ALPHA & OMEGA SEMICONDUCTOR

AO4622

20V Dual P + N-Channel MOSFET

General Description

The AO4622 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, and for a host of other applications.

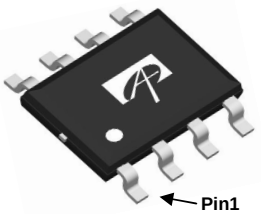
Product Summary

N-Channel	P-Channel
V_{DS} (V) = 20V	-20V
I_D = 7.3A (V_{GS}=4.5V)	-5A (V_{GS}=-4.5V)
$R_{DS(ON)}$	$R_{DS(ON)}$
< 23mΩ (V_{GS}=10V)	< 53mΩ (V_{GS} = -4.5V)
< 30mΩ (V_{GS}=4.5V)	< 87mΩ (V_{GS} = -2.5V)
< 84mΩ (V_{GS}=2.5V)	
100% UIS Tested	100% UIS Tested
100% Rg Tested	100% Rg Tested

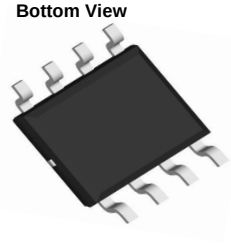
Green Product

SOIC-8

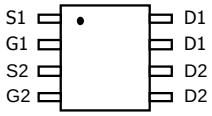
Top View

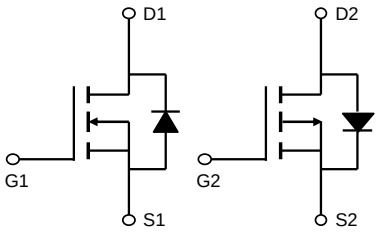


Bottom View



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}	20	-20	V
Gate-Source Voltage		V_{GS}	±16	±12	V
Continuous Drain Current [AF]	T_A=25°C	I_D	7.3	-5	A
	T_A=70°C		6.2	-4.2	
Pulsed Drain Current [B]		I_{DM}	35	-25	
Power Dissipation	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.44	1.44	
Avalanche Current [B]		I_{AR}	13	13	A
Repetitive avalanche energy 0.3mH [B]		E_{AR}	25	25	mJ
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	48	62.5	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		n-ch	74	110	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	n-ch	35	40	°C/W
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	p-ch	48	62.5	°C/W
Maximum Junction-to-Ambient [A]	Steady-State		p-ch	74	110	°C/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	p-ch	35	40	°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	uA
		T_J=55°C			5	
I_{GSS}	Gate-Body leakage current	V_{DS}=0V, V_{GS}=±16V			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} I_D=250µA	0.6	1.25	2	V
$I_{D(ON)}$	On state drain current	V_{GS}=4.5V, V_{DS}=5V	35			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V, I_D=7.3A		19	23	mΩ
		T_J=125°C		28	33.6	
		V_{GS}=4.5V, I_D=6.4A		24	30	mΩ
		V_{GS}=2.5V, I_D=2A		67	84	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=7.3A		17		S
V_{SD}	Diode Forward Voltage	I_S=1A		0.7	1	V
I_S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=10V, f=1MHz		900	1100	pF
C_{oss}	Output Capacitance			162		pF
C_{rss}	Reverse Transfer Capacitance			105		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		0.9	1.35	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=10V, I_D=6.5A		15	18	nC
Q_g(4.5V)	Total Gate Charge			7.2	9	nC
Q_{gs}	Gate Source Charge			1.8		nC
Q_{gd}	Gate Drain Charge			2.8		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=10V, R_L=1.4Ω, R_{GEN}=3Ω		4.5		ns
t_r	Turn-On Rise Time			9.2		ns
$t_{D(off)}$	Turn-Off DelayTime			18.7		ns
t_f	Turn-Off Fall Time			3.3		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=7.3A, dI/dt=100A/µs		18		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=7.3A, dI/dt=100A/µs		9.5		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.
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. $R_{\theta JL}$ and $R_{\theta JC}$ are equivalent terms referring to thermal resistance from junction to drain lead.
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.
F. The current rating is based on the t ≤ 10s thermal resistance rating.
Rev5: Nov 2010

N-CHANNEL TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

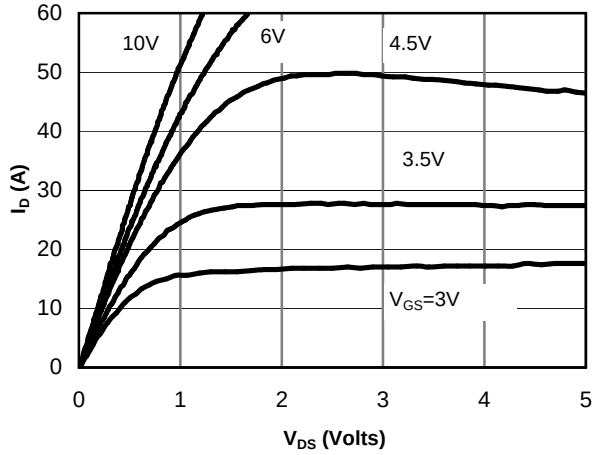


Figure 1: On-Region Characteristics

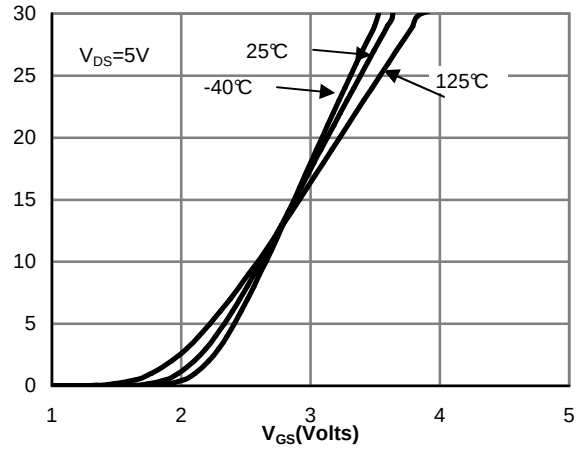


Figure 2: Transfer Characteristics

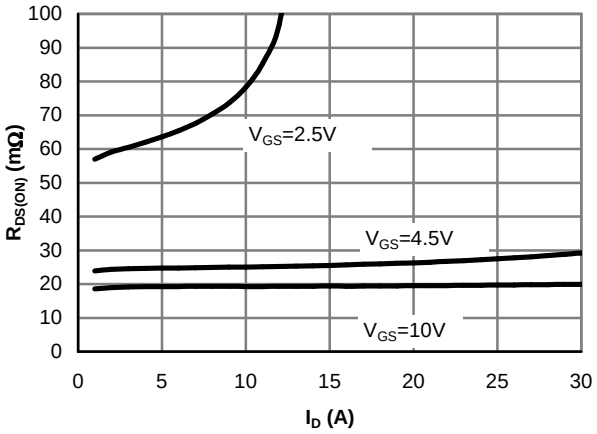


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

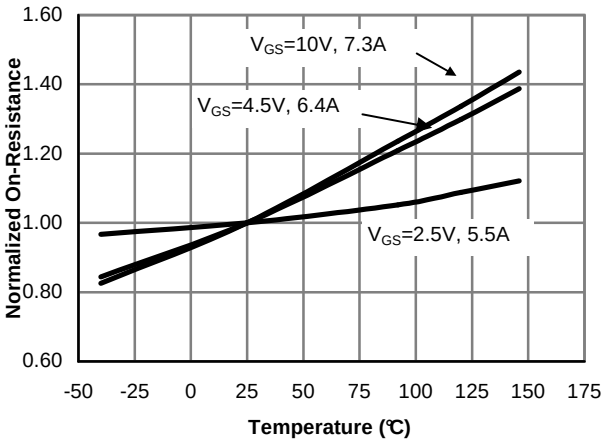


Figure 4: On-Resistance vs. Junction Temperature

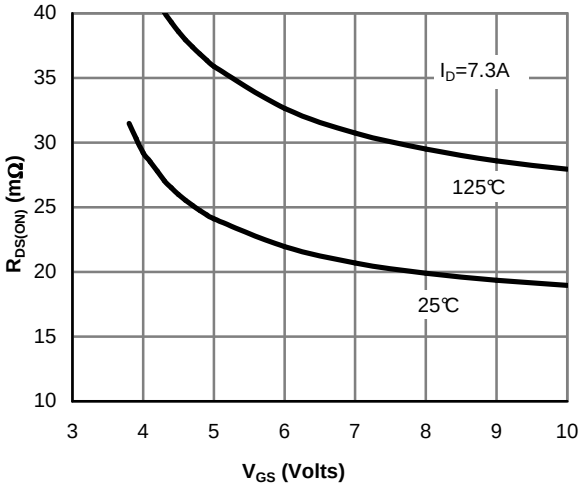


Figure 5: On-Resistance vs. Gate-Source Voltage

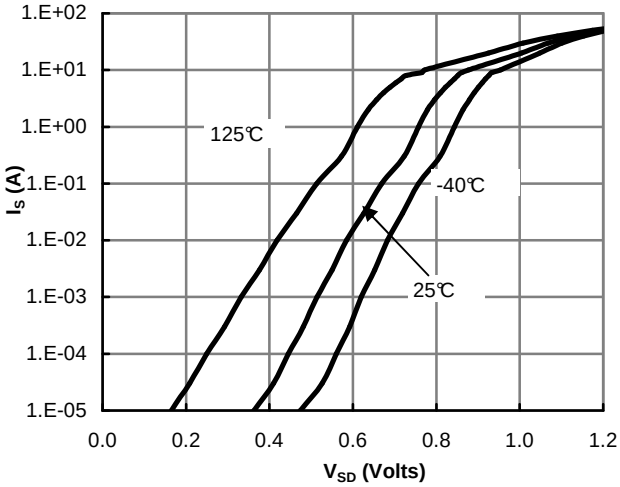


Figure 6: Body-Diode Characteristics

N-Channel TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

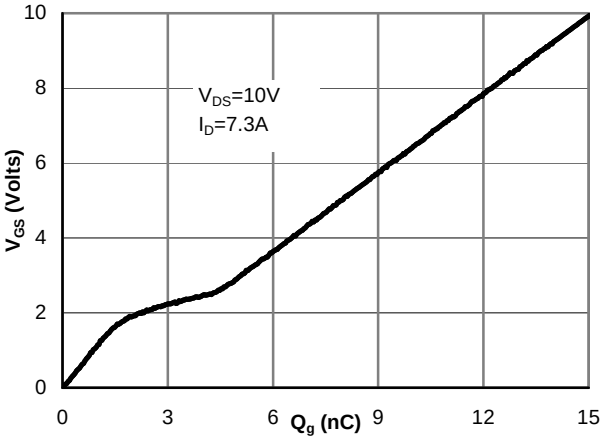


Figure 7: Gate-Charge Characteristics

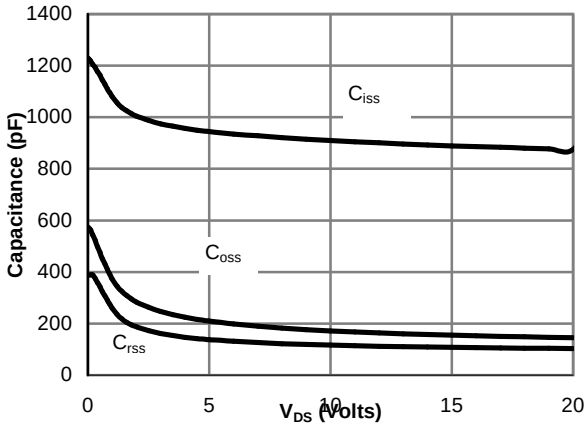


Figure 8: Capacitance Characteristics

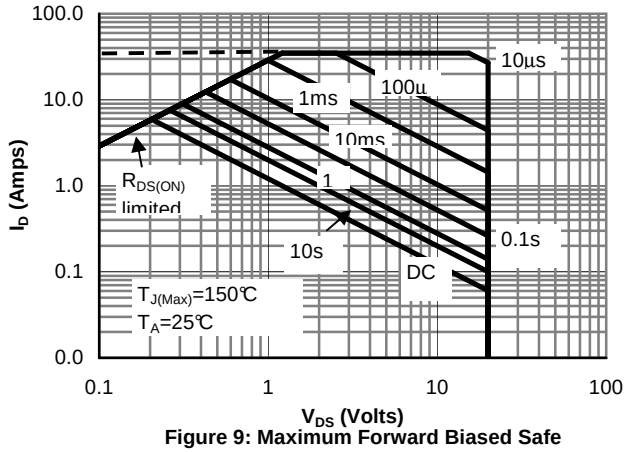


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

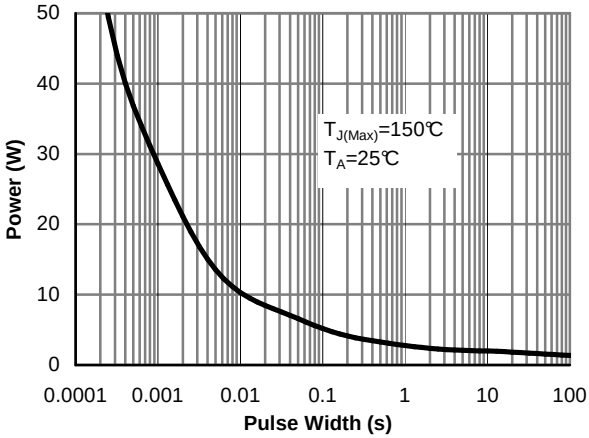


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

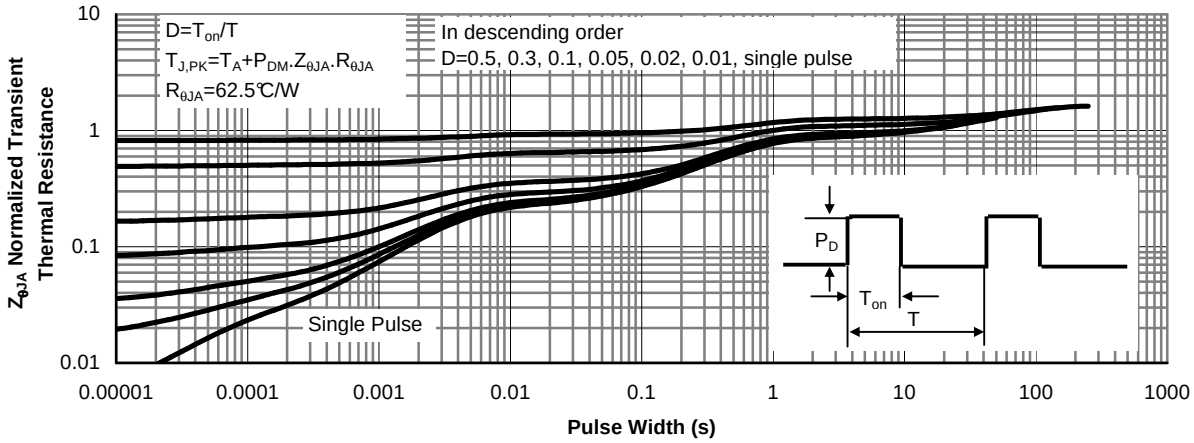
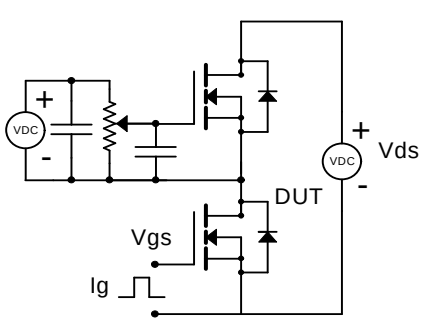
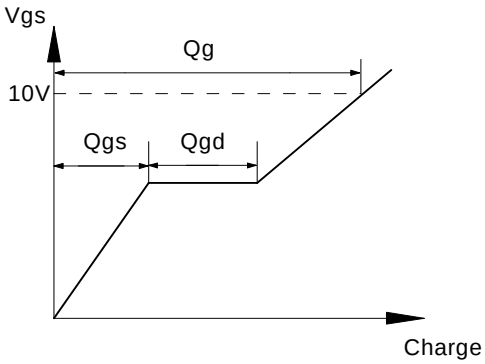


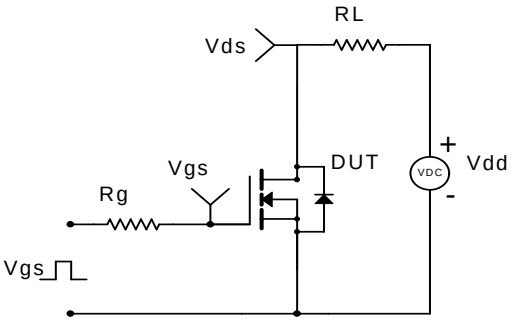
Figure 11: Normalized Maximum Transient Thermal Impedance

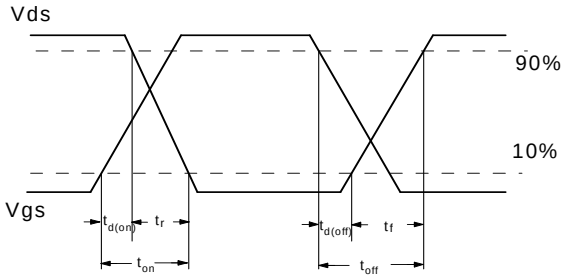
Gate Charge Test Circuit & Waveform



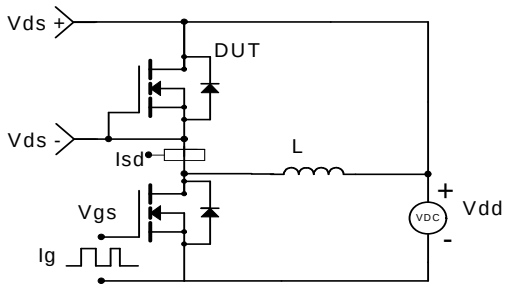


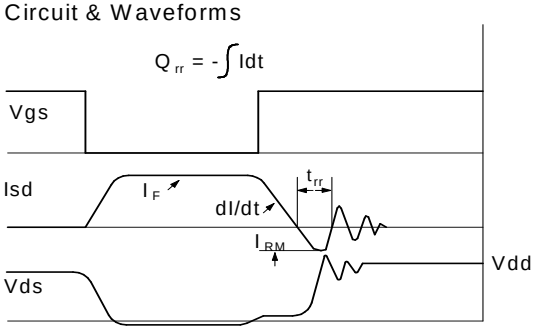
Resistive Switching Test Circuit & Waveforms





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}=-16V, 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	-1.3	-0.9	-0.5	V
$I_{D(ON)}$	On state drain current	V_{GS}=-4.5V, V_{DS}=-5V	-25			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-4.5V, I_D=-5A		44	53	mΩ
		T_J=125°C		59	71	
		V_{GS}=-2.5V, I_D=-4.2A		67	87	mΩ
g_{FS}	Forward Transconductance	V_{DS}=-5V, I_D=-5A		13		S
V_{SD}	Diode Forward Voltage	I_S=-1A,V_{GS}=0V		-0.76	-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		800	960	pF
C_{oss}	Output Capacitance			131		pF
C_{rss}	Reverse Transfer Capacitance			103		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		6.7	10	Ω
SWITCHING PARAMETERS						
Q_g(10V)	Total Gate Charge (10V)	V_{GS}=-4.5V, V_{DS}=-10V, I_D=-4.5A		15.5		nC
Q_g(4.5V)	Total Gate Charge (4.5V)			7.4		nC
Q_{gs}	Gate Source Charge			1.3		nC
Q_{gd}	Gate Drain Charge			2.9		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=-4.5V, V_{DS}=-10V, R_L=2Ω, R_{GEN}=3Ω		4.4		ns
t_r	Turn-On Rise Time			7.6		ns
$t_{D(off)}$	Turn-Off DelayTime			44		ns
t_f	Turn-Off Fall Time			13.5		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=-5A, dI/dt=100A/µs		20		ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=-5A, dI/dt=100A/µs		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.

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. $R_{\theta JL}$ and $R_{\theta JC}$ are equivalent terms referring to thermal resistance from junction to drain lead.

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.

