

# ULI-224D ULI-224T ULI-224TCL

BB-4WSD9R  
BB-4WSD9TB  
BB-4WSD90TB

## Inline, Commercial-grade RS-232 to RS-485 Serial Converters – with port power options



### Features

- Convert RS-232 to RS-485 signals
- Extend RS-232 data signals up to 1.2 km
- Data rate: 115.2 kbps
- 2000V two-way optical isolation (ULI-224TCL)
- Quick, inline installation
- DIP switch selectable RS-422 or RS-485
- RS-232 port-power or 12 Vdc external power (sold separately)
- Isolated model requires 12 Vdc external power (sold separately)

### Introduction

Advantech ULI series converters convert RS-232 to RS-422/RS-485 using either port-power or an external power supply. Data is converted in both directions, RS-232 TD is converted to balanced RS-422 or RS-485 TD. Received RS-422/485 signals are converted to RS-232. Automatic Send Data Control eliminates the need for programming hardware handshaking signals to control RS-422 or RS-485 operation. Model ULI-224TCL provides 2000 V optical isolation and requires an external power source.

### Specifications

#### Serial Technology

- **Data Rate** 115.2 kbps, max.
- **RS-232 Connector** All models: DB9 female (DCE)
- **RS-232 Signals** RD, TD, GND
- **RS-422/485 Connector**

ULI-224D	DB9 female
ULI-224T	Terminal block
ULI-224TCL	Terminal block
- **RS-422/485 Signals** TDA(-), TDB(+), RDA(-), RDB(+), GND
- **RS-422/485 Operation** DIP switch selectable RS-422 or RS-485  
RS-485 2-wire or 4-wire, RS-422 4-wire  
4.7k Ohms
- **Biasing Resistors** None
- **Termination** None
- **Isolation** ULI-224TCL: 2 kV, 2-way optical
- **LEDs** ULI-224TCL: TD, RD

#### Power

- **Port Power** RS-232 handshake lines  
Pins 7 (RTS) and 8 (CTS) tied together.  
Pins 6 (DSR), 1 (DCD) and 4 (DTR) tied together.

Model:	Connector:	Port Power:	12Vdc External Power (PSU#):
ULI-224D	2.5mm plug, tip+	RS232 handshake	BB-SMI6B-12V-P230C1 (optional)
ULI-224T	2.5mm plug, tip+	RS232 handshake	BB-SMI6B-12V-P230C1 (optional)
ULI-224TCL	Terminal block	-	BB-SMI6B-12-V-ST (required)

#### Mechanical

- **Enclosure** Plastic
- **Installation** Inline
- **Dimensions**

ULI-224D	7.8 x 4.3 x 2.0 cm
ULI-224T	9.0 x 4.3 x 2.3 cm
ULI-224TCL	9.8 x 4.3 x 2.3 cm
- **Weight**

ULI-224D	0.049 kg (net, without packaging)
ULI-224T	0.05 kg (net, without packaging)
ULI-224TCL	0.05 kg (net, without packaging)

#### Meantime Between Failures (MTBF)

Calculation Method	MIL217F Parts Count Reliability Prediction
ULI-224D	880179 hours
ULI-224T	345242 hours
ULI-224TCL	179604 hours

#### Environmental

- **Operating Temperature** 0 to +70 °C
- **Storage Temperature** -40 to +85 °C
- **Operating Humidity** 95%, non-condensing

#### Regulatory / Approvals / Certifications

- **FCC, CE**
- **CE Directives** 2014/30/EU - Electromagnetic Compatibility  
2011/65/EU amended by (EU) 2015/863 Reduction of Hazardous Substances (RoHS)  
2012/19/EU - Waste Electrical and Electronic Equipment
- **CE Standards (EMC)** EN 55032 Class B - Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements  
EN 55024 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement
- **Other Standards** EN 61000-6-3 + A1 - Generic Emission Standard for Residential, Commercial and Light-industrial Environments (Class B)  
EN 61000-6-1 - Generic Immunity Standard for Residential, Commercial and Light-industrial Environments

### Ordering Information

Model	Part Number to Order	Description
ULI-224D	BB-4WSD9R	RS-232 to RS-422/485 Converter – DB9F/DB9F
ULI-224T	BB-4WSD9TB	RS-232 to RS-422/485 Converter – DB9F/TB
ULI-224TCL	BB-4WSD90TB	RS-232 to RS-422/485 Converter – DB9F/TB, 2kV Isolation

#### Accessories – Sold Separately

- **BB-SMI6B-12V-P230C1** PSU, 12Vdc, 6W, 2.5mm plug, int'l AC input, int'l AC blades  
(Optional for ULI-224D, ULI-224T)
- **BB-SMI6B-12-V-ST** PSU, 12Vdc, 0.5A, 8W, stripped/tinned  
(Required for ULI-224TCL)

# ULI-224TB BB-485BAT3

## Battery Powered RS-232 to RS-422/485 Serial Converter



### Features

- Change RS-232 TD and RD to RS-485 signals
- Extend RS-232 data signals up to 1.2 km
- Data rates up to 115.2 kbps
- 3 powering options: battery (2) AAA, RS-232 handshake lines, or external power supply (not included, sold separately)
- Quick, easy inline installation
- Automatic Send Data Control – no software drivers necessary

### Introduction

With three power options, Model ULI-224TB (BB-485BAT3) is ideal for field service applications. Use battery power with a low-power RS-232 port (laptop), when handshake lines are unavailable, or when a PSU is not possible. The unit draws available power from the RS-232 port getting additional current from the batteries. If you have a full-power port and handshake lines, turn Off the battery switch to use port-powering, saving the batteries for emergencies. (Battery On/Off switch conserves battery life; it does not turn on/off all power.)

### Specifications

#### Serial Technology

- **Data Rate** 115.2 kbps, max.
- **RS-232 Connector** DB9 female (DCE)
- **RS-232 Signals** RD, TD, GND, DCD, DTR, DSR, RTS, CTS
- **RS-232 Port Power** Pins 7 (RTS) and 8 (CTS) tied together. Pins 6 (DSR), 1 (CD) and 4 (DTR) tied together. Terminal Block
- **RS-422/485 Connector** TDA (-), TDB (+), RDA (-), RDB (+), GND
- **RS-422/485 Signals** DIP switch selectable RS-422 or RS-485
- **RS-422/485 Operation** RS-485 2-wire or 4-wire, RS-422 4-wire
- **Biasing Resistors** 4.7k Ohms
- **Termination** None

#### Power

- **Source #1: Battery** (2) AAA batteries (not included)
- **Source #1: Battery Life** 7 hours fully loaded with no port power available. 100 to 250 hours, typical.
- **Source #2: RS-232** Port-powered from RS-232 handshake lines (requires 7-12 Vdc on at least one handshake line)
- **Source #3: External** 12 Vdc external PSU (not included, sold separately)
- **Source #3: Connector** Terminal block
- **Input Voltage** 12 Vdc @ 100 mA

#### Mechanical

- **Dimensions** 9.0 x 6.5 x 2.8 cm (3.6 x 2.6 x 1.1 in)
- **Enclosure** Plastic, ABS
- **Installation** Inline
- **Weight** 0.104 kg (net, without packaging)

#### Meantime Between Failures (MTBF)

- **MTBF** 241370 hours
- **Calculation Method** MIL217F Parts Count Reliability Prediction

#### Environmental

- **Operating Temperature** 0 to +70 °C
- **Storage Temperature** -40 to +85 °C
- **Operating Humidity** 95%, non-condensing

#### Regulatory / Approvals / Certifications

- **FCC Part 15, CISPR**
- **CE Directives** 2011/65/EU amended by (EU) 2015/863 Reduction of Hazardous Substances Directive (RoHS) 2011/65/EU amended by (EU) 2015/863 Reduction of Hazardous Substances (RoHS) 2012/19/EU - Waste Electrical & Electronic Equipment
- **Standards** EN 55022 + AC Class A Emissions EN 61000-6-1 Generic Standards for Residential, Commercial and Light-Industrial Environments

### Ordering Information

Model Number	Part Number to Order	Description
ULI-224TB	BB-485BAT3	RS-232 to RS-422/485 Converter – DB9F/TB, (2) AAA batteries or port powered or external source

#### Accessories – Sold Separately

- **BB-SMI6B-12-V-ST** PSU, 12 Vdc, 500 mA, stripped/tinned

# ULI-224TC BB-485LDRC9

# ULI-224TCI BB-485DRCI

# ULI-224TE BB-485DRCI-PH

## Industrial-grade RS-232 to RS-485 Serial Converters



### Features

- Converts RS-232 signals to RS-422/RS-485 signals
- Data rate: up to 115.2 kbps
- Extends data up to 1.2 km
- Optical isolation protection
- Wide operating temperature range
- Modbus compatible
- Automatic Send Data Control - no software drivers required
- External power source required (not included, sold separately)
- DIN rail and panel mount options
- UL Class 1 / Division 2 and cULus Recognized options



### Introduction

ULI-224 series industrial adapters convert RS-232 to RS-422/485. Optical isolation and surge suppression protect connected equipment from ground loops and surges - ideal for factory/warehouse automation, in-cabinet, security and other applications. Models ULI-224TCI and ULI-224TE provide premium 3-way isolation on input, output and power lines. Model ULI-224TCI is UL C1/D2 certified for rugged industrial use. Model ULI-224TE meets IEC-61850-3 and IEEE-1613 for electrical substations.

### Specifications

#### Serial Technology

- **Data Rate** 115.2 kbps, max.
- **LED Indicators** TD, RD, Power
- **Modes** RS-422 4-wire, RS-485 2-wire & 4-wire
- **RS-232** Signals: TD, RD, GND

Model:	RS-232 Connector:	RS-422/485 Connector:	Termination, Ohms:	Industrial Bus:	Biasing:
ULI-224TC	DB9 female or TB	TB	120Ω	Modbus ASCII/RTU	–
ULI-224TCI	DB9 female	TB	120Ω	Modbus ASCII/RTU, Allen-Bradley® DH-485 compatible	–
ULI-224TE	DB9 female	TB	120Ω	Modbus ASCII/RTU	1.2KΩ XMT/RCV, built-in, switchable

#### Isolation

- **Rating** 2000 V
- **Method** Optical
- **Lines Protected** ULI-224TC: Data lines  
ULI-224TCI, ULI-224TE: Data lines, power

#### Surge Suppression

- **Method** TVS
- **Lines Protected** Data lines
- **Response Time** <1 pico-second
- **Peak Power Dissipation** ULI-224TC: 500 W, 7.5 bi-directional avalanche breakdown device  
ULI-224TCI, ULI-224TE: 600 W

#### Environmental

- **Operating Temperature** ULI-224TC, ULI-224TCI: -40 to +80 °C  
ULI-224TE: -40 to +85 °C
- **Storage Temperature** -40 to +85 °C (-40 to +185 °F)
- **Operating Humidity** 95%, non-condensing

#### Power

- **Source** External power required (sold separately)

Model:	Connector:	Input Voltage:	Consumption:
ULI-224TC	Terminal block	10-30 Vdc	0.5 W
ULI-224TCI	Terminal block	10-48 Vdc	0.96 W
ULI-224TE	Terminal block	10-48 Vdc	0.5 W

#### Mechanical

Model:	Enclosure:	Mounting:	Dimensions, mm:	Weight (net, without packaging):
ULI-224TC	IP20, plastic	DIN rail	25 x 79 x 95	0.249 kg
ULI-224TCI	IP30, plastic	DIN rail	114 x 33 x 124	0.204 kg
ULI-224TE	IP30, metal	Panel (DIN option)	132 x 93 x 31	0.209 kg

#### Meantime Between Failures (MTBF)

- **Calculation Method** MIL217F Parts Count Reliability Prediction

ULI-224TC	257448 hours
ULI-224TCI	254617 hours
ULI-224TE	163611 hours

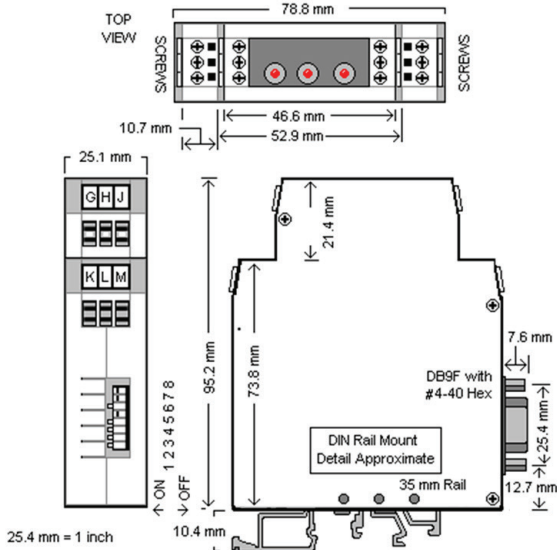
#### Regulatory/Approvals/Certifications

- **CE Directives (all)** 2014/30/EU – Electromagnetic Compatibility (EMC)  
2011/65/EU amended by (EU) 2015/863 Reduction of Hazardous Substances (RoHS)  
2012/19/EU – Waste Electrical and Electronic Equipment

Model:	Regulatory:	CE Standards (EMC):	IEC Standards:
ULI-224TC	FCC, UL Recognized Comp. #E222870, KCC	EN 55032 Class B – Electromagnetic Compatibility of Multimedia Equipment – Emission Requirement EN 55024	–
ULI-224TCI	FCC, UL C1/D2 #E245458, UL 508 #E222870	– Information Technology Equipment - Immunity Characteristics – Limits and Methods of Measurement	EN 61000-6-1 – Generic Immunity Standards for Residential, Commercial and Light-Industrial Environments
ULI-224TE	FCC, UL C1/D2 #E245458, IEEE-1613, IEC-61850	EN 55011+AC – Information Technology Equipment – Class A RF Emissions EN 61000-6-2 – Generic Immunity Standard for (Heavy) Industrial Environments	–

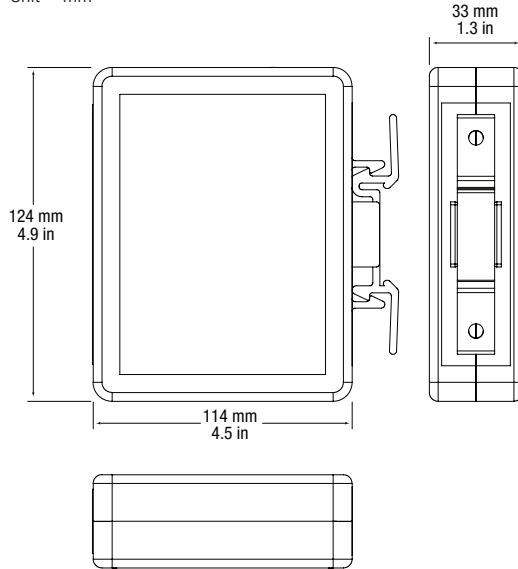
## Dimensions - ULI-224TC

Unit = mm



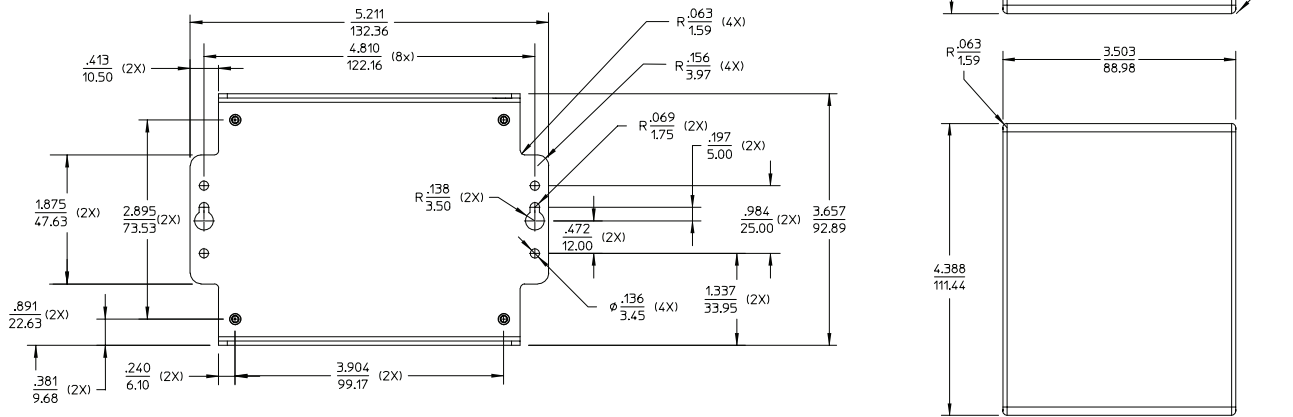
## Dimensions - ULI-224TCI

Unit = mm



## Dimensions - ULI-224TE

Unit = mm



## Ordering Information

Model Number	Part Number to Order	Description
ULI-224TC	BB-485LDR9	RS-232 to RS-422/485 Converter – 2-way Isolation, RS-232 DB9/TB to RS-422/485 TB
ULI-224TCI	BB-485DRCI	RS-232 to RS-422/485 Converter – 3-way Isolation, DB9/TB, UL C1/D2, UL508, AB® DH-485
ULI-224TE	BB-485DRCI-PH	RS-232 to RS-422/485 Converter – 3-way Isolation, DB9/TB, UL C1/D2, IEEE1613, IEC61850

# ULI-224TH ULI-224THC

BB-SCP211-DFTB3

BB-SCP311-DFTB3

## Compact, Panel Mount RS-232 to RS-485 Serial Converters



ULI-224THC  
BB-SCP311T-DFTB3

(optional DIN rail mounting clips,  
sold separately)

ULI-224TH  
BB-SCP211-DFTB3



### Features

- Convert RS-232 data signals to RS-422/485 signals
- 2kV optical isolation (Model# ULI-224THC)
- ESD protection: 8 kV contact, 15 kV air
- Data rate: up to 460.8 kbps (bit-wise enable)
- -40 to +80 °C wide operating temperature (model# ULI-224THC)
- Rugged metal panel mount case (DIN rail adapters sold separately)
- 10-30 Vdc external power source (not included, sold separately)
- UL Listed

### Introduction

ULI- series RS-232 to RS-422/485 converters meet heavy industrial EMC standards. Bit-wise enabled circuitry automatically detects character time-outs – no need to set DIP switches for baud rate. Basic model ULI-224TH is designed for less demanding temperatures or when isolation is not required, such as applications where the data line does not exit the control cabinet. Model ULI-224THC is more robust and suitable for protecting expensive control equipment.

### Specifications

#### Serial Technology

- **Data Rate** 460.8 kbps, max.
- **RS-232 Connector** DB9 female (DCE)
- **RS-232 Signals** TD, RD, GND
- **RS-422/485 Connector** Terminal block, removable
- **Modes** RS-422 4-wire, RS-485 2-wire & 4-wire
- **LED Indicators** TD, RD (Green LED, also indicates Power)
- **Industrial Bus** Modbus ASCII/RTU
- **Biasing** 1kΩ, switchable
- **Termination, Ohms** 120Ω, switchable

#### Isolation

- **Rating** 2000 V (model# ULI-224THC)
- **Method** Optical
- **Lines Protected** Data lines

#### Surge Suppression

- **DC Ports** +/- 0.5 kV +/- 1 kV
- **Signal Ports** +/- 1 kV

#### Environmental

- **Operating Temperature** ULI-224TH: 0 to +70 °C  
ULI-224THC: -40 to +80 °C
- **Storage Temperature** -40 to +85 °C
- **Operating Humidity** 95%, non-condensing

#### Power

- **Source** External PSU required (not included, sold separately)
- **Connector** Terminal block, removable
- **Input Voltage** 10-30 Vdc
- **Consumption** 1.0 Watt, max.

#### Mechanical

- **Enclosure** IP30, metal
- **Mounting** Panel (2 panel mount brackets included)
- **Dimensions** 99.1 x 22.9 x 73.7 mm
- **Weight** 0.15 kg (net, without packaging)

#### Mean Time Between Failures (MTBF)

- **MTBF** ULI-224TH: 313926 hours  
ULI-224THC: 217576 hours
- **Calculation Method** MIL217F Parts Count Reliability Prediction

#### Regulatory/Approvals/Certifications

- **Emissions** FCC Class B, CISPR Class B (File# EN55022)
- **Regulatory** UL Listed, UL File# E222870
- **CE Directives** 2014/30/EU - Electromagnetic Compatibility (EMC)  
2011/65/EU amended by (EU) 2015/863 Reduction of Hazardous Substances (RoHS)  
2012/19/EU - Waste Electrical and Electronic Equipment  
EN 55032 Class B – Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements  
EN 55024 - Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement  
EN 61000-6-2 – Generic Immunity Standard for (Heavy) Industrial Environments
- **CE Standards (EMC)**
- **ULI-224THC (only)**

