

Complementary Trench MOSFET

AO4613 (KO4613)

■ Features

● N-Channel :

$$V_{DS} (V) = 30V$$

$$I_D = 7.2 \text{ A } (V_{GS} = 10V)$$

$$R_{DS(ON)} < 24m \Omega (V_{GS} = 10V)$$

$$R_{DS(ON)} < 40m \Omega (V_{GS} = 4.5V)$$

● P-Channel :

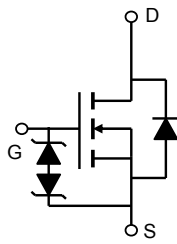
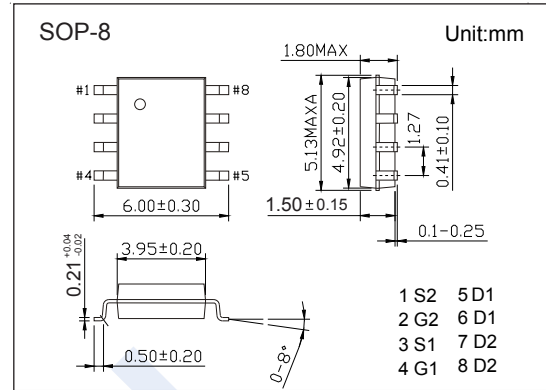
$$V_{DS} (V) = -30V$$

$$I_D = -6.1 \text{ A } (V_{GS} = -10V)$$

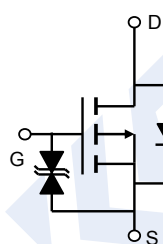
$$R_{DS(ON)} < 37m \Omega (V_{GS} = -10V)$$

$$R_{DS(ON)} < 60m \Omega (V_{GS} = -4.5V)$$

● ESD Rating: 2KV HBM



N-channel



P-channel

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

Parameter	Symbol	N-Channel	P-Channel	Unit	
Drain-Source Voltage	V_{DS}	30	-30	V	
Gate-Source Voltage	V_{GS}	± 20		V	
Continuous Drain Current	I_D	$T_A=25^\circ\text{C}$	7.2	-6.1	A
		$T_A=70^\circ\text{C}$	6.1	-5.1	
Pulsed Drain Current	I_{DM}	30	-30	A	
Avalanche Current	I_{AR}	15	20		
Repetitive Avalanche Energy	E_{AR}	11	20		
Power Dissipation	P_D	$T_A=25^\circ\text{C}$	2		W
		$T_A=70^\circ\text{C}$	1.44		
Thermal Resistance.Junction- to-Ambient	R_{thJA}	$t \leq 10s$	62.5		$^\circ\text{C/W}$
		Steady-State	110		
Thermal Resistance.Junction- to-Lead	R_{thJL}	50			
Junction Temperature	T_J	150		$^\circ\text{C}$	
Storage Temperature Range	T_{stg}	-55 to 150		$^\circ\text{C}$	

Complementary Trench MOSFET

AO4613 (KO4613)

■ 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} =±12V			±10	μA
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 =7.2A			24	mΩ
		V _{GS} =10V, I _D =7.2A, T _J =125°C			35	
		V _{GS} =4.5V, I _D =4A			40	
On State Drain Current	I _{D(ON)}	V _{GS} =10V, V _{DS} =5V	20			A
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =7.2A	10	18		S
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =15V, f=1MHz		522	630	pF
Output Capacitance	C _{oss}			110		
Reverse Transfer Capacitance	C _{rss}			75		
Gate Resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz		2.1	3	Ω
Total Gate Charge (10V)	Q _g	V _{GS} =10V, V _{DS} =15V, I _D =7.2A		11	15	nC
Total Gate Charge (4.5V)				5.3	7	
Gate Source Charge	Q _{gs}			1.9		
Gate Drain Charge	Q _{gd}			4		
Turn-On DelayTime	t _{d(on)}		V _{GS} =10V, V _{DS} =15V, R _L =2.1Ω, R _{GEN} =3Ω		4.7	
Turn-On Rise Time	t _r			4.9	10	
Turn-Off DelayTime	t _{d(off)}			16.2	22	
Turn-Off Fall Time	t _f			3.5	7	
Body Diode Reverse Recovery Time	t _{rr}	I _F = 7.2A, di/dt= 100A/us		15.7	20	nC
Body Diode Reverse Recovery Charge	Q _{rr}			7.9	10	
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 us pulses, duty cycle 0.5% max.

■ Marking

Marking	4613 KA****
---------	----------------

Complementary Trench MOSFET

AO4613 (KO4613)

■ 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	uA	
		V _{DS} =-24V, V _{GS} =0V, T _J =55°C			-5		
Gate-Body leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =±12V			±10	uA	
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 =-6.1A			37	mΩ	
		V _{GS} =-10V, I _D =-6.1A T _J =125°C			48		
		V _{GS} =-4.5V, I _D =-4A			60		
On state drain current	I _{D(ON)}	V _{GS} =-10V, V _{DS} =-5V	-30			A	
Forward Transconductance	g _{FS}	V _{DS} =-5V, I _D =-6.1A		12.5		S	
Input Capacitance	C _{iss}	V _{GS} =0V, V _{DS} =-15V, f=1MHz		1040	1250	pF	
Output Capacitance	C _{oss}			179			
Reverse Transfer Capacitance	C _{rss}			134			
Gate resistance	R _g	V _{GS} =0V, V _{DS} =0V, f=1MHz		5	10	Ω	
Total Gate Charge (10V)	Q _g	V _{GS} =-10V, V _{DS} =-15V, I _D =-6.1A		16.8	22	nC	
Total Gate Charge (4.5V)				8.7	12		
Gate Source Charge			Q _{gs}		3.4		
Gate Drain Charge			Q _{gd}		5		
Turn-On DelayTime	t _{d(on)}	V _{GS} =-10V, V _{DS} =-15V, R _L =2.5Ω, R _{GEN} =3Ω		9	12	ns	
Turn-On Rise Time	t _r			5.7	11		
Turn-Off DelayTime	t _{d(off)}			22.7	30		
Turn-Off Fall Time	t _f			10.2	20		
Body Diode Reverse Recovery Time	t _{rr}	I _F =-6.1A, di/dt=100A/us		21.7	27	nC	
Body Diode Reverse Recovery Charge	Q _{rr}			13.6	18		
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 us pulses, duty cycle 0.5% max.

Complementary Trench MOSFET AO4613 (KO4613)

