

AOD417
P-Channel Enhancement Mode Field Effect Transistor

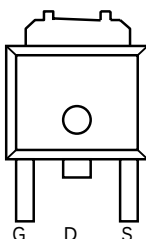
General Description

The AOD417 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and low gate resistance. With the excellent thermal resistance of the DPAK package, this device is well suited for high current load applications. *Standard Product AOD417 is Pb-free (meets ROHS & Sony 259 specifications).*

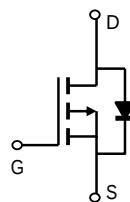
Features

$V_{DS} (V) = -30V$
 $I_D = -25A \quad (V_{GS} = -10V)$
 $R_{DS(ON)} < 34m\Omega \quad (V_{GS} = -10V)$
 $R_{DS(ON)} < 55m\Omega \quad (V_{GS} = -4.5V)$

TO-252
D-PAK



Top View
Drain Connected
to Tab


Absolute Maximum Ratings $T_A=25^\circ C$ 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,G}	I_D	$T_A=25^\circ C$ ^G -25	A
$T_A=100^\circ C$		-20	
Pulsed Drain Current ^C	I_{DM}	-60	
Avalanche Current ^C	I_{AR}	-14	A
Repetitive avalanche energy $L=0.3mH$ ^C	E_{AR}	30	mJ
Power Dissipation ^B	P_D	$T_C=25^\circ C$ 50	W
		$T_C=100^\circ C$ 25	
Power Dissipation ^A	P_{DSM}	$T_A=25^\circ C$ 5	W
		$T_A=70^\circ C$ 3.2	
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	$R_{\theta JA}$	$t \leq 10s$ 16.7	25	$^\circ C/W$
Maximum Junction-to-Ambient ^A		Steady-State 40	50	$^\circ C/W$
Maximum Junction-to-Case ^D	$R_{\theta JL}$	Steady-State 2.5	3	$^\circ C/W$

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	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-24\text{V}$, $V_{GS}=0\text{V}$			-1	μA
		$T_J=55^{\circ}\text{C}$			-5	
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	-1.9	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	-60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-20\text{A}$		27	34	m Ω
		$T_J=125^{\circ}\text{C}$		36		
		$V_{GS}=-4.5\text{V}$, $I_D=-7\text{A}$		40	55	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-20\text{A}$		18		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.75	-1	V
I_S	Maximum Body-Diode Continuous Current				-6	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		920		pF
C_{oss}	Output Capacitance			140		pF
C_{rss}	Reverse Transfer Capacitance			90		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		6	9	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-20\text{A}$		16.2		nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			8.2		nC
Q_{gs}	Gate Source Charge			2.9		nC
Q_{gd}	Gate Drain Charge			3.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=0.75\Omega$, $R_{GEN}=3\Omega$		8		ns
t_r	Turn-On Rise Time			30		ns
$t_{D(off)}$	Turn-Off DelayTime			22		ns
t_f	Turn-Off Fall Time			26		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		23		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		14		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in 2 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 $R_{\theta JA}$ ($<10\text{s}$) 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.

