ALPHA & OMEGA SEMICONDUCTOR

AO6608

20V Complementary MOSFET

General Description

The AO6608 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

• RoHS and Halogen-Free Compliant

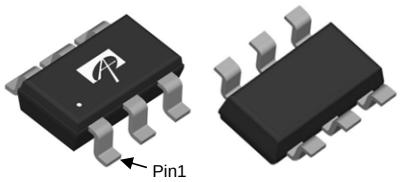
Product Summary

N-Channel	**P-Channel**
V_{DS}= 30V	-20V
ID= 3.4A (VGS=10V)	-3.3A (V_{GS}=-4.5V)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 60mΩ (V_{GS}=10V)	< 75mΩ (V_{GS}=-4.5V)
< 70mΩ (V_{GS}=4.5V)	< 105mΩ (V_{GS}=-2.5V)
< 90mΩ (V_{GS}=2.5V)	< 135mΩ (V_{GS}=-1.8V)

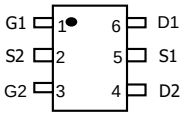
Green Product

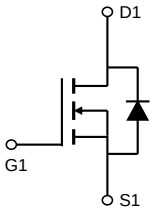
TSOP6

Top View **Bottom View**

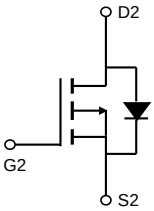


Top View





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	-20	V
Gate-Source Voltage		V_{GS}	±12	±8	V
Continuous Drain Current	T_A=25°C	I_D	3.4	-3.3	A
	T_A=70°C		2.7	-2.5	
Pulsed Drain Current [C]		I_{DM}	20	-13	
Power Dissipation [B]	T_A=25°C	P_D	1.25	1.25	W
	T_A=70°C		0.80	0.80	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150		°C

Thermal Characteristics

Parameter		**Symbol**	**Typ**	**Max**	**Units**
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	75	100	°C/W
Maximum Junction-to-Ambient [A D]	Steady-State		105	130	°C/W
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	50	65	°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}=30V, V_{GS}=0V			1	µA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±12V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.5	1	1.5	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=3.4A		46	60	mΩ
		T_J=125°C		73	88	
		V_{GS}=4.5V, I_D=3A		50	70	mΩ
		V_{GS}=2.5V, I_D=2A		62	90	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=3.4A		14		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.75	1	V
I_S	Maximum Body-Diode Continuous Current				1.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=15V, f=1MHz		235		pF
C_{oss}	Output Capacitance			35		pF
C_{rss}	Reverse Transfer Capacitance			18		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.9	1.8	2.7	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=15V, I_D=3.4A		6	10	nC
Q_g(4.5V)	Total Gate Charge			3		nC
Q_{gs}	Gate Source Charge			0.55		nC
Q_{gd}	Gate Drain Charge			0.8		nC
$t_{D(on)}$	Turn-On DelayTime	VGS=10V, VDS=15V, RL=4.4 Ω, RGEN=3 Ω		1.5		ns
t_r	Turn-On Rise Time			2.5		ns
$t_{D(off)}$	Turn-Off DelayTime			16		ns
t_f	Turn-Off Fall Time			2		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=3.4A, dI/dt=100A/µs		6		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=3.4A, dI/dt=100A/µs		1.2		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.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

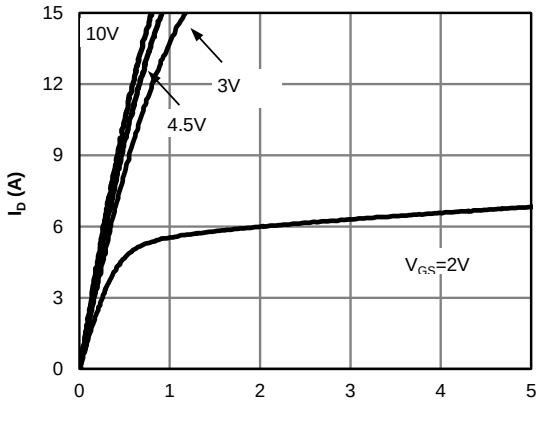


Fig 1: On-Region Characteristics (Note E)

