

**GEMINI**

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# Gemini User Manual

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## Hardware User Manual

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### Hardware User Manual

Gemini COM-Based SBC with PCI/104 Express Expansion Hardware User Manual



# 1. IMPORTANT SAFE HANDLING INFORMATION

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## ESD-Sensitive Electronic Equipment

Observe ESD-safe handling procedures when working with this product.

Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.

Always store this product in ESD-protective packaging when not in use.

## Safe Handling Precautions

The Gemini carrier card contains a high number of I/O connectors with connection to sensitive electronic components. This creates many opportunities for accidental damage during handling, installation and connection to other equipment. The list here describes common causes of failure found on boards returned to Diamond Systems for repair. This information is provided as a source of advice to help you prevent damaging your Diamond (or any vendor's) embedded computer boards.

**ESD damage** - This type of damage is usually almost impossible to detect, because there is no visual sign of failure or damage. The symptom is that the board eventually simply stops working, because some component becomes defective. Usually the failure can be identified and the chip can be replaced. To prevent ESD damage, always follow proper ESD-prevention practices when handling computer boards.

**Damage during handling or storage** – On some boards we have noticed physical damage from mishandling. A common observation is that a screwdriver slipped while installing the board, causing a gouge in the PCB surface and cutting signal traces or damaging components.

Another common observation is damaged board corners, indicating the board was dropped. This may or may not cause damage to the circuitry, depending on what is near the corner. Most of our boards are designed with at least 25 mils clearance between the board edge and any component pad, and ground / power planes are at least 20 mils from the edge to avoid possible shorting from this type of damage. However these design rules are not sufficient to prevent damage in all situations. A third cause of failure is when a metal screwdriver tip slips, or a screw drops onto the board while it is powered on, causing a short between a power pin and a signal pin on a component. This can cause overvoltage / power supply problems described below. To avoid this type of failure, only perform assembly operations when the system is powered off.

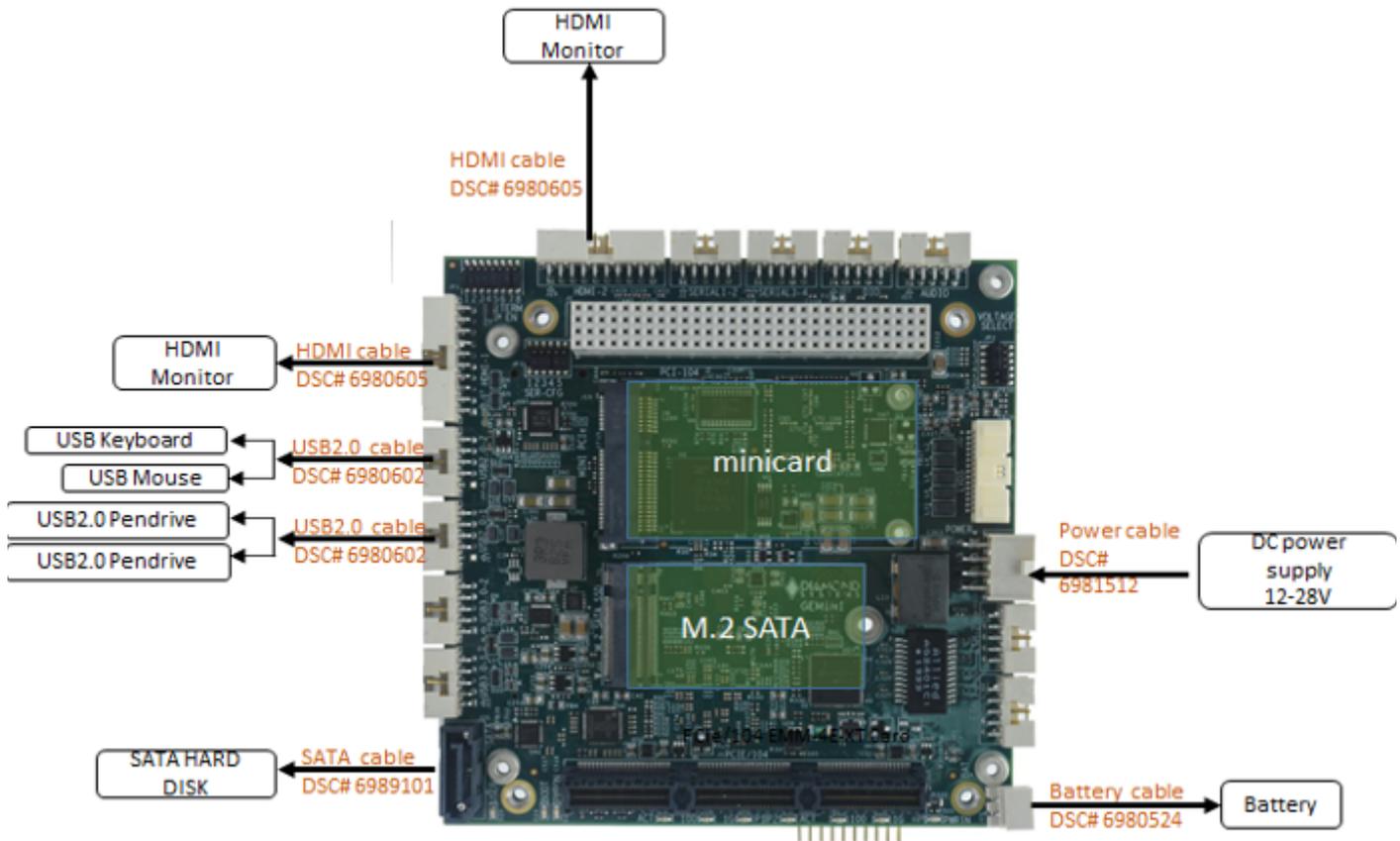
Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. However our boards are generally very dense, and if the board has components very close to the board edge, they can be damaged or even knocked off the board when the board tilts back in the rack. Diamond recommends that all our boards be stored only in individual ESD-safe packaging. If multiple boards are stored together, they should be contained in bins with dividers between boards. Do not pile boards on top of each other or cram too many boards into a small location. This can cause damage to connector pins or fragile components.

**Power supply wired backwards** – Our power supplies and boards are not designed to withstand a reverse power supply connection. This will destroy each IC that is connected to the power supply (i.e. almost all ICs). In this case the board will most likely will be unrepairable and must be replaced. A chip destroyed by reverse power or by excessive power will often have a visible hole on the top or show some deformation on the top surface due to vaporization inside the package. **Check twice before applying power!**

## 2. QUICK START GUIDE

### 2.1 Hardware Setup

The illustration below shows the minimum hardware set up required to boot the system:



Follow the below steps to do a quick start of Gemini to start testing.

1. Connect M.2 SATA SSD or SATA Hard disk using SATA cable number 6989101.
2. Connect the Power supply cable and connect to 12V DC power supply.
3. Connect an HDMI monitor using DSC cable number 6980605.
4. Connect USB disk with OS to be installed to one of the USB ports.
5. Connect Keyboard and mouse to USB ports.
6. Ensure all the connections are intact.
7. Double-check the power supply.
8. Power on the system.
9. On the initial boot, the system will prompt for installation settings. Set up as required.
10. Once the OS installation is completed, the Desktop is loaded. The system is now ready to be used.

For the easiest startup, we recommend to buy the development kit which includes a cable kit and Flash drive with the programmed OS or at least the SDK with the OS.

In case the customer wants to install OS by themselves then please follow [Section 2.2](#) to install the OS.

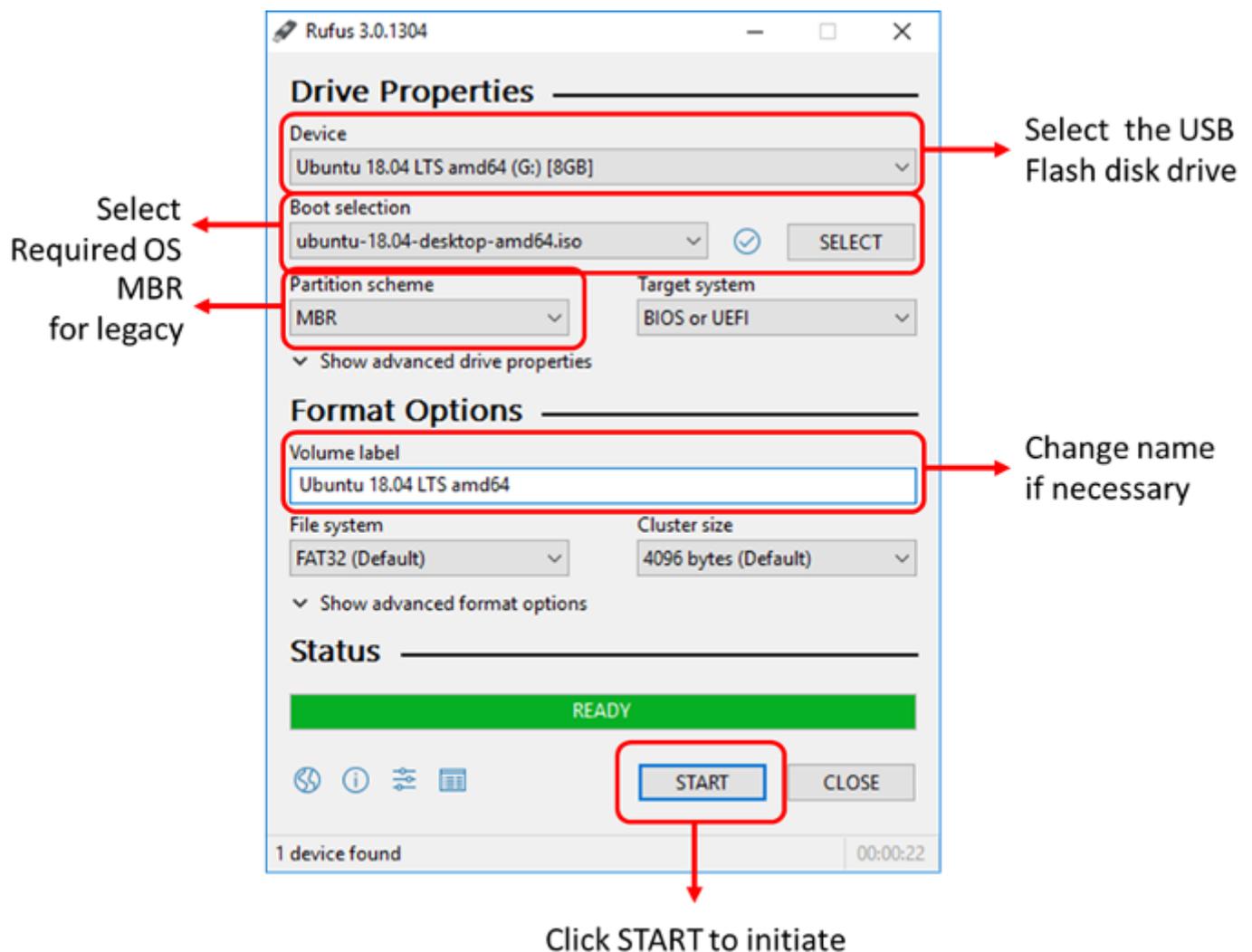
We recommend to buy cable kit CK-GEM-01 for Gemini for quick startup. In case the customer wants to build the cables themselves click [here](#) for the cable drawings.

## 2.2 Software Setup

In order to use Gemini SBC, an operating system needs to be installed. This OS can be either installed in the M.2 SSD or an external HDD. Depending upon the purchase made, an M.2 SSD may or may not be included with the purchase kit.

The software setup is as described below:

1. Download the necessary OS on a workstation. It is recommended to download the OS in ISO format.
2. Download the Rufus utility program to create a bootable USB flash disk. Rufus can be downloaded here: [Rufus](#)
3. Insert a USB flash disk in the workstation & launch Rufus
4. Follow the Rufus settings & initiate the bootable USB flash disk creation process



Rufus settings

## 3. INTRODUCTION & PRODUCT CONFIGURATIONS

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### 3.1 Introduction

Gemini COM-based SBC is the newest addition to Diamond Systems product-line that integrates the latest generation of the embedded COM Express® Compact cExpress-WL 8665UE Type 6 Module from ADLINK, featuring Intel® 8th Generation Quad-core i7 processor, and PCI/104-Express Expansion.

Gemini COM-based SBC offers a scalable embedded system infrastructure that significantly enhances performance, power efficiency, and optimized I/O capabilities.

The SBCs mechanical dimensions slightly exceed the dimensions of the COM Express Compact form factor and PC/104 specification form factor so that mounting hole patterns of both form factors can be accommodated. This also allows additional space for I/O connectors.

The PCI/104-Express expansion sockets are located on the top side of the board. The COM Express module is mounted on the bottom side of the board.

The SBC is a multi-layer Printed Circuit Board that is designed on a thicker scale measuring .090" (2.3 mm). This enables the carrier board to operate reliably in mobile and harsh environmental applications.

The following table summarizes the on-board key features, components, and specifications of the Gemini COM-based SBC.

#### 3.1.2 Gemini Peripheral current supported

The following table shows the current supported on each peripheral which supports add-on cards or devices by Gemini.

### 3.2 Gemini Configurations

Gemini is offered with cExpress-WL-8665UE Intel 8th gen i7 processor in the following configurations

Gemini is designed also to support other higher and lower end COM modules. Contact DSC support for ordering Gemini configured for lower end COM modules.

Gemini is also available as a carrier card for type 6 compact form-factor COM modules. The below table lists the carrier card feature list and corresponding SBC features:

Note: Any COM module feature not listed above is not available when used with the Gemini baseboard.

## 4. MODULE FEATURES

The **cExpress-WL module** from ADLINK is compact size type 6 module with form factor 95mm x 95mm. cExpress-WL module features quad/dual core 8th gen Intel® core processors and supports upto 64GB non-ECC DDR4 memory on two SODIMM sockets.

Following summarizes key features and specifications of cExpress-WL type 6 module.

