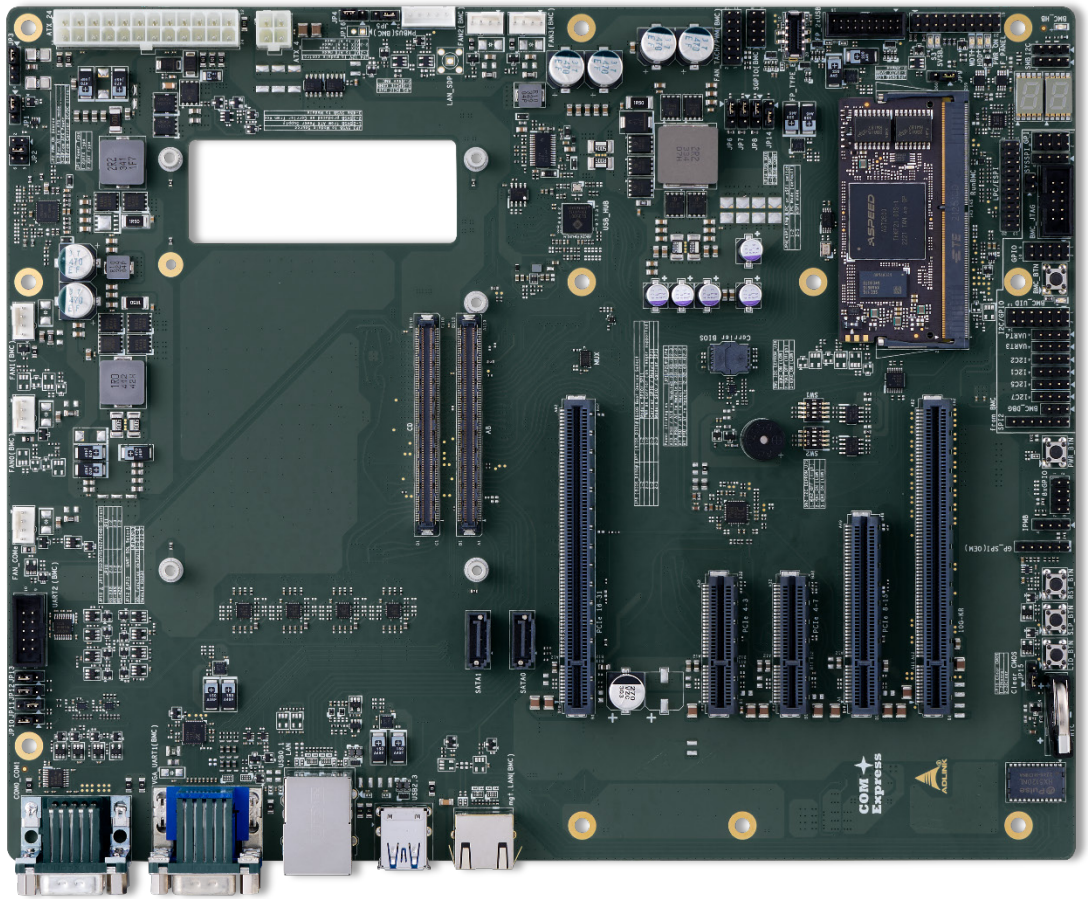
Express-BASE7 R3.1

User's Guide



COM Express®

Revision:	0.5
Date:	2026-07-21
Part Number:	50M-77109-1000

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LEADING EDGE AI COMPUTING

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Revision History

Revision	Description	Date	Author
0.1	Preliminary release	2026-01-13	AL
0.2	Connectors, pinouts, and jumpers updated	2026-01-14	AL
0.3	Connectors, pinouts, and jumpers updated	2026-01-20	AL
0.4	Connectors, pinouts, and jumpers updated and appendix added, change location diagram.	2026-01-21	AL
0.5	Introduction, specifications, connectors, jumpers, and switch locations, pinout and signal descriptions, mechanical dimensions, appendix updated	2026-07-21	AL

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Preface

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Safety Instructions

For user safety, please read and follow all Instructions, **WARNING**s, **CAUTION**s, and **NOTE**s marked in this manual and on the associated equipment before handling/operating the equipment.

Read these safety instructions carefully.

- ☐ Keep this manual for future reference.
- ☐ Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- ☐ Turn off power and unplug any power cords/cables when installing/mounting or un-installing/removing equipment.
- ☐ To avoid electrical shock and/or damage to equipment:
- ☐ Keep equipment away from water or liquid sources;
- ☐ Keep equipment away from high heat or high humidity;
- ☐ Keep equipment properly ventilated (do not block or cover ventilation openings);
- ☐ Make sure to use recommended voltage and power source settings;
- ☐ Always install and operate equipment near an easily accessible electrical socket outlet;
- ☐ Secure the power cord (do not place any object on/over the power cord);
- ☐ Only install/attach and operate equipment on stable surfaces and/or recommended mountings;
- ☐ If the equipment will not be used for long periods of time, turn off the power source and unplug the equipment.

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Conventions

The following conventions may be used throughout this manual, denoting special levels of information

Note: This information adds clarity or specifics to text and illustrations.

Caution: This information indicates the possibility of minor physical injury, component damage, data loss, and/or program corruption.

Warning: This information warns of possible serious physical injury, component damage, data loss, and/or program corruption.

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1. Introduction

Leveraging the COM Express standard and off-the-shelf silicon for custom carrier boards relieves developers of the need to design their own system core. This not only significantly accelerates proof-of-concept development but also enables seamless upgrades to later-generation processors without requiring a redesign. It is ideal for system integration projects with production volumes ranging from 500 to 10,000 units per year. The COM Express concept reduces engineering complexity, lowers the minimum project volume required to justify development, and, last but not least, helps bring your product to market in less time. On average, designing a carrier board takes less than half the time required to develop a fully custom OEM board.

The Express-BASE7 R3.1, based on the **PICMG COM.0 Rev. 3.1** specification, is a **standard ATX-size** carrier board. Combined with a COM Express Type 7 module of your choice and off-the-shelf adapter cards, it enables you to quickly emulate the functionality of your target end product for software development and hardware verification.

To build a functional prototype of your target system, you will need:

- COM Express Type 7 module (based on COM.0 R3.1 specification)
- Express-BASE7 R3.1 carrier board (based on COM.0 R3.1 specification)
- 10GbE Ethernet adapter card (2 options available, dedicated to each COM Express Type 7 module
  - 10G SFP+ card (10GBASE-KR to 10G SFP+, based on COM.0 R3.1 specification)
  - 10GBASE-T card (10GBASE-KR to 10GBASE-T, based on COM.0 R3.1 specification)
- SATA drive storage or flash disk solution

The Express-BASE7 R3.1 carrier is compatible with Basic size and Compact size COMe Type 7 modules, and accommodates:

- 1x PCI Express x16 slot with proprietary pinout for inserting a 10GbE Ethernet adapter card (up to 4x 10G signals, dependent on module)
- 1x PCI Express x16 slot, 2x PCI Express x4 slots, 1x PCI Express x8 slot, all supporting PCIe Gen4
- 1x 260-pin SO-DIMM socket for the RunBMC module and multiple headers/connectors for interfaces come from RunBMC module

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Note: The x16 slot (PCIe lanes 16–31) for general-purpose PCIe usage is, by default, based on the second PCIe clock as defined in the PICMG R3.1 specification. However, we need to include a BOM option to support a single PCIe clock for this x16 slot. Not every platform requires a second PCIe clock for Gen4 operation.

Note: Support for PCIe Gen4 speed and the addition of the RunBMC module are the main updates in the new Express-BASE7 R3.1.

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2. Specifications

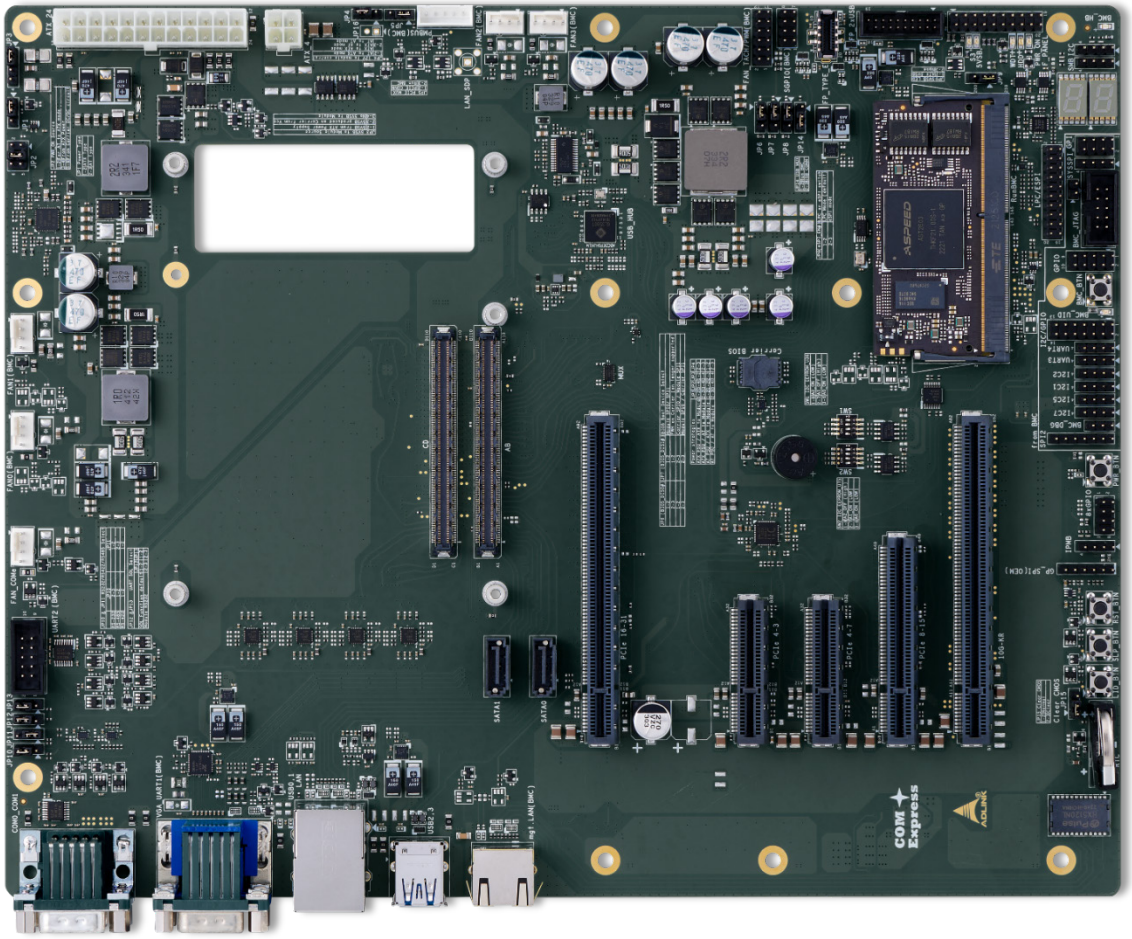


Figure 1 – Carrier top view

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2.1 4x 10GBASE-KR Connector

The Express-BASE7 R3.1 features a PCI Express x16 slot with proprietary pinout for COM Express COM.0 R3.1 Type 7 modules. This slot can route up to four 10GBASE-KR signals from the COM Express Type 7 R3.1 module to a 10GbE Ethernet adapter card for up to four SFP+ signals or 10GBASE-T ports.

Two optional 10GbE Ethernet adapter cards are available for prototyping:

- **10G SFP+ Card:** converts up to 4x 10GBASE-KR signals to 4x SFP+ signals through high-end optical fiber PHY
- **10GBASE-T Card:** converts up to 4x 10GBASE-KR signals to 4x 10GBASE-T signals through high-end copper PHY

2.2 32x PCI Express Lanes

1x PCI Express x16 slot, 2x PCI Express x4 slots, 1x PCI Express x8 slot, for peripheral expansion such as data acquisition cards, **all Gen4 speed**

- PCIe lane 15-31 at x16 slot. This x16 slot support **2-slot width** PCIe based cards.
- PCIe lane 0-3 at x4 slot, PCIe lane 4-7 at the other x4 slot. The slot is open-end style.
- PCIe lane 8-15 at x8 slot. The slot is open-end style.

Note: PCIe lane 4 from the COMe module connects either to the PCIe x4 connector or the RunBMC module through a MUX selection.

Note: PCI Express speed support is dependent on the capability of the COM Express module used.

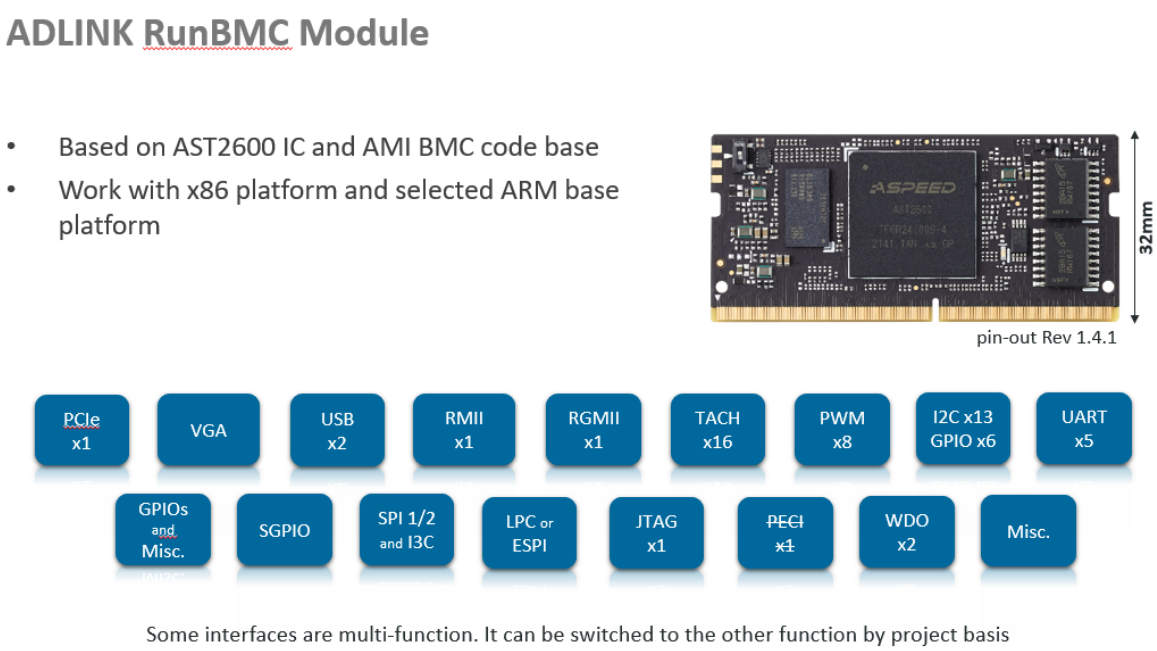
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2.3 RunBMC Module Slot

A RunBMC module can optionally be inserted into the 260-pin SO-DIMM socket to provide out-of-band management features.

The RunBMC is based on the ASPEED AST2600 BMC chip and complies with the Open Compute Project RunBMC Rev. 1.4.1 specification.



RunBMC offers remote management LAN, VGA, IPMB interfaces, COM ports, system fan control, remote firmware updates, I2C/SMBus, and more. For more details, refer to the functional diagram in Chapter 4.

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2.4 Secondary BIOS

Supports Serial Peripheral Interface (SPI) for COM Express R3.1 Type 7 modules.

Only when using the carrier BIOS, you can remotely update the BIOS out-of-band through the IPMI / RunBMC module.

2.5 VGA

- VGA Analog output port is supported on the rear I/O connector.
- VGA is only available when using the RunBMC module that includes a PCIe based graphics controller.
- PCIe lane 4 is by default assigned to the RunBMC module through a Mux with JP5 jumper settings.

2.6 Information LEDs

General information is obtained through LEDs, indicating the HDD, power, and Watchdog statuses.

2.7 Power, Reset, Lid, and Sleep Switches

4 mini switches respectively for Power, Reset, and COM.0 R3.1 specified 'Lid' and 'Sleep' functions.

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3. Connectors, Jumpers, and Switch locations

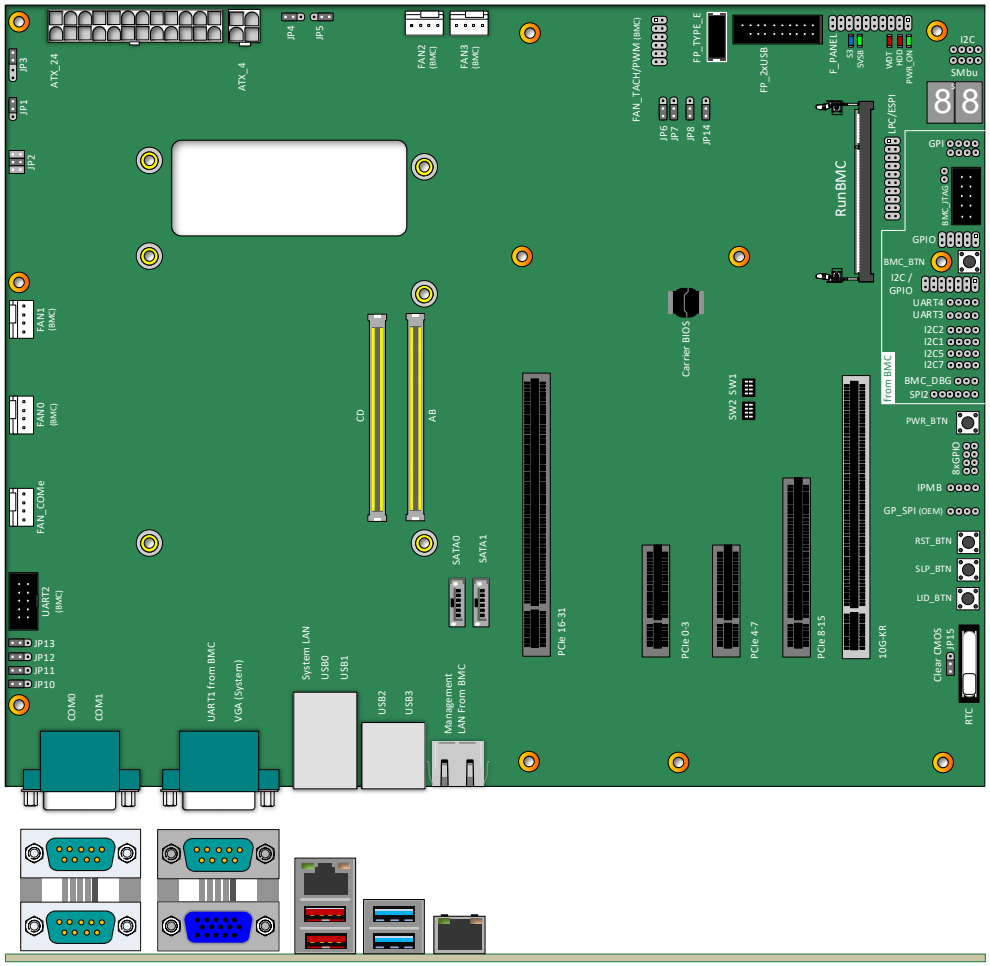
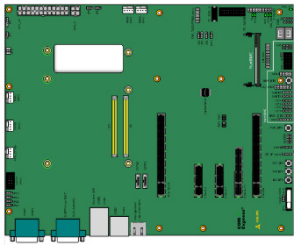


Figure 2 – Connectors, jumpers, and switch locations

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4. Carrier Functional Block Diagram



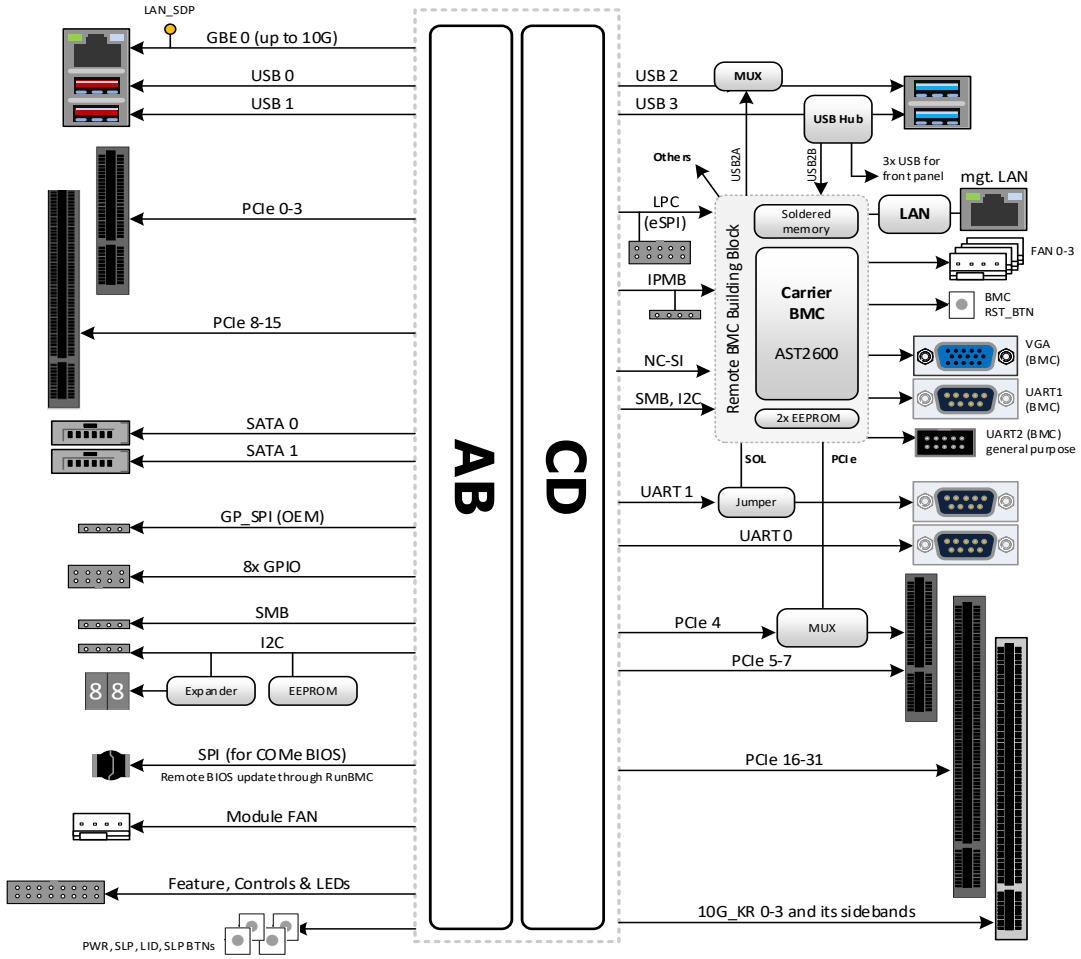


Figure 3 – Carrier functional block diagram

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4.1 RunBMC Pinout and Connectors



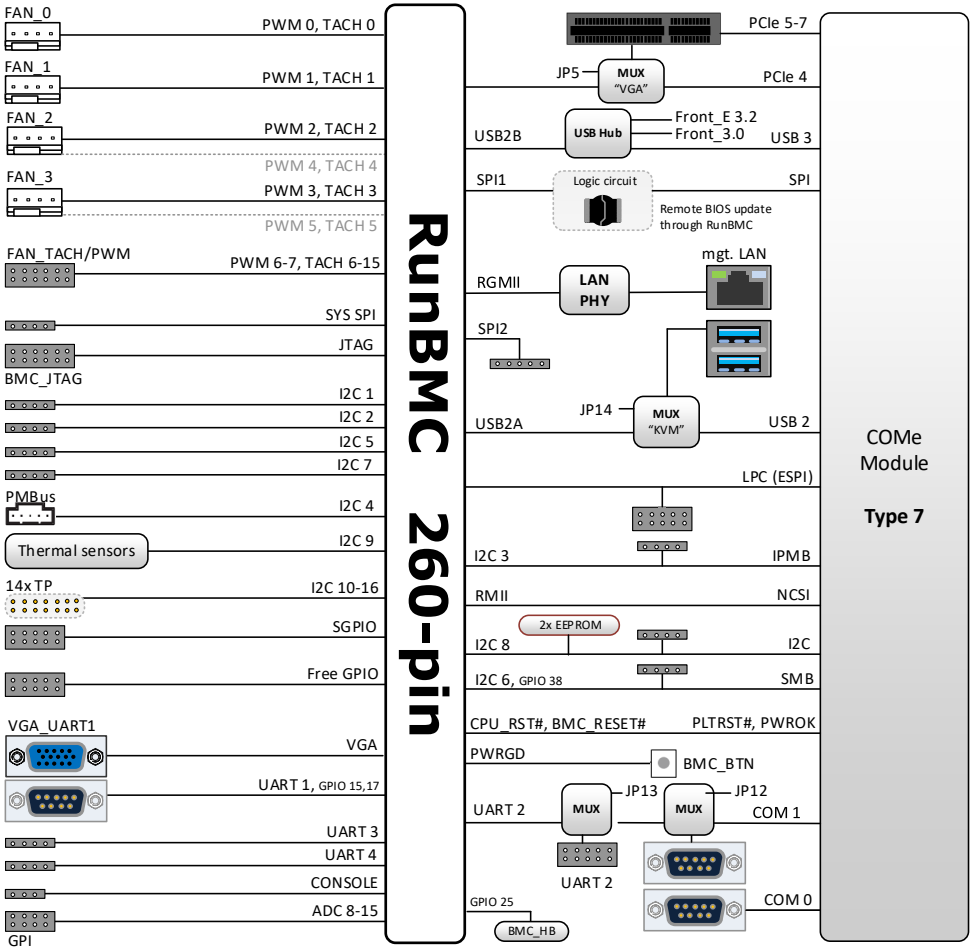


Figure 4 – RunBMC pinout and connectors

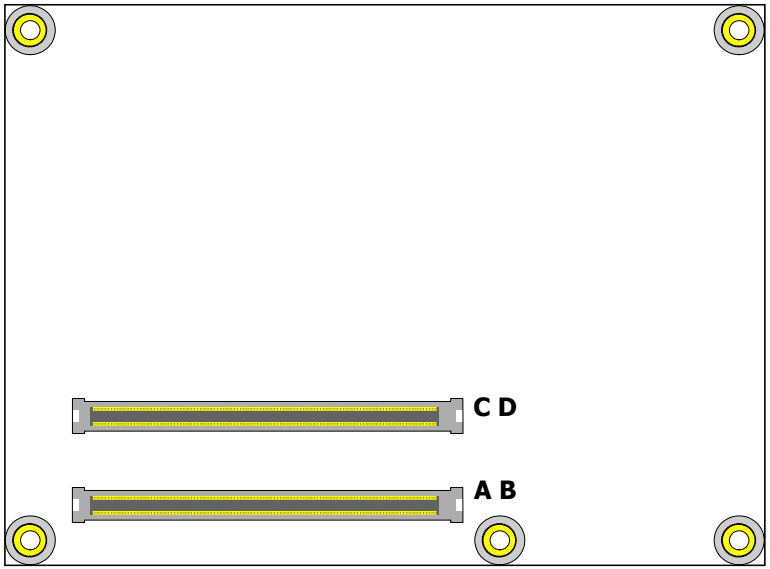
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5. Pinout and Signal Descriptions

5.1 COM Express Board to Board Connector Pinout

AB Connector
Ethernet Port
LPC / eSPI Interface
2 Serial ATA Channels
PCI Express Lanes 0-5
PCI Express Lanes 8-15
4 USB Ports
NCSI
8 GPIO, COM 1/2
SMBus and I^2C Bus
+12V Primary Power Input
+5V Standby and 3V RTC
Smart Fan



CD Connector
USB 3.x Support, extended signaling on four USB 2.0 ports
PCI Express Lanes 6-7
4 10GBASE-KR Interfaces & Sideband Siganls
PCI Express lanes 16-31
+12V Primary Power Input

The following table describes above table describes the standard PICMG defined pinout.

Actual support of these signals depends on the type 7 module being used. Please refer to the module user guide to see what signals are supported

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Row A			Row B			Row C			Row D	
A1	GND (fixed)		B1	GND (fixed)		C1	GND (fixed)		D1	GND (fixed)
A2	GBE0_MDI3-		B2	GBE0_ACT#		C2	GND		D2	GND
A3	GBE0_MDI3+		B3	LPC_FRAME#/ESPI_CS0#		C3	USB_SSRX0-		D3	USB_SSTX0-
A4	GBE0_LINK100#		B4	LPC_AD0/ESPI_IO_0		C4	USB_SSRX0+		D4	USB_SSTX0+
A5	GBE0_LINK1000#		B5	LPC_AD1/ESPI_IO_1		C5	GND		D5	GND
A6	GBE0_MDI2-		B6	LPC_AD2/ESPI_IO_2		C6	USB_SSRX1-		D6	USB_SSTX1-
A7	GBE0_MDI2+		B7	LPC_AD3/ESPI_IO_3		C7	USB_SSRX1+		D7	USB_SSTX1+
A8	GBE0_LINK#		B8	LPC_DRQ0#/ESPI_ALERT0#		C8	GND		D8	GND
A9	GBE0_MDI1-		B9	LPC_DRQ1#/ESPI_ALERT1#		C9	USB_SSRX2-		D9	USB_SSTX2-
A10	GBE0_MDI1+		B10	LPC_CLK/ESPI_CK		C10	USB_SSRX2+		D10	USB_SSTX2+
A11	GND (fixed)		B11	GND (fixed)		C11	GND (fixed)		D11	GND (fixed)
A12	GBE0_MDI0-		B12	PWRBTN#		C12	USB_SSRX3-		D12	USB_SSTX3-
A13	GBE0_MDI0+		B13	SMB_CK		C13	USB_SSRX3+		D13	USB_SSTX3+
A14	GBE0_CTREF		B14	SMB_DAT		C14	GND		D14	GND
A15	SUS_S3#		B15	SMB_ALERT#		C15	RSVD10G		D15	RSVD10G
A16	SATA0_TX+		B16	SATA1_TX+		C16	RSVD10G		D16	RSVD10G
A17	SATA0_TX-		B17	SATA1_TX-		C17	10G_SDP2		D17	10G_SDP3
A18	SUS_S4#		B18	SUS_STAT#/ESPI_RESET#		C18	GND		D18	GND
A19	SATA0_RX+		B19	SATA1_RX+		C19	PCIE_RX6+		D19	PCIE_TX6+
A20	SATA0_RX-		B20	SATA1_RX-		C20	PCIE_RX6-		D20	PCIE_TX6-
A21	GND (fixed)		B21	GND (fixed)		C21	GND (fixed)		D21	GND (fixed)
A22	PCIE_TX15+		B22	PCIE_RX15+		C22	PCIE_RX7+		D22	PCIE_TX7+
A23	PCIE_TX15-		B23	PCIE_RX15-		C23	PCIE_RX7-		D23	PCIE_TX7-
A24	SUS_S5#		B24	PWR_OK		C24	RSVD10G		D24	RSVD10G
A25	PCIE_TX14+		B25	PCIE_RX14+		C25	GND		D25	GND
A26	PCIE_TX14-		B26	PCIE_RX14-		C26	10G_KR_RX3+		D26	10G_KR_TX3+
A27	BATLOW#		B27	WDT		C27	10G_KR_RX3-		D27	10G_KR_TX3-
A28	ATA_ACT#		B28	GND		C28	GND		D28	GND
A29	RSVD		B29	PCIE_CK_REF1+		C29	10G_KR_RX2+		D29	10G_KR_TX2+
A30	RSVD		B30	PCIE_CK_REF1-		C30	10G_KR_RX2-		D30	10G_KR_TX2-
A31	GND (fixed)		B31	GND (fixed)		C31	GND (fixed)		D31	GND (fixed)
A32	IPMB_CLK		B32	SPKR		C32	RSVD10G		D32	RSVD10G
A33	IPMB_DAT		B33	I2C_CK		C33	RSVD10G		D33	RSVD10G
A34	BIOS_DIS0#/ESPI_SAFS		B34	I2C_DAT		C34	RSVD10G		D34	RSVD10G
A35	THRMTRIP#		B35	THRM#		C35	CEI_RST#		D35	CEI_PRSNT#
A36	PCIE_TX13+		B36	PCIE_RX13+		C36	RSVD10G		D36	RSVD
A37	PCIE_TX13-		B37	PCIE_RX13-		C37	RSVD10G		D37	RSVD
A38	GND		B38	GND		C38	RSVD10G		D38	RSVD10G
A39	PCIE_TX12+		B39	PCIE_RX12+		C39	CEI_SDA		D39	CEI_SCL
A40	PCIE_TX12-		B40	PCIE_RX12-		C40	10G_SDP0		D40	10G_SDP1
A41	GND (fixed)		B41	GND (fixed)		C41	GND (fixed)		D41	GND (fixed)

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Row A			Row B			Row C			Row D	
A42	USB2-		B42	USB3-		C42	10G_KR_RX1+		D42	10G_KR_TX1+
A43	USB2+		B43	USB3+		C43	10G_KR_RX1-		D43	10G_KR_TX1-
A44	USB_2_3_OC#		B44	USB_0_1_OC#		C44	GND		D44	GND
A45	USB0-		B45	USB1-		C45	RSVD10G		D45	RSVD10G
A46	USB0+		B46	USB1+		C46	CEI_MDC		D46	CEI_MDIO
A47	VCC_RTC		B47	ESPI_EN#		C47	CEI_INT#		D47	ETH_PHY_INT#
A48	RSMRST_OUT#		B48	USB0_HOST_PRSNT		C48	GND		D48	GND
A49	GBE0_SDP		B49	SYS_RESET#		C49	10G_KR_RX0+		D49	10G_KR_TX0+
A50	LPC_SERIRQ/ESPI_CS1#		B50	CB_RESET#		C50	10G_KR_RX0-		D50	10G_KR_TX0-
A51	GND (fixed)		B51	GND (fixed)		C51	GND (fixed)		D51	GND (fixed)
A52	PCIE_TX5+		B52	PCIE_RX5+		C52	PCIE_RX16+		D52	PCIE_TX16+
A53	PCIE_TX5-		B53	PCIE_RX5-		C53	PCIE_RX16-		D53	PCIE_TX16-
A54	GPI0		B54	GPO1		C54	TYPE0#		D54	GND
A55	PCIE_TX4+		B55	PCIE_RX4+		C55	PCIE_RX17+		D55	PCIE_TX17+
A56	PCIE_TX4-		B56	PCIE_RX4-		C56	PCIE_RX17-		D56	PCIE_TX17-
A57	GND		B57	GPO2		C57	TYPE1#		D57	TYPE2#
A58	PCIE_TX3+		B58	PCIE_RX3+		C58	PCIE_RX18+		D58	PCIE_TX18+
A59	PCIE_TX3-		B59	PCIE_RX3-		C59	PCIE_RX18-		D59	PCIE_TX18-
A60	GND		B60	GND (fixed)		C60	GND (fixed)		D60	GND (fixed)
A61	PCIE_TX2+		B61	PCIE_RX2+		C61	PCIE_RX19+		D61	PCIE_TX19+
A62	PCIE_TX2-		B62	PCIE_RX2-		C62	PCIE_RX19-		D62	PCIE_TX19-
A63	GPI1		B63	GPO3		C63	GND		D63	RSVD
A64	PCIE_TX1+		B64	PCIE_RX1+		C64	RSVD		D64	RSVD
A65	PCIE_TX1-		B65	PCIE_RX1-		C65	PCIE_RX20+		D65	PCIE_TX20+
A66	GND		B66	WAKE0#		C66	PCIE_RX20-		D66	PCIE_TX20-
A67	GPI2		B67	WAKE1#		C67	RAPID_SHUTDOWN		D67	GND
A68	PCIE_TX0+		B68	PCIE_RX0+		C68	PCIE_RX21+		D68	PCIE_TX21+
A69	PCIE_TX0-		B69	PCIE_RX0-		C69	PCIE_RX21-		D69	PCIE_TX21-
A70	GND (fixed)		B70	GND (fixed)		C70	GND (fixed)		D70	GND (fixed)
A71	PCIE_TX8+		B71	PCIE_RX8+		C71	PCIE_RX22+		D71	PCIE_TX22+
A72	PCIE_TX8-		B72	PCIE_RX8-		C72	PCIE_RX22-		D72	PCIE_TX22-
A73	GND		B73	GND		C73	GND		D73	GND
A74	PCIE_TX9+		B74	PCIE_RX9+		C74	PCIE_RX23+		D74	PCIE_TX23+
A75	PCIE_TX9-		B75	PCIE_RX9-		C75	PCIE_RX23-		D75	PCIE_TX23-
A76	GND		B76	GND		C76	GND		D76	GND
A77	PCIE_TX10+		B77	PCIE_RX10+		C77	GND		D77	RSVD
A78	PCIE_TX10-		B78	PCIE_RX10-		C78	PCIE_RX24+		D78	PCIE_TX24+
A79	GND		B79	GND		C79	PCIE_RX24-		D79	PCIE_TX24-
A80	GND (fixed)		B80	GND (fixed)		C80	GND (fixed)		D80	GND (fixed)
A81	PCIE_TX11+		B81	PCIE_RX11+		C81	PCIE_RX25+		D81	PCIE_TX25+
A82	PCIE_TX11-		B82	PCIE_RX11-		C82	PCIE_RX25-		D82	PCIE_TX25-

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Row A			Row B			Row C			Row D	
A83	GND		B83	GND		C83	GND		D83	GND
A84	NCSI_TX_EN		B84	VCC_5V_SBY		C84	GND		D84	GND
A85	GPI3		B85	VCC_5V_SBY		C85	PCIE_RX26+		D85	PCIE_TX26+
A86	RSVD		B86	VCC_5V_SBY		C86	PCIE_RX26-		D86	PCIE_TX26-
A87	GND		B87	VCC_5V_SBY		C87	GND		D87	GND
A88	PCIE_CLK_REF0+		B88	BIOS_DIS1#		C88	PCIE_RX27+		D88	PCIE_TX27+
A89	PCIE_CLK_REF0-		B89	NSCI_RX_ER		C89	PCIE_RX27-		D89	PCIE_TX27-
A90	GND (fixed)		B90	GND (fixed)		C90	GND (fixed)		D90	GND (fixed)
A91	SPI_POWER		B91	NCSI_CLK_IN		C91	PCIE_RX28+		D91	PCIE_TX28+
A92	SPI_MISO		B92	NCSI_RXD1		C92	PCIE_RX28-		D92	PCIE_TX28-
A93	GPO0		B93	NCSI_RXD0		C93	GND		D93	GND
A94	SPI_CLK		B94	NCSI_CRS_DV		C94	PCIE_RX29+		D94	PCIE_TX29+
A95	SPI_MOSI		B95	NCSI_TXD1		C95	PCIE_RX29-		D95	PCIE_TX29-
A96	TPM_PP		B96	NCSI_TXD0		C96	GND		D96	GND
A97	TYPE10#		B97	SPI_CS#		C97	GND		D97	GND
A98	SER0_TX / CAN_TX		B98	NCSI_ARB_IN		C98	PCIE_RX30+		D98	PCIE_TX30+
A99	SER0_RX / CAN_RX		B99	NCSI_ARB_OUT		C99	PCIE_RX30-		D99	PCIE_TX30-
A100	GND (fixed)		B100	GND (fixed)		C100	GND (fixed)		D100	GND (fixed)
A101	SER1_TX		B101	FAN_PWMOUT		C101	PCIE_RX31+		D101	PCIE_TX31+
A102	SER1_RX		B102	FAN_TACHIN		C102	PCIE_RX31-		D102	PCIE_TX31-
A103	LID#		B103	SLEEP#		C103	GND		D103	GND
A104	VCC_12V		B104	VCC_12V		C104	VCC_12V		D104	VCC_12V
A105	VCC_12V		B105	VCC_12V		C105	VCC_12V		D105	VCC_12V
A106	VCC_12V		B106	VCC_12V		C106	VCC_12V		D106	VCC_12V
A107	VCC_12V		B107	VCC_12V		C107	VCC_12V		D107	VCC_12V
A108	VCC_12V		B108	VCC_12V		C108	VCC_12V		D108	VCC_12V
A109	VCC_12V		B109	VCC_12V		C109	VCC_12V		D109	VCC_12V
A110	GND (fixed)		B110	GND (fixed)		C110	GND (fixed)		D110	GND (fixed)

Note: The table above shows the standard PICMG-defined pinout. Actual support for these signals depends on the Type 7 module being used. Please refer to the module user guide.

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5.3 PCIe (PCI Express) Slots

5.3.1 PEG x16

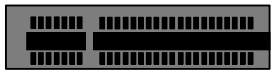


PCIe 16-31: x16, up to Gen4, support up to 2-slot wide addon cards

5.3.2 PCIe x4 Slots (x2)



PCIe 0-3: x4, up to Gen4



PCIe 4-7: x4, up to Gen3 (optionally disabled and assigned to RunBMC graphics)

5.3.3 PCIe x8 Slot



PCIe 8-15: x8, up to Gen3

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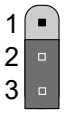
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5.3.4 JP5 (PCIe Lane 4 Mux):

The JP5 jumper configures the multiplexer to route PCIe lane 4 to either the standard PCIe x4 expansion slot or the RunBMC integrated graphics. Note that the other RunBMC functions do not depend on the PCIe input and can operate without it.

If PCIe lane 4 is assigned to the standard PCIe x4 expansion slot, the system can still be accessed graphically through a web browser (Edge, Chrome, Firefox, etc.) using the KVM feature provided by the RunBMC module.

JP5	PCIe lane 4 assignment
1-2	PCIe x4 Connector
2-3	RunBMC onboard graphics controller (default)

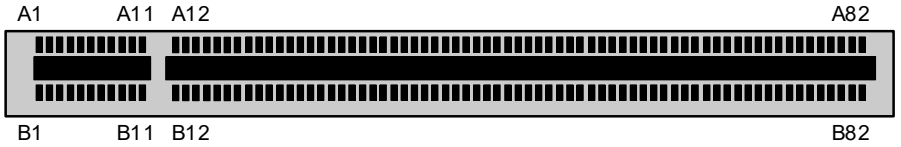


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5.4 10GbE Extension Slot

The Express-BASE7 R3.1 features a PCI Express x16 slot with proprietary pinout for COM Express COM.0 R3.1 Type 7 modules.



This slot can route up to four 10GBASE-KR signals from the COM Express Type 7 R3.1 module to a 10GbE Ethernet adapter card for up to four SFP+ signals or four 10GBASE-T ports.

Warning: This slot is **not** a generic PCIe slot, only use this slot for the special 10GbE adapter cards

5.4.1 Optional 10GbE Ethernet Adapter Cards

Optional 10GbE Ethernet adapter cards are available for prototyping, but note that these cards are COM Express module depended:

10G SFP+ Card: converts up to 4x 10GBASE-KR signals to 4x SFP+ signals through high-end optical fiber PHY

10GBASE-T Card: converts up to 4x 10GBASE-KR signals to 4x 10GBASE-T signals through high-end copper PHY

Check the modules manual to understand what Ethernet adapter cards suit your COM Express modules

Note: 10GbE Ethernet adapter cards are specifically designed and unique to each COM Express Type 7 module, due to the required communication between PHY and 10GbE MAC being defined by silicon vendor.

Note: Schematics designs for adapter cards as well as the carrier board schematics are available upon requests.

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Pin	Signal	Pin	Signal
B1	+ 12V	A1	NC
B2	+ 12V	A2	+ 12V
B3	+ 12V	A3	+ 12V
B4	GND	A4	GND
B5	NC	A5	NC
B6	NC	A6	NC
B7	GND	A7	GND
B8	CEI_SDA	A8	NC
B9	CEI_SCL	A9	NC
B10	+ 3.3VSB	A10	NC
B11	+ 3.3VSB	A11	NC
B12	NC	A12	GND
B13	+ 5VSB	A13	NC
B14	+ 5VSB	A14	NC
B15	NC	A15	NC
B16	*10G_INT1/ETH0-*	A16	NC
B17	CEI_INTN	A17	NC
B18	GND	A18	GND
B19	NC	A19	NC
B58	NC	A58	GND
B59	NC	A59	GND
B60	GND	A60	NC
B61	GND	A61	NC
B62	NC	A62	GND
B63	NC	A63	GND
B64	GND	A64	NC
B65	GND	A65	NC
B66	NC	A66	GND

Pin	Signal	Pin	Signal
B20	NC	A20	GND
B21	GND	A21	NC
B22	GND	A22	NC
B23	10G_KR_RX3_P	A23	GND
B24	10G_KR_RX3_N	A24	GND
B25	GND	A25	10G_KR_TX3_P
B26	GND	A26	10G_KR_TX3_N
B27	10G_KR_RX2_P	A27	GND
B28	10G_KR_RX2_N	A28	GND
B29	GND	A29	10G_KR_TX2_P
B30	NC	A30	10G_KR_TX2_N
B31	CEI_ResetN	A31	GND
B32	GND	A32	10G_LED_SDA
B33	10G_KR_RX1_P	A33	10G_LED_SCL
B34	10G_KR_RX1_N	A34	GND
B35	GND	A35	10G_KR_TX1_P
B36	GND	A36	10G_KR_TX1_N
B37	*10G_PHY_MDIO_SDA1*	A37	GND
B38	*10G_PHY_MDIO_SCL1*	A38	GND
B67	NC	A67	GND
B68	GND	A68	NC
B69	GND	A69	NC
B70	NC	A70	GND
B71	NC	A71	GND
B72	GND	A72	NC
B73	GND	A73	NC
B74	NC	A74	GND
B75	NC	A75	GND

Pin	Signal	Pin	Signal
B39	GND	A39	CEI_MDIO
B40	GND	A40	CEI_MDC
B41	10G_KR_RX0_P	A41	GND
B42	10G_KR_RX0_N	A42	GND
B43	GND	A43	10G_KR_TX0_P
B44	GND	A44	10G_KR_TX0_N
B45	10G_SDP3	A45	GND
B46	10G_SDP2	A46	GND
B47	GND	A47	NC
B48	10G_SDP1	A48	CEI_PresentN
B49	GND	A49	GND
B50	NC	A50	10G_SDP0
B51	NC	A51	GND
B52	GND	A52	NC
B53	GND	A53	NC
B54	NC	A54	GND
B55	NC	A55	GND
B56	GND	A56	NC
B57	GND	A57	NC
B76	GND	A76	NC
B77	GND	A77	NC
B78	NC	A78	GND
B79	NC	A79	GND
B80	GND	A80	NC
B81	NC	A81	NC
B82	NC	A82	GND

Note : GP_SPI (D32,D33,D34,D36 pin) and 10G_PHY_MDIO/MDC (C45,D45 pin) are for testing purpose, intended for internal usage.

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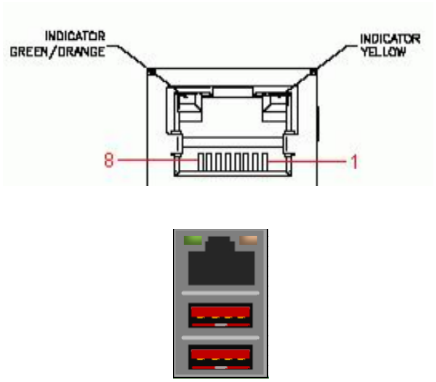
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5.5 Ethernet Ports

5.5.1 LAN: System LAN Port

One Ethernet port is available at the RJ45 connector combined with 2 USB 3.x connectors.
It is sourced from the COM Express module. It supports up to 2.5 GbE, depending on the COM Express module specification.

Pin	Signal
1	BI_DA+
2	BI_DA-
3	BI_DB+
4	BI_DC+
5	BI_DC-
6	BI_DB-
7	BI_DD+
8	BI_DD-

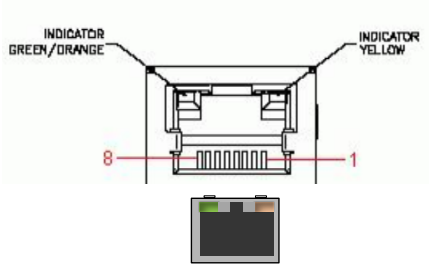


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5.5.2 Mgt.LAN: Out of Band Management Port

This port originates from the RunBMC module with a 1GbE Realtek PHY on the carrier

Pin	Signal
1	BI_DA+
2	BI_DA-
3	BI_DB+
4	BI_DC+
5	BI_DC-
6	BI_DB-
7	BI_DD+
8	BI_DD-



This port offers access to the browser based IPMI Web UI of the RunBMC module

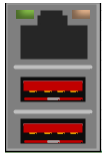
The default IP number is 192.168.1.1.

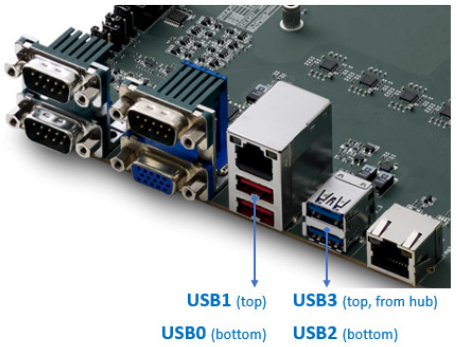
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5.6 USB Connectors & Headers

USB0,1: 2x USB 3.x/2.0 Type-A connectors on the rear I/O panel





USB2,3: 2x USB 3.x/2.0 Type-A connectors on the rear I/O panel



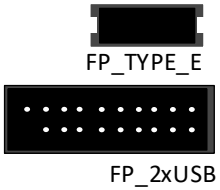
Pin	Signal	Pin	Signal
1	+ 5V	10	+ 5V
2	USB0N	11	USB1N
3	USB0P	12	USB1P
4	GND	13	GND
5	USB_SSRX0N	14	USB_SSRX1N
6	USB_SSRX0P	15	USB_SSRX1P
7	GND	16	GND
8	USB_SSTX0N	17	USB_SSTX1N
9	USB_SSTX0P	18	USB_SSTX1P

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5.6.1 FP_TYPE_E & FP_2xUSB

FP_TYPE_E: 1x USB 3.x/2.0 at Type E connector, vertical direction for Front Panel
FP_2xUSB: 2x USB 3.x/2.0 at 19-pin header, 2.54 mm pitch for Front Panel



FP_TYPE_E

Pin	Signal	Pin	Signal
1	+ 5V	11	+ 5V
2	USB_SSTX1P	12	USB_SSTX2P
3	USB_SSTX1N	13	USB_SSTX2N
4	GND	14	GND
5	USB_SSRX1P	15	USB_SSRX2P
6	USB_SSRX1N	16	USB_SSRX2N
7	+ 5V	17	GND
8	HUB_P1_CC1	18	USBN
9	NC	19	USBP
10	NC	20	HUB_P1_CC

FP_2xUSB

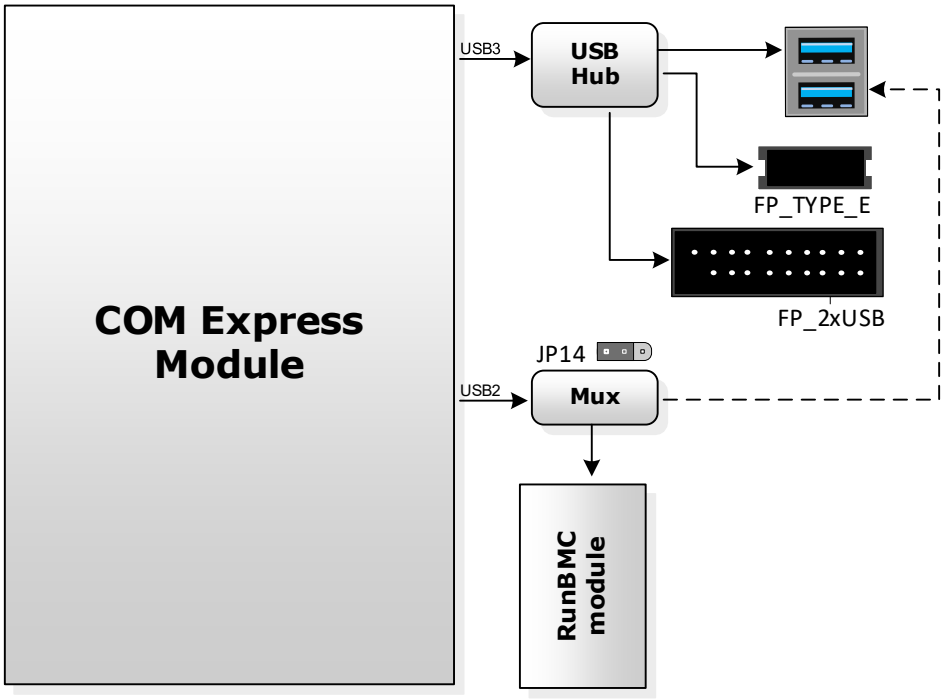
Pin	Signal	Pin	Signal
1	NC	2	USB2P
3	USB1P	4	USB2N
5	USB1N	6	GND
7	GND	8	USB_SSTX2P
9	USB_SSTX1P	10	USB_SSTX2N
11	USB_SSTX1N	12	GND
13	GND	14	USB_SSRX2P
15	USB_SSRX1P	16	USB_SSRX2N
17	USB_SSRX1N	18	+ 5V
19	+ 5V		

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5.6.2 JP14

JP14 (USB MUX): Jumper for KVM selection. Routes the USB connection from the COM Express module either to the RunBMC module for KVM operation or to the Type-A connector for normal USB operation.



JP14	Status
1-2	Run BMC(Default)
2-3	USB CONN

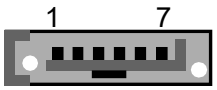
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5.7 SATA Connectors

SATA0: up to 6Gb/s
SATA1: up to 6Gb/s

Pin	Signal	Pin	Signal
1	GND	2	TX+
3	TX-	4	GND
5	RX-	6	RX+
7	GND	A4	



5.8 VGA Connector

VGA_UAR1: VGA output is available through the DB9 connector, sourced from the BMC module. Default support is provided. It works when the BMC module is installed with pins 2–3 shorted on JP5.

VGA

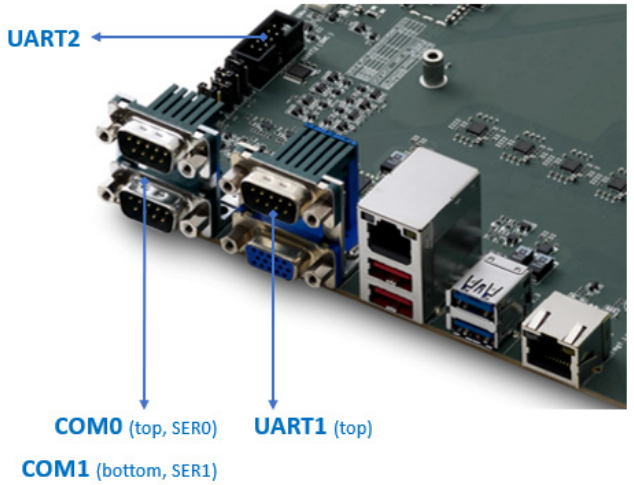
Pin	Signal	Pin	Signal
1	RED	2	SER0_RX
3	BLUE	4	NC
5	GND	6	GND
7	GND	8	GND
9	NC	10	GND
11	DDC POWER	12	DDC2B DATA
13	HSYNC	14	VSYNC
15	DDC2B CLOCK		

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5.9 Serial Ports from the COM Express Module

Serial ports labeled **"COM"** originate from the **COM Express** module.



COM0 DB9 supporting RS-232 two-wire

Pin	Signal	Pin	Signal
1	NC	2	SER0_RX
3	SER0_TX	4	NC
5	GND	6	NC
7	NC	8	NC
9	NC		

COM1 DB9 supporting RS-232 two-wire

Pin	Signal	Pin	Signal
1	NC	2	SER1_RX
3	SER1_TX	4	NC
5	GND	6	NC
7	NC	8	NC
9	NC		

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5.10 Serial Ports from the RunBMC Module

5.10.1 Console Mode Access to RunBMC

UART0 DB9 supporting RS-232 (RunBMC)

Pin	Signal	Pin	Signal
1	NC	2	NC
3	SER2_RX	4	SER2_RTS
5	SER2_TX	6	SER2_CTS
7	NC	8	NC
9	GND	10	NC

5.10.2 Serial Over LAN

Serial over LAN (SOL) is a technology that allows you to remotely access a computer's serial port over a network (LAN).

SOL lets you control a system's serial console remotely through a network connection instead of using a physical RS-232 cable.

UART1 9-pin header 2.54 pitch supporting RS-232 (RunBMC)

Pin	Signal	Pin	Signal
1	NC	2	NC
3	SER2_RX	4	SER2_RTS
5	SER2_TX	6	SER2_CTS
7	NC	8	NC
9	GND	10	NC

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JP12/13 (UART SOL selection): jumpers for SOL setting

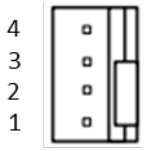
JP12	JP13	Status
1-2	1-2	SOL (Default)
2-3	2-3	RS-232 active

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5.11 FAN Connectors

1x Fan connector for the COM Express module, 4x Fan connectors for system level usage



FAN_COMe: 4-pin connector, supporting 12V fan power, managed by the COM Express module

FAN0-3: 4-pin connector, supporting 12V fan power, managed by the BMC module. PWM default setting is 100%

Pin	Signal
1	GND
2	FAN Power 12V
3	FAN Speed Sense
4	FAN Speed Control (PWM)

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5.12 RunBMC Socket

RunBMC: A 260-pin DDR4 SO-DIMM socket is used for inserting the BMC module. For details, see the **BMC Introduction**.

5.13 IPMB Header

IPMB: 1x IPMB bus at 4-pin header, 2.54 mm pitch. IPMB bus from BMC module and COM Express module (specific SKU).

Pin	Signal	Pin	Signal
1	+ 3.3V	2	I2C_DAT
3	I2C_CLK	4	GND

5.14 I2C & SMB Headers

I2C: 1x I2C at 4-pin header, 2.54 mm pitch. Source from the COM Express module

Pin	Signal	Pin	Signal
1	+ 3.3V	2	I2C_DAT
3	I2C_CLK	4	GND

SMB: 1x SMB at 4-pin header, 2.54 mm pitch. source from COM Express module

Pin	Signal	Pin	Signal
1	+ 3.3V	2	SMB_DAT
3	SMB_CLK	4	GND

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5.15 GPIO Header

8xGPIO: 8x GPIO at 8-pin header, 2.54 mm pitch. source from COM Express module

Pin	Signal	Pin	Signal
1	GPI0	2	GPO0
3	GPI1	4	GPO1
5	GIP2	6	GPO2
7	GIP3	8	GPO3

5.16 Carrier BIOS Socket

A socket for SPI BOIS ROM and jumper setting, JP6/JP7 (not default offering).

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5.17 LPC/ESPI Debug Header

LPC bus is default setting. supporting of ESPI bus will require JP8 setting and specific HW rework on carrier board.

Pin	Signal	Pin	Signal
1	LPC_CLK	2	GND
3	LPC_FRAME#	4	NC
5	LPC_RST#	6	+ 5V
7	LPC_AD3	8	LPC_AD2
9	+ 3.3VSB	10	LPC_AD1
11	LPC_AD0	12	GND
13	SMB_CK	14	SMB_DAT
15	+ 1.8VSB *	16	NC
17	GND	18	LPC_SERIRQ
19	LPC_DRQ0	20	LPC_DRQ1

Pin.15 is for ESPI usage

JP8 (LPC or ESPI switch)

Jumper	Status
1-2	LPC mode (**Default**)
2-3	eSPI mode (not offering)

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5.18 Front Panel Header

F_PANEL

Pin	Signal	Pin	Signal
1	HDD_LED_P	2	PWR_LED_P (5V)
3	HDD_LED_N	4	PWR_LED_N
5	GND	6	PWR_BTN_P
7	RST_BTN_P	8	PWR_BTN_N
9	NC	10	NC
11	PWR_LED_P (5V)	12	+ 5VSB
13	PWR_LED_N	14	GND
15	NC	16	NC
17	GND	18	NC
19	NC	20	NC

5.19 RTC Battery

RTC: A holder for installing an RTC coin-cell battery.
JP15 (Clear CMOS): To clear CMOS, shut down the power and short pins 2 and pin 3 (short VBAT to ground)

Jumper	Status
1-2	Normal (**Default**)
2-3	Clear CMOS

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5.20 Power Connectors & Power Jumpers

ATX 24-pin and 4-pin power connectors are provided, along with several jumpers for configuring different power modes. The power mode configuration also depends on the COM Express module being used.

ATX_24: Connect the ATX 24-pin (or 20-pin) connector to supply power to the Express-BASE7 R3.1 carrier board.
ATX_4: Connect the ATX 12V 4-pin connector to supply power to the COM Express module.

JP1 (ATX/AT Mode): In AT mode, JP1 shorts PS_ON# to ground to force the system power on.

Jumper	Status
1-2	ATX mode (**Default**)
2-3	AT mode

JP2 (PWR_OK_Config): Connect the ATX 12V 4-pin connector to supply power to the COM Express module

Jumper	Status
1-2	Add 3.3V Pull-up with 10k to signal PWR_OK
3-4	Connect PWRGOOD of ATX power supply (**Default**)
5-6	Connect PWRGOOD of onboard DC-DC regulator

JP3 (5VSB to Module Source): When an AT power supply is connected to the Express-BASE7 R3.1, JP3 can be used to provide 5VSB to the COM Express module from the carrier board.

Jumper	Status
1-2	5VSB from ATX power supply (**Default**)
2-3	5VSB produced on carrier from Vcc
3-4	No 5VSB to module

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JP4 (12V to Module in S3/S5 mode):
JP1-2: No 12V supply is provided to the module in S3/S5 mode.
JP2-3: 2V is always supplied to the module regardless of the module power state.

Jumper	Status
1-2	12V off in S3/S5
2-3	12V on in S3/S4 (**Default**)

Power Strategy

	JP1	JP2	JP3	JP4
ATX PSU / ATX to COM Express module (**Default**)	1-2	3-4	1-2	2-3
ATX PSU / AT to COM Express module	2-3	3-4	3-4	2-3
AT PSU / ATX to COM Express module	1-2	1-2	2-3	1-2
AT PSU / AT to COM Express module	2-3	3-4	3-4	2-3

Note: All 12V power for the COM Express module is provided by the ATX 12V 4-pin connector. To avoid damage to the carrier board and installed components, ensure that the ATX power supply is connected to the correct connectors. Refer to the Power Connector Connections section.

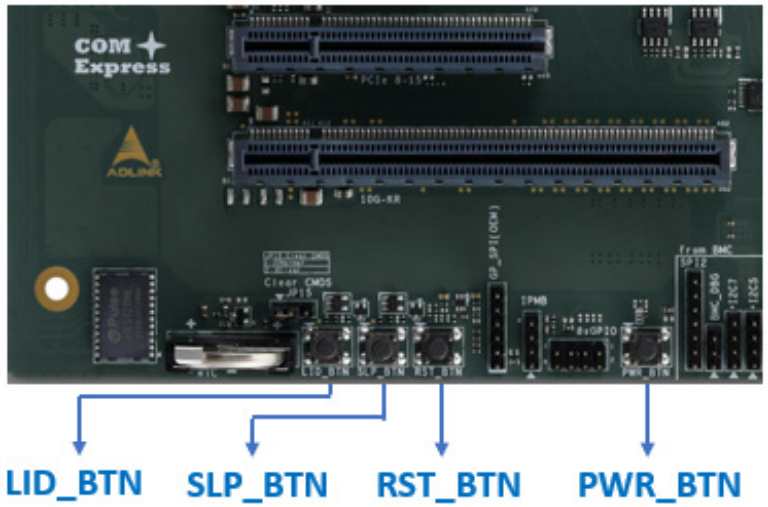
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6. Buttons, LEDs, and POST

6.1 Buttons

PWR_BTN, **RST_BTN** & **SLP_BTN**, **LID_BTN** (SLP_BTN, LID_BTN also depends on COM Express module)

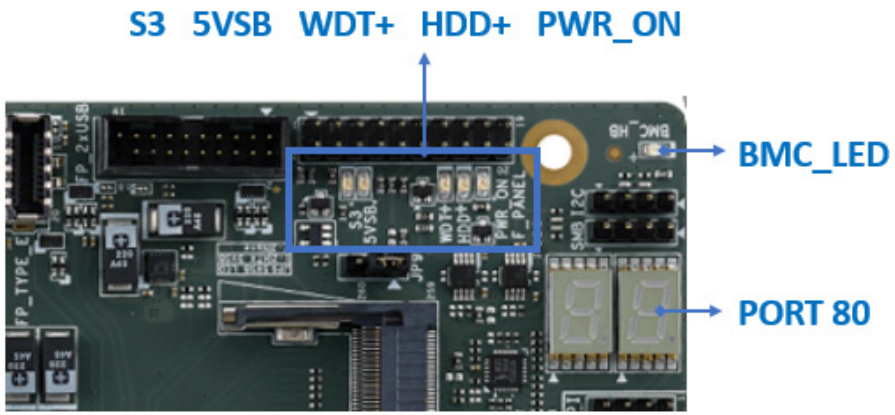


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6.2 POST and Indicator LEDs

An I2C-based expander located on the carrier board for POST display has been added for debugging. The two 7-segment LEDs show the actual POST data. A row of mini-LEDs indicates the various power states.



LED	Status
S3	Indicates S3 status
5VSB	ATX power attached on standby or active
WDT+	Indicates watchdog activity watchdog source from COM Express module
HDD+	Indicates hard drive activity
PWR_ON	Indicates power on
BMC_LED	Indicates BMC module status It indicates the readiness of firmware initiation of the BMC chip (Always on means ready)

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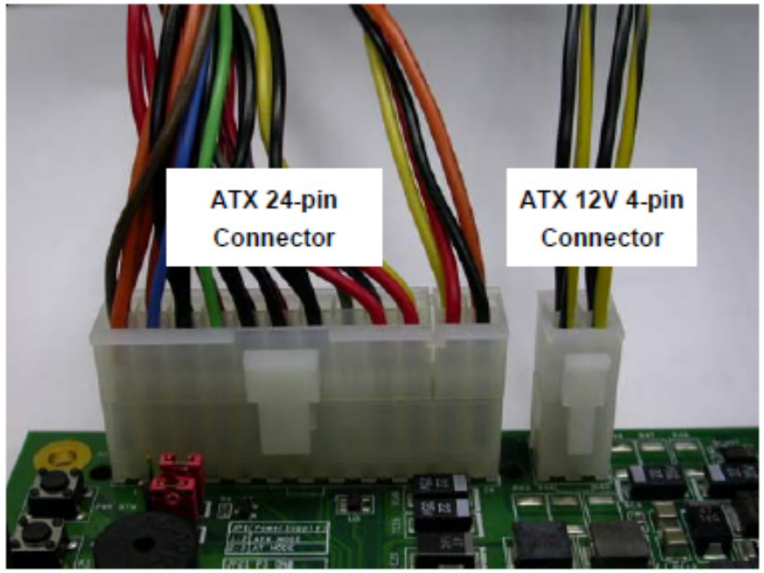
6.3 Power Connector Connections

ATX Power Connectors

The Express-Base7 R3.1 carrier board has one ATX 24-pin connector to supply power to the carrier board and one ATX 12V 4-pin connector to supply power to the COM Express module. **The system will not power on unless the ATX 12V 4-pin connector is connected**.

Note: **DO NOT** plug the ATX 12V 4-pin connector into the ATX 24-pin power connector.

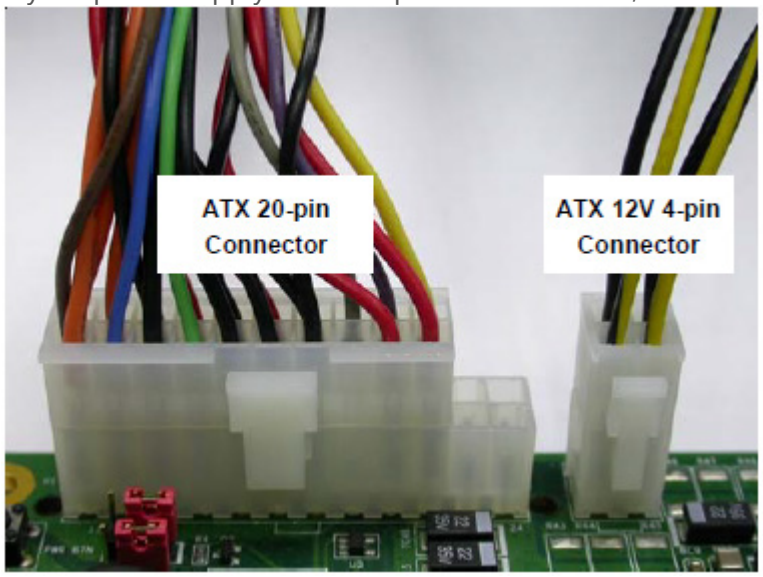
If your power supply has a 24-pin ATX connector, attach the connectors as illustrated below.



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If your power supply has a 20-pin ATX connector, attach the connectors as illustrated below.



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6.4 Feature Support Matrix

The supported interfaces also depend on the COM Express module configuration. The table below indicates the main supported features based on the Express-VR7 (AMD Ryzen V3000-based COM Express Type 7 module), the Express-BASE7 R3.1 carrier board, and the RunBMC-AST2600 (BMC module).

Function	Maximum Feature	Note
PCI Express	1x PCIe Gen4x8 at slot 16-31 1x PCIe Gen4x4 at slot 0-3 1x PCIe Gen3x2 at slot 4-7	x8 only event at this x16 slot as KVM usage default
Ethernet	2x 10GbE at slot 10G-KR 1x 2.5GbE at RJ-45 1x mgt. GbE at RJ-45	10G Ethernet card required
USB	4x USB3.x/2.0 at Type A 2x USB3.x/2.0 at header 1x USB3.x/2.0 at Type E	USB_2 as KVM usage default
SATA	2x SATA	
Display	1x VGA at DB9	
UART	2x UART at DB9 1x UART at DB9 1x UART at header	SOL usage as default
FAN	1x FAN for COM module 4x FAN	PWM = 100% default

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7. Mechanical Dimensions

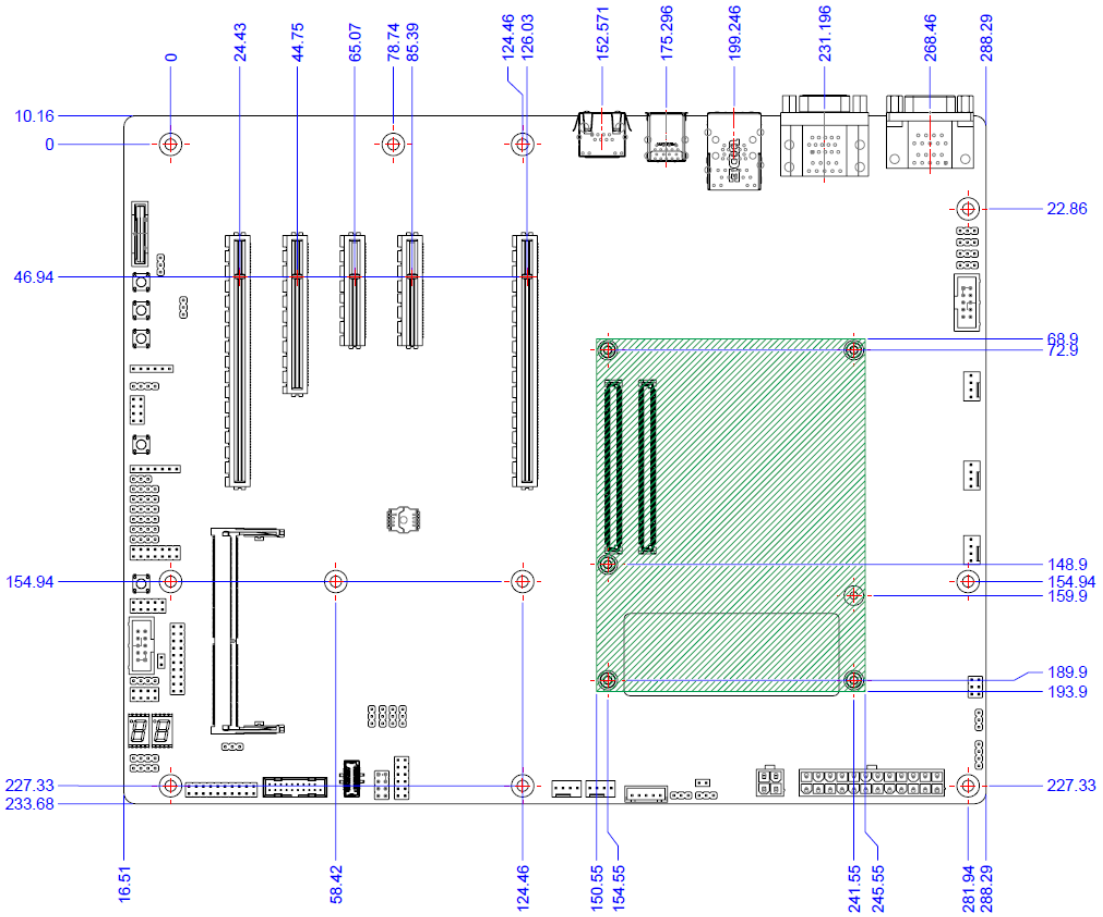


Figure 5 – Express-BASE7 R3.1 mechanical dimensions

Note: All dimensions are shown in millimeters with a tolerance of ± 0.25mm unless otherwise noted.
Module connector locating peg holes (dimensions [16.50, 6.00] and [16.50, 18.00]) shall have tolerances of ± 0.10mm.

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8. Appendix

8.1 PCI Express Second Reference Clock Diagrams

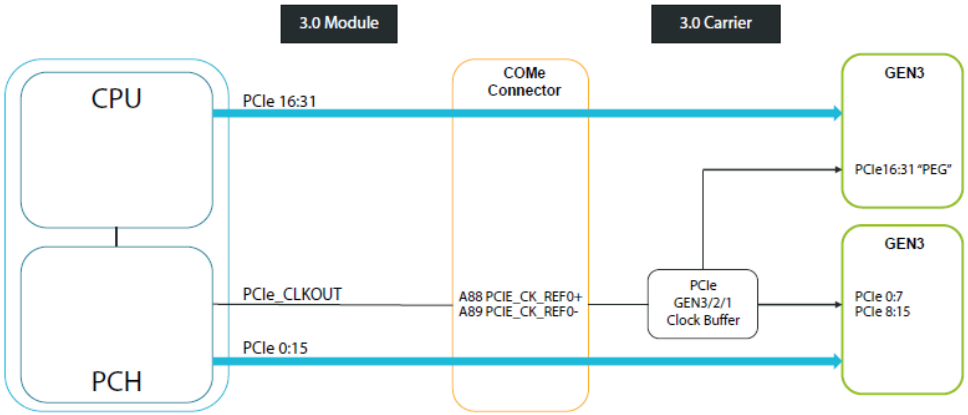


Figure 6 – PCIe Ref Clock: Rev 3.0 module on rev 3.0 carrier

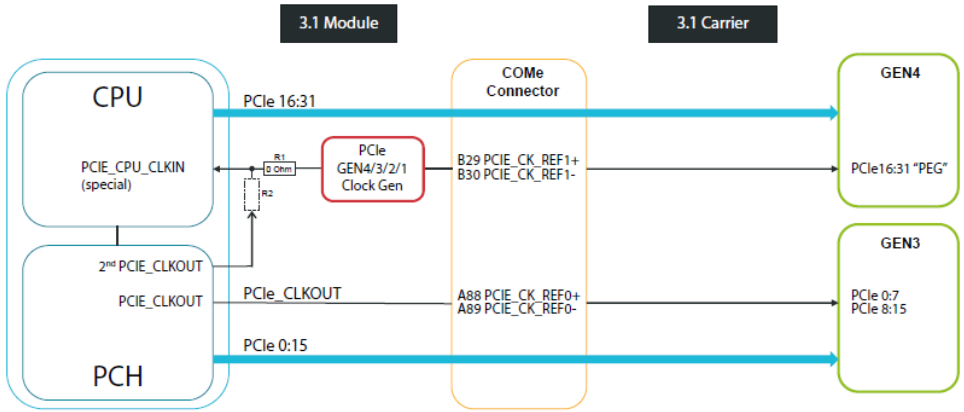


Figure 7 – PCIe Ref Clock: Rev3.1 module on rev 3.1 carrier (with 2nd clock gen)

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The module chipset requires a second PCIe reference clock source. The PCH hosts PCIe Gen3 root devices and provides the required clock source. The CPU in this chipset hosts PCIe Gen4 root devices but requires a high-accuracy external clock source, as shown in red in this figure. The external clock source provides the reference clock to both the CPU and the carrier board PCIe Gen4 target through the second set of PCIe reference clock pins defined in COM.0 Rev. 3.1.

8.2 Pinout Changes from Type 7 Rev 3.0 to Rev 3.1

Table 1 – Comparison of Type 7 Rev. 3.0 to Rev. 3.1

Type 7 Rev 3.0				
Pin	**Row A**	**Row B**	**Row C**	**Row D**
15	SUS_S3#	SMB_ALERT#	10G_PHY_MDC _SCL3	10G_PHY_MDIO _SDA3
16	SATAO_TX+	SATA1_TX+	10G_PHY_MDC _SCL2	10G_PHY_MDIO _SDA2
24	SUS_S5#	PWR_OK	10G_INT2	10G_INT3
28	(S)ATA_ACT#	RSVD	GND	GND
29	RSVD	RSVD	10G_KR_RX2+	10G_KR_TX2+
30	RSVD	RSVD	10G_KR_RX2-	10G_KR_TX2-
32	RSVD	SPKR	10G_SFP_SDA3	10G_SFP_SCL3
33	RSVD	12C_CK	10G_SFP_SDA2	10G_SFP_SCL2
34	BIOS_DISO#/E SPI_SAFS	12C_DAT	10G_PHY_RST_ 23	10G_PHY_CAP_ 23
35	THRMTRIP#	THRM#	10G_PHY_RST_ 01	10G_PHY_CAP_ 01
36	PCIE_TX13+	PCIE_RX13+	10G_LED_SDA	RSVD
37	PCIE_TX13-	PCIE_RX13-	10G_LED_SCL	RSVD
38	GND	GND	10G_SFP_SDA1	10G_SFP_SCL1
39	PCIE_TX12+	PCIE_RX12+	10G_SFP_SDAO	10G_SFP_SCLO
45	USBO-	USB1-	10G_PHY_MDC _SCL1	10G_PHY_MDIO _SDA1

Type 7 Rev 3.0				
Pin	**Row A**	**Row B**	**Row C**	**Row D**
15	SUS_S3#	SMB_ALERT#	**RSVD10G**	**RSVD10G**
16	SATA0_TX+	SATA1_TX+	**RSVD10G**	**RSVD10G**
24	SUS_S5#	PWR_OK	**RSVD10G**	**RSVD10G**
28	(S)ATA_ACT#	GND	GND	GND
29	RSVD	**PCIE1_CK_REF+**	10G_KR_RX2+	10G_KR_TX2+
30	RSVD	**PCIE1_CK_REF-**	10G_KR_RX2-	10G_KR_TX2-
32	**IPMB_CLK**	SPKR	**RSVD10G**	**RSVD10G**
33	**IPMB_DAT**	12C_CK	**RSVD10G**	**RSVD10G**
34	BIOS_DISO#/ESPI_SAFS	12C_DAT	**RSVD10G**	**RSVD10G**
35	THRMTRIP#	THRM#	**CEI_RST#**	**CEI_PRSNT#**
36	PCIE_TX13+	PCIE_RX13+	**RSVD10G**	RSVD
37	PCIE_TX13-	PCIE_RX13-	**RSVD10G**	RSVD
38	GND	GND	**RSVD10G**	**RSVD10G**
39	PCIE_TX12+	PCIE_RX12+	**CEI_SDA**	**CEI_SCL**
45	USB0-	USB1-	**RSVD10G**	**RSVD10G**

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46	USB0+	USB1+	10G_PHY_MDC _SCL0	10G_PHY_MDIO _SDAO
47	VCC_RTC	ESPI_EN#	10G_INT0	10G_INT1
48	RSVD	USB0_HOST_P RSNT	GND	GND
54	GPIO	GPO1	TYPE0#	RSVD
63	GPI1	GPO3	RSVD	RSVD
64	PCIE_TX1+	PCIE_RX1+	RSVD	RSVD
77	PCIE_TX10+	PCIE_RX10+	RSVD	RSVD
83	GND	GND	RSVD	RSVD
87	RSVD	VCC_SV_SBY	GND	GND
97	TYPE10#	SPI_CS#	RSVD	RSVD

46	USB0+	USB1+	**CEI_MDC**	**CEI_MDIO**
47	VCC_RTC	ESPI_EN#	**CEI_INT#**	**ETH_PHY_INT#**
48	**RSMRST_OUT#**	USB0_HOST_PR SNT	GND	GND
54	GPIO	GPO1	TYPE0#	**GND**
63	GPI1	GPO3	**GND**	**GND**
64	PCIE_TX1+	PCIE_RX1+	**GND**	**GND**
77	**PCIE_TX10+**	**PCIE_RX10+**	**GND**	**GND**
83	GND	GND	**GND**	**GND**
87	GND	VCC_SV_SBY	GND	GND
97	TYPE10#	SPI_CS#	**GND**	**GND**

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