ALPHA & OMEGA SEMICONDUCTOR

# AOL1424
## N-Channel Enhancement Mode Field Effect Transistor

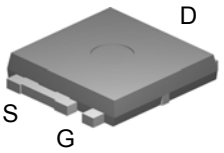
### General Description
The AOL1424 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V,while retaining a 20V $V_{GS(MAX)}$ rating. It is ESD protected.This device is suitable for use as a load switch.

-RoHS Compliant
-Halogen and Antimony Free Green Device*

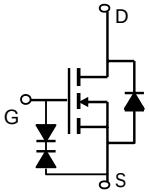
### Features
$V_{DS}$ (V) = 30V
$I_D$ = 70A ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 6.5mΩ ($V_{GS}$ = 10V)
$R_{DS(ON)}$ < 9.8mΩ ($V_{GS}$ = 4.5V)

ESD Protected
UIS Tested
Rg,Ciss,Coss,Crss Tested

*Ultra* SO-8™ Top View




Bottom tab connected to drain




**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current [B] | $T_C$=25°C | $I_D$ | 70 | A |
| | $T_C$=100°C | | 50 | |
| Pulsed Drain Current [C] | | $I_{DM}$ | 120 | |
| Continuous Drain Current [A] | $T_A$=25°C | $I_{DSM}$ | 15 | A |
| | $T_A$=70°C | | 12 | |
| Avalanche Current [H] | | $I_{AR}$ | 30 | A |
| Repetitive avalanche energy L=0.3mH [H] | | $E_{AR}$ | 135 | mJ |
| Power Dissipation [B] | $T_C$=25°C | $P_D$ | 50 | W |
| | $T_C$=100°C | | 25 | |
| Power Dissipation [A] | $T_A$=25°C | $P_{DSM}$ | 2.2 | W |
| | $T_A$=70°C | | 1.5 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 175 | °C |

**Thermal Characteristics**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 20 | 24 | °C/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 45 | 55 | °C/W |
| Maximum Junction-to-Case [D] | Steady-State | $R_{\theta JC}$ | 2.5 | 3.0 | °C/W |

**Electrical Characteristics ($T_J$=25°C unless otherwise noted)**

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **STATIC PARAMETERS** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $I_D$=250µA, $V_{GS}$=0V | 30 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=30V, $V_{GS}$=0V | | | 1 | µA |
| | | $T_J$=55°C | | | 5 | |
| $I_{GSS}$ | Gate-Body leakage current | $V_{DS}$=0V, $V_{GS}$= ±16V | | | 10 | µA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ $I_D$=250µA | 1.4 | 1.8 | 2.5 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}$=10V, $V_{DS}$=5V | 120 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | | 5.3 | 6.5 | mΩ |
| | | $T_J$=125°C | | 7.4 | 8.9 | |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 7.8 | 9.8 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=20A | | 67 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.7 | 1.0 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 70 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 1803 | 2170 | pF |
| $C_{oss}$ | Output Capacitance | | | 387 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 238 | | pF |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz | | 1.3 | 2 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=20A | | 36 | 48 | nC |
| $Q_g$(4.5V) | 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 DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=0.75Ω, $R_{GEN}$=3Ω | | 7.6 | | ns |
| $t_r$ | Turn-On Rise Time | | | 6.4 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 27 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 8.5 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=20A, dI/dt=100A/µs | | 27 | 33 | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=20A, dI/dt=100A/µs | | 17 | | nC |

A: The value of $R_{\theta JA}$ is measured with the device in a still air environment with $T_A$ =25°C. The power dissipation $P_{DSM}$ and current rating $I_{DSM}$ are based on $T_{J(MAX)}$=150°C, using steady state junction-to-ambient thermal resistance.

B. The power dissipation $P_D$ is based on $T_{J(MAX)}$=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=175°C.

D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to case $R_{\theta JC}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedence which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C.

G. These tests are performed with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25°C. The SOA curve provides a single pulse rating.

H. EAR and IAR ratings are based on low frequency and duty cycles such that Tj(start)=25C for each pulse.

* This device is guaranteed green after date code 8P11 (June 1$^{ST}$ 2008)

Rev6: Marchl 2009

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

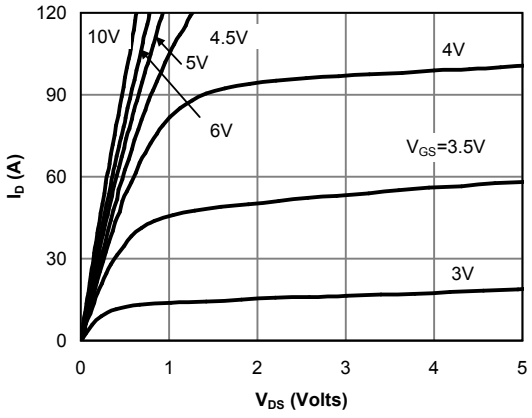



Figure 1: On-Region Characteristics

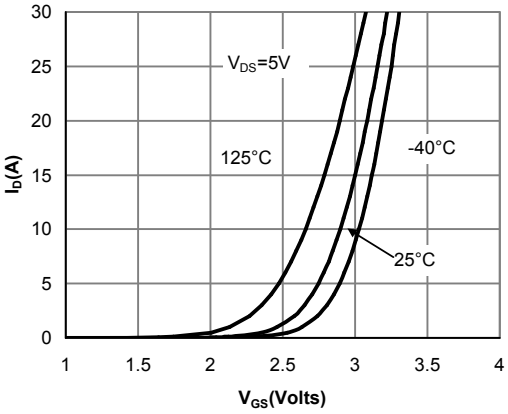



Figure 2: Transfer Characteristics

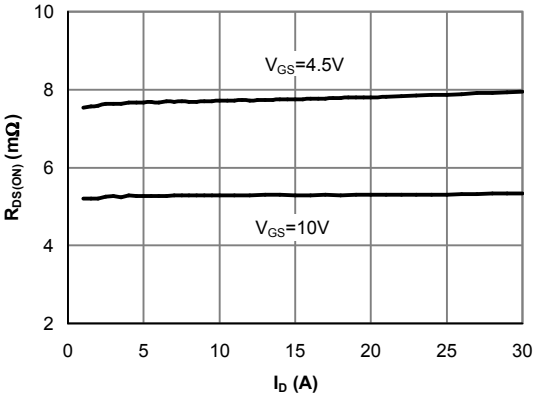



Figure 3: On-Resistance vs. Drain Current and Gate Voltage

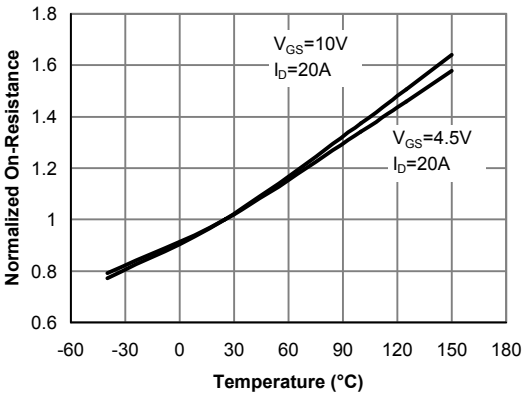



Figure 4: On-Resistance vs. Junction Temperature

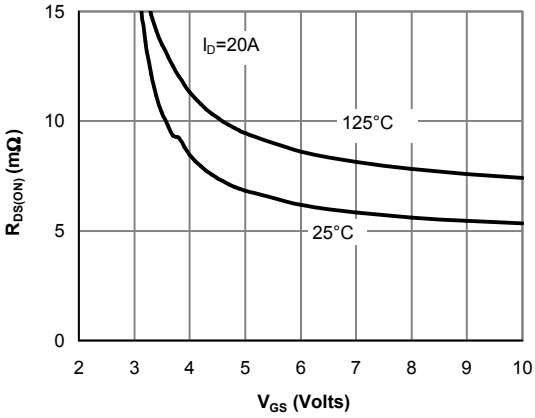



Figure 5: On-Resistance vs. Gate-Source Voltage

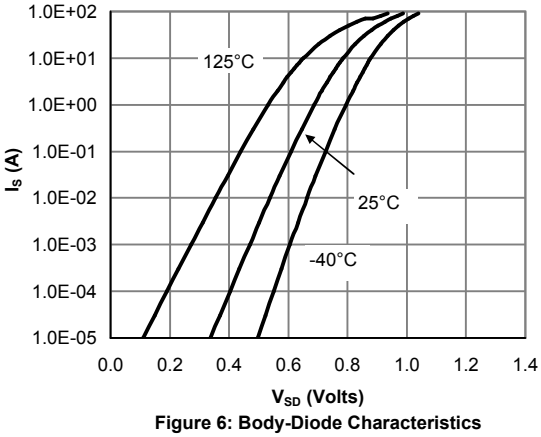



Figure 6: Body-Diode Characteristics

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

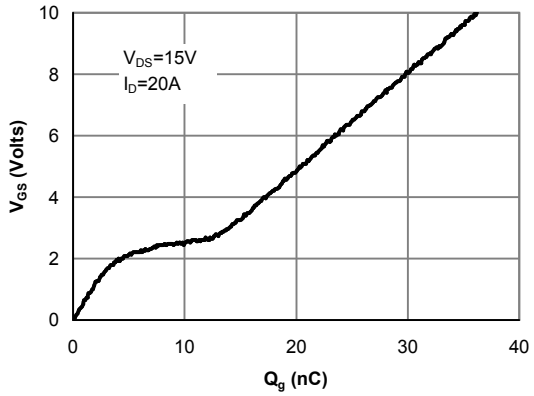



Figure 7: Gate-Charge Characteristics

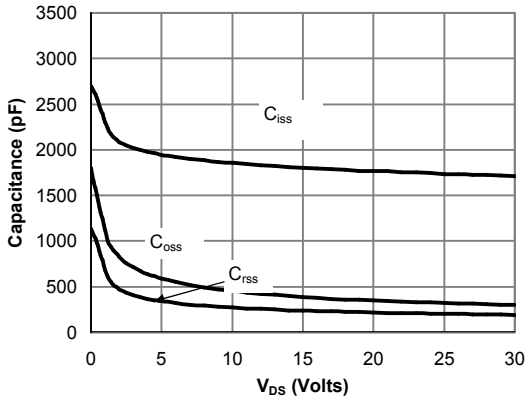



Figure 8: Capacitance Characteristics

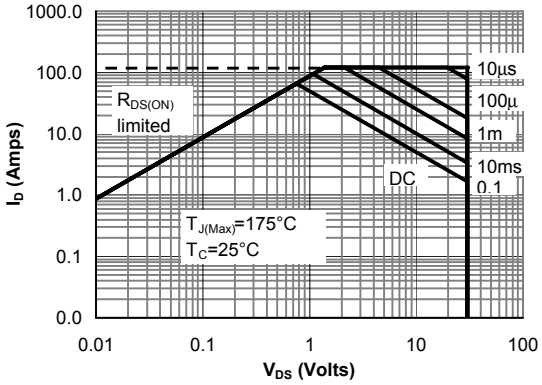



Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

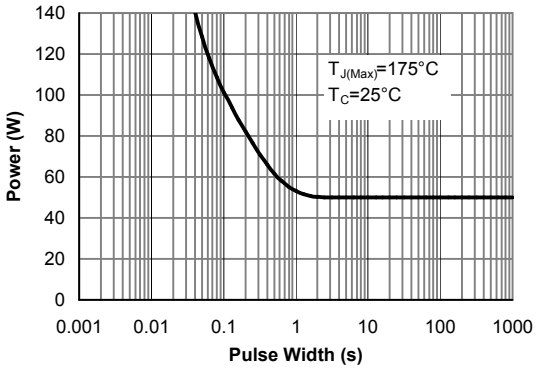



Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

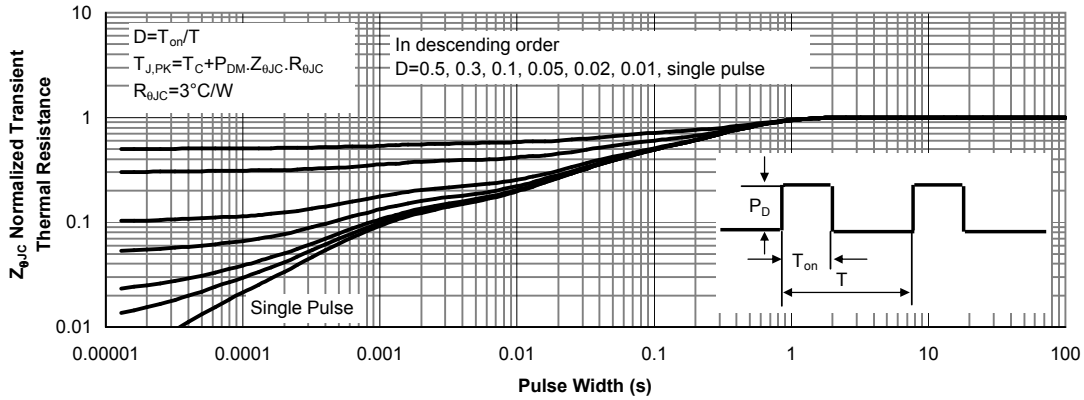



Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

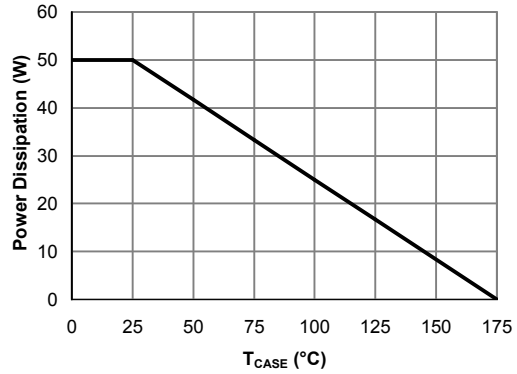



Figure 12: Power De-rating (Note B)

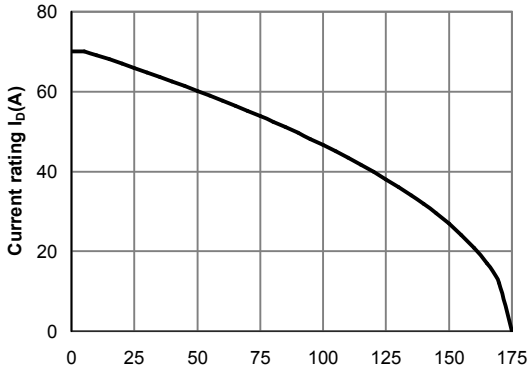



Figure 13: Current De-rating (Note B)

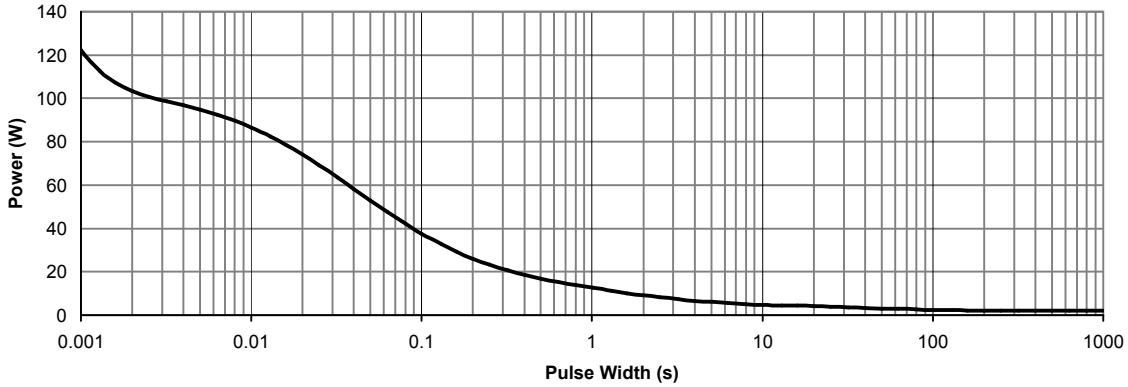



Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note G)

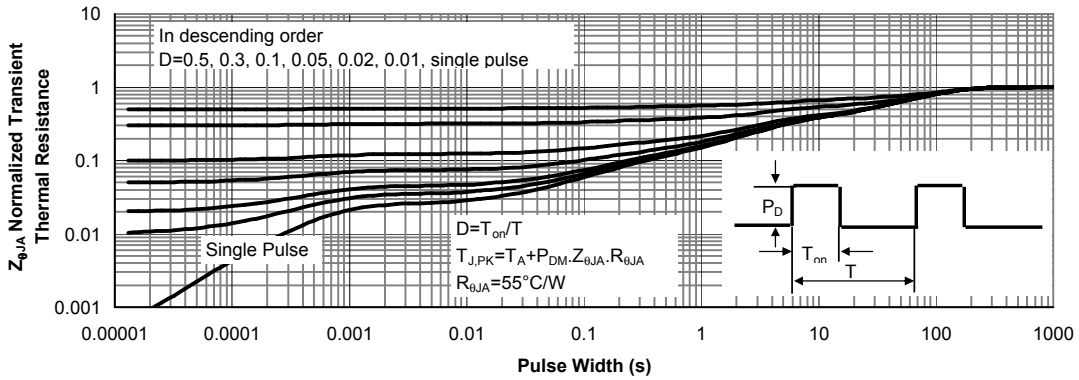
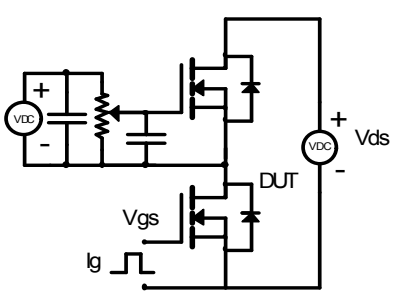
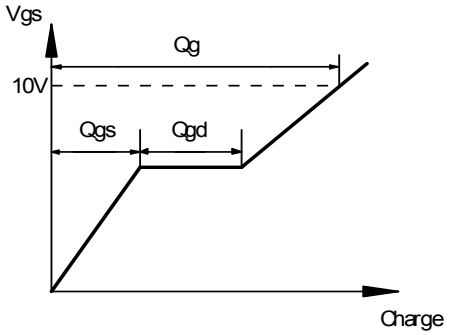


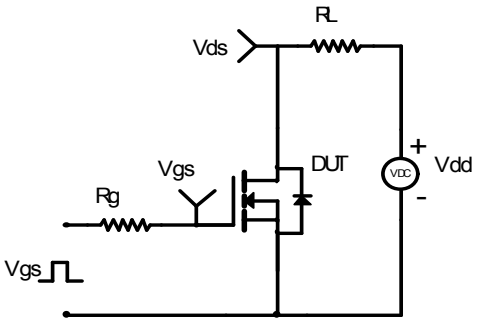

Figure 15: Normalized Maximum Transient Thermal Impedance (Note G)

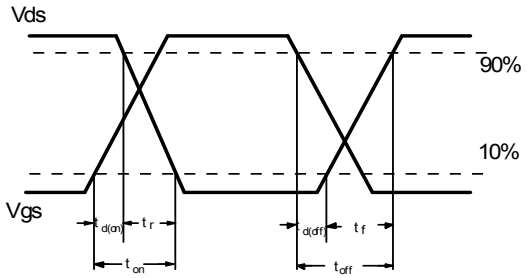
## Gate Charge Test Circuit & Waveform



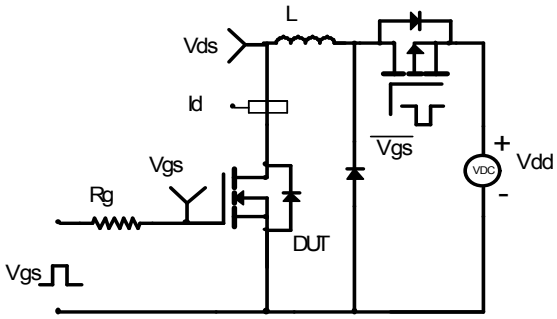



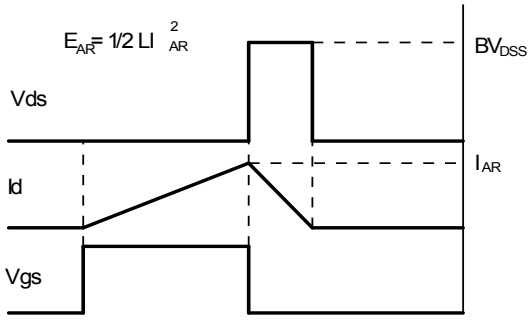

## Resistive Switching Test Circuit & Waveforms




## Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




## Diode Recovery Test Circuit & Waveforms