

**AO3424**
**N-Channel Enhancement Mode Field Effect Transistor**

**General Description**

The AO3424/L uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , very 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. *AO3424 and AO3424L are electrically identical.*

-RoHS Compliant

-AO3424L is Halogen Free

**Features**

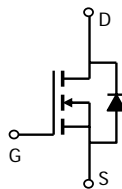
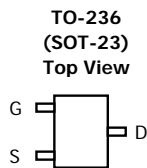
$V_{DS}$  (V) = 30V

$I_D$  = 2 A ( $V_{GS}$  = 10V)

$R_{DS(ON)} < 80m\Omega$  ( $V_{GS}$  = 10V)

$R_{DS(ON)} < 95m\Omega$  ( $V_{GS}$  = 4.5V)

$R_{DS(ON)} < 157m\Omega$  ( $V_{GS}$  = 2.5V)


**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                    | $V_{GS}$       | $\pm 12$                 | V                |
| Continuous Drain Current <sup>A</sup>  | $I_D$          | $T_A=25^\circ\text{C}^F$ | A                |
|  |                | $T_A=70^\circ\text{C}^F$ |                  |
| Pulsed Drain Current <sup>B</sup>      | $I_{DM}$       | 8                        |                  |
| Power Dissipation <sup>A</sup>         | $P_D$          | $T_A=25^\circ\text{C}$   | W                |
|  |                | $T_A=70^\circ\text{C}$   |                  |
| 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> | $R_{\theta JA}$ | $t \leq 10s$ | 70  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State | 100 | 125                |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 63           | 80  | $^\circ\text{C/W}$ |

**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  | 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                         |     | 0.001 | 1   | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V  |     |       | 100 | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                  | 1   | 1.45  | 1.8 | V     |
| I <sub>D(ON)</sub>          | On state drain current                | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V  | 8   |       |     | A     |
| R <sub>DS(ON)</sub>         | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =2A<br>T <sub>J</sub> =125°C                         |     | 67    | 80  | mΩ    |
|                             |                                       | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A   |     | 76    | 95  | mΩ    |
|                             |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =1A   |     | 121   | 157 | mΩ    |
| g <sub>FS</sub>             | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =2A   |     | 11.7  |     | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =0V   |     | 0.8   | 1   | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current |   |     |       | 1.8 | A     |
| <b>DYNAMIC PARAMETERS</b>   |                                       |   |     |       |     |       |
| C <sub>iss</sub>            | Input Capacitance                     | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz   |     | 226   | 270 | pF    |
| C <sub>oss</sub>            | Output Capacitance                    |   |     | 39    |     | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance          |   |     | 29    |     | pF    |
| R <sub>g</sub>              | Gate resistance                       | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  |     | 1.4   | 4   | Ω     |
| <b>SWITCHING PARAMETERS</b> |                                       |   |     |       |     |       |
| Q <sub>g</sub>              | Total Gate Charge                     | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =2A                           |     | 2.6   | 3.2 | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                    |   |     | 1.3   |     | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                     |   |     | 0.5   |     | nC    |
| t <sub>D(on)</sub>          | Turn-On Delay Time                    | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =7.5Ω,<br>R <sub>GEN</sub> =6Ω |     | 2.6   | 4   | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                     |   |     | 3.2   | 5   | ns    |
| t <sub>D(off)</sub>         | Turn-Off Delay Time                   |   |     | 14.5  | 22  | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                    |   |     | 2.1   | 3   | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time      | I <sub>F</sub> =2A, dI/dt=100A/μs   |     | 10.2  | 13  | ns    |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =2A, dI/dt=100A/μs   |     | 3.8   | 5   | 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 <300 μs pulses, duty cycle 0.5% max.

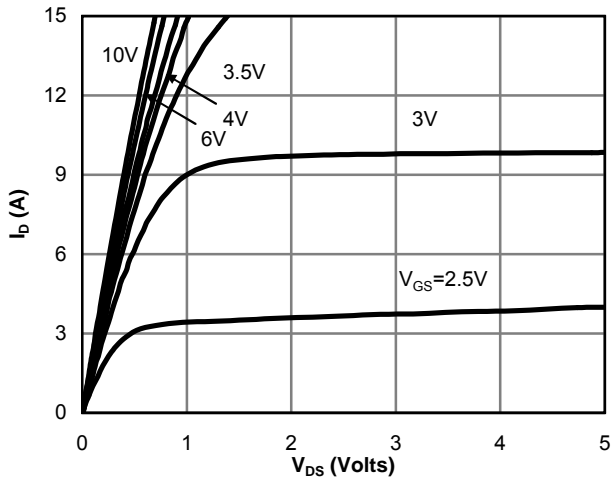
E: These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

F: The maximum current rating is limited by bond-wires.

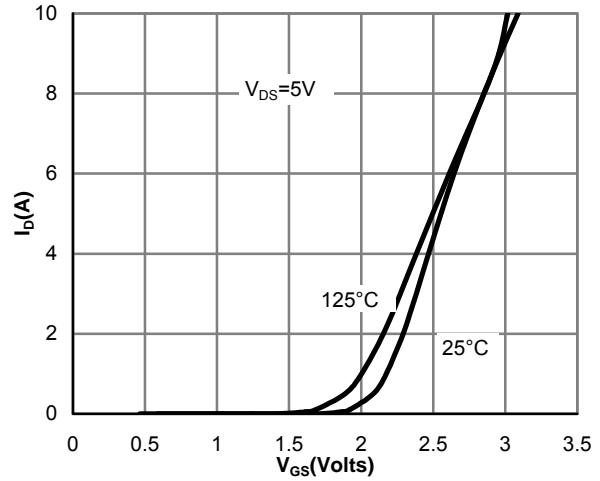
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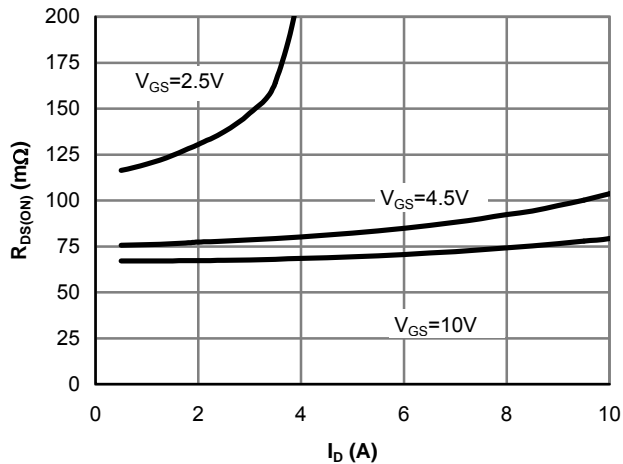
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



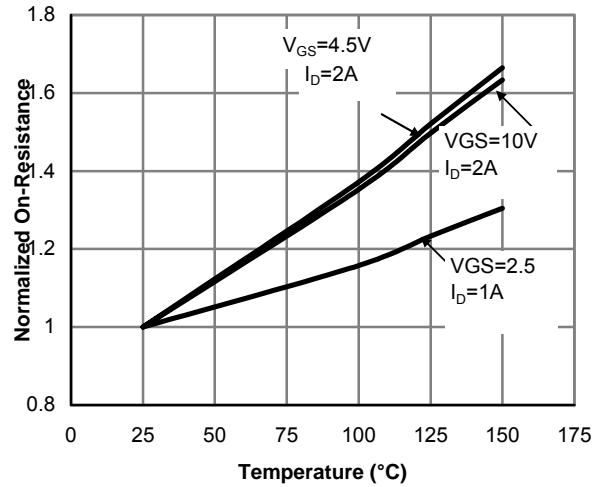
**Fig 1: On-Region Characteristics**



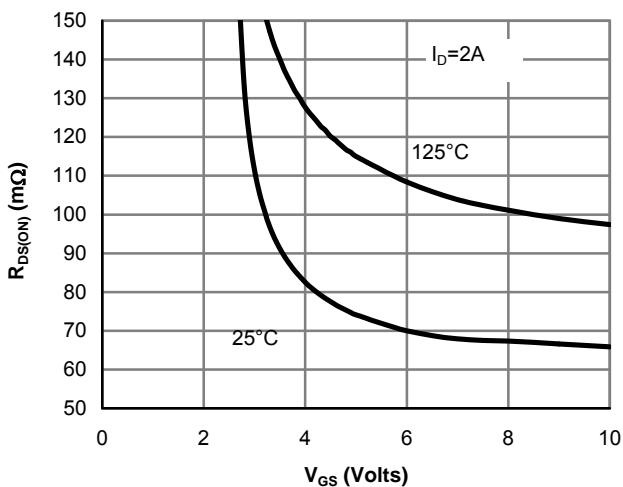
**Figure 2: Transfer Characteristics**



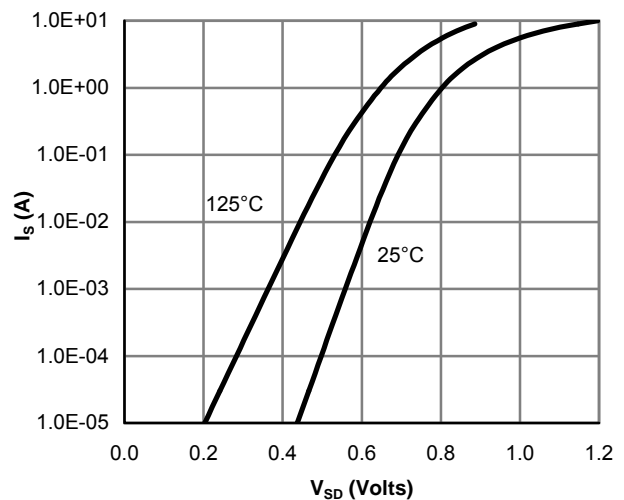
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**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

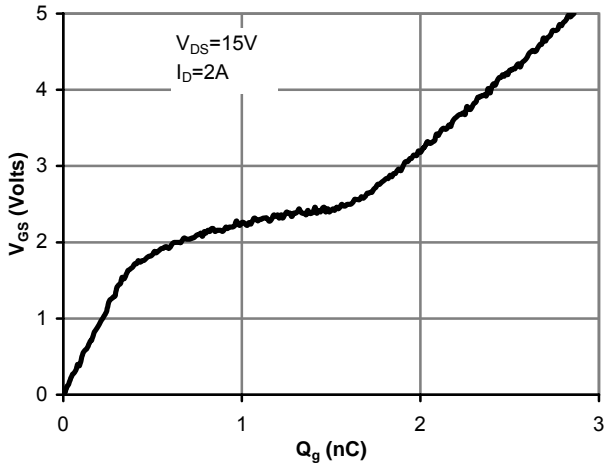


Figure 7: Gate-Charge Characteristics

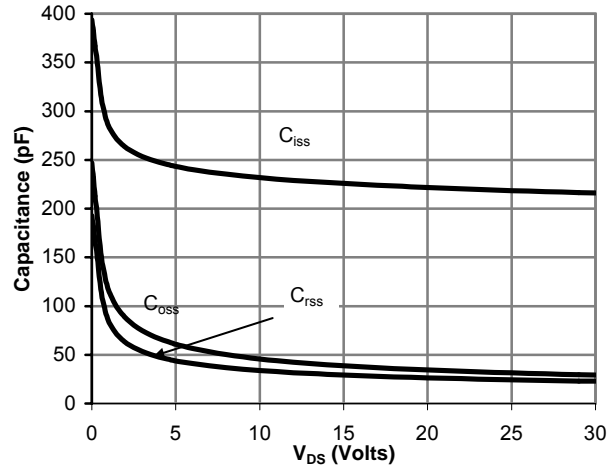


Figure 8: Capacitance Characteristics

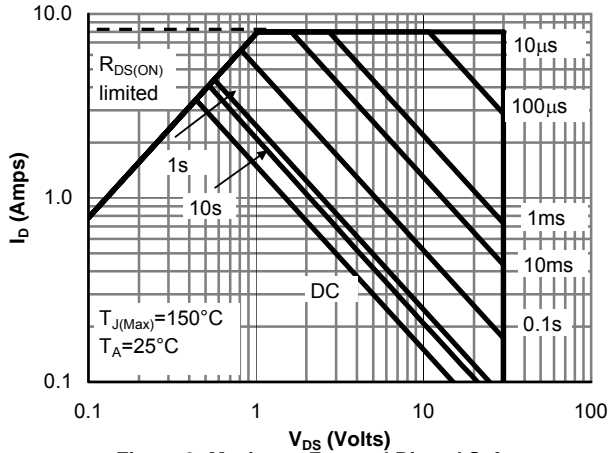


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

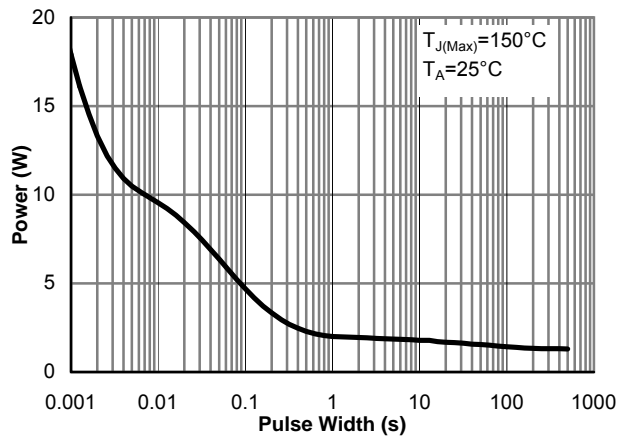


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

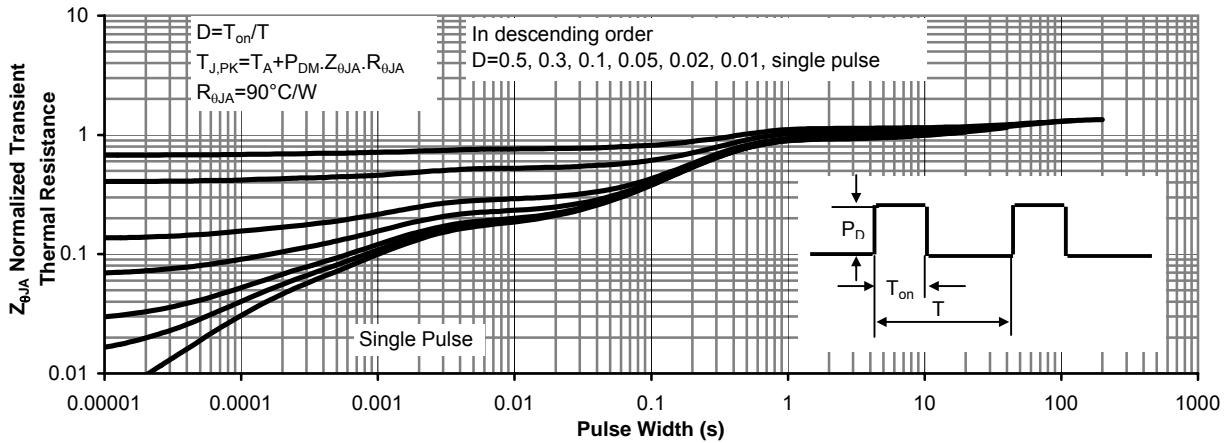


Figure 11: Normalized Maximum Transient Thermal Impedance