ALPHA & OMEGA SEMICONDUCTOR

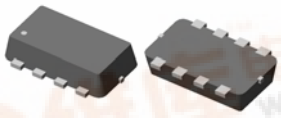
AON4604
Complementary Enhancement Mode Field Effect Transistor

General Description

The AON4604 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 AON4604 is Pb-free (meets ROHS & Sony 259 specifications).

Features

	n-channel	p-channel	
V_{DS} (V) =	20V	-20V	
I_D =	5.4A	-3.8A	(V_{GS}= ±4.5V)
$R_{DS(ON)}$	< 42mΩ	< 90mΩ	(V_{GS} = ±4.5V)
$R_{DS(ON)}$	< 52mΩ	< 120mΩ	(V_{GS} = ±2.5V)
$R_{DS(ON)}$	< 72mΩ	< 170mΩ	(V_{GS} = ±1.8V)



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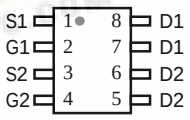

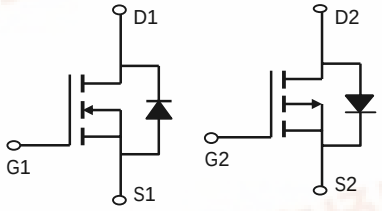

n-channel p-channel

Absolute Maximum Ratings T_A=25°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°C	I_D	5.4	-3.8	A
	T_A=70°C		4.3	-3.0	
Pulsed Drain Current [B]		I_{DM}	15	-15	
Power Dissipation	T_A=25°C	P_D	1.9	1.9	W
	T_A=70°C		1.2	1.2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Thermal Characteristics: n-channel

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	51.5	65	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		82	100	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	37	50	°C/W

Thermal Characteristics: p-channel

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	51.5	65	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		82	100	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	37	50	°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			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.4	0.7	1	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=4.5V, I_D=5.4A		34	42	mΩ
		T_J=125°C		50	70	
		V_{GS}=2.5V, I_D=4.8A		43	52	mΩ
		V_{GS}=1.8V, I_D=4A		57	72	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=5.4A		11		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.8	1	V
I_S	Maximum Body-Diode Continuous Current				2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz		436		pF
C_{oss}	Output Capacitance			66		pF
C_{rss}	Reverse Transfer Capacitance			44		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		3		Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=5.4A		6.5		nC
Q_{gs}	Gate Source Charge			0.8		nC
Q_{gd}	Gate Drain Charge			2.1		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=5V, V_{DS}=10V, R_L=1.9Ω, R_{GEN}=6Ω		7		ns
t_r	Turn-On Rise Time			11.2		ns
$t_{D(off)}$	Turn-Off DelayTime			36.5		ns
t_f	Turn-Off Fall Time			12.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=5.4A, dI/dt=100A/µs		15.2		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=5.4A, dI/dt=100A/µs		4.7		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in ^{2} 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.

E. These tests are performed with the device mounted on 1 in ^{2} 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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TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

