Boundary Devices

Nit8MP_ENC_CAR_BRD

User Manual

REVISION HISTORY		
Date	**Revision**	**Description**
7/1/2021	0.1	First Draft

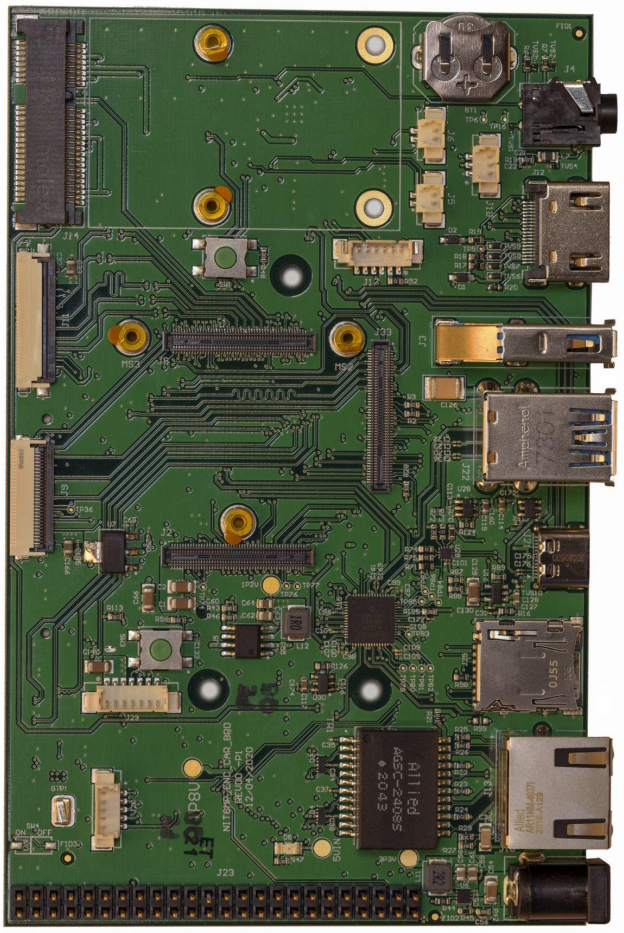


TABLE OF CONTENTS

1. NITROGEN8M PLUS ENC CARRIER OVERVIEW

1.1 NITROGEN PLATFORM

The first Nitrogen platform was launched in 2014 after the worldwide success of Boundary Devices' BD-SL-i.MX6. The Nitrogen platforms consist of Single Board Computers (SBC) and System on Modules (SOM) using BD's proprietary board layout design and featuring NXP's i.MX6, i.MX7, and i.MX8 applications processors.

The Nitrogen platforms come with a Board Support Package fully supported by Boundary Devices' engineering team. Nitrogen platforms are designed to serve as a development platform as well as a production-ready solution. All Nitrogen boards can be de-populated or fully customized to meet specific project and budget requirements. Contact a Boundary Devices representative at info@boundarydevices.com to learn more.

1.2 NITROGEN8 FAMILY

The Nitrogen8 family of SBCs and SOMs are the latest in Boundary Devices' i.MX based embedded computing solutions. The Nitrogen8 family consists of the Nitrogen8M, Nitrogen8M Mini, Nitrogen8M Nano, and Nitrogen8M Plus featuring NXP's i.MX 8 family of processors that were released in 2018.

The different Nitrogen8 members of SBCs and SOMs are designed to best leverage the advantages of the i.MX8M, i.MX8M Mini, i.MX8 Nano, and i.MX8 Plus applications processors to fit a variety of embedded and IoT applications including: industrial automation, aviation & aerospace, HMI, industrial control, robotics, building control, digital displays, infotainment, telematics, Machine Learning, AI, and more.

1.3 SOFTWARE SUPPORT

Boundary Devices provides a full Board Support Package (BSP) for all Nitrogen boards.
The BSP includes boot loader, kernel and user-space components optimized for each platform.

The boards ship with U-Boot, Linux Kernel as well as an Ubuntu operating system.

Industry leading OS-Level support can be found on the Boundary Devices website via the Blog and Wiki. You can also find images for the latest versions of popular OS supported by the Nitrogen platforms including: Yocto, Buildroot, Ubuntu, Debian, Android, QNX, and FreeRTOS.

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

1.3.1 U-BOOT CONFIGURATION

The U-Boot configuration isn't carrier specific, so it only depends on your SOM configuration:

- nitrogen8mp_2g_defconfig: for Nitrogen8M Plus SOM with 2G of LPDDR4
- nitrogen8mp_4g_defconfig: for Nitrogen8M Plus SOM with 4G of LPDDR4

For more information about the build process, please refer to this blog post:
https://boundarydevices.com/u-boot-2020-10-for-i-mx-platforms/

1.3.2 LINUX DEVICE TREE

Although the EVK and ENC carriers are close to each other, some features are only enabled on the ENC version of the device tree:

- imx8mp-nitrogen8mp.dts: default dts for EVK
- imx8mp-nitrogen8mp-enc.dts: dts for ENC

In U-Boot, you can easily select one of the other as follows:

```
=> setenv fdt_file imx8mp-nitrogen8mp-enc.dtb
```

1.4 MAIN SPECIFICATIONS

The Nitrogen8M Carrier is a complete development board, utilizing all of the key features of the Nitrogen8M Plus SOM.

