



AXIOMTEK

CEM561

**12th Generation Intel® Core i7/i5/i3
processors COM Express™ Type 6
Basic Module**

User's Manual



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CAUTION

If you replace wrong batteries, it causes the danger of explosion. It is recommended by the manufacturer that you follow the manufacturer's instructions to only replace the same or equivalent type of battery, and dispose of used ones.

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ESD Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please take care of the following jobs with precautions:

- Do not remove modules or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the module or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. It discharges static electricity from your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling modules and components.

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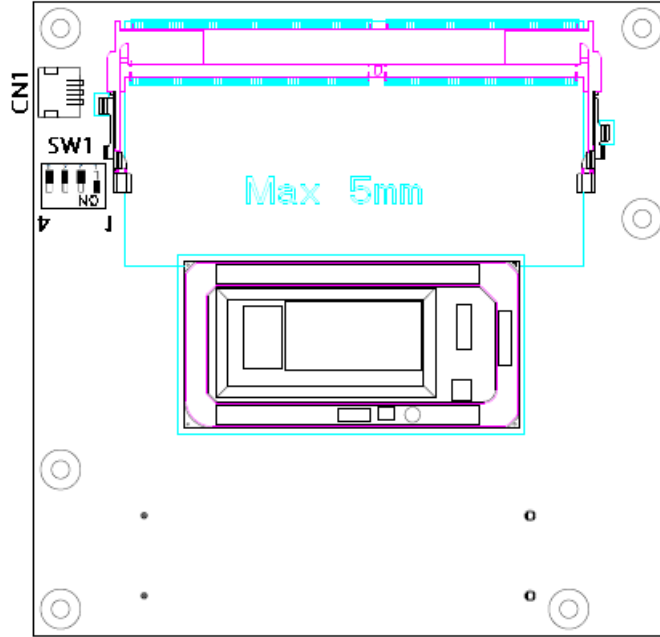
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Checklist

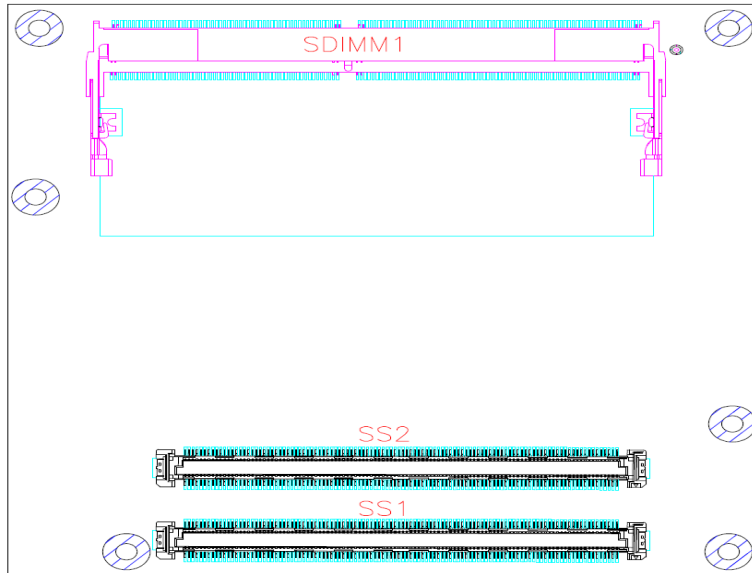
- ✓ CEM561 Board x1
- ✓ Quick Installation Guide x1

Note: Please contact your local vendors if any damaged or missing items. DO NOT apply power to the board if there is any damaged component.

Module Layout



Top View



Bottom View

Switch Settings

Before applying power to the CEM561, please make sure onboard switches are in factory default positions.

Auto Power On and Restore BIOS Optimal Defaults (SW1 1 & 2)

If dip1 of SW1 (SW1-1) is set to ON position, the system will be automatically power on without pressing soft power button. If this switch is set to OFF position, it is necessary to manually press soft power button to power on the system.

The dip2 of SW1 (SW1-2) is for restoring BIOS default status. Flip SW1-2 to ON position for a few seconds then flip it back to OFF position. Doing this procedure can restore BIOS optimal defaults.

Function	Setting
Disable auto power on (Default)	SW1-1 OFF
Enable auto power on	SW1-1 ON
Normal operation (Default)	SW1-2 OFF
Restore BIOS optimal defaults	SW1-2 ON



2.4.2 PCI-Express Bifurcation Setting (SW1 3 & 4)

The SW2 is for PCI-Express bifurcation setting. See table below for detailed information.

Function	Setting
Not Support	SW1-3 ON, SW1-4 ON
Port B Reversed	SW1-3 OFF, SW1-4 ON
Port A Reversed (not supported on NvMe SKU)	SW1-3 ON, SW1-4 OFF
Select two x4 PCI-Express (Port A not supported on NvMe SKU)	SW1-3 OFF, SW1-4 OFF



Switch	Description	Setting
SW1	Auto Power On Default: Disable	SW1-1 OFF
	Restore BIOS Optimal Defaults Default: Normal Operation	SW1-2 OFF
	PCI-Express Bifurcation Setting Default: 2 x4 PCI-Express	SW1-3 OFF, SW1-4 OFF

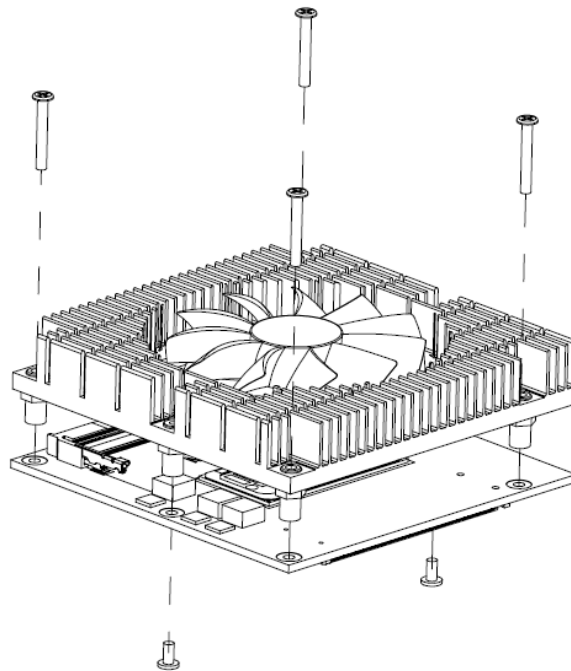
Connectors

Connector	Description
CN1	Fan Connector
SS1	COM Express™ Connector
SS2	COM Express™ Connector
DIMM1	Channel 0 DDR4 SO-DIMM Socket
SDIMM1	Channel 1 DDR4 SO-DIMM Socket

Installing Thermal Solution

For thermal dissipation, a thermal solution enables the CEM561's components to dissipate heat efficiently. All heat generating components are thermally conducted to the heatsink in order to avoid hot spots. Figure below illustrates how to install the thermal solution on CEM561.

1. There is a protective plastic covering on the thermal pads. This must be removed before the heatsink can be mounted.
2. Each heatsink is designed for a specific CEM module. The thermal pads on the heatsink are designed to make contact with the necessary components on the CEM module. When mounting the heatsink you must make sure that the thermal pads on the heatsink make complete contact (no space between thermal pad and component) with the corresponding components on the CEM module. This is especially critical for CEM modules that have higher CPU speeds (for example 1.0GHz or more) to ensure that the heatsink acts as a proper thermal interface for cooling solutions.
3. Before installing the heatsink to the CPU module, please apply thermal grease on the CPU die. This CPU module has assembly holes for installing heatsink plate. Use the appropriate screws to secure the heatsink plate to the CEM561. Be careful not to over-tighten the screws.



Quick Start

The basic procedures required to power on CEM561:

- (1). Make sure the power is OFF before connecting the CEM561.
- (2). Check to ensure the onboard switch SW1-1 and SW1-2 are set to default (OFF position).
- (3). Firmly install DDR4 SO-DIMM in DIMM1/SDIMM1 until fully seated. For single memory channel configuration, install memory module in channel 0 (DIMM1) DDR4 SO-DIMM socket. For dual memory channel configuration, install memory modules of the same size, chip width, density and rank in both channel 0 (DIMM1) and channel 1 (SDIMM1) DDR4 SO-DIMM sockets.
- (4). Attach heatsink to the CEM561, refer to section Installing Thermal Solution.
- (5). Install the CEM561 onto COM Express™ baseboard, for example, CEB94011 baseboard.
- (6). Properly install all necessary peripheral devices such as hard disk, display, keyboard and etc. to the baseboard.
- (7). Firmly attach power supply to the baseboard power connector.
- (8). Turn on the system power.
- (9). Press power button on the baseboard to start CEM561.

2.4 Switch Settings

Properly configure switch settings on the CEM520 to meet your application purpose. Below you can find a summary table of all switches and onboard default settings.



Note

Once the default switch setting needs to be changed, please do it under power-off condition.

Switch	Description	Setting
SW1	Auto Power On Default: Disable	SW1-1 OFF
	Restore BIOS Optimal Defaults Default: Normal Operation	SW1-2 OFF
	PCI-Express Bifurcation Setting Default: One x16 PCI-Express	SW1-1 OFF, SW1-2 OFF

2.4.1

2.5 Connectors

Signals go to the other parts of the system through connectors. Loose or improper connection might cause problems, please make sure all connectors are properly and firmly connected. Here is a summary table which shows connectors on the hardware.

Connector	Description
CN1	Fan Connector
BAT1	Battery Connector
SS1	COM Express™ Connector
SS2	COM Express™ Connector
DIMM1	Channel 0 DDR4 SO-DIMM Socket
DIMM2	Channel 1 DDR4 SO-DIMM Socket



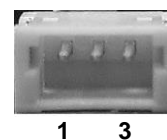
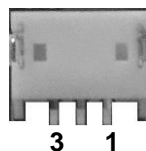
Note

- For single memory channel configuration, install memory module in channel 0 (DIMM1) DDR4 SO-DIMM socket.
- For dual memory channel configuration, install memory modules of the same size, chip width, density and rank in channel 0 (DIMM1) and channel 1 (DIMM2) DDR4 SO-DIMM sockets.

2.5.1 Fan Connector (CN1)

The CN1 is a 3-pin connector for fan interface.

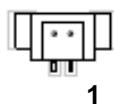
Pin	Signal
1	GND
2	+12V fan speed control
3	Fan speed feedback



2.5.2 CMOS Battery Connector (BAT1)

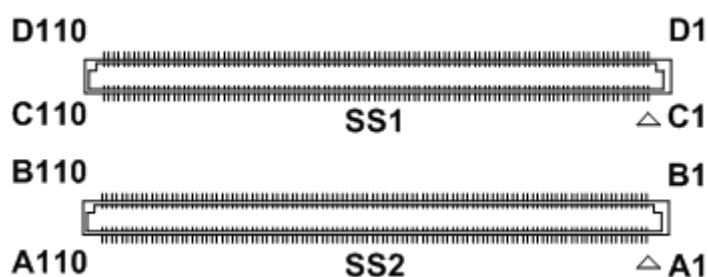
This connector is CMOS battery interface only for debugging.

Pin	Signal
1	+3V
2	GND



2.5.3 COM Express™ Connectors (SS1 and SS2)

The following table shows pin assignments of the 220-pin COM Express™ connectors.



Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	GND (FIXED)	B1	GND (FIXED)	C1	GND (FIXED)	D1	GND (FIXED)
A2	GBE0_MDI3-	B2	GBE0_ACT#	C2	GND (FIXED)	D2	GND (FIXED)
A3	GBE0_MDI3+	B3	LPC_FRAME#	C3	USB_SSRX0-	D3	USB_SSTX0-
A4	GBE0_LINK2500#	B4	LPC_AD0	C4	USB_SSRX0+	D4	USB_SSTX0+
A5	GBE0_LINK1000#	B5	LPC_AD1	C5	GND (FIXED)	D5	GND (FIXED)
A6	GBE0_MDI2-	B6	LPC_AD2	C6	USB_SSRX1-	D6	USB_SSTX1-
A7	GBE0_MDI2+	B7	LPC_AD3	C7	USB_SSRX1+	D7	USB_SSTX1+
A8	GBE0_LINK#	B8	RSVD	C8	GND (FIXED)	D8	GND (FIXED)
A9	GBE0_MDI1-	B9	RSVD	C9	USB_SSRX2-	D9	USB_SSTX2-
A10	GBE0_MDI1+	B10	LPC_CLK	C10	USB_SSRX2+	D10	USB_SSTX2+
A11	GND (FIXED)	B11	GND (FIXED)	C11	GND (FIXED)	D11	GND (FIXED)
A12	GBE0_MDI0-	B12	PWRBTN#	C12	USB_SSRX3-	D12	USB_SSTX3-
A13	GBE0_MDI0+	B13	SMB_CK	C13	USB_SSRX3+	D13	USB_SSTX3+
A14	GBE0_CTREF	B14	SMB_DAT	C14	GND (FIXED)	D14	GND (FIXED)
A15	SUS_S3#	B15	SMB_ALERT#	C15	RSVD	D15	DDI1_CTRLCLK_AUX+
A16	SATA0_TX+	B16	SATA1_TX+	C16	RSVD	D16	DDI1_CTRLDATA_AUX-
A17	SATA0_TX-	B17	SATA1_TX-	C17	RSVD	D17	RSVD
A18	SUS_S4#	B18	SUS_STAT#	C18	RSVD	D18	RSVD
A19	SATA0_RX+	B19	SATA1_RX+	C19	PCIE_RX6+(Optional With USBSSRX2+)	D19	PCIE_TX6+(Optional With USBSSTX2+)
A20	SATA0_RX-	B20	SATA1_RX-	C20	PCIE_RX6-(Optional With USBSSRX2-)	D20	PCIE_TX6-(Optional With USBSSTX2+)
A21	GND (FIXED)	B21	GND (FIXED)	C21	GND (FIXED)	D21	GND (FIXED)
A22	RSVD	B22	RSVD	C22	PCIE_RX7+(Optional With USBSSRX3+)	D22	PCIE_TX7+(Optional With USBSSTX3+)
A23	RSVD	B23	RSVD	C23	PCIE_RX7-(Optional With USBSSRX2-)	D23	PCIE_TX7-(Optional With USBSSTX3+)
A24	SUS_S5#	B24	PWR_OK	C24	DDI1_HPD	D24	RSVD
A25	RSVD	B25	RSVD	C25	RSVD	D25	RSVD
A26	RSVD	B26	RSVD	C26	RSVD	D26	DDI1_PAIR0+
A27	BATLOW#	B27	WDT	C27	RSVD	D27	DDI1_PAIR0-
A28	(S)ATA_ACT#	B28	RSVD	C28	RSVD	D28	RSVD
A29	HDA_SYNC	B29	HDA_SDIN1	C29	RSVD	D29	DDI1_PAIR1+
A30	HDA_RST#	B30	HDA_SDIN0	C30	RSVD	D30	DDI1_PAIR1-
A31	GND (FIXED)	B31	GND (FIXED)	C31	GND (FIXED)	D31	GND (FIXED)
A32	AC/HDA_BITCLK	B32	SPKR(Optional With SATA_ACT#)	C32	DDI2_CTRLCLK_AUX+	D32	DDI1_PAIR2+
A33	AC/HDA_SDOUT	B33	I2C_CK	C33	DDI2_CTRLDATA_AUX-	D33	DDI1_PAIR2-
A34	BIOS_DISABLE#	B34	I2C_DAT	C34	DDI2_DDC_AUX_SEL	D34	DDI1_DDC_AUX_SEL
A35	THRMTRIP#	B35	RSVD	C35	RSVD	D35	RSVD
A36	USB6-	B36	USB7-	C36	DDI3_CTRLCLK_AUX+	D36	DDI1_PAIR3+
A37	USB6+	B37	USB7+	C37	DDI3_CTRLDATA_AUX-	D37	DDI1_PAIR3-
A38	USB_6_7_OC#	B38	USB_4_5_OC#	C38	DDI3_DDC_AUX_SEL	D38	RSVD
A39	USB4-	B39	USB5-	C39	DDI3_PAIR0+(Optional With TCP PAIR0+)	D39	DDI2_PAIR0+
A40	USB4+	B40	USB5+	C40	DDI3_PAIR0-(Optional With TCP PAIR0-)	D40	DDI2_PAIR0-
A41	GND (FIXED)	B41	GND (FIXED)	C41	GND (FIXED)	D41	GND (FIXED)
A42	USB2-	B42	USB3-	C42	DDI3_PAIR1+(Optional With TCP PAIR1+)	D42	DDI2_PAIR1+
A43	USB2+	B43	USB3+	C43	DDI3_PAIR1-(Optional With TCP PAIR1-)	D43	DDI2_PAIR1-
A44	USB_2_3_OC#	B44	USB_0_1_OC#	C44	RSVD For DDI3_HPD	D44	DDI2_HPD
A45	USB0-	B45	USB1-	C45	RSVD	D45	RSVD
A46	USB0+	B46	USB1+	C46	DDI3_PAIR2+	D46	DDI2_PAIR2+
A47	VCC_RTC	B47	ESPI_EN#	C47	DDI3_PAIR2-	D47	DDI2_PAIR2-
A48	RSVD	B48	RSVD	C48	RSVD	D48	RSVD
A49	GBE0_SDP	B49	SYS_RESET#	C49	DDI3_PAIR3+	D49	DDI2_PAIR3+

A50	LPC_SERIRQ	B50	CB_RESET#	C50	DDI3_PAIR3-	D50	DDI2_PAIR3-
A51	GND (FIXED)	B51	GND (FIXED)	C51	GND (FIXED)	D51	GND (FIXED)
A52	PCIE_TX5+(Optional With I226)	B52	PCIE_RX5+(Optional With I226)	C52	PEG_RX0+	D52	PEG_TX0+
A53	PCIE_TX5-(Optional With I226)	B53	PCIE_RX5-(Optional With I226)	C53	PEG_RX0-	D53	PEG_TX0-
A54	GPI0	B54	GPO1	C54	RSVD	D54	PEG_LANE_RV#
A55	PCIE_TX4+	B55	PCIE_RX4+	C55	PEG_RX1+	D55	PEG_TX1+

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A56	PCIE_TX4-	B56	PCIE_RX4-	C56	PEG_RX1-	D56	PEG_TX1-
A57	GND	B57	GPO2	C57	RSVD	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	PEGB_RX4+	D65	PEGB_TX4+
A66	GND	B66	WAKE0#	C66	PEGB_RX4-	D66	PEGB_TX4-
A67	GPI2	B67	WAKE1#	C67	RAPID_SHOTDOWN	D67	GND
A68	PCIE_TX0+	B68	PCIE_RX0+	C68	PEGB_RX5+	D68	PEGB_TX5+
A69	PCIE_TX0-	B69	PCIE_RX0-	C69	PEGB_RX5-	D69	PEGB_TX5-
A70	GND(FIXED)	B70	GND(FIXED)	C70	GND(FIXED)	D70	GND(FIXED)
A71	LVDS_A0+	B71	LVDS_B0+	C71	PEGB_RX6+	D71	PEGB_TX6+
A72	LVDS_A0-	B72	LVDS_B0-	C72	PEGB_RX6-	D72	PEGB_TX6-
A73	LVDS_A1+	B73	LVDS_B1+	C73	GND(FIXED)	D73	GND
A74	LVDS_A1-	B74	LVDS_B1-	C74	PEGB_RX7+	D74	PEGB_TX7+
A75	LVDS_A2+	B75	LVDS_B2+	C75	PEGB_RX7-	D75	PEGB_TX7-
A76	LVDS_A2-	B76	LVDS_B2-	C76	GND	D76	GND
A77	LVDS_VDD_EN	B77	LVDS_B3+	C77	RSVD	D77	RSVD
A78	LVDS_A3+	B78	LVDS_B3-	C78	RSVD	D78	RSVD
A79	LVDS_A3-	B79	LVDS_BKLT_EN	C79	RSVD	D79	RSVD
A80	GND(FIXED)	B80	GND(FIXED)	C80	GND(FIXED)	D80	GND(FIXED)
A81	LVDS_A_CK+	B81	LVDS_B_CK+	C81	RSVD	D81	RSVD
A82	LVDS_A_CK-	B82	LVDS_B_CK-	C82	RSVD	D82	RSVD
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	RSVD	D85	RSVD
A86	RSVD	B86	VCC_5V_SBY	C86	RSVD	D86	RSVD
A87	eDP_HPD	B87	VCC_5V_SBY	C87	GND	D87	GND
A88	PCIE0_CK_REF+	B88	BIOS_DIS1	C88	RSVD	D88	RSVD
A89	PCIE0_CK_REF-	B89	VGA_RED	C89	RSVD	D89	RSVD
A90	GND (FIXED)	B90	GND (FIXED)	C90	GND (FIXED)	D90	GND (FIXED)
A91	SPI_POWER	B91	VGA_GRN	C91	RSVD	D91	RSVD
A92	SPI_MISO	B92	VGA_BLU	C92	RSVD	D92	RSVD
A93	GPO0	B93	VGA_HSYNC	C93	GND	D93	GND
A94	SPI_CLK	B94	VGA_VSYNC	C94	RSVD	D94	RSVD
A95	SPI_MOSI	B95	VGA_I2C_CK	C95	RSVD	D95	RSVD
A96	TPM_PP	B96	VGA_I2C_DAT	C96	GND	D96	GND
A97	RSVD	B97	SPI_CS#	C97	RSVD	D97	RSVD
A98	SER0_TX	B98	RSVD For DUAL BIOS SW	C98	RSVD	D98	RSVD
A99	SER0_RX	B99	RSVD	C99	RSVD	D99	RSVD
A100	GND (FIXED)	B100	GND (FIXED)	C100	GND (FIXED)	D100	GND (FIXED)
A101	SER1_TX	B101	FAN_PWMOUT	C101	RSVD	D101	RSVD

A102	SER1_RX	B102	FAN_TACHIN	C102	RSVD	D102	RSVD
A103	LID#	B103	SLEEP#	C103	GND	D103	GND
A104	VCC_12V	B104	VCC_12V	C104	VCC_12V	D104	VCC_12V
A105	VCC_12V	B105	VCC_12V	C105	VCC_12V	D105	VCC_12V
A106	VCC_12V	B106	VCC_12V	C106	VCC_12V	D106	VCC_12V
A107	VCC_12V	B107	VCC_12V	C107	VCC_12V	D107	VCC_12V
A108	VCC_12V	B108	VCC_12V	C108	VCC_12V	D108	VCC_12V
A109	VCC_12V	B109	VCC_12V	C109	VCC_12V	D109	VCC_12V
A110	GND (FIXED)	B110	GND (FIXED)	C110	GND (FIXED)	D110	GND (FIXED)

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