

Complementary MOSFET with schottky diode

ELM14610AA-N

General description

ELM14610AA-N uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

Features

- | | | |
|--|----------------------------------|-------------------|
| N-channel | P-channel | Schottky diode |
| • $V_{ds}=30V$ | $V_{ds}=-30V$ | • $V_{ds}(V)=30V$ |
| • $I_d=8.5A$ ($V_{gs}=10V$) | $I_d=-7.1A$ ($V_{gs}=-10V$) | • $I_f=1A$ |
| • $R_{ds(on)} < 18m\Omega$ ($V_{gs}=10V$) | $< 25m\Omega$ ($V_{gs}=-10V$) | • $V_f < 0.5V@1A$ |
| • $R_{ds(on)} < 28m\Omega$ ($V_{gs}=4.5V$) | $< 40m\Omega$ ($V_{gs}=-4.5V$) | |

Maximum absolute ratings

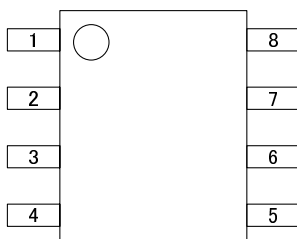
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Schottky(Max.)	Unit	Note	
Drain-source voltage	V_{ds}	30	-30		V		
Gate-source voltage	V_{gs}	± 20	± 20		V		
Continuous drain current	I_d	$T_a=25^\circ C$	8.5	-7.1		A	1
		$T_a=70^\circ C$	6.6	-5.6			
Pulsed drain current	I_{dm}	30	-30		A	2	
Reverse voltage	V_{ds}			30	V		
Continuous forward current	I_f	$T_a=25^\circ C$		3	A	1	
		$T_a=70^\circ C$		2			
Pulsed diode forward current	I_{fm}			20	A	2	
Power dissipation	P_d	$T_a=25^\circ C$	2.00	2.00	2.00	W	1
		$T_a=70^\circ C$	1.28	1.28	1.28		
Junction and storage temperature range	T_j, T_{stg}	-55 to 150	-55 to 150	-55 to 150	$^\circ C$		

Thermal characteristics

Parameter	Symbol	Device	Typ.	Max.	Unit	Note	
Maximum junction-to-ambient	$R_{\theta ja}$	N-ch	$t \leq 10s$	48.0	62.5	$^\circ C/W$	1
Maximum junction-to-ambient			Steady-state	74.0	110.0		
Maximum junction-to-lead			Steady-state	$R_{\theta jl}$	35.0		
Maximum junction-to-ambient	$R_{\theta ja}$	P-ch	$t \leq 10s$	48.0	62.5	$^\circ C/W$	1
Maximum junction-to-ambient			Steady-state	74.0	110.0		
Maximum junction-to-lead			Steady-state	$R_{\theta jl}$	35.0		
Maximum junction-to-ambient	$R_{\theta ja}$	Schottky	$t \leq 10s$	47.5	62.5	$^\circ C/W$	1
Maximum junction-to-ambient			Steady-state	71.0	110.0		
Maximum junction-to-lead			Steady-state	$R_{\theta jl}$	32.0		

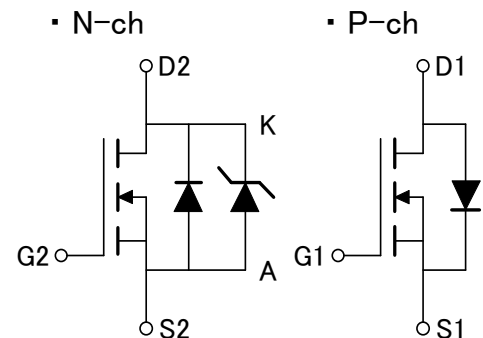
Pin configuration

SOP-8 (TOP VIEW)



Pin No.	Pin name
1	SOURCE2/ANODE
2	GATE2
3	SOURCE1
4	GATE1
5	DRAIN1
6	DRAIN1
7	DRAIN2/CATHODE
8	DRAIN2/CATHODE

Circuit



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■ Electrical characteristics (N-ch + Schottky)

T_a=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BV _{dss}	I _d =250 μA, V _{gs} =0V	30			V
Zero gate voltage drain current	I _{dss}	V _{ds} =24V, V _{gs} =0V			25	μA
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	1.0	1.8	3.0	V
On state drain current	I _{d(on)}	V _{gs} =4.5V, V _{ds} =5V	40			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V		15.5	18.0	mΩ
		I _d =8.5A	T _j =125°C	22.3	27.0	
		V _{gs} =4.5V, I _d =6.6A		23.0	28.0	mΩ
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =8.5A	10	23		S
Body diode+Schottky forward voltage	V _{sd}	I _s =1A		0.75	1.00	V
Max. body-diode+Schottky continuous current	I _s				5.5	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =15V, f=1MHz		1040		pF
Output capacitance (FET+Schottky)	C _{oss}			180		pF
Reverse transfer capacitance	C _{rss}			110		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		0.7		Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Q _g	V _{gs} =10V, V _{ds} =15V, I _d =8.5A		19.20		nC
Total gate charge (4.5V)	Q _g			9.36		nC
Gate-source charge	Q _{gs}			2.60		nC
Gate-drain charge	Q _{gd}			4.20		nC
Turn-on delay time	t _{d(on)}	V _{gs} =10V, V _{ds} =15V R _l =1.8 Ω, R _{gen} =3 Ω		5.2		ns
Turn-on rise time	t _r			4.4		ns
Turn-off delay time	t _{d(off)}			17.3		ns
Turn-off fall time	t _f			3.3		ns
Body diode+Schottky reverse recovery time	t _{rr}	I _f =8.5A, dI/dt=100A/μs		16.7		ns
Body diode+Schottky reverse recovery charge	Q _{rr}	I _f =8.5A, dI/dt=100A/μs		6.7		nC
SCHOTTKY PARAMETERS						
Forward voltage drop	V _f	I _f =1.0A		0.45	0.50	V
Max. reverse leakage current	I _{rm}	V _r =30V		0.007	0.050	mA
		V _r =30V, T _j =125°C		3.200	10.000	
		V _r =30V, T _j =150°C		12.000	20.000	
Junction capacitance	C _t	V _r =15V		37		pF

NOTE :

- The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.
- Repetitive rating, pulse width limited by junction temperature.
- The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
- The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5%max.
- These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics (N-ch)

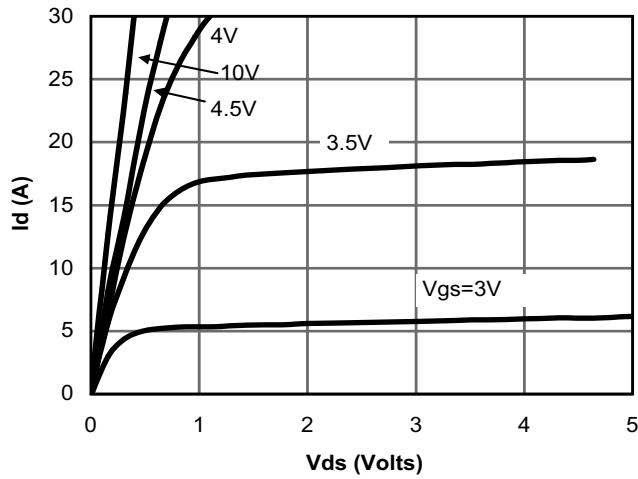


Fig 1: On-Region Characteristics

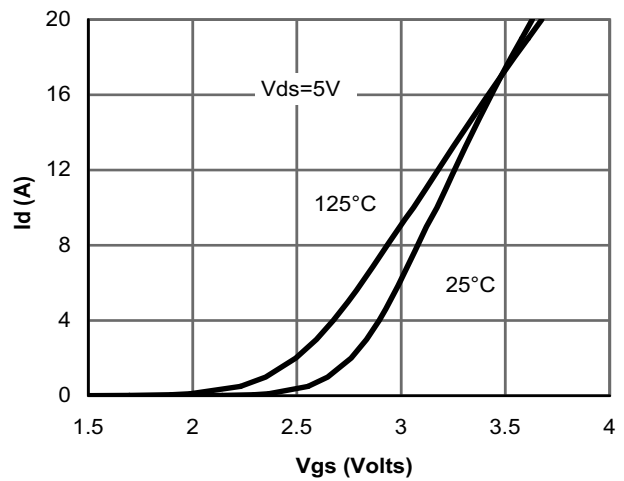


Figure 2: Transfer Characteristics

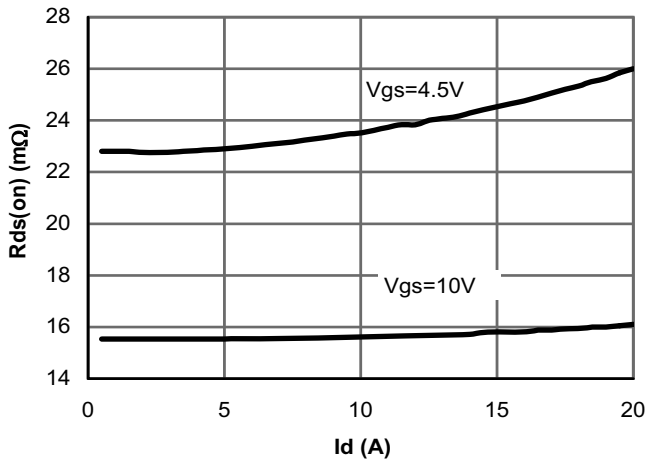


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

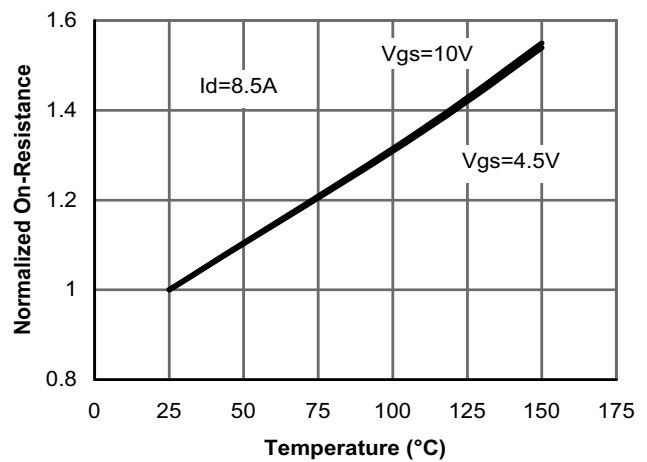


Figure 4: On-Resistance vs. Junction Temperature

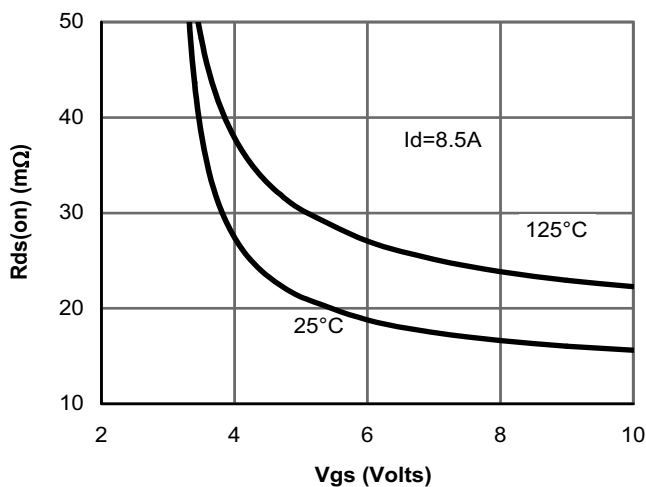


Figure 5: On-Resistance vs. Gate-Source Voltage

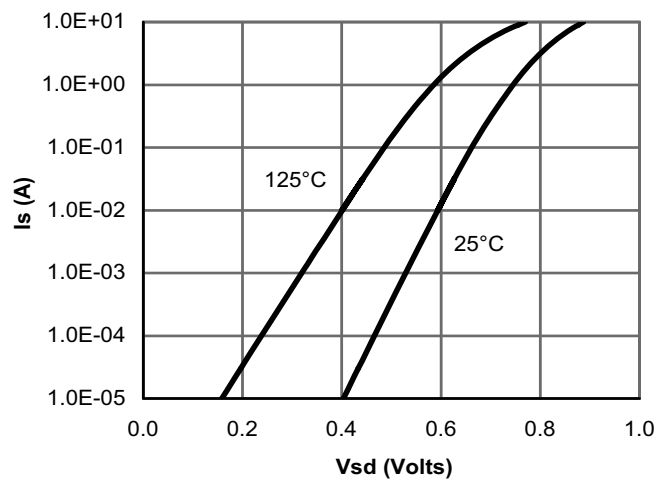


Figure 6: Body-Diode Characteristics

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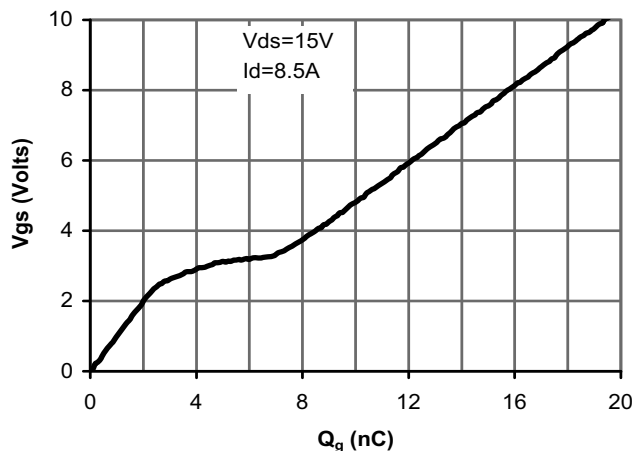


Figure 7: Gate-Charge Characteristics

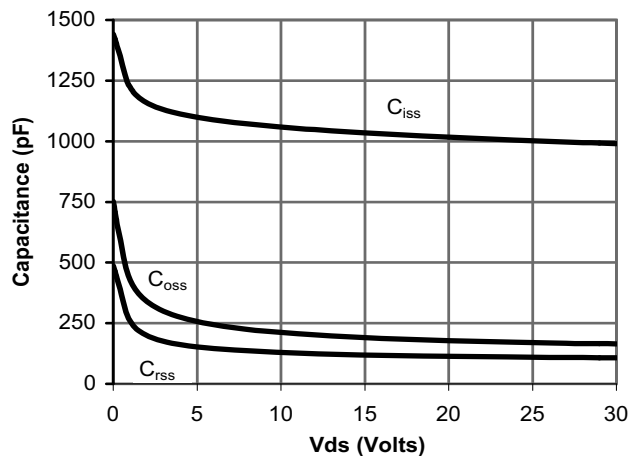


Figure 8: Capacitance Characteristics

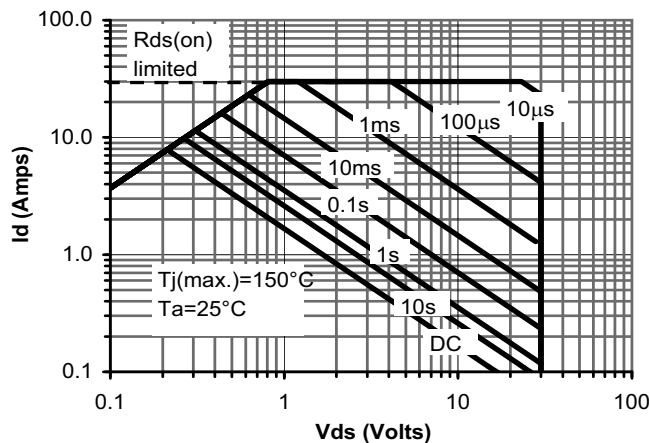


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

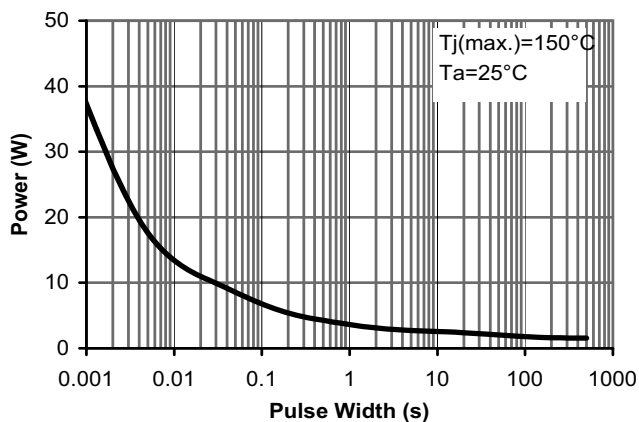


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

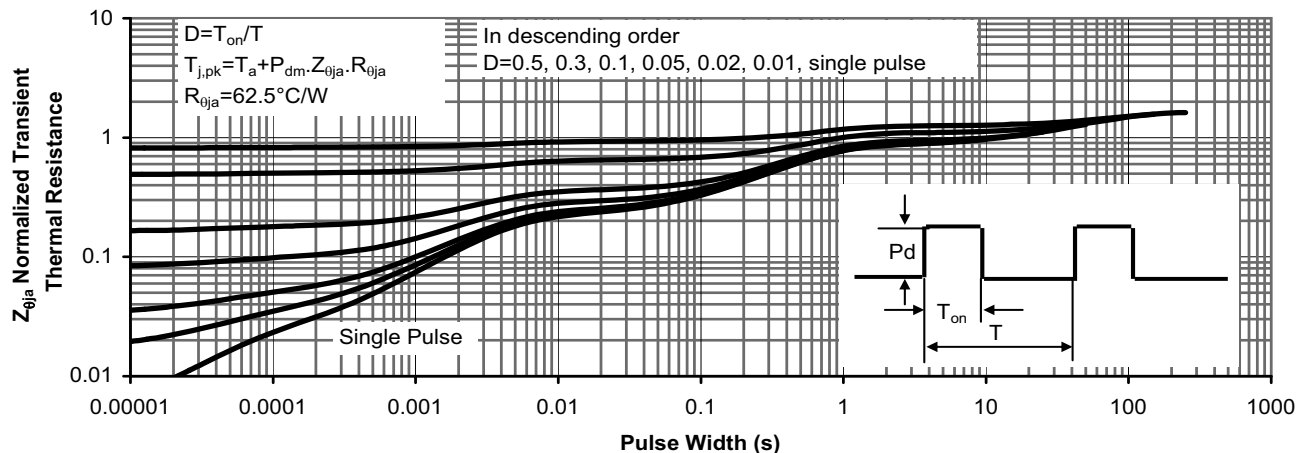


Figure 11: Normalized Maximum Transient Thermal Impedance

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■ Electrical characteristics (P-ch)

T_a=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BV _{dss}	I _d =-250 μA, V _{gs} =0V	-30			V
Zero gate voltage drain current	I _{dss}	V _{ds} =-24V V _{gs} =0V T _j =55°C			-1 -5	μA
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	-1.4	-2.0	-2.7	V
On state drain current	I _{d(on)}	V _{gs} =-10V, V _{ds} =-5V	-30			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =-10V I _d =-7.1A T _j =125°C		20	25	mΩ
		V _{gs} =-4.5V, I _d =-5.6A		27	33	
					29	40
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-7.1A		19.6		S
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.7	-1.0	V
Max. body-diode continuous current	I _s				-4.2	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			1573		pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =-15V, f=1MHz		319		pF
Reverse transfer capacitance	C _{rss}			211		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		6.7		Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Q _g			30.9		nC
Total gate charge (4.5V)	Q _g	V _{gs} =-10V, V _{ds} =-15V		16.1		nC
Gate-source charge	Q _{gs}	I _d =-7.1A		8.0		nC
Gate-drain charge	Q _{gd}			4.4		nC
Turn-on delay time	t _{d(on)}			9.5		ns
Turn-on rise time	t _r	V _{gs} =-10V, V _{ds} =-15V		8.0		ns
Turn-off delay time	t _{d(off)}	R _l =2.2 Ω, R _{gen} =3 Ω		44.2		ns
Turn-off fall time	t _f			22.2		ns
Body diode reverse recovery time	t _{rr}	I _f =-7.1A, dI/dt=100A/μs		25.5		ns
Body diode reverse recovery charge	Q _{rr}	I _f =-7.1A, dI/dt=100A/μs		14.7		nC

NOTE :

1. The value of R_{θja} is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with T_a=25°C. The value in any given applications depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The R_{θja} is the sum of the thermal impedance from junction to lead R_{θjl} and lead to ambient.
4. The static characteristics in Figures 1 to 6, 12, 14 are obtained using 80 μs pulses, duty cycle 0.5% max.
5. These tests are performed with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_a=25°C. The SOA curve provides a single pulse rating.

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Typical electrical and thermal characteristics (P-ch)

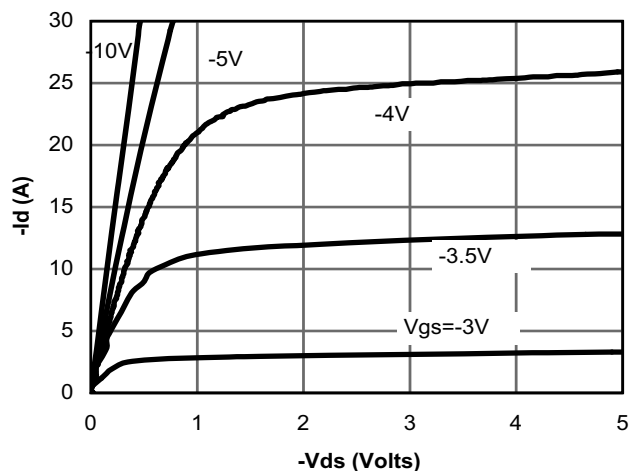


Fig 16: On-Region Characteristics

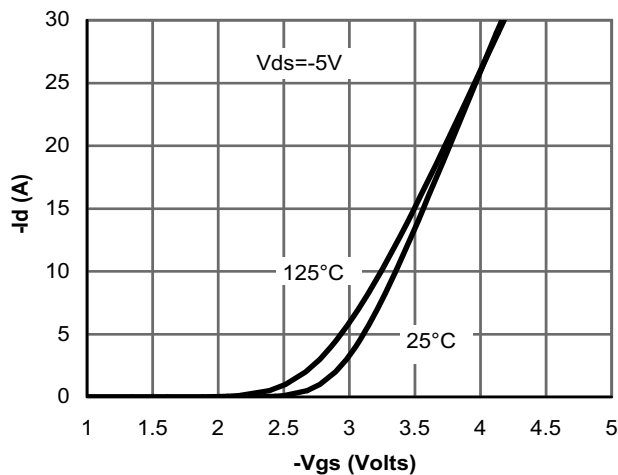


Figure 17: Transfer Characteristics

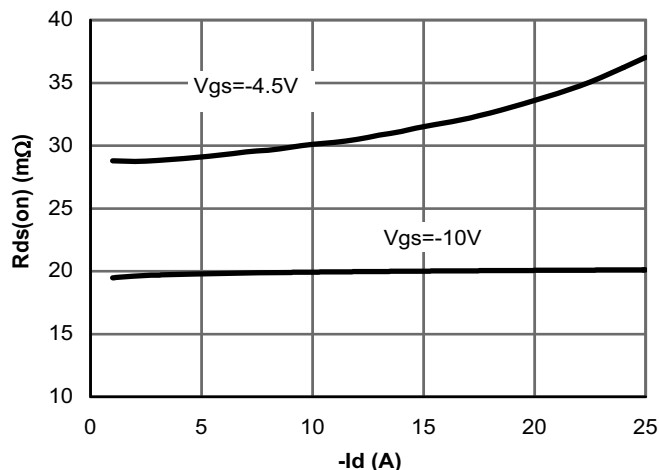


Figure 18: On-Resistance vs. Drain Current and Gate Voltage

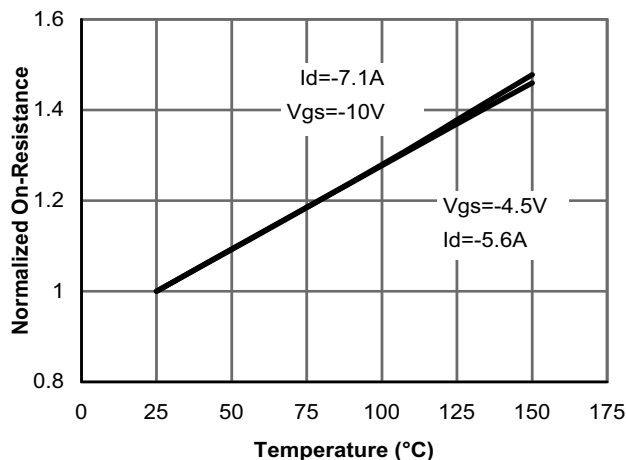


Figure 19: On-Resistance vs. Junction Temperature

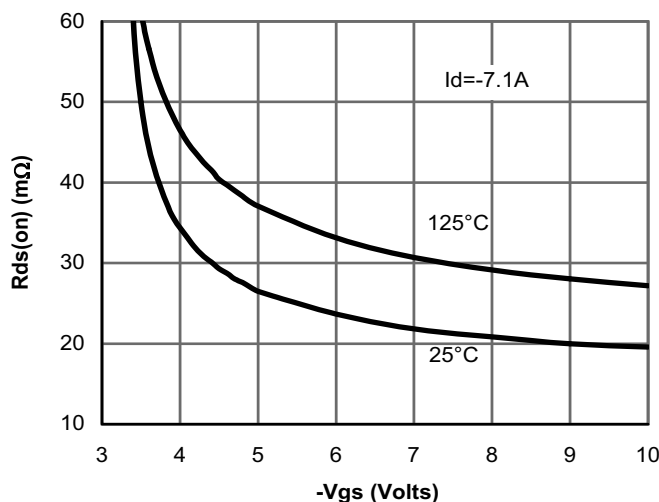


Figure 20: On-Resistance vs. Gate-Source Voltage

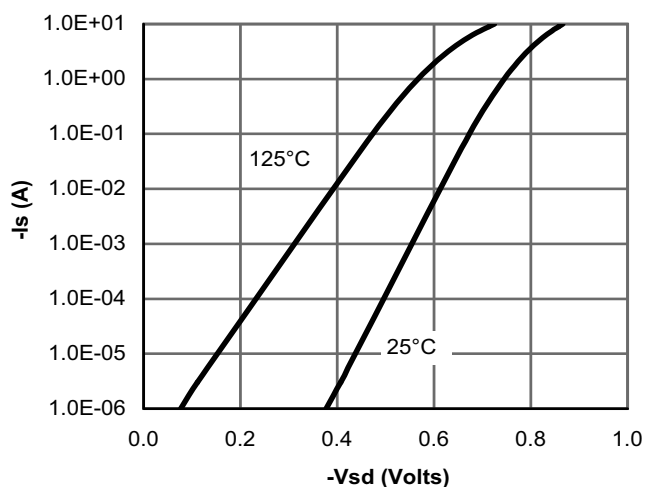


Figure 21: Body-Diode Characteristics

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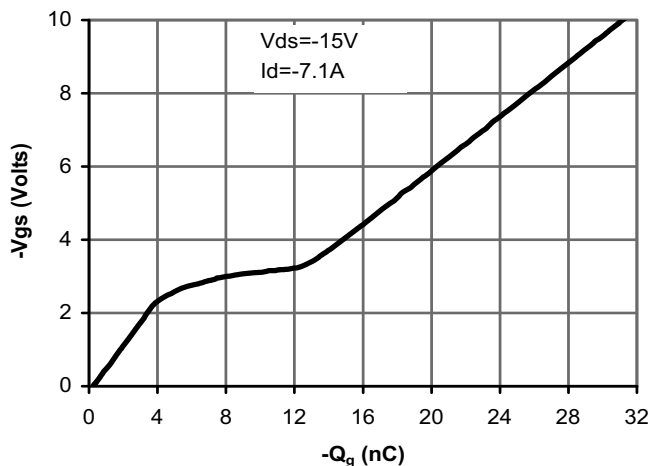


Figure 22: Gate-Charge Characteristics

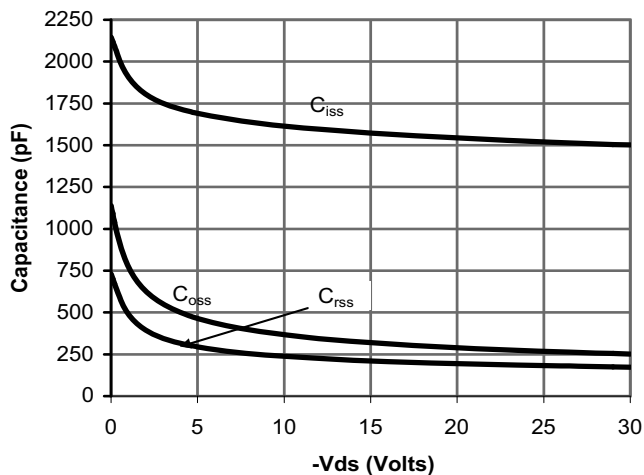


Figure 23: Capacitance Characteristics

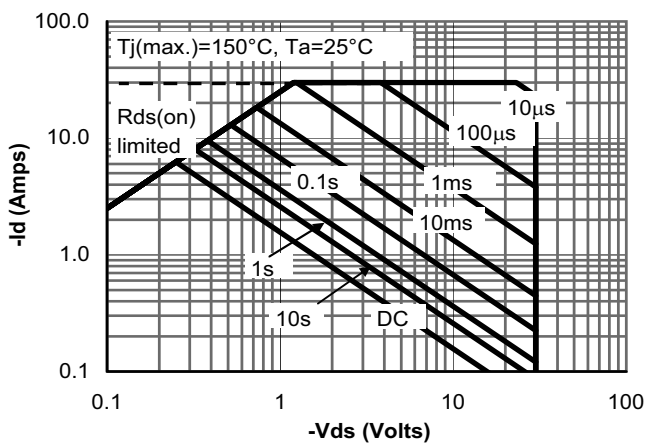


Figure 24: Maximum Forward Biased Safe Operating Area (Note E)

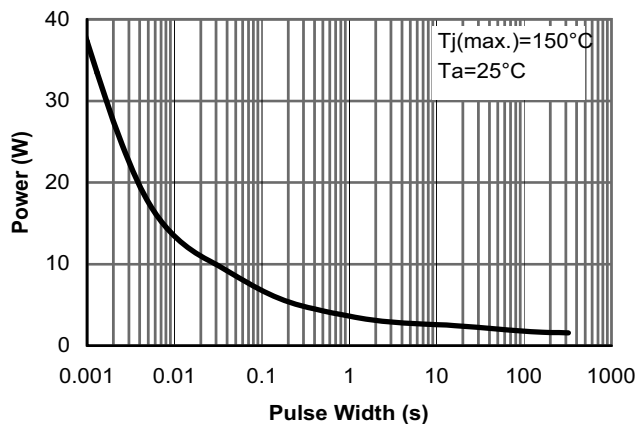


Figure 25: Single Pulse Power Rating Junction-to-Ambient (Note E)

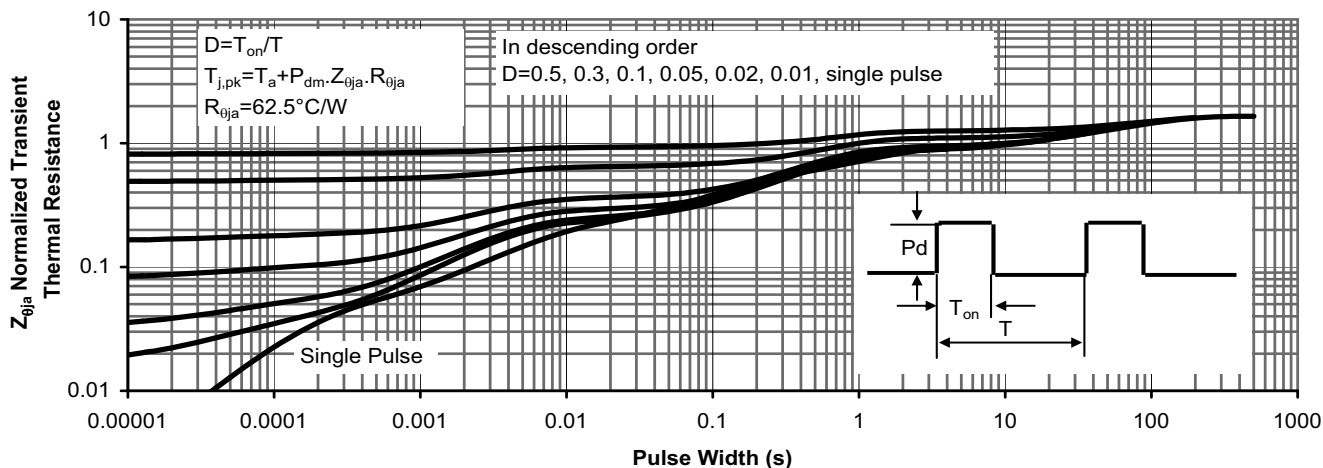


Figure 26: Normalized Maximum Transient Thermal Impedance

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Typical electrical and thermal characteristics (Schottky)

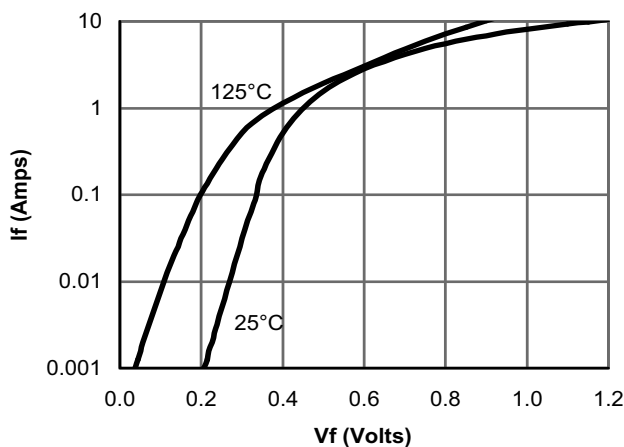


Figure 12: Schottky Forward Characteristics

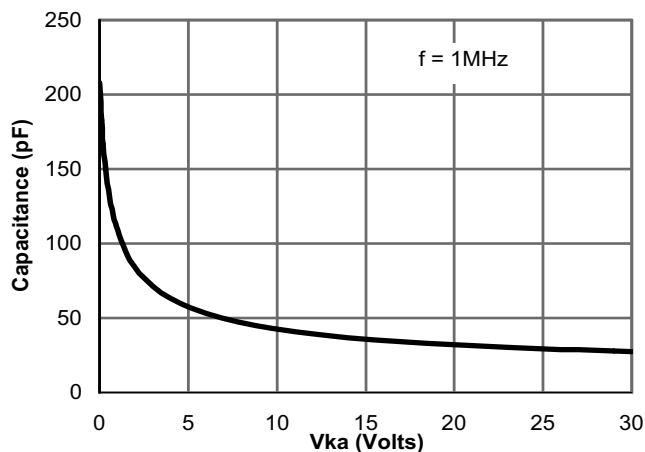


Figure 13: Schottky Capacitance Characteristics

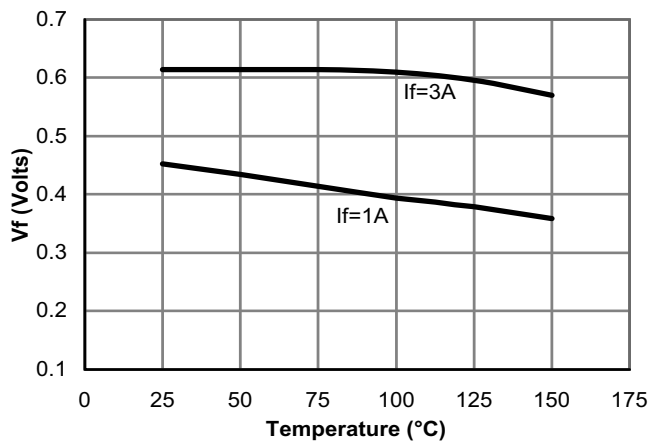


Figure 14: Schottky Forward Drop vs. Junction Temperature

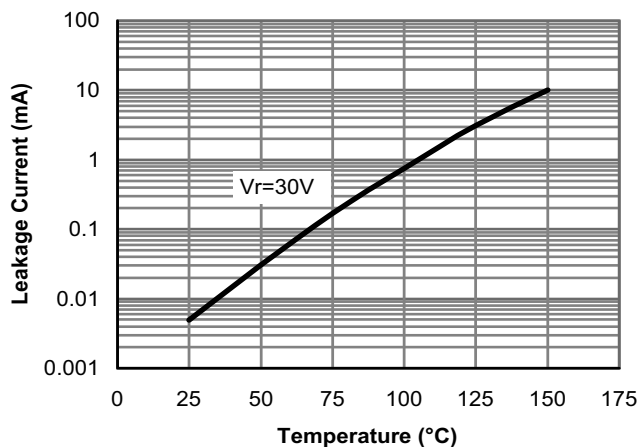


Figure 15: Schottky Leakage current vs. Junction Temperature

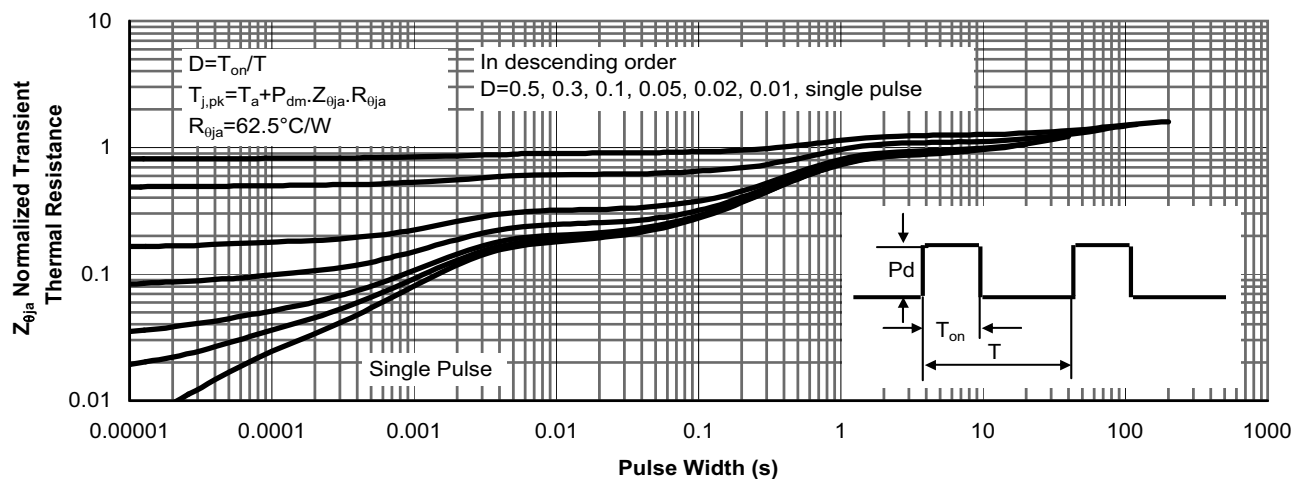


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance