AONR66922
100V N-Channel AlphaSGT™

General Description

- Trench Power AlphaSGT™ technology
- Low R_{DS(ON)}
- Low Gate Charge
- Logic Level Gate Drive
- RoHS 2.0 and Halogen-Free Compliant

Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Chargers
- PD Adaptor

Product Summary

V_{DS} 100V
I_{D} (at V_{GS}=10V) 80A
R_{DS(ON)} (at V_{GS}=10V) < 9mΩ
R_{DS(ON)} (at V_{GS}=4.5V) < 12mΩ

100% UIS Tested
100% R_{g} Tested

Orderable Part Number              Package Type              Form          Minimum Order Quantity
AONR66922                          DFN 3.3x3.3 EP             Tape & Reel    3000

Absolute Maximum Ratings  T_{A}=25°C unless otherwise noted

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Maximum</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>V_{DS}</td>
<td>100</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>80</td>
<td>A</td>
</tr>
<tr>
<td>(T_{C}=25°C)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(T_{C}=100°C)</td>
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<tr>
<td>Pulsed Drain Current</td>
<td>I_{DM}</td>
<td>150</td>
<td>A</td>
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<tr>
<td>(C)</td>
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<td></td>
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<tr>
<td>Continuous Drain Current</td>
<td>I_{DSM}</td>
<td>15</td>
<td>A</td>
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<tr>
<td>(T_{A}=25°C)</td>
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<td></td>
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<tr>
<td>(T_{A}=70°C)</td>
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<tr>
<td>Avalanche Current</td>
<td>I_{AS}</td>
<td>35</td>
<td>A</td>
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<tr>
<td>(T_{A}=0,1mH)</td>
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<tr>
<td>Avalanche energy</td>
<td>E_{AS}</td>
<td>61</td>
<td>mJ</td>
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<tr>
<td>Power Dissipation</td>
<td>P_{D}</td>
<td>113</td>
<td>W</td>
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<tr>
<td>(T_{C}=25°C)</td>
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<tr>
<td>(T_{C}=100°C)</td>
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<tr>
<td>Power Dissipation</td>
<td>P_{DSM}</td>
<td>4.1</td>
<td>W</td>
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<td>(T_{A}=25°C)</td>
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<tr>
<td>(T_{A}=70°C)</td>
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</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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Thermal Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
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<tbody>
<tr>
<td>Maximum Junction-to-Ambient</td>
<td>R_{JUA}</td>
<td>≤ 10s</td>
<td>25</td>
<td>30</td>
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<tr>
<td>Maximum Junction-to-Ambient</td>
<td>R_{JUC}</td>
<td>Steady-State</td>
<td>0.9</td>
<td>1.1</td>
</tr>
<tr>
<td>Maximum Junction-to-Case</td>
<td>R_{JUC}</td>
<td>Steady-State</td>
<td>0.9</td>
<td>1.1</td>
</tr>
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</table>
### 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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<tbody>
<tr>
<td>BV&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>Drain-Source Breakdown Voltage</td>
<td>I&lt;sub&gt;D&lt;/sub&gt;=250μA, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td>100</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;D&lt;/sub&gt;=100V, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>T&lt;sub&gt;j&lt;/sub&gt;=55°C</td>
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<tr>
<td>I&lt;sub&gt;DS&lt;/sub&gt;</td>
<td>Zero Gate Voltage Drain Current</td>
<td>V&lt;sub&gt;D&lt;/sub&gt;=100V, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td>1</td>
<td></td>
<td></td>
<td>μA</td>
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<tr>
<td>I&lt;sub&gt;GS&lt;/sub&gt;</td>
<td>Gate-Body leakage current</td>
<td>V&lt;sub&gt;D&lt;/sub&gt;=0V, V&lt;sub&gt;GS&lt;/sub&gt;=±20V</td>
<td>±100</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>V&lt;sub&gt;DS(th)&lt;/sub&gt;</td>
<td>Gate Threshold Voltage</td>
<td></td>
<td>1.5</td>
<td>2.0</td>
<td>2.5</td>
<td>V</td>
</tr>
<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;=15A</td>
<td>7.4</td>
<td>9</td>
<td></td>
<td>mΩ</td>
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<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;GS&lt;/sub&gt;=4.5V, I&lt;sub&gt;D&lt;/sub&gt;=13A</td>
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<td></td>
<td></td>
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<tr>
<td>g&lt;sub&gt;f&lt;/sub&gt;</td>
<td>Forward Transconductance</td>
<td>V&lt;sub&gt;D&lt;/sub&gt;=5V, I&lt;sub&gt;D&lt;/sub&gt;=15A</td>
<td>55</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>V&lt;sub&gt;SD&lt;/sub&gt;</td>
<td>Diode Forward Voltage</td>
<td>I&lt;sub&gt;S&lt;/sub&gt;=1A, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td>0.72</td>
<td>1</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum Body-Diode Continuous Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### STATIC PARAMETERS

