

## General Description

The AOD404 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and low gate resistance. This device is ideally suited for use as a high side switch in CPU core power conversion.

Standard Product AOD404 is Pb-free (meets ROHS & Sony 259 specifications). AOD404L is a Green Product ordering option. AOD404 and AOD404L are electrically identical.

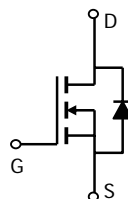
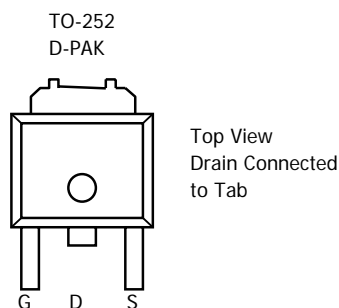
## Features

$V_{DS}$  (V) = 30V

$I_D$  = 85A ( $V_{GS}$  = 10V)

$R_{DS(ON)}$  < 7m $\Omega$  ( $V_{GS}$  = 10V)

$R_{DS(ON)}$  < 8m $\Omega$  ( $V_{GS}$  = 4.5V)



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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>B,G</sup>	$T_C=25^\circ\text{C}$ <sup>G</sup>	85	A
	$T_C=100^\circ\text{C}$ <sup>B</sup>	65	
Pulsed Drain Current	$I_{DM}$	200	
Avalanche Current <sup>C</sup>	$I_{AR}$	30	A
Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AR}$	120	mJ
Power Dissipation <sup>B</sup>	$T_C=25^\circ\text{C}$	100	W
	$T_C=100^\circ\text{C}$	50	
Power Dissipation <sup>A</sup>	$T_A=25^\circ\text{C}$	2.5	W
	$T_A=70^\circ\text{C}$	1.6	
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 <sup>A</sup>	$R_{\theta JA}$	14.2	20	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	39	50
Maximum Junction-to-Case <sup>C</sup>	$R_{\theta JL}$	0.8	1.5	$^\circ\text{C/W}$

Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C		0.002	1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.6	2	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	85			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A T <sub>J</sub> =125°C		5.4 8.4	7 10.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A		6.6	8	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A		90		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.74	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				85	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance			2100	2520	pF
C <sub>oss</sub>	Output Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		536		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			165		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.95	1.2	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(4.5V)</sub>	Total Gate Charge			19.7	24	nC
Q <sub>gs</sub>	Gate Source Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A		3.6		nC
Q <sub>gd</sub>	Gate Drain Charge			7.9		nC
t <sub>D(on)</sub>	Turn-On Delay Time			5.9	10	ns
t <sub>r</sub>	Turn-On Rise Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω,		11	17	ns
t <sub>D(off)</sub>	Turn-Off Delay Time	R <sub>GEN</sub> =3Ω		36.2	55	ns
t <sub>f</sub>	Turn-Off Fall Time			12	18	ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =20A, dI/dt=100A/μs		35	42	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =20A, dI/dt=100A/μs		33	50	nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The Power dissipation P<sub>DSM</sub> is based on steady-state R<sub>θJA</sub> 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 or heatsink allows it.

B: The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=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. It is used to determine the current rating, when this rating falls below the package limit.

C: Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=175°C.

D: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> 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 tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

G: The maximum current rating is limited by the package current capability.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

