

# DATASHEET

NORVI CONTROLLERS  
NORVI CPU-ESPS3-X3

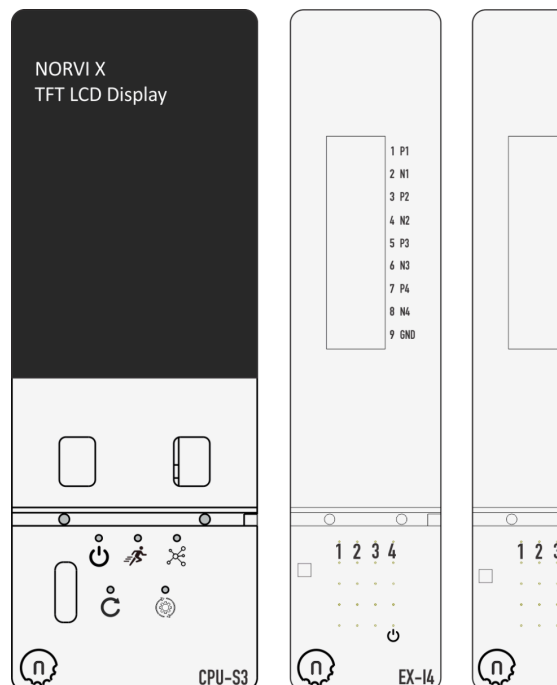
NORVI X is a next-generation modular industrial controller designed to power smart automation and IoT solutions. With a powerful CPU module and plug-and-play expansion modules, it scales up to 200 inputs and outputs – delivering unmatched flexibility, connectivity, and reliability.

## Product Features

- Based on ESP32-S3-WROOM
- TFT SPI Display with touch input
- High-speed 4G LTE Cellular Communication
- Built-in RS-485 Communication
- Built-in Ethernet Communication
- DS3231 RTC
- DIN-Rail mount

## Expansions Supported

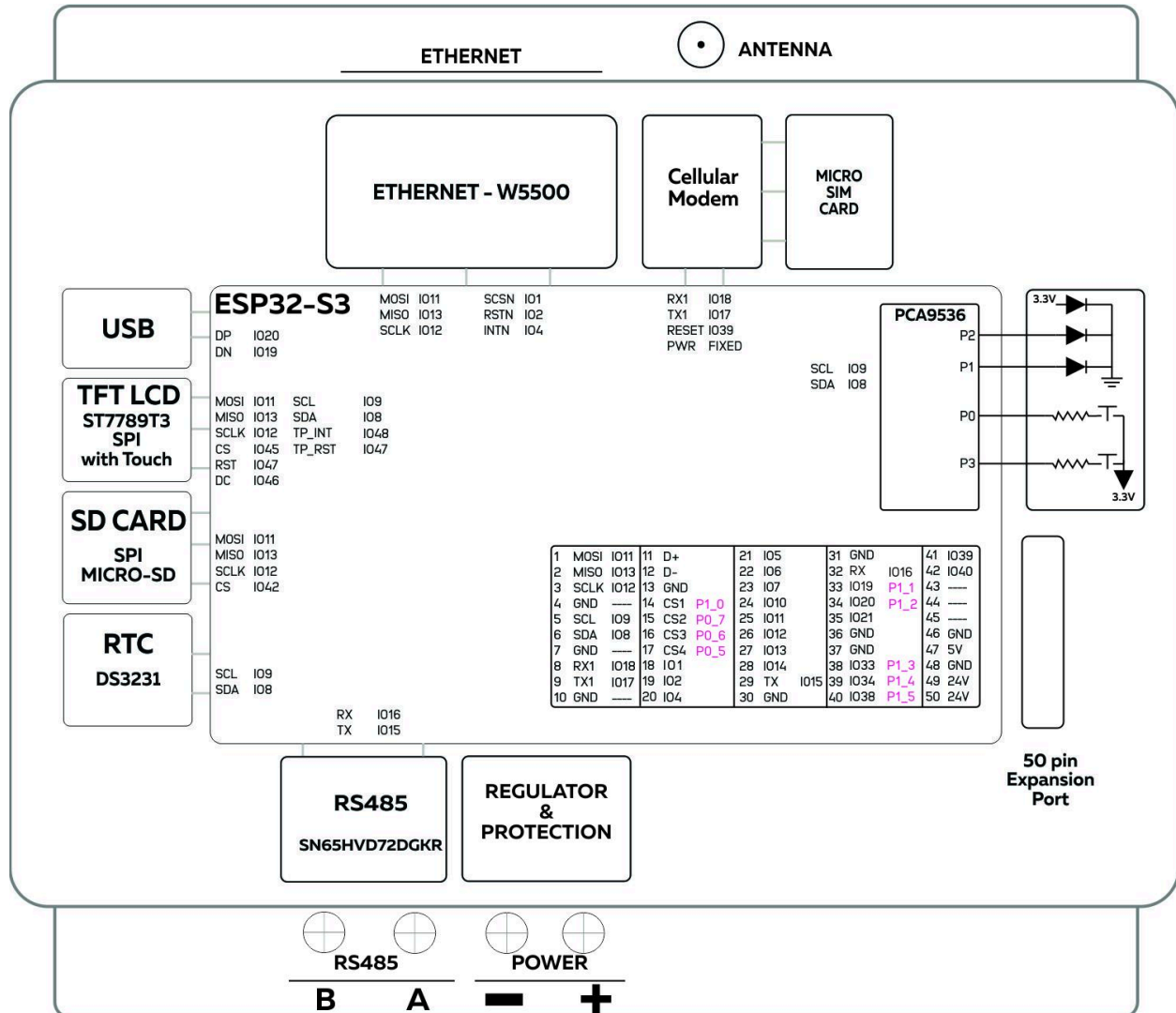
<b>Digital Input Modules</b> 4 x Digital Inputs 8 x Digital Inputs 16 x Digital Inputs	<b>Relay Output Modules</b> 4 x Relay Output 8 x Relay Output	<b>Transistor Output Modules</b> 4 x Transistor Output 8 x Transistor Output 16 x Transistor Output
<b>Analog Input Modules</b> 4 x Analog Inputs 0-10V 4 x Analog Inputs 4-20mA	<b>Analog Output Modules</b> 4 x Analog Outputs 0-10V / 4-20mA	<b>Communication Modules</b> Cellular Modem Quectel EC25 Cellular Modem SIMCOM A7672
<b>Power &amp; Utility Modules</b> 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