■ N-Channel Typical Characteristics

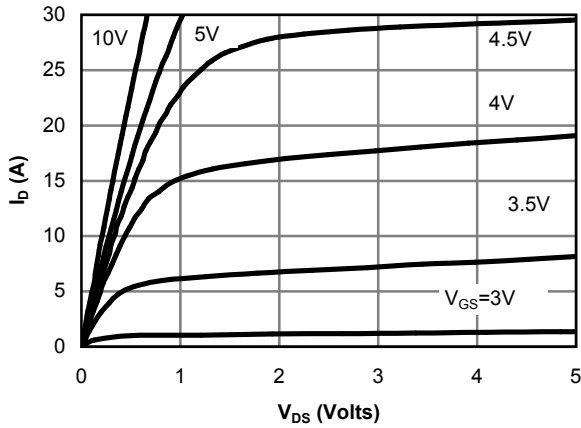


Fig 1: On-Region Characteristics

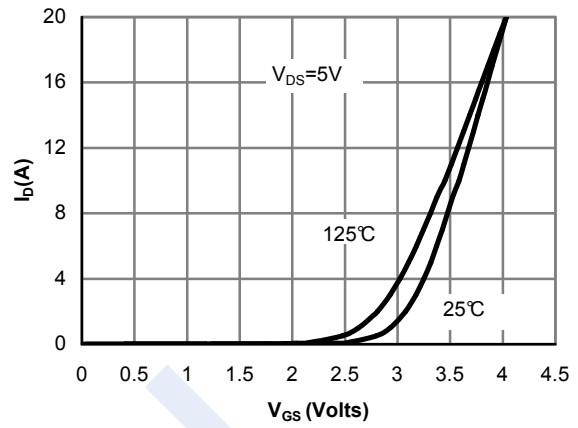


Figure 2: Transfer Characteristics

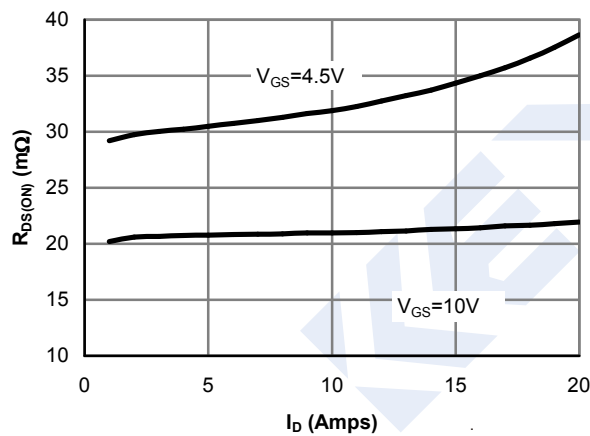


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

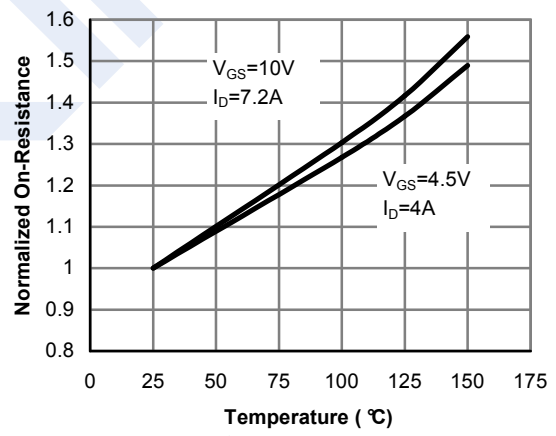


Figure 4: On-Resistance vs. Junction Temperature

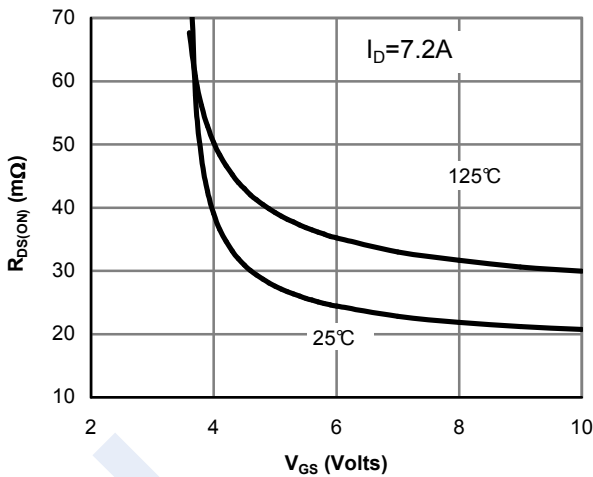


Figure 5: On-Resistance vs. Gate-Source Voltage

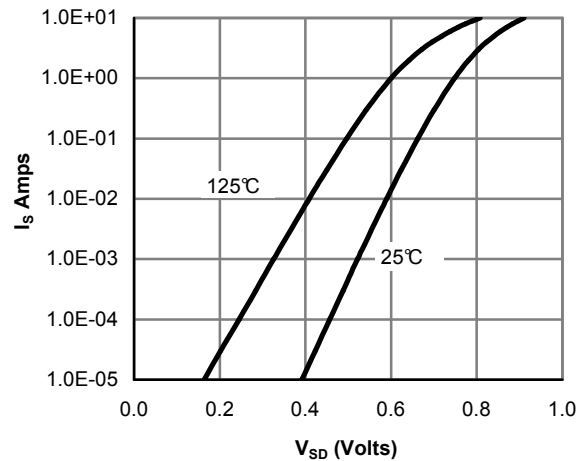


Figure 6: Body diode characteristics

Complementary Trench MOSFET AO4613 (KO4613)

■ N-Channel Typical Characteristics

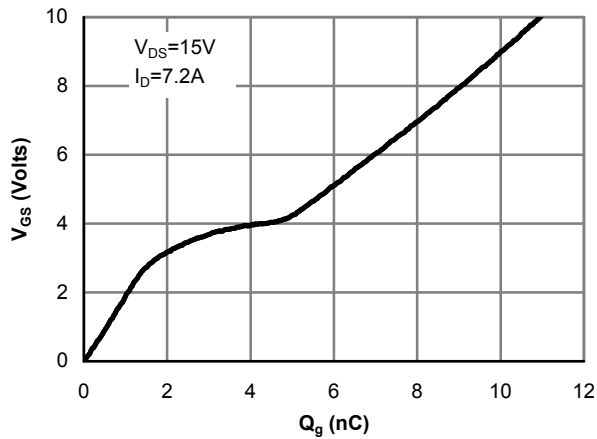


Figure 7: Gate-Charge characteristics

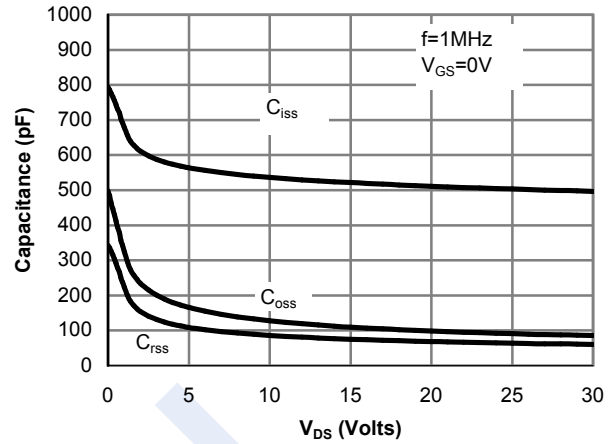


Figure 8: Capacitance Characteristics

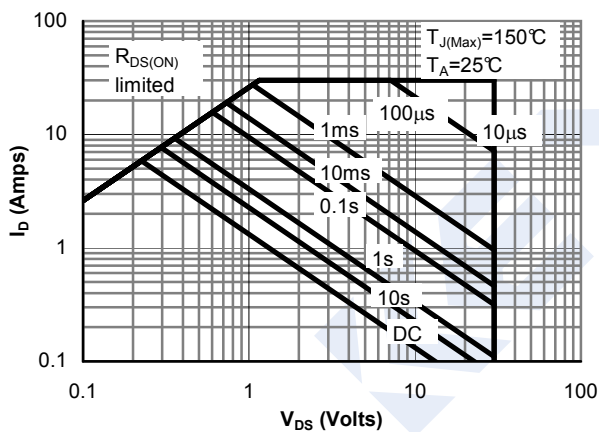


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

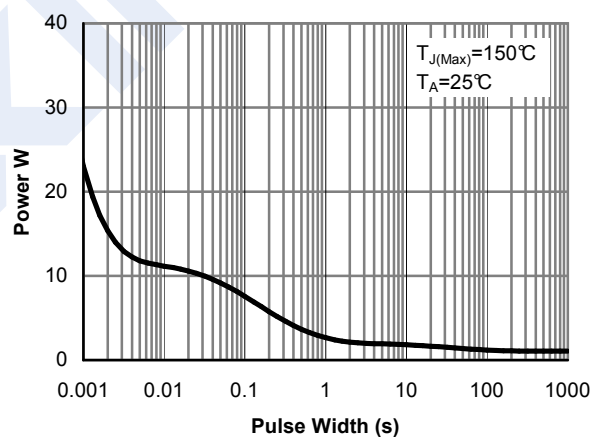


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

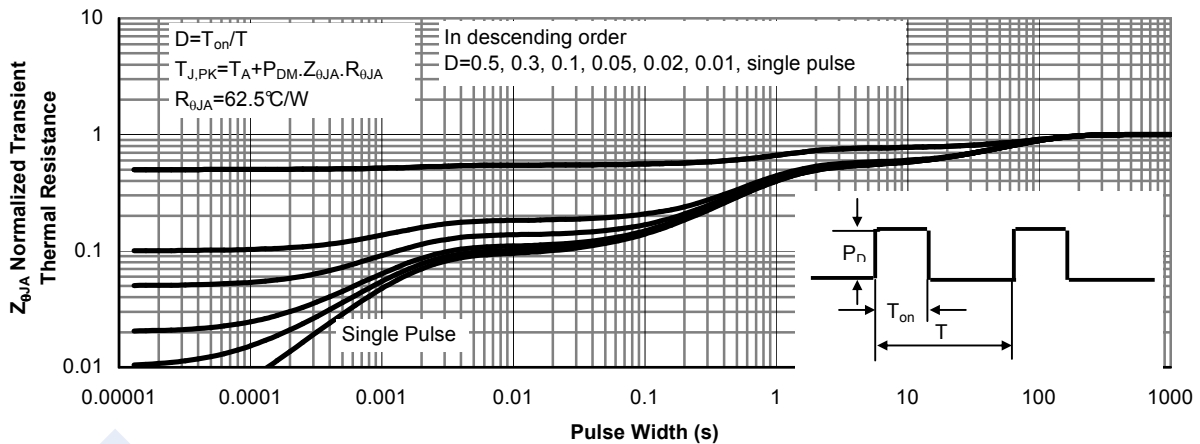


Figure 11: Normalized Maximum Transient Thermal Impedance

Complementary Trench MOSFET AO4613 (KO4613)

■ P-Channel Typical Characteristics

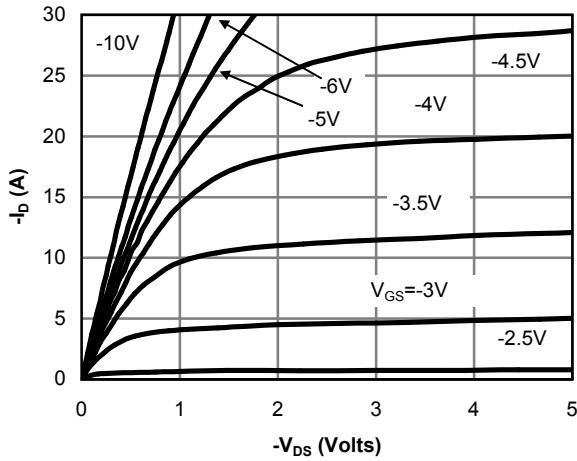


Fig 1: On-Region Characteristics

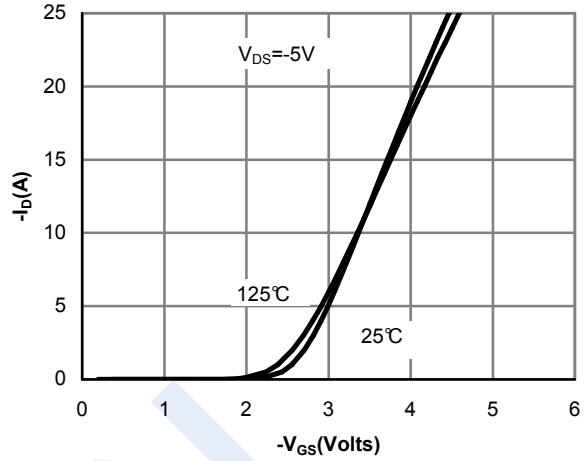


Figure 2: Transfer Characteristics

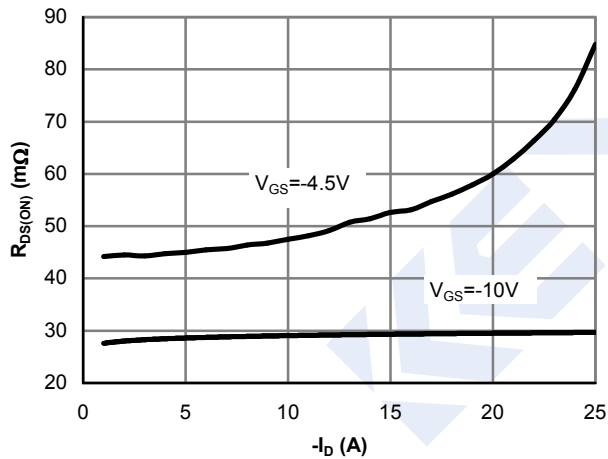


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

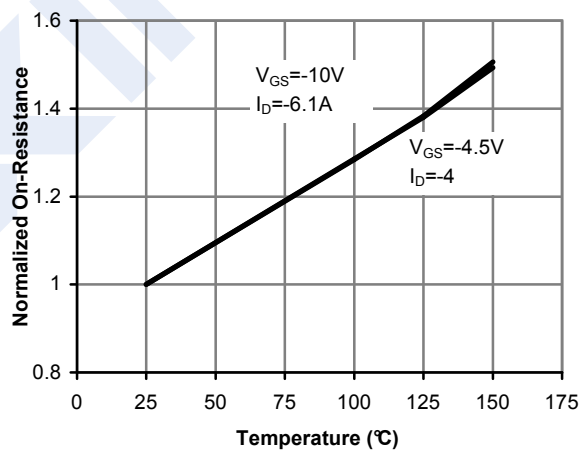


Figure 4: On-Resistance vs. Junction Temperature

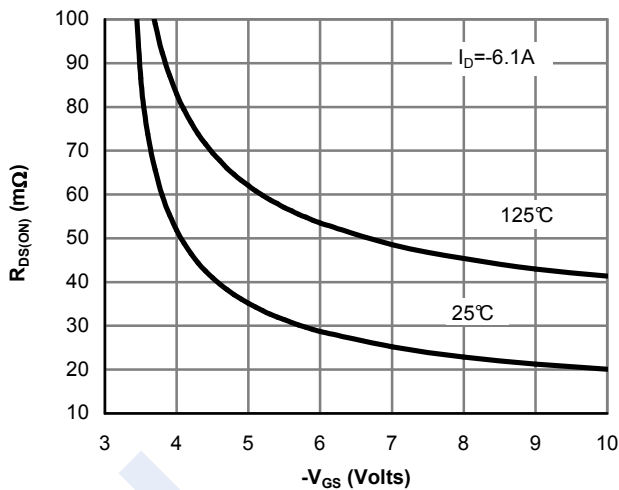


Figure 5: On-Resistance vs. Gate-Source Voltage

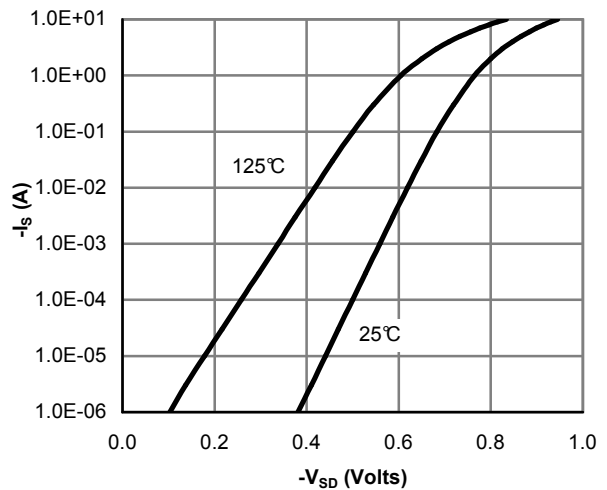


Figure 6: Body-Diode Characteristics

Complementary Trench MOSFET AO4613 (KO4613)

■ P-Channel Typical Characteristics

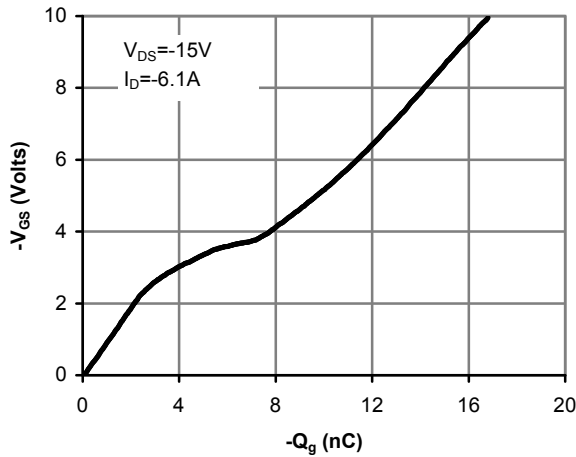


Figure 7: Gate-Charge Characteristics

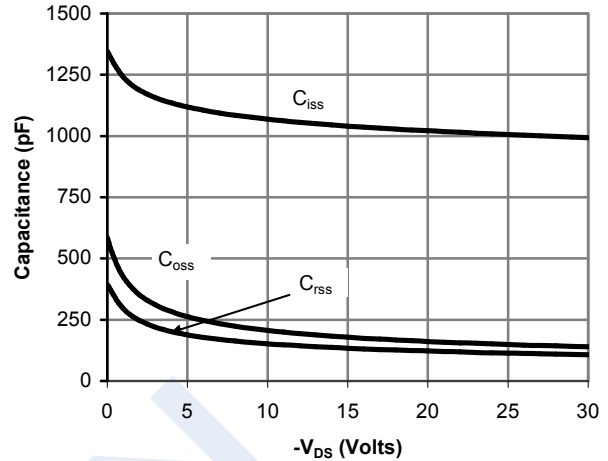


Figure 8: Capacitance Characteristics

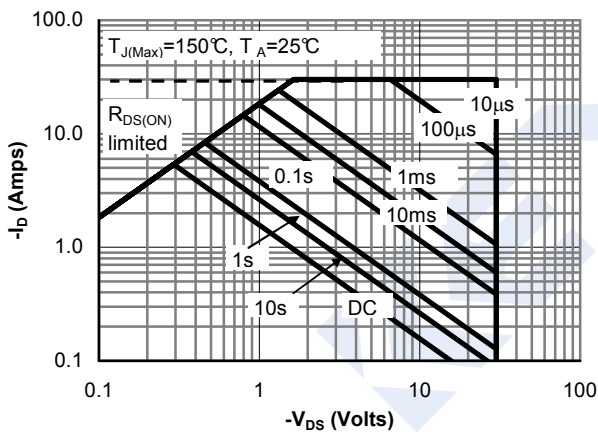


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

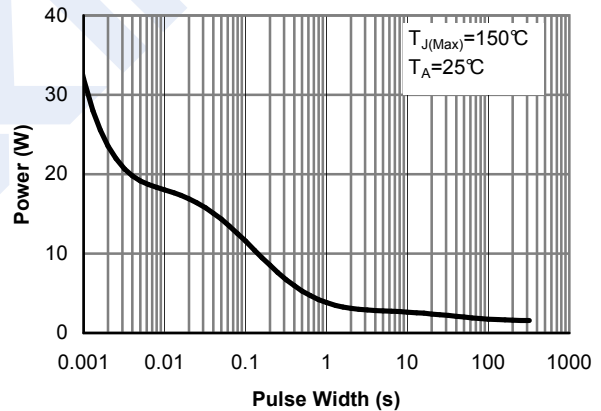


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

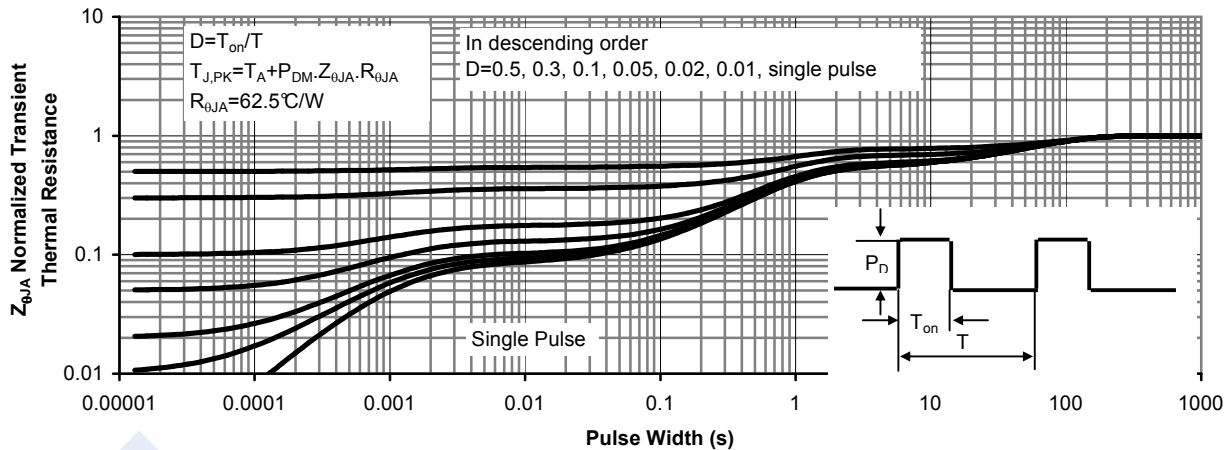


Figure 11: Normalized Maximum Transient Thermal Impedance