

# » Kontron User's Guide «



## COM Express Type 6 Evaluation Carrier

Document Revision 1.1



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# 1 User Information

## 1.1 About This Document

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## 1.2 Copyright Notice

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- » Intel is a registered trademark of Intel Corp.
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## 1.4 Standards

Kontron is certified to ISO 9000 standards.

## 1.5 Warranty

This Kontron product is warranted against defects in material and workmanship for the warranty period from the date of shipment. During the warranty period, Kontron will at its discretion decide to repair or replace defective products.

Within the warranty period, the repair of products is free of charge as long as warranty conditions are observed.

The warranty does not apply to defects resulting from improper or inadequate maintenance or handling by the buyer, unauthorized modification or misuse, operation outside of the product's environmental specifications or improper installation or maintenance.

Kontron will not be responsible for any defects or damages to other products not supplied by Kontron that are caused by a faulty Kontron product.

## 1.6 Technical Support

Technicians and engineers from Kontron and/or its subsidiaries are available for technical support. We are committed to making our product easy to use and will help you use our products in your systems.

Please consult our Web site at <http://www.kontron.com/support> for the latest product documentation, utilities, drivers and support contacts. Consult our customer section <http://emdcustomersection.kontron.com> for the latest BIOS downloads, Product Change Notifications and additional tools and software. In any case you can always contact your board supplier for technical support.

## 2 Introduction

The COM Express® Evaluation carrier board for Type 6 modules is designed to allow embedded application developers to get up and running quickly on the COM Express® basic and compact form factors, giving them a head start on the total system design. Simply select a pin-out Type 6 COM Express CPU module, then Plug & Go. The Kontron COM Express® Eval Type 6 is an evaluation backplane for COM Express® Computer-on-Modules following the PICMG COM.0 specification with pin-out Type 6.

### Ordering Information

Article	Part-No.	Description
COM Express® Type 6 Evaluation Carrier	38106-0000-00-0	Evaluation Board COM.0 pin-out Type 6

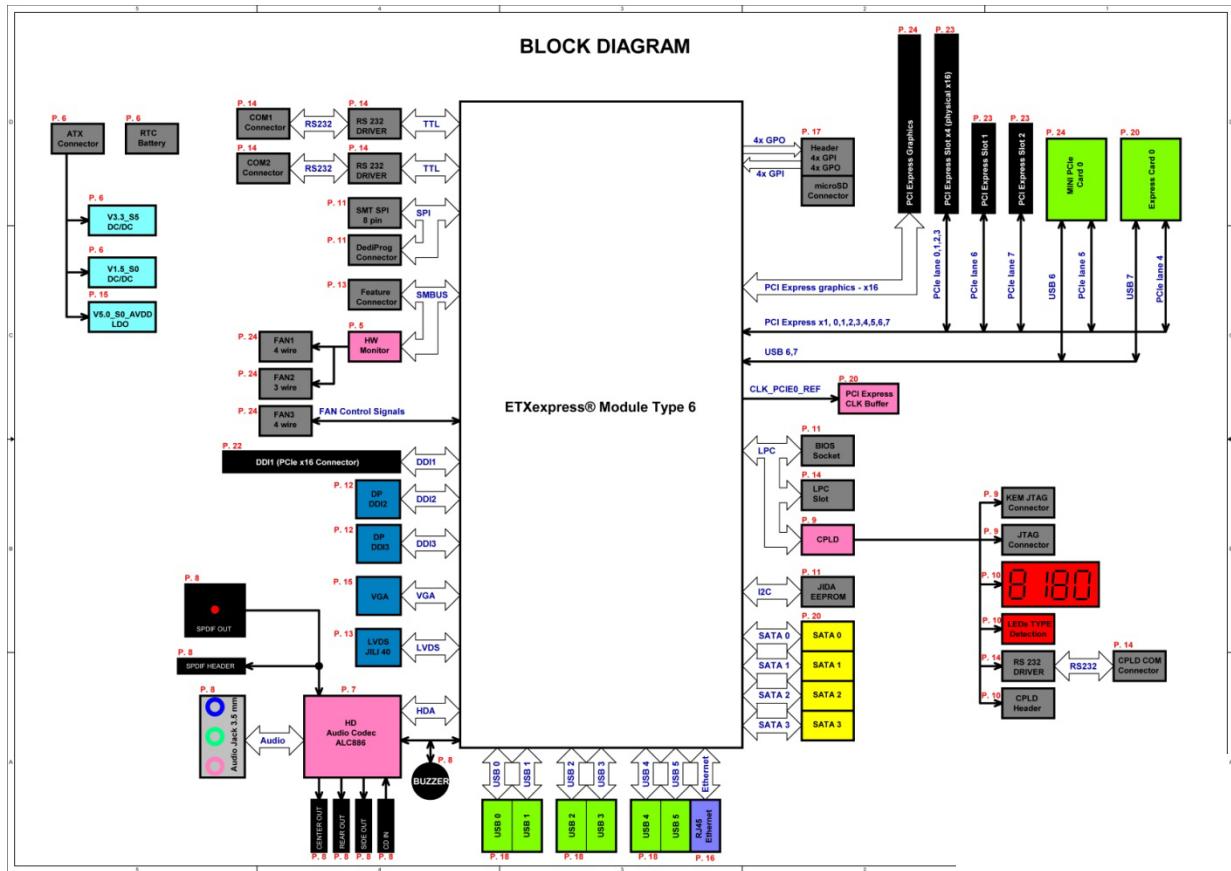
## 3 Specification

### 3.1 Functional Specification

- » COM Express® baseboard compatible to Type 6 pin-out based modules
- » ATX EPS (20pin + 4pin) power connector
- » 1x PEG x16 slot
- » 1x PCI Express x4 slots
- » 2x PCI Express x1 slots
- » 4 x SATA
- » 1x LVDS/JILI FFC 40 connector
- » 3x DDI (2x Display Port, 1x PCIe x16)
- » 1x PEG x16
- » 1x VGA
- » 1x 1x 10/100/1000 MBit LAN; RJ45 connector
- » 2x USB 2.0
- » 4x USB 3.0
- » 1x USB on Express Card
- » 1x USB on miniPCI Express
- » LPC Firmware Hub and SPI Flash support for external BIOS
- » Kontron feature connector
- » Front panel connectors (HDD Act., Reset and Power Switch)
- » Status LED
- » MicroSD Connector
- » GPIO pin header for module GPIO and Nuvotron LPC-I/O GPIO
- » 4 digit Port 80/81 POST code display with POST code control
- » LID and SLEEP support
- » Power Control functions (Power Button override, module single supply, power consumption measurements)
- » Realtek ALC886 HD-Audio
  - » Audio Jack 3 in 1
- » PWM FAN and Hardware Monitor connectors (FAN/Voltage)



### 3.2 Block Diagram



### 3.3 Mechanical Specification

- » Size: 243.8mm x 304.8mm
- » max height on top: 3.81mm (Connector J7)
- » PCB thickness: 1.55mm ±10%

## 3.4 Electrical Specification

### Supply Voltage

- » ATX Main Power 24pin
- » ATX\_12V P4 connector (wide range input depends on module specification)

### Power Supply Rise time

- » The input voltages shall rise from  $\leq 10\%$  of nominal to within the regulation ranges within 0.1ms to 20ms.
- » There must be a smooth and continuous ramp of each DC input voltage from 10% to 90% of its final set-point following the ATX specification

### Supply Voltage Ripple

- » Maximum 100 mV peak to peak 0-20MHz

## 3.5 Environmental Specification

### Ambient temperature

- » Operating: 0 to +60 °C
- » Non-operating: -30 to +85 °C

### Humidity

- » Operating: 10% to 90% (non condensing)
- » Non operating: 5% to 95% (non condensing)

## 3.6 MTBF

The following MTBF (Mean Time Between Failures) values were calculated using a combination of manufacturer's test data, if the data was available, and a Bellcore calculation for the remaining parts. The Bellcore calculation used is "Method 1 Case 1". In that particular method the components are assumed to be operating at a 50 % stress level in a 40° C ambient environment and the system is assumed to have not been burned in. Manufacturer's data has been used wherever possible. The manufacturer's data, when used, is specified at 50° C, so in that sense the following results are slightly conservative. The MTBF values shown below are for a 40° C in an office or telecommunications environment. Higher temperatures and other environmental stresses (extreme altitude, vibration, salt water exposure, etc.) lower MTBF values.

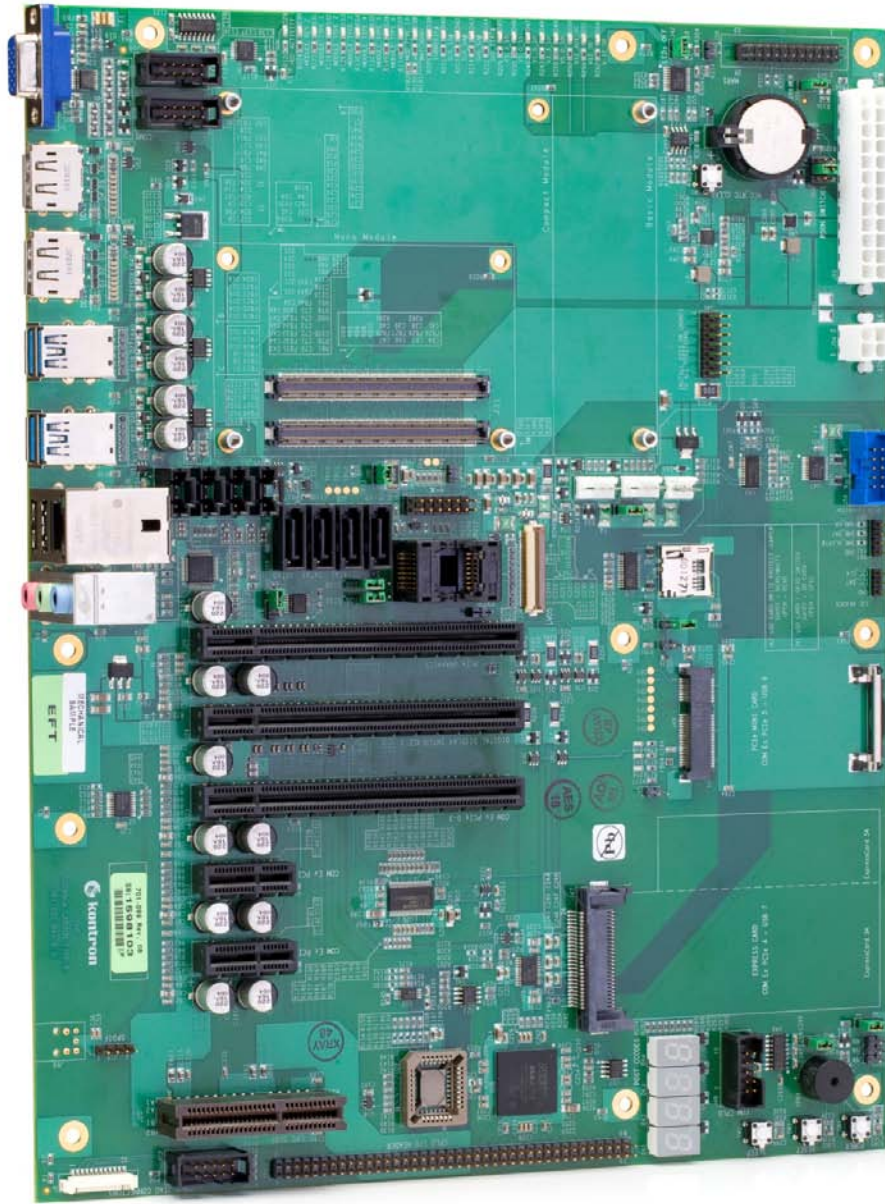
- » System MTBF: 227731 hours @ 40°C

## 4 Connector Layout

### 4.1 Rear Panel



## 4.2 Connector Locations



### 4.3 Component overview

Connector	Short Description
J1	VGA
J2	DP DDI2
J3	DP DDI3
J4, J5	2x Dual USB 3.0
J6A	Gigabit Ethernet
J6B	Dual USB 2.0
J9	COM1
J10	COM2
J12	CPLD JTAG
J14	SMBus Header
J16	S/PDIF Header
J17	I2C Header
J18, J19, J26, J29	SATA Ports
J20	LPC Slot
J21, J22	2x PCIe x1
J23	PCIe x4
J24	DDI1
J25	PCIe Graphics
J27, J28	BIOS Disable Jumpers
J31A	COM Express AB Connector
J31B	COM Express CD Connector
J32	SPI Flash Dediprog Connector
J36	LVDS
J37, J39, J43	3x Fan Header
J38	Fan Power
J44	HDD Activity LED
J46	MicroSD Card
J47	Express Card
J48	COM CPLD
J49	PCIe Mini Card
J50	Feature Connector - MARS compatible
J52	PC Buzzer
J54	12V for Module (4-pin)
J55	ATX Connector (24-pin)
J56	GPIO Connector
J58	SW4
J59	SW3
J60	SW2
J65	Side Audio
J66	Center Audio
J67	Rear Audio
U3	Audio Codec VR
U12	HD Audio Codec
U20	PCIe Clock Buffer
U22	SPI Flash

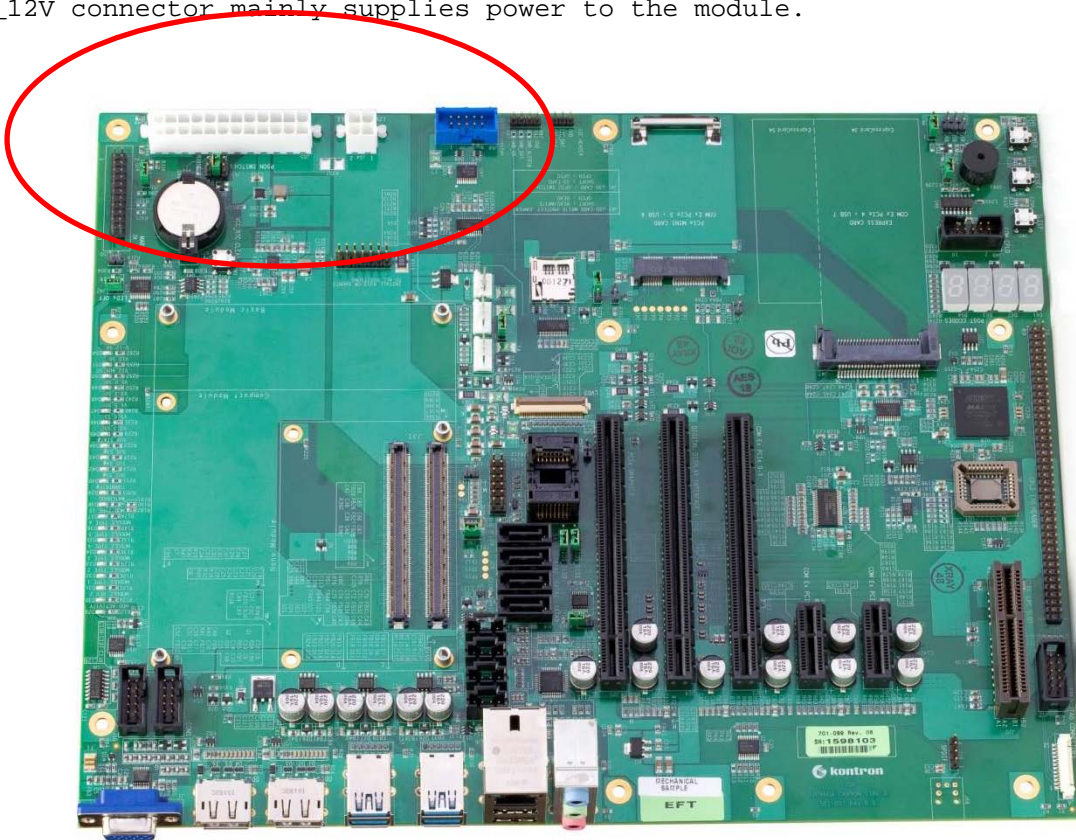
U28	EPM1270F256 CPLD
U29	Express Card Power
U38	SD Card / GPIO Switch
U41	JIDA EEPROM
U43	HW Monitor
D61, D62, D63, D64	POST Code Port 0x81 and Port 0x80

## 5 Connectors and Features

### 5.1 Power supply

#### 5.1.1 ATX connector

The COM Express® Eval Type 6 power supply follows the ATX 2.x specification and the baseboard should be supplied by connecting an ATX PSU with 24-pin ATX (J55) and 4-pin ATX\_12V (J54) supply cable in correct orientation. The 4-pin ATX\_12V connector mainly supplies power to the module.



Pin	ATX Main Power	Pin	ATX Main Power
1 (Orange)	+3.3V	13 (Orange/Brown)	+3.3V / +3.3V sense
2 (Orange)	+3.3V	14 (Blue)	-12V
3 (Black)	GND	15 (Black)	GND
4 (Red)	+5V	16 (Green)	Power on
5 (Black)	GND	17 (Black)	GND
6 (Red)	+5V	18 (Black)	GND
7 (Black)	GND	19 (Black)	GND
8 (Grey)	PWR_OK	20	No connection
9 (Purple)	+5VSB	21 (Red)	+5V
10 (Yellow)	+12V	22 (Red)	+5V
11 (Yellow)	+12V	23 (Red)	+5V
12 (Orange)	+3.3V	24 (Black)	GND



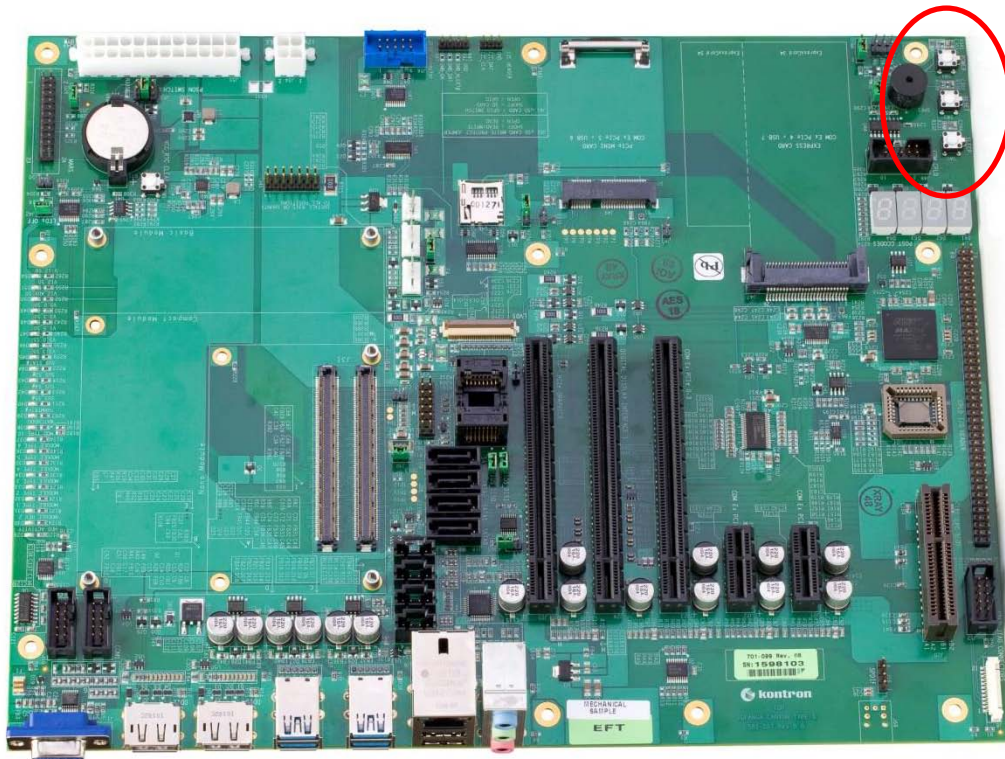
Pin	ATX_12V	Pin	ATX_12V
1 (Black)	GND	3 (Yellow)	Module VCC (12V nominal)
2 (Black)	GND	4 (Yellow)	Module VCC (12V nominal)

### 5.1.2 Reset and Power button

The COM Express® Eval Type 6 provides an onboard Reset Button (SW3) and Power Button (SW4).

Connector	Function
SW4	Power Button
SW3	Reset Button

### 5.1.3



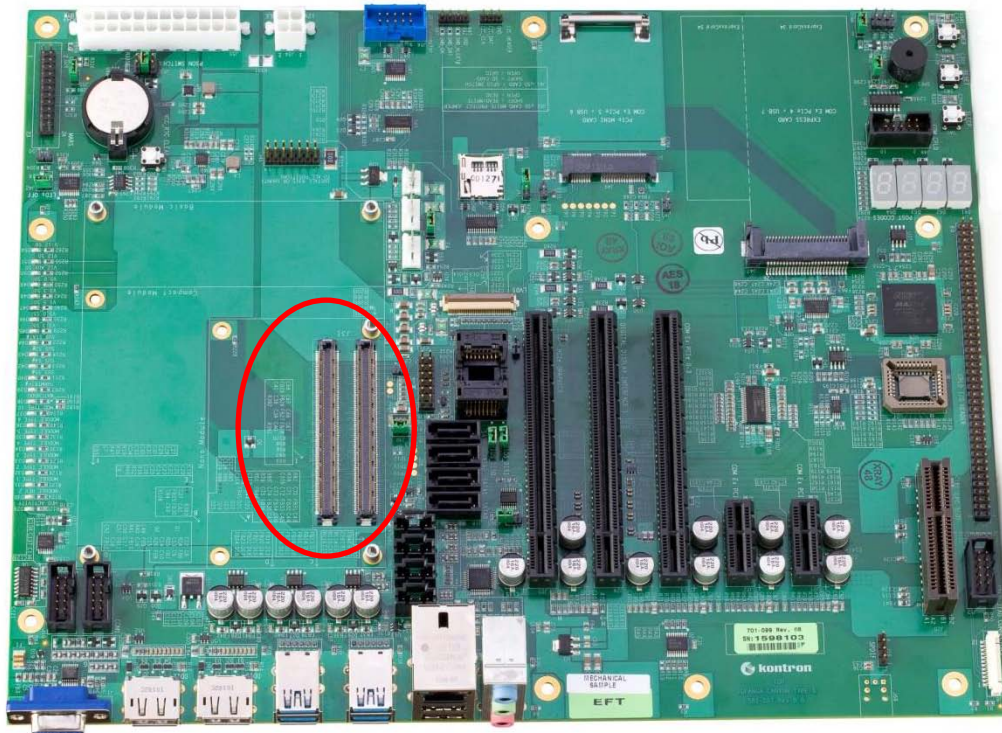
## Sleep

The latest specification updates for PICMG COM.0 modules implement new signals for Sleep. The low active signals can be simulated by pressing the sleep button.

Connector	Function
SW2	Sleep

## 5.2 COM Express® connector

The COM Express® Eval Type 6 is an evaluation carrier board for Type 6 based Computer-on-Modules. The type 6 module pin-out is based on two connectors with 2 rows (Row A and B and Row C and D) with 440 pins overall (220 pins for each of the two connectors). Please refer to your module documentation for detailed pin-out descriptions.

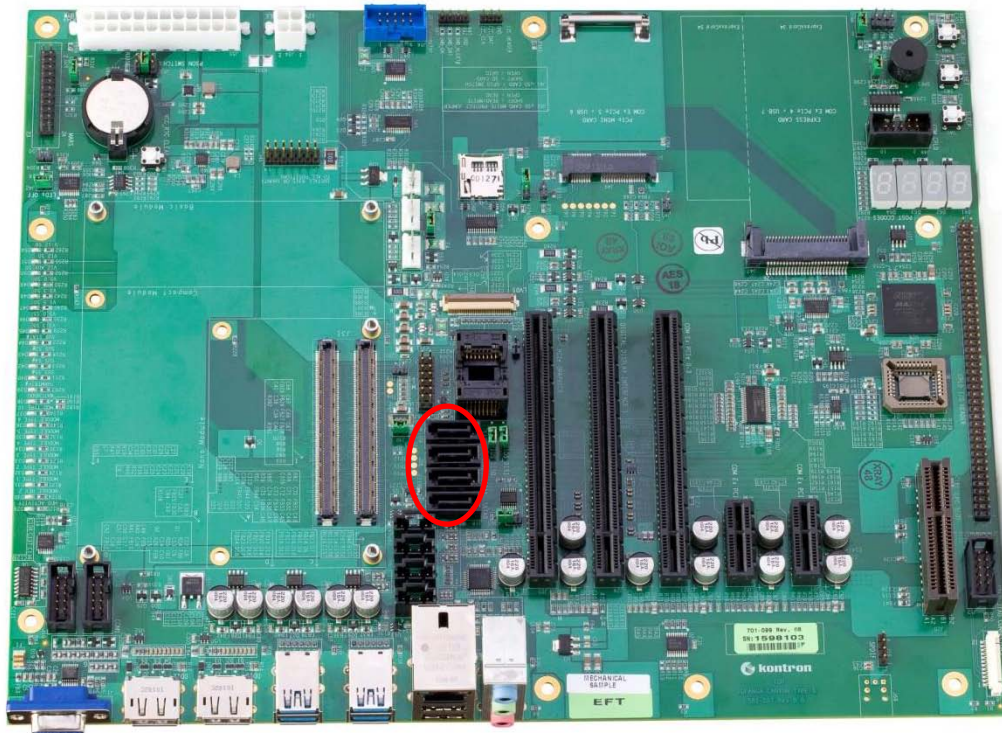


## 5.3 Serial ATA

The COM Express® Eval Type 6 provides 4 7-pin SATA data connectors as standard 1.27mm Pitch Serial ATA High Speed Header with Locking Latch.

SATA Pin	Signal
1	Ground
2	Transmit +
3	Transmit -
4	Ground
5	Receive -
6	Receive +
7	Ground

Connector	SATA Port
J18	SATA #0
J19	SATA #1
J26	SATA #2
J29	SATA #3

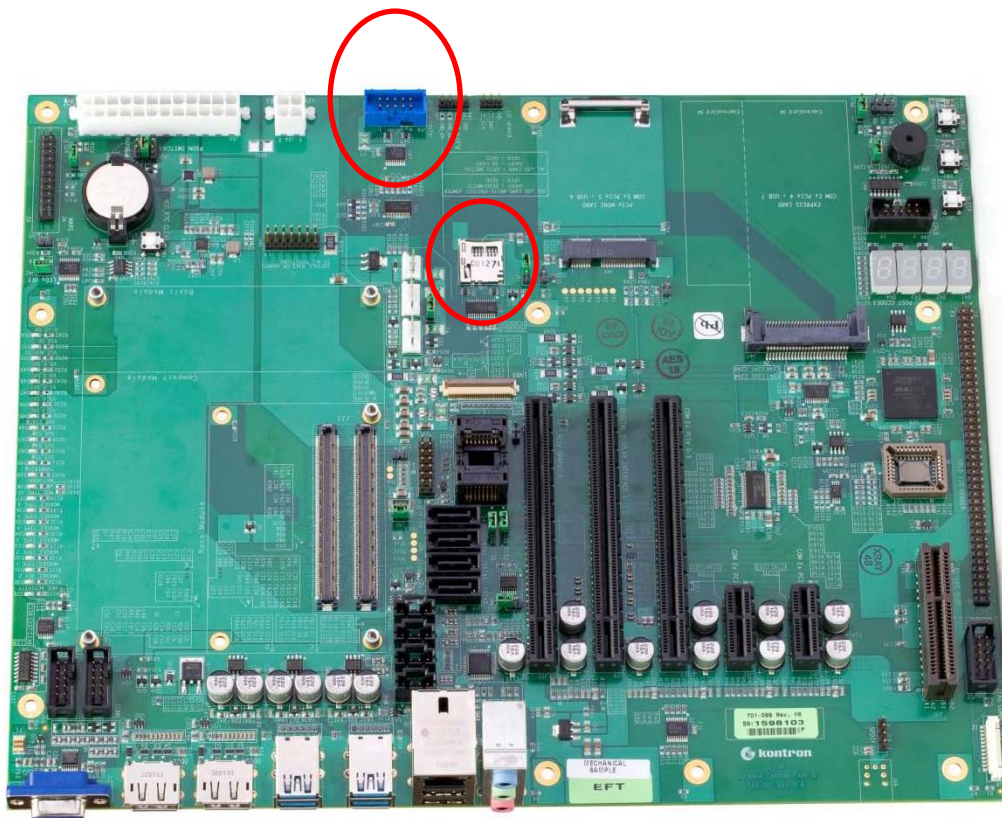


## SD-Card / Module GPIO

The SD-Card standard is a standard for removable memory storages designed and licensed by the SD Card Association (<http://sdcard.org>). The card form factor, electrical interface and protocol are all part of the SD Card specification. COM Express® Type 6 pin-out based modules may provide a SDIO interface shared with GPIO signals. Therefore on COM Express® Eval Type 6 a SD-Card connector is available. Please check the documentation of your module if SDIO is supported and how to enable.

This carrier features an SD Card slot at U38

The onboard GPIO connector is at J56



GPIO J48 PIN	Description	GPIO J48 Pin	Description
1	VCC 3.3V	2	GPO0 / SD_CLK
3	GPI0 / SD_DATA0	4	GPO1 / SD_CMD
5	GPI1 / SD_DATA1	6	GPO2 / SD_WP
7	GPI2 / SD_DATA2	8	GPO3 / SD_CD#
9	GPI3 / SD_DATA3	10	GND

Note1: A SD-Card is detected if Card Detect is at low level. The write protection is active (read only) if SD\_WP is at high level.

Note2: The switching circuitry which selects GPIO or SDIO interface may influence the signal quality of SDIO which results in detection or boot issues with some fast SD/SDHC cards. Therefore it's recommended to reduce SDIO interface speed to 24MHz in module's BIOS if supported

## 5.4 High Definition Audio

The COM Express® Eval Type 6 provides HDAudio via Realtek ALC886 High Definition Audio Codec supporting analog, optical and digital audio connections.

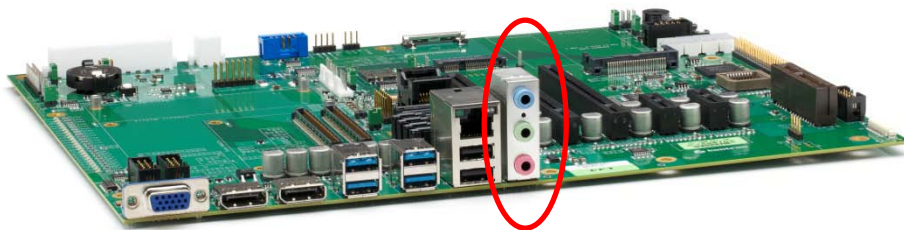
### Audio Connector J7 - Speaker Configuration

The Audio Connector J7 on the COM Express® Evaluation Board is a full featured analog audio jack for speaker configuration up to 8-channel.

J8	2-channel	4-channel	6-channel	8-channel
Blue	Line In	Line In	Line In	Line In
Green	Line Out	Front Speaker	Front Speaker	Front Speaker
Pink	Mic In	Mic In	Mic In	Mic In

**Note1:** In addition to the default speaker settings, the analog audio Jacks can be reconfigured to perform different functions via the Realtek HDAudio Driver Software which is available on Kontron website. Only microphones still must be connected to the default pink jack.

**Note2:** Audio is only supported with HD Audio compatible COM Express® Modules.





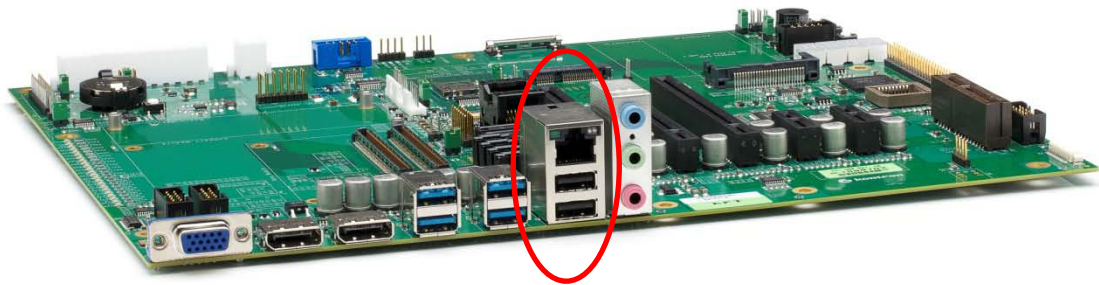
## Ethernet

The COM Express® Eval Type 6 provides a RJ45/Dual USB Combo with a single RJ45 in combination with 2 USB ports (USB 4/6). Ethernet Connector J6 with integrated magnetics and LED is configured to support modules with 10/100/1000.

### J6 LED function

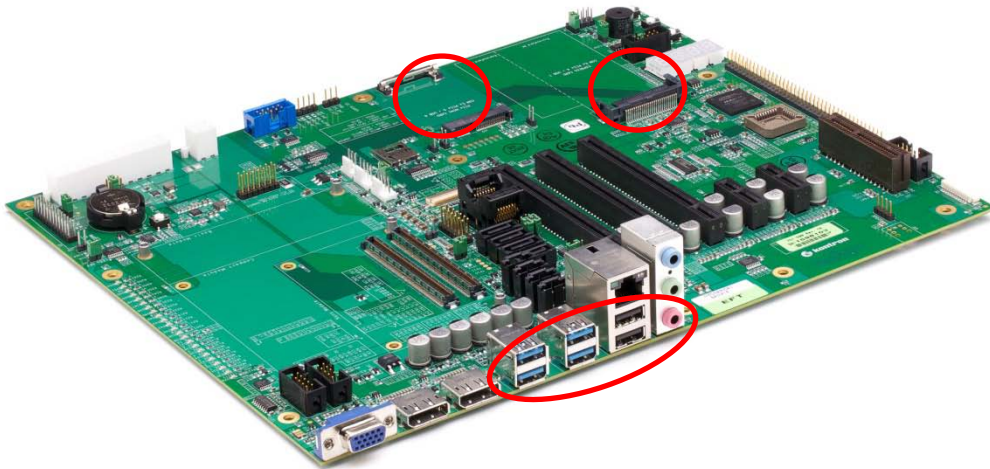
Function	J61 Left LED	J61 Right LED	Status LED
Activity	Green	-	D69
Link10	-	Off	D70
Link100	-	Yellow	D71
Link1000	-	Green	D72

## 5.5



## USB

The COM Express® module's USB ports 0 to 5 are available on rear panel connectors J4, J5, and J6. USB port 6 is used on Express Card connector and USB port 7 is used for the miniPCI Express card connector. The COM Express® Eval Type 6 provides USB port up to 8 with 2 on RJ45/USB Combo connector J6, 4 as standalone (J4, J5), 1 shared with Mini PCIe and 1 shared with the ExpressCard.



## 5.6 PCI

The COM Express® Eval Type 6 Does not support PCI

## 5.7 PCIexpress and Express Card

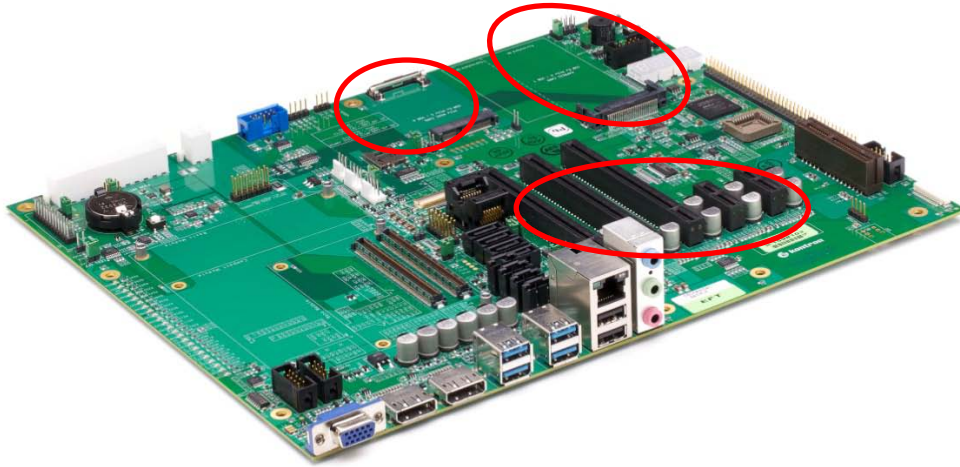
The COM Express® Eval Type 6 provides two PCIexpress x1 slots, three PCIexpress x16 slots (1 x4 slot), one Express Card Slot, and one Mini PCIe.

Connector	Function
J25	PCIe Graphics
J24	Digital display interface 1
J23	PCIe x16 (0-3)
J22	PCIe (6) x1
J21	PCIe (7) x1
J49	PCIe Mini Card / PCIe 5 / USB 6
J47	Express Card (supports 34 and 54)/ PCIe 4 / USB 7

### Express Card

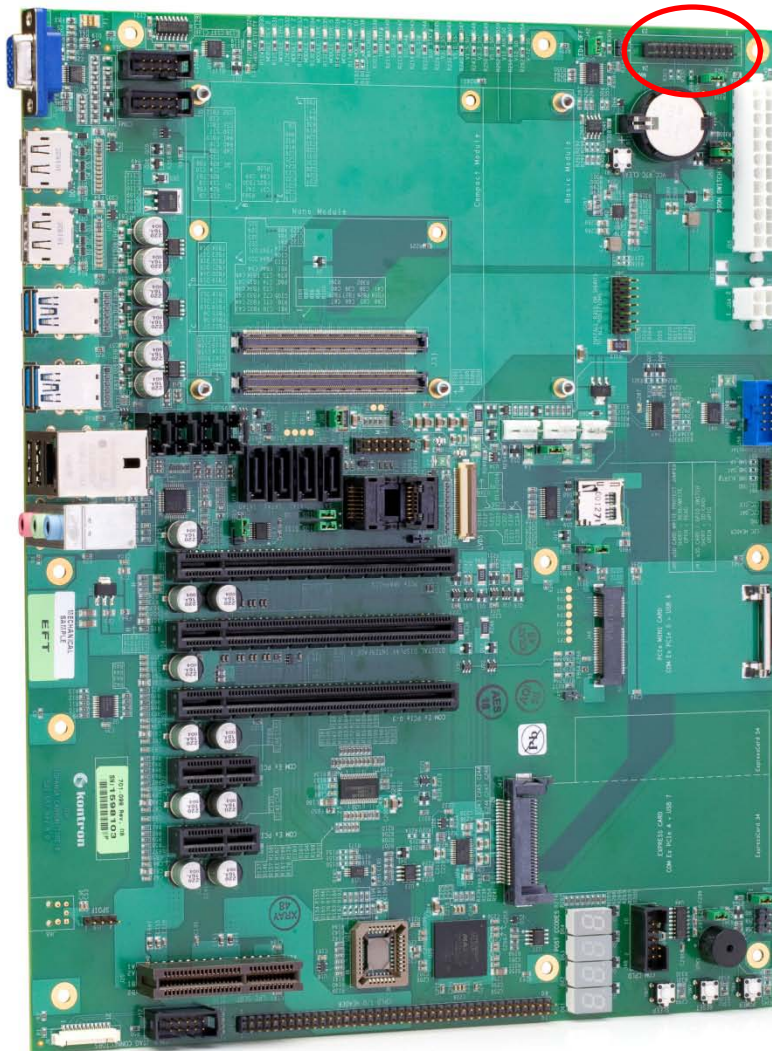
The Express Card Slot J41 in combination with USB #5 allows 1.3A on 3.3V, 275mA on AuxPower and 650mA on 1.5V continuous Card Power with pin-out in table below. Close configuration jumper J64 to disable the Express Card slot

Pin	J41 Signal	Pin	J41 Signal
1	GND	14	3.3VS_1
2	USB_D-	15	3.3VS_0
3	USB_D+	16	CLKREQ#
4	CPUSB#	17	CPPE#
5	NC	18	REFCLK-
6	NC	19	REFCLK+
7	SMB_CLK	20	GND
8	SMB_DATA	21	PERN0
9	1.5V_2	22	PERP0
10	1.5V_1	23	GND_1



## 5.8 MARS connector

The MARS connector (J50) provides additional interfaces for Smart Battery Power Control Signals.



## 5.9 VGA & DP

On COM Express® Eval Type 6 the VGA output (J1) is available along with 2x DP (J2, J3).

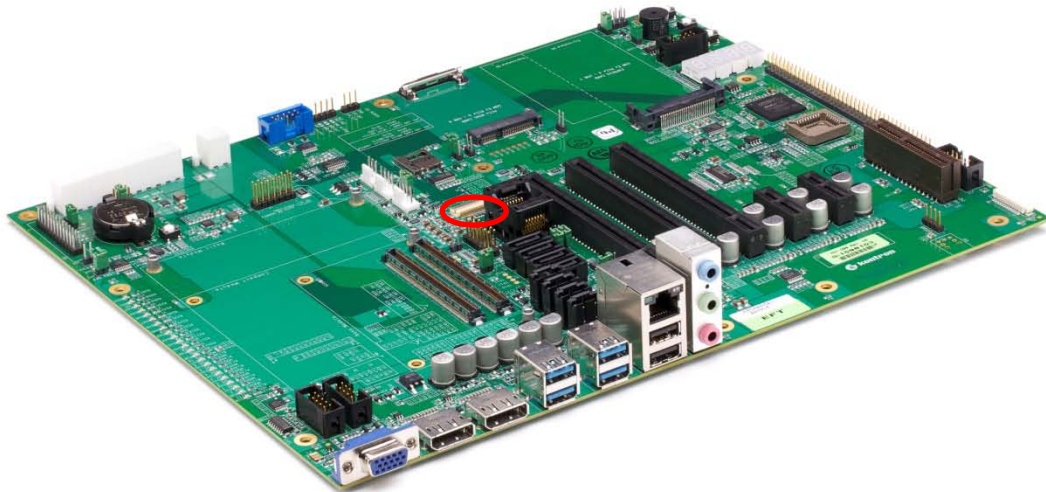
## 5.10



## LVDS

The 40-pin JILI LVDS panel connector J36 allows connecting a flat panel directly to the module's dual channel LVDS output. Check your module documentation for available BIOS configurations for this flat panel output.

Pin	LVDS Signal	Pin	LVDS Signal
1	NC	21	LCDDO13
2	LCDDO0	22	DETECT# (GND)
3	LCDDO1	23	LCDDO14
4	ENAVDD	24	LCDDO15
5	LCDDO2	25	GND
6	LCDDO3	26	LCDDO16
7	NC	27	LCDDO17
8	LCDDO4	28	GND
9	LCDDO5	29	LCDDO18
10	GND	30	LCDDO19
11	LCDDO6	31	+5V
12	LCDDO7	32	+5V
13	GND	33	+5V
14	LCDDO8	34	+5V
15	LCDDO9	35	BLON#
16	JILI_DAT	36	GND
17	LCDDO10	37	GND
18	LCDDO11	38	+12V
19	JILI_CLK	39	+12V
20	LCDDO12	40	+12V





## 5.11 External BIOS

The COM Express® Eval Type 6 supports external boot. By closing Jumper J27 the module's onboard BIOS is disabled and the system will boot from an external Firmware Hub in U21 PLCC socket.

For modules supporting SPI boot the COM Express® Eval Type 6 provides a SPI socket U22 for an optional available SPI Flash. SPI is part of COM.0 Specification Rev 2.0 and external SPI boot can be enabled by closing Jumper J27. Please check the documentation of your module if SPI is supported and which SPI Flash size is required.

### Booting from external BIOS:

- » Close Jumper J27 to boot from the baseboard's SPI Flash

### Flashing the external BIOS:

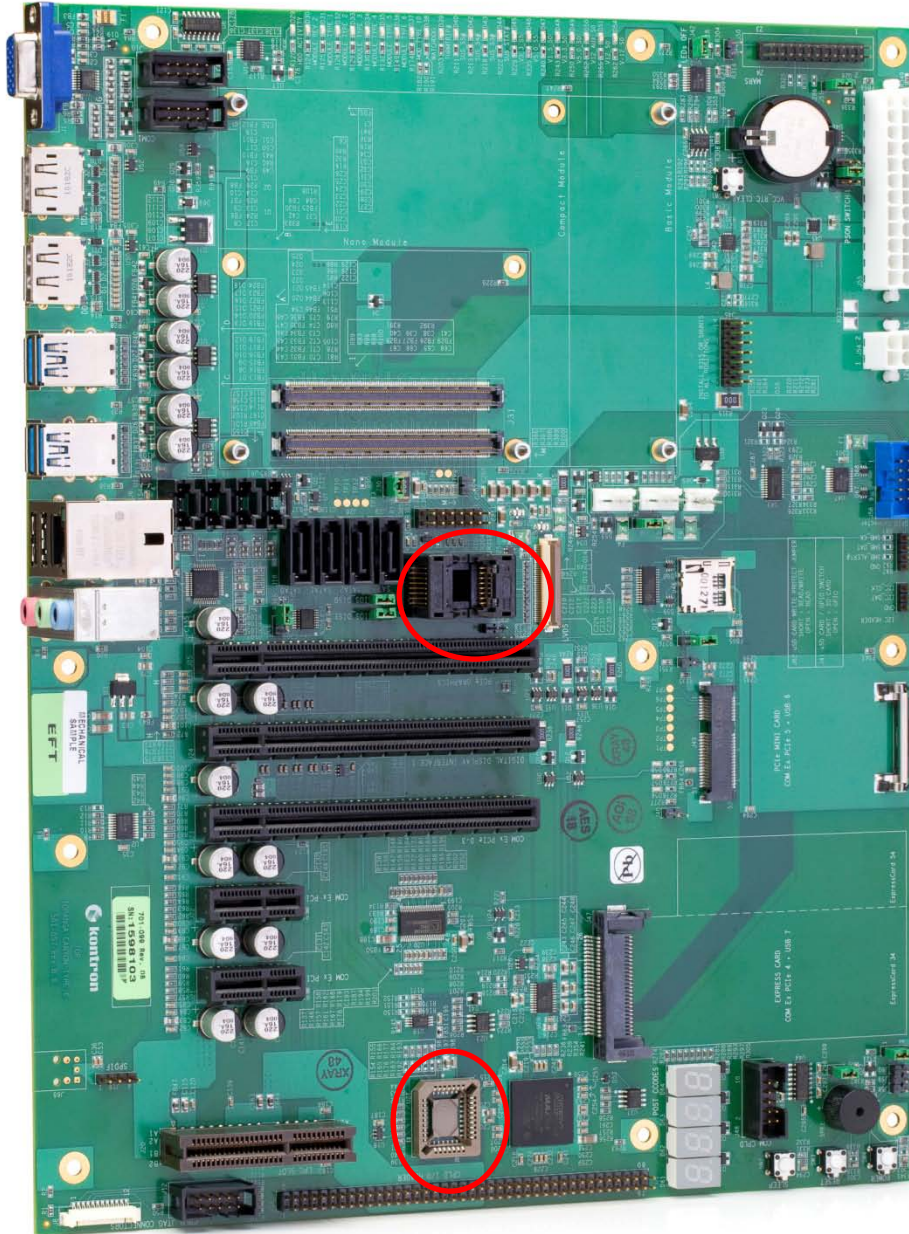
- » Prepare a bootable USB flash drive and save BIOS and flash utility in the root folder

Please check Application Note KEMAP046 available at Kontron's customer section for more details

- » Open J27 to boot from the module's BIOS
- » Power on the system and boot from our USB flash drive
- » Close J46 to enable the LPC FWH or close J75 to enable the SPI Flash
- » Execute the BIOS update command (e.g. `afudos.exe bios.rom /P /B /N /C /X`)
- » Reboot your system if flash procedure has finished
- » Your system should now start from external BIOS

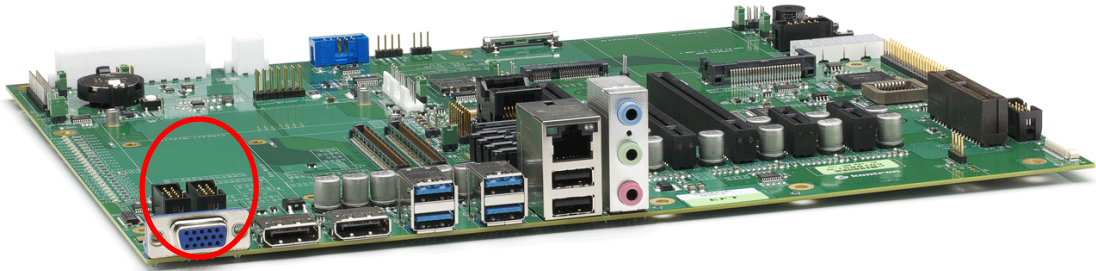
Note: Please check module documentation if external boot from LPC FWH and/or SPI Flash is supported

Warning: Do not close both jumpers at the same time



## 5.12 Serial Interface

The PICMG COM.0 specification defines two optional 2-pin serial interfaces on COM Express® connector pins A98/A99 and A101/A102 formerly used for 12V VCC input. Both new interfaces are available directly on optional pin-header J9 and J10.



J9 and J10 allow both interfaces to be used as 2-pin RS232 interfaces COMA and COMB with Kontron Adapter cable [KAB-DSUB9-2](#). Please check the documentation of your module if this interface is supported and how to configure.

Pin	J9 (COMA)	J10 (COMB)
1	n.c.	n.c.
2	n.c.	n.c.
3	RX0	RX1
4	n.c.	n.c.
5	TX0	TX1
6	n.c.	n.c.
7	n.c.	n.c.
8	n.c.	n.c.
9	GND	GND
10	N.C.	N.C.

## 5.13 CPLD & POST-Code Display

Power Management control, 4 digits LPC/PCI Port 80/81 Post Code and additional GPIOs are implemented in onboard Altera CPLD (U28).

### Port 80/81 POST Code

The 7-segment display D63/D64 for Port 81 and D61/62 for Port 80 shows BIOS status codes during boot-up process.

**J12 - CPLD JTAG Connector**

J7 pin	Function	J7 pin	Function
1	TCK (PU 1K0)	2	GND
3	TDO (PU 1K0 3.3VSBY)	4	3.3V SBY
5	TMS (PU 1K0 3.3VSBY)	6	n.c.
7	n.c.	8	n.c.
9	TDI (PU 1K0 3.3VSBY)	10	GND

### 5.13.1 FAN

The COM Express® Eval Type 6 provides two 4-pin (J37, J39) and one 3-pin (J43) PWM FAN connectors.

J39 and J43 are controlled by HW monitor (ADT7476) at U44.

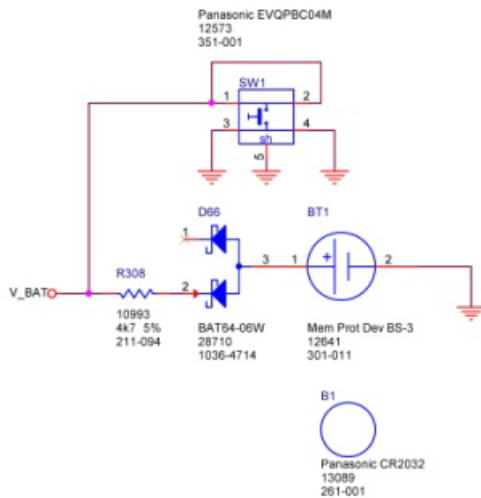
J37 is controlled by the COM Express module selected for use with the carrier board.

### 5.14 FRU-PROM (I2C EEPROM)

Following the new COM Express® specification, the COM Express® Eval Type 6 provides an I2C EEPROM. The FRU-PROM (Field Replacable Unit; U4) at I2C address 0<AF. The default setting is write protected. This is for Kontron factory use and not recommended for non-Kontron modification.

## 6 Battery Information

### RTC Battery Socket with VCC RTC clear button



#### English:

**CAUTION:** Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

#### Deutsch:

**VORSICHT:** Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch denselben oder einen vom Hersteller empfohlenen gleichwertigen Typ. Entsorgung gebrauchter Batterien nach Angaben des Herstellers.

#### French:

**ATTENTION:** Risque d'explosion avec l'échange inadéquat de la batterie. Remplacement seulement par le même ou un type équivalent recommandé par le producteur. L'évacuation des batteries usagées conformément à des indications du fabricant.

**Danish:**

ADVARSEL: Lithiumbatteri - Eksplosionsfare ved fejlagtig Håndtering.  
 Udskifting må kun ske med batteri af samme fabrikant og type.  
 Lever det brugte batteri tilbage til leverandøren.

**Finnish:**

VAROITUS: Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda  
 paristo ainoastaanlaltevalmistajan suosittelmaan tyyppiln.  
 Havita kaytetty paristo valmistajan ohjeiden mukaisesti.

**Spanish:**

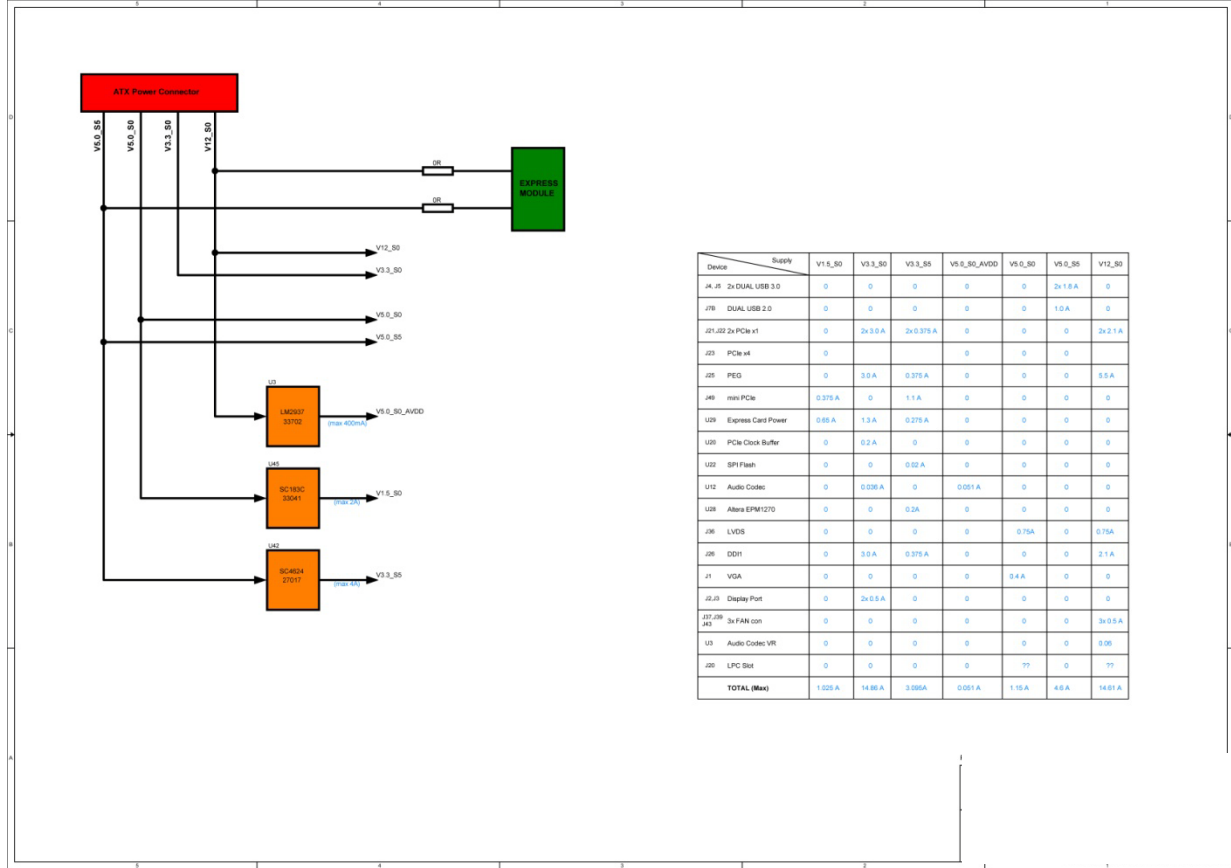
Precaución: Peligro de explosión si la batería se sustituye incorrectamente.  
 Sustituya solamente por el mismo o tipo equivalente recomendado  
 por el fabricante. Disponga las baterías usadas según las  
 instrucciones del fabricante.

Note: The battery of this product is not considered to be  
 accessible by the end user. Therefore the safety instructions are  
 only given in English, German, French, Danish, Finish and Spanish  
 language.

If the battery of this product however is accessible by the end  
 user, it is in the responsibility of the Kontron customer to give the  
 corresponding safety instructions in the required language(s).



# 7 Power Distribution



## 8 Security Advice

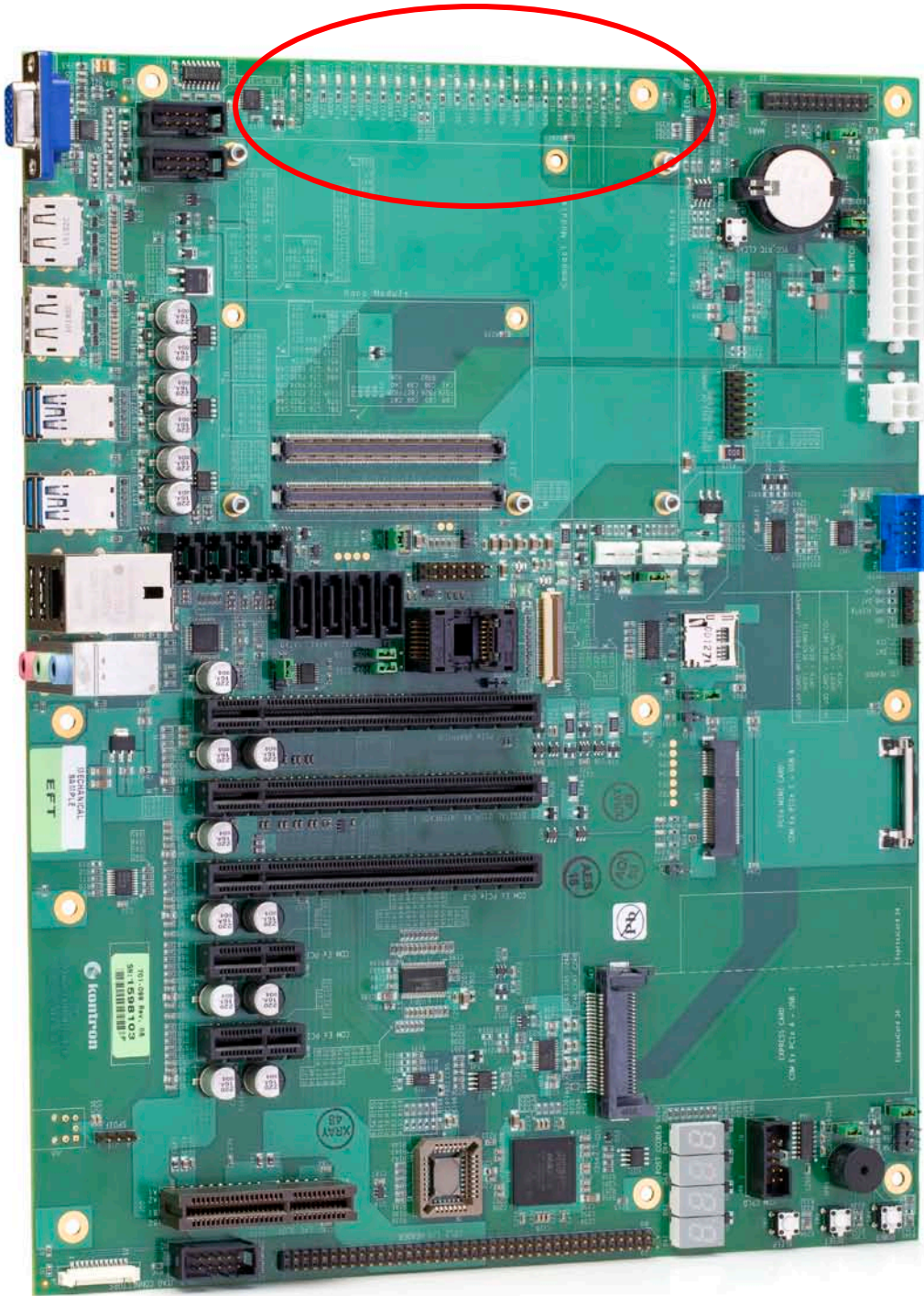
To protect the external power lines to peripheral devices the customer has to take care about:

- The wires to the external device have the right diameter to withstand the maximum available current
- The housing of the external device fulfils the fire protection requirements of IEC/EN 60950.

## 9 LEC Indicators

For user convenience, Kontron has included some LED indicators along the side of the board design. These are noted in the chart below and circled in the picture of the carrier board included at the end of this section.

Resistor	LED	Function
R120	D29	Hdd Activity
R124	D30	Module Rev 2
R125	D31	Module Type 1
R126	D32	Module Type 2
R129	D33	Module Type 3
R130	D34	Module Type 4
R132	D35	Module Type 5
R149	D36	Module Type 6
R174	D37	Module Type 10
R191	D38	Watchdog
R203	D39	THRMTRIP#
R211	D40	SUS_S5#
R213	D42	SUS_S4#
R216	D43	SUS_S3#
R222	D44	Sus_state#
R229	D45	V3.3_S5
R235	D46	V5.0_S5
R240	D47	V1.5_S0
R243	D48	V3.3_S0
R250	D49	V5.0_S0
R252	D50	V12_AUX_S0
R255	D51	V12_S0
R262	D54	V-12_S0



## 10 Document Revision History

Revision	Date	Edited by	Changes
0.1_prelim	1 Nov 2011	CAV	Initial Release for COM Express Type 6 Evaluation carrier board
0.2_prelim	8 Feb 2012	CAV	Engineering updates throughout Future revision will include chapter for the indicator LEDs.
1.0	27 Feb 2012	CAV	Addition of the LED indicator section and minor corrections throughout
1.1	30 May 2012	CAV	Page numbering update and update to info about SD-card

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