

Datasheet

Tungsten HMI

Version 1.2

Revision History

Version	Date	Notes	Contributors	Approver
1.0	4 August 2025	Initial Release	Jody Van Jeremiah Stanek	Pejman Kalkhoran
1.1	9 Sept 2025	Updated TOPS to reflect MediaTek data	Dave Drogowski	Pejman Kalkhoran
1.2	18 Nov 2025	Clarified support for UART/RS485 on J16	Dave Drogowski	Pejman Kalkhoran

Contents

1	Scope.....	4
2	Introduction.....	4
2.1	Key Features.....	4
	Connectivity with Optional Wi-Fi 6/6E and BT 5.4.....	4
	Display and Power.....	4
	ML, Graphics, Camera, Vision, and Audio.....	4
	Memory.....	4
2.2	Application Areas.....	4
	Digital Signage.....	4
	Food and Beverage.....	4
	Industrial Automation.....	4
	Smart Buildings and Smart Cities.....	4
	Medical Devices.....	4
3	Specifications.....	5
3.1	General Specifications.....	5
3.2	Electrical Characteristic and Power Consumption.....	5
4	Tungsten HMI Mechanical Details.....	7
5	Interface Details.....	8
5.1	Multimedia interfaces.....	8
5.2	Audio interfaces.....	9
5.3	Networking interfaces.....	10
5.4	Connectivity ports.....	10
5.5	Miscellaneous interfaces.....	13
6	Storage instructions.....	14
7	Ordering Information.....	14
8	Additional Information.....	15

1 Scope

This document describes key hardware aspects of Ezurio's Tungsten HMI.

Note: Information in this document is subject to change. Contact us for the most updated version of this document.

2 Introduction

Introducing our latest Tungsten Human Machine Interface (HMI), a robust and reliable solution engineered to meet the real-world demands of industrial environments. Proudly made in the USA, this HMI is equipped with the most widely used industrial interfaces, including RS485 and UART, ensuring seamless integration with a broad range of systems. With FCC, CE, and many other certifications already in place, our device is ready for global deployment, helping you speed time-to-market and simplify compliance. The Tungsten HMI can support any of Ezurio's SMARC SOMs and is ideal fit for smart buildings, industrial automation, food and beverage equipment, and medical environments.

- **Pre-configured HMI Platform:** Ready to deploy 10.1" touch display, Tungsten510 SMARC SOM, a dedicated HMI carrier board, all enclosed in a rugged mechanical housing.
- **Powered by Genio510 MediaTek SMARC Tungsten510:** Quad-core Cortex-A55 up to 2GHz, Dual Cortex-A78 up to 2GHz, with 3.2 TOPS AI/Machine Learning Processing Unit, 4K video, audio DSP, and optional Wi-Fi 6 or 6E + Bluetooth 5.4 connectivity.
- **I/O and Interface Flexibility:** Modified carrier board for key interfaces: RS485, serial, SPI, GPIO, USB, HDMI, and audio.
- **Display Size:** 10.1" touch-capacitive display with 1080p60 resolution. 7" and 15.6" touchscreens are available upon request. They are based on the same platform and can be supported through custom design.
- **KIT Configuration Available (-H3):** Ships with power supply and evaluation cables to allow for immediate out-of-box testing and streamlined system bring-up.
- **BOM Simplification:** Pre-integrated solution reduces sourcing complexity, eliminates multi-vendor headaches, and backed by Ezurio's commitment to 10+ year industrial lifecycles.
- **US Based Manufacturing:** Built in our ISO 13485 certified Irvine, California facility.
- **Diverse Software and Board Support Options:** Choose from Yocto and Android BSPs

2.1 Key Features



Connectivity with Optional Wi-Fi 6/6E and BT 5.4

Dual GB Ethernet, RS485, USB-A/C, HDMI, plus best-in-class Wi-Fi and BT Classic / LE connectivity



Display and Power

10.1" Touch-capacitive touchscreen with 24V DC power input. Also available in 7" and 15.6" upon request.



