



AO4607

Complementary Enhancement Mode Field Effect Transistor

General Description

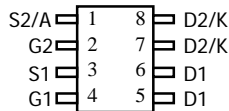
The AO4607 uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used in inverter and other applications. A Schottky diode is co-packaged with the n-channel FET to minimize body diode losses. AO4607 is Pb-free (meets ROHS & Sony 259 specifications). AO4607L is a Green Product ordering option. AO4607 and AO4607L are electrically identical.

Features

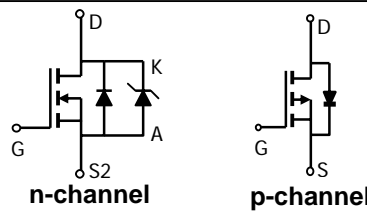
n-channel	p-channel
$V_{DS} (V) = 30V$	-30V
$I_D = 6.9A (V_{GS}=10V)$	-6A ($V_{GS}=1-0V$)
$R_{DS(ON)}$	$R_{DS(ON)}$
$< 28m\Omega (V_{GS}=10V)$	$< 35m\Omega (V_{GS} = -10V)$
$< 42m\Omega (V_{GS}=4.5V)$	$< 58m\Omega (V_{GS} = -4.5V)$

SCHOTTKY

$V_{DS} (V) = 30V, I_F = 3A, V_F < 0.5V @ 1A$



SOIC-8



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	$T_A=25^\circ C$	6.9	-6
		$T_A=70^\circ C$	5.8	-5
Pulsed Drain Current ^B	I_{DM}	30	-30	A
Power Dissipation	P_D	$T_A=25^\circ C$	2	2
		$T_A=70^\circ C$	1.28	1.28
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ C$

Parameter	Symbol	Maximum Schottky	Units
Reverse Voltage	V_{DS}	30	V
Continuous Forward Current ^A	I_D	$T_A=25^\circ C$	3
		$T_A=70^\circ C$	2
Pulsed Diode Forward Current ^B	I_{DM}	20	A
Power Dissipation ^A	P_D	$T_A=25^\circ C$	2
		$T_A=70^\circ C$	1.28
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	$^\circ C$

Thermal Characteristics: n-channel, Schottky and p-channel						
Parameter		Symbol	Device	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	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 _{θJL}	n-ch	35	60	°C/W
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	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 _{θJL}	p-ch	35	40	°C/W
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	Schottky	47.5	62.5	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		Schottky	71	110	°C/W
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	Schottky	32	40	°C/W

N-Channel + Schottky Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	30			V
I_{DSS}	Zero Gate Voltage Drain Current. (Set by Schottky leakage)	$V_R=30\text{V}$		0.007	0.05	mA
		$V_R=30\text{V}$, $T_J=125^\circ\text{C}$		3.2	10	
		$V_R=30\text{V}$, $T_J=150^\circ\text{C}$		12	20	
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1	1.9	3	V
$I_{D(ON)}$	On state drain current	$V_{GS}=4.5\text{V}$, $V_{DS}=5\text{V}$	20			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10\text{V}$, $I_D=6.9\text{A}$		22.5	28	m Ω
		$T_J=125^\circ\text{C}$		31.3	38	
		$V_{GS}=4.5\text{V}$, $I_D=5.0\text{A}$		34.5	42	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=5\text{V}$, $I_D=6.9\text{A}$	10	15.4		S
V_{SD}	Body-Diode+Schottky Forward Voltage	$I_S=1\text{A}$		0.45	0.5	V
I_S	Maximum Body-Diode+Schottky Continuous Current				5.5	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=15\text{V}$, $f=1\text{MHz}$		680	820	pF
C_{oss}	Output Capacitance (FET+Schottky)			131		
C_{rss}	Reverse Transfer Capacitance			77		
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3	3.6	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $I_D=6.9\text{A}$		13.84	16.6	nC
$Q_g(4.5\text{V})$	Total Gate Charge			6.74		
Q_{gs}	Gate Source Charge			1.82		
Q_{gd}	Gate Drain Charge			3.2		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS}=10\text{V}$, $V_{DS}=15\text{V}$, $R_L=2.2\Omega$, $R_{GEN}=3\Omega$		4.6		ns
t_r	Turn-On Rise Time			4.1		
$t_{D(off)}$	Turn-Off Delay Time			20.6		
t_f	Turn-Off Fall Time			5.2		
t_{rr}	Body-Diode+Schottky Reverse Recovery Time	$I_F=6.9\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		13.7	16.5	ns
Q_{rr}	Body-Diode+Schottky Reverse Recovery Charge	$I_F=6.9\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		4.1		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

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

C: The $R_{\theta JA}$ is the sum of the thermal impedance from junction to lead $R_{\theta JL}$ and lead to ambient.

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 $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

F: The Schottky appears in parallel with the MOSFET body diode, even though it is a separate chip. Therefore, we provide the net forward drop, capacitance and recovery characteristics of the MOSFET and Schottky. However, the thermal resistance is specified for each chip separately

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CANNEL

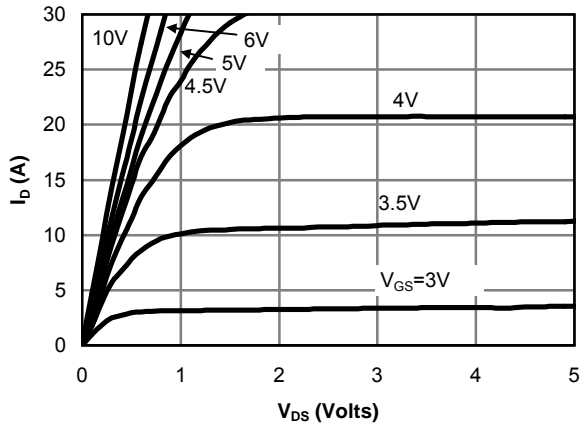


Fig 1: On-Region Characteristics

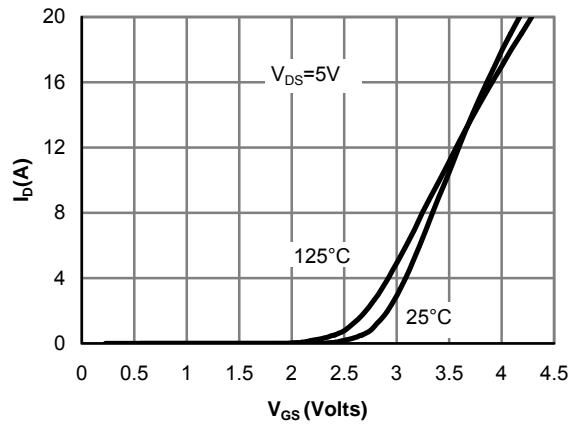


Figure 2: Transfer Characteristics

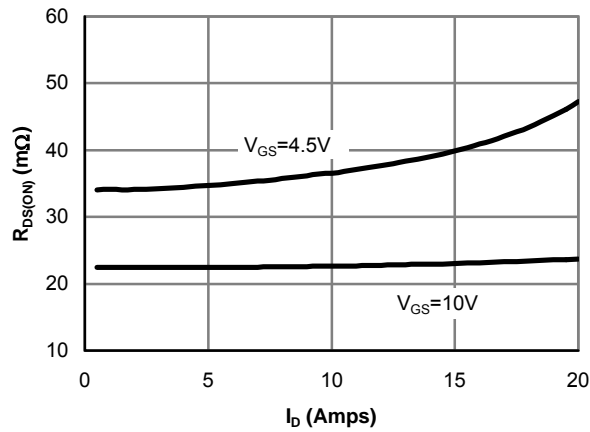


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

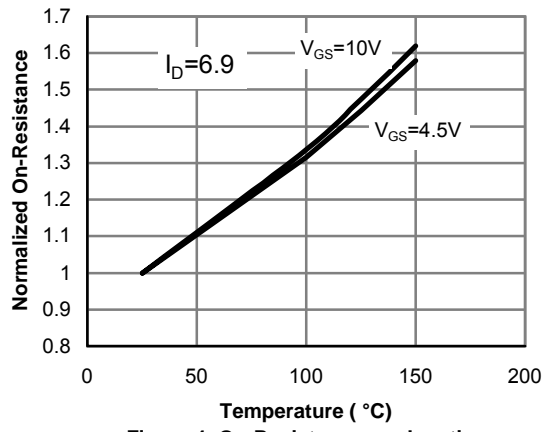


Figure 4: On-Resistance vs. Junction Temperature

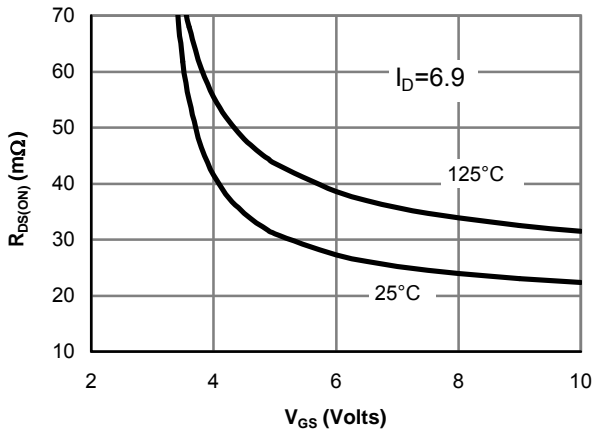


Figure 5: On-Resistance vs. Gate-Source Voltage

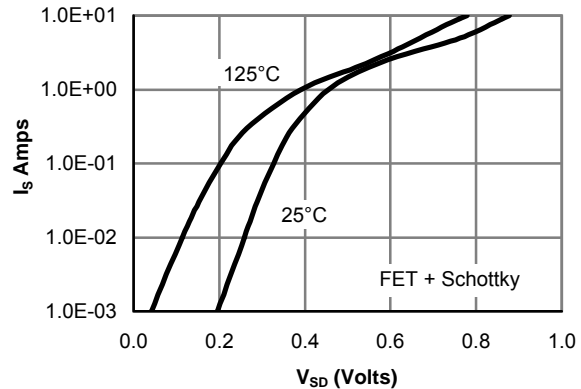


Figure 6: Body diode with parallel Schottky characteristics (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CANNEL

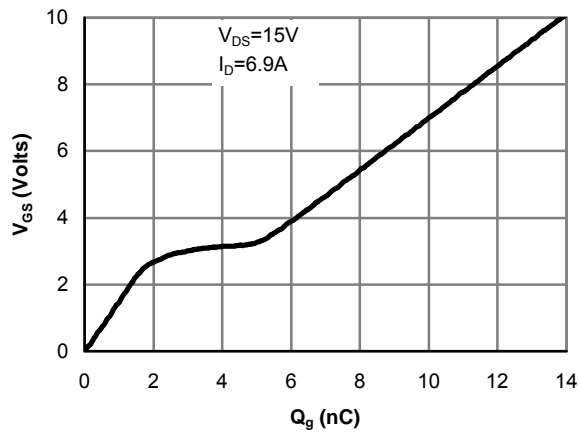


Figure 7: Gate-Charge characteristics

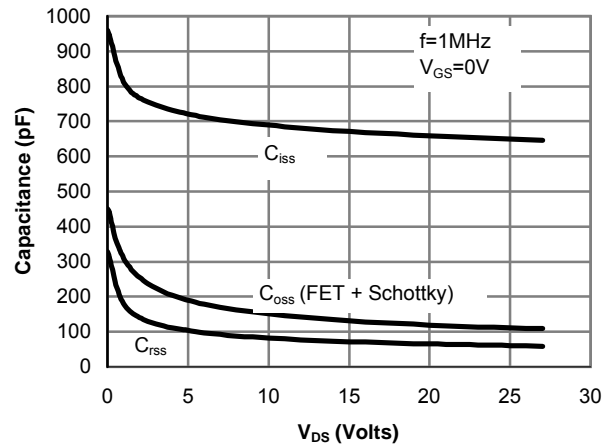


Figure 8: Capacitance Characteristics: MOSFET + Parallel Schottky

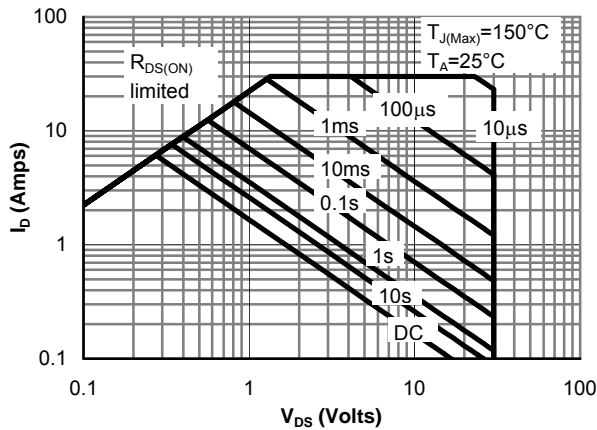


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

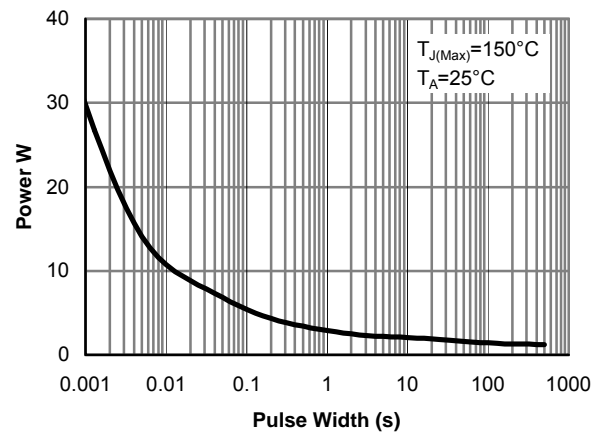


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

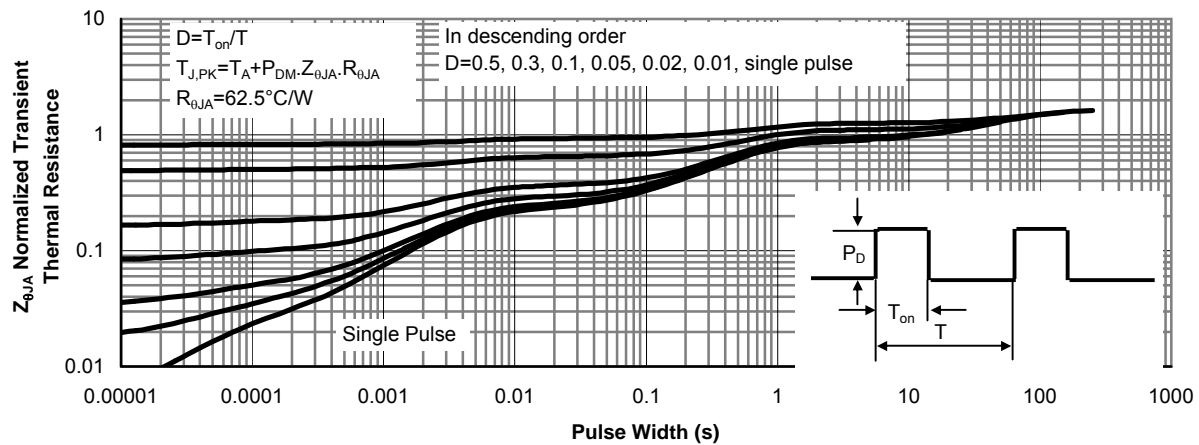


Figure 11: Normalized Maximum Transient Thermal Impedance

P-Channel Electrical Characteristics ($T_J=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D=-250\mu\text{A}$, $V_{GS}=0\text{V}$	-30			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-24\text{V}$, $V_{GS}=0\text{V}$ $T_J=55^\circ\text{C}$			-1 -5	μA
I_{GSS}	Gate-Body leakage current	$V_{DS}=0\text{V}$, $V_{GS}=\pm 20\text{V}$			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}$, $I_D=-250\mu\text{A}$	-1.2	-2	-2.4	V
$I_{D(ON)}$	On state drain current	$V_{GS}=-10\text{V}$, $V_{DS}=-5\text{V}$	30			A
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10\text{V}$, $I_D=-6\text{A}$ $T_J=125^\circ\text{C}$		28 37	35 45	m Ω
		$V_{GS}=-4.5\text{V}$, $I_D=-5\text{A}$		44	58	m Ω
g_{FS}	Forward Transconductance	$V_{DS}=-5\text{V}$, $I_D=-6\text{A}$		13		S
V_{SD}	Diode Forward Voltage	$I_S=-1\text{A}$, $V_{GS}=0\text{V}$		-0.76	-1	V
I_S	Maximum Body-Diode Continuous Current				-4.2	A
DYNAMIC PARAMETERS						
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$, $V_{DS}=-15\text{V}$, $f=1\text{MHz}$		920	1100	pF
C_{oss}	Output Capacitance			190		pF
C_{rss}	Reverse Transfer Capacitance			122		pF
R_g	Gate resistance	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$, $f=1\text{MHz}$		3.6	4.4	Ω
SWITCHING PARAMETERS						
$Q_g(10\text{V})$	Total Gate Charge (10V)	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $I_D=-6\text{A}$		18.5	22.2	nC
$Q_g(4.5\text{V})$	Total Gate Charge (4.5V)			9.6		nC
Q_{gs}	Gate Source Charge			2.7		nC
Q_{gd}	Gate Drain Charge			4.5		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=-10\text{V}$, $V_{DS}=-15\text{V}$, $R_L=2.7\Omega$, $R_{GEN}=3\Omega$		7.7		ns
t_r	Turn-On Rise Time			5.7		ns
$t_{D(off)}$	Turn-Off DelayTime			20.2		ns
t_f	Turn-Off Fall Time			9.5		ns
t_{rr}	Body Diode Reverse Recovery Time	$I_F=-6\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		20	24	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$I_F=-6\text{A}$, $dI/dt=100\text{A}/\mu\text{s}$		8.8		nC

A: The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ\text{C}$. The value in any given application depends on the user's specific board design. The current rating is based on the $t \leq 10\text{s}$ thermal resistance rating.

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

C: The $R_{\theta JA}$ is the sum of the thermal impedance 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 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 $T_A=25^\circ\text{C}$. The SOA curve provides a single pulse rating.

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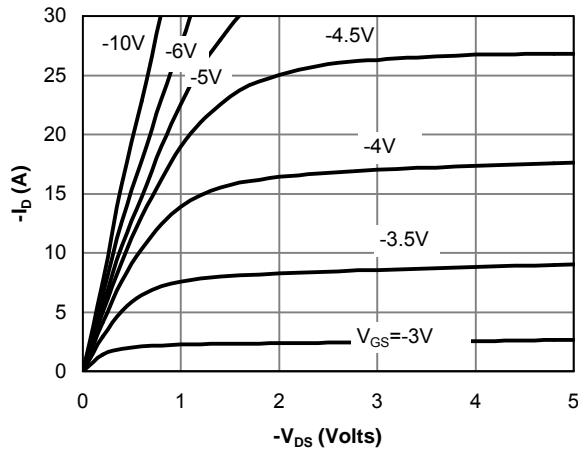


Fig 1: On-Region Characteristics

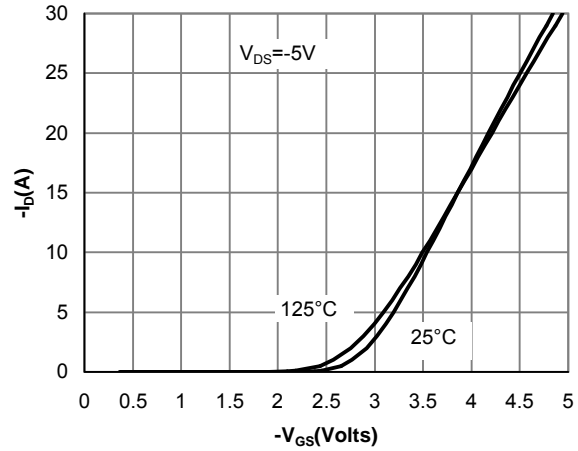


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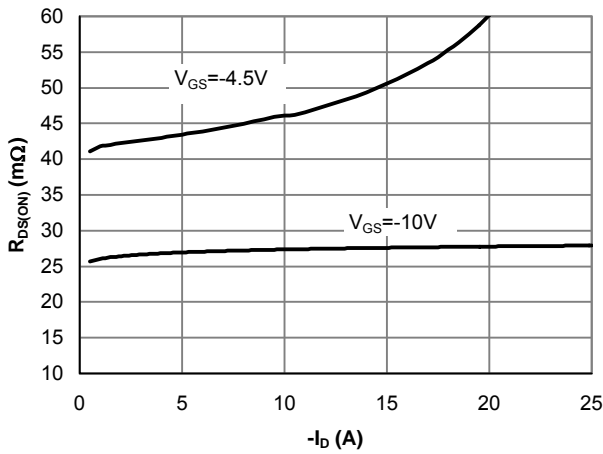


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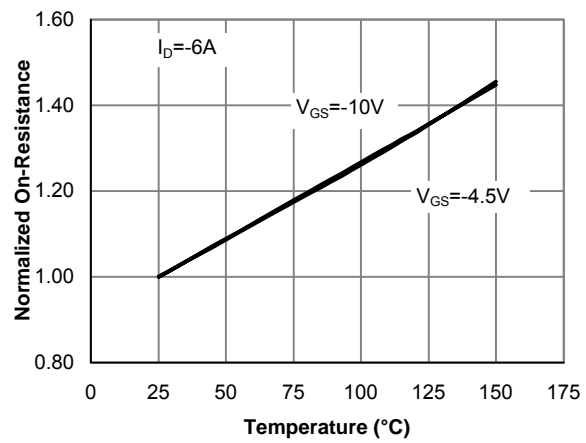


Figure 4: On-Resistance vs. Junction Temperature

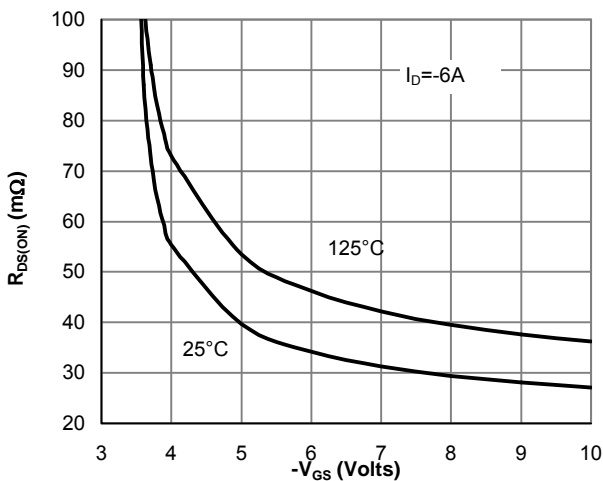


Figure 5: On-Resistance vs. Gate-Source Voltage

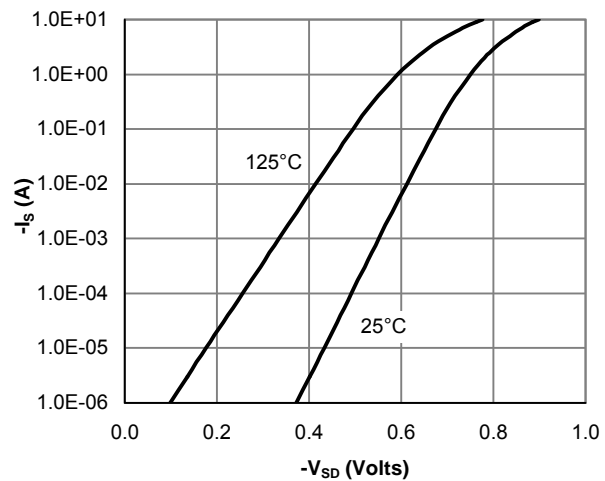


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

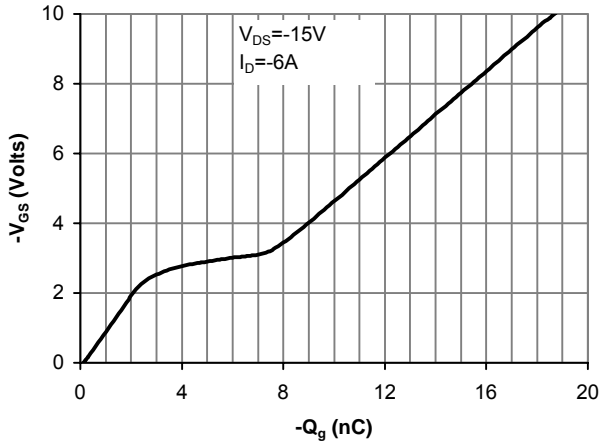


Figure 7: Gate-Charge Characteristics

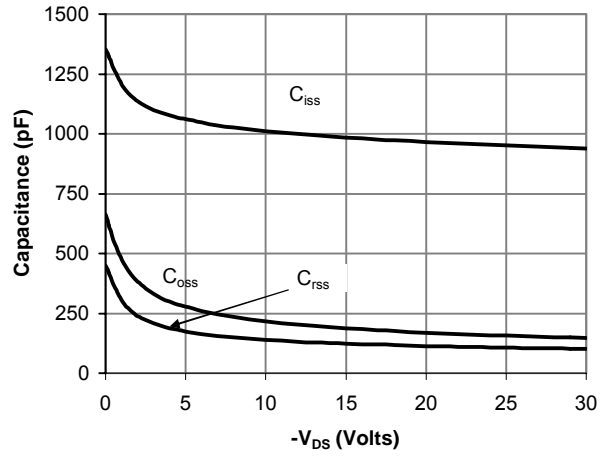


Figure 8: Capacitance Characteristics

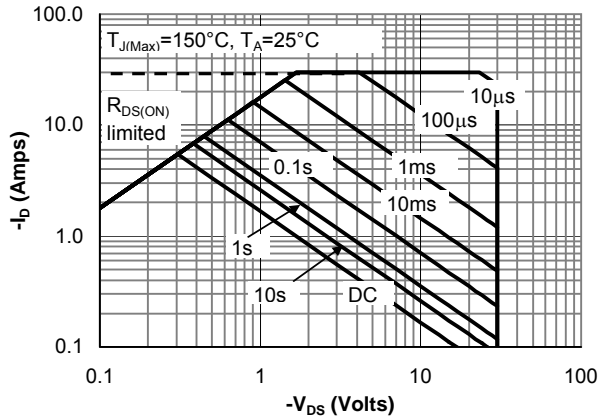


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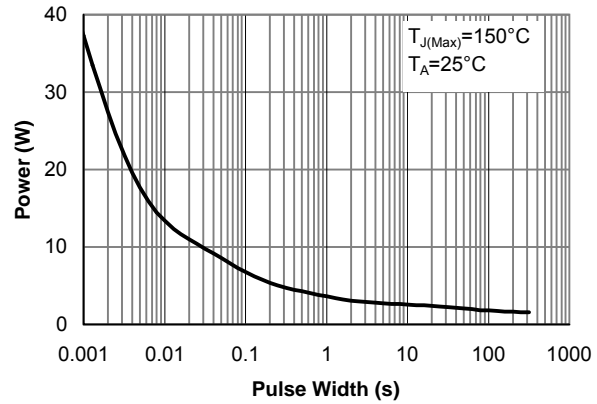


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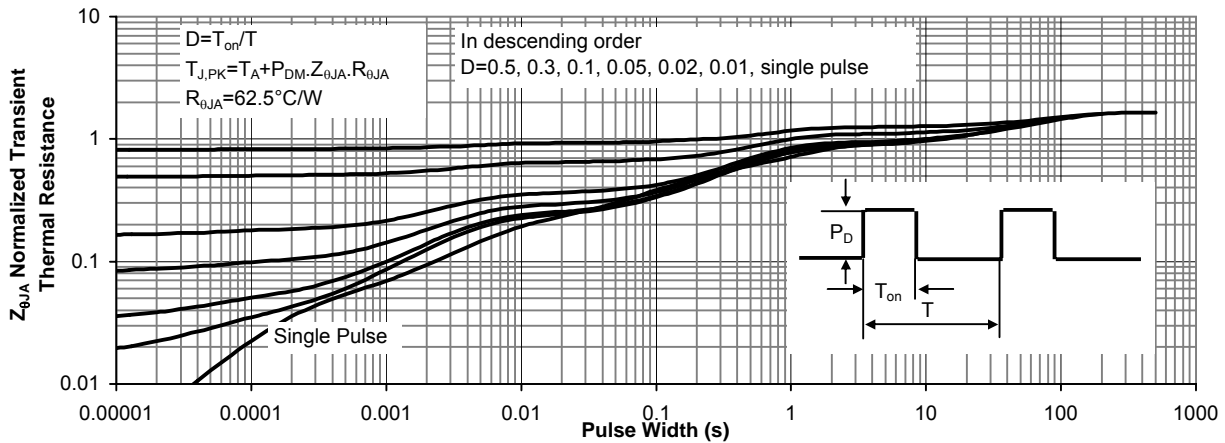


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