ALPHA & OMEGA SEMICONDUCTOR

# AO8820
20V Common-Drain Dual N-Channel MOSFET

General Description

The AO8820 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V while retaining a 12V $V_{GS(MAX)}$ rating. It is ESD protected. This device is suitable for use as a uni-directional or bi-directional load switch, facilitated by its common-drain configuration.

Product Summary

V_{DS}	20V
I_D (at V_{GS}=10V)	7A
$R_{DS(ON)}$ (at V_{GS}=10V)	< 21mΩ
$R_{DS(ON)}$ (at V_{GS}=4.5V)	< 24mΩ
$R_{DS(ON)}$ (at V_{GS}=3.6V)	< 28mΩ
$R_{DS(ON)}$ (at V_{GS}=2.5V)	< 32mΩ
$R_{DS(ON)}$ (at V_{GS}=1.8V)	< 50mΩ

ESD protected!

Green Product

TSSOP8
Top View   Bottom View

Pin 1

Top View

D1/D2	1	8	D1/D2
S1	2	7	S2
S1	3	6	S2
G1	4	5	G2
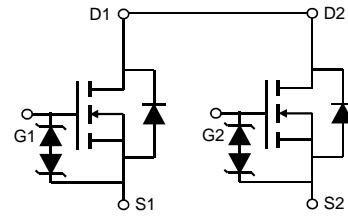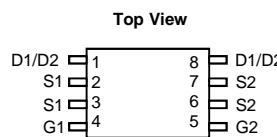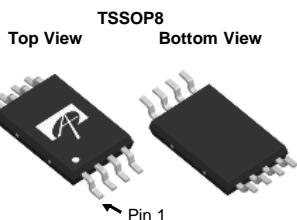
Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current	T_A=25℃	I_D	7	A
	T_A=70℃		5.5	
Pulsed Drain Current [C]		I_{DM}	30	
Power Dissipation [B]	T_A=25℃	P_D	1.5	W
	T_A=70℃		0.96	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	64	83	℃/W
Maximum Junction-to-Ambient [A D]	Steady-State		89	120	℃/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	53	70	℃/W

Electrical Characteristics (T$_J$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV$_{DSS}$	Drain-Source Breakdown Voltage	I$_D$=250μA, V$_{GS}$=0V		20			V
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$=16V, V$_{GS}$=0V				1	μA
			T$_J$=55℃			5	
I$_{GSS}$	Gate-Body leakage current	V$_{DS}$=0V, V$_{GS}$= ±10V				10	μA
V$_{GS(th)}$	Gate Threshold Voltage	V$_{DS}$=V$_{GS}$ I$_D$=250μA		0.5	0.8	1.1	V
I$_{D(ON)}$	On state drain current	V$_{GS}$=10V, V$_{DS}$=5V		30			A
R$_{DS(ON)}$	Static Drain-Source On-Resistance	V$_{GS}$=10V, I$_D$=7A		13	17.2	21	mΩ
			T$_J$=125℃		24	29	
		V$_{GS}$=4.5V, I$_D$=6.6A		15	19.4	24	
		V$_{GS}$=3.6V, I$_D$=6A		16	20.7	28	
		V$_{GS}$=2.5V, I$_D$=5.5A		18	25	32	
		V$_{GS}$=1.8V, I$_D$=2A			35	50	
g$_{FS}$	Forward Transconductance	V$_{DS}$=5V, I$_D$=7A			25		S
V$_{SD}$	Diode Forward Voltage	I$_S$=1A,V$_{GS}$=0V			0.65	1	V
I$_S$	Maximum Body-Diode Continuous Current					2.5	A
DYNAMIC PARAMETERS							
C$_{iss}$	Input Capacitance	V$_{GS}$=0V, V$_{DS}$=10V, f=1MHz			500		pF
C$_{oss}$	Output Capacitance				100		pF
C$_{rss}$	Reverse Transfer Capacitance				52		pF
SWITCHING PARAMETERS							
Q$_g$	Total Gate Charge	V$_{GS}$=4.5V, V$_{DS}$=10V, I$_D$=7A			6	9	nC
Q$_{gs}$	Gate Source Charge				2		nC
Q$_{gd}$	Gate Drain Charge				1		nC
t$_{D(on)}$	Turn-On DelayTime	V$_{GS}$=5V, V$_{DS}$=10V, R$_L$=1.4Ω, R$_{GEN}$=3Ω			0.2		us
t$_r$	Turn-On Rise Time				1.5		us
t$_{D(off)}$	Turn-Off DelayTime				7.4		us
t$_f$	Turn-Off Fall Time				18		us
t$_{rr}$	Body Diode Reverse Recovery Time	I$_F$=7A, dI/dt=100A/μs			9		ns
Q$_{rr}$	Body Diode Reverse Recovery Charge	I$_F$=7A, dI/dt=100A/μs			10		nC

