

Single N-channel MOSFET

ELM4N4094FDA-N

<http://www.elm-tech.com>

■ General description

ELM4N4094FDA-N uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate threshold voltage.

■ Features

- $V_{ds}=40V$
- $I_d=114A$ ($V_{gs}=10V$)
- $R_{ds(on)} = 3.2m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} = 5.3m\Omega$ ($V_{gs}=4.5V$)

■ Maximum absolute ratings

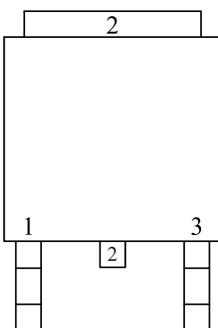
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	40	V		
Gate-source voltage	V_{gs}	± 20	V		
Continuous drain current ($V_{gs}=10V$)	I_d	$T_c=25^\circ C$	114	A	1
		$T_c=100^\circ C$	72		
Pulsed drain current	I_{dm}	240	A	2	
Single pulsed avalanche energy	E_{as}	145	mJ	3	
Avalanche current	I_{as}	54	A		
Power dissipation	P_d	$T_c=25^\circ C$	73.5	W	4
Storage temperature range	T_{stg}	-55 to +150	$^\circ C$		
Operating junction temperature range	T_j	-55 to +150	$^\circ C$		

■ Thermal characteristics

Parameter	Symbol	Typ.	Max.	Unit	Note
Thermal resistance junction-to-ambient	$R_{\theta ja}$	-	55.0	$^\circ C/W$	1
Thermal resistance junction-to-case	$R_{\theta jc}$	-	1.7	$^\circ C/W$	1

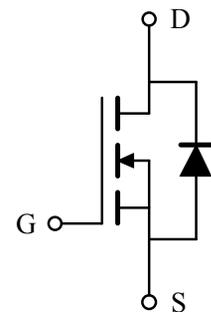
■ Pin configuration

TO-252(TOP VIEW)



Pin No.	Pin name
1	GATE
2	DRAIN
3	SOURCE

■ Circuit



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■ Electrical characteristics

T_j=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BV _{dss}	V _{gs} =0V, I _d =250μA	40	-	-	V	
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V, I _d =20A	-	2.5	3.2	mΩ	2
		V _{gs} =4.5V, I _d =15A	-	3.8	5.3		
Gate threshold voltage	V _{gs(th)}	V _{gs} =V _{ds} , I _d =250μA	1.2	1.7	2.2	V	
Zero gate voltage drain current	I _{dss}	V _{ds} =40V, V _{gs} =0V	-	-	1	μA	
		V _{ds} =40V, V _{gs} =0V, T _j =55°C	-	-	5		
Gate-body leakage current	I _{gss}	V _{gs} =±20V, V _{ds} =0V	-	-	±100	nA	
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =20A	-	75	-	S	
Max. body-diode continuous current	I _s	V _{gs} =V _{ds} =0V, Force current	-	-	30	A	1, 5
Diode forward voltage	V _{sd}	V _{gs} =0V, I _s =1A	-	-	1	V	2
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{ds} =20V, V _{gs} =0V, f=1MHz	-	2648	-	pF	
Output capacitance	C _{oss}		-	899	-	pF	
Reverse transfer capacitance	C _{rss}		-	71	-	pF	
Gate resistance	R _g	V _{ds} =0V, V _{gs} =0V, f=1MHz	-	1.5	-	Ω	
SWITCHING PARAMETERS							
Total gate charge (4.5V)	Q _g	V _{ds} =20V, V _{gs} =4.5V I _d =20A	-	22.7	-	nC	
Gate-source charge	Q _{gs}		-	7.5	-	nC	
Gate-drain charge	Q _{gd}		-	5.5	-	nC	
Turn-on delay time	t _{d(on)}	V _{ds} =20V, V _{gs} =10V R _{gen} =3Ω, I _d =20A	-	10.0	-	ns	
Turn-on rise time	t _r		-	5.0	-	ns	
Turn-off delay time	t _{d(off)}		-	33.0	-	ns	
Turn-off fall time	t _f		-	6.5	-	ns	

NOTE :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300μs and duty cycle ≤ 2%.
3. The Eas data shows Max. rating . The test condition is V_{dd}=25V, V_{gs}=10V, L=0.1mH, I_{as}=54A.
4. The power dissipation is limited by 150°C junction temperature.
5. The data is theoretically the same as I_d and I_{dm}, in real applications, should be limited by total power dissipation.

