Infineon FF400R07A01E3 Double Side Cooled IGBT Module

**Discover Infineon’s first double sided cooling power module for automotive**

Pushed by aggressive legislation, CO2 emission reduction is one of the key challenges in the 21st century. Therefore, carmakers need to develop cleaner vehicles. To achieve these ambitious targets, the best solution currently available is the electrification of vehicles, with different levels of electrification depending on the strategies of different car manufacturers. The full hybrid electric vehicle (HEV) segment will drive the IGBT power module market in the automotive industry, with IGBT power modules used for electric vehicles and hybrid electric vehicles (EV/HEV), competing with superjunction (SJ) MOSFETs. The IGBT market for EV/HEV reached $845M in 2016, making it the biggest IGBT market by value. However the market for IGBTs in the EV/HEV sector is expected to be worth almost $2.1B by 2022, representing over 41% of the whole IGBT market’s value.

In a compact car the maximum power of the motor is 60kW, while the hybrid systems used in medium and large vehicles have inverter power exceeding 160kW. But when converting an existing petrol vehicle to a hybrid version, the available space in the engine compartment is often so limited that it is difficult to accommodate a Power Control Unit (PCU). Thus, it is necessary that the PCU, which controls the traction motors of HEVs, get smaller, with higher power density.

To achieve these targets, manufacturers have developed different solutions, such as reducing wire bonding or using a double-sided cooling (DSC) structure to efficiently cool the power semiconductor chips.

The HybridPACK Double Sided Cooled (DSC) power module is the first DSC IGBT module from Infineon specifically designed for automotive inverters. The FF400R07A01E3 drives 700A and uses a molded structure optimized for cooling, thus improving its thermal cycling capability and extending the lifetime of the power module.

The terminals are connected directly on the DBC with wire bonding and the dies are dissipated on the front side by alloy spacers.

The IGBT is manufactured with the standard TrenchStop technology design, which reduces losses in conduction and switching. The module uses an EMCON PN diode.

Based on a complete teardown analysis, the report also provides an estimation of the production cost of the IGBT, diode and package. The report also contains a technical and cost comparison between Infineon’s design and the Toyota Prius inverter’s DSC power module. It highlights the differences in design of the packaging and the material solutions adopted by the two companies.
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