



AOI452

N-Channel Enhancement Mode Field Effect Transistor

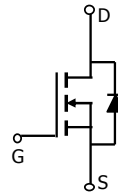
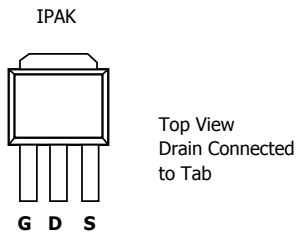
General Description

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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
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	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	1.8	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
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=12.5\text{V}$, $f=1\text{MHz}$		1230	1476	pF
C_{oss}	Output Capacitance			315	400	pF
C_{rss}	Reverse Transfer Capacitance			190	280	pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.2	2	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	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

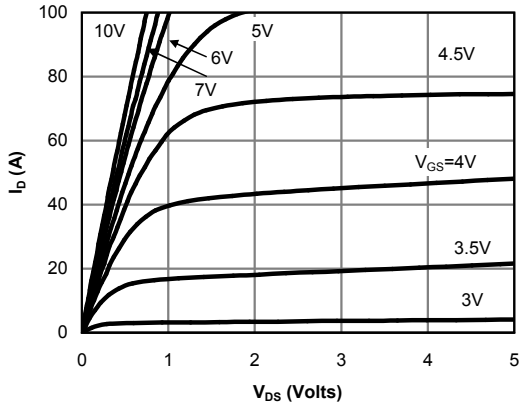


Fig 1: On-Region Characteristics

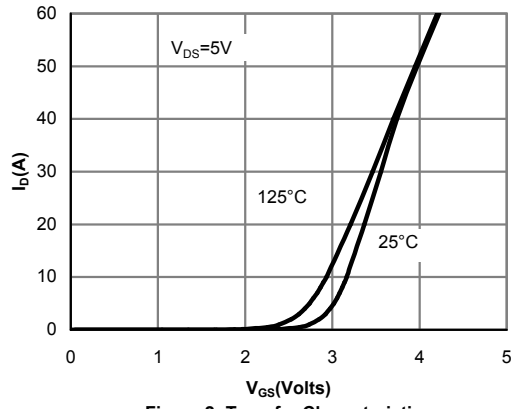


Figure 2: Transfer Characteristics

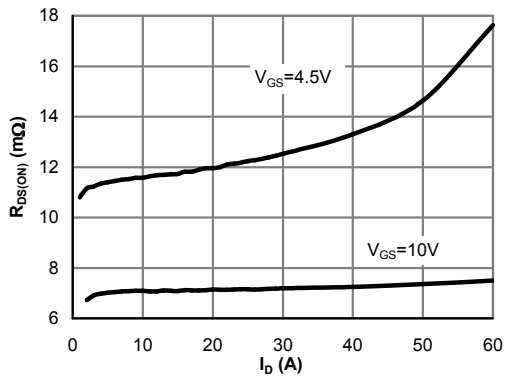


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

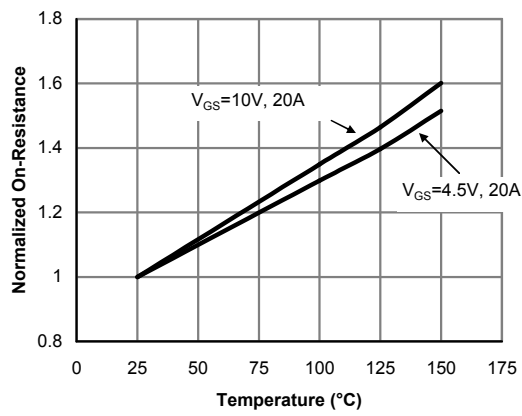


Figure 4: On-Resistance vs. Junction Temperature

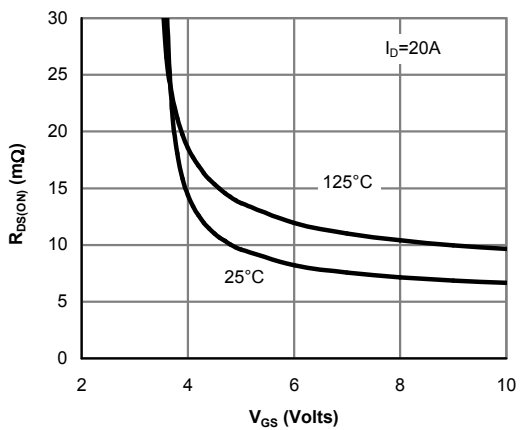


Figure 5: On-Resistance vs. Gate-Source Voltage

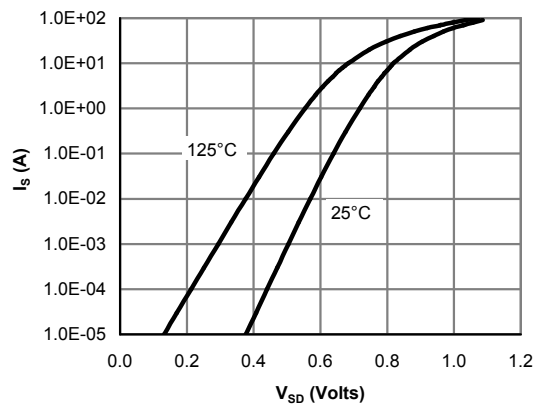


Figure 6: Body-Diode Characteristics

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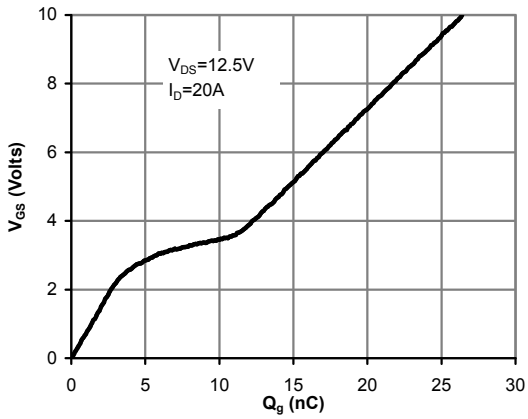


Figure 7: Gate-Charge Characteristics

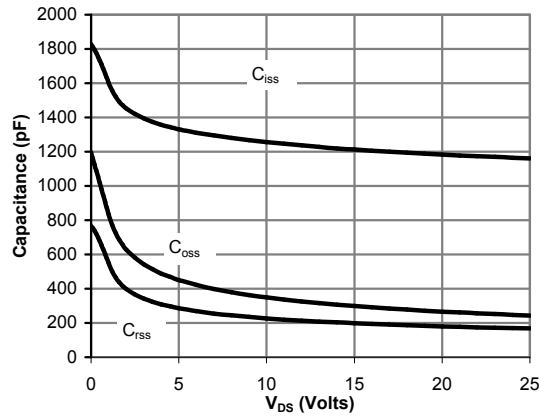


Figure 8: Capacitance Characteristics

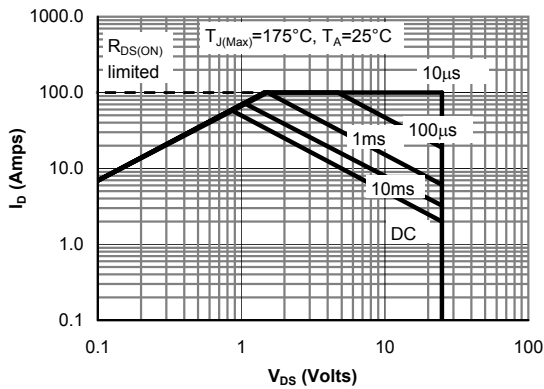


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

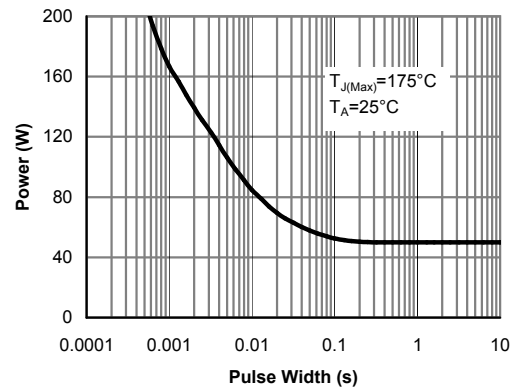


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

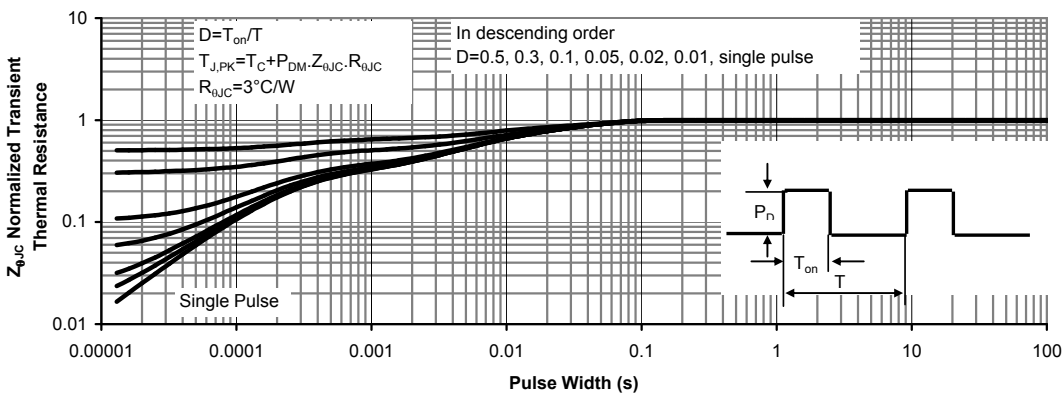


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

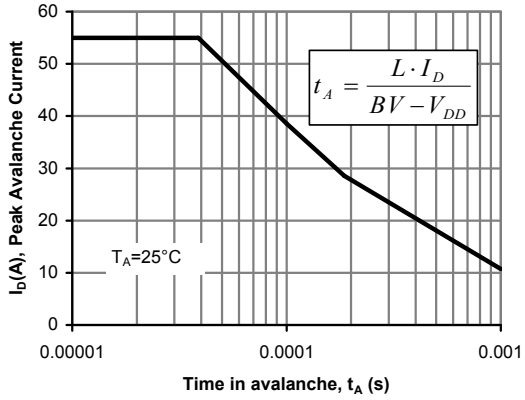


Figure 12: Single Pulse Avalanche capability

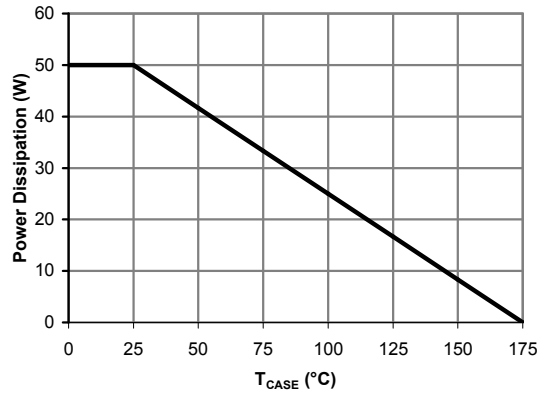


Figure 13: Power De-rating (Note B)

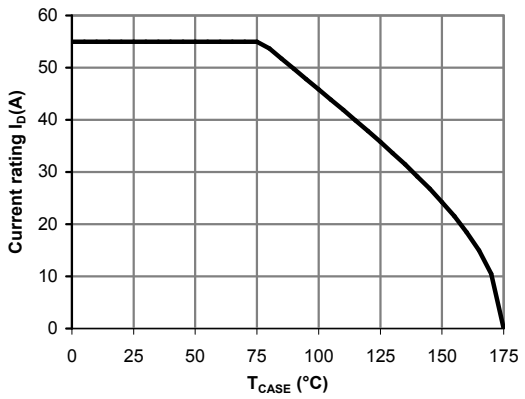


Figure 14: Current De-rating (Note B)