F. The current rating is based on the t ≤ 10s thermal resistance rating.

Rev5: Nov 2010

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

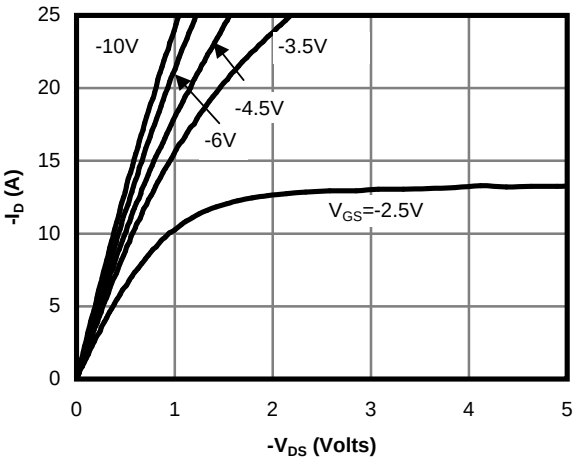


Fig 1: On-Region Characteristics

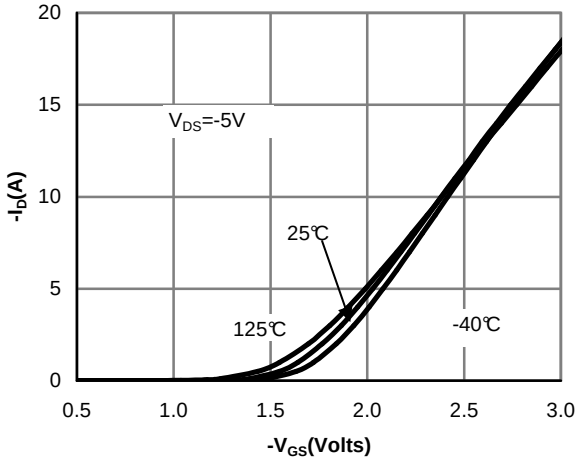


Figure 2: Transfer Characteristics

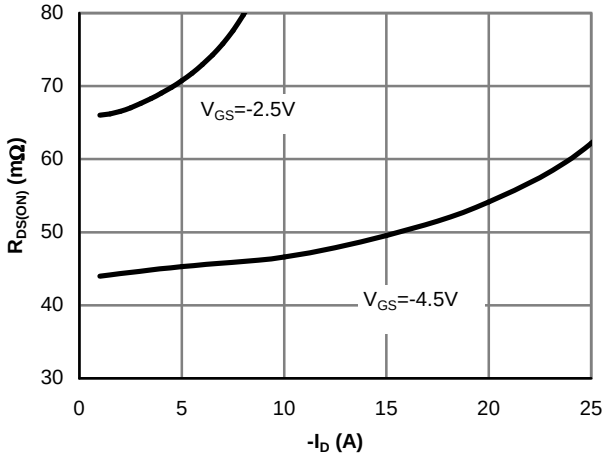


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

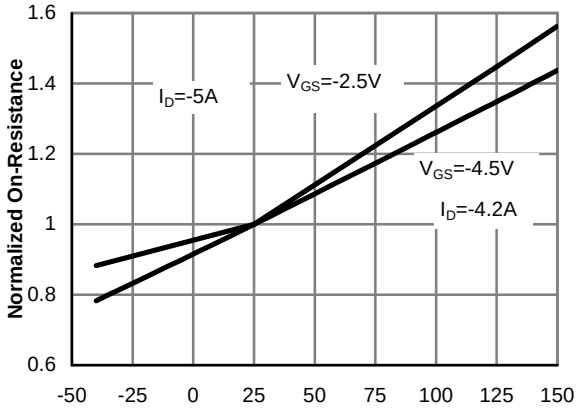


Figure 4: On-Resistance vs. Junction Temperature

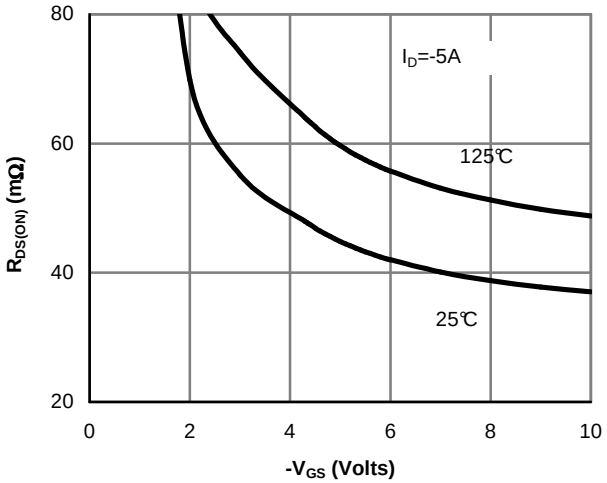


Figure 5: On-Resistance vs. Gate-Source Voltage

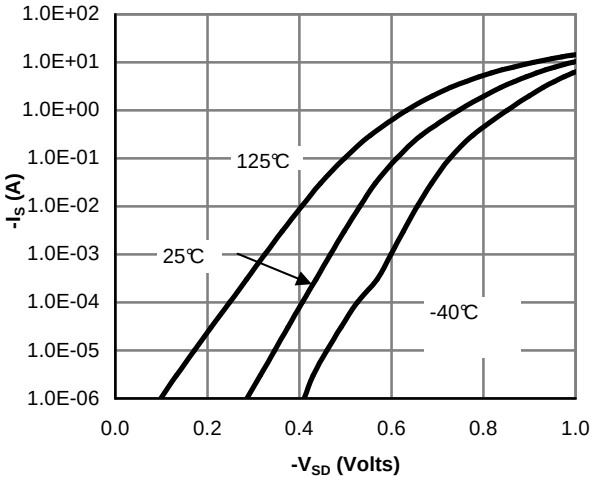


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

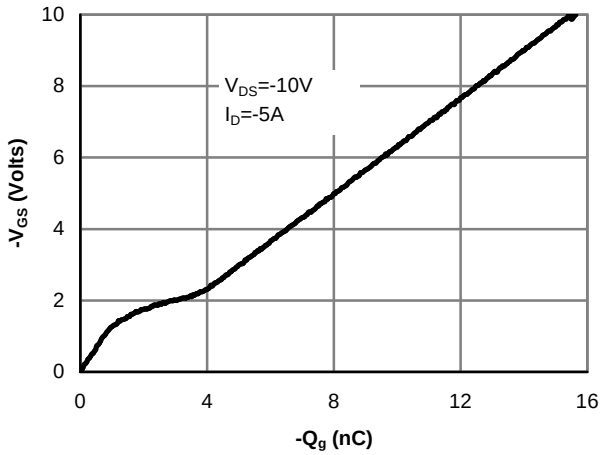


Figure 7: Gate-Charge Characteristics

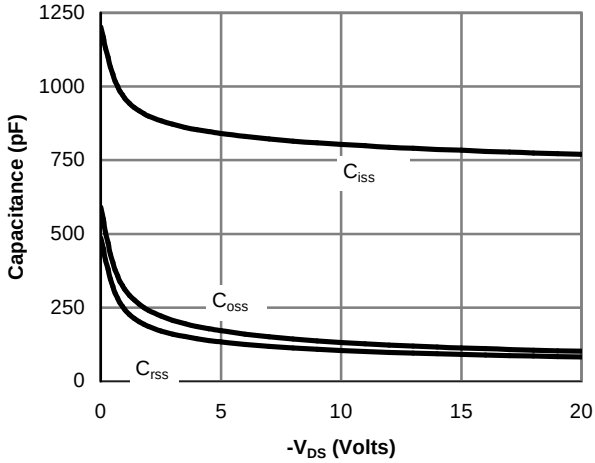


Figure 8: Capacitance Characteristics

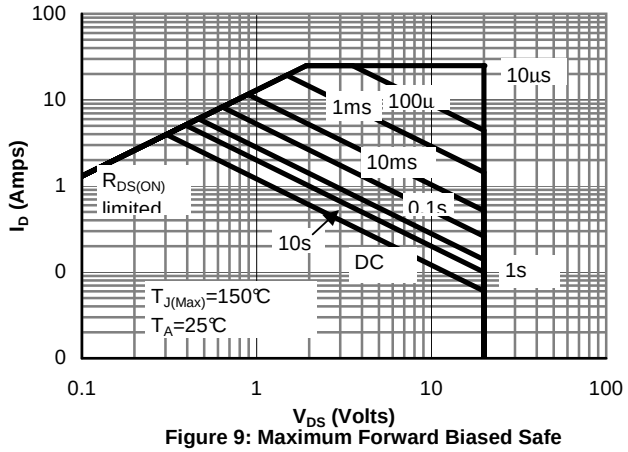


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

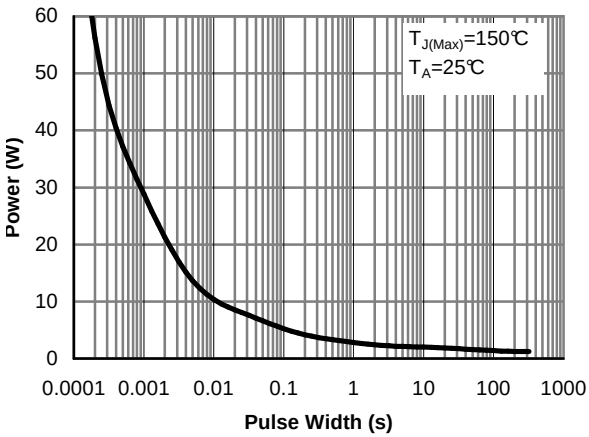


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

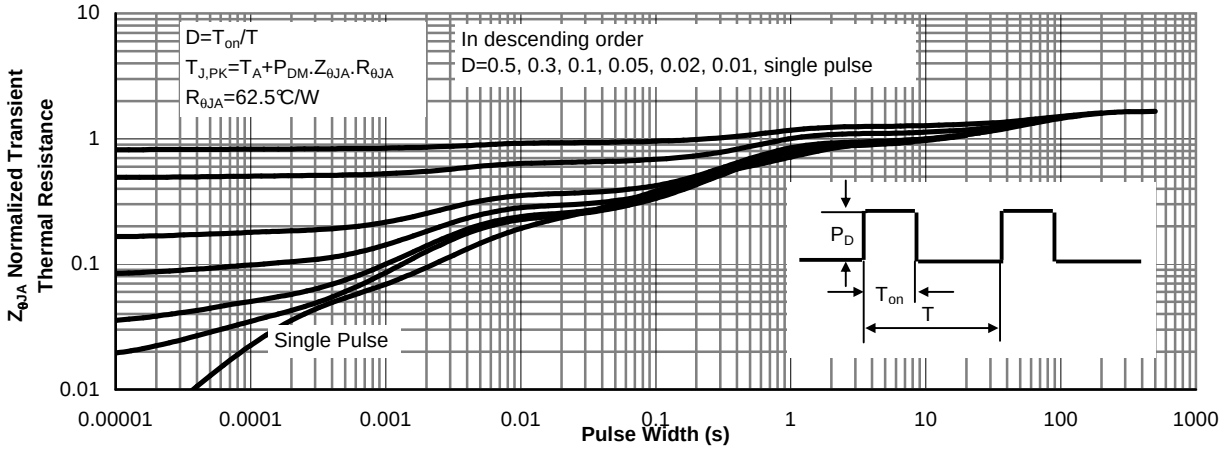
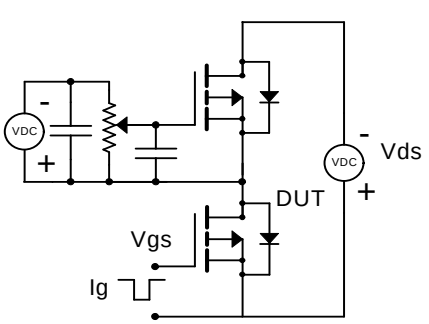
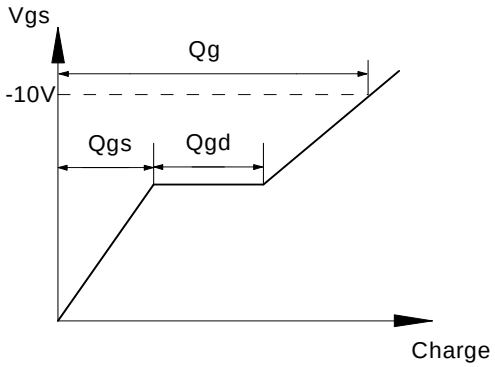


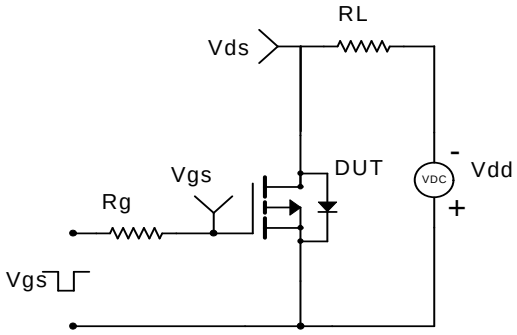
Figure 11: Normalized Maximum Transient Thermal Impedance

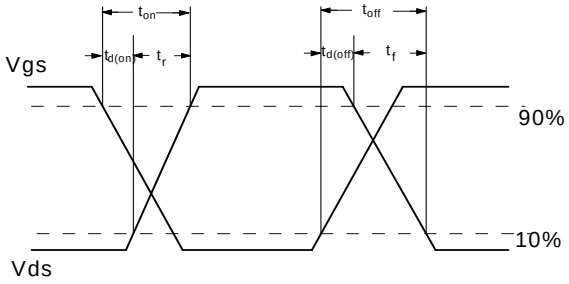
Gate Charge Test Circuit & Waveform





Resistive Switching Test Circuit & Waveforms





Diode Recovery Test Circuit & Waveforms