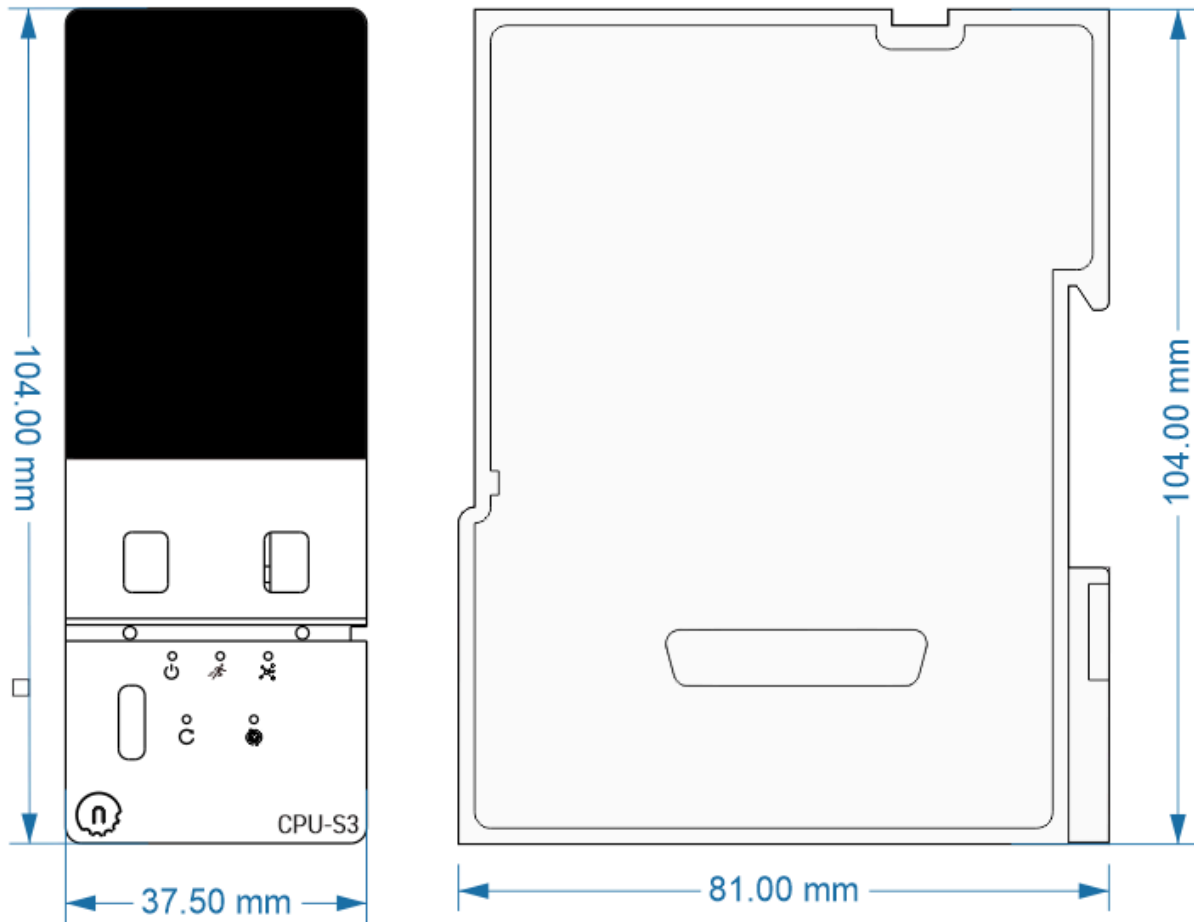
Product Unified Code	NORVI CPU-ESPS3-X3
Product Part Numbers	NORVI CPU-ESPS3-X3

## 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	IO35
MISO	IO37
SCLK	IO36
CS	IO47
RST	IO45
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
Thermocouple x 4
8 x Transistor Outputs
UART - IO
4 x RTD

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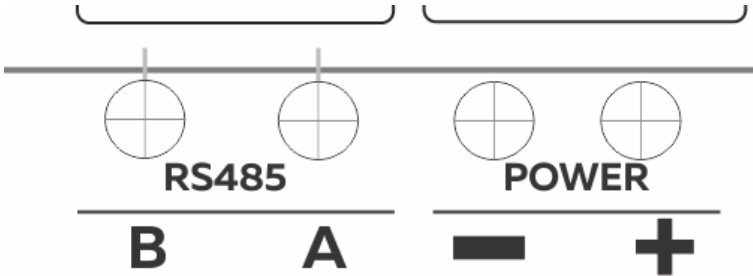
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## EC21 Cellular Communication Specifications

Category	Specification / Feature
Connectivity	LTE, UMTS/HSPA(+), GSM/GPRS/EDGE
Coverage	Worldwide
Power Consumption	Cost-effective, lower-power for broadband IoT applications
GNSS	Multi-constellation GNSS receiver for fast and accurate positioning in any environment
Firmware Features	Supports DFOTA (Device Firmware Over-The-Air) and DTMF
Wireless Technology	MIMO technology for higher data rates and link reliability
Application Focus	Optimized for broadband IoT and wireless communication systems

## Communication Channels

### RS-485 Communication

Communication Mode	HALF-DUPLEX
Transceiver	SN65HVD72
Unit Load	1/4
Flow Control / Direction Control Pin	IO41
TX Pin	IO15
RX Pin	IO16
Terminal Arrangement	

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## GPIO Map

GPIO	Utilisation		Type / RTC	Typical Usage
	CPU	Expansion Port		
0	BOOT Button		I/O/T (Yes)	Boot, GPIO
1	SCSN - Ethernet	IO1	I/O/T (Yes)	ADC input, touch pad
2	RSTN - Ethernet	IO2	I/O/T (Yes)	ADC input, touch pad
3			I/O/T (Yes)	GPIO, JTAG control
4	INTN - Ethernet	IO4	I/O/T (Yes)	ADC input, touch pad
5		IO5	I/O/T (Yes)	ADC input, touch pad
6		IO6	I/O/T (Yes)	ADC input, touch pad
7		IO7	I/O/T (Yes)	ADC input, touch pad
8	SDA	SDA	I/O/T (Yes)	ADC input, touch pad
9	SCL	SCL	I/O/T (Yes)	ADC input, touch pad
10		IO10	I/O/T (Yes)	ADC input, touch pad
11	MOSI	MOSI	I/O/T (Yes)	ADC input, touch pad
12	SCLK	SCLK	I/O/T (Yes)	ADC input, touch pad
13	MISO	MISO	I/O/T (Yes)	ADC input, touch pad
14		IO14	I/O/T (Yes)	ADC input, touch pad
15	RS485 - TX	IO15	I/O/T (Yes)	UART flow control
16	RS485 - RX	IO16	I/O/T (Yes)	UART flow control
17	MODEM - TX1		I/O/T (Yes)	UART TX
18	MODEM - RX1		I/O/T (Yes)	UART RX
19	USB - DN		I/O/T (Yes)	USB / UART1 RTS
20	USB - DP		I/O/T (Yes)	USB / UART1 CTS
21		IO21	I/O/T (Yes)	I <sup>2</sup> C SDA, GPIO
26			I/O/T	PWM, GPIO
27			I/O/T	PWM, GPIO
28			I/O/T	Free only if no PSRAM
29			I/O/T	Free only if no PSRAM

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30			I/O/T	Free only if no PSRAM
31			I/O/T	GPIO, SPI
32			I/O/T	JTAG TCK, GPIO
33			I/O/T	JTAG TDO, GPIO
34			I/O/T	JTAG TDI, GPIO
35		IO11	I/O/T	JTAG TMS, GPIO
36		IO12	I/O/T	Serial RX
37		IO13	I/O/T	Serial TX
38	PCA9536 - RESET		I/O/T	Boot config
39		IO39	I/O/T	Boot config
40		IO40	I/O/T	Differential SPI
41	RS485 - FC		I/O/T	Differential SPI
42	SD CARD - CS			
43				
44				
45	CS - TFT DISPLAY			
46	DC - TFT DISPLAY			
47	RESET - TFT DISPLAY			
48	INTERRUPT - TOUCH PANEL			

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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	IO36	
27	IO13	IO37	
28	IO14	IO14	
29	RS485_TX	IO15	
30	GND	----	
31	GND	----	
32	RS485_RX	IO16	

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33	P1_1	P1_1	PCA9539 I2C Address 0x75
34	P1_2	P1_2	
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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## REACH US

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