ALPHA & OMEGA SEMICONDUCTOR

AO4771L

30V P-Channel MOSFET with Schottky Diode

General Description

AO4771L 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 "standard buck" DC-DC conversion applications.

Product Summary

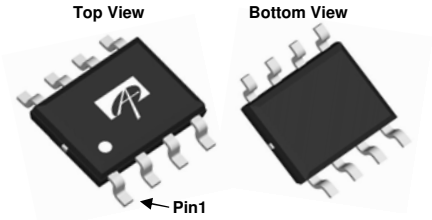
V_{DS}	-30V
I_D (at V_{GS}=-10V)	-4A
$R_{DS(ON)}$ (at V_{GS}=-10V)	< 68mΩ
$R_{DS(ON)}$ (at V_{GS}=-4.5V)	< 105mΩ

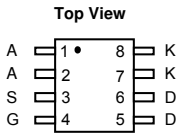
Schottky

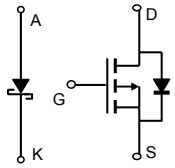
V_{KA}	30V
I_F	4A
V_F (at I_F=1A)	<0.5V

Green Product

SOIC-8







Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	MOSFET	Schottky	Units
Drain-Source Voltage		V_{DS}	-30		V
Gate-Source Voltage		V_{GS}	±20		V
Continuous Drain Current	T_A=25°C	I_D	-4		A
	T_A=70°C		-3		
Pulsed Drain Current [C]		I_{DM}	-18		
Avalanche Current [C]		I_{AS}, I_{AR}	11		A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	6		mJ
Schottky reverse voltage		V_{KA}		30	
Continuous Forward Current	T_A=25°C	I_F		4	
	T_A=70°C			2.5	
Power Dissipation [B]	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.3	1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Thermal Characteristics

Parameter: MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	48	62.5	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		74	90	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	32	40	°C/W
Parameter: Schottky					
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	49	62.5	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		72	90	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	31	40	°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	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-30V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}= ±20V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-1.3	-1.8	-2.3	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V	-18			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-4A		56	68	mΩ
		T_J=125°C		79	95	
		V_{GS}=-4.5V, I_D=-3A		83	105	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-4A		8		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.8	-1	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz	230	290	350	pF
C_{oss}	Output Capacitance		40	60	80	pF
C_{rss}	Reverse Transfer Capacitance		25	40	55	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	7.5	16	24	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=-10V, V_{DS}=-15V, I_D=-4A	4.6	5.8	7	nC
Q_g(4.5V)	Total Gate Charge		2.2	2.8	3	nC
Q_{gs}	Gate Source Charge		0.9	1.1	1.3	nC
Q_{gd}	Gate Drain Charge		0.8	1.3	1.8	nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=3.75Ω, R_{GEN}=3Ω		6		ns
t_r	Turn-On Rise Time			5		ns
$t_{D(off)}$	Turn-Off DelayTime			21		ns
t_f	Turn-Off Fall Time			9		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-4A, dI/dt=100A/µs	8	10	12	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-4A, dI/dt=100A/µs	16	20	24	nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	I_F=1A		0.4	0.5	V
I_{rm}	Maximum reverse leakage current	V_R=24V			0.05	mA
		V_R=24V, T_J=125°C			10	
C_T	Junction Capacitance	V_R=15V		56		pF

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.

B. The power dissipation P_D is based on $T_{J(MAX)}$=150°C, using ≤ 10s junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initialT_J=25°C.

D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

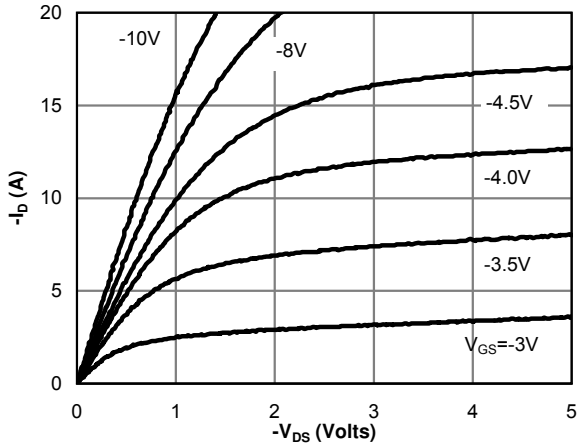


Fig 1: On-Region Characteristics(Note E)

