![ALPHA & OMEGA SEMICONDUCTOR]

AO4914

30V Dual N-Channel MOSFET with Schottky Diode

General Description

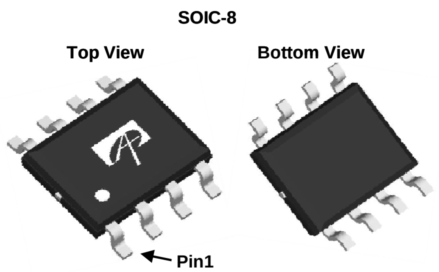
The AO4914 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The two MOSFETs make a compact and efficient switch and synchronous rectifier combination for use in DC-DC converters. A Schottky diode is co-packaged in parallel with the synchronous MOSFET to boost efficiency further.

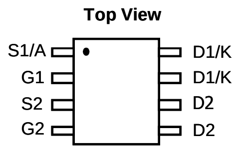
Product Summary

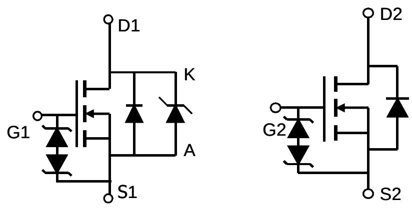
Q1(N-Channel)	**Q2(N-Channel)**
V_{DS}= 30V	30V
I_D= 8A (V_{GS}=10V)	8A (V_{GS}=10V)
$R_{DS(ON)}$ <20.5mΩ	$R_{DS(ON)}$ <20.5mΩ (V_{GS}=10V)
$R_{DS(ON)}$ <28mΩ	$R_{DS(ON)}$ <28mΩ (V_{GS}=4.5V)
ESD Protected	ESD Protected
100% UIS Tested	100% UIS Tested
100% R_g Tested	100% R_g Tested

SCHOTTKY

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







Absolute Maximum Ratings T_A=25℃ 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	T_A=25℃	I_D	8	8	A
	T_A=70℃		6.5	6.5	
Pulsed Drain Current [C]		I_{DM}	40	40	
Avalanche Current [C]		I_{AS}, I_{AR}	19	19	A
Avalanche energy L=0.1mH [C]		E_{AS}, E_{AR}	18	18	mJ
Power Dissipation [B]	T_A=25℃	P_D	2	2	W
	T_A=70℃		1.3	1.3	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		℃

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

Thermal Characteristics - MOSFET					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	$t \leq 10s$	$R_{\theta JA}$	48	62.5	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		74	90	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	32	40	°C/W

Thermal Characteristics - Schottky					
Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	$t \leq 10s$	$R_{\theta JA}$	48	62.5	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		74	90	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	32	40	°C/W

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.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

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=250uA, V_{GS}=0V		30			V
I_{DSS}	Zero Gate Voltage Drain Current (Set by Schottky leakage)	V_R=30V				0.05	mA
		V_R=30V, T_J=125°C				10	
		V_R=30V, T_J=150°C				20	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V,V_{GS}=±16V				10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1.2	1.8	2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8A			17	20.5	mΩ
			T_J=125°C		23.5	29	
		V_{GS}=4.5V, I_D=4A			20.5	28	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8A			30		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.45	0.5	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		575	730	865	pF
C_{oss}	Output Capacitance			115	165	215	pF
C_{rss}	Reverse Transfer Capacitance			50	82	120	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.5	1.1	1.7	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=8A		12	15	18	nC
Q_g(4.5V)	Total Gate Charge			6	7.5	9	nC
Q_{gs}	Gate Source Charge				2.5		nC
Q_{gd}	Gate Drain Charge				3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.8Ω, R_{GEN}=3Ω			5		ns
t_r	Turn-On Rise Time				3.5		ns
$t_{D(off)}$	Turn-Off DelayTime				19		ns
t_f	Turn-Off Fall Time				3.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=8A, dI/dt=500A/µs			8		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=8A, dI/dt=500A/µs			8		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.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

Q1: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

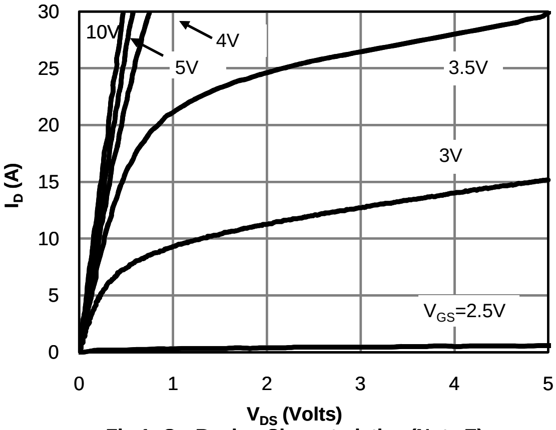


Fig 1: On-Region Characteristics (Note E)

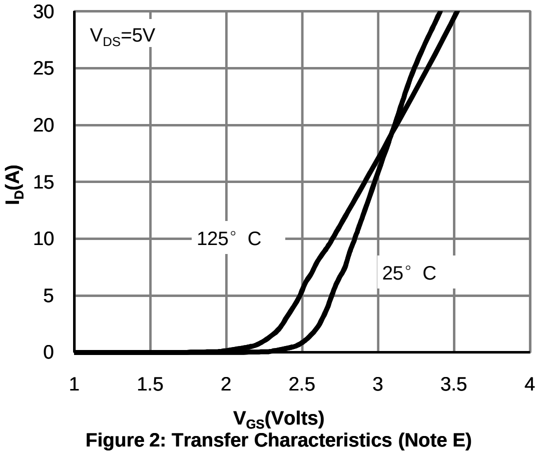


Figure 2: Transfer Characteristics (Note E)

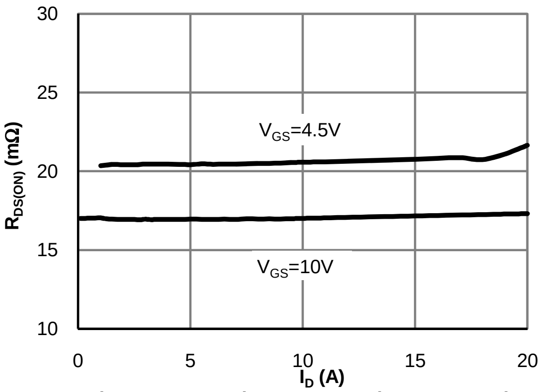


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

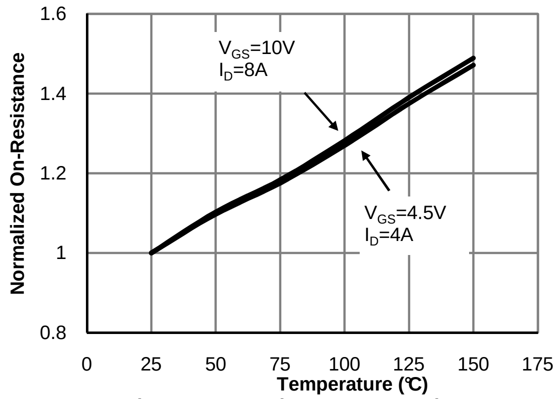


Figure 4: On-Resistance vs. Junction Temperature (Note E)

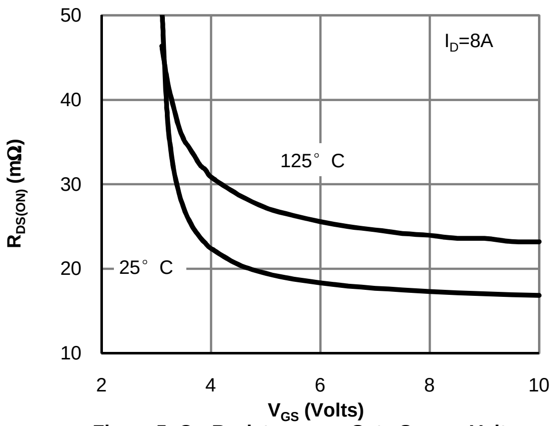


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

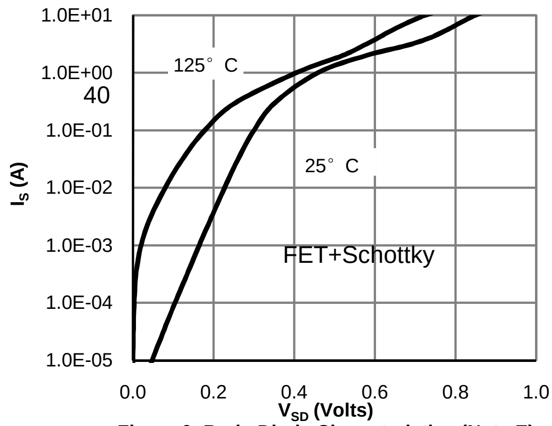


Figure 6: Body-Diode Characteristics (Note E)

