



ALPHA & OMEGA
SEMICONDUCTOR



AO7600

Complementary Enhancement Mode Field Effect Transistor

General Description

The AO7600/L 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. *AO7600 and AO7600L are electrically identical.*

-RoHS Compliant

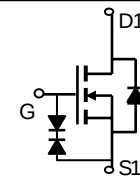
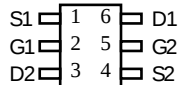
-AO7600L is Halogen Free

Features

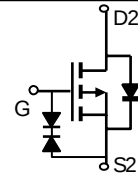
n-channel	p-channel
$V_{DS} (V) = 20V$	-20V
$I_D = 0.9A (V_{GS}=4.5V)$	-0.6A ($V_{GS}=-4.5V$)

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

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



n-channel



p-channel

Absolute Maximum Ratings $T_A=25^\circ\text{C}$ 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}	± 8	± 8	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	0.9	-0.6	A
	$T_A=70^\circ\text{C}$	0.7	-0.48	
Pulsed Drain Current ^B	I_{DM}	5	-3	
Power Dissipation	$T_A=25^\circ\text{C}$	0.3	0.3	W
	$T_A=70^\circ\text{C}$	0.19	0.19	
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	360	415	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		p-ch	400	460	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	n-ch	300	350	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	p-ch	360	415	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A		p-ch	400	460	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	p-ch	300	350	$^\circ\text{C/W}$

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	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			25	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.5	0.75	0.9	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	5			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =4.5V, I _D =0.9A T _J =125°C		181 253	300 330	mΩ
		V _{GS} =2.5V, I _D =0.75A		237	350	mΩ
		V _{GS} =1.8V, I _D =0.7A		317	450	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =0.8A		2.6		S
V _{SD}	Diode Forward Voltage	I _S =0.5A, V _{GS} =0V		0.69	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		101	120	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		3	4	Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =0.8A		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} =5V, V _{DS} =10V, R _L =12.5Ω, R _{GEN} =6Ω		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 =0.8A, dI/dt=100A/μs		6.7	8.1	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =0.8A, dI/dt=100A/μs		1.6		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 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: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

