

# Single N-channel MOSFET

## ELM4N20N15FDA-N

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

### ■ General description

ELM4N20N15FDA-N uses advanced trench technology to provide excellent  $R_{ds(on)}$ , low gate charge and low gate threshold voltage.

### ■ Features

- $V_{ds}=150V$
- $I_d=20A$  ( $V_{gs}=10V$ )
- $R_{ds(on)} = 88m\Omega$  ( $V_{gs}=10V$ )
- $R_{ds(on)} = 100m\Omega$  ( $V_{gs}=4.5V$ )

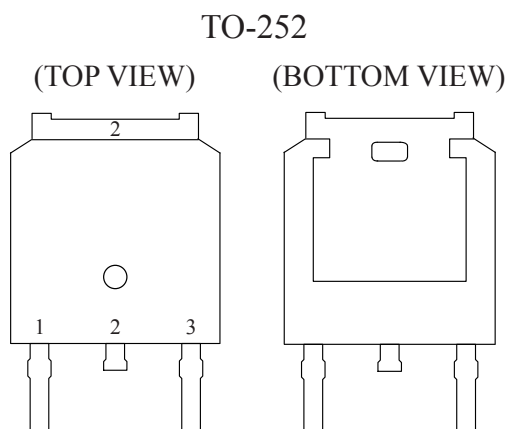
### ■ Maximum absolute ratings

Parameter	Symbol	Limit	Unit	Note	
Drain-source voltage	$V_{ds}$	150	V		
Gate-source voltage	$V_{gs}$	$\pm 20$	V		
Continuous drain current ( $V_{gs}=10V$ )	$I_d$	$T_c=25^\circ C$	20.0	A	1
		$T_c=100^\circ C$	14.0		
		$T_a=25^\circ C$	3.0		
		$T_a=70^\circ C$	2.5		
Pulsed drain current	$I_{dm}$	40	A	2	
Single pulsed avalanche energy	$E_{as}$	53	mJ	3	
Avalanche current	$I_{as}$	18	A		
Total power dissipation	$P_d$	$T_c=25^\circ C$	72.6	W	4
		$T_a=25^\circ C$	2.1	W	
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ C$		
Operating junction temperature range	$T_j$	-55 to 150	$^\circ C$		

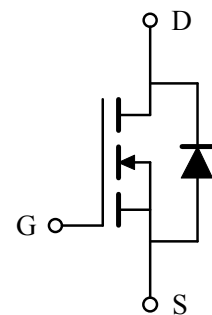
### ■ Thermal characteristics

Parameter	Symbol	Typ.	Max.	Unit	Note
Thermal resistance junction-ambient	$R_{\theta ja}$	--	60	$^\circ C/W$	1
Thermal resistance junction-case	$R_{\theta jc}$	--	1.72	$^\circ C/W$	1

### ■ Pin configuration



### ■ Circuit



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### ■Electrical characteristics

T<sub>j</sub>=25°C. Unless otherwise noted.

