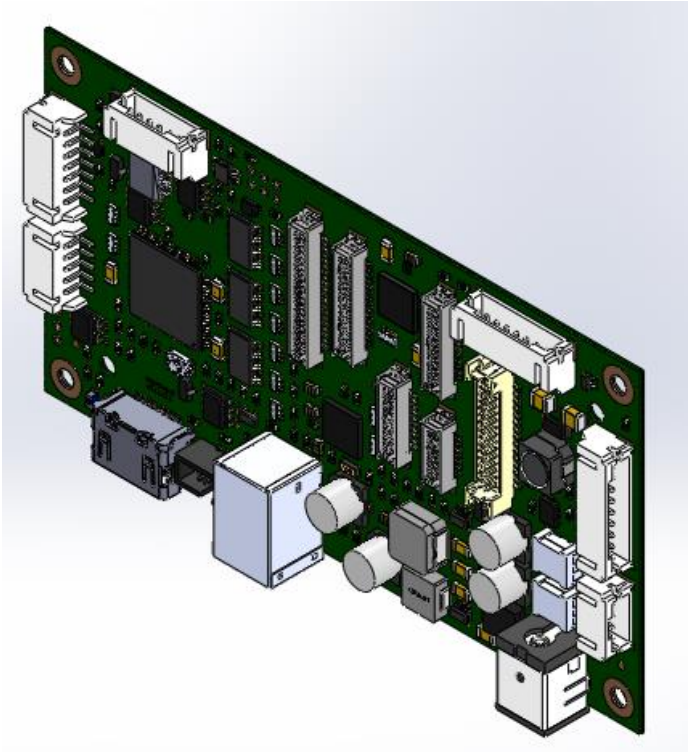
**Date:** February 6, 2020
**Subject:** Industrial HDMI Interface Board
**Document:** PS163000-0

## 1. Overview



The Industrial HDMI Interface Board (IHIB) is a critical component of a high reliability display-based system. IHIB supports LCD modules having LVTTL/LVCMOS interfaces as well as LVDS interfaced modules using one or two channels. It supports display resolutions up to 1080p and WUXGA in 18- or 24-bit true-color pixel format. The maximum pixel rate supported is 165MHz.

Complemented by a family of remote sensor modules including ambient light sensors, the IHIB can be the primary reliability control device within a display-based system.

A simple one-time setup allows programming of temperature and illuminance setpoints and thus allows optimized performance of the system under all conditions. This feature requires the addition of our optional sensor package.

Backlight power and internal temperature are continuously monitored. Notifications can be made available to the host in the event of tampering or malfunction so that service is requested and performed immediately.

The IHIB is highly customizable. An elegant daughtercard-based approach to connecting with LCD modules having FFC and FPC type interaces allows fast prototyping and evaluation while also removing the multiple failure points associated with “wired” FFC/FPC to round wire adapters so commonly available.

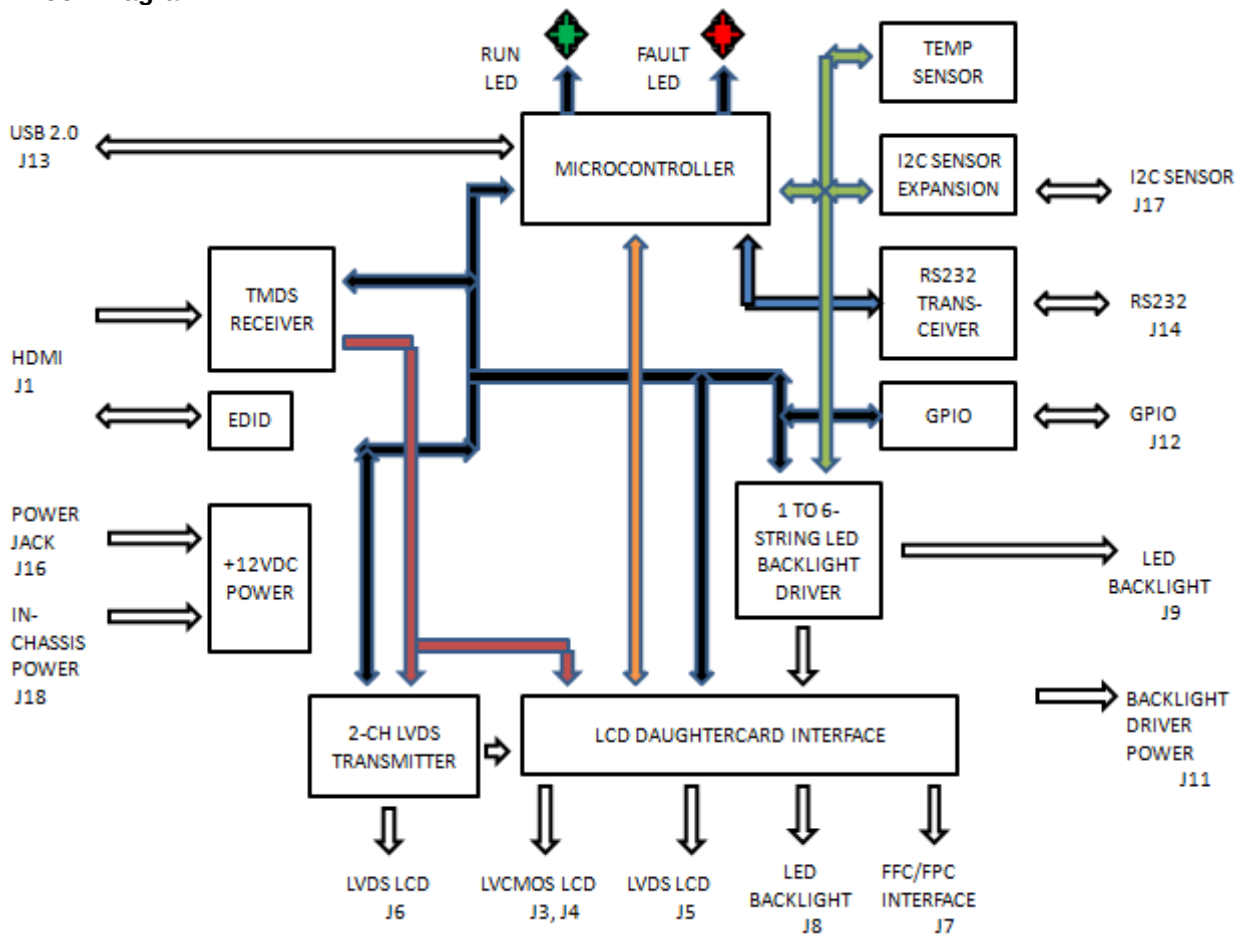
Perfect for small- and medium-diagonal displays, an onboard multi-string LED backlight is optionally provided, supporting up to six independently regulated LED strings at up to 50mA per string. LED driver outputs may be connected in parallel to drive, for example, three strings at 100mA per string, two strings at 150mA per string or one string at a whopping 300mA.

Certain configurations supporting small and medium diagonal displays with low power budgets may be bus-powered using the USB 2.0 interface.

Designed for harsh environments, IHIB boasts an operating temperature range of -40 to 85°C, filling a void in an industry that is saturated with consumer/commercial operating range products.

This rich feature set is product is not without limitations. IHIB is not High-bandwidth Digital Content Protection (HDCP) compliant. Therefore it cannot be used with protected content such as Blu-ray DVDs, certain streaming devices and some set top boxes. Also, it has no ability to lock to HDMI sources that encode audio within the video stream. As a result it is always necessary to disable audio. Finally, IHIB is a fixed resolution interface. It relies on the HDMI source to scale video to the native resolution of the attached LCD module based on information provided by IHIB. In some cases that will not be possible, and the LCD module will remain blanked. In any case IHIB protects the LCD module from out of range input resolutions if present.

## 2. Block Diagram




## 3. Specifications

### 3.1 Absolute Maximum Ratings

| | Min | Max | Units |
|---|---|---|---|
| Supply Voltage Range | +4.5 | +15 | V |
| Operating Temperature | -40 | 85 | °C |
| Storage Temperature | -65 | 150 | °C |

### 3.2 Recommended Operating Conditions

| | Min | Typ | Max | Units |
|---|---|---|---|---|
| Supply Voltage | +9.6 | +12 | +14.4 | V |
| Operating Temperature | -40 | 25 | 85 | °C |

3.3 Electrical Characteristics

VINF = +12V, unless otherwise noted. Operating temperature range -40 to 85°C.

| Parameter | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| **Backlight Driver** | | | | | |
| Analog Dimming Control Voltage | +V_EXTA | | +5 | | V |
| Output Voltage | VLED | | | +45 | V |
| **LCD Power** | | | | | |
| Output Voltage | VLCD (application specific) | | +3.3 | | V |
| | VLCD (application specific) | | +5 | | |
| | VLCD (application specific) | | +12 | | |

