

## Dual N-Channel MOSFET

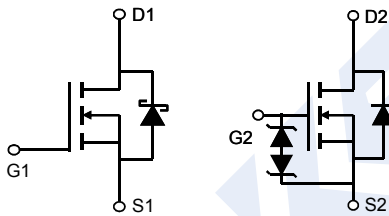
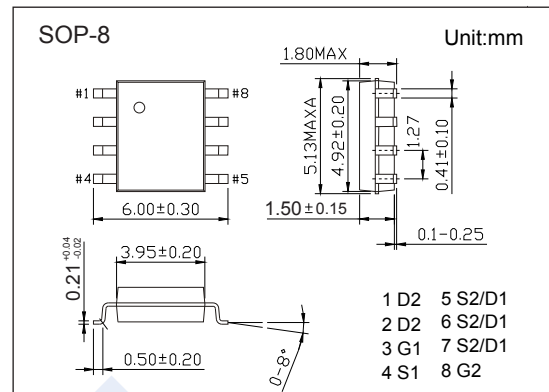
### AO4938 (KO4938)

#### ■ Features

N-Channel 1

- $V_{DS}$  (V) = 30V
- $I_D$  = 8.8 A ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  < 16m $\Omega$  ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  < 22m $\Omega$  ( $V_{GS}$  = 4.5V)
- SRFET™ Soft Recovery MOSFET: Integrated Schottky Diode  
N-Channel 2

- $V_{DS}$  (V) = 30V
- $I_D$  = 8 A ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  < 19m $\Omega$  ( $V_{GS}$  = 10V)
- $R_{DS(ON)}$  < 28m $\Omega$  ( $V_{GS}$  = 4.5V)
- ESD Rating: 2KV HBM



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

Parameter	Symbol	N-Channel 1	N-Channel 2	Unit	
Drain-Source Voltage	$V_{DS}$	30		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$			
Continuous Drain Current	$I_D$	$T_A=25^\circ\text{C}$	8.8	A	
		$T_A=70^\circ\text{C}$	7.1		
Pulsed Drain Current	$I_{DM}$	60	40		
Avalanche Current	$I_{AS}, I_{AR}$	21	13		
Repetitive Avalanche Energy	$L=0.3\text{mH}$	$E_{AS}, E_{AR}$	66	25	mJ
Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	2		W
		$T_A=70^\circ\text{C}$	1.3		
Thermal Resistance.Junction- to-Ambient	$R_{thJA}$	$t \leq 10\text{s}$	62.5		$^\circ\text{C/W}$
		Steady-State	90		
Thermal Resistance.Junction- to-Lead	$R_{thJL}$	40			
Junction Temperature	$T_J$	150		$^\circ\text{C}$	
Storage Temperature Range	$T_{stg}$	-55 to 150			

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#### ■ N-Channel 1 Electrical Characteristics Ta = 25°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Drain-Source Breakdown Voltage	V <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	30			V	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V			0.1	mA	
		V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C			20		
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V			±100	nA	
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.1		2.2	V	
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =8.8A			16	mΩ	
		V <sub>GS</sub> =10V, I <sub>D</sub> =8.8A, T <sub>J</sub> =125°C			25		
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A			22		
On State Drain Current	I <sub>D(ON)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	60			A	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =8.8A		29		S	
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz		1267	1600	pF	
Output Capacitance	C <sub>oss</sub>			308			
Reverse Transfer Capacitance	C <sub>rss</sub>			118			
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz		1.3	2	Ω	
Total Gate Charge (10V)	Q <sub>g</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =8.8A		21	30	nC	
Total Gate Charge (4.5V)				10.4			
Gate Source Charge			Q <sub>gs</sub>		3		
Gate Drain Charge			Q <sub>gd</sub>		3.6		
Turn-On DelayTime	t <sub>d(on)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.7Ω, R <sub>GEN</sub> =3Ω		5.2		ns	
Turn-On Rise Time	t <sub>r</sub>			3.8			
Turn-Off DelayTime	t <sub>d(off)</sub>			21.2			
Turn-Off Fall Time	t <sub>f</sub>			4.4			
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8.8A, di/dt= 300A/us		11.2	15	nC	
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>			10.5			
Maximum Body-Diode Continuous Current	I <sub>S</sub>				3.5	A	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =1A, V <sub>GS</sub> =0V			0.5	V	

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

#### ■ Marking

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## Dual N-Channel MOSFET

### AO4938 (KO4938)

#### ■ N-Channel 2 Electrical Characteristics Ta = 25°C

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V <sub>DSS</sub>	I <sub>D</sub> =250 μA, V <sub>GS</sub> =0V	30			V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V			1	μA
		V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C			5	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±16V			±10	μA
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.2		2.4	V
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =8A			19	mΩ
		V <sub>GS</sub> =10V, I <sub>D</sub> =8A, T <sub>J</sub> =125°C			25	
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A			28	
On State Drain Current	I <sub>D(ON)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =5V	40			A
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =8A		30		S
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz	600		888	pF
Output Capacitance	C <sub>oss</sub>		77		145	
Reverse Transfer Capacitance	C <sub>rss</sub>		50		115	
Gate Resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	0.5		1.7	Ω
Total Gate Charge (10V)	Q <sub>g</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =8A	12		18	nC
Total Gate Charge (4.5V)			6		9	
Gate Source Charge			Q <sub>gs</sub>	2		
Gate Drain Charge	Q <sub>gd</sub>		2		5	
Turn-On DelayTime	t <sub>d(on)</sub>	V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =1.8Ω, R <sub>GEN</sub> =3Ω		5		ns
Turn-On Rise Time	t <sub>r</sub>			3.5		
Turn-Off DelayTime	t <sub>d(off)</sub>			19		
Turn-Off Fall Time	t <sub>f</sub>			3.5		
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8A, di/dt= 500A/us	6		10	nC
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		14		22	
Maximum Body-Diode Continuous Current	I <sub>S</sub>				2.5	A
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =1A, V <sub>GS</sub> =0V			1	V

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

## Dual N-Channel MOSFET

### AO4938 (KO4938)

■ N-Channel 1 Typical Characteristics

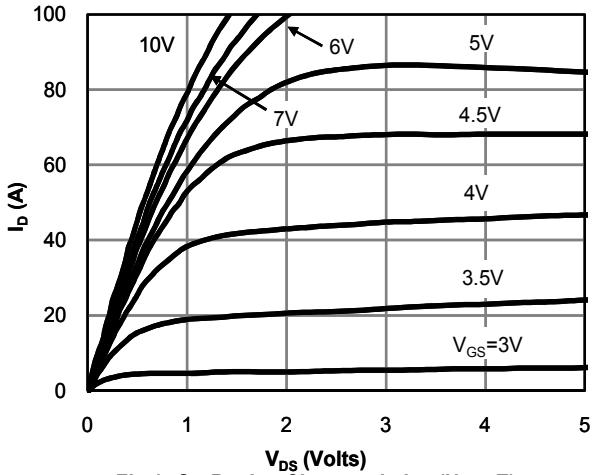


Fig 1: On-Region Characteristics (Note E)

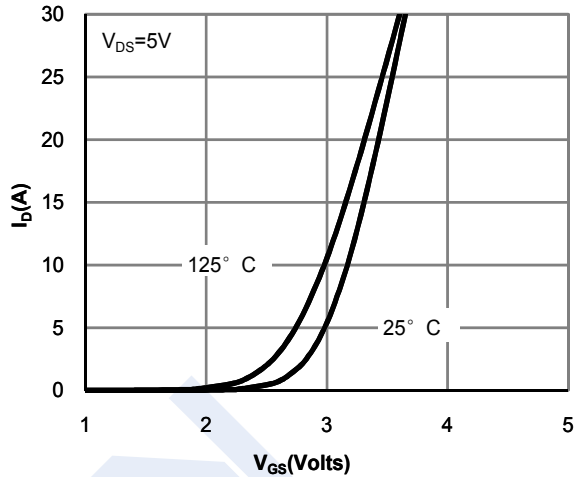


Figure 2: Transfer Characteristics (Note E)

