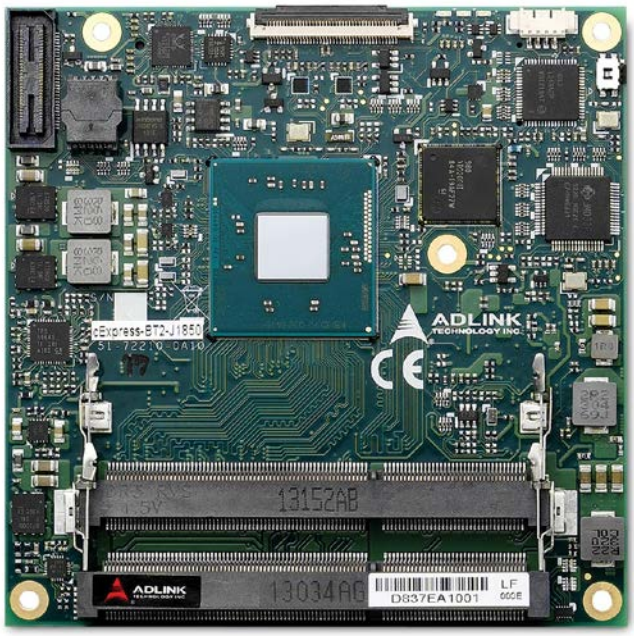
cExpress-BT2

User's Manual

COM Express Compact Size Type 2 Module with
Intel Atom® E3800 and Celeron® Processor SoC



COM Express®

Manual Rev.:	1.2
Revision Date:	April 7, 2020
Part Number:	50-1J052-1020

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Leading EDGE COMPUTING

Preface

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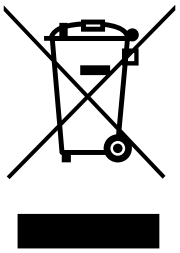
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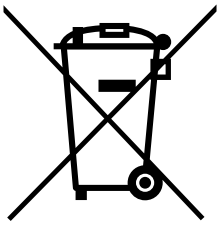
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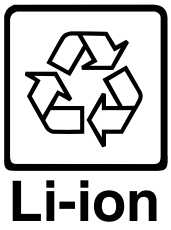
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ADLINK is committed to fulfill its social responsibility to global environmental preservation through compliance with the European Union's Restriction of Hazardous Substances (RoHS) directive and Waste Electrical and Electronic Equipment (WEEE) directive. Environmental protection is a top priority for ADLINK. We have enforced measures to ensure that our products, manufacturing processes, components, and raw materials have as little impact on the environment as possible. When products are at their end of life, our customers are encouraged to dispose of them in accordance with the product disposal and/or recovery programs prescribed by their nation or company.



Battery Labels (for products with battery)









California Proposition 65 Warning



WARNING: This product can expose you to chemicals including acrylamide, arsenic, benzene, cadmium, Tris(1,3-dichloro-2-propyl)phosphate (TDCPP), 1,4-Dioxane, formaldehyde, lead, DEHP, styrene, DINP, BBP, PVC, and vinyl materials, which are known to the State of California to cause cancer, and acrylamide, benzene, cadmium, lead, mercury, phthalates, toluene, DEHP, DIDP, DnHP, DBP, BBP, PVC, and vinyl materials, which are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Trademarks

Product names mentioned herein are used for identification purposes only and may be trademarks and/or registered trademarks of their respective companies.

Revision History

Revision	Description	Date	By
1.00	Initial release	2014-09-24	JC
1.01	Correct specifications (memory, GPIO, LAN, serial port, GPIO, eMMC, OS)	2015-09-14	JC
1.2	Update BIOS	2020-04-07	JC

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1. Introduction

The cExpress-BT2 is a COM Express® COM.0 R2.1 Type 2 module supporting the Intel Atom® E3800 processor and Intel® Celeron® processor, memory controller, and graphics processor on a single-chip design. The cExpress-BT2 is specifically designed for customers who need high-level processing and graphics performance with low power consumption in a long product life solution.

The cExpress-BT2 features the Intel Atom® E3800 processor and Intel® Celeron® processor supporting non-ECC type DDR3L dual-channel memory at 1066/1333 MHz to provide excellent overall performance.

Integrated Intel® 7th Generation HD Graphics includes features such as OpenGL 3.1, DirectX 11, OpenCL 1.1 support for H.264, MPEG2, VC1, VP8 hardware decode. Graphics outputs include VGA and dual-channel 18/24-bit LVDS. The cExpress-BT2 is specifically designed for customers with high-performance graphics processing requirements who want to outsource the custom core logic of their systems for reduced development time.

The cExpress-BT2 has dual stacked SODIMM sockets for up to 8 GB non-ECC type DDR3L memory. In addition, an onboard eMCC memory is supported (optional, 8GB/16GB/32GB).

The cExpress-BT2 features a single onboard Gigabit Ethernet port, USB 2.0 ports, PATA and SATA 3 Gb/s ports, and PCI 2.3. Support is provided for SMBus and I^2C. The module is equipped with SPI AMI EFI BIOS with CMOS backup, supporting embedded features such as remote console, CMOS backup, hardware monitor, and watchdog timer.

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2. Specifications

2.1. Core System

CPU	Single, dual or quad-core Intel Atom® or Celeron® Processor • Intel Atom® E3845 1.91 GHz 542/792 (Turbo) 10W (4C/1333) • Intel Atom® E3827 1.75 GHz 542/792 (Turbo) 8W (2C/1333) • Intel Atom® E3826 1.46 GHz 533/667 (Turbo) 7W (2C/1066) • Intel Atom® E3825 1.33 GHz 533 (No Turbo) 6W (2C/1066) • Intel Atom® E3815 1.46 GHz 400 (No Turbo) 5W (1C/1066) • Intel Atom® E3805 1.33 GHz (No Graphics) 3W (2C/1066) • Celeron® N2930 1.83/2.16 (Burst) GHz, 311/854 (Turbo) 7.5W (4C/1333) • Celeron® J1900 2.0/2.42 (Burst) GHz, 688/854 (Turbo) 10W (4C/1333) Single, dual or quad Out-of-Order Execution (OOE) processor cores. Intel® VT-x, Intel® SSE4.1 and SSE4.2, Intel® 64 architecture, IA 32-bit, PCLMULQDQ Instruction. DRNG, Intel® Thermal Monitor (TM1 & TM2) **Notes:** Availability of features may vary between processor SKUs.
Cache	• 2MB L2 Cache: E3845, N2930 and J1900 • 1MB L2 Cache: E3827, E3826, E3825 and E3805 • 512k L2 Cache: E3815
Memory	Non-ECC 1066/1333 MHz DDR3L memory up to 8GB • Dual stacked SODIMM sockets: E3845, E3827, E3826, N2930, J1900 (lower slot must be populated) • Single SODIMM socket: E3825, E3815, E3805
BIOS	AMI EFI with CMOS backup in 8MB SPI BIOS

2.2. Expansion Busses

PCI Express	• 2 PCI Express x1 (AB): Lanes 0/1
Other	• 1 PCI (CD): PCI 2.3, 32-bit, 33MHz • LPC bus, SMBus (system), I^2C (user)

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2.3. Video

Integrated on Processor	7th generation graphics Intel core architecture with four execution units supporting two independent displays
GPU Feature Support	• 3D graphics hardware acceleration • Support for DirectX 11, OpenCL 1.1, OpenGL ES Halti/2.0/1.1, OpenGL 3.2 • Video decode hardware acceleration including support for H.264, MPEG2, MVC, VC-1, WMV9 and VP8 formats • Video encode hardware acceleration including support for H.264, MPEG2 and MVC formats • Playback of Blu-ray disc 3D content using HDMI (1.4a spec compliant with 3D) **Note:** Availability of features may vary between operating systems.
Display Types	• **Dual channel 18/24-bit LVDS** through eDP-to-LVDS bridge (use DDI0 signal of SoC) • **VGA** supporting resolutions of up to 2560x1600x24bpp @60Hz

2.4. Audio

Integrated	Intel® HD Audio integrated on SoC
Codec	Located on carrier Express-BASE2 (ALC886 standard support)

2.5. LAN

MAC/PHY	Intel® Ethernet Controller I210
Interface	10/100/1000 Mbit/s connection

2.6. Multi I/O and Storage

USB	7x USB 1.1/2.0 (USB 0/1/2/3/4/5/6, ports 3~6 from USB hub)
SATA	1x SATA 3Gb/s (SATA0) Build option two SATA 3GB/s (SATA0, SATA1) when PATA bridge is not used (lose PATA function)
PATA	1x PATA port (through SATA to PATA bridge)
GPIO	4 GPO and 4 GPI
eMMC	Soldered on module bootable eMMC flash storage 8GB or 16GB or 32GB (optional, support dependent on OS)

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2.7. SEMA Board Controller

- **Type:** ADLINK Smart Embedded Management Agent (SEMA)
- **Functions:**
  - Voltage/Current monitoring
  - Power sequence debug support
  - AT/ATX mode control
  - Logistics and forensic information
  - Flat panel control
  - General purpose I2C
  - Failsafe BIOS (dual BIOS by build option)
  - Watchdog timer and fan control

2.8. Debug

- 40-pin flat cable connector to be used with DB-40 debug module
  Supports: BIOS POST code LED, BMC access, SPI BIOS flashing, power testpoints, debug LEDs
- MIPI60 60-pin header for debug of SoC (build option)

2.9. Trusted Platform Module (TPM)

- **Chipset:** AT97SC3204 (build option)
- **Type:** TPM 1.2

2.10. Power Specifications

Power Modes	AT and ATX mode (AT mode startup controlled by SEMA Board Controller)
Standard Voltage Input	ATX: 12V ±5% / 5Vsb ±5%, or AT: 12V ±5%
Wide Voltage Input	ATX: 5-20 V / 5Vsb ±5% , or AT: 5-20 V
Power Management	ACPI 4.0 compliant, Smart Battery support
Power States	Supports C1-C6, S0, S3, S4, S5, S5 ECO mode (Wake-on-USB S3/S4, WoL S3/S4/S5)
ECO Mode	Supports deep S5 (S5 ECO mode) for 5Vsb power saving

Please contact your ADLINK representative for the document “COM Express Module Power Consumption”.

2.11. Operating Temperatures

Standard Operating Temperature	0°C to +60°C (Wide Voltage Input) Storage: -20°C to +70°C
Extreme Rugged Operating Temperature (optional)*	-40°C to +85°C (Standard Voltage Input only, build option supported by Atom™ SKUs only) Storage: -40°C to +85°C *Intel Atom® E3800 Series processors only

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2.12. Environmental

Humidity	Operating: 5-90% RH, non-condensing Storage: 5-95% RH (and operating with conformal coating)
Shock and Vibration	IEC 60068-2-64 and IEC-60068-2-27 MIL-STD-202F, Method 213B, Table 213-I, Condition A and Method 214A, Table 214-I, Condition D
HALT	Thermal Stress, Vibration Stress, Thermal Shock and Combined Test

2.13. Specification Compliance

- PICMG COM.0: Rev. 2.1 Type 2, Compact size 95 x 95 mm

2.14. Operating Systems

Standard Support	• Windows 7/8 32/64-bit • Linux 32/64-bit
Extended Support (BSP)	• WES7/8 • WEC7 32-bit • Linux 32/64-bit • VxWorks

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2.15. Functional Diagram

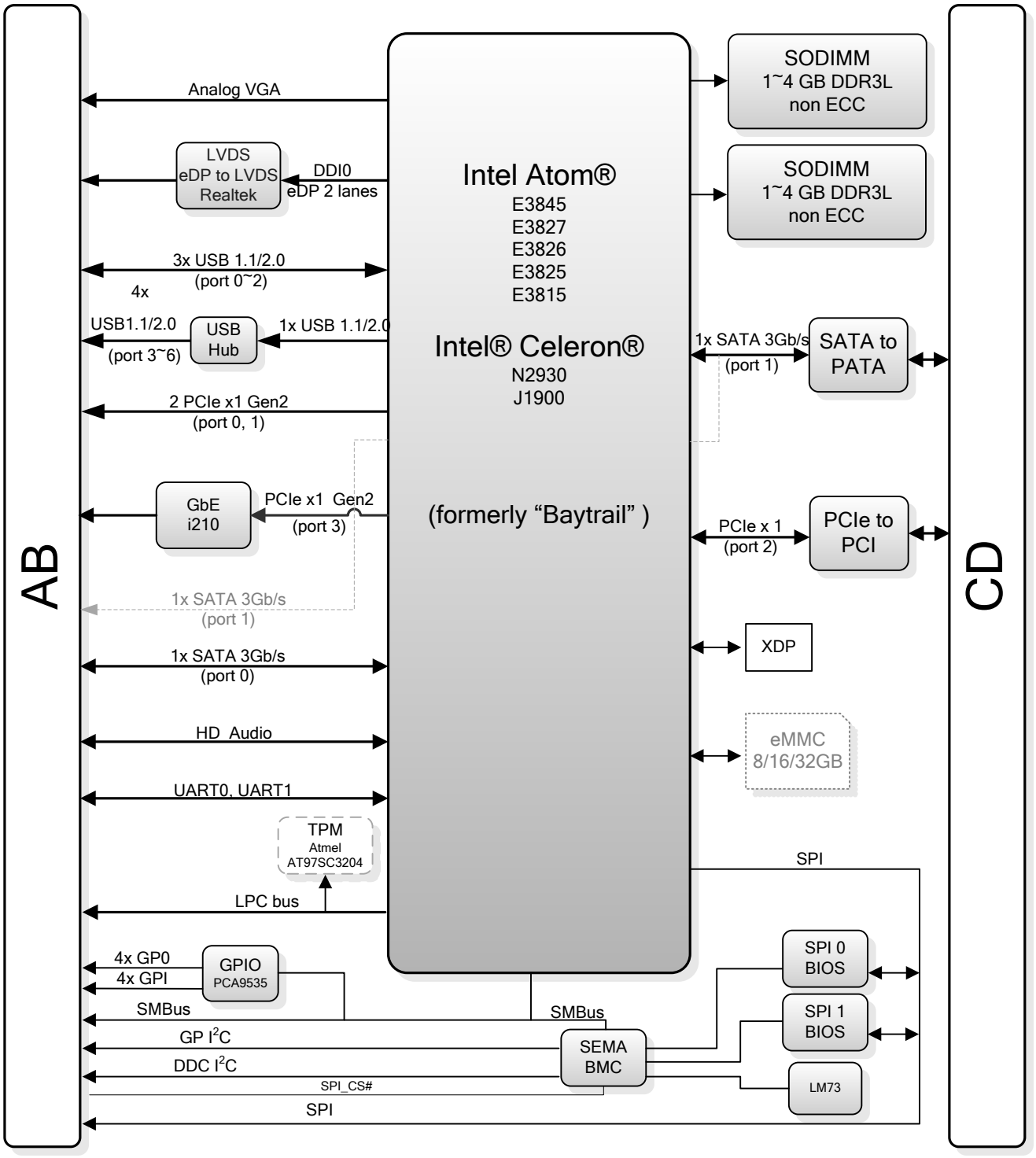
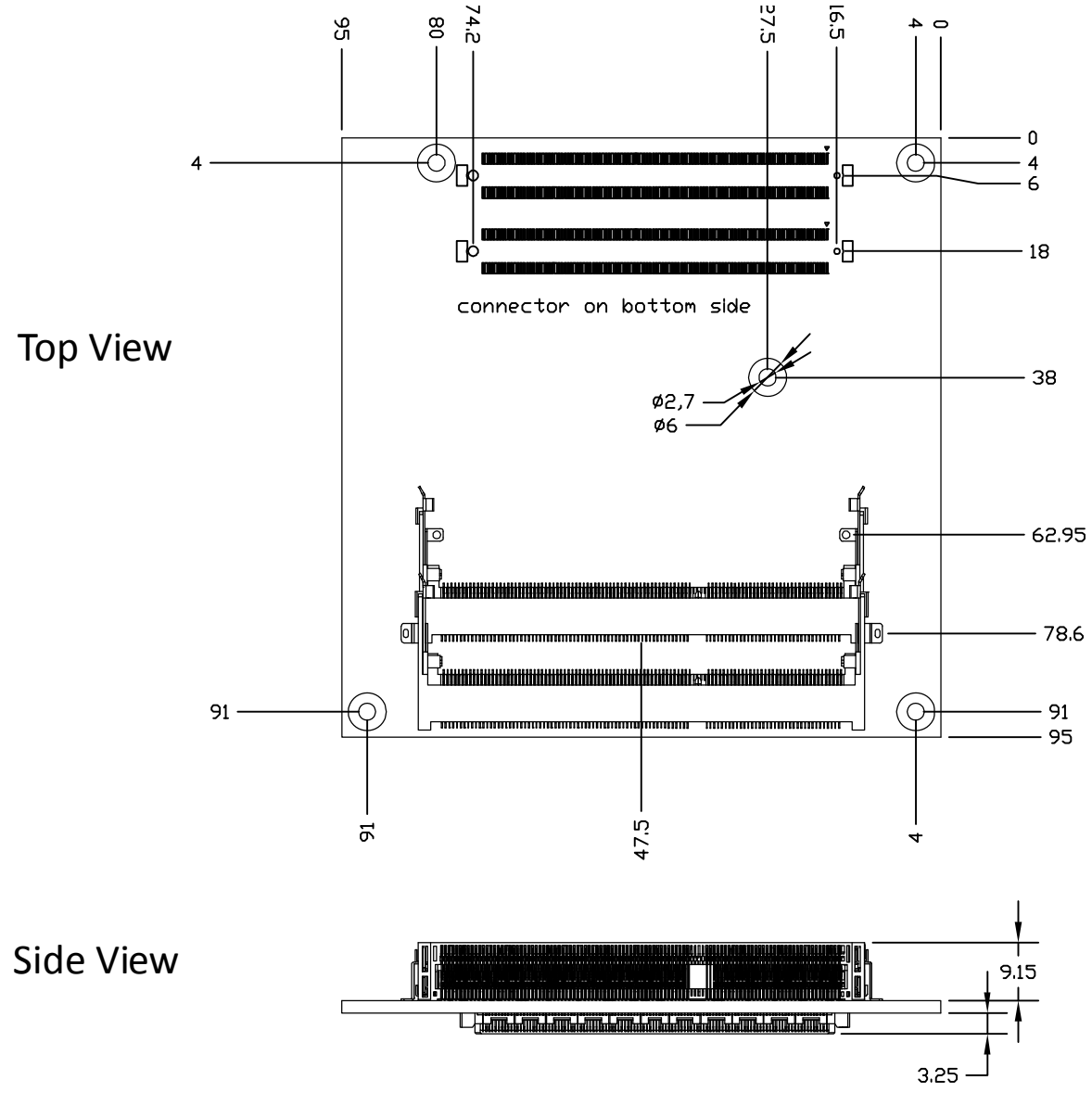


Figure 1: cExpress-BT2 Functional Block Diagram

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2.16. Mechanical Dimensions



All Ø tolerances ± 0.05 mm
Other tolerances ± 0.2 mm

All are dimensions shown in millimeters.