## 4. Connectorization

4.1 List of connectors used:

| Conn | Function | Manufacturer | Part Number |
|---|---|---|---|
| J1 | HDMI Receptacle | AMPHENOL | 10029449-111RLF |
| J3 | LVCMOS LCD Interface VGA Class | HIROSE | DF9-31P-1V(32) |
| J4 | LVCMOS LCD Interface SVGA Class | HIROSE | DF9-41P-1V(32) |
| J5 | LVDS LCD FFC/FPC/Daughtercard Mate | HIROSE | DF9-25P-1V(32) |
| J6 | LVDS Twisted Pair Round Wire Mate | HIROSE | DF13EA-30DP-1.25V(51) |
| J7 | LVCMOS LCD FFC/FPC/Daughtercard Mate | HIROSE | DF9-21P-1V(32) |
| J8 | LED Backlight FFC/FPC/Daughtercard Mate | HIROSE | DF9-15P-1V(32) |
| J9 | LED Backlight Round Wire Interface | JST | S9B-PH-SM4-TB(LF)(SN) |
| J11 | External Backlight Driver Power | JST | S8B-PH-SM4-TB(LF)(SN) |
| J12 | GPIO and Backlight Dimming Control | JST | S7B-PH-SM4-TB(LF)(SN) |
| J13 | USB 2.0 | AMPHENOL | 61729-1011RLF |
| J14 | RS232 Control Interface | JST | S6B-PH-SM4-TB(LF)(SN) |
| J16 | Power Supply Jack | CUI INC. | PJ-063AH |
| J17 | External I2C Sensor Interface | JST | S5B-PH-SM4-TB(LF)(SN) |
| J18 | In-Chassis Power Connector | JST | S4B-PH-SM4-TB(LF)(SN) |

Note: The following connectors are application specific and may not be populated on all board models: J2, J3, J4, J5, J6, J7, J8, J9, J11, J13, J14, J16, J17, J18.

4.2 Connector pinouts and descriptions:

J1 HDMI Receptacle

| | | |
|---|---|---|
| Used: | 10029449-111RLF | AMPHENOL |
| Mate: | ANY | ANY |

| Pin | Signal | Function |
|---|---|---|
| 1 | RX2+ | |
| 2 | GND | Ground |
| 3 | RX2- | |
| 4 | RX1+ | |
| 5 | GND | Ground |
| 6 | RX1- | |
| 7 | RX0+ | |
| 8 | GND | Ground |
| 9 | RX0- | |
| 10 | RXC+ | |
| 11 | GND | Ground |
| 12 | RXC- | |
| 13 | CEC | |
| 15 | DVISCL | |
| 16 | DVISDA | |
| 17 | GND | Ground |
| 18 | +5VDVI | |
| 19 | HP | |

Description: This connector is a standard HDMI receptacle.

J3 LVCMOS LCD Interface VGA Class

| | | |
|---|---|---|
| Used: | DF9-31P-1V(32) | Hirose |
| Mate: | TBA | Hirose |

| Pin | Signal | Function |
|---|---|---|
| 1 | GND | Ground |
| 2 | PCCLKO | |
| 3 | PCHSO | |
| 4 | PCVSO | |
| 5 | GND | Ground |
| 6 | RO0 | |
| 7 | RO1 | |
| 8 | RO2 | |
| 9 | RO3 | |

| | | |
|---|---|---|
| 10 | RO4 | |
| 11 | RO5 | |
| 12 | GND | Ground |
| 13 | GO0 | |
| 14 | GO1 | |
| 15 | GO2 | |
| 16 | GO3 | |
| 17 | GO4 | |
| 18 | GO5 | |
| 19 | GND | Ground |
| 20 | BO0 | |
| 21 | BO1 | |
| 22 | BO2 | |
| 23 | BO3 | |
| 24 | BO4 | |
| 25 | BO5 | |
| 26 | GND | Ground |
| 27 | PCHREFO | |
| 28 | VLCD | |
| 29 | VLCD | |
| 30 | RL | |
| 31 | UD | |

Description: This connector is used to interface directly to a “VGA Class” LCD module having an LVCMOS/LVTTL interface.

J4 LVCMOS LCD Interface SVGA Class

Used: DF9-41P-1V(32) Hirose

Mate: TBA Hirose

| Pin | Signal | Function |
|---|---|---|
| 1 | GND | Ground |
| 2 | PCCLKO | |
| 3 | GND | Ground |
| 4 | PCHSO | |
| 5 | PCVSO | |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | GND | Ground |
| 9 | RO0 | |
| 10 | RO1 | |
| 11 | RO2 | |

| | | |
|---|---|---|
| 12 | GND | Ground |
| 13 | RO3 | |
| 14 | RO4 | |
| 15 | RO5 | |
| 16 | GND | Ground |
| 17 | GND | Ground |
| 18 | GND | Ground |
| 19 | GO0 | |
| 20 | GO1 | |
| 21 | GO2 | |
| 22 | GND | Ground |
| 23 | GO3 | |
| 24 | GO4 | |
| 25 | GO5 | |
| 26 | GND | Ground |
| 27 | GND | Ground |
| 28 | GND | Ground |
| 29 | BO0 | |
| 30 | BO1 | |
| 31 | BO2 | |
| 32 | GND | Ground |
| 33 | BO3 | |
| 34 | BO4 | |
| 35 | BO5 | |
| 36 | GND | Ground |
| 37 | PCHREFO | |
| 39 | VLCD | |
| 40 | VLCD | |
| 41 | UD | |

Description: This connector is used to interface directly to an “SVGA Class” LCD module having an LVCMOS/LVTTL interface.

J5 LVDS LCD FFC/FPC/Daughtercard Mate

| | | |
|---|---|---|
| Used: | DF9-25P-1V(32) | Hirose |
| Mate: | TBA | Hirose |

Description: This connector is used for connection to certain LCD modules. The pinouts are proprietary.

J6 LVDS Twisted Pair Round Wire Mate

| | | |
|---|---|---|
| Used: | DF13EA-30DP-1.25V(51) | Hirose |
| Mate: | TBA | Hirose |

| Pin | Signal | Function |
|---|---|---|
| 1 | +5VLCDD | |
| 2 | +3.3VLCDD | |
| 3 | OUTA_D0_N | |
| 4 | OUTB_D0_N | |
| 5 | OUTA_D0_P | |
| 6 | OUTB_D0_P | |
| 7 | OUTA_D1_N | |
| 8 | OUTB_D1_N | |
| 9 | OUTA_D1_P | |
| 10 | OUTB_D1_P | |
| 11 | OUTA_D2_N | |
| 12 | OUTB_D2_N | |
| 13 | OUTA_D2_P | |
| 14 | OUTB_D2_P | |
| 15 | OUTA_D3_N | |
| 16 | OUTB_D3_N | |
| 17 | OUTA_D3_P | |
| 18 | OUTB_D3_P | |
| 19 | GND | Ground |
| 20 | GND | Ground |
| 21 | OUTA_CK_N | |
| 22 | OUTB_CK_N | |
| 23 | OUTA_CK_P | |
| 24 | OUTB_CK_P | |
| 25 | GND | Ground |
| 26 | GND | Ground |
| 27 | VLCDD | |
| 28 | VLCDD | |
| 29 | VLCD | |
| 30 | VLCD | |

Description: This connector is used to interface to an LCD module having a twisted pair round wire LVDS interface.

J7 LVCMOS LCD Daughtercard Mate

| | | |
|---|---|---|
| Used: | DF9-21P-1V(32) | Hirose |
| Mate: | TBA | Hirose |

Description: This connector is used for connection to certain LCD modules. The pinouts are proprietary.

J8 LED Backlight Daughtercard Mate

| | | |
|---|---|---|
| Used: | DF9-15P-1V(32) | Hirose |
| Mate: | TBA | Hirose |

Description: This connector is used for connection to certain LCD modules. The pinouts are proprietary.

J9 LED Backlight Round Wire Interface

| | | |
|---|---|---|
| Used: | S9B-PH-SM4-TB(LF)(SN) | JST |
| Mate: | PHR-9 | JST |

| Pin | Signal | Function |
|---|---|---|
| 1 | VLED | |
| 2 | CATH0 | |
| 3 | CATH1 | |
| 4 | CATH2 | |
| 5 | CATH3 | |
| 6 | CATH4 | |
| 7 | CATH5 | |
| 8 | GND | Ground |
| 9 | ADDATHRM | |

Description: This connector is used.

J11 External Backlight Driver Power

| | | |
|---|---|---|
| Used: | S8B-PH-SM4-TB(LF)(SN) | JST |
| Mate: | PHR-8 | JST |

| Pin | Signal | Function |
|---|---|---|
| 1 | +VBLU | |
| 2 | +VBLU | |
| 3 | GND | Ground |
| 4 | GND | Ground |
| 5 | BLON | |
| 6 | PWMBLU | |
| 7 | GND | Ground |
| 8 | ADDATHRM | |

Description: This connector is used.

