ALPHA & OMEGA SEMICONDUCTOR

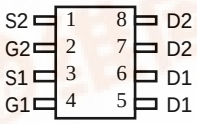
AOP606
Complementary Enhancement Mode Field Effect Transistor

General Description

The AOP606 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in inverter and other PWM applications. Standard Product AOP606 is Pb-free (meets ROHS & Sony 259 specifications). AOP606L is a Green Product ordering option. AOP606 and AOP606L are electrically identical.

Features

n-channel	p-channel
V_{DS} (V) = 60V	-60V
I_D = 7.9A (V_{GS}=10V)	-6.1A
$R_{DS(ON)}$	$R_{DS(ON)}$
< 25mΩ (V_{GS}=10V)	< 42mΩ (V_{GS} = -10V)
< 30mΩ (V_{GS}=4.5V)	< 52mΩ (V_{GS} = -4.5V)



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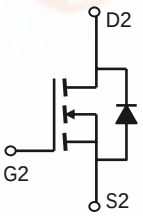
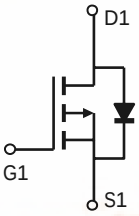


n-channel



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}	60	-60	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current [A]	T_A=25°C	I_D	7.9	-6.1	A
	T_A=70°C		6.3	-4.9	
Pulsed Drain Current [B]		I_{DM}	40	-30	
Power Dissipation	T_A=25°C	P_D	3.1	3.1	W
	T_A=70°C		2	2	
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	Device	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	n-ch	30	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		n-ch	66	85	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	n-ch	25	35	°C/W
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	p-ch	30	40	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		p-ch	66	85	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	p-ch	25	35	°C/W

N Channel 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	60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=48V, V_{GS}=0V			1	µA
		T_J=55°C			5	
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	2.1	3	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=7.9A		17.8	25	mΩ
		T_J=125°C		32.2	42	
		V_{GS}=4.5V, I_D=7.1A		19.7	30	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=7.9A		30		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.74	1	V
I_S	Maximum Body-Diode Continuous Current				4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		1920	2300	pF
C_{oss}	Output Capacitance			155		pF
C_{rss}	Reverse Transfer Capacitance			116		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.65	0.8	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=30V, I_D=7.9A		47.6	68	nC
Q_g(4.5V)	Total Gate Charge			24.2	30	nC
Q_{gs}	Gate Source Charge			6		nC
Q_{gd}	Gate Drain Charge			14.4		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=30V, R_L=3.9Ω, R_{GEN}=3Ω		7.4		ns
t_r	Turn-On Rise Time			5.1		ns
$t_{D(off)}$	Turn-Off DelayTime			28.2		ns
t_f	Turn-Off Fall Time			5.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=7.9A, dI/dt=100A/µs		34	41	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=7.9A, dI/dt=100A/µs		46		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 3: Sept 2005

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

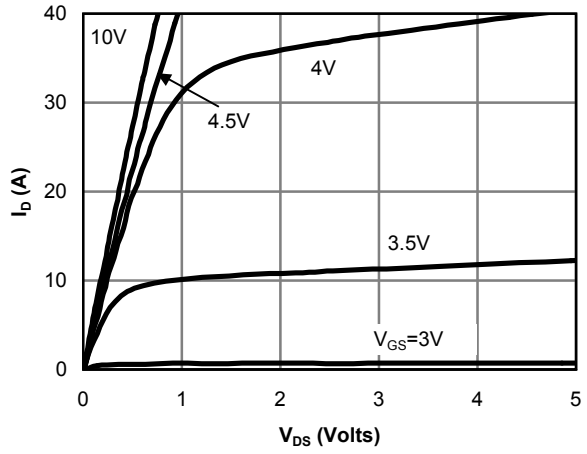


Fig 1: On-Region Characteristics

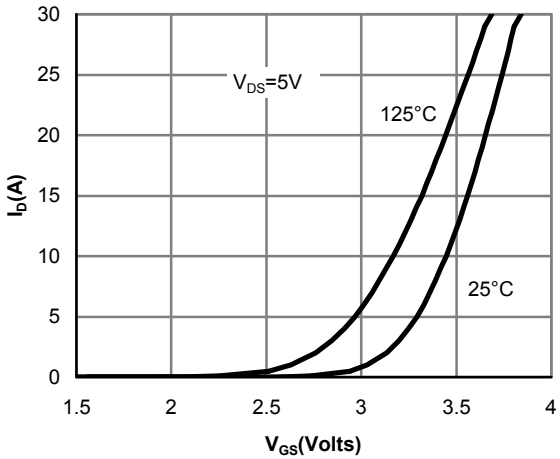


Figure 2: Transfer Characteristics

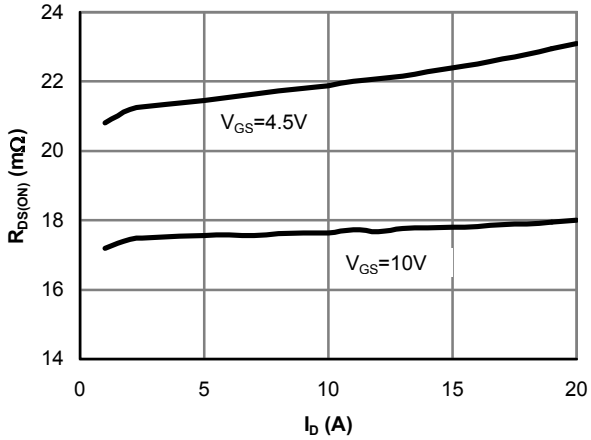


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

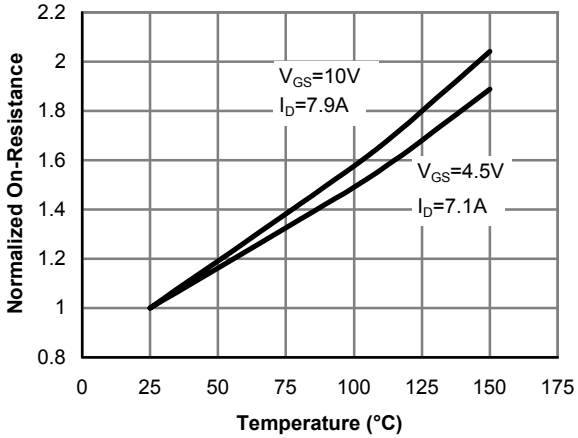


Figure 4: On-Resistance vs. Junction Temperature

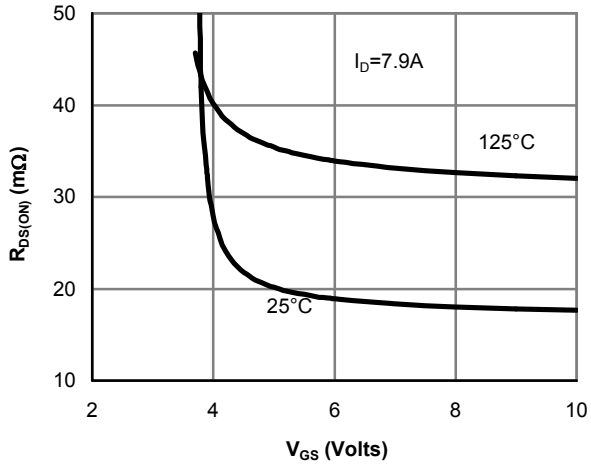


Figure 5: On-Resistance vs. Gate-Source Voltage

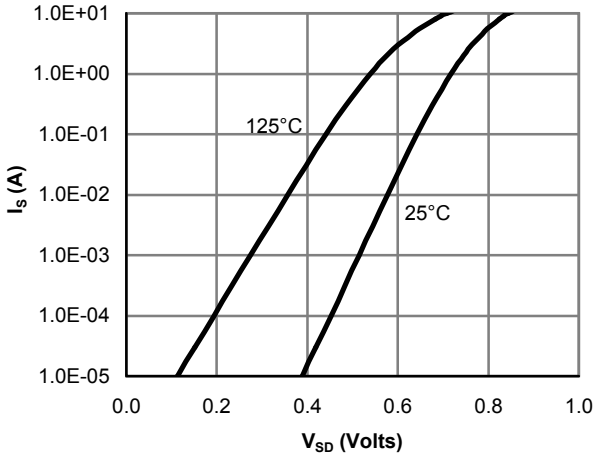


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

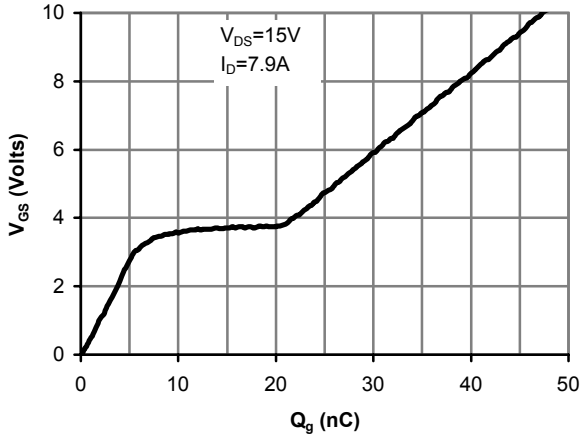


Figure 7: Gate-Charge Characteristics

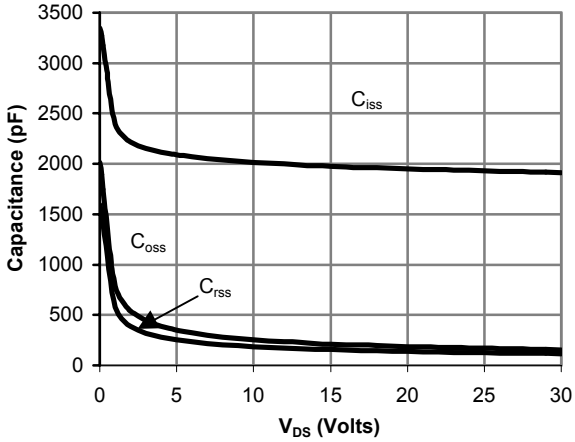


Figure 8: Capacitance Characteristics

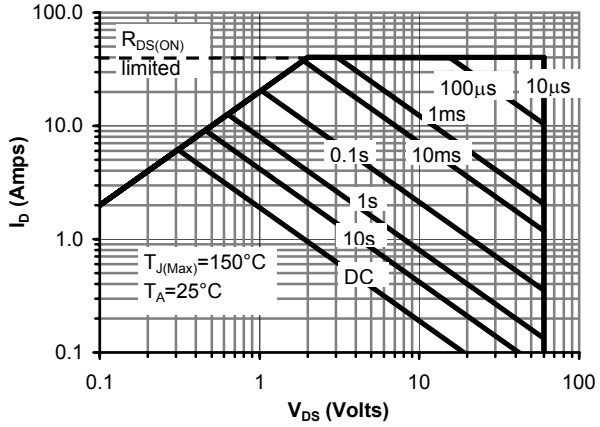


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

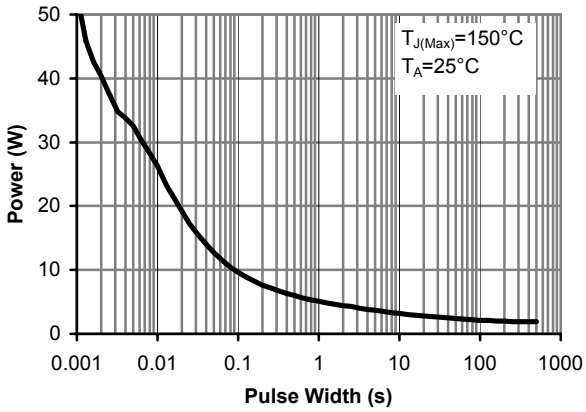


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

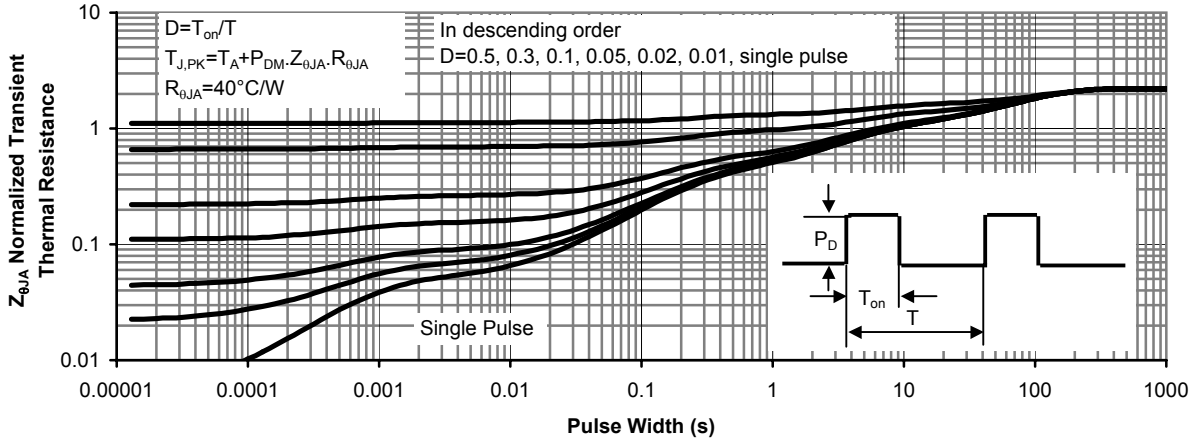


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel 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	-60			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=-48V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
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	-1.2	-1.9	-2.4	V
$I_{D(ON)}$	On state drain current	V_{GS}=-10V, V_{DS}=-5V	-30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V, I_D=-6.1A		34	42	mΩ
		T_J=125°C		58	72	
		V_{GS}=-4.5V, I_D=-5.5A		42	52	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-6.1A		17.8		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.73	-1	V
I_S	Maximum Body-Diode Continuous Current				-3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-30V, f=1MHz		2417	2900	pF
C_{oss}	Output Capacitance			179		pF
C_{rss}	Reverse Transfer Capacitance			120		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		1.9	2.3	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge (10V)	V_{GS}=-10V, V_{DS}=-30V, I_D=-6.1A		45.2	55	nC
Q_g(4.5V)	Total Gate Charge (4.5V)			22.8	28	nC
Q_{gs}	Gate Source Charge			5.8		nC
Q_{gd}	Gate Drain Charge			9.6		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-10V, V_{DS}=-30V, R_L=4.7Ω, R_{GEN}=3Ω		9.8		ns
t_r	Turn-On Rise Time			6.1		ns
$t_{D(off)}$	Turn-Off DelayTime			44		ns
t_f	Turn-Off Fall Time			12.7		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-6.1A, dI/dt=100A/µs		32	42	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-6.1A, dI/dt=100A/µs		42		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.

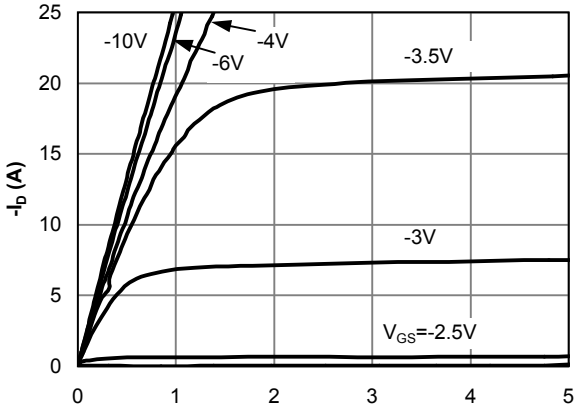
C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

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

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL



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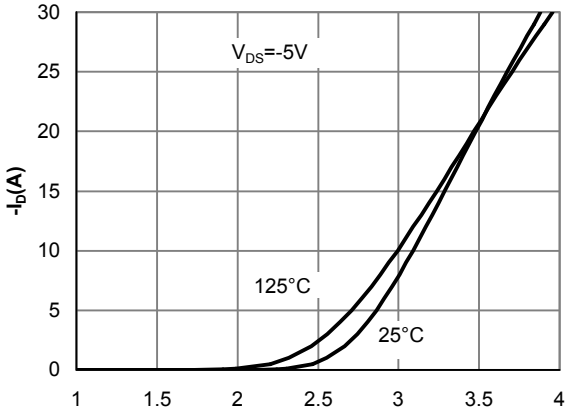


Figure 2: Transfer Characteristics

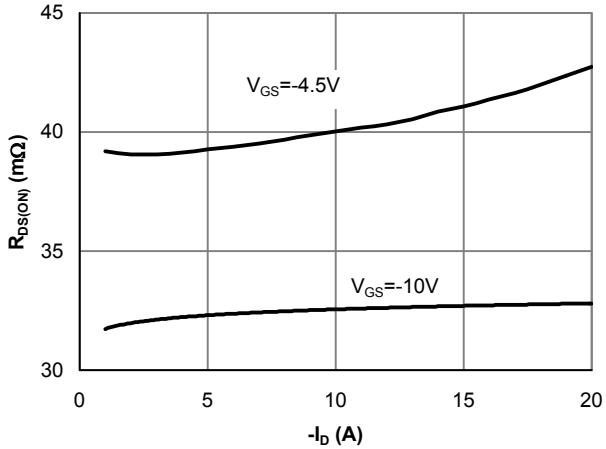


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

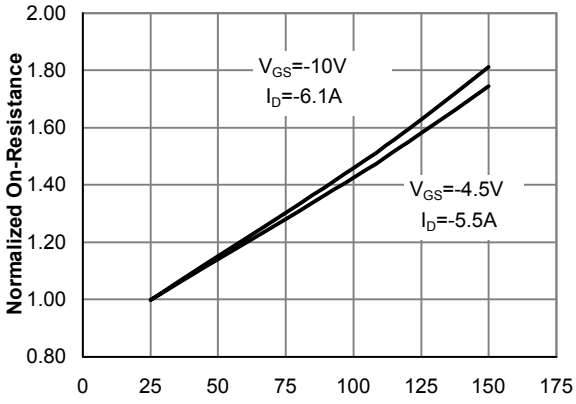
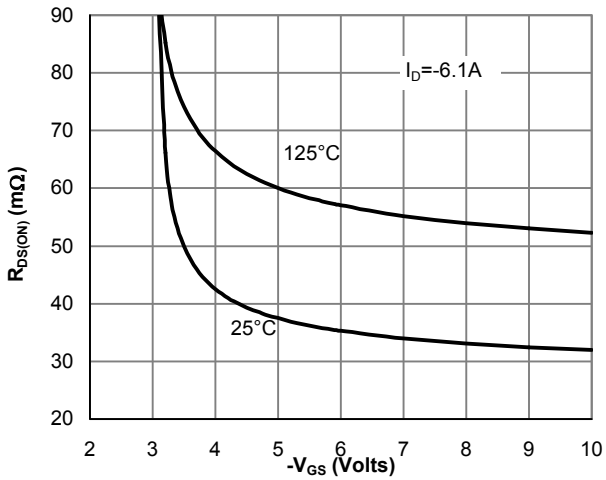


Figure 4: On-Resistance vs. Junction Temperature



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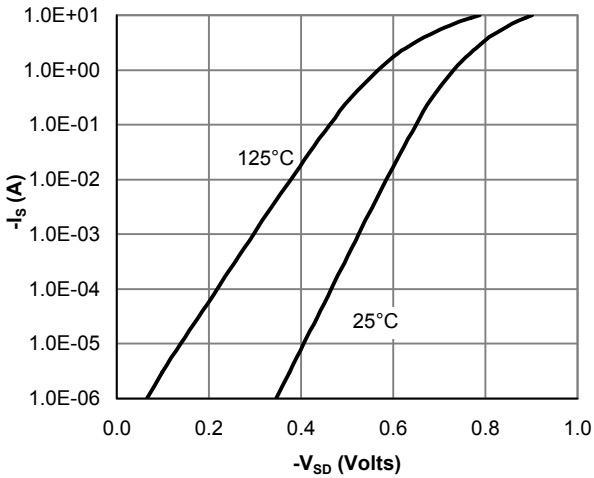

Figure 6: Body-Diode Characteristics

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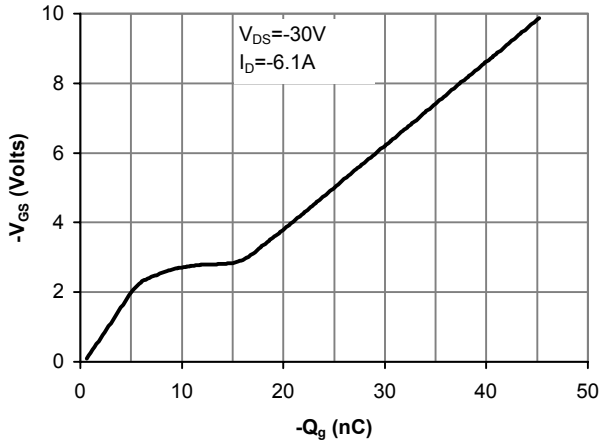

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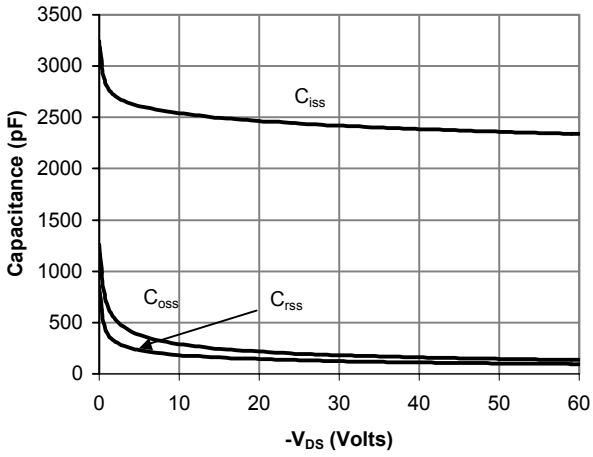

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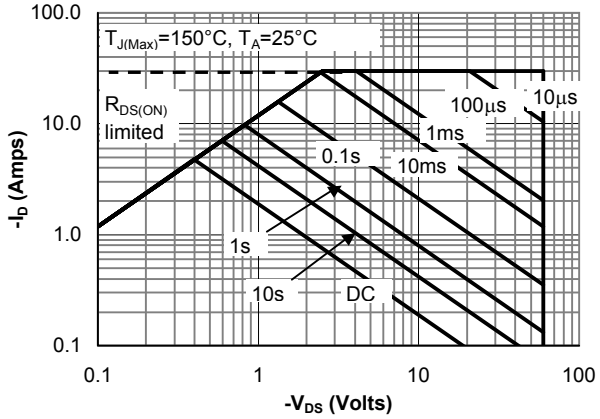

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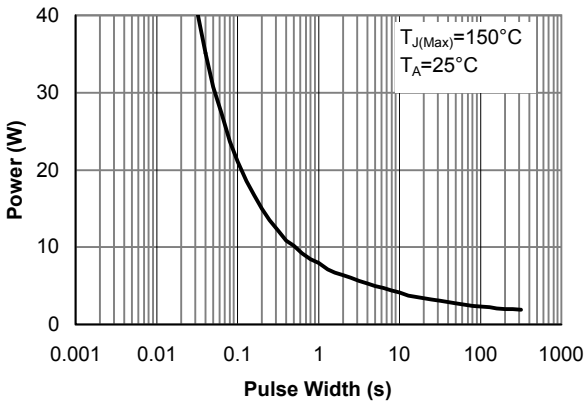

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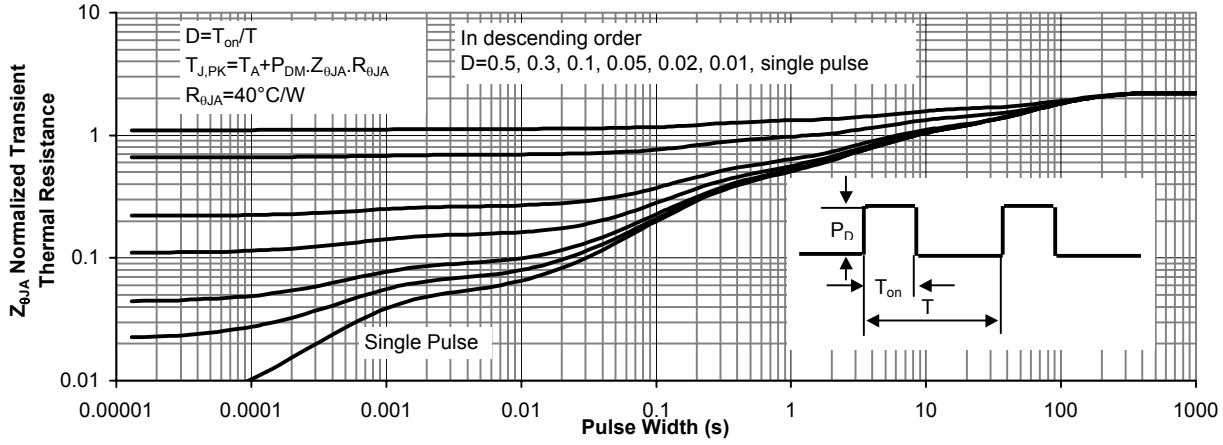

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