Isolated IO Controller Datasheet

1 Introduction

The LDSBus Isolated IO Controller provides two isolated channels of digital and analog inputs. It supports a variety of power source options, enabling signal levels of 3.3V, 5V, 10V and 12V. Additionally, it can source power from either internal or external voltage supplies for I/O functionality, offering greater flexibility in system integration. Each channel (input and output) is isolated from the others.

Each digital output can switch between 0V and 3.3V, 5V, 12V or referenced to an external voltage source. Each digital input can be between 0V and 1.8V to 12V. A 5V voltage source is provided for common applications that switch between 0-5V.

Each analog output can produce a voltage between 0-10V, and each analog input supports voltage or current controlled input sources ranging between 0-10V.

The controller may be used in numerous and diverse applications such as simple IO control, or 0-10V dimmers, weather station, water level detector or sensor, etc.

1.1 Features

- 2 isolated digital output channels
- 2 isolated digital input channels
- 2 isolated analog output channels
- 2 isolated analog input channels
- Built-in power supply (3.3V/ 5V/ 10V/ 12V) and external power supply option
- Flexible combination of internal or external power supply
- Supports BRTSys LDSBus protocol
- Low power consumption
- Operating temperature range: 0°C to +55°C
- Flush mount and DIN Rail mounting options
- Supported platforms:
  - IoTPortal
  - PanL Smart Living products
  - LDSBus Python SDK
  - LDSBus .Net SDK

Visit https://brtsys.com/resources for more information.

2 Part Numbers/Ordering Information

Part#	Description
LC-0601-01A	LDSBus Isolated IO Controller
LA-0501-01A	LDSBus RJ11-RJ11 Cable (5m)
LA-1201-01A	LDSBus DIN Rail Mount Set

Table 1- Part Numbers / Ordering Information

Table of Contents

3 Specifications

Features	Interface	RS485
	System Status Indicator	1x RGB LED
	Mounting	Flush Mount
		DIN-Rail Mount
Power	Device Input Voltage	5V DC Bus Power
	Power (Typ)	1.15W
	Power (Max)	1.20W
	Output Power*	3.3V/30mW
		5V/50mW
		10V/400mW
		12V/240mW
Analog Input	Number of Channels	2
	Analog Input range	0V - 10V
	Analog Input resolution	10mV
	Analog Input Accuracy	Typical: +/- 3%;
		For 0V - 1V, Accuracy: +/- 10mV (typical)
Analog Output	Number of Channels	2
	Analog Output range	0V - 10V
	Analog Output resolution	10mV
	Analog Output Accuracy	Typical: +/- 3%;
		For 0V - 1V, Accuracy: +/- 10mV (typical)
Digital IO Input	Number of Channels	2
	Digital Input Voltage	1.8VDC - 12VDC (refer to external power voltage)
Digital IO Output	Number of Channels	2
	Digital Output Voltage	1.8VDC - 12VDC (refer to external power voltage)
Physical Characteristics	Color	White
	Housing	Polycarbonate
	Dimension	L138.2mm x W76.0mm x H31.9mm
Environmental Limits	Operating Temperature	0 to 55°C
	Storage Temperature	-20 to 85°C
	Ambient Relative Humidity	5 to 95% (non-condensing)
Package Contents	Device	1x LDSBus Isolated IO Controller
	Wire Assembly	1x LDSBus RJ11-RJ11 Cable (5m)
Optional	Mounting Accessories	1x LDSBus DIN Rail Mount set

Table 2 - LDSBus Isolated IO Controller Specifications

* Total current output up to 60mA.

4 FCC Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) These devices may not cause harmful interference, and

(2) These devices must accept any interference received, including interference that may cause undesired operation.

NOTE: The equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If the equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF exposure guidelines, at least 20cm of separation distance between the device and the user's body must be always maintained.

FCC Radiation Exposure Statement

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules. This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and consider removing the no-collocation statement.

Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

5 Hardware Features

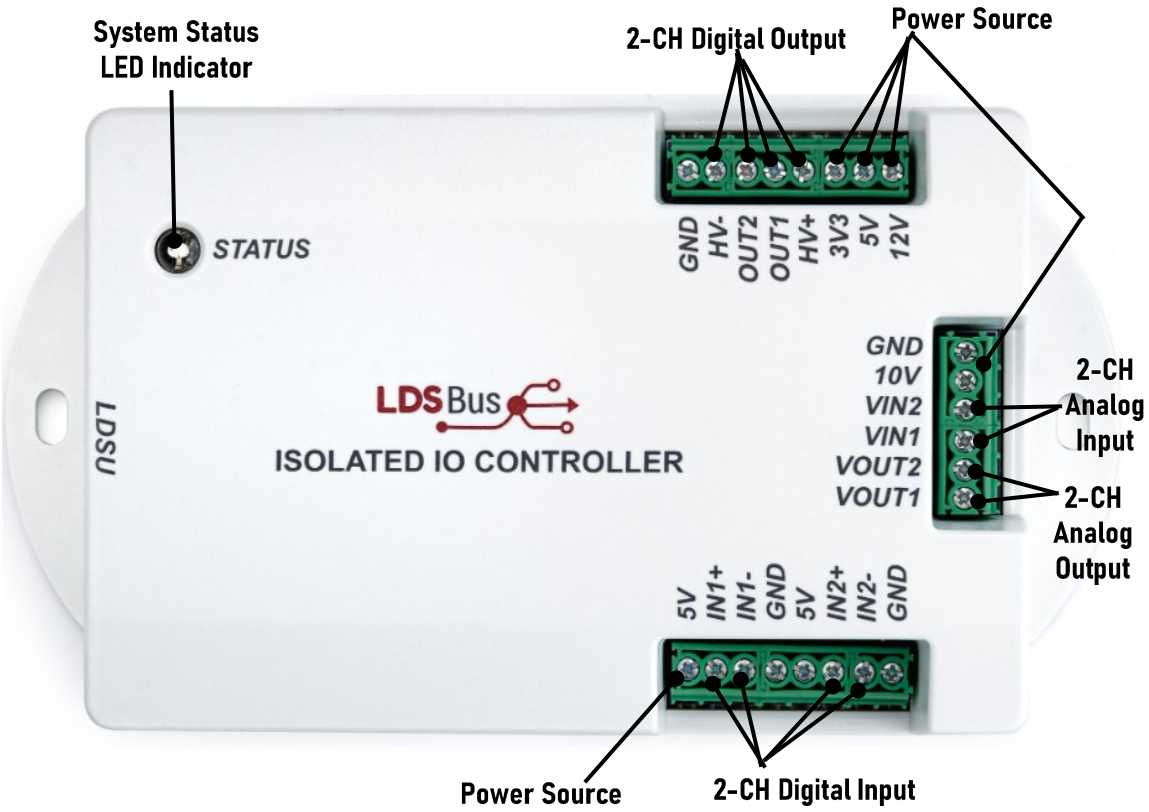


Figure 1 - LDSBus Isolated IO Controller Hardware Features

Function	Labels	Description
2-CH Digital Input	IN1+ IN1- IN2+ IN2-	Two individual digital input channels to measure (monitor) the digital input TTL status. These 2 inputs are isolated from each other.
2-CH Digital Output	OUT2 OUT1	Two individual digital output channels to control external controller by TTL signal
	HV+ HV-	Used to define the power supply of Digital IO Output. OUT1 and OUT2 share a common power source (on-board external) though HV+ and HV- connections.
2-CH Analog Input	VIN2 VIN1	Two individual analog input channels to measure (monitor) the analog voltage. These 2 inputs are isolated from each other.
2-CH Analog Output	VOUT2 VOUT1	Two individual analog output channels to supply the analog voltage. VOUT1 and VOUT2 share a common power source (on-board).
Power Source	3V3 5V 10V 12V	Output supply voltage for internal or external use.
System Status LED Indicator	LED	Status LED
RJ12 Port	LDSU	LDSBus data and power interface port.

Table 3 - LDSBus Isolated IO Controller Hardware Features

6 Isolated IO Controller Configuration and Installation

Please refer to LDSBus Configuration Utility User Guide on how to configure the device name, address, and termination settings before using it for your application.

6.1 Connection Diagram

Figure 2 illustrates the connection of the LDSBus Isolated IO Controller (LDSBus Device) to the LDSBus. Please visit https://brtsys.com/resources to view the full device application, setup and installation guides.

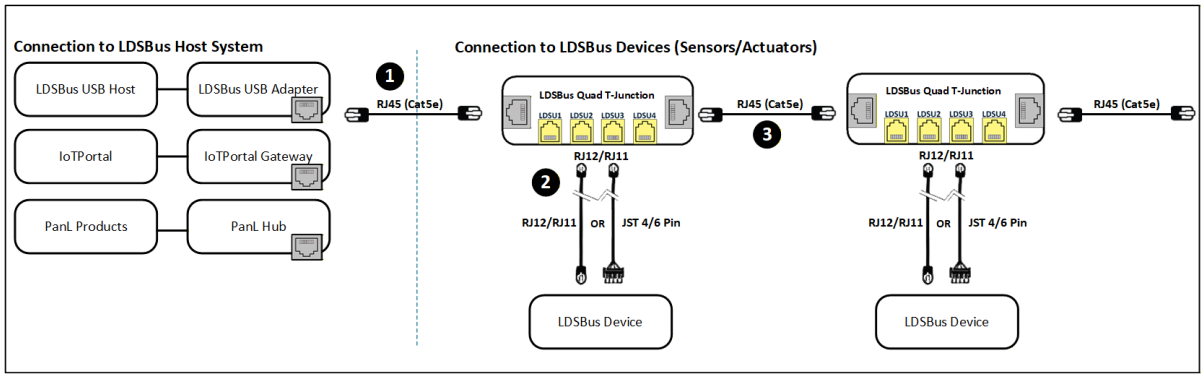


Figure 2 - Connection Diagram

Setup Instructions:

1. Connect the first LDSBus Quad T-Junction to any of the LDSBus Host Systems using a RJ45(CAT5e) cable.

2. Connect the configured LDSBus Isolated IO controller to the LDSBus Quad T-Junction as shown in Figure 2.

3. If there is more than one LDSBus Quad T-Junction, chain them together as shown in Figure 2.

   Enable termination for the last device in LDSBus.

7 Mounting Instructions

7.1 Flush Mount

The device can be flush mounted directly on a wall or any flat surface using 2 M3.5*16mm (thread) screws.

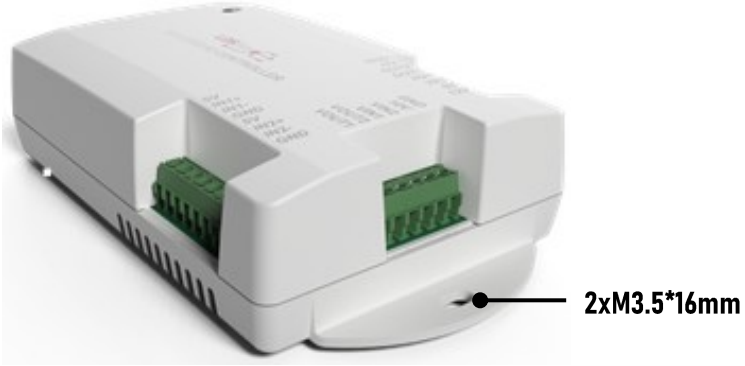


Figure 3 - LDSBus Isolated IO Controller Flush Mount

7.2 DIN Rail Mount

The device can be mounted on a DIN Rail using the LDSBus DIN Rail Mount set. This set is optional and includes the bracket and mounting screws.

Figure 4 - LDSBus Isolated IO Controller DIN Rail Mount

8 Terminal Wiring Instructions Isolated IO Controller

Terminal blocks are secured using screws. To clamp the wire to the terminal block, insert a 0.4mm x 2.5mm slotted screwdriver and rotate in a clockwise direction. To release the wire, turn the handle in an anticlockwise direction.

Figure 5 - Clamping wire with screwdriver in clockwise direction

Table 4 provides a list of American Wire Gauges (AWGs) that can be used in Terminal Blocks.

Conductor Type	**Wire dimeter/AWG**
Solid conductor	0.2~1.5mm^2/26~16 AWG
Stranded conductor	0.2~1.5mm^2/26~16 AWG
Stranded conductor; with insulated ferrule	0.25~0.75mm^2

Table 4 - AWG to use in terminal block

As shown in Figure 6, the wire strip is 3mm to 5mm long.

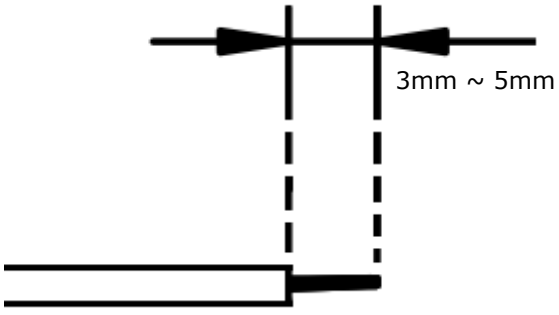


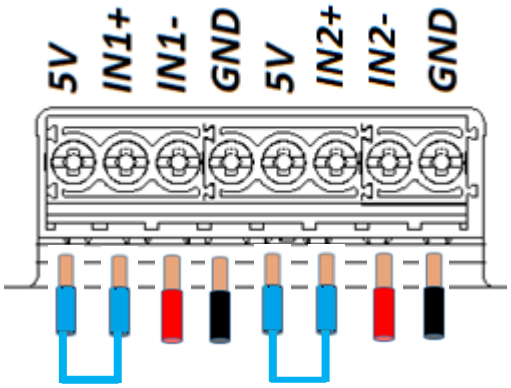
Figure 6 - Wire Strip Length

8.1 Isolated IO Digital INPUT Setup

The 2CH isolated digital input supports external digital signals ranging from 1.8 to 12V. The two options for connecting are as follows:

Note: As each channel is independent, Channel 1 and Channel 2 can use different configurations.

IO Digital Input with 5V Application



Use AWG 26~16; The RED wire indicates that it comes from an external IO source

→ Connect to the IN1- or IN2-

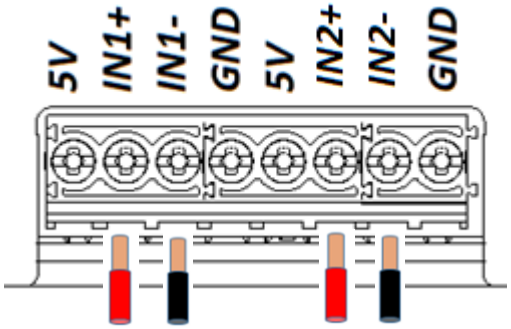
Use AWG 26~16; The BLACK wire indicates that it comes from external GND

→ Connect to the GND

Use AWG 26~16; The BLUE wire connects to the 5V source on board

→ Connect to the IN1+ or IN2+

IO Digital Input with External Pull-up



Use AWG 26~16; The RED wire indicates that it comes from External IO source

→ Connect to the IN1+ or IN2+

Use AWG 26~16; The BLACK wire indicates that it comes from external GND

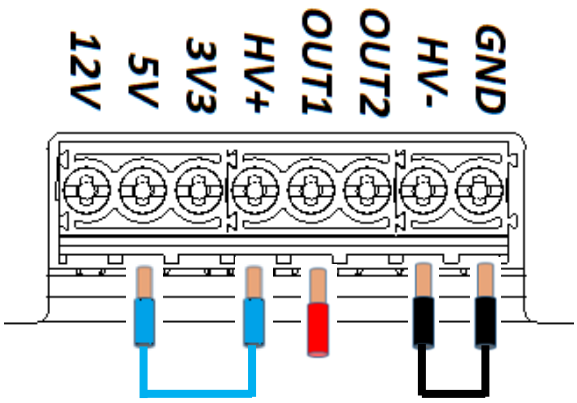
→ Connect to the IN1- or IN2-

WARNING: When wiring, always TURN OFF the Power Supply.

8.2 Isolated IO Digital OUTPUT Setup

The 2CH isolated digital output supports external digital signals ranging from 1.8 to 12V. The two options for connecting are as follows:

Digital Output with 5V Application



Use AWG 26~16; The RED wire indicates that it outputs an IO signal

→ Connect to the OUT1 or OUT2

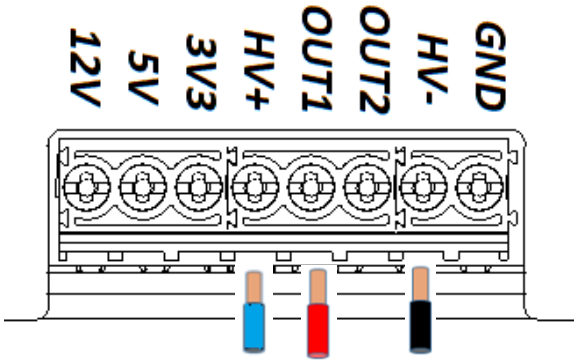
Use AWG 26~16; The BLACK wire connects to on board GND

→ Connect to HV-

Use AWG 26~16; The Blue wire connects to the 5V source on board

→ Connect to the HV+

Digital Output with External Source



Use AWG 26~16; The RED wire indicates that it outputs IO signal

→ Connect to the OUT1 or OUT2

Use AWG 26~16; The BLACK wire indicates that it comes from External GND

→ Connect to HV-

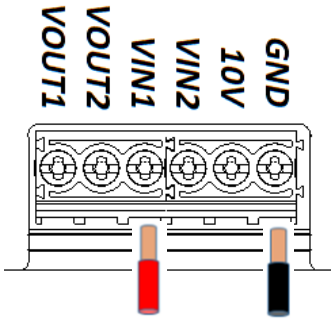
Use AWG 26~16; The BLUE wire indicates that it comes from External Source

→ Connect to HV+

8.3 Isolated Analog INPUT Setup

The 2CH isolated analog input supports external analog signals ranging from 0 to 10V. The two options for connecting are as follows:

Analog Input with External Voltage Source



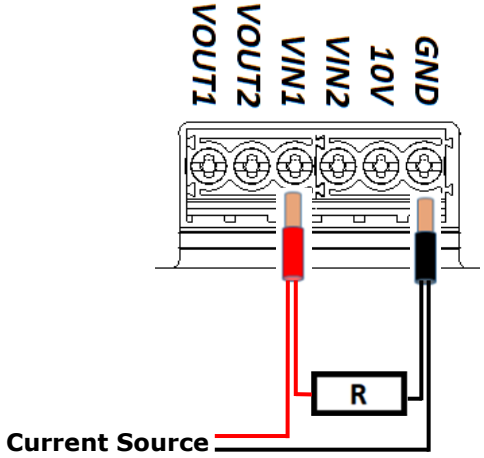
Use AWG 26~16; The RED wire indicates that it comes from external voltage source

→ Connect to VIN1 or VIN2

Use AWG 26~16; The BLACK wire indicates that it comes external GND

→ Connect to GND

Analog Input with External Current Source



Use AWG 26~16; The RED wire indicates that it comes from external current source

→ Connect to VIN1 or VIN2

Use AWG 26~16; The BLACK wire indicates that it comes from external GND

→ Connect to GND

R

Serial Resistor value depends on current source

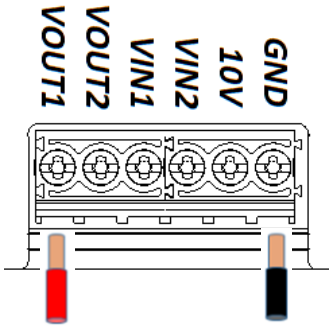
→ Connect in between VIN1/VIN2 and GND

For example: Application current source 4mA to 20mA, recommend using 420ohm resistor

8.4 Isolated Analog OUTPUT Setup

The 2CH isolated analog output supports external analog signals ranging from 0 to 10V. The two options for connecting are as follows:

Analog Voltage Output



Use AWG 26~16; The RED wire indicates that it outputs 0V - 10V power

→ Connect to VOUT1 or VOUT2

Use AWG 26~16; The BLACK wire indicates that it comes external GND

→ Connect to GND

9 Mechanical Dimensions

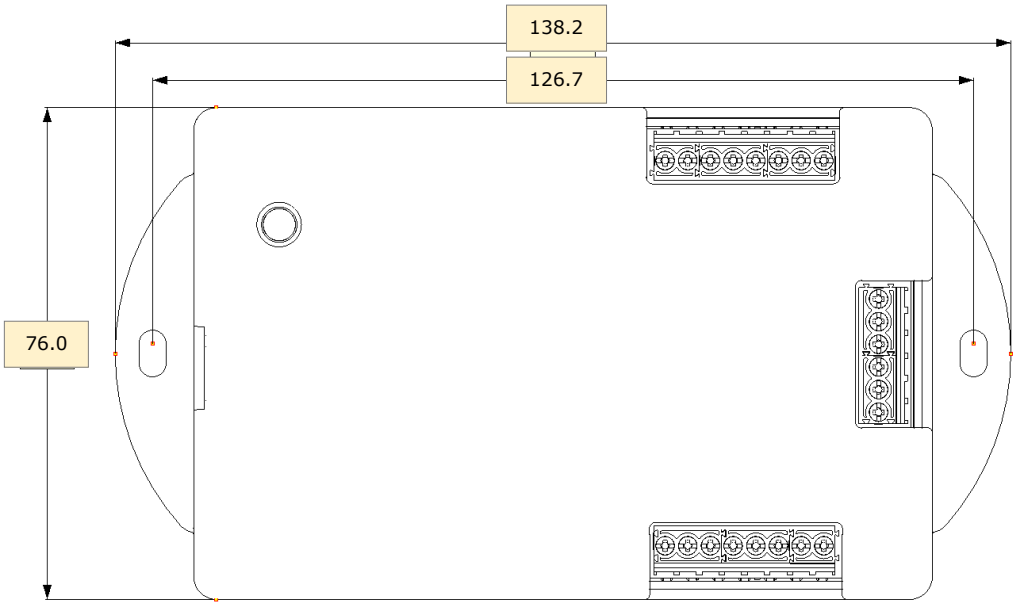


Figure 7 - LDSBus Isolated IO Controller Dimension – Top View

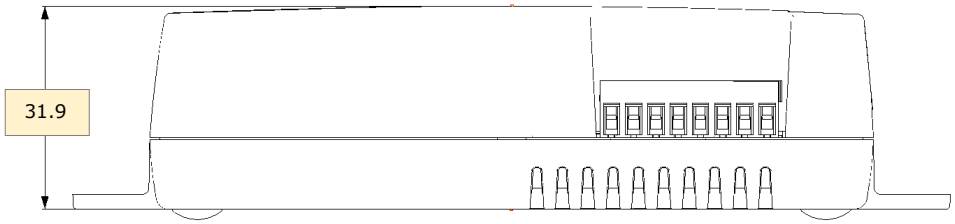


Figure 8 - LDSBus Isolated IO Controller Dimension – Side View

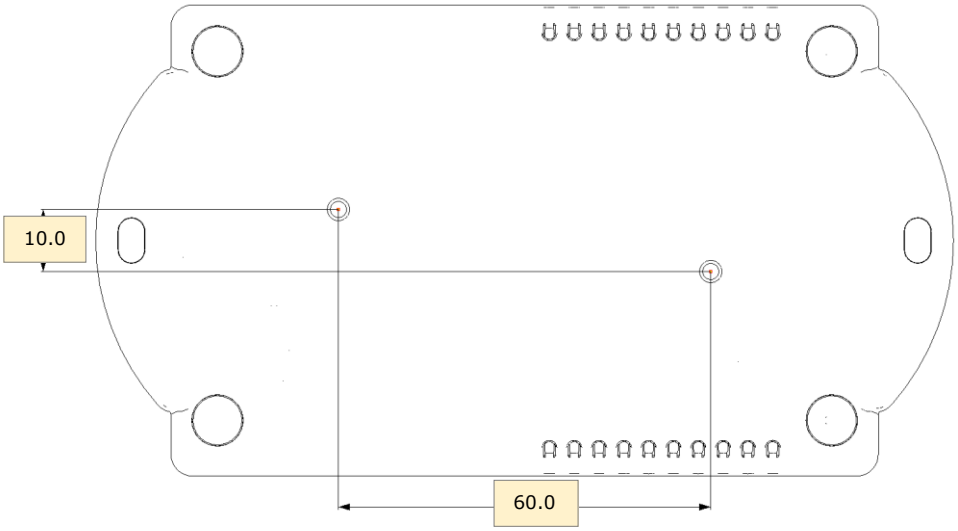


Figure 9 - LDSBus Isolated IO Controller Dimension – Bottom View

Note: All dimensions are in millimeters.

10 System Status LED Indicators

LDSU devices come with a tri-color LED, and LED status are mentioned in the table below.

Status display colors:

1. RED - Device in error conditions
2. YELLOW - Un-configured device
3. GREEN - Device in normal state (Device termination is OFF)
4. BLUE - Device in normal state (Device termination is ON)

Device Status	LED Color		Flashing Frequency	Description
Un-configured device	YELLOW		LED flashing @1Hz	Un-configured device with factory default address (126)
Configured device	GREEN		Steady – Non-flashing	Configured device (Device ID 1-125) and device is idle
	BLUE			
Addressed device	GREEN		LED flashing @5Hz	Device is busy communicating
	BLUE			
Identified device	GREEN		LED flashing @1Hz	Device in identify state
	BLUE			
Device error	RED		Steady – Non-flashing	Device error has occurred
Firmware update	YELLOW		Steady – Non-flashing	Device firmware update

Table 5 - System Status LED Indicators

11 Contact Information

Refer to https://brtsys.com/contact-us/ for contact information.

Appendix A – References

Document References

LDSBus Configuration Utility User Guide

LDSBus Python SDK V3.0.0 Guide

Acronyms and Abbreviations

Terms	Description
AC	Alternating Current
AWG	American Wire Gauges
DC	Direct Current
IoT	Internet of Things
LED	Light Emitting Diode
LDSBus	Long Distance Sensor Bus

Appendix B – List of Figures and Tables

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Appendix C – Revision History

Document Title: LDSBus Isolated IO Controller Datasheet

Document Reference No.: BRTSYS_000009

Clearance No.: BRTSYS#005

Product Page: https://brtsys.com/product/isolated-io-controller/

Document Feedback: Send Feedback

Revision	Changes	Date
Version 1.0	Initial Release	15-02-2022
Version 1.1	Updated release under BRT Systems	15-09-2022
Version 1.2	Updated the specifications table (RJ12 –> RJ11)	24-03-2023
Version 1.3	Updated the following: HVT references to Quad T-Junction; Singapore address	11-09-2023
Version 1.4	Updated Section 3. Specifications	04-09-2024
Version 1.5	Section 1.1 - Added .Net SDK to Supported platforms Section 2 - Added part number LA-0501-01A in Table 1 Section 3 - Updated "Wire Assembly" Section 4 – Added FCC statement Section 5 - Added Table 3; Updated Figure 1 (Changed from "RJ11" to "RJ12" for LDSU port) Appendix A – References > Document References - updated	12-01-2026