



ALPHA & OMEGA
SEMICONDUCTOR, LTD

AO8814

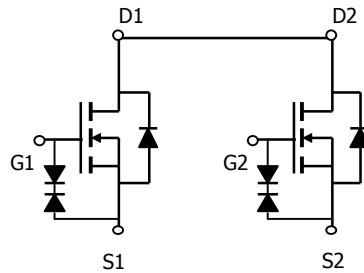
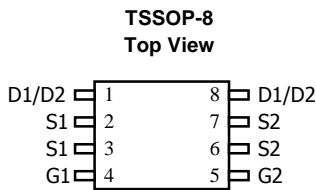
Common-Drain Dual N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO8814 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.

Features

- V_{DS} (V) = 20V
- I_D = 7.5 A (V_{GS} = 10V)
- $R_{DS(ON)}$ < 16m Ω (V_{GS} = 10V)
- $R_{DS(ON)}$ < 18m Ω (V_{GS} = 4.5V)
- $R_{DS(ON)}$ < 20m Ω (V_{GS} = 3.6V)
- $R_{DS(ON)}$ < 24m Ω (V_{GS} = 2.5V)
- $R_{DS(ON)}$ < 34m Ω (V_{GS} = 1.8V)
- ESD Rating: 2500V HBM



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}	± 12	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	7.5	A
	$T_A=70^\circ\text{C}$	6	
Pulsed Drain Current ^B	I_{DM}	30	
Power Dissipation ^A	$T_A=25^\circ\text{C}$	1.5	W
	$T_A=70^\circ\text{C}$	0.96	
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	$R_{\theta JA}$	64	83	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		Steady-State	89	120
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	53	70	$^\circ\text{C/W}$

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	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	20			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=16\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 10\text{V}$			10	μA
BV_{GSO}	Gate-Source Breakdown Voltage	$V_{DS}=0\text{V}$, $I_G=\pm 250\mu\text{A}$	± 12			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.5	0.71	1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=7.5\text{A}$ $T_J=125^\circ\text{C}$	10	13	16	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=7\text{A}$	11.5	15	18	
		$V_{GS}=3.6\text{V}$, $I_D=6\text{A}$	13	16.8	20	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$, $I_D=6\text{A}$	15	19	24	$\text{m}\Omega$
		$V_{GS}=1.8\text{V}$, $I_D=5\text{A}$	20	26	34	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=7.5\text{A}$		30		S
V_{SD}	Diode Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.74	1	V
I_S	Maximum Body-Diode Continuous Current				2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1\text{MHz}$		1390		pF
C_{oss}	Output Capacitance			190		pF
C_{rss}	Reverse Transfer Capacitance			150		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		1.5		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=10\text{V}$, $I_D=7.5\text{A}$		15.4		nC
Q_{gs}	Gate Source Charge			1.4		nC
Q_{gd}	Gate Drain Charge			4		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=5\text{V}$, $V_{DS}=10\text{V}$, $R_L=1.3\Omega$, $R_{GEN}=3\Omega$		6.2		ns
t_r	Turn-On Rise Time			11		ns
$t_{D(off)}$	Turn-Off DelayTime			40.5		ns
t_f	Turn-Off Fall Time			10		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=7.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		15		ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=7.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		5.1		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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 6,12,14 are obtained using $<300\mu\text{s}$ pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in² 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

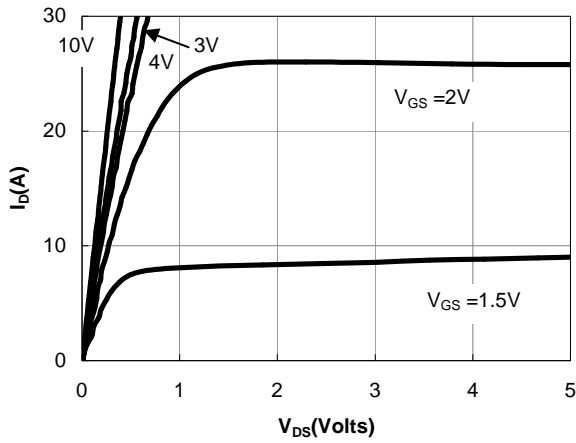


Figure 1: On-Regions Characteristics

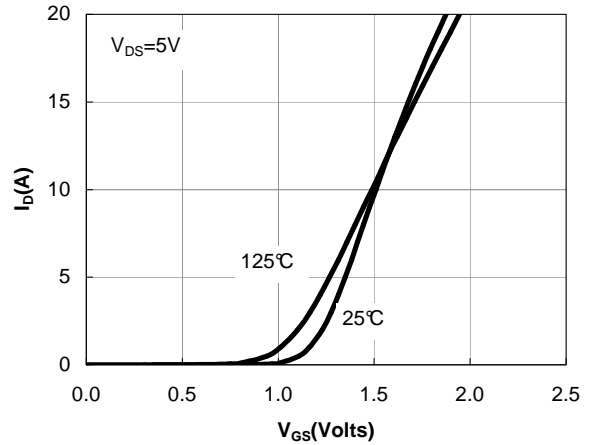


Figure 2: Transfer Characteristics

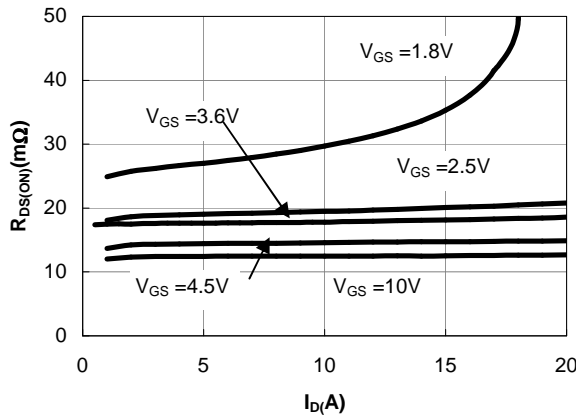


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

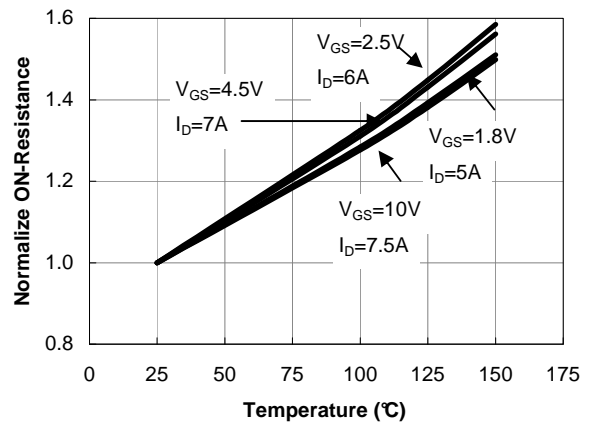


Figure 4: On-Resistance vs. Junction Temperature

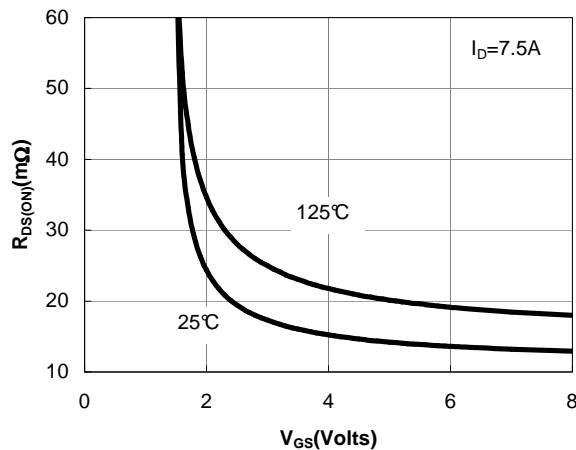


Figure 5: On-Resistance vs. Gate-Source Voltage

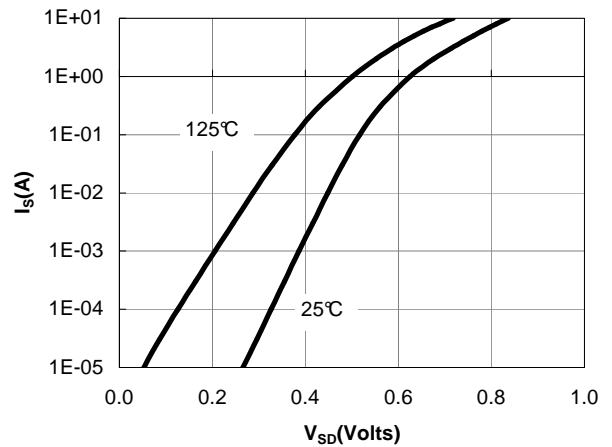


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

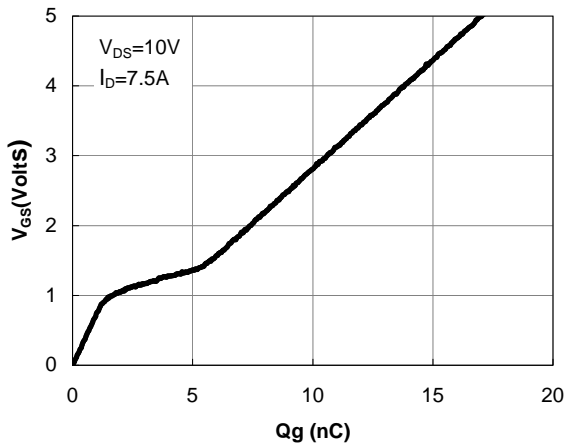


Figure 7: Gate-Charge Characteristics

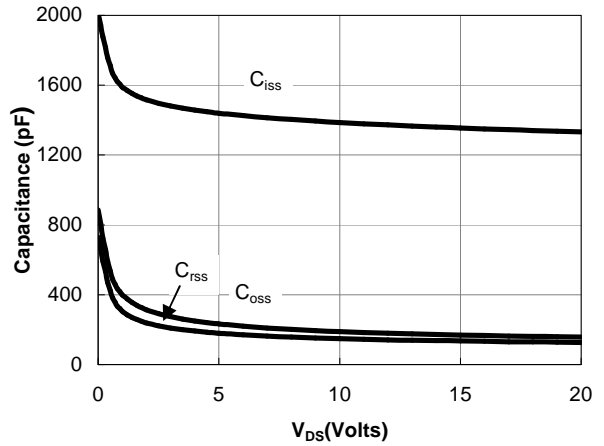


Figure 8: Capacitance Characteristics

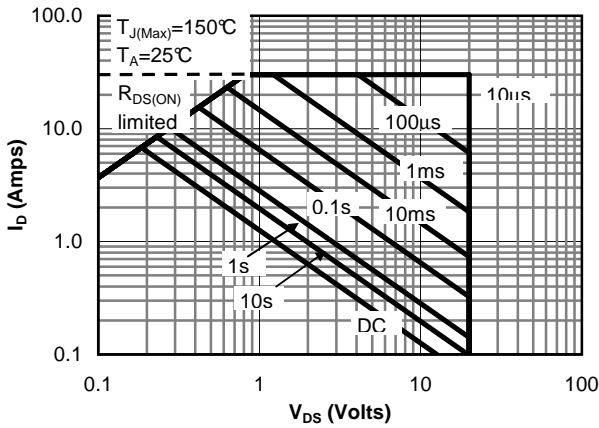


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

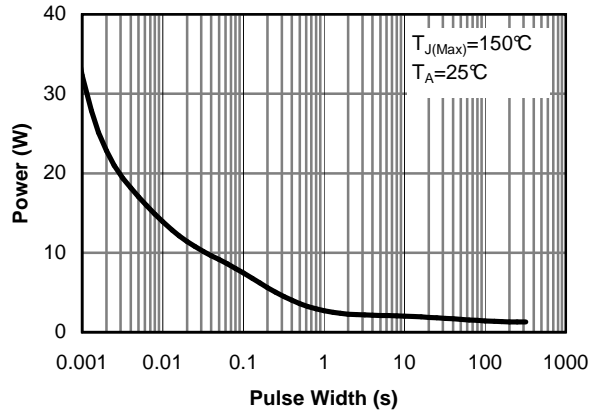


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

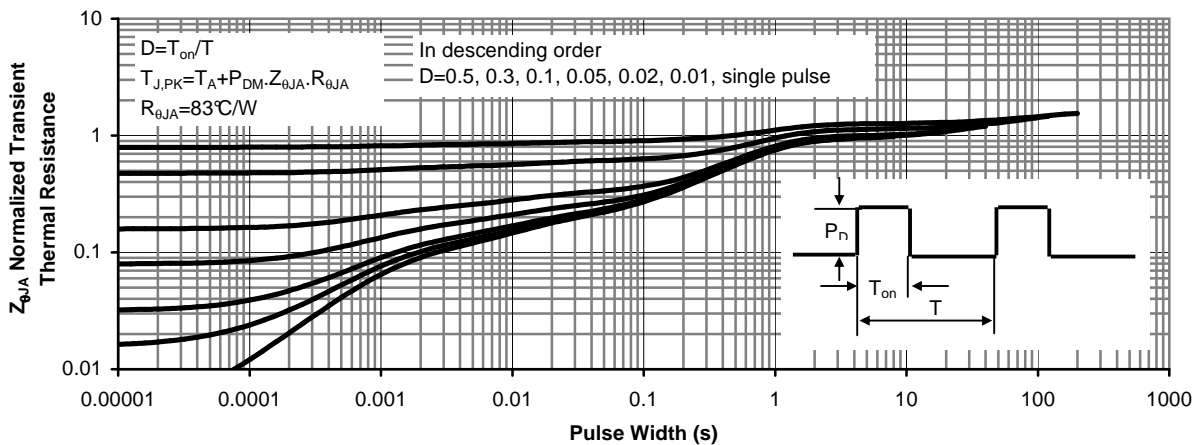


Figure 11: Normalized Maximum Transient Thermal Impedance