



ALPHA & OMEGA
SEMICONDUCTOR



AO7600

Complementary Enhancement Mode Field Effect Transistor

General Description

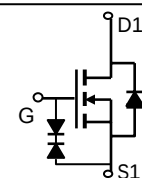
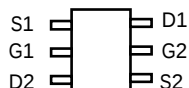
The AO7600 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, an inverter, and for a host of other applications. Both devices are ESD protected. *Standard Product AO7600 is Pb-free (meets ROHS & Sony 259 specifications). AO7600L is a Green Product ordering option. AO7600 and AO7600L are electrically identical.*

Features

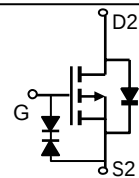
n-channel	p-channel
$V_{DS} (V) = 20V$	-20V
$I_D = 0.9A (V_{GS}=4.5V)$	-0.6A ($V_{GS}=-4.5V$)

$R_{DS(ON)}$	$R_{DS(ON)}$
$< 300m\Omega (V_{GS}=4.5V)$	$< 550m\Omega (V_{GS}=-4.5V)$
$< 350m\Omega (V_{GS}=2.5V)$	$< 700m\Omega (V_{GS}=-2.5V)$
$< 450m\Omega (V_{GS}=1.8V)$	$< 950m\Omega (V_{GS}=-1.8V)$

SC-70-6
(SOT-323)
Top View



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}	20	-20	V
Gate-Source Voltage	V_{GS}	± 8	± 8	V
Continuous Drain Current ^A	I_D	0.9	-0.6	A
		0.7	-0.48	
Pulsed Drain Current ^B	I_{DM}	5	-3	
Power Dissipation	P_D	0.3	0.3	W
		0.19	0.19	
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	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	n-ch	360	415	$^\circ C/W$
Maximum Junction-to-Ambient ^A		n-ch	400	460	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	n-ch	300	350	$^\circ C/W$
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	p-ch	360	415	$^\circ C/W$
Maximum Junction-to-Ambient ^A		p-ch	400	460	$^\circ C/W$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	p-ch	300	350	$^\circ C/W$

N-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	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	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	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			25	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	0.5	0.75	0.9	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	$V_{GS}=4.5\text{V}$, $I_D=0.9\text{A}$ $T_J=125^\circ\text{C}$		181 253	300 330	$\text{m}\Omega$
		$V_{GS}=2.5\text{V}$, $I_D=0.75\text{A}$		237	350	$\text{m}\Omega$
		$V_{GS}=1.8\text{V}$, $I_D=0.7\text{A}$		317	450	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=0.8\text{A}$		2.6		S
V_{SD}	Diode Forward Voltage	$I_S=0.5\text{A}$, $V_{GS}=0\text{V}$		0.69	1	V
I_S	Maximum Body-Diode Continuous Current				0.4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=10\text{V}$, $f=1\text{MHz}$		101	120	pF
C_{oss}	Output Capacitance			17		pF
C_{rss}	Reverse Transfer Capacitance			14		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3	4	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=4.5\text{V}$, $V_{DS}=10\text{V}$, $I_D=0.8\text{A}$		1.57	1.9	nC
Q_{gs}	Gate Source Charge			0.13		nC
Q_{gd}	Gate Drain Charge			0.36		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=5\text{V}$, $V_{DS}=10\text{V}$, $R_L=12.5\Omega$, $R_{GEN}=6\Omega$		3.2		ns
t_r	Turn-On Rise Time			4		ns
$t_{D(off)}$	Turn-Off DelayTime			15.5		ns
t_f	Turn-Off Fall Time			2.4		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=0.8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		6.7	8.1	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=0.8\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		1.6		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 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 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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N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

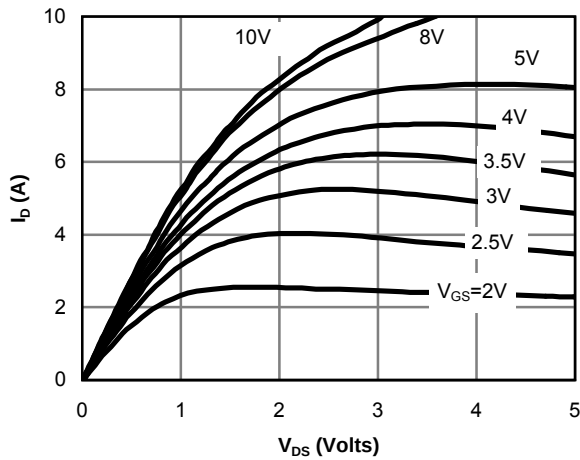


Fig 1: On-Region Characteristics

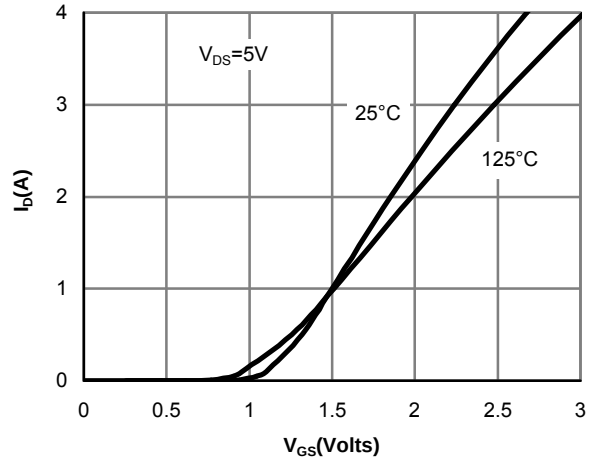


Figure 2: Transfer Characteristics

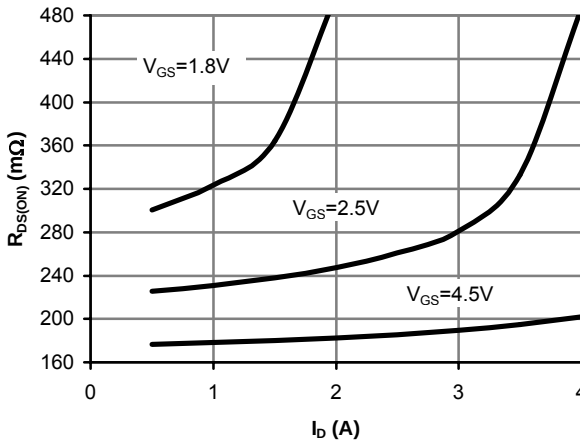


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

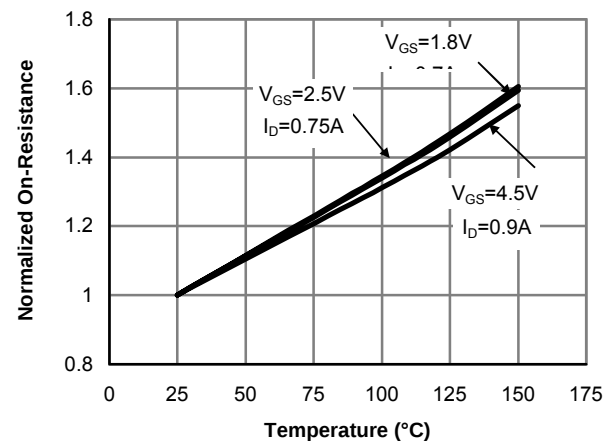


Figure 4: On-Resistance vs. Junction Temperature

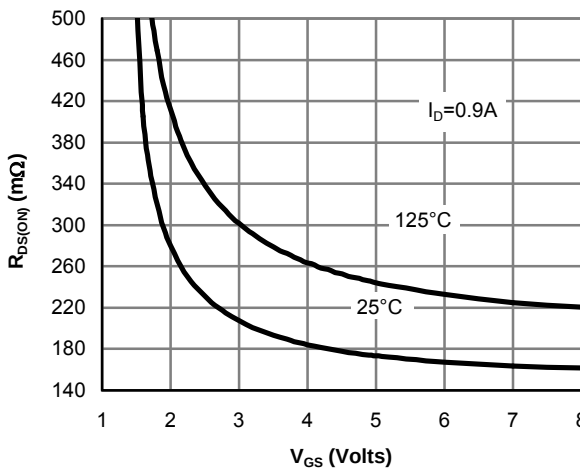


Figure 5: On-Resistance vs. Gate-Source Voltage

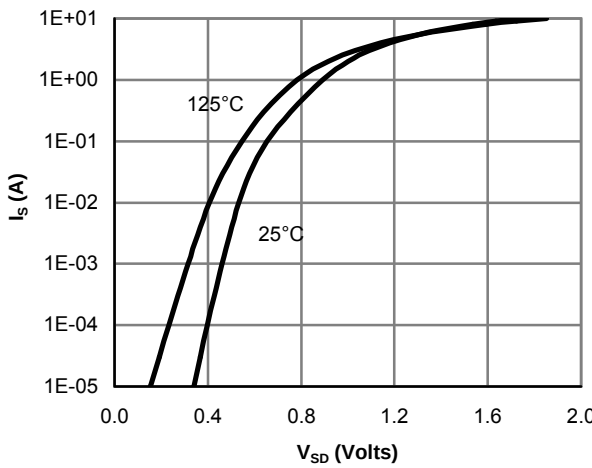


Figure 6: Body-Diode Characteristics

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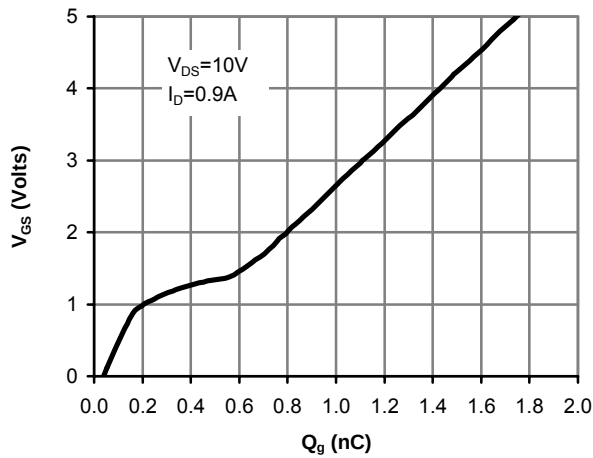


Figure 7: Gate-Charge Characteristics

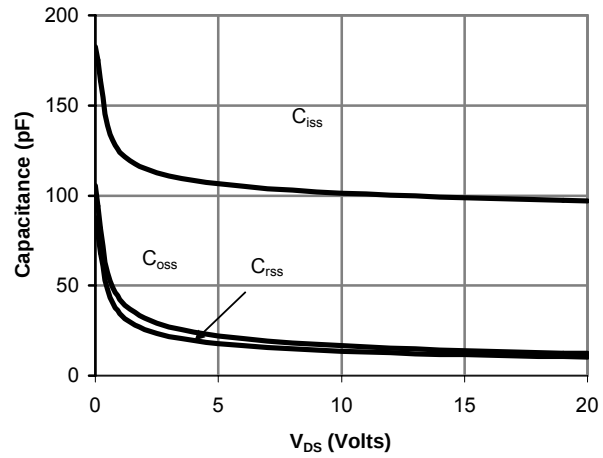


Figure 8: Capacitance Characteristics

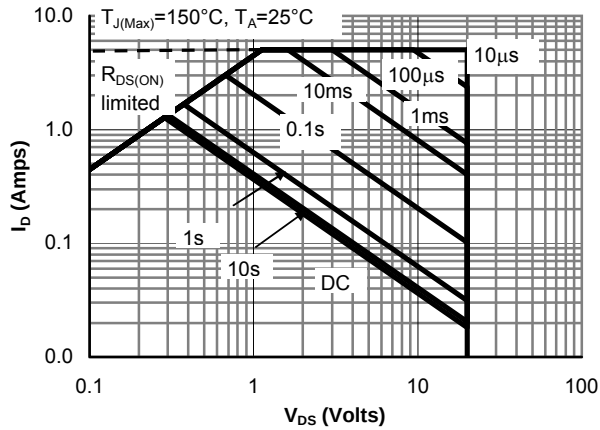


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

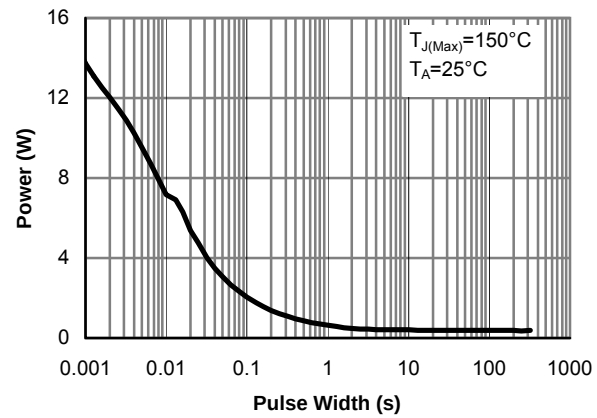


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

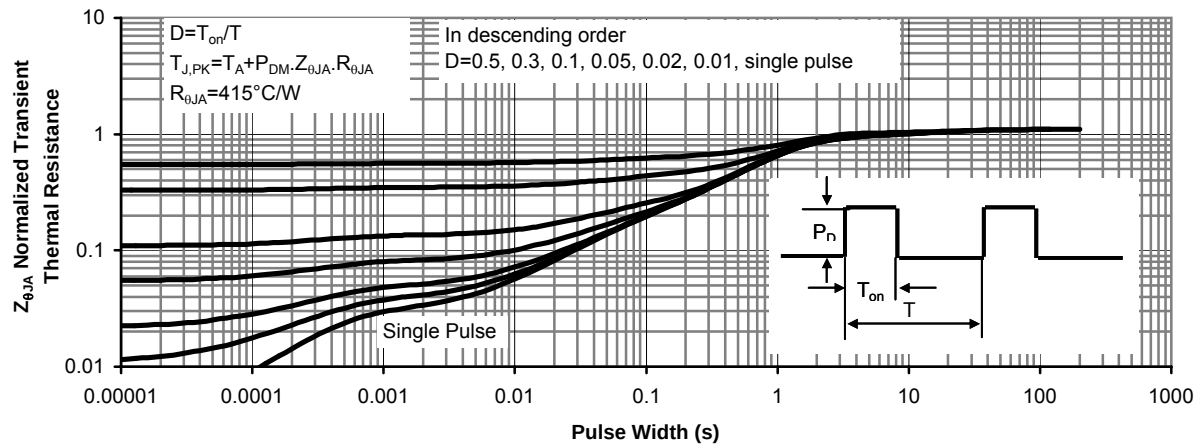


Figure 11: Normalized Maximum Transient Thermal Impedance

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	-20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-16V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±8V			±10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =-250μA	-0.5	-0.6	-0.9	V
I _{D(ON)}	On state drain current	V _{GS} =-4.5V, V _{DS} =-5V	-3			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-4.5V, I _D =-0.6A T _J =125°C		415 542	550 700	mΩ
		V _{GS} =-2.5V, I _D =-0.5A		590	700	mΩ
		V _{GS} =-1.8V, I _D =-0.4A		700	950	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-0.6A		1.7		S
V _{SD}	Diode Forward Voltage	I _S =-0.5A, V _{GS} =0V		-0.86	-1	V
I _S	Maximum Body-Diode Continuous Current				-0.4	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-10V, f=1MHz		114	140	pF
C _{oss}	Output Capacitance			17		pF
C _{rss}	Reverse Transfer Capacitance			14		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		12	17	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =-4.5V, V _{DS} =-10V, I _D =-0.6A		1.44	1.8	nC
Q _{gs}	Gate Source Charge			0.14		nC
Q _{gd}	Gate Drain Charge			0.35		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-4.5V, V _{DS} =-10V, R _L =16.7Ω, R _{GEN} =3Ω		6.5		ns
t _r	Turn-On Rise Time			6.5		ns
t _{D(off)}	Turn-Off DelayTime			18.2		ns
t _f	Turn-Off Fall Time			5.5		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-0.6A, dI/dt=100A/μs		10	13	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-0.6A, dI/dt=100A/μs		3		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 ≤ 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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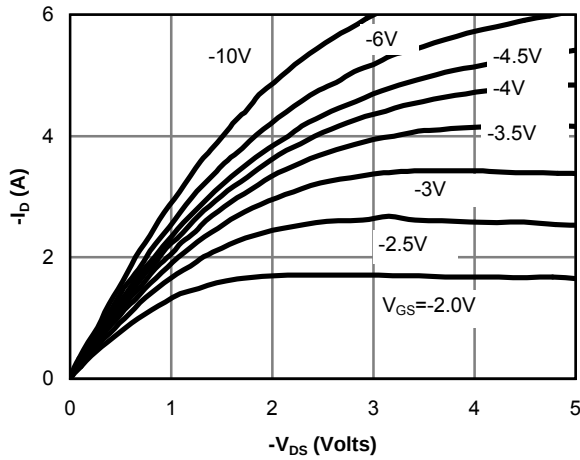


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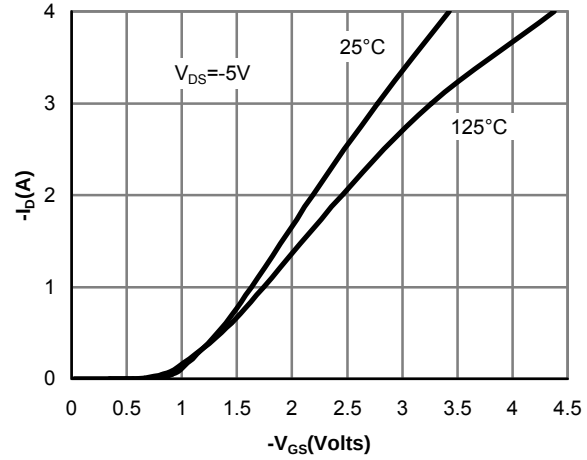


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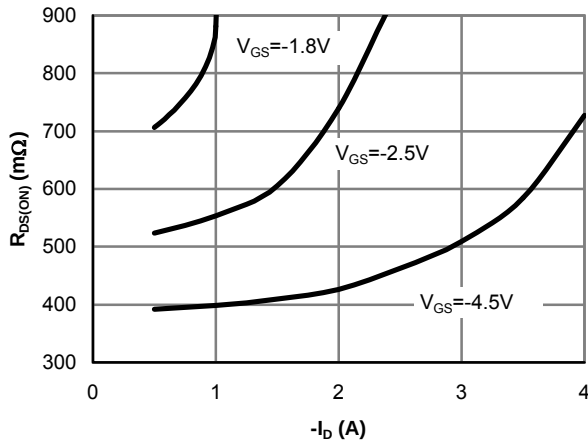


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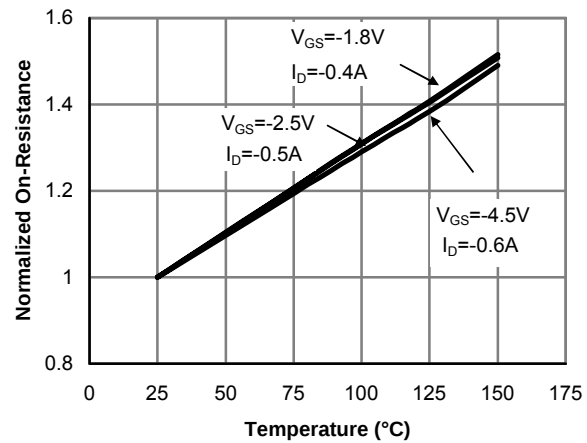


Figure 4: On-Resistance vs. Junction Temperature

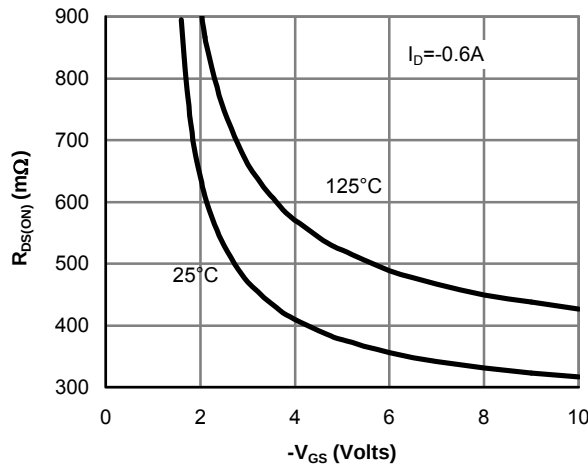


Figure 5: On-Resistance vs. Gate-Source Voltage

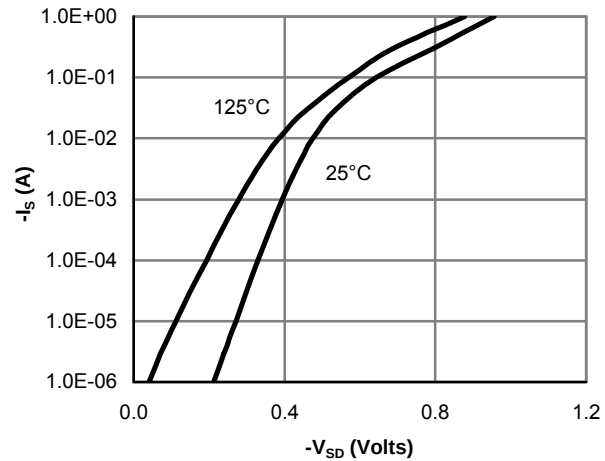


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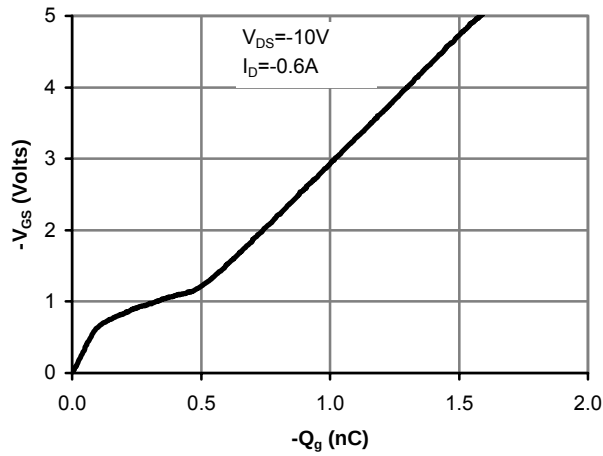


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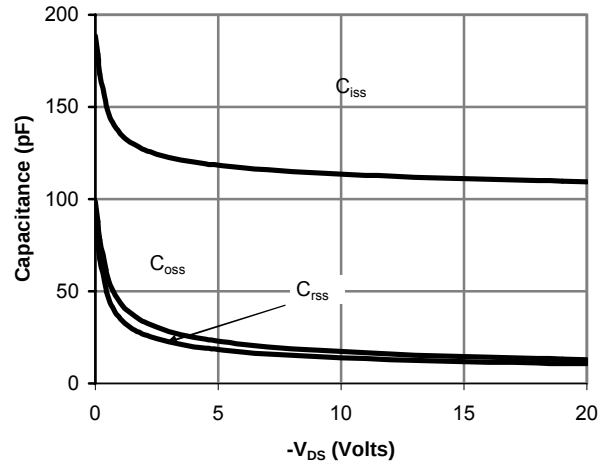


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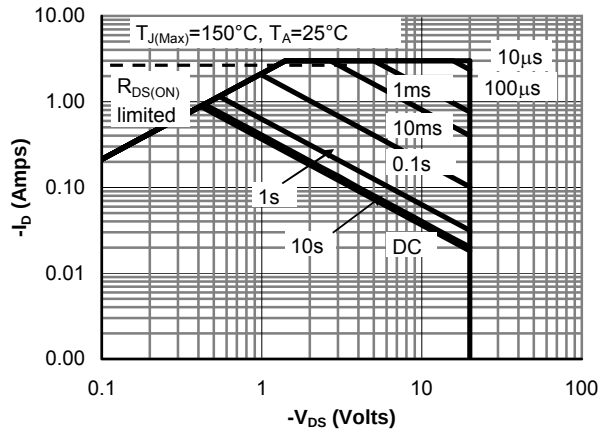


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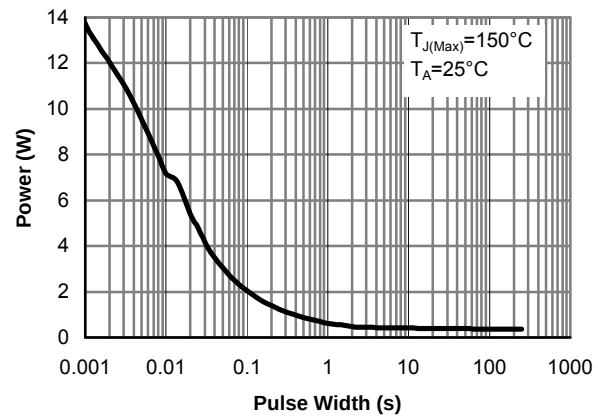


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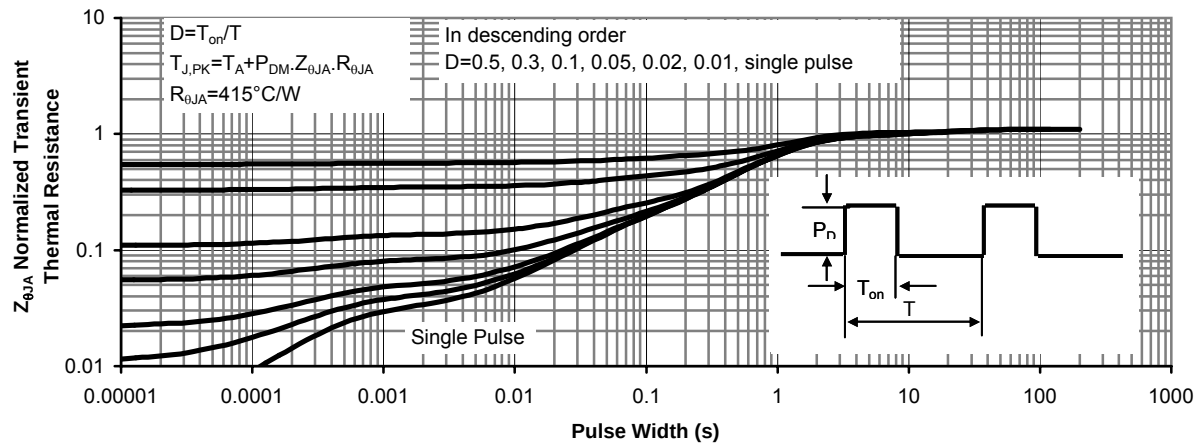


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