

EVERY CONNECTION COUNTS

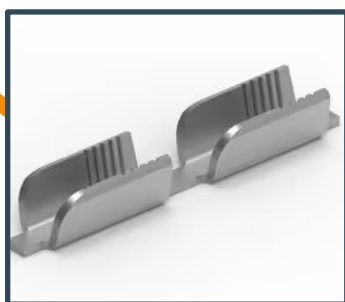


WHITE PAPER

**MAGNET
WIRE
SOLDERLESS
SOLUTIONS
FOR CEILING
FAN MOTORS**

INTRODUCTION

A ceiling fan generates airflow to cool or circulate air within a room. Ceiling fan motors represent a critical component in modern climate solution systems, converting electrical energy into mechanical torque, driving the rotational motion of the blade assembly to provide consistent air circulation and comfort. As the industry evolves toward greater efficiency and cost-effective solutions, with a focus on reducing operational noise, extending service life, and enhancing overall user experience, traditional magnet wire connection methods face increasing limitations. This white paper examines TE Connectivity (TE)'s advanced solderless solutions for ceiling fan motor applications, addressing current market trends, technical challenges, and the compelling advantages of Insulation Displacement Connection (IDC) technology.



AMPLIVAR splice



SIAMEZE terminal

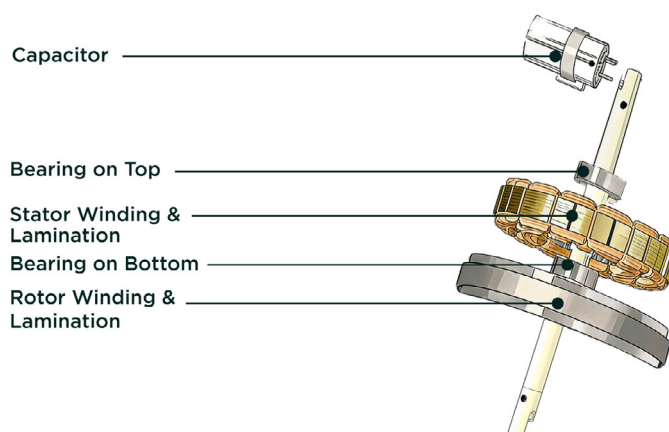


MAG-MATE terminal

MOST COMMON TYPES OF CEILING FAN MOTORS

Single Phase AC Induction Motors

Induction motors remain widely deployed in ceiling fan applications due to their reliability and durability. Operating on standard AC power, these motors deliver efficient performance with excellent torque characteristics and speed control capabilities, making them well-suited for ceiling fan applications.

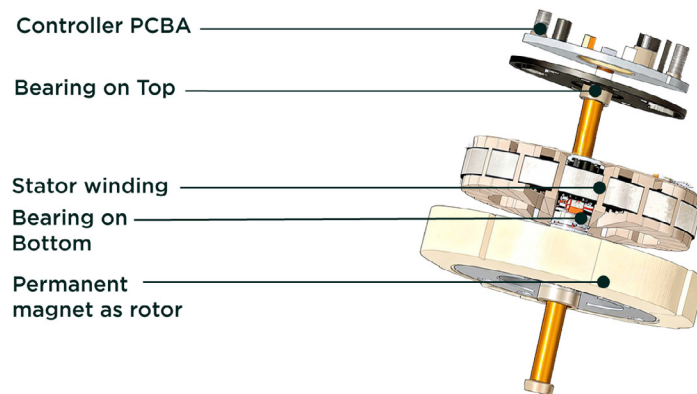


Induction Motor in Ceiling Fan

Brushless DC (BLDC) Motors

BLDC motors are experiencing rapid adoption in modern ceiling fan designs, particularly in premium and energy-efficient applications. Operating on DC power, BLDC motors offer several distinct advantages:

- Excellent energy efficiency
- Reduced noise and vibration levels
- Extended operational lifespan
- Improved energy savings



BLDC Motor in Ceiling Fan

MAGNET WIRE CONNECTION TECHNOLOGIES

Magnet wire—also known as winding wire or enameled wire—is a specially coated copper or aluminum conductor that helps ensure electrical isolation while maintaining excellent conductivity, making it essential for efficient motor winding performance.

