ALPHA & OMEGA
SEMICONDUCTOR

AO4914A

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

General Description

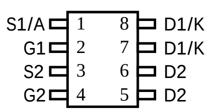
The AO4914A uses advanced trench technology to provide excellent R DS(ON) and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A Schottky diode is co-packaged in parallel with the synchronous MOSFET to boost efficiency further *Standard product AO4914A is Pb-free (meets ROHS & Sony 259 specifications). AO4914AL is a Green Product ordering option. AO4914A and AO4914AL are electrically identical.*

Features

Q1	**Q2**	
V_{DS} (V) = 30V	V_{DS}(V) = 30V	
I_D = 8.5A (V_{GS} = 10V)	I_D = 8.5A (V_{GS} = 10V)	
$R_{DS(ON)}$ < 18mΩ	<18mΩ	(V_{GS} = 10V)
$R_{DS(ON)}$ < 28mΩ	<28mΩ	(V_{GS} = 4.5V)

SCHOTTKY

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



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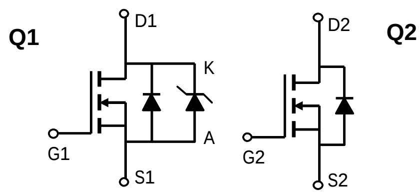

Absolute Maximum Ratings T_A=25°C unless otherwise noted					
Parameter		**Symbol**	**Max Q1**	**Max Q2**	**Units**
Drain-Source Voltage		V_{DS}	30	30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current [A]	T_A=25°C		8.5	8.5	
	T_A=70°C	I_D	6.6	6.6	A
Pulsed Drain Current [B]		I_{DM}	30	30	
	T_A=25°C	P_D	2	2	W
Power Dissipation	T_A=70°C		1.28	1.28	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Parameter		**Symbol**	**Maximum Schottky**	**Units**
Reverse Voltage		V_{DS}	30	V
Continuous Forward Current [A]	T_A=25°C		3	
	T_A=70°C	I_F	2.2	A
Pulsed Diode Forward Current [B]		I_{FM}	20	
	T_A=25°C	P_D	2	W
Power Dissipation [A]	T_A=70°C		1.28	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

Parameter: Thermal Characteristics MOSFET Q1		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	

Parameter: Thermal Characteristics MOSFET Q2		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	

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 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.

F. The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.

Rev 0: Aug 2005

Q1 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. (Set by Schottky leakage)	V_R=30V		0.005	0.05	mA
		V_R=30V, T_J=125°C		3.2	10	
		V_R=30V, T_J=150°C		12	20	
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	1.7	3	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8.5A		14.8	18	mΩ
		T_J=125°C		20.5	25	
		V_{GS}=4.5V, I_D=6A		20.6	28	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8.5A		23		S
V_{SD}	Diode+Schottky Forward Voltage	I_S=1A		0.46	0.6	V
I_S	Maximum Body-Diode+Schottky Continuous Current				3.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		955	1250	pF
C_{oss}	Output Capacitance (FET + Schottky)			175		pF
C_{rss}	Reverse Transfer Capacitance			112		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.5	0.85	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=8.5A		17	23	nC
Q_g(4.5V)	Total Gate Charge			9	11.2	nC
Q_{gs}	Gate Source Charge			3.4		nC
Q_{gd}	Gate Drain Charge			4.7		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.8Ω, R_{GEN}=3Ω		5	6.5	ns
t_r	Turn-On Rise Time			6	7.5	ns
$t_{D(off)}$	Turn-Off DelayTime			19	25	ns
t_f	Turn-Off Fall Time			4.5	6	ns
t_{rr}	Body Diode + Schottky Reverse Recovery Time	I_F=8.5A, dI/dt=100A/µs		20	24	ns
Q_{rr}	Body Diode + Schottky Reverse Recovery Charge	I_F=8.5A, dI/dt=100A/µs		9.5	12	nC

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.
F. The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately.
Rev 0 : Aug 2005

Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

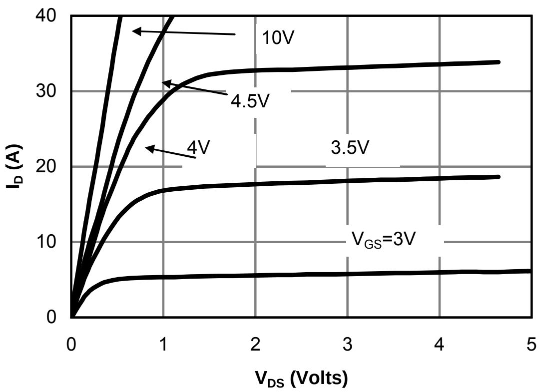

Fig 1: On-Region Characteristics

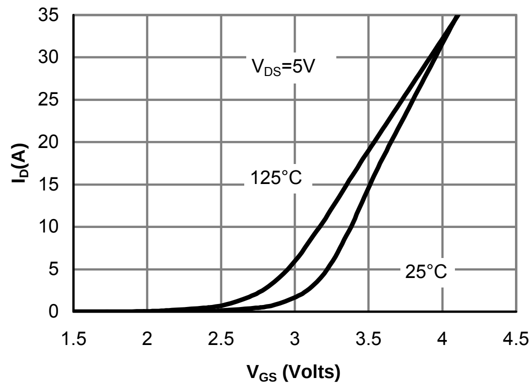

Figure 2: Transfer Characteristics

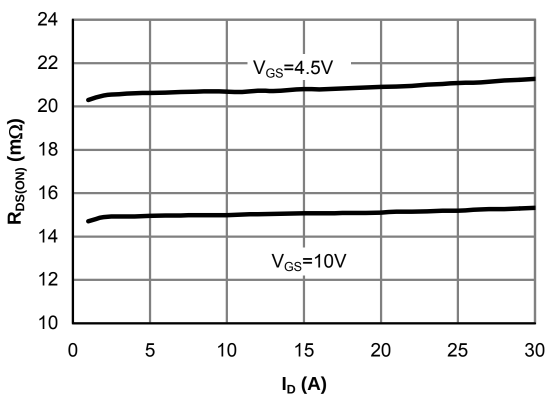

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

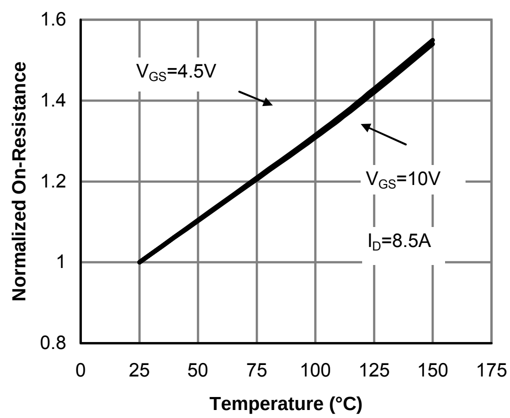

Figure 4: On resistance vs. Junction Temperature

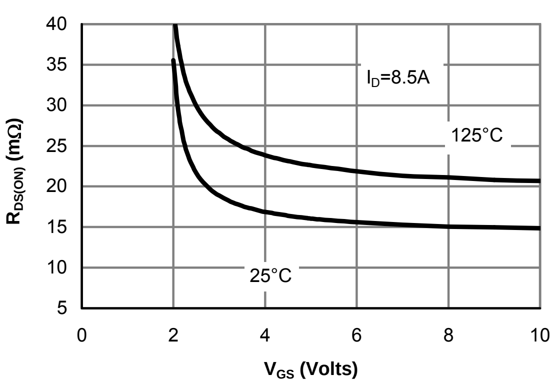

Figure 5: On resistance vs. Gate-Source Voltage

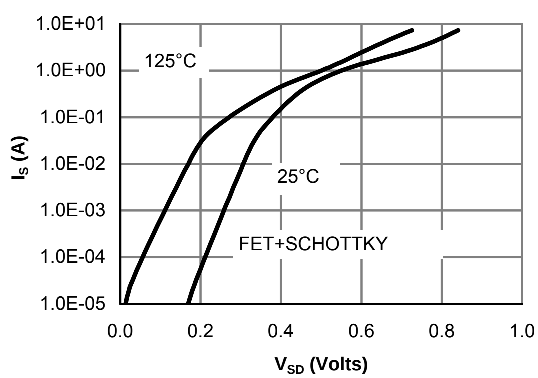

Figure 6: Body-Diode Characteristics (Note F)

Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

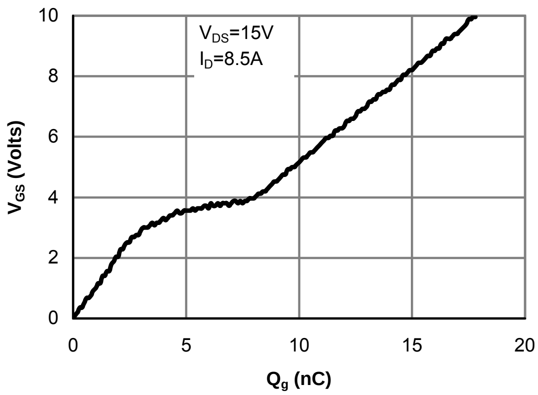

Figure 7: Gate-Charge Characteristics

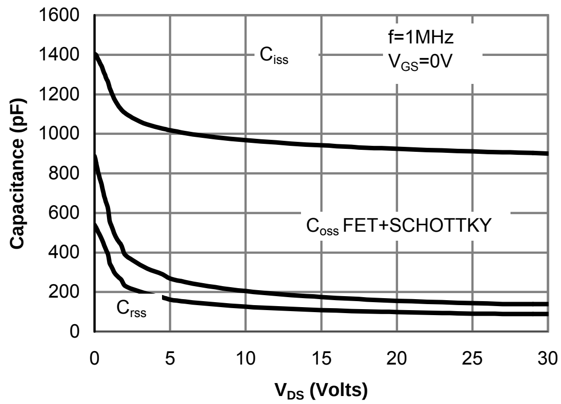

Figure 8: Capacitance Characteristics

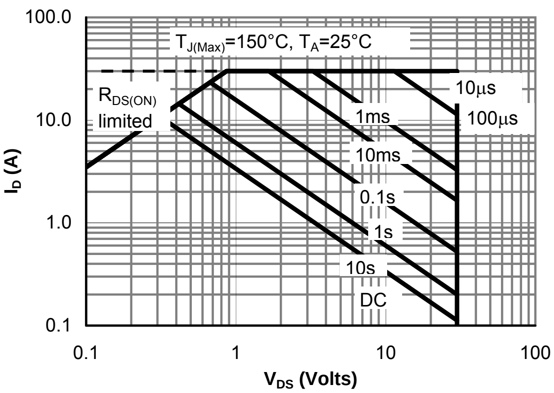

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

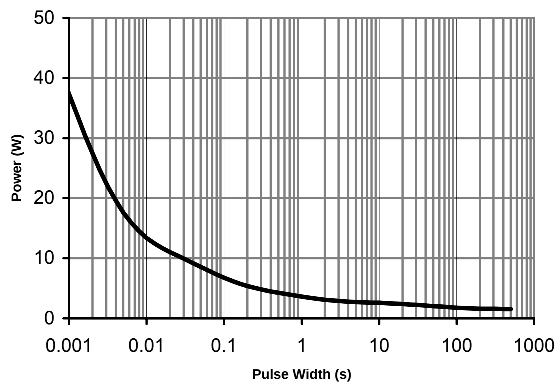

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

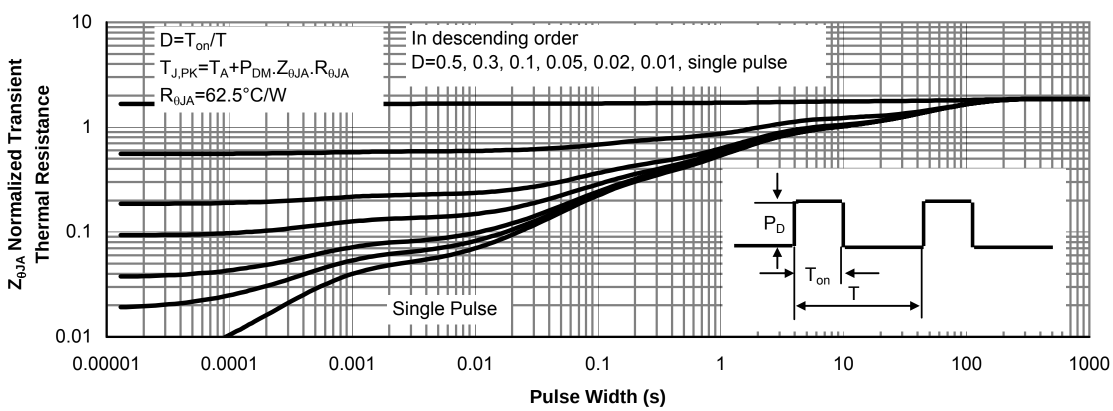

Figure 11: Normalized Maximum Transient Thermal Impedance

Q2 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}= ±20V				100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1	1.7	3	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8.5A			14.8	18	mΩ
			T_J=125°C		22	27	
		V_{GS}=4.5V, I_D=6A			20.6	28	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8.5A			23		S
V_{SD}	Diode+Schottky Forward Voltage	I_S=1A			0.75	1	V
I_S	Maximum Body-Diode+Schottky Continuous Current					3	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz			955	1250	pF
C_{oss}	Output Capacitance				145		pF
C_{rss}	Reverse Transfer Capacitance				112		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz			0.5	0.85	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=8.5A			17	24	nC
Q_g	Total Gate Charge				9	12	nC
Q_{gs}	Gate Source Charge				3.4		nC
Q_{gd}	Gate Drain Charge				4.7		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.8Ω, R_{GEN}=3Ω			5	6.5	ns
t_r	Turn-On Rise Time				6	7.5	ns
$t_{D(off)}$	Turn-Off DelayTime				19	25	ns
t_f	Turn-Off Fall Time				4.5	6	ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=8.5A, dI/dt=100A/µs			16.7	21	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=8.5A, dI/dt=100A/µs			6.7	10	nC

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 80µs 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.
Rev 0 : Aug 2005

Q2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

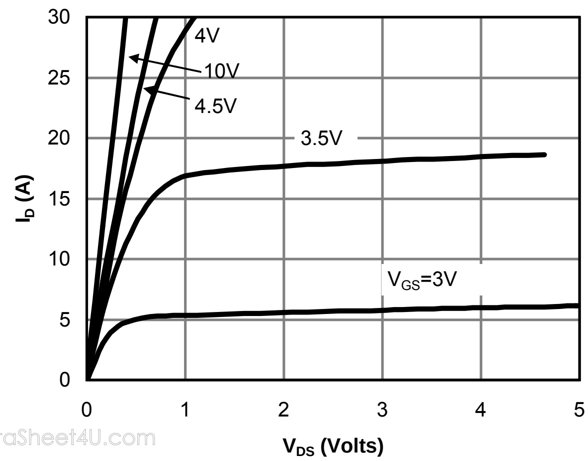

Fig 1: On-Region Characteristics

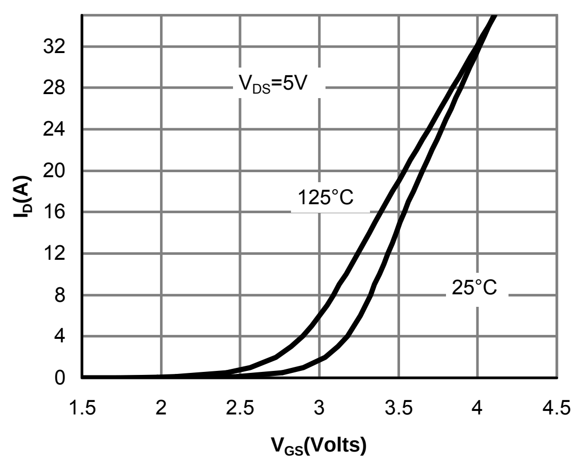

Figure 2: Transfer Characteristics

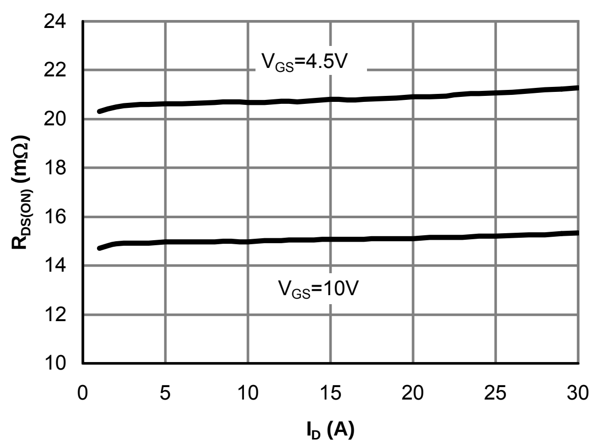

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

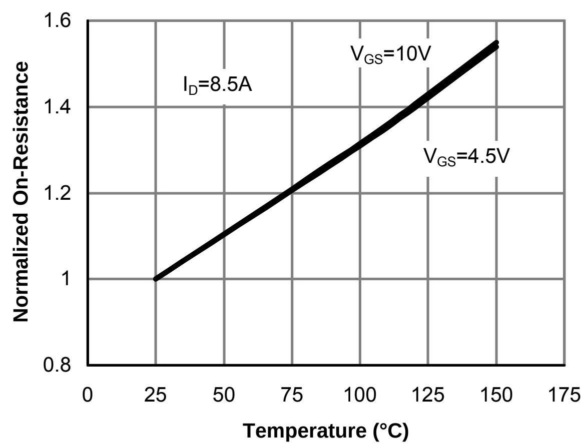

Figure 4: On-Resistance vs. Junction Temperature

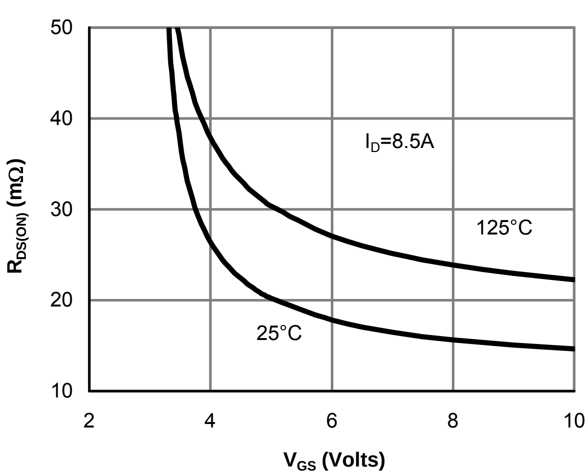

Figure 5: On-Resistance vs. Gate-Source Voltage

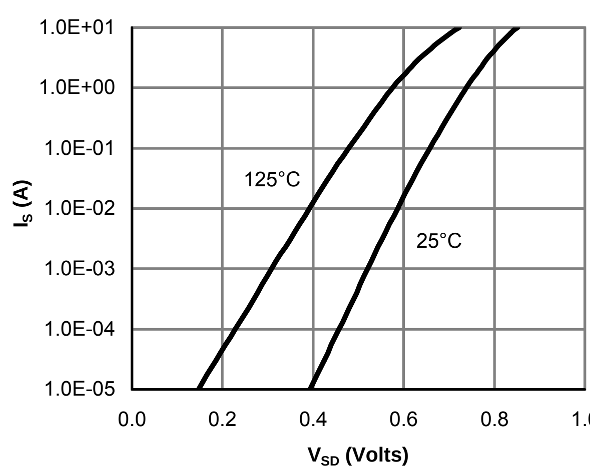

Figure 6: Body-Diode Characteristics

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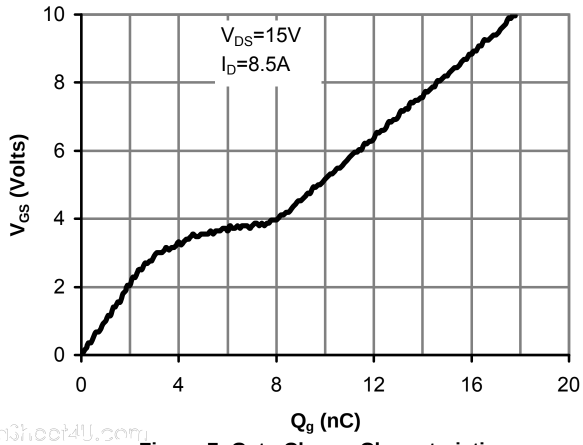

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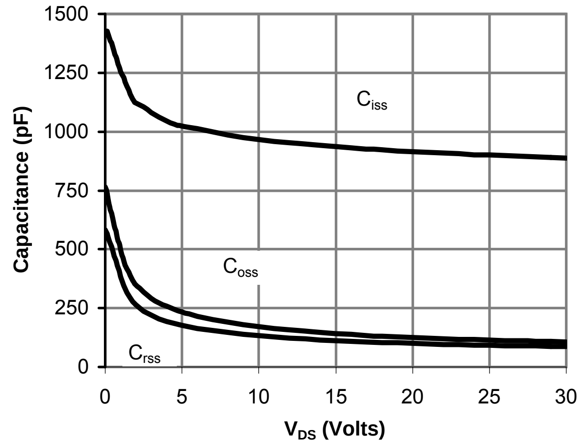

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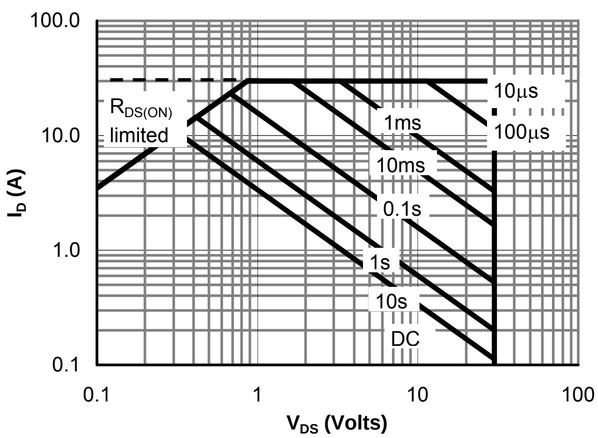

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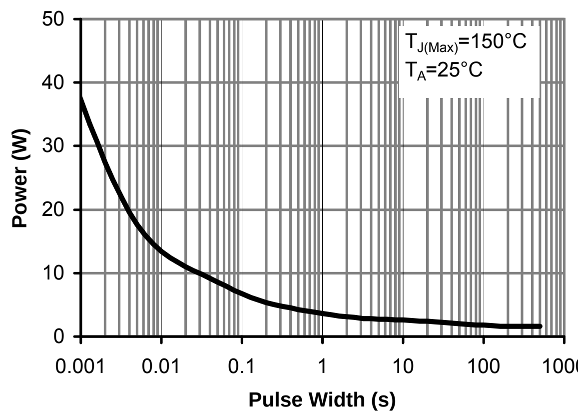

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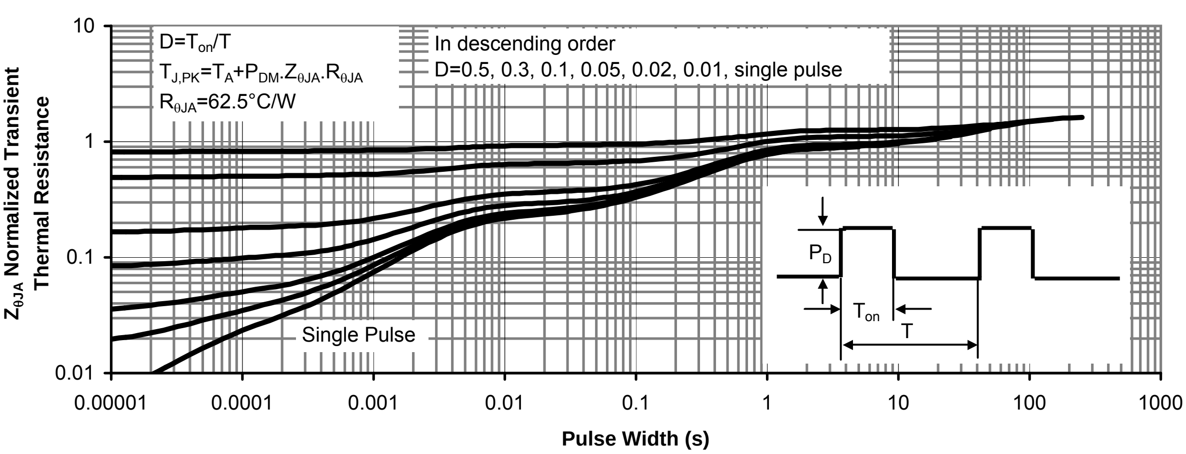

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