- **B.V<sub>DS</sub>** (Drain-Source Breakdown Voltage):
  - Conditions: I<sub>D</sub>=250μA, V<sub>GS</sub>=0V
  - Min: 100 V
- **I<sub>DS</sub>** (Zero Gate Voltage Drain Current):
  - Conditions: V<sub>D</sub>=100V, V<sub>GS</sub>=0V
  - Min: 1 μA
  - Max: 5 μA
- **I<sub>GS</sub>** (Gate-Body leakage current):
  - Conditions: V<sub>D</sub>=0V, V<sub>GS</sub>=±20V
  - Min: ±100 nA
- **V<sub>DS(th)</sub>** (Gate Threshold Voltage):
  - Conditions: V<sub>DS</sub>=V<sub>GS</sub>, I<sub>D</sub>=250μA
  - Min: 1.5 V
  - Typ: 2.0 V
  - Max: 2.5 V
- **R<sub>DS(ON)</sub>** (Static Drain-Source On-Resistance):
  - Conditions: V<sub>GS</sub>=10V, I<sub>D</sub>=15A
  - Min: 7.4 mΩ
  - Typ: 9 mΩ
  - Max: 12.8 mΩ
  - T<sub>j</sub>=125°C
- **g<sub>f</sub>** (Forward Transconductance):
  - Conditions: V<sub>D</sub>=5V, I<sub>D</sub>=15A
  - Min: 55 S
- **V<sub>SD</sub>** (Diode Forward Voltage):
  - Conditions: I<sub>S</sub>=1A, V<sub>GS</sub>=0V
  - Min: 0.72 V
  - Typ: 1 V
  - Max: 4 V

#### DYNAMIC PARAMETERS

- **C<sub>iss</sub>** (Input Capacitance):
  - Conditions: V<sub>GS</sub>=0V, V<sub>D</sub>=50V, f=1MHz
  - Min: 2180 pF
- **C<sub>oss</sub>** (Output Capacitance):
  - Conditions: V<sub>GS</sub>=0V, V<sub>D</sub>=50V, f=1MHz
  - Min: 550 pF
- **R<sub>gg</sub>** (Reverse Transfer Capacitance):
  - Conditions: f=1MHz
  - Min: 13 pF
  - Typ: 17 pF
  - Max: 19 pF

#### SWITCHING PARAMETERS

- **Q<sub>g</sub>(10V)** (Total Gate Charge):
  - Conditions: V<sub>GS</sub>=10V, V<sub>D</sub>=50V, I<sub>D</sub>=15A
  - Min: 32.5 nC
  - Typ: 46 nC
- **Q<sub>g</sub>(4.5V)** (Total Gate Charge):
  - Conditions: V<sub>GS</sub>=10V, V<sub>D</sub>=50V, I<sub>D</sub>=15A
  - Min: 15 nC
- **Q<sub>gs</sub>** (Gate Source Charge):
  - Conditions: V<sub>GS</sub>=0V, V<sub>D</sub>=50V
  - Min: 7 nC
- **Q<sub>gd</sub>** (Gate Drain Charge):
  - Conditions: V<sub>GS</sub>=0V, V<sub>D</sub>=50V
  - Min: 5 nC
- **Q<sub>oss</sub>** (Output Charge):
  - Conditions: V<sub>GS</sub>=0V, V<sub>D</sub>=50V
  - Min: 45 nC
- **t<sub>on</sub>** (Turn-On Delay Time):
  - Conditions: V<sub>GS</sub>=10V, V<sub>D</sub>=50V, R<sub>L</sub>=3.35Ω
  - Min: 8.5 ns
- **t<sub>rr</sub>** (Turn-Off Rise Time):
  - Conditions: R<sub>GEN</sub>=3Ω
  - Min: 5.5 ns
- **t<sub>off</sub>** (Turn-Off Delay Time):
  - Conditions: R<sub>GEN</sub>=3Ω
  - Min: 27.5 ns
- **t<sub>D(on)</sub>** (Body Diode Reverse Recovery Time):
  - Conditions: I<sub>D</sub>=15A, di/dt=500A/μs
  - Min: 32 ns
  - Max: 138 ns
  - T<sub>j</sub>=150°C

A. The value of R<sub>qJA</sub> is measured 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. The Power dissipation P<sub>DSM</sub> is based on R<sub>qJA</sub> 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>J(MAX)</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>J(MAX)</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>J(MAX)</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.

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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)
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

Figure 12: Power De-rating (Note F)

Figure 13: Current De-rating (Note F)

Figure 14: Coss stored Energy

Figure 15: Single Pulse Power Rating

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