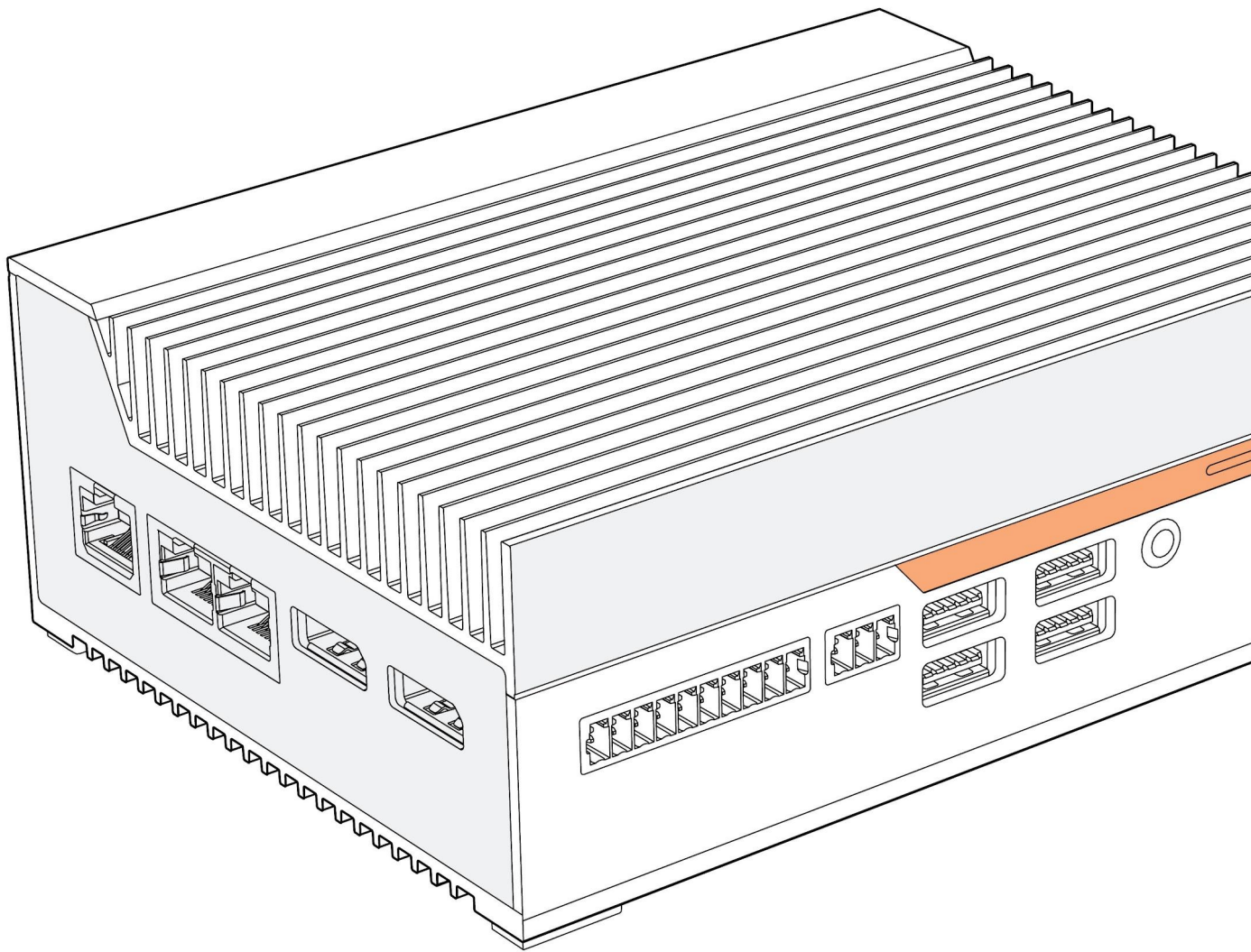


# Karbon 300 Product Manual

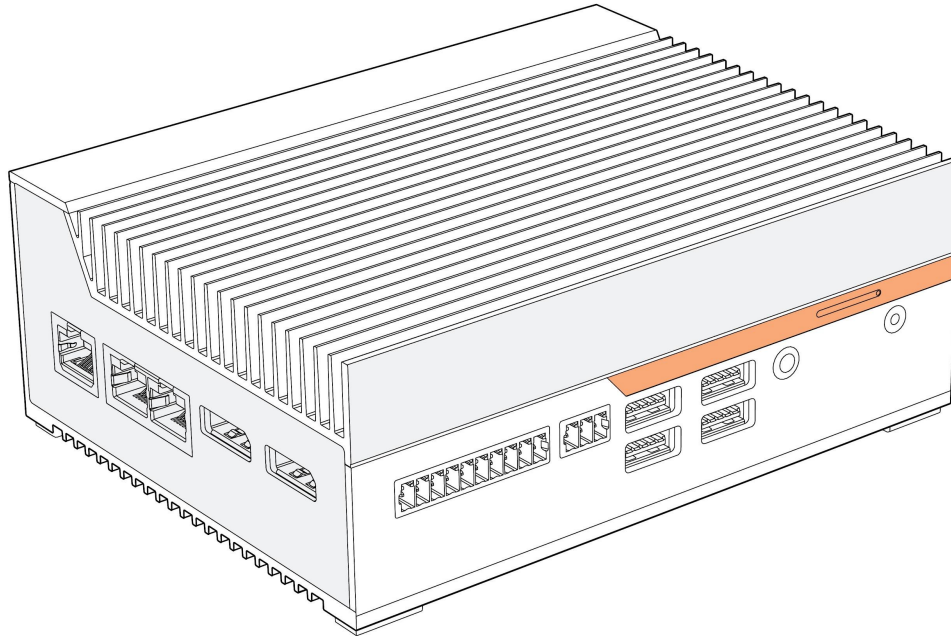


# Revision History

Revision History	Date
First release of Karbon 300 manual	05/15/2019
Updated DIO Circuit Diagram	07/29/2019
Updated part number for 3-pin CAN bus terminal block connector	08/20/2019
Added dimensional drawings for wall mount	01/27/2020
Updated Serial Ports Language & CAN Bus Diagram	09/08/2020
Added page numbers & updated diagram 2.2.1	10/15/2020
Updated diagram 2.2	11/17/2020
Updated table 1.2 & Updated diagram 2.1	04/22/2021
Updated Mounting Instructions	05/12/2022

<b>1 - System Overview</b>	<b>4</b>
<b>1.1 - Accessories</b>	<b>4</b>
<b>1.2 - Product Specifications</b>	<b>5</b>
<b>1.3 - Exterior Features and Dimensions</b>	<b>7</b>
1.3.1 - Karbon 300 Dimensions	7
1.3.2 - Front I/O	7
1.3.3 - Side I/O	7
<b>1.4 - Motherboard Overview</b>	<b>8</b>
1.4.1 - System Block Diagram	8
1.4.2 - Motherboard Features	9
<b>2 - I/O Definitions</b>	<b>10</b>
<b>2.1 - Serial Ports</b>	<b>10</b>
<b>2.2 - DIO</b>	<b>11</b>
2.2.1 - DIO Connection Diagram	11
<b>2.3 - LEDs</b>	<b>12</b>
<b>2.4 - Automotive Ignition Power Sensing (IGN)</b>	<b>12</b>
<b>2.5 - CAN Bus</b>	<b>13</b>
2.5.1 - CAN Bus Connection Diagram	13
<b>2.6 - LAN</b>	<b>13</b>
<b>3 - Mounting Instructions</b>	<b>14</b>
<b>3.1 - Wall Mount</b>	<b>14</b>
<b>3.2 - DIN Rail Mounting</b>	<b>14</b>
<b>3.3 - VESA Mounting</b>	<b>15</b>
<b>4 - Microcontroller</b>	<b>16</b>
<b>4.1 - Overview</b>	<b>16</b>
<b>5 - Power Management</b>	<b>16</b>
<b>5.1 - Wake-Up Events</b>	<b>16</b>
<b>5.2 - Protection Circuitry</b>	<b>17</b>

# 1 - System Overview



## 1.1 - Accessories

- 3-pin Power Terminal Block Connector (Dinkle PN: 2ESDVM-03P)
- 3-pin CAN bus Terminal Block Connector (Dinkle PN: EC350V-03P)
- 10-pin DIO Terminal Block Connector (Dinkle PN: EC350V-10P)
- M.2 and mPCIe expansion card screws

If you purchased additional items such as mounting brackets, power supplies or antennas, 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 300 pages at:

