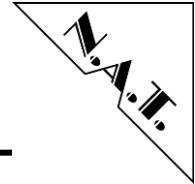


**NAMC-8569-E3/DS3
E3/DS3 AMC Module
Technical Reference Manual V1.2
HW Revision 1.2**

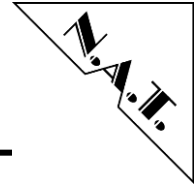


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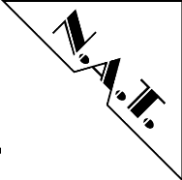


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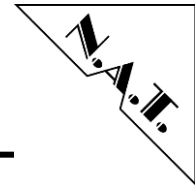
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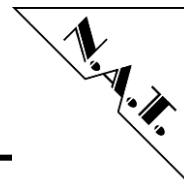
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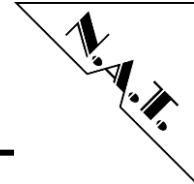


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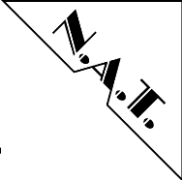
Conventions

If not otherwise specified, addresses and memory maps are written in hexadecimal notation, identified by 0x.

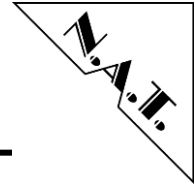
The following table gives a list of the abbreviations used in this document.

Table 1: List of used abbreviations

| Abbreviation | Description |
|------------------|---|
| AMC | Advanced Mezzanine Card |
| BDM | Background Debug Mode |
| BNC | Bayonet Neill Concelman – Coax Connector |
| CPU | Central Processing Unit |
| DDR SDRAM | Double Data Rate Synchronous Dynamic RAM |
| DIP SW | Dual In-Line Switch |
| DS3 | PDH signal – data rate 44.736 Mbit/s |
| E3 | PDH signal – data rate 34.368 Mbit/s |
| EEPROM | Electrically Erasable PROM |
| FCLK | Fabric Clock |
| FPGA | Field Programmable Gate Array |
| GMII | Gigabit Media Independent Interface |
| I ² C | Inter-Integrated Circuit |
| I/O | Input/Output |
| IPMB | Intelligent Platform Management Bus |
| IPMI | Intelligent Platform Management Interface |
| IRQ | Interrupt Request |
| iTDM | Internal TDM |
| LIU | Line Interface Unit |
| LSB | Least Significant Bit |
| μC | Microcontroller |
| μTCA | Micro Telecommunications Computing Architecture |
| MAC | Media Access Control |
| MCC | Memory Chip Controller |
| MLVDS | Multipoint Low Voltage Differential Signaling |
| MRAM | Magnetoresistive RAM |
| MSB | Most Significant Bit |
| PCB | Printed Circuit Board |
| PCI(e) | Peripheral Component Interconnect (Express) |
| R/W | Read/Write |
| RAM | Random Access Memory |
| RISC | Reduced Instruction Set Computing |
| RX | Receiver |
| (P)ROM | (Programmable) Read Only Memory |
| RTC | Real Time Clock |
| PLL | Phase Locked Loop |
| SD-Card | Secure Digital Memory Card |
| SerDes | Serializer/Deserializer |
| SRIO | Serial Rapid I/O |
| TCKL | Telecom Clock |
| TDM | Time Division Multiplex |
| TSI | Time Slot Interchanger |



| Abbreviation | Description |
|---------------------|---|
| TX | Transmitter |
| UART | Universal Asynchronous Receiver/Transmitter |
| USB | Universal Serial Bus |



1 Introduction

The **NAMC-8569-E3/DS3** is a E3/DS3 line interface card in AMC (Advanced Mezzanine Card) form factor. Physically, it consists of the **NAMC-8569-E3/DS3 BASE-PCB** and the **NAMC-8569-E3/DS3 EXTENSION-PCB**.

Key component of the **NAMC-8569-E3/DS3** is the MPC8569 CPU which offers a maximum TDM processing capability of 512 64kbps channels. It features an e500 PowerPC core combined with dedicated interface hardware and four RISC cores.

The **NAMC-8569-E3/DS3** is dedicated for (tele-)communication applications with extensive need for a high aggregation of E3/DS3 interfaces combined with access to switched networks based on high bandwidth Ethernet.

It features a powerful onboard CPU for direct processing both signalling and payload data transported via the line interfaces. These software based processing resources are extended by FPGA-based hardware resources to offer a wide spread of possible applications.

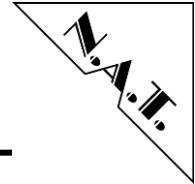
By default, the chipset on the submodule consists of a line interface unit (LIU) from Maxim-Dallas (DS3251) that connects to a multiplexer/demultiplexer chip from PCM-Sierra (Temux84) to get access down to DS0 level.

To offer E3-functionality, a Temux84**E3** type needs to be installed (assembly option).

The TDM- to iTDM-converter connects the on-board E3/DS3 interface with a Gigabit Ethernet port for system interconnect (iTDM).

The E3/DS3 framer interfaces to the on-board timeslot interchanger (TSI) chipset. The TSI as well as the TDM-to-iTDM bridge are incorporated in an ECP3 FPGA from Lattice. The TSI allows flexible routing as well as multi-casting of 64kbps timeslots between the various E3/DS3 streams. The TDM-to-iTDM bridge converts the TDM oriented bit stream into Ethernet packets and vice versa.

The **NAMC-8569-E3/DS3** is available as mid-size AMC-module only.

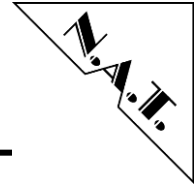


2 Overview

2.1 Major Features

- PowerQUICC III MPC8569 based Embedded PowerPC Architecture
- Lattice ECP3 FPGA
- 128 – 1024 MB DDR2 SDRAM @ 800MHz (main memory)
- 16 – 128 MB Flash PROM
- Micro SD-Card slot (optional)
- Flexible Fat Pipe Connectivity
- E3/DS3 interface on front plate via 2 BNC connectors
- Gigabit Backplane Ethernet to AMC Ports 0 / 1
- iTDM Interface
- TDM functionality (optional)
- AMC Clock Interface
- I²C-Devices and IPMB
- Optional: H.110 alike Backplane TSI bus

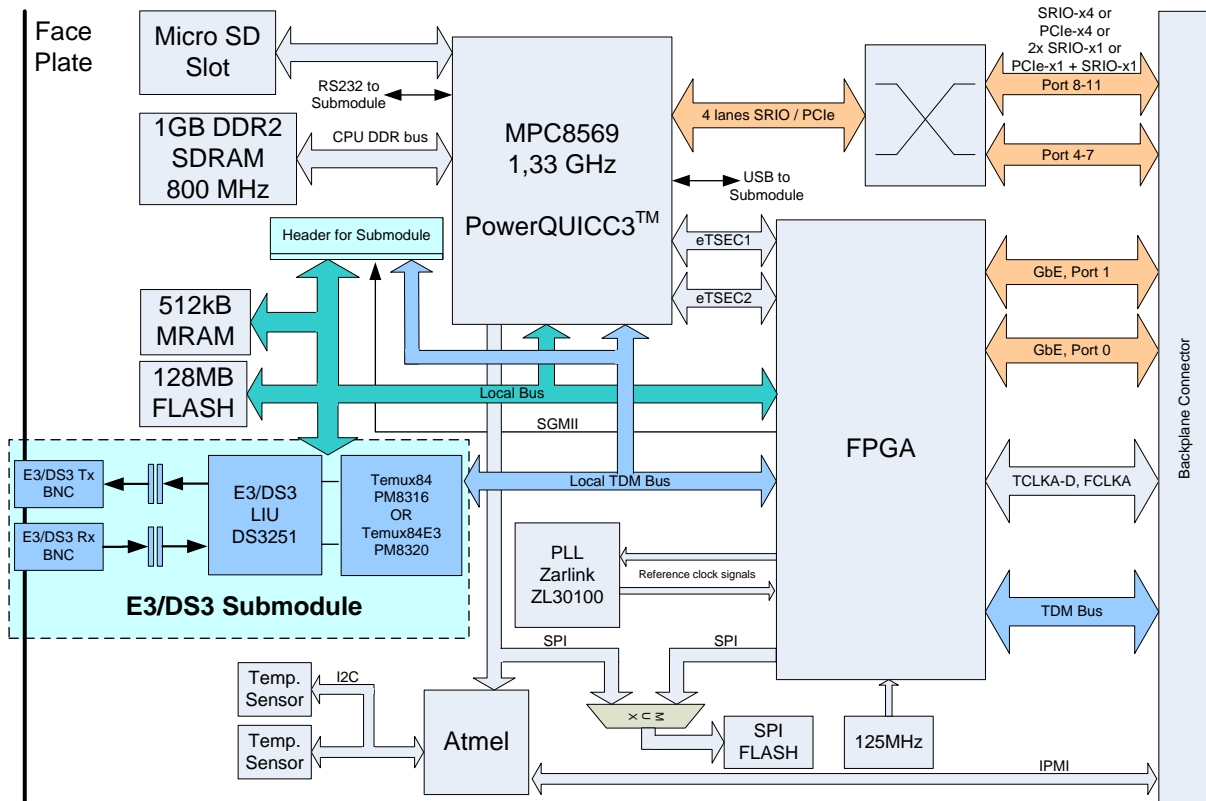
For detailed description see the following chapter.

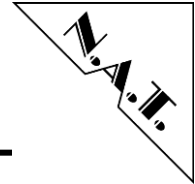


2.2 Block Diagram

The following figure shows a block diagram of the **NAMC-8569-E3/DS3** module.