1.4.1 MULTIMEDIA

MULTIMEDIA	
Camera Interfaces	x2 4-Lane MIPI CSI (HDR-capable Image Signal Processor (ISP))

1.4.2 DISPLAY & AUDIO CONNECTIONS

DISPLAY CONNECTIONS	
HDMI	x1 (up to 1080p60 or 4k30), 2.1 eARC supported
MIPI DSI	x1 4-lane (up to 1080p)
LVDS	x1 Dual-Link LVDS Interface (2 x 4-lane)
AUDIO INTERFACES	
Headphone	x1 (WM8960)
Microphone	x1 connector (J18) or via headphone jack
Amplifier	1W (per channel)

1.4.3 NETWORKING CONNECTIONS

NETWORKING CONNECTIONS	
Ethernet	x1 Gigabit Ethernet controller with support for EEE AR8035 PHY

1.4.4 CONNECTIVITY PORTS

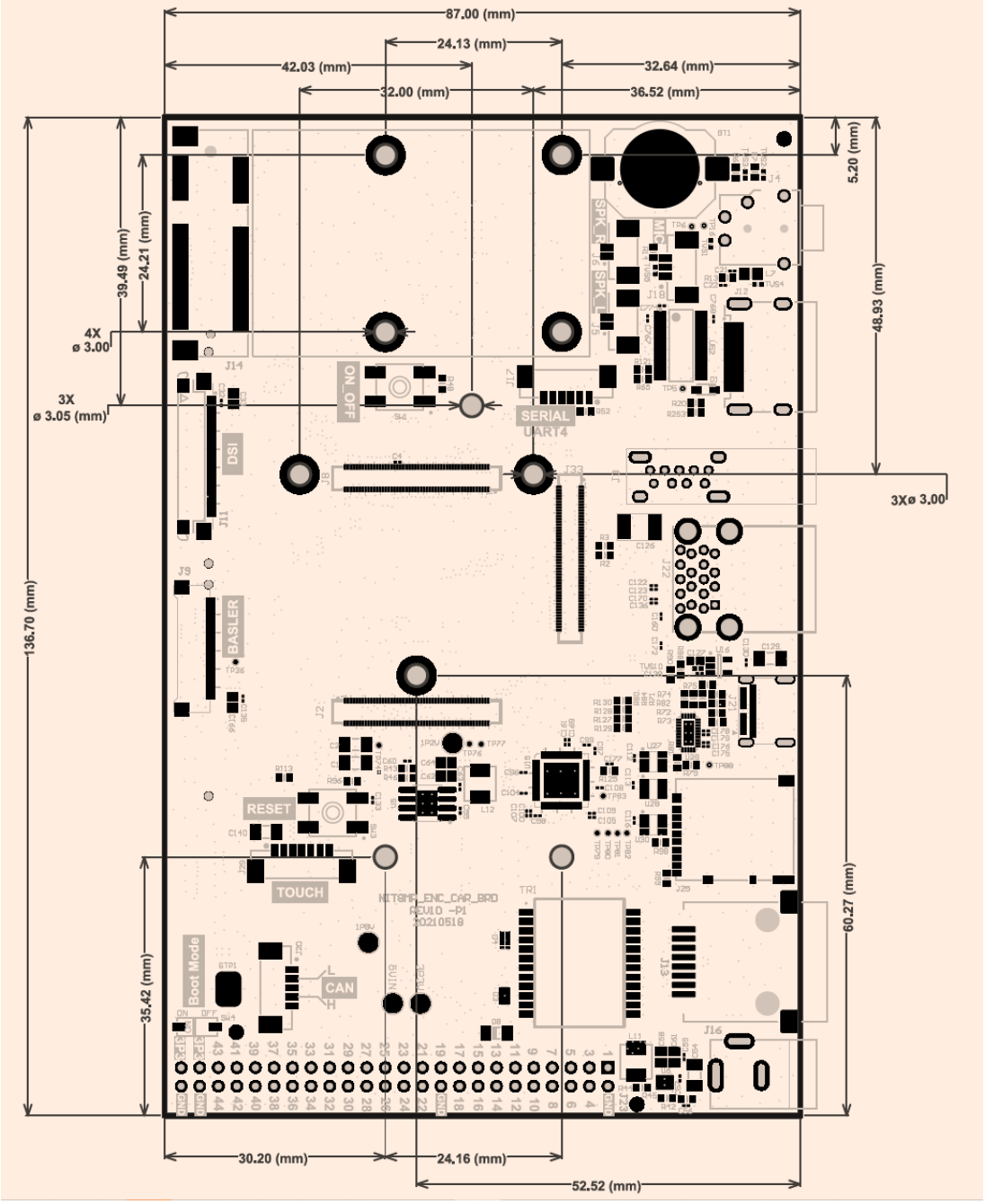
CONNECTIVITY PORTS	
I2C	x3
SPI	x3
UART	x3 RS-232
SD / MMC	x1 microSD
SIM Card	x1
USB	x3 USB 3.0 Host + x1 USB 3.0 Type C
RTC	x1 + battery
PCIe	x1 mPCIe
CAN	x1 FlexCAN supporting flexible data-rate (FD)

1.4.5 MISCELLANEOUS SPECIFICATIONS

PCB SPECIFICATIONS	
Dimensions (L x W)	87mm x 136.7mm
MISCELLANEOUS SPECIFICATIONS	
Temperature Rating	0°- +70°C
Power Supply	5V

1.5 BOARD DIMENSIONS

Units are in mm.