A. The value of R$_{θJA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T$_A$ =25° 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° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT$_J$=25° C.
D. The R$_{θJA}$ is the sum of the thermal impedence from junction to lead R$_{θJL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of T$_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

ALPHA & OMEGA
SEMICONDUCTOR

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**
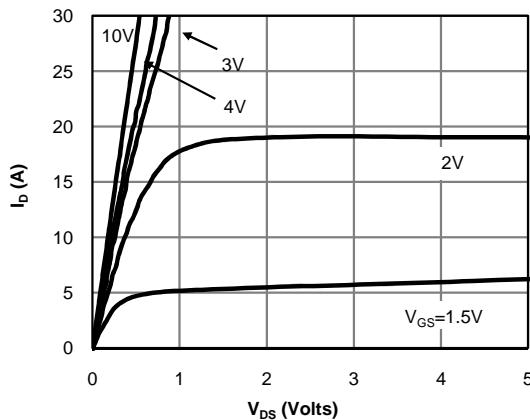
Fig 1: On-Region Characteristics (Note E)
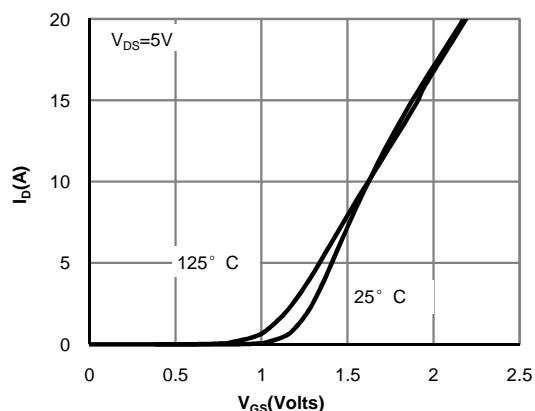

Figure 2: Transfer Characteristics (Note E)
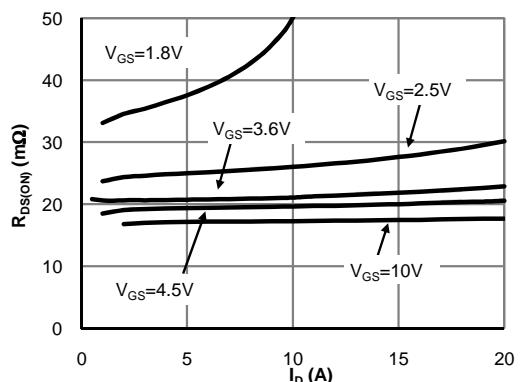
Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)
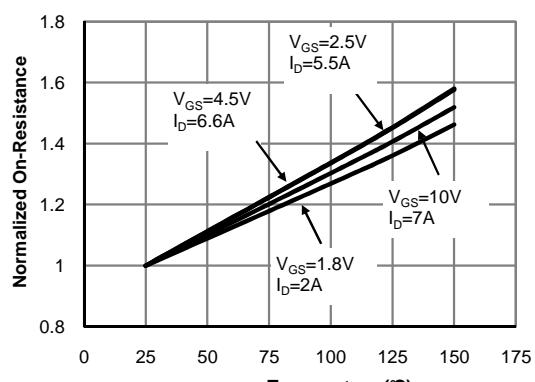

Figure 4: On-Resistance vs. Junction Temperature (Note E)
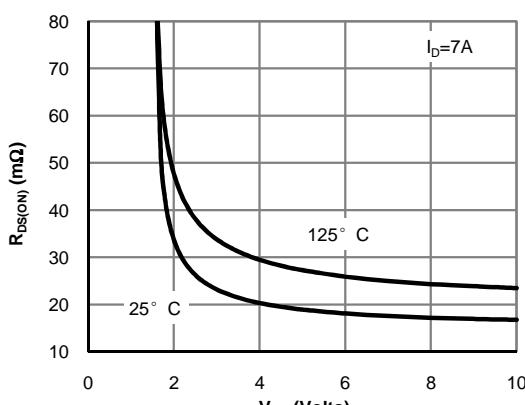
Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)
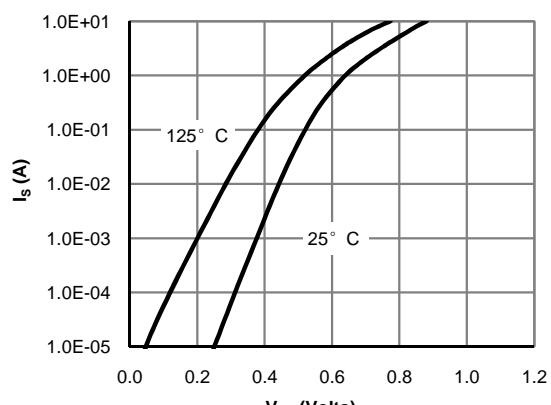
Figure 6: Body-Diode Characteristics (Note E)

ALPHA & OMEGA
SEMICONDUCTOR

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
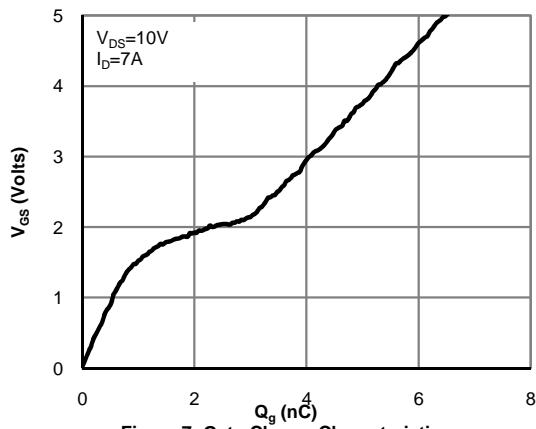
Figure 7: Gate-Charge Characteristics
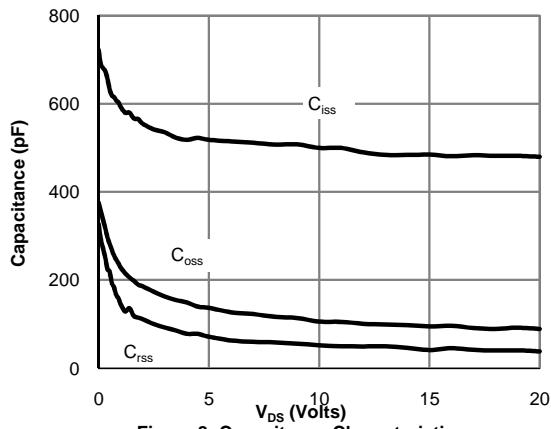
Figure 8: Capacitance Characteristics
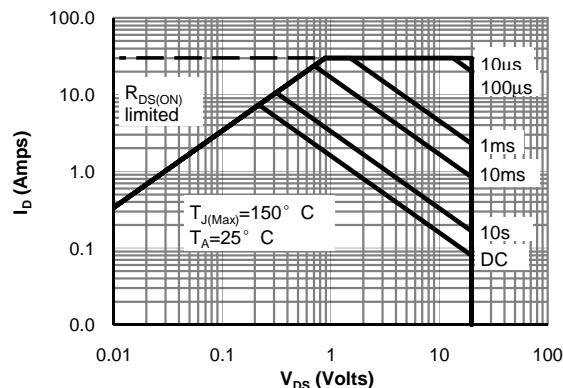
Figure 9: Maximum Forward Biased Safe
Operating Area (Note F)
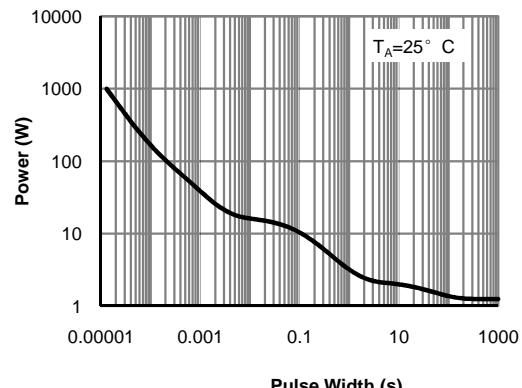
Figure 10: Single Pulse Power Rating Junction-to-
Ambient (Note F)
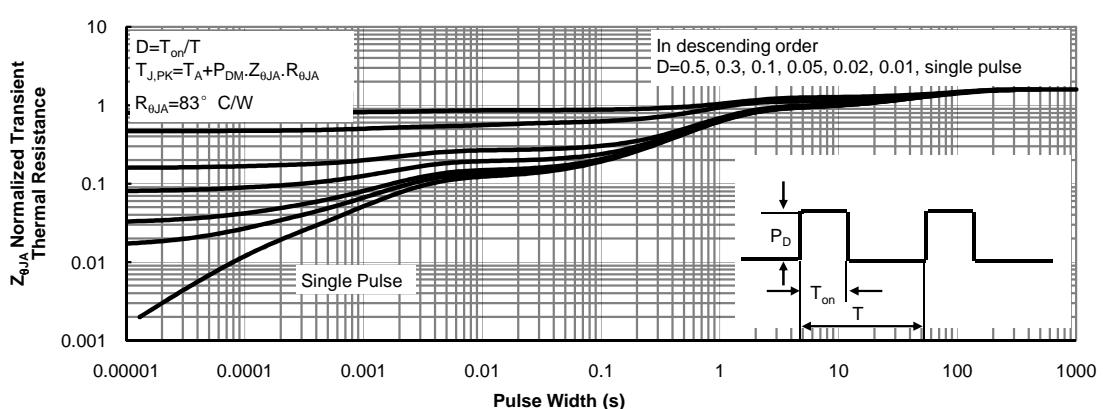

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

ALPHA & OMEGA
SEMICONDUCTOR

Gate Charge Test Circuit & Waveform
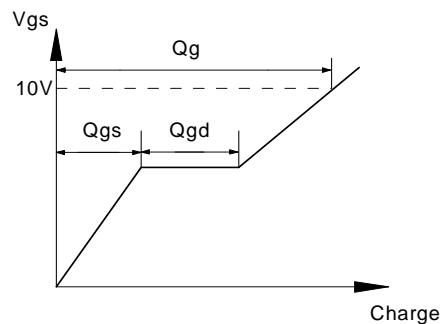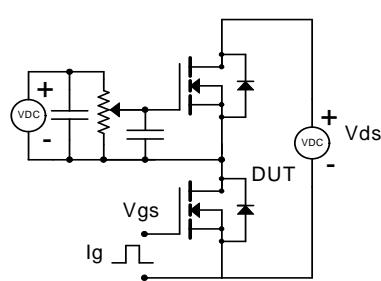
Resistive Switching Test Circuit & Waveforms
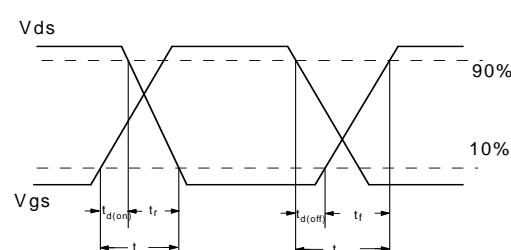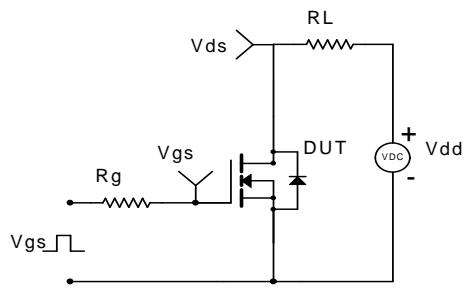
Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = -\int Idt$$