

AO4458

N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO4458/L uses advanced trench technology to provide excellent $R_{DS(ON)}$ with low gate charge. This device is ESD protected and it is suitable for use as a load switch or in PWM applications. AO4458 and AO4458L are electrically identical.

-RoHS Compliant

-AO4458L is Halogen Free

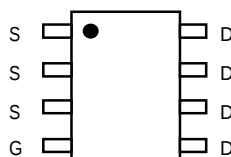
Features

V_{DS} (V) = 30V

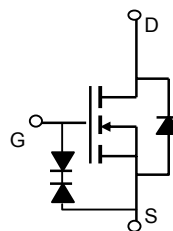
I_D = 20A (V_{GS} = 10V)

$R_{DS(ON)} < 4.6m\Omega$ (V_{GS} = 10V)

$R_{DS(ON)} < 6.4m\Omega$ (V_{GS} = 4.5V)



SOIC-8



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

Parameter	Symbol	10 Sec	Steady State	Units
Drain-Source Voltage	V_{DS}	30		V
Gate-Source Voltage	V_{GS}	± 20		V
Continuous Drain Current ^A	I_D	20	15	A
$T_A=70^\circ\text{C}$		17	12	
Pulsed Drain Current ^B	I_{DM}	80		
Avalanche Current ^G	I_{AR}	50		
Repetitive avalanche energy $L=0.3mH$ ^G	E_{AR}	375		mJ
Power Dissipation ^A	P_D	3.1	1.7	W
$T_A=70^\circ\text{C}$		2.0	1.1	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	31	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		59	75	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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	$V_{DS} = 30\text{V}$, $V_{GS} = 0\text{V}$ $T_J = 55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 16\text{V}$			± 10	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	1.0	1.7	3	V
$I_{D(ON)}$	On state drain current	$V_{GS} = 10\text{V}$, $V_{DS} = 5\text{V}$	80			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$ $T_J = 125^{\circ}\text{C}$ $V_{GS} = 4.5\text{V}$, $I_D = 18\text{A}$		3.8 5.3 5.2	4.6 6.5 6.4	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}$, $I_D = 20\text{A}$		72		S
V_{SD}	Diode Forward Voltage	$I_S = 1\text{A}$, $V_{GS} = 0\text{V}$		0.69	1	V
I_S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		5450	6800	pF
C_{oss}	Output Capacitance			760		pF
C_{rss}	Reverse Transfer Capacitance			540		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1	1.5	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=20\text{A}$		84	112	nC
$Q_g(4.5\text{V})$	Total Gate Charge			42	56	nC
Q_{gs}	Gate Source Charge			12		nC
Q_{gd}	Gate Drain Charge			21		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=0.75\Omega$, $R_{GEN}=3\Omega$		13		ns
t_r	Turn-On Rise Time			9.8		ns
$t_{D(off)}$	Turn-Off DelayTime			49		ns
t_f	Turn-Off Fall Time			16		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		42	56	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=20\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		31		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 value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using $< 300\mu\text{s}$ pulses, duty cycle 0.5% max.

E: These tests are performed 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 SOA curve provides a single pulse rating.

F: The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

G: E_{AR} and I_{AR} ratings are based on low frequency and duty cycles to keep $T_J=25^{\circ}\text{C}$.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

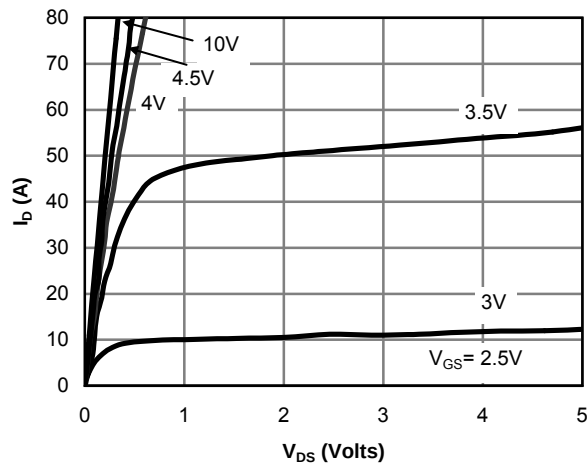


Figure 1: On-Region Characteristics

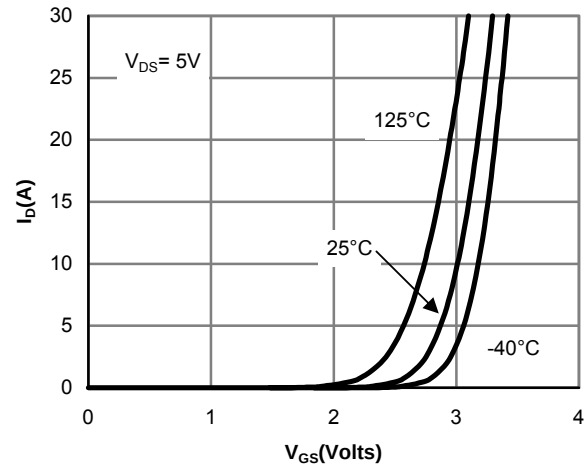


Figure 2: Transfer Characteristics

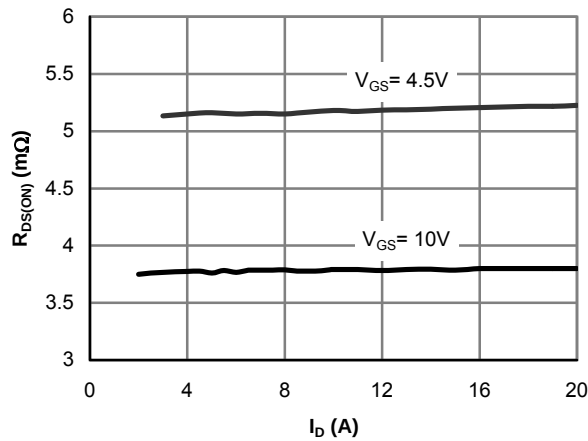


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

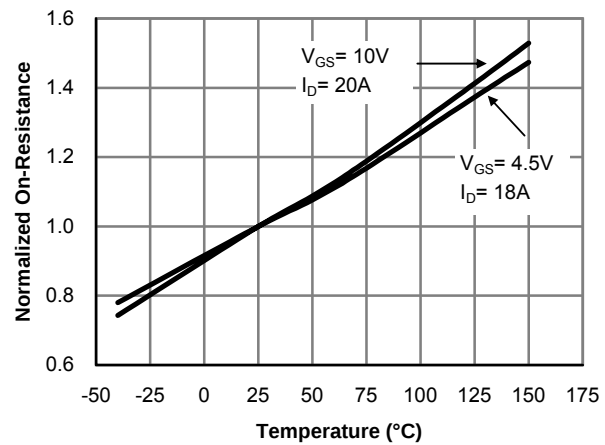


Figure 4: On-Resistance vs. Junction Temperature

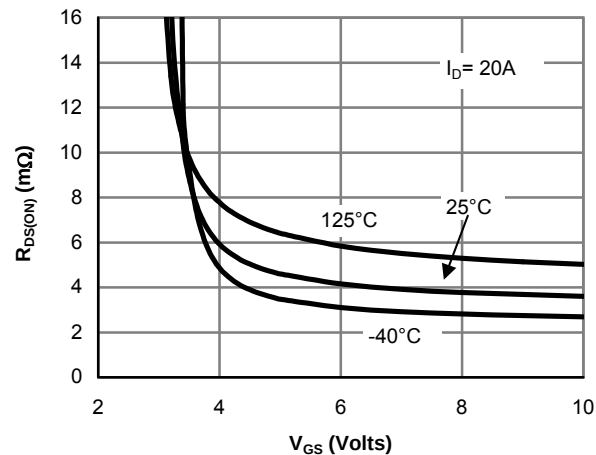


Figure 5: On-Resistance vs. Gate-Source Voltage

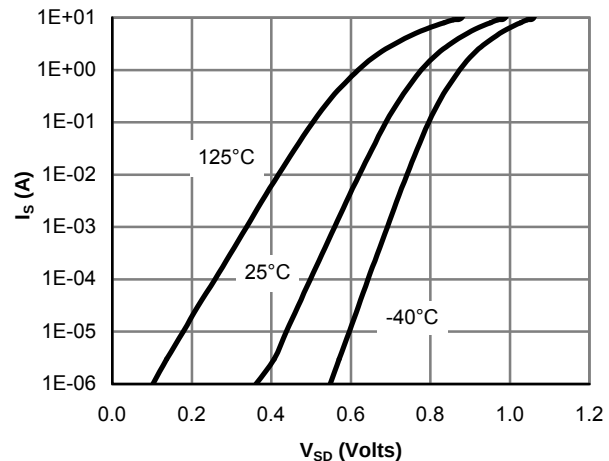


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

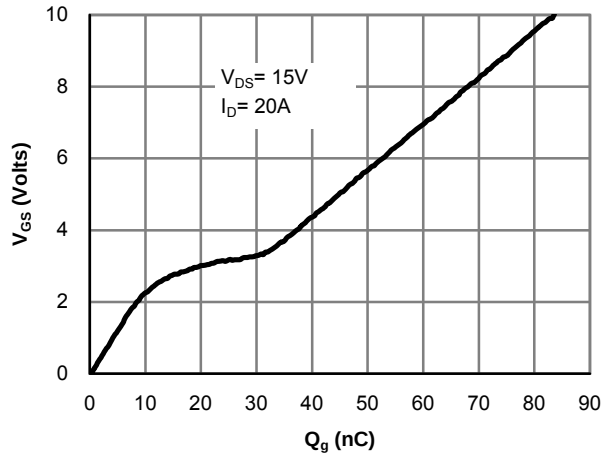


Figure 7: Gate-Charge Characteristics

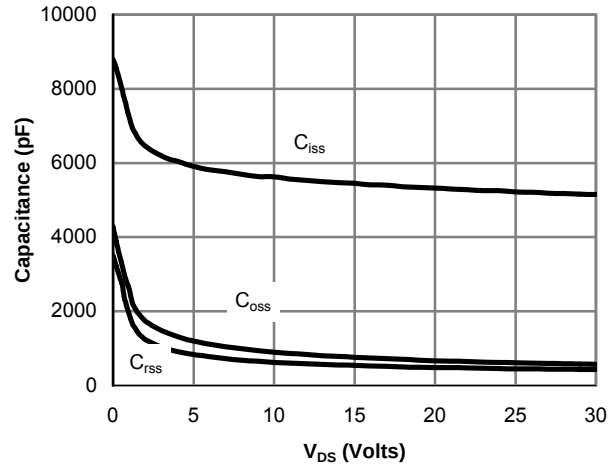


Figure 8: Capacitance Characteristics

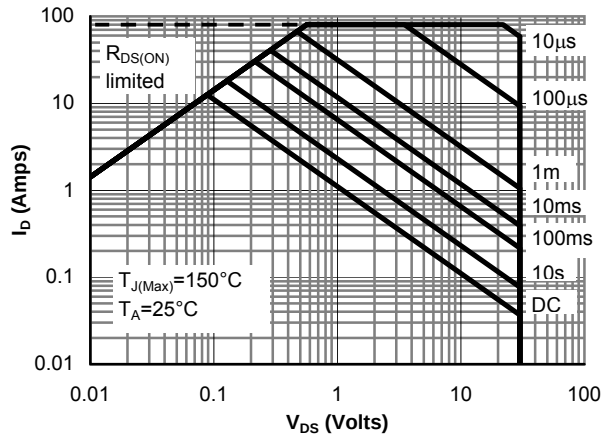


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

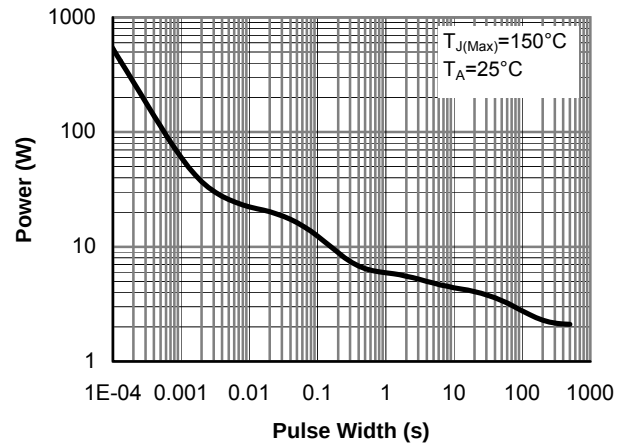


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

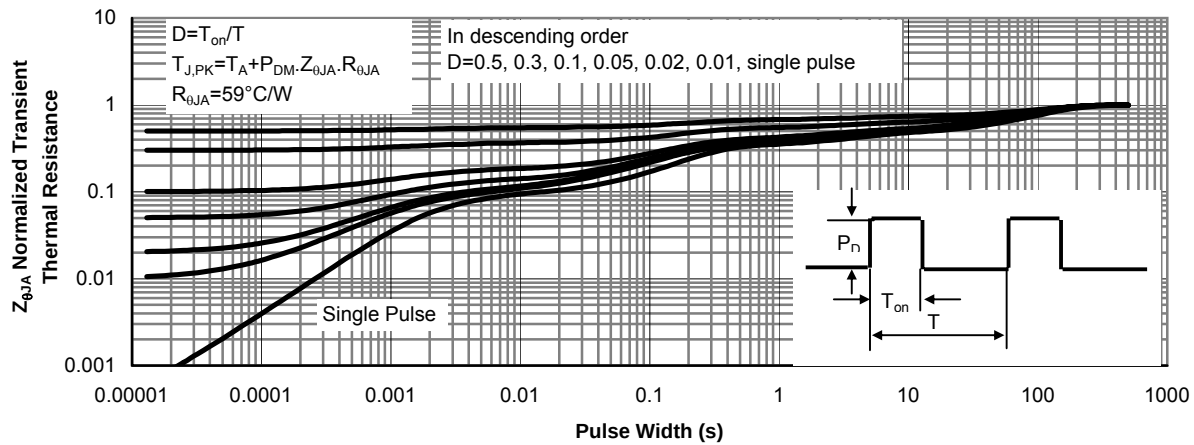


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)