

AO4601

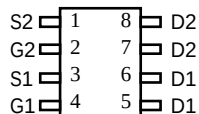
Complementary Enhancement Mode Field Effect Transistor

General Description

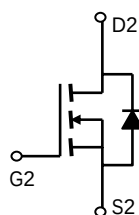
The AO4601 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications. *Standard Product AO4601 is Pb-free (meets ROHS & Sony 259 specifications). AO4601L is a Green Product ordering option. AO4601 and AO4601L are*

Features

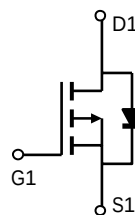
n-channel	p-channel
V_{DS} (V) = 30V	-30V
I_D = 4.7A ($V_{GS}=10V$)	-8A ($V_{GS} = -20V$)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 55m Ω ($V_{GS}=10V$)	< 18m Ω ($V_{GS} = -20V$)
< 70m Ω ($V_{GS}=4.5V$)	< 19m Ω ($V_{GS} = -10V$)
< 110m Ω ($V_{GS} = 2.5V$)	



SOIC-8



n-channel



p-channel

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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	± 25	V
Continuous Drain Current ^A	I_D	4.7	-8	A
		4	-6.9	
Pulsed Drain Current ^B	I_{DM}	30	-50	
Power Dissipation	P_D	2	2	W
		1.44	1.44	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Characteristics: n-channel and p-channel

Parameter	Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	n-ch	52	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		n-ch	78	110	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	n-ch	48	60	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	p-ch	50	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		p-ch	73	110	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	p-ch	31	40	$^\circ\text{C/W}$

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 T _J =55°C			1 5	μA
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 =4A T _J =125°C		45 66	55 80	mΩ
		V _{GS} =4.5V, I _D =3A		55	70	mΩ
		V _{GS} =2.5V, I _D =2A		83	110	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =4A		8		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.8	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		390		pF
C _{oss}	Output Capacitance			54.5		pF
C _{rss}	Reverse Transfer Capacitance			41		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		3		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =15V, I _D =4A		0.6		nC
Q _{gs}	Gate Source Charge			1.38		nC
Q _{gd}	Gate Drain Charge			4.34		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =3.75Ω, R _{GEN} =6Ω		3.3		ns
t _r	Turn-On Rise Time			1		ns
t _{D(off)}	Turn-Off DelayTime			21.7		ns
t _f	Turn-Off Fall Time			2.1		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =4A, di/dt=100A/μs		12		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =4A, di/dt=100A/μs		6.3		nC

A: The value of R_{θJA} is measured with the device mounted on 1 in² 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_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80 μs 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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N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

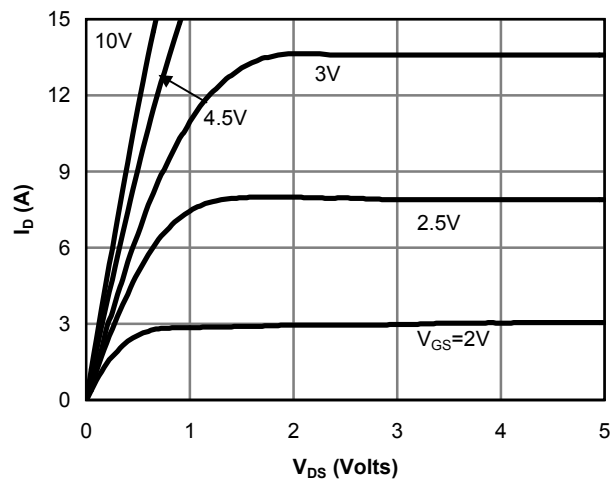


Fig 1: On-Region Characteristics

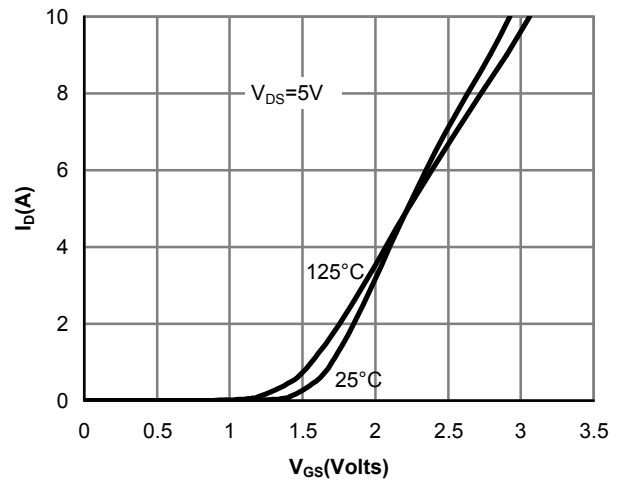


Figure 2: Transfer Characteristics

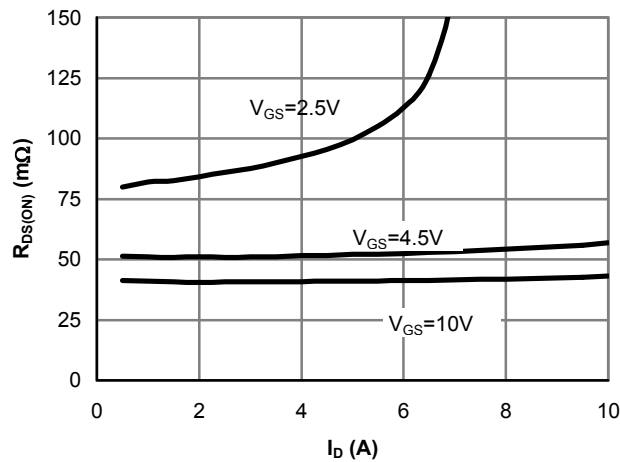


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

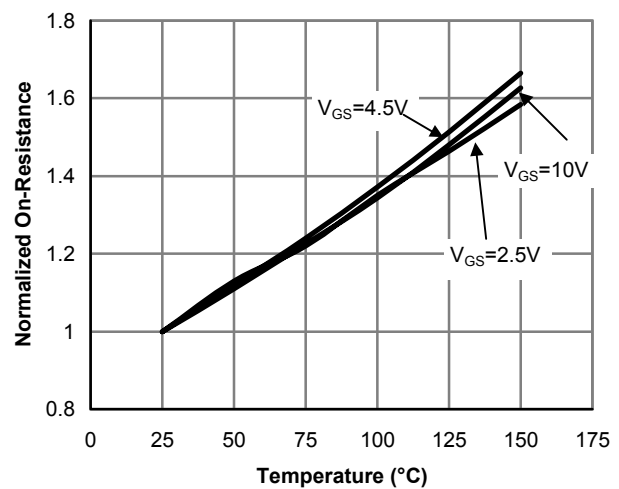


Figure 4: On-Resistance vs. Junction Temperature

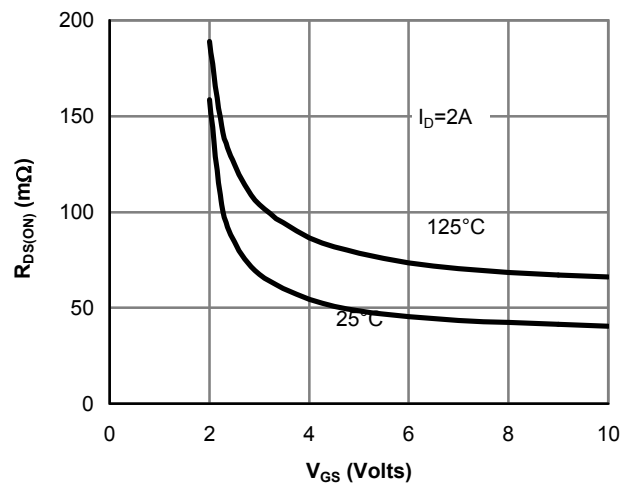


Figure 5: On-Resistance vs. Gate-Source Voltage

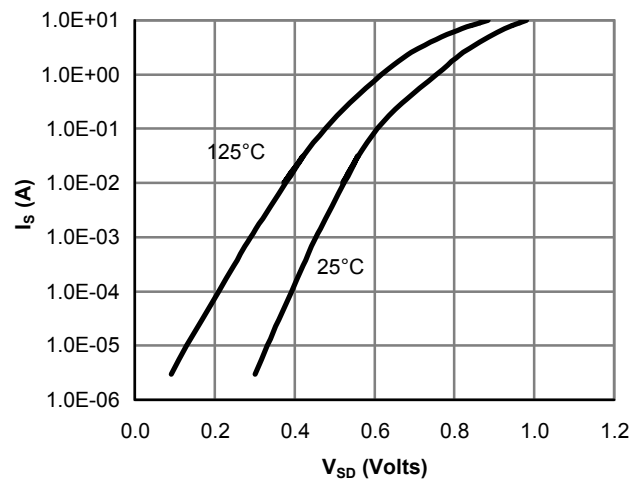


Figure 6: Body-Diode Characteristics

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

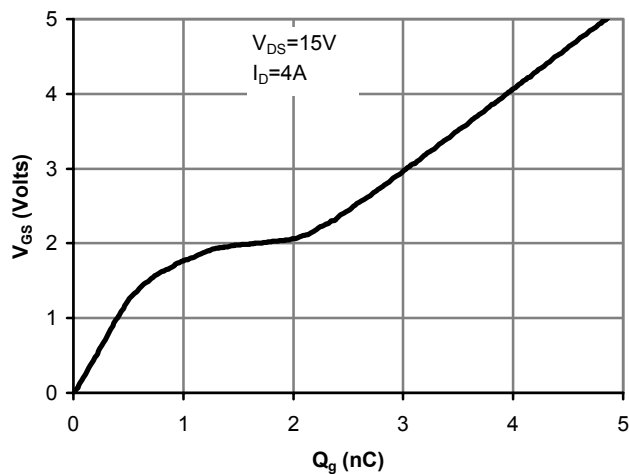


Figure 7: Gate-Charge Characteristics

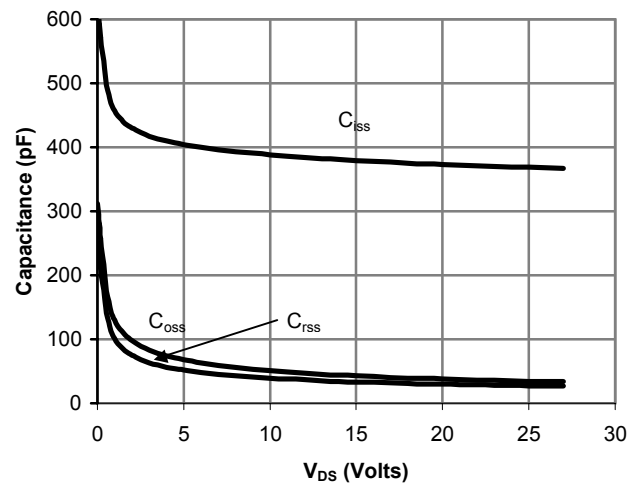


Figure 8: Capacitance Characteristics

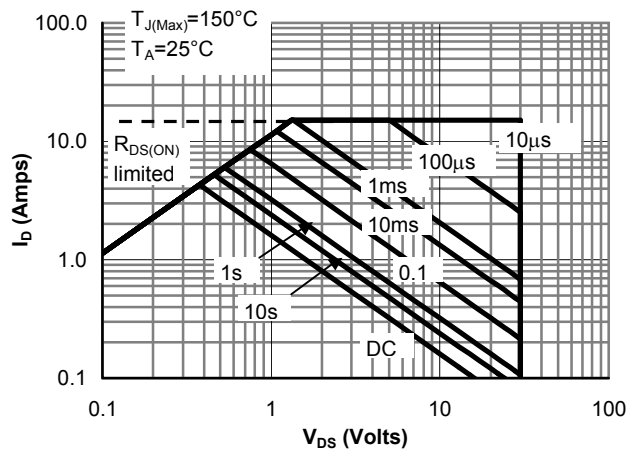


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

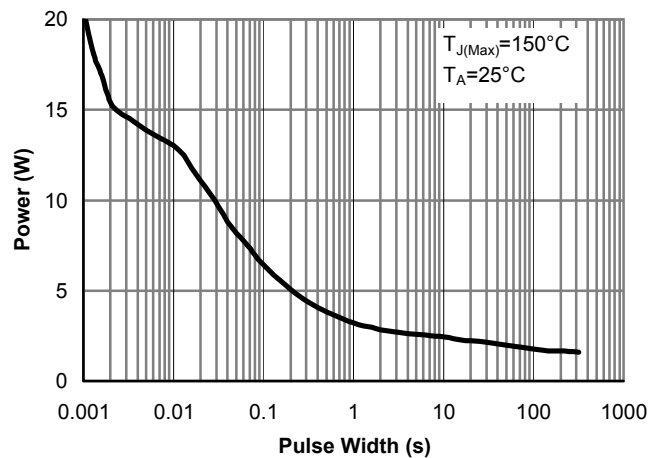


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

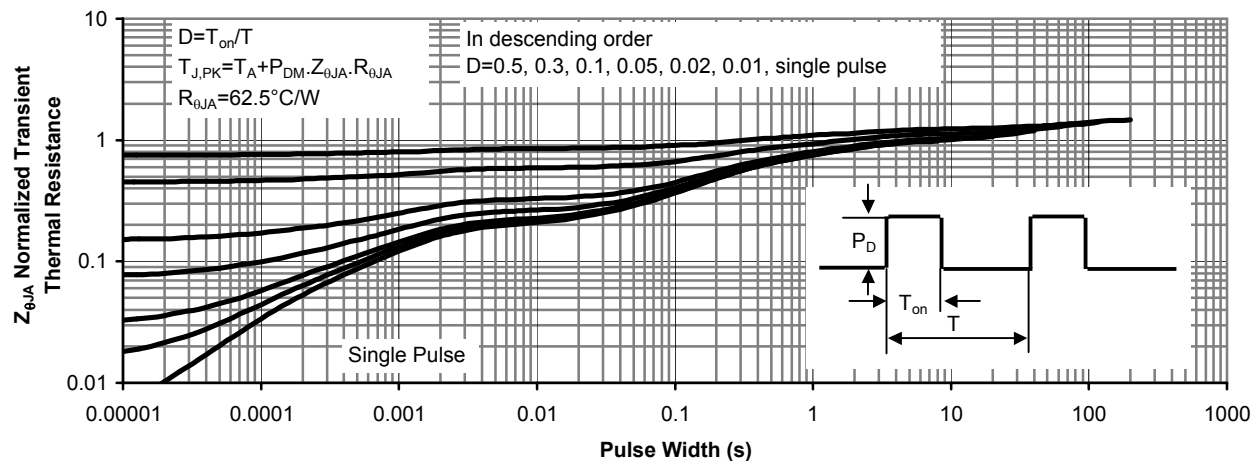


Figure 11: Normalized Maximum Transient Thermal Impedance

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 T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±25V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-1.7	-2.5	-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 =-8A T _J =125°C		16 20.5	19 25	mΩ
		V _{GS} =-20V, I _D =-8A		15	18	mΩ
		V _{GS} =-4.5V, I _D =-5A		33		mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-8A	16	21		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.75	-1	V
I _S	Maximum Body-Diode Continuous Current				-2.6	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		2076		pF
C _{oss}	Output Capacitance			503		pF
C _{rss}	Reverse Transfer Capacitance			302		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-10V, V _{DS} =-15V, I _D =-8A		39		nC
Q _{gs}	Gate Source Charge			8		nC
Q _{gd}	Gate Drain Charge			11.4		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =1.8Ω, R _{GEN} =3Ω		12.7		ns
t _r	Turn-On Rise Time			7		ns
t _{D(off)}	Turn-Off DelayTime			25.2		ns
t _f	Turn-Off Fall Time			12		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-8A, dI/dt=100A/μs		32		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-8A, dI/dt=100A/μs		26		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 t ≤ 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.

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 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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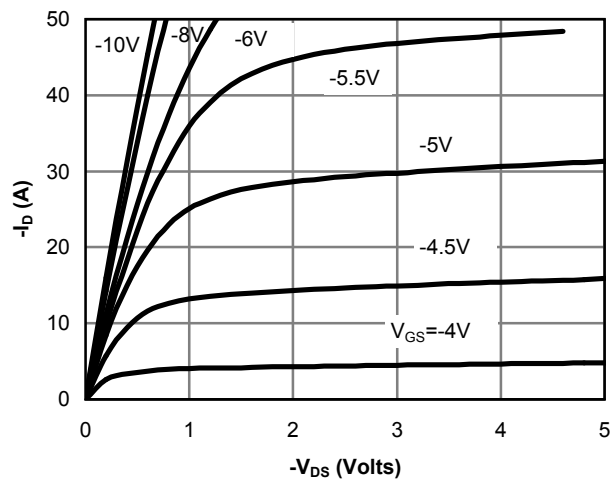


Fig 1: On-Region Characteristics

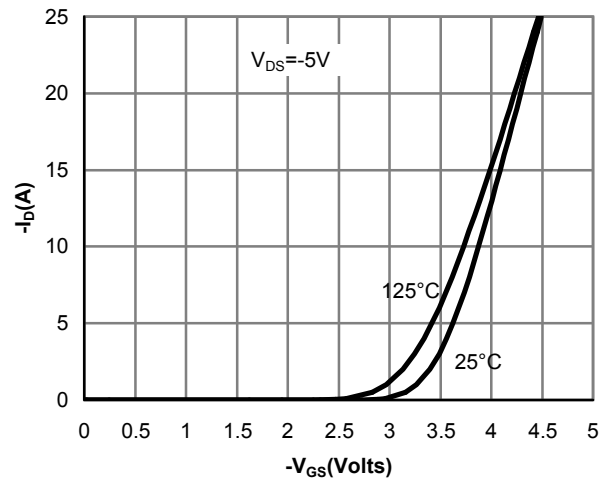


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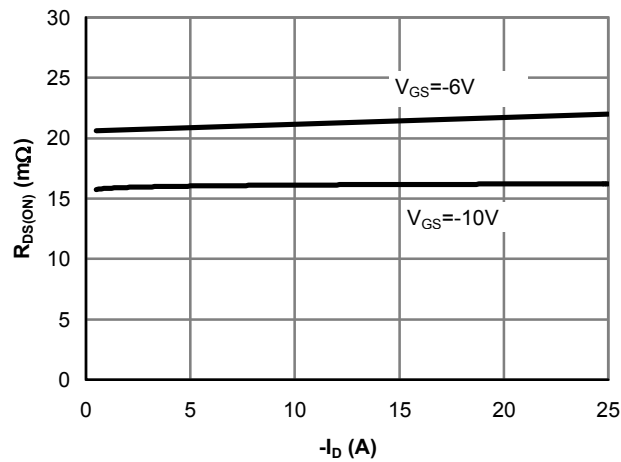


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

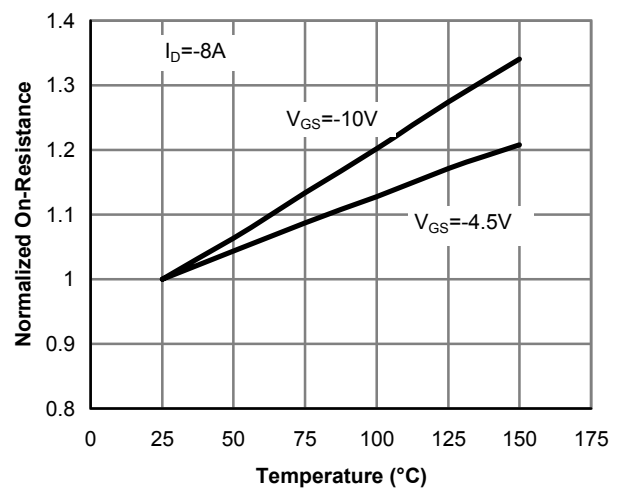


Figure 4: On-Resistance vs. Junction Temperature

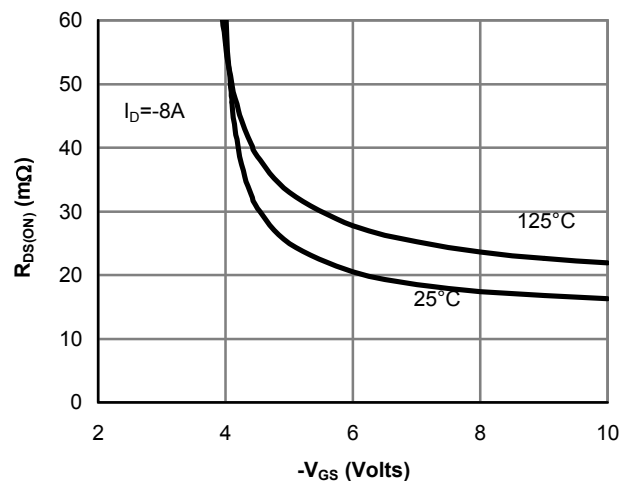


Figure 5: On-Resistance vs. Gate-Source Voltage

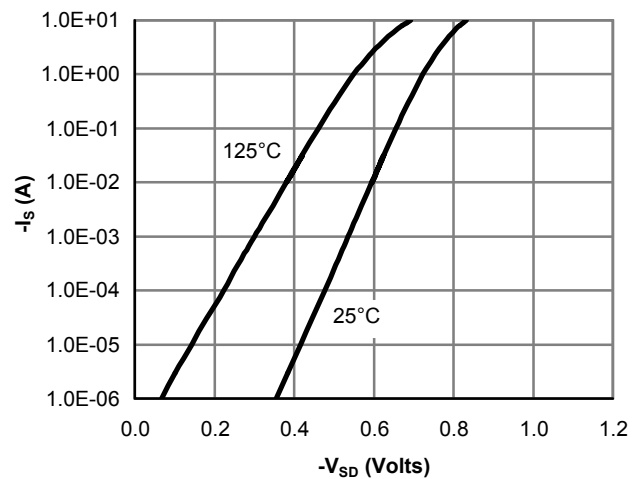


Figure 6: Body-Diode Characteristics

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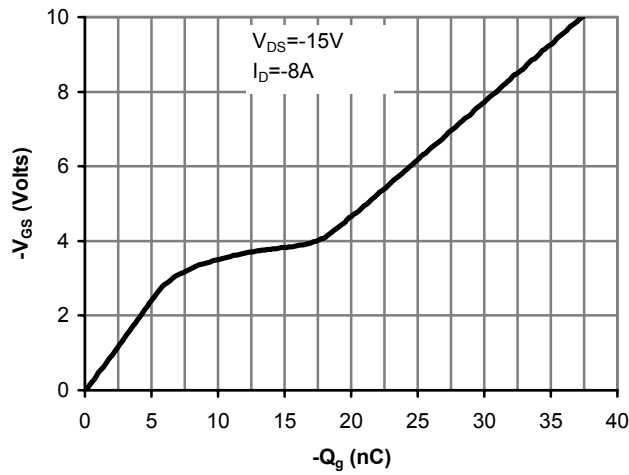


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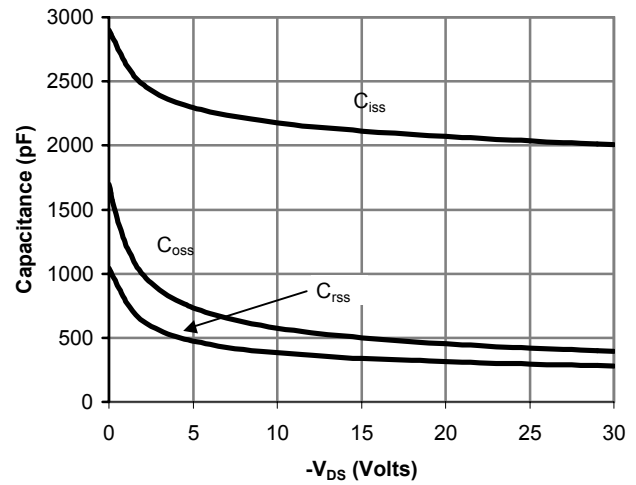


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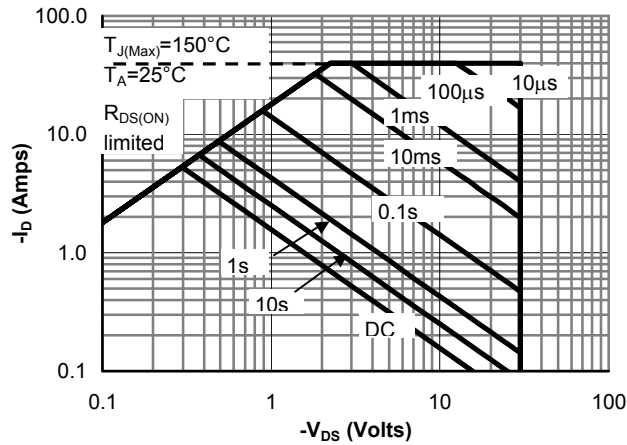


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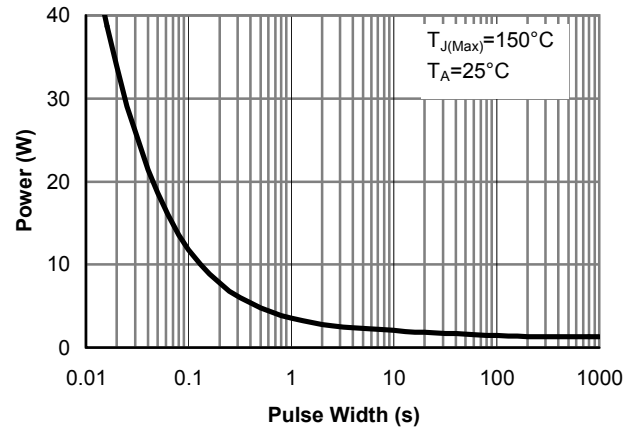


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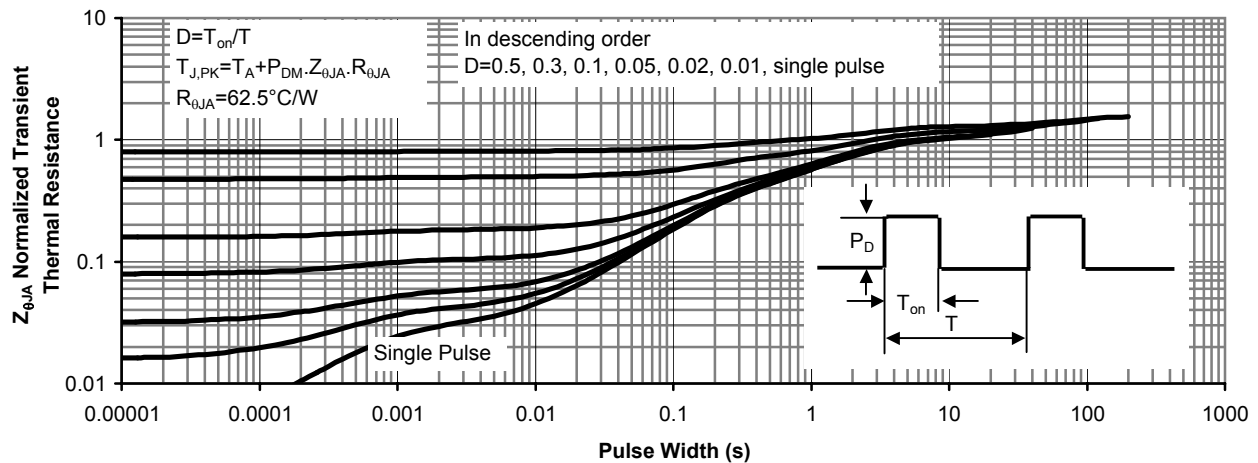


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