Single N-channel MOSFET
ELM14404AA-N

■General description

ELM14404AA-N uses advanced trench technology to provide excellent Rds(on), low gate charge and low gate resistance.

■Features

- Vds=30V
- Id=8.5A (Vgs=10V)
- Rds(on) < 24mΩ (Vgs=10V)
- Rds(on) < 30mΩ (Vgs=4.5V)
- Rds(on) < 48mΩ (Vgs=2.5V)

■Maximum absolute ratings

Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		Vds	30	V	
Gate-source voltage		Vgs	±12	V	
Continuous drain current	Ta=25℃	Id	8.5	A	1
	Ta=70℃		7.1		
Pulsed drain current		Idm	60	A	2
Power dissipation	Ta=25℃	Pd	3.0	W	
	Ta=70℃		2.1		
Junction and storage temperature range		Tj, Tstg	−55 to 150	℃	

■Thermal characteristics

Parameter		Symbol	Typ.	Max.	Unit	Note
Maximum junction-to-ambient	t≤10s	$R\theta$ja	31	40	℃/W	1
Maximum junction-to-ambient	Steady-state		59	75	℃/W	
Maximum junction-to-lead	Steady-state	$R\theta$jl	16	24	℃/W	3

■Pin configuration

SOP-8 (TOP VIEW)
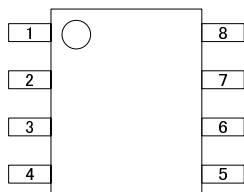
Pin No.	Pin name
1	SOURCE
2	SOURCE
3	SOURCE
4	GATE
5	DRAIN
6	DRAIN
7	DRAIN
8	DRAIN

■Circuit

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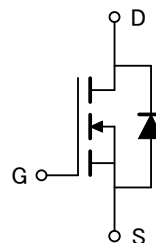
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■Electrical characteristics

Ta=25℃

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Id=250μA, Vgs=0V		30			V
Zero gate voltage drain current	Idss	Vds=24V			0.002	1.000	μA
		Vgs=0V	Tj=55℃			5.000	
Gate-body leakage current	Igss	Vds=0V, Vgs=±12V				100	nA
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA		0.7	1.0	1.4	V
On state drain current	Id(on)	Vgs=4.5V, Vds=5V		40			A
Static drain-source on-resistance	Rds(on)	Vgs=10V			20.5	24.0	mΩ
		Id=8.5A	Tj=125℃		30.0	36.0	
		Vgs=4.5V, Id=8.5A			25.0	30.0	mΩ
		Vgs=2.5V, Id=5A			40.0	48.0	mΩ
Forward transconductance	Gfs	Vds=5V, Id=5A		10	16		S
Diode forward voltage	Vsd	Is=1A, Vgs=0V			0.71	1.00	V
Max. body-diode continuous current	Is					4.3	A
DYNAMIC PARAMETERS							
Input capacitance	Ciss				857	1030	pF
Output capacitance	Coss	Vgs=0V, Vds=15V, f=1MHz			97		pF
Reverse transfer capacitance	Crss				71		pF
Gate resistance	Rg	Vgs=0V, Vds=0V, f=1MHz			1.4	3.6	Ω
SWITCHING PARAMETERS							
Total gate charge	Qg				9.70	12.00	nC
Gate-source charge	Qgs	Vgs=4.5V, Vds=15V, Id=8.5A			1.63		nC
Gate-drain charge	Qgd				3.10		nC
Turn-on delay time	td(on)				3.3	5.0	ns
Turn-on rise time	tr	Vgs=10V, Vds=15V			4.7	7.0	ns
Turn-off delay time	td(off)	Rl=1.8Ω, Rgen=6Ω			26.0	39.0	ns
Turn-off fall time	tf				4.1	6.2	ns
Body diode reverse recovery time	trr	If=5A, dl/dt=100A/μs			15.0	20.0	ns
Body diode reverse recovery charge	Qrr	If=5A, dl/dt=100A/μs			8.6	12.0	nC

NOTE :

1. The value of Rθja is measured with the device mounted on 1in² FR-4 board of 2oz. Copper, in still air environment with Ta=25℃. The value in any given applications depends on the user's specific board design, The current rating is based on the t ≤ 10s themal resistance rating.
2. Repetitive rating, pulse width limited by junction temperature.
3. The Rθja is the sum of the thermal impedance from junction to lead Rθjl 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 Ta=25℃. The SOA curve provides a single pulse rating.

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■Typical electrical and thermal characteristics

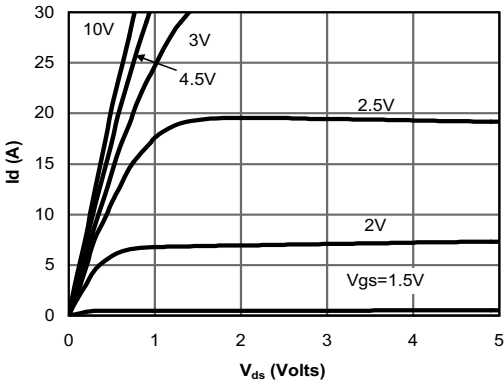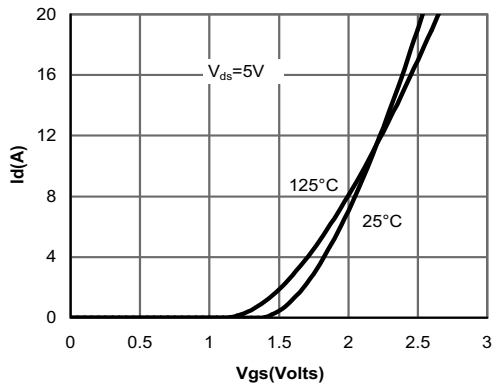
Fig 1: On-Region Characteristics
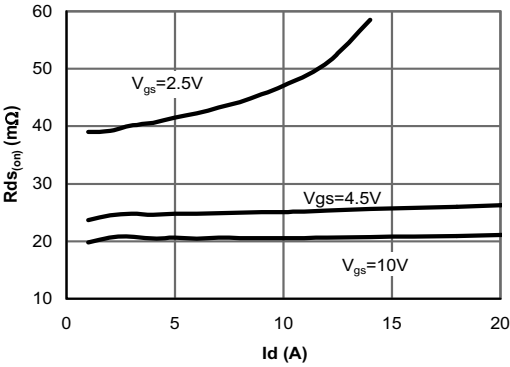

Figure 2: Transfer Characteristics

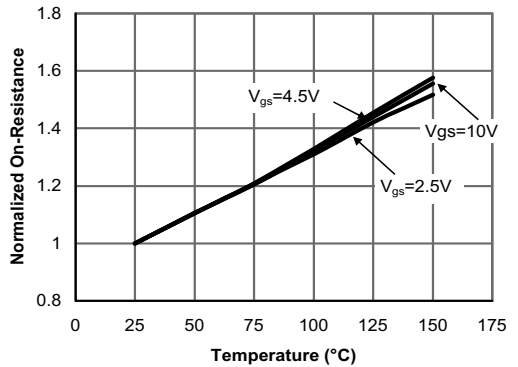Figure 3: On-Resistance vs. Drain Current and Gate Voltage
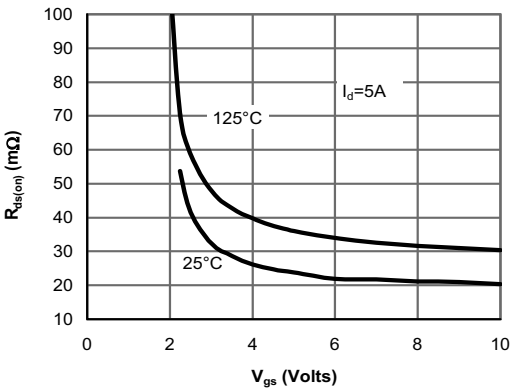

Figure 4: On-Resistance vs. Junction Temperature

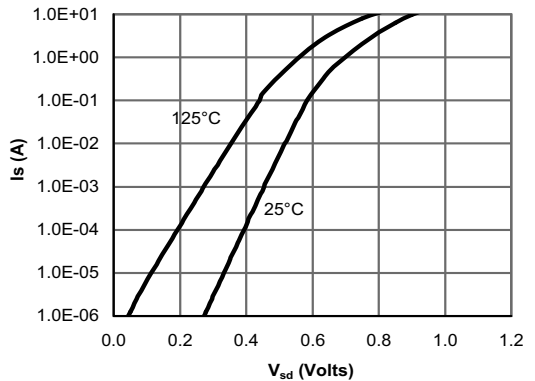Figure 5: On-Resistance vs. Gate-Source Voltage

Figure 6: Body-Diode Characteristics

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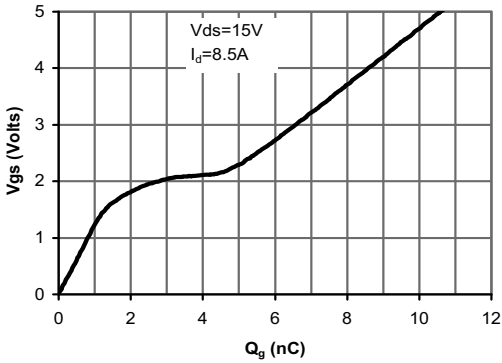TECHNOLOGY

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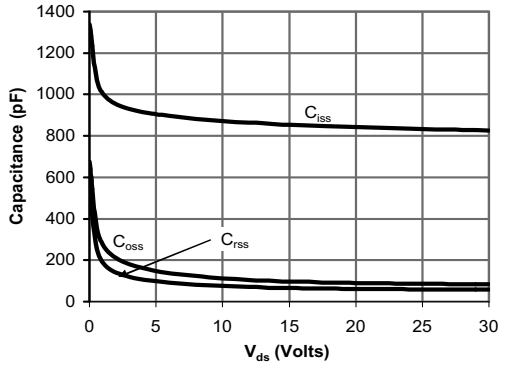
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Figure 7: Gate-Charge Characteristics

(Graph: Vgs (Volts) vs Q_g (nC). Conditions: Vds=15V, I_d=8.5A)

Figure 8: Capacitance Characteristics

(Graph: Capacitance (pF) vs V_{ds} (Volts). Curves: C_{iss}, C_{oss}, C_{rss})
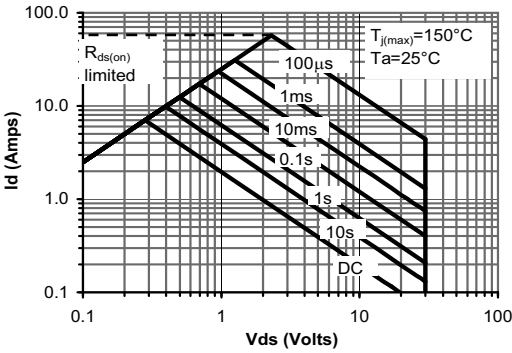
Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

(Graph: Id (Amps) vs Vds (Volts). $R_{ds(on)}$ limited, $T_{j(max)}$=150°C, Ta=25°C. Curves: 100µs, 1ms, 10ms, 0.1s, 1s, 10s, DC)
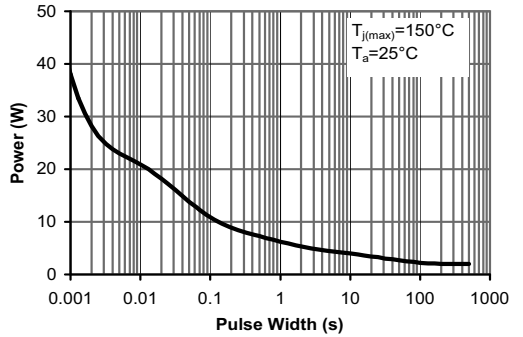
Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

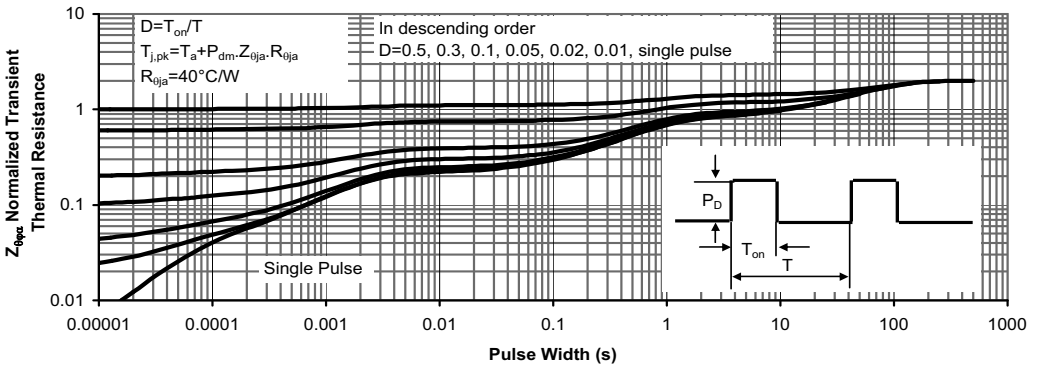(Graph: Power (W) vs Pulse Width (s). $T_{j(max)}$=150°C, T_a=25°C)

Figure 11: Normalized Maximum Transient Thermal Impedance

(Graph: $Z_{\theta ja}$ Normalized Transient Thermal Resistance vs Pulse Width (s))

$D=T_{on}/T$
$T_{j,pk}=T_a+P_{dm} \cdot Z_{\theta ja} \cdot R_{\theta ja}$
$R_{\theta ja}=40°C/W$

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

P_D, T_{on}, T