Figure 1: NAMC-8569-E3/DS3 – Block Diagram

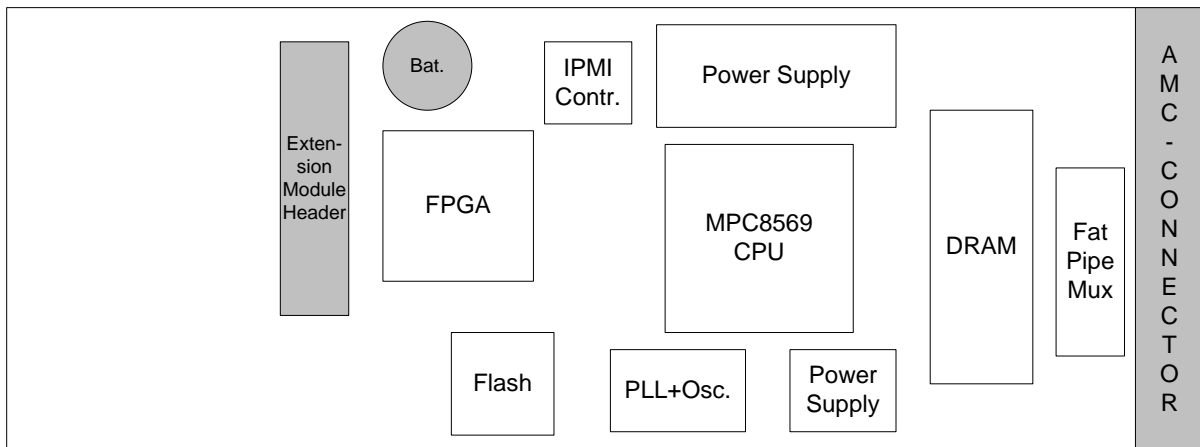




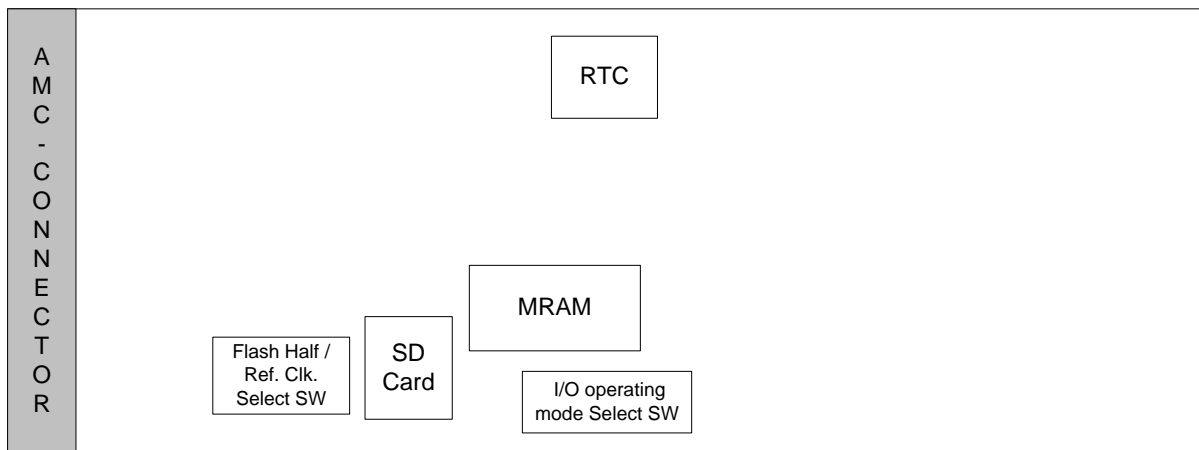
2.3 Location Diagram

The position of important components is shown in the following location overview. Depending on the board type it might be that the board does not include all components named in the location diagram.

Figure 2: NAMC-8569-E3/DS3 BASE-PCB– Location Diagram



Top View



Bottom View

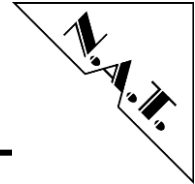
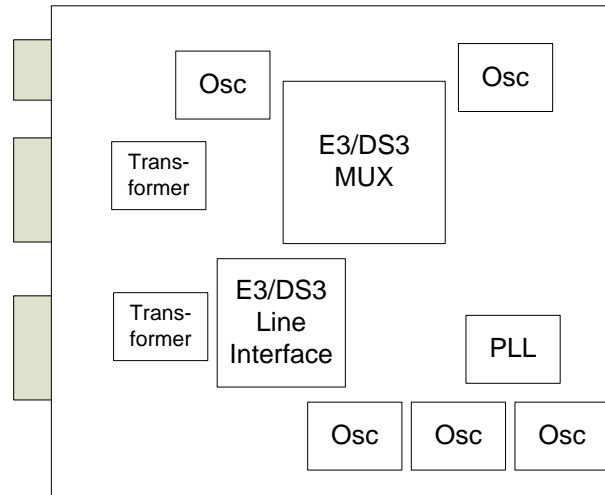
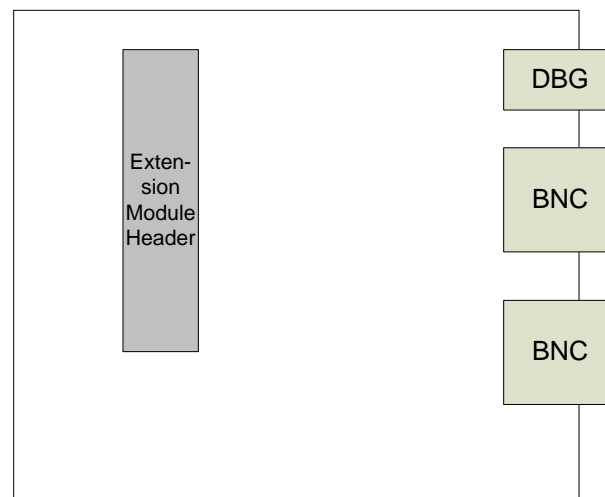


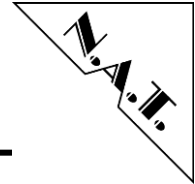
Figure 3: NAMC-8569-E3/DS3 EXTENSION-PCB – Location Diagram



Top View



Bottom View



3 Board Features

The **NAMC-8569-E3/DS3** can be divided into a number of functional blocks, which are described in the following paragraphs.

3.1 CPU

The MPC8569 PowerQUICC III™ is a versatile communications processor that integrates on one chip a high-performance PowerPC™ microprocessor, a very flexible co-processor unit and many communications peripheral controllers that can be used in a variety of applications, particularly in communications and networking systems.

The core is an embedded variant of the PowerPC e500™ core with 32 Kbytes of instruction cache and 32 Kbytes of data cache. To this primary cache adds 512 Kbytes of Level 2 cache. The auxiliary co-processor unit consists of four RISC cores and many hardware peripherals making this device a complete system on a chip.

Depending on the assembled CPU the PowerQUICC III runs with a core clock frequency of 800 - 1333 MHz. The QUICCEngine frequency may be set up to 667 MHz (assembly option).

3.2 FPGA

Main task of the FPGA residing on the **NAMC-8569-E3/DS3** is offering a powerful TDM to iTDM conversion engine to the board.

3.3 Memory

3.3.1 SDRAM

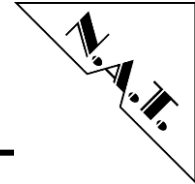
The onboard DDR2 SDRAM memory is 64 bit wide. Its default size is 512 MB or 128, 256, 1024 MB as assembly option. The interface to the DDR2 SDRAM is implemented in the MPC8569. By programming several registers the DDR2 RAM controller can be adapted to different RAM architectures.

3.3.2 NOR-Flash

The flash memory on the **NAMC-8569-E3/DS3** is connected to the demultiplexed upper 16 data bits D0 – 15 and to the latched address lines. Demultiplexing of the local address/data bus of the CPU, as well as address latching, is performed by an FPGA. The flash memory can be programmed by the CPU or through the BDM port. The 16 bit wide Flash PROM provides a capacity of 16 – 128 MB (assembly option). Its default size is 128 MB.

3.3.3 Micro SD-Card Slot

The optional Micro SD-Card Slot provides an additional non-volatile memory up to 2GB.



3.3.4 MRAM

The non-volatile 512kB MRAM is used for storing data permanently. It can be accessed like an SRAM, without having any limitation in the number of allowed write cycles like known from EEPROM or Flash memories.

3.4 Flexible Fat Pipe Connectivity

The MPC8569 CPU offers four bidirectional serial lines (four-line SerDes) that can be operated either as PCIe, SRIO or a combination of both. In cooperation with an external multiplexing unit the full Fat Pipe Region from Ports 4-11 is made accessible.

3.4.1 PCIe

The **NAMC-8569-E3/DS3** can be configured to implement either an x1 or an x4 PCIe interface. Per default and per AMC specification this interface operates on ports 4-7 for the x4 and on port 4 for the x1 configuration. This implementation of PCIe conforms to the AMC.1 specification.

Beyond the specification the board can also be configured to run PCIe on port 8 (x1 Link) or port 8-11 (x4 Link).

3.4.2 SRIO

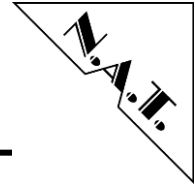
The **NAMC-8569-E3/DS3** can be configured to implement either two x1 or one x4 SRIO interface(s). If configured for two x1 interfaces these operate on port 4 and port 8. If configured for one x4 interface this can be selected to operate on port 4-7 or on port 8-11. In addition the speed of the SRIO interface(s) can be configured for 1.25 Gb/s, 2.5 Gb/s or 3.125 Gb/s operation.

3.4.3 PCIe/SRIO

The **NAMC-8569-E3/DS3** can be configured to implement an x1 PCIe interface operating on port 4 and an SRIO interface operating on port 8. In this case the speed of the SRIO interface is fixed at 2.5Gb/s

Table 2: Flexible Fat Pipe Connectivity – Configuration options

| Configuration options | | | | | | | |
|-----------------------|--------|--------|--------|---------|--------|---------|---------|
| Port 4 | Port 5 | Port 6 | Port 7 | Port 8 | Port 9 | Port 10 | Port 11 |
| PCIe x4 | | | | - | - | - | - |
| - | - | - | - | PCIe x8 | | | |
| PCIe x1 | - | - | - | - | - | - | - |
| - | - | - | - | PCIe x1 | - | - | - |
| SRIO x4 | | | | - | - | - | - |
| - | - | - | - | SRIO x4 | | | |
| SRIO x1 | - | - | - | SRIO x1 | - | - | - |
| PCIe x1 | - | - | - | SRIO x1 | | | |



3.5 Line Interfaces

The **NAMC-8569-E3/DS3** features one E3/DS3 line interface which is physically represented by two standard-size BNC 75 ohm jacks for RX-/TX-direction.

If the board is equipped with the PCM-Sierra Temux84 PM8316, it features DS3 functionality (**NAMC-8569-DS3**). If the PCM-Sierra Temux84E3 PM8320 multiplexer has been installed (assembly option), the module offers both, E3 and DS3 functionality (**NAMC-8569-E3/DS3**).

3.6 Backplane Ethernet

The **NAMC-8569-E3/DS3** implements a so called SerDes ethernet interface towards the backplane. This path connects to Port 0/1 of the Common Options Region of the AMC backplane connector.

The FPGA internal SerDes Ethernet is connected to the MPC8569's Ethernet MAC through two GMII interfaces, which are fed through the FPGA. It connects to the backplane Ethernet, the physical layer of which is 1000BaseX. Within FPGA logic the CPU Ethernet data is multiplexed with the iTDM data and transferred through the same physical port.

3.7 iTDM

The **NAMC-8569-E3/DS3** implements a serial iTDM backplane interface, the physical layer of which is 1000BaseX. The iTDM interface connects to Port 0/1 of the Common Options Region of the AMC backplane connector and shares the ports with the CPU Ethernet path by doing arbitration for iTDM packets and CPU Ethernet packets to be sent. The iTDM interface is implemented in FPGA logic and conforms to the SFP.0 and SFP.1 specifications.

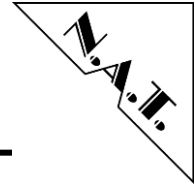
For the on-chip TDM devices, the FPGA implements TSI functionality. This can be used for directly connecting channels from the line interface of other AMC boards to channels of the MPC8569 MCC controllers. Attached to this TSI are then 1024 bidirectional iTDM channels that can be used for connecting CPU channels to destinations outside the board.

3.8 TDM

The **NAMC-8569-E3/DS3** implements an 8 bit TDM interface, similar to H.110. The same throughput as with a complete H.110 bus is achieved by clocking the 8 backplane TDM lines with 32 MHz. Thus, every frame consists of 512 timeslots. The purpose of this TDM backplane bus is to establish 'private' TDM links to adjacent modules. The TDM interface is implemented in FPGA logic. It bridges to a module – internal TDM bus, which connects to the MCC ports of the MPC8569 and to the DS26518 framer. The TDM interface connects to ports 12, 13 (data) and port 14 (Sync) of the Common Options Region of the AMC connector.

3.9 AMC Clock Interface

The **NAMC-8569-E3/DS3** implements a very flexible clocking functionality concerning the AMC backplane clock ports TCLKA-D and FCLKA.



All TCLK ports are connected directly to the FPGA and can be used for reception of any clock or can be configured to drive a clock signal. This infrastructure can be used for distributing recovered reference clocks from the line interfaces or to synchronize the **NAMC-8569-E3/DS3** to an external clock.

AMC backplane clock port FCLKA is connected to a multiplexer, which allows programming the clock source of the MPC8569 SerDes reference clock input to be either sourced from FCLKA or an internal differential reference clock.

3.10 I²C-Devices and IPMB

The **NAMC-8569-E3/DS3** owns several I²C-Devices on different busses. Please note that the 7-bit I²C-Address is left aligned in the notation below, meaning that in the most-right bit (LSB) the I²C R/W bit resides.

3.10.1 CPU Local I²C-Bus

Two I²C-Devices connect to the MPC8569's local bus:

- AT24C256 – EEPROM used for storage of board-specific information
– I²C-Address: 0xA0
- DS1339 – Real-Time-Clock device – I²C-Address: 0xD0

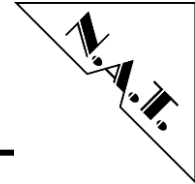
3.10.2 IPMB

To the IPMI-Controller (ATmega1284) connect several I²C-Devices:

- LM95241 – Temperature sensor device with two external sensors (for CPU temperature) and one internal sensor – I²C-Address: 0x56
- LTC4215 – Hot Swap Controller – I²C-Address: 0x96
- IDT8N3Q001 – programmable oscillator – I²C-Address :0xDC
- AT24C256 – EEPROM located on extension board – I²C-Address: 0xA4
- LM75 – Temperature sensor located on extension board – I²C-Address: 0x94

Additionally, the IPMB-Bus of the AMC connector is attached to the IPMI-Controller.

The IPMI-Controller manages the geographical address as requested by the AMC specification.

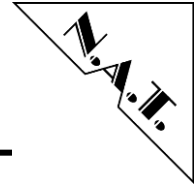


4 Hardware

4.1 AMC Port Definition

Table 3: AMC Port Mapping Strategy

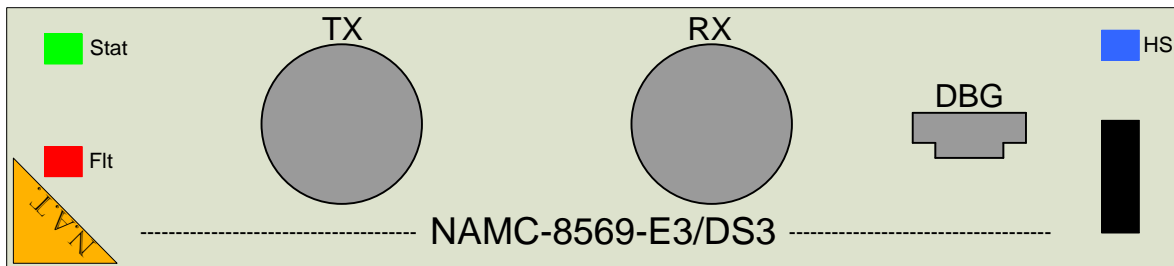
| | Port # | AMC Port Mapping Strategy | Ports used as |
|--------------------|-------------------|-------------------------------|---|
| Basic Connector | CLK1 | Clocks | Reference Clock 1 / TCLKA |
| | CLK2 | | Reference Clock 2 / TCLKB |
| | CLK3 | | Reference Clock 3 / FCLKA |
| | 0 | Common Options Region | 1000BaseX Ethernet Channel 1 (iTDM and CPU Ethernet), default |
| | 1 | | 1000BaseX Ethernet Channel 2 (iTDM and CPU Ethernet), redundant |
| | 2 | | unassigned |
| | 3 | | unassigned |
| | 4 | Fat Pipes Region | SerDes Mux Lane 0 |
| | 5 | | SerDes Mux Lane 1 |
| 6 | SerDes Mux Lane 2 | | |
| 7 | SerDes Mux Lane 3 | | |
| 8 | SerDes Mux Lane 4 | | |
| Extended Connector | 9 | Region | SerDes Mux Lane 5 |
| | 10 | | SerDes Mux Lane 6 |
| | 11 | | SerDes Mux Lane 7 |
| | 12 | | TDM Bus D0-3 (H.110 extended) |
| | 13 | TDM Bus D4-7 (H.110 extended) | |
| | 14 | Extended Options Region | optional clock lines (H.110 extended)/ unassigned |
| | 15 | | Unassigned |
| | 16 | | TCLKC / TCLKD |
| | 17 | | MLVDS I/O (Trigger Signals for xTCA) |
| | 18 | | MLVDS I/O (Trigger Signals for xTCA) |
| | 19 | | MLVDS I/O (Trigger Signals for xTCA) |
| | 20 | | MLVDS I/O (Trigger Signals for xTCA) |



4.2 Front Panel and LED

The **NAMC-8569-E3/DS3** module is equipped with 2 BNC jacks (Tx and Rx) for connecting to the E3/DS3 interface.

Figure 4: NAMC-8569-E3/DS3 – Front Panel View

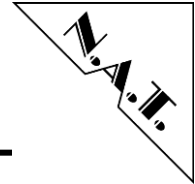


An RS232 interface for debugging purposes is mounted on the faceplate as well.

Additionally the module contains the standard AMC LED consisting of a fault indication LED controlled by the IPMI controller, a general purpose status LED controlled by the FPGA/CPU and the Hot-Swap handle with the corresponding blue LED.

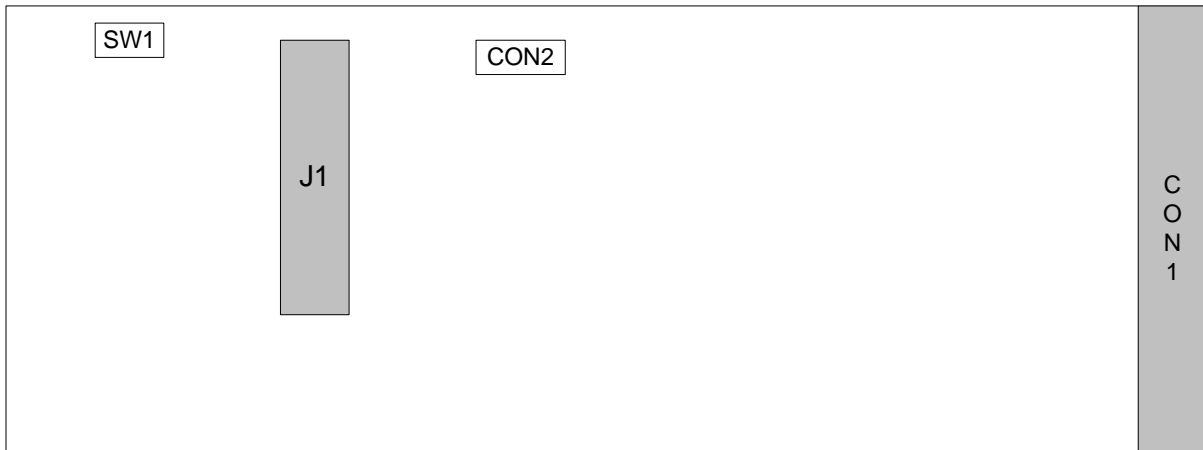
The Fault Indication LED turns to "On" if the temperature sensor registers a temperature value falling below or exceeding a threshold level. If the temperature returns to normal value, the LED is switched to "Off" again.

Although optically appearing as one LED, the General Purpose LED physically consists of two LEDs (green and orange) sharing the same hole in the Front Plate. For more information on the behaviour of these LEDs, please refer to chapter 5.1.1.11.

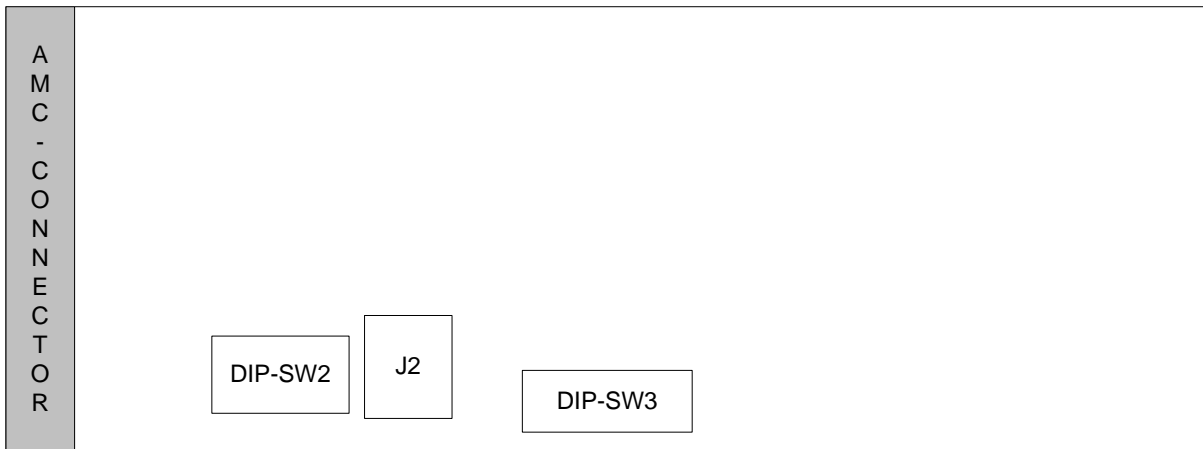


4.3 Connectors and Switches

Figure 5: NAMC-8569-E3/DS3 BASE-PCB – Connector and Switch Location



Top View



Bottom View

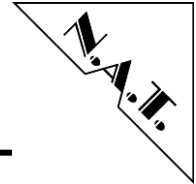
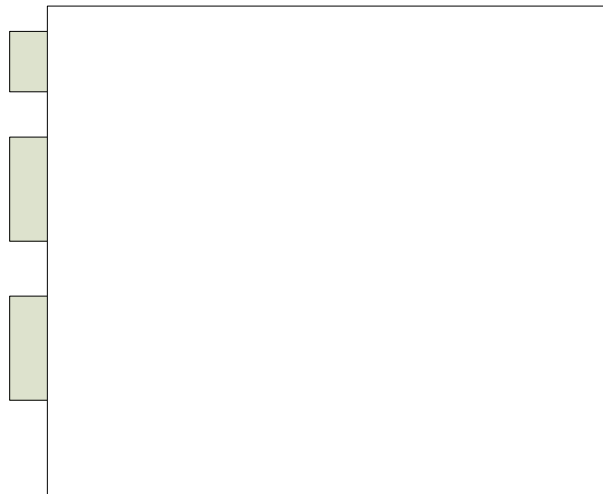
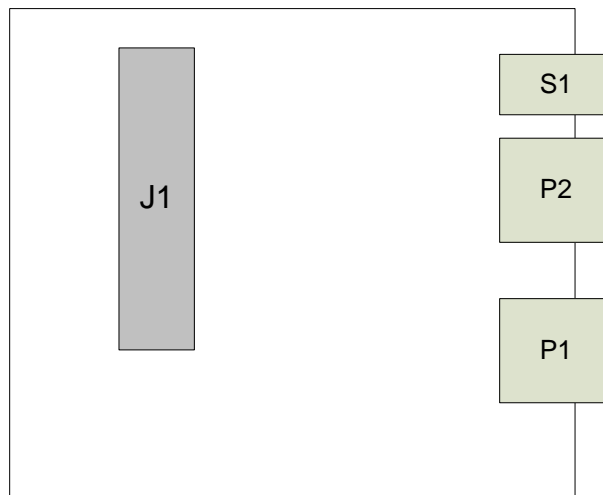


Figure 6: NAMC-8569-E3/DS3 EXTENSION-PCB – Connector and Switch Location

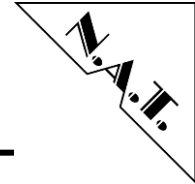


Top View



Bottom View

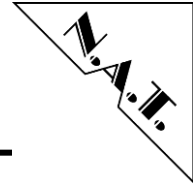
Please refer to the following tables to look up the connector and switch pin assignment of the **NAMC-8569-E3/DS3**.



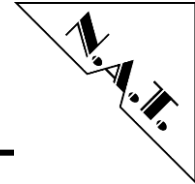
4.3.1 CON1: AMC Connector

Table 4: CON1: AMC Connector – Pin-Assignment

| Pin # | AMC-Signal | AMC-Signal | Pin # |
|-------|------------|-------------|-------|
| 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 | PORT20_TX_P | 163 |
| 9 | PWR | PORT20_TX_N | 162 |
| 10 | GND | GND | 161 |
| 11 | PORT0_TX_P | PORT20_RX_P | 160 |
| 12 | PORT0_TX_N | PORT20_RX_N | 159 |
| 13 | GND | GND | 158 |
| 14 | PORT0_RX_P | PORT19_TX_P | 157 |
| 15 | PORT0_RX_N | PORT19_TX_N | 156 |
| 16 | GND | GND | 155 |
| 17 | GA1 | PORT19_RX_P | 154 |
| 18 | PWR | PORT19_RX_N | 153 |
| 19 | GND | GND | 152 |
| 20 | PORT1_TX_P | PORT18_TX_P | 151 |
| 21 | PORT1_TX_N | PORT18_TX_N | 150 |
| 22 | GND | GND | 149 |
| 23 | PORT1_RX_P | PORT18_RX_P | 148 |
| 24 | PORT1_RX_N | PORT18_RX_N | 147 |
| 25 | GND | GND | 146 |
| 26 | GA2 | PORT17_TX_P | 145 |
| 27 | PWR | PORT17_TX_N | 144 |
| 28 | GND | GND | 143 |
| 29 | NC | PORT17_RX_P | 142 |
| 30 | NC | PORT17_RX_N | 141 |
| 31 | GND | GND | 140 |
| 32 | NC | TCLKD_P | 139 |
| 33 | NC | TCLKD_N | 138 |
| 34 | GND | GND | 137 |
| 35 | NC | TCLKC_P | 136 |
| 36 | NC | TCLKC_N | 135 |
| 37 | GND | GND | 134 |
| 38 | NC | NC | 133 |
| 39 | NC | NC | 132 |
| 40 | GND | GND | 131 |
| 41 | /ENABLE | NC | 130 |
| 42 | PWR | NC | 129 |
| 43 | GND | GND | 128 |
| 44 | PORT4_TX_P | RESVD | 127 |



| Pin # | AMC-Signal | AMC-Signal | Pin # |
|-------|------------|-------------|-------|
| 45 | PORT4_TX_N | TDM_REF | 126 |
| 46 | GND | GND | 125 |
| 47 | PORT4_RX_P | TDM_FS | 124 |
| 48 | PORT4_RX_N | TDM_CLK | 123 |
| 49 | GND | GND | 122 |
| 50 | PORT5_TX_P | TDM7 | 121 |
| 51 | PORT5_TX_N | TDM6 | 120 |
| 52 | GND | GND | 119 |
| 53 | PORT5_RX_P | TDM5 | 118 |
| 54 | PORT5_RX_N | TDM4 | 117 |
| 55 | GND | GND | 116 |
| 56 | IPMB_SCL | TDM3 | 115 |
| 57 | PWR | TDM2 | 114 |
| 58 | GND | GND | 113 |
| 59 | PORT6_TX_P | TDM1 | 112 |
| 60 | PORT6_TX_N | TDM0 | 111 |
| 61 | GND | GND | 110 |
| 62 | PORT6_RX_P | PORT11_TX_P | 109 |
| 63 | PORT6_RX_N | PORT11_TX_N | 108 |
| 64 | GND | GND | 107 |
| 65 | PORT7_TX_P | PORT11_RX_P | 106 |
| 66 | PORT7_TX_N | PORT11_RX_N | 105 |
| 67 | GND | GND | 104 |
| 68 | PORT7_RX_P | PORT10_TX_P | 103 |
| 69 | PORT7_RX_N | PORT10_TX_N | 102 |
| 70 | GND | GND | 101 |
| 71 | IPMB_SDA | PORT10_RX_P | 100 |
| 72 | PWR | PORT10_RX_N | 99 |
| 73 | GND | GND | 98 |
| 74 | TCLKA_P | PORT9_TX_P | 97 |
| 75 | TCLKA_N | PORT9_TX_N | 96 |
| 76 | GND | GND | 95 |
| 77 | TCLKB_P | PORT9_RX_P | 94 |
| 78 | TCLKB_N | PORT9_RX_N | 93 |
| 79 | GND | GND | 92 |
| 80 | FCLKA_P | PORT8_TX_P | 91 |
| 81 | FCLKA_N | PORT8_TX_N | 90 |
| 82 | GND | GND | 89 |
| 83 | /PS0 | PORT8_RX_P | 88 |
| 84 | PWR | PORT8_RX_N | 87 |
| 85 | GND | GND | 86 |



4.3.2 CON2: RS232 Connector

The debug terminal connector CON2 offers the option to connect to the UART1 of the MPC8569 CPU to realize a serial terminal interface.

Table 5: CON2: RS232 connector – Pin-Assignment

| Pin# | Signal | Signal | Pin No. |
|------|--------|--------|---------|
| 1 | RxDA | GND | 2 |
| 3 | TxDA | | |

4.3.3 P1: E3/DS3 Interface Connector - Tx

The BNC jack P1 provides the E3/DS3 interface transmitting functionality.

Table 6: P1: E3/DS3 Interface Connector - Tx – Pin-Assignment

| Pin# | Signal | Signal | Pin No. |
|------|--------|--------|---------|
| 1 | Tx | SGND | 2 |

4.3.4 P2: E3/DS3 Interface Connector - Rx

The BNC jack P2 provides the E3/DS3 interface receiving functionality.

Table 7: P1: E3/DS3 Interface Connector - Tx – Pin-Assignment

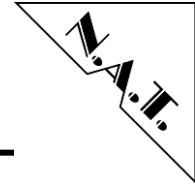
| Pin# | Signal | Signal | Pin No. |
|------|--------|--------|---------|
| 1 | Rx | SGND | 2 |

4.3.5 S1: External RS232 Connector

Parallel to the internal debug terminal connector CON2 on the **NAMC-8569-E3/DS3 BASE-PCB**, the module offers an external debugging interface on the front plate as well.

Table 8: S1: External RS232 Connector – Pin-Assignment

| Pin# | Signal | Signal | Pin No. |
|------|---------|---------|---------|
| 1 | nc | UART_Rx | 2 |
| 3 | UART_Tx | nc | 4 |
| 5 | GND | SGND | 6 |
| 7 | SGND | SGND | 8 |
| 9 | SGND | | |

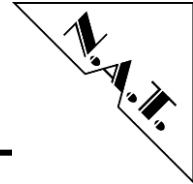


4.3.6 J1: Extension Module Connector

Connector J1 connects the **BASE-PCB** and the **EXTENSION-PCB** of the **NAMC-8569-E3/DS3**.

Table 9: J1: Extension Module Connector – Pin-Assignment

| Pin # | Signal | Signal | Pin # |
|-------|--------------|---------------|-------|
| 1 | SGND | +12V | 2 |
| 3 | NC | +12V | 4 |
| 5 | NC | GND | 6 |
| 7 | GND | PS1_PIGGYn | 8 |
| 9 | SCL_INT | SDA_INT | 10 |
| 11 | SD_D0 | SD_D2 | 12 |
| 13 | SD_D1 | SD_D3 | 14 |
| 15 | FPGA_TDI | SD_D4 | 16 |
| 17 | FPGA_DONE | SD_D5 | 18 |
| 19 | FPGA_TDO | CPU_TDO | 20 |
| 21 | /PROGRAMN | CPU_TDI | 22 |
| 23 | FPGA_TMS | CPU_TCK | 24 |
| 25 | FPGA_TCK | CPU_TMS | 26 |
| 27 | INITN | CPU_/SRESET | 28 |
| 29 | ATMEL_MISO | CPU_/HRESET | 30 |
| 31 | ATMEL_MOSI | /CKSTP_OUT | 32 |
| 33 | ATMEL_SCK | /CKSTP_IN | 34 |
| 35 | /RST_IPMI | UART_Rx | 36 |
| 37 | SREFCLK_BASE | UART_Tx | 38 |
| 39 | SAC1FP | CON_RES1 | 40 |
| 41 | GND | /CPU_TRST | 42 |
| 43 | SA_D0 | DS_TXEN | 44 |
| 45 | SA_D1 | LB_/CS6 | 46 |
| 47 | SA_D2 | LB_/CS7 | 48 |
| 49 | SA_D3 | /LWE1 | 50 |
| 51 | SA_D4 | LA11 | 52 |
| 53 | SA_D5 | LA12 | 54 |
| 55 | SA_D6 | LA13 | 56 |
| 57 | SA_D7 | LA14 | 58 |
| 59 | GND | GND | 60 |
| 61 | VCC_IPMB | RESETn | 62 |
| 63 | NC | GND | 64 |
| 65 | PLL_/TIE_CLR | PLL_REF_SEL | 66 |
| 67 | PLL_FASTLOCK | PLL_REF_FAIL1 | 68 |
| 69 | DS2_MCLK | PLL_REF_FAIL0 | 70 |
| 71 | DS2_/RESET | PLL_LOCK | 72 |
| 73 | DS_PL | PLL_HOLDOVER | 74 |
| 75 | LB_/INT | GND | 76 |
| 77 | SD_V5 | SD_D6 | 78 |
| 79 | GND | GND | 80 |
| 81 | SA_JUST_REQ | SD_C1FP | 82 |
| 83 | GND | GND | 84 |



| Pin # | Signal | Signal | Pin # |
|-------|--------------|-----------|-------|
| 85 | PLL_REF_BASE | SD_D7 | 86 |
| 87 | GND | GND | 88 |
| 89 | SBI_ACT | DS2_RSIG1 | 90 |
| 91 | GND | GND | 92 |
| 93 | LB_D7 | LB_/CS2 | 94 |
| 95 | LB_D6 | LB_/OE | 96 |
| 97 | LB_D5 | LB_/WR | 98 |
| 99 | LB_D4 | LB_A9 | 100 |
| 101 | LB_D3 | LB_A8 | 102 |
| 103 | LB_D2 | LB_A7 | 104 |
| 105 | LB_D1 | LB_A6 | 106 |
| 107 | LB_D0 | LB_A5 | 108 |
| 109 | LB_A12 | LB_A4 | 110 |
| 111 | LB_A11 | LB_A3 | 112 |
| 113 | LB_A10 | LB_A2 | 114 |
| 115 | GND | LB_A1 | 116 |
| 117 | +3.3V | LB_A0 | 118 |
| 119 | +3.3V | GND | 120 |

4.3.7 J2: Micro SD-Card Slot

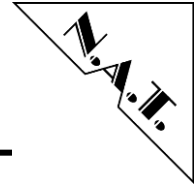
J2 connects directly to the MPC8569 SD-Card interface and offers the option to use Micro SD-Cards as removable Flash Memory on the **NAMC-8569-E3/DS3** board.

Table 10: J2: Micro SD-Card Slot – Pin-Assignment

| Pin # | Signal | Signal | Pin # |
|-------|---------|---------|-------|
| 1 | SD_DAT2 | SD_DAT3 | 2 |
| 3 | SD_CMD | +3.3V | 4 |
| 5 | SD_CLK | GND | 6 |
| 7 | SD_DAT0 | SD_DAT1 | 8 |

4.3.8 SW1: Hot Swap Switch

Switch SW1 is used to support hot swapping of the module. It conforms to PICMG AMC.0.



4.3.9 DIP SW2: Flash Half Select / Reference Clock Select

The table below gives an overview of the operating parameters configurable via DIP SW2. Details are given in the following subchapters.

Table 11: DIP SW2 – Pin-Assignment – Overview

| Switch # | Function |
|----------|-------------------|
| 1 | Flash half select |
| 2 | Ref. clock select |

4.3.9.1 DIP SW2: Switch 1 – Boot Flash Select Switch

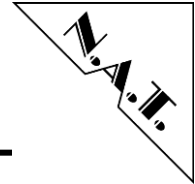
By operating switch 1 of DIP SW2 to ON, the upper half of the Boot Flash is selected for booting. If switch 1 of DIP SW2 is turned to OFF, the lower half of the Boot Flash is selected for booting.

Table 12: DIP SW2: Switch 1 – Boot Flash Select – Pin-Assignment

| DIP SW2 – Switch 1 | Function |
|--------------------|--|
| | Upper Flash Half, usually used for OK1 |
| | Lower Flash Half, usually used for Linux |

Default:

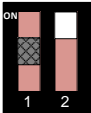
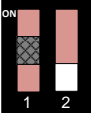
Switch 1 of DIP SW2 is toggled to OFF, lower half of the Boot Flash is selected for booting.



4.3.9.2 DIP SW2: Switch 2 – Reference Clock Select Switch

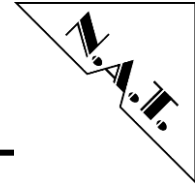
This switch is used to select the source for the MPC8569 SerDes reference clock input. Switching it to ON selects FCLKA as source for this input, setting to OFF selects the board-internal generated reference clock.

Table 13: DIP SW2: Switch 2 – Reference Clock Select – Pin-Assignment

| DIP SW2 – Switch 2 | Function |
|---|----------------|
|  | FCLKA |
|  | Board-internal |

Default:

Switch 2 of DIP SW2 is toggled to OFF, board-internal reference clock is used for SerDes.



4.3.10 DIP SW3: I/O operating mode

The table below gives an overview of the operating parameters configurable via DIP SW3. Details are given in the following subchapters.

Table 14: DIP SW3 – Pin-Assignment – Overview

| Switch # | Function |
|----------|--------------------|
| 1 | SerDes Mode |
| 2 | |
| 3 | |
| 4 | |
| 5 | PortSel 4-7 / 8-11 |
| 6 | PCIe RC enable |
| 7 | SRIO host enable |
| 8 | unassigned |

Please note:

After changing parameters of DIP SW3, a complete power cycle (including IPMI μ C) is required to make the new settings active within E-keying. This is indicated by the orange AMC LED (label Stat) blinking fast, regardless of the register value stated in the respective FPGA register.

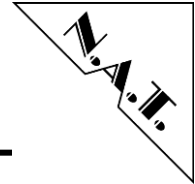
Therefore, after changing DIP SW3 please insert the board once, let power up, then extract it from the backplane to interrupt the management power of the Atmel μ C and insert it again. On the first inserting after a DIP switch change it will do E-Keying using the old Fat Pipe configuration, on the second insertion it will use the new configuration for E-keying. The orange AMC LED operates again according to the register value.

4.3.10.1 DIP SW3: Switches 1-4 – SerDes Mode Select Switch

By operating switches 1-4 of DIP SW3 one of the SerDes configurations listed in the following table can be selected.

Table 15: DIP SW3: Switches 1-4 – SerDes Mode Select – Pin-Assignment

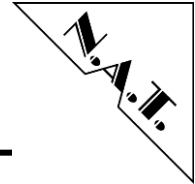
| DIP SW3 – Switches 1-4 | Function |
|------------------------|----------------------------|
| | PCIe x1 |
| | Redundant SRIO x1; 2.5Gb/s |



| | |
|--|--|
| | <p>Redundant SRIO x1; 1.25Gb/s</p> |
| | <p>Redundant SRIO x1; 3.125Gb/s</p> |
| | <p>SRIO x4; 1.25Gb/s</p> |
| | <p>SRIO x4; 2.5Gb/s</p> |
| | <p>SRIO x4; 3.125Gb/s</p> |
| | <p>Port4: PCIe x1 / Port8: SRIO x1</p> |
| | <p>SerDes disabled</p> |
| | <p>PCIe x4</p> |

Default:

Switches 1-4 of DIP SW3 are toggled to OFF, PCIe x4 is selected.



4.3.10.2 DIP SW3: Switch 5 – Fat Pipe Port Select

By operating switch 5 of DIP SW3 the active ports within the Fat Pipe Region for the non-redundant operation can be selected.

Table 16: DIP SW3: Switch 5 – Fat Pipe Port Select – Pin-Assignment

| DIP SW3 – Switch 5 | Function |
|--------------------|-------------------------|
| | Operation on ports 8-11 |
| | Operation on ports 4-7 |

Default:

Switch 5 of DIP SW3 is toggled to OFF, operation on ports 4-7 is selected.

4.3.10.3 DIP SW3: Switch 6 – PCIe Root Complex Select

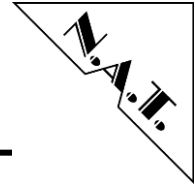
By operating switch 6 of DIP SW3 the CPU can be configured to operate as PCIe root complex or as PCIe end point.

Table 17: DIP SW3: Switch 6 – PCIe Root Complex Select – Pin-Assignment

| DIP SW3 – Switch 6 | Function |
|--------------------|-------------------|
| | PCIe Root Complex |
| | PCIe End-Point |

Default:

Switch 6 of DIP SW3 is turned to OFF, operation as PCIe End-Point is selected.



4.3.10.4 DIP SW3: Switch 7 – SRIO Host Mode Selection

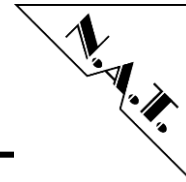
By operating switch 7 of DIP SW3 the CPU can be configured to operate in SRIO Host Mode or as SRIO Agent.

Table 18: DIP SW3: Switch 7 – SRIO Host Mode Select – Pin-Assignment

| DIP SW3 – Switch 7 | Function |
|--|----------------|
| <p>The diagram shows a row of eight DIP switches labeled 1 through 8. Switch 7 is white, indicating it is turned ON. All other switches (1, 2, 3, 4, 5, 6, 8) are red, indicating they are turned OFF. A small 'ON' label is positioned above the top-left corner of the switch row.</p> | SRIO Host Mode |
| <p>The diagram shows a row of eight DIP switches labeled 1 through 8. Switch 7 is red, indicating it is turned OFF. All other switches (1, 2, 3, 4, 5, 6, 8) are white, indicating they are turned ON. A small 'ON' label is positioned above the top-left corner of the switch row.</p> | SRIO Agent |

Default:

Switch 7 of DIP SW3 is toggled to OFF, operation as SRIO Agent is selected.



4.4 CPU Port Pin Definition

Table 19: CPU Port Pin Definition – Port A

| Signal Function | Port A Pin |
|-----------------|------------|
| UCC1_TXD0 | PA[0] |
| UCC1_TXD1 | PA[1] |
| UCC1_TXD2 | PA[2] |
| UCC1_TXD3 | PA[3] |
| UCC1_TX_EN | PA[4] |
| UCC1_TX_ER | PA[5] |
| UCC1_RXD0 | PA[6] |
| UCC1_RXD1 | PA[7] |
| UCC1_RXD2 | PA[8] |
| UCC1_RXD3 | PA[9] |
| nc | PA[10] |
| nc | PA[11] |
| UCC1_RX_DV | PA[12] |
| UCC1_RX_ER | PA[13] |
| UCC2_TXD0 | PA[14] |
| UCC2_TXD1 | PA[15] |
| UCC2_TXD2 | PA[16] |
| UCC2_TXD3 | PA[17] |
| nc | PA[18] |
| UCC2_TX_ER | PA[19] |
| UCC2_RXD0 | PA[20] |
| UCC2_RXD1 | PA[21] |
| UCC2_RXD2 | PA[22] |
| UCC2_RXD3 | PA[23] |
| nc | PA[24] |
| UCC2_TX_EN | PA[25] |
| UCC2_RX_DV | PA[26] |
| UCC2_RX_ER | PA[27] |
| UCC2_RXD4 | PA[28] |
| nc | PA[29] |
| nc | PA[30] |
| UCC1_RXD7 | PA[31] |

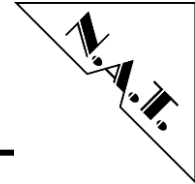


Table 20: CPU Port Pin Definition – Port B

| Signal Function | Port B Pin |
|------------------------|-------------------|
| UCC1_TX_D5 | PB[0] |
| nc | PB[1] |
| UCC1_RXD6 | PB[2] |
| nc | PB[3] |
| nc | PB[4] |
| UCC1_TXD7 | PB[5] |
| UCC1_RXD5 | PB[6] |
| UCC1_TXD6 | PB[7] |
| UCC1_TXD4 | PA[8] |
| nc | PB[9] |
| nc | PB[10] |
| UCC1_RXD4 | PB[11] |
| nc | PB[12] |
| nc | PB[13] |
| UCC2_RXD7 | PB[14] |
| UCC2_TXD5 | PB[15] |
| nc | PB[16] |
| UCC2_RXD6 | PB[17] |
| nc | PB[18] |
| nc | PB[19] |
| UCC2_TXD7 | PA[20] |
| UCC2_RXD5 | PB[21] |
| UCC2_TXD6 | PB[22] |
| UCC2_TXD4 | PB[23] |
| nc | PB[24] |
| nc | PB[25] |
| DS1_REFCLKIO | PB[26] |
| QE_PB27 | PB[27] |
| CPU_SPI MOSI | PB[28] |
| CPU_SPI MISO | PB[29] |
| CPU_SPI CLK | PB[30] |
| CPU_/SPI SEL | PB[31] |

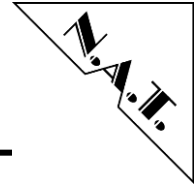


Table 21: CPU Port Pin Definition – Port C

| Signal Function | Port C Pin |
|-----------------|------------|
| nc | PC[0] |
| QE_CLK2 | PC[1] |
| UCC2_GTX_CLK | PC[2] |
| UCC2_GRX_CLK | PC[3] |
| QE_CLK5 | PC[4] |
| nc | PC[5] |
| QE_CLK7 | PC[6] |
| nc | PC[7] |
| UCC1_GRX_CLK | PC[8] |
| QE_CLK10 | PC[9] |
| QE_CLK11 | PC[10] |
| nc | PC[11] |
| QE_CLK13 | PC[12] |
| QE_CLK14 | PC[13] |
| nc | PC[14] |
| QE_CLK16 | PC[15] |
| nc | PC[16] |
| nc | PC[17] |
| QE_CLK19 | PC[18] |
| nc | PC[19] |
| UCC1_GTX_CLK | PC[20] |
| nc | PC[21] |
| QE_CLK23 | PC[22] |
| QE_CLK24 | PC[23] |
| nc | PC[24] |
| nc | PC[25] |
| QE_CLK27 | PC[26] |
| nc | PC[27] |
| CPU_DEBUG4 | PC[28] |
| nc | PC[29] |
| UCC1_MDIO | PC[30] |
| UCC1_MDC | PC[31] |

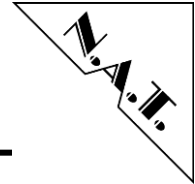


Table 22: CPU Port Pin Definition – Port D

| Signal Function | Port D Pin |
|-----------------|------------|
| RESET_ATMEL | PD[0] |
| nc | PD[1] |
| RES4 | PD[2] |
| SI_TDM_SYNC | PD[3] |
| RES2 | PD[4] |
| SI12_TDMe_RxD | PD[5] |
| nc | PD[6] |
| nc | PD[7] |
| nc | PD[8] |
| nc | PD[9] |
| SI2_TDMe_TxD | PD[10] |
| SI_TDM_SYNC | PD[11] |
| nc | PD[12] |
| nc | PD[13] |
| nc | PD[14] |
| nc | PD[15] |
| nc | PD[16] |
| SI_TDM_SYNC | PD[17] |
| nc | PD[18] |
| SI1_TDMf_RxD | PD[19] |
| nc | PD[20] |
| nc | PD[21] |
| RES5 | PD[22] |
| nc | PD[23] |
| SI1_TDMf_TxD | PD[24] |
| SI_TDM_SYNC | PD[25] |
| nc | PD[26] |
| PLL_FASTLOCK | PD[27] |
| nc | PD[28] |
| nc | PD[29] |
| nc | PD[30] |
| SI_TDM_SYNC | PD[31] |

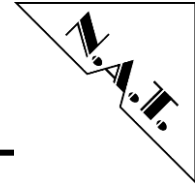


Table 23: CPU Port Pin Definition – Port E

| Signal Function | Port E Pin |
|------------------------|-------------------|
| CON_RES1 | PE[0] |
| SI1_TDMg_RxD | PE[1] |
| nc | PE[2] |
| nc | PE[3] |
| RES6 | PE[4] |
| DS_TXEN | PE[5] |
| SI1_TDMg_TxD | PE[6] |
| SI_TDM_SYNC | PE[7] |
| nc | PE[8] |
| nc | PE[9] |
| RES3 | PE[10] |
| nc | PE[11] |
| RES1 | PE[12] |
| SI_TDM_SYNC | PE[13] |
| nc | PE[14] |
| SI2_TDMh_RxD | PE[15] |
| PLL_MS1 | PE[16] |
| nc | PE[17] |
| nc | PE[18] |
| PLL_MS0 | PE[19] |
| SI2_TDMh_TxD | PE[20] |
| SI_TDM_SYNC | PE[21] |
| PLL_HMS | PE[22] |
| nc | PE[23] |
| PLL_TIE_CLEARn | PE[24] |
| PLL_OUTSEL | PE[25] |
| PLL_BW_SEL | PE[26] |
| DS2_TSERCLK | PE[27] |
| QE_PE28 | PE[28] |
| QE_PE29 | PE[29] |
| CPU_DEBUG0 | PE[30] |
| CPU_DEBUG1 | PE[31] |

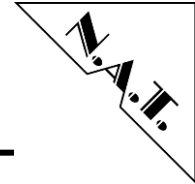
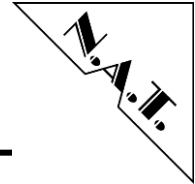


Table 24: CPU Port Pin Definition – Port F

| Signal Function | Port F Pin |
|-----------------|------------|
| CPU_DEBUG2 | PF[0] |
| COU_DEBUG3 | PF[1] |
| nc | PF[2] |
| USB_/OE | PF[3] |
| USB_TP | PF[4] |
| USB_TN | PF[5] |
| USB_RP | PF[6] |
| USB_RXD | PF[7] |
| USB_RN | PF[8] |
| UART1_SOUT | PF[9] |
| UART1_CTS | PF[10] |
| UART1_RTS | PF[11] |
| UART1_SIN | PF[12] |
| nc | PF[13] |
| QE_PF14 | PF[14] |
| CPU_DEBUG5 | PF[15] |
| CPU_DEBUG6 | PF[16] |
| CPU_DEBUG7 | PF[17] |
| CPU_CON | PF[18] |
| nc | PF[19] |
| nc | PF[20] |
| /INT2_ATMEL | PF[21] |
| PS1_PIGGYn | PF[22] |
| nc | PF[23] |
| nc | PF[24] |
| nc | PF[25] |
| nc | PF[26] |
| nc | PF[27] |
| nc | PF[28] |
| nc | PF[29] |
| nc | PF[30] |
| nc | PF[31] |

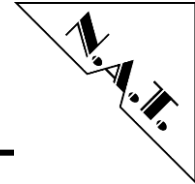


5 NAMC-8569-E3/DS3 Programming Notes

5.1 FPGA Memory Map

Table 25: FPGA Memory Map – Overview

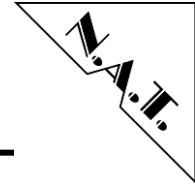
| | Logical Block | Description |
|-------------------------|---------------------------------|----------------------------|
| 0x00000..0x000ff | General Purpose Status | General Purpose Read-Only |
| 0x00100..0x001ff | General Purpose Registers | General Purpose Read/Write |
| 0x01000..0x01fff | FPGA SPI Flash Interface | |
| 0x02000..0x02fff | Atmel SPI Interface | |
| 0x10000..0x1ffff | GigabitEthernet Interface Block | |
| 0x20000..0x2ffff | Local TDM Block | |
| 0x80000..0xfffff | iTDM Block | |



5.1.1 FPGA Register Description General Purpose Status Registers - 0x00..0x1ff

Table 26: FPGA Register Description General Purpose Status / Registers

| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------|--------------|----|----|----|----|----|---|---|--------------|---|---|-------------|----------|---|---|---|
| 0x00 | Reserved | | | | | | | | PCB_VERS | | | | | | | |
| 0x02 | Reserved | | | | | | | | FPGA_VERS | | | | | | | |
| 0x04 | TEST_VAL_1 | | | | | | | | | | | | | | | |
| 0x06 | TEST_VAL_2 | | | | | | | | | | | | | | | |
| 0x08 | Board_ID | | | | | | | | | | | | | | | |
| 0x0A | Reserved | | | | | | | | | | | ASS_OPT | Reserved | | | |
| 0x0C | IRQ_STAT | | | | | | | | | | | | | | | |
| 0x0E | Reserved | | | | | | | | | | | PLL_STAT | | | | |
| 0x10 | CARRIER_ID | | | | | | | | | | | GEO_ADDRESS | | | | |
| 0x100 | RST | | | | | | | | | | | | | | | |
| 0x102 | Reserved | | | | | | | | AMC_LED_CTRL | | | | | | | |
| 0x104 | Reserved | | | | | | | | | | | | | | | |
| 0x106 | Reserved | | | | | | | | | | | | | | | |
| 0x108 | Reserved | | | | | | | | | | | | | | | |
| 0x10A | Reserved | | | | | | | | | | | | | | | |
| 0x10C | IRQ_ENBL | | | | | | | | | | | | | | | |
| 0x10E | TCKL_A_CTRL | | | | | | | | | | | | | | | |
| 0x110 | TCKL_B_CTRL | | | | | | | | | | | | | | | |
| 0x112 | TCKL_C_CTRL | | | | | | | | | | | | | | | |
| 0x114 | TCKL_D_CTRL | | | | | | | | | | | | | | | |
| 0x116 | PLL_REF0_SEL | | | | | | | | | | | | | | | |
| 0x118 | PLL_REF1_SEL | | | | | | | | | | | | | | | |
| 0x11A | Reserved | | | | | | | | | | | | | | | |
| 0x11C | Reserved | | | | | | | | | | | | | | | |
| 0x11E | Reserved | | | | | | | | | | | | | | | |
| 0x120 | PLL_CTRL | | | | | | | | | | | | | | | |



5.1.1.1 FPGA Register Description – PCB_VERS – 0x00

| Bit | Name | Description | Default | Access |
|-------|--------------|--|---------|-----------|
| 15..8 | | Reserved | 0x00 | Read Only |
| 7..4 | PCB_MAJ_VERS | PCB Major Version (x.y) 4 bit unsigned number | HW init | Read Only |
| 3..0 | PCB_MIN_VERS | PCB Minor Version (x.y) 4 bit unsigned number | HW init | Read Only |

Note: The PCB Version is determined by the level of unused pins hardcoded on the PCB.

5.1.1.2 FPGA Register Description – FPGA_VERS – 0x02

| Bit | Name | Description | Default | Access |
|-------|---------------|---|---------|-----------|
| 15..8 | FPGA_SUB_VERS | FPGA Sub Version (x.y.z); 8 bit unsigned number | n/a | Read Only |
| 7..4 | FPGA_MAJ_VERS | FPGA Major Version (x.y.z) 4 bit unsigned number | n/a | Read Only |
| 3..0 | FPGA_MIN_VERS | FPGA Minor Version (x.y.z) 4 bit unsigned number | n/a | Read Only |

5.1.1.3 FPGA Register Description – TEST_VAL_1 – 0x04

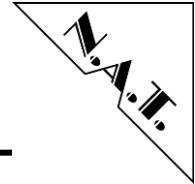
| Bit | Name | Description | Default | Access |
|-------|--------|------------------------------------|---------|-----------|
| 15..0 | TEST_1 | Random number for testing purposes | 0xAA55 | Read Only |

5.1.1.4 FPGA Register Description – TEST_VAL_2 – 0x06

| Bit | Name | Description | Default | Access |
|-------|--------|------------------------------------|---------|-----------|
| 15..0 | TEST_2 | Random number for testing purposes | 0xDEAD | Read Only |

5.1.1.5 FPGA Register Description – BOARD_ID – 0x08

| Bit | Name | Description | Default | Access |
|-------|----------|-------------------------|---------|-----------|
| 15..0 | BOARD_ID | Holds internal board ID | 0x0B2B | Read Only |



5.1.1.6 FPGA Register Description – ASS_OPT – 0x0A

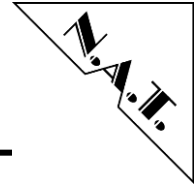
| Bit | Name | Description | Default | Access |
|-------|-----------|--|---------|-----------|
| 15..4 | | Reserved | 0x00 | Read Only |
| 3..2 | DRAM_SIZE | Assembly option – DRAM size 00 – 128 MB 01 – 256 MB 10 – 512 MB 11 – 1024 MB | 10 | Read Only |
| 1..0 | | Reserved | 00 | Read Only |

5.1.1.7 FPGA Register Description – IRQ_STAT – 0x0C

| Bit | Name | Description | Default | Access |
|-------|----------|-------------|---------|-----------|
| 15..0 | IRQ_STAT | IRQ_Status | 0x0000 | Read Only |

5.1.1.8 FPGA Register Description – PLL_STAT – 0x0E

| Bit | Name | Description | Default | Access |
|-------|----------|---------------------------|---------|-----------|
| 15..5 | | Reserved | n/a | Read Only |
| 4 | LOCK | PLL locked | n/a | Read Only |
| 3 | HLD_OV | Hold over mode | n/a | Read Only |
| 1..2 | REF_FAIL | PLL reference failed | n/a | Read Only |
| 0 | SEL_REF | Selected reference signal | n/a | Read Only |



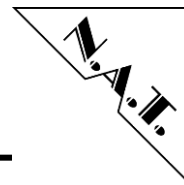
5.1.1.9 FPGA Register Description – CARRIER_ID / GEO_ADDRESS – 0x10

| Bit | Name | Description | Default | Access |
|--------------|-------------|---|---------|-----------|
| 15..8 | CARRIER_ID | Carrier Manager ID 0x80 + 2*Carrier Number | na | Read Only |
| 7..0 | GEO_ADDRESS | Geographical Address (Slot ID) 0x72: AMC1 0x74: AMC2 0x76: AMC3 0x78: AMC4 0x7A: AMC5 0x7C: AMC6 0x7E: AMC7 0x80: AMC8 0x82: AMC9 0x84: AMC10 0x86: AMC11 0x88: AMC12 | na | Read Only |

5.1.1.10 FPGA Register Description – RST – 0x100

Writing "1" to a bit of this register causes a reset pulse on the respective device. All bits are self-clearing.

| Bit | Name | Description | Default | Access |
|--------------|-------------|---|---------|------------|
| 15 | BOARD_RST | Complete System reset | 0x0 | Read/Write |
| 7..14 | | Reserved | 0x0 | Read/Write |
| 6 | IPMI_RST | IPMI reset | 0x0 | Read/Write |
| 5 | | Reserved | 0x0 | Read/Write |
| 4 | SPI_RST | SPI controller to FPGA configuration EEPROM reset | 0x0 | Read/Write |
| 3 | LOC_TDM_RST | Local TDM logic reset | 0x0 | Read/Write |
| 2 | GBE_RST | Gigabit Ethernet logic reset | 0x0 | Read/Write |
| 1 | ITDM_RST | IDTM reset | 0x0 | Read/Write |
| 0 | LOC_RST | Local bus devices reset | 0x0 | Read/Write |



5.1.1.11 FPGA Register Description – AMC_LED_CTRL – 0x102

| Bit | Name | Description | Default | Access |
|-------|------|------------------------|---------|------------|
| 15..8 | | Reserved | 0x00 | Read/Write |
| 7..4 | ORNG | AMC_LED control orange | 0x0 | Read/Write |
| 3..0 | GRN | AMC_LED control green | 0x7 | Read/Write |

Note: As both LEDs share one hole in the Front Panel, they optically appear as one LED.

| Register Value | Behaviour green LED | Behaviour orange LED |
|----------------|--|------------------------|
| 0x0 | LED off | |
| 0x1 | LED solid on | |
| 0x2 | LED slow blink | |
| 0x3 | LED fast blink | |
| 0x4 | PLL locked | |
| 0x5 | Ethernet Activity | |
| 0x6 | Ethernet Link established | |
| 0x7 | Alternating: PLL locked / Ethernet Link established* | PCIe-Link established* |
| 0x8 | Local Bus Activity | |

* If both LED control nibbles hold the value "0x7", they show alternating "PLL locked", "Ethernet Link established" and "PCIe-Link established" in the corresponding colour.

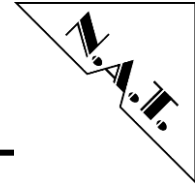
5.1.1.12 FPGA Register Description – IRQ_ENBL – 0x10C

| Bit | Name | Description | Default | Access |
|-------|----------|-------------|---------|------------|
| 15..0 | IRQ_ENBL | IRQ_Enable | 0x0000 | Read/Write |

5.1.1.13 FPGA Register Description – TCKL_A_CTRL – 0x10E

| Bit | Name | Description | Default | Access |
|-------|--------|---|---------|------------|
| 15..0 | TCKL_A | Selects which signal is driven on TCKLA | 0x0000 | Read/Write |

| Register Value | Signal |
|----------------|------------------------------------|
| 0x0 | Output disabled (Tristate) |
| 0x01..0x10 | Static Low Level |
| 0x11 | TCLK_A |
| 0x12 | TCLK_B |
| 0x13 | TCLK_C |
| 0x14 | TCLK_D |
| 0x15 | Frame sync signal of the local TSI |
| 0x16 | Telecom PLL output 8.192 MHz |
| 0x17 | Telecom PLL output 65.536 MHz |
| 0x18 | Telecom PLL output 1.544 MHz |



5.1.1.14 FPGA Register Description – TCKL_B_CTRL – 0x110

| Bit | Name | Description | Default | Access |
|-------|--------|---|---------|------------|
| 15..0 | TCKL_B | Selects which signal is driven on TCKLB | 0x0000 | Read/Write |

For detailed information on the register values and the related signals, please refer to chapter 5.1.1.13.

5.1.1.15 FPGA Register Description – TCKL_C_CTRL – 0x112

| Bit | Name | Description | Default | Access |
|-------|--------|---|---------|------------|
| 15..0 | TCKL_C | Selects which signal is driven on TCKLC | 0x0000 | Read/Write |

For detailed information on the register values and the related signals, please refer to chapter 5.1.1.13.

5.1.1.16 FPGA Register Description – TCKL_D_CTRL – 0x114

| Bit | Name | Description | Default | Access |
|-------|--------|---|---------|------------|
| 15..0 | TCKL_D | Selects which signal is driven on TCKLD | 0x0000 | Read/Write |

For detailed information on the register values and the related signals, please refer to chapter 5.1.1.13.

5.1.1.17 FPGA Register Description – PLL_REF0_SEL – 0x116

| Bit | Name | Description | Default | Access |
|-------|--------------|--|---------|------------|
| 15..0 | PLL_REF0_SEL | Selects which signal is driven to PLL_REF0 | 0x0011 | Read/Write |

For detailed information on the register values and the related signals, please refer to chapter 5.1.1.13.

Note: If the PLL_REF0_SEL-Register holds the value "0", the signal is "0" (not Tristate).

5.1.1.18 FPGA Register Description – PLL_REF1_SEL – 0x118

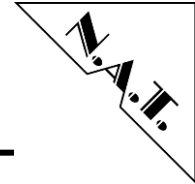
| Bit | Name | Description | Default | Access |
|-------|--------------|--|---------|------------|
| 15..0 | PLL_REF1_SEL | Selects which signal is driven to PLL_REF1 | 0x0000 | Read/Write |

For detailed information on the register values and the related signals, please refer to chapter 5.1.1.13.

Note: If the PLL_REF1_SEL-Register holds the value "0", the signal is "0" (not Tristate).

5.1.1.19 FPGA Register Description – PLL_CTRL – 0x120

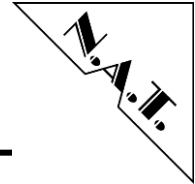
| Bit | Name | Description | Default | Access |
|-------|-------------|--|---------|------------|
| 15..8 | | Reserved | 00 | Read/Write |
| 7 | PLL_OOR_SEL | Out of range Select For detailed information please refer to the Zarlink ZL30100 Data Sheet | 0 | Read/Write |
| 6..0 | | Reserved | 0x00 | Read/Write |



6 Board Specification

Table 27: NAMC-8569-E3/DS3 Features – Overview

| | |
|---|--|
| Processor | PowerQUICC III MPC8569 (800, 1000 or 1333 MHz) based Embedded PowerPC Architecture |
| AMC-Module | Standard Advanced Mezzanine Card, single width |
| Front-I/O | 2x BNC, RS 232 (Mini-USB) |
| Main Memory | 128 – 1024 MB DDR2 SDRAM |
| Flash PROM | 16 – 128 MB 16-bit parallel NOR-Flash 2 GB NAND-Flash |
| Removable Flash | Micro SD-Card Slot |
| Firmware | OK1, QNX BSP and Linux BSP (on request) |
| Power Consumption (MPC8569 / 1333 MHz) | 12V / 2.5A |
| Operating Temperature | 0°C – +55°C with forced cooling |
| Storage Temperature | -40°C - +85°C |
| Humidity | 10% – 90% rh non-condensing |
| Standards compliance | PICMG AMC.0 Rev. 2.0 PICMG AMC.1 Rev. 1.0 PICMG AMC.2 Rev. 1.0 (Type E2) PCI Express Base Specification Rev. 1.1 PICMG SFP.0 Rev. 1.0 (System Fabric Plane Format) PICMG SFP.1 Rev. 1.0 (Internal TDM) IPMI Specification v2.0 Rev. 1.0 PICMG µTCA.0 Rev. 1.0 |



7 Installation

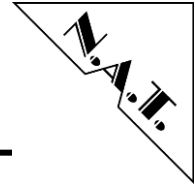
7.1 Safety Note

To ensure proper functioning of the **NAMC-8569-E3/DS3** 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-8569-E3/DS3** read this installation section
- Before installing or uninstalling the **NAMC-8569-E3/DS3**, read the Installation Guide and the User's Manual of the carrier board used, or of the uTCA system the board will be plugged into.
- Before installing or uninstalling the **NAMC-8569-E3/DS3** on a carrier board or both 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 if necessary
 - Make sure the part to be installed / removed is hot swap capable, if you don't switch off the power.
- Before touching integrated circuits ensure to take all required precautions for handling electrostatic devices.
- Ensure that the **NAMC-8569-E3/DS3** is connected to the carrier board or to the μ TCA backplane with the connector completely inserted.
- When operating the board in areas of strong electromagnetic radiation ensure that the module
 - is bolted to the front panel or rack
 - and shielded by closed housing



7.2 Installation Prerequisites and Requirements

IMPORTANT

Before powering up check this section for installation prerequisites and requirements!

7.2.1 Requirements

The installation requires only:

- an ATCA carrier board, or a μ TCA backplane for connecting the **NAMC-8569-E3/DS3**
- power supply
- cooling devices

7.2.2 Power supply

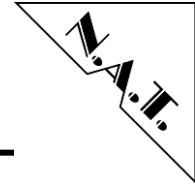
The power supply for the **NAMC-8569-E3/DS3** must meet the following specifications:

- required for the module: +12V / 2.5A max.

7.2.3 Automatic Power Up

In the following situations the **NAMC-8569-E3/DS3** will automatically be reset and proceed with a normal power up:

- The voltage sensor generates a reset
- when +12V voltage level drops below 10V
- when +3.3V voltage level drops below 3.08V
- The carrier board / backplane signals a PCIe-Reset.



7.3 Statement on Environmental Protection

7.3.1 Compliance to RoHS Directive

Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 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.

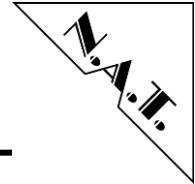
Although many of hardware products of N.A.T. are exempted from the RoHS directive it is a declared policy of N.A.T. to provide all products fully compliant to the RoHS directive as soon as possible. For this purpose since January 31st, 2005 N.A.T. is requesting RoHS compliant deliveries from its suppliers.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

7.3.2 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 electronic 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 Commission 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 electronic 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 2011/65/EU of the European Parliament and of the Council of 8 June 2011 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.

7.3.3 Compliance to CE Directive

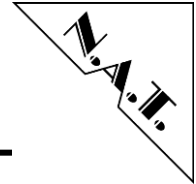
Compliance to the CE directive is declared. A 'CE' sign can be found on the PCB.

7.3.4 Product Safety

The board complies with EN60950 and UL1950.

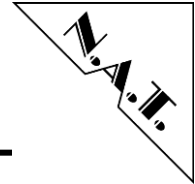
7.3.5 Compliance to REACH

The REACH EU regulation (Regulation (EC) No 1907/2006) is known to N.A.T. GmbH. N.A.T. did not receive information from their European suppliers of substances of very high concern of the ECHA candidate list. Article 7(2) of REACH is notable as no substances are intentionally being released by NAT products and as no hazardous substances are contained. Information remains in effect or will be otherwise stated immediately to our customers.



8 Known Bugs / Restrictions

none



Appendix A: Reference Documentation

- [1] MPC8569 Reference Manual, Rev. 0
- [2] Atmel, AT24C128/256 Data Sheet, Rev. 0670J-SEEPR-4/1/03
- [3] Atmel, Atmega16/16L Product Data, Rev. 2466C-03/02
- [4] Lattice, ECP3 Handbook, Version 1.7
- [5] Zarlink, T1/E1 System Synchronizer Data Sheet, April 2010

