



Power Electronics Applications and Supply Chain Development

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What are Power Electronics and Drives?

Power Electronics are switching devices

Drives are collections of power electronics devices that control electrical output

Automotive Applications

- Variable speed motor control
- Battery charging
- DC/DC converters
- Wireless power transfer



Photo Courtesy of BMW

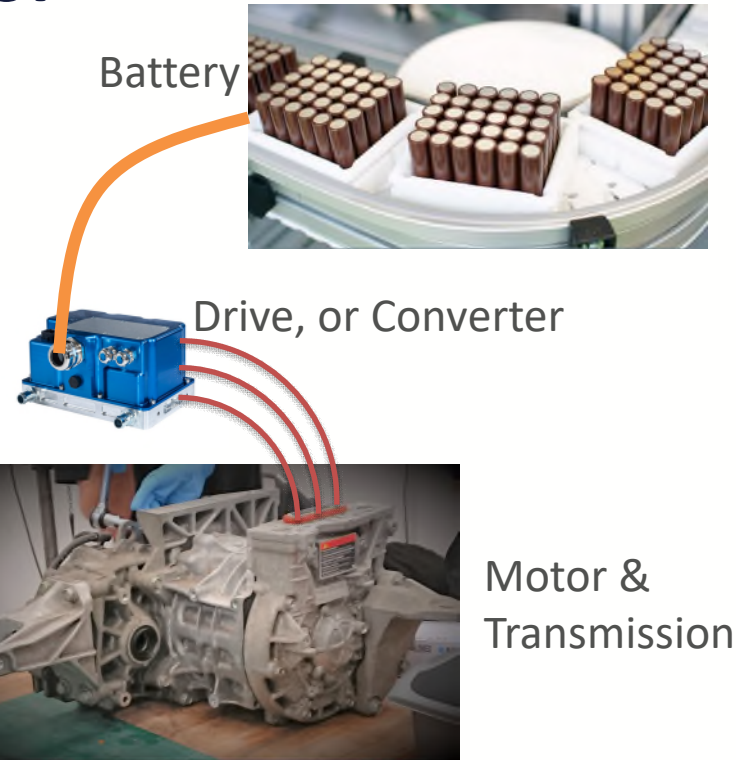
Variable Speed Motor Control

The drive **converts** DC from the battery to power the motor

The motor needs the right voltage, current and frequency to convert to mechanical power

The drive **converts** power returned to the battery when the motor acts as a generator (brake)

The drive is matched to the motor and battery and is generally less than 200 kW

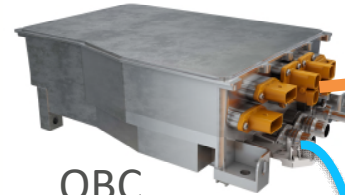


On-Board Charger

The OBC converts AC from the mains supply to DC for the battery at the right voltage, current and quality

The OBC is generally less than 11 kW

Battery



OBC



Grid Supply
wall box

DC to DC Conversion

The DC/DC converter takes DC from the HV battery and converts to LV DC for vehicle accessories and systems

The power rating is usually less than 3 kW

High Voltage Battery



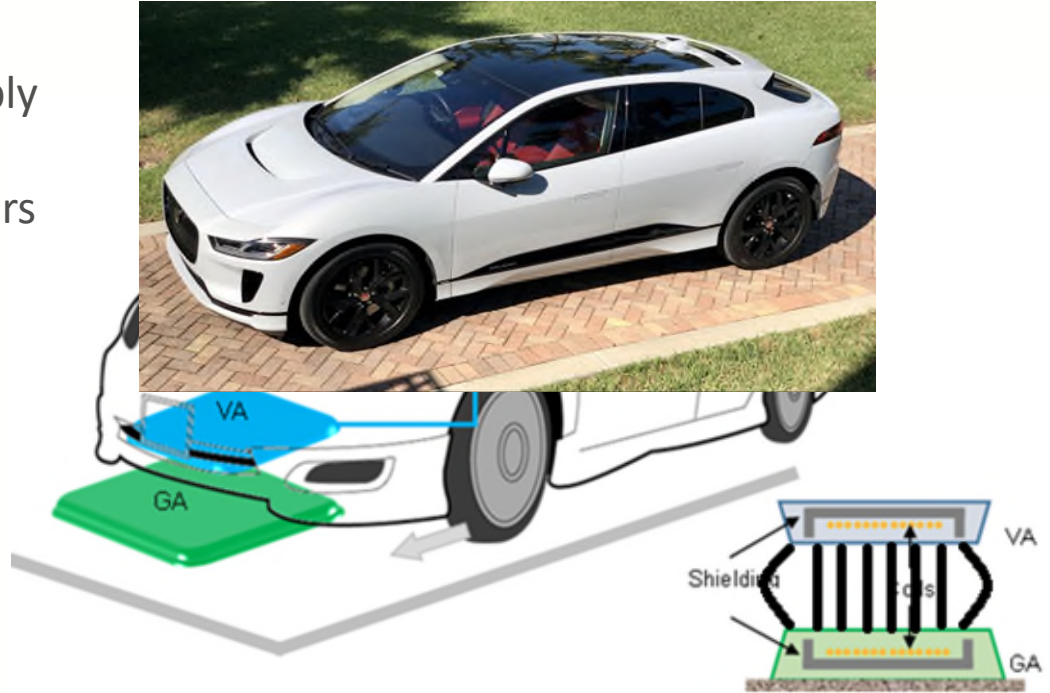
DC to DC Converter



Wireless Charging

Wireless Charging uses a power supply from the grid, converts to 85 kHz creating a magnetic field that transfers across to a receiving coil on the car, and converts to the right voltage for the vehicle battery

Wireless charging is typically 3 to 50 kW



What's in a Drive?

- Power Electronics devices and gate drives
- Thermal Management (heat exchangers & fluids, pumps etc.)
- Control systems
 - Voltage and current sensors
 - Temperature sensors
 - Speed or position feedback
- Connectors and cables
- Housings

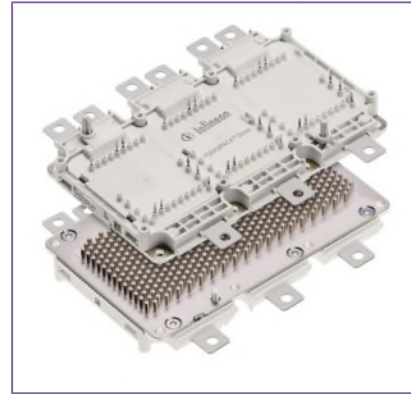


Photo of an Automotive Drive, Infineon



Photo of an Industrial Drive, WMG

Supply Chain Opportunities - Components

Enclosures

Sheet metal – aluminium and steel

Plastic mouldings

Aluminium castings

Thermal Management

Heat Exchangers

Valves and other plumbing

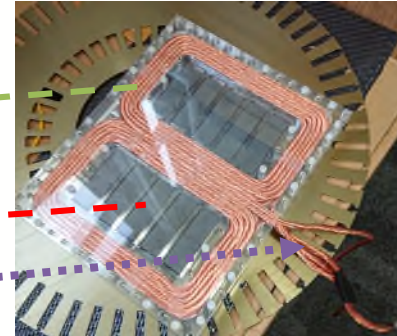
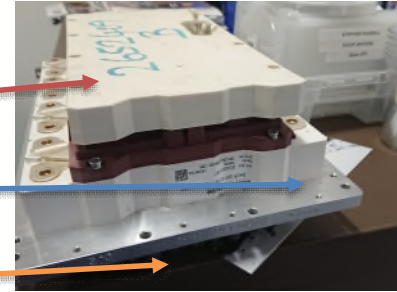
Electrical Components

Coil assemblies

Bus bars and flexible connections

Soft Magnetic Materials

Cables and cable management



Summary

- Opportunities for new entrants to the automotive industry
 - Components and materials
 - Automation and manufacturing technology
 - Final assembly partners
 - Integration partners