

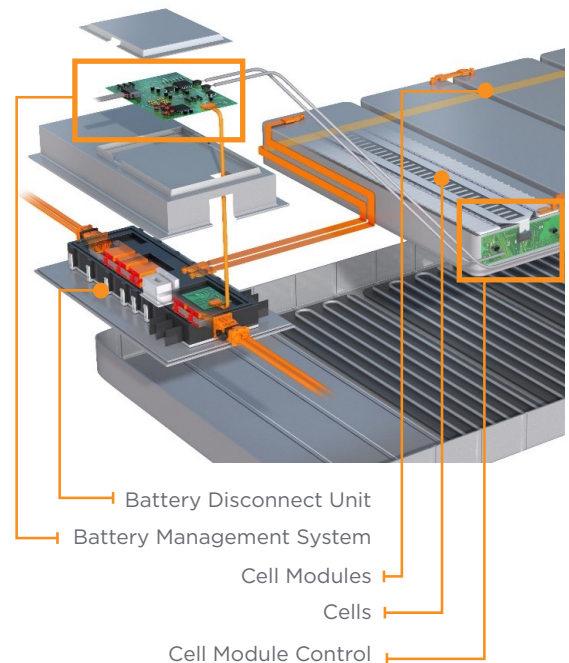
SIGNAL AND POWER CONNECTOR SYSTEMS FOR EV BATTERIES

The battery management system (BMS) is critical for optimum battery performance and safety. It must operate with a high degree of accuracy and reliability. However, it also needs to be compact and lightweight, adding the least possible bulk to the battery pack. Connectivity is necessary within the BMS for transferring analog and digital signals. Analog cell sensing signals, such as low voltage and temperature, are usually processed into digital signals by a Cell Management Controller (CMC) and shared to a master battery management controller (BMC). The BMC and CMC work in tandem to safely balance cell voltages and enable controlled flow of power, for example, during charging.

BMS electronics require highly compact, flexible connector systems because of the vertical and horizontal space limitations of a battery pack. Given that the ratio between battery cells and CMCs vary according to the vehicle's energy and capacity requirements, connector systems must have the power to accommodate multiple connector configurations. They should also support different types of cables, including flat flexible (FFC) and flexible printed (FPC) cables that can be routed around compact and complex battery geometries.

In addition, the connector system requires a safe creepage and clearance distance between the pins, so that there's no risk of failure from short circuits caused by pollution, such as dust or condensation, or arcing. As battery modules and battery management systems are integrated in a sealed pack enclosure, OEMs and battery pack manufacturers must ensure the critical BMS connections meet automotive-grade performance robustness.

TE Connectivity (TE) offers a variety of automotive-grade connectors and terminals for EV battery management systems. TE's NanoMQS and PicoMQS miniaturized connector systems support FFC/FPC cables, and round wires with multiple pin count and pitch variations without sacrificing vibration stability and can facilitate FFC/FPC-to-board, FFC/FPC-to-wire, and wire-to-board connections. Additionally, with the increased prevalence of automated manufacturing from the harness maker to the OEM, TE's NanoMQS and PicoMQS connectors are ready for complete, automated assembly.



APPLICATION REQUIREMENTS

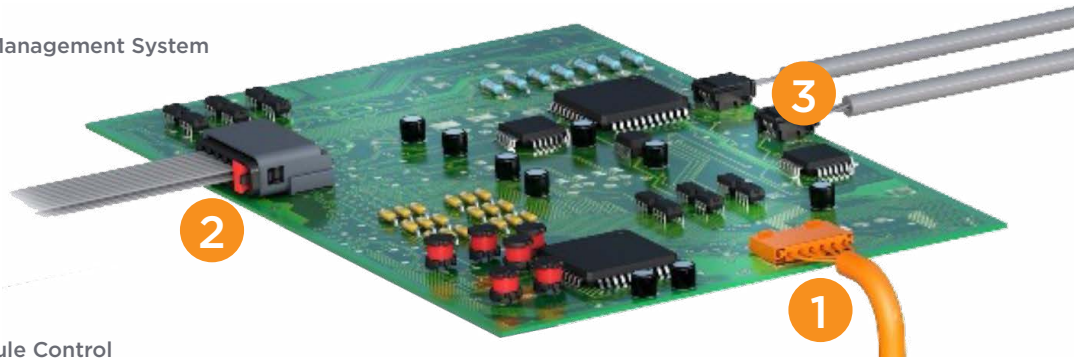
- Over-temperature or over-voltage event of Li-cells shall never occur
- Monitoring compliant to ISO 26262 (ASIL D)
- Flammability class V0
- Provide necessary clearance and creepage distance in accordance with ISO60664-1
- Car lifetime: 15 years
- Operation drive: 8.000h
- Operation charge: 30.000h

PRODUCT REQUIREMENTS

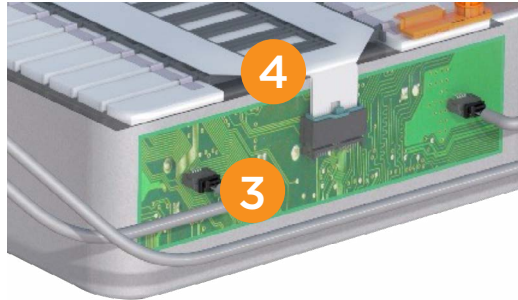
- Connector orientation: preferred 90°
- Pin count: from 2 to 40pos
- Surface Mounted Devices (SMD), or Thru Hole (TH) Reflow
- FFC/FPC side connection
- Unsealed mostly
- USCAR/LV214 validated
- Flammability UL 94 V0
- Operating ambient temperature: -40 / +125°C
- Connector Positions Assurance (CPA) possible
- Average operating pin-to-pin voltage: 24V
- Current rating: <2A, up to 7A
- Pollution Degree: Level 2 minimum

SIGNAL AND POWER CONNECTOR SYSTEMS FOR EV BATTERIES

Battery Management System



Cell Module Control



BATTERY MANAGEMENT SYSTEM PRODUCT EXAMPLES

| | Product | SMD or TH | Current | CPA | USCAR/ LV214 validated | Product Range Available | Flammability Class | Product Number |
|---|--|-----------|------------|----------------|------------------------------|---|-----------------------|---|
| 1 | MQS High Voltage Sensing Detector (1000V capable) | SMD & TH | Up to 8.5A | No | LV214 | 2P, 6P and 10P Header Connector and Terminal | V0 or HB | 2322946-1 2322948-1 5-963715-1 2393302-1 |
| 2 | NanoMQS 0.50mm Connector System | SMD & TH | 6A | Yes (Optional) | USCAR and LV214 | 1 and 2-row 4-48P Headers and Connectors NanoMQS Terminal | V0 or HB | 2312118-1 2317515 2-1703930-2 |
| 3 | PicoMQS 0.50mm Connector System or NanoMQS 0.50mm Connector System | SMD & TH | 4A | Yes (Optional) | LV214 | 2-10P PicoMQS Headers and Connectors 4-20P NanoMQS Headers and Connectors PicoMQS and NanoMQS Terminals | V0 or HB | 2339204-4 1-2332184-1 2-2287720-1 2333102-1 2315405-1 |
| 4 | NanoMQS 0.50mm Connector System | SMD & TH | 6A | Yes (Optional) | USCAR and LV214 | 2-row 8 - 48P FFC/FPC Headers and Connectors NanoMQS FFC/FPC Terminal | V0 or HB | 2303088-1 2177419-3 1-2291853-1 |

- MINIATURE AUTOMOTIVE TERMINALS AND CONNECTORS
- PicoMQS MINIATURE CONNECTOR SYSTEM
- BATTERY PACK SOLUTIONS

- NanoMQS MINIATURE CONNECTOR SYSTEM
- FFC/FPC CONNECTORS
- ERNI MicroBridge CONNECTORS

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