



## 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.*

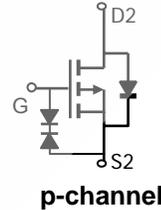
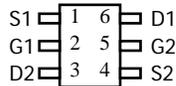
- RoHS Compliant
- AO7600L is Halogen Free

#### Features

n-channel	p-channel
$V_{DS} = 20V$	-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



#### 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	$V_{GS}$	$\pm 8$	$\pm 8$	V
Continuous Drain Current <sup>A</sup>	$T_A=25^\circ C$	0.9	-0.6	A
	$T_A=70^\circ C$	0.7	-0.48	
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	5	-3	
Power Dissipation	$T_A=25^\circ C$	0.3	0.3	W
	$T_A=70^\circ C$	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 <sup>A</sup>	$R_{\theta JA}$	n-ch	360	415	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		n-ch	400	460	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	n-ch	300	350	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>	$R_{\theta JA}$	p-ch	360	415	$^\circ C/W$
Maximum Junction-to-Ambient <sup>A</sup>		p-ch	400	460	$^\circ C/W$
Maximum Junction-to-Lead <sup>C</sup>	$R_{\theta JL}$	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
<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	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 8\text{V}$			25	$\mu\text{A}$
$V_{GS(th)}$	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
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	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	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g$	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 Delay Time	$V_{GS}=5\text{V}$ , $V_{DS}=10\text{V}$ , $R_L=12.5\Omega$ , $R_{GEN}=6\Omega$		3.2		ns
$t_r$	Turn-On Rise Time		4		ns	
$t_{D(off)}$	Turn-Off Delay Time		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 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 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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N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

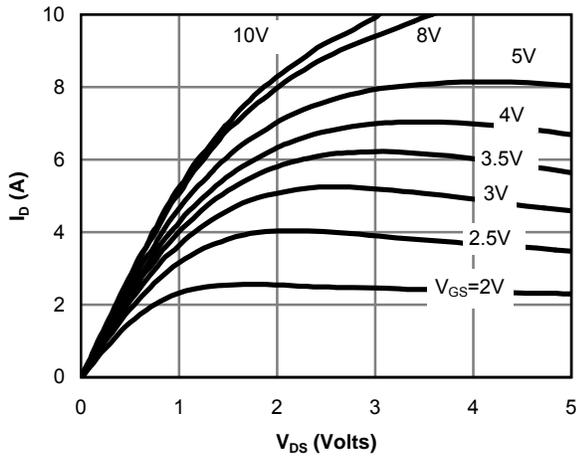


Fig 1: On-Region Characteristics

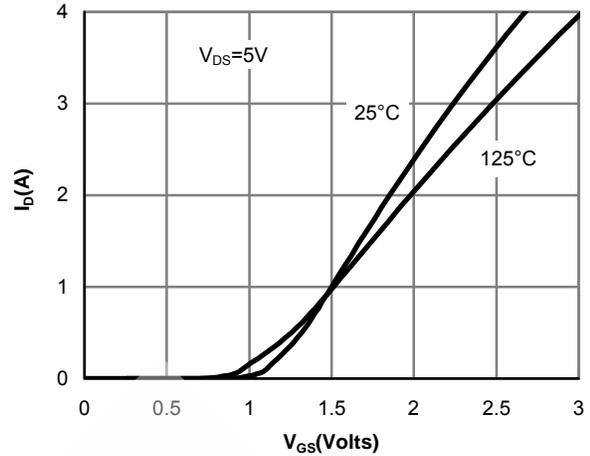


Figure 2: Transfer Characteristics

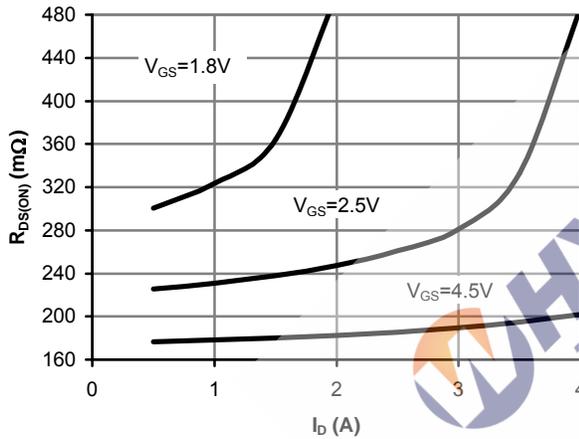


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

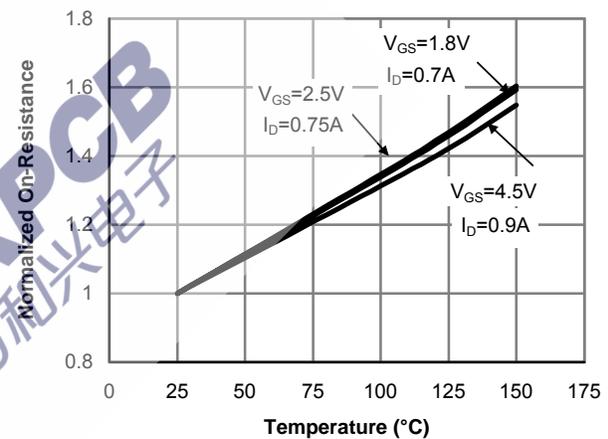


Figure 4: On-Resistance vs. Junction Temperature

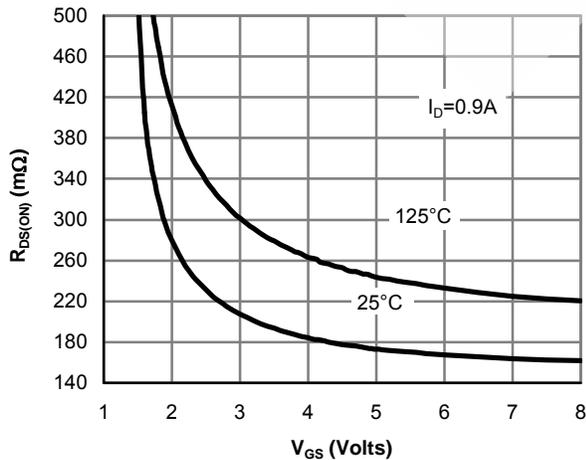


Figure 5: On-Resistance vs. Gate-Source Voltage

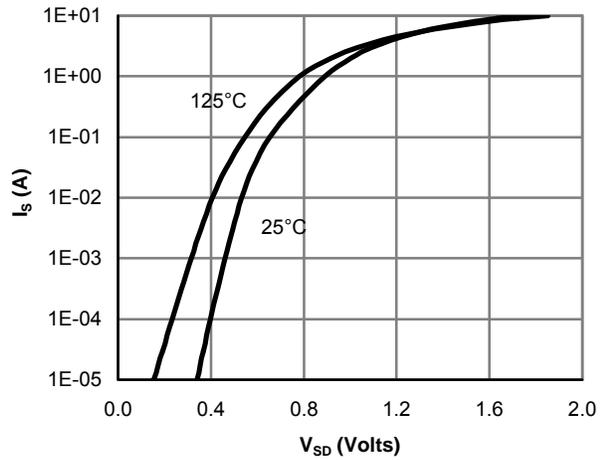


Figure 6: Body-Diode Characteristics

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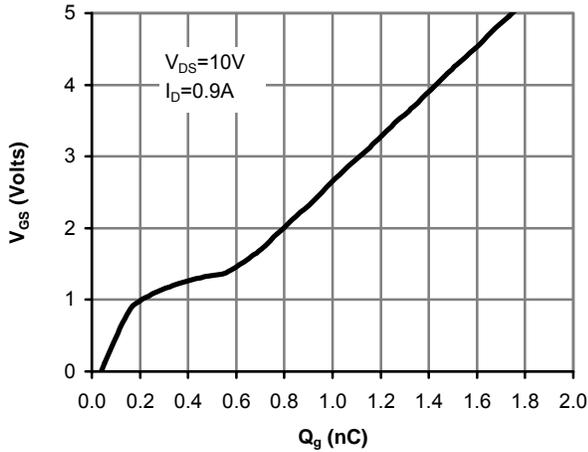


Figure 7: Gate-Charge Characteristics

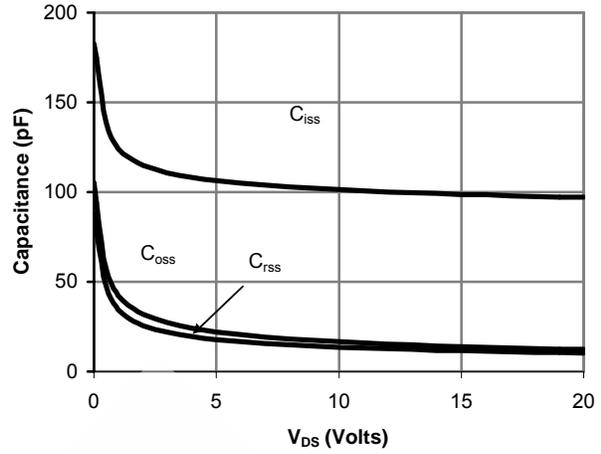


Figure 8: Capacitance Characteristics

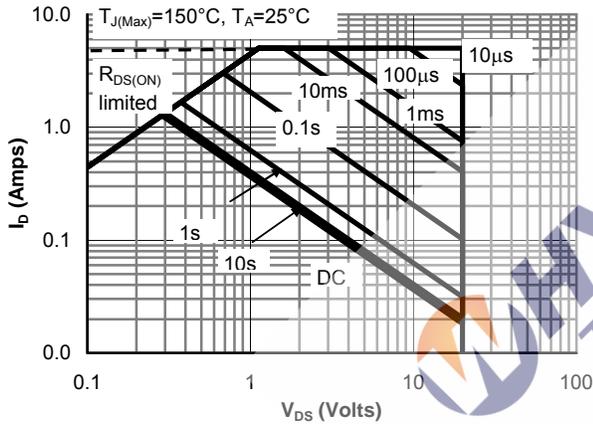


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

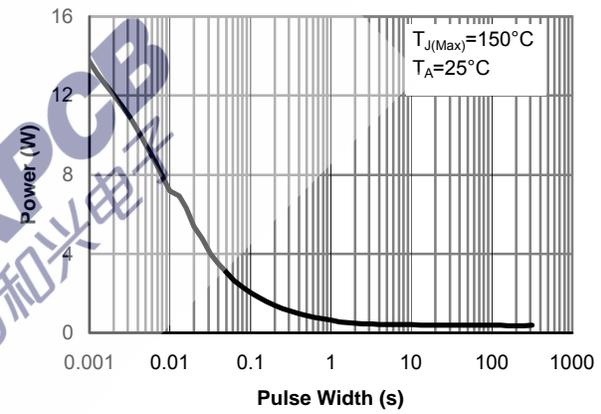


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

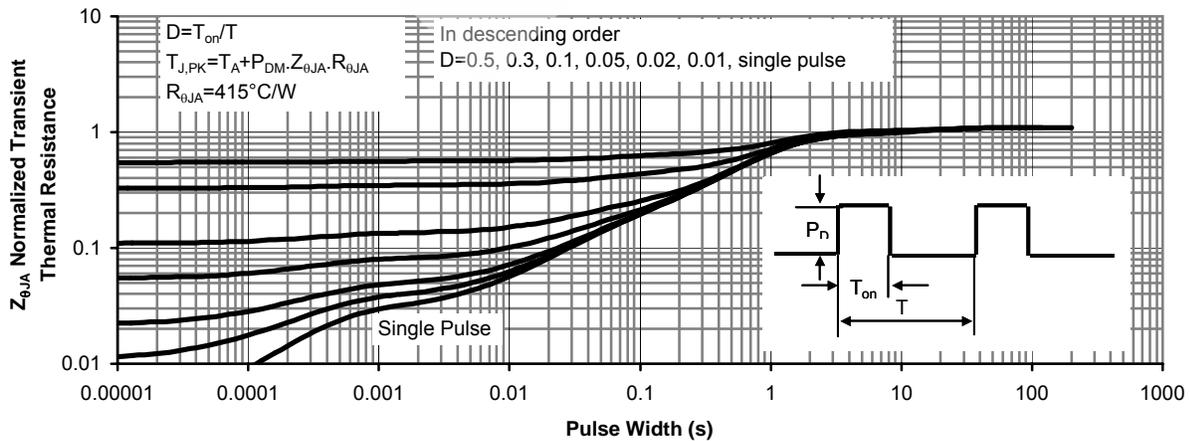


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics (T<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			±10	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =-250μA	-0.5	-0.6	-0.9	V
I <sub>D(ON)</sub>	On state drain current	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-5V	-3			A
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-0.6A T <sub>J</sub> =125°C		415 542	550 700	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-0.5A		590	700	mΩ
		V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-0.4A		700	950	mΩ
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-0.6A		1.7		S
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =-0.5A, V <sub>GS</sub> =0V		-0.86	-1	V
I <sub>S</sub>	Maximum Body-Diode Continuous Current				-0.4	A
<b>DYNAMIC PARAMETERS</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V, f=1MHz		114	140	pF
C <sub>oss</sub>	Output Capacitance		17		pF	
C <sub>riss</sub>	Reverse Transfer Capacitance		14		pF	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		12	17	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> =-0.6A		1.44	1.8	nC
Q <sub>gs</sub>	Gate Source Charge		0.14		nC	
Q <sub>gd</sub>	Gate Drain Charge		0.35		nC	
t <sub>D(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V, R <sub>L</sub> =16.7Ω, R <sub>GEN</sub> =3Ω		6.5		ns
t <sub>r</sub>	Turn-On Rise Time		6.5		ns	
t <sub>D(off)</sub>	Turn-Off DelayTime		18.2		ns	
t <sub>f</sub>	Turn-Off Fall Time		5.5		ns	
t <sub>rr</sub>	Body Diode Reverse Recovery Time	I <sub>F</sub> =-0.6A, di/dt=100A/μs		10	13	ns
Q <sub>rr</sub>	Body Diode Reverse Recovery Charge	I <sub>F</sub> =-0.6A, di/dt=100A/μs		3		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 ≤ 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 6,12,14 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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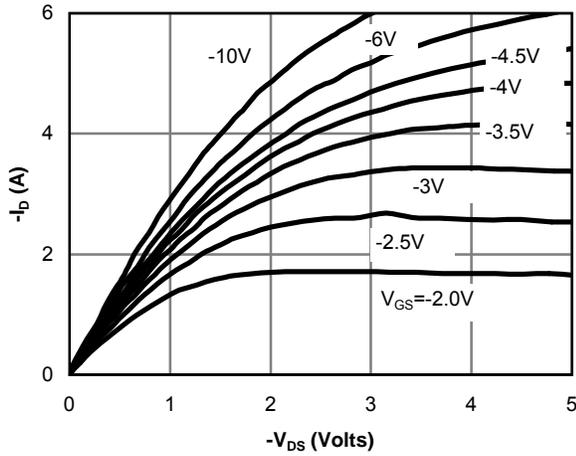


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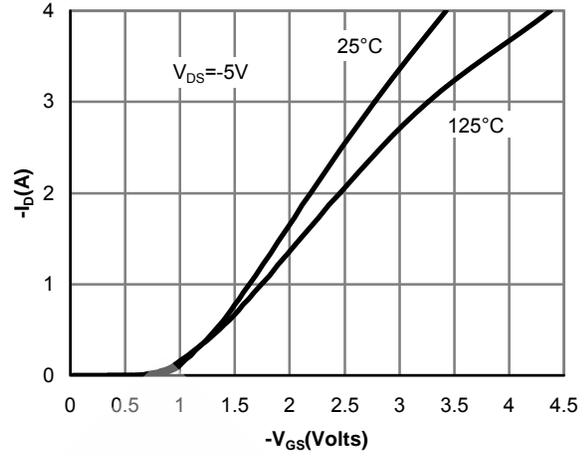


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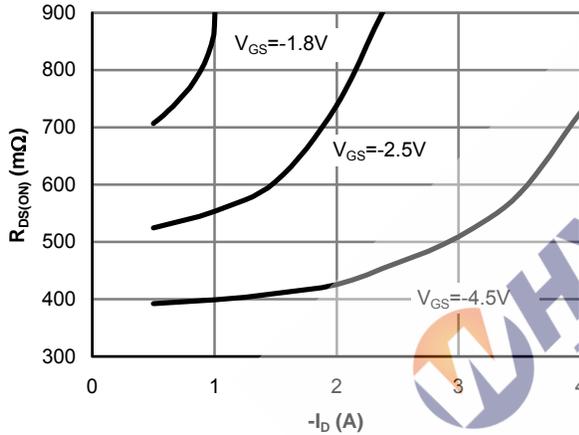


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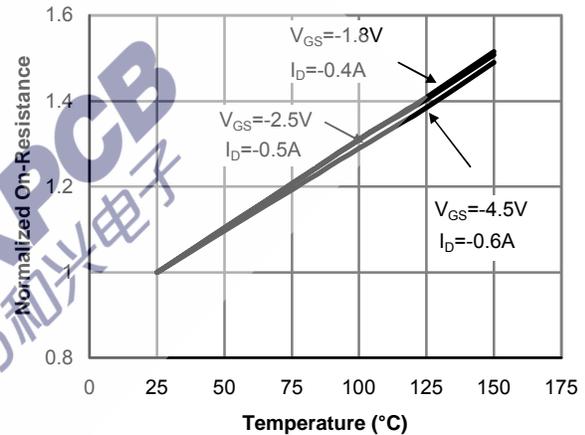


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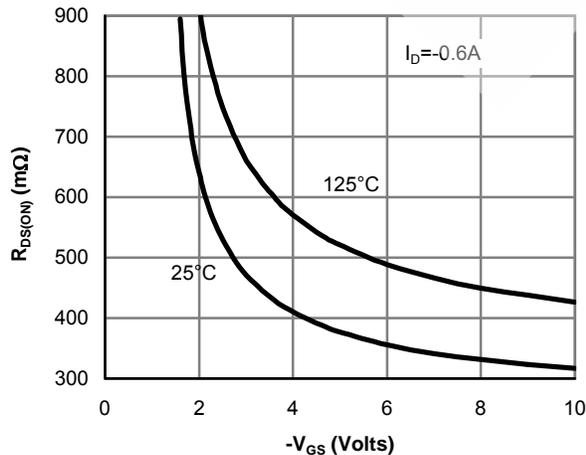


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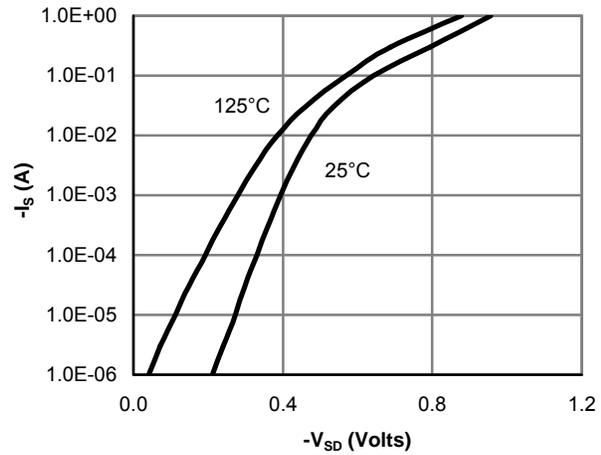


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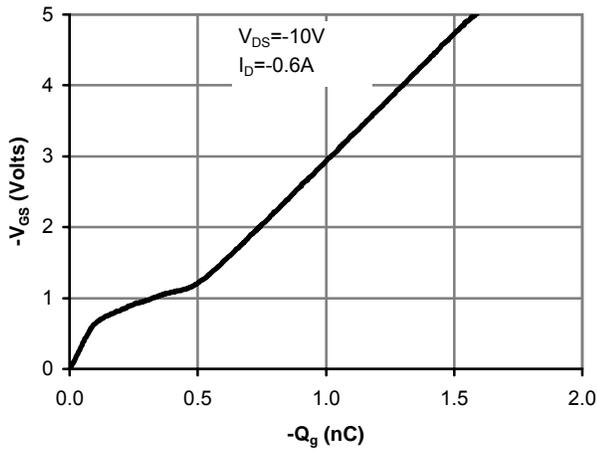


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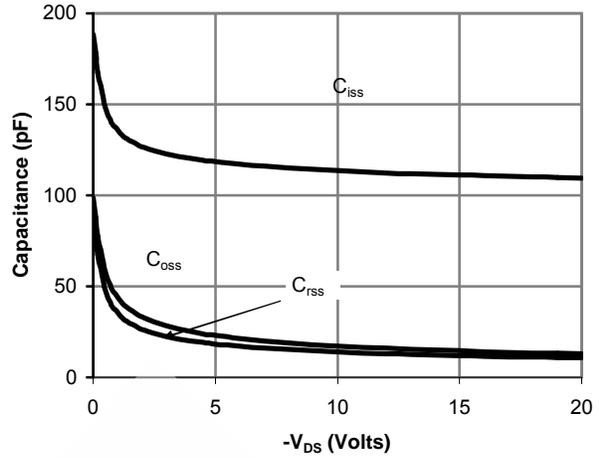


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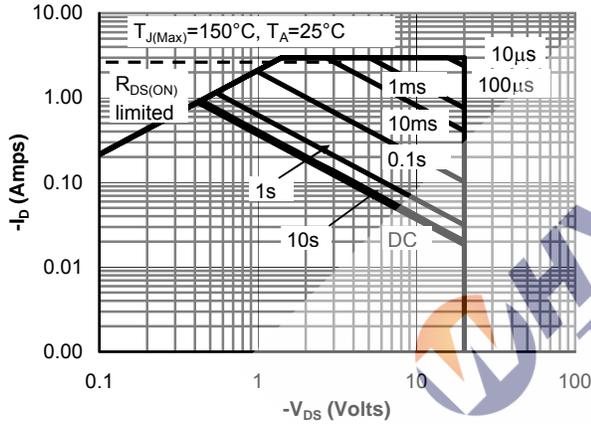


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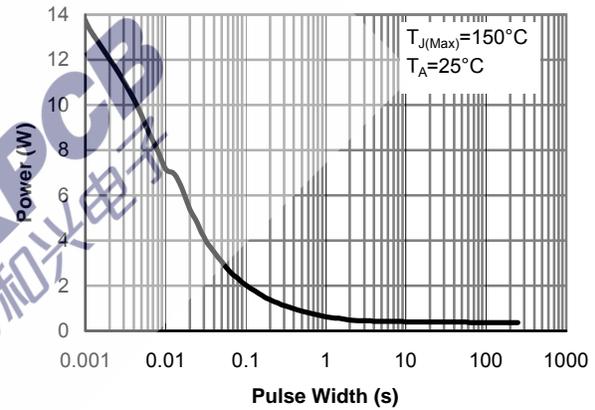


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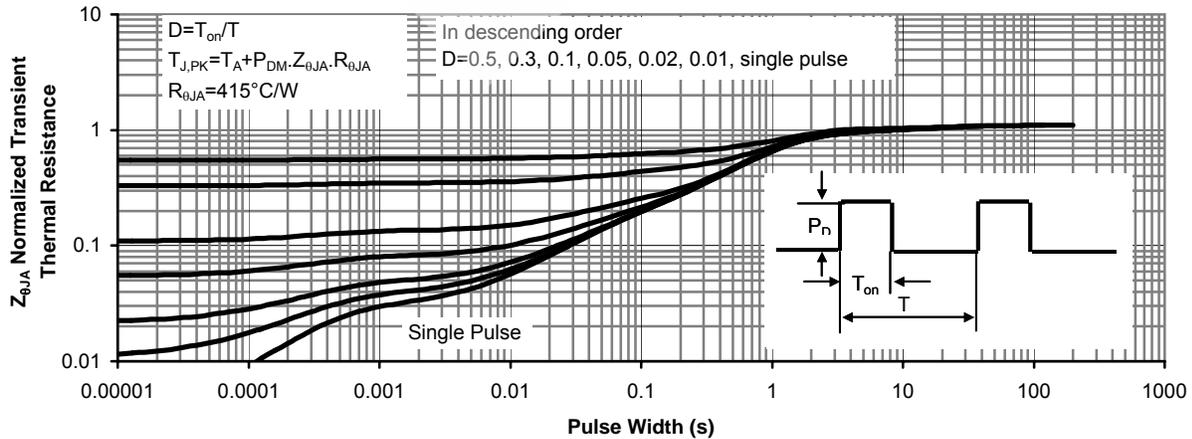


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