Q1: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

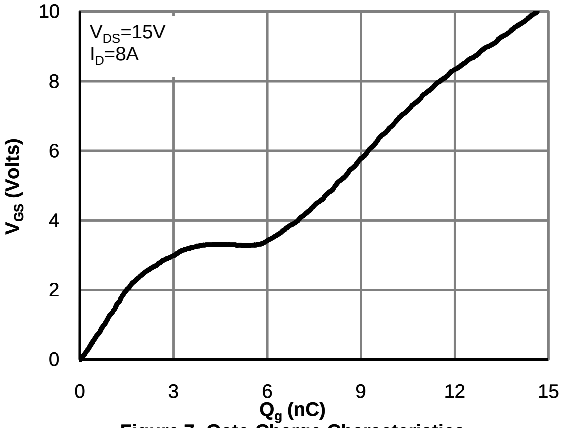


Figure 7: Gate-Charge Characteristics

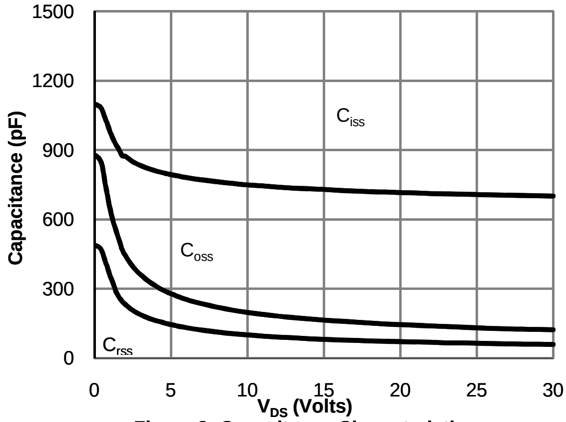


Figure 8: Capacitance Characteristics

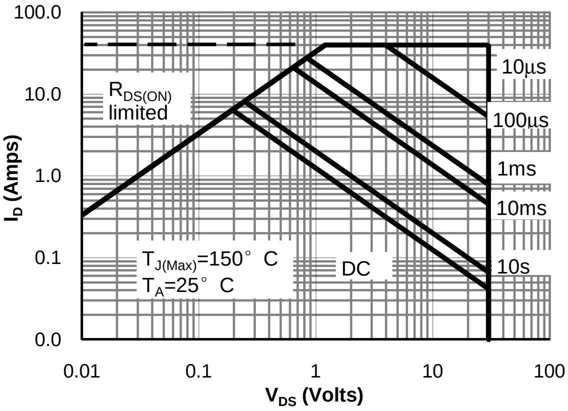


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

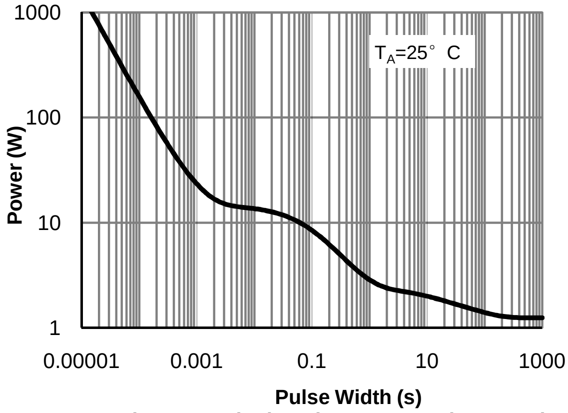


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

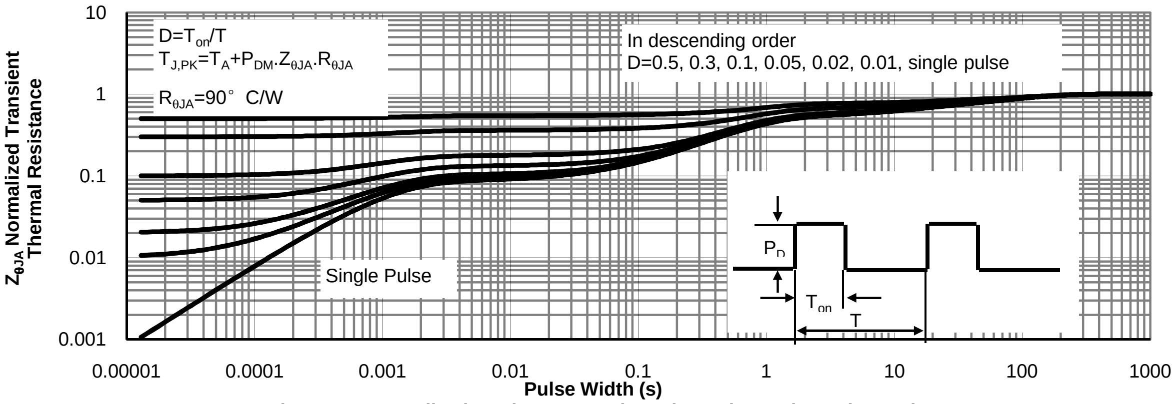


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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}=30V, V_{GS}=0V				1	µA
			T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±16V				10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA		1.2	1.8	2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=10V, V_{DS}=5V		40			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=8A			17	20.5	mΩ
			T_J=125°C		23.5	29	
		V_{GS}=4.5V, I_D=4A			20.5	28	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=8A			30		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V			0.75	1	V
I_S	Maximum Body-Diode Continuous Current					2.5	A
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		600	740	888	pF
C_{oss}	Output Capacitance			77	110	145	pF
C_{rss}	Reverse Transfer Capacitance			50	82	115	pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.5	1.1	1.7	Ω
SWITCHING PARAMETERS							
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=8A		12	15	18	nC
Q_g(4.5V)	Total Gate Charge			6	7.5	9	nC
Q_{gs}	Gate Source Charge				2.5		nC
Q_{gd}	Gate Drain Charge				3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=1.8Ω, R_{GEN}=3Ω			5		ns
t_r	Turn-On Rise Time				3.5		ns
$t_{D(off)}$	Turn-Off DelayTime				19		ns
t_f	Turn-Off Fall Time				3.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=8A, dI/dt=500A/µs		6	8	10	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=8A, dI/dt=500A/µs		14	18	22	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.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

Q2: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

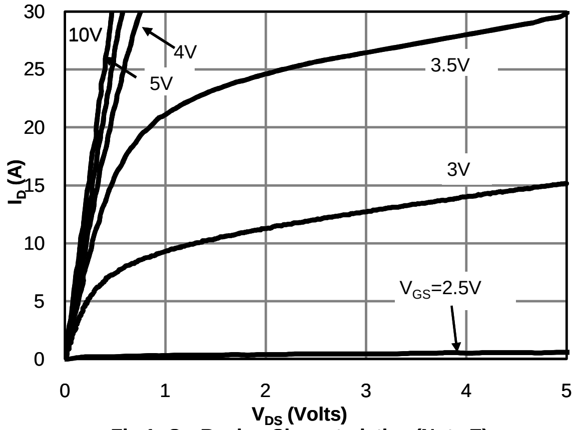


Fig 1: On-Region Characteristics (Note E)

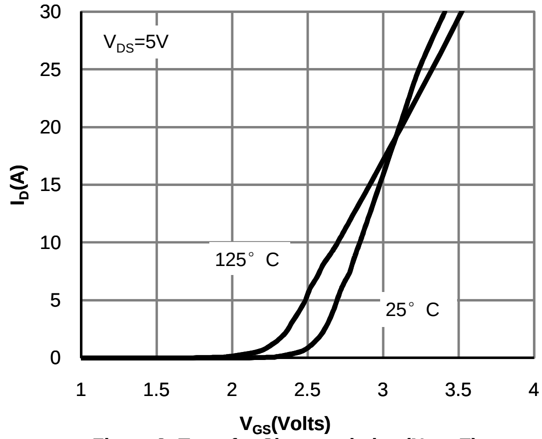


Figure 2: Transfer Characteristics (Note E)

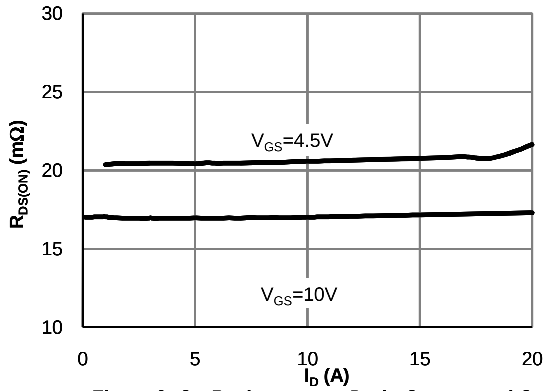


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

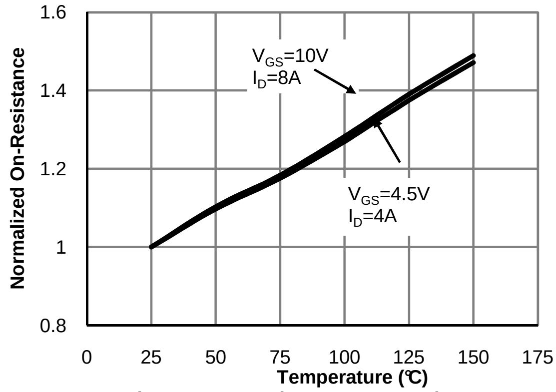


Figure 4: On-Resistance vs. Junction Temperature (Note E)

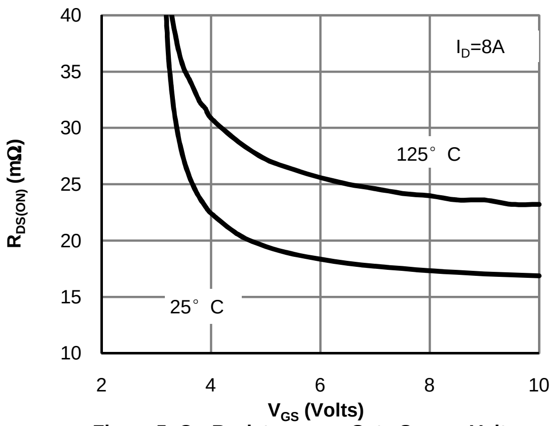


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

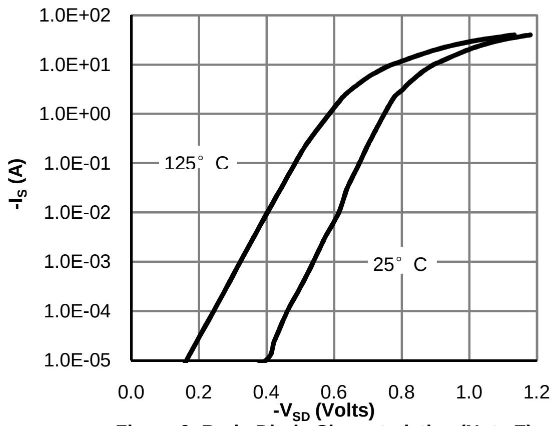


Figure 6: Body-Diode Characteristics (Note E)

Q2: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

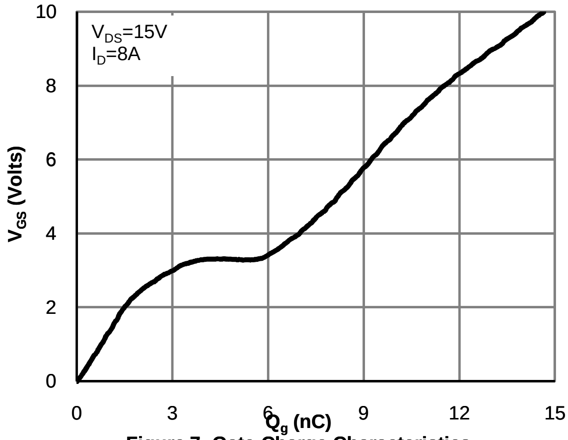


Figure 7: Gate-Charge Characteristics

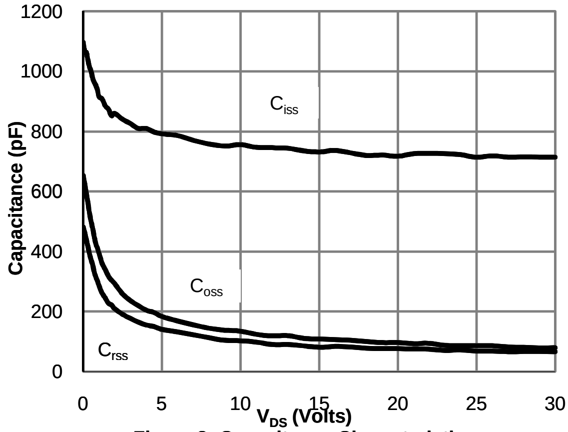


Figure 8: Capacitance Characteristics

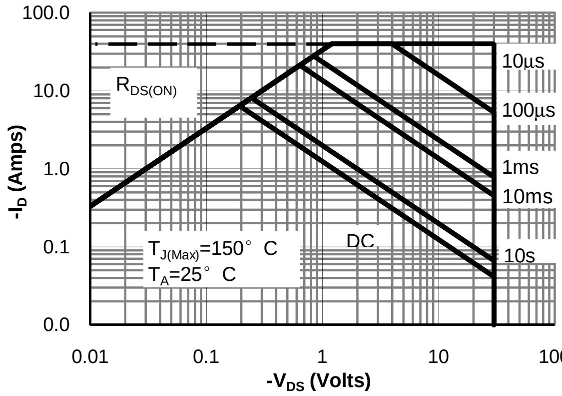


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

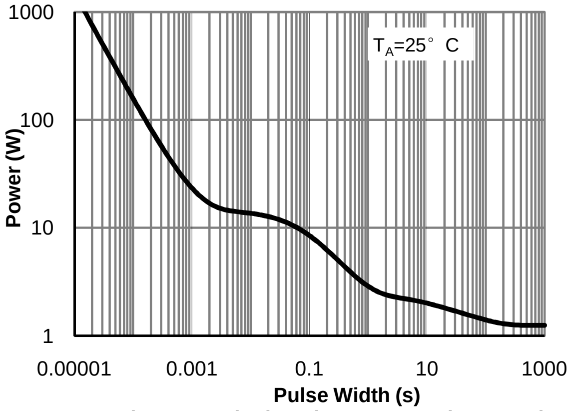


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

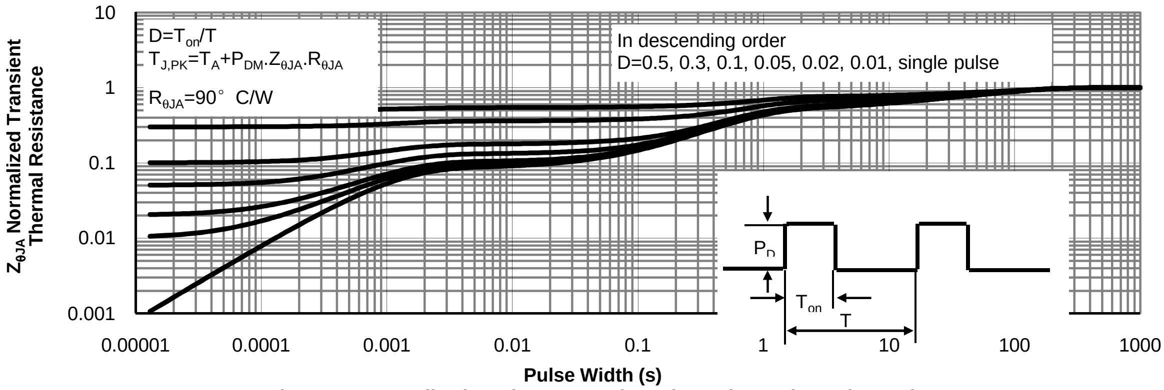
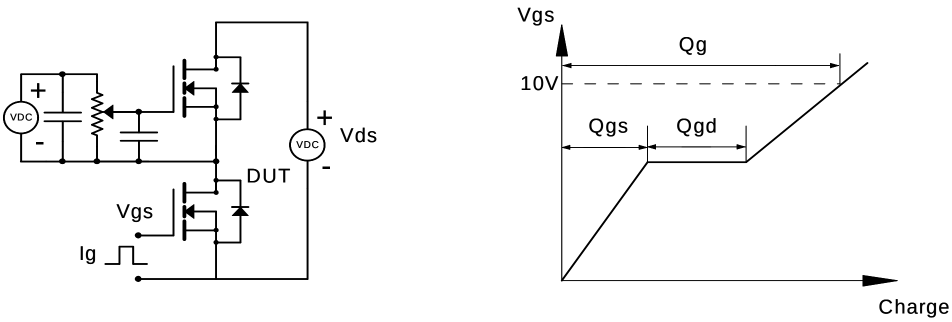
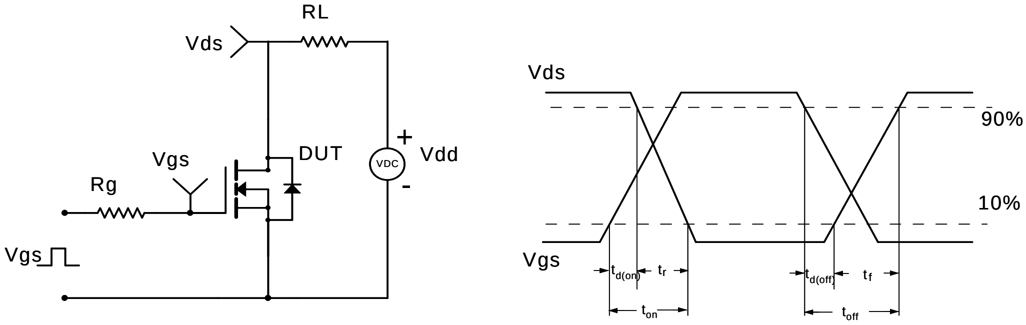


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

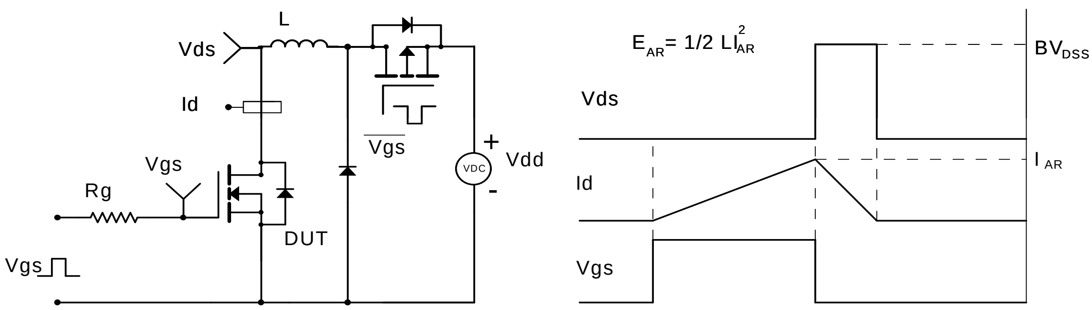
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms