Industrial Welding Power Supply Solutions

High Speed, High Efficiency, High Reliability, High Performance

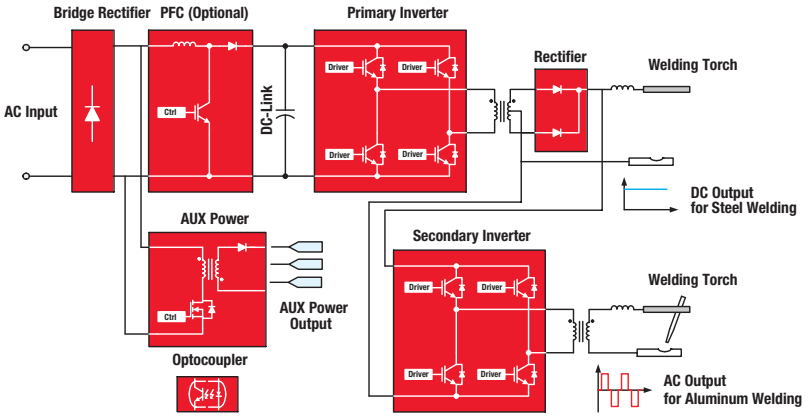
Fairchild's broad power portfolio offers energy and cost-saving solutions to meet the diverse range of low-, mid- and high-power welding inverter design requirements—high efficiency, high switching frequency while decreasing size and weight. Our high-end IGBT technology offers optimum performance where low conduction and switching losses are essential—even at high current levels.

Rectifier provides low voltage drop as well as fast reverse recovery time and softness factor. Integrated FPS™ series enables the auxiliary (aux) power design to achieve lower standby power losses with compact size and reliability. Optically isolated gate drivers offer wide operating voltage range and high common-mode transient immunity. In addition, high-voltage gate drivers have excellent noise immunity and low power consumption.

Full-Bridge/Half-Bridge Topology for Single-(>20 kHz) and Three (<40 kHz)-Phase Inverters

- Excellent transformer utilization
- Reduced inductor current ripple (by doubling the switching frequency)

Stage	Solutions
PFC	600/650 V Field Stop IGBTs without anti-parallel diode
Inverter	1-Phase: 600/650 V Field Stop IGBTs with anti-parallel diode
	3-Phase: 1000/1200 V Field Stop IGBTs with anti-parallel diode
Rectifier	Fast reverse recovery diodes with Low V_F and softness factor
Aux	800 V FPS™ series, integrated power switches
	PWM controllers, 800 V power MOSFETs



Two-Switch Forward Topology for Single-Phase Inverters (>40 kHz)

- Suited for sudden load-changes
- Excellent noise immunity
- No need for reset-circuit compared to forward topology

Stage	Solutions
PFC	600/650 V Field Stop IGBTs without anti-parallel diode
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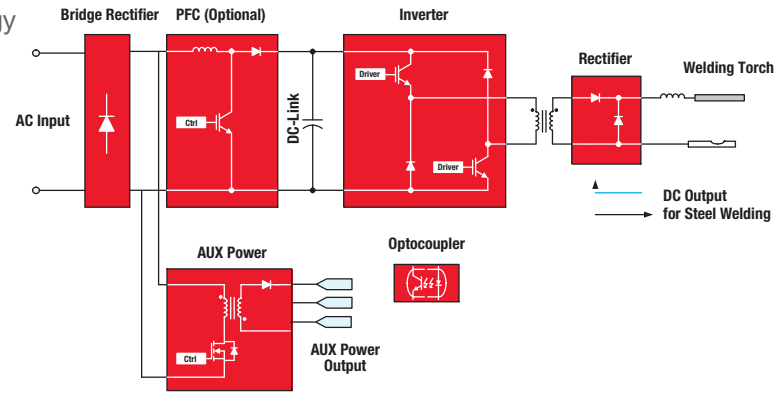


High-Speed Field Stop IGBT Technology Optimized for High-End Welding Applications

Energy-saving, high-reliability, and compact design can be achieved by using Fairchild's latest Field Stop IGBT technology. Our solution is especially optimized for welding applications that require high-speed switching characteristics balancing between switching and conduction losses. Fairchild's high-speed IGBTs offer superior switching performance characteristics that ensure improved system efficiency as well as minimizing total losses.

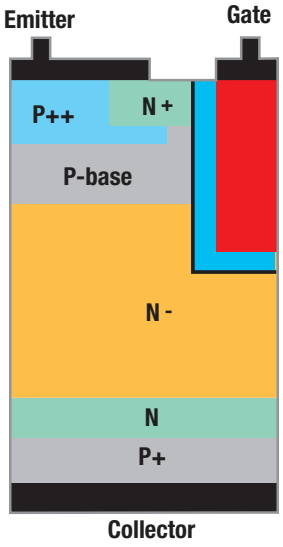
650V Field Stop Trench IGBT for Single-Phase Applications

Features and Benefits

- Low switching and conduction loss suitable for industrial applications
- Positive temperature coefficient for easy parallel operation
- Maximum junction temperature: T_J = 175°C
- High-current capability up to 75 A
- Wide SOA (100% inductive switching test at 3x I_C)
- Higher breakdown voltage with excellent ruggedness characteristics

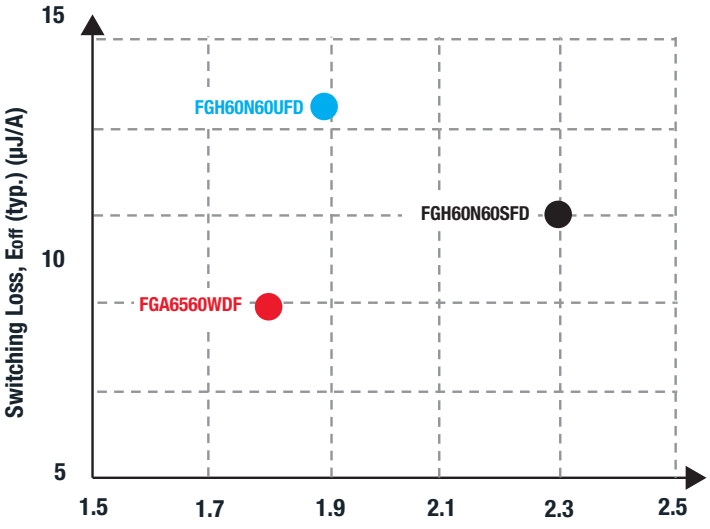
Additional Applications

- Solar inverter, UPS, SMPS, and hard switching topologies
- PFC and industrial power supplies

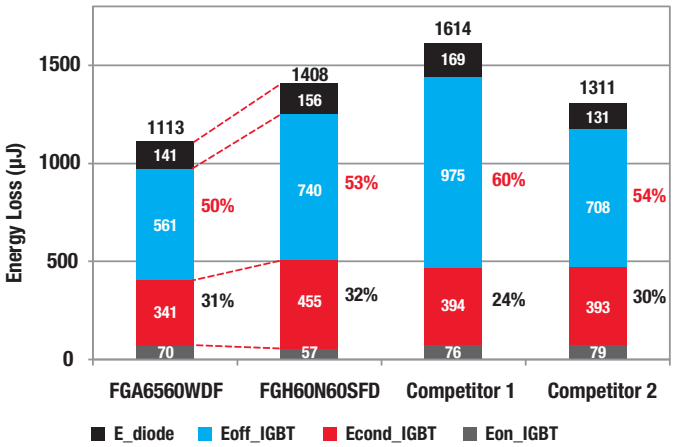


Field Stop Trench Structure

IGBT Eoff vs $V_{CE(sat)}$ Trade-Off Characteristics



IGBT Power Loss Analysis on Welding Machine



1200 V Field Stop Trench IGBT in Three-Phase Welder

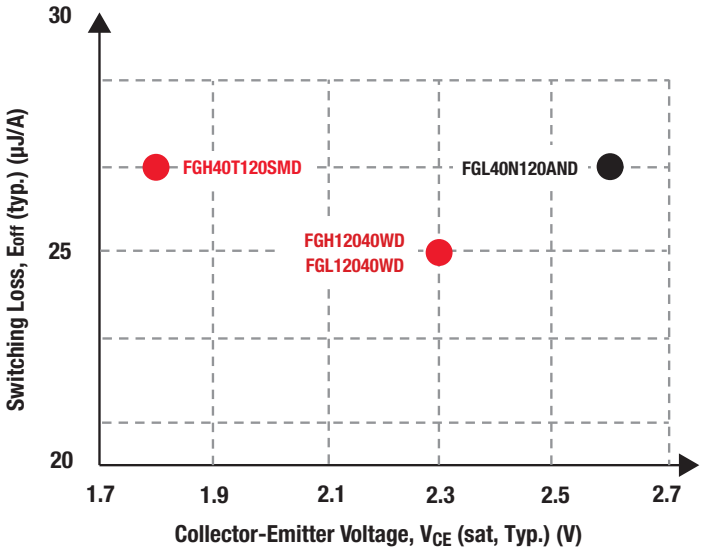
Features and Benefits

- Low saturation voltage: $V_{CE(sat)}$ = 1.8 V at I_C = 40 A
- High speed switching: Low Eoff = 27 µJ/A
- Easy parallel operation (positive temperature coefficient)
- Wide SOA (100% inductive switching test 4x I_C)
- Maximum junction temperature: T_J = 175°C

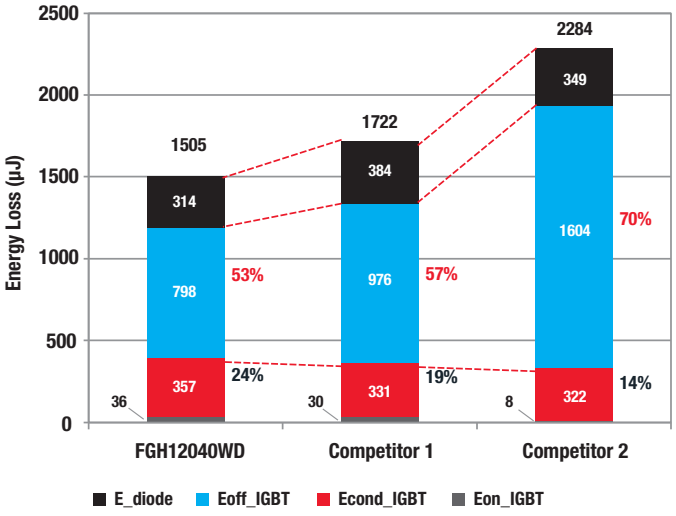
Additional Applications

- Solar inverter, UPS, SMPS and hard switching topologies
- PFC and industrial power supplies

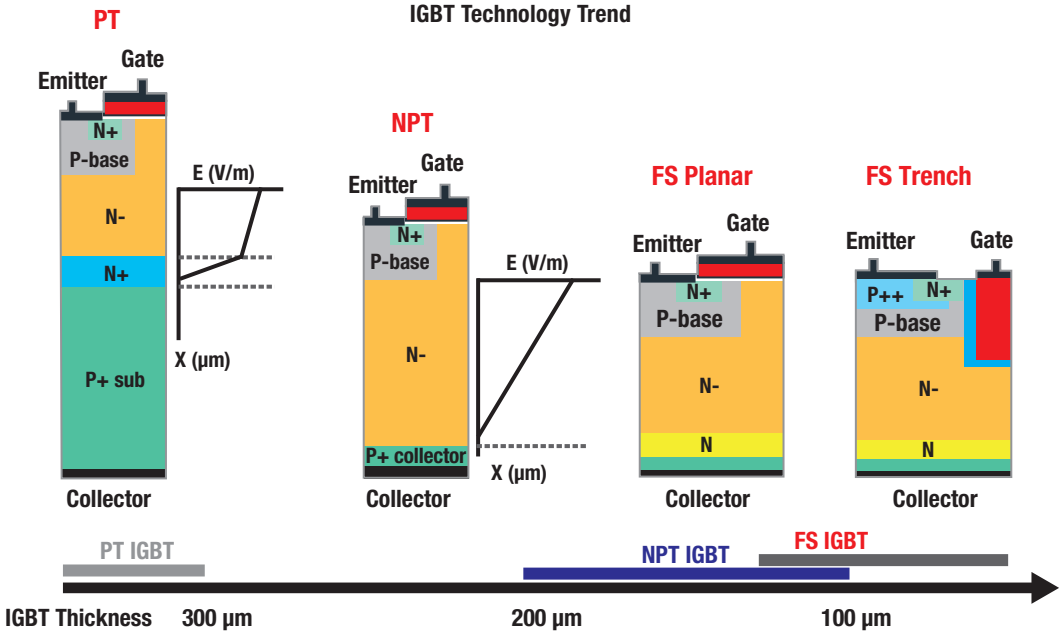
IGBT Eoff vs $V_{CE(sat)}$ Trade-Off Characteristics



IGBT Power Loss Analysis on Welding Machine



IGBT Technology Trend



PT: Punch-Through, NPT: Non Punch-Through, FS: Field Stop

Industrial Welding Power Supply Solutions

650V Field Stop Trench IGBT

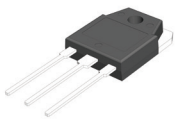
Voltage / Current	V_{CE}(sat) / Eoff	Product Name	
		TO-3PN	TO-247LL
650V / 75A	1.6V / 10 µJ/A		FGH75T65SHD_F155
650V / 60A	1.6V / 7 µJ/A 1.8V / 9 µJ/A	FGA6560WDF	FGH60T65SHD_F155
650V / 50A	1.6V / 7 µJ/A	FGA50T65SHD	
650V / 40A	1.45V / 11 µJ/A 1.6V / 7 µJ/A 1.8V / 6 µJ/A	FGA40T65SHDF FGA40T65SHD FGA6540WDF	FGH40T65SHDF_F155 FGH40T65SHD_F155 FGH40T65SH_F155
650V / 30A	1.6V / 7 µJ/A 1.8V / 6 µJ/A	FGA30T65SHD FGA6530WDF	

1000 / 1200V Field Stop Trench IGBT

Voltage / Current	V_{CE}(sat) / Eoff	Product Name	
		TO-247LL	TO-264
1000V / 40A	1.9V / 27 µJ/A	FGH40T100SMD_F155	
1200V / 40A	1.8V / 27 µJ/A 2.3V / 25 µJ/A	FGH40T120SMD_F155 FGH12040WD_F155	FGL12040WD
1200V / 25A	1.8V / 27 µJ/A	FGH25T120SMD_F155	
1200V / 15A	1.8V / 27 µJ/A	FGH15T120SMD_F155	

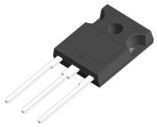
Fairchild TO-247 long lead (20 mm)

TO-3PN



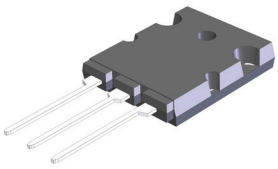
4.8 x 15.8 x 38.7 mm

TO-247 Long Lead



4.7 x 15.6 x 40.6 mm

TO-264



5 x 20 x 46 mm

For more information on Fairchild solutions for welding applications, visit **fairchildsemi.com/welding**

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