phyBOARD®-Wega AM335x

Hardware Manual

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Conventions, Abbreviations and Acronyms

This hardware manual describes the PB-00802-xxx Single Board Computer (SBC) in the following referred to as phyBOARD-Wega AM335x. The manual specifies the phyBOARD-Wega AM335x's design and function. Precise specifications for the Texas Instruments AM335x microcontrollers can be found in the Texas Instrumenten's AM335x Data Sheet and Technical Reference Manual.

Conventions

The conventions used in this manual are as follows:

- Signals that are preceded by an "n", "/", or "#"character (e.g.: nRD, /RD, or #RD), or that have a dash on top of the signal name (e.g.: $\overline{\text{RD}}$) are designated as active low signals. That is, their active state is when they are driven low, or are driving low.
- A "0" indicates a logic zero or low-level signal, while a "1" represents a logic one or high-level signal.
- The hex-numbers given for addresses of I^2C devices always represent the 7 MSB of the address byte. The correct value of the LSB which depends on the desired command (read (1), or write (0)) must be added to get the complete address byte. E.g. given address in this manual 0x41 => complete address byte = 0x83 to read from the device and 0x82 to write to the device.
- Tables which describe jumper settings show the default position in **bold, blue text.**
- Text in *blue italic* indicates a hyperlink within, or external to the document. Click these links to quickly jump to the applicable URL, part, chapter, table, or figure.
- Text in ***bold italic*** indicates an interaction by the user, which is defined on the screen.
- Text in `Consolas` indicates an input by the user, without a premade text or button to click on.
- Text in *italic* indicates proper names of development tools and corresponding controls (windows, tabs, commands etc.) used within the development tool, no interaction takes place.
- White Text on black background shows the result of any user interaction (command, program execution, etc.)

Abbreviations and Acronyms

Many acronyms and abbreviations are used throughout this manual. Use the table below to navigate unfamiliar terms used in this document.

Abbreviation	Definition
A/V	Audio/Video
BSP	Board Support Package (Software delivered with the Development Kit including an operating system (Windows, or *Linux*) pre-installed on the module and Development Tools)
CB	Carrier Board; used in reference to the phyBOARD-Wega Development Kit Carrier Board
DFF	D flip-flop
DSC	Direct Solder Connect
EMB	External memory bus
EMI	Electromagnetic Interference
GPI	General purpose input
GPIO	General purpose input and output
GPO	General purpose output
IRAM	Internal RAM; the internal static RAM on the Texas Instruments AM335x microcontroller
J	Solder jumper; these types of jumpers require solder equipment to remove and place
JP	Solderless jumper; these types of jumpers can be removed and placed by hand with no special tools
NC	Not Connected
NM	Not Mounted
NS	Not Specified
PCB	Printed circuit board
PDI	Phytec Display Interface; defined to connect Phytec display adapter boards, or custom adapters
PEB	Phytec Expansion Board
PMIC	Power management IC
PoE	Power over Ethernet
PoP	Package on Package
POR	Power-on reset
RTC	Real-time clock
SBC	Single Board Computer; used in reference to the PBA-CD-02 /phyBOARD-Wega AM335x
SMT	Surface mount technology
SOM	System on Module; used in reference to the PCL-051 /phyCORE-AM335x module
Sx	User button Sx (e.g. S1, S2) used in reference to the available user buttons, or DIP switches on the CB
Sx_y	Switch y of DIP switch Sx; used in reference to the DIP switch on the carrier board
VSTBY	SOM standby voltage input

Table 1: Abbreviations and Acronyms used in this Manual

	At this icon you might leave the path of this Application Guide.
	This is a warning. It helps you to avoid annoying problems.
	You can find information to solve problems.

Preface

As a member of Phytec's new phyBOARD® product family the phyBOARD®-Wega AM335x is one of a series of Phytec System on Modules (SBCs) that offer off-the-shelf solutions for a huge variety of industrial applications. The new phyBOARD® product family consists of a series of extremely compact embedded control engines featuring various processing performance classes. All phyBOARDs are rated for industry, cost optimized and offer long-term availability. The phyBOARD®-Wega AM335x is one of currently six industrial-grade carrier boards which are suitable for series production and that have been realized in accordance with Phytec's new SBCplus concept. It is an excellent example of this concept.

SBCplus Concept

The SBCplus concept was developed to meet fine differences in customer requirements with little development effort and thus to greatly reduce the time-to-market.

Core of the SBCplus concept is the SBC design library (a kind of construction set) that consists of a great number of function blocks (so-called "building blocks") which are refined constantly. The recombination of these function blocks allows to develop a customer specific SBC within a short time. Thus, Phytec is able to deliver production-ready custom Single Board Computers within a few weeks at very low costs.

The already developed SBCs, such as the phyBOARD®-Wega, each represent an intersection of different customer wishes. Because of that all necessary interfaces are already available on the standard versions, thus, allowing to integrate them in a large number of applications without modification. For any necessary detail adjustment extension connectors are available to enable adding of a wide variety of functions.

Cost-optimized with Direct Solder Connect (DSC) Technology

At the heart of the phyBOARD®-Wega is the phyCORE®-AM335x System on Module (SOM). As with all SBCs of the phyBOARD® family the SOM is directly soldered onto the carrier board PCB for routing of signals from the SOM to applicable I/O interfaces. This “Direct Solder Connect” (DSC) of the SOM eliminates costly PCB to PCB connectors, thereby further reducing overall system costs, and making the phyBOARDs ideally suited for deployment into a wide range of cost-optimized and robust industrial applications.

Customized Expandability from Phytec

Common interface signals route to standard connector interfaces on the carrier board such as Ethernet, CAN, RS-232, and audio. Due to the easily modifiable phyBOARD® design approach (see "*SBCplus concept*"), these plug-and-play interfaces can be readily adapted in customer-specific variants according to end system requirements.

Some signals from the processor populating the SOM also extend to the expansion, and A/V connectors of the phyBOARD®-Wega. This provides for customized expandability according to end user requirements. Thus expandability is made easy by available plug-and-play expansion modules from Phytec.

- HDMI and LVDS/Parallel Displays
- Power Supply, with broad voltage range
- Industrial I/O (including WLAN)
- Home-Control Board (WiFi, KNX/EIB, I/O)
- M2M Board (GPS, GSM, I/O's)
- Debug Adapter

The default orientation of the expansion bus connectors is parallel and on the top side of the carrier board PCB. However, in custom configurations the connectors can be mounted on the PCB's underside. Connectors in perpendicular orientation can also populate the top or underside of the PCB. This enables maximum flexibility for orientation of expansion modules on the phyBOARD®-Wega, as well as integration of the system into a variety of end application physical envelopes and form factors.

Easy Integration of Display und Touch
The phyBOARD® and its expansion modules enable easy connection of parallel or LVDS based displays, as well as resistive or capacitive touch screens.

OEM Implementation
Implementation of an OEM-able SBC subassembly as the "core" of your embedded design allows you to focus on hardware peripherals and firmware without expending resources to "re-invent" microcontroller circuitry. Furthermore, much of the value of the phyBOARD® SBC lies in its layout and test.

Software Support
Production-ready Board Support Packages (BSPs) and Design Services for our hardware will further reduce your development time and risk and allow you to focus on your product expertise.

Ordering Information

Ordering numbers:

phyBOARD®-Wega AM335x Development Kit:	**KPB-00802-xxx**
phyBOARD®-Wega AM335x SBC:	**PB-00802-xxx**

Product Specific Information and Technical Support

In order to receive product specific information on changes and updates in the best way also in the future, we recommend to register at

http://www.phytec.de/de/support/registrierung.html or
http://www.phytec.eu/europe/support/registration.html

For technical support and additional information concerning your product, please visit the support section of our web site which provides product specific information, such as errata sheets, application notes, FAQs, etc.

http://www.phytec.de/de/support/faq/faq-phyBOARD-Wega-AM335x.html or
http://www.phytec.eu/europe/support/faq/faq-phyBOARD-Wega-AM335x.html

Other Products and Development Support

Aside of the new phyBOARD® family, Phytec supports a variety of 8-/16- and 32-bit controllers in two ways:

(1) as the basis for Rapid Development Kits which serve as a reference and evaluation platform

(2) as insert-ready, fully functional OEM modules, which can be embedded directly into the user's peripheral hardware design.

Take advantage of Phytec products to shorten time-to-market, reduce development costs, and avoid substantial design issues and risks. With this new innovative full system solution you will be able to bring your new ideas to market in the most timely and cost-efficient manner.

For more information go to:

http://www.phytec.de/de/leistungen/entwicklungsunterstuetzung.html or
http://www.phytec.eu/europe/oem-integration/evaluation-start-up.html

Declaration of Electro Magnetic Conformity of the Phytec phyBOARD®-Wega AM335x

Phytec Single Board Computers (henceforth products) are designed for installation in electrical appliances, or as part of custom applications, or as dedicated Evaluation Boards (i.e.: for use as a test and prototype platform for hardware/software development) in laboratory environments.

Caution!
Phytec products lacking protective enclosures are subject to damage by ESD and, hence, may only be unpacked, handled or operated in environments in which sufficient precautionary measures have been taken in respect to ESD-dangers. It is also necessary that only appropriately trained personnel (such as electricians, technicians and engineers) handle and/or operate these products. Moreover, Phytec products should not be operated without protection circuitry if connections to the product's pin header rows are longer than 3 m.

Phytec products fulfill the norms of the European Union's Directive for Electro Magnetic Conformity only in accordance to the descriptions and rules of usage indicated in this hardware manual (particularly in respect to the pin header row connectors, power connector and serial interface to a host-PC).

Implementation of Phytec products into target devices, as well as user modifications and extensions of Phytec products, is subject to renewed establishment of conformity to, and certification of, Electro Magnetic Directives. Users should ensure conformance following any modifications to the products as well as implementation of the products into target systems.

Product Change Management and information in this manual on parts populated on the SOM / SBC

When buying a Phytec SOM / SBC, you will, in addition to our HW and SW offerings, receive a free obsolescence maintenance service for the HW we provide.

Our PCM (Product Change Management) Team of developers, is continuously processing, all incoming PCN's (Product Change Notifications) from vendors and distributors concerning parts which are being used in our products.

Possible impacts to the functionality of our products, due to changes of functionality or obsolesce of a certain part, are being evaluated in order to take the right masseurs in purchasing or within our HW/SW design.

Our general philosophy here is: **We never discontinue a product as long as there is demand for it.**

Therefore we have established a set of methods to fulfill our philosophy:

Avoiding strategies

- Avoid changes by evaluating long-livety of parts during design in phase.
- Ensure availability of equivalent second source parts.
- Stay in close contact with part vendors to be aware of roadmap strategies.

Change management in rare event of an obsolete and non replaceable part

- Ensure long term availability by stocking parts through last time buy management according to product forecasts.
- Offer long term frame contract to customers.

Change management in case of functional changes

- Avoid impacts on product functionality by choosing equivalent replacement parts.
- Avoid impacts on product functionality by compensating changes through HW redesign or backward compatible SW maintenance.
- Provide early change notifications concerning functional relevant changes of our products.

Therefore we refrain from providing detailed part specific information within this manual, which can be subject to continuous changes, due to part maintenance for our products.

In order to receive reliable, up to date and detailed information concerning parts used for our product, please contact our support team through the contact information given within this manual.

1 Introduction

1.1 Hardware Overview

The phyBOARD-Wega for phyCORE-AM335x is a low-cost, feature-rich software development platform supporting the Texas Instruments AM335x microcontroller. Moreover, due to the numerous standard interfaces the phyBOARD-Wega AM335x can serve as bedrock for your application. At the core of the phyBOARD-Wega is the PCL-051/phyCORE-AM335x System On Module (SOM) in a direct solder form factor, containing the processor, DRAM, NAND Flash, power regulation, supervision, transceivers, and other core functions required to support the AM335x processor. Surrounding the SOM is the PBA-CD-02/phyBOARD-Wega carrier board, adding power input, buttons, connectors, signal breakout, and Ethernet connectivity amongst other things.

The PCL-051 System On Module is a connector-less, BGA style variant of the PCM-051/phyCORE-AM335x SOM. Unlike traditional Phytec SOM products that support high density connectors, the PCL-051 SOM is directly soldered down to the phyBOARD-Wega using Phytec's Direct Solder Connect technology. This solution offers an ultra-low cost Single Board Computer for the AM335x processor, while maintaining most of the advantages of the SOM concept.

Adding the phyCORE-AM335x SOM into your own design is as simple as ordering the connectored version (PCM-051) and making use of our phyCORE Carrier Board reference schematics.

1.1.1 Features of the phyBOARD-Wega AM335x

The phyBOARD-Wega AM335x supports the following features :

- Developed in accordance with Phytec's new SBCplus concept (*Preface*)
- Phytec’s phyCORE-AM335x SOM with Direct Solder Connect (DSC)
- Pico ITX standard dimensions (100 mm × 72 mm)
- Boot from MMC or NAND Flash
- Max. 1 GHz core clock frequency
- Three different power supply options (5 V via 3.5 mm combicon or micro USB connector; or 12 V – 24 V through external power module)
- Two RJ45 jacks for 10/100 Mbps Ethernet
- One USB host interface brought out to an upright USB Standard-A connector, or at the expansion connector[1]
- One USB OTG interface available at an USB Micro-AB connector at the back side, or at the expansion connector[1]
- One Secure Digital / Multi Media Memory Card interface brought out to a Micro-SD connector at the back side

[1]: **Caution!** There is no protective circuit for the USB interface brought out at the expansion connector.

- CAN interface at 2×5 pin header 2.54 mm
- Audiocodec with Stereo Line In and Line Out (2×3 pin header 2.54 mm) and mono speaker (2-pole Molex SPOX)
- RS-232 transceiver supporting UART1 incl. handshake signals with data rates of up to 1 Mbps (2×5 pin header 2.54 mm)
- Reset-Button
- Audio/Video (A/V) connectors
- Expansion connector with different interfaces
- Gold Capacitor for backup supply of RTC (lasts approx. 17 ½ days)