COMMON CONNECTION METHODS FOR MAGNET WIRE

Soldering:

Conventional soldering involves melting solder alloy and applying it to wire termination points to establish electrical connections. While widely used, this method presents several challenges including thermal stress on components, chemical fumes, flux contamination, and process inconsistency.

Welding:

Arc welding techniques melt wire termination points using controlled electrical arc processes. This method requires specialized equipment, protective atmospheres, and presents challenges with process control overall.

Advanced Solderless Solutions:

TE Connectivity's solderless termination technology helps to eliminate the need for pre-stripping magnet wire insulation while forming reliable, permanent connections through mechanical displacement processes.

MARKET TREND: THE ALUMINUM WIRE TRANSITION

The ceiling fan motor industry is experiencing a significant shift toward aluminum magnet wire, driven by compelling economic and performance factors:



Cost-Effectiveness Benefits: Aluminum wire is less expensive than copper wire, which helps manufacturers reduce production costs. As ceiling fan manufacturers strive to offer competitive pricing, the use of aluminum wire can contribute to cost savings



Weight and Efficiency Advantages:

- Aluminum weighs approximately one-third than copper
- Reduced motor weight decreases energy consumption
- Lower shipping and handling costs
- Enhanced heat dissipation characteristics



Environmental Considerations: Aluminum's abundance and recyclability align with sustainability initiatives, reducing environmental impact throughout the manufacturing and disposal lifecycle.

However, it's important to note that the use of aluminum wire does come with some challenges. Aluminum has a lower conductivity than copper, which can result in higher resistive losses and potentially require higher wire sizes to compensate. Additionally, aluminum wire requires special considerations for termination and connection techniques, as soldering/welding is no longer easily performed

TE CONNECTIVITY'S SOLDERLESS SOLUTIONS

TE Connectivity offers advanced IDC technology that helps create clean, consistent, reliable metal-to-metal connections without requiring soldering or pre-stripping magnet wire and lead wire.

MAG-MATE Terminal Technology

MAG-MATE terminals are solderless technology. This technology utilizes proven IDC technology specifically engineered for both copper and aluminum magnet wire applications. Key features include:

- **Dual IDC slots** with chamfered lead-ins for reliable wire capture
- **Four-point contact design** helping ensure gas-tight electrical terminations
- **Self-cleaning action** removing oxides and contaminants during insertion
- **Residual spring energy** maintaining constant contact pressure for long-term reliability

Design-in Questions

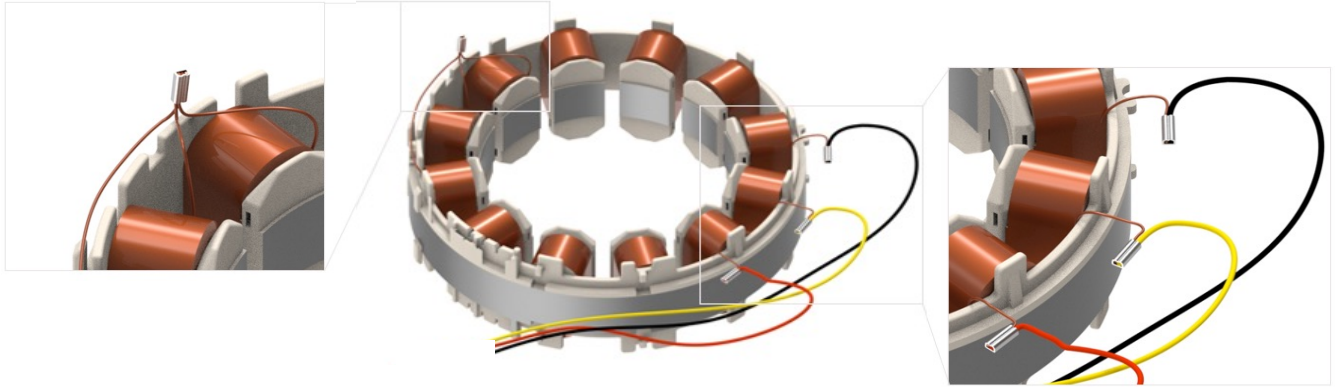
- Are you looking for a more efficient termination technology, replacing welding or soldering?
- Do you need to terminate finer copper and aluminum wire within a stable process?
- Do you want a clean metal-to-metal interface that produces gas-tight electrical terminations free of oxides and other contaminants?
- Would you be interested in a mechanical termination process that requires no pre-stripping of the magnet wire and does not expose the wire or components to high temperatures?
- Would you be interested in a solution that can accommodate both copper and aluminum wires?
- Would you be interested in a process that can be automated and result in a low applied cost?

If the answers are "yes," TE's AMPLIVAR & MAG-MATE terminals could be a highly suitable solutions for your needs.

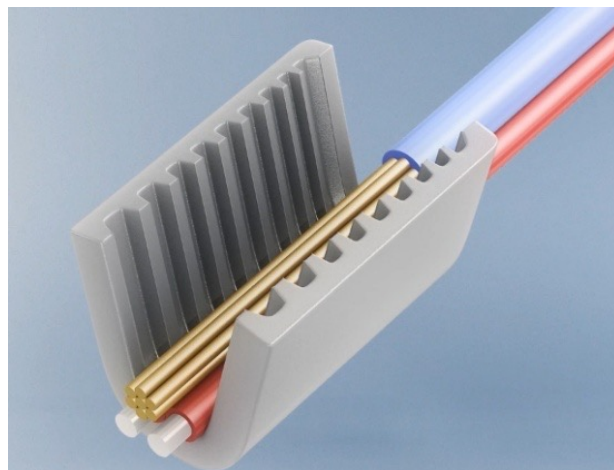
SOLUTION 1 - AMPLIVAR SPLICE

The AMPLIVAR splice is a wire barrel or sleeve featuring internal serrations and burrs designed to help ensure secure electrical and mechanical connections. During assembly, all magnet wires must be positioned at the bottom of the barrel. If a lead wire is included in the same termination, it should be placed above the magnet wires. Upon crimping, the insulation is pierced, and the conductor is extruded into the serrations, establishing a reliable electrical contact surface and providing strong mechanical tensile strength.

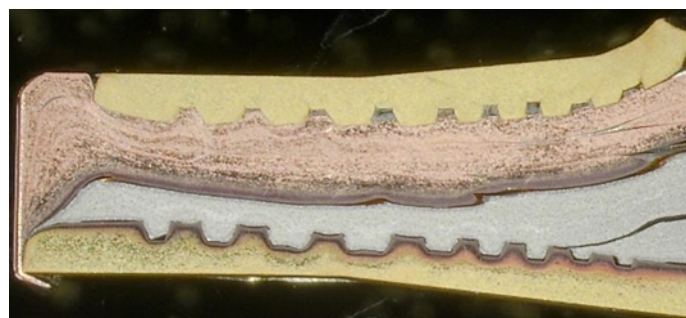
AMPLIVAR splice is the most flexible option for soldering replacement or low demand platforms. Minimal or no design changes required in motor structure and connection space.



