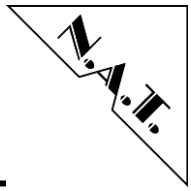
# NAMC-Extender
# AMC Extender Module
# Technical Reference Manual V1.5
# HW Revision 1.5



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**Note:**

**The release of the Hardware Manual is related to a certain HW board revision given in the document title. For HW revisions earlier than the one given in the document title please contact N.A.T. for the corresponding older Hardware Manual release.**

# Table of Contents

# List of Tables



# List of Figures

# 1 Introduction

The **NAMC-Extender** is an extender card for standard Advanced Mezzanine Cards, single width, double height. It can be plugged onto any ATCA carrier board supporting AMC standards. It is also designed to meet the requirements of µTCA systems.

It eases debugging of AMC boards by enabling the user to access the module under test from both sides, install debug port cables, and allow access for measurement of power supplies.

# 2 Technical Specifications

## *2.1 Bus Interface*

- All AMC ports connected

## *2.2 Power Supply*

- The NAMC-Extender draws very little power from the carrier supplies. Current drawn from +3.3V, and +12V is less than 10mA each.
- Power planes for GND, payload power and management power.
- Both power supplies drive signalling LEDs.
- Both power supplies may be cut by opening wire bridges for current measurements.
- +3.3V Management power may either be taken from the backplane, or generated locally from Payload Power.
- Payload Power may either be taken from the backplane, or a +12V power supply may be connected to wire bridge BR1.

## *2.3 Environment*

- Temperature: -40 – +85°C operating and storage
- Humidity: 5 – 90% rh not condensing

# 3 Installation

## 3.1 Safety Note

To ensure proper functioning of the **NAMC-Extender** during its usual lifetime take the following precautions before handling the board.

**CAUTION**

Electrostatic discharge and incorrect board installation and uninstallation can damage circuits or shorten their lifetime.

- Before installing or uninstalling the **NAMC-Extender** read this installation section
- Before installing or uninstalling the **NAMC-Extender** in a rack:
  - Check all installed boards and modules for steps that you have to take before turning on or off the power.
  - Take those steps.
  - Finally turn on or off the power.
- Before touching integrated circuits ensure to take all require precautions for handling electrostatic devices.

## 3.2 Installation Requirements

### 3.2.1 Requirements

The installation requires only

- an AMC backplane for connecting the **NAMC-Extender.**
  This can be either an ATCA carrier board, or a µTCA backplane
- a power supply

### 3.2.2 Power supply

The power supply for the **NAMC-Extender** must meet the following specifications:

- required for the extender board:
  - +3.3V / 0.01A typical
  - +12V / 0.01A typical
- required for the board under test:
  - refer to the BUT power specification

## 3.3 Statement on Environmental Protection

### 3.3.1 Compliance to RoHS Directive

Directive 2002/95/EC of the European Commission on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS) predicts that all electrical and electronic equipment being put on the European market after June 30th, 2006 must contain lead, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) and cadmium in maximum concentration values of 0.1% respective 0.01% by weight in homogenous materials only.

As these hazardous substances are currently used with semiconductors, plastics (i.e. semiconductor packages, connectors) and soldering tin any hardware product is affected by the RoHS directive if it does not belong to one of the groups of products exempted from the RoHS directive.

Although many of hardware products of N.A.T. are exempted from the RoHS directive it is a declared policy of N.A.T. to provide all products fully compliant to the RoHS directive as soon as possible. For this purpose since January 31st, 2005 N.A.T. is requesting RoHS compliant deliveries from its suppliers. Special attention and care has been payed to the production cycle, so that wherever and whenever possible RoHS components are used with N.A.T. hardware products already.

### 3.3.2 Compliance to WEEE Directive

Directive 2002/95/EC of the European Commission on "Waste Electrical and Electronic Equipment" (WEEE) predicts that every manufacturer of electrical and electronical equipment which is put on the European market has to contribute to the reuse, recycling and other forms of recovery of such waste so as to reduce disposal. Moreover this directive refers to the Directive 2002/95/EC of the European Comission on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

Having its main focus on private persons and households using such electrical and electronic equipment the directive also affects business-to-business relationships. The directive is quite restrictive on how such waste of private persons and households has to be handled by the supplier/manufacturer, however, it allows a greater flexibility in business-to-business relationships. This pays tribute to the fact with industrial use electrical and electronical products are commonly integrated into larger and more complex environments or systems that cannot easily be split up again when it comes to their disposal at the end of their life cycles.

As N.A.T. products are solely sold to industrial customers, by special arrangement at time of purchase the customer agreed to take the responsibility for a WEEE compliant disposal of the used N.A.T. product. Moreover, all N.A.T. products are marked according to the directive with a crossed out bin to indicate that these products within the European Community must not be disposed with regular waste.

If you have any questions on the policy of N.A.T. regarding the Directive 2002/95/EC of the European Commission on the "Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS) or the Directive 2002/95/EC of the European Commission on "Waste Electrical and Electronic Equipment" (WEEE) please contact N.A.T. by phone or e-mail.

### *3.3.3 Compliance to CE Directive*

Compliance to the CE Directive is declared. A ‘CE’ sign can ce found on the PCB.

### *3.3.4 Product Safety*

The board complies to EN60950 and UL1950.

# 4 Hardware Description

This chapter contains a brief description of the NAMC-Extender board.

## 4.1 Hardware Overview

The NAMC-Extender is a passive extender board, i.e. it does not contain any circuitry apart from 2 AMC connector sets (J1 plugging into the backplane, JP1 for acceptance of the board under test).

The figure 1 "Location diagram of the **NAMC-Extender**" highlights the position of the important components. Depending on the board type it might be that the board does not include all components named in the location diagram. This applies e.g. to the Management Power supply circuitry for local Management Power generation from Payload Power, which is an assembly option.

