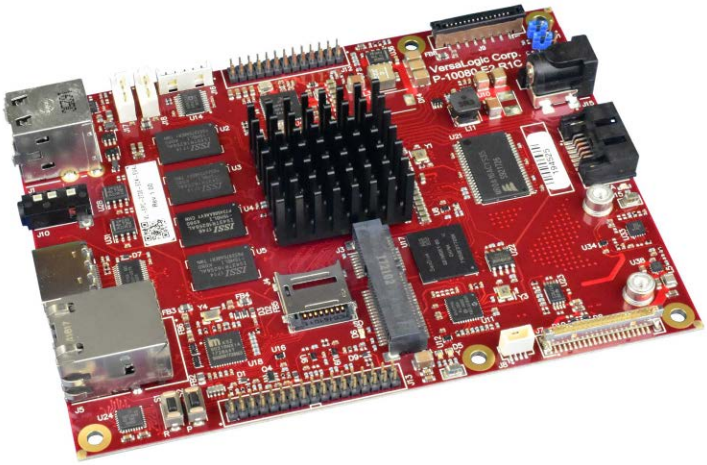


Hardware Reference Manual

REV. January 2020

Tetra (VL-EPC-2700)

Arm* i.MX6 Single Board Computer with Gigabit Ethernet, Video, USB, SATA, Serial I/O, Digital I/O, CAN Bus, SPI, Mini PCIe, mSATA and I²C

VERSALOGIC CORPORATION

WWW.VERSALOGIC.COM

12100 SW Tualatin Road
Tualatin, OR 97062-7341
(503) 747-2261
Fax (971) 224-4708

Notice:

Although every effort has been made to ensure this document is error-free, VersaLogic makes no representations or warranties with respect to this product and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose.

VersaLogic reserves the right to revise this product and associated documentation at any time without obligation to notify anyone of such changes.

* Other names and brands may be claimed as the property of others.

Product Release Notes

Rev 1.00	Production release for the Rev 1.0 board
Rev 1.10	Added backup battery information
Rev 1.20	Updated the Block Diagram for clarity. Added PCI Messaging interrupt information in the Known Issues section.
Rev 1.30	Added CBR-0406
Rev 1.40	Updated table 2 with various connector details
Rev 1.50	Added a backdrive note to table 11

Support Page

The Tetra Support Page contains additional information and resources for this product including:

- Operating system information and software drivers
- Data sheets and manufacturers' links for chips used in this product
- BIOS information and upgrades

VersaTech KnowledgeBase

The VersaTech KnowledgeBase contains useful technical information about VersaLogic products, along with product advisories.

Customer Support

If you are unable to solve a problem after reading this manual, visiting the product support page, or searching the KnowledgeBase, contact VersaLogic Technical Support at (503) 747-2261. VersaLogic support engineers are also available via e-mail at Support@VersaLogic.com.

Repair Service

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling 503-747-2261. Be ready to provide the following information:

Your name, the name of your company, your phone number, and e-mail address

The name of a technician or engineer that can be contacted if any questions arise

The quantity of items being returned

The model and serial number (barcode) of each item

A detailed description of the problem

Steps you have taken to resolve or recreate the problem

The return shipping address

Warranty Repair: All parts and labor charges are covered, including return shipping charges for UPS Ground delivery to United States addresses.

Non-warranty Repair: All approved non-warranty repairs are subject to diagnosis and labor charges, parts charges and return shipping fees. Specify the shipping method you prefer and provide a purchase order number for invoicing the repair.

Note: Mark the RMA number clearly on the outside of the box before returning.

Contents

Figures

Tables

Introduction 1

Description

Features and Construction

The Tetra is a compact embedded computer system featuring very low power consumption. Designed around an NXP i.MX6 quad-core processor, the entire board typically uses about 4W of power. Multiple on-board I/O interfaces and soldered-on memory offers system designers a flexible, reliable, low-power platform. In addition, the Tetra also contains a full complement of on-board I/O interfaces, including USB 2.0, a mini PCIe expansion or mSATA socket, Gigabit Ethernet, multiple serial interfaces, and 8-bits of digital I/O.

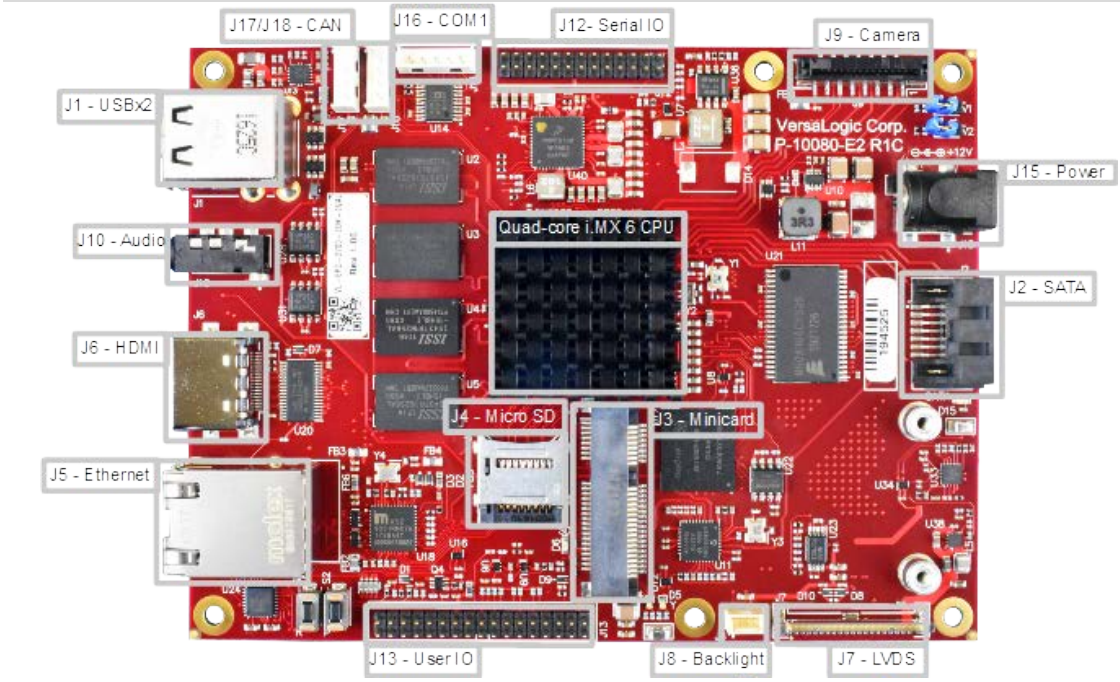
Tetra is designed to operate with no moving parts and is tested to withstand extreme temperatures, high-impact, and vibration. A built-in power supply permits 8 to 17 volt input, such as 12 volt automotive systems. This single board computer is an ideal choice for applications that require moderate performance, low-power, highest quality, and long product life.