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
<b>STATIC PARAMETERS</b>							
Drain-source breakdown voltage	BV <sub>dss</sub>	V <sub>gs</sub> =0V, I <sub>d</sub> =250μA	150	--	--	V	
Static drain-source on-resistance	R <sub>ds(on)</sub>	V <sub>gs</sub> =10V, I <sub>d</sub> =10A	--	--	88	mΩ	2
		V <sub>gs</sub> =4.5V, I <sub>d</sub> =10A	--	--	100		
Gate threshold voltage	V <sub>gs(th)</sub>	V <sub>gs</sub> =V <sub>ds</sub> , I <sub>d</sub> =250μA	1.2	--	2.5	V	
Drain-source leakage current	I <sub>dss</sub>	V <sub>ds</sub> =120V, V <sub>gs</sub> =0V	--	--	1	μA	
		V <sub>ds</sub> =120V, V <sub>gs</sub> =0V, T <sub>j</sub> =55°C	--	--	5		
Gate-source leakage current	I <sub>gss</sub>	V <sub>gs</sub> =±20V, V <sub>ds</sub> =0V	--	--	±100	nA	
Forward transconductance	G <sub>fs</sub>	V <sub>ds</sub> =5V, I <sub>d</sub> =10A	--	33	--	S	
Continuous source current	I <sub>s</sub>	V <sub>gs</sub> =V <sub>ds</sub> =0V, Force current	--	--	20	A	1, 5
Pulsed source current	I <sub>sm</sub>		--	--	40	A	2, 5
Diode forward voltage	V <sub>sd</sub>	V <sub>gs</sub> =0V, I <sub>s</sub> =1A	--	--	1.2	V	2
<b>DYNAMIC PARAMETERS</b>							
Input capacitance	C <sub>iss</sub>	V <sub>ds</sub> =25V, V <sub>gs</sub> =0V, f=1MHz	--	2285	--	pF	
Output capacitance	C <sub>oss</sub>		--	110	--	pF	
Reverse transfer capacitance	C <sub>rss</sub>		--	83	--	pF	
<b>SWITCHING PARAMETERS</b>							
Total gate charge	Q <sub>g</sub>	V <sub>ds</sub> =75V, V <sub>gs</sub> =4.5V, I <sub>d</sub> =10A	--	25.1	--	nC	
Gate-source charge	Q <sub>gs</sub>		--	6.8	--	nC	
Gate-drain charge	Q <sub>gd</sub>		--	12.6	--	nC	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>dd</sub> =75V, V <sub>gs</sub> =10V R <sub>gen</sub> =3.3Ω, I <sub>d</sub> =10A	--	13.0	--	ns	
Turn-on rise time	t <sub>r</sub>		--	8.2	--	ns	
Turn-off delay time	t <sub>d(off)</sub>		--	25.0	--	ns	
Turn-off fall time	t <sub>f</sub>		--	11.0	--	ns	
Reverse recovery time	t <sub>rr</sub>	I <sub>f</sub> =10A, di/dt=100A/μs	--	37	--	nS	
Reverse recovery charge	Q <sub>rr</sub>		--	263	--	nC	

#### NOTE :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> 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<sub>dd</sub>=25V, V<sub>gs</sub>=10V, L=0.3mH, I<sub>as</sub>=18A.
4. The power dissipation is limited by 150°C junction temperature.
5. The data is theoretically the same as I<sub>d</sub> and I<sub>dm</sub>, in real applications, should be limited by total power dissipation.

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### ■ Typical characteristics