Figure 2: cExpress-BT2 Mechanical Drawing

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3. Pinouts and Signal Descriptions

3.1. AB/CD Pin Definitions

The cExpress-BT2 is a Type 6 module supporting USB 3.0 upgrade signals and DDI channels on the CD connector

All pins in the COM Express specification are described, including those not supported on the cExpress-BT2. Those not supported on the cExpress-BT2 module are ~~crossed out~~.

Table 1: cExpress-BT2 AB/CD Pin Definitions

	Row A		Row B		Row C		Row D
Pin	**Name**	**Pin**	**Name**	**Pin**	**Name**	**Pin**	**Name**
A1	GND (FIXED)	**B1**	GND (FIXED)	**C1**	GND FIXED)	**D1**	GND FIXED)
A2	GBE0_MDI3-	**B2**	GBE0_ACT#	**C2**	IDE_D7	**D2**	IDE_D5
A3	GBE0_MDI3+	**B3**	LPC_FRAME#	**C3**	IDE_D6	**D3**	IDE_D10
A4	GBE0_LINK100#	**B4**	LPC_AD0	**C4**	IDE_D3	**D4**	IDE_D11
A5	GBE0_LINK1000#	**B5**	LPC_AD1	**C5**	IDE_D15	**D5**	IDE_D12
A6	GBE0_MDI2-	**B6**	LPC_AD2	**C6**	IDE_D8	**D6**	IDE_D4
A7	GBE0_MDI2+	**B7**	LPC_AD3	**C7**	IDE_D9	**D7**	IDE_D0
A8	GBE0_LINK#	**B8**	LPC_DRQ0#	**C8**	IDE_D2	**D8**	IDE_REQ
A9	GBE0_MDI1-	**B9**	LPC_DRQ1#	**C9**	IDE_D13	**D9**	IDE_IOW#
A10	GBE0_MDI1+	**B10**	LPC_CLK	**C10**	IDE_D1	**D10**	IDE_ACK#
A11	GND (FIXED)	**B11**	GND (FIXED)	**C11**	GND (FIXED)	**D11**	GND (FIXED)
A12	GBE0_MDI0-	**B12**	PWRBTN#	**C12**	IDE_D14	**D12**	IDE_IRQ
A13	GBE0_MDI0+	**B13**	SMB_CK	**C13**	IDE_IORDY	**D13**	IDE_A0
A14	GBE0_CTREF	**B14**	SMB_DAT	**C14**	IDE_IOR#	**D14**	IDE_A1
A15	SUS_S3#	**B15**	SMB_ALERT#	**C15**	PCI_PME#	**D15**	IDE_A2
A16	SATA0_TX+	**B16**	~~SATA1_TX+~~ *	**C16**	PCI_GNT2#	**D16**	IDE_CS1#
A17	SATA0_TX-	**B17**	~~SATA1_TX-~~ *	**C17**	PCI_REQ2#	**D17**	IDE_CS3#
A18	SUS_S4#	**B18**	SUS_STAT#	**C18**	PCI_GNT1#	**D18**	IDE_RESET#
A19	SATA0_RX+	**B19**	~~SATA1_RX+~~ *	**C19**	PCI_REQ1#	**D19**	PCI_GNT3#
A20	SATA0_RX-	**B20**	~~SATA1_RX-~~ *	**C20**	PCI_GNT0#	**D20**	PCI_REQ3#
A21	GND (FIXED)	**B21**	GND (FIXED)	**C21**	GND (FIXED)	**D21**	GND (FIXED)
A22	~~SATA2_TX+~~	**B22**	~~SATA3_TX+~~	**C22**	PCI_REQ0#	**D22**	PCI_AD1
A23	~~SATA2_TX-~~	**B23**	~~SATA3_TX-~~	**C23**	PCI_RESET#	**D23**	PCI_AD3
A24	SUS_S5#	**B24**	PWR_OK	**C24**	PCI_AD0	**D24**	PCI_AD5
A25	~~SATA2_RX+~~	**B25**	~~SATA3_RX+~~	**C25**	PCI_AD2	**D25**	PCI_AD7
A26	~~SATA2_RX-~~	**B26**	~~SATA3_RX-~~	**C26**	PCI_AD4	**D26**	PCI_C/BE0#
A27	BATLOW#	**B27**	WDT	**C27**	PCI_AD6	**D27**	PCI_AD9
A28	(S)ATA_ACT#	**B28**	~~AC/HDA_SDIN2~~	**C28**	PCI_AD8	**D28**	PCI_AD11
A29	AC/HDA_SYNC	**B29**	AC/HDA_SDIN1	**C29**	PCI_AD10	**D29**	PCI_AD13
A30	AC/HDA_RST#	**B30**	AC/HDA_SDIN0	**C30**	PCI_AD12	**D30**	PCI_AD15
A31	GND (FIXED)	**B31**	GND (FIXED)	**C31**	GND (FIXED)	**D31**	GND (FIXED)
A32	AC/HDA_BITCLK	**B32**	SPKR	**C32**	PCI_AD14	**D32**	PCI_PAR
A33	AC/HDA_SDOUT	**B33**	I2C_CK	**C33**	PCI_C/BE1#	**D33**	PCI_SERR#
A34	BIOS_DIS0#	**B34**	I2C_DAT	**C34**	PCI_PERR#	**D34**	PCI_STOP#
A35	THRMTRIP#	**B35**	THRM#	**C35**	PCI_LOCK#	**D35**	PCI_TRDY#

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	Row A		Row B		Row C		Row D
Pin	**Name**	**Pin**	**Name**	**Pin**	**Name**	**Pin**	**Name**
A36	USB6-	**B36**	USB7-	**C36**	PCI_DEVSEL#	**D36**	PCI_FRAME#
A37	USB6+	**B37**	USB7+	**C37**	PCI_IRDY#	**D37**	PCI_AD16
A38	USB_6_7_OC#	**B38**	USB_4_5_OC#	**C38**	PCI_C/BE2#	**D38**	PCI_AD18
A39	USB4-	**B39**	USB5-	**C39**	PCI_AD17	**D39**	PCI_AD20
A40	USB4+	**B40**	USB5+	**C40**	PCI_AD19	**D40**	PCI_AD22
A41	GND (FIXED)	**B41**	GND (FIXED)	**C41**	GND (FIXED)	**D41**	GND (FIXED)
A42	USB2-	**B42**	USB3-	**C42**	PCI_AD21	**D42**	PCI_AD24
A43	USB2+	**B43**	USB3+	**C43**	PCI_AD23	**D43**	PCI_AD26
A44	USB_2_3_OC#	**B44**	USB_0_1_OC#	**C44**	PCI_C/BE3#	**D44**	PCI_AD28
A45	USB0-	**B45**	USB1-	**C45**	PCI_AD25	**D45**	PCI_AD30
A46	USB0+	**B46**	USB1+	**C46**	PCI_AD27	**D46**	PCI_IRQC#
A47	VCC_RTC	**B47**	EXCD1_PERST#	**C47**	PCI_AD29	**D47**	PCI_IRQD#
A48	EXCD0_PERST#	**B48**	EXCD1_CPPE#	**C48**	PCI_AD31	**D48**	PCI_CLKRUN#
A49	EXCD0_CPPE#	**B49**	SYS_RESET#	**C49**	PCI_IRQA#	**D49**	PCI_M66EN GND)
A50	LPC_SERIRQ	**B50**	CB_RESET#	**C50**	PCI_IRQB#	**D50**	PCI_CLK
A51	GND (FIXED)	**B51**	GND (FIXED)	**C51**	GND (FIXED)	**D51**	GND (FIXED)
A52	~~PCIE_TX5+~~	**B52**	~~PCIE_RX5+~~	**C52**	~~PEG_RX0+~~	**D52**	~~PEG_TX0+~~
A53	~~PCIE_TX5-~~	**B53**	~~PCIE_RX5-~~	**C53**	~~PEG_RX0-~~	**D53**	~~PEG_TX0-~~
A54	GPI0	**B54**	GPO1	**C54**	TYPE0#	**D54**	~~PEG_LANE_RV#~~
A55	~~PCIE_TX4+~~	**B55**	~~PCIE_RX4+~~	**C55**	~~PEG_RX1+~~	**D55**	~~PEG_TX1+~~
A56	~~PCIE_TX4-~~	**B56**	~~PCIE_RX4-~~	**C56**	~~PEG_RX1-~~	**D56**	~~PEG_TX1-~~
A57	GND	**B57**	GPO2	**C57**	TYPE1#	**D57**	TYPE2#
A58	~~PCIE_TX3+~~	**B58**	~~PCIE_RX3+~~	**C58**	~~PEG_RX2+~~	**D58**	~~PEG_TX2+~~
A59	~~PCIE_TX3-~~	**B59**	~~PCIE_RX3-~~	**C59**	~~PEG_RX2-~~	**D59**	~~PEG_TX2-~~
A60	GND (FIXED)	**B60**	GND (FIXED)	**C60**	GND (FIXED)	**D60**	GND (FIXED)
A61	~~PCIE_TX2+~~	**B61**	~~PCIE_RX2+~~	**C61**	~~PEG_RX3+~~	**D61**	~~PEG_TX3+~~
A62	~~PCIE_TX2-~~	**B62**	~~PCIE_RX2-~~	**C62**	~~PEG_RX3-~~	**D62**	~~PEG_TX3-~~
A63	GPI1	**B63**	GPO3	**C63**	RSVD	**D63**	RSVD
A64	PCIE_TX1+	**B64**	PCIE_RX1+	**C64**	RSVD	**D64**	RSVD
A65	PCIE_TX1-	**B65**	PCIE_RX1-	**C65**	~~PEG_RX4+~~	**D65**	~~PEG_TX4+~~
A66	GND	**B66**	WAKE0#	**C66**	~~PEG_RX4-~~	**D66**	~~PEG_TX4-~~
A67	GPI2	**B67**	WAKE1#	**C67**	RSVD	**D67**	GND
A68	PCIE_TX0+	**B68**	PCIE_RX0+	**C68**	~~PEG_RX5+~~	**D68**	~~PEG_TX5+~~
A69	PCIE_TX0-	**B69**	PCIE_RX0-	**C69**	~~PEG_RX5-~~	**D69**	~~PEG_TX5-~~
A70	GND (FIXED)	**B70**	GND (FIXED)	**C70**	GND (FIXED)	**D70**	GND (FIXED)
A71	LVDS_A0+	**B71**	LVDS_B0+	**C71**	~~PEG_RX6+~~	**D71**	~~PEG_TX6+~~
A72	LVDS_A0-	**B72**	LVDS_B0-	**C72**	~~PEG_RX6-~~	**D72**	~~PEG_TX6-~~
A73	LVDS_A1+	**B73**	LVDS_B1+	**C73**	~~SDVO_DATA~~	**D73**	~~SDVO_CLK~~
A74	LVDS_A1-	**B74**	LVDS_B1-	**C74**	~~PEG_RX7+~~	**D74**	~~PEG_TX7+~~
A75	LVDS_A2+	**B75**	LVDS_B2+	**C75**	~~PEG_RX7-~~	**D75**	~~PEG_TX7-~~
A76	LVDS_A2-	**B76**	LVDS_B2-	**C76**	GND	**D76**	GND
A77	LVDS_VDD_EN	**B77**	LVDS_B3+	**C77**	RSVD	**D77**	IDE_CBLID#
A78	LVDS_A3+	**B78**	LVDS_B3-	**C78**	~~PEG_RX8+~~	**D78**	~~PEG_TX8+~~
A79	LVDS_A3-	**B79**	LVDS_BKLT_EN	**C79**	~~PEG_RX8-~~	**D79**	~~PEG_TX8-~~

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	Row A		Row B		Row C		Row D
Pin	**Name**	**Pin**	**Name**	**Pin**	**Name**	**Pin**	**Name**
A80	GND (FIXED)	**B80**	GND (FIXED)	**C80**	GND (FIXED)	**D80**	GND (FIXED)
A81	LVDS_A_CK+	**B81**	LVDS_B_CK+	**C81**	~~PEG_RX9+~~	**D81**	~~PEG_TX9+~~
A82	LVDS_A_CK-	**B82**	LVDS_B_CK-	**C82**	~~PEG_RX9-~~	**D82**	~~PEG_TX9-~~
A83	LVDS_I2C_CK	**B83**	LVDS_BKLT_CTRL	**C83**	RSVD	**D83**	RSVD
A84	LVDS_I2C_DAT	**B84**	VCC_5V_SBY	**C84**	GND	**D84**	GND
A85	GPI3	**B85**	VCC_5V_SBY	**C85**	~~PEG_RX10+~~	**D85**	~~PEG_TX10+~~
A86	~~KBD_RST#~~	**B86**	VCC_5V_SBY	**C86**	~~PEG_RX10-~~	**D86**	~~PEG_TX10-~~
A87	~~KBD_A20GATE~~	**B87**	VCC_5V_SBY	**C87**	GND	**D87**	GND
A88	PCIE0_CK_REF+	**B88**	BIOS_DIS1#	**C88**	~~PEG_RX11+~~	**D88**	~~PEG_TX11+~~
A89	PCIE0_CK_REF-	**B89**	VGA_RED	**C89**	~~PEG_RX11-~~	**D89**	~~PEG_TX11-~~
A90	GND (FIXED)	**B90**	GND (FIXED)	**C90**	GND (FIXED)	**D90**	GND (FIXED)
A91	SPI_POWER	**B91**	VGA_GRN	**C91**	~~PEG_RX12+~~	**D91**	~~PEG_TX12+~~
A92	SPI_MISO	**B92**	VGA_BLU	**C92**	~~PEG_RX12-~~	**D92**	~~PEG_TX12-~~
A93	GPO0	**B93**	VGA_HSYNC	**C93**	GND	**D93**	GND
A94	SPI_CLK	**B94**	VGA_VSYNC	**C94**	~~PEG_RX13+~~	**D94**	~~PEG_TX13+~~
A95	SPI_MOSI	**B95**	VGA_I2C_CK	**C95**	~~PEG_RX13-~~	**D95**	~~PEG_TX13-~~
A96	GND	**B96**	VGA_I2C_DAT	**C96**	GND	**D96**	GND
A97	TYPE10#	**B97**	SPI_CS#	**C97**	RSVD	**D97**	~~PEG_ENABLE#~~
A98	RSVD	**B98**	RSVD	**C98**	~~PEG_RX14+~~	**D98**	~~PEG_TX14+~~
A99	RSVD	**B99**	RSVD	**C99**	~~PEG_RX14-~~	**D99**	~~PEG_TX14-~~
A100	GND (FIXED)	**B100**	GND (FIXED)	**C100**	GND (FIXED)	**D100**	GND (FIXED)
A101	RSVD	**B101**	RSVD	**C101**	~~PEG_RX15+~~	**D101**	~~PEG_TX15+~~
A102	RSVD	**B102**	RSVD	**C102**	~~PEG_RX15-~~	**D102**	~~PEG_TX15-~~
A103	RSVD	**B103**	RSVD	**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: *Second SATA can be supported by BOM option with loss of PATA IDE

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3.2. Signal Description Terminology

The following terms are used in the COM Express AB/CD Signal Descriptions below.

