Single N-channel MOSFET

ELM4NS138ECA-S

■General description

ELM4NS138ECA-S uses advanced trench technology to provide excellent Rds(on), low gate charge and low gate threshold voltage. ESD protection is included.

■Features

- Vds=60V
- Id=300mA
- Rds(on) = 2.2Ω (Vgs=10V)
- Rds(on) = 3.0Ω (Vgs=4.5V)
- ESD = 2KV HBM

■Maximum absolute ratings

Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		Vds	60	V	
Gate-source voltage		Vgs	±20	V	
Continuous drain current	Ta=25°C	Id	300	mA	
	Ta=100°C		180		
Pulsed drain current		Idm	1.2	A	1
Total power dissipation	Ta=25°C	Pd	0.35	W	
	Ta=100°C		0.14		
Storage temperature range		Tstg	-55 to 150	°C	
Operating junction temperature range		Tj	-55 to 150	°C	

■Thermal characteristics

Parameter	Symbol	Typ.	Max.	Unit	Note
Thermal resistance junction-ambient	Rθja	--	357	°C/W	2

NOTE :

1. Repetitive rating: Pulse width limited by maximum junction temperature.

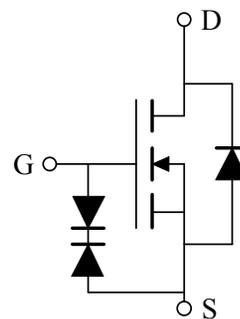2. Rθja is measured with the device mounted on a 1inch2 pad of 2oz copper FR4 PCB.

■Pin configuration

SOT-23S(TOP VIEW)
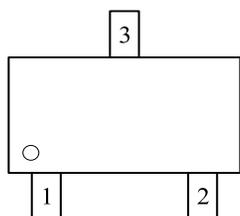
Pin No.	Pin name
1	GATE
2	SOURCE
3	DRAIN

■Circuit

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■Electrical characteristics

Tj=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
STATIC PARAMETERS							
Drain-source breakdown voltage	BVdss	Vgs=0V, Id=250μA	60	--	--	V	
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=300mA	--	1.8	2.2	Ω	3
		Vgs=4.5V, Id=200mA	--	2.0	3.0		
Gate threshold voltage	Vgs(th)	Vgs=Vds, Id=250μA	0.7	1.1	1.5	V	
Drain-source leakage current	Idss	Vds=60V, Vgs=0V	--	--	1.0	μA	
Gate-source leakage current	Igss	Vgs=±20V, Vds=0V	--	--	±10	μA	
Drain to source diode forward current	Is		--	--	0.3	A	
	Ism		--	--	1.2	A	
Diode forward voltage	Vsd	Vgs=0V, Is=300mA	--	--	1.2	V	3
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vds=25V, Vgs=0V, f=1MHz	--	22.0	--	pF	
Output capacitance	Coss		--	3.4	--	pF	
Reverse transfer capacitance	Crss		--	2.3	--	pF	
SWITCHING PARAMETERS							
Total gate charge	Qg	Vds=10V, Vgs=4.5V Id=300mA	--	1.2	--	nC	
Gate-source charge	Qgs		--	0.6	--	nC	
Gate-drain charge	Qgd		--	0.5	--	nC	
Turn-on delay time	td(on)	Vdd=10V, Vgs=10V Rgen=10Ω, Id=200mA	--	2	--	ns	
Turn-on rise time	tr		--	14	--	ns	
Turn-off delay time	td(off)		--	6	--	ns	
Turn-off fall time	tf		--	19	--	ns	

NOTE :

3. Pulse test : Pulse Width ≤ 300μs, duty cycle ≤ 0.5%.

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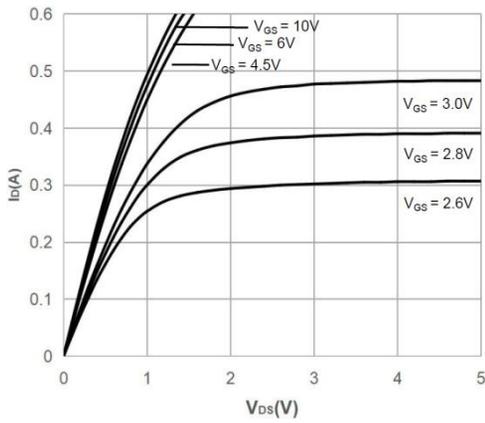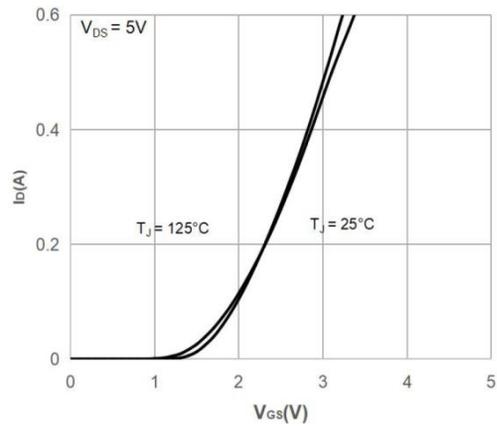## ■Typical characteristics

Fig.1 Typical Output Characteristics
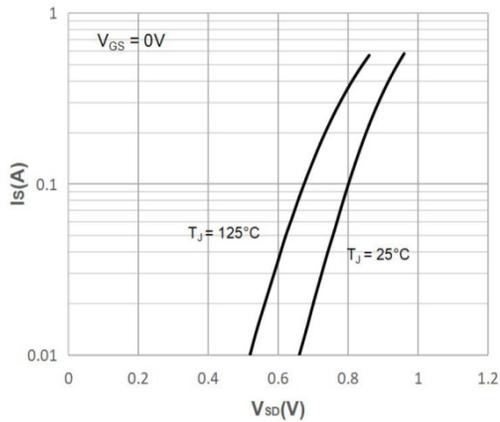

Fig.2 Transfer Characteristics

Fig.3 Source Drain Forward Characteristics
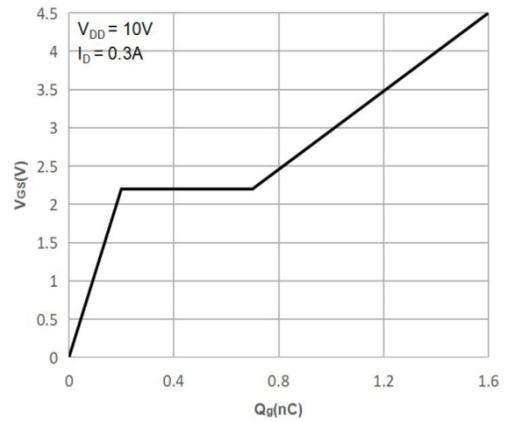
Fig.4 Gate-Charge Characteristics
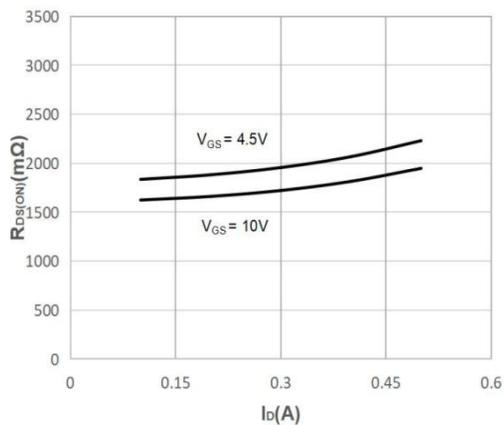
Fig.5 On-Resistance vs Drain Current
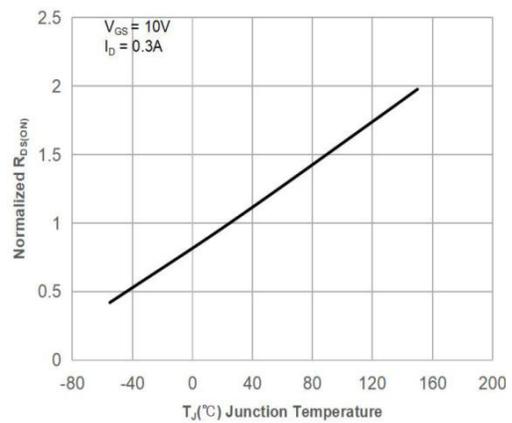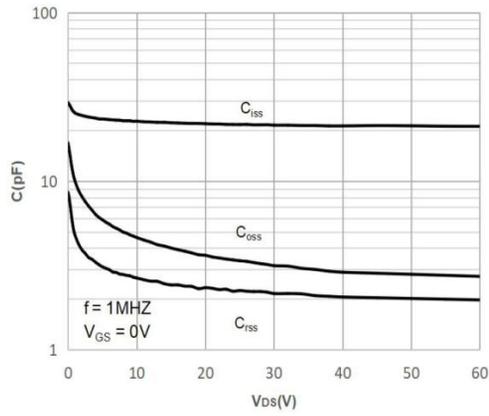

Fig.6 Normalized R_{DSON} vs T_J
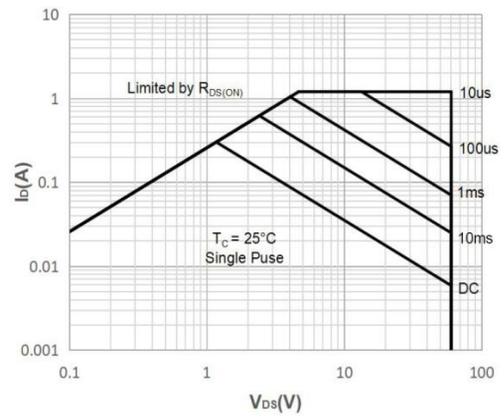
Fig.7 Capacitance Characteristics

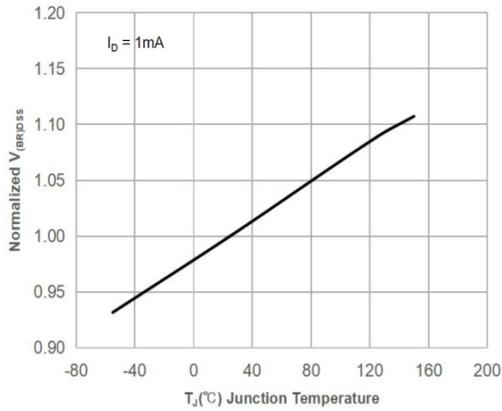**Fig.8 Safe Operating Area**
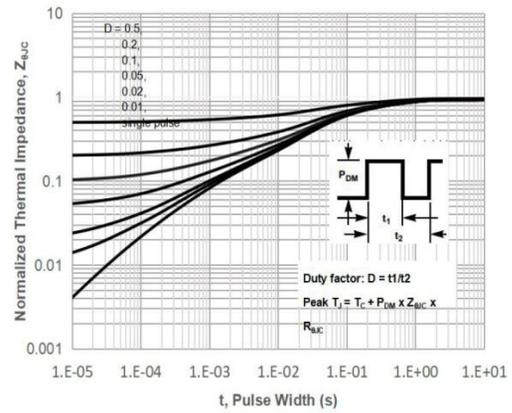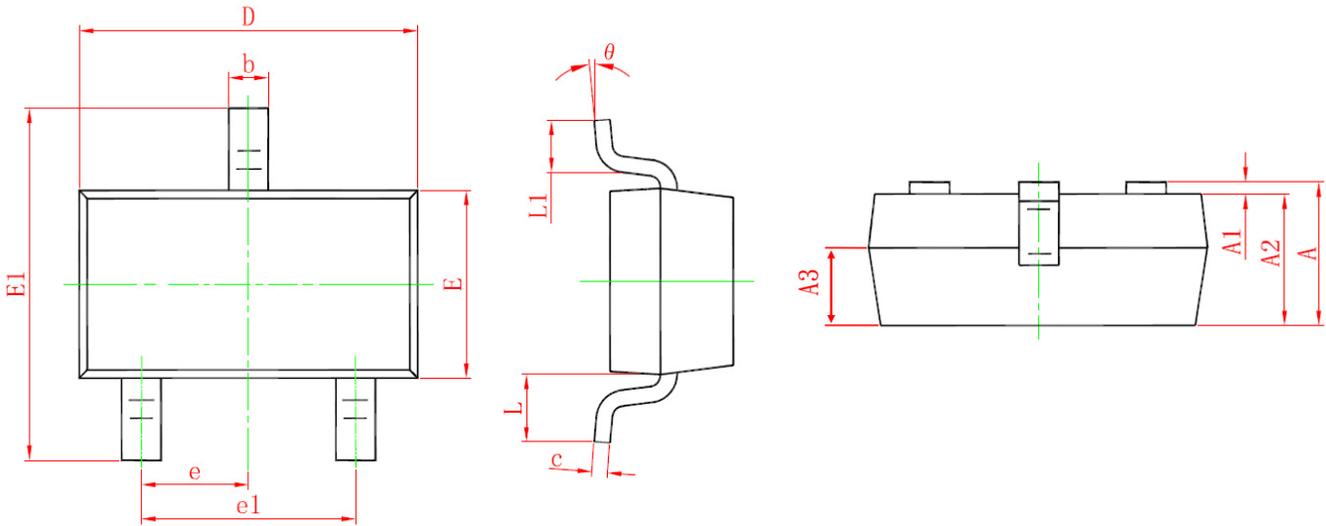

Fig.9 Breakdown Voltage vs Temperature

Fig.10 Transient Thermal Response Curve

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■SOT−23S dimension (3,000pcs/reel)

Symbols	Millimeters		Inches		Symbols	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.89	1.12	0.035	0.044	E	1.20	1.40	0.047	0.055
A1	0.01	0.15	0.000	0.006	E1	2.10	2.64	0.083	0.104
A2	0.88	1.05	0.035	0.041	e	0.95 BSC		0.037 BSC	
A3	0.41	0.66	0.016	0.026	e1	1.90 BSC		0.075 BSC	
b	0.30	0.50	0.012	0.020	L	0.54 Ref		0.021 Ref	
c	0.08	0.20	0.003	0.008	L1	0.40	0.60	0.016	0.024
D	2.80	3.04	0.110	0.120	θ	0°	8°	0°	8°

■**Marking**
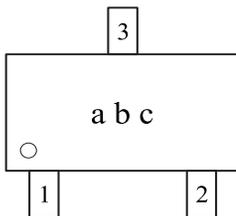
Symbols	Content
a	Product code
b	Yearly code：ex 2019=9, 2020=A, 2021=B, 2022=C...
c	Sequence：1 to 9, A to Z

Rev.1.0