1.1.2 Block Diagram

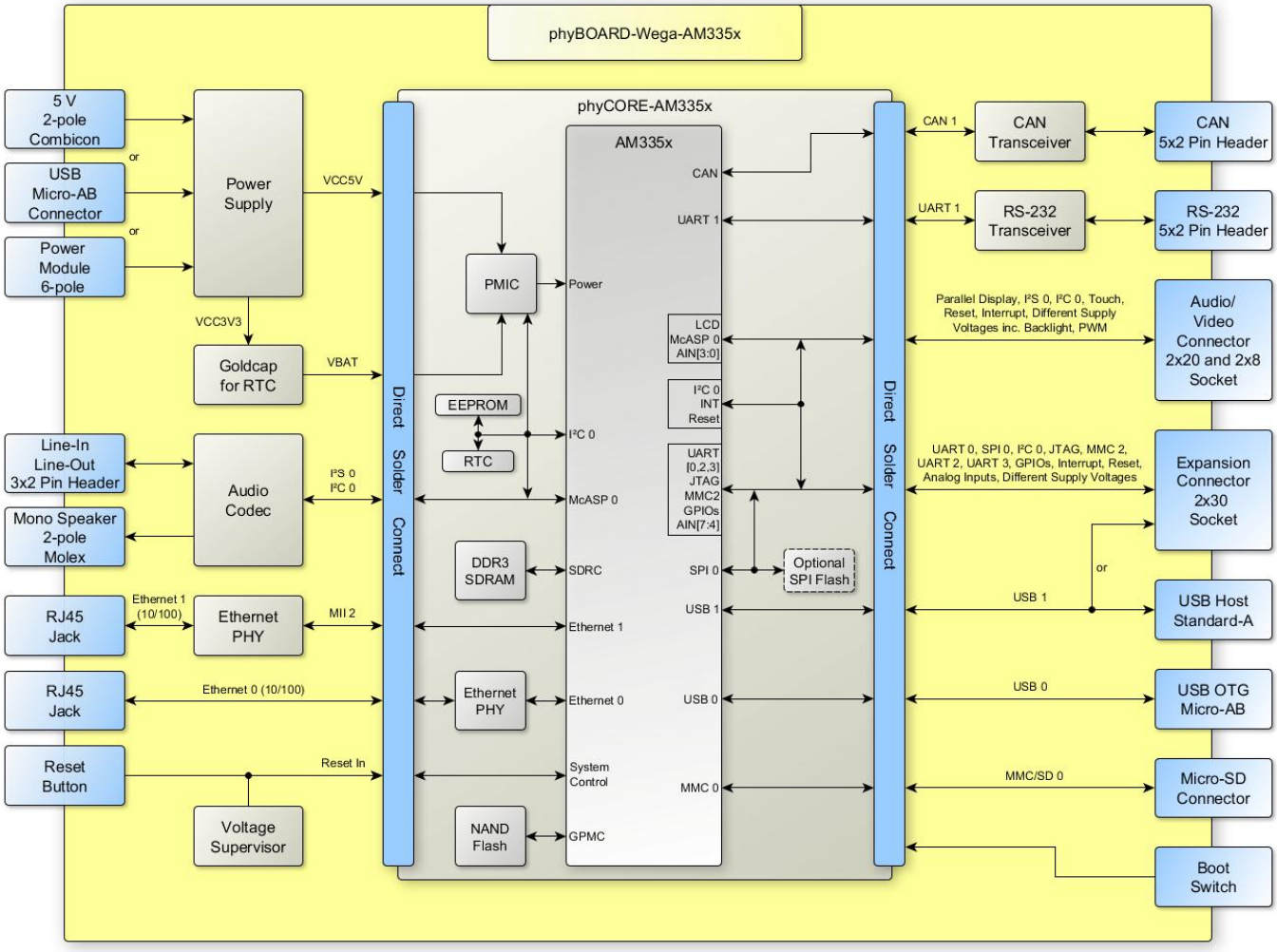


Figure 1: Block Diagram of the phyBOARD-Wega AM335x

1.1.3 View of the phyBOARD-Wega AM335x

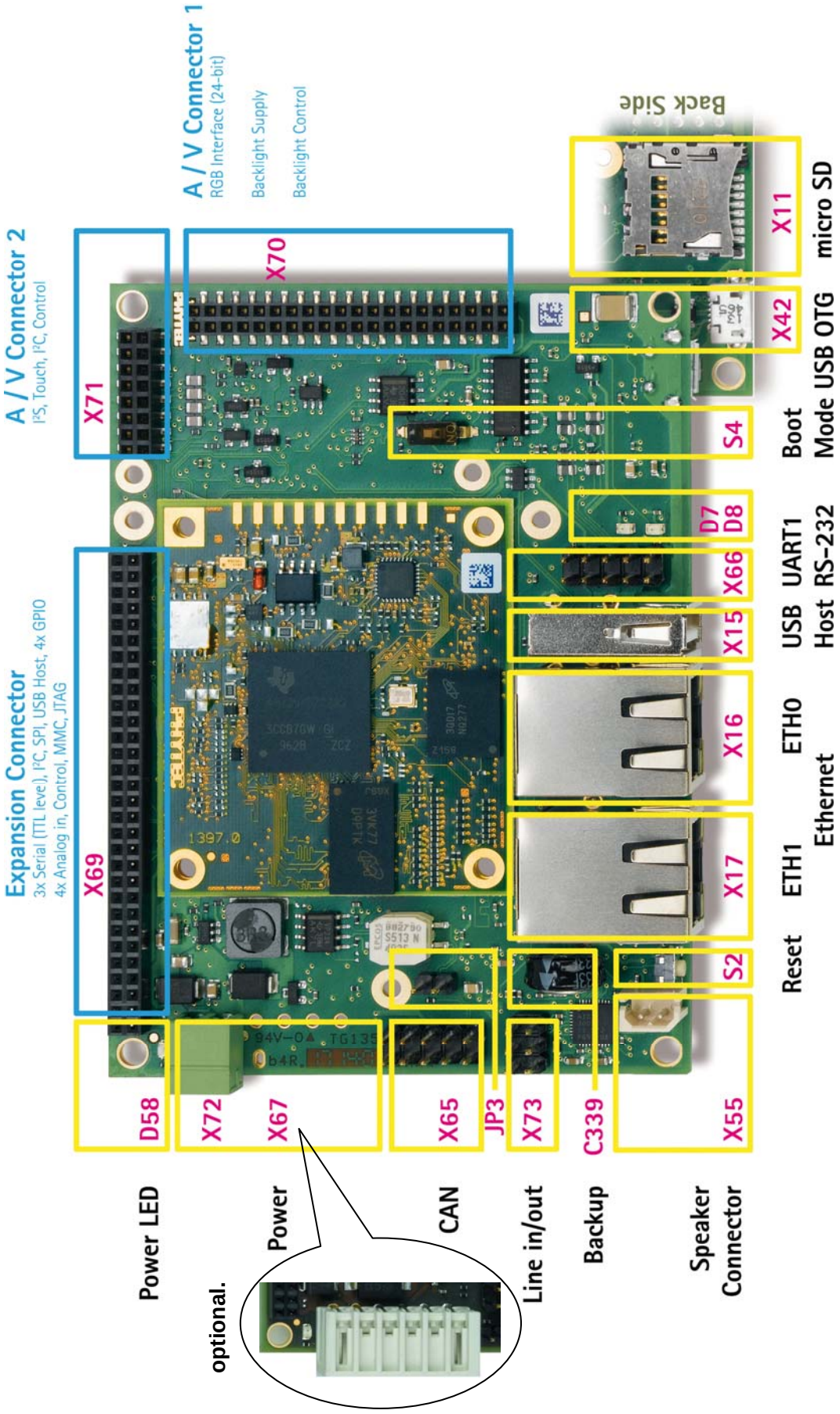


Figure 2: View of the phyBOARD-Wega AM335x

2 Accessing the phyBOARD-Wega Features

Phytec phyBOARD-Wega is fully equipped with all mechanical and electrical components necessary for the speedy and secure start-up.

2.1 Overview of the phyBOARD-Wega Peripherals

The phyBOARD-Wega is depicted in *Figure 2*. It features many different interfaces and is equipped with the components as listed in *Table 2*, and *Table 3*. For a more detailed description of each peripheral refer to the appropriate chapter listed in the applicable table. *Figure 2* highlights the location of each peripheral for easy identification.

2.1.1 Connectors and Pin Header

Table 2 lists all available connectors on the phyBOARD-Wega. *Figure 2* highlights the location of each connector for easy identification.

Reference Designator	Description	See Section
X11	Secure Digital / Multi Media Card (Micro-slot)	*2.2.7*
X15	USB host connector (USB 2.0 Standard-A)	*2.2.4*
X16	Ethernet 0 connector (RJ45 with speed and link LED)	*2.2.3*
X17	Ethernet 1 connector (RJ45 with speed and link LED)	
X42	USB On-The-Go connector (USB Micro-AB)	*2.2.4*
X55	Mono Speaker output (2-pole Molex SPOX 2.5 mm pitch)	*2.2.5*
X65	CAN connector (2×5 pin header 2.54 mm pitch)	*2.2.6*
X66	RS-232 with RTS and CTS (UART1; 2×5 pin header 2.54 mm pitch)	*2.2.2*
X67	Power supply 5 V only (via 6-pole WAGO male header, or 2-pole Phoenix Contact MINI COMBICON base strip)	*2.2.1.1*
X69	Expansion connector (2×30 socket connector 2 mm pitch)	*2.2.11*
X70	A/V connector #1 (2×20 socket connector 2 mm pitch)	*2.2.10, 3.2.3*
X71	A/V connector #2 (2×8 socket connector 2 mm pitch)	
X72	Optional 5 V power supply via USB Micro-AB connector	*2.2.1.1.2*
X73	Stereo Line Out and Line In connector (2×3 pin header 2.54 mm pitch)	*2.2.5*

Table 2: phyBOARD-Wega Connectors and Pin Headers

	Ensure that all module connections are not to exceed their expressed maximum voltage or current. Maximum signal input values are indicated in the corresponding controller User's Manual/Data Sheets. As damage from improper connections varies according to use and application, it is the user's responsibility to take appropriate safety measures to ensure that the module connections are protected from overloading through connected peripherals.

2.1.2 LEDs

The phyBOARD-Wega is populated with three LEDs to indicate the status of the USB VBUS voltages, as well as of the power supply voltage.

Figure 2 shows the location of the LEDs. Their function is listed in the table below:

LED	Color	Description	See Section
D7	green	Indicates presence of VBUS1 at the USB host interface	*2.2.4*
D8	green	Indicates presence of VBUS0 at the USB OTG interface	
D58	red	3.3 V voltage generation of the phyBOARD-Wega	*2.2.1.2*

Table 3: phyBOARD-Wega LEDs Descriptions

2.1.3 Switches

The phyBOARD-Wega is populated with two switches, one to reset the phyBOARD-Wega and another to configure the boot sequence.

Figure 2 shows the location of the switches. Their function is listed in the table below:

Switch	Description	See Section
S2	Reset Button	*2.2.9*
S4	Boot Switch	*2.2.8*

Table 4: phyBOARD-Wega Switches Description

2.1.4 Jumpers

The phyBOARD-Wega comes pre-configured with one removable jumper (JP) and several solder jumpers (J). The jumpers allow flexible configuring of a limited number of features for development purposes to the user.

	Due to the small footprint of the solder jumpers (J) we do not recommend manual jumper modifications. This might also render the warranty invalid. Because of that only the removable jumper is described in this section. For information on the solder jumpers see *section 3.2* and contact our sales team if you need jumper configurations different from the default configuration.

The function of the removable jumper on the phyBOARD-Wega is shown in *Table 5*. More detailed information can be found in the appropriate section.

Figure 2 shows the location of jumper JP3.

Jumper	Description	See Section
JP3	CAN Termination	*2.2.6*

Table 5: phyBOARD-Wega Jumper Description

	Detailed descriptions of the assembled connectors, jumpers and switches can be found in the following chapters.

2.2 Functional Components on the phyBOARD-Wega SBC

This section describes the functional components of the phyBOARD-Wega. Each subsection details a particular connector/interface and associated jumpers for configuring that interface.

2.2.1 Power Supply

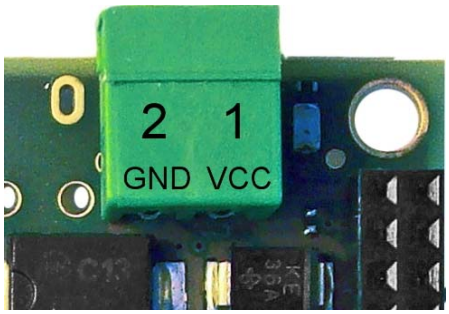
	Do not change modules or jumper settings while the phyBOARD-Wega is supplied with power!

2.2.1.1 Power Connectors (X67 and X72)

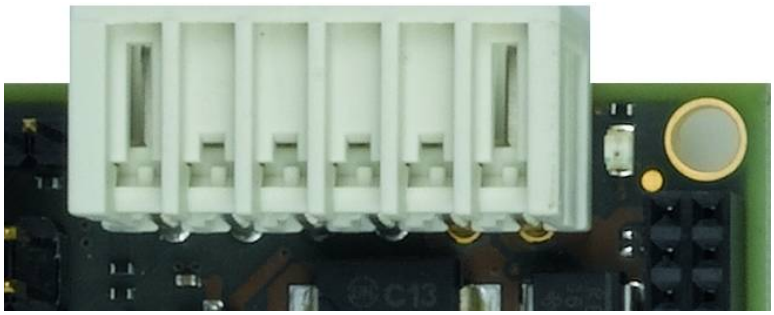
The phyBOARD-Wega is available with three different power supply connectors. Depending on your order you will find one of the following connectors on your SBC:

1. a 2-pole Phoenix Contact MINI COMBICON base strip 3.5 mm connector (X67) suitable for a single 5 V supply voltage, or
2. an USB Micro-AB connector (X72) to connect a standard 5 V USB power supply, or
3. a 6-pole WAGO male header (X67) to attach the Power Module for phyBOARDs (PEB-POW-01) which provides connectivity for 12 V – 24 V

The required current load capacity for all power supply solutions depends on the specific configuration of the phyCORE mounted on the phyBOARD-Wega, the particular interfaces enabled while executing software, as well as whether an optional expansion board is connected to the carrier board.



Phoenix MINI COMBICON base strip



WAGO male header 6-pole

Figure 3: Power Supply Connectors (X67)

2.2.1.1.1 Phoenix Contact 2-pole MINI COMBICON Base Strip (X67)

The permissible input voltage is +5 V DC if your SBC is equipped with a 2-pole Phoenix Contact MINI COMBICON base strip. A 5 V adapter with a minimum supply of 1.5 A is recommended to supply the board via the 2-pole base strip.

Figure 3 and the following table show the pin assignment.

Pin	Signal	Description
1	VCC5V_IN	+5 V power supply
2	GND	Ground

Table 6: Pin Assignment of the 2-pole Phoenix Contact MINI COMBICON Base Strip at X67

2.2.1.1.2 USB Micro-AB (X72)

If your board provides an USB Micro-AB female connector (X72) at the upper side of the board a standard USB Micro power supply with +5 V DC can be used to supply the phyBOARD-Wega.

	Do not confuse the USB Micro connector on the upper side of the board with the one on the back side of the board which provides USB OTG connectivity. The USB Micro connector on the upper side is exclusively used for power supply and has no other USB functionality!

2.2.1.1.3 WAGO 6-pole Male Header (X67)

If a WAGO 6-pole male header is mounted on your board (*Figure 2* and *Figure 3*) your board is prepared to connect to a phyBOARD Power Module (PEB-POW-01), or a custom power supply circuitry. The ordering number of the mating connector from WAGO is:
EAN 4045454120610.

Use of the 6-pole connector has the following advantages:

- Higher and wider operate range of the input voltage
- External scaling potential to optimize the electrical output current, by use of customized power modules which match the requirements
- 5 V, 3.3 V and backlight power supply

Pin assignment of the 6–pole WAGO connector:

Pin	Signal	Description
1	VCC5V_IN	+5 V power supply
2	GND	Ground
3	VCC3V3_PMOD	+3.3 V power supply
4	VCC_BL	Backlight power supply (input voltage of power module)
5	PMOD_PWRGOOD	Power good signal (connected to reset nRESET_IN)
6	nPMOD_PWRFAIL	Power fail signal

Table 7: Pin Assignment of the 6-pole WAGO Connector at X67

A detailed description of the Power Module for phyBOARDs can be found in the Application Guide for phyBOARD Expansion Boards (L-793e).

2.2.1.2 Power LED D58

The red LED D58 right next to the power connector (*Figure 2*) indicates the presence of the 3.3 V supply voltage generated from the 5 V input voltage.

2.2.1.3 VBAT and RTC

The phyBOARD-Wega features an external RTC mounted on the phyCORE-AM335x module. It is used for real-time or time-driven applications. To backup the RTC on the module, a Gold cap (C339) (*Figure 2*) is placed on the phyBOARD-Wega. This voltage source is connected to the backup voltage pin VBAT_IN_4RTC (A2) of the phyCORE-AM335x and supplies the RTC and some critical registers of the Power Management IC when the primary system power, VCC5V_IN, is removed. The backup supply lasts approximately 17½ days.

2.2.2 UART Connectivity (X66 and X69)

The AM335x SOM supports up to 6 so called UART units. On the phyBOARD-Wega the TTL level signals of UART0 (the standard console), UART2 and UART3 are routed to expansion connector X69. UART1 is available at pin header connector X66 at RS-232 level.

	The Evaluation Board (PEB-EVAL-01) delivered with the kit plugs into the expansion connector and allows easy use of the standard console (UART0) which is required for debugging. Please find additional information on the Evaluation Board in the Application Guide for phyBOARD Expansion Boards (L-793e).

Further information on the expansion connector can be found in *section 3.2.4.*

Pin header connector X66 is located next to the USB host connector (*Figure 4)* and provides the UART1 signals of the AM335x at RS-232 level. The serial interface is intended to be used as data terminal equipment (DTE) and allows for a 5-wire connection including the signals RTS and CTS for hardware flow control. *Table 8* shows the signal mapping of the RS-232 level signals at connector X66.

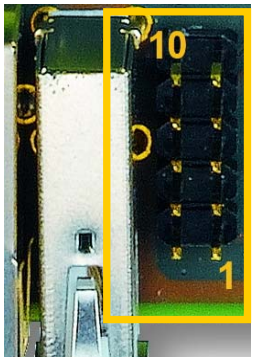


Figure 4: RS-232 Interface Connector (X66)

Pin	Signal	Pin	Signal
1	NC	2	NC
3	UART1_RXD_RS232	4	UART1_RTS_RS232
5	UART1_TXD_RS232	6	UART1_CTS_RS232
7	NC	8	NC
9	GND	10	NC

Table 8: Pin Assignment of RS-232 Interface Connector X66

An adapter cable is included in the phyBOARD-Wega AM335x Kit to facilitate the use of the UART1 interface. The following figure shows the signal mapping of the adapter.

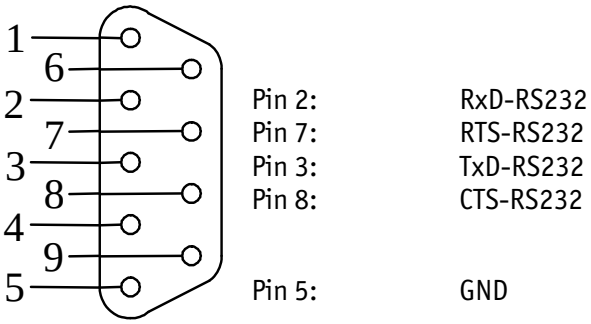


Figure 5: RS-232 Connector Signal Mapping

2.2.3 Ethernet Connectivity (X16 and X17)

The Ethernet interfaces of the phyBOARD-Wega are accessible at two RJ45 connectors X16 (Ethernet 0) and X17 (Ethernet 1).

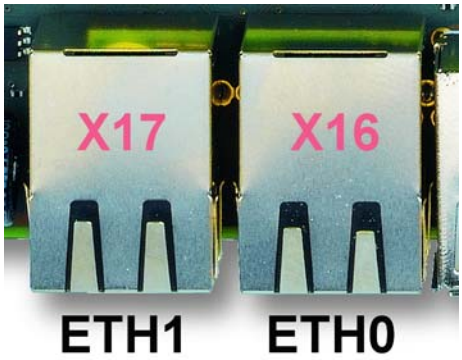


Figure 6: Ethernet Interfaces at Connectors (X16 and X17)

Both Ethernet interfaces are configured as 10/100Base-T networks. The LEDs for LINK (green) and SPEED (yellow) indication are integrated in the connector. Both Ethernet transceivers support HP Auto-MDIX, eliminating the need for the consideration of a direct connect LAN cable, or a cross-over path cable. They detect the TX and RX pins of the connected device and automatically configure the PHY TX and RX pins accordingly.

2.2.3.1 MAC Address

In a computer network such as a local area network (LAN), the MAC (Media Access Control) address is a unique computer hardware number. For a connection to the Internet, a table is used to convert the assigned IP number to the hardware's MAC address.

In order to guarantee that the MAC address is unique, all addresses are managed in a central location. Phytec has acquired a pool of MAC addresses. The MAC address of the phyBOARD-Wega is located on the bar code sticker attached to the module. This number is a 12-digit HEX value.

2.2.4 USB Connectivity (X15 and X42)

The phyBOARD-Wega provides one USB host and one USB OTG interface.

USB0 is accessible at connector X42 (USB Micro-AB) located at the back side of the phyBOARD-Wega. It is configured as USB OTG. USB OTG devices are capable to initiate a session, control the connection and exchange host and peripheral roles between each other. This interface is compliant with USB revision 2.0.

USB1 is accessible on the top at connector X15 (USB Standard-A) and is configured as USB host.

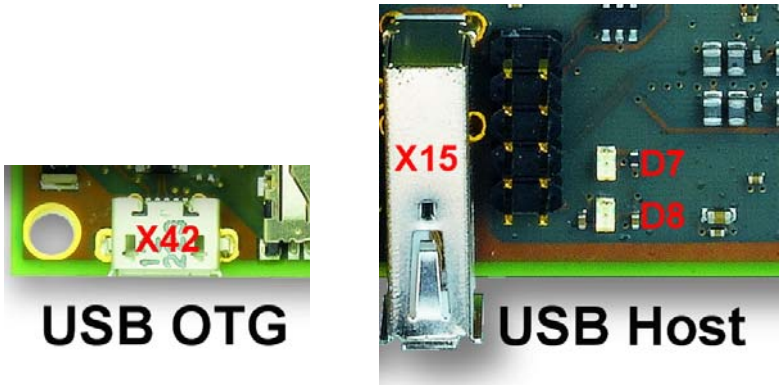


Figure 7: Components supporting the USB Interfaces

LED D8 displays the status of USB0_VBUS and LED D7 the status of USB1_VBUS.

Numerous jumpers allow configuring the USB interfaces according to your needs. Please refer to *section 3.2.1* for more information.

2.2.5 Audio Interface (X55 and X73)

The audio interface provides a method of exploring AM335x's audio capabilities. The phyBOARD-Wega is populated with an audio codec at U35. The audio codec is connected to the AM335x's McASP0 interface to support stereo line input and stereo line output at connector X73. In addition to that the phyBOARD-Wega has one direct mono speaker output (1 W) at the Molex connector X55.

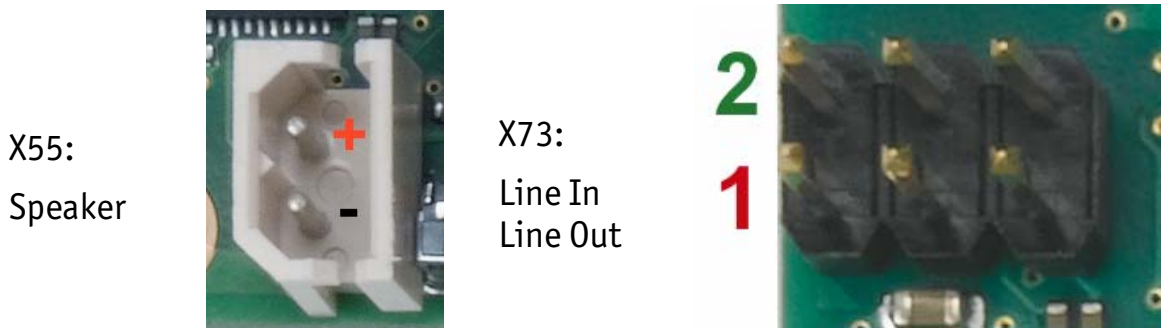


Figure 8: Audio Interfaces at Connectors (X55 and X73)

Pin	Signal	Pin	Signal
1	LINE_IN_L	2	LINE_IN_R
3	AGND	4	AGND
5	LINE_OUT_L	6	LINE_OUT_R

Table 9: Pin Assignment of Audio Connector X73

Pin	Signal	Description
1	SPOP	Class-D positive differential output
2	SPOM	Class-D negative differential output

Table 10: Pin Assignment of Audio Connector X55

The audio codec can be configured via I²C interface I²C0 at address 0x18.

For additional audio applications the McASP0 interface of the AM335x including the signals X_MCASP0_AHCLKX, X_I2S_CLK, X_I2S_FRM, X_I2S_ADC and X_I2S_DAC are routed to the A/V connector X71 (please refer to *section 3.2.3* for additional information on the A/V connector).

Please refer to the audio codec's reference manual for additional information regarding the special interface specification.

2.2.6 CAN Connectivity (X65, JP3)

The Controller Area Network (CAN) bus offers a low-bandwidth, prioritized message fieldbus for serial communication between microcontrollers. It efficiently supports distributed real time control with a high level of security. The DCAN module of the AM335x implements the CAN protocol according to the CAN 2.0B protocol specification and supports bitrates up to 1 Mbit/s.

The CAN1 interface of the phyBOARD-Wega AM335x is accessible at connector X65 (2×5 pin header, 2.54 mm pitch).

Jumper JP3 can be installed to add a 120 Ohm termination resistor across the CAN data lines if needed.

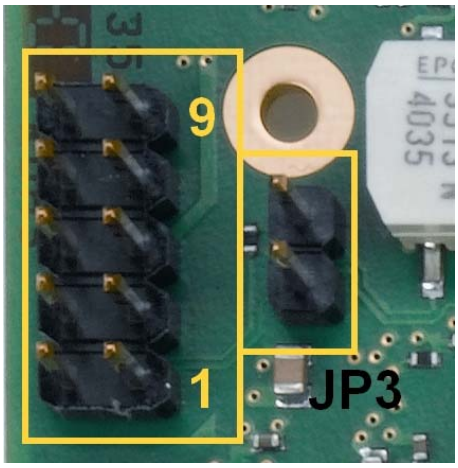


Figure 9: Components supporting the CAN Interface

Table 11 below shows the signal mapping of the CAN1 signals at connector X65.

Pin	Signal	Pin	Signal
1	NC	2	GND
3	X_CANL	4	X_CANH
5	GND	6	NC
7	NC	8	NC
9	Shield	10	NC

Table 11: Pin Assignment of CAN Connector X65

An adapter cable is included in the phyBOARD-Wega AM335x Kit to facilitate the use of the CAN interface. The following figure shows the signal mapping of the adapter.

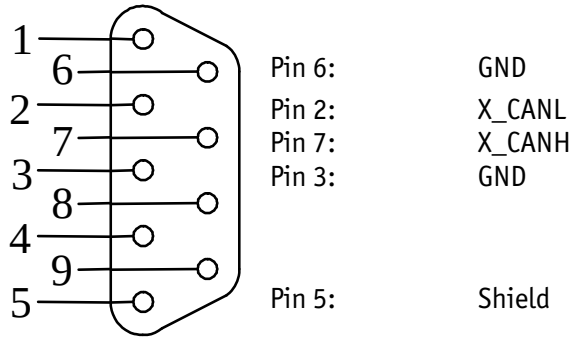


Figure 10: CAN Connector Signal Mapping

Depending on the muxing options a second CAN interface (CAN0) is available on expansion port X69 (*section 3.2.4*). CAN0 (TX and RX) can be used instead of UART0 (RX and TX) or MMC2 (DAT1 and DAT2).

2.2.7 Secure Digital Memory Card/ MultiMedia Card (X11)

Figure 11: MMC/SD Card Interface at Connector (X11)

The phyBOARD-Wega provides a standard microSDHC card slot at X11 for connection to MMC/SD interface cards. It allows easy and convenient connection to peripheral devices like SD- and MMC cards. Power to the SD interface is supplied by inserting the appropriate card into the MMC/SD connector, which features card detection, a lock mechanism and a smooth extraction function by Push-in/ Push-out of card.

DIP switch S4 allows to toggle between NAND boot and boot from SD card. In order to boot from SD card S4 must be switched ON (refer to *section 2.2.8* for further information).

2.2.8 Boot Mode (S4)

The pyhBOARD-Wega has two defined boot sequences which can be selected with DIP switch S4.

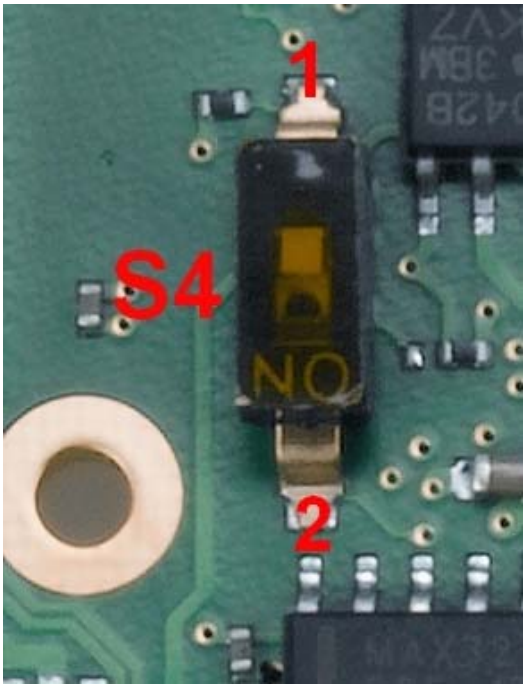


Figure 12: Boot Switch (S4)

Boot Mode	Description
Boot mode 1 (S4 = OFF)	SYSBOOT[4:0] = 10011b → NAND, NANDI2C, MMC0, UART0
Boot mode 2 (S4 = ON)	SYSBOOT[4:0] = 10111b → MMC0, SPI0, UART0, USB

Table 12: Boot Switch Configuration (S4)

2.2.9 System Reset Button (S2)

The phyBOARD-Wega is equipped with a system reset button at S2. Pressing this button will toggle the X_nRESET_IN pin (X64A11) of the phyCORE SOM low, causing the module to reset. Additionally, the reset signal nRESET_OUT is generated on the module to also reset the peripherals on the carrier board.

Figure 13: System Reset Button (S2)

2.2.10 Audio/Video Connectors (X70 and X71)

The Audio/Video (A/V) connectors X70 and X71 provide an easy way to add typical A/V functions and features to the phyBOARD-Wega. Standard interfaces such as parallel display, I^2S and I^2C as well as different supply voltages are available at the two A/V female dual entry connectors. Special feature of these connectors are their connectivity from the bottom or the top.

For further information of the A/V connectors see *chapter 3.2.2*. Information on the expansion boards available for the A/V Connectors can be found in the Application Guide for phyBOARD Expansion Boards (L-793e).

2.2.11 Expansion Connector (X69)

Expansion connector X69 provides an easy way to add other functions and features to the phyBOARD-Wega. Standard interfaces such as JTAG, UART, MMC2, SPI and I^2C as well as different supply voltages and some GPIOs and analog inputs are available at the expansion female connector.

For further information of the expansion connector and the pinout see *chapter 3.2.4*. Information on the expansion boards available for the expansion connector can be found in the Application Guide for phyBOARD Expansion Boards (L-793e).

3 System Level Customizing

3.1 About this Section

This section addresses advanced developers who want to design custom expansion boards, or display adapters. It includes detailed information on the different interfaces and features of the phyBOARD-Wega at a system level.

3.2 System Level Hardware Information

3.2.1 USB Connectivity (X15 and X42)

Numerous jumpers allow configuring the USB interfaces according to your needs.

	Due to the small footprint of the jumpers we do not recommend manual jumper modifications. This might also render the warranty invalid. Please contact our sales team if you need one of the USB configurations described below.

3.2.1.1 Combining the Overcurrent Signals (J78 and J77)

To save one GPIO of the controller for other purposes jumper J78 allows connecting the overcurrent signals of both USB interfaces USB0 and USB1 to one single GPIO (GPIO3_18). If the two overcurrent signals need to be evaluated separately, the OC signal of USB0 can be connected to GPIO3_19 and the OC signal of USB1 to GPIO3_18.

The following table shows the available configurations:

J78	Description
1+2	Separate OC signals for USB1 (nUSB1_OC_GPIO3_18) and USB0 (nUSB0_OC_GPIO3_19)
2+3	**One OC signal (nUSB1_OC_GPIO3_18) for both USB interfaces**

Table 13: USB0C Configuration

	If J78 is set to 1+2, J77 also has to be set to 1+2.

3.2.1.2 Rerouting the USB Interfaces to different Connectors (J72 – J75, J79 and J80)

For later expansion boards one of the two USB interfaces can be routed to the expansion connector (X69). The following table shows all possible configurations.

Mode	J72	J73	J74	J75	J79	J80
USB1 at USB-A connector X15 and USB0 at USB-OTG connector X42	**1+2**	**1+2**	**1+2**	**1+2**	**nm**	**nm**
USB1, USB1_VBUS and X_USB1_ID at expansion connector X69[2, 3] USB0 at USB-OTG connector X42	2+3	2+3	1+2	1+2	1+2[4]	1+2
USB0, USB0_VBUS and USB0_ID at expansion connector X69[2, 3] USB1 at USB-A connector X15	1+2	1+2	2+3	2+3	2+3	2+3

Table 14: USB Routing Configuration

3.2.2 I²C Connectivity

The I²C interface of the AM335x is available at different connectors on the phyBOARD-Wega. The following table provides a list of the connectors and pins with I²C connectivity.

Connector	Location
Expansion connector X69	pin 11 (X_I2C0_SDA); pin 13 (X_I2C0_SCL)
A/V connector X71	pin 16 (X_I2C0_SDA); pin 15 (X_I2C0_SCL)

Table 15: I²C Connectivity

To avoid any conflicts when connecting external I²C devices to the phyBOARD-Wega the addresses of the on-board I²C devices must be considered. *Table 16* lists the addresses already in use. The table shows only the default address.

[2]: **Caution!** The voltage level of the USB ID signal X_USB_ID_EXP, is 1.8 V. Steady state voltages above 2.1 V applied to this signal may damage the AM335x.
[3]: **Caution!** There is no protective circuit for the USB interfaces brought out at the expansion connector.
[4]: **Note:** The ID pin of USB1 is hardwired. To use the function at the expansion connector R399 must be removed, too.

Board	Prod. No.	Device	Address used (7 MSB)
phyCORE-AM335x	PCL-051	EEPROM	0x52
		RTC	0x68
		PMIC	0x2D, 0x12
phyBOARD-Wega	PBA-CD-02	Audio	0x18
AV-Adapter HDMI	PEB-AV-01	HDMI Core	0x70
		CEC Core	0x34
AV-Adapter Display	PEB-AV-02	GPIO Expander	0x41
Evaluation Board	PEB-EVAL-01	EEPROM	0x56
M2M Board	PEB-C-01	GPIO Expander	0x20
		GPIO Expander	0x21
		GPIO Expander	0x22

Table 16: I^2C Addresses in Use

3.2.3 Audio/Video Connectors (X70 and X71)

The Audio/Video (A/V) connectors X70 and 71 provide an easy way to add typical A/V functions and features to the phyBOARD-Wega. Standard interfaces such as parallel display, I^2S and I^2C as well as different supply voltages are available at the two A/V female dual entry connectors. Special feature of these connectors are their connectivity from the bottom or the top. The pinout of the A/V connectors is shown in *Table 17* and *Table 18*.

The A/V connector is intended for use with phyBOARD Expansion Boards[5], and to add specific audio/video connectivity with custom expansion boards.

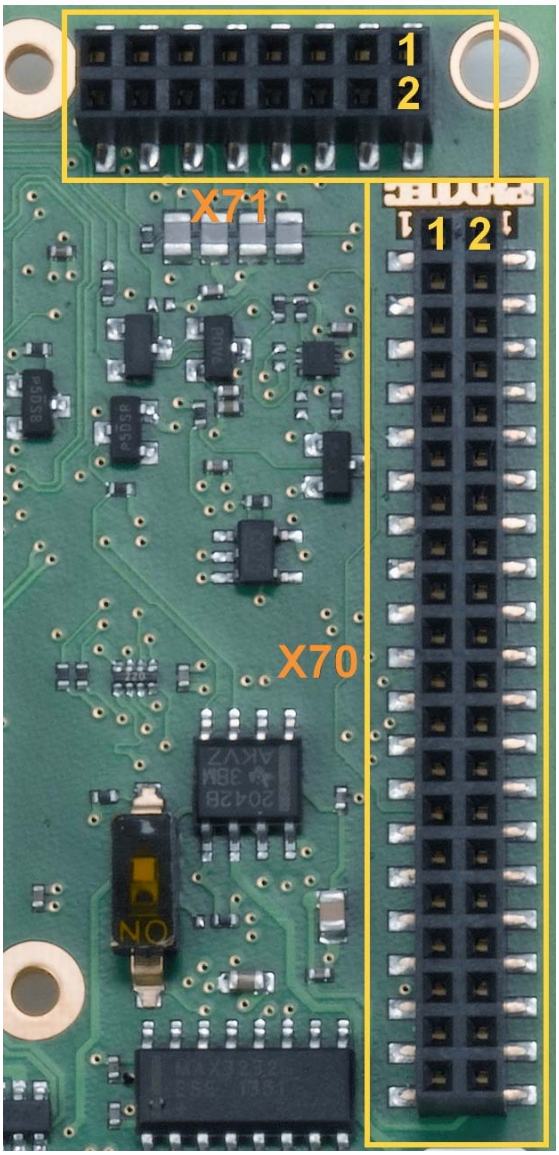


Figure 14: Audio/Video Connectors (X70 and X71)

A/V connector X70 makes all signals for display connectivity available, while X71 provides signals for audio and touch screen connectivity, as well as an I^2C bus and additional control signals.

5: Please find additional information on phyBOARD Expansion Boards in the corresponding application guide (L-793e).

Pin #	Signal Name	Type	SL	Description
1	GND	-	-	Ground
2	X_LCD_D21	OUT	3.3 V	LCD D21
3	X_LCD_D18	OUT	3.3 V	LCD D18
4	X_LCD_D16	OUT	3.3 V	LCD D16
5	X_LCD_D0	OUT	3.3 V	LCD D0
6	GND	-	-	Ground
7	X_LCD_D1	OUT	3.3 V	LCD D1
8	X_LCD_D2	OUT	3.3 V	LCD D2
9	X_LCD_D3	OUT	3.3 V	LCD D3
10	X_LCD_D4	OUT	3.3 V	LCD D4
11	GND	-	-	Ground
12	X_LCD_D22	OUT	3.3 V	LCD D22
13	X_LCD_D19	OUT	3.3 V	LCD D19
14	X_LCD_D5	OUT	3.3 V	LCD D5
15	X_LCD_D6	OUT	3.3 V	LCD D6
16	GND	-	-	Ground
17	X_LCD_D7	OUT	3.3 V	LCD D7
18	X_LCD_D8	OUT	3.3 V	LCD D8
19	X_LCD_D9	OUT	3.3 V	LCD D9
20	X_LCD_D10	OUT	3.3 V	LCD D10
21	GND	-	-	Ground
22	X_LCD_D23	OUT	3.3 V	LCD D23
23	X_LCD_D20	OUT	3.3 V	LCD D20
24	X_LCD_D17	OUT	3.3 V	LCD D17
25	X_LCD_D11	OUT	3.3 V	LCD D11
26	GND	-	-	Ground
27	X_LCD_D12	OUT	3.3 V	LCD D12
28	X_LCD_D13	OUT	3.3 V	LCD D13
29	X_LCD_D14	OUT	3.3 V	LCD D14
30	X_LCD_D15	OUT	3.3 V	LCD D15
31	GND	-	-	Ground
32	X_LCD_PCLK	OUT	3.3 V	LCD Pixel Clock
33	X_LCD_BIAS_EN	OUT	3.3 V	LCD BIAS
34	X_LCD_HSYNC	OUT	3.3 V	LCD Horizontal Synchronization
35	X_LCD_VSYNC	OUT	3.3 V	LCD Vertical Synchronization

Table 17: Pin Assignment of Phytec A/V Connector X70

Pin #	Signal Name	Type	SL	Description
36	GND	-	-	Ground
37	GND	-	-	Ground
38	X_PWM1_OUT	OUT	3.3 V	Pulse Width Modulation
39	VCC_BL	OUT	NS	Backlight power supply[6]
40	VCC5V	OUT	5.0 V	5 V power supply

Table 17: Pin Assignment of Phytec A/V Connector X70 (continued)

Pin #	Signal Name	Type	SL	Description
1	X_I2S_CLK	I/O	3.3 V	I²S Clock
2	X_I2S_FRM	I/O	3.3 V	I²S Frame
3	X_I2S_ADC	I/O	3.3 V	I²S Analog-Digital converter (microphone)
4	X_I2S_DAC	I/O	3.3 V	I²S Digital-Analog converter (speaker)
5	X_AV_INT_GPIO1_30	I/O	3.3 V	A/V interrupt; GPIO1_30
6	nUSB0_OC_GPIO3_19 or X_MCASP0_AHCLKX_GPIO3_21	I/O	3.3 V	GPIO3_19 or McASP0 high frequency clock (see below)
7	GND	-	-	Ground
8	nRESET_OUT	OUT	3.3 V	Reset
9	TS_X+	IN	1.8 V	Touch X+
10	TS_X-	IN	1.8 V	Touch X-
11	TS_Y+	IN	1.8 V	Touch Y+
12	TS_Y-	IN	1.8 V	Touch Y-
13	VCC3V3	OUT	3.3 V	3.3 V power supply
14	GND	-	-	Ground
15	X_I2C0_SCL	I/O	3.3 V	I²C Clock
16	X_I2C0_SDA	I/O	3.3 V	I²C Data

Table 18: Pin Assignment of Phytec A/V Connector X71

Jumper J77 connects either signal X_MCASP0_AHCLKX_GPIO3_21, or signal nUSB1_OC_GPIO3_19 to pin 6 of X71. The following table shows the available configurations:

J77	Description
1+2	X_MCASP0_AHCLKX_GPIO3_21
2+3	**nUSB1_OC_GPIO3_19**

Table 19: A/V Jumper Configuration J77

[6] Voltage level is not specified and depends on the connected power module and the voltage attached.

	If J77 is set to 2+3, J78 also has to be set to 2+3.

3.2.3.1 Brightness

The PWM signal at pin 38 allows changing the brightness of the display attached to the A/V connector.

3.2.3.2 I²C Connectivity

Please refer to *section 3.2.2* for complete information on the I²C connectivity.

3.2.3.3 Audio I²S

Audio support on the module is done via the I²S interface and controlled via I²C.

On the phyBOARD-Wega the audio codec's registers can be accessed via the I2C0 interface at address 0x18 (7-bit MSB addressing).

3.2.3.4 User programmable GPIOs

Two pins of the A/V connector X71 are dedicated as GPIO (*Table 18*). These signals are also available/used on the corresponding expansion-boards, e.g. PEB-AV-02. For more information please look at the Expansion Boards Application Guide (L-793e).

	The BSP delivered with the phyBOARD-Wega supports the GPIOs according to the configuration done in correspondence to the expansion board installed on delivery. Thus the GPIOs might not be available if they are needed to support functions of the expansion board. In order to apply the GPIOs for other purposes after removal of the expansion board the BSP must be exchanged, too. From BSP version Am335x-PD14.1-rc1 on it is possible to configure the BSP in regard to the hardware configuration. This allows to easily adapt the BSP if an expansion board is attached, removed, or exchanged, thus allowing to release the GPIOs for other purposes.

With the appropriate BSP / BSP configuration the GPIOs (GPIO1_30, GPIO3_19, or GPIO3_21) are available as input by default.

The following table lists all GPIOs, their location, their number and their default usage.

Pin #	GPIO Name	Default Usage	Comment
5	GPIO1_30	IN	
6	GPIO3_19 or GPIO3_21	IN	selectable with jumper J77

Table 20: GPIOs available at A/V Connector X71

3.2.4 Expansion Connector (X69)

Figure 15: Expansion Connector (X69)

Expansion connector X69 provides an easy way to add other functions and features to the phyBOARD-Wega. Standard interfaces such as UART, SPI and I^2C as well as different supply voltages and some GPIOs are available at the expansion female connector.

The expansion connector is intended for use with phyBOARD Expansion Boards[7], and to add specific functions with custom expansion boards.

The pinout of the expansion connector is shown in the following table.

[7]: Please find additional information on phyBOARD Expansion Boards in the corresponding application guide (L-793e).

Pin #	Signal Name	Type	SL	Description
1	VCC3V3	OUT	3.3 V	3.3 V power supply
2	VCC5V	OUT	5.0 V	5 V power supply
3	VDIG1_1P8V	OUT	1.8 V	1.8 V power supply (max. 300 mA)
4	GND	-	-	Ground
5	X_SPI0_CS0	OUT	3.3 V	SPI 0 chip select 0
6	X_SPI0_MOSI	OUT	3.3 V	SPI 0 master output/slave input
7	X_SPI0_MISO	IN	3.3 V	SPI 0 master input/slave output
8	X_SPI0_CLK	OUT	3.3 V	SPI 0 clock output
9	GND	-	-	Ground
10	X_UART0_RXD	IN	3.3 V	UART 0 receive data (standard debug interface)
11	X_I2C0_SDA	I/O	3.3 V	I2C0 Data
12	X_UART0_TXD	OUT	3.3 V	UART 0 transmit data (standard debug interface)
13	X_I2C0_SCL	I/O	3.3 V	I2C0 Clock
14	GND	-	-	Ground
15	X_JTAG_TMS	IN	3.3 V	JTAG Chain Test Mode Select signal
16	X_nJTAG_TRST	IN	3.3 V	JTAG Chain Test Reset
17	X_JTAG_TDI	IN	3.3 V	JTAG Chain Test Data Input
18	X_JTAG_TDO	OUT	3.3 V	JTAG Chain Test Data Output
19	GND	-	-	Ground
20	X_JTAG_TCK	IN	3.3 V	JTAG Chain Test Clock signal
21	X_USB_DP_EXP	I/O	3.3 V	USB data plus (for USB0 or USB1)[9; 10]
22	X_USB_DM_EXP	I/O	3.3 V	USB data minus (for USB0 or USB1)[9; 10]
23	nRESET_OUT	OUT	3.3 V	Reset
24	GND	-	-	Ground
25	X_MMC2_CMD	I/O	3.3 V	MMC command
26	X_MMC2_DAT0	I/O	3.3 V	MMC data 0
27	X_MMC2_CLK	I/O	3.3 V	MMC clock
28	X_MMC2_DAT1	I/O	3.3 V	MMC data 1
29	GND	-	-	Ground
30	X_MMC2_DAT2	I/O	3.3 V	MMC data 2
31	X_UART2_RX_GPIO3_9	I/O	3.3 V	UART 2 receive data; GPIO3_9[8]
32	X_MMC2_DAT3	I/O	3.3 V	MMC data 3
33	X_UART2_TX_GPIO3_10	I/O	3.3 V	UART 2 transmit data; GPIO3_10[8]

Table 21: Pin Assignment of Phytec Expansion Connector X69

Pin #	Signal Name	Type	SL	Description
34	GND	-	-	Ground
35	X_UART3_RX_GPIO2_18	I/O	3.3 V	UART 3 receive data; GPIO2_18[8]
36	X_UART3_TX_GPIO2_19	I/O	3.3 V	UART 3 transmit data; GPIO2_19[8]
37	X_INTR1_GPIO0_20	I/O	3.3 V	Interrupt 1; GPIO0_20
38	X_GPIO0_7	I/O	3.3 V	GPIO0_7
39	X_AM335_EXT_WAKEUP	IN	3.3 V	External wakeup
40	X_INT_RTCn	OUT	3.3 V	Interrupt from the RTC
41	GND	-	-	Ground
42	X_GPIO3_7_nPMOD_PWRFAIL	I/O	3.3 V	GPIO3_7; **Caution!** Also connected to power fail signal through R415.
43	nRESET_IN	IN	3.3 V	Push-button reset
44	X_GPIO1_31	I/O	3.3 V	GPIO1_31
45	X_AM335_NMIn	IN	3.3 V	AM335x non-maskable interrupt
46	GND	-	-	Ground
47	X_AIN4	IN	1.8 V	Analog input 4
48	X_AIN5	IN	1.8 V	Analog input 5
49	X_AIN6	IN	1.8 V	Analog input 6
50	X_AIN7	IN	1.8 V	Analog input 7
51	GND	-	-	Ground
52	X_GPIO_CKSYNC	I/O	3.3 V	GPIO Clock Synchronization
53	X_USB_ID_EXP	IN	1.8 V	USB port identification (for USB0 or USB1)[9]
54	USB_VBUS_EXP	OUT	5.0 V	USB bus voltage (for USB0 or USB1) [9] [10]
55	X_USB1_CE	OUT	3.3 V	USB 1 charger enable
56	GND	-	-	Ground
57	VCC_BL	OUT	NS	Backlight power supply[11]
58	X_PB_POWER	IN	5.0 V	Power On for Power Management IC for AM335x
59	GND	-	-	Ground
60	VCC5V_IN	IN	5.0 V	5 V input supply voltage

Table 21: Pin Assignment of Phytec Expansion Connector X69 (continued)

[8]: These pins are configured as GPIO pins. To use them as UART interface the pin muxing must be changed and additional software development is required.
[9]: Jumpers J72 – J75, J79 and J80 allow to configure the USB interface at the expansion connector (*Table 14*).
[10]: **Caution!** There is no protective circuit for the USB interface brought out at the expansion connector X69.
[11]: Voltage level is not specified and depends on the connected power module and the voltage attached.

	If the SPI-NOR Flash on the phyCORE-AM335x is populated, the SPI signals on the expansion port can not be used.

3.2.4.1 USB Connectivity

Depending on the configuration of jumpers J72 – JJ75, J79 and J80 either USB0, or USB1 can be connected to the expansion connector X69 (*section 3.2.1.2*). Both USB interfaces can be used as USB host as well as USB OTG interface.

	**Caution!** There is no protective circuit for the USB interface brought out at the expansion connector X69.

	**Caution!** The voltage level of the USB ID signal X_USB_ID_EXP, is 1.8 V. Steady state voltages above 2.1 V applied to this signal may damage the AM335x.

3.2.4.2 I²C Connectivity

Please refer to *section 3.2.2* for complete information on I²C connectivity.

3.2.4.3 User programmable GPIOs

Eight pins of the expansion connector are dedicated as GPIO (*Table 21*). These signals are also available on the corresponding expansion-boards, e.g. PEB-EVAL-01. For more information please look at the Expansion Boards Application Guide (L-793e).

	The BSP delivered with the phyBOARD-Wega supports the GPIOs according to the configuration done in correspondence to the expansion board installed on delivery. Thus the GPIOs might not be available if they are needed to support functions of the expansion board. In order to apply the GPIOs for other purposes after removal of the expansion board the BSP must be exchanged, too. From BSP version Am335x-PD14.1-rc1 on it is possible to configure the BSP in regard to the hardware configuration. This allows to easily adapt the BSP if an expansion board is attached, removed, or exchanged, thus allowing to release the GPIOs for other purposes.

With the appropriate BSP / BSP configuration the GPIOs (GPIO0_20, GPIO0_7, GPIO1_31, GPIO3_7 and GPIO3_10) are available as input by default.

The following table lists all GPIOs, their location and default usage as configured in the standard BSP delivered with the phyBOARD-Wega AM335x.

Pin #	GPIO Name	Default Usage
31	GPIO3_9	LED3 out
33	GPIO3_10	IN
35	GPIO2_18	LED1 out
36	GPIO2_19	LED2 out
37	GPIO0_20	IN
38	GPIO0_7	IN
42	GPIO3_7	IN
44	GPIO1_31	IN

Table 22: GPIOs available at Expansion Connector X69

4 Revision History

Date	Version #	Changes in this manual
20.04.2017	First Edition L-836e_1	First edition created by extracting the hardware part from the former Application Guide (L-792e_2) describing the phyCORE-AM335x SOM with phyBOARD-Wega- Carrier Board.

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