



ALPHA & OMEGA
SEMICONDUCTOR



AO6602

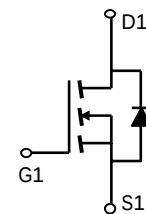
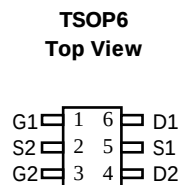
Complementary Enhancement Mode Field Effect Transistor

General Description

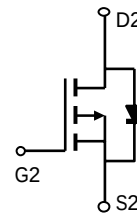
The AO6602 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications. *Standard Product AO6602 is Pb-free (meets ROHS & Sony 259 specifications). AO6602L is a Green Product ordering option. AO6602 and AO6602L are electrically identical.*

Features

n-channel	p-channel
$V_{DS} (V) = 30V$	$-30V$
$I_D = 3.1A (V_{GS} = 10V)$	$-2.7A (V_{GS} = -10V)$
$R_{DS(ON)}$	
$< 75m\Omega (V_{GS} = 10V) < 100m\Omega (V_{GS} = -10V)$	
$< 115m\Omega (V_{GS} = 4.5V) < 180m\Omega (V_{GS} = -4.5V)$	



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	$T_A=25^\circ C$	3.1	-2.7	A
	$T_A=70^\circ C$	2.4	-2.1	
Pulsed Drain Current ^B	I_{DM}	12	-12	
Power Dissipation	$T_A=25^\circ C$	1.15	1.15	W
	$T_A=70^\circ C$	0.73	0.73	
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 ^A	$R_{\theta JA}$	78	110	$^\circ C/W$
Maximum Junction-to-Ambient ^A		106	150	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	64	80	$^\circ C/W$

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	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} =±20V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1	1.9	3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	10			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =3.1A T _J =125°C		54 78	75	mΩ
		V _{GS} =4.5V, I _D =2A		88	115	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =3.1A		4.5		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.79	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		200	240	pF
C _{oss}	Output Capacitance			40		pF
C _{rss}	Reverse Transfer Capacitance			20		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.3	3	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =3.1A		6.5	8.5	nC
Q _g (4.5V)	Total Gate Charge			3.1	4	nC
Q _{gs}	Gate Source Charge			1.2		nC
Q _{gd}	Gate Drain Charge			1.6		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =4.7Ω, R _{GEN} =3Ω		3.3		ns
t _r	Turn-On Rise Time			2.5		ns
t _{D(off)}	Turn-Off DelayTime			13.2		ns
t _f	Turn-Off Fall Time			1.7		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =3.1A, di/dt=100A/μs		9.4	12	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =3.1A, di/dt=100A/μs		3.5		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_s 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 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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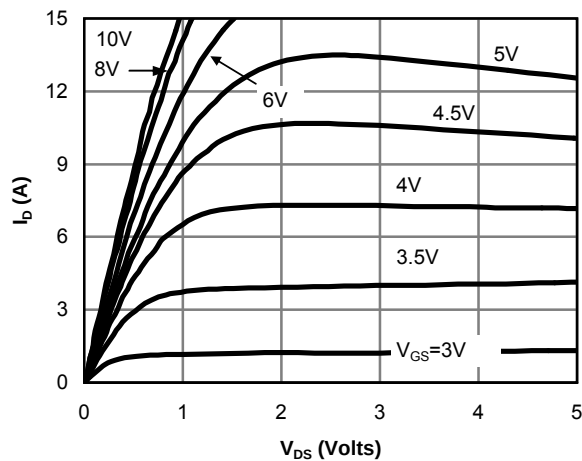
N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Fig 1: On-Region Characteristics

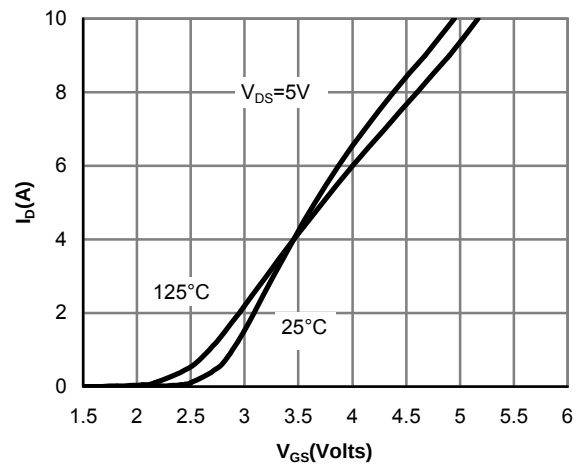


Figure 2: Transfer Characteristics

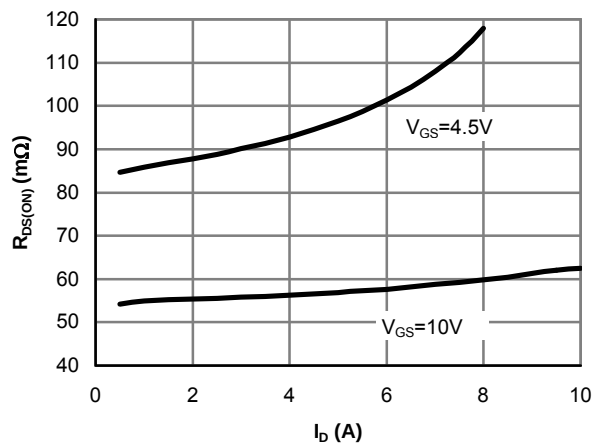


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

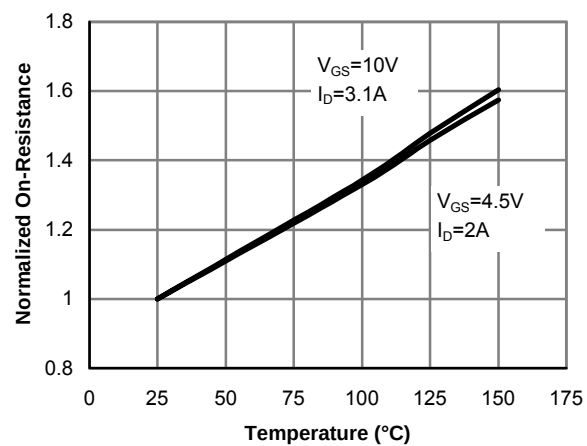


Figure 4: On-Resistance vs. Junction Temperature

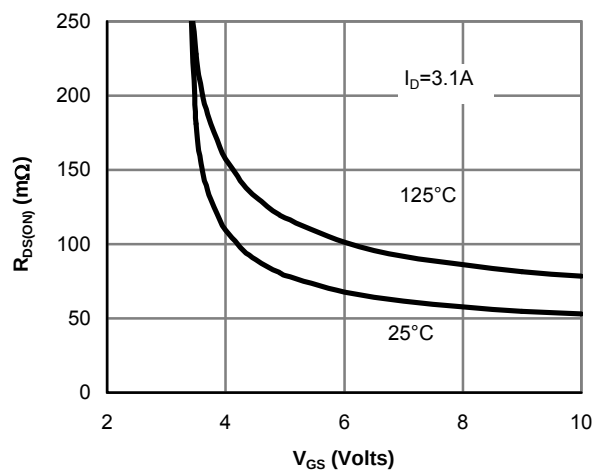


Figure 5: On-Resistance vs. Gate-Source Voltage

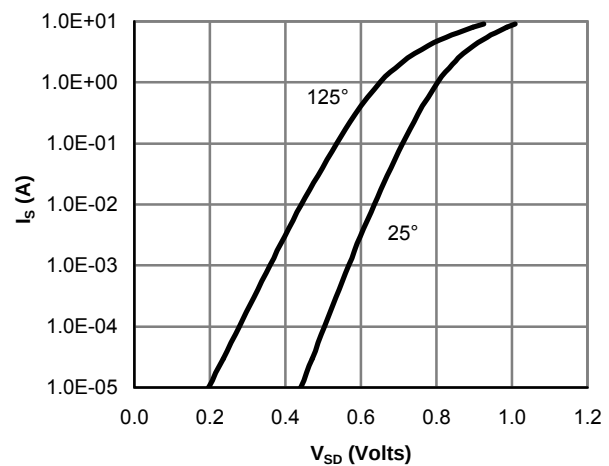


Figure 6: Body-Diode Characteristics

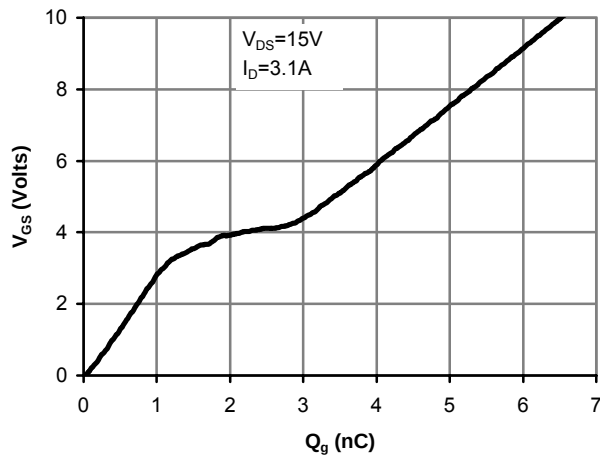
N-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Figure 7: Gate-Charge Characteristics

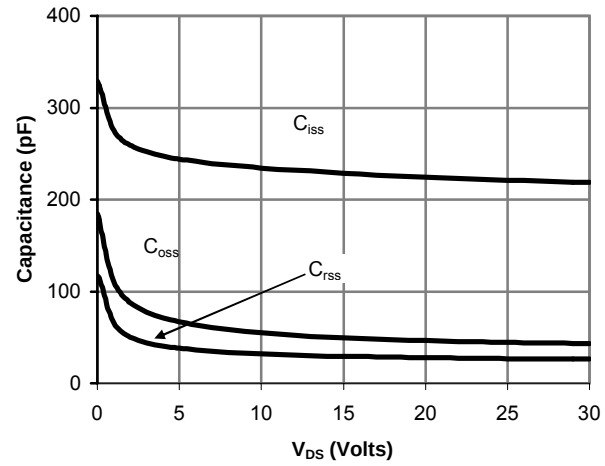


Figure 8: Capacitance Characteristics

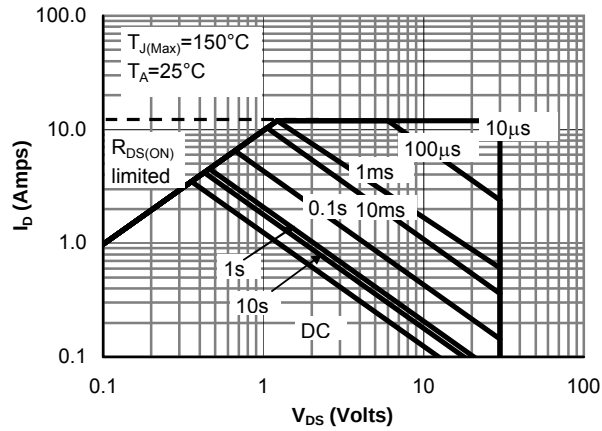


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

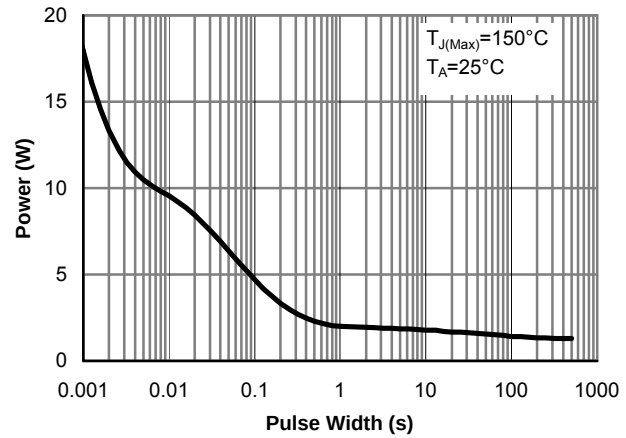


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

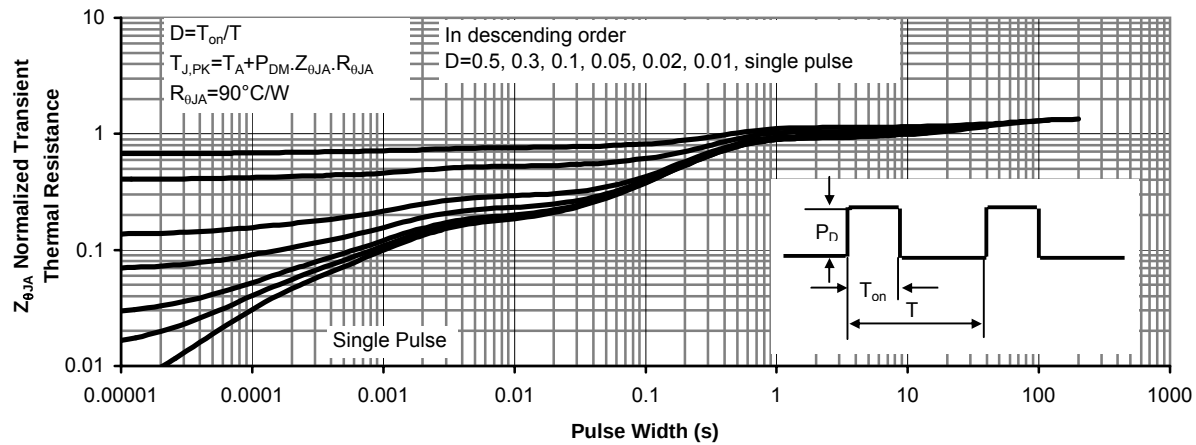


Figure 11: Normalized Maximum Transient Thermal Impedance

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
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	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1	-1.9	-3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-5			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-2.7\text{A}$ $T_J=125^\circ\text{C}$		77 110	100	$\text{m}\Omega$
		$V_{GS}=-4.5\text{V}$, $I_D=-2\text{A}$		130	180	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-2.7\text{A}$		4.1		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.81	-1	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		260	312	pF
C_{oss}	Output Capacitance			55		pF
C_{rss}	Reverse Transfer Capacitance			44		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		4.3	5	Ω
SWITCHING PARAMETERS						
$Q_g(10)$	Total Gate Charge(10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-2.7\text{A}$		5.8	7	nC
$Q_g(4.5)$	Total Gate Charge(4.5V)			3	4	nC
Q_{gs}	Gate Source Charge			0.78		nC
Q_{gd}	Gate Drain Charge			1.6		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=5.6\Omega$, $R_{GEN}=3\Omega$		7		ns
t_r	Turn-On Rise Time			6		ns
$t_{D(off)}$	Turn-Off DelayTime			15		ns
t_f	Turn-Off Fall Time			7.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-2.7\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		12.5	15	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-2.7\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		5.5		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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 $\leq 10\text{s}$ 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 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 $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

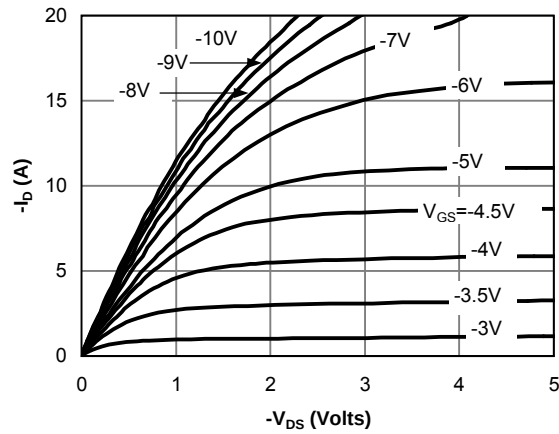


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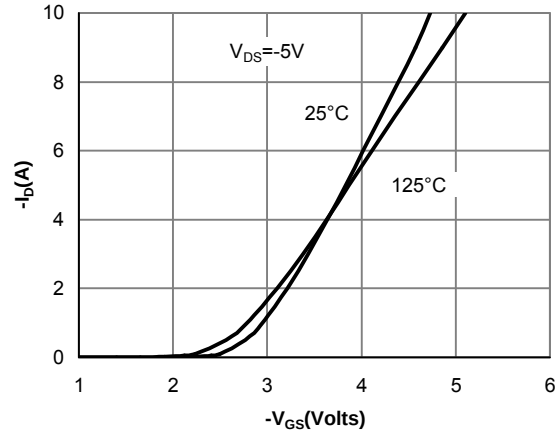


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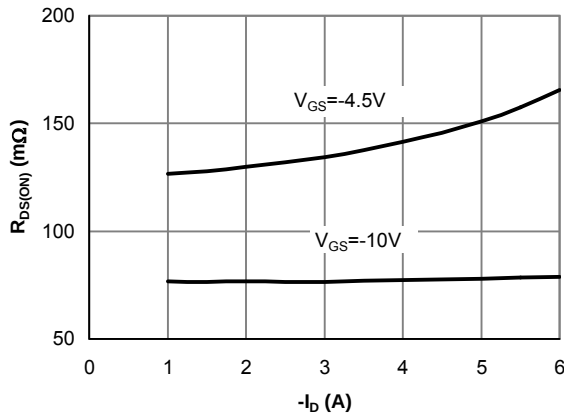


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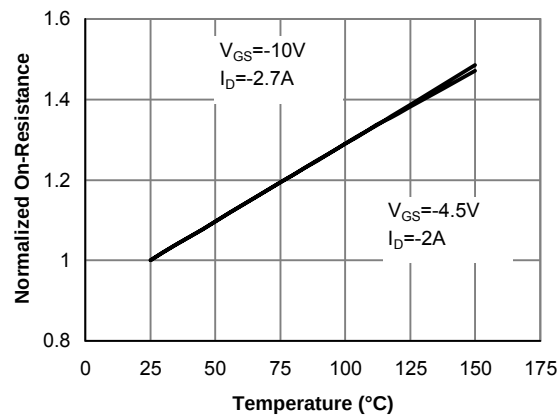


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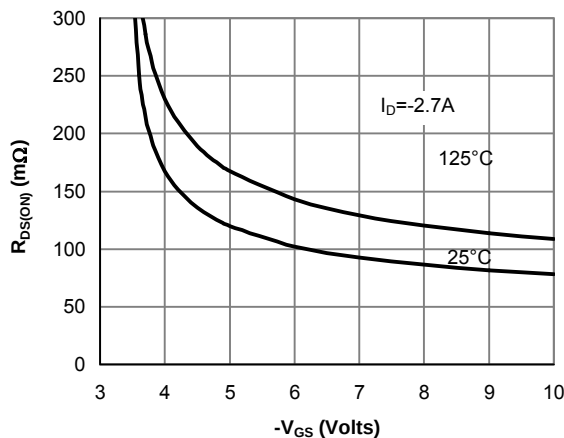


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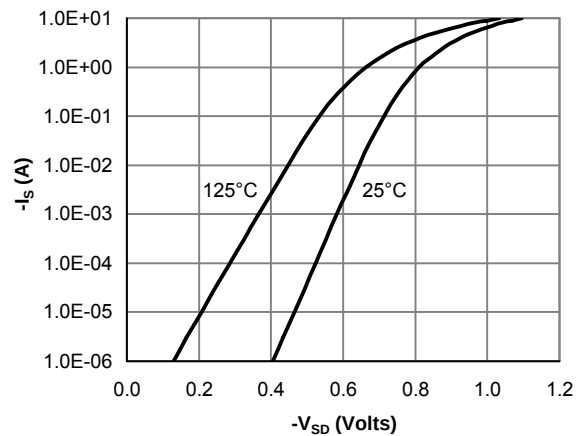


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

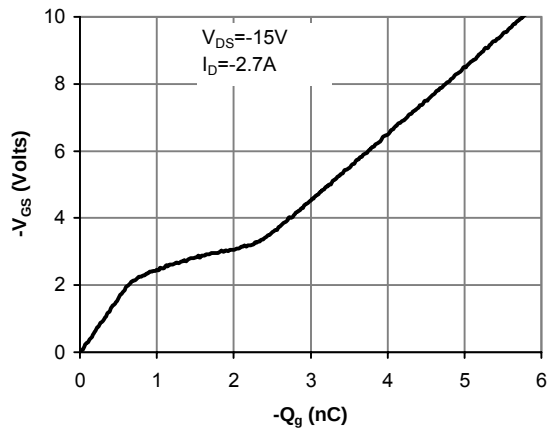


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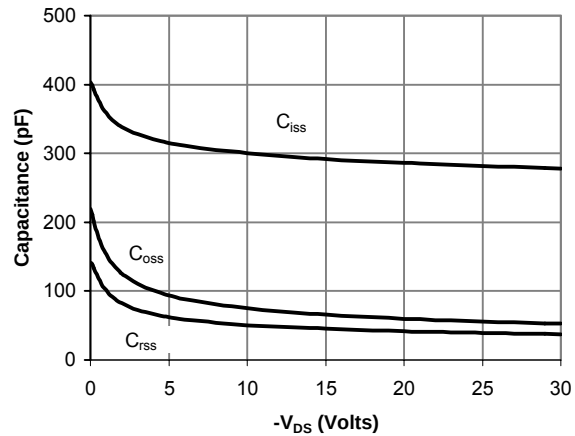


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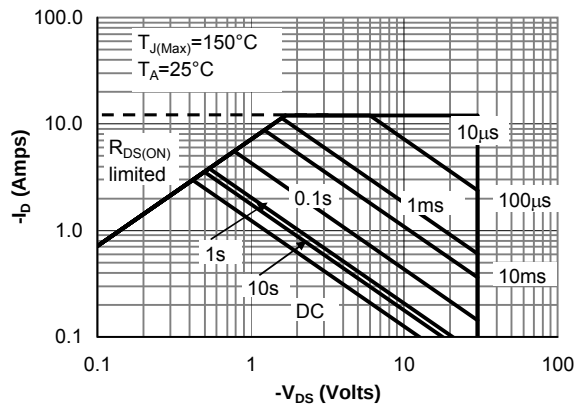


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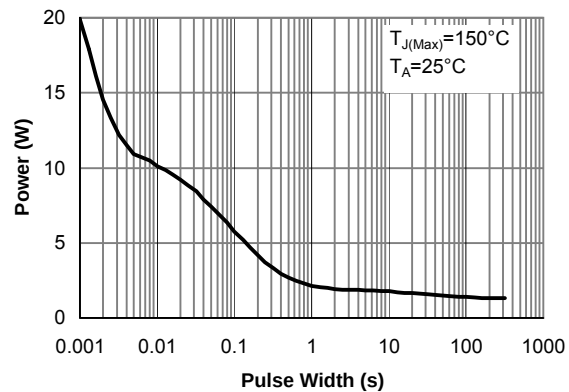


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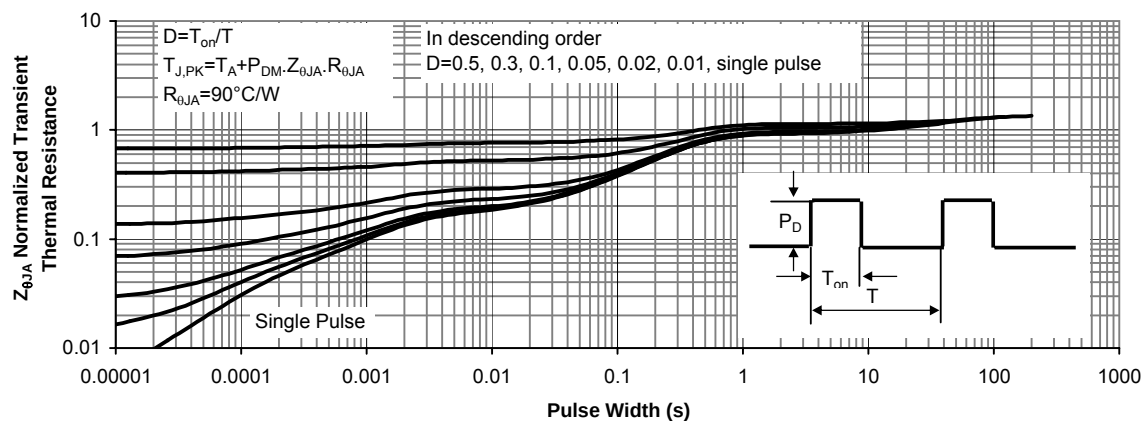


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