

## AO8814

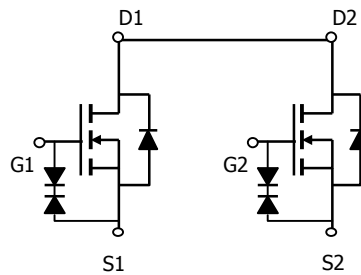
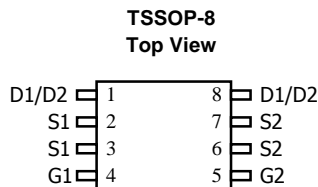
### Common-Drain Dual N-Channel Enhancement Mode Field Effect Transistor

#### 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 $\Omega$  ( $V_{GS}$  = 10V)  
 $R_{DS(ON)}$  < 18m $\Omega$  ( $V_{GS}$  = 4.5V)  
 $R_{DS(ON)}$  < 20m $\Omega$  ( $V_{GS}$  = 3.6V)  
 $R_{DS(ON)}$  < 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>	$I_D$	$T_A=25^\circ\text{C}$	A
		$T_A=70^\circ\text{C}$	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	30	
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ\text{C}$	W
		$T_A=70^\circ\text{C}$	
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>	$R_{\theta JA}$	$t \leq 10\text{s}$	64	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	89	$^\circ\text{C/W}$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	53	70	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±10V			10	μA
BV <sub>GSO</sub>	Gate-Source Breakdown Voltage	V <sub>DS</sub> =0V, I <sub>G</sub> =±250μA	±12			V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.5	0.71	1	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	30			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A T <sub>J</sub> =125°C	10	13	16	mΩ
		T <sub>J</sub> =125°C	14	18	22	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A	11.5	15	18	mΩ
		V <sub>GS</sub> =3.6V, I <sub>D</sub> =6A	13	16.8	20	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =6A	15	19	24	mΩ
V <sub>GS</sub> =1.8V, I <sub>D</sub> =5A	20	26	34	mΩ		
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =7.5A		30		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.74	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				2.5	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		1390		pF
C <sub>oss</sub>	Output Capacitance			190		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			150		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.5		Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =7.5A		15.4		nC
Q <sub>gs</sub>	Gate Source Charge			1.4		nC
Q <sub>gd</sub>	Gate Drain Charge			4		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =1.3Ω, R <sub>GEN</sub> =3Ω		6.2		ns
t <sub>r</sub>	Turn-On Rise Time			11		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			40.5		ns
t <sub>f</sub>	Turn-Off Fall Time			10		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =7.5A, dI/dt=100A/μs		15	
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =7.5A, dI/dt=100A/μs		5.1		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

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

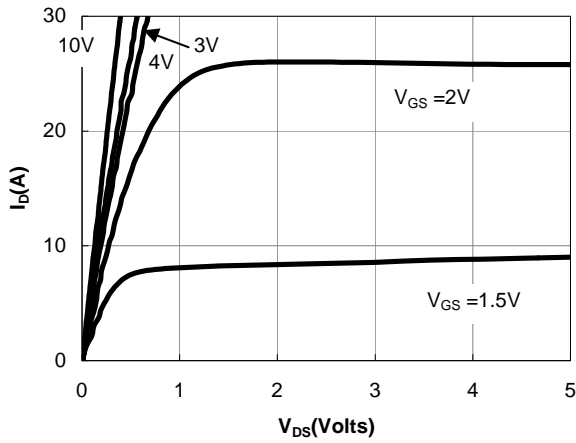
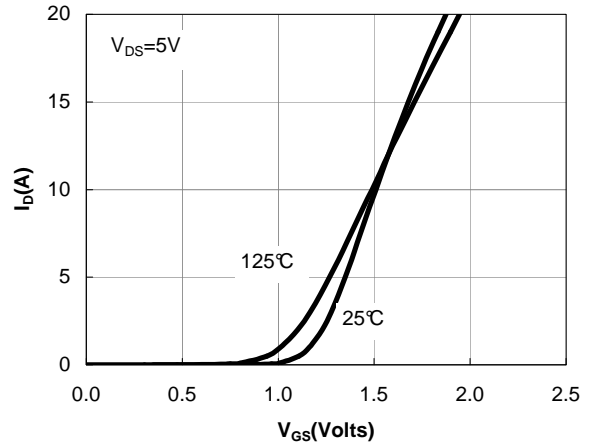
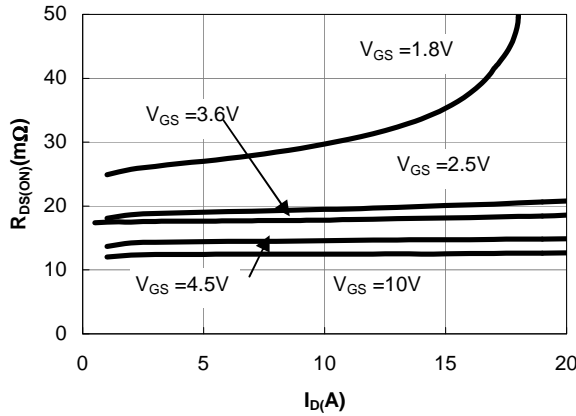
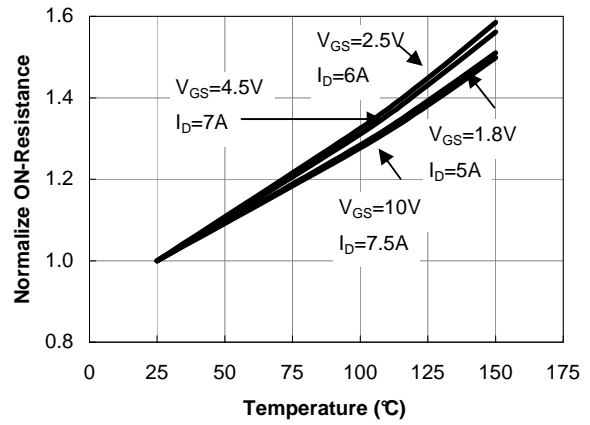
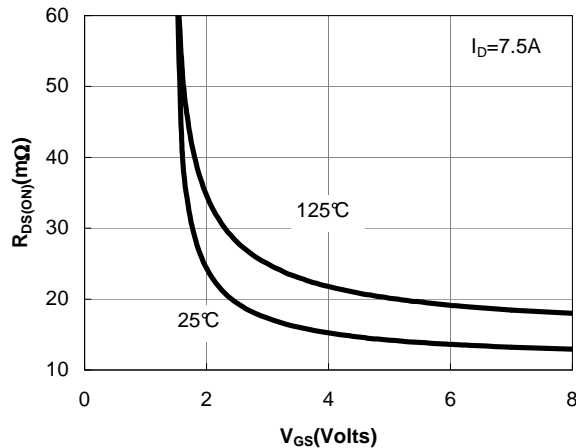
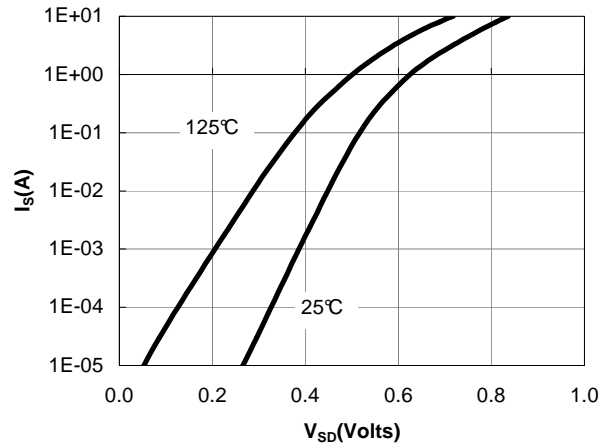
C. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

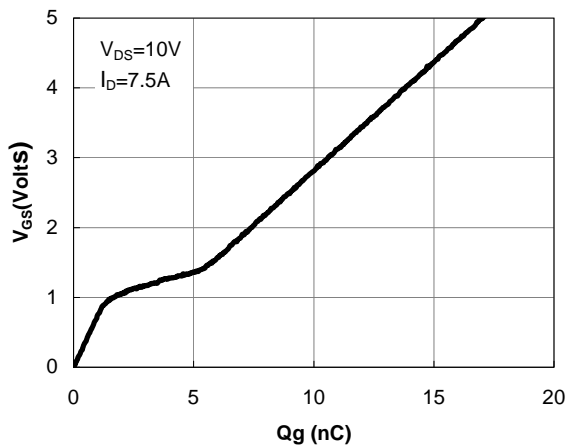
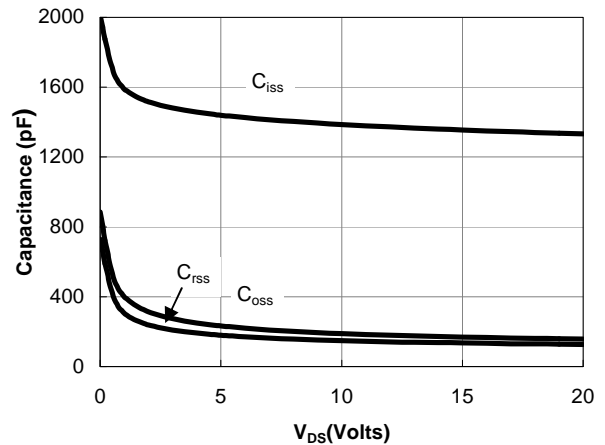
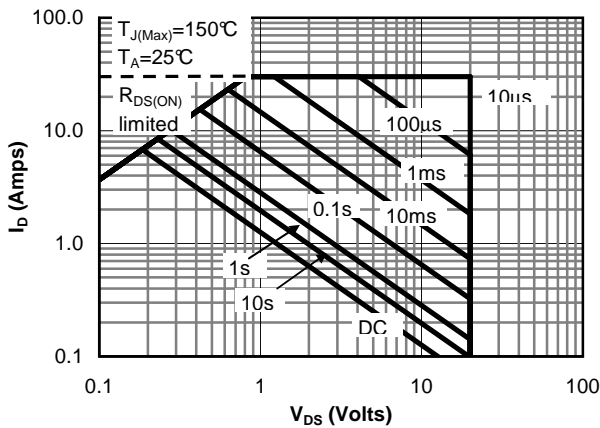
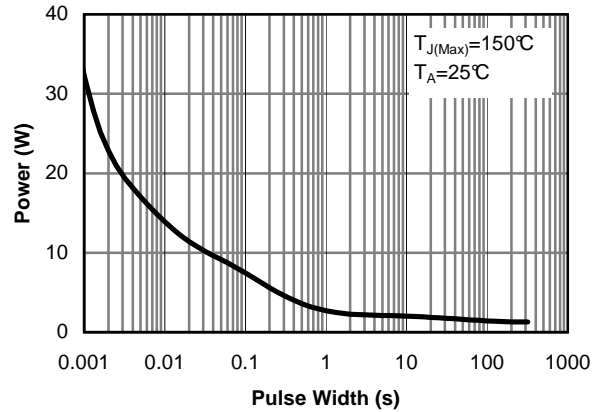
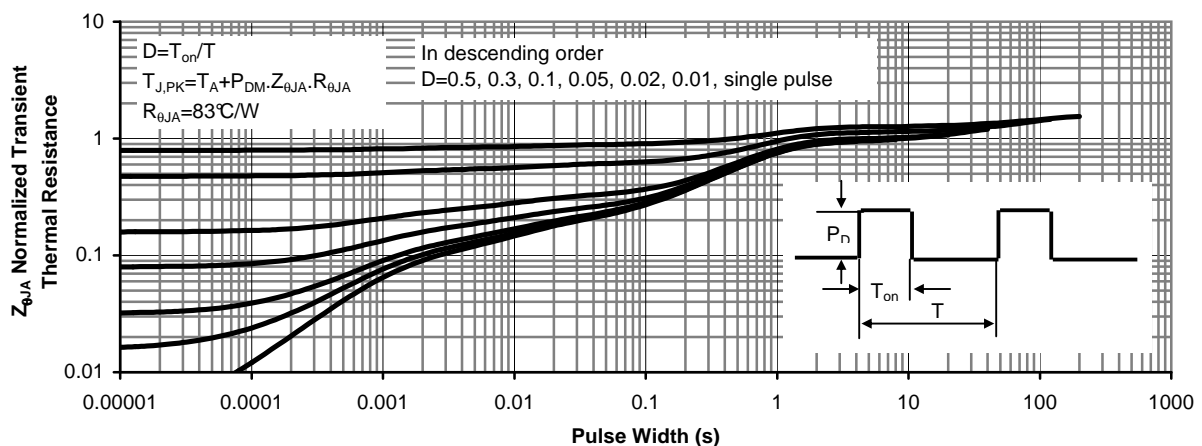
D. The static characteristics in Figures 1 to 6,12,14 are obtained using <300 μs pulses, duty cycle 0.5% max.

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<sub>A</sub>=25°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**