



# AO8801A

**20V P-Channel MOSFET**

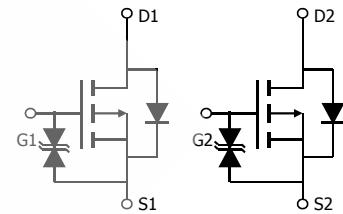
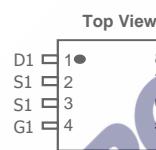
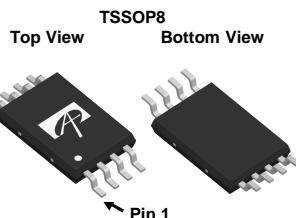
**General Description**

The AO8801A uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

**Product Summary**

$V_{DS}$	-20V
$I_D$ (at $V_{GS}=-10V$ )	-4.5A
$R_{DS(ON)}$ (at $V_{GS} = -4.5V$ )	< 42mΩ
$R_{DS(ON)}$ (at $V_{GS} = -2.5V$ )	< 54mΩ
$R_{DS(ON)}$ (at $V_{GS} = -1.8V$ )	< 68mΩ

ESD Protected

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	$V_{DS}$	-20	V
Gate-Source Voltage	$V_{GS}$	$\pm 8$	V
Continuous Drain Current	$I_D$	-4.5	A
$T_A=70^\circ\text{C}$		-3.6	
Pulsed Drain Current <sup>C</sup>	$I_{DM}$	-30	
Power Dissipation <sup>B</sup>	$P_D$	1.5	W
$T_A=70^\circ\text{C}$		0.96	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	°C

**Thermal Characteristics**

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10\text{s}$	$R_{\theta JA}$	63	83	°C/W
Maximum Junction-to-Ambient <sup>A,D</sup> Steady-State		101	130	°C/W
Maximum Junction-to-Lead Steady-State	$R_{\theta JL}$	64	83	°C/W

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$\text{BV}_{\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}, V_{GS}=0\text{V}$	-20			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS}=-20\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}= \pm 8\text{V}$			$\pm 10$	$\mu\text{A}$
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-0.3	-0.57	-0.9	V
$I_{\text{D(ON)}}$	On state drain current	$V_{GS}=-4.5\text{V}, V_{DS}=-5\text{V}$	-30			A
$R_{\text{DS(ON)}}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}, I_D=-4.5\text{A}$		35	42	$\text{m}\Omega$
		$T_J=125^\circ\text{C}$		49	59	
		$V_{GS}=-2.5\text{V}, I_D=-4\text{A}$		43	54	
$g_{\text{FS}}$	Forward Transconductance	$V_{DS}=-5\text{V}, I_D=-4.5\text{A}$		20		S
		$I_S=-1\text{A}, V_{GS}=0\text{V}$		-0.64	-1	
		$I_s$ Maximum Body-Diode Continuous Current			-2	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=-10\text{V}, f=1\text{MHz}$	600	751	905	$\text{pF}$
$C_{\text{oss}}$	Output Capacitance		80	115	150	$\text{pF}$
$C_{\text{rss}}$	Reverse Transfer Capacitance		48	80	115	$\text{pF}$
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$	6	13	20	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-4.5\text{V}, V_{DS}=-10\text{V}, I_D=-4.5\text{A}$	7.4	9.3	11	nC
$Q_{\text{gs}}$	Gate Source Charge		0.8	1	1.2	nC
$Q_{\text{gd}}$	Gate Drain Charge		1.3	2.2	3.1	nC
$t_{\text{D(on)}}$	Turn-On Delay Time	$V_{GS}=-4.5\text{V}, V_{DS}=-10\text{V}, R_L=2.2\Omega, R_{\text{GEN}}=3\Omega$		13		ns
$t_r$	Turn-On Rise Time			9		ns
$t_{\text{D(off)}}$	Turn-Off Delay Time			19		ns
$t_f$	Turn-Off Fall Time			29		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=-4.5\text{A}, dI/dt=500\text{A}/\mu\text{s}$	20	26	32	ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=-4.5\text{A}, dI/dt=500\text{A}/\mu\text{s}$	40	51	62	nC

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> 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.

B. The power dissipation  $P_D$  is based on  $T_{J(\text{MAX})}=150^\circ\text{C}$ , using  $\leqslant 10\text{s}$  junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(\text{MAX})}=150^\circ\text{C}$ . 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 lead  $R_{\theta JL}$  and lead 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-ambient thermal impedance which is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, assuming a maximum junction temperature of  $T_{J(\text{MAX})}=150^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

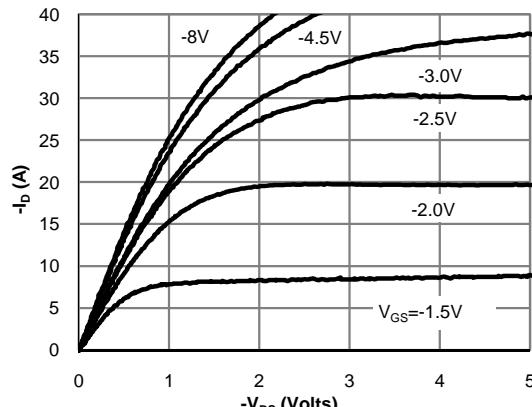


Fig 1: On-Region Characteristics (Note E)

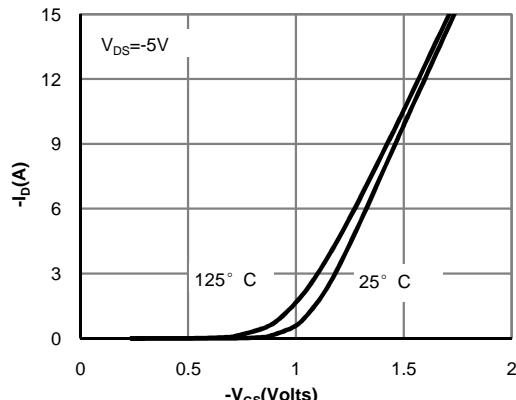


Figure 2: Transfer Characteristics (Note E)

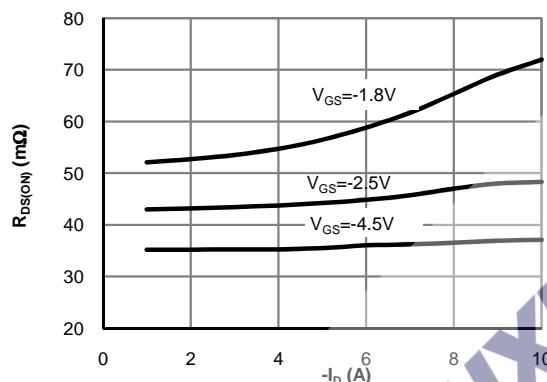


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

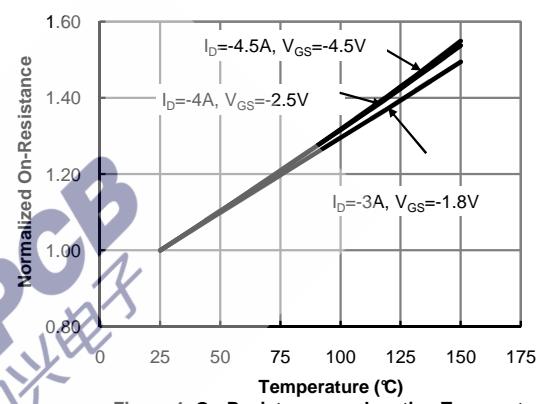


Figure 4: On-Resistance vs. Junction Temperature (Note E)

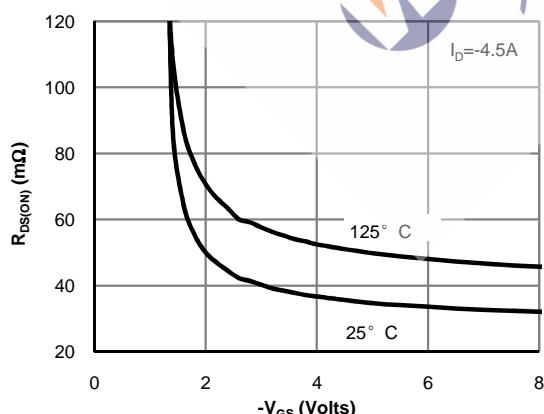


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

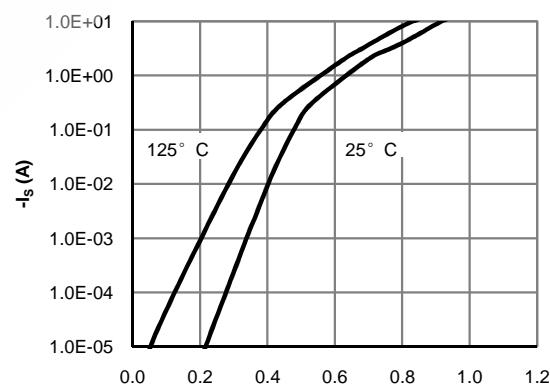
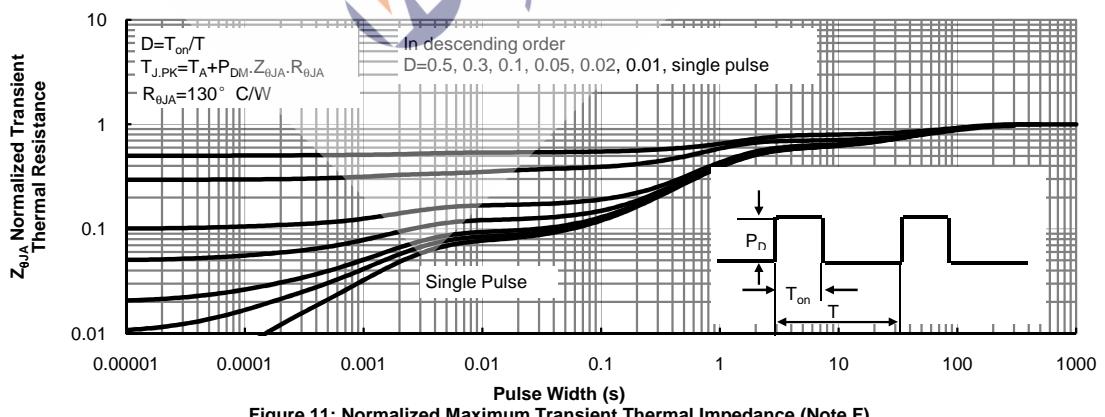
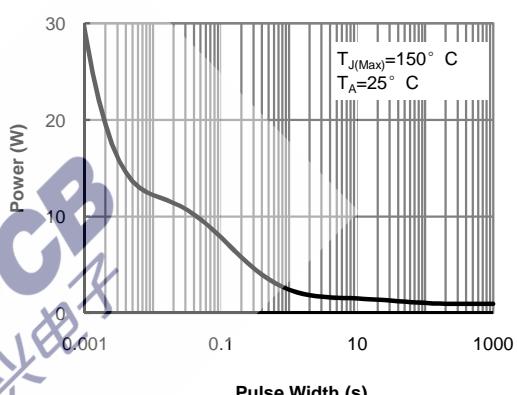
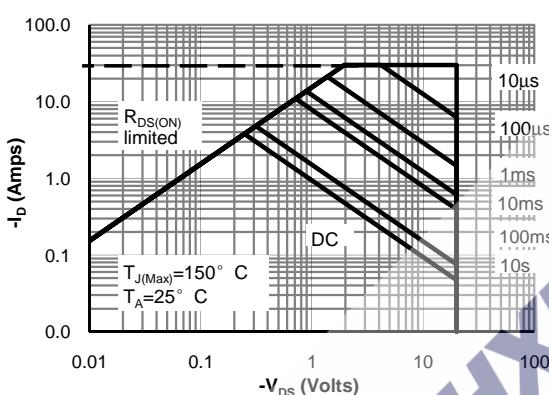
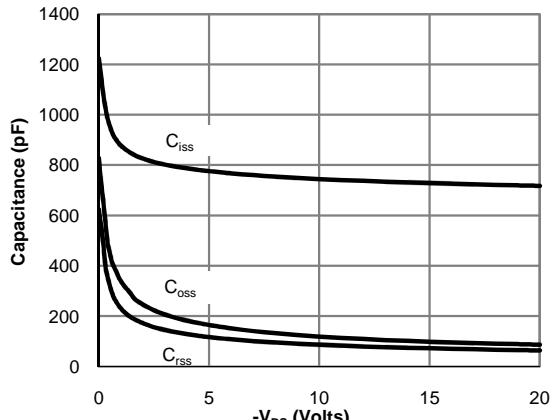
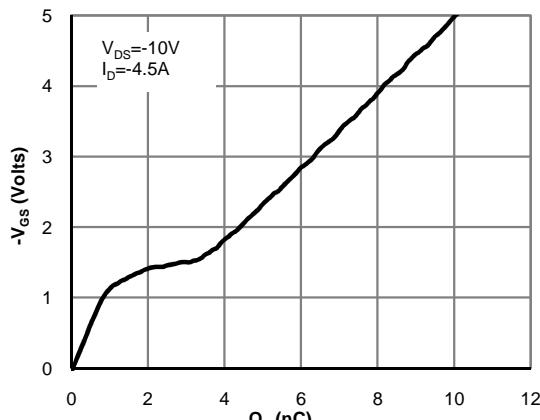
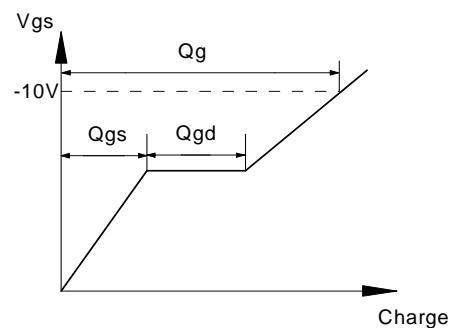
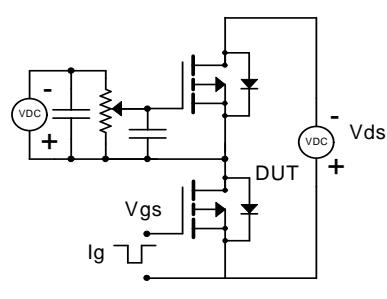
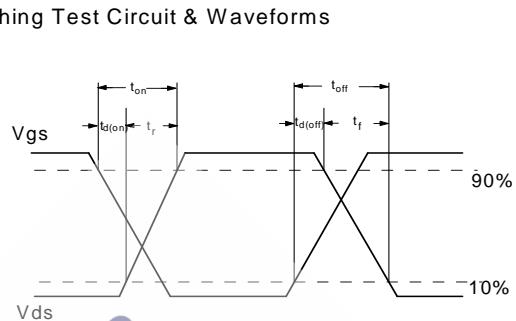
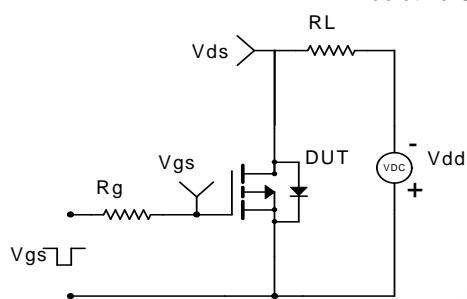


Figure 6: Body-Diode Characteristics (Note E)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



**Gate Charge Test Circuit & Waveform**

**Resistive Switching Test Circuit & Waveforms**

**Diode Recovery Test Circuit & Waveforms**