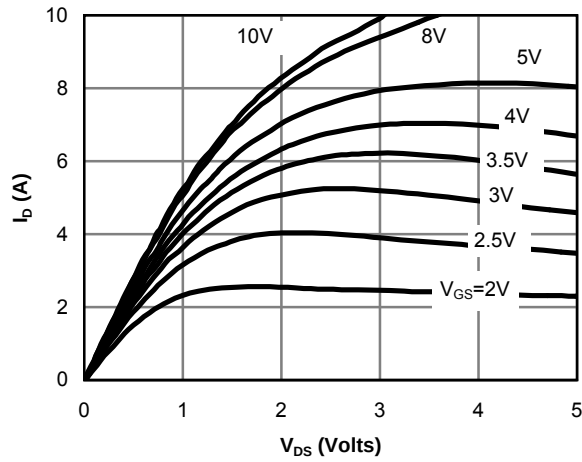


Fig 1: On-Region Characteristics

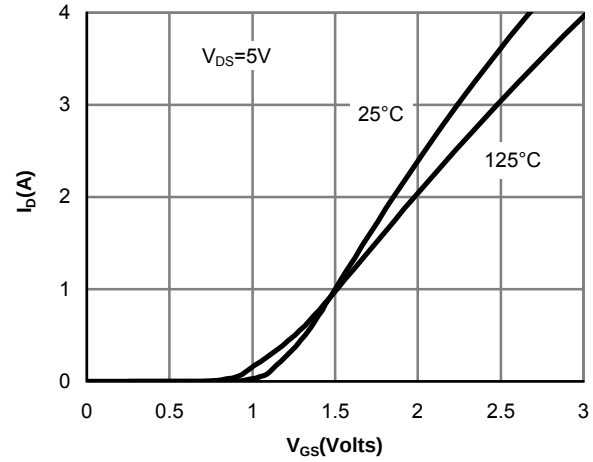


Figure 2: Transfer Characteristics

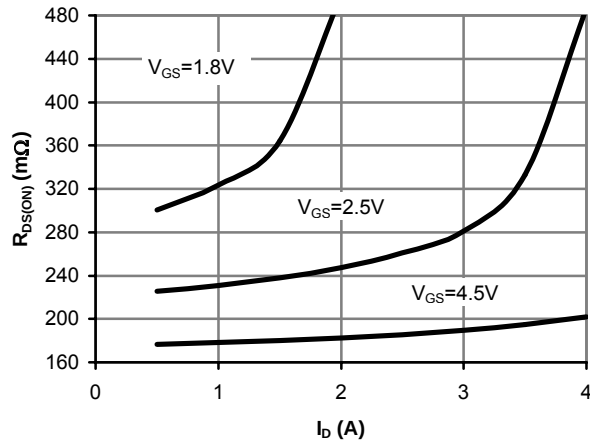


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

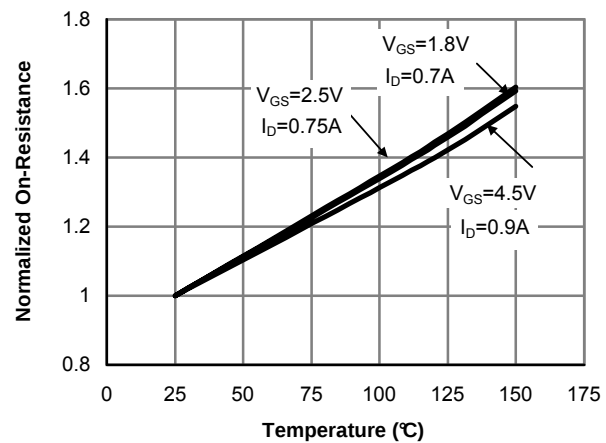


Figure 4: On-Resistance vs. Junction Temperature

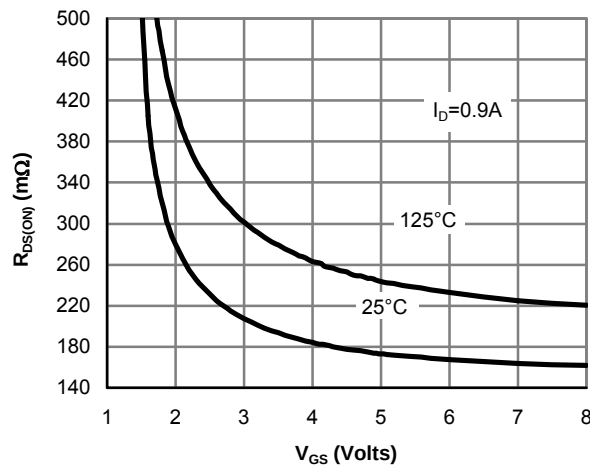


Figure 5: On-Resistance vs. Gate-Source Voltage

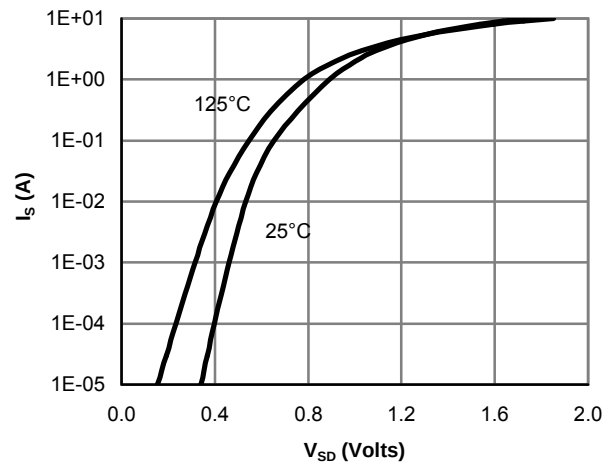


Figure 6: Body-Diode Characteristics

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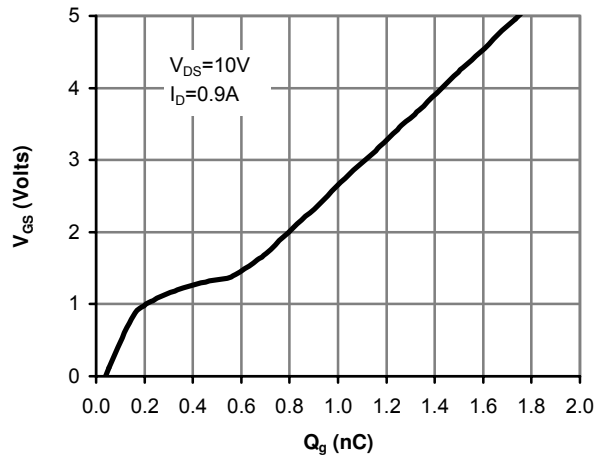


Figure 7: Gate-Charge Characteristics

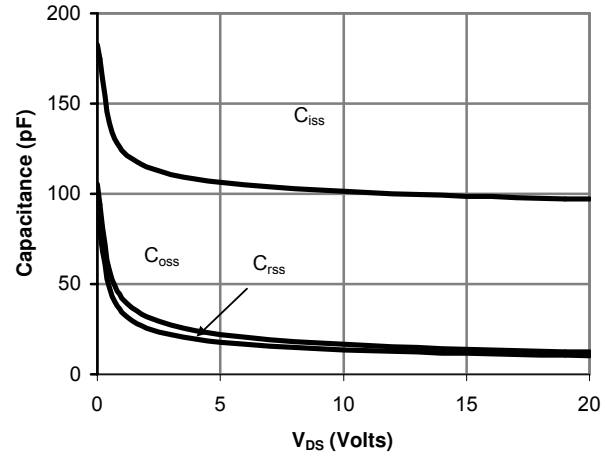


Figure 8: Capacitance Characteristics

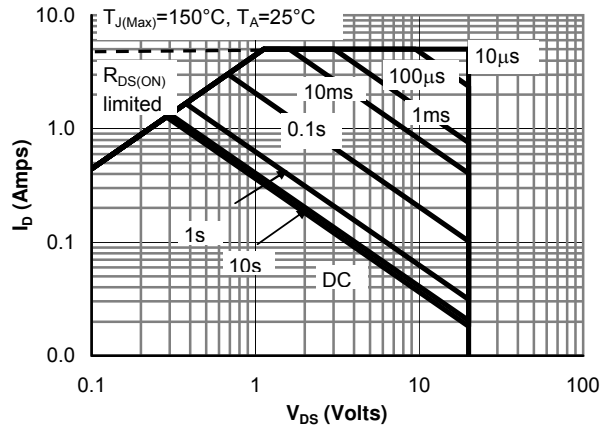


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

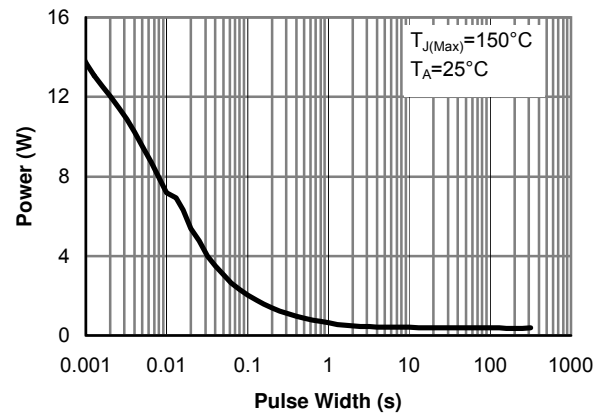


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

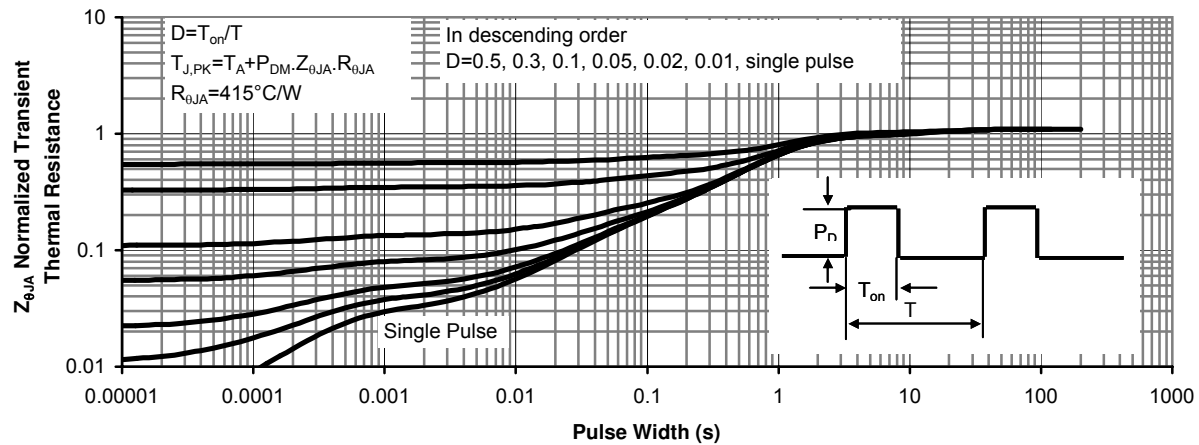


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ 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	$V_{DS}=0\text{V}$, $V_{GS}=\pm 8\text{V}$			± 10	μA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-0.5	-0.6	-0.9	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-4.5\text{V}$, $V_{DS}=-5\text{V}$	-3			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5\text{V}$, $I_D=-0.6\text{A}$ $T_J=125^\circ\text{C}$		415 542	550 700	$\text{m}\Omega$
		$V_{GS}=-2.5\text{V}$, $I_D=-0.5\text{A}$		590	700	$\text{m}\Omega$
		$V_{GS}=-1.8\text{V}$, $I_D=-0.4\text{A}$		700	950	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-0.6\text{A}$		1.7		S
V_{SD}	Diode Forward Voltage	$I_S=-0.5\text{A}$, $V_{GS}=0\text{V}$		-0.86	-1	V
I_S	Maximum Body-Diode Continuous Current				-0.4	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-10\text{V}$, $f=1\text{MHz}$		114	140	pF
C_{oss}	Output Capacitance			17		pF
C_{rss}	Reverse Transfer Capacitance			14		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		12	17	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $I_D=-0.6\text{A}$		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	$V_{GS}=-4.5\text{V}$, $V_{DS}=-10\text{V}$, $R_L=16.7\Omega$, $R_{GEN}=3\Omega$		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	$I_F=-0.6\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		10	13	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-0.6\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		3		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 $\leq 10\text{s}$ 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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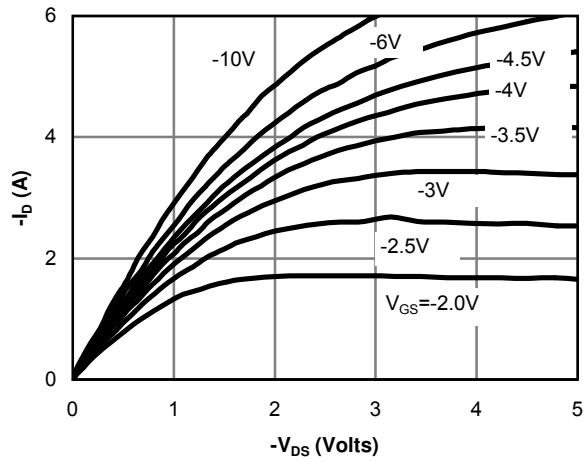


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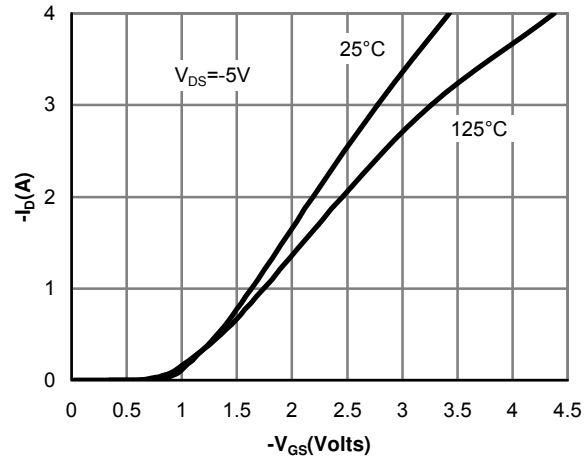


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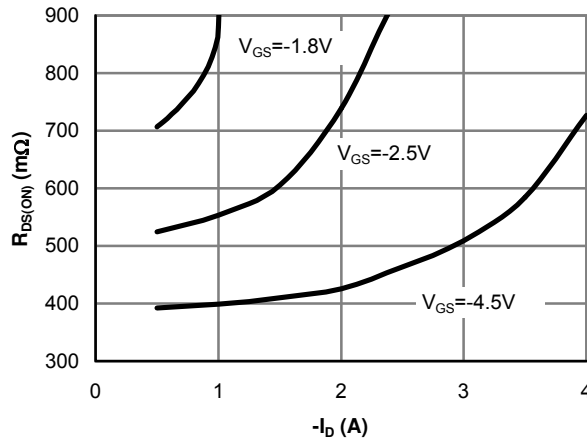


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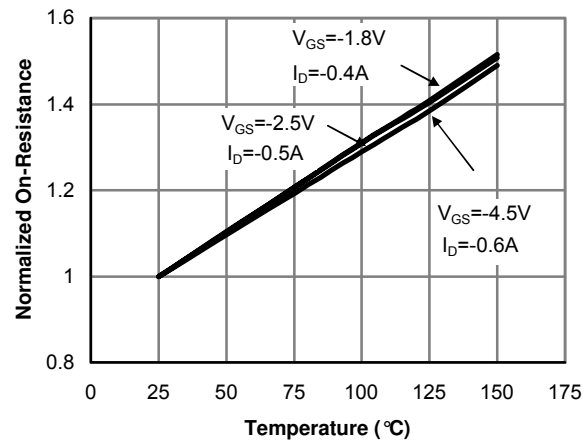


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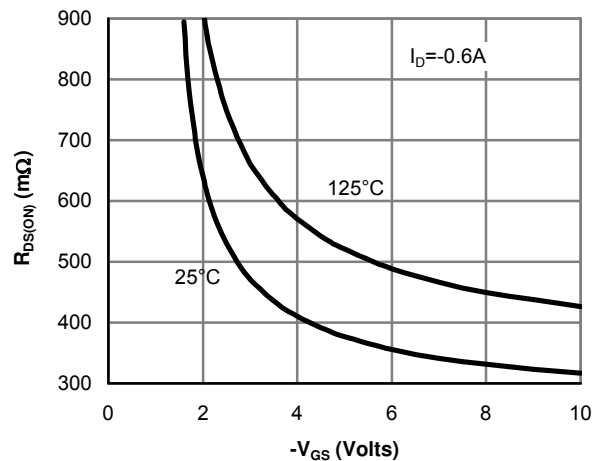


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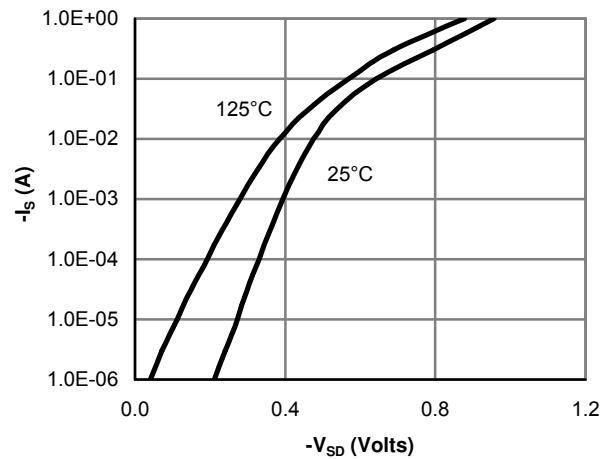


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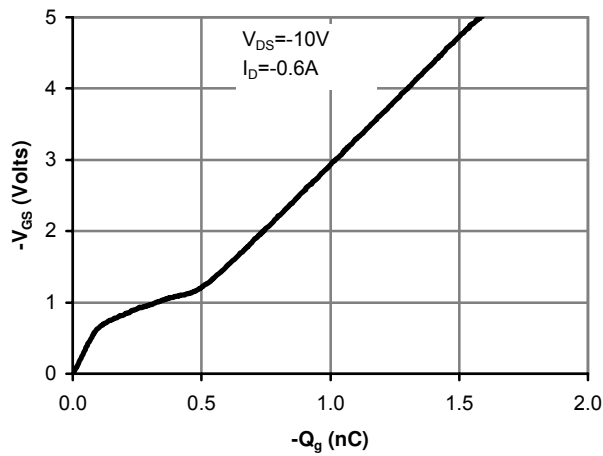


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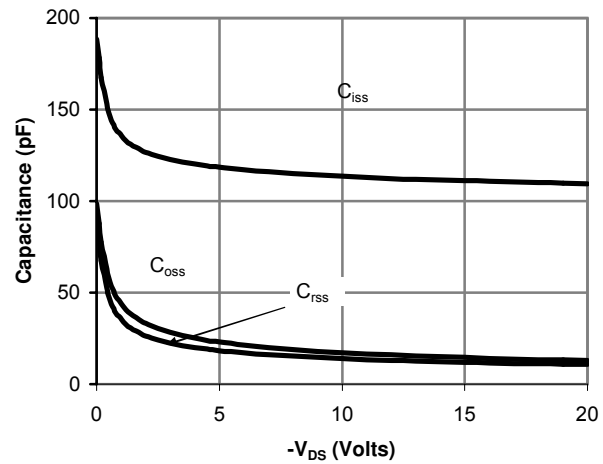


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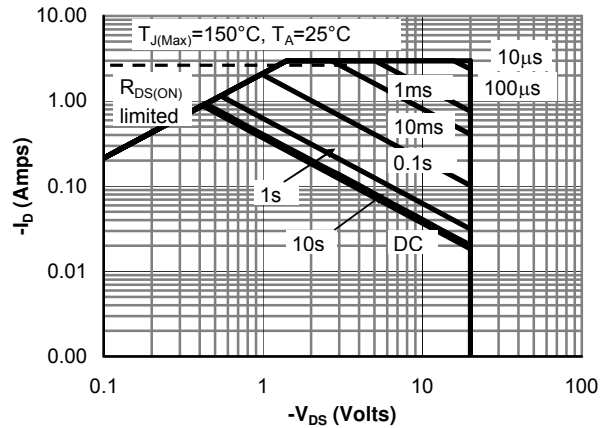


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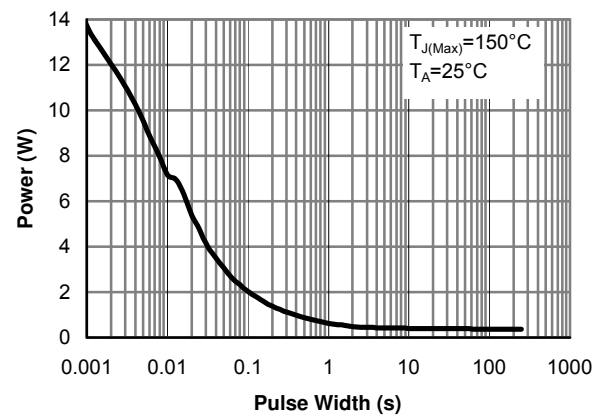


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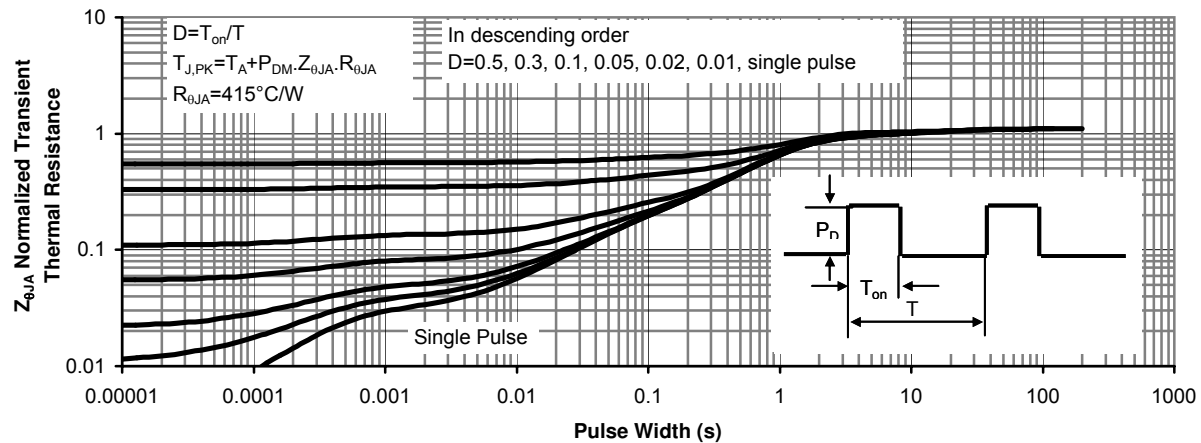


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