



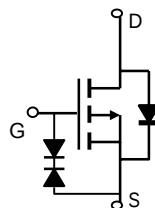
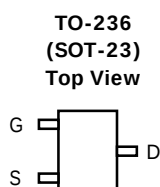
**AO3419, AO3419L ( Green Product )**  
**P-Channel Enhancement Mode Field Effect Transistor**

**General Description**

The AO3419 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected. AO3419L ( Green Product ) is offered in a lead-free package.

**Features**

$V_{DS} (V) = -20V$   
 $I_D = -3.5 A$   
 $R_{DS(ON)} < 75m\Omega (V_{GS} = -10V)$   
 $R_{DS(ON)} < 95m\Omega (V_{GS} = -4.5V)$   
 $R_{DS(ON)} < 145m\Omega (V_{GS} = -2.5V)$   
ESD Rating: 2000V HBM



**Absolute Maximum Ratings**  $T_A=25^\circ C$  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>  | $I_D$          | -3.5       | A          |
| $T_A=25^\circ C$                       |                |            |            |
| $T_A=70^\circ C$                       |                | -2.8       |            |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | -15        |            |
| Power Dissipation <sup>A</sup>         | $P_D$          | 1.4        | W          |
| $T_A=25^\circ C$                       |                |            |            |
| $T_A=70^\circ C$                       |                | 0.9        |            |
| 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> | $R_{\theta JA}$ | 65  | 90  | $^\circ C/W$ |
| $t \leq 10s$                             |                 |     |     |              |
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 85  | 125 | $^\circ C/W$ |
| Steady-State                             |                 |     |     |              |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 43  | 60  | $^\circ C/W$ |
| 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                                                 | -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                          |       |          | -0.5<br>-2.5 | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V                                                  |       |          | ±1           | μA    |
|                             |                                       | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                                  |       |          | ±10          | μA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -0.7  | -0.9     | -1.4         | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V                                                | -15   |          |              | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-10V, I <sub>D</sub> =-3.5A<br>T <sub>J</sub> =125°C                       |       | 59<br>83 | 75<br>105    | mΩ    |
|                             |                                       | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A                                                 |       | 76       | 95           | mΩ    |
|                             |                                       | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-1A                                                 |       | 111      | 145          | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3.5A                                                 |       | 6.8      |              | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                    | -0.65 | -0.81    | -0.95        | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                             |       |          | -2           | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                             |       |          |              |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V, f=1MHz                                          |       | 512      | 620          | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                             |       | 77       |              | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                             |       | 62       |              | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                            |       | 9.2      | 13           | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                             |       |          |              |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, I <sub>D</sub> =-3.5A                        |       | 5.5      | 6.6          | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                             |       | 0.8      |              | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                             |       | 1.9      |              | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-10V, R <sub>L</sub> =2.8Ω,<br>R <sub>GEN</sub> =3Ω |       | 5        |              | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                             |       | 6.7      |              | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                             |       | 28       |              | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                             |       | 13.5     |              | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-3.5A, dI/dt=100A/μs                                                        |       | 9.8      | 12           | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-3.5A, dI/dt=100A/μs                                                        |       | 2.7      |              | nC    |

A: The value of R<sub>θJA</sub> is measured 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 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

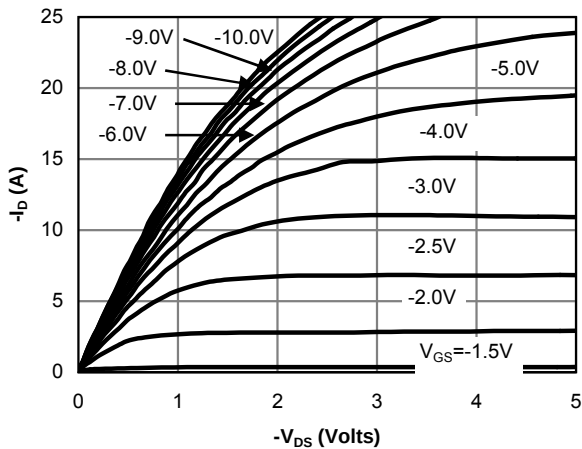


Fig 1: On-Region Characteristics

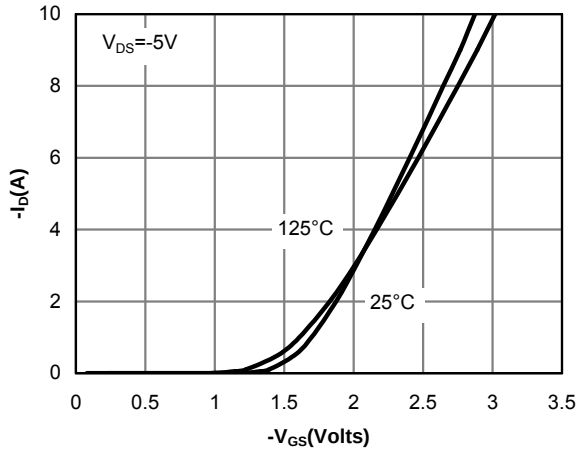


Figure 2: Transfer Characteristics

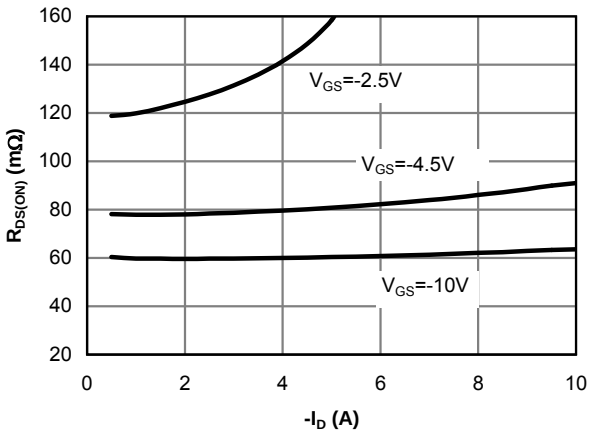


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

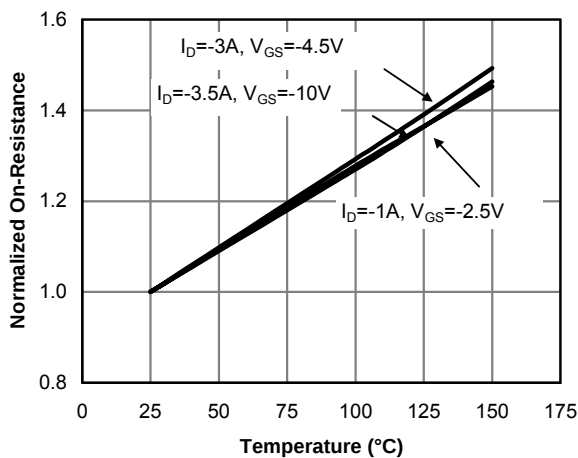


Figure 4: On-Resistance vs. Junction Temperature

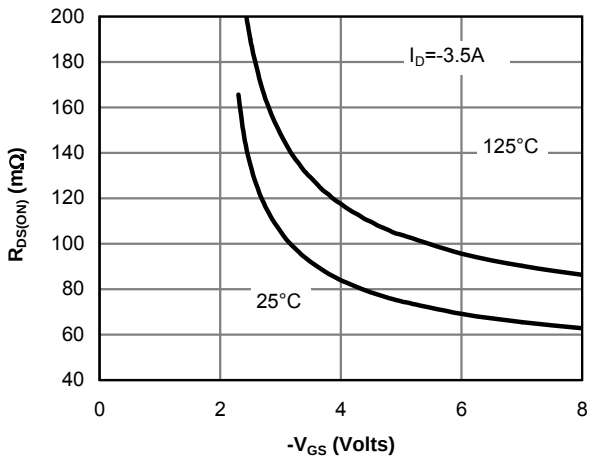


Figure 5: On-Resistance vs. Gate-Source Voltage

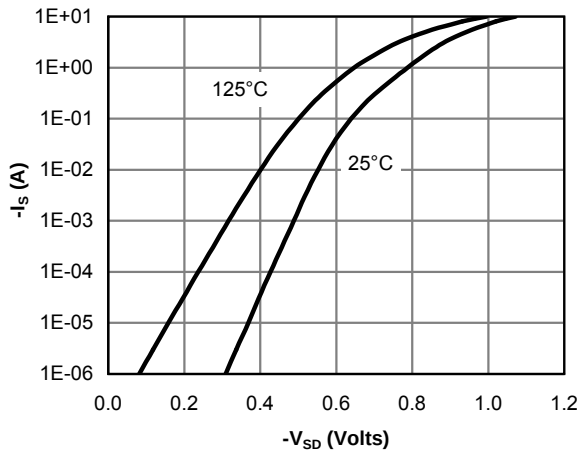


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

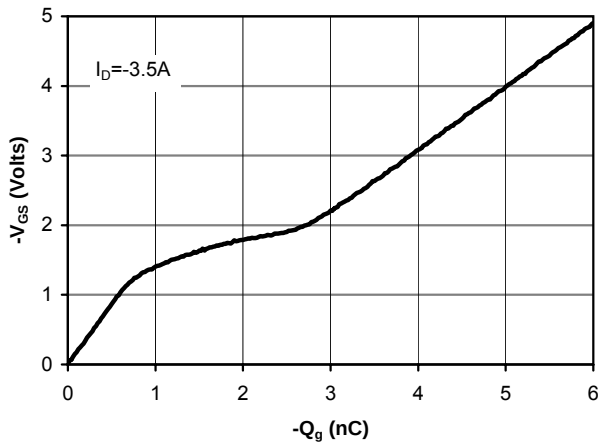


Figure 7: Gate-Charge Characteristics

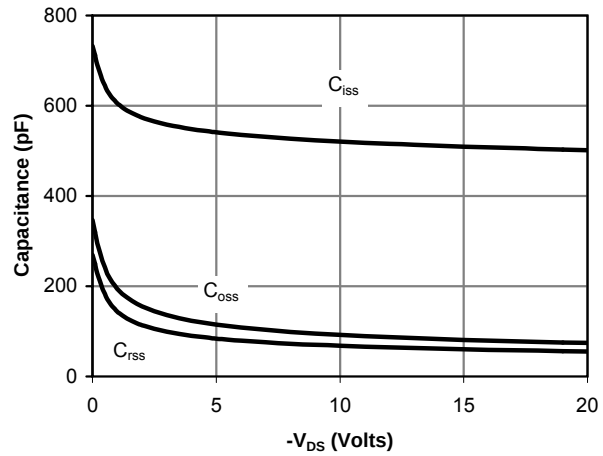


Figure 8: Capacitance Characteristics

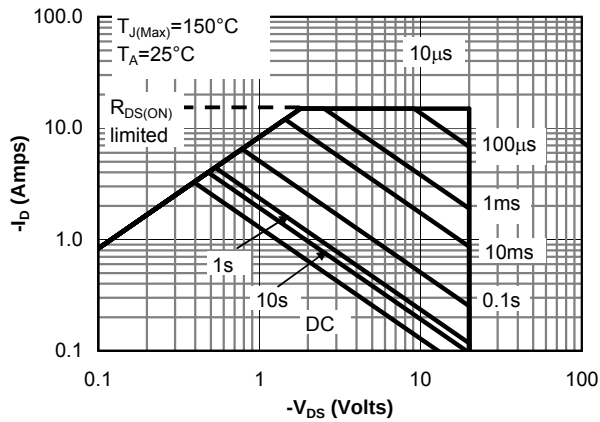


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

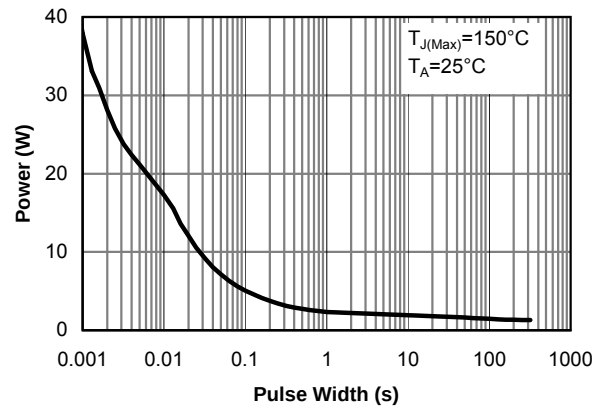


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

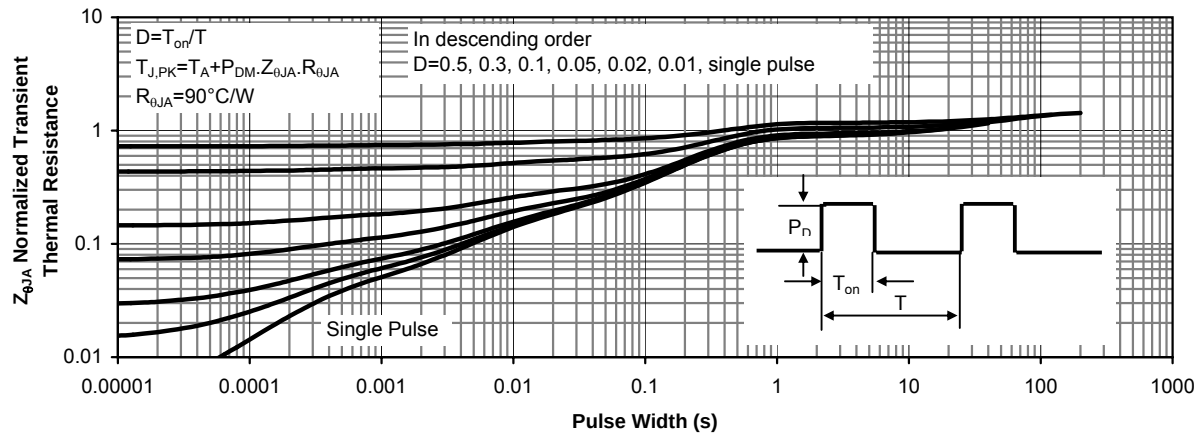


Figure 11: Normalized Maximum Transient Thermal Impedance