

Complementary MOSFET

ELM14613AA-N

General Description

ELM14613AA-N uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge. Internal ESD protection is included.

Features

- | | |
|--|---|
| N-channel | P-channel |
| $V_{ds}=30V$ | $V_{ds}=-30V$ |
| $I_d=7.2A(V_{gs}=10V)$ | $I_d=-6.1A(V_{gs}=-10V)$ |
| $R_{ds(on)} < 24m\Omega (V_{gs}=10V)$ | $R_{ds(on)} < 37m\Omega (V_{gs}=-10V)$ |
| $R_{ds(on)} < 40m\Omega (V_{gs}=4.5V)$ | $R_{ds(on)} < 60m\Omega (V_{gs}=-4.5V)$ |

ESD rating : 1500V(HBM)

Maximum Absolute Ratings

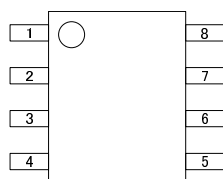
Parameter	Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note	
Drain-source voltage	V_{ds}	30	-30	V		
Gate-source voltage	V_{gs}	± 20	± 20	V		
Continuous drain current	I_d	$T_a=25^\circ C$	7.2	-6.1	A	1
		$T_a=70^\circ C$	6.1	-5.1		
Pulsed drain current	I_{dm}	30	-30	A	2	
Power dissipation	P_d	$T_a=25^\circ C$	2.00	2.00	W	
		$T_a=70^\circ C$	1.44	1.44		
Avalanche current	I_{ar}	15	20	A	2	
Repetitive avalanche energy 0.1mH	E_{ar}	11	20	mJ	2	
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	55.0	62.5	$^\circ C/W$	1
Maximum junction-to-ambient			Steady-state	92.0	110.0	
Maximum junction-to-lead	Steady-state		$R_{\theta jl}$	37.0	50.0	$^\circ C/W$
Maximum junction-to-ambient	$R_{\theta ja}$	P-ch	48.0	62.5	$^\circ C/W$	1
Maximum junction-to-ambient			Steady-state	84.0	110.0	
Maximum junction-to-lead	Steady-state		$R_{\theta jl}$	37.0	50	$^\circ C/W$

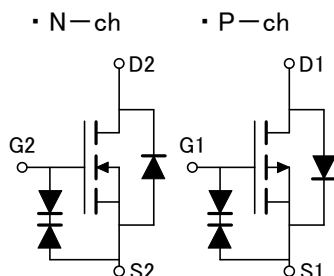
Pin Configuration

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)

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			1	μA
		T _j =55°C			5	
Gate-body leakage current	I _{gss}	V _{ds} =0V, V _{gs} =±20V			10	μA
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =250 μA	1	2	3	V
On state drain current	I _{d(on)}	V _{gs} =10V, V _{ds} =5V	20			A
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V I _d =7.2A		20	24	mΩ
		T _j =125°C		29	35	
		V _{gs} =4.5V, I _d =4A		30	40	
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =7.2A	10	18		S
Diode forward voltage	V _{sD}	I _s =1A		0.77	1.00	V
Max.body-diode continuous current	I _s				3	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			522	630	pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =15V, f=1MHz		110		pF
Reverse transfer capacitance	C _{rss}			75		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		2.1	3.0	Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Q _g	V _{gs} =10V, V _{ds} =15V, I _d =7.2A		11.0	15.0	nC
Total gate charge (4.5V)	Q _g			5.3	7.0	nC
Gate-source charge	Q _{gs}			1.9		nC
Gate-drain charge	Q _{gd}			4.0		nC
Turn-on delay time	t _{d(on)}			4.7	7.0	ns
Turn-on rise time	t _r	V _{gs} =10V, V _{ds} =15V		4.9	10.0	ns
Turn-off delay time	t _{d(off)}	R _l =2.1 Ω, R _{gen} =3 Ω		16.2	22.0	ns
Turn-off fall time	t _f			3.5	7.0	ns
Body-diode reverse recovery time	t _{rr}	I _f =7.2A, dI/dt=100A/μs		15.7	20.0	ns
Body-diode reverse recovery charge	Q _{rr}	I _f =7.2A, dI/dt=100A/μs		7.9	10.0	nC

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 80 μs 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)

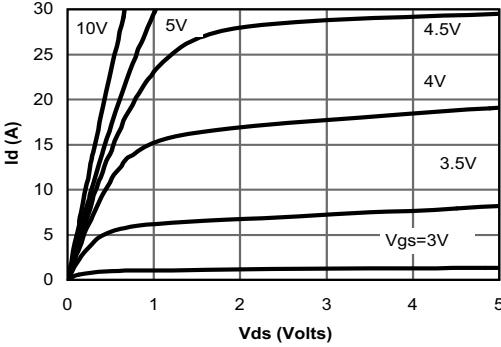


Fig 1: On-Region Characteristics

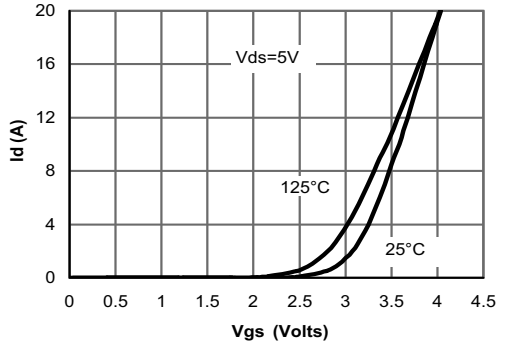


Figure 2: Transfer Characteristics

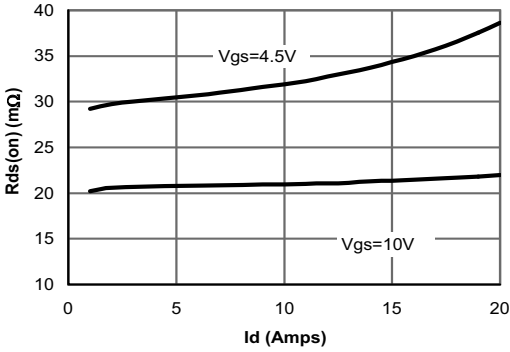


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

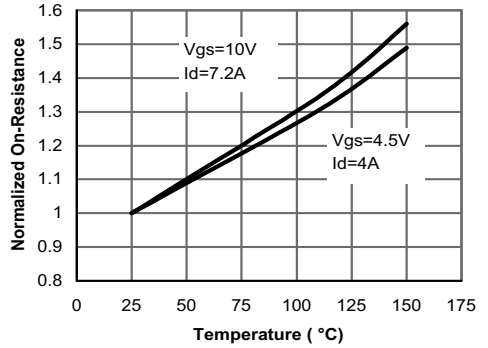


Figure 4: On-Resistance vs. Junction Temperature

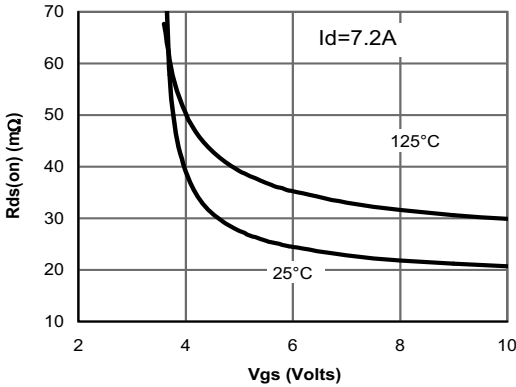


Figure 5: On-Resistance vs. Gate-Source Voltage

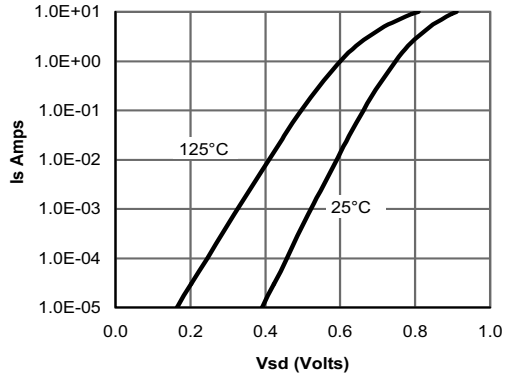


Figure 6: Body diode characteristics

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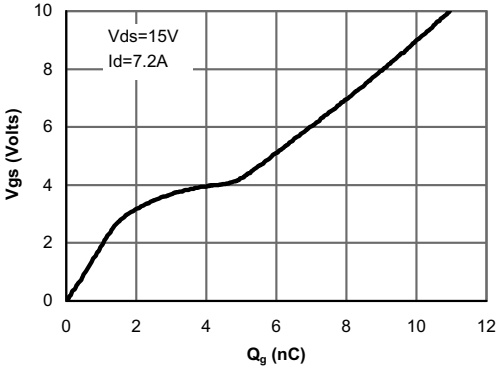


Figure 7: Gate-Charge characteristics

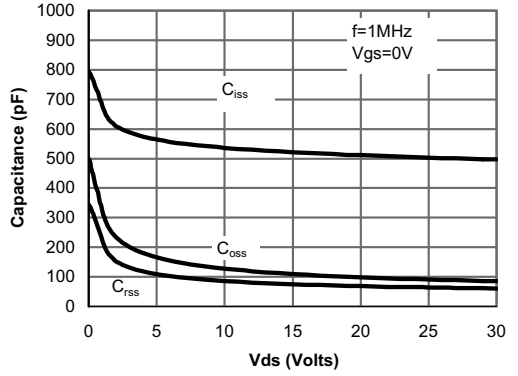


Figure 8: Capacitance Characteristics

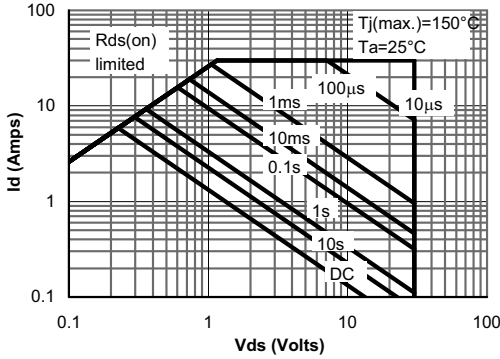


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

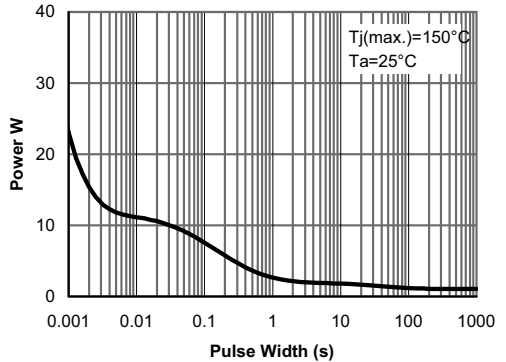


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

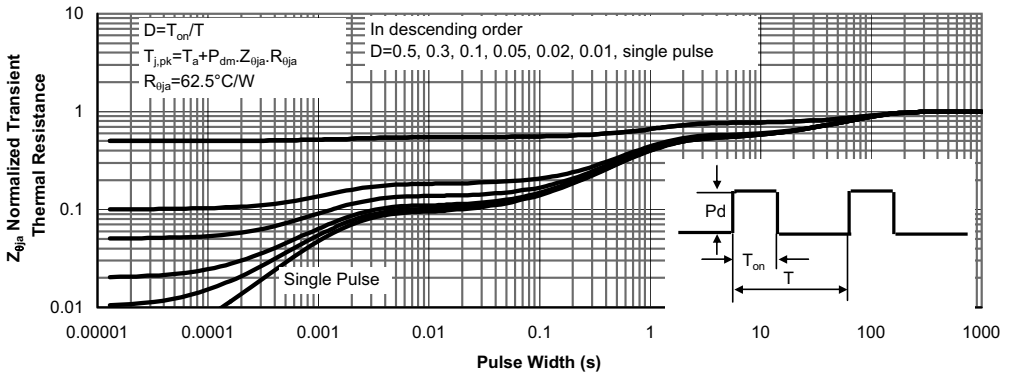


Figure 11: Normalized Maximum Transient Thermal Impedance

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Electrical Characteristics (P-ch)

T_a=25°C

Parameter	Symbol	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			10	μA
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =-250 μA	-1.0	-1.7	-3.0	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		28	37	mΩ
		I _d =-6.1A		39	48	
			T _j =125°C		45	60
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-6.1A		12.5		S
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.77	-1.00	V
Max. body-diode continuous current	I _s				-3	A
DYNAMIC PARAMETERS						
Input capacitance	C _{iss}			1040	1250	pF
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =-15V, f=1MHz		179		pF
Reverse transfer capacitance	C _{rss}			134		pF
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		5	10	Ω
SWITCHING PARAMETERS						
Total gate charge (10V)	Q _g			16.8	22.0	nC
Total gate charge (4.5V)	Q _g	V _{gs} =-10V, V _{ds} =-15V		8.7	12.0	nC
Gate-source charge	Q _{gs}	I _d =-6.1A		3.4		nC
Gate-drain charge	Q _{gd}			5.0		nC
Turn-on delay time	t _{d(on)}			9.0	12.0	ns
Turn-on rise time	t _r	V _{gs} =-10V, V _{ds} =-15V		5.7	11.0	ns
Turn-off delay time	t _{d(off)}	R _l =2.5 Ω, R _{gen} =3 Ω		22.7	30.0	ns
Turn-off fall time	t _f			10.2	20.0	ns
Body diode reverse recovery time	t _{rr}	I _f =-6.1A, dI/dt=100A/μs		21.7	27.0	ns
Body diode reverse recovery charge	Q _{rr}	I _f =-6.1A, dI/dt=100A/μs		13.6	18.0	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 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 T_a=25°C. The SOA curve provides a single pulse rating.

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Typical Electrical and Thermal Characteristics (P-ch)

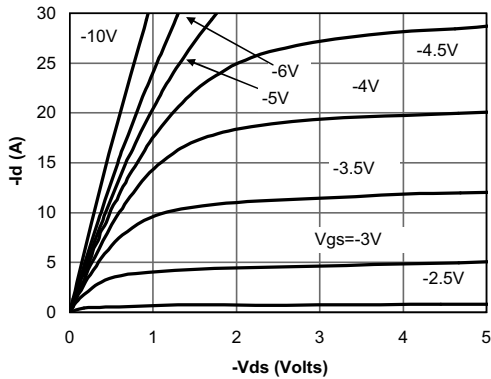


Fig 1: On-Region Characteristics

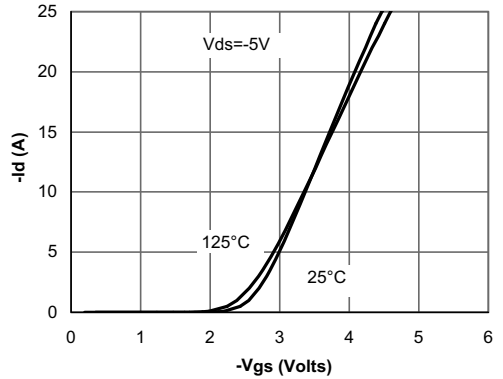


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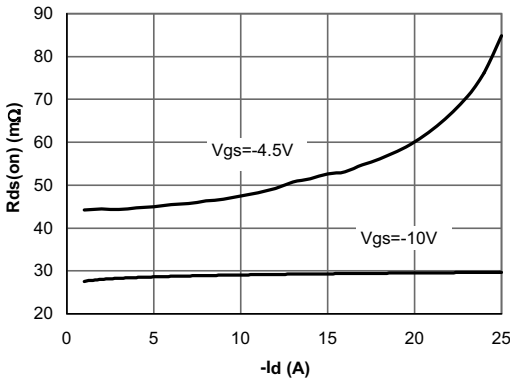


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

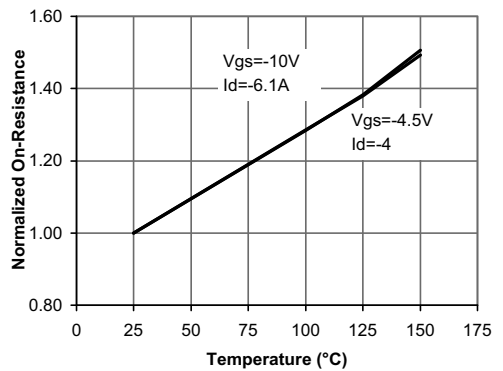


Figure 4: On-Resistance vs. Junction Temperature

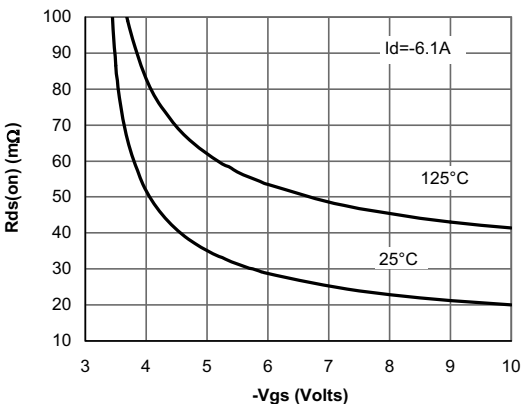


Figure 5: On-Resistance vs. Gate-Source Voltage

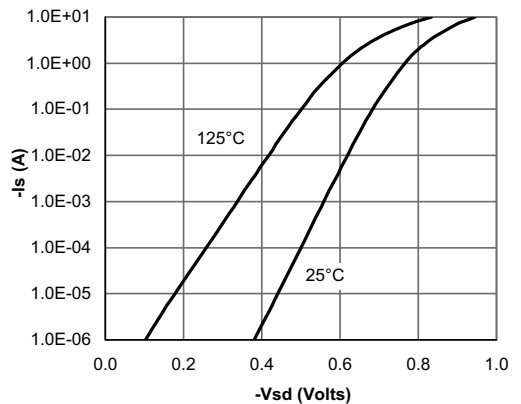


Figure 6: Body-Diode Characteristics

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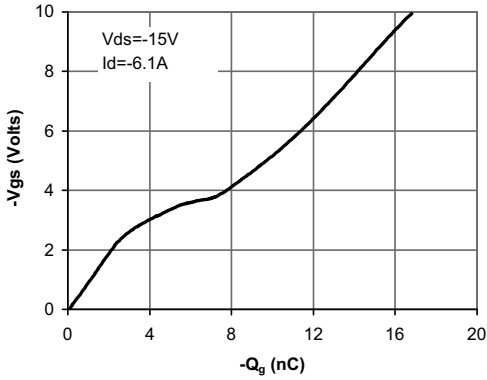


Figure 7: Gate-Charge Characteristics

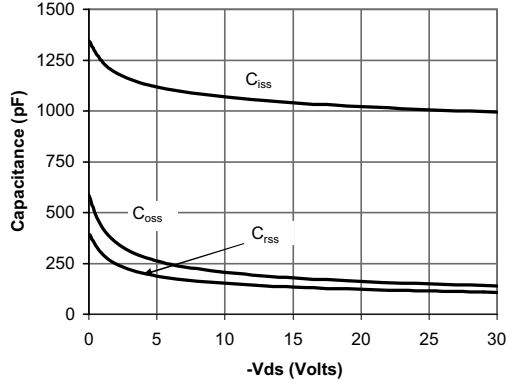


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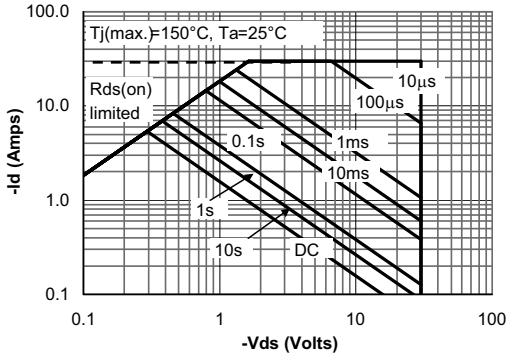


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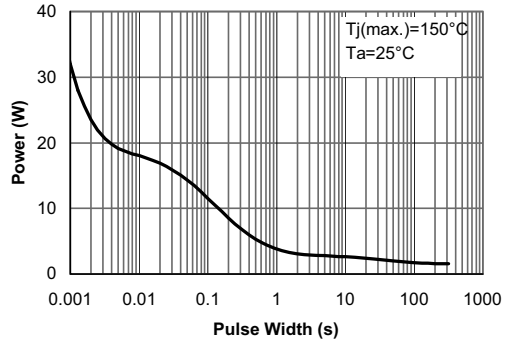


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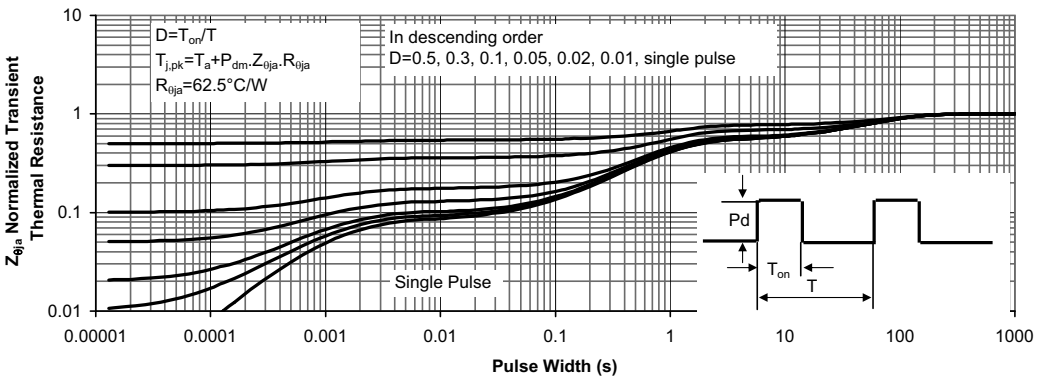


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