WIHART2/WISA2 and Dual-Boot Wireless Module Hardware Integration Manual

Version 1.3

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1. Introduction

The purpose of this integration manual is to provide comprehensive specifications and details needed for engineers to integrate the WIHART2/WISA2 module into a novel or existing product. The WIHART2/WISA2 wireless module is a drop-in replacement for Centero's first generation WIHART/WISA wireless module.

The WIHART2/WISA2 wireless module hardware model and part number is CW-24-200.

The document collects and presents the WIHART2/WISA2 module:

- Functional specifications

- Electrical characteristics

- Pinout and connectivity interfaces

- Mechanical drawings

- Wireless module integration instructions to ensure compliance to FCC and ISED

- RF

It also provides the necessary specifications to:

- connect the WIHART2/WISA2 module to an external application processor that runs the ISA100 application layer firmware

- connect the WiHART module to an external application processor that runs HART/WirelessHART™ application layer firmware

The WiHART module is pre-loaded with a WirelessHART™ compliant and certified communication stack.

The WISA module is pre-loaded with an ISA100 Wireless compliant and certified communication stack.

The module is also offered in dual-boot ISA100/WirelessHART™ mode where the stack being loaded at boot time is dependent on the state of a digital input.

1.1 *Audience*

This manual is intended for hardware and integration engineers.

1.2   *Revision History*

Revision History

Rev.	Date	Description
1.0	October 4, 2016	Initial baseline document.
1.1	December 14, 2017	Updated to include functional details related to connectivity.
1.2	March 9 ,2017	Revised pin definitions. Added PCB stack-up, drawings and block diagram.
1.3	June 30, 2017	Revised section 5 – connectivity to external application processor.
1.4	July 11, 2017	Added mechanical drawings.
1.8	April 22, 2018	Added Manufacturing Information section.
1.81	May 18, 2018	Added RoHS compliance statement.
1.83	August 24, 2018	Changed max voltage of any digital I/O to 3.3 V.
1.85	March 2, 2019	Minor revisions.
1.90	October 16, 2019	Cosmetic revisions to the WiHART module connectivity – no impact on functionality.
1.91	January 8, 2020	Following additional measurement, extended the supply voltage range to 2.9 V.
1.92	February 27, 2020	Revised V_LDO_OUT parameter to reflect extended voltage range.
2.0	February 26, 2021	Added reference design schematics for WISA, WiHART and Dual-Boot modules.
1.0	July 14, 2024	Reset revision number and revised entire document for the second generation WIHART2 and WISA2 drop in replacement module
1.1	January 8, 2025	Editorial revision of some of the JTAG pin names.

1.2	February 28, 2025	Revised various pictures to show correct FCC and IC ID numbers.
1.3	June 12, 2025	Revised to comply with FCC/ISED documentation requirements.

1.3 *Definitions, Acronyms, and Abbreviations*

The following list defines the acronyms and abbreviations used in this document.

ADC	Analog to Digital Converter
AES	Advanced Encryption Standard
CTS	Clear to Send
DAC	Digital to Analog Converter
DMA	Direct Memory Access
FEM	Front End Module
I2C	Inter-Integrated Circuit is a multi-master serial computer bus
ISM	Industrial Scientific Medical 2.4 GHz radio frequency band
JTAG	Joint Test Action Group
LDO	Low Drop Regulator
LGA	Land Grid Array
MAC	Media Access Controller
MCU	Microcontroller Unit
MEMS	Micro Electro Mechanical Systems
MMCX	Micro Miniature Coaxial
NEXUS	An embedded processor development tool interface that helps design engineers identify software and hardware-level issues.
PA	Power Amplifier
PCB	Printed circuit board
SiP	Platform in Package
PWM	Pulse-width modulation
RTC	Real Time Clock
RTS	Request to Send
SPI	Serial Peripheral Interface
SSI	Synchronous Serial Interface
USB	Universal Serial Bus
VCP	Virtual Com Port

2. Description and Functional Specifications

2.1 *General Features*

The WIHART2/WISA2 wireless module is centered on the Silicon Labs EFR32MG24 chipset, a cutting-edge IEEE 802.15.4 platform. The wireless module integrates a low-power 2.4 GHz radio frequency transceiver. Operating within the 2400-2483.5 MHz band and optimized with a RF matching network for +16dBm output power, the module is designed to support industrial wireless applications compliant with standards like ISA100.11a and WirelessHART. Its System on Chip (SoC) architecture combines a radio and microcontroller, offering a cost-effective solution with a compact form factor that leads the market.

- Multi-protocol support for 802.15.4 based ISA100/WirelessHART and Bluetooth Low Energy (BLE)
- Drop-in replacement for Centero's 1st generation WIHART/WISA wireless module
- The CW24-200 is an IEEE 802.15.4 compliant wireless module offered in three models:
  - WISA2 – CW-24-200 module loaded with a certified ISA100 Wireless communication stack
  - WIHART2 – CW-24-200 module with a compliant/certifiable WirelessHART stack
  - Dual-boot - CW-24-200 module with a both the ISA100 Wireless and WirelessHART communication stacks, will boot into one or the other based on the state of a digital pin
- Based on Silicon Labs' EFR32MG24 chipset, a complete, low power, 2.4 GHz SoC, 32-bit ARM core based MCU, hardware acceleration for both the IEEE 802.15.4 MAC and AES security
- State-of-the-art security as it includes Silicon Labs' Secure Vault™, a PSA Level 3 certification which is the highest level of IoT security protection
- On-chip over-the-air (OTA), secure upgrades – all communication stacks can be upgraded wirelessly via a secured, authenticated mechanism.
- Market leading sensitivity of -104 dBm with maximum link budget of 120 dB (ISA100), 114 dB (WirelessHART) and 113 dB (Bluetooth Low Energy)
- Specifically designed for integration in intrinsically safe (Exi) compliant or certified devices
- Wireless features and capabilities
  - Single-ended output RF port from the EFR32MG
  - Maximum -105 dBm sensitivity at MMCX port
  - Programmable output power range from -5 dBm to +16 dBm
  - Hardware-based dynamic control of external RF elements
  - External antenna connectivity via MMCX RF direct connect or RF output pin (for PCB antennas external matching circuitry)
  - Includes Faraday shield for FCC and other regulatory compliance
- Ready for automated assembly as it is offered in JEDEC compliant trays for automated pick-n-place assembly
- On-board regulator provides power for external circuitry - no need for additional external voltage regulation results in low product cost and size
- System clock options supporting ISA100 and WirelessHART tight time synchronization requirements

The WIHART2/WISA2 module is offered in a surface mountable, castellated PCB form factor and the user interface exposes various serial interfaces, MCU digital/analog I/Os and power. Firmware development and debugging are supported through the JTAG SWD port which is also exposed through the castellated PCB pins.

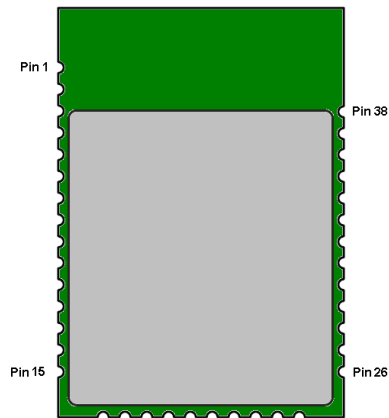The figure below depicts a the WIHART2/WISA2 module's form factor.

Figure 1 – WIHART2/WISA2 Module Form Factor

The figure below shows the markings present on the WIHART2/WISA2 module.
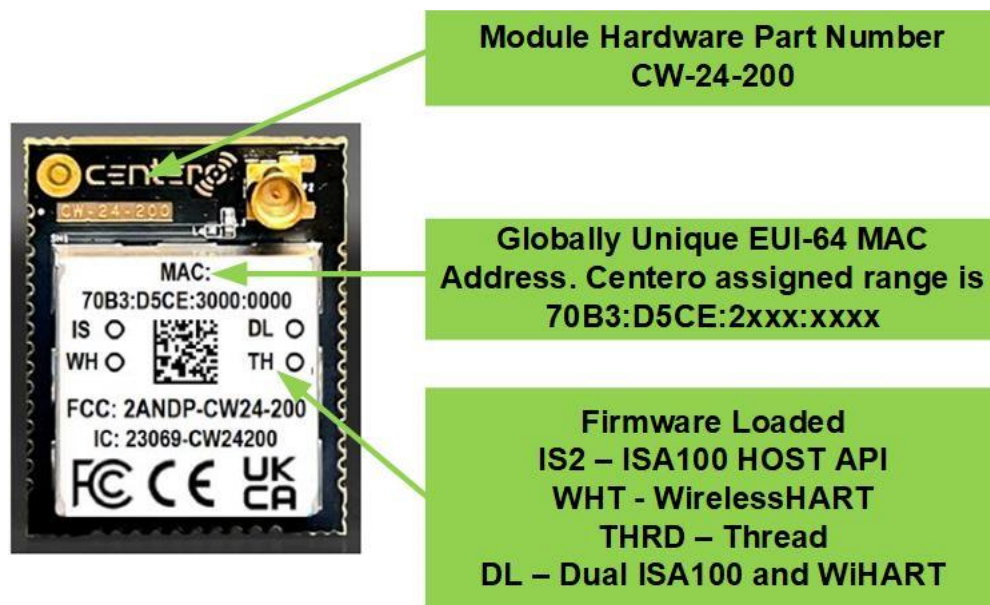
Figure 2 – WIHART2/WISA2 Module Markings

2.2 *Features and Functional Specifications*

3. Specifications and Performance Parameters

3.1 *Electrical Specifications*

PARAMETER	MIN	TYPICAL	MAX	UNITS	NOTES/CONDITIONS
Supply Voltage (VCC)	2.9 V	3.3 V	4.2 V	V	Max 6V for 10 seconds
Supply Voltage Noise	0	0	200	mVPP	50Hz – 15MHz
Regulated Voltage Output	VCC-200 mV (non-reg if VCC <3.2 V)	3.00	3.02	V	Supplied to external circuitry via pin V_LDO_OUT (PIN 29). Please note that if VCC > 3.2 then voltage output is 3.0. If VCC < 3.2, voltage output if VCC-200 mV non-regulated.
Regulated Voltage Output Noise	30	35	40	mVPP	Supplied to external circuitry via pin V_LDO_OUT (PIN 29)
LDO Output Max Current	0	0	25	mA	Maximum current supplied by V_LDO_OUT (PIN 29)
Voltage on any digital I/O	0	3.0	3.3	V	CMOS compatible
Voltage on any analog I/O	0	3.0	VREF	V	Internal VREF is 3.0 V
Idle mode current	3.0	4.5	6	mA	At 25° C
Transmit Current - 802.15.4 and BLE at 0 dBm	22	23	27	mA	At 25° C
Transmit Current - 802.15.4 and BLE at 10 dBm	56	59	61	mA	At 25° C
Transmit Current - 802.15.4 and BLE at 16 dBm	116	119	124	mA	At 25° C
Receive Current 802.15.4	11	11.5	12	mA	At 25° C
Receive Current BLE – 1 MBPS PHY	7	7.5	8	mA	At 25° C
Receive Current BLE – 2 MBPS PHY	8	8.5	9	mA	At 25° C
Sleep Current	1.8	2	5	µA	At 25° C

3.2   RF Specifications

Parameter	MIN	TYPICAL	MAX	Units	Notes/Conditions
802.15.4 Frequency range	2400	NA	2475	MHz	
Range (outdoor line-of-sight)			0.75 miles (1200 meters)	Miles/ Meters	<5% PER for 20-byte packets (using +2 dBi antenna isotropic antenna)
Range (indoor/industrial/urban)			1000 ft (300 m)	Feet/ Meters	5% PER for 20-byte packets (using +2 dBi antenna isotropic antenna)
Number of Frequency Channels		15			IEEE 802.15.4 frequency channels. Channel 26 is no used due to FCC regulatory
Occupied Channel BW		2.65 MHz			Per IEEE 802.15.4 standard specification.
Channel Separation		5 MHz			Per IEEE 802.15.4 standard specification.
Modulation		Q-PSK			Per IEEE 802.15.4 standard specification.
Raw Data Rate		250 kbps			Per IEEE 802.15.4 standard specification.
Frequency Accuracy	-10	Frequency	+10	ppm	±4 ppm at +25 °C
RF Transmitter					
RF Output Power	-5	0	+16	dBm	Programmable. Note: When transmitting on channel 26, output power should not exceed -4 dBm to meet FCC Part 15
RF Receiver					
RF Sensitivity – 802.15.4	-103	-104	-105	dBm	<1% PER for 20-byte packets per 802.15.4 -2003 standards specification.

Bluetooth Low Energy – 1 Mbps GFSK	-96	-97	-98	dBm	<1% PER for 20-byte packets per 802.15.4 -2003 standards specification.
Bluetooth Low Energy – 2 Mbps GFSK	-93	-94	-94	dBm	
Antenna Port					
Connector – antenna port		MMCX		NA	
Impedance		50		Ω	

3.3 Mechanical and Board Specifications

Parameter	MIN	TYP	MAX	Units	Notes/Conditions
Size – Module with Shield Mounted	0.8" x 1" x 0.2" 20.5 x 25.5 x 5.25			inches mm	
Form Factor	Surface Mount			NA	
Layer build (PCB) width		1.6		mm	1.57mm option 4-Layer board
Dielectric material (PCB)		FR4		NA	FR4

3.4 Environmental Specifications

Parameter	MIN	TYP	MAX	Units	Notes/Conditions
Temperature					
Operating temperature (see note)	-40	+25	+85	°C	
Storage temperature	-40	+25	+85	°C	
Operating Relative Humidity	10		90	%	Non-condensing humidity

3.5 User Interfaces

User Interfaces

UART Ports	Two (2) – for data interface with WirelessHART communication stack See table detailing WISA2/WIHART2 module pin definition.
SPI Ports	One (1) - See table detailing WISA2/WIHART2 module pin definition.
I2C port	One (1) - Need external pull-up resistors. See table detailing WISA2/WIHART2 module pin definition.
JTAG debug port	One (1) - See table detailing WISA2/WIHART2 module pin definition.
GPIOs	5 (dedicated)
ADC Inputs	3 inputs - One dedicated ADC input. Two inputs can also be used as GPIOs. Two additional pins provided for connectivity to external voltage reference.

3.6 Regulatory Compliance

Compliance Type	Status	Notes
EMI/RF Compliance – USA	Certified	FCC Section 15, Part 247 – modular certification – see antenna list
EMI/RF Compliance – Canada	Certified	IC RSS 210 – modular certification Canada: IC RSS-247/RSS-GEN – modular certification (see antenna list)
EMI/RF – EU/UKCA	Certified	CE-Approval –R&TTE Directive Modular certification – see antenna list Compliant to RED & EMCD 2014/53/EU, 2014/30/EU EN 300-328 V2.2.2 (includes receiver blocking and intentional spurious emissions).
RoHS	Compliant	Directive 2015/863 commonly referred to as RoHS 3.
HAZLOC and Intrinsic Safety	Compliant	Designed to pass intrinsic safety compliance tests. This include following design considerations: • Minimizing overall lump capacitance • Minimizing overall lump inductance • Minimizing the passive component energy storage capacity of the WISA2/WIHART2 module in order to prevent sparking

	Not including any voltage enhancing devices (such as boost regulators or doublers)

4. Interface and Pinout

This chapter provides a description of the WIHART2/WISA2 module interfaces, pinout and associated functionality.

4.1 *User Interface*

The user interface is exposed through a standard castellated 1.27 mm pitch PCB pinout (see Figure 2 below).
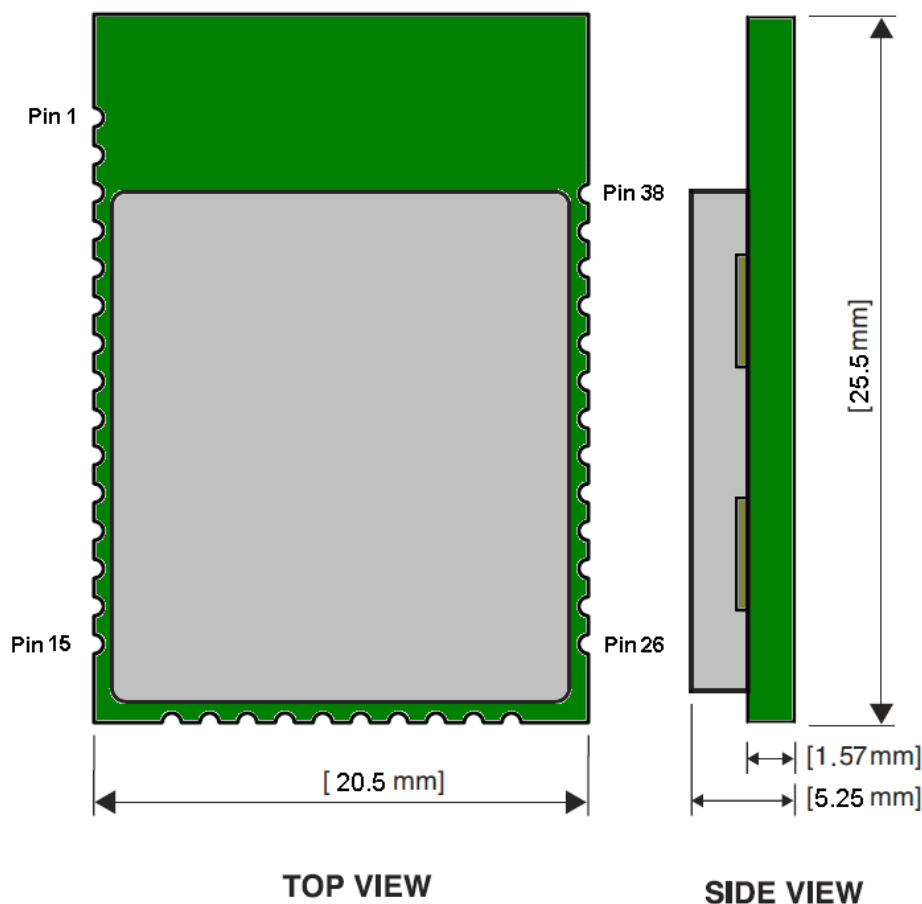

Figure 3 Interface Locations and Pinout

The interface provides access to selected micro-controller GPIOs and serial interface ports. Power is also provided through this interface.