### Ordering Information

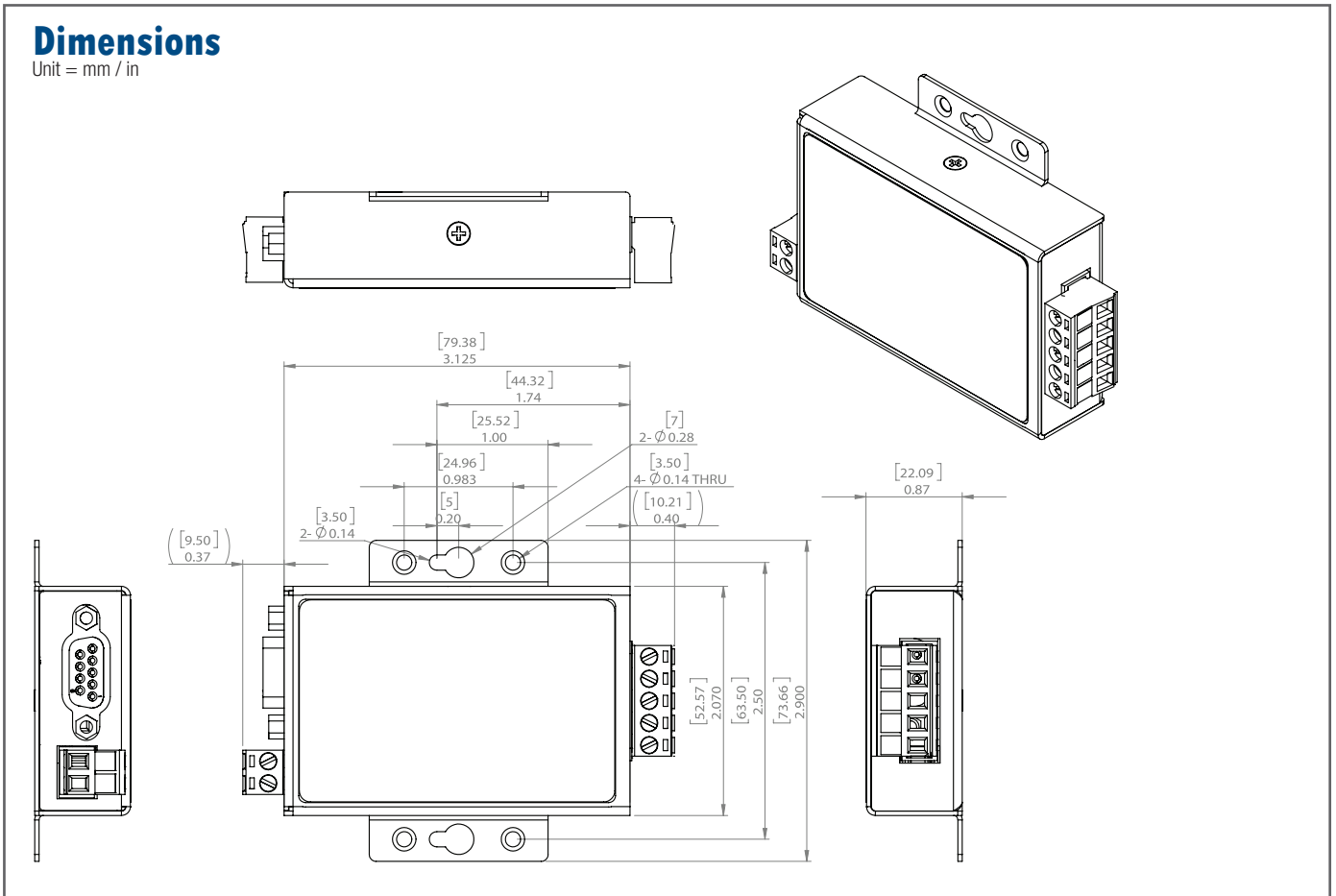
Model Number	Part Number to Order	Description
ULI-224TH	BB-SCP211-DFTB3	RS-232 to RS-422/485 Converter, DB9F/TB, Non-isolated, Standard Temp.
ULI-224THC	BB-SCP311T-DFTB3	RS-232 to RS-422/485 Converter, DB9F/TB, 2kV Isolation, Wide Temp.