87.00 (mm)
24.13 (mm)
42.03 (mm)
32.64 (mm)
32.00 (mm)
36.52 (mm)
5.20 (mm)
39.49 (mm)
24.21 (mm)
48.93 (mm)
4X
ø 3.00
3X
ø 3.05 (mm)
3Xø 3.00
136.70 (mm)
35.42 (mm)
60.27 (mm)
30.20 (mm)
24.16 (mm)
52.52 (mm)
ON_OFF
SERIAL
UART4
DSI
BASLER
RESET
TOUCH
Boot Mode
CAN
SPK_R
SPK_L
MIC
NIT8MP_ENC_CAR_BRD
REV1.0 -P1
20210510

2. CONNECTOR DETAILS

Nit8MP_ENC_CAR_BRD Carrier Board Connectors		
Reference	**Function**	**Type**
J2	Mating with J5 on SOM	100 Position Connector
J8	Mating with J4 on SOM	100 Position Connector
J33	Mating with J8 on SOM	100 Position Connector
J16	Power In	DC IN Jack 2.0mm
BT1	Battery Holder	COIN CELL RETAINER 12MM
J23	Expansion Connector	HEADER 48 POS 2.54MM
SW1	ON-OFF	Tactile Switches
SW3	RESET	Tactile Switches
J17	UART 2/4	CONN HEADER 6POS
J14	PCIE Connector	PCI EXP MINI FEMALE 52POS
J15	SIM CARD Holder	MICRO SIM CARD PUSH
J21	USB Type C	USB 3.0 VERT 90DEG TYPE A
J22	Dual USB 3.0 Host	USB 3.0 CONN TYPE A
J3	USB 3.0 Host	CONN RCPT USB3.0 MICRO
J11	DSI	CONN FPC 33POS 0.50MM
J9	CSI1	28POS 0.50MM Connector
J10	CSI2	28POS 0.50MM Connector
J27	LVDS1	HEADER 20POS 1.25MM
J28	LVDS0	HEADER 20POS 1.25MM
J29	I2C/Touch	HEADER 7POS 1.25MM TIN
J5	SPKR Left	HEADER 2POS 1.25MM
J6	SPKR Right	HEADER 2POS 1.25MM
J18	MIC	HEADER 3POS 1.25MM
J4	HP	CONN JACK 4COND 3.5MM
J25	Micro SD Holder	CONN MICRO SD CARD
J13	ETH1	CONN MOD JACK 8P8C R/A
J12	HDMI	CONN RCPT 19POS HDMI RT
J20	CAN1	HDR 5POS 90DEG 5MM

J2: 100 Pin Carrier to SOM Board Connector Interface Connector P/N: Hirose - DF40C-100DS-0.4V(51) Mating Connector P/N: Hirose - DF40C-100DP-0.4V(51)			
PIN#	SOM Signal	SOM Voltage Domain	Voltage Level
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	+5V	-	5V Power
10	+5V	-	5V Power
11	GND	-	Ground
12	GND	-	Ground
13	GND	-	Ground
14	GND	-	Ground
15	GND	-	Ground
16	GND	-	Ground
17	BOOT_MODE1	NVCC_JTAG	3.3V
18	TP73	-	-
19	SYS_RESETn	PMIC_RST_B	
20	SAI1_RXFS	NVCC_SAI1_SAI5	3.3V
21	I2C2_SCL	NVCC_I2C_UART	3.3V
22	SAI1_RXC	NVCC_SAI1_SAI5	3.3V
23	I2C2_SDA	NVCC_I2C_UART	3.3V
24	SAI1_RXD0	NVCC_SAI1_SAI5	3.3V
25	GND	-	Ground
26	SAI1_RXD1	NVCC_SAI1_SAI5	3.3V
27	I2C3_SCL	NVCC_I2C_UART	3.3V
28	SAI1_RXD2	NVCC_SAI1_SAI5	3.3V
29	I2C3_SDA	NVCC_I2C_UART	3.3V
30	SAI1_RXD3	NVCC_SAI1_SAI5	3.3V
31	I2C4_SCL	NVCC_I2C_UART	3.3V
32	GND	-	Ground
33	I2C4_SDA	NVCC_I2C_UART	3.3V
34	SAI1_RXD4	NVCC_SAI1_SAI5	3.3V
35	SAI5_RXFS	NVCC_SAI1_SAI5	3.3V
36	SAI1_RXD5	NVCC_SAI1_SAI5	3.3V
37	SAI5_RXC	NVCC_SAI1_SAI5	3.3V
38	SAI1_RXD6	NVCC_SAI1_SAI5	3.3V
39	GND	-	Ground
40	SAI1_RXD7	NVCC_SAI1_SAI5	3.3V
41	SAI5_MCLK	NVCC_SAI1_SAI5	3.3V
42	GND	-	Ground
43	GND	-	Ground
44	SAI1_TXC	NVCC_SAI1_SAI5	3.3V
45	SAI5_RXD3	NVCC_SAI1_SAI5	3.3V
46	GND	-	Ground
47	SAI5_RXD2	NVCC_SAI1_SAI5	3.3V
48	SAI1_TXD0	NVCC_SAI1_SAI5	3.3V
49	SAI5_RXD1	NVCC_SAI1_SAI5	3.3V
50	SAI1_TXD1	NVCC_SAI1_SAI5	3.3V
51	SAI5_RXD0	NVCC_SAI1_SAI5	3.3V

52	SAI1_TXD2	NVCC_SAI1_SAI5	3.3V
53	GND	-	Ground
54	SAI1_TXD3	NVCC_SAI1_SAI5	3.3V
55	SPDIF_TX	NVCC_SAI2_SAI3_SPDIF	3.3V
56	SAI1_TXD4	NVCC_SAI1_SAI5	3.3V
57	SPDIF_RX	NVCC_SAI2_SAI3_SPDIF	3.3V
58	SAI1_TXD5	NVCC_SAI1_SAI5	3.3V
59	GND	-	Ground
60	SAI1_TXD6	NVCC_SAI1_SAI5	3.3V
61	SPDIF_EXT_CLK	NVCC_SAI2_SAI3_SPDIF	3.3V
62	SAI1_TXD7	NVCC_SAI1_SAI5	3.3V
63	GND	-	Ground
64	SAI1_TXFS	NVCC_SAI1_SAI5	3.3V
65	EARC_P_UTIL	VDD_EARC_1P8	1.8V
66	GND	-	Ground
67	HDMI_DDC_SCL	NVCC_ECSPI_HDMI	5V
68	SAI1_MCLK	NVCC_SAI1_SAI5	3.3V
69	HDMI_DDC_SDA	NVCC_ECSPI_HDMI	5V
70	GND	-	Ground
71	HDMI_HPD	NVCC_ECSPI_HDMI	3.3V
72	ECSPI2_MOSI	NVCC_ECSPI_HDMI	3.3V
73	HDMI_CEC	NVCC_ECSPI_HDMI	3.3V
74	ECSPI2_MISO	NVCC_ECSPI_HDMI	3.3V
75	GND	-	Ground
76	ECSPI2_CS0	NVCC_ECSPI_HDMI	3.3V
77	HDMI_TXC_N	VDD_HDMI_1P8	1.8V
78	GND	-	Ground
79	HDMI_TXC_P	VDD_HDMI_1P8	1.8V
80	ECSPI2_SCLK	NVCC_ECSPI_HDMI	3.3V
81	GND	-	Ground
82	GND	-	Ground
83	HDMI_TX0_N	VDD_HDMI_1P8	1.8V
84	EARC_AUX	VDD_EARC_1P8	1.8V
85	HDMI_TX0_P	VDD_HDMI_1P8	1.8V
86	EARC_N_HPD	VDD_EARC_1P8	1.8V
87	GND	-	Ground
88	GND	-	Ground
89	HDMI_TX1_N	VDD_HDMI_1P8	1.8V
90	UART3_RXD/ECSPI1_SCLK	NVCC_ECSPI_HDMI	3.3V
91	HDMI_TX1_P	VDD_HDMI_1P8	1.8V
92	GND	-	Ground
93	GND	-	Ground
94	UART3_TXD/ECSPI1_MOSI	NVCC_ECSPI_HDMI	3.3V
95	HDMI_TX2_N	VDD_HDMI_1P8	1.8V
96	UART3_CTS/ECSPI1_MISO	NVCC_ECSPI_HDMI	3.3V

97	HDMI_TX2_P	VDD_HDMI_1P8	1.8V
98	UART3_RTS/ECSPI1_CS0	NVCC_ECSPI_HDMI	3.3V
99	GND	-	Ground
100	GND	-	Ground

J8: 100 Pin Board to Carrier Board Connector Interface Connector P/N: Hirose - DF40C-100DS-0.4V(51) Mating Connector P/N: Hirose - DF40C-100DP-0.4V(51)			
PIN#	**SOM Signal**	**SOM Voltage Domain**	**Voltage Level**
1	GND	-	Ground
2	GND	-	Ground
3	CSI1_D3_P	VDD_MIPI_1P8	1.8V
4	CSI2_D0_P	VDD_MIPI_1P8	1.8V
5	CSI1_D3_N	VDD_MIPI_1P8	1.8V
6	CSI2_D0_N	VDD_MIPI_1P8	1.8V
7	GND	-	Ground
8	GND	-	Ground
9	CSI1_D2_P	VDD_MIPI_1P8	1.8V
10	CSI2_D1_P	VDD_MIPI_1P8	1.8V
11	CSI1_D2_N	VDD_MIPI_1P8	1.8V
12	CSI2_D1_N	VDD_MIPI_1P8	1.8V
13	GND	-	Ground
14	GND	-	Ground
15	CSI1_CK_P	VDD_MIPI_1P8	1.8V
16	CSI2_CK_P	VDD_MIPI_1P8	1.8V
17	CSI1_CK_N	VDD_MIPI_1P8	1.8V
18	CSI2_CK_N	VDD_MIPI_1P8	1.8V
19	GND	-	Ground
20	GND	-	Ground
21	CSI1_D1_P	VDD_MIPI_1P8	1.8V
22	CSI2_D2_P	VDD_MIPI_1P8	1.8V
23	CSI1_D1_N	VDD_MIPI_1P8	1.8V
24	CSI2_D2_N	VDD_MIPI_1P8	1.8V
25	GND	-	Ground
26	GND	-	Ground
27	CSI1_D0_P	VDD_MIPI_1P8	1.8V
28	CSI2_D3_P	VDD_MIPI_1P8	1.8V
29	CSI1_D0_N	VDD_MIPI_1P8	1.8V
30	CSI2_D3_N	VDD_MIPI_1P8	1.8V
31	GND	-	Ground
32	GND	-	Ground
33	PCIE_REFCLK_P	VDD_PCI_1P8	1.8V
34	DSI_D3_P	VDD_MIPI_1P8	1.8V
35	PCIE_REFCLK_N	VDD_PCI_1P8	1.8V
36	DSI_D3_N	VDD_MIPI_1P8	1.8V

