



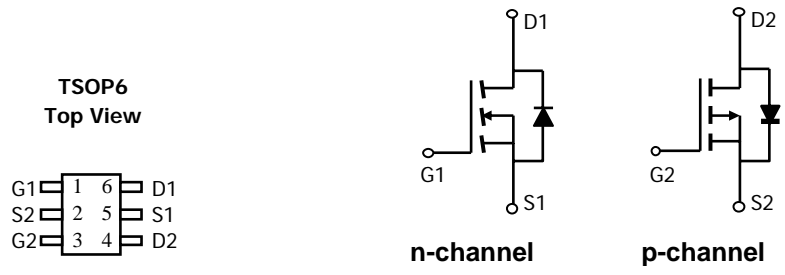
**AO6604, AO6604L ( Green Product )**  
**Complementary Enhancement Mode Field Effect Transistor**

**General Description**

The AO6604 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. AO6604L ( Green Product ) is offered in a lead-free package.

**Features**

n-channel	p-channel
$V_{DS}$ (V) = 20V	-20V
$I_D$ = 3.4A	-2.5A
$R_{DS(ON)}$	
< 60m $\Omega$	< 110m $\Omega$ ( $V_{GS}$ = 4.5V)
< 75m $\Omega$	< 140m $\Omega$ ( $V_{GS}$ = 2.5V)
< 100m $\Omega$	< 200m $\Omega$ ( $V_{GS}$ = 1.8V)



**Absolute Maximum Ratings  $T_A=25^\circ\text{C}$  unless otherwise noted**

Parameter	Symbol	Max n-channel	Max p-channel	Units	
Drain-Source Voltage	$V_{DS}$	20	-20	V	
Gate-Source Voltage	$V_{GS}$	$\pm 8$	$\pm 8$	V	
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ\text{C}$	$I_D$	3.4	-2.5	A
			$T_A=70^\circ\text{C}$	2.7	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	15	-15		
Power Dissipation	$T_A=25^\circ\text{C}$	$P_D$	1.15	1.15	W
			$T_A=70^\circ\text{C}$	0.73	
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	Typ	Max	Units
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	78	110	$^\circ\text{C/W}$
Maximum Junction-to-Ambient <sup>A</sup>		Steady-State	106	150
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	64	80	$^\circ\text{C/W}$

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	20			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =16V, 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> =±8V			100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA	0.4	0.6	1	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =5V	15			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =3.4A T <sub>J</sub> =125°C		46 63	60 80	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A		57	75	
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A		72	100	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =3.4A		10		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =1A, V <sub>GS</sub> =0V		0.76	1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				2	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =10V, f=1MHz		436	570	pF
C <sub>oss</sub>	Output Capacitance			66		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			44		pF
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		3	4	Ω
<b>SWITCHING PARAMETERS</b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> =4.5V, V <sub>DS</sub> =10V, I <sub>D</sub> =3.4A		6.2	8.1	nC
Q <sub>gs</sub>	Gate Source Charge			1.6		nC
Q <sub>gd</sub>	Gate Drain Charge			0.5		nC
t <sub>D(on)</sub>	Turn-On Delay Time	V <sub>GS</sub> =5V, V <sub>DS</sub> =10V, R <sub>L</sub> =3Ω, R <sub>GEN</sub> =3Ω		5.5		ns
t <sub>r</sub>	Turn-On Rise Time			6.3		ns
t <sub>D(off)</sub>	Turn-Off Delay Time			40		ns
t <sub>f</sub>	Turn-Off Fall Time			12.7		ns
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =3.4A, di/dt=100A/μs		12.3	16	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =3.4A, di/dt=100A/μs		3.5		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 a given application depends on the user's specific board design. The current rating is based on the ≤ 10s thermal resistance rating.

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

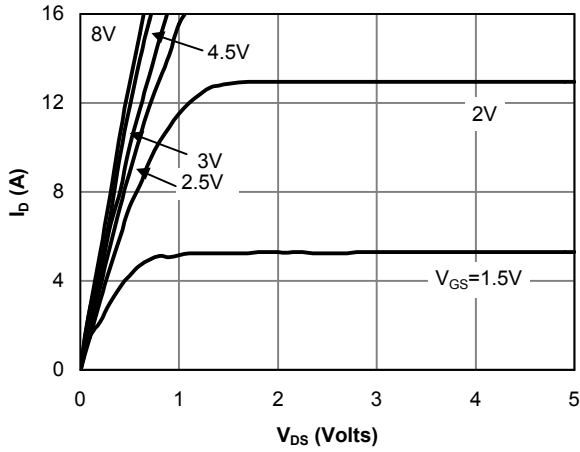
C: The R<sub>θJA</sub> is the sum of the thermal impedance from junction to lead R<sub>θJL</sub> and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

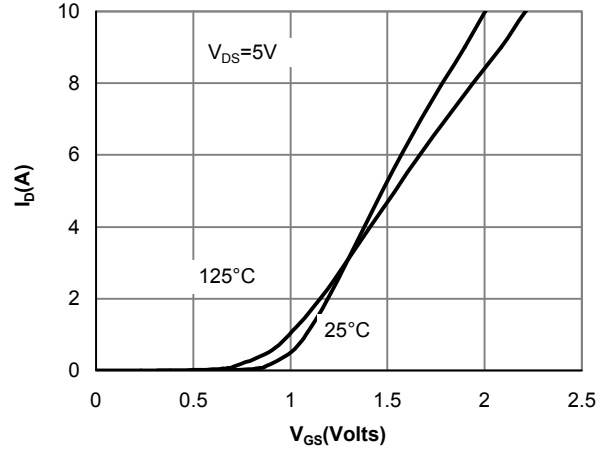
E: These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25°C. The SOA curve provides a single pulse rating.

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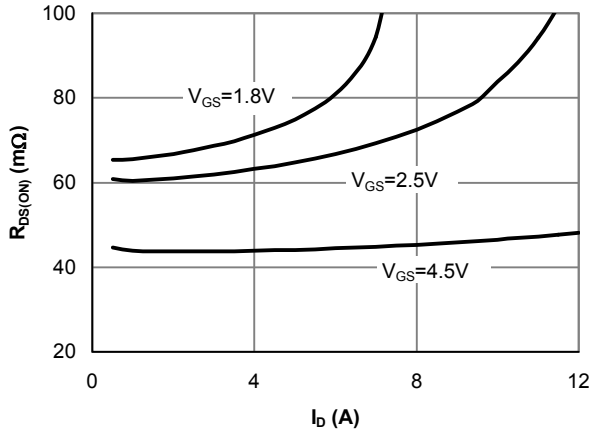
**N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



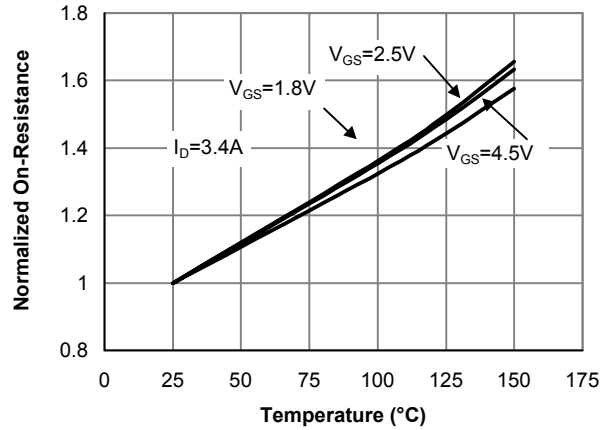
**Fig 1: On-Region Characteristics**



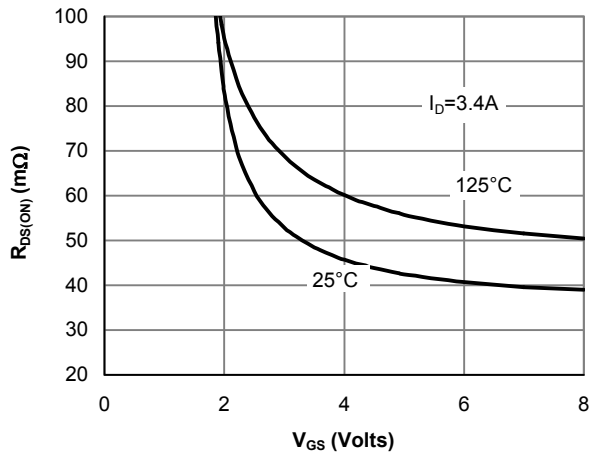
**Figure 2: Transfer Characteristics**



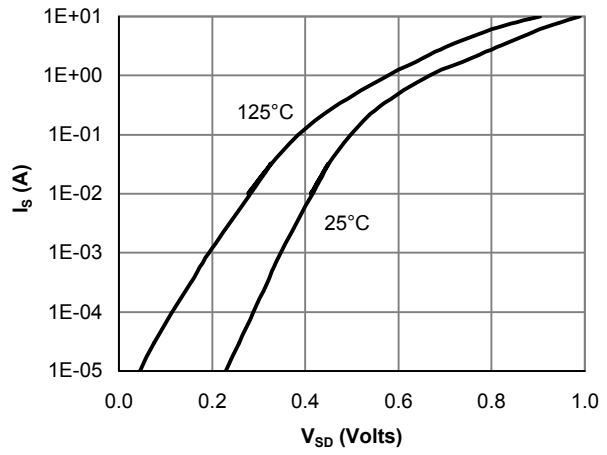
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**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

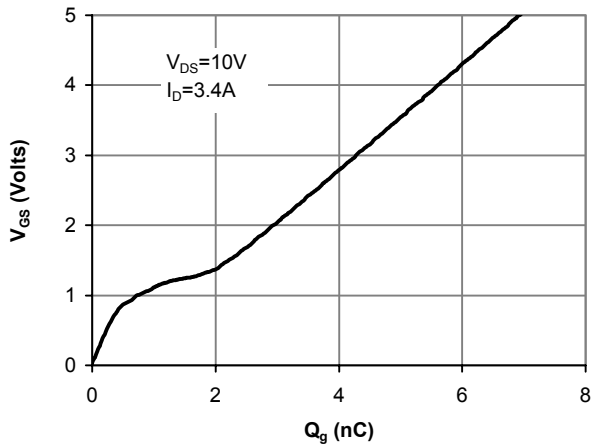


Figure 7: Gate-Charge Characteristics

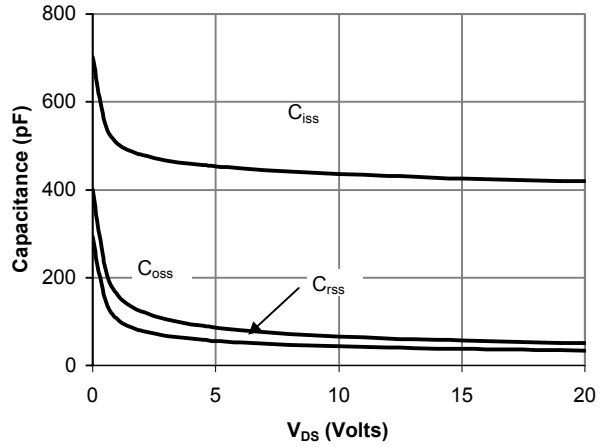


Figure 8: Capacitance Characteristics

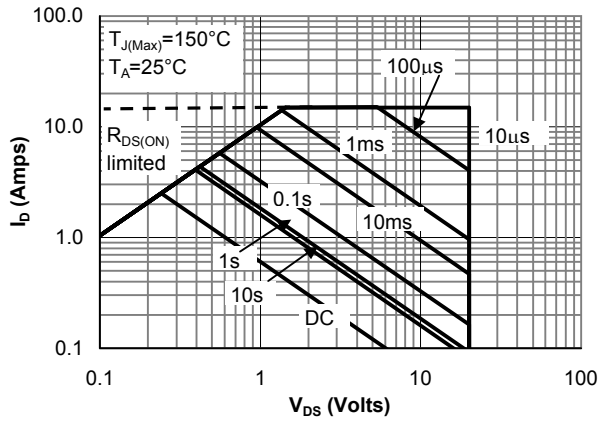


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

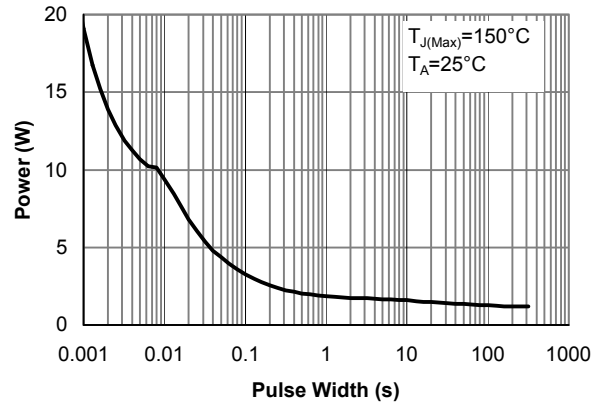


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

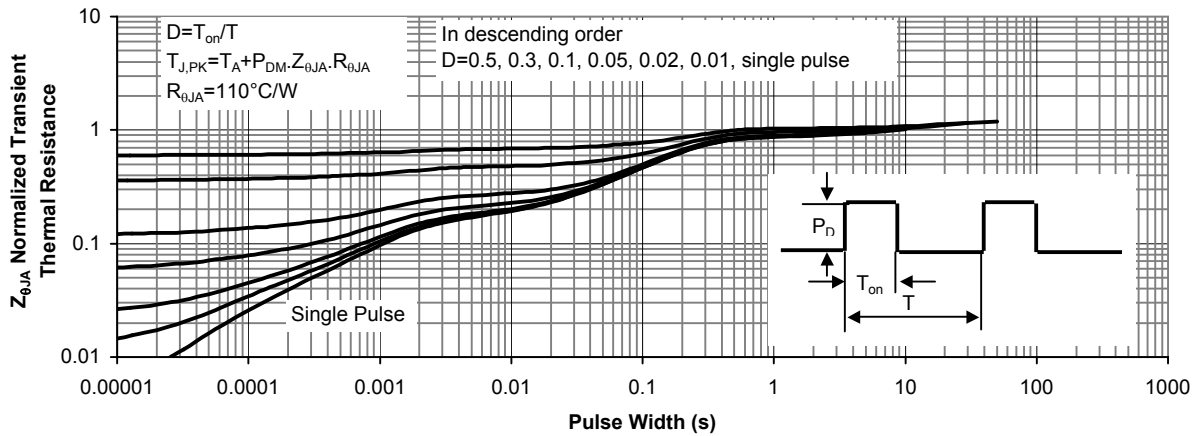


Figure 11: Normalized Maximum Transient Thermal Impedance

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$ , $V_{GS}=0\text{V}$	-20			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=-16\text{V}$ , $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	$\mu\text{A}$
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 8\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$ , $I_D=-250\mu\text{A}$	-0.3	-0.55	-1	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$ , $V_{DS}=-5\text{V}$	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$ , $I_D=-2.5\text{A}$ $T_J=125^\circ\text{C}$		86	110	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$ , $I_D=-2\text{A}$		113	140	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$ , $I_D=-1\text{A}$		151	200	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS}=-5\text{V}$ , $I_D=-3\text{A}$	4	6		S
$V_{SD}$	Diode Forward Voltage	$I_S=-1\text{A}$ , $V_{GS}=0\text{V}$		-0.78	-1	V
$I_S$	Maximum Body-Diode Continuous Current				-2	A
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}$ , $V_{DS}=-10\text{V}$ , $f=1\text{MHz}$		540	700	pF
$C_{oss}$	Output Capacitance			72		pF
$C_{rss}$	Reverse Transfer Capacitance			49		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		12	15.6	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	Total Gate Charge	$V_{GS}=-4.5\text{V}$ , $V_{DS}=-10\text{V}$ , $I_D=-2.5\text{A}$		6.1	8	nC
$Q_{gs}$	Gate Source Charge			0.6		nC
$Q_{gd}$	Gate Drain Charge			1.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-4.5\text{V}$ , $V_{DS}=-10\text{V}$ , $R_L=3.9\Omega$ , $R_{GEN}=3\Omega$		10		ns
$t_r$	Turn-On Rise Time			12		ns
$t_{D(off)}$	Turn-Off DelayTime			44		ns
$t_f$	Turn-Off Fall Time			22		ns
$t_{rr}$	Body Diode Reverse Recovery Time	$I_F=-2.5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		21	28	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge	$I_F=-2.5\text{A}$ , $dI/dt=100\text{A}/\mu\text{s}$		7.5		nC

A: The value of  $R_{\theta JA}$  is measured 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 value in any a 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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P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

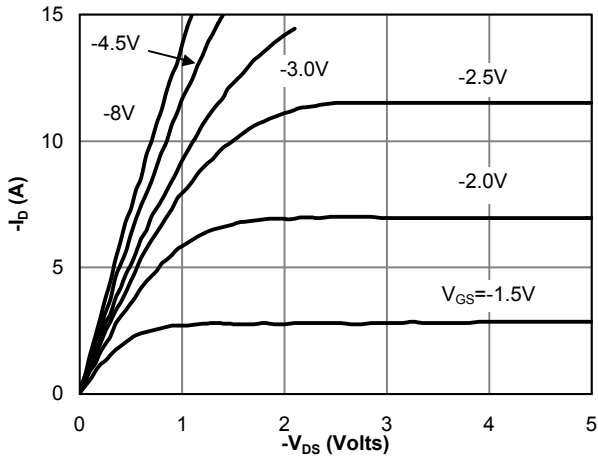


Fig 1: On-Region Characteristics

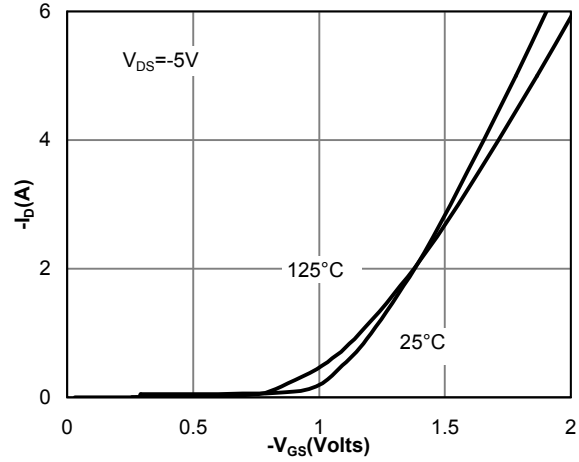


Figure 2: Transfer Characteristics

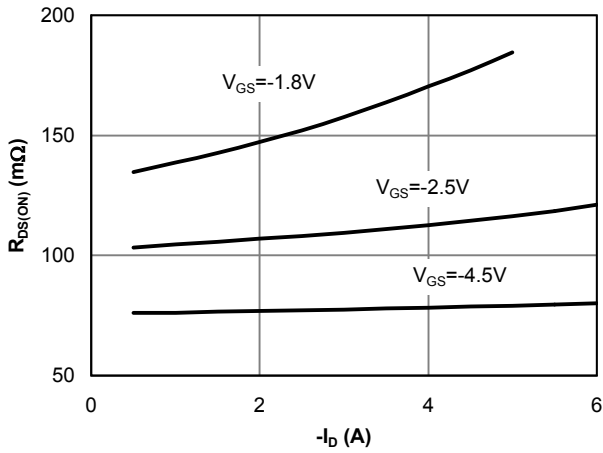


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

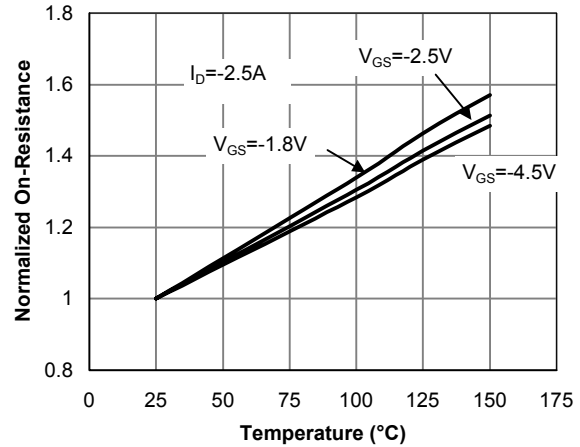


Figure 4: On-Resistance vs. Junction Temperature

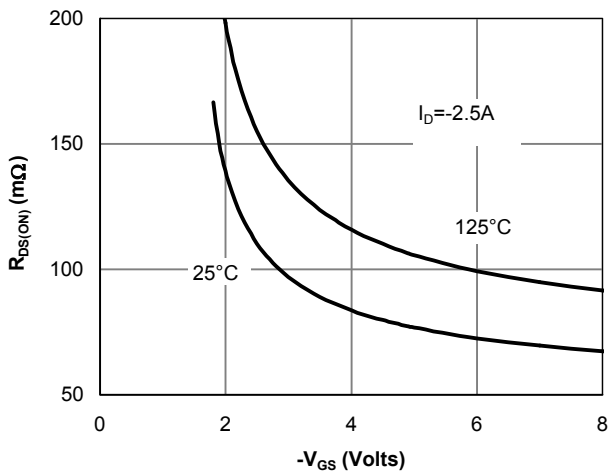


Figure 5: On-Resistance vs. Gate-Source Voltage

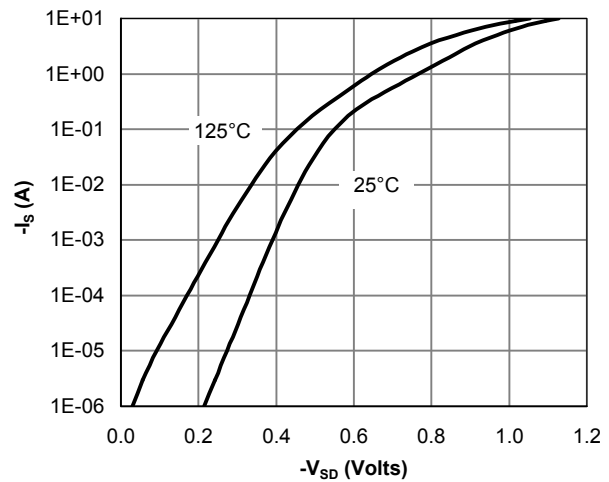


Figure 6: Body-Diode Characteristics

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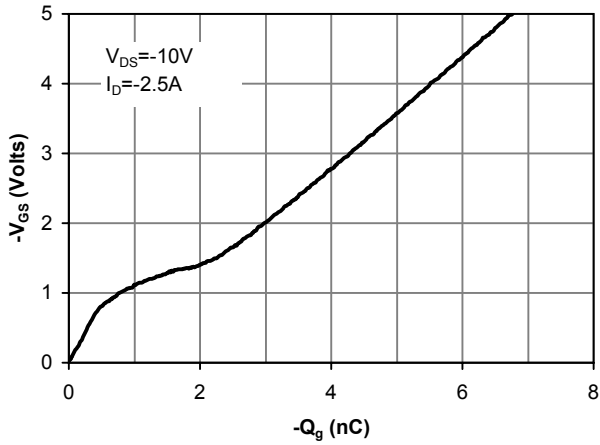


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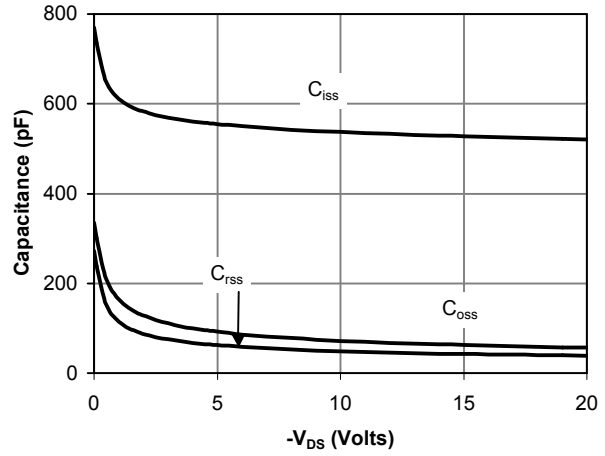


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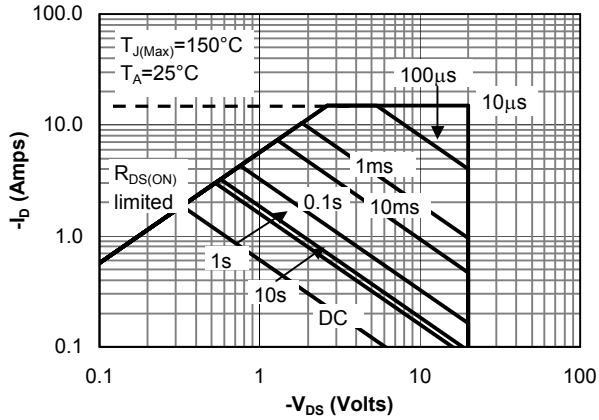


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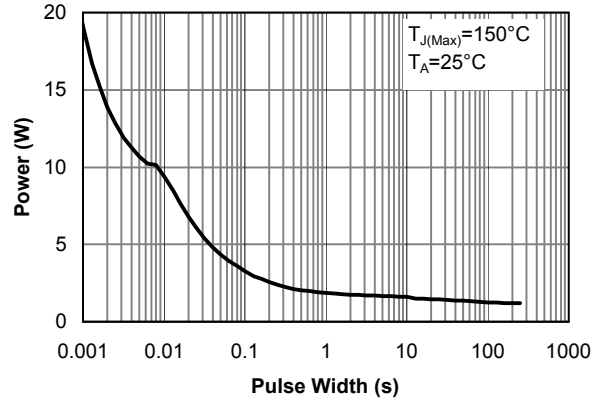


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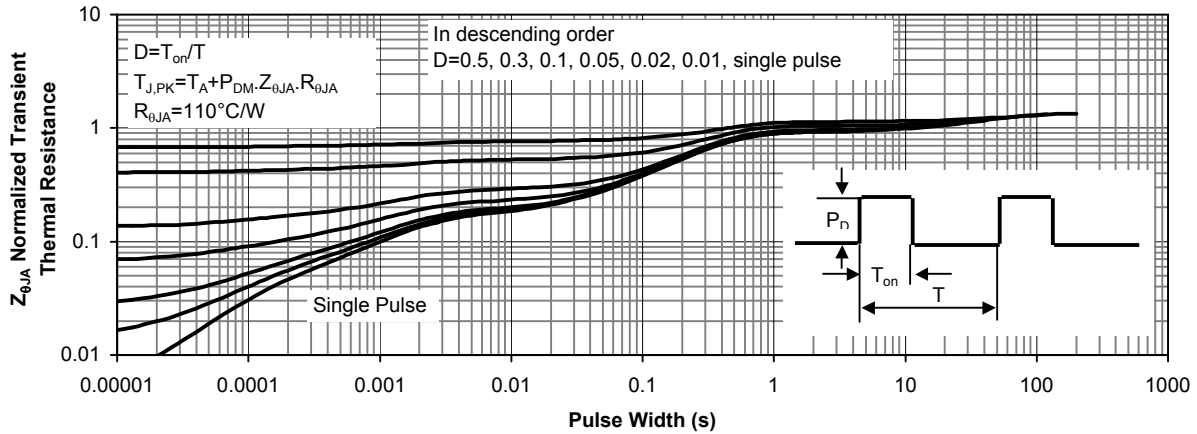


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