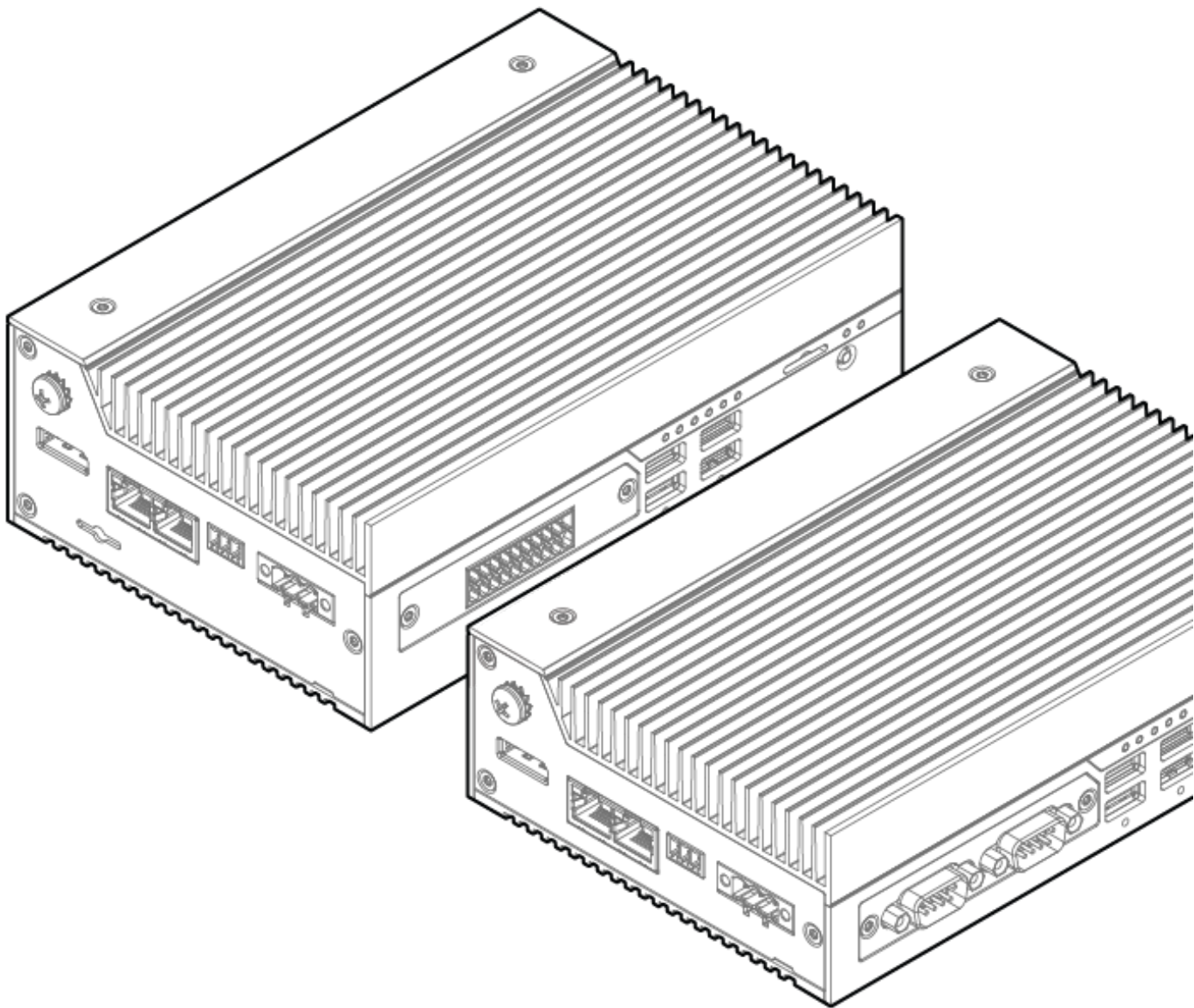


K410 / K430 Product Manual



Revision History

Revision	Date
First release of K400 manual	09/16/2021
Update including radio transmitter info, VCCI, RF, and Safety info	1/25/2022
Updated DIO Link	05/04/2022

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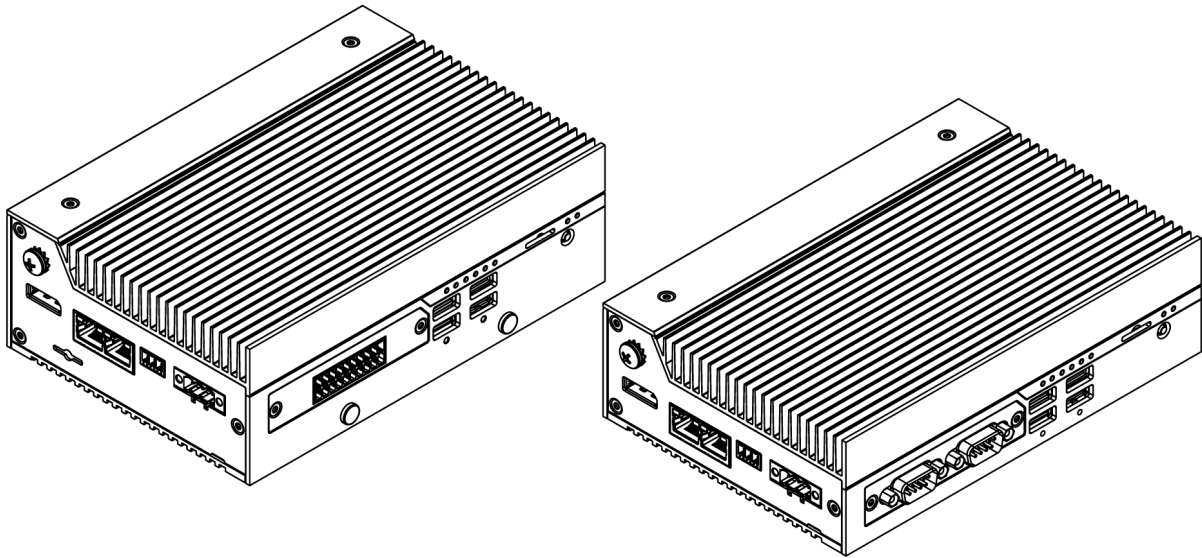
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1 - System Overview

1.1 - System Introduction

The Karbon 400 Series packs the power and advanced IoT capabilities of the latest Intel® Atom® x6000E processors (formerly Elkhart Lake) into low profile, rugged and fanless systems built for the challenges of the IoT Edge.



The Karbon 400 Series was designed to be installed anywhere you need ultra-reliable computing power. Sensitive internal components are protected from dust, debris, chemicals, and moisture with OnLogic's integrated Hardshell™ Fanless Technology. Its rugged design, -40° to 70°C operating temperature range, 9~48 V power input, and the absence of any moving parts dramatically improve the lifespan and reliability of the system.

1.2 - Accessories

- Terminal block kit (Power, CAN bus)
- Rubber Feet (4)

If you purchased additional items such as mounting brackets, power supplies, or cables, they will be located in the system box or within the outer shipping carton.

All drivers and product guides can be found on the corresponding product page. For more information on accessories and additional features, visit the Karbon series page.

Karbon Series Page: <https://www.onlogic.com/computers/rugged/karbon/>

Karbon 410 Page: <https://www.onlogic.com/k410/>

Karbon 430 Page: <https://www.onlogic.com/k430/>

1.3 - Product Specifications

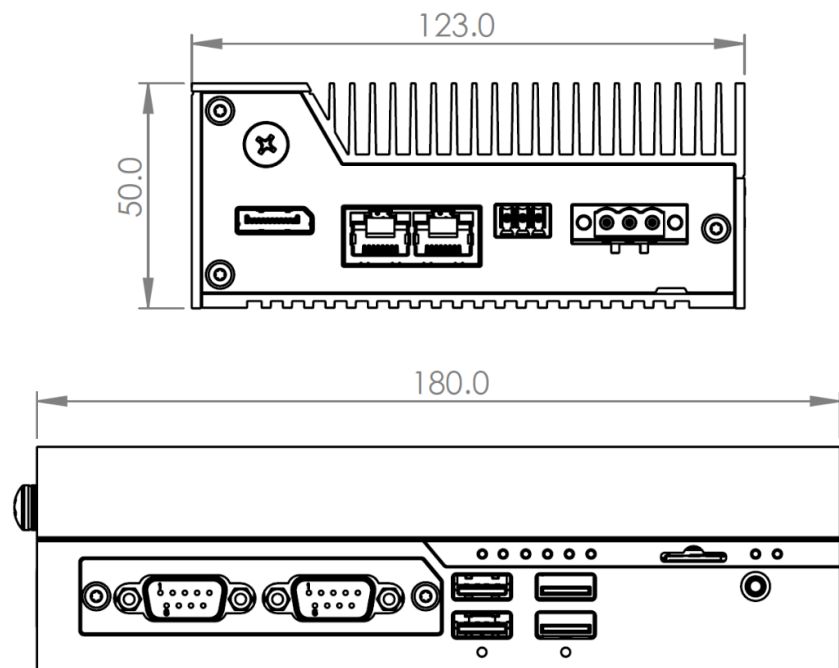
	Karbon K410	Karbon 430
Dimensions	180 x 123 x 50 mm	180 x 123 x 60 mm
CPU	Intel Atom x6211E (2 core, 2 thread, 1.3~3.0 GHz, 6W) Intel Atom x6425E (4 core, 4 thread, 2.0~3.0 GHz, 12W)	
Memory	2 SO-DIMM DDR4 3200 up to 32GB total with IB ECC support	
LAN Controller	2 Intel I210-IT	
Motherboard Expansion	M.2 3042/2260/80 B-key (PCIe x2, USB 2.0, SATA, SIM) M.2 2230 E-key (PCIe x1, USB 2.0) mPCIe (PCIe x1, USB 2.0, SATA, SIM)	
Motherboard I/O	2 GbE LAN (optional 2 PoE using module) 2 USB 3.2 Gen 2 Type-A 2 USB 2.0 Type-A 1 DisplayPort (DP 1.4 & HDMI 2.0b) 3-pin CAN bus 3-pin Power input 1 Power button 1 3FF Micro-SIM (mapped to motherboard mPCIe and M.2) 8 LED array (Power, Storage, Ignition, Watchdog, 4 User Configurable)	
Motherboard Headers	TPM 2.0 module header PoE module header DC power header RTC battery holder	
Daughterboard Expansion	N/A	M.2 3042/52/2260/80 B-key (PCIe x1, USB 3.0, USB 2.0, SIM) M.2 2242/60/80 B-key (PCIe x1, USB 3.0, USB 2.0)
Daughterboard I/O	N/A	3FF Micro-SIM (mapped to M.2 3042/52)
Daughterboard Headers	N/A	3FF Micro-SIM (mapped to M.2 3042/52)
Voltage Input	9~48 VDC (3-pin Terminal Block with IGN pin)	
Power Protections	Reverse Power Input Protection Over Voltage Protection (52.8V) ESD Protection (15kV Air, 8kV Contact) Chassis Grounding Nut	
OS Support	Windows IoT Enterprise	
Special Features	Automotive Power with Ignition Sensing Watchdog Timer PTT and Secure Boot in BIOS	
Mounting	Wall, DIN rail, VESA	
Temperature	-40~70°C, Operating	

	-40~85°C, Storage
Humidity	10~95% non-condensing, Operating 0~95% non-condensing, Storage
Shock	Tested according to IEC 60068-2-27 and MIL-STD-810H Method 516.6
Vibration	Tested according to IEC 60068-2-64 and MIL-STD-810H Method 514.6
Regulatory Certifications	FCC part 15b (Class A), CE, VCCI, RCM Meets requirements of CE Directives for I.T.E. (EMC 2014/30/EU, ErP 2009/125/EC, Low Voltage 2014/35/EU, Radio Equipment 2014/53/EU, RoHS 3 EU 2015/863, WEEE 2002/96/EC) Meets requirements of IEC 60601-1-2:2014 Medical Electrical Equipment Meets requirements of CEC Title 20 Appliance Efficiency Regulations Meets requirements of E-Mark (UNECE Reg. 10, latest revision) Meets requirements of EN 50155 (via testing to EN 50121-3-2) Meets requirements of IEC 60945 Ed. 4 Maritime Navigation and Radiocommunication Equipment and Systems Meets requirements of IEC 62368-1 Audio/Video, Information And Communication Technology Equipment - Part 1: Safety Requirements
Radio Specifications when equipped with INT-9260 Wifi/BT (device for indoor use)	
Frequency Bands	2.4GHz and 5GHz bands
Operating Frequency	2400 - 2485 MHz 5150 - 5250 MHz, 5250 - 5350 MHz 5470 - 5725 MHz, 5725 - 5878 MHz
Channel spacing / Bandwidth	2.4GHz: 802.11b/g/n; 5 MHz / BT: 1MHz Bandwidth: 20 MHz / 40 MHz 5 GHz: 802.11a/n/ac: 20, 40, 80, 160 MHz
RF output power	20dBm (2400-2485 MHz) IEEE 802.11b/g/n& BT 10dBm (2400-2485 MHz) BLE 23dBm (5150-5725 MHz) IEEE 802.11a/n/ac 13.98 dBm (5725-5875MHz) IEEE 802.11a/n/ac
Type of Modulation	2.4GHz: DSSS/OFDM/FHSS 5 GHz: OFDM
Type of Antenna	Reference antenna is PIFA type (2dBi/2dBi gain)
Modes of operation	Duplex (Tx/Rx)
Duty cycle (access protocol)	As In: IEEE 802.11 a/b/g/n/ac

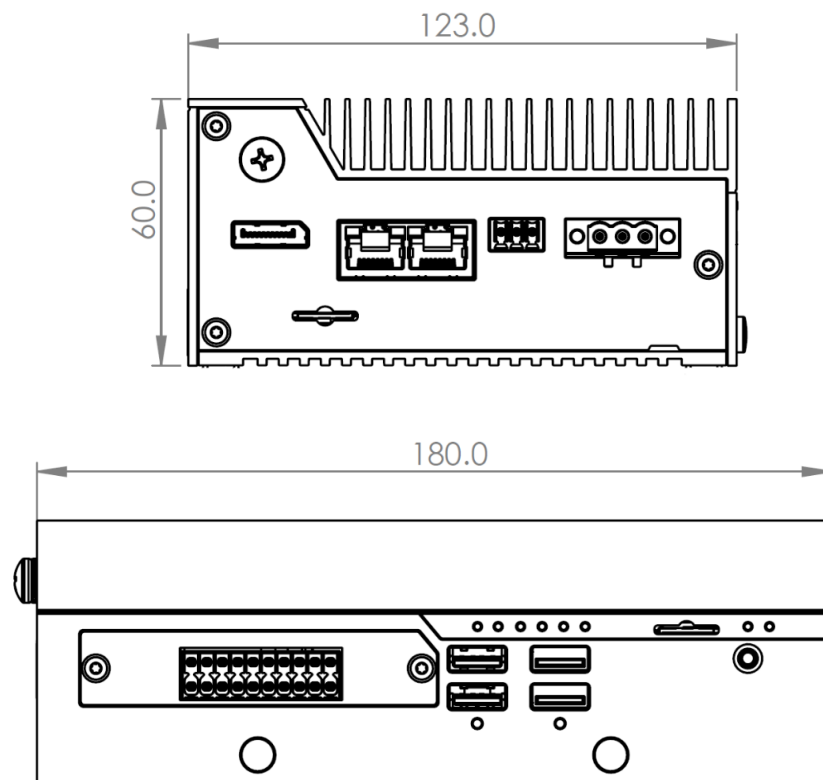
Version of firmware/software	Software Intel PROSet/Wireless WiFi Software 20..x and following versions for WIFI/BT
Antenna Specifications	PIFA (2dBi / 2dBi Gain for 2.4 and 5GHz) RP-SMA connector

1.4 - Exterior Dimensions

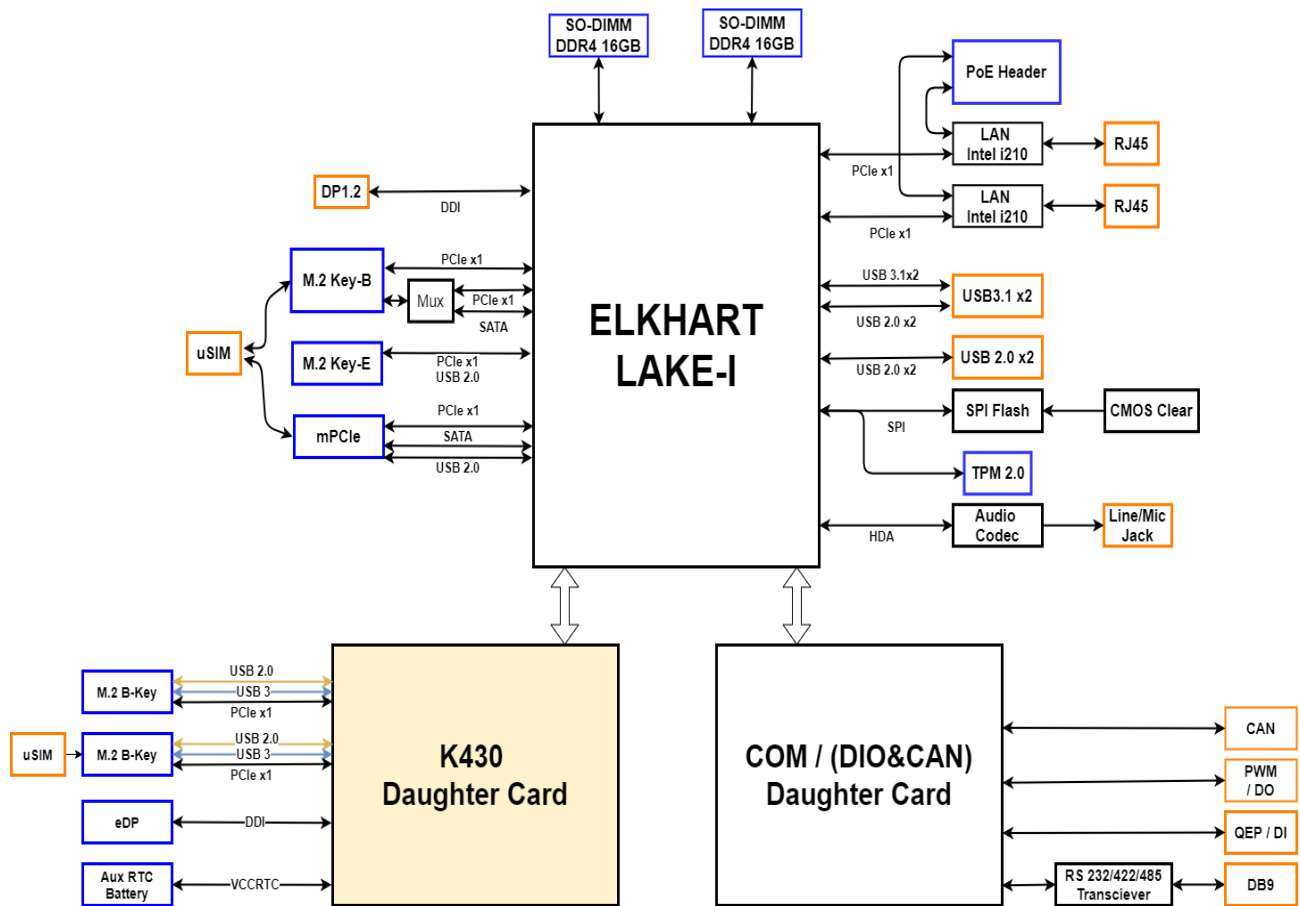
1.4.1 - Karbon 410 Dimensions (K410)



