



ALPHA & OMEGA
SEMICONDUCTOR, LTD

AO6804

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



General Description

The AO6804 uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a load switch or in PWM applications. AO6804 is Pb-free (meets ROHS & Sony 259 specifications).

Features

$V_{DS} = 20V$

$I_D = 5.0A$ ($V_{GS} = 4.5V$)

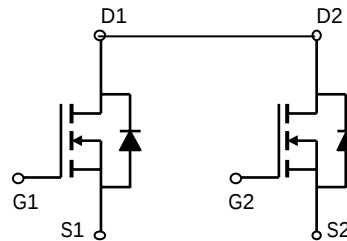
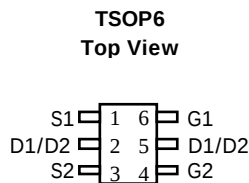
Typical R_{ds}

$R_{DS(ON)} < 24m\Omega$ ($V_{GS} = 4.5V$)

$R_{DS(ON)} < 26m\Omega$ ($V_{GS} = 4.0V$)

$R_{DS(ON)} < 28m\Omega$ ($V_{GS} = 3.1V$)

$R_{DS(ON)} < 31m\Omega$ ($V_{GS} = 2.5V$)



Absolute Maximum Ratings $T_A=25^\circ C$ unless otherwise noted

Parameter	Symbol	10 Sec	Steady State	Units
Drain-Source Voltage	V_{DS}	20		V
Gate-Source Voltage	V_{GS}	± 12		V
Continuous Drain Current ^A	$T_A=25^\circ C$	5	4	A
	$T_A=70^\circ C$	4	3.2	
Pulsed Drain Current ^B	I_{DM}	25		
Power Dissipation ^A	$T_A=25^\circ C$	1.3	0.8	W
	$T_A=70^\circ C$	0.8	0.5	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150		$^\circ C$

Thermal Characteristics

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	76	95	$^\circ C/W$
Maximum Junction-to-Ambient ^A		118	150	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	54	68	$^\circ C/W$

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	$V_{DS} = 20\text{V}$, $V_{GS} = 0\text{V}$ $T_J = 55^{\circ}\text{C}$			1 5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 12\text{V}$			± 500	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	0.5	0.75	1.2	V
$I_{D(ON)}$	On state drain current	$V_{GS} = 4.5\text{V}$, $V_{DS} = 5\text{V}$	25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 4.5\text{V}$, $I_D = 5.0\text{A}$ $T_J = 125^{\circ}\text{C}$	18 25	24 33	32 43	$\text{m}\Omega$
		$V_{GS} = 4.0\text{V}$, $I_D = 4.5\text{A}$	22	26	34	$\text{m}\Omega$
		$V_{GS} = 3.1\text{V}$, $I_D = 4.5\text{A}$	21	28	37	$\text{m}\Omega$
		$V_{GS} = 2.5\text{V}$, $I_D = 4.0\text{A}$	22	31	42	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}$, $I_D = 5.0\text{A}$		7		S
V_{SD}	Diode Forward Voltage	$I_S = 1\text{A}$, $V_{GS} = 0\text{V}$		0.65	1	V
I_S	Maximum Body-Diode Continuous Current				1.1	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1\text{MHz}$		580	725	pF
C_{oss}	Output Capacitance			95		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3.5	5.3	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS} = 4.5\text{V}$, $V_{DS} = 10\text{V}$, $I_D = 5\text{A}$		5.8	7.7	nC
Q_{gs}	Gate Source Charge			1		nC
Q_{gd}	Gate Drain Charge			1.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=10\text{V}$, $R_L=2.0\Omega$, $R_{GEN}=3\Omega$		2.4		ns
t_r	Turn-On Rise Time			6.4		ns
$t_{D(off)}$	Turn-Off DelayTime			38		ns
t_f	Turn-Off Fall Time			9.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		18	24	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		6		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 $T_A = 25^{\circ}\text{C}$. 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 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

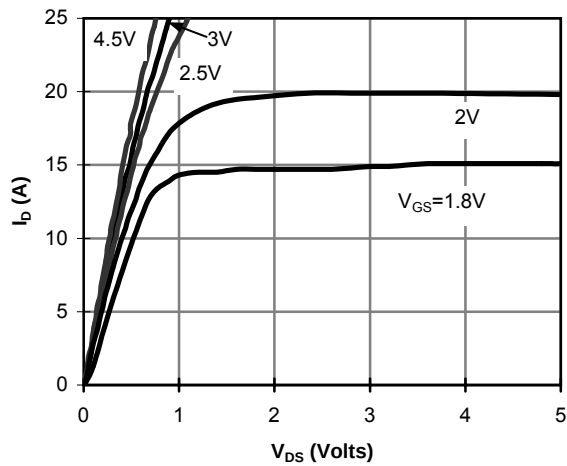


Figure 1: On-Region Characteristics

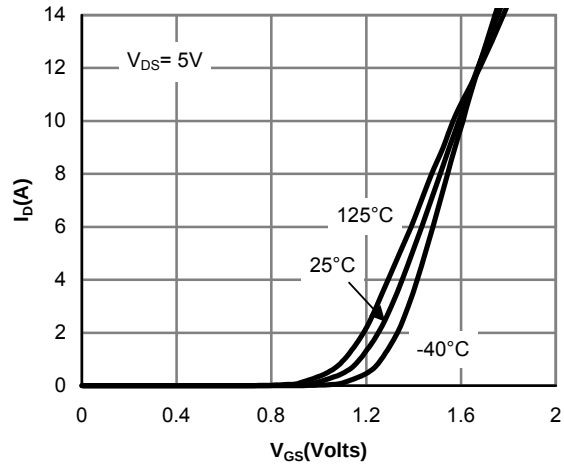


Figure 2: Transfer Characteristics

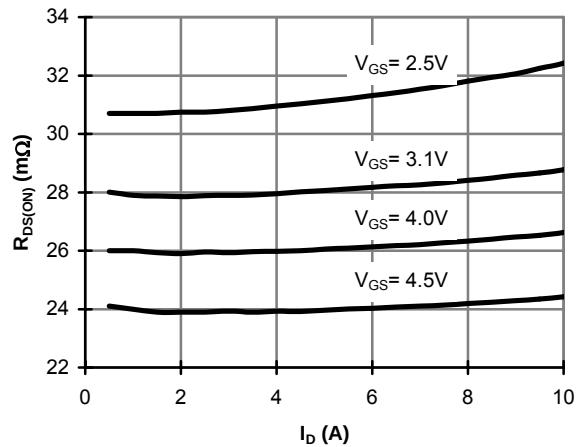


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

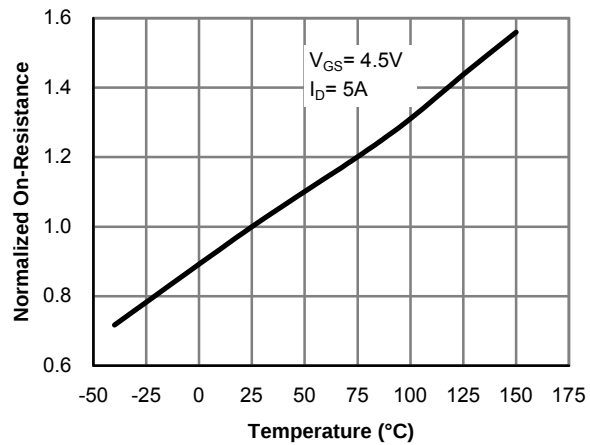


Figure 4: On-Resistance vs. Junction Temperature

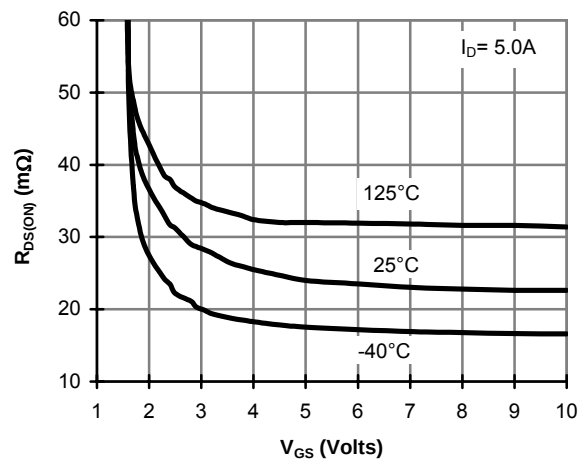


Figure 5: On-Resistance vs. Gate-Source Voltage

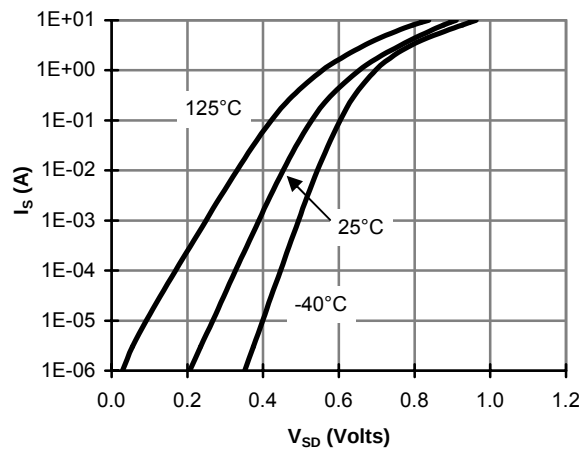


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

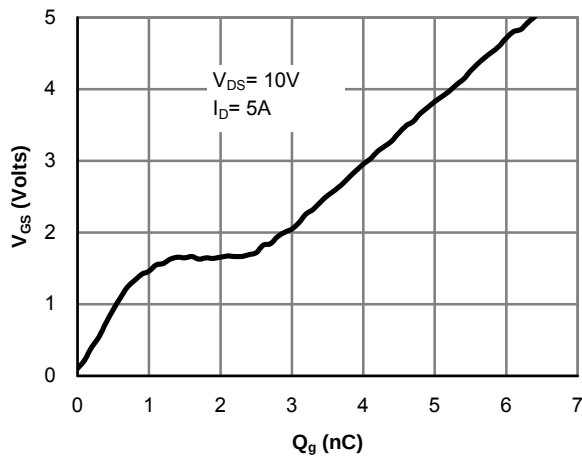


Figure 7: Gate-Charge Characteristics

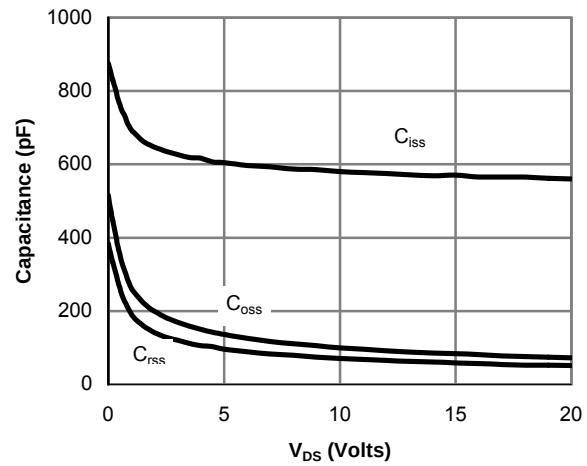


Figure 8: Capacitance Characteristics

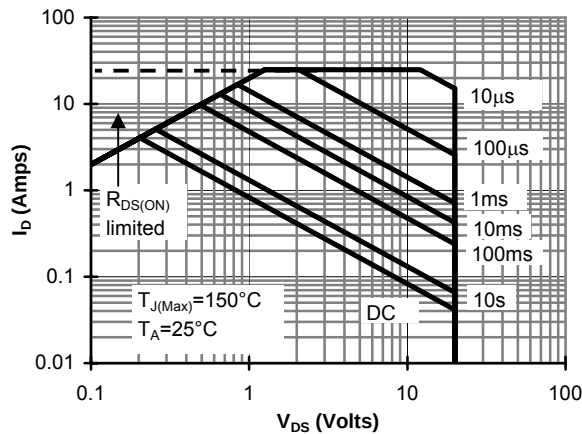


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

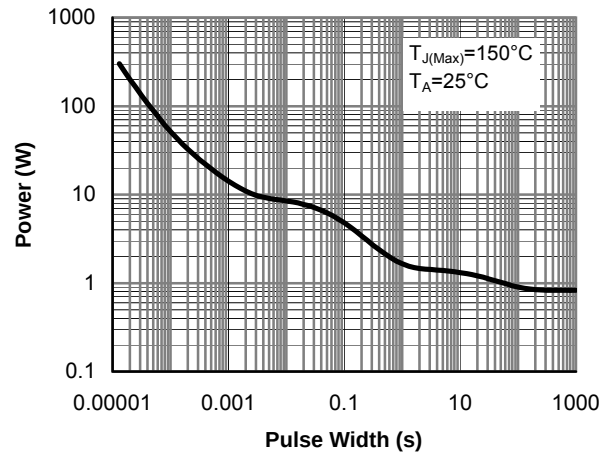


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

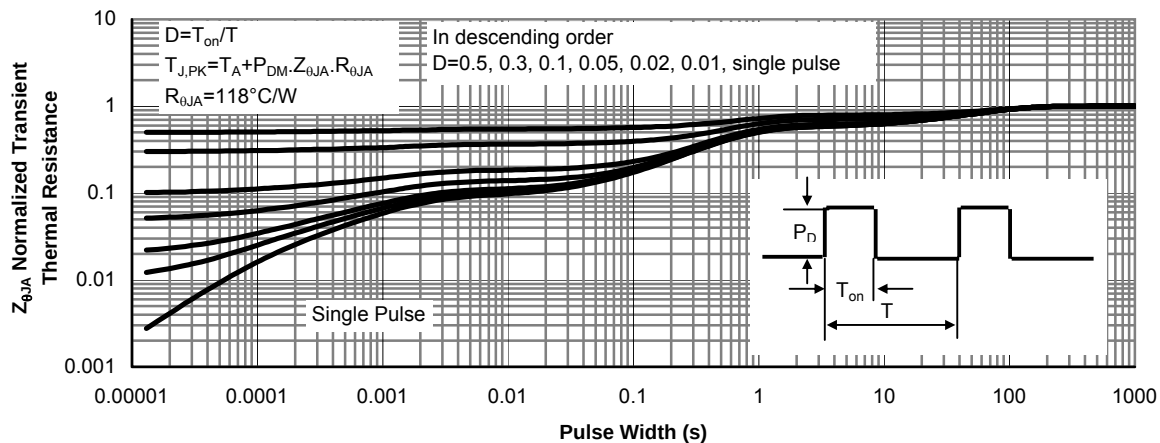


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)