



ALPHA & OMEGA
SEMICONDUCTOR

AO4918A

Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor



General Description

The AO4918A 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. AO4918A is Pb-free (meets ROHS & Sony 259 specifications). AO4918AL is a Green Product ordering option. AO4918A and AO4918AL are electrically identical.

Features

Q1

V_{DS} (V) = 30V

I_D = 9.3A

$R_{DS(ON)} < 14.5m\Omega$

$R_{DS(ON)} < 16m\Omega$

Q2

$V_{DS}(V)$ = 30V

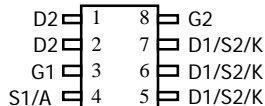
$I_D=8.5A$

$<18m\Omega$ ($V_{GS} = 10V$)

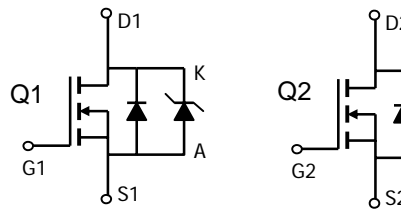
$<27m\Omega$ ($V_{GS} = 4.5V$)

SCHOTTKY

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



SOIC-8



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Max Q1	Max Q2	Units
Drain-Source Voltage	V_{DS}	30	30	V
Gate-Source Voltage	V_{GS}	± 12	± 20	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	9.3	8.5	A
	$T_A=70^\circ\text{C}$	7.4	6.7	
Pulsed Drain Current ^B	I_{DM}	40	30	
Power Dissipation	$T_A=25^\circ\text{C}$	2	2	W
	$T_A=70^\circ\text{C}$	1.28	1.28	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

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

Parameter: Thermal Characteristics MOSFET Q1		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	53	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		81.9	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	30.5	40	
Parameter: Thermal Characteristics MOSFET Q2		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	53	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		81.9	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	30.5	40	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	50.4	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		86	110	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	26.6	40	

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in ² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}C$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10s$ 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 in ² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}C$. 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°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		0.007	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} = ±12V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.6	1.1	2	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	40			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =9.3A		11.7	14.5	mΩ
		T _J =125°C		15.4	19	
		V _{GS} =4.5V, I _D =8.8A		13.1	16	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =9.3A	30	37		S
V _{SD}	Diode+Schottky Forward Voltage	I _S =1A		0.46	0.5	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		3740	4488	pF
C _{oss}	Output Capacitance (FET + Schottky)			295		pF
C _{rss}	Reverse Transfer Capacitance			186		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.86	1.1	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =9.3A		30.5	37	nC
Q _{gs}	Gate Source Charge			4.5		nC
Q _{gd}	Gate Drain Charge			8.5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.6Ω, R _{GEN} =3Ω		6	9	ns
t _r	Turn-On Rise Time			8.2	12	ns
t _{D(off)}	Turn-Off DelayTime			54.5	75	ns
t _f	Turn-Off Fall Time			10.5	15	ns
t _{rr}	Body Diode + Schottky Reverse Recovery Time	I _F =9.3A, dI/dt=100A/μs		23.5	28	ns
Q _{rr}	Body Diode + Schottky Reverse Recovery Charge	I _F =9.3A, dI/dt=100A/μs		13.3	16	nC

A: The value of R_{θJA} is measured with the device mounted on 1 in² 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_{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 6,12,14 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 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

