ALPHA & OMEGA SEMICONDUCTOR

AO7600
Complementary Enhancement Mode Field Effect Transistor

General Description

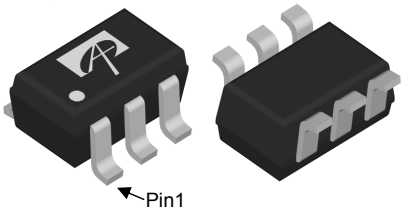
The AO7600 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, an inverter, and for a host of other applications. Both devices are ESD protected.

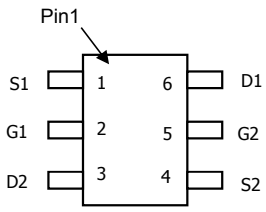
Features

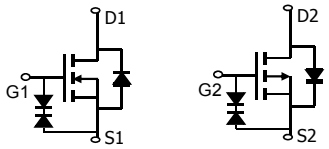
n-channel	p-channel
V_{DS} (V) = 20V	-20V
I_D = 0.9A (V_{GS}=4.5V)	-0.6A (V_{GS}=-4.5V)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 300mΩ (V_{GS}=4.5V)	< 550mΩ (V_{GS}=-4.5V)
< 350mΩ (V_{GS}=2.5V)	< 700mΩ (V_{GS}=-2.5V)
< 450mΩ (V_{GS}=1.8V)	< 950mΩ (V_{GS}=-1.8V)

Green Product

SC70-6L (SOT-363)







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	0.9	-0.6	A
	T_A=70°C		0.7	-0.48	
Pulsed Drain Current [B]		I_{DM}	5	-3	
Power Dissipation	T_A=25°C	P_D	0.3	0.3	W
	T_A=70°C		0.19	0.19	
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	Device	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	n-ch	360	415	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		n-ch	400	460	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	n-ch	300	350	°C/W
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	p-ch	360	415	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		p-ch	400	460	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	p-ch	300	350	°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			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		181	300	mΩ
		T_J=125°C		253	330	
		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 $R_{\theta JA}$ 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.

