Nitrogen8M User Manual

REVISION HISTORY		
Date	**Revision**	**Description**
3/30/2018	0.1	First Draft
6/25/2018	1.0	Final spec released
7/18/2018	1.1	Included new diagram
10/10/2018	1.2	UART fix
07/15/2020	1.3	Spec updates

TABLE OF CONTENTS

1.NITROGEN8MOVERVIEW

1.1 NITROGEN PLATFORM

The first Nitrogen platform was launched in 2014 after the worldwide success of Boundary Devices' i.MX 6 SABRE Lite Reference Design (now 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.MX 6, i.MX 7, and i.MX 8 applications processors.

The Nitrogen platforms come fully supported by Boundary Devices' engineering team, and includes a full Board Support Package. 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 requirement. 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 includes the Nitrogen8M, Nitrogen8X and Nitrogen8MAX featuring NXP's i.MX 8 family of processors that were released in 2018.

The different Nitrogen8 series of SBCs and SOMs include offerings designed to best leverage the advantages of the i.MX 8, i.MX 8X, and i.MX 8M 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, and more.

1.3 SOFTWARE SUPPORT

Boundary Devices provides a full Board Support Package (BSP) for all Nitrogen boards.

The BSP includes bootloader, kernel and user-space components optimized for each platform.

The boards ship with U-Boot,Linux Kernel as well as a Yocto-based Qt operating system (Boot2Qt).

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, QNX, and FreeRTOS. Visit https://boundarydevices.com/wiki/operating-systems/

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

1.4 MAIN SPECIFICATIONS

The Nitrogen8M series of single board computers (SBC) is the latest in our line of i.MX based Nitrogen platform. The Nitrogen8M series will leverage the i.MX 8M family of applications processors from NXP. Built with industry-leading audio, voice and video processing, the i.MX 8M applications processor family is ideal for applications scaling from consumer home audio to industrial building automation and mobile computers. The Nitrogen8M platform will include a robust set of populated attributes, allowing them to be embedded in a variety of applications.

Key Features of the Nitrogen8M Series:

- Cortex-A53 (64-bit) + Cortex-M4F
- 2-4GB of LPDDR4 RAM
- 4-128GB of eMMC
- Pre-Certified WiFi (802.11ac) & Bluetooth (BT 4.1) module
- 4K + HDR Video Capabilities
- 4-Lane MIPI-DSI Display (up to 1080p)
- Dual Camera Inputs (4-Lane MIPI-CSI)
- High Performance GPU3D (GC7000)

1.4.1 CPU

CPU			
CPU Name	NXP i.MX 8M Dual	NXP i.MX 8M QuadLite	NXP i.MX 8M Quad
CPU Type	2x Cortex-A53 1x Cortex-M4F	4x Cortex-A53 1x Cortex-M4F	4x Cortex-A53 1x Cortex-M4F
CPU Cores	2	4	4
CPU Clock (Max)	1.5GHz	1.5GHz	1.5GHz

1.4.2 MEMORY & STORAGE

MEMORY & STORAGE	
RAM	2GB LPDDR4 (up to 4 GB)
eMMC	16GB eMMC (upto 128 GB)

1.4.3 MULTIMEDIA

MULTIMEDIA	
2D/3D Graphics Acceleration	VivanteGC7000Lite
Video Encode / Decode	4Kp60, h.265 and VP9
Camera Interfaces	2x MIPI CSI

1.4.4 DISPLAY & AUDIO CONNECTIONS

DISPLAY CONNECTIONS	
HDMI	1x (w/CEC, up to 4K)
MIPI DSI	1x 4-lane (up to 1080p)
AUDIO INTERFACES	
Headphone	1x (WM8960)
Microphone	1x
Amplifier	1W (per channel)

1.4.5 NETWORKING CONNECTIONS

NETWORKING CONNECTIONS	
Ethernet	10/100/1GB
WiFi	802.11ac (BD-SMAC / QCA9377)
Bluetooth	BT5.0 (BD-SMAC / QCA9377)

1.4.6 CONNECTIVITY PORTS

CONNECTIVITY PORTS	
I2C	3x
SPI	1x
UART	2x RS-232
SD / MMC	1x (optional)
USB	3x USB 3.0 Host + 1x USB 3.0 OTG
RTC	1x + battery
PCIe	2x (1 mPCIe + 1 expansion connector)
JTAG	1x