AMPLIVAR splice application for main & star point (common) connection



AMPLIVAR splice with lead wire and magnet wires

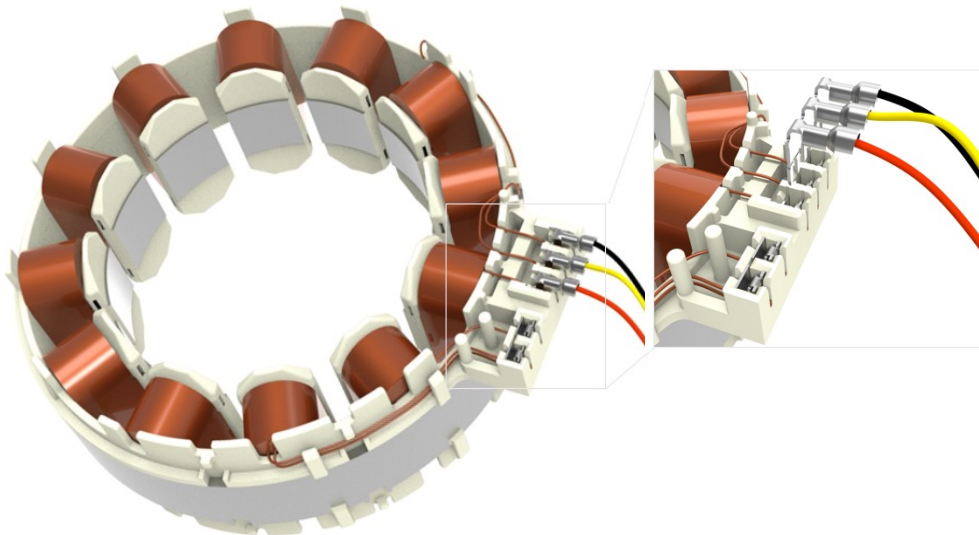


Cross sectional view of crimped AMPLIVAR splice

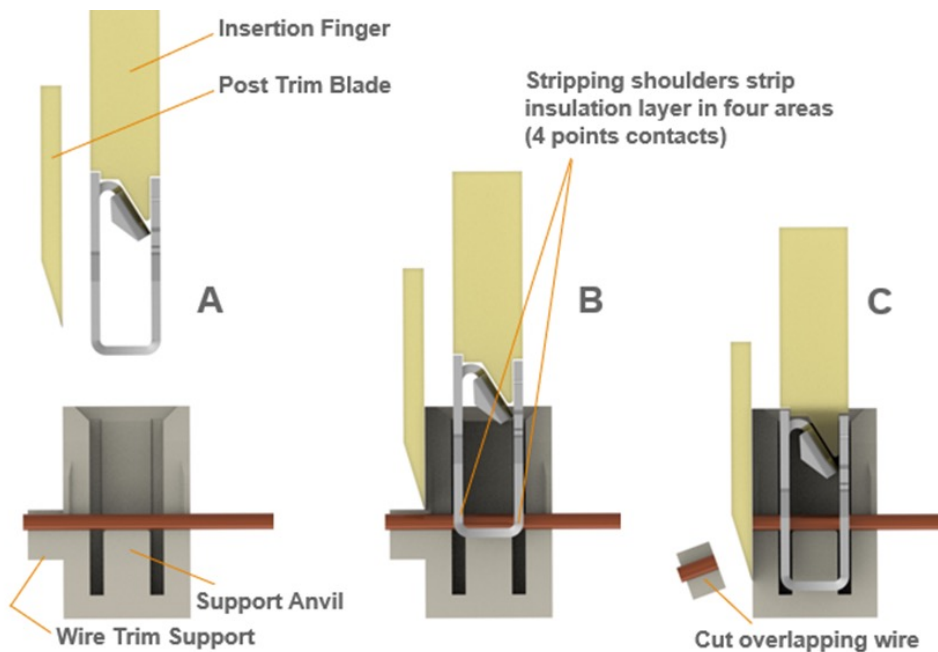
SOLUTION 2 - MAG-MATE TERMINAL

The MAG-MATE terminal features two IDC (Insulation Displacement Connection) slots, each equipped with inlet chambers at the entry points. During assembly, the terminal is positioned over the magnet wire within a plastic cavity and then pressed into place. As the terminal is inserted, it removes the insulation film from the wire surface. Once fully seated, the wire is securely held within the two IDC slots, helping ensure a virtually safe and reliable termination.

MAG-MATE terminations can be fully automated into the manufacturing process.



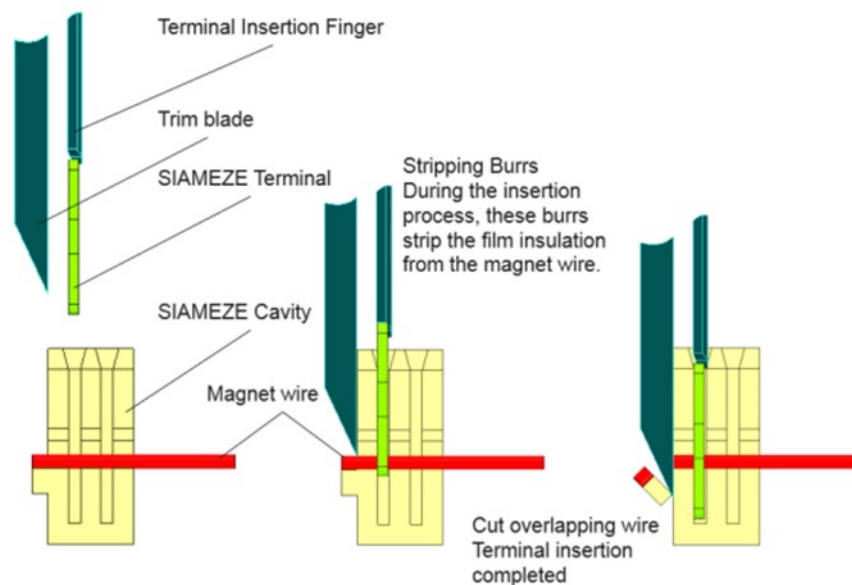
MAG-MATE terminal application main & star point (common) connection



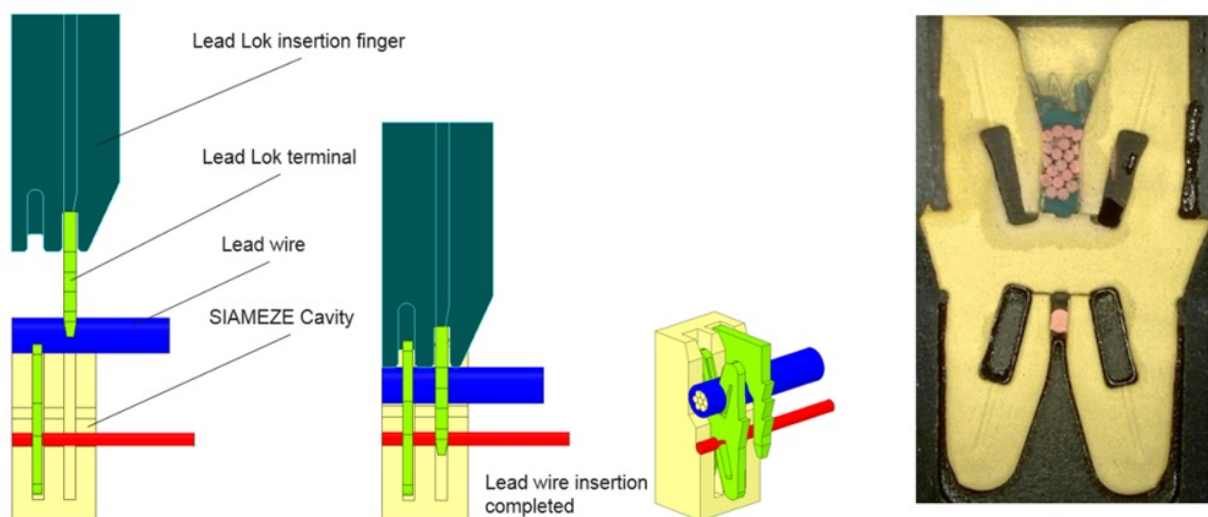
Cross section view of MAG-MATE terminal connection

SOLUTION 3 - SIAMEZE TERMINAL

The SIAMEZE terminal incorporates IDC (Insulation Displacement Connection) slots with inlet chambers at the entry points. During assembly, the terminal is positioned over the magnet wire within a designated plastic cavity and then inserted onto the wire. This insertion process removes the insulation film from the wire surface, helping to ensure proper electrical contact. Once the SIAMEZE wire-to-wire terminal is fully seated in the TE-specified cavity, the setup is ready for secondary lead wire attachment. The lead wire is then manually placed over the magnet wire already terminated by the SIAMEZE terminal, completing the connection.



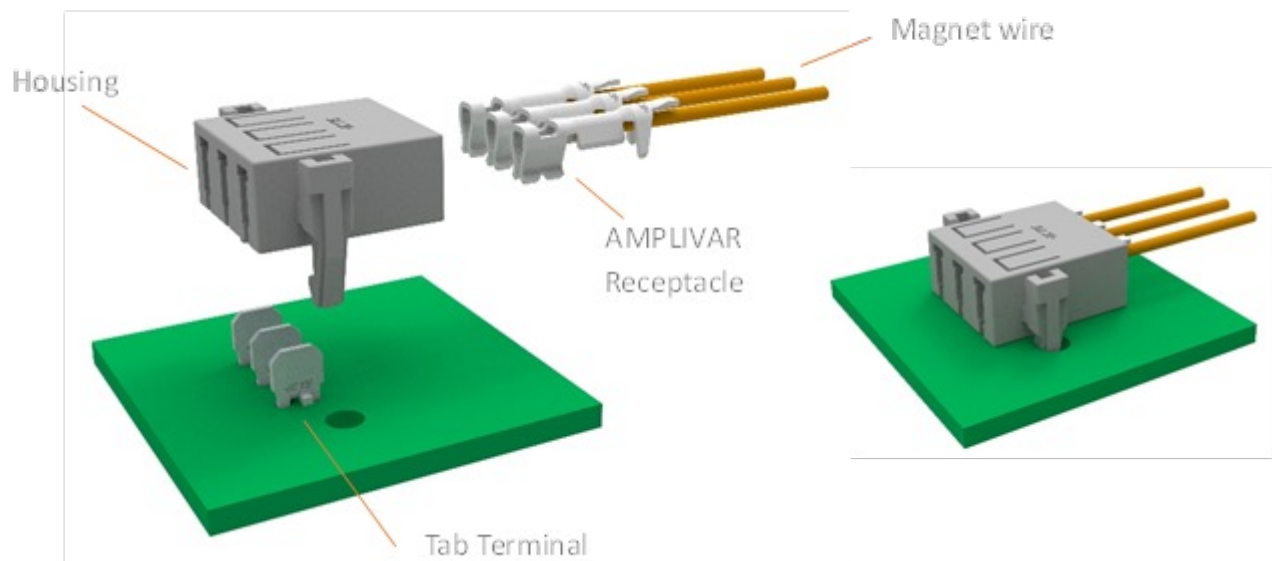
Cross section view of connection with SIAMEZE terminal



Cross section view of termination of Lead wire with SIAMEZE terminal

SOLUTION 4 - DIRECT MAGNET WIRE TO PCB CONNECTOR (CUSTOMIZED DESIGN)

This is a customized solution for connecting magnet wire to a PCB, consisting of three key components. The AMPLIVAR receptacle, featuring internal serrations and burrs, is used to crimp copper or aluminum magnet wire. After crimping, the AMPLIVAR receptacle is inserted into a housing and then mated with soldered tabs on the PCB. Snap latches serve as mounting locators, helping secure the connection.



Customized solution for magnet wire to PCB connection

APPLICATION TOOLING

For information on the application tooling required to terminate TE's solderless magnet-wire terminals—and to learn more about the available solutions ranging from semi-automatic to fully automated systems—please contact a Product Specialist at www.te.com/support

CONCLUSION

As ceiling fan motor manufacturers continue pursuing efficiency gains and cost optimization, TE Connectivity's solderless magnet wire solutions provide compelling advantages over traditional connection methods. The transition to aluminum wire in ceiling fan motors represents both an opportunity and a challenge. TE's MAG-MATE terminal and AMPLIVAR splice solutions help address aluminum wire's unique characteristics while maintaining the reliability and quality essential for Climate solution applications.

- **Cost-Efficiency:** Semi-automatic or fully automated assembly helps enable significant cost savings by reducing labor requirements and increasing production output
- **Reliability:** Low manual intervention and precisely controlled termination processes help eliminate human error, virtually ensuring consistent quality
- **Flexibility:** Suitable to connect both copper and aluminum magnet wires and lead wires, these solutions deliver stable, gas-tight terminations for dependable electrical performance
- **Customized Solutions:** Tailored designs are available to meet specific customer requirements
- **Environmentally Friendly:** No chemicals, heat, or soldering are involved, resulting in connections virtually free from thermal damage and fumes

CONNECT WITH US

We make it easy to connect with our experts and are ready to provide all the support you need.

Visit www.te.com/support to chat with a Product Information Specialist



Clinton Pereira
Supervisor
Product Development
Engineer



Trevis L Benchoff
Senior Director
Engineering



Tim Ding
Senior Manager
Engineering



Vinut Indi
R&D / Product
Development
Engineer

TE Connectivity
Connected Living Solutions

te.com/consumer-solutions-magnet-wire-campaign

TE Connectivity, TE, TE connectivity (logo), AMPLIVAR, MAG-MATE, SIAMEZE and EVERY CONNECTION COUNTS are trademarks owned or licensed by the TE Connectivity plc family of companies. All other logos, products and/or company names referred to herein might be trademarks of their respective owners

The information given herein, including drawings, illustrations and schematics which are intended for illustration purposes only, is believed to be reliable. However, TE Connectivity makes no warranties as to its accuracy or completeness and disclaims any liability in connection with its use. TE Connectivity's obligations shall only be as set forth in TE Connectivity's Standard Terms and Conditions of Sale for this product and in no case will TE Connectivity be liable for any incidental, indirect or consequential damages arising out of the sale, resale, use or misuse of the product. Users of TE Connectivity products should make their own evaluation to determine the suitability of each such product for the specific application.

© 2026 TE Connectivity. All Rights Reserved.

03-26