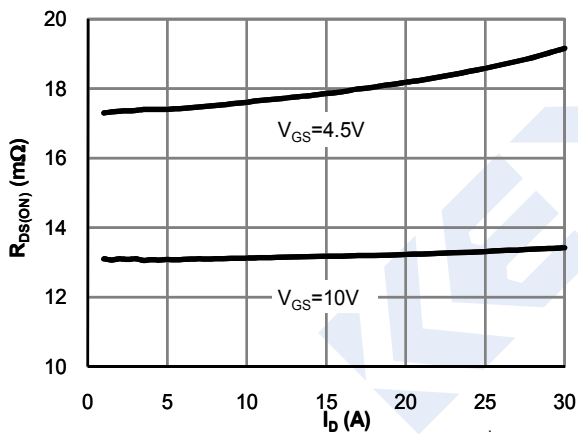


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

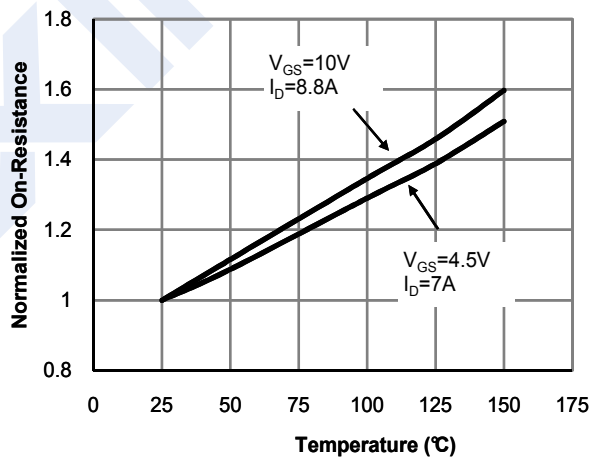


Figure 4: On-Resistance vs. Junction Temperature

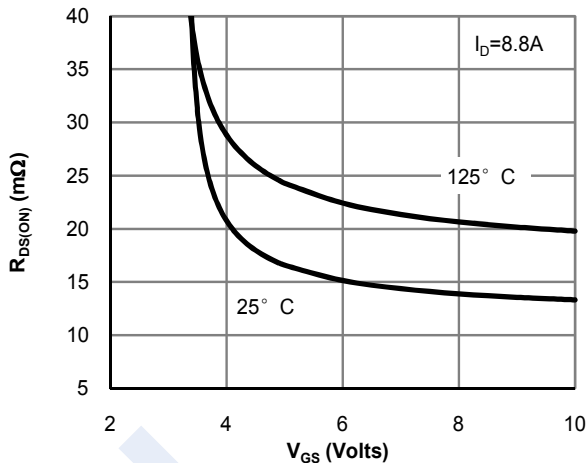


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

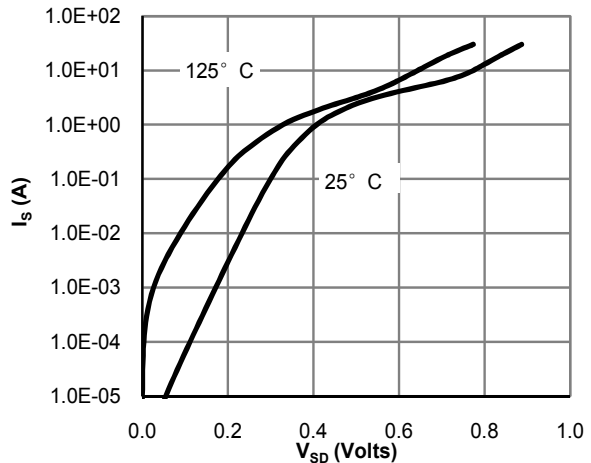


Figure 6: Body-Diode Characteristics (Note E)

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### AO4938 (KO4938)

■ N-Channel 1 Typical Characteristics

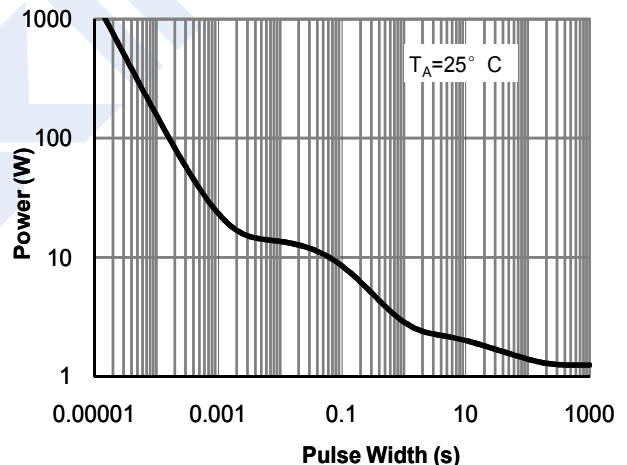
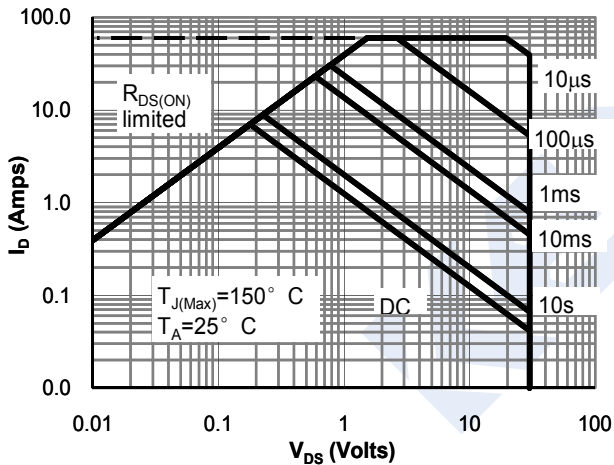
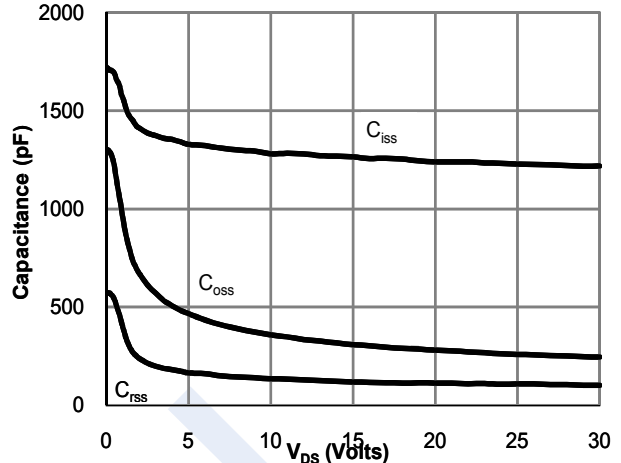
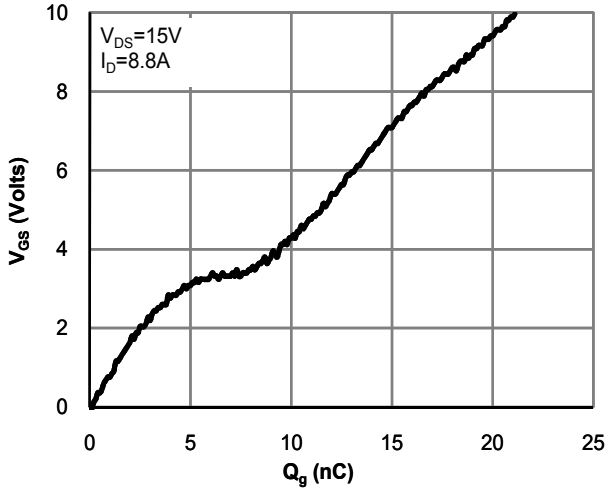


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

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

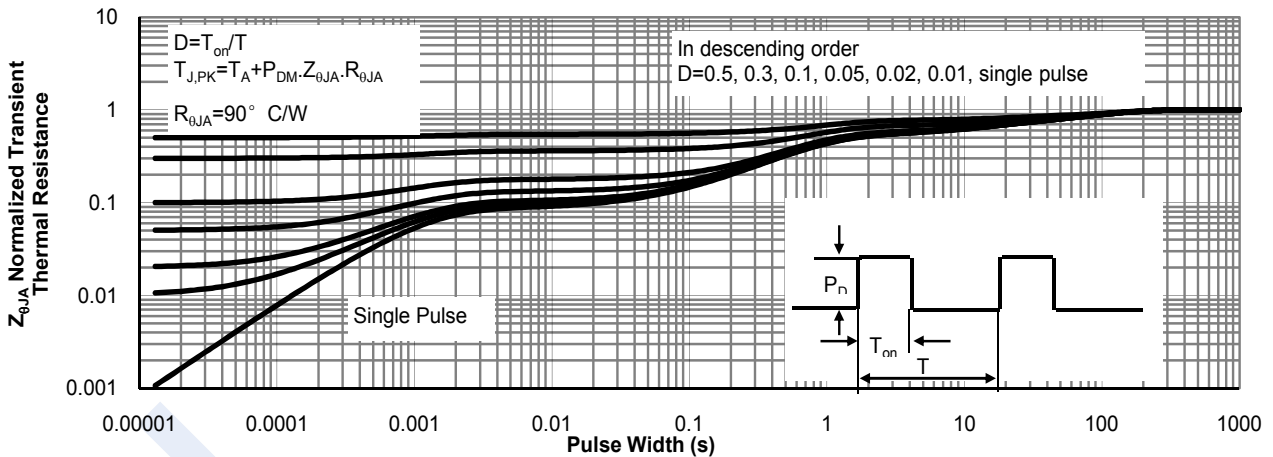


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## Dual N-Channel MOSFET

### AO4938 (KO4938)

■ N-Channel 2 Typical Characteristics

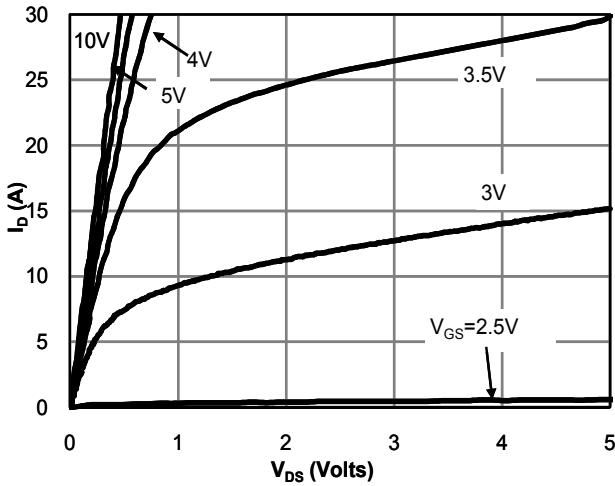


Fig 1: On-Region Characteristics (Note E)

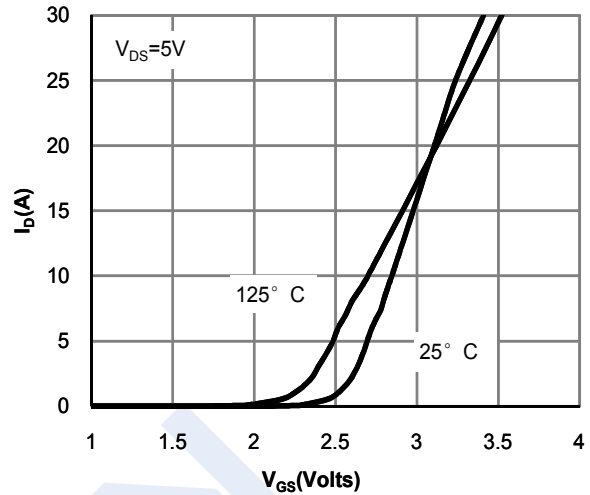


Figure 2: Transfer Characteristics (Note E)

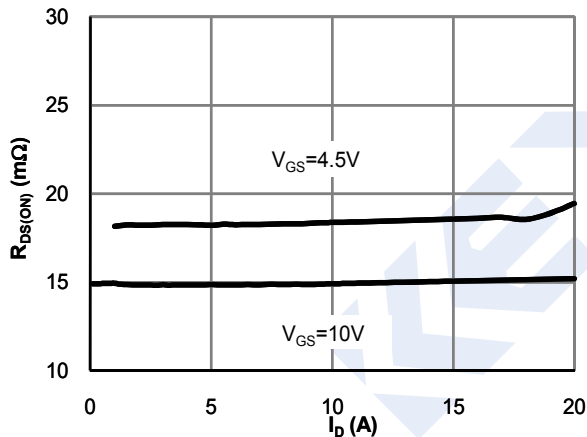


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

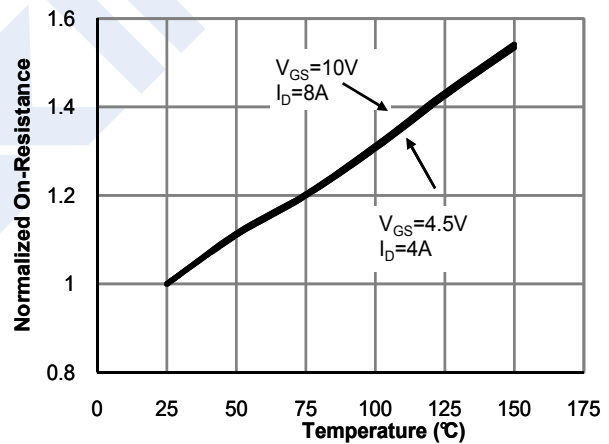


Figure 4: On-Resistance vs. Junction Temperature

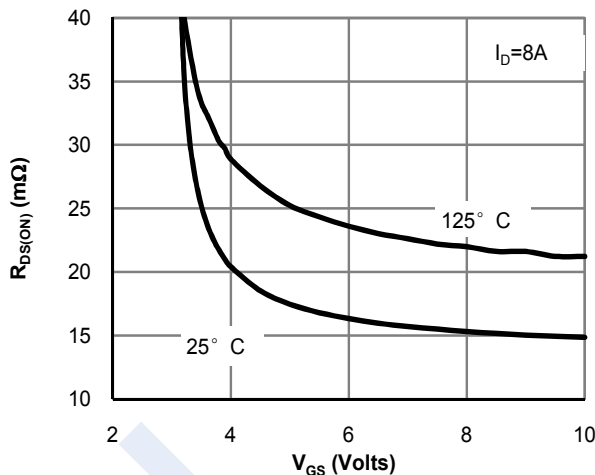


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

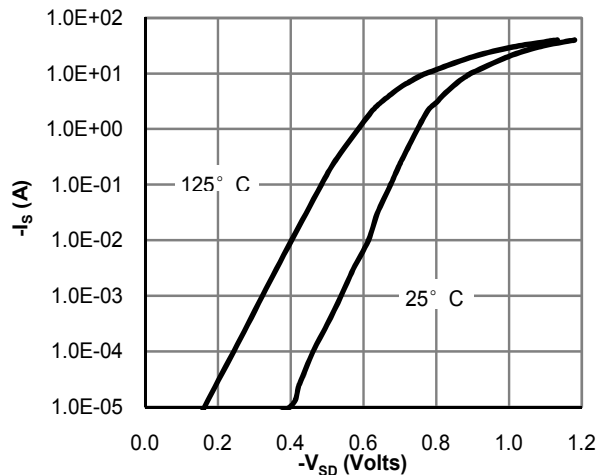


Figure 6: Body-Diode Characteristics (Note E)

## Dual N-Channel MOSFET AO4938 (KO4938)

■ N-Channel 2 Typical Characteristics

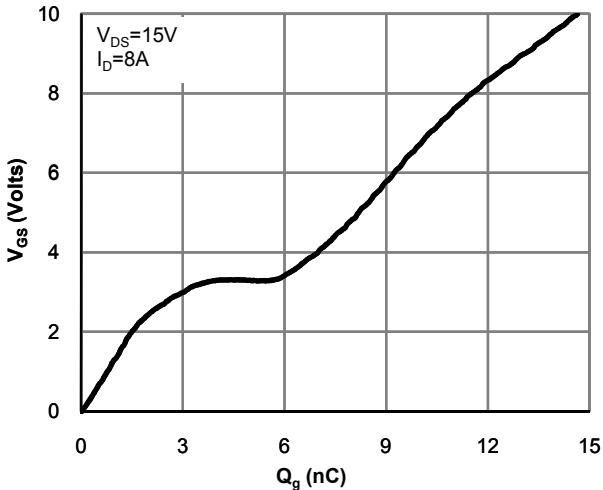


Figure 7: Gate-Charge Characteristics

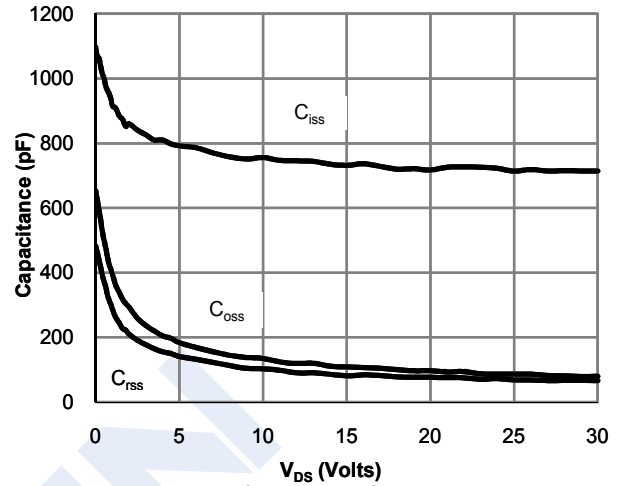


Figure 8: Capacitance Characteristics

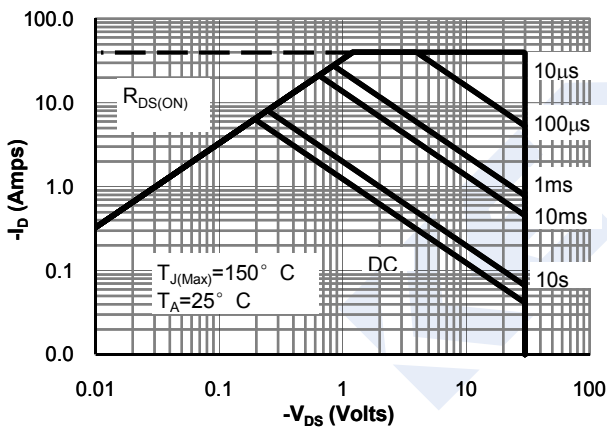


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

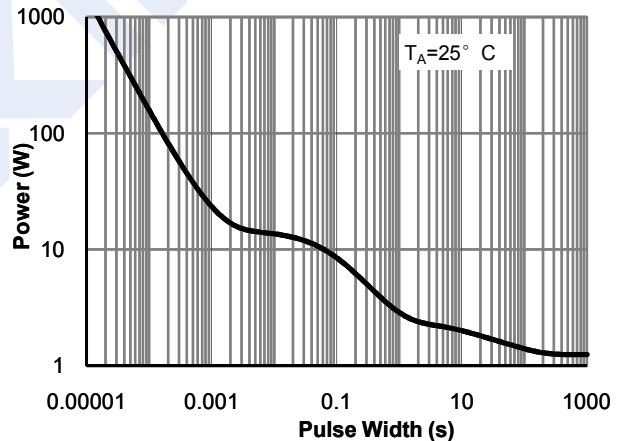


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note F)

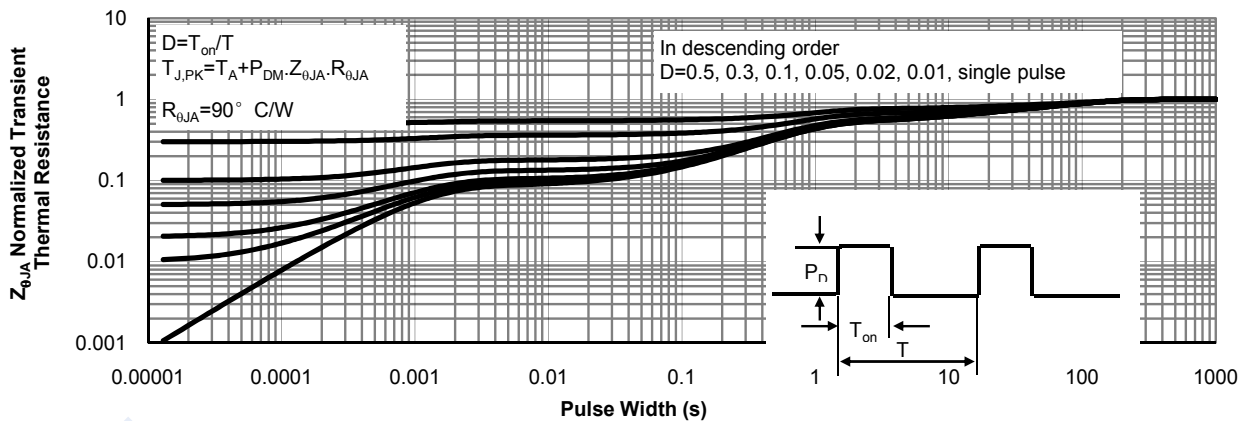


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)