1.4.2 - Karbon 430 Dimensions (K430)

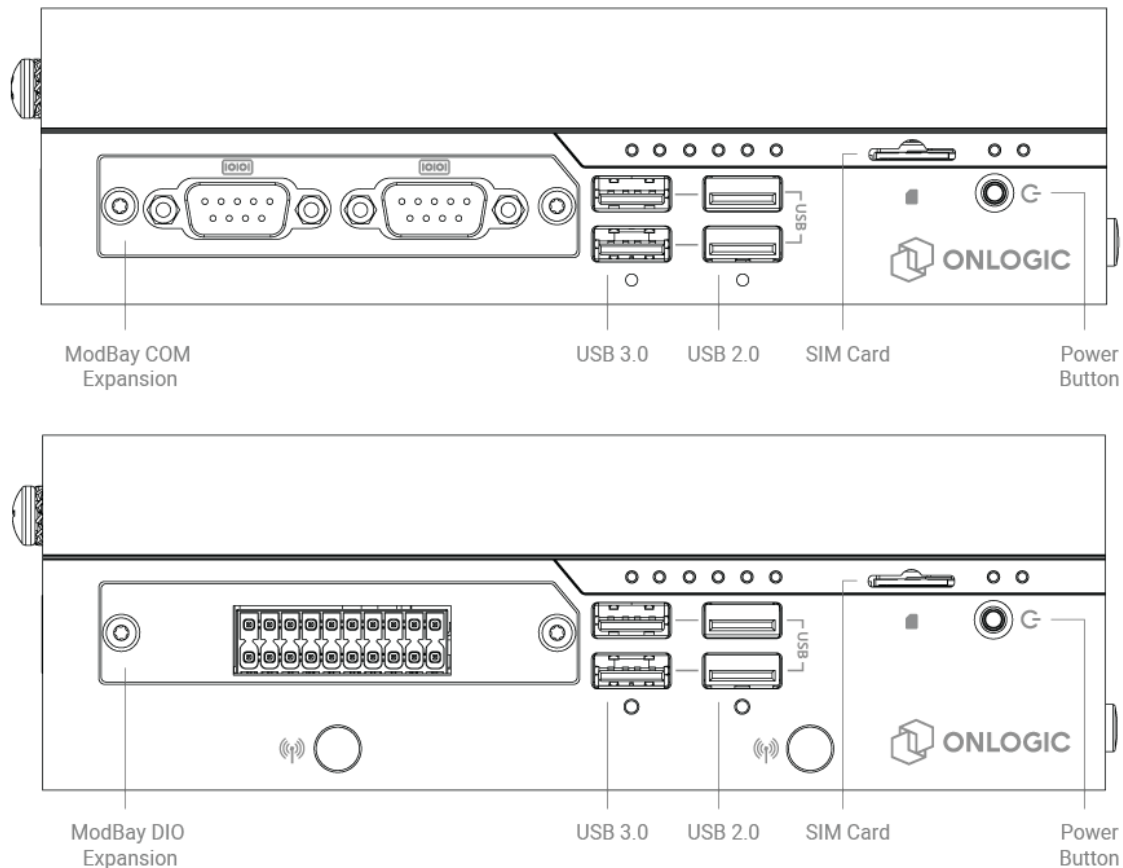


1.5 - System Block Diagram



2 - I/O Definitions

2.1 - Front I/O Definition



Power Button & LED

The front power button can be used to turn on and off the Karbon system. The power button is a momentary contact button with a blue LED backlight used to display the status of the system. A single press while the system is on will initiate a graceful shutdown operation from the OS. Pressing and holding the button for 4 seconds while the system is running will cause a hard reset of the system. The system can be woken by a single press of the power button from any state.

The LED backlight will indicate the system status. A solid blue light indicates that the system is powered in the S0 state. A flashing blue light indicates the system is in the sleep state. The LED is off in S5 and deep sleep states.

SIM Card

A 3FF Micro-SIM card slot is present on the front panel of the Karbon 400 platform allowing native support for OnLogic Extrovert 4G LTE modules. The SIM signals can be connected to either the mPCIe

or M.2 B-Key internal expansion slots. This selection is controlled in BIOS with the default BIOS setting being mPCIe. Please refer to the BIOS user manual for more information.

The SIM slot is a Push-Push type receptacle. To insert or remove the SIM card from the front panel of the Karbon platform, please use a small implement to push the card into the slot until it clicks. To remove the card, push with a small implement until the card clicks, then pull on the free end of the card to remove it.

USB 2.0

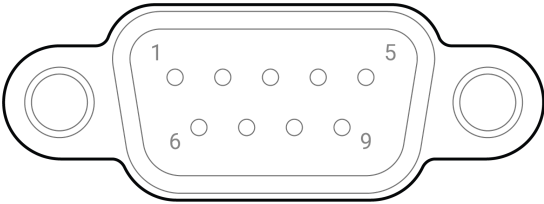
There are two USB 2.0 Type-A ports on the front panel of the K400 platform. These ports are capable of linking at 480Mbps transfer rates.

USB 3.2

There are two USB 3.2 Gen 2 Type A ports on the front panel of the K400 platform. These ports are capable of linking at 10Gbps transfer rates.

ModBay COM Expansion

The K400 platform supports an optional COM DB9 add-in card (OnLogic MOD109). The serial port mode and voltage between Off/5V/12V on Pin 9 on K400 can be selected in the BIOS configuration. The serial ports support RS-232, RS-422, and RS-485 configurations. Refer to the BIOS manual in Appendix B for configuration instructions.

	Pin	RS-232	RS-422	RS-485
	1	DCD	TX-	TX-/RX-
	2	RX	TX+	TX+/RX+
	3	TX	RX+	NC
	4	NC	RX-	NC
	5	GND	NC	NC
	6	NC	NC	NC
	7	RTS	NC	NC
	8	CTS	NC	NC
	9	RI/PWR	NC/PWR	NC/PWR

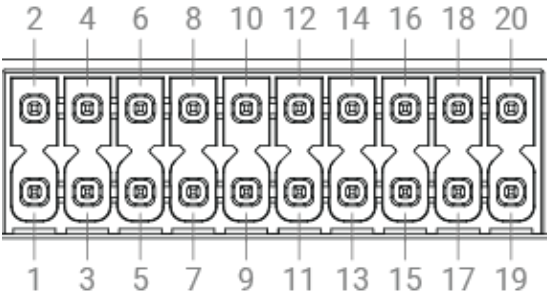
ModBay COM DB9 Pinout

ModBay DIO Expansion

The K410/K430 platform supports an optional Isolated Digital I/O add-in card (OnLogic MOD110). This option allows for integration of the Karbon 400 Series with existing PLC integrations or other

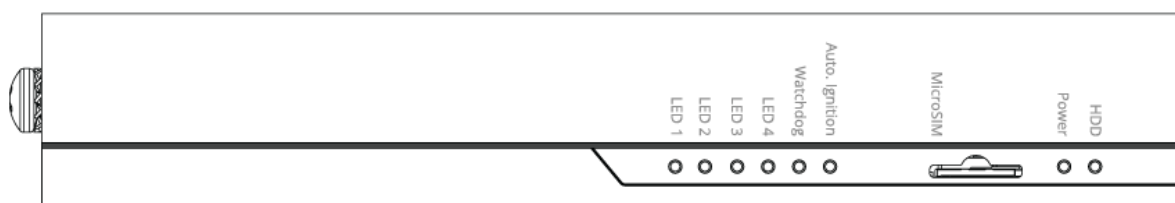
digital logic applications. For a complete explanation of features, operating voltages, and safety information, please refer to the DIO expansion information on the OnLogic support site.

<https://www.onlogic.com/support/documentation/mod110-dio/>

		Pin	Definition	Pin	Definition
		1	Power	2	GND
		3	In0/QEP0A	4	Out0/PWM0
		5	In1/QEP0B	6	Out1/PWM1
		7	In2/QEP0I	8	Out2/PWM2
		9	In3/QEP1A	10	Out3
		11	In4/QEP1B	12	Out4
		13	In5/QEP1I	14	Out5
		15	In6	16	Out6
		17	In7	18	Out7
		19	CANL	20	CANH

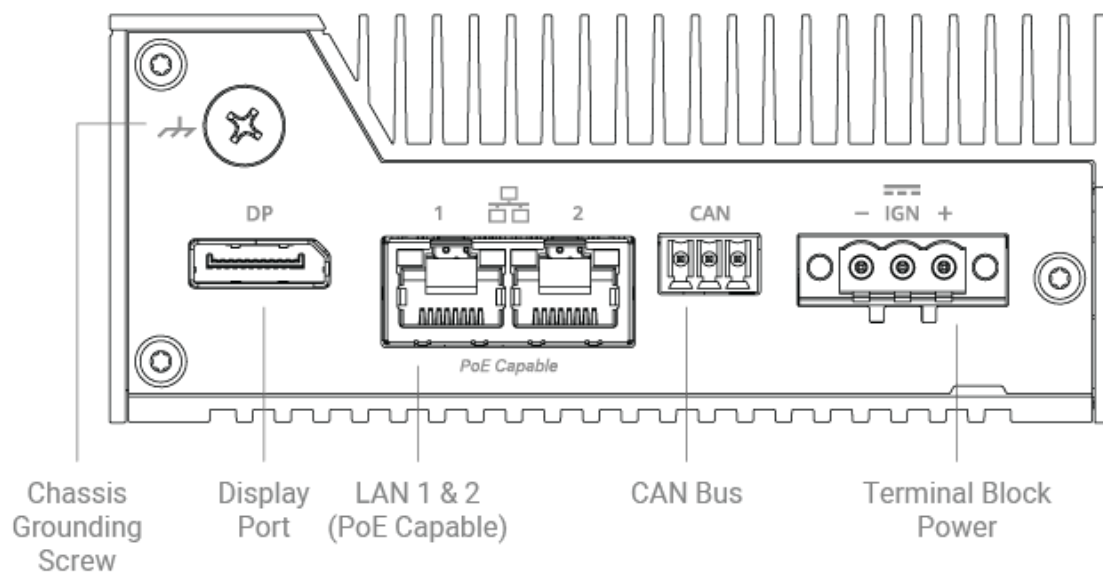
ModBay DIO Pinout

LED Functionality

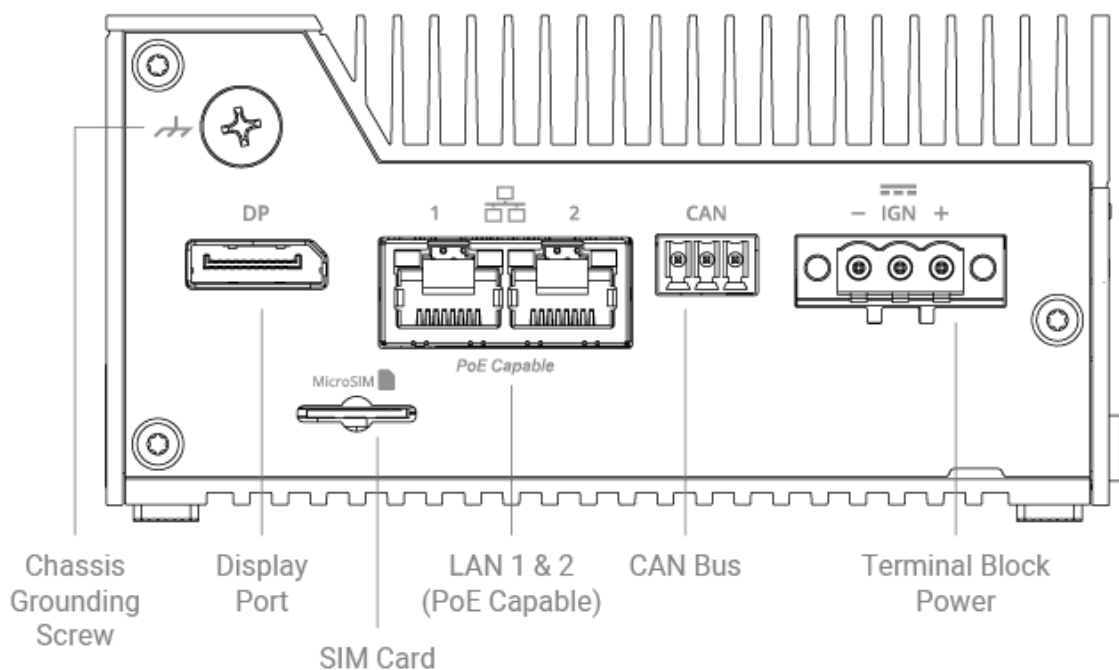


LED	On	Off	Blink	Pulse
HDD	-	-	Internal storage drive activity with supported devices	-
Power	Device is on	Device is off	Device is asleep	-
Automotive Ignition	Ignition input to device is on	Ignition input to device is off	-	-
Watchdog	-	-	-	-
Configurable LED 1-4	User Programmable	User Programmable	User Programmable	User Programmable

2.2 - Bottom I/O Definition



K410 Bottom I/O

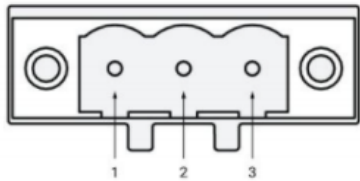


K430 Bottom I/O

3-Pin Terminal Power Connector

Mainboard power is applied to the Karbon 400 platform by Dinkle 2EHDRM-03P (Mating part: Dinkle: 2ESDVM-03P or equivalent 5.08mm pitch terminal plug). The system is operational from 9V~48V. The maximum rated current of the connector is 15A per pin. Use a wire gauge that is rated for the operational current. The ignition pin may be used to turn the system on when configured. The timing

is configurable through the OS, similar to K700/K300 configurations. Please see the [OnLogic support site](#) for Ignition and timing configuration. See below for on-board connector pinout.

	Pin	Definition
	1	GND
	2	Ignition (9-48V)
	3	DC Input (9-48V)

Power Input Pinout

CAN Bus

Supports CAN 2.0 A/B at 100-1000 kbaud via the Programmable Services Engine. Messages may be sent/received through the HECI (Host Embedded Controller Interface). A command line interface utility for interfacing with the CAN device over HECI is provided, and applications can also interact with the HECI driver directly. For more information, please refer to our [technical documentation on the OnLogic support site](#).

The internal CAN signals are unterminated; the CAN device should be externally terminated.

- 3-pin CAN Bus
- Dinkle EC350V-03P terminal block

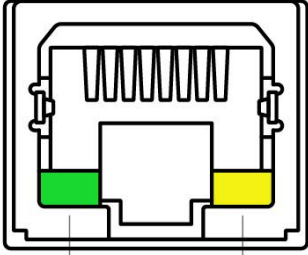
	Pin	Definition
	1	GND
	2	CAN L
	3	CAN H

CAN Bus Pinout

LAN 1 & 2

There are two LAN Ports on the K400 platform that support up to 1 Gbps link speeds over standard shielded CAT5e or CAT6 cables. The connector is the industry standard RJ45 connector. The LAN link state is shown by the two LEDs embedded within the port. The description is included below.

The PoE add-on card option enables Power over Ethernet for both LAN ports. Both ports are configured for 802.3at capabilities. A total power budget of 36W is provided for both ports, such that two 802.3af devices may be used, with a single port connected to a 802.3at device as an additional supported configuration.

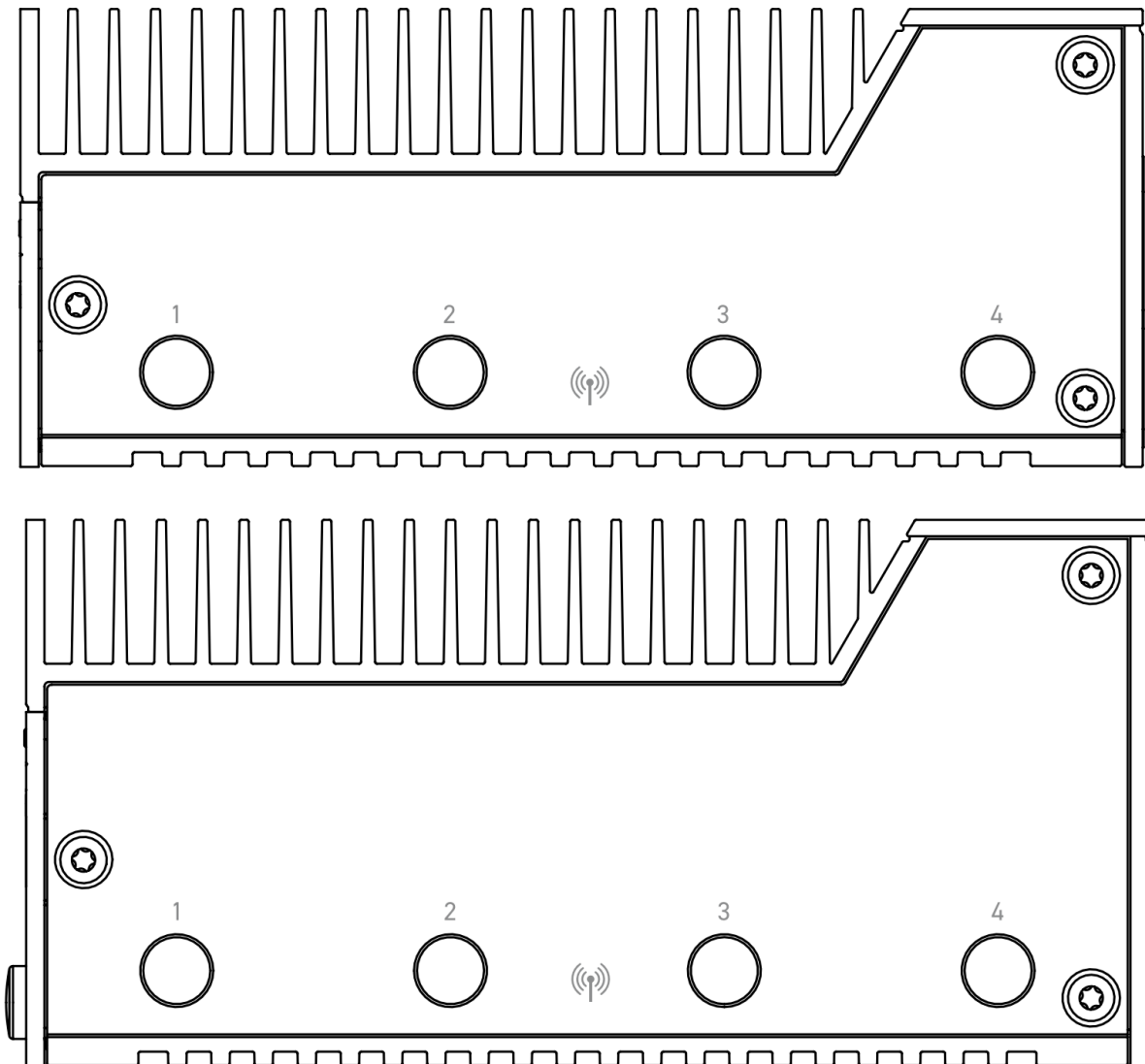
 Link LED (Green) Speed LED (Green/Yellow)	LED	Color	State	Function
	Link	-	Off	LAN link not established
		Green	On	LAN link established
			Blinking	LAN activity occurring
	Speed	-	Off	10 Mb/s data rate
		Green	On	100 Mb/s data rate
		Yellow	On	1000 Mb/s data rate

LAN Activity Light Definition

DisplayPort

The Karbon 400 platform utilizes Intel's Integrated processor graphics that power the onboard DisplayPort with support for resolutions up to 4096x2304 at 60Hz. The port also supports Multi-Stream Transport (MST) which allows for triple independent display output using a certified MST hub. The DisplayPort connector supports CEC protocol.

2.3 - Top I/O Definition

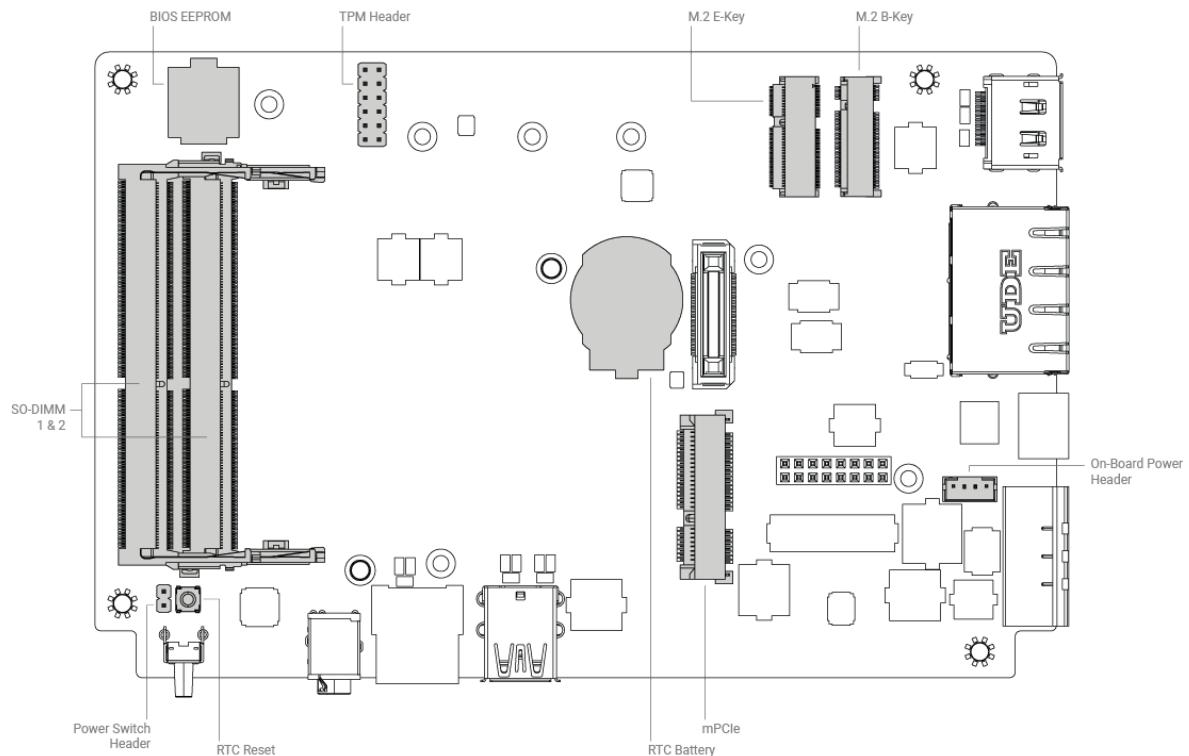


Antenna SMA Ports

The Karbon 410 and 430 both have four SMA ports for antennas on the top of the system. The Karbon 430 includes two additional SMA ports on the front of the system.

2.4 - Motherboard Connectors

The motherboard is the same for K410 and K430.



M.2 B-Key

An M.2 B-Key slot on the Karbon 400 motherboard provides support for B-Key form-factor expansion cards. Supported cards include 3042, 2242, 2260, 2280 form-factors. The B-Key connector supports PCIe Gen 3 x2, USB 3.2 5Gbps, USB 2.0, SATA Gen I (1.5Gbps), SATA Gen II (3.0Gbps), and SATA Gen III (6.0Gbps) devices.

The 3FF Micro SIM card slot is multiplexed to both the M.2 B-Key and mPCIe expansion slot. The routing can be selected in the BIOS and is set to the mPCIe slot by default. Please refer to the BIOS user manual (Appendix B) for more information.

A full pinout table for this expansion slot is provided in Appendix D.

M.2 E-Key

An M.2 E-Key slot on the Karbon 400 motherboard provides support for E-Key form-factor expansion cards. Only 2230 form-factor cards are supported. The E-Key connector supports PCIe Gen 3 x1 and USB 2.0 devices. A full pinout table for this expansion slot is provided in Appendix D.

mPCIe

A mPCIe slot is present on the Karbon 400 motherboard to allow support for mini-PCIe form-factor expansion cards. Full length cards and half-length cards (with an adapter) are supported. The mPCIe

connector supports PCIe Gen 3 x1 and USB 2.0 devices. A full pinout table for this expansion slot is provided in Appendix D.

The 3FF Micro-SIM card slot is multiplexed to both the M.2 B-Key and mPCIe expansion slot. The routing can be selected in the BIOS and is set to the mPCIe slot by default. Please refer to the BIOS user manual (Appendix B) for more information.

SO-DIMM1 & SO-DIMM2

Karbon 400 has two onboard DDR4 SO-DIMM slots:

- Maximum Capacity: 32GB DDR4-3200 total using two 16GB SO-DIMM modules
- Channel configuration: 1 DIMM Per Channel (DPC) - 2 Channels
- In Band ECC Support (IB ECC)

RTC RESET

The snap dome tact switch behind the power button on the Karbon 400 motherboard may be used to clear the CMOS settings in the BIOS. Remove external power to the system before clearing the CMOS. Removing the RTC battery is not an accepted method for clearing BIOS settings.

BIOS EEPROM

If the BIOS needs to be updated, please refer to Appendix B for reflashing instructions.

Power Switch Header

The on-board power switch header can be used to control the power state of the Karbon 400 platform in parallel with the front panel power button. Mating power switch cables should be a twisted-pair wire with floating shield to assure proper immunity to EMI/RFI. The mating connector is a standard 2.54mm female header. It is recommended to keep wires at less than 3 meters in length. Switches must be momentary contact type only.

RTC Battery Header

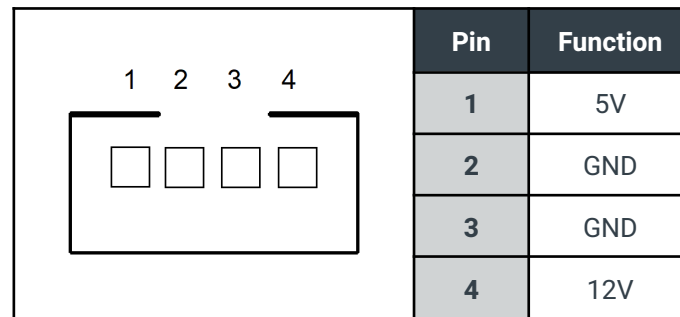
The RTC battery on the Karbon 400 platform is used to retain BIOS CMOS settings and maintain the real-time clock for the system. If the RTC battery is low, CMOS settings will not be retained and you may receive an alert in the operating system. Replacement batteries should be a UL listed type CR2032 3V cell.

TPM header

Karbon 400 features an onboard TPM (Trusted Platform Module) header. It supports OnLogic's wide-temperature TPM 2.0 module (OnLogic TPM01). This gives the option to have a dedicated secure module to secure the system through cryptographic keys.

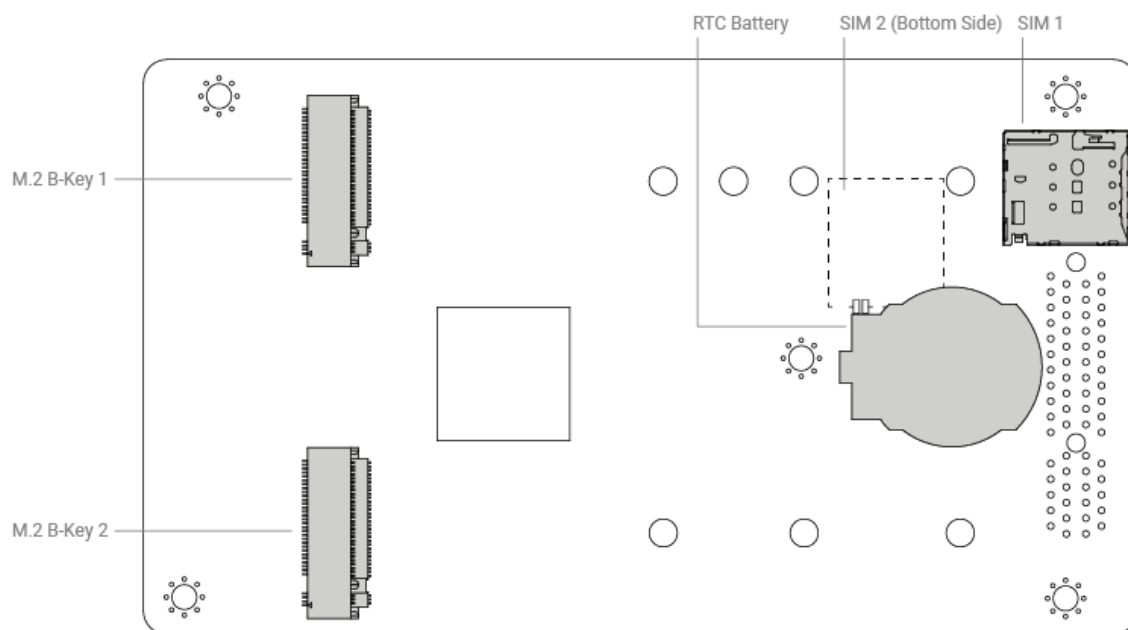
Onboard Power Header

An onboard connector is provided for power to internal expansion cards. The connector is a JST 2.0mm PH series connector (pn: B4B-PH-K-S). A suitable mating connector from the same series should be used. The Pinout is provided below. The maximum operating current per pin is 2A. The header is only powered while the system is in the S0 operating state.



High Speed Daughter Board

The Karbon 430 system supports an additional daughter board for additional high speed storage and connectivity options. The daughter board is pictured below.



M.2 B-Key 1

The upper B-Key slot is provided to allow support for B-Key form-factor PCIe and USB expansion cards. Supported cards include 3042, 3052, 2260, 2280 form-factors. The B-Key connector on the Karbon expansion card supports PCIe Gen 3 x1, USB 3.2 5Gbps, USB 2.0 devices. B-Key SATA drives are not electrically compatible with this slot.

There are two 3FF SIM slots on the daughter board to support networking capabilities. One SIM slot is externally accessible, with the other accessed on the bottom of the HSIO card.

M.2 B-Key 2

The lower B-Key slot is provided to allow support for B-Key form-factor PCIe and USB expansion cards. Supported cards include 2042, 2260, and 2280 form-factors. The B-Key connector on the Karbon 400 expansion card supports PCIe Gen 3 x1, USB 3.2 5Gbps, USB 2.0 devices. B-Key SATA drives are not electrically compatible with this port.

SIM 1

The externally accessible 3FF SIM 1 slot is provided for networking capabilities on the B-Key 1 slot.

SIM 2

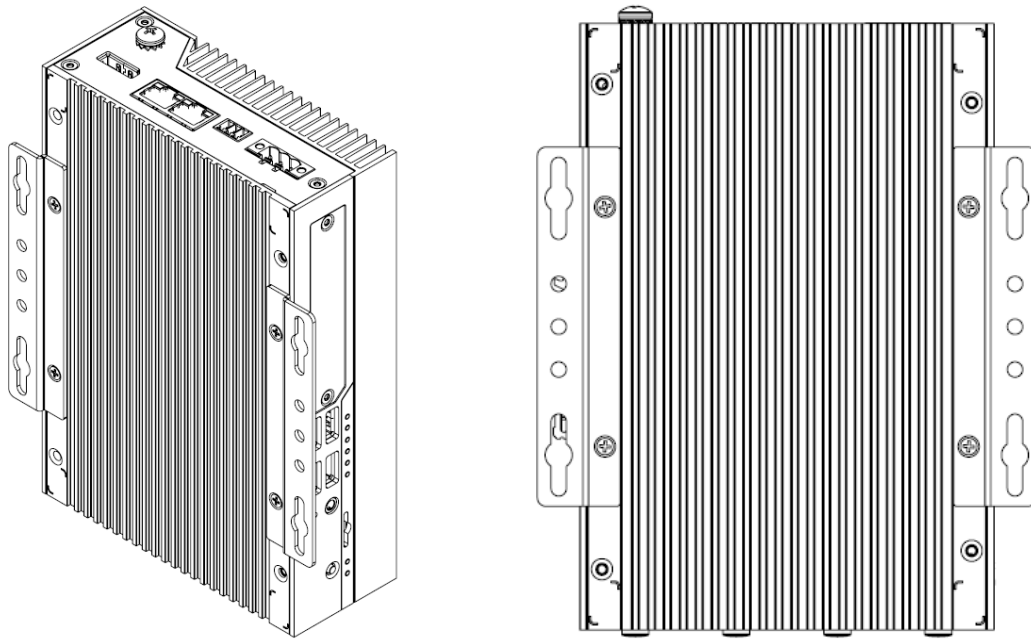
The internally accessible 3FF SIM 2 slot is provided for networking capabilities on the B-Key 1 slot. This slot is on the bottom side of the Expansion card and is only accessible by removing the daughterboard from the chassis.

RTC Battery

The RTC battery on the Karbon 400 expansion card is provided for redundancy with the main CMOS battery to retain BIOS CMOS settings and maintain the real-time clock for the system. If the RTC battery is low, CMOS settings will not be retained and you may receive an alert in the operating system. Replacement batteries should be a UL listed type CR2032 3V cell.

3 - Mounting Instructions

3.1 - Wall Mounting (MTW101)



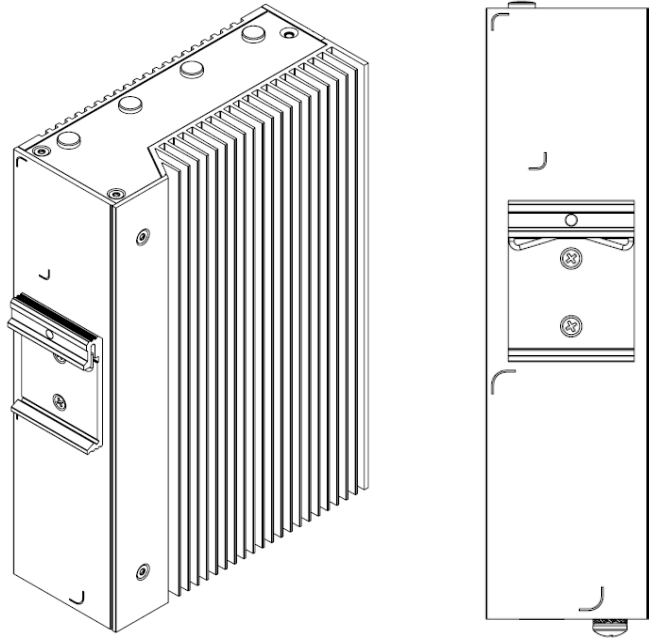
Step 1: Attach wall mounting brackets to the chassis using the provided screws. To assemble, locate the four holes in the chassis that line up to the two countersunk holes in each wall mount bracket.

Screw type: M3x0.5 FH 120 Degree
Length: 4 mm

Step 2: Take care to ensure that the brackets are oriented correctly and that the part of the brackets in contact with the mounting surface is positioned away from the system to ensure a small air gap is maintained between the mounting surface and the system. Install the four supplied screws.

Step 3: Fasten system to the mounting surface (hardware not provided). The mounting bracket systems are required to secure 3x the hanging weight of the computer system. The mating substrate must be capable of maintaining the same rating.

3.2 - DIN Rail Mounting - Edge (MTD102)



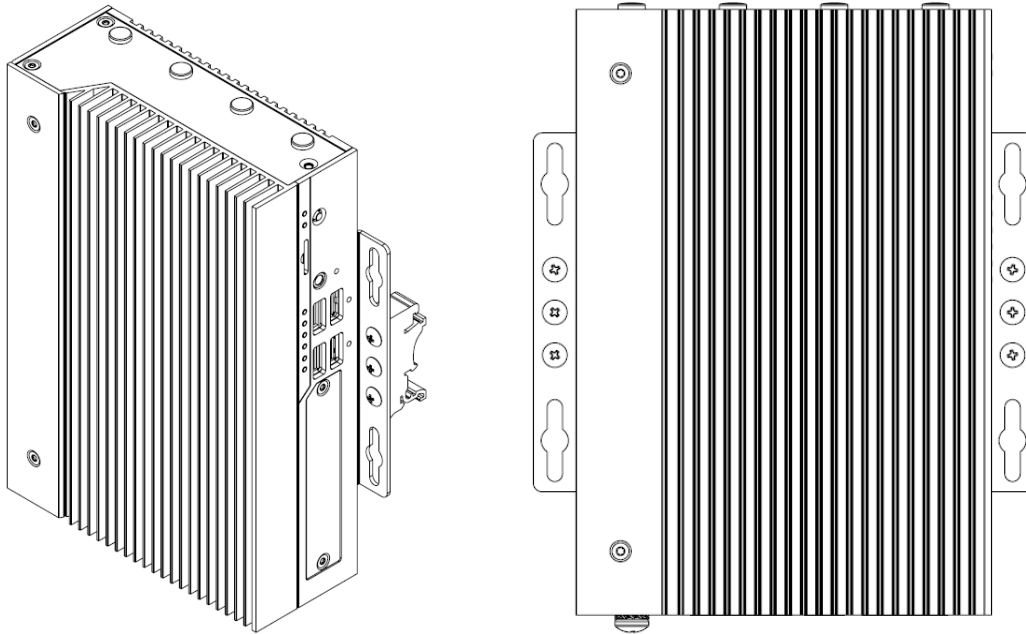
Step 1: Attach DIN Clip to the back of the chassis using the provided screws. To assemble, locate the two holes in the back of the chassis that line up to the two countersunk holes on the DIN clip.

Screw type: M3x0.5 FH 120 Degree
Length: 6 mm

Step 2: The orientation of the DIN clip is interchangeable between the two options. Determine the preferred orientation of the system and install the screws to the DIN clip accordingly.

Step 3: Install the system onto a DIN rail in the desired location.

3.3 - DIN Rail Mounting - Bottom (MTD103)



Step 1: Attach wall mounting brackets to the chassis using the provided screws. To assemble, locate the four holes in the chassis that line up to the two countersunk holes in each wall mount bracket.

Screw type: M3x0.5 FH 120 Degree
Length: 4 mm

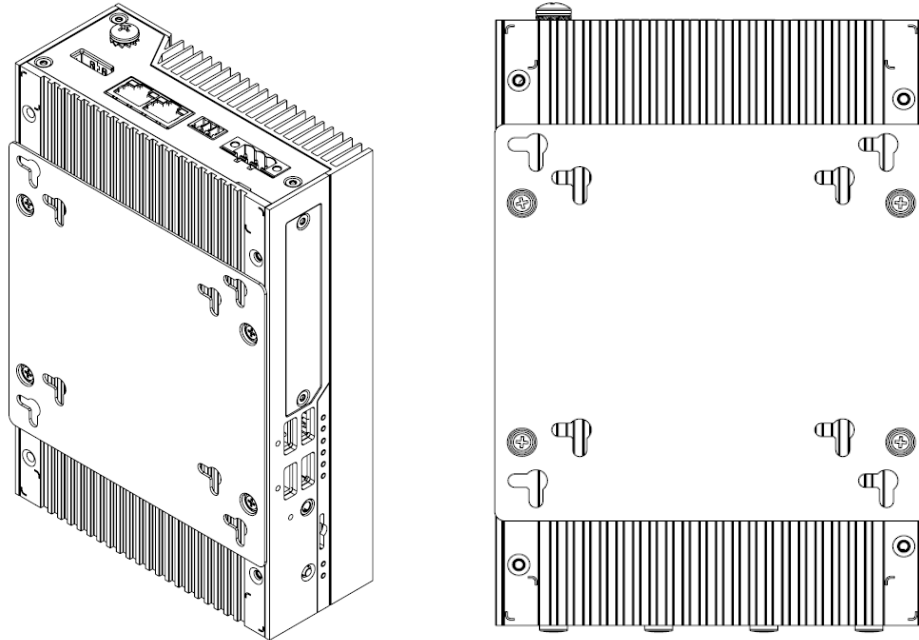
Step 2: Take care to ensure that the brackets are oriented correctly and that the part of the brackets in contact with the mounting surface is positioned away from the system to ensure a small air gap is maintained between the mounting surface and the system. Install the four supplied screws.

Step 3: Take the two plastic DIN clips and align the two outer holes with the two outer holes in the middle of each of the wall mount brackets.

Screw type: M3x0.5 PH
Length: 6 mm

Step 4: The orientation of the DIN clips is interchangeable between the two options. Determine the preferred orientation of the system and install the screws to the DIN clips accordingly.

3.3 - VESA Mounting (VMPL-1056)



Step 1: Attach VESA mounting plate to the chassis using the provided screws. Align the four holes on the VESA mounting plate with the corresponding holes on the chassis bottom.

Screw type: M3x0.5 FH 120 Degree
Length: 4 mm

Step 2: Attach system to a corresponding VESA MIS-D 75 or MIS-D 100 mounting pattern using the supplied M4x0.7 slotted standoffs.

4 - Power Management

4.1 - Wake-Up Events

The Karbon 400 platform supports multiple power states. The wake-up events can be configured in the BIOS. This section describes the supported power management functions and gives information on protection circuitry for power adapters.

Wake-Up Event	From ACPI State	Comments
Power Button	Low Power Shutdown, S5, S3	
LAN	S5, S3	Must be enabled in BIOS
USB	S3	
RTC Wake set by BIOS	S5, S3	Must be enabled in BIOS
RTC Wake set by OS	S3	Must be enabled in OS
Ignition	Low Power Shutdown, S5, S3	Must be enabled in OS

4.2 - Protection Circuitry

Parameter	Value
Nominal operating voltage (Rated DC value of input)	9~48V
Undervoltage protection trip DC level (system turns off)	6.9V
Maximum safe DC voltage (system not damaged)	57V
Ignition pin operating voltage	8~48V
Ignition pin max safe voltage (system not damaged)	57V

The specified DC levels are the absolute maximum values for function and safety of the system. The protection circuitry allows for brief transient voltages above these levels without the system turning off or being damaged. A transient voltage suppressor on the power input allows momentary excursions above stated limits. For input power consumption and current see **Appendix A**.

The Karbon 400 platform enables a unique low power state for use in automotive or battery powered applications. When enabled, the total power draw for the system is less than 10mA, making this solution ideal for systems requiring ultra-low quiescent power draw. This setting must be enabled from the OS similar to ignition settings. The system may be woken by either the power button or the ignition pin.

5 - Regulatory Compliance

CE

The computer system was evaluated for medical, IT equipment, automotive, maritime and railway EMC standards as a class A device. The computer complies with the relevant IT equipment directives for the CE mark. Modification of the system may void the certifications. Testing included: EN 55032, EN 55035, EN 60601-1, EN 62368-1, EN 50121-3-2, and UN Regulation No. 10 ISO 17650-2.

FCC Statement

This device complies with part 15 of the FCC rules as a Class A device. Operation is 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.

ISED (Innovation, Science and Economic Development Canada)

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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.

CAN ICES-003(A) / NMB-003(A)

UKCA

The computer system was evaluated for medical, IT equipment, automotive, maritime and railway EMC standards as a class A device. The computer complies with the relevant IT equipment directives for the UKCA mark.

VCCI

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。 VCCI-A

6 - Appendices

6.1 - Appendix A: Power Consumption

The power consumption of the K410 and K430 was measured for various system configurations, workloads, and power states at both 9V and 48V system input voltages. Tests were performed using Burnintest v9.0 build 1012 to stress system components with and without graphics enabled. The build configurations and power consumption are listed in the tables below.

The configurations below are using representative samples of internal devices, the specific components mentioned below may vary from the devices provided by OnLogic. The power consumption for each system configuration is record below

System Component	Config 1 Low K410	Config 2 Mid K410	Config 3 High K430
CPU	Atom x6211E 2C/2T/6W	Atom x6425E 4C/4T/12W	Atom x6425E 4C/4T/12W
Memory	8GB DDR4 So-DIMM	2x 16GB DDR4 So-DIMM	2x 16GB DDR4 So-DIMM
LAN	2x Intel I210	2x Intel I210	2x Intel I210
Storage #1 mPCIe SATA	none	128Gb SATA	128Gb SATA
Storage #2 M.2 B-Key	128Gb SATA	1TB NVMe	1TB NVMe
M.2 E-Key	none	Intel 9260	Intel 9260
COM1	Loopback test	Loopback test	Loopback test
COM2	Loopback test	Loopback test	Loopback test
Expansion M.2 B-Key #1	N/A	N/A	512GB NVMe
Expansion M.2 B-Key #2	N/A	N/A	512GB NVMe
USB	Loopback test (all ports)	Loopback test (all ports)	Loopback test (all ports)
OS	Windows 10 Pro 64 Bit	Windows 10 Pro 64 Bit	Windows 10 Pro 64 Bit
BIOS Version	A049	A049	A049

Config 1 Low K410		
Power Consumption	9V (avg W)	48V (avg W)
Windows Idle	6.3	6.9
CPU / system Stress	12.0	13.1
CPU / System & Graphics Stress	12.3	13.3
S3	1.58	1.87
S5	1.05	1.36
Deep S5	0.04	0.19

Config 2 Mid K410		
Power Consumption	9V (avg W)	48V (avg W)
Windows Idle	14.4	17.3
CPU / system Stress	21.5	22.7
CPU / System & Graphics Stress	26.6	27.2
S3	2.82	3.31
S5	1.11	1.39
Deep S5	0.04	0.19

Config 3 High K430		
Power Consumption	9V (avg W)	48V (avg W)
Windows Idle	19.7	21.4
CPU / system Stress	26.7	30.0
CPU / System & Graphics Stress	33.2	34.2
S3	6.44	7.30
S5	1.13	1.39
Deep S5	0.04	0.19

6.2 - Appendix B: BIOS Manual

For a detailed overview of the BIOS screens and individual settings, please refer to the OnLogic support site. Instructions for updating the BIOS can also be found on the support site. Please refer to the link below for detailed instructions.

<https://www.onlogic.com/support/documentation/k400-technical-resources>

6.3 - Appendix C: System Thermal Results

The thermal performance of the Karbon 400 platform was validated by loading the system to simulate workloads in excess of expected workloads. That is to say, the system was loaded to run at its full rated TDP (12W) while also simultaneously stressing memory and storage at different set points across the system's rated operating temperature range for hours on end. System performance was reviewed to look for any indication of performance issues or for components operating outside of their rated temperature range. Samples of data collected during one of these thermal evaluations for this platform are shown below. The sample data was collected during a test of the K410 chassis with the x6425E processor, 64 GB of DDR4 RAM and an NVMe storage drive. Of note in these results is the fact that no significant drops (10% or more) were observed in core frequency or package power. There were no indications of any throttling in the system throughout the entirety of the test.



6.4 - Appendix D: Expansion Port Pinout

6.4.1 - M.2 B-Key

Pin	Function	Function	Pin
1	CONFIG_3	3.3V	2
3	GND	3.3V	4
5	GND	FULL_CARD_POWER_OFF#	6
7	USB 2.0 D+	W_DISABLE1#	8
9	USB 2.0 D-	NC	10
11	GND	KEY	12
13	KEY	KEY	14
15	KEY	KEY	16
17	KEY	KEY	18
19	KEY	NC	20
21	CONFIG_0	NC	22
23	NC	NC	24
25	NC	GPIO_10/W_DISABLE2#	26
27	GND	NC	28
29	PERn1/USB3.1-Rx-	UIM-RESET	30
31	PERp1/USB3.1-Rx+	UIM_CLK	32
33	GND	UIM_DATA	34
35	PETn1/USB3.1-Tx-	UIM_PWR	36
37	PETp1/USB3.1-Tx+	NC	38
39	GND	NC	40
41	PERn0/SATA-B+	NC	42
43	PERp0/SATA-B-	NC	44
45	GND	NC	46
47	PETn0/SATA-A-	NC	48
49	PETp0/SATA-A+	PERST#	50
51	GND	CLKREQ#	52
53	REFCLKn	PEWAKE#	54
55	REFCLKp	NC	56
57	GND	NC	58
59	NC	NC	60
61	NC	NC	62
63	NC	NC	64
65	NC	SIM_DETECT	66
67	RESET_N	SUSCLK	68
69	CONFIG_1	3.3V	70
71	GND	3.3V	72
73	GND	3.3V	74
75	CONFIG_2		

6.4.2 - M.2 E-Key

Pin	Function	Function	Pin
1	GND	3.3 V	2
3	USB_D+	3.3 V	4
5	USB_D-	NC	6
7	GND	PCM_CLK	8
9	RESERVED	CNV_RF_RESET#_R	10
11	RESERVED	BT_PCMIN	12
13	GND	BT_PCMOUT	14
15	RESERVED	NC	16
17	RESERVED	GND	18
19	GND	NC	20
21	RESERVED	RESERVED	22
23	RESERVED	KEY	24
25	KEY	KEY	26
27	KEY	KEY	28
29	KEY	KEY	30
31	KEY	RESERVED	32
33	GND	RESERVED	34
35	PETp0	RESERVED	36
37	PETn0	RESERVED	38
39	GND	RESERVED	40
41	PERp0	RESERVED	42
43	PERn0	RESERVED	44
45	GND	RESERVED	46
47	REFCLKp0	RESERVED	48
49	REFCLKn0	SUSCLK(32kHz)	50
51	GND	PERST0#	52
53	CLKREQ0#	W_DISABLE2#	54
55	PEWAKE0#	W_DISABLE1#	56
57	GND	NC	58
59	RESERVED	NC	60
61	RESERVED	NC	62
63	GND	RESERVED	64
65	RESERVED	NC	66
67	RESERVED	NC	68
69	GND	NC	70
71	RESERVED	3.3V	72
73	RESERVED	3.3V	74
75	GND		

6.4.4 - mPCIe

Pin	Function	Function	Pin
1	WAKE#	3.3V	2
3	NC	GND	4
5	NC	1.5V	6
7	CLKREQ#	UIM_PWR	8
9	GND	UIM_DATA	10
11	REFCLK-	UIM_CLK	12
13	REFCLK+	UIM_RESET	14
15	GND	UIM_SPU	16
17	KEY	KEY	18
17	NC	GND	18
19	NC	W_DISABLE1#	20
21	GND	PERST#	22
23	PERn0	3.3V	24
25	PERp0	GND	26
27	GND	1.5V	28
29	GND	SMB_CLK	30
31	PETn0	SMB_DATA	32
33	PETp0	GND	34
35	GND	USB 2.0_D-	36
37	GND	USB 2.0_D+	38
39	3.3V	GND	40
41	3.3V	NC	42
43	GND	NC	44
45	NC	NC	46
47	NC	1.5V	48
49	NC	GND	50
51	W_DISABLE2#	3.3V	52

6.5 - Appendix F: Safety Information

Do not open or modify the device. The device uses components that comply with FCC and CE regulations. Modification of the device may void these certifications.

Ne pas ouvrir ni modifier l'appareil. L'appareil utilise des composants conformes aux réglementations FCC et CE. La modification de l'appareil peut annuler ces certifications.

6.5.1 - Safe Use and Installation Instructions

1. Install the device securely. Be careful handling the device to prevent injury and do not drop.
2. To protect against excessive RF exposure, maintain at least 20cm from any user and the RF antennas. Only use provided dual band antennas of 2dBi/2dBi gain.
3. Wall or ceiling mounting the device requires use of a mounting plate or bracket. The plate or bracket must be of metal construction and have a minimum thickness of 1mm.
4. Use M3x0.5mm Flat Head screws to attach mounting plate or mounting brackets to threaded holes on bottom or rear of chassis. Screws should be a minimum length of 4mm. Add 1mm of screw length for every mm of additional thickness of plate or bracket beyond 1.5mm.
5. Ambient operating temperature must be between -40 °C to 70 °C with a non-condensing relative humidity of 10-90%.
6. The device can be stored at temperatures between -40 °C to 85 °C.
7. Keep the device away from liquids and flammable materials.
8. Do not clean the device with liquids. The chassis can be cleaned with a cloth.
9. Allow at least 2 inches of space around all sides of the device for proper cooling. If the device is mounted to a vertical surface then recommended device orientation is so that heatsink fins allow air to rise unobstructed. Alternative orientations may result in reduced operational temperature range.
10. This device is intended for indoor operation only.
11. Use UL Listed external power supply with rated output 9-48Vdc
12. Install the device only with shielded network cables.
13. Only use SAE approved cables for automotive installation.
14. The installer should be experienced in aftermarket installation and familiar with general practices for installing electronics devices in vehicles.
15. The device should not be installed in the driver's area of a vehicle.
16. The device should be mounted in accordance with accepted aftermarket practices and materials for vehicle installation.
17. Only use UL Listed connectors for connection to automotive fuse panels.
18. Radio device is not intended for emergency service use.
19. Service and repair of the device must be done by qualified service personnel. This includes, but is not limited to, replacement of the CMOS battery. Replacement CMOS battery must be of the same type as the original.
20. Proper disposal of CMOS batteries must comply with local governance.



WARNING: There is danger of explosion if the CMOS battery is replaced incorrectly.

Disposal of battery into fire or a hot oven, or mechanically crushing or cutting of a battery can result in an explosion.

6.5.2 - Précautions et guide d'installation

1. Installez l'appareil en toute sécurité. Soyez prudent lors de la manipulation de l'appareil pour éviter les blessures et ne pas faire tomber.
2. Pour vous protéger contre une exposition RF excessive, maintenez au moins 20 cm de tout utilisateur et des antennes RF. Utilisez uniquement les antennes double bande fournies avec un gain de 2 dBi/2 dBi.
3. Le montage au mur ou au plafond nécessite l'utilisation d'une plaque de montage ou d'un support. La plaque ou le support doit être en métal et doit avoir une épaisseur minimale de 1 mm.
4. Utilisez des vis à tête plate M3x0,5mm pour fixer la plaque de montage ou les supports aux trous filetés situés au bas ou à l'arrière du châssis. Les vis doivent avoir une longueur minimale de 4 mm. Ajoutez 1 mm de longueur de vis pour chaque mm d'épaisseur supplémentaire de plaque ou de support dépassant 1,5 mm.
5. La plage de températures de fonctionnement doit être de -40 °C à 70 °C avec une humidité relative de 10 à 90% sans condensation. La température de fonctionnement dépend du choix du composant, y compris de l'adaptateur d'alimentation. Voir le tableau 1 ci-dessous pour le déclassement.
6. La plage de températures de stockage doit être de -40 °C à 85 °C.
7. Gardez l'appareil à l'écart des liquides et des matières inflammables.
8. Ne nettoyez pas l'appareil avec des liquides. Le châssis peut être nettoyé avec un chiffon.
9. Laissez au moins 5 cm d'espace autour de tous les côtés de l'appareil pour un refroidissement correct. Si l'appareil est monté sur une surface verticale, l'orientation recommandée est telle que les ailettes du dissipateur de chaleur permettent à l'air de monter sans obstruction. Les orientations alternatives peuvent entraîner une réduction de la plage de température de fonctionnement.
10. Cet appareil est conçu uniquement pour une utilisation en intérieur.
11. Utilisez une alimentation externe listée UL avec une sortie nominale de 9-48Vdc.
12. Installez l'appareil uniquement avec des câbles réseau blindés.
13. Utilisez uniquement des câbles approuvés par SAE pour l'installation automobile.
14. L'installateur doit être expérimenté dans l'installation après-vente et familiarisé avec les pratiques générales d'installation de dispositifs électroniques dans les véhicules.
15. L'appareil ne doit pas être installé dans la zone du conducteur d'un véhicule.
16. L'appareil doit être monté conformément aux pratiques et aux matériaux acceptés du marché secondaire pour l'installation du véhicule.
17. Utilisez uniquement des connecteurs homologués UL pour la connexion aux panneaux de fusibles automobiles.
18. L'appareil radio n'est pas destiné aux services d'urgence.
19. L'entretien et la réparation de l'appareil doivent être effectués par du personnel qualifié. Cela inclut, sans toutefois s'y limiter, le remplacement de la batterie CMOS. La batterie CMOS de remplacement doit être du même type que l'originale.
20. La mise au rebut des batteries usagées doit être réalisée conformément aux réglementations environnementales.



ATTENTION: Il existe un risque d'explosion si la pile CMOS n'est pas remplacée correctement. La mise au rebut de la batterie au feu ou dans un four chaud, ou l'écrasement ou la coupure mécanique d'une batterie peut entraîner une explosion.

6.6 - Appendix G: Errata

6.6.1 FE-1: RS422 and RS485 Require SerCx2

Overview

Category:	Software / Drivers
SKU(s) Affected:	K410, K430
Revision(s) Affected:	All release hardware
Revision Resolved:	Workaround
Severity:	Low

Description

Configuring the system to use RS422 or RS485 serial modes on Windows requires using the SerCx2.sys driver framework. Most existing serial utilities only support the Serial.sys driver framework, requiring the use of [Windows APIs](#) to use the RS422/485 serial device.

RS232 serial mode uses the Serial.sys driver framework.

Workaround

A UART Sub-Device driver is [available for download](#), and provides a mapping layer to the Serial.sys driver framework. This driver does not support setting the DTR/RTS hardware lines, which may result in compatibility issues with some software packages, including PuTTY.

Resolution

There are no planned changes to the serial framework.

FE-2: Digital and Chassis Ground Not Isolated

Overview

Category:	Hardware / PCB
SKU(s) Affected:	K410, K430
Revision(s) Affected:	B01-00005R(1-5)
Revision Resolved:	B01-00005R6
Severity:	Low

Description

For all PCB revisions (5R1-5R5), the SIM slot connects the digital and chassis ground planes, removing isolation between the two. Under normal operating conditions, the function of the motherboard should not be affected.

Customers who rely on chassis ground isolation are recommended to isolate the chassis from earth ground externally.

Resolution

Steps to mitigate the issue will be taken in PCB B01-00005R6 by eliminating the short. The changes are present in F01-x0005R6.