

General Description

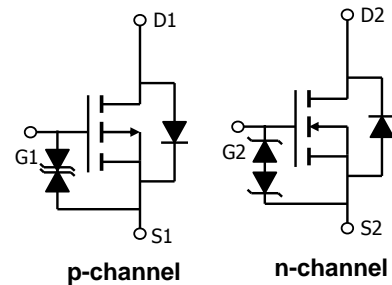
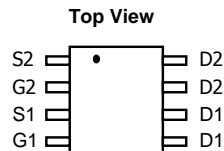
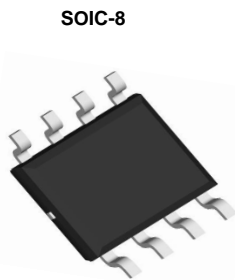
The AO4613 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

Features

N-Channel

 $V_{DS} (V) = 30V$
 $I_D = 7.2A (V_{GS}=10V)$
 $R_{DS(ON)}$
 $< 24m\Omega (V_{GS}=10V)$
 $< 40m\Omega (V_{GS}=4.5V)$

P-Channel

 $-30V$
 $-6.1A (V_{GS}=10V)$
 $R_{DS(ON)}$
 $< 37m\Omega (V_{GS} = -10V)$
 $< 60m\Omega (V_{GS} = -4.5V)$


Absolute Maximum Ratings $T_A=25^\circ C$ 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	I_D	$T_A=25^\circ C$	7.2	-6.1
		$T_A=70^\circ C$	6.1	-5.1
Pulsed Drain Current ^B	I_{DM}	30	-30	A
Power Dissipation	P_D	$T_A=25^\circ C$	2	2
		$T_A=70^\circ C$	1.44	1.44
Avalanche Current ^B	I_{AR}	15	20	A
Repetitive avalanche energy 0.1mH ^B	E_{AR}	11	20	mJ
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

Thermal Characteristics: n-channel and p-channel

Parameter	Symbol	Typ	Max		Units
			n-ch	p-ch	
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	$t \leq 10s$	n-ch	55	62.5
			p-ch	92	110
Maximum Junction-to-Ambient ^A	$R_{\theta JA}$	Steady-State	n-ch	37	50
			p-ch	48	62.5
Maximum Junction-to-Lead ^C	$R_{\theta JL}$	Steady-State	n-ch	84	110
			p-ch	37	50

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 T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1	2	3	V
I _{D(ON)}	On state drain current	V _{GS} =10V, V _{DS} =5V	20			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =7.2A T _J =125°C		20 29	24 35	mΩ
		V _{GS} =4.5V, I _D =4A		30	40	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =7.2A	10	18		S
V _{SD}	Diode Forward Voltage	I _S =1A		0.77	1	V
I _S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, f=1MHz		522	630	pF
C _{oss}	Output Capacitance			110		pF
C _{rss}	Reverse Transfer Capacitance			75		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.1	3	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge	V _{GS} =10V, V _{DS} =15V, I _D =7.2A		11	15	nC
Q _{g(4.5V)}	Total Gate Charge			5.3	7	nC
Q _{gs}	Gate Source Charge			1.9		nC
Q _{gd}	Gate Drain Charge			4		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =15V, R _L =2.1Ω, R _{GEN} =3Ω		4.7	7	ns
t _r	Turn-On Rise Time			4.9	10	ns
t _{D(off)}	Turn-Off DelayTime			16.2	22	ns
t _f	Turn-Off Fall Time			3.5	7	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =7.2A, di/dt=100A/μs		15.7	20	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =7.2A, di/dt=100A/μs		7.9	10	nC

A: The value of R_{θJA} 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. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient. R_{θJL} and R_{θJC} are equivalent terms referring to thermal resistance from junction to drain lead.

D: The static characteristics in Figures 1 to 6 are obtained using 80 μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² 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 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 T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±12V			10	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1	-1.7	-3	V
I _{D(ON)}	On state drain current	V _{GS} =-10V, V _{DS} =-5V	30			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-6.1A T _J =125°C		28 39	37 48	mΩ
		V _{GS} =-4.5V, I _D =-4A		45	60	
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-6.1A		12.5		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.77	-1	V
I _S	Maximum Body-Diode Continuous Current				3	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, f=1MHz		1040	1250	pF
C _{oss}	Output Capacitance			179		pF
C _{rss}	Reverse Transfer Capacitance			134		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		5	10	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge (10V)	V _{GS} =-10V, V _{DS} =-15V, I _D =-6.1A		16.8	22	nC
Q _{g(4.5V)}	Total Gate Charge (4.5V)			8.7	12	nC
Q _{gs}	Gate Source Charge			3.4		nC
Q _{gd}	Gate Drain Charge			5		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-15V, R _L =2.5Ω, R _{GEN} =3Ω		9	12	ns
t _r	Turn-On Rise Time			5.7	11	ns
t _{D(off)}	Turn-Off DelayTime			22.7	30	ns
t _f	Turn-Off Fall Time			10.2	20	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-6.1A, di/dt=100A/μs		21.7	27	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-6.1A, di/dt=100A/μs		13.6	18	nC

A: The value of R_{θJA} 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. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C. The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient. R_{θJL} and R_{θJC} are equivalent terms referring to thermal resistance from junction to drain lead.

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 in² 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-CH TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

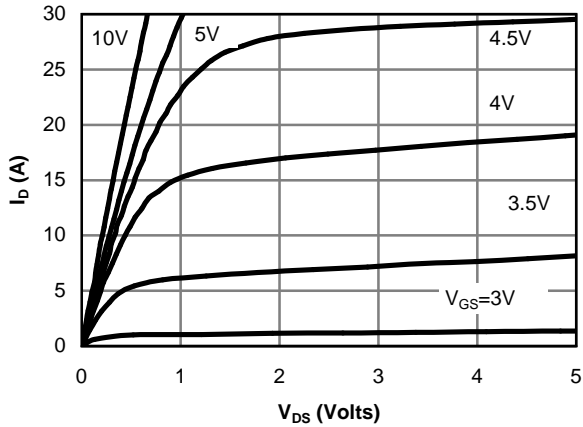


Fig 1: On-Region Characteristics

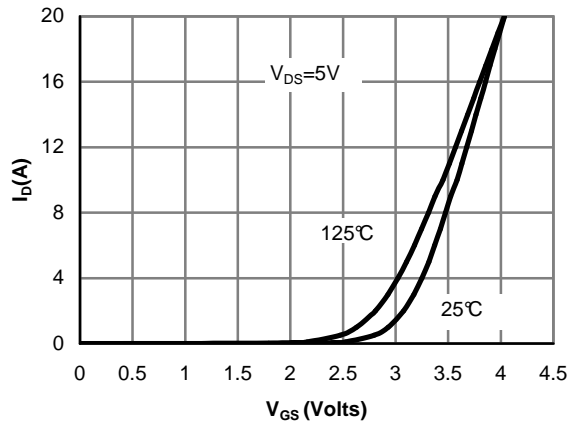


Figure 2: Transfer Characteristics

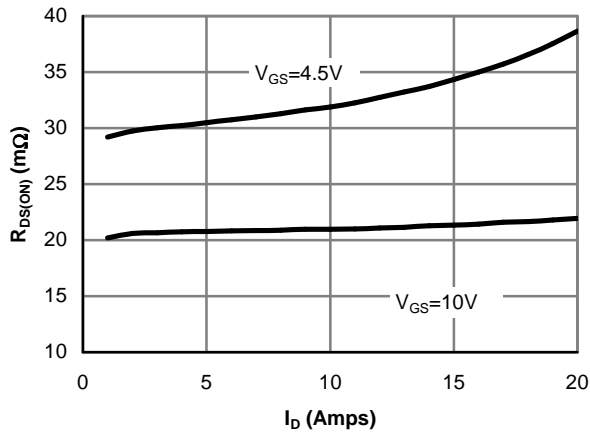


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

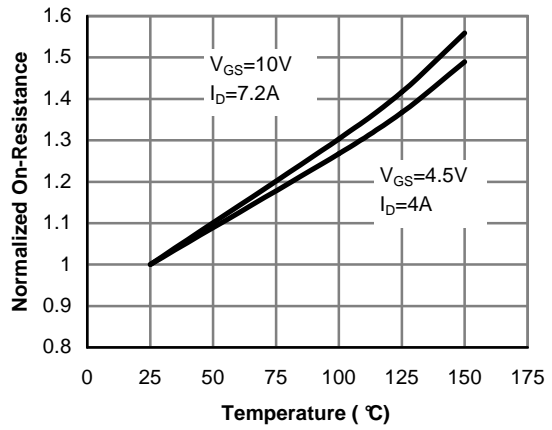


Figure 4: On-Resistance vs. Junction Temperature

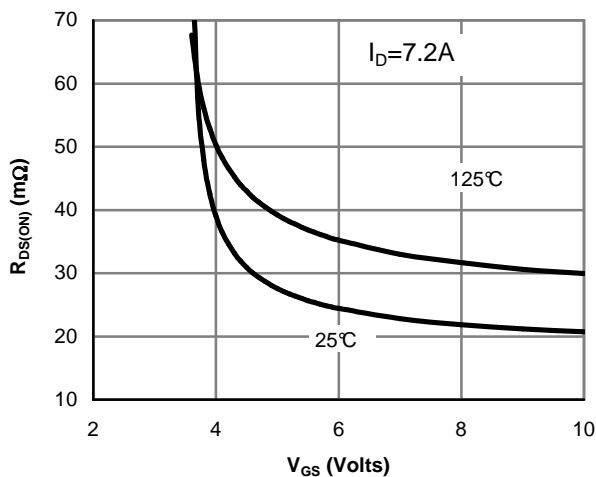


Figure 5: On-Resistance vs. Gate-Source Voltage

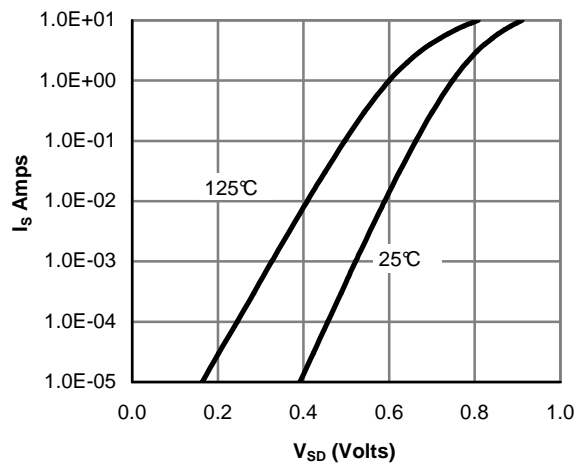


Figure 6: Body diode characteristics

N-CH TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

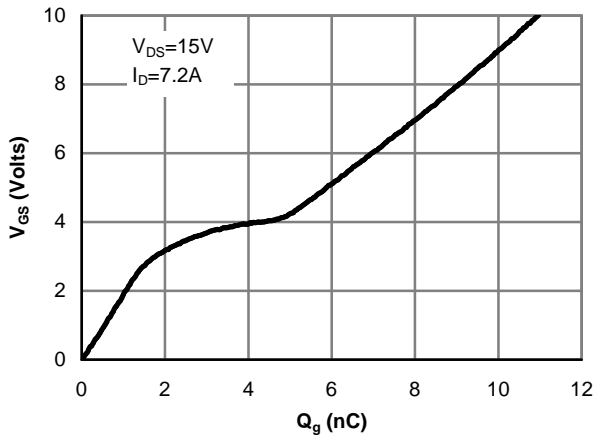


Figure 7: Gate-Charge characteristics

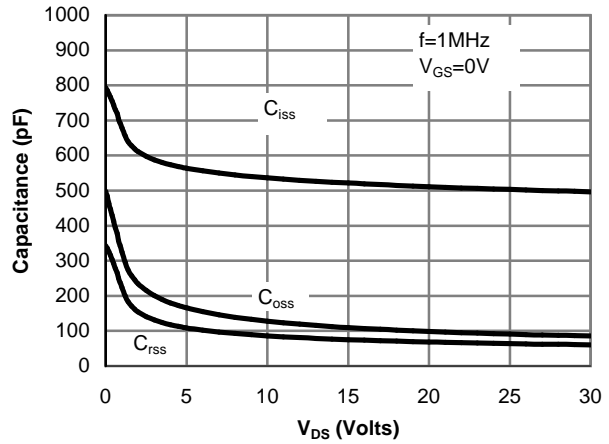


Figure 8: Capacitance Characteristics

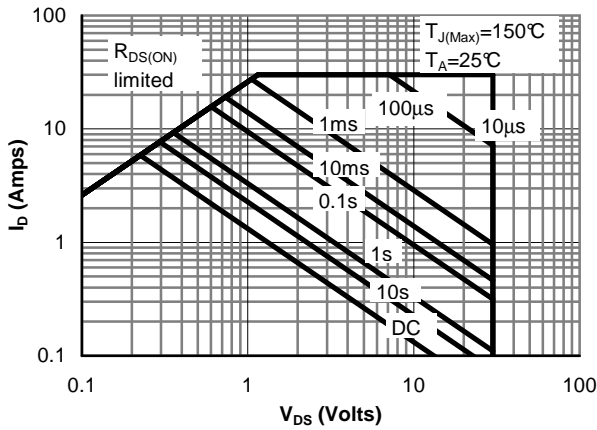


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

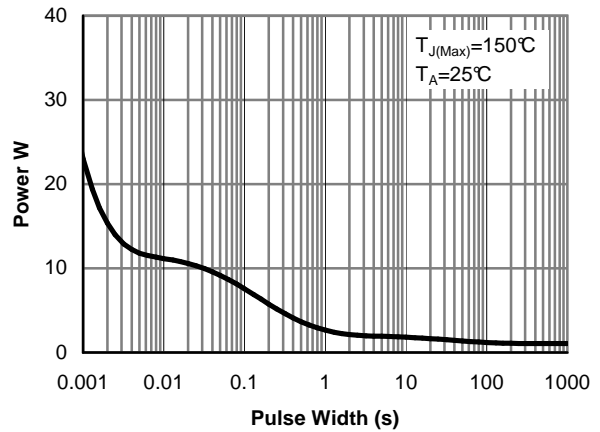


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

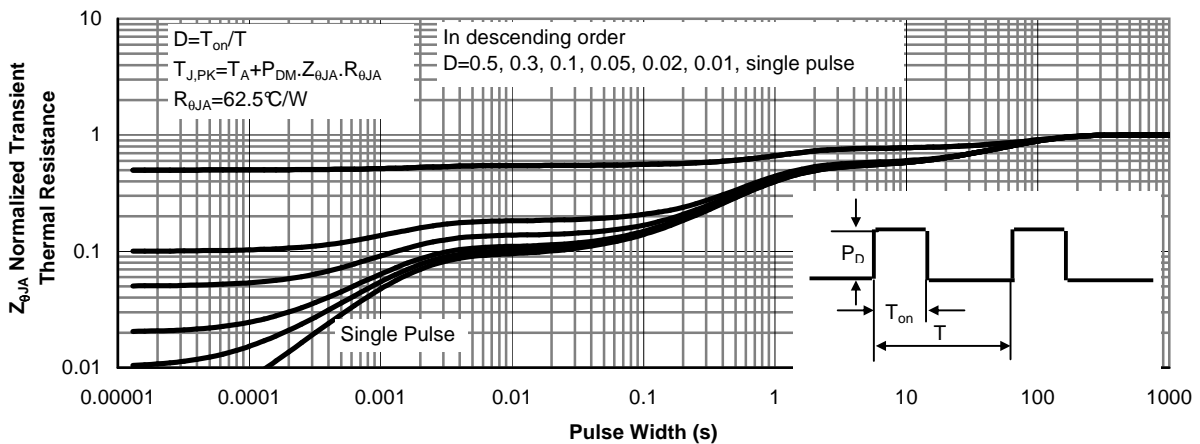


Figure 11: Normalized Maximum Transient Thermal Impedance

P-CH TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

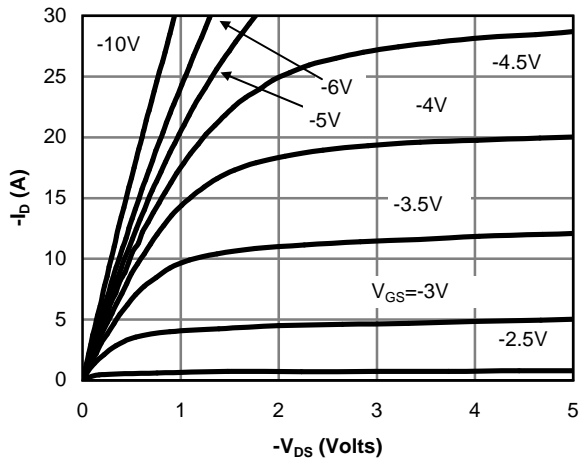


Fig 1: On-Region Characteristics

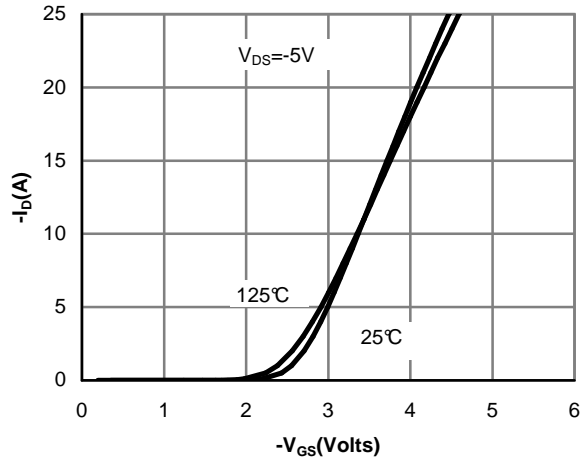


Figure 2: Transfer Characteristics

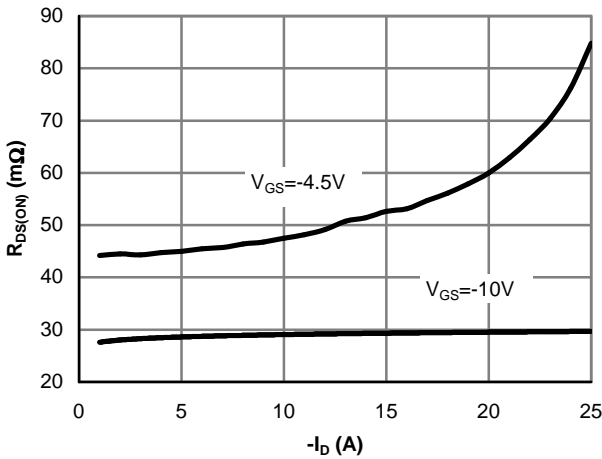


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

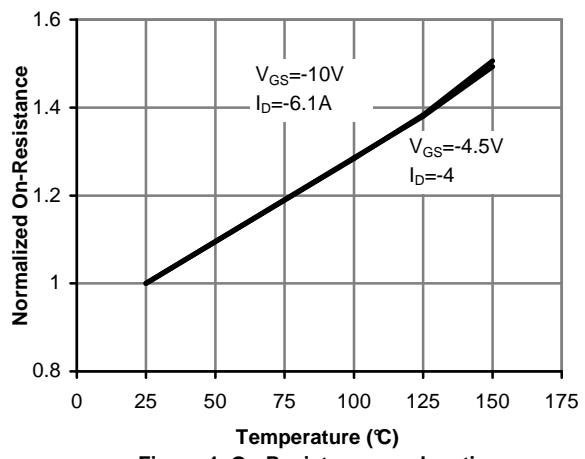


Figure 4: On-Resistance vs. Junction Temperature

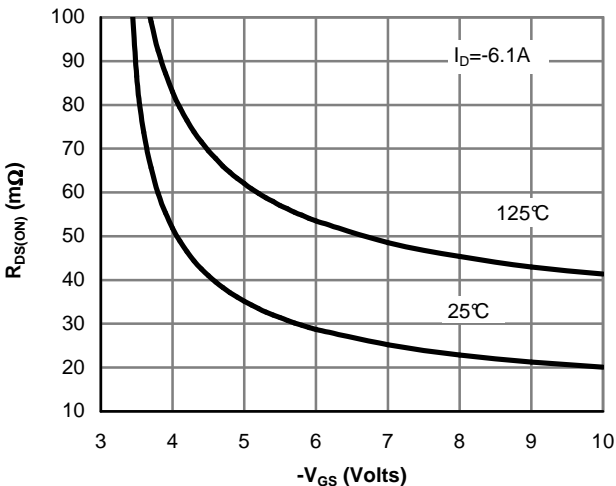


Figure 5: On-Resistance vs. Gate-Source Voltage

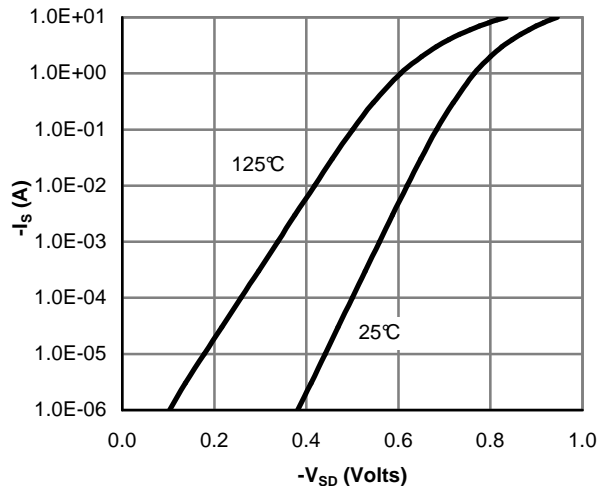


Figure 6: Body-Diode Characteristics

P-CH TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

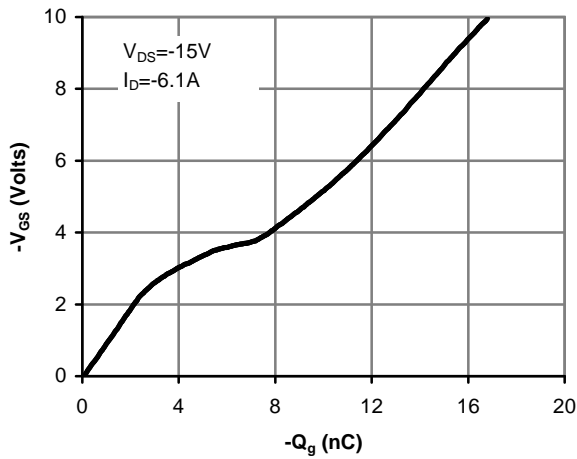


Figure 7: Gate-Charge Characteristics

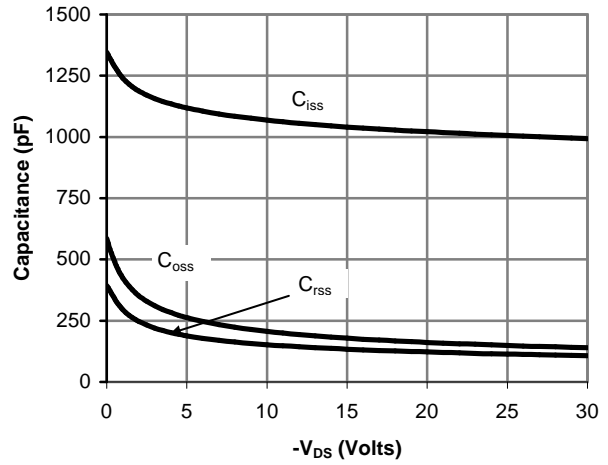


Figure 8: Capacitance Characteristics

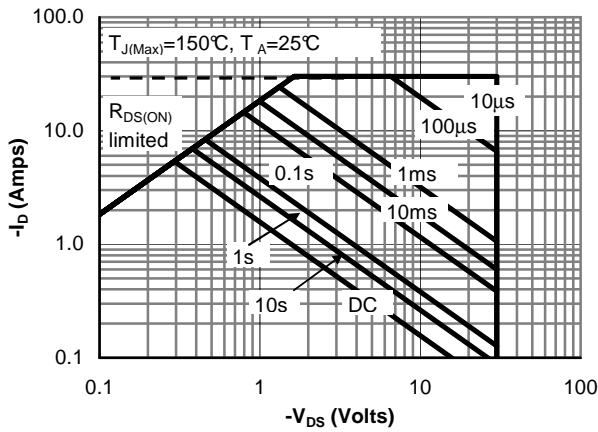


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

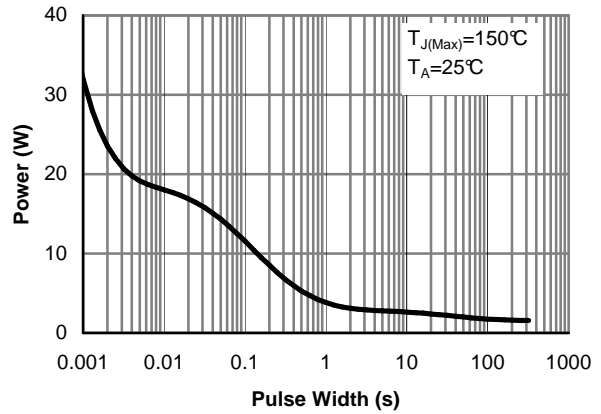


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

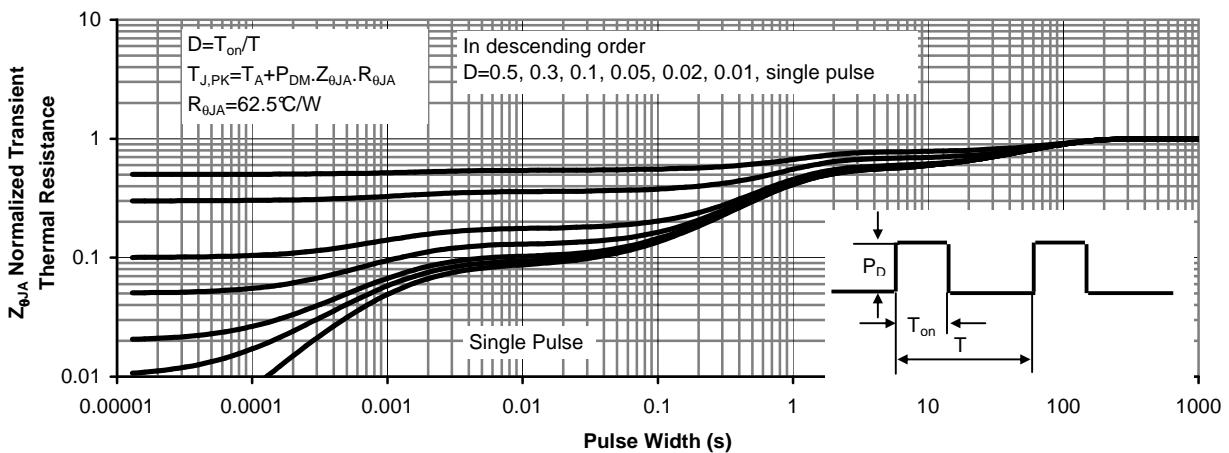


Figure 11: Normalized Maximum Transient Thermal Impedance