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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.
## Absolute Maximum Ratings

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<tr>
<th>Symbol</th>
<th>Description</th>
<th>Ratings</th>
<th>Unit</th>
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<tbody>
<tr>
<td>$V_{CES}$</td>
<td>Collector to Emitter Voltage</td>
<td>1250</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GES}$</td>
<td>Gate to Emitter Voltage</td>
<td>± 25</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current @ $T_C = 25^\circ C$</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Collector Current @ $T_C = 100^\circ C$</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>$I_{CM(1)}$</td>
<td>Pulsed Collector Current</td>
<td>45</td>
<td>A</td>
</tr>
<tr>
<td>$I_F$</td>
<td>Diode Continuous Forward Current @ $T_C = 25^\circ C$</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Diode Continuous Forward Current @ $T_C = 100^\circ C$</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Maximum Power Dissipation @ $T_C = 25^\circ C$</td>
<td>136</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>Maximum Power Dissipation @ $T_C = 100^\circ C$</td>
<td>68</td>
<td>W</td>
</tr>
<tr>
<td>$T_J$</td>
<td>Operating Junction Temperature</td>
<td>-55 to +175</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>Storage Temperature Range</td>
<td>-55 to +175</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>
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## Thermal Characteristics

<table>
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<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>$R_{JIC}(IGBT)$</td>
<td>Thermal Resistance, Junction to Case, Max</td>
<td>-</td>
<td>1.1</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{JA}$</td>
<td>Thermal Resistance, Junction to Ambient, Max</td>
<td>-</td>
<td>40</td>
<td>°C/W</td>
</tr>
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</table>

**Notes:**
1. Limited by $T_{jmax}$

**General Description**

Using advanced field stop trench and shorted-anode technology, Fairchild's shorted-anode trench IGBTs offer superior conduction and switching performances for switching applications. The device can operate in parallel configuration with exceptional avalanche capability. This device is designed for induction heating and microwave oven.

**Applications**

- Induction Heating, Microwave Oven

**Features**

- High Speed Switching
- Low Saturation Voltage: $V_{CE(sat)} = 2.25 \text{ V} @ I_C = 15 \text{ A}$
- High Input Impedance
- RoHS Compliant
## Package Marking and Ordering Information

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<th>Device</th>
<th>Package</th>
<th>Reel Size</th>
<th>Tape Width</th>
<th>Quantity</th>
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<td>FGA15S125P</td>
<td>FGA15S125P</td>
<td>TO-3PN</td>
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<td>-</td>
<td>30</td>
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</tbody>
</table>

## Electrical Characteristics of the IGBT \( T_C = 25°C \) unless otherwise noted

### Off Characteristics

<table>
<thead>
<tr>
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<th>Parameter</th>
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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{CES} )</td>
<td>Collector Cut-Off Current</td>
<td>( V_{CE} = 1250V, V_{GE} = 0V )</td>
<td>-</td>
<td>-</td>
<td>1 mA</td>
<td>mA</td>
</tr>
<tr>
<td>( I_{GES} )</td>
<td>G-E Leakage Current</td>
<td>( V_{GE} = V_{GES}, V_{CE} = 0V )</td>
<td>-</td>
<td>-</td>
<td>±500 nA</td>
<td>nA</td>
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### On Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{GE(th)} )</td>
<td>G-E Threshold Voltage</td>
<td>( I_C = 15mA, V_{CE} = V_{GE} )</td>
<td>4.5</td>
<td>6.0</td>
<td>7.5</td>
<td>V</td>
</tr>
<tr>
<td>( V_{CE(sat)} )</td>
<td>Collector to Emitter Saturation Voltage</td>
<td>( I_C = 15A, V_{CE} = 15V ), ( T_C = 25°C )</td>
<td>-</td>
<td>2.25</td>
<td>2.72</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_C = 15A, V_{CE} = 15V ), ( T_C = 125°C )</td>
<td>-</td>
<td>2.5</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_C = 15A, V_{CE} = 15V, T_C = 175°C )</td>
<td>-</td>
<td>2.75</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>( V_{FM} )</td>
<td>Diode Forward Voltage</td>
<td>( I_F = 15A, T_C = 25°C )</td>
<td>-</td>
<td>2</td>
<td>2.55</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 15A, T_C = 175°C )</td>
<td>-</td>
<td>2.55</td>
<td>-</td>
<td>V</td>
</tr>
</tbody>
</table>

### Dynamic Characteristics

<table>
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<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_{ies} )</td>
<td>Input Capacitance</td>
<td>( V_{CE} = 30V, V_{GE} = 0V, f = 1MHz )</td>
<td>-</td>
<td>1360</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>( C_{oes} )</td>
<td>Output Capacitance</td>
<td></td>
<td>-</td>
<td>40</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>( C_{res} )</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>pF</td>
</tr>
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</table>

### Switching Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_{d(on)} )</td>
<td>Turn-On Delay Time</td>
<td>( V_{CC} = 600V, I_C = 15A, R_G = 10Ω, V_{GE} = 15V, Resistive Load, T_C = 25°C )</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_r )</td>
<td>Rise Time</td>
<td></td>
<td>-</td>
<td>260</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{d(off)} )</td>
<td>Turn-Off Delay Time</td>
<td></td>
<td>-</td>
<td>400</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_f )</td>
<td>Fall Time</td>
<td></td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( E_{on} )</td>
<td>Turn-On Switching Loss</td>
<td></td>
<td>-</td>
<td>0.74</td>
<td>-</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{off} )</td>
<td>Turn-Off Switching Loss</td>
<td></td>
<td>-</td>
<td>0.50</td>
<td>-</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{ts} )</td>
<td>Total Switching Loss</td>
<td></td>
<td>-</td>
<td>1.24</td>
<td>-</td>
<td>mJ</td>
</tr>
<tr>
<td>( t_{d(on)} )</td>
<td>Turn-On Delay Time</td>
<td>( V_{CC} = 600V, I_C = 15A, R_G = 10Ω, V_{GE} = 15V, Resistive Load, T_C = 175°C )</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_r )</td>
<td>Rise Time</td>
<td></td>
<td>-</td>
<td>320</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{d(off)} )</td>
<td>Turn-Off Delay Time</td>
<td></td>
<td>-</td>
<td>420</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( t_f )</td>
<td>Fall Time</td>
<td></td>
<td>-</td>
<td>250</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>( E_{on} )</td>
<td>Turn-On Switching Loss</td>
<td></td>
<td>-</td>
<td>0.94</td>
<td>-</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{off} )</td>
<td>Turn-Off Switching Loss</td>
<td></td>
<td>-</td>
<td>1.23</td>
<td>-</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{ts} )</td>
<td>Total Switching Loss</td>
<td></td>
<td>-</td>
<td>2.17</td>
<td>-</td>
<td>mJ</td>
</tr>
<tr>
<td>( Q_g )</td>
<td>Total Gate Charge</td>
<td></td>
<td>-</td>
<td>129</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{ge} )</td>
<td>Gate to Emitter Charge</td>
<td>( V_{CE} = 600V, I_C = 15A, V_{GE} = 15V )</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{gc} )</td>
<td>Gate to Collector Charge</td>
<td></td>
<td>-</td>
<td>66</td>
<td>-</td>
<td>nC</td>
</tr>
</tbody>
</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](image)

- Common Emitter
- $T_C = 175^\circ C$
- $I_C = 7.5A$
- $30A$

Figure 8. Capacitance Characteristics

![Graph showing capacitance characteristics](image)

- Common Emitter
- $V_{GE} = 6V$, $f = 1MHz$
- $T_C = 25^\circ C$

Figure 9. Gate charge Characteristics

![Graph showing gate charge characteristics](image)

- Common Emitter
- $T_C = 25^\circ C$
- $V_{CC} = 200V$
- $400V$
- $600V$

Figure 10. SOA Characteristics

![Graph showing safe operating area characteristics](image)

- Collector Current, $I_C$ [A]
- Collector-Emitter Voltage, $V_{CE}$ [V]

Figure 11. Turn-on Characteristics vs. Gate Resistance

![Graph showing turn-on characteristics vs. gate resistance](image)

- Switching Time, $t_{on}$ [ns]
- Gate Resistance, $R_G$ [Ω]

Figure 12. Turn-off Characteristics vs. Gate Resistance

![Graph showing turn-off characteristics vs. gate resistance](image)

- Switching Time, $t_{off}$ [ns]
- Gate Resistance, $R_G$ [Ω]
Typical Performance Characteristics

Figure 13. Turn-on Characteristics vs. Collector Current

Figure 14. Turn-off Characteristics vs. Collector Current

Figure 15. Switching Loss vs. Gate Resistance

Figure 16. Switching Loss vs. Collector Current

Figure 17. Turn-off Switching SOA Characteristics

Figure 18. Forward Characteristics
Typical Performance Characteristics

Figure 19. Transient Thermal Impedance of IGBT

Duty Factor, D = t1/t2

Peak $T_J = P_{dm} \times Z_{thjc} + T_C$
Mechanical Dimensions

Figure 20. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65

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Dimensions in Millimeters
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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<td>Advance Information</td>
<td>Formative / In Design</td>
<td>Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
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