**AONS32306**  
**30V N-Channel MOSFET**

### General Description
- Latest Advanced Trench Technology
- Low \( R_{DS(ON)} \)
- High Current Capability
- RoHS and Halogen-Free Compliant

### Applications
- Load Switch
- Battery Protection

### Product Summary
- \( V_{DS} \) = 30V
- \( I_D \) (at \( V_{GS}=10V \)) = 36A
- \( R_{DS(ON)} \) (at \( V_{GS}=10V \)) < 3.6mΩ
- \( R_{DS(ON)} \) (at \( V_{GS}=4.5V \)) < 4.7mΩ

### Orderable Part Number
<table>
<thead>
<tr>
<th>AONS32306</th>
<th>DFN 5X6</th>
</tr>
</thead>
</table>

### 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>30</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>( V_{GS} )</td>
<td>( \pm 20 )</td>
<td>V</td>
</tr>
<tr>
<td>Continuous Drain Current ( T_J=25°C )</td>
<td>( I_D )</td>
<td>36</td>
<td>A</td>
</tr>
<tr>
<td>Continuous Drain Current ( T_J=100°C )</td>
<td>( I_D )</td>
<td>36</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed Drain Current ( T_J=25°C )</td>
<td>( I_{DM} )</td>
<td>144</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed Drain Current ( T_J=100°C )</td>
<td>( I_{DM} )</td>
<td>26</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche Current ( T_J=25°C )</td>
<td>( I_{AS} )</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Avalanche Energy ( L=0.1mH )</td>
<td>( E_{AS} )</td>
<td>80</td>
<td>mJ</td>
</tr>
<tr>
<td>( V_{DS} ) Spike ( T_J=25°C )</td>
<td>( V_{SPIKE} )</td>
<td>36</td>
<td>V</td>
</tr>
<tr>
<td>( V_{DS} ) Spike ( T_J=100°C )</td>
<td>( V_{SPIKE} )</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation ( T_J=25°C )</td>
<td>( P_D )</td>
<td>50</td>
<td>W</td>
</tr>
<tr>
<td>Power Dissipation ( T_J=100°C )</td>
<td>( P_D )</td>
<td>20</td>
<td>W</td>
</tr>
<tr>
<td>Power Dissipation ( T_J=25°C )</td>
<td>( P_{DSM} )</td>
<td>6.2</td>
<td>W</td>
</tr>
<tr>
<td>Power Dissipation ( T_J=70°C )</td>
<td>( P_{DSM} )</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>
</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 ( I \leq 10s )</td>
<td>( R_{UJA} )</td>
<td>Steady-State</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Maximum Junction-to-Ambient ( T_J )</td>
<td>( R_{UJA} )</td>
<td>Steady-State</td>
<td>45</td>
<td>55</td>
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<tr>
<td>Maximum Junction-to-Case</td>
<td>( R_{UC} )</td>
<td>Steady-State</td>
<td>2.0</td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Rev.1.0: August 2017**  
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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></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>V</td>
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<td>µA</td>
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<td>mΩ</td>
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<td>Ω</td>
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<td>nC</td>
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<td>pF</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
</tbody>
</table>

**STATIC PARAMETERS**

- **BV<sub>DS</sub>** Drain-Source Breakdown Voltage  
  \( I_D = 250\mu A, V_G = 0V \)  
  Min: 30 V  
  Typ: 30 V  
  Max: 40 V  
  Units: V

- **IGSS** Zero Gate Voltage Drain Current  
  \( V_G = 30V, V_D = 0V \)  
  Min: 1 µA  
  Typ: 1 µA  
  Max: 5 µA  
  Units: µA

- **VGS(th)** Gate Threshold Voltage  
  \( V_G = V_D, I_D = 250\mu A \)  
  Min: 1.1 V  
  Typ: 1.55 V  
  Max: 2.1 V  
  Units: V

- **R<sub>DS(ON)</sub>** Static Drain-Source On-Resistance  
  \( V_G = 10V, I_D = 20A \)  
  Min: 3.0 mΩ  
  Typ: 3.6 mΩ  
  Max: 4.5 mΩ  
  Units: mΩ

- **GF** Forward Transconductance  
  \( V_D = 5V, I_D = 20A \)  
  Min: 100 S  
  Typ: 100 S  
  Max: 100 S  
  Units: S

- **VRDS** Diode Forward Voltage  
  \( I_D = 1A, V_G = 0V \)  
  Min: 0.7 V  
  Typ: 1 V  
  Max: 2 V  
  Units: V

- **IS** Maximum Body-Diode Continuous Current  
  Min: 0 A  
  Typ: 0 A  
  Max: 36 A  
  Units: A

**DYNAMIC PARAMETERS**

- **C<sub>gs</sub>** Input Capacitance  
  \( V_G = 0V, V_D = 15V, f = 1MHz \)  
  Min: 4080 pF  
  Typ: 410 pF  
  Max: 1000 pF  
  Units: pF

- **C<sub>oss</sub>** Output Capacitance  
  \( V_G = 0V, V_D = 15V, f = 1MHz \)  
  Min: 410 pF  
  Typ: 410 pF  
  Max: 1000 pF  
  Units: pF

- **C<sub>rss</sub>** Reverse Transfer Capacitance  
  Min: 1000 pF  
  Typ: 1000 pF  
  Max: 2000 pF  
  Units: pF

**SWITCHING PARAMETERS**

- **Qg(10V)** Total Gate Charge  
  \( V_G = 10V, V_D = 15V, I_D = 20A \)  
  Min: 63 nC  
  Typ: 90 nC  
  Max: 100 nC  
  Units: nC

- **Qg(4.5V)** Total Gate Charge  
  \( V_G = 4.5V, V_D = 15V, I_D = 20A \)  
  Min: 29 nC  
  Typ: 40 nC  
  Max: 50 nC  
  Units: nC

- **Qgs** Gate Source Charge  
  Min: 9.0 nC  
  Typ: 9.0 nC  
  Max: 9.0 nC  
  Units: nC

- **Qgd** Gate Drain Charge  
  Min: 9.5 nC  
  Typ: 9.5 nC  
  Max: 9.5 nC  
  Units: nC

- **tr** Turn-On Rise Time  
  \( V_G = 10V, V_D = 15V, R_L = 0.75Ω \)  
  Min: 9 ns  
  Typ: 9 ns  
  Max: 9 ns  
  Units: ns

- **toff** Turn-Off Delay Time  
  \( R_G = 3Ω \)  
  Min: 52 ns  
  Typ: 52 ns  
  Max: 52 ns  
  Units: ns

- **tf** Turn-Off Fall Time  
  Min: 11.5 ns  
  Typ: 11.5 ns  
  Max: 11.5 ns  
  Units: ns

- **td** Body Diode Reverse Recovery Time  
  \( I_D = 20A, \frac{dI_D}{dt} = 500A/µs \)  
  Min: 11 ns  
  Typ: 11 ns  
  Max: 11 ns  
  Units: ns

- **Qrr** Body Diode Reverse Recovery Charge  
  \( I_D = 20A, \frac{dI_D}{dt} = 500A/µs \)  
  Min: 19 nC  
  Typ: 19 nC  
  Max: 19 nC  
  Units: nC

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A. The value of \( R_{θJA} \) is measured with the device mounted on 1x2 FR-4 board with 2oz. Copper, in a still air environment with \( T_a = 25°C \). The Power dissipation \( P_{DSM} \) is based on \( R_{θJA} \) ≤ 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 \( P_D \) is based on \( T_{J(MAX)} = 150°C \), 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 \( T_{J(MAX)} = 150°C \), using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

D. The \( R_{θJC} \) is the sum of the thermal impedance from junction to case \( R_{θJC} \) 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 \( T_{J(MAX)} = 150°C \). 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 in² FR-4 board with 2oz. Copper, in a still air environment with \( T_a = 25°C \).

I. The spike duty cycle 5% max, limited by junction temperature \( T_{J(MAX)} = 125°C \).

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A. **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)

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

Figure 15: 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