

# Single N-channel MOSFET with schottky diode

ELM14704AA-N

## General description

ELM14704AA-N uses advanced trench technology to provide excellent  $R_{ds(on)}$  and low gate charge.

## Features

- $V_{ds}=30V$
- $I_d=13A$
- $R_{ds(on)} < 11.5m\Omega$  ( $V_{gs}=10V$ )
- $R_{ds(on)} < 13m\Omega$  ( $V_{gs}=4.5V$ )
- Schottky diode
- $V_{ds(V)}=30V$
- $I_f=3A$
- $V_f < 0.5V@1A$

## Maximum absolute ratings

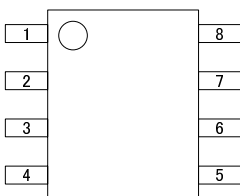
Parameter	Symbol	MOSFET	Schottky	Unit	Note
Drain-source voltage	$V_{ds}$	30		V	
Gate-source voltage	$V_{gs}$	$\pm 12$		V	
Continuous drain current	$I_d$			$T_a=25^\circ C$	1
				$T_a=70^\circ C$	
Pulsed drain current	$I_{dm}$	40		A	2
Schottky reverse voltage	$V_{ka}$		30	V	
Continuous forward current	$I_f$			$T_a=25^\circ C$	1
				$T_a=70^\circ C$	
Pulsed diode forward current	$I_{fm}$		30	A	2
Power dissipation	$P_d$			$T_a=25^\circ C$	
				$T_a=70^\circ C$	
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	$t \leq 10s$	$R\theta_{ja}$	28	40	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		54	75	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	21	30	$^\circ C/W$	3
Parameter (Schottky)		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	$t \leq 10s$	$R\theta_{ja}$	36	40	$^\circ C/W$	1
Maximum junction-to-ambient	Steady-state		67	75	$^\circ C/W$	
Maximum junction-to-lead	Steady-state	$R\theta_{jl}$	25	30	$^\circ C/W$	3

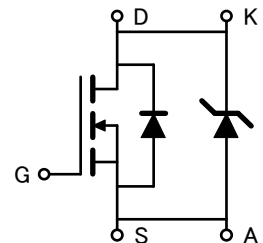
## Pin configuration

SOP-8 (TOP VIEW)



Pin No.	Pin name
1	SOURCE/ANODE
2	SOURCE/ANODE
3	SOURCE/ANODE
4	GATE
5	DRAIN/CATHODE
6	DRAIN/CATHODE
7	DRAIN/CATHODE
8	DRAIN/CATHODE

## Circuit



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### Electrical characteristics

Ta=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 (Set by schottky leakage)	I <sub>dss</sub>	V <sub>r</sub> =30V		0.007	0.050	mA
		V <sub>r</sub> =30V, T <sub>j</sub> =125°C		3.200	10.000	
		V <sub>r</sub> =30V, T <sub>j</sub> =150°C		12.000	20.000	
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		9.1	11.5	mΩ
		I <sub>d</sub> =13A	T <sub>j</sub> =125°C	13.3	16.5	
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =12.2A		10.5	13.0	mΩ
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =13A	30	37		S
Diode+schottky forward voltage	V <sub>sd</sub>	I <sub>s</sub> =1A, V <sub>gs</sub> =0V		0.45	0.50	V
Max. body-diode+schottky continuous current	I <sub>s</sub>				5	A
<b>DYNAMIC PARAMETERS</b>						
Input capacitance	C <sub>iss</sub>	V <sub>gs</sub> =0V, V <sub>ds</sub> =15V		3656	4050	pF
Output capacitance (FET+Schottky)	C <sub>oss</sub>	f=1MHz		322		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	1.10	Ω
<b>SWITCHING PARAMETERS</b>						
Total gate charge (4.5V)	Q <sub>g</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V		30.5	36.0	nC
Gate-source charge	Q <sub>gs</sub>	I <sub>d</sub> =13A		4.6		nC
Gate-drain charge	Q <sub>gd</sub>			8.6		nC
Turn-on delay time	t <sub>d(on)</sub>			6.2	9.0	ns
Turn-on rise time	t <sub>r</sub>	V <sub>gs</sub> =10V, V <sub>ds</sub> =15V		4.8	7.0	ns
Turn-off delay time	t <sub>d(off)</sub>	R <sub>l</sub> =1.1 Ω, R <sub>gen</sub> =0 Ω		55.0	75.0	ns
Turn-off fall time	t <sub>f</sub>			7.3	11.0	ns
Body diode+schottky reverse recovery time	t <sub>rr</sub>	I <sub>f</sub> =13A, dl/dt=100A/μs		20.3	25.0	ns
Body diode+schottky reverse recovery charge	Q <sub>rr</sub>	I <sub>f</sub> =13A, dl/dt=100A/μs		8.4	12.5	nC

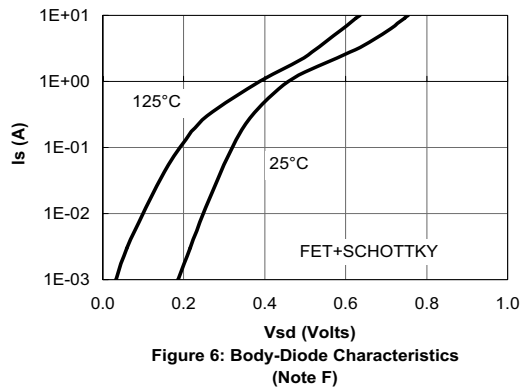
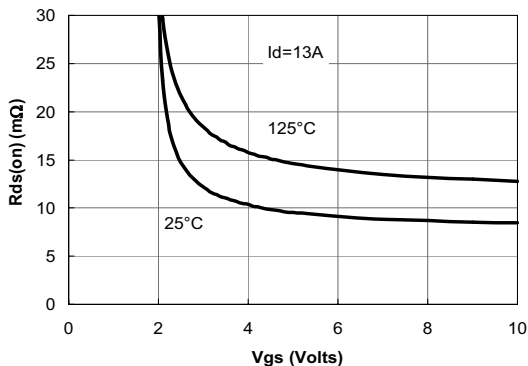
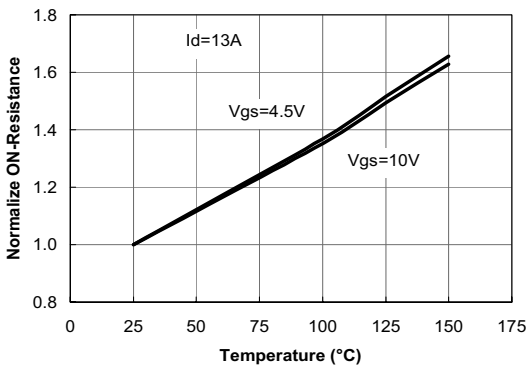
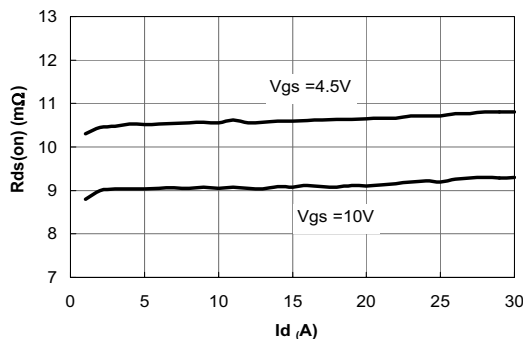
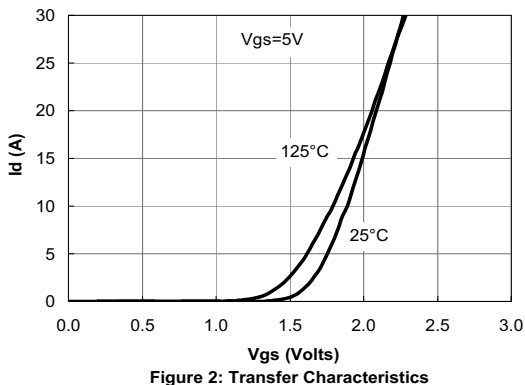
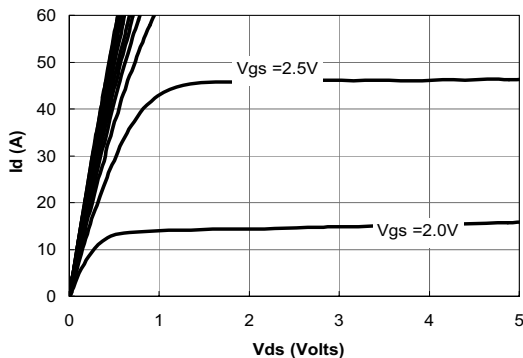
#### NOTE :

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 Ta=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.
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 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with Ta=25°C. The SOA curve provides a single pulse rating.

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## Typical electrical and thermal characteristics



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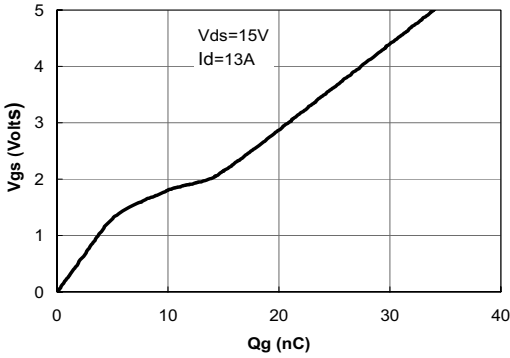


Figure 7: Gate-Charge Characteristics

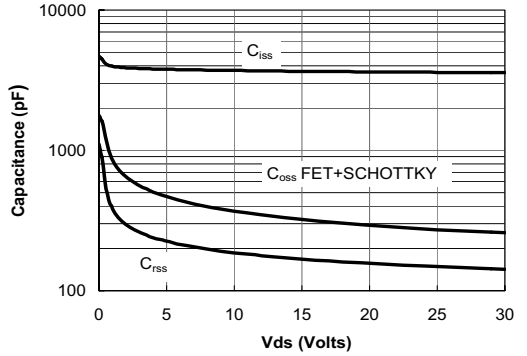


Figure 8: Capacitance Characteristics

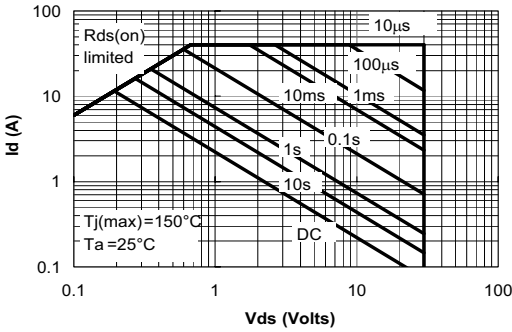


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

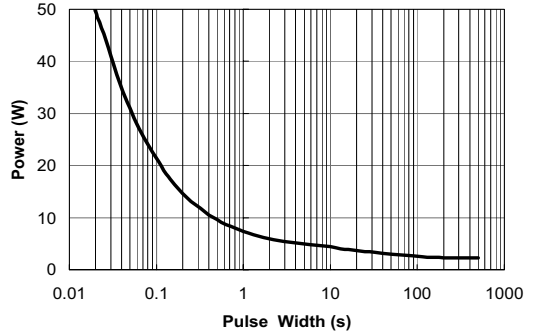


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

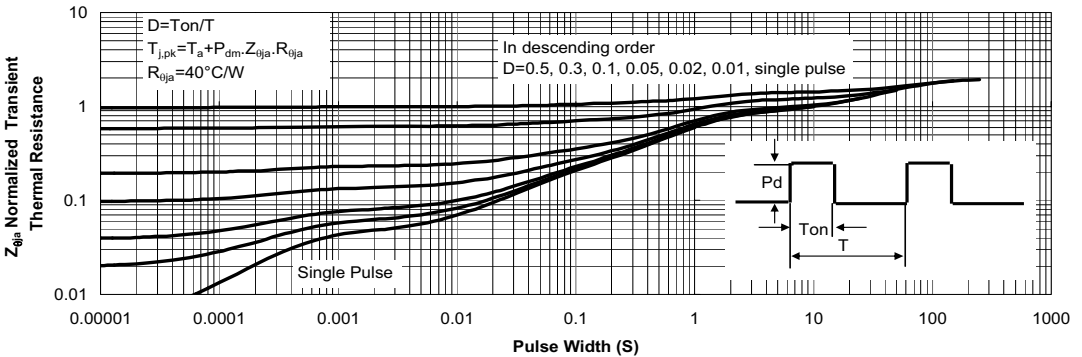


Figure 11: Normalized Maximum Transient Thermal Impedance