



# THE DATASHEET OF AO7800



## AO7800

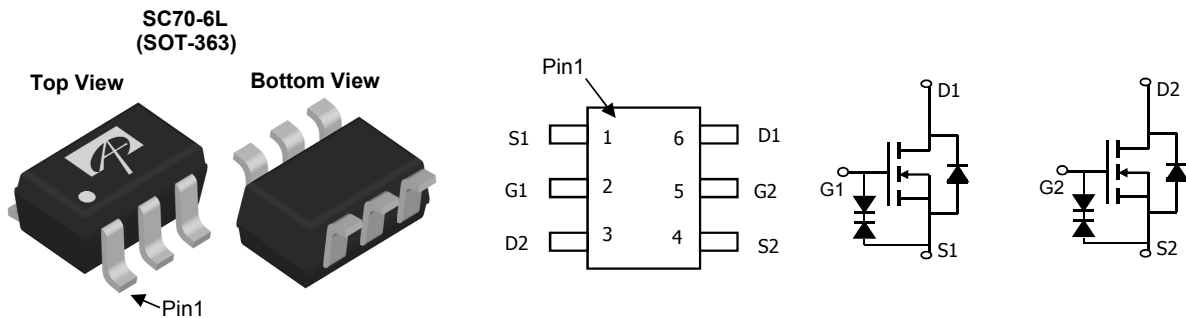
### Dual N-Channel Enhancement Mode Field Effect Transistor

#### General Description

The AO7800 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 1.8V, in the small SOT363 footprint. It can be used for a wide variety of applications, including load switching, low current inverters and low current DC-DC converters. It is ESD protected.

#### Features

$V_{DS} (V) = 20V$   
 $I_D = 0.9 A (V_{GS} = 4.5V)$   
 $R_{DS(ON)} < 300m\Omega (V_{GS} = 4.5V)$   
 $R_{DS(ON)} < 350m\Omega (V_{GS} = 2.5V)$   
 $R_{DS(ON)} < 450m\Omega (V_{GS} = 1.8V)$



#### 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	$V_{GS}$	$\pm 8$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	A
		$T_A=70^\circ C$	
		Pulsed Drain Current <sup>B</sup>	
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	W
		$T_A=70^\circ C$	
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>	$R_{\theta JA}$	120	145	$^\circ C/W$
$t \leq 10s$				
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	156	190	$^\circ C/W$
Steady-State				
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	130	150	$^\circ C/W$

**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> =±8V			25	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.5	0.75	0.9	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	5			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.9A T <sub>J</sub> =125°C		181 253	300 350	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =0.75A		237	350	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =0.7A		317	450	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =0.8A		2.6		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =0.5A, V <sub>GS</sub> =0V		0.69	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				0.4	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		101	120	pF
C <sub>oss</sub>	Output Capacitance		17		pF	
C <sub>rss</sub>	Reverse Transfer Capacitance		14		pF	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		3	4	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> =0.8A		1.57	1.9	nC
Q <sub>gs</sub>	Gate Source Charge		0.13		nC	
Q <sub>gd</sub>	Gate Drain Charge		0.36		nC	
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =12.5Ω, R <sub>GEN</sub> =6Ω		3.2		ns
t <sub>r</sub>	Turn-On Rise Time		4		ns	
t <sub>D(off)</sub>	Turn-Off DelayTime		15.5		ns	
t <sub>f</sub>	Turn-Off Fall Time		2.4		ns	
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =0.8A, di/dt=100A/μs		6.7	8.1	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =0.8A, di/dt=100A/μs		1.6		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 80 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

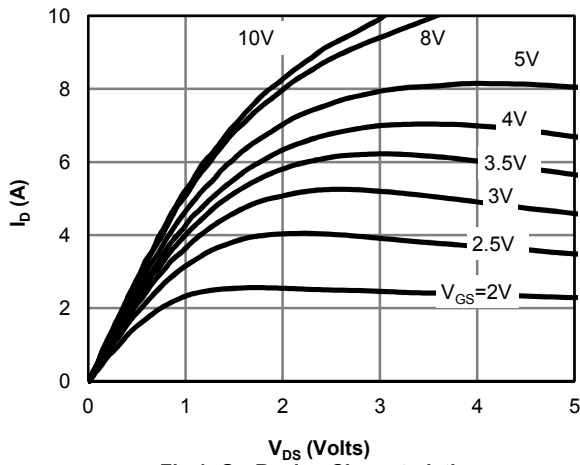


Fig 1: On-Region Characteristics

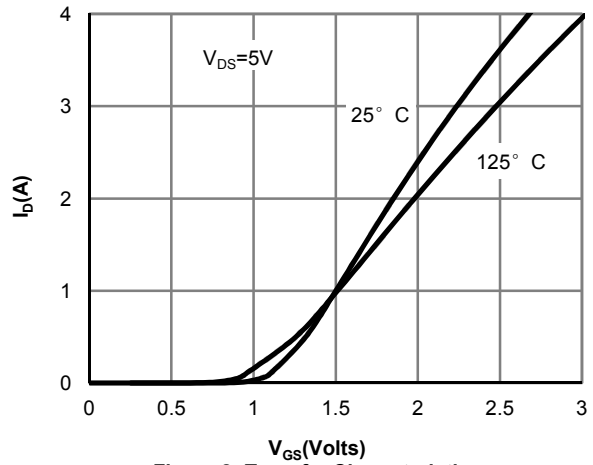


Figure 2: Transfer Characteristics

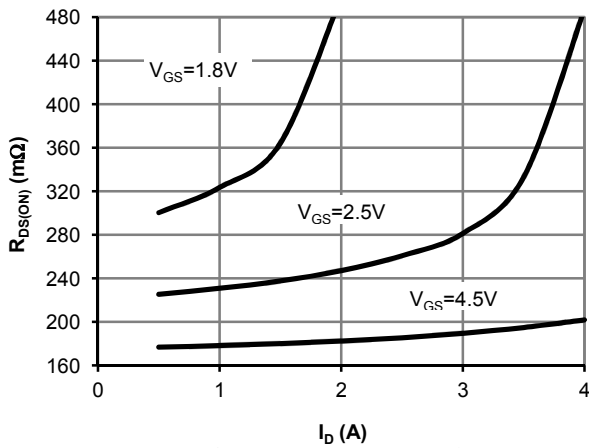


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

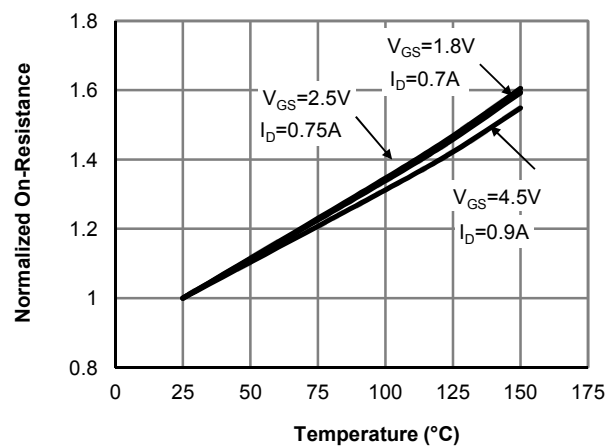


Figure 4: On-Resistance vs. Junction Temperature

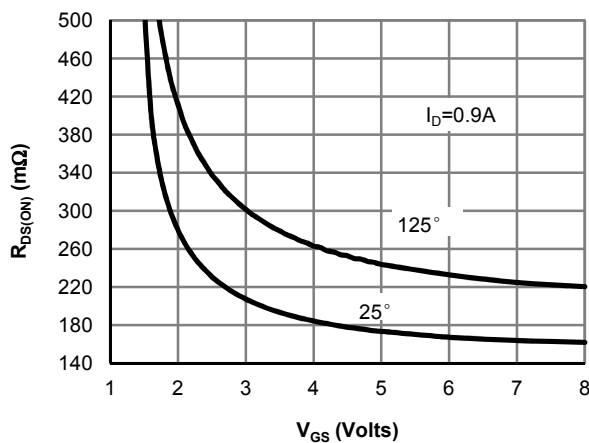


Figure 5: On-Resistance vs. Gate-Source Voltage

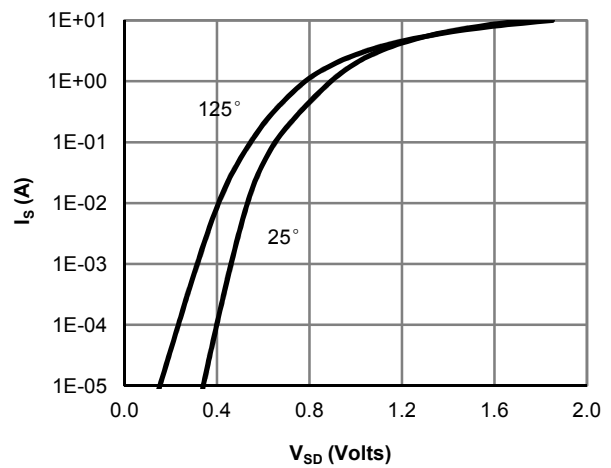
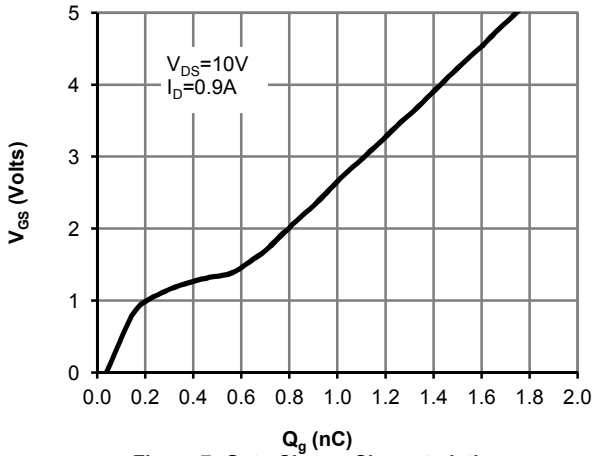
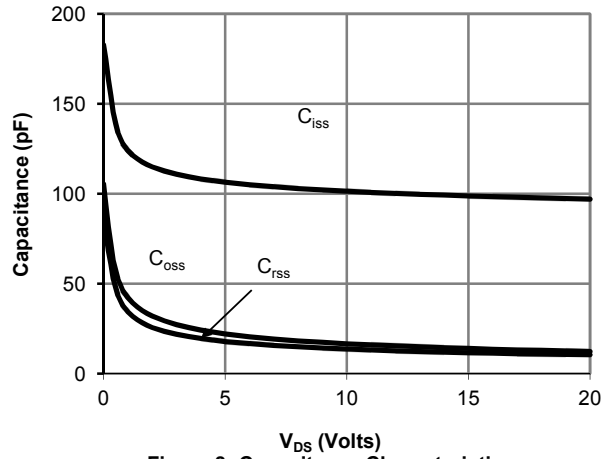


Figure 6: Body-Diode Characteristics

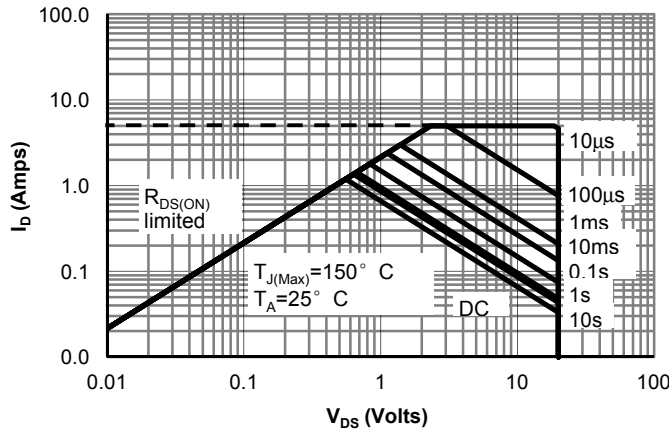
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



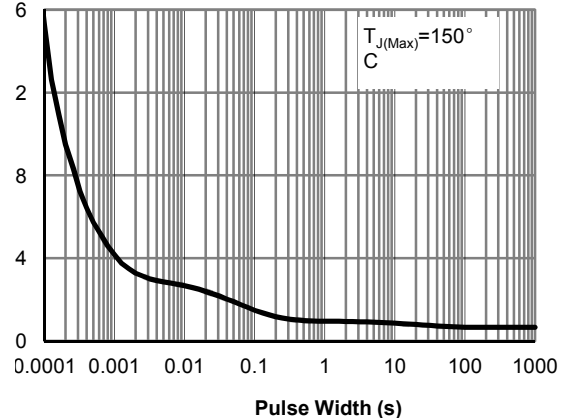
**Figure 7: Gate-Charge Characteristics**



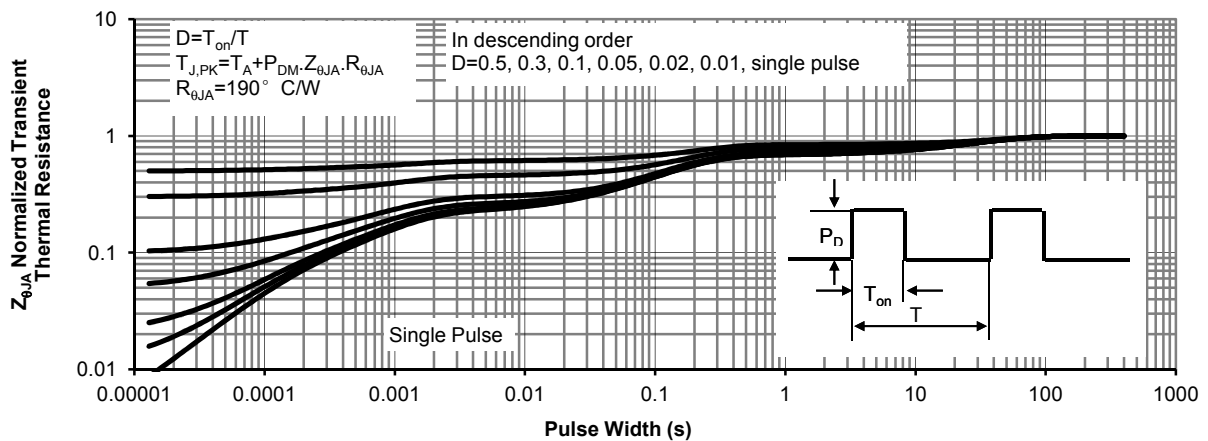
**Figure 8: Capacitance Characteristics**



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

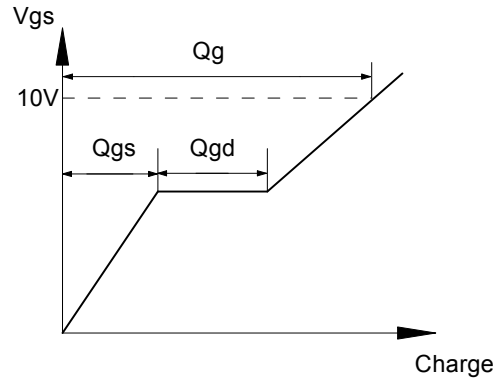
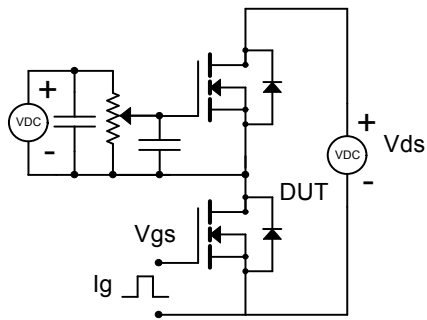


**Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)**

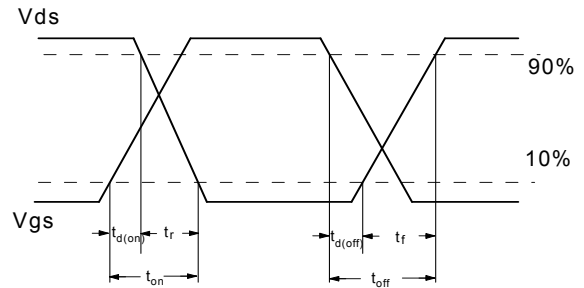
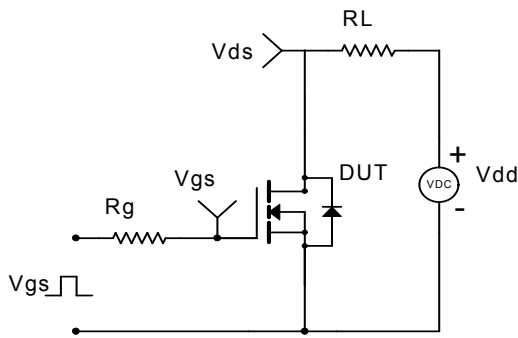


**Figure 11: Normalized Maximum Transient Thermal Impedance**

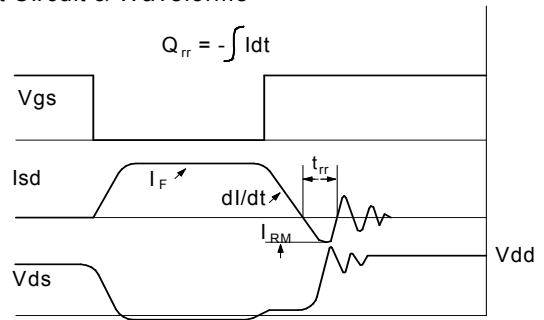
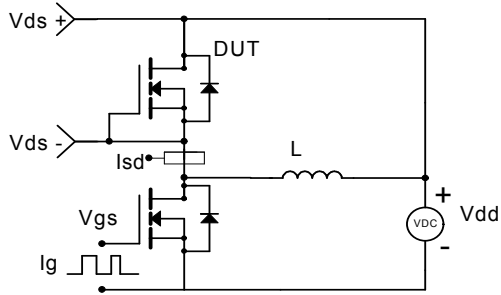
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms





### Diode Recovery Test Circuit & Waveforms



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