**Figure 1: Location diagram of the NAMC-Extender (top left side)**

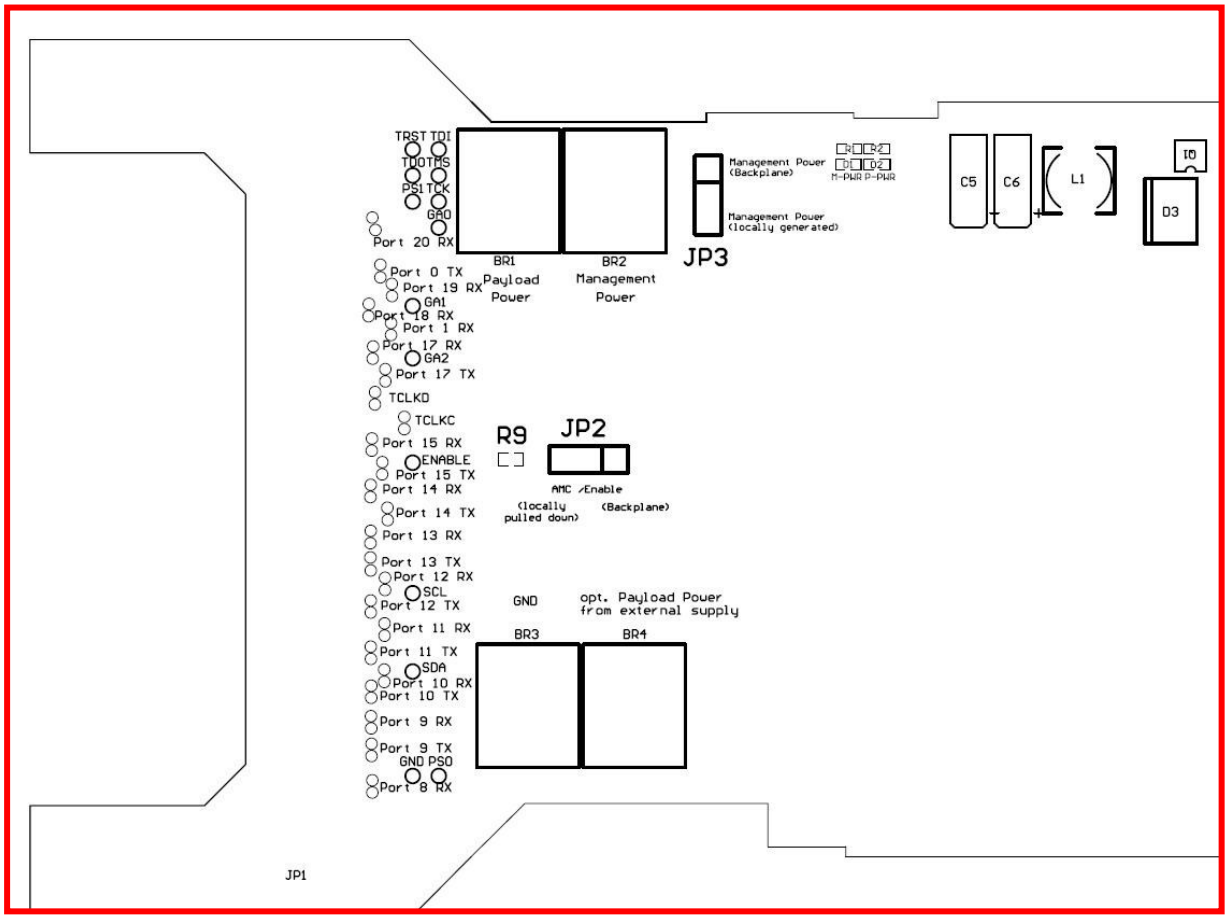
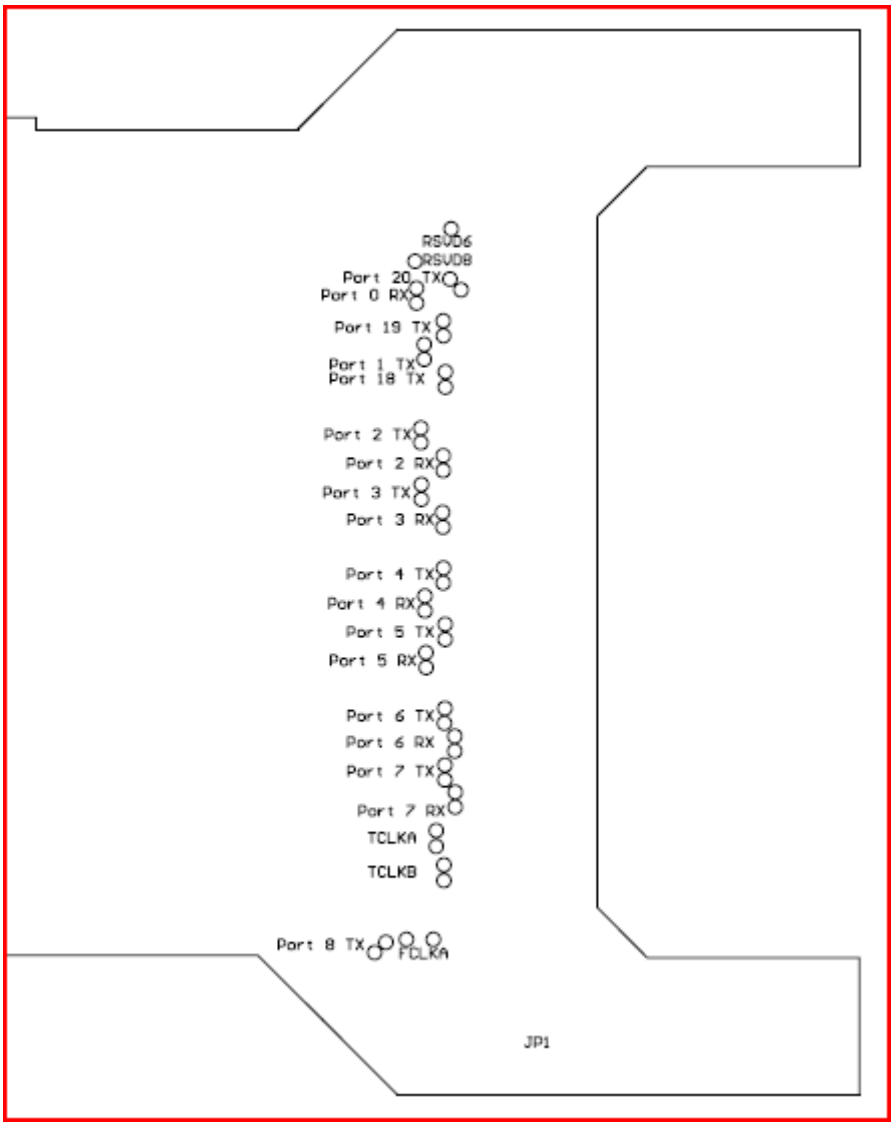


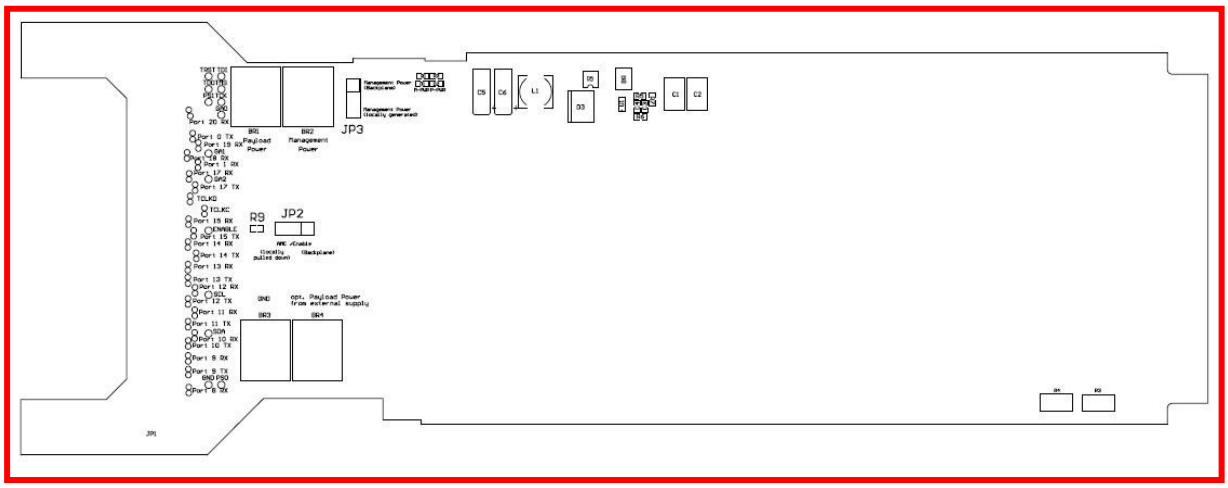
**Figure 2: Location diagram of the NAMC-Extender (bottom left side)**



## 4.2 Connectors, Switch and Wire Bridges

There are 2 connectors and 3 wire bridges on the NAMC-Extender. Connector J1 is a direct connector and fits into the ATCA or µTCA AMC slot. Connector JP1 is the socket into which the device under test is plugged. Figure 3 shows the connectors, as well as the wire bridges:

**Figure 3: Connectors of the NAMC-Extender**



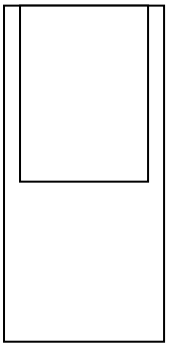

### 4.2.1 Jumper JP2

The setting of jumper JP3 defines the source for /AMC_ENABLE signal. The default position (right aligned) means the signal is connected to the backplane. In the left aligned position the signal is pulled down locally on the extender board.

### 4.2.2 Jumper JP3

The setting of jumper JP3 defines the source of Management Power. By default, Management Power is taken from the backplane (jumper JP3 in the upper position). In case there is no Management Power available (e.g. a test assembly with just a +12V supply), Management Power can be generated onboard from the +12V Payload Power. In order to make use of this feature, set switch JP3 to the lower position.

**Jumper JP3**



upper position:
Management Power taken from backplane

lower position:
Management Power locally generated

### 4.2.3 Wire Bridges

By means of the wire bridges BR1 and BR2 the supply voltages are connected. By placing an ampere-meter between the contacts of one of these wire bridge, the supply current of the respective power supply can be measured. Table 1 shows these wire bridges, and which supply they connect:

**Table 1: Wire Bridges**

| Supply | Wire Bridge |
|---|---|
| +12V Payload Power | BR1 |
| +3.3V Management Power | BR2 |
| GND (reference point or external supply) | BR3 |
| +12V Payload Power (external supply) | BR4 |

Both contacts of BR3 are connected to GND, hence GND cannot be disconnected from the device under test by opening this wire bridge. BR3 serves 2 purposes:

- GND can easily be accessed, e.g. as a reference contact for measuring purposes
- by means of these GND contacts an external power supply may be connected

Both contacts of BR4 are connected to Payload Power, hence +12V cannot be disconnected from the device under test by opening this wire bridge. BR4 may be used to connect an external power supply to the extender board, e.g. when there is no backplane available.

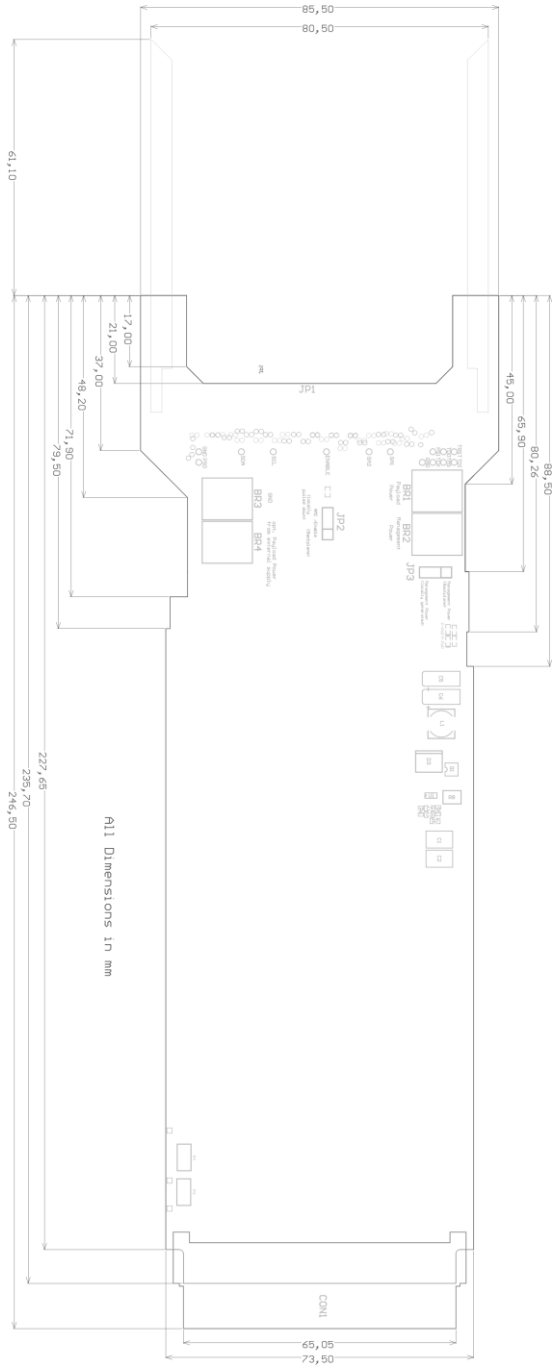
## 4.3 Testpoints

There are a number of testpoints available on the NAMC-Extender. Due to layout reasons (differential trace routing for signals with up to 2.5 GHz frequency is somewhat critical), there are only small SMD testpoints for the differential signals. All other signals (e.g. geographical address, IPMB signals, etc.) are routed to standard testpoints, into which standard 100 mil header connectors may be assembled. By default, there are no headers assembled. The signals testpoints carry are printed on the silkscreen.

## 4.4 Dimensions

The main purpose of the NAMC-Extender is to enable the user to do measurements on a standard AMC outside the chassis. Therefore the connector JP1 (that picks up the AMC) and all measure Points are outside the Chassis. To allow that this area varies from the outlines defined in the AMC.0 specification. While the part that fits into the chassis still complies to the dimensions defined by the AMC.0 specification. Figure 4: is showing the dimensions of the NAMC-Extender.

**Figure 4: NAMC-Extender Dimensions**



# 5 AMC Port Definition

**Table 2: AMC Port Definition for N.A.T. AMC Modules**

| | Port No. | AMC Port Mapping Strategy | Ports used as |
|---|---|---|---|
| Basic Connector | CLK1 | Clocks | Reference Clock TCLKA |
| | CLK2 | | Reference Clock TCLKB |
| | CLK3 | | Reference Clock FCLKA |
| | 0 | Common Options Region | 1000Base-BX Ethernet Channel 1 |
| | 1 | | 1000Base-BX Ethernet Channel 2 |
| | 2 | | unassigned |
| | 3 | | unassigned |
| | 4 | Fat Pipes | Fat Pipe Lane 0 |
| | 5 | | Fat Pipe Lane 1 |
| | 6 | | Fat Pipe Lane 2 |
| | 7 | | Fat Pipe Lane 3 |
| Extended Connector | 8 | Region | Fat Pipe Lane 4 |
| | 9 | | Fat Pipe Lane 5 |
| | 10 | | Fat Pipe Lane 6 |
| | 11 | | Fat Pipe Lane 7 |
| | 12 | Extended Options Region | TDM Bus D0-3 (H.110 extended) |
| | 13 | | TDM Bus D4-7 (H.110 extended) |
| | 14 | | optional clock lines (H.110 extended)/ unassigned |
| | 15 | | Unassigned |
| | 16 | | TCLKC / TCLKD |
| | 17 | | Unassigned |
| | 18 | | optional clock lines (Rear I/O)/ unassigned |
| | 19 | | Rear I/O (TDM P2P/E1 Framer) |
| | 20 | | Rear I/O (SPI) |

# 6 Connectors

## 6.1 AMC Connectors J1 / JP1

**Table 3: AMC Connectors J1 / JP1**

| Pin No. | AMC-Signal | AMC-Signal | Pin No. |
|---|---|---|---|
| 1 | GND | GND | 170 |
| 2 | PWR | TDI | 169 |
| 3 | /PS1 | TDO | 168 |
| 4 | PWR_IPMB | /TRST | 167 |
| 5 | GA0 | TMS | 166 |
| 6 | RESVD | TCK | 165 |
| 7 | GND | GND | 164 |
| 8 | RESVD | Tx20+ | 163 |
| 9 | PWR | Tx20- | 162 |
| 10 | GND | GND | 161 |
| 11 | Tx0+ | Rx20+ | 160 |
| 12 | Tx0- | Rx20- | 159 |
| 13 | GND | GND | 158 |
| 14 | Rx0+ | Tx19+ | 157 |
| 15 | Rx0- | Tx19- | 156 |
| 16 | GND | GND | 155 |
| 17 | GA1 | Rx19+ | 154 |
| 18 | PWR | Rx19- | 153 |
| 19 | GND | GND | 152 |
| 20 | Tx1+ | Tx18+ | 151 |
| 21 | Tx1- | Tx18- | 150 |
| 22 | GND | GND | 149 |
| 23 | RLINK2_P | Rx18+ | 148 |
| 24 | RLINK2_N | Rx18- | 147 |
| 25 | GND | GND | 146 |
| 26 | GA2 | Tx17+ | 145 |
| 27 | PWR | Tx17- | 144 |
| 28 | GND | GND | 143 |
| 29 | Tx2+ | Rx17+ | 142 |
| 30 | Tx2- | Rx17- | 141 |
| 31 | GND | GND | 140 |
| 32 | Rx2+ | Tx16+ | 139 |
| 33 | Rx2- | Tx16- | 138 |

| Pin No. | AMC-Signal | AMC-Signal | Pin No. |
|---|---|---|---|
| 34 | GND | GND | 137 |
| 35 | Tx3+ | Rx16+ | 136 |
| 36 | Tx3- | Rx16- | 135 |
| 37 | GND | GND | 134 |
| 38 | Rx3+ | Tx15+ | 133 |
| 39 | Rx3- | Tx15- | 132 |
| 40 | GND | GND | 131 |
| 41 | /ENABLE | Rx15+ | 130 |
| 42 | PWR | Rx15- | 129 |
| 43 | GND | GND | 128 |
| 44 | Tx4+ | Tx14+ | 127 |
| 45 | Tx4- | Tx14- | 126 |
| 46 | GND | GND | 125 |
| 47 | Rx4+ | Rx14+ | 124 |
| 48 | Rx4- | Rx14- | 123 |
| 49 | GND | GND | 122 |
| 50 | Tx5+ | Tx13+ | 121 |
| 51 | Tx5- | Tx13- | 120 |
| 52 | GND | GND | 119 |
| 53 | Rx5+ | Rx13+ | 118 |
| 54 | Rx5- | Rx13- | 117 |
| 55 | GND | GND | 116 |
| 56 | IPMB_SCL | Tx12+ | 115 |
| 57 | PWR | Tx12- | 114 |
| 58 | GND | GND | 113 |
| 59 | Tx6+ | Rx12+ | 112 |
| 60 | Tx6- | Rx12- | 111 |
| 61 | GND | GND | 110 |
| 62 | Rx6+ | Tx11+ | 109 |
| 63 | Rx6- | Tx11- | 108 |
| 64 | GND | GND | 107 |
| 65 | Tx7+ | Rx11+ | 106 |
| 66 | Tx7- | Rx11- | 105 |
| 67 | GND | GND | 104 |
| 68 | Rx7+ | Tx10+ | 103 |
| 69 | Rx7- | Tx10- | 102 |
| 70 | GND | GND | 101 |
| 71 | IPMB_SDA | Rx10+ | 100 |
| 72 | PWR | Rx10- | 99 |
| 73 | GND | GND | 98 |
| 74 | TCLKA+ | Tx9+ | 97 |

| Pin No. | AMC-Signal | AMC-Signal | Pin No. |
|---|---|---|---|
| 75 | TCLKA- | Tx9- | 96 |
| 76 | GND | GND | 95 |
| 77 | TCLKB+ | Rx9+ | 94 |
| 78 | TCLKB- | Rx9- | 93 |
| 79 | GND | GND | 92 |
| 80 | FCLKA+ | Tx8+ | 91 |
| 81 | FCLKA- | Tx8- | 90 |
| 82 | GND | GND | 89 |
| 83 | /PS0 | Rx8+ | 88 |
| 84 | PWR | Rx8- | 87 |
| 85 | GND | GND | 86 |

# 7 Known Bugs / Restrictions

none

# Appendix A: Document's History

| Revision | Date | Description | Author |
|---|---|---|---|
| 1.0 | 05.01.2007 | initial revision | ga |
| 1.1 | 14.03.2007 | adapted to HW Release 1.3 and to AMC Spec R. 2.0 | ga |
| 1.2 | 02.05.2007 | adapted to HW Release 1.4 | ga |
| 1.3 | 26.06.2007 | altered naming of signals to be board-independent | te |
| 1.4 | 10.06.2008 | adapted to HW Release 1.5 | te |
| 1.5 | 14.11.2011 | Added chapter 4.4 Dimensions | ks |