1.4.7 MISCELLANEOUS SPECIFICATIONS

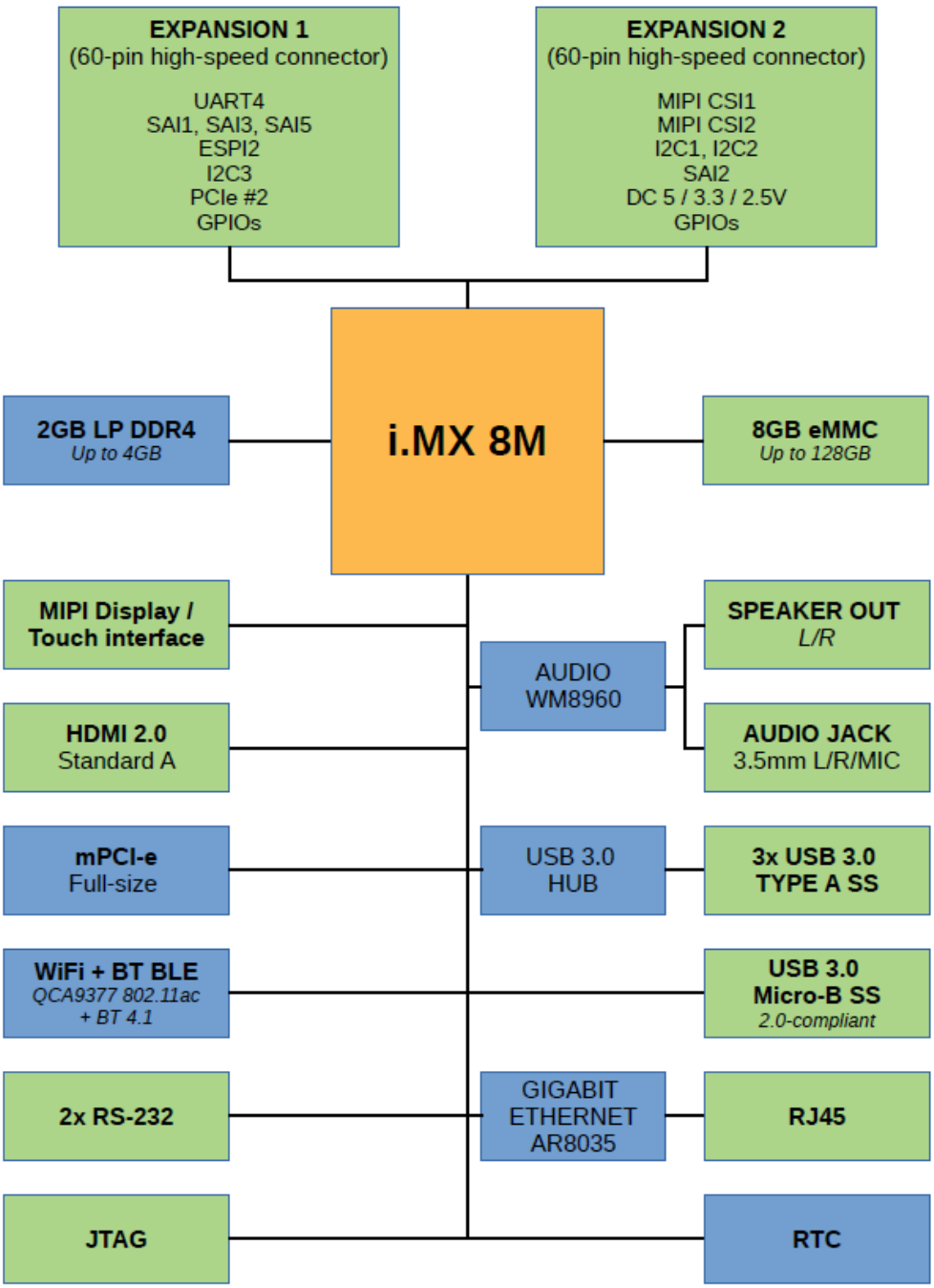
PCB SPECIFICATIONS	
Dimensions (L x W)	136.7mm x 87mm
MISCELLANEOUS SPECIFICATIONS	
Temperature Rating	0°- +70°C (-40°- +85°C optional)
Power Supply	5V

1.5 SUPPORTED OPERATING SYSTEMS

OS SUPPORTED	
Yocto	Yes
Buildroot	Yes
Debian	Yes
Ubuntu	Yes
Android	Yes
QNX	No
FreeRTOS	Yes (M4 core)
Windows Embedded Compact (WEC)	No

2.ARCHITECTURE OVERVIEW

2.1 BLOCK DIAGRAM



3.ELECTRICAL CHARACTERISTICS

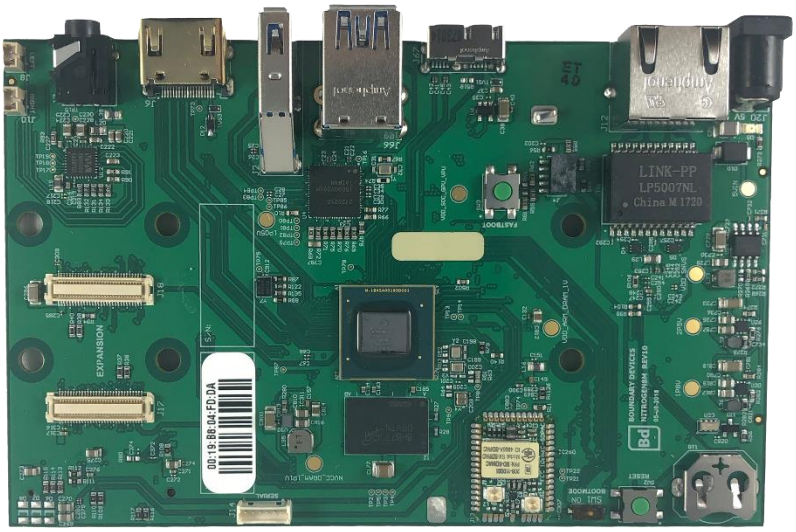
3.1 ELECTRICAL CHARACTERISTICS OF NITROGEN8M

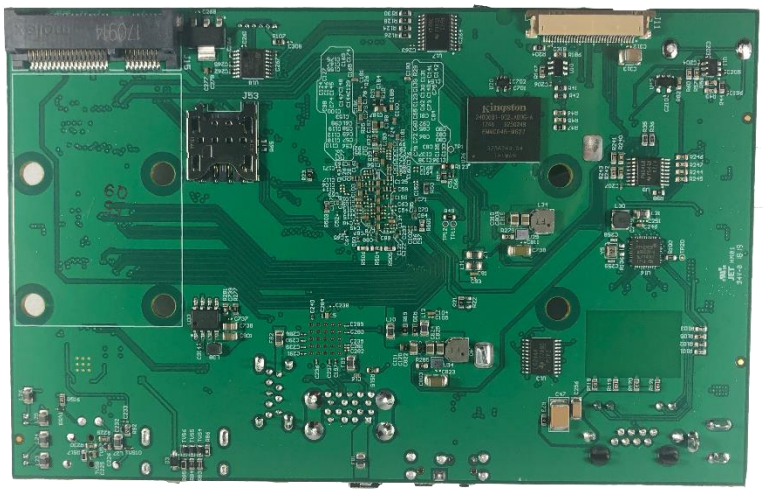
PARAMETER	MIN	TYP	MAX	UNIT
Main Input Voltage		5		V
Power Consumption*		X		mW
CPU Clock			1.5	GHz

*The Power Consumption refers to a single board with no other peripherals plugged in

4.CONNECTOR DETAILS

4.1 CONNECTOR LAYOUT





4.2 STANDARD CONNECTORS

List of industry standard connectors with known pin outs:

REF DESIGNTOR	FUNCTION
J2	USB 3.0 Host x1 (vertical)
J6	HDMI Type A
J7	Headphone + Microphone 3.5mm Jack
J12	Gigabit Ethernet RJ45 port
J15	mPCIe connector
J20	DC Power Jack (5V)
J53	SIM Card
J66	USB 3.0 Host x2 (horizontal stack)
J67	USB 3.0 OTG (micro-B SS)

4.3 CUSTOM CONNECTORS

The Nitrogen8M has a robust set of peripheral interfaces available via custom connectors:

J4: JTAG (20021121-00010T4LF FCI)	
PIN#	**Function**
1	+3.3V
2	JTAG_TMS
3	GND
4	JTAG_TCK
5	GND
6	JTAG_TDO
7	JTAG_MOD
8	JTAG_TDI
9	JTAG_nTRST
10	BRESET_N

J8: 2W Amplified Audio – Left Channel (Molex 53047-0210)	
PIN#	**Function**
1	OUTLP
2	OUTlM

J10: 2W Amplified Audio – Right Channel (Molex 53047-0210)	
PIN#	**Function**
1	OUTRP
2	OUTRM

J11: MIPI-DSI + Touch connector (AVX 086210033340800)	
PIN#	**Function**
1	GND
2	GND
3	+5V
4	+5V
5	+5V
6	+5V
7	SPDIF_TX/PWM3
8	GPIO1_IO01
9	TOUCH_INT
10	TOUCH_RESET
11	NAND_RE_B
12	GND
13	DSI_D3_N
14	DSI_D3_P
15	GND
16	DSI_D2_N
17	DSI_D2_P
18	GND
19	DSI_CLK_N
20	DSI_CLK_P
21	GND
22	DSI_D1_N
23	DSI_D1_P
24	GND
25	DSI_D0_N
26	DSI_D0_P
27	GND
28	I2C4_SCL
29	I2C4_SDA
30	GND
31	VDD_SNVS
32	VDD_SNVS
33	VDD_SNVS

J14: COM1 & COM2 (Molex 53047-0610)*	
PIN#	**Function**
1	UART2 TX
2	+5V
3	GND
4	UART1 TX
5	UART1 RX
6	UART2 RX

*UART1 is used as the U-Boot and O/S console.
*UART1/2 are mapped to /dev/ttymxc0 and /dev/ttymxc1 under Linux.

J17: Expansion Connector #1 (Molex 52991-0608)			
PIN#	**Function**	**PIN#**	**Function**
1	ECSPI2_SS0	2	GND
3	ECSPI2_MISO	4	PCIE2_REFCLK_P
5	ECSPI2_SCLK	6	PCIE2_REFCLK_N
7	ECSPI2_MOSI	8	GND
9	GND	10	PCIE2_TX_P
11	SPDIF_EXT_CLK/PWM1	12	PCIE2_TX_N
13	I2C2_SDA	14	GND
15	I2C2_SCL	16	PCIE2_RX_P
17	GND	18	PCIE2_RX_N
19	SAI1_RXFS	20	GND
21	SAI1_RXC	22	SAI2_RXD
23	SAI1_RXD1	24	SAI2_RXFS
25	SAI1_RXD2	26	SAI2_TXC
27	SAI1_RXD3	28	SAI2_TXFS
29	SAI1_RXD4	30	SAI2_RXC
31	SAI1_RXD5	32	SAI2_MCLK
33	SAI1_RXD6	34	SAI2_TXD
35	SAI1_RXD7	36	SAI3_MCLK/PWM4
37	GND	38	GND
39	SAI1_TXD1	40	CAMERA_CLK
41	SAI1_TXD2	42	GND
43	SAI1_TXD3	44	SAI3_RXFS
45	SAI1_TXD4	46	EXT_RESET_N
47	SAI1_TXD5	48	SAI3_RXC
49	SAI1_TXD6	50	GPIO1_IO10

51	SAI1_TXD7	52	PMIC_ON_REQ
53	GND	54	GPIO1_IO3
55	SPDIF_RX/PWM2	56	GP_M4_NMI
57	UART4_RXD	58	2P5V
59	UART4_TXD	60	2P5V

J18: Expansion Connector #2 (Molex 52991-0608)			
PIN#	**Function**	**PIN#**	**Function**
1	CSI_P1_D0_N	2	CSI_P2_D0_N
3	CSI_P1_D0_P	4	CSI_P2_D0_P
5	GND	6	GND
7	CSI_P1_D1_N	8	CSI_P2_D1_N
9	CSI_P1_D1_P	10	CSI_P2_D1_P
11	GND	12	GND
13	CSI_P1_D2_N	14	CSI_P2_D2_N
15	CSI_P1_D2_P	16	CSI_P2_D2_P
17	GND	18	GND
19	CSI_P1_D3_N	20	CSI_P2_D3_N
21	CSI_P1_D3_P	22	CSI_P2_D3_P
23	GND	24	GND
25	CSI_P1_CK_P	26	CSI_P2_CK_N
27	CSI_P1_CK_N	28	CSI_P2_CK_P
29	GND	30	GND
31	HDMI_AUX_P	32	QSPIA_SCLK
33	HDMI_AUX_N	34	GND
35	GND	36	QSPIA_NSS0
37	NAND_nCE1	38	QSPIA_DATA0
39	NAND_NCE2	40	QSPIA_DATA1
41	NAND_NCE3	42	QSPIA_DATA2
43	NAND_CLE	44	QSPIA_DATA3
45	NAND_NREADY	46	QSPIA_DATA4
47	NAND_DATA05	48	I2C3_SCL
49	NAND_NWP	50	I2C3_SDA
51	NAND_NWE	52	GND
53	NAND_DQS	54	GND
55	SD2_RESET_B	56	5VIN
57	VDD_SNVS	58	5VIN
59	VDD_SNVS	60	5VIN

5.MOUNTING INFORMATION

5.1 NITROGEN8M MOUNTING SPECIFICATIONS

The overall dimensions of the Nitrogen8M board are 136.7mm x 87mm