



# THE DATASHEET OF AO6804A

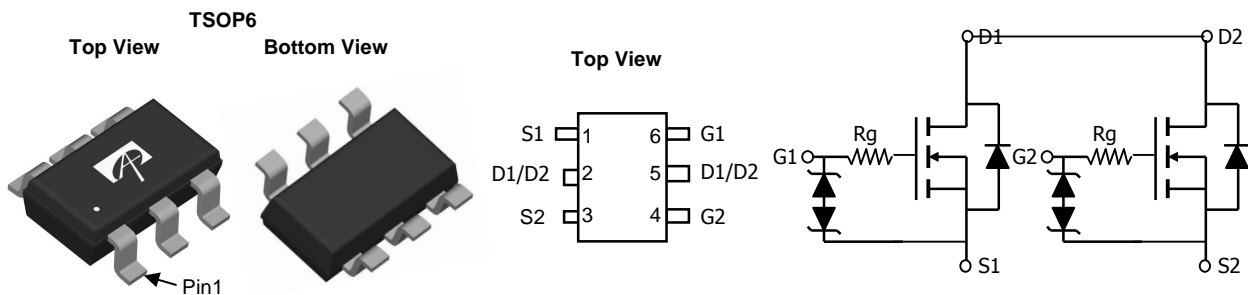


### General Description

The AO6804A 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 applications.

### Product Summary

$V_{DS} = 20V$   
 $I_D = 5.0A$  ( $V_{GS} = 4.5V$ )  
 $R_{DS(ON)} < 28m\Omega$  ( $V_{GS} = 4.5V$ )  
 $R_{DS(ON)} < 30m\Omega$  ( $V_{GS} = 4.0V$ )  
 $R_{DS(ON)} < 34m\Omega$  ( $V_{GS} = 3.1V$ )  
 $R_{DS(ON)} < 39m\Omega$  ( $V_{GS} = 2.5V$ )



### Absolute Maximum Ratings $T_A=25^\circ C$ 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>	$I_D$	$T_A=25^\circ C$	5
		$T_A=70^\circ C$	4
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	25	A
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	1.3
		$T_A=70^\circ C$	0.8
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 <sup>A</sup>	$R_{\theta JA}$	76	95	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady State	118	150
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	54	68	$^\circ C/W$

Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	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	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS} = 0\text{V}$ , $V_{GS} = \pm 10\text{V}$			$\pm 10$	$\mu\text{A}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	0.5	0.7	1	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 26	23 33	28 40	$\text{m}\Omega$
		$V_{GS} = 4.0\text{V}$ , $I_D = 4.5\text{A}$	19	24	30	$\text{m}\Omega$
		$V_{GS} = 3.1\text{V}$ , $I_D = 4.5\text{A}$	20	27	34	$\text{m}\Omega$
		$V_{GS} = 2.5\text{V}$ , $I_D = 4.0\text{A}$	21	30	39	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}$ , $I_D = 5.0\text{A}$		18		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				1.3	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$ , $V_{DS} = 10\text{V}$ , $f = 1\text{MHz}$		180	225	pF
$C_{oss}$	Output Capacitance			95		pF
$C_{riss}$	Reverse Transfer Capacitance			18		pF
$R_g$	Gate resistance	$V_{GS} = 0\text{V}$ , $V_{DS} = 0\text{V}$ , $f = 1\text{MHz}$		2.7	4	k $\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS} = 4.5\text{V}$ , $V_{DS} = 10\text{V}$ , $I_D = 5\text{A}$		5.6	7.5	nC
$Q_{gs}$	Gate Source Charge			0.85		nC
$Q_{gd}$	Gate Drain Charge			1.7		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}$ , $V_{DS} = 10\text{V}$ , $R_L = 2.0\Omega$ , $R_{GEN} = 3\Omega$		172		ns
$t_r$	Turn-On Rise Time			368		ns
$t_{D(off)}$	Turn-Off DelayTime			2.94		$\mu\text{s}$
$t_f$	Turn-Off Fall Time			2.5		$\mu\text{s}$
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F = 5\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		32	43	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F = 5\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		3.2		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A = 25^\circ\text{C}$ . 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 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

