freescale
飞思卡尔(深圳)功率半导体有限公司

AO4904

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

General Description

The AO4904 uses advanced trench technology to provid excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A Schottky diode is co-packaged in parallelwith the synchronous MOSFET to boost efficiency further

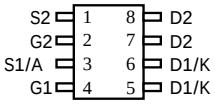
Standard Product AO4904 is Pb-free (meets ROHS &Sony 259 specifications). AO4904L is a Green Product ordering option. AO4904 and AO4904L are electrically identical.

Features

V_{DS} (V) = 30V
I_D = 6.9A (V_{GS} = 10V)
$R_{DS(ON)}$ < 27mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 32mΩ (V_{GS} = 4.5V)
$R_{DS(ON)}$ < 50mΩ (V_{GS} = 2.5V)

SCHOTTKY

V_{DS} (V) = 30V, I_F = 3A, V_F=0.5V@1A



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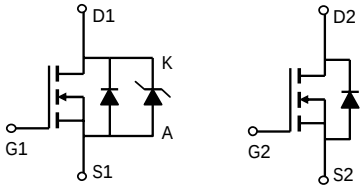

Absolute Maximum Ratings T_A=25°C unless otherwise noted					
Parameter		**Symbol**	**MOSFET**	**Schottky**	**Units**
Drain-Source Voltage		V_{DS}	30		V
Gate-Source Voltage		V_{GS}	±12		V
Continuous Drain Current[A]	T_A=25°C	I_D	6.9		A
	T_A=70°C		5.8		
Pulsed Drain Current[B]		I_{DM}	40		
Schottky reverse voltage		V_{KA}		30	V
Continuous Forward Current[A]	T_A=25°C	I_F		3	A
	T_A=70°C			2	
Pulsed Forward Current[B]		I_{FM}		40	
Power Dissipation	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.44	1.44	
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	$R_{\theta JA}$	48	62.5	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		74	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	35	40	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient[A]	t ≤ 10s	$R_{\theta JA}$	47.5	62.5	°C/W
Maximum Junction-to-Ambient[A]	Steady-State		71	110	
Maximum Junction-to-Lead[C]	Steady-State	$R_{\theta JL}$	32	40	

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}= ±12V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.7	1	1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=6.9A		22.6	27	mΩ
		T_J=125°C		33	40	
		V_{GS}=4.5V, I_D=6.0A		27	32	mΩ
		V_{GS}=2.5V, I_D=5A		42	50	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=5A	12	16		S
V_{SD}	Diode Forward Voltage	I_S=1A		0.71	1	V
I_S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		846	1050	pF
C_{oss}	Output Capacitance			96		pF
C_{rss}	Reverse Transfer Capacitance			67		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.24	3.6	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=6.9A		9.6	12	nC
Q_{gs}	Gate Source Charge			1.65		nC
Q_{gd}	Gate Drain Charge			3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=2.2Ω, R_{GEN}=3Ω		5.7	8.55	ns
t_r	Turn-On Rise Time			13	6.2	ns
$t_{D(off)}$	Turn-Off DelayTime			37	40	ns
t_f	Turn-Off Fall Time			4.2	5.5	ns
t_{rr}	Body Diode Reverse Recovery time	I_F=5A, dI/dt=100A/µs		15.5	20	ns
Q_{rr}	Body Diode Reverse Recovery charge	I_F=5A, dI/dt=100A/µs		7.9		nC
SCHOTTKY PARAMETERS						
V_F	Forward Voltage Drop	I_F=1.0A		0.45	0.5	V
I_{rm}	Maximum reverse leakage current	V_R=30V		0.007	0.05	mA
		V_R=30V, T_J=125°C		3.2	10	
		V_R=30V, T_J=150°C		12	20	
C_T	Junction Capacitance	V_R=15V		37		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

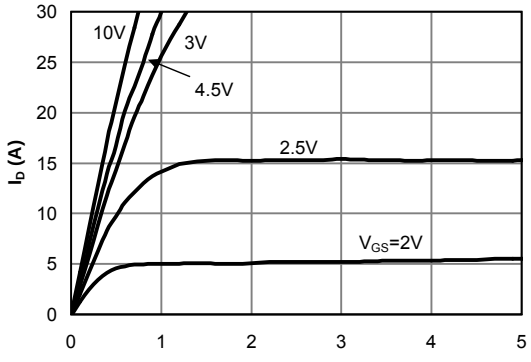

Fig 1: On-Region Characteristics

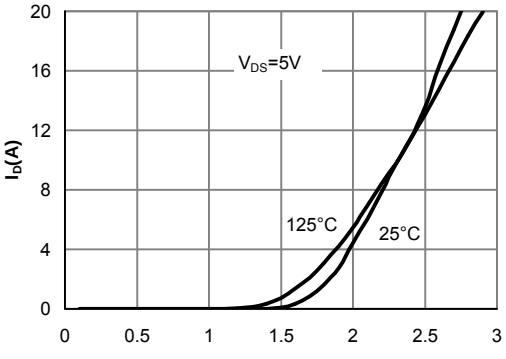

Figure 2: Transfer Characteristics

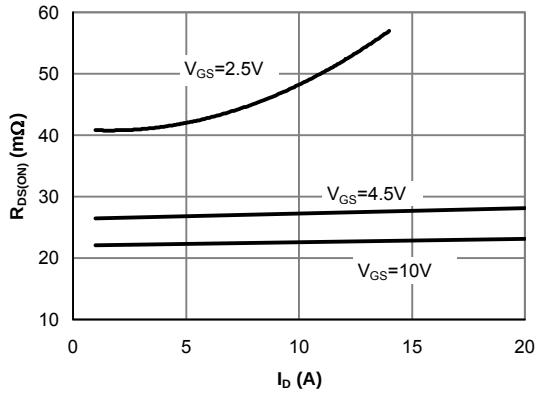

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

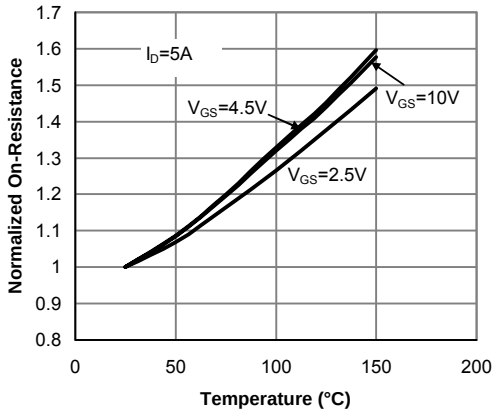

Figure 4: On resistance vs. Junction Temperature

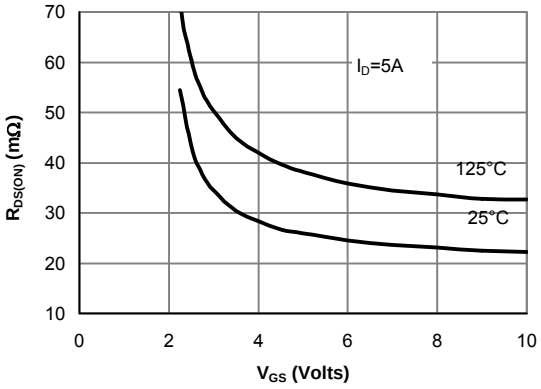

Figure 5: On resistance vs. Gate-Source Voltage

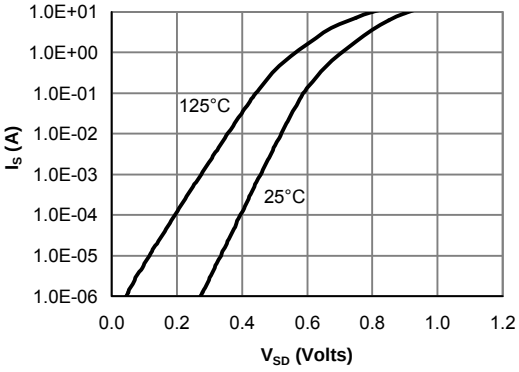

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

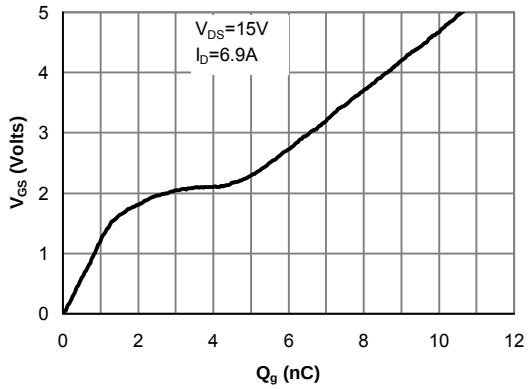

Figure 7: Gate-Charge Characteristics

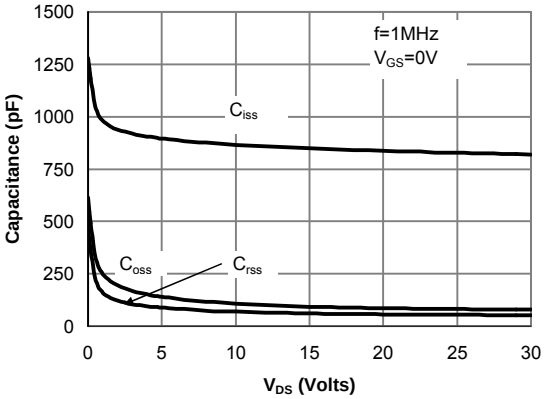

Figure 8: Capacitance Characteristics

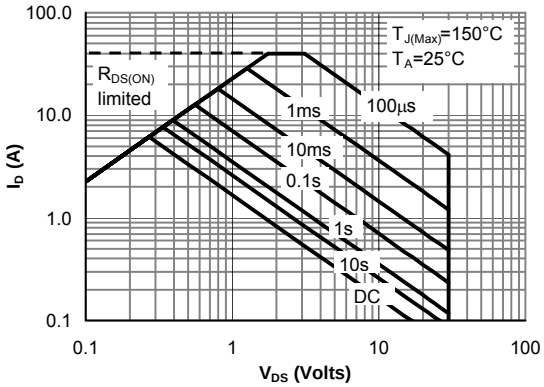

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

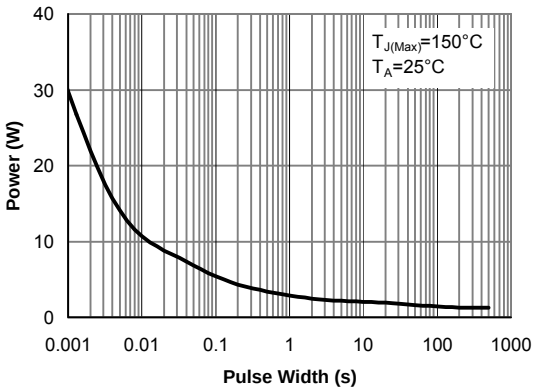

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

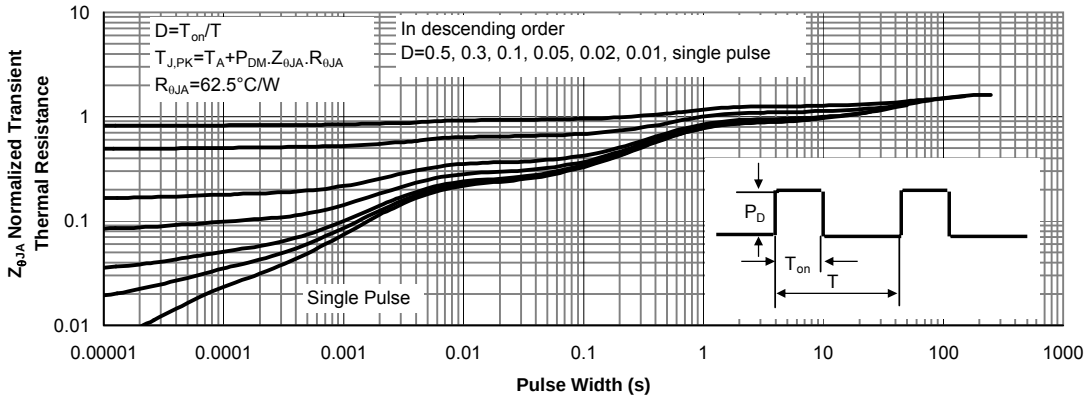

Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

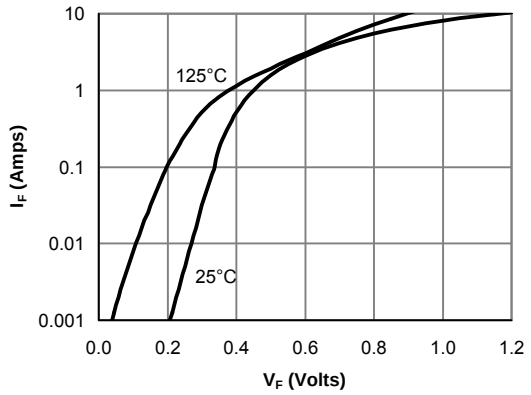

Figure 12: Schottky Forward Characteristics

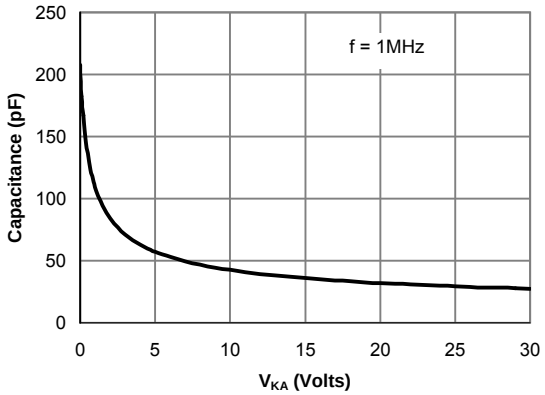

Figure 13: Schottky Capacitance Characteristics

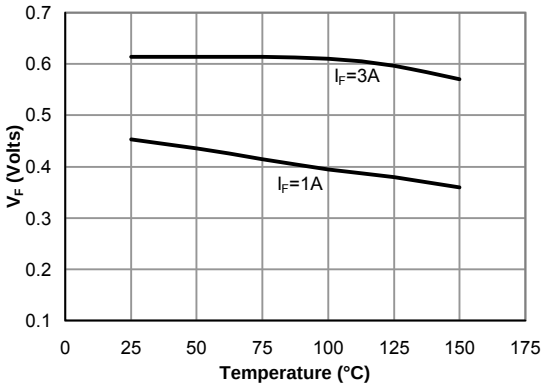

Figure 14: Schottky Forward Drop vs. Junction Temperature

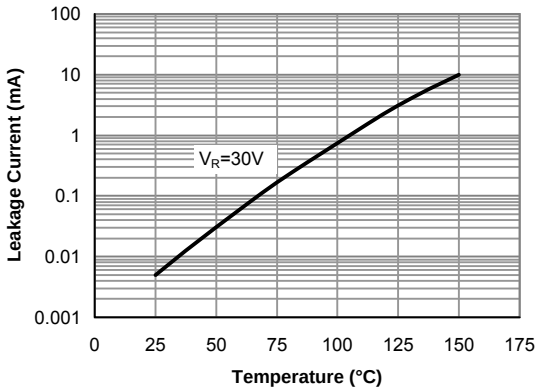

Figure 15: Schottky Leakage current vs. Junction Temperature

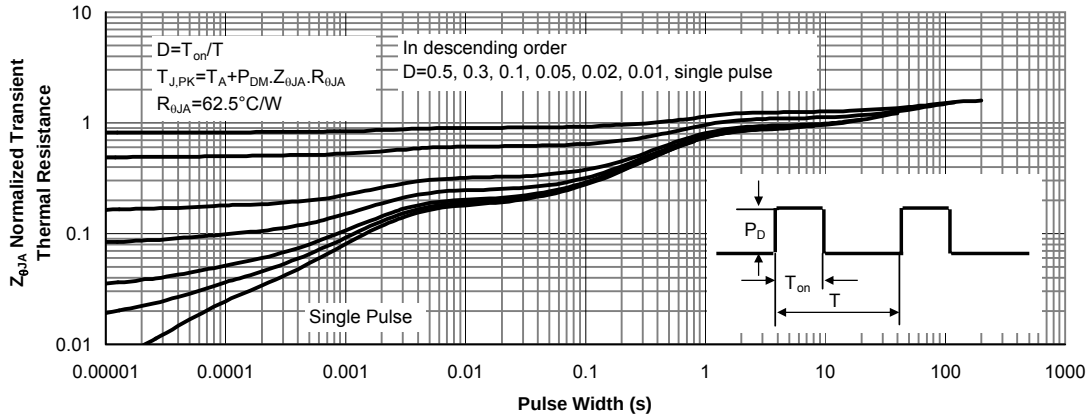

Figure 15: Schottky Normalized Maximum Transient Thermal Impedance