Rev 0: Oct. 2006

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

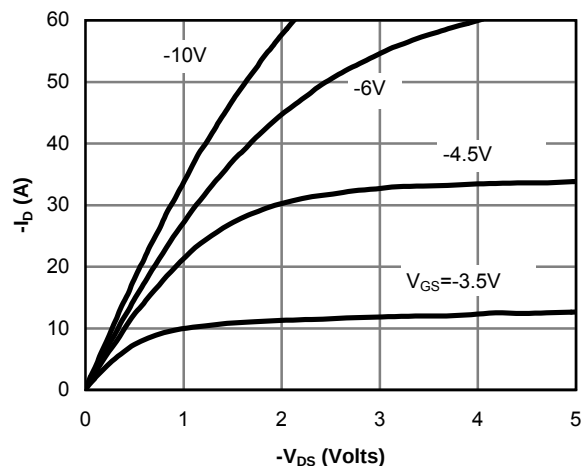


Figure 1: On-Region Characteristics

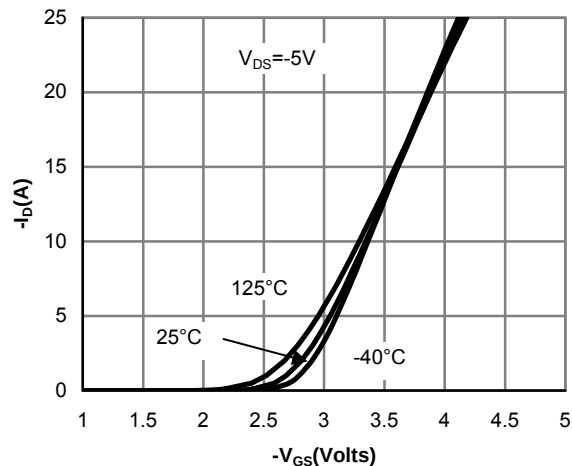


Figure 2: Transfer Characteristics

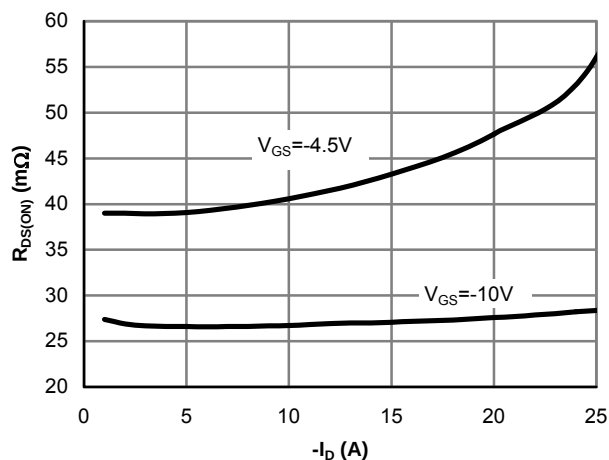


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

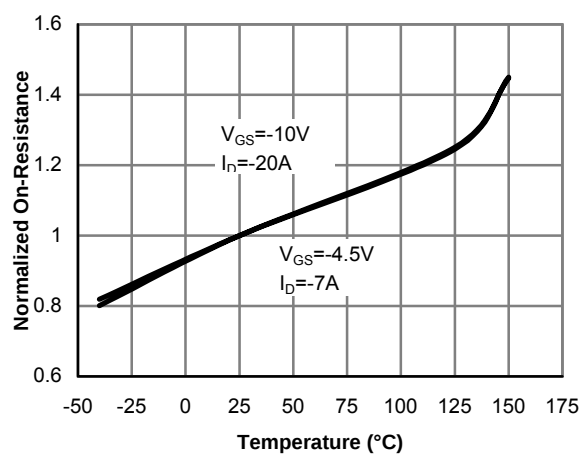


Figure 4: On-Resistance vs. Junction Temperature

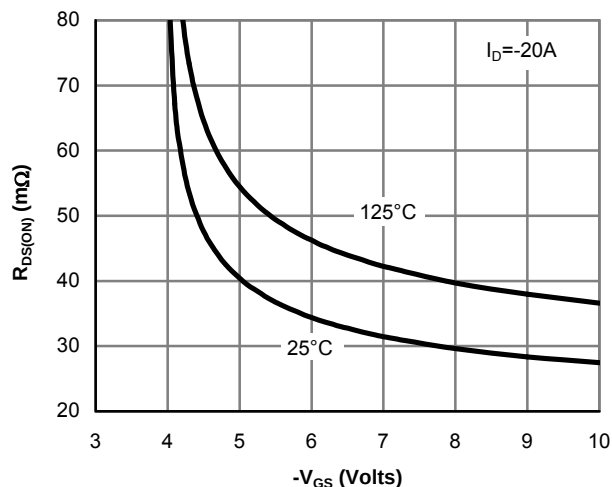


Figure 5: On-Resistance vs. Gate-Source Voltage

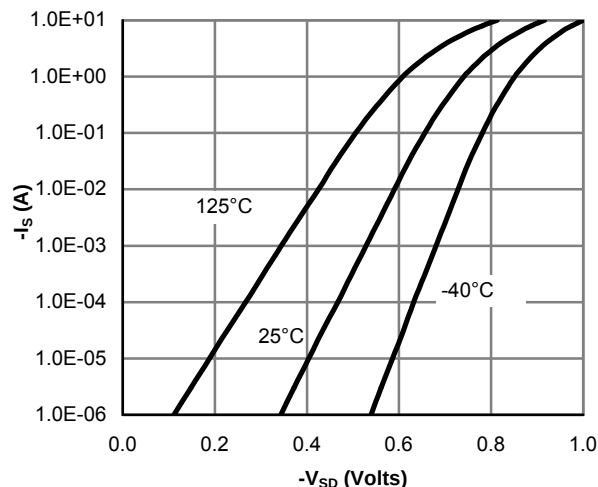
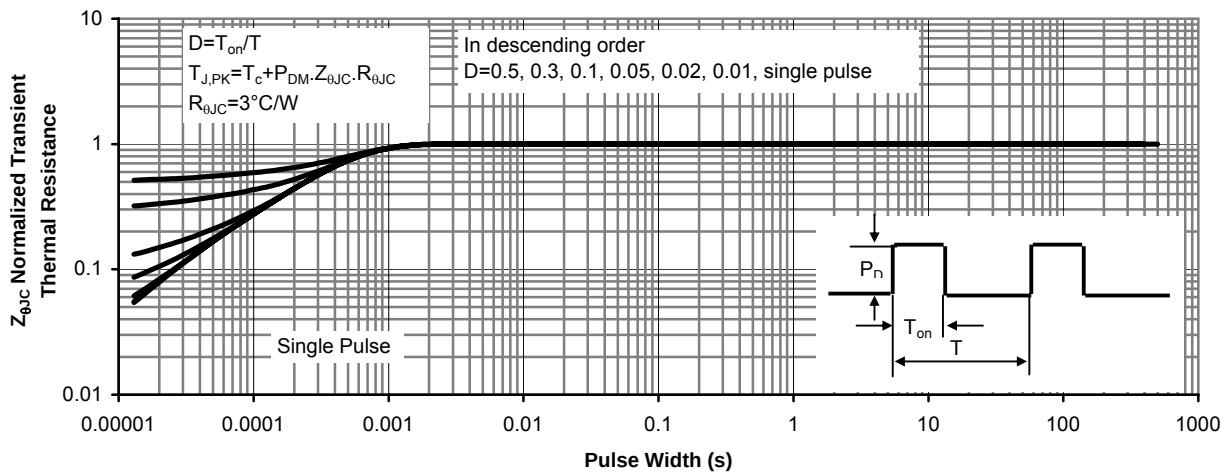
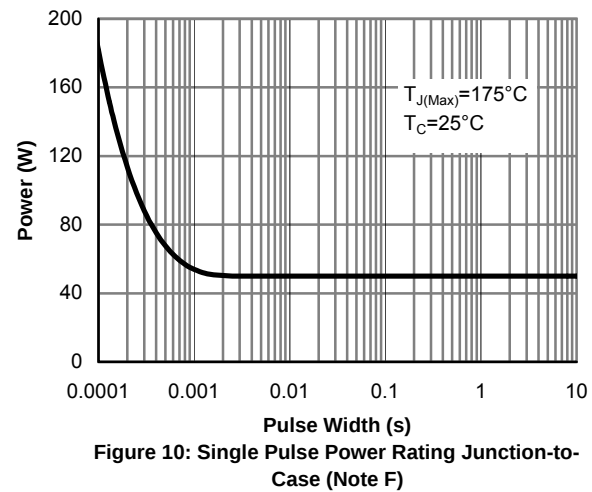
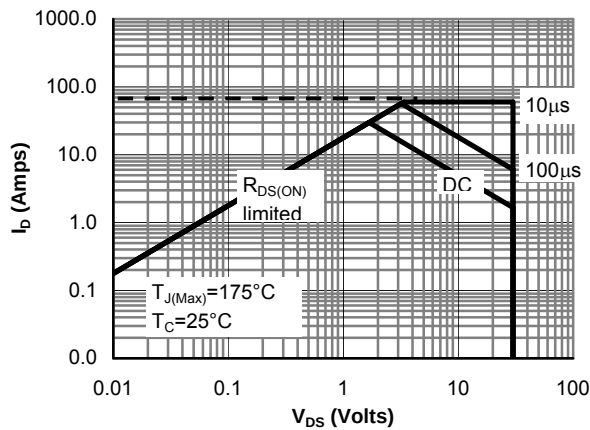
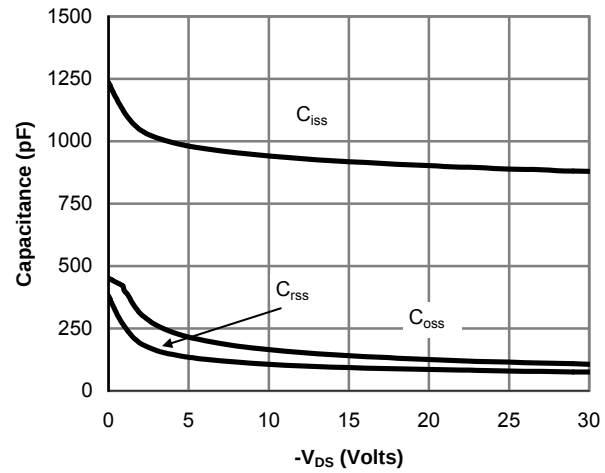
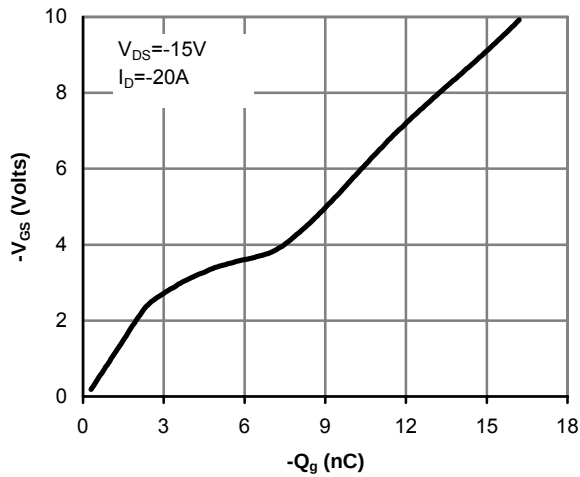


Figure 6: Body-Diode Characteristics

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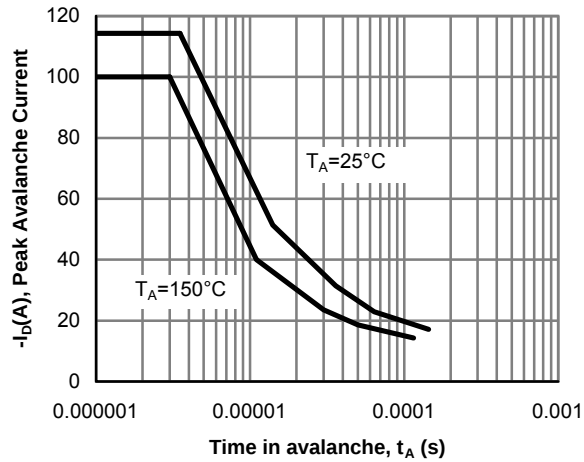


Figure 12: Single Pulse Avalanche capability

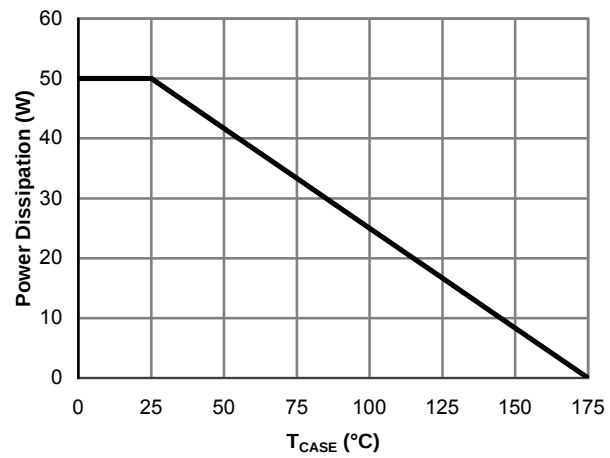


Figure 13: Power De-rating (Note B)

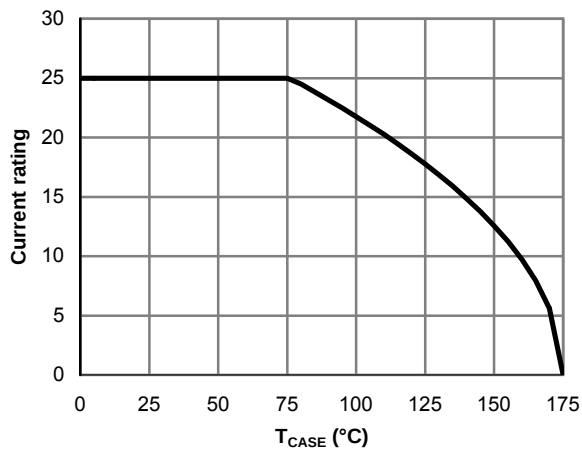


Figure 14: Current De-rating (Note B)

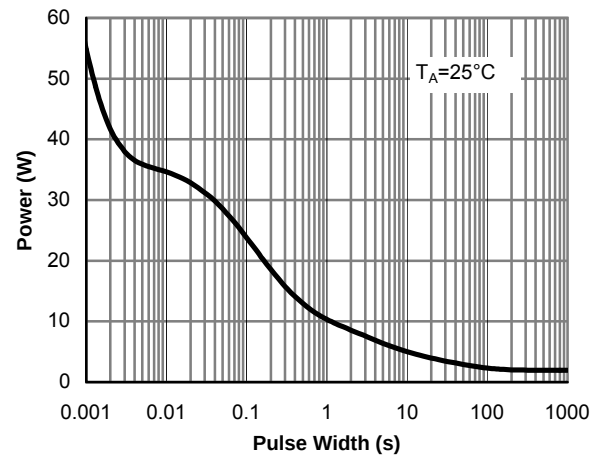


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

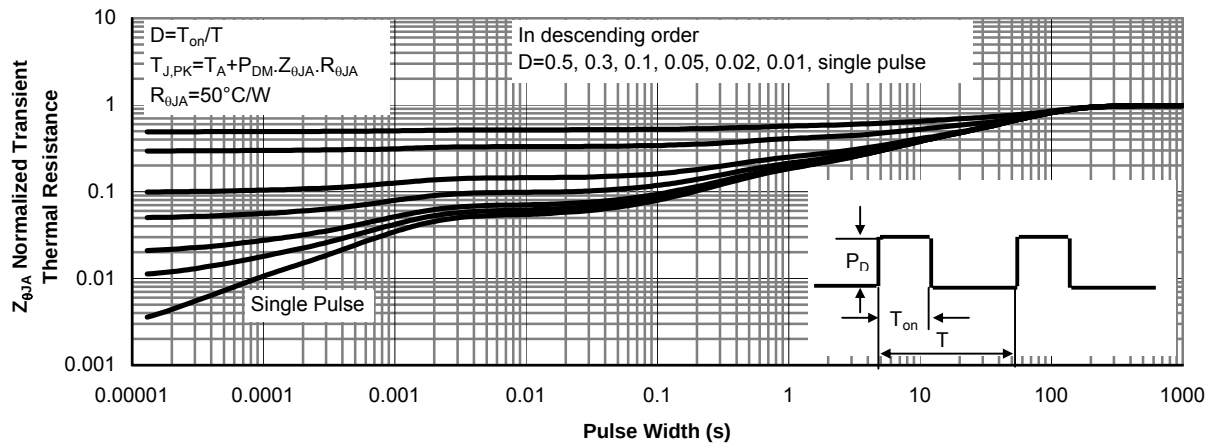


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)