ALPHA & OMEGA SEMICONDUCTOR

AO5804E
Dual N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO5804E/L uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. AO5804E and AO5804EL are electrically identical.

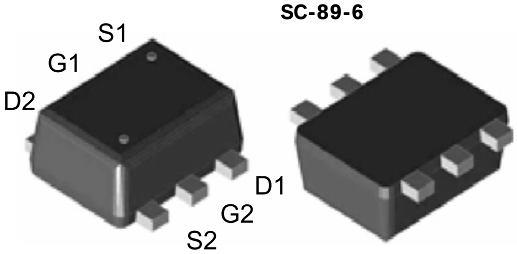
-RoHS Compliant
-AO5804EL is Halogen Free

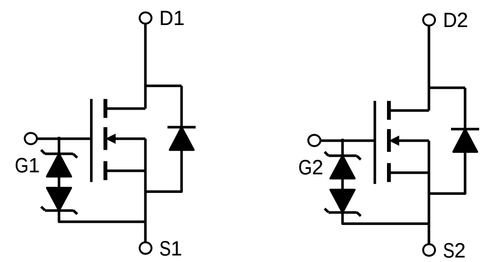
Features

V_{DS} (V) = 20V
I_D = 0.5 A (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 0.55Ω (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 0.68Ω (V_{GS} = 2.5V)
$R_{DS(ON)}$ < 0.80Ω (V_{GS} = 1.8V)

ESD PROTECTED!

SC-89-6





Absolute Maximum Ratings T_A=25°C unless otherwise noted					
Parameter		**Symbol**	**10 Sec**	**Steady State**	**Units**
Drain-Source Voltage		V_{DS}	20		V
Gate-Source Voltage		V_{GS}	±8		V
Continuous Drain Current [A, F]	T_A=25°C	I_D	0.5	0.5	A
	T_A=70°C		0.5	0.45	
Pulsed Drain Current [B]		I_{DM}	3		
Power Dissipation [A]	T_A=25°C	P_D	0.38	0.28	W
	T_A=70°C		0.24	0.18	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		°C

Thermal Characteristics					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	275	330	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		360	450	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	300	350	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	I_D=250µA, V_{GS}=0V		20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V, V_{GS}=0V				1	µA
			T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±4.5V				±1	µA
		V_{DS}=0V, V_{GS}=±8V				±100	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		0.45	0.6	1	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V		3			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=4.5V, I_D=0.5A			0.4	0.55	Ω
			T_J=125°C		0.6	0.85	
		V_{GS}=2.5V, I_D=0.5A			0.48	0.68	Ω
		V_{GS}=1.8V, I_D=0.3A			0.6	0.8	Ω
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=0.5A			1.5		S
V_{SD}	Diode Forward Voltage	I_S=0.1A,V_{GS}=0V			0.65	1	V
I_S	Maximum Body-Diode Continuous Current					0.4	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz			35	45	pF
C_{oss}	Output Capacitance				8		pF
C_{rss}	Reverse Transfer Capacitance				6		pF
SWITCHING PARAMETERS							
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=0.5A			0.63	1	nC
Q_{gs}	Gate Source Charge				0.08		nC
Q_{gd}	Gate Drain Charge				0.16		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=5V, V_{DS}=10V, R_L=50Ω, R_{GEN}=3Ω			4.5		ns
t_r	Turn-On Rise Time				3.3		ns
$t_{D(off)}$	Turn-Off DelayTime				78		ns
t_f	Turn-Off Fall Time				32		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=0.5A, dI/dt=100A/µs			8	10	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=0.5A, dI/dt=100A/µs			2		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A =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 $R_{\theta JA}$ is the sum of the thermal impedence 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 µs pulses, duty cycle 0.5% max.
E. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.
F. The maximum current rating is limited by bond-wires
Rev3: Aug 2008

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

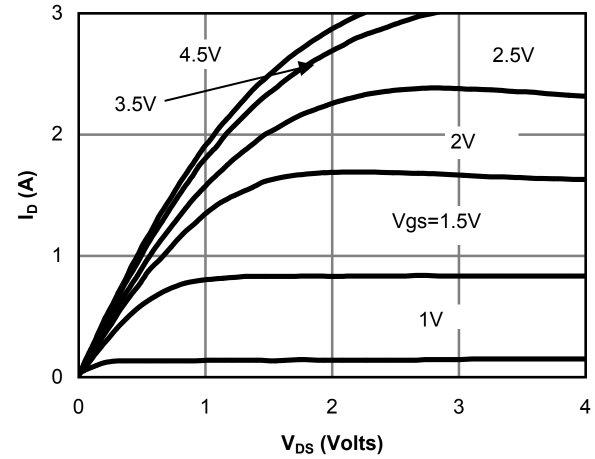


Figure 1: On-Region Characteristics

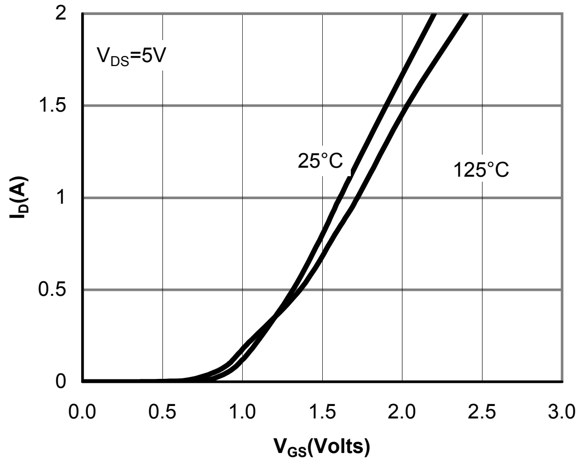


Figure 2: Transfer Characteristics

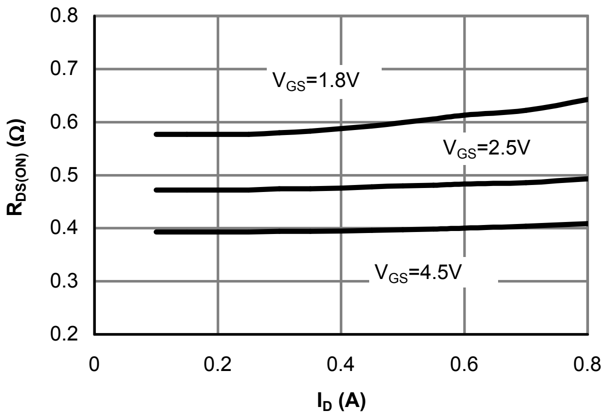


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

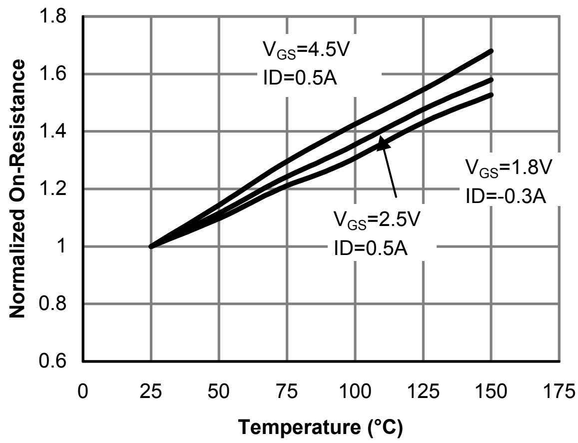


Figure 4: On-Resistance vs. Junction Temperature

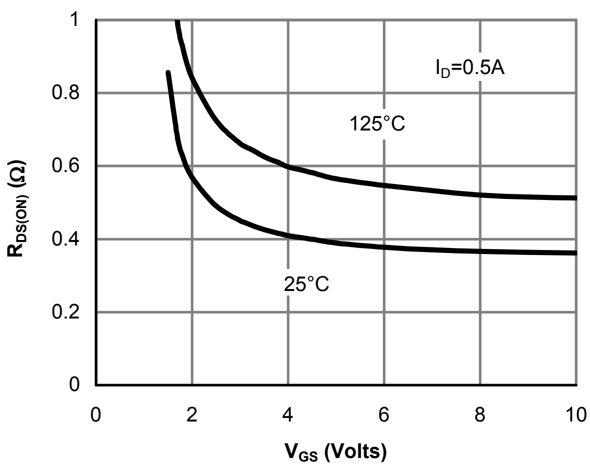


Figure 5: On-Resistance vs. Gate-Source Voltage

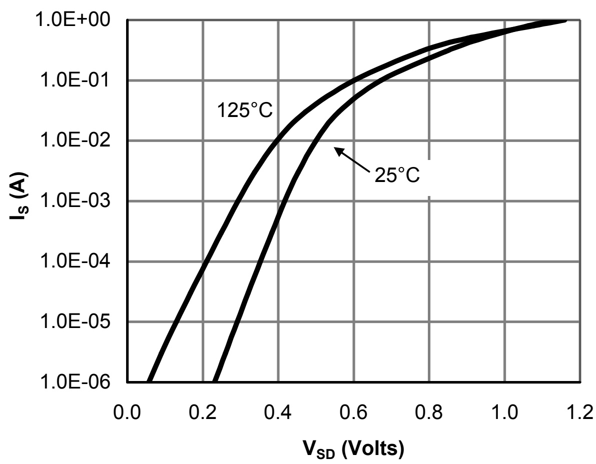


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

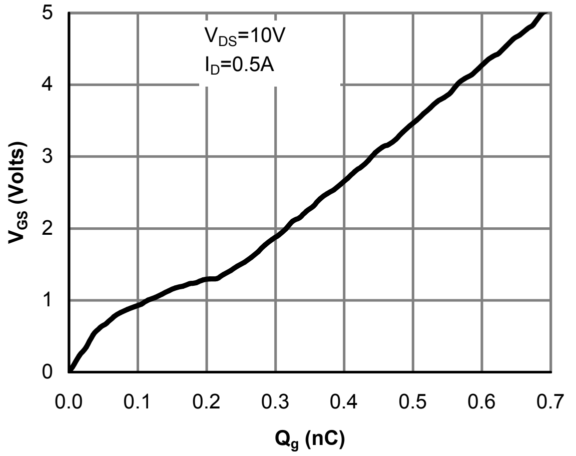


Figure 7: Gate-Charge Characteristics

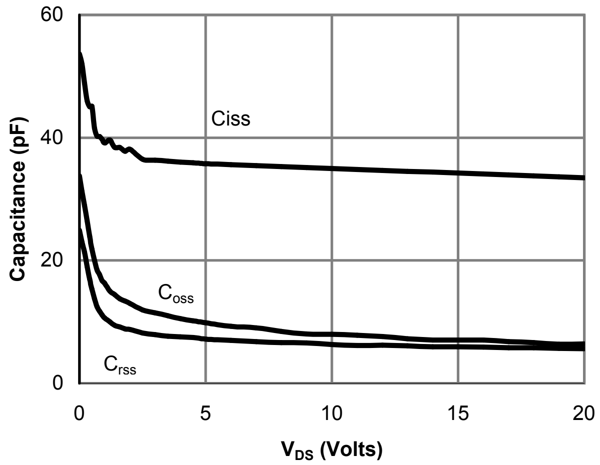


Figure 8: Capacitance Characteristics

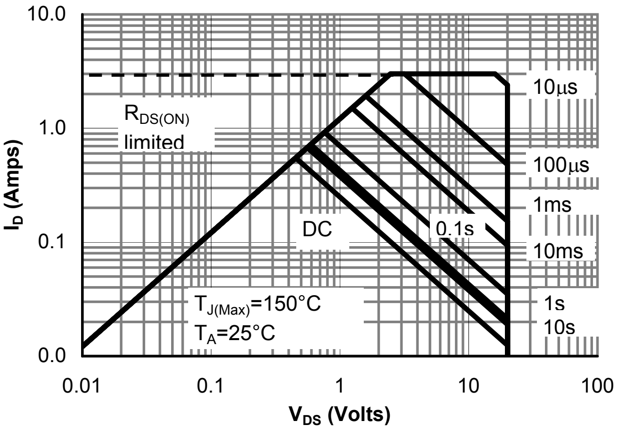


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

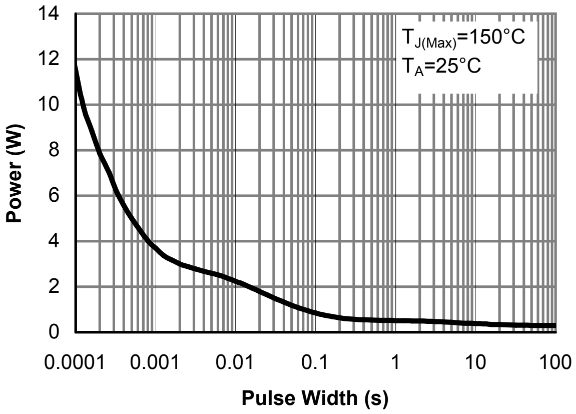


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

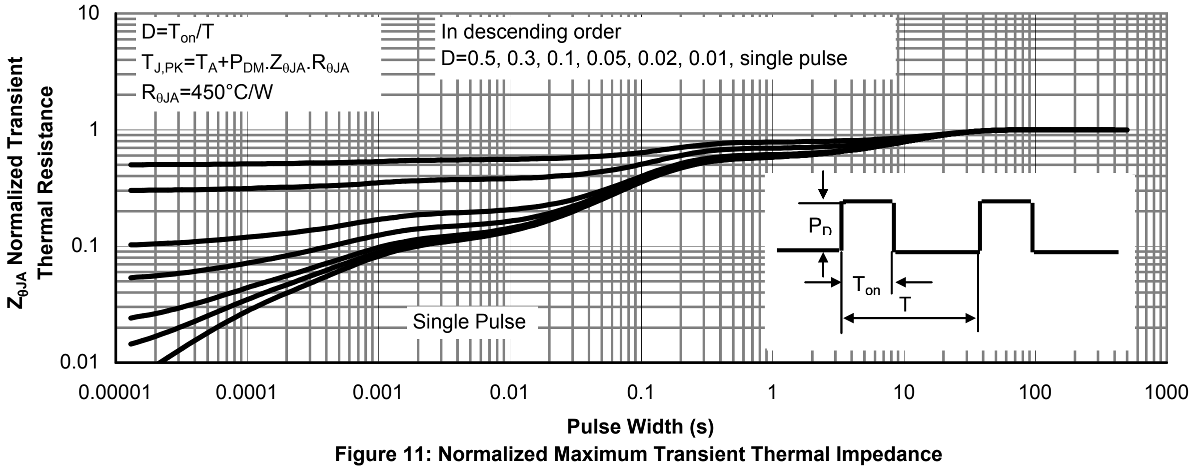
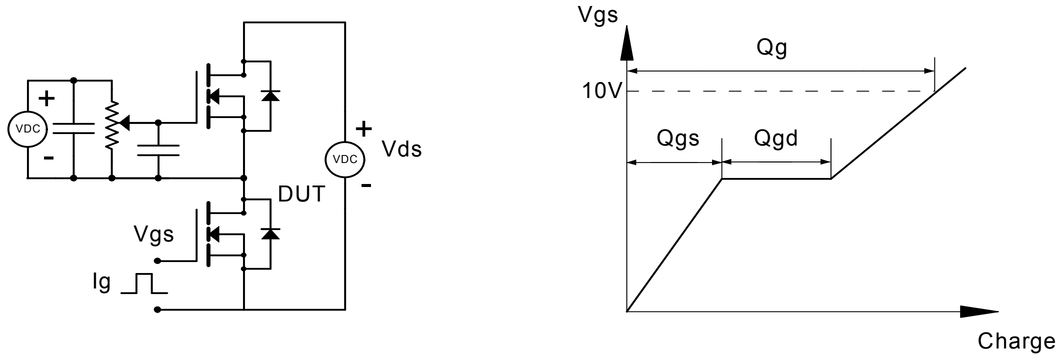
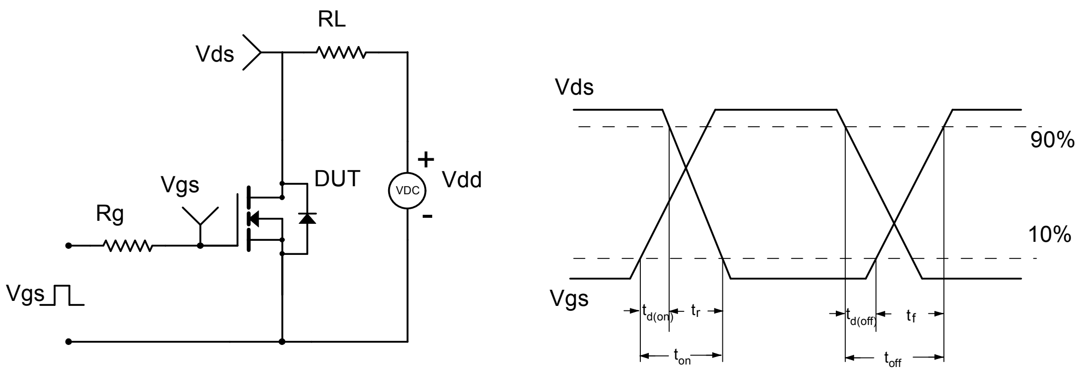


Figure 11: Normalized Maximum Transient Thermal Impedance

Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms