

AOD452
N-Channel Enhancement Mode Field Effect Transistor

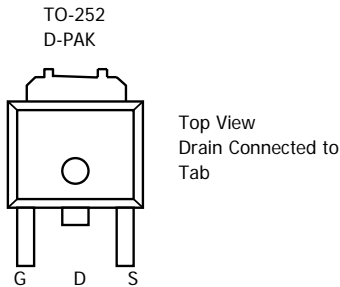
General Description

The AOD452/L uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications. *AOD452 and AOD452L are electrically identical.*
 -RoHS Compliant
 -AOD452L is Halogen Free

Features

$V_{DS} (V) = 25V$
 $I_D = 55 A (V_{GS} = 10V)$
 $R_{DS(ON)} < 8.5 m\Omega (V_{GS} = 10V)$
 $R_{DS(ON)} < 14 m\Omega (V_{GS} = 4.5V)$

UIS Tested
Rg, Ciss, Coss, Crss Tested


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

| Parameter | Symbol | Maximum | Units |
|----------------------------------------------------|----------------|-------------------|------------|
| Drain-Source Voltage | V_{DS} | 25 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current ^G | I_D | $T_C=25^\circ C$ | A |
| | | $T_C=100^\circ C$ | |
| Pulsed Drain Current ^C | I_{DM} | 150 | A |
| Pulsed Forward Diode Current ^C | I_{SM} | 150 | |
| Avalanche Current ^C | I_{AR} | 35 | |
| Repetitive avalanche energy $L=0.1mH$ ^C | E_{AR} | 61 | mJ |
| Power Dissipation ^B | P_D | $T_C=25^\circ C$ | W |
| | | $T_C=100^\circ C$ | |
| Power Dissipation ^A | P_{DSM} | $T_A=25^\circ C$ | W |
| | | $T_A=70^\circ C$ | |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | $^\circ C$ |

Thermal Characteristics

| Parameter | Symbol | Typ | Max | Units |
|------------------------------------------|---------------------|--------------|------|--------------|
| Maximum Junction-to-Ambient ^A | $R_{\theta JA}$ | $t \leq 10s$ | 14.2 | 20 |
| Maximum Junction-to-Ambient ^A | | Steady-State | 39 | 50 |
| Maximum Junction-to-Case ^B | $R_{\theta JC}$ | 2.5 | 3 | $^\circ C/W$ |
| Maximum Junction-to-TAB ^B | $R_{\theta JC-TAB}$ | 2.7 | 3.2 | $^\circ C/W$ |

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 | $I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$ | 25 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS}=20\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$ | | | 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 | $V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$ | 1.2 | 1.8 | 3 | V |
| $I_{D(ON)}$ | On state drain current | $V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$ | 100 | | | A |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10\text{V}$, $I_D=30\text{A}$ | | 6.5 | 8.5 | m Ω |
| | | $T_J=125^\circ\text{C}$ | | 9.7 | 12 | |
| | | $V_{GS}=4.5\text{V}$, $I_D=20\text{A}$ | | 11.5 | 14 | m Ω |
| g_{FS} | Forward Transconductance | $V_{DS}=5\text{V}$, $I_D=10\text{A}$ | | 35 | | 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 | | | | 55 | A |
| DYNAMIC PARAMETERS | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS}=0\text{V}$, $V_{DS}=12.5\text{V}$, $f=1\text{MHz}$ | | 1230 | 1476 | pF |
| C_{oss} | Output Capacitance | | | 315 | 400 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 190 | 280 | pF |
| R_g | Gate resistance | $V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$ | | 1.2 | 2 | Ω |
| SWITCHING PARAMETERS | | | | | | |
| $Q_g(10\text{V})$ | Total Gate Charge | $V_{GS}=10\text{V}$, $V_{DS}=12.5\text{V}$, $I_D=20\text{A}$ | | 26.4 | 32 | nC |
| $Q_g(4.5\text{V})$ | Total Gate Charge | | | 13.5 | 17 | nC |
| Q_{gs} | Gate Source Charge | | | 3.9 | 5 | nC |
| $Q_{gs(Vth)}$ | Gate Source Charge at V_{th} | | | 1.3 | 2 | nC |
| Q_{gd} | Gate Drain Charge | | | 7.8 | 10 | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}=10\text{V}$, $V_{DS}=12.5\text{V}$, $R_L=0.6\Omega$, $R_{GEN}=3\Omega$ | | 6.5 | 8 | ns |
| t_r | Turn-On Rise Time | | | 10 | 20 | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 22.7 | 30 | ns |
| t_f | Turn-Off Fall Time | | | 6.2 | 12 | ns |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | | 23.1 | 28 | ns |
| Q_{rr} | Body Diode Reverse Recovery Charge | $I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$ | | 15.3 | 18 | nC |

A: The value of $R_{\theta JA}$ is measured 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 Power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design, and the maximum temperature of 175°C may be used if the PCB allows it.

B: The power dissipation P_D is based on $T_{J(MAX)}=175^\circ\text{C}$, 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 $T_{J(MAX)}=175^\circ\text{C}$.

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

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

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

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

H: 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

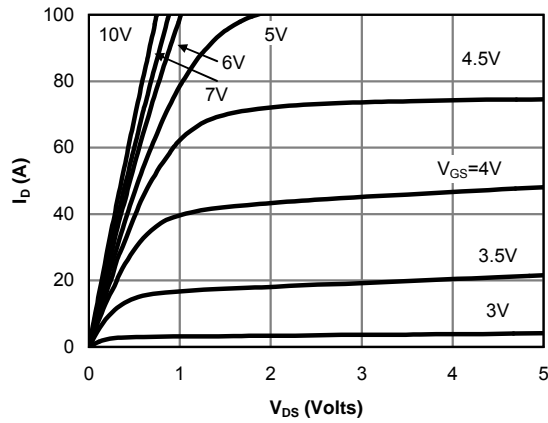


Fig 1: On-Region Characteristics

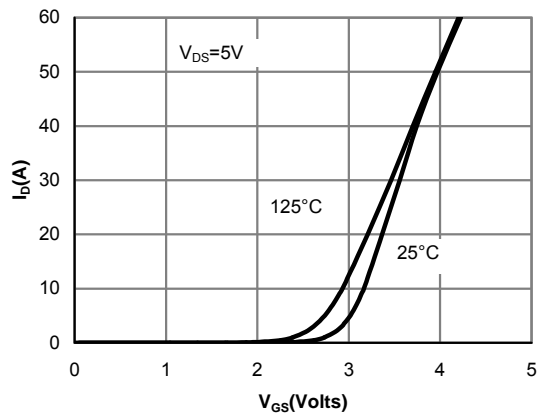


Figure 2: Transfer Characteristics

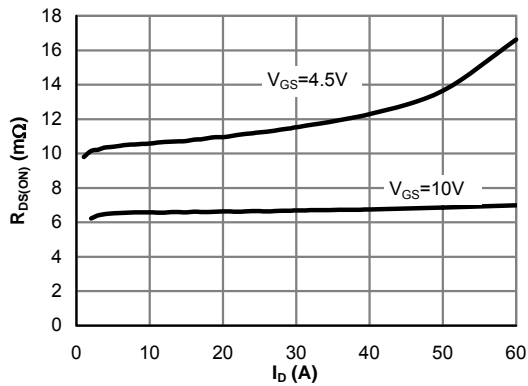


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

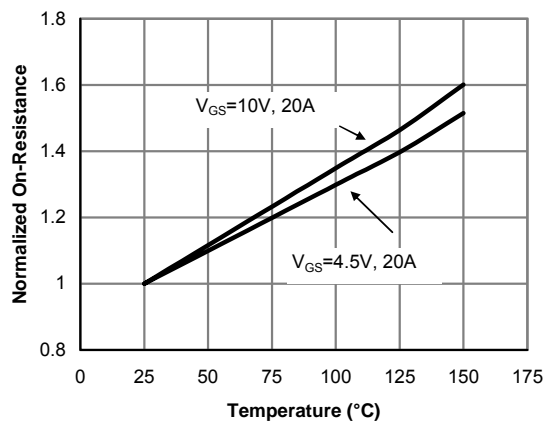


Figure 4: On-Resistance vs. Junction Temperature

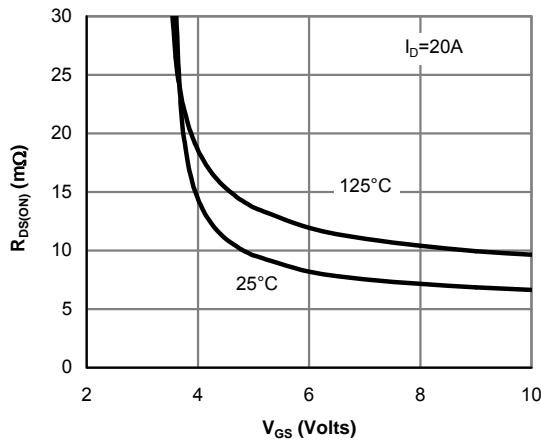


Figure 5: On-Resistance vs. Gate-Source Voltage

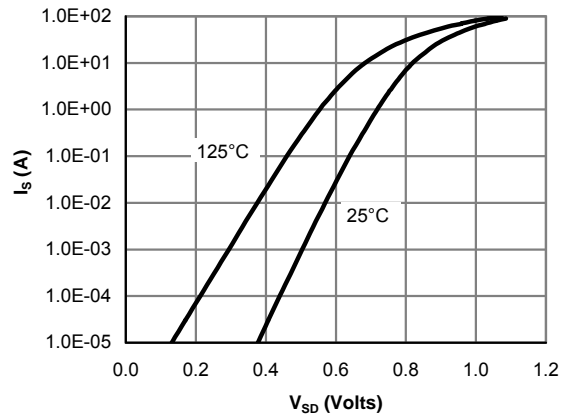


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

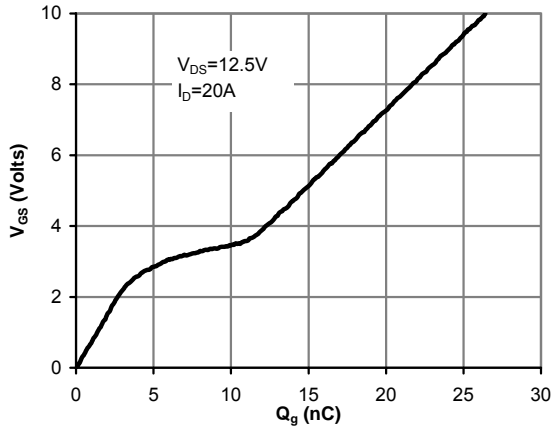


Figure 7: Gate-Charge Characteristics

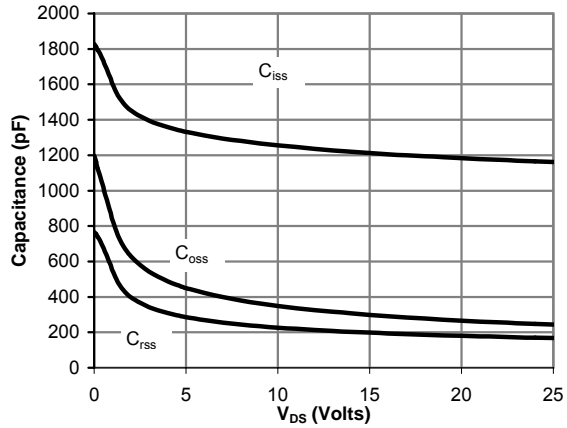


Figure 8: Capacitance Characteristics

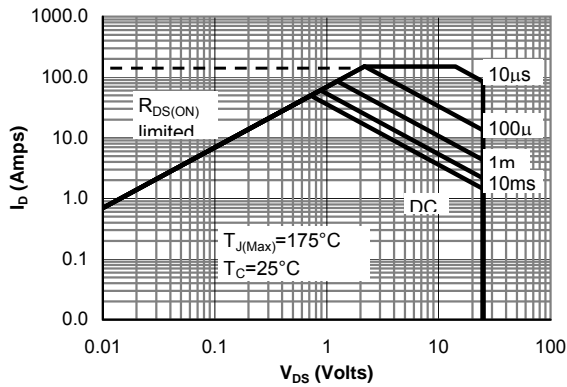


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

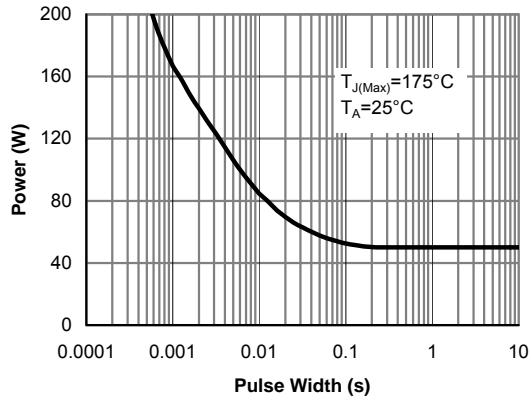


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

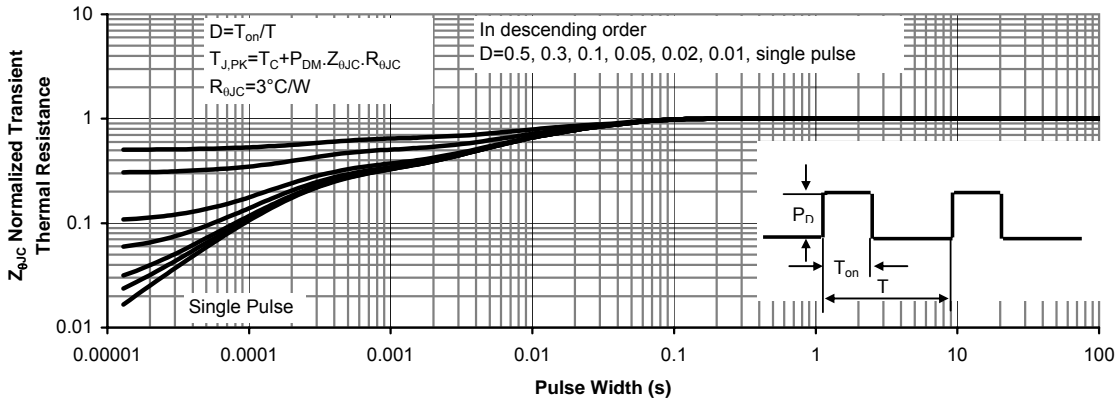


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

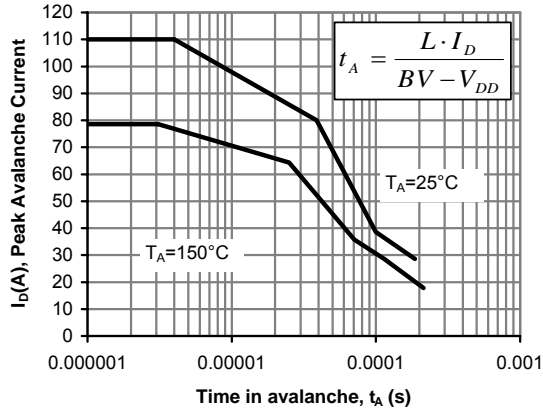


Figure 12: Single Pulse Avalanche capability

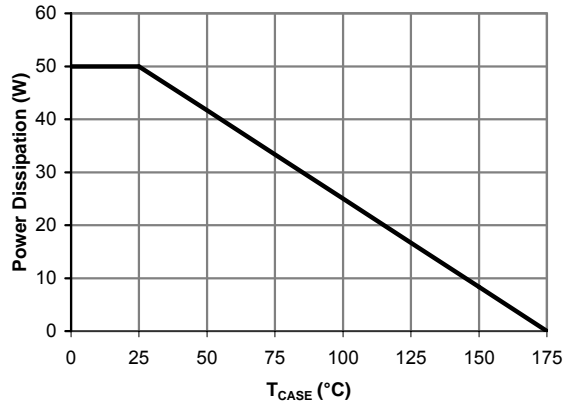


Figure 13: Power De-rating (Note B)

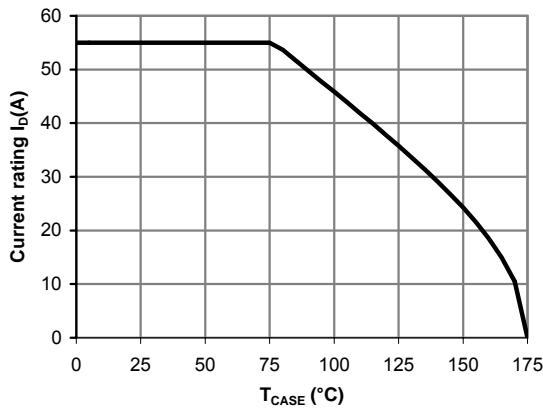


Figure 14: Current De-rating (Note B)

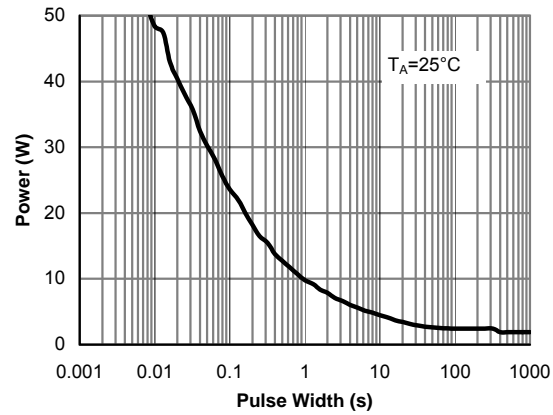


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

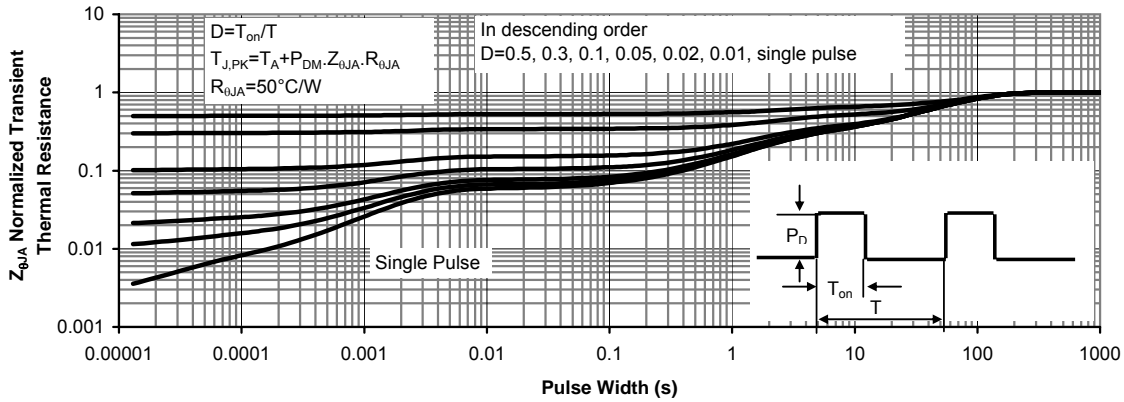


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)