ML, Graphics, Camera, Vision, and Audio

3.2 TOPS Machine Learning, up to 1200p60 or 4Kp30 displays, 2 MIPI-CSI camera interfaces, dedicated Image Signal Processing up to 32 MP, HiFi4 audio DSP



Memory

4GB LPDDR4 and 16GB eMMC

2.2 Application Areas



Digital Signage



Food and Beverage



Industrial Automation



Smart Buildings and Smart Cities



Medical Devices

3 Specifications

3.1 General Specifications

CATEGORY	FEATURE	SPECIFICATION
Processors	Microprocessor	2x Cortex-A78, 4x Cortex®-A55 cores @ up to 2 GHz
	Graphics	Arm Mali-G57 MC2 950MHz
	Machine Learning	AI Accelerator with up to 2.8 TOP/s
Memory	RAM	4GB (For custom sizes, please contact sales)
	Storage	16GB (For custom sizes, please contact sales)
Machine Learning	AI Processing Accelerator	- Fix 8 × Fix 8: 3.2 TOPS - Fix 16 × Fix 8: 1.6 TOPS - Fix 16 × Fix 16: 0.8 TOPS - FP 16/BF 16: 0.8 TOPS
Vision	Camera	2x 4-lane MIPI CSI
	Image Signal Processor	- Single camera: 32MP @ 30fps - Dual camera: 16MP + 16MP @ 30fps - Video High Dynamic Range (HDR) with stagger HDR sensor: up to 12 MP at 30 fps
Display	Touchscreen Display	10.1" Touch-capacitive display with 1280x800 resolution
Audio	Audio Processing and I/O	Tensilica® HiFi 4 DSP, 1x 3.5mm audio connector (speaker and microphone)
Peripherals	Input/Output	2x USB 3.0 (type A) 1x USB 2.0 (type C) 1x HDMI 2x RJ45 gigabit Ethernet connectors 1x RS232 5Mbit/s 1x I2C 1x SPI - Up to 14x GPIO 1x RS485
Optional Wireless Specification	Wi-Fi	Wi-Fi 6
	Frequency	Dual-Band 2.4GHz & 5GHz
	Bluetooth	Bluetooth 5.4
Supply Voltage		12-24 V
Physical	Dimensions	249.4 x 170 x 41.9mm
Environmental	Temp Range	0°C to +40°C
Miscellaneous	Lead Free	Lead-free and RoHS-compliant
Regulatory	Approvals	FCC/IC/CE/MIC/RCM (Optional Wi-Fi Radio)

3.2 Electrical Characteristic and Power Consumption

3.2.1 Absolute Maximum Ratings

Error! Reference source not found. summarizes the absolute maximum ratings and lists the recommended operating conditions for the Tungsten HMI. Absolute maximum ratings are those values beyond which damage to the device can occur. Functional operation under these conditions, or at any other condition beyond those indicated in the operational sections of this document, is not recommended.

Note: Maximum rating for signals follows the supply domain of the signals.

Table 1: Absolute maximum ratings

Symbol (Domain)	Parameter	Min.	Max	Unit
VDD_IN	Input voltage	+5	+36	V
I/O Input/output voltage range	Any I/O pin referred 1.8V tolerant	-0.3	+2.1	V
I/O Input/output voltage range	Any I/O pin referred 3.3V tolerant	-0.3	+3.6	V
T _{STORAGE}	Storage Temperature Range	0	+60	°C
ESD	Electrostatic discharge tolerance	-2000	+2000	V

3.2.2 Recommended Operating Conditions

Table 2: Recommended Operating Conditions

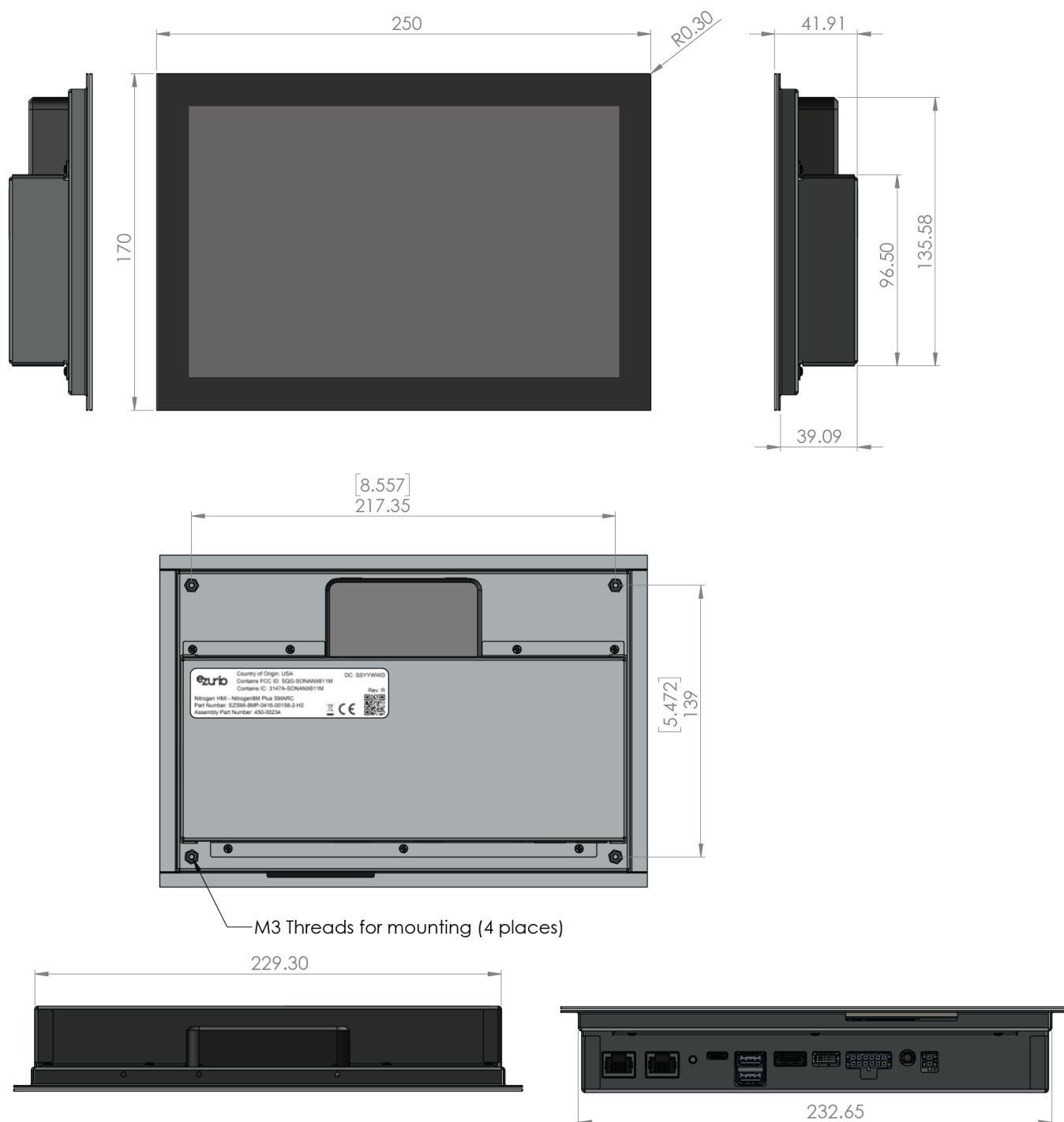
Symbol (Domain)	Parameter	Min	Typ	Max	Unit
I/O voltage range	Any I/O pin referred 1.8V tolerant	1.71	1.8	1.89	V
I/O voltage range	Any I/O pin referred 3.3V tolerant	3.0	3.3	3.6	V
T-ambient	Operating Ambient temperature	0	25	40	°C
	Input voltage	+5V	24	+36V	V

Note: The operating ambient temperature ratings are highly dependent on the design-case, such as the enclosure design, system design, processor activity, GPU/VPU activity, and peripherals used.

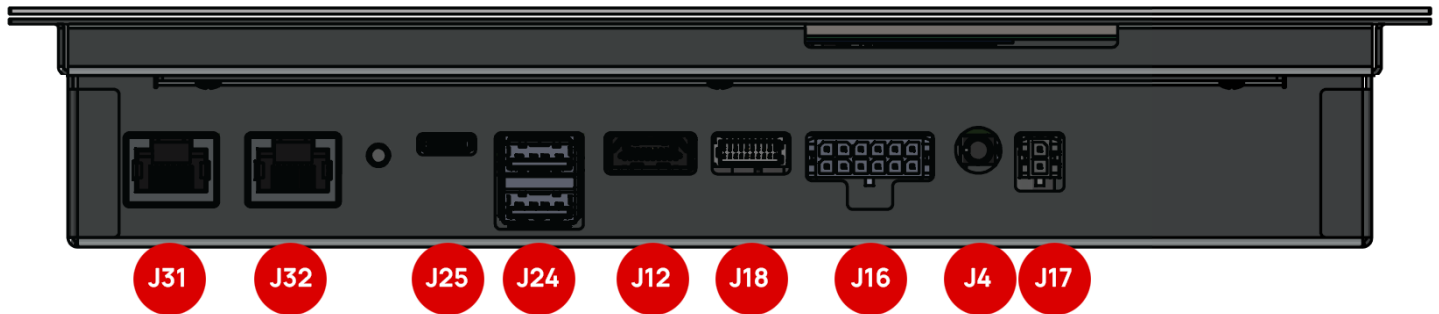
Running over 70° C ambient temperature typically requires the implementation of thermal management strategies such as passive (heatsink/spreader). Please [contact Ezurio](#) if you need information and guidance for thermal management.

4 Tungsten HMI Mechanical Details

Physical dimensions of the Tungsten HMI are shown below.



5 Interface Details



External connectors from the Tungsten HMI are listed in order from left to right in Table 3.

Table 3: Tungsten HMI connectors

Reference	Function	Type
J31	Ethernet0 connector	Link-PP LPJE8802DNL-1
J32	Ethernet1 connector	Link-PP LPJE8802DNL-1
J25	USB Type-C connector	Molex 1054500101
J24	USB 3.0 Host connector	Amphenol GSB311231HR
J12	HDMI connector	Molex 471511041
J18	I2C/SPI/GPIO connector	JST SM20B-SRDS-G-TF
J16	UART/RS485 connector	Molex 0430451200
J4	Headphones jack	Cui SJ-43515TS-SMT-TR
J17	Power in connector	Molex 0430450200

5.1 Multimedia interfaces

Table 4: J12 - HDMI display connector

Pin #	Signal	Pin #	Signal
1	HDMI_D2+ (P92)	2	GND
3	HDMI_D2- (P93)	4	HDMI_D1+ (P95)
5	GND	6	HDMI_D1- (P96)
7	HDMI_D0+ (P98)	8	GND
9	HDMI_D0- (P99)	10	HDMI_CK+ (P101)
11	GND	12	HDMI_CK- (P102)
13	HDMI_CEC (P107)	14	TP7
15	HDMI_CTRL_CK (P105)	16	HDMI_CTRL_DAT (P106)
17	GND	18	5VIN
19	HDMI_HPD (P104)		

Table 6: J21 - LVDS0 display connector

Pin #	Signal	Pin #	Signal
1	3P3V	2	3P3V
3	GND	4	GND
5	LVDS0_D0- (S126)	6	LVDS0_D0+ (S125)
7	GND	8	LVDS0_D1- (S129)
9	LVDS0_D1+ (S128)	10	GND
11	LVDS0_D2- (S132)	12	LVDS0_D2+ (S131)
13	GND	14	LVDS0_CK- (S135)
15	LVDS0_CK+ (S134)	16	GND
17	LVDS0_D3- (S138)	18	LVDS0_D3+ (S137)
19	LCD0_BKLT_EN (S127)	20	LCD0_BKLT_PWM (S141)

Table 7: J22 - LVDS1 display connector

Pin #	Signal	Pin #	Signal
1	3P3V	2	3P3V
3	GND	4	GND
5	LVDS1_D0- (S112)	6	LVDS1_D0+ (S111)
7	GND	8	LVDS1_D1- (S115)
9	LVDS1_D1+ (S114)	10	GND
11	LVDS1_D2- (S118)	12	LVDS1_D2+ (S117)
13	GND	14	LVDS1_CK- (S109)
15	LVDS1_CK+ (S108)	16	GND
17	LVDS1_D3- (S121)	18	LVDS1_D3+ (S120)
19	LCD1_BKLT_EN (S107)	20	LCD1_BKLT_PWM (S122)

Table 8: J23 - LVDS touch connector

Pin #	Signal	Pin #	Signal
1	5VIN	2	5VIN
3	ESPI_ALERT0# (S43)	4	SMBUS_IRQ_1V8# (P1)
5	I2C_PM_DAT (P122)	6	I2C_PM_CK (P121)
7	GND		

5.2 Audio interfaces

Table 9: J4 - Headphones jack connector

Pin #	Signal	Pin #	Signal
1	MIC_IN_P / IN2P (XTAC5112IRGER)	2	OUT1P (XTAC5112IRGER)
3	OUT2P (XTAC5112IRGER)	4	GND
5	GPI1 / HP_DET (XTAC5112IRGER)		

Table 10: J8 - Microphone connector

Pin #	Signal	Pin #	Signal
1	GND	2	MIC_IN2_P / IN1P (XTAC5112IRGER)
3	GPIO2 / MIC_DET (XTAC5112IRGER)		

Table 11: J5 - Left speaker connector

Pin #	Signal	Pin #	Signal
1	OUTLM (TPA2012D2)	2	OUTLP (TPA2012D2)

Table 12: J7 - Right speaker connector

Pin #	Signal	Pin #	Signal
1	OUTRP (TPA2012D2)	2	OUTR (TPA2012D2)

5.3 Networking interfaces

Table 13: J31 - Ethernet0 connector

Pin #	Signal	Pin #	Signal
1	GBE0_MDIO+ (P30)	2	GBE0_MDIO- (P29)
3	GBE0_MDIO1+ (P27)	4	GBE0_MDIO2+ (P24)
5	GBE0_MDIO2+ (P23)	6	GBE0_MDIO1- (P26)
7	GBE0_MDIO3+ (P20)	8	GBE0_MDIO3- (P19)

Table 14: J32 - Ethernet1 connector

Pin #	Signal	Pin #	Signal
1	GBE1_MDIO+ (S17)	2	GBE1_MDIO- (S18)
3	GBE1_MDIO1+ (S20)	4	GBE1_MDIO2+ (S23)
5	GBE1_MDIO2+ (S24)	6	GBE1_MDIO1- (S21)
7	GBE1_MDIO3+ (S26)	8	GBE1_MDIO3- (S27)

5.4 Connectivity ports

Table 15: J16 - UART/RS485 connector

Pin #	Signal	Pin #	Signal
1	Unused	2	Unused
3	SER1_TX (P134) RS-232	4	SER1_RX (P135) RS-232
5	GND	6	GND
7	Unused	8	Unused
9	B (THVD1400DR) RS485	10	A (THVD1400DR) RS485
11	GND	12	GND

Table 16: J18 - I2C/SPI/GPIO connector

Pin #	Signal	Pin #	Signal
1	1P8V	2	SD1 (TCA9546APWR)
3	3P3V	4	SC1 (TCA9546APWR)
5	GPIO2/CAM0_RST (P110)	6	GND
7	GPIO9 (P117)	8	ESPI_CS0# (P54)
9	RESERVED_05 (S4)	10	ESPI_CS1# (P55)
11	SDIO_WP (P33)	12	ESPI_IO_1 (P58)
13	HDA_SYNC/I2S2_LRCK (S50)	14	ESPI_IO_0 (P57)
15	HDA_CK/I2S2_CK (S53)	16	GND
17	HDA_SDI/I2S2_SDIN (S52)	18	ESPI_CK (P56)
19	HDA_SDO/I2S2_SDOOUT (S51)	20	GND
SH1	GND	SH2	GND

Table 17: J25 - USB TypeC connector

Pin #	Signal	Pin #	Signal
A1	GND	B1	GND
A2	NC	B2	NC
A3	NC	B3	NC
A4	VBUS	B4	VBUS
A5	NC	B5	NC
A6	USB0_D+ (P60)	B6	USB0_D+ (P60)
A7	USB0_D- (P61)	B7	USB0_D- (P61)
A8	NC	B8	NC
A9	VBUS	B9	VBUS
A10	NC	B10	NC
A11	NC	B11	NC
A12	GND	B12	GND

Table 18: J24 - USB 3.0 Host connector

Pin #	Signal	Pin #	Signal
1	VBUS	2	USB3_D- (S69)
3	USB3_D+ (S68)	4	GND
5	USB3_SSRX- (S66)	6	USB3_SSRX+ (S65)
7	GND	8	USB3_SSTX- (S63)
9	USB3_SSTX+ (S62)	10	VBUS
11	USB2_D- (P70)	12	USB2_D+ (P69)
13	GND	14	USB2_SSRX- (S75)
15	USB2_SSRX+ (S74)	16	GND
17	USB2_SSTX- (S72)	18	USB2_SSTX+ (S71)
19	GND	20	GND
21	GND	22	GND

Table 19: J15 - M.2 connector

Pin #	Signal	Pin #	Signal
1	GND	2	3P3V
3	USB4_D+ (S35)	4	3P3V
5	USB4_D- (S36)	6	NC
7	GND	8	NC
9	SDIO_CLK (P36 if R282 stuffed)	10	NC
11	SDIO_CMD (P34 if R283 stuffed)	12	NC
13	SDIO_D0 (P39 if R284 stuffed)	14	NC
15	SDIO_D1 (P40 if R285 stuffed)	16	NC
17	SDIO_D2 (P41 if R286 stuffed)	18	3P3V
19	SDIO_D3 (P42 if R287 stuffed)	20	NC
21	SDIO_CD (P35 if R288 stuffed)	22	SER0_TX (P129)
23	CARRIER_PWR_ON (S154)	24	NC
25	NC	26	NC
27	NC	28	NC
29	NC	30	NC
31	NC	32	SER0_RX (P130)
33	3P3V	34	SER0_CTS# (P132)
35	PCIE_A_TX_P (P89)	36	SER0_RTS# (P131)
37	PCIE_A_TX_N (P90)	38	SPI0_DO (P46)
39	3P3V	40	SPI0_DIN (P45)
41	PCIE_A_RX_P (P86)	42	SPI0_CK (P44)
43	PCIE_A_RX_N (P87)	44	NC
45	3P3V	46	NC
47	PCIE_A_REFCK+ (P83)	48	NC
49	PCIE_A_REFCK- (P84)	50	CLK_OUT (RV-3028-C7TAQC)
51	3P3V	52	PCIE_A_RST# (P75)
53	PCIE_CLK_REQ (P78)	54	NC
55	PCIE_WAKE# (S146)	56	SDIO_PWR_EN (P37)
57	3P3V	58	SD3 (TCA9546APWR)
59	NC	60	SC3 (TCA9546APWR)
61	NC	62	GPIO11 (P119)
63	3P3V	64	SPI0_CS0# (P43)
65	NC	66	NC
67	NC	68	NC
69	3P3V	70	NC
71	NC	72	3P3V
73	NC	74	3P3V
75	GND		

Table 20: J26 - SD Card connector

Pin #	Signal	Pin #	Signal
1	SDIO_D2 (P41)	2	SDIO_D3 (P42)
3	SDIO_CMD (P34)	4	3P3V
5	SDIO_CLK (P36)	6	GND
7	SDIO_D0 (P39)	8	SDIO_D1 (P40)
9	GND	10	NC
11	GND	12	SDIO_CD (P35)

Table 21: J2 - USB (Molex Connector)

Pin #	Signal	Pin #	Signal
1	VBUS	2	USB1_D-
3	USB1_D+	4	GND

5.5 Miscellaneous interfaces

Table 22: J17 - Power in connector

Pin #	Signal	Pin #	Signal
1	24V	2	GND

Table 23: BT1 - RTC Battery socket

Pin #	Signal	Pin #	Signal
1	3V	2	GND

6 Storage instructions

Required Storage Conditions:

- **Prior to Opening the Dry Packing**

The following are required storage conditions prior to opening the dry packing:

- Normal temperature: 5~40°C
- Normal humidity: 80% (Relative humidity) or less

7 Ordering Information

Order Model	Description
EZSM-510-0416-00176-2-H3	Kit / HMI Carrier / Tungsten510 SMARC / 4GB Flash / 16GB Memory / Sona™ MT320 (antenna on back)
EZSM-510-0416-00176-2-H2	HMI Carrier / Tungsten510 SMARC / 4GB Flash / 16GB Memory / Sona™ MT320 (antenna on back)

8 Additional Information

Please contact your local sales representative or our support team for further assistance:

Headquarters	Ezurio 50 S. Main St. Suite 1100 Akron, OH 44308 USA
Website	http://www.ezurio.com
Technical Support	http://www.ezurio.com/resources/support
Sales Contact	http://www.ezurio.com/contact

Note: Information contained in this document is subject to change.

Ezurio's products are subject to standard [Terms & Conditions](#).

© Copyright 2025 Ezurio All Rights Reserved. Any information furnished by Ezurio and its agents is believed to be accurate but cannot be guaranteed. All specifications are subject to change without notice. Responsibility for the use and application of Ezurio materials or products rests with the end user since Ezurio and its agents cannot be aware of all potential uses. Ezurio makes no warranties as to non-infringement nor as to the fitness, merchantability, or sustainability of any Ezurio materials or products for any specific or general uses. Ezurio or any of its affiliates or agents shall not be liable for incidental or consequential damages of any kind. All Ezurio products are sold pursuant to the Ezurio Terms and Conditions of Sale in effect from time to time, a copy of which will be furnished upon request. Nothing herein provides a license under any Ezurio or any third-party intellectual property right. Ezurio and its associated logos are trademarks owned by Ezurio and/or its affiliates.