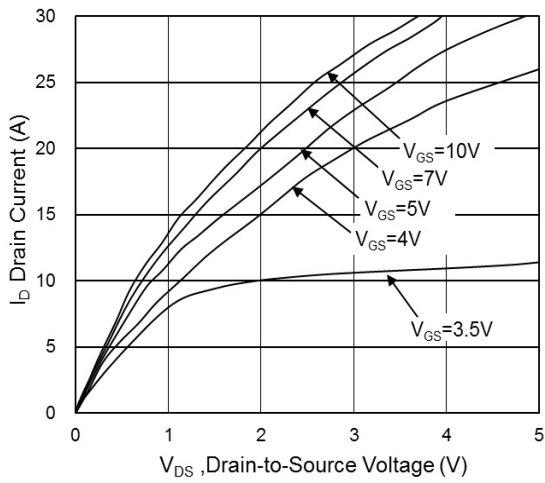


Fig.1 Typical Output Characteristics

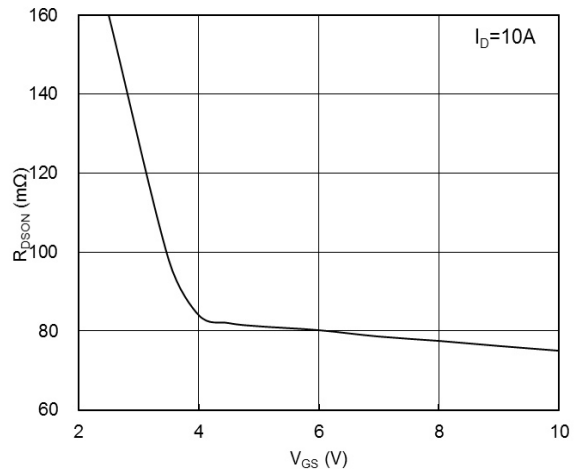


Fig.2 On-Resistance vs. Gate-Source Voltage

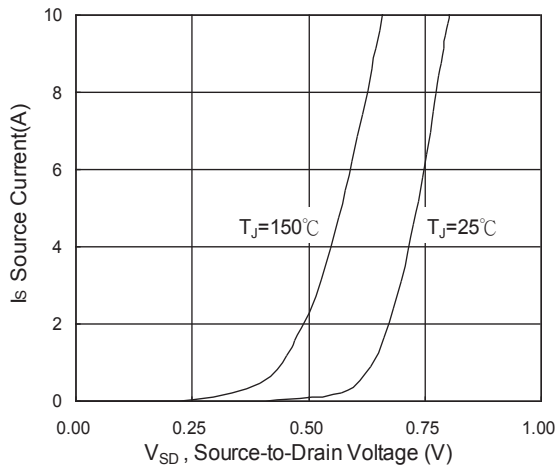


Fig.3 Forward Characteristics of Reverse

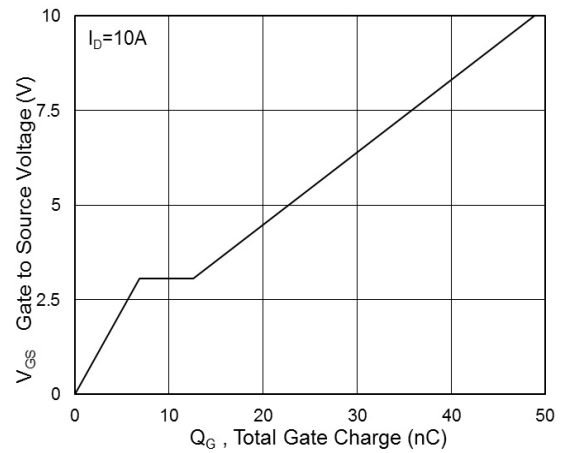


Fig.4 Gate-Charge Characteristics

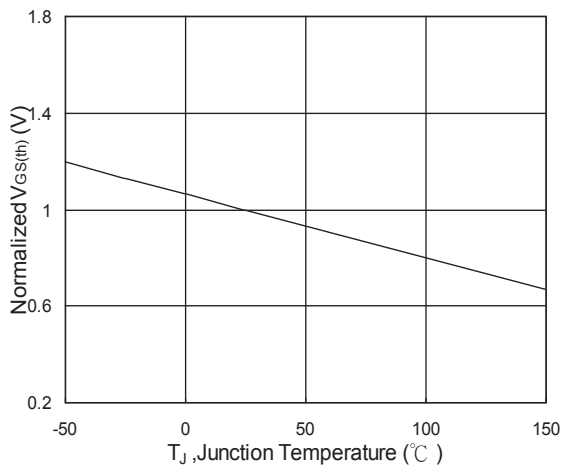


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

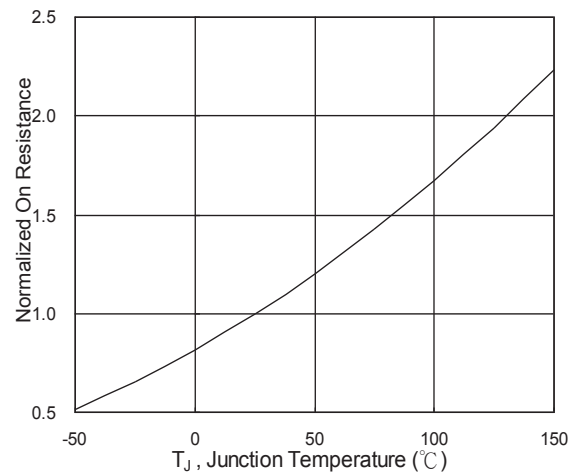


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

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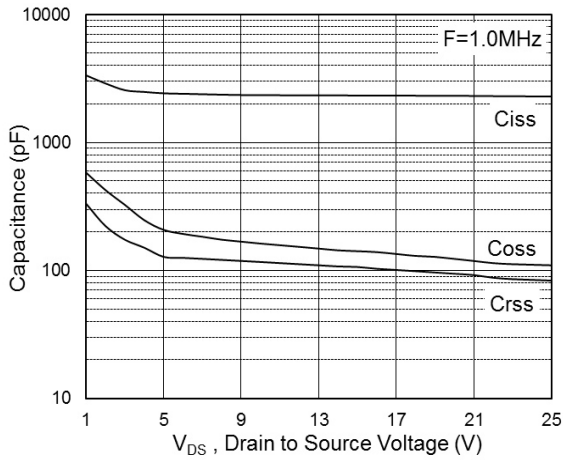


