

# Dual N-channel MOSFET with schottky diode

ELM14904AA-N

## General description

ELM14904AA-N uses advanced trench technology to provide excellent  $R_{ds(on)}$  and low gate charge.

## Features

- $V_{ds}=30V$
  - $I_d=6.9A$  ( $V_{gs}=10V$ )
  - $R_{ds(on)} < 27m\Omega$  ( $V_{gs}=10V$ )
  - $R_{ds(on)} < 32m\Omega$  ( $V_{gs}=4.5V$ )
  - $R_{ds(on)} < 50m\Omega$  ( $V_{gs}=2.5V$ )
- Schottky diode
- $V_{ds}(V)=30V$
  - $I_f=3A$
  - $V_f = 0.5V@1A$

## Maximum absolute ratings

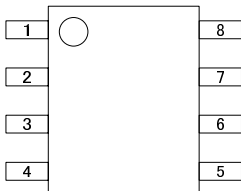
Parameter	Symbol	MOSFET	Schottky	Unit	Note
Drain-source voltage	$V_{ds}$	30		V	
Gate-source voltage	$V_{gs}$	$\pm 12$		V	
Continuous drain current	$I_d$	$T_a=25^\circ C$	6.9	A	1
		$T_a=70^\circ C$	5.8		
Pulsed drain current	$I_{dm}$	40		A	2
Schottky reverse voltage	$V_{ka}$		30	V	
Continuous forward current	$I_f$	$T_a=25^\circ C$	3	A	1
		$T_a=70^\circ C$	2		
Pulsed forward current	$I_{fm}$		40	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 (MOSFET)	Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$R\theta_{ja}$	$t \leq 10s$	48.0	62.5	$^\circ C/W$
Maximum junction-to-ambient		Steady-state	74.0	110.0	
Maximum junction-to-lead	$R\theta_{jl}$	35.0	40.0	$^\circ C/W$	3
Parameter (Schottky)	Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$R\theta_{ja}$	$t \leq 10s$	47.5	62.5	$^\circ C/W$
Maximum junction-to-ambient		Steady-state	71.0	110.0	
Maximum junction-to-lead	$R\theta_{jl}$	32.0	40.0	$^\circ C/W$	3

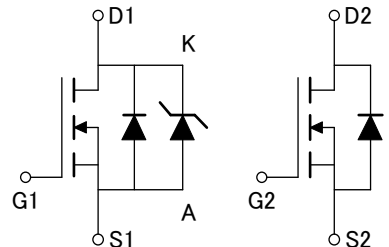
## Pin configuration

SOP-8 (TOP VIEW)



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

## Circuit



# Dual N-channel MOSFET with schottky diode

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### Electrical characteristics

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 T <sub>j</sub> =55°C			1	μA	
					5		
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	0.7	1.0	1.4	V	
On state drain current	I <sub>d(on)</sub>	V <sub>gs</sub> =4.5V, V <sub>ds</sub> =5V	25			A	
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V I <sub>d</sub> =6.9A T <sub>j</sub> =125°C		22.6	27.0	mΩ	
				33.0	40.0		
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =6A		27.0	32.0	mΩ	
		V <sub>gs</sub> =2.5V, I <sub>d</sub> =5A		42.0	50.0	mΩ	
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =5A	12	16		S	
Diode forward voltage	V <sub>sd</sub>	I <sub>s</sub> =1A		0.71	1.00	V	
Max. body-diode continuous current	I <sub>s</sub>				3	A	
<b>DYNAMIC PARAMETERS</b>							
Input capacitance	C <sub>iss</sub>			846	1050	pF	
Output capacitance	C <sub>oss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =15V, f=1MHz		96		pF	
Reverse transfer capacitance	C <sub>rss</sub>			67		pF	
Gate resistance	R <sub>g</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =0V, f=1MHz		1.24	3.60	Ω	
<b>SWITCHING PARAMETERS</b>							
Total gate charge	Q <sub>g</sub>			9.60	12.00	nC	
Gate-source charge	Q <sub>gs</sub>	V <sub>gs</sub> =4.5V, V <sub>ds</sub> =15V, I <sub>d</sub> =6.9A		1.65		nC	
Gate-drain charge	Q <sub>gd</sub>			3.00		nC	
Turn-on delay time	t <sub>d(on)</sub>			5.70	8.55	ns	
Turn-on rise time	t <sub>r</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V		13.00	6.20	ns	
Turn-off delay time	t <sub>d(off)</sub>	R <sub>l</sub> =2.2 Ω, R <sub>gen</sub> =3 Ω		37.00	40.00	ns	
Turn-off fall time	t <sub>f</sub>			4.20	5.50	ns	
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>f</sub> =5A, dl/dt=100A/μs		15.5	20.0	ns	
Body diode reverse recovery charge	Q <sub>rr</sub>	I <sub>f</sub> =5A, dl/dt=100A/μs		7.9		nC	
<b>SCHOTTKY PARAMETERS</b>							
Forward voltage drop	V <sub>f</sub>	I <sub>f</sub> =1A		0.45	0.50	V	
Max. reverse leakage current	I <sub>rm</sub>	V <sub>r</sub> =30V		0.007	0.050	mA	
		V <sub>r</sub> =30V	T <sub>j</sub> =125°C		3.2		10.0
			T <sub>j</sub> =150°C		12.0		20.0
Junction capacitance	C <sub>t</sub>	V <sub>r</sub> =15V		37		pF	

#### 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>θj</sub> and lead to ambient.
- The static characteristics in Figures 1 to 6,12,14 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

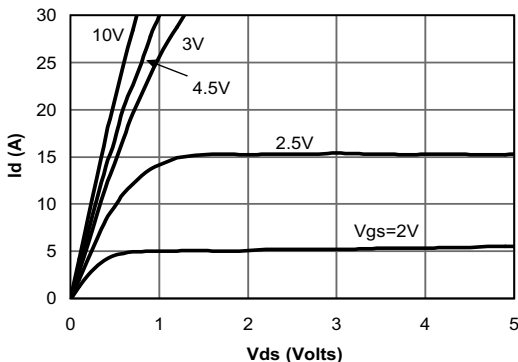


Fig 1: On-Region Characteristics

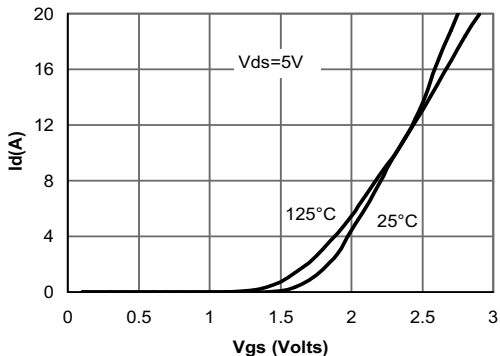


Figure 2: Transfer Characteristics

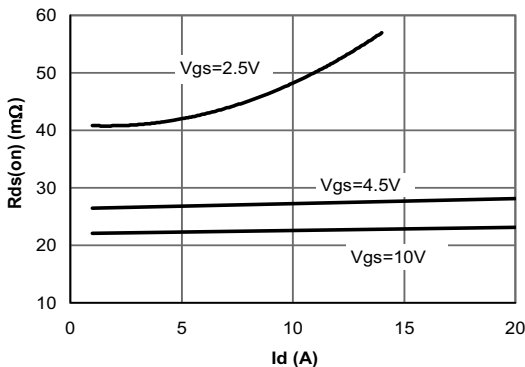


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

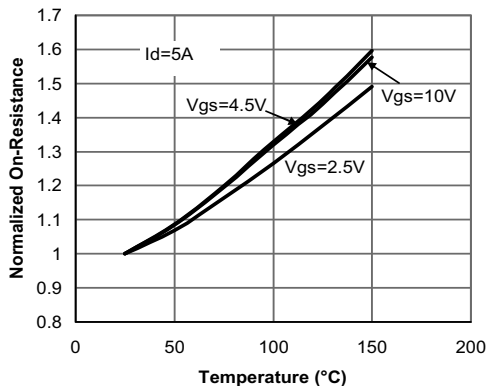


Figure 4: On resistance vs. Junction Temperature

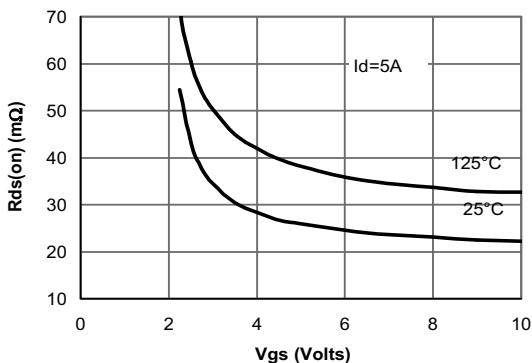


Figure 5: On resistance vs. Gate-Source Voltage

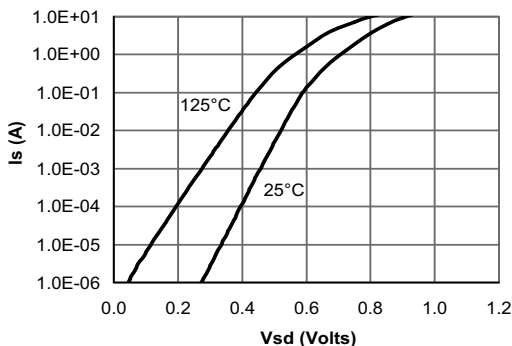


Figure 6: Body-Diode Characteristics

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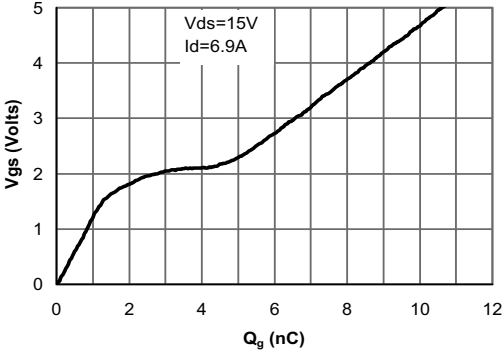


Figure 7: Gate-Charge Characteristics

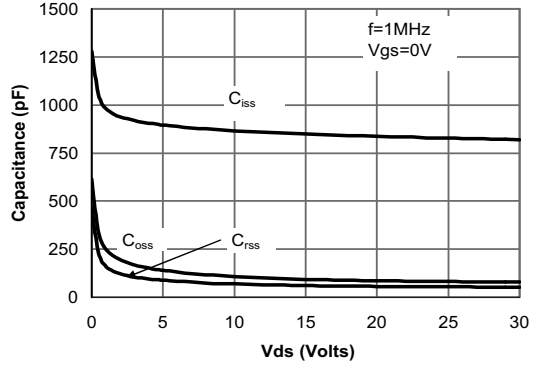


Figure 8: Capacitance Characteristics

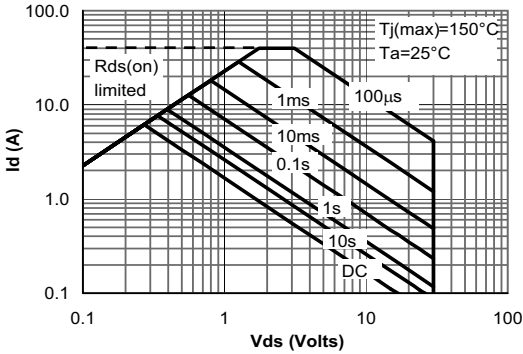


Figure 9: Maximum Forward Biased Safe Operating Area (Note 5)

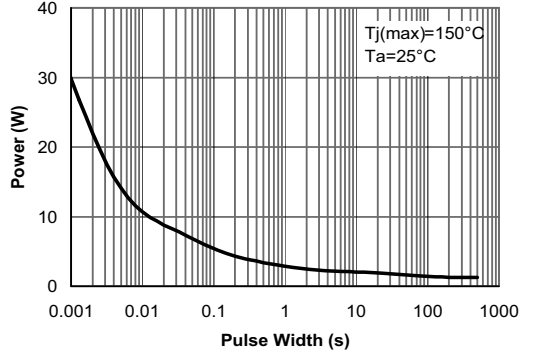


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note 5)

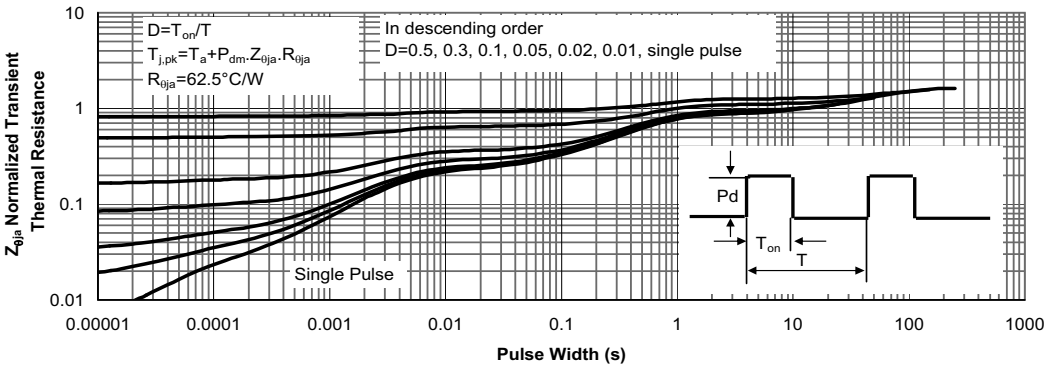


Figure 11: Normalized Maximum Transient Thermal Impedance

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## Typical electrical and thermal characteristics (Schottky)

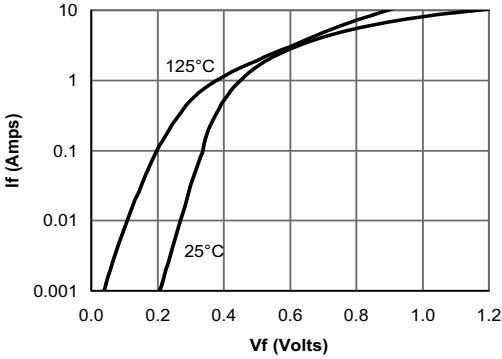


Figure 12: Schottky Forward Characteristics

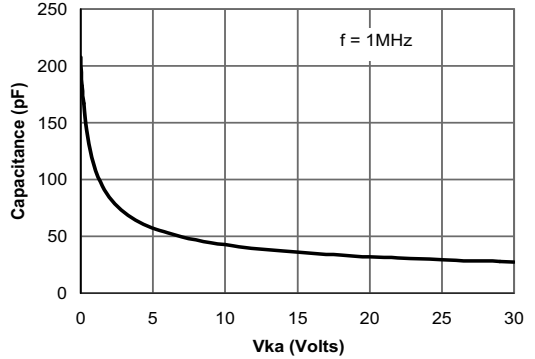


Figure 13: Schottky Capacitance Characteristics

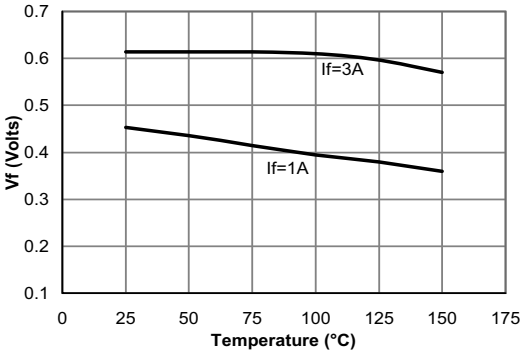


Figure 14: Schottky Forward Drop vs. Junction Temperature

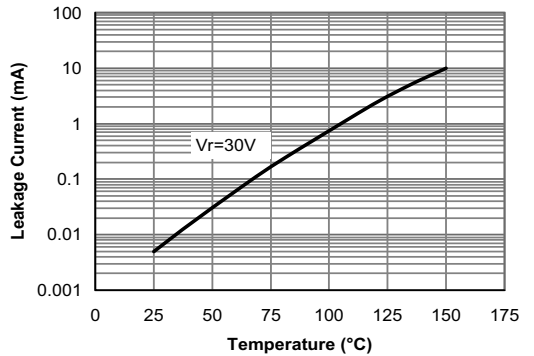


Figure 15: Schottky Leakage current vs. Junction Temperature

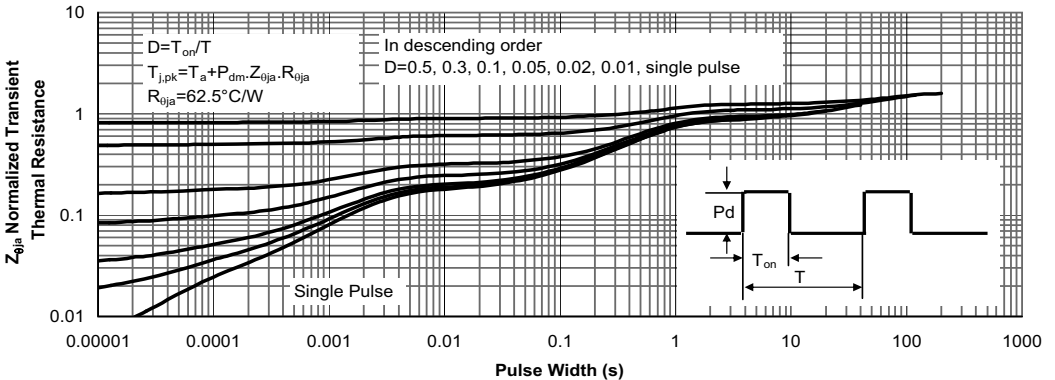


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance