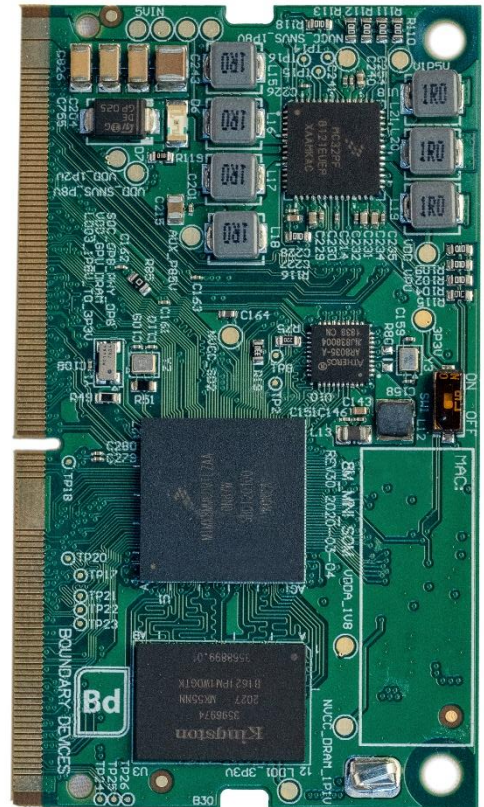




**Boundary**  
Devices

# Nit8M\_Mini\_SOM

## PRODUCT MANUAL





## REVISION HISTORY

| DATE       | REVISION | DESCRIPTION   | APPROVAL |
|------------|----------|---|----------|
| 10/29/2019 | 0.1      | First Draft   | KG       |
| 3/31/2020  | 0.2      | Added SDIO Note.<br>Added Product Link for BD_DSIHD | KG       |
| 6/13/2020  | 0.3      | Added SODIMM Mating Part Number Link                | KG       |
| 11/10/2022 | 0.4      | Added MTBF and storage information                  | GB       |

## TABLE OF CONTENTS

### TABLE OF CONTENTS

|  |    |
|--|----|
| <b>Revision History</b> .....                | 2  |
| <b>Table of Contents</b> .....               | 3  |
| <b>1. Overview</b> .....                     | 4  |
| 1.1. General Information.....                | 4  |
| 1.2. Feature Summary.....                    | 5  |
| 1.3. Block Diagram.....                      | 6  |
| 1.4. NXP i.MX 8M Mini Processor.....         | 7  |
| <b>2. Connector Details</b> .....            | 10 |
| 2.1. Custom Connectors.....                  | 10 |
| 2.2. SODIMM 260 Pin Mux.....                 | 16 |
| <b>3. SOM Interfaces</b> .....               | 16 |
| 3.1. Display Interfaces.....                 | 16 |
| 3.2. Camera Interfaces.....                  | 17 |
| 3.3. Gigabit Ethernet.....                   | 17 |
| 3.4. Wi-Fi & Bluetooth.....                  | 18 |
| 3.5. USB Host2.0.....                        | 18 |
| 3.6. USB 2.0OTG.....                         | 18 |
| 3.7. MMC/SD/SDIO.....                        | 19 |
| 3.8. Audio.....                              | 19 |
| 3.9. UART Interfaces.....                    | 20 |
| 3.10. Flexible SPI.....                      | 21 |
| 3.11. eCSPI KEY features.....                | 21 |
| 3.12. PCIe.....                              | 22 |
| 3.13. I2C.....                               | 23 |
| 3.14. General Purpose I/O.....               | 23 |
| 3.15. General System Control.....            | 23 |
| 3.16. Reference Clock Out.....               | 23 |
| 3.17. Power.....                             | 24 |
| <b>4. Operational Characteristics</b> .....  | 25 |
| 4.1. Power Supply.....                       | 25 |
| 4.2. Power Consumption.....                  | 25 |
| <b>5. Environmental Specifications</b> ..... | 25 |
| <b>6. Mechanical Drawings</b> .....          | 26 |
| <b>7. Orderable Part Numbers</b> .....       | 26 |
| <b>8. Warranty Terms</b> .....               | 27 |
| <b>9. Contact Information</b> .....          | 28 |

## 1. OVERVIEW

### 1.1. GENERAL INFORMATION

The Nitrogen8 family of SBCs and SOMs are the latest in Boundary Device's i.MX based embedded computing solutions.

The different Nitrogen8 series of SBCs and SOMs include offerings designed to best leverage the advantages of the i.MX 8M applications processors to fit a variety of embedded and IoT applications including: consumer/ industrial automation, aviation & aerospace, HMI, industrial control, robotics, building control, digital displays, infotainment, telematics, and more.

The Nitrogen8M\_Mini SOM is designed for mass production use with a guaranteed 10-year life span, FCC Pre-scan results, and a stable supply chain. Industrial temperature and conformal coating options are available. It can also include from 2GB up to 4GB of LPDDR4 RAM.

#### **Software Support:**

Industry leading OS-Level support can be found on the Boundary Devices website via the Blog (<https://boundarydevices.com/blog>) and Wiki (<https://boundarydevices.com/wiki>). You can also find images for the latest versions of popular OS supported by the Nitrogen platforms including: Yocto, Buildroot, Ubuntu, Debian, Android, and FreeRTOS.

Visit: [https://wiki.boundarydevices.com/index.php/Nitrogen8M\\_Mini\\_SOM/](https://wiki.boundarydevices.com/index.php/Nitrogen8M_Mini_SOM/)

Boundary Devices does not provide application development, but does have large list of software partners who can. You can browse our partners at <https://boundarydevices.com/support>

Email: [info@boundarydevices.com](mailto:info@boundarydevices.com) to discuss all build options.

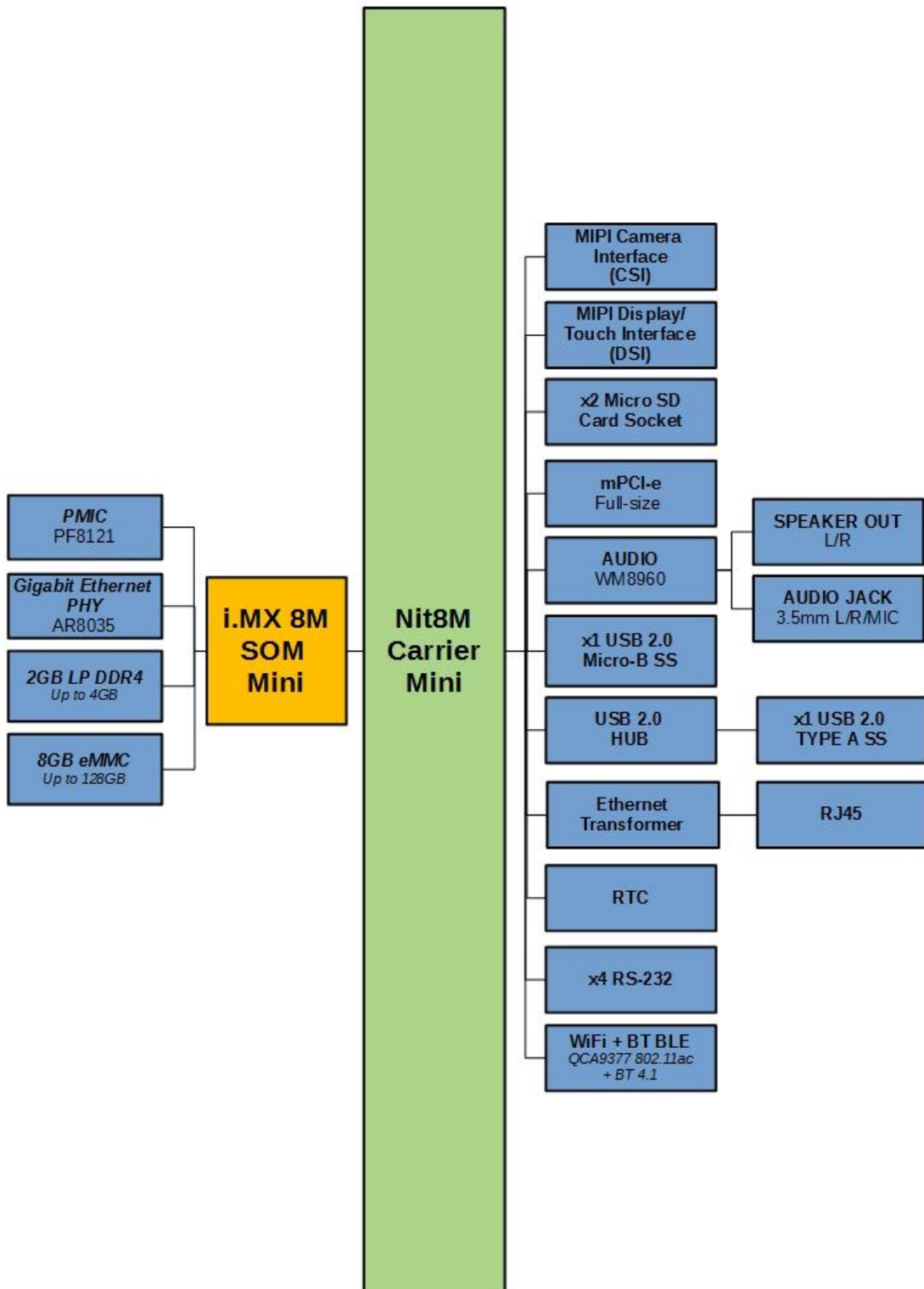
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## 1.2. FEATURE SUMMARY

---

- Quad-Core ARM® Cortex-A53 processor at 1.6GHz
- General purpose Cortex M-4 400Mhz core processor for low-power processing
- 2GB of LPDDR4. Expandable to 4GB LPDDR4
- 16GB eMMC – Expandable to 128GB
- One MIPI DSI Display Port (4-lane up to 1080p60 via carrier board)
- One MIPI CSI Camera Interface (4-lane MIPI CSI via carrier board)
- HD Video Engine
- SDIO Interface (via carrier board)
- PCIe (via carrier board)
- 10/100/GB Ethernet (via carrier board)
- 2 High speed USB ports (1x Host, 1x OTG via carrier board)
- I2C (x3 via carrier board)
- General Purpose I/O for Device Control
- Industrial Temperature versions available
- Small Size (69.6mm x 40mm)

1.3. BLOCK DIAGRAM

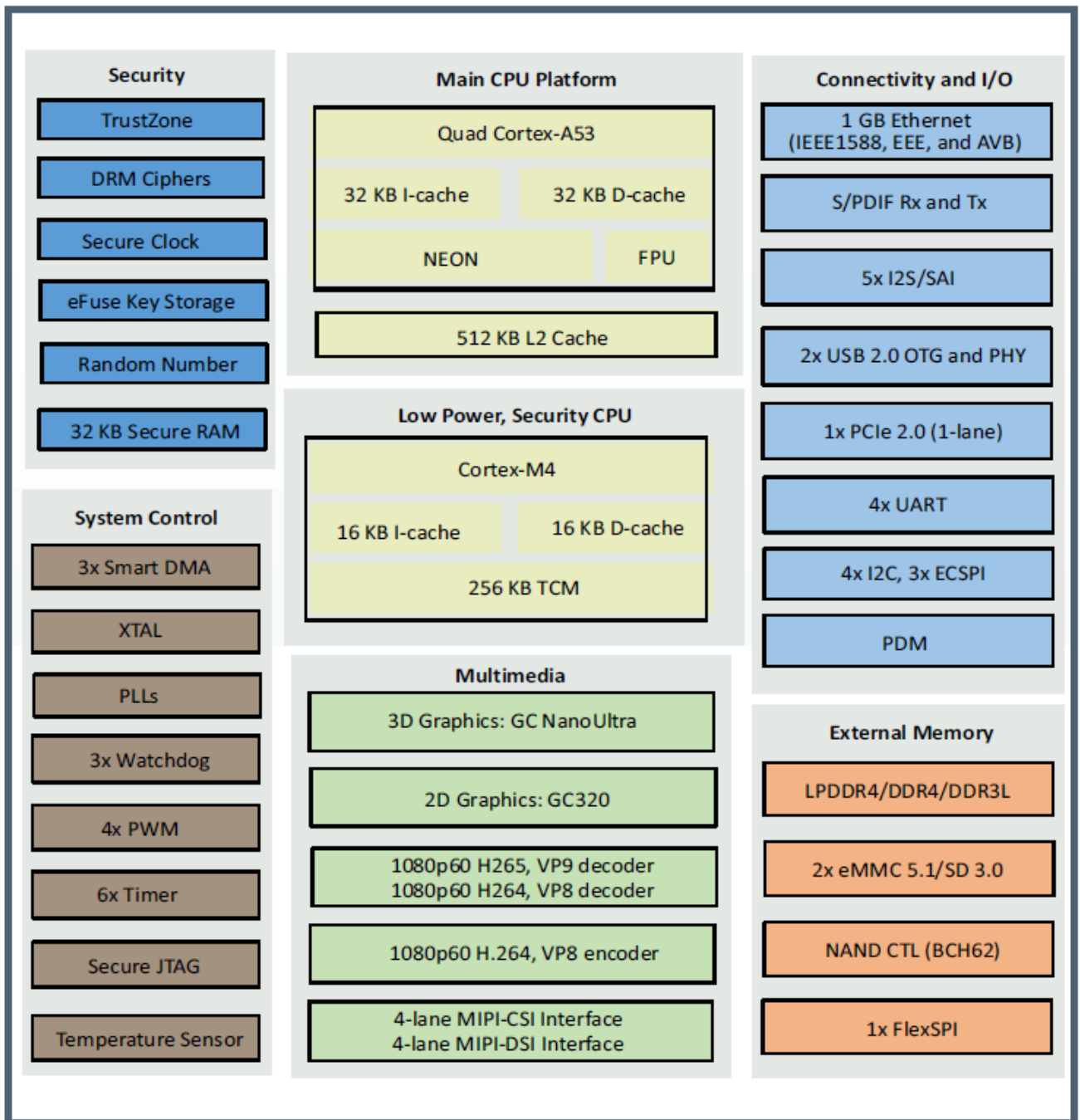


## 1.4. NXP I.MX 8M MINI PROCESSOR

### 1.4.1. OVERVIEW

The i.MX 8M Mini family of processors features advanced implementation of a quad Arm® Cortex®-A53 core, which operates at speeds of up to 1.6 GHz. A general purpose Cortex®-M4 400 MHz core processor is for low-power processing. The DRAM controller supports 32-bit/16-bit LPDDR4, DDR4, and DDR3L memory. A wide range of audio interfaces are available, including I2S, AC97, TDM, and S/PDIF. There are a number of other interfaces for connecting peripherals, such as USB, PCIe, and Ethernet.

### 1.4.2. I.MX 8M MINI BLOCK DIAGRAM



## 143. CPU

The i.MX 8M Mini applications processor represents NXP's latest video and audio experience combining state-of-the-art media-specific features with high-performance processing while optimized for lowest power consumption:

- Arm Cortex-A53 MPCore platform
- Quad symmetric Cortex-A53 processors :
  - 32 KB L1 Instruction Cache
  - 32 KB L1 Data Cache
  - Media Processing Engine (MPE) with NEON technology supporting the Advanced Single Instruction Multiple Data architecture:
  - Floating Point Unit (FPU) with support of the VFPv4-D16 architecture
  - Support of 64-bit Armv8-A architecture
  - 512 KB unified L2 cache
- Arm Cortex-M4 core platform
  - 16 KB L1 Instruction Cache
  - 16 KB L1 Data Cache
  - 256 KB tightly coupled memory (TCM)
- Low power microcontroller available for customer application
  - low power microcontroller available for customer application
  - low power standby mode
  - IoT features including Weave
  - Manage IR or Wireless Remote

## 144. MEMORY

The on-chip memory system consists of the following:

- Boot ROM (256KB)
- On-chip RAM (256KB + 32KB)

The external memory interfaces supported on this chip include:

- 16/32-bit DRAM Interface:
  - LPDDR4-3000
- eMMC 5.0 FLASH
- SPI NOR FLASH

The i.MX 8M Mini supports the following boot devices:

- SDIO / MMC / SDXC
- eSD 3.0/eMMC 5.0 (fast boot)
- USB
- QSPI Ethernet (via plug-in mode)



## 145. DISPLAY

The i.MX8 video graphics subsystem consists of the following dedicated modules:

- High Performance Video Processing Unit (VPU)
- Three Graphics Processing Units (GPUs):
  - 3D GPU: accelerating the generation of 3D graphics (OpenGL/ES) and vector graphics (OpenVG)
  - 2D GPU: acceleration the generation of 2D graphics (BitBLT).
  - OpenVG: acceleration of vector graphics (OpenVG).

The chip has the following display support:

LCDIF Display Controller:

- Supports up to 2 layers of overlay
- Support up to 1080p60 display through MIPI DSI

MIPI Interface:

- 4-lane MIPI CSI interface
- 4-lane MIPI DSI interface

CSI Interface:

- CSI is a simple camera interface which is used to capture the MIPI CSI input and save the pixels into memory

## 146. GRAPHICS PROCESSING UNIT

The chip incorporates the following Graphics Processing Unit (GPU) features:

- 2D/3D acceleration
- Target frequency of 800 MHz
- Support OpenGL ES 1.1, 2.0, OpenVG 1.1
- TrustZone support using a local MMU to manage secure regions
- Support multi-source composition
- Support one-pass filter
- Support tile format

## 147. VIDEO PROCESSING UNIT

The chip incorporates the following Video Processing Unit (VPU) features:

- 1080p60 VP9 Profile 0, 2 (10 bit) Decoder (Hantro G2)
- 1080p60 HEVC/H.265 Decoder (Hantro G2)
- 1080p60 AVC/H.264 Baseline, Main, High Decoder (Hantro G1)
- 1080p60 VP8 Decoder (Hantro G1)
- 1080p60 AVC/H.264 Encoder (Hantro H1)
- 1080p60 VP8 Encoder (Hantro H1)
- TrustZone support

## 2. CONNECTOR DETAILS

The Nit8M\_Mini\_SOM exposes a 260 pin SODIMM mechanical standard interface. The recommended mating connector for baseboard interfacing is: Tyco Electronics - [TE 2309407-1](#)

### 2.1. CUSTOM CONNECTORS

| 260 Pin SODIMM Edge Connector to Carrier Board Interface<br>Mating Connector P/N: TE <a href="#">2309407-1</a> |                   |                    |               |  |
|--|-------------------|--------------------|---------------|--|
| PIN#   | SOM Signal        | SOM Voltage Domain | Voltage Level | Comments                                 |
| 1  | +5V               | -                  | 5V Power      |  |
| 2  | +5V               | -                  | 5V Power      |  |
| 3  | +5V               | -                  | 5V Power      |  |
| 4  | +5V               | -                  | 5V Power      |  |
| 5  | +5V               | -                  | 5V Power      |  |
| 6  | +5V               | -                  | 5V Power      |  |
| 7  | +5V               | -                  | 5V Power      |  |
| 8  | +5V               | -                  | 5V Power      |  |
| 9  | GND               | -                  | Ground        |  |
| 10   | GND               | -                  | Ground        |  |
| 11   | GND               | -                  | Ground        |  |
| 12   | GND               | -                  | Ground        |  |
| 13   | GND               | -                  | Ground        |  |
| 14   | GND               | -                  | Ground        |  |
| 15   | GND               | -                  | Ground        |  |
| 16   | GND               | -                  | Ground        |  |
| 17   | GND               | -                  | Ground        |  |
| 18   | GND               | -                  | Ground        |  |
| 19   | LDO3_1P8V_TO_3P3V |                    | Power Output  | DEFAULT 1.8V FOR CUSTOMER USE 350 MA MAX |
| 20   | GND               | -                  | Ground        |  |
| 21   | LDO3_1P8V_TO_3P3V |                    | Power Output  | DEFAULT 1.8V FOR CUSTOMER USE 350 MA MAX |
| 22   | VDD_LICELL        |                    | 3V Battery    |  |
| 23   | RGMIIL_ACT        |                    | Ethernet      |  |
| 24   | SAI1_RXFS         | NVCC_SAI1          | 3.3V          |  |
| 25   | RGMIIL_LINK       |                    | Ethernet      |  |
| 26   | SAI1_RXC          | NVCC_SAI1          | 3.3V          |  |
| 27   | GND               | -                  | Ground        |  |
| 28   | SAI1_RXD0         | NVCC_SAI1          | 3.3V          |  |
| 29   | TRX3_N            |                    | Ethernet      |  |
| 30   | SAI1_RXD1         | NVCC_SAI1          | 3.3V          |  |
| 31   | TRX3_P            |                    | Ethernet      |  |
| 32   | SAI1_RXD2         | NVCC_SAI1          | 3.3V          |  |

|    |              |           |          |  |
|----|--------------|-----------|----------|--|
| 33 | GND          | -         | Ground   |  |
| 34 | SAI1_RXD3    | NVCC_SAI1 | 3.3V     |  |
| 35 | TRX2_N       |           | Ethernet |  |
| 36 | SAI1_RXD4    | NVCC_SAI1 | 3.3V     |  |
| 37 | TRX2_P       |           | Ethernet |  |
| 38 | SAI1_RXD5    | NVCC_SAI1 | 3.3V     |  |
| 39 | GND          | -         | Ground   |  |
| 40 | SAI1_RXD6    | NVCC_SAI1 | 3.3V     |  |
| 41 | TRX1_N       |           | Ethernet |  |
| 42 | SAI1_RXD7    | NVCC_SAI1 | 3.3V     |  |
| 43 | TRX1_P       |           | Ethernet |  |
| 44 | GND          | -         | Ground   |  |
| 45 | GND          | -         | Ground   |  |
| 46 | SAI1_MCLK    | NVCC_SAI1 | 3.3V     |  |
| 47 | TRX0_N       |           | Ethernet |  |
| 48 | GND          | -         | Ground   |  |
| 49 | TRX0_P       |           | Ethernet |  |
| 50 | SAI1_TXFS    | NVCC_SAI1 | 3.3V     |  |
| 51 | GND          | -         | Ground   |  |
| 52 | SAI1_TXC     | NVCC_SAI1 | 3.3V     |  |
| 53 | CLKOUT2      | NVCC_CLK  | 1.8V     |  |
| 54 | SAI1_TXD0    | NVCC_SAI1 | 3.3V     |  |
| 55 | CLKIN2       | NVCC_CLK  | 1.8V     |  |
| 56 | SAI1_TXD1    | NVCC_SAI1 | 3.3V     |  |
| 57 | GND          | -         | Ground   |  |
| 58 | SAI1_TXD2    | NVCC_SAI1 | 3.3V     |  |
| 59 | CLKOUT1      | NVCC_CLK  | 1.8V     |  |
| 60 | SAI1_TXD3    | NVCC_SAI1 | 3.3V     |  |
| 61 | CLKIN1       | NVCC_CLK  | 1.8V     |  |
| 62 | SAI1_TXD4    | NVCC_SAI1 | 3.3V     |  |
| 63 | GND          | -         | Ground   |  |
| 64 | SAI1_TXD5    | NVCC_SAI1 | 3.3V     |  |
| 65 | JTAG_TMS     | NVCC_JTAG | 3.3V     |  |
| 66 | SAI1_TXD6    | NVCC_SAI1 | 3.3V     |  |
| 67 | JTAG_TCK     | NVCC_JTAG | 3.3V     |  |
| 68 | SAI1_TXD7    | NVCC_SAI1 | 3.3V     |  |
| 69 | JTAG_TDI     | NVCC_JTAG | 3.3V     |  |
| 70 | GND          | -         | Ground   |  |
| 71 | JTAG_TDO     | NVCC_JTAG | 3.3V     |  |
| 72 | WIFI_RESET   | NVCC_SD1  | 1.8V     |  |
| 73 | JTAG_MOD     | NVCC_JTAG | 3.3V     |  |
| 74 | WL_WAKE_HOST | NVCC_SAI2 | 3.3V     |  |
| 75 | JTAG_NTRST   | NVCC_JTAG | 3.3V     |  |
| 76 | SAI5_RXC     | NVCC_SAI5 | 3.3V     |  |



|     |               |            |           |                                 |
|-----|---------------|------------|-----------|---------------------------------|
| 77  | GND           | -          | Ground    |                                 |
| 78  | SD3_DATA3     | NVCC_NAND  | 3.3V      |                                 |
| 79  | SD2_RESET_B   | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 80  | SD3_DATA2     | NVCC_NAND  | 3.3V      |                                 |
| 81  | SD2_CD        | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 82  | SD3_DATA1     | NVCC_NAND  | 3.3V      |                                 |
| 83  | SD2_DATA0     | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 84  | SD3_DATA0     | NVCC_NAND  | 3.3V      |                                 |
| 85  | SD2_DATA1     | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 86  | SD3_CMD       | NVCC_NAND  | 3.3V      |                                 |
| 87  | SD2_DATA2     | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 88  | GND           | -          | Ground    |                                 |
| 89  | SD2_DATA3     | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 90  | SD3_CLK       | NVCC_NAND  | 3.3V      |                                 |
| 91  | SD2_CMD       | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 92  | GND           | -          | Ground    |                                 |
| 93  | GND           | -          | Ground    |                                 |
| 94  | SAI2_TXFS     | NVCC_SAI2  | 3.3V      |                                 |
| 95  | SD2_CLK       | NVCC_SD2   | 1.8V/3.3V | CUSTOMER DRIVEN<br>1.8V OR 3.3V |
| 96  | UART1_TXD     | NVCC_UART  | 3.3V      |                                 |
| 97  | GND           | -          | Ground    |                                 |
| 98  | UART1_RTS     | NVCC_UART  | 3.3V      |                                 |
| 99  | USB_OTG2_PWR  | NVCC_GPIO1 | 3.3V      |                                 |
| 100 | UART1_RXD     | NVCC_UART  | 3.3V      |                                 |
| 101 | CAMERA_CLK    | NVCC_GPIO1 | 3.3V      |                                 |
| 102 | SAI2_TXC      | NVCC_SAI2  | 3.3V      |                                 |
| 103 | USB_OTG2_VBUS | USB POWER  | 5V        |                                 |
| 104 | SAI2_RXD0     | NVCC_SAI2  | 3.3V      |                                 |
| 105 | GND           | -          | Ground    |                                 |
| 106 | UART1_CTS     | NVCC_UART  | 3.3V      |                                 |
| 107 | USB_OTG2_D_P  | USB_OTG2   | 3.3V      |                                 |
| 108 | SAI2_TXD      | NVCC_SAI2  | 3.3V      |                                 |
| 109 | USB_OTG2_D_N  | USB_OTG2   | 3.3V      |                                 |
| 110 | CLK_REQ_O     | NVCC_SAI3  | 3.3V      |                                 |
| 111 | GND           | -          | Ground    |                                 |
| 112 | BT_WAKE_DEV   | NVCC_SAI2  | 3.3V      |                                 |
| 113 | USB_OTG1_PWR  | NVCC_GPIO1 | 3.3V      |                                 |
| 114 | SLOW_CLK      | NVCC_GPIO1 | 3.3V      |                                 |
| 115 | USB_OTG1_OC   | NVCC_GPIO1 | 3.3V      |                                 |

|     |               |              |           |  |
|-----|---------------|--------------|-----------|--|
| 116 | BT_REG_ON     | NVCC_NAND    | 3.3V      |  |
| 117 | USB_OTG1_ID   | USB_OTG1     | 1.8V      |  |
| 118 | SAI2_RXC      | NVCC_SAI2    | 3.3V      |  |
| 119 | GND           | -            | Ground    |  |
| 120 | GND           | -            | Ground    |  |
| 121 | USB_OTG1_D_P  | USB_OTG1     | 3.3V      |  |
| 122 | PCIE_RST_B    | NVCC_SAI3    | 3.3V      |  |
| 123 | USB_OTG1_D_N  | USB_OTG1     | 3.3V      |  |
| 124 | PCIE_DIS_B    | NVCC_GPIO1   | 3.3V      |  |
| 125 | GND           | -            | Ground    |  |
| 126 | GND           | -            | Ground    |  |
| 127 | USB_OTG1_VBUS | USB_OTG1     | 5V        |  |
| 128 | PCIE_TX_P     | VDD_PCI_1P8  | PCIE      |  |
| 129 | QSPIA_NSS0    | NVCC_NAND    | 3.3V      |  |
| 130 | PCIE_TX_N     | VDD_PCI_1P8  | PCIE      |  |
| 131 | QSPIA_DATA0   | NVCC_NAND    | 3.3V      |  |
| 132 | GND           | -            | Ground    |  |
| 133 | QSPIA_DATA1   | NVCC_NAND    | 3.3V      |  |
| 134 | PCIE_RX_P     | VDD_PCI_1P8  | PCIE      |  |
| 135 | QSPIA_DATA2   | NVCC_NAND    | 3.3V      |  |
| 136 | PCIE_RX_N     | VDD_PCI_1P8  | PCIE      |  |
| 137 | QSPIA_DATA3   | NVCC_NAND    | 3.3V      |  |
| 138 | GND           | -            | Ground    |  |
| 139 | GND           | -            | Ground    |  |
| 140 | PCIE_REFCLK_P | VDD_PCI_1P8  | PCIE      |  |
| 141 | QSPIA_SCLK    | NVCC_NAND    | 3.3V      |  |
| 142 | PCIE_REFCLK_N | VDD_PCI_1P8  | PCIE      |  |
| 143 | GND           | -            | Ground    |  |
| 144 | GND           | -            | Ground    |  |
| 145 | GND           | -            | Ground    |  |
| 146 | GND           | -            | Ground    |  |
| 147 | TP18          | -            | -         |  |
| 148 | CSI_D0_N      | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 149 | UART4_RXD     | NVCC_UART    | 3.3V      |  |
| 150 | CSI_D0_P      | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 151 | UART4_TXD     | NVCC_UART    | 3.3V      |  |
| 152 | GND           | -            | Ground    |  |
| 153 | GND           | -            | Ground    |  |
| 154 | CSI_D1_N      | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 155 | GND           | -            | Ground    |  |
| 156 | CSI_D1_P      | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 157 | GND           | -            | Ground    |  |
| 158 | GND           | -            | Ground    |  |
| 159 | GND           | -            | Ground    |  |

|     |                    |              |           |  |
|-----|--------------------|--------------|-----------|--|
| 160 | CSI_D2_N           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 161 | GND                | -            | Ground    |  |
| 162 | CSI_D2_P           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 163 | GND                | -            | Ground    |  |
| 164 | GND                | -            | Ground    |  |
| 165 | GND                | -            | Ground    |  |
| 166 | CSI_D3_N           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 167 | GND                | -            | Ground    |  |
| 168 | CSI_D3_P           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 169 | GND                | -            | Ground    |  |
| 170 | GND                | -            | Ground    |  |
| 171 | UART2_RXD          | NVCC_UART    | 3.3V      |  |
| 172 | CSI_CK_N           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 173 | UART2_TXD          | NVCC_UART    | 3.3V      |  |
| 174 | CSI_CK_P           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 175 | GND                | -            | Ground    |  |
| 176 | GND                | -            | Ground    |  |
| 177 | GND                | -            | Ground    |  |
| 178 | I2C3_SCL           | NVCC_I2C     | 3.3V      |  |
| 179 | TP20               | -            | -         |  |
| 180 | I2C3_SDA           | NVCC_I2C     | 3.3V      |  |
| 181 | GND                | -            | Ground    |  |
| 182 | GND                | -            | Ground    |  |
| 183 | GND                | -            | Ground    |  |
| 184 | NAND_CLE           | NVCC_NAND    | 3.3V      |  |
| 185 | I2C4_SDA           | NVCC_I2C     | 3.3V      |  |
| 186 | SPDIF_EXT_CLK/PWM1 | NVCC_SAI3    | 3.3V      |  |
| 187 | I2C4_SCL           | NVCC_I2C     | 3.3V      |  |
| 188 | GND                | -            | Ground    |  |
| 189 | GND                | -            | Ground    |  |
| 190 | I2C2_SDA           | NVCC_I2C     | 3.3V      |  |
| 191 | TP17               | -            | -         |  |
| 192 | I2C2_SCL           | NVCC_I2C     | 3.3V      |  |
| 193 | GND                | -            | Ground    |  |
| 194 | GND                | -            | Ground    |  |
| 195 | TP21               | -            | -         |  |
| 196 | DSI_D0_P           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 197 | TP22               | -            | -         |  |
| 198 | DSI_D0_N           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 199 | TP23               | -            | -         |  |
| 200 | GND                | -            | Ground    |  |
| 201 | GND                | -            | Ground    |  |
| 202 | DSI_D1_P           | VDD_MIPI_1P8 | MIPI 1.8V |  |
| 203 | ECSPI2_SCLK        | NVCC_ECSPi   | 3.3V      |  |

|     |                 |               |           |  |
|-----|-----------------|---------------|-----------|--|
| 204 | DSI_D1_N        | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 205 | GND             | -             | Ground    |  |
| 206 | GND             | -             | Ground    |  |
| 207 | ECSPI2_MOSI     | NVCC_ECSPi    | 3.3V      |  |
| 208 | DSI_CLK_P       | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 209 | ECSPI2_MISO     | NVCC_ECSPi    | 3.3V      |  |
| 210 | DSI_CLK_N       | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 211 | ECSPI2_SS0      | NVCC_ECSPi    | 3.3V      |  |
| 212 | GND             | -             | Ground    |  |
| 213 | UART3_TXD       | NVCC_UART     | 3.3V      |  |
| 214 | DSI_D2_P        | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 215 | UART3_RXD       | NVCC_UART     | 3.3V      |  |
| 216 | DSI_D2_N        | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 217 | UART3_CTS       | NVCC_ECSPi    | 3.3V      |  |
| 218 | GND             | -             | Ground    |  |
| 219 | UART3_RTS       | NVCC_ECSPi    | 3.3V      |  |
| 220 | DSI_D3_P        | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 221 | GPIO1_IO5/M4NMI | NVCC_GPIO1    | 3.3V      |  |
| 222 | DSI_D3_N        | VDD_MIPI_1P8  | MIPI 1.8V |  |
| 223 | USB_OTG2_OC     | NVCC_GPIO1    | 3.3V      |  |
| 224 | GND             | -             | Ground    |  |
| 225 | GPIO1_IO11      | NVCC_GPIO1    | 3.3V      |  |
| 226 | GPIO1_IO09      | NVCC_GPIO1    | 3.3V      |  |
| 227 | ON_OFF          | NVCC_SNVS_1P8 | 1.8V      |  |
| 228 | TOUCH_RESET     | NVCC_GPIO1    | 3.3V      |  |
| 229 | RTC_IRQ         | NVCC_GPIO1    | 3.3V      |  |
| 230 | TOUCH_INT       | NVCC_GPIO1    | 3.3V      |  |
| 231 | EXT_RESET_N     | NVCC_SNVS_1P8 | 1.8V      |  |
| 232 | GPIO1_IO01      | NVCC_GPIO1    | 3.3V      |  |
| 233 | HP_DET          | NVCC_SAI3     | 3.3V      |  |
| 234 | SPDIF_TX/PWM3   | NVCC_SAI3     | 3.3V      |  |
| 235 | MIC_DET         | NVCC_GPIO1    | 3.3V      |  |
| 236 | GND             | -             | Ground    |  |
| 237 | GND             | -             | Ground    |  |
| 238 | SPDIF_RX/PWM2   | NVCC_SAI3     | 3.3V      |  |
| 239 | SAI3_MCLK/PWM4  | NVCC_SAI3     | 3.3V      |  |
| 240 | GND             | -             | Ground    |  |
| 241 | GND             | -             | Ground    |  |
| 242 | SAI5_MCLK       | NVCC_SAI5     | 3.3V      |  |
| 243 | SAI3_TXC        | NVCC_SAI3     | 3.3V      |  |
| 244 | GND             | -             | Ground    |  |
| 245 | SAI3_RXD        | NVCC_SAI3     | 3.3V      |  |
| 246 | SAI5_RXFS       | NVCC_SAI5     | 3.3V      |  |
| 247 | SAI3_TXD        | NVCC_SAI3     | 3.3V      |  |

|     |           |           |        |  |
|-----|-----------|-----------|--------|--|
| 248 | SAI5_RXD0 | NVCC_SAI5 | 3.3V   |  |
| 249 | TP26      | -         | -      |  |
| 250 | SAI5_RXD1 | NVCC_SAI5 | 3.3V   |  |
| 251 | TP25      | -         | -      |  |
| 252 | SAI5_RXD2 | NVCC_SAI5 | 3.3V   |  |
| 253 | TP24      | -         | -      |  |
| 254 | SAI5_RXD3 | NVCC_SAI5 | 3.3V   |  |
| 255 | GND       | -         | Ground |  |
| 256 | GND       | -         | Ground |  |
| 257 | GND       | -         | Ground |  |
| 258 | GND       | -         | Ground |  |
| 259 | GND       | -         | Ground |  |
| 260 | GND       | -         | Ground |  |

## 2.2. SODIMM 260 PIN MUX

There are many pin muxing options on the i.MX 8M Mini so we recommend registering on the NXP website to get the [i.MX 8M Mini Technical Reference Manual](#). The “**Chapter 8 Chip IO and Pinmux**” will provide all the possible combinations available.

If unsure about the capabilities, please contact us to discuss pin muxing options.

## 3. SOMINTERFACES

### 3.1. DISPLAY INTERFACES

#### 3.1.1. OVERVIEW

The Nit8M\_Mini\_SOM consists of the following display interfaces:

- One MIPI/DSI port - driven by the MIPI/DSI transmitter; four data lane 1080p60 with a maximum bit rate of 1.5 Gbps.

#### 3.1.2. DSI

Nit8M\_Mini\_SOM MIPI DSI Host Controller supports up to **4** D-PHY data lanes:

##### DSI SIGNALS:

| Pin # | Signal    | Description                      |
|-------|-----------|----------------------------------|
| 196   | DSI_D0_P  | Positive DSI Data 0 Differential |
| 198   | DSI_D0_N  | Negative DSI Data 0 Differential |
| 202   | DSI_D1_P  | Positive DSI Data 1 Differential |
| 204   | DSI_D1_N  | Negative DSI Data 1 Differential |
| 208   | DSI_CLK_P | Positive DSI Clock Differential  |
| 210   | DSI_CLK_N | Negative DSI Clock Differential  |
| 214   | DSI_D2_P  | Positive DSI Data 2 Differential |
| 216   | DSI_D2_N  | Negative DSI Data 2 Differential |
| 220   | DSI_D3_P  | Positive DSI Data 3 Differential |
| 222   | DSI_D3_N  | Negative DSI Data 3 Differential |



### 3.1.3. HDMI

HDMI is available using Boundary Devices DSI to HDMI converter daughter board.

DB\_8mm\_DSIHD Product Link: [DB\\_8mm\\_DSIHD](#)

### 3.1.4. LVDS

LVDS is available using Boundary Devices DSI to LVDS converter daughter board.

DB\_8mm\_DSIHD Product Link: [DB\\_8mm\\_DSIHD](#)

## 3.2. CAMERA INTERFACES

### 3.2.1. MIPI CSI

MIPI CSI2 (four-lane)- This module provides one four-lane MIPI camera serial interfaces, which operates up to a maximum bit rate of 1.5 Gbps. The CSI-2 Host Controller is a digital core that implements all protocol functions defined in the MIPI CSI-2 specification, providing an interface between the system and the MIPI D-PHY, allowing communication with an MIPI CSI-2 compliant camera sensor.

#### MIPI CSI-2 SIGNALS:

| Pin # | Signal   | Description                       |
|-------|----------|-----------------------------------|
| 148   | CSI_D0_N | Negative CSI-0 Clock Differential |
| 150   | CSI_D0_P | Positive CSI-0 Clock Differential |
| 154   | CSI_D1_N | Negative CSI-1 Clock Differential |
| 156   | CSI_D1_P | Positive CSI-1 Clock Differential |
| 160   | CSI_D2_N | Positive CSI-2 Clock Differential |
| 162   | CSI_D2_P | Negative CSI-2 Clock Differential |
| 166   | CSI_D3_N | Negative CSI-3 Clock Differential |
| 168   | CSI_D3_P | Positive CSI-3 Clock Differential |
| 172   | CSI_CK_N | Negative Clock Differential       |
| 174   | CSI_CK_P | Positive Clock Differential       |

### 3.3. GIGABIT ETHERNET

#### GIGABIT ETHERNET FEATURES:

The Ethernet Media Access Controller (MAC) is designed to support 10/100/1000 Mbps Ethernet/IEEE 802.3 networks. An external Gigabit magnetics is required to complete the interface to the media. The i.MX8 processor also consists of HW assist for IEEE1588 standard. See the ENET chapter of the i.MX 8M Mini Applications Processor Reference Manual (IMX8MMRM) for details

#### GIGABIT ETHERNET:

| Vendor   | Part Number             | Package              |
|----------|-------------------------|----------------------|
| Qualcomm | AR8035-AL1A / KSZ9031RN | PHY Transceiver      |
| Amphenol | RJHSE-5381              | RJ45 Ethernet Jack   |
| Link PP  | LP5007NL                | Ethernet Transformer |

**GIGABIT ETHERNET SIGNALS:**

| Pin # | Signal     |
|-------|------------|
| 23    | RGMII_ACT  |
| 25    | RGMII_LINK |
| 29    | TRX3_N     |
| 31    | TRX3_P     |
| 35    | TRX2_N     |
| 37    | TRX2_P     |
| 41    | TRX1_N     |
| 43    | TRX1_P     |
| 47    | TRX0_N     |
| 49    | TRX0_P     |

**3.4. WI-FI & BLUETOOTH**

The Nit8M\_Mini\_SOM does not contain WiFi+BT directly on the SOM. The WiFi+BT functionality is available on the carrier board via the SDIO + BT interfaces. Please see the Nitrogen8M\_Mini Carrier board schematics for connection details as well as the recommended BD\_SDMAC WiFi+BT module.

**3.5. USB HOST2.0**

The USB controller block provides high performance USB functionality that conforms to the USB 2.0 specification.

**USB HOST SIGNALS:**

| Pin # | Signal        | Description                     |
|-------|---------------|---------------------------------|
| 99    | USB_OTG2_PWR  | USB OTG Power Enable            |
| 101   | USB_OTG2_OC   | USB OTG Over Current            |
| 103   | USB_OTG2_VBUS | USB 2.0 OTG VBUS Indicator (5V) |
| 107   | USB_OTG2_D_P  | Positive USB OTG Data           |
| 109   | USB_OTG2_D_N  | Negative USB OTG Data           |

**3.6. USB 2.0OTG****USB 2.0 ON-THE-GO FEATURES:**

High-speed OTG core:

- HS/FS/LS UTMI compliant interface
- High speed, full speed and low speed operation in host mode (with UTMI transceiver)
- High speed, and full speed operation in peripheral mode (with UTMI transceiver)
- Hardware support for OTG signaling, session request protocol, and host negotiation protocol
- Up to 8 bidirectional end points
- Integrated HS USBPHY

**OTG SIGNALS:**

| Pin # | Signal        | Description                     |
|-------|---------------|---------------------------------|
| 113   | USB_OTG1_PWR  | USB OTG Power Enable            |
| 115   | USB_OTG1_OC   | USB OTG Over Current            |
| 117   | USB_OTG1_ID   | USB ID /3.3V                    |
| 121   | USB_OTG1_D_P  | Positive USB OTG Data           |
| 123   | USB_OTG1_D_N  | Negative USB OTG Data           |
| 127   | USB_OTG1_VBUS | USB 2.0 OTG VBUS Indicator (5V) |

**3.7. MMC/SD/SDIO**

i.MX 8M Mini SoC characteristics:

All the MMC/SD/SDIO controller IPs are based on the uSDHC IP.

They are designed to support:

- SD/SDIO standard, up to version 3.0.
- MMC standard, up to version 5.1.
- Support for SDXC (extended capacity)
- 1.8 V and 3.3 V operation, but do not support 1.2 V operation.
- 1-bit/4-bit SD and SDIO modes, 1-bit/4-bit/8-bit MMC mode.

Two uSDHC controllers (SDHC1 and SDHC3) can support up to an 8-bit interface, the other controller (SDHC2) can only support up to a 4-bit interface.

**SDMMC2 SIGNALS:**

| Pin # | Signal      | Description                           |
|-------|-------------|---------------------------------------|
| 79    | SD2_RESET_B | Connect to SD2 Reset Pin on SD CACARD |
| 81    | SD2_CD      | Connect to SD2 CD Pin on SD Card      |
| 83    | SD2_DATA0   | SD2 Data 0 Line                       |
| 85    | SD2_DATA1   | SD2 Data 1 Line                       |
| 87    | SD2_DATA2   | SD2 Data 2 Line                       |
| 89    | SD2_DATA3   | SD2 Data 3 Line                       |
| 91    | SD2_CMD     | CMD Line Connect To Card              |
| 95    | SD2_CLK     | Clock                                 |

**Note:** SDIO does not require pull-ups

**3.8. AUDIO**

The Nit8M\_Mini\_SOM features these audio interfaces:

- WM8960CGEFL/V Audio codec interfaces
  1. Analog outputs/inputs:
    - Stereo HP out
    - Lineout L/R
    - Built-In 2W Amplifier

\*Reference the Cirrus Website for technical specifications.

[https://statics.cirrus.com/pubs/proDatasheet/WM8960\\_v4.4.pdf](https://statics.cirrus.com/pubs/proDatasheet/WM8960_v4.4.pdf)

**AUDIO SIGNALS:**

| Pin # | Signal    | Description            |
|-------|-----------|------------------------|
| 28    | SAI1_RXD0 | GPIO or SAI Audio 3.3V |
| 46    | SAI1_MCLK | GPIO or SAI Audio 3.3V |
| 50    | SAI1_TXFS | GPIO or SAI Audio 3.3V |
| 52    | SAI1_TXC  | GPIO or SAI Audio 3.3V |
| 54    | SAI1_TXD0 | GPIO or SAI Audio 3.3V |

**3.9. UARTINTERFACES**

All 4 UART interfaces are supported, based on pin mux configurations of the UART interface.

**UART FEATURES:**

- High-speed TIA/EIA-232-F compatible, up to Mbit/s
- Serial IR interface low-speed, IrDA-compatible (up to 115.2 Kbit/s)
- 9-bit or Multidrop mode (RS-485) support (automatic slave address detection)
- 7 or 8 data bits for RS-232 characters, or 9 bit RS-485 format
- 1 or 2 stop bits
- Programmable parity (even, odd, and no parity)
- Hardware flow control support for request to send (RTS\_B) and clear to send (CTS\_B) signals
- RS-485 driver direction control via CTS\_B signal
- Edge-selectable RTS\_B and edge-detect interrupts
- Status flags for various flow control and FIFO states
- Voting logic for improved noise immunity (16x oversampling)
- Transmitter FIFO empty interrupt suppression
- UART internal clocks enable/disable
- Auto baud rate detection (up to 115.2 Kbit/s)
- Receiver and transmitter enable/disable for power saving
- RX\_DATA input and TX\_DATA output can be inverted respectively in RS-232/RS-485 mode
- DCE/DTE capability
- RTS\_B, IrDA asynchronous wake (AIRINT), receive asynchronous wake (AWAKE) interrupts wake the processor from STOP mode
- Maskable interrupts
- Two DMA Requests (TxFIFO DMA Request and Rx FIFO DMA Request)
- Escape character sequence detection
- Software reset (SRST\_B)
- Two independent, 32-entry FIFOs for transmit and receive
- The peripheral clock can be totally asynchronous with the module clock. The module clock determines baud rate. This allows frequency scaling on peripheral clock (such as during DVFS mode) while remaining the module clock frequency and baud rate

**UART1 SIGNALS:**

| Pin # | Signal    | Description               |
|-------|-----------|---------------------------|
| 96    | UART1_TXD | UART1 Transmit            |
| 98    | UART1_RTS | UART1 HW Flow Control RTS |
| 100   | UART1_RXD | UART1 Receive             |
| 106   | UART1_CTS | UART1 HW Flow Control CTS |

**UART2 SIGNALS:**

| Pin # | Signal    | Description    |
|-------|-----------|----------------|
| 171   | UART2_RXD | UART2 Receive  |
| 173   | UART2_TXD | UART2 Transmit |

**UART3 SIGNALS:**

| Pin # | Signal    | Description               |
|-------|-----------|---------------------------|
| 213   | UART3_TXD | UART3 Transmit            |
| 215   | UART3_RXD | UART3 Receive             |
| 217   | UART3_CTS | UART3 HW Flow Control CTS |
| 219   | UART3_RTS | UART3 HW Flow Control RTS |

**UART4 SIGNALS:**

| Pin # | Signal    | Description    |
|-------|-----------|----------------|
| 149   | UART2_RXD | UART2 Receive  |
| 151   | UART2_TXD | UART2 Transmit |

**Note:** UART4 is used as default boot debug port. (Console/Debug Port)

### 3.10. FLEXIBLE SPI

---

FlexSPI with support for XIP (for ME in low-power mode) and parallel read mode of two identical FLASH devices

The FlexSPI module acts as an interface to external serial flash devices. This module contains the following features:

- Flexible sequence engine to support various flash vendor devices
- Single pad/Dual pad/Quad pad mode of operation
- Single Data Rate/Double Data Rate mode of operation
- Parallel Flash mode
- DMA support
- Memory mapped read access to connected flash devices
- Multi master access with priority and flexible and configurable buffer for each master GIC  
Generic Interrupt Controller The GIC handles all interrupts

### 3.11. ECSPI KEY FEATURES

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The Enhanced Configurable Serial Peripheral Interface (ECSPI) is a Full-duplex enhanced Synchronous Serial Interface, with data rate up to 52 Mbit/s. Configurable to support Master/Slave modes, four chip selects to support multiple peripherals.

- Full-duplex synchronous serial interface

- Master/slave configurable
- Four chip select (SS) signals to support multiple peripherals
- Transfer continuation function allows unlimited length data transfers
- 32-bit wide by 64-entry FIFO for both transmitting and receiving data
- 32-bit wide by 16-entry FIFO for HT message data
- Polarity and phase of the chip select (SS) and SPI clock (SCLK) are configurable
- Direct Memory Access (DMA)support
- Max operation frequency up to the reference clock frequency

**SPI isMuxed with SD2 a CSI Signals and is supported as follows:**

**Table 6-22. SD/MMC IOMUX pin configuration**

| Signal | USDHC1         | USDHC2         | USDHC3         |
|--------|----------------|----------------|----------------|
| CLK    | SD1_CLK.alt0   | SD2_CLK.alt0   | SD3_CLK.alt0   |
| CMD    | SD1_CMD.alt0   | SD2_CMD.alt0   | SD3_CMD.alt0   |
| DATA0  | SD1_DATA0.alt0 | SD2_DATA0.alt0 | SD3_DATA0.alt0 |
| DATA1  | SD1_DATA1.alt0 | SD2_DATA1.alt0 | SD3_DATA1.alt0 |
| DATA2  | SD1_DATA2.alt0 | SD2_DATA2.alt0 | SD3_DATA2.alt0 |

### 3.12. PCIE

Nit8M\_Mini\_SOM PCI Express functionality has the following parts:

PCI Express includes the following cores:

- PCI Express Dual Mode (DM)core
- PCI Express Root Complex (RC)core
- PCI Express Endpoint (EP)core

PCI Express 2.0 PHY:

- PCIe 2.0 PHY is a complete mixed-signal semiconductor intellectual property (IP) solution, designed for single-chip integration into computer applications
- The PCIe 2.0 PHY supports both the 5 Gbps data rate of the PCI Express Gen 2.0 specifications as well as being backwards compatible to the 2.5Gb/s Gen 1.1 specification

#### PCIE SIGNALS:

| Pin # | Signal        | Description                  |
|-------|---------------|------------------------------|
| 122   | PCIE_RST_B    | Reset PCIE Module 3.3V       |
| 124   | PCIE_DIS_B    | Disable PCIE Signal 3.3V     |
| 128   | PCIE_TX_P     | Positive PCI TX Differential |
| 130   | PCIE_TX_N     | Negative PCI TX Differential |
| 134   | PCIE_RX_P     | Positive PCI RX Differential |
| 136   | PCIE_RX_N     | Negative PCI RX Differential |
| 140   | PCIE_REFCLK_P | PCIE Clock                   |
| 142   | PCIE_REFCLK_N | PCIE Clock                   |

### 3.13. I2C

---

I2C-1, 2,3, 4 Interface connectivity peripherals provide serial interface for external devices.

The I2C operates primarily in two functional modes: Standard mode and Fast mode.

- In Standard mode, I2C supports the data transfer rates up to 100 kbits/s.
- In Fast mode, data transfer rates up to 400 kbits/s can be achieved. Per blockoperation, there is no special configuration required for Fast or Standard mode. It is the data transfer rate that distinguishes Standard and Fast mode.

#### I2C1 SIGNALS: I2C1 IS RESERVED FOR PMIC

#### I2C2 SIGNALS:

| Pin # | Signal   | Description |
|-------|----------|-------------|
| 190   | I2C1_SDA | I2C Signal  |
| 192   | I2C1_SCL | I2C Signal  |

#### I2C3 SIGNALS:

| Pin # | Signal   | Description |
|-------|----------|-------------|
| 178   | I2C2_SCL | I2C Signal  |
| 180   | I2C2_SDA | I2C Signal  |

#### I2C4 SIGNALS:

| Pin # | Signal   | Description |
|-------|----------|-------------|
| 185   | I2C3_SDA | I2C Signal  |
| 187   | I2C3_SCL | I2C Signal  |

### 3.14. GENERAL PURPOSE I/O

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Most of the SOM's IO pins can be used as GPIOs. If you need more GPIO, or need other signals, please contact us to discuss pin muxing options.

### 3.15. GENERAL SYSTEM CONTROL

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#### 3.15.1. RESET

'0' logic will reset Nit8M\_Mini\_SOM

### 3.16. REFERENCE CLOCK OUT

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Nit8M\_Mini\_SOM output clock is controlled by the i.MX8 Mini CCM module. Please refer to the i.MX8 Mini User Manual regarding the configuration option for this clock.

### 3.17. POWER

#### 3.17.1. POWER SUPPLY

| Pin #                  | Signal | Description                |
|------------------------|--------|----------------------------|
| 1, 2, 3, 4, 5, 6, 7, 8 | 5VIN   | DC Supply Voltage (5 Volt) |

#### 3.17.2. GROUND

| Pin #   | Signal | Description    |
|---|--------|----------------|
| 9, 10, 11, 12, 13, 14, 15,<br>16, 17, 18, 20, 27, 33, 39,<br>44, 45, 48, 51, 57, 63, 70,<br>77, 88, 92, 93, 97, 105,<br>111, 119, 120, 125, 126,<br>132, 138, 139, 143, 144,<br>145, 146, 152, 153, 155,<br>157, 158, 159, 161, 163,<br>164, 165, 167, 169, 170,<br>175, 176, 177, 181, 182,<br>183, 188, 189, 193, 194,<br>200, 201, 205, 206, 212,<br>218, 224, 236, 237, 240,<br>241, 244, 255, 256, 257,<br>258, 259, 260 | GND    | Digital Ground |



## 4. OPERATIONAL CHARACTERISTICS

### 4.1. POWER SUPPLY

| Description              | Signal | Description       | Typical | Tolerance | Unit |
|--------------------------|--------|-------------------|---------|-----------|------|
| Main Power Supply, DC-IN | 5VIN   | DC Supply Voltage | 5       | +/- 5%    | V    |

### 4.2. POWER CONSUMPTION

| Parameter          | Min | Typical | Max  | Unit |
|--------------------|-----|---------|------|------|
| Main Input Voltage | -   | 5       | -    | V    |
| Power Consumption* | -   | 1300    | 2700 | mW   |
| CPU Clock          | 1.2 | -       | 1.8  | GHz  |

\*Reference the NXP Website to get the i.MX8 reference manual for power consumption and CPU clock speed specifications

## 5. ENVIRONMENTAL SPECIFICATIONS

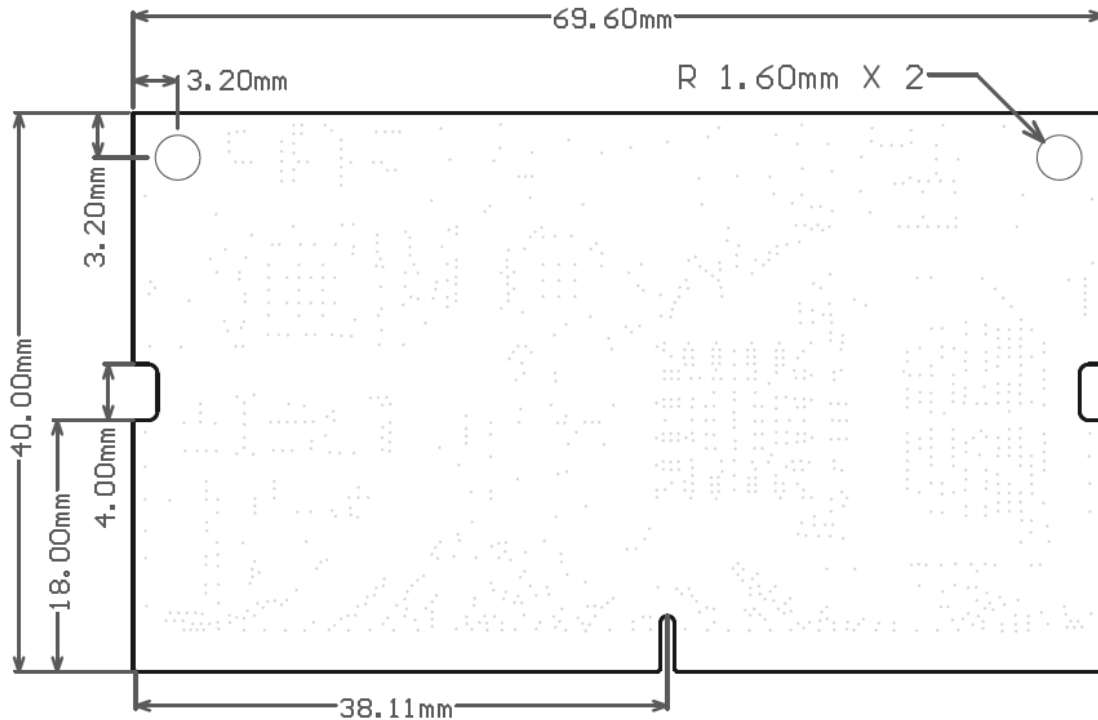
| Operating Rating                       | Min.       | Max.   |
|--|------------|--------|
| Commercial Operating Temperature Range | 0 °C       | +70 °C |
| Industrial Operating Temperature Range | -40 °C     | +85 °C |
| Relative humidity, Operational         | 10%        | 90%    |
| Relative humidity, Storage             | 5%         | 95%    |
| MTBF                                   | 215 kHours | -      |

#### Notes:

- Commercial and Industrial Temperature is based on the operating temperature grade of the SOM components. Customer should consider specific thermal design for the final product based upon the specific environmental and operational conditions.
- WiFi+BT module is only rated to -20 to +70 °C.

**6. MECHANICALDRAWINGS**

**TOP VIEW**



|                |                    |            |       |
|----------------|--------------------|------------|-------|
| <b>COMPANY</b> | BOUNDARY DEVICES   |            |       |
| <b>ASSY #</b>  | ASM_NIT8M_MINI_SOM | <b>REV</b> | REV00 |
| <b>DATE</b>    | 2019-01-15         |            |       |

**7. ORDERABLE PART NUMBERS**

| SKU                     | CPU             | DDR Memory | eMMC Storage Size | Operating Rating | Operating Temperature Range |
|-------------------------|-----------------|------------|-------------------|------------------|-----------------------------|
| NIT8MQ_Mini_SOM_2r16e   | i.MX8 Mini Quad | 2GB        | 16GB              | Commercial       | 0° to 70°C                  |
| NIT8MQ_Mini_SOM_4r16e   | i.MX8 Mini Quad | 4GB        | 16GB              | Commercial       | 0° to 70°C                  |
| NIT8MQ_Mini_SOM_2r16e_i | i.MX8 Mini Quad | 2GB        | 16GB              | Industrial       | -40° to 85°C                |
| NIT8MQ_Mini_SOM_4r16e_i | i.MX8 Mini Quad | 4GB        | 16GB              | Industrial       | -40° to 85°C                |

\*Please contact us to discuss other custom options

## 8. WARRANTY TERMS

Seller warrants to Buyer that goods and merchandise sold to Buyer will be free from liens and encumbrances when shipped to Buyer and will be free from defects in material and workmanship for a period of one year from the date of shipments to Buyer provided that:

- (a) Seller is promptly notified (within the warranty period) of any warranty claim
- (b) The goods and merchandise are returned to Seller, freight prepaid, after Buyer has received a return authorization number from Seller. Seller will credit Buyer for reasonable freight charges paid to return such goods and merchandise
- (c) Seller's examination of such items shall disclose to its reasonable satisfaction that the claimed defect in the goods and merchandise was not caused by misuse, static discharge, abuse, neglect, improper handling, installation, unauthorized repair, alteration or accident. Modification of goods and merchandise by Buyer, or at Buyer's direction, or by any subsequent purchaser or user, unless specifically authorized in writing by Seller, shall invalidate the above warranty.

Seller's liability under this warranty is limited to repairing, replacing, or issuing a credit in the amount of the unit contract price, at its election, for any such claim. Any repair or replacement shall not extend the warranty period. Because identical parts may not be available upon return of a device, Seller may replace components with functionally equivalent parts. Buyer will be notified of any replacement which is known to require modifications to software installed on the device.

This warranty is extended to Buyer and subsequent purchasers or users of such goods and merchandise. Buyer is the sole entity entitled to exercise this warranty and may act as an agent on behalf of subsequent purchasers. Seller will not honor any claims under this warranty directly from subsequent purchasers or third parties. This warranty is given in lieu of all other warranties, express or implied, including implied warranties of merchantability and fitness for a particular purpose.



## 9. CONTACT INFORMATION

### HEADQUARTERS:

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