



**ALPHA & OMEGA**  
SEMICONDUCTOR

**AO6419**

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



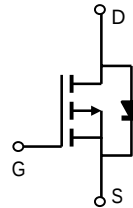
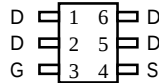
### General Description

The AO6419 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use as a load switch or in PWM applications. *Standard Product AO6419 is Pb-free (meets ROHS & Sony 259 specifications). AO6419L is a Green Product ordering option. AO6419 and AO6419L are electrically identical.*

### Features

$V_{DS} (V) = -30V$   
 $I_D = -5 A (V_{GS} = -10V)$   
 $R_{DS(ON)} < 52m\Omega (V_{GS} = -10V)$   
 $R_{DS(ON)} < 87m\Omega (V_{GS} = -4.5V)$   
 $R_{DS(ON)} < 110m\Omega (V_{GS} = -3.5V)$

**TSOP6  
Top View**



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

| Parameter                              | Symbol         | Maximum    | Units      |
|----------------------------------------|----------------|------------|------------|
| Drain-Source Voltage                   | $V_{DS}$       | -30        | V          |
| Gate-Source Voltage                    | $V_{GS}$       | $\pm 20$   | V          |
| Continuous Drain Current <sup>A</sup>  | $I_D$          | -5         | A          |
|                                        |                | -4.2       |            |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | -20        |            |
| Power Dissipation <sup>A</sup>         | $P_D$          | 2          | W          |
|                                        |                | 1.4        |            |
| 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> | $R_{\theta JA}$ | 47.5 | 62.5 | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | 74   | 110  | $^\circ C/W$ |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 37   | 50   | $^\circ C/W$ |

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                                               | -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> =±20V                                                |     |          | ±100     | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                 | -1  | -1.8     | -3       | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V                                              | -20 |          |          | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =-10V, I <sub>D</sub> =5.0A<br>T <sub>J</sub> =125°C                      |     | 39<br>54 | 52<br>70 | mΩ    |
|                             |                                       | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A                                               |     | 67       | 87       | mΩ    |
|                             |                                       | V <sub>GS</sub> =-3.5V, I <sub>D</sub> =-1A                                               |     | 85       | 110      | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =-5V, I <sub>D</sub> =-5A                                                 | 6   | 8.6      |          | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =-1A, V <sub>GS</sub> =0V                                                  |     | -0.77    | -1       | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |                                                                                           |     |          | -2.8     | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |                                                                                           |     |          |          |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz                                        |     | 700      | 840      | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |                                                                                           |     | 120      |          | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |                                                                                           |     | 75       |          | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                          |     | 10       | 15       | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |                                                                                           |     |          |          |       |
| Q <sub>g</sub> (10V)        | Total Gate Charge (10V)               | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-5A                         |     | 14.7     | 18       | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge (4.5V)              |                                                                                           |     | 7.6      | 9.5      | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |                                                                                           |     | 2        |          | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |                                                                                           |     | 3.8      |          | nC    |
| t <sub>D(on)</sub>          | Turn-On DelayTime                     | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, R <sub>L</sub> =3Ω,<br>R <sub>GEN</sub> =3Ω |     | 8.3      |          | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |                                                                                           |     | 5        |          | ns    |
| t <sub>D(off)</sub>         | Turn-Off DelayTime                    |                                                                                           |     | 29       |          | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |                                                                                           |     | 14       |          | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =-5A, dI/dt=100A/μs                                                        |     | 23.5     | 30       | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =-5A, dI/dt=100A/μs                                                        |     | 13.4     |          | 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 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 80μs 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

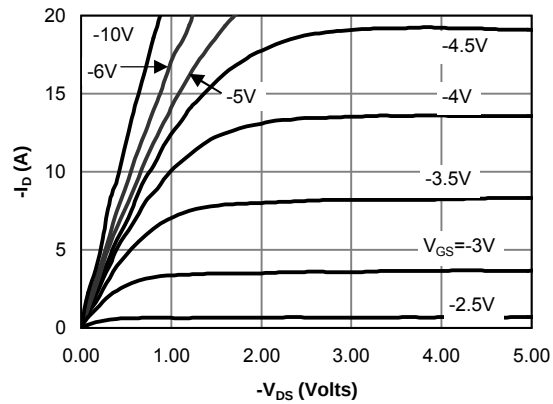


Figure 1: On-Region Characteristics

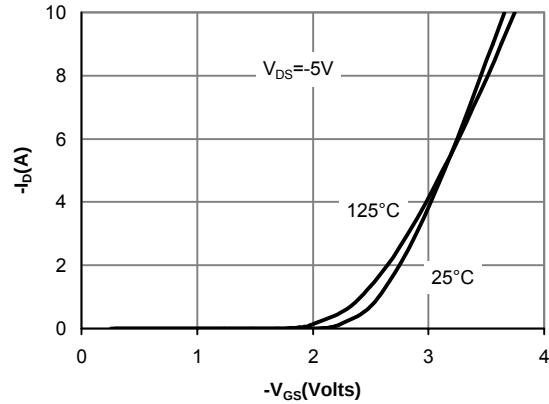


Figure 2: Transfer Characteristics

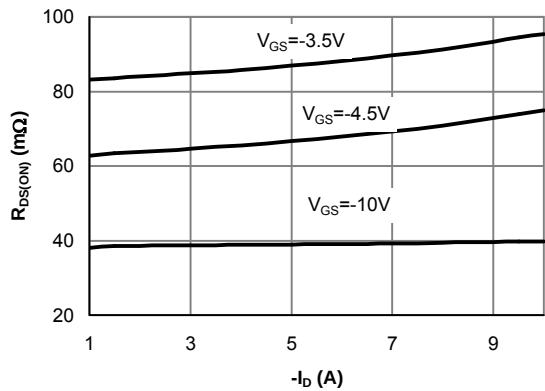


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

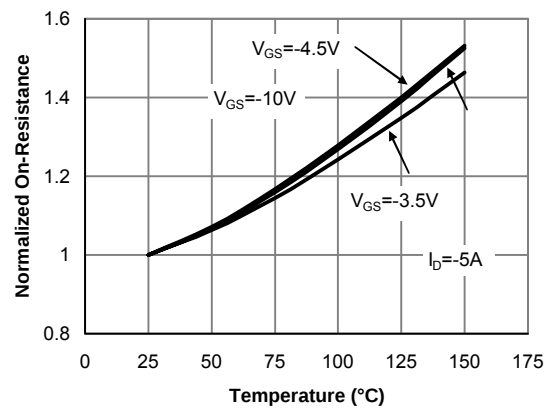


Figure 4: On-Resistance vs. Junction Temperature

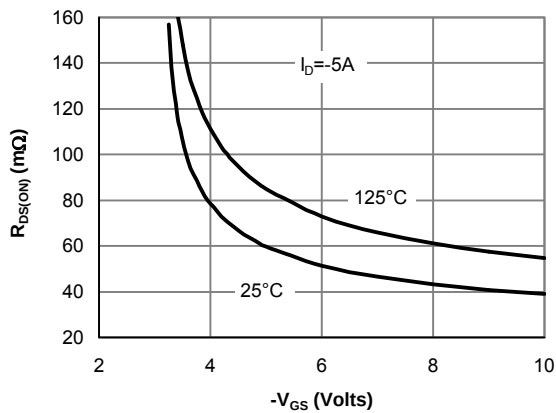


Figure 5: On-Resistance vs. Gate-Source Voltage

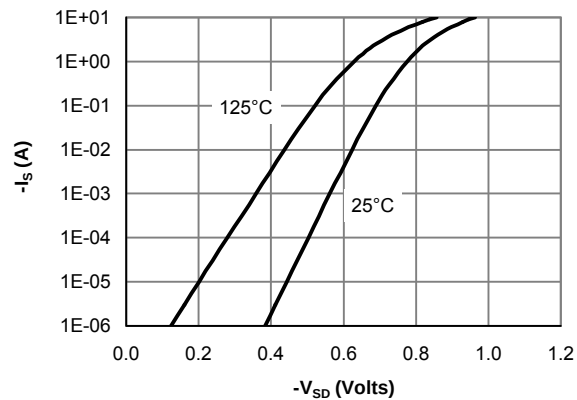


Figure 6: Body-Diode Characteristics

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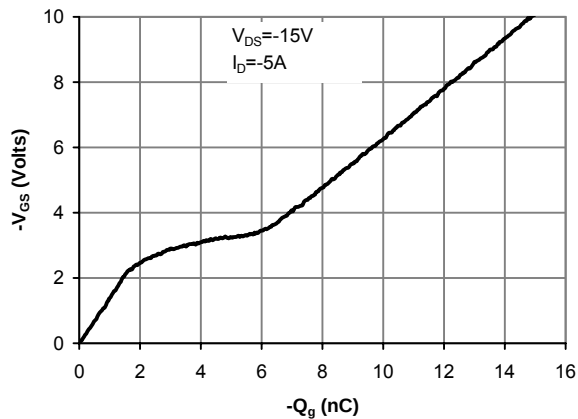


Figure 7: Gate-Charge Characteristics

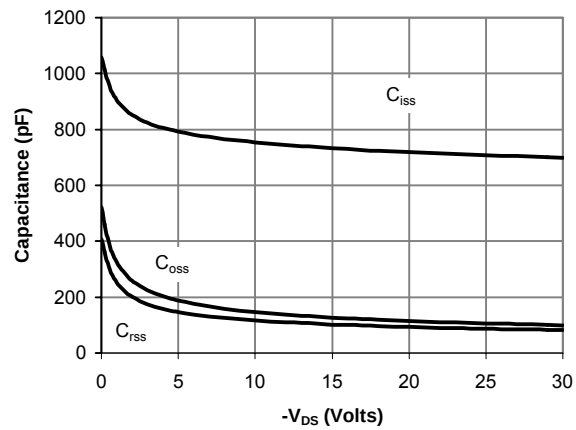


Figure 8: Capacitance Characteristics

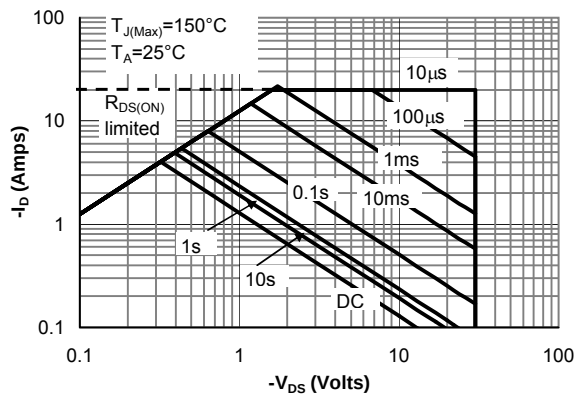


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

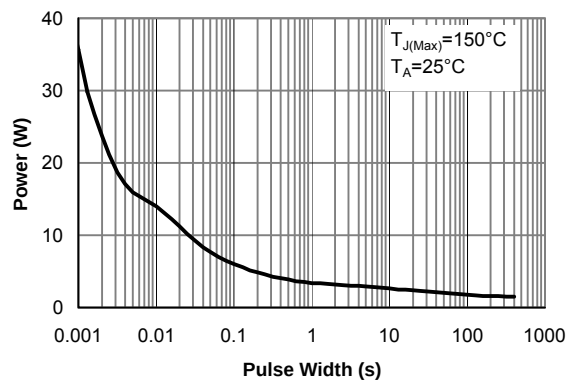


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

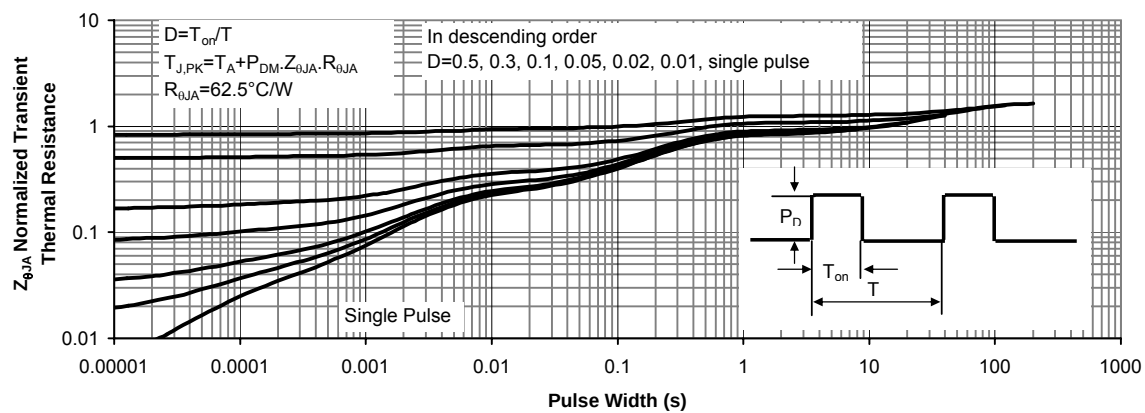


Figure 11: Normalized Maximum Transient Thermal Impedance