

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

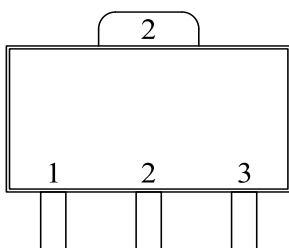
Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		V_{ds}	100	V	
Gate-source voltage		V_{gs}	± 20	V	
Continuous drain current ($V_{gs}=10V$)	$T_a=25^{\circ}C$	I_d	2.2	A	1
	$T_a=70^{\circ}C$		1.7		
Pulsed drain current		I_{dm}	5.5	A	2
Total power dissipation	$T_a=25^{\circ}C$	P_d	1.5	W	3
Storage 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

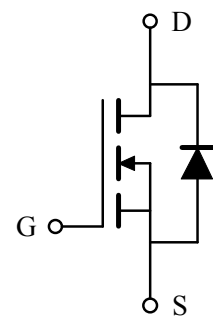
■Pin configuration

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 2OZ 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

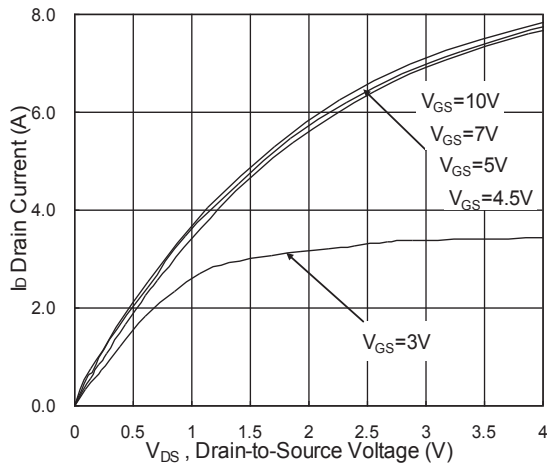


Fig.1 Typical Output Characteristics

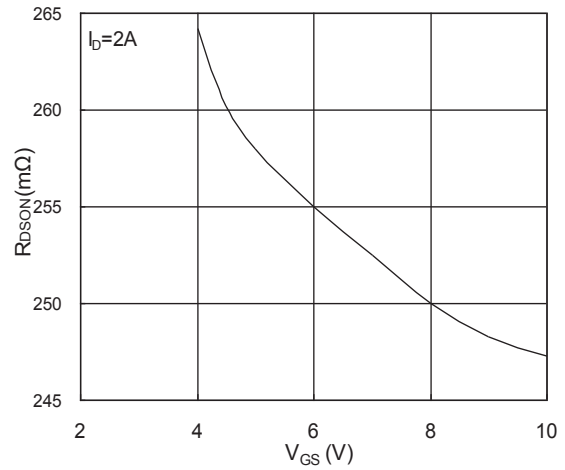


Fig.2 On-Resistance vs G-S Voltage

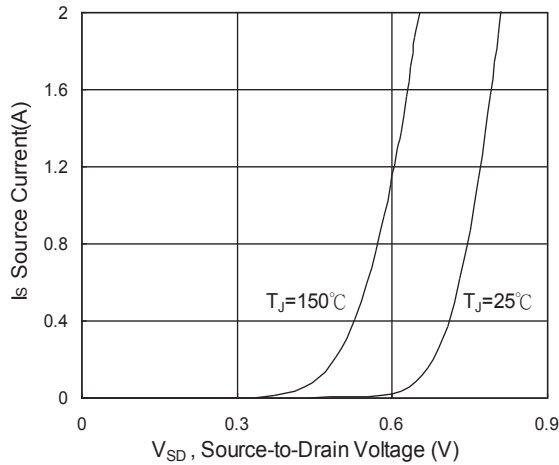


Fig.3 Source Drain Forward Characteristics

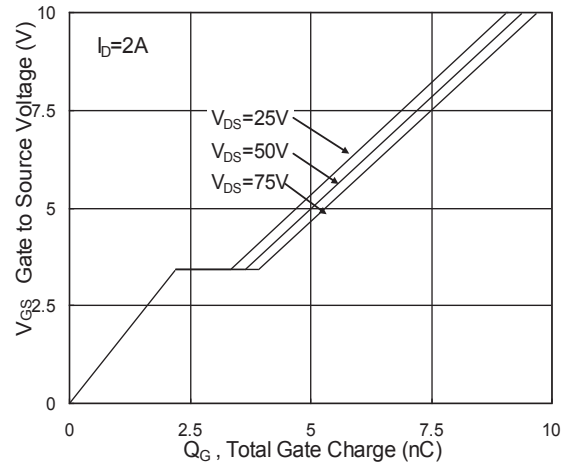


Fig.4 Gate-Charge Characteristics

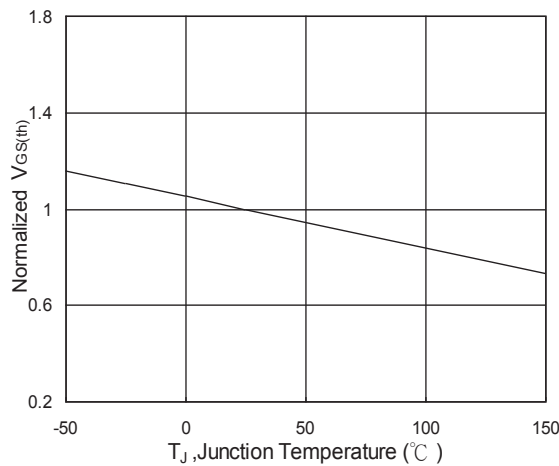


Fig.5 Normalized $V_{GS(th)}$ vs T_J

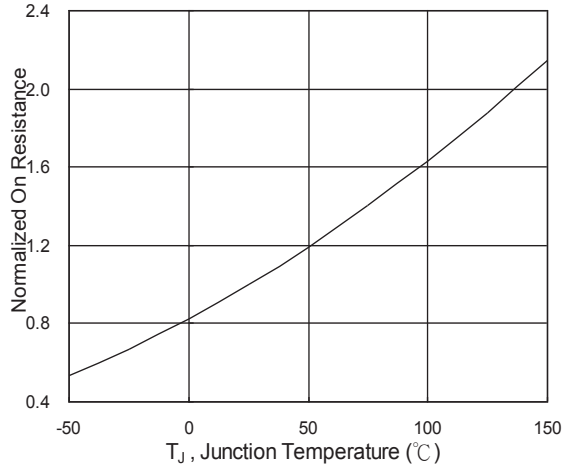


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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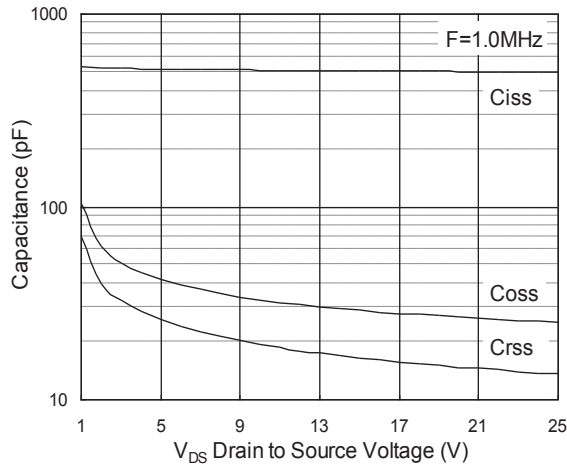


Fig.7 Capacitance

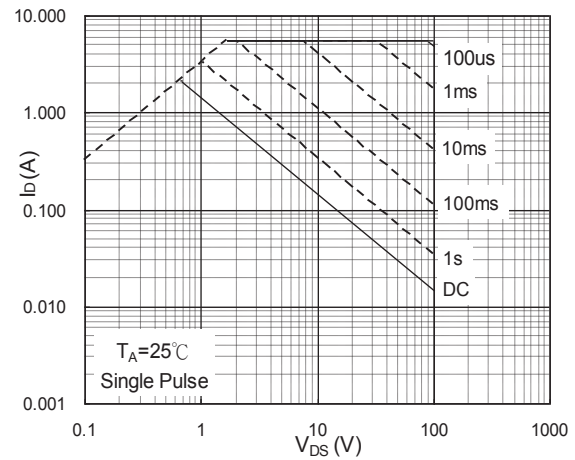


Fig.8 Safe Operating Area

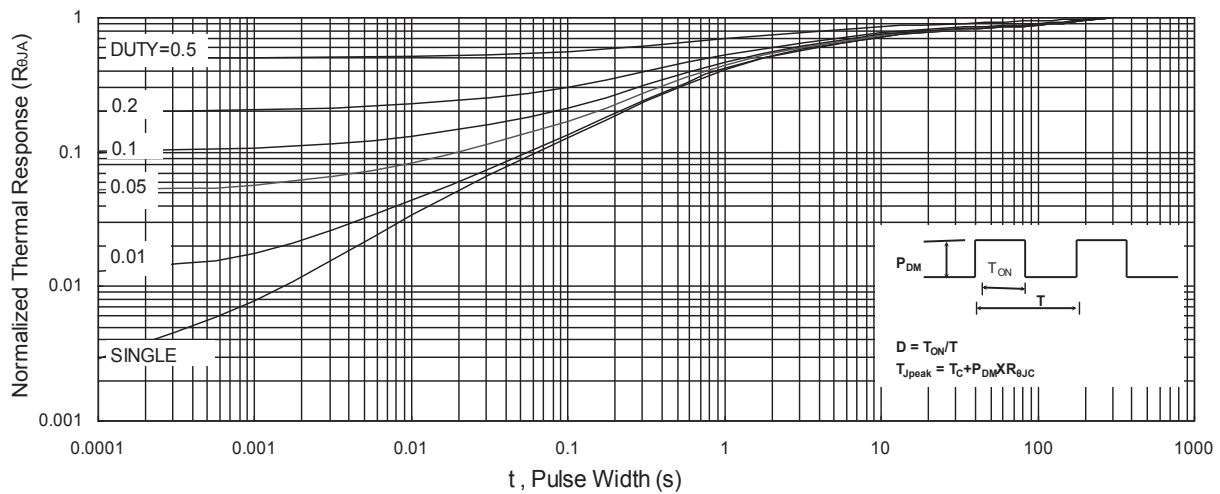


Fig.9 Normalized Maximum Transient Thermal Impedance

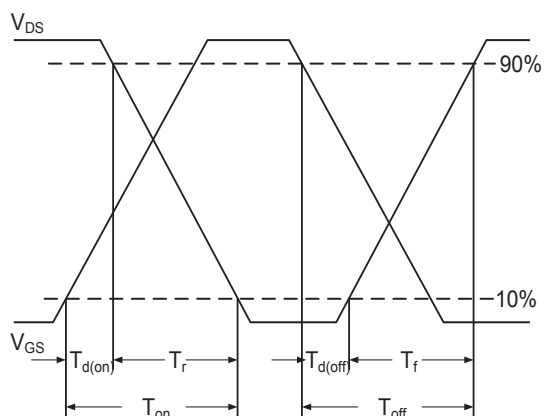


Fig.10 Switching Time Waveform

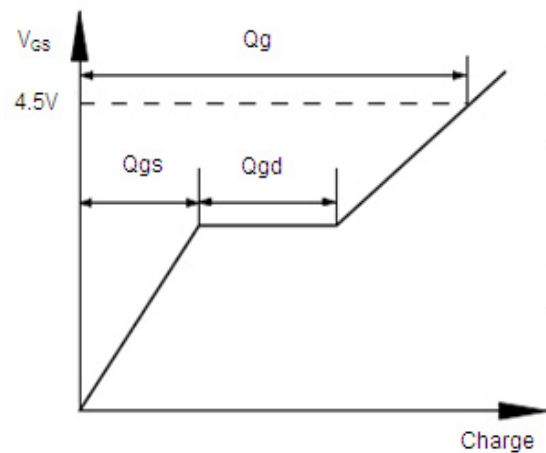


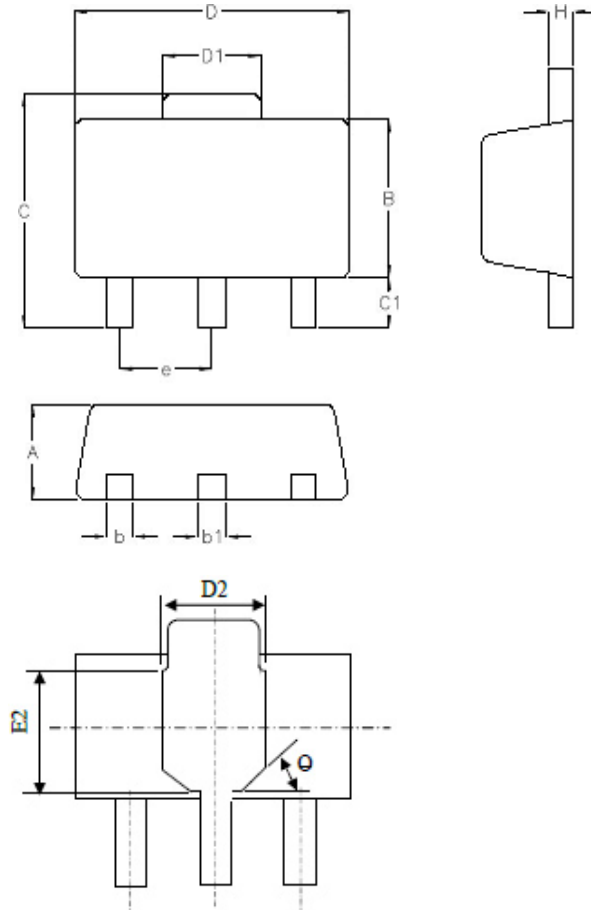
Fig.11 Gate Charge Waveform

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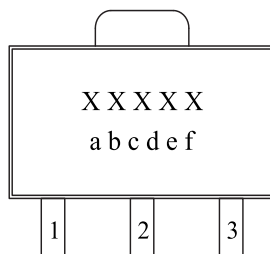
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■SOT-89 dimension (1,000pcs/reel)



Symbols	Millimeters		Inches		Symbols	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	1.397	1.600	0.0550	0.0630	D1	1.397	1.830	0.0550	0.0720
b	0.350	0.460	0.0137	0.0181	D2	1.725 REF		0.0680 REF	
b1	0.400	0.560	0.0157	0.0220	E2	1.900 REF		0.0748 REF	
B	2.388	2.600	0.0940	0.1020	e	1.500 TYP		0.0590 TYP	
C	3.937	4.242	0.1550	0.1670	θ	45°		45°	
C1	0.787	1.194	0.0310	0.0470	H	0.300	0.500	0.0118	0.0197
D	4.394	4.597	0.1730	0.1810					

■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)