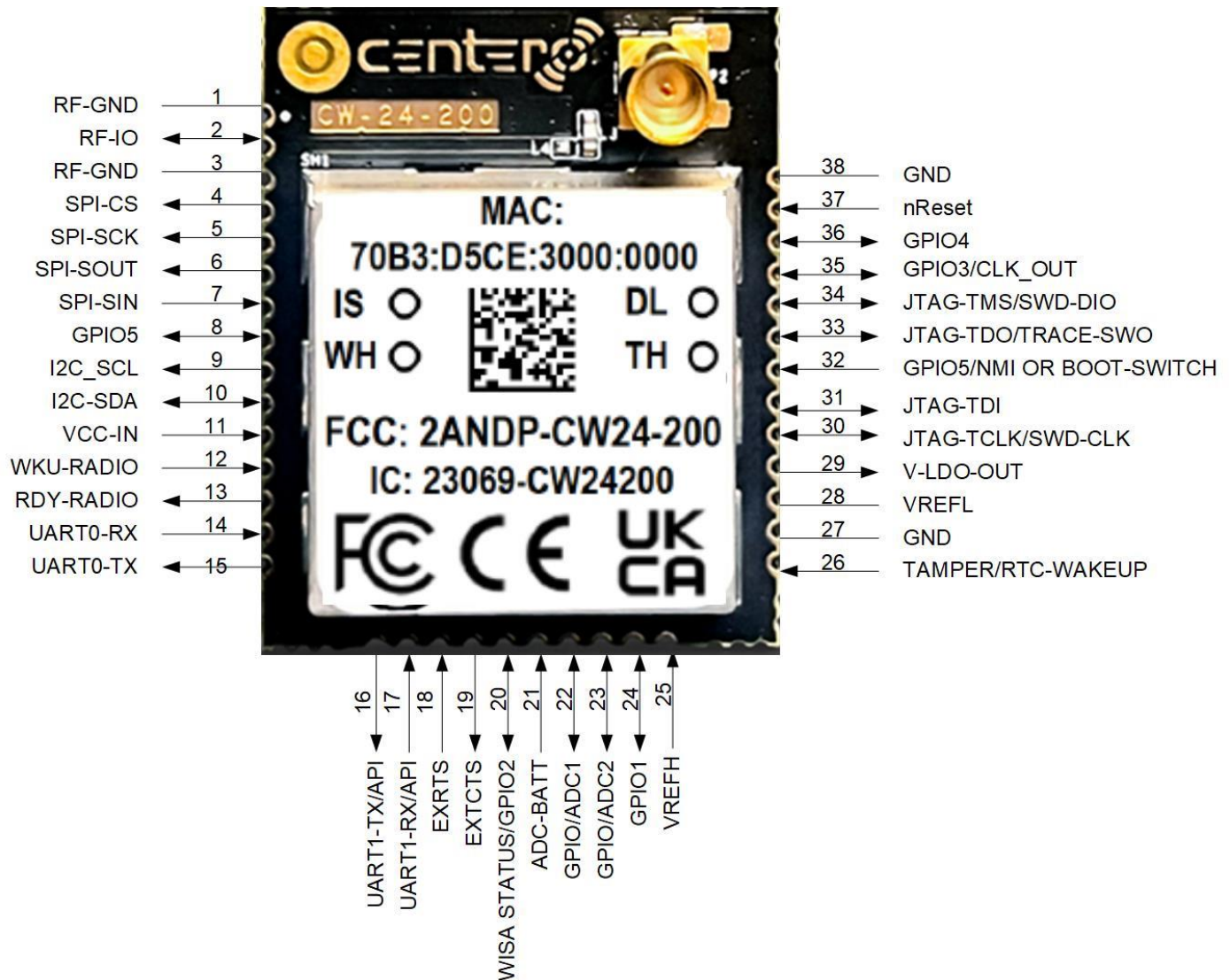The figure below shows the pinout of the WIHART2/WISA2 module.

Figure 4 WIHART2/WISA2 Module - Interface and Pinout

4.2   *WIHART2/WISA2 Module- Pin Definition and Functionality*

The table below lists the pins exposed through the WIHART2/WISA2 module interface. It also describes the functionality associated with each pin.

| No.	Name	Description	Type	Direction	Functionality
1	RF-GND	Ground	Power	NAPP	Ground to be used for RF IO signal.
2	RF-IO	RF Signal	RF	I/O	RF port signal routed to an external board when C26 is populated and C22 is not populated. For PCB antennas or external matching circuitry.
3	RF-GND	Ground	Power	NAPP	Ground to be used for RF IO signal.
4	SPI-CS	SPI Chip Select	DIG	OUT	Standard SPI communication chip select signal.
5	SPI-SCK	SPI Clock	DIG	OUT	Standard SPI communication clock signal.
6	SPI-SOUT	SPI Data Out	DIG	OUT	Standard SPI communication data out signal (MOSI – Master Output Slave Input).
7	SPI-SIN	SPI Data In	DIG	IN	Standard SPI communication data in signal (MISO – Master Input Slave Output).
8	GPIO5	General Purpose I/O	DIG	I/O	General purpose digital I/O.
9	I2C-SCL	I2C Clock	DIG	OUT	I2C clock output – pull-up resistors need to be provided externally.
10	I2C-SDA	I2C Serial Data Line	DIG	I/O	I2C serial data – pull-up resistors need to be provided externally.
11	VCC-IN	Supply Voltage	POWER	NAPP	Supply voltage – provide external 3.3 VDC.

12	WKU-RADIO	Wake-up signal for external application processor	DIG	IN	Digital line used by the application processor to wake up WIHART2/WISA2 module from sleep mode. The signal is active high and notifies the WIHART2/WISA2 module that the application processor intends to communicate. When line is active the WIHART2/WISA2 module will not enter the low-power sleep mode.
13	RDY-RADIO	Ready signal for external application processor	DIG	OUT	Digital line used by WIHART2/WISA2 module to wake up the external application processor. Connect to external application processor GPIO.
14	UART0-RX	UART0 Receive Data	DIG	IN	UART used for the bootloader, wired firmware upgrades and serial debug interface (when module is running Hardware Test Firmware)
15	UART0-TX	UART0 Transmit Data	DIG	OUT	UART used for the bootloader, wired firmware upgrades and serial debug interface (when module is running Hardware Test Firmware)
16	UART1-TX/ API	UART1 Transmit Data	DIG	OUT	UART TX signal used for communication with the external application processor. Connect to RX signal of the application processor UART.
17	UART1-RX/ API	UART1 Receive Data	DIG	IN	UART RX signal used for communication with the external application processor. Connect to TX signal of the application processor UART.
18	EXTRTS	UART1 Clear to Send	DIG	IN	UART CTS signal used for communication with external application processor. Connect to RTS (OUTPUT) signal of the application processor UART.

19	EXTCTS	UART1 Request to Send	DIG	OUT	UART RTS signal used for communication with external application processor. Connect to CTS (INPUT) signal of the application processor UART.
20	WISA STATUS/GPIO2	General Purpose I/O	DIG	I/O	ISA100 Wireless wakeup/status/provisioning signal, typically connected to a push-button. Holding this signal low for > 30 seconds will cause the WISA module ISA100 stack to erase its provisioning information to the factory default state and unjoin the ISA100 network. No WiHART functionality associated to this pin.
21	ADC-BATT	Analog Input for Battery	ANALOG	IN	Analog input used to read battery voltage level.
22	GPIO/ADC1	General Purpose I/O	DIG	I/O	General purpose digital I/O. Alternate functionality: Analog input to ADC.
23	GPIO/ADC2	General Purpose I/O	DIG	I/O	General purpose digital I/O. Alternate functionality: Analog input to ADC.
24	GPIO1	General Purpose I/O	DIG	I/O	General purpose digital I/O.
25	VREFH	ADC Voltage Reference	POWER	IN	External high voltage reference for the ADC. Connect to external 3.0 VDC reference. If not connected to and external 3.0 VDC reference, connect to WIHART2/WISA2 pin 29, V—LDO-OUT.
26	TAMPER/RTC-WAKEUP	Tamper detect.	DIG	IN	Tamper detect digital line.

					Alternate functionality: Real-time clock wake-up.
27	GND	Ground	POWER	NAPP	Ground.
28	VREFL	ADC Voltage Reference	POWER	NAPP	Voltage reference for the ADC. Connect to GND.
29	V—LDO-OUT	Power output.	POWER	NAPP	Voltage output of the internal LDO at 3.0 VDC – can be used to power external sensing/control circuitry. Limit current draw on this pin to <25 mA.
30	JTAG-TCLK/SWD-CLK	JTAG	DIG	I/O	JTAG clock signal – SWD-CLK.
31	JTAG-TDI	JTAG	DIG	I/O	JTAG TDI signal.
32	GPIO5/NMI OR BOOT-SWITCH	General Purpose I/O or BOOT-SWITCH	DIG	I/O	BOOT-SWITCH signal read by the bootloader at start-up. The status of this pin dictates the firmware image that will be loaded (HIGH -> ISA100, LOW ->WirelessHART). General purpose digital I/O with non-masking interrupt.
33	JTAG-TDO/TRACE-SWO	JTAG	DIG	I/O	JTAG SWO signal. Traditional serial JTAG Trace signal.
34	JTAG-TMS/SWD-DIO	JTAG	DIG	I/O	Serial JTAG SWD-DIO signal. JTAG TMS signal.
35	GPIO3/CLK-OUT	General Purpose I/O	DIG	I/O	General purpose digital I/O
36	GPIO4	General Purpose I/O	DIG	I/O	General purpose digital I/O.
37	nReset	Reset	DIG	IN	Reset signal of the KW21 chipset.
38	GND	Ground	POWER	NAPP	Ground.

4.3   WISA2 Reference Design Schematic

The figure below shows the schematic for a reference hardware integration of the WISA2 (ISA100 Wireless) module.
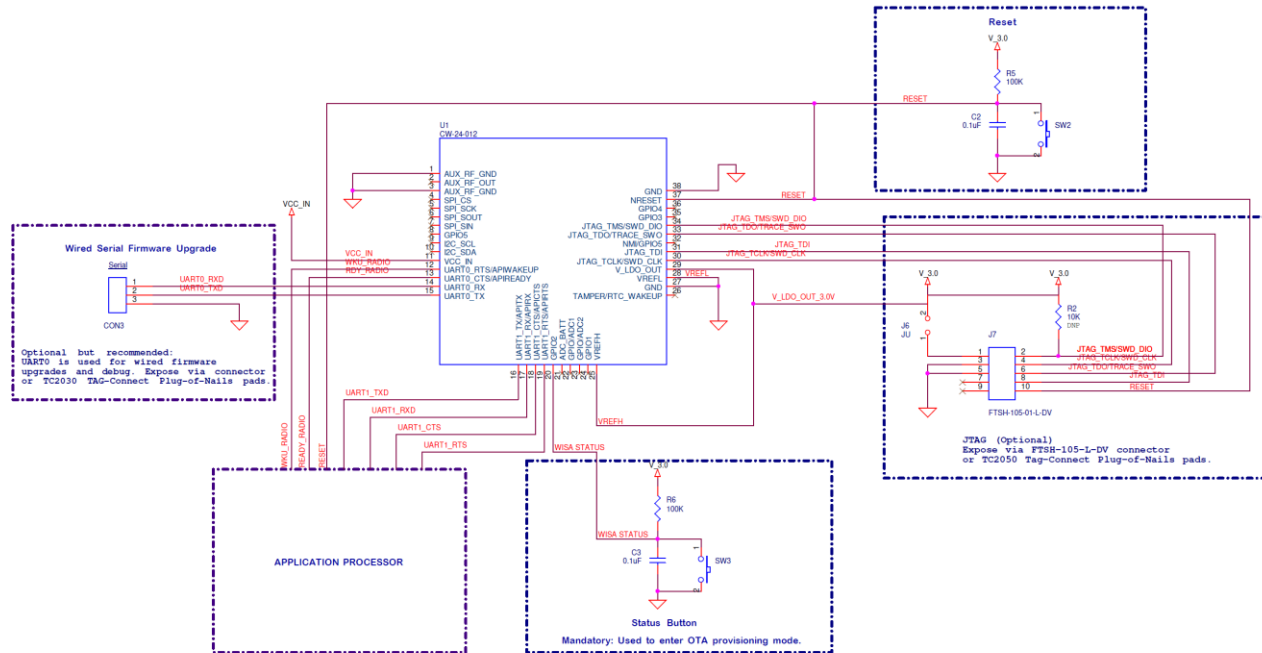
4.4   WiHART2 Reference Design Schematic

The figure below shows the schematic for a reference hardware integration of the WiHART2 (WirelessHART) module.

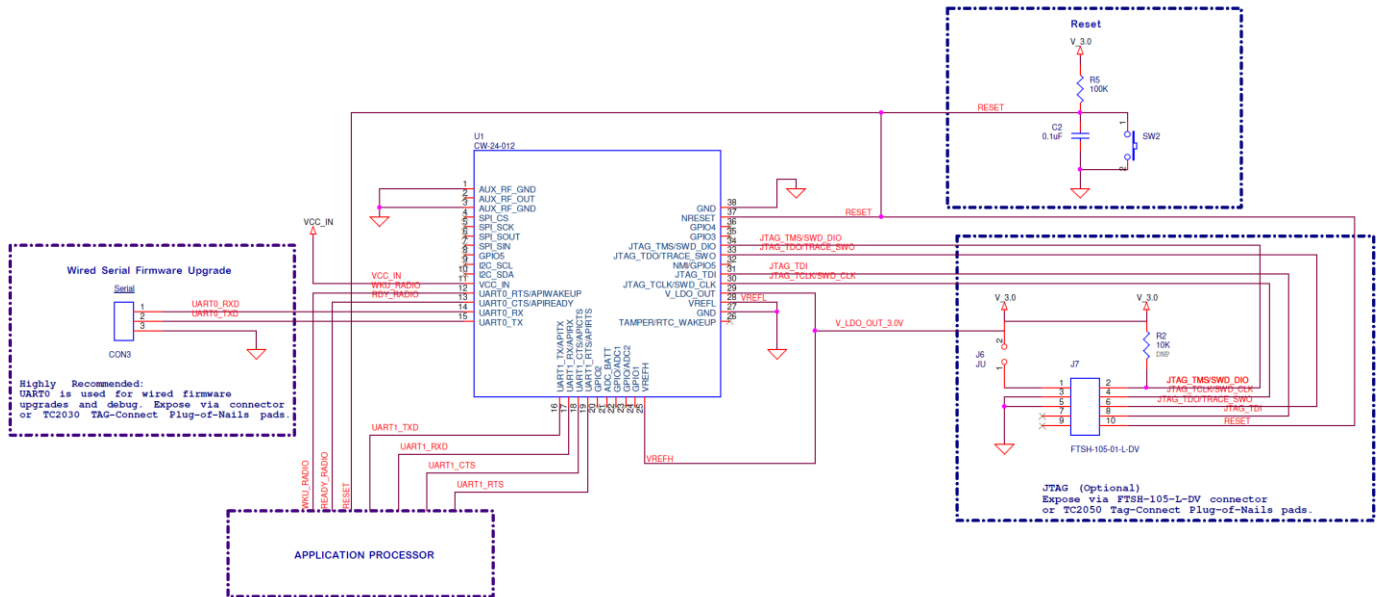## 4.5 Dual-Boot WISA2 – WiHART2 Reference Design Schematic

The figure below shows the schematic for a reference hardware integration of the Dual-Boot ISA100 Wireless (WISA2) and WirelessHART (WiHART2) module.

5. ISA100/WirelessHART™ Communication Stack - External Application Processor Interface

NOTE: For additional information on the external application processor interface (pins, timing, sequence) please consult the API Integration document.

The WIHART2/WISA2 wireless module communicates with external application processors via a serial UART interface.

The figure below depicts the minimal recommended connectivity between the WIHART2/WISA2 wireless module and an external application processor. It also includes flow control signals to ensure that the UART serial connection is reliable.

Most WirelessHART and ISA100 Wireless compliant and certified field instruments spend most of the time in deep sleep mode to conserve precious battery power which results in prolonged battery life.

The interface includes wake-up signals that allow the two entities two wake each other up while in sleep mode.
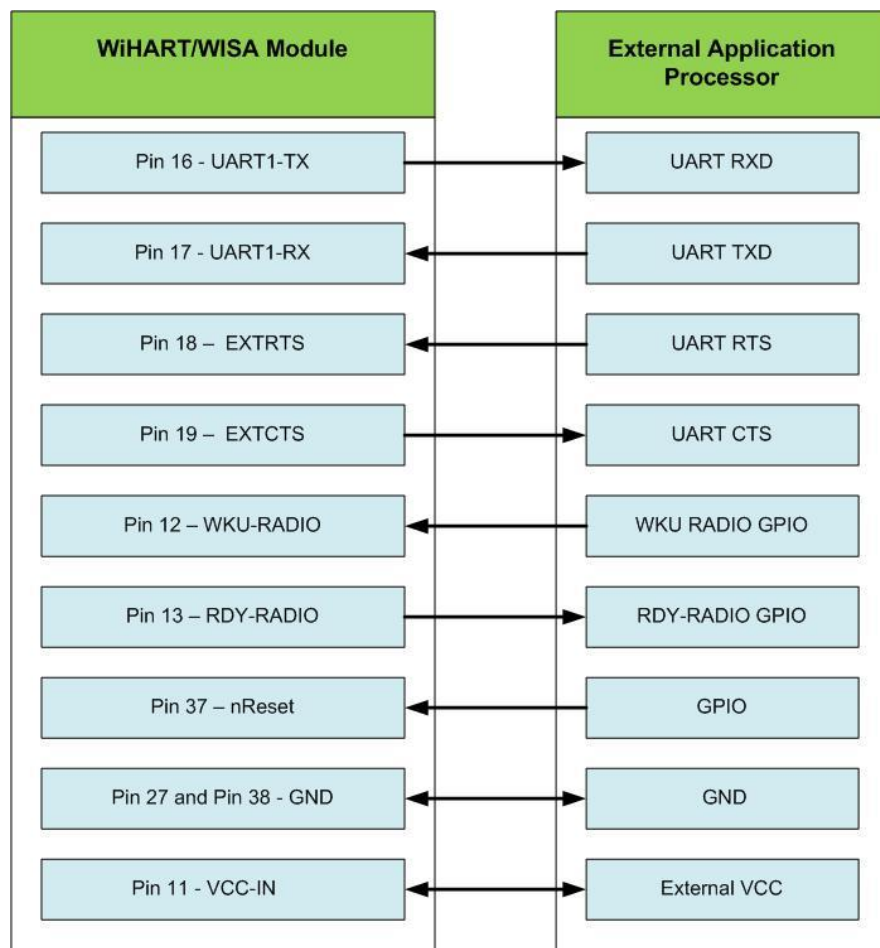
Figure 5 - Connectivity for UART Communication between WIHART2/WISA2 Module and External Application Processor

6. Antenna List

The WIHART2/WISA2 wireless module (hardware part number CW-24-200) has obtained wireless modular certifications and can be used with the antennas listed below.

Antenna	Description - Type	Manufacturer	Model	Gain
1	Direct mount, 2 dBi, omni-directional whip antenna, SMA male connector.	Nearson	S181AH-2450S	2.0 dBi
2	Remote mount, 4 dBi, omni-directional antenna for ATEX Zone 1 and 2 area classifications, SMA-male connector, with L-mount bracket for wall or pipe installations.	Mimes	UHF2458G	4 dBi

3	Remote mount, 8 dBi, omni-directional antenna for, N-male connector, with L-mount bracket for wall or pipe installations.	Data Alliance	A2O8Nm-MTL16N	8 dBi

7. Detailed Mechanical Specifications

7.1 *Mechanical Drawings*

NOTE: For additional, more detailed information please consult the WISA2/WIHART2 Hardware Engineering Package. The WISA2/WIHART2 Hardware Engineering includes schematic symbols, footprints and mechanical drawings.

Figure 6 – WIHART2/WISA2 Module Installation Outline Drawing

7.2 Recommended PCB Footprint Specifications

NOTE: For additional, more detailed information please consult the WISA2/WIHART2 Hardware Engineering Package. The WISA2/WIHART2 Hardware Engineering includes schematic symbols, footprints and mechanical drawings.

Figure 7 – WIHART2/WISA2 Module Recommended Footprint

Note: Solder mask to be per PCB vendor recommendation.

8. Regulatory Compliance Information

8.1 *Wireless Compliance – USA (FCC)*

FCC ID: 2ANDP-CW24-200

Labelling: When this transmitter is installed in a host device, the host integrator must place a physical permanent label, visible on the outside of the host device which that shows the following information: "**Contains FCC ID: 2ANDP-CW24-200".**

FCC Compliance: The CW-24-200 modular transmitter complies **only** with FCC rules, Part 15.207, P15.209 and P15.247 which are listed on the grant. These are the rules that specifically establish the frequency bands of operation, the RF output power, spurious emissions, and operating fundamental frequencies. Operation is also subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note 1: The CW-24-200 modular transmitter is **only** FCC authorized for FCC rules, Part 15.207, P15.209 and P15.247. The host product manufacturer that integrates this device into a product requires Part 15 Subpart B compliance testing with the CW-24-200 integrated in their product.

Additional Testing: The CW-24-200 modular transmitter is shipped pre-loaded with "Hardware Test Firmware" that includes all functionality needed and RF test modes used during compliance/certification testing. For information on how to enable this firmware, documentation and RF test procedures, please contact Centero via e-mail at: contact@centerotech.com or open a support ticket in our support portal at https://centerotech.com/contact/.

Note 2: Limited modular procedures are not applicable to the CW-24-200 modular transmitted and device.

Warning: Only the grantee (Centero) is permitted to make permissive changes. Any changes or modifications not expressly approved by Centero will void FCC compliance and the validity of the certification. If the host integrator intends to use the CW-24-200 modular transmitter differently than described in this "Hardware Integration Manual" or make any changes, please contact Centero via e-mail at: contact@centerotech.com or open a support ticket in our support portal at https://centerotech.com/contact/.

Antennas: This equipment uses the following antennas (tested for modular certification) listed in the table below, and may not be used with other antenna types or with antennas of higher gain.

Non-standard RF connector: If the host integrator chooses to design a product hat uses an external antenna for the host device (final product), the host integrator must choose a non-standard RF connector.

Professional Installation: If the host integrator chooses antennas to use antenna #2 (Mimes/Comrod UHF2458G or #3 (Data Alliance A2O8Nm-MTL16N) listed in the table below, the host manufacturer must ensure that the host devices are professionally installed.

Antenna	Description - Type	Manufacturer	Model	Gain
1	Direct mount, 2 dBi, monopole, omni-directional whip antenna, SMA male connector.	Nearson	S181AH-2450S	2.0 dBi
2	Remote mount, 4 dBi, monopole, omni-directional antenna for ATEX Zone 1 and 2 area classifications, SMA-male connector, with L-mount bracket for wall or pipe installations.	Comrod/Mimes	UHF2458G	4 dBi
3	Remote mount, 8 dBi, monopole, omni-directional antenna for, N-male connector, with L-mount bracket for wall or pipe installations.	Data Alliance	A2O8Nm-MTL16N	8 dBi

Trace Antennas: The CW-24-200 modular transmitter and device is not designed to be used with trace antennas.

RF Exposure: This equipment can be integrated in stationary, mobile or portable products. This equipment complies with FCC Radiation Exposure limits and should be installed and operated with a minimum distance of 20 cm between the radiator and any part of the human body. The host product manufacturer is required to provide the RF Exposure information to end users in their end-product manuals.

The CW-24-200 modular transmitter can only be used in a host for the conditions it was granted for. To be used in any other way then granted, such as in a mobile of portable product of with other transmitter operating simultaneously, requires additional evaluation, testing, or testing and Class 2 permissive change.

8.2 *Wireless Compliance - Canada*

Labelling: When this transmitter is installed in a host device, the host integrator must place a physical, permanent label, visible on the outside of the host device which that shows the following information: "**Contains IC: 23069-CW24200**".

IC RSS Compliance: The CW-24-200 modular transmitter complies only with IC RSS rules RSS-247 for Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and License-Exempt Local Area Network (LE-LAN) Devices. These are the rules that specifically establish the frequency bands of operation, the RF output power, spurious emissions, and operating fundamental frequencies. Operation is also subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note 1: The CW-24-200 modular transmitter is **only** IC RSS authorized for RSS-247 rules. The host product manufacturer that integrates this device into a product requires Part 15 Subpart B compliance testing with the CW-24-200 integrated in their product.

Additional Testing: The CW-24-200 modular transmitter is shipped pre-loaded with "Hardware Test Firmware" that includes all functionality needed and RF test modes used during compliance/certification testing. For information on how to enable this firmware, documentation and RF test procedures, please contact Centero via e-mail at: contact@centerotech.com or open a support ticket in our support portal at https://centerotech.com/contact/.

Note 2: Limited modular procedures are not applicable to the CW-24-200 modular transmitted and device.

Warning: Changes or modifications not expressly approved by the party responsible could void the user's authority to operate the product.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This radio transmitter, IC: 23069-CW24200, has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio, IC: 23069-CW24200 *a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.*

Antenna	Description - Type	Manufacturer	Model	Gain
1	Direct mount, 2 dBi, monopole, omni-directional whip antenna, SMA male connector.	Nearson	S181AH-2450S	2.0 dBi
2	Remote mount, 4 dBi, monopole, omni-directional antenna for ATEX Zone 1 and 2 area classifications, SMA-male connector, with L-mount bracket for wall or pipe installations.	Comrod/Mimes	UHF2458G	4 dBi

3	Remote mount, 8 dBi, monopole, omni-directional antenna for, N-male connector, with L-mount bracket for wall or pipe installations.	Data Alliance	A2O8Nm-MTL16N	8 dBi

Trace Antennas: The CW-24-200 modular transmitter and device is not designed to be used with trace antennas.

Antennes de traçage : L'émetteur et l'appareil modulaires CW-24-200 ne sont pas conçus pour être utilisés avec des antennes de traçage.

RF Exposure: This equipment can be integrated in stationary, mobile or portable products. This equipment complies with FCC Radiation Exposure limits and should be installed and operated with a minimum distance of 20 cm between the radiator and any part of the human body. The host product manufacturer is required to provide the RF Exposure information to end users in their end-product manuals.

The CW-24-200 modular transmitter can only be used in a host for the conditions it was granted for. To be used in any other way then granted, such as in a mobile of portable product of with other transmitter operating simultaneously, requires additional evaluation, testing, or testing and Class 2 permissive change.

Exposition aux Radiation : Cet équipement est conforme aux limites d'exposition aux radiations ICES définies pour un environnement non contrôlé . Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et une partie de votre corps. L'émetteur modulaire CW-24-200 ne peut être utilisé dans un hôte que dans les conditions pour lesquelles il a été autorisé. Le fabricant du produit hôte est tenu de fournir les informations sur l'exposition aux RF aux utilisateurs finaux dans leurs manuels de produits finaux.

Toute utilisation autre que celles autorisées, par exemple dans un appareil mobile ou portable, ou avec un autre émetteur fonctionnant simultanément, nécessite une évaluation, des tests supplémentaires ou une modification de l'autorisation de classe 2.

Warning: Only the grantee (Centero) is permitted to make permissive changes. Any changes or modifications not expressly approved by Centero will void IC compliance and the validity of the certification. If the host integrator intends to use the CW-24-200 modular transmitter differently than described in this "Hardware Integration Manual" or make any changes, please contact Centero via e-mail at: contact@centerotech.com or open a support ticket in our support portal at https://centerotech.com/contact/.

8.3   RoHS Compliance

This equipment is manufactured in compliance with the with European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directives

- 2002/95/EU – commonly referred to as RoHS and

- Revision 2011/65/EU - commonly referred to as RoHS 2
- Revision 2015/863 - commonly referred to as RoHS 3

9. Manufacturing Information

The WIHART2/WISA2 wireless module is designed to surface-mount on OEM PCBs and has castellated pads to allow for easy soldering and inspection. All castellated pads are located on the edge of the wireless module.

9.1 *Moisture Proofing*

The WIHART2/WISA2 wireless module has a Moisture Sensitivity Level (MSL) of 3. For additional handling instructions please review IPC/JEDEC J-STD-020 and JEDEC J-STD-033A.

Packaging information for baking	Yes
Baking Temperature	100° - 125° C
Baking Humidity	Ambient
Minimum/Maximum Baking Duration	4 – 24 hours
Number of Times for Baking	2 Max
Moisture Proofing condition remarks	Re-seal in original packaging

9.2 *Recommended Solder Cycle and Instructions*

The following table lists the recommended solder reflow cycle and shows the temperature setting and the time to reach the temperature.

Time (seconds)	Temperature (°C)
30	65
60	100

90	135
120	160
150	195
180	240
210	260

The table below provides additional recommended soldering instructions.

Ability/Inability for flow soldering	Yes
Flow soldering temperature	500 to 510 degrees F
Flow soldering time	3 to 7 seconds dwell in solder
Capable number of re-flow soldering	2
Re-flow soldering peak temperature	260 degrees C
Re-flow soldering time	5 to 15 seconds at maximum temperature
Manual Soldering possible/not possible	Yes
Manual soldering temperature	600 to 750 degrees F tip temperature
Manual soldering time	3 to 10 seconds
Lead-free soldering (Sn-3Ag-0.5Cu) possible/ not possible	Yes
Eutectic lead soldering (Sn-Pb) possible/ not possible	Yes
Plated or ball composition of outmost external layer	ENIG
Soldering Condition Remarks	Soldering time and temperatures based on thermal mass

9.3   *Flux and Cleaning Instructions*

We recommend that you use a "no clean" solder paste when assembling the wireless module. This eliminates the clean step and ensures that you do not leave unwanted residual flux under the device where it is difficult to remove.

⚠️ *Cleaning can result in residual liquid remaining under the device or in the gap between the device and the host PCB, which can lead to unintended, possibly shorting connections between pads. The residual moisture and flux under the device are not easily seen during an inspection process.*

If cleaning is needed, follow the instructions shown in the table below.

Type of Cleaner	Kyzen 4241 aqueous chemistry
Ability of ultrasonic cleaning	No
Ability of nozzle type cleaning	Yes, Aqueous Tech Batch Cleaner
Cleaning Temperature	150 degrees F
Cleaning Time	20 minutes
Cleaning Condition Remarks	Removes flux residue, light oils and dirt

9.4   Rework Instructions

⚠️ *CAUTION! Any modifications to the wireless module voids the warranty coverage and certifications.*

Rework on the module itself should not be performed. The wireless module itself is designed to function optimally and any modifications or rework will void the warranty coverage and certifications. We recognize that some customer will choose to rework the wireless module and void the warranty; the following information is given as guidelines to maximize the chances of success during the rework process.

The wireless module may be removed from the OEM PCN using a hot air rework station of hot plate. Care should be taken not to overheat the module. During rework the module temperature may rise above its internal solder melting point and care should be taken not to dislodge internal components from their intended positions.