



ALPHA & OMEGA
SEMICONDUCTOR

AO4614

40V Dual P + N-Channel MOSFET

General Description

The AO4614 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in H-bridge, Inverters and other applications.

Product Summary

N-Channel

V_{DS} (V) = 40V

I_D = 6A ($V_{GS}=10V$)

$R_{DS(ON)}$

< 31m Ω ($V_{GS}=10V$)

< 45m Ω ($V_{GS}=4.5V$)

100% UIS Tested

100% Rg Tested

P-Channel

-40V

-5A ($V_{GS} = -10V$)

$R_{DS(ON)}$

< 45m Ω ($V_{GS} = -10V$)

< 63m Ω ($V_{GS} = -4.5V$)

100% UIS Tested

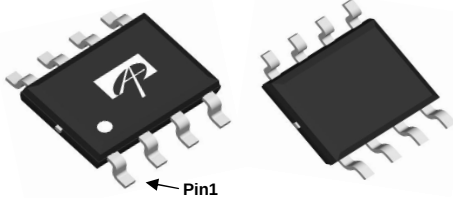
100% Rg Tested



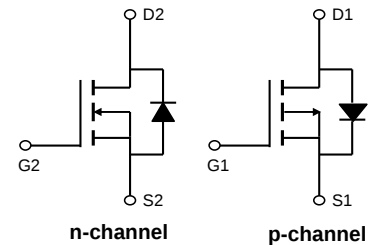
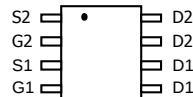
SOIC-8

Top View

Bottom View



Top View



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Max n-channel	Max p-channel	Units
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	± 20	± 20	V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	6	-5	A
	$T_A=70^\circ\text{C}$	5	-4	
	$T_A=85^\circ\text{C}$	4.5	-3.8	
Pulsed Drain Current ^B	I_{DM}	20	-20	
Avalanche Current	I_{AS}	12	14	
Single Pulse Avalanche Energy $L=0.3\text{mH}$	E_{AS}	22	29	mJ
Power Dissipation	$T_A=25^\circ\text{C}$	2	2	W
	$T_A=70^\circ\text{C}$	1.28	1.28	
	$T_A=85^\circ\text{C}$	1.05	1.05	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Characteristics: n-channel and p-channel

Parameter		Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	$t \leq 10\text{s}$	$R_{\theta JA}$	n-ch	48	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		n-ch	74	110	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	n-ch	35	50	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	$t \leq 10\text{s}$	$R_{\theta JA}$	p-ch	48	62.5	$^\circ\text{C/W}$
Maximum Junction-to-Ambient ^A	Steady-State		p-ch	74	110	$^\circ\text{C/W}$
Maximum Junction-to-Lead ^C	Steady-State	$R_{\theta JL}$	p-ch	35	50	$^\circ\text{C/W}$

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 =10mA, V _{GS} =0V	40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =32V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} = ±20V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} I _D =250μA	1.5	2.3	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 =6A T _J =125°C		23.2	31	mΩ
				36	48	
		V _{GS} =4.5V, I _D =5A		32.6	45	mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =6A		22		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.77	1	V
I _S	Maximum Body-Diode Continuous Current				2.5	A
I _{SM}	Pulsed Body-Diode Current ^B				20	A
DYNAMIC PARAMETERS						
C _{ISS}	Input Capacitance	V _{GS} =0V, V _{DS} =20V, f=1MHz		404	500	pF
C _{OSS}	Output Capacitance			95	120	pF
C _{rss}	Reverse Transfer Capacitance			37	50	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.7	4	Ω
SWITCHING PARAMETERS						
Q _g (10V)	Total Gate Charge	V _{GS} =10V, V _{DS} =20V, I _D =6A		8.3	10	nC
Q _g (4.5V)	Total Gate Charge			4.2	5.1	nC
Q _{gs}	Gate Source Charge			1.3	2	nC
Q _{gd}	Gate Drain Charge			2.3	3	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =10V, V _{DS} =20V, R _L =3.3Ω, R _{GEN} =3Ω		4.2	5.5	ns
t _r	Turn-On Rise Time			3.3	4.5	ns
t _{D(off)}	Turn-Off DelayTime			15.6	21	ns
t _f	Turn-Off Fall Time			3	4	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =6A, dI/dt=100A/μs		20.5	27	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =6A, dI/dt=100A/μs		14.5	19	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.

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 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.

Rev9 : June 2008

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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 =-10mA, V _{GS} =0V	-40			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-32V, V _{GS} =0V T _J =55°C			-1 -5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±20V			±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1.5	-1.9	-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 =-5A T _J =125°C		34.7 52	45 65	mΩ
		V _{GS} =-4.5V, I _D =-2A		50.6	63	mΩ
g _{FS}	Forward Transconductance	V _{DS} =-5V, I _D =-4.8A		12		S
V _{SD}	Diode Forward Voltage	I _S =-1A, V _{GS} =0V		-0.75	-1	V
I _S	Maximum Body-Diode Continuous Current				-2.5	A
I _{SM}	Pulsed Body-Diode Current ^B				-20	A
DYNAMIC PARAMETERS						
C _{ISS}	Input Capacitance	V _{GS} =0V, V _{DS} =-20V, f=1MHz		657	870	pF
C _{OSS}	Output Capacitance			143	200	pF
C _{rss}	Reverse Transfer Capacitance			63	110	pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		6.5	10	Ω
SWITCHING PARAMETERS						
Q _{g(10V)}	Total Gate Charge (10V)	V _{GS} =-10V, V _{DS} =-20V, I _D =-5A		13.6	17	nC
Q _{g(4.5V)}	Total Gate Charge (4.5V)			6.8	8.5	nC
Q _{gs}	Gate Source Charge			1.8	2.5	nC
Q _{gd}	Gate Drain Charge			3.9	5	nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =-10V, V _{DS} =-20V, R _L =4Ω, R _{GEN} =3Ω		7.5	10	ns
t _r	Turn-On Rise Time			6.7	9	ns
t _{D(off)}	Turn-Off DelayTime			26	34	ns
t _f	Turn-Off Fall Time			11.2	15	ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =-5A, dI/dt=100A/μs		22.3	29	ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =-5A, dI/dt=100A/μs		15.2	20	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.

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 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.

Rev8 : Oct 2007

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

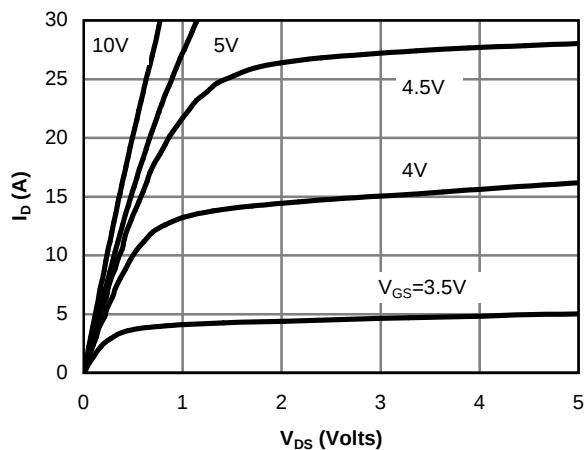


Fig 1: On-Region Characteristics

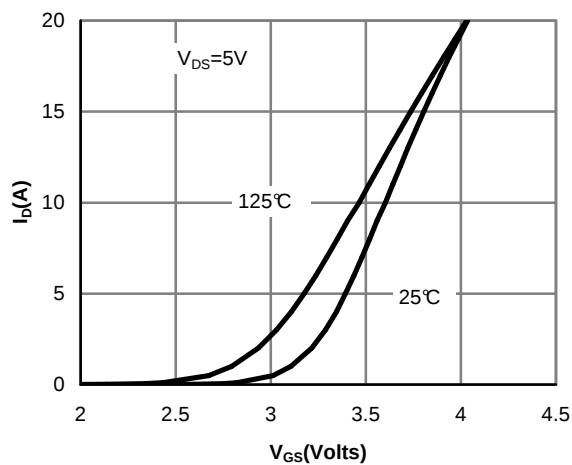


Figure 2: Transfer Characteristics

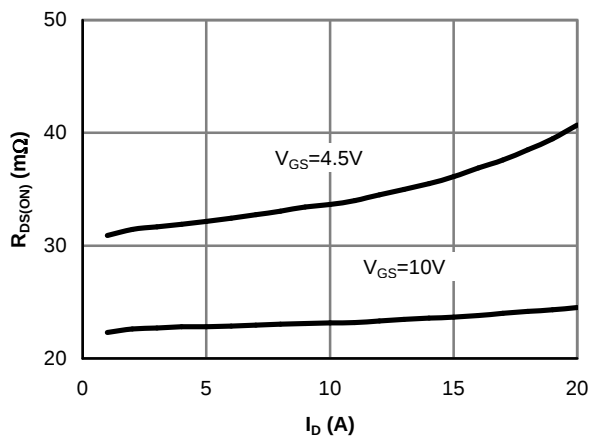


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

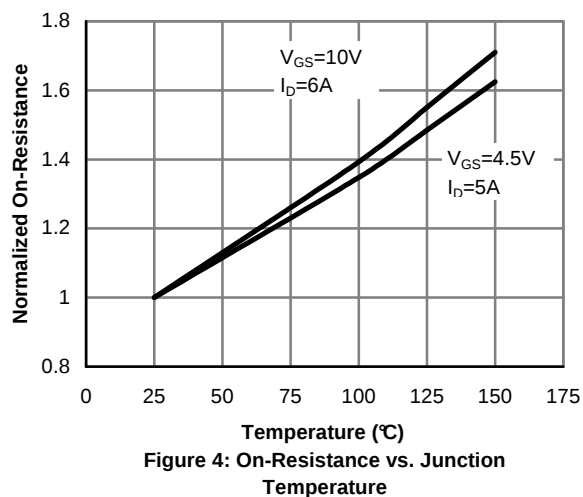


Figure 4: On-Resistance vs. Junction Temperature

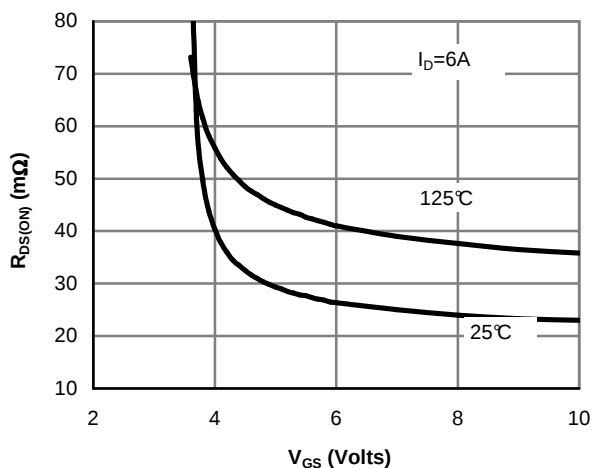


Figure 5: On-Resistance vs. Gate-Source Voltage

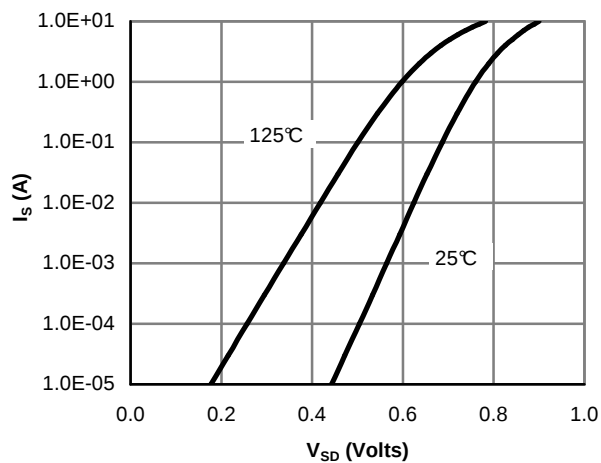


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

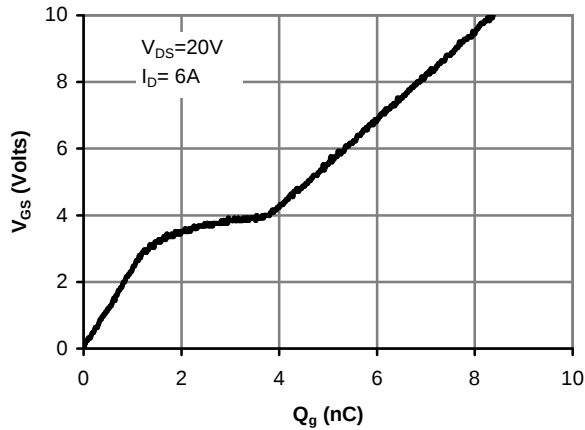


Figure 7: Gate-Charge Characteristics

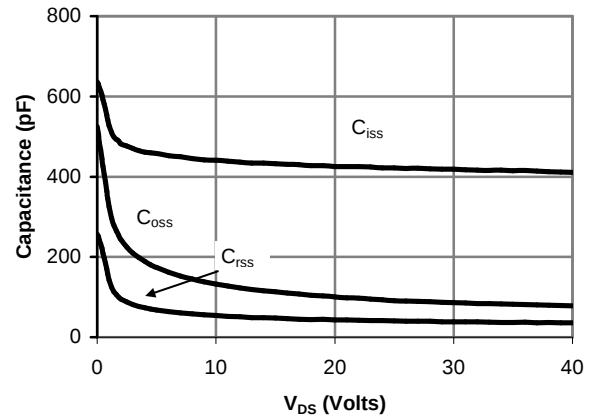


Figure 8: Capacitance Characteristics

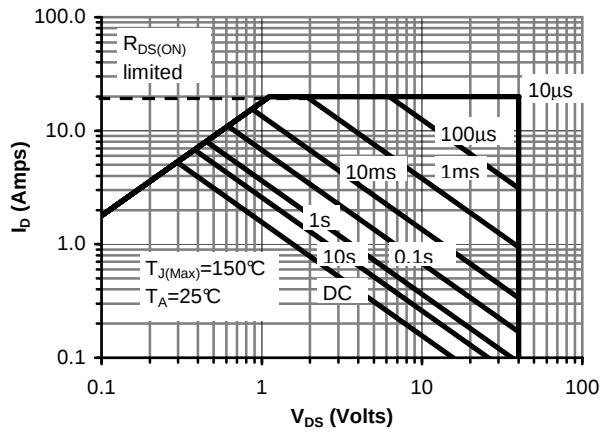