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■ Typical characteristics

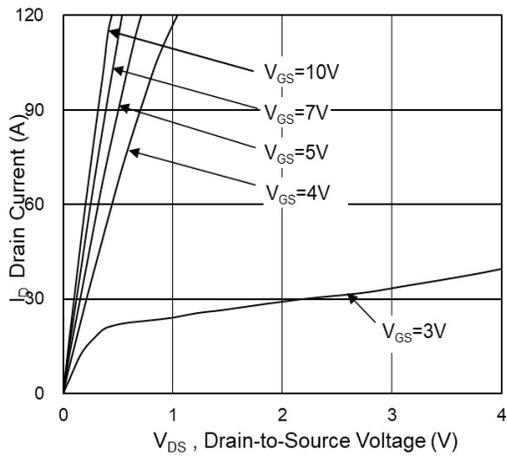


Fig.1 Typical Output Characteristics

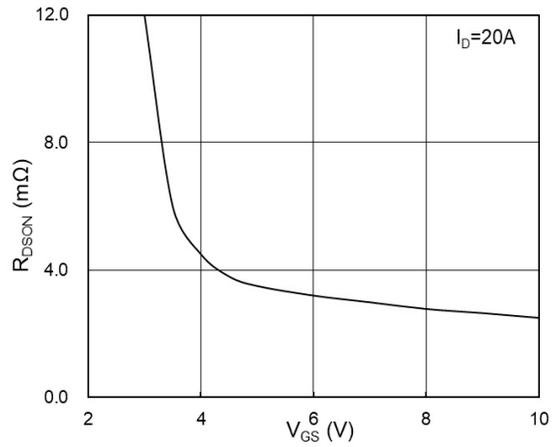


Fig.2 On-Resistance vs G-S Voltage

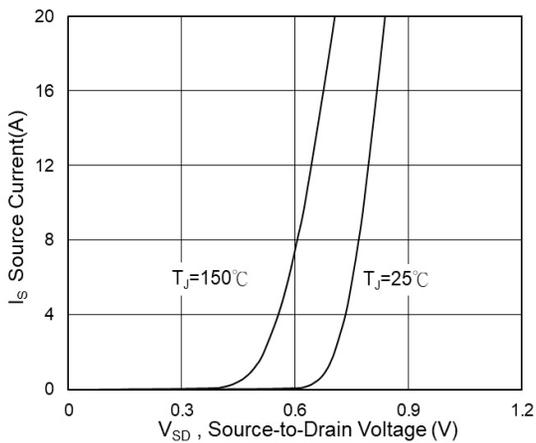


Fig.3 Source Drain Forward Characteristics

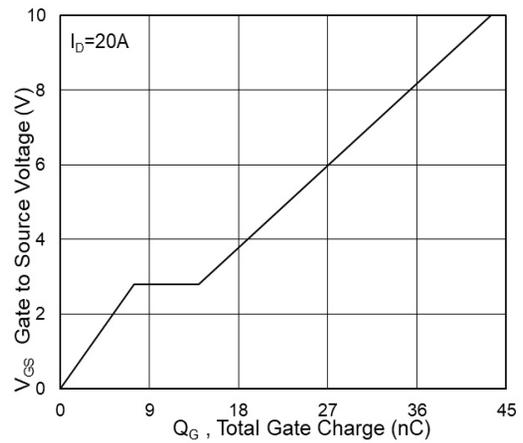


Fig.4 Gate-Charge Characteristics

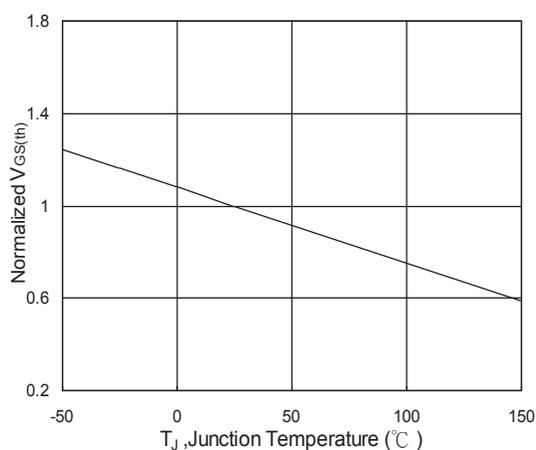


Fig.5 Normalized $V_{GS(th)}$ vs T_J

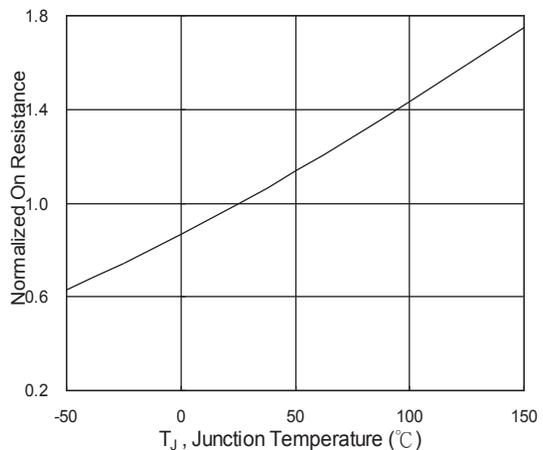


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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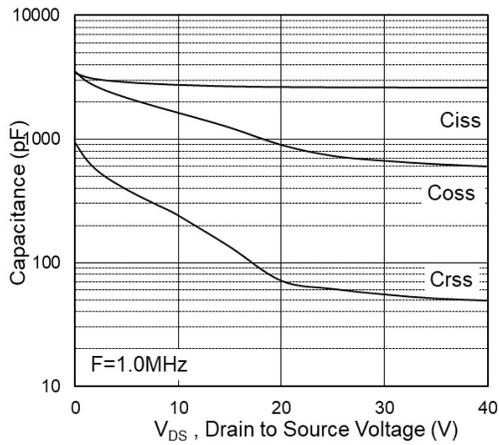


Fig.7 Capacitance

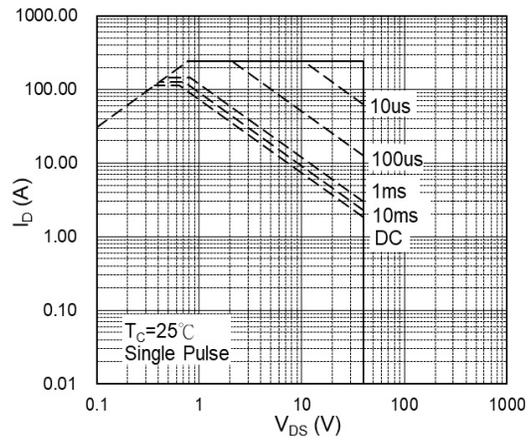


Fig.8 Safe Operating Area

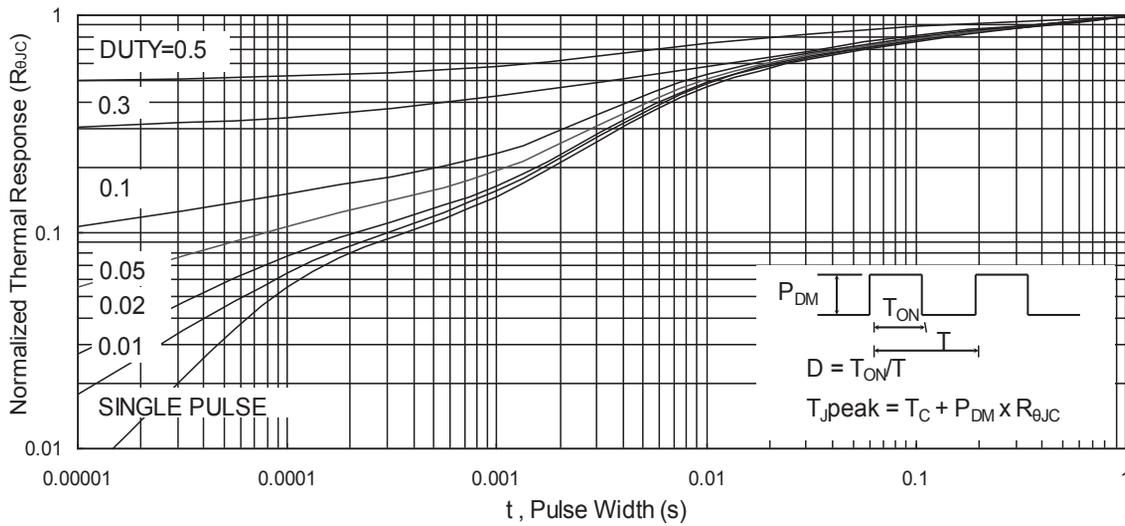


Fig.9 Normalized Maximum Transient Thermal Impedance

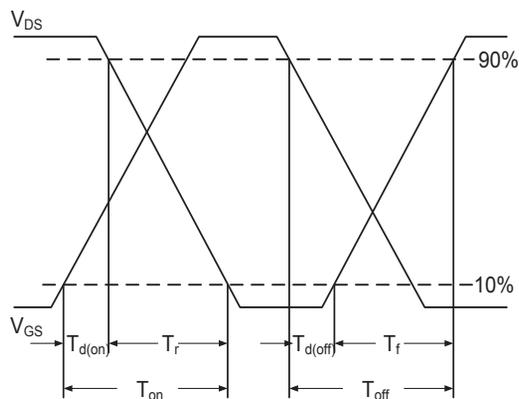


Fig.10 Switching Time Waveform

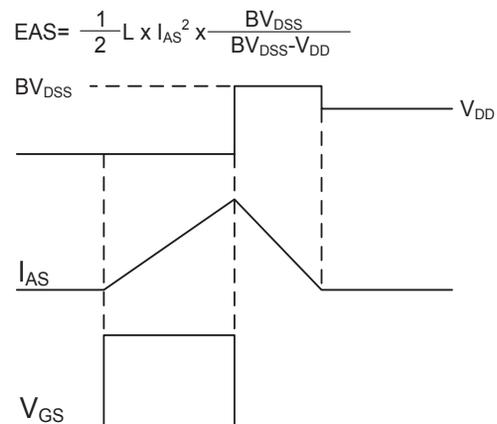


Fig.11 Unclamped Inductive Switching Wave