I	Input to the Module
O	Output from the Module
I/O	Bi-directional input/output signal
OD	Open drain output
I 3.3V	Input 3.3V tolerant
I 5V	Input 5V tolerant
O 3.3V	Output 3.3V signal level
O 5V	Output 5V signal level
I/O 3.3V	Bi-directional signal 3.3V tolerant
I/O 5V	Bi-directional signal 5V tolerant
I/O 3.3Vsb	Input 3.3V tolerant active in standby state
P	Power Input/Output
REF	Reference voltage output that may be sourced from a module power plane.
PDS	Pull-down strap. This is an output pin on the module that is either tied to GND or not connected. The signal is used to indicate the PICMG module type to the Carrier Board.
PU	ADLINK implemented pull-up resistor on module
PD	ADLINK implemented pull-down resistor on module

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3.3. AB Signal Descriptions

3.3.1. Audio Signals

Signal	Pin #	Description	I/O	PU/PD	Comment
AC_RST# / HDA_RST#	A30	Reset output to CODEC, active low.	O 3.3V		
AC_SYNC / HDA_SYNC	A29	Sample-synchronization signal to the CODEC(s).	O 3.3V		
AC_BITCLK / HDA_BITCLK	A32	Serial data clock generated by the external CODEC(s).	I/O 3.3V		
AC _SDOUT / HDA_SDOUT	A33	Serial TDM data output to the CODEC.	O 3.3V		
AC _SDIN[2:0] HDA_SDIN[2:0]	B28 B30	Serial TDM data inputs from up to 3 CODECs.			AC_SDIN0: supported AC_SDIN1: supported AC_SDIN2: not supported

3.3.2. Analog VGA

Signal	Pin #	Description	I/O	PU/PD	Comment
VGA_RED	B89	Red for monitor. Analog DAC output, designed to drive a 37.5-Ohm equivalent load.	O Analog	PD 150R	shall also be terminated on the carrier with 150Ω resistor to ground close to VGA connector
VGA_GRN	B91	Green for monitor Analog DAC output, designed to drive a 37.5-Ohm equivalent load.	O Analog	PD 150R	shall also be terminated on the carrier with 150Ω resistor to ground close to VGA connector
VGA_BLU	B92	Blue for monitor. Analog DAC output, designed to drive a 37.5-Ohm equivalent load.	O Analog	PD 150R	shall also be terminated on the carrier with 150Ω resistor to ground close to VGA connector
VGA_HSYNC	B93	Horizontal sync output to VGA monitor	O 3.3V		
VGA_VSYNC	B94	Vertical sync output to VGA monitor	O 3.3V		
VGA_I2C_CK	B95	DDC clock line (I²C port dedicated to identify VGA monitor capabilities)	I/O OD 3.3V	PU 2k2 3.3V	
VGA_I2C_DAT	B96	DDC data line.	I/O OD 3.3V	PU 2k2 3.3V	

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3.3.3. LVDS

Signal	Pin #	Description	I/O	PU/PD	Comment
LVDS_A0+ LVDS_A0- LVDS_A1+ LVDS_A1- LVDS_A2+ LVDS_A2- LVDS_A3+ LVDS_A3-	A71 A72 A73 A74 A75 A76 A78 A79	LVDS Channel A differential pairs	O LVDS		
LVDS_A_CK+ LVDS_A_CK-	A81 A82	LVDS Channel A differential clock	O LVDS		
LVDS_B0+ LVDS_B0- LVDS_B1+ LVDS_B1- LVDS_B2+ LVDS_B2- LVDS_B3+ LVDS_B3-	B71 B72 B73 B74 B75 B76 B77 B78	LVDS Channel B differential pairs	O LVDS		
LVDS_B_CK+ LVDS_B_CK-	B81 B82	LVDS Channel B differential clock	O LVDS		
LVDS_VDD_EN	A77	LVDS panel power enable	O 3.3V		
LVDS_BKLT_EN	B79	LVDS panel backlight enable	O 3.3V		
LVDS_BKLT_CTRL	B83	LVDS panel backlight brightness control	O 3.3V	PD 100K	
LVDS_I2C_CK	A83	DDC lines used for flat panel detection and control.	O 3.3V	PU 2k2 3.3V	
LVDS_I2C_DAT	A84	DDC lines used for flat panel detection and control.	I/O 3.3V	PU 2k2 3.3V	

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3.3.4. Gigabit Ethernet

Gigabit Ethernet	Pin #	Description	I/O	PU/PD	Comment
GBE0_MDI0+ GBE0_MDI0- GBE0_MDI1+ GBE0_MDI1- GBE0_MDI2+ GBE0_MDI2- GBE0_MDI3+ GBE0_MDI3-	A13 A11 A10 A9 A7 A6 A3 A2	Gigabit Ethernet Controller 0: Media Dependent Interface Differential Pairs 0, 1, 2, 3. The MDI can operate in 1000, 100, and 10Mbit/sec modes. Some pairs are unused in some modes according to the following: **1000 100 10** MDI[0]+/- B1_DA+/- TX+/- TX+/- MDI[1]+/- B1_DB+/- RX+/- RX+/- MDI[2]+/- B1_DC+/- MDI[3]+/- B1_DD+/-	I/O Analog		Twisted pair signals for external transformer.
GBE0_ACT#	B2	Gigabit Ethernet Controller 0 activity indicator, active low.	O 3.3VSB	PU 10k 3.3VSB	
GBE0_LINK#	A8	Gigabit Ethernet Controller 0 link indicator, active low.	O 3.3VSB		
GBE0_LINK100#	A4	Gigabit Ethernet Controller 0 100Mbit/sec link indicator, active low.	O 3.3VSB		
GBE0_LINK1000#	A5	Gigabit Ethernet Controller 0 1000Mbit/sec link indicator, active low.	O 3.3VSB		
GBE0_CTREF	A14	Reference voltage for Carrier Board Ethernet channel 1 and 2 magnetics center tap. The reference voltage is determined by the requirements of the Module PHY and may be as low as 0V and as high as 3.3V. The reference voltage output shall be current limited on the Module. In the case in which the reference is shorted to ground, the current shall be 250 mA or less.	GND min 3.3V max		

3.3.5. SATA

Signal	Pin #	Description	I/O	PU/PD	Comment
SATA0_TX+ SATA0_TX-	A16 A17	Serial ATA channel 0, Transmit Output differential pair.	O SATA		AC coupled on Module
SATA0_RX+ SATA0_RX-	A19 A20	Serial ATA channel 0, Receive Input differential pair.	I SATA		AC coupled on Module
SATA1_TX+ SATA1_TX-	B16 B17	Serial ATA channel 1, Transmit Output differential pair.	O SATA		Optional supported second SATA by BOM loose PATA IDE AC coupled on Module
SATA1_RX+ SATA1_RX-	B19 B20	Serial ATA channel 1, Receive Input differential pair.	I SATA		
SATA2_TX+ SATA2_TX-	A22 A23	Serial ATA channel 2, Transmit Output differential pair.	O SATA		Not supported
SATA2_RX+ SATA2_RX-	A25 A26	Serial ATA channel 2, Receive Input differential pair.	I SATA		Not supported
SATA3_TX+ SATA3_TX-	B22 B23	Serial ATA channel 3, Transmit Output differential pair.	O SATA		Not supported
SATA3_RX+ SATA3_RX-	B25 B26	Serial ATA channel 3, Receive Input differential pair.	I SATA		Not supported
(S)ATA_ACT#	A28	ATA (parallel and serial) or SAS activity indicator, active low.	O 3.3V		

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3.3.6. PCI Express

Signal	Pin #	Description	I/O	PU/PD	Comment
PCIE_TX0+ PCIE_TX0-	A68 A69	PCI Express channel 0, Transmit Output differential pair.	O PCIE		AC coupled on Module
PCIE_RX0+ PCIE_RX0-	B68 B69	PCI Express channel 0, Receive Input differential pair.	I PCIE		AC coupled off Module
PCIE_TX1+ PCIE_TX1-	A64 A65	PCI Express channel 1, Transmit Output differential pair.	O PCIE		AC coupled on Module
PCIE_RX1+ PCIE_RX1-	B64 B65	PCI Express channel 1, Receive Input differential pair.	I PCIE		AC coupled off Module
PCIE_TX2+ PCIE_TX2-	A61 A62	PCI Express channel 2, Transmit Output differential pair.	O PCIE		Not supported
PCIE_RX2+ PCIE_RX2-	B61 B62	PCI Express channel 2, Receive Input differential pair.	I PCIE		Not supported
PCIE_TX3+ PCIE_TX3-	A58 A59	PCI Express channel 3, Transmit Output differential pair.	O PCIE		Not supported
PCIE_RX3+ PCIE_RX3-	B58 B59	PCI Express channel 3, Receive Input differential pair.	I PCIE		Not supported
PCIE_TX4+ PCIE_TX4-	A55 A56	PCI Express channel 4, Transmit Output differential pair.	O PCIE		Not supported
PCIE_RX4+ PCIE_RX4-	B55 B56	PCI Express channel 4, Receive Input differential pair.	I PCIE		Not supported
PCIE_TX5+ PCIE_TX5-	A52 A53	PCI Express channel 5, Transmit Output differential pair.	O PCIE		Not supported
PCIE_RX5+ PCIE_RX5-	B52 B53	PCI Express channel 5, Receive Input differential pair.	I PCIE		Not supported
PCIE_CLK_REF+ PCIE_CLK_REF-	A88 A89	PCI Express Reference Clock output for all PCI Express and PCI Express Graphics Lanes.	O PCIE		

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3.3.7. Express Card

Signal	Pin #	Description	I/O	PU/PD	Comment
EXCD0_CPPE# EXCD1_CPPE#	A49 B48	PCI ExpressCard: PCI Express capable card request	I 3.3V	PU 10k 3.3V	
EXCD0_PERST# EXCD1_PERST#	A48 B47	PCI ExpressCard: reset	O 3.3V		

3.3.8. LPC bus

Signal	Pin #	Description	I/O	PU/PD	Comment
LPC_AD[0:3]	B4-B7	LPC multiplexed address, command and data bus	I/O 3.3V		
LPC_FRAME#	B3	LPC frame indicates the start of an LPC cycle	O 3.3V		
LPC_DRQ0# LPC_DRQ1#	B8 B9	LPC serial DMA request	I 3.3V		
LPC_SERIRQ	A50	LPC serial interrupt	I/O OD 3.3V	PU 8k2 3.3V	
LPC_CLK	B10	LPC clock output –33MHz nominal	O 3.3V		Atom clock 33 MHz Celeron clock 25 MHz

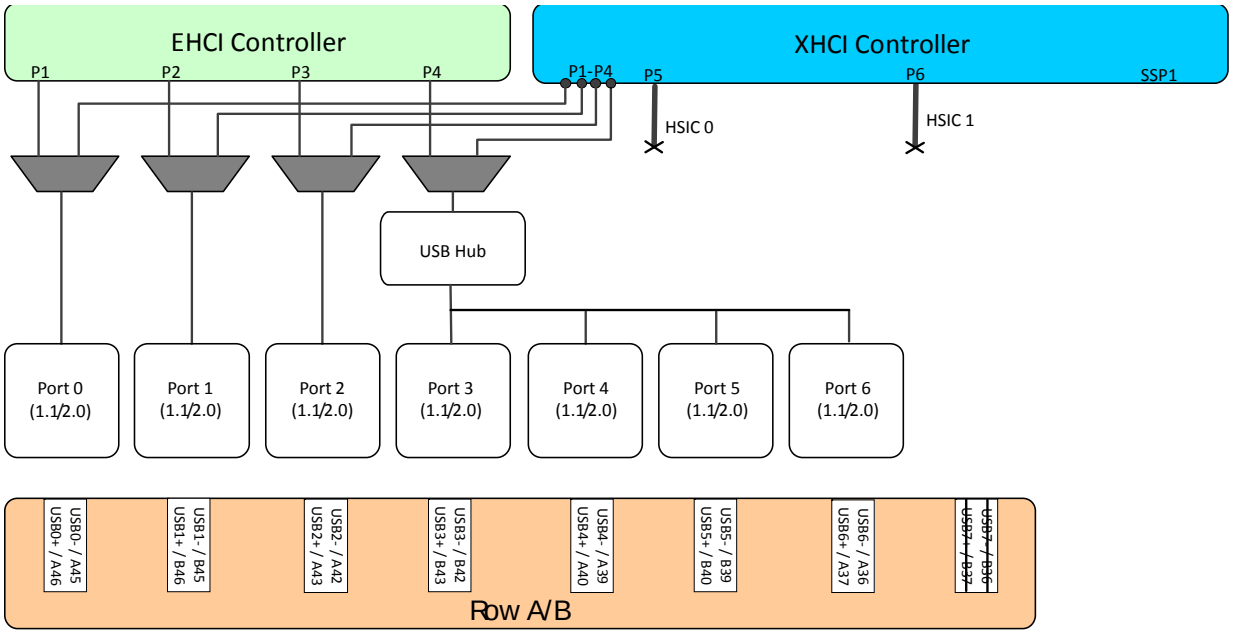
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3.3.9. USB

Signal	Pin #	Description	I/O	PU/PD	Comment
USB0+ USB0-	A46 A45	USB differential data pairs for Port 0	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB1+ USB1-	B46 B45	USB differential data pairs for Port 1	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB2+ USB2-	A43 A42	USB differential data pairs for Port 1	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB3+ USB3-	B43 B42	USB differential data pairs for Port 2	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB4+ USB4-	A40 A39	USB differential data pairs for Port 3	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB5+ USB5-	B40 B39	USB differential data pairs for Port 4	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB6+ USB6-	A37 A36	USB differential data pairs for Port 5	I/O 3.3VSB		USB 1.1/ 2.0 compliant
USB7+ USB7-	B37 B37	USB differential data pairs for Port 6	I/O 3.3VSB		Not supported
USB_0_1_OC#	B44	USB over-current sense, USB ports 0 and 1. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low.	I 3.3VSB	PU 10k 3.3VSB	Do not pull high on carrier
USB_2_3_OC#	A44	USB over-current sense, USB ports 2 and 3. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low. .	I 3.3VSB	PU 10k 3.3VSB	Do not pull high on carrier
USB_4_5_OC#	B38	USB over-current sense, USB ports 4 and 5. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low.	I 3.3VSB	PU 10k 3.3VSB	Do not pull high on carrier
USB_6_7_OC#	A38	USB over-current sense, USB ports 6 and 7. A pull-up for this line shall be present on the module. An open drain driver from a USB current monitor on the carrier board may drive this line low.	I 3.3VSB	PU 10k 3.3VSB	Do not pull high on carrier

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3.3.10. USB Root Segmentation



3.3.11. SPI (BIOS only)

Signal	Pin #	Description	I/O	PU/PD	Comment
SPI_CS#	B97	Chip select for Carrier Board SPI BIOS Flash.	O 3.3VSB		Only support CS0
SPI_MISO	A92	Data in to module from carrier board SPI BIOS flash.	I 3.3VSB		
SPI_MOSI	A95	Data out from module to carrier board SPI BIOS flash.	O 3.3VSB		
SPI_CLK	A94	Clock from module to carrier board SPI BIOS flash.	O 3.3VSB		
SPI_POWER	A91	Power supply for Carrier Board SPI – sourced from Module – nominally 3.3V. The Module shall provide a minimum of 100mA on SPI_POWER. Carriers shall use less than 100mA of SPI_POWER. SPI_POWER shall only be used to power SPI devices on the Carrier	O P 3.3VSB		
BIOS_DIS0#	A34	Selection strap to determine the BIOS boot device.	I	PU 10K 3.3V	Carrier shall pull to GND or leave not-connected.
BIOS_DIS1#	B88	Selection strap to determine the BIOS boot device.	I	PU 10K 3.3V	Carrier shall pull to GND or leave not-connected

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3.3.12. Miscellaneous

Signal	Pin #	Description	I/O	PU/PD	Comment
SPKR	B32	Output for audio enunciator, the “speaker” in PC-AT systems	O 3.3V		
WDT	B27	Output indicating that a watchdog time-out event has occurred.	O 3.3V		
THRM#	B35	Input from off-module temp sensor indicating an over-temp situation.	I 3.3V		
THRMTRIP#	A35	Active low output indicating that the CPU has entered thermal shutdown.	O 3.3V	PU 10k 3.3V	
FAN_PWMOUT	B101	Fan speed control. Uses the Pulse Width Modulation (PWM) technique to control the fan’s RPM.	O OD 3.3V		
FAN_TACHIN	B102	Fan tachometer input for a fan with a two pulse output.	I OD 3.3V	PU 10k 3.3V	

3.3.13. SMBus

Signal	Pin #	Description	I/O	PU/PD	Comment
SMB_CK	B13	System Management Bus bidirectional clock line. Power sourced through 5V standby rail and main power rails.	I/O OD 3.3VSB	PU 2k2 3.3VSB	
SMB_DAT#	B14	System Management Bus bidirectional data line. Power sourced through 5V standby rail and main power rails.	I/O OD 3.3VSB	PU 2k2 3.3VSB	
SMB_ALERT#	B15	System Management Bus Alert – active low input can be used to generate an SMI# (System Management Interrupt) or to wake the system. Power sourced through 5V standby rail and main power rails.	I 3.3VSB	PU 10k 3.3VSB	

3.3.14. I2C Bus

Signal	Pin #	Description	I/O	PU/PD	Comment
I2C_CK	B33	General purpose I²C port clock output/input	I/O OD 3.3VSB	PU 2k2 3.3VSB	
I2C_DAT	B34	General purpose I²C port data I/O line	I/O OD 3.3VSB	PU 2k2 3.3VSB	

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3.3.15. General Purpose I/O (GPIO)

Signal	Pin #	Description	I/O	PU/PD	Comment
GPO[0]	A93	General purpose output pins.	O 3.3V	PU 10K 3.3V	After hardware RESET output low
GPO[1]	B54	General purpose output pins.	O 3.3V	PU 10K 3.3V	After hardware RESET output low
GPO[2]	B57	General purpose output pins.	O 3.3V	PU 10K 3.3V	After hardware RESET output low
GPO[3]	B63	General purpose output pins.	O 3.3V	PU 10K 3.3V	After hardware RESET output low
GPI[0]	A54	General purpose input pins. Pulled high internally on the module.	I 3.3V	PU 10K 3.3V	
GPI[1]	A63	General purpose input pins. Pulled high internally on the module.	I 3.3V	PU 10K 3.3V	
GPI[2]	A67	General purpose input pins. Pulled high internally on the module.	I 3.3V	PU 10K 3.3V	
GPI[3]	A85	General purpose input pins. Pulled high internally on the module.	I 3.3V	PU 10K 3.3V	

3.3.16. Serial Interface Signals

Signal	Pin #	Description	I/O	PU/PD	Comment
SER0_TX	A98	General purpose serial port transmitter (TTL level output)	O CMOS		Power rail tolerance 5V / 12V
SER0_RX	A99	General purpose serial port receiver (TTL level input)	I CMOS		Power rail tolerance 5V / 12V
SER1_TX	A101	General purpose serial port transmitter (TTL level output)	O CMOS		Power rail tolerance 5V / 12V
SER1_RX	A102	General purpose serial port receiver (TTL level input)	I CMOS		Power rail tolerance 5V / 12V

3.3.17. Power And System Management

Signal	Pin #	Description	I/O	PU/PD	Comment
PWRBTN#	B12	Power button to bring system out of S5 (soft off), active on falling edge.	I 3.3VSB	PU 10k 3.3VSB	
SYS_RESET#	B49	Reset button input. Active low request for module to reset and reboot. May be falling edge sensitive. For situations when SYS_RESET# is not able to reestablish control of the system, PWR_OK or a power cycle may be used.	I 3.3VSB	PU 10k 3.3VSB	
CB_RESET#	B50	Reset output from module to Carrier Board. Active low. Issued by module chipset and may result from a low SYS_RESET# input, a low PWR_OK input, a VCC_12V power input that falls below the minimum specification, a watchdog timeout, or may be initiated by the module software.	O 3.3VSB		
PWR_OK	B24	Power OK from main power supply. A high value indicates that the power is good. This signal can be used to hold off Module startup to allow carrier based FPGAs or other	I 3.3V	PU 100k 3.3VSB	

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Signal	Pin #	Description	I/O	PU/PD	Comment
		configurable devices time to be programmed.			
SUS_STAT#	B18	Indicates imminent suspend operation; used to notify LPC devices.	O 3.3VSB		
SUS_S3#	A15	Indicates system is in Suspend to RAM state. Active-low output. An inverted copy of SUS_S3# on the carrier board (also known as “PS_ON”) may be used to enable the non-standby power on a typical ATX power supply.	O 3.3VSB		
SUS_S4#	A18	Indicates system is in Suspend to Disk state. Active low output.	O 3.3VSB		
SUS_S5#	A24	Indicates system is in Soft Off state.	O 3.3VSB		Not supported, connect to SUS_S4#
WAKE0#	B66	PCI Express wake up signal.	I 3.3VSB	PU 10k 3.3VSB	Not supported, connected to WAKE1#
WAKE1#	B67	General purpose wake up signal. May be used to implement wake-up on PS/2 keyboard or mouse activity.	I 3.3VSB	PU 10k 3.3VSB	
BATLOW#	A27	Battery low input. This signal may be driven low by external circuitry to signal that the system battery is low, or may be used to signal some other external power-management event.	I 3.3VSB	PU 10k 3.3VSB	
LID#		LID button. Low active signal used by the ACPI operating system for a LID switch.	I OD 3.3VSB	PU 10k 3.3VSB	Emulated on GPIO (BIOS)
SLEEP#		Sleep button. Low active signal used by the ACPI operating system to bring the system to sleep state or to wake it up again.	I OD 3.3VSB	PU 10K 3.3VSB	Emulated on GPIO (BIOS)

3.3.18. Power and Ground

Signal	Pin #	Description	I/O	PU/PD	Comment
VCC_12V	A104-A109 B104-B109	Primary power input: +12V nominal (wide range 5 ~ 20V). All available VCC_12V pins on the connector(s) shall be used.	P		5~20 V
VCC_5V_SBY	B84-B87	Standby power input: +5.0V nominal. See section 7 “Electrical Specifications“ for allowable input range. If VCC5_SBY is used, all available VCC_5V_SBY pins on the connector(s) shall be used. Only used for standby and suspend functions. May be left unconnected if these functions are not used in the system design.	P		5Vsb ±5%
VCC_RTC	A47	Real-time clock circuit-power input. Nominally +3.0V.	P		
GND	A1, A11, A21, A31, A41, A51, A57, A66, A80, A90, A96, A100, A110, B1, B11, B21,B31, B41, B51, B60, B70, B80, B90, B100, B110	Ground - DC power and signal and AC signal return path.	P		

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3.4. CD Signal Descriptions

3.4.1. PATA IDE

Signal	Pin #	Description	I/O	PU/PD	Comment
IDE_D0 IDE_D1 IDE_D2 IDE_D3 IDE_D4 IDE_D5 IDE_D6 IDE_D7 IDE_D8 IDE_D9 IDE_D10 IDE_D11 IDE_D12 IDE_D13 IDE_D14 IDE_D15	D7 C10 C8 C4 D6 D2 C3 C2 C6 C7 D3 D4 D5 C9 C12 C5	Bidirectional data to / from IDE device.	I/O 3.3V		
IDE_A0	D13	Address lines to IDE device.	O 3.3V		
IDE_A1	D14	Address lines to IDE device.	O 3.3V		
IDE_A2	D15	Address lines to IDE device.	O 3.3V		
IDE_IOW#	D9	I/O write line to IDE device. Data latched on trailing (rising) edge.	O 3.3V		
IDE_IOR#	C14	I/O read line to IDE device.	O 3.3V		
IDE_REQ	D8	IDE Device DMA Request. It is asserted by the IDE device to request a data transfer.	I 3.3V		
IDE_ACK#	D10	IDE Device DMA Acknowledge.	O 3.3V		
IDE_CS1#	D16	IDE Device Chip Select for 1F0h to 1FFh range.	O 3.3V		
IDE_CS3#	D17	IDE Device Chip Select for 3F0h to 3FFh range.	O 3.3V		
IDE_IORDY	C13	IDE device I/O ready input. Pulled low by the IDE device to extend the cycle.	I 3.3V	PU 4k7 3.3V	
IDE_RESET#	D18	Reset output to IDE device, active low.	O 3.3V		
IDE_IRQ	D12	Interrupt request from IDE device.	I 3.3V	PD 10k shall	
IDE_CBLID#	D77	Input from off-module hardware indicating the type of IDE cable being used. High indicates a 40-pin cable used for legacy IDE modes. Low indicates that an 80-pin cable with interleaved grounds is used. Such a cable is required for Ultra-DMA 66, 100 and 133 modes.	I 3.3V		

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3.4.2. PCI

Signal	Pin #	Description	I/O	PU/PD	Comment
PCI_AD0 PCI_AD1 PCI_AD2 PCI_AD3 PCI_AD4 PCI_AD5 PCI_AD6 PCI_AD7 PCI_AD8 PCI_AD9 PCI_AD10 PCI_AD11 PCI_AD12 PCI_AD13 PCI_AD14 PCI_AD15 PCI_AD16 PCI_AD17 PCI_AD18 PCI_AD19 PCI_AD20 PCI_AD21 PCI_AD22 PCI_AD23 PCI_AD24 PCI_AD25 PCI_AD26 PCI_AD27 PCI_AD28 PCI_AD29 PCI_AD30 PCI_AD31	C24 D22 C25 D23 C26 D24 C27 D25 C28 D27 C29 D28 C30 D29 C32 D30 D37 C39 D38 C40 D39 C42 D40 C43 D42 C45 D43 C46 D44 C47 D45 C48	PCI bus multiplexed address and data lines	I/O 3.3V		
PCI_C/BE0# PCI_C/BE1# PCI_C/BE2# PCI_C/BE3#	D26 C33 C38 C44	PCI bus byte enable lines, active low	I/O 3.3V		
PCI_DEVSEL#	C36	PCI bus Device Select, active low.	I/O 3.3V	PU 8k2 3.3V	
PCI_FRAME#	D36	PCI bus Frame control line, active low.	I/O 3.3V	PU 8k2 3.3V	
PCI_IRDY#	C37	PCI bus Initiator Ready control line, active low.	I/O 3.3V	PU 8k2 3.3V	
PCI_TRDY#	D35	PCI bus Target Ready control line, active low.	I/O 3.3V	PU 8k2 3.3V	
PCI_STOP#	D34	PCI bus STOP control line, active low, driven by cycle initiator.	I/O 3.3V	PU 8k2 3.3V	
PCI_PAR	D32	PCI bus parity	I/O 3.3V		
PCI_PERR#	C34	Parity Error: An external PCI device drives PERR# when it receives data that has a parity error.	I/O 3.3V	PU 8k2 3.3V	
PCI_REQ0# PCI_REQ1# PCI_REQ2# PCI_REQ3#	C22 C19 C17 D20	PCI bus master request input lines, active low.	I 3.3V	PU 8k2 3.3V	

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Signal	Pin #	Description	I/O	PU/PD	Comment
PCI_GNT0# PCI_GNT1# PCI_GNT2# PCI_GNT3#	C20 C18 C16 D19	PCI bus master grant output lines, active low.	O 3.3V		PCI_GNT[0..3]# are boot strap signals (see note below)
PCI_RESET#	C23	PCI Reset output, active low.	O 3.3V		
PCI_LOCK#	C35	PCI Lock control line, active low.	I/O 3.3V	PU 8k2 3.3V	
PCI_SERR#	D33	System Error: SERR# may be pulsed active by any PCI device that detects a system error condition.	I/O 3.3V	PU 8k2 3.3V	
PCI_PME#	C15	PCI Power Management Event: PCI peripherals drive PME# to wake system from low-power states S1–S5.	I 3.3VSB		
PCI_CLKRUN#	D48	Bidirectional pin used to support PCI clock run protocol for mobile systems.	I/O 3.3V	PU 10k 3.3V	
PCI_IRQA# PCI_IRQB# PCI_IRQC# PCI_IRQD#	C49 C50 D46 D47	PCI interrupt request lines	I 3.3V	PU 8k2 3.3V	
PCI_CLK	D50	PCI 33MHz clock output	O 3.3V		

3.4.3. Module Type Definition

Signal	Pin #	Description	I/O	Comment
TYPE0# TYPE1# TYPE2#	C54 C57 D57	The TYPE pins indicate to the Carrier Board the Pin-out Type that is implemented on the module. The pins are tied on the module to either ground (GND) or are no-connects (NC). For Pinout Type 1, these pins are don't care (X). TYPE2# TYPE1# TYPE0# X X X Pinout Type 1 **NC NC NC Pinout Type 2** NC NC GND Pinout Type 3 (no IDE) NC GND NC Pinout Type 4 (no PCI) NC GND GND Pinout Type 5 (no IDE, no PCI) GND NC NC Pinout Type 6 (no IDE, no PCI) The Carrier Board should implement combinatorial logic that monitors the module TYPE pins and keeps power off (e.g deactivates the ATX_ON signal for an ATX power supply) if an incompatible module pin-out type is detected. The Carrier Board logic may also implement a fault indicator such as an LED.		Type 2

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3.4.4. Power and Ground

Signal	Pin #	Description	I/O	PU/PD	Comment
VCC_12V	C104-C109 D104-D109	Primary power input: +12V nominal (wide range 5 ~ 20V). All available VCC_12V pins on the connector(s) shall be used	P		5 ~ 20V
GND	C1, C11, C21, C31, C41, C51, C60, C70, C76, C80, C84, C87, C90, C93, C96, C100, C103, C110, D1, D11, D21, D31, D41, D51, D60, D67, D70, D76, D80, D84, D87, D90, D93, D96, D100, D103, D110	Ground - DC power and signal and AC signal return path. All available GND connector pins shall be used and tied to carrier board GND plane.	P		

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4. Module Interfaces

This chapter describes connectors and pinouts, LEDs and switches that are used on the module but are not included in the PICMG standard specification

4.1. Connector, Switch and LED Locations

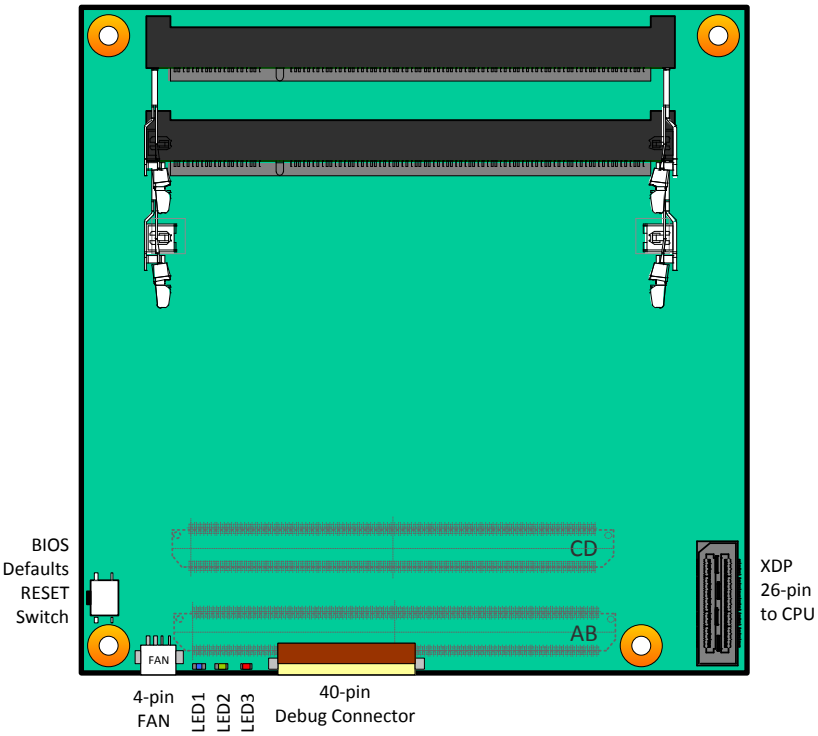


Figure 3: cExpress-BT2 Connector, Switch and LED Locations

cExpress-BT2 and the DB40 Debug Module

For illustration purposes only

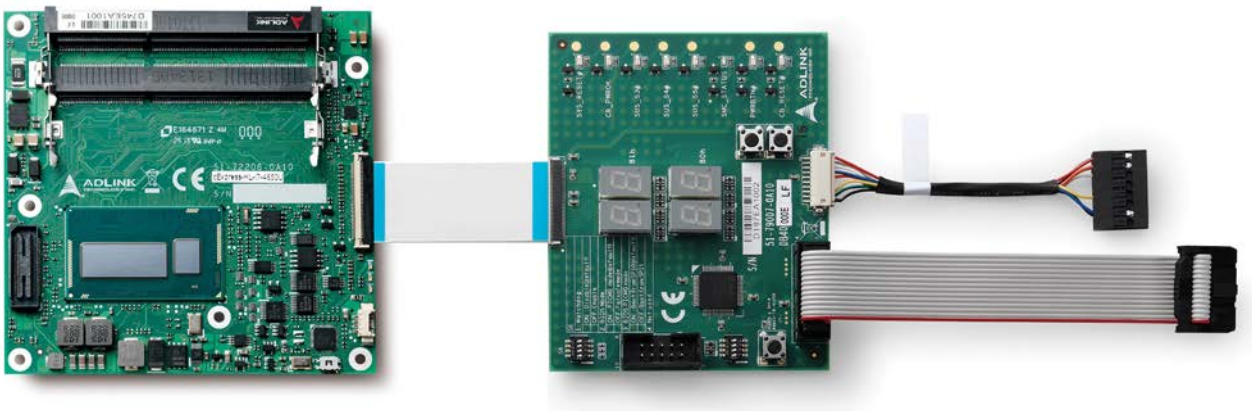


Figure 4: cExpress-BT2 and the DB40 Debug Module

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4.2. 40-pin Debug Connector

FPC Connector Type: FCI 59GF Flex 10042867

Pin Orientation



1 40

40-pin Debug Connector Pin Definition on the COM Express Module

Pin	Interface	Signal	Remark
1	SPI Program interface	VCC_SPI_IN	SPI Power Input from flash tool to module. HW need add MOS FET to switch SPI power for SPI ROM
2		GND	
3		SPI_BIOS_CS0#	
4		SPI_BIOS_CS1#	
5		SPI_BIOS_MISO	
6		SPI_BIOS_MOSI	
7		SPI_BIOS_CLK	
8	LPC Bus	3V3_LPC	System power 3.3V provide from COM module
9		GND	
10		BIOS_DIS0	
11		RST#	
12		CLK33_LPC	
13		LPC_FRAME#	
14		LPC_AD3	
15		LPC_AD2	
16		LPC_AD1	always power 3.3V provide from COM module
17		LPC_AD0	
18	BMC Program interface	3.3V_BMC	always power 3.3V provide from COM module
19		3.3V_BMC	always power 3.3V provide from COM module
20		GND	

Pin	Interface	Signal	Remark
21	BMC Program interface (cont'd)	TXD6	
22		RXD6	
23		FUMD0	
24		RESET_IN#	
25		DATA	
26		CLK	
27		OCD0A	Include a jumper to connect OCD0A via 1K0 pull-up to 3.3V_BMC
28		OCD0B	Include a jumper to connect OCD0A via 1K0 pull-up to 3.3V_BMC
29	Test points	PWRBTN#	
30		SYS_RESET#	
31		CB_RESET#	
32		CB_PWROK	
33		SUS_S3#	
34		SUS_S4#	
35		SUS_S5#	
36	BMC Debug signals	POSTWDT_DIS#	Connect to Jumper for Debug
37		SEL_BIOS	Connect to Jumper for Debug
38		BIOS_MODE	Connect to Jumper for Debug
39		BMC_STATUS	
40	Reserved		

Table 2: 40-pin Debug Connector Pin Definition

Note: The pin definition on the debug module is the inverse of that on the COM Express module.

