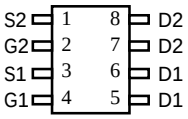
ALPHA & OMEGA SEMICONDUCTOR, LTD

AO4614B
Complementary Enhancement Mode Field Effect Transistor

General Description
The AO4614B/L 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.
AO4614B and AO4614BL are electrically identical.

-RoHS Compliant
-AO4614BL is Halogen Free

Features
n-channel
V_{DS} (V) = 40V, I_D = 6A (V_{GS}=10V)
$R_{DS(ON)}$< 30mΩ (V_{GS}=10V)
$R_{DS(ON)}$< 38mΩ (V_{GS}=4.5V)
p-channel
V_{DS} (V) = -40V, I_D = -5A (V_{GS}=-10V)
$R_{DS(ON)}$< 45mΩ (VGS= -10V)
$R_{DS(ON)}$< 63mΩ (VGS= -4.5V)



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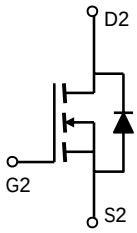
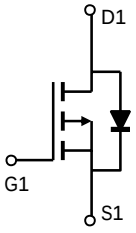


n-channel



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}	40	-40	V
Gate-Source Voltage		V_{GS}	±20	±20	V
Continuous Drain Current [A]	T_A=25°C	I_D	6	-5	A
	T_A=70°C		5	-4	
Pulsed Drain Current [B]		I_{DM}	30	-30	
Avalanche Current [B]		I_{AR}	14	-20	
Repetitive avalanche energy L=0.1mH [B]		E_{AR}	9.8	20	mJ
Power Dissipation	T_A=25°C	P_D	2	2	W
	T_A=70°C		1.28	1.28	
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	50	°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	50	°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	40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=40V, V_{GS}=0V			1	µA
		T_J=55°C			5	
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	1.7	2.5	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=6A		24	30	mΩ
		T_J=125°C		36	45	
		V_{GS}=4.5V, I_D=5A		30	38	
g_{FS}	Forward Transconductance	V_{DS}=5V, I_D=6A		19		S
V_{SD}	Diode Forward Voltage	I_S=1A,V_{GS}=0V		0.76	1	V
I_S	Maximum Body-Diode Continuous Current				2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, f=1MHz		516	650	pF
C_{oss}	Output Capacitance			82		pF
C_{rss}	Reverse Transfer Capacitance			43		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		4.6		Ω
SWITCHING PARAMETERS						
Q_g (10V)	Total Gate Charge	V_{GS}=10V, V_{DS}=20V, I_D=6A		8.9	10.8	nC
Q_g (4.5V)	Total Gate Charge			4.3	5.6	nC
Q_{gs}	Gate Source Charge			2.4		nC
Q_{gd}	Gate Drain Charge			1.4		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}=10V, V_{DS}=20V, R_L=3.3Ω, R_{GEN}=3Ω		6.4		ns
t_r	Turn-On Rise Time			3.6		ns
$t_{D(off)}$	Turn-Off DelayTime			16.2		ns
t_f	Turn-Off Fall Time			6.6		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F=6A, dI/dt=100A/µs		18	24	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F=6A, dI/dt=100A/µs		10		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 <300µs 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

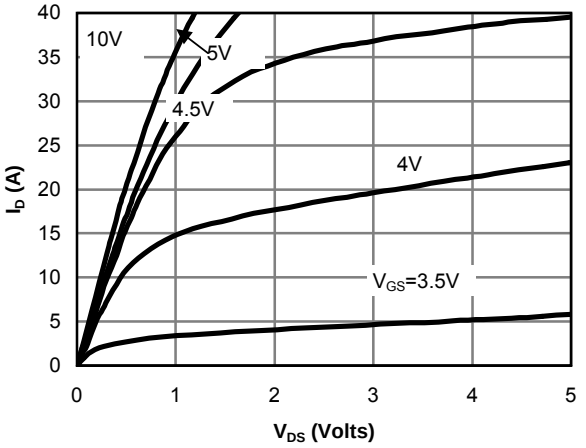

Fig 1: On-Region Characteristics

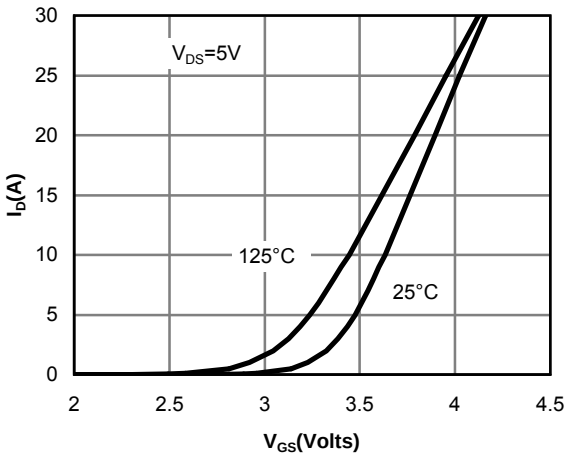

Figure 2: Transfer Characteristics

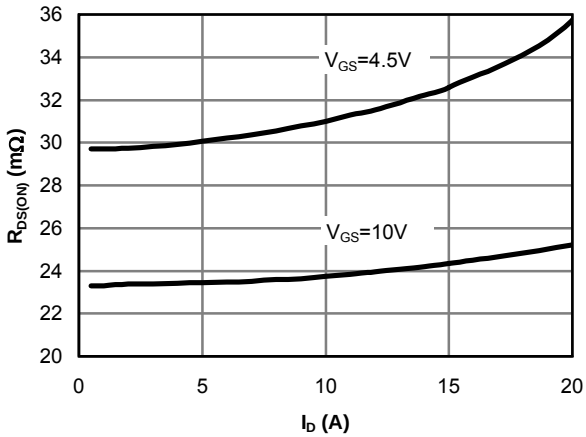

Figure 3: On-Resistance vs. Drain Current and Gate Voltage

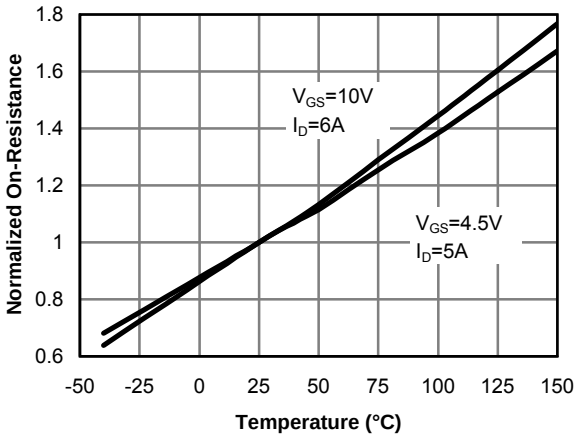

Figure 4: On-Resistance vs. Junction Temperature

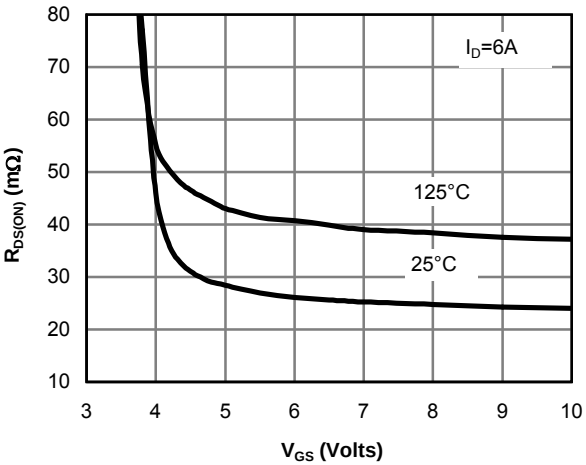

Figure 5: On-Resistance vs. Gate-Source Voltage

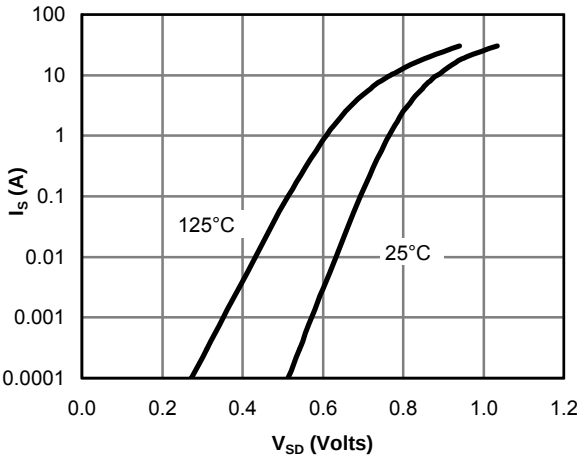

Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

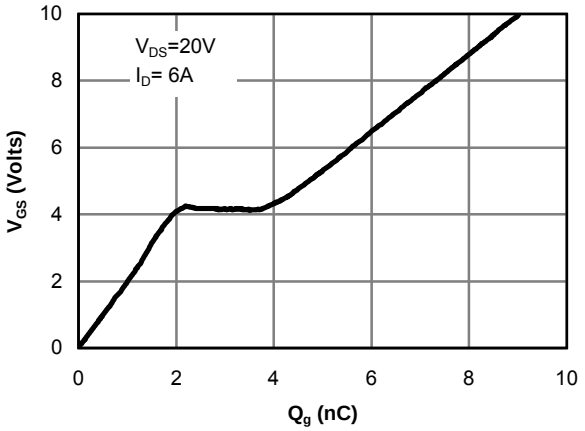

Figure 7: Gate-Charge Characteristics

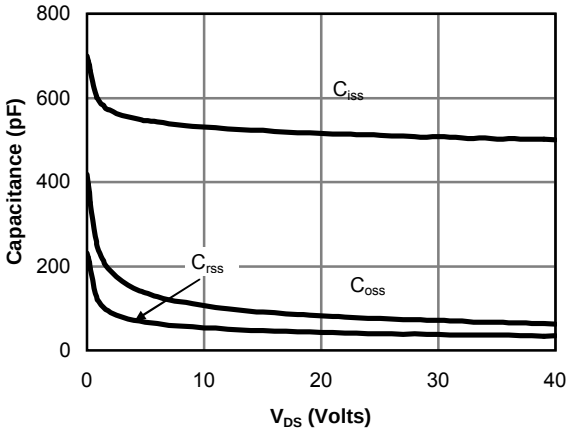

Figure 8: Capacitance Characteristics

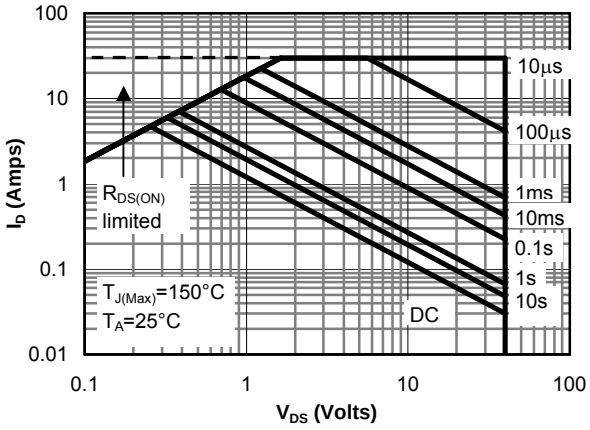

Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

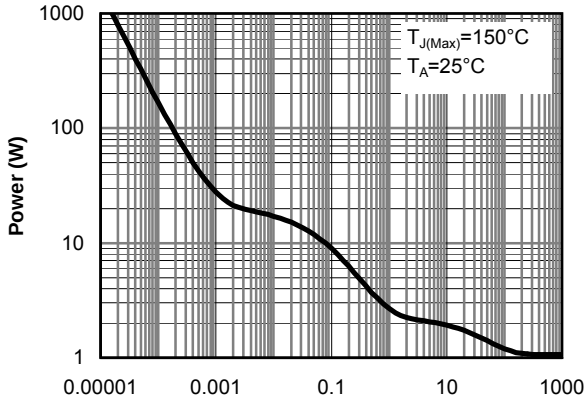

Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

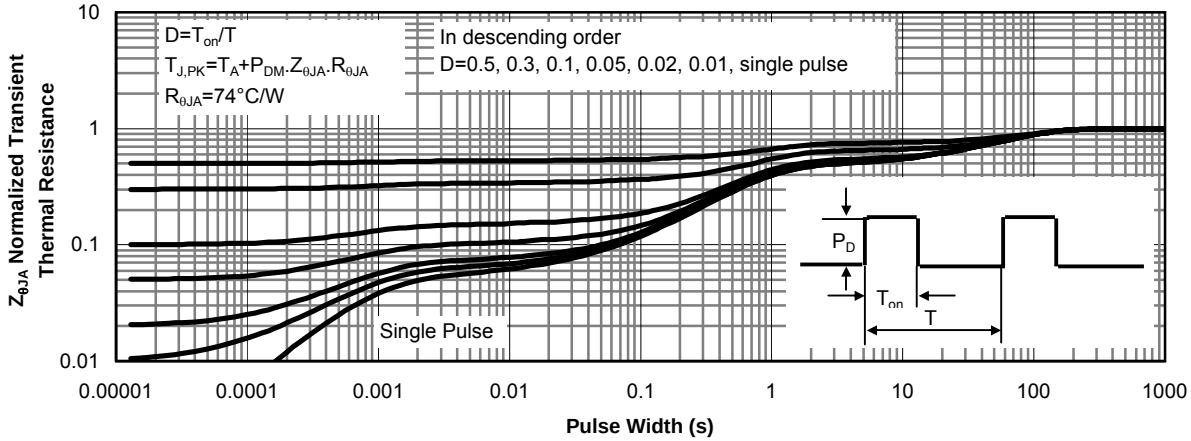

Figure 11: Normalized Maximum Transient Thermal Impedance

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	-40			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}= -40V, V_{GS}=0V			-1	µA
		T_J=55°C			-5	
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	-1.7	-2	-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= -5A		36	45	mΩ
		T_J=125°C		52	65	
		V_{GS}= -4.5V, I_D= -4A		50	63	
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	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}= -20V, f=1MHz		940	1175	pF
C_{oss}	Output Capacitance			97		pF
C_{rss}	Reverse Transfer Capacitance			72		pF
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, f=1MHz		14		Ω
SWITCHING PARAMETERS						
Q_g (-10V)	Total Gate Charge	V_{GS}= -10V, V_{DS}= -20V, I_D= -5A		17	22	nC
Q_g (-4.5V)	Total Gate Charge			7.9	10	nC
Q_{gs}	Gate Source Charge			3.4		nC
Q_{gd}	Gate Drain Charge			3.2		nC
$t_{D(on)}$	Turn-On DelayTime	V_{GS}= -10V, V_{DS}= -20V, R_L=4Ω, R_{GEN}=3Ω		6.2		ns
t_r	Turn-On Rise Time			8.4		ns
$t_{D(off)}$	Turn-Off DelayTime			44.8		ns
t_f	Turn-Off Fall Time			41.2		ns
t_{rr}	Body Diode Reverse Recovery Time	I_F= -5A, dI/dt=100A/µs		21	27	ns
Q_{rr}	Body Diode Reverse Recovery Charge	I_F= -5A, dI/dt=100A/µs		14		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 <300µs 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.

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

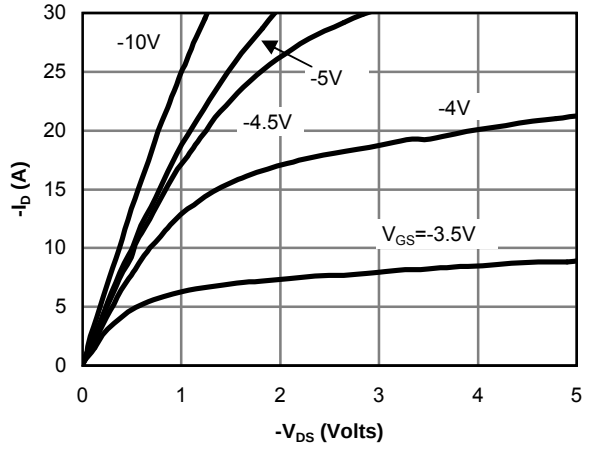

Fig 12: On-Region Characteristics

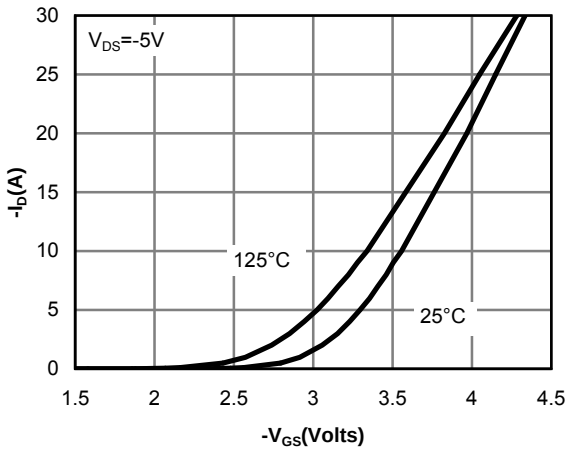

Figure 13: Transfer Characteristics

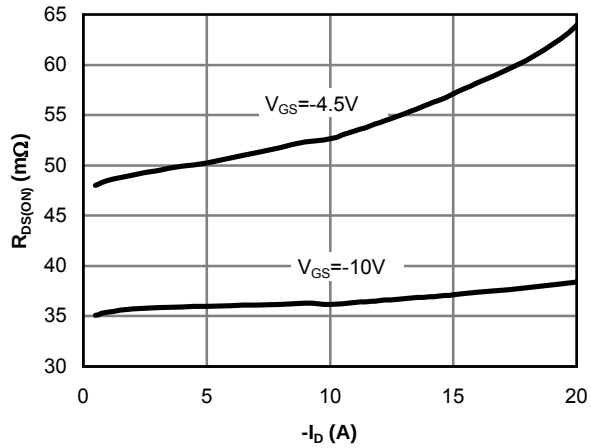

Figure 14: On-Resistance vs. Drain Current and Gate Voltage

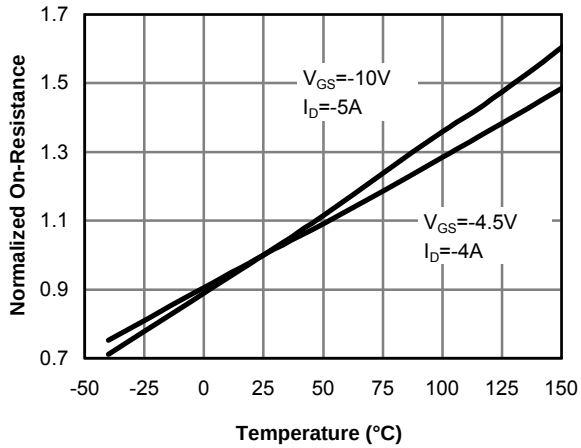

Figure 15: On-Resistance vs. Junction Temperature

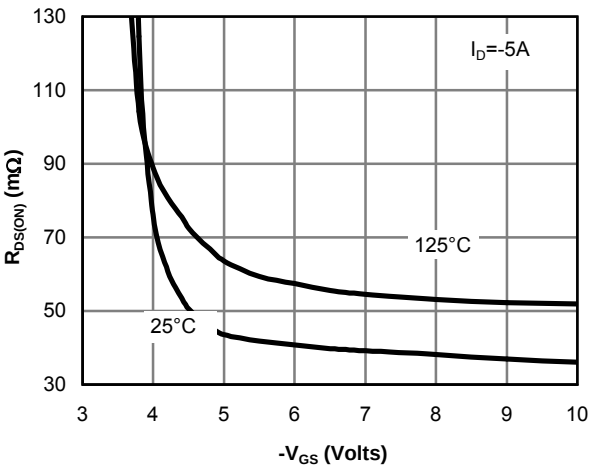

Figure 16: On-Resistance vs. Gate-Source Voltage

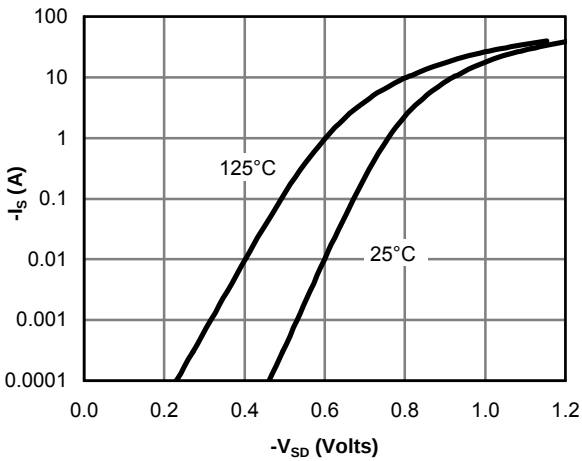

Figure 17: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

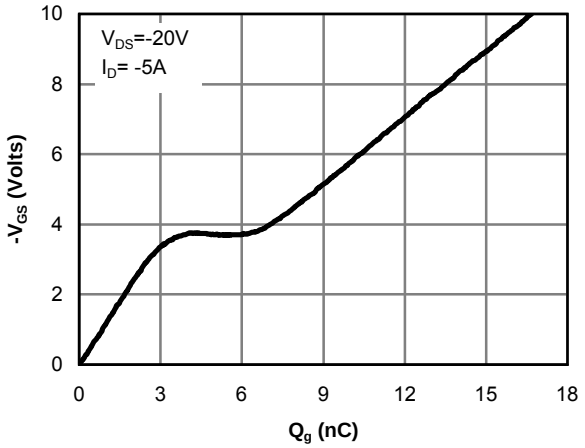

Figure 18: Gate-Charge Characteristics

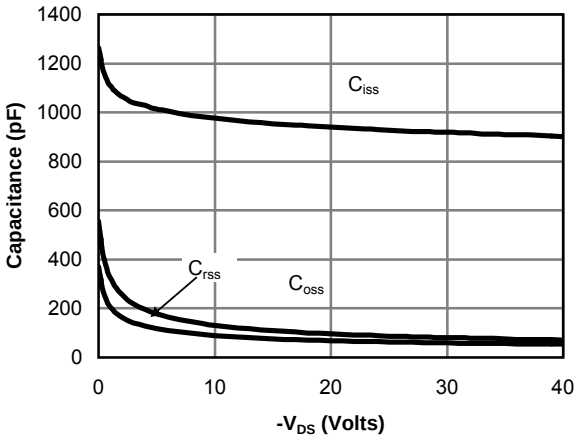

Figure 19: Capacitance Characteristics

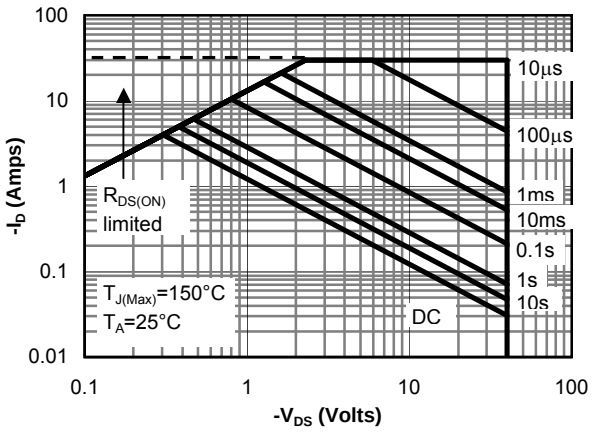

Figure 20: Maximum Forward Biased Safe Operating Area (Note E)

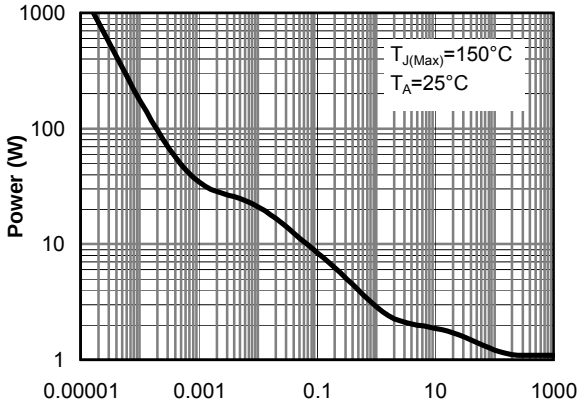

Figure 21: Single Pulse Power Rating Junction-to Ambient (Note E)

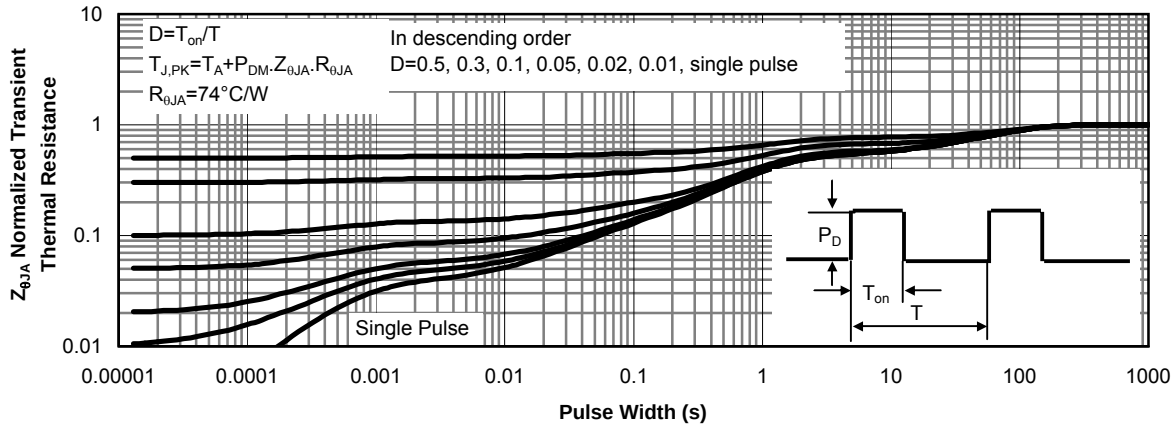

Figure 22: Normalized Maximum Transient Thermal Impedance