



**ALPHA & OMEGA**  
SEMICONDUCTOR, LTD

**AO8814**

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

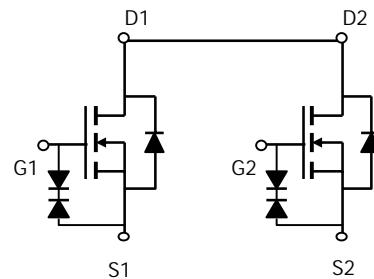
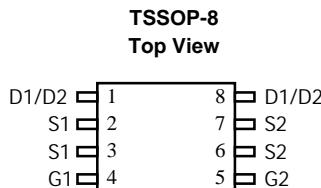


**General Description**

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. Standard Product AO8814 is Pb-free (meets ROHS & Sony 259 specifications). AO8814L is a Green Product ordering option. AO8814 and AO8814L are electrically identical.

**Features**

$V_{DS}$  (V) = 20V  
 $I_D$  = 7.5 A ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 16m\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)} < 18m\Omega$  ( $V_{GS}$  = 4.5V)  
 $R_{DS(ON)} < 24m\Omega$  ( $V_{GS}$  = 2.5V)  
 $R_{DS(ON)} < 34m\Omega$  ( $V_{GS}$  = 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	$V_{GS}$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	7.5	A
$T_A=70^\circ\text{C}$	$I_D$	6	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	30	
Power Dissipation <sup>A</sup>	$T_A=25^\circ\text{C}$	1.5	W
$T_A=70^\circ\text{C}$	$P_D$	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>	$t \leq 10\text{s}$	64	83	°C/W
Maximum Junction-to-Ambient <sup>A</sup>		89	120	°C/W
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	53	70	°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	$I_D=250\mu\text{A}$ , $V_{\text{GS}}=0\text{V}$	20			V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}}=16\text{V}$ , $V_{\text{GS}}=0\text{V}$ $T_J=55^\circ\text{C}$		1	5	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body leakage current	$V_{\text{DS}}=0\text{V}$ , $V_{\text{GS}}=\pm10\text{V}$		10		$\mu\text{A}$
$\text{BV}_{\text{GSO}}$	Gate-Source Breakdown Voltage	$V_{\text{DS}}=0\text{V}$ , $I_G=\pm250\mu\text{A}$	$\pm12$			V
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	$V_{\text{DS}}=V_{\text{GS}}$ $I_D=250\mu\text{A}$	0.5	0.71	1	V
$I_{\text{D}(\text{ON})}$	On state drain current	$V_{\text{GS}}=4.5\text{V}$ , $V_{\text{DS}}=5\text{V}$	30			A
$R_{\text{DS}(\text{ON})}$	Static Drain-Source On-Resistance	$V_{\text{GS}}=10\text{V}$ , $I_D=7.5\text{A}$ $T_J=125^\circ\text{C}$		13	16	$\text{m}\Omega$
		$V_{\text{GS}}=4.5\text{V}$ , $I_D=7\text{A}$		18	22	$\text{m}\Omega$
		$V_{\text{GS}}=2.5\text{V}$ , $I_D=6\text{A}$		15	18	$\text{m}\Omega$
		$V_{\text{GS}}=1.8\text{V}$ , $I_D=5\text{A}$		19	24	$\text{m}\Omega$
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}}=5\text{V}$ , $I_D=7.5\text{A}$		26	34	$\text{m}\Omega$
$V_{\text{SD}}$	Diode Forward Voltage	$I_S=1\text{A}$ , $V_{\text{GS}}=0\text{V}$		0.74	1	V
$I_S$	Maximum Body-Diode Continuous Current				2.5	A
<b>DYNAMIC PARAMETERS</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=10\text{V}$ , $f=1\text{MHz}$		1390		$\text{pF}$
$C_{\text{oss}}$	Output Capacitance			190		$\text{pF}$
$C_{\text{rss}}$	Reverse Transfer Capacitance			150		$\text{pF}$
$R_g$	Gate resistance	$V_{\text{GS}}=0\text{V}$ , $V_{\text{DS}}=0\text{V}$ , $f=1\text{MHz}$		1.5		$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{\text{GS}}=4.5\text{V}$ , $V_{\text{DS}}=10\text{V}$ , $I_D=7.5\text{A}$		15.4		$\text{nC}$
$Q_{\text{gs}}$	Gate Source Charge			1.4		$\text{nC}$
$Q_{\text{gd}}$	Gate Drain Charge			4		$\text{nC}$
$t_{\text{D}(\text{on})}$	Turn-On Delay Time	$V_{\text{GS}}=5\text{V}$ , $V_{\text{DS}}=10\text{V}$ , $R_L=1.3\Omega$ , $R_{\text{GEN}}=3\Omega$		6.2		ns
$t_r$	Turn-On Rise Time			11		ns
$t_{\text{D}(\text{off})}$	Turn-Off Delay Time			40.5		ns
$t_f$	Turn-Off Fall Time			10		ns
$t_{\text{rr}}$	Body Diode Reverse Recovery Time	$I_F=7.5\text{A}$ , $dl/dt=100\text{A}/\mu\text{s}$		15		ns
$Q_{\text{rr}}$	Body Diode Reverse Recovery Charge	$I_F=7.5\text{A}$ , $dl/dt=100\text{A}/\mu\text{s}$		5.1		$\text{nC}$

A: The value of  $R_{\text{0JA}}$  is measured with the device mounted on 1 in<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. The current rating is based on the  $\leq 10\text{s}$  thermal resistance rating.

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

C. The  $R_{\text{0JA}}$  is the sum of the thermal impedance from junction to lead  $R_{\text{0JL}}$  and lead to ambient.

D. The static characteristics in Figures 1 to 6, 12, 14 are obtained using 80  $\mu\text{s}$  pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in<sup>2</sup> 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

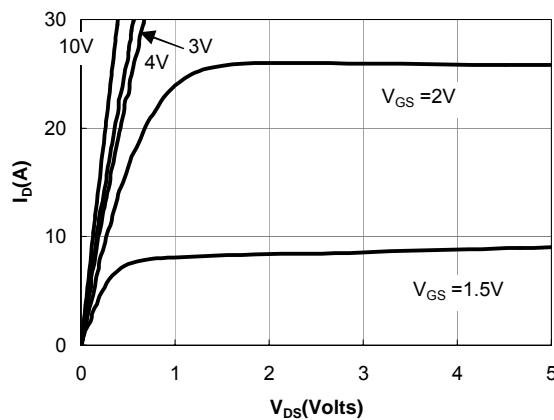


Figure 1: On-Regions Characteristics

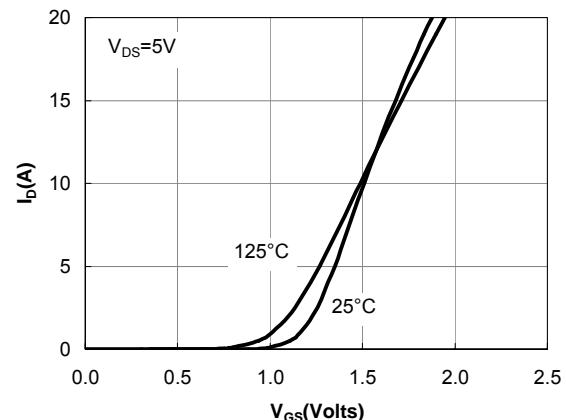


Figure 2: Transfer Characteristics

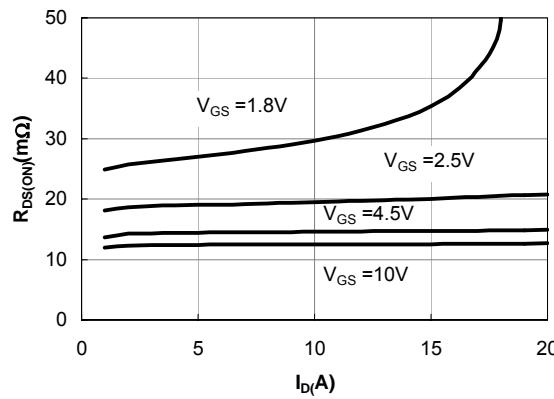


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

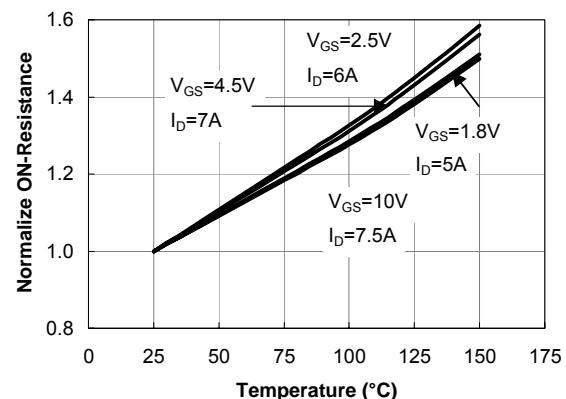


Figure 4: On-Resistance vs. Junction Temperature

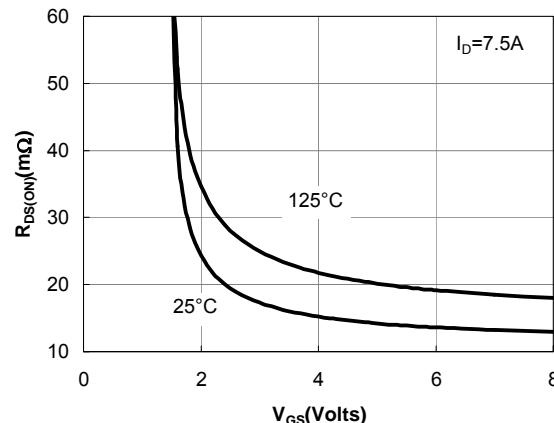


Figure 5: On-Resistance vs. Gate-Source Voltage

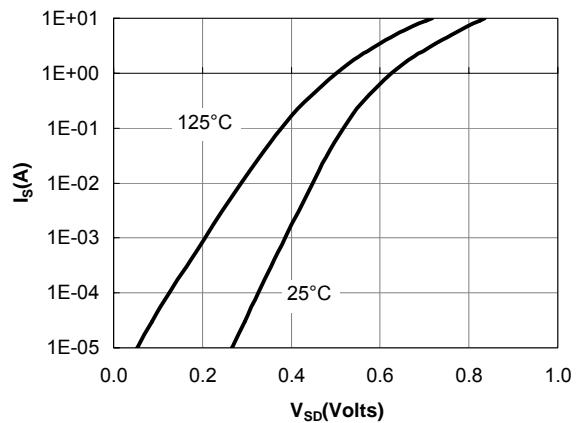


Figure 6: Body-Diode Characteristics

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