

Complementary MOSFET

ELM14614AA-N

General Description

ELM14614AA-N uses advanced trench technology to provide excellent $R_{ds(on)}$ and low gate charge.

Features

- | | |
|--|---|
| N-channel | P-channel |
| • $V_{ds}=40V$ | $V_{ds}=-40V$ |
| • $I_d=6A(V_{gs}=10V)$ | $I_d=-5A(V_{gs}=-10V)$ |
| • $R_{ds(on)} < 31m\Omega (V_{gs}=10V)$ | $R_{ds(on)} < 45m\Omega (V_{gs}=-10V)$ |
| • $R_{ds(on)} < 45m\Omega (V_{gs}=4.5V)$ | $R_{ds(on)} < 63m\Omega (V_{gs}=-4.5V)$ |

Maximum Absolute Ratings

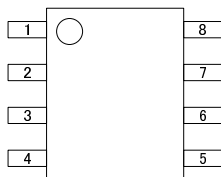
Parameter		Symbol	N-ch (Max.)	P-ch (Max.)	Unit	Note
Drain-source voltage		V_{ds}	40	-40	V	
Gate-source voltage		V_{gs}	± 20	± 20	V	
Continuous drain current	$T_a=25^\circ C$	I_d	6.0	-5.0	A	1
	$T_a=70^\circ C$		5.0	-4.0		
	$T_a=85^\circ C$		4.5	-3.8		
Pulsed drain current		I_{dm}	20	-20	A	2
Avalanche current		I_{ar}	12	14	A	
Single pulse avalanche energy $L=0.3mH$		E_{as}	22	29	mJ	
Power dissipation	$T_a=25^\circ C$	P_d	2.00	2.00	W	
	$T_a=70^\circ C$		1.28	1.28		
	$T_a=85^\circ C$		1.05	1.05		
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	$t \leq 10s$	$R\theta_{ja}$	N-ch	48.0	62.5	$^\circ C/W$	1
	Steady-state			74.0	110.0		
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$		35.0	50.0	$^\circ C/W$	3
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	P-ch	48.0	62.5	$^\circ C/W$	1
	Steady-state			74.0	110.0		
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$		35.0	50.0	$^\circ C/W$	3

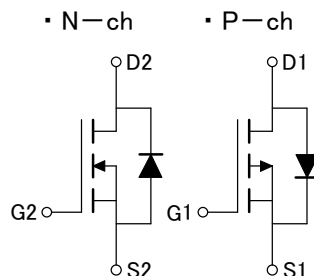
Pin Configuration

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	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BV _{dss}	I _d =10mA, V _{gs} =0V	40			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =32V V _{gs} =0V			1	μA	
		T _j =55°C			5		
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	1.5	2.3	3.0	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 =6A		23.2	31.0	mΩ	
		T _j =125°C		36.0	48.0		
		V _{gs} =4.5V, I _d =5A		32.6	45.0		
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =6A		22		S	
Diode forward voltage	V _{sd}	I _s =1A, V _{gs} =0V		0.77	1.00	V	
Max.body-diode continuous current	I _s				2.5	A	
Pulsed body-diode current	I _{sm}				20	A	2
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}			404	500	pF	
Output capacitance	C _{oss}	V _{gs} =0V, V _{ds} =20V, f=1MHz		95	120	pF	
Reverse transfer capacitance	C _{rss}			37	50	pF	
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		2.7	4.0	Ω	
SWITCHING PARAMETERS							
Total gate charge (10V)	Q _g			8.3	10.0	nC	
Total gate charge (4.5V)	Q _g	V _{gs} =10V, V _{ds} =20V		4.2	5.1	nC	
Gate-source charge	Q _{gs}	I _d =6A		1.3	2.0	nC	
Gate-drain charge	Q _{gd}			2.3	3.0	nC	
Turn-on delay time	t _{d(on)}			4.2	5.5	ns	
Turn-on rise time	t _r	V _{gs} =10V, V _{ds} =20V		3.3	4.5	ns	
Turn-off delay time	t _{d(off)}	R _l =3.3Ω, R _{gen} =3Ω		15.6	21.0	ns	
Turn-off fall time	t _f			3.0	4.0	ns	
Body-diode reverse recovery time	t _{rr}	I _f =6A, dI/dt=100A/μs		20.5	27.0	ns	
Body-diode reverse recovery charge	Q _{rr}	I _f =6A, dI/dt=100A/μs		14.5	19.0	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 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)

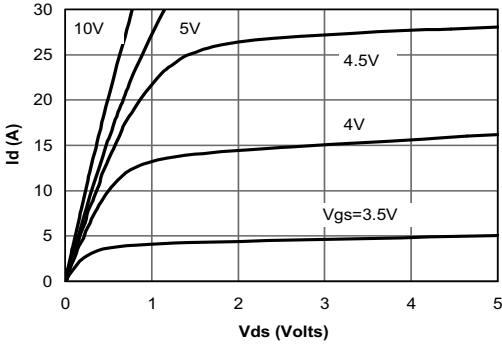


Fig 1: On-Region Characteristics

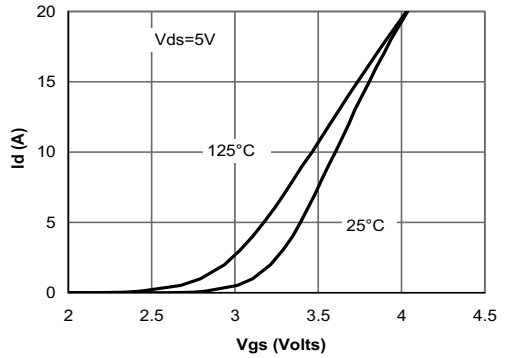


Figure 2: Transfer Characteristics

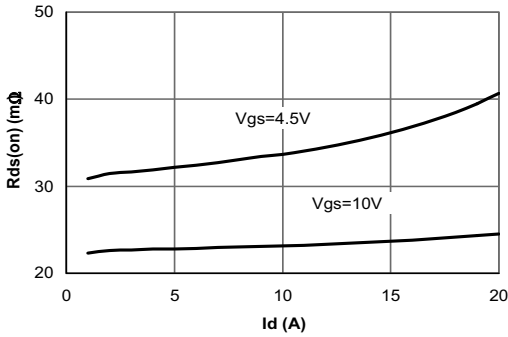


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

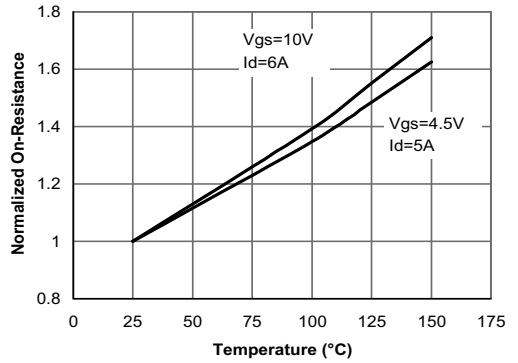


Figure 4: On-Resistance vs. Junction Temperature

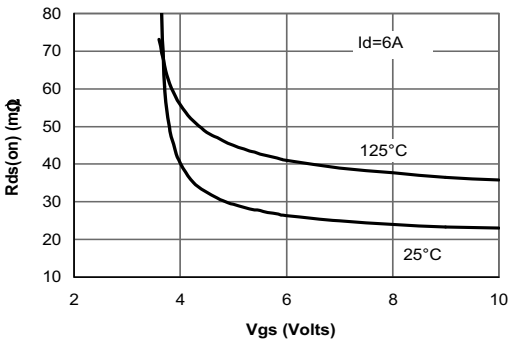


Figure 5: On-Resistance vs. Gate-Source Voltage

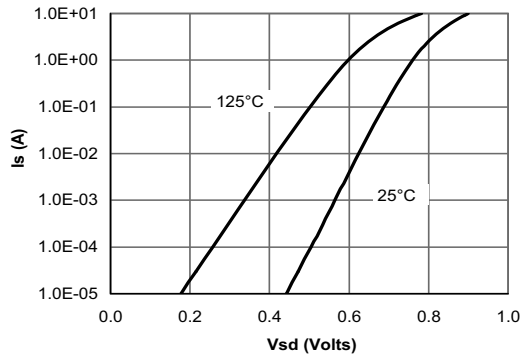


Figure 6: Body-Diode Characteristics

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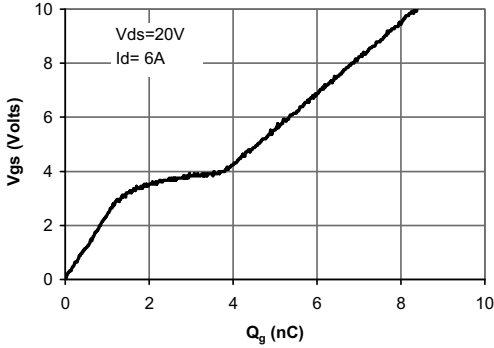


Figure 7: Gate-Charge Characteristics

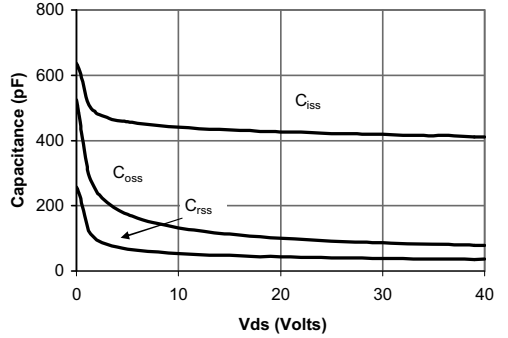


Figure 8: Capacitance Characteristics

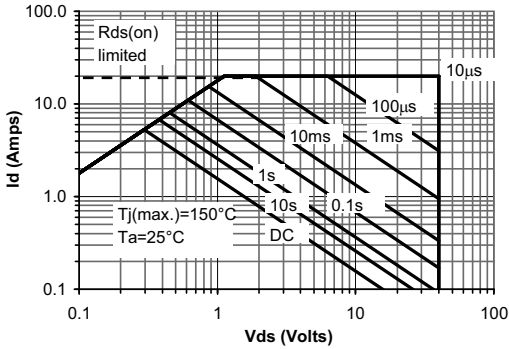


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

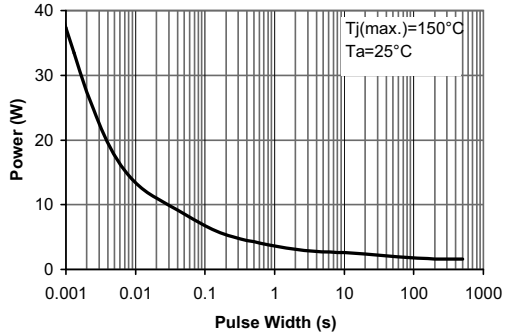


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

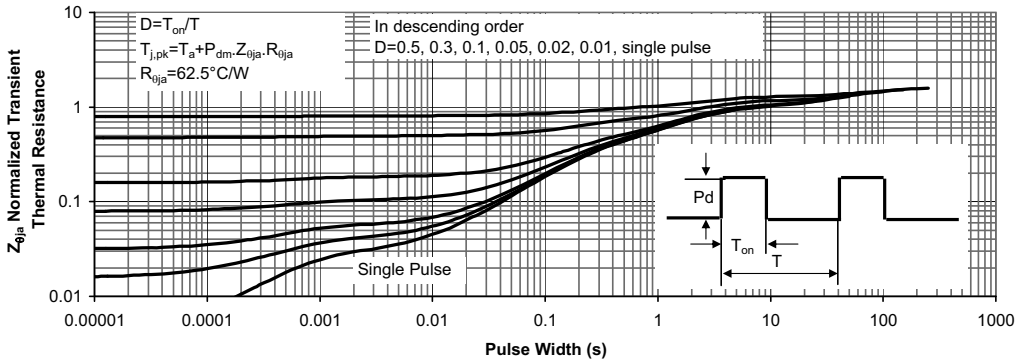


Figure 11: Normalized Maximum Transient Thermal Impedance

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Electrical Characteristics (P-ch)

T_a=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BV _{dss}	I _d =-10mA, V _{gs} =0V	-40			V	
Zero gate voltage drain current	I _{dss}	V _{ds} =-32V			-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 =-250μA	-1.5	-1.9	-3.0	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		34.7	45.0	mΩ	
		I _d =-5A		52.0	65.0		
			T _j =125°C				
		V _{gs} =-4.5V, I _d =-2A		50.6	63.0	mΩ	
Forward transconductance	G _{fs}	V _{ds} =-5V, I _d =-4.8A		12		S	
Diode forward voltage	V _{sd}	I _s =-1A, V _{gs} =0V		-0.75	-1.00	V	
Max. body-diode continuous current	I _s				-2.5	A	
Pulsed body-diode current	I _{sm}				-20	A	2
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{gs} =0V, V _{ds} =-20V f=1MHz		657	870	pF	
Output capacitance	C _{oss}			143	200	pF	
Reverse transfer capacitance	C _{rss}			63	110	pF	
Gate resistance	R _g	V _{gs} =0V, V _{ds} =0V, f=1MHz		6.5	10.0	Ω	
SWITCHING PARAMETERS							
Total gate charge (10V)	Q _g	V _{gs} =-10V, V _{ds} =-20V I _d =-5A		13.6	17.0	nC	
Total gate charge (4.5V)	Q _g			6.8	8.5	nC	
Gate-source charge	Q _{gs}			1.8	2.5	nC	
Gate-drain charge	Q _{gd}			3.9	5.0	nC	
Turn-on delay time	t _{d(on)}			7.5	10.0	ns	
Turn-on rise time	t _r	V _{gs} =-10V, V _{ds} =-20V		6.7	9.0	ns	
Turn-off delay time	t _{d(off)}	R _l =4 Ω, R _{gen} =3 Ω		26.0	34.0	ns	
Turn-off fall time	t _f			11.2	15.0	ns	
Body diode reverse recovery time	t _{rr}	I _f =-5A, dI/dt=100A/μs		22.3	29.0	ns	
Body diode reverse recovery charge	Q _{rr}	I _f =-5A, dI/dt=100A/μs		15.2	20.0	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.
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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.
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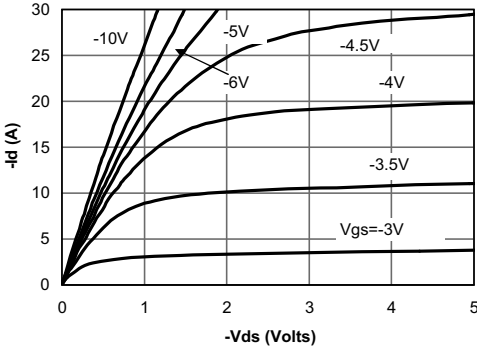


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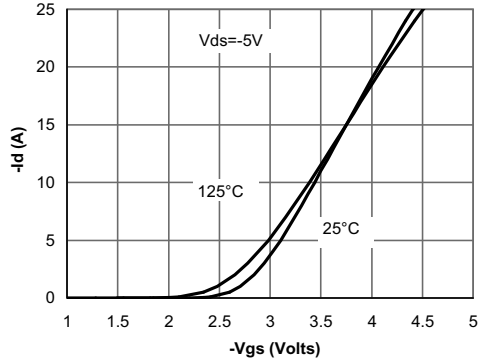


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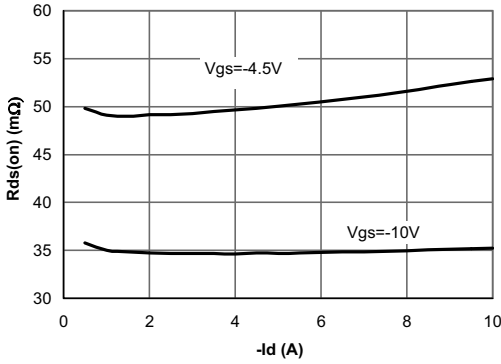


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

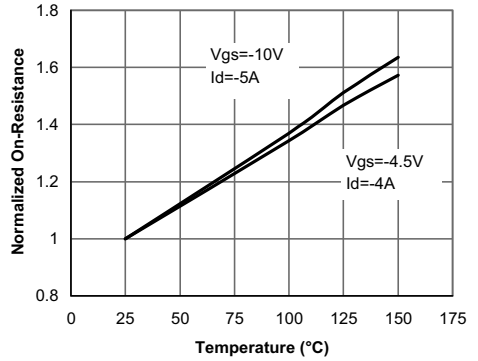


Figure 4: On-Resistance vs. Junction Temperature

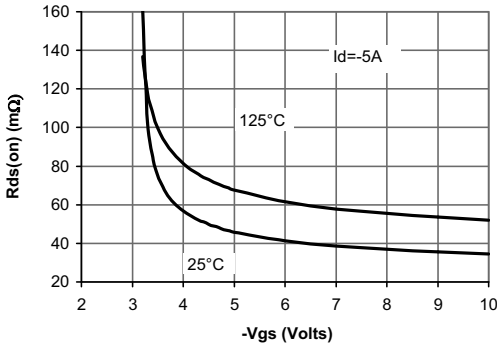


Figure 5: On-Resistance vs. Gate-Source Voltage

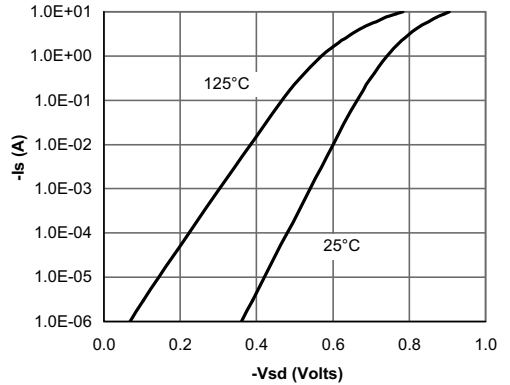


Figure 6: Body-Diode Characteristics

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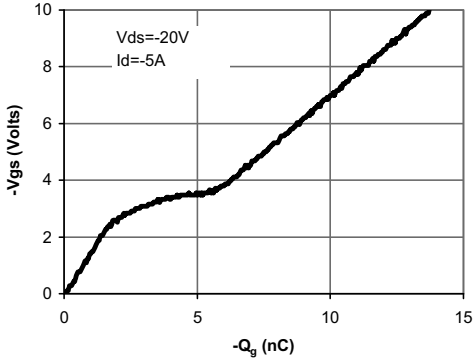


Figure 7: Gate-Charge Characteristics

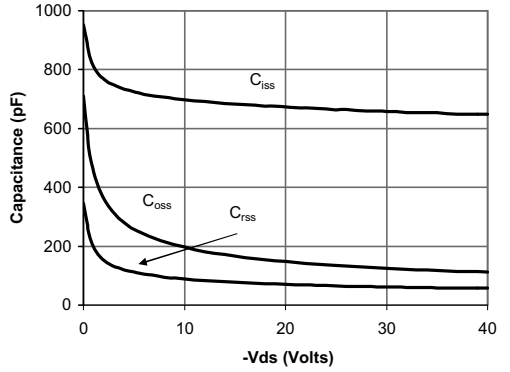


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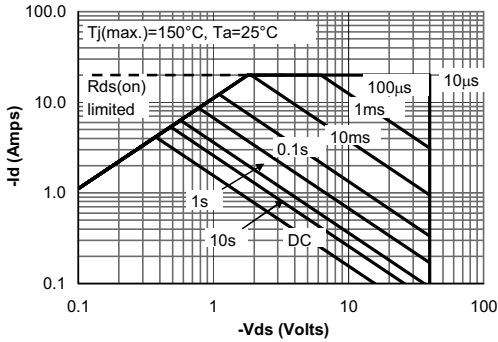


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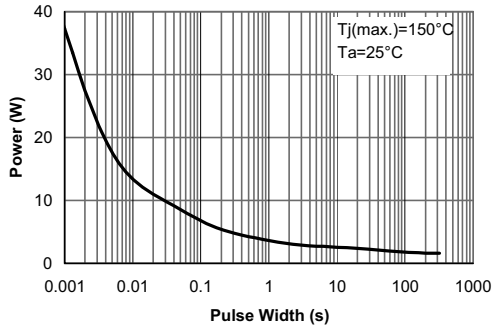


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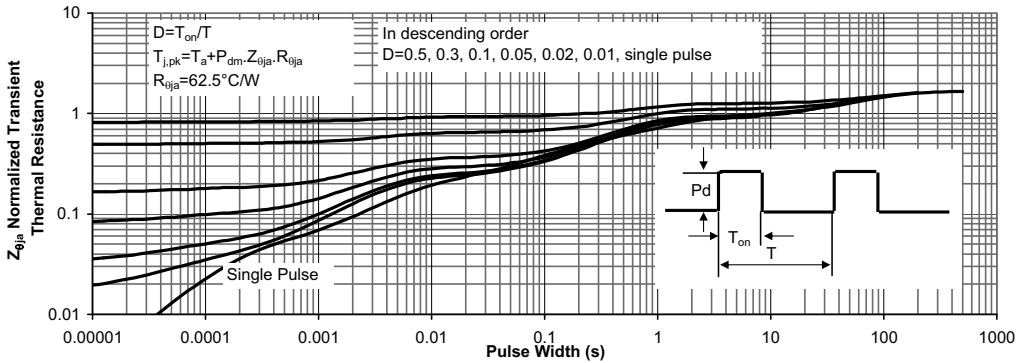


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