US: <https://www.onlogic.com/k300/>

EU: <https://www.onlogic.com/eu-en/k300/>

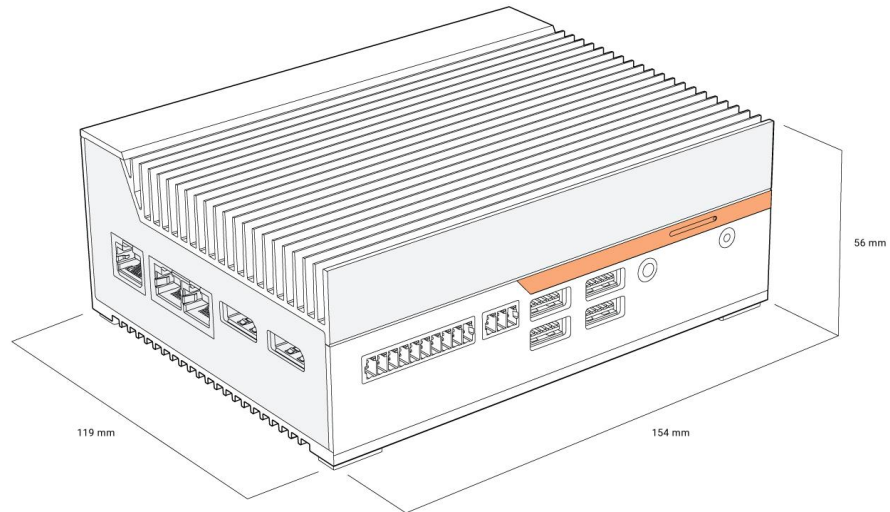
## 1.2 - Product Specifications

	Karbon 300 Series			
	K300-E3940-4-P	K300-E3930-4P-P	K300-E3950-8-P	K300-E3950-8P-P
<b>Processor</b>	Intel Atom x5-E3930 Dual-core		Intel Atom x7-E3950 Quad-core	
<b>Memory</b>	4GB Onboard LPDDR4		8GB Onboard LPDDR4	
<b>Integrated Graphics</b>	Intel HD Graphics 500		Intel HD Graphics 505	
<b>Bottom I/O</b>	3x GbE LAN	1x GbE LAN 2x PoE LAN	3x GbE LAN	1x GbE LAN 2x PoE LAN
	2x Full-size DisplayPort			
<b>Top I/O</b>	2x Serial RS-232/422/485			
	3-pin Power input			
	4x Antenna holes			
<b>Front I/O</b>	Power button			
	1x 3.5 mm Audio jack (mic-in, line-out)			
	8-bit Isolated DIO			
	4x USB 3.0 Type A			
	8x Status LEDs			
	3-pin CAN bus 2.0B			
	Nano-SIM slot (4FF)			
<b>Storage</b>	M.2 2280 M-key (PCIe x2, SATA)			
<b>Expansion</b>	Full-length mPCIe slot (PCIe, SATA)			
	M.2 2230 E-key (PCIe, USB)			
<b>Special Features</b>	OnLogic Microcontroller (MCU)			
	Onboard TPM 2.0 (Nuvoton NPCT750)			
	Automotive Ignition Power Sensing			
	SuperCap backup for RTC battery			
<b>Operating Systems</b>	Windows 10, Ubuntu 18.04			

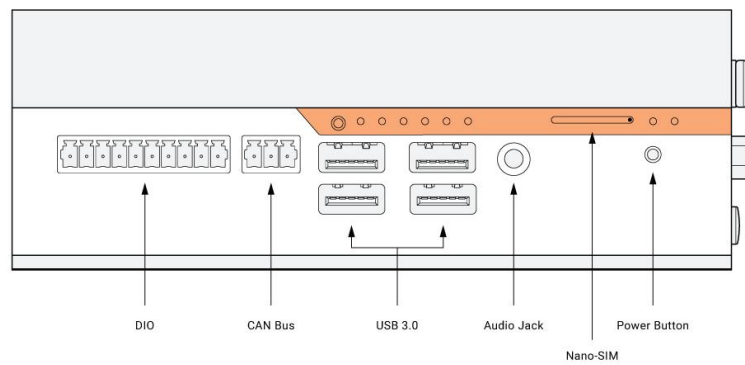
<b>LAN Controllers</b>	Intel Ethernet Controller 1210-IT
<b>Voltage Input</b>	9~36 VDC
<b>Dimensions</b>	56 x 154 x 119 mm
<b>Mounting</b>	Wall mount (edge and bottom) DIN Rail mount (edge and bottom) VESA mount (bottom)
<b>Environment</b>	Operating Temperature: -25°C ~ 70°C
	Operating Humidity: 10 ~ 90% (non-condensing)
	Storage Temperature: -40°C ~ 85°C
	Storage Humidity: 0 ~ 90% (non-condensing)
<b>Certifications</b>	UL Listed configurations available CB Scheme FCC 47 CFR Part 15 Low-Voltage (2014/35/EU) Electromagnetic Compatibility (2014/30/EU) Radio Equipment (2014/53/EU) - Only applicable for configurations with wireless transmitters EN 55032 EN 55035 RoHS 3 (2015/863/EU) WEEE Directive (2012/19/EU) EN 50121 EN 62368-1 IEC 62368-1 UL 62368-1

## 1.3 - Exterior Features and Dimensions

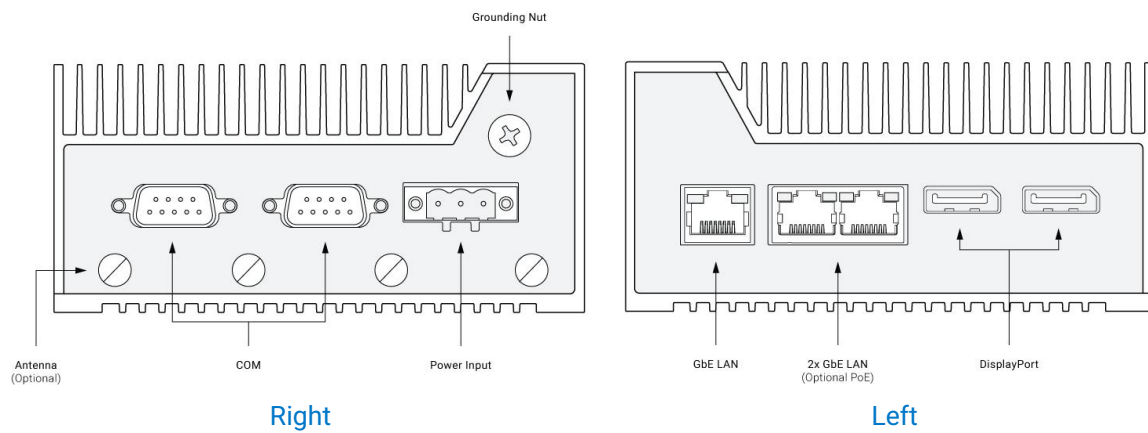
### 1.3.1 - Karbon 300 Dimensions



### 1.3.2 - Front I/O

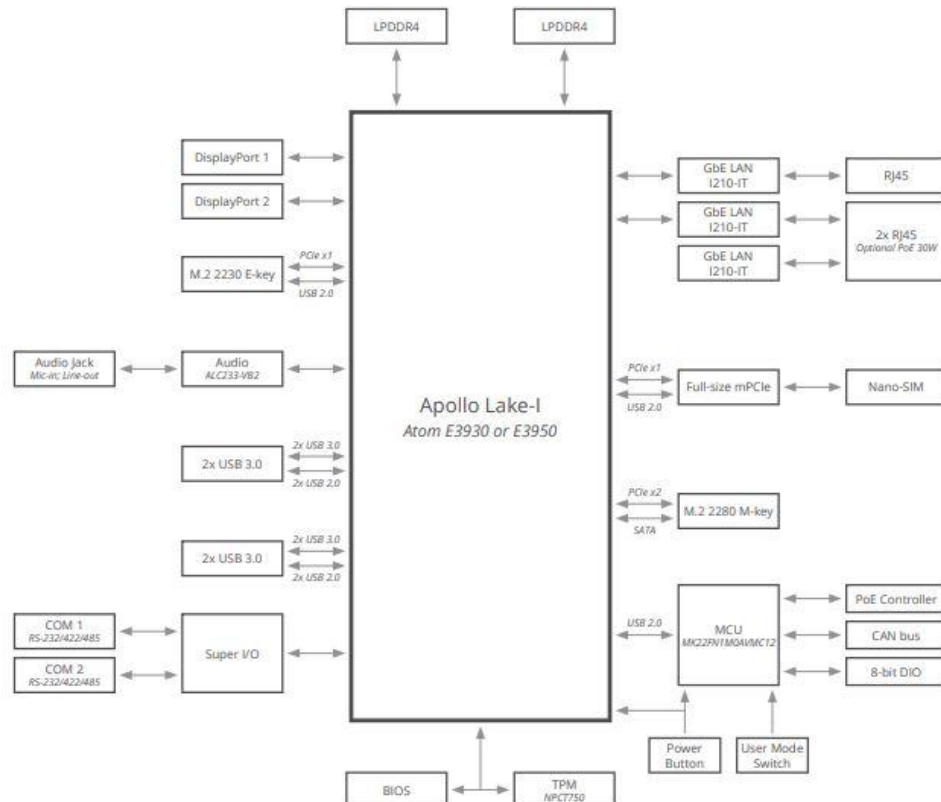


### 1.3.3 - Side I/O



## 1.4 - Motherboard Overview

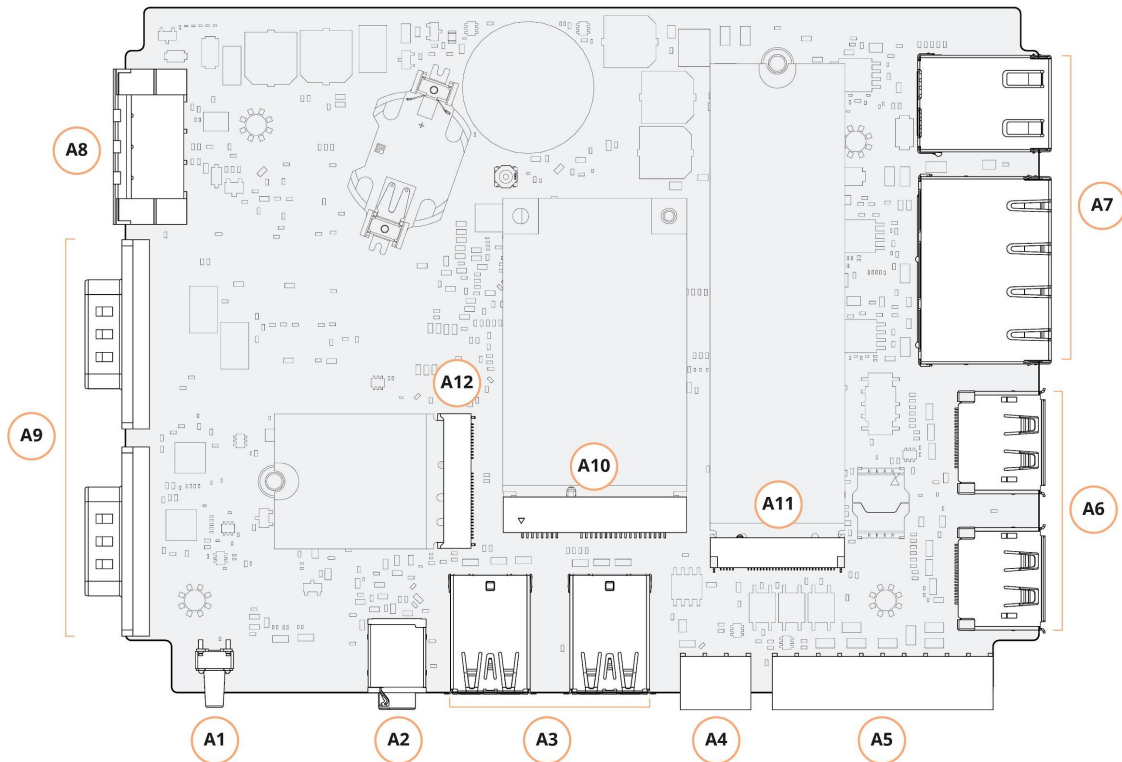
### 1.4.1 - System Block Diagram





System	Memory	Manufacturer	Part Number	Quantity	Total Capacity
K300-E3930-4-P	LPDDR4	Samsung	K4F6E304HBMGCJ	2	4 GB
K300-E3930-4P-P	LPDDR4	Samsung	K4F6E304HBMGCJ	2	4 GB
K300-E3950-8-P	LPDDR4	Samsung	K4FBE3D4HMMGCJ	2	8 GB
K300-E3950-8P-P	LPDDR4	Samsung	K4FBE3D4HMMGCJ	2	8 GB

## 1.4.2 - Motherboard Features

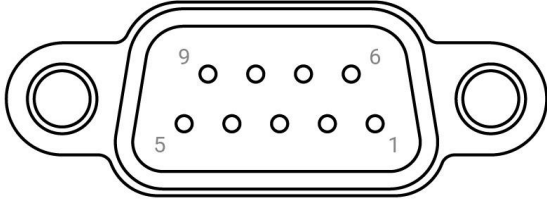


Item	Function Description
A1	Power button
A2	3.5 mm Audio jack
A3	4 x USB 3.0 Type A ports
A4	3-pin CAN bus
A5	8-bit isolated DIO (10-pin)
A6	2 x Full-size DisplayPort
A7	1 x RJ45 GbE LAN port
	2 x RJ45 GbE LAN ports with optional PoE (30W total)
A8	3-pin power input (9 ~ 36 VDC)
A9	2 x Serial RS-232/422/485 ports
A10	Full-size mPCIe
A11	M.2 2280 M-key for NVMe or SATA storage

A12	M.2 2230 E-key for Wi-Fi or WAN card
-----	--------------------------------------

## 2 - I/O Definitions

### 2.1 - Serial Ports

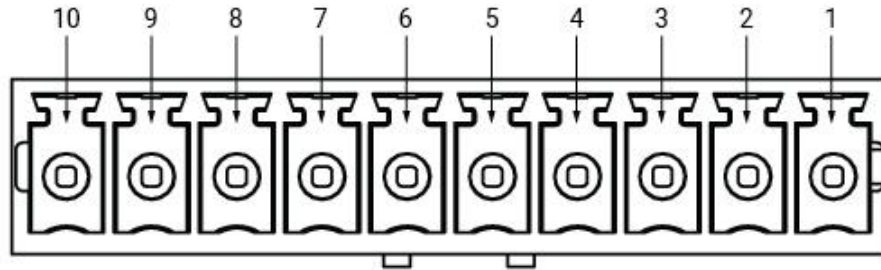
	Pin	RS-232	RS-422	RS-485
	1	DCD	TX-	TX-/RX-
	2	RX	TX+	TX+/RX+
	3	TX	RX+	NC
	4	DTR	RX-	NC
	5	GND	GND*	GND*
	6	DSR	NC	NC
	7	RTS	NC	NC
	8	CTS	NC	NC
	9	RI	NC	NC

NC = Not Connected

\* GND is optional as a signal return path for RS422/485 and may not be valid for all applications.

## 2.2 - DIO

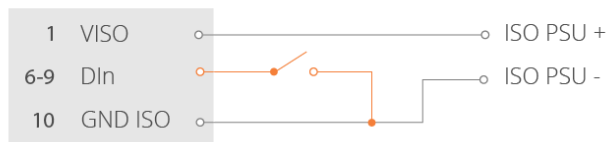
The Karbon 300 DIO terminals are optically isolated. This means that the terminal is separated from other motherboard features for protection. In addition, the DIO requires external power from a 9-36VDC source through Pin 1 to function.



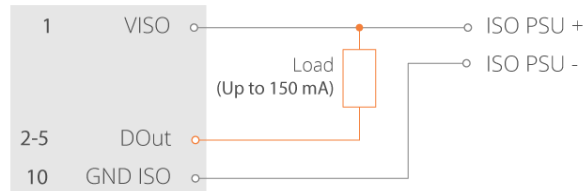
Pin 10	Pin 9	Pin 8	Pin 7	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2	Pin 1
GND	In 4	In 3	In 2	In 1	Out 4	Out 3	Out 2	Out 1	Power

### 2.2.1 - DIO Connection Diagram

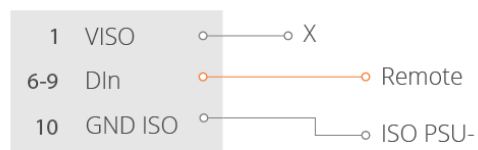
Karbon 300



Karbon 300



Karbon 300



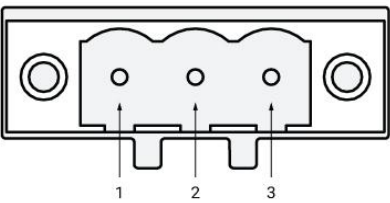
## 2.3 - LEDs



LED	On	Off	Blink	Pulse
<b>HDD</b>	-	-	Internal storage drive activity	-
<b>Power</b>	Device is on	Device is off	Device is asleep	-
<b>Automotive Ignition</b>	Ignition input to device is on	Ignition input to device is off	-	-
<b>Watchdog</b>	Internal MCU is not functioning normally	Internal MCU is not functioning normally	Firmware bootloader is active	Internal MCU is functioning normally
<b>LEDs 1-4</b>	Currently selected user mode	-	-	-

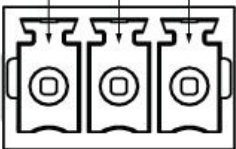
## 2.4 - Automotive Ignition Power Sensing (IGN)

The K300 3-pin power input terminal offers automotive ignition sensing. The ignition sensing timing for power on and off delays can be modified through OnLogic's microcontroller (MCU) using serial commands. These commands allow setting the delay on startup after ignition is detected, the delay until soft and hard shutdown when ignition is lost, and enabling/disabling ignition sensing. For more information on ignition power sensing, and instructions on using these serial commands from Windows or Linux, visit our [Karbon series technical support site](#).

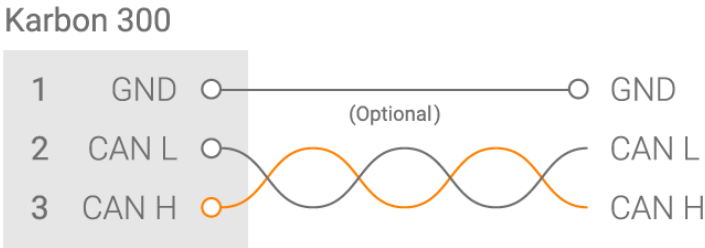
	Pin	Definition
	1	GND
	2	Ignition
	3	9~36 VDC Input

## 2.5 - CAN Bus

See Section 4 for information on how to drive the CAN bus.

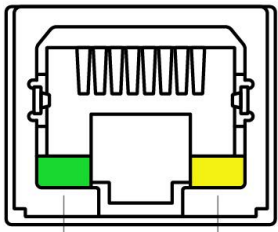
	Pin	Definition
	1	GND
	2	CAN L
	3	CAN H

### 2.5.1 - CAN Bus Connection Diagram



## 2.6 - LAN

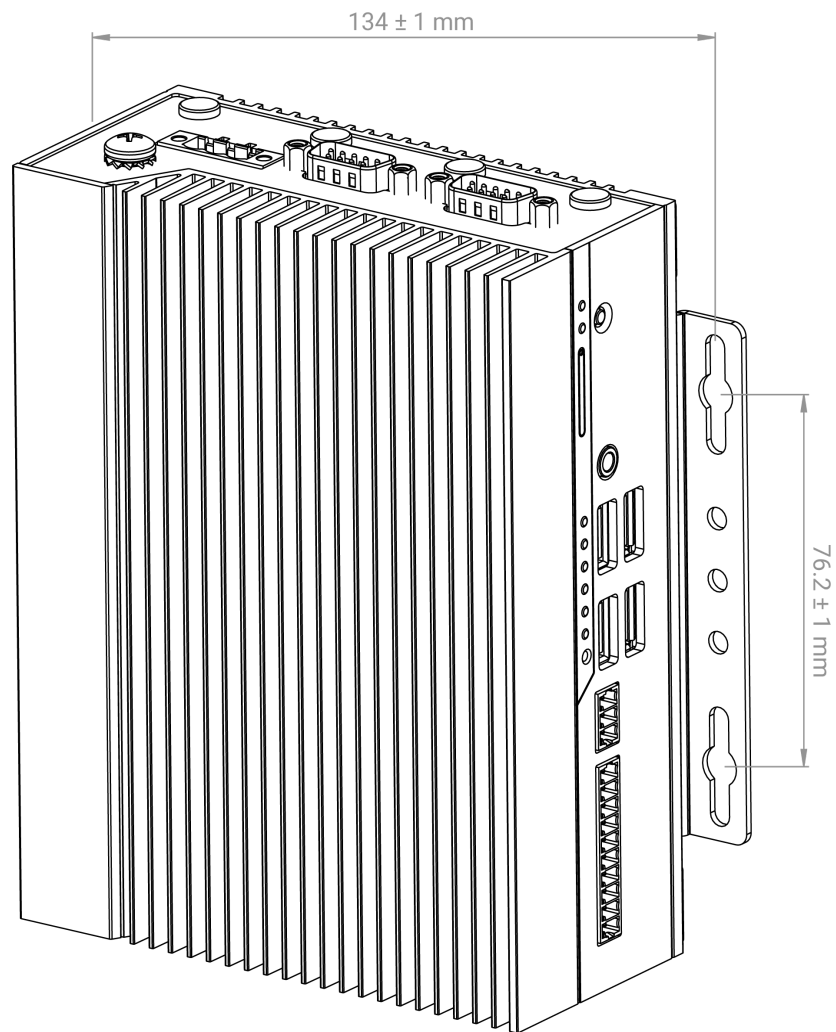
The dual LAN ports on Karbon 300 are PoE enabled for models K300-E3930-4P-P and K300-E3950-8P-P. When PoE is disabled the LAN ports function as standard GbE ports. The single LAN ports on all Karbon 300 models are standard GbE ports.

 Link LED (Green)      Speed LED (Green/Yellow)	LED	Color	State	Condition
	Link	-	Off	LAN link is not established
		Green	On	LAN link is 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

## 3 - Mounting Instructions

### 3.1 - Wall Mount

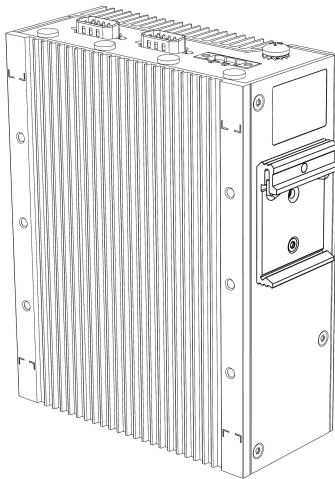
- Step 1:** Mark and prep holes in surface for mounting
- Step 2:** Attach wall mount brackets to chassis
- Step 3:** Fasten system to surface



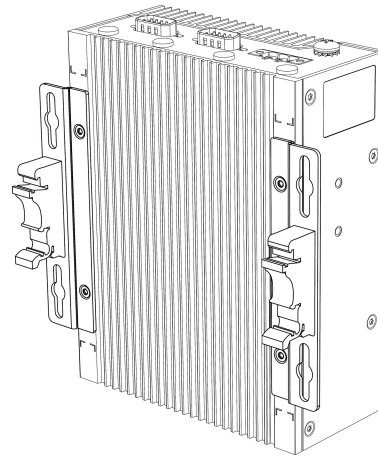
## 3.2 - DIN Rail Mounting

- Step 1:** Attach wall mounting brackets to the chassis
- Step 2:** Attach DIN Rail mounting brackets to the chassis
- Step 3:** Clip system to the DIN Rail





DIN Rail Edge Mounting



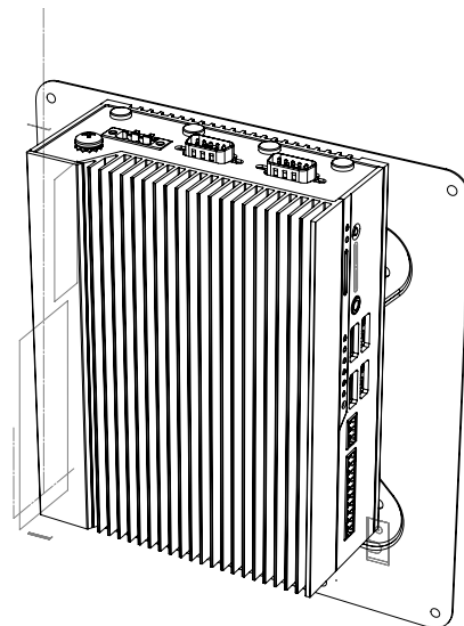
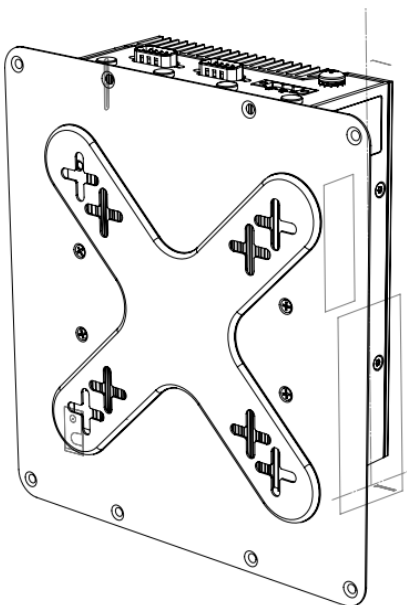
DIN Rail Back Mounting

### 3.3 - VESA Mounting

**Step 1:** Install four VESA screws into the display/surface

**Step 2:** Attach VESA bracket to the chassis

**Step 3:** Hang combined system and bracket to the display/surface



## 4 - Microcontroller

### 4.1 - Overview

The microcontroller (MCU) on Karbon 300 controls several systems, including:

- Automotive ignition power sensing
- CAN bus
- DIO
- Status LEDs
- Power management and wake-up
- DisplayPort CEC and persistent EDID

A segment is exposed for user control via two serial ports. By reading and writing to these serial ports, the user can send and receive CAN messages, read/set the DIO state, and select from a number of configuration options. One port is dedicated to K300's CAN bus, while another doubles as a serial terminal and the DIO interface. Any configuration settings may be saved to non-volatile memory. This means that upon a long power-off, the MCU settings will be retained.

The serial interfaces can be controlled through Pykarbon, the karbon series' very own MCU interface tool. To learn more about how to use the Karbon series MCU and Pykarbon interface tools, visit our [Karbon Series technical support site](#) for a complete overview of articles.

View the following articles for specific information:

[Introducing the Pykarbon Module: Karbon Series Interface Tool](#): for information on the Pykarbon module and how to set up the Pykarbon module to configure your system.

[Karbon Series - Using the Serial Interface](#): for information regarding voltage settings, timing settings, and sending commands to the serial interface to configure your system.

[Karbon Series - CAN Bus FAQ](#): for information regarding the CAN Bus and how to configure it.

The Pykarbon module is designed to be a simple and easy tool for configuring your system to meet your needs and applications. Visit [OnLogic's Pykarbon GitHub page](#) for specific information regarding using the interface tool.

## 5 - Power Management

### 5.1 - Wake-Up Events

Karbon 300 supports multiple power states. The wake-up events can be configured in the MCU and BIOS. This section describes the power management functions you can perform and gives information on protection circuitry for power adapters.

Wake-Up Event	From ACPI State	Comments
Power Button	VR-Disabled, S5, S4, S3	
Ignition	VR-Disabled, S5, S4, S3	Must be enabled in MCU.

Digital Input	S5, S4, S3	Must be enabled in MCU. Requires external reference power source.
LAN	S5, S4, S3	Must be enabled per port and generally in BIOS.
USB	S3	
RTC Alarm	S5	Wake from S5 must be enabled in BIOS.

## 5.2 - Protection Circuitry

Parameter	Value
Nominal operating voltage (Rated DC value of input)	9~36VDC
Undervoltage protection trip DC level (system turns off)	8.1V
Overvoltage protection trip DC level (system turns off)	42.5V
Maximum safe DC voltage (system not damaged)	50V
Minimum safe reverse voltage (system not damaged)	-40V
Ignition pin safe working voltage range (system not damaged)	-20~50V

These DC levels specified are the absolute max values for the pins for function and safety of the system. The protection circuitry allows for brief transient voltages above these levels without the system turning off (transients up to 50V for <30 ms). A TVS protection on the input allows protection for:

- 5000W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles): .01%
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- EFT protection in accordance with IEC 61000-4-4