

Complementary MOSFET

ELM14604AA-N

■ General Description

ELM14604AA-N uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

■ Features

- | | |
|---|--|
| N-channel | P-channel |
| • $V_{ds}=30V$ | $V_{ds}=-30V$ |
| • $I_d=6.9A(V_{gs}=10V)$ | $I_d=-5A(V_{gs}=-10V)$ |
| • $R_{ds(on)} < 28m\Omega(V_{gs}=10V)$ | $R_{ds(on)} < 52m\Omega(V_{gs}=-10V)$ |
| • $R_{ds(on)} < 42m\Omega(V_{gs}=4.5V)$ | $R_{ds(on)} < 87m\Omega(V_{gs}=-4.5V)$ |

■ Maximum Absolute Ratings

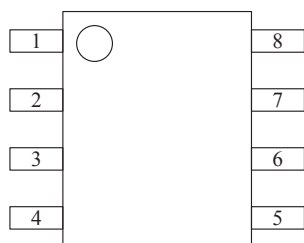
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note	
Drain-source voltage	V_{ds}	30	-30	V		
Gate-source voltage	V_{gs}	± 20	± 20	V		
Continuous drain current	I_d	$T_a=25^\circ C$	6.9	-5.0	A	1
		$T_a=70^\circ C$	5.8	-4.2		
Pulsed drain current	I_{dm}	30	-20	A	2	
Power dissipation	P_d	$T_a=25^\circ C$	2.00	2.00	W	
		$T_a=70^\circ C$	1.44	1.44		
Junction and storage temperature range	T_j, T_{stg}	-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	$^\circ C/W$	
Maximum junction-to-lead			Steady-state	35.0	40.0	$^\circ C/W$	
Maximum junction-to-ambient	$R_{\theta ja}$	P-ch	$t \leq 10s$	48.0	62.5	$^\circ C/W$	1
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Maximum junction-to-lead			Steady-state	35.0	40.0	$^\circ C/W$	

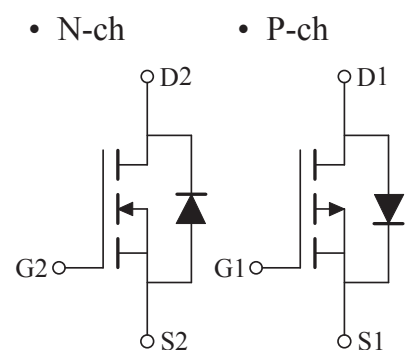
■ Pin configuration

SOP-8(TOP VIEW)



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

■ Circuit



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■ Electrical Characteristics (N-ch)

Ta=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V	30			V
Zero gate voltage drain current	Idss	Vds=24V, Vgs=0V Tj=55°C		0.004	1.000	μA
					5.000	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA	1.0	1.9	3.0	V
On state drain current	Id(on)	Vgs=4.5V, Vds=5V	20			A
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=6.9A Tj=125°C		22.5	28.0	mΩ
				31.3	38.0	
		Vgs=4.5V, Id=5.0A		34.5	42.0	
Forward transconductance	Gfs	Vds=5V, Id=6.9A	10.0	15.4		S
Diode forward voltage	Vsd	Is=1A		0.76	1.00	V
Max.body-diode continuous current	Is				3	A
DYNAMIC PARAMETERS						
Input capacitance	Ciss			680	820	pF
Output capacitance	Coss	Vgs=0V, Vds=15V, f=1MHz		102		pF
Reverse transfer capacitance	Crss			77		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz		3.0	3.6	Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Qg	Vgs=10V, Vds=15V, Id=6.9A		13.84	17.00	nC
Total gate charge (4.5V)	Qg			6.74	8.10	nC
Gate-source charge	Qgs			1.82		nC
Gate-drain charge	Qgd			3.20		nC
Turn-on delay time	td(on)	Vgs=10V, Vds=15V Rl=2.2Ω, Rgen=3Ω		4.6		ns
Turn-on rise time	tr			4.1		ns
Turn-off delay time	td(off)			20.6		ns
Turn-off fall time	tf			5.2		ns
Body-diode reverse recovery time	trr	If=6.9A, dl/dt=100A/μs		16.5	20.0	ns
Body-diode reverse recovery charge	Qrr	If=6.9A, dl/dt=100A/μs		7.8		nC

NOTE :

1. The value of Rθja is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with Ta=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 Rθja is the sum of the thermal impedance from junction to lead Rθjl and lead to ambient.
4. The static characteristics in Figures 1 to 6 are obtained using 80μs 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 Ta=25°C. The SOA curve provides a single pulse rating.

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■ Typical Electrical and Thermal Characteristics (N-ch)

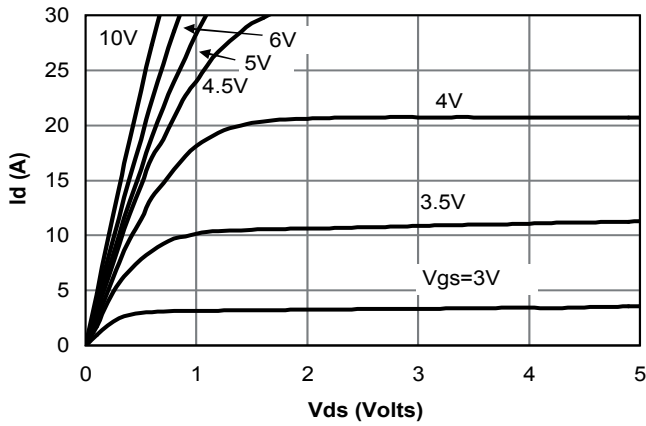


Fig 1: On-Region Characteristics

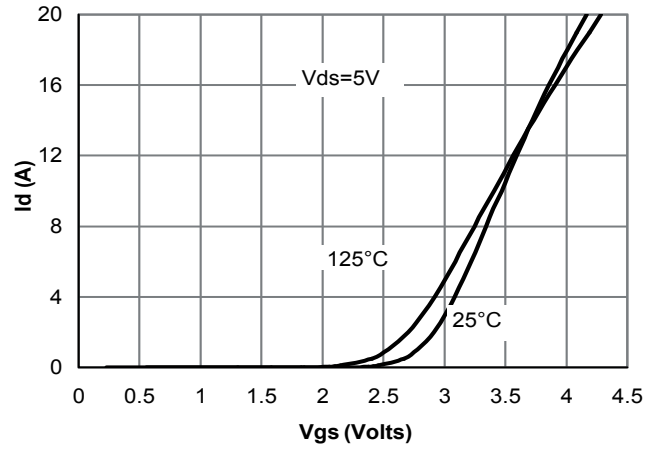


Figure 2: Transfer Characteristics

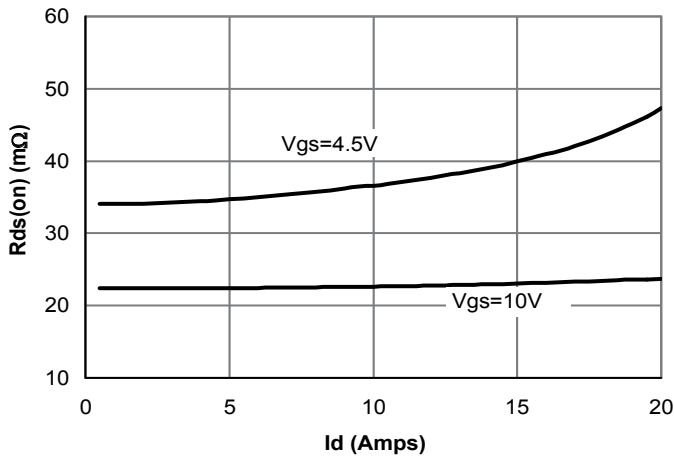


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

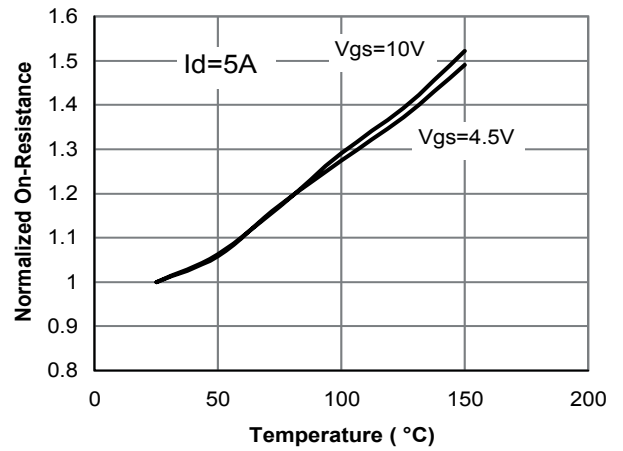


Figure 4: On-Resistance vs. Junction Temperature

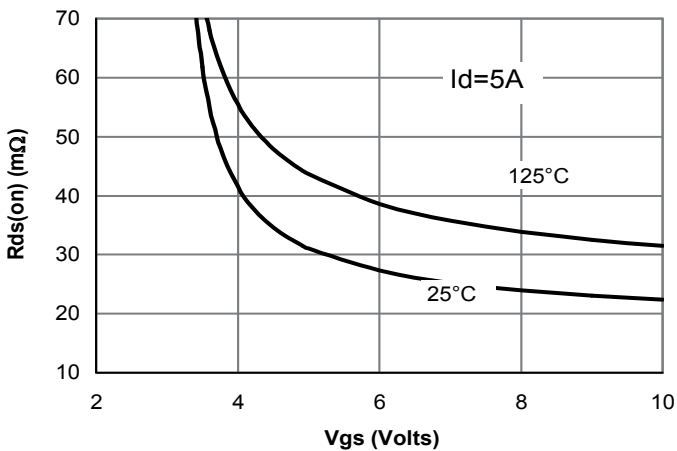


Figure 5: On-Resistance vs. Gate-Source Voltage

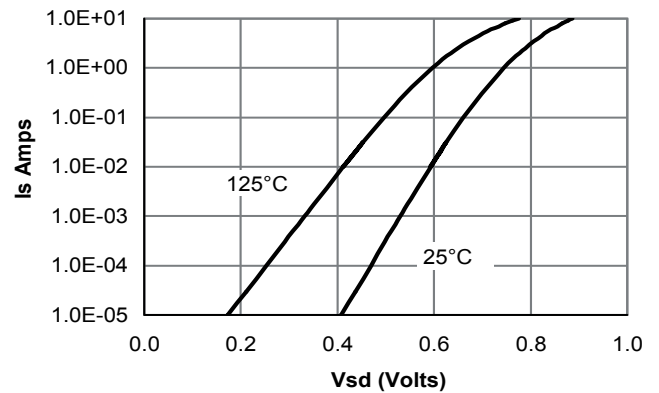


Figure 6: Body diode characteristics

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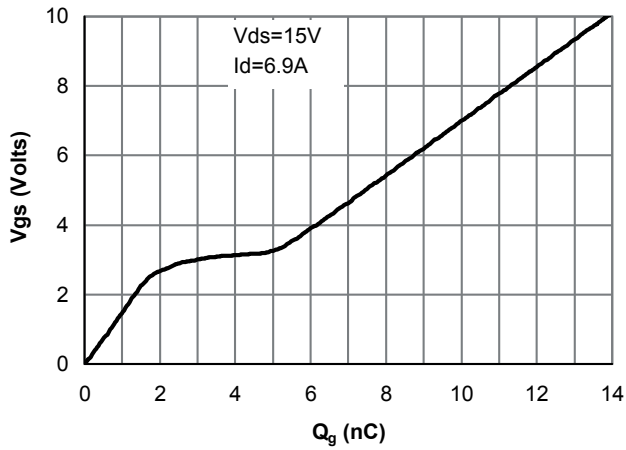


Figure 7: Gate-Charge characteristics

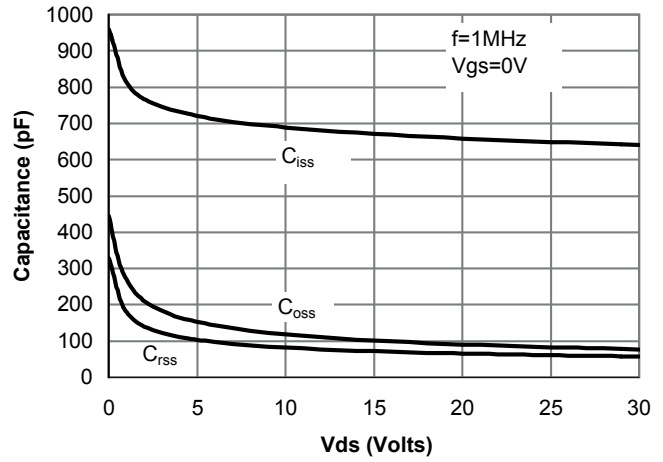


Figure 8: Capacitance Characteristics

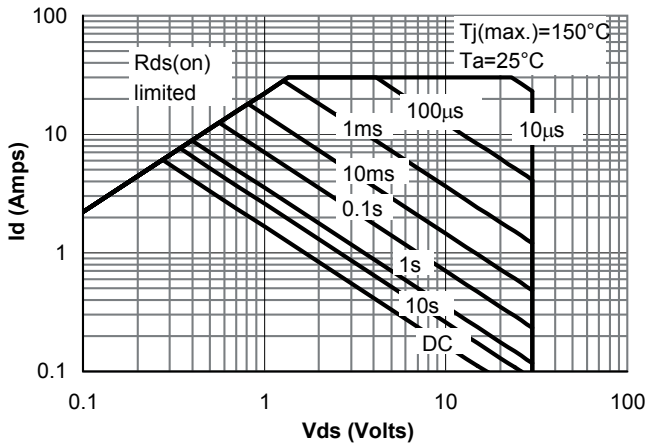


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

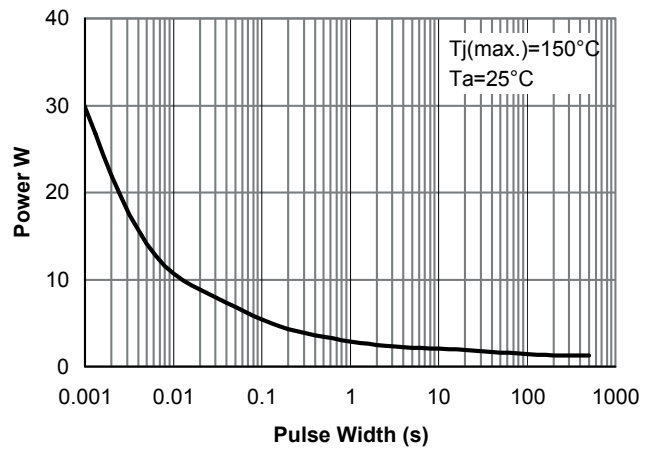


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

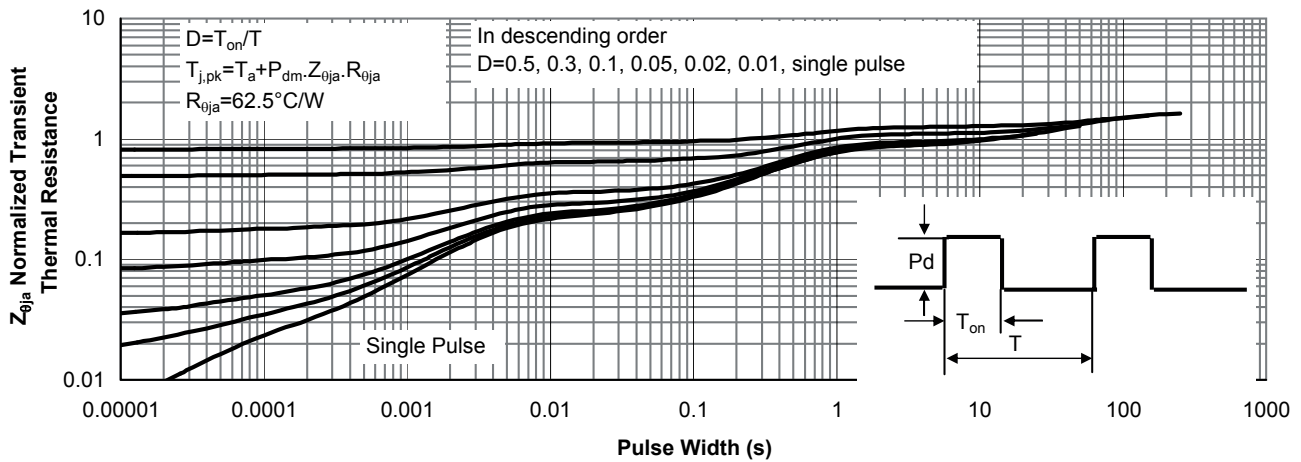


Figure 11: Normalized Maximum Transient Thermal Impedance

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■ Electrical Characteristics (P-ch)

Ta=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-source breakdown voltage	BVdss	Id=-250μA, Vgs=0V	-30			V
Zero gate voltage drain current	Idss	Vds=-24V, Vgs=0V Tj=55°C			-1	μA
					-5	
Gate-body leakage current	Igss	Vds=0V, Vgs=±20V			±100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=-250μA	-1.0	-1.8	-3.0	V
On state drain current	Id(on)	Vgs=-4.5V, Vds=-5V	-20			A
Static drain-source on-resistance	Rds(on)	Vgs=-10V, Id=-5A Tj=125°C		39	52	mΩ
				54	70	
		Vgs=-4.5V, Id=-4A		67	87	mΩ
Forward transconductance	Gfs	Vds=-5V, Id=-5A	6.0	8.6		S
Diode forward voltage	Vsd	Is=-1A, Vgs=0V		-0.77	-1.00	V
Max. body-diode continuous current	Is				-2.8	A
DYNAMIC PARAMETERS						
Input capacitance	Ciss			700	900	pF
Output capacitance	Coss	Vgs=0V, Vds=-15V, f=1MHz		120		pF
Reverse transfer capacitance	Crss			75		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz		10	15	Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Qg	Vgs=-10V, Vds=-15V, Id=-5A		14.7	19.0	nC
Total gate charge (4.5V)	Qg			7.6	10.0	nC
Gate-source charge	Qgs			2.0		nC
Gate-drain charge	Qgd			3.8		nC
Turn-on delay time	td(on)			8.3		ns
Turn-on rise time	tr	Vgs=-10V, Vds=-15V		5.0		ns
Turn-off delay time	td(off)	RI=3Ω, Rgen=3Ω		29.0		ns
Turn-off fall time	tf			14.0		ns
Body diode reverse recovery time	trr	If=-5A, dl/dt=100A/μs		23.5	30.0	ns
Body diode reverse recovery charge	Qrr	If=-5A, dl/dt=100A/μs		13.4		nC

NOTE :

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2. Repetitive rating, pulse width limited by junction temperature.
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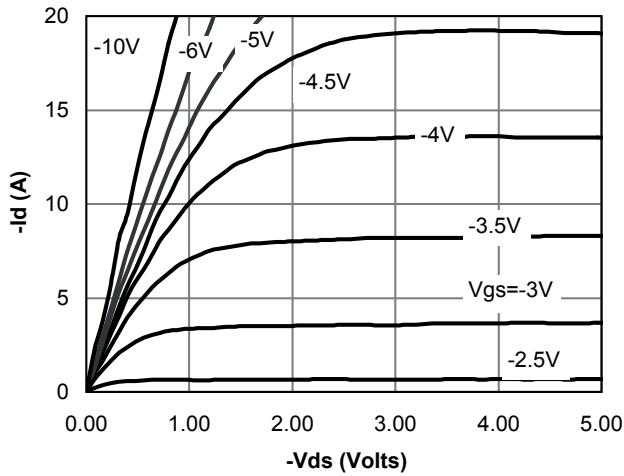


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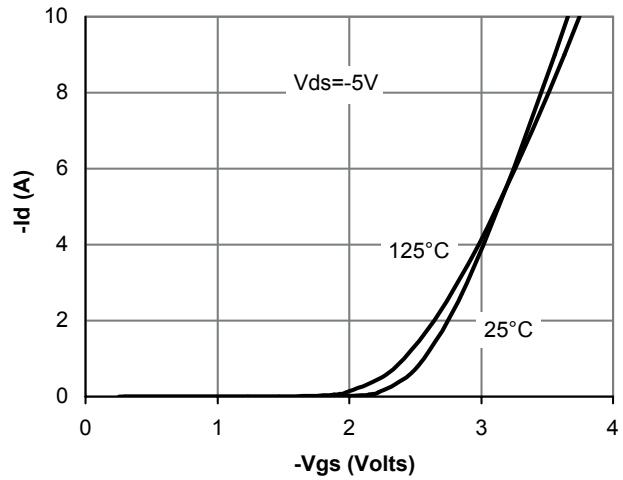


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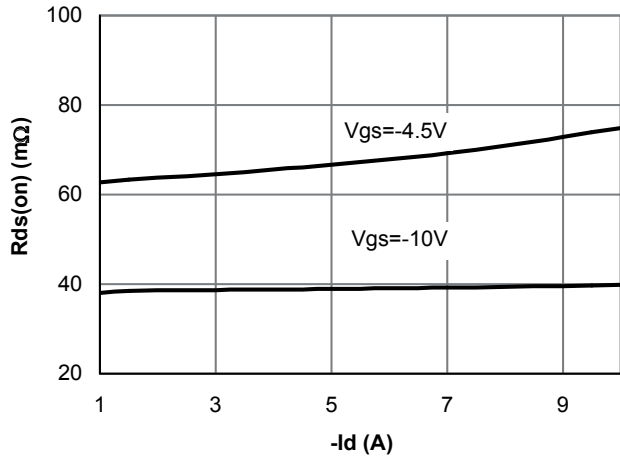


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

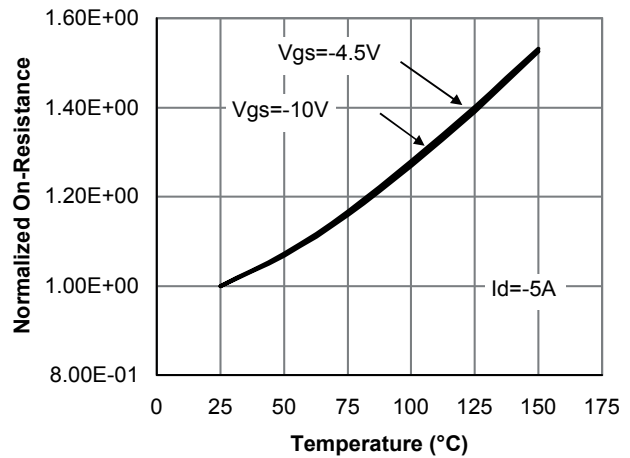


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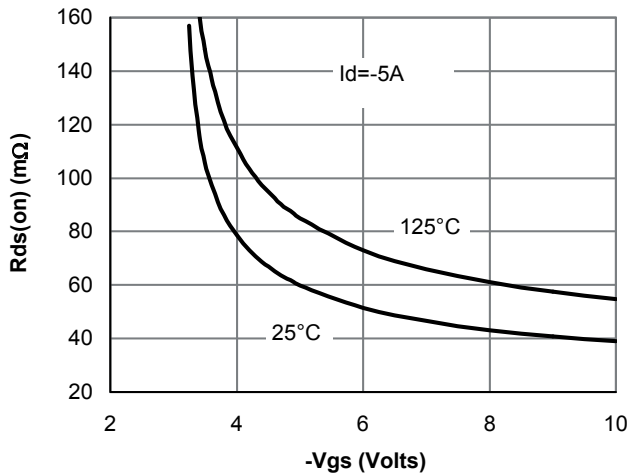


Figure 5: On-Resistance vs. Gate-Source Voltage

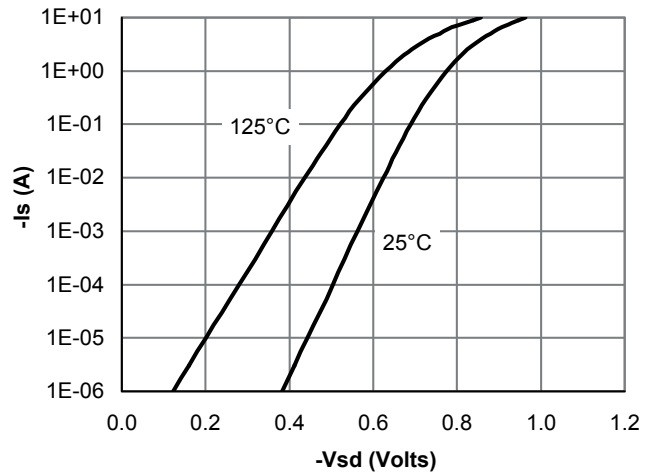


Figure 6: Body-Diode Characteristics

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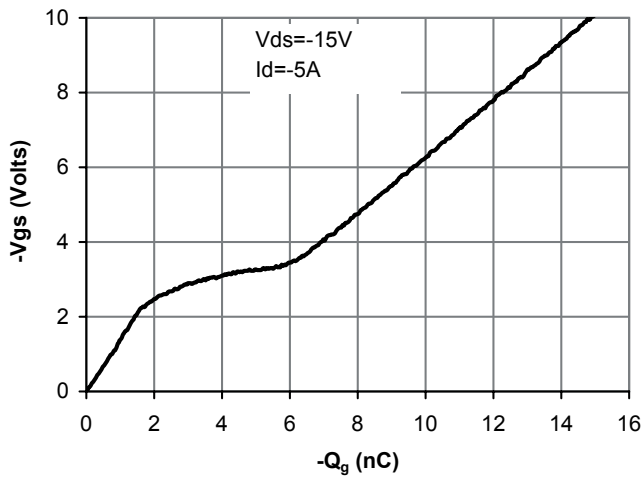


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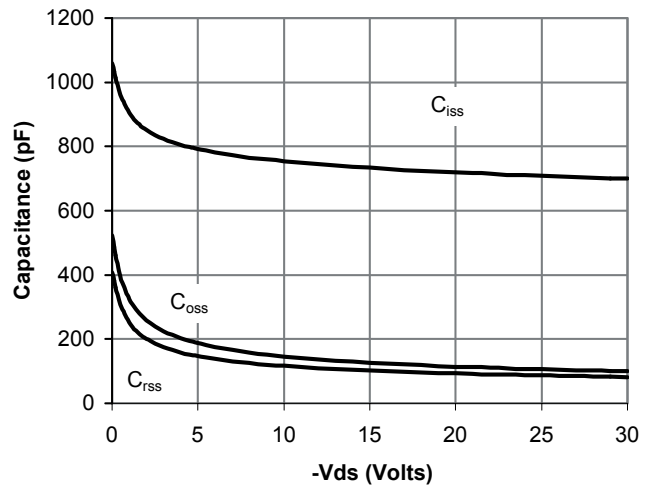


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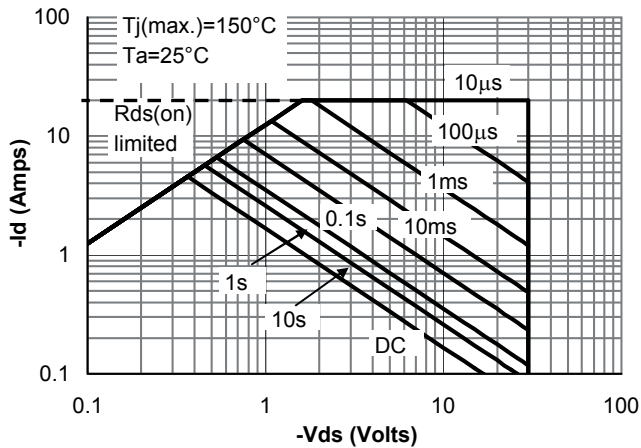


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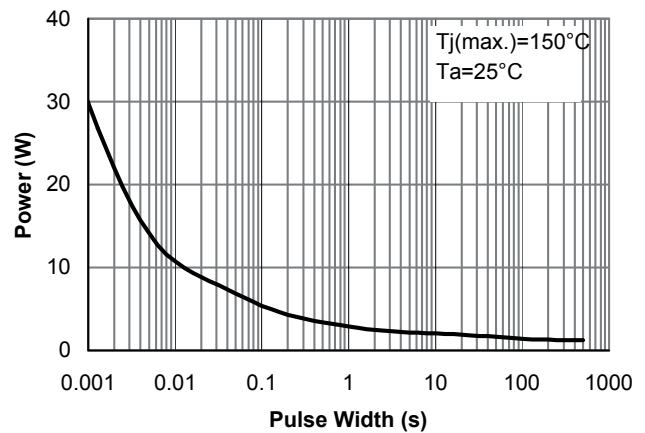


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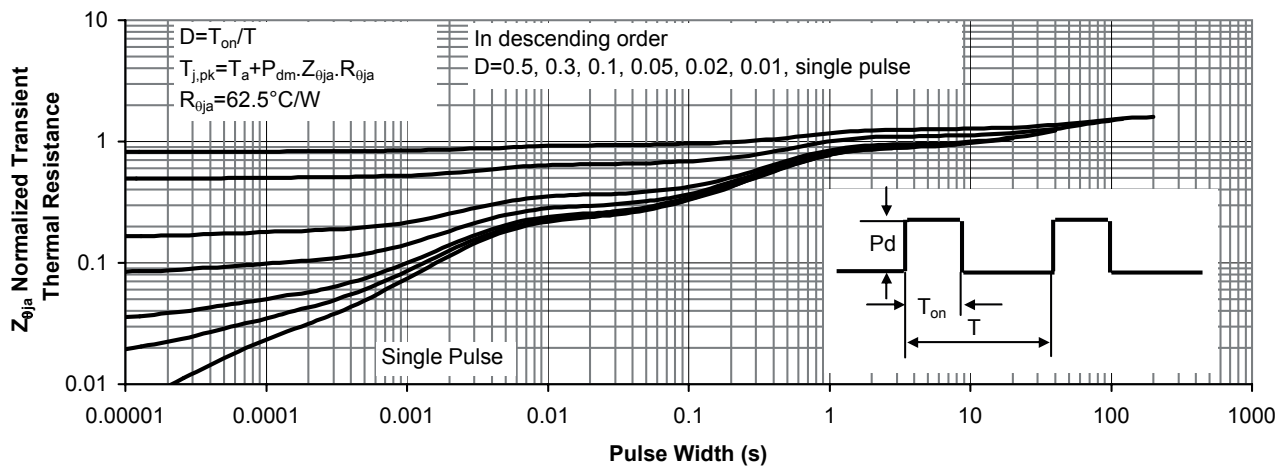


Figure 11: Normalized Maximum Transient Thermal Impedance