



Rev 3: June 2005



**AO7801**  
**Dual P-Channel Enhancement Mode Field Effect Transistor**

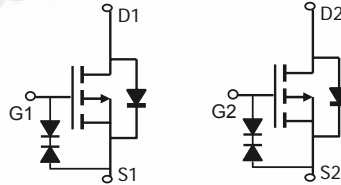
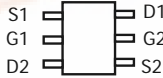
**General Description**

The AO7801 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 SOT323 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 to 2KV HBM. *Standard Product AO7801 is Pb-free (meets ROHS & Sony 259 specifications). AO7801L is a Green Product ordering option. AO7801 and AO7801L are electrically identical.*

**Features**

- $V_{DS}$  (V) = -20V
- $I_D$  = -0.6A ( $V_{GS}$  = -4.5V)
- $R_{DS(ON)}$  < 520m $\Omega$  ( $V_{GS}$  = -4.5V)
- $R_{DS(ON)}$  < 700m $\Omega$  ( $V_{GS}$  = -2.5V)
- $R_{DS(ON)}$  < 950m $\Omega$  ( $V_{GS}$  = -1.8V)

SC-70-6  
(SOT-323)  
Top View



**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	$V_{GS}$	$\pm 8$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	-0.6	A
	$T_A=70^\circ\text{C}$	-0.48	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	-3	
Power Dissipation <sup>A</sup>	$T_A=25^\circ\text{C}$	0.3	W
	$T_A=70^\circ\text{C}$	0.19	
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>	$R_{\theta JA}$	360	415	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		400	460	
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	300	350	$^\circ\text{C/W}$



**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> =±8V			±10	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA	-0.5	-0.6	-0.9	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V	-3			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-0.6A T <sub>J</sub> =125°C		400 542	520 700	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-0.5A		540	700	mΩ
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-0.4A		700	950	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-0.6A		1.7		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-0.5A, V <sub>GS</sub> =0V		-0.86	-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		114	140	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		12	17	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> =-0.6A		1.44	1.8	nC
Q <sub>gs</sub>	Gate Source Charge			0.14		nC
Q <sub>gd</sub>	Gate Drain Charge			0.35		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, R <sub>L</sub> =16.7Ω, R <sub>GEN</sub> =3Ω		6.5		ns
t <sub>r</sub>	Turn-On Rise Time			6.5		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			18.2		ns
t <sub>f</sub>	Turn-Off Fall Time			5.5		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-0.6A, dI/dt=100A/μs		10	13	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-0.6A, dI/dt=100A/μs		3		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 a given application depends on the user's specific board design. The current rating is based on the ≤ 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 80μs 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

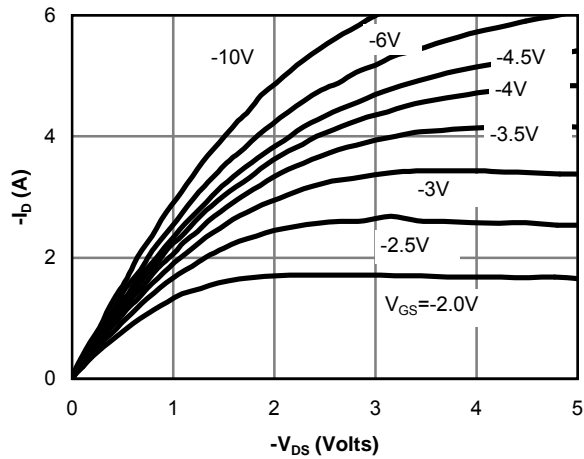


Fig 1: On-Region Characteristics

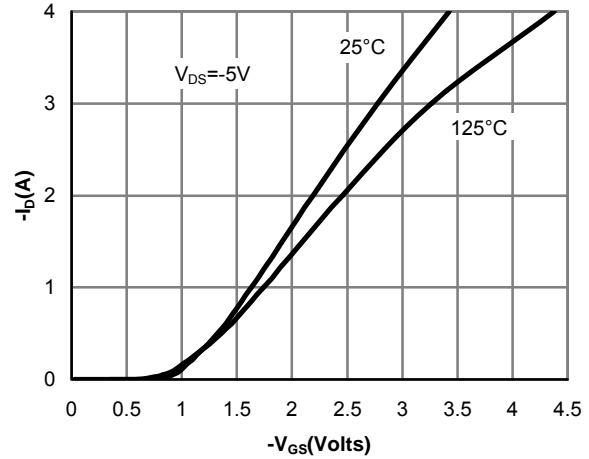


Figure 2: Transfer Characteristics

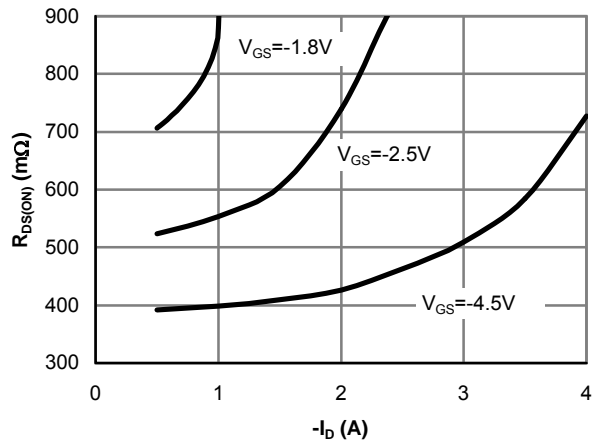


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

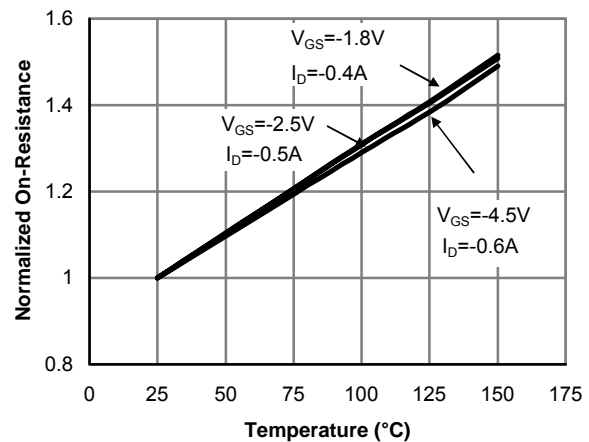


Figure 4: On-Resistance vs. Junction Temperature

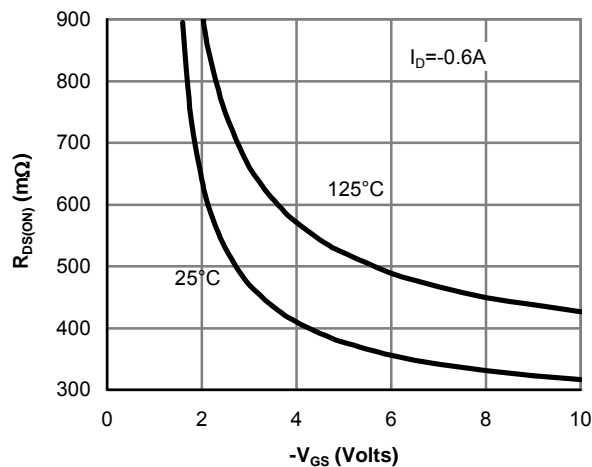


Figure 5: On-Resistance vs. Gate-Source Voltage

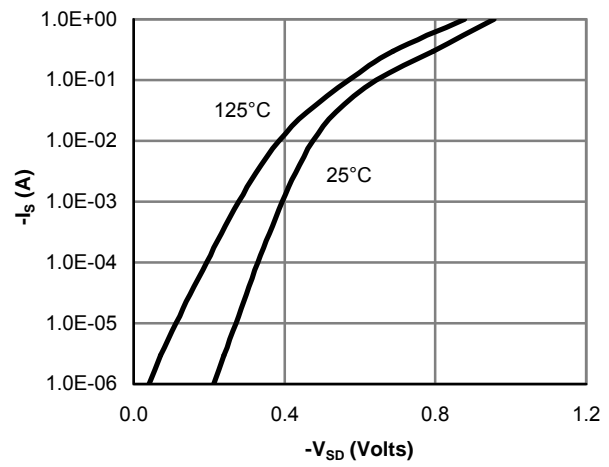
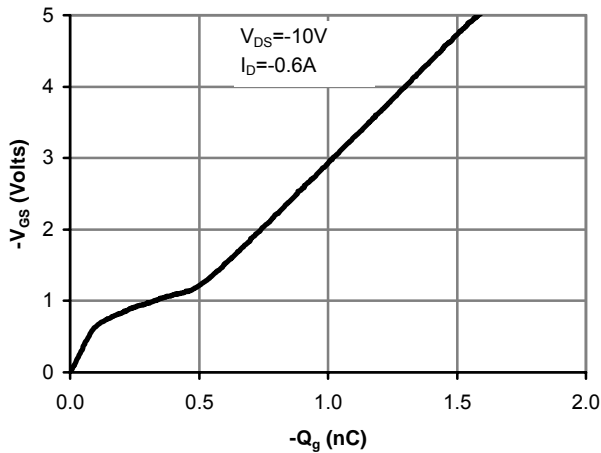
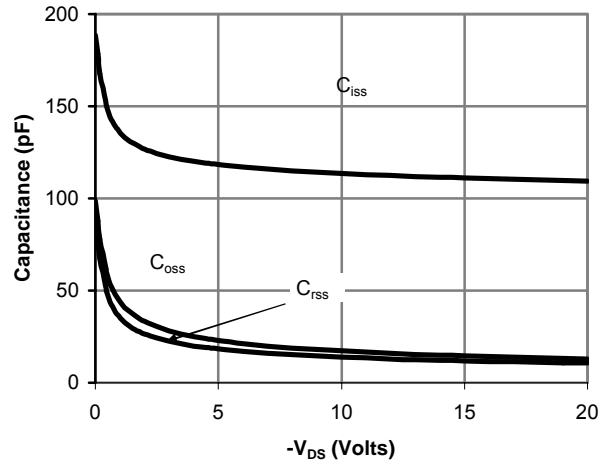


Figure 6: Body-Diode Characteristics

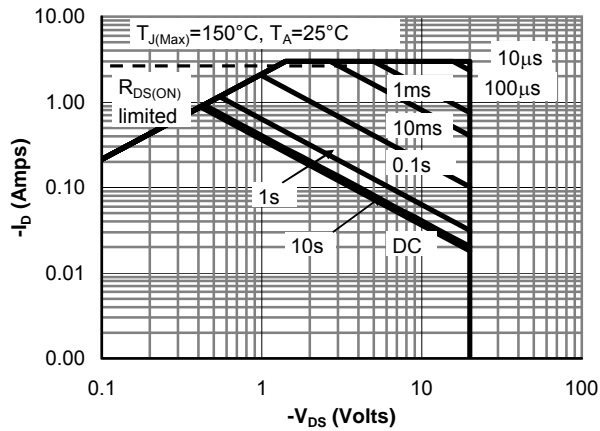
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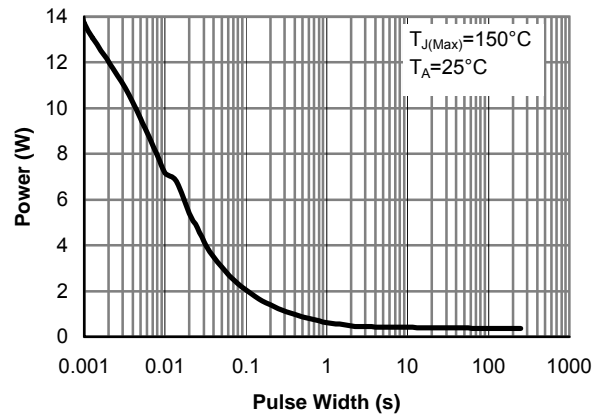
**Figure 7: Gate-Charge Characteristics**



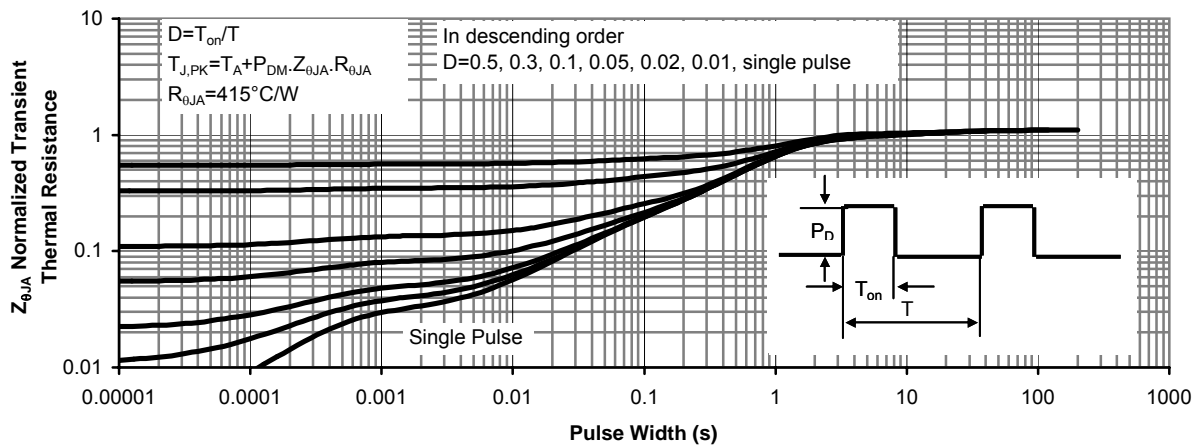
**Figure 8: Capacitance Characteristics**



**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**