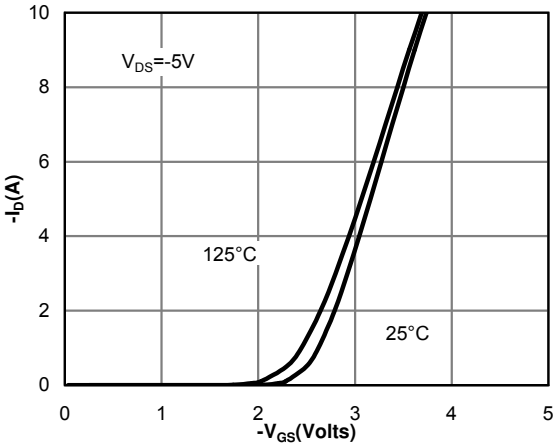


Figure 2: Transfer Characteristics(Note E)

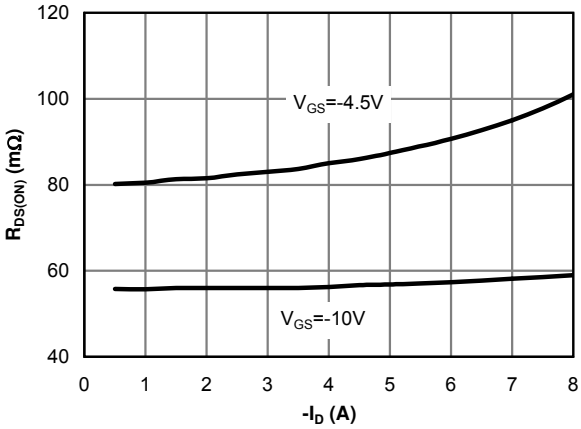


Figure 3: On-Resistance vs. Drain Current and Gate Voltage(Note E)

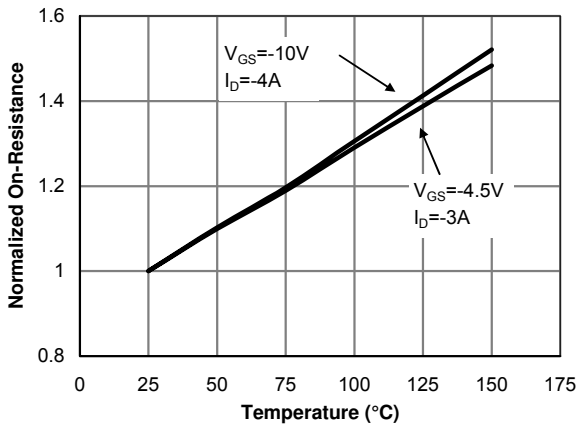


Figure 4: On-Resistance vs. Junction Temperature(Note E)

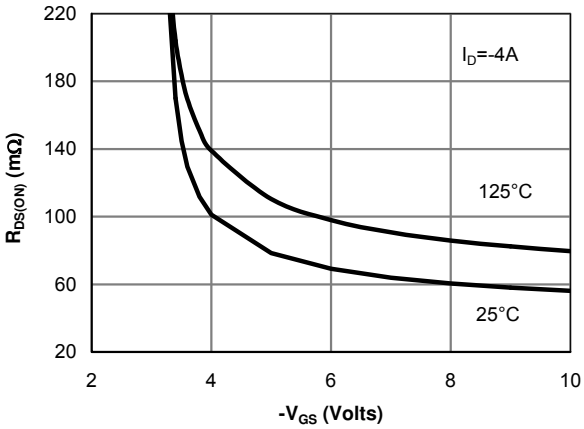


Figure 5: On-Resistance vs. Gate-Source Voltage(Note E)

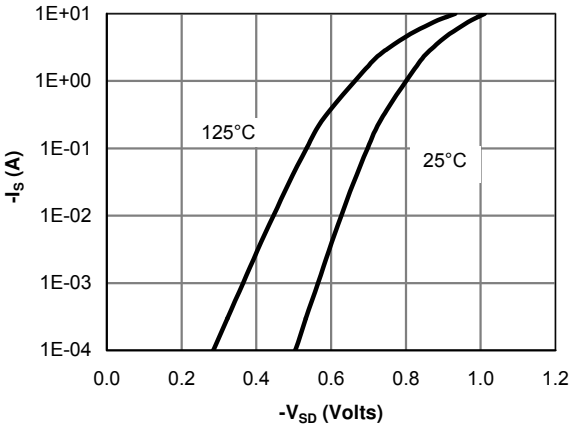


Figure 6: Body-Diode Characteristics(Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

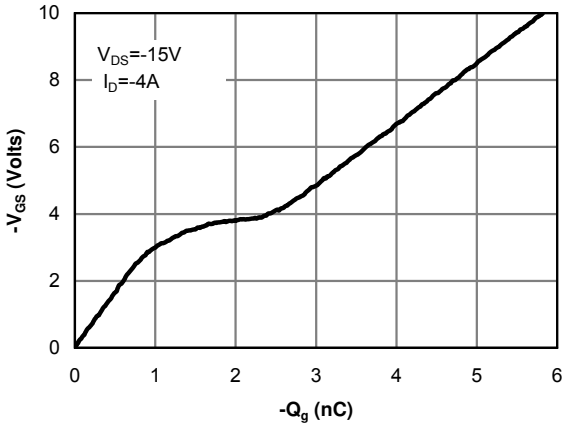


Figure 7: Gate-Charge Characteristics

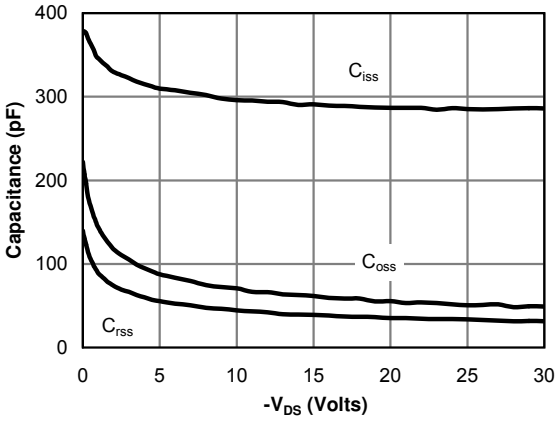


Figure 8: Capacitance Characteristics

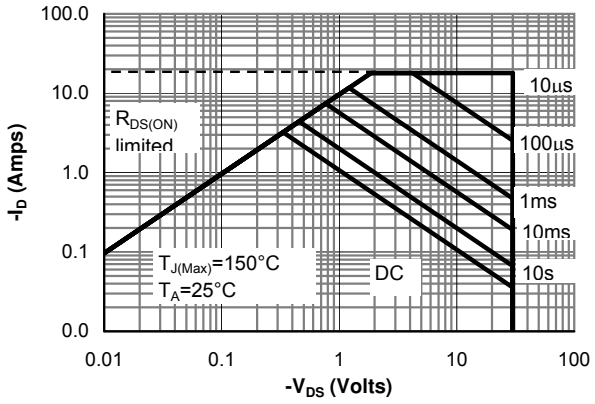


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

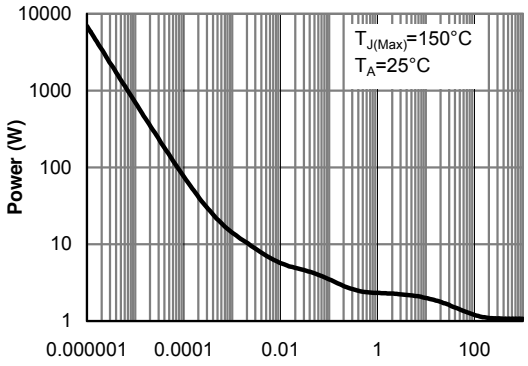


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

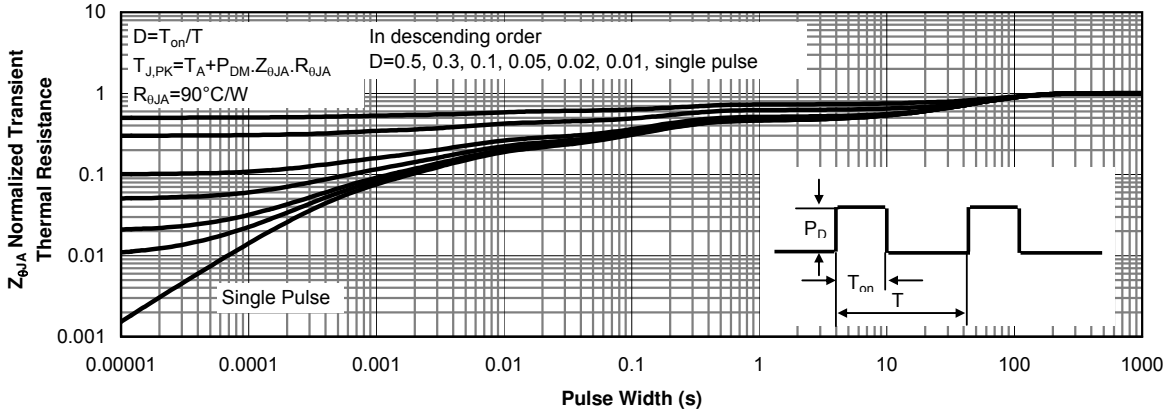


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

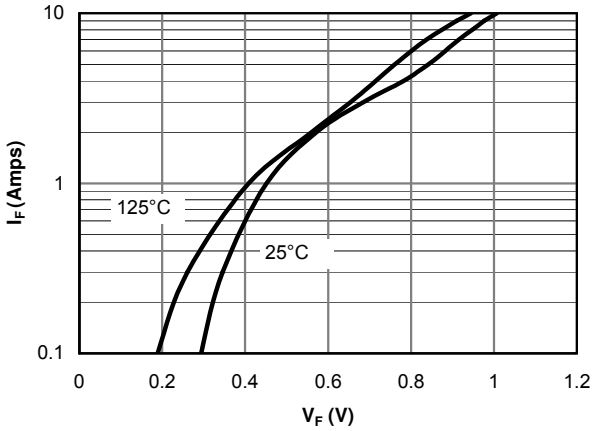


Figure 12: Schottky Forward Characteristics

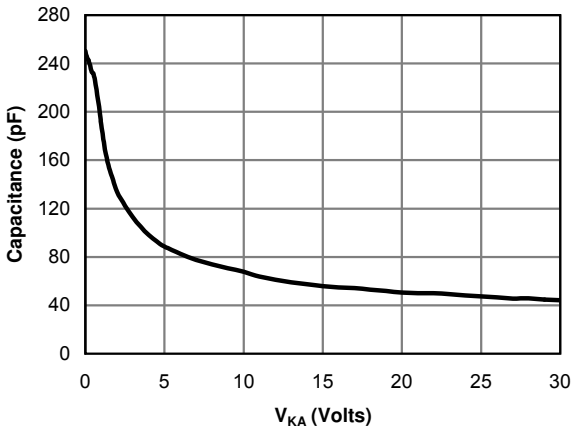


Figure 13: Schottky Capacitance Characteristics

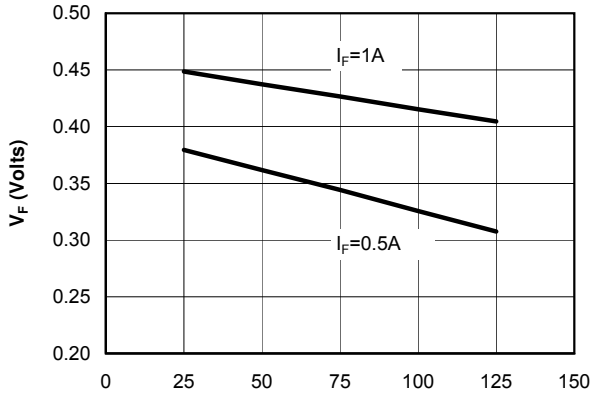


Figure 14: Schottky Forward Drop vs. Junction Temperature

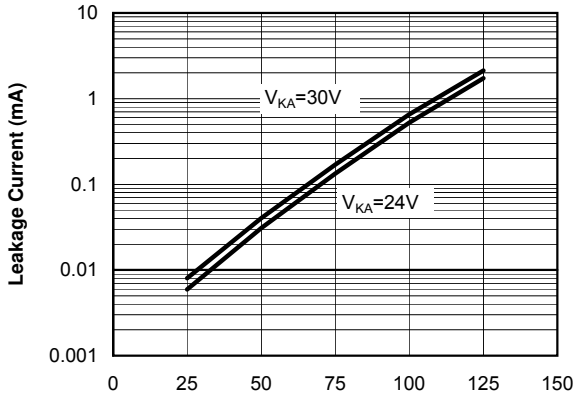
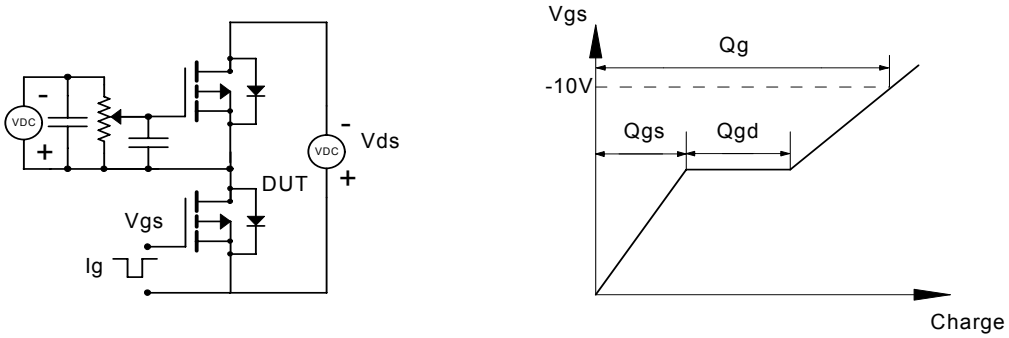
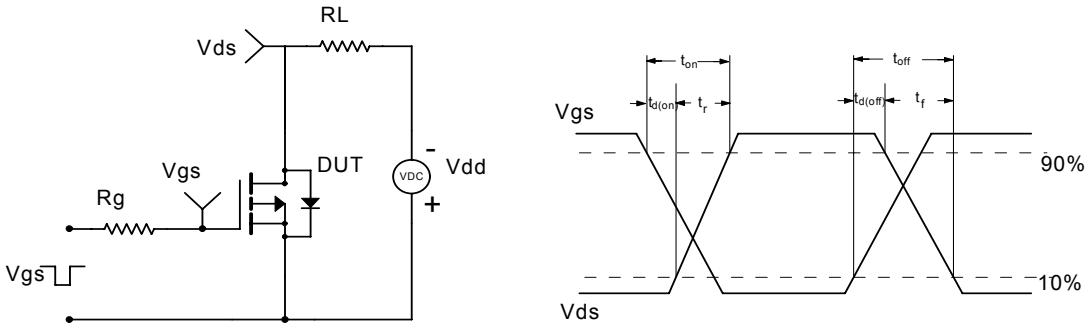


Figure 15: Schottky Leakage Current vs. Junction Temperature

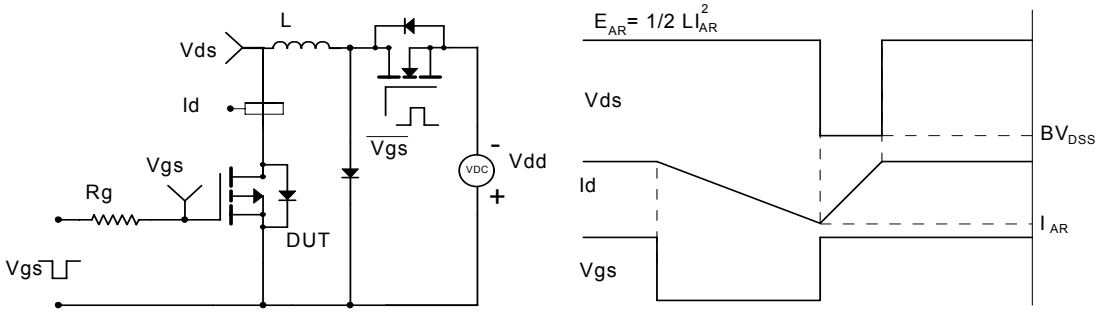
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms