



AO4912

Asymmetric Dual N-Channel Enhancement Mode Field Effect Transistor

General Description

The AO4912 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 AO4912 is Pb-free (meets ROHS & Sony 259 specifications). AO4912L is a Green Product ordering option. AO4912 and AO4912L are electrically identical.*

Features

Q1

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

$I_D = 8.5A$

$R_{DS(ON)} < 17m\Omega$

$R_{DS(ON)} < 25m\Omega$

Q2

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

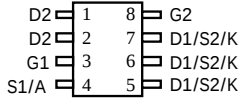
$I_D=7A$ ($V_{GS} = 10V$)

$<26m\Omega$ ($V_{GS} = 10V$)

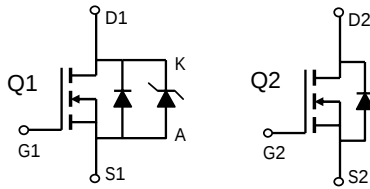
$<31m\Omega$ ($V_{GS} = 4.5V$)

SCHOTTKY

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



SOIC-8



Absolute Maximum Ratings $T_A=25^\circ C$ 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	$T_A=25^\circ C$	8.5	7	A
	$T_A=70^\circ C$	6.8	6.4	
Pulsed Drain Current ^B	I_{DM}	40	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	$^\circ C$

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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 $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}C$. 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 in² 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.

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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} = ±12V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1	1.5	2	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 =7.0A T _J =125°C		20 31.6	26 38	mΩ
		V _{GS} =4.5V, I _D =6.0A		24.3	31	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =7A		22		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.78	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		590	710	pF
C _{oss}	Output Capacitance			162		pF
C _{rss}	Reverse Transfer Capacitance			40		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		0.45	0.6	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =7.0A		6.04	7.3	nC
Q _{gs}	Gate Source Charge			1.46		nC
Q _{gd}	Gate Drain Charge			2.56		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =2.2Ω, R _{GEN} =3Ω		3.7	5.5	ns
t _r	Turn-On Rise Time			3.5	5.5	ns
t _{D(off)}	Turn-Off DelayTime			14.9	22	ns
t _f	Turn-Off Fall Time			2.5	4	ns
t _{rr}	Body Diode Reverse Recovery time	I _F =7A, dI/dt=100A/μs		21.2	26	ns
Q _{rr}	Body Diode Reverse Recovery charge	I _F =7A, dI/dt=100A/μs		14.2	21	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 ≤ 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.

Q2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

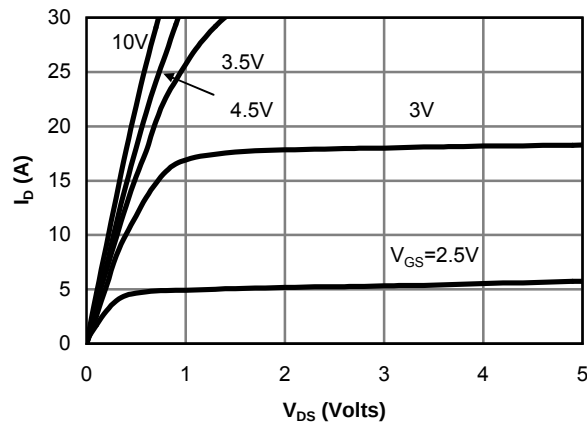


Fig 1: On-Region Characteristics

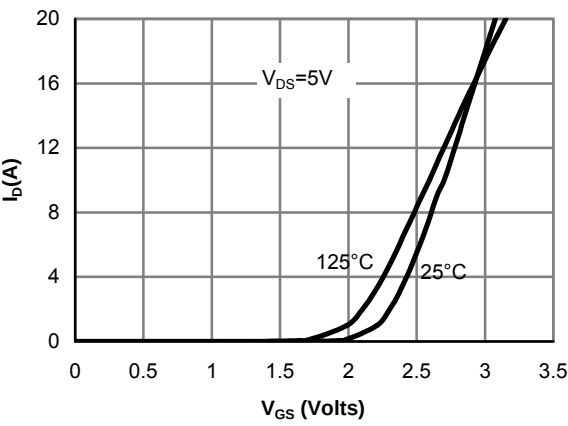


Figure 2: Transfer Characteristics

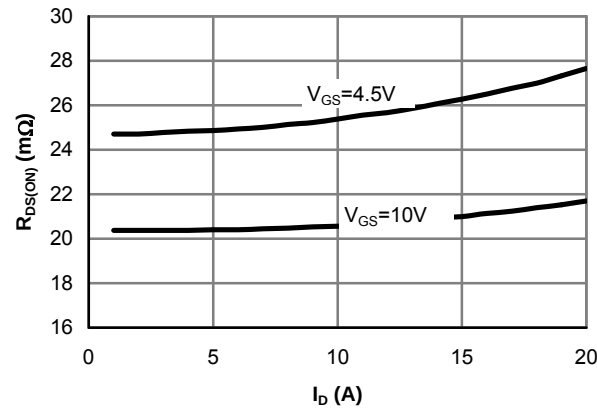


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

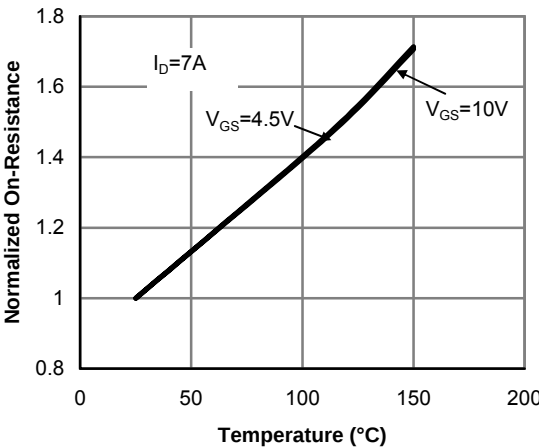


Figure 4: On resistance vs. Junction Temperature

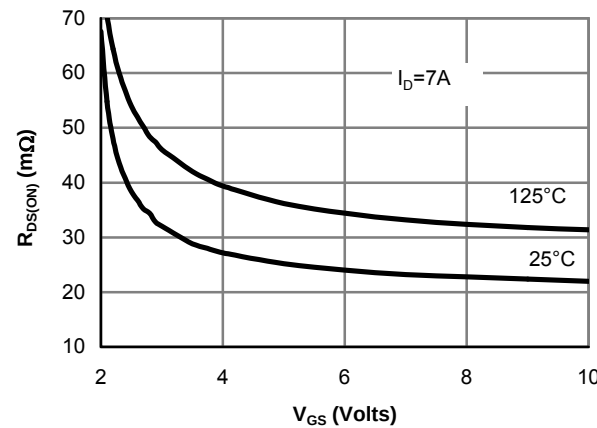


Figure 5: On resistance vs. Gate-Source Voltage

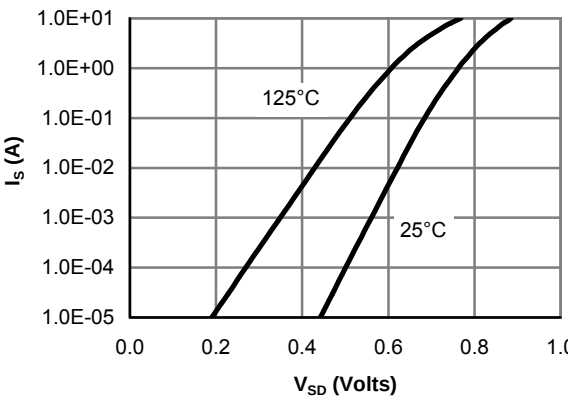


Figure 6: Body-Diode Characteristics

Q2 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

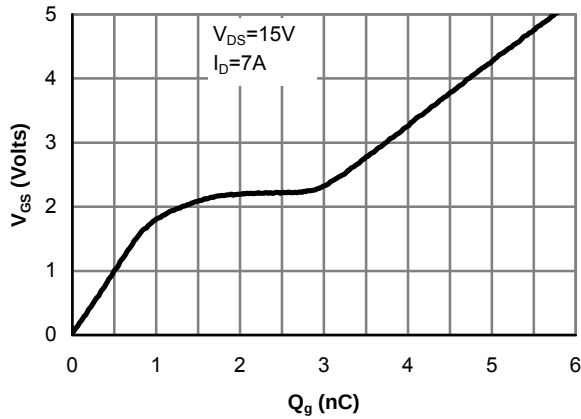


Figure 7: Gate-Charge Characteristics

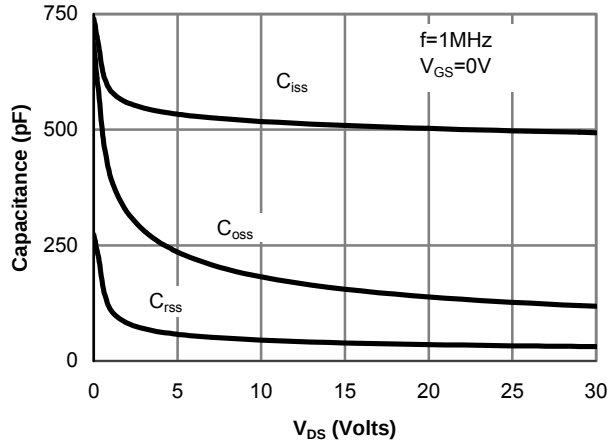


Figure 8: Capacitance Characteristics

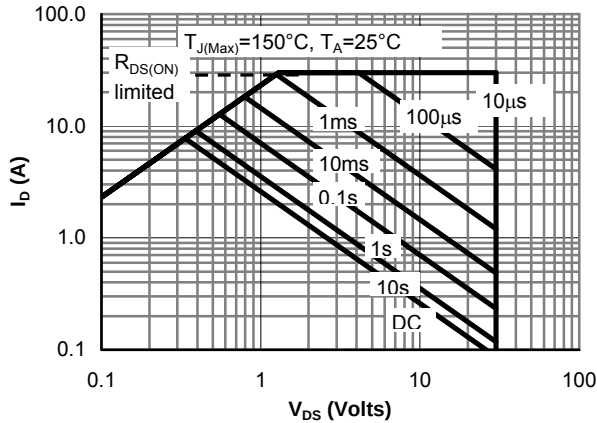


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

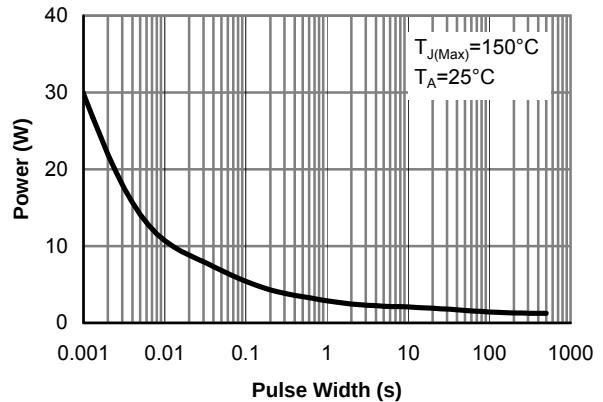


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

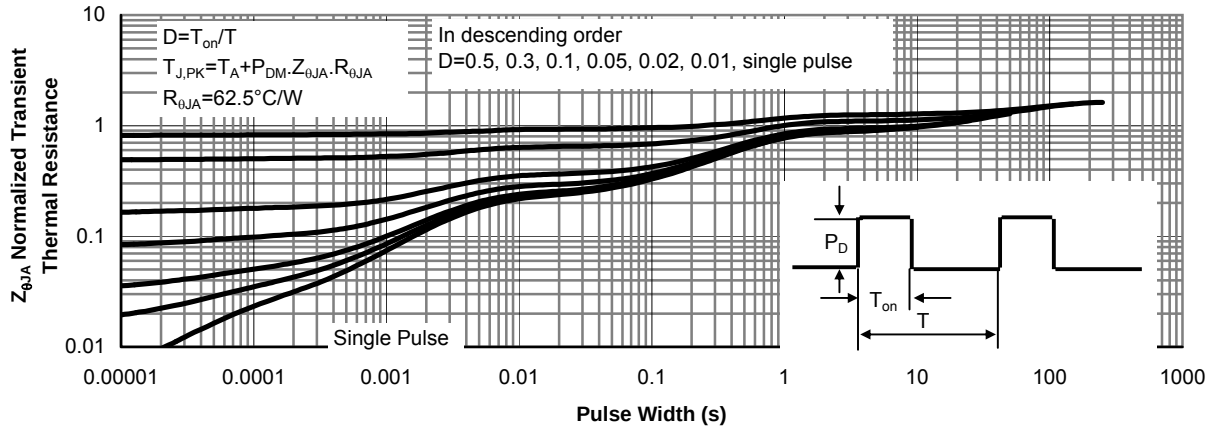


Figure 11: Normalized Maximum Transient Thermal Impedance

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. by Schottky leakage)	(Set 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} = ±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} =4.5V, V _{DS} =5V	30			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =8.5A		13.8	17	mΩ
		T _J =125°C		20	24	
		V _{GS} =4.5V, I _D =7A		19.7	25	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =8.5A		23		S
V _{SD}	Diode+Schottky Forward Voltage	I _S =1A		0.45	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		971	1165	pF
C _{oss}	Output Capacitance (FET + Schottky)			190		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	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	25	ns
t _f	Turn-Off Fall Time			3.3	5	ns
t _{rr}	Body Diode + Schottky Reverse Recovery Time	I _F =8.5A, dI/dt=100A/μs		19.3	23	ns
Q _{rr}	Body Diode + Schottky Reverse Recovery Charge	I _F =8.5A, dI/dt=100A/μs		9.4	11	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

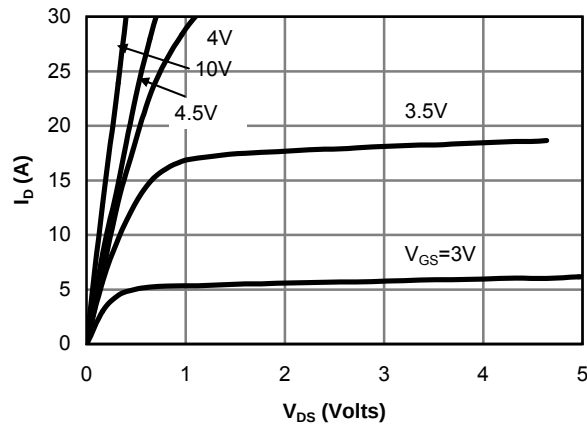


Fig 1: On-Region Characteristics

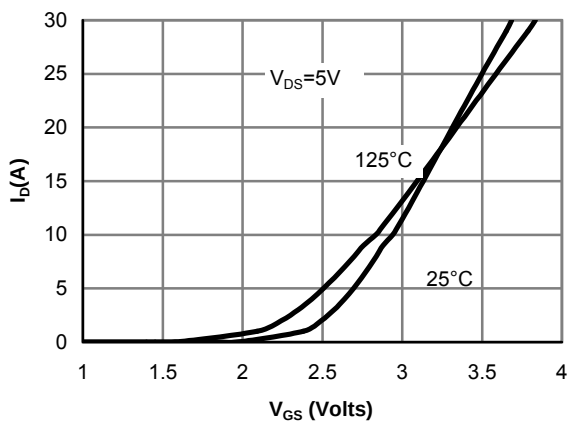


Figure 2: Transfer Characteristics

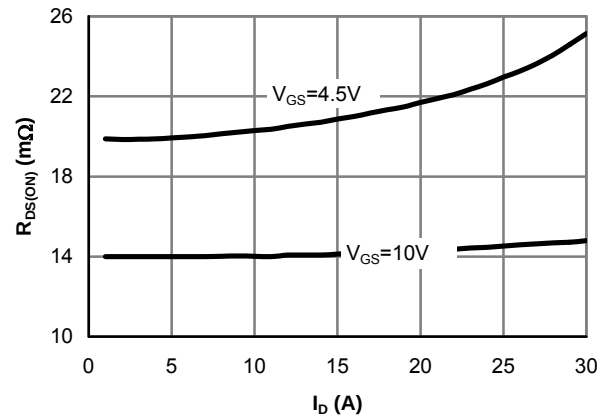


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

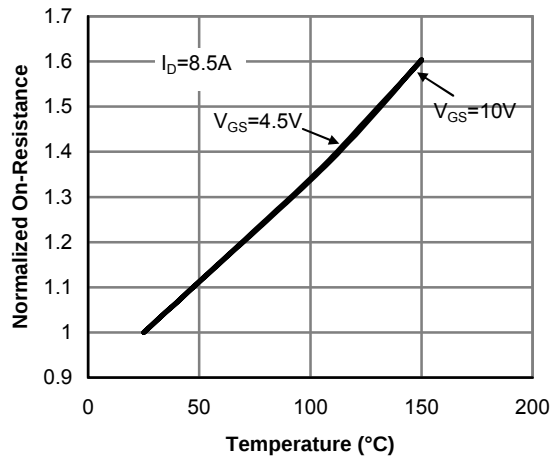


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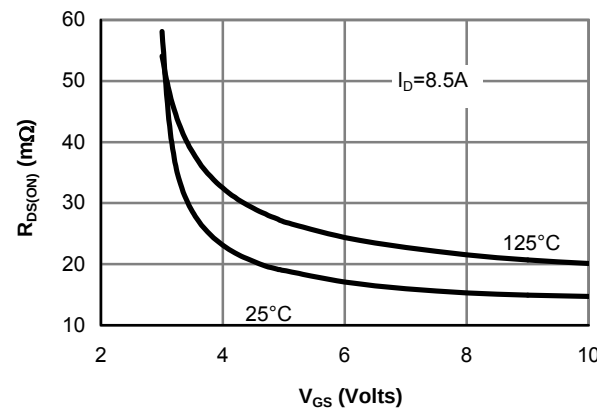


Figure 5: On resistance vs. Gate-Source Voltage

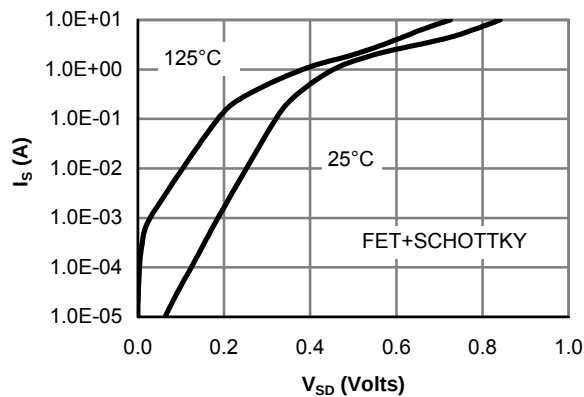


Figure 6: Body-Diode Characteristics (Note F)

Q1 TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

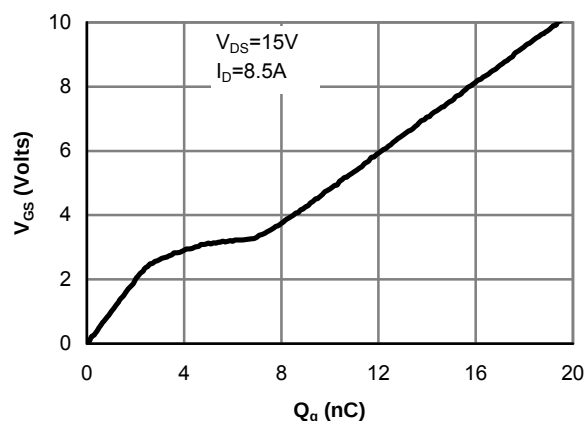


Figure 7: Gate-Charge Characteristics

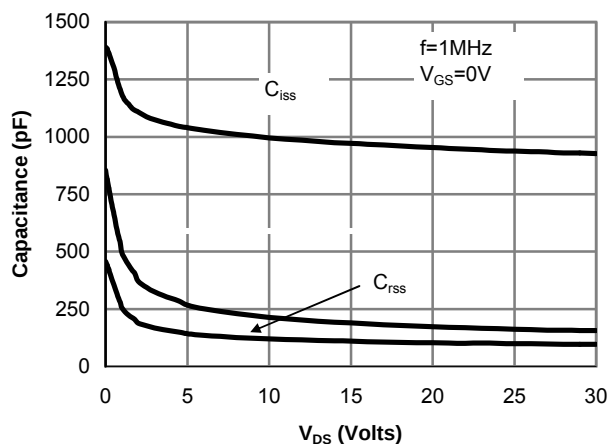


Figure 8: Capacitance Characteristics

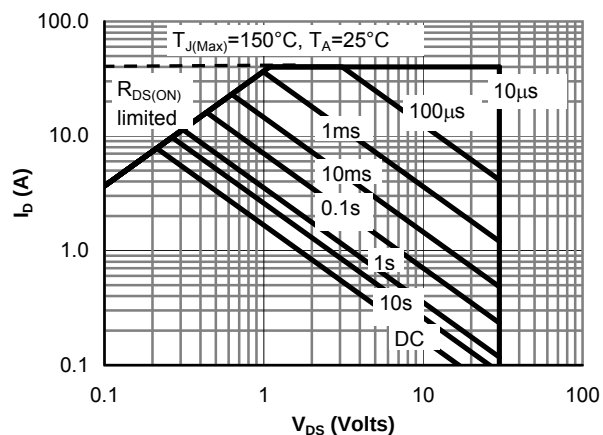


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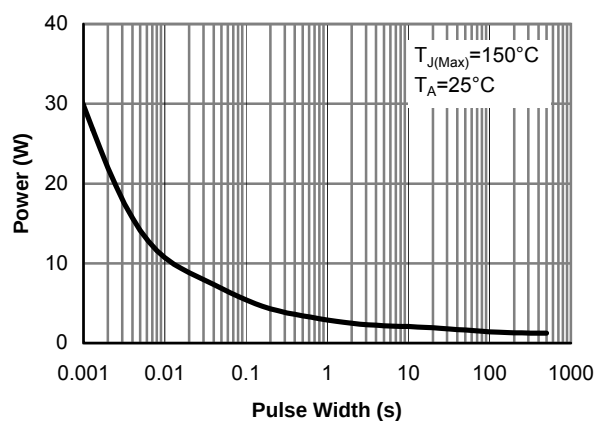


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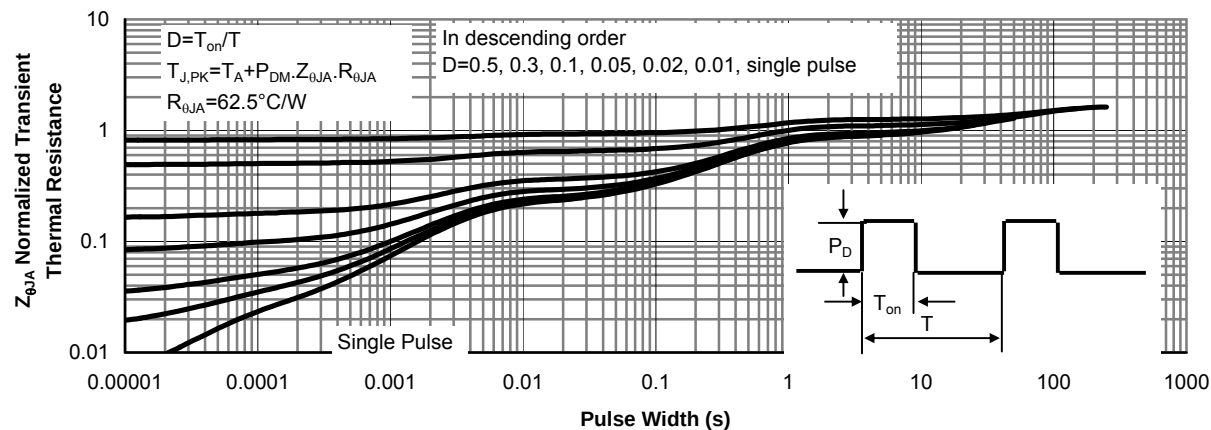


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