AO4264E
60V N-Channel AlphaSGT™

General Description
• Trench Power AlphaSGT™ technology
• Low \( R_{DS(ON)} \)
• Low Gate Charge
• ESD protected

Applications
• High efficiency power supply
• Secondary synchronous rectifier

Product Summary
\[ V_{DS} \] 60V
\[ I_D \text{ (at } V_{GS}=10V) \] 13.5A
\[ R_{DS(ON)} \text{ (at } V_{GS}=10V) \] < 9.8mΩ
\[ R_{DS(ON)} \text{ (at } V_{GS}=4.5V) \] < 13.5mΩ

Typical ESD protection
HBM Class 2
100% UIS Tested
100% Rg Tested

Orderable Part Number
AO4264E
Package Type
SO-8
Form
Tape & Reel
Minimum Order Quantity
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>
</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 \text{ (at } T_A=25°C) )</td>
<td>13.5</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>( I_D \text{ (at } T_A=70°C) )</td>
<td>10.5</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed Drain Current</td>
<td>( I_{DM} )</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Avalanche Current</td>
<td>( I_{AS} )</td>
<td>17</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche energy</td>
<td>( E_{AS} )</td>
<td>43</td>
<td>mJ</td>
</tr>
<tr>
<td>( V_{DS} ) Spike</td>
<td></td>
<td>72</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>( P_D \text{ (at } T_A=25°C) )</td>
<td>3.1</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>( P_D \text{ (at } T_A=70°C) )</td>
<td>2.0</td>
<td>W</td>
</tr>
<tr>
<td>Junction and Storage Temperature Range</td>
<td>( T_J \text{, } T_{STG} )</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Thermal Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Junction-to-Ambient</td>
<td>( R_{JA} )</td>
<td>31</td>
<td>40</td>
<td>°C/W</td>
</tr>
<tr>
<td>Maximum Junction-to-Ambient Steady-State</td>
<td>( R_{JUL} )</td>
<td>59</td>
<td>75</td>
<td>°C/W</td>
</tr>
<tr>
<td>Maximum Junction-to-Lead Steady-State</td>
<td>( R_{JUL} )</td>
<td>16</td>
<td>24</td>
<td>°C/W</td>
</tr>
</tbody>
</table>
### Electrical Characteristics (\(T_J=25^\circ C\) 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>
</tr>
</thead>
<tbody>
<tr>
<td>(BV_{DSS})</td>
<td>Drain-Source Breakdown Voltage</td>
<td>(I_D=250\mu A, V_{GS}=0V)</td>
<td>60</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>(I_{GSS})</td>
<td>Zero Gate Voltage Drain Current</td>
<td>(V_{DS}=60V, V_{GS}=0V)</td>
<td>1</td>
<td></td>
<td></td>
<td>(\mu A)</td>
</tr>
<tr>
<td>(I_{BS})</td>
<td>Gate-Body leakage current</td>
<td>(V_{DS}=0V, V_{GS}=\pm 20V)</td>
<td>10</td>
<td></td>
<td></td>
<td>(\mu A)</td>
</tr>
<tr>
<td>(V_{GS(th)})</td>
<td>Gate Threshold Voltage</td>
<td>(V_{DS}=V_{GS}, I_D=250\mu A)</td>
<td>1.4</td>
<td>1.8</td>
<td>2.4</td>
<td>V</td>
</tr>
<tr>
<td>(R_{DS(on)})</td>
<td>Static Drain-Source On-Resistance</td>
<td>(V_{GS}=10V, I_P=13.5A)</td>
<td>8</td>
<td>9.8</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td>(V_{DS})</td>
<td>Diode Forward Voltage</td>
<td>(V_{DS}=5V, I_D=13.5A)</td>
<td>48</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>(f_s)</td>
<td>Maximum Body-Diode Continuous Current</td>
<td></td>
<td>0.72</td>
<td>1</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

### Dynamic Parameters

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(C_{iss})</td>
<td>Input Capacitance</td>
<td>(V_{GS}=0V, V_{DS}=30V, f=1MHz)</td>
<td>1100</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>(C_{oss})</td>
<td>Output Capacitance</td>
<td></td>
<td>300</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>(C_{iss})</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>(R_g)</td>
<td>Gate resistance</td>
<td>(f=1MHz)</td>
<td>0.6</td>
<td>1.2</td>
<td>2.0</td>
<td>Ω</td>
</tr>
</tbody>
</table>

### Switching Parameters

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Q_{(10V)})</td>
<td>Total Gate Charge</td>
<td>(V_{GS}=10V, V_{DS}=30V, I_D=13.5A)</td>
<td>14.5</td>
<td>25</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>(Q_{(4.5V)})</td>
<td>Total Gate Charge</td>
<td>(V_{GS}=10V, V_{DS}=30V, I_D=13.5A)</td>
<td>7</td>
<td>13</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>(Q_{gs})</td>
<td>Gate Source Charge</td>
<td></td>
<td>2.5</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>(Q_{gd})</td>
<td>Gate Drain Charge</td>
<td></td>
<td>3.5</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>(t_{on})</td>
<td>Turn-On Rise Time</td>
<td>(V_{GS}=10V, V_{DS}=30V, R_L=2.2\Omega)</td>
<td>6.5</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_{off})</td>
<td>Turn-Off Delay Time</td>
<td>(R_{GEN}=3\Omega)</td>
<td>22</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_r)</td>
<td>Turn-Off Fall Time</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_{br})</td>
<td>Body Diode Reverse Recovery Time</td>
<td>(I_F=13.5A, \frac{dI}{dt}=500A/\mu s)</td>
<td>18.5</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(Q_{br})</td>
<td>Body Diode Reverse Recovery Charge</td>
<td>(I_F=13.5A, \frac{dI}{dt}=500A/\mu s)</td>
<td>59</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
</tbody>
</table>

A. The value of \(R_{th JA}\) is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with \(T_A=25^\circ C\). The value in any given application depends on the user’s specific board design.

B. The power dissipation \(P_D\) is based on \(T_{J(MAX)}=150^\circ C\), using \(\leq 10s\) junction-to-ambient thermal resistance. Ratings are based on low frequency and duty cycles to keep initial \(T_J=25^\circ C\).

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

D. The \(R_{th JA}\) is the sum of the thermal impedance from junction to lead \(R_{th JL}\) and lead to ambient.

E. These curves are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of \(T_{J(MAX)}=150^\circ C\). The SOA curve provides a single pulse rating.

F. The spike duty cycle 5% max, limited by junction temperature \(T_J(MAX)=125^\circ C\).

### Applications or Use as Critical Components in Life Support Devices or Systems Are Not Authorized. Aos Does Not Assume Any Liability Arising Out of Such Applications or Uses of Its Products. Aos Reserves the Right to Improve Product Design, Functions and Reliability Without Notice.
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

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

- $V_{DS}$ (Volts)
- $I_D$ (A)

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

- $V_{GS}$ (Volts)
- $I_D$ (A)

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

- $R_{DS(ON)}$ (mΩ)
- $V_{GS}$

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

- Normalized On-Resistance
- Temperature (°C)

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

- $R_{DS(ON)}$ (mΩ)
- $V_{GS}$

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

- $I_S$ (A)
- $V_{SD}$ (Volts)
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-Ambient (Note F)

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)
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