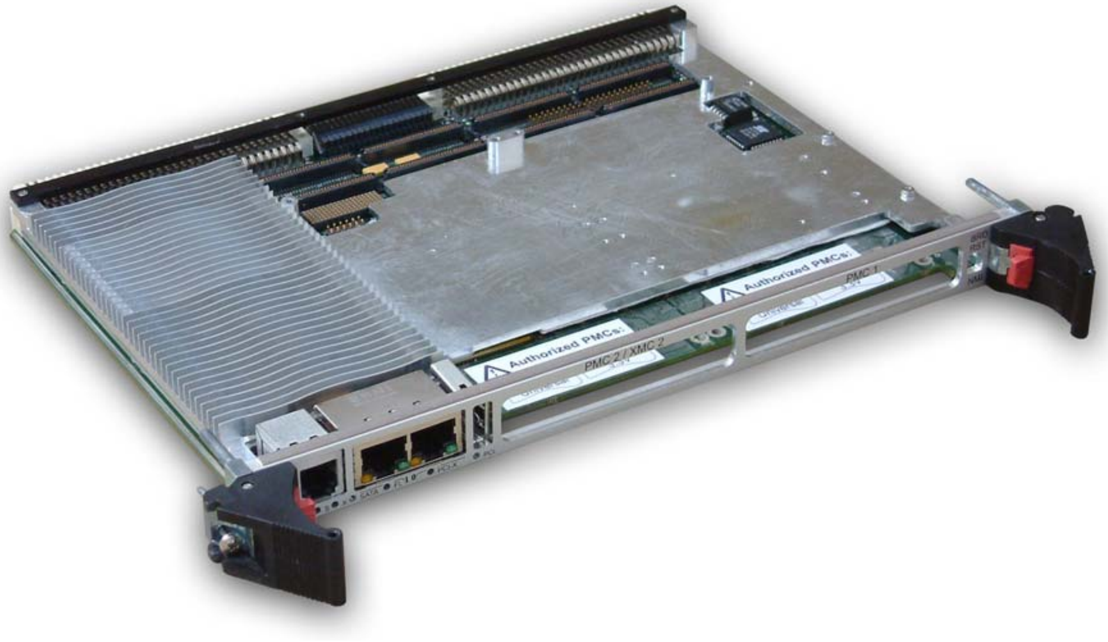
# » PENTXM2/RA & PENTXM4/RA «



## User's Guide Supplement

CA.DT.A72-2e - October 2010

# Revision History

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## Proprietary Note

## Trademarks

## 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 DEEE/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 they 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

# Conventions

This guide uses several types of notice: Note, Caution, ESD.

Note: this notice calls attention to important features or instructions.

Caution: this notice alert you to system damage, loss of data, or risk of personal injury.

ESD: This banner indicates an Electrostatic Sensitive Device.

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. The prefix `0x' shows a hexadecimal number, following the `C' programming language convention.

The multipliers `k', `M' and `G' have their conventional scientific and engineering meanings of $*10^3$, $*10^6$ and $*10^9$ respectively. The only exception to this is in the description of the size of memory areas, when `K', `M' and `G' mean $*2^{10}$, $*2^{20}$ and $*2^{30}$ respectively.

When describing transfer rates, `k' `M' and `G' mean $*10^3$, $*10^6$ and $*10^9$ *not* $*2^{10}$ $*2^{20}$ *and* $*2^{30}$.

In PowerPC terminology, multiple bit fields are numbered from 0 to n, where 0 is the MSB and n is the LSB. PCI and CompactPCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Signal names ending with an asterisk (*) or a hash (#) denote active low signals; all other signals are active high.

Signal names follow the PICMG 2.0 R3.0 CompactPCI Specification and the PCI Local Bus 2.3 Specification.

# 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

**Warning!**
All operations on this device must be carried out by sufficiently skilled personnel only.

**Caution, Electric Shock!**
Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

## Special Handling and Unpacking Instructions

**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 board 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 board.

## General Instructions on Usage

In order to maintain Kontron’s product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron’s Technical Support as a special handling instruction, will void your warranty.

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

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

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

# Table Of Contents

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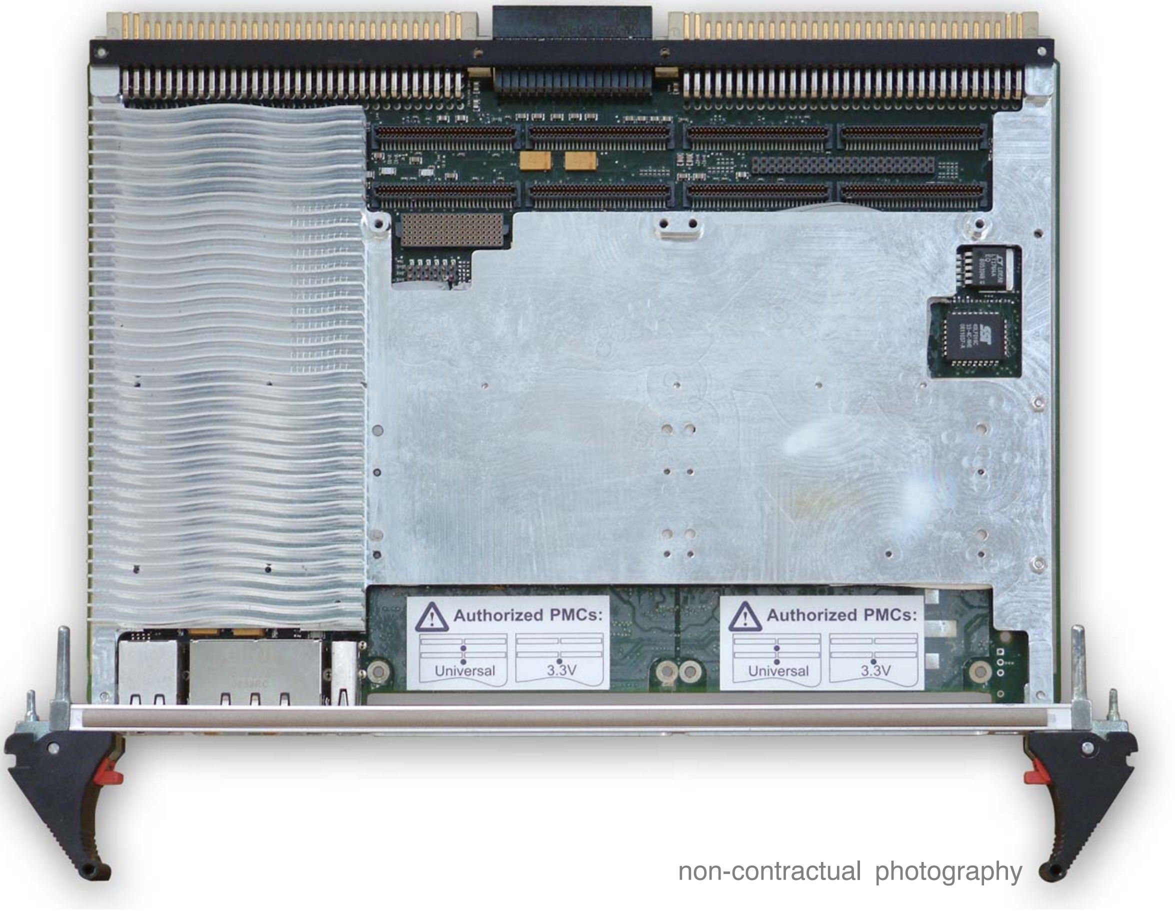
# Chapter 1 - Introduction

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

The PENTXM2/RA & PENTXM4/RA boards use “The Ruggedizer", a Kontron proven technology to meet the requirements for harsh environments. With an operational temperature range from -40º C up to +71º C (VITA 47 AC3) and its mechanical environmental performances, the PENTXM2/RA & PENTXM4/RA are designed for severe environmental applications with high levels of shock and vibration, small space envelope and restricted cooling such as required in military, marine, avionics, sheltered and industrial applications.



non-contractual photography

Figure 1: PENTXM2/RA & PENTXM4/RA - Overview

## Order Code

| | |
|---|---|
| PENTXM2-RA34S-10000 | Rugged Air-Cooled RA Class<br>Dual-Core Intel Xeon @1.67 GHz<br>**1 GB DDR2-SDRAM**<br>4 GB soldered Flash Disk<br>Coated |
| PENTXM2-RA36S-10000 | Rugged Air-Cooled RA Class<br>Dual-Core Intel Xeon @1.67 GHz<br>**2 GB DDR2-SDRAM**<br>4 GB soldered Flash Disk<br>Coated |
| PENTXM2-RA38S-10000 | Rugged Air-Cooled RA Class<br>Dual-Core Intel Xeon @1.67 GHz<br>**4 GB DDR2-SDRAM**<br>4 GB soldered Flash Disk<br>Coated |

## 1.1 Objectives

This document describes the specificities of the PENTXM2/RA & PENTXM4/RA boards compared to the PENTXM2/SA and PENTXM4/SA boards. It focuses on the features which are specific to the air-cooled version of the boards.

This document does not supersede the “PENTXM2 and PENTXM4 Boards - User's Guide" which contains important information for unpacking, identifying, configuring, installing and operating the PENTXM2 and PENTXM4 boards and which should be read first.

Note

- The “User's Guide” and “Connection Guide” manuals (see section 1.2 “Related Documents") reflect the most recent version of the Kontron products.

- The “Hardware Release Notes" documentation (see section 1.2 “Related Documents") helps to keep track of various evolutions of the products.

## 1.2 Related Documents

### Hardware Documentation

| | |
|---|---|
| PENTXM2 and PENTXM4 Hardware Release Notes | CA.DT.A09 |
| PENTXM2 and PENTXM4 User's Guide | CA.DT.A07 |
| PENTXM2 and PENTXM4 Connection Guide | CA.DT.A10 |
| PENTMX2/RC and PENTXM4/RC Supplement User's Guide | CA.DT.A08 |
| PENTXM2/RA & PENTXM4/RA Supplement User's Guide (this manual) | CA.DT.A72 |

### Firmware Documentation

| | |
|---|---|
| InsydeH20 Firmware for PENXTM2 and PENTXM4 - User Reference Manual | SD.DT.E86 |
| PENTXM2 and PENTXM4 XBIT User's Guide | SD.DT.E90 |
| PENTXM2 and PENTXM4 IPMI BMC User's Manual | SD.DT.F12 |

### Software Documentation

| | |
|---|---|
| Release Notes RHEL5.2 on PENTXM2 and PENTXM4 Boards | SD.DT.F34 |
| Release Notes RHEL5 on PENTXM2 and PENTXM4 Boards | SD.DT.F28 |
| Release Notes RHEL4 on PENTXM2 and PENTXM4 Boards | SD.DT.E82 |
| Release Notes Windows XP on PENTXM2 and PENTXM4 Boards | SD.DT.F39 |

# Chapter 2 - Characteristics of the Board

## 2.1 PENTXM2/RA & PENTXM4/RA Specificities

The PENTXM2/RA & PENTXM4/RA boards have the same features as the PENTXM2/SA & PENTXM4/SA boards (refer to the "PENTXM2 and PENTXM4" Boards - User's Guide" for more information) except for the following items which are fully described in associated section below:

| FUNCTION | DESCRIPTION | SEE ALSO |
|---|---|---|
| Battery | No battery available onboard | Section 2.2 page 5 |
| Board Identification | Specific ruggedizer identification | Section 2.3 page 6 |
| Environmental Specifications | Depend on environmental class | Section 2.4 page 7 |
| Hardware Configuration | Depend on the environmental class | Section 2.5 page 8 |
| Mechanical Specifications | Depend on the environmental class | Section 2.6 page 11 |
| MTBF | Depend on the environmental class | Section 2.7 page 12 |
| System Flash | System Flash soldered onboard | |
| Thermal Performance | Depend on the environmental class | Section 2.8 page 13 |

Table 1: PENTXM2/RA & PENTXM4/RA Specificities

## 2.2 Batteryless Operation and Non-Volatile Board Settings

For specific applications, the limited lifetime of the battery in extreme environmental conditions is an issue. In this case, system requirement forbids the use of a battery.

The PENTXM2/RA & PENTXM4/RA boards operate safely without a battery fitted. In this case, the non-volatile board settings are managed this way:

- All BIOS user settings are kept forever (in a specific area of the BIOS Flash)
- By default, all PENTXM2/RA & PENTXM4/RA boards are delivered without a baterry fitted, so **the Date/Time is lost at each power-on/power-off and the BIOS displays: `01/01/2001 00:00/00`**

## 2.3 Board Identification

The PENTXM2/RA & PENTXM4/RA boards are identified by labels fitted to the bottom side. These labels are at the same location and have the same meaning (except the “Board Identification" label) as the PENTXM2/SA boards labels (refer to the “PENTXM2 and PENTXM4” Boards - User's Guide" for more information).

> The “Board Identification" label prefix of a PENTXM2/RA & PENTXM4/RA board is **PENTXM2-RA or PENTXM4-RA.**

> In addition, the ruggedizer is identified by:

- the “Ruggedizer Identification” (printed on the ruggedizer). **AA**
- the “Engineering Change Level" (E.C. Level) of the ruggedizer. **AB**

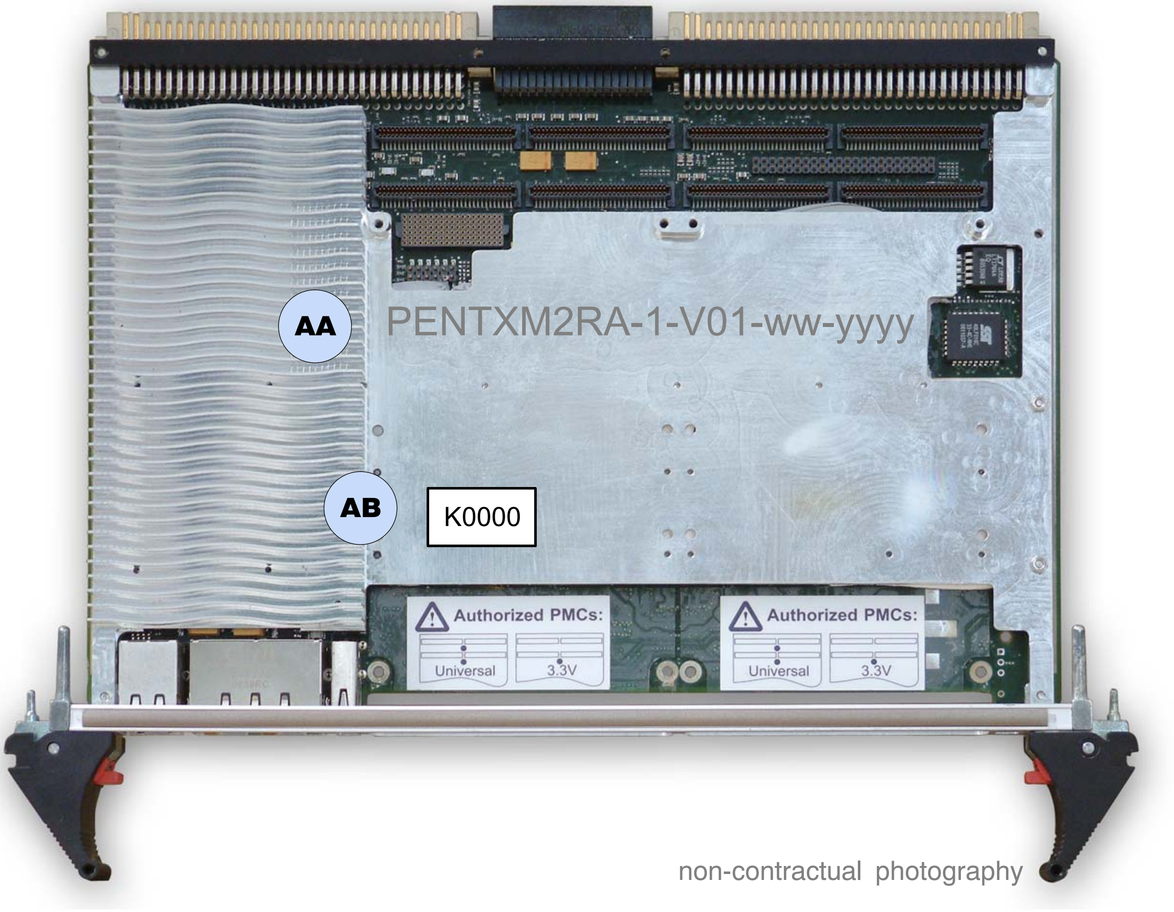


Figure 2: PENTXM2/RA & PENTXM4/RA Identification

## 2.4 Environmental Specifications

| Environmental Specifications | RA (Rugged Air-Cooled) |
|---|---|
| **Conformal Coating** | Standard |
| **Temperature** | |
| Cooling Method | Air-Cooled |
| Operating | -40° to +71°C - VITA 47 - Class AC3 |
| Storage | -45 ° to +100°C |
| **Vibration Sine (Operating)** | 20 / 2000 Hz 3g |
| **Random Vibration** | VITA 47 - Class V2 |
| **Shock (Operating)** | Half Sine 40 g / 20 ms |
| **Altitude (Operating)** | -1,640 to 33,000 ft |
| **Relative Humidity** | 95% without condensation |

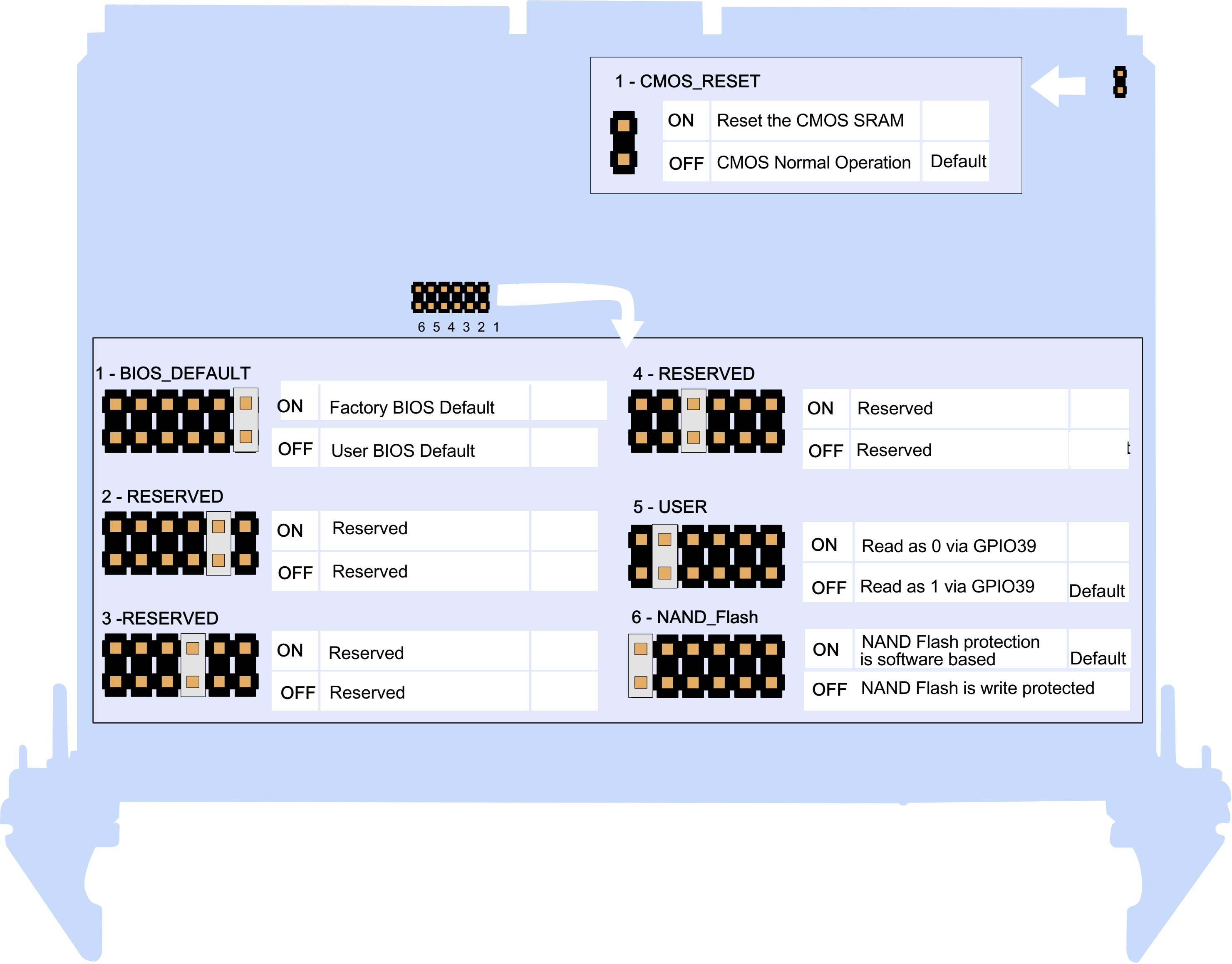
Table 2: Environmental Specifications

Note Please, check in chapter 2.8 the graph of operating temperature usage versus air-flow.

## 2.5 Hardware Configuration

When setting jumpers, avoid touching areas of integrated circuitry; static discharge can damage circuits.

To ensure proper operation of the PENTXM2/RA & PENTXM4/RA board, you may need to check its jumpers configuration. Figure 3 illustrates the placement of the jumpers on the board and their default settings.



1 - CMOS_RESET

| | | |
|---|---|---|
| ON | Reset the CMOS SRAM | |
| OFF | CMOS Normal Operation | Default |

1 - BIOS_DEFAULT

| | | |
|---|---|---|
| ON | Factory BIOS Default | |
| OFF | User BIOS Default | |

2 - RESERVED

| | | |
|---|---|---|
| ON | Reserved | |
| OFF | Reserved | |

3 -RESERVED

| | | |
|---|---|---|
| ON | Reserved | |
| OFF | Reserved | |

4 - RESERVED

| | | |
|---|---|---|
| ON | Reserved | |
| OFF | Reserved | t |

5 - USER

| | | |
|---|---|---|
| ON | Read as 0 via GPIO39 | |
| OFF | Read as 1 via GPIO39 | Default |

6 - NAND_Flash

| | | |
|---|---|---|
| ON | NAND Flash protection is software based | Default |
| OFF | NAND Flash is write protected | |

Figure 3: PENTXM2/RA & PENTXM4/RA Jumpers Locations and Default Settings

### 2.5.1 NAND Flash Protection

GPIO23 connects to the `WP_PD#` bit of the the SST55LD019 to invoke hardware write protection via a specific jumper (NAND_Flash).

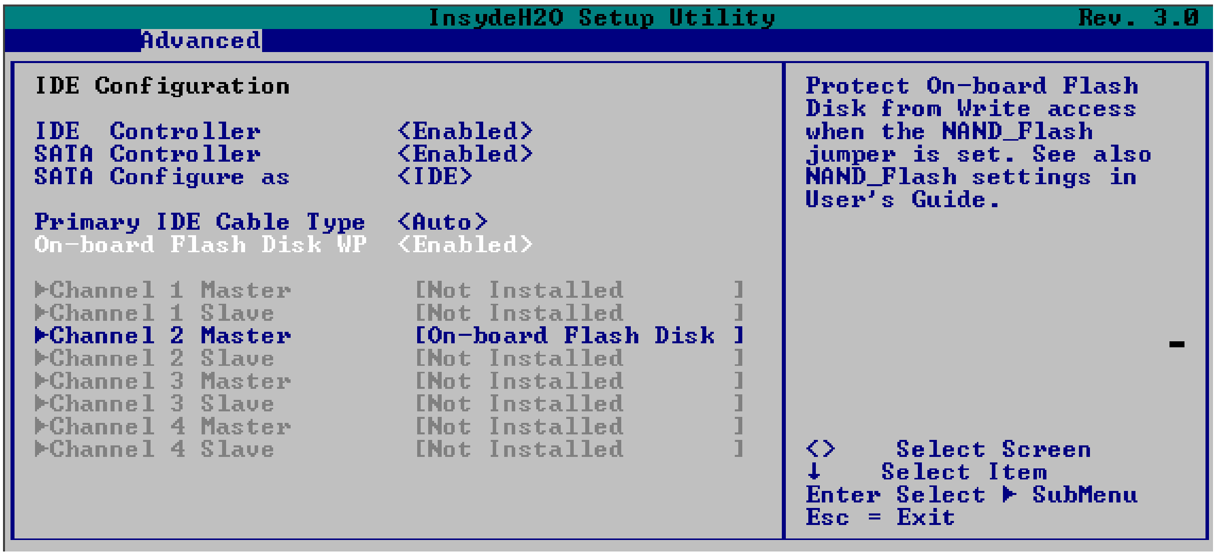
- If the local NAND_Flash jumper is installed (ON) and
  - GPIO23 is logic 1 the NAND Flash is not write protected.
  - GPIO23 is logic 0 the NAND Flash is write protected.
- If the local NAND_Flash jumper is removed (OFF), the NAND Flash is write protected.

| LOCATION | NAME | CONNECTS TO | SETTING | DESCRIPTION |
|---|---|---|---|---|
| 6 | NAND_Flash | 6300ESB<br>GPIO23 | ON | Default configuration:<br>NAND Flash protection is software based. |
| | | | OFF | NAND Flash is write protected. |

Table 3: Jumper Description: NAND Flash Protection

#### » Controf of the NAND Flash Protection

The NAND Flash write protection can be managed by software with the onboard NAND_Flash jumper installed (ON) by handling the `GPIO23`. The `GPIO23` can be set up from the BIOS firmware (release 1.00.56 and higher). Refer to section 4.2.4 “Onboard Flash Disk Write Protection” in InsydeH2O Firmware User's Manual.



```
                              InsydeH2O Setup Utility                      Rev. 3.0
          Advanced

 IDE Configuration                                    Protect On-board Flash
                                                      Disk from Write access
 IDE  Controller           <Enabled>                  when the NAND_Flash
 SATA Controller           <Enabled>                  jumper is set. See also
 SATA Configure as         <IDE>                      NAND_Flash settings in
                                                      User's Guide.
 Primary IDE Cable Type    <Auto>
 On-board Flash Disk WP    <Enabled>

 ▶Channel 1 Master          [Not Installed       ]
 ▶Channel 1 Slave           [Not Installed       ]
 ▶Channel 2 Master          [On-board Flash Disk ]
 ▶Channel 2 Slave           [Not Installed       ]
 ▶Channel 3 Master          [Not Installed       ]
 ▶Channel 3 Slave           [Not Installed       ]
 ▶Channel 4 Master          [Not Installed       ]   <>    Select Screen
 ▶Channel 4 Slave           [Not Installed       ]   ↓    Select Item
                                                      Enter Select ▶ SubMenu
                                                      Esc = Exit
```

Figure 4: InsydeH2O: IDE Configuration

In the Linux RHELx BSP, a driver is provided to handle the user's GPIO: `GPIO41`, `GPIO42` and `GPIO43`. The `GPIO23` could be managed (output only) by adapting this driver. More detail available in:
- section 6.5.9 “User's GPIO” in the “Release Notes RHEL4 for PENTXM2 and PENTXM4 Boards - SD.DT.E82”
- section 6.9 “User's GPIO” in the “Release Notes RHEL5 for PENTXM2 and PENTXM4 Boards - SD.DT.F28”
- section 6.10 “User's GPIO” in the “Release Notes RHEL5.2 for PENTXM2 and PENTXM4 Boards - SD.DT.F34”

Summary Control of NAND Flash Protection

| **Onboard Flash Disk WP (setup from BIOS menu)** | **Onboard NAND-Flash Jumper: ON** | **Onboard NAND-Flash Jumper:OFF** |
|---|---|---|
| <Enabled><br>GPIO23=0 | Onboard flash is:<br>Write Protected | Onboard flash is:<br>Write Protected |
| <Disabled><br>GPIO23=1 | Onboard flash is:<br>NOT Write Protected | Onboard flash is:<br>Write Protected |

Table 4: Control of the NAND Flash Protection

## 2.6 Mechanical Specifications

The PENTXM2/RA & PENTXM4/RA boards are build on a multi-layer double Eurocard and conforms to the dimensions specified in the ANSI/VITA VME64 1-1994. The dimensions shown below are in millimeters, with inches (in parentheses) for general guidance only.

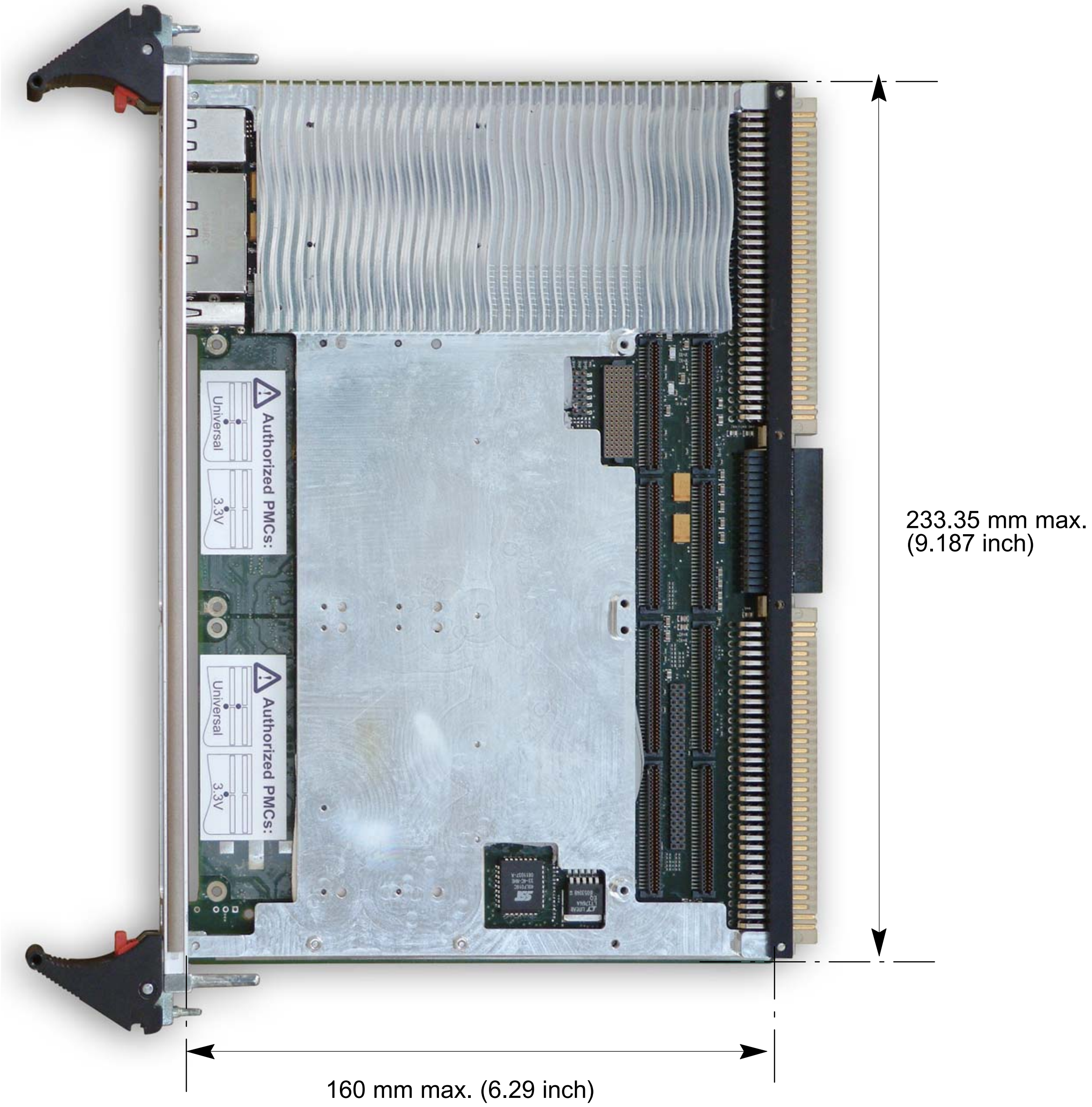


Figure 5: VME Dimensions

- Length: 233.35 mm max
- Depth: 160 mm max. (without connectors)
- Height: 1 VME slot compatible
- Weight: 670 g (approximatively)

## 2.7 MTBF Data

Calculations are made according to the standard MIL-HDBK217F-2 for four types of environment:

- Ground Benign (GB)
- Air Inhabited Cargo (AIC)
- Naval Sheltered (NS)
- Air Rotary Wing (ARW)

| | GB (Hours) | | AIC (Hours) | NS (Hours) | | ARW (Hours) |
|---|---|---|---|---|---|---|
| | 25°C | 40°C | 40°C | 25°C | 40°C | 55°C |
| PENTXM2/RA<br>Order Code:<br>PENTXM2-RA34S-10000 | 380 132 | 292 228 | 49 069 | 61 376 | 53 131 | 13 077 |
| PENTXM4/RA<br>Order Code:<br>PENTXM4-RA34S-10000 | 276 979 | 212 257 | 39 202 | 41 713 | 40 247 | 9 622 |

Table 5: MTBF Data

## 2.8 Thermal Performance

The standard operating range for PENTXM2/RA & PENTXM4/RA is -40° to +71°C. To achieve this specification, the cooling airflow should be set according to both following graphes for PENTXM2/RA & PENTXM4/RA @1.67GHz and PENTXM2/RA & PENTXM4/RA @1.33GHz.

To modify the dual-core processing frequency, please refer to the section 6.1.1 “CPU Frequency" of the InsydeH2O Firmware User Reference Manual (SD.DT.E86).

### » PENTXM2/RA - 1.67 GHz

For instance, the thermal operating point according to the PENTXM2/RA – 1.67 GHz thermal performance graph should be 3.5 m/s and 65°C for cooling airflow direction coming from PMC to CPU.

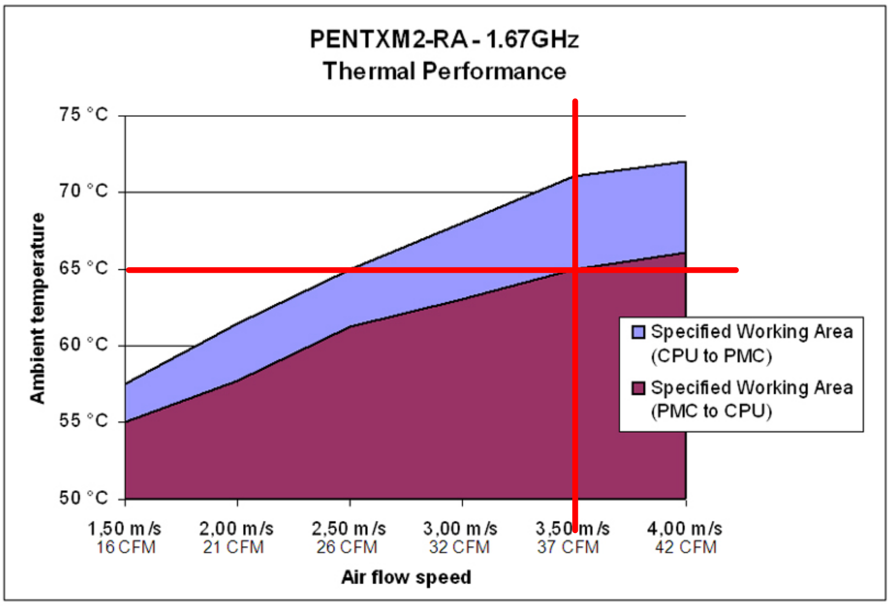


Figure 6: Thermal Performance - PENTXM2/RA @ 1.67 GHz

## » PENTXM2/RA - 1.33 GHz

For instance, the thermal operating point according to the PENTXM2/RA – 1.33 GHz thermal performance graph should be 3.5 m/s and 71°C for cooling airflow direction coming from PMC to CPU.

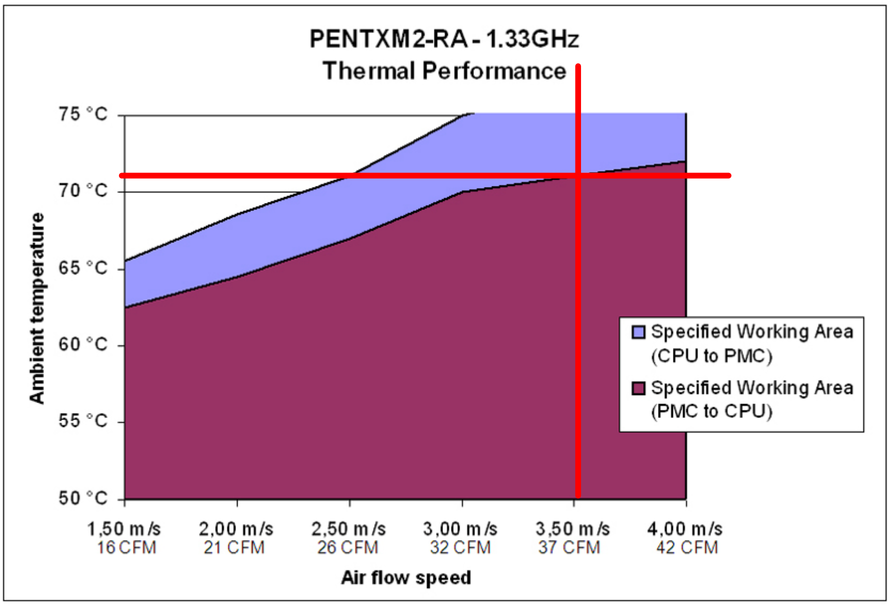


Figure 7: Thermal Performance - PENTXM2/RA @ 1.33 GHz

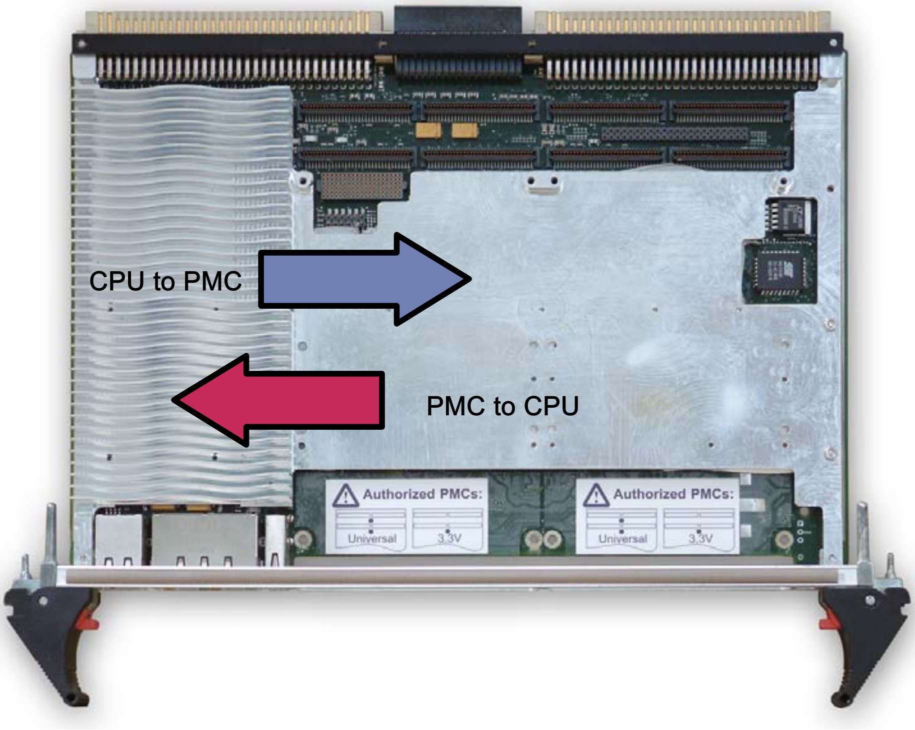


Figure 8: Air Flow Direction

Note The air flow direction “CPU to PMC” is more efficient.

## » PENTXM4-RA-1.67GHz

For instance, the thermal operating point according to the PENTXM4/RA – 1.67 GHz thermal performance graph should be 3.2 m/s and 61°C for cooling airflow direction coming from PMC to CPU.

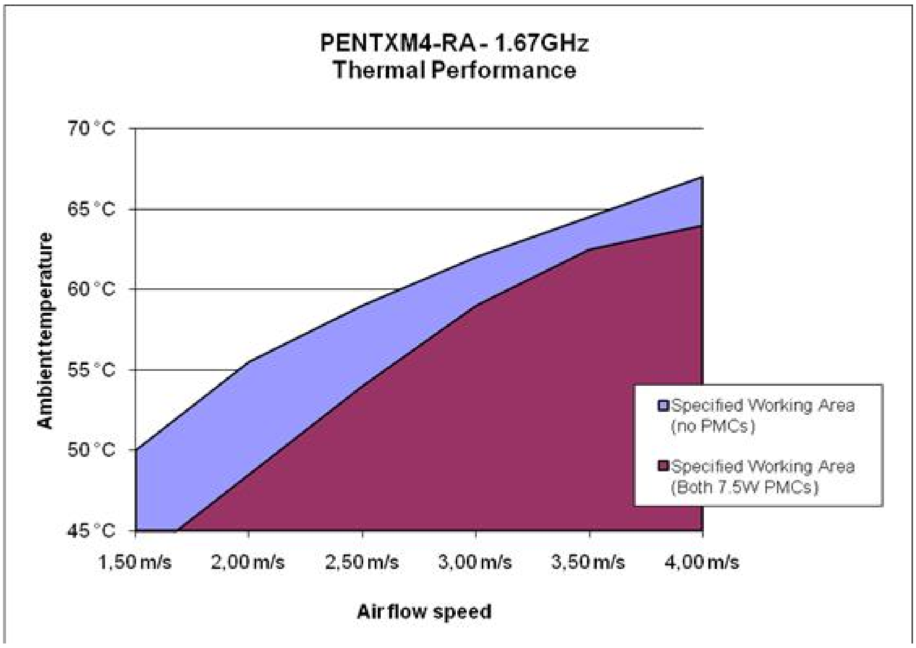


Figure 9: Thermal Performance – PENTXM4/RA @ 1.67 GHz

## » PENTXM4-RA-1.33GHz

Estimated usage graph:

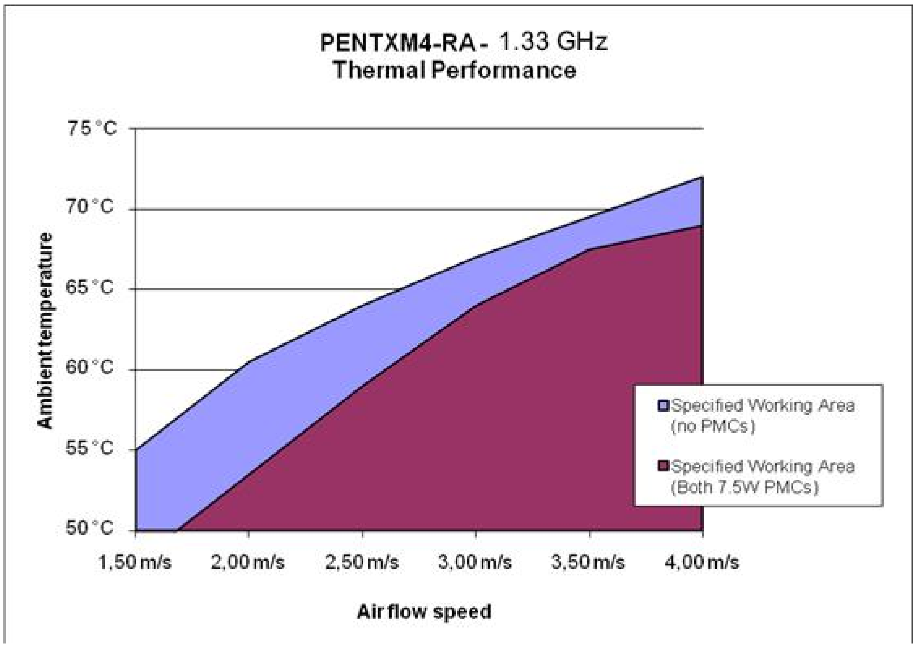


Figure 10: Thermal Performance (Estimation)– PENTXM4/RA @ 1.33 GHz

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