
MICRO-INTERCONNECT SOLUTIONS ADDRESSING ELECTRIC VEHICLE DEMANDS

molex

creating connections for life

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DYNAMICS DRIVING EV ADOPTION

After 100-plus years of internal combustion engine domination, are we ready to embrace the electric vehicle (EV)? According to McKinsey, we are. Government regulations, technology advancements and consumer desire are aligning, creating an environment ripe for EV growth.

Even amid the global COVID-19 pandemic, the International Energy Agency (IEA) reported a substantial increase in EV purchases, with sales share rising by 70% to a record 4.6% in 2020. Projections published by IHS Markit show that uptake is set to gain greater pace in the next few years — with the global insights firm forecasting that battery EVs will constitute 15% of global car sales by 2025 and 23% by 2030.

To gain greater insight into the trends that will define this sector over the next decade, Molex recently partnered with third-party research firm Dimensional Research to conduct an extensive survey of 230 automotive manufacturing decision-makers. The survey findings were very positive about longer-term EV acceptance. In fact, 91% of the respondents believed that by 2030 all newly purchased cars will be either fully electric or hybrid.

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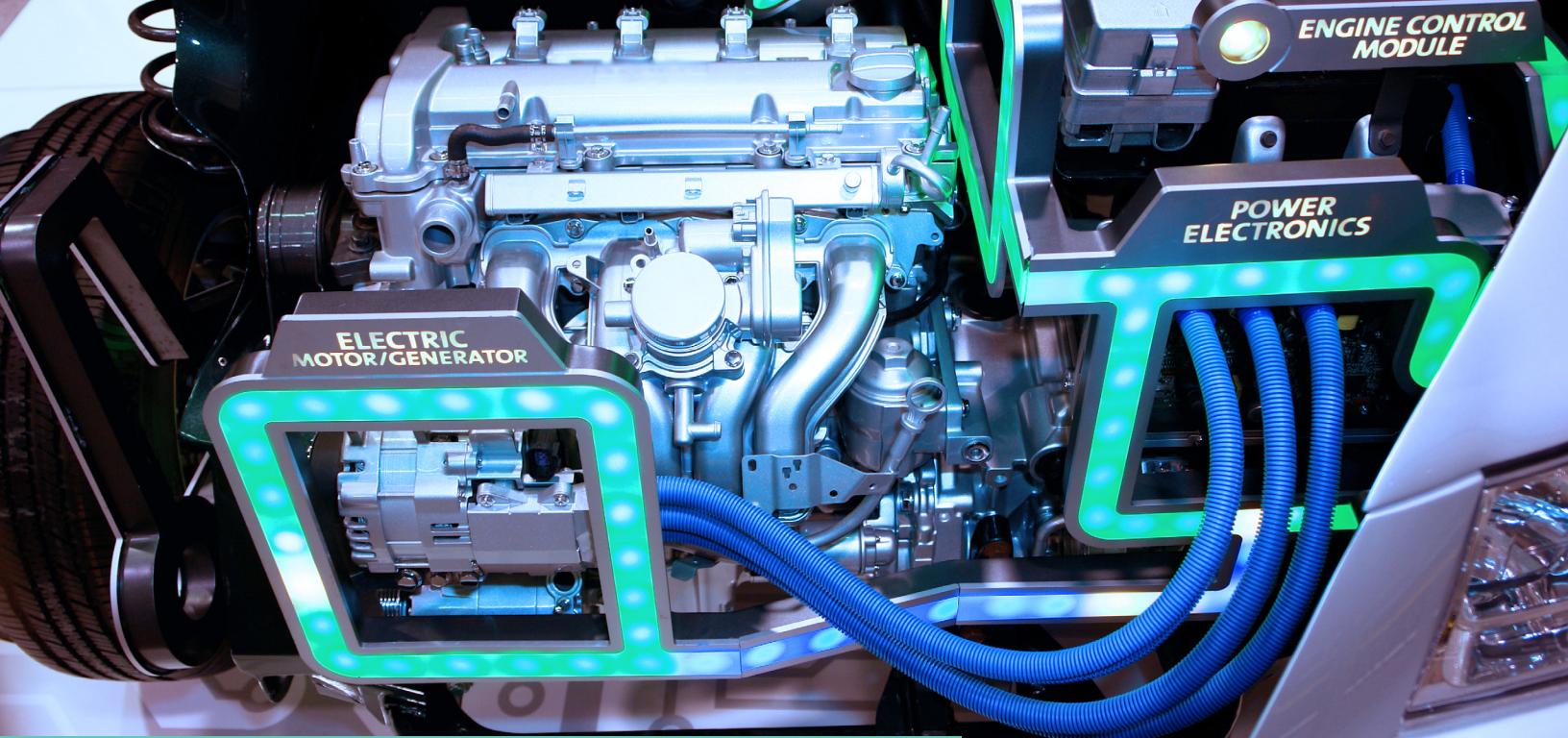
POWERTRAIN CONSIDERATIONS

While 12V systems are common in conventional internal combustion engine systems, EVs rely on much higher voltage levels — with 48V being utilized by hybrids and >400V systems starting to be leveraged in fully electric vehicles. The efficiency improvements derived from these higher voltages will mean cable harnesses incorporated into vehicle designs will be much less extensive. Consequently, cabling systems will not be as complex as they were in the past, and the related costs will be lower too. More important, the contribution of the cabling to the overall weight of the vehicle will be substantially less, and the distance that can be traveled before needing to recharge will be extended.

THE BMS ASPECT

Pivotal to the safe long-term operation of any EV is an effective battery management system (BMS). The BMS monitors the health and charging state of the battery cells. Data needs to be constantly acquired from sensors distributed across the battery — relating to the amount of current being output, the temperature of the battery cells, etc. The reliability of the interconnects carrying this data must be totally assured. Otherwise, the BMS will not be able to respond during a safety-critical situation, potentially placing passengers in danger.





ENGINEERING CHALLENGES

To ensure proper safety in the high-voltage environment of an electric powertrain, interconnects require greater degrees of isolation. Additionally, the harsh operating environment of a vehicle powertrain requires strong connections that can withstand various heat, moisture and vibration conditions. Operational reliability is critical in preventing vehicle failures and the associated repair costs.

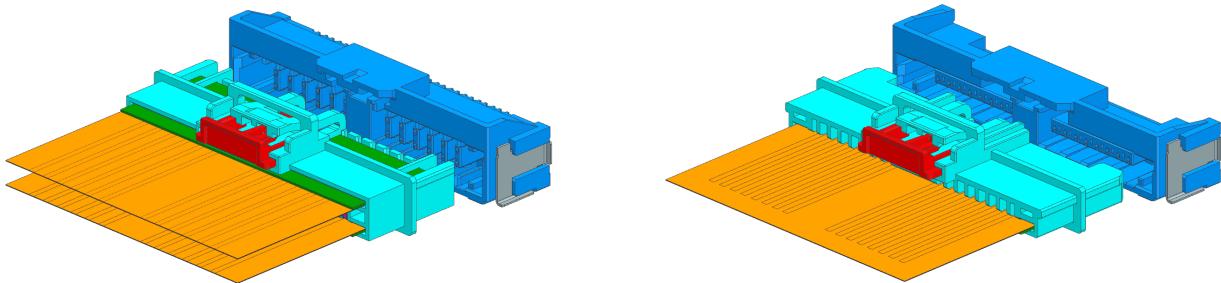




ADVANCED MICRO-INTERCONNECT SOLUTIONS

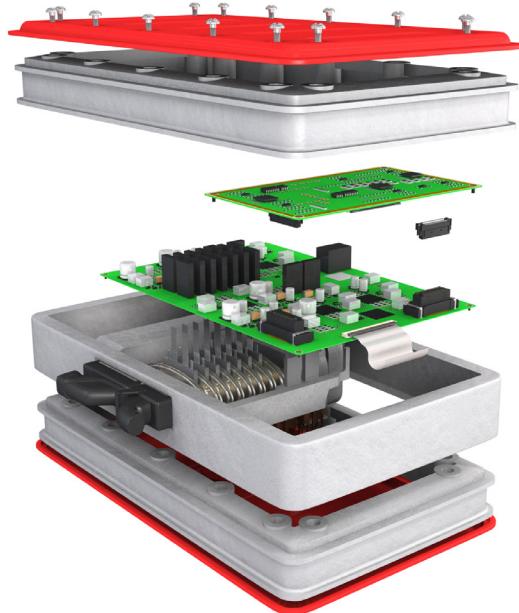
Tier 1 suppliers cannot afford to compromise on quality. The hardware they provide to their OEM customers must feature superior micro-interconnect solutions. Molex has leveraged its extensive legacy in the automotive sector and the status we have gained as one of its foremost component suppliers, and our micro-interconnect products are highly optimized for EV implementation. They offer the robust performance necessary to cope with harsh conditions and industry-leading resilience to vibration, shock, heat, etc. Molex's micro-interconnect solutions enable prolonged operational life spans. Further, the compact profile of these components means that even the most acute space constraints can be respected.

Molex FPC-to-board connectors are ideally suited for use in EV BMS designs. Available in single-row (1.50mm pitch) and dual-row (2.00mm pitch) formats, these components have a 125V maximum voltage rating and a 1.0A maximum current rating. Their low-profile design (with a height <10mm) means that they take up minimal space, thereby allowing more battery capacity to be added. Scoop-proof contacts prevent accidental connection during assembly, and polarization mechanisms are included to ensure that damage cannot be done through mis-mating.



FPC-to-Board Connectors for EV Applications

The integrity of the connection is maintained even when subject to high levels of vibration or thermal shock (in accordance with SAE USCAR 2 and EU LV214 requirements). The dual-beam contact arrangement makes these connectors far better at dealing with heavy vibrations, while the plastic jacket safeguards against the presence of dust on the contacts.



Power Control Unit with Molex Board-to-Board and FPC-to-Board Connectors

The 1.0mm-pitch high-power board-to-board connectors from Molex have the attributes required for modern EV designs, with the capacity to deal with the high-voltage powertrains that will become commonplace in the near future. They have a dielectric withstand value of <100mA (when voltages under 500V are applied), plus >100 Megohms insulation resistance (below 1,000V AC/1,600V DC).

In addition, the high-power board-to-board connectors have a deep wipe length of $\pm 1.75\text{mm}$. Their dust-proof terminal covers help minimize the threat posed by contamination during production, which mitigates the risk of short circuits. The $\pm 0.75\text{mm}$ floating range in the X, Y and Z axes aids the assembly process by providing more than adequate tolerances for automated equipment. As a result, automobile manufacturers can maintain elevated levels of productivity with confidence in the build quality of the vehicles using these micro-interconnects.

Learn more about the Molex micro-interconnect solutions that are revolutionizing EV powertrains and BMS implementations here:

www.molex.com/link/fpc-to-b_ev.html

www.molex.com/link/highpowerb-to-b.html

Sources:

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