Module	Specification
CPU	Core™ i7-8665UE, 1.7 (4.4 Turbo) GHz, 8MB, 15W (25W-12.5W cTDP), 4C/GT2
Audio Chipset and Codec	Intel HD Audio integrated into SoC; On Carrier Express-BASE6. Standard Support for ALC886
Ethernet and Interface	Intel MAC/PHY; Intel I219-LM/V (LM supports AMT 12.x); 10/100/1000 Mbit/s Connection
Display	Intel Generation 9 LP Graphics Core Architecture. Supports 3 Independent and Simultaneous Display Combinations of DisplayPort/HDMI/LVDS, eDP or VGA Outputs  Two DDI Channels, One LVDS, <b>Optional:</b> 4 Lanes eDP, <b>Optional:</b> One VGA
Expansion Busses	6 PCI Express x1 Gen3 (AB): Lanes 0/1/2/3/4/5 (configurable to x2, x4) 2 PCI Express x1 Gen3 (CD): Lanes 6/7 1 PCI Express x1 Gen3 (CD): Lane 16 Muxed with SATA Port 3, by Build Option <b>NOTE:</b> Supports 5 PCIe Devices LPC Bus, SMBus (System), I2C (User)
eMMC Chip	5.0 (8/16/32GB by Build Option)
Memory	Up to 64GB Dual Channel Non-ECC DDR4 at 2133/2400MHz in Two SODIMM Sockets
SATA Ports	3x SATA 6Gb/s (SATA 0,1,2), SATA Port 3 Muxed with PCIe Lane 16 <b>NOTE:</b> SATA Port 3 is the Default Setting.
USB Ports	4x USB 3.1 Gen 2/2.0/1.1 (USB 0, 1, 2, 3) and 4x USB 2.0/1.1 (USB 4, 5, 6, 7)
Mechanical, Electrical, and Environmental Specifications	
Form-Factor	H 3.74" x W 3.74" (95 mm x 95 mm): PICMG COM.0: Rev 3.0 Type 6; Compact  15 Watts Standard Input: ATX: 12V ±5% / 5Vsb ±5%; or AT: 12V±5% Wide Input: ATX: 5-20 V / 5Vsb ±5%; or AT: 5-20V Management: ACPI 5.0 Compliant, Smart Battery Support

Power Power States: C1-C6, S0, S1, S3, S4, S5, S5 ECO Mode (Wake on USB S3/S4, WoL - Wake-on-LAN S3/S4/S5) ECO Mode: Support Deep S5 Mode for Power Saving

Consumption

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Temperature

Range at

Module

-40°C to +85°C (-40°F to +185°F)

Thermal

Extreme Rugged **Optional** : -45°C to + 185°C on Selected SKUs

Transfer Plate

(TTP)

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Cooling

Mechanism

Conduction Cooling

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Humidity

5-90% RH Operating, Non-Condensing

5-95% RH Storage and Operating with Conformal Coating

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Shock and

Vibration

IEC 60068-2-64 and IEC-60068-2-27

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MIL-STD-202F, Method 213B, Table 213-I, Condition A and Method 214A, Table 214-I, Condition D

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HALT (Highly

Accelerated

Life Test)

Thermal Stress, Vibration Stress, Thermal Shock and Combined Test

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The following figure depicts the COM Express Type 6 connector layout.

## 5. FUNCTIONAL OVERVIEW

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### 5.1 Power Supply Specifications

Gemini carrier board is powered by a wide range of power supply ranging from +12V to 28VDC(+/-10%). The maximum permissible reflected ripple measured at the voltage input connector is +/-100mV p-p.

All required supply voltages for the board are derived from the 12V-30VDC input. The maximum power required with the COMExpress module loaded and all interfaces along with addon-cards installed is 95W.

### 5.2 Backup Battery

A 2x1 right angle connector is available to support an external RTC battery connection. The Voltage level for RTC is 3V.

The Current requirement for RTC: 4uA. Back-up time for CR2032: 56250 hours

### 5.3 Digital I/O

Gemini includes a CP2112 USB to GPIO expander to provide 8 GPIO lines which are accessible on a 2x5 2mm pitch pin header. All GPIOs are 3.3V compatible. CP2112 is a USB to SMBus bridge IC which has 8 GPIO lines. Gemini is making use of these GPIO lines for DIO capability. CP2112 is USB HID IC. No additional drivers are required.

USB to GPIO is shared with mPCIe socket. GPIO is selected as default. A jumper selects which device is active.

Refer to [section 11](#) for jumper details.

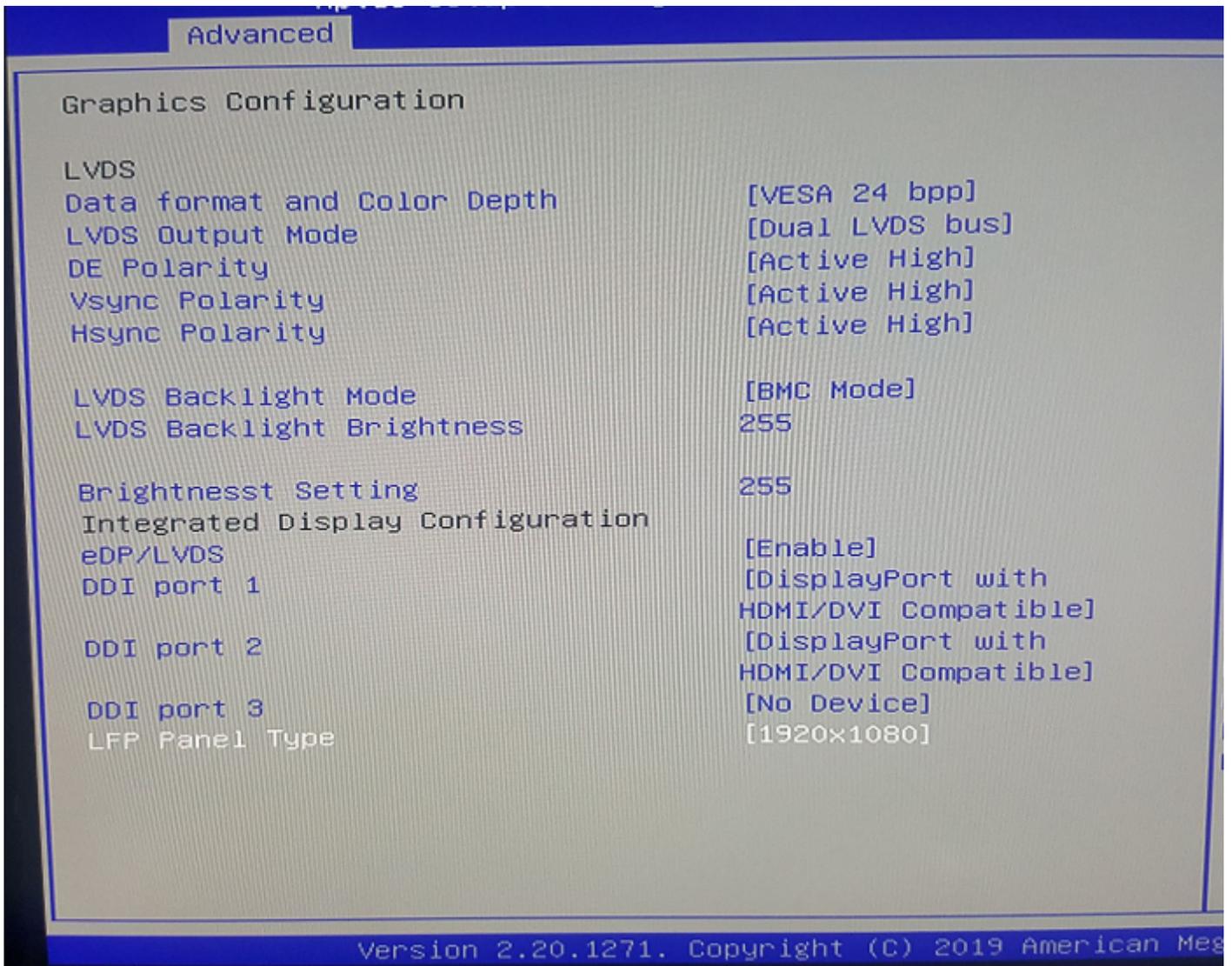
### 5.4 Display Output Controller

Gemini has 3 video output ports available, one LVDS and 2 HDMI. Simultaneous video output on 3 video ports is supported.

#### 5.4.1 LVDS LCD Connector

Gemini supports a 24-bit dual-channel LVDS display accessible on a 2x15 right-angle latching connector. The backlight supply and PWM control signals are provided on a separate right-angle connector. The backlight supply and LCD supply are user selectable using the JP2 jumper to support multiple LCD displays.

For enabling the LVDS display eDP/LVDS should be enabled and the LFP panel type resolution should be set as 1920x1080.



### 5.4.2 HDMI ports

Gemini SBC offers two HDMI 1.4 video output ports routed from the module. The HDMI ports are made available on two separate 2x10 2mm pitch pin headers. HDMI Integrated audio is supported on HDMI ports.

PTN3363BSMP low power HDMI/DVI level shifter is used to level shift AC coupled differential DDI signals to HDMI 1.4b compliant differential signals. PTN3363BSMP also takes care of HPD and DDC signal level translation.

## 5.5 Ethernet Ports

Two Gigabit Ethernet ports are available. Both ports support 10/100/1000 MBPS.

- One Ethernet port is available directly from the COM module
- The second port is implemented using the WI210 Ethernet controller via x1 PCIe lane from the module.

Both Ethernet ports are accessible on 2 2x5 2mm pitch header compatible with Diamond systems standard Ethernet cables.

There are 3 LEDs for each port indicating activity and speed.

## 5.6 Audio Interface

Audio codec ALC892-CG converts HD audio signals from module to analog audio signals which are accessible over a standard 2x5 pin header. The audio I/O signals include the below signals:

- Stereo Line-In
- Stereo Line-Out
- Mic-In

## 5.7 LED Indicators

Gemini has 10 LEDs on board to indicate board and Ethernet status.

## 5.8 PCIe Link routing

cExpress-WL 8665UE module supports 8 x1 lanes. PCIe lanes are routed from module to support Serial port, mPCIe socket, Ethernet port, PCIe to PCI bridge, and PCIe/104 expansion.

All Gemini variants have PCIe x16 lane connected to PCIe/104 banks 2 & 3. The x16 PCIe lane support is module dependant

The lanes are routed from the COM module and mapped to the on-board I/O interfaces and expansion sockets as specified in the following table and the diagram below.

## 5.9 PCIe mini-Card Socket

Gemini is equipped with a PCIe mini-card full-size socket to support full-size PCIe and USB2.0 mini-cards. USB to mPCIe socket is shared with GPIO. GPIO is selected as default. A jumper selects which device is active.

Two threaded spacers are provided on the Gemini carrier card for installing PCIe mini-card module

Refer to [section 11](#) for jumper details.

## 5.10 M.2 Socket

Gemini has one SATA port from module routed to M.2 M-key socket to support M.2 SSDs. The M.2 Formfactor supported is 2242(22mm W x 42mm L). A threaded spacer is provided on the Gemini carrier card for installing M.2 module.

## 5.11 SATA connector

Gemini has one SATA port accessible on a standard 7-pin SATA connector.

## 5.12 Serial ports

Gemini supports 4 serial ports. Each serial port supports RS232, RS485, and RS422 protocol.

The Serial protocol is selectable using jumper settings. The default configuration is RS232. Refer to Jumper configurations for more details

The serial ports are implemented using the XR17V354 PCIe UART transceiver.

The SP336E transceiver converts the UART signals to RS232, RS485, or RS422 based on jumper settings. Max data rate supported is 250kbps with Slew rate tied low and 1Mbps with slew rate tied high.

The RS-232 driver output capability is +/-6.6V. The RS-485/RS-422 Driver Common mode voltage is 3V and the differential driver output is 1.5V to 3.3V. Optional 121-Ohm line terminations for RS485 and RS422. They can be selected by jumper settings.

Refer to [section 11](#) for jumper details.

## 5.13 Trusted Platform Module

Gemini provides a TPM 2.0 IC SLB 9670XQ2.0 from Infineon accessible through the SPI interface. The TPM 2.0

- Meets Intel TXT, Microsoft Windows, and Google Chromebook certification criteria for successful platform qualification
- supports Random Number Generator (RNG) according to NIST SP800-90A
- supports Full personalization with Endorsement Key (EK) and EK certificate

For enabling TPM functionality TPM 2.0 should be enabled, activated, and set to UEFI from the BIOS screen.

## 5.14 USB ports

Gemini provides 6 USB ports to the user.

- Four ports are USB 2.0 ports. These are accessible on 2 2x5 headers.
- Two ports are USB 3.0 ports. These are accessible on 2 2x5 headers.

COMExpress type 6 pinout supports 8 USB2.0 ports from the module. These ports are mapped as follows.

## 5.15 PCI-104 and PCIe/104 Expansion Interface

Gemini supports PCI/104-Express expansion. The PCI bus is realized using PCIe-PCI bridge XIO2001 from TI. Both 5V and 3.3 V levels are supported on the PCI bus. The voltage level is selectable using Jumper settings.

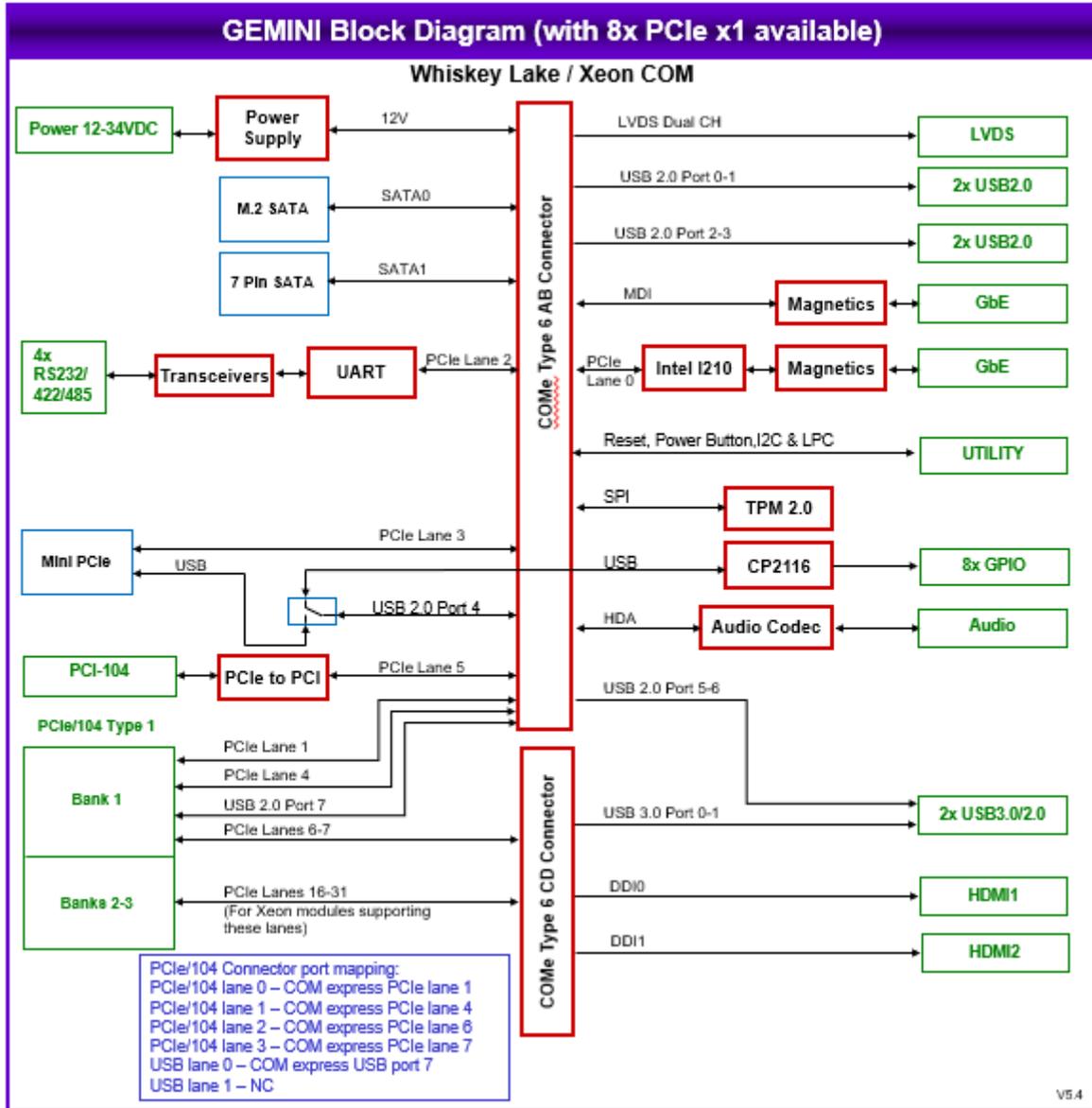
4 x1 PCIe gen2, x16 PEG and 1 USB2.0 port are supported on PCIe/104 expansion connector. x16 PEG is module dependant.