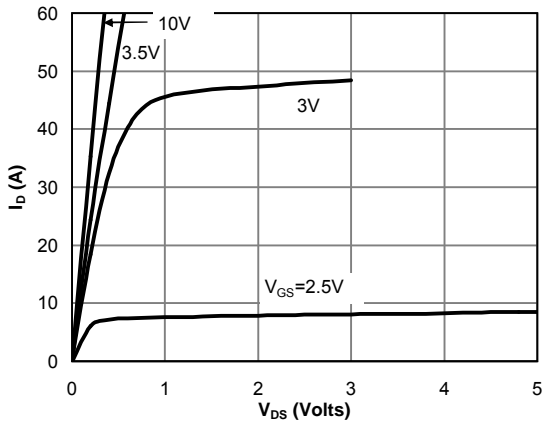


Fig 1: On-Region Characteristics

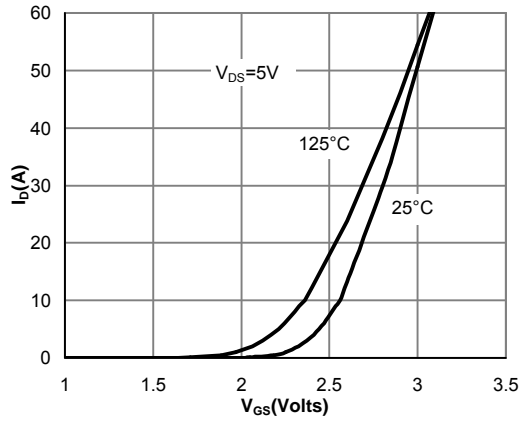


Figure 2: Transfer Characteristics

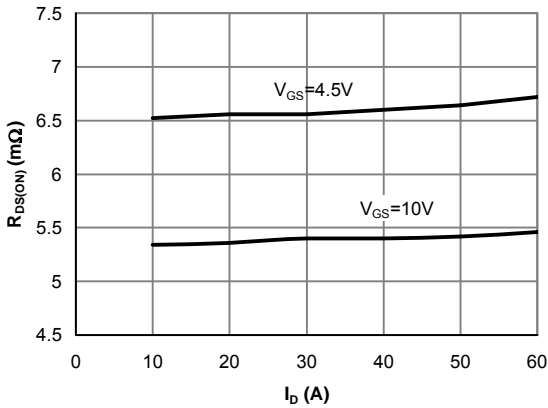


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

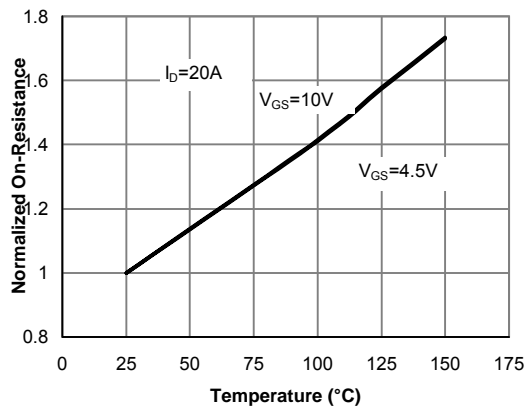


Figure 4: On-Resistance vs. Junction Temperature

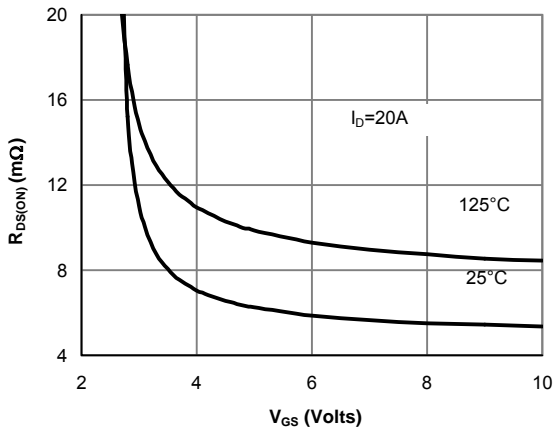


Figure 5: On-Resistance vs. Gate-Source Voltage

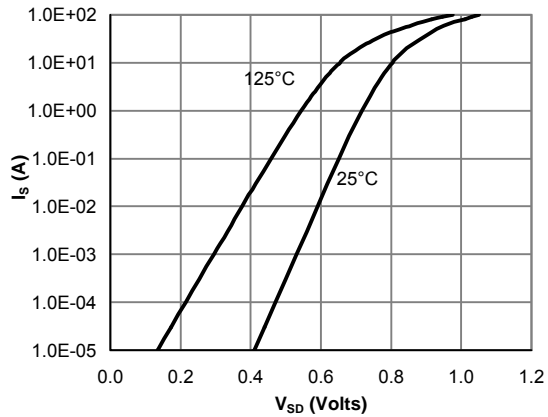


Figure 6: Body-Diode Characteristics

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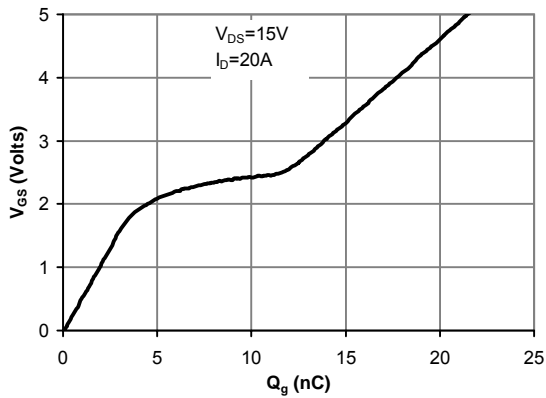


Figure 7: Gate-Charge Characteristics

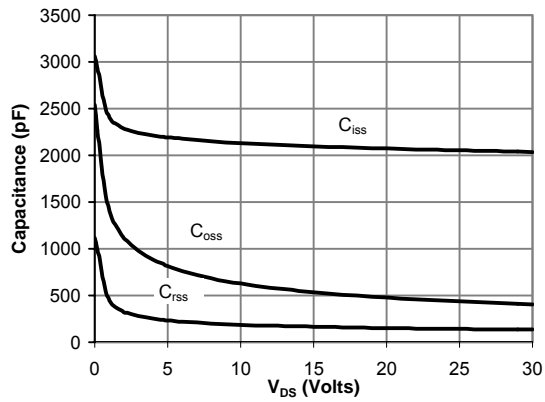


Figure 8: Capacitance Characteristics

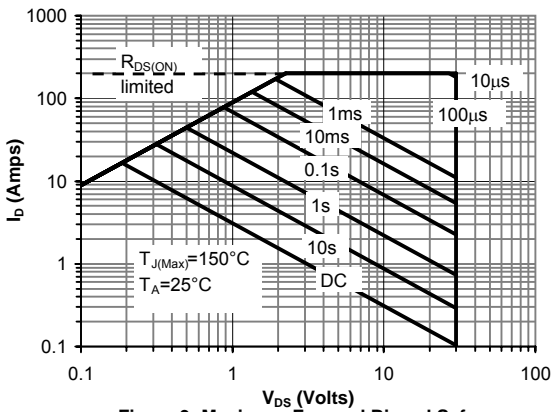


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

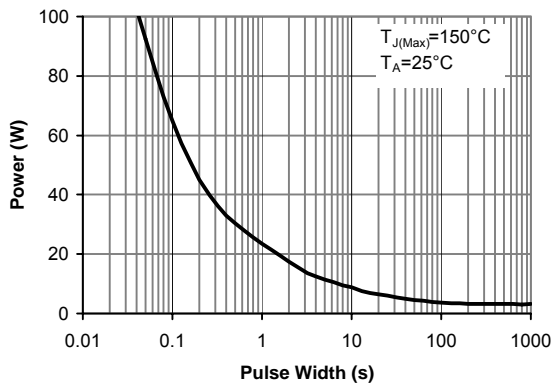


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

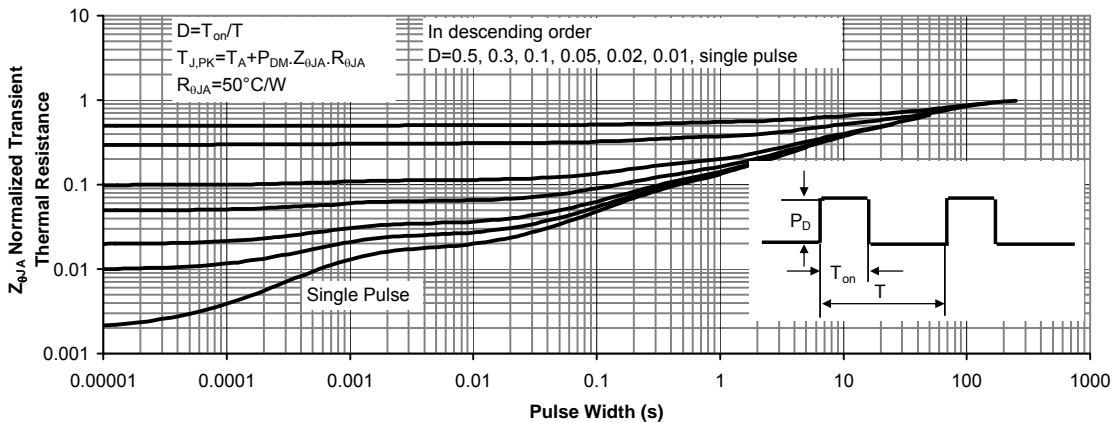


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

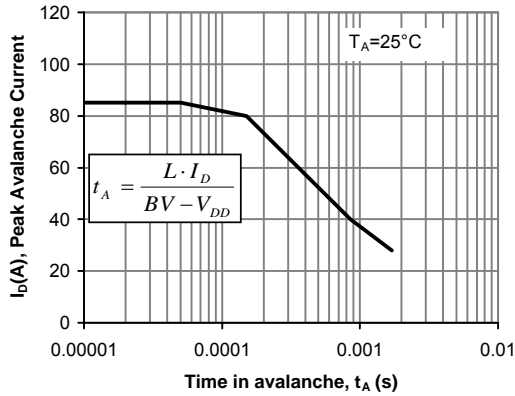


Figure 12: Single Pulse Avalanche capability

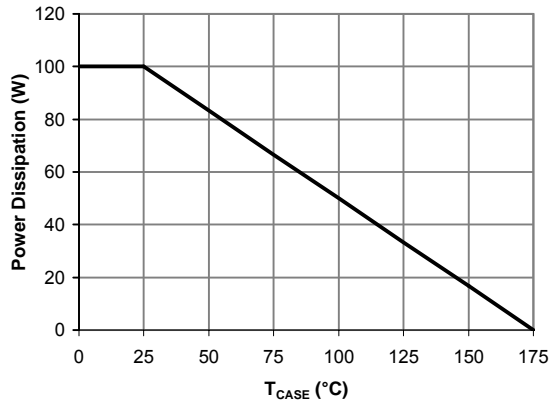


Figure 13: Power De-rating (Note B)

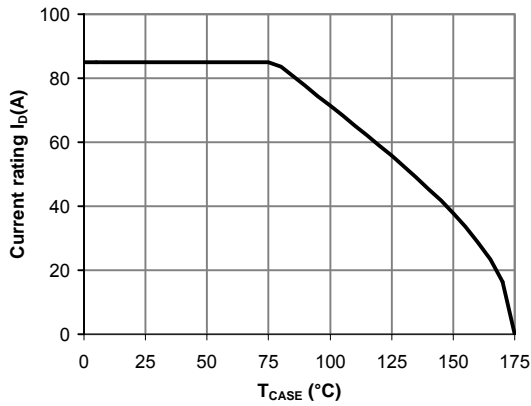


Figure 14: Current De-rating (Note B)