FGH60N60SFD 600V, 60A Field Stop IGBT

Features
- High current capability
- Low saturation voltage: $V_{CE(sat)} = 2.3V$ @ $I_C = 60A$
- High input impedance
- Fast switching
- RoHS compliant

Applications
- Induction Heating, UPS, SMPS, PFC

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CES}$</td>
<td>Collector to Emitter Voltage</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GES}$</td>
<td>Gate to Emitter Voltage</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current</td>
<td>@ $T_C = 25^\circ$C</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ $T_C = 100^\circ$C</td>
<td>60</td>
</tr>
<tr>
<td>$I_{CM(1)}$</td>
<td>Pulsed Collector Current</td>
<td>@ $T_C = 25^\circ$C</td>
<td>180</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Maximum Power Dissipation</td>
<td>@ $T_C = 25^\circ$C</td>
<td>378</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ $T_C = 100^\circ$C</td>
<td>151</td>
</tr>
<tr>
<td>$T_J$</td>
<td>Operating Junction Temperature</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>Storage Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_L$</td>
<td>Maximum Lead Temp. for soldering Purposes, 1/8&quot; from case for 5 seconds</td>
<td>300</td>
<td>°C</td>
</tr>
</tbody>
</table>

Notes:
1: Repetitive test, Pulse width limited by max. junction temperature

Thermal Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{VJC}(IGBT)$</td>
<td>Thermal Resistance, Junction to Case</td>
<td>-</td>
<td>0.33</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{VJC}(Diode)$</td>
<td>Thermal Resistance, Junction to Case</td>
<td>-</td>
<td>1.1</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{UA}$</td>
<td>Thermal Resistance, Junction to Ambient</td>
<td>-</td>
<td>40</td>
<td>°C/W</td>
</tr>
</tbody>
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General Description
Using Novel Field Stop IGBT Technology, Fairchild’s new series of Field Stop IGBTs offer the optimum performance for Induction Heating, UPS, SMPS and PFC applications where low conduction and switching losses are essential.
## Package Marking and Ordering Information

<table>
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<th>Device Marking</th>
<th>Device</th>
<th>Package</th>
<th>Packaging Type</th>
<th>Qty per Tube</th>
<th>Max Qty per Box</th>
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<tr>
<td>FGH60N60SFD</td>
<td>FGH60N60SFDTU</td>
<td>TO-247</td>
<td>Tube</td>
<td>30ea</td>
<td>-</td>
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</table>

## Electrical Characteristics of the IGBT

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV_CES</td>
<td>Collector to Emitter Breakdown Voltage V_GE = 0V, I_C = 250µA</td>
<td>600</td>
<td></td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>∆BV_CES</td>
<td>Temperature Coefficient of Breakdown Voltage V_GE = 0V, I_C = 250µA</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
<td>-</td>
<td>V/°C</td>
</tr>
<tr>
<td>ICES</td>
<td>Collector Cut-Off Current V_CE = V_CES, V_GE = 0V</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td>IGES</td>
<td>G-E Leakage Current V_GE = V_GES, V_CE = 0V</td>
<td>-</td>
<td>-</td>
<td>±400</td>
<td>nA</td>
<td></td>
</tr>
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### Off Characteristics

### On Characteristics

### Dynamic Characteristics

### Switching Characteristics
## Electrical Characteristics of the Diode

TC = 25°C unless otherwise noted

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFM</td>
<td>Diode Forward Voltage</td>
<td>I_F = 30A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 25°C</td>
<td>-</td>
<td>2.0</td>
<td>2.6</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 125°C</td>
<td>-</td>
<td>1.8</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>trr</td>
<td>Diode Reverse Recovery Time</td>
<td>I_ES = 30A, dI_ES/dt = 200A/µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 25°C</td>
<td>-</td>
<td>47</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 125°C</td>
<td>-</td>
<td>179</td>
<td>-</td>
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<tr>
<td>Qrr</td>
<td>Diode Reverse Recovery Charge</td>
<td>I_ES = 30A, dI_ES/dt = 200A/µs</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>TC = 25°C</td>
<td>-</td>
<td>83</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 125°C</td>
<td>-</td>
<td>567</td>
<td>-</td>
<td></td>
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</table>
Typical Performance Characteristics

Figure 1. Typical Output Characteristics

Figure 2. Typical Output Characteristics

Figure 3. Typical Saturation Voltage Characteristics

Figure 4. Transfer Characteristics

Figure 5. Saturation Voltage vs. Case Temperature at Variant Current Level

Figure 6. Saturation Voltage vs. $V_{GE}$
Typical Performance Characteristics

Figure 7. Saturation Voltage vs. $V_{GE}$

![Graph showing saturation voltage vs. gate-emitter voltage for different currents and temperatures.]

Figure 8. Saturation Voltage vs. $V_{GE}$

![Graph showing saturation voltage vs. gate-emitter voltage for different currents and temperatures.]

Figure 9. Capacitance Characteristics

![Graph showing capacitance characteristics vs. collector-emitter voltage for different conditions.]

Figure 10. Gate charge Characteristics

![Graph showing gate charge characteristics vs. gate-emitter voltage for different voltages and temperatures.]

Figure 11. SOA Characteristics

![Graph showing safe operating area vs. collector-emitter voltage for different conditions.]

Figure 12. Turn off Switching SOA Characteristics

![Graph showing turn off switching safe operating area vs. collector-emitter voltage for different conditions.]

Collector Emitter Voltage, $V_{CE}$ [V]

Gate Emitter Voltage, $V_{GE}$ [V]

Collector Current, $I_C$ [A]

Safe Operating Area

$V_{GE} = 15V, T_J = 125^\circ C$

Curves must be derated linearly with increase in temperature.
Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Gate Resistance

Figure 14. Turn-off Characteristics vs. Gate Resistance

Figure 15. Turn-on Characteristics vs. Collector Current

Figure 16. Turn-off Characteristics vs. Collector Current

Figure 17. Switching Loss vs Gate Resistance

Figure 18. Switching Loss vs Collector Current
Typical Performance Characteristics

Figure 19. Forward Characteristics

![Forward Characteristics](image1)

Figure 20. Reverse Current

![Reverse Current](image2)

Figure 21. Stored Charge

![Stored Charge](image3)

Figure 22. Reverse Recovery Time

![Reverse Recovery Time](image4)

Figure 23. Transient Thermal Impedance of IGBT

![Transient Thermal Impedance](image5)
Mechanical Dimensions

TO-247AB (FKS PKG CODE 001)

Dimensions in Millimeters
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<th>Product Status</th>
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Rev. 140