### General Description

- Trench Power MOSFET technology
- Low $R_{DS(ON)}$
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

### Applications

- DC/DC Converters in Computing
- POL in Telecom and Industrial

### Product Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Q1</th>
<th>Q2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{DS}$ (30V)</td>
<td>30V</td>
<td>30V</td>
</tr>
<tr>
<td>$I_D$ (at $V_{GS}=10V$)</td>
<td>51A</td>
<td>85A</td>
</tr>
<tr>
<td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td>
<td>&lt;5.2mΩ</td>
<td>&lt;2.8mΩ</td>
</tr>
<tr>
<td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td>
<td>&lt;8.6mΩ</td>
<td>&lt;3.5mΩ</td>
</tr>
</tbody>
</table>

100% UIS Tested
100% $R_g$ Tested

### Orderable Part Number

<table>
<thead>
<tr>
<th>AONY36304</th>
<th>DFN 5x6D</th>
<th>Tape &amp; Reel</th>
<th>Minimum Order Quantity</th>
</tr>
</thead>
</table>

### Absolute Maximum Ratings

$T_A=25^\circ C$ unless otherwise noted

#### Parameter

- **Drain-Source Voltage**
  - Symbol: $V_{DS}$
  - Typ: 30
  - Max Q1: 30
  - Max Q2: 30
  - Units: V

- **Gate-Source Voltage**
  - Symbol: $V_{GS}$
  - $T_A=25^\circ C$
  - $T_A=100^\circ C$
  - $I_D$:
    - Typ: 51
    - Max: 83
  - $I_{DM}$:
    - Typ: 110
    - Max: 180

- **Continuous Drain Current**
  - $T_A=25^\circ C$
  - $T_A=70^\circ C$
  - $I_{DSM}$:
    - Typ: 20
    - Max: 26
  - $I_{AS}$:
    - Typ: 50
    - Max: 75

- **Avalanche Current**
  - $L=0.01mH$
  - $E_{AS}$:
    - Typ: 12.5
    - Max: 28
  - $T_{C}=25^\circ C$
  - $T_{C}=100^\circ C$
  - $P_D$:
    - Typ: 21
    - Max: 31.5
  - $T_{A}=25^\circ C$
  - $T_{A}=70^\circ C$
  - $P_{DSM}$:
    - Typ: 3.1
    - Max: 3.1

- **Power Dissipation**
  - $P_{DJ}$
    - Typ: 2
    - Max: 2

- **Junction and Storage Temperature Range**
  - $T_J$, $T_{STG}$
    - Min: -55
    - Max: 150
    - Units: °C

### Thermal Characteristics

#### Parameter

- **Maximum Junction-to-Ambient**
  - Typ: 4.6
  - Steady-State: 3.1
  - Max: 6
  - Units: °C/W
- **Maximum Junction-to-Case**
  - Typ: 4.6
  - Steady-State: 3.1
  - Max: 4
  - Units: °C/W
## Q1 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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATIC PARAMETERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<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>30</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;=30V, V&lt;sub&gt;GS&lt;/sub&gt;=0V</td>
<td></td>
<td></td>
<td>1</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T&lt;sub&gt;j&lt;/sub&gt;=55°C</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>IGSS</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></td>
<td>±100</td>
<td>nA</td>
</tr>
<tr>
<td>VGS(TH)</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>1.3</td>
<td>1.75</td>
<td>2.2</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;=20A</td>
<td>3.8</td>
<td>5.2</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T&lt;sub&gt;j&lt;/sub&gt;=125°C</td>
<td></td>
<td></td>
<td>5.4</td>
<td>7.6</td>
</tr>
<tr>
<td>V&lt;sub&gt;fs&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>80</td>
<td></td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>V&lt;sub&gt;gd&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>0.7</td>
<td>1</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>IS</td>
<td>Maximum Body-Diode Continuous Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>DYNAMIC PARAMETERS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>Input Capacitance</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt;=0V, V&lt;sub&gt;DS&lt;/sub&gt;=15V, f=1MHz</td>
<td>1000</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>CGS</td>
<td>Output Capacitance</td>
<td></td>
<td></td>
<td></td>
<td>290</td>
<td>pF</td>
</tr>
<tr>
<td>C&lt;sub&gt;gs&lt;/sub&gt;</td>
<td>Reverse Transfer Capacitance</td>
<td></td>
<td></td>
<td></td>
<td>50</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RG</td>
<td>Gate resistance</td>
<td>f=1MHz</td>
<td>0.2</td>
<td>0.6</td>
<td>1</td>
<td>Ω</td>
</tr>
<tr>
<td><strong>SWITCHING PARAMETERS</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Qg(10V)</td>
<td>Total Gate Charge</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt;=10V, V&lt;sub&gt;DS&lt;/sub&gt;=15V, I&lt;sub&gt;D&lt;/sub&gt;=20A</td>
<td>17</td>
<td>30</td>
<td></td>
<td>nC</td>
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<tr>
<td>Qg(4.5V)</td>
<td>Total Gate Charge</td>
<td></td>
<td></td>
<td>8</td>
<td>15</td>
<td>nC</td>
</tr>
<tr>
<td>Qgs</td>
<td>Gate Source Charge</td>
<td></td>
<td></td>
<td>2.8</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Qgd</td>
<td>Gate Drain Charge</td>
<td></td>
<td></td>
<td>4.1</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>t&lt;sub&gt;rr&lt;/sub&gt;</td>
<td>Turn-On Rise Time</td>
<td>V&lt;sub&gt;GS&lt;/sub&gt;=10V, V&lt;sub&gt;DS&lt;/sub&gt;=15V, R&lt;sub&gt;L&lt;/sub&gt;=0.75Ω,</td>
<td>7</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>t&lt;sub&gt;on&lt;/sub&gt;</td>
<td>Turn-Off DelayTime</td>
<td>R&lt;sub&gt;GEN&lt;/sub&gt;=3Ω</td>
<td>19</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>t&lt;sub&gt;f&lt;/sub&gt;</td>
<td>Turn-Off Fall Time</td>
<td></td>
<td></td>
<td>2.5</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Q&lt;sub&gt;rr&lt;/sub&gt;</td>
<td>Body Diode Reverse Recovery Time</td>
<td>I&lt;sub&gt;D&lt;/sub&gt;=20A, di/dt=500A/μs</td>
<td>11</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Q&lt;sub&gt;pr&lt;/sub&gt;</td>
<td>Body Diode Reverse Recovery Charge</td>
<td>I&lt;sub&gt;D&lt;/sub&gt;=20A, di/dt=500A/μs</td>
<td>19</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
</tbody>
</table>

A. The value of R<sub>qJA</sub> is measured with the device mounted on a 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>≤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>DSM</sub> is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of 150°C. The SOA curve provides a single pulse rating.

C. Single pulse width limited by junction temperature T<sub>MAX</sub>=150°C. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

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. 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>MAX</sub>=150°C. The SOA curve provides a single pulse rating.

F. These characteristics are obtained using <300μs pulses, duty cycle 0.5% max.

G. The maximum current rating is package limited.

H. These tests are performed 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.
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)
## Q2 Electrical Characteristics (T_J=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>
</tr>
</thead>
<tbody>
<tr>
<td>BV_DSS</td>
<td>Drain-Source Breakdown Voltage</td>
<td>V_DG=250μA, V_GS=0V</td>
<td>30</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>I_GS</td>
<td>Zero Gate Voltage Drain Current</td>
<td>V_DG=30V, V_GS=0V, T_J=55°C</td>
<td>1</td>
<td>5</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>I_GS</td>
<td>Gate-Body leakage current</td>
<td>V_DG=0V, V_GS=±12V</td>
<td>±100</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>V_GS(TH)</td>
<td>Gate Threshold Voltage</td>
<td>V_DG=V_GS, I_D=250μA</td>
<td>1.1</td>
<td>1.5</td>
<td>1.9</td>
<td>V</td>
</tr>
<tr>
<td>R(DS(ON))</td>
<td>Static Drain-Source On-Resistance</td>
<td>V_GS=10V, I_D=20A, T_J=125°C</td>
<td>2.1</td>
<td>2.8</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td>I_F</td>
<td>Forward Transconductance</td>
<td>V_DG=5V, I_D=20A</td>
<td>165</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V_FD</td>
<td>Diode Forward Voltage</td>
<td>V_DG=1A, I_D=20A</td>
<td>0.7</td>
<td>1</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>I_S</td>
<td>Maximum Body-Diode Continuous Current</td>
<td>I_D=1A, V_DG=0V</td>
<td>40</td>
<td></td>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

### STATIC PARAMETERS

**Input Capacitance**

C_iss

**Output Capacitance**

C_oss

**Reverse Transfer Capacitance**

Crss

**Gate resistance**

R_g

### DYNAMIC PARAMETERS

- **Total Gate Charge**
  - I_iss
  - Iiss
- **Gate Source Charge**
  - Qiss
- **Gate Drain Charge**
  - Qgd
- **Turn-On Delay Time**
  - t_on
- **Turn-Off Delay Time**
  - t_off
- **Turn-Off Fall Time**
  - t_f
- **Body Diode Reverse Recovery Time**
  - t_r
- **Body Diode Reverse Recovery Charge**
  - Qrr

### SWITCHING PARAMETERS

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

![Graph of Gate-Charge Characteristics](image1)

Figure 7: Gate-Charge Characteristics

![Graph of Capacitance Characteristics](image2)

Figure 8: Capacitance Characteristics

![Graph of Maximum Forward Biased Safe Operating Area](image3)

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

![Graph of Single Pulse Power Rating Junction-to-Case](image4)

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

![Graph of Normalized Maximum Transient Thermal Impedance](image5)

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

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