



AO4824

Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor



General Description

The AO4824 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. *Standard Product AO4824 is Pb-free (meets ROHS & Sony 259 specifications). AO4824L is a Green Product ordering option. AO4824 and AO4824L are electrically identical.*

Features

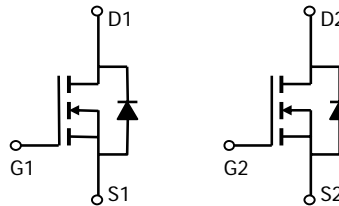
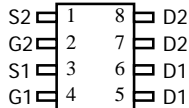
Q1

V_{DS} (V) = 30V
 I_D = 8.5A
 $R_{DS(ON)} < 17m\Omega$
 $R_{DS(ON)} < 27m\Omega$

Q2

V_{DS} (V) = 30V
 $I_D=9.8A$ ($V_{GS} = 10V$)
 $<13m\Omega$ ($V_{GS} = 10V$)
 $<15m\Omega$ ($V_{GS} = 4.5V$)

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}	± 20	± 12	V
Continuous Drain Current ^A	I_D	$T_A=25^\circ\text{C}$	8.5	A
		$T_A=70^\circ\text{C}$	6.8	
Pulsed Drain Current ^B	I_{DM}	30	40	
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	2	W
		$T_A=70^\circ\text{C}$	1.28	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Parameter: Thermal Characteristics MOSFET Q1		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	48	62.5	$^\circ\text{C/W}$
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	$t \leq 10s$	$R_{\theta JA}$	48	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		74	110	
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	35	40	

Q1 Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
I_{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	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$		0.003	1	μA
I_{GSS}	Gate-Body leakage current				100	nA
$V_{GS(th)}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 20\text{V}$	1	1.8	3	V
$I_{D(ON)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	30			A
$R_{DS(ON)}$	On state drain current	$V_{GS}=10\text{V}, V_{DS}=5\text{V}$		13.8	17	
	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}, I_D=8.5\text{A}$ $T_J=125^\circ\text{C}$		20	25	m Ω
					21	27
g_{FS}	Forward Transconductance	$V_{GS}=4.5\text{V}, I_D=6\text{A}$		23		S
V_{SD}	Diode Forward Voltage	$V_{DS}=5\text{V}, I_D=8.5\text{A}$		0.76	1	V
I_S	Diode Forward Voltage	$I_S=1\text{A}, V_{GS}=0\text{V}$			3	A
Maximum Body-Diode Continuous Current						
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance			1040	1250	pF
C_{oss}	Output Capacitance	$V_{GS}=0\text{V}, V_{DS}=15\text{V}, f=1\text{MHz}$		180		pF
C_{rss}	Reverse Transfer Capacitance			110		pF
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						
$Q_g(4.5\text{V})$	Total Gate Charge			19.2	23	nC
Q_{gs}	Total Gate Charge	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, I_D=8.5\text{A}$		9.36	11.2	nC
Q_{gd}	Gate Source Charge			2.6		nC
$t_{D(on)}$	Gate Drain Charge			4.2		nC
t_r	Turn-On Delay Time			5.2	7.5	ns
$t_{D(off)}$	Turn-On Rise Time	$V_{GS}=10\text{V}, V_{DS}=15\text{V}, R_L=1.8\Omega,$ $R_{GEN}=3\Omega$		4.4	6.5	ns
t_f	Turn-Off Delay Time			17.3	25	ns
t_{rr}	Turn-Off Fall Time			3.3	5	ns
Q_{rr}	Body Diode Reverse Recovery Time	$I_F=8.5\text{A}, dI/dt=100\text{A}/\mu\text{s}$		16.7	21	ns
	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.

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.

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Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

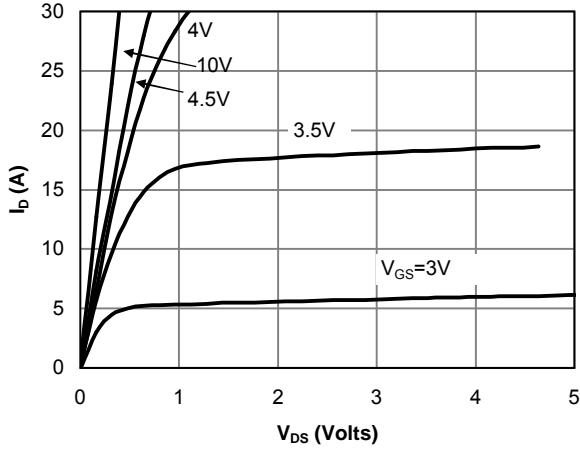


Fig 1: On-Region Characteristics

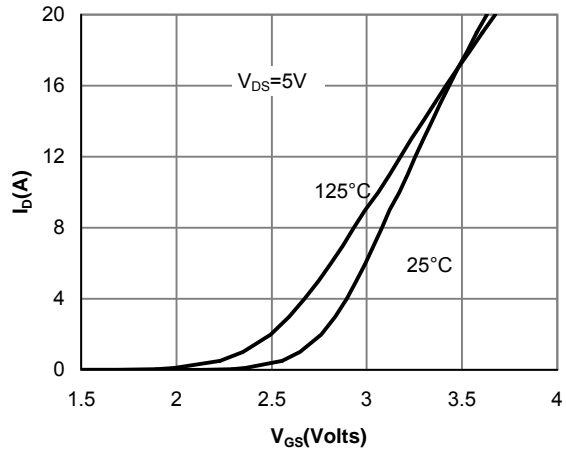


Figure 2: Transfer Characteristics

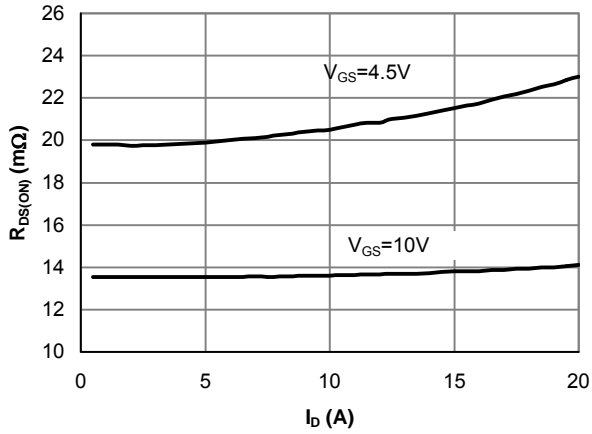


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

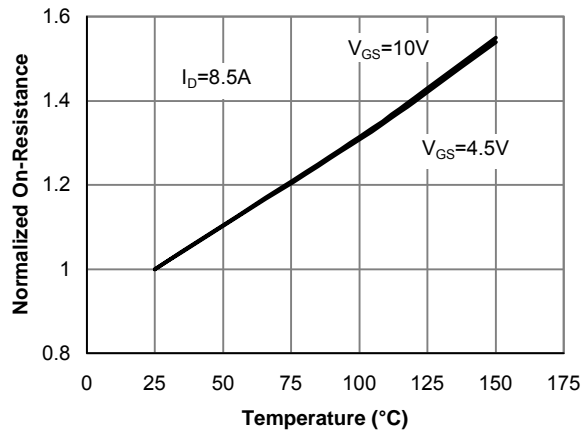


Figure 4: On-Resistance vs. Junction Temperature

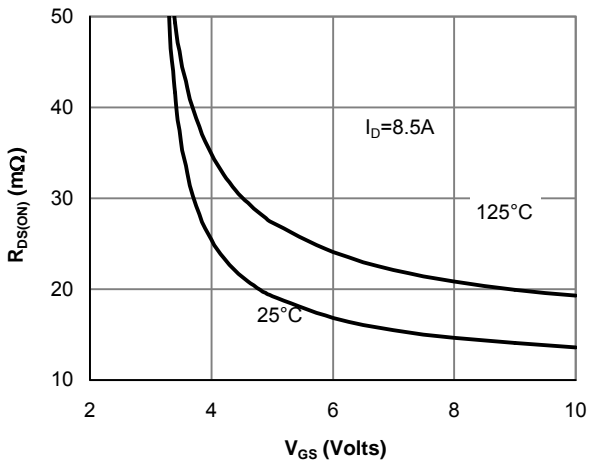


Figure 5: On-Resistance vs. Gate-Source Voltage

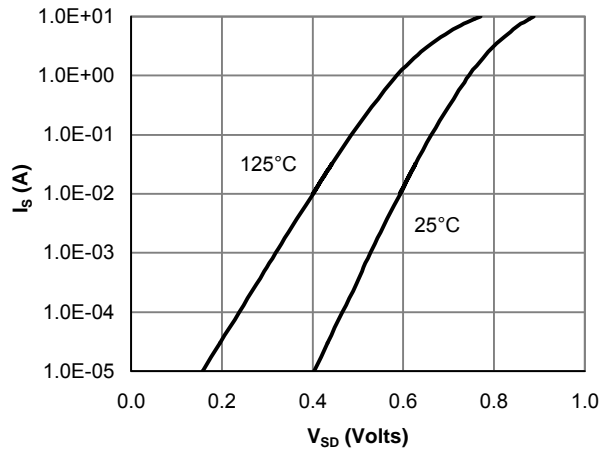


Figure 6: Body-Diode Characteristics

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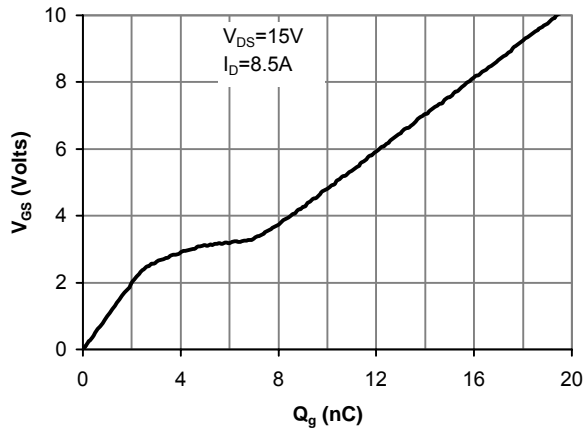


Figure 7: Gate-Charge Characteristics

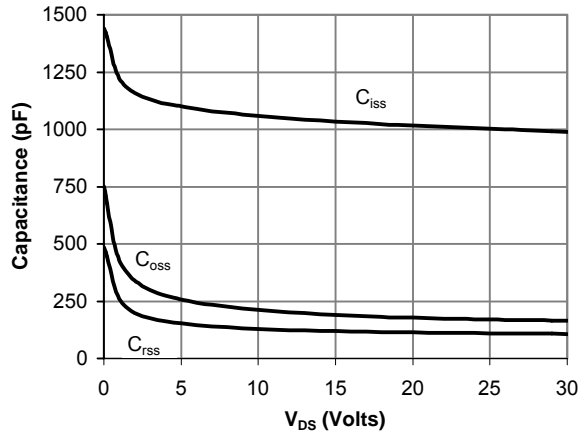


Figure 8: Capacitance Characteristics

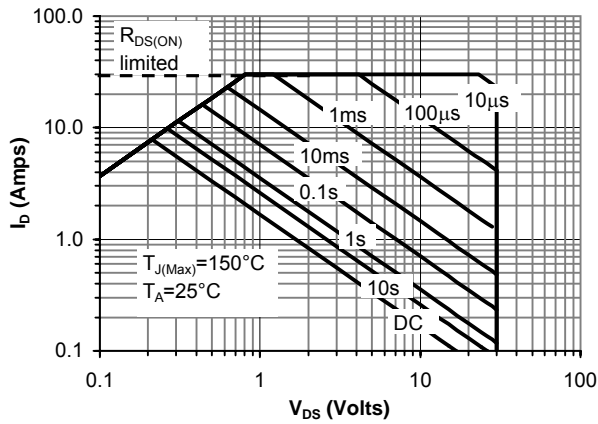


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

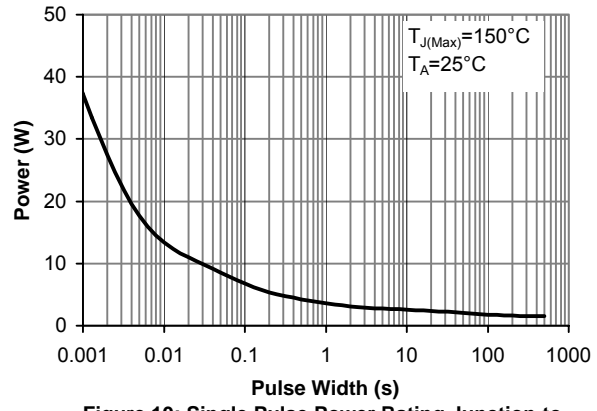


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

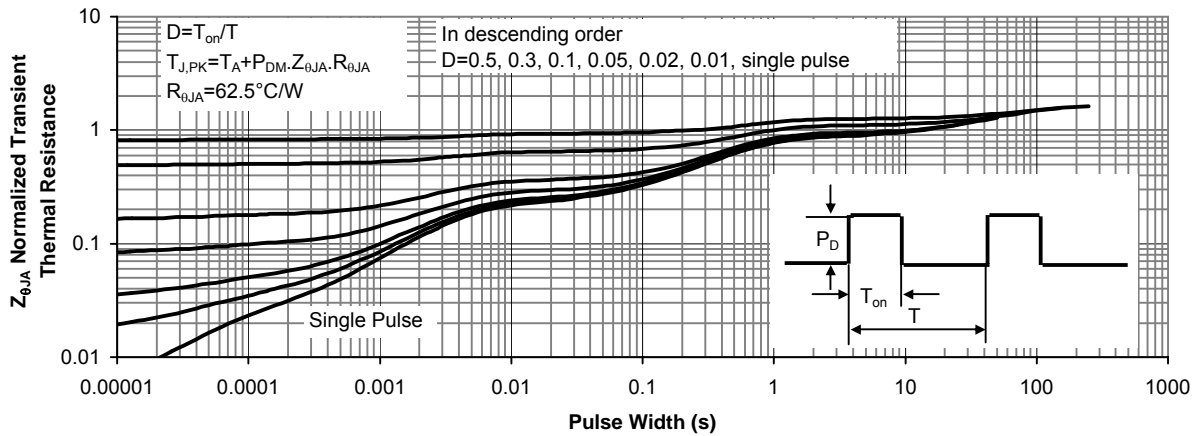


Figure 11: Normalized Maximum Transient Thermal Impedance

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		0.004	1 5	μA
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 =9.8A T _J =125°C		10.5 13.4	13 17	mΩ
		V _{GS} =4.5V, I _D =9A		12	15	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =9.8A	30	37		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.73	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		3656	4250	pF
C _{oss}	Output Capacitance			256		pF
C _{rss}	Reverse Transfer Capacitance			168		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.86	1.05	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =9.8A		30.5	36	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		5.5	8.2	ns
t _r	Turn-On Rise Time			3.1	5	ns
t _{D(off)}	Turn-Off DelayTime			52.4	75	ns
t _f	Turn-Off Fall Time			5.7	8.5	ns
t _{rr}	Body Diode Reverse Recovery time	I _F =9.8A, dI/dt=100A/μs		21.5	26	ns
Q _{rr}	Body Diode Reverse Recovery charge	I _F =9.8A, dI/dt=100A/μs		11	15	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 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 6,12,14 are obtained using 80μs 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.

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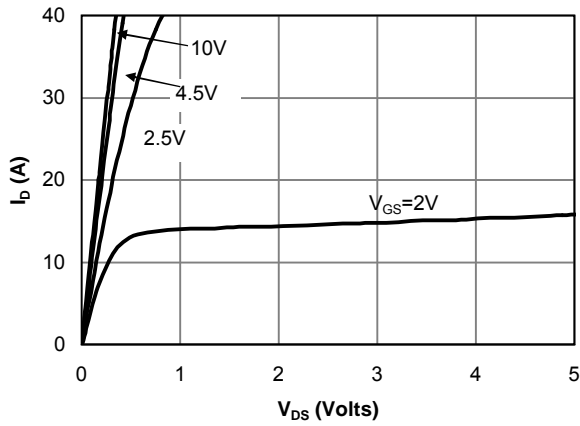


Fig 1: On-Region Characteristics

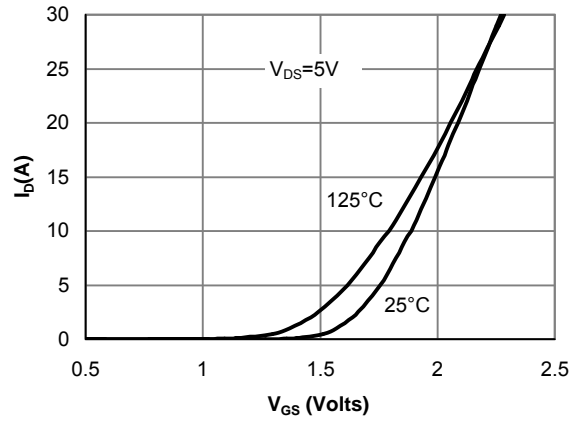


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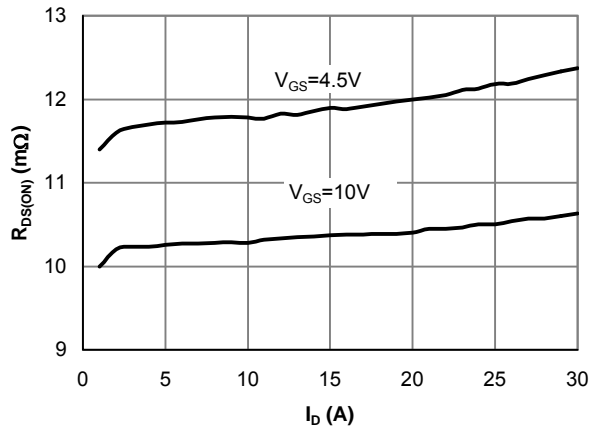


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

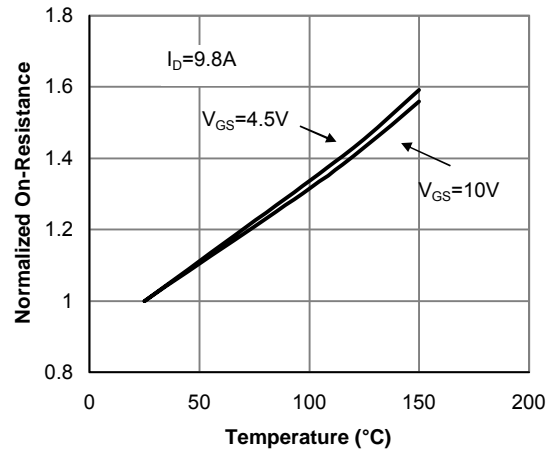


Figure 4: On resistance vs. Junction Temperature

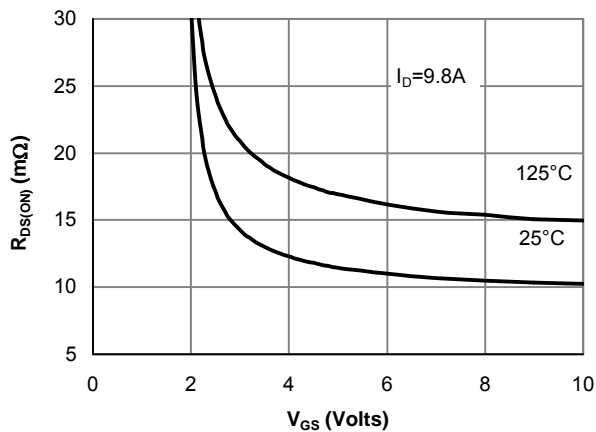


Figure 5: On resistance vs. Gate-Source Voltage

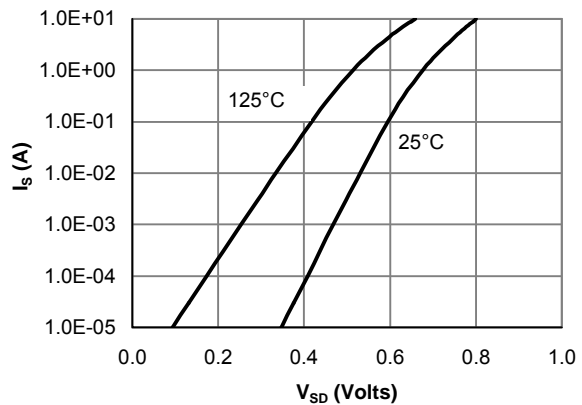


Figure 6: Body-Diode Characteristics

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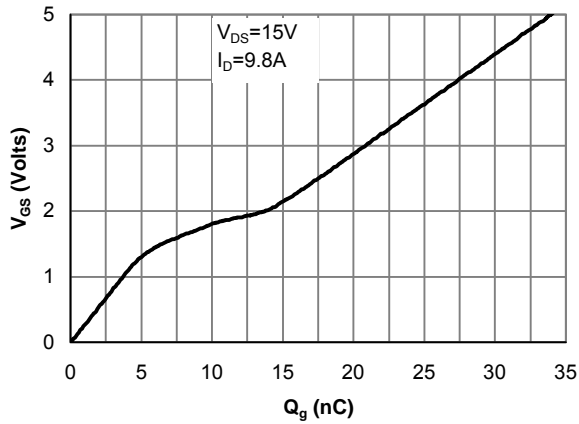


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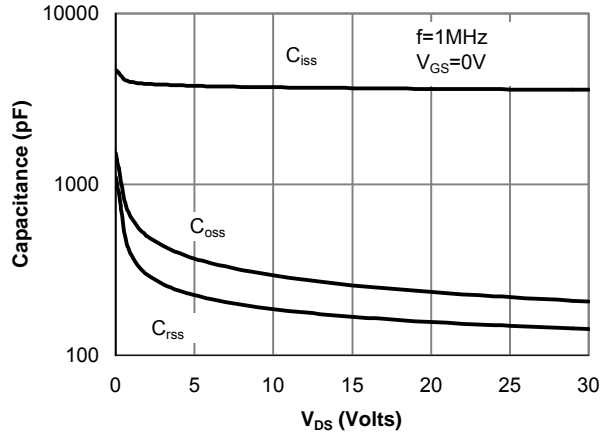


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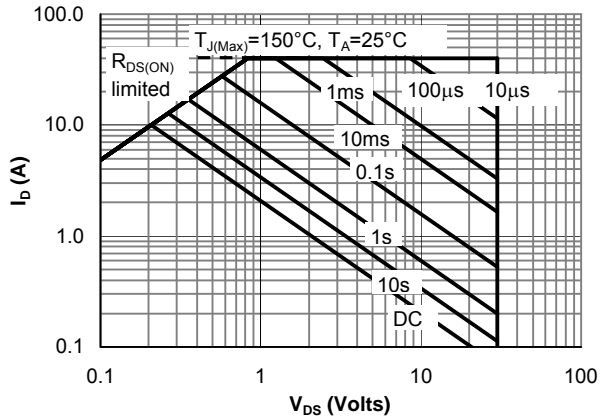


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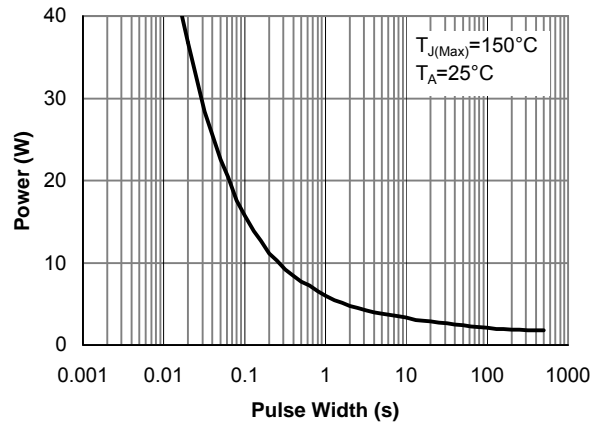


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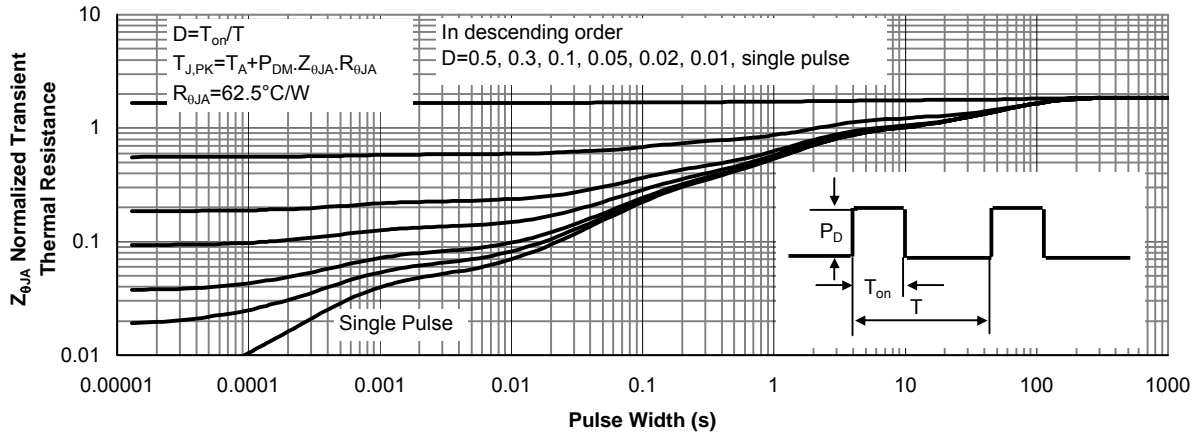


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