

Complementary Trench MOSFET

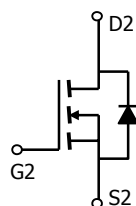
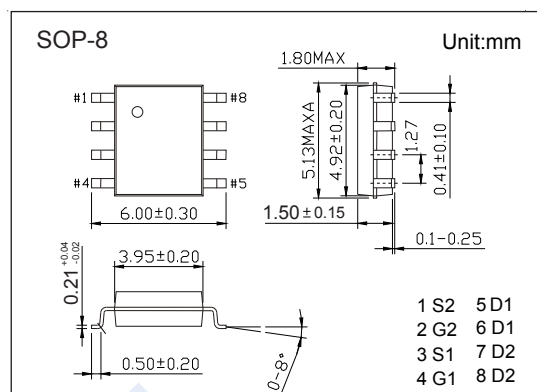
AO4604 (KO4604)

■ Features

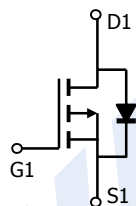
● N-Channel :

 $V_{DS} (V) = 30V$ $I_D = 6.9 A (V_{GS} = 10V)$ $R_{DS(ON)} < 28m\Omega (V_{GS} = 10V)$ $R_{DS(ON)} < 42m\Omega (V_{GS} = 4.5V)$

● P-Channel :

 $V_{DS} (V) = -30V$ $I_D = -5 A (V_{GS} = -10V)$ $R_{DS(ON)} < 52m\Omega (V_{GS} = -10V)$ $R_{DS(ON)} < 87m\Omega (V_{GS} = -4.5V)$ 

N-channel



P-channel

■ Absolute Maximum Ratings $T_a = 25^\circ C$

Parameter		Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage		V _{DS}	30	-30	V
Gate-Source Voltage		V _{GS}	± 20		
Continuous Drain Current	T _A =25℃	I _D	6.9	-5	A
	T _A =70℃		5.8	-4.2	
Pulsed Drain Current		I _{DM}	30	-20	
Power Dissipation	T _A =25℃	P _D	2		W
	T _A =70℃		1.44		
Thermal Resistance.Junction- to-Ambient	t ≤ 10s	R _{thJA}	62.5		℃/W
	Steady-State		110		
Thermal Resistance.Junction- to-Lead		R _{thJL}	40		
Junction Temperature		T _J	150		℃
Storage Temperature Range		T _{stg}	-55 to 150		

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■ N-Channel Electrical Characteristics Ta = 25°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V _{DSS}	I _D =250 μA, V _{GS} =0V	30			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =24V, V _{GS} =0V			1	μA
		V _{DS} =24V, V _{GS} =0V, T _J =55°C			5	
Gate-Body Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1		3	V
Static Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =10V, I _D =6.9A			28	mΩ
		V _{GS} =10V, I _D =6.9A, T _J =125°C			38	
		V _{GS} =4.5V, I _D =5A			42	
On State Drain Current	I _{D(on)}	V _{GS} =4.5V, V _{DS} =5V	20			A
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =5A	10	15.4		S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =15V, f=1MHz		680	820	pF
Output Capacitance	C _{oss}			102		
Reverse Transfer Capacitance	C _{rss}			77		
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz		1.2	2	Ω
Total Gate Charge (10V)	Q _g	V _{GS} =10V, V _{DS} =15V, I _D =6.9A		13.84	17	nC
Total Gate Charge (4.5V)				6.74	8.1	
Gate Source Charge	Q _{gs}			1.82		
Gate Drain Charge	Q _{gd}			3.2		
Turn-On DelayTime	t _{d(on)}	V _{GS} =10V, V _{DS} =15V, R _L =2.2Ω, R _{GEN} =3Ω		4.6		ns
Turn-On Rise Time	t _r			4.1		
Turn-Off DelayTime	t _{d(off)}			20.6		
Turn-Off Fall Time	t _f			5.2		
Body Diode Reverse Recovery Time	t _{rr}	I _F = 6.9A, dI/dt= 100A/μs		16.5	20	nC
Body Diode Reverse Recovery Charge	Q _{rr}			7.8		
Maximum Body-Diode Continuous Current	I _S				3	A
Diode Forward Voltage	V _{SD}	I _S =1A, V _{GS} =0V			1	V

Note : The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

■ Marking

Marking	4604 KA****
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■ P-Channel Electrical Characteristics Ta = 25°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V _{DSS}	I _D =-250 μA, V _{GS} =0V	-30			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =-24V, V _{GS} =0V			-1	μA
		V _{DS} =-24V, V _{GS} =0V, T _J =55°C			-5	
Gate-Body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250 μA	-1		-3	V
Static Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =-10V, I _D =-5A			52	mΩ
		V _{GS} =-10V, I _D =-5A, T _J =125°C			70	
		V _{GS} =-4.5V, I _D =-4A			87	
On state drain current	I _{D(ON)}	V _{GS} =-4.5V, V _{DS} =-5V	-20			A
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-5A	6	8.6		S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =-15V, f=1MHz		700	900	pF
Output Capacitance	C _{oss}			120		
Reverse Transfer Capacitance	C _{rss}			75		
Gate resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz		10	15	Ω
Total Gate Charge (10V)	Q _g	V _{GS} =-10V, V _{DS} =-15V, I _D =-5A		14.7	19	nC
Total Gate Charge (4.5V)				7.6	10	
Gate Source Charge	Q _{gs}			2		
Gate Drain Charge	Q _{gd}			3.8		
Turn-On DelayTime	t _{d(on)}	V _{GS} =-10V, V _{DS} =-15V, R _L =3Ω, R _{GEN} =3Ω		8.3		ns
Turn-On Rise Time	t _r			5		
Turn-Off DelayTime	t _{d(off)}			29		
Turn-Off Fall Time	t _f			14		
Body Diode Reverse Recovery Time	t _{rr}	I _F =-5A, dI/dt=100A/μs		23.5	30	nC
Body Diode Reverse Recovery Charge	Q _{rr}			13.4		
Maximum Body-Diode Continuous Current	I _S				-2.8	A
Diode Forward Voltage	V _{SD}	I _S =-1A, V _{GS} =0V			-1	V

Note : The static characteristics in Figures 1 to 6 are obtained using <300 μs pulses, duty cycle 0.5% max.

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■ N-Channel Typical Characteristics

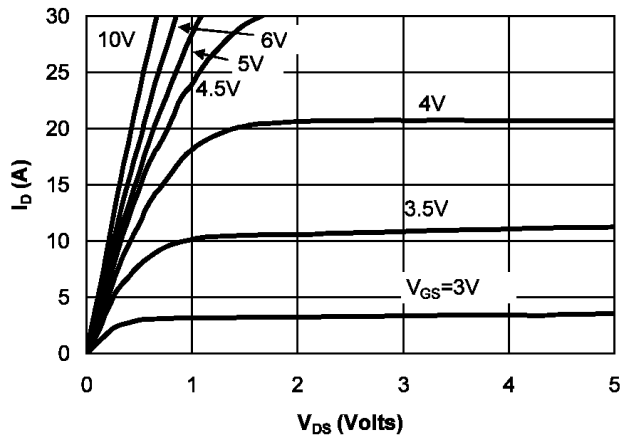


Fig 1: On-Region Characteristics

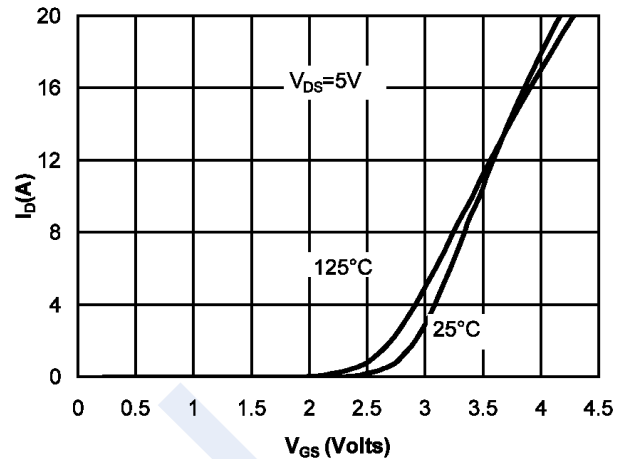


Figure 2: Transfer Characteristics

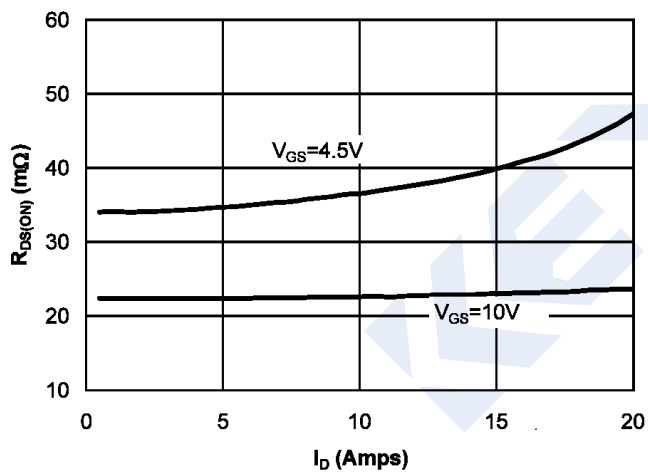


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

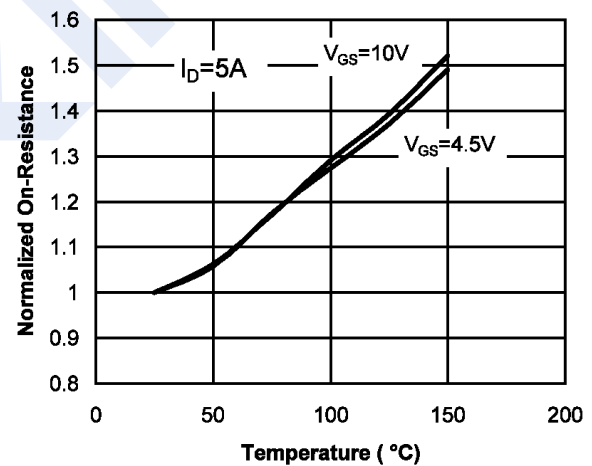


Figure 4: On-Resistance vs. Junction Temperature

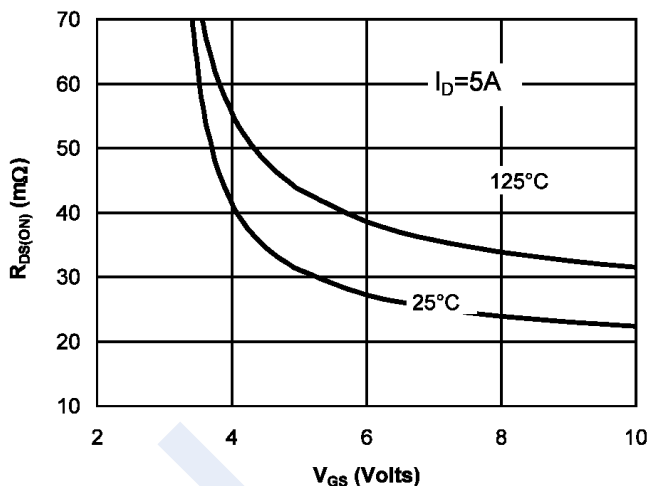


Figure 5: On-Resistance vs. Gate-Source Voltage

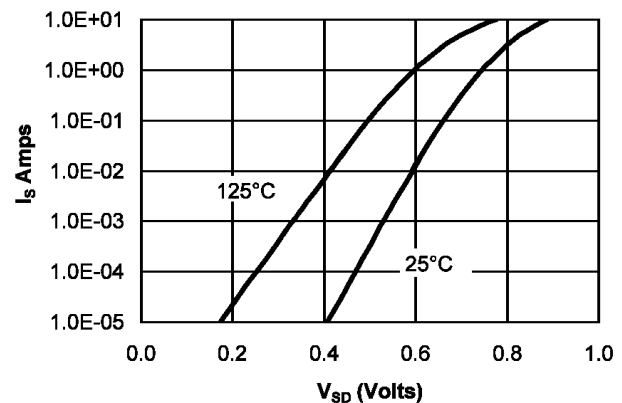


Figure 6: Body diode characteristics

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AO4604 (KO4604)

■ N-Channel Typical Characteristics

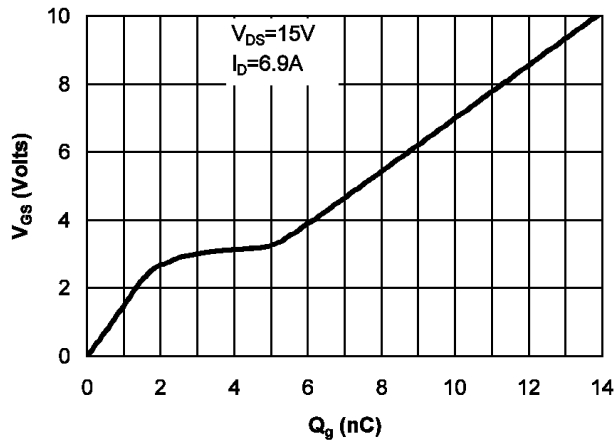


Figure 7: Gate-Charge characteristics

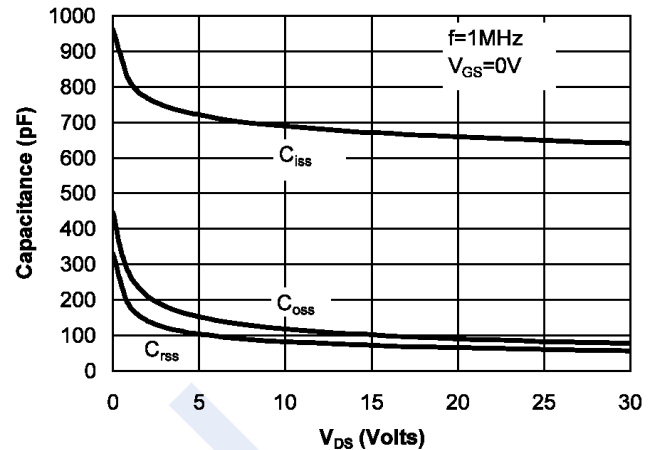


Figure 8: Capacitance Characteristics

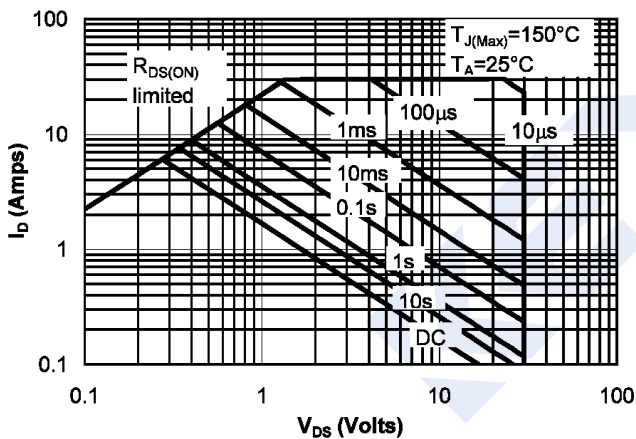


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

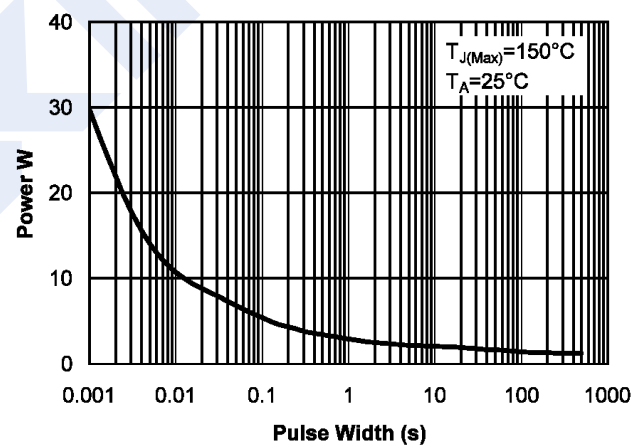


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

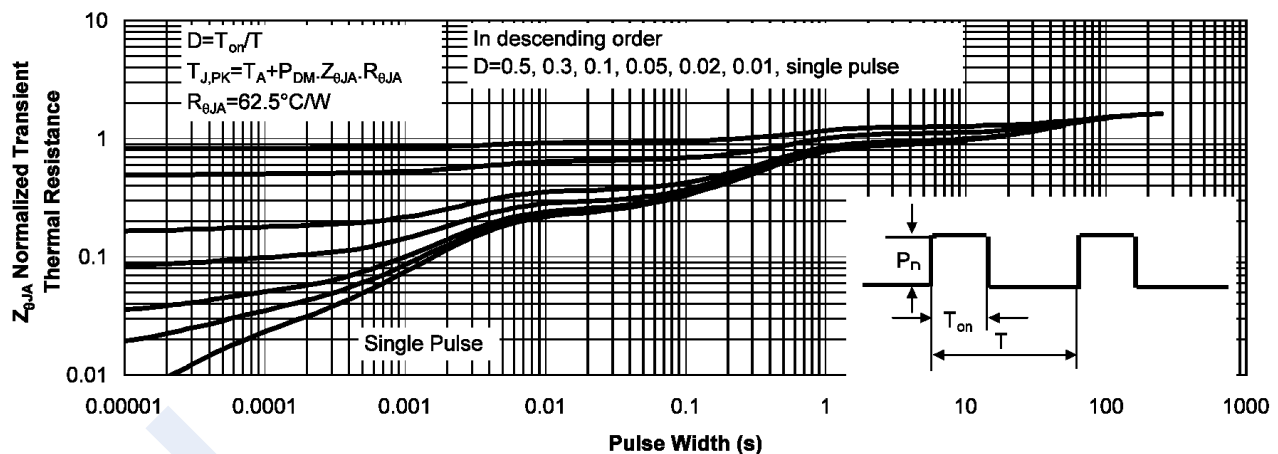


Figure 11: Normalized Maximum Transient Thermal Impedance

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■ P-Channel Typical Characteristics

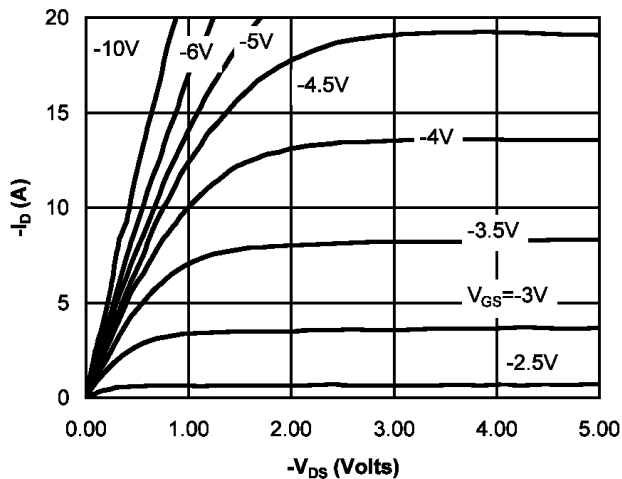


Figure 1: On-Region Characteristics

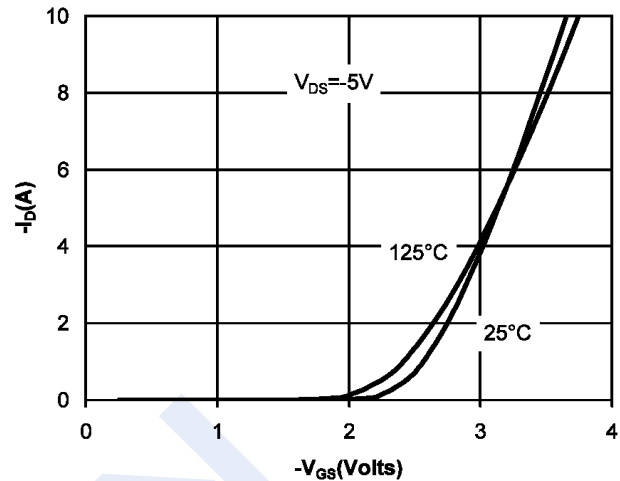


Figure 2: Transfer Characteristics

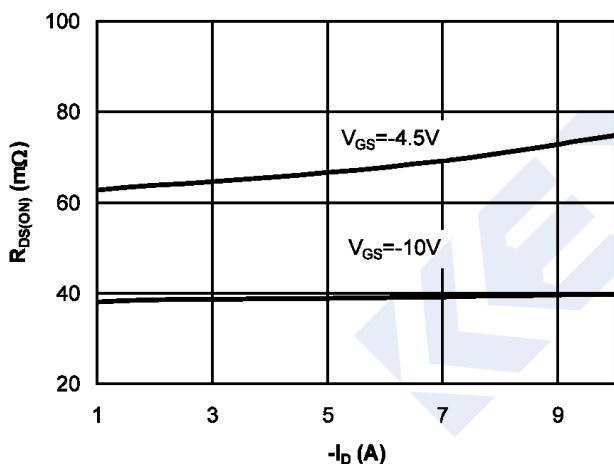


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

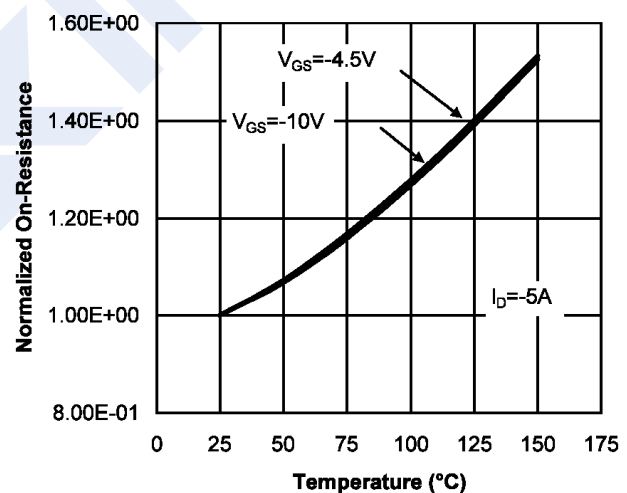


Figure 4: On-Resistance vs. Junction Temperature

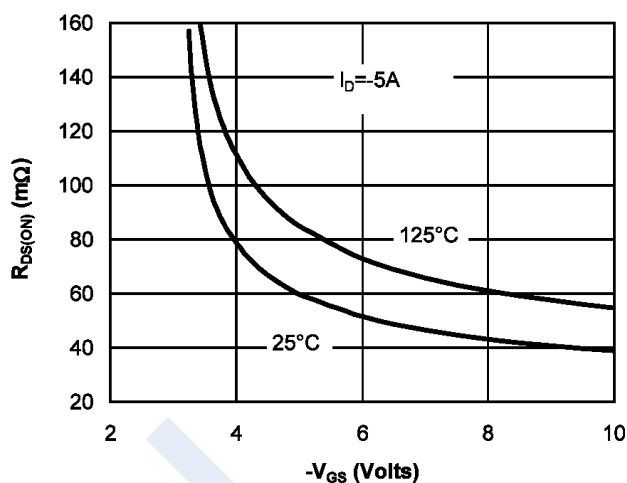


Figure 5: On-Resistance vs. Gate-Source Voltage

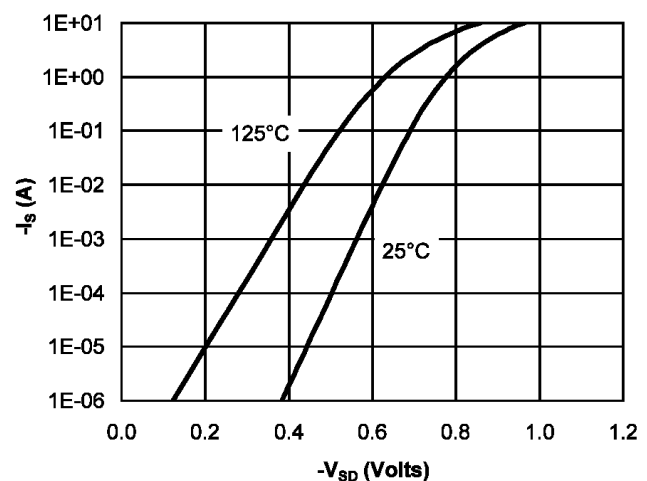


Figure 6: Body-Diode Characteristics

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■ P-Channel Typical Characteristics

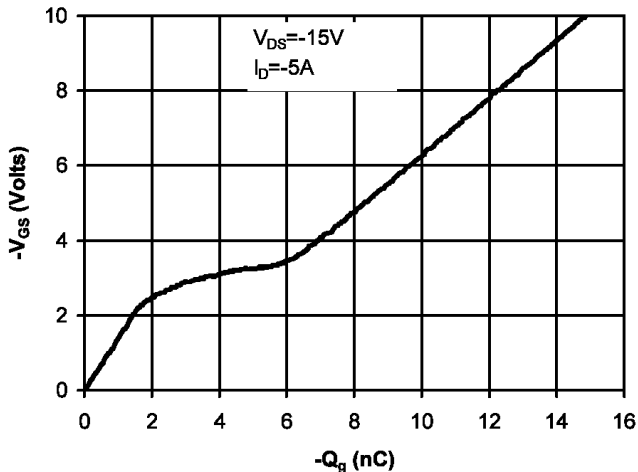


Figure 7: Gate-Charge Characteristics

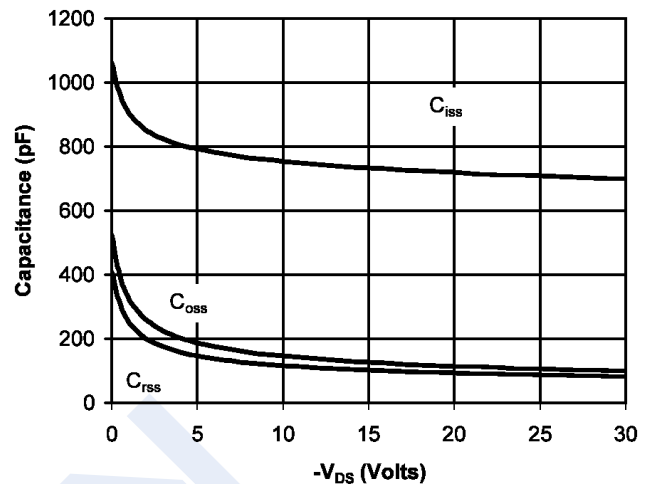


Figure 8: Capacitance Characteristics

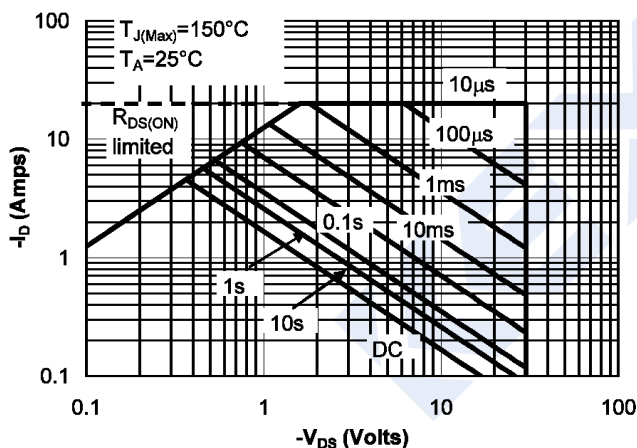


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

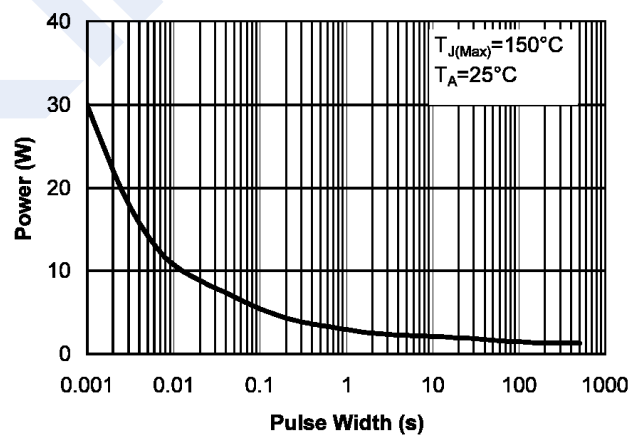


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

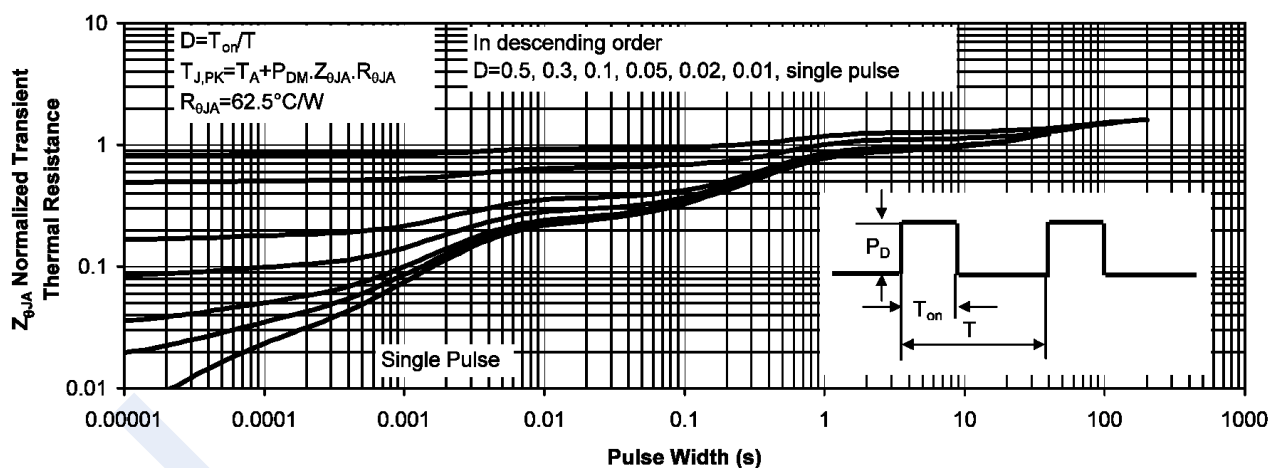


Figure 11: Normalized Maximum Transient Thermal Impedance