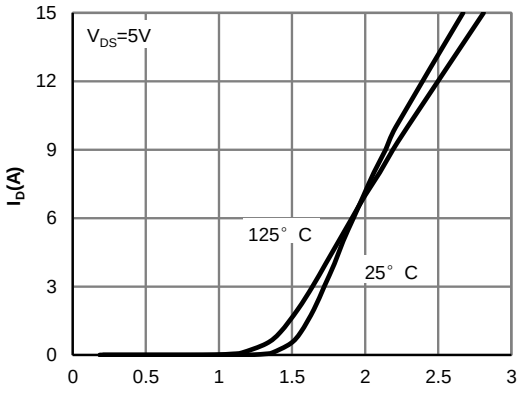


Figure 2: Transfer Characteristics (Note E)

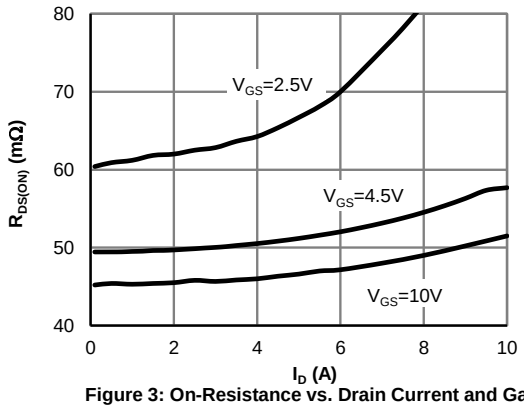


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

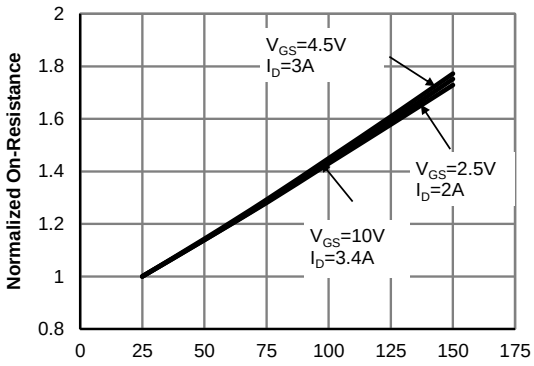


Figure 4: On-Resistance vs. Junction Temperature (Note E)

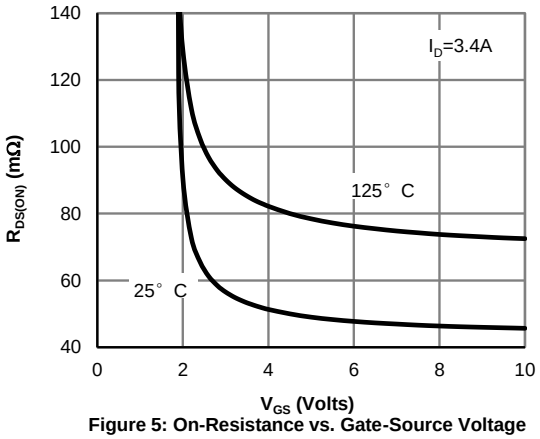


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

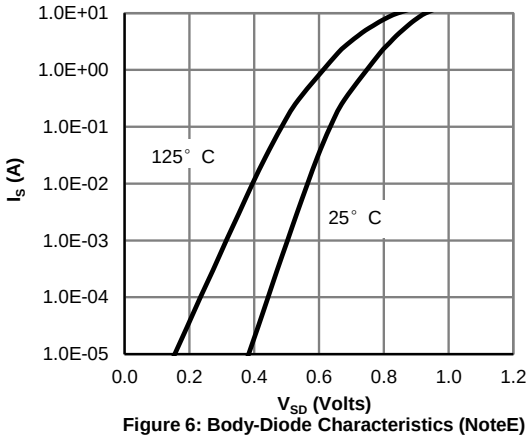


Figure 6: Body-Diode Characteristics (NoteE)

N-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

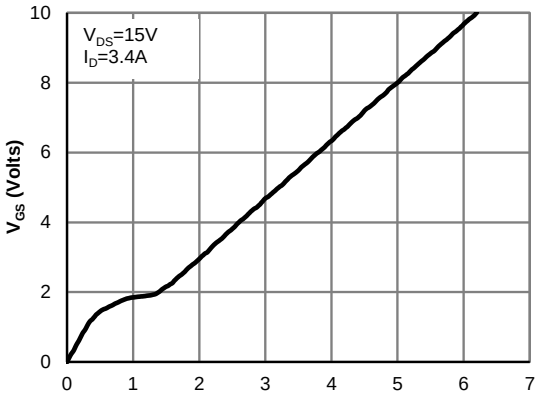


Figure 7: Gate-Charge Characteristics

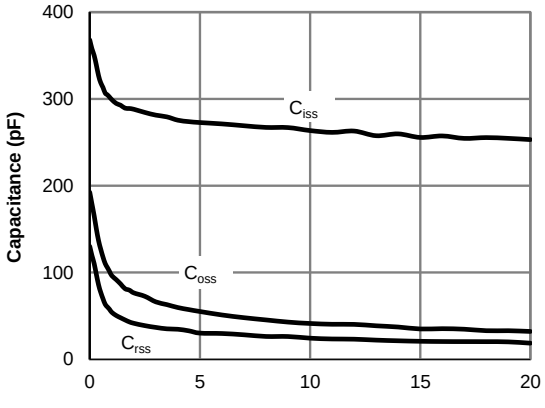


Figure 8: Capacitance Characteristics

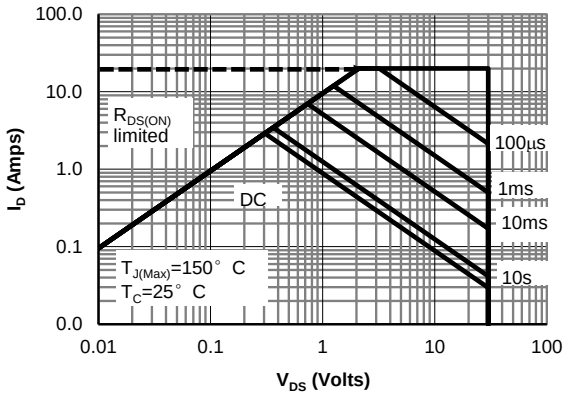


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

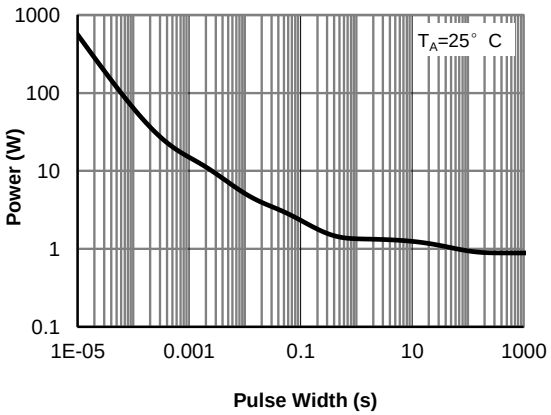


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

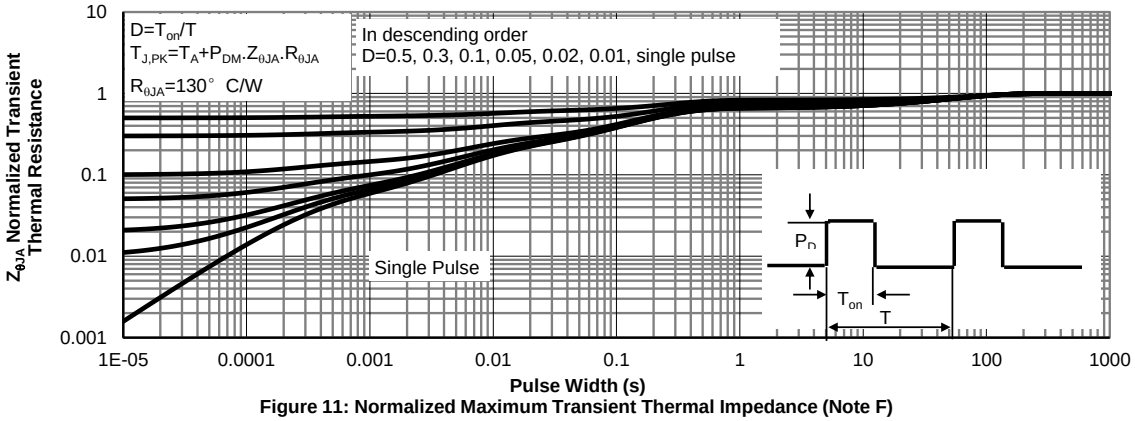
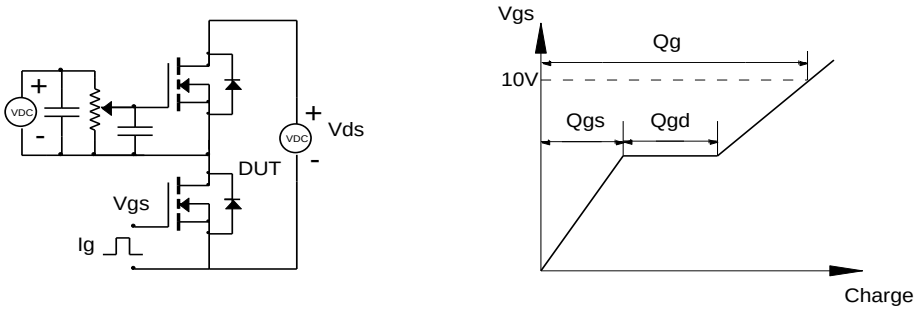
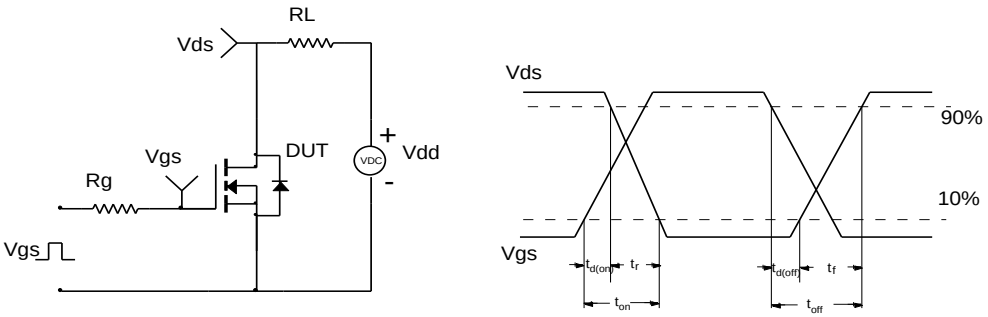


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

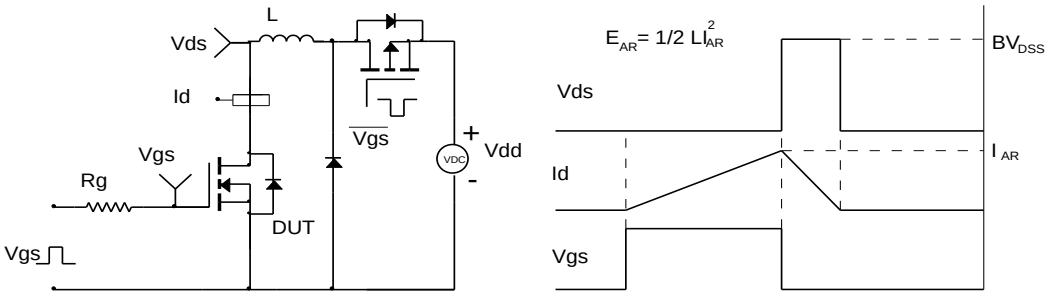
Gate Charge Test Circuit & Waveform



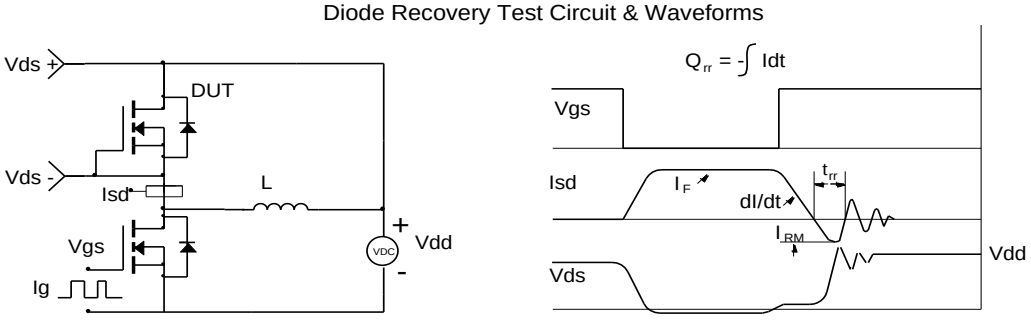
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



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}=-20V, 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	-0.65	-1	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-3.3A		63	75	mΩ
		T_J=125°C		87	105	
		V_{GS}=-2.5V, I_D=-2.5A		78	105	mΩ
		V_{GS}=-1.8V, I_D=-1A		96	135	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-3.3A		13		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.7	-1	V
I_S	Maximum Body-Diode Continuous Current				-1.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=-10V, f=1MHz		510		pF
C_{oss}	Output Capacitance			70		pF
C_{rss}	Reverse Transfer Capacitance			50		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		15	30	Ω
SWITCHING PARAMETERS						
Q_g(4.5V)	Total Gate Charge	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.3A		6	10	nC
Q_{gs}	Gate Source Charge			0.6		nC
Q_{gd}	Gate Drain Charge			1.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=4Ω, R_{GEN}=6Ω		11		ns
t_r	Turn-On Rise Time			11		ns
$t_{D(off)}$	Turn-Off DelayTime			60		ns
t_f	Turn-Off Fall Time			30		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-3.3A, dI/dt=100A/µs		16		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-3.3A, dI/dt=100A/µs		4		nC

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² 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.
B. The power dissipation P_D is based on $T_{J(MAX)}$=150° C, using ≤ 10s junction-to-ambient thermal resistance.
C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150° C. Ratings are based on low frequency and duty cycles to keep initialT_J=25° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedence from junction to lead $R_{\theta JL}$ and lead to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300µs pulses, duty cycle 0.5% max.
F. These curves are based on the junction-to-ambient thermal impedence which is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150° C. The SOA curve provides a single pulse rating.

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

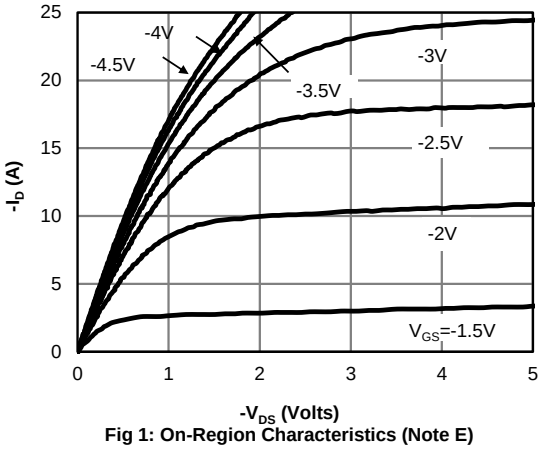


Fig 1: On-Region Characteristics (Note E)

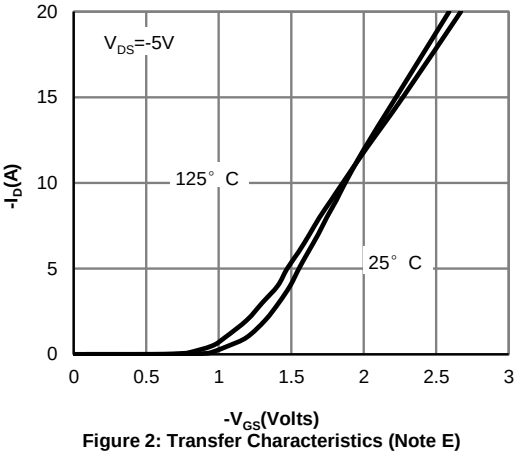


Figure 2: Transfer Characteristics (Note E)

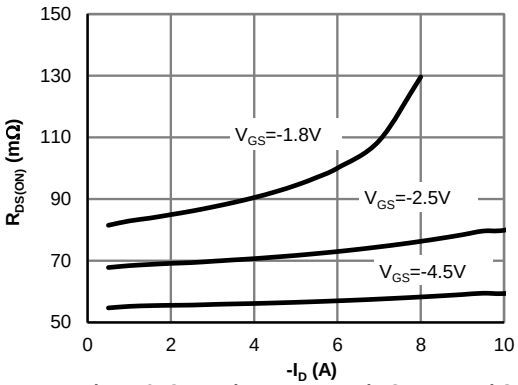


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

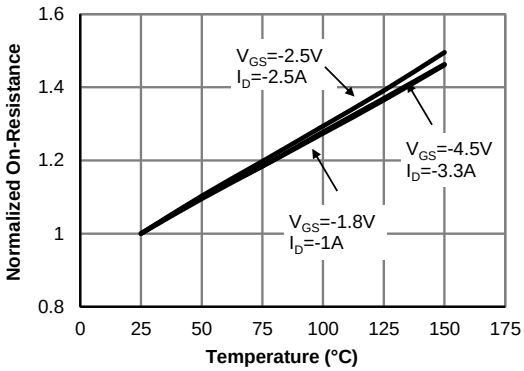


Figure 4: On-Resistance vs. Junction Temperature (Note E)

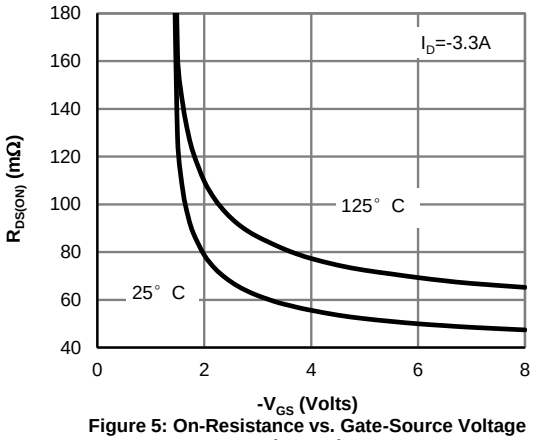


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

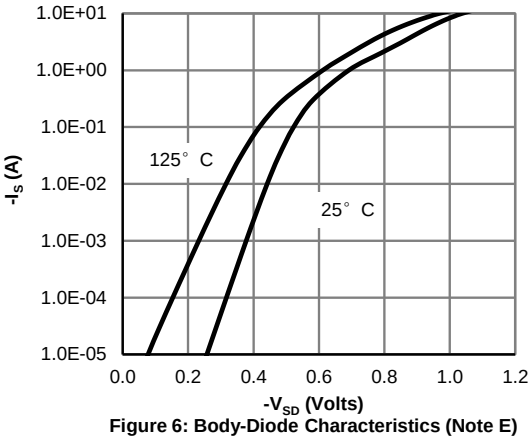


Figure 6: Body-Diode Characteristics (Note E)

P-Channel: TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

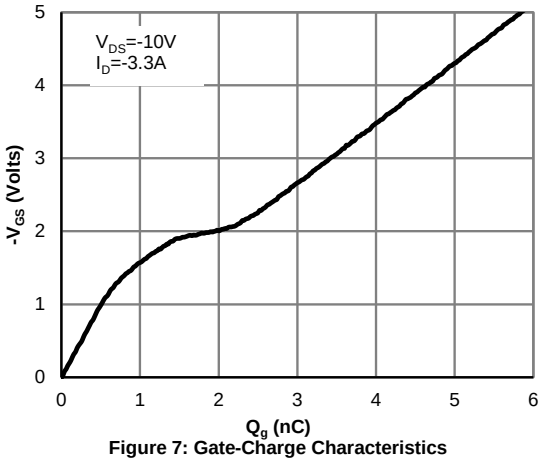


Figure 7: Gate-Charge Characteristics

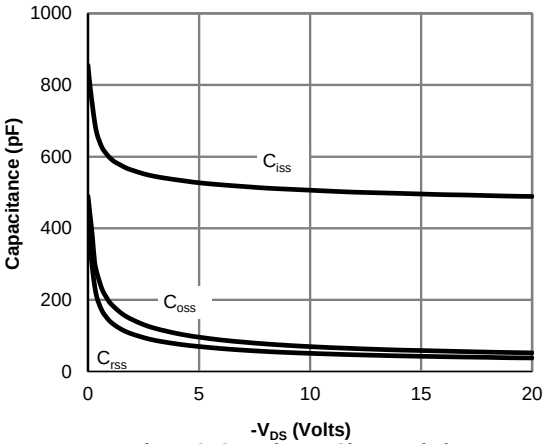


Figure 8: Capacitance Characteristics

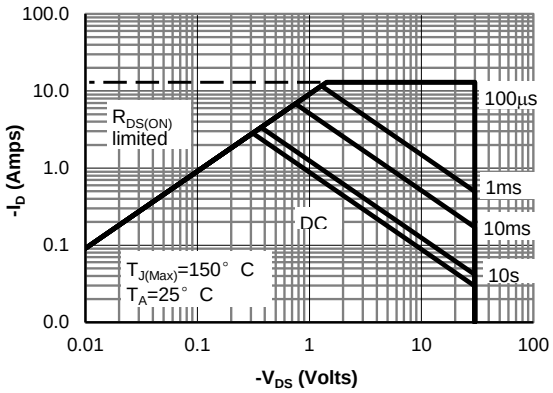


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

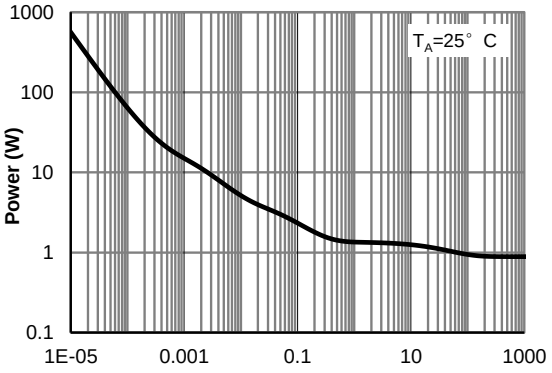


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

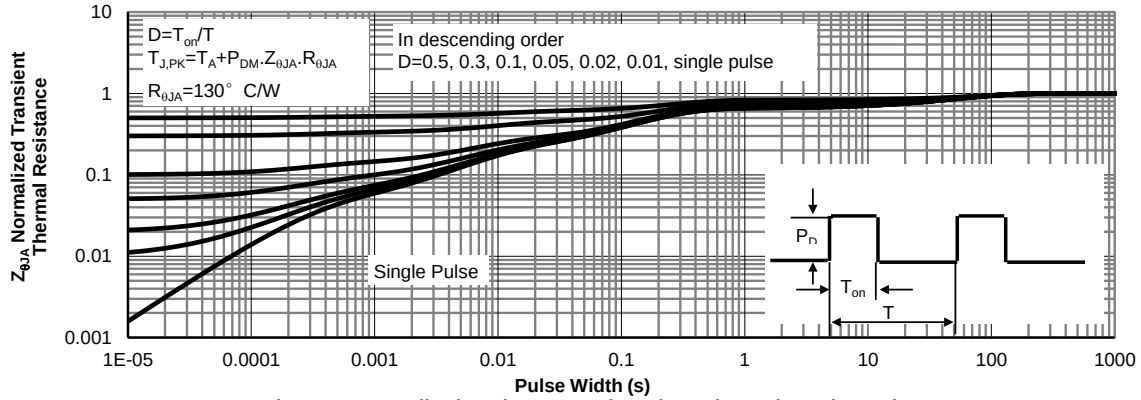
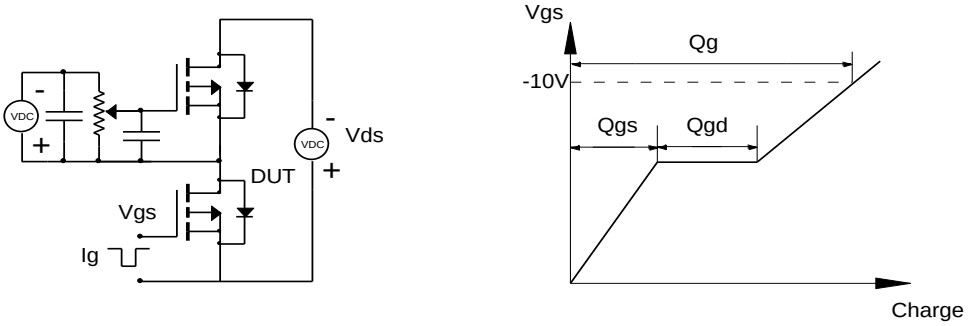
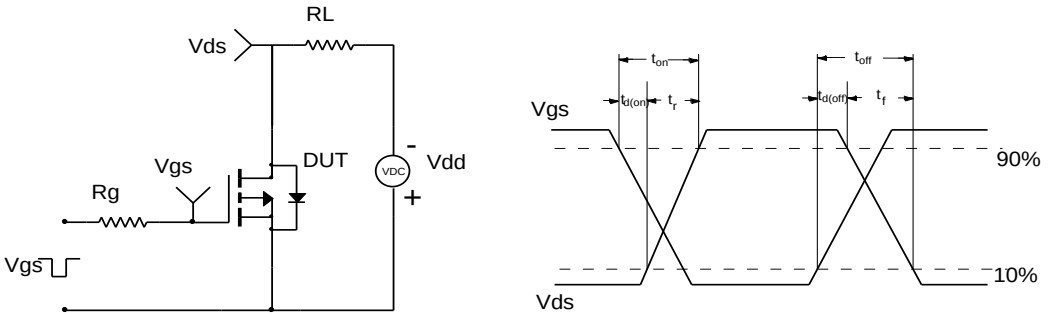


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

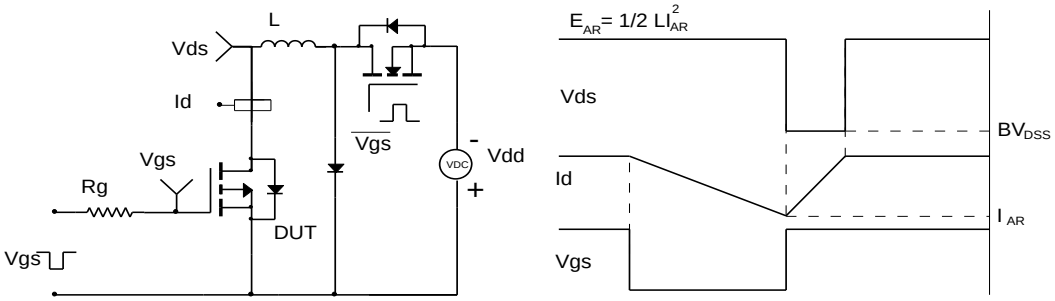
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms