



**AOI452**

**N-Channel Enhancement Mode Field Effect Transistor**

**General Description**

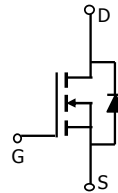
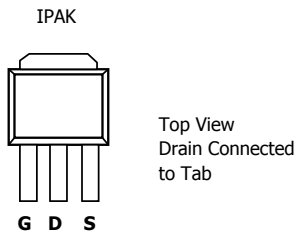
The AOI452 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications. *Standard Product AOI452 is Pb-free (meets ROHS & Sony 259 specifications).*

**Features**

$V_{DS} (V) = 25V$   
 $I_D = 55 A (V_{GS} = 10V)$

$R_{DS(ON)} < 8.7 m\Omega (V_{GS} = 10V)$   
 $R_{DS(ON)} < 14.7 m\Omega (V_{GS} = 4.5V)$

**UIS Tested**  
**Rg, Ciss, Coss, Crss Tested**



**Absolute Maximum Ratings  $T_A=25^\circ C$  unless otherwise noted**

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	25	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current <sup>G</sup>	$T_C=25^\circ C$	55	A
	$T_C=100^\circ C$	40	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	100	
Avalanche Current <sup>C</sup>	$I_{AR}$	40	A
Repetitive avalanche energy $L=0.1mH$ <sup>C</sup>	$E_{AR}$	80	mJ
Power Dissipation <sup>B</sup>	$T_C=25^\circ C$	50	W
	$T_C=100^\circ C$	25	
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>	$R_{\theta JA}$	14.2	20	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	39	50
Maximum Junction-to-Case <sup>B</sup>	$R_{\theta JC}$	2.5	3	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	25			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=25\text{V}$ , $V_{GS}=0\text{V}$			1	$\mu\text{A}$
		$T_J=55^\circ\text{C}$			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	1.8	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$	100			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$ , $I_D=20\text{A}$		7	8.7	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		10	12	
		$V_{GS}=4.5\text{V}$ , $I_D=20\text{A}$		12	14.7	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=10\text{A}$		35		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.72	1	V
$I_S$	Maximum Body-Diode Continuous Current				55	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=12.5\text{V}$ , $f=1\text{MHz}$		1230	1476	$\text{pF}$
$C_{oss}$	Output Capacitance		315	400	$\text{pF}$	
$C_{rss}$	Reverse Transfer Capacitance		190	280	$\text{pF}$	
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		1.2	2	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=12.5\text{V}$ , $I_D=20\text{A}$		26.4	32	nC
$Q_g(4.5\text{V})$	Total Gate Charge		13.5	17	nC	
$Q_{gs}$	Gate Source Charge		3.9	5	nC	
$Q_{gd}$	Gate Drain Charge		7.75	10	nC	
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$ , $V_{DS}=12.5\text{V}$ , $R_L=0.6\Omega$ , $R_{GEN}=3\Omega$		6.5	8	ns
$t_r$	Turn-On Rise Time		10	20	ns	
$t_{D(off)}$	Turn-Off Delay Time		22.7	30	ns	
$t_f$	Turn-Off Fall Time		6.2	12	ns	
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=20\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		23.06	28	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		15.25	18	nC

A: The value of  $R_{\theta JA}$  is measured with the device in a still air environment with  $T_A=25^\circ\text{C}$ .

