ALPHA & OMEGA SEMICONDUCTOR

AO6603
Complementary Enhancement Mode Field Effect Transistor

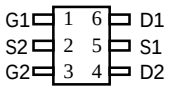
General Description

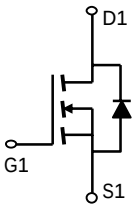
The AO6603 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications.
Standard Product AO6603 is Pb-free (meets ROHS & Sony 259 specifications). AO6603L is a Green Product ordering option. AO6603 and AO6603L are electrically identical.

Features

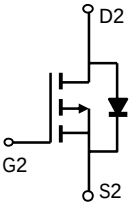
	n-channel	p-channel
V_{DS} (V) =	20V	-30V
I_D = 1.7 (V_{GS} = 4.5V)		-2.5A
$R_{DS(ON)}$		
< 225mΩ (V_{GS} = 4.5V)		< 135mΩ (V_{GS} = -10V)
< 290mΩ (V_{GS} = 2.5V)		< 185mΩ (V_{GS} = 2.5V)
< 425mΩ (V_{GS} = 1.8V)		< 265mΩ (V_{GS} = 1.8V)

TSOP6
Top View





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}	20	-30	V
Gate-Source Voltage		V_{GS}	±8	±12	V
Continuous Drain Current [A]	T_A=25°C	I_D	1.7	-2.3	A
	T_A=70°C		1.4	-1.8	
Pulsed Drain Current [B]		I_{DM}	15	-30	
Power Dissipation	T_A=25°C	P_D	1.15	1.15	W
	T_A=70°C		0.73	0.73	
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	$R_{\theta JA}$	78	110	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		106	150	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	64	80	°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	20			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=16V, V_{GS}=0V			1	μA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			25	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250μA	0.4	0.55	0.8	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	5			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=4.5V, I_D=1.7A		186	225	mΩ
		T_J=125°C		262	315	
		V_{GS}=2.5V, I_D=1A		241	290	mΩ
		V_{GS}=1.8V, I_D=0.7A		326	425	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=1.7A		2.8		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.69	1	V
I_S	Maximum Body-Diode Continuous Current				0.4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz		101	125	pF
C_{oss}	Output Capacitance			17		pF
C_{rss}	Reverse Transfer Capacitance			14		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		3	4	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=1.7A		1.57	8.1	nC
Q_{gs}	Gate Source Charge			0.13		nC
Q_{gd}	Gate Drain Charge			0.36		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=5V, V_{DS}=10V, R_L=3Ω, R_{GEN}=3Ω		3.2		ns
t_r	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off DelayTime			15.5		ns
t_f	Turn-Off Fall Time			2.4		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=1A, dI/dt=100A/μs		6.7	16	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=1A, dI/dt=100A/μs		1.6		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. 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.

Rev 2: Sept 2005

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

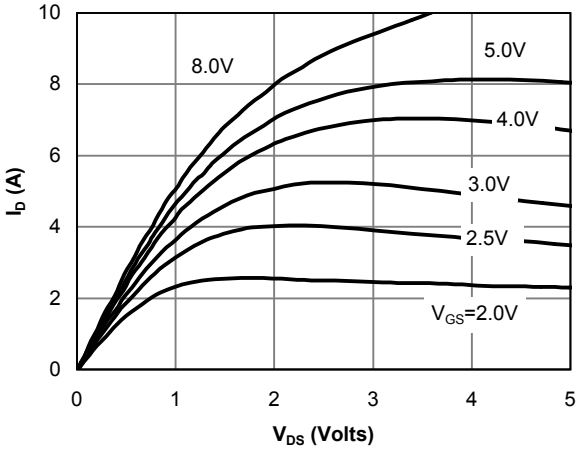


Fig 1: On-Region Characteristics

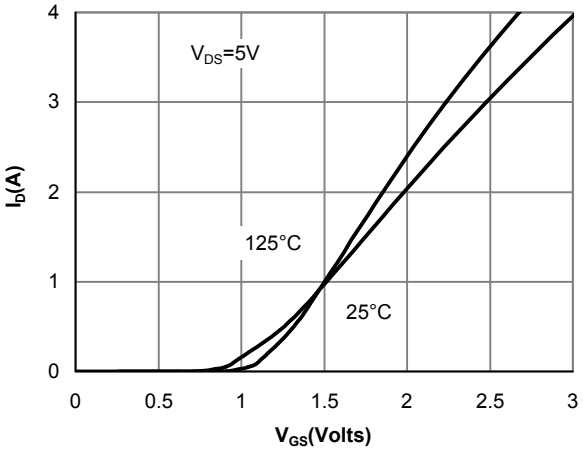


Figure 2: Transfer Characteristics

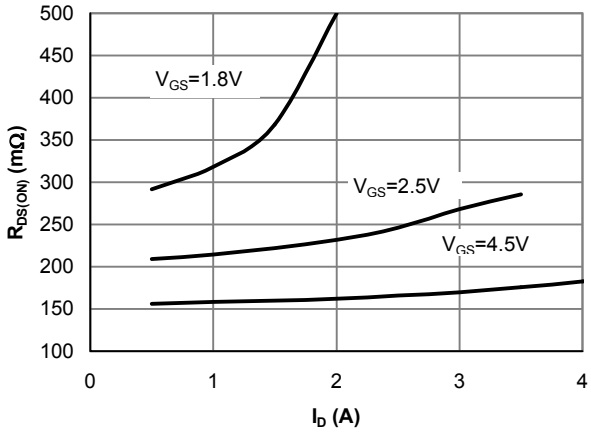


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

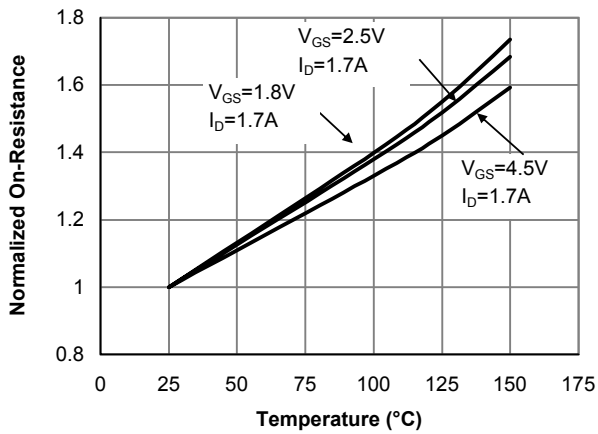


Figure 4: On-Resistance vs. Junction Temperature

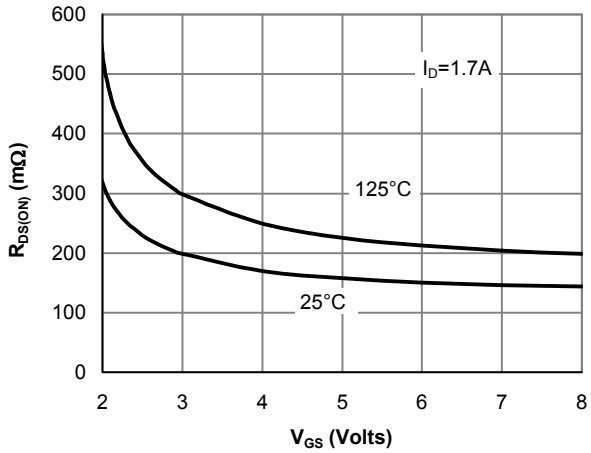


Figure 5: On-Resistance vs. Gate-Source Voltage

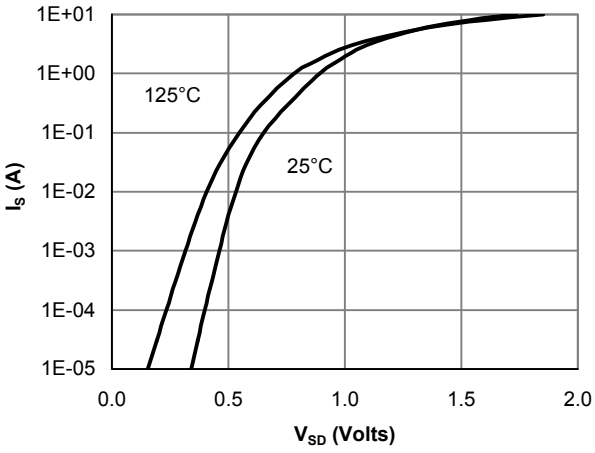


Figure 6: Body-Diode Characteristics

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

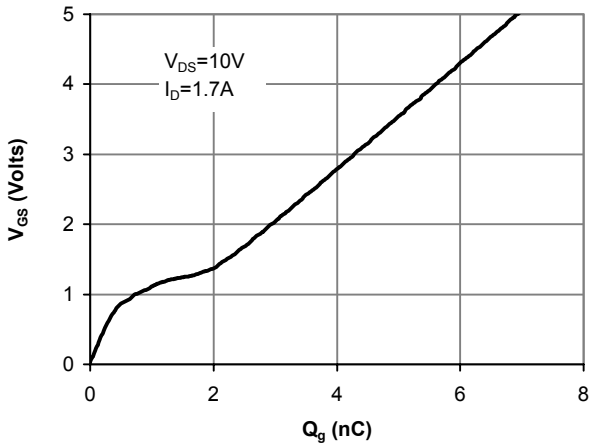


Figure 7: Gate-Charge Characteristics

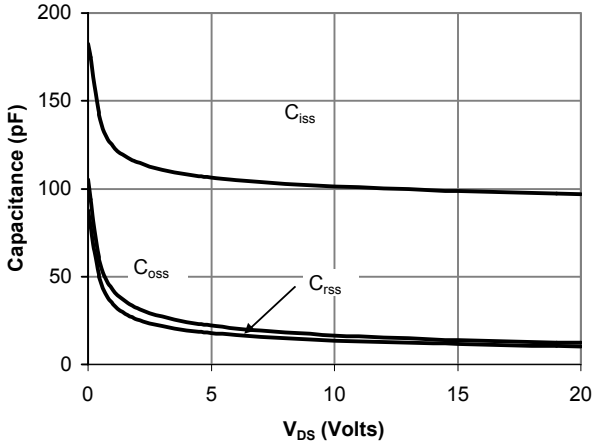


Figure 8: Capacitance Characteristics

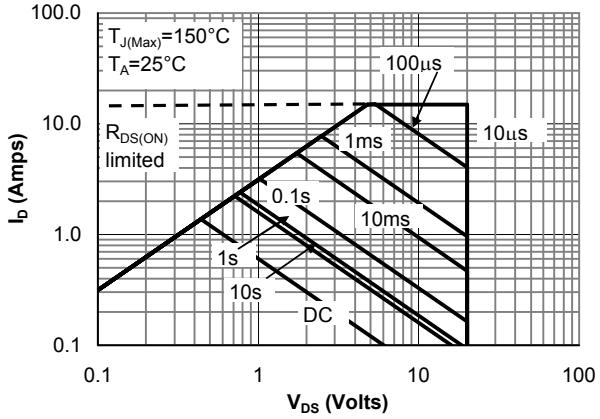


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

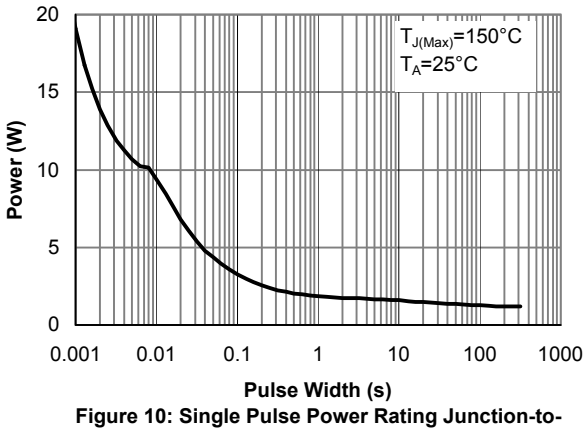


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

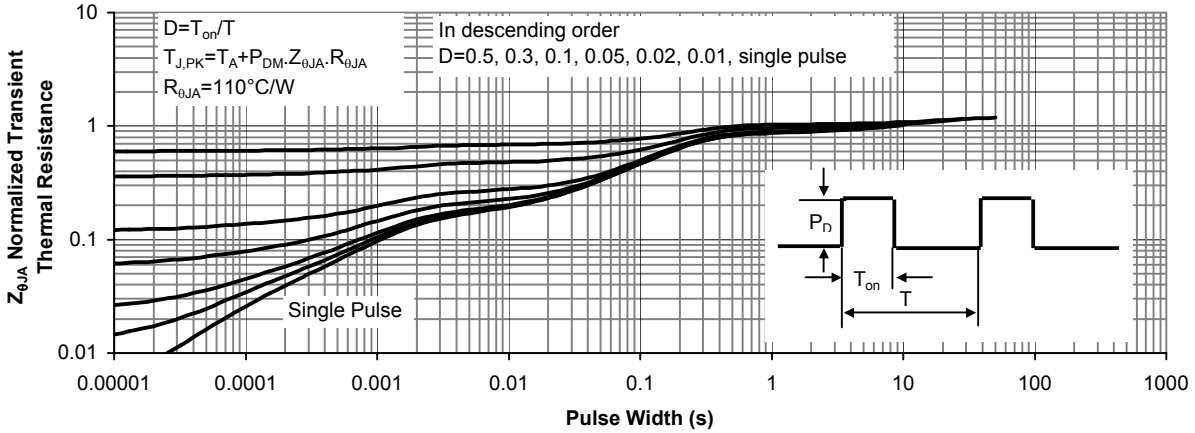


Figure 11: Normalized Maximum Transient Thermal Impedance

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	-0.6	-1	-1.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-10			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-2.3A		107	135	mΩ
		T_J=125°C				
		V_{GS}=-4.5V, I_D=-2A		135	185	mΩ
		V_{GS}=-2.5V, I_D=-1A		195	265	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-2.3A		8		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.85	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.35	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		409		pF
C_{oss}	Output Capacitance			55		pF
C_{rss}	Reverse Transfer Capacitance			42		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		12		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-15V, I_D=-2.5A		0.72		nC
Q_{gs}	Gate Source Charge			1.34		nC
Q_{gd}	Gate Drain Charge			4.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-15V, R_L=6Ω, R_{GEN}=6Ω		8.5		ns
t_r	Turn-On Rise Time			10		ns
$t_{D(off)}$	Turn-Off DelayTime			55		ns
t_f	Turn-Off Fall Time			25.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-2.5A, dI/dt=100A/µs		26		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-2.5A, dI/dt=100A/µs		15.6		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. The current rating is based on the t≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

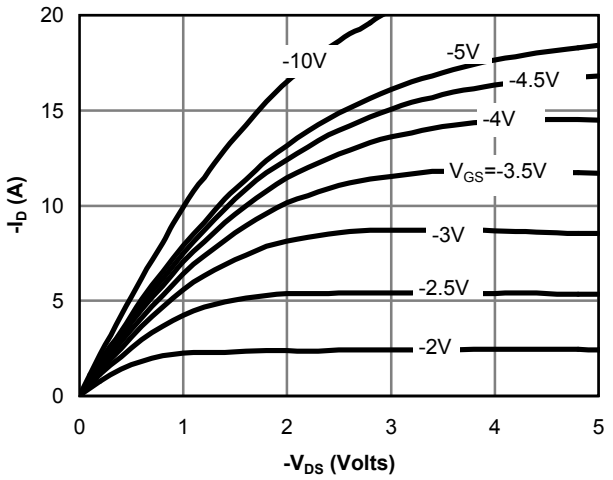
C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 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.

 Rev2: August 2005

P-CHANNEL: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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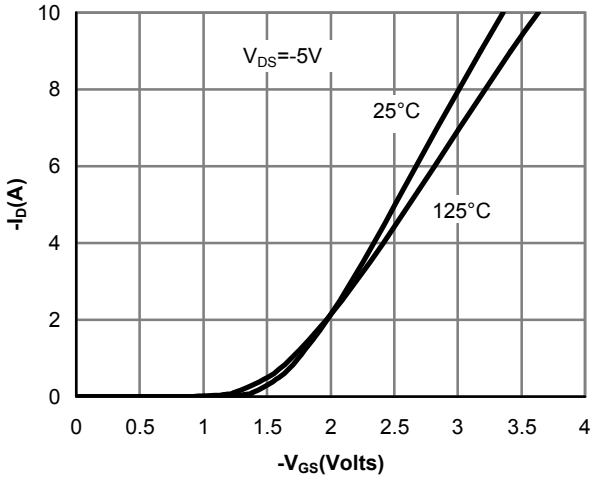


Figure 2: Transfer Characteristics

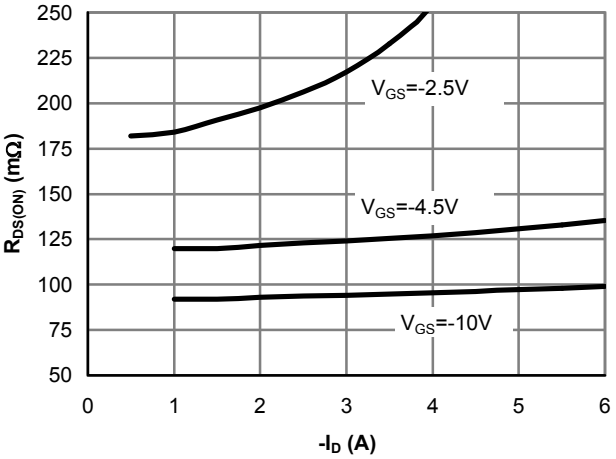


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

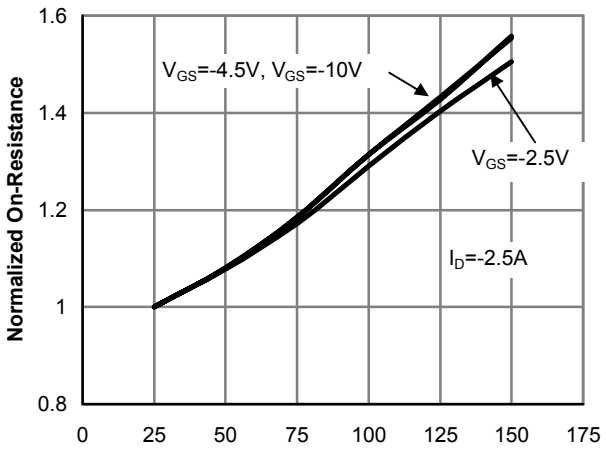
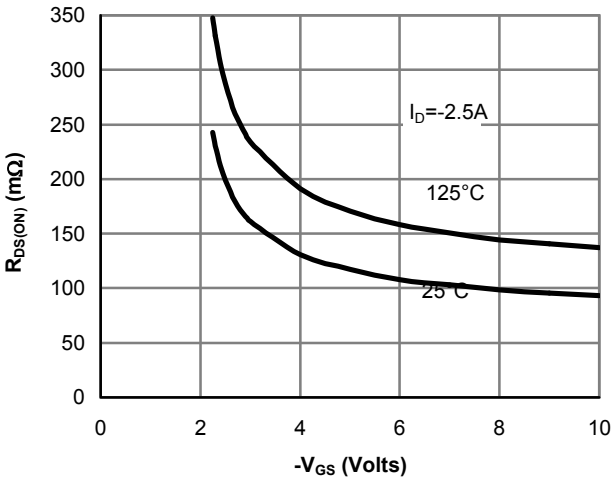


Figure 4: On-Resistance vs. Junction Temperature



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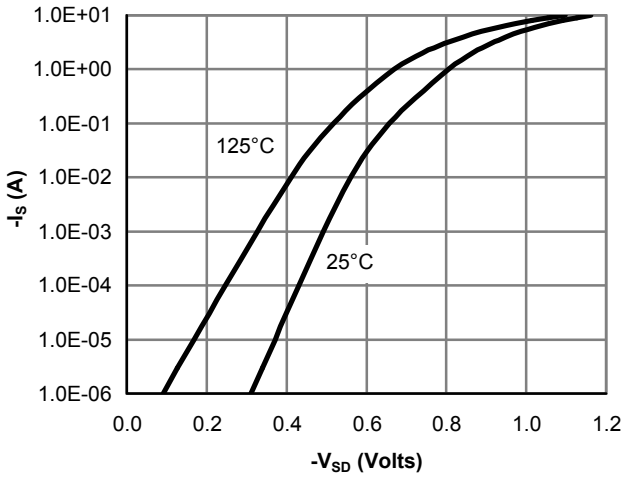

Figure 6: Body-Diode Characteristics

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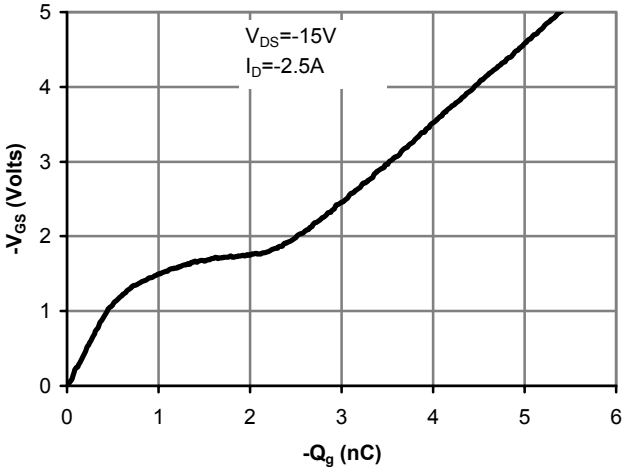

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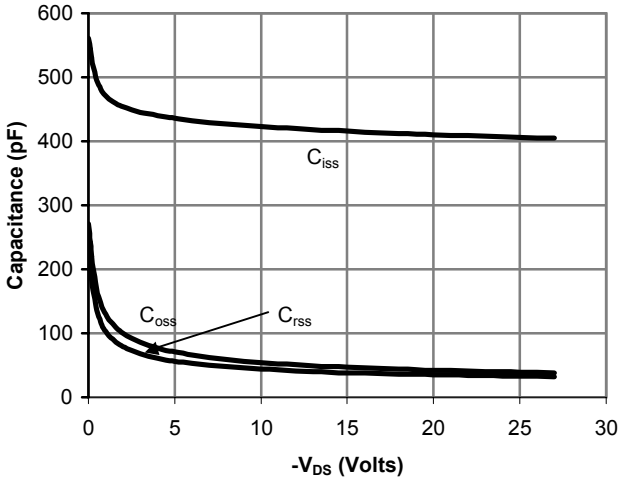

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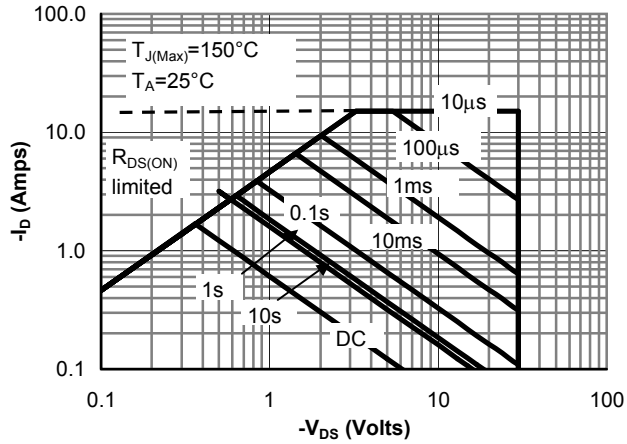

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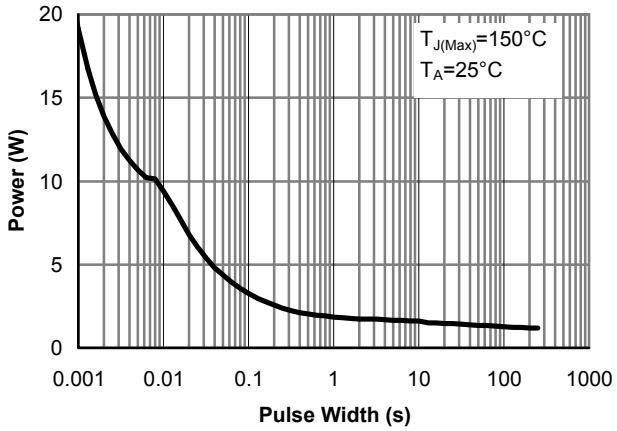

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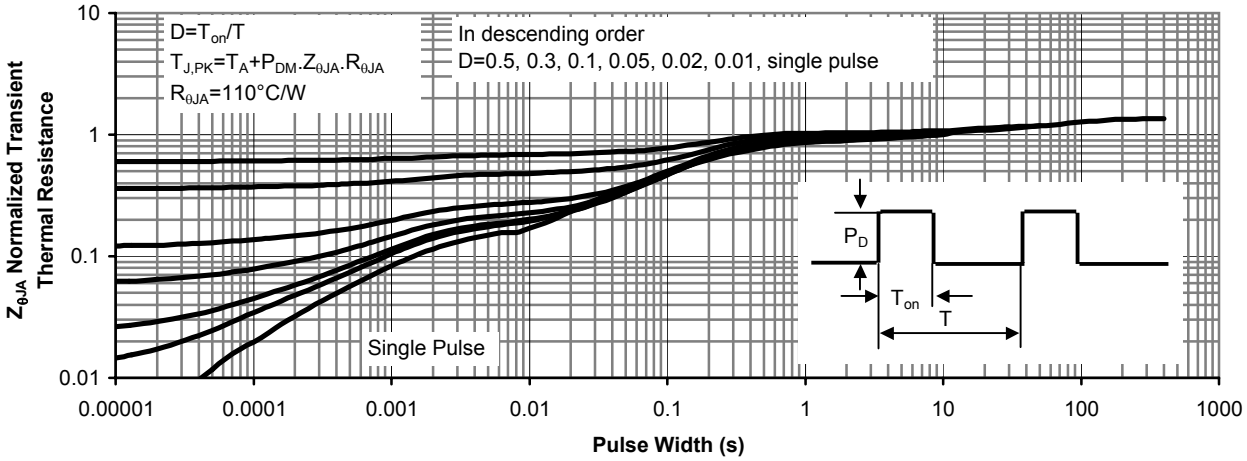

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