



AOP610

Complementary Enhancement Mode Field Effect Transistor

General Description

The AOP610 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications. A Schottky diode in parallel with the n-channel FET reduces body diode related losses. It is ESD protected.

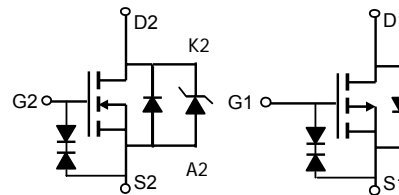
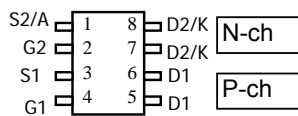
Standard product AOP610 is Pb-free (meets ROHS & Sony 259 specifications). AOP610L is a Green Product ordering option. AOP610 and AOP610L are electrically identical.

Features

n-channel	p-channel
$V_{DS} (V) = 30V$	-30V
$I_D = 7.7A (V_{GS}=10V)$	-6.2A ($V_{GS}=10V$)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 24m Ω ($V_{GS}=10V$)	< 39m Ω ($V_{GS} = -10V$)
< 42m Ω ($V_{GS}=4.5V$)	< 56m Ω ($V_{GS} = -4.5V$)

ESD rating: 2000V (HBM)

PDIP-8



n-channel

p-channel

Absolute Maximum Ratings $T_A=25^\circ C$ 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}	± 20	± 20	V
Continuous Drain Current ^A	$T_A=25^\circ C$	7.7	-6.2	A
		$T_A=70^\circ C$	6.1	
Pulsed Drain Current ^B	I_{DM}	30	-30	A
Power Dissipation	$T_A=25^\circ C$	2.3	2.3	W
	$T_A=70^\circ C$	1.45	1.45	
Avalanche Current ^B	I_{AR}	10	15	A
Repetitive avalanche energy 0.3mH ^B	E_{AR}	15	33	mJ
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

Thermal Characteristics: n-channel+schottky and p-channel

Parameter	Symbol	Typ	Max		Units	
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	n-ch	45	55	$^\circ C/W$
			n-ch	78	95	$^\circ C/W$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	n-ch	30	40	$^\circ C/W$
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	p-ch	38.5	55	$^\circ C/W$
			p-ch	78	95	$^\circ C/W$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	p-ch	28	40	$^\circ C/W$

N-Channel+Schottky 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		2	50 125	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1	2	3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =7.7A T _J =125°C		20 29	24 35	mΩ
		V _{GS} =4.5V, I _D =4A		32	42	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =7.7A	10	18		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.5	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		543	630	pF
C _{OSS}	Output Capacitance			142		pF
C _{RSS}	Reverse Transfer Capacitance			76		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.1	3	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =7.7A		11	15	nC
Q _g (4.5V)	Total Gate Charge			5.3	7	nC
Q _{gs}	Gate Source Charge			1.9		nC
Q _{gd}	Gate Drain Charge			4		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =1.9Ω, R _{GEN} =3Ω		4.7	7	ns
t _r	Turn-On Rise Time			4.9	10	ns
t _{D(off)}	Turn-Off DelayTime			16.2	22	ns
t _f	Turn-Off Fall Time			3.5	7	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =7.7A, dI/dt=100A/μs		15.7	20	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =7.7A, dI/dt=100A/μs		7.9	10	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 ts 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. R_{θJL} and R_{θJC} are equivalent terms referring to thermal resistance from junction to drain lead.

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 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: Rev 3: Jul 2006

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N-CH+SCHOTTKY TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

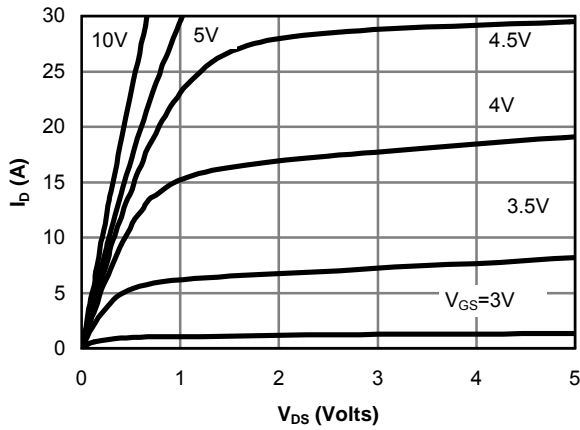


Fig 1: On-Region Characteristics

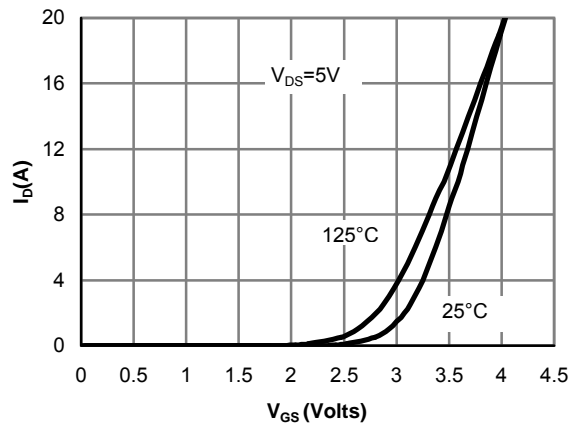


Figure 2: Transfer Characteristics

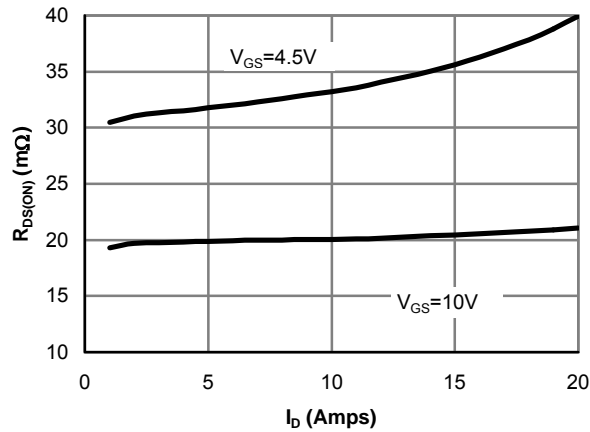


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

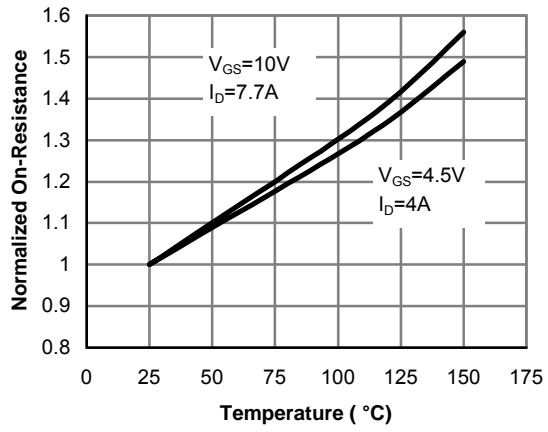


Figure 4: On-Resistance vs. Junction Temperature

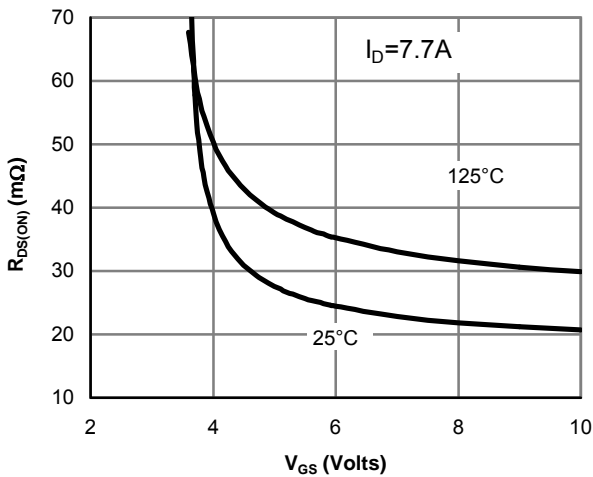


Figure 5: On-Resistance vs. Gate-Source Voltage

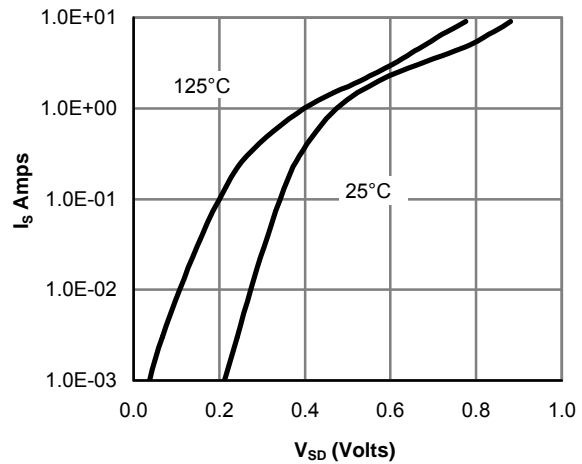


Figure 6: Body diode characteristics

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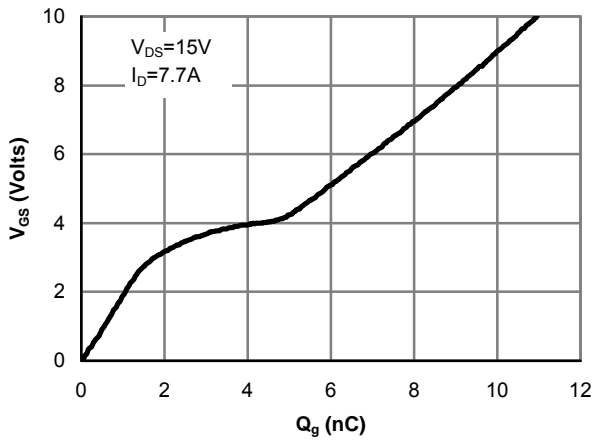


Figure 7: Gate-Charge characteristics

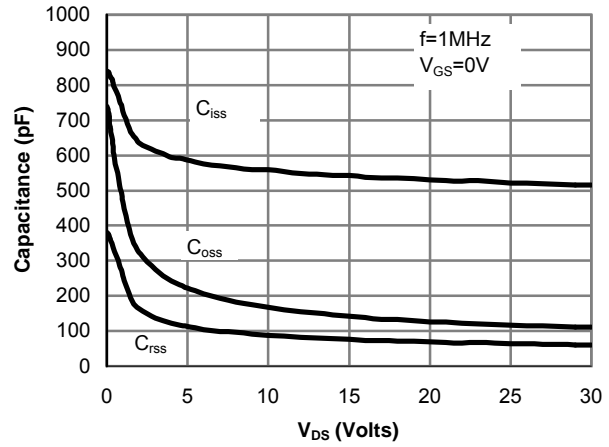


Figure 8: Capacitance Characteristics

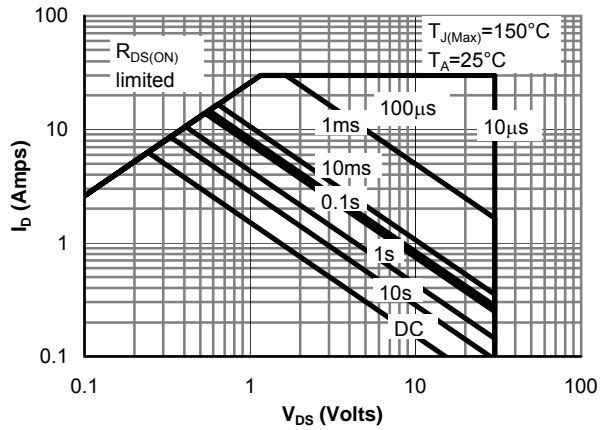


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

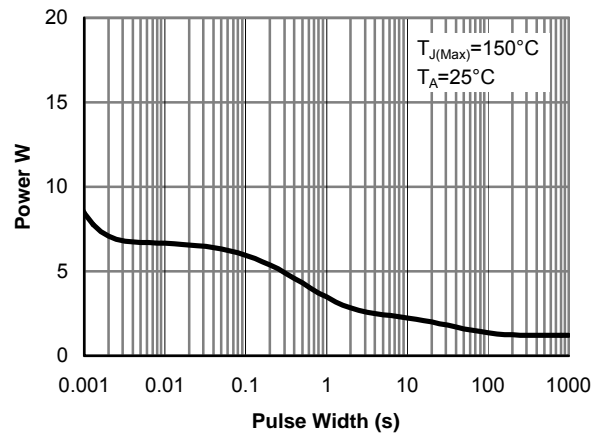


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

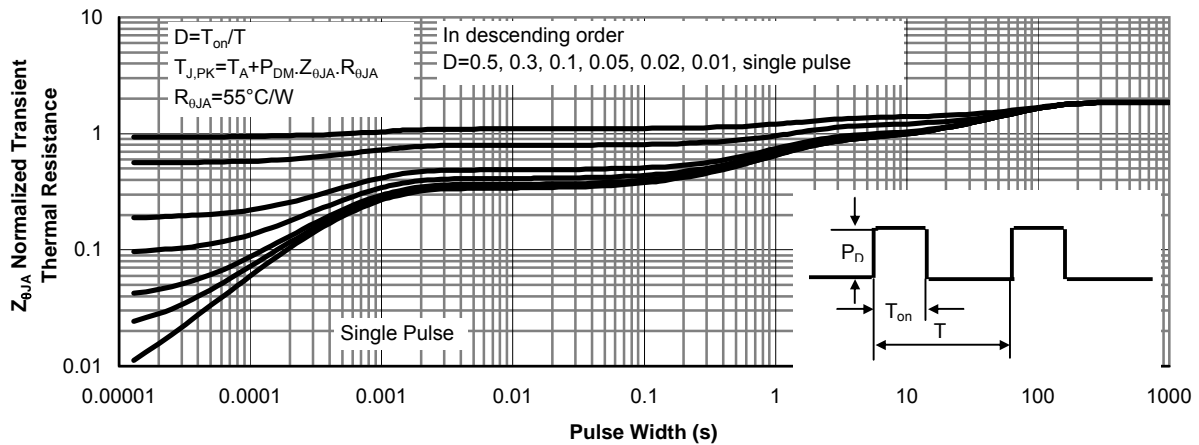


Figure 11: Normalized Maximum Transient Thermal Impedance

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	-30			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-24V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			10	μA
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} =-10V, V _{DS} =-5V	30			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-6.2A T _J =125°C		32 43	39 52	mΩ
		V _{GS} =-4.5V, I _D =4A		45	56	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-6.2A		12.5		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.77	-1	V
I _S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance			1040	1250	pF
C _{oss}	Output Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		179		pF
C _{rss}	Reverse Transfer Capacitance			134		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		5	10	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge (10V)			16.8	22	nC
Q _{g(4.5V)}	Total Gate Charge (4.5V)			8.7	12	nC
Q _{gs}	Gate Source Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-6.2A		3.4		nC
Q _{gd}	Gate Drain Charge			5		nC
t _{D(on)}	Turn-On DelayTime			9	12	ns
t _r	Turn-On Rise Time	V _{GS} =-10V, V _{DS} =-15V, R _L =2.5Ω,		5.7	11	ns
t _{D(off)}	Turn-Off DelayTime	R _{GEN} =3Ω		22.7	30	ns
t _f	Turn-Off Fall Time			10.2	20	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-6.2A, dI/dt=100A/μs		21.7	27	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-6.2A, dI/dt=100A/μs		13.6	18	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 ts 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. R_{θJL} and R_{θJC} are equivalent terms referring to thermal resistance from junction to drain lead.

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 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.

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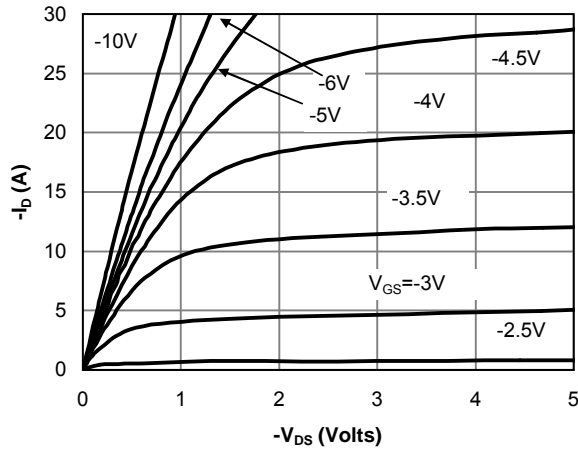


Fig 1: On-Region Characteristics

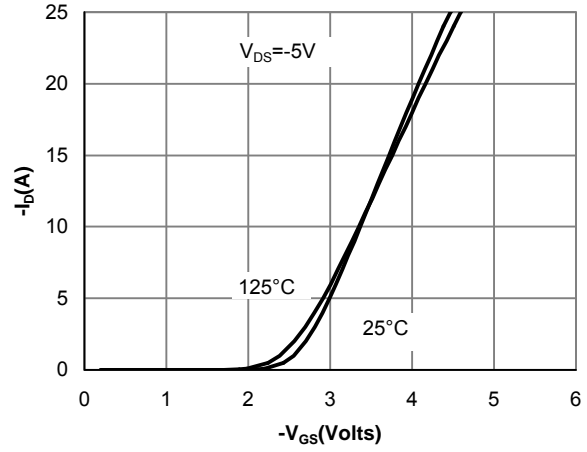


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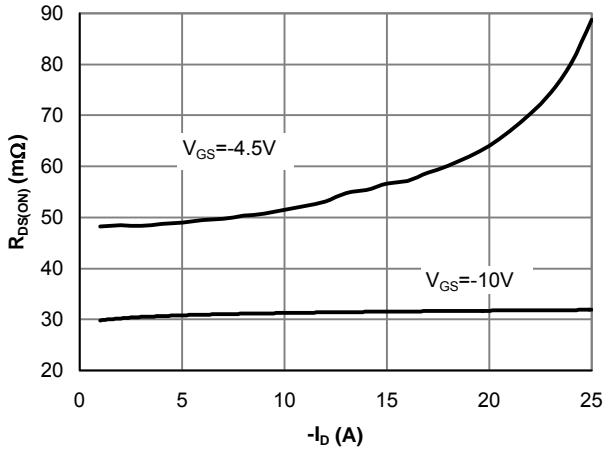


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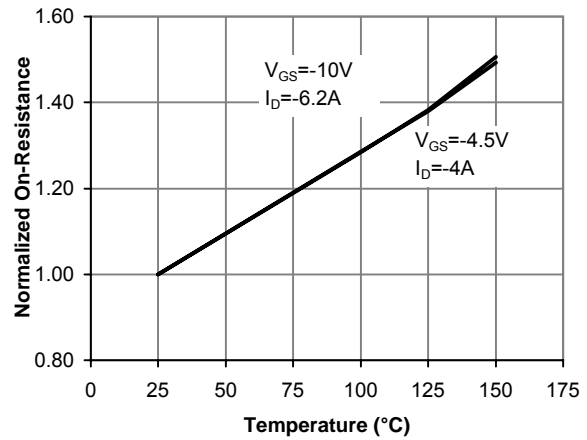


Figure 4: On-Resistance vs. Junction Temperature

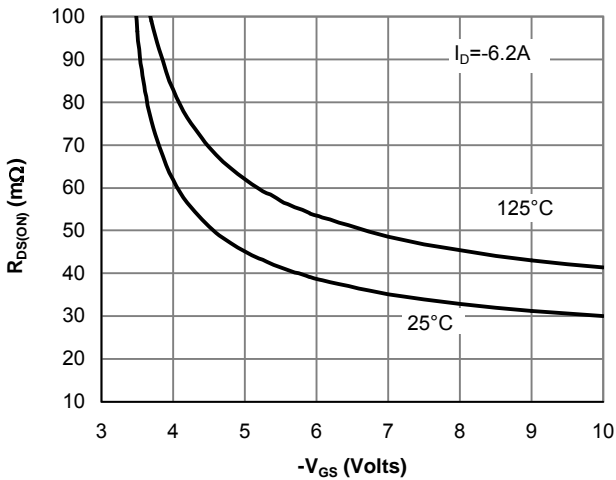


Figure 5: On-Resistance vs. Gate-Source Voltage

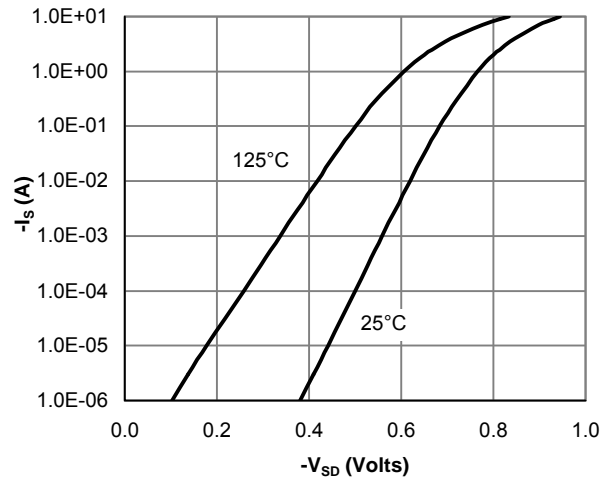


Figure 6: Body-Diode Characteristics

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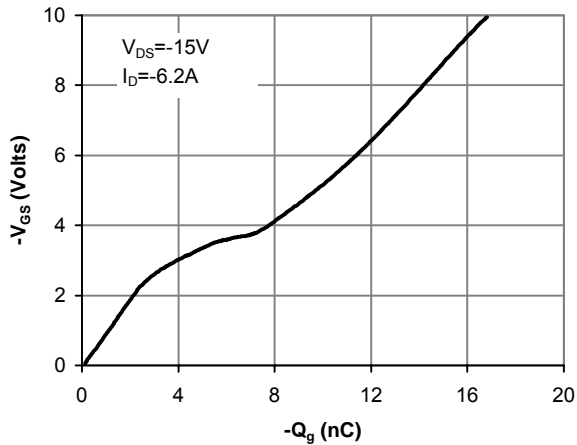


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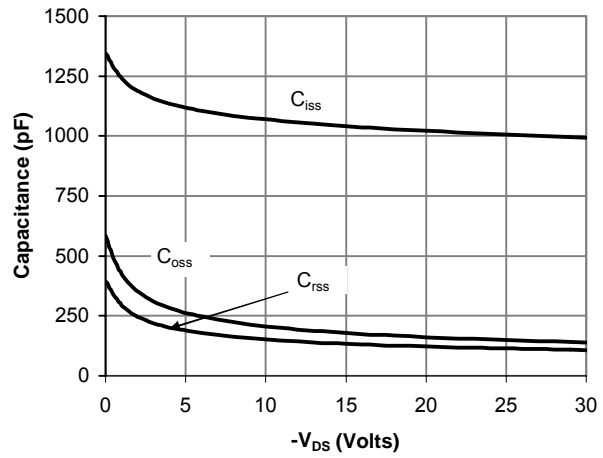


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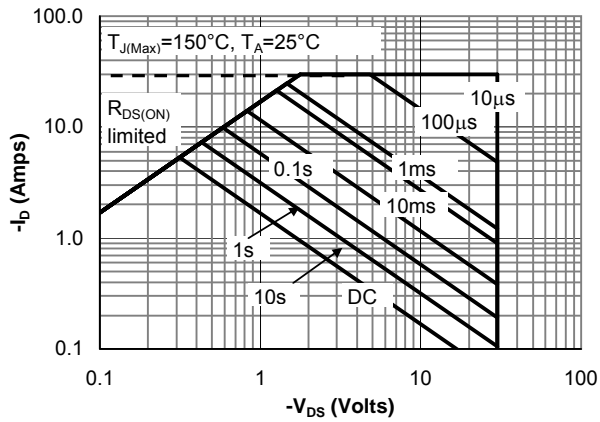


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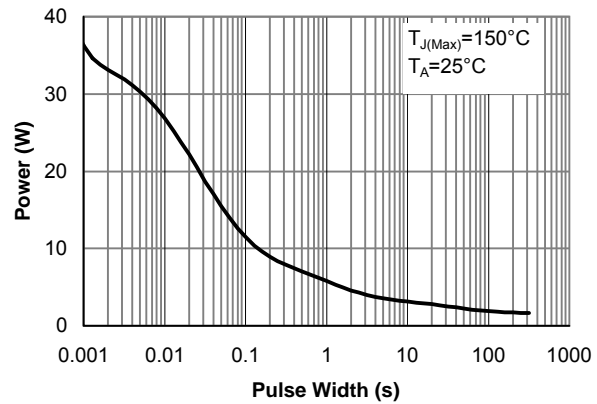


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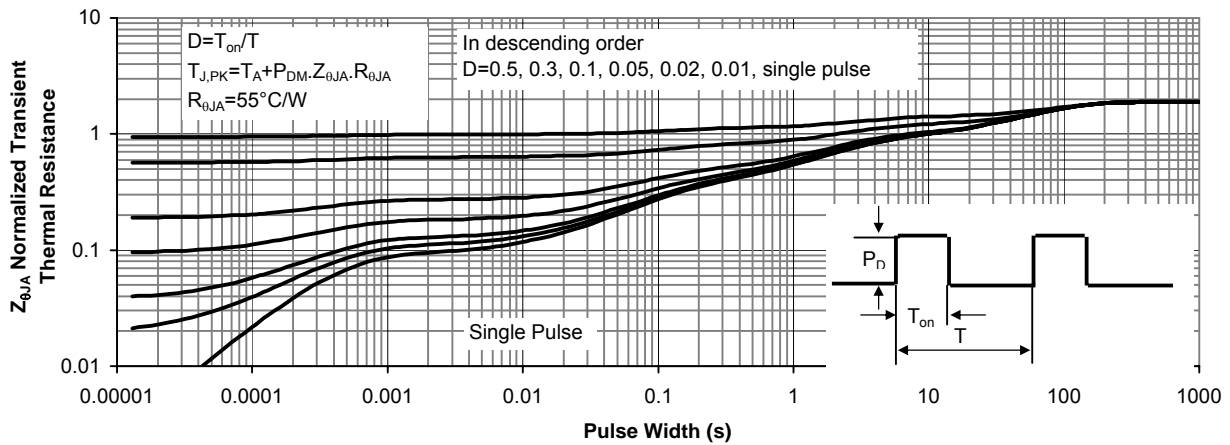


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