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

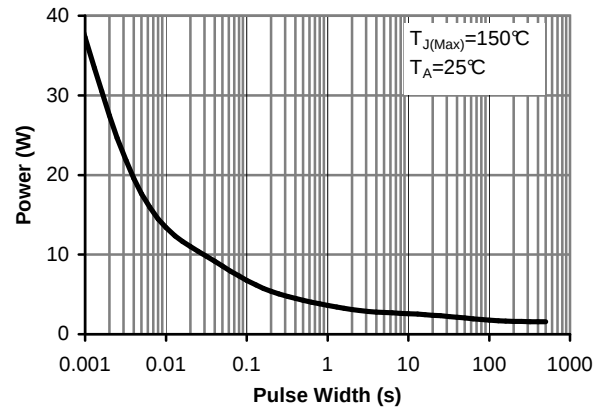


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

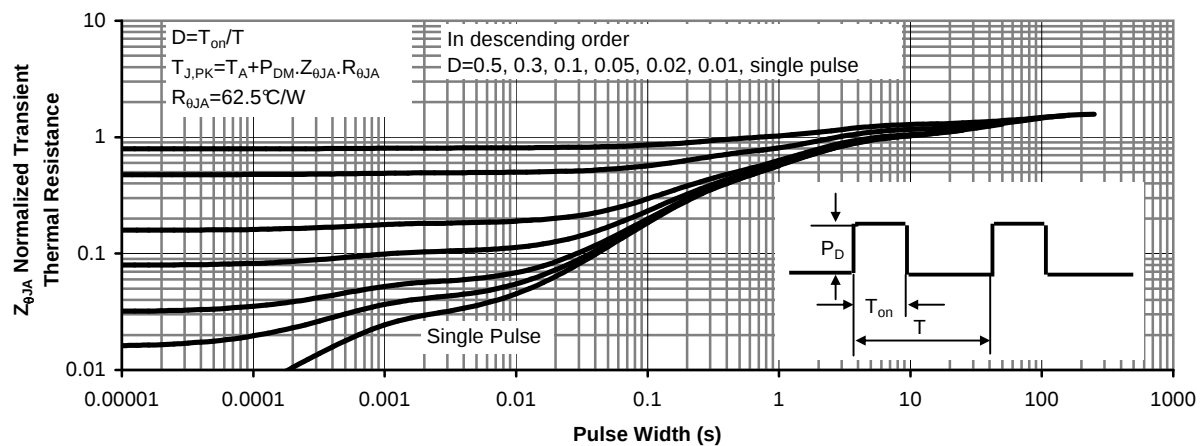


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

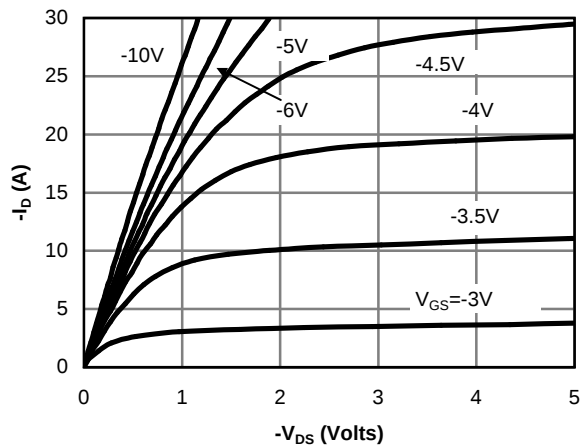


Fig 1: On-Region Characteristics

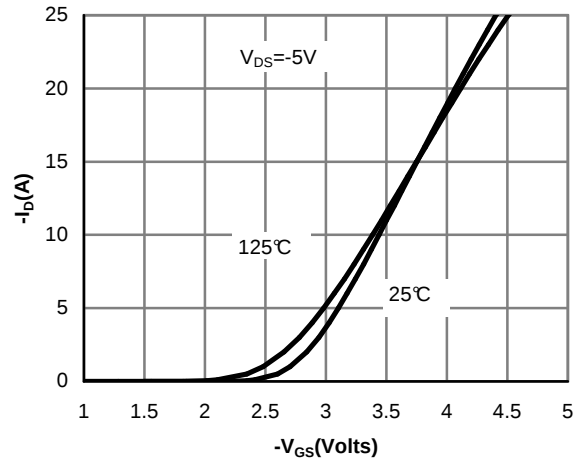


Figure 2: Transfer Characteristics

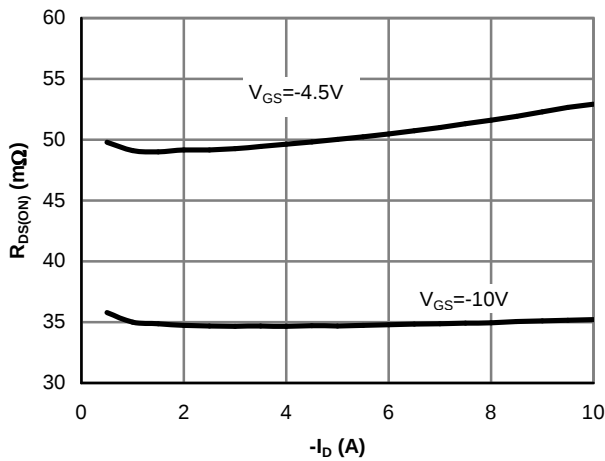


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

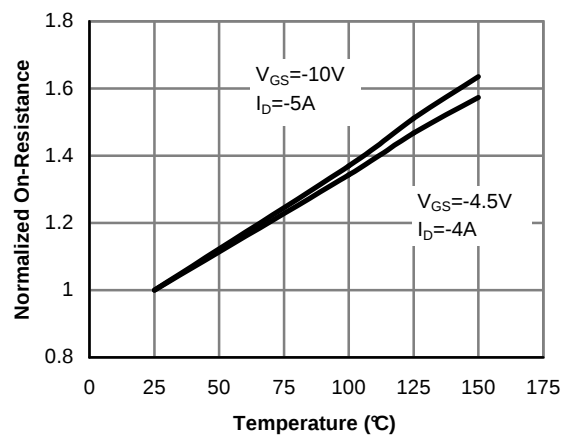


Figure 4: On-Resistance vs. Junction Temperature

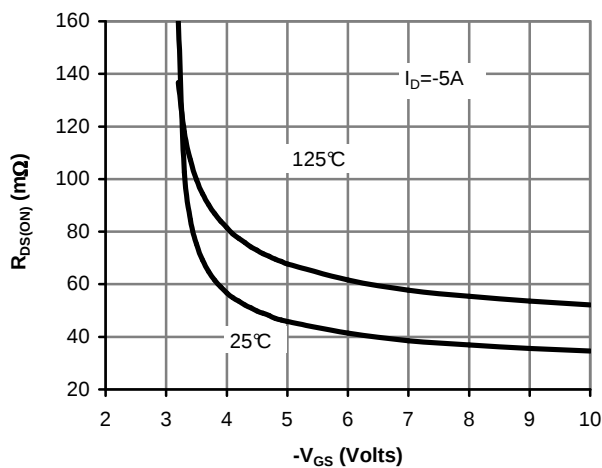


Figure 5: On-Resistance vs. Gate-Source Voltage

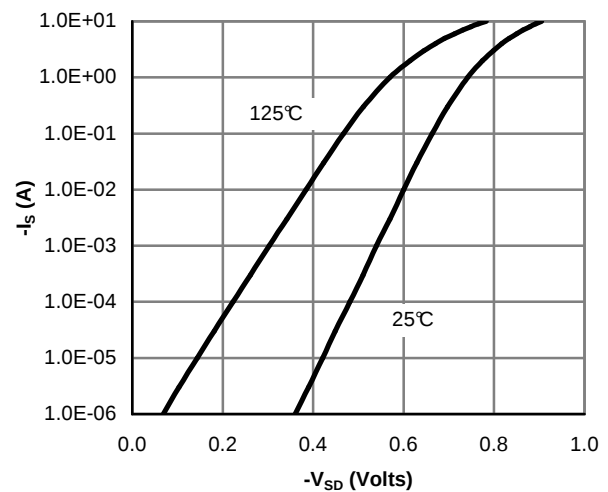


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

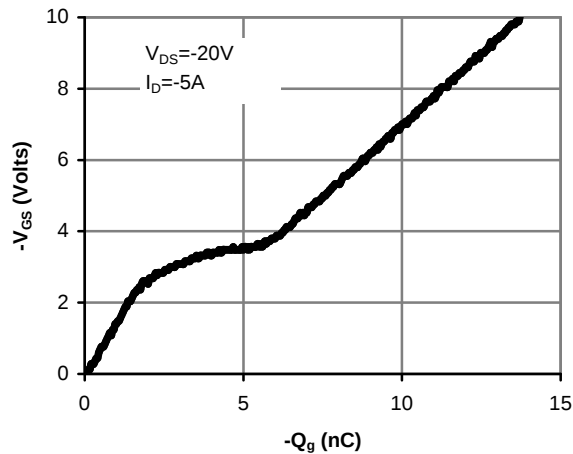


