

**AO4425**
**P-Channel Enhancement Mode Field Effect Transistor**

**General Description**

The AO4425/L uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , and ultra-low low gate charge with a 25V gate rating. This device is suitable for use as a load switch or in PWM applications. It is ESD protected. *AO4425 and AO4425L are electrically identical.*

-RoHS Compliant

-AO4425L is Halogen Free

**Features**

$V_{DS} (V) = -38V$

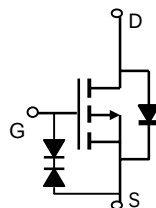
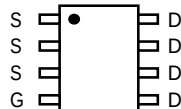
$I_D = -14A (V_{GS} = -20V)$

$R_{DS(ON)} < 10m\Omega (V_{GS} = -20V)$

$R_{DS(ON)} < 11m\Omega (V_{GS} = -10V)$

ESD Rating: 4000V HBM

**SOIC-8**  
**Top View**


**Absolute Maximum Ratings**  $T_A=25^\circ C$  unless otherwise noted

| Parameter                              | Symbol         | Maximum    | Units      |
|----------------------------------------|----------------|------------|------------|
| Drain-Source Voltage                   | $V_{DS}$       | -38        | V          |
| Gate-Source Voltage                    | $V_{GS}$       | $\pm 25$   | V          |
| Continuous Drain Current <sup>A</sup>  | $I_D$          | -14        | A          |
| $T_A=25^\circ C$                       |                |            |            |
| $T_A=70^\circ C$                       |                | -11        |            |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | -50        |            |
| Power Dissipation <sup>A</sup>         | $P_D$          | 3.1        | W          |
| $T_A=25^\circ C$                       |                |            |            |
| $T_A=70^\circ C$                       |                | 2          |            |
| Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 to 150 | $^\circ C$ |

**Thermal Characteristics**

| Parameter                                | Symbol          | Typ | Max | Units        |
|------------------------------------------|-----------------|-----|-----|--------------|
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 26  | 40  | $^\circ C/W$ |
| $t \leq 10s$                             |                 |     |     |              |
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 50  | 75  | $^\circ C/W$ |
| Steady-State                             |                 |     |     |              |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 14  | 24  | $^\circ C/W$ |
| Steady-State                             |                 |     |     |              |

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                                                  | -38 |           |              | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                           |     |           | -100<br>-500 | nA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V<br>V <sub>DS</sub> =0V, V <sub>GS</sub> =±25V     |     |           | ±1<br>±10    | μA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA                                      | -2  | -2.5      | -3.5         | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-5V                                                  | -50 |           |              | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-20V, I <sub>D</sub> =-14A<br>T <sub>J</sub> =125°C                         |     | 7.7<br>11 | 10<br>13.5   | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-14A                                                   |     | 43        |              | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                     |     | 0.71      | 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> =-20V, f=1MHz                                           |     | 3800      |              | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                              |     | 560       |              | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                              |     | 350       |              | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                             |     | 7.5       |              | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                              |     |           |              |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, I <sub>D</sub> =-14A                           |     | 63        |              | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                              |     | 14.1      |              | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                              |     | 16.1      |              | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-20V, R <sub>L</sub> =1.35Ω,<br>R <sub>GEN</sub> =3Ω |     | 12.4      |              | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                              |     | 9.2       |              | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                              |     | 97.5      |              | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                              |     | 45.5      |              | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-14A, dI/dt=100A/μs                                                          |     | 35        |              | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-14A, dI/dt=100A/μs                                                          |     | 33        |              | 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 given application depends on the user's specific board design. The current rating is based on the ≤ 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 <300μs 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

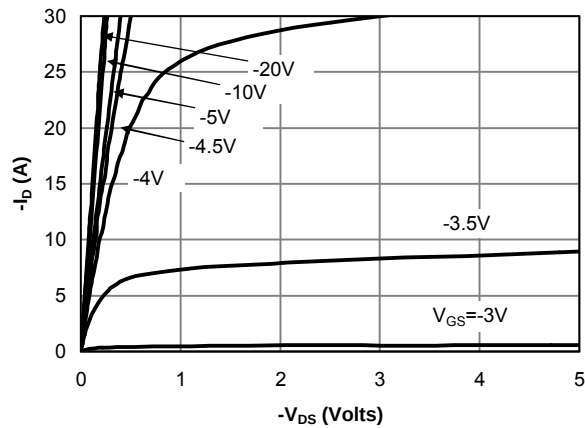


Fig 1: On-Region Characteristics

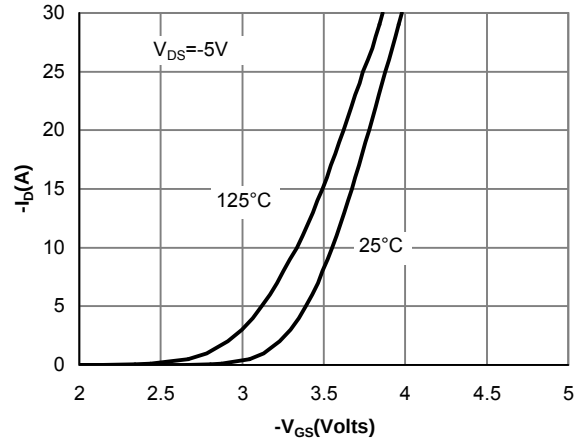


Figure 2: Transfer Characteristics

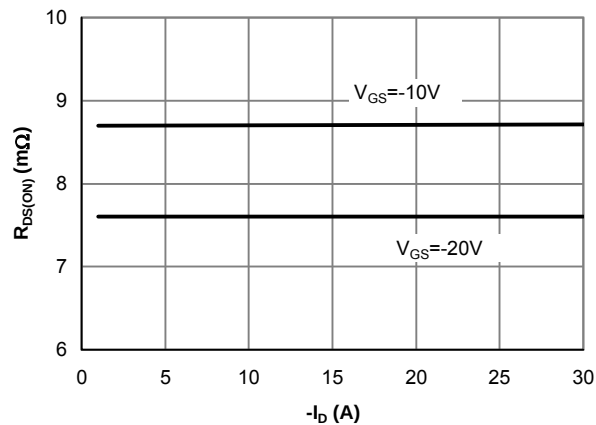


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

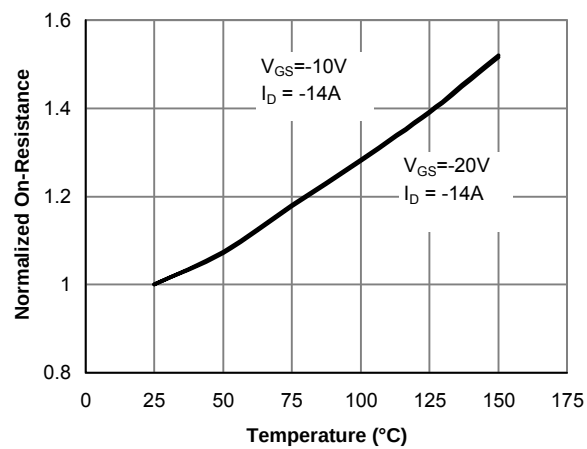


Figure 4: On-Resistance vs. Junction Temperature

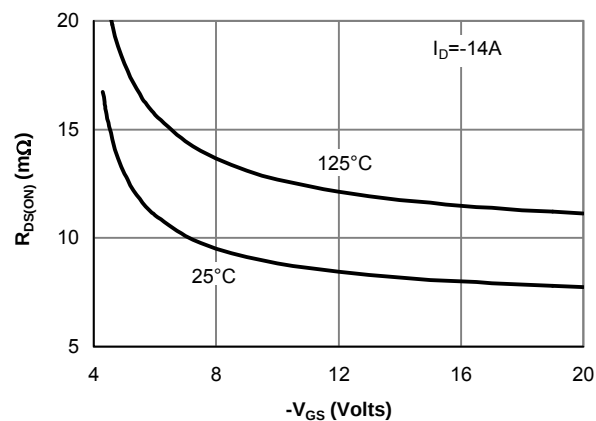


Figure 5: On-Resistance vs. Gate-Source Voltage

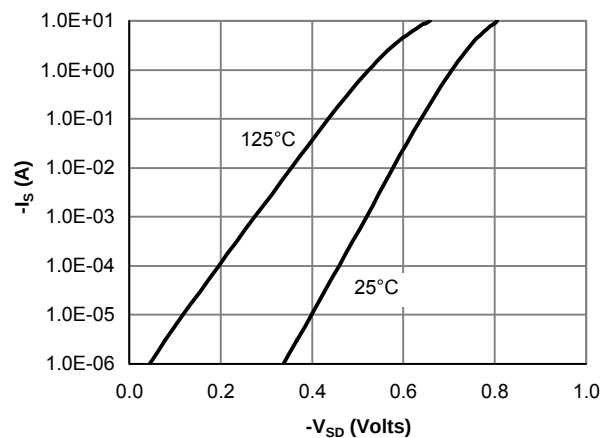


Figure 6: Body-Diode Characteristics

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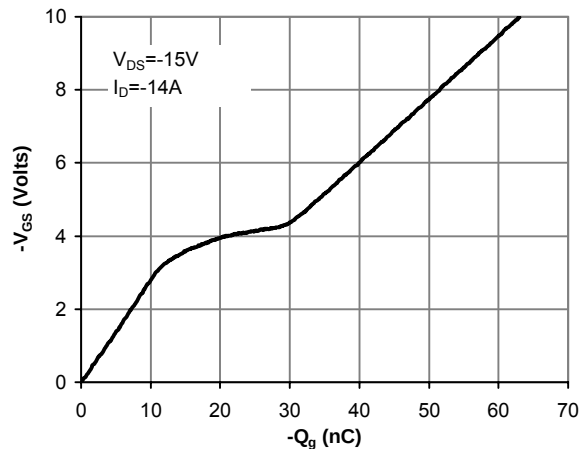


Figure 7: Gate-Charge Characteristics

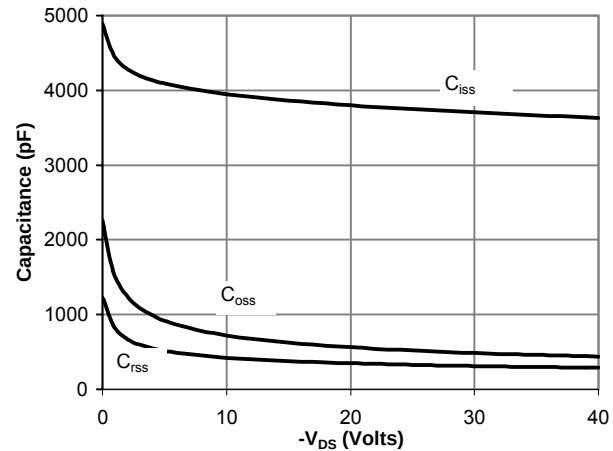


Figure 8: Capacitance Characteristics

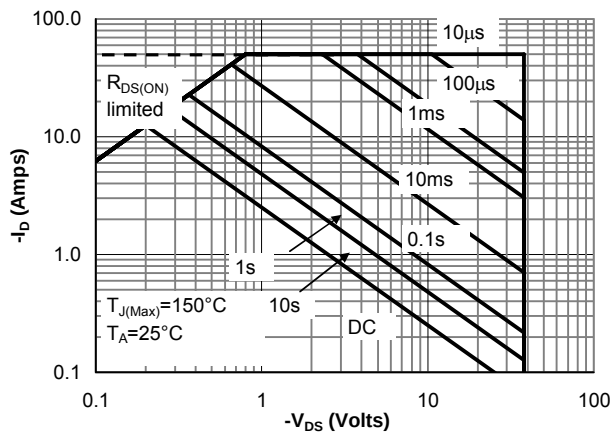


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

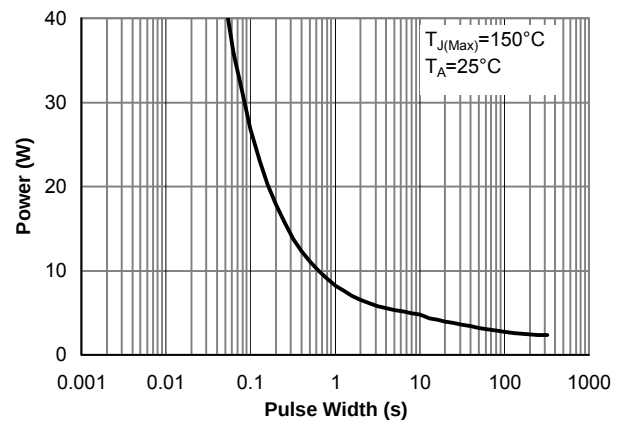


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

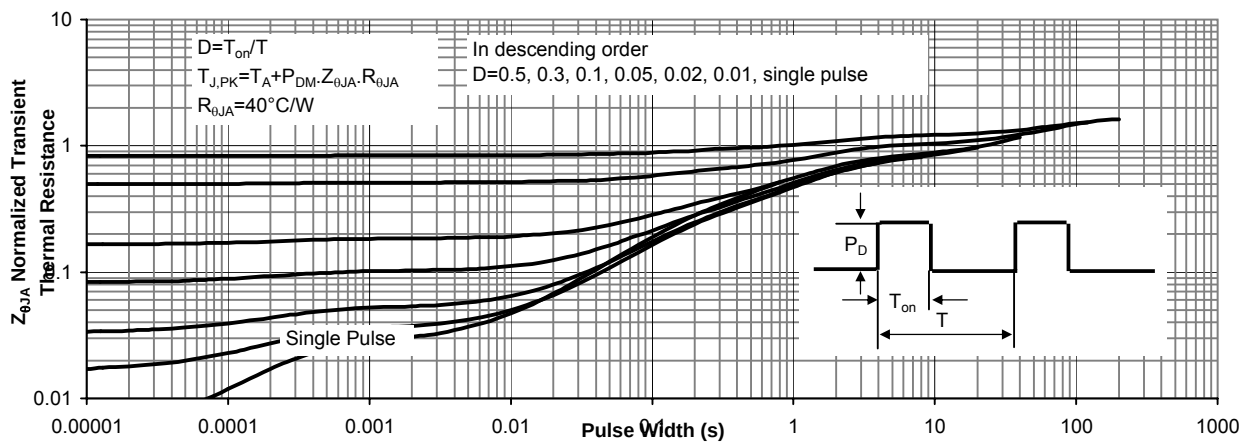


Figure 11: Normalized Maximum Transient Thermal Impedance