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

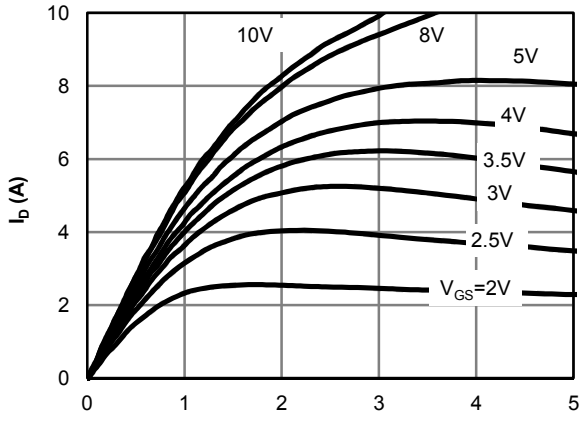


Fig 1: On-Region Characteristics

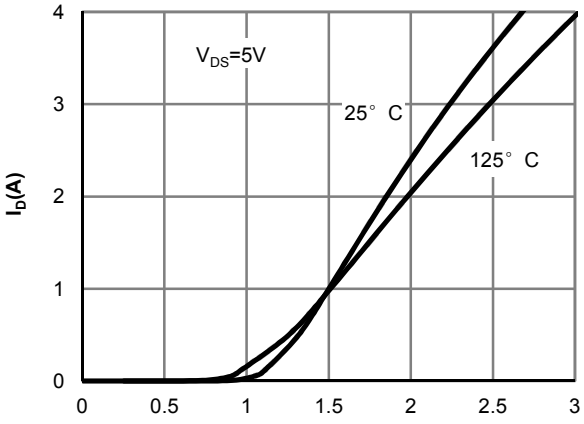


Figure 2: Transfer Characteristics

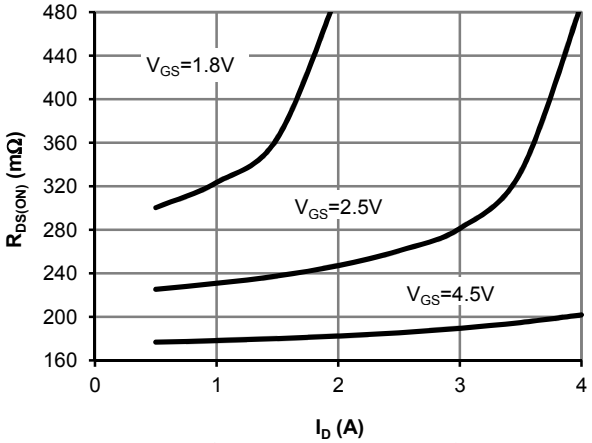


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

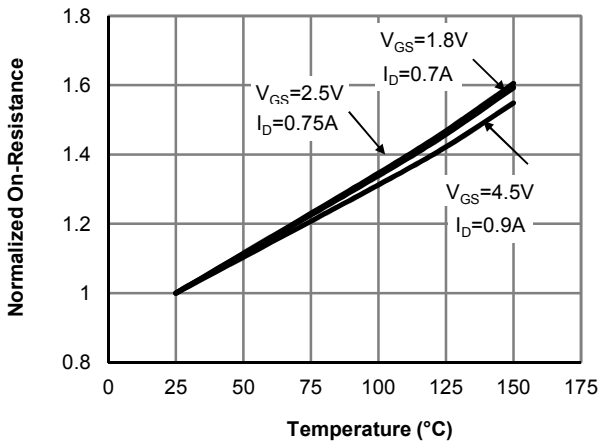


Figure 4: On-Resistance vs. Junction Temperature

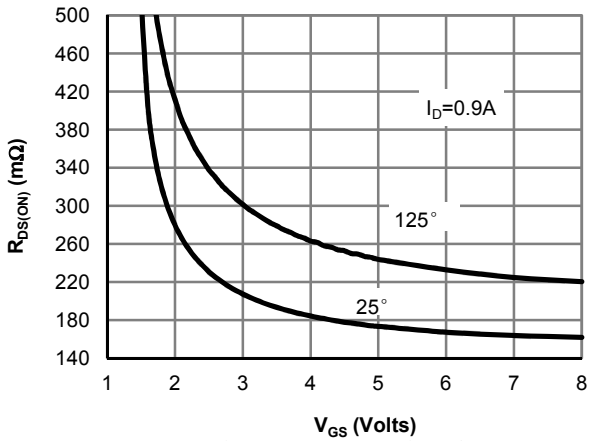


Figure 5: On-Resistance vs. Gate-Source Voltage

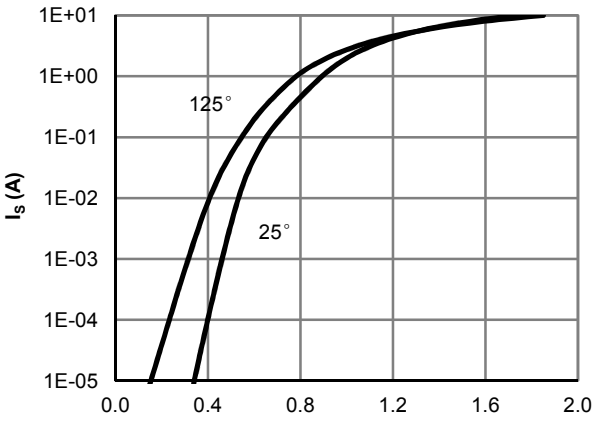


Figure 6: Body-Diode Characteristics

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

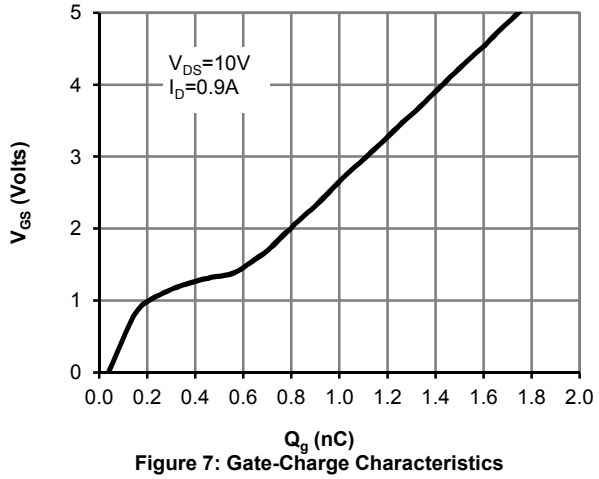


Figure 7: Gate-Charge Characteristics

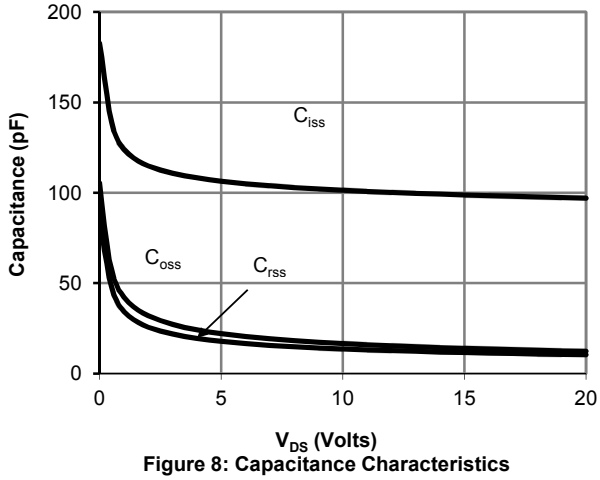


Figure 8: Capacitance Characteristics

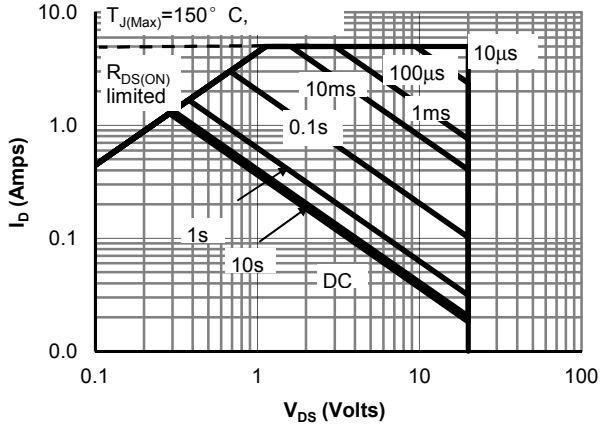


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

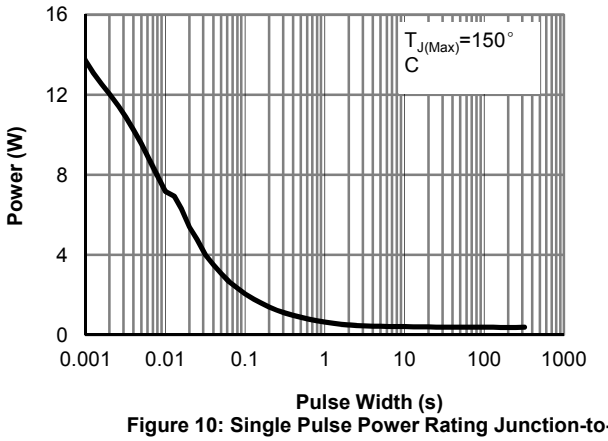


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

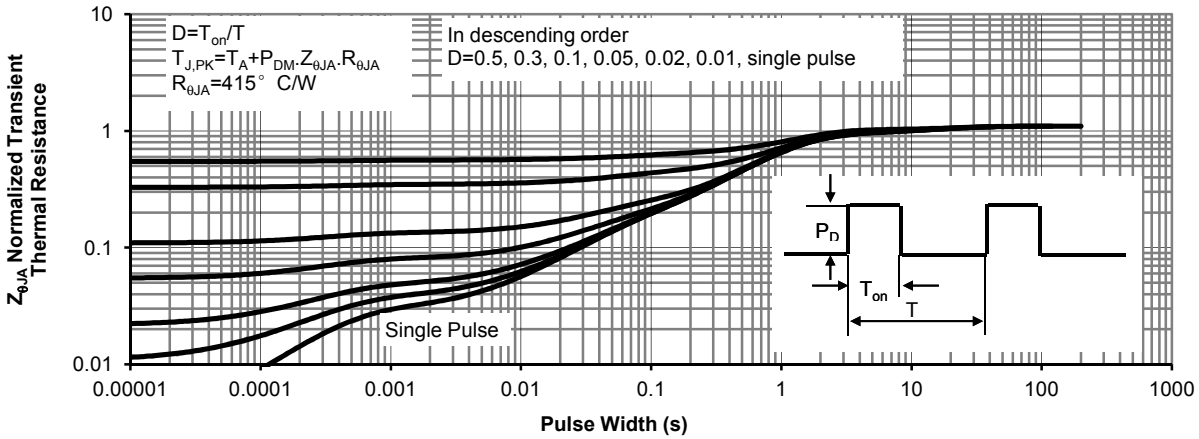


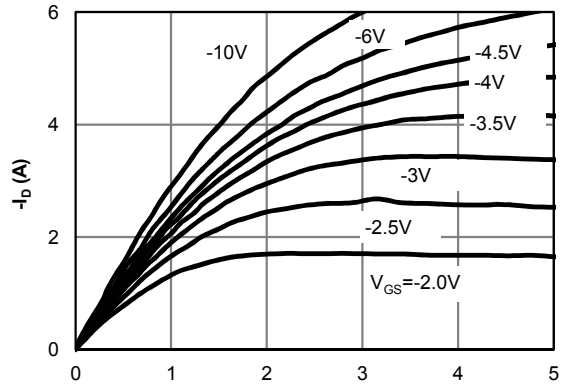
Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel 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			±10	µA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=-250µA	-0.5	-0.6	-0.9	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-3			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-0.6A		415	550	mΩ
		T_J=125°C		542	700	
		V_{GS}=-2.5V, I_D=-0.5A		590	700	mΩ
		V_{GS}=-1.8V, I_D=-0.4A		700	950	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-0.6A		1.7		S
V_{SD}	Diode Forward Voltage	I_S=-0.5A,V_{GS}=0V		-0.86	-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		114	140	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		12	17	Ω
SWITCHING PARAMETERS						
Q_g	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-0.6A		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}=-4.5V, V_{DS}=-10V, R_L=16.7Ω, R_{GEN}=3Ω		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=-0.6A, dI/dt=100A/µs		10	13	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-0.6A, dI/dt=100A/µs		3		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.

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



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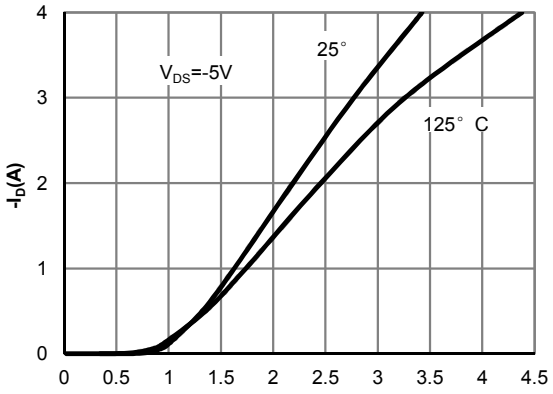


Figure 2: Transfer Characteristics

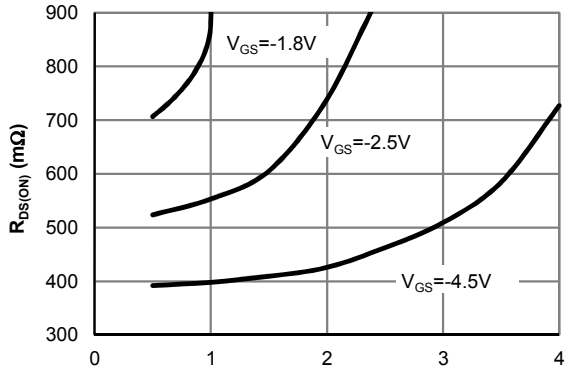


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

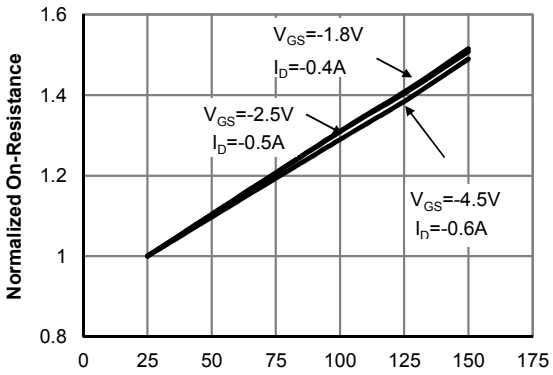
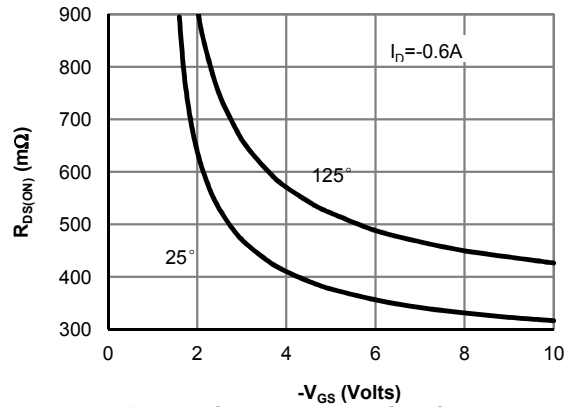


Figure 4: On-Resistance vs. Junction Temperature



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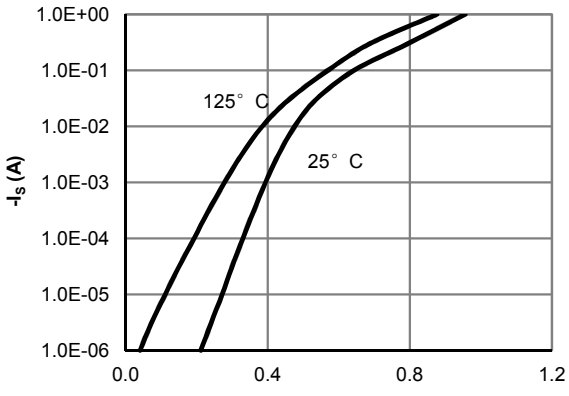

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P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

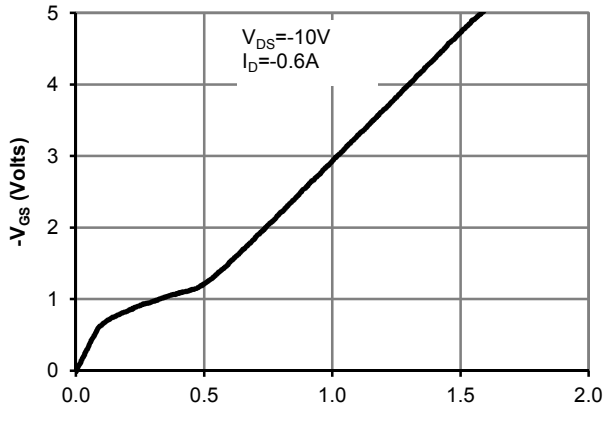
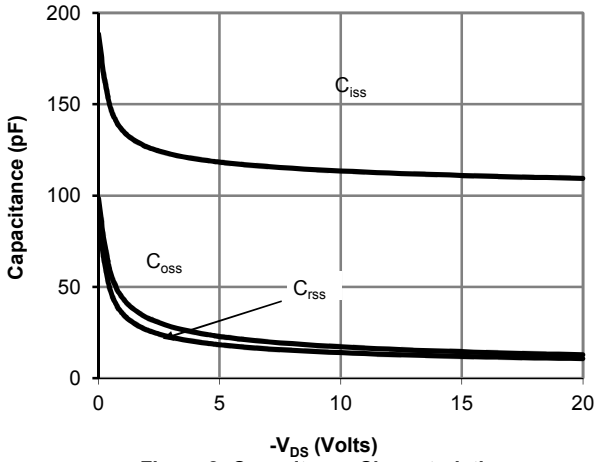


Figure 7: Gate-Charge Characteristics



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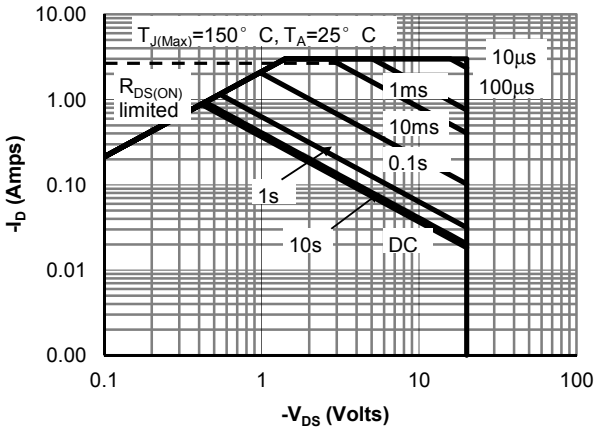

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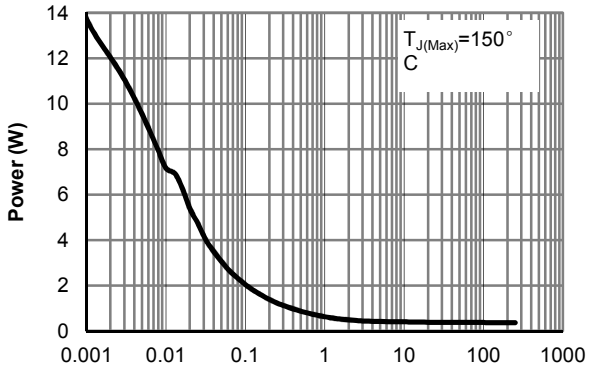

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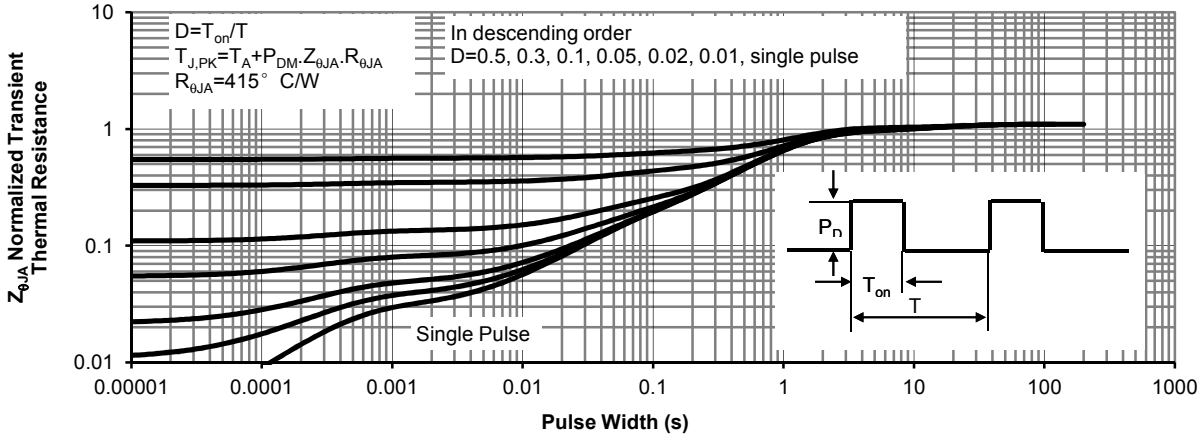
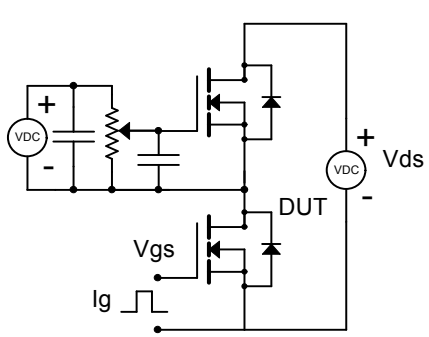
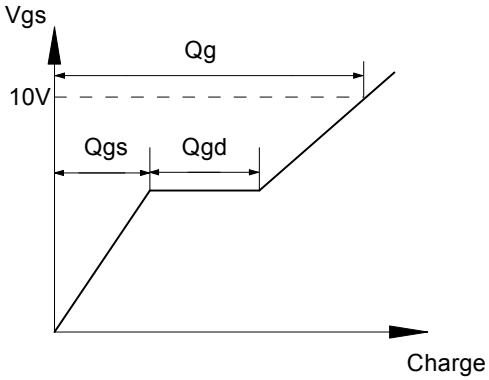


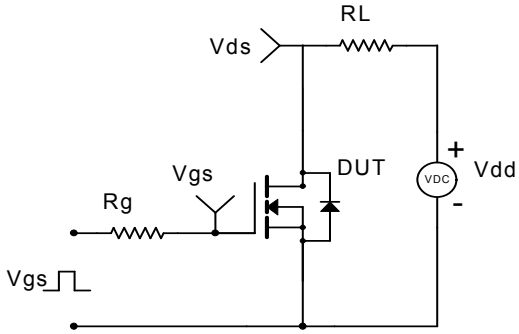
Figure 11: Normalized Maximum Transient Thermal Impedance

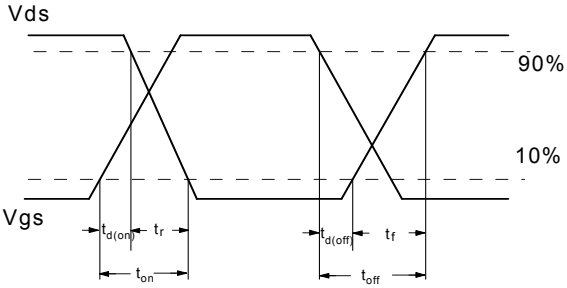
Gate Charge Test Circuit & Waveform





Resistive Switching Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms