

### General Description

The AO6408 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. It offers operation over a wide gate drive range from 1.8V to 12V. It is ESD protected. This device is suitable for use as a load switch.

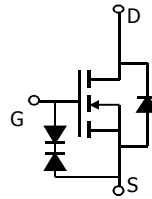
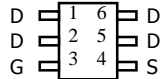
### Features

$V_{DS}$  (V) = 20V  
 $I_D = 8.8A$  ( $V_{GS} = 10V$ )  
 $R_{DS(ON)} < 18m\Omega$  ( $V_{GS} = 10V$ )  
 $R_{DS(ON)} < 20m\Omega$  ( $V_{GS} = 4.5V$ )  
 $R_{DS(ON)} < 25m\Omega$  ( $V_{GS} = 2.5V$ )  
 $R_{DS(ON)} < 32m\Omega$  ( $V_{GS} = 1.8V$ )  
 ESD Rating: 2000V HBM

ESD Protected  
 100% UIS Tested  
 100% Rg Tested



**TSOP-6  
Top View**



### Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

| Parameter                              | Symbol         | Maximum                | Units            |
|--|----------------|------------------------|------------------|
| Drain-Source Voltage                   | $V_{DS}$       | 20                     | V                |
| Gate-Source Voltage                    | $V_{GS}$       | $\pm 12$               | V                |
| Continuous Drain Current <sup>A</sup>  | $I_D$          | $T_A=25^\circ\text{C}$ | 8.8              |
|  |                | $T_A=70^\circ\text{C}$ | 7                |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | 40                     | A                |
| Power Dissipation                      | $P_D$          | $T_A=25^\circ\text{C}$ | 2                |
|  |                | $T_A=70^\circ\text{C}$ | 1.28             |
| Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 to 150             | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                                | Symbol          | Typ          | Max  | Units              |
|--|-----------------|--------------|------|--------------------|
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | $t \leq 10s$ | 47.5 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State | 74   | $^\circ\text{C/W}$ |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 37           | 40   | $^\circ\text{C/W}$ |

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

| Symbol                      | Parameter                             | Conditions  | Min | Typ          | Max      | Units |
|-----------------------------|---------------------------------------|---|-----|--------------|----------|-------|
| <b>STATIC PARAMETERS</b>    |                                       |   |     |              |          |       |
| BV <sub>DSS</sub>           | Drain-Source Breakdown Voltage        | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V  | 20  |              |          | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                         |     |              | 10<br>25 | μA    |
| I <sub>GSS</sub>            | Gate-Source leakage current           | V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V  |     |              | ±10      | μA    |
| BV <sub>GSO</sub>           | Gate-Source Breakdown Voltage         | V <sub>DS</sub> =0V, I <sub>G</sub> =±250μA   | ±12 |              |          | V     |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA                                    | 0.5 | 0.75         | 1        | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V  | 40  |              |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =8.8A<br>T <sub>J</sub> =125°C                       |     | 14.4<br>18.5 | 18<br>23 | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A   |     | 16           | 20       | mΩ    |
|                             |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =6A   |     | 20.5         | 25       | mΩ    |
|                             |                                       | V <sub>GS</sub> =1.8V, I <sub>D</sub> =4A   |     | 25.6         | 32       | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =8.8A   |     | 33           |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A  |     | 0.72         | 1        | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |   |     |              | 3        | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |     |              |          |       |
| C <sub>iss</sub>            | Input Capacitance                     |   |     | 1810         | 2200     | pF    |
| C <sub>oss</sub>            | Output Capacitance                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz   |     | 232          |          | pF    |
| C <sub>riss</sub>           | Reverse Transfer Capacitance          |   |     | 200          |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  |     | 1.6          | 2.2      | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |   |     |              |          |       |
| Q <sub>g</sub>              | Total Gate Charge                     |   |     | 17.9         | 22       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =8.8A                         |     | 1.5          |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   |     | 4.7          |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     |   |     | 3.3          |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     | V <sub>GS</sub> =10V, V <sub>DS</sub> =10V, R <sub>L</sub> =1.1Ω,<br>R <sub>GEN</sub> =3Ω |     | 5.9          |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |   |     | 44           |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |     | 7.7          |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =8.8A, di/dt=100A/μs   |     | 22           | 27       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =8.8A, di/dt=100A/μs   |     | 9.8          |          | nC    |

A: The value of R<sub>θJA</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 value in any a given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: 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. The SOA curve provides a single pulse rating. Rev3: August 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

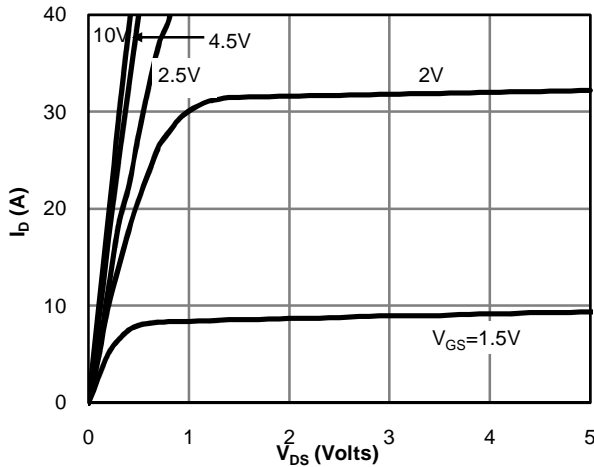


Fig 1: On-Region Characteristics

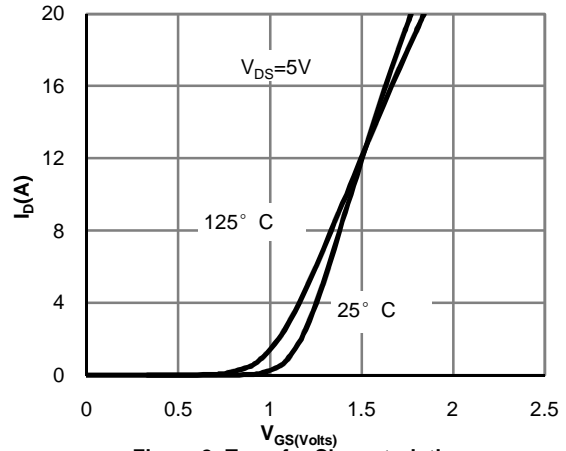


Figure 2: Transfer Characteristics

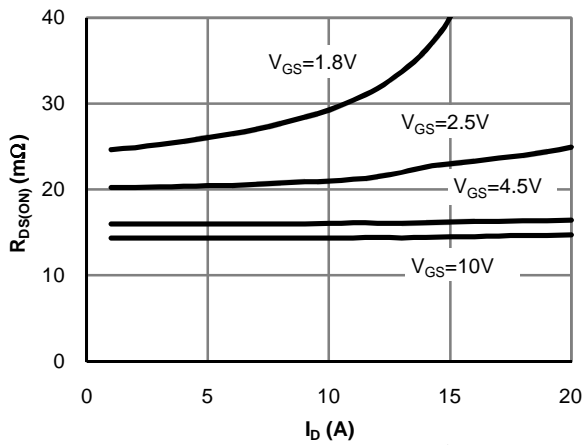


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

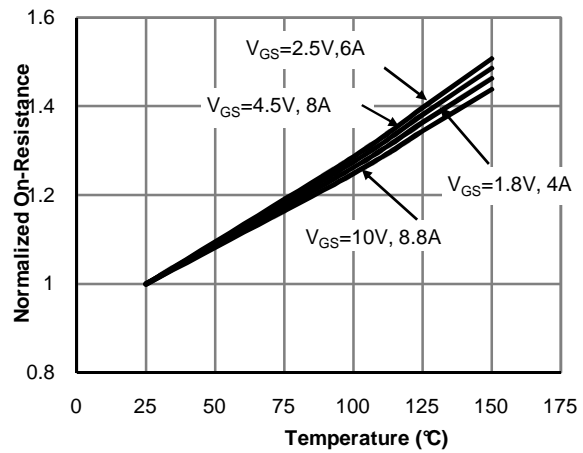


Figure 4: On-Resistance vs. Junction Temperature

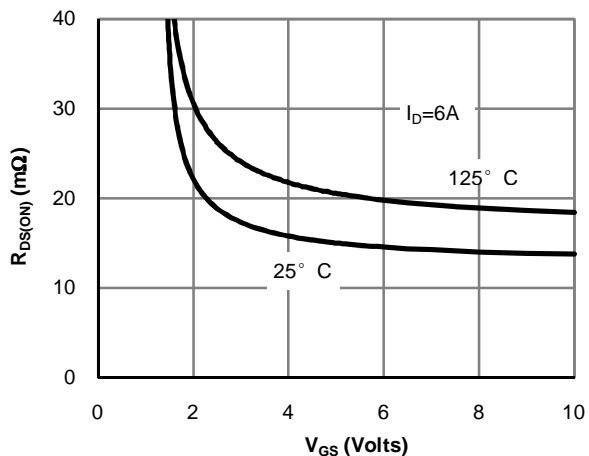


Figure 5: On-Resistance vs. Gate-Source Voltage

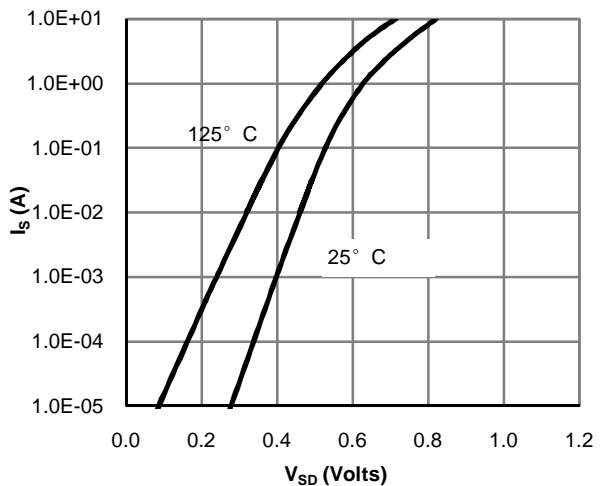
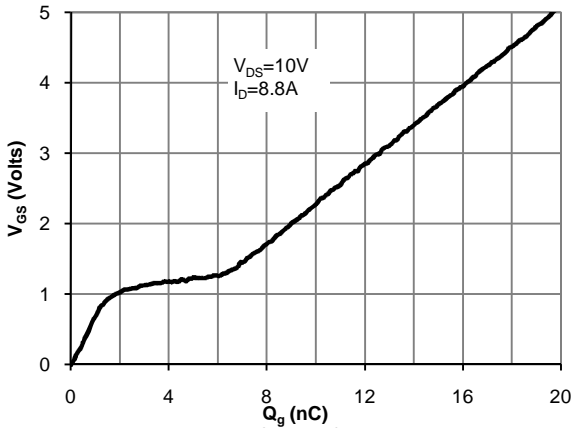
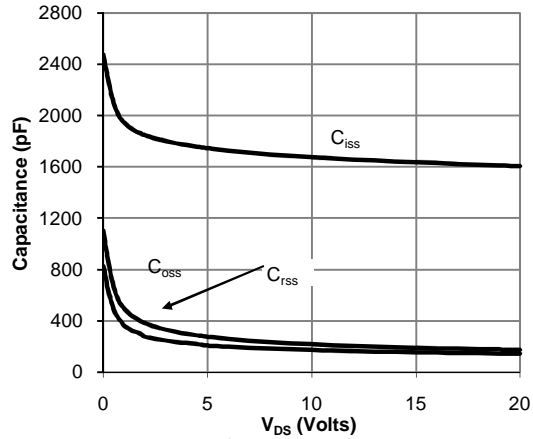


Figure 6: Body-Diode Characteristics

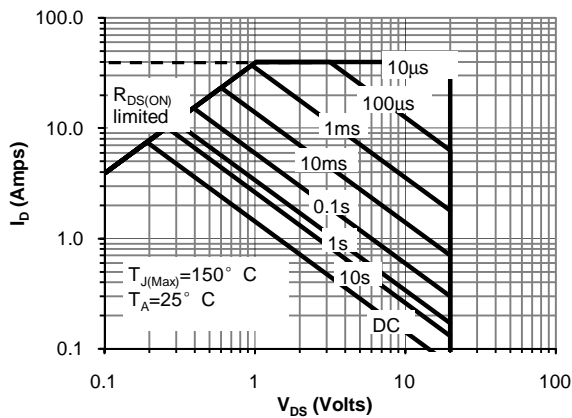
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



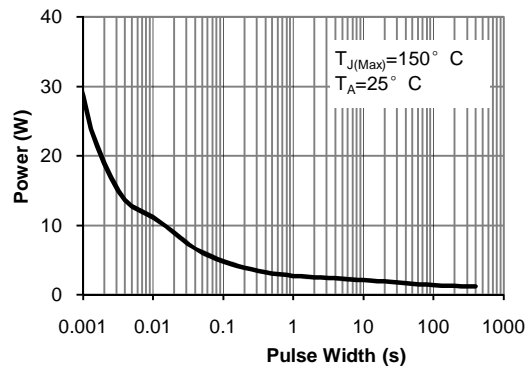
**Figure 7: Gate-Charge Characteristics**



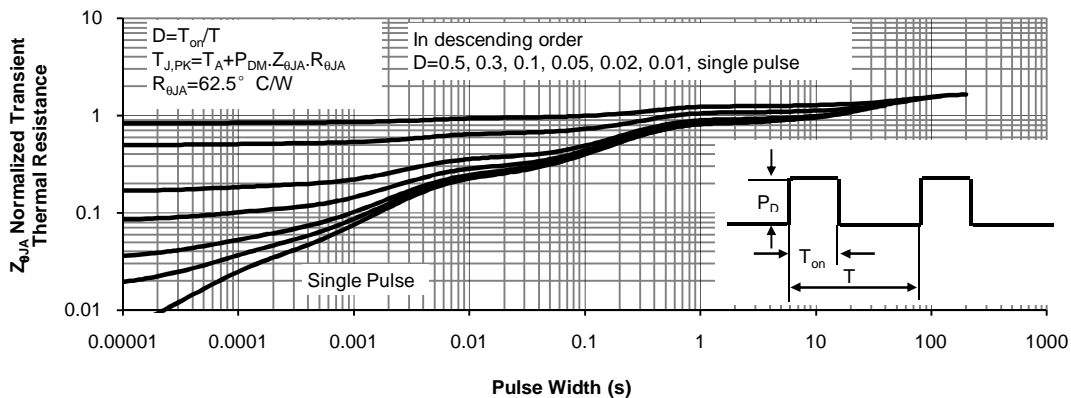
**Figure 8: Capacitance Characteristics**



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



**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**



**Figure 11: Normalized Maximum Transient Thermal Impedance**

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