37	GND	-	Ground
38	GND	-	Ground
39	PCIE_TX_P	VDD_PCI_1P8	1.8V
40	DSI_D2_P	VDD_MIPI_1P8	1.8V
41	PCIE_TX_N	VDD_PCI_1P8	1.8V
42	DSI_D2_N	VDD_MIPI_1P8	1.8V
43	GND	-	Ground
44	GND	-	Ground
45	PCIE_RX_P	VDD_PCI_1P8	1.8V
46	DSI_CK_P	VDD_MIPI_1P8	1.8V
47	PCIE_RX_N	VDD_PCI_1P8	1.8V
48	DSI_CK_N	VDD_MIPI_1P8	1.8V
49	GND	-	Ground
50	GND	-	Ground
51	USB2_TX_P	VDD_USB_3P3	3.3V
52	DSI_D1_P	VDD_MIPI_1P8	1.8V
53	USB2_TX_N	VDD_USB_3P3	3.3V
54	DSI_D1_N	VDD_MIPI_1P8	1.8V
55	GND	-	Ground
56	GND	-	Ground
57	USB2_RX_P	VDD_USB_3P3	3.3V
58	DSI_D0_P	VDD_MIPI_1P8	1.8V
59	USB2_RX_N	VDD_USB_3P3	3.3V
60	DSI_D0_N	VDD_MIPI_1P8	1.8V
61	GND	-	Ground
62	GND	-	Ground
63	USB2_D_P	VDD_USB_3P3	3.3V
64	USB1_VBUS_3V3	VDD_USB_3P3	3.3V
65	USB2_D_N	VDD_USB_3P3	3.3V
66	USB1_ID	VDD_USB_3P3	3.3V
67	GND	-	Ground
68	GND	-	Ground
69	USB2_VBUS_3V3	VDD_USB_3P3	3.3V
70	USB1_TX_P	VDD_USB_3P3	3.3V
71	USB2_ID	VDD_USB_3P3	3.3V
72	USB1_TX_N	VDD_USB_3P3	3.3V
73	GPIO1_IO11	NVCC_GPIO1	3.3V
74	GND	-	Ground
75	GPIO1_IO01	NVCC_GPIO1	3.3V
76	USB1_RX_P	VDD_USB_3P3	3.3V
77	GPIO1_IO07	NVCC_GPIO1	3.3V
78	USB1_RX_N	VDD_USB_3P3	3.3V
79	GPIO1_IO03	NVCC_GPIO1	3.3V
80	GND	-	Ground
81	GPIO1_IO04	NVCC_GPIO1	3.3V

82	USB1_D_P	VDD_USB_3P3	3.3V
83	GPIO1_IO10	NVCC_GPIO1	3.3V
84	USB1_D_N	VDD_USB_3P3	3.3V
85	GPIO1_IO13/USB1_OC	NVCC_GPIO1	3.3V
86	GND	-	Ground
87	GPIO1_IO12	NVCC_GPIO1	3.3V
88	GPIO1_IO08	NVCC_GPIO1	3.3V
89	GND	-	Ground
90	GPIO1_IO09	NVCC_GPIO1	3.3V
91	GPIO1_IO15/USB2_OC	NVCC_GPIO1	3.3V
92	UART2_TXD	NVCC_I2C_UART	3.3V
93	GPIO1_IO14	NVCC_GPIO1	3.3V
94	UART2_RXD	NVCC_I2C_UART	3.3V
95	GND	-	Ground
96	GND	-	Ground
97	GPIO1_IO05	NVCC_GPIO1	3.3V
98	UART4_TXD	NVCC_I2C_UART	3.3V
99	GPIO1_IO06	NVCC_GPIO1	3.3V
100	UART4_TXD	NVCC_I2C_UART	3.3V

J33: 100 Pin Board to Carrier Board Connector Interface Connector P/N: Hirose - DF40C-100DS-0.4V(51) Mating Connector P/N: Hirose - DF40C-100DP-0.4V(51)			
PIN#	**SOM Signal**	**SOM Voltage Domain**	**Voltage Level**
1	GND	-	Ground
2	GND	-	Ground
3	LVDS0_TX0_P	VDD_LVDS_1P8	1.8V
4	LVDS1_TX0_P	VDD_LVDS_1P8	1.8V
5	LVDS0_TX0_N	VDD_LVDS_1P8	1.8V
6	LVDS1_TX0_N	VDD_LVDS_1P8	1.8V
7	GND	-	Ground
8	GND	-	Ground
9	LVDS0_TX1_P	VDD_LVDS_1P8	1.8V
10	LVDS1_TX1_P	VDD_LVDS_1P8	1.8V
11	LVDS0_TX1_N	VDD_LVDS_1P8	1.8V
12	LVDS1_TX1_N	VDD_LVDS_1P8	1.8V
13	GND	-	Ground
14	GND	-	Ground
15	LVDS0_CLK_P	VDD_LVDS_1P8	1.8V
16	LVDS1_CLK_P	VDD_LVDS_1P8	1.8V
17	LVDS0_CLK_N	VDD_LVDS_1P8	1.8V
18	LVDS1_CLK_N	VDD_LVDS_1P8	1.8V
19	GND	-	Ground

20	GND	-	Ground
21	LVDS0_TX2_P	VDD_LVDS_1P8	1.8V
22	LVDS1_TX2_P	VDD_LVDS_1P8	1.8V
23	LVDS0_TX2_N	VDD_LVDS_1P8	1.8V
24	LVDS1_TX2_N	VDD_LVDS_1P8	1.8V
25	GND	-	Ground
26	GND	-	Ground
27	LVDS0_TX3_P	VDD_LVDS_1P8	1.8V
28	LVDS1_TX3_P	VDD_LVDS_1P8	1.8V
29	LVDS0_TX3_N	VDD_LVDS_1P8	1.8V
30	LVDS1_TX3_N	VDD_LVDS_1P8	1.8V
31	GND	-	Ground
32	GND	-	Ground
33	PMIC_ON_REQ	NVCC_S NVS_1P8	1.8V
34	JTAG_TDO	N VCC_JTAG	3.3V
35	ONOFF	NVCC_S NVS_1P8	1.8V
36	JTAG_MOD	N VCC_JTAG	3.3V
37	RSVD3	NVCC_NAND	1.8V
38	JTAG_TMS	N VCC_JTAG	3.3V
39	RSVD2	NVCC_NAND	1.8V
40	JTAG_TDI	N VCC_JTAG	3.3V
41	RSVD1	NVCC_NAND	1.8V
42	JTAG_TCK	N VCC_JTAG	3.3V
43	GND	-	Ground
44	GND	-	Ground
45	CLKIN1	NVCC_CLK	
46	SD1_STROBE	NVCC_SD1	1.8V
47	GND	-	Ground
48	SD1_RESET_B	NVCC_SD1	1.8V
49	CLKOUT1	NVCC_CLK	
50	SD1_CMD	NVCC_SD1	1.8V
51	GND	-	Ground
52	GND	-	Ground
53	CLKIN2	NVCC_CLK	
54	SD1_CLK	NVCC_SD1	1.8V
55	GND	-	Ground
56	GND	-	Ground
57	CLKOUT2	NVCC_CLK	
58	SD1_DATA0	NVCC_SD1	1.8V
59	GND	-	Ground
60	SD1_DATA1	NVCC_SD1	1.8V
61	SAI2_MCLK	NVCC_SAI2_SAI3_SPDIF	3.3V
62	SD1_DATA2	NVCC_SD1	1.8V
63	GND	-	Ground
64	SD1_DATA3	NVCC_SD1	1.8V

65	SAI2_RXD	NVCC_SAI2_SAI3_SPDIF	3.3V
66	GND	-	Ground
67	SAI2_TXC	NVCC_SAI2_SAI3_SPDIF	3.3V
68	SD1_DATA4	NVCC_SD1	1.8V
69	SAI2_RXC	NVCC_SAI2_SAI3_SPDIF	3.3V
70	SD1_DATA5	NVCC_SD1	1.8V
71	SAI2_TXD	NVCC_SAI2_SAI3_SPDIF	3.3V
72	SD1_DATA6	NVCC_SD1	1.8V
73	SAI2_RXFS	NVCC_SAI2_SAI3_SPDIF	3.3V
74	SD1_DATA7	NVCC_SD1	1.8V
75	SAI2_TXFS	NVCC_SAI2_SAI3_SPDIF	3.3V
76	GND	-	Ground
77	GND	-	Ground
78	TRX0_P	-	Ethernet
79	SAI3_MCLK	NVCC_SAI2_SAI3_SPDIF	3.3V
80	TRX0_N	-	Ethernet
81	GND	-	Ground
82	GND	-	Ground
83	SAI3_TXFS	NVCC_SAI2_SAI3_SPDIF	3.3V
84	TRX1_P	-	Ethernet
85	SAI3_RXD	NVCC_SAI2_SAI3_SPDIF	3.3V
86	TRX1_N	-	Ethernet
87	SAI3_RXC	NVCC_SAI2_SAI3_SPDIF	3.3V
88	GND	-	Ground
89	SAI3_TXD	NVCC_SAI2_SAI3_SPDIF	3.3V
90	TRX2_P	-	Ethernet
91	SAI3_RXFS	NVCC_SAI2_SAI3_SPDIF	3.3V
92	TRX2_N	-	Ethernet
93	SAI3_TXC	NVCC_SAI2_SAI3_SPDIF	3.3V
94	GND	-	Ground
95	RGMII_ACT		
96	TRX3_P	-	Ethernet
97	RGMII_1000		
98	TRX3_N	-	Ethernet
99	RGMII_10/100		
100	GND	-	Ground

2.1 EXPANSION CONNECTOR

The expansion connector exposes standard functionalities like GPIO/I2C/SPI for customers to easily prototype their project and connect many different chips.

J23: EXPANSION (Molex 0702871022)			
Pin#	**Signal**	**Pin#**	**Signal**
1	SAI1_TXD7	2	GND
3	SAI1_RXD4	4	SAI1_MCLK
5	SAI1_TXC	6	SAI5_MCLK / CAN2_RX
7	SAI1_RXD5	8	SAI5_RXD3 / CAN2_TX
9	GPIO1_IO07	10	ECSPI2_MISO
11	SAI1_RXD6	12	ECSPI2_MOSI
13	SAI1_TXD4	14	ECSPI2_CS0
15	SAI1_RXD7	16	ECSPI2_SCLK
17	SAI1_TXFS	18	UART3_RTS
19	SAI1_TXD0	20	GND
21	UART3_CTS	22	SD1_DATA4
23	SAI1_TXD1	24	SD1_DATA5
25	SAI1_RXD2	26	SD1_DATA6
27	SAI1_TXD2	28	SD1_RESET_B
29	SAI1_RXD3	30	SPDIF_TX / PWM3
31	SAI1_TXD3	32	EARC_P_UTIL
33	SAI1_TXD5	34	SD1_DATA7 / CAN2_STBY
35	CLKIN2	36	SAI2_RXD / CAN2_DET
37	CLKOUT2	38	PMIC_ON_REQ
39	CLKOUT1	40	UART3_TXD
41	CLKIN1	42	UART4_TXD
43	UART4_RXD	44	UART3_RXD
45	3P3V	46	GND
47	3P3V	48	GND

2.2 UART

UART features:

- RS-232-Level Transceiver
- Recommend USB to Serial RS-232 Converter such as:
  https://www.tripplite.com/keyspan-high-speed-usb-to-serial-adapter~USA19HS

J17: UART2 (Molex 53047-0610)	
Pin#	**Signal**
1	UART4_TXD
2	5V IN
3	GND
4	UART2_TXD
5	UART2_RXD
6	UART4_RXD

*UART 2/4 are mapped to /dev/ttymxc1 and /dev/ttymxc3 under Linux.
UART3 is exposed on the expansion connector (see 2.1 EXPANSION CONNECTOR).

2.3 DISPLAY

Three LCDIF Display Controllers:

- One LCDIF drives MIPI DSI
- One LCDIF drives LVDS Tx
- One LCDIF drives HDMI Tx
- Supports 8-bit / 16-bit / 18-bit / 24-bit / 32-bit pixel depth
- Supports up to 1080p60 display per LCDIF, if no more than 2 instances used simultaneously
- Supports 1x1080p60 + 2x720p60 if all 3 instances are used simultaneously

MIPI Interface:

- One 4-lane MIPI-DSI interface (J11)

LVDS Interface:

- Two 4-lane interfaces

HDMI Interface:

- HDMI 2.0a Tx supporting one display
- Resolutions of: 740x480p60, 720x480p60, 1280x720p60, 1920x1080p60
- HDCP 2.2 and HDCP 1.4
    - Audio support
        - 32 channel audio output support
        - 1 S/PDIF audio eARC input support

J11: DSI (Omron XF2M-3315-1A)			
Pin#	**Signal**	**Pin#**	**Signal**
1	GND	2	GND
3	5V IN	4	5V IN
5	5V IN	6	5V IN
7	GPIO1_IO01	8	SAI1_RXFS
9	SAI2_TXC	10	SAI2_TXFS
11	SAI2_MCLK	12	GND
13	DSI_D3_P	14	DSI_D3_N
15	GND	16	DSI_D2_P
17	DSI_D2_N	18	GND
19	DSI_CLK_P	20	DSI_CLK_N
21	GND	22	DSI_D1_P
23	DSI_D1_N	24	GND
25	DSI_D0_P	26	DSI_D0_N
27	GND	28	I2C2D_SCL
29	I2C2D_SDA	30	GND
31	3P3V	32	3P3V
33	3P3V	---	---

J28: LVDS0 (Hirose DF14-20P-1.25H)			
Pin#	**Signal**	**Pin#**	**Signal**
1	3P3V	2	3P3V
3	GND	4	GND
5	LVDS0_TX0_N	6	LVDS0_TX0_P
7	GND	8	LVDS0_TX1_N

9	LVDS0_TX1_P	10	GND
11	LVDS0_TX2_N	12	LVDS0_TX2_P
13	GND	14	LVDS0_CLK_N
15	LVDS0_CLK_P	16	GND
17	LVDS0_TX3_N	18	LVDS0_TX3_P
19	SAI2_RXC/LVDS0_GPIO	20	GPIO1_IO09/PWM2

J27: LVDS1 (Hirose DF14-20P-1.25H)			
Pin#	**Signal**	**Pin#**	**Signal**
1	3P3V	2	3P3V
3	GND	4	GND
5	LVDS1_TX0_N	6	LVDS1_TX0_P
7	GND	8	LVDS1_TX1_N
9	LVDS1_TX1_P	10	GND
11	LVDS1_TX2_N	12	LVDS1_TX2_P
13	GND	14	LVDS1_CLK_N
15	LVDS1_CLK_P	16	GND
17	LVDS1_TX3_N	18	LVDS1_TX3_P
19	SAI2_RXFS/LVDS1_GPIO	20	SAI5_RXD0/PWM2

J29: I2C/TOUCH (Molex 53047-0710)			
Pin#	**Signal**	**Pin#**	**Signal**
1	5V IN	2	5V IN
3	5V IN	4	GPIO1_IO10/PWM3
5	I2C4_SDA	6	I2C4_SCL
7	GND	---	

2.4 CAMERA

MIPI Interface:

- Two 4-lane MIPI-CSI interfaces
- Maximum bit rate of 1.5 Gbps

ISI (Image Sensor Interface):

- The ISI is a simple camera interface that supports image processing and transfer via a bus master interface for up to 2 cameras

Two ISP supporting 375Mpixel/s aggregate performance and up to 3-exposure HDR processing:

- When one camera is used, supports up to 12MP@30fps or 4kp45
- When two cameras are used, each supports up to 1080p80

J9: CSI1 (Omron XF2M-2815-1A)			
Pin#	**Signal**	**Pin#**	**Signal**
1	GND	2	CSI1_D3_P
3	CSI1_D3_N	4	GND
5	CSI1_D2_P	6	CSI1_D2_N
7	GND	8	CSI1_CK_P
9	CSI1_CK_N	10	GND

11	CSI1_D1_P	12	CSI1_D1_N
13	GND	14	CSI1_D0_P
15	CSI1_D0_N	16	GND
17	TP29	18	RSVD2
19	GND	20	I2C2B_SCL
21	I2C2B_SDA	22	GND
23	RSVD3	24	RSVD1
25	5V IN	26	5V IN
27	5V IN	28	GND

J10: CSI2 (Omron XF2M-3315-1A)			
Pin#	**Signal**	**Pin#**	**Signal**
1	5V IN	2	5V IN
3	5V IN	4	5V IN
5	GND	6	PWM4
7	PWM2	8	PWM1
9	I2C2C_SDA	10	I2C2C_SCL
11	GND	12	NC
13	NC	14	NC
15	NC	16	NC
17	NC	18	GND
19	CSI1_CK_P	20	CSI1_CK_N
21	GND	22	CSI1_D3_P
23	CSI1_D3_N	24	GND
25	CSI1_D2_P	26	CSI1_D2_N
27	GND	28	CSI1_D1_P
29	CSI1_D1_N	30	GND
31	CSI1_D0_P	32	CSI1_D0_N
33	GND		

2.5 CAN

The TJA1048 is a dual high-speed CAN transceiver that provides an interface between a Controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The transceiver is designed for high-speed CAN applications in the automotive industry, providing the differential transmit and receive capability to (a microcontroller with) a CAN protocol controller

J20: CAN1 (Molex 53047-0510)	
Pin#	**Signal**
1	OPTO C/A
2	CAN1L
3	GND
4	CAN1H
5	OPTO A/C

2.6 AUDIO

The Nit8M_Plus_SOM features these audio interfaces:

- WM8960 audio codec, 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

Audio Connectors:

J5: Left Speaker (Molex 53398-0271)	
Pin#	**Signal**
1	SPK_LN
2	SPK_LP

J6: Right Speaker (Molex 53398-0271)	
Pin#	**Signal**
1	SPK_RN
2	SPK_RP

J18: Microphone (Molex 53398-0371)	
Pin#	**Signal**
1	GND
2	MIC_IN_2
3	MIC_DET

J4: Headphones (CUI SJ-43515TS)	
Pin#	**Signal**
1	MIC_IN_1
2	HP_L
3	HP_R
4	GND
5	HP_DET

2.7 GIGABIT ETHERNET

The Nitrogen8M Plus SOM allows up to 2 gigabit Ethernet connections:

- One Gigabit Ethernet controller with support for Energy Efficient Ethernet (EEE), Ethernet AVB, and IEEE 1588
- One Gigabit Ethernet controller with support for TSN in addition to EEE, Ethernet AVB, and IEEE 1588

The ENC Carrier only uses the ENET_QoS controller which is compliant with the IEEE 802.3–2015 specification.

Vendor	Part Number	Package
Qualcomm	AR8035-AL1A	PHY Transceiver (U16 on SOM)
Amphenol	RJHSE-5381	RJ45 Ethernet Jack (J13 on Carrier)
Link PP	LP5007NL	Ethernet Transformer (TR1 on Carrier)

2.8 PCIE

The carrier includes a standard mPCIe connector.

J14: mPCIe (Molex 679100002)			
Pin#	**Signal**	**Pin#**	**Signal**
1	NC	2	MPCIE_3V3
3	NC	4	GND
5	NC	6	1P5V
7	NC	8	UIM_PWR
9	GND	10	UIM_DATA
11	PCIE_REFCLK_N	12	UIM_CLK
13	PCIE_REFCLK_P	14	UIM_RESET
15	GND	16	NC
17	NC	18	GND
19	NC	20	PCIE_DIS
21	GND	22	PCIE_REST
23	PCIE1_RX_N	24	MPCIE_3V3
25	PCIE1_RX_P	26	GND
27	GND	28	1P5V
29	GND	30	I2CD_SCL
31	PCIE1_TX_N	32	I2CD_SDA
33	PCIE1_TX_P	34	GND
35	GND	36	USB_PCIE_D_N
37	GND	38	USB_PCIE_D_P
39	MPCIE_3V3	40	GND
41	MPCIE_3V3	42	NC
43	GND	44	NC

45	NC	46	NC
47	NC	48	1P5V
49	NC	50	GND
51	NC	52	MPCIE_3V3

2.9 USB

The USB module is a USB 3.0-compliant serial interface engine for implementing a USB interface. This module may be connected to an external port. Collectively the module and external port are called the USB 3.0 interface. USB 3.0 supports super-speed (SS), high-speed (HS), full-speed (FS), and low-speed (LS) operations.

The USB 3.0 module includes the following features:

- Complies with USB specification rev 3.0 (xHCI compatible)
- Supports operation as a standalone USB host controller
- USB dual-role operation and can be configured as host or device
- Super-speed (5 Gbit/s), high-speed (480 Mbit/s), full-speed (12 Mbit/s), and low-speed (1.5 Mbit/s) operations.
- Supports operation as a standalone single port USB
- Supports four programmable, bidirectional USB endpoints
- OTG (on-the-go) 2.0 compliant, which includes both device and host capability.

USB Connectors:

J3: 3.0 RVS REC VERT 90DEG TH TYPE A (PN: 48404-0003)

J22: USB 3.0 CONN TYPE A STACKED R/A (PN: GSB311231HR)

J21: USB Type C (PN: 1054500101)

2.10 INPUT POWER

Connector: J16 (Barrel Connector PN: KLDX-0202-A)
Power Supply: 5V

3. 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.

4. ORDERABLE PART NUMBERS

SKU	CPU	DDR Memory	eMMC Storage Size	Operating Rating	Operating Temperature Range
NIT8MQ_Plus_SOM_2r16e	i.MX8M Quad Plus	2GB	16GB	Commercial	0° to 70°C
NIT8MQ_Plus_SOM_2r16eWB	i.MX8M Quad Plus (Wifi+BT)	2GB	16GB	Commercial	0° to 70°C
NIT8MQ_Plus_SOM_2r16e_i	i.MX8M Quad Plus	2GB	16GB	Industrial	-40° to 85°C
NIT8MQ_Plus_SOM_2r16eWB_i	i.MX8M Quad Plus (Wifi+BT)	2GB	16GB	Industrial	-40° to 85°C
Nit8MP_ENC_CAR_BRD					

***Note:* Please contact us to discuss other custom options**