to this product.

**Table 1-3: Related Publications**

PRODUCT	PUBLICATION
XMC	IEEE 1386-2001, IEEE Standard for a Common Mezzanine Card (CMC) Family ANSI/VITA 42.0-200x XMC Switched Mezzanine Card Auxiliary Standard ANSI/VITA 42.3-2006 XMC PCI Express Protocol Layer Standard
SFP+	SFF-8431 Specifications for Enhanced Small Form Factor Pluggable Module SFP+ Revision 4.1, 6th July 2009
All Kontron products	Product Safety and Implementation Guide, ID 1021-9142



This page has been intentionally left blank.