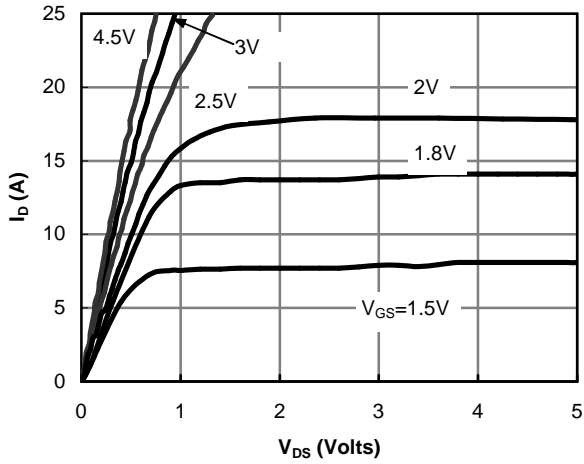


Figure 1: On-Region Characteristics

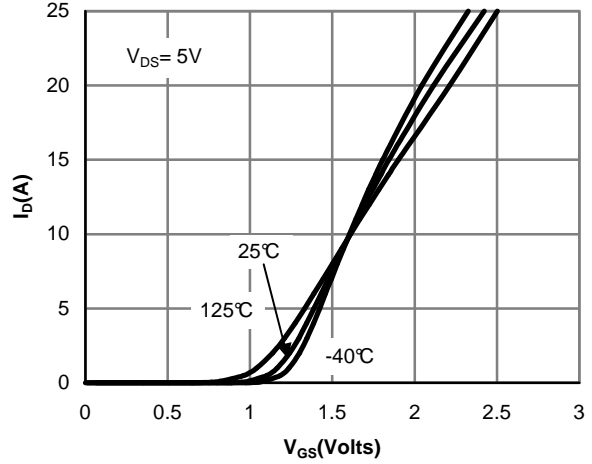


Figure 2: Transfer Characteristics

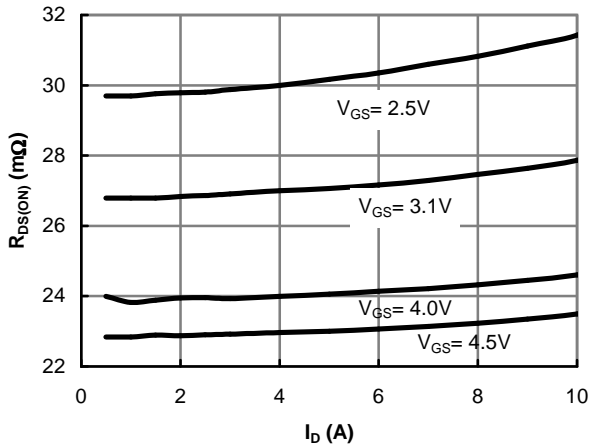


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

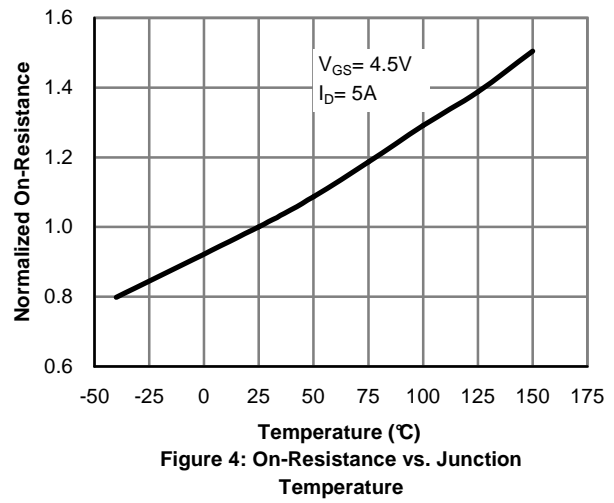


Figure 4: On-Resistance vs. Junction Temperature

