freescale
飞思卡尔(深圳)功率半导体有限公司

AO4705

P-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

The AO4705 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of non-synchronous DC-DC converters.

Standard Product AO4705 is Pb-free (meets ROHS & Sony 259 specifications). AO4705L is a Green Product ordering option. AO4705 and AO4705L are electrically identical.

Features

V_{DS} (V) = -30V

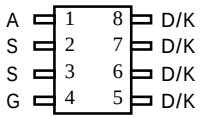
I_D = -10A (V_{GS} = -10V)

$R_{DS(ON)}$ < 14mΩ (V_{GS} = -20V)

$R_{DS(ON)}$ < 16mΩ (V_{GS} = -10V)

SCHOTTKY

V_{DS} (V) = 30V, I_F = 5A, V_F<0.52V@3A



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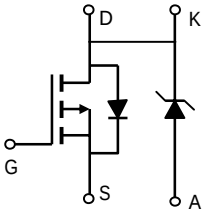

Absolute Maximum Ratings T_A=25°C unless otherwise noted					
Parameter		**Symbol**	**MOSFET**	**Schottky**	**Units**
Drain-Source Voltage		V_{DS}	-30		V
Gate-Source Voltage		V_{GS}	±25		V
Continuous Drain Current[A]	T_A=25°C	I_D	-10		A
	T_A=70°C		-8		
Pulsed Drain Current[B]		I_{DM}	-60		
Schottky reverse voltage		V_{KA}		30	V
Continuous Forward Current[A]	T_A=25°C	I_F		5	A
	T_A=70°C			3.5	
Pulsed Forward Current[B]		I_{FM}		30	
Power Dissipation	T_A=25°C	P_D	3	3	W
	T_A=70°C		2	2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Parameter: Thermal Characteristics MOSFET		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	28	40	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		54	75	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	21	30	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	36	40	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		67	75	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	25	30	

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}=-24V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±25V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-1.7	-2.5	-3	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V	60			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-10A		13	16	mΩ
		T_J=125°C		16	21	
		V_{GS}=-20V, I_D=-10A		10.7	14	mΩ
		V_{GS}=-4.5V, I_D=-10A		25		mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-10A		26		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.72	-1	V
I_S	Maximum Body-Diode Continuous Current				-4.2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		2076		pF
C_{oss}	Output Capacitance			503		pF
C_{rss}	Reverse Transfer Capacitance			302		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		2		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-10V, V_{DS}=-15V, I_D=-10A		37.2		nC
Q_{gs}	Gate Source Charge			7		nC
Q_{gd}	Gate Drain Charge			10.4		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=1.0Ω, R_{GEN}=3Ω		12.4		ns
t_r	Turn-On Rise Time			8.2		ns
$t_{D(off)}$	Turn-Off DelayTime			25.6		ns
t_f	Turn-Off Fall Time			12		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-10A, dI/dt=100A/µs		33		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-10A, dI/dt=100A/µs		23		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	I_F=3.0A		0.48	0.52	V
I_{rm}	Maximum reverse leakage current	V_R=24V		0.07	0.15	mA
		V_R=24V, T_J=125°C		4.2	20	
		V_R=24V, T_J=150°C		15	60	
C_T	Junction Capacitance	V_R=15V		120		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. 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 80 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

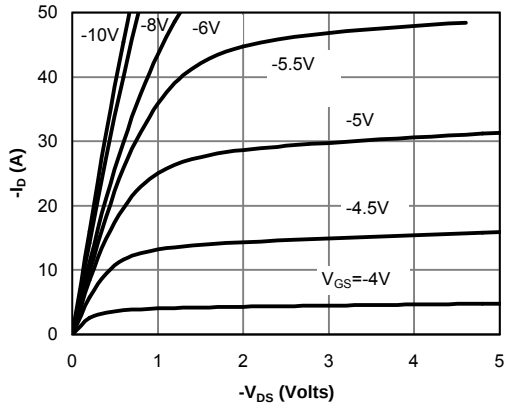

Fig 1: On-Region Characteristics

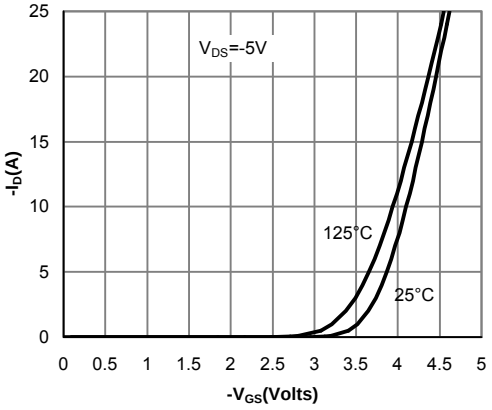

Figure 2: Transfer Characteristics

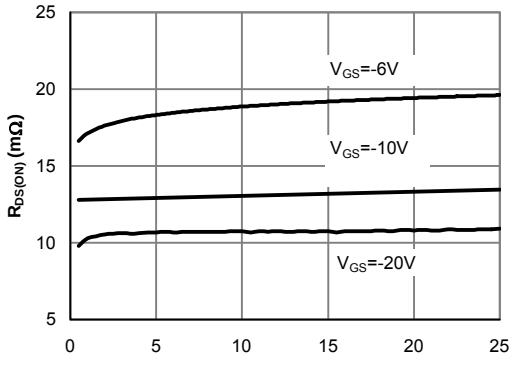

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

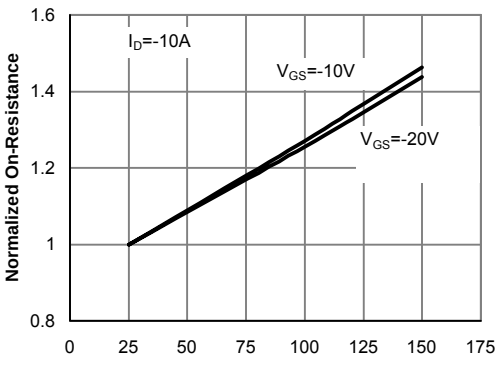

Figure 4: On-Resistance vs. Junction Temperature

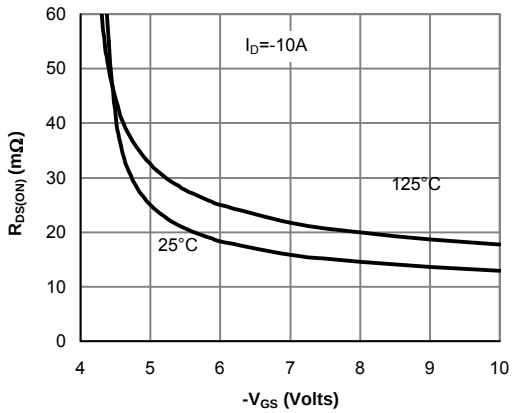

Figure 5: On-Resistance vs. Gate-Source Voltage

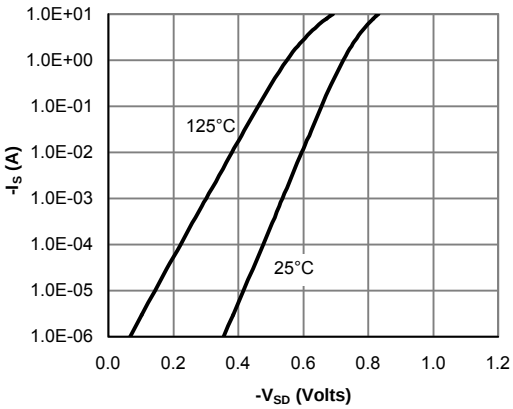

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

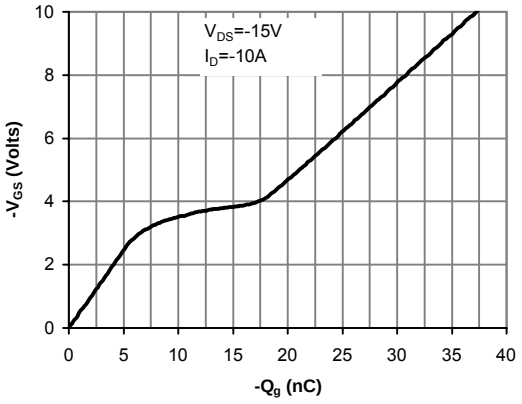

Figure 7: Gate-Charge Characteristics

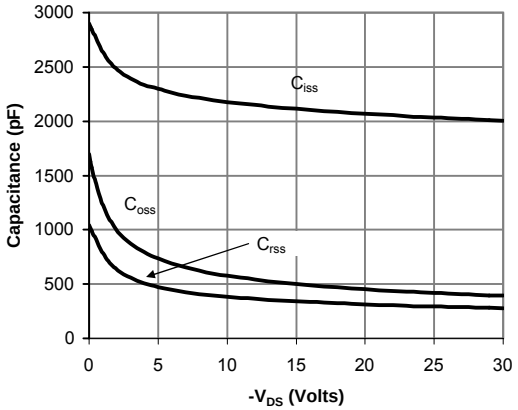

Figure 8: Capacitance Characteristics

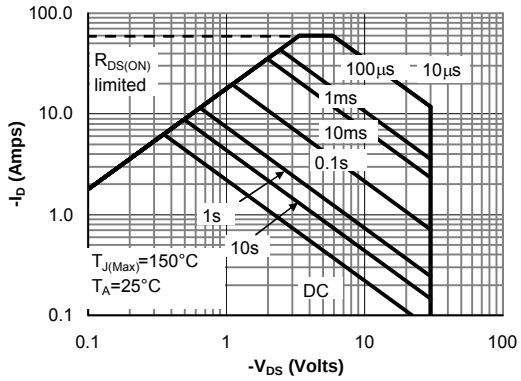

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

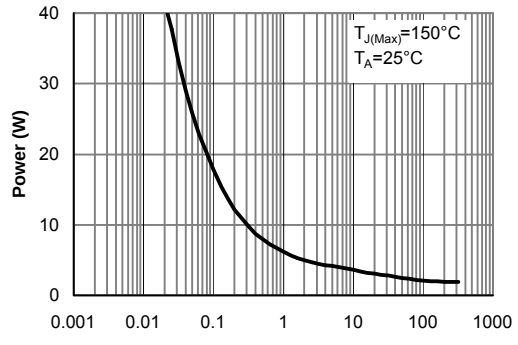

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

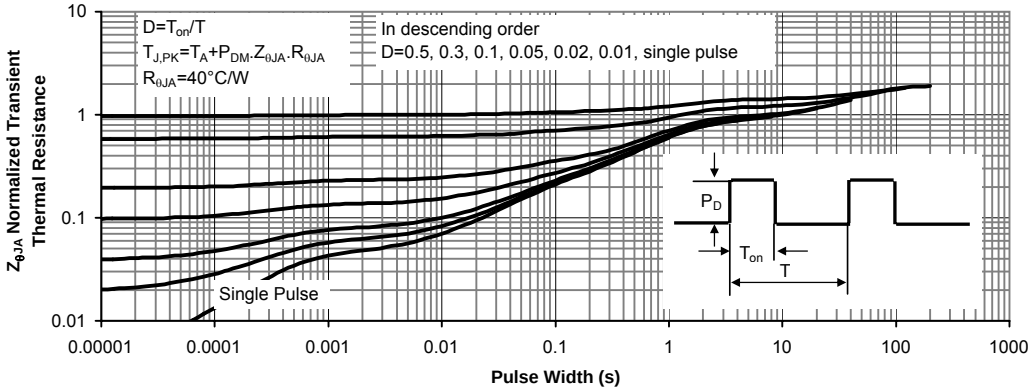

Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

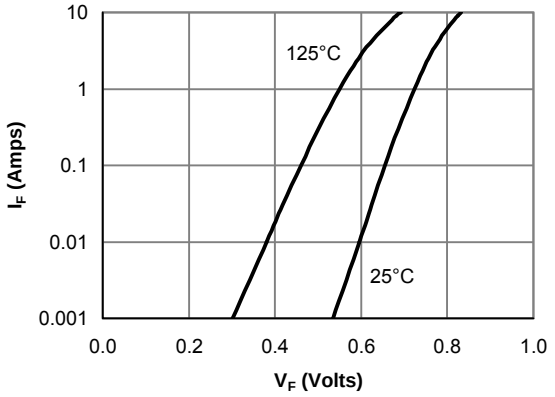

Figure 12: Schottky Forward Characteristics

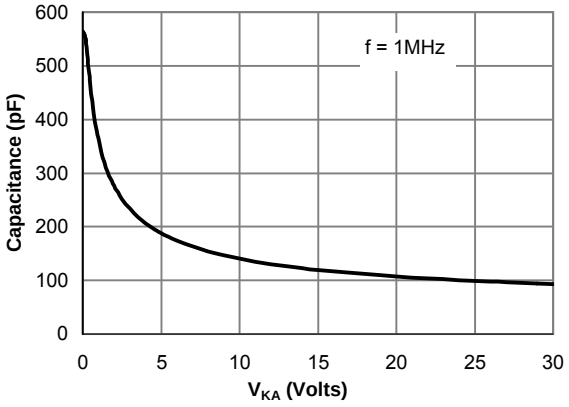

Figure 13: Schottky Capacitance Characteristics

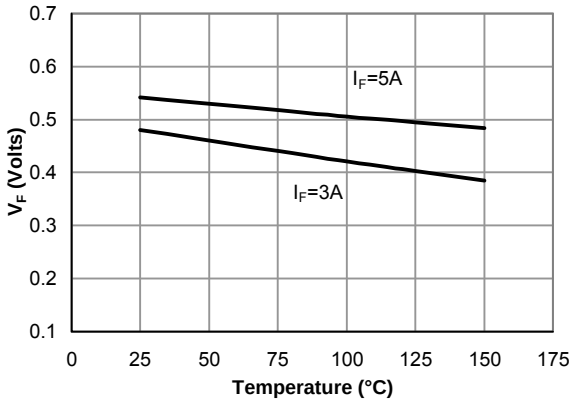

Figure 14: Schottky Forward Drop vs. Junction Temperature

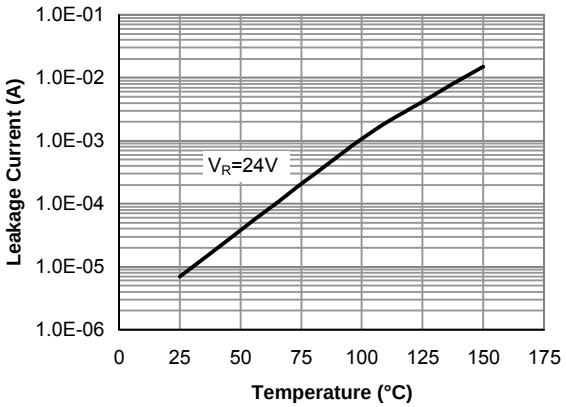

Figure 15: Schottky Leakage current vs. Junction Temperature