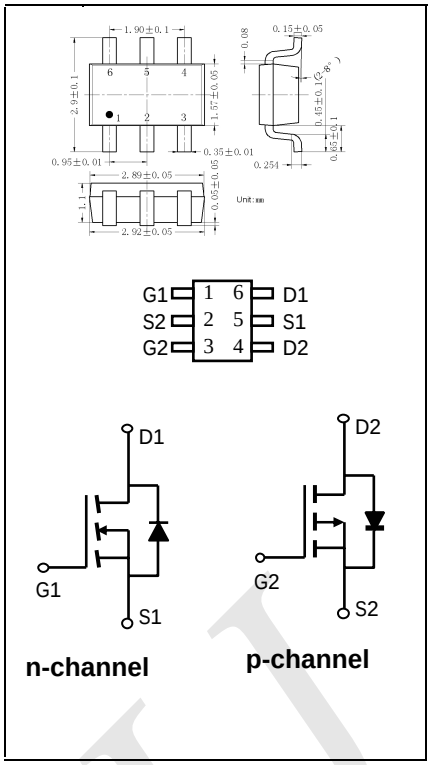
SOT-23-6L Plastic-Encapsulate Mosfets

LJ6604NPT5G

Complementary Enhancement Mode Field Effect Transistor



General Description

The LJ6604NPT5G 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. LJ6604NPT5G(Green Product) is offered in a lead-free package.

Features

n-channel	p-channel
V_{DS} (V) = 20V	-20V
I_D = 3.4A	-2.5A
$R_{DS(ON)}$	
< 60mΩ	< 110mΩ (V_{GS} = 4.5V)
< 75mΩ	< 140mΩ (V_{GS} = 2.5V)
< 100mΩ	< 200mΩ (V_{GS} = 1.8V)

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Max n-channel	Max p-channel	Units
V_{DS}	Drain-Source Voltage		20	-20	V
V_{GS}	Gate-Source Voltage		±8	±8	V
I_D	Continuous Drain Current [A]	T_A=25°C	3.4	-2.5	A
		T_A=70°C	2.7	-2.0	
I_{DM}	Pulsed Drain Current [B]		15	-15	
P_D	Power Dissipation	T_A=25°C	1.15	1.15	W
		T_A=70°C	0.73	0.73	
T_J, T_{STG}	Junction and Storage Temperature Range		-55 to 150	-55 to 150	°C

Thermal Characteristics: n-channel and p-channel

Symbol	Parameter		Typ	Max	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient [A]	t ≤ 10s	78	110	°C/W
	Maximum Junction-to-Ambient [A]	Steady-State	106	150	°C/W
$R_{\theta JL}$	Maximum Junction-to-Lead [C]	Steady-State	64	80	°C/W

Electrical Characteristics (T_a=25°C unless otherwise specified)

N-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	0.4	0.6	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=3.4A		46	60	mΩ
		T_J=125°C		63	80	
		V_{GS}=2.5V, I_D=3A		57	75	mΩ
		V_{GS}=1.8V, I_D=2A		72	100	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3.4A		10		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.76	1	V
I_S	Maximum Body-Diode Continuous Current				2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz	200	260	320	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	4	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=4.5V, V_{DS}=10V, I_D=3.4A		6.2	8.1	nC
Q_{gs}	Gate Source Charge			1.6		nC
Q_{gd}	Gate Drain Charge			0.5		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=5V, V_{DS}=10V, R_L=3Ω, R_{GEN}=3Ω		5.5		ns
t_r	Turn-On Rise Time			6.3		ns
$t_{D(off)}$	Turn-Off DelayTime			40		ns
t_f	Turn-Off Fall Time			12.7		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=3.4A, dI/dt=100A/μs		12.3	16	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=3.4A, 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 a 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 80μs 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.

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

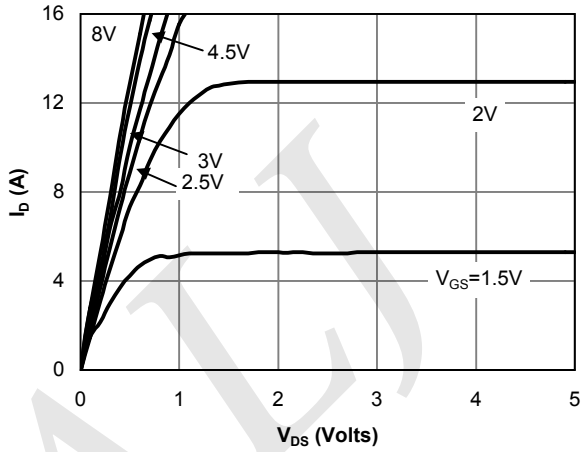


Fig 1: On-Region Characteristics

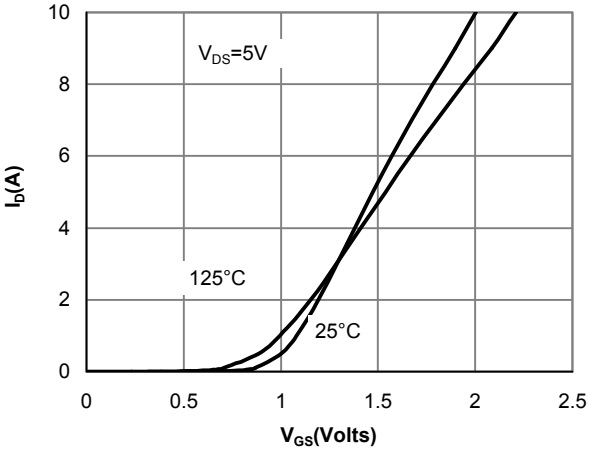


Figure 2: Transfer Characteristics

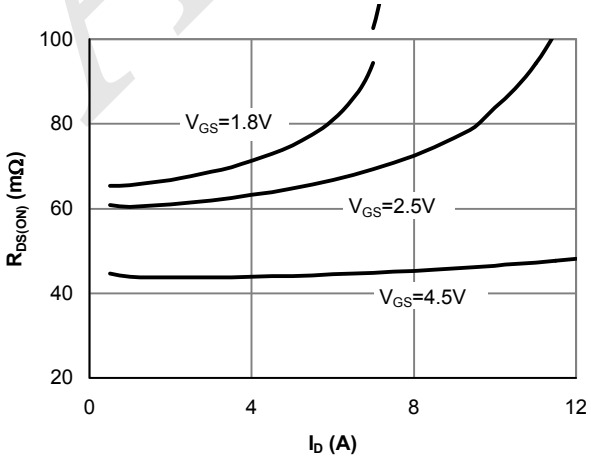


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

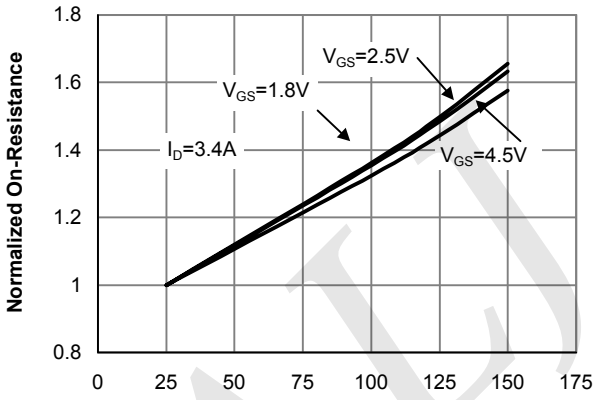


Figure 4: On-Resistance vs. Junction Temperature

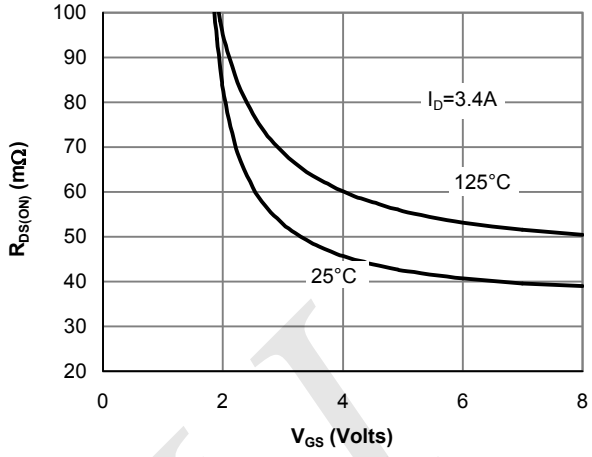


Figure 5: On-Resistance vs. Gate-Source Voltage

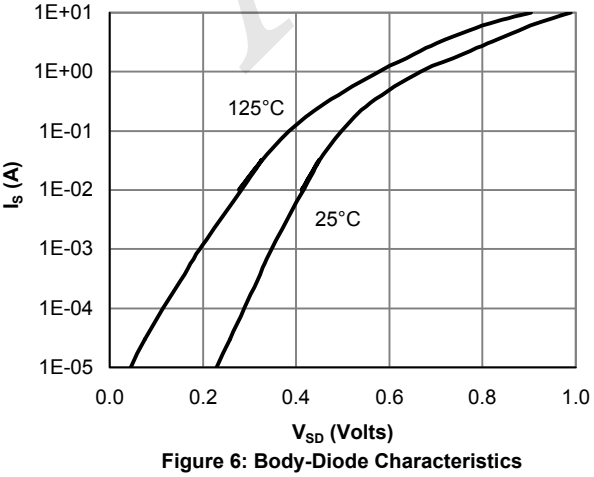


Figure 6: Body-Diode Characteristics

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

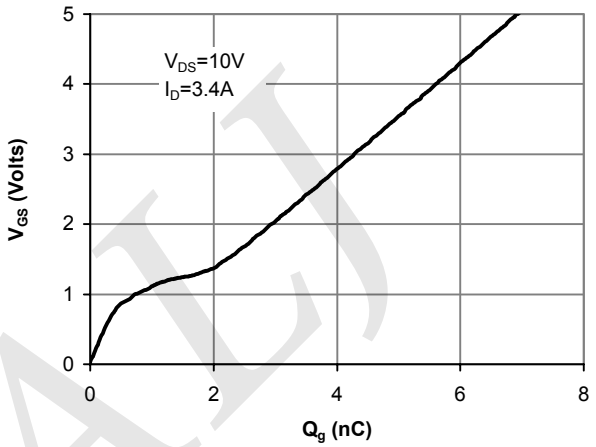


Figure 7: Gate-Charge Characteristics

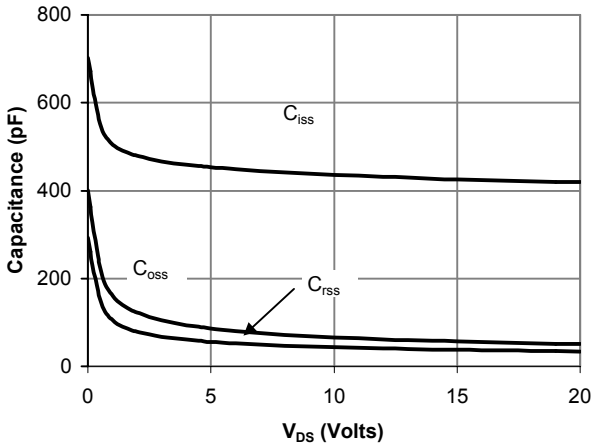


Figure 8: Capacitance Characteristics

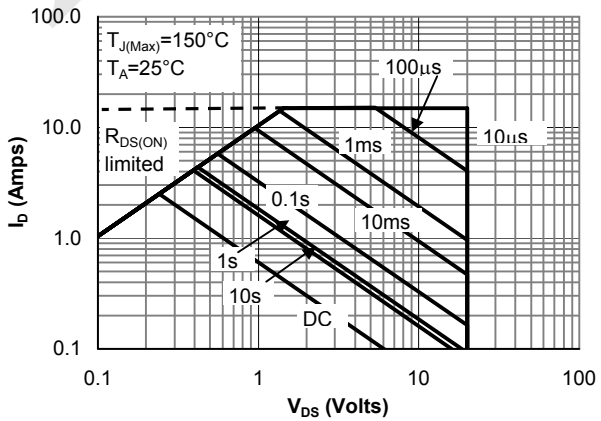


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

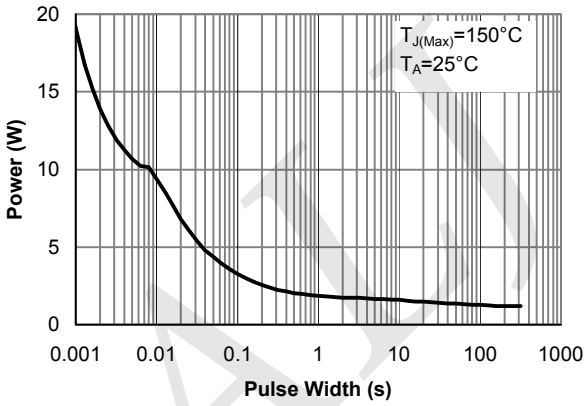


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

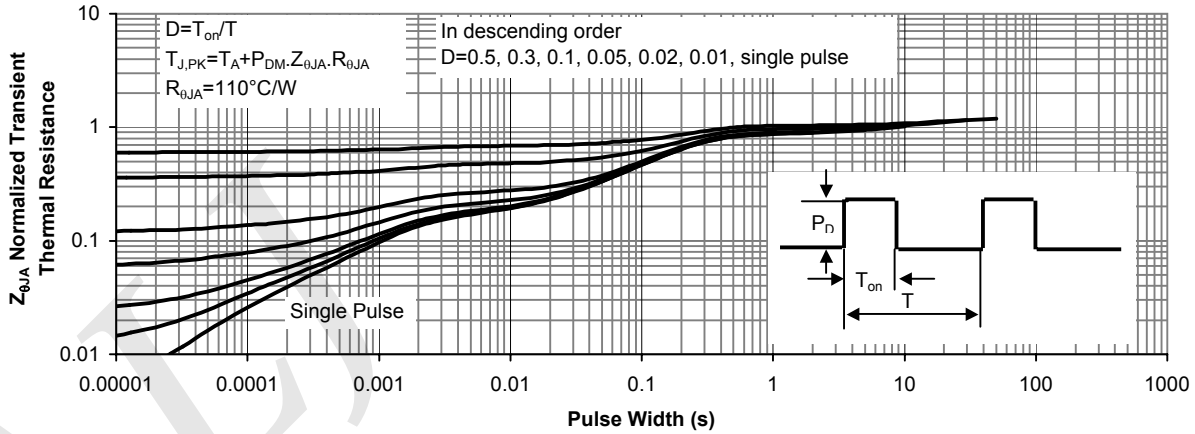


Figure 11: Normalized Maximum Transient Thermal Impedance

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	-0.55	-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=-2.5A		86	110	mΩ
		T_J=125°C		116	145	
		V_{GS}=-2.5V, I_D=-2A		113	140	mΩ
		V_{GS}=-1.8V, I_D=-1A		151	200	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3A	4	6		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.78	-1	V
I_S	Maximum Body-Diode Continuous Current				-2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz	380	400	550	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	15.6	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-2.5A		6.1	8	nC
Q_{gs}	Gate Source Charge			0.6		nC
Q_{gd}	Gate Drain Charge			1.6		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=3.9Ω, R_{GEN}=3Ω		10		ns
t_r	Turn-On Rise Time			12		ns
$t_{D(off)}$	Turn-Off DelayTime			44		ns
t_f	Turn-Off Fall Time			22		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-2.5A, dI/dt=100A/μs		21	28	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-2.5A, dI/dt=100A/μs		7.5		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 a 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.

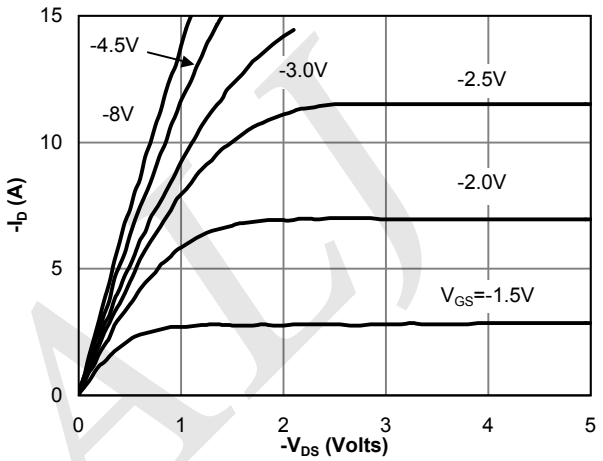
C. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.

D. The static characteristics in Figures 1 to 6,12,14 are obtained using 80 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.

Typical Characteristics (Cont.)

P-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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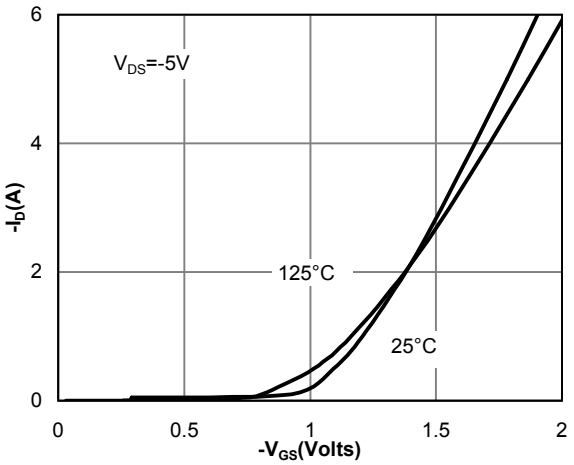


Figure 2: Transfer Characteristics

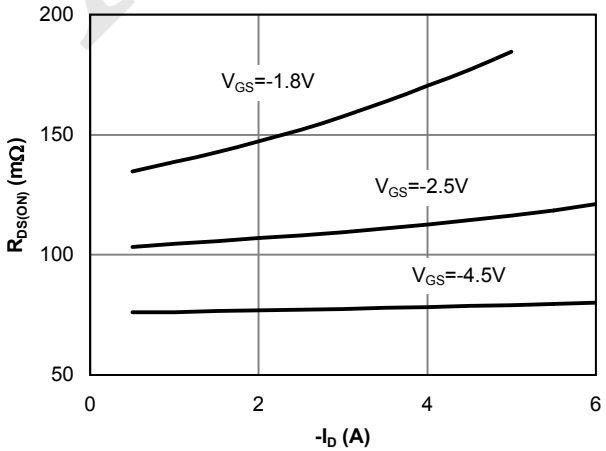


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

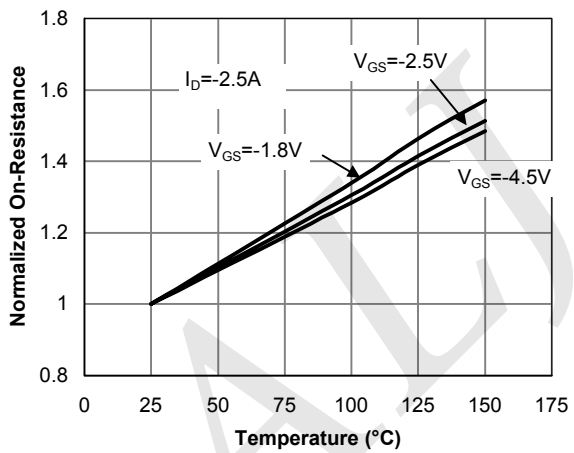
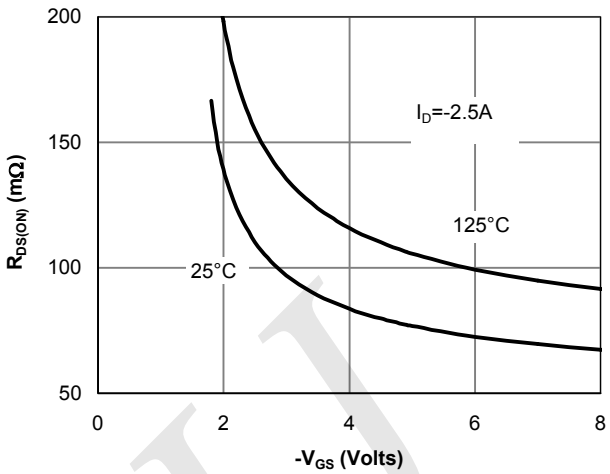


Figure 4: On-Resistance vs. Junction Temperature



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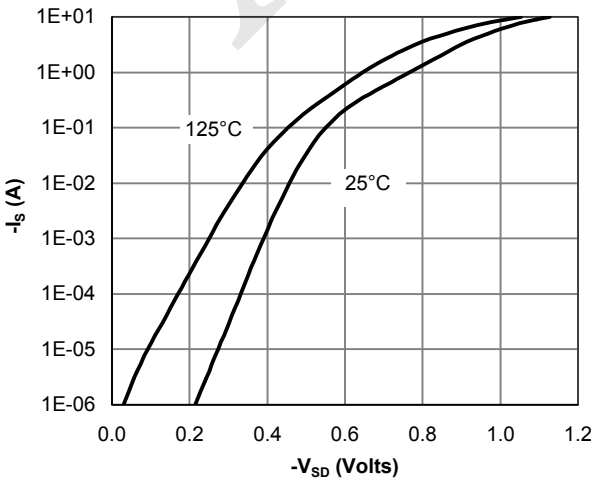

Figure 6: Body-Diode Characteristics

Typical Characteristics (Cont.)

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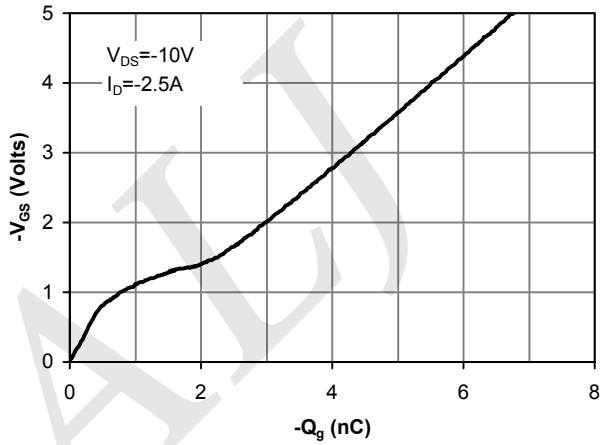
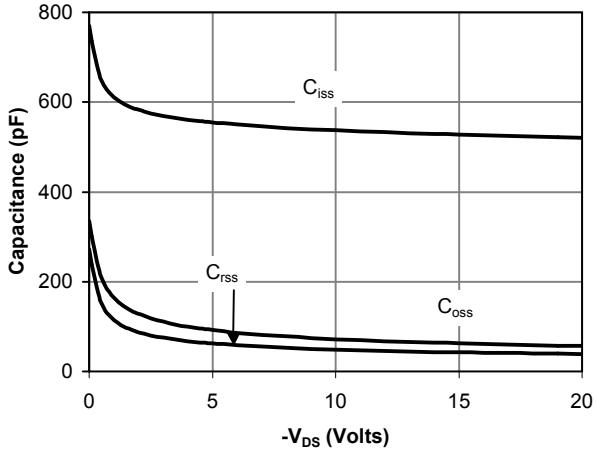


Figure 7: Gate-Charge Characteristics



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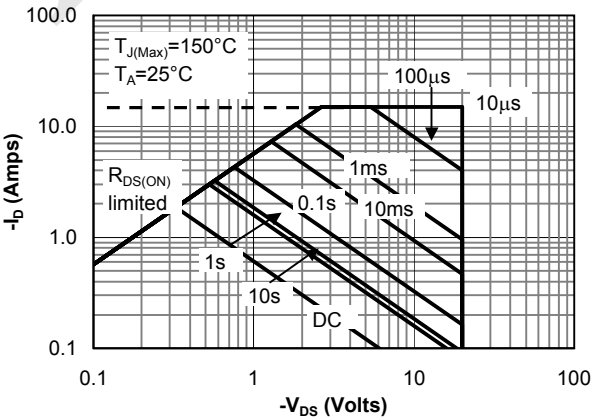

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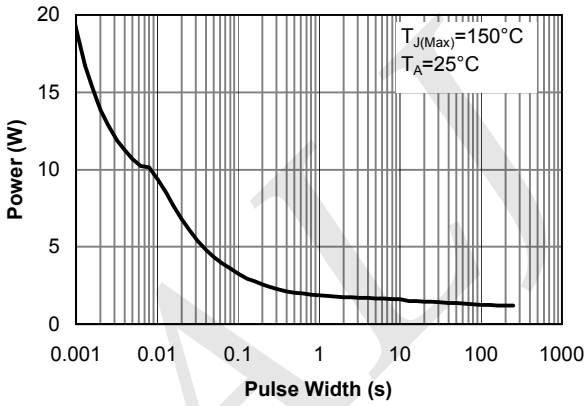

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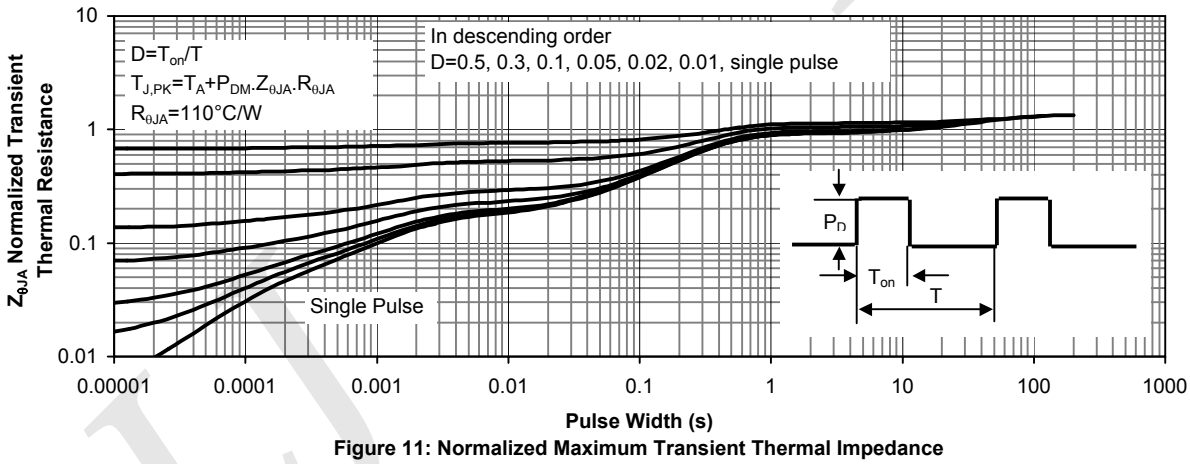

Figure 11: Normalized Maximum Transient Thermal Impedance