EKF SYSTEM

Technical Information

C41-CFAST

CFast™ Card Mezzanine Module

SATA & USB

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Contents

About this Manual

This manual is a short form description of the technical aspects of the C41-CFAST, required for installation and system integration. It is intended for the advanced user only.

Edition History

EKF Document	Ed.	Contents/*Changes*	Author	Date
Text # 5686 c41_tie.wpd	1	Technical Information C41-CFAST English, Preliminary Edition	wro	1 March 2010
	2	General Review	jj	24 March 2010
	3	Added Photos	jj	12 May 2010
	4	Added Photo PC1-GROOVE w. C41-CFAST	jj	21 May 2010
	5	Updated Photos	jj	9 June 2010
	6	Added Photo PC1/C41 Exploded View	jj	28 March 2012
	7	Added Photos SC1/C41 & PC1/PCS/C41	j	28 January 2013

C41-CFAST on CPU Card

Related Documents

For a description of the SC1-ALLEGRO or PC1-GROOVE CPU cards, which may act as carrier board with respect to the C41-CFAST, please refer to the correspondent CPU user guide, available by download (change URL accordingly for other potential carrier cards).

Download Carrier Card User Guides	
CCM-BOOGIE	www.ekf.com/c/ccpu/ccm/ccm_e.html
PC1-GROOVE	www.ekf.com/p/pc1/pc1.html
PC2-LIMBO	www.ekf.com/p/pc2/pc2.html
PCS-BALLET	www.ekf.com/p/pcs/pcs.html
SC1-ALLEGRO	www.ekf.com/s/sc1/sc1.html

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 Serial: ® PICMG
▸ Windows XP, Windows 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	
CFast™	CFast™ Specification Rev. 1.0 www.compactflash.org
SATA	Serial ATA 2.5/2.6/3.0 Specification www.sata-io.org
USB	Universal Serial Bus Revision 2.0 specification www.usb.org/developers

C41-CFAST Mezzanine Module

Features

Feature Summary	
Form Factor	Proprietary size mezzanine module, fits basically into the 4HP (20.3mm) envelope of the CPU carrier board, typically delivered as a ready to use assembly unit (including the PC1-GROOVE, SC1-ALLEGRO or successor CPU card), mounting position right (on top of CPU board)
Host I/F Connector (Bottom Mount, Towards Carrier)	▸ High Speed mezzanine connector P-MEZ suitable e.g. for CCM-BOOGIE, PC1-GROOVE and successor CPU carrier boards, and also side cards such as the PCS-BALLET ▸ conveys 3 x SATA, 2 x USB 2.0
SATA Port Usage	▸ SATA1, bound to the on-board CFast™ host connector CF1 (typically sourced from the PCH southbridge on a CPU carrier board) ▸ SATA2 and SATA3 (may be derived from a CPU carrier board secondary SATA controller), wired to the optional vertical SATA latching connectors P-SATA2 & P-SATA3 (additional headroom is required beyond 4HP for this option)
USB Port Usage	▸ Option 2.0mm pitch pin header P-UFD1 for industrial grade low profile USB SSD mezzanine module ▸ Option USB 2.0 type A receptacle J-USB3, horizontal mount
CFast™ Connector	▸ Docking connector CF1 for on-board CFast™ card ▸ 7 pins signal section + 17 pins power section
Top Mount Connectors Summary	▸ CF1 for a SATA CFast™ Card ▸ Option P-SATA2 and P-SATA3 cable connectors for attachment of system internal SATA drives ▸ Option P-UFD1 for a low profile USB 2.0 SSD mezzanine module (exclusive to J-USB3) ▸ Option J-USB3 for system internal attachment of USB 2.0 devices (exclusive to P-UFD1)
Thermal Conditions Environmental 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

Not all of the connectors may be present or functional on your actual C41-CFAST 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 PC1-GROOVE, SC1-ALLEGRO and successor CPU carrier cards, the main purpose of the C41-CFAST is to provide a CFast™ host connector for attachment of a CFast™ storage card, as a rugged and fast mass storage media, which can be easy replaced. Basically, the C41-CFAST is designed to fit into the 4HP (20.32mm) envelope of a CompactPCI® CPU carrier board, so that another 4HP pitch mezzanine expansion board can be stacked above the CPU/C41 assembly in addition.

Further more, the C41-CFAST can be optionally equipped with an USB Silicon State Drive (SSD) module [1], or an USB type A host receptacle [1]. In addition, two SATA connectors (latching headers) are optionally available on the C41-CFAST [1], for attachment of system internal drives by ordinary SATA cable harnesses.

Industrial grade CFast™ cards are widely available. While compatible to the classic CompactFlash card with respect to its dimensions, the CFast™ card uses the SATA signal interface for fast data transfers. The newly defined CFast™ docking connector protects from erroneous insertion of classic CompactFlash cards. Installation of an operating system to the CFast™ card, and system boot from this media is straightforward. With ruggedized systems in mind, the CFast™ card can be fastened by means of a screw locked retainer on the C41-CFAST module PCB.

Low profile USB SSD modules (2.00mm connector pitch) have also become popular in embedded systems. Such a module [1] can be optionally mounted on the C41-CFAST, either in addition to the CFast™ card, or as alternate mass storage.

[1] Some of the population options mentioned may exceed the 4HP total stack height for the CPU carrier board and C41-CFAST assembly. Please read carefully the respective notes (subchapters 'P-UFD1', 'J-USB3', and 'P-SATA2 P-SATA3'. For some EKF expansion boards slight violations of the 4HP envelope may be tolerable. Furthermore, some of the C41 stuffing options are exclusive to each other, due to space restrictions on the C41-CFAST (see table below).

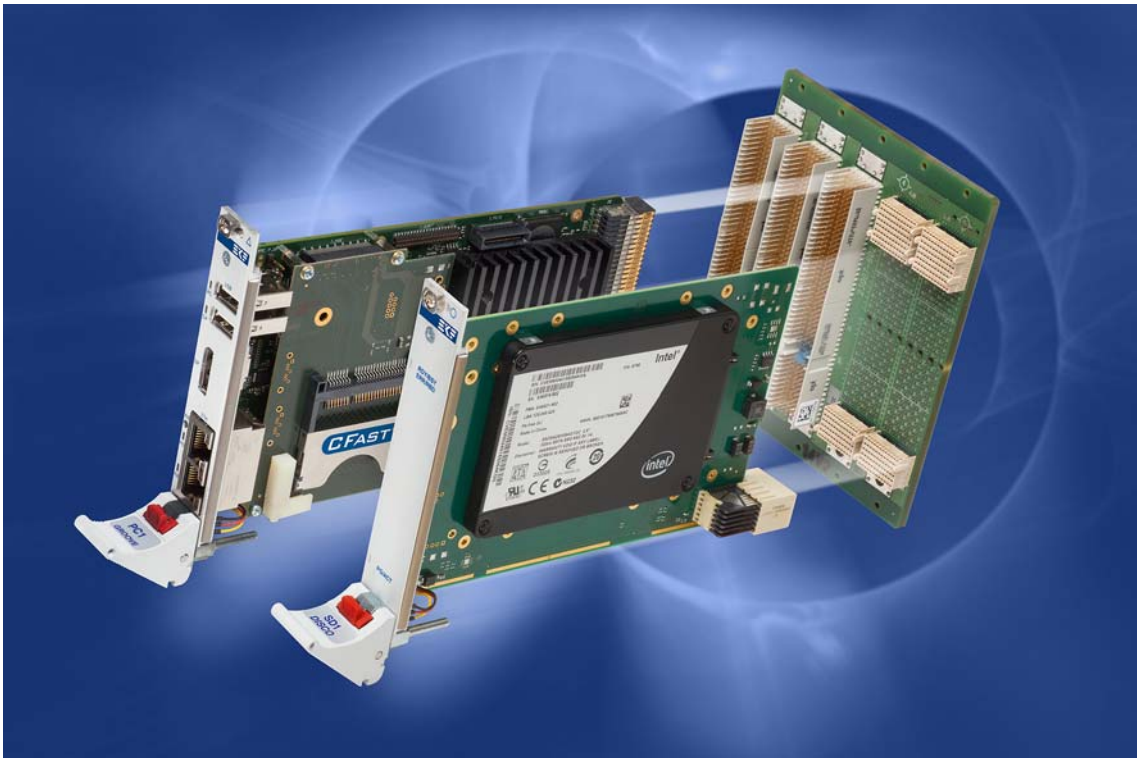| C41-CFAST Stuffing Options			
CFast™ Card 4HP Envelope Maintained	USB SSD Module 4HP Envelope Slightly Exceeded	USB A Host Receptacle 4HP Envelope Slightly Exceeded	Latching SATA Headers 4HP Envelope Exceeded with SATA Cable Assy
1 x CFast™ Card	1 x SSD	-	with or w/o SATA headers
1 x CFast™ Card	-	1 x USB	with or w/o SATA headers

C41-CFAST on a CPU Carrier Card
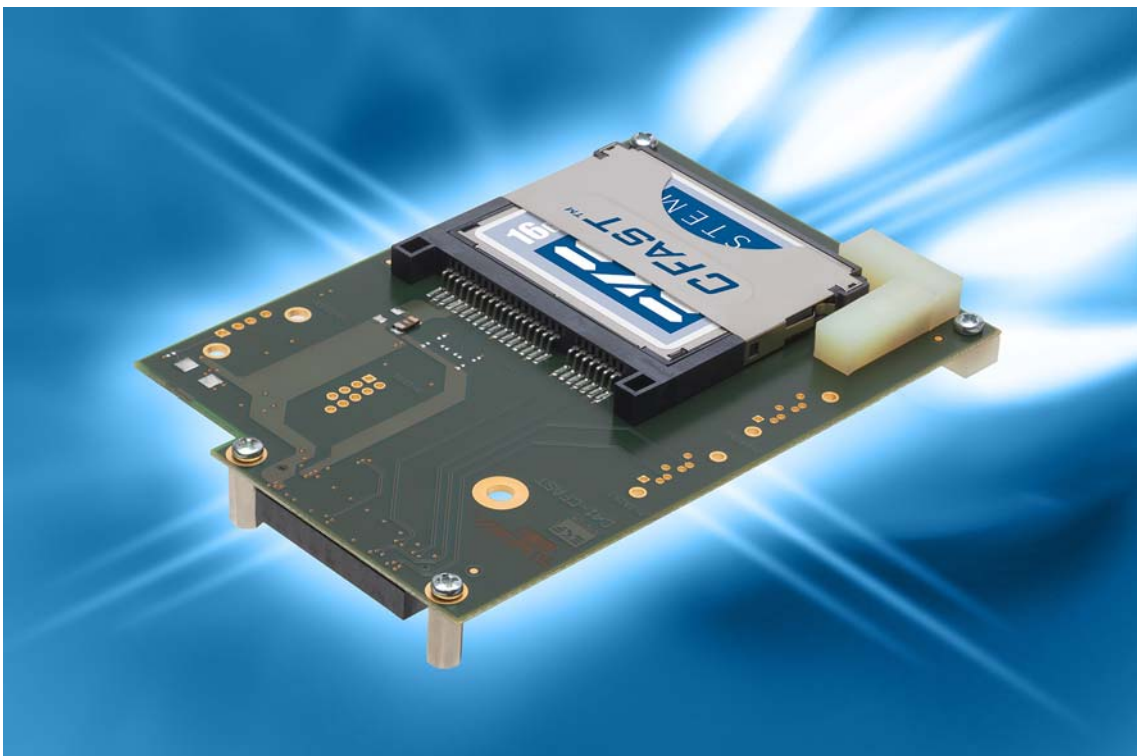
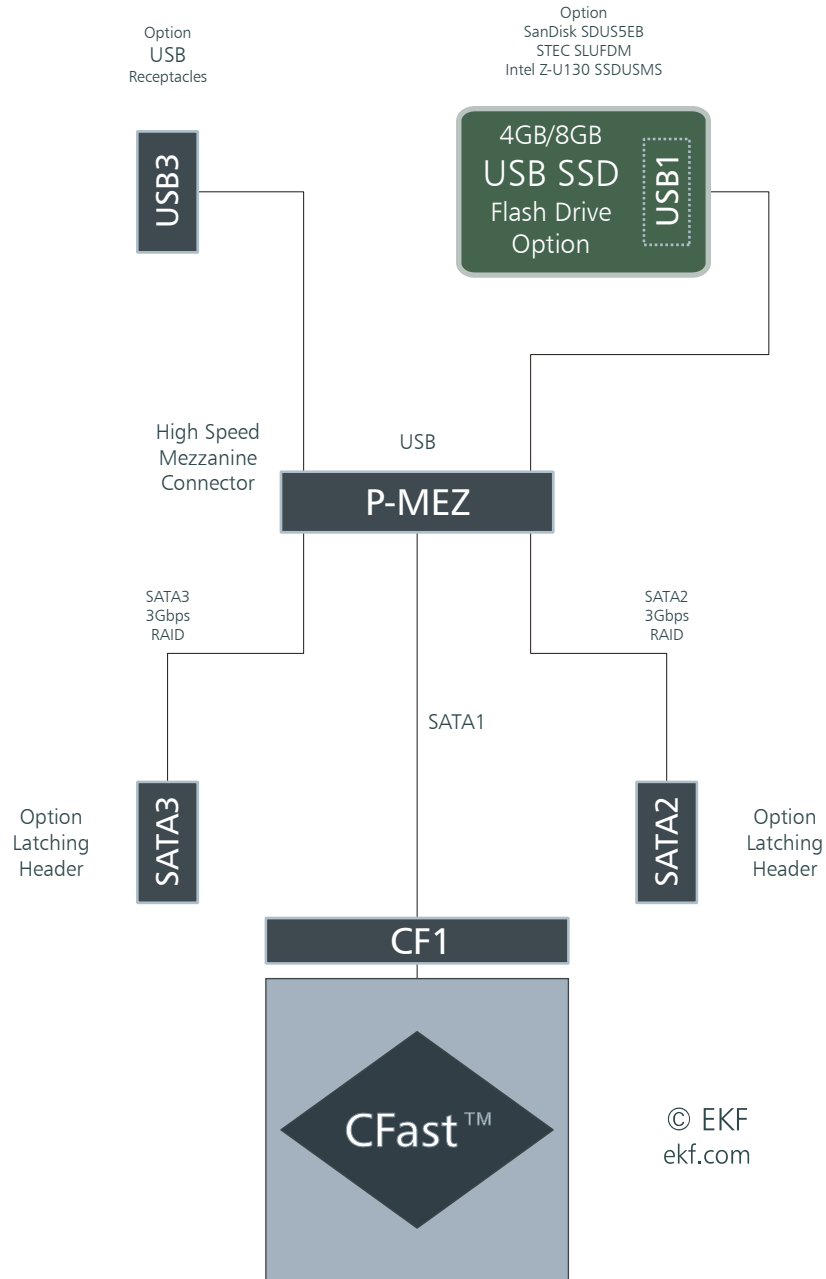C41-CFAST over SC1-ALLEGRO CPU Card

C41-CFAST on the SC1-ALLEGRO CPU Card

C41-CFAST on a Side Card (8HP Assembly)

Block Diagram

Simplified Block Diagram
C41-CFAST

Option
USB
Receptacles

Option
SanDisk SDUS5EB
STEC SLUFDM
Intel Z-U130 SSDUSMS

USB3

4GB/8GB
USB SSD
Flash Drive
Option

USB1

High Speed
Mezzanine
Connector

USB

P-MEZ

SATA3
3Gbps
RAID

SATA2
3Gbps
RAID

SATA1

Option
Latching
Header

SATA3

SATA2

Option
Latching
Header

CF1

CFast™

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ekf.com

Top View Component Assembly
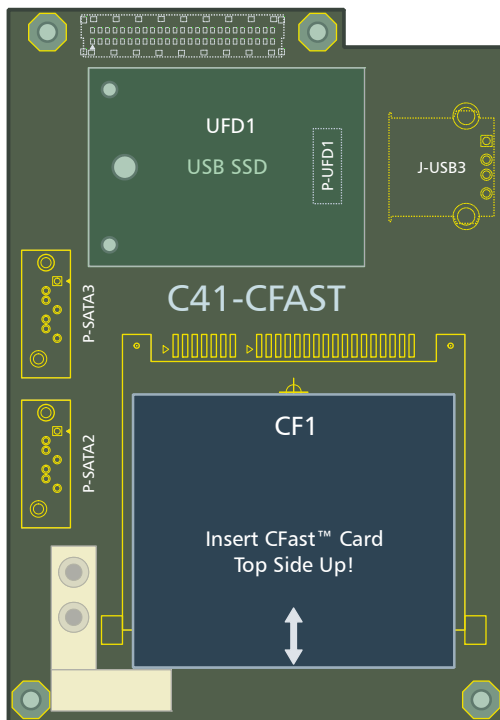
Installing and Replacing Components

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 C41-CFAST mezzanine module may be equipped with several on-board connectors for system internal usage. Not all of these connectors may be present on a particular board. Be sure to specify your individual needs when ordering the C41-CFAST board. Characteristic features and the pin assignments of each connector are described on the following pages.

I/O Connectors

The C41-CFAST can be equipped with several top side connectors. Some of these connectors are available as an option only or exclusive to each other, and therefore may not be functional or even present on your actual board.

Assembly of these connectors is highly custom specific. Discuss your needs with EKF before ordering, so that the optimum board configuration for your application will be chosen.
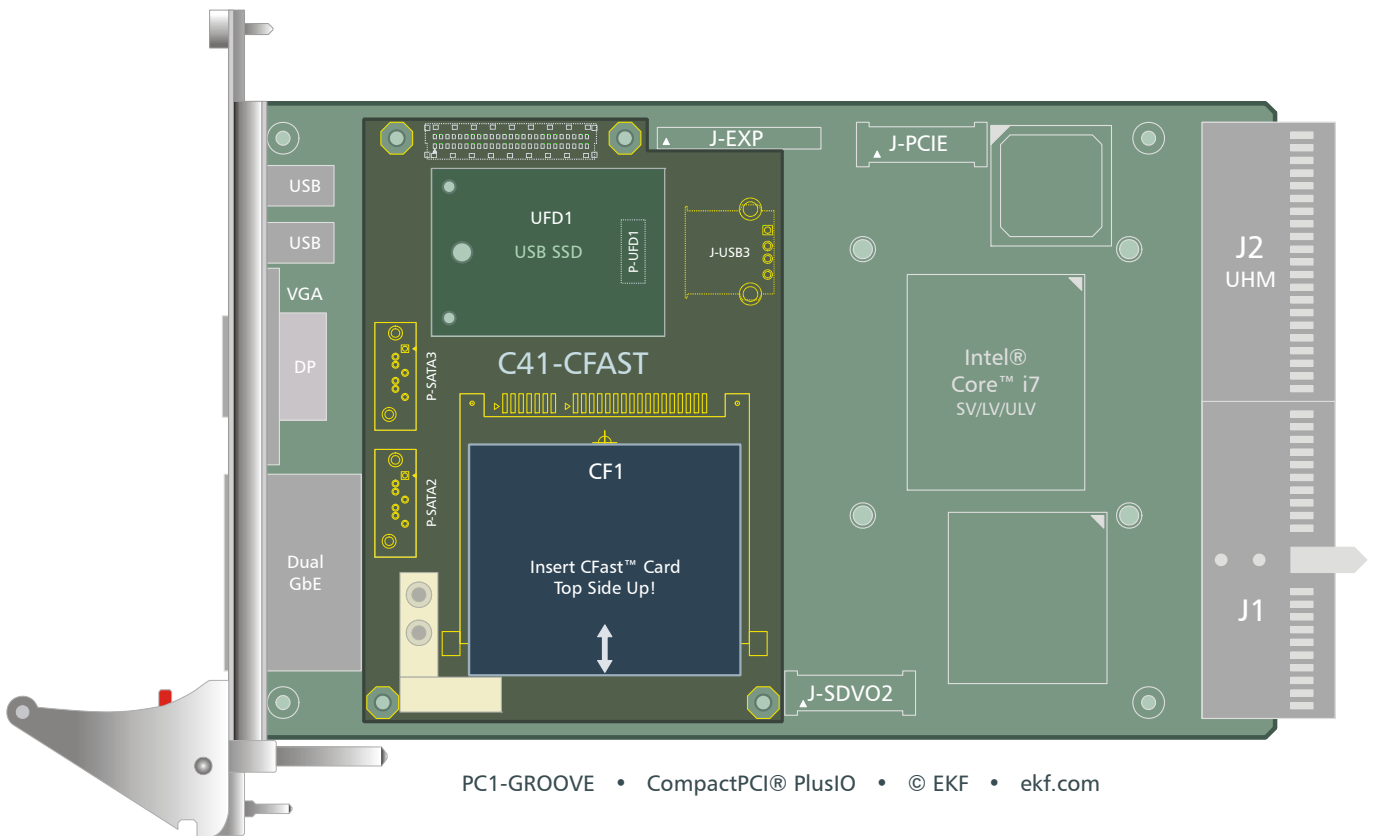
CF1 CFast™ Host Connector

As an option, the C41-CFAST can be provided with the CFast™ Host Connector CF1. It is suitable for CFast™ cards operated in SATA mode, which are available up to 32GB as of current. After inserted, the CFast™ card will have to be secured manually by a retainer assembly, in order to withstand shock and vibration.

CF1 CFast™ Host Connector 218.5.024.1	
Part No. 218.5.024.1 • CFast™ Host Connector • © EKF • ekf.com	
S1	GND
S2	SATA1_TXP
S3	SATA1_TXN
S4	GND
S5	SATA1_RXN
S6	SATA1_RXP
S7	GND
PC1	CDI
PC2	GND
PC3	TBD
PC4	TBD
PC5	TBD
PC6	TBD
PC7	GND
PC8	LED1
PC9	LED2
PC10	IO1
PC11	IO2
PC12	IO3
PC13	+3.3VS 1)
PC14	+3.3VS 1)
PC15	GND
PC16	GND
PC17	CDO

1)   Alternate stuffing for +5VS on request

The CFast™ card retainer assembly is comprised of several parts, which come with the C41-CFAST mezzanine module. If any element gets lost, spare parts may be obtained from EKF:
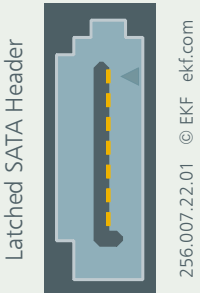
EKF Part #	Description	Qty
440.05.020.004	M2x4 cross recess screw	1
440.05.020.008	M2x8 cross recess screw	1
710.9.CFA.7	Base fixing element (PCB mount)	1
710.9.CFA.8	Removable fixing element	1

P-SATA2 P-SATA3

The C41-CFAST can be optionally stuffed with two vertical latched SATA signal headers. TX/RX designation of signals are shown with respect to the SATA controller. P-SATA2 corresponds to the SATA channel 0 of the JMB362 controller on the carrier board, and P-SATA3 is wired to the JMB362 SATA channel 1. The SATA ports can be used individually or as RAID 0/1.

Latching cable assemblies are recommended for reliable industrial usage. Both on-board SATA headers are aligned so, that a cable assembly with R/A plug leads to the rear side (opposite side with respect to the front panel), for system internal attachment of SATA drives.

Usage of P-SATA2/3 exceeds the 4HP total height of the board assembly (carrier board together with C41-CFAST mezzanine) by ~10mm, a cable harness with R/A SATA plug assumed. This is not tolerable for an additional 4HP mezzanine expansion card such as the CCL-CAPELLA or the CCI-RAP. Discuss your actual needs with sales@ekf.de before ordering.
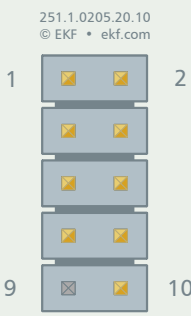
P-SATA2 P-SATA3 #256.007.22.01 Latched Headers	
1	GND
2	SATA_TX+
3	SATA_TX-
4	GND
5	SATA_RX-
6	SATA_RX+
7	GND

P-UFD1

As a custom specific option, the C41-CFAST can be provided with one USB SSD (Solid State Drive) low profile mezzanine module. However, the total stack height of the CPU carrier board and the C41-CFAST mezzanine module assembly would then exceed the 4HP envelope up to ~ 1.8mm. This may be tolerable under the condition that there is no 4HP pitch expansion side board mounted, or the locking screw for the USB Flash module is omitted, or the adjacent side board has no bottom mount components opposed to the USB SSD.

The UFD1 Flash module cannot be populated together with the J-USB3 receptacle, since both components would overlap each other. Be sure to discuss your needs with sales@ekf.de before ordering.

The C41-CFAST USB ports are derived from the ICH southbridge on the CPU carrier board. Self resettable fuses are provided on the C41-CFAST for short-circuit and overcurrent control regarding the P-UFD1 pin headers.

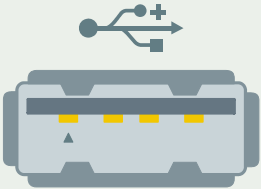| P-UFD1 P-UFD2 • 2.00mm Pin Header 2x5 (251.1.0205.20.10) USB Solid-State Drive (Low Profile) 562.20.0004.00 (4GB) Sandisk uSSD 5000 • STec SLUFDM • Intel Z-U130 SSDUSMS				
+5V 1)	1	2	NC
USB_D-	3	4	NC
USB_D+	5	6	NC
GND	7	8	NC
Mech. Key	9	10	NC

1)   Self resetting fuse 0.5A, power switched according to CPU carrier board sleep state

J-USB3

As a custom specific option, the C41-CFAST can be provided with one USB receptacles. Due to the USB connector dimensions, the total stack height of the CPU carrier board and the C41-CFAST mezzanine module assembly will exceed the 4HP envelope about ~1.3mm. This may be tolerable in some situations, but should be nevertheless considered. USB cable assemblies with slim and short plugs are also required - not any USB harness matches with the C41-CFAST due to space restrictions. The same issue must be strictly observed if direct attachment of an USB stick (e.g. Flash Drive) is intended - only a very short, low profile stick (with an overall length of less than 50mm) would be suitable.

The J-USB3 receptacle cannot be populated together with the UFD1 Flash module, since both components would overlap each other.Be sure to discuss your needs with sales@ekf.de before ordering.
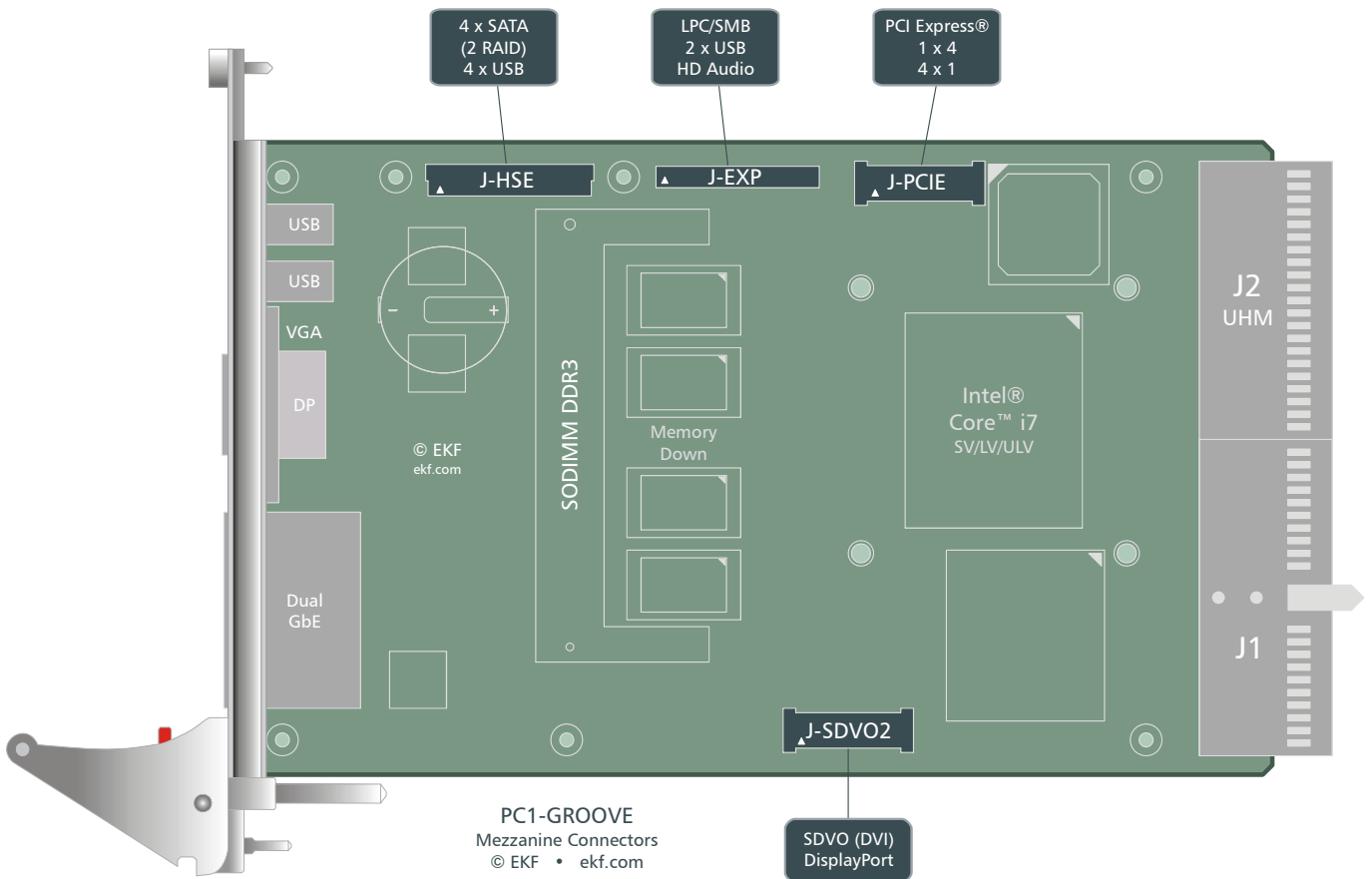
The C41-CFAST USB port are derived from the ICH southbridge on the CPU carrier board. A dual electronic switch is provided on the C41-CFAST for short-circuit and overcurrent control regarding the J-USB3 receptacle (0.5A).

USB Receptacles J-USB3 & J-USB4 • 270.20.04.0		
USB Receptacle © EKF • 270.20.04.0 • ekf.com 1) Dual Channel Electronic Switch Protection	1	+5V_USB 0.5A 1)
	2	DATA-
	3	DATA+
	4	GND

Inter-Board Connector

The C41-CFAST is equipped with a high speed mezzanine connector, mating with the connector J-HSE on the CCM-BOOGIE or PC1-GROOVE CPU board and its successors. The inter-board connector is situated at the bottom of the C41-CFAST and establishes the data path and power link to the carrier board CPU via J-HSE. Since the C41-CFAST comes typically mounted as a unit together with the CCM-BOOGIE or PC1-GROOVE, 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 C41-CFAST.

4 x SATA
(2 RAID)
4 x USB

LPC/SMB
2 x USB
HD Audio

PCI Express®
1 x 4
4 x 1

J-HSE   J-EXP   J-PCIE

USB
USB
VGA
DP

© EKF
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SODIMM DDR3

Memory
Down

Intel®
Core™ i7
SV/LV/ULV

J2
UHM

J1

Dual
GbE

J-SDVO2

SDVO (DVI)
DisplayPort
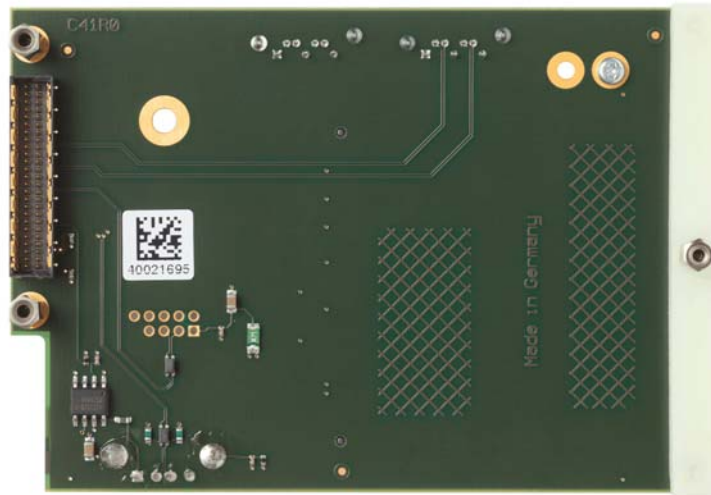
PC1-GROOVE
Mezzanine Connectors
© EKF • ekf.com

P-MEZ

The connector P-MEZ is a 1mm height shielded male pin header. Its counterpart on the CPU carrier board is J-HSE, a 8mm height receptacle, for a nominal headroom of 9mm between the boards.

| P-MEZ SATA & USB Mezzanine Interface			
1.00mm Pitch Male Connector 1mm Height (275.90.01.068.51)			
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_P*
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)
+5V	b24	a24	*+3.3V*
RSVD	b25	a25	*+12V*

1) 2)   Switched voltages from carrier board, according to CPU sleep state S0

3)   This SATA channel has been derived from ICH southbridge (dedicated to PATA bridge on C40-SCFA CompactFlash mezzanine module)

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)

C41-CFAST Bottom View
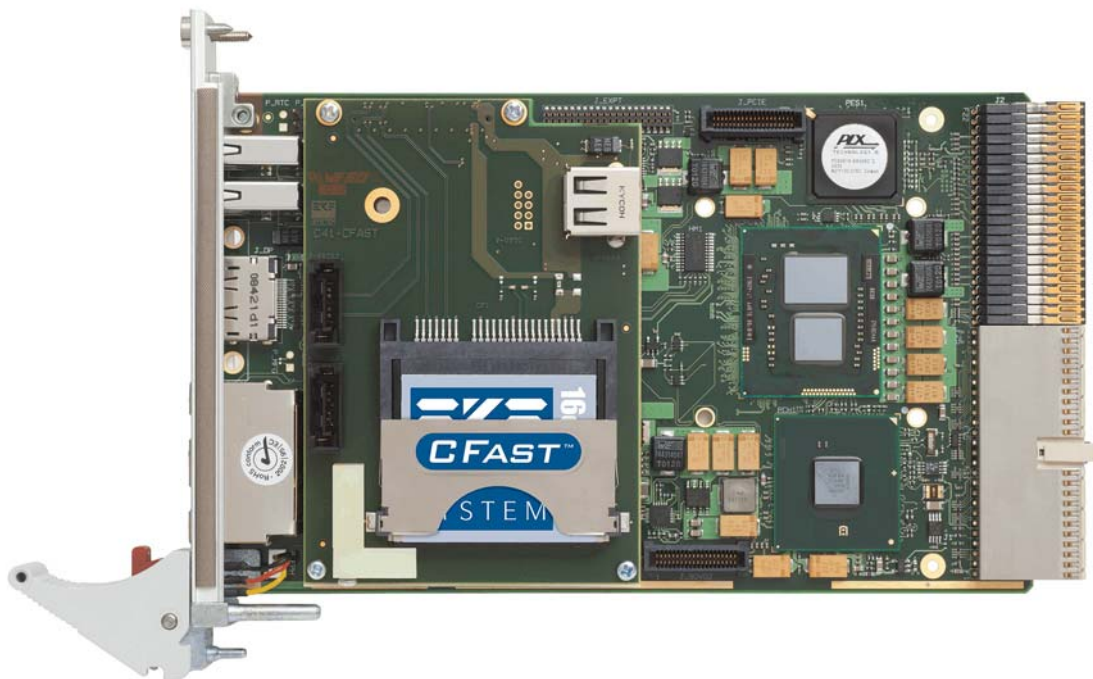
C41-CFAST on the PC1-GROOVE

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.
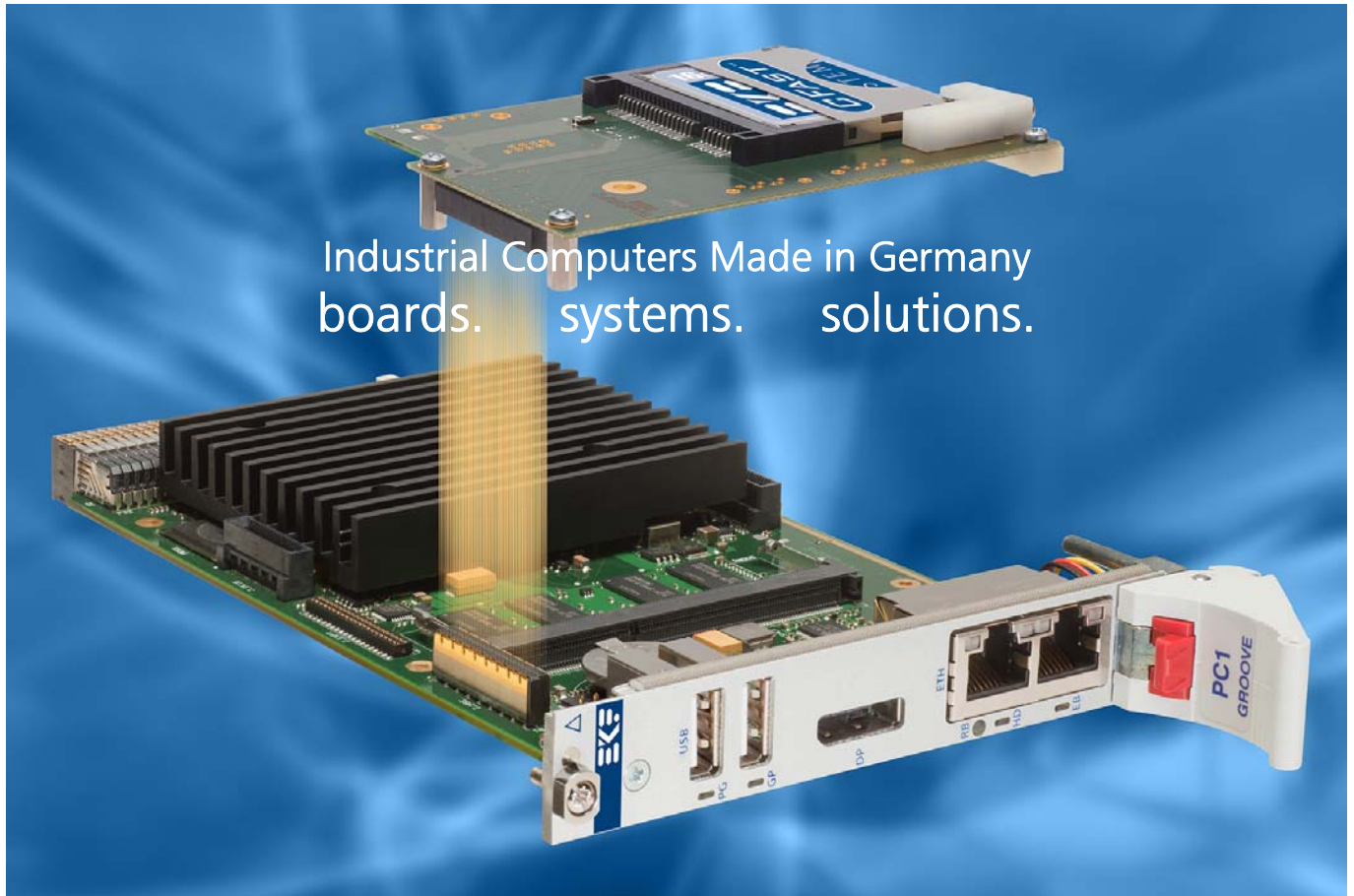
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Ordering Information

Ordering Information
For popular C41-CFAST SKUs please refer to www.ekf.com/liste/liste_20.html#C41

Industrial Computers Made in Germany
boards.   systems.   solutions.