



ALPHA & OMEGA
SEMICONDUCTOR, LTD

AO4484

N-Channel Enhancement Mode Field Effect Transistor



General Description

The AO4484/L uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge. This is an all purpose device that is suitable for use in a wide range of power conversion applications.

AO4484 and AO4484L are electrically identical.

-RoHS Compliant

-AO4484L is Halogen Free

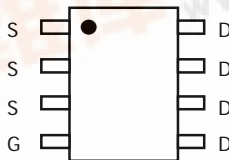
Features

V_{DS} (V) = 40V

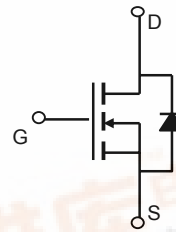
I_D = 10A (V_{GS} = 10V)

$R_{DS(ON)}$ < 10m Ω (V_{GS} = 10V)

$R_{DS(ON)}$ < 12m Ω (V_{GS} = 4.5V)



SOIC-8



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

| Parameter | Symbol | 10 Sec | Steady State | Units |
|---|----------------|------------|--------------|------------------|
| Drain-Source Voltage | V_{DS} | 40 | | V |
| Gate-Source Voltage | V_{GS} | ± 20 | | V |
| Continuous Drain Current ^A | I_D | 13.5 | 10 | A |
| $T_A=25^\circ\text{C}$ | | | | |
| $T_A=70^\circ\text{C}$ | | 10.8 | 8 | |
| Pulsed Drain Current ^B | I_{DM} | 120 | | |
| Avalanche Current ^G | I_{AR} | 23 | | |
| Repetitive avalanche energy $L=0.3\text{mH}$ ^G | E_{AR} | 79 | | mJ |
| Power Dissipation ^A | P_D | 3.1 | 1.7 | W |
| $T_A=25^\circ\text{C}$ | | | | |
| $T_A=70^\circ\text{C}$ | | 2.0 | 1.1 | |
| 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 ^A | $R_{\theta JA}$ | 31 | 40 | $^\circ\text{C/W}$ |
| $t \leq 10\text{s}$ | | | | |
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | 59 | 75 | $^\circ\text{C/W}$ |
| Steady State | | | | |
| Maximum Junction-to-Lead ^C | $R_{\theta JL}$ | 16 | 24 | $^\circ\text{C/W}$ |
| Steady State | | | | |

Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|-----------------------------|---------------------------------------|---|-----|-------------------|------------------|------------------|
| STATIC PARAMETERS | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$ | 40 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 40\text{V}$, $V_{GS} = 0\text{V}$ $T_J = 55^{\circ}\text{C}$ | | | 1 5 | μA |
| I_{GSS} | Gate-Body leakage current | $V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$ | 1.7 | 2.2 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS} = 10\text{V}$, $V_{DS} = 5\text{V}$ | 120 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{V}$, $I_D = 10\text{A}$ $T_J = 125^{\circ}\text{C}$ $V_{GS} = 4.5\text{V}$, $I_D = 8\text{A}$ | | 8.2 12.5 10 | 10 16 12.5 | $\text{m}\Omega$ |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{V}$, $I_D = 10\text{A}$ | | 75 | | S |
| V_{SD} | Diode Forward Voltage | $I_S = 1\text{A}$, $V_{GS} = 0\text{V}$ | | 0.72 | 1 | V |
| I_S | Maximum Body-Diode Continuous Current | | | | 2.5 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=20\text{V}$, $f=1\text{MHz}$ | | 1500 | 1950 | pF |
| C_{oss} | Output Capacitance | | | 215 | | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 135 | | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$ | 2 | 3.5 | 5 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $I_D=10\text{A}$ | | 27.2 | 37 | nC |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 13.6 | 18 | nC |
| Q_{gs} | Gate Source Charge | | | 4.5 | | nC |
| Q_{gd} | Gate Drain Charge | | | 6.4 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}=10\text{V}$, $V_{DS}=20\text{V}$, $R_L = 2\Omega$, $R_{GEN}=3\Omega$ | | 6.4 | | ns |
| t_r | Turn-On Rise Time | | | 17.2 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 29.6 | | ns |
| t_f | Turn-Off Fall Time | | | 16.8 | | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=10\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | | 30 | 40 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=10\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | | 19 | | nC |

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^{\circ}\text{C}$. The value in any given application depends on the user's specific board design.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using $t \leq 300\mu\text{s}$ pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

F: The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

G: E_{AR} and I_{AR} ratings are based on low frequency and duty cycles to keep $T_J=25^{\circ}\text{C}$.

Rev0 April 2008

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

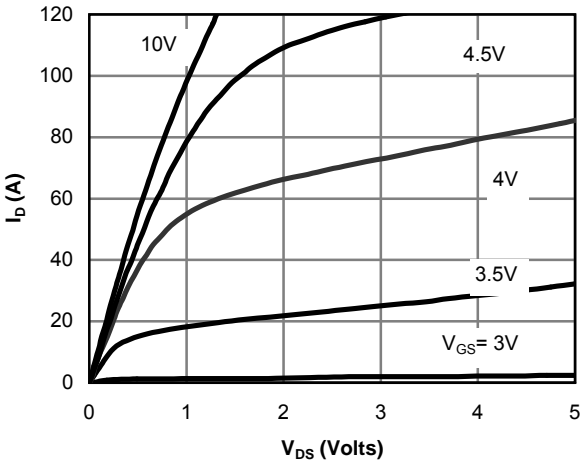


Figure 1: On-Region Characteristics

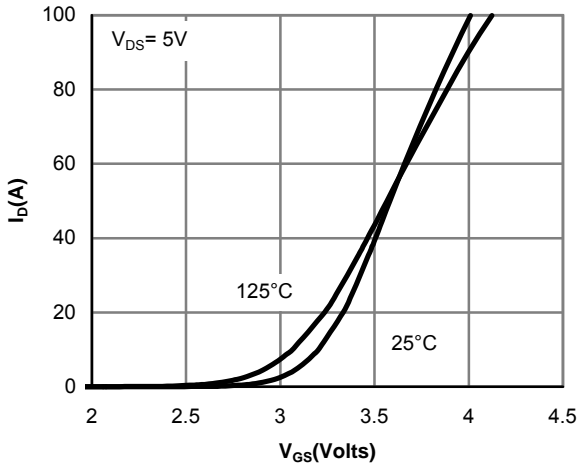


Figure 2: Transfer Characteristics

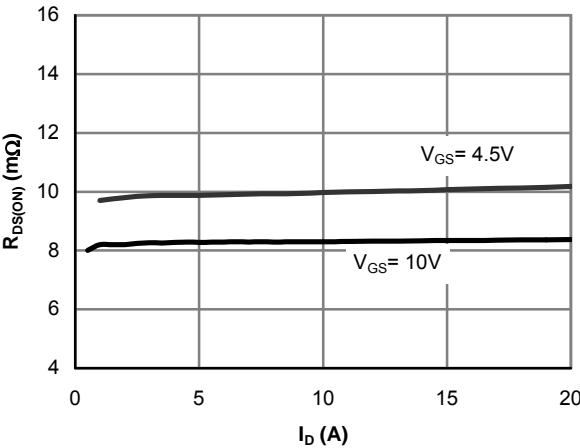


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

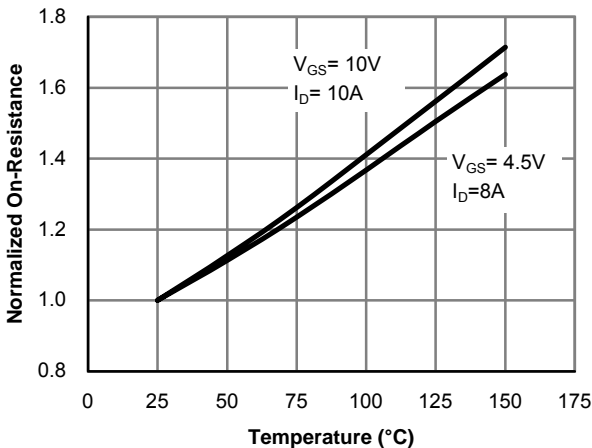


Figure 4: On-Resistance vs. Junction Temperature

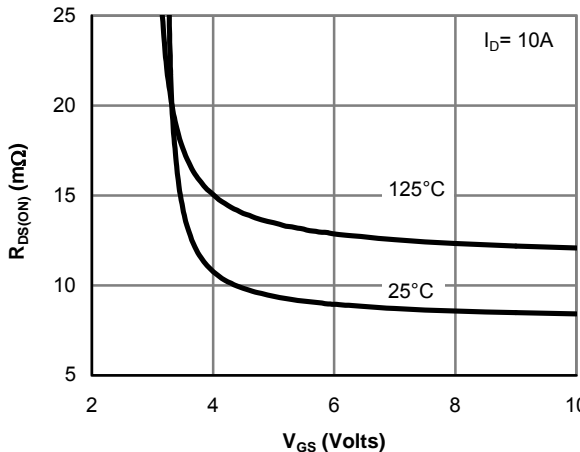


Figure 5: On-Resistance vs. Gate-Source Voltage

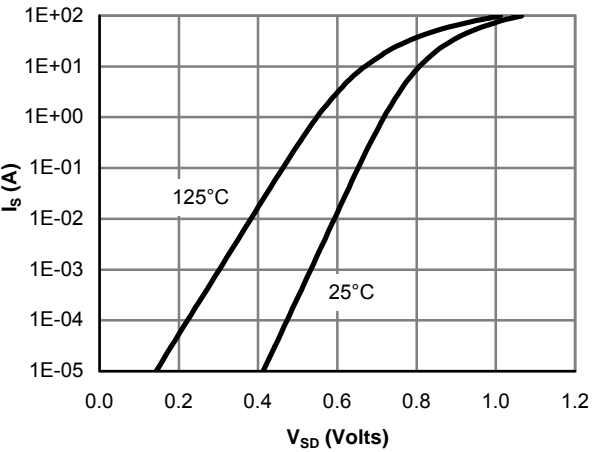


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

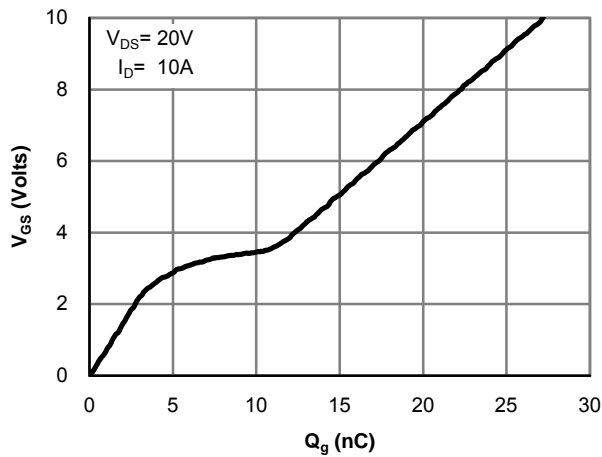


Figure 7: Gate-Charge Characteristics

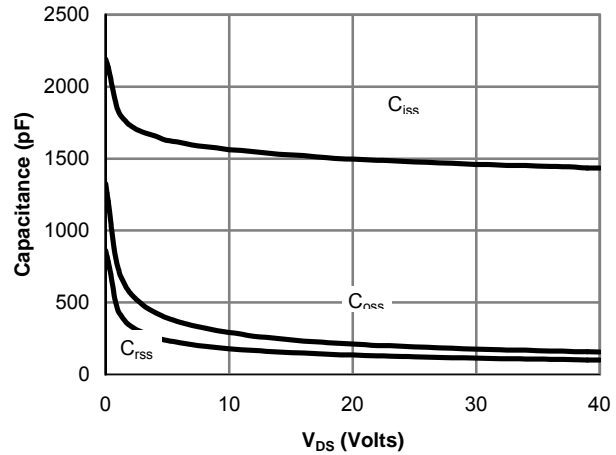


Figure 8: Capacitance Characteristics

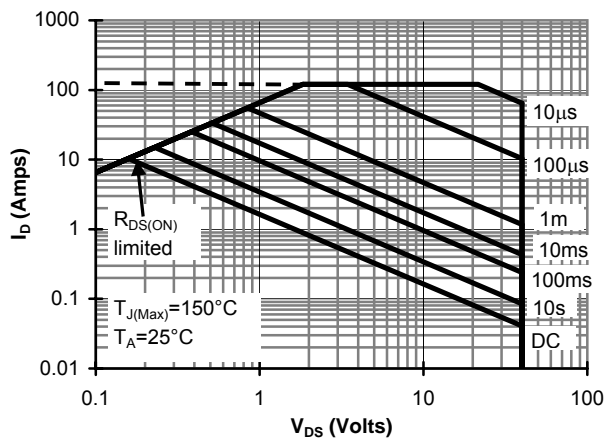


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

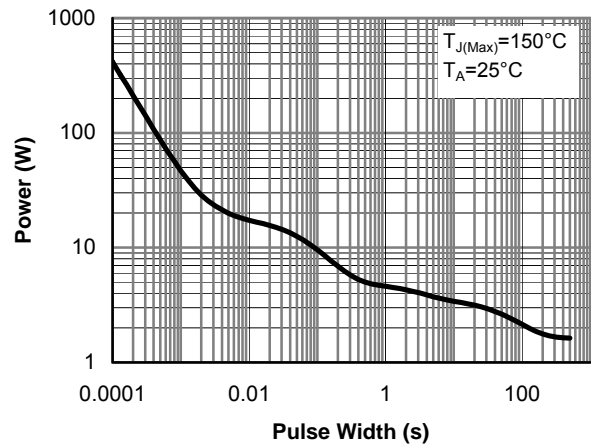


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

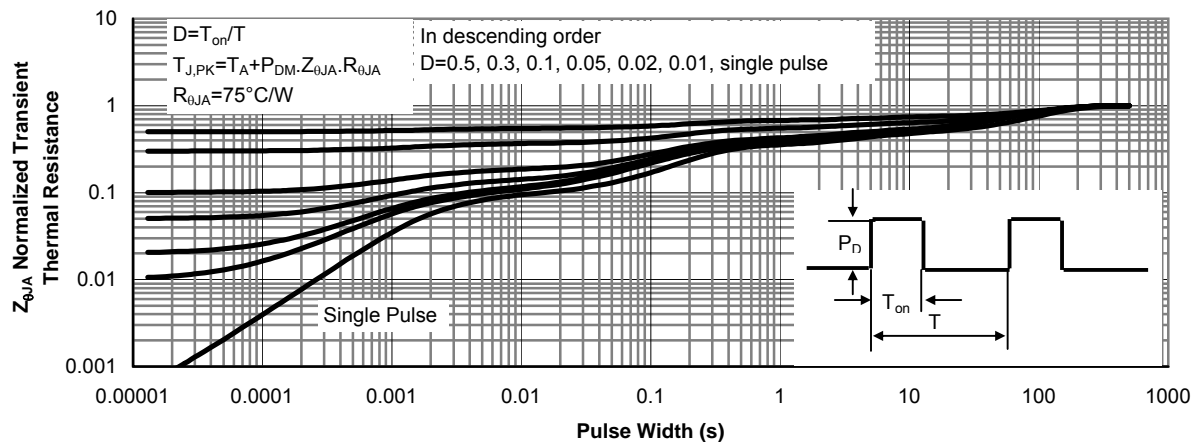


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)