

# Dual N-channel MOSFET

ELM14824AA-N

## General description

ELM14824AA-N uses advanced trench technology to provide excellent  $R_{ds(on)}$  and low gate charge.

## Features

- |                            |  |
|----------------------------|--|
| <b>Q1</b>                  | <b>Q2</b>                                    |
| • $V_{ds}=30V$             | • $V_{ds}=30V$                               |
| • $I_d=8.5A$               | • $I_d=9.8A$ ( $V_{gs}=10V$ )                |
| • $R_{ds(on)} < 17m\Omega$ | • $R_{ds(on)} < 13m\Omega$ ( $V_{gs}=10V$ )  |
| • $R_{ds(on)} < 27m\Omega$ | • $R_{ds(on)} < 15m\Omega$ ( $V_{gs}=4.5V$ ) |

## Maximum absolute ratings

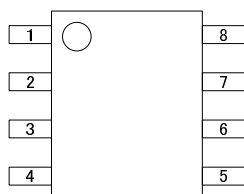
Parameter	Symbol	Max. Q1	Max. Q2	Unit	Note	
Drain-source voltage	$V_{ds}$	30	30	V		
Gate-source voltage	$V_{gs}$	$\pm 20$	$\pm 12$	V		
Continuous drain current	$I_d$	$T_a=25^\circ C$	8.5	9.8	A	1
		$T_a=70^\circ C$	6.8	7.8		
Pulsed drain current	$I_{dm}$	30	40	A	2	
Power dissipation	$P_d$	$T_a=25^\circ C$	2.00	2.00	W	
		$T_a=70^\circ C$	1.28	1.28		
Junction and storage temperature range	$T_j, T_{stg}$	-55 to 150	-55 to 150	$^\circ C$		

## Thermal characteristics

Parameter (Q1,Q2)		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	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	$R\theta_{jl}$	35.0	40.0	$^\circ C/W$	3

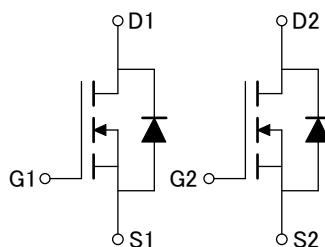
## Pin configuration

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 (Q1)

T<sub>a</sub>=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BV <sub>dss</sub>	I <sub>d</sub> =250 μA, V <sub>gs</sub> =0V	30			V
Zero gate voltage drain current	I <sub>dss</sub>	V <sub>ds</sub> =24V V <sub>gs</sub> =0V		0.003	1.000	μA
		T <sub>j</sub> =55°C			5.000	
Gate-body leakage current	I <sub>gss</sub>	V <sub>ds</sub> =0V, V <sub>gs</sub> =±20V			100	nA
Gate threshold voltage	V <sub>gs(th)</sub>	V <sub>ds</sub> =V <sub>gs</sub> , I <sub>d</sub> =250 μA	1.0	1.8	3.0	V
On state drain current	I <sub>d(on)</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =5V	30			A
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V		13.8	17.0	mΩ
		I <sub>d</sub> =8.5A	T <sub>j</sub> =125°C	20.0	25.0	
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =6A		21.0	27.0	mΩ
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =8.5A		23		S
Diode forward voltage	V <sub>sd</sub>	I <sub>s</sub> =1A, V <sub>gs</sub> =0V		0.76	1.00	V
Max. body-diode continuous current	I <sub>s</sub>				3	A
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	C <sub>iss</sub>			1040	1250	pF
Output capacitance	C <sub>oss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =15V, f=1MHz		180		pF
Reverse transfer capacitance	C <sub>rss</sub>			110		pF
Gate resistance	R <sub>g</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =0V, f=1MHz		0.70	0.85	Ω
<b>SWITCHING PARAMETERS</b>						
Total gate charge (10V)	Q <sub>g</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V, I <sub>d</sub> =8.5A		19.20	23.00	nC
Total gate charge (4.5V)	Q <sub>g</sub>			9.36	11.20	nC
Gate-source charge	Q <sub>gs</sub>			2.60		nC
Gate-drain charge	Q <sub>gd</sub>			4.20		nC
Turn-on delay time	t <sub>d(on)</sub>			5.2	7.5	ns
Turn-on rise time	t <sub>r</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V		4.4	6.5	ns
Turn-off delay time	t <sub>d(off)</sub>	R <sub>l</sub> =1.8 Ω, R <sub>gen</sub> =3 Ω		17.3	25.0	ns
Turn-off fall time	t <sub>f</sub>			3.3	5.0	ns
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>f</sub> =8.5A, dI/dt=100A/μs		16.7	21.0	ns
Body diode reverse recovery charge	Q <sub>rr</sub>	I <sub>f</sub> =8.5A, dI/dt=100A/μs		6.7	10.0	nC

### NOTE :

- The value of R<sub>θja</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board of 2oz. Copper, in still air environment with T<sub>a</sub>=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<sub>θja</sub> is the sum of the thermal impedance from junction to lead R<sub>θjl</sub> 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 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>a</sub>=25°C. The SOA curve provides a single pulse rating.

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## Typical electrical and thermal characteristics (Q1)

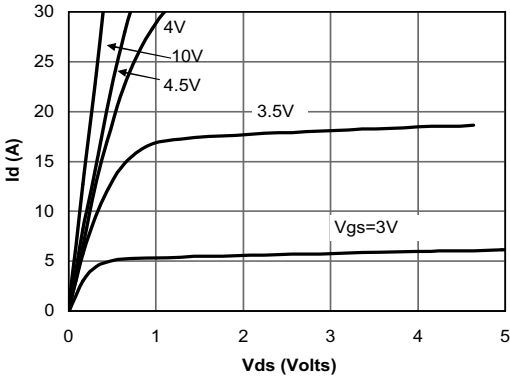


Figure 1: On-Region Characteristics

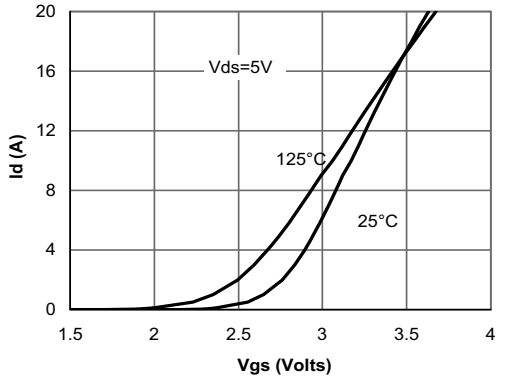


Figure 2: Transfer Characteristics

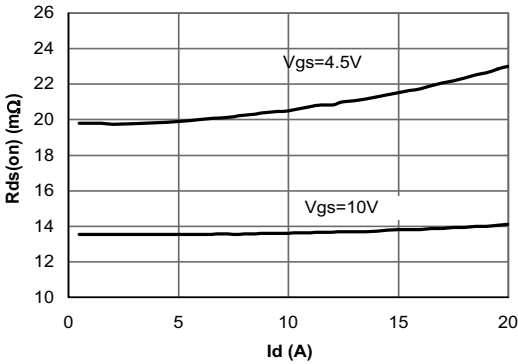


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

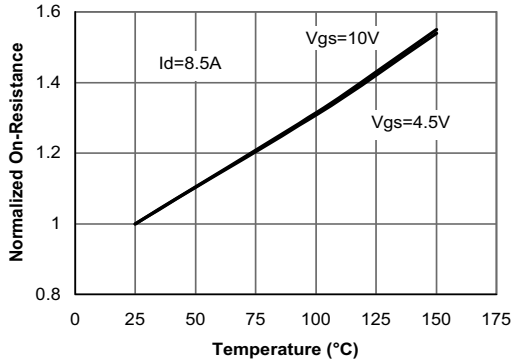


Figure 4: On-Resistance vs. Junction Temperature

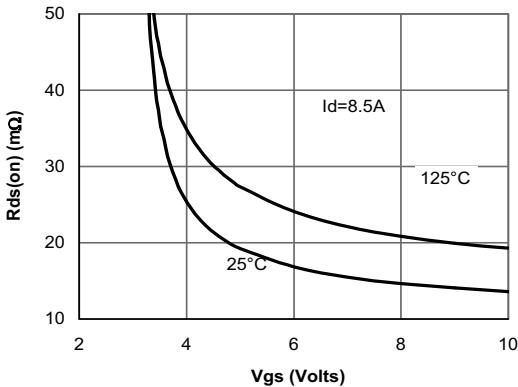


Figure 5: On-Resistance vs. Gate-Source Voltage

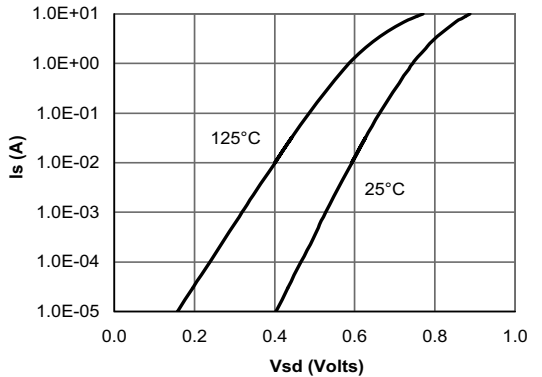


Figure 6: Body-Diode Characteristics

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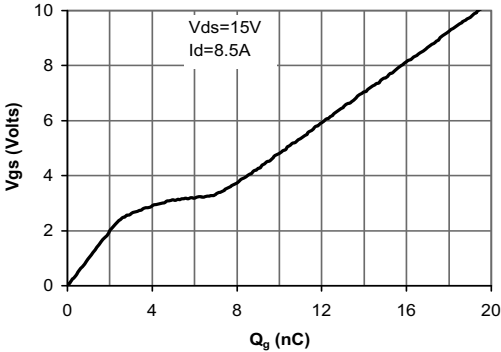


Figure 7: Gate-Charge Characteristics

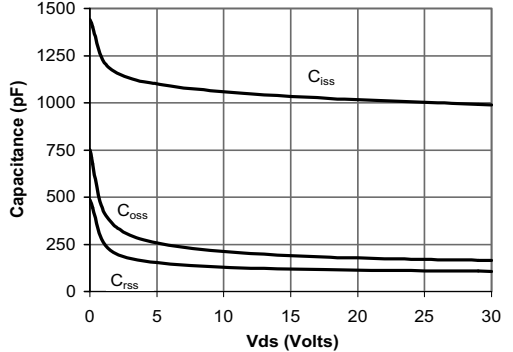


Figure 8: Capacitance Characteristics

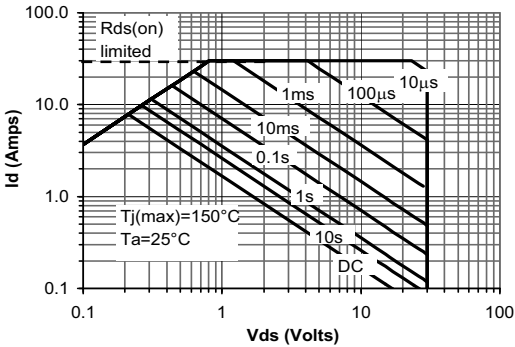


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

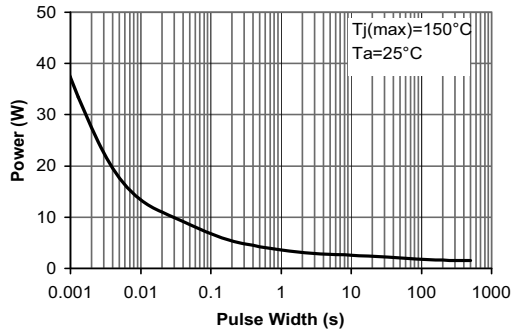


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

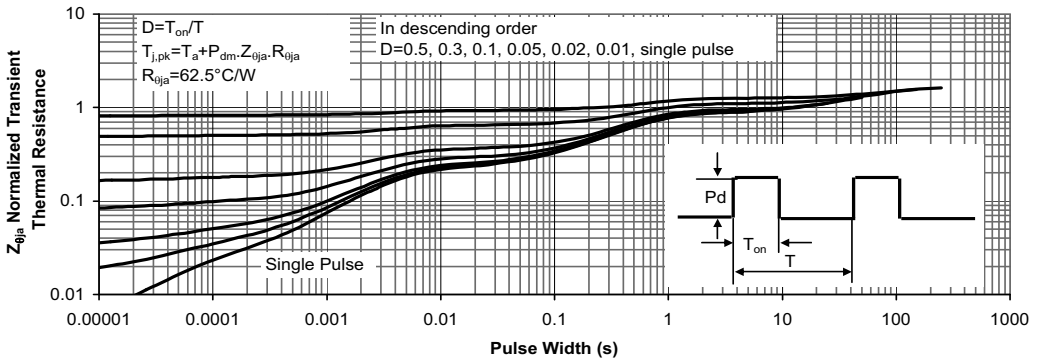


Figure 11: Normalized Maximum Transient Thermal Impedance

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## ■ Electrical characteristics (Q2)

T<sub>a</sub>=25°C

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
<b>STATIC PARAMETERS</b>						
Drain-source breakdown voltage	BV <sub>dss</sub>	I <sub>d</sub> =250 μA, V <sub>gs</sub> =0V	30			V
Zero gate voltage drain current	I <sub>dss</sub>	V <sub>ds</sub> =24V V <sub>gs</sub> =0V		0.004	1.000	μA
		T <sub>j</sub> =55°C			5.000	
Gate-body leakage current	I <sub>gss</sub>	V <sub>ds</sub> =0V, V <sub>gs</sub> =±12V			100	nA
Gate threshold voltage	V <sub>gs(th)</sub>	V <sub>ds</sub> =V <sub>gs</sub> , I <sub>d</sub> =250 μA	0.6	1.1	2.0	V
On state drain current	I <sub>d(on)</sub>	V <sub>gs</sub> =4.5V, V <sub>ds</sub> =5V	40			A
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V		10.5	13.0	mΩ
		I <sub>d</sub> =9.8A		13.4	17.0	
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =9A		12.0	15.0	mΩ
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =9.8A	30	37		S
Diode forward voltage	V <sub>sd</sub>	I <sub>s</sub> =1A		0.73	1.00	V
Max. body-diode continuous current	I <sub>s</sub>				3	A
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	C <sub>iss</sub>			3656	4250	pF
Output capacitance	C <sub>oss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =15V, f=1MHz		256		pF
Reverse transfer capacitance	C <sub>rss</sub>			168		pF
Gate resistance	R <sub>g</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =0V, f=1MHz		0.86	1.05	Ω
<b>SWITCHING PARAMETERS</b>						
Total gate charge	Q <sub>g</sub>			30.5	36.0	nC
Gate-source charge	Q <sub>gs</sub>	V <sub>gs</sub> =4.5V, V <sub>ds</sub> =15V, I <sub>d</sub> =9.8A		4.5		nC
Gate-drain charge	Q <sub>gd</sub>			8.5		nC
Turn-on delay time	t <sub>d(on)</sub>			5.5	8.2	ns
Turn-on rise time	t <sub>r</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V		3.1	5.0	ns
Turn-off delay time	t <sub>d(off)</sub>	R <sub>l</sub> =1.6 Ω, R <sub>gen</sub> =3 Ω		52.4	75.0	ns
Turn-off fall time	t <sub>f</sub>			5.7	8.5	ns
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>f</sub> =9.8A, dI/dt=100A/μs		21.5	26.0	ns
Body diode reverse recovery charge	Q <sub>rr</sub>	I <sub>f</sub> =9.8A, dI/dt=100A/μs		11.0	15.0	nC

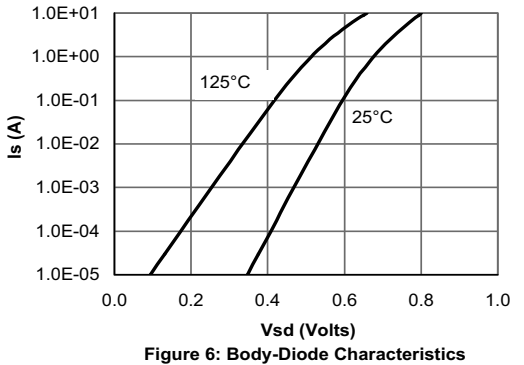
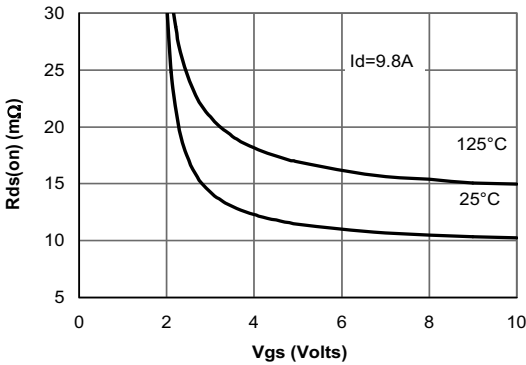
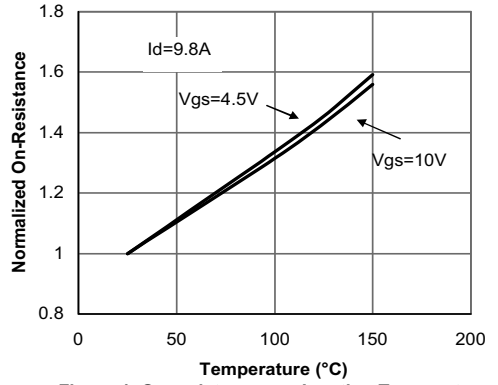
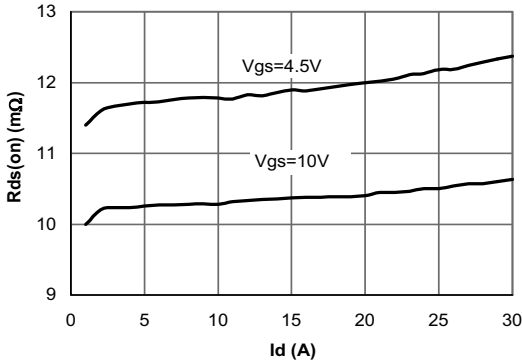
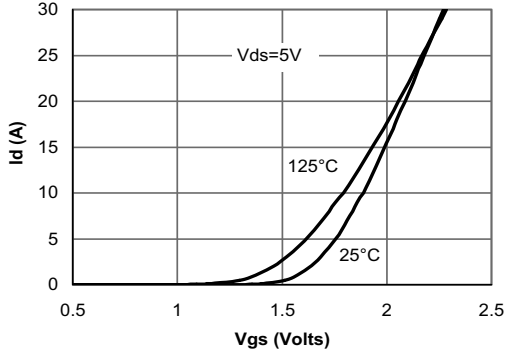
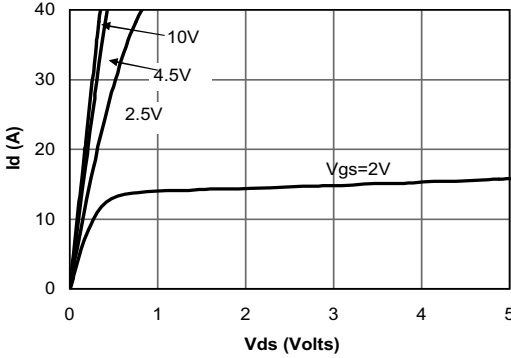
### NOTE :

1. The value of R<sub>θja</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board of 2oz. Copper, in still air environment with T<sub>a</sub>=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<sub>θja</sub> is the sum of the thermal impedance from junction to lead R<sub>θjl</sub> and lead to ambient.
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## Typical electrical and thermal characteristics (Q2)



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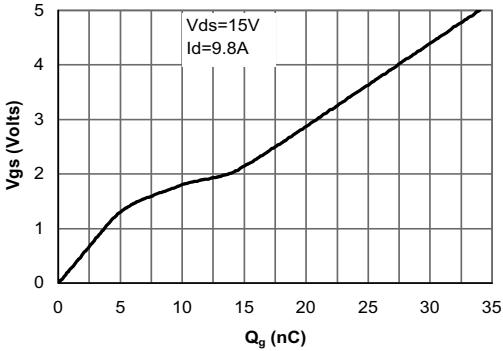


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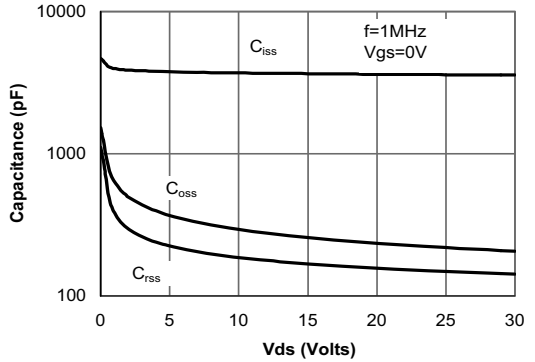


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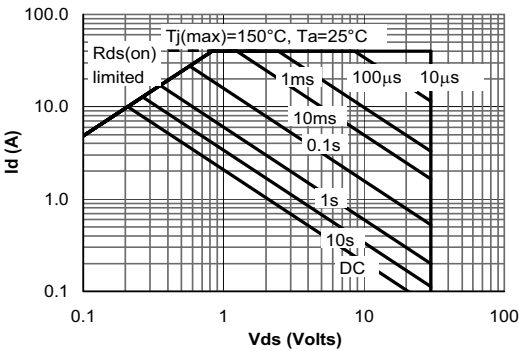


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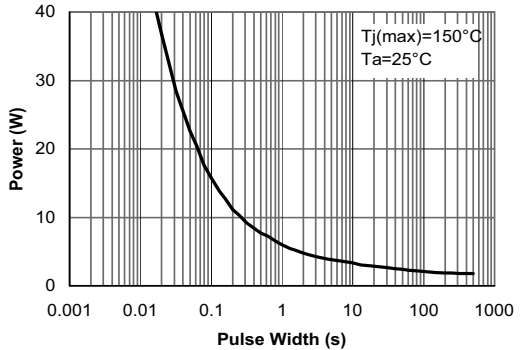


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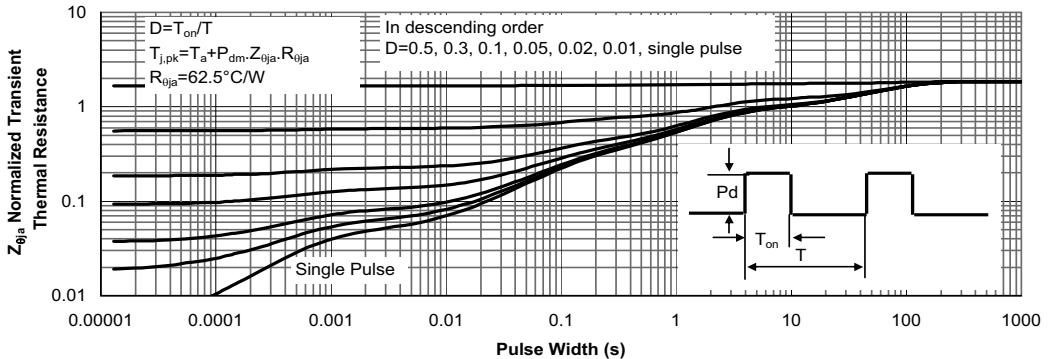


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