Avago Optocouplers for Extended Temperature Industrial Applications

Introduction
Several factors have increased the need for high temperature industrial optical isolation products: high component density, system miniaturization, greater system capability, and harsh operating environments. System power density and operating temperature have increased. Protecting operators and the system from high voltage are top safety and reliability design goals for engineers today.

Galvanic Isolation plays an important role in the electrical safety and integrity of the industrial equipments in removing ground loop currents and decrease interference from noise.

Designers must select isolation components that operate reliably over time with optimal performance in high temperature, high voltage environments.

Avago Optocouplers for Extended Temperature Industrial Applications

The Avago extended temperature optocouplers feature reinforced insulation and reliability for safety and signal isolation in critical applications. Standard Avago industrial optocouplers operate up to 105°C maximum, but by using an alloy lead frame for superior heat dissipation, extended temperature optocouplers operate up to 125°C maximum and are designated by the letter “U” suffix in the product part number (examples: ACFL-5211U, ACPL-M49U, etc.). In addition to the low thermal resistance alloy lead frame, the extended temperature optocouplers feature a double wire bonding process for redundancy and reduced wire breakage issues.

Avago optocouplers meet worldwide industrial safety standards, such as IEC/EN/DIN EN 60747-5-5, UL1577 and CSA. With the trend to compact systems, components are densely packed on a PCB, and PCBs are tightly placed, leaving minimal space for heat dissipation. In addition, fanless designs are very popular because of their compactness, lower noise, easier system integration, and reliability. In these types of industrial environments, extended temperature optocouplers meet the needs for high voltage isolation, safety and reliability at higher temperature operation.

ACFL-5211U / ACFL-621xU / ACPL-xxxU Optocouplers
The Avago extended temperature optocouplers are summarized in Table 1. The ACPL-xxxU optocouplers are offered in S05, S08, stretched S08, and DIP8 packages. The stretched S06 and S08 packages have a 1.27 mm lead pitch. The new ACFL-xxxxU devices use a new package, the stretched S012, with a fine pitch of 0.8 mm. Both package types are shown in Figure 1.

ACFL-5211U and ACFL-6211U / 6212U optocouplers have two channels internally aligned 180 degrees from each other for bi-directional transmit/receive (Tx/Rx) data communication design and board layout. The two channels are electrically independent and galvanically isolated for reliable, robust bi-directional power system communication interfaces.

Table 1. Avago Extended Temperature Optocouplers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>ACFL-5211U</th>
<th>ACFL-6211U/6212U</th>
<th>ACPL-M43U/M46U</th>
<th>ACPL-M49U/K49U</th>
<th>ACPL-M61U/M71U/M72U</th>
<th>ACPL-312U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Family, Output Type</td>
<td>1Mbd Open-collector</td>
<td>10Mbd CMOS Output</td>
<td>1Mbd Open-collector</td>
<td>20kb/s Open-collector</td>
<td>10 Mbd Open-collector (M61U)</td>
<td>Gate Driver</td>
</tr>
<tr>
<td>Channels</td>
<td>Dual</td>
<td>Dual</td>
<td>Single</td>
<td>Single</td>
<td>Single</td>
<td>Single</td>
</tr>
<tr>
<td>Package</td>
<td>S0012</td>
<td>S0012</td>
<td>S05</td>
<td>S05 (M49U) S08 (K49U)</td>
<td>S05</td>
<td>DIP8</td>
</tr>
<tr>
<td>Creepage/Clearance</td>
<td>8mm/8mm</td>
<td>8mm/8mm</td>
<td>5mm/5mm</td>
<td>5mm/5mm (M49U) 8mm/8mm (K49U)</td>
<td>5mm/5mm</td>
<td>7.4mm/7.1mm</td>
</tr>
<tr>
<td>UL Isolation Voltage</td>
<td>5000 Vrms</td>
<td>5000 Vrms</td>
<td>3750 Vrms</td>
<td>3750 Vrms (M49U) 5000 Vrms (K49U)</td>
<td>3750 Vrms</td>
<td>3750 Vrms</td>
</tr>
<tr>
<td>Recommended VCC</td>
<td>20V max</td>
<td>3.0V - 5.5V</td>
<td>4.5V - 15V (M43U) 4.5V-30V (M46U)</td>
<td>20V max</td>
<td>4.5V - 5.5V (M61U) 3.0V - 5.5V (M71U/M72U)</td>
<td>15V - 30V</td>
</tr>
</tbody>
</table>
The Avago Advantage

Technical Notes

Contact us for your design needs: www.avagotech.com/optocouplers

Reliability of Extended Temperature Optocouplers

Avago extended temperature industrial optocouplers are designed with high reliability LEDs, double bonding, and an alloy lead frame for superior thermal dissipation. They meet the critical reliability requirements needed in a wide range of applications.

The LEDs used in the extended temperature optocouplers have minimum degradation performance (<10%) over 30 years of operation. CTR performance at 125°C with an LED forward current of 4mA and a 100% duty cycle is shown in Figure 4.

Conclusion

Avago extended temperature optocouplers offer the high performance, galvanic isolation and increased system noise immunity needed in modern-day industrial applications: motor inverter systems, industrial networking, test equipments, medical equipments, solar and wind power conversion, smart meters, and motor inverter systems.

Avago ACFL-5211U and ACFL-621xU are new 2-channel bi-directional optocouplers that feature extended temperature operation of up to 125°C, 5000 V RMS isolation voltage, and a high 1140 V PEAK insulation voltage in an 8mm creepage/clearance stretched SO12 package.

Contact us for your design needs: www.avagotech.com/optocouplers

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