- Arm* i.MX6 quad-core processor
- 95 x 125mm size
- Low power draw
- Fanless Operation
- Up to 4 GB soldered-on RAM
- Gigabit Ethernet
- HDMI and LVDS video
- CAN Bus
- MIPI camera input
- Mini PCIe or mSATA socket
- USB 2.0 ports
- Serial I/O (RS-232)
- SATA II port
- MicroSD card socket
- 128 KB Magnetic RAM
- eMMC Flash. Up to 32 GB
- SPI
- I^2C
- Eight 3.3V GPIO and three PWM outputs

VL-EPC-2700 boards are subjected to complete functional testing and are backed by a limited five-year warranty. Careful parts sourcing and US-based technical support ensure the highest possible quality, reliability, service, and product longevity for this exceptional single-board computer (SBC).

The next figure shows the locations of the Tetra board's connectors and major components on the top.

Figure 1. Major Components and Connectors



Technical Specifications

See the Tetra Data Sheet for complete specifications.

Thermal Considerations

The operating temperature for the Tetra is -40°C to +85°C, de-rated -1.1 °C per 305m (1,000 ft.) above 2,300m (7,500 ft.).

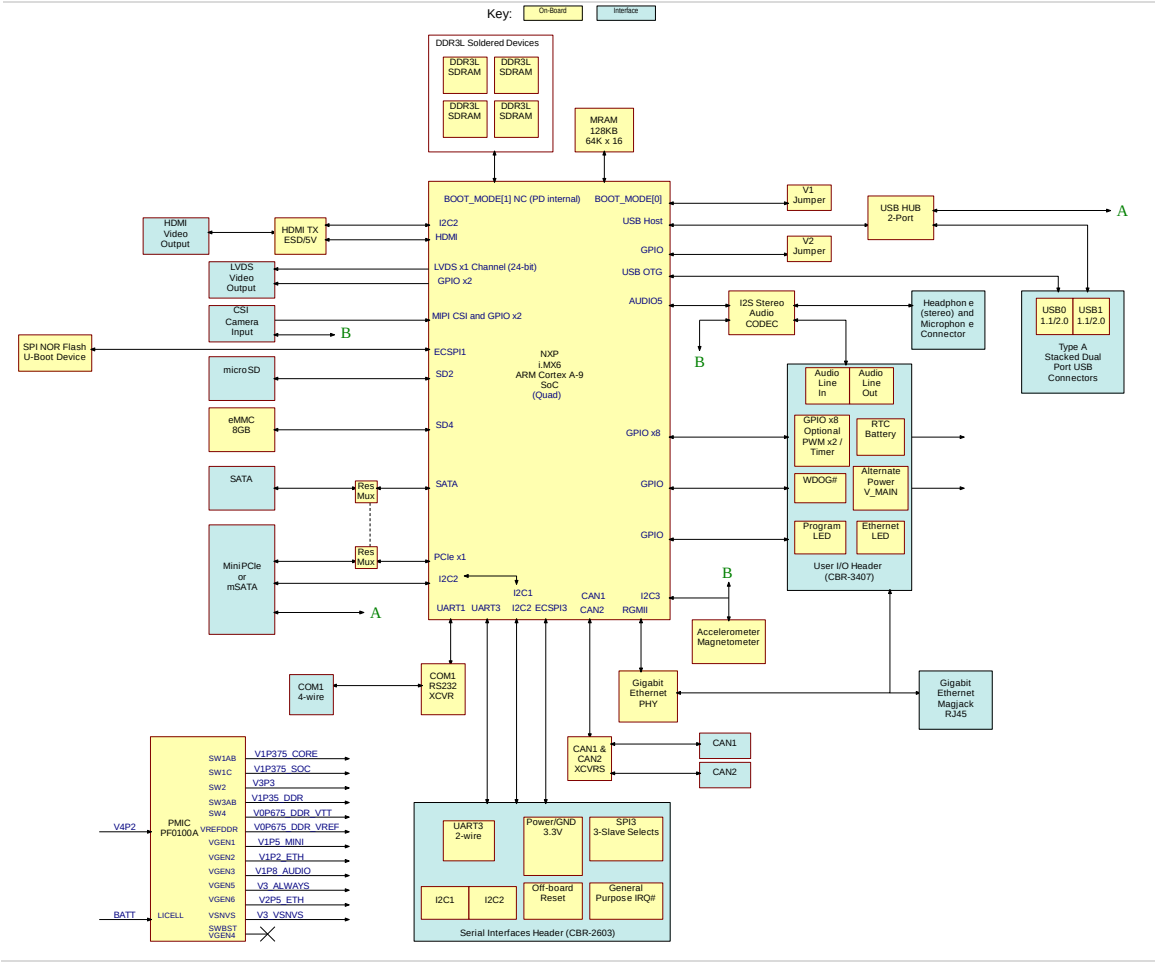
Table 1. Environmental Specifications

Characteristic	Value
Operating Temperature	Ext Temp *(-40°C to +85°C)*
Storage Temperature	-40 to +85
Cooling	Fanless. Heatsink for SoC
Airflow Requirements	100 Linear Feet per Minute
Thermal Shock	5ºC/min. over operating temperature
Humidity	Less than 95%, noncondensing

Characteristic	Value
Vibration, Sinusoidal Sweep	MIL-STD-202G Sinusoidal sweep: Method 204, Modified Condition A, 2g constant acceleration from 5 to 500 Hz, 20 minutes per axis
Vibration, Random	Random vibration: Method 214A, Condition A, 5.35g rms, 5 minutes per axis
Mechanical Shock	Shock: Method 213B, Condition G, 20g half-sine, 11 msec duration per axis

Block Diagram

Figure 2. Tetra Board Block Diagram



Cautions

Electrostatic Discharge

CAUTION:

Electrostatic discharge (ESD) can damage circuit boards, disk drives, and other components. Handle circuit board at an ESD workstation. If an approved station is not available, wearing a grounded antistatic wrist strap provides some measure of protection. Keep all plastic away from the board, and do not slide the board over any surface.

After removing the board from its protective wrapper, place the board on a grounded, static-free surface, component side up. Use an antistatic foam pad if available.

Ship and store the board inside a closed metallic antistatic envelope for protection.

Note: The exterior coating on some metallic antistatic bags is sufficiently conductive to cause excessive battery drain if the bag is in contact with the bottom side of the Tetra.

Handling Care

CAUTION:

Avoid touching the exposed circuitry with your fingers when handling the board. Though it will not damage the circuitry, it is possible that small amounts of oil or perspiration on the skin could have enough conductivity to cause the contents of CMOS RAM to become corrupted through careless handling, resulting in CMOS resetting to factory defaults.

Earth Ground Requirement

CAUTION:

All mounting standoffs for EPC boards should be connected to earth ground (chassis ground). This provides proper grounding for EMI purposes.

Configuration and Setup 2

Initial Configuration

Use the following components for a typical development system:

- Tetra (VL-EPC-2700) computer
- VL-PS-WALL12-24 – 90 ~ 264 VAC to 12VDC @ 2A, 2.1mm ID Plug, International
- VL-F41-8SBN-LINUX1 – 8GB microSD card with bootable Linux, standard temp
- VL-HDW-108 – M2.5 x 6 mm Metric Nylon Screw kit (10ea) RoHS
- USB keyboard and mouse
- HDMI monitor and cable

Note: VL-CKR-Tetra includes: VL-F41-8SBN-LINUX1, CBR-0504, 2603, 3407, PS-WALL12-24, HDW-108

Use the following VersaLogic cables for wiring access points to serial (J12) and user (J13) interfaces:

- VL-CBR-2603 -- 0.5m 26-pin 2mm IDC to Ribbon Cable
- VL-CBR-3407 – 0.5m 34-pin 2mm IDC to Ribbon Cable

Basic Setup

1. Attach Cables and Peripherals

- Attach a HDMI display to the HDMI connector at J6.Plug a USB keyboard, and a USB mouse into the USB connectors at J1 (Note if using the top USB port, you must install the jumper on V2 pins 1-2 for the OTG USB port to be placed in Host mode. Alternatively, you can use an external powered USB Hub to provide separate mouse and keyboard connections for the bottom USB port.)
- Insert a VL-F41-8SBN-LINUX1 MicroSD card into the MicroSD slot located at J4

2. Attach Power

- Plug the power adapter cable VL-PS-WALL12-24 into the power jack J15.

3. Review Configuration

- Before you power up the system, double-check all the connections. Make sure all cables are oriented correctly and that there is adequate power to the VL-EPC-2700 and peripheral devices.

4. Power On

- Turn on the power supply and the video monitor. The presence of a video signal indicates proper configuration of the system.

Note: Booting and operating the Yocto Linux operating system is covered in the VersaLogic Yocto Linux User Guide.

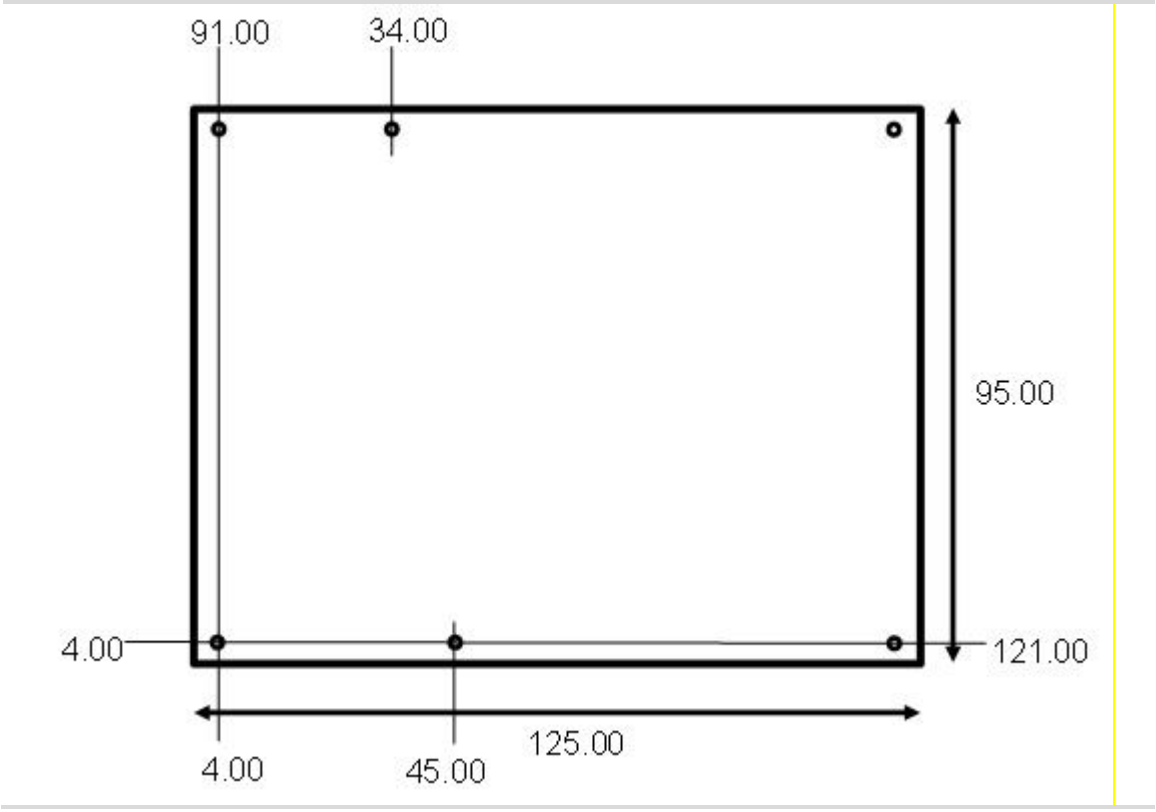
Physical Layout

Tetra Dimensions

The figure below shows board dimensions to help with pre-production planning and layout.

Figure 3. Tetra Board Dimensions and Mounting Holes

(Not to scale. All dimensions in millimeters.)

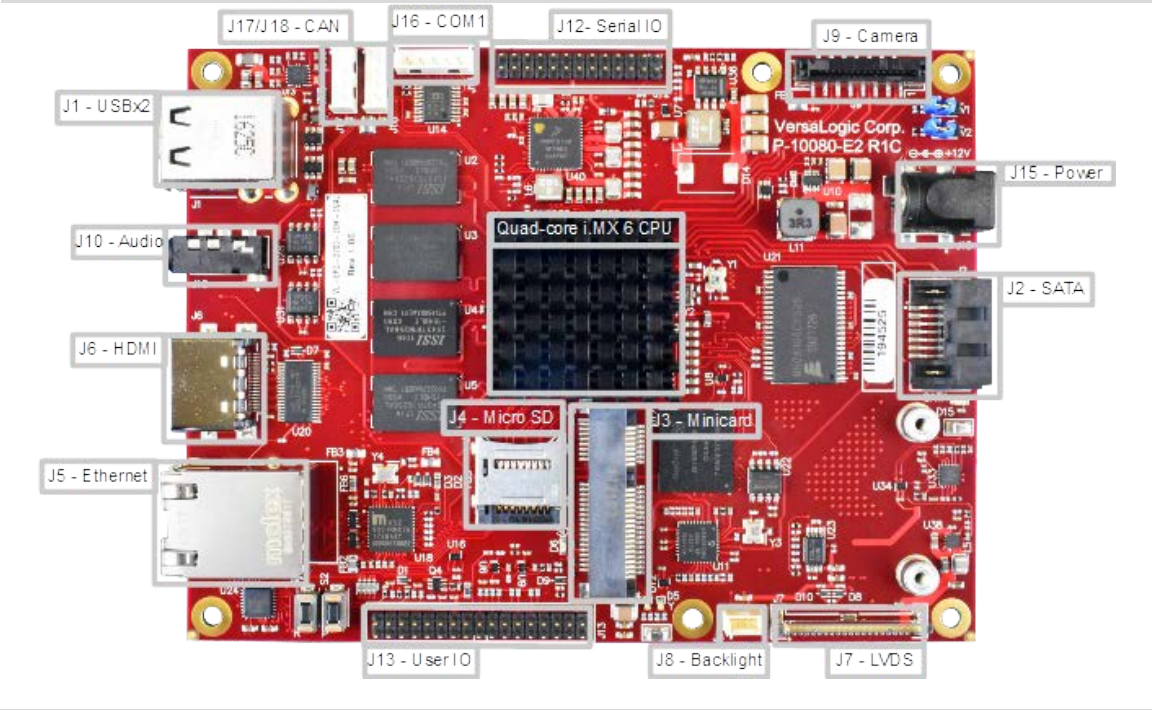


Hardware Assembly

The entire assembly can fit on a tabletop. When bolting the unit down, make sure to secure all standoffs to the mounting surface to prevent circuit board flexing. Standoffs secure the top circuit board using four pan head screws.

External Connectors

Figure 4. Connector Locations (Top Side)



Tetra Connector Functions and Interface Cables

The table below provides information about the function, mating connectors, and transition cables for Tetra connectors.

Table 2. Connector Functions and Interface Cables

Connector (Note)	Function	Mating Connector/Device	Transition Cable	Cable/Device Description
J1	USB (dual stacked)	Standard USB Type A	USB	Male Type A USB 2.0 to Male Type B for downstream devices, Male Type A USB 2.0 to Male Type A USB 2.0 for top port only when OTG port is set as Device mode (V2 jumper off).
J2	SATA	Standard SATA	VL-CBR-0701 VL-CBR-0702	Standard Cable Latching Cable
J3	Minicard PCIe or mSATA	MPEe/MPEu/MPEs Minicards	N/A	Tetra model dependent (-02A: mSATA or USB type Minicard, -02B & -EVAL: MiniPCIe or USB type Minicard)
J4	MicroSD	8GB microSD card with bootable Linux 2GB microSD card 4GB microSD card 8GB microSD card	N/A	VL-F41-8SBNLINUX1 (Standard Temperature) VL-F41-2EBN (ExtendedTemperature) VL-F41-4EBN (Extended Temperature) VL-F41-8EBN (Extended Temperature)
J5	Ethernet	RJ45 Crimp-on Plug	Cat5e	Cat5e Ethernet Patch Cable
J6	HDMI	Standard HDMI Plug	N/A	Standard HDMI Cable
J7	LDVS	Housing = Hirose DF19G-20S-1C and Pin Crimps = Hirose DF19-2830SCFA	VL-CBR-2015 VL-CBR-2016 VL-CBR-2017	20-pin Hirose 1mm to Hirose 1mm 24-bit cable 20-pin Hirose 1mm to JAE 1.25mm 18-bit cable 20-pin Hirose 1mm to 20-pin Hirose 1.25mm 24-bit cable
J8	LDVS Backlight	Housing = Molex 501330-0400 and Pin Crimps = Molex 501193-2000	VL-CBR-0404	20" 12V LED Backlight Control Cable
J9	MIPI Camera	FFC/FPC, 15-Pos, 1mm pitch	FFC/FPC Cable	Raspberry Pi Camera Rev 1.3
J10	Audio	3.5mm 4-Pole Audio Plug	TRRS	TRRS Male 4-Conductor Audio Devices like a PC Headset
J12	Serial I/O	26-pin 2mm pitch IDC Female	VL-CBR-2603	Serial Interface Ribbon Cable
J13	User I/O	34-pin 2mm pitch IDC Female	VL-CBR-3407	User Input/Output Interface Ribbon Cable
J15	Power	DC Power Plug, 2.0mm positive center pin	AC/DC 12V - VL-PS-WALL12-24	AC/DC 12V Power Adapter
J16	COM1	Housing = Molex 51065-0500 and Pin Crimps = Molex 050212-8000	VL-CBR-0504	DB9 COM Port Interface Cable
J17, J18	CAN	Housing = Molex 51065-0400 and Pin Crimps = Molex 050212-8000	VL-CBR-0405 VL-CBR-0406	2 mm 4-pin to 2 mm 4-pin MicroClasp, 1m 2 mm 4-pin MicroClasp to DB9 connector, 0.5m

Table 3. Jumper Information

EPC-2700 Reference Designator	EPC-2700 Signal Name	Control/Description
V1	BOOT_MODE0	BOOT_MODE0 setting to allow use of USB OTG Device communications using the NXP i.MX6 Serial Downloader method. When this jumper is installed V2 should not be installed! Normal eFuse selected boot via SPI NOR Flash U-Boot and microSD card Yocto Linux when the jumper is removed.
V2	USB_OTG_ID	Install jumper to set USB_OTG port to host mode. No jumper sets port to Device Mode

System Features 3

Power Supply

Power Connectors

Main power is applied to the Tetra through a 4-pin connector (J15), with mating connector VersaLogic VL-PS12-24 (12V). See the table below for connector pinout.

CAUTION:

To prevent severe and possibly irreparable damage to the system, it is critical that the power connectors are wired correctly. The power connector is not fuse or diode protected. Proper polarity must be followed otherwise damage will occur.

Table 4. J15 Main Power Connector Pinout

Pin	Signal	Description
1	V_MAIN (first pin)	Center Pin Voltage
1	V_MAIN (second pin)	Center Pin Voltage
2	Ground	Ground
3	Plug Detection	Ground when no plug, open otherwise.

Power Requirements

Model	Idle	Typical	Max.
VL-EPC-2700-EDK-02A	3.0W	4.2W	6.9W
VL-EPC-2700-EDK-02B	3.1W	4.5W	8.5W
VL-EPC-2700-EDK-EVAL	3.1W	4.5W	8.5W

Note: The VL-EPC-2700 does not come with an on-board RTC backup battery. The VL-CKR-TETRA Cable kit includes a User Interface breakout cable (VL-CBR-3407) that connects to the J13 connector. It is an open ended-cable that can connect a backup battery on pins 29 (V_BATT) and pin 30 (Return_Battery/Ground). A connector and/or external battery is then hardwired.

CPU

The Tetra uses a low power Arm i.MX6 quad-core processor featuring:

- i.MX 6Quad (quad Arm Cortex-A9 core) - Specifications

System RAM

The Tetra ships with soldered-on DDR3L RAM. 2GB of RAM is on standard products, but custom options allow memory capacities down to 1GB or up to 4GB.

Interfaces and Connectors 4

Connectors and Jumpers

V1 – BOOT_MODE0 Jumper

The EPC-2700 uses a jumper to provide access to two required boot modes. BOOT_MODE[1:0] are input pins on the i.MX6 quad-core processor, and when not connected, the signals are held low by 100k Ohm pull-downs internal to the SoC. By default, the jumper is in the store position resting on pin 2 (open) and the BOOT_MODE[1:0] settings of “00” select the default mode of “Boot from fuses.”

Note: When the fuses have not yet been blown (OTP), the boot attempt will automatically switch to the “Serial downloader” method for the i.MX 6. It then, may accept commands and programming from a USB Host (provided that the V2 jumper is removed/stored - setting the USB OTG port in Device mode).

The only time the jumper needs to be placed on pins 1-2 (BOOT_MODE[1:0] settings of “01”) is to force the boot mode to use the “Serial downloader” instead of the fuses. At that point, a new image can be loaded to the on-board memory device (like the SPI Flash) or new DDR device Calibrations and Stress Testing can be run.

Do not hot-plug this jumper. There is no ESD protection employed and the settings are only read when POR# is tripped.

VersaLogic part number for the jumper header is X2H2S1-R.

Table 5. V1 Pinout

Pin	Signal Name
1	PU_BOOT_MODE0
2	BOOT_MODE0

V2 - USB_OTG_ID Jumper

The EPC-2700 uses a jumper to provide control settings for the USB OTG block, allowing it to function as either an OTG port set to device mode or set to host mode. By default, the jumper is in the store position resting on pin 2 (open) so that the USB_OTG_ID signal is pulled high (device mode).

When the jumper is placed on pins 1-2, the USB_OTG_ID signal is grounded, which forces the i.MX6 quad-core processor OTG port to behave as a Host enabling VBUS 5V power switch for the USB port.

Note: Do not hot-plug this jumper. Host Negotiation Protocol (HNP) is not enabled for the port and there is no ESD protection employed.

VersaLogic part number for the jumper header is X2H2S1-R.

Table 6. V2 Pinout

Pin	Signal Name
1	USB_OTG_ID
2	GND

Storage Interfaces

SATA Interface (J2)

The table below lists the pinout of the 7-pin SATA connector.

Table 7. J2 SATA Pinout

Pin	Signal
1	GND
2	**SATA_TX_P**
3	**SATA_TX_N**
4	GND
5	**SATA_RX_N**
6	**SATA_RX_P**
7	GND

Minicard Interface (J3)

The table below lists the pinout of the 52-pin Minicard connector.

Table 8. J3 Minicard Pinout

Pin	mSATA Signal	PCIe Minicard Signal
1	Reserved (NC)	WAKE#
3	Reserved (NC)	COEX1
5	Reserved (NC)	COEX2
7	Reserved (NC)	CLKREQ#
9	GND	GND
11	Reserved (NC)	REFCLK_N
13	Reserved (NC)	REFCLK_P
15	GND	GND
17	Reserved (NC)	UIM_IC_DM
19	Reserved (NC)	UIM_IC_DP
21	GND	GND
23	SATA_RX_**P**	PER0_**N**
25	SATA_RX_**N**	PER0_**P**
27	GND	GND
29	GND	GND
31	SATA_TX_N	PET0_N
33	SATA_TX_P	PET0_P
35	GND	GND
37	GND	GND

Pin	mSATA Signal	PCIe Minicard Signal
2	+3.3V	+3.3V
4	GND	GND
6	+1.5V	+1.5V
8	Reserved (NC)	UIM_PWR
10	Reserved (NC)	UIM_DATA
12	Reserved (NC)	UIM_CLK
14	Reserved (NC)	UIM_RESET
16	Reserved (NC)	UIM_SPU
18	GND	GND
20	Reserved (NC)	W_DISABLE1#
22	Reserved (NC)	PERST#
24	+3.3V	+3.3V
26	GND	GND
28	+1.5V	+1.5V
30	SMB_CLK	SMB_CLK
32	SMB_DATA	SMB_DATA
34	GND	GND
36	Reserved (NC)	USB_N
38	Reserved (NC)	USB_P

Pin	mSATA Signal	PCIe Minicard Signal
39	+3.3V	+3.3Vaux
41	+3.3V	+3.3Vaux
43	No Connect (some GND)	GND
45	Vendor Specific	Reserved
47	Vendor Specific	Reserved
49	DAS/DSS (or NC)	Reserved
51	Presence Detect (or NC)	W_DISABLE2#

Pin	mSATA Signal	PCIe Minicard Signal
40	GND	GND
42	Reserved (NC)	LED_WWAN#
44	Reserved (NC)	LED_WLAN#
46	Reserved (NC)	LED_WPAN#
48	+1.5V	+1.5V
50	GND	GND
52	+3.3V	+3.3V

MicroSD Interface (J4)

The table below lists the pinout of the 8-pin MicroSD connector.

Supported VersaLogic SLC extended temperature cards:

- VL-F41-2EBN (2 GB)
- VL-F41-4EBN (4GB)
- VL-F41-8EBN (8 GB)

Note: MicroSD card number VL-F41-8SBN-LINUX1 is an 8 GB MLC MicroSD card with bootable Linux, standard temperature

Table 9. J4 MicroSD Pinout

Pin	Signal
1	DAT2
2	CD/DAT3
3	CMD
4	VDD
5	CLK
6	VSS (GND)
7	DAT0
8	DAT1

Network Interface

Ethernet Interface (J5)

The table below lists the pinout of the Ethernet connector.

Table 10. J5 Ethernet RJ45 Pinout

J5 RJ45 Pin #	Wire-Color (CAT5E)	10/100 Signals	10/100/1000 Signals
1	White/Orange	+ Auto Switch (can be either Tx or Rx)	BI_DA+
2	Orange	- Auto Switch (can be either Tx or Rx)	BI_DA-
3	White/Green	+ Auto Switch (can be either Tx or Rx)	BI_DB+
4	Blue	+ Auto Switch (can be either Tx or Rx)	BI_DC+
5	White/Blue	- Auto Switch (can be either Tx or Rx)	BI_DC-
6	Green	- Auto Switch (can be either Tx or Rx)	BI_DB-
7	White/Brown	+ Auto Switch (can be either Tx or Rx)	BI_DD+
8	Brown	- Auto Switch (can be either Tx or Rx)	BI_DD-

Video Interfaces

HDMI (J6)

Table 11. HDMI Connector Pinout

Pin	Signal	Direction	Description
1	HDMI_D2_P	Out	HDMI Data 2 Differential Pair +
2	DATA2SHIELD	--	Ground
3	HDMI_D2_N	Out	HDMI Data 2 Differential Pair -
4	HDMI_D1_P	Out	HDMI Data 1 Differential Pair +
5	DATA1SHIELD	--	Ground
6	HDMI_D1_N	Out	HDMI Data 1 Differential Pair -
7	HDMI_D0_P	Out	HDMI Data 0 Differential Pair +
8	DATA2SHIELD	--	Ground
9	HDMI_D0_N	Out	HDMI Data 0 Differential Pair -
10	CLK_HDMI_P	Out	HDMI Clock Differential Pair +
11	DATA2SHIELD	--	Ground
12	CLK_HDMI_N	Out	HDMI Clock Differential Pair -
13	HDMI_CEC_CON	I/O	HDMI CEC Line
14	HDMI_NC_CON	N/A	No Connect - Resistor to GND option
15	HDMI_SCL_CON_R	Out	DDC Serial Clock Line (5V signal)
16	HDMI_SDA_CON_R	I/O	DDC Serial Data Line (5V signal)
17	HDMI_CEC_GND	I/O	CEC_GND - 0 Ohm Resistor to GND
18	V5_HDMI_CON	Out	5V HDMI Cable Power
19	HDMI_HPD_CON	In	HDMI Hot Plug Detection Signal

Note: Some back-drive occurs when an HDMI panel has power and is connected to an unpowered board.

LVDS (J7)

Table 12. LVDS Connector Pinout

Pin	Signal	Direction	Description
1	GND	--	Signal Ground
2	GND	--	Signal Ground
3	LVDS_TX3_P	Output	LVDS Data 3 (positive)
4	LVDS_TX3_N	Output	LVDS Data 3 (negative)
5	GND	--	Signal Ground
6	CLK_LVDS_P	Output	LVDS Clock (positive)
7	CLK_LVDS_N	Output	LVDS Clock (negative)
8	GND	--	Signal Ground

Pin	Signal	Direction	Description
9	LVDS_TX2_P	Output	LVDS Data 2 (positive)
10	LVDS_TX2_N	Output	LVDS Data 2 (negative)
11	GND	--	Signal Ground
12	LVDS_TX1_P	Output	LVDS Data 1 (positive)
13	LVDS_TX1_N	Output	LVDS Data 1 (negative)
14	GND	--	Signal Ground
15	LVDS_TX0_P	Output	LVDS Data 0 (positive)
16	LVDS_TX0_N	Output	LVDS Data 0 (negative)
17	GND	--	Power Ground
18	GND	--	Power Ground
19	V3P3_LVDS_PANEL	Output	LVDS Panel Power (+3.3V)
20	V3P3_LVDS_PANEL	Output	LVDS Panel Power (+3.3V)

LVDS Backlight (J8)

Table 13. LVDS Backlight Connector Pinout

Pin	Signal	Direction Relative to Our Product	Description
1	LVDS_BKLT_EN	Output	Backlight Enable for LVDS panel
2	GND	--	Ground
3	LVDS_BLKT_CTRL	Output	Backlight Control for LVDS panel (PWM)
4	V_LVDS_BKLGT	Input	Voltage for LVDS Backlight control

I/O Interfaces

USB Interfaces (J1)

Table 14. USBx2 2.0 Connector Pinout

Pin	Signal	Description
T1	V5_USB0_OTG	Top Connector Switched USB +5V Power
T2	USB0_OTG_N	USB OTG DN diff pair - (Via SoC)
T3	USB0_OTG_P	USB OTG DP diff pair + (Via SoC)
T4	GND	Top Connector Ground
TM1	V5_USB1_H1	Bottom Connector Switched USB +5V Power
TM2	USB1_HUB1_N	USB Host1 DN diff pair - (Via USB Hub)
TM3	USB1_HUB1_P	USB Host1 DP diff pair + (Via USB Hub)
TM4	GND	Bottom Connector Ground

Serial I/O (J12)

Table 15. Serial I/O Pinouts

Pin	Signal	Description
1	OFFBRD_RST#	3.3V Active Low Reset Output
3	GP_IRQ#	3.3V Active Low Interrupt Input
5	CSPI3_SS2#	3.3V Slave Select #2 for Bus CSPI3 (active low)
7	CSPI3_SS0#	3.3V Slave Select #0 for Bus CSPI3 (active low)
9	CSPI3_MOSI	3.3V Master Out/Slave In for Bus CSPI3
11	CSPI3_MISO	3.3V Master In/Slave Out for Bus CSPI3
13	CLK_CSPI3	3.3V Clock for Bus CSPI3
15	V3P3	3.3V Power for I/O devices
17	GND	Ground (I^2C2)
19	GND	Ground
21	GND	Ground (I^2C1)
23	GND	Ground
25	GND	Ground (UART3)

Pin	Signal	Description
2	GND	Ground (OFFBRD_RST#)
4	GND	Ground (GP_IRQ#)
6	CSPI3_SS1#	3.3V Slave Select #1 for Bus CSPI3 (active low)
8	GND	Ground (CSPI3)
10	GND	Ground (CSPI3)
12	GND	Ground (CSPI3)
14	GND	Ground (V3P3)
16	I2C2_SDA	3.3V Data for Bus I^2C2
18	CLK_I2C2_SCL	3.3V Clock for Bus I^2C2
20	I2C1_SDA	3.3V Data for Bus I^2C1
22	CLK_I2C1_SCL	3.3V Clock for Bus I^2C1
24	UART3_RXD	3.3V UART3 Receive Data Input
26	UART3_TXD	3.3V UART3 Transmit Data Output

User I/O (J13)

Table 16. User I/O Pinouts

Pin	Signal	Description	Pin	Signal	Description
1	AUD_LIN	Audio Left Line Input (Stereo Left Input)	2	AUD_RIN	Audio Right Line Input (Stereo Right Input)
3	GND_AUD	Analog Audio Ground	4	AUD_LOUT	Audio Left Line Output (Stereo Left Output)
5	AUD_ROUT	Audio Right Line Output (Stereo Right Output)	6	GND_AUD	Analog Audio Ground
7	PB_CTL_PWR#	Open-Drain Push Button Control Power Input	8	GND	Ground (for PB_CTL_PWR#)
9	PB_CTL_RST#	Open-Drain Push Button Control Reset Input	10	GND	Ground (for PB_CTL_RST#)
11	PLED#	Open-Drain 3.3V max Programmable LED driver	12	V3P3	3.3V power for Programmable LED
13	LED_ETH_GRN#	Open-Drain 3.3V max Ethernet LED driver	14	V3P3	3.3V power for Ethernet LED
15	WDOG1#	Watch dog 1 Output	16	GND	Ground
17	GPIO1	3.3V General Purpose I/O	18	GPIO2	3.3V General Purpose I/O
19	GND	Ground	20	GPIO3	3.3V General Purpose I/O
21	GPIO4	3.3V General Purpose I/O	22	GND	Ground
23	GPIO5	3.3V General Purpose I/O	24	GPIO6	3.3V General Purpose I/O
25	GND	Ground	26	GPIO7	3.3V General Purpose I/O
27	GPIO8	3.3V General Purpose I/O	28	GND	Ground
29	V_BATT	Battery Input (3.0V Coin Cell)	30	RETURN_BATT/GND	Tied to GND on CPU board and direct to the battery minus terminal on a paddleboard or external battery connector.
31	GND	Ground	32	GND	Ground
33	V_MAIN	V_MAIN power. Voltage can be 8V to 17V (default 12V).	34	V_MAIN	V_MAIN power. Voltage can be 8V to 17V (default 12V).

Audio (J10)

Table 17. Audio Jack Pinout

Pin	Signal	Description
1	AUD_FIL_MIC_IN	Microphone input from sleeve in jack
2	AUD_FIL_HP_LOUT	Headphone output, stereo left
3	AUD_FIL_HP_ROUT	Headphone output, stereo right
4	GND_AUD	Audio Ground

CAN Interface (J17, J18)

Table 18. CAN Pinouts

Pin	x = 1 for J17 x = 2 for J18 Signal	Description
1	CANx_P	CANH signal for CAN bus
2	CANx_N	CANL signal for CAN bus
3	GND	Ground
4	V5	5V power (for off-board use)

COM1 Interface (J16)

Table 19. COM1 Pinout

Pin	Signal	Description
1	COM1_RTS	COM1 RS-232 Request to Send
2	COM1_TXD#	COM1 RS-232 Transmit Data (active low)
3	COM1_CTS	COM1 RS-232 Clear to Send
4	COM1_RXD#	COM1 RS-232 Receive Data (active low)
5	GND	Ground

Low Cost Camera Interface (J9)

The 15-pin input connector is ideal for using low cost MIPI CSI-2, Raspberry Pi* compatible cameras. The input channel is limited to 8M pixel images and 1080p30 or 720p60 video. For higher performance imaging, use cameras that connect to Tetra's USB 2.0 or Ethernet input channels.

Table 20. Camera Pinouts

Pin	Signal	Description
1	GND	Ground
2	CSI_D0_N	MIPI CSI-2 Data Lane 0 (negative diff pair)
3	CSI_D0_P	MIPI CSI-2 Data Lane 0 (positive diff pair)
4	GND	Ground
5	CSI_D1_N	MIPI CSI-2 Data Lane 1 (negative diff pair)
6	CSI_D1_P	MIPI CSI-2 Data Lane 1 (positive diff pair)
7	GND	Ground
8	CLK_CSI_N	MIPI CSI-2 Clock (negative diff pair)
9	CLK_CSI_P	MIPI CSI-2 Clock (positive diff pair)
10	GND	Ground
11	CSI_GPIO0	3.3V General Purpose I/O (function depends on camera)
12	CSI_GPIO1	3.3V General Purpose I/O (function depends on camera)
13	CLK_I2C3_SCL	I^2C Interface Serial Clock
14	I2C3_SDA	I^2C Interface Serial Data
15	V_CSI_VDD	3.3V Power for Camera Module

Power Button

Table 21. Power Buttons and Designator

Reference Designator	Signal Name	Description
S1	PB_CTL_RST#	Push Button Control for Power-On Reset
S2	PB_CTL_PWR#	Push Button Control for PMIC Power Outputs

Note: The power pushbutton is level sensitive by default, holding the pushbutton in or driving the signal low (using open-drain driver) from the User I/O connector pin is the only way to turn off the power to the processor and I/O when the board input power is still being applied.

Appendix A – References

5

- Yocto Linux User Guide for the VL-EPC-2700
- i.MX 6Dual/6 Quad Applications Processors for Industrial Products Datasheet
- Hardware Development Guide for i.MX 6 Families of Application Processors
- i.MX 6Dual/6Quad Applications Processor Reference Manual
- Chip Errata for the i.MX 6Dual/6Quad and i.MX 6DualPlus/6QuadPlus

Hardware

- Currently the VersaLogic PCIe card VL-MPEe-U2 does not work with the Tetra board
- i.MX 6 SW controlled power-off is unsupported. In order to turn off the PMIC power output while the power input to the board is still supplied, you must either hold the S2 power pushbutton in or drive the PB_CTL_PWR# signal on the User IO connector (J13) low (with an open-drain driver) since the input is level sensitive by default.
- To get the U2 working on the EPC-2700, the Kernel config has to have PCI Messaging Signal Interrupts disabled (CONFIG_PCI_MSI=n). When disabled, the U2 serial ports work in both RS232 or RS422/485 and the MPIOs also work.