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. Rev0: April 2007

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

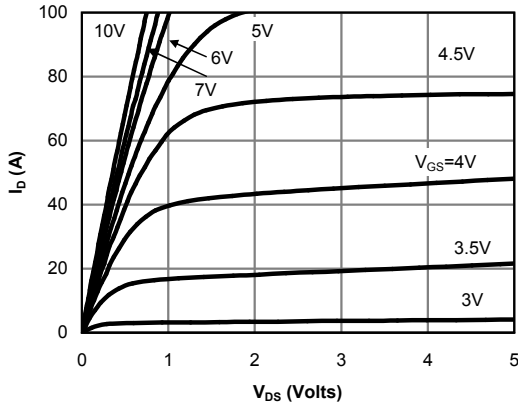


Fig 1: On-Region Characteristics

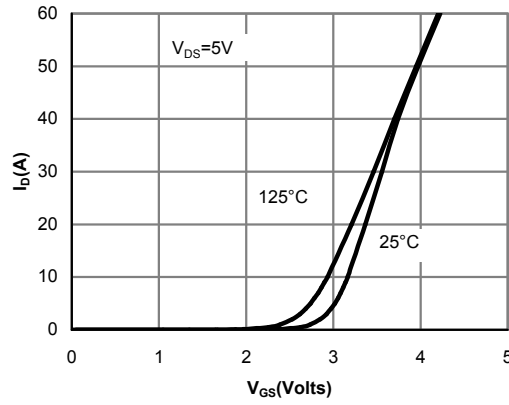


Figure 2: Transfer Characteristics

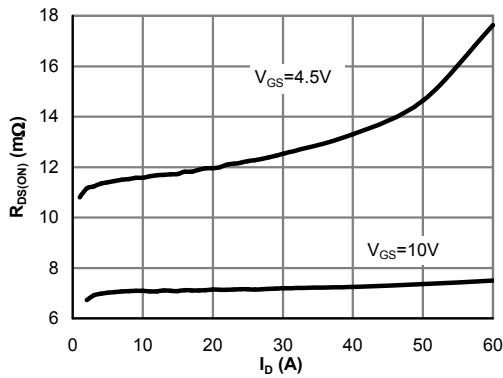


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

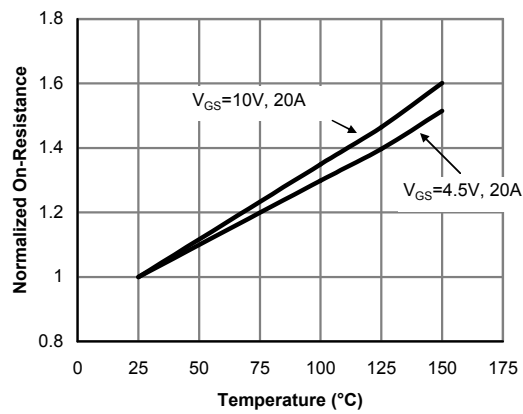


Figure 4: On-Resistance vs. Junction Temperature

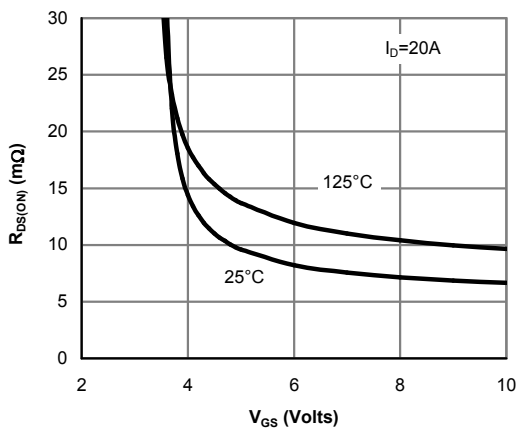


Figure 5: On-Resistance vs. Gate-Source Voltage

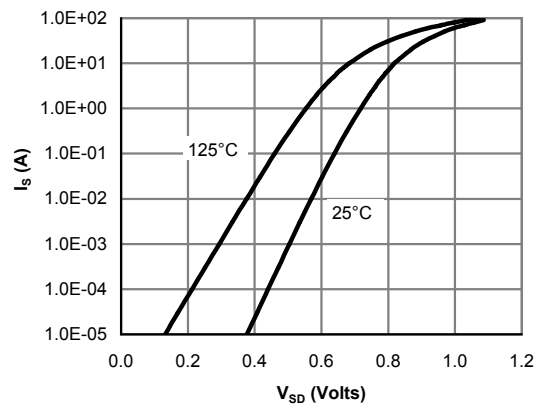


Figure 6: Body-Diode Characteristics

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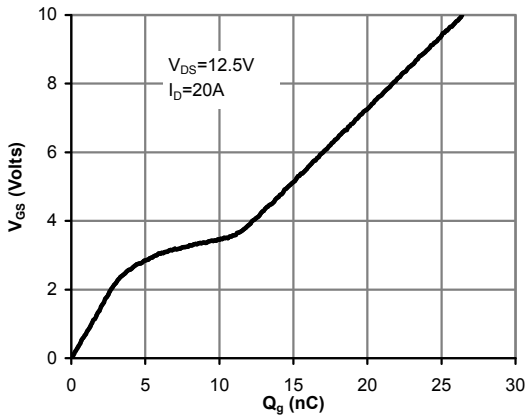


Figure 7: Gate-Charge Characteristics

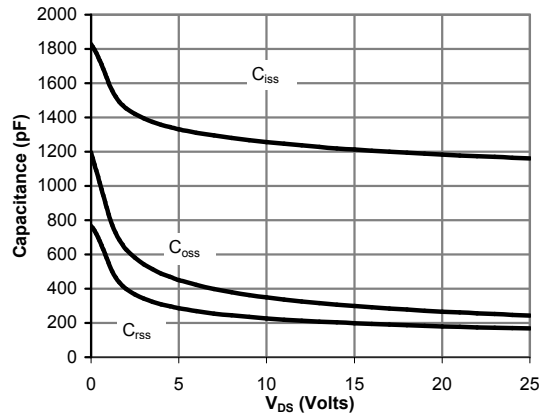


Figure 8: Capacitance Characteristics

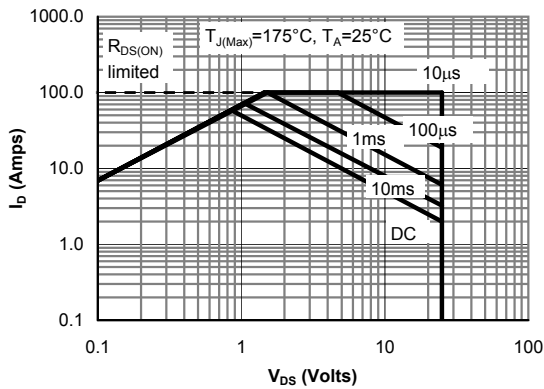


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

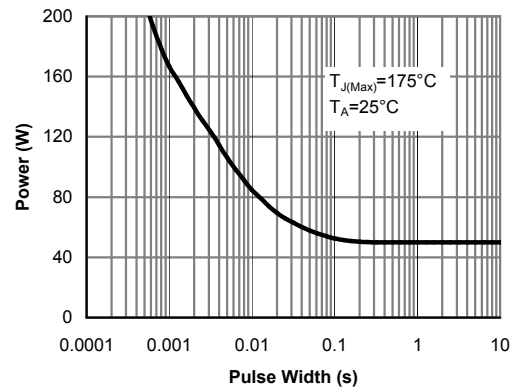


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

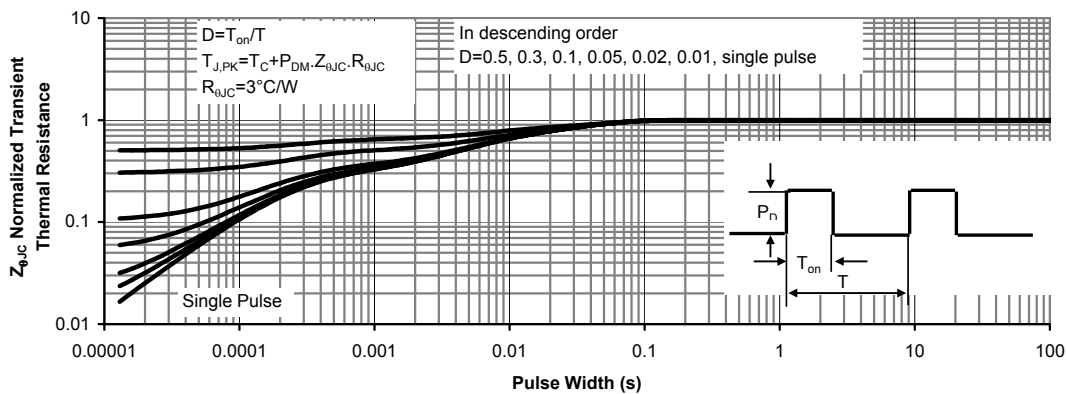


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

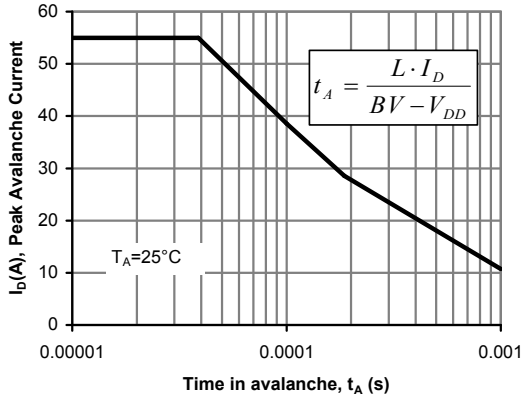


Figure 12: Single Pulse Avalanche capability

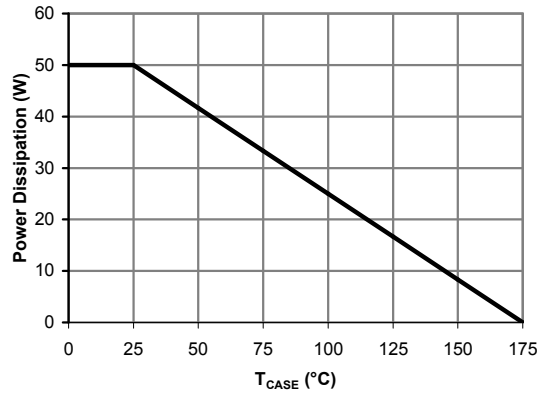


Figure 13: Power De-rating (Note B)

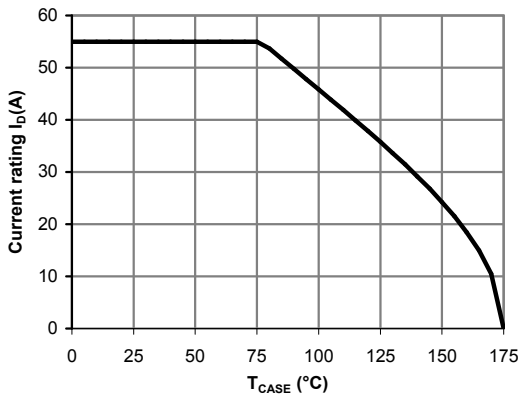


Figure 14: Current De-rating (Note B)