

## AO6706

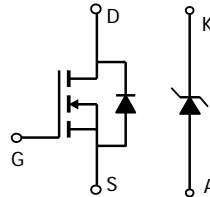
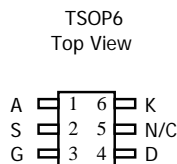
### N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

#### General Description

The AO6706 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications. Standard Product AO6706 is Pb-free (meets ROHS & Sony 259 specifications). AO6706L is a Green Product ordering option. AO6706 and AO6706L are electrically identical.

#### Features

$V_{DS} (V) = 30V$   
 $I_D = 3.6A (V_{GS} = 10V)$   
 $R_{DS(ON)} < 65m\Omega (V_{GS} = 10V)$   
 $R_{DS(ON)} < 75m\Omega (V_{GS} = 4.5V)$   
 $R_{DS(ON)} < 160m\Omega (V_{GS} = 2.5V)$   
**SCHOTTKY**  
 $V_{DS} (V) = 20V, I_F = 1A, V_F < 0.5V @ 0.5A$



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

Parameter	Symbol	MOSFET	Schottky	Units
Drain-Source Voltage	$V_{DS}$	30		V
Gate-Source Voltage	$V_{GS}$	$\pm 12$		V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	3.3	A
		$T_A=70^\circ C$	2.6	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	10		
Schottky reverse voltage	$V_{KA}$		20	V
Continuous Forward Current <sup>A</sup>	$I_F$	$T_A=25^\circ C$	2	A
		$T_A=70^\circ C$	1	
Pulsed Forward Current <sup>B</sup>	$I_{FM}$		10	
Power Dissipation	$P_D$	$T_A=25^\circ C$	1.15	W
		$T_A=70^\circ C$	0.7	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$

Parameter: Thermal Characteristics MOSFET	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	80.3	110	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup> Steady-State		117	150	
Maximum Junction-to-Lead <sup>C</sup> Steady-State	$R_{\theta JL}$	43	80	
<b>Thermal Characteristics Schottky</b>				
Maximum Junction-to-Ambient <sup>A</sup> $t \leq 10s$	$R_{\theta JA}$	109.4	135	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup> Steady-State		136.5	175	
Maximum Junction-to-Lead <sup>C</sup> Steady-State	$R_{\theta JL}$	58.5	80	

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	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, 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> =±12V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.4	1.8	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	10			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =3.3A T <sub>J</sub> =125°C		44 64	65 90	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =3.0A		53	75	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =1A		106	160	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =3.3A		11.7		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.81	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				2.5	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		226	270	pF
C <sub>oss</sub>	Output Capacitance			39		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			29		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.4	1.7	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =3.3A		3	3.6	nC
Q <sub>gs</sub>	Gate Source Charge			1.4		nC
Q <sub>gd</sub>	Gate Drain Charge			0.55		nC
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =4.7Ω, R <sub>GEN</sub> =6Ω		2.6		ns
t <sub>r</sub>	Turn-On Rise Time			3.2		ns
t <sub>D(off)</sub>	Turn-Off DelayTime			14.5		ns
t <sub>f</sub>	Turn-Off Fall Time			2.1		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time		I <sub>F</sub> =3.3A, di/dt=100A/μs		10.2	13
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =3.3A, di/dt=100A/μs		3.8		nC
<b>SCHOTTKY PARAMETERS</b>						
V <sub>F</sub>	Forward Voltage Drop	I <sub>F</sub> =0.5A		0.39	0.5	V
I <sub>rm</sub>	Maximum reverse leakage current	V <sub>R</sub> =16V			0.1	mA
		V <sub>R</sub> =16V, T <sub>J</sub> =125°C			20	
C <sub>T</sub>	Junction Capacitance	V <sub>R</sub> =10V		34		pF
t <sub>rr</sub>	Schottky Reverse Recovery Time	I <sub>F</sub> =1A, di/dt=100A/μs		5.2	10	ns
Q <sub>rr</sub>	Schottky Reverse Recovery Charge	I <sub>F</sub> =1A, di/dt=100A/μs		0.8		nC

A: The value of R<sub>thJA</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>thJA</sub> is the sum of the thermal impedance from junction to lead R<sub>thJL</sub> and lead to ambient.

D: The static characteristics in Figures 1 to 6 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.

Rev2: August 2005

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

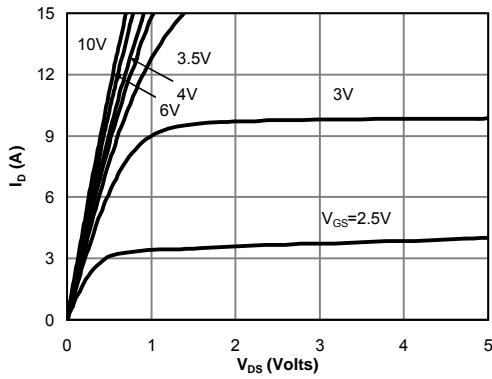


Fig 1: On-Region Characteristics

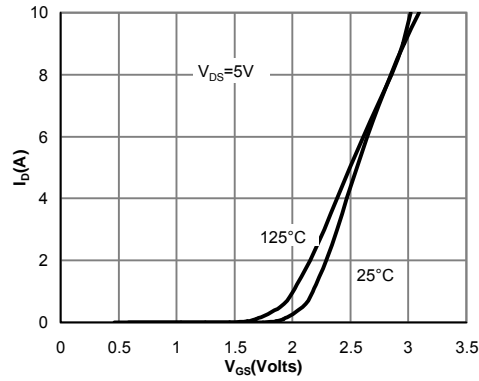


Figure 2: Transfer Characteristics

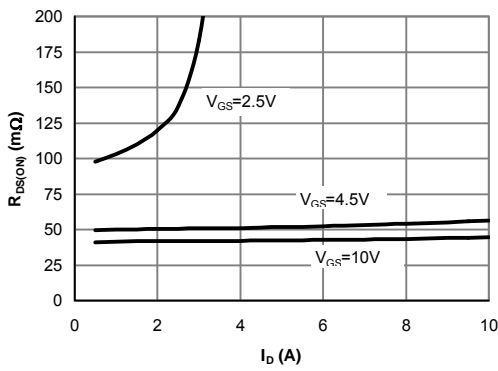


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

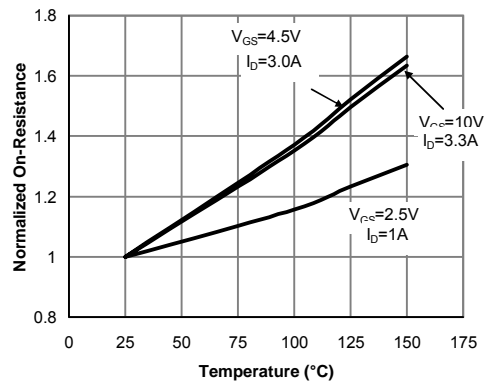


Figure 4: On-Resistance vs. Junction Temperature

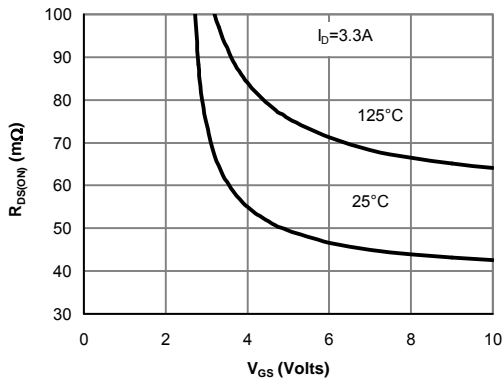


Figure 5: On-Resistance vs. Gate-Source Voltage

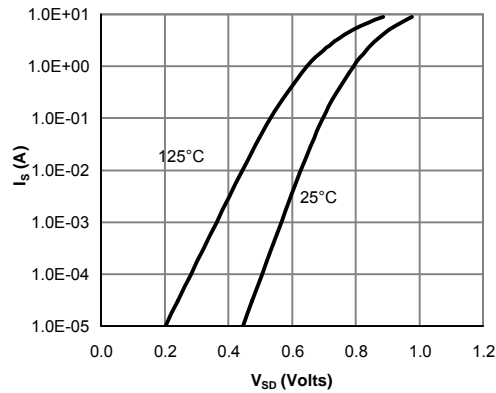


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

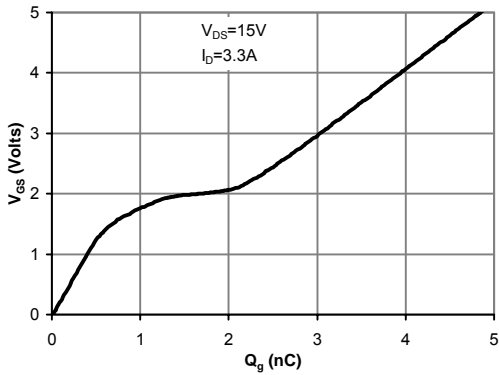


Figure 7: Gate-Charge Characteristics

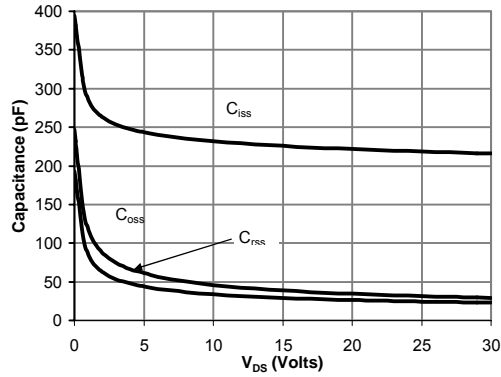


Figure 8: Capacitance Characteristics

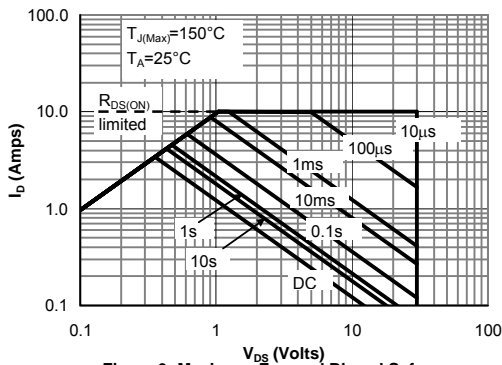


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

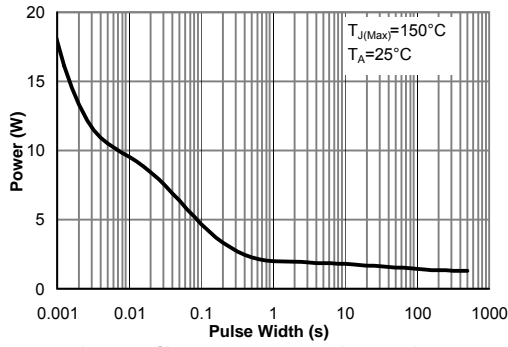


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

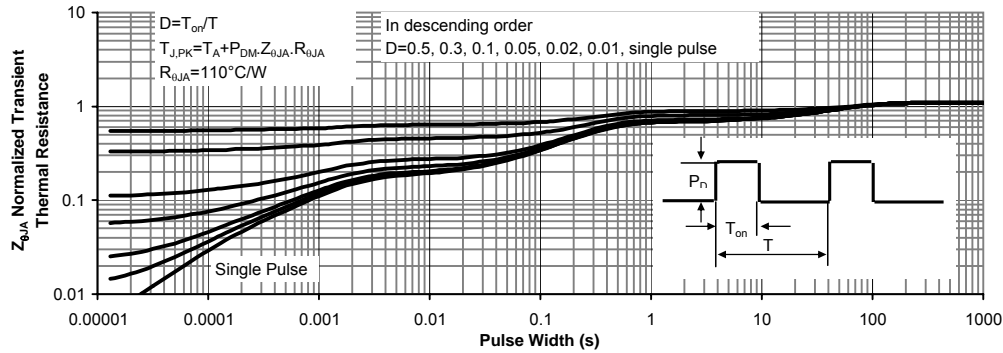


Figure 11: Normalized Maximum Transient Thermal Impedance