

DATASHEET

NORVI CONTROLLERS NORVI CPU-ESPS3-X1

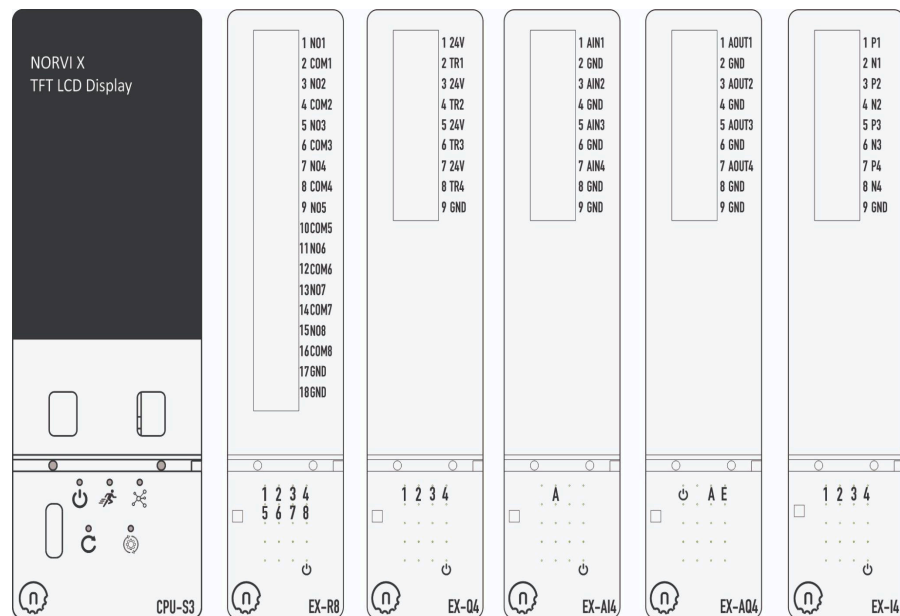
NORVI X is a next-generation modular industrial controller designed to power smart automation and IoT solutions. With a powerful CPU module and plug-and-play expansion modules, it scales up to 200 inputs and outputs – delivering unmatched flexibility, connectivity, and reliability.

Product Features

- Based on ESP32-S3-WROOM
- TFT SPI Display with touch input
- Built-in RS-485 Communication
- Built-in Ethernet Communication
- DS3231 RTC
- DIN-Rail mount

Expansions Supported

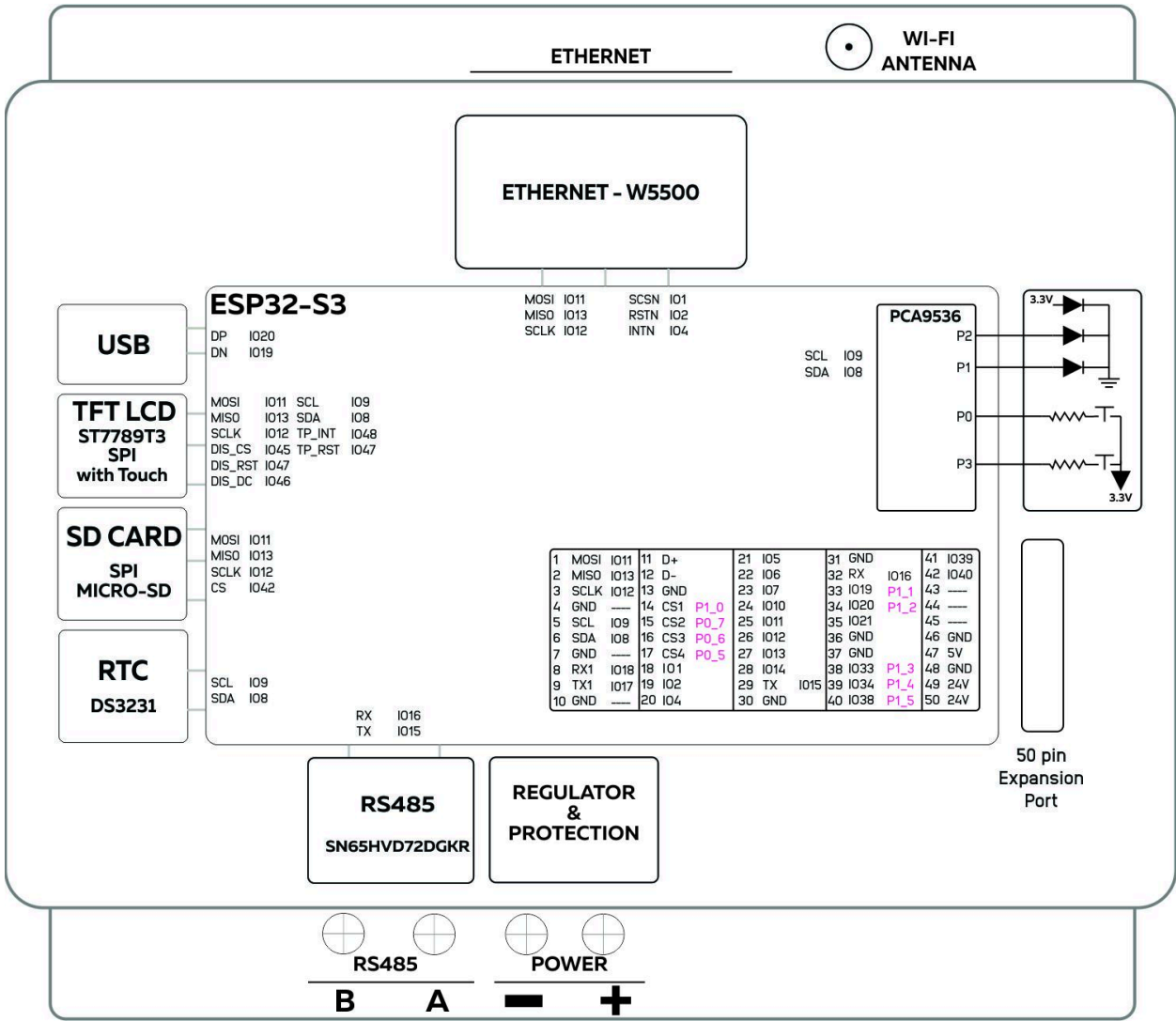
Digital Input Modules 4 x Digital Inputs 8 x Digital Inputs 16 x Digital Inputs	Relay Output Modules 4 x Relay Output 8 x Relay Output	Transistor Output Modules 4 x Transistor Output 8 x Transistor Output 16 x Transistor Output
Analog Input Modules 4 x Analog Inputs 0-10V 4 x Analog Inputs 4-20mA	Analog Output Modules 4 x Analog Outputs 0-10V / 4-20mA	Communication Modules Cellular Modem Quectel EC25 Cellular Modem SIMCOM A7672
Power & Utility Modules 3 x Current Transformer (Energy)		



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Product Block Diagram



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Main

Range of Product	NORVI X
Product type	Modular Programmable Controller
Certifications	EN 61131-2:2007 EN 61010-1:2010+A1:2019 EN IEC 61010-2-201:2018 2014/30/EU- Electromagnetic Compatibility (EMC) Annex III, Part B, Module C
Rated supply voltage	24V DC
Communication	WiFi 2.5GHz / Bluetooth Ethernet RS-485
Displays and Visual Indicators	2.0 inch TFT LCD Display 240*320

Complementary

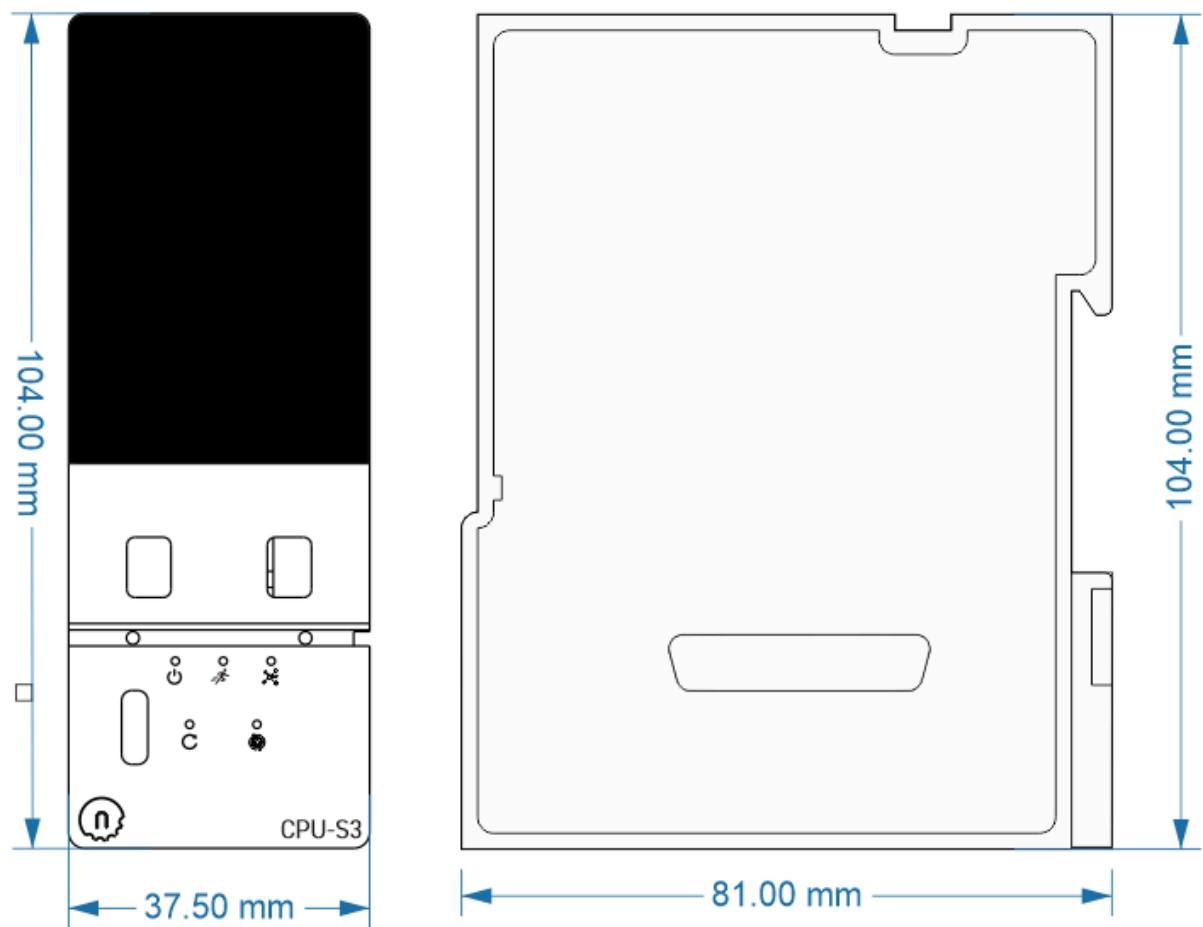
Product Unified Code	NORVI CPU-ESPS3-X1
Product Part Numbers	NORVI CPU-ESPS3-X1

Mechanical Properties

Enclosure	NORVI X
Mounting / Installation Method	DIN RAIL
Terminal Type	Push-in terminal
Terminal Arrangement	Bottom
Length	81.00 mm
Height	104.00 mm
Width	37.50 mm

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Environment

IP degree of protection	IP20
Operating altitude	0 - 2000 meters
Operating Temperature	- -10 ... +85° C (14...185 °F)
Storage altitude	0 - 3000 meters
Shock resistance	15 gn for 11ms
Resistance to electrostatic discharge	4kV on contact 8kV on air
Resistance to electromagnetic fields	10 V/m (80 MHz 1GHz) 3 V/m (1.4 MHz 2 GHz) 1 V/m (2 MHz 3 GHz)

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Electrical Characteristics

Grid Powered Devices

Rated Supply Voltage (V)	24V DC
Current Consumption (mA)	400mA
Recommended Power Source	1A 24V DC

Processing

SOC / MCU	ESP32-S3-WROOM-1U-N16R2
Flash Memory	16MB
ROM	384 KB
SRAM	512 KB
PSRAM	2 MB (Quad-SPI)

Peripherals

Micro SD Card Support

Card Type	MicroSD
Interface	SPI
SD CARD CS	IO42
MISO	IO13
MOSI	IO11
SCLK	IO12
SD Detect	NOT CONNECTED

Built-in Buttons

Button 1 Pin	P0	PCA9536 - IO Expander - I2C Address -0x41
Button 2 Pin	P3	

Built-in Indicators

RUN Indicator	P2	PCA9536 - IO Expander - I2C Address -0x41
ERROR Indicator	P1	

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LCD TFT

Display Driver	ST7789
Display Size	2.0 inch
MOSI	IO11
MISO	IO13
SCLK	IO12
DIS_CS	IO45
TP_RST/ DIS_RST	IO47
DIS_DC	IO46
SCL Pin (Touch Screen)	IO9
SDA Pin (Touch Screen)	IO8
RESET Pin	NOT CONNECTED

INPUTS and OUTPUTS

An expansion module from NORVI Controllers should be used to add I/O to the CPU Module.
Refer products section [Link](#) for information on Expansion Modules.
Currently Available Expansion Modules are

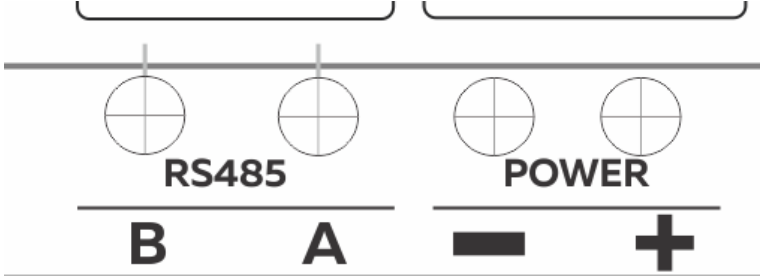
4 x Digital Inputs
4 x Relay Outputs
4 x Transistor Outputs
4 x Analog Inputs 0-10V
4 x Analog Inputs 4-20mA
4 x Analog Outputs 0-10V / 4-20mA
8 x Digital Inputs
16 x Digital Inputs
8 x Relay Outputs
16 x Transistor Outputs
4 x Thermocouple
8 x Transistor Outputs
UART - IO
4 x RTD

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Communication Channels

RS-485 Communication

Communication Mode	HALF-DUPLEX
Transceiver	SN65HVD72
Unit Load	1/4
TX Pin	IO15
RX Pin	IO16
Terminal Arrangement	 The diagram shows a terminal block with four pins. The first two pins are labeled 'RS485' and are connected to terminals 'B' and 'A' respectively. The last two pins are labeled 'POWER' and are connected to terminals '-' and '+' respectively. The terminals are represented by a thick horizontal line with a crossbar and a vertical line extending downwards. The labels 'B', 'A', '-', and '+' are placed below the terminals. The 'RS485' and 'POWER' labels are placed above the terminals. The diagram is enclosed in a rectangular box with a horizontal line at the top and a vertical line on the left.

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GPIO Map

GPIO	Utilisation	
	CPU	Expansion Port
0	BOOT Button	NC
1	SCSN - Ethernet	IO1
2	RSTN - Ethernet	IO2
3	-	-
4	INTN - Ethernet	IO4
5		IO5
6		IO6
7		IO7
8	SDA	SDA
9	SCL	SCL
10		IO10
11	MOSI	MOSI
12	SCLK	SCLK
13	MISO	MISO
14		IO14
15	RS485 - TX	IO15
16	RS485 - RX	IO16
17	MODEM - TX1	TX1
18	MODEM - RX1	RX1
19	USB - DN	D_N
20	USB - DP	D_P
21		IO21
35		IO11
36		IO36
37		IO13
38	PCA9536 - RESET	RST_PCA

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39		IO39
40		IO40
41		IO12
42	SD CARD - CS	NC
45	CS - TFT DISPLAY	NC
46	DC - TFT DISPLAY	NC
47	RESET - TFT DISPLAY	NC
48	INTERRUPT - TOUCH PANEL	NC

Note: For the N16R8 version, these GPIOs are not available. They are supported only on the standard version.

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Expansion Port

PIN INDEX	Purpose	GPIO	SOURCE
1	MOSI	IO11	ESP32-S3
2	MISO	IO13	
3	SCLK	IO12	
4	GND	----	
5	SCL	IO9	
6	SDA	IO8	
7	GND	----	
8	RX1	IO18	
9	TX1	IO17	
10	GND	----	
11	D+	----	
12	D-	----	
13	GND	----	
14	CS1	P1_0	PCA9539 I2C Address 0x75
15	CS2	P0_7	
16	CS3	P0_6	
17	CS4	P0_5	
18	IO1	IO1	ESP32-S3
19	IO2	IO2	
20	IO4	IO4	
21	IO5	IO5	
22	IO6	IO6	
23	IO7	IO7	
24	IO10	IO10	
25	IO11	IO35	
26	IO12	IO41	
27	IO13	IO37	
28	IO14	IO14	
29	RS485_TX	IO15	
30	GND	----	
31	GND	----	
32	RS485_RX	IO16	
33	P1_1	P1_1	PCA9539

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34	P1_2	P1_2	I2C Address 0x75
35	IO21	IO21	ESP32-S3
36	GND	----	
37	GND	----	
38	P1_3	P1_3	PCA9539 I2C Address 0x75
39	P1_4	P1_4	
40	P1_5	P1_5	
41	IO39	IO39	ESP32-S3
42	IO40	IO40	
43	NC	----	
44	NC	----	
45	NC	----	
46	GND	----	
47	5V	5V	
48	GND	GND	
49	24V	24V	
50	24V	24V	

Product Type	MCU / PSRAM	Expansion Compatibility	Notes
Standard Product	ESP32-S3 (N16R2) – PSRAM via QSPI	All expansion modules supported	-
Customized Product	ESP32-S3 (N16R8) – PSRAM via OPI	All except X-Q4 expansion	X-Q4 not supported on this variant

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