

# EPED003

## ISO UART MICRO MODULE

### DATASHEET

# Table of Contents

1.	Description .....	3
1.1	Key Features .....	3
1.2	Benefits .....	3
1.3	Applications .....	3
2.	Overview.....	4
3.	Functional Block Diagram .....	5
4.	UART Pinout .....	5
5.	Status LED.....	5
6.	Electrical Characteristics.....	6
6.1	Absolute Maximum Ratings .....	6
6.2	Recommended Operating Conditions .....	6
7.	Application Example .....	7
7.1	EPED003 ISO UART Micro Module Application vs System Without Isolation .....	7
7.2	EPED003 ISO UART Micro Module Application vs Multi-Host System Without Isolation .....	8
8.	Solder Reflow Profile .....	9
9.	Ordering Information.....	10
10.	Mechanical Details .....	11
11.	Recommended PCB Footprint Pattern .....	12
12.	Document Revision History .....	13
13.	Disclaimer .....	14

# 1. Description

EPED003 - ISO UART Micro Module is a compact, complete and fully self-contained surface mount module that ensures functional 3kV isolation between PC Host USB and target board UART console.

UART signals use 4mA three-state buffers that allow signal voltages from 1.8V to 5V and data rate up to 3Mb/s. EPED003 ISO UART Micro Module is CE/FCC/UKCA certified.

## 1.1 Key Features

- Small, complete, All-In-One isolated USB  $\leftrightarrow$  UART solution
- No external components required
- Up to 3Mb/s UART transfer data rate
- 3kV isolation (60s / 1s test)
- USB-Type C host connection Full Speed compatible
- Flexible reference voltage (1.8V – 5V)
- Small size – 10mm x 22mm x 4.9mm
- Direct-to-PCB implementation
- Device status LED indicator
- -40°C to +85°C operational temperature
- Supports royalty-free Virtual Com Port (VCP) and Direct (D2XX) drivers



Figure 1. EPED003 ISO UART Micro Module

## 1.2 Benefits

- Ensures 3kV isolation barrier (safety and reliability)
- 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

