ALPHA & OMEGA SEMICONDUCTOR, INC.

March 2002

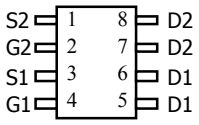
AOP600
Complementary Enhancement Mode Field Effect Transistor

General Description

The AOP600 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications.

Features

n-channel	p-channel
V_{DS} (V) = 30V	-30V
I_D = 6.9A	-5A
$R_{DS(ON)}$	
< 27mΩ	< 49mΩ (V_{GS} = 10V)
< 32mΩ	< 64mΩ (V_{GS} = 4.5V)
< 50mΩ	< 120mΩ (V_{GS} = 2.5V)



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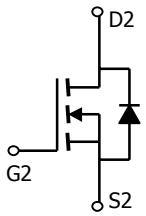
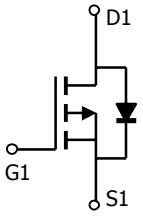


n-channel



p-channel

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	Max n-channel	Max p-channel	Units
Drain-Source Voltage		V_{DS}	30	-30	V
Gate-Source Voltage		V_{GS}	±12	±12	V
Continuous Drain Current [A]	T_A=25°C	I_D	6.9	-5	A
	T_A=70°C		5.8	-4.2	
Pulsed Drain Current [B]		I_{DM}	40	-30	
Power Dissipation	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.44	1.44	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Thermal Characteristics: n-channel and p-channel

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	40	50	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		67	80	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	35	40	°C/W

n-channel MOSFET 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			1	µA
		T_J=55°C			5	
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	0.7	1	1.4	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=6.9A		22.6	27	mΩ
		T_J=125°C		33	40	
		V_{GS}=4.5V, I_D=6.0A		27	32	mΩ
		V_{GS}=2.5V, I_D=5A		42	50	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=5A	12	16		S
V_{SD}	Diode Forward Voltage	I_S=1A		0.71	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		858		pF
C_{oss}	Output Capacitance			110		pF
C_{rss}	Reverse Transfer Capacitance			80		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.24		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=15V, I_D=6.9A		9.6		nC
Q_{gs}	Gate Source Charge			1.65		nC
Q_{gd}	Gate Drain Charge			3		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=15V, R_L=2.2Ω, R_{GEN}=6Ω		5.7		ns
t_r	Turn-On Rise Time			13		ns
$t_{D(off)}$	Turn-Off DelayTime			37		ns
t_f	Turn-Off Fall Time			4.2		ns
t_{rr}	Body Diode Reverse Recovery time	I_F=5A, dI/dt=100A/µs		15.5		ns
Q_{rr}	Body Diode Reverse Recovery charge	I_F=5A, dI/dt=100A/µs		7.9		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 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using 80µs 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°C. The SOA curve provides a single pulse rating.

p-channel MOSFET 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			-1	µA
		T_J=55°C			-5	
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	-0.7	-1	-1.4	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=-5A		42.5	49	mΩ
		T_J=125°C			74	
		V_{GS}=-4.5V, I_D=-4A		54	64	mΩ
		V_{GS}=-2.5V, I_D=-1A		80	120	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-5A	7	11		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		952		pF
C_{oss}	Output Capacitance			103		pF
C_{rss}	Reverse Transfer Capacitance			77		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		5.9		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-15V, I_D=-5A		9.5		nC
Q_{gs}	Gate Source Charge			2		nC
Q_{gd}	Gate Drain Charge			3.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=3Ω, R_{GEN}=6Ω		12		ns
t_r	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off DelayTime			37		ns
t_f	Turn-Off Fall Time			12		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-5A, dI/dt=100A/µs		21		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-5A, dI/dt=100A/µs		13		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 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ 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 in ^{2} FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

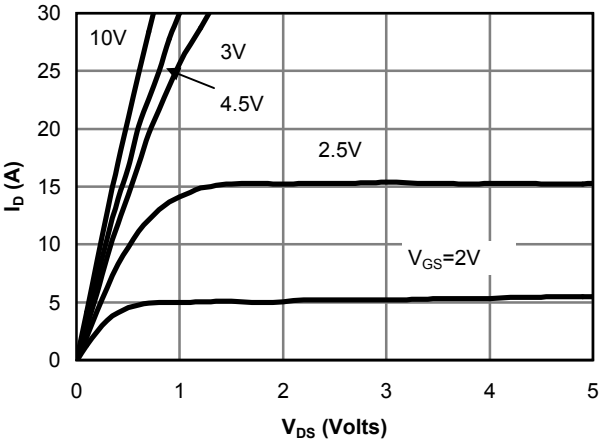


Fig 1: On-Region Characteristics

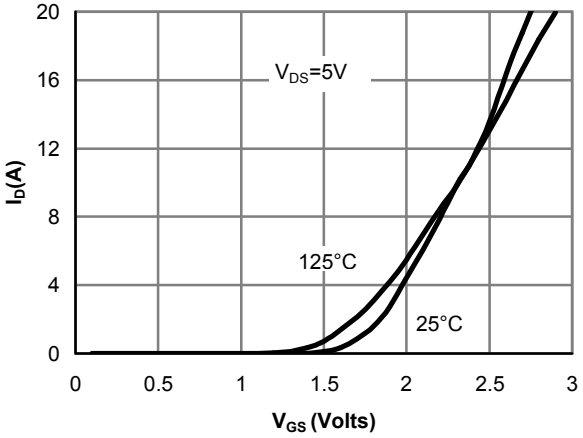


Figure 2: Transfer Characteristics

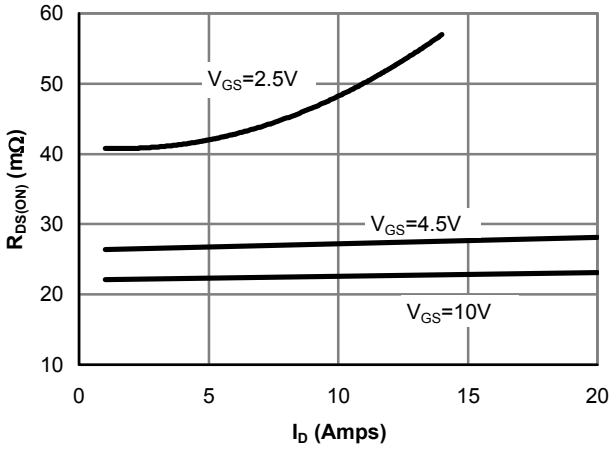


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

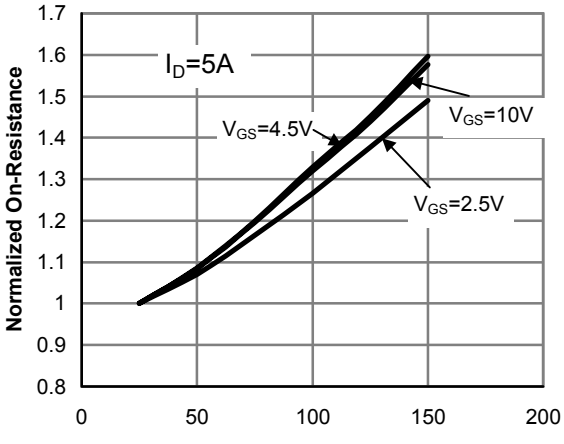


Figure 4: On-Resistance vs. Junction Temperature

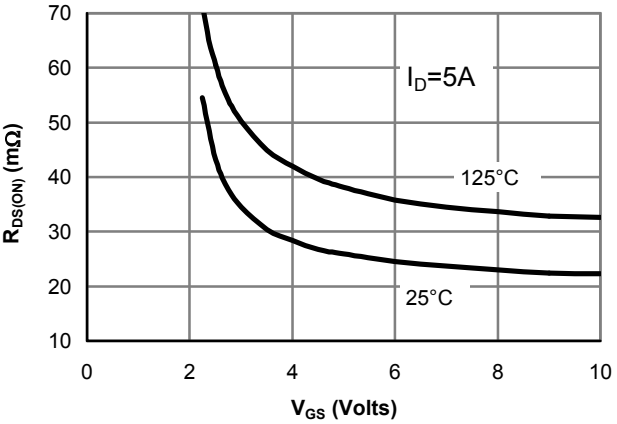


Figure 5: On-Resistance vs. Gate-Source Voltage

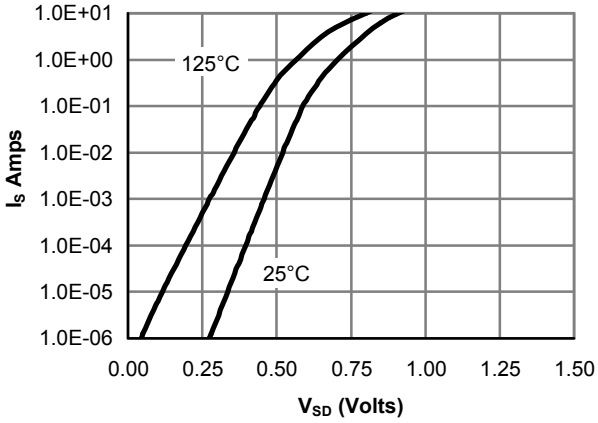


Figure 6: Body diode characteristics

TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

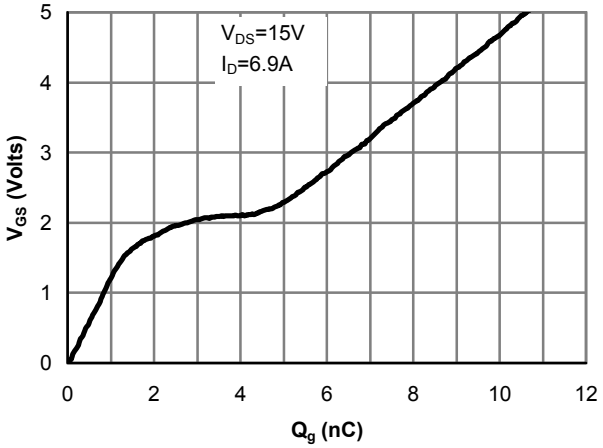


Figure 7: Gate-Charge characteristics

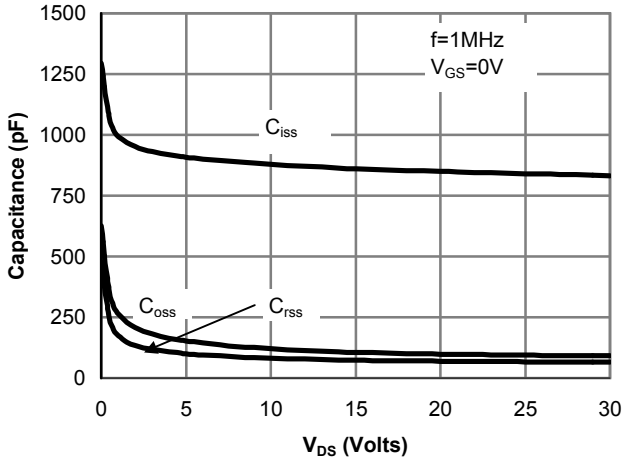


Figure 8: Capacitance Characteristics

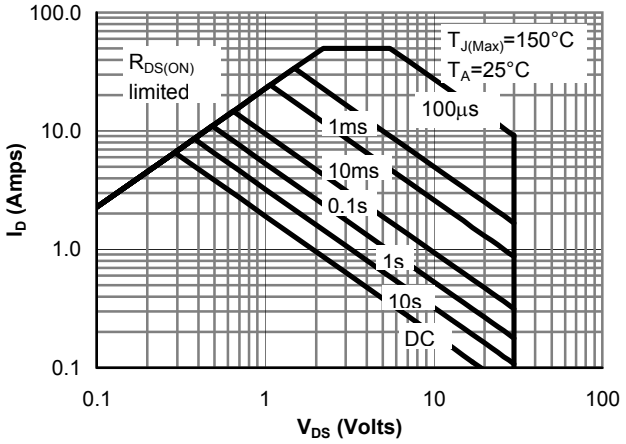


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

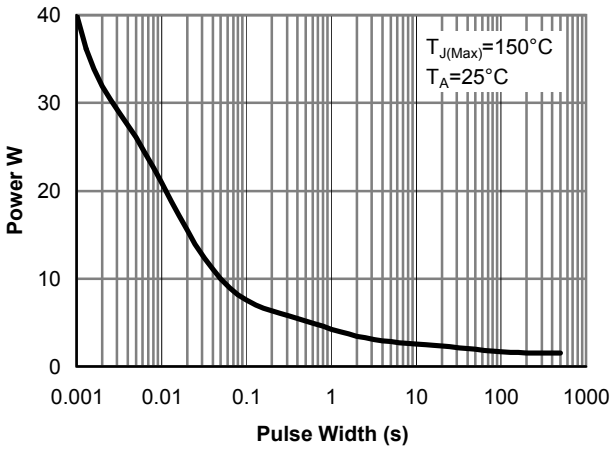


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

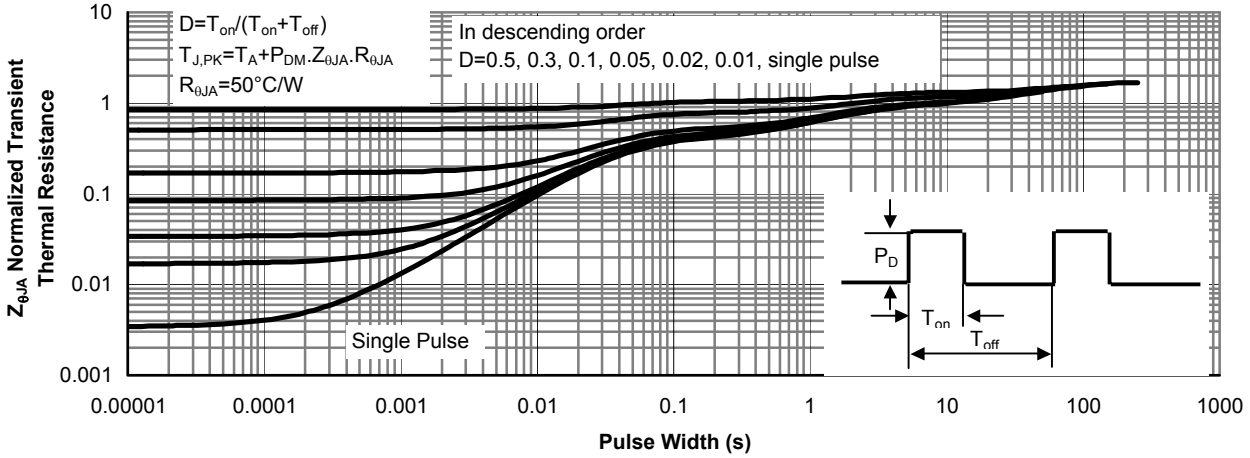


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL P-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

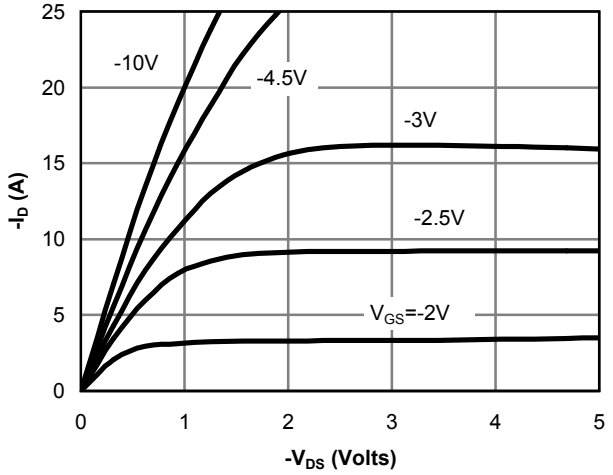


Fig 1: On-Region Characteristics

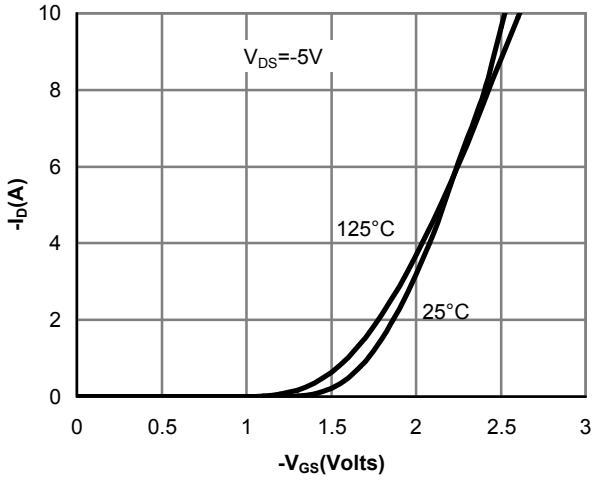


Figure 2: Transfer Characteristics

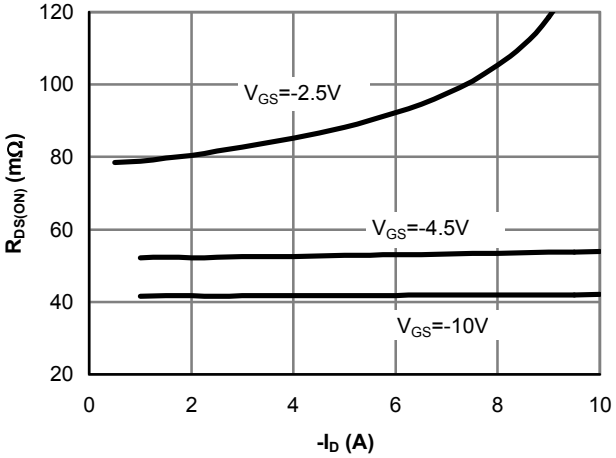


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

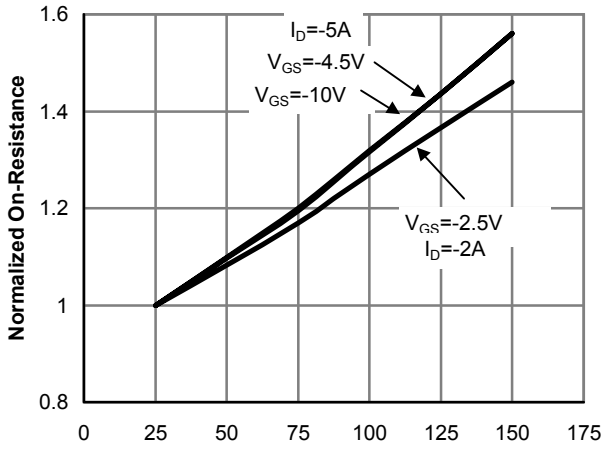


Figure 4: On-Resistance vs. Junction Temperature

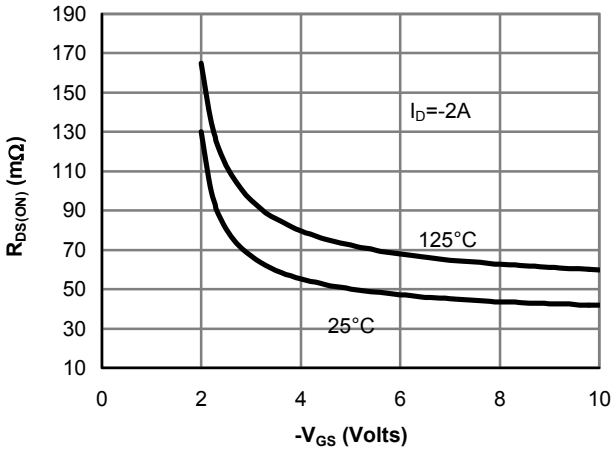


Figure 5: On-Resistance vs. Gate-Source Voltage

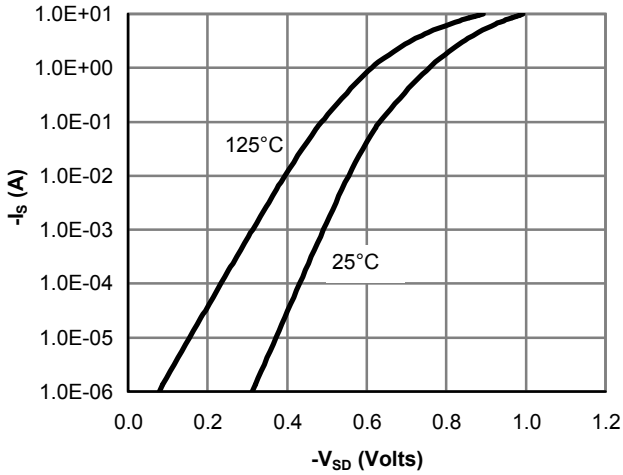


Figure 6: Body-Diode Characteristics

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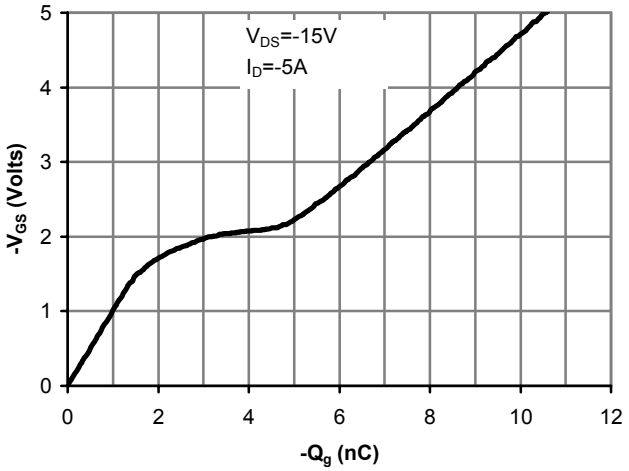


Figure 7: Gate-Charge Characteristics

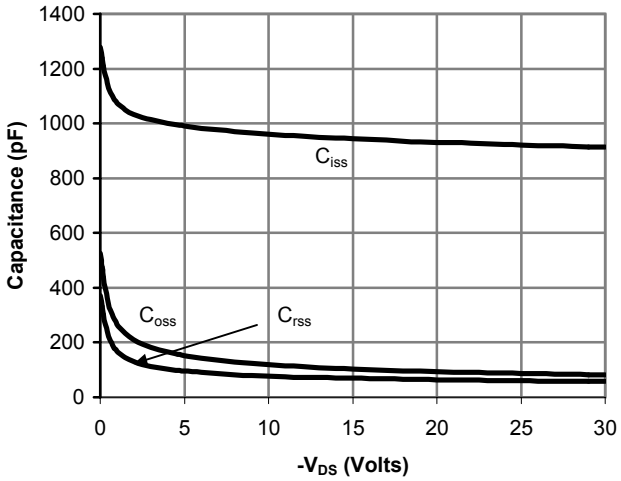
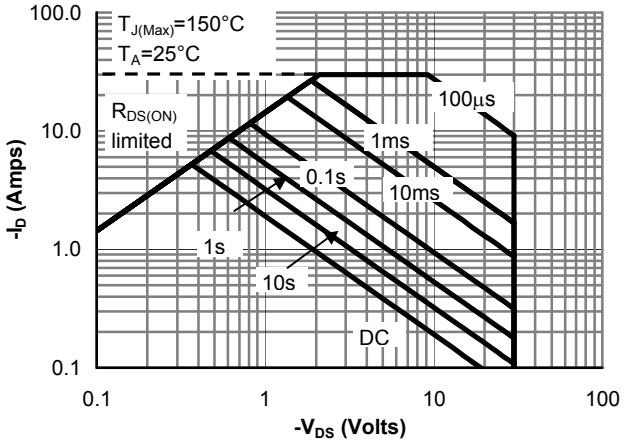


Figure 8: Capacitance Characteristics



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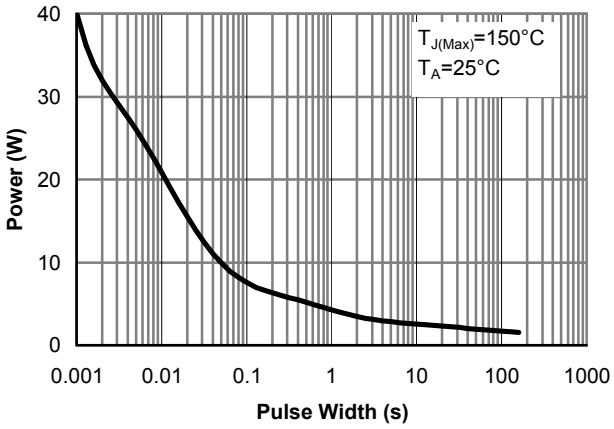

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

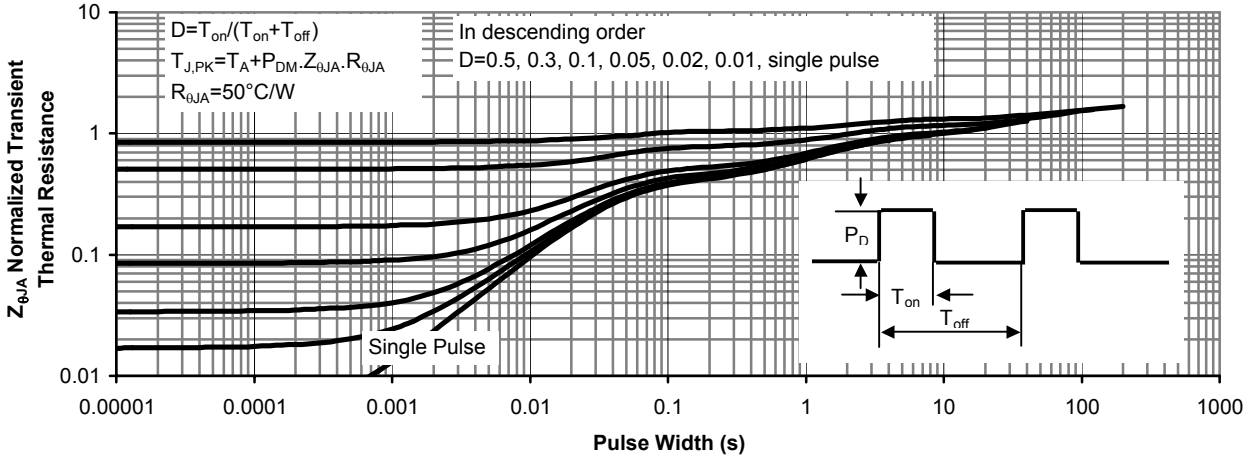

Figure 11: Normalized Maximum Transient Thermal Impedance