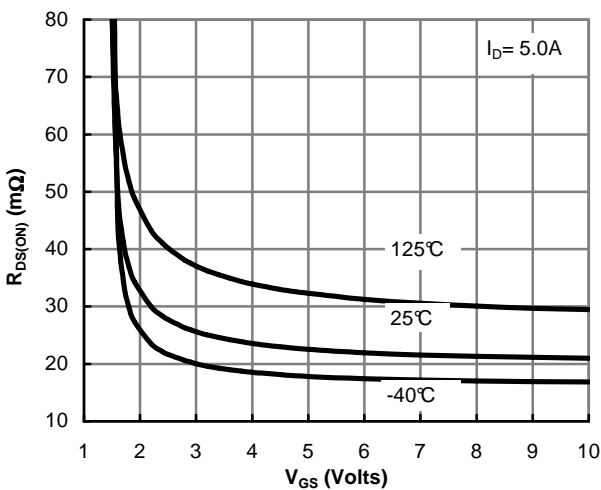


Figure 5: On-Resistance vs. Gate-Source Voltage

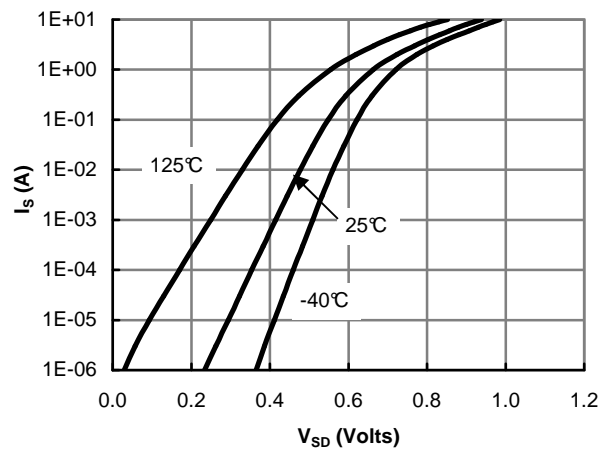


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

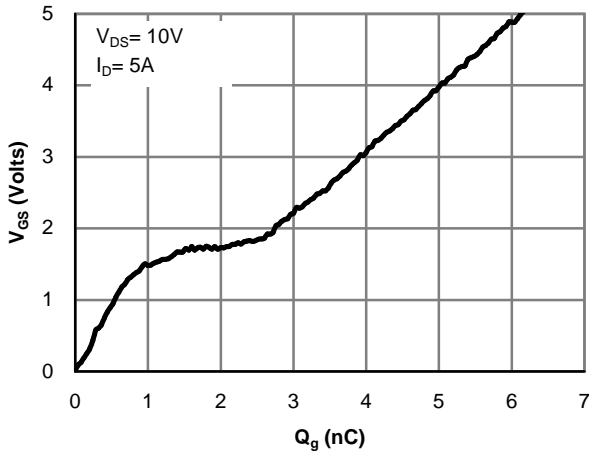


Figure 7: Gate-Charge Characteristics

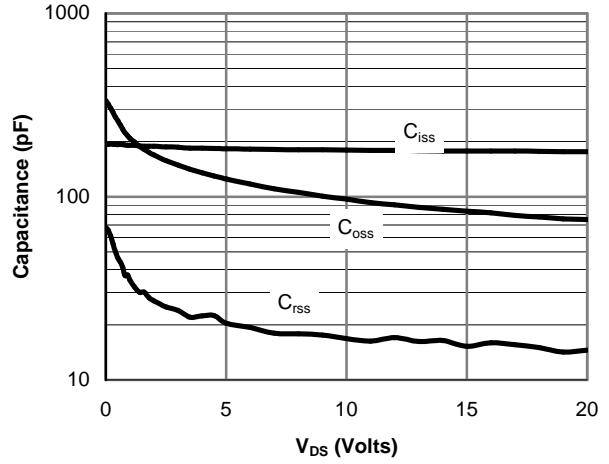


Figure 8: Capacitance Characteristics

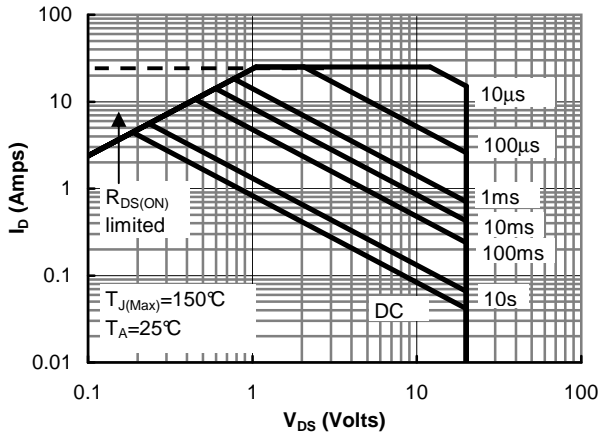


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

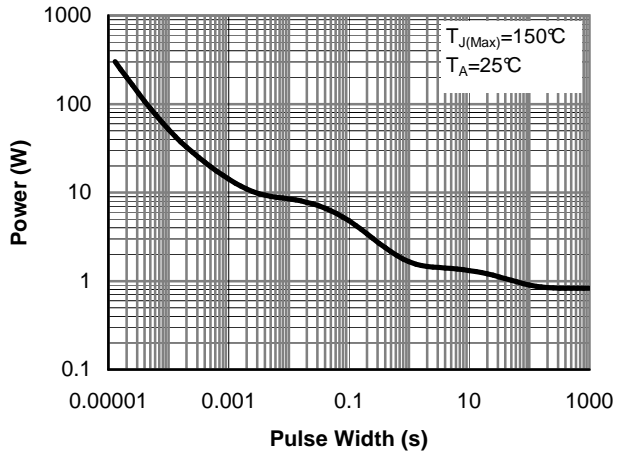


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

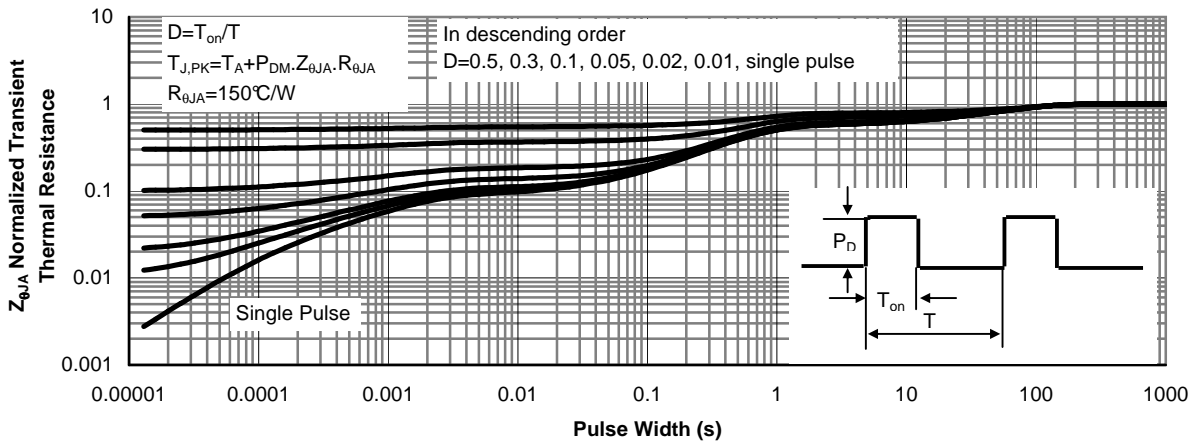
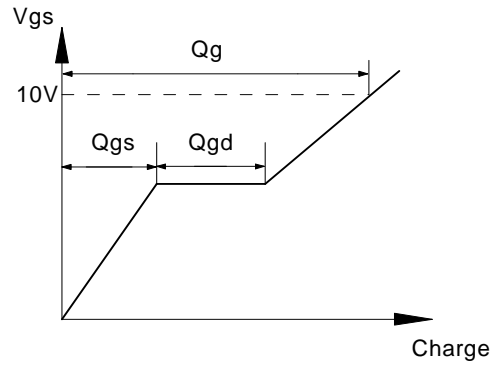
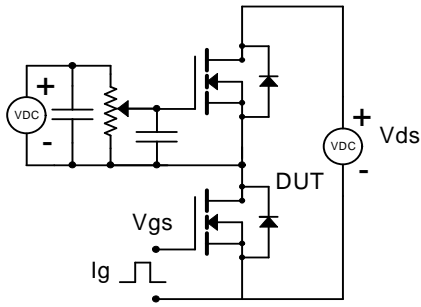
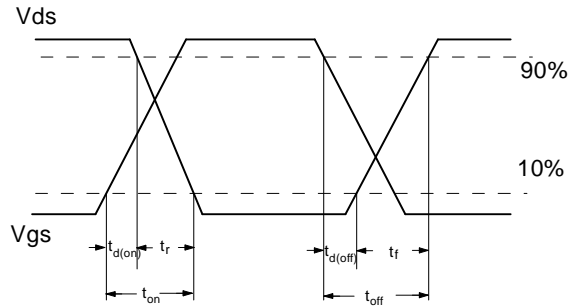
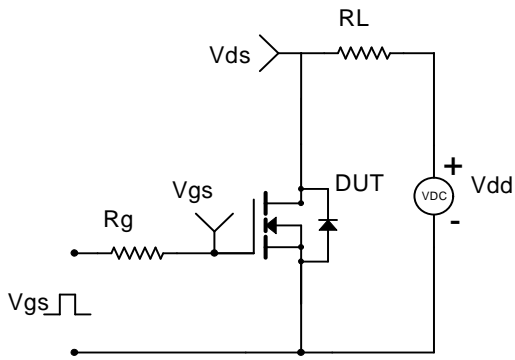


Figure 11: Normalized Maximum Transient Thermal Impedance (Note E)

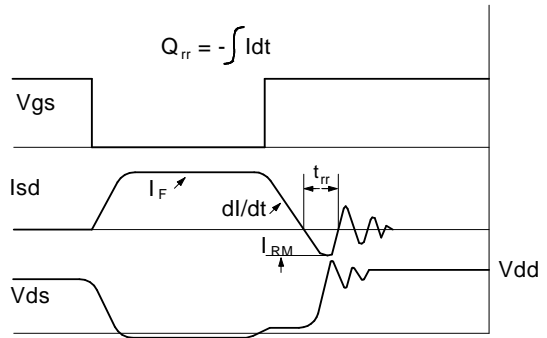
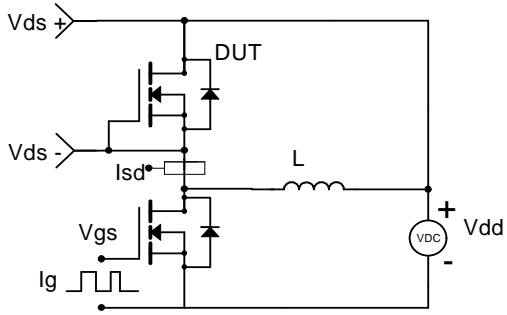
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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