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4.3. Status LEDs

To facilitate easier maintenance, status LED's are mounted on the board.



LED1 LED2 LED3

LED Descriptions

Name	Color	Connection	Function
LED1	Blue	BMC output	Power Sequence Status Code (BMC) Power Changes, RESET (see 5.1.4 Exception Codes)
LED2	Green	Power Source 3Vcc	S0 LED ON S3/S4/S5 LED OFF ECO mode LED OFF
LED3	Red	BMC output and same signal as WDT (B27) on BtB connector	Module power up LED OFF Watchdog counting LED OFF Watchdog timed out LED ON Watchdog RESET LED ON Rebooted after WD RESET LED ON Rebooted after PWRBTN LED ON Rebooted after RESET BTN LED OFF **Note:** only a RESET not initiated by the BMC can clear the WD LED (user action)

Table 3: cExpress-BT2 LED Descriptions

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4.4. XDP Debug Header



The debug port is a connection into a target-system environment that provides access to JTAG, run control, system control, and observation resources. The XDP target system connector is a Molex 26-pin 52435-2671 connector. Specific plating types, locking clips, and alignment pin details of this connector can be obtained from Molex. No specific plating types, locking clipsor alignment pins are required for the XDP tool.

Pin	XDP Signal	Target Signal	I/O	Device	Pin	XDP Signal	Target Signal	I/O	Device
1	OBSFN_A0	TAP_PREQ#	I/O	SoC	2	OBSFN_A1	TAP_PRDY#	I/O	SoC
3	GND	GND	NA		4	OBSDATA_A[0]	DBG[0]	I/O	SoC
5	OBSDATA_A[1]	DBG[1]	I/O	SoC	6	GND	GND	NA	
7	OBSDATA_A[2]	DBG[2]	I/O	SoC	8	OBSDATA_A[3]	DBG[3]	I/O	SoC
9	GND	GND	NA		10	HOOK0	PMC_RSMRST#	I	SoC
11	HOOK1	PMIC_PWRBTN#	O	System	12	HOOK2	PMC_CORE_PW ROK	I	SoC
13	HOOK3	ILB_RTC_TEST#	O	SoC	14	HOOK4	Open	NA	
15	HOOK5	Open	NA		16	VCCOBS_AB	1.8VS (SUS)	I	System
17	HOOK6	PMC_PLTRST#	I	SoC	18	HOOK7	PMC_RSTBTN#	O	SoC
19	GND	GND	NA		20	TDO	TAP_TDO	I	SoC
21	TRSTn	TAP_TRST#	O	SoC	22	TDI	TAP_TDI	O	SoC
23	TMS	TAP_TMS	O	SoC	24	TCK1	Open	NA	
25	GND	GND	NA		26	TCK0	TAP_TCK	O	SoC

Note: Refer to the "Bay Trail M/D/I Platform" Debug Port Design Guide (DPDG), Document Number: 512816, Revision: 2.1

Table 4: MIPI60 Debug Header Pin Definition

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4.5. Fan Connector

Connector Type: JVE 24W1125A-04M00

Pin Orientation



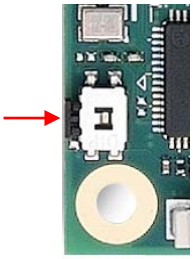
Pin Assignment

Name	Signal
1	FAN_PWMOUT
2	FAN_TACHIN
3	Ground
4	5V

Table 5: Fan Connector Pin Definition

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4.6. BIOS Setup Defaults Reset Button



To perform a hardware reset of BIOS default settings, perform the following steps:

1. Shut down the system.
2. Press the BIOS Setup Defaults RESET Button continuously and boot up the system. You can release the button when the BIOS prompt screen appears
3. The BIOS prompt screen will display a confirmation that BIOS defaults have been reset and request that you reboot the system.



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5. Smart Embedded Management Agent (SEMA)

The onboard microcontroller (BMC) implements power sequencing and Smart Embedded Management Agent (SEMA) functionality. The microcontroller communicates via the System Management Bus with the CPU/chipset. The following functions are implemented:

- Total operating hours counter. Counts the number of hours the module has been run in minutes.
- On-time minutes counter. Counts the seconds since last system start.
- Temperature monitoring of CPU and board temperature. Minimum and maximum temperature values of CPU and board are stored in flash.
- Power cycles counter
- Boot counter. Counts the number of boot attempts.
- Watchdog Timer. Set/Reset/Disable Watchdog Timer. Features auto-reload at power-up.
- System Restart Cause. Power loss/BIOS Fail/Watchdog/Internal Reset/External Reset
- Fail-safe BIOS support. In case of a boot failure, hardware signals tells external logic to boot from fail-safe BIOS.
- Flash area. 1kB Flash area for customer data
- 2K Bytes Protected Flash area. Keys, IDs, etc. can be stored in a write- and clear-protectable region.
- Board Identify. Vendor/Board/Serial number/Production Date
- Main-current & voltage. Monitors drawn current and main voltages

For a detailed description of SEMA features and functionality, please refer to **SEMA Technical Manual** and **SEMA Software Manual**, downloadable at: **http://www.adlinktech.com/sema/**.

Note: Due to limitations of the Intel “Bay Trail” platform, SEMA can only obtain CPU temperature readings when the OS is running.

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5.1. Board Specific SEMA Functions

5.1.1. Voltages

The BMC of the cExpress-BT2 implements a voltage monitor and samples several onboard voltages. The voltages can be read by calling the SEMA function “Get Voltages”. The function returns a 16-bit value divided into high-byte (MSB) and low-byte (LSB).

ADC Channel	Voltage Name	Voltage Formula [V]
0	CPU-Vcore	(MSB<<8 + LSB) x 3.3 / 1024
1	GFX-Vcore	(MSB<<8 + LSB) x 3.3 / 1024
2	+V1.05S	(MSB<<8 + LSB) x 3.3 / 1024
3	Vmem	(MSB<<8 + LSB) x 3.3 / 1024
4	+V1.0V	(MSB<<8 + LSB) x 3.3 / 1024
5	+V3.3V	(MSB<<8 + LSB) x 1.1 x 3.3 / 1024
6	+VIN	(MSB<<8 + LSB) x 6.000 x 3.3 / 1024
7	(MAIN CURRENT)	Use Main Current Function

Table 6: SEMA Onboard Voltage Monitor

5.1.2. Main Current

The BMC of the cExpress-BT2 implements a current monitor. The current can be read by calling the SEMA function “Get Main Current”. The function returns four 16-bit values divided in high-byte (MSB) and low-byte (LSB). These 4 values represent the last 4 currents drawn by the board. The values are sampled every 250ms. The order of the 4 values is NOT in chronological order. Access by the BMC may increase the drawn current of the whole system. In this case, there are still 3 samples not influenced by the read access.

Main Current = (MSB_n<<8 + LSB_n) x 8.06mA

5.1.3. BMC Status

This register shows the status of BMC controlled signals on the cExpress-BT2.

Status Bit	Signal
0	WDT_OUT
1	LVDS_VDDEN
2	LVDS_BKLTEN
3	BIOS_MODE
4	POSTWDT_DISn
5	SEL_BIOS
6	BIOS_DIS0n
7	BIOS_DIS1n

Table 7: SEMA BMC Status

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5.1.4. Exception Codes

In case of an error, the BMC drives a blinking code on the blue Status LED (LED1). The same error code is also reported by the BMC Flags register. The Exception Code is not stored in the Flash Storage and is cleared when the power is removed. Therefore, a “Clear Exception Code” command is not needed or supported.

Exception Code	Error Message
0	NOERROR
2	NO_SUSCLK
3	NO_SLP_S5
4	NO_SLP_S4
5	NO_SLP_S3
6	BIOS_FAIL
7	RESET_FAIL
8	POWER_FAIL
9	LOW_VIN
10	VCORE
11	VGFX
12	V1P05S
13	VMEM
14	V1P0A
15	V3P3A
16	+P12V_5V
18	CRITICAL_TEMP
19	NO_CB_PWROK
20	NO_HW_PWORK
21	NO_V1P24A_PG

Table 8: SEMA Exception Codes

5.1.5. BMC Flags

The BMC Flags register returns the last detected Exception Code since power-up and shows the BIOS in use and the power mode.

Bit	Description
[0 ~ 4]	Exception Code
[6]	0 = AT mode 1 = ATX mode
[7]	0 = Standard BIOS 1 = Fail-safe BIOS.

Table 9: SEMA BMC Flags

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6. System Resources

6.1. System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
Start 128KB below 1MB	000E0000h-000FFFFFh		Low BIOS
Starts 20MB below 4GB	FEC00000h-FEC0040h		IO APIC
Start 19MB below 4GB	FED00000h-FED003FFh		HPET
Start 64 KB below 4GB	FFFF0000h-FFFFFFFFh		High BIOS
0K –1MB		1MB	DOS DRAM

6.2. I/O Map

Hex Range	Device
20h-21h, 24h-25h, 28h-29h, 2Ch-2Dh, 30h-31h, 34h-5h, 38h-39h, 3Ch-3Dh	8259 Master
40h-43h, 50h-53h	8254s
60h, 64h	PS2 Control
61h, 63h, 65h, 67h	NMI Controller
70h-77h	RTC
80h-83h	Port 80h
92h	Init Register
A0h-A1h, A4h-A5h, A8h-A9h, ACh-ADh, B0h-B1h,B4h-B5h, B8h-B9h, BCh-BDh, 4D0h-4D1h	8259 Slave
2E8h-2FFh	COM2
3F8h-3FFh	COM1
B2h-B3h	Active Power Management
E000	SMBus base address for SB.
500	GPIO Base Address for SB
400	PM (ACPI) Base Address for SB

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6.3. Interrupt Request (IRQ) Lines

6.3.1. PIC Mode

IRQ#	Typical Intterupt Resource	Connected to Pin	Available
0	Counter 0	N/A	No
1	Keyboard controller	IRQ1 via SERIRQ / PIRQ	No
2	Cascade interrupt from slave PIC	N/A	No
3	Serial Port 2 (COM2)	IRQ3 via SERIRQ / PIRQ	Note (1)
4	Serial Port 1 (COM1)	IRQ4 via SERIRQ / PIRQ	Note (1)
5	Parallel Port (LPT)	IRQ5 via SERIRQ / PIRQ	Note (1)
6	Generic	IRQ6 via SERIRQ / PIRQ	Note (1)
7	Generic	IRQ7 via SERIRQ / PIRQ	Note (1)
8	Real-time clock	N/A	No
9	Generic	IRQ9 via SERIRQ / PIRQ	Note (1)
10	Generic	IRQ10 via SERIRQ / PIRQ	Note (1)
11	Generic	IRQ11 via SERIRQ / PIRQ	Note (1)
12	PS/2 Mouse	IRQ12 via SERIRQ / PIRQ	Note (1)
13	Math Processor	N/A	No
14	Primary IDE controller	IRQ14 via SERIRQ / PIRQ	Note (1)
15	Secondary IDE controller	IRQ15 via SERIRQ / PIRQ	Note (1)

Note (1): These IRQs can be used for PCI devices when onboard device is disabled.

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6.3.2. APIC Mode

IRQ#	Typical Intterupt Resource	Connected to Pin	Available
0	System timer	N/A	No
1	Standard PS/2 Keyboard	N/A	No
2	N/A	N/A	
3	Communication Port(COM2)	IRQ3 via SERIRQ / PIRQ	Note (1)
4	Communication Port(COM1)	IRQ4 via SERIRQ / PIRQ	Note (1)
6	N/A	N/A	Note (1)
7	N/A	N/A	Note (1)
8	High precision event timer	N/A	No
9	N/A	N/A	Note (1)
10	N/A	N/A	Note (1)
11	N/A	N/A	Note (1)
12	PS/2 Mouse	IRQ12 via SERIRQ / PIRQ	Note (1)
13	N/A	N/A	Note (1)
14	N/A	N/A	Note (1)
15	N/A	N/A	Note (1)
16	N/A	PCIE Port 1/2/3/4, eMMC, IGD, PCI Slot 1/2/3/4	Note (1)
17	N/A	PCIE Port 1/2/3/4, SDIO Device, PCI Slot 1/2/3/4	Note (1)
18	N/A	PCIE Port 1/2/3/4, SD Device, PCI Slot 1/2/3/4	Note (1)
19	N/A	PCIE Port 1/2/3/4, AHCI controller, PCI Slot 1/2/3/4	Note (1)
20	N/A	Gbe controller, xHCI controller	Note (1)
21	N/A	Low Power Audio Engine,TXE	Note (1)
22	N/A	Intel HDA	Note (1)
23	N/A	N/A	Note (1)

Note (1): These IRQs can be used for PCI devices when onboard device is disabled.

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6.4. PCI Configuration Space Map

Bus Number	Device Number	Function Number	Routing	Description
00h	00h	00h	N/A	Soc Transaction Router
00h	02h	00h	Internal	Graphics & Display
00h	10h	00h	Internal	Storage Control Cluster(MMC Port)
00h	11h	00h	Internal	Storage Control Cluster(SDIO Port)
00h	12h	00h	Internal	Storage Control Cluster(SD Port)
00h	13h	00h	Internal	SATA
00h	14h	00h	Internal	xHCI USB
00h	18h	00h	Internal	Serial IO(SIO:DMA)
00h	18h	01h	Internal	Serial IO(SIO:I2C Port 1)
00h	18h	02h	Internal	Serial IO(SIO:I2C Port 2)
00h	1Ah	00h	Internal	Trusted Execution Engine
00h	1Bh	00h	Internal	HD Audio
00h	1Ch	00h	Internal	PCI Express Root port 1
00h	1Ch	01h	Internal	PCI Express Root port 2
00h	1Ch	02h	Internal	PCI Express Root port 3
00h	1Ch	03h	Internal	PCI Express Root port 4
00h	1Dh	00h	Internal	EHCI USB
00h	1Fh	00h	N/A	Platform Controller Unit(LPC)
00h	1Fh	03h	Internal	SMBus Controller
03h	00h	00h	Internal	Texas Instruments PCI-to-PCI Bridge
05h	00h	00h	Internal	Intel Corporation Ethernet Controller

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6.5. PCI Interrupt Routing Map

INT Line	Intel I.G.D	PCIE Root Port#1	PCIE Root Port#2	PCIE Root Port#3	PCIE Root Port#4	SD Host # 0 eMMC	SD Host# 1 SDIO
Int0	INTA:16	INTA:16				INTA:16	
Int1			INTB:17				INTB:17
Int2				INTC:18			
Int3					INTD:19		

INT Line	SD Host#2 SD Card	SATA Controller	Texas Instruments PCIe to PCI Bridge	xHCI Host	Low Power Audio Engine	TXE	HDA
Int0				INTE:20	INTF:21	INTF:21	INTG:22
Int1							
Int2	INTC:18		INTC:18				
Int3		INTD:19					

INT Line	EHCI Controller	SMBus Controller	GBE Controller	LPSS2 DMA	LPSS2 I2C#1	LPSS2 I2C#2
Int0	INTH:23		INTE:20	INTB:17		
Int1		INTC:18				
Int2					INTD:19	
Int3						INTC:18

6.6. PCI Interrupt Routing Map

Device	Address
DIMM A	A0h
DIMM B	A4h
BMC	50h
Extend GPIO	40h

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7. BIOS Setup

7.1. Menu Structure

This section presents the six primary menus of the BIOS Setup Utility. Use the following table as a quick reference for the contents of the BIOS Setup Utility. The subsections in this section describe the submenus and setting options for each menu item. The default setting options are presented in **bold**, and the function of each setting is described in the right hand column of the respective table.

Main	Advanced	Boot	Security	Save & Exit
- System Information - Processor Information - VGA Firmware Version - Memory Information - SOC Information - System Management ► - System Date - System Time	- CPU ► - Memory ► - Graphics ► - SATA ► - USB ► - Network ► - PCI and PCIe ► - Super IO ► - ACPI and Power Management ► - Sound ► - Serial Port Console ► - Thermal ► - Miscellaneous ►	- Boot Configuration ► - CSM Parameters ►	- Password Description - Secure Boot Menu ►	- Reset Options - Save Options

Notes:

► indicates a submenu

Gray text indicates info only

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7.2. Main

The Main Menu provides read-only information about your system and also allows you to set the System Date and Time. Refer to the tables below for details of the submenus and settings.

7.2.1. System Information

Feature	Options	Description
BIOS Version	Info only	ADLINK BIOS version
Build Date and Time	Info only	Date the BIOS was built

7.2.2. Processor Information

Feature	Options	Description
CPU Brand String	Info only	Display CPU brand name
Max CPU Speed	Info only	Display CPU frequency
CPU Signature	Info only	Display CPU ID
Number of Processors	Info only	Display number of processor

7.2.3. VGA Firmware Version

Feature	Options	Description
IGFX VBIOS Version IGFX GOP Version	Info only	Display legacy VBIOS or GOP driver version

7.2.4. Memory Information

Feature	Options	Description
Total Memory	Info only	Display total memory information

7.2.5. SOC Information

Feature	Options	Description
BayTrail Soc	Info only	Display SOC stepping
TXE FW Version	Info only	Display version of TXE

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7.2.6. System Management

7.2.6.1. System Management > Board Information

Board Information	Info only	
SMC Firmware	Read only	Display SMC firmware
Build Date	Read only	Display SMC firmware build date
SMC Boot loader	Read only	Display SMC boot loader
Build Date	Read only	Display SMC boot loader build date
Hardware Version	Read only	Display SMC hardware version
PCBA Revision	Read only	Display PCBA revision
Serial Number	Read only	Display SMC serial number
Manufacturing Date	Read only	Display SMC manufacturing date
Last Repair Date	Read only	Display SMC last repair date
MAC ID	Read only	Display SMC MAC ID
SEMA Features:	Read only	Display SEMA features

7.2.6.2. System Management > Temperatures and Fan Speed

Feature	Options	Description
Temperatures and Fan	Info only	
Board Temperatures	Info only	
Current	Read only	Display current board temperature
Startup	Read only	Display board startup temperature
Min	Read only	Display board min. temperature
Max	Read only	Display board max. temperature
CPU Fan Speed	Read only	Display CPU fan speed
System Fan Speed	Read only	Display system fan speed

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7.2.6.3. System Management > Power Consumption

Feature	Options	Description
Power Consumption	Info only	
Current Input Current	Read only	Display input current
Current Input Power	Read only	Display input power
GPU-Vcore	Read only	Display actual GPU-Vcore voltage
GFX-Vcore	Read only	Display actual GFX-Vcore voltage
V1.05V	Read only	Display actual V1.05 voltage
VMEM	Read only	Display actual VMEM voltage
V1.00	Read only	Display actual V1.00 voltage
V3.30	Read only	Display actual V3.30 voltage
VIN	Read only	Display actual VIN voltage

7.2.6.4. System Management > Runtime Statistics

Feature	Options	Description
Runtime Statistics	Info only	
Total Runtime	Read only	The returned value specifies the total time in minutes the system is running in S0 state.
Current Runtime	Read only	The returned value specifies the time in seconds the system is running in S0 state. This counter is cleared when the system is removed from the external power supply.
Power Cycles	Read only	The returned value specifies the number of times the external power supply has been shut down
Boot Cycles	Read only	The Bootcounter is increased after a HW- or SW-Reset or after a successful power-up.
Boot Reason	Read only	The boot reason is the event which causes the reboot of the system.

7.2.6.5. System Management > Flags

Feature	Options	Description
Flags	Info only	
BMC Flags	Read only	
BIOS Select	Read only	Display the selection of current BIOS ROM
ATX/AT-Mode	Read only	Display ATX/AT-Mode
Exception Code	Read only	System exception reason

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7.2.6.6. System Management > Power Up

Feature	Options	Description
Power Up	Info only	
Power Up watchdog Attention: F12 disables the Power Up Watchdog.	Enabled **Disabled**	The Power-Up Watchdog resets the system after a certain amount of time after power-up.
ECO Mode	**Disabled** Enable	Reduces the power consumption of the system
Power-up Mode Attention: The Power-Up Mode only has effect, if the module is in ATX-Mode.	**Turn on** Remain off Last State	Turn On: The machine starts automatically when the power supply is turned on. Remain Off: To start the machine the power button has to be pressed. Last State: When powered on during a power failure the system will automatically power on when power is restored.

7.2.6.7. System Management > LVDS Backlight

Feature	Options	Description
LVDS Backlight	Info only	
LVDS Backlight Bright	255	The value range starts at 0 and ends at 255.

7.2.6.8. System Management > Smart Fan

Feature	Options	Description
Smart Fan	Info only	
CPU Fan Mode	**AUTO (Smart Fan)** Fan Off Fan On	Select CPU fan mode
CPU Trigger Point 1	Read only	
Trigger Temperature	15	Specifies the temperature threshold at which the BMC turns on the CPU fan with the specified PWM level
PWM Level	30	Select PWM level
CPU Trigger Point 2	Read only	
Trigger Temperature	60	Specifies the temperature threshold at which the BMC turns on CPU fan the specified PWM level
PWM Level	40	Select PWM level
CPU Trigger Point 3	Read only	
Trigger Temperature	70	Specifies the temperature threshold at which the BMC turns on CPU fan the specified PWM level
PWM Level	63	Select PWM level
CPU Trigger Point 4	Read only	
Trigger Temperature	80	Specifies the temperature threshold at which the BMC turns on CPU fan the specified PWM level

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Feature	Options	Description
PWM Level	100	Select PWM level

7.2.7. System Date and Time

Feature	Options	Description
System Date	Day of Week, MM/DD/YYYY	Requires the alpha-numeric entry of the day of the week, day of the month, calendar month, and all 4 digits of the year, indicating the century and year (Fri XX/XX/20XX)
System Time	HH/MM/SS	Presented as a 24-hour clock setting in hours, minutes, and seconds

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7.3. Advanced

This menu contains the settings for most of the user interfaces in the system.

7.3.1. CPU

Feature	Options	Description
CPU	Infor only	
CPU Brand Name	Info only	Display CPU brand name
CPU Signature	Info only	Display CPU signature
Processor Family	Info only	Display processor family
Microcode Patch	Info only	Display microcode patch
Max CPU speed	Info only	Display max. CPU speed
Min CPU speed	Info only	Display min. CPU speed
Processor Cores	Info only	Display number of processor cores
Intel HT Technology	Info only	Display Intel HT Technology support
Intel VT-x Technology	Info only	Display Intel VT-x Technology support
64-bit	Info only	Display 64-bit support
L1 Data Cache	Info only	Display cache info
L1 Code Cache	Info only	Display cache info
L2 Cache	Info only	Display cache info
L3 Cache	Inf o only	Display cache info
Limit CPUID Maximum	**Disabled** Enabled	Disabled for Windows XP
Execute Disabled Bit	Disabled **Enabled**	XD can prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS (Windows Server 2003 SP1, Windows XP SP2, SuSE Linux 9.2, Red Hat Enterprise 3 Update 3.)
Intel Virtualization Technology	Disabled **Enabled**	When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.
SB CRID	**Revision ID** CRID 0 CRID 1 CRID 2	Select the Revision ID (Revision ID, CRID 0, CRID 1, CRID 2) reflected in PCI config space
CPU Processor Power Management (PPM)	Info only	
EIST	Disabled **Enabled**	Enable/Disable Intel SpeedStep
CPU C state Report	Disabled **Enabled**	Enable/Disable CPU C state report to OS
CPU DTS	Disabled **Enabled**	Enabled/Disable digital thermal sensor

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7.3.2. Memory

Feature	Options	Description
Memory	Info only	
Total Memory	Info only	Display total memory
DIMM#0/1	Info only	Display DIMM#0/1
SPD Write Protect	**Enabled** Disabled	Enabled: Writes to SMBus slave addresses A0h – Aeh are disabled
Max TOLUD	**Dynamic**	Maximum value of TOLUD

7.3.3. Graphics

Feature	Options	Description
Graphics	Info only	
IGFX VBIOS Version	Info only	
Primary Display	Auto **IGD** PCIE	Select which graphics device (IGD/PCI) should be primary display
Integrated Graphics Device	**Enabled** Disabled	Enabled: Enable Integrated Graphics Device (IGD) when selected as the primary display; Disabled: Always disable IGD
Aperture Size	**256MB**	Select the aperture size
DVMT Pre-Allocated	**64M**	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
DVMT Total Gfx Mem	**256MB**	Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device.
LVDS Backlight Mode	**BMC Mode** GTT Mode	Select LVDS backlight control function.
LCD Panel Type	**Auto**	Select LCD panel used by Internal Graphics Device by selecting the appropriate setup item
AMI Graphics Output Protocol Policy [UEFI GOP only]	Submenu	User select monitor output by graphics output protocol
GT – Power Management Control	Info only	
RC6 (Render Standby)	**Enabled** Disabled	Enable/Disable render standby support

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7.3.3.1. AMI Graphics Output Protocol Policy

Feature	Options	Description
Intel(R) Valley View Graphics Controller	Info only	
Intel(R) GOP Driver	Info only	
Output Select [List connect device]	CRT	Output Interface.
Brightness Setting [LFP device connect only]	255	Set GOP Brightness value
BIST Enable	Enabled **Disabled**	Starts or stops the built-in self-test (BIST) on the integrated display panel.

7.3.4. SATA

Feature	Options	Description
SATA	Info only	
SATA Controller(s)	**Enabled** Disabled	Enable/Disable Serial ATA.
SATA Mode Selection	IDE Mode **AHCI Mode**	Select IDE/AHCI
SATA Test Mode	Enabled **Disabled**	Test Mode enable/disable
SATA Controller Speed	Gen1 **Gen2**	SATA speed support Gen1 or Gen2.
SATA Port Configuration	Submenu	

7.3.4.1. SATA > SATA Port Configuration

Feature	Options	Description
SATA Port Configuration	Info only	
Port X	Disabled **Enabled**	Enable/Disable SATA port X.
HotPlug	**Enabled** Disabled	Enable/Disable SATA port X hotplug.

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7.3.5. USB

Feature	Options	Description
USB	Info only	
USB Module Version	Info only	
USB Devices	Info only	Drives, keyboards, mouse, hubs
Legacy USB Support	**Enabled** Disabled Auto	Enables legacy USB support. Auto option disables legacy support if no USB devices are connected. Disable option will keep USB devices available only for EFI applications and setup.
XHCI Hand-off	**Enabled** Disabled	This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by the XHCI OS driver.
EHCI Hand-off	**Enabled** Disabled	This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by the EHCI OS driver.
USB Mass Storage Driver Support	**Enabled** Disabled	Enable/Disable USB mass storage driver support.
Chipset USB Configuration	Submenu	
USB hardware delays and time-outs:	Info only	
USB transfer time-out	1 sec 5 sec 10 sec **20 sec**	The time-out value for control, bulk, and interrupt transfers
Device reset time-out	10 sec **20 sec** 30 sec 40 sec	USB mass storage device Start Unit command time-out.
Device power-up delay	**Auto** Manual	Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.
Mass Storage Devices	Info only	List current USB mass storage devices.

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7.3.5.1. USB > Chipset USB Configuration

Feature	Options	Description
USB Configuration	Info only	
XHCI Mode	Enabled Disabled Auto **Smart Auto**	Mode of operation of xHCI controller.
USB 2.0 (EHCI) Support	Enabled **Disabled**	Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled.
USB Per Port Control	**Enabled** Disabled	Control each of the USB ports (0~3). Enable: Enable USB per port; Disable: Use USB port x settings.
USB Port #0~3	**Enabled** Disabled	Enable/Disable USB port 0-3.

7.3.6. Network

Feature	Options	Description
Network	Info only	
Network Stack	Enabled **Disabled**	Enable/Disable UEFI network stack.
LAN Controller	**Enabled** Disabled	Enable/Disable LAN controller.

7.3.7. PCI and PCIe

Feature	Options	Description
PCI and PCIe	Info only	
PCI Common Settings	Info only	
PCI Latency	32 PCI Bus Clocks 64 PCI Bus Clocks 96 PCI Bus Clocks 128 PCI Bus Clocks 160 PCI Bus Clocks 192 PCI Bus Clocks 224 PCI Bus Clocks 248 PCI Bus Clocks	Value to be programmed into PCI latency timer register.
VGA Palette Snoop	**Disabled** Enabled	Enables or Disables VGA palette registers snooping.
PERR# Generation	Enabled **Disabled**	Enable or Disable the PCI Express port 1 in the chipset.
SERR# Generation	Enabled **Disabled**	Enables or Disables PCI Device to generate SERR#.
PCI Express Settings	Info only	
Relaxed Ordering	**Disabled** Enabled	Enables or Disables PCI Express device relaxed ordering.

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Feature	Options	Description
Extended Tag	**Disabled** Enabled	If Enabled, allows device to use 8-bit tag field as a requester.
No Snoop	Disabled **Enabled**	Enables or Disables PCI Express device No Snoop option.
Maximum Payload	**Auto** 128 Bytes 256 Bytes 512 Bytes 1024 Bytes 2048 Bytes 4096 Bytes	Set maximum payload of PCI Express device or allow system BIOS to select the value.
Maximum Read Request	**Auto** 128 Bytes 256 Bytes 512 Bytes 1024 Bytes 2048 Bytes 4096 Bytes	Set maximum read request size of PCI Express device or allow system BIOS to select the value.
PCI Express Link Register Settings	Info only	
ASPM Support WARNING: Enabling ASPM may cause some PCI-E devices to fail	**Disabled** Auto Force L0s	Set the ASPM Level: Force L0s - Force all links to L0s Auto - BIOS auto configure Disabled - Disables ASPM
Extended Synch	**Disabled** Enabled	If enabled, allows generation of Extended Synchronization patterns.
Link Training Retry	Disable 2 3 **5**	Defines number of retry attempts software will take to retrain the link if previous training attempt was unsuccessful.
Link Training Timeout (Us)	1000	Defines number of microseconds software will wait before polling 'Link Training' bit in Link Status register. Value range from 10 to 10000 uS.
Unpopulated Links	**Keep Link ON** Disabled	In order to save power, software will disable unpopulated PCI Express links if this option set to Disabled.
Restore PCIE Registers	Enabled **Disabled**	On non-PCI Express aware OSes (pre Windows Vista) some devices may not be correctly reinitialized after S3. Enabling this restores PCI Express device configurations on S3 resume. Warning: Enabling this may cause issues with other hardware after S3 resume.
PCIe Configuration	Info only	
PCIe Configuration	Submenu	

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7.3.7.1. PCI and PCIe > PCIe Configuration

Feature	Options	Description
PCIe Configuration	Info only	
PCI Express Root Port x	Submenu	

7.3.7.2. PCI and PCIe > PCIe Configuration > PCI Express Port x

Feature	Options	Description
PCI Express Port x	**Enabled** Disabled	Enable or disable the PCI Express port x in the chipset.
ASPM	**Disabled**	PCI Express Active State Power Management settings.
URR	**Disabled** Enabled	Enable or disable PCI Express Unsupported Request Reporting.
FER	**Disabled** Enabled	Enable or disable PCI Express Device Fatal Error Reporting.
NFER	**Disabled** Enabled	Enable or disable PCI Express Device Non-Fatal Error Reporting.
CER	**Disabled** Enabled	Enable or disable PCI Express Device Correctable Error Reporting.
SEFE	**Disabled** Enabled	Enable or disable Root PCI Express System Error on Fatal Error.
SENFE	**Disabled** Enabled	Enable or disable Root PCI Express System Error on Non-Fatal Error.
SECE	**Disabled** Enabled	Enable or disable Root PCI Express System Error on Correctable Error.
PME SCI	Disabled **Enabled**	Enable or disable PCI Express PME SCI.
Hot Plug	Disabled **Enabled**	Enable or disable PCI Express hotplug.
Speed	**Auto** Gen 2 Gen 1	Configure PCIe port speed.

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7.3.8. Super IO

Feature	Options	Description
Super IO Chip	Info only	
W83627DHG Super IO Configuration	Info only	
Serial Port 1 Configuration Serial Port	**Enabled** Disabled	Enable/Disable Serial Port 1 (COM0).
Device Settings	IO=3F8h; IRQ=4	Fixed configuration of serial port.
Change Settings	**Auto** IO=3F8h; IRQ=4 IO=3F8h; IRQ=3,4,5,6,7,10,11,12 IO=2F8h; IRQ=3,4,5,6,7,10,11,12 IO=3E8h; IRQ=3,4,5,6,7,10,11,12 IO=2E8h; IRQ=3,4,5,6,7,10,11,12	Select an optimal setting for Super IO device.
Serial Port 2 Configuration Serial Port	**Enabled** Disabled	Enable/Disable Serial Port 2 (COM1).
Device Settings	IO=2F8h; IRQ=3	Fixed configuration of serial port.
Change Settings	**Auto** IO=2F8h; IRQ=3 IO=3F8h; IRQ=3,4,5,6,7,10,11,12 IO=2F8h; IRQ=3,4,5,6,7,10,11,12 IO=3E8h; IRQ=3,4,5,6,7,10,11,12 IO=2E8h; IRQ=3,4,5,6,7,10,11,12	Select an optimal setting for Super IO device.
Parallel Port Configuration Parallel Port	**Enabled** Disabled	Enable/Disable Parallel Port 2 (LPT/LPTE).
Device Settings	IO=378h; IRQ=5	Fixed configuration of parallel port.
Change Settings	**Auto** IO=378h; IRQ=5 IO=378h; IRQ=5,6,7,9,10,11,12 IO=278h; IRQ=5,6,7,9,10,11,12 IO=3BCh; IRQ=5,6,7,9,10,11,12	Select an optimal settings for Super IO Device.

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7.3.9. ACPI and Power Management

Feature	Options	Description
ACPI and Power Management	Info only	
Enable ACPI Auto Configuration	Enabled **Disabled**	Enables or disables BIOS ACPI Auto Configuration.
Enable Hibernation	**Enabled** Disabled	Enables or disables system's ability to hibernate (OS/S4 Sleep State). This option may be not effective with some OSes.
ACPI Sleep State	Suspend Disabled **S3 (Suspend to RAM)**	Select the highest ACPI sleep state the system will enter when the Suspend button is pressed.
Emulation AT/ATX	Emulation AT **ATX**	Select Emulation AT or ATX function.If this option set to [Emulation AT]. BIOS will report no suspend functions to ACPI OS.In windows XP, it will make OS show shutdown message during system shutdown.

7.3.10. Sound

Feature	Options	Description
Sound	Info only	
Azalia	Disabled **Enabled**	Control detection of the Azalia device. Disabled = Azalia will be unconditionally disabled. Enabled = Azalia will be unconditionally enabled. Auto = Azalia will be enabled if present, disabled otherwise.
Azalia Docking Support	**Disabled** Enabled	Enable/Disable Azalia docking support of audio controller.
Azalia PME	Disabled **Enabled**	Enable/Disable power management capability of audio controller.

7.3.11. Serial Port Console

Feature	Options	Description
Serial Port Console	Info only	
COM1	Info only	
Console Redirection	**Disabled** Enabled	Console Redirection enable or disable.
Console Redirection Settings	Submenu	The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.
COM2	Info only	
Console Redirection	**Disabled** Enabled	Console Redirection enable or disable.
Console Redirection Settings	Submenu	The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

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7.3.11.1. Serial Port Console > Console Redirection Settings

Feature	Options	Description
COM1/COM2 Console Redirection Settings	Info only	
Terminal Type	VT100 **VT100+** VT-UTF8 ANSI	VT100: ASCII char set. VT100+: Extends VT100 to support color, function keys, etc. VT-UTF8: Uses UTF8 encoding to map Unicode chars onto 1 or more bytes. ANSI: Extended ASCII char set.
Bits per second	9600 19200 38400 57600 **115200**	Selects serial port transmission speed. The speed must be matched on the remote computer. Long or noisy lines may require lower speeds.
Data Bits	7 **8**	Select data bits.
Parity	**None** Even Odd Mark Space	Select parity.
Stop Bits	**1** 2	Select number of stop bits.
Flow Control	**None** Hardware RTS/CTS	Select flow control.
VT-UTF8 Combo Key Support	Disabled **Enable**	Enable VT-UTF8 combination key support for ANSI/VT100 terminals.
Recorder Mode	**Disabled** Enable	With this mode enabled only text will be sent. This is to capture terminal data.
Resolution 100x31	**Disabled** Enable	Enables or disables extended terminal resolution
Legacy OS Redirection	**80x24** 80x25	On legacy OSes, the number of rows and columns supported by redirection
Putty KeyPad	**VT100** LINUX XTERMR6 SCO ESCN VT400	Select FunctionKey and KeyPad on Putty.
Redirection After BIOS Post	**Always Enabled** BootLoader	The Settings specify if BootLoader is selected, then legacy console redirection is disabled before booting to legacy OS. Default value is Always Enable which means legacy console redirection is enabled for legacy OS.

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7.3.12. Thermal

Feature	Options	Description
Thermal	Info only	
CPU Temperature	**Info only**	
Critical Trip Point	**Disabled** 85 C 95 C	This value controls the temperature of the ACPI Critical Trip Point - the point at which the OS will shut the system down.
Active Cooling Trip Point	Disabled 40 C 50 C 60 C 70 C **BMC Default**	Active Cooling Trip Point.
Passive Trip Point	**Disabled** 90 C 80 C	This value controls the temperature of the ACPI Passive Trip Point - the point at which the OS will begin throtting the processor.
Passive TC1 Value	**1**	This value sets the TC1 value for the ACPI Passive Cooling Formula. Range 1 - 16
Passive TC2 Value	**5**	This value value sets the TC2 value for the ACPI Passive Cooling Formula. Range 1 - 16
Passive TSP Value	**10**	This item sets the TSP value for the ACPI Passive Cooling Formula. It represents in tenths of a second how often the OS will read the temperature when passive cooling is enabled. Range 2 - 32

7.3.13. Miscellaneous

Feature	Options	Description
Miscellaneous	Info only	
High Precision Timer	**Enabled** Disabled	Enable or disable the High Precision Event Timer.
SCC Configuration	Submenu	
Security	Info only	
BIOS Security Configuration	Submenu	
Trusted Computing	Submenu	

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7.3.13.1. Miscellaneous > SCC Configuration

Feature	Options	Description
OS Selection	Windows 8.X Android **Windows 7**	OS Selection
SCC Configuration	Info only	
SCC eMMC Support	Enable eMMC 4.5 Support Enable eMMC 4.41 Support **eMMC AUTO MODE** Disable	SCC eMMC support enable/disable.
SCC eMMC 4.5 DDR50 Support	**Enabled** Disabled	SCC eMMC 4.5 DDR50 support enable/disable.
SCC eMMC 4.5 HS200 Support	Enabled **Disabled**	SCC eMMC 4.5 HS200 support enable/disable.
eMMC Secure Erase	Enabled **Disabled**	Disable/Enable eMMC secure erase. When enabled, all the data on eMMC will be erased.
SCC SD Card Support	**Enabled** Disabled	SCC SD card support enable/disable.
SDR25 Support for SDCard	Enabled **Disabled**	Disable/Enable SDR25 capability in SD Card controller.
DDR50 Support for SDCard	**Enabled** Disabled	Disable/Enable DDR50 capability in SD Card controller.
MIPI HIS Support	Enabled **Disabled**	MIPI HIS support enable/disable.

7.3.13.2. Miscellaneous > BIOS Security Configuration

Feature	Options	Description
BIOS Security Configuration	**Info only**	
Global SMI Lock	**Enabled** Disabled	Enable or disable SMI lock.

7.3.13.3. Miscellaneous > Trusted Computing

Feature	Options	Description
Coniguration	Info only	
Security Device Support	Enabled **Disabled**	Enables or disables BIOS support for security device. OS will not show security device. TCG EFI protocol and INT1A interface will not be available.
Current Status Information	Info only	

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7.4. Boot

7.4.1. Boot Configuration

Feature	Options	Description
Boot Configuration	Info only	
Setup Prompt Timeout	**1**	Number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	**On** Off	Select the keyboard NumLock state.
Quiet Boot	**Disabled** Enabled	Enable or disables Quiet Boot option.
Fast Boot	**Disabled** Enabled	Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect on BBS boot options.
WIN8 Support	**Disabled** Enabled	If enabled, some of default settings will be configured properly for Windows8. Affected items: CSM Configuration->Boot option filter CSM Configuration->Video
Boot Option Priorities	Info only	
Hard Drive BBS Priorities	Info only	
CSM Parameters	Submenu	CSM configuration: Enable/Disable, Option ROM execution settings, etc.

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7.4.1.1. Boot Configuration > CSM Parameters

Feature	Options	Description
Compatibility Support Module Configuration	Info	
CSM Support	**Enabled** Disable	Enable/Disable CSM Support.
CSM16 Module Version	Info only	
GataA20 Active	**Upon Request** Always	Upon Request – GA20 can be disabled using BIOS services. Always – do not allow disabling of GA20; this option is useful when any RT code is executed above 1MB.
Option ROM Messages	**Force BIOS** Keep Current	Set display mode for Option ROM.
INT19 Trap Response	**Immediate** Postponed	BIOS reaction on INT19 trapping by Option ROM: Immediate - execute the trap right away; Postponed – execute the trap during legacy boot.
Boot option filter	**UEFI and Legacy** Legacy only UEFI only	This option controls legacy/UEFI ROM priority.
Option ROM execution order	Info only	
Network	**Do not launch** UEFI only Legacy only	Controls the execution of UEFI and legacy PXE OpROM.
Storage	Do not launch UEFI only **Legacy only**	Controls the execution of UEFI and legacy storage OpROM.
Video	Do not launch UEFI only **Legacy only**	Controls the execution of UEFI and legacy video OpROM.
Other PCI devices	**UEFI only** Legacy only	Determines OpROM execution policy for devices other than network, storage or video.

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7.5. Security

7.5.1. Password Description

Feature	Options	Description
Administrator Password	Enter password	
User Password	Enter password	
Secure Boot menu	Submenu	Customizable Secure Boot settings.

7.5.1.1. Security > Secure Boot Menu

Feature	Options	Description
System Mode	Setup	
Secure Boot	Info only	
Secure Boot	**Disabled** Enabled	Secure Boot can be enabled if: 1. System running in User mode with enrolled Platform Key (PK) 2. CSM function is disabled.
Secure Boot Mode	Standard **Custom**	Secure Boot mode selector. 'Custom' Mode enables users to change Image Execution policy and manage Secure Boot keys.

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7.6. Save & Exit

Feature	Options	Description
Save Changes and Exit	Yes No	Exit system setup after saving the changes.
Discard Changes and Exit	Yes No	Exit system setup without saving any changes.
Save Changes and Reset	Yes No	Reset the system after saving the changes.
Discard Changes and Reset	Yes No	Reset system setup without saving any changes.
Save Options	Info only	
Save Changes	Yes No	Save Changes done so far to any of the setup options.
Discard Changes	Yes No	Discard Changes done so far to any of the setup options.
Restore Defaults	Yes No	Restore/Load Default values for all the setup options.
Save as User Defaults	Yes No	Save the changes done so far as User Defaults.
Restore User Defaults	Yes No	Restore the User Defaults to all the setup options.

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8. BIOS Checkpoints, Beep Codes

This section of this document lists checkpoints and beep codes generated by AMI Aptio BIOS. The checkpoints defined in this document are inherent to the AMIBIOS generic core, and do not include any chipset or board specific checkpoint definitions.

Checkpoints and Beep Codes Definition

A checkpoint is either a byte or word value output to I/O port 80h. The BIOS outputs checkpoints throughout bootblock and Power-On Self Test (POST) to indicate the task the system is currently executing. Checkpoints are very useful for debugging problems that occur during the preboot process.

Beep codes are used by the BIOS to indicate a serious or fatal error. They are used when an error occurs before the system video has been initialized, and generated by the system board speaker.

Aptio Boot Flow

While performing the functions of the traditional BIOS, Aptio 5.x core follows the firmware model described by the Intel Platform Innovation Framework for EFI (“the Framework”). The Framework refers the following “boot phases”, which may apply to various status code & checkpoint descriptions:

- Security (SEC) – initial low-level initialization
- Pre-EFI Initialization (PEI) – memory initialization[1]
- Driver Execution Environment (DXE) – main hardware initialization[2]
- Boot Device Selection (BDS) – system setup, pre-OS user interface & selecting a bootable device (CD/DVD, HDD, USB, Network, Shell, …)

Viewing BIOS Checkpoints

Viewing all checkpoints generated by the BIOS requires a checkpoint card, also referred to as a □OST Card or POST Diagnostic Card. These are PCI add-in cards that show the value of I/O port 80h on a LED display.

Some computers display checkpoints in the bottom right corner of the screen during POST. This display method is limited, since it only displays checkpoints that occur after the video card has been activated.

Keep in mind that not all computers using AMI Aptio BIOS enable this feature. In most cases, a checkpoint card is the best tool for viewing AMI Aptio BIOS checkpoints.

[1]Analogous to “bootblock” functionality of legacy BIOS.
[2]Analogous to “POST” functionality in legacy BIOS.

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8.1. Status Code Ranges

Status Code Range	Description
0x01 – 0x0B	SEC execution
0x0C – 0x0F	SEC errors
0x10 – 0x2F	PEI execution up to and including memory detection
0x30 – 0x4F	PEI execution after memory detection
0x50 – 0x5F	PEI errors
0x60 – 0x8F	DXE execution up to BDS
0x90 – 0xCF	BDS execution
0xD0 – 0xDF	DXE errors
0xE0 – 0xE8	S3 Resume (PEI)
0xE9 – 0xEF	S3 Resume errors (PEI)
0xF0 – 0xF8	Recovery (PEI)
0xF9 – 0xFF	Recovery errors (PEI)

8.2. Standard Status Codes

8.2.1. SEC Phase

Status Code	Description
0x00	Not used
Progress Codes	
0x01	Power on. Reset type detection (soft/hard).
0x02	AP initialization before microcode loading
0x03	North Bridge initialization before microcode loading
0x04	South Bridge initialization before microcode loading
0x05	OEM initialization before microcode loading
0x06	Microcode loading
0x07	AP initialization after microcode loading
0x08	North Bridge initialization after microcode loading
0x09	South Bridge initialization after microcode loading
0x0A	OEM initialization after microcode loading
0x0B	Cache initialization

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SEC Error Codes	
0x0C – 0x0D	Reserved for future AMI SEC error codes
0x0E	Microcode not found
0x0F	Microcode not loaded

8.2.2. SEC Beep Codes

None

8.2.3. PEI Phase

Status Code	Description
Progress Codes	
0x10	PEI Core is started
0x11	Pre-memory CPU initialization is started
0x12	Pre-memory CPU initialization (CPU module specific)
0x13	Pre-memory CPU initialization (CPU module specific)
0x14	Pre-memory CPU initialization (CPU module specific)
0x15	Pre-memory North Bridge initialization is started
0x16	Pre-Memory North Bridge initialization (North Bridge module specific)
0x17	Pre-Memory North Bridge initialization (North Bridge module specific)
0x18	Pre-Memory North Bridge initialization (North Bridge module specific)
0x19	Pre-memory South Bridge initialization is started
0x1A	Pre-memory South Bridge initialization (South Bridge module specific)
0x1B	Pre-memory South Bridge initialization (South Bridge module specific)
0x1C	Pre-memory South Bridge initialization (South Bridge module specific)
0x1D – 0x2A	OEM pre-memory initialization codes
0x2B	Memory initialization. Serial Presence Detect (SPD) data reading
0x2C	Memory initialization. Memory presence detection
0x2D	Memory initialization. Programming memory timing information
0x2E	Memory initialization. Configuring memory
0x2F	Memory initialization (other).
0x30	Reserved for ASL (see ASL Status Codes section below)
0x31	Memory Installed
0x32	CPU post-memory initialization is started
0x33	CPU post-memory initialization. Cache initialization
0x34	CPU post-memory initialization. Application Processor(s) (AP) initialization

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Status Code	Description
0x35	CPU post-memory initialization. Boot Strap Processor (BSP) selection
0x36	CPU post-memory initialization. System Management Mode (SMM) initialization
0x37	Post-Memory North Bridge initialization is started
0x38	Post-Memory North Bridge initialization (North Bridge module specific)
0x39	Post-Memory North Bridge initialization (North Bridge module specific)
0x3A	Post-Memory North Bridge initialization (North Bridge module specific)
0x3B	Post-Memory South Bridge initialization is started
0x3C	Post-Memory South Bridge initialization (South Bridge module specific)
0x3D	Post-Memory South Bridge initialization (South Bridge module specific)
0x3E	Post-Memory South Bridge initialization (South Bridge module specific)
0x3F-0x4E	OEM post memory initialization codes
0x4F	DXE IPL is started
PEI Error Codes	
0x50	Memory initialization error. Invalid memory type or incompatible memory speed
0x51	Memory initialization error. SPD reading has failed
0x52	Memory initialization error. Invalid memory size or memory modules do not match.
0x53	Memory initialization error. No usable memory detected
0x54	Unspecified memory initialization error.
0x55	Memory not installed
0x56	Invalid CPU type or Speed
0x57	CPU mismatch
0x58	CPU self test failed or possible CPU cache error
0x59	CPU micro-code is not found or micro-code update is failed
0x5A	Internal CPU error
0x5B	reset PPI is not available
0x5C-0x5F	Reserved for future AMI error codes
S3 Resume Progress Codes	
0xE0	S3 Resume is stared (S3 Resume PPI is called by the DXE IPL)
0xE1	S3 Boot Script execution
0xE2	Video repost
0xE3	OS S3 wake vector call
0xE4-0xE7	Reserved for future AMI progress codes

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Status Code	Description
S3 Resume Error Codes	
0xE8	S3 Resume Failed
0xE9	S3 Resume PPI not Found
0xEA	S3 Resume Boot Script Error
0xEB	S3 OS Wake Error
0xEC-0xEF	Reserved for future AMI error codes
Recovery Progress Codes	
0xF0	Recovery condition triggered by firmware (Auto recovery)
0xF1	Recovery condition triggered by user (Forced recovery)
0xF2	Recovery process started
0xF3	Recovery firmware image is found
0xF4	Recovery firmware image is loaded
0xF5-0xF7	Reserved for future AMI progress codes
Recovery Error Codes	
0xF8	Recovery PPI is not available
0xF9	Recovery capsule is not found
0xFA	Invalid recovery capsule
0xFB – 0xFF	Reserved for future AMI error codes

8.2.4. PEI Beep Codes

# of Beeps	Description
1	Memory not Installed
1	Memory was installed twice (InstallPeiMemory routine in PEI Core called twice)
2	Recovery started
3	DXEIPL was not found
3	DXE Core Firmware Volume was not found
4	Recovery failed
4	S3 Resume failed
7	Reset PPI is not available

