ELECTRONIC
PROTOTYPES

EPED001

1.5kV ISO UART

DATASHEET

07.03.2024

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1. Description

EPED001 - 1.5kV ISO UART is a compact interface solution for embedded engineers or operators who need safe, stable, and reliable connection to UART console.

UART Interface is driven by three-state buffers that allow signal voltages from 1.8V to 3.3V and data rate up to 12Mb/s. EPED001 1.5kV ISO UART device is CE/FCC/UKCA certified.

1.1 Key Features

Figure 1. EPED001 - 1.5kV ISO UART

- 4 isolated UART ports
- Up to 12Mb/s UART transfer data rate
- 1.5kV / 3kV isolation (60s / 1s test)
- USB-Type C host connection High Speed compatible
- 1.8V/3.3V and ADJ version available
- 2 isolated domains (A & B)
- Supports royalty-free Virtual Com Port (VCP) and Direct (D2XX) drivers
- -40°C to +55°C operational temperature

1.2 Benefits

- Breaks GND loop in Host-Device connection
- Breaks AC mains loop in Multi-Host connection
- Improves electro-magnetic immunity
- Removes coupling between EM field and cabling
- Removes return current from Host-Device connection
- Ensures 1.5kV/3kV isolation barrier (safety and reliability)
- Improve cabling (one device supports up to 4 UART interfaces)

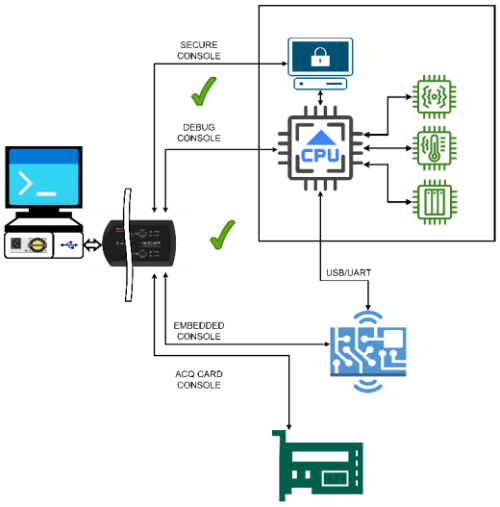


Figure 2. Exemplary application

1.3 Applications

- IoT Embedded Systems
- SoC / CPU / FPGA Platforms
- Medical and Data Acquisition
- EMC & Immunity Testing

2. Overview

Dimensions: L:107mm W:67mm H:25mm

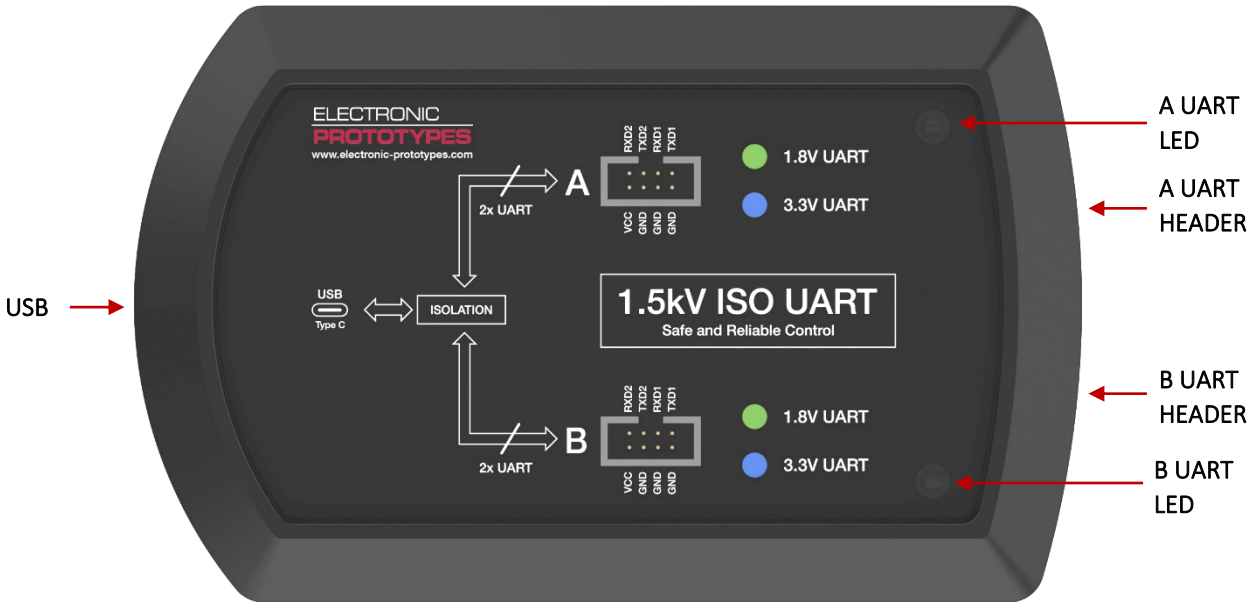


Figure 3. EPED001 1.5kV ISO UART top view

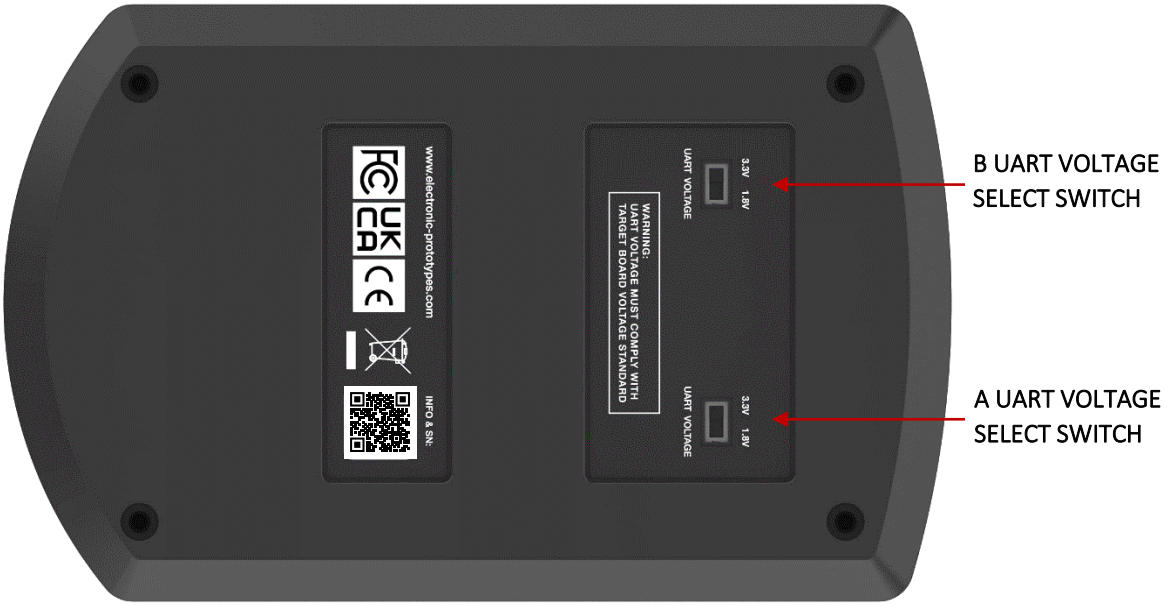


Figure 4. EPED001 1.5kV ISO UART bottom view

3. Functional Block Diagrams

3.1 EPED001A-10-STD (Standard option)

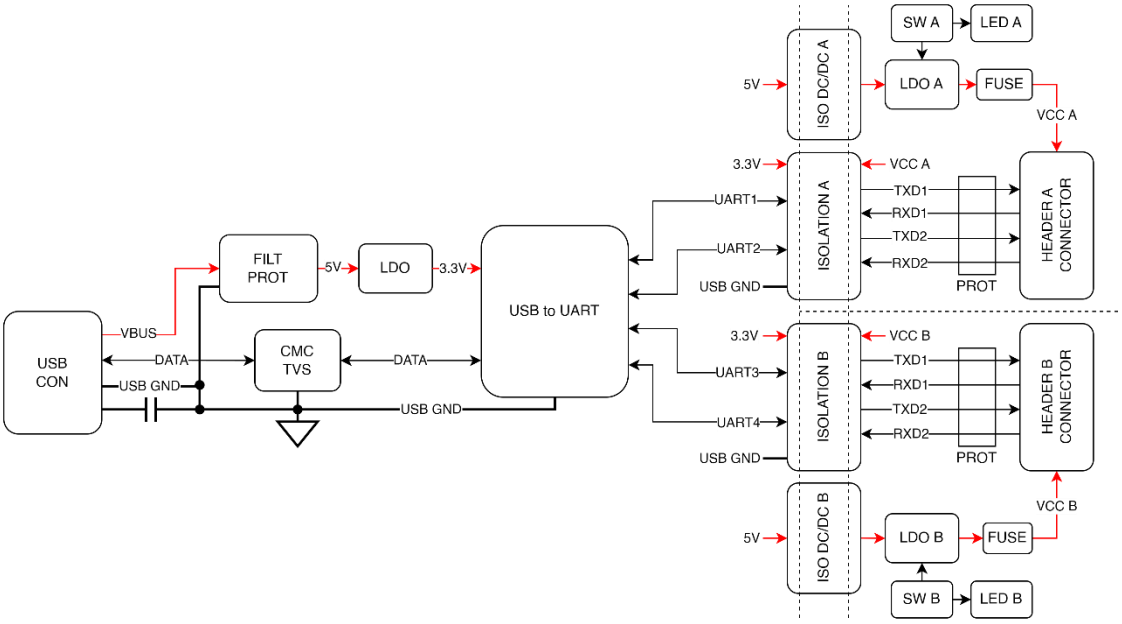


Figure 5. Functional block diagram for standard variant

Key Components Description:

- USB CON – USB Type C connector
- FILT PROT – USB VBUS filtering and protection circuitry
- CMC TVS – Filtering and protection of USB data lines
- LDO, LDO A, LDO B – Low Dropout Regulator
- USB to UART – FT4232 family converter
- LED A, LED B – UART voltage standard and VCC voltage level indicator[1]
- ISO DC/DC A, ISO DC/DC B – Isolated DC/DC converter
- ISOLATION A, ISOLATION B – ADuM142D family isolator IC
- SW A, SW B – UART voltage standard and VCC voltage level selection switch
- FUSE – PTC fuse 50mA
- HEADER A CONNECTOR, HEADER B CONNECTOR – UART interface connector (refer to UART Headers Connector Pinout for detailed pinout information)

1) Depending on output voltage selection switch position, different LED color is visible when operating

Switch selection	LED Color	Description
1.8V	GREEN	UART channel is set to 1.8V standard. Reference output voltage VCC = 1.8V
3.3V	BLUE	UART channel is set to 3.3V standard. Reference output voltage VCC = 3.3V

3.2 EPED001A-10-180 / EPED001A-10-250 / EPED001A-10-330

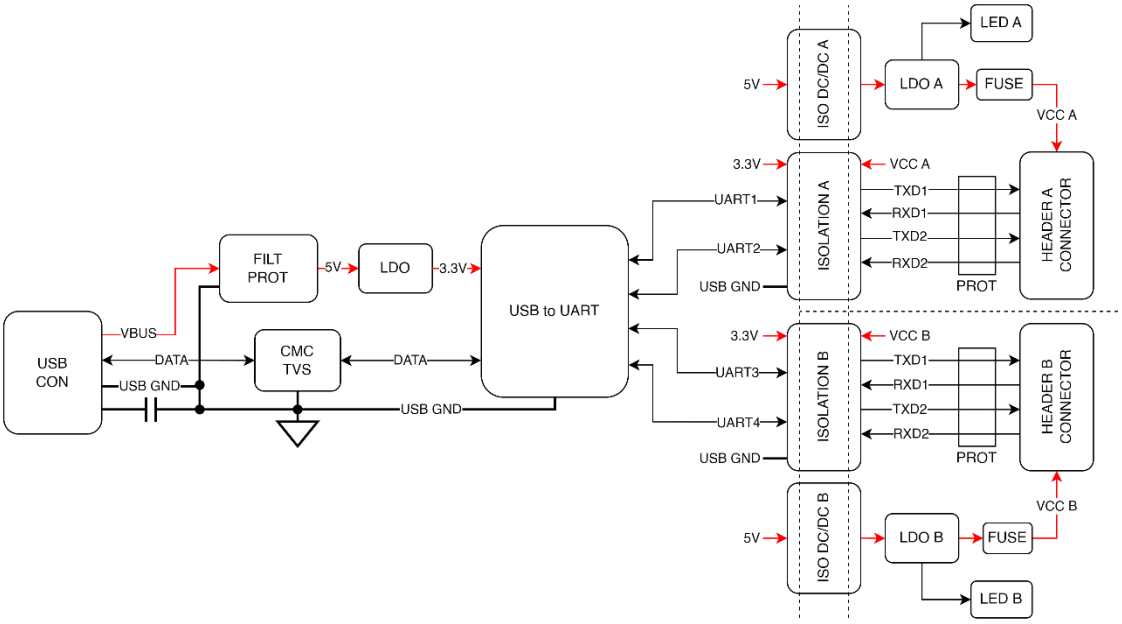


Figure 6. Functional block diagram for fixed UART voltage variant

Key Components Description:

- USB CON – USB Type C connector
- FILT PROT – USB VBUS filtering and protection circuitry
- CMC TVS – Filtering and protection of USB data lines
- LDO, LDO A, LDO B – Low Dropout Regulator
- USB to UART – FT4232 family converter
- LED A, LED B – UART voltage standard and VCC voltage level indicator[1]
- ISO DC/DC A, ISO DC/DC B – Isolated DC/DC converter
- ISOLATION A, ISOLATION B – ADuM142D family isolator IC
- FUSE – PTC fuse 50mA
- HEADER A CONNECTOR, HEADER B CONNECTOR – UART interface connector (refer to UART Headers Connector Pinout for detailed pinout information)

1) Depending on part number, different LED color is visible when operating

Part Number	LED Color	Description
EPED001A-10-180	GREEN	UART channel is set to 1.8V standard. Reference output voltage VCC = 1.8V
EPED001A-10-250	PURPLE	UART channel is set to 2.5V standard. Reference output voltage VCC = 2.5V
EPED001A-10-330	BLUE	UART channel is set to 3.3V standard. Reference output voltage VCC = 3.3V

3.3 EPED001A-10-ADJ (Adjustable option)

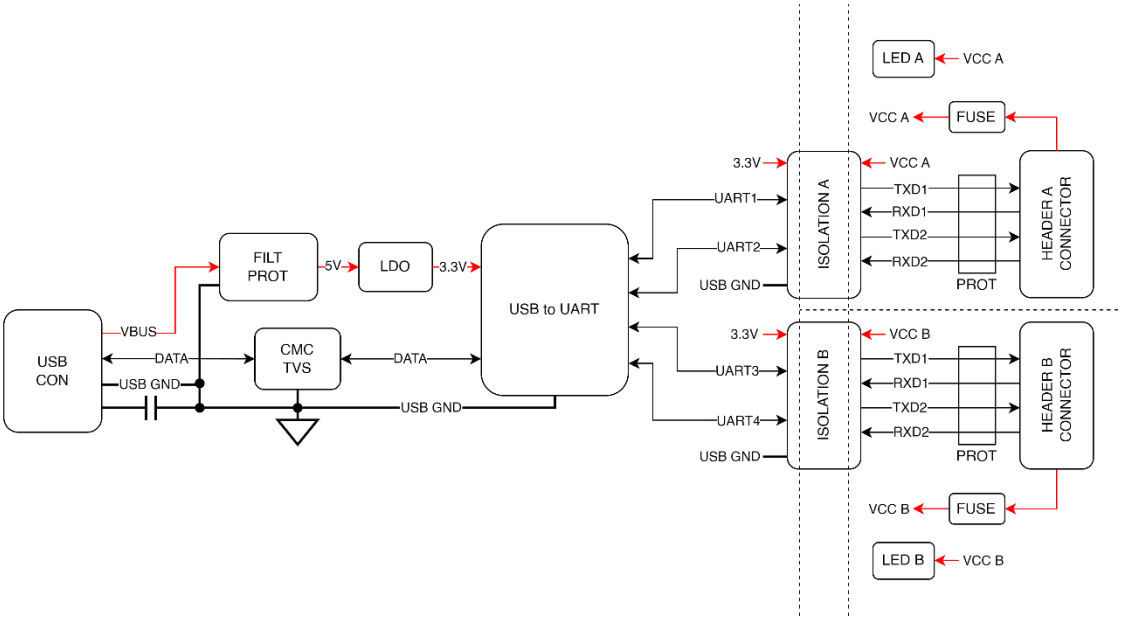


Figure 7. Functional block diagram for adjustable UART voltage variant

Key Components Description:

- USB CON – USB Type C connector
- FILT PROT – USB VBUS filtering and protection circuitry
- CMC TVS – Filtering and protection of USB data lines
- LDO – Low Dropout Regulator
- USB to UART – FT4232 family converter
- LED A, LED B – UART voltage standard and VCC voltage level indicator (red LED)
- ISOLATION A, ISOLATION B – ADuM142D family isolator IC
- FUSE – PTC fuse 50mA
- HEADER A CONNECTOR, HEADER B CONNECTOR – UART interface connector (refer to UART Headers Connector Pinout for detailed pinout information)

4. UART Headers Connector Pinout

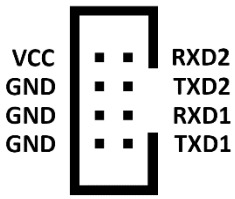


Figure 8. EPED001 1.5kV ISO UART pinout diagram

Table 1. UART header connector pinout table

Name	Type	Cable Color[1]	Description
VCC	PWR	Red	Reference output voltage[2] (limited to 50mA)
GND	GND	Black	Ground, connect to device GND
RXD2	Input	Blue	Connect to device2 TX
TXD2	Output	Green	Connect to device2 RX
RXD1	Input	Yellow	Connect to device1 TX
TXD1	Output	Orange	Connect to device1 RX

1) Applies to UART cable delivered with the device
2) VCC pin works as Reference Input Voltage in EPED001A-10-ADJ

5. Status LED

LED A/B (as shown on block diagram) is UART voltage standard/VCC voltage level indicator. Color of the LED is associated with UART voltage standard. Each isolated domain is independent, meaning LED A/B can illuminate different color for different voltage level on domain A/B. LED colors for different device versions are described below:

Table 2. Status LED colors for different device versions

Part Number	LED Color	Description
EPED001A-10-STD	BLUE	UART channel is set to 3.3V standard. Reference output voltage VCC = 3.3V
	GREEN	UART channel is set to 1.8V standard. Reference output voltage VCC = 1.8V
EPED001A-10-180	GREEN	UART channel is set to 1.8V standard. Reference output voltage VCC = 1.8V
EPED001A-10-250	PURPLE	UART channel is set to 2.5V standard. Reference output voltage VCC = 2.5V
EPED001A-10-330	BLUE	UART channel is set to 3.3V standard. Reference output voltage VCC = 3.3V
EPED001A-10-ADJ	RED	VCC pin is used as reference voltage input – requires external supply voltage from target board. Red LED is turned on when external power supply voltage is applied to VCC pin. Please refer to Recommended Operating Conditions for VCC requirement.

6. Electrical Characteristics

6.1 Absolute Maximum Ratings

Table 3. Absolute maximum ratings

Symbol	Parameter		Minimum	Maximum	Unit
V_{BUS}	USB Supply Voltage		-0.3	6	V
V_{CC}	Reference Input Voltage (ADJ version only)		-0.5	7	V
V_I	UART Level Input Voltage	V_{CC} = 3.3V	-0.5	3.8	V
		V_{CC} = 2.5V	-0.5	3.0	V
		V_{CC} = 1.8V	-0.5	2.3	V
V_{IO}	Input/Output Voltage		-0.5	V_{CC} + 0.5	V
I_{OUT}	Output Current		-10	10	mA

6.2 Recommended Operating Conditions

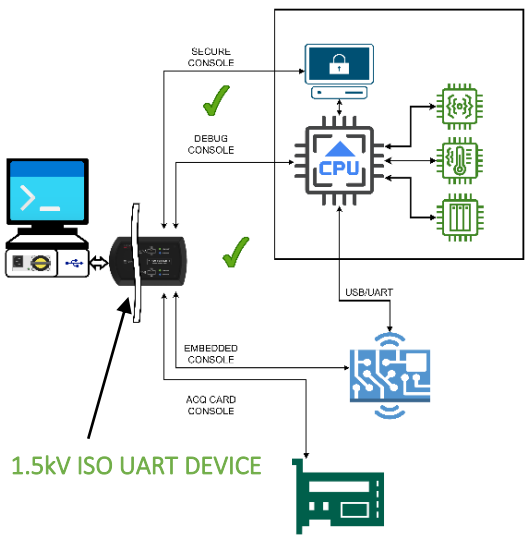
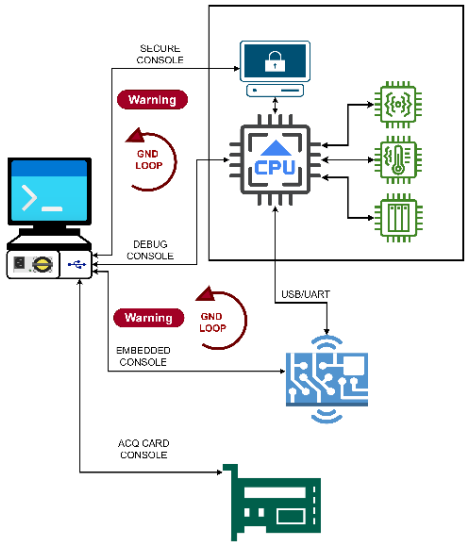
Table 4. Recommended operating conditions

Symbol	Parameter		Minimum	Typical	Maximum	Unit
V_{BUS}	USB Supply Voltage		4.5	5	5.5	V
V_{CC}	Reference Output Voltage	V_{CC} = 3.3V	3.2	3.3	3.4	V
		V_{CC} = 2.5V	2.45	2.5	2.55	V
		V_{CC} = 1.8V	1.75	1.8	1.85	V
I_{CC}	Output current				50	mA
V_{IH}	UART High Level Input Voltage		0.7 x V_{CC}		V_{CC}	V
V_{IL}	UART Low Level Input Voltage		0		0.3 x V_{CC}	V
V_{OH}	UART High Level Output Voltage		V_{CC} – 0.4	V_{CC}		V
V_{OL}	UART Low Level Output Voltage			0	0.4	V
I_{OH}	UART High Level Output Current	V_{CC} = 3.3V	-10		10	µA
		V_{CC} = 2.5V	-10		10	µA
		V_{CC} = 1.8V	-10		10	µA
I_{OL}	UART Low Level Output Current	V_{CC} = 3.3V	-10		10	µA
		V_{CC} = 2.5V	-10		10	µA
		V_{CC} = 1.8V	-10		10	µA
Data Rate	UART Data Rate				12	Mb/s
T_A	Ambient Temperature		-40		55	°C
T_{ST}	Storage Temperature		-65		150	°C

7. Application Example

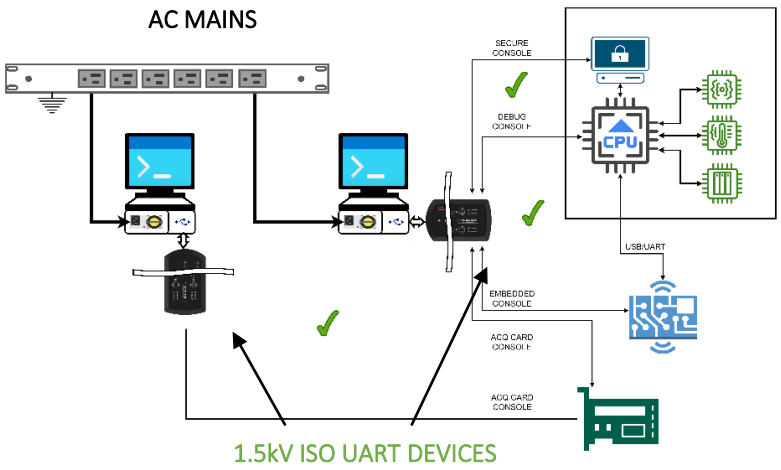
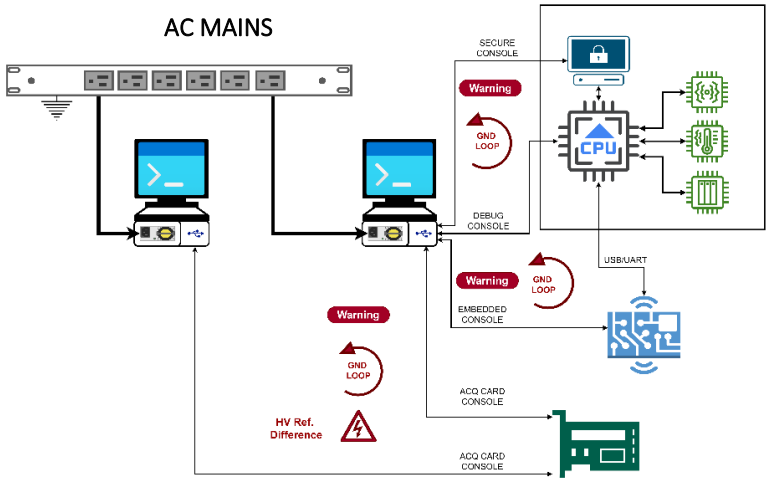
7.1 EPED001 1.5kV ISO UART Application vs System Without Isolation

Table 5. EPED001 1.5kV ISO UART application vs system without isolation

System with EPED001 1.5kV ISO UART	System without interfaces isolation
	
SAFETY	
• Up to 1.5kV functional isolation barrier • Improved safety and reliability • No high voltage reference ground difference	• Potential high voltage reference ground difference • Potential risk of equipment damage • Potential risk of injury
EMC / IMMUNITY	
• No Host – Device ground loops • No AC Mains loop • Improved EMC and EMI of the system • No conducted Host – Device emission • Improved USB interface connectivity	• Potential EMC/EMI issues • Potential EM coupling • Increased radiated emission • Potential Host – Device conducted emission coupling

7.2 EPED001 1.5kV ISO UART Application vs Multi-Host System Without Isolation

Table 6. EPED001 1.5kV ISO UART application vs multi-host system without isolation

Multi-Host System with ISO UART	
	• Functional isolation barrier • Improved EMC and EMI of the system • No AC Mains loop • No ground loops between hosts • Improved Safety and Reliability • No high voltage reference ground difference
Multi-Host System without isolation	
	• Potential risk of equipment damage • Potential risk of injury • No functional isolation • Potential EMC and EMI issues • Potential EM coupling • Ground loop radiated emission • High voltage ground difference • Host – Device conducted emission coupling

8. Ordering Information

Table 7. Ordering information

Part Number	Description
EPED001A-10-STD	Standard ISO UART Device with selectable 1.8V/3.3V UART Voltage
EPED001A-10-180	ISO UART Device with fixed 1.8V UART Voltage
EPED001A-10-250	ISO UART Device with fixed 2.5V UART Voltage
EPED001A-10-330	ISO UART Device with fixed 3.3V UART Voltage
EPED001A-10-ADJ	ISO UART Device with UART interface voltage set by target board
EPED001A-CUS-X	Customized version of ISO UART device on special request

9. Kit Content

Table 8. Kit content

#	Item	QTY
1	1.5kV ISO UART	1
2	4x2 UART Harness	2
3	USB 2.0 Type C Cable	1

10. Document Revision History

Table 9. Document revision history

Date	Rev	Changes Description
29.12.2023	1.0	Initial Release
08.01.2024	1.1	Formatted table headers
07.03.2024	1.2	Document structure + table of contents update Chapter 3 updated – more detailed diagrams and description added Electrical Characteristics chapter added Disclaimer text added

11. Disclaimer

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