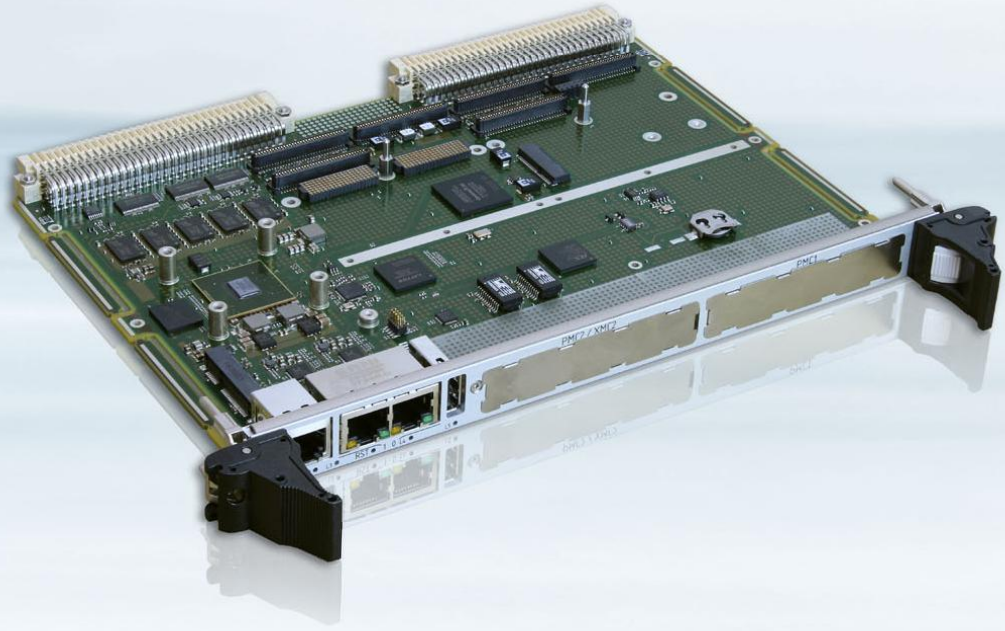
EFT RELEASE NOTE



VM6103-EFT

CA.DT.B39.2e - March 2019

VM6103 – EFT RELEASE NOTE

Disclaimer

Kontron would like to point out that the information contained in this user guide may be subject to alteration, particularly as a result of the constant upgrading of Kontron products. This document does not entail any guarantee on the part of Kontron with respect to technical processes described in the user guide or any product characteristics set out in the user guide. Kontron assumes no responsibility or liability for the use of the described product(s), conveys no license or title under any patent, copyright or mask work rights to these products and makes no representations or warranties that these products are free from patent, copyright or mask work right infringement unless otherwise specified. Applications that are described in this user guide are for illustration purposes only. Kontron makes no representation or warranty that such application will be suitable for the specified use without further testing or modification. Kontron expressly informs the user that this user guide only contains a general description of processes and instructions which may not be applicable in every individual case. In cases of doubt, please contact Kontron.

Kontron S&T AG

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
www.kontron.com

Revision History

Publication Title:	VM6103 EFT Release Note	
Doc. ID:	CA.DT.B39-2e	
Revision	Brief Description of Changes	Date of Issue
0e	Initial issue	01-2018
1e	Updated sections: - 1/ Introduction - 5.1 EFT Configuration Overview - 5.2 VM6103 EFT Functions Overview - 5.4 Known Issues / Restrictions New section: - 6/ Board Revision Guide for VM6103	05-2018
2e	Rugged air-cooled class added Updated sections: - 1/ Introduction - 5.1 EFT Configuration Overview - 5.2 VM6103 EFT Functions Overview - 5.4 Known Issues / Restrictions - 6.3 VM6103 EFT Revision Guide Table for Functional E.C. Levels - 6.4 Item DetailedDescription for VM6103 EFT Functional E.C. levels New section: - 5.5 U-Boot Release Note - 5.6 Linux & VxWorks Release Note	03-2019

Customer Support

Please contact our support team at support.KFR@kontron.com

Customer Service

As a trusted technology innovator and global solutions provider, Kontron extends its embedded market strengths into a services portfolio allowing companies to break the barriers of traditional product lifecycles. Proven product expertise coupled with collaborative and highly-experienced support enables Kontron to provide exceptional peace of mind to build and maintain successful products.

For more details on Kontron's service offerings such as: enhanced repair services, extended warranty, Kontron training academy, and more visit http://www.kontron.com/support-and-services/services.

Customer Comments

If you have any difficulties using this user guide, discover an error, or just want to provide some feedback, contact Kontron support. Detail any errors you find. We will correct the errors or problems as soon as possible and post the revised user guide on our website.

Symbols

The following symbols may be used in this user guide

⚠DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	NOTICE indicates a property damage message.
	**Electric Shock!** This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.
	**ESD Sensitive Device!** This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.
	**HOT Surface!** Do NOT touch! Allow to cool before servicing.
	**Laser!** This symbol inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	This symbol indicates general information about the product and the user guide. This symbol also indicates detail information about the specific product configuration.
	This symbol indicates important information which must be read carefully.
	This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

⚠CAUTION

Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

General Instructions on Usage

In order to maintain Kontron's product warranty and CE compliance, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty and CE compliance.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

Environmental protection is a high priority with Kontron.
Kontron follows the WEEE directive
You are encouraged to return our products for proper disposal.

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- Reduce waste arising from electrical and electronic equipment (EEE)
- Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- Improve the environmental performance of all those involved during the lifecycle of EEE

Table of Contents

List of Figures

1/ Introduction – EFT and Product name

The VM6103 single board computer is a low power dissipation (<10W) 6U VME computing blade featuring the NXP QorIQ Layerscape processor coupled with up to 8 GB DDR4 memory.

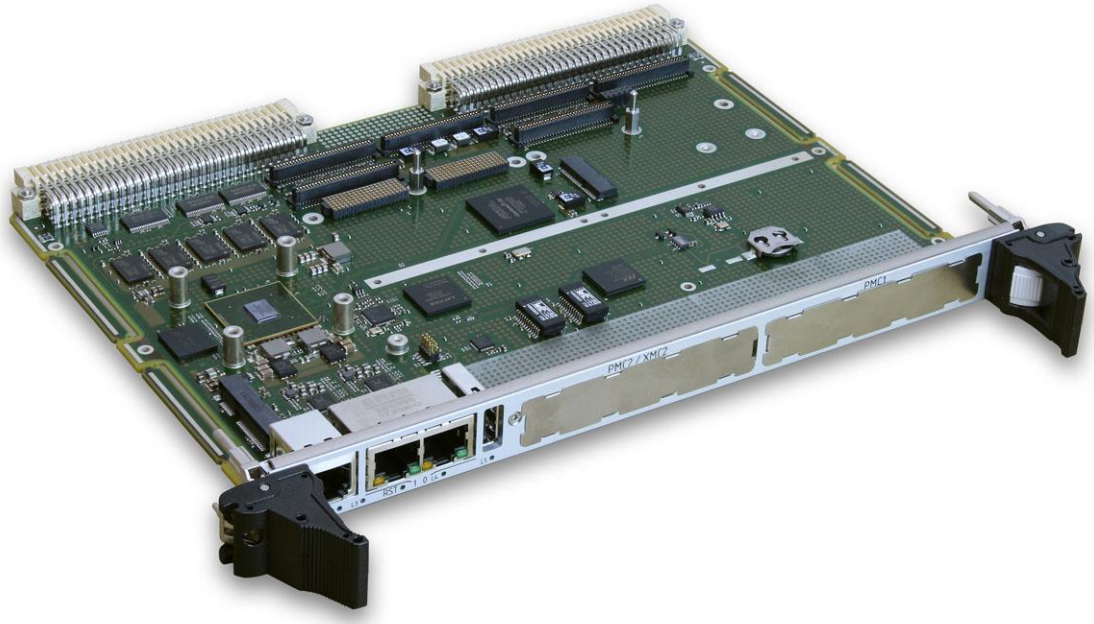
The VM6103 board is based on a dual core LS1023A 64bit ARM® A53 processor speed up to 1.6 GHz.

The VM6103 provides necessary I/O capabilities onboard and outstanding flexibility by providing support for PMC, XMC, miniPCIe and M.2 storage mezzanine cards. The VM6103's high performance, 2eSST, VME interface helps customers preserve their investment in legacy VME equipment.

The VM6103 is designed to be Kontron's new generation VME SBC based on ARM processor architecture providing substantial price and low consumption advantages.

PROTO-VM6103-SA-A and VM6103-SA24-00000000 are the Early Field Test (EFT) sample first release of this new Kontron VME SBC based on a dual core LS1023A 64-bit ARM® A53 processor speed at 1.0 GHz. The EFT comes with soldered 4 GB DDR4 memory and eMMC MLC flash 32 GB or 64 GB, two PMC slots, one XMC slot, no P0 connector, one SATA M.2 Type 2242, key M slot for storage module, one MiniPCIe socket, 3 GPIOs on P2, 2 secure element chips (TPM/Wibu), four serial lines on P2, Air-Cooled.

Figure 1: VM6103 6U VME Overview



2/ Manual Overview

Early Field Trials boards or EFT boards allow users to evaluate a product before it is effectively released.

This document defines the VM6103-EFT boards and their limitations.

Functional changes that differ from previous version of the document are identified by a vertical bar in the margin.

This document refers to the up-to-date release of the following documentation:

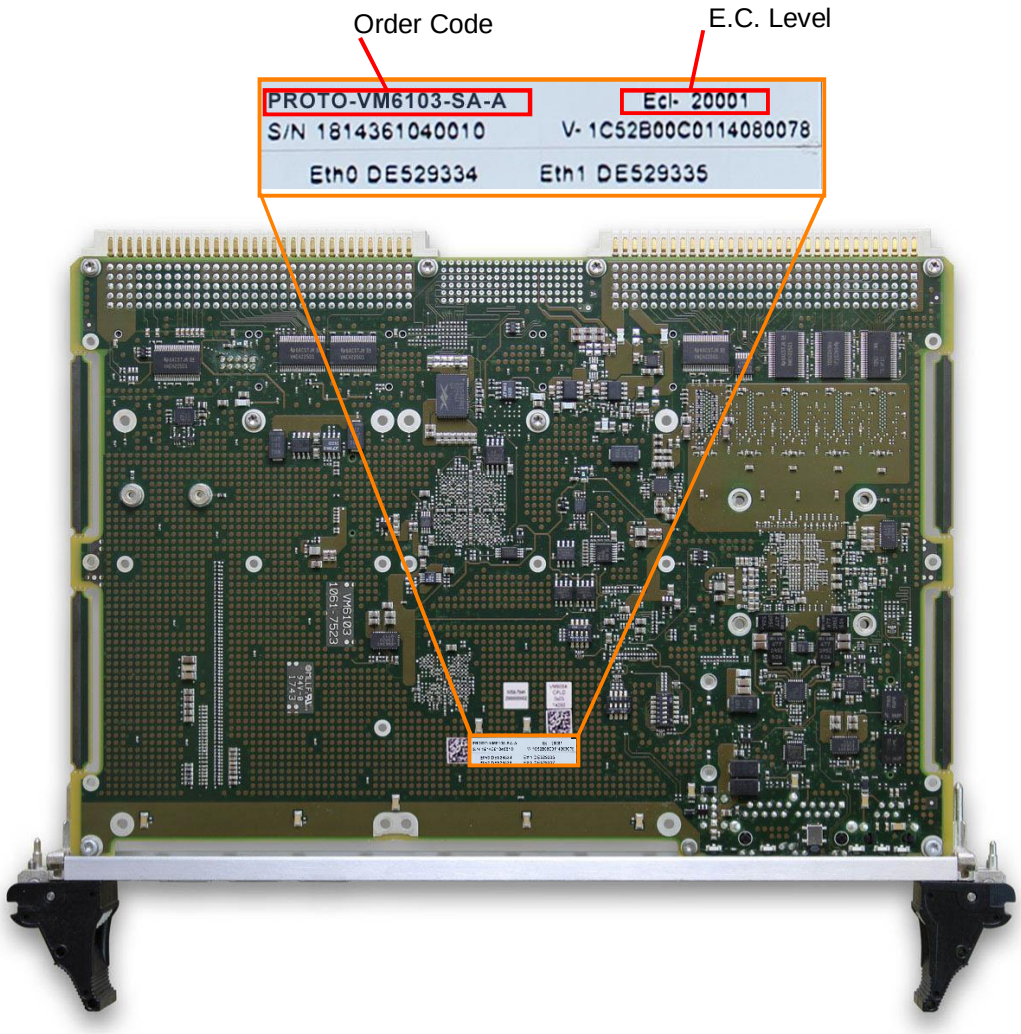
- VM6103 User's Guide CA.DT.B38
- VM6103 U-Boot User Manual SD.DT.G83
- Yocto Linux Release Notes for VM6103 . . . . . SD.DT.G84
- VxWorks 7 on VM6103 - Release Notes SD.DT.G91

3/ EFT Board Identification

Engineering Change Level and Order Code for VM6103

The Engineering Change Level (E.C. Level) and the Order Code information are available on the “Board Identification" label, located on the bottom side of the board.

Figure 2: VM6103 Identification



4 / General Information

4.1. Handling

Personal Injuries

- SoC heatsinks may get hot; do not touch them while removing the board from chassis.
- Be careful of cutting edges when handling the board.
- Do not place the board on any surface or in its storage container before the board and its heatsinks have cooled down to room temperature.

EMC Gasket

In order to protect the EMC gasket located on top of front panel, it is recommended to insert the boards in the chassis starting from the higher slot number and to extract them starting from the lowest slot number.

4.2. Power Supplies

On +5V power supply, monotonic rise time have to be included between 1 ms and 25 ms at Power on.

For a power off condition to be valid, the +5V power supply input should remain at 0V for at least one second.

4.3. Components Height on Top Side of the Board- CRP 3980

The front panel connectors are marginally higher than the maximum height specified by the VME standard. List of components of the VM6103 that do not respect the VME standard (13.7 mm top height):

- Front panel Ethernet connectors: 13.80 mm
- Front panel USB connector: 13.83 mm
- Front panel Console (RJ-11) connector: 13.84 mm

No impact since the exceeding height is located very close to the front panel.

4.4. Breaking ESD Contact before Board Connector Locking - CRP 4260

ESD discharge strip is reduced in order to integrate the pre-cut of PCB for RC version. This means that ESD contact is broken with the earth when board is plugged in the chassis. VM6103 is compliant with IEEE1101.10 §9.1.2 instead of §9.1.1.

4.5. Battery Replacement

To replace the battery, proceed as follows:

- Turn off the power and remove the board from the chassis.
- Use a thin plastic tool to push the battery out of its holder.

Do not subject the holder to mechanical stress when inserting the tool to eject battery..

- Remove the battery.
- Place the new battery into the battery holder.
- Be sure to insert the battery with positive side (+) upwards and negative side (-) closest to printed circuit board.

⚠CAUTION

Warning

Danger of explosion when replacing with wrong type of battery. Replace only with the same or equivalent type recommended by the manufacturer. The lithium battery type must be UL recognized.

Do not dispose of lithium batteries in general trash collection. Dispose of the battery according to the local regulations dealing with the disposal of these special materials, (e.g. to the collecting points for dispose of batteries).

5/ EFT Specifications & Limitations

5.1. EFT configuration Overview

Refer also to the user's Guide for order code description.

Table 1: EFT configuration

EFT	PROTO-VM6103-SA-A	VM6103-SA24-00000000	VM6103-RA24-00000000
Operating conditions	See VM6103 User's Guide CA.DT.B38	See VM6103 User's Guide CA.DT.B38	-40°C to +70°C, air-cooled 1.5m/s
Processor	QorIQ LS1023A 1.0GHz rev 1.0	QorIQ LS1023A 1.0GHz rev 1.1	QorIQ LS1023A 1.0GHz rev 1.1
eMMC size	64GB	32GB	32GB
Hardware Engineering Level	ECL 10002A0 min.	ECL 10002A0 min.	ECL 11004A0 min.
U-Boot min. version	ID18019	ID18019	ID18248
Supported Operating System	Yocto Linux (ID18023 min), VxWorks 7 (ID18023 min)		
Pre-installed Flash Boot Device	Depending on customer request		

5.2. VM6103 EFT Functions Overview

Test Acronyms

In this chapter, the following acronyms are used:

- HWTS: Kontron Proprietary Hardware Test Suite under Linux
- PBITs: Kontron Proprietary Power-on Built-In Tests

Functions Overview

The following table gives the status of each interface and function of VM6103 EFT:

- Available: the interface/function has been tested with basic or thorough test.
- Limitations: the interface/function is available with limitations.
- Assumed available: the interface/function has not been tested on VM6103 EFT but is assumed available because it was derived from former VME board and fully tested on them. The interface/function may be used by development team.
- Not available (or empty): the interface/function is not equipped or it has not been sufficiently tested. If this interface/function is needed, contact Kontron.

Table 2: Functions Overview

ID	PROTOCOL / FUNCTION	TEST	SEVERITY	LINUX STATUS	COMMENT
Onboard functions					
Processor	QorIQ layerscape LS1023A 1GHz	HWTS	Basic test	Available	
DDR4	DDR4-1600 36-bits memory with ECC	HWTS	Basic test	Available	4 GByte memory size tested
eMMC	64GB eMMC MLC flash	Install Linux and VxWorks, used as boot device	Basic test	Available	Device used to boot Linux or VxWorks and launch the tests.
RTC & Battery	Real time Clock RV8564C2 device powered by onboard battery or backplane VBAT	Tested by operator with onboard battery	Basic test	Available	
Watchdog, Timer	Watchdog, Timer in CPLD	Tested by operator	Basic test	Available	
FRAM	1-Mbit FRAM non-volatile memory	HWTS	Basic test	Available	Storage device available to user
QSPI Flash	Boot Flash (Main & Rescue)	Content upgrade and boot	Basic test	Available	QSPI use with U-BOOT
VPD EEPROM	Vital Product Data EEPROM	VPD storage	Basic test	Available	Only use to write and read VPD data
System EEPROM	Used by PBIT.	Read/write access	Basic test	Available	
System CPLD	Board control and monitoring.	Powergood signals tested.	Basic test	Available	
SW1, SW2, SW3	Microswitch, Board configuration	Used during bring up.	Basic test	Available	
Temp. sensors	Processor package and on-board temperature monitoring on I2C bus	HWTS	Basic test	Available	Available with Linux command “sensors”
Current. sensor	Processor core current monitoring on I2C bus	Tested by operator	Basic test	Available	Available with Linux command “sensors”
Volt. sensor	Internal voltage monitoring on I2C bus	Tested by operator	Basic test	Available	Available with Linux command “sensors”
Wibu	Secure Element on USB2.0 port 2	-	Not tested	Not available	
TPM	Trusted Platform Module 2.0	-	Not tested	Not available	
Memory WP	Memories write protection	Not tested	Not tested	Not available	
Onboard interfaces					
M2	M.2 mezzanine with SATAIII interface	HWTS	Basic test	Available	
miniPCIe	miniPCIe mezzanine with PCIe 1x and USB 2.0 port 1	HWTS	Basic test	Available	PCIe and USB 2.0 interfaces are available

ID	PROTOCOL / FUNCTION	TEST	SEVERITY	LINUX STATUS	COMMENT
Cortex JTAG	Processor JTAG debug connector for CodeWarrior TAP	U-boot programming, debug	Basic test	Available	
PMC1	32-bit/66Mhz PMC	HWTS	Basic test	Available	
PMC2	32-bit/66Mhz PMC	HWTS	Basic test	Available	
XMC2	VITA 42 XMC 1x	HWTS	Basic test	Available	
Front panel					
Port COM1	Serial EIA-232	- 115200 bauds - U-BOOT & Linux console	Basic test	Available	RTS/CTS not tested, EIA-422/485 mode not tested
Port ETH1	1000BASE-T 100BASE-T	HWTS	Basic test	Available	10Base-T not tested
Port ETH2	1000BASE-T 100BASE-T	HWTS	Basic test	Available	10Base-T not tested
Port USB0	USB 2.0 port 0	HWTS	Basic test	Available	Overcurrent protection not available.
LEDs	5-color LEDs	LEDs status at power up & debug mode	Basic test	Available	
Reset	Reset Push-Button	Push button to generate a reset	Basic test	Available	
VME back plane					
VCC_IN	+5V voltage from VME backplane	HWTS	Basic test	N/A	Nominal voltage test done only
VDD_IN	+3.3V voltage from VME backplane	-	Not equipped	N/A	
+5V_STANDBY	+5V standby voltage from VME backplane	-	Not equipped	N/A	
VME	VME64x & 2eSST	HWTS	Basic test	Available	VME broadcast not supported.
IPMB	I2C bus on P1 connector	Basic test	Basic test	Available	Proprietary bus to control and manage the board
SMB	I2C bus on P1 connector	-	Not tested	Assume available	
PMC1 IO	PMC IO [1..64] signal on P2 connector	-	Not tested	Assume available	
PMC2/XMC2 IO	PMC and XMC IO [1..32] signal on P2 connector	-	Not tested	Assume available	
PMC2/XMC2 IO	PMC and XMC IO [33..64] signal on P0 connector	-	Not equipped	Not available	
Port SATA	SATAIII on P0 connector	-	Not equipped	Not available	
Port ETH1	Ethernet 1000BASE-T on P0 connector	-	Not equipped	Not available	
Port ETH2	Ethernet 1000BASE-T on P0 connector	-	Not equipped	Not available	

ID	PROTOCOL / FUNCTION	TEST	SEVERITY	LINUX STATUS	COMMENT
Port USB1	USB 2.0 port 1 on P0 connector	-	Not equipped	Not available	
Port USB2	USB 2.0 port 2 on P0 connector	-	Not equipped	Not available	
Port COM1	Serial EIA-232	Console 115.200 bauds	Basic test	Available	
Port COM2	Serial EIA-232	Console redirection 115.200 bauds	Basic test	Available	
Port COM3	Serial EIA-232	Console redirection 115.200 bauds	Basic test	Available	
Port COM4	Serial EIA-232	Console redirection 115.200 bauds	Basic test	Available	
GPIO[1:3]	GPIOs on P0 connector	Not equipped	Not equipped	Not available	
GPIO[4:6]	GPIOs on P2 connector	-	Basic test	Available	
GPIO[7:8]	GPIOs	Not equipped	Not equipped	Not available	
GEOID	Geographical ID	-	Basic test	Available	
SYSRESET#	SYSRESET#	U-BOOT	Basic test	Available	
NVMRO	NVMRO	-	Not tested	Not available	

5.3. Qualification Tests

Qualification tests including environmental and mechanical tests have not been done on EFT boards.

Contact Kontron support for further details

Product Hardware, U-Boot and Board Support Package (BSP) are still in development and product qualification is in progress. Some limitations may be appear or be cancelled according Hardware, U-Boot and Linux BSP software updates.

5.4. Hardware Known Issues / Restrictions

- Known issues:
  - Linux hang-up may occur when using serial line other than /dev/ttyS0 (#35499)
  - Front Ethernet speed LED meaning different from User's Guide, yellow blink means 1 Gbit speed (#29839)
  - Ethernet RX error may appear on Ethernet front panel interfaces when they are configured in 10 Mbit (#36014)
  - VPD is not write protected when micro-switch SW3601.2 is in default position (OFF) (#36219)
  - Power supply output on XMC and PMC connectors are not fuse protected, this may cause damage on VM6103 board in case of short-circuit on mezzanine boards. (#36033)
- Restrictions:
  - No P0 option
  - No VME broadcast
  - No write protection feature on QSPI flashes (boot flashes). (#36056)
  - No Ethernet speed and link/activity present on front LED when Ethernet interfaces are switched to the rear P0 connector (3#6027)
  - Hardware write protection feature is not available on eMMC device (no WP pin available), the write protection can only be done by software on this kind of flash device. (#36028)

5.5. U-Boot Release Note

Refer to the “VM6103 U-Boot User Manual” SD.DT.G83, to know the known limitations and to know the recommendations.

5.6. Linux & VxWorks Release Note

Some EFT limitations may be cancelled with future BSP releases.

Refer to the “Yocto Linux Release Notes for VM6103” SD.DT.G84, to know the known Linux limitations and to know the Linux recommendations.

Refer to the “VxWorks 7 on VM6103 - Release Notes” SD.DT.G91, to know the known VxWorks limitations and to know the VxWorks recommendations.

How to Log into the system (login and passwd): “root”, passwd is “kontron”.

5.7. Boot Devices

Allowed boot interfaces are: internal M2 slot, onboard eMMC flash, front panel USB port, Ethernet port 1 and 2.

5.8. In case of Trouble

In case of trouble, contact your Kontron support.

6/ EFT Board Revision Guide

6.1. How to Use the Board Revision Guide Table

E.C. Level or ECL means Engineering change level.

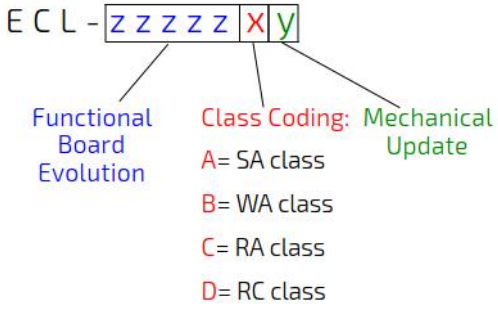
1. Find the E.C. Level associated to your board as described in the section 3/ “EFT Board Identification” page 11.
2. Find the column associated to the E.C. Level of your board in this table.
3. Check for a specific item in the table lines:
   a. A X (cross) in the E.C. Level column indicates that this item applies to this E.C. Level.
   b. No X (cross) in the E.C. Level column indicates that this item does not apply to this E.C. Level.
   c. If the functionality described by the item is not available on your board don't take into account this item. To know the functionalities available or not on your board, read the User's Guide associated with your board version.

Each item is fully described in section 6.4 “Item Detailed Description" page 21.

6.2. E.C. Level Coding

The E.C. Level of VM6103 board is composed of a functional part coding and a mechanical part coding.

The five first digits are used to code the functional board evolution and the two last digits are used to code the mechanical board evolution, as described as follows:



6.3. VM6103 EFT Revision Guide Table for Functional E.C. Levels

Table 3: EFT Revision Guide Table

Item	KDP	Description	E.C. Levels		
			1x002	1x004	
1	34781	No USB over current alert returned to the SoC	X	X	
2	35526	Internal power supply failure after reboot command and VME activity	X	X	
3	36293	SoC watchdog feature not available	X		
4	36297	Electrical and mechanical ground connection	X		
5	36331	I2C bus failure	X		

x digit in functional board evolution is used to code the major features of processor (frequency and die revision) :

- 0 means processor featuring 1GHz, die revision 1.0 (for ECL 10002, only frequency is coded, board may be stuffed with processor with either die revision 1.0 or 1.1)
- 1 means processor featuring 1GHz, die revision 1.1

6.4. Item Detailed Description for VM6103 EFT Functional E.C. Levels

Each item applies only to a specific group of E.C. levels.
Refer to the table available in section 6.3 “Revision Guide” page 21 to find the specific E.C. levels associated to a specific item.

Item #1 No USB over current alert returned to the SoC

Description:	USB over current alerts are not returned to the SoC when the current drawn by the USB device exceeds the limits of the USB power-distribution switch. Independently of this issue, the output current is limited as expected and the output will be shut off if the over current event persist in order to prevent damage of the board.
Impact:	SoC is not prevented from an USB over current event.
Workaround:	None
Fix:	No plan to fix on PCB A.

Item #2 Internal power supply failure after reboot command and VME activity

Description:	Following VME DMA activity, a reboot command on Linux system may cause an error on internal power supply.
Impact:	Internal power supply failure may occur after VME DMA activity and reboot command. Note that reset appears on backplane with this failure.
Workaround:	Program PEX8112 arbiter to park PCI bus on PEX8112 after a PCI transfer. Set bit [3:1] of PCI Control register to 001b. This register is accessed by the PCI memory base address register 0, offset 100Ch.
Fix:	No plan to fix on PCB A. Note that workaround will be applied by default on a future u-boot release.

Item #3 SoC watchdog feature not available

Description:	32 KHz clock used by SoC for watchdog feature was not available on the device.
Impact:	SoC watchdog feature not operating.
Workaround:	None
Fix:	Fixed on E.C. Level 1x004 (CPLD v2).

Item #4 Electrical and mechanical ground connection

Description:	Electrical ground and mechanical ground are connected by 0 Ohm resistors.
Impact:	Negligible impact on the EFT boards..
Workaround:	None
Fix:	Fixed on E.C. Level 1x0004

Item #5 I2C bus failure

Description:	I2C bus of SoC may fail in rare condition.
Impact:	I2C transactions are no longer possible when issue occurs, I2C device are no longer available with Linux sensors command. Power-off/on must be done to recover the I2C bus feature.
Workaround:	None
Fix:	Fixed on E.C. Level 1x0004

About Kontron – An S&R Company

Kontron is a global leader in embedded computing technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall.

For more information, please visit: **www.kontron.com**

CORPORATE OFFICES

FRANCE

150, rue Marcelin Berthelot
ZI de Toulon-Est - BP 244
83078 Toulon Cedex 9 - France
Tel: +33 4 98 16 34 00
Fax: +33 4 98 16 34 01
sales.KFR@kontron.com

GLOBAL HEADQUARTERS

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
Tel.: + 49 821 4086-0
Fax: + 49 821 4086-111
info@kontron.com

NORTH AMERICA

9477 Waples Street, Suite 150
San Diego, CA 92121
USA
Tel.: + 1 888 294 4558
Fax: + 1 858 677 0898
info@us.kontron.com

ASIA PACIFIC

1~2F, 10 Bldg, N° 8 Liangshuihe 2nd Str.
Economical & Techno. Develop. Zone,
Beijing, 100176, P.R. China
Tel.: + 86 10 63751188
Fax: + 86 10 83682438
info@kontron.cn