

### General Description

The AO4415 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , and ultra-low low gate charge. This device is suitable for use as a load switch or in PWM applications.

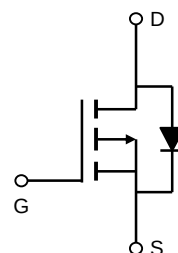
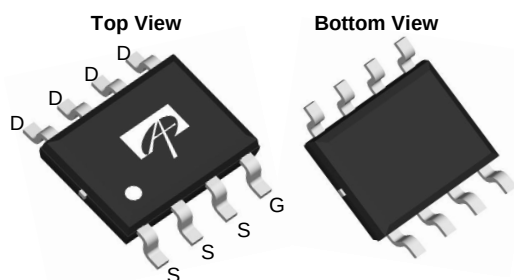
### Product Summary

$V_{DS}$  (V) = -30V  
 $I_D$  = -8 A ( $V_{GS}$  = -20V)  
 $R_{DS(ON)}$  < 26m $\Omega$  ( $V_{GS}$  = -20V)  
 $R_{DS(ON)}$  < 35m $\Omega$  ( $V_{GS}$  = -10V)

100% UIS Tested  
 100% Rg Tested



SOIC-8



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

| Parameter                              | Symbol         | Maximum    | Units            |
|----------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                   | $V_{DS}$       | -30        | V                |
| Gate-Source Voltage                    | $V_{GS}$       | $\pm 25$   | V                |
| Continuous Drain Current <sup>A</sup>  | $I_D$          | -8         | A                |
| $T_A=25^\circ\text{C}$                 |                | -6.6       |                  |
| $T_A=70^\circ\text{C}$                 |                | -40        |                  |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | -40        |                  |
| Power Dissipation <sup>A</sup>         | $P_D$          | 3          | W                |
|                                        |                | 2.1        |                  |
| 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> | $R_{\theta JA}$ | 24  | 40  | $^\circ\text{C/W}$ |
| $t \leq 10\text{s}$                      |                 | 54  | 75  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JL}$ | 21  | 30  | $^\circ\text{C/W}$ |
| Steady-State                             |                 |     |     |                    |
| Maximum Junction-to-Lead <sup>C</sup>    |                 |     |     |                    |

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                                                 | -30  |            |          | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                          |      |            | -1<br>-5 | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±25V                                                  |      |            | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA                                     | -1.7 | -2.8       | -3.5     | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V                                                 | 40   |            |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-20V, I <sub>D</sub> =-8A<br>T <sub>J</sub> =125°C                         |      | 21.5<br>29 | 26<br>35 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-10V, I <sub>D</sub> =-8A                                                  |      | 28.5       | 35       | mΩ    |
|                             |                                       | V <sub>GS</sub> =-6V, I <sub>D</sub> =-5A                                                   |      | 41         |          | mΩ    |
|                             |                                       |                                                                                             |      |            |          |       |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-8A                                                   |      | 11.5       |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                    |      | -0.76      | -1       | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                             |      |            | -4.2     | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                             |      |            |          |       |
| C <sub>ISS</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz                                          |      | 893        | 1100     | pF    |
| C <sub>OSS</sub>            | Output Capacitance                    |                                                                                             |      | 204        |          | pF    |
| C <sub>RSS</sub>            | Reverse Transfer Capacitance          |                                                                                             |      | 151        |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                            |      | 4          | 6        | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                             |      |            |          |       |
| Q <sub>g(10V)</sub>         | Total Gate Charge (10V)               | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-8A                           |      | 16.6       | 21       | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                             |      | 3.2        |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                             |      | 5.2        |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =1.8Ω,<br>R <sub>GEN</sub> =3Ω |      | 10.5       |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                             |      | 7.3        |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                             |      | 15.1       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                             |      | 8.6        |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-8A, dI/dt=100A/μs                                                          |      | 21         | 26       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-8A, dI/dt=100A/μs                                                          |      | 10.7       |          | 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 6,12,14 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

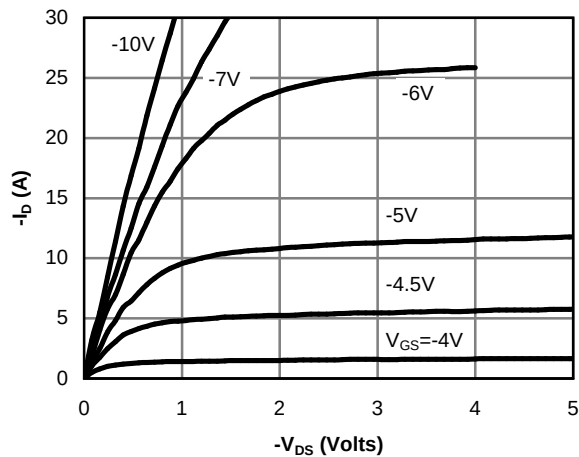


Fig 1: On-Region Characteristics

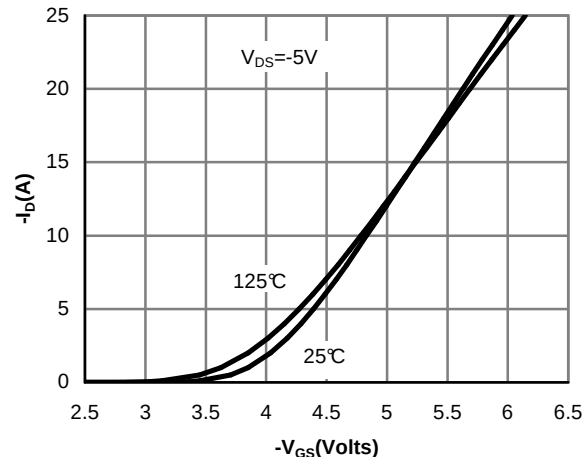


Figure 2: Transfer Characteristics

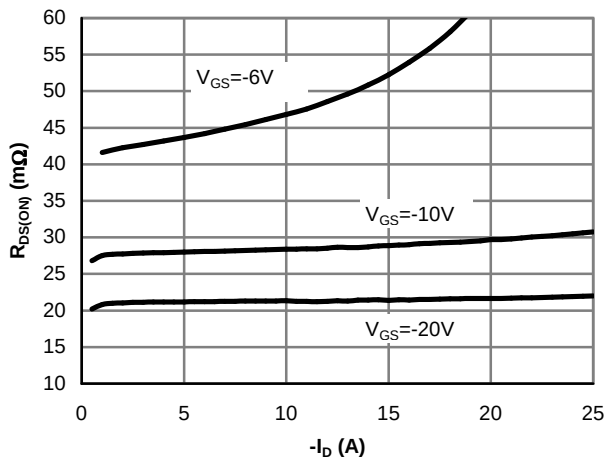


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

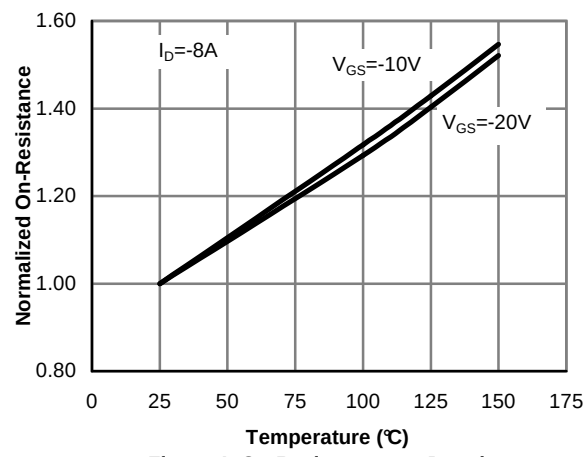


Figure 4: On-Resistance vs. Junction Temperature

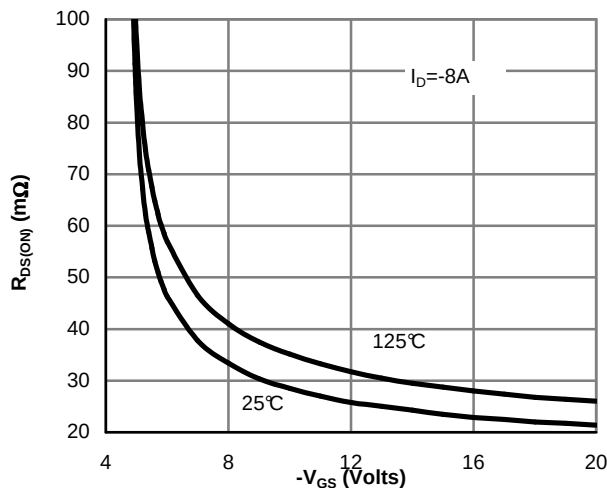


Figure 5: On-Resistance vs. Gate-Source Voltage

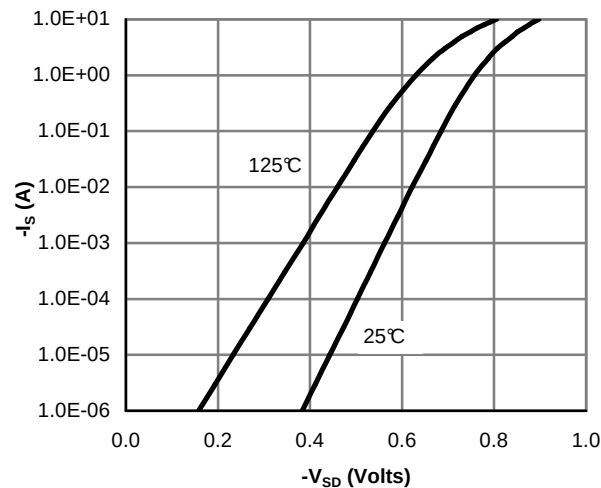


Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

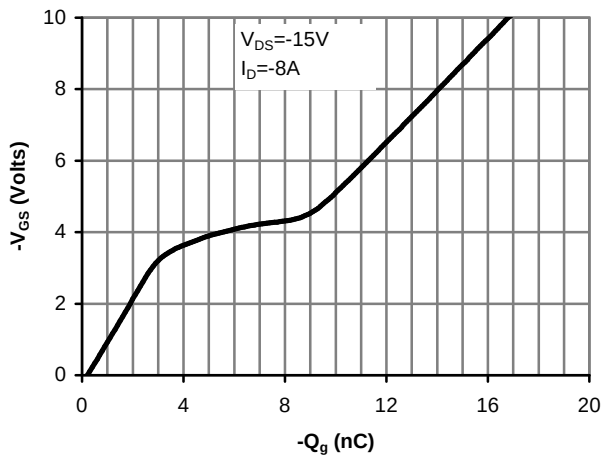


Figure 7: Gate-Charge Characteristics

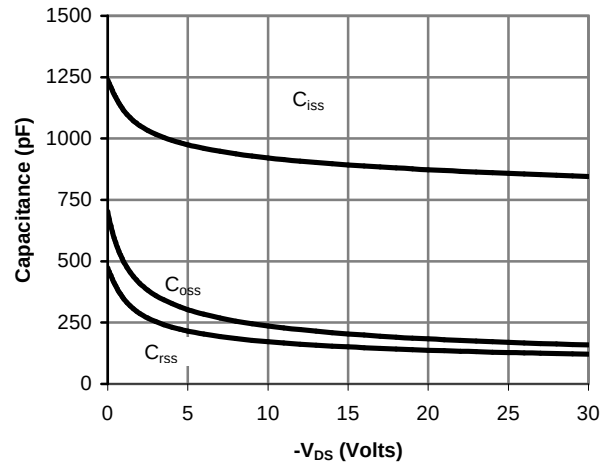


Figure 8: Capacitance Characteristics

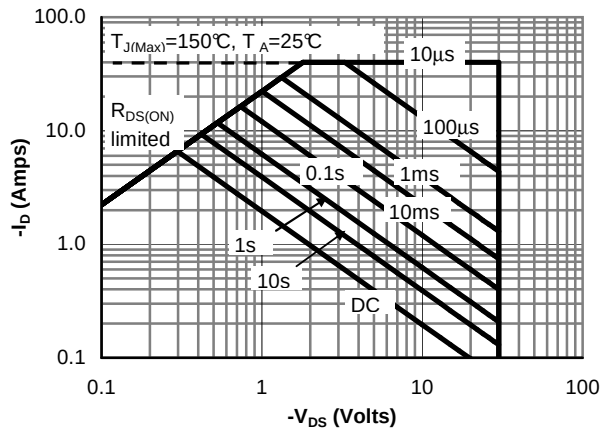


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

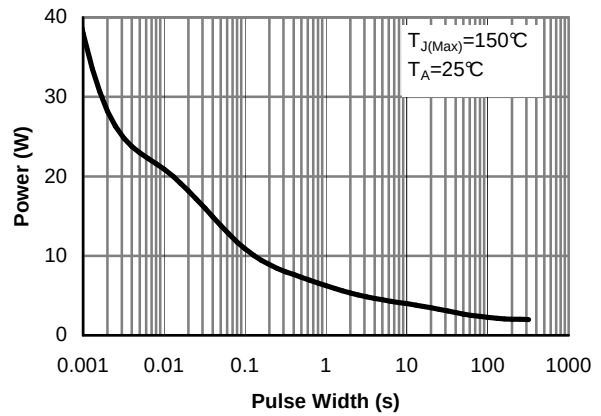


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

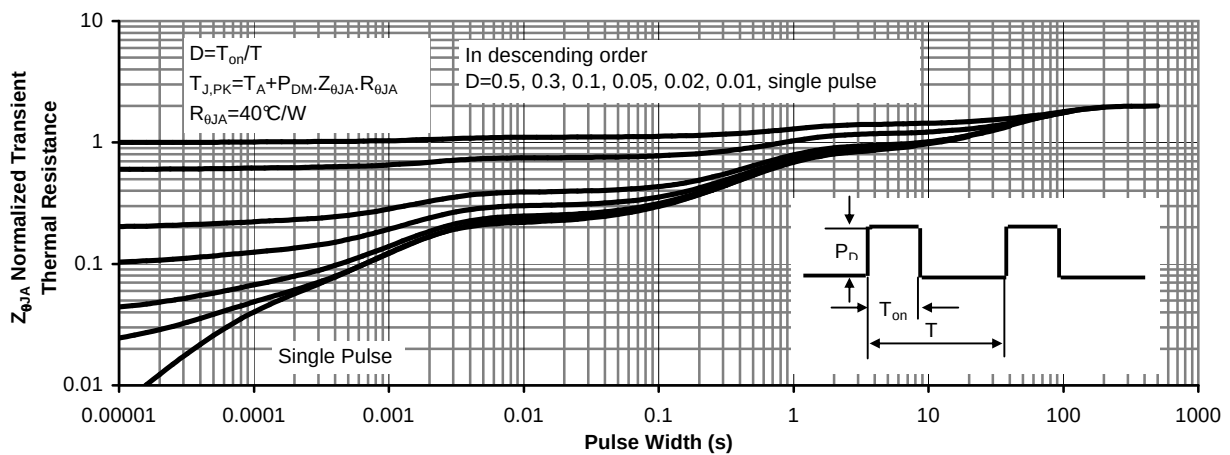


Figure 11: Normalized Maximum Transient Thermal Impedance