SYSTEM

Technical Information

C44-SATA

SATA/USB

Mezzanine Module

Document No. 5400 • Ed. 5 • 26 May 2010

Contents

About this Manual

This manual is a short form description of the technical aspects of the C44-SATA, required for installation and system integration. It is intended for the advanced user only.

Edition History

EKF Document	Ed.	Contents/*Changes*	Author	Date
Text # 5400 c44_tie.wpd	1	Technical Information C44-SATA English, Preliminary Edition	jj	11 February 2009
	2	General review	jj	17 April 2009
	3	Added photos 2.5-inch SSD	jj	20 April 2009
	4	Added photos C44-SATA	jj	8 March 2010
	5	Added photo PC1-GROOVE with C44-SATA	jj	26 May 2010

Related Documents

Related Documents CPU Cards	
CCM-BOOGIE	www.ekf.com/c/ccpu/ccm/ccm_e.html
PC1-GROOVE	www.ekf.com/p/pc1/pc1.html

Related Documents Mezzanine Modules and Side Cards	
C40 ... C45 Series Mezzanine Storage Modules	www.ekf.com/c/ccpu/c4x_mezz_ovw.pdf
Mezzanine Modules Overview	www.ekf.com/c/ccpu/mezz_ovw.pdf
The EKF Mezzanine Module Concept	www.ekf.com/c/ccpu/cpci_mezzanine_evolution.pdf

Nomenclature

Signal names used herein with an attached '#' designate active low lines.

Trade Marks

Some terms used herein are property of their respective owners, e.g.

- Intel, Pentium, Celeron, Core 2 Duo, Core i7: ® Intel
- CompactPCI, CompactPCI PlusIO, CompactPCI Serial : ® PICMG
- Windows XP, WEPOS, POSReady, Windows 7: ® Microsoft
- EKF, ekf system: ® EKF

EKF does not claim this list to be complete.

Legal Disclaimer - Liability Exclusion

This document has been edited as carefully as possible. We apologize for any potential mistake. Information provided herein is designated exclusively to the proficient user (system integrator, engineer). EKF can accept no responsibility for any damage caused by the use of this manual.

Standards

Specifications/Standards	
SATA	Serial ATA 2.5/2.6 Specification (www.sata-io.org)
USB	Universal Serial Bus Revision 2.0 specification (www.usb.org/developers)

C44-SATA on the CCM-BOOGIE CPU Card

Feature Summary

Feature Summary	
Form Factor	▸ Proprietary size mezzanine module 146mm x 100mm ▸ 4HP (20.32mm) mounting offset with respect to the CPU carrier board ▸ Typically delivered as a ready to use assembly unit (including the CCM-BOOGIE or successor CPU card) ▸ Mounting position right (on top of CPU board) ▸ 8HP front panel width (with front I/O connectors)
Host I/F Connector (Bottom Mount to CPU Carrier)	▸ P-MEZ High Speed mezzanine connector suitable for CCM-BOOGIE and successor CPU carrier boards ▸ Nominal headroom 18.7mm (4HP) between carrier board and C44-SATA ▸ 3 x SATA channels (2 RAID capable) ▸ 4 x USB ports (3 in use only)
SATA Usage	▸ P-SATA1: horizontal mount docking connector (from ICH southbridge on CPU carrier board), suitable for on-board 2.5-inch SATA SSD/HDD ▸ P-SATA2 and P-SATA3: front panel e-SATA connectors (derived from the CPU carrier board secondary SATA controller), suitable for SATA RAID level 0/1 or non-RAID applications with external e-SATA device(s)
USB Usage	▸ Up to 3 x USB type A receptacles, front panel I/O ▸ Overcurrent protection (electronic switches)
On-Board Storage	▸ 2.5-Inch SATA on-board drive option ▸ Solid State Drive (SSD) or Hard Disk Drive (HDD) ▸ Intel X-25E Single Level Cell (SLC) recommended for fastest transfer speed ▸ Intel X-25M Multi Level Cell (MLC) recommended for more storage capacity ▸ Hard disk recommended for low cost applications and maximum storage capacity
Thermal [1] Conditions Environmental [1] Conditions	▸ Operating temperature: 0°C ... +70°C ▸ Storage temperature: -40°C ... +85°C, max. gradient 5°C/min ▸ Humidity 5% ... 95% RH non condensing ▸ Altitude -300m ... +3000m ▸ Shock 15g 0.33ms, 6g 6ms ▸ Vibration 1g 5-2000Hz
EC Regulations	▸ EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1) ▸ 2002/95/EC (RoHS)
MTBF	tbd

[1] Observe degradation of temperature limits and other conditions when hard disk drive is in use - consult manufacturers data sheet - SSD recommended for rugged environment

Not all of the connectors may be present or functional on your actual C44-SATA board; assembly is highly custom specific. Options may be exclusive, i.e. not necessarily concurrently present. Discuss your needs with EKF before ordering.

Short Description

Available as a mezzanine add-on expansion board to the CCM-BOOGIE and successor CPU carrier cards, the main purpose of the C44-SATA is to provide SATA and USB connectors for front panel I/O. In addition, the C44-SATA can accommodate a 2.5-inch SATA drive, either SSD (Solid State Drive) or HDD (Hard Disk Drive). Since only a few active components are required on the C44-SATA PCB, it is a reasonable low cost system expansion module.

Two eSATA connectors are available via the C44-SATA front panel, for attachment of external drives by e-SATA cable harnesses. The SATA channels may be either operated in a low level RAID (0/1) mode, or as universal non-RAID SATA ports, driven by the carrier board JMB362 secondary SATA controller.

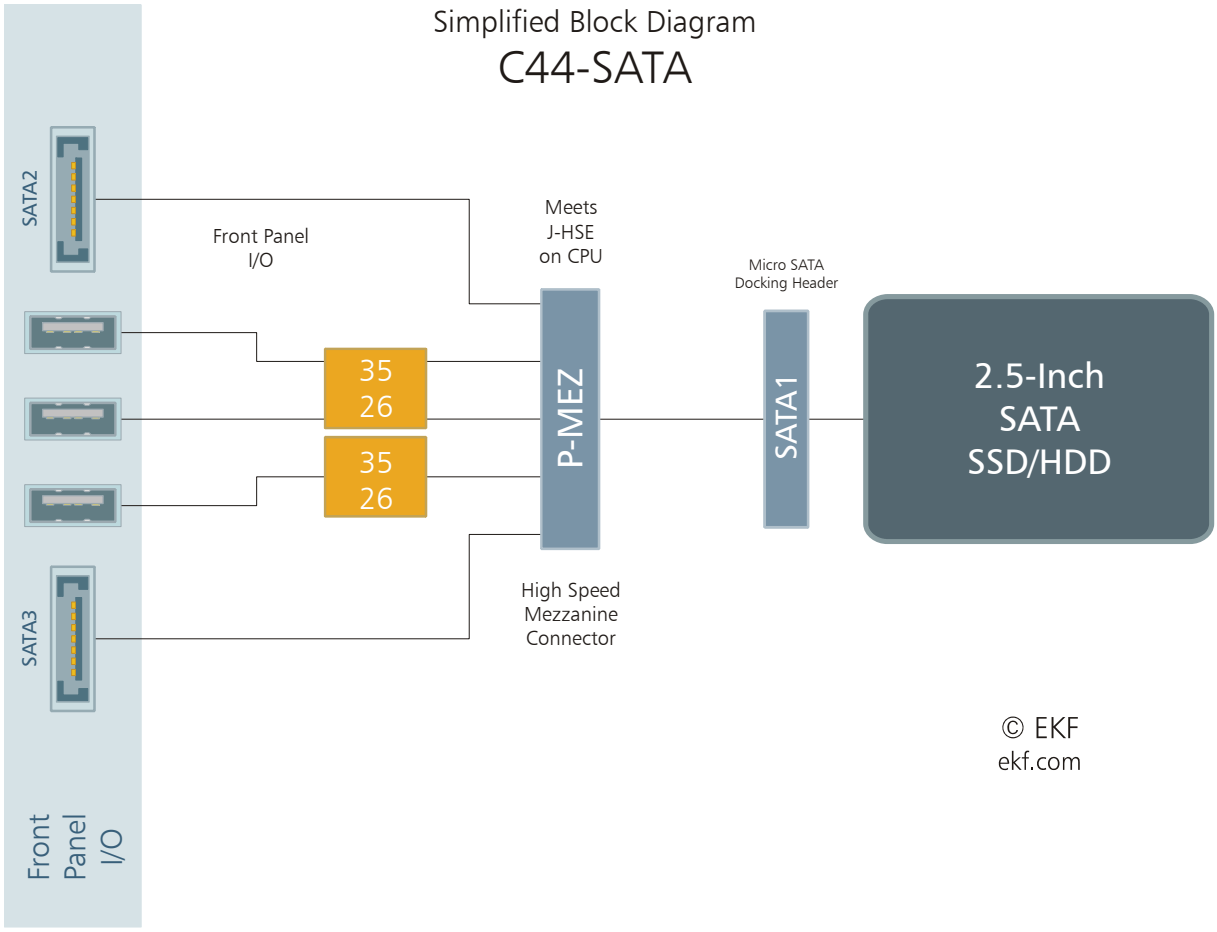
In addition, three USB-A receptacles are situated in the front panel, for universal use (ICH/PCH Southbridge root hub). All connectors are individually protected from an overcurrent situation by electronic switches.

The C44-SATA accommodates a 2.5-inch SATA drive, attached to the SATA docking header (ICH/PCH Soutbridge bound). A solid state drive (SSD aka Flash Drive) is recommended for fast and rugged operation. Single level cell (SLC) drives offer the highest transfer speed and superior reliability. A hard drive should be considered as an economic solution, with decreased operating temperature and performance compared to a SLC SSD, but maximum storage capacity as of current.

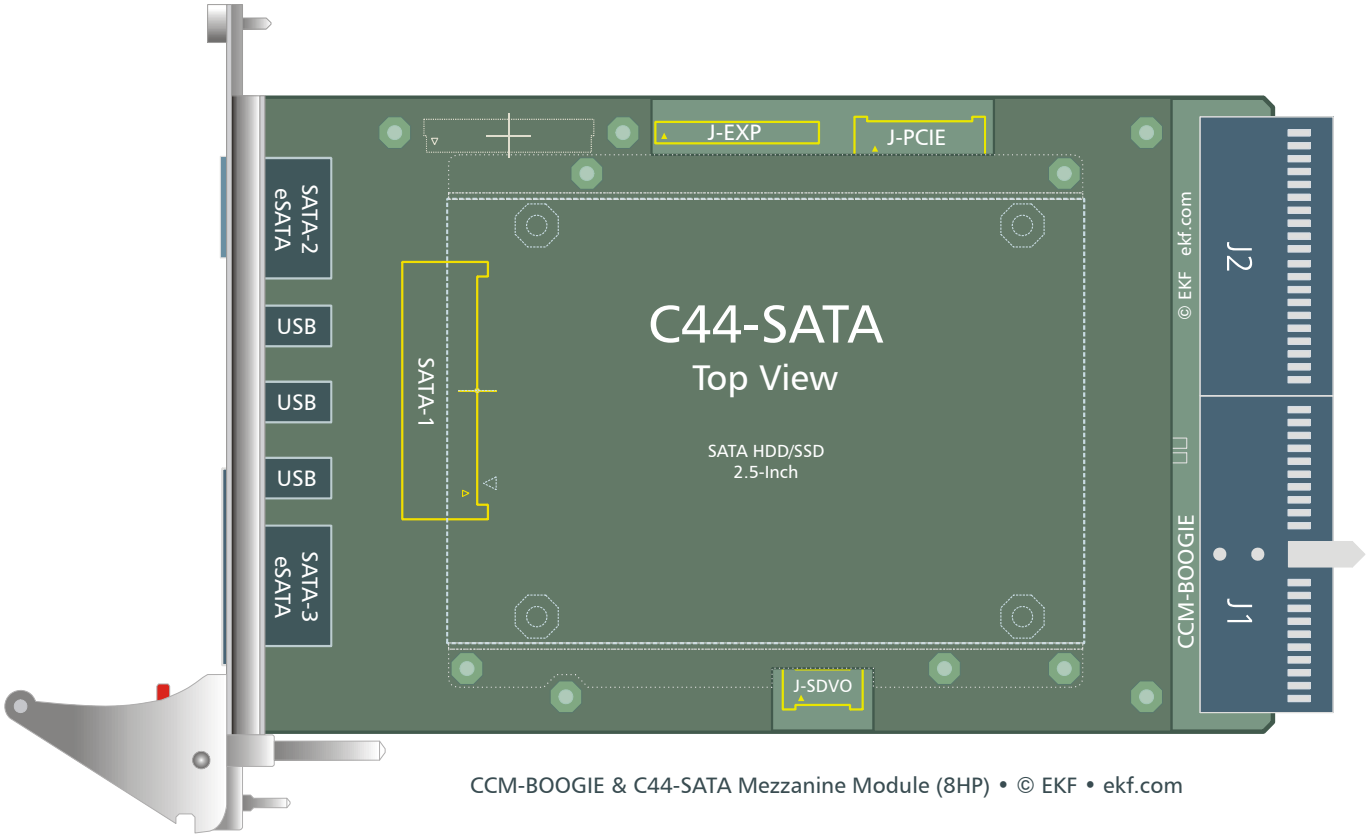
The C44-SATA mounts on top of the CPU carrier board, with a 4HP pitch off-stand, resulting in a 8HP front panel for the entire dual-board assembly. If no front panel I/O would be required (I/O connectors not populated), a 6HP common front panel would be also suitable (7mm mounting height of Intel X25-E or X-25M SATA SSD assumed). For low cost applications, the C44-SATA can be populated with either the internal SATA connector only (pure storage module function), or the front panel connectors only (pure I/O expansion module).

C44-SATA on the PC1-GROOVE CPU Card

Block Diagram

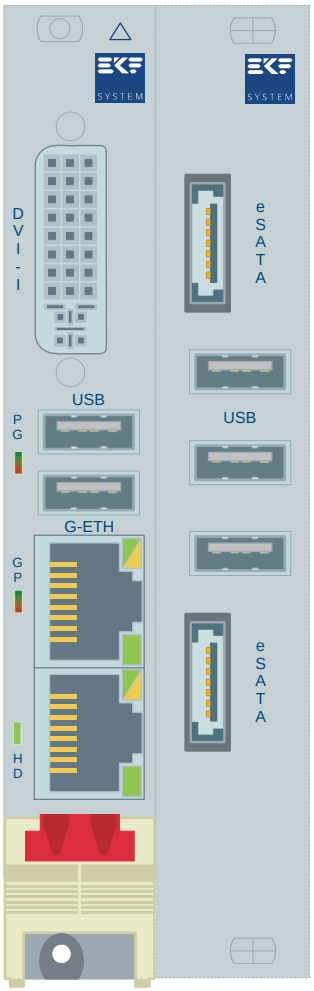


Top View Component Assembly



CCM-BOOGIE & C44-SATA Mezzanine Module (8HP) • © EKF • ekf.com

Front Panel


DVI-I
USB
PG
G-ETH
GP
HD
eSATA
USB
eSATA
draft only - do not scale • © EKF • ekf.com
CCM-BOOGIE
C44-SATA

Installing and Replacing Components

Before You Begin

Warnings

The procedures in this chapter assume familiarity with the general terminology associated with industrial electronics and with safety practices and regulatory compliance required for using and modifying electronic equipment. Disconnect the system from its power source and from any telecommunication links, networks or modems before performing any of the procedures described in this chapter. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage. Some parts of the system can continue to operate even though the power switch is in its off state.

Caution

Electrostatic discharge (ESD) can damage components. Perform the procedures described in this chapter only at an ESD workstation. If such a station is not available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the system chassis or board front panel. Store the board only in its original ESD protected packaging. Retain the original packaging (antistatic bag and antistatic box) in case of returning the board to EKF for repair.

Installing the Board Assembly

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system 
- Remove the board packaging, be sure to touch the board only at the front panel
- Identify the related CompactPCI slot (peripheral slot for I/O boards, system slot for CPU boards, with the system slot typically most right or most left to the backplane)
- Insert card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighboured front panels)
- A card with onboard connectors requires attachment of associated cabling now
- Lock the ejector lever, fix screws at the front panel (top/bottom)
- Retain original packaging in case of return

Removing the Board Assembly

Warning

This procedure should be done only by qualified technical personnel. Disconnect the system from its power source before doing the procedures described here. Failure to disconnect power, or telecommunication links before you open the system or perform any procedures can result in personal injury or equipment damage.

Typically you will perform the following steps:

- Switch off the system, remove the AC power cord
- Attach your antistatic wrist strap to a metallic part of the system
- Identify the board, be sure to touch the board only at the front panel
- unfasten both front panel screws (top/bottom), unlock the ejector lever
- Remove any onboard cabling assembly
- Activate the ejector lever
- Remove the card carefully (be sure not to damage components mounted on the bottom side of the board by scratching neighboured front panels)
- Store board in the original packaging, do not touch any components, hold the board at the front panel only

Warning

Do not expose the card to fire. Battery cells and other components could explode and cause personal injury.

EMC Recommendations

In order to comply with the CE regulations for EMC, it is mandatory to observe the following rules:

- The chassis or rack including other boards in use must comply entirely with CE
- Close all board slots not in use with a blind front panel
- Front panels must be fastened by built-in screws
- Cover any unused front panel mounted connector with a shielding cap
- External communications cable assemblies must be shielded (shield connected only at one end of the cable)
- Use ferrite beads for cabling wherever appropriate
- Some connectors may require additional isolating parts

Reccomended Accessories

Blind CPCI Front Panels	EKF Elektronik	Widths currently available (1HP=5.08mm): with handle 4HP/8HP without handle 2HP/4HP/8HP/10HP/12HP
Ferrit Bead Filters	ARP Datacom, 63115 Dietzenbach	Ordering No. 102 820 (cable diameter 6.5mm) 102 821 (cable diameter 10.0mm) 102 822 (cable diameter 13.0mm)
Metal Shielding Caps	Conec-Polytronic, 59557 Lippstadt	Ordering No. CDFA 09 165 X 13129 X (DB9) CDSFA 15 165 X 12979 X (DB15) CDSFA 25 165 X 12989 X (DB25)

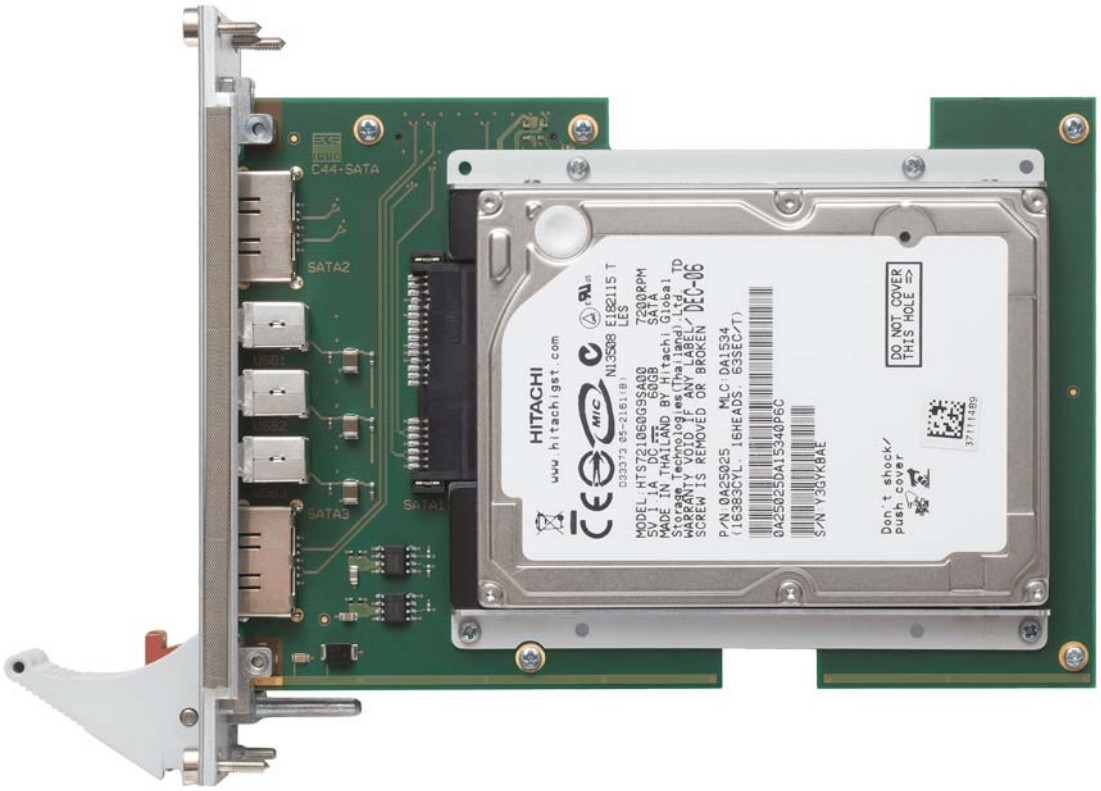
Technical Reference - Connectors

Caution

Some of the connectors may provide operating voltage (e.g. +12V, +5V and +3.3V) to devices inside the system chassis, such as internal peripherals. Not all of these connectors are overcurrent protected. Do not use these connectors for powering devices external to the computer chassis. A fault in the load presented by the external devices could cause damage to the board, the interconnecting cable and the external devices themselves.

Please Note

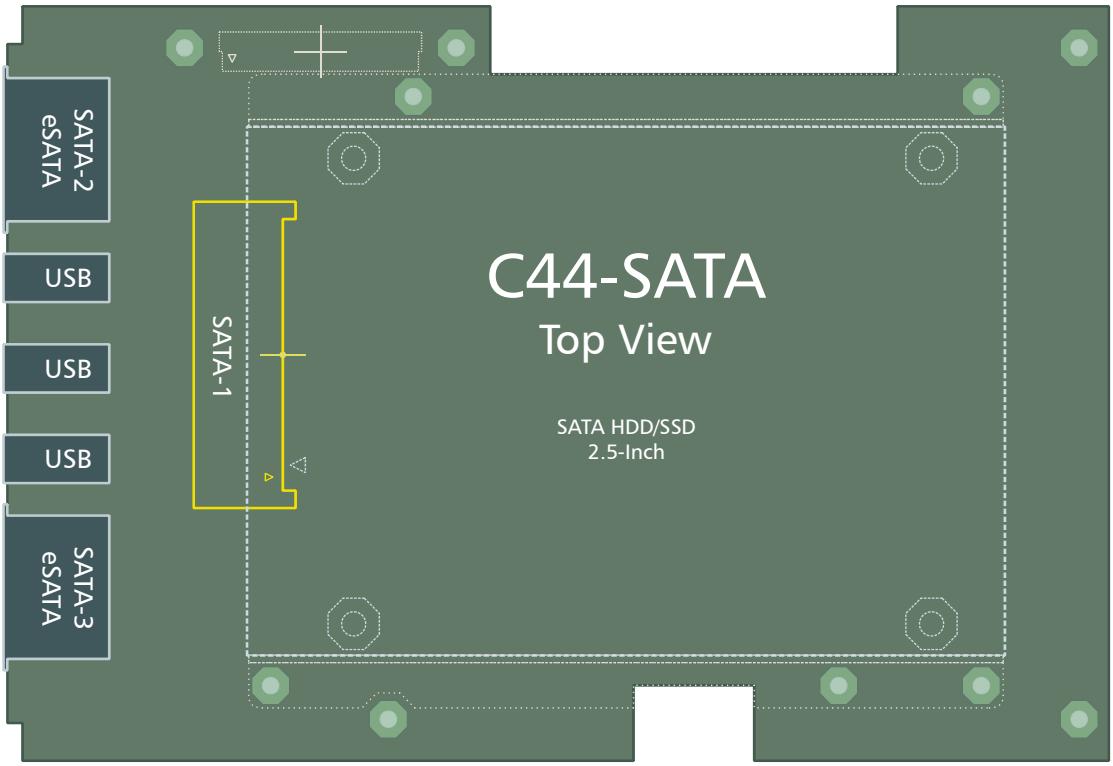
The C44-SATA mezzanine module may be equipped with several connectors for system internal and front panel (external) usage. Not all of these connectors may be present on a particular board. Be sure to specify your individual needs when ordering the C44-SATA board. Characteristic features and the pin assignments of each connector are described on the following pages.



C44-SATA Top View

I/O Connectors

The C44-SATA is typically provided with several front panel I/O connectors, and an on-board SATA docking header.



I/O Connectors	
SATA-1	SATA docking connector suitable for 2.5-inch on-board SATA drive - ICH/PCH Southbridge
SATA-2/SATA3	eSATA front panel jacks suitable for external eSATA devices - JMB362 RAID or non RAID
USB	3 x Type A front panel USB connectors for external USB equipment - ICH/PCH Southbridge

SATA-1 Docking Header

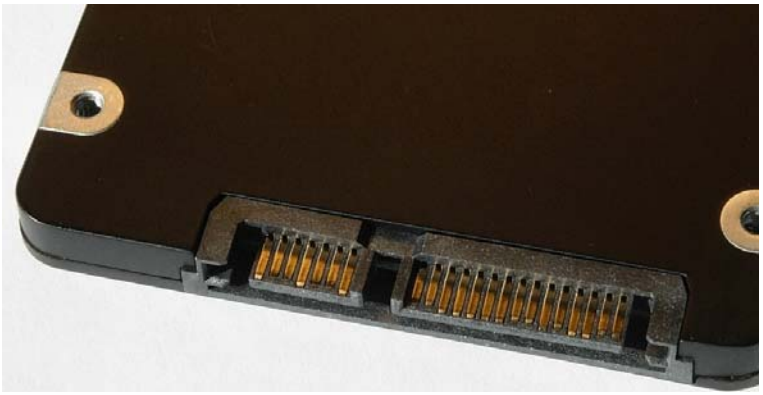
As an option, the C44-SATA can be equipped with an on-board 2.5-inch SATA drive, either hard disk (HDD), or silicon state (SSD). The 22-position SATA docking header SATA-1 allows for direct attachment of any drive, without cable assembly.

Signal designations RX/TX shown here with respect to the SATA host controller (ICH/PCH Southbridge on the CPU carrier board).

SATA-1 • SATA Docking Connector 15+7 • 256.022.10.01		
	S1	GND
	S2	TX+ SATA01
	S3	TX- SATA01
	S4	GND
	S5	RX- SATA01
	S6	RX+ SATA01
	S7	GND
	P1	*+3.3V*
	P2	*+3.3V*
	P3	*+3.3V*
	P4	GND
	P5	GND
	P6	GND
	P7	+5V
	P8	+5V
	P9	+5V
	P10	GND
	P11	*RSVD*
	P12	GND
	P13	*+12V*
	P14	*+12V*
	P15	*+12V*

Despite the SATA connector is also provided with pins assigned to +12V and +3.3V, only +5V is required for typical 2.5-inch SATA drives. As a C44-SATA stuffing option, +5V can be derived either from the carrier board +5VS (switched power well) or +5VA (always on).

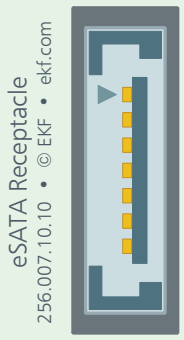
SATA Solid State Drive • 7mm Height Profile



Standard SATA Drive Connector

SATA-2 SATA-3 eSATA F/P Connectors

The C44-SATA can be optionally equipped with two front panel eSATA signal headers. TX/RX designation of signals are shown with respect to the SATA controller JMB362 on the CPU carrier board. Shielded external eSATA cable assemblies are recommended for reliable industrial usage.

2 x F/P eSATA #256.007.10.10 Receptacles		
	1	GND
	2	SATA_TX+
	3	SATA_TX-
	4	GND
	5	SATA_RX-
	6	SATA_RX+
	7	GND

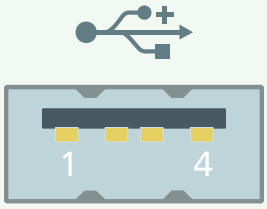
Remember that SATA is a high speed data link - the typical external cable length should not exceed 2m. Chose the minimum distance possible for locating the external SATA device, and use high quality cable assemblies for reliable industrial operation, such as the Molex 68782 series (EKF part no. 256.007.82.10 and 256.007.82.20). For experimental purposes, there are also adapter cable assemblies available from eSATA to SATA (EKF part no. 256.007.81.10).

Compared to internal SATA cabling, the eSATA front panel connectors offer superior shielding and provide EMI protection. eSATA connectors and cable harnesses used or supplied by EKF adhere to the design specifications recommended by the Serial ATA International Organization (SATA-IO).

With a CCM-BOOGIE CPU carrier board, JMicron JMB36 drivers must be installed before using the front panel connectors, either RAID drivers or non-RAID drivers: ftp://driver.jmicron.com.tw/jmb36x/

USB F/P Receptacles

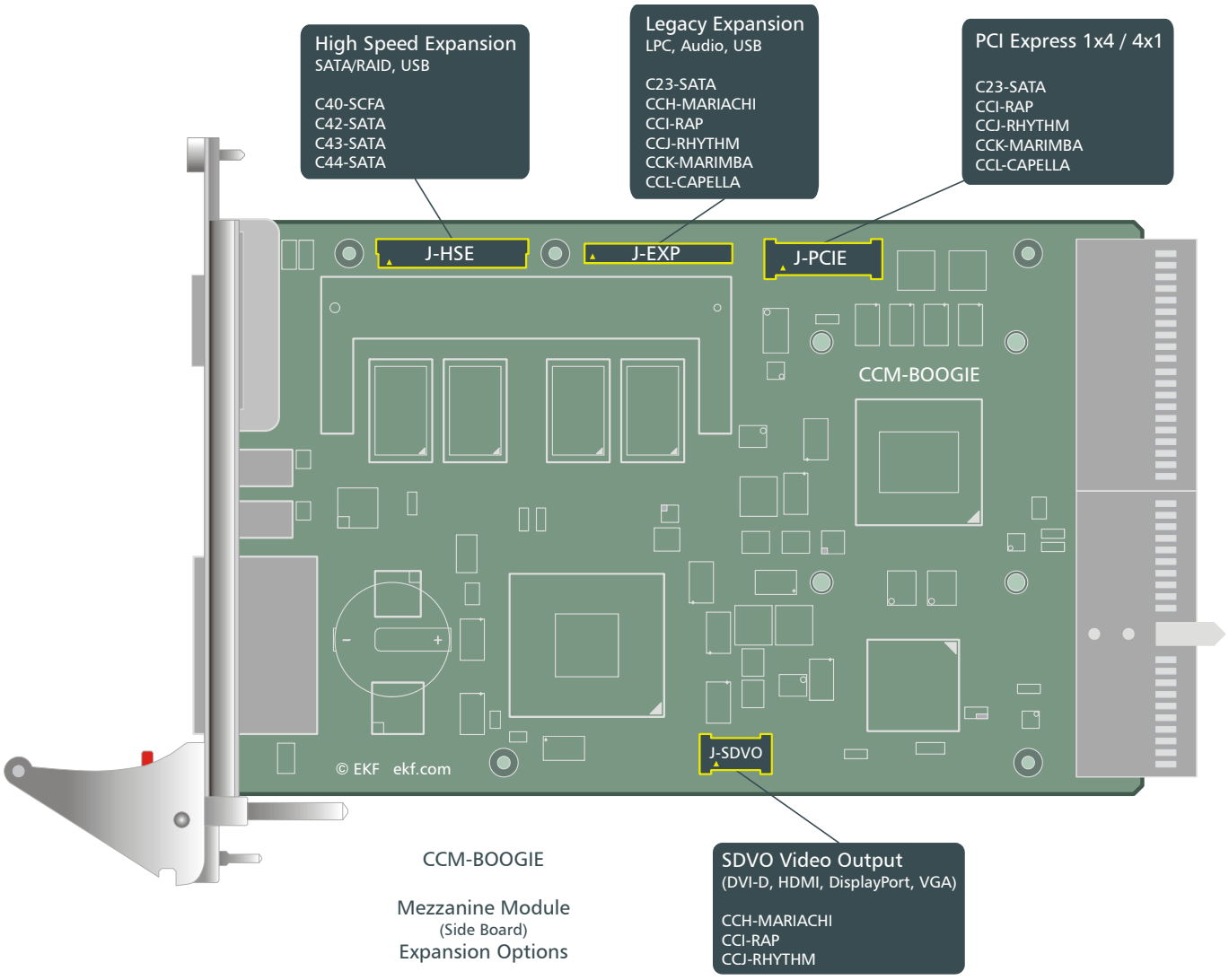
The host CPU board is equipped with an ICHx (Input/Output Controller Hub), which incorporates a number of USB 1.1/2.0 compliant ports. Four of the USB interfaces are passed to the C44-SATA through the inter-board connector J-MEZ, ending up in the front panel USB connectors. Overcurrent protection is provided by electronic switches individually for each USB receptacle.

4 x USB Receptacle 270.20.04.1		
 USB Receptacle © EKF • ekf.com 270.20.04.1	1	+5V_USB 0.5A 1)
	2	DATA-
	3	DATA+
	4	GND

1) Electronic Power Switch

Inter-Board Connector

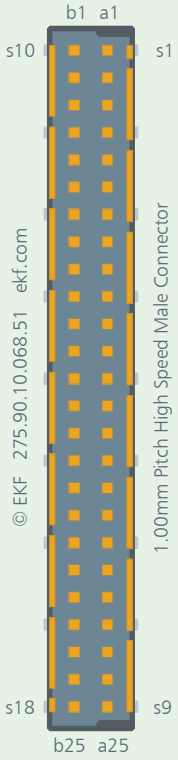
The C44-SATA is equipped with a high speed mezzanine connector P-MEZ, mating with the CCM-BOOGIE CPU carrier board and its successors. The inter-board connector is situated at the bottom of the C44-SATA and establishes the data path and power link to the carrier board J-HSE. Since the C44-SATA comes typically mounted as a unit together with the CPU carrier board, there is normally no need for the user to get access to the inter-board connector. It is described here as a reference only and for better understanding of the C44-SATA



P-MEZ

The connector P-MEZ is a 10mm nominal height shielded male pin header. Its counterpart on the CPU carrier board is a 8mm height receptacle (J-HSE), for a nominal headroom of 18.72mm between the two boards (which is equivalent to 4HP=20.32mm board to board CL).

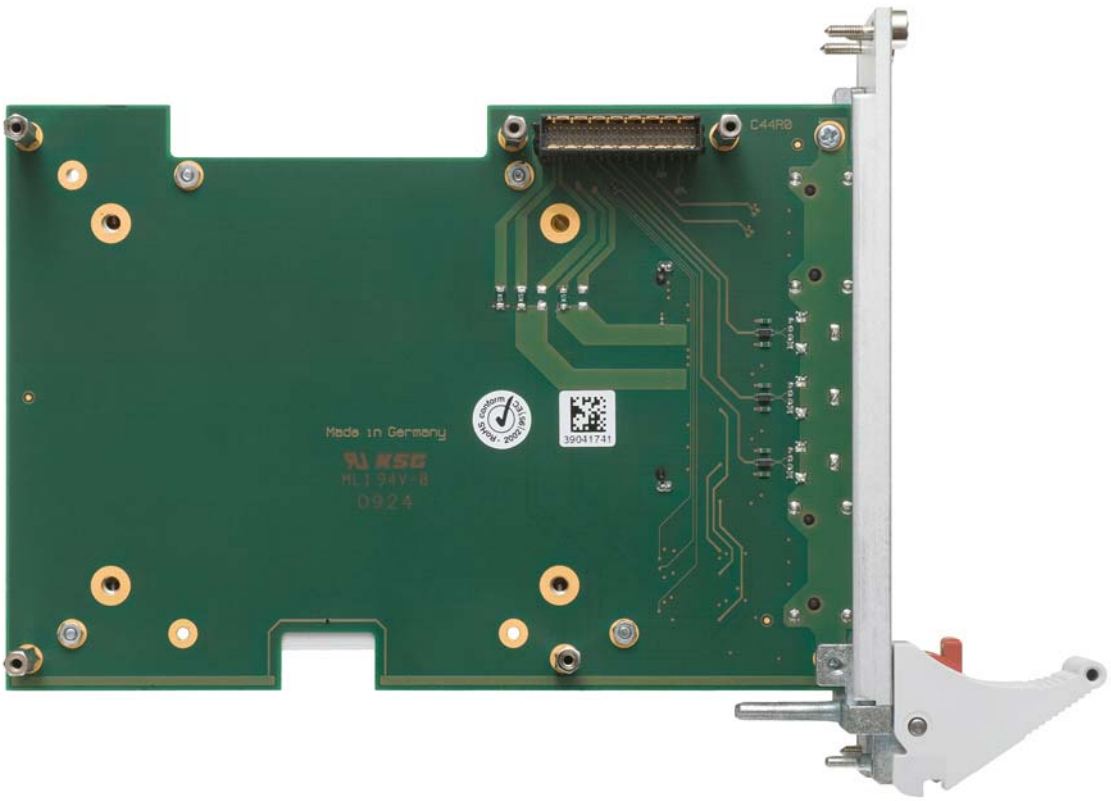
P-MEZ • SATA & USB Mezzanine Interface
1.00mm Pitch Male Connector 10mm Height (275.90.10.068.51)



GND	b1	a1	GND
SATA3_TXP 4)	b2	a2	SATA1_TXP 3)
SATA3_TXN 4)	b3	a3	SATA1_TXN 3)
GND	b4	a4	GND
SATA3_RXN 4)	b5	a5	SATA1_RXN 3)
SATA3_RXP 4)	b6	a6	SATA1_RXP 3)
GND	b7	a7	GND
SATA4_TXP	b8	a8	SATA2_TXP 4)
SATA4_TXN	b9	a9	SATA2_TXN 4)
GND	b10	a10	GND
SATA4_RXN	b11	a11	SATA2_RXN 4)
SATA4_RXP	b12	a12	SATA2_RXP 4)
GND	b13	a13	GND
USB3_P	b14	a14	USB1_P
USB3_N	b15	a15	USB1_N
GND	b16	a16	GND
USB4_P	b17	a17	USB2_P
USB4_N	b18	a18	USB2_N
GND	b19	a19	GND
USB3_OC#	b20	a20	USB1_OC#
USB4_OC#	b21	a21	USB2_OC#
+5VS 2)	b22	a22	+3.3VS 1)
+5VS 2)	b23	a23	+3.3VS 1)
+5VA	b24	a24	*+3.3VA*
RSVD	b25	a25	*+12VA*

1) 2) Switched voltages from carrier board, according to CPU sleep state S0
3) This SATA channel has been derived from ICH/PCH southbridge
4) These SATA channels are derived from the additional secondary PCIe SATA controller, RAID 0/1/10 capable

Notes:
- All s# connector pins (shield) are tied to GND
- All TX/RX designations with respect to SATA controller (TX controller = RX drive, RX controller = TX drive)



C44-SATA Bottom View

Schematics

Complete circuit diagrams for this product are available for customers on request. Signing of a non-disclosure agreement would be needed. Please contact sales@ekf.de for details.

EKF reserves the right to refuse distribution of confidential information material for any reason that EKF may consider substantial.

Industrial Computers Made in Germany

boards. systems. solutions.

EKF Elektronik GmbH
Philipp-Reis-Str. 4
59065 Hamm
Germany

Phone +49 (0)2381/6890-0
Fax +49 (0)2381/6890-90
Internet www.ekf.com
E-Mail info@ekf.com