Figure 7: Gate-Charge Characteristics

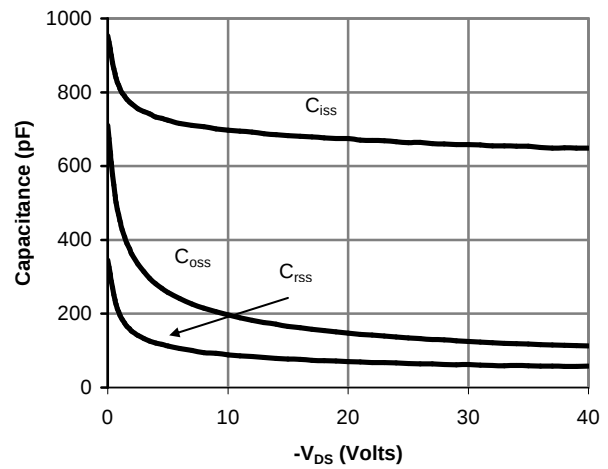


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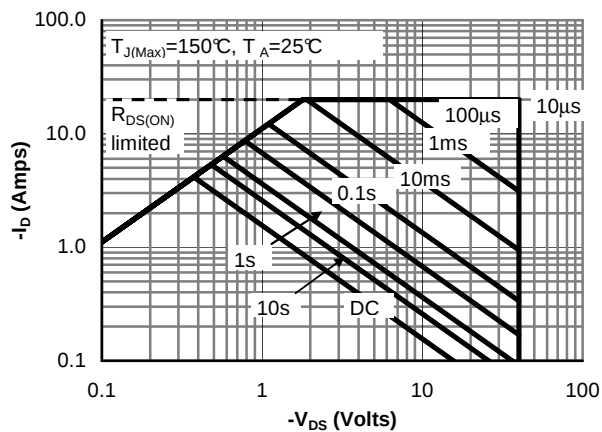


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

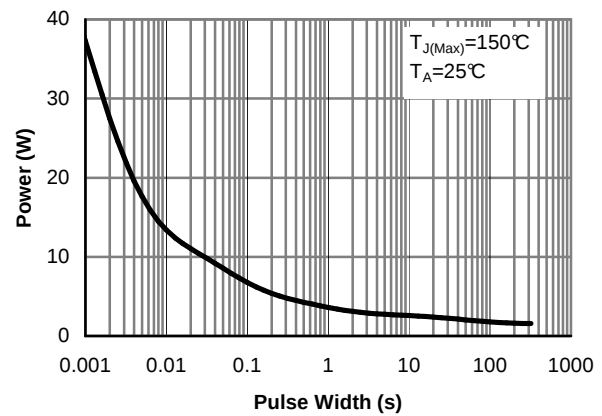


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

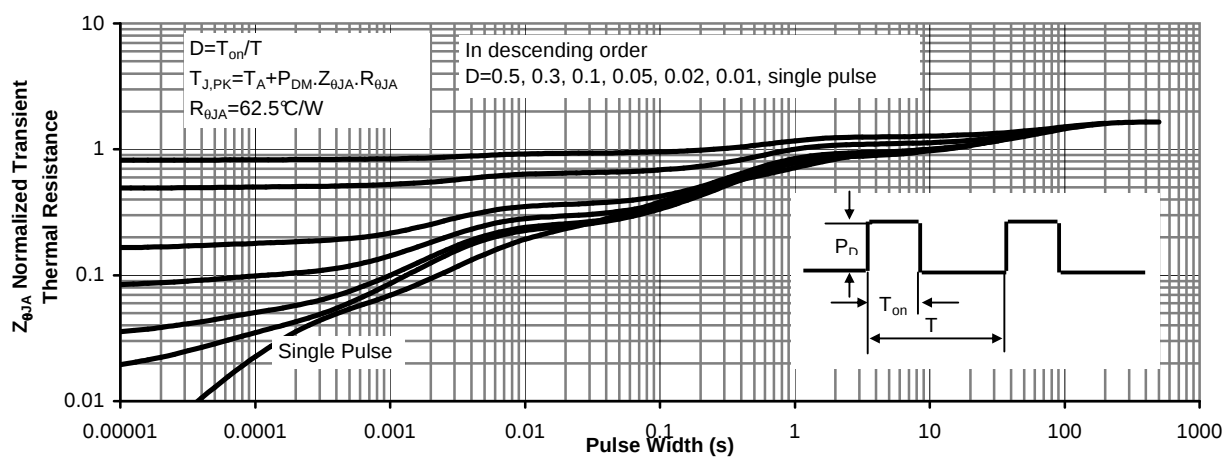


Figure 11: Normalized Maximum Transient Thermal Impedance