FGA25N120ANTD
1200 V, 25 A NPT Trench IGBT

Features
• NPT Trench Technology, Positive Temperature Coefficient
• Low Saturation Voltage: $V_{CE(sat)}$, typ = 2.0 V
  @ $I_C = 25$ A and $T_C = 25^\circ$C
• Low Switching Loss: $E_{off}$, typ = 0.96 mJ
  @ $I_C = 25$ A and $T_C = 25^\circ$C
• Extremely Enhanced Avalanche Capability

Applications
• Induction Heating, Microwave Oven

Description
Using Fairchild's proprietary trench design and advanced NPT technology, the 1200V NPT IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation. This device is well suited for the resonant or soft switching application such as induction heating, microwave oven.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CES}$</td>
<td>Collector-Emitter Voltage</td>
<td>1200</td>
<td>V</td>
</tr>
<tr>
<td>$V_{GES}$</td>
<td>Gate-Emitter Voltage</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Collector Current</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>$I_{CM(1)}$</td>
<td>Pulsed Collector Current</td>
<td>90</td>
<td>A</td>
</tr>
<tr>
<td>$I_F$</td>
<td>Diode Continuous Forward Current</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FM}$</td>
<td>Diode Maximum Forward Current</td>
<td>150</td>
<td>A</td>
</tr>
<tr>
<td>$P_D$</td>
<td>Maximum Power Dissipation</td>
<td>312</td>
<td>W</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” from case for 5 seconds</td>
<td>300</td>
<td>°C</td>
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Notes:
(1) Repetitive rating: Pulse width limited by max. junction temperature

Thermal Characteristics

<table>
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<th>Unit</th>
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<tr>
<td>$R_{thJC(IGBT)}$</td>
<td>Thermal Resistance, Junction-to-Case</td>
<td>--</td>
<td>0.4</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{thJC(Diode)}$</td>
<td>Thermal Resistance, Junction-to-Case</td>
<td>--</td>
<td>2.0</td>
<td>°C/W</td>
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<tr>
<td>$R_{thJA}$</td>
<td>Thermal Resistance, Junction-to-Ambient</td>
<td>--</td>
<td>40</td>
<td>°C/W</td>
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## Package Marking and Ordering Information

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<th>Reel Size</th>
<th>Tape Width</th>
<th>Quantity</th>
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<td>FGA25N120ANTD</td>
<td>TO-3P</td>
<td>Tube</td>
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<td>N/A</td>
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## Electrical Characteristics of the IGBT \( T_C = 25^\circ C \) unless otherwise noted

### Off Characteristics

<table>
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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} = V_{CES}, V_{GE} = 0 \ V )</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td>mA</td>
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<tr>
<td>( I_{GES} )</td>
<td>G-E Leakage Current</td>
<td>( V_{GE} = V_{GES}, V_{CE} = 0 \ V )</td>
<td>--</td>
<td>--</td>
<td>± 250</td>
<td>nA</td>
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</table>

### On Characteristics

<table>
<thead>
<tr>
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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>( V_{GE(th)} )</td>
<td>G-E Threshold Voltage</td>
<td>( I_C = 25 \ mA, V_{CE} = V_{GE} )</td>
<td>3.5</td>
<td>5.5</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 = 25 \ mA, V_{GE} = 15 \ V )</td>
<td>--</td>
<td>2.0</td>
<td>--</td>
<td>V</td>
</tr>
<tr>
<td>( I_C = 25 \ mA, V_{GE} = 15 \ V, T_C = 125^\circ C )</td>
<td></td>
<td></td>
<td></td>
<td>2.15</td>
<td>--</td>
<td>V</td>
</tr>
<tr>
<td>( I_C = 50 \ mA, V_{GE} = 15 \ V )</td>
<td></td>
<td></td>
<td></td>
<td>2.65</td>
<td>--</td>
<td>V</td>
</tr>
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### Dynamic Characteristics

<table>
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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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<tbody>
<tr>
<td>( C_{ies} )</td>
<td>Input Capacitance</td>
<td>( V_{CE} = 30 \ V, V_{GE} = 0 \ V, f = 1 \ MHz )</td>
<td>--</td>
<td>3700</td>
<td>--</td>
<td>pF</td>
</tr>
<tr>
<td>( C_{oes} )</td>
<td>Output Capacitance</td>
<td></td>
<td>--</td>
<td>130</td>
<td>--</td>
<td>pF</td>
</tr>
<tr>
<td>( C_{res} )</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td>--</td>
<td>80</td>
<td>--</td>
<td>pF</td>
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### Switching Characteristics

<table>
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<tr>
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<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>( t_{(on)} )</td>
<td>Turn-On Delay Time</td>
<td>( V_{CC} = 600 \ V, I_C = 25 \ mA, R_G = 10 \ \Omega, V_{GE} = 15 \ V, Inductive Load, T_C = 25^\circ C )</td>
<td>--</td>
<td>50</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>( t_r )</td>
<td>Rise Time</td>
<td></td>
<td>--</td>
<td>60</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{(off)} )</td>
<td>Turn-Off Delay Time</td>
<td></td>
<td>--</td>
<td>190</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>4.1</td>
<td>--</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{off} )</td>
<td>Turn-Off Switching Loss</td>
<td></td>
<td>--</td>
<td>0.96</td>
<td>--</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{ts} )</td>
<td>Total Switching Loss</td>
<td></td>
<td>--</td>
<td>5.06</td>
<td>--</td>
<td>mJ</td>
</tr>
<tr>
<td>( t_{(on)} )</td>
<td>Turn-On Delay Time</td>
<td>( V_{CC} = 600 \ V, I_C = 25 \ mA, R_G = 10 \ \Omega, V_{GE} = 15 \ V, Inductive Load, T_C = 125^\circ C )</td>
<td>--</td>
<td>50</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>( t_r )</td>
<td>Rise Time</td>
<td></td>
<td>--</td>
<td>60</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>( t_{(off)} )</td>
<td>Turn-Off Delay Time</td>
<td></td>
<td>--</td>
<td>200</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>( t_f )</td>
<td>Fall Time</td>
<td></td>
<td>--</td>
<td>154</td>
<td>--</td>
<td>ns</td>
</tr>
<tr>
<td>( E_{on} )</td>
<td>Turn-On Switching Loss</td>
<td></td>
<td>--</td>
<td>4.3</td>
<td>--</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{off} )</td>
<td>Turn-Off Switching Loss</td>
<td></td>
<td>--</td>
<td>1.5</td>
<td>--</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{ts} )</td>
<td>Total Switching Loss</td>
<td></td>
<td>--</td>
<td>5.8</td>
<td>--</td>
<td>mJ</td>
</tr>
<tr>
<td>( Q_g )</td>
<td>Total Gate Charge</td>
<td>( V_{CE} = 600 \ V, I_C = 25 \ mA, V_{GE} = 15 \ V )</td>
<td>--</td>
<td>200</td>
<td>--</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{ge} )</td>
<td>Gate-Emitter Charge</td>
<td></td>
<td>--</td>
<td>15</td>
<td>--</td>
<td>nC</td>
</tr>
<tr>
<td>( Q_{gc} )</td>
<td>Gate-Collector Charge</td>
<td></td>
<td>--</td>
<td>100</td>
<td>--</td>
<td>nC</td>
</tr>
</tbody>
</table>
### Electrical Characteristics of DIODE

**Symbol** | **Parameter** | **Test Conditions** | **Min.** | **Typ.** | **Max.** | **Unit**
--- | --- | --- | --- | --- | --- | ---
\(V_{FM}\) | Diode Forward Voltage | \(I_F = 25\ A\) \(T_C = 25^\circ C\) \(T_C = 125^\circ C\) | -- | 2.0 | 3.0 | V
\(t_{rr}\) | Diode Reverse Recovery Time | \(I_F = 25\ A\) \(\frac{dI_F}{dt} = 200\ A/\mu s\) \(T_C = 25^\circ C\) \(T_C = 125^\circ C\) | -- | 235 | 350 | ns
\(I_{rr}\) | Diode Peak Reverse Recovery Current | \(T_C = 25^\circ C\) \(T_C = 125^\circ C\) | -- | 27 | 40 | A
\(Q_{rr}\) | Diode Reverse Recovery Charge | \(T_C = 25^\circ C\) \(T_C = 125^\circ C\) | -- | 3130 | 4700 | nC
Typical Performance Characteristics

Figure 1. Typical Output Characteristics

![Figure 1. Typical Output Characteristics](image1)

Figure 2. Typical Saturation Voltage Characteristics

![Figure 2. Typical Saturation Voltage Characteristics](image2)

Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

![Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level](image3)

Figure 4. Saturation Voltage vs. $V_{GE}$

![Figure 4. Saturation Voltage vs. $V_{GE}$](image4)

Figure 5. Saturation Voltage vs. $V_{GE}$

![Figure 5. Saturation Voltage vs. $V_{GE}$](image5)

Figure 6. Saturation Voltage vs. $V_{GE}$

![Figure 6. Saturation Voltage vs. $V_{GE}$](image6)
Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

Figure 8. Turn-On Characteristics vs. Gate Resistance

Figure 9. Turn-Off Characteristics vs. Gate Resistance

Figure 10. Switching Loss vs. Gate Resistance

Figure 11. Turn-On Characteristics vs. Collector Current

Figure 12. Turn-Off Characteristics vs. Collector Current
Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

![Switching Loss vs. Collector Current Graph]

Figure 14. Gate Charge Characteristics

![Gate Charge Characteristics Graph]

Figure 15. SOA Characteristics

![SOA Characteristics Graph]

Figure 16. Turn-Off SOA

![Turn-Off SOA Graph]

Figure 17. Transient Thermal Impedance of IGBT

![Transient Thermal Impedance Graph]
Typical Performance Characteristics (Continued)

Figure 18. Forward Characteristics

![Graph showing forward characteristics with TC = 125°C and TC = 25°C]

Figure 19. Reverse Recovery Current

![Graph showing reverse recovery current with di/dt = 100A/μs and di/dt = 200A/μs]

Figure 20. Stored Charge

![Graph showing stored charge with di/dt = 100A/μs and di/dt = 200A/μs]

Figure 21. Reverse Recovery Time

![Graph showing reverse recovery time with di/dt = 100A/μs and di/dt = 200A/μs]
**Mechanical Dimensions**

**Figure 22. TO-3P 3L - 3LD, T03, PLASTIC, EIAJ SC-65**

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<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
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<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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