



**AO4490**

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

**General Description**

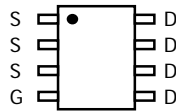
The AO4490/L uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V, while retaining a 20V  $V_{GS(MAX)}$  rating. It is ESD protected. This device is suitable for use as a load switch and general purpose applications. *AO4490 and AO4490L are electrically identical.*  
-RoHS Compliant  
-AO4490L is Halogen Free

**Features**

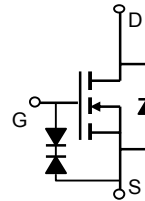
$V_{DS}$  (V) = 30V  
 $I_D$  = 16A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 7.2m\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 10m\Omega$  ( $V_{GS}$  = 4.5V)

ESD protected

***UIS Tested!***  
***Rg, Ciss, Coss, Crss Tested***



**SOIC-8**



**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                                | $V_{GS}$               | $\pm 20$   | V                |
| Continuous Drain Current <sup>AF</sup>             | $T_A=25^\circ\text{C}$ | 16         | A                |
|  | $T_A=70^\circ\text{C}$ | 13         |                  |
| Pulsed Drain Current <sup>B</sup>                  | $I_{DM}$               | 120        |                  |
| Avalanche Current <sup>G</sup>                     | $I_{AR}$               | 30         | A                |
| Repetitive avalanche energy $L=0.3mH$ <sup>G</sup> | $E_{AR}$               | 135        | mJ               |
| Power Dissipation                                  | $T_A=25^\circ\text{C}$ | 2.8        | W                |
|  | $T_A=70^\circ\text{C}$ | 1.8        |                  |
| 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> | $R_{\theta JA}$ | 32           | 45  | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady-State | 62  | 75                 |
| Maximum Junction-to-Lead <sup>C</sup>    | $R_{\theta JL}$ | 18           | 24  | $^\circ\text{C/W}$ |

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

| Symbol                      | Parameter                             | Conditions   | Min | Typ  | Max  | Units            |
|-----------------------------|---------------------------------------|--|-----|------|------|------------------|
| <b>STATIC PARAMETERS</b>    |                                       |  |     |      |      |                  |
| $BV_{DSS}$                  | Drain-Source Breakdown Voltage        | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$  | 30  |      |      | V                |
| $I_{DSS}$                   | Zero Gate Voltage Drain Current       | $V_{DS}=30\text{V}$ , $V_{GS}=0\text{V}$<br>$T_J=55^\circ\text{C}$               |     |      | 1    | $\mu\text{A}$    |
|                             |                                       |  |     |      | 5    |                  |
| $I_{GSS}$                   | Gate-Body leakage current             | $V_{DS}=0\text{V}$ , $V_{GS}=\pm 16\text{V}$                                     |     |      | 10   | $\mu\text{A}$    |
| $V_{GS(th)}$                | Gate Threshold Voltage                | $V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$   | 1.4 | 1.8  | 2.5  | 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     | $V_{GS}=10\text{V}$ , $I_D=16\text{A}$<br>$T_J=125^\circ\text{C}$                |     | 6    | 7.2  | $\text{m}\Omega$ |
|                             |                                       |  |     | 8.5  | 10   |                  |
|                             |                                       | $V_{GS}=4.5\text{V}$ , $I_D=12\text{A}$  |     | 8    | 10   | $\text{m}\Omega$ |
| $g_{FS}$                    | Forward Transconductance              | $V_{DS}=5\text{V}$ , $I_D=16\text{A}$  |     | 55   |      | S                |
| $V_{SD}$                    | Diode Forward Voltage                 | $I_S=1\text{A}$ , $V_{GS}=0\text{V}$   |     | 0.70 | 1.0  | V                |
| $I_S$                       | Maximum Body-Diode Continuous Current |  |     |      | 4    | A                |
| <b>DYNAMIC PARAMETERS</b>   |                                       |  |     |      |      |                  |
| $C_{iss}$                   | Input Capacitance                     |  |     | 1803 | 2170 | pF               |
| $C_{oss}$                   | Output Capacitance                    | $V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$                       |     | 387  |      | pF               |
| $C_{rss}$                   | Reverse Transfer Capacitance          |  |     | 238  |      | pF               |
| $R_g$                       | Gate resistance                       | $V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$                        |     | 1.3  | 2    | $\Omega$         |
| <b>SWITCHING PARAMETERS</b> |                                       |  |     |      |      |                  |
| $Q_g(10\text{V})$           | Total Gate Charge                     | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=16\text{A}$                     |     | 36   | 48   | nC               |
| $Q_g(4.5\text{V})$          | Total Gate Charge                     |  |     | 19   |      | nC               |
| $Q_{gs}$                    | Gate Source Charge                    |  |     | 3.9  |      | nC               |
| $Q_{gd}$                    | Gate Drain Charge                     |  |     | 8.7  |      | nC               |
| $t_{D(on)}$                 | Turn-On Delay Time                    | $V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=1\Omega$ ,<br>$R_{GEN}=3\Omega$ |     | 7.6  |      | ns               |
| $t_r$                       | Turn-On Rise Time                     |  |     | 6.4  |      | ns               |
| $t_{D(off)}$                | Turn-Off Delay Time                   |  |     | 27   |      | ns               |
| $t_f$                       | Turn-Off Fall Time                    |  |     | 8.5  |      | ns               |
| $t_{rr}$                    | Body Diode Reverse Recovery Time      | $I_F=16\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                               |     | 27   | 33   | ns               |
| $Q_{rr}$                    | Body Diode Reverse Recovery Charge    | $I_F=16\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$                               |     | 17   |      | nC               |

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> 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  $<300\mu\text{s}$  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  $T_A=25^\circ\text{C}$ . 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: EAR and IAR ratings are based on low frequency and duty cycles such that  $T_J(\text{start})=25\text{C}$  for each pulse.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

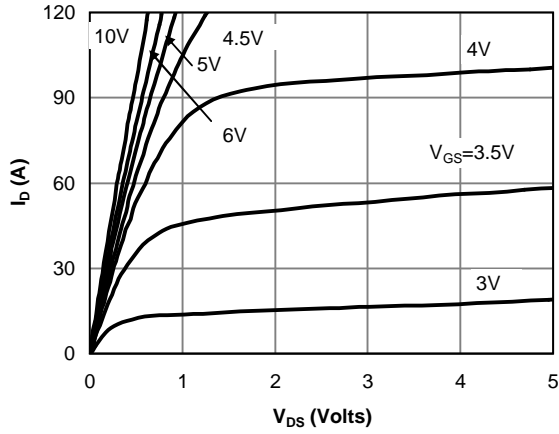


Figure 1: On-Region Characteristics

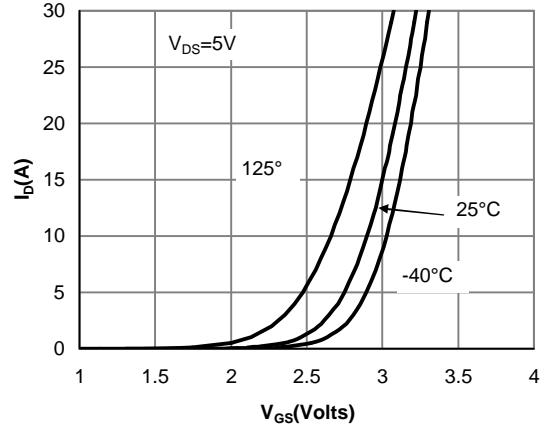


Figure 2: Transfer Characteristics

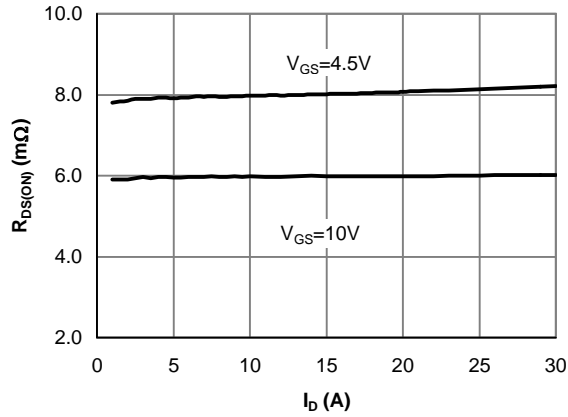


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

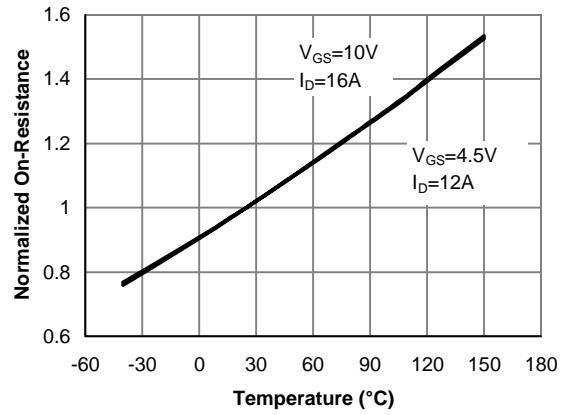


Figure 4: On-Resistance vs. Junction Temperature

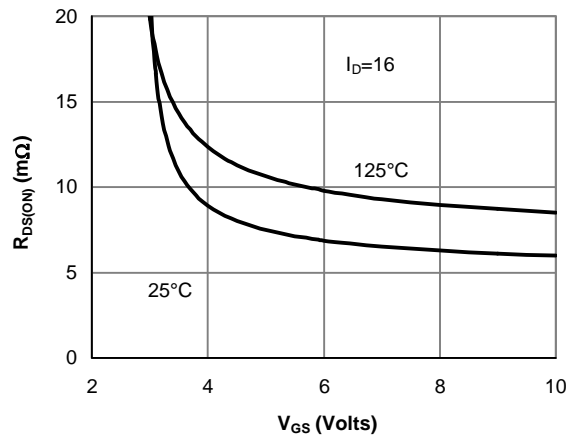


Figure 5: On-Resistance vs. Gate-Source Voltage

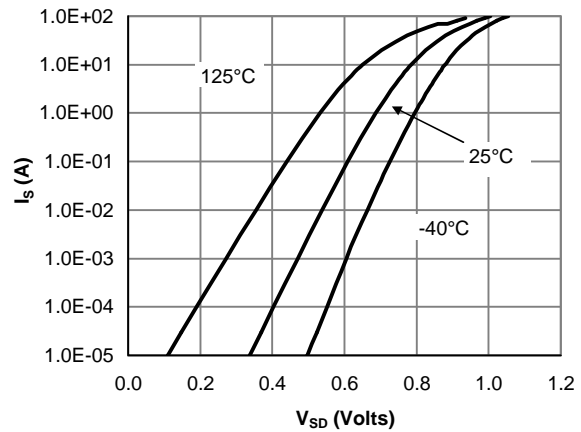


Figure 6: Body-Diode Characteristics

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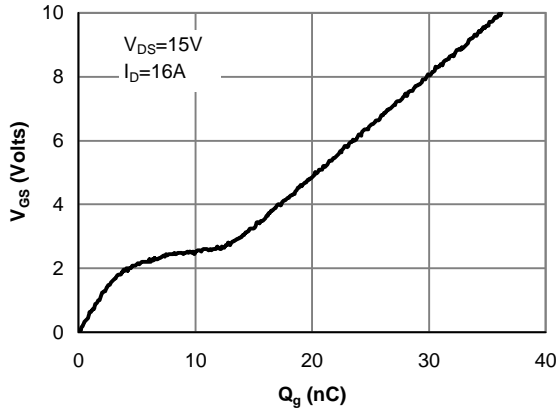


Figure 7: Gate-Charge Characteristics

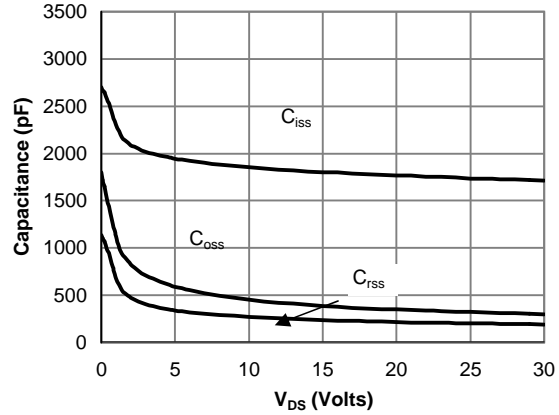


Figure 8: Capacitance Characteristics

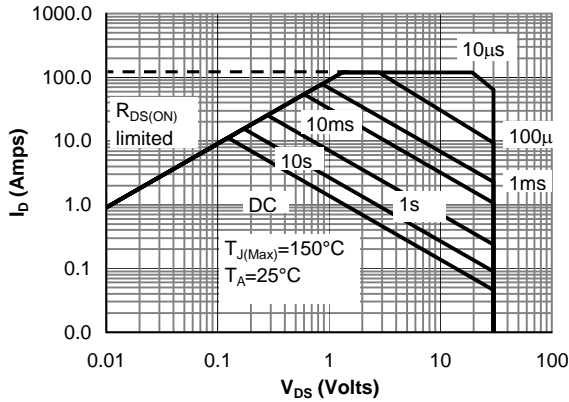


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

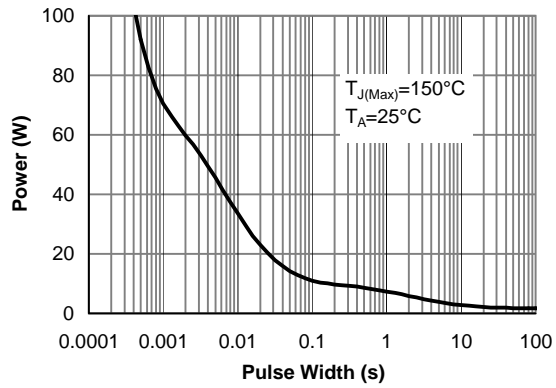


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

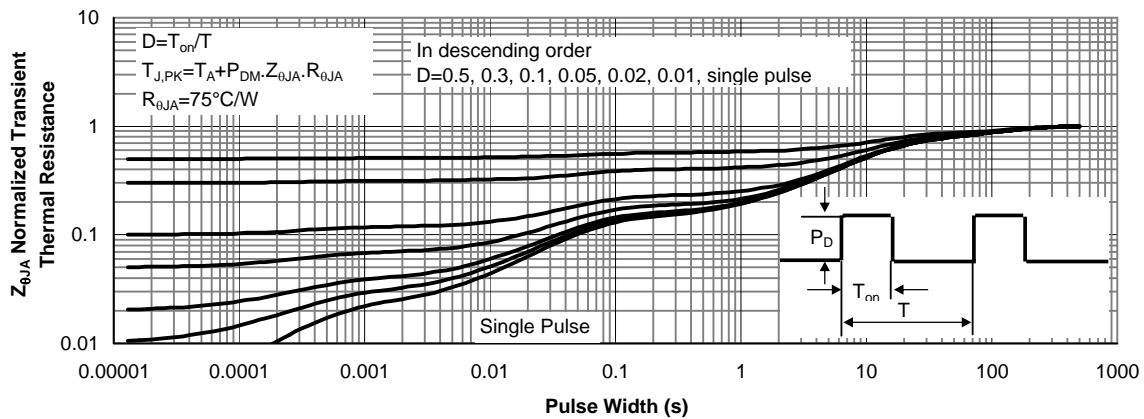


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

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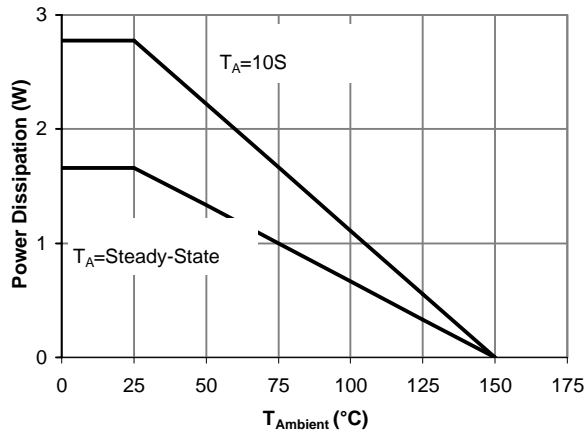


Figure 12: Power De-rating (Note A)