#### Accessories – Sold Separately

- **BB-SMI6-12-V-ST** PSU, 12 Vdc, 500 mA, 6 W, stripped/tinned, international AC input & blades
- **BB-DRAD35** DIN rail mounting clips, 35mm

## Dimensions

Unit = mm / in



# ULI-224 Series Selection Guide

## RS-232 to RS-422/485 Converters



### Common Features

- Convert RS-232 to RS-422/485 signals
- Data rates: up to 115.2 kbps or 480.8 kbps
- Industrial designs and specifications
- Automatic Send Data Control
- Isolation and surge suppression options
- Industrial protocol support options
- Wide operating temperature
- External, port or battery powering
- DIN rail, panel mount or in-line installation

### Serial Converters Comparison Table

Model Number	ULI-224TC	ULI-224TCI	ULI-224TE	ULI-224TH	ULI-224THC	ULI-224D	ULI-224T	ULI-224TCL	ULI-224TB
Part Number to Order	BB-485LDR9	BB-485DRCI	BB-485DRCI-PH	BB-SCP211-DFTB3	BB-SCP311T-DFTB3	BB-4WSD9R	BB-4WSD9TB	BB-4WSD90TB	BB-485BAT3
Description	Industrial-grade RS-232 to RS-422/485 Converters			Compact, Panel Mount RS-232 to RS-422/485 Converters		In-line, Commercial-grade RS-232 to RS-422/485 Converters			Battery-Powered RS-232 to 422/485 Converter
Key Features	Dual RS-232 connectors (terminal block & DB9)	3-way isolation, A-B® DH-485, UL C1/D2, Oil & Gas	3-way isolation, UL C1/D2, IEC-61850, Power Utilities	Small Form Factor, Panel Mount		Inline Installation			3 power options
Industrial Rating	Light			Heavy		Light			
RS-232 Connector	Terminal block (DB9 option)	DB9 female							
RS-422/485 Connector	Terminal block				DB9 female		Terminal block		
Data Rate, maximum	115.2 kbps			460.8 kbps		115.2 kbps			
Modes (RS-422 4-wire RS-485 2 & 4 wire)	✓	✓	✓	✓	✓	✓	✓	✓	✓
LEDs	TD, RD, PWR			TD, RD		-	-	TD, RD	-
Isolation	2 kV (input, output)	2 kV (input, output, power)		-	2 kV (input, output)	-	-	2 kV (input, output)	-
Surge Suppression	500 W	600 W		± 0.5 kVdc ports, ±1 kV signal ports		-	-	-	-
Modbus	✓	Allen-Bradley® DH-485	✓	✓	✓	-	-	✓	-
Automatic Send Data Control	✓	✓	✓	✓	✓	✓	✓	✓	✓
Operating Temperature	-40 to +80 °C	-40 to +85 °C		-0 to +70 °C	-40 to +80 °C	0 to +70 °C			
External Power	10 to 30 Vdc	10 to 48 Vdc		10 to 30 Vdc		12 Vdc		10 to 48 Vdc	12 to 16 Vdc
Power Connector	Terminal block				2.5 mm plug, tip positive		Terminal block		
Port Power	-	-	-	-	-	RS-232 handshake		-	RS-232 handshake
Battery Power	-	-	-	-	-	-	-	-	(2) AAA
Enclosure	IP20, plastic	IP30, plastic	IP30, metal	IP30, metal		Plastic			
Mounting Installation	DIN rail			Panel (DIN option)		Inline			
Dimensions, mm	25 x 79 x 95	114 x 33 x 124	132 x 93 x 33	99 x 23 x 74	99 x 23 x 74	78 x 43 x 20	90 x 43 x 23	98 x 43 x 23	90 x 65 x 28
MTBF (MIL217F), hours	257448	254617	163611	313926	217576	880179	345242	179604	241370
Regulatory/Approvals/Certifications	KCC, cULus Recognized #E222870, EN55021, EN55024	UL 508 #E222870, UL C1/D2 #E245458*, EN55032/B, EN55024, EN61000-6-1	UL C1/D2 #E245458*, IEC61850-3†, IEEE-1613‡, EN55011+AC, EN61000-6-2	UL, EN55032/B, EN55024	UL, EN55032/B, EN55024, EN61000-6-2	EN55032/B, EN55024, EN61000-6-3+A1, EN61000-6-1		EN55022+AC, EN61000-6-1	



\*UL C1/D2 #E245458

†IEC61850-3

‡IEEE-1613