The below table lists the features available on the Utility connector:

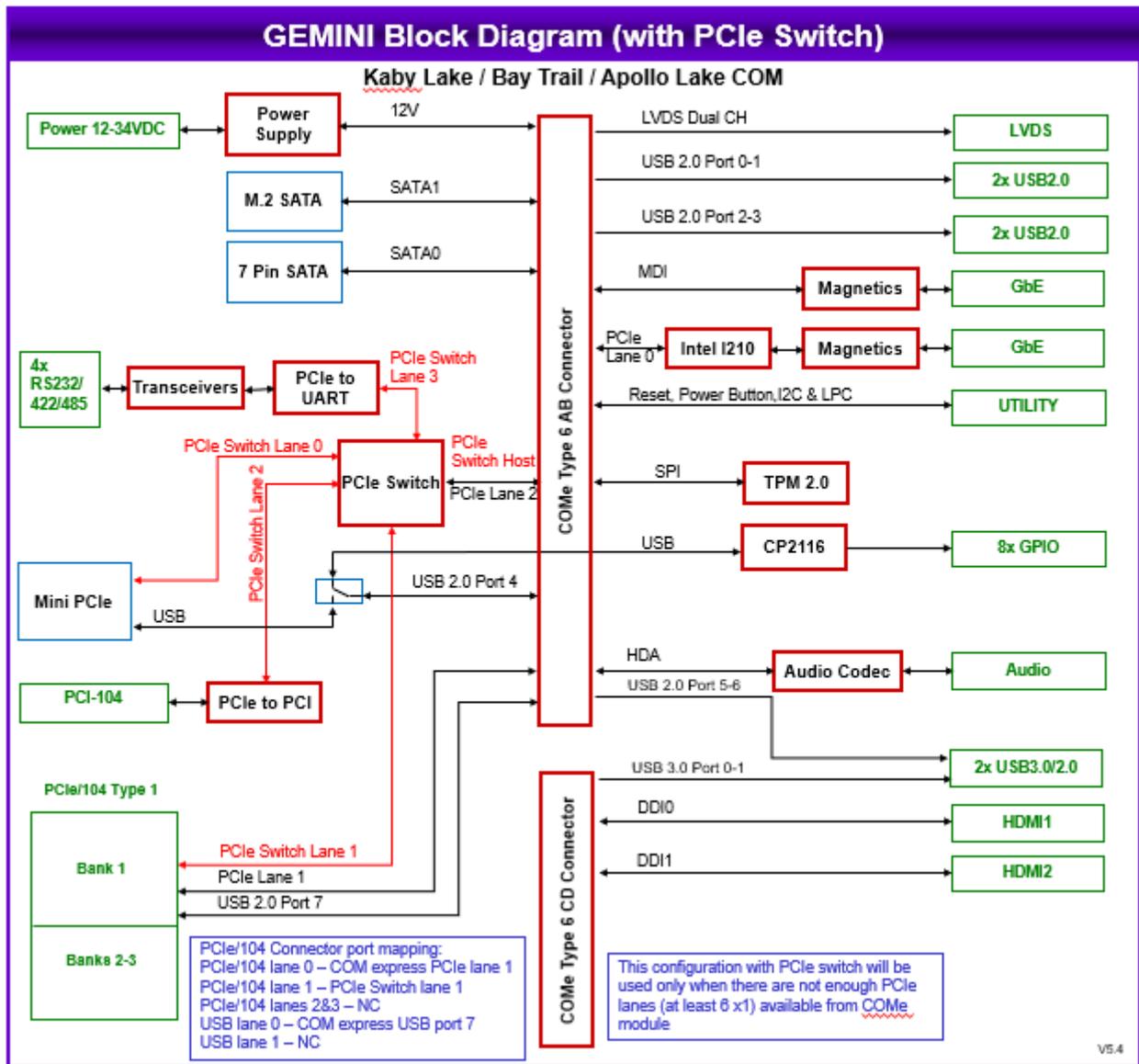
# 6. BLOCK DIAGRAM

## 6. BLOCK DIAGRAM

This page illustrates the functional block diagram of Gemini SBC



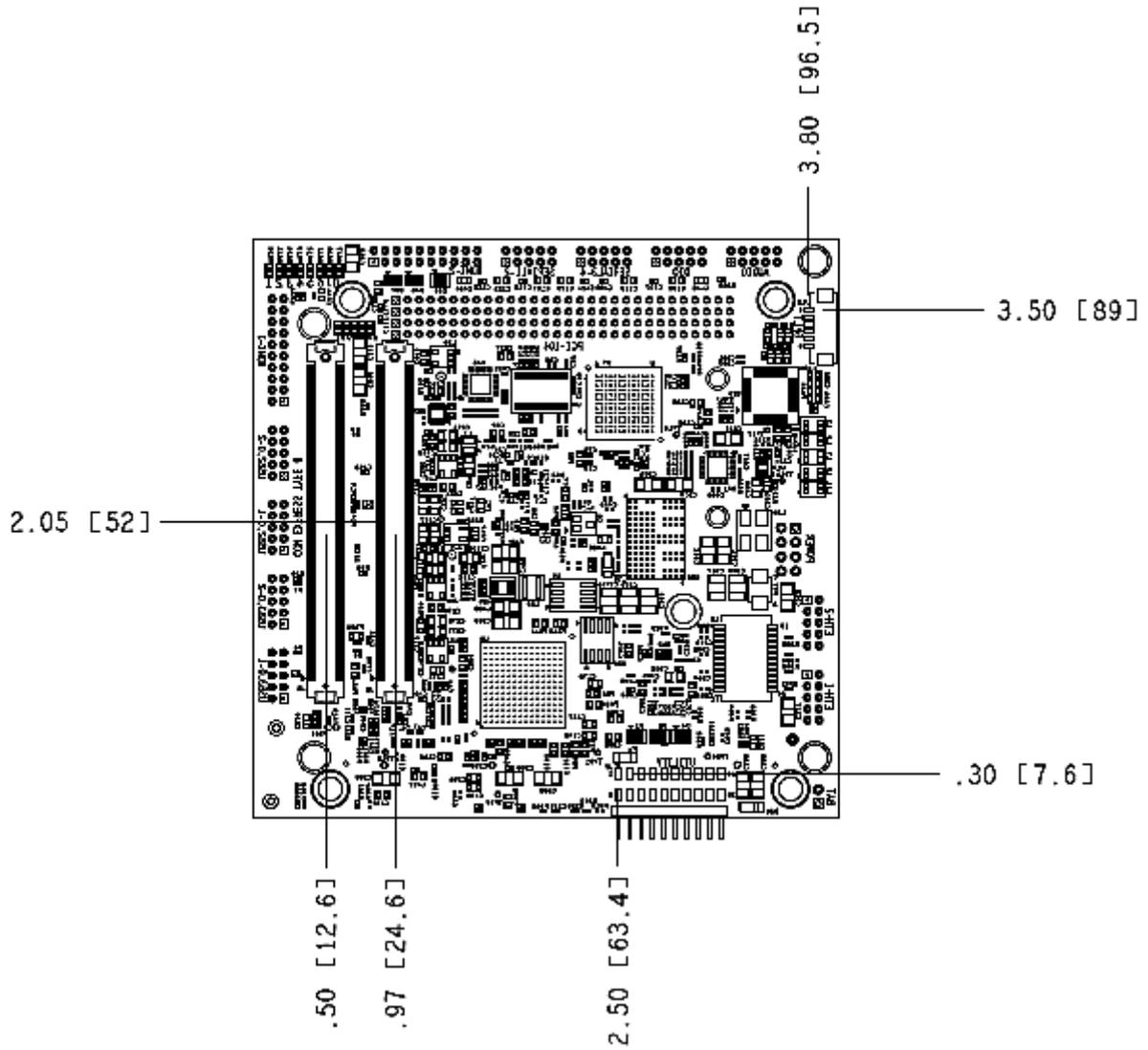
Gemini without PCIe Switch Block Diagram



Gemini with PCIe Switch Block Diagram

The Block diagram can be downloaded from the below links. [Gemini Without PCIe Switch Block Diagram.JPG](#) Gemini Without PCIe Switch Block Diagram.JPG - 211KB [Gemini with PCIe Switch Block Diagram](#) Gemini With PCIe Switch Block Diagram.JPG - 235KB



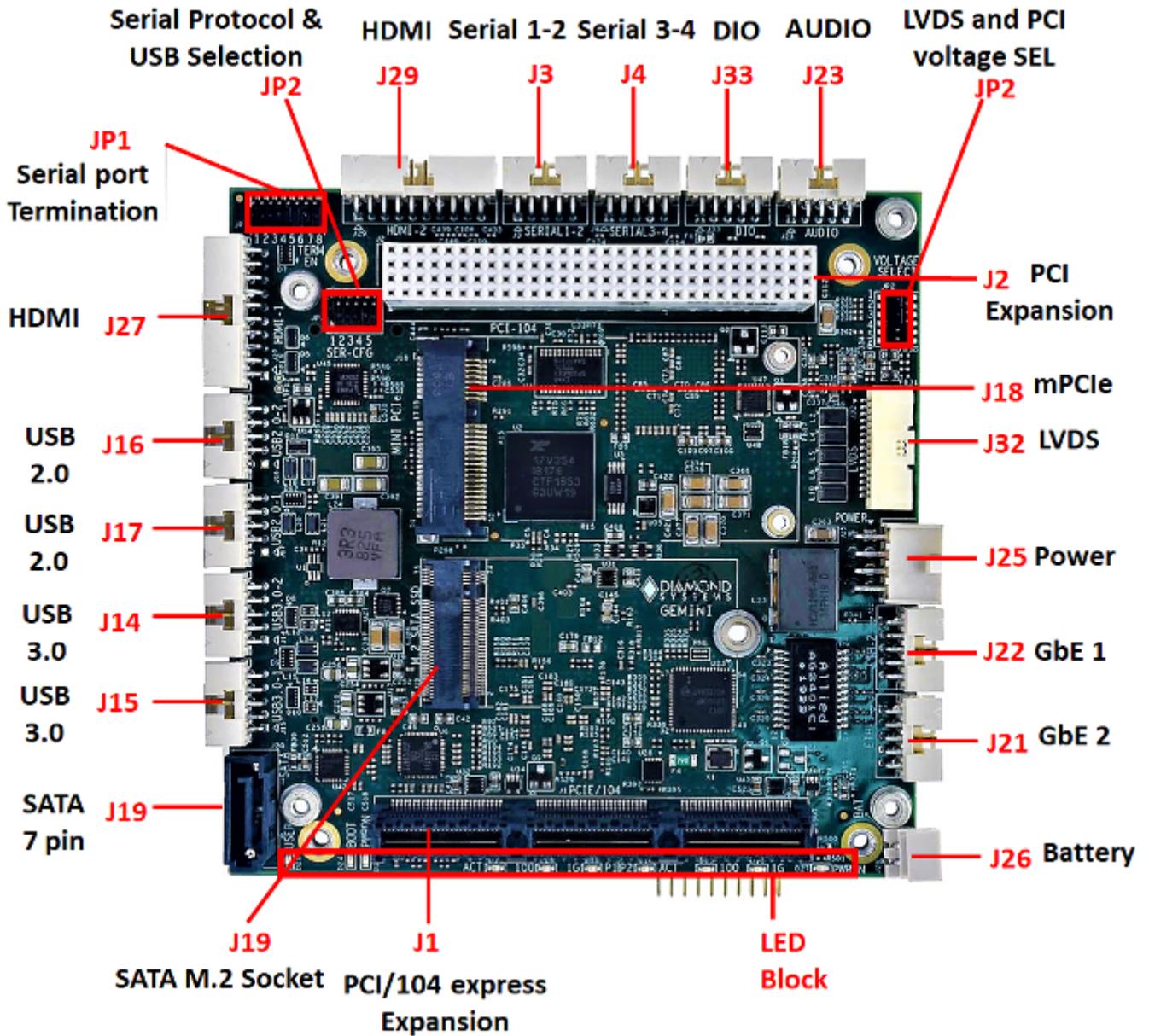


Gemini Bottom dimensions Gemini Bottom dimensionsGem Bottom dimension.png - 63KB

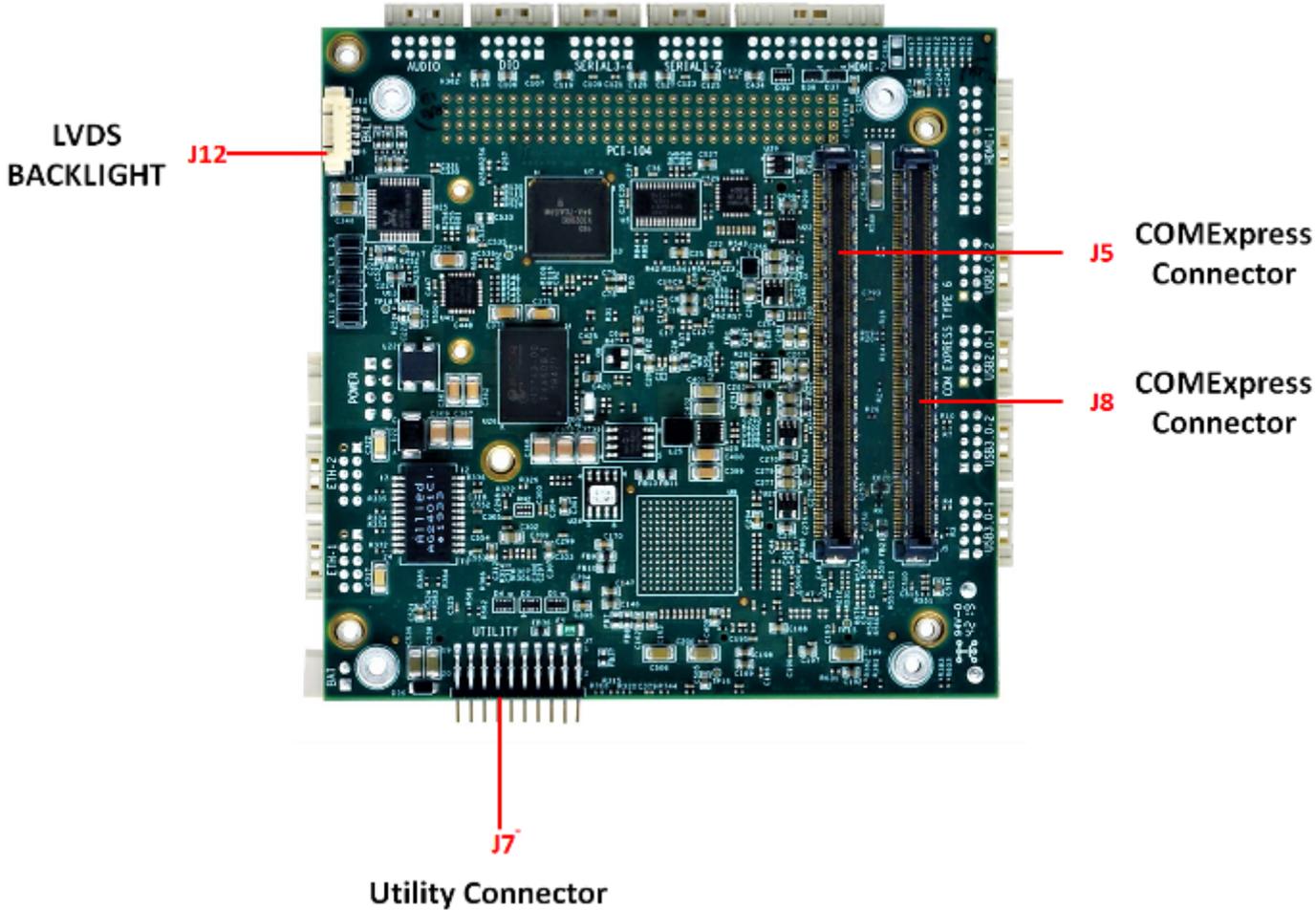
# 8.FEATURE LOCATIONS

## 8.FEATURE LOCATIONS

Illustrates the top layout view of Gemini carrier with Jumper Locations



Gemini Top feature locations



Gemini Bottom feature locations [Previous7. MECHANICAL DRAWING](#) [Next9. FEATURE REFERENCE TABLE](#)

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## 9. FEATURE REFERENCE TABLE

### 9. FEATURE REFERENCE TABLE

Lists the I/O connectors, Jumpers and LED Block Reference tables

#### 9.1 Connector Reference Table

Connector	Function
J1	PCI/104 Express
J14, J15	USB3.0
J16, J17	USB 2.0
J18	PCIe MiniCard
J19	SATA M.2
J20	SATA 7 Pin
J21, J22	Ethernet
J23	Audio
J25	Power
J26	Battery
J27, J29	HDMI
J32	LVDS
J33	Audio
J5, J8 (Bottom Side)	COM Express Connector
J7 (Bottom Side)	Utility
J12 (Bottom Side)	LVDS Backlight

#### 9.2 Jumper Reference Table

Jumper	Function
JP1	Serial port Termination select

JP2	LVDS and PCI
JP3	Serial Protocol selection, USB Selection

### 9.3 LED Reference Table

#### LED Block P1

1st LED: Left on the Block	1Gbps link
2nd LED	100Mbps link
3rd LED	Gbe ACT

#### LED Block P2

1st LED: Left on the Block	1Gbps link
2nd LED	100Mbps link
3rd LED	Gbe ACT

#### LED Block 3

1st LED: Left on the Block	Power OK
2nd LED: Centered on the Block	Boot
3rd LED	User

#### LED Block 4

1st LED	Power IN
---------	----------

## 10. CONNECTOR PINOUT SPECIFICATION

Note: Signals highlighted by grey are not supported on Gemini. COM Express type 6 row A and B pinout:

GND	A1	B1	GND
GBE0 MDI3-	A2	B2	GBE0 ACT#
GBE0 MDI3+	A3	B3	LPC FRAME#
GBE0 LINK100#	A4	B4	LPC AD0
GBE0 LINK1000#	A5	B5	LPC AD1
GBE0 MDI2-	A6	B6	LPC AD2
GBE0 MDI2+	A7	B7	LPC AD3
GBE0 LINK#	A8	B8	LPC DRQ0#
GBE0 MDI1-	A9	B9	LPC DRQ1#
GBE0 MDI1+	A10	B10	LPC CLK
GND	A11	B11	GND
GBE0 MDI0-	A12	B12	PWRBTN#
GBE0 MDI0+	A13	B13	SMB CK
GBE0 CTREF	A14	B14	SMB DAT
SUS S3#	A15	B15	SMB ALERT#
SATA0 TX+	A16	B16	SATA1 TX+
SATA0 TX-	A17	B17	SATA1 TX-
SUS S4#	A18	B18	SUS STAT#
SATA0 RX+	A19	B19	SATA1 RX+
SATA0 RX-	A20	B20	SATA1 RX-

GND	A21	B21	GND
SATA2 TX+	A22	B22	SATA3 TX+
SATA2 TX-	A23	B23	SATA3 TX-
SUS S5#	A24	B24	PWR OK
SATA2 RX+	A25	B25	SATA3 RX+
SATA2 RX-	A26	B26	SATA3 RX-
BATLOW#	A27	B27	WDT
ATA ACT#	A28	B28	AC SDIN2
AC SYNC	A29	B29	AC SDIN1
AC RST#	A30	B30	AC SDIN0/HDA SDIN
GND	A31	B31	GND
AC BITCLK	A32	B32	SPKR
AC SDOUT	A33	B33	I2C CK
BIOS DIS0#	A34	B34	I2C DAT
THRMTRIP#	A35	B35	THRM#
USB6-	A36	B36	USB7-
USB6+	A37	B37	USB7+
USB 6 7 OC#	A38	B38	USB 4 5 OC#
USB4-	A39	B39	USB5-
USB4+	A40	B40	USB5+

GND	A41	B41	GND
USB2-	A42	B42	USB3-
USB2+	A43	B43	USB3+
USB 2 3 OC#	A44	B44	USB 0 1 OC#
USB0-	A45	B45	USB1-
USB0+	A46	B46	USB1+
VCC RTC	A47	B47	EXCD1 PERST#
EXCD0 PERST#	A48	B48	EXCD1 CPPE#
EXCD0 CPPE#	A49	B49	SYS RESET#
LPC SERIRQ	A50	B50	CB RESET#
GND	A51	B51	GND
PCIE TX5+	A52	B52	PCIE RX5+
PCIE TX5-	A53	B53	PCIE RX5-
GPI0	A54	B54	SD CMD
PCIE TX4+	A55	B55	PCIE RX4+
PCIE TX4-	A56	B56	PCIE RX4-
GND	A57	B57	SD WP
PCIE TX3+	A58	B58	PCIE RX3+
PCIE TX3-	A59	B59	PCIE RX3-
GND	A60	B60	GND

PCIE TX2+	A61	B61	PCIE RX2+
PCIE TX2-	A62	B62	PCIE RX2-
GPI1	A63	B63	SD CD#
PCIE TX1+	A64	B64	PCIE RX1+
PCIE TX1-	A65	B65	PCIE RX1-
GND	A66	B66	WAKE0#
GPI2	A67	B67	WAKE1#
PCIE TX0+	A68	B68	PCIE RX0+
PCIE TX0-	A69	B69	PCIE RX0-
GND	A70	B70	GND
LVDS A0+	A71	B71	LVDS B0+
LVDS A0-	A72	B72	LVDS B0-
LVDS A1+	A73	B73	LVDS B1+
LVDS A1-	A74	B74	LVDS B1-
LVDS A2+	A75	B75	LVDS B2+
LVDS A2-	A76	B76	LVDS B2-
LVDS VDD EN	A77	B77	LVDS B3+
LVDS A3+	A78	B78	LVDS B3-
LVDS A3-	A79	B79	LVDS BKLT EN
GND	A80	B80	GND

LVDS A CLK+	A81	B81	LVDS B CLK+
LVDS A CLK-	A82	B82	LVDS B CLK-
LVDS I2C CK	A83	B83	LVDS BKLT CTRL
LVDS I2C DAT	A84	B84	VCC 5V SBY
GPI3	A85	B85	VCC 5V SBY
RSVD (N/C)	A86	B86	VCC 5V SBY
eDP_HRPD	A87	B87	VCC 5V SBY
PCIE0 CK REF+	A88	B88	BIOS DIS1#
PCIE0 CK REF-	A89	B89	VGA RED
GND	A90	B90	GND
SPI POWER	A91	B91	VGA GRN
SPI MSIO	A92	B92	VGA BLU
SD CLK	A93	B93	VGA HSYNC
SPI CKL	A94	B94	VGA VSYNC
SPI MOSI	A95	B95	VGA I2C CK
TPM PP (N/C)	A96	B96	VGA I2C DAT
TYPE10#	A97	B97	SPI CS#
SER0 TX	A98	B98	RSVD
SER0 RX	A99	B99	RSVD
GND	A100	B100	GND

GND	A100	B100	GND
SER1 TX	A101	B101	FAN PWMOUT
SER1 RX	A102	B102	FAN TACHIN
LID#	A103	B103	SLEEP#
VCC 12V	A104	B104	VCC 12V
VCC 12V	A105	B105	VCC 12V
VCC 12V	A106	B106	VCC 12V
VCC 12V	A107	B107	VCC 12V
VCC 12V	A108	B108	VCC 12V
VCC 12V	A109	B109	VCC 12V
GND	A110	B110	GND

COM Express type 6 row C and D pinout:

GND	C1	D1	GND
GND	C2	D2	GND
USB_SSRX0-	C3	D3	USB_SSTX0-
USB_SSRX0+	C4	D4	USB_SSTX0+
GND	C5	D5	GND
USB_SSRX1-	C6	D6	USB_SSTX1-
USB_SSRX1+	C7	D7	USB_SSTX1+
GND	C8	D8	GND
USB_SSRX2-	C9	D9	USB_SSTX2-
USB_SSRX2+	C10	D10	USB_SSTX2+
GND	C11	D11	GND
USB_SSRX3-	C12	D12	USB_SSTX3-
USB_SSRX3+	C13	D13	USB_SSTX3+
GND	C14	D14	GND
DDI1_PAIR6+	C15	D15	DDI1_CTRLCLK_AUX+
DDI1_PAIR6-	C16	D16	DDI1_CTRLDATA_AUX-
RSVD	C17	D17	RSVD
RSVD	C18	DUS	RSVD
PCIE_RX6+	C19	D19	PCIE_TX6+
PCIE_RX6-	C20	D20	PCIE_TX6-

GND	C21	D21	GND
PCIE_RX7+	C22	D22	PCIE_TX7+
PCIE_RX7-	C23	D23	PCIE_TX7-
DDI1_HPD	C24	D24	RSVD
DDI1_PAIR4+	C25	D25	RSVD
DDI1_PAIR4-	C26	D26	DDI1_PAIR0+
RSVD	C27	D27	DDI1_PAIR0-
RSVD	C28	D28	RSVD
DDI1_PAIR5+	C29	D29	DDI1_PAIR1+
DDI1_PAIR5-	C30	D30	DDI1_PAIR1-
GND	C31	D31	GND
DDI2_CTRLCLK_AUX+	C32	D32	DDI1_PAIR2+
DDI2_CTRLDATA_AUX-	C33	D33	DDI1_PAIR2-
DDI2_DDC_AUX_SEL	C34	D34	DDI1_DDC_AUX_SEL
RSVD	C35	D35	RSVD
DDI3_CTRLCLK_AUX+	C36	D36	DDI1_PAIR3+
DDI3_CTRLDATA_AUX-	C37	D37	DDI1_PAIR3-
DDI3_DDC_AUX_SEL	C38	D38	RSVD
DDI3_PAIR0+	C39	D39	DDI2_PAIR0+
DDI3_PAIR0-	C40	D40	DDI2_PAIR0-

GND	C41	D41	GND
DDI3_PAIR1+	C42	D42	DDI2_PAIR1+
DDI3_PAIR1-	C43	D43	DDI2_PAIR1-
DDI3_HPD	C44	D44	DDI2_HPD
RSVD	C45	D45	RSVD
DDI3_PAIR2+	C46	D46	DDI2_PAIR2+
DDI3_PAIR2-	C47	D47	DDI2_PAIR2-
RSVD	C48	D48	RSVD
DDI3_PAIR3+	C49	D49	DDI2_PAIR3+
DDI3_PAIR3-	C50	D50	DDI2_PAIR3-
GND	C51	D51	GND
PEG_RX0+	C52	D52	PEG_TX0+
PEG_RX0-	C53	D53	PEG_TX0-
TYPE0#	C54	D54	PEG_LANE_RV#
PEG_RX1+	C55	D55	PEG_TX1+
PEG_RX1-	C56	D56	PEG_TX1-
TYPE0#	C57	D57	TYPE2#
PEG_RX2+	C58	D58	PEG_TX2+
PEG_RX2-	C59	D59	PEG_TX2-
GND	C60	D60	GND

PEG_RX3+	C61	D61	PEG_TX3+
PEG_RX3-	C62	D62	PEG_TX3-
RSVD	C63	D63	RSVD
RSVD	C64	D64	RSVD
PEG_RX4+	C65	D65	PEG_TX4+
PEG_RX4-	C66	D66	PEG_TX4-
RSVD	C67	D67	GND
PEG_RX5+	C68	D68	PEG_TX5+
PEG_RX5-	C69	D69	PEG_TX5-
GND	C70	D70	GND
PEG_RX6+	C71	D71	PEG_TX6+
PEG_RX6-	C72	D72	PEG_TX6-
GND	C73	D73	GND
PEG_RX7+	C74	D74	PEG_TX7+
PEG_RX7-	C75	D75	PEG_TX7-
GND	C76	D76	GND
RSVD	C77	D77	RSVD
PEG_RX8+	C78	D78	PEG_TX8+
PEG_RX8-	C79	D79	PEG_TX8-
GND	C80	D80	GND

PEG_RX9+	C81	D81	PEG_TX9+
PEG_RX9-	C82	D82	PEG_TX9-
RSVD	C83	D83	RSVD
GND	C84	D84	GND
PEG_RX10+	C85	D85	PEG_TX10+
PEG_RX10-	C86	D86	PEG_TX10-
GND	C87	D87	GND
PEG_RX11+	C88	D88	PEG_TX11+
PEG_RX11-	C89	D89	PEG_TX11-
GND	C90	D90	GND
PEG_RX12+	C91	D91	PEG_TX12+
PEG_RX12-	C92	D92	PEG_TX12-
GND	C93	D93	GND
PEG_RX13+	C94	D94	PEG_TX13+
PEG_RX13-	C95	D95	PEG_TX13-
GND	C96	D96	GND
RSVD	C97	D97	RSVD
PEG_RX14+	C98	D98	PEG_TX14+
PEG_RX14-	C99	D99	PEG_TX14-
GND	C100	D100	GND

PEG_RX15+	C101	D101	PEG_TX15+
PEG_RX15-	C102	D102	PEG_TX15-
GND	C103	D103	GND
VCC_12V	C104	D104	VCC_12V
VCC_12V	C105	D105	VCC_12V
VCC_12V	C106	D106	VCC_12V
VCC_12V	C107	D107	VCC_12V
VCC_12V	C108	D108	VCC_12V
VCC_12V	C109	D109	VCC_12V
GND	C110	D110	GND

## 10.2 J25 Power IN Connector

GND	1	5	VIN
GND	2	6	VIN
GND	3	7	VIN
GND	4	8	VIN

Connector Part Number : **ASP-194529-01** Mating cable part no: **DSC No.6980512** Mating connector part no.: **IPD1-04-D-K**

Crimp terminal part no.: **CC79L-2024-01-L/CC79R-2024-01-L**

## 10.3 J26 External Battery Connector

1	Battery V+
2	Ground

Connector part no. : **Molex Mini-SPOX 22057025** Mating cable Part no. : **DSC No. 6980524**

Mating connector part no.: **5037-5023/A2505H02-2P** Crimp terminal part no.: **0870-1039/A2505TOP-2**

## 10.4 J21, J22 Ethernet Connectors

### 10.4.1 J21 Ethernet connector

Chassis Gnd	1	2	Key
D1A+	3	4	D1A-
D1B+	5	6	D1B-
D1C+	7	8	D1C-
D1D+	9	10	D1D-

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980604**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

### 10.4.2 J22 Ethernet connector

Chassis Gnd	1	2	Key
D2A+	3	4	D2A-
D2B+	5	6	D2B-
D2C+	7	8	D2C-
D2D+	9	10	D2D-

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980604**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.5 J27, J29 HDMI Connectors

### 10.5.1 J27 HDMI connector

HDMI1 Data 2+	1	2	Ground
HDMI1 Data 2-	3	4	HDMI1 Data 1+
Ground	5	6	HDMI1 Data 1-
HDMI1 Data 0+	7	8	Ground
HDMI1 Data 0-	9	10	HDMI1 Clock+
Ground	11	12	HDMI1 Clock-
HDMI1 CEC	13	14	Reserved
HDMI1 DDC Clock	15	16	HDMI1 DDC Data
Ground	17	18	+5V
Hot Plug Detect	19	20	Chassis Ground

Connector Part No. : **FCI 98414-F06-20ULF** Mating cable part No. : **DSC No. 6980605**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

### 10.5.2 J29 HDMI connector

HDMI2 Data 2+	1	2	Ground
HDMI2 Data 2-	3	4	HDMI2 Data 1+
Ground	5	6	HDMI2 Data 1-
HDMI2 Data 0+	7	8	Ground
HDMI2 Data 0-	9	10	HDMI2 Clock+
Ground	11	12	HDMI2 Clock-
HDMI2 CEC	13	14	Reserved
HDMI2 DDC Clock	15	16	HDMI2 DDC Data
Ground	17	18	+5V
Hot Plug Detect	19	20	Chassis Ground

Connector Part No. : **FCI 98414-F06-20ULF** Mating cable part No. : **DSC No. 6980605**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.6 J32 LVDS LCD Connector

VDD 5V/3.3V	1	2	VDD 5V/3.3V
VDD 5V/3.3V	3	4	VDD 5V/3.3V
CLK+ Odd	5	6	CLK+ Even
CLK- Odd	7	8	CLK-Even
Ground	9	10	Ground
D0+ Odd	11	12	D0+ Even
D0- Odd	13	14	D0- Even
D1+ Odd	15	16	D1+ Even
D1- Odd	17	18	D1- <u>Even</u>
D2+ Odd	19	20	D2+ Even
D2- Odd	21	22	D2- Even
D3+ Odd	23	24	D3+ Even
D3- Odd	25	26	D3- Even
Ground	27	28	Ground
DDC CLK	29	30	DDC DATA

Connector Part No. : **Molex 5015713007** Mating cable part No. : **Specific to the target display**

## 10.7 J12 LCD Backlight Connector

1	Power +5V/+12V, Jumper Selectable
2	Power +5V/+12V, Jumper Selectable
3	Ground
4	Ground
5	Enable (GPIO Output), 0 = Off, Open Circuit = on
6	Brightness, 0-5VDC Variable; 0V = Max, 5V = Min

Connector Part No. : **Molex 53261-0671** Mating cable part No. : **Specific to the target display**

## 10.8 J16, J17 USB 2.0 Connectors

### 10.8.1 J16 USB2.0 connector

Key	1	2	Shield
USB1 Power-	3	4	USB0 Power-
USB 1 Data+	5	6	USB0 Data+
USB 1 Data-	7	8	USB0 Data-
USB 1 Power+	9	10	USB0 Power+

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980602**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

### 10.8.1 J17 USB2.0 connector

Key	1	2	Shield
USB3 Power-	3	4	USB2 Power-
USB3 Data+	5	6	USB2 Data+
USB3 Data-	7	8	USB2 Data-
USB3 Power+	9	10	USB2 Power+

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980602**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.9 J14, J15 USB 3.0 connectors

### 10.9.1 J14 USB3.0 connectors

USB_SSRX0-	1	2	Shield
USB_SSRX0+	3	4	USB0 Pwr-
USB0 Pwr-	5	6	D0+
USB_SSTX0-	7	8	D0-
USB_SSTX0+	9	10	USB0 Pwr+

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980603**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

### 10.9.2 J14 USB3.0 connectors

USB_SSRX1-	1	2	Shield
USB_SSRX1+	3	4	USB1 Pwr-
USB1 Pwr-	5	6	D1+
USB_SSTX1-	7	8	D1-
USB_SSTX1+	9	10	USB1 Pwr+

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980603**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.10 J18 PCIe miniCard Socket

RSVD	1	2	+3.3V
RSVD	3	4	Gnd
RSVD	5	6	+1.5V
Clkreq-	7	8	UIM PWR
Gnd	9	10	UIM CLK
PCIe 1 Clk-	11	12	UIM DATA
PCIe 1 Clk+	13	14	UIM RESET
Gnd	15	16	UIM VPP
<b>KEY</b>			
RSVD	17	18	Gnd
RSVD	19	20	Disable-
Gnd	21	22	PCIe Reset-
PCIe 1 RX-	23	24	+3.3V
PCIe 1 RX+	25	26	Gnd

Gnd	27	28	+1.5V
Gnd	29	30	SMB Clk
PCIe 1 TX-	31	32	SMB Data
PCIe 1 TX+	33	34	Gnd
Gnd	35	36	USB D-
Gnd	37	38	USB D+
+3.3V	39	40	Gnd
+3.3V	41	42	WWAN LED-
Ground	43	44	WLAN LED-
RSVD	45	46	WPAN LED-
RSVD	47	48	+1.5V
Pull-up to +3.3V	49	50	Gnd
	51	52	+3.3V

Connector Part No. : MM60-52B1-E1-R650

## 10.11 J19 M.2 SATA SSD Socket

Gnd	1	2	+3.3V
Gnd	3	4	+3.3V
	5	6	
	7	8	
	9	10	DAS/DSS#
	11	12	
	13	14	
	15	16	
	17	18	
	19	20	
Gnd	21	22	
	23	24	
	25	26	
Gnd	27	28	
	29	30	
	31	32	
Gnd	33	34	
	35	36	

	37	38	DEVSLP
Gnd	39	40	
SATA_RX+	41	42	
SATA_RX-	43	44	
Gnd	45	46	
SATA_TX-	47	48	
SATA_TX+	49	50	
Gnd	51	52	
	53	54	
	55	56	
Gnd	57	58	
	KEY		
	67	68	
GND	69	70	+3.3V
GND	71	72	+3.3V
GND	73	74	+3.3V
GND	75		

Connector Part No. : **MDT320M030001**

## 10.12 J20 SATA Connector

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

Mating cable part No. : **DSC No. 6989101**

## 10.13 J23 Audio Connector

LineOut-L	1	2	LineOut-R
GND_Audio	3	4	GND_Audio
LineIn-L	5	6	LineIn-R
GND_Audio	7	8	GND_Audio
NC	9	10	MIC_IN

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980608**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.14 J3, J4 Serial port Connectors

### 10.14.1 J3 Serial port connector

RS232 pinout:

TX1	1	2	RTS1
RX1	3	4	CTS1
GND	5	6	GND
TX2	7	8	RTS2
RX2	9	10	CTS2

RS422 pinout:

TX1+	1	2	TX1-
RX1+	3	4	RX1-
GND	5	6	GND
TX2+	7	8	TX2-
RX2+	9	10	RX2-

RS485 pinout:

TX1/RX1+	1	2	TX1/RX1-
NC	3	4	NC
GND	5	6	GND
TX2/RX2+	7	8	TX2/RX2-
NC	9	10	NC

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980601**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

### 10.14.2 J4 Serial port connector

RS232 pinout:

TX3	1	2	RTS3
RX3	3	4	CTS3
GND	5	6	GND
TX4	7	8	RTS4
RX4	9	10	CTS4

RS422 pinout:

TX3+	1	2	TX3-
RX3+	3	4	RX3-
GND	5	6	GND
TX4+	7	8	TX4-
RX4+	9	10	RX4-

RS485 pinout:

TX3/RX3+	1	2	TX3/RX3-
NC	3	4	NC
GND	5	6	GND
TX4/RX4+	7	8	TX4/RX4-
NC	9	10	NC

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980601**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.15 J33 Digital I/O

Ground	1	2	+3.3V 100mA Fuse
DIO 0	3	4	DIO 4
DIO 1	5	6	DIO 5
DIO 2	7	8	DIO 6
DIO 3	9	10	DIO 7

Connector Part No. : **FCI 98414-F06-10ULF** Mating cable part No. : **DSC No. 6980609**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

## 10.16 J1 PCIe/104 Connector

Bank 1 pinout:

USB-OC#	1	+5 V TAB	2	PCIe Reset#
+3.3V	3		4	+3.3V
USB_1+	5		6	USB_0+
USB_1-	7		8	USB_0-
Ground	9		10	Ground
PCIe1 Tx+	11		12	PCIe0 Tx+
PCIe1 Tx-	13		14	PCIe0 Tx-
Ground	15		16	Ground
PCIe2 Tx+	17		18	PCIe3 Tx+
PCIe2 Tx-	19		20	PCIe3 Tx-
Ground	21		22	Ground
PCIe1 Rx+	23		24	PCIe0 Rx+
PCIe1 Rx-	25		26	PCIe0 Rx-

Ground	27	+5 V TAB	28	Ground
PCIe2 Rx+	29		30	PCIe3 Rx+
PCIe2 Rx-	31		32	PCIe3 Rx-
Ground	33		34	Ground
PCIe1 Clk+	35		36	PCIe0 Clk+
PCIe1 Clk-	37		38	PCIe0 Clk-
+5VSB	39		40	+5VSB
PCIe2 Clk+	41		42	PCIe3 Clk+
PCIe2 Clk-	43		44	PCIe3 Clk-
Ground(Dir)	45		46	PWRGOOD
SMB Data	47		48	PE <sub>x</sub> _CLK+
SMB Clk	49		50	PE <sub>x</sub> _CLK-
SMB Alert#	51		52	PSO <sub>N</sub> #

## Bank 2 Pinout

STK0 / WAKE#	53	<b>+5 V TAB</b>	54	STK1 / PEG_ENA#
Ground	55		56	Ground
PEx16 Tx8+	57		58	PEx16 Tx0+
PEx16 Tx8-	59		60	PEx16 Tx0-
Ground	61		62	Ground
PEx16 Tx9+	63		64	PEx16 Tx1+
PEx16 Tx9-	65		66	PEx16 Tx1-
Ground	67		68	Ground
PEx16 Tx10+	69		70	PEx16 Tx2+
PEx16 Tx10-	71		72	PEx16 Tx2-
Ground	73		74	Ground
PEx16 Tx11+	75		76	PEx16 Tx3+
PEx16 Tx11-	77		78	PEx16 Tx3-

Ground	79	<b>+5 V TAB</b>	80	Ground
PEx16 Tx12+	81		82	PEx16 Tx4+
PEx16 Tx12-	83		84	PEx16 Tx4-
Ground	85		86	Ground
PEx16 Tx13+	87		88	PEx16 Tx5+
PEx16 Tx13-	89		90	PEx16 Tx5-
Ground	91		92	Ground
PEx16 Tx14+	93		94	PEx16 Tx6+
PEx16 Tx14-	95		96	PEx16 Tx6-
Ground	97		98	Ground
PEx16 Tx15+	99		100	PEx16 Tx7+
PEx16 Tx15-	101		102	PEx16 Tx7-
Ground	103		104	Ground

## Bank 3 pinout

STK2 / SDVO_DAT	105	+5 V TAB	106	SDVO_CLK
Ground	107		108	Ground
PEX16 Rx8+	109		110	PEX16 Rx0+
PEX16 Rx8-	111		112	PEX16 Rx0-
Ground	113		114	Ground
PEX16 Rx9+	115		116	PEX16 Rx1+
PEX16 Rx9-	117		118	PEX16 Rx1-
Ground	119		120	Ground
PEX16 Rx10+	121		122	PEX16 Rx2+
PEX16 Rx10-	123		124	PEX16 Rx2-
Ground	125		126	Ground
PEX16 Rx11+	127		128	PEX16 Rx3+
PEX16 Rx11-	129		130	PEX16 Rx3-

Ground	131	+5 V TAB	132	Ground
PEX16 Rx12+	133		134	PEX16 Rx4+
PEX16 Rx12-	135		136	PEX16 Rx4-
Ground	137		138	Ground
PEX16 Rx13+	139		140	PEX16 Rx5+
PEX16 Rx13-	141		142	PEX16 Rx5-
Ground	143		144	Ground
PEX16 Rx14+	145		146	PEX16 Rx6+
PEX16 Rx14-	147		148	PEX16 Rx6-
Ground	149		150	Ground
PEX16 Rx15+	151		152	PEX16 Rx7+
PEX16 Rx15-	153		154	PEX16 Rx7-
Ground	155		156	Ground

## 10.17 J2 PCI-104 Connector

<i>Pin</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	GND/5.0V KEY <sup>2</sup>	Reserved	+5	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	PSON#	PAR
10	GND	PERR#	+3.3V	SDONE
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3V	C/BE2#
15	AD18	+3.3V	AD17	GND

16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VI/O
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VI/O	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	Reserved	Reserved	GND/3.3V KEY

## 10.18 J7 Utility Connector

Power Button	1	2	I2C Data
Reset-	3	4	I2C Clock
Ground	5	6	Ground
5V Fused 500mA	7	8	3.3V Fused 500mA
5V Utility	9	10	Ground
5V Utility	11	12	Ground
LPC Frame	13	14	LPC AD0
LPC Clock	15	16	LPC AD1
LPC DRQ0#	17	18	LPC AD2
LPC DRQ1#	19	20	LPC AD3

Connector Part No. : **10112690-G03-10ULF** Mating cable part No. : **DSC No. C-20MM-18**

Mating connector part no.: **10073599-010LF** Crimp terminal part no.: **77138-001LF**

# 11. I/O CONNECTOR LIST

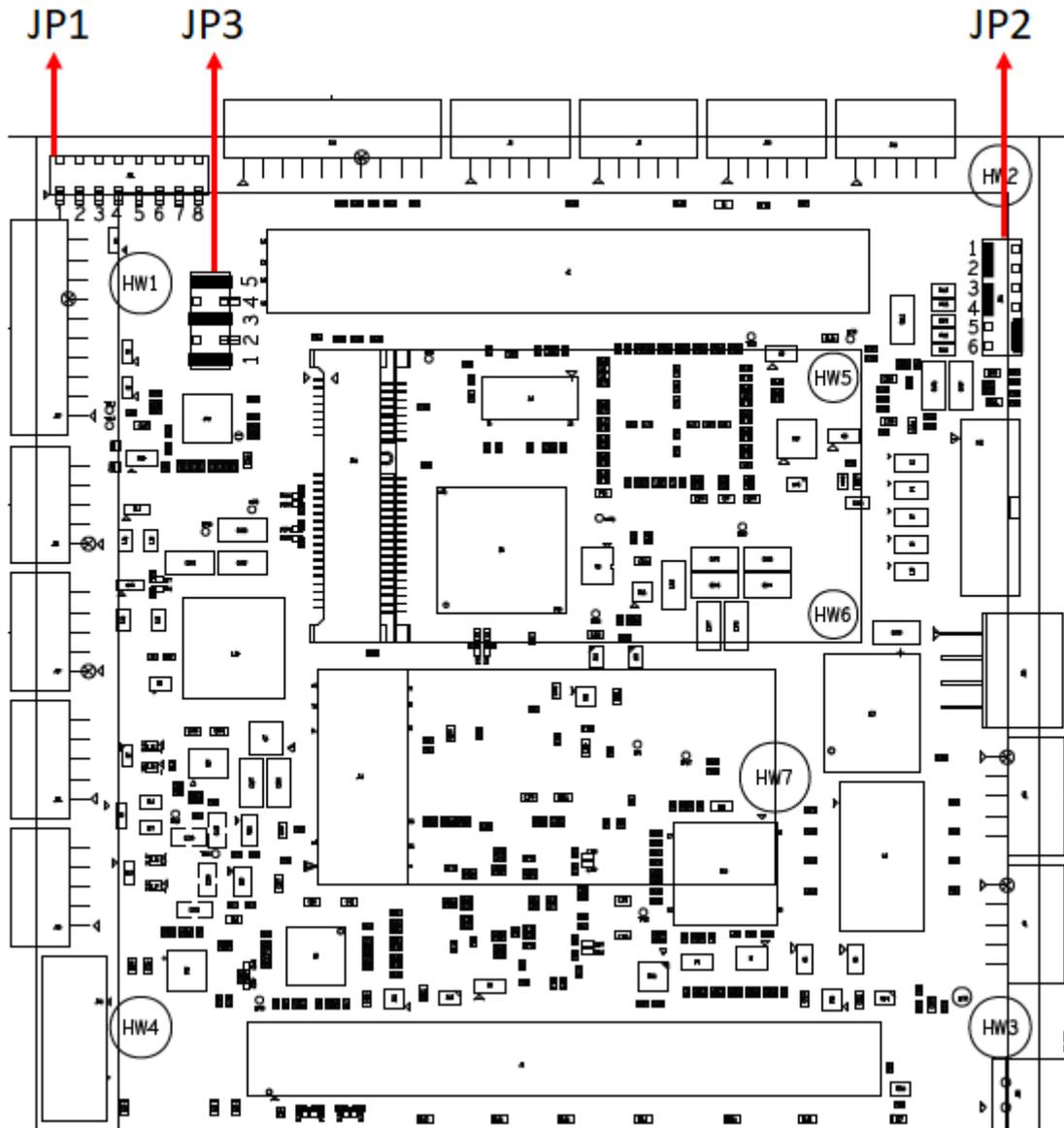
The following table provides a summary of the I/O connectors on the Gemini carrier board.

Function	Manufacturer	Part No.	Description	DSC Mating Cable
Module COM Express Compact Connector(J5, J8)	Foxconn	QT002206-4131-3H	220 Position Connector Plug, SMT, Outer Shroud. Contacts Surface Mount Gold	N/A
Power IN(J25)	Samtec	ASP-194529-01	2x4 Latching Box Header T/H Right Angle 1" Pitch Long PCB Pins	6980512
External Battery(J26)	Molex	22057025	2 Pos. 2.5 mm Pitch RA TH Header	6980524
Audio Connector(J23)	Amphenol	98464-G61-10ULF	2x5 2 mm Pitch Latching RA TH Header	6980608
GbE Ethernet (x2)(J21, J22)	Amphenol	98464-G61-10ULF	2 Pos. 2.5 mm Pitch Latching RA TH Header	6980604
GPIO(J33)	Amphenol	98464-G61-10ULF	2x5 2mm pitch latching RA TH header	6980606
HDMI(J27, J29)	Amphenol	98464-G61-20ULF	2x10 2 mm Pitch, Latching RA TH Header	6980605
LVDS(J32)	Molex	5015713007	2x 15 1 mm RA SMT Shrouded Header	Custom
LCD Backlight(J12)	Molex	053261-0671	1x6 1.25 mm Pitch, SMD RA Header	Custom
PCIe MiniCard(J18)	JAE	MM60-52B1-E1-R650	52-Pin MiniCard Full Size with PCB Mount Threaded Spacers	N/A
PCIe/104 (J1)	Samtec	ASP-142781-03	156 Position. Top Mount	N/A

PCI-104(J2)	EPT	264-61303-02	30 x 4 pin 2mm Pitch with Solder Tails	NA
SATA M.2 SSD Socket (J19)	Amphenol	MDT320M03001	Connector Female. 67 Position. 0.020 Gold Plated	N/A
SATA Connector(J20)	Molex	0678008025	Connector Header 7 Position. Vertical T/H	Standard Cable
Serial Ports (x2) (J3, J4)	Amphenol	98464-G61-10ULF	2x5 2mm Pitch Latching RA TH Header	6980601
USB 2.0 (x2) (J16, J17)	Amphenol	98464-G61-10ULF	2x5, 2 mm Pitch, Latching RA TH Header	6980602
USB 3.0 (x2) (J14, J15)	Amphenol	98464-G61-10ULF	2x5, 2 mm Pitch, Latching RA TH Header	6980603

## 12. JUMPER DESCRIPTION

The following figure represents the jumpers on Gemini and their default configurations. Default jumper configuration is highlighted in black.



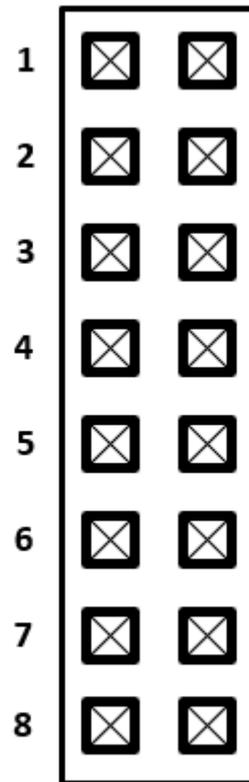
Jumper Locations Contact DSC for rugged options

### 12.1 JP1 Serial Termination Jumper

Gemini provides option termination resistors for RS422 and RS485 protocols.

When loaded a 121-Ohm resistor is connected across differential pairs. JP1 jumpers are not loaded by default.

The label number corresponds to silkscreen labels on PCB for pin locations.

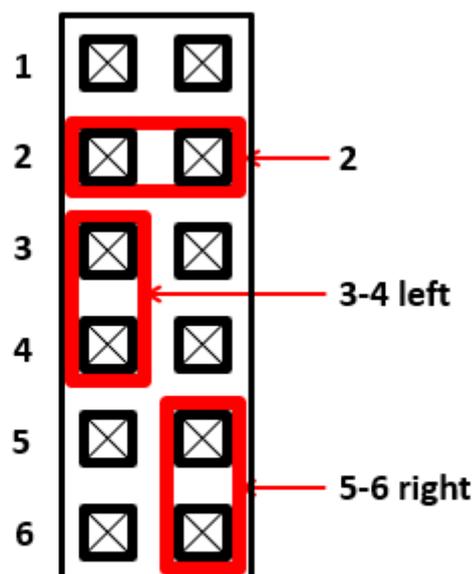


**JP1 jumper connection**

## 12.2 JP2 Peripheral voltage selector

On Gemini, JP2 provides an option to select PCI I/O voltage level, LCD supply voltage, and LCD backlight supply voltage. The pinout is designed to prevent the possibility of shorting two supply voltages if loaded correctly.

The table below shows jumper settings for JP2. The default setting is highlighted in **Bold**.



**JP2 default jumper connection**

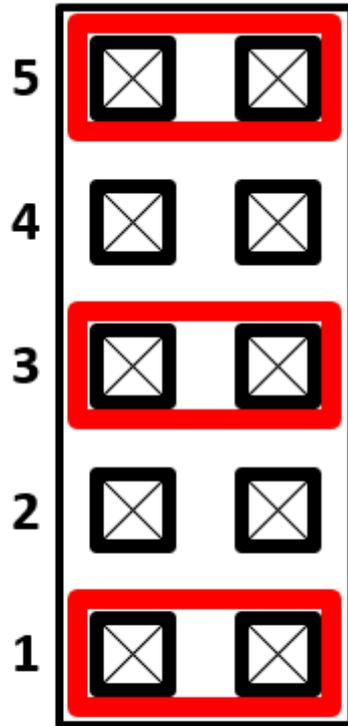
### 12.3 JP3 Serial Port Protocol Selector and USB Mux selection

Gemini has jumper JP3 to select the Serial protocols for serial port pairs and USB 2.0 signals for USB to I2C bridge or mini-card socket.

The serial port labels and associated functions are specified in the table below.

Jumper labels 2 and 3 must be used for serial protocol selection of Ports 1 and 2. Jumper labels 4 and 5 must be used for serial protocol selection of Ports 3 and 4.

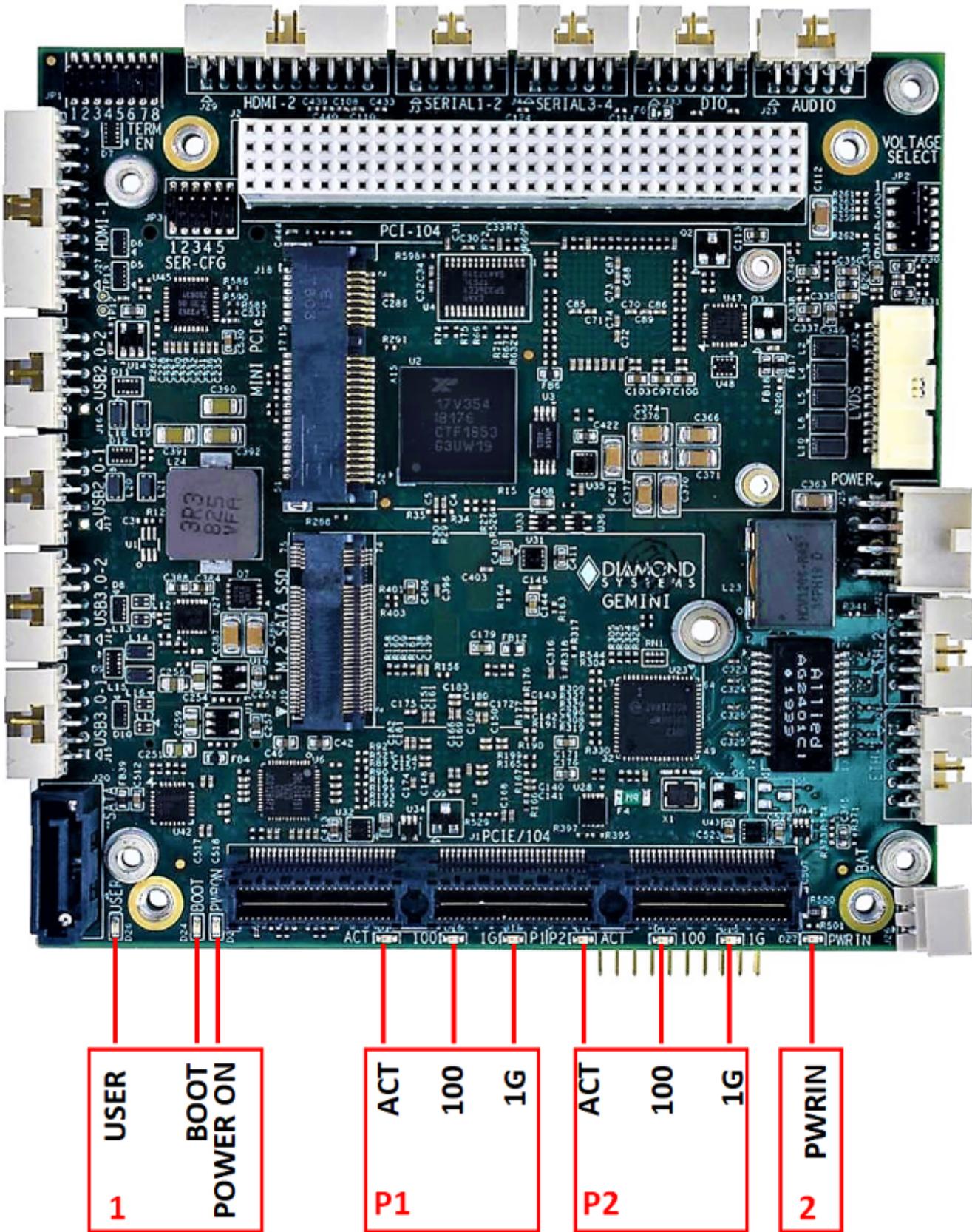
USB 2.0 jumper option is as given below(default option in **Bold**):



**JP3 default jumper connection**

# 13. LED DESCRIPTION

This page describes the LEDs and its functionalities



## LED Callout

## LED Block P1

SILK LABEL	DESCRIPTION
ACT	To indicate Ethernet activity
100	To indicate 100Mbps speed
1G	To indicate 1Gbps speed

## LED Block P2

SILK LABEL	DESCRIPTION
ACT	To indicate Ethernet activity
100	To indicate 100Mbps speed
1G	To indicate 1Gbps speed

## LED Block 1

SILK LABEL	DESCRIPTION
USER	USER configurable LED. User LED can be turned on by driving low on MPIO 6 of XR17V354 IC (U2).
BOOT	To indicate the SBC has successfully booted to OS.
POWER ON	To indicate all Power on SBCs are Ok.

## LED Block 2

Title

SILK LABEL	DESCRIPTION
PWRIN	To indicate Power Input is present

Last updated 5 months ago

# 14. PCI-104 AND PCIe/104 BOARD INSTALLATION

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## 14.1 PCI-104 board installation

Steps for PCI-104 board installation:

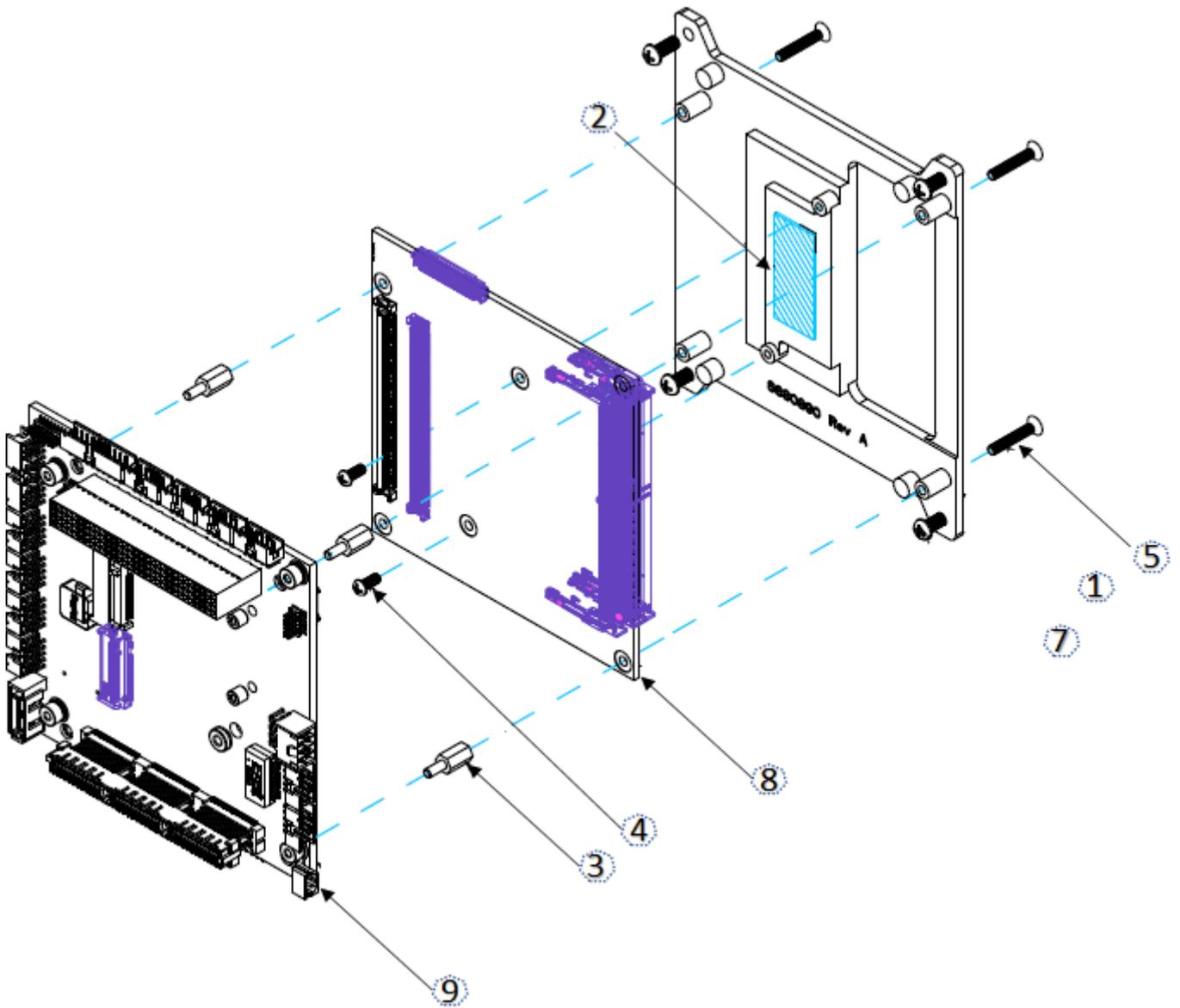
1. Configure the VIO as required by the I/O module. Check the label on the PCI-104 module for VIO level supported.
2. Install 4 22mm 4-40 M/F PC/104 spacers.
3. Install the board on top by aligning the connectors and spacers.
4. Install 4 4-40 screws to hold the PCI-104 board in place.
5. If any configuration is needed, consult the user manual of the PCI-104 board for configuration instructions.

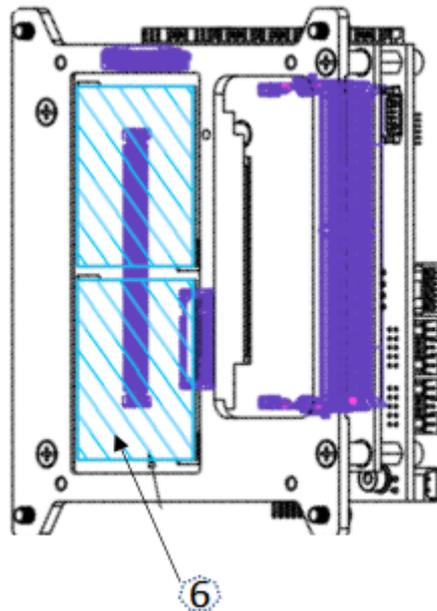
## 14.2 PCIe/104 board installation

Steps for PCI-104 board installation:

1. Install 4 22mm 4-40 M/F PC/104 spacers.
2. Install the board on top by aligning the connectors and spacers.
3. Install 4 4-40 screws to hold the PCI-104 board in place.
4. If any configuration is needed, consult the user manual of the PCIe/104 board for configuration instructions.

# 15. SYSTEM ASSEMBLY

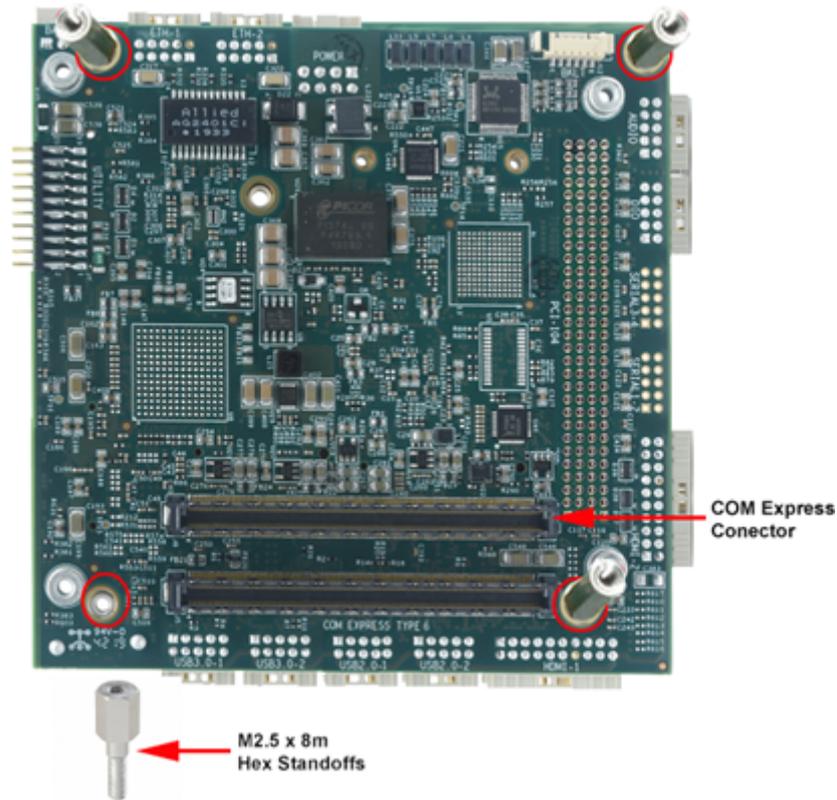




Sl. No	Description	Qty	Part number
1	Gemini HEAT SPREADER	1	6880890
2	Gemini THERMAL GAP FILLER	1	GP8100
3	M2.5x8 M/F SPACER	4	
4	M2.5x6 PAN PH HD SCREW	2	
5	M2.5x16 FLAT HEAD SCREW	4	
6	HSPDR THERMAL GAP FILLER	2	GP8100
7	M3x8 PAN PH HD SCREW	4	
8	comExpress ASSEMBLY	1	cExpress-WL 8665UE
9	Gemini Base Board	1	8240890

Always observe ESD safe handling procedures to minimize any risk of damages to the system

1. Place the Gemini carrier board on an antistatic surface on the front side with the COM Express connector facing above.
2. Mount four M2.5 x 8mm male-female standoffs into the mounting holes on the carrier boards as marked in image below.



3. Align the comExpress module connector to the comExpress connector to align both connectors. Ensure that required memory modules are plugged onto the SODIMM socket.

4. Press firmly to interconnect both connectors.

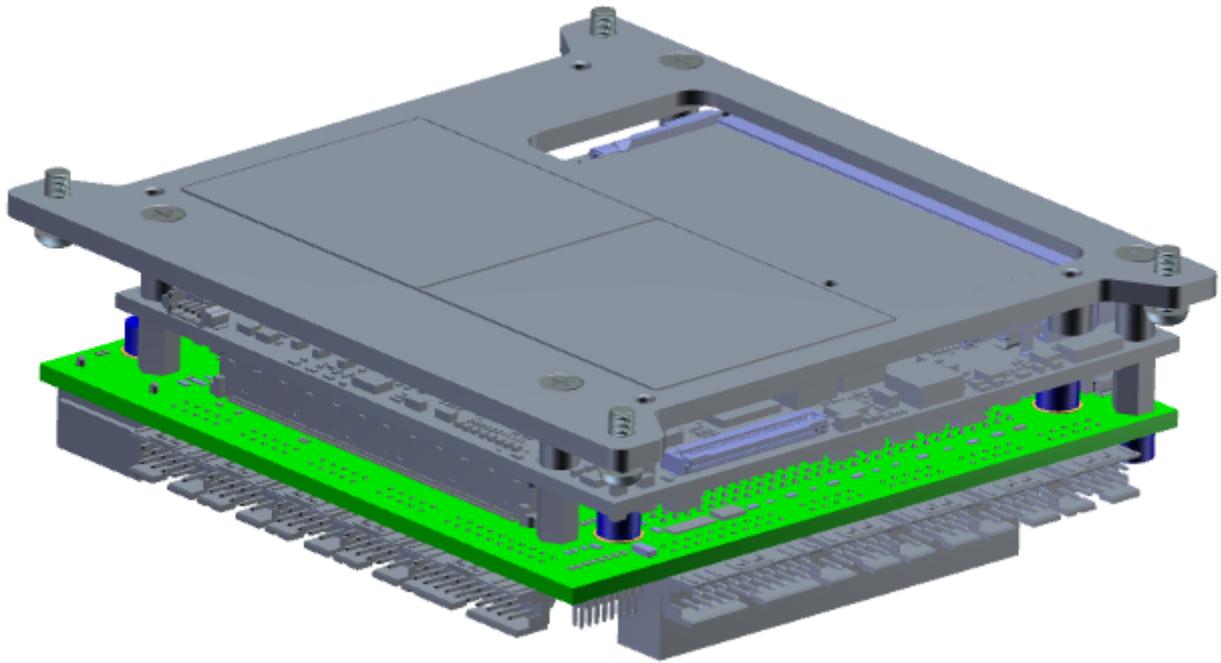
5. Inspect the heatspreader and ensure that the thermal pads are in good condition.

6. Remove all thermal pad liners from bottom of the heatspreader to avoid contaminating exposed thermal pad surfaces. Check orientation of heatspreader with respect to COM module before placing the heatspreader to avoid damaging thermal pads

Check orientation of heatspreader with respect to COM module before placing the heatspreader to avoid damaging thermal pads.

8. Install the heatspreader on top of the module.

9. Install 4 M2.5 x 16mm flat-head screws on the mounting holes on top of the heat spreader.



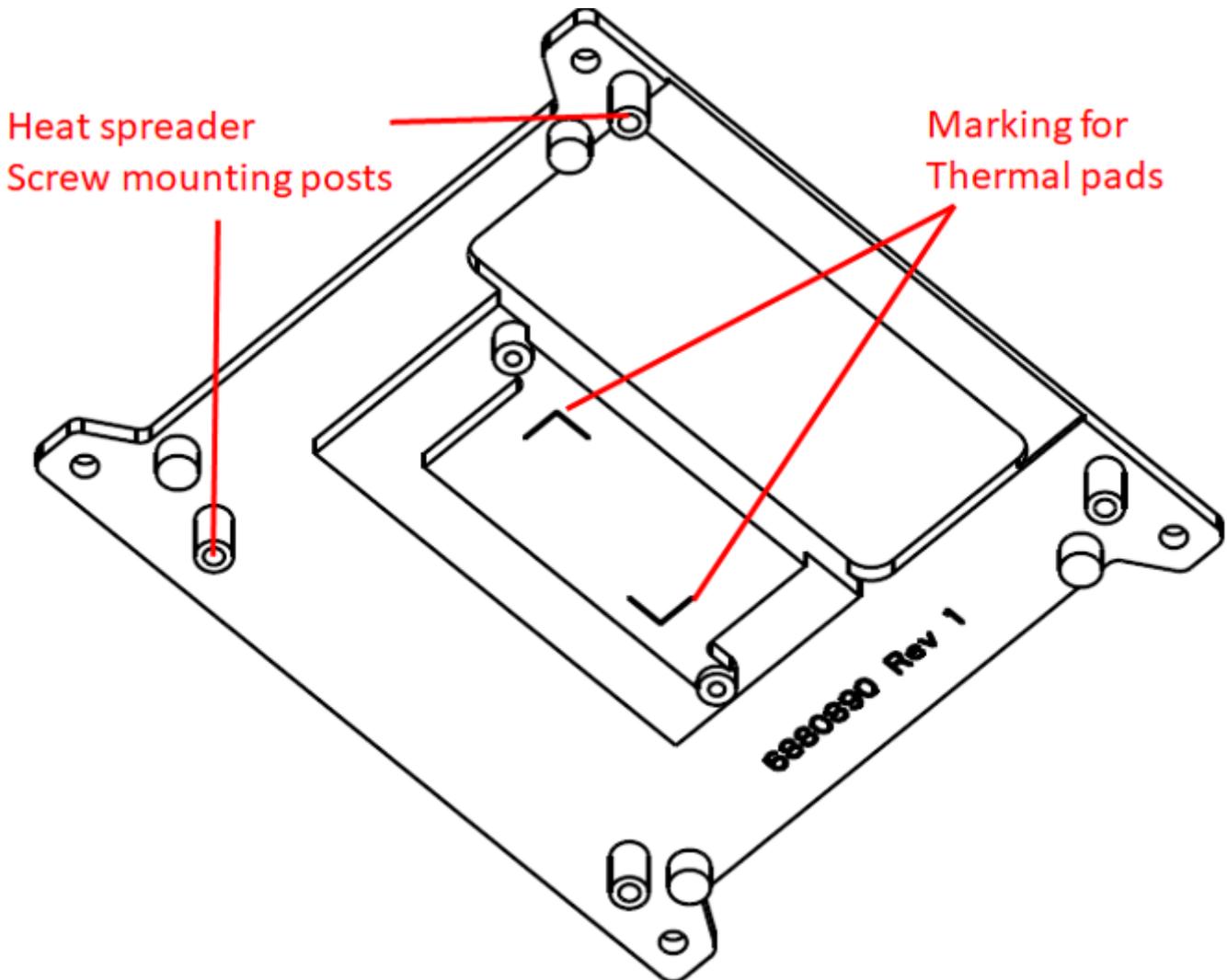
#### Sample Heatspreader connection

Heat sink installation can be done either by securing the heatsink from bottom or from the top based on heatsink design. Heatspreader supports both options

## 16. HEAT SPREADER

Heatspreader & its related accessories are provided along with Gemini SBC. The heat sink is specifically designed to support the cExpress-WL 866UE module. This heat sink cannot be used with a different module.

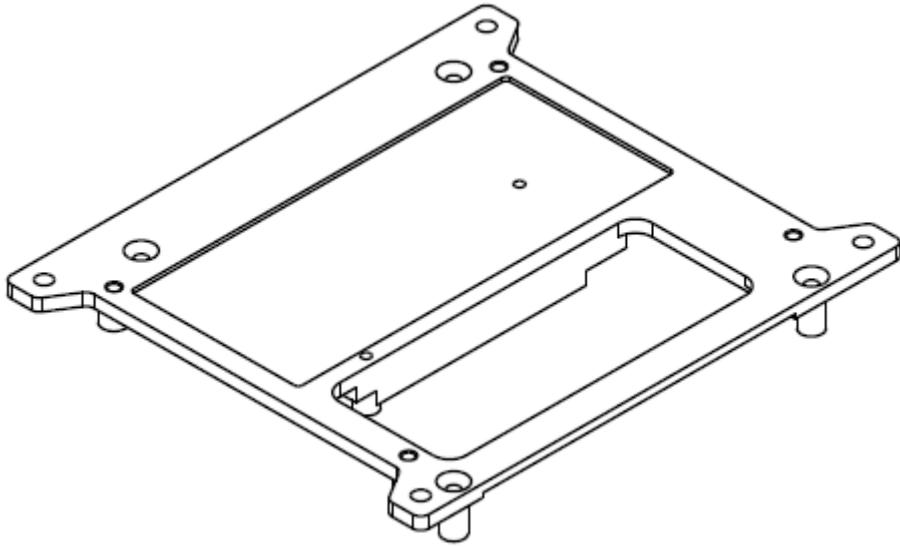
The following figure represents the bottom view of the heatspreader.



Heatspreader bottom view Take care not to damage thermal pads.

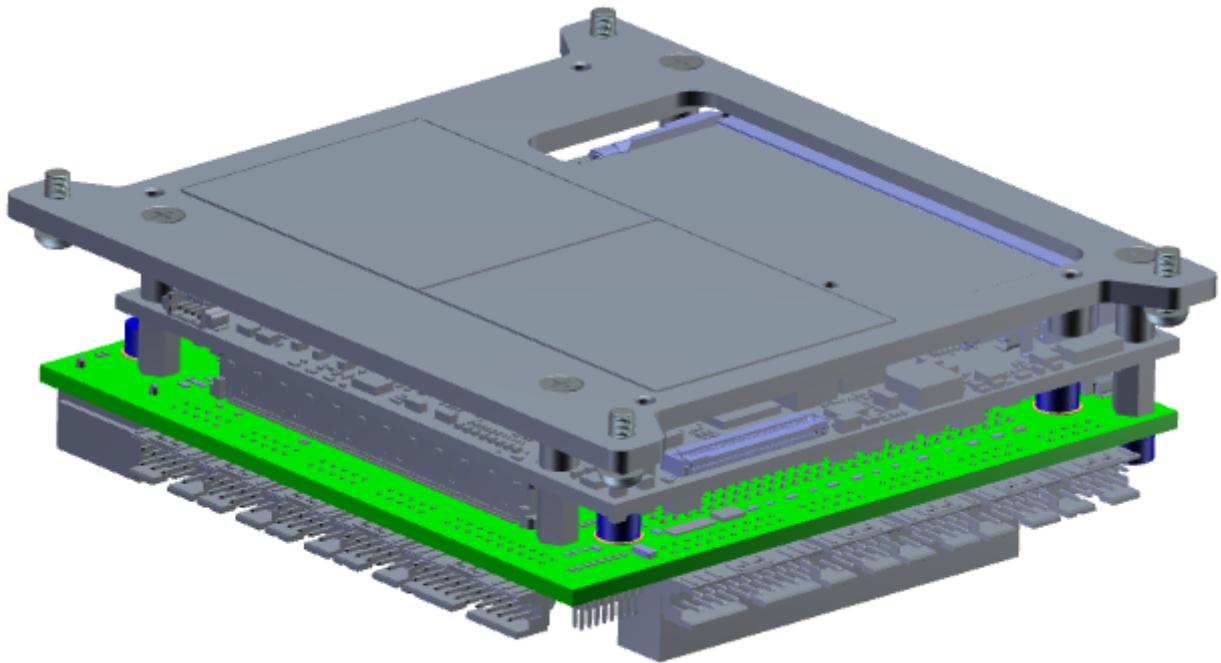
Ensure to remove liners from both sides of thermal pads when installing new thermal pads.

The following figure represents the top view of the heat spreader.



Heatspreader top view

The heat spreader can be used to connect to a heatsink based on customer requirements. The heats preader dimensions are 117.6mm x 101.6mm.



3D view of Gemini assembly with heatspreader



Gemini assembly(to be updated with REVA design)

## 17. DIGITAL I/O

### 17.1 DIGITAL I/O specification

Each digital I/O line can be individually configured to set the input or output direction. This enables the Digital I/O pins to be split as input and output. All lines can be individually read or written, enabling I/O peripherals configurations to be customized to suit application requirements. The output pins can be set as open-drain or push-pull.

Since the Digital I/Os are realized with USB to GPIO expander, the Digital I/Os do not support additional features such as edge detection on input, PWM features on output, etc, but can only be used to write and read logic high & logic low.

The Digital I/O pins are not 5V tolerant.

### 17.2 DIGITAL I/O Software

The CP2112 USB to I2C bridge is configured to be an HID device so separate drivers are not needed for this device.

Silicon Labs provides an SDK for the CP2112 device which can be used to program the Digital I/Os. Click [here](#) to download the SDK for the CP2112 device.

The mapping table below represents DIO signals from CP2112 IC to J33 DIO connector.

	Ground	1	2	+3.3V 100mA Fuse	
U47-23	DIO 0	3	4	DIO 4	U47-15
U47-22	DIO 1	5	6	DIO 5	U47-14
U47-21	DIO 2	7	8	DIO 6	U47-13
U47-20	DIO 3	9	10	DIO 7	U47-12

## 18. SERIAL PROTOCOL SELECTION

Gemini has multiprotocol support on all 4 serial ports. Serial port protocols supported are RS232, RS422 and RS485.

The below table shows the mode settings of SP336 for protocol selection:

Mode 0	Mode 1	Mode 2	Protocol
0	0	1	RS232
1	0	0	RS485
1	0	1	RS422

Mode 0 of SP336 is always connected to Ground.

The serial protocols can either be selected by jumper setting or using software-programmable MPIO pins.

Click [here](#) for Jumper options for Serial protocol selection.

The below table shows the MPIO mappings from U2 IC to the Mode pins of SP336.

U2 Pin number	SP336 IC	Mode pin
C1	U4	Mode 0
D2	U4	Mode 2
D1	U5	Mode 0
E3	U5	Mode 2

## 19. SPECIFICATIONS

Feature	Description
Module	cExpress-WL-i7-8665UE
CPU	8th Generation Intel® Quad/Dual-Core™ i7
Cooling Accessory	Heat-Spreader Assembly
Memory	16 GB, 32 GB and 64 GB DDR4s
Display	2x HDMI 1.4, HEVC, 1 x Dual Channel 24-bit LVDS Port at.3V and 5V Power Range @ Maximum Resolution 1920x1200, LCD Backlight
USB Ports	4x USB 2.0, 2x USB 3.1
Serial Ports	4 RS-232/422/485 Ports. Max data rate 1Mbps(115200 baud rate)
	RS232 voltage specification: +/-6.6V
	RS485/RS422 Driver Common mode voltage is 3V
	RS485/RS422 Driver differential voltage is 1.5 to 3V
Ethernet Controller	ETH-1 10/100/1000Mbps Routed from COM Module ETH-2 10/100/1000Mbps Routed from Intel I210 Ethernet Controller
Mass Storage	1x Mini-PCI Express (mPCIe) Socket with Optional USB Support 1x M.2 SATA Socket 2242 (22mm Wide x 42mm Long)
Expansion Busses	4 x1 PCIe Gen 2 ports, x16 PEG (PCI Express Graphics Adapter Ports and 1x USB 2.0 Port via the PCIe/104 Connector 3.3V and 5V compatible PCI bus via PCI-104 Connector.
Utility	1x I2C, Power Button, Reset Button, LPC or GbE LEDs, 5V @ 2A Power Supply
Digital I/O Specifications	
Number of Lines	8 Programmable Direction, 3.3V Logic Compatible
Direction	Bidirectional
Input voltage	
Logic 0:	Low: 0.6 - 0V
Logic 1	High: 2.31 - 3.3V

## Output Voltage

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Logic 0: Low: 0.6 - 0V @ 25mA

---

Logic 1 High: 2.9 - 3.3V @ -10mA

---

Mechanical and  
Environmental  
Properties

---

Dimensions H 4.00" x W 4.00" (101.6 mm x 101.6 mm)

---

Weight TBU With/Without Heat Spreader

---

DC Power Input Voltage 12V-28VDC. Wide Input Supply Range

---

Power Consumption 36 W

---

With Passmark software running, 2 HDMI and LVDS monitors, USB3.0 and USB2.0 pendrives connected. Both Ethernet ports connected.

---

Operating Temperature -40°C to +85°C (-40°F to +185°F)

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Shock MIL-STD-202G Compatible

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Vibration MIL-STD-202G Compatible

---

RoHS Compliant

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## 20. SOFTWARE SPECIFICATIONS

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### 20.1 Operating system support software

Diamond Systems offers software support for our embedded computer boards, ranging from drivers to complete OS board support packages. The currently available driver and BSP support can be found by clicking on the links below.

[Windows10 support](#) [Linux support](#)

### 20.2 OS Driver packages

All SBCs are supported with driver packages for popular embedded operating systems. Most of these drivers are provided by the chip vendors. The drivers that have been tested and proven to work on our boards are available to download from the [product support pages](#).

### 20.3 Software Development Kits(SDK)

We offer preconfigured, ready to run OS images for popular embedded OSes on Gemini SBC. The tables linked above list the currently available packages. A fee is charged for BSPs and includes the OS license fee where necessary. Support is provided free after purchase of the BSP.

BSPs are available in the form of a software development kit (SDK), which consists of the BSP pre-installed on a solid-state disk that plugs onto the board, so you can boot up and be running instantly. Instructions and a backup image are provided for rebuilding the BSP. The BSP image can be freely copied as many times as necessary. Customers are responsible for meeting any software licensing requirements for additional copies.

SDKs are available as standalone products and are also included in our SBC development kits (DKs). If you are buying multiple units of SBC, you can buy a single DK or SDK and then buy additional SBCs, cables, and flashdisks as needed for your development and deployment. You are responsible for meeting any software licensing requirements for duplication of the BSP.

In most cases, custom versions of our BSPs can be provided under our engineering services program. Examples of customizations include 64-bit vs. 32-bit versions, a particular Linux distribution, or the inclusion of customer drivers and applications.

### 20.4 Universal Driver

Universal Driver is Diamond's free software package for controlling Digital I/O features on Gemini SBC. Universal Driver includes a C language library that provides control of all the Digital IO features on the board. A convenient graphical user interface program is available to provide benchtop control of the Digital I/O features. This program can be used for application modeling or board/system debugging. Please visit the [Universal Driver](#) page for more information. Universal Driver is generally not included in our BSPs, because it is subject to frequent updates. The latest version can quickly be downloaded from our site and installed into your BSP or OS image.

## 21. ORDERING INFO

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This page describes the orderable part numbers for Gemini SBC and related accessories

Ordering part number	Description
GEM-WL8665UE-16G	Gemini SBC with 16GB DDR4 memory
GEM-WL8665UE-32G	Gemini SBC with 32GB DDR4 memory
GEM-WL8665UE-64G	Gemini SBC with 64GB DDR4 memory
CK-GEM-01	Gemini SBC cable kit
DK-GEM-WL8665-WE1064	Gemini SBC development kit - Windows 10 64 bit
DK-GEM-WL8665-LNX64	Gemini SBC development kit - Linux 64 bit
SDK-GEM-WL8665-WE1064	Gemini SBC software development kit - Windows 10 64 bit
SDK-GEM-WL8665-LNX64	Gemini SBC software development kit - Linux 64 bit

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Last updated 5 months ago

## 22. LIMITED WARRANTY POLICY

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Diamond Systems Corporation warrants that its products will be free from defects and errors in material and workmanship and perform in full accordance with the technical specifications stated in the description of the product for a 2-Year Period from the Date of Shipment. Unless otherwise stated, Diamond Systems Corporation Limited Warranty Policy covers the following criterion:

- It is extended to the original Purchaser/Consumer.
- Under Terms and Conditions of the Warranty, Diamond Systems Corporation, at its sole discretion, will repair or replace any defective parts or components of its product.
- The product must be returned to Diamond Systems Corporation in the-approved packaging, pre-authorized with a Diamond Systems Corporation-assigned Return Material Authorization (RMA) Number which is referenced on the shipping document.
- The Customer will prepay the shipment cost of the product to the Diamond Systems Corporation designated site.
- Diamond Systems Corporation will prepay the return shipping cost of the repaired or replaced the RMA product. Diamond Systems Corporation Limited Warranty Policy does not cover product defects or damages incurred due to:
  - Attempts by Customer to repair or resolve any product issues without the prior consent of Diamond Systems Corporation.
  - Mishandling, misuse, neglect, normal wear, and tear, or accident.
- DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, OR UNDER ANY OTHER LEGAL THEORY, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DOWNTIME, GOODWILL, DAMAGE TO OR REPLACEMENT OF EQUIPMENT AND PROPERTY, ANY COSTS OF RECOVERING, REPROGRAMMING, OR REPRODUCING ANY PROGRAM OR DATA STORED IN OR USED WITH DIAMOND SYSTEMS CORPORATION PRODUCTS, AND ANY FAILURE TO MAINTAIN THE CONFIDENTIALITY OF DATA STORED ON THE PRODUCT.

NOTE: *THE LIMITED WARRANTY POLICY DOES NOT WARRANT TO REPAIR ANY OR EVERY DIAMOND SYSTEMS CORPORATION PRODUCT.*