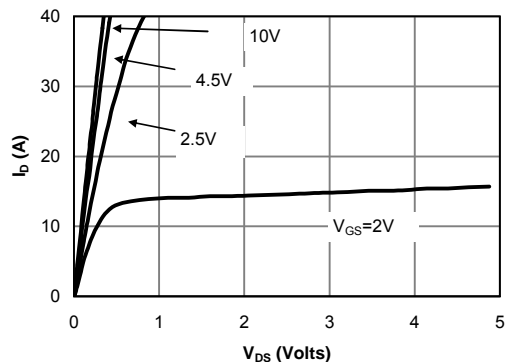


Fig 1: On-Region Characteristics

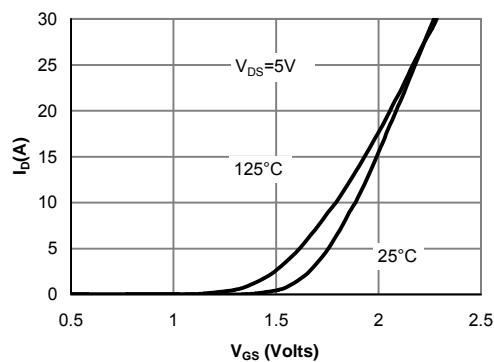


Figure 2: Transfer Characteristics

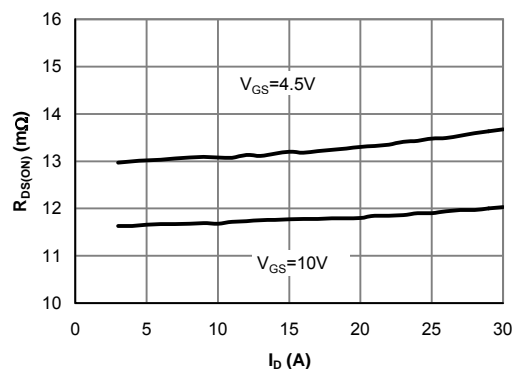


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

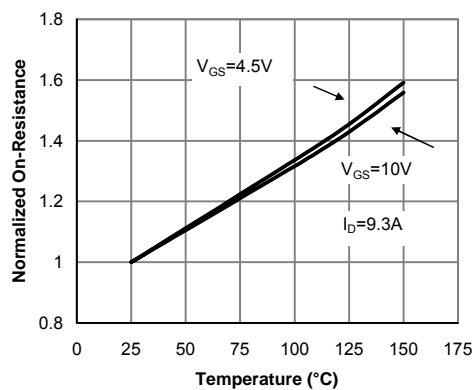


Figure 4: On resistance vs. Junction Temperature

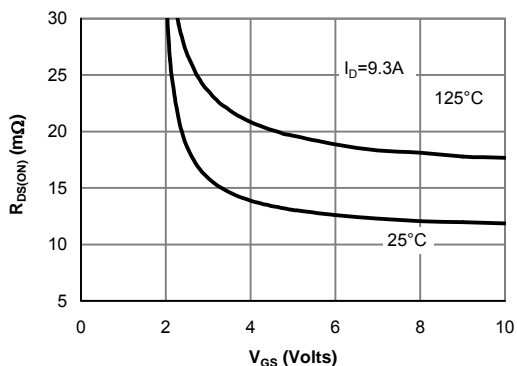


Figure 5: On resistance vs. Gate-Source Voltage

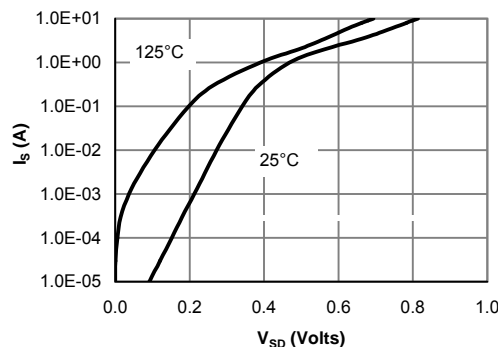


Figure 6: Body-Diode Characteristics (Note F)

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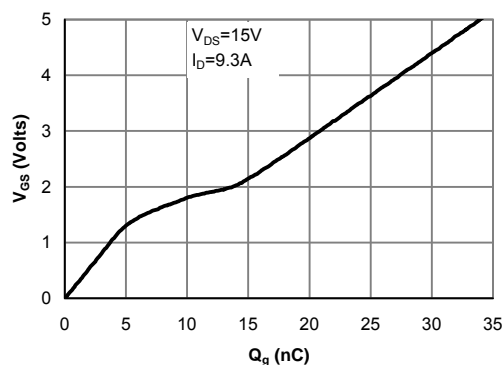


Figure 7: Gate-Charge Characteristics

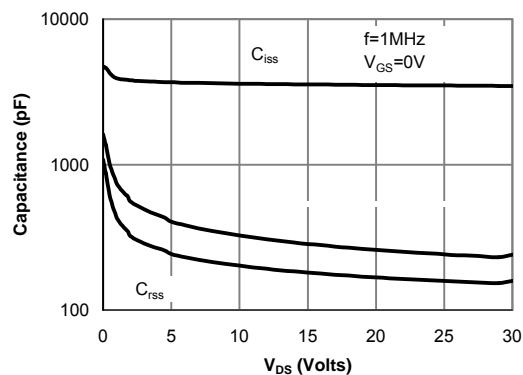


Figure 8: Capacitance Characteristics

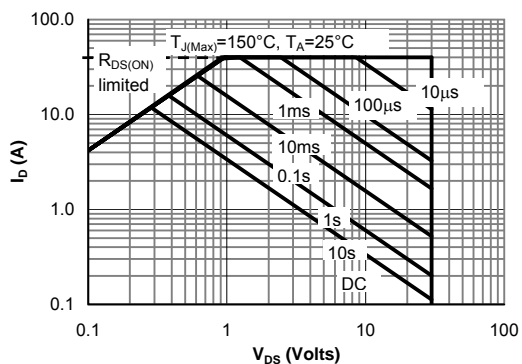


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

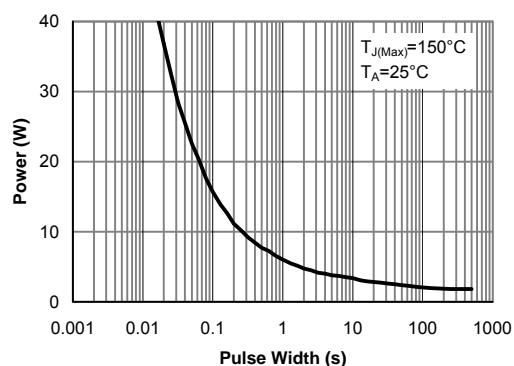


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

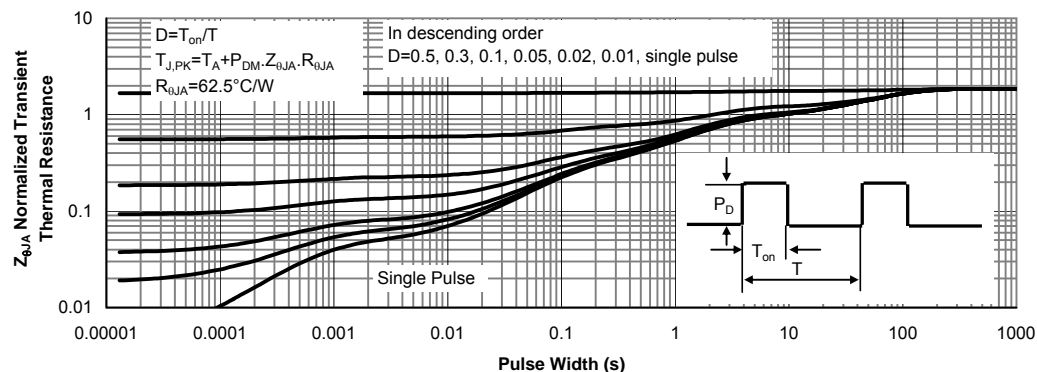


Figure 11: Normalized Maximum Transient Thermal Impedance

Q2 Electrical Characteristics ($T_J=25^{\circ}\text{C}$ 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	$V_{DS}=24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^{\circ}\text{C}$			1 5	μA
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	1.7	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=8.5\text{A}$ $T_J=125^{\circ}\text{C}$		14.6 22	18 27	$\text{m}\Omega$
		$V_{GS}=4.5\text{V}$, $I_D=6\text{A}$		20.6	27	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=8.5\text{A}$		23		S
V_{SD}	Diode Voltage	$I_S=1\text{A}$		0.75	1	V
I_S	Maximum Body Continuous Current				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		955	1250	pF
C_{oss}	Output Capacitance			145		pF
C_{rss}	Reverse Transfer Capacitance			112		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		0.5	0.85	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=8.5\text{A}$		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	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=1.8\Omega$, $R_{GEN}=3\Omega$		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	$I_F=8.5\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		16.7	21	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=8.5\text{A}$, $di/dt=100\text{A}/\mu\text{s}$		6.7	10	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 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.

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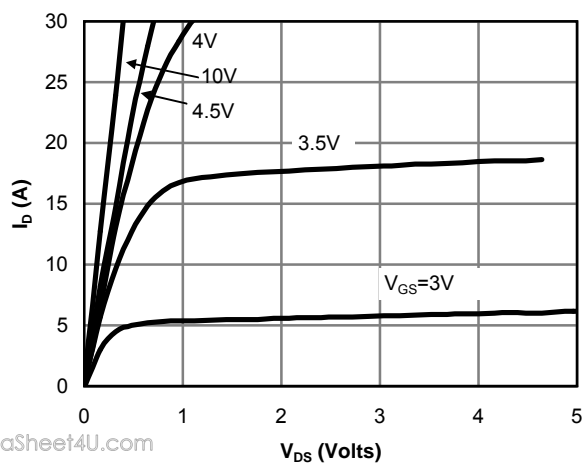


Fig 1: On-Region Characteristics

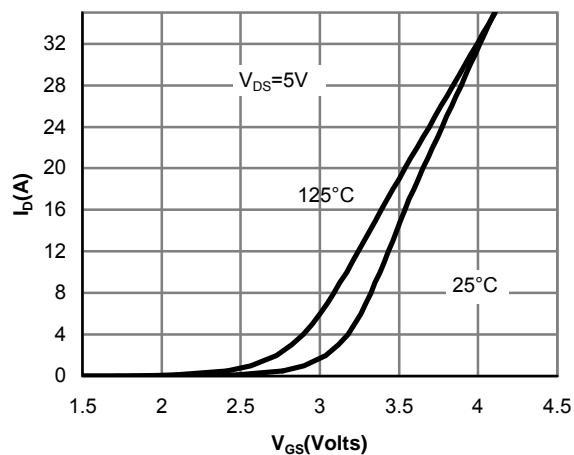


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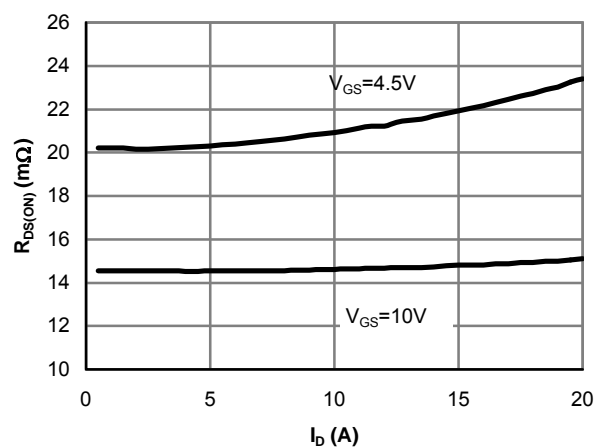


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

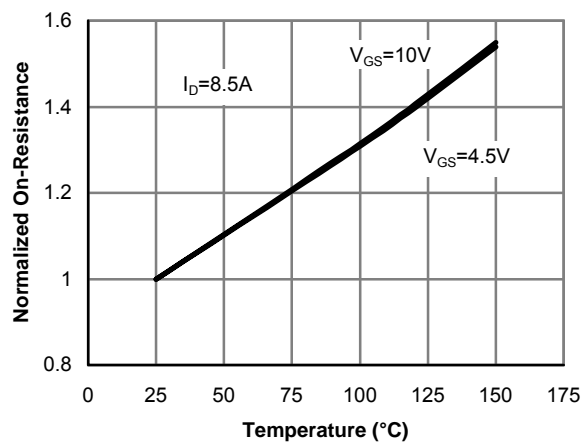


Figure 4: On-Resistance vs. Junction Temperature

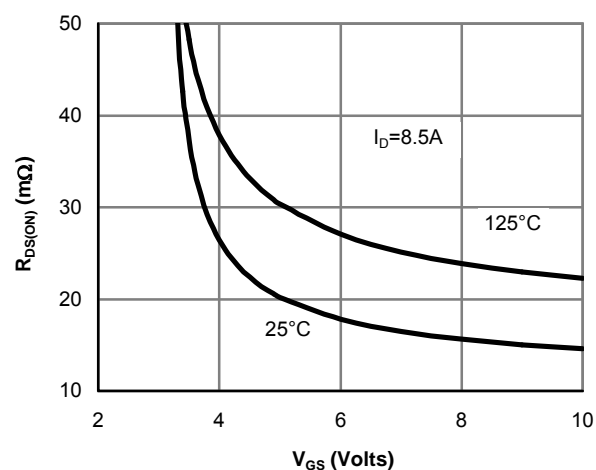


Figure 5: On-Resistance vs. Gate-Source Voltage

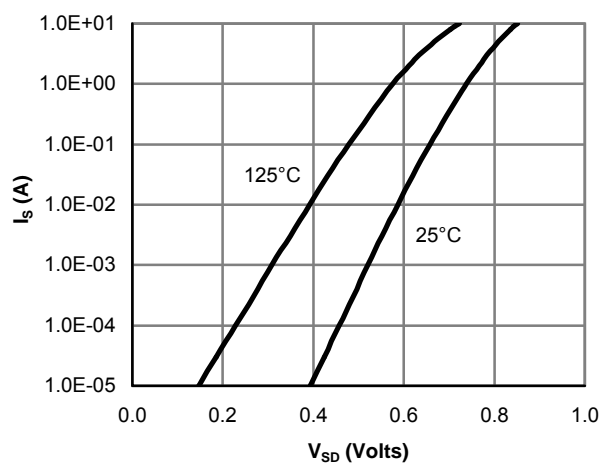


Figure 6: Body-Diode Characteristics

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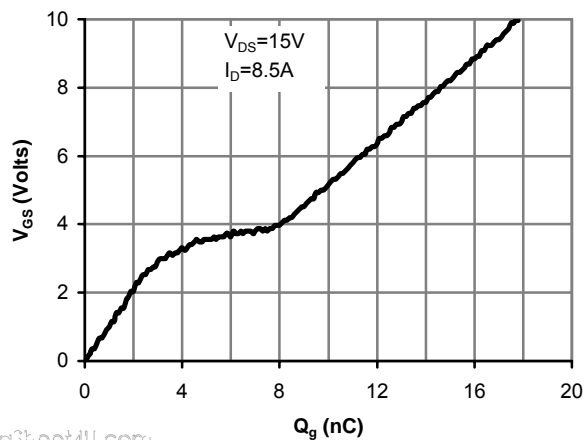


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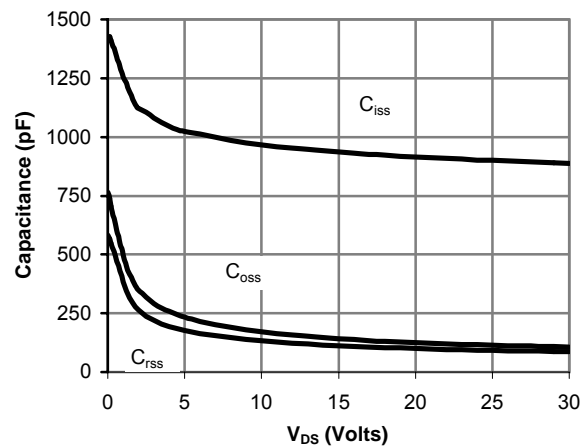


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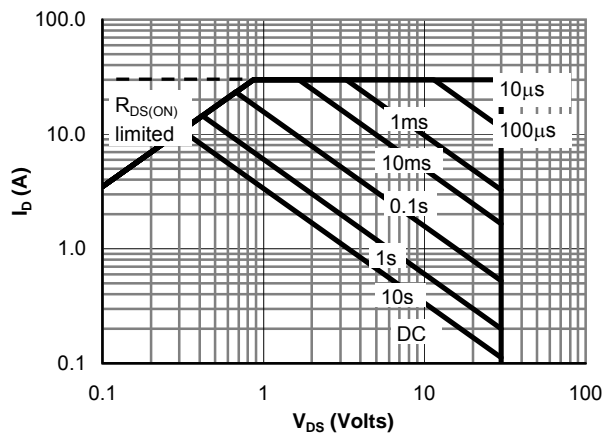


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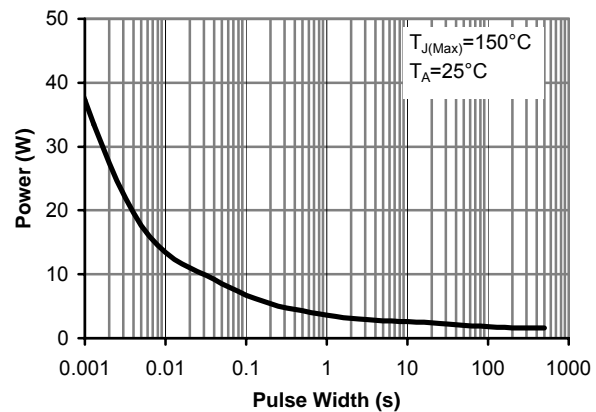


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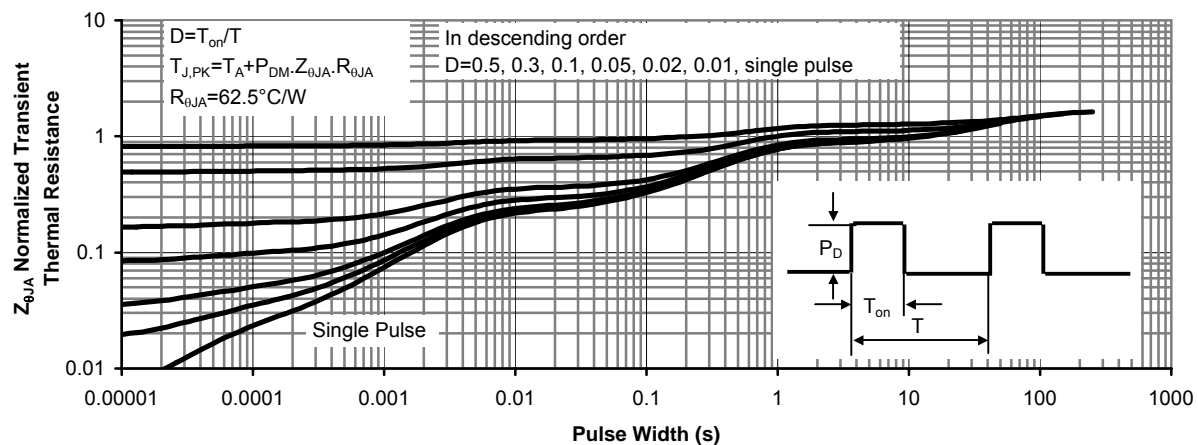


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