

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

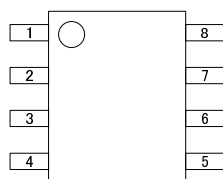
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage	V_{ds}	30	-30	V	
Gate-source voltage	V_{gs}	± 20	± 20	V	
Continuous drain current	$T_a=25^\circ C$	6.9	-5.0	A	1
	$T_a=70^\circ C$	5.8	-4.2		
Pulsed drain current	I_{dm}	30	-20	A	2
Power dissipation	$T_a=25^\circ C$	2.00	2.00	W	
	$T_a=70^\circ C$	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
			Steady-state	74.0	110.0	$^\circ C/W$	
			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
			Steady-state	74.0	110.0	$^\circ C/W$	
			Maximum junction-to-lead	Steady-state	$R_{\theta jl}$	35.0	

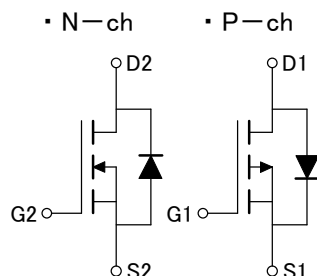
Pin Configuration

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



Complementary MOSFET

ELM14604AA-N

Electrical Characteristics (N-ch)

T_a=25°C

Parameter	Symbol	Conditions	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		0.004	1.000	μA
		T _j =55°C			5.000	
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	1.9	3.0	V
On state drain current	I _{d(on)}	V _{gs} =4.5V, V _{ds} =5V	20			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V I _d =6.9A		22.5	28.0	mΩ
		T _j =125°C		31.3	38.0	
		V _{gs} =4.5V, I _d =5.0A		34.5	42.0	
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =6.9A	10.0	15.4		S
Diode forward voltage	V _{sd}	I _s =1A		0.76	1.00	V
Max.body-diode continuous current	I _s				3	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =15V, f=1MHz		680	820	pF
Output capacitance	C _{oss}			102		pF
Reverse transfer capacitance	C _{rss}			77		pF
Gate resistance	R _g			3.0	3.6	Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Q _g	V _{gs} =10V, V _{ds} =15V, I _d =6.9A		13.84	17.00	nC
Total gate charge (4.5V)	Q _g			6.74	8.10	nC
Gate-source charge	Q _{gs}			1.82		nC
Gate-drain charge	Q _{gd}			3.20		nC
Turn-on delay time	t _{d(on)}			4.6		ns
Turn-on rise time	t _r	V _{gs} =10V, V _{ds} =15V		4.1		ns
Turn-off delay time	t _{d(off)}	R _l =2.2 Ω, R _{gen} =3 Ω		20.6		ns
Turn-off fall time	t _f			5.2		ns
Body-diode reverse recovery time	t _{rr}	I _f =6.9A, dI/dt=100A/μs		16.5	20.0	ns
Body-diode reverse recovery charge	Q _{rr}	I _f =6.9A, dI/dt=100A/μs		7.8		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 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.

Complementary MOSFET

ELM14604AA-N

Typical Electrical and Thermal Characteristics (N-ch)

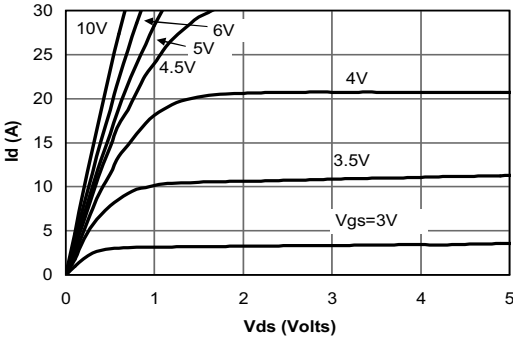


Fig 1: On-Region Characteristics

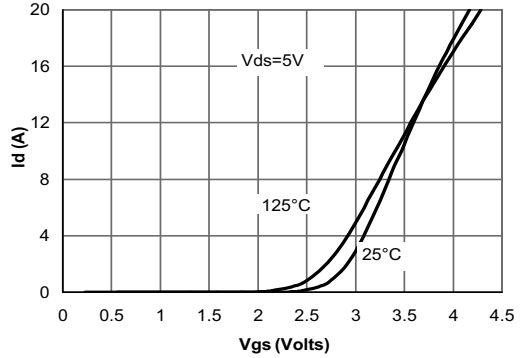


Figure 2: Transfer Characteristics

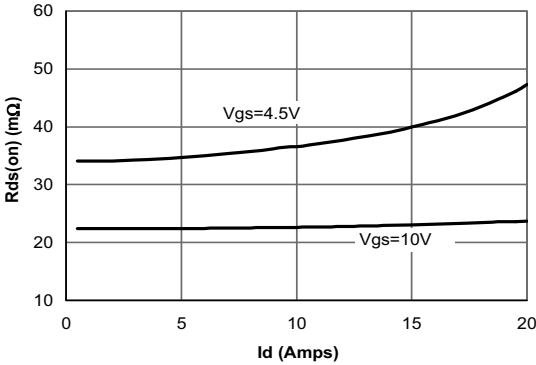


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

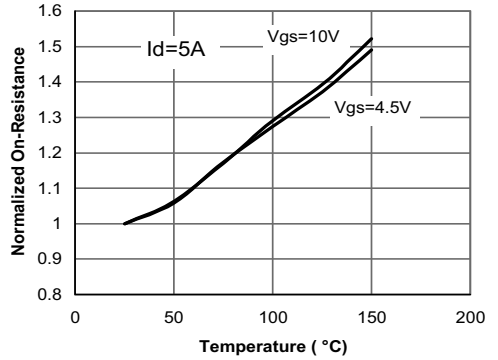


Figure 4: On-Resistance vs. Junction Temperature

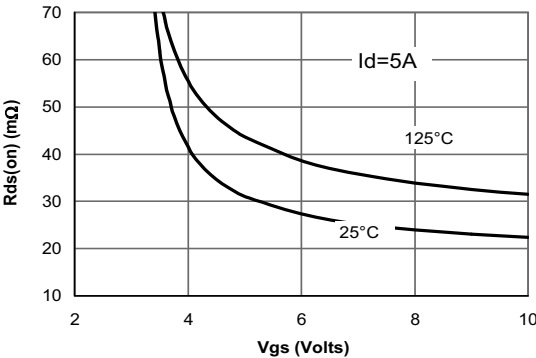


Figure 5: On-Resistance vs. Gate-Source Voltage

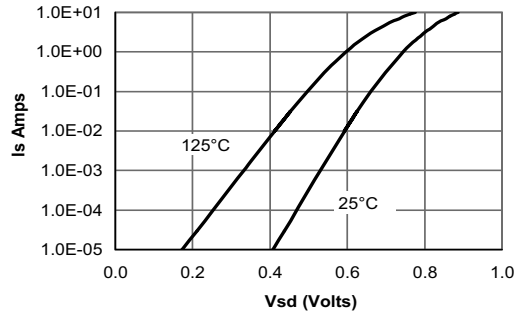


Figure 6: Body diode characteristics

Complementary MOSFET

ELM14604AA-N

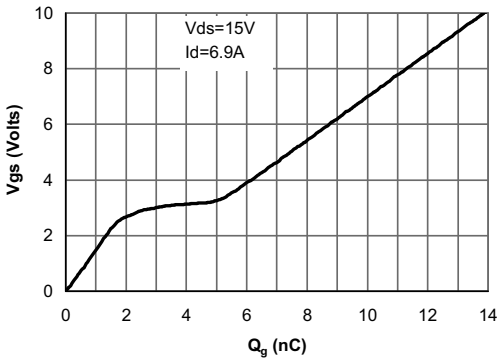


Figure 7: Gate-Charge characteristics

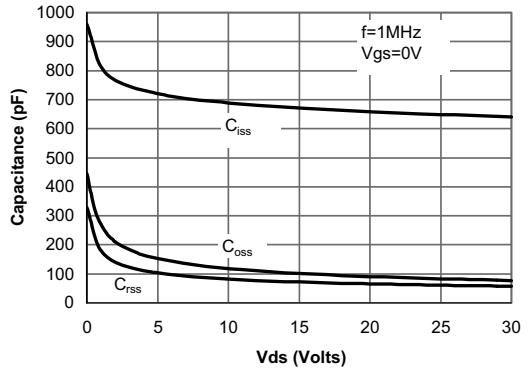


Figure 8: Capacitance Characteristics

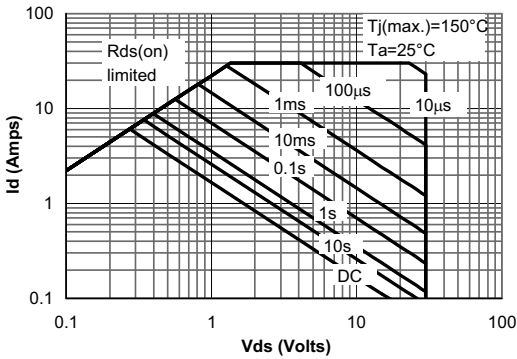


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

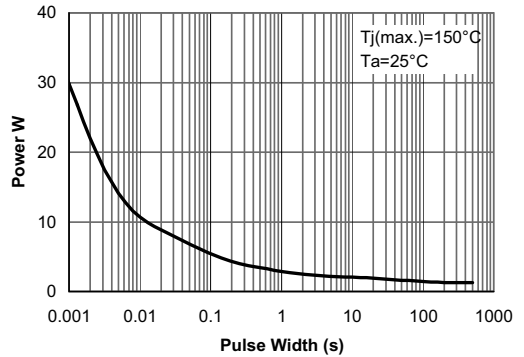


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

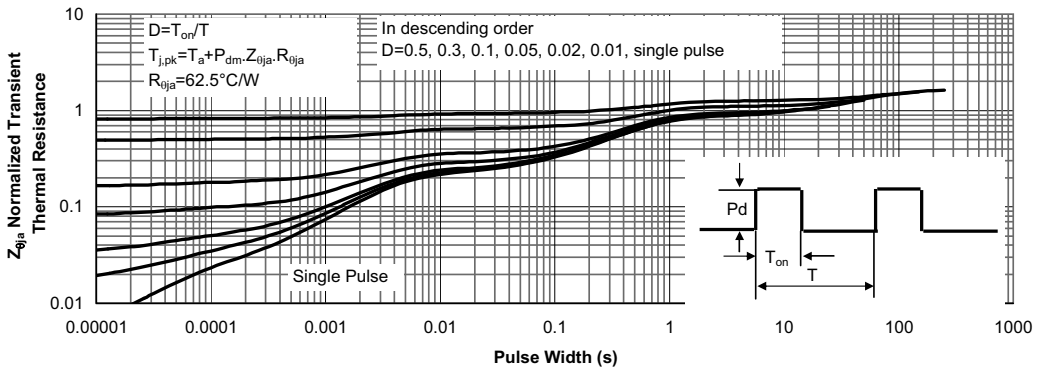


Figure 11: Normalized Maximum Transient Thermal Impedance

Complementary MOSFET

ELM14604AA-N

Electrical Characteristics (P-ch)

T_a=25°C

Parameter	Symbol	Conditions	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			-1	μA
		V _{gs} =0V			-5	
		T _j =55°C				
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	-20			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =-10V		39	52	mΩ
		I _d =-5A		54	70	
			T _j =125°C			
		V _{gs} =-4.5V, I _d =-4A		67	87	mΩ
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-5A	6.0	8.6		S
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.77	-1.00	V
Max. body-diode continuous current	I _s				-2.8	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =-15V, f=1MHz		700	900	pF
Output capacitance	C _{oss}			120		pF
Reverse transfer capacitance	C _{rss}			75		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		10	15	Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Q _g	V _{gs} =-10V, V _{ds} =-15V, I _d =-5A		14.7	19.0	nC
Total gate charge (4.5V)	Q _g			7.6	10.0	nC
Gate-source charge	Q _{gs}			2.0		nC
Gate-drain charge	Q _{gd}			3.8		nC
Turn-on delay time	t _{d(on)}			8.3		ns
Turn-on rise time	t _r	V _{gs} =-10V, V _{ds} =-15V		5.0		ns
Turn-off delay time	t _{d(off)}	R _l =3 Ω, R _{gen} =3 Ω		29.0		ns
Turn-off fall time	t _f			14.0		ns
Body diode reverse recovery time	t _{rr}	I _f =-5A, dI/dt=100A/μs		23.5	30.0	ns
Body diode reverse recovery charge	Q _{rr}	I _f =-5A, dI/dt=100A/μs		13.4		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 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.

Complementary MOSFET

ELM14604AA-N

Typical Electrical and Thermal Characteristics (P-ch)

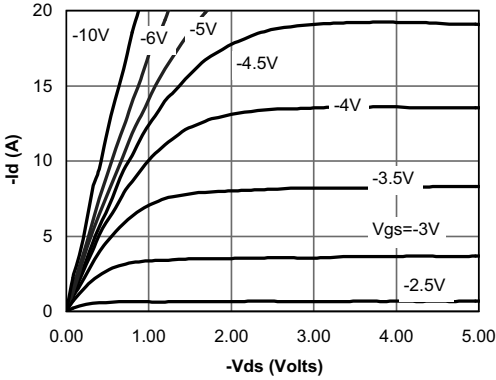


Figure 1: On-Region Characteristics

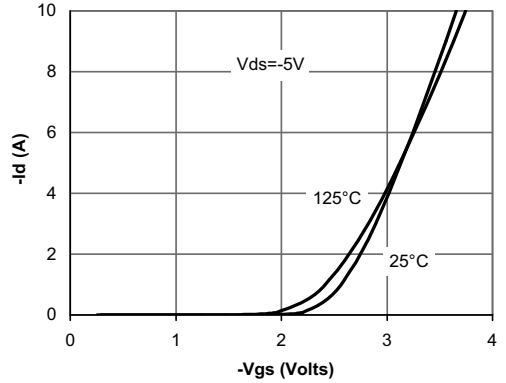


Figure 2: Transfer Characteristics

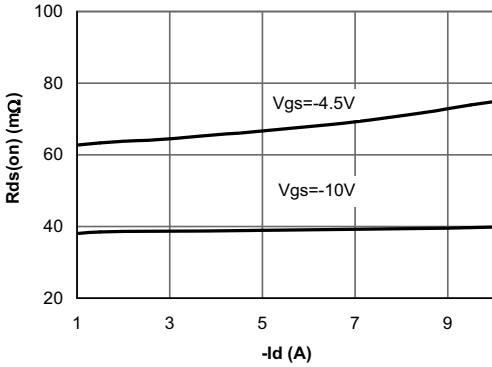


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

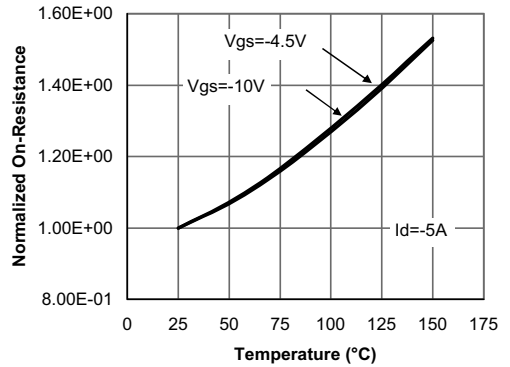


Figure 4: On-Resistance vs. Junction Temperature

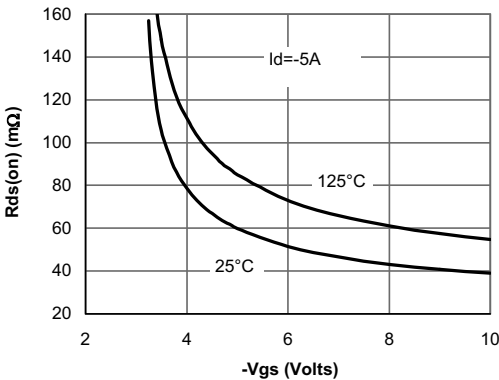


Figure 5: On-Resistance vs. Gate-Source Voltage

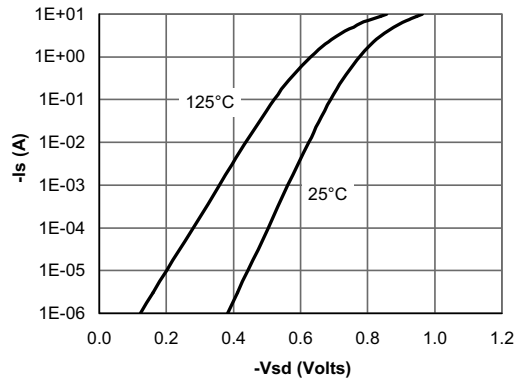


Figure 6: Body-Diode Characteristics

Complementary MOSFET

ELM14604AA-N

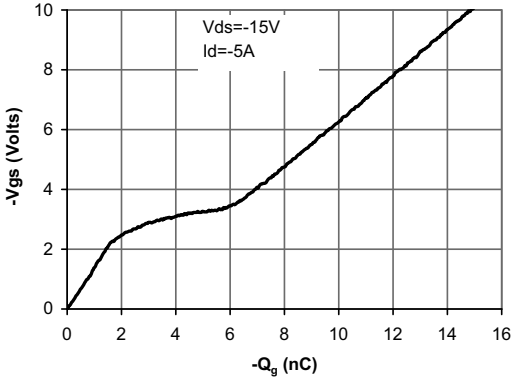


Figure 7: Gate-Charge Characteristics

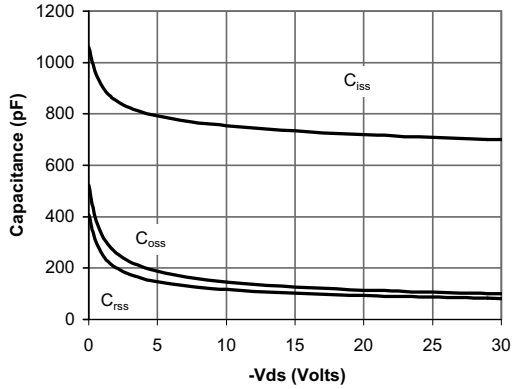


Figure 8: Capacitance Characteristics

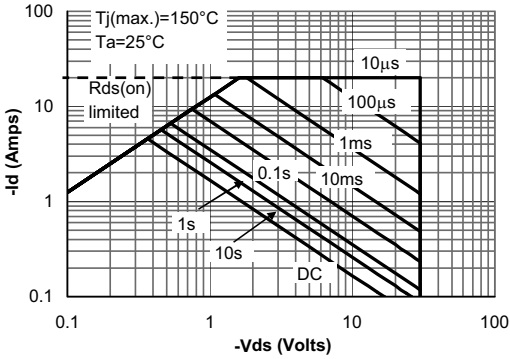


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

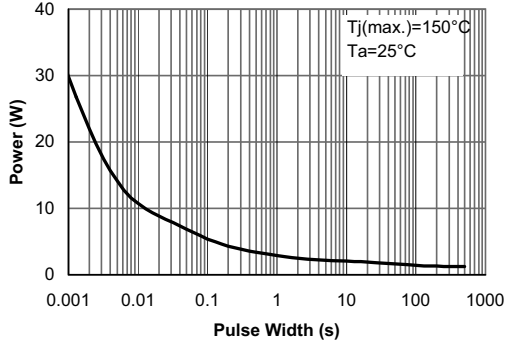


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

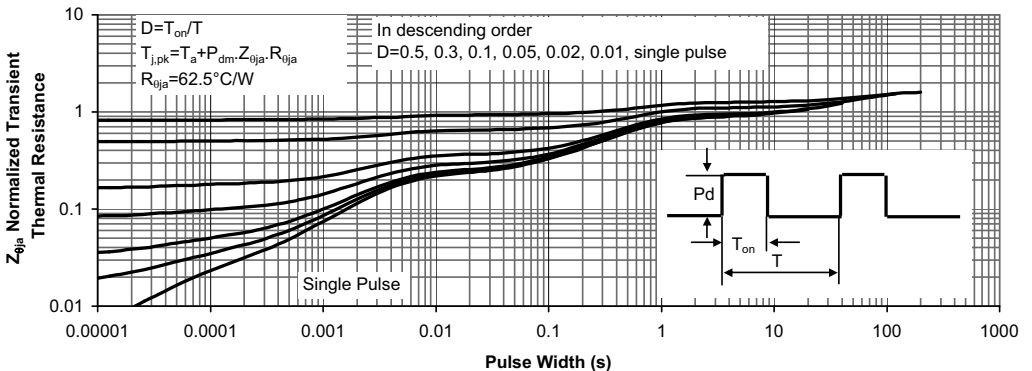


Figure 11: Normalized Maximum Transient Thermal Impedance