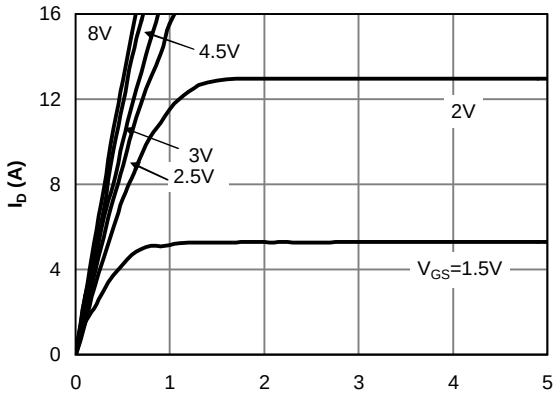

Figure 1: On-Region Characteristics

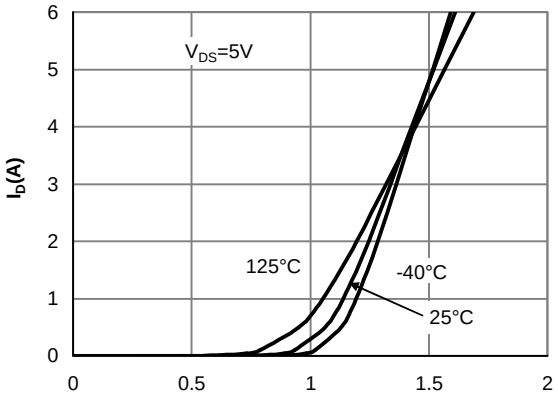

Figure 2: Transfer Characteristics

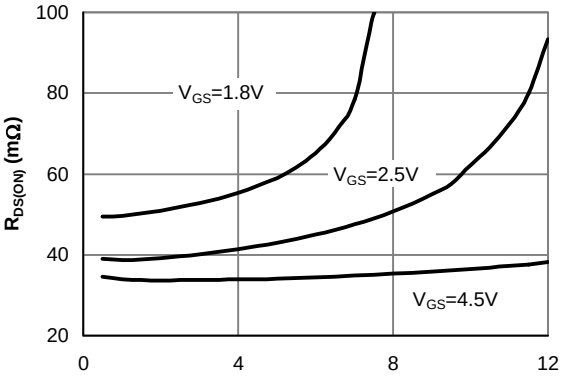

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

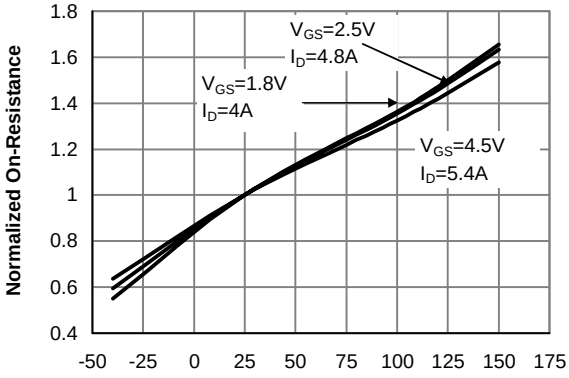

Figure 4: On-Resistance vs. Junction Temperature

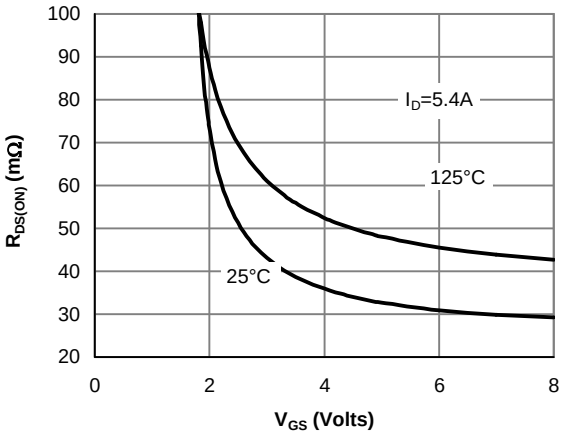

Figure 5: On-Resistance vs. Gate-Source Voltage

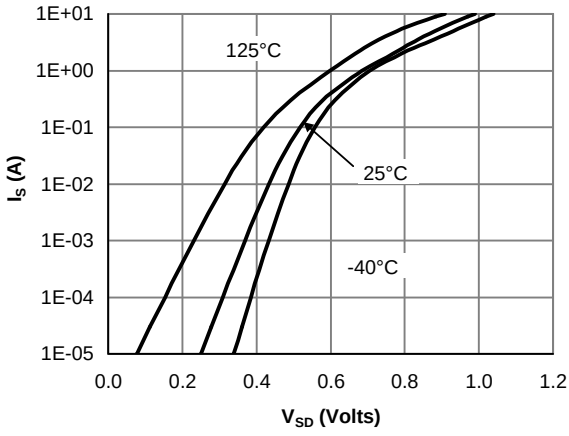

Figure 6: Body-Diode Characteristics

TYPICAL N-CHANNEL ELECTRICAL AND THERMAL CHARACTERISTICS

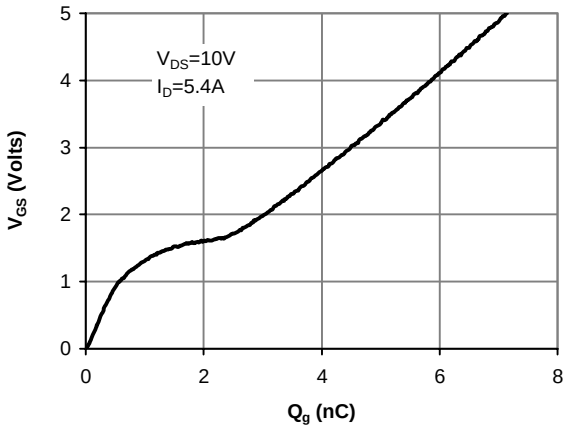

Figure 7: Gate-Charge Characteristics

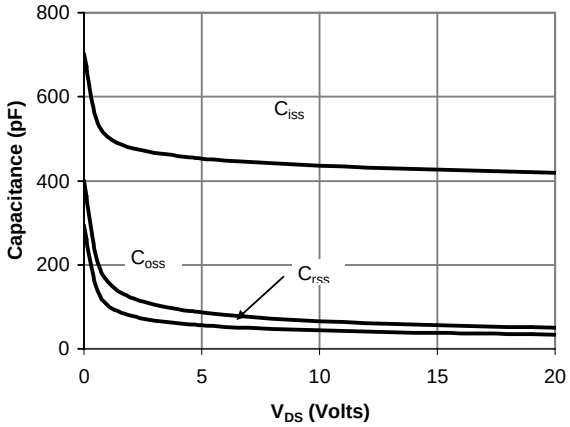

Figure 8: Capacitance Characteristics

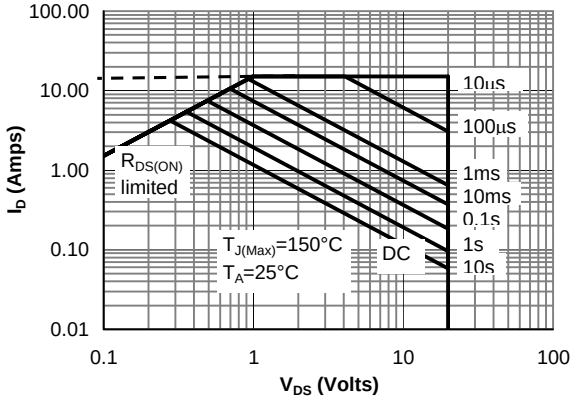

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

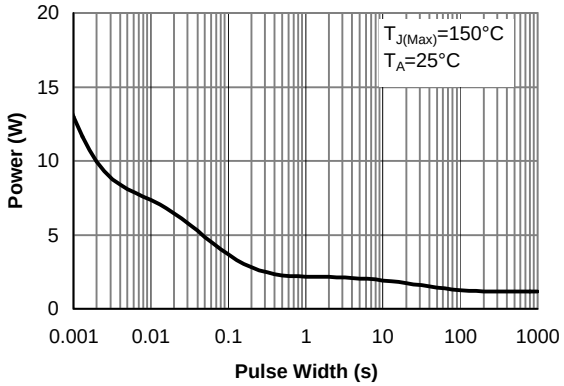

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

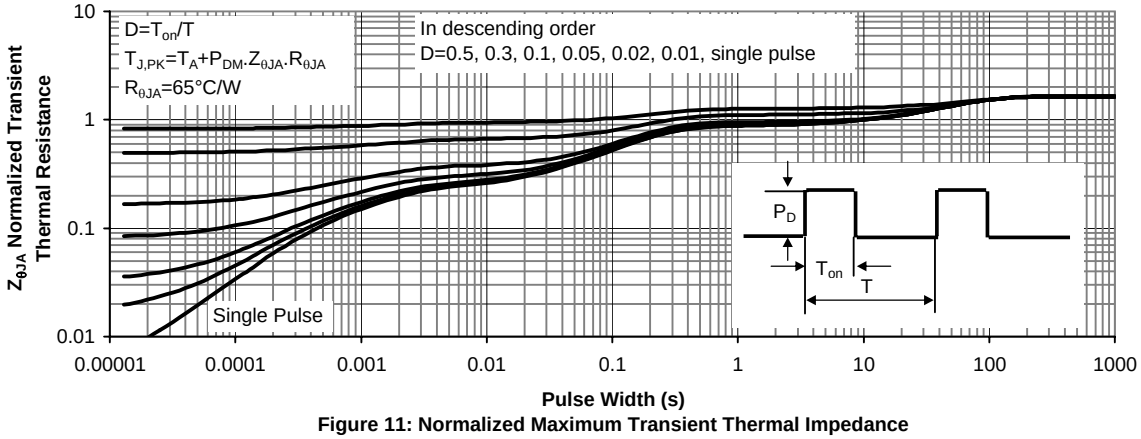

Figure 11: Normalized Maximum Transient Thermal Impedance

p-channel MOSFET Electrical Characteristics (T_J=25°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			-1	µA
		T_J=55°C			-5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±8V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.3	-0.63	-1	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-15			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3.8A		73	90	mΩ
		T_J=125°C		102	125	
		V_{GS}=-2.5V, I_D=-3.3A		95	120	mΩ
		V_{GS}=-1.8V, I_D=-2.8A		130	170	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.8A		7		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.83	-1	V
I_S	Maximum Body-Diode Continuous Current				-2.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		540		pF
C_{oss}	Output Capacitance			72		pF
C_{rss}	Reverse Transfer Capacitance			49		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		12	18	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.8A		5.9		nC
Q_{gs}	Gate Source Charge			0.9		nC
Q_{gd}	Gate Drain Charge			1.9		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=2.6Ω, R_{GEN}=3Ω		11.5		ns
t_r	Turn-On Rise Time			15.5		ns
$t_{D(off)}$	Turn-Off DelayTime			37.5		ns
t_f	Turn-Off Fall Time			23		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.8A, dI/dt=100A/µs		23.1		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3.8A, dI/dt=100A/µs		8.9		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1in ^{2} 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 $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6 are obtained using <300 µs pulses, duty cycle 0.5% max.

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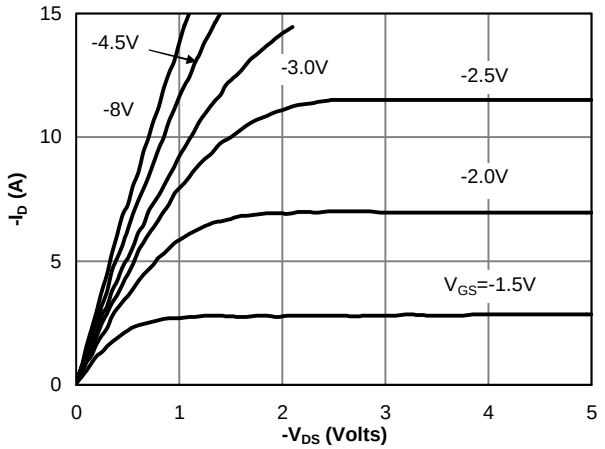

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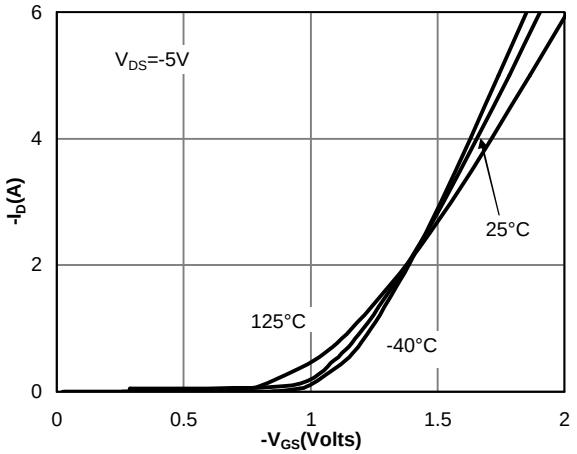

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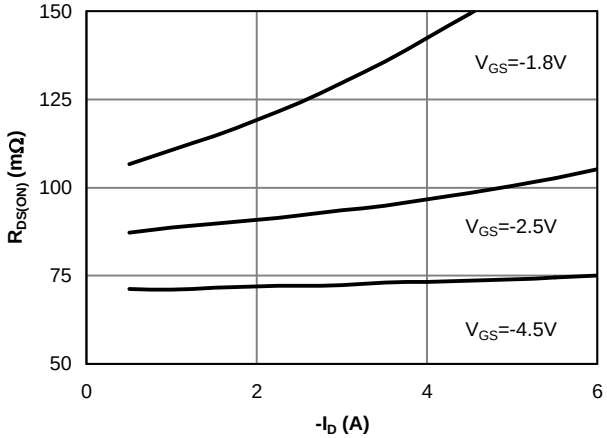

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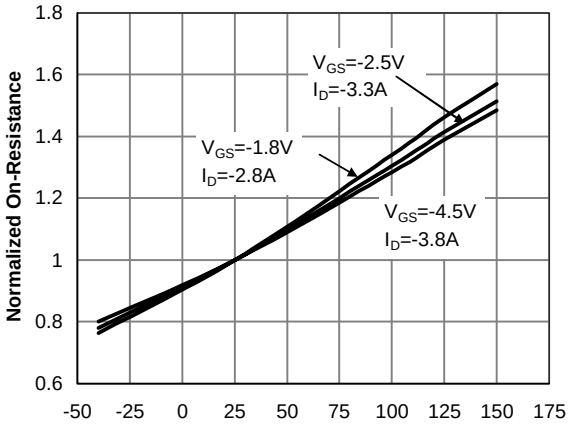

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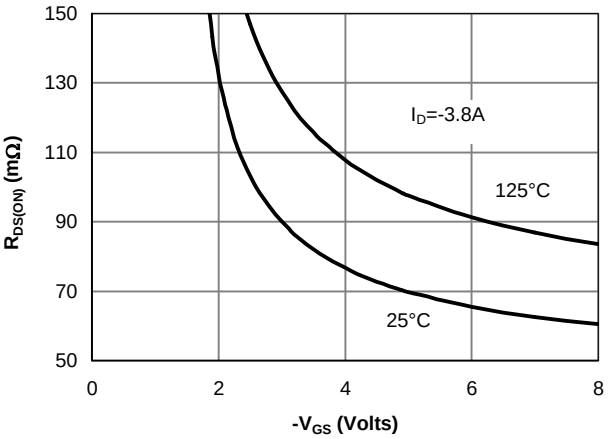

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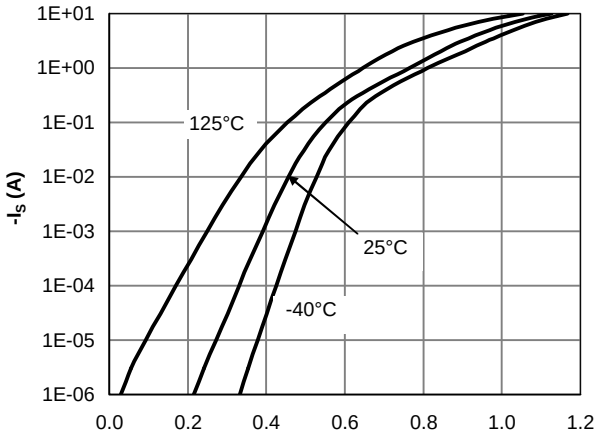

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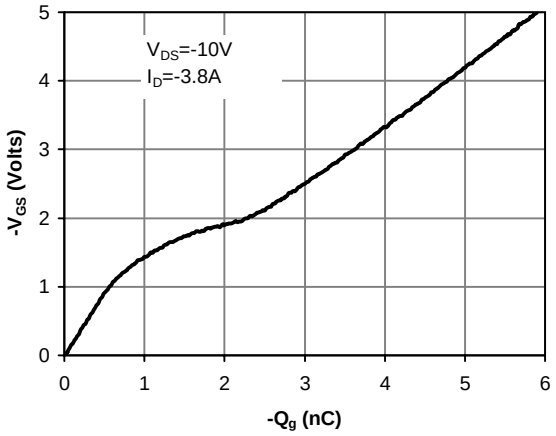

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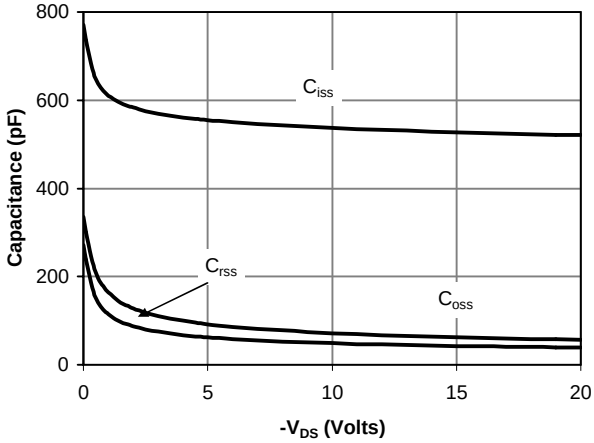

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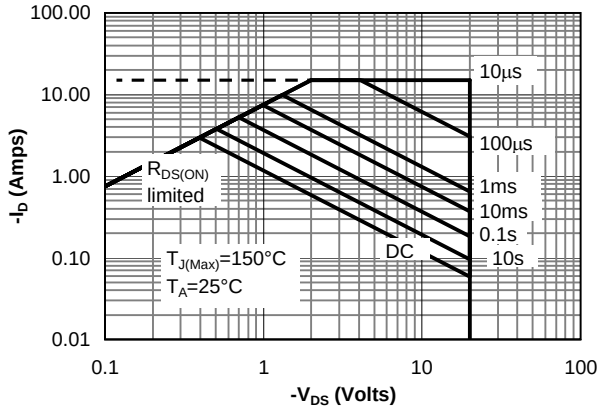

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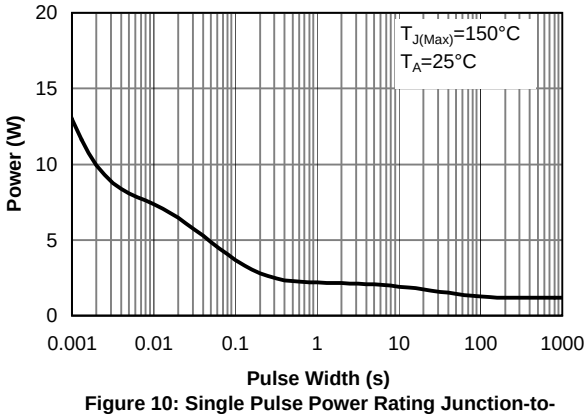

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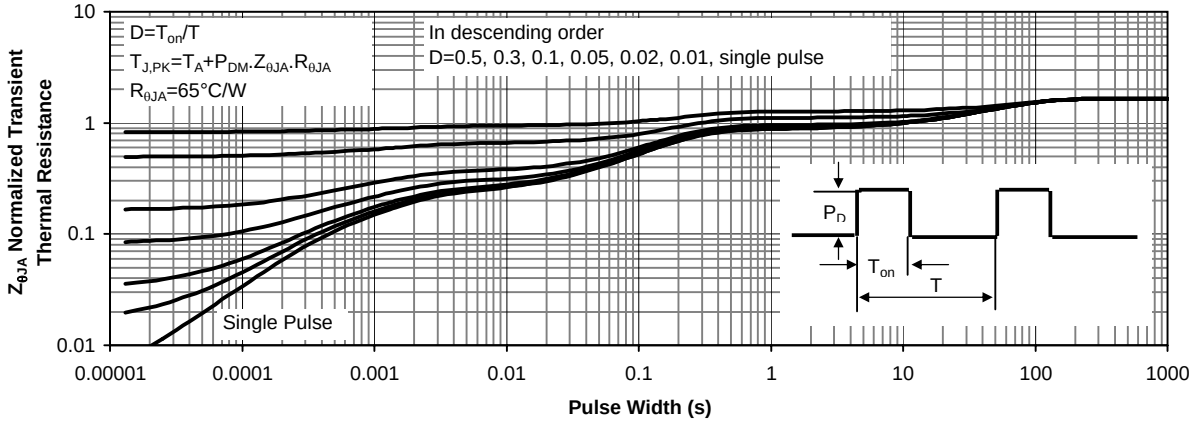

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