

## General Description

The AOD402 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 AOD402 is Pb-free (meets ROHS & Sony 259 specifications). AOD402L is a Green Product ordering option. AOD402 and AOD402L are electrically identical.

## Features

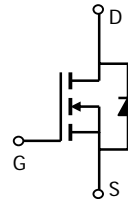
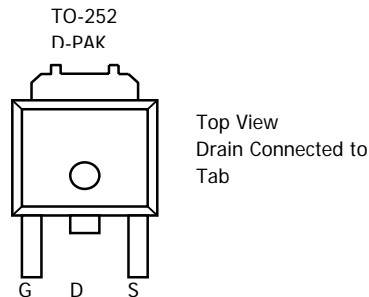
$$V_{DS} (V) = 30V$$

$$I_D = 18 A (V_{GS} = 20V)$$

$$R_{DS(ON)} < 15 m\Omega (V_{GS} = 20V)$$

$$R_{DS(ON)} < 18 m\Omega (V_{GS} = 10V)$$

$$R_{DS(ON)} < 44 m\Omega (V_{GS} = 4.5V)$$



### 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	$V_{GS}$	$\pm 25$	V
Continuous Drain Current <sup>G</sup>	$I_D$	$T_C=25^\circ C$	18
		$T_C=100^\circ C$	12
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	40	A
Avalanche Current <sup>C</sup>	$I_{AR}$	18	A
Repetitive avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AR}$	40	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ C$	60
		$T_C=100^\circ C$	30
Power Dissipation <sup>A</sup>	$P_{DSM}$	$T_A=25^\circ C$	2.5
		$T_A=70^\circ C$	1.6
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 <sup>A</sup>	$R_{\theta JA}$	$t \leq 10s$	16.7	25
		Steady-State	40	50
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	1.9	2.5	$^\circ C/W$

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			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±25V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	2.4	3	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	40			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =20V, I <sub>D</sub> =18A T <sub>J</sub> =125°C		12 17.4	15 21	mΩ
		V <sub>GS</sub> =10V, I <sub>D</sub> =18A		15	18	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A		36	44	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =18A		24		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =18A, V <sub>GS</sub> =0V		0.8	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				18	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		769		pF
C <sub>oss</sub>	Output Capacitance			185		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			131		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		0.7		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>GS</sub> =10V, V <sub>DS</sub> =10V, I <sub>D</sub> =18A		15.9		nC
Q <sub>gs</sub>	Gate Source Charge			2.44		nC
Q <sub>gd</sub>	Gate Drain Charge			4.92		nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =18A, R <sub>L</sub> =0.82Ω, R <sub>GEN</sub> =3Ω		6.2		ns
t <sub>r</sub>	Turn-On Rise Time			10.9		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			16		ns
t <sub>f</sub>	Turn-Off Fall Time			4.8		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =18A, dI/dt=100A/μs		18		ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =18A, dI/dt=100A/μs		8.1		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<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 R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C. The value in any given application depend 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<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.

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 <300μs 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 bond-wires. Rev3: August 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

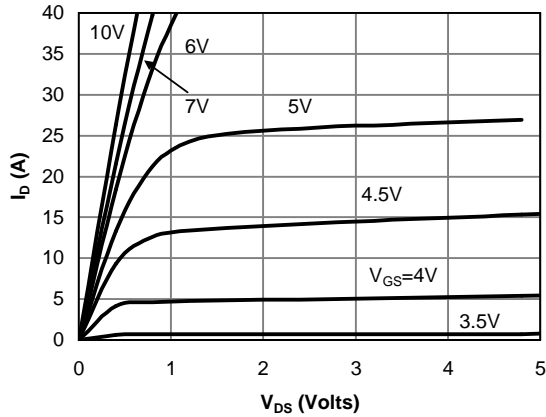


Fig 1: On-Region Characteristics

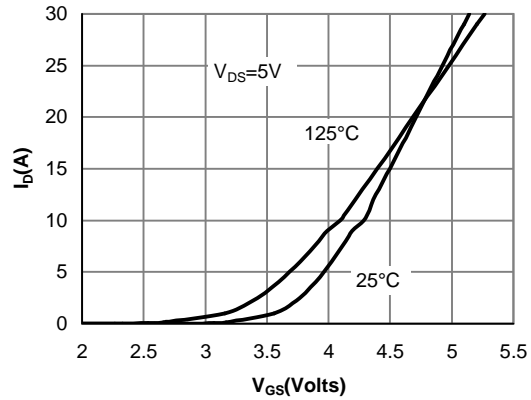


Figure 2: Transfer Characteristics

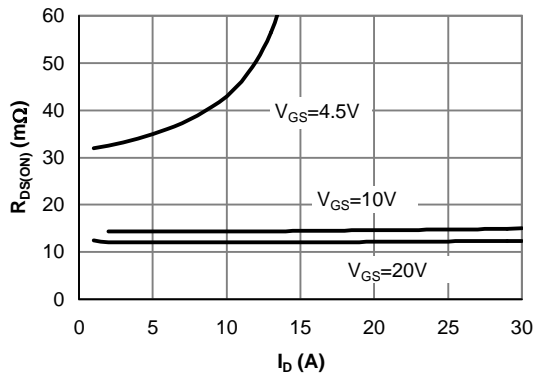


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

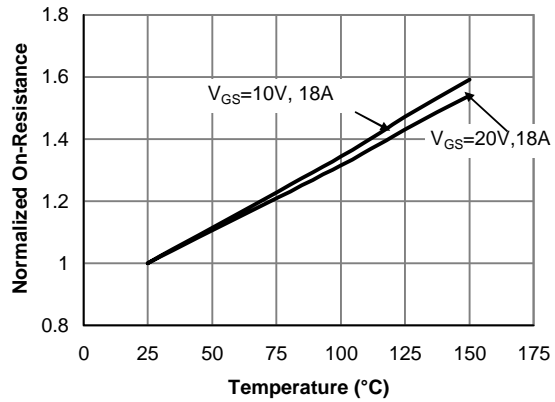


Figure 4: On-Resistance vs. Junction Temperature

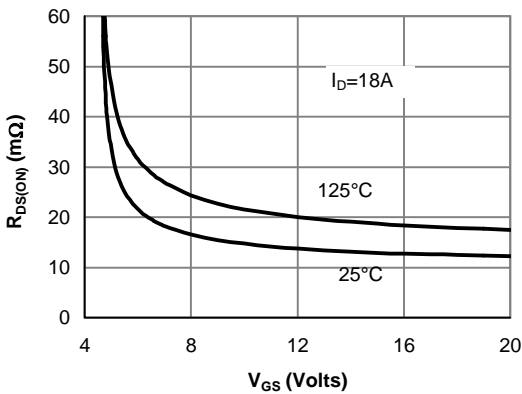


Figure 5: On-Resistance vs. Gate-Source Voltage

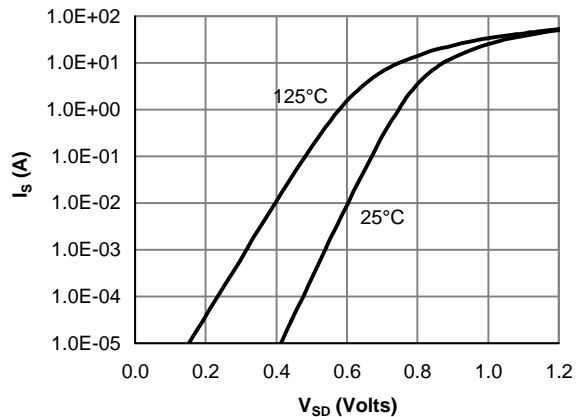


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

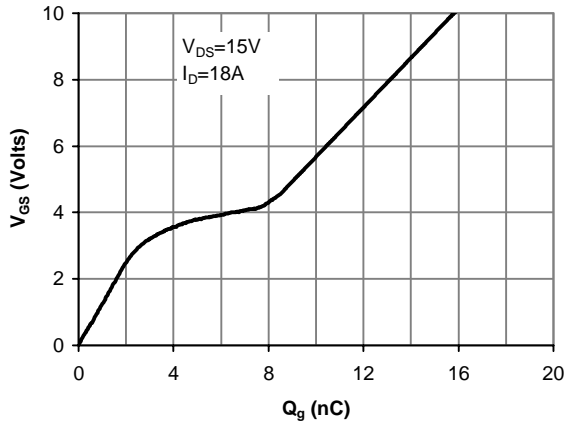


Figure 7: Gate-Charge Characteristics

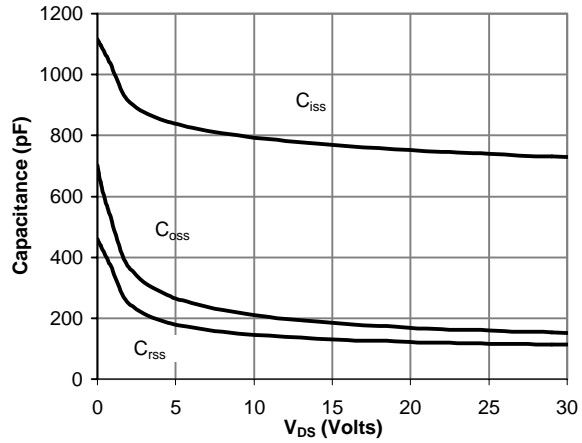


Figure 8: Capacitance Characteristics

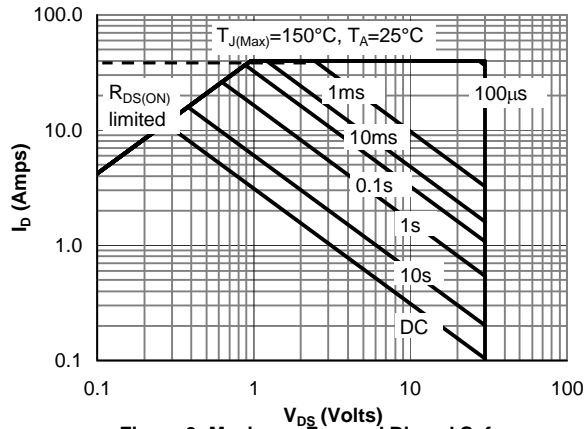


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

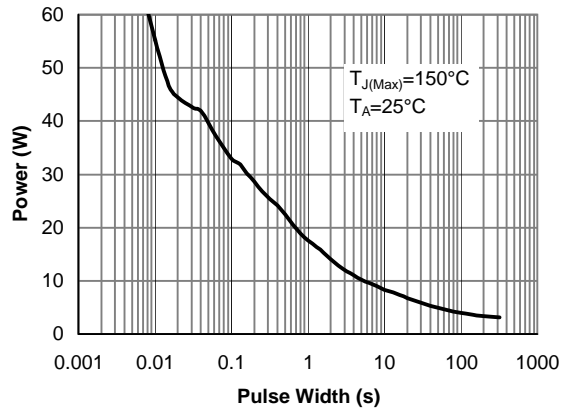


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

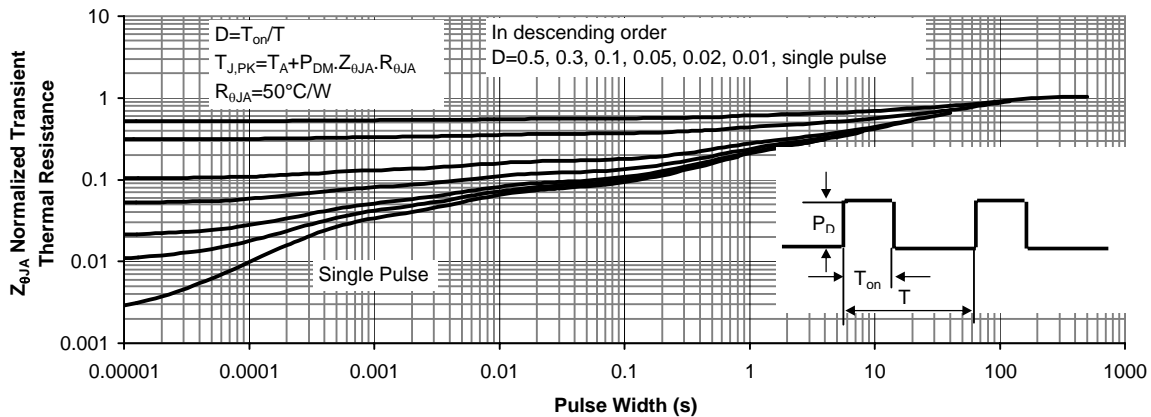


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)