

Nitrogen6X_MAX User Manual

REVISION HISTORY

Date	Revision	Description
07/20/2014	1.0	First Draft
11/04/2015	1.1	Added Quad Plus Capability
12/2/2019	1.2	Updated J14, Pin7 Signal Name

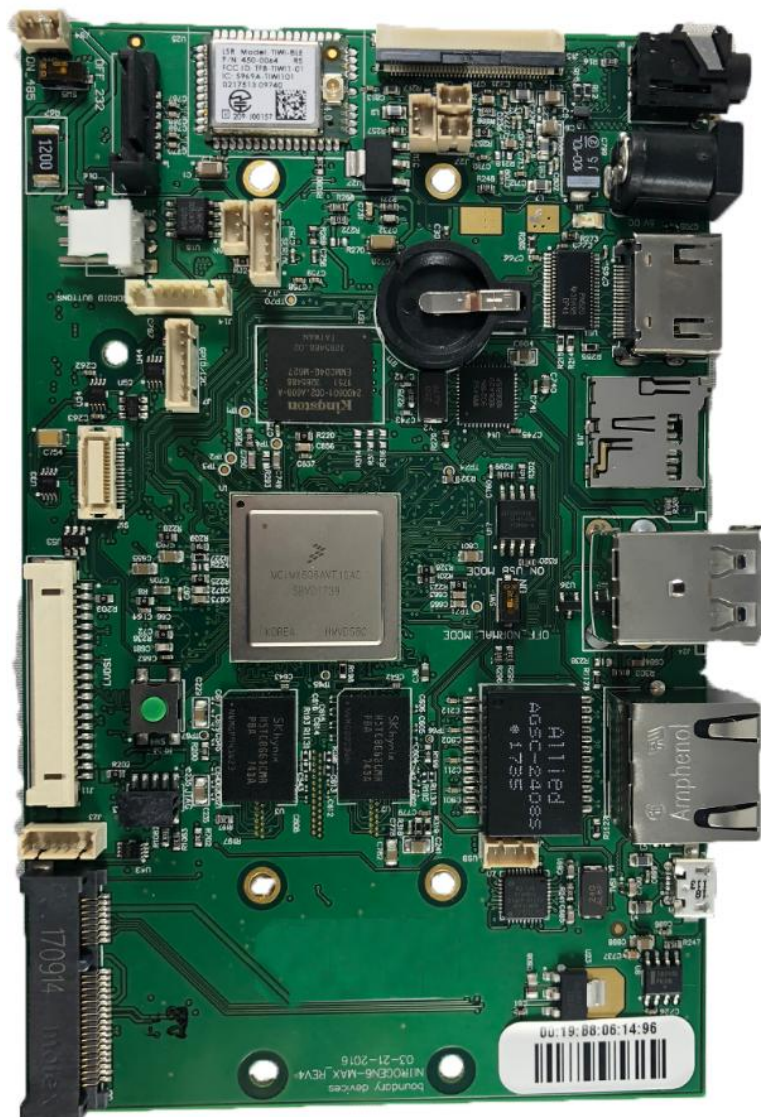




TABLE OF CONTENTS

1.Nitrogen6X_MAX Overview	1
1.1 Nitrogen Platform.....	1
1.2 Nitrogen6 Family.....	1
1.3 Software Support	1
1.4 Main Specifications	2
1.4.1 CPU	2
1.4.2 Memory & Storage.....	2
1.4.3 Multimedia	3
1.4.4 Display & Audio Connections	3
1.4.5 Networking Connections.....	3
1.4.6 Connectivity Ports.....	3
1.4.7 Miscellaneous Specifications	4
1.5 Supported Operating Systems	4
2.Architecture Overview	5
2.1 Block Diagram.....	5
3.Electrical Characteristics	6
3.1 Electrical Characteristics of Nitrogen6X_MAX	6
4.Connector Details.....	7
4.1 Connector Layout	7
4.2 Standard Connectors.....	8
4.3 Custom Connectors	8
5.Mounting Information.....	18
5.1 Nitrogen6X_MAX Mounting Specifications	18



1.NITROGEN6X_MAXOVERVIEW

1.1 NITROGEN PLATFORM

The first Nitrogen platform was launched in 2014 after the worldwide success of Boundary Device's i.MX6 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 Device's 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 NITROGEN6 FAMILY

The Nitrogen6 family of boards focus on the i.MX6 processor from NXP. With a full array of i.MX6 Single, Dual, Quad, and Quad Plus processors, the Nitrogen6 family has solutions to meet cost and performance targets.

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, and QNX. Visit <https://boundarydevices.com/wiki/>

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 Nitrogen6X_MAX is a turbo-charged version of our popular Nitrogen6X platform. The Nitrogen6X_MAX features the same Quad-Core i.MX6 processor from NXP but has some other notable upgrades to allow for high-end performance.

Key Features of the Nitrogen6X_MAX Series:

- Quad-Core (or Quad PLUS) ARM® Cortex A9 processor at 1GHz per core
- 4GByte of 64-bit wide DDR3L @ 532MHz
- 2 LVDS Outputs for Dual-Display or Dual-Channel 1080p displays
- RGB and HDMI 1.4a
- 4GB eMMC
- Three camera ports (2xParallel, 1x MIPI CSI-2)
- On-Board mPCIe connector with both PCIe and USB interfaces
- 2W Audio Amplifier to directly drive speakers
- 3 RS-232 serial ports, (1 software-selectable as RS-485)
- 802.11b/g/n WiFi/Bluetooth (LSR TiWi BLE) comes standard
- Serial ATA 2.5 (SATA) at 3Gbps
- 1 microSD 3.0/SDXC card slot
- Analog (headphone/mic) and Digital (HDMI) audio
- 10/100/Gb Ethernet
- 10-pin JTAG interface
- 3 High speed USB ports (2xHost, 1xOTG)
- 1xCAN port
- I2C
- Real-Time Clock with battery backup
- SIM Card Holder
- General Purpose I/O for Device Control

1.4.1 CPU

CPU		
CPU Name	NXP i.MX6 Quad	NXP i.MX6 QuadPlus
CPU Type	ARM Cortex-A9	ARM Cortex-A9
CPU Cores	4	4
CPU Clock (Max)	1GHz	1GHz

1.4.2 MEMORY & STORAGE

MEMORY & STORAGE	
RAM	4GB DDR3L
eMMC	4GB eMMC (upto 128 GB)

1.4.3 MULTIMEDIA

MULTIMEDIA	
2D/3D Graphics Acceleration	VivanteGC2000/GC320
Video Encode/Decode	1080p30 H.264 / 1080p60 H.264
Camera Interfaces	1 MIPI, 2 CSI

1.4.4 DISPLAY & AUDIO CONNECTIONS

DISPLAY CONNECTIONS	
HDMI	1x (v1.4 1920 x 1080p)
LVDS	1 x 24-bit
RGB	1 x 24-bit
MIPI DSI	1x 2-lane
AUDIO INTERFACES	
Headphone	1x (SGTL5000-XNAA3)
Microphone	1x Analog
Amplifier	2W

1.4.5 NETWORKING CONNECTIONS

NETWORKING CONNECTIONS	
Ethernet	10/100/1GB
WiFi	802.11ac (BD-SMAC / QCA9377)
Bluetooth	BT4.1 (BD-SMAC / QCA9377)

1.4.6 CONNECTIVITY PORTS

CONNECTIVITY PORTS	
I2C	x3
SPI	x1 (via J15)
UART	x2 RS-232 + x1 Selectable RS-485/RS-232
SD / MMC	x1MicroSD
USB	x3 USB 2.0 Host + x1 USB 2.0 OTG
SATA	x1
RTC	x1 + Battery
PCIe	x1 + SIM Card Option
JTAG	x1
CAN	x1

1.4.7 MISCELLANEOUS SPECIFICATIONS

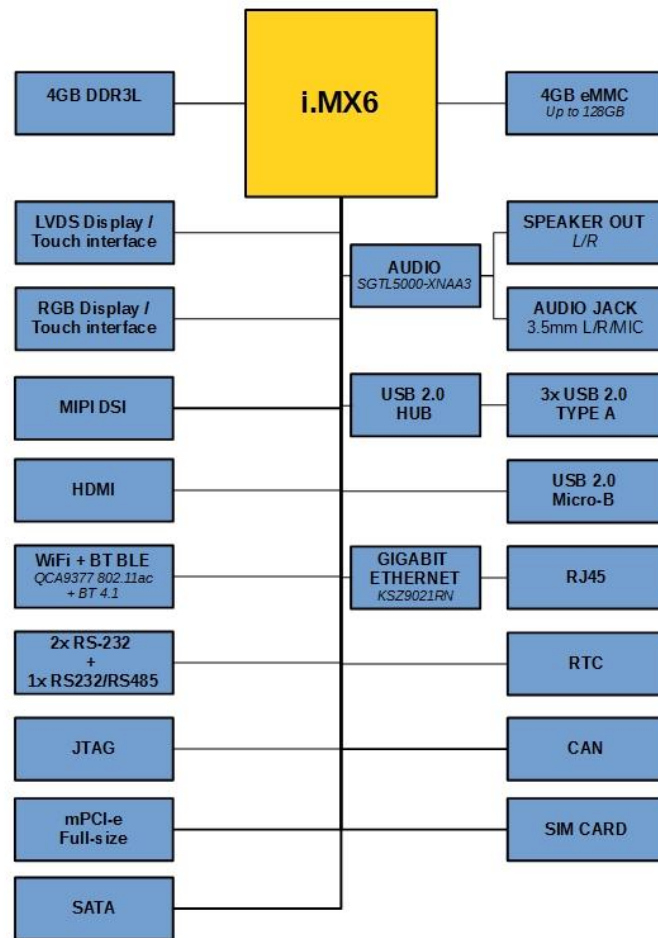
PCB SPECIFICATIONS	
Dimensions (L x W)	136.7mm x 87mm
MISCELLANEOUS SPECIFICATIONS	
Temperature Rating	0°- +70°C (-40°- +85°C optional)
Power Supply	5V

1.5 SUPPORTED OPERATING SYSTEMS

OS SUPPORTED	
Yocto	Yes
Buildroot	Yes
Debian	Yes
Ubuntu	Yes
Android	Yes
QNX	Yes
Windows Embedded Compact (WEC)	Yes

2.ARCHITECTURE OVERVIEW

2.1 BLOCK DIAGRAM



3.ELECTRICAL CHARACTERISTICS

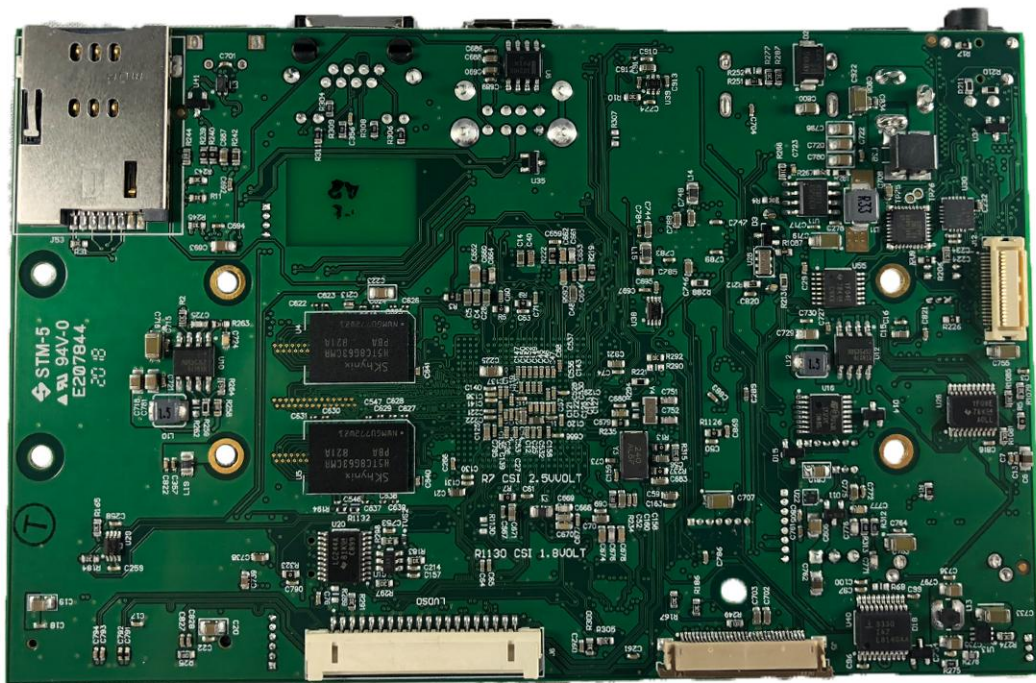
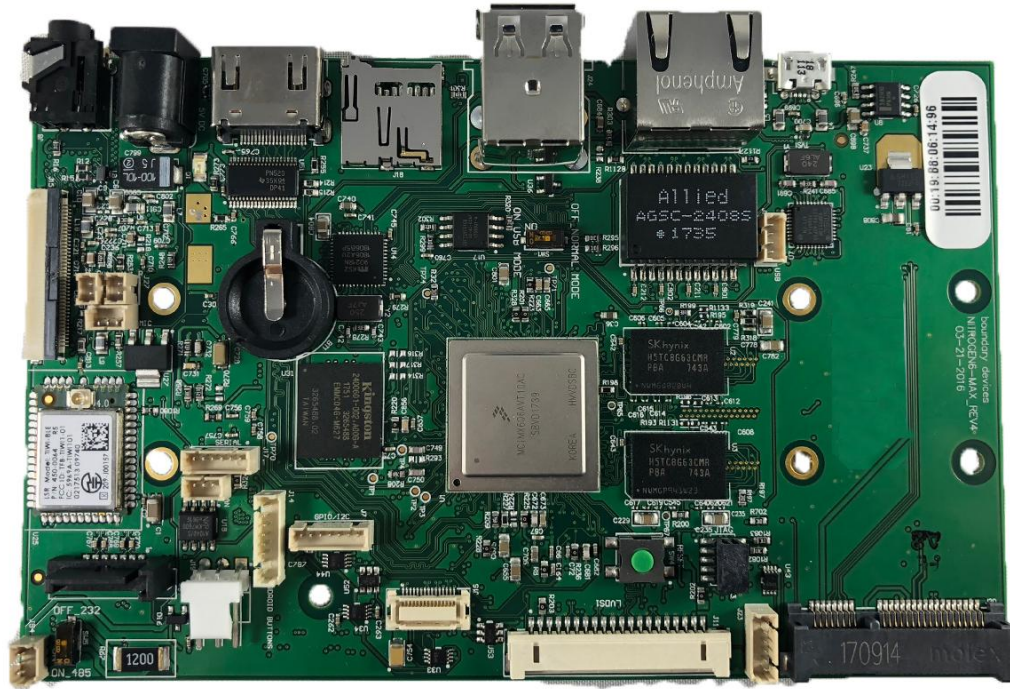
3.1 ELECTRICAL CHARACTERISTICS OF NITROGEN6X_MAX

PARAMETER	MIN	TYP	MAX	UNIT
Main Input Voltage	-	5	-	V
Power Consumption*	-	1500	-	mW
CPU Clock	-	1	1	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 DESIGNATOR	FUNCTION
J3	USB OTG
J4	HDMI
J8	Headphone Jack
J10	DC Power Jack
J18	microSD Slot 1
J21	SATA
J24	2xUSB Host
J44	10/100/1G Ethernet
J53	SIM Card Holder

4.3 CUSTOM CONNECTORS

The Nitrogen6X_MAX has a robust set of peripheral interfaces available via custom connectors:

J1: USB (Molex 53047-0410)	
PIN#	Function
1	+5V
2	USBDN_DM3
3	USBDN_DP3
4	GND

J5: Camera (AVX 086210033340800)	
PIN#	Function
1	GND
2	D19
3	D18
4	D17
5	D16
6	D15
7	D14
8	D13
9	D12
10	D11
11	D10
12	D9
13	D8
14	SCL

15	SDA
16	GND
17	GPIO_3_CLKO2
18	GND
19	2.5V
20	2.5V
21	2.5V
22	2.5V
23	GND
24	CSI0_DATA_EN
25	GND
26	CSI0_RST
27	CSI0_VSYNC
28	CSI0_HSYNC
29	GND
30	CSI0_PIXCLK
31	GPIO_6
32	GND
33	GPIO1_16

J6: LVDS (Hirose DF14-20P-1.25H)	
PIN#	Function
1	3.3V
2	3.3V
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	DISP0_CONTRAST (NANDF_D0)
20	PWM4

J7: I2C/GPIO (Molex 53047-0710)

PIN#	Function
1	+5V
2	+5V
3	+5V
4	GPIO9
5	I2C3_SDA
6	I2C3_SCL
7	GND

J9: Microphone In (Molex 53047-0310)

PIN#	Function
1	GND_Analog
2	MIC In
3	MIC Det

J11: LVDS (Hirose DF14-20P-1.25H)

PIN#	Function
1	3.3V
2	3.3V
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	LVDS1_GPIO (EIM_CS0)
20	PWM2

J12: CSI1 (Molex 52991-0408)	
PIN#	Function
1	EIM_A23
2	EIM_DA0
3	EIM_A22
4	EIM_DA1
5	EIM_A21
6	EIM_DA2
7	EIM_A20
8	EIM_DA3
9	EIM_A19
10	EIM_DA4
11	EIM_A18
12	EIM_DA5
13	EIM_A17
14	EIM_DA6
15	EIM_A16
16	EIM_DA7
17	EIM_EB3
18	EIM_DA8
19	EIM_EB2
20	EIM_DA9
21	EIM_RW
22	EIM_DA10
23	EIM_EB1
24	EIM_DA11
25	EIM_EB0
26	GND
27	EIM_LBA
28	EIM_DA12
29	GND
30	GND
31	EIM_WAIT
32	EIM_DA13
33	GND

34	GND
35	EIM_A24
36	EIM_DA14
37	+3.3V
38	GND
39	+3.3V
40	EIM_DA15

J13: JTAG (FCI 20021121-00010T4LF)

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

J14: Android Buttons (Molex 52991-0810)

PIN#	Function	Signal
1	ON/OFF	-
2	KEY_VOL_UP	GPIO_18
3	HOME	NANDE_D4
4	SEARCH	NANDE_D3
5	BACK	NANDE_D2
6	MENU	NANDE_D1
7	KEY_VOL_DN	SD3_DAT4
8	GND	-

J15: Parallel RGB (Omron XF2M-4015-1A)

PIN#	Function
1	GND
2	GND
3	GND
4	DISP0_CNTRST
5	R0



6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DISP0_CLK
31	GND
32	DISP0_HSYNC
33	DISP0_VSYNC
34	DISP0_DRDY
35	I2C3_SCL
36	I2C3_SDA
37	PWM1
38	+5V
39	+5V
40	+5V



J16: MIPI (Molex 52991-0308)

PIN#	Function
1	CSI_D0M
2	+5V
3	CSI_D0P
4	+5V
5	GND
6	I2C2_SDA
7	CSI_D1M
8	I2C2_SCL
9	CSI_D1P
10	PWM3
11	GND
12	MIPI_BAKLGT_ON
13	CSI_D2M
14	NANDE_D5
15	CSI_D2P
16	DSI_D0P
17	GND
18	DSI_D0M
19	CSI_D3M
20	GND
21	CSI_D3P
22	DSI_CLK0P
23	GND
24	DSI_CLK0M
25	CSI_CLK0M
26	GND
27	CSI_CLK0P
28	DSI_D1P
29	GND
30	DSI_D1M

J17: COM1 & COM2 (Molex 53047-0610)

PIN#	Function
1	UART1 TX
2	+5V
3	GND
4	UART2 TX



5	UART2 RX
6	UART1 RX

*UART2 is used as the U-Boot and O/S console. UART1 or UART5 on J54 should be used for external connections

*UART1/2 are mapped to /dev/ttyMXC0 and /dev/ttyMXC1 under Linux and COM1/2 under Windows Embedded

J19: SATA POWER (Tyco 640457-3)

PIN#	Function
1	+3.3V
2	GND
3	+5V

J20: PCIe (Molex 679100002)

PIN#	Function
1	-
2	+3.3V
3	-
4	GND
5	-
6	+1.5V
7	-
8	To SIM Card C1
9	GND
10	To SIM Card C7
11	CLK1_N
12	To SIM Card C3
13	CLK1_P
14	To SIM Card C2
15	GND
16	-
17	-
18	GND
19	-
20	-
21	GND
22	PCIE_Reset (EIM_BCLK)
23	PCIE_RXM
24	+3.3V
25	PCIE_RXP
26	GND

27	GND
28	+1.5V
29	GND
30	I2C3_SCL
31	PCIE_TXM
32	I2C3_SDA
33	PCIE_TXP
34	GND
35	GND
36	USBDN_DM3
37	-
38	USBDN_DP3
39	-
40	GND
41	-
42	-
43	-
44	-
45	-
46	-
47	-
48	+1.5V
49	-
50	GND
51	-
52	+3.3V

J22: CAN Interface (Molex 53047-0310)

PIN#	Function
1	CANH
2	GND
3	CANL

J27: 2W Amplified Audio – Right Channel (Molex 53047-0210)

PIN#	Function
1	OUTRP
2	OUTRM



J28: 2W Amplified Audio – Left Channel (Molex 53047-0210)

PIN#	Function
1	OUTLP
2	OUTLM

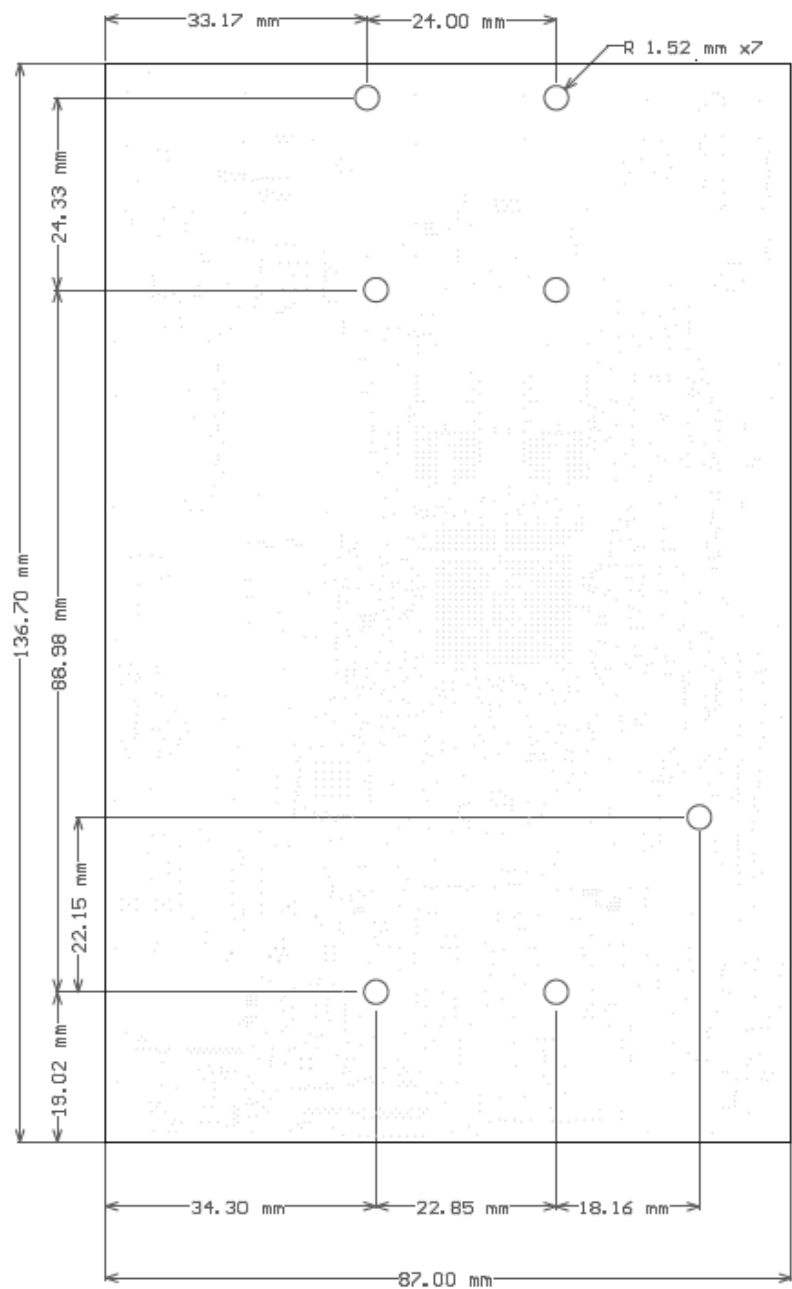
J54: Selectable RS232/RS485 (Molex 53047-0310)

PIN#	Function
1	GND
2	UART5 RXD/RS-485-
3	UART5 TXD/RS-485+



5.MOUNTING INFORMATION

5.1 NITROGEN6X_MAX MOUNTING SPECIFICATIONS



COMPANY	BOUNDARY DEVICES		
ASSY #	ASM_Nit6_MAX_BRD	REV	REV4
DATE	20170901		