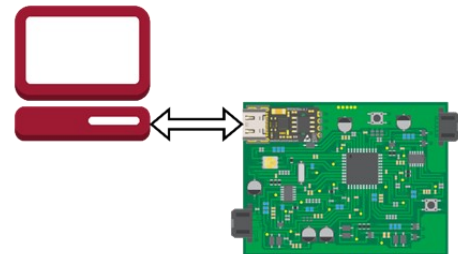


Figure 2. Exemplary application

## 1.3 Applications

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

## 2. Overview

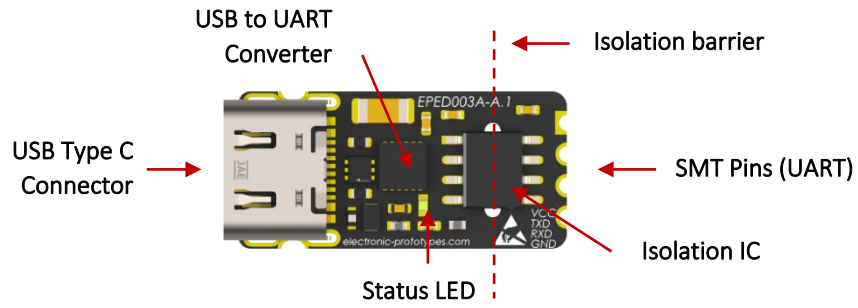


Figure 3. EPED003 ISO UART Micro Module top view

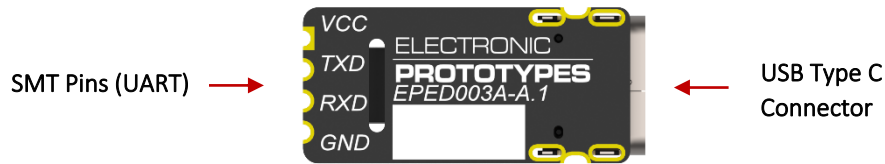


Figure 4. EPED003 ISO UART Micro Module bottom view

### 3. Functional Block Diagram

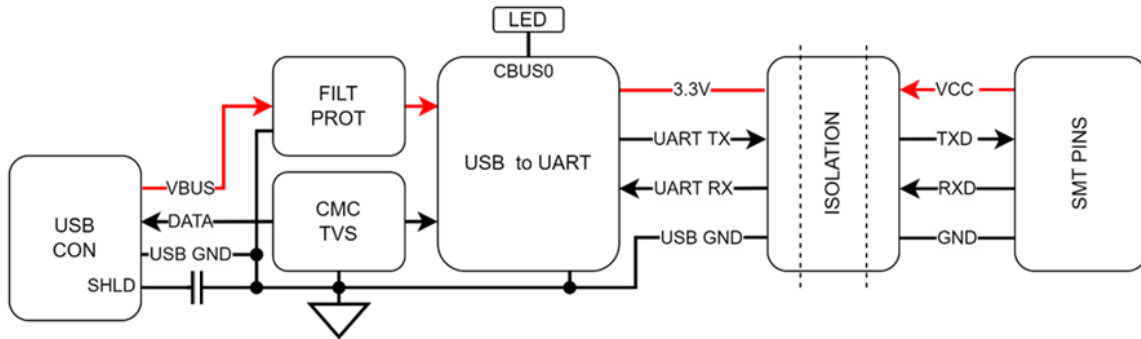


Figure 5. Functional block diagram

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
- USB to UART – FT234XD USB to UART converter
- LED – Device status indicator
- ISOLATION – 3kV ISO672x family isolator IC
- SMT PINS – Micro Module’s castellated SMT pins / target board pins

### 4. UART Pinout



Table 1. UART pinout

Pin#	Name	Type	Description
1	VCC	Power	Reference Voltage Input <sup>1</sup> (1.8V – 5V)
2	TXD	Output	Connect to device RX
3	RXD	Input	Connect to device TX
4	GND	GND	Ground, connect to device GND

1) Should be delivered from target board

Figure 4. EPED003 ISO UART  
Micro Module Pin Diagram

Refer to Recommended PCB Footprint Pattern section for recommended PCB footprint and Mechanical Details for detailed mechanical information.

### 5. Status LED

Table 2. Status LED description

Status	Description
ON	Device ready to work
OFF	USB cable not connected/not powered

## 6. Electrical Characteristics

### 6.1 Absolute Maximum Ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Minimum	Maximum	Unit
V <sub>BUS</sub>	USB Max Voltage	-0.3	5.5	V
V <sub>CC</sub>	UART Voltage	-0.5	6	V
V <sub>IO</sub>	Input/Output Voltage	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>OUT</sub>	Output Current	-15	15	mA

### 6.2 Recommended Operating Conditions

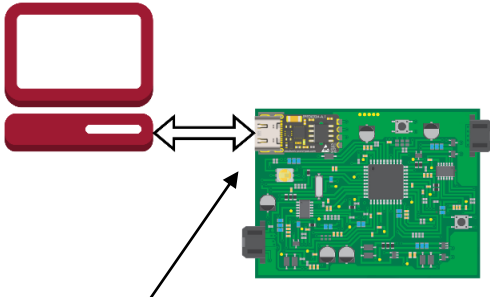
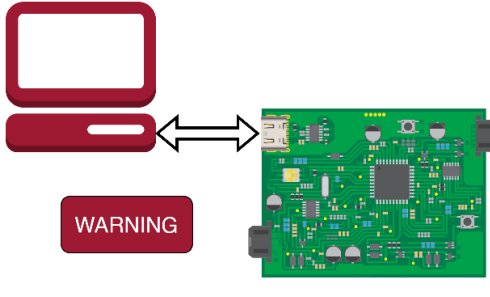
Table 4. Recommended operating conditions

Symbol	Parameter	Minimum	Typical	Maximum	Unit
V <sub>BUS</sub>	USB Supply Voltage	2.97	5	5.5	V
V <sub>CC</sub>	UART Supply Voltage	1.71		5.5	V
I <sub>CC</sub>	UART Supply Current			9.5	mA
V <sub>IH</sub>	UART High Level Input Voltage	0.7 x V <sub>CC</sub>		V <sub>CC</sub>	V
V <sub>IL</sub>	UART Low Level Input Voltage	0		0.3 x V <sub>CC</sub>	V
V <sub>OH</sub>	UART High Level Output Voltage	V <sub>CC</sub> = 5V	V <sub>CC</sub> - 0.4		V
		V <sub>CC</sub> = 3.3V	V <sub>CC</sub> - 0.2		V
		V <sub>CC</sub> = 2.5V	V <sub>CC</sub> - 0.1		V
		V <sub>CC</sub> = 1.8V	V <sub>CC</sub> - 0.1		V
V <sub>OL</sub>	UART Low Level Output Voltage	V <sub>CC</sub> = 5V		0.4	V
		V <sub>CC</sub> = 3.3V		0.2	V
		V <sub>CC</sub> = 2.5V		0.1	V
		V <sub>CC</sub> = 1.8V		0.1	V
I <sub>OH</sub>	UART High Level Output Current	V <sub>CC</sub> = 5V	-4		mA
		V <sub>CC</sub> = 3.3V	-3		mA
		V <sub>CC</sub> = 2.5V	-2		mA
		V <sub>CC</sub> = 1.8V	-1		mA
I <sub>OL</sub>	UART Low Level Output Current	V <sub>CC</sub> = 5V		4	mA
		V <sub>CC</sub> = 3.3V		3	mA
		V <sub>CC</sub> = 2.5V		2	mA
		V <sub>CC</sub> = 1.8V		1	mA
Data Rate	UART Data Rate			3	Mb/s
T <sub>A</sub>	Ambient Temperature	-40		85	°C
T <sub>ST</sub>	Storage Temperature	-65		150	°C

## 7. Application Example

### 7.1 EPED003 ISO UART Micro Module Application vs System Without Isolation

Table 5. EPED003 ISO UART Micro Module application vs system without isolation

System with EPED003 ISO UART Micro Module	System without Interface isolation
 <p style="color: green; text-align: center;">ISO UART Micro Module</p>	 <p style="color: red; text-align: center;">WARNING</p>
SAFETY	
<ul style="list-style-type: none"> <li>• Up to 3kV functional isolation barrier</li> <li>• Improved safety and reliability</li> <li>• No high voltage reference ground difference</li> </ul>	<ul style="list-style-type: none"> <li>• Potential high voltage reference ground difference</li> <li>• Potential risk of equipment damage</li> <li>• Potential risk of injury</li> </ul>
EMC / IMMUNITY	
<ul style="list-style-type: none"> <li>• No Host – Device ground loops</li> <li>• No AC Mains loop</li> <li>• Improved EMC and EMI of the system</li> <li>• No conducted Host – Device emission</li> <li>• Improved USB interface connectivity</li> </ul>	<ul style="list-style-type: none"> <li>• Potential EMC/EMI issues</li> <li>• Potential EM coupling</li> <li>• Increased radiated emission</li> <li>• Potential Host – Device conducted emission coupling</li> </ul>

## 7.2 EPED003 ISO UART Micro Module Application vs Multi-Host System Without Isolation

Table 6. EPED003 ISO UART Micro Module Application vs Multi-Host System without isolation

Multi-Host System with EPED003 ISO UART Micro Module	
<p style="text-align: center;">ISO UART Micro Modules</p>	<ul style="list-style-type: none"> <li>• Functional isolation barrier (up to 3kV)</li> <li>• Improved EMC and EMI of the system</li> <li>• No AC Mains loop</li> <li>• No ground loops between hosts</li> <li>• Improved Safety and Reliability</li> <li>• No high voltage reference ground difference</li> </ul>
Multi-Host System without isolation	
<p style="text-align: center;">HV REF. DIFFERENCE</p> <p style="text-align: center;">WARNING</p> <p style="text-align: center;">GND LOOP</p>	<ul style="list-style-type: none"> <li>• Potential risk of equipment damage</li> <li>• Potential risk of injury</li> <li>• No functional isolation</li> <li>• Potential EMC and EMI issues</li> <li>• Potential EM coupling</li> <li>• Ground loop radiated emission</li> <li>• High voltage ground difference</li> <li>• Host – Device conducted emission coupling</li> </ul>



## 8. Solder Reflow Profile

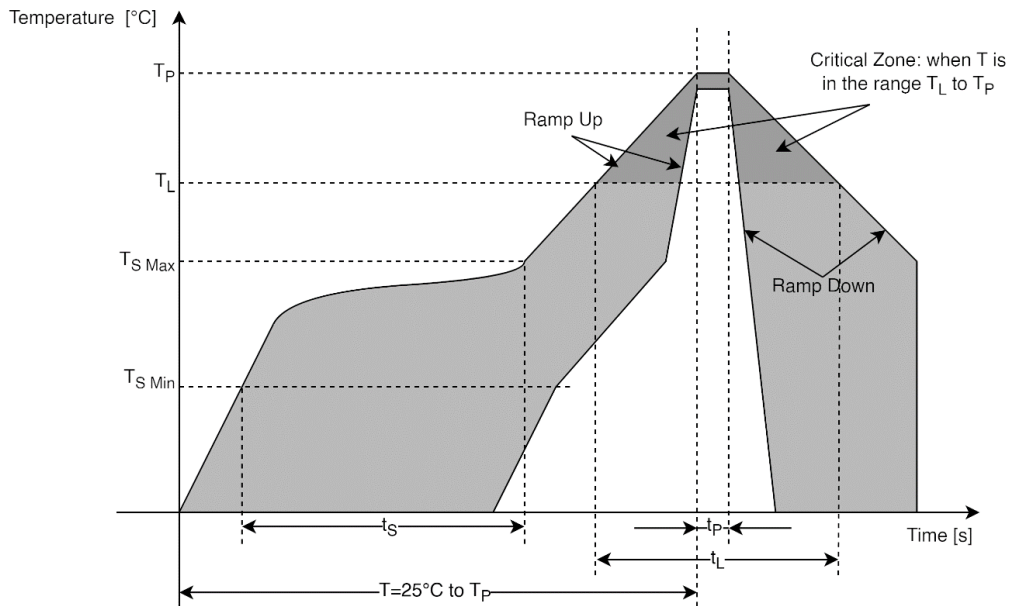


Figure 7. EPED003 ISO UART Micro Module Reflow Profile

Table 7. EPED003 ISO UART Micro Module Recommended Reflow Parameters

Profile Feature	PB FREE Solder Process	NON-PB FREE Solder Process
Ramp Up Rate ( $T_S$ to $T_P$ )	3°C/s (Max)	3°C/s (Max)
Preheat		
- Temperature Min ( $T_{S\ Min}$ )	150°C	100°C
- Temperature Max ( $T_{S\ Max}$ )	200°C	150°C
- Time ( $t_s$ )	60 to 120 seconds	60 to 120 seconds
Critical Temperature ( $T_L$ )	217°C	183°C
Time ( $t_L$ ) Maintained Above $T_L$	60s to 150s	60s to 150s
Peak Temperature ( $T_P$ )	260°C	240°C
Time ( $t_p$ ) within 5°C of actual Peak Temperature	20s to 40s	20s to 40s
Ramp Down Rate	6°C/s max	6°C/s max
Time for $T = 25^\circ\text{C}$ to Peak Temperature ( $T_P$ )	8 minutes max	6 minutes max

Notes:

- EPED003 ISO UART Micro Module has a moisture sensitivity level (MSL) of 6
- Module should be dried by baking it at 125°C for 17 hours before reflow process (to MSL of 3)
- All SMT pads of EPED003 module are finished with ENIG, ensuring compatibility with most mounting and reflow processes (see section Solder Reflow Profile)

## 9. Ordering Information

Table 8. Ordering information

Part Number	Description
EPED003	Standard EPED003 ISO UART Micro Module device

## 10. Mechanical Details

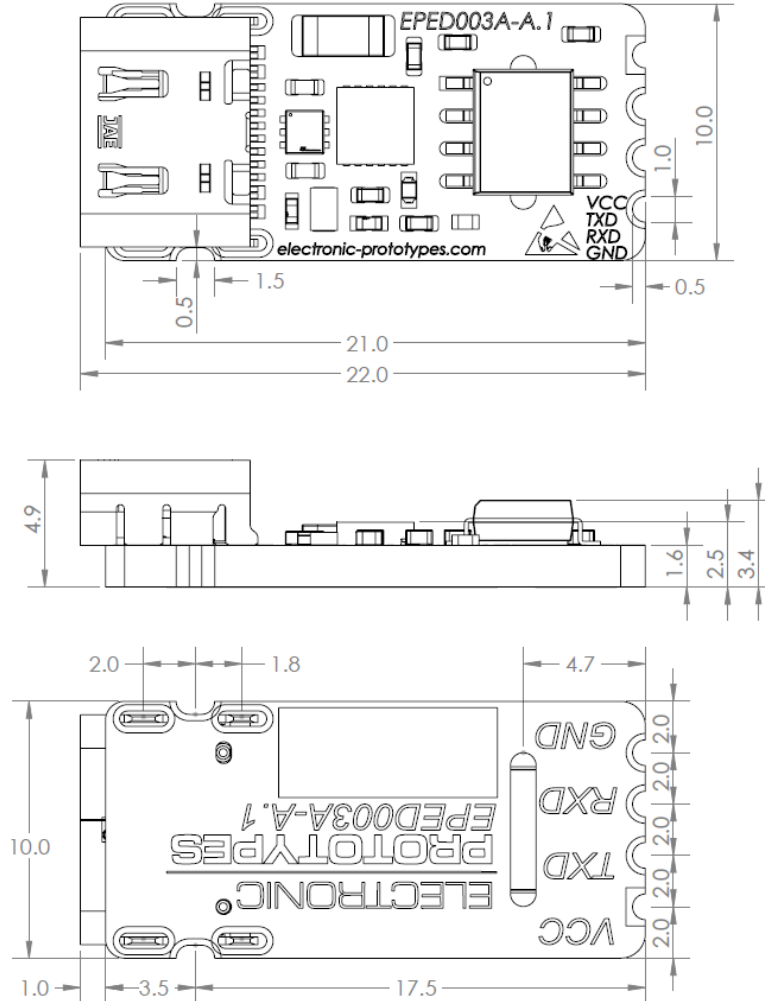


Figure 6. EPED003 ISO UART Micro Module Dimensions

Notes:

- All dimensions provided on Figure 7. are in millimeters
- All dimensions are nominal and should be followed during PCB footprint pattern design
- +/- 0.2mm tolerance should be considered for external dimensions
- 10% tolerance should be considered for PCB thickness and total height tolerance

## 11. Recommended PCB Footprint Pattern

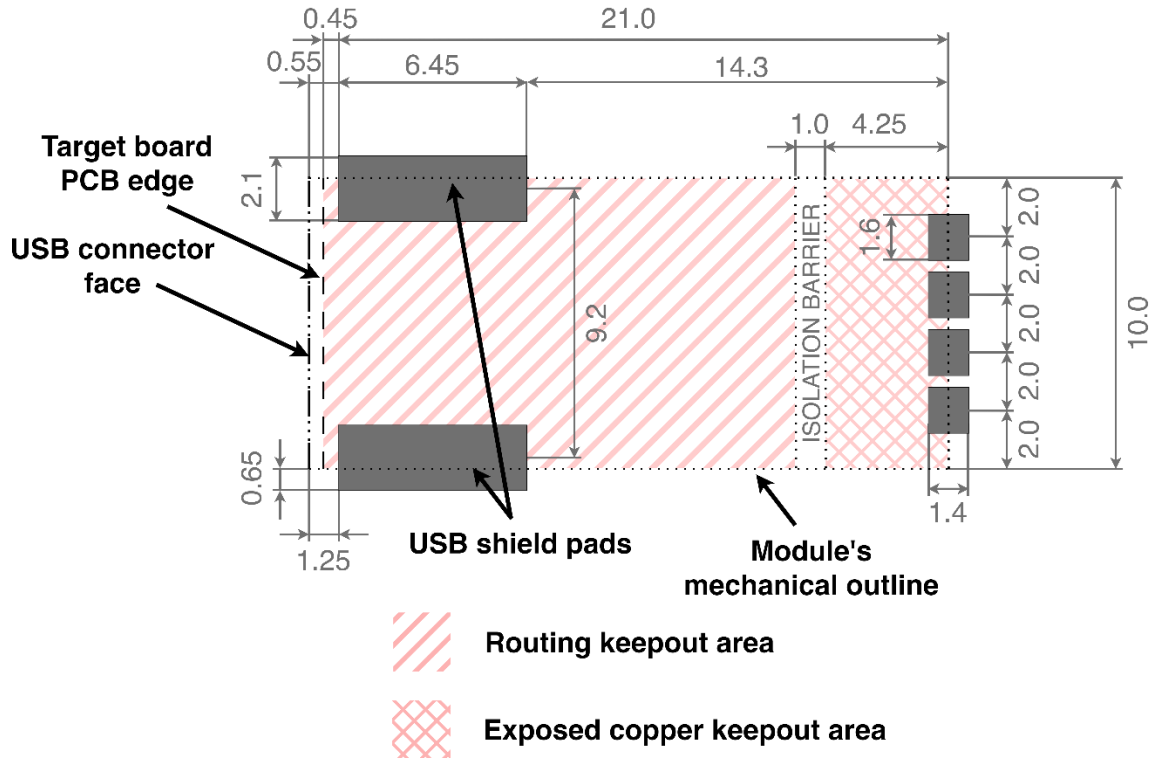


Figure 8. Recommended Footprint

Notes:

- All dimensions provided on Figure 9. are in millimeters
- Module's library package and 3D model available to download from Electronic Prototypes website <https://www.electronic-prototypes.com/products/iso-uart-micro-module>
- Refer to UART Pinout section for detailed pinout information.
- **USB shield pads should not be tied to target board GND potential**

## 12. Document Revision History

Table 9. Document Revision History

Date	Rev	Changes Description
07.03.2024	1.0	Initial Release

## 13. Disclaimer

Electronic Prototypes reserve the right to make changes, corrections, enhancements, modifications, and improvements to Electronic Prototypes products and technical documentation at any time without notice.

Latest technical documentation is available at [www.electronic-prototypes.com](http://www.electronic-prototypes.com).

No license, express or implied, to any intellectual property right is granted by Electronic Prototypes herein.

Electronic Prototypes name and the Electronic Prototypes logo are trademarks of Electronic Prototypes. All other product or service names are the property of their respective owners.