



## AO4494L

### N-Channel Enhancement Mode Field Effect Transistor

#### General Description

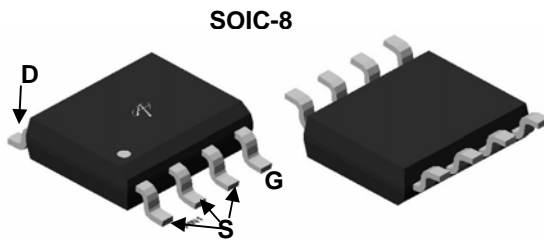
The AO4494L combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ . This device is for PWM applications.

- RoHS Compliant
- Halogen Free

#### Features

$V_{DS}$  (V) = 30V  
 $I_D$  = 18A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 6.5m $\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 9.5m $\Omega$  ( $V_{GS}$  = 4.5V)

**100% UIS Tested!**  
**100%  $R_g$  Tested!**



#### 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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	$T_C=25^\circ\text{C}$	18
		$T_C=70^\circ\text{C}$	14
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	130	A
Avalanche Current <sup>C</sup>	$I_{AR}$	32	A
Repetitive avalanche energy $L=0.1\text{mH}$ <sup>C</sup>	$E_{AR}$	51	mJ
Power Dissipation <sup>B</sup>	$P_D$	$T_C=25^\circ\text{C}$	3.1
		$T_C=70^\circ\text{C}$	2
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 <sup>A</sup>	$R_{\theta JA}$	28	40	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A,D</sup>		Steady-State	59	75
Maximum Junction-to-Lead	$R_{\theta JL}$	16	24	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$	30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=30\text{V}$ , $V_{GS}=0\text{V}$ $T_J=125^\circ\text{C}$			1 5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=250\mu\text{A}$	1.5	2	2.5	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$ , $V_{DS}=5\text{V}$	130			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$ , $I_D=18\text{A}$ $T_J=125^\circ\text{C}$		5.4 8.4	6.5 10.1	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$ , $I_D=16\text{A}$		7.5	9.5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=5\text{V}$ , $I_D=18\text{A}$		70		S
$V_{SD}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{GS}=0\text{V}$		0.75	1	V
$I_S$	Maximum Body-Diode Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=15\text{V}$ , $f=1\text{MHz}$	1270	1590	1900	pF
$C_{oss}$	Output Capacitance		170	240	310	pF
$C_{riss}$	Reverse Transfer Capacitance		87	145	200	pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$	0.8	1.5	2.3	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $I_D=18\text{A}$	24	30	36	nC
$Q_g(4.5\text{V})$	Total Gate Charge		12	15	18	nC
$Q_{gs}$	Gate Source Charge		4.2	5.2	6.2	nC
$Q_{gd}$	Gate Drain Charge		4.7	7.8	11	nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=0.83\Omega$ , $R_{GEN}=3\Omega$		6.7		ns
$t_r$	Turn-On Rise Time			3.5		ns
$t_{D(off)}$	Turn-Off DelayTime			22.5		ns
$t_f$	Turn-Off Fall Time			4		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=18\text{A}$ , $dI/dt=500\text{A}/\mu\text{s}$	22	28	34	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=18\text{A}$ , $dI/dt=500\text{A}/\mu\text{s}$	19	24	30	nC

A. The value of  $R_{\theta JA}$  is measured with the device mounted on  $1\text{in}^2$  FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The Power dissipation  $P_{DSM}$  is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^\circ\text{C}$ . The value in any given application depends on the user's specific board design.

B. The power dissipation  $P_D$  is based on  $T_{J(MAX)}=150^\circ\text{C}$ , 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  $T_{J(MAX)}=150^\circ\text{C}$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ\text{C}$ .

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  $T_{J(MAX)}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

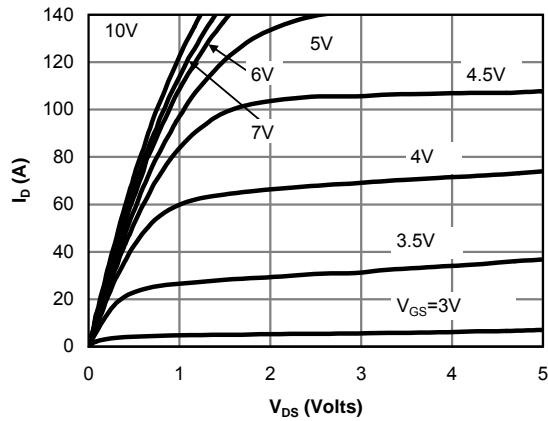


Fig 1: On-Region Characteristics (Note E)

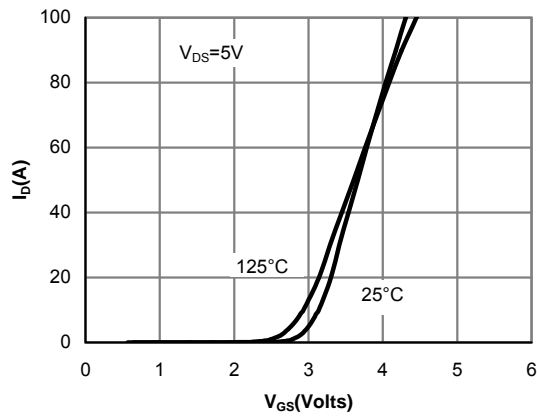


Figure 2: Transfer Characteristics (Note E)

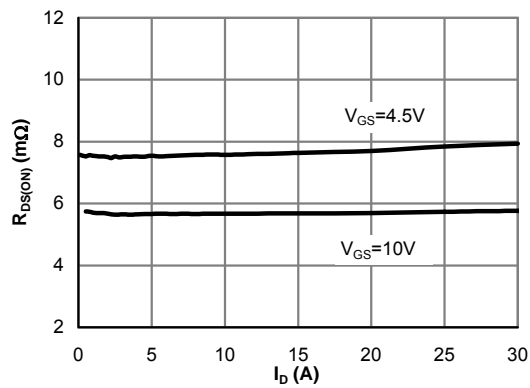


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

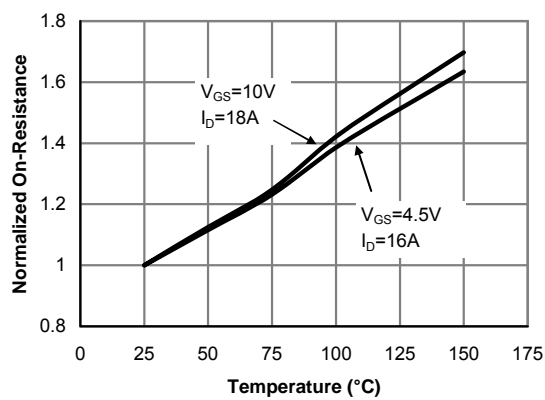


Figure 4: On-Resistance vs. Junction Temperature (Note E)

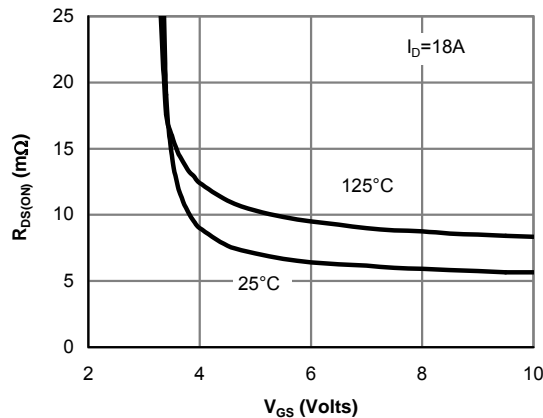


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

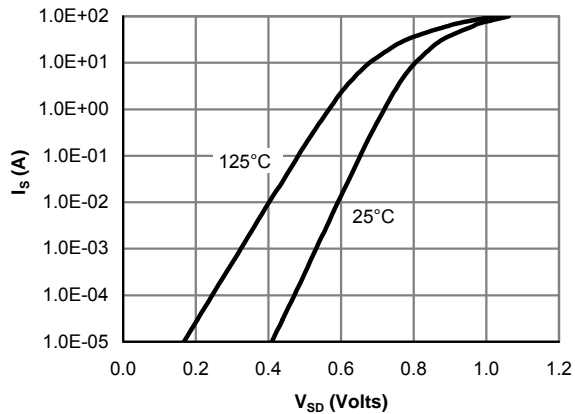


Figure 6: Body-Diode Characteristics (Note E)

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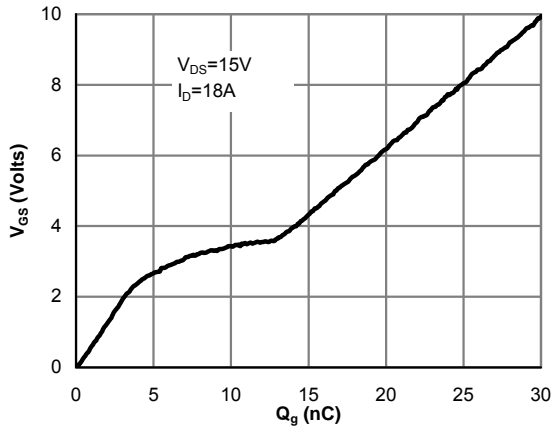


Figure 7: Gate-Charge Characteristics

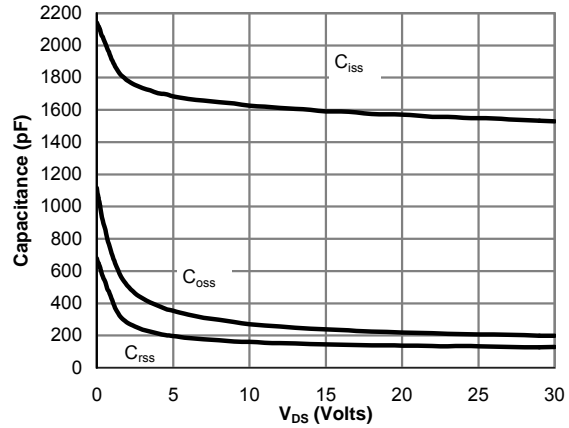


Figure 8: Capacitance Characteristics

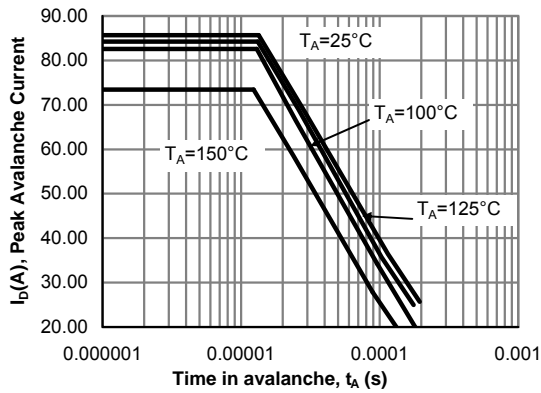


Figure 12: Single Pulse Avalanche capability (Note C)

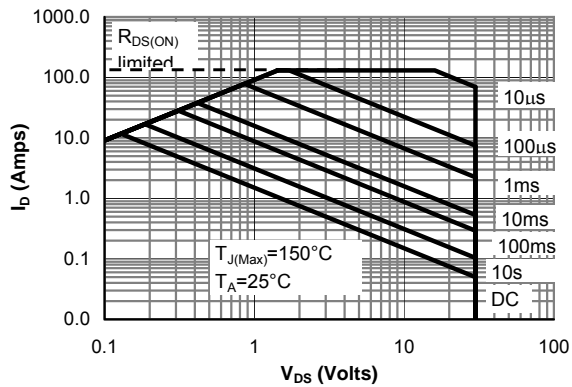


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

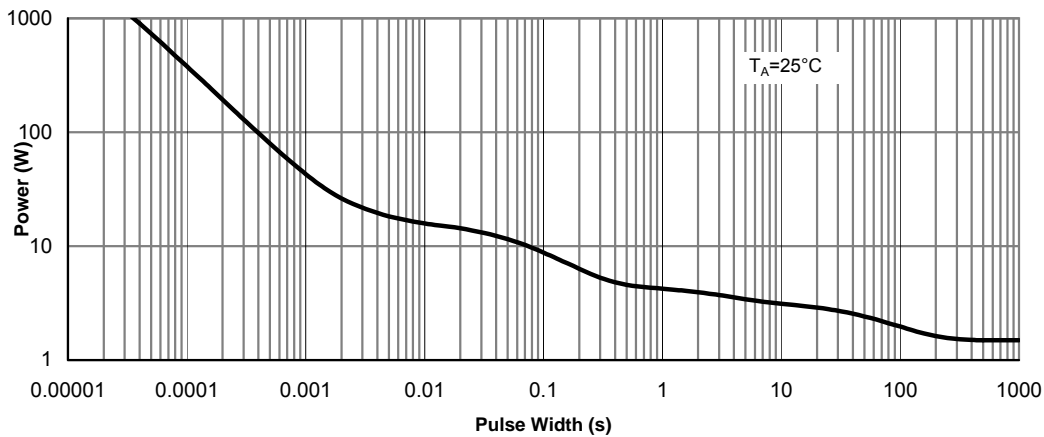


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

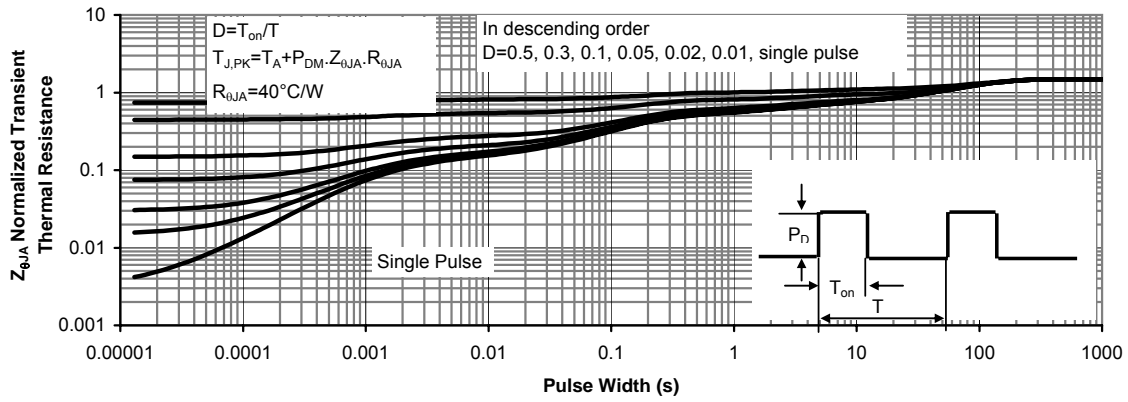
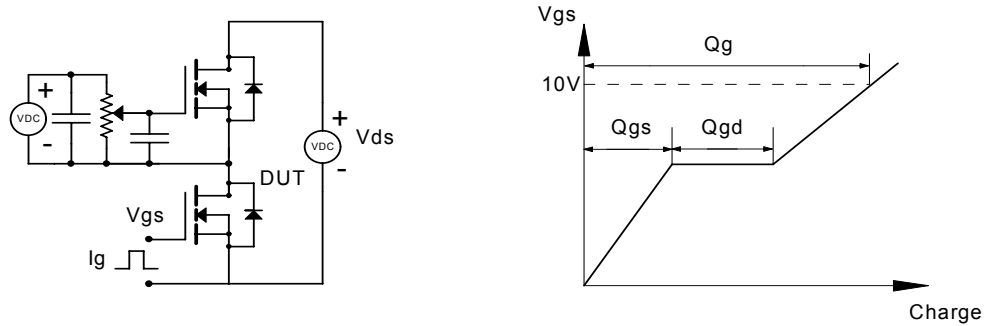
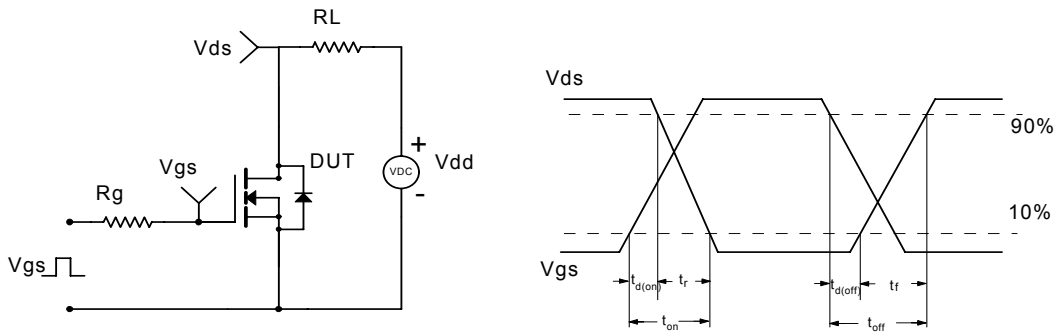


Figure 16: Normalized Maximum Transient Thermal Impedance (Note F)

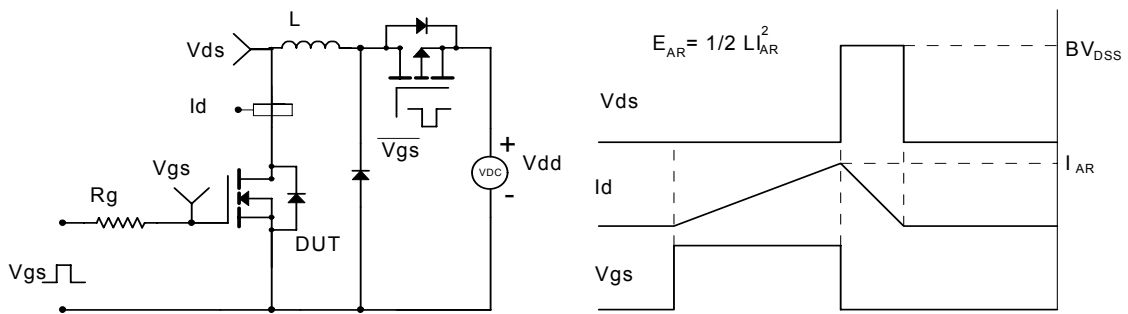
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

