

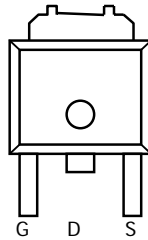
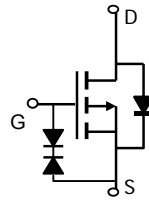
AOD421
P-Channel Enhancement Mode Field Effect Transistor

General Description

The AOD421 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for load switching. It is ESD protected. *Standard Product AOD421 is Pb-free (meets ROHS & Sony 259 specifications). AOD421L is a Green Product ordering option. AOD421 and AOD421L are electrically identical.*

Features

V_{DS} (V) = -20V
 I_D = -12.5 A (V_{GS} = -10V)
 $R_{DS(ON)} < 75m\Omega$ (V_{GS} = -10V)
 $R_{DS(ON)} < 95m\Omega$ (V_{GS} = -4.5V)
 $R_{DS(ON)} < 145m\Omega$ (V_{GS} = -2.5V)
 ESD Rating: 2000V HBM

 TO-252
 D-PAK

 Top View
 Drain Connected
 to Tab

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	-20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current ^G	I_D	$T_A=25^\circ\text{C}$	A
		$T_A=70^\circ\text{C}$	
Pulsed Drain Current ^C	I_{DM}	-30	
Power Dissipation ^B	P_D	$T_C=25^\circ\text{C}$	W
		$T_C=100^\circ\text{C}$	
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ\text{C}$	W
		$T_A=70^\circ\text{C}$	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units	
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10\text{s}$	23	28	$^\circ\text{C/W}$
		Steady-State	50	60	$^\circ\text{C/W}$
Maximum Junction-to-Case ^B	$R_{\theta JC}$	6	8	$^\circ\text{C/W}$	

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-0.5	μA
					-2.5	
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 10\text{V}$			± 1	μA
		$V_{DS}=0\text{V}$, $V_{GS}=\pm 12\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.7	-0.9	-1.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-12.5\text{A}$ $T_J=125^\circ\text{C}$		61	75	$\text{m}\Omega$
				83	105	
		$V_{GS}=-4.5\text{V}$, $I_D=-3\text{A}$ $V_{GS}=-2.5\text{V}$, $I_D=-1\text{A}$		75	95	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-12.5\text{A}$		8.8		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$	-1	-0.81		V
I_S	Maximum Body-Diode Continuous Current				-8.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance			512	620	pF
C_{oss}	Output Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		77		pF
C_{rss}	Reverse Transfer Capacitance			62		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		9.2	13	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-12.5\text{A}$		4.6		nC
Q_{gs}	Gate Source Charge			0.9		nC
Q_{gd}	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}$, $V_{DS}=-10\text{V}$, $R_L=0.75\Omega$, $R_{GEN}=3\Omega$		5.2		ns
t_r	Turn-On Rise Time			38		ns
$t_{D(off)}$	Turn-Off Delay Time			17		ns
t_f	Turn-Off Fall Time			31		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-12.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		19		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-12.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		6.3		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 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 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.

I: Revision 0: July 2006

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

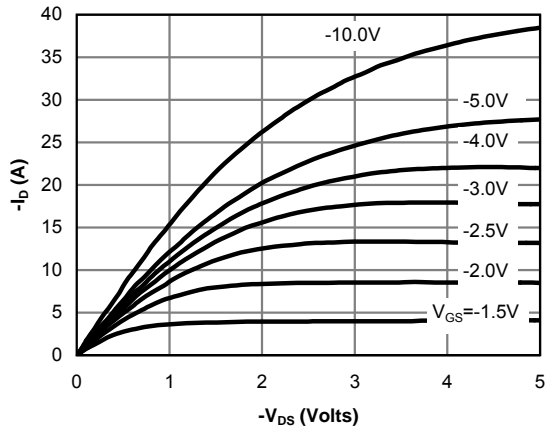


Figure 1: On-Region Characteristics

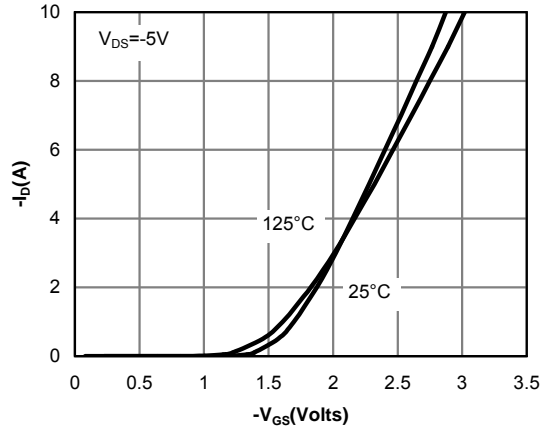


Figure 2: Transfer Characteristics

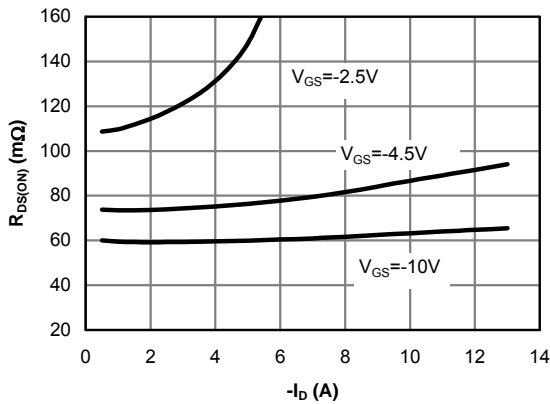


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

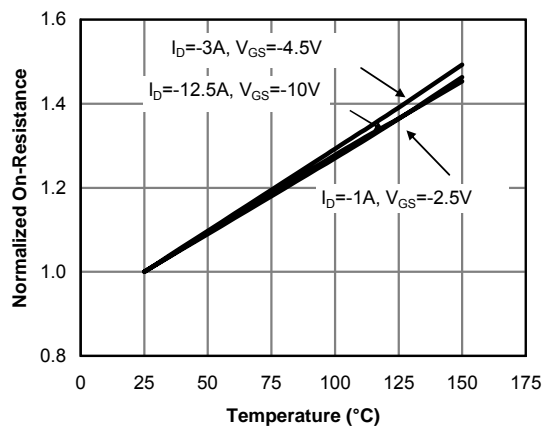


Figure 4: On-Resistance vs. Junction Temperature

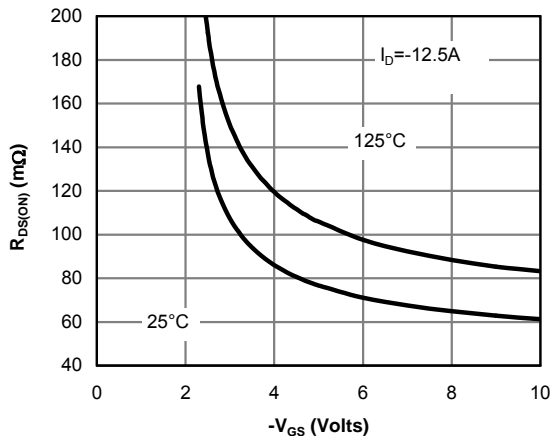


Figure 5: On-Resistance vs. Gate-Source Voltage

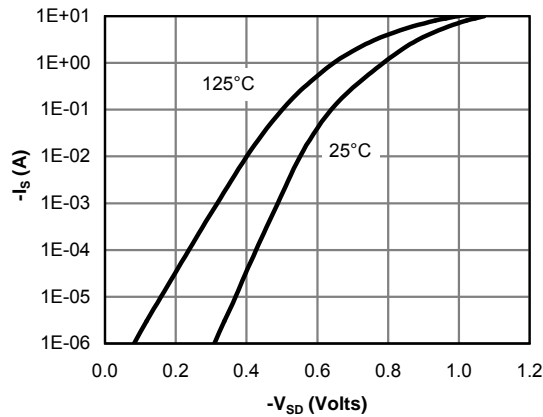


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

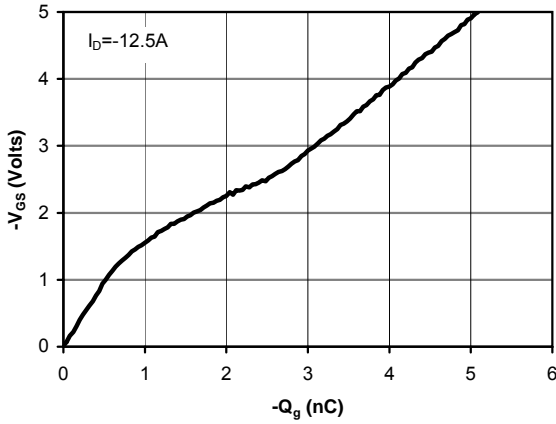


Figure 7: Gate-Charge Characteristics

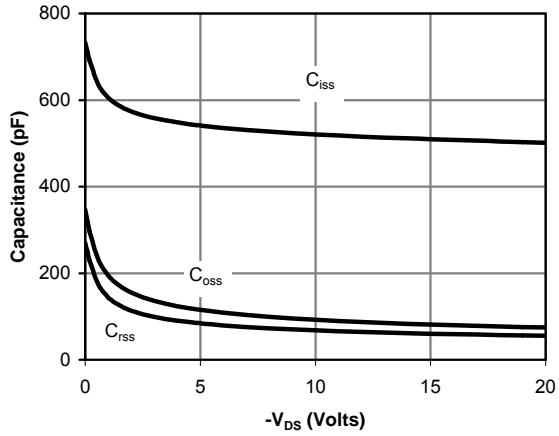


Figure 8: Capacitance Characteristics

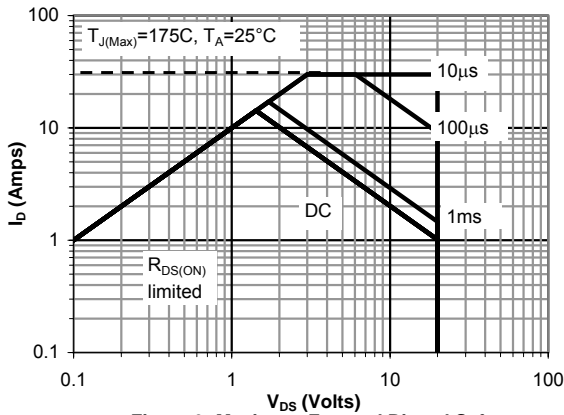


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

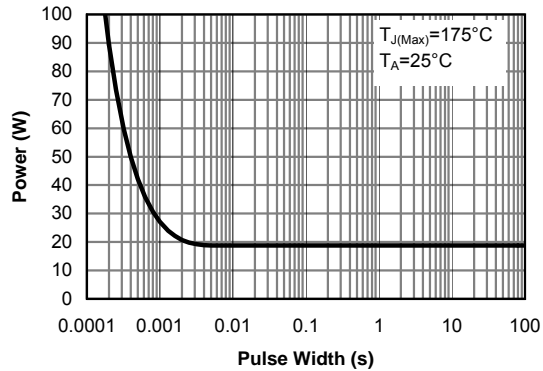


Figure 10: Single Pulse Power Rating Junction-to-case (Note F)

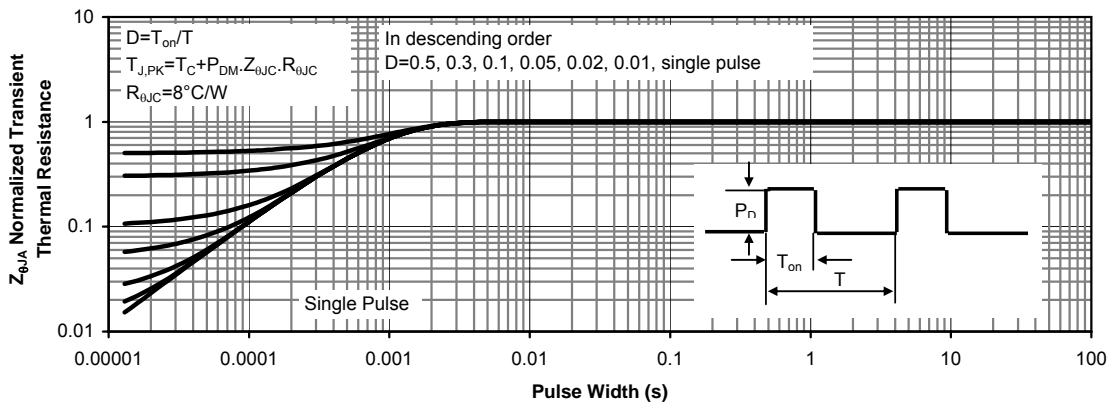


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

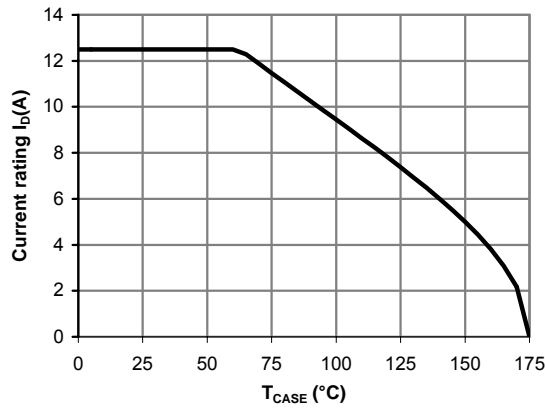


Figure 12: Current De-rating (Note B)

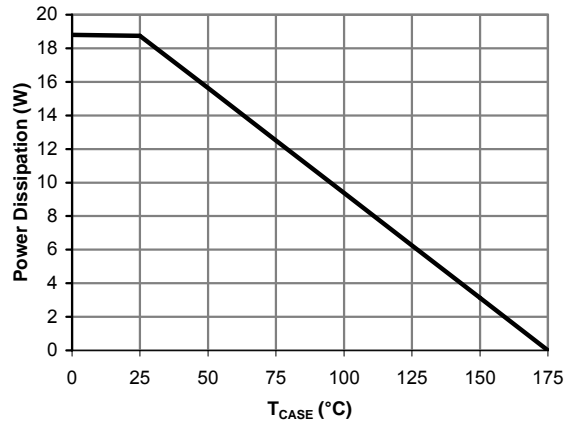


Figure 13: Power De-rating (Note B)

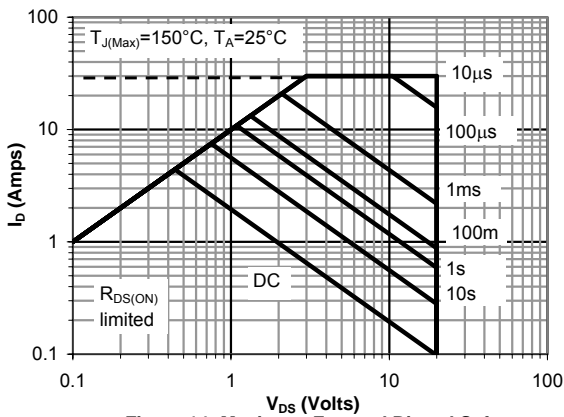


Figure 14: Maximum Forward Biased Safe Operating Area (Note H)

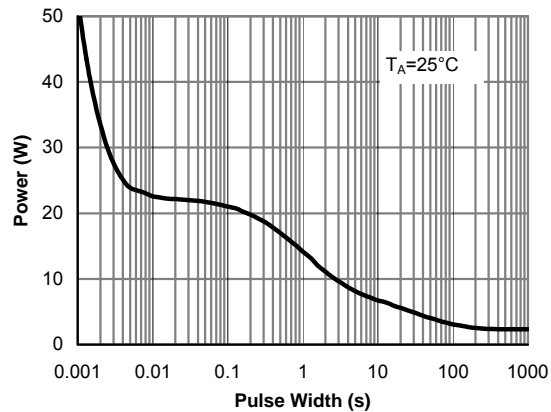


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

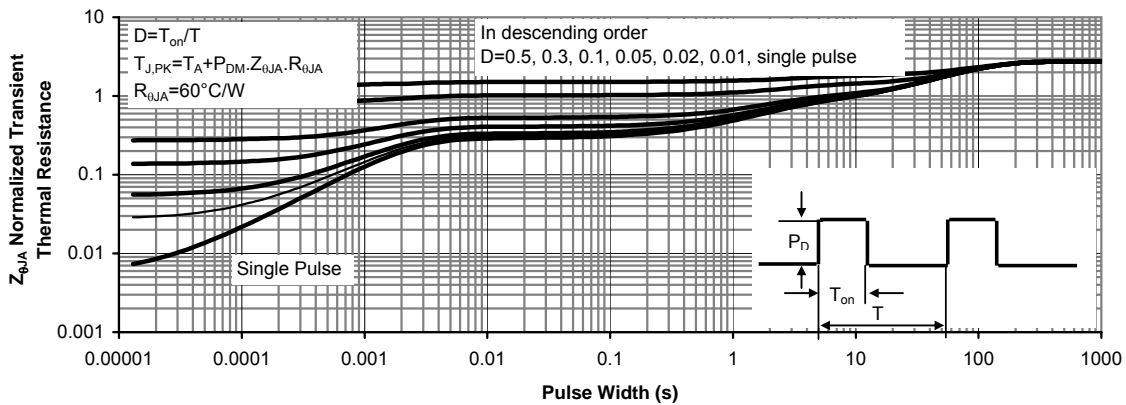


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)