



**AO4600**

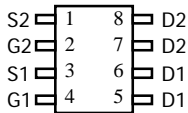
**Complementary Enhancement Mode Field Effect Transistor**

**General Description**

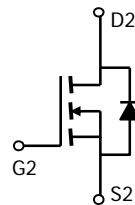
The AO4600 uses advanced trench technology to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications. Standard Product AO4600 is Pb-free (meets ROHS & Sony 259 specifications). AO4600L is a Green Product ordering option. AO4600 and AO4600L are electrically identical.

**Features**

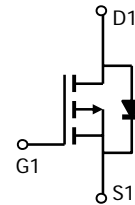
n-channel	p-channel
$V_{DS} (V) = 30V$	-30V
$I_D = 6.9A (V_{GS} = 10V)$	-5A ( $V_{GS} = -10V$ )
$R_{DS(ON)}$	
< 27m $\Omega$	< 49m $\Omega$ ( $V_{GS} = -10V$ )
< 32m $\Omega$	< 64m $\Omega$ ( $V_{GS} = -4.5V$ )
< 50m $\Omega$	< 120m $\Omega$ ( $V_{GS} = -2.5V$ )



SOIC-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	$V_{GS}$	$\pm 12$	$\pm 12$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ C$	6.9	-5	A
	$T_A=70^\circ C$	5.8	-4.2	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	40	-30	
Power Dissipation	$T_A=25^\circ C$	2	2	W
	$T_A=70^\circ C$	1.44	1.44	
Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ C$

**Thermal Characteristics: n-channel and p-channel**

Parameter	Symbol	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	48	62.5	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	74	110
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	35	40	$^\circ C/W$

n-channel MOSFET Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V T <sub>J</sub> =55°C			1 5	μA
I <sub>GSS</sub>	Gate-Body leakage current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.7	1	1.4	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	25			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =6.9A T <sub>J</sub> =125°C		22.6	27	mΩ
				33	40	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =6.0A		27	32	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =5A		42	50	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =5A	12	16		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A		0.71	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				3	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		858	1050	pF
C <sub>oss</sub>	Output Capacitance			110		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			80		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.24	4	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V, I <sub>D</sub> =6.9A		9.6	12	nC
Q <sub>gs</sub>	Gate Source Charge			1.65		nC
Q <sub>gd</sub>	Gate Drain Charge			3		nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =2.2Ω, R <sub>GEN</sub> =6Ω		5.7		ns
t <sub>r</sub>	Turn-On Rise Time			13		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			37		ns
t <sub>f</sub>	Turn-Off Fall Time			4.2		ns
t <sub>rr</sub>	Body Diode Reverse Recovery time	I <sub>F</sub> =5A, dI/dt=100A/μs		15.5	20	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery charge	I <sub>F</sub> =5A, dI/dt=100A/μs		7.9		nC

A: The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=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<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> 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<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

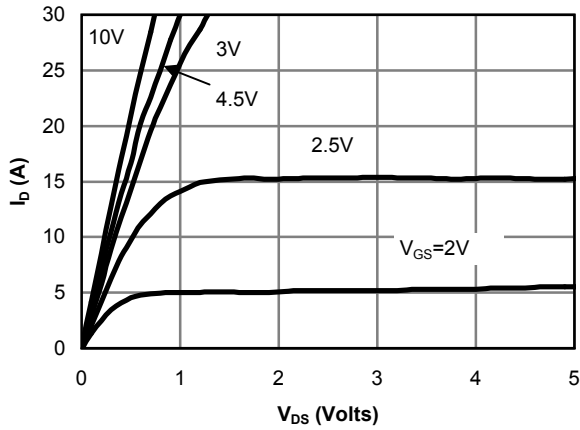


Fig 1: On-Region Characteristics

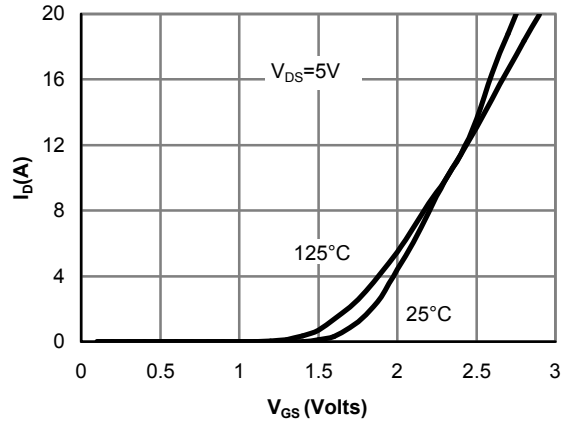


Figure 2: Transfer Characteristics

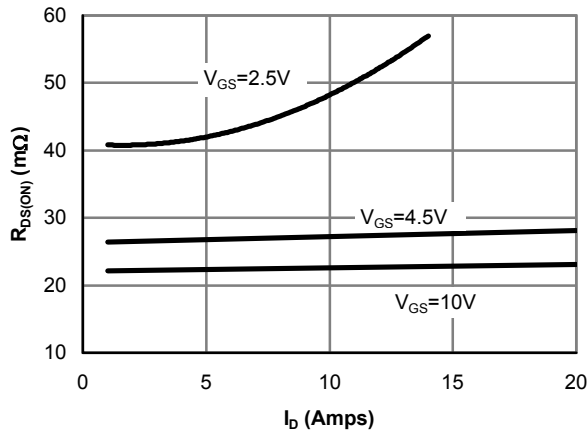


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

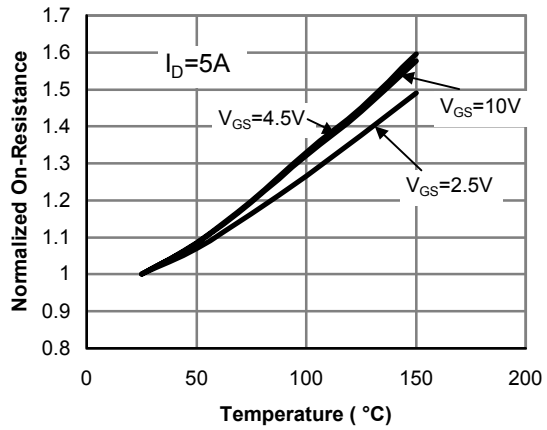


Figure 4: On-Resistance vs. Junction Temperature

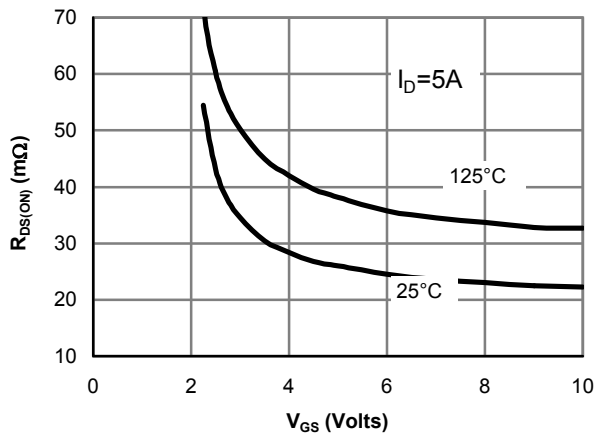


Figure 5: On-Resistance vs. Gate-Source Voltage

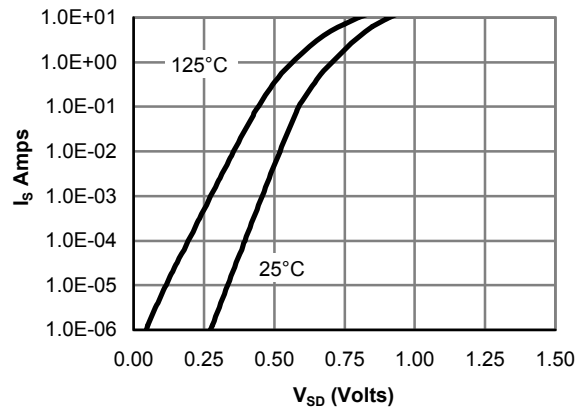


Figure 6: Body diode characteristics

TYPICAL N-CANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

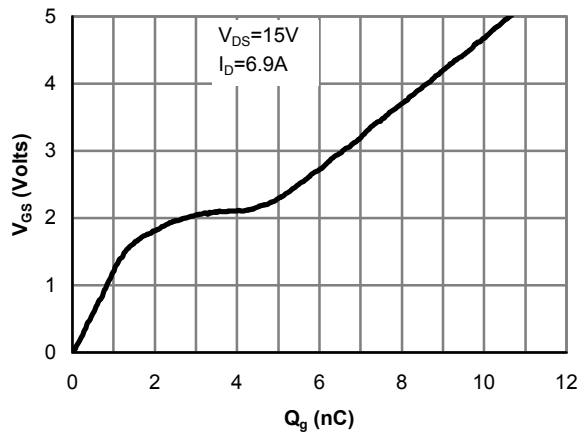


Figure 7: Gate-Charge characteristics

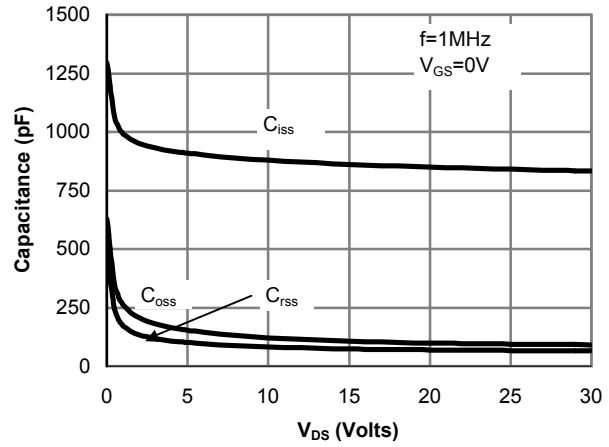


Figure 8: Capacitance Characteristics

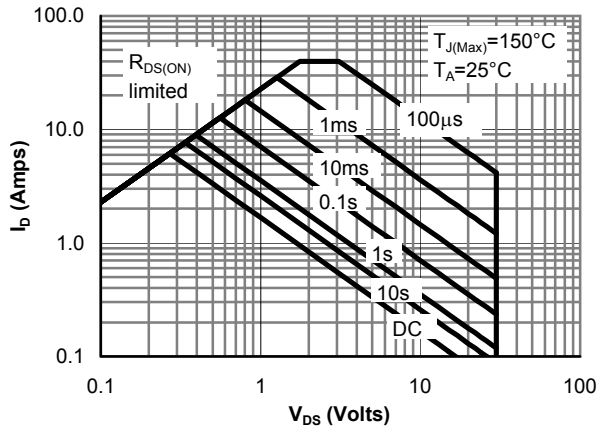


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

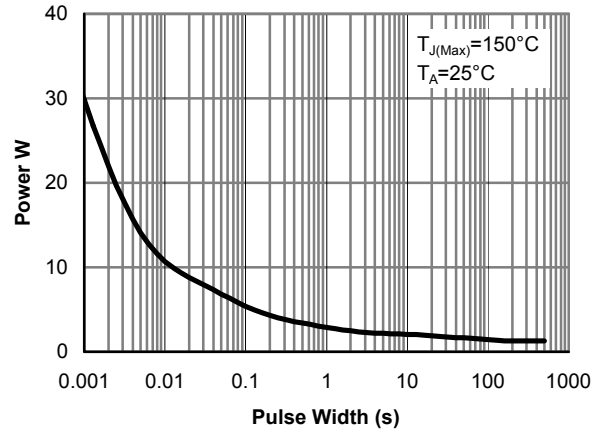


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

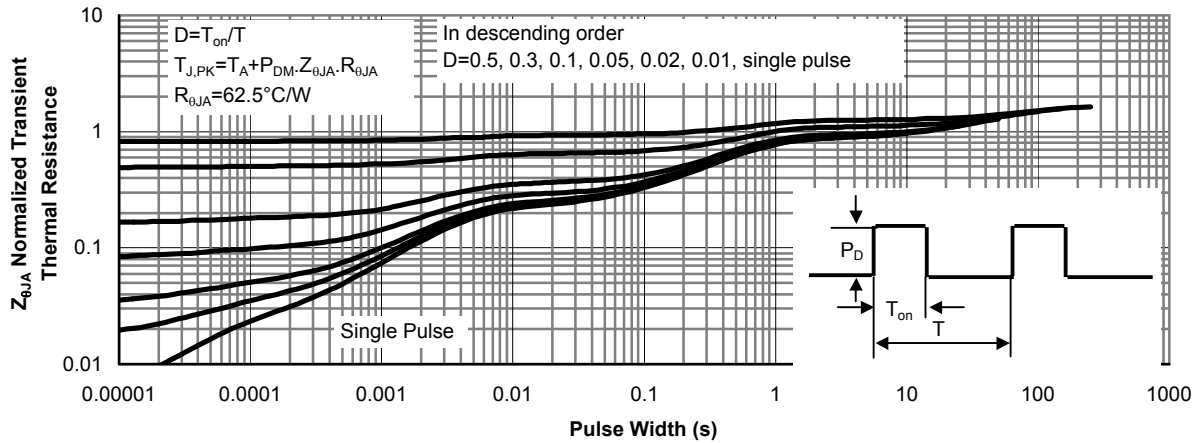


Figure 11: Normalized Maximum Transient Thermal Impedance

p-channel MOSFET Electrical Characteristics ( $T_J=25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}, V_{GS}=0\text{V}$	-30			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-24\text{V}, V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}, V_{GS}=\pm 12\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-0.7	-1	-1.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}, V_{DS}=-5\text{V}$	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}, I_D=-5\text{A}$ $T_J=125^\circ\text{C}$		42.5	49	m $\Omega$
		$V_{GS}=-4.5\text{V}, I_D=-4\text{A}$		54	64	
		$V_{GS}=-2.5\text{V}, I_D=-1\text{A}$		80	120	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5\text{V}, I_D=-5\text{A}$	7	11		S
$V_{SD}$	Diode Forward Voltage	$I_S=-1\text{A}, V_{GS}=0\text{V}$		-0.75	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-3	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=-15\text{V}, f=1\text{MHz}$		952	1200	pF
$C_{oss}$	Output Capacitance			103		pF
$C_{riss}$	Reverse Transfer Capacitance			77		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}, V_{DS}=0\text{V}, f=1\text{MHz}$		5.9	30	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-4.5\text{V}, V_{DS}=-15\text{V}, I_D=-5\text{A}$		9.5	12	nC
$Q_{gs}$	Gate Source Charge			2		nC
$Q_{gd}$	Gate Drain Charge			3.1		nC
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=-10\text{V}, V_{DS}=-15\text{V}, R_L=3\Omega,$ $R_{GEN}=6\Omega$		12		ns
$t_r$	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off Delay Time			37		ns
$t_f$	Turn-Off Fall Time			12		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=-5\text{A}, dI/dt=100\text{A}/\mu\text{s}$		21	26	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-5\text{A}, dI/dt=100\text{A}/\mu\text{s}$		13		nC

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The value in any given application depends on the user's specific board design. The current rating is based on the  $t \leq 10\text{s}$  thermal resistance rating.

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

C: The  $R_{\theta JA}$  is the sum of the thermal impedance 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 $\mu\text{s}$  pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ\text{C}$ . The SOA curve provides a single pulse rating.

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TYPICAL P-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

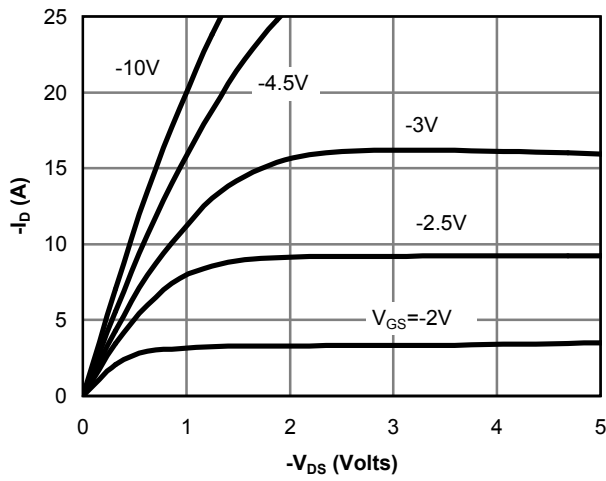


Fig 1: On-Region Characteristics

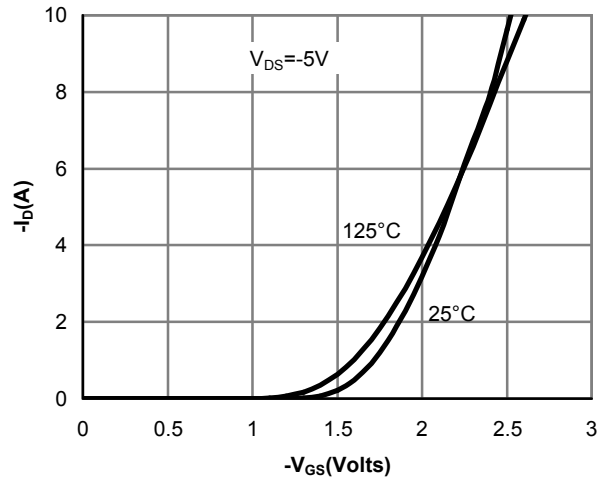


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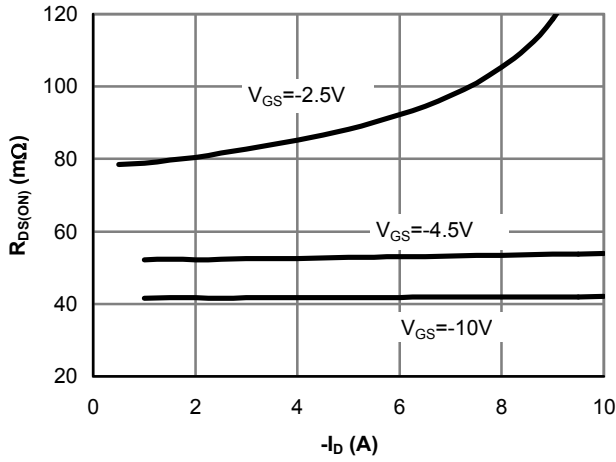


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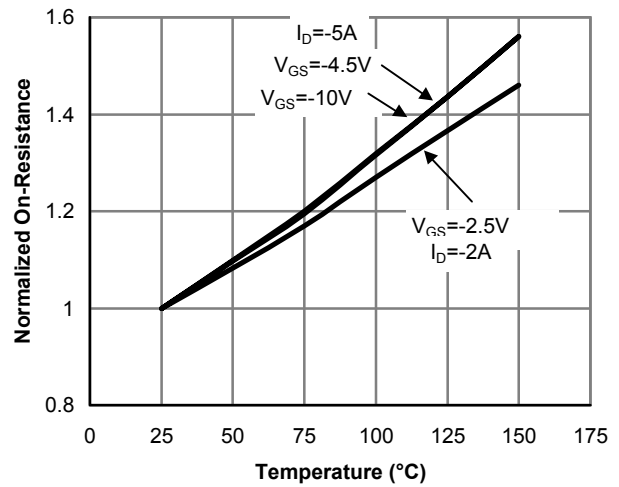


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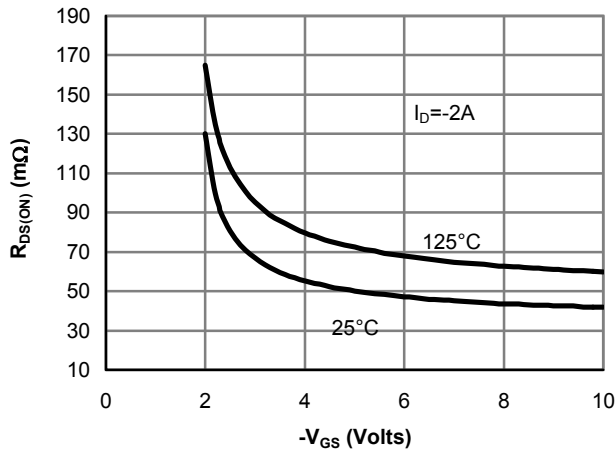


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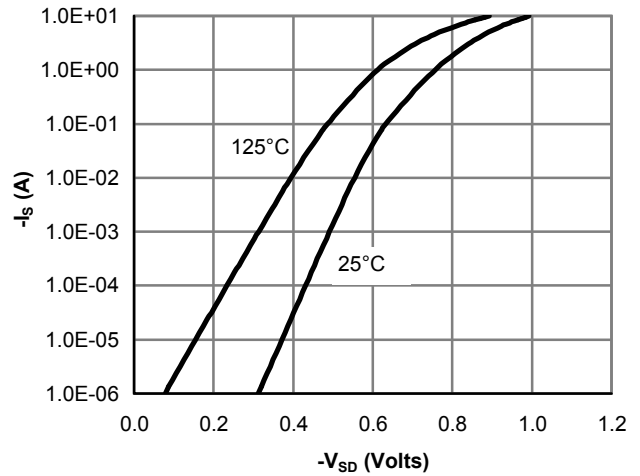


Figure 6: Body-Diode Characteristics

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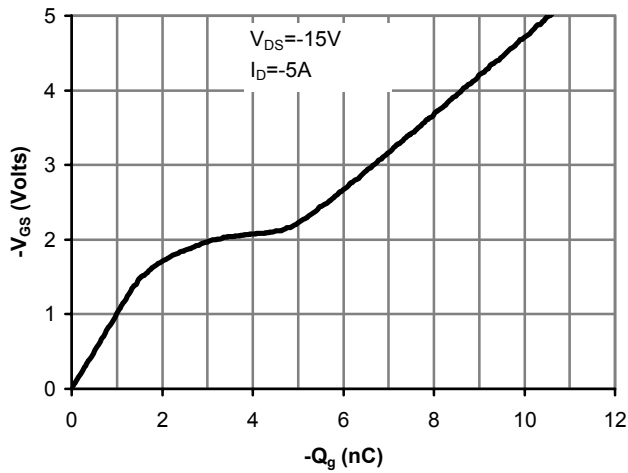


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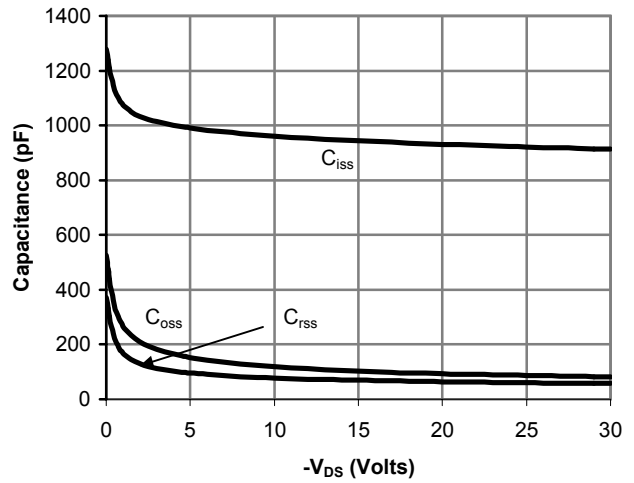


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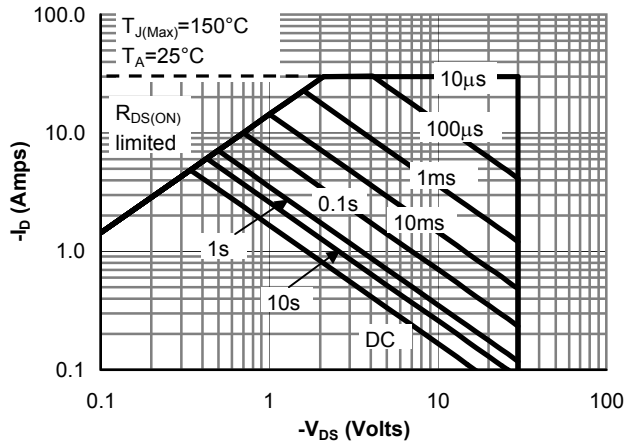


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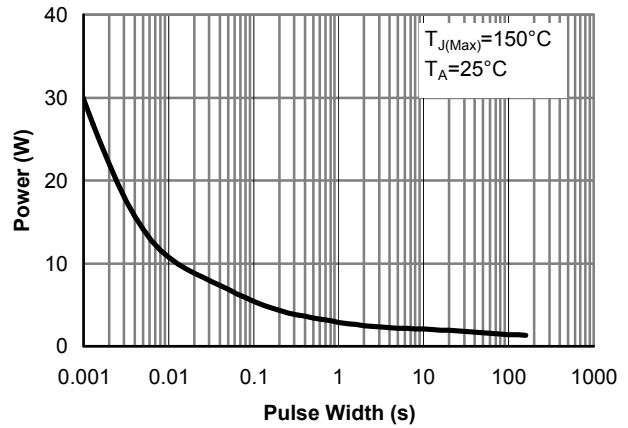


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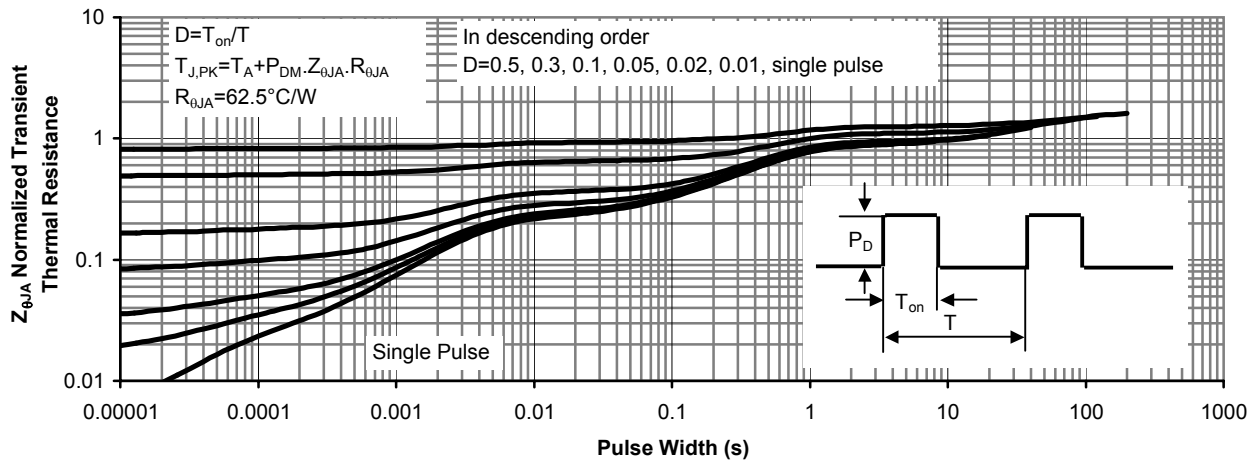


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