



**AO4607**

**Complementary Enhancement Mode Field Effect Transistor**

**General Description**

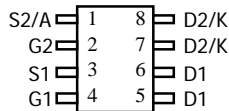
The AO4607 uses advanced trench technology MOSFETs to provide excellent  $R_{DS(ON)}$  and low gate charge. The complementary MOSFETs may be used in inverter and other applications. A Schottky diode is co-packaged with the n-channel FET to minimize body diode losses. AO4607 is Pb-free (meets ROHS & Sony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

**Features**

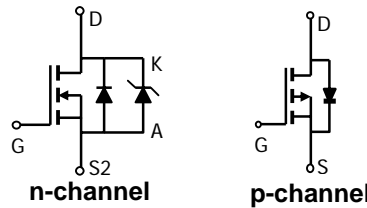
n-channel	p-channel
$V_{DS} (V) = 30V$	-30V
$I_D = 6.9A (V_{GS}=10V)$	-6A ( $V_{GS}=1-0V$ )
$R_{DS(ON)}$	$R_{DS(ON)}$
< 28m $\Omega$ ( $V_{GS}=10V$ )	< 35m $\Omega$ ( $V_{GS} = -10V$ )
< 42m $\Omega$ ( $V_{GS}=4.5V$ )	< 58m $\Omega$ ( $V_{GS} = -4.5V$ )

**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	$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current <sup>A</sup>	$I_D$	$T_A=25^\circ C$	6.9	-6
		$T_A=70^\circ C$	5.8	-5
Pulsed Drain Current <sup>B</sup>	$I_{DM}$	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 <sup>A</sup>	$I_D$	$T_A=25^\circ C$	3
		$T_A=70^\circ C$	2
Pulsed Diode Forward Current <sup>B</sup>	$I_{DM}$	20	A
Power Dissipation <sup>A</sup>	$P_D$	$T_A=25^\circ C$	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 <sup>A</sup>	t ≤ 10s	R <sub>θJA</sub>	n-ch	48	62.5	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		n-ch	74	110	°C/W
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	R <sub>θJL</sub>	n-ch	35	60	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	t ≤ 10s	R <sub>θJA</sub>	p-ch	48	62.5	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		p-ch	74	110	°C/W
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	R <sub>θJL</sub>	p-ch	35	40	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	t ≤ 10s	R <sub>θJA</sub>	Schottky	47.5	62.5	°C/W
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State		Schottky	71	110	°C/W
Maximum Junction-to-Lead <sup>C</sup>	Steady-State	R <sub>θJL</sub>	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
<b>STATIC PARAMETERS</b>						
$BV_{DSS}$	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 $\Omega$
		$T_J=125^\circ\text{C}$		31.3	38	
		$V_{GS}=4.5\text{V}$ , $I_D=5.0\text{A}$		34.5	42	m $\Omega$
$g_{FS}$	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
<b>DYNAMIC PARAMETERS</b>						
$C_{iss}$	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		pF
$C_{rss}$	Reverse Transfer Capacitance			77		pF
$R_g$	Gate resistance	$V_{GS}=0\text{V}$ , $V_{DS}=0\text{V}$ , $f=1\text{MHz}$		3	3.6	$\Omega$
<b>SWITCHING PARAMETERS</b>						
$Q_g(10\text{V})$	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		nC
$Q_{gs}$	Gate Source Charge			1.82		nC
$Q_{gd}$	Gate Drain Charge			3.2		nC
$t_{D(on)}$	Turn-On DelayTime	$V_{GS}=10\text{V}$ , $V_{DS}=15\text{V}$ , $R_L=2.2\Omega$ , $R_{GEN}=3\Omega$		4.6		ns
$t_r$	Turn-On Rise Time			4.1		ns
$t_{D(off)}$	Turn-Off DelayTime			20.6		ns
$t_f$	Turn-Off Fall Time			5.2		ns
$t_{rr}$	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 in<sup>2</sup> 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  $\mu\text{s}$  pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in<sup>2</sup> 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

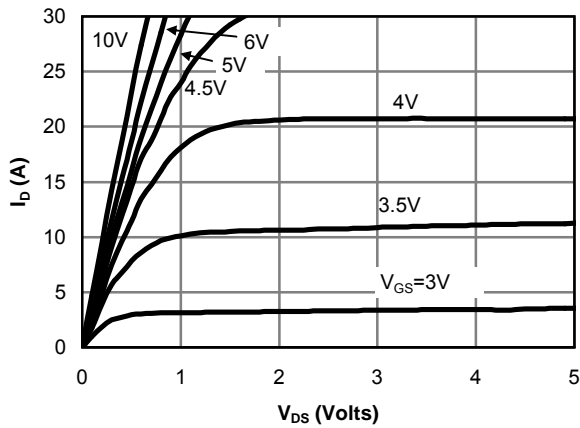


Fig 1: On-Region Characteristics

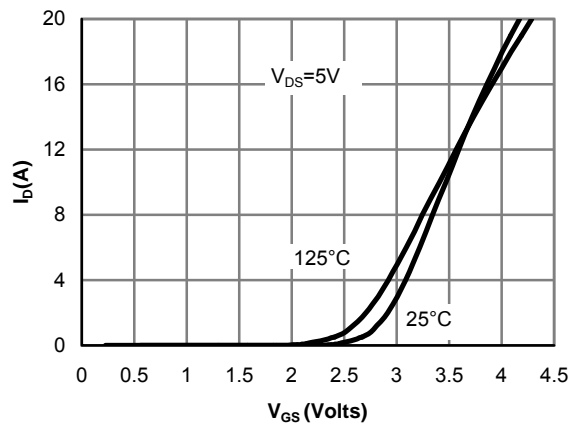


Figure 2: Transfer Characteristics

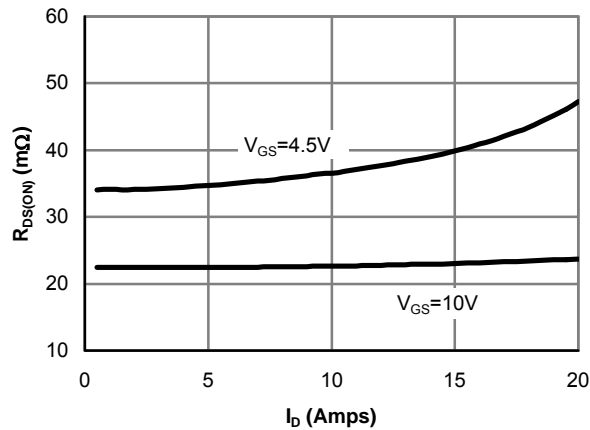


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

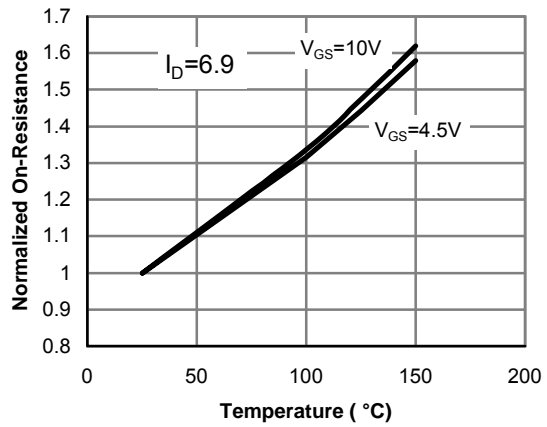


Figure 4: On-Resistance vs. Junction Temperature

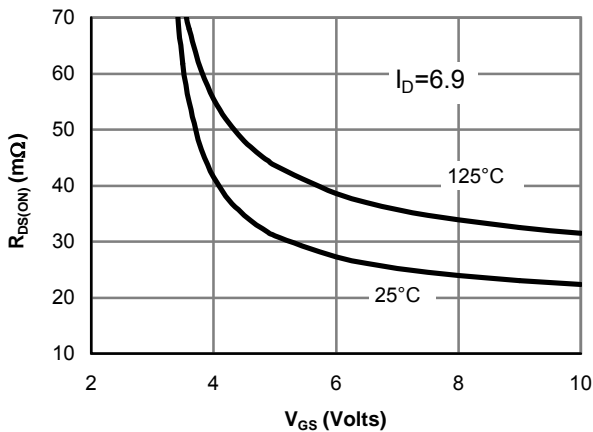


Figure 5: On-Resistance vs. Gate-Source Voltage

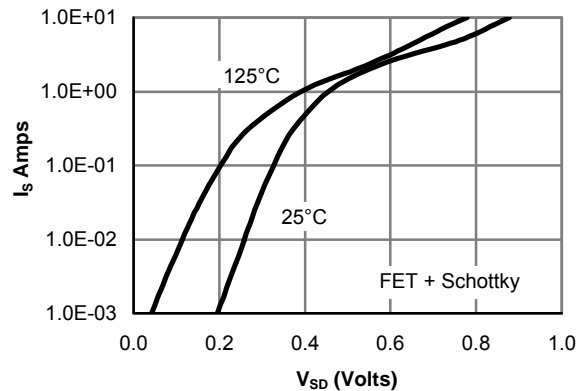


Figure 6: Body diode with parallel Schottky characteristics (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: N-CHANNEL

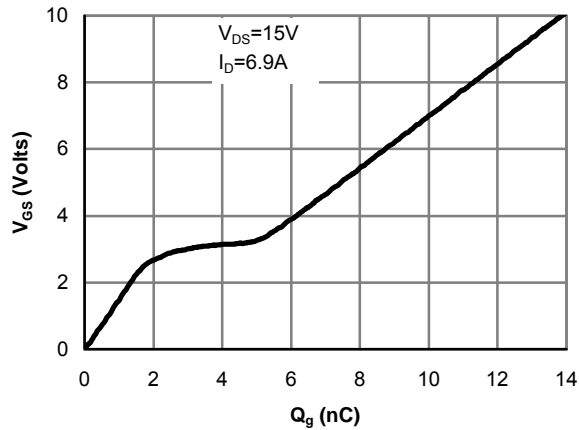


Figure 7: Gate-Charge characteristics

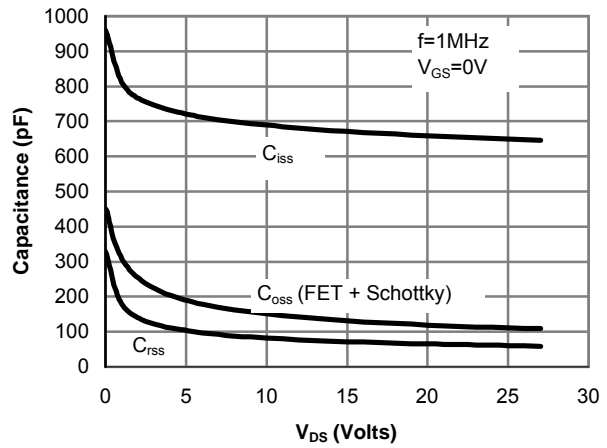


Figure 8: Capacitance Characteristics: MOSFET + Parallel Schottky

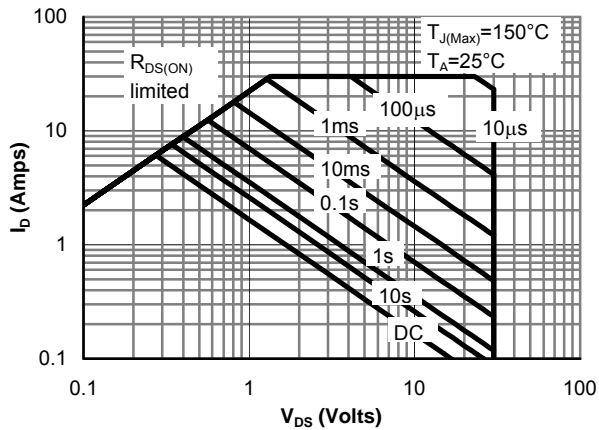


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

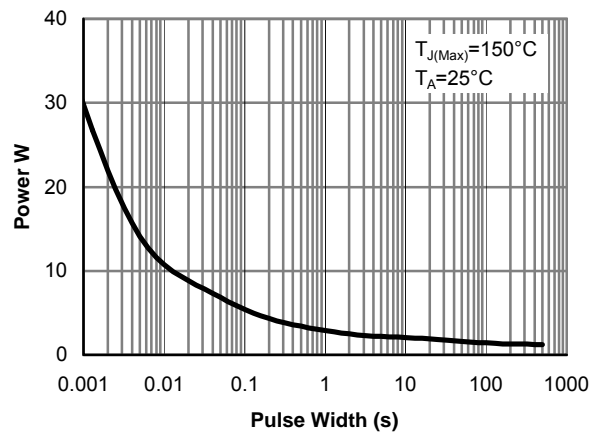


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

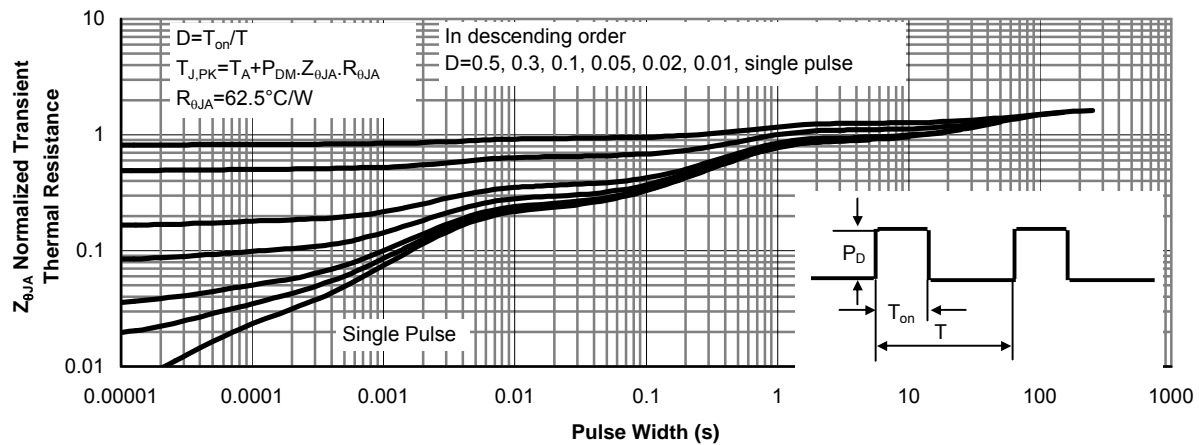


Figure 11: Normalized Maximum Transient Thermal Impedance

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
<b>STATIC PARAMETERS</b>							
$BV_{DSS}$	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	$\mu\text{A}$	
$I_{GSS}$	Gate-Body leakage current	$V_{DS}=0\text{V}$ , $V_{GS}=\pm 20\text{V}$			$\pm 100$	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	$\text{m}\Omega$	
		$V_{GS}=-4.5\text{V}$ , $I_D=-5\text{A}$		44	58	$\text{m}\Omega$	
$g_{FS}$	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	
<b>DYNAMIC PARAMETERS</b>							
$C_{iss}$	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	$\Omega$	
<b>SWITCHING PARAMETERS</b>							
$Q_g(10\text{V})$	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 in<sup>2</sup> 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  $\mu\text{s}$  pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in<sup>2</sup> 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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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

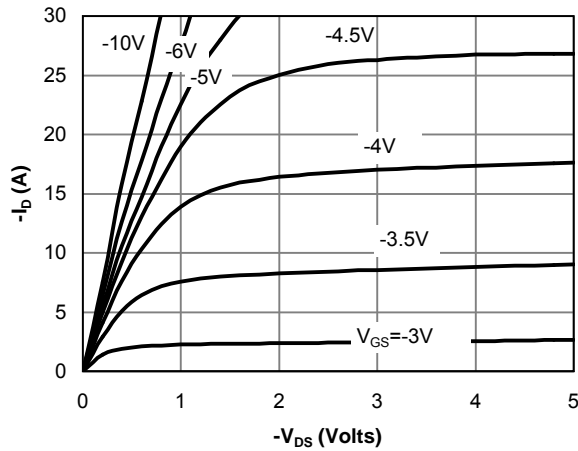


Fig 1: On-Region Characteristics

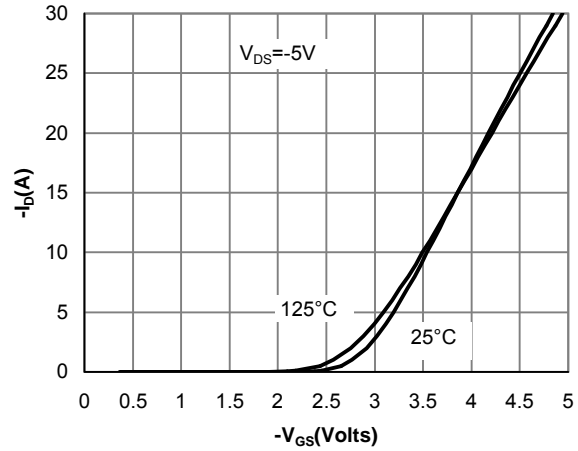


Figure 2: Transfer Characteristics

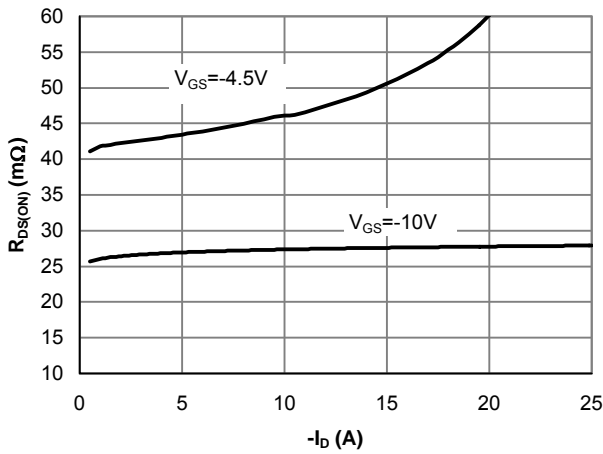


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

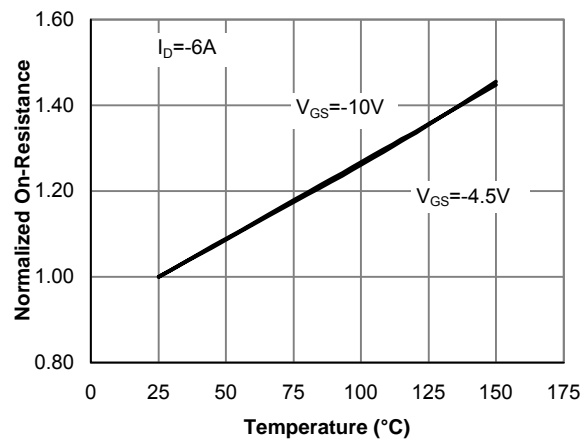


Figure 4: On-Resistance vs. Junction Temperature

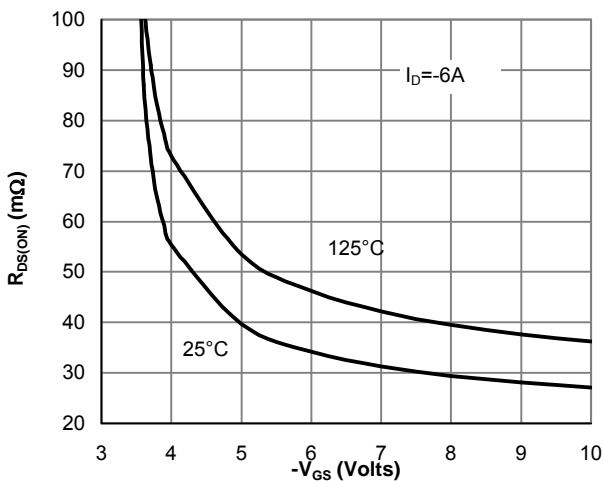


Figure 5: On-Resistance vs. Gate-Source Voltage

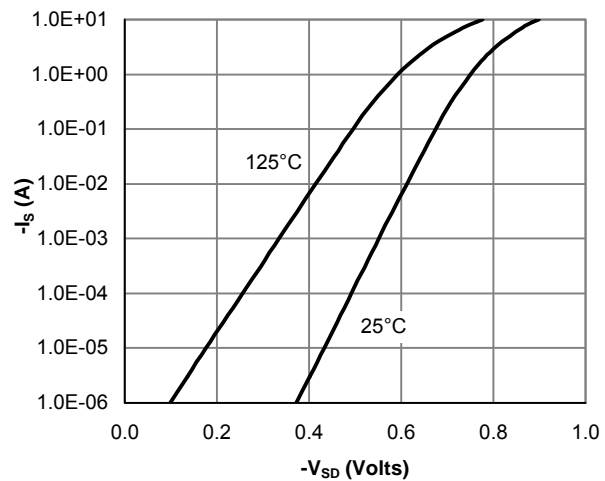


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: P-CHANNEL

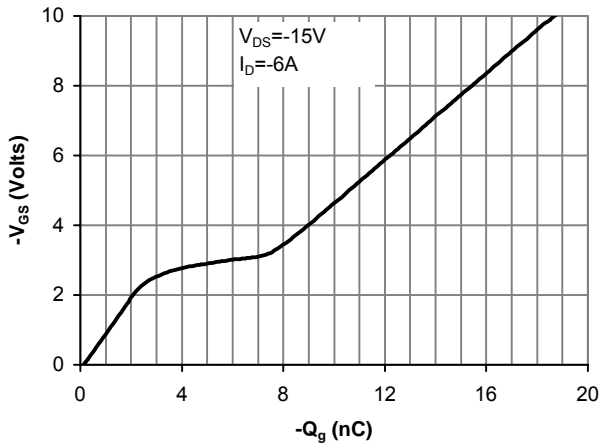


Figure 7: Gate-Charge Characteristics

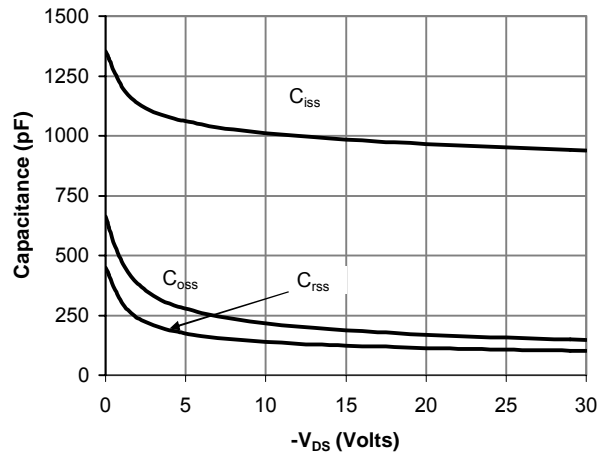


Figure 8: Capacitance Characteristics

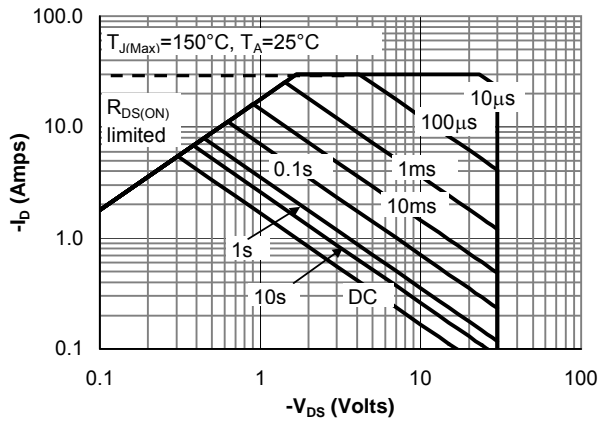


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

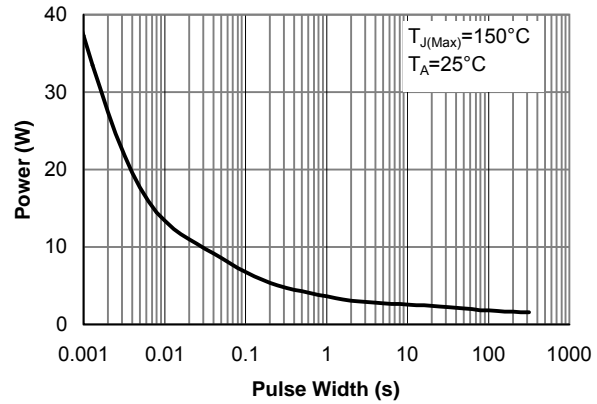


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

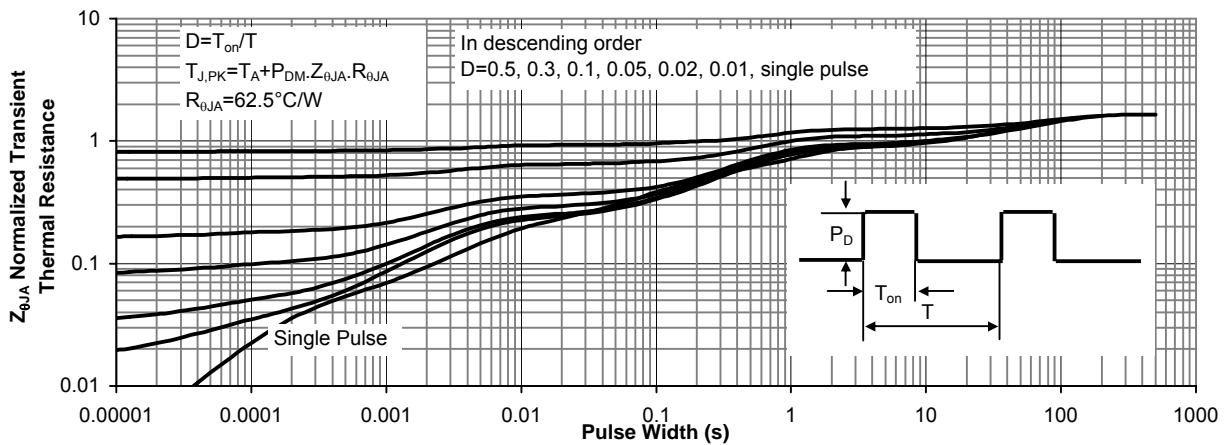


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