



## AOD488 N-Channel Enhancement Mode Field Effect Transistor

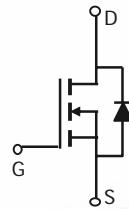
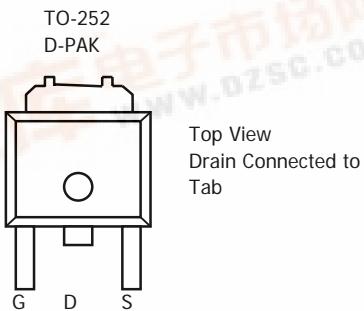


### General Description

The AOD488 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. Standard Product AOD488 is Pb-free (meets ROHS & Sony 259 specifications). AOD488L is a Green Product ordering option. AOD488 and AOD488L are electrically identical.

### Features

$V_{DS}$  (V) = 40V  
 $I_D$  = 20 A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 26 \text{ m}\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 39 \text{ m}\Omega$  ( $V_{GS}$  = 4.5V)



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>T<sub>C</sub>=25°C</sup>	$I_D$	20	A
T <sub>C</sub> =100°C		15	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	50	
Avalanche Current <sup>C</sup>	$I_{AR}$	12	A
Repetitive avalanche energy L=0.3mH <sup>C</sup>	$E_{AR}$	22	mJ
Power Dissipation <sup>B</sup> T <sub>C</sub> =25°C	$P_D$	20	W
T <sub>C</sub> =100°C		10	
Power Dissipation <sup>A</sup> T <sub>A</sub> =25°C	$P_{DSM}$	2	W
T <sub>A</sub> =70°C		1.3	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 175	°C

### Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> t ≤ 10s	$R_{\theta JA}$	17.4	30	°C/W
Maximum Junction-to-Ambient <sup>A</sup> Steady-State		50	60	°C/W
Maximum Junction-to-Case <sup>B</sup> Steady-State	$R_{\theta JC}$	4	7.5	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=10\text{mA}, V_{GS}=0\text{V}$	40	45		V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS}=32\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		1	5	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm20\text{V}$		0.1	0.1	$\text{uA}$
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1	2.3	3	V
$I_{\text{D(ON)}}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$	50			A
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=20\text{A}$		21.5	26	$\text{m}\Omega$
				34	41	
		$V_{GS}=4.5\text{V}, I_D=8\text{A}$		31	39	
$g_{\text{FS}}$	Forward Transconductance	$V_{DS}=5\text{V}, I_D=20\text{A}$		25		S
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$		0.76	1	V
$I_S$	Maximum Body-Diode Continuous Current				20	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=20\text{V}, f=1\text{MHz}$		404	500	pF
$C_{\text{oss}}$	Output Capacitance			95		pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			37		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		2.7	4	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=20\text{V}, I_D=20\text{A}$		9.2	12	nC
$Q_g(4.5\text{V})$	Total Gate Charge			4.5		nC
$Q_{\text{gs}}$	Gate Source Charge			1.6		nC
$Q_{\text{gd}}$	Gate Drain Charge			2.6		nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=10\text{V}, V_{DS}=20\text{V}, R_L=1.0\Omega, R_{\text{GEN}}=3\Omega$		3.5		ns
$t_r$	Turn-On Rise Time			6		ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			13.2		ns
$t_f$	Turn-Off Fall Time			3.5		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}, dI/dt=100\text{A}/\mu\text{s}$		22.9		ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}, dI/dt=100\text{A}/\mu\text{s}$		18.3		nC

A: The value of  $R_{\text{qJA}}$  is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{\text{DSM}}$  is based on  $R_{\text{qJA}}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $175^\circ\text{C}$  may be used if the PCB allows it.

B. The power dissipation PD is based on  $T_J(\text{MAX})=175^\circ\text{C}$ , 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  $T_J(\text{MAX})=175^\circ\text{C}$ .

D. The  $R_{\text{qJA}}$  is the sum of the thermal impedance from junction to case  $R_{\text{qJC}}$  and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using  $<300\text{ ms}$  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  $T_J(\text{MAX})=175^\circ\text{C}$ .

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  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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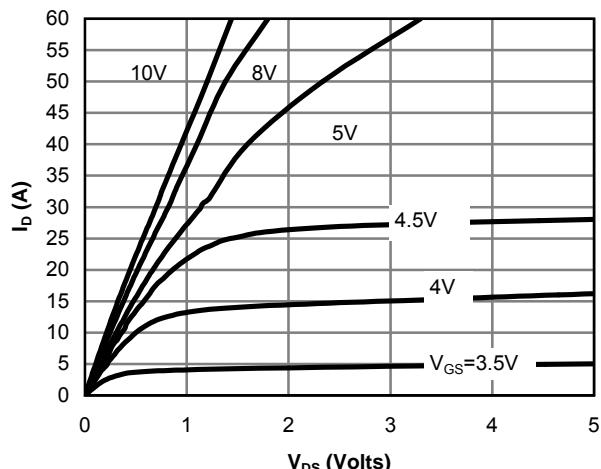
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

Fig 1: On-Region Characteristics

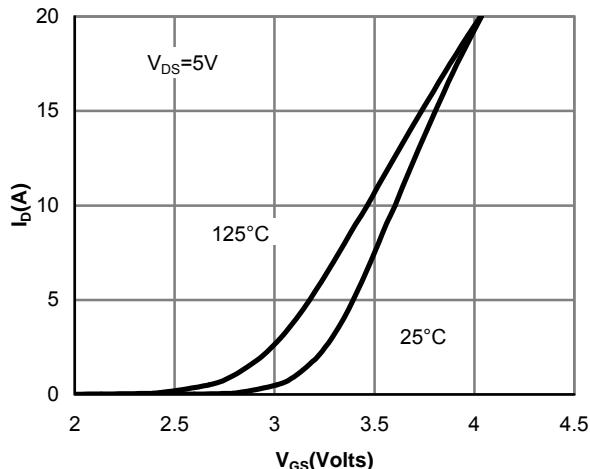


Figure 2: Transfer Characteristics

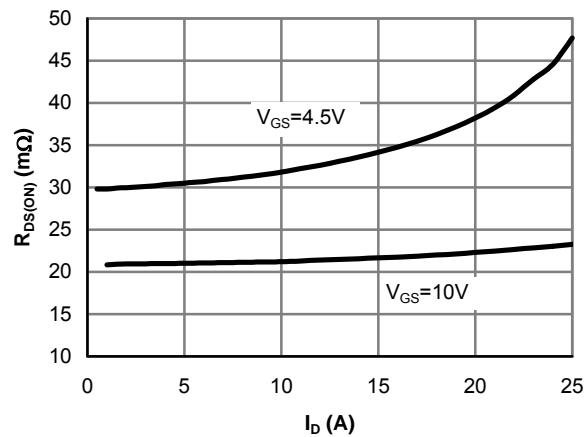


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

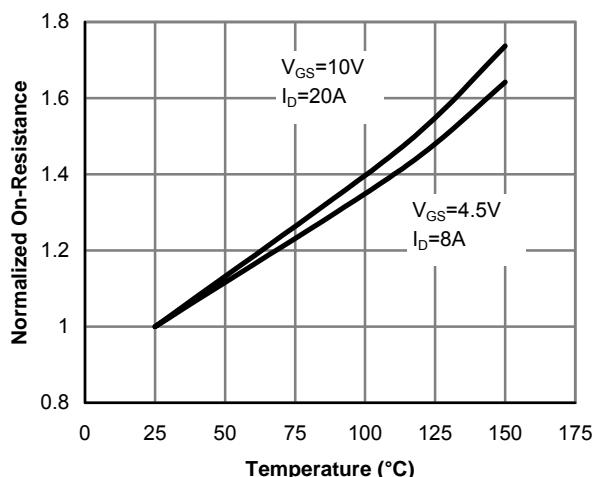


Figure 4: On-Resistance vs. Junction Temperature

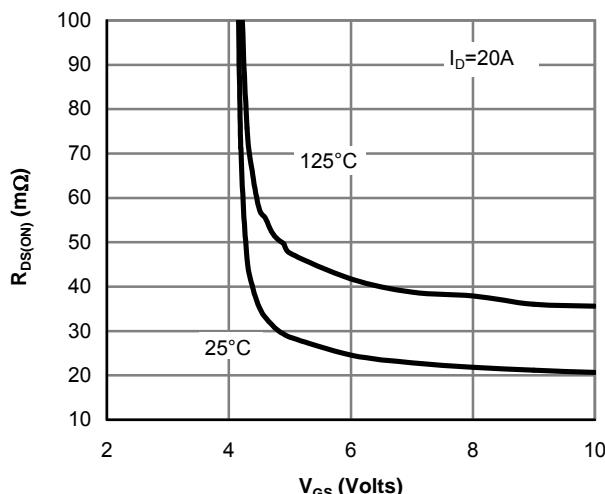


Figure 5: On-Resistance vs. Gate-Source Voltage

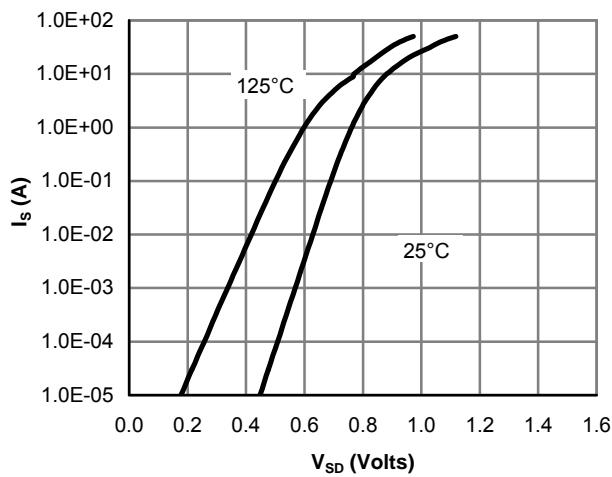


Figure 6: Body-Diode Characteristics

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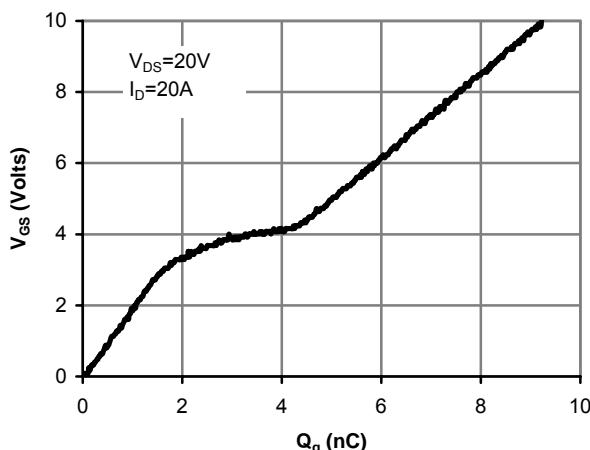


Figure 7: Gate-Charge Characteristics

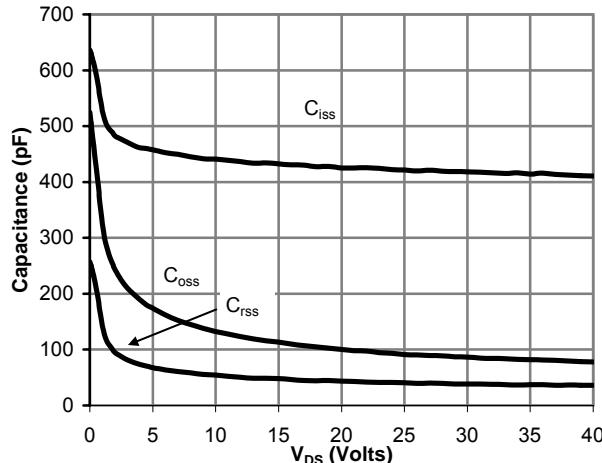


Figure 8: Capacitance Characteristics

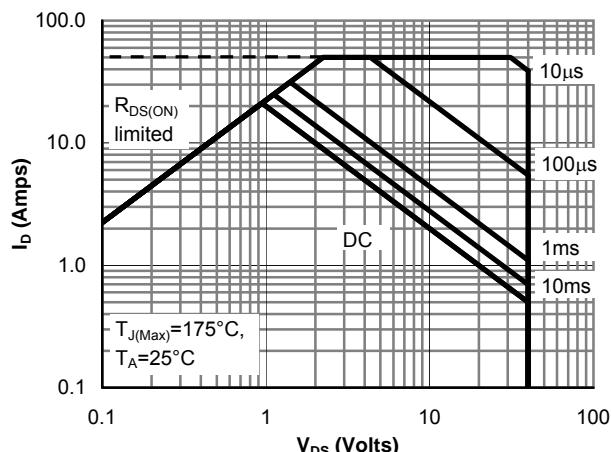


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

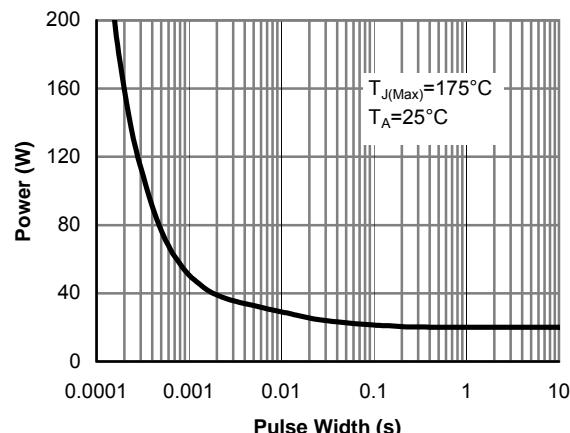


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

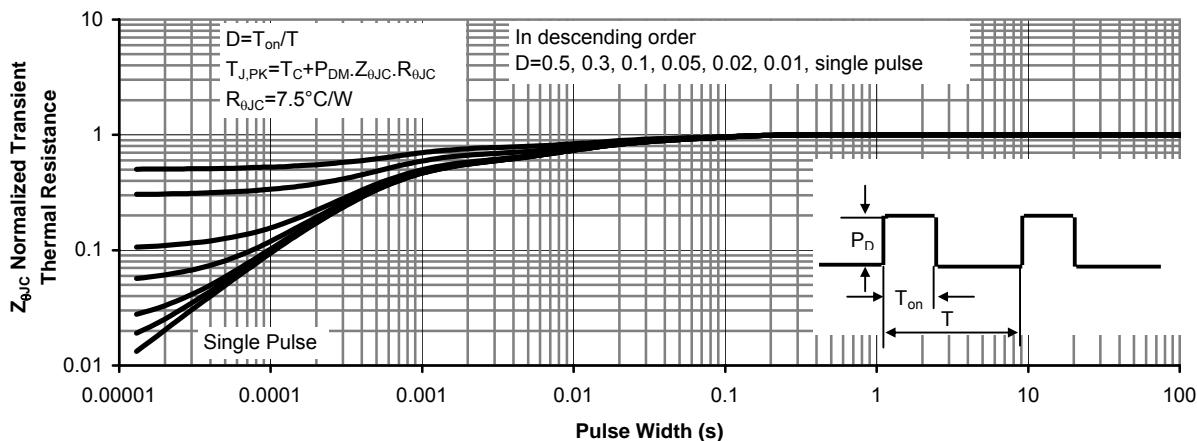


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

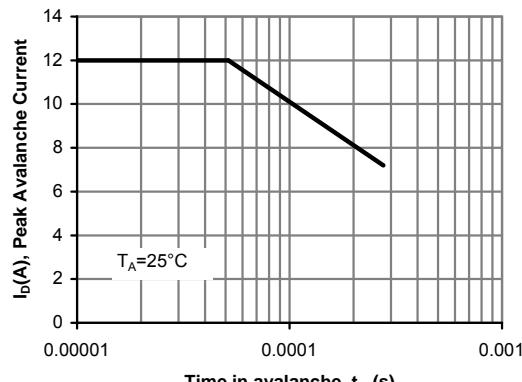
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

Figure 12: Single Pulse Avalanche capability

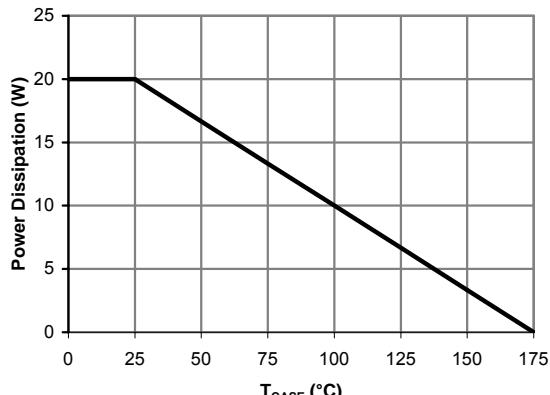


Figure 13: Power De-rating (Note B)

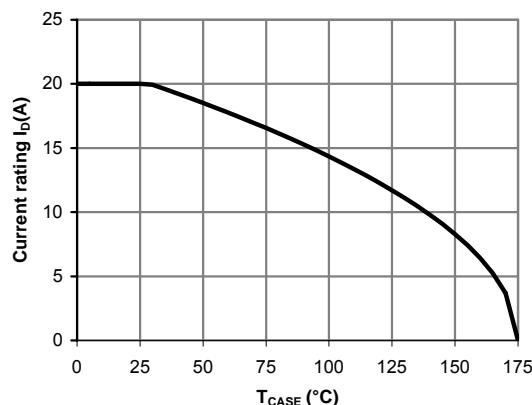


Figure 14: Current De-rating (Note B)

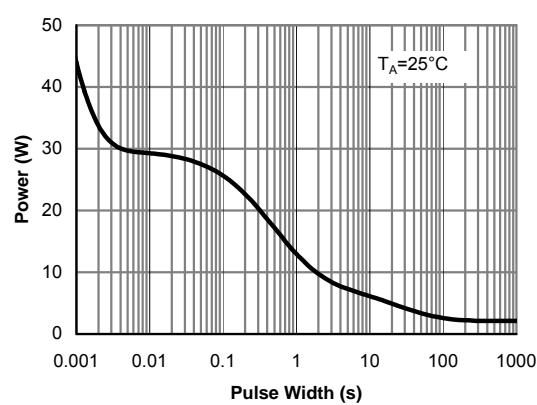


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

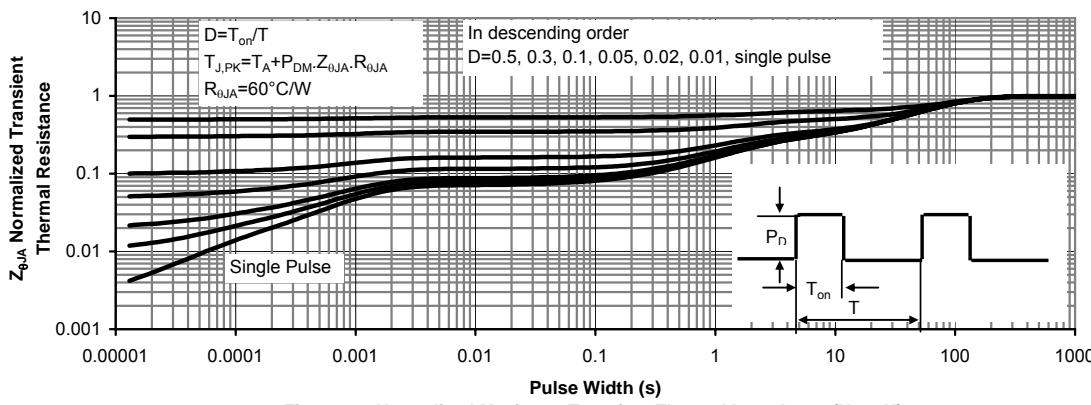


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)