**Introduction**

Model ULI-234TCL is an RS-422/485 signal repeater with 2 kV optical isolation on data lines and terminal blocks for RS-422, RS-485 2 or 4-wire modes. It extends RS-422/485 an additional 1.2 km to double the communication range. Another benefit is the ability to add another 32 nodes to an RS-485 network and join 2 and 4 wire systems. Its compact design fits almost anywhere. Wiring schematic on the label eliminates guesswork. 12 Vdc PSU is required and included with USA, EU, UK, AU, UP and CN blades.

**Specifications**

**Serial Technology**
- **Connector**: Terminal block
- **Signals**: TDA(-), TDB(+), RDA(-), RDB(+), GND
- **Modes**: RS-485 2-wire or 4-wire, RS-422 2-wire
- **LED Indicators**: Data flow and Power

**Isolation**
- **Method**: Optical
- **Rating**: 2000 V
- **Lines Protected**: Data lines

**Surge Suppression**
- **Method**: TVS
- **Rating**: 6.5 V, bi-directional, 600W peak power dissipation
- **Lines Protected**: Data lines

**Industrial Bus**
- **Protocol**: Modbus ASCII / RTU

**Terminal Block**
- **Wire Size**: 22 to 14 AWG
- **Torque**: 0.5 Nm

**Power**
- **Connector**: Terminal block
- **Voltage**: 10 – 14 Vdc
- **Consumption**: 1.0 W
- **Source**: External 12 Vdc source, required.
  - Note: one wall transformer power supply included.

**Power Supply, included**
- **Input Voltage**: 96 – 264 Vac
- **Input Connections**: AC blades for USA, EU, UK, AU, CN, JP
- **Output Connections**: Stripped and tinned leads
- **Output Current**: 500 mA
- **Output Power**: 6 W
- **Output Voltage**: 12 Vdc
- **Efficiency Level**: VI

**Mechanical**
- **Enclosure Material**: Plastic
- **IP Rating**: 30
- **Dimensions**: 97 x 61 x 25 mm
- **Mounting**: In-line installation

**Environmental**
- **Operating Temperature**: 0 to +40 °C
- **Operating Humidity**: 0 to 95%, non-condensing

**Mean Time Between Failures (MTBF)**
- **MTBF, hours**: 453103
- **Calculation Method**: MIL217F Parts Count Reliability Prediction

**Regulatory Certifications**
- **Approvals**: FCC
  - EN 55032 (Class B) – Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements
  - EN 55024 – Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement
  - EN 60950-1 +A1 +A11 +A12 +A2 – Information Technology Equipment – Safety – Part 1 General Requirements

**Ordering Information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number to Order</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULI-234TCL</td>
<td>BB-485OP</td>
<td>Industrial isolated RS-422/485 Repeater</td>
</tr>
</tbody>
</table>
Introduction
These rugged isolated repeaters from Advantech are ideal for demanding industrial applications. Heavy-duty repeaters can be DIN rail mounted in a cabinet or directly to a panel. Advanced EMC specifications support 2 kV isolation on input and output lines. Models ULI-234TCI and ULI-234TE protect input and output lines plus the power line providing triple protection against electrical transients. Model ULI-234TE is a premium performance repeater for electrical substation and other advanced applications.

Specifications
Serial Technology
- Data Rate, Biasing, Termination
  - Data Rate (max): 115.2 kbps
  - Biasing: Built-in, switchable, 1.2KΩ, TX/RX
  - Termination: Built-in, switchable, 120Ω
- LED Indicators
  - Data flow, Power
- RS-422/485 Connector
  - Terminal block
- RS-422/485 Signals
  - TDA(–), TDB(+) – Input, output
  - RDA(–), RDB(+) – Input, output
  - GND
- RS-422/485 Modes
  - RS-485 2-wire or 4-wire, RS-422 4-wire
- Industrial Bus
  - Modbus ASCII / RTU
  - Allen-Bradley® 1747-AIC 485 (DH-485), Modbus ASCII / RTU

Isolation & Surge Suppression
- Optical Isolation: 2 kV
- Isolated Lines: Input, output
- Surge Rating:
  - Surge Suppression: 600 W, TVS
  - Surge: 8.9V bi-directional avalanche breakdown device, 500W peak power dissipation, <1 picc, response time
  - Surge: 12V bi-directional avalanche breakdown device, 600W peak power dissipation, <1 picc, response time
  - Surge: 12V bi-directional avalanche breakdown device, 600W peak power dissipation, <1 picc, clamping time

Power
- Model: ULI-234TC
  - Connector: Terminal block
  - Input: 110 to 30 Vdc
  - Source: External, not included
  - Consumption: 0.7 W
- Model: ULI-234TCH
  - Connector: Terminal block
  - Input: 25 x 79 x 106
  - Source: DIN rail, panel mount
  - Consumption: 1.9 W
- Model: ULI-234TCI
  - Connector: Terminal block
  - Input: 123 x 113 x 32
  - Source: DIN rail
  - Consumption: 0.5 W
- Model: ULI-234TE
  - Connector: Terminal block
  - Input: 132 x 93 x 31
  - Source: Panel mount
  - Consumption: 0.5 W

Mechanical
- Model: ULI-234TC
  - Enclosure: IP20 plastic
  - Dimensions, mm: 25 x 79 x 106
  - Mounting: DIN rail, panel mount
  - Weight, gm: 90.72
- Model: ULI-234TCH
  - Enclosure: IP30 metal
  - Dimensions, mm: 123 x 113 x 32
  - Mounting: Panel mount
  - Weight, gm: 222.0
- Model: ULI-234TCI
  - Enclosure: IP30 metal
  - Dimensions, mm: 132 x 93 x 31
  - Mounting: Panel mount
  - Weight, gm: 208.65

Meantime Between Failures (MTBF)
- Calculation Method: MIL-217F Parts Count Reliability Prediction
- Model: Hours:
  - ULI-234TC: 225299
  - ULI-234TCH: 117736
  - ULI-234TCI: 114696
  - ULI-234TE: 122832

Environmental
- Model: Operating Temperature: -40 to +80 °C
  - Storage Temperature: -40 to +85 °C
  - Operating Humidity: 0 to 95%, non-condensing
## Regulatory / Approvals / Certifications

- **FCC, CE (all models)**

<table>
<thead>
<tr>
<th>Model</th>
<th>CE Standards</th>
<th>CE Directives</th>
<th>Other Standards</th>
</tr>
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<tbody>
<tr>
<td>ULI-234TC</td>
<td></td>
<td><strong>EN 55032 Class A – Electromagnetic Compatibility of Multimedia Equipment</strong>- Emission Requirements</td>
<td><strong>KCC, UL Recognized Component #E222870</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>EN 55024 – Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement</strong></td>
<td><strong>CISPR Class B (EN 55032)</strong></td>
</tr>
<tr>
<td>ULI-234TCH</td>
<td></td>
<td><strong>EN 55032 Class B – Electromagnetic Compatibility of Multimedia Equipment</strong> - Emission Requirements</td>
<td><strong>EN 61000-2-27 (Shock) 150 Peak, 11 ms, 3 axes</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>EN 61000-6-1 – Generic Immunity Standard for Residential, Commercial and Light-industrial Environments</strong></td>
<td><strong>EN 60068-2-25 (Vibration) 1.0g 10,000 h, 3 axes</strong></td>
</tr>
<tr>
<td>ULI-234TCI</td>
<td></td>
<td><strong>EN 55032 Class B – Electromagnetic Compatibility of Multimedia Equipment</strong> - Emission Requirements</td>
<td><strong>UL C1/D2 #E245458, Groups A,B,C,D</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>EN 55024 – Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement</strong></td>
<td><strong>UL C1/D2 #E245458, IEC-61850-3, IEEE-1613</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>EN 61000-6-2 – Generic Immunity Standard for (Heavy) Industrial Environments</strong></td>
<td></td>
</tr>
</tbody>
</table>

## Dimensions - ULI-234TC

**Unit = mm**

- **25±0.25**
- **79±0.38**
- **78.95±0.38**

## Dimensions - ULI-234TCH

**Unit = mm / in**

## Dimensions - ULI-234TCI

**Unit = mm / in**

## Dimensions - ULI-234TE

**Unit = in / mm**

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<td>ULI-234TC</td>
<td>BB-485OPDR</td>
<td>Industrial Isolated RS-422/485 Repeater – 2 kV 2-way isolated, 115.2 kbps, wide operating temperature range. PSU not included.</td>
</tr>
<tr>
<td>ULI-234TCH</td>
<td>BB-485OPDR-HS</td>
<td>Industrial Isolated RS-422/485 Repeater – 2 kV 2-way isolated, 1.5 Mbps, wide operating temperature range. PSU not included.</td>
</tr>
<tr>
<td>ULI-234TCI</td>
<td>BB-485OPDRI</td>
<td>Industrial Isolated RS-422/485 Repeater – 3 kV 2-way isolated, 115.2 kbps, wide operating temperature range. PSU not included.</td>
</tr>
<tr>
<td>ULI-234TE</td>
<td>BB-485OPDRI-PH</td>
<td>Industrial Isolated RS-422/485 Repeater – 3 kV 2-way isolated, 115.2 kbps, wide operating temperature range. PSU not included.</td>
</tr>
</tbody>
</table>
ULI-234 Series Selection Guide
Industrial Heavy-duty, Isolated RS-422/485 Repeaters

Common Features
- Extend RS-422/RS-485 signals an extra 1.2 km
- Add up to 32 more nodes to RS-485 network
- 2 kV optical isolation protection
- 600 W transient voltage suppression
- Industrial-grade design, specifications and certifications
- Industrial protocol support
- Wide operating temperature options
- External powering (PSU required, sold separately)
- DIN rail, panel mount or in-line installation

Serial Converters Comparison Table

<table>
<thead>
<tr>
<th>Model Number</th>
<th>ULI-234TCL</th>
<th>ULI-234TC</th>
<th>ULI-234TCH</th>
<th>ULI-234TCI</th>
<th>ULI-234TE</th>
</tr>
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<tbody>
<tr>
<td>Part Number to Order</td>
<td>BB-485OP</td>
<td>BB-485OPDR</td>
<td>BB-485OPDR HS</td>
<td>BB-485OPDR</td>
<td>BB-485OPDR PH</td>
</tr>
<tr>
<td>Description</td>
<td>2-way Isolated RS-422/485 Repeaters</td>
<td>3-way Isolated RS-422/485 Repeater</td>
<td>3-way Isolated RS-422/485 Repeater</td>
<td>Hardened, 3-way Isolated RS-422/485 Repeater</td>
<td>Hardened, 3-way Isolated RS-422/485 Repeater</td>
</tr>
<tr>
<td>Key Features</td>
<td>Two terminal blocks join 2-wire and 4-wire systems</td>
<td>UL Recognized Component</td>
<td>1.5 Mbps, high-speed</td>
<td>UL C1/D2, UL 508, 3-way isolation, Oil &amp; Gas applications</td>
<td>UL C1/D2, EN61850-3, IEE-1613, 3-way isolation, Electrical substations</td>
</tr>
<tr>
<td>Industrial Rating</td>
<td>Heavy-duty</td>
<td>2 kV, input/output</td>
<td>1.5 Mbps</td>
<td>UL C1/D2</td>
<td>IEE-1613</td>
</tr>
<tr>
<td>Isolation</td>
<td>2 kV, input/output</td>
<td>2 kV, input/output</td>
<td>1.5 Mbps</td>
<td>UL C1/D2</td>
<td>IEE-1613</td>
</tr>
<tr>
<td>Surge Protection</td>
<td>600 W, TVS</td>
<td>600 W, TVS</td>
<td>115.2 kbps</td>
<td>UL C1/D2</td>
<td>IEE-1613</td>
</tr>
<tr>
<td>Industrial Bus</td>
<td>Modbus ASCII / RTU</td>
<td>Modbus ASCII / RTU</td>
<td>Modbus ASCII / RTU</td>
<td>Modbus ASCII / RTU</td>
<td>Modbus ASCII / RTU</td>
</tr>
<tr>
<td>Baud Rate, max.</td>
<td>115.2 kbps</td>
<td>1.5 Mbps</td>
<td>115.2 kbps</td>
<td>115.2 kbps</td>
<td>115.2 kbps</td>
</tr>
<tr>
<td>RS-422/485 Connector</td>
<td>Terminal block</td>
<td>Terminal block</td>
<td>Terminal block</td>
<td>Terminal block</td>
<td>Terminal block</td>
</tr>
<tr>
<td>Automatic Send Data Control</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Power Source</td>
<td>10 to 14 Vdc</td>
<td>10 to 30 Vdc</td>
<td>10 to 48 Vdc</td>
<td>10 to 48 Vdc</td>
<td>10 to 48 Vdc</td>
</tr>
<tr>
<td>Power Connector</td>
<td>External PSU</td>
<td>External PSU</td>
<td>External PSU</td>
<td>External PSU</td>
<td>External PSU</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to +40 °C</td>
<td>-40 to +80 °C</td>
<td>-40 to +85 °C</td>
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<td>-40 to +85 °C</td>
</tr>
<tr>
<td>Enclosure</td>
<td>IP30 plastic</td>
<td>IP20 plastic</td>
<td>IP50 metal</td>
<td>IP50 metal</td>
<td>IP50 metal</td>
</tr>
<tr>
<td>Dimensions</td>
<td>97 x 61 x 25 mm</td>
<td>25 x 79 x 106 mm</td>
<td>25 x 79 x 95 mm</td>
<td>123 x 113 x 32 mm</td>
<td>132 x 93 x 33 mm</td>
</tr>
<tr>
<td>Mounting Installation</td>
<td>In-line</td>
<td>DIN rail</td>
<td>DIN rail, panel mount option</td>
<td>DIN rail</td>
<td>Panel mount</td>
</tr>
<tr>
<td>MTBF (MIL217F), hours</td>
<td>453103</td>
<td>225299</td>
<td>117376</td>
<td>114696</td>
<td>122832</td>
</tr>
<tr>
<td>Regulatory/Approvals/ Certifications</td>
<td>EN50532, EN50524, EN 60950-1+A1+A12+A2</td>
<td>UL Recognized Component</td>
<td>EN50532A, EN50524, EN61000-6-1, EN61800-6-2, EEC60950-2-27-6, -32</td>
<td>UL C1/D2, EEC61850-3, EEE-1613</td>
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Last updated: 10-Aug-2021