



Automotive Solutions

Leading-edge solutions for automotive applications



Introduction

As a global leader in power semiconductors, Fairchild’s portfolio combines state-of-the-art products with advanced packaging to help customers minimize power losses while increasing system efficiency and reducing system weight.

Application-Focused Solutions

Fairchild has a legacy of more than 50 years as a worldwide automotive semiconductor supplier with a portfolio covering the spectrum of the automotive power market. Fairchild’s leading-edge IGBTs, MOSFETs, ignition IGBTs, injector drivers, gate drivers and power modules are used in engine management, electric power assisted steering (EPAS), motor drives, traction inverters, chargers, DC-DC converters, PTC heaters and other systems that require high quality, power efficient components.

Our best-in-class products are complemented by a focused automotive product line with dedicated resources, including global power labs and regional applications support. These solutions are built on best-in-class, automotive-grade 650V Field Stop Trench IGBTs, rectifiers up to 1000V, power modules up to 40V, and a wide range of MOSFETs from -100V to 650V.

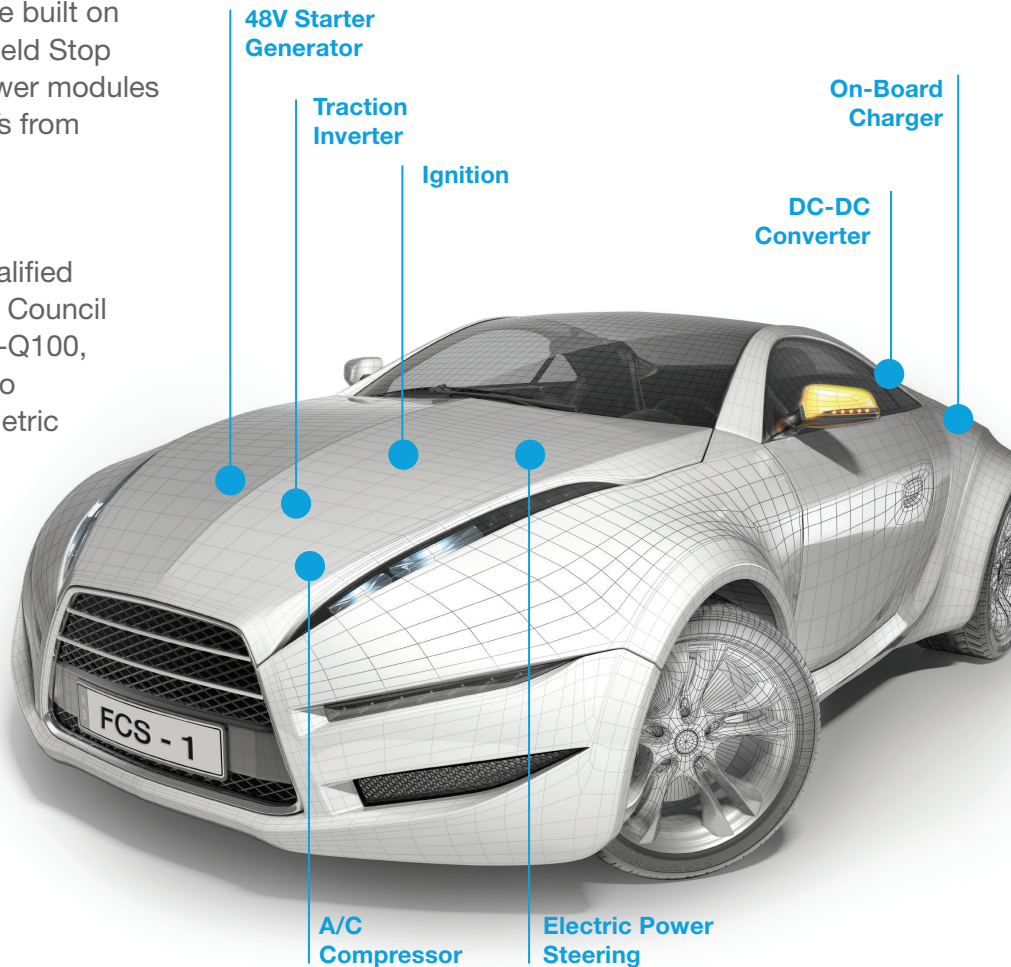
Quality

All Fairchild automotive products are qualified according to the Automotive Electronics Council (AEC) Reliability Test requirements (AEC-Q100, AEC-Q101) and where applicable, also to Customer Specific Reliability and Parametric Test requirements.

Fairchild’s automotive product development and manufacturing sites are QS-9000 and ISO/TS-16949 certified.

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EV/HEV DC-DC Converters

Description

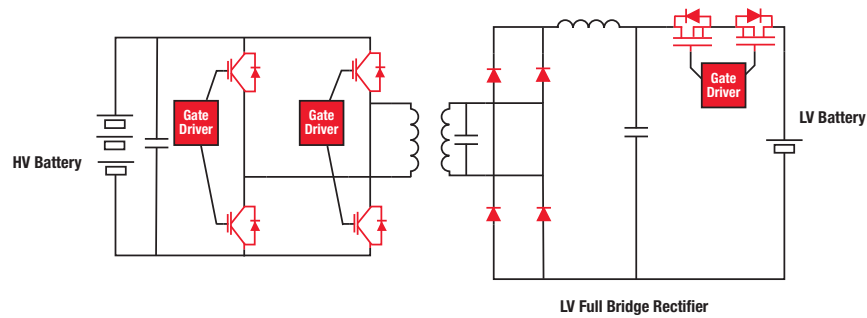
In EV/HEVs, DC-DC converters are used to transfer energy from one battery to another. Various switching power supply architectures are used in DC-DC converters.

Fairchild offers competitive power semiconductor solutions for all stages of the DC-DC converter.

Design Advantages

- Wide range of input and output voltages
- Wide range of power levels
- High frequency switching capability

HV-LV DC/DC (Auxiliary DC/DC)



EV/HEV On-Board Charger

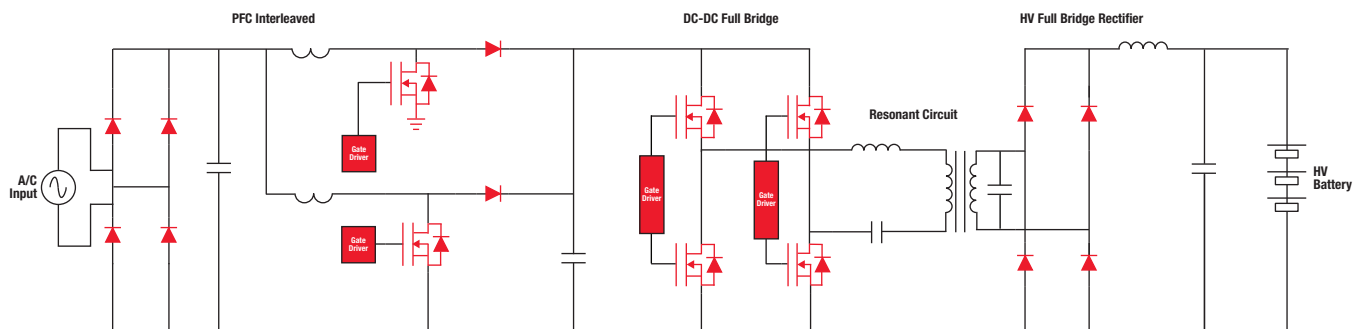
Description

On-board chargers are used to recharge the battery in electric or plug-in hybrid vehicles. These chargers must have high efficiency and high power density to keep the weight low. Long-term trends require bidirectional architectures to allow the transfer of power from the battery to the grid, and high frequency switching to reduce the overall size and weight of the charger.

Design Advantages

- Wide range of input and output voltages
- Wide range of power levels
- High frequency switching capability

On-Board Charger (Rectification + PFC + DC/DC)



For a complete product overview please visit:
fairchildsemi.com/evhevcharger

EV/HEV Traction Inverters

Description

The traction inverter controls the electric traction motor in EV/HEVs. It is a key component as it is responsible for the performance of the vehicle.

Minimization of conduction losses and switching losses both at high- and low-current allows maximizing vehicle acceleration and driving range. During regenerative braking, the inverter plays an important role in transferring energy from the generator back to the battery.

Fairchild's latest generation of Field Stop Trench IGBTs offer optimized performance for inverter and motor control applications under a broad range of working conditions. Die size customization is possible to meet specific customer requirements.

Design Advantages

- Wide range of current and voltage levels
- Very low conducting and switching losses
- Availability in power discrete packages and die
- Customization of die size available for IGBTs and rectifiers
- Wide range of current and voltage levels
- Very low conducting and switching losses

For a complete product overview please visit:
fairchildsemi.com/tractioninverter

Electrically-Driven A/C Compressor

Description

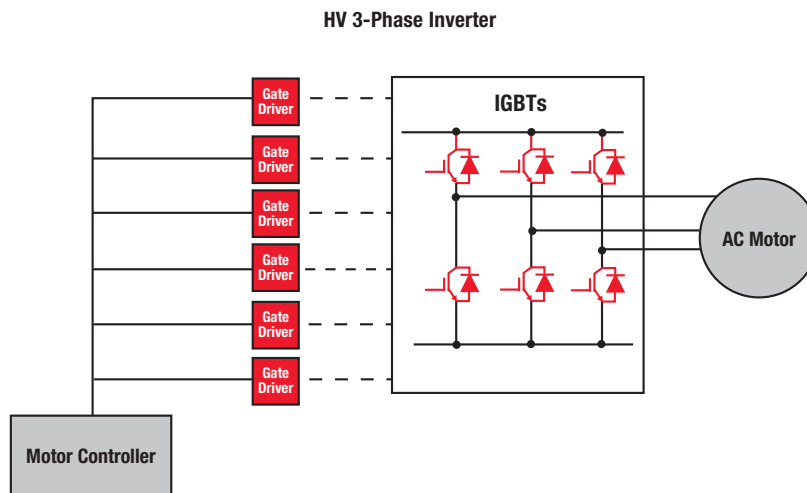
For hybrid electric and full electric vehicles with no permanent running engine, an electric powered air-conditioning system is a must.

Fairchild's power solutions for this application enable ease-of-assembly, space savings, as well as the highest efficiency for the application.

Design Advantages

- Compact system design
- Variable speed drive offers higher performance and increased system efficiency
- Automotive rugged IGBTs offer highest reliability
- Optimized conduction and switching losses allow lowest operating temperatures and EMI

For a complete product overview please visit:
fairchildsemi.com/accompressor



Electric Power Steering

Description

The electrification of the belt-driven hydraulic pump in power steering applications reduces the CO² emission up to 6g/km (0.13oz/mi) and improves gas mileage. Further benefits include less maintenance and in the case of EPS, the elimination of hazardous hydraulic fluid.

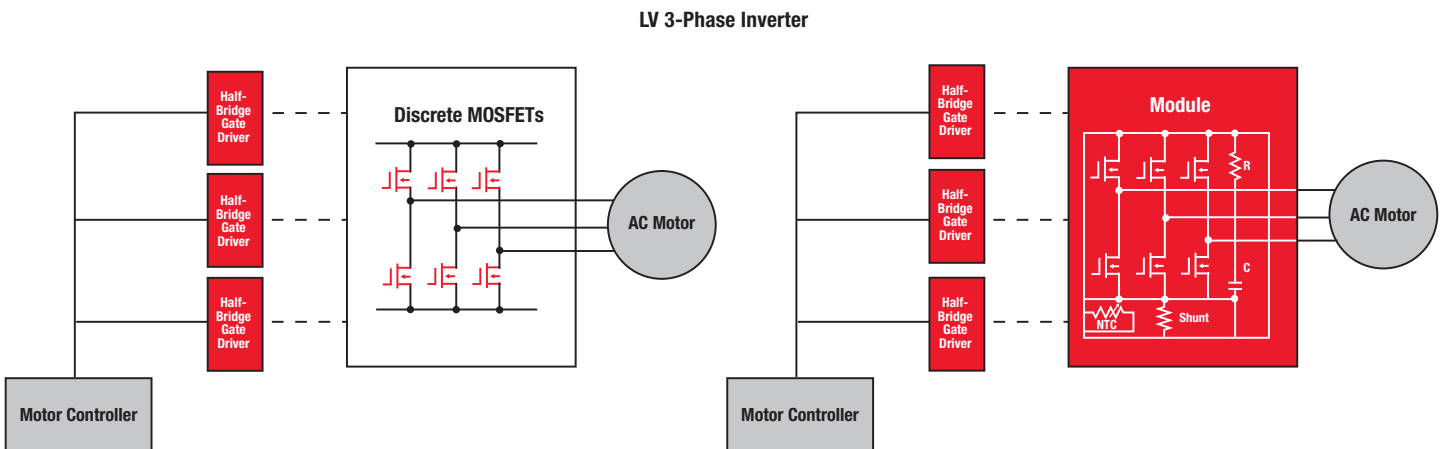
For 12V battery systems, Fairchild offers automotive-qualified power modules and discrete power MOSFETs, including the highest current handling TO-LL package.

Fairchild's automotive power module technology applied to electric power steering, enables customers to provide higher levels of torque output, reducing system size and power consumption in smaller vehicles and expanding the range of EPS to heavier vehicle applications.

Design Advantages

- Increased electronics integration reducing overall system component count
- Compact system design with increased thermal efficiency
- Improved EMC performance and electrical isolation through compact layout and smaller parasitic inductance
- Simpler manufacturing and more reliable installation
- Better system reliability and full automotive qualification
- Low $R_{DS(on)}$ and overall electrical resistance and high current handling

For a complete product overview please visit: fairchildsemi.com/powersteering



48V Starter Generator

Description

48V mild hybrid vehicles bring more than 50% of the fuel and emissions savings of a full hybrid vehicle at a fraction of the cost. The 48V starter generator allows more than just start-and-stop by enabling passive coasting, regenerative braking—and in some cases modest boost. This application is quite demanding for power semiconductors as they are required to handle current levels in excess of 500A.

Fairchild's latest N-Channel MOSFET technology, with breakdown voltages of 80V and 100V, deliver very low on-state resistance and complement the available packaging options. For discrete solutions, TO-LL is the ideal package, while for higher integration, unmatched inductance and overall parasitic resistance, Fairchild offers custom specific half-bridge power modules.

Design Advantages

- Low electrical resistance
- Low inductance
- Increased electronics integration reducing overall system component count
- Compact system design with increased thermal efficiency
- Simpler manufacturing and more reliable installation

For a complete product overview please visit: fairchildsemi.com/48vstarter

Ignition

Description

As the world's largest supplier of ignition IGBTs, Fairchild has the proven expertise to further enhance this critical function in automotive internal combustion engine systems.

EcoSPARK® I and EcoSPARK® II Ignition IGBTs are optimized to control the load current through the ignition coil and feature an integrated clamp structure that limits the maximum voltage on the primary side.

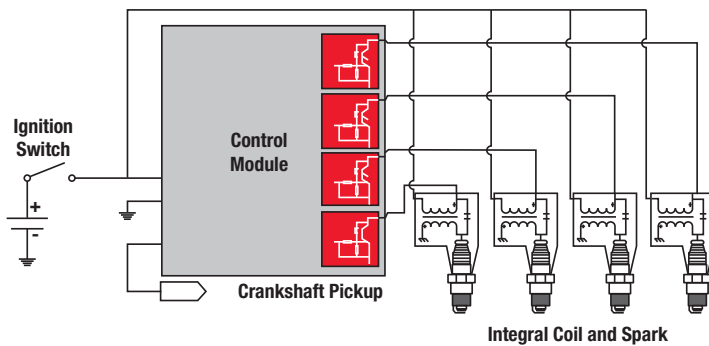
In addition to discrete solutions, Fairchild offers the capability to integrate advanced functionality and protective features into new products for the ignition market. Features include max dwell time control and soft-shutdown as well as diagnostic feedback to the engine control unit. In custom specific solutions – smart IGBTs and fully integrated igniters – a control and diagnostic IC is co-packaged with robust EcoSPARK IGBTs.

Fairchild's custom igniter solutions in the FIM6 package further integrate all passive components required for a complete ignition system optimized for switch on coil architectures.

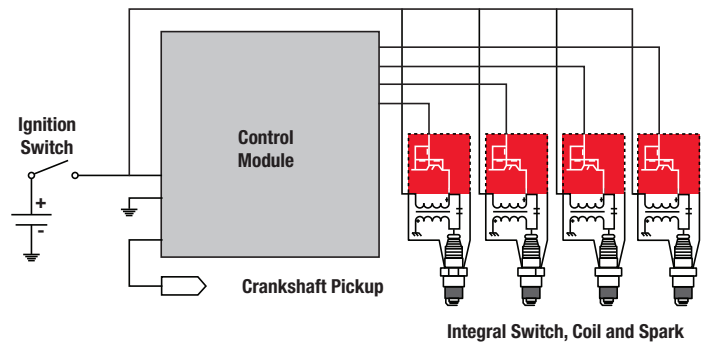
Design Advantages

- Wide range of discrete ignition IGBTs
 - 250V to 650V clamp
 - 200 mJ to 500 mJ SCIS energy rating
- Smart ignition IGBT solutions, including control, protection, and diagnostic
- Fully integrated customized igniter solutions in FIM6 package (ignition module)
- Lowest V_{sat}
- Proven reliability and robustness
- Availability in standard power discrete packages and die scale

Coil-on-Plug (COP) System Architecture



Switch-on-Coil System Architecture



For a complete product overview please visit:
fairchildsemi.com/ignition

Product Selector Guide

Diodes and Rectifiers

Configuration	VRRM	Die	D-PAK	D2-PAK (2-lead)	T0-220 (2-lead)	T0-247 (2-lead)	T0-247 (3-lead)
Dual Common Cathode	200		✓	✓			
Dual Common Cathode	600						✓
Single	600	✓	✓		✓	✓	
Single	1000				✓		
Single	1200		✓				

IGBTs

IGBT Voltage	Die/Wafer	D-PAK	D2-PAK	T0-247
600V	✓	✓	✓	✓
650V	✓			✓

Ignition IGBT Voltage	Die/Wafer	T0-262	D-PAK	D2-PAK	T0-220
250V			✓		
360V		✓	✓	✓	✓
400V	✓	✓	✓	✓	✓
430V		✓	✓	✓	✓
450V			✓	✓	

Gate Driver ICs

Configuration	Voltage	SOIC-8
Single Low Side	20	✓
Dual Low Side	20	✓
Dual Low Side (P/N Ch)	20	✓
Single High Side	325	✓
High & Low Side	625	✓
Half Bridge	625	✓

Modules

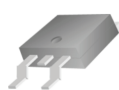
Configuration	Voltage	APM 19L DIP
3-Phase	40	✓



Die



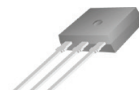
SOIC-8



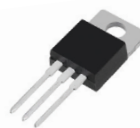
D-Pak



D2-Pak



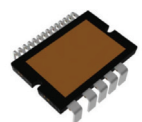
T0-262



T0-220



T0-247

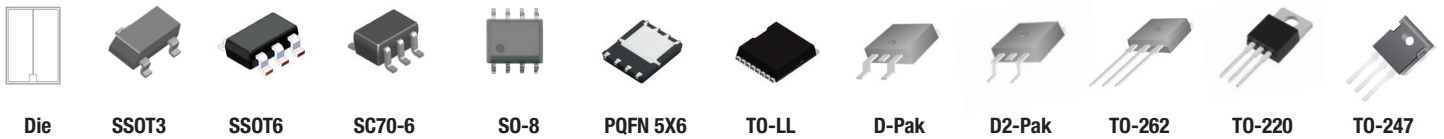


APM 19L DIP

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MOSFETs

Channel	Voltage	Die	SS0T3	SS0T6	SC70-6	S0-8	PQFN 5X6 Power 56	T0-LL	T0-262	D-PAK (TO-252)	Dual D-PAK (TO-252)	D2-PAK (TO-263)	T0-220	T0-247
P Channel														
P Channel	-100									✓		✓		
P Channel	-40					✓				✓				
P Channel	-35									✓				
P Channel	-30					✓								
P Channel	-30					✓								
P Channel	-20			✓		✓								
P Channel	-60					✓								
N- Channel														
N-Channel	20					✓								
N-Channel	25				✓									
N-Channel	30					✓				✓		✓	✓	
N-Channel	40					✓		✓	✓	✓		✓	✓	
N-Channel	55	✓								✓			✓	✓
N-Channel	60		✓	✓		✓	✓	✓	✓	✓		✓		
N-Channel	75									✓		✓		
N-Channel	80						✓	✓		✓		✓	✓	
N-Channel	100						✓			✓		✓	✓	
N-Channel	150							✓		✓		✓		✓
N-Channel	200					✓						✓		
N-Channel	250								✓			✓	✓	
N-Channel	500									✓				
N-Channel	600											✓		✓
N-Channel	650													✓
N & P Channel														
N & P Channel	-20, 20				✓									
N & P Channel	-30, 30					✓								
N & P Channel	-40, 40										✓			
N & P Channel	-60, 60					✓								



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