

Single N-channel MOSFET

ELM4N0008FRA-S

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

■ General description

ELM4N0008FRA-S uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate threshold voltage.

■ Features

- $V_{ds}=100V$
- $I_d=2.2A$
- $R_{ds(on)} = 310m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} = 320m\Omega$ ($V_{gs}=4.5V$)

■ Maximum absolute ratings

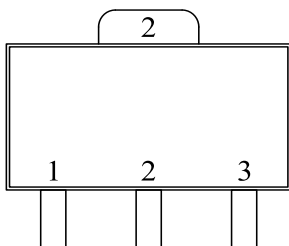
Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	V_{ds}	100	V		
Gate-source voltage	V_{gs}	± 20	V		
Continuous drain current ($V_{gs}=10V$)	I_d	$T_a=25^\circ C$	2.2	A	1
		$T_a=70^\circ C$	1.7		
Pulsed drain current	I_{dm}	5.5	A	2	
Total power dissipation	P_d	1.5	W	3	
Storage temperature range	T_{stg}	-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-ambient	$R_{\theta ja}$	--	85	$^\circ C/W$	1
Thermal resistance junction-case	$R_{\theta jc}$	--	36	$^\circ C/W$	1

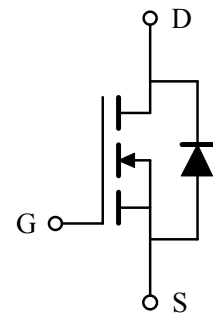
■ Pin configuration

SOT-89(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	100	--	--	V	
BV _{dss} Temperature coefficient	$\frac{\Delta BV_{dss}}{\Delta T_j}$	Reference to 25°C, I _d =1mA	--	0.067	--	V/°C	
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V, I _d =2A	--	260	310	mΩ	2
		V _{gs} =4.5V, I _d =1A	--	270	320		
Gate threshold voltage	V _{gs(th)}	V _{gs} =V _{ds} , I _d =250μA	1.0	1.5	2.5	V	
V _{gs(th)} Temperature coefficient	ΔV _{gs(th)}		--	-4.2	--	mV/°C	
Drain-source leakage current	I _{dss}	V _{ds} =80V, V _{gs} =0V	--	--	1	μA	
		V _{ds} =80V, V _{gs} =0V, T _j =55°C	--	--	5		
Gate-source leakage current	I _{gss}	V _{gs} =±20V, V _{ds} =0V	--	--	±100	nA	
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =2A	--	5.4	--	S	
Continuous source current	I _s	V _{gs} =V _{ds} =0V, Force current	--	--	2.2	A	1, 4
Pulsed source current	I _{sm}		--	--	5.5	A	2, 4
Diode forward voltage	V _{sd}	V _{gs} =0V, I _s =1A	--	--	1.2	V	2
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{ds} =15V, V _{gs} =0V, f=1MHz	--	508.0	711.0	pF	
Output capacitance	C _{oss}		--	29.0	41.0	pF	
Reverse transfer capacitance	C _{rss}		--	16.4	33.0	pF	
Gate resistance	R _g	V _{ds} =0V, V _{gs} =0V, f=1MHz	--	2.8	5.6	Ω	
SWITCHING PARAMETERS							
Total gate charge (10V)	Q _g	V _{ds} =50V, V _{gs} =10V, I _d =2A	--	9.1	12.7	nC	
Gate-source charge	Q _{gs}		--	2.0	2.8	nC	
Gate-drain charge	Q _{gd}		--	1.4	2.0	nC	
Turn-on delay time	t _{d(on)}	V _{dd} =50V, V _{gs} =10V R _{gen} =3.3Ω, I _d =2A	--	2.0	4.0	ns	
Turn-on rise time	t _r		--	21.6	39.0	ns	
Turn-off delay time	t _{d(off)}		--	11.2	22.0	ns	
Turn-off fall time	t _f		--	18.8	37.6	ns	
Reverse recovery time	t _{rr}	I _f =2A, di/dt=100A/μs	--	17.5	--	nS	
Reverse recovery charge	Q _{rr}		--	14.0	--	nC	

NOTE :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width ≤ 300μs and duty cycle ≤ 2%.
3. The power dissipation is limited by 150°C junction temperature.
4. 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

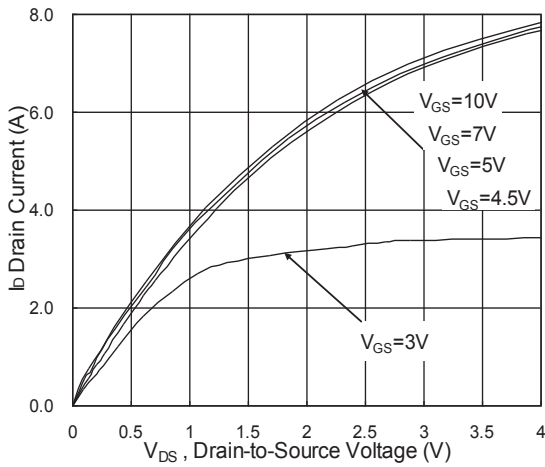


Fig.1 Typical Output Characteristics

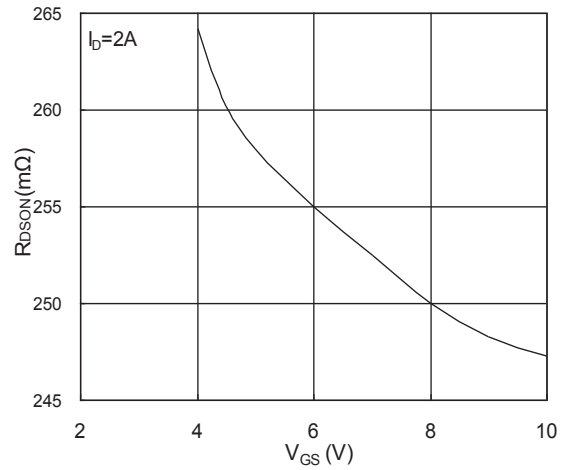


Fig.2 On-Resistance vs G-S Voltage

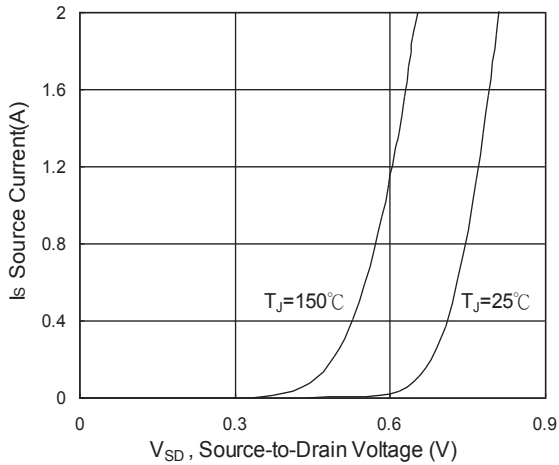


Fig.3 Source Drain Forward Characteristics

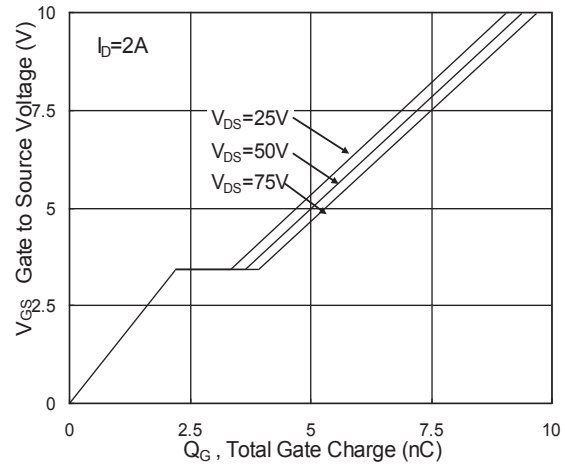


Fig.4 Gate-Charge Characteristics

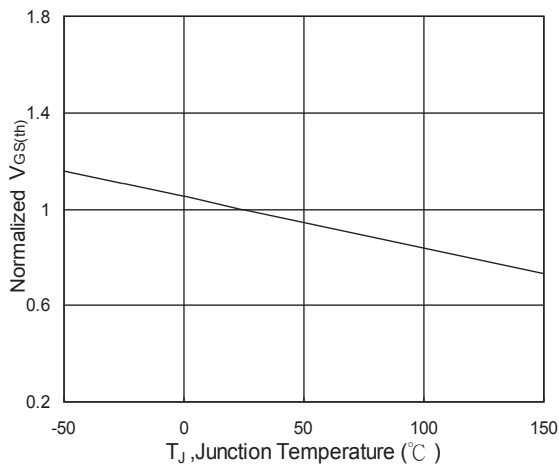


Fig.5 Normalized $V_{GS(th)}$ vs T_J

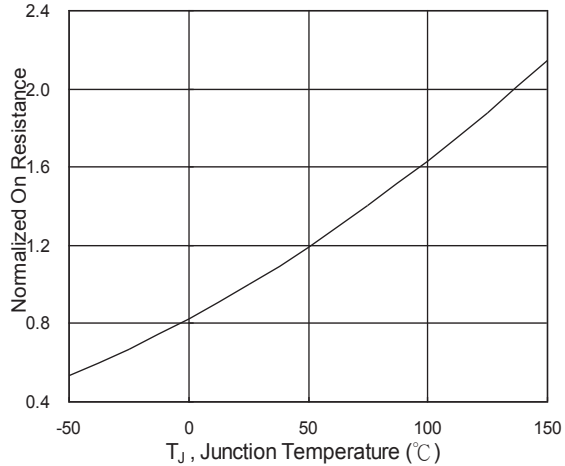


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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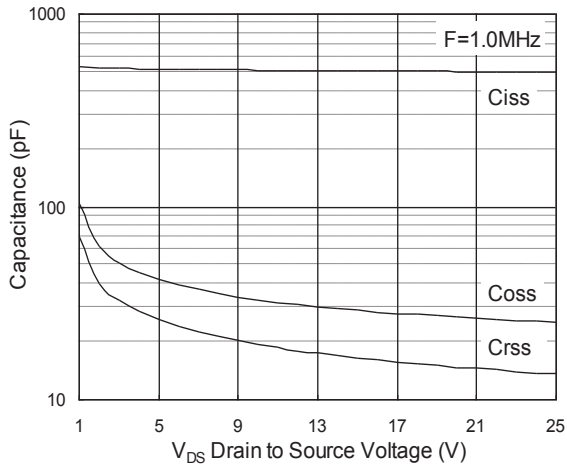


Fig.7 Capacitance

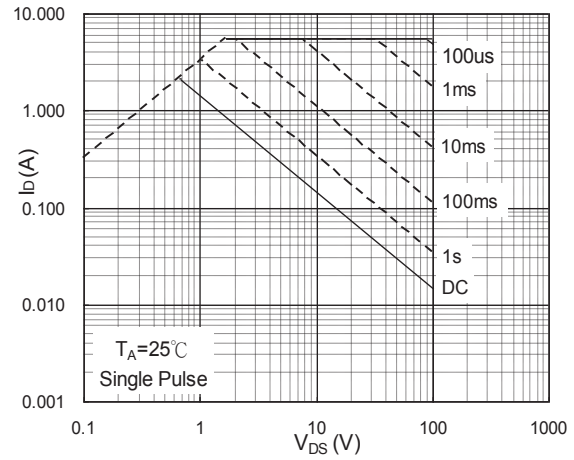


Fig.8 Safe Operating Area

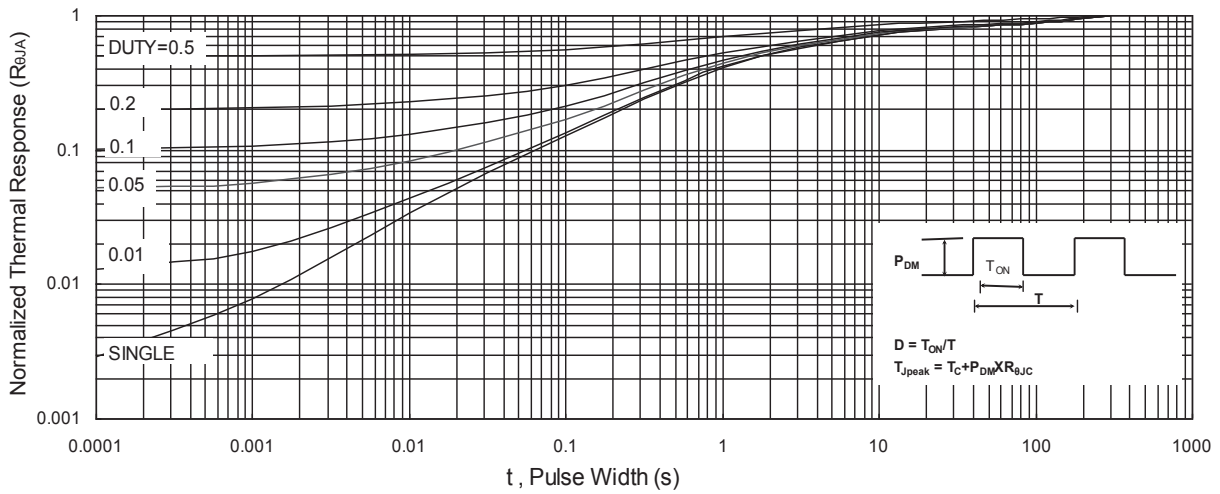


Fig.9 Normalized Maximum Transient Thermal Impedance

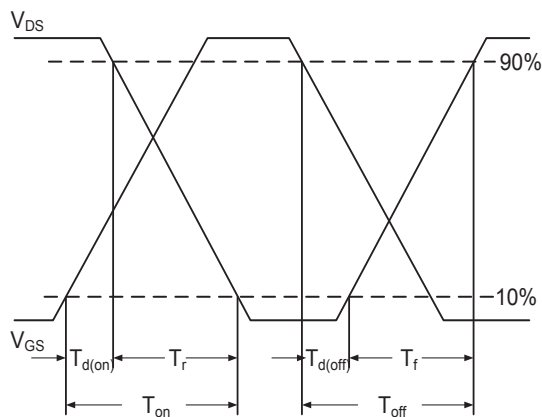


Fig.10 Switching Time Waveform

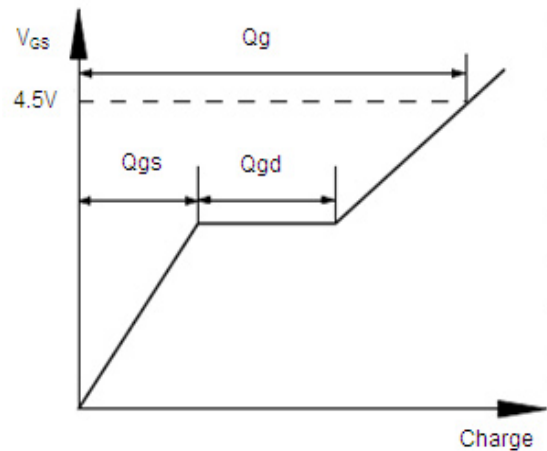


Fig.11 Gate Charge Waveform

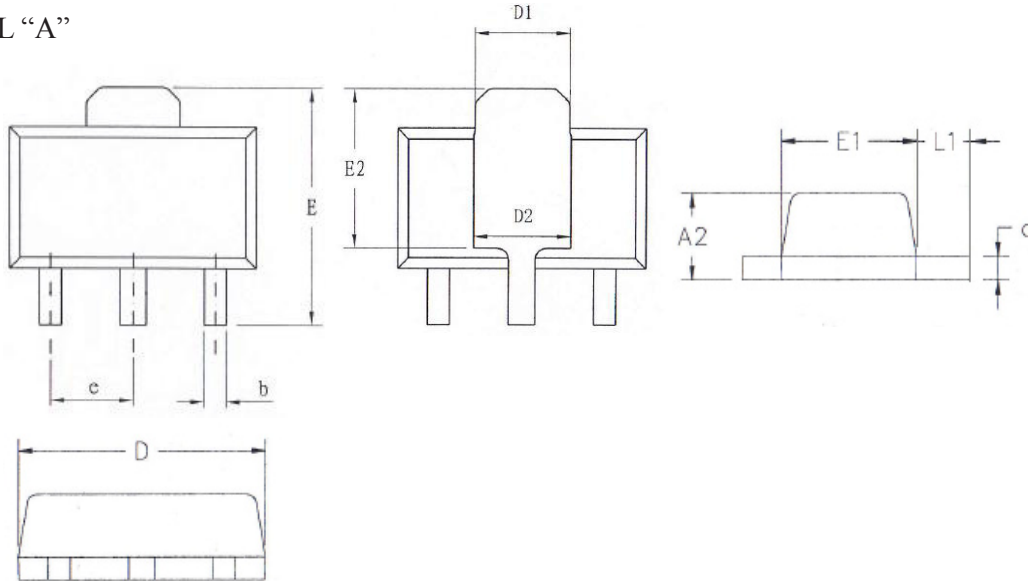
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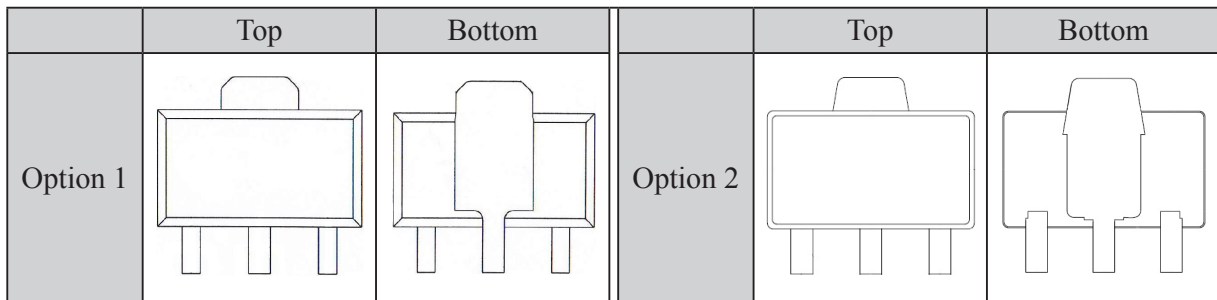
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■SOT-89 dimension (1,000pcs/reel)

SEE DETAIL "A"

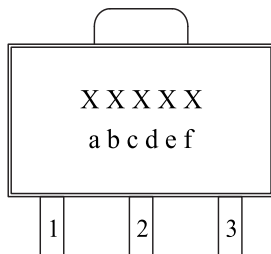


Detail "A"



Symbols	Millimeters		Inches		Symbols	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A2	1.40	1.60	0.055	0.063	E	3.95	4.25	0.156	0.167
b	0.38	0.56	0.015	0.022	E1	2.40	2.60	0.094	0.102
c	0.35	0.44	0.014	0.017	E2	2.84 Ref		0.112 Ref	
D	4.40	4.60	0.173	0.181	e	1.50 BSC		0.059 BSC	
D1	1.62	1.83	0.064	0.072	L1	0.81	1.20	0.032	0.047
D2	1.75 Ref		0.069 Ref						

■Marking



Symbols	Content
xxxxx	Product code
a	Yearly code : 2019=K, 2020=L, 2021=M....
b, c	Weekly code : 01 to 53
d, e	Sequence : 01 to 99 or 0A to 0Z
f	Assembly code : A to Z (I, O excepted)