



AO4914

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

General Description

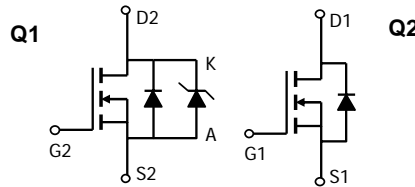
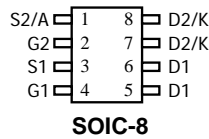
The AO4914 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A Schottky diode is co-packaged in parallel with the synchronous MOSFET to boost efficiency further. *AO4914 is Pb-free (meets ROHS & Sony 259 specifications). AO4914L is a Green Product ordering option. AO4914 and AO4914L are electrically identical.*

Features

Q1	Q2
$V_{DS} (V) = 30V$	$V_{DS}(V) = 30V$
$I_D = 8.5A$	$I_D = 8.5A$
$R_{DS(ON)} < 18m\Omega$	$<18m\Omega \quad (V_{GS} = 10V)$
$R_{DS(ON)} < 28m\Omega$	$<28m\Omega \quad (V_{GS} = 4.5V)$

SCHOTTKY

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



Absolute Maximum Ratings $T_A=25^\circ C$ 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	$T_A=25^\circ C$	8.5	8.5	A
	$T_A=70^\circ C$	6.6	6.6	
Pulsed Drain Current ^B	I_{DM}	30	30	
Power Dissipation	$T_A=25^\circ C$	2	2	W
	$T_A=70^\circ C$	1.28	1.28	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

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

AO4912, AO4912L

Parameter: Thermal Characteristics MOSFET Q1		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	48	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	35	40	

Parameter: Thermal Characteristics MOSFET Q2		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	48	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	35	40	

Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	47.5	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		71	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	32	40	

A: The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any a 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_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} 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 in² 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.

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Q1 Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current. (Set by Schottky leakage)	$V_R=30\text{V}$		0.007	0.05	mA
		$V_R=30\text{V}$, $T_J=125^\circ\text{C}$		3.2	10	
		$V_R=30\text{V}$, $T_J=150^\circ\text{C}$		12	20	
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1	1.8	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=10\text{V}$, $V_{DS}=5\text{V}$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=8.5\text{A}$		15.5	18	m Ω
		$T_J=125^\circ\text{C}$		22.3	27	
		$V_{GS}=4.5\text{V}$, $I_D=6\text{A}$		23	28	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=8.5\text{A}$		23		S
V_{SD}	Diode + Schottky Forward Voltage	$I_S=1\text{A}$, $V_{GS}=0\text{V}$		0.45	0.5	V
I_S	Maximum Body-Diode + Schottky Continuous Current				3.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		971	1165	pF
C_{oss}	Output Capacitance (FET + Schottky)			190		
C_{rss}	Reverse Transfer Capacitance			110		
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		0.7	0.85	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=8.5\text{A}$		19.2	23	nC
$Q_g(4.5\text{V})$	Total Gate Charge			9.36	11.2	
Q_{gs}	Gate Source Charge			2.6		
Q_{gd}	Gate Drain Charge			4.2		
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.8\Omega$, $R_{GEN}=3\Omega$		5.2	7.5	ns
t_r	Turn-On Rise Time			4.4	6.5	
$t_{D(off)}$	Turn-Off DelayTime			17.3	26	
t_f	Turn-Off Fall Time			3.3	5	
t_{rr}	Body Diode + Schottky Reverse Recovery Time	$I_F=8.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		18.8	23	ns
Q_{rr}	Body Diode + Schottky Reverse Recovery Charge	$I_F=8.5\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		9.2	11	nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any a given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The $R_{\theta JA}$ is the sum of the thermal impedance 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 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. 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.

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Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

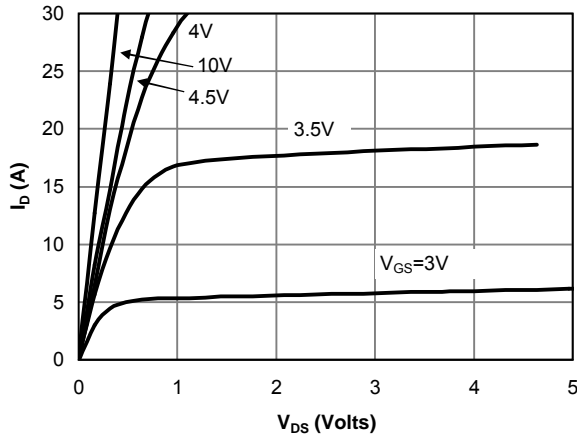


Fig 1: On-Region Characteristics

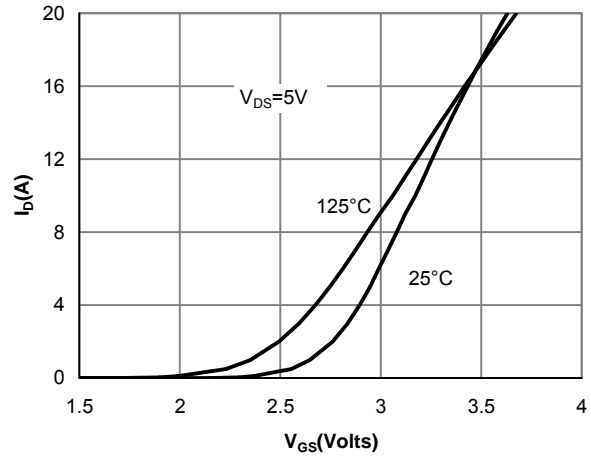


Figure 2: Transfer Characteristics

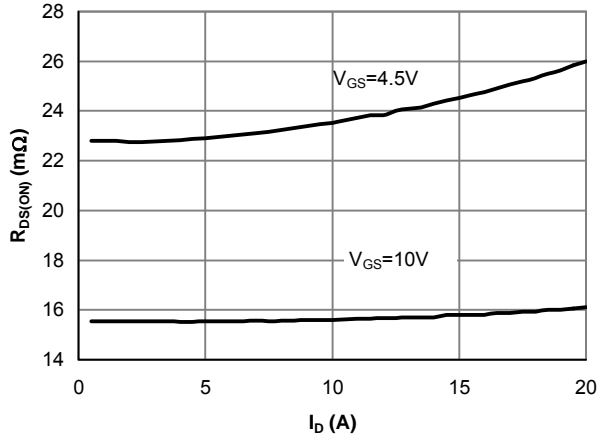


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

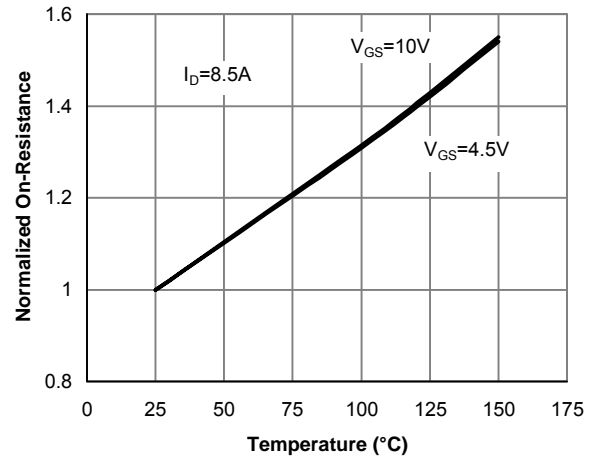


Figure 4: On-Resistance vs. Junction Temperature

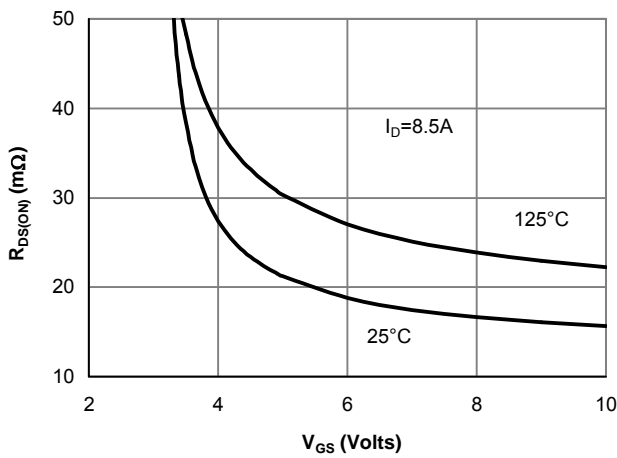


Figure 5: On-Resistance vs. Gate-Source Voltage

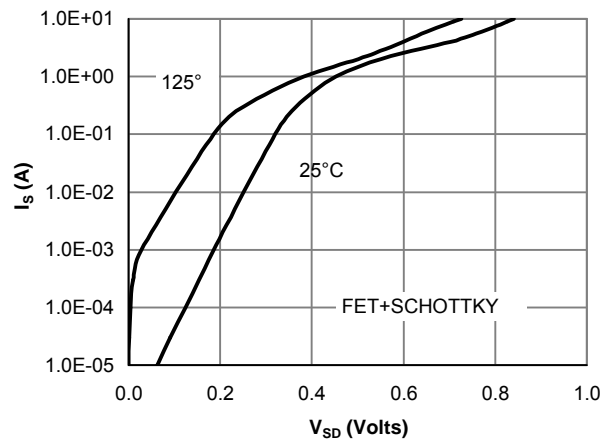


Figure 6: Body-Diode Characteristics (Note F)

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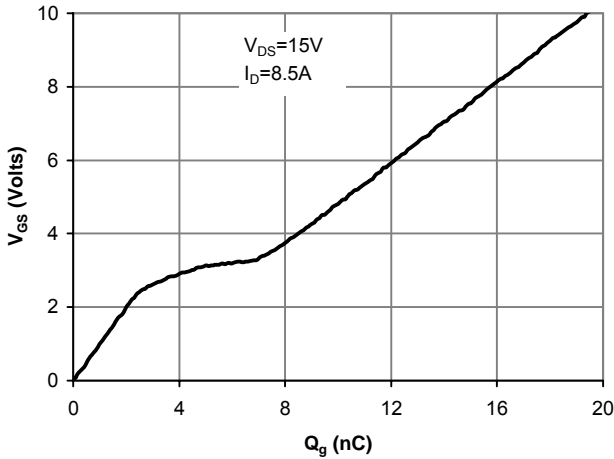


Figure 7: Gate-Charge Characteristics

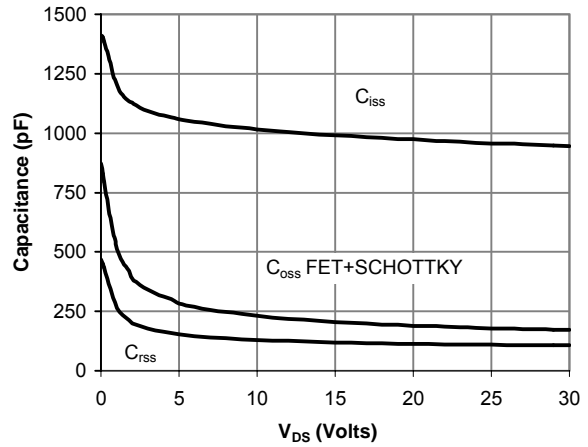


Figure 8: Capacitance Characteristics

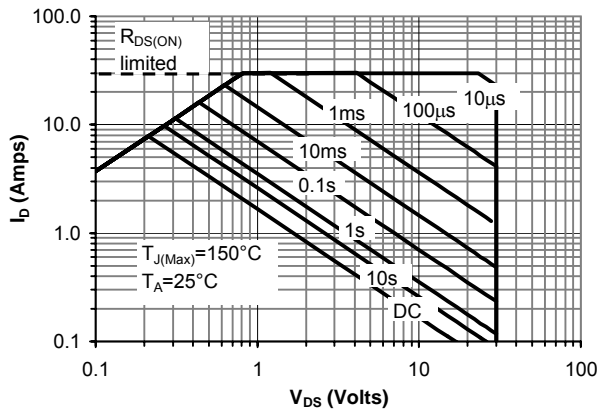


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

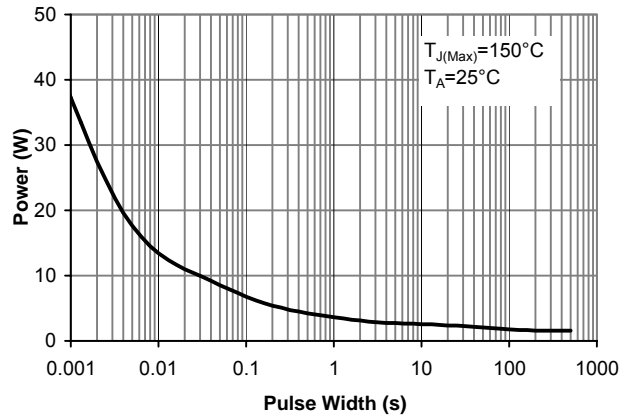


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

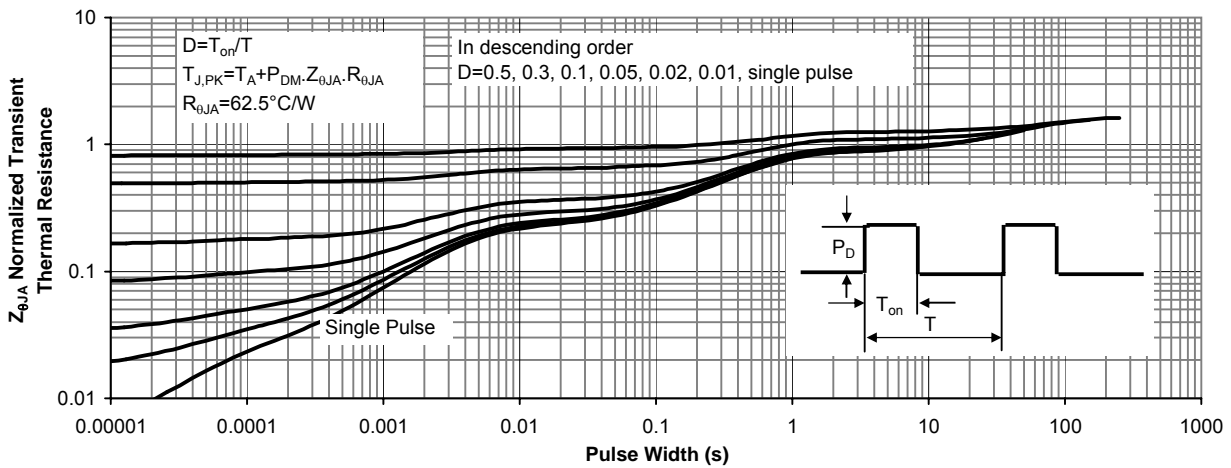


Figure 11: Normalized Maximum Transient Thermal Impedance

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 T _J =55°C		0.003	1 5	μA
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	1.8	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		15.5	18	mΩ
		T _J =125°C		22.3	27	
		V _{GS} =4.5V, I _D =6A		23	28	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =8.5A		23		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.75	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		1040	1250	pF
C _{OSS}	Output Capacitance			180		pF
C _{RSS}	Reverse Transfer Capacitance			110		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.7	0.85	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =8.5A		19.2	23	nC
Q _g (4.5V)	Total Gate Charge			9.36	11.2	nC
Q _{gs}	Gate Source Charge			2.6		nC
Q _{gd}	Gate Drain Charge			4.2		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.8Ω, R _{GEN} =3Ω		5.2	7.5	ns
t _r	Turn-On Rise Time			4.4	6.5	ns
t _{D(off)}	Turn-Off DelayTime			17.3	26	ns
t _f	Turn-Off Fall Time			3.3	5	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_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any a given application depends on the user's specific board design. The current rating is based on the t_s 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

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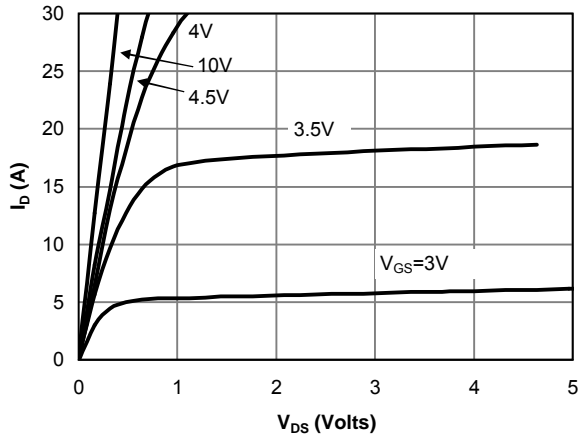


Fig 1: On-Region Characteristics

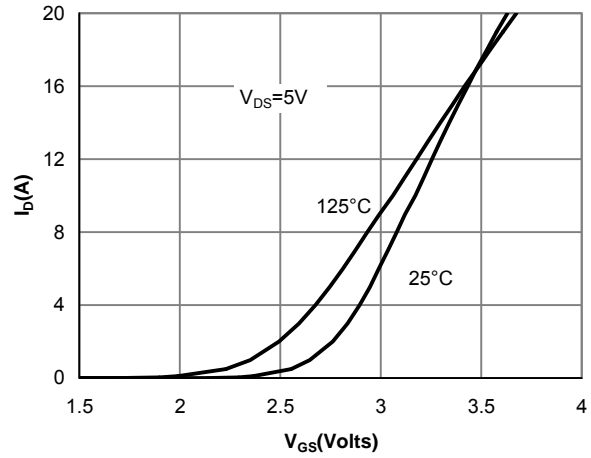


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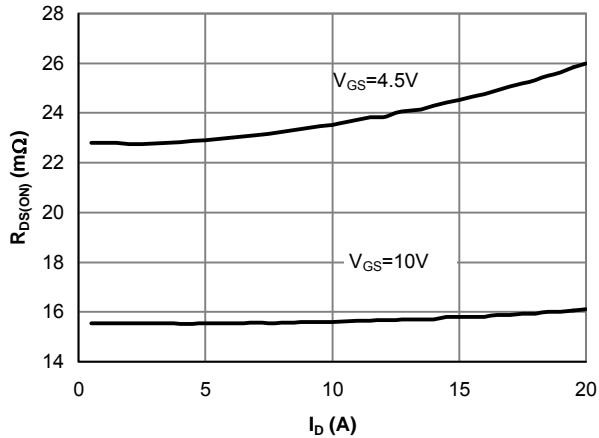


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

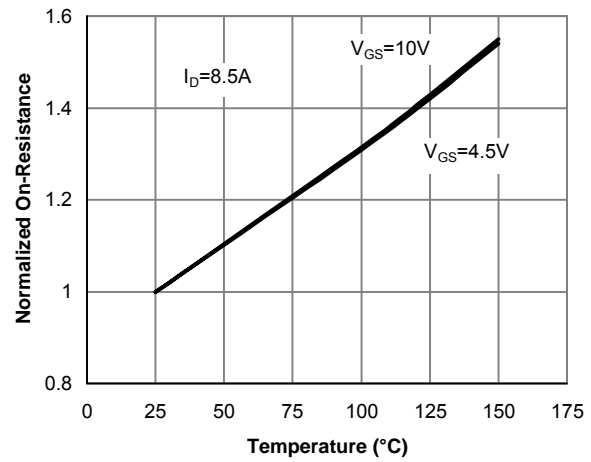


Figure 4: On-Resistance vs. Junction Temperature

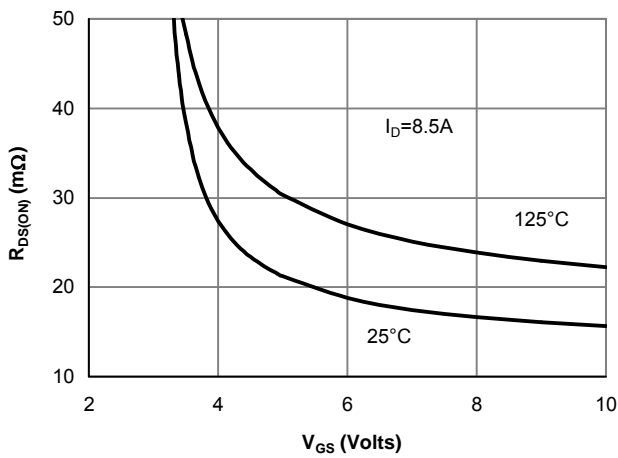


Figure 5: On-Resistance vs. Gate-Source Voltage

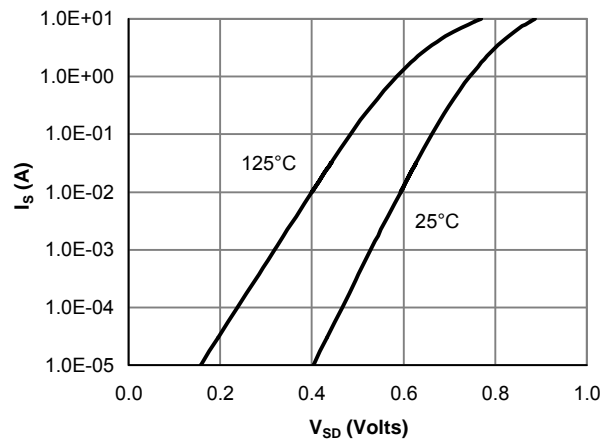


Figure 6: Body-Diode Characteristics

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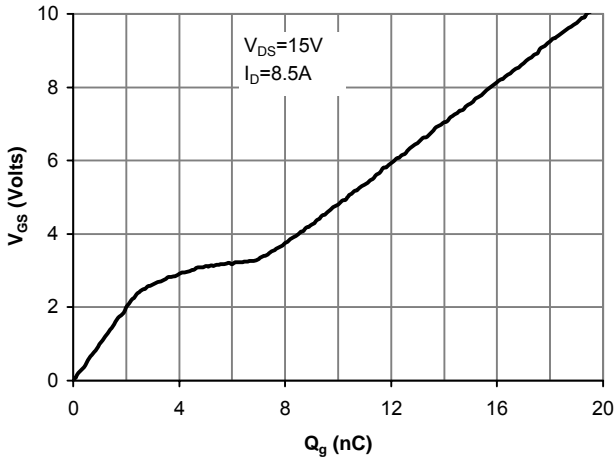


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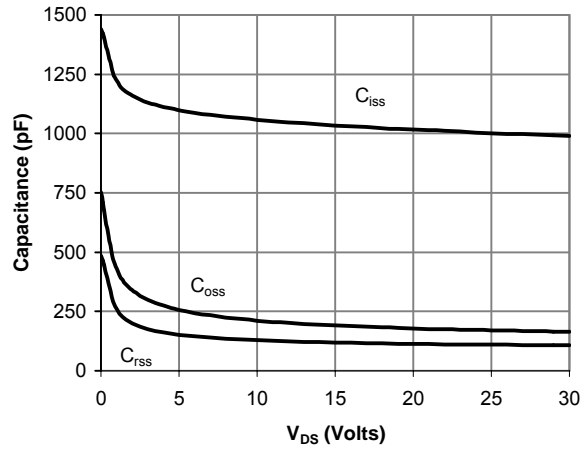


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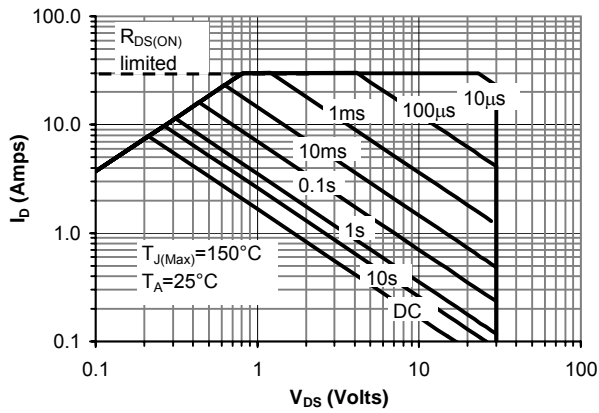


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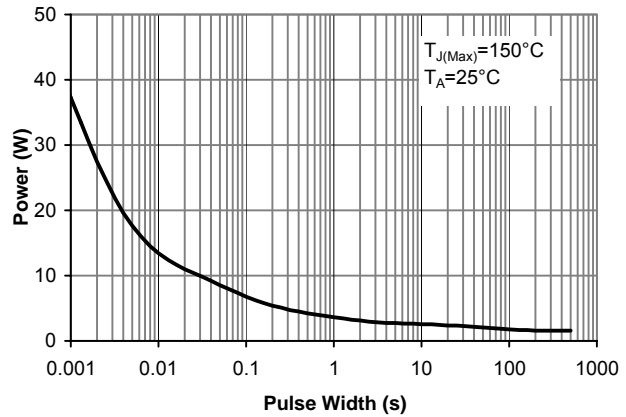


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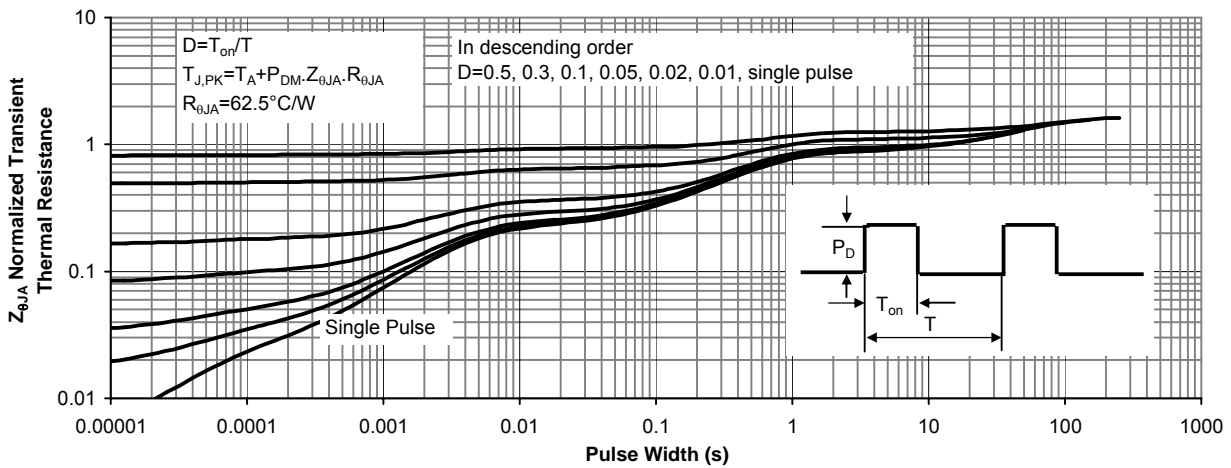


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