ALPHA & OMEGA SEMICONDUCTOR

AO6602
Complementary Enhancement Mode Field Effect Transistor

General Description

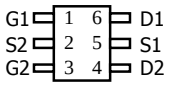
The AO6602 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs form a high-speed power inverter, suitable for a multitude of applications.
Standard Product AO6602 is Pb-free (meets ROHS & Sony 259 specifications). AO6602L is a Green Product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

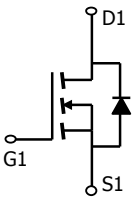
Features

n-channel	p-channel
V_{DS} (V) = 30V	-30V
I_D = 3.1A (V_{GS} = 10V)	-2.7A (V_{GS} = -10V)

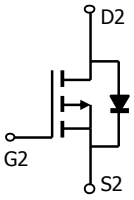
$R_{DS(ON)}$
< 75mΩ (V_{GS} = 10V) < 100mΩ(V_{GS} = -10V)
< 115mΩ (V_{GS} = 4.5V) < 180mΩ(V_{GS} = -4.5V)

TSOP6
Top View





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}	30	-30	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current [A]	T_A=25°C	I_D	3.1	-2.7	A
	T_A=70°C		2.4	-2.1	
Pulsed Drain Current [B]		I_{DM}	12	-12	
Power Dissipation	T_A=25°C	P_D	1.15	1.15	W
	T_A=70°C		0.73	0.73	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	-55 to 150	°C

Thermal Characteristics: n-channel and p-channel

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	78	110	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		106	150	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	64	80	°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			1	µA
		T_J=55°C			5	
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	1.2	1.9	2.5	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		54	75	mΩ
		T_J=125°C		78		
		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 $R_{\theta JA}$ 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 6,12,14 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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N-Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

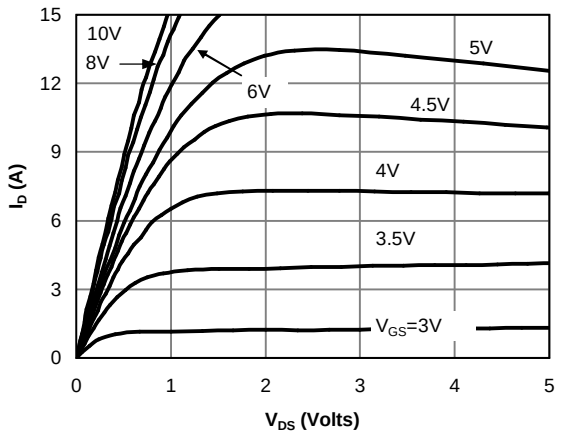

Fig 1: On-Region Characteristics

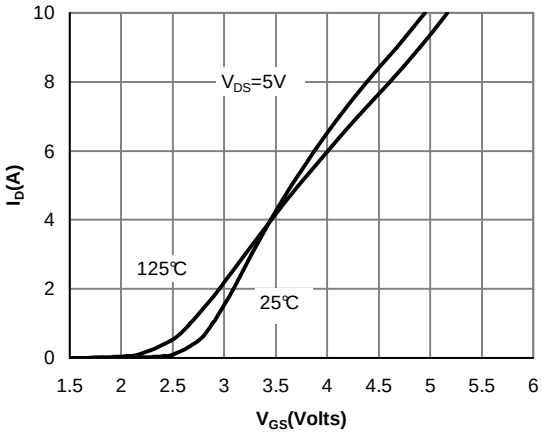

Figure 2: Transfer Characteristics

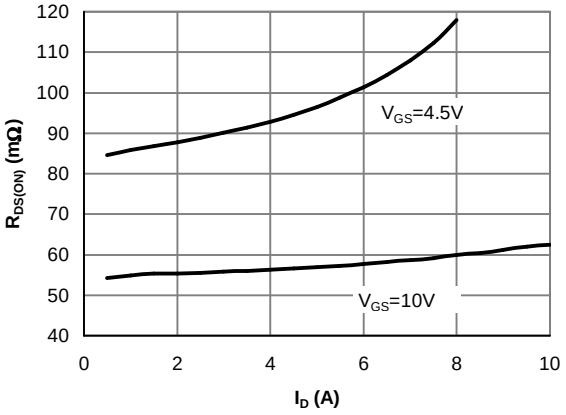

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

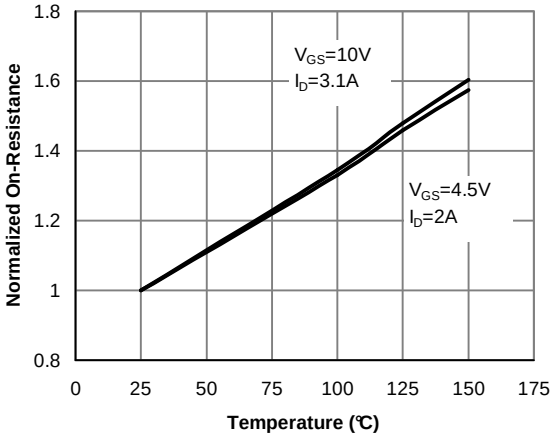

Figure 4: On-Resistance vs. Junction Temperature

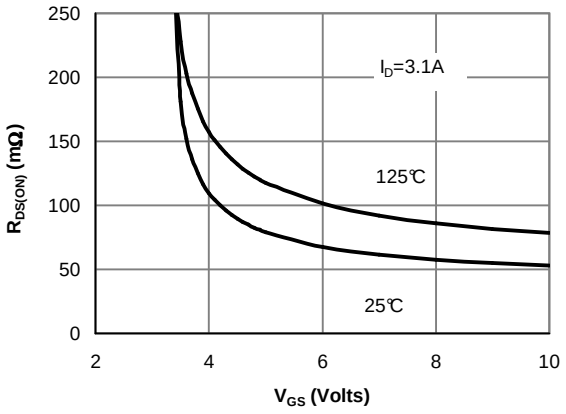

Figure 5: On-Resistance vs. Gate-Source Voltage

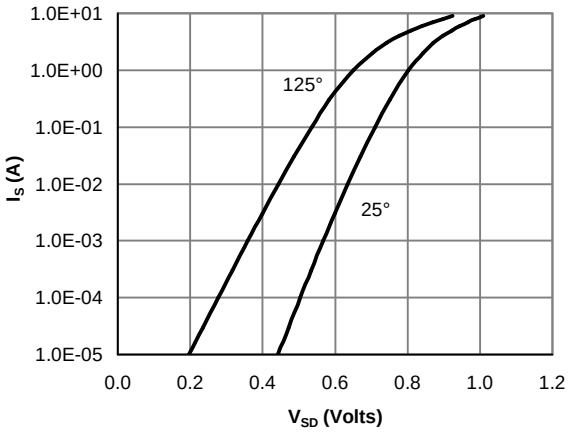

Figure 6: Body-Diode Characteristics

N-Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

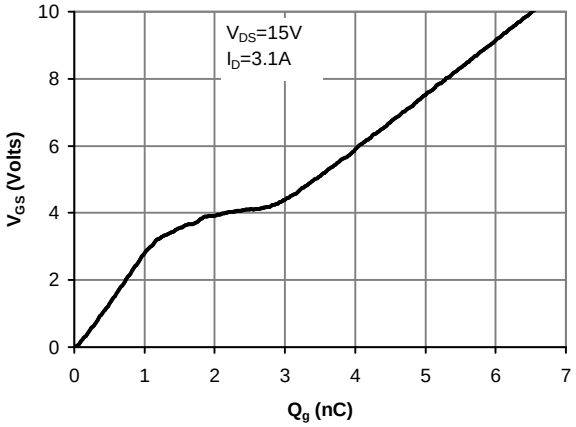

Figure 7: Gate-Charge Characteristics

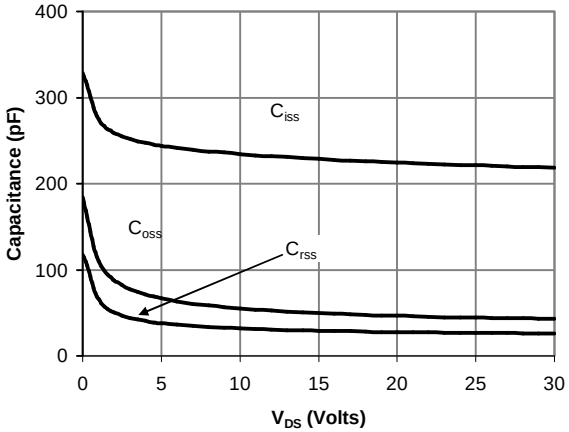

Figure 8: Capacitance Characteristics

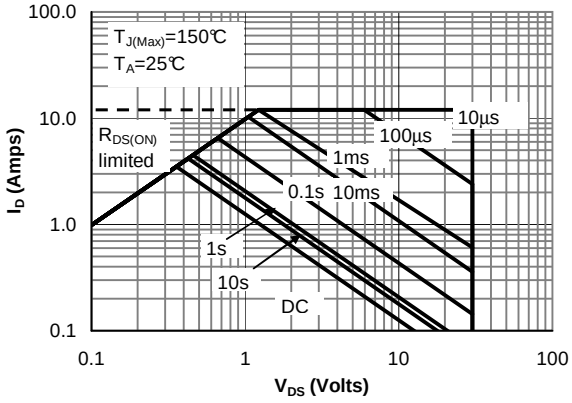

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

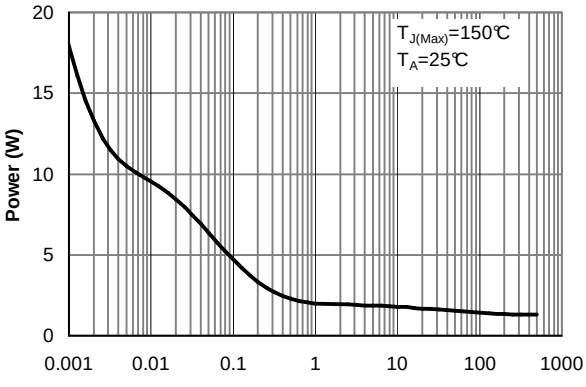

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

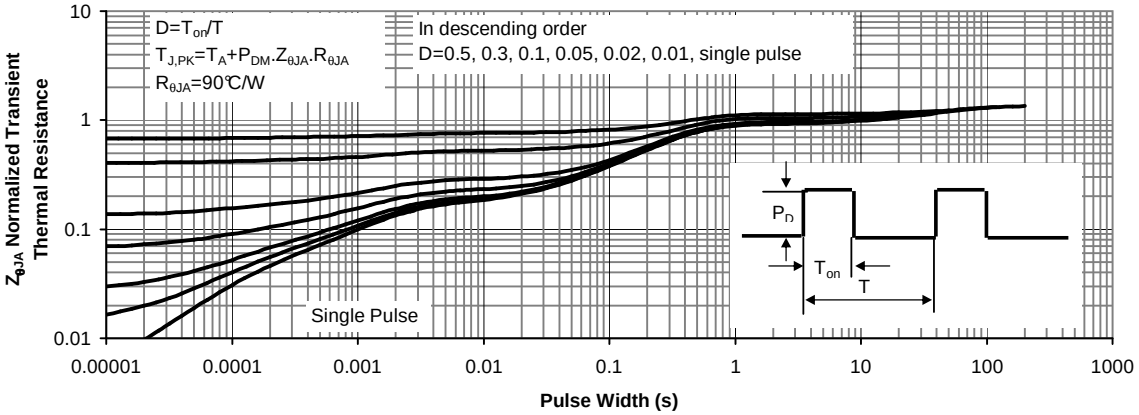

Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics (T_J=25°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			-1	µA
		T_J=55°C			-5	
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	-1.2	-1.9	-2.5	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}=-10V, I_D=-2.7A		77	100	mΩ
		T_J=125°C		110		
		V_{GS}=-4.5V, I_D=-2A		130	180	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-2.7A		4.1		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.81	-1	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-15V, f=1MHz		260	312	pF
C_{oss}	Output Capacitance			55		pF
C_{rss}	Reverse Transfer Capacitance			44		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		4.3	5	Ω
SWITCHING PARAMETERS						
Q_g(10)	Total Gate Charge(10V)	V_{GS}=-10V, V_{DS}=-15V, I_D=-2.7A		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}=-10V, V_{DS}=-15V, R_L=5.6Ω, R_{GEN}=3Ω		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=-2.7A, dI/dt=100A/µs		12.5	15	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-2.7A, dI/dt=100A/µs		5.5		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 6,12,14 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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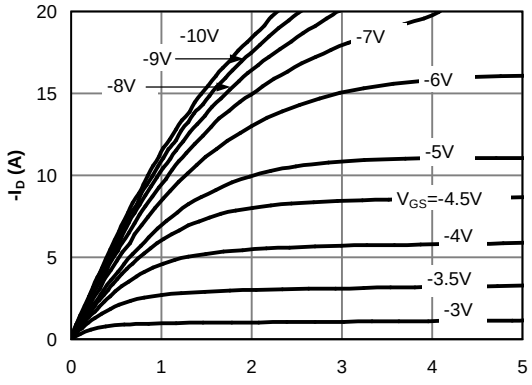
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL



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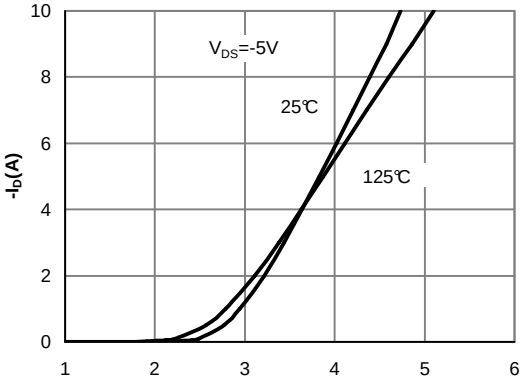
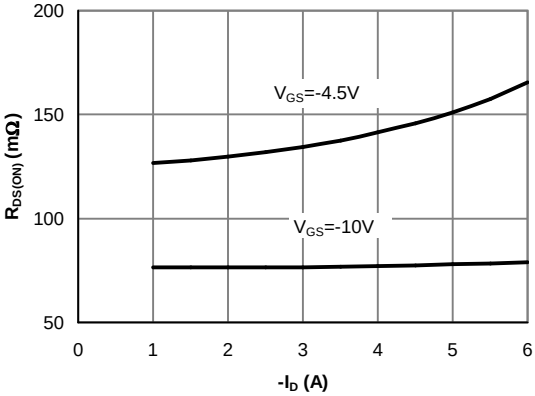


Figure 2: Transfer Characteristics



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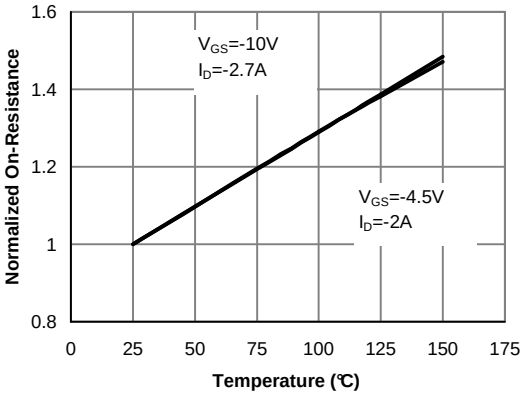

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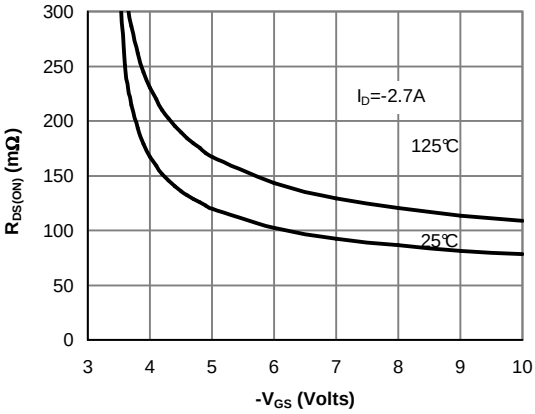

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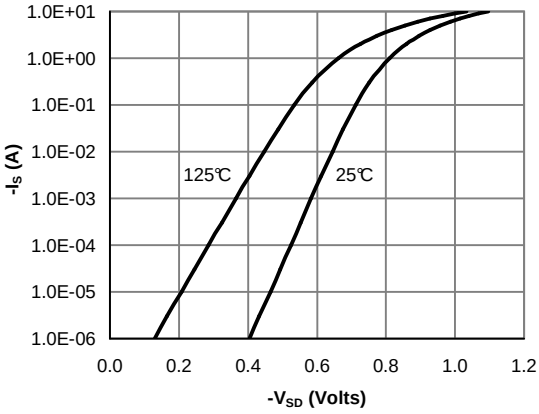

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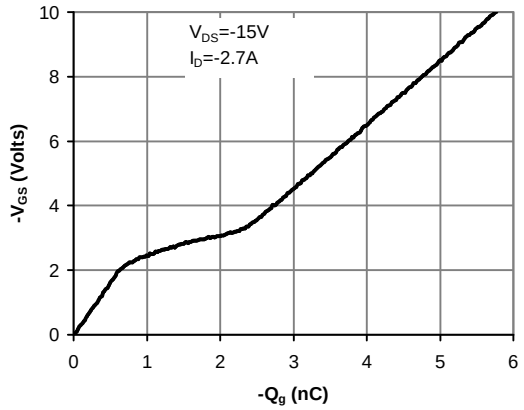

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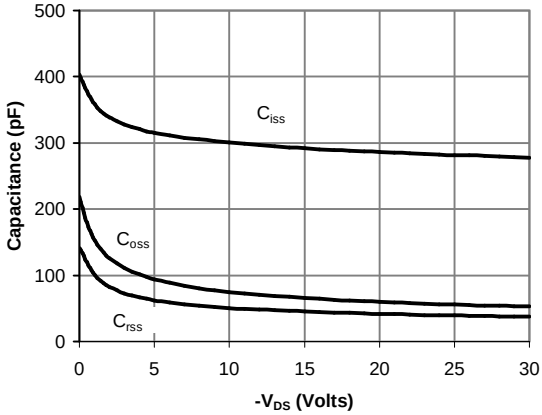

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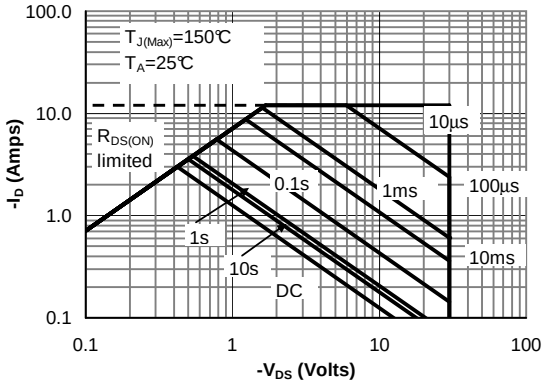

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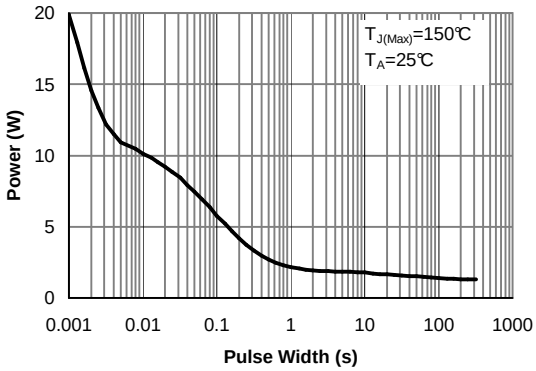

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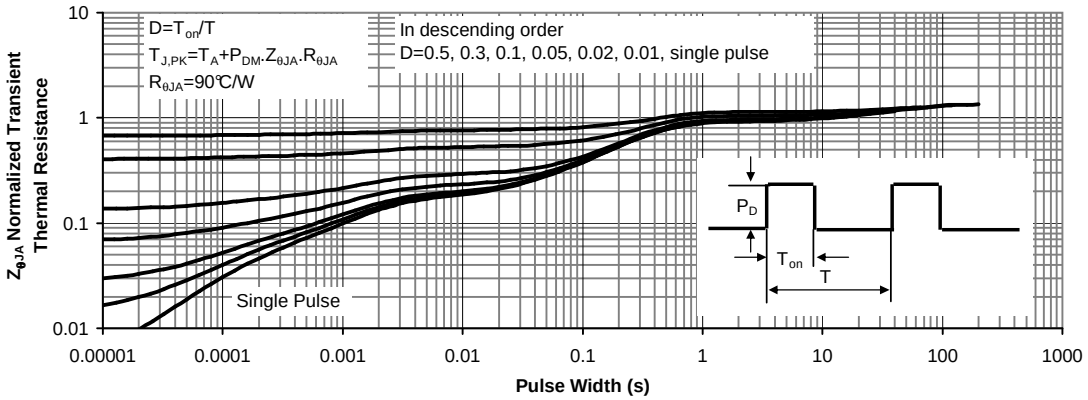

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