J12 GPIO and Backlight Dimming Control

| | | |
|---|---|---|
| Used: | S7B-PH-SM4-TB(LF)(SN) | JST |
| Mate: | PHR-7 | JST |

| Pin | Signal | Function |
|---|---|---|
| 1 | +5V | +5V Power |
| 2 | +V_EXTA | |
| 3 | GND | Ground |
| 4 | SW0 | |
| 5 | SW1 | |
| 6 | SW2 | |
| 7 | GND | Ground |

Description: The

J13 USB 2.0 Device Interface Type B

| | | |
|---|---|---|
| Used: | 61729-1011RLF | AMPHENOL |
| Mate: | ANY | ANY |

| Pin | Signal | Function |
|---|---|---|
| 1 | +5V_U | |
| 2 | USB_N | |
| 3 | USB_P | |
| 4 | GND | Ground |

Description: This is the interface to a USB 2.0 host.

J14 RS232 Control Interface

| | | |
|---|---|---|
| Used: | S6B-PH-SM4-TB(LF)(SN) | JST |
| Mate: | PHR-6 | JST |

| Pin | Signal | Function |
|---|---|---|
| 1 | +3.3V | +3.3V Power |
| 2 | GND | Ground |
| 3 | T1OUT | |
| 4 | R1IN | |
| 5 | GPIOS | |
| 6 | GND | Ground |

Description: This connector is used .

J16 Power Supply Jack

| | | |
|---|---|---|
| Used: | PJ-063AH | CUI INC. |
| Mate: | ANY | ANY |

| Pin | Signal | Function |
|---|---|---|
| 1 | VINF | |
| 2 | GNDF | |

Description: This connector is used.

J17 External I2C Sensor Interface

Used: S5B-PH-SM4-TB(LF)(SN) JST

Mate: PHR-5 JST

| Pin | Signal | Function |
|---|---|---|
| 1 | +3.3V | +3.3V Power |
| 2 | GND | Ground |
| 3 | RSCL | |
| 4 | RSDA | |
| 5 | N/C | No connection |

Description: This connector is used.

J18 In-Chassis Power Connector

Used: S4B-PH-SM4-TB(LF)(SN) JST

Mate: PHR-4 JST

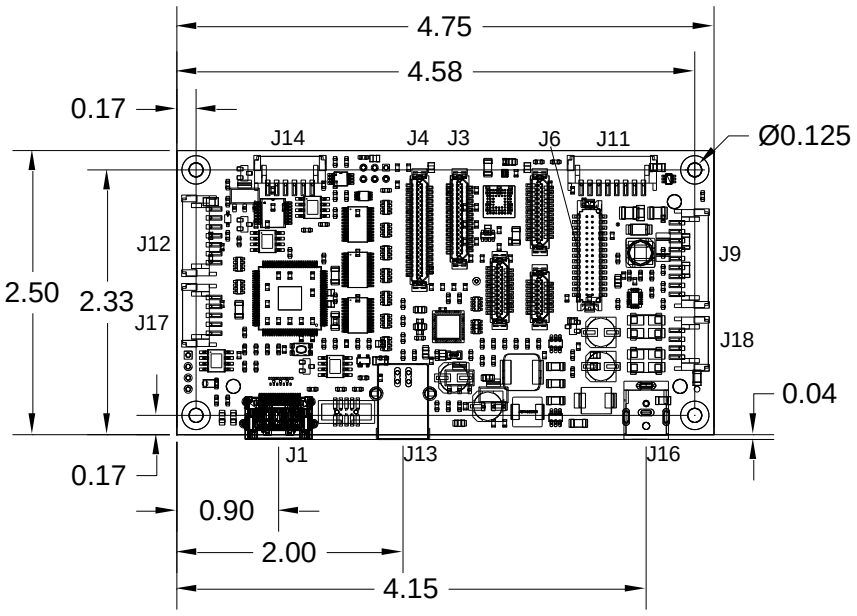
| Pin | Signal | Function |
|---|---|---|
| 1 | VINF | |
| 2 | VINF | |
| 3 | GNDF | |
| 4 | GNDF | |

Description:

**5. Application Notes**

To be completed at a later date.

**6. Mechanical Outline Drawing**




Notes: Tallest component top side is 0.45”. Printed circuit board thickness 0.062” ±10%. Tallest component bottom side is 0.075”.