AONS62614
60V N-Channel AlphaSGT™

General Description

- Trench Power MOSFET - AlphaSGT™ technology
- Low R_{DS(ON)}
- Logic Level Gate Drive
- Excellent Gate Charge x R_{DS(ON)} Product (FOM)
- RoHS and Halogen-Free Compliant

Applications

- High Frequency Switching and Synchronous Rectification

Product Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>V_{DS}</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>V_{GS}</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Continuous Drain Current</td>
<td>I_D</td>
<td>100</td>
<td>A</td>
</tr>
<tr>
<td>Continuous Drain Current</td>
<td>I_{DM}</td>
<td>320</td>
<td>A</td>
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<tr>
<td>Continuous Drain Current</td>
<td>I_{OSM}</td>
<td>37</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche Current</td>
<td>I_{AS}</td>
<td>42</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche energy</td>
<td>L=0.3mH</td>
<td>E_{AS}</td>
<td>265</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>V_{SPIKE}</td>
<td>72</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>P_D</td>
<td>119</td>
<td>W</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>P_{DSM}</td>
<td>47.5</td>
<td>W</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>P_{DAM}</td>
<td>6.2</td>
<td>W</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>P_{DCM}</td>
<td>4.0</td>
<td>W</td>
</tr>
<tr>
<td>Junction and Storage Temperature Range</td>
<td>T_J, T_{STG}</td>
<td>-55 to 150</td>
<td>°C</td>
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</tbody>
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Orderable Part Number

| AONS62614 | DFN 5x6 | Tape & Reel | 3000 |

Absolute Maximum Ratings  T_A=25°C unless otherwise noted

Thermal Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Type</th>
<th>Max</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Maximum Junction-to-Ambient</td>
<td>R_{JAA}</td>
<td>15s</td>
<td>20</td>
<td>°C/W</td>
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<tr>
<td>Maximum Junction-to-Ambient</td>
<td>R_{JAC}</td>
<td>Steady-State</td>
<td>40</td>
<td>°C/W</td>
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<tr>
<td>Maximum Junction-to-Case</td>
<td>R_{JUC}</td>
<td>Steady-State</td>
<td>0.85</td>
<td>1.05</td>
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</table>

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### Electrical Characteristics (T<sub>j</sub>=25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>BV&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>Drain-Source Breakdown Voltage</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt;=250μA, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td>60</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>IDSS</td>
<td>Zero Gate Voltage Drain Current</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt;=60V, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td></td>
<td>1</td>
<td></td>
<td>μA</td>
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<tr>
<td>V&lt;sub&gt;GS&lt;/sub&gt;</td>
<td>Gate-Body leakage current</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt;=0V, V&lt;sub&gt;GS&lt;/sub&gt;=±20V</td>
<td></td>
<td>±100</td>
<td></td>
<td>nA</td>
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<tr>
<td>V&lt;sub&gt;GS(TH)&lt;/sub&gt;</td>
<td>Gate Threshold Voltage</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt;=V&lt;sub&gt;GS&lt;/sub&gt;, I&lt;sub&gt;D&lt;/sub&gt;=250μA</td>
<td>1.2</td>
<td>1.6</td>
<td>2.2</td>
<td>V</td>
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<tr>
<td>R&lt;sub&gt;DS(ON)&lt;/sub&gt;</td>
<td>Static Drain-Source On-Resistance</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt;=10V, I&lt;sub&gt;D&lt;/sub&gt;=20A</td>
<td>2.1</td>
<td>2.5</td>
<td></td>
<td>mΩ</td>
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<tr>
<td>R&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>Forward Transconductance</td>
<td>V&lt;sub&gt;DS&lt;/sub&gt;=5V, I&lt;sub&gt;D&lt;/sub&gt;=20A</td>
<td>110</td>
<td></td>
<td></td>
<td>S</td>
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<td>V&lt;sub&gt;GD&lt;/sub&gt;</td>
<td>Diode Forward Voltage</td>
<td>I&lt;sub&gt;G&lt;/sub&gt;=1A, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td>0.67</td>
<td>1</td>
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<td>V</td>
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<td>IS</td>
<td>Maximum Body-Diode Continuous Current</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

#### STATIC PARAMETERS

- **C<sub>iss** Input Capacitance: V<sub>GS</sub>=0V, V<sub>DS</sub>=30V, f=1MHz
- **C<sub>oss** Output Capacitance: V<sub>GS</sub>=0V, V<sub>DS</sub>=30V, f=1MHz
- **C<sub>rss** Reverse Transfer Capacitance: | 108 | pF |
- **R<sub>g** Gate resistance: f=1MHz | 0.3 | 0.75 | 1.2 | Ω |

#### DYNAMIC PARAMETERS

- **Qg(10V** Total Gate Charge: V<sub>GS</sub>=10V, V<sub>DS</sub>=30V, I<sub>D</sub>=20A | 64 | 90 | nC |
- **Qg(4.5V** Total Gate Charge: V<sub>GS</sub>=10V, V<sub>DS</sub>=30V | 32 | 50 | nC |
- **Qg** Gate Source Charge: | 8.5 | nC |
- **Qgd** Gate Drain Charge: | 11.5 | nC |
- **Qoss** Output Charge: V<sub>GS</sub>=0V, V<sub>DS</sub>=30V | 57 | nC |
- **t<sub>ON** Turn-On Delay Time: | 7.5 | ns |
- **t<sub>R** Turn-On Rise Time: V<sub>GS</sub>=10V, V<sub>DS</sub>=30V, | 7 | ns |
- **t<sub>OFF** Turn-Off Delay Time: R<sub>GEN</sub>=3Ω | 44 | ns |
- **t<sub>F** Turn-Off Fall Time: | 12.5 | ns |
- **t<sub>L** Body Diode Reverse Recovery Time: I<sub>l</sub>=20A, di/dt=500A/μs | 26 | ns |
- **Q<sub>rr** Body Diode Reverse Recovery Charge: I<sub>l</sub>=20A, di/dt=500A/μs | 92 | nC |

A. The value of R<sub>qJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>a</sub>=25°C. The Power dissipation P<sub>DSM</sub> is based on R<sub>qJA</sub>t≤ 10s and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

B. The power dissipation P<sub>D</sub> is based on T<sub>JMAX</sub>=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Single pulse width limited by junction temperature T<sub>JMAX</sub>=150°C.

D. The R<sub>qJA</sub> is the sum of the thermal impedance from junction to case R<sub>qJC</sub> and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>JMAX</sub>=150°C. The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>a</sub>=25°C.

I. The spike duty cycle 5% max, limited by junction temperature T<sub>JMAX</sub>=125°C.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

**Figure 1: On-Region Characteristics (Note E)**

**Figure 2: Transfer Characteristics (Note E)**

**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**

**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

**Figure 6: Body-Diode Characteristics (Note E)**

\( V_{GS} = 2.5 \text{V} \)

\( V_{GS} = 4.5 \text{V} \)

\( V_{GS} = 10 \text{V} \)

\( V_{DS} = 5 \text{V} \)

\( V_{GS} = 4.5 \text{V} \)

\( V_{GS} = 10 \text{V} \)

\( I_D = 20 \text{A} \)

\( I_S = 20 \text{A} \)

\( V_{SD} = 5 \text{V} \)

\( V_{SD} = 3 \text{V} \)

\( V_{SD} = 3.5 \text{V} \)

\( V_{SD} = 4.5 \text{V} \)

\( V_{SD} = 10 \text{V} \)
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

Figure 7: Gate-Charge Characteristics

Figure 8: Capacitance Characteristics

Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

![Graph 1](image1)

**Figure 12: Power De-rating (Note F)**

![Graph 2](image2)

**Figure 13: Current De-rating (Note F)**

![Graph 3](image3)

**Figure 14: Coss stored Energy**

![Graph 4](image4)

**Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)**

![Graph 5](image5)

**Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)**

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Figure A: Gate Charge Test Circuit & Waveforms

Figure B: Resistive Switching Test Circuit & Waveforms

Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

Figure D: Diode Recovery Test Circuit & Waveforms