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8.2.5. DXE Status Codes

Status Code	Description
0x60	DXE Core is started
0x61	NVRAM initialization
0x62	Installation of the South Bridge Runtime Services
0x63	CPU DXE initialization is started
0x64	CPU DXE initialization (CPU module specific)
0x65	CPU DXE initialization (CPU module specific)
0x66	CPU DXE initialization (CPU module specific)
0x67	CPU DXE initialization (CPU module specific)
0x68	PCI host bridge initialization
0x69	North Bridge DXE initialization is started
0x6A	North Bridge DXE SMM initialization is started
0x6B	North Bridge DXE initialization (North Bridge module specific)
0x6C	North Bridge DXE initialization (North Bridge module specific)
0x6D	North Bridge DXE initialization (North Bridge module specific)
0x6E	North Bridge DXE initialization (North Bridge module specific)
0x6F	North Bridge DXE initialization (North Bridge module specific)
0x70	South Bridge DXE initialization is started
0x71	South Bridge DXE SMM initialization is started
0x72	South Bridge devices initialization
0x73	South Bridge DXE Initialization (South Bridge module specific)
0x74	South Bridge DXE Initialization (South Bridge module specific)
0x75	South Bridge DXE Initialization (South Bridge module specific)
0x76	South Bridge DXE Initialization (South Bridge module specific)
0x77	South Bridge DXE Initialization (South Bridge module specific)
0x78	ACPI module initialization
0x79	CSM initialization
0x7A – 0x7F	Reserved for future AMI DXE codes
0x80 – 0x8F	OEM DXE initialization codes
0x90	Boot Device Selection (BDS) phase is started
0x91	Driver connecting is started
0x92	PCI Bus initialization is started
0x93	PCI Bus Hot Plug Controller Initialization
0x94	PCI Bus Enumeration

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Status Code	Description
0x95	PCI Bus Request Resources
0x96	PCI Bus Assign Resources
0x97	Console Output devices connect
0x98	Console input devices connect
0x99	Super IO Initialization
0x9A	USB initialization is started
0x9B	USB Reset
0x9C	USB Detect
0x9D	USB Enable
0x9E – 0x9F	Reserved for future AMI codes
0xA0	IDE initialization is started
0xA1	IDE Reset
0xA2	IDE Detect
0xA3	IDE Enable
0xA4	SCSI initialization is started
0xA5	SCSI Reset
0xA6	SCSI Detect
0xA7	SCSI Enable
0xA8	Setup Verifying Password
0xA9	Start of Setup
0xAA	Reserved for ASL (see ASL Status Codes section below)
0xAB	Setup Input Wait
0xAC	Reserved for ASL (see ASL Status Codes section below)
0xAD	Ready To Boot event
0xAE	Legacy Boot event
0xAF	Exit Boot Services event
0xB0	Runtime Set Virtual Address MAP Begin
0xB1	Runtime Set Virtual Address MAP End
0xB2	Legacy Option ROM Initialization
0xB3	System Reset
0xB4	USB hot plug
0xB5	PCI bus hot plug
0xB6	Clean-up of NVRAM
0xB7	Configuration Reset (reset of NVRAM settings)
0xB8 – 0xBF	Reserved for future AMI codes
0xC0 – 0xCF	OEM BDS initialization codes

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Status Code	Description
DXE Error Codes	
0xD0	CPU initialization error
0xD1	North Bridge initialization error
0xD2	South Bridge initialization error
0xD3	Some of the Architectural Protocols are not available
0xD4	PCI resource allocation error. Out of Resources
0xD5	No Space for Legacy Option ROM
0xD6	No Console Output Devices are found
0xD7	No Console Input Devices are found
0xD8	Invalid password
0xD9	Error loading Boot Option (LoadImage returned error)
0xDA	Boot Option is failed (StartImage returned error)
0xDB	Flash update is failed
0xDC	Reset protocol is not available

8.2.6. DXE Beep Codes

# of Beeps	Description
1	Invalid password
4	Some of the Architectural Protocols are not available
5	No Console Output Devices are found
5	No Console Input Devices are found
6	Flash update is failed
7	Reset protocol is not available
8	Platform PCI resource requirements cannot be met

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8.2.7. ACPI/ASL Checkpoint

Status Code	Description
0x01	System is entering S1 sleep state
0x02	System is entering S2 sleep state
0x03	System is entering S3 sleep state
0x04	System is entering S4 sleep state
0x05	System is entering S5 sleep state
0x10	System is waking up from the S1 sleep state
0x20	System is waking up from the S2 sleep state
0x30	System is waking up from the S3 sleep state
0x40	System is waking up from the S4 sleep state
0xAC	System has transitioned into ACPI mode. Interrupt controller is in PIC mode.
0xAA	System has transitioned into ACPI mode. Interrupt controller is in APIC mode.

8.3. OEM-Reserved Checkpoint Ranges

Status Code	Description
0x05	OEM SEC initialization before microcode loading
0x0A	OEM SEC initialization after microcode loading
0x1D – 0x2A	OEM pre-memory initialization codes
0x3F – 0x4E	OEM PEI post memory initialization codes
0x80 – 0x8F	OEM DXE initialization codes
0xC0 – 0xCF	OEM BDS initialization codes

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9. Mechanical Information

9.1. Board-to-Board Connectors

To allow for different stacking heights, the receptacles for COM Express carrier boards are available in two heights: 5 mm and 8 mm. When 5 mm receptacles are chosen, the carrier board should be free of components.

Tyco 3-1827253-6

Foxconn QT002206-2131-3H

- 220-pin board-to-board connector with 0.5mm for a stacking height of 5 mm.
- This connector can be used with 5 mm through-hole standoffs (SMT type).



Tyco 3-6318491-6

Foxconn QT002206-4141-3H

- 220-pin board-to-board connector with 0.5mm for a stacking height of 8 mm.
- This connector can be used with 8 mm through-hole standoffs (SMT type).



Common Specifications

- Current capacity: 0.5A per pin
- Rated voltage: 50 VAC
- Insulation resistance: 100M or greater @ 500 VDC
- Temperature rating: -40°C ~ 85°C
- UL certification (ECBT2.E28476)
- Copper alloy (contacts)
- Housing: thermo-plastic molded compound (L.C.P.)

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9.2. Thermal Solution

9.2.1. Heat Spreaders

The function of the heat spreader is to ensure an identical mechanical profile for all COM Express modules. By using a heat spreader, the thermal solution that is built on top of the module is compatible with all COM Express modules.

9.2.2. Heat Sinks

A heat sink can be used as a thermal solution for a specific COM Express module and can have a fan or be fanless, depending on the thermal requirements.

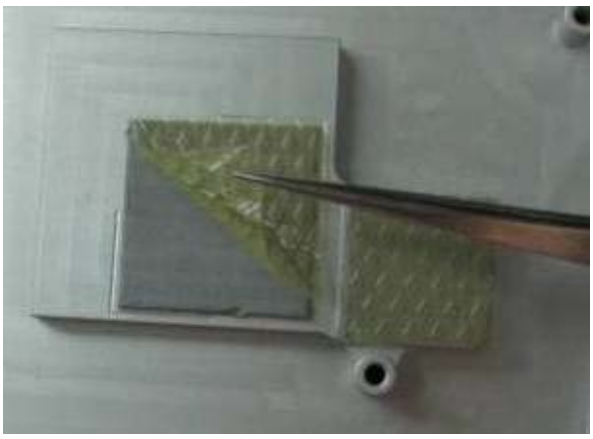
9.2.3. Installation

Install a heat spreader or heat sink using the following instructions.

Step 1: Before mounting the heatsink, install the required memory modules onto the SODIMM socket(s) on the COM Express module.

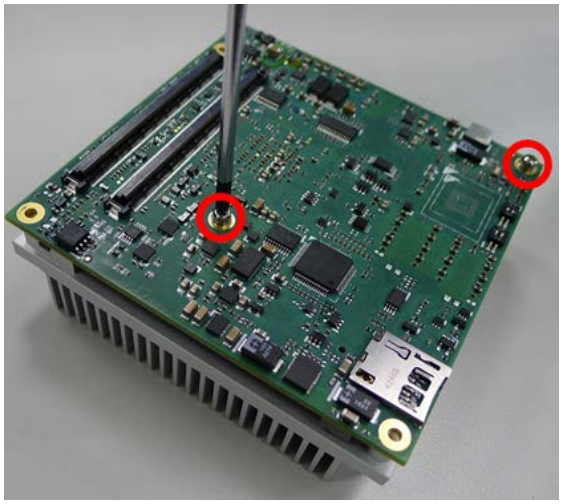


Step 2: Remove the protective membranes from the thermal pads.

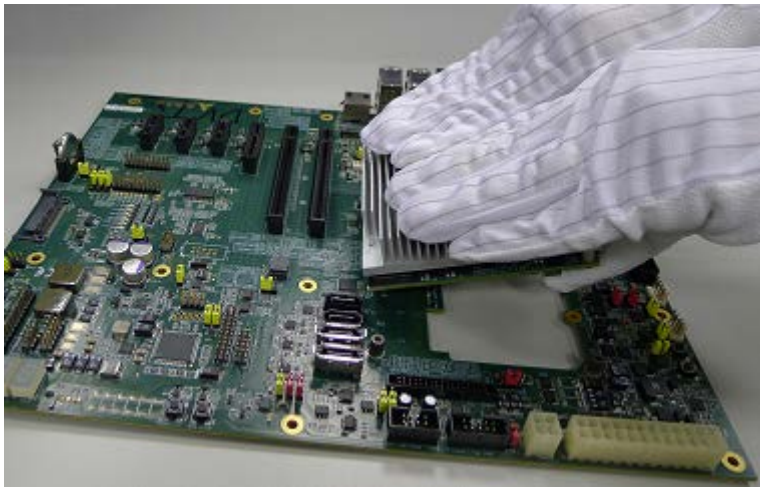


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Step 3: Assemble the heatsink onto the COM Express module. Use the four M2.5, L=6mm screws provided to fasten the heatsink to the module.

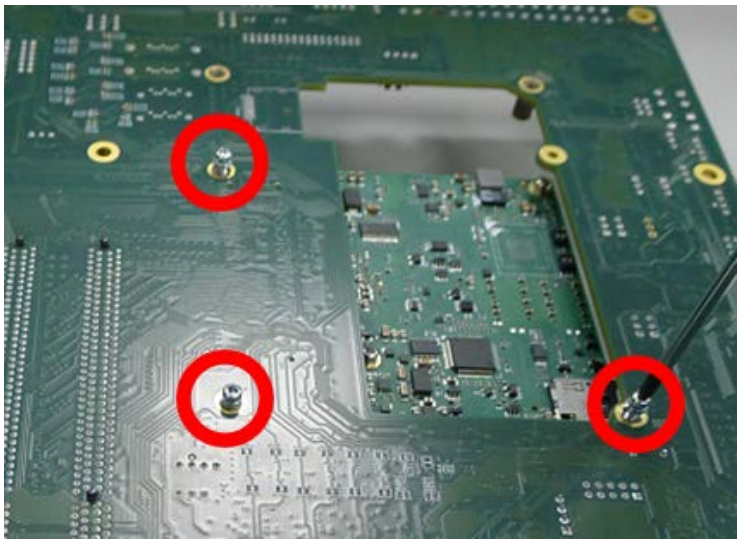


Step 4: Place the COM Express module and heatsink assembly onto the connectors on the carrier board as shown.



Then press down on the module until it is firmly seated on the carrier board.

Step 5: Use the five M2.5, L=16mm screws provided to secure the COM Express module to the carrier board from the solder side.



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Step 6: If you are installing a heatsink with a fan, plug the fan connector into the carrier board as shown.



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9.3. Mounting Methods

There are several standard ways to mount the COM Express module with a thermal solution onto a carrier board. In addition to the choice of 5 mm or 8mm board-to-board connectors, there is the choice of Top and Bottom mounting. In Top mounting, the threaded standoffs are on the carrier board and the thermal solution is equipped with through-hole standoffs. In Bottom mounting, the threaded standoffs are on the thermal solution and the carrier board has through-hole standoffs.

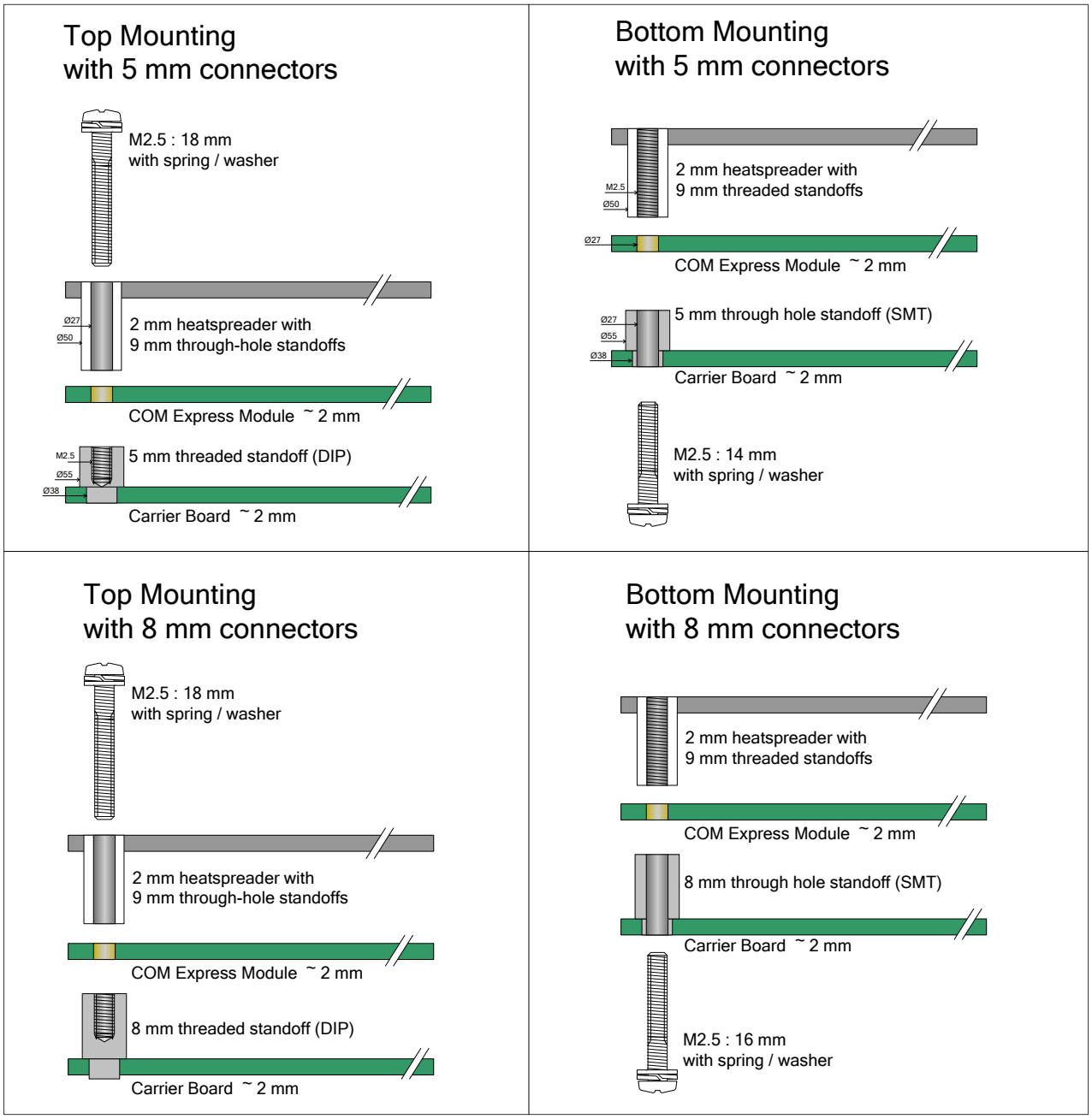


Figure 5: COM Express Mounting Methods

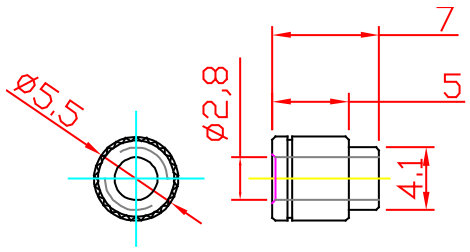
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9.4. Standoff Types

The standoffs available for Top and Bottom mounting methods are shown below. Note that threaded standoffs are DIP type and through-hole standoffs are SMT type. Other types not listed are available upon request.

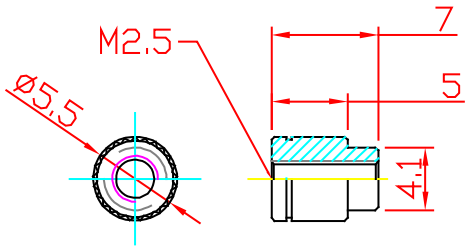
5mm through-hole standoff (SMT type)

P/N: 33-72000-0050



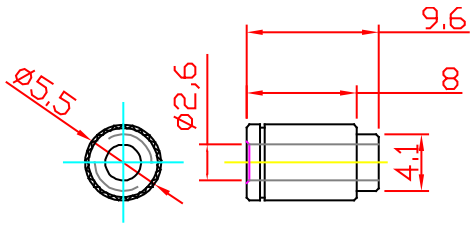
5mm threaded standoff (DIP type)

P/N: 33-72016-0050



8mm through-hole standoff (SMT type)

P/N: 33-72000-0080



8mm threaded standoff (DIP type)

P/N: 33-72015-0050

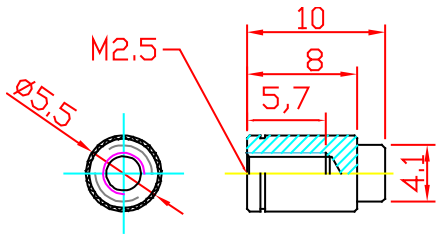


Figure 6: COM Express Standoff Types

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Safety Instructions

Read and follow all instructions marked on the product and in the documentation before you operate your system. Retain all safety and operating instructions for future use.

- Please read these safety instructions carefully.
- Please keep this User‘s Manual for later reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment, turn off the power and unplug any power cords/cables.
- 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 and unplug the equipment from its power source.
- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

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Getting Service

Ask an Expert: http://askanexpert.adlinktech.com

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