Fig.7 Capacitance

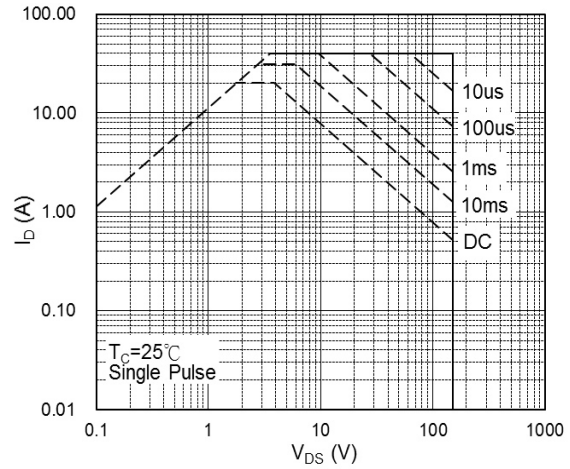


Fig.8 Safe Operating Area

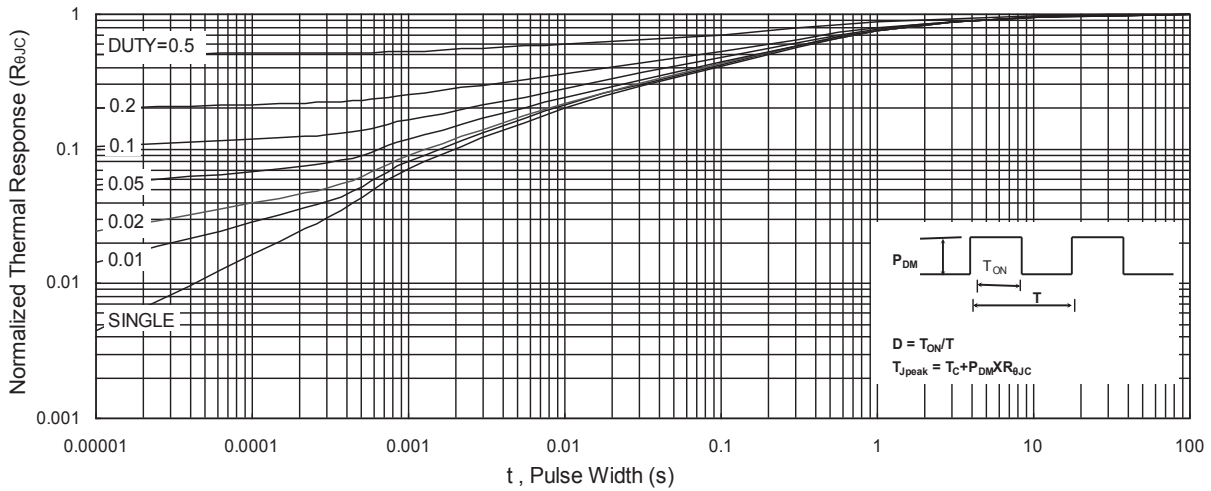


Fig.9 Normalized Maximum Transient Thermal Impedance

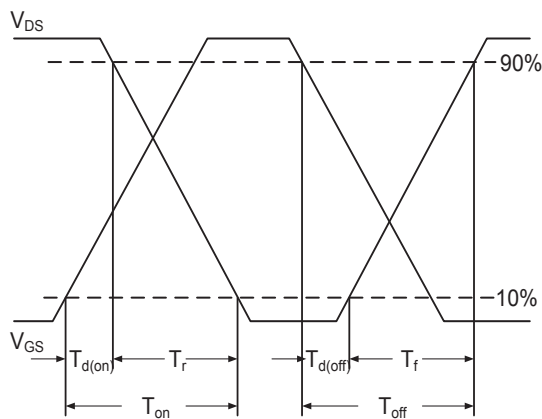


Fig.10 Switching Time Waveform

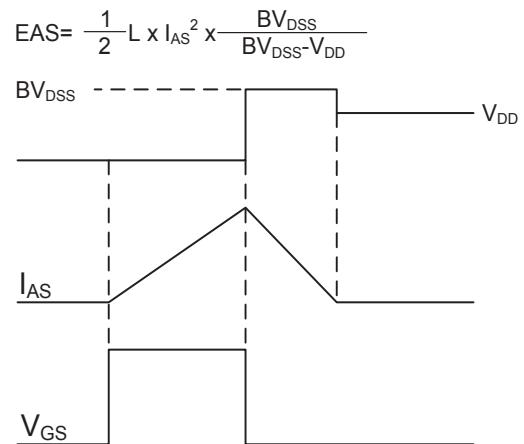


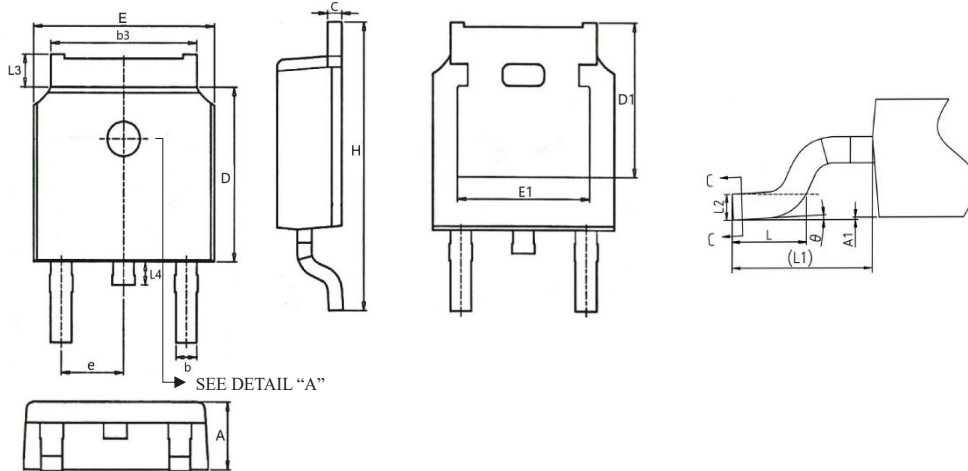
Fig.11 Unclamped Inductive Switching Waveform

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### ■ TO-252 dimension (2,500pcs/reel)

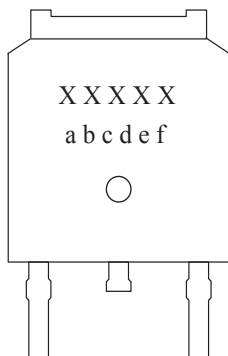


Detail "A"

	Top	Bottom		Top	Bottom
Option 1			Option 3		
Option 2			Option 4		

Symbols	Millimeters		Inches		Symbols	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	2.18	2.40	0.086	0.094	e	2.29 BSC		0.090 BSC	
A1	0.00	0.20	0.000	0.008	H	9.40	10.50	0.370	0.413
b	0.64	0.90	0.025	0.035	L	1.27	2.03	0.050	0.080
b3	4.95	5.50	0.195	0.217	L1	2.90 REF		0.114 REF	
c	0.43	0.61	0.017	0.024	L2	0.51 BSC		0.020 BSC	
D	5.90	6.30	0.232	0.248	L3	0.88	1.28	0.035	0.050
D1	5.30 REF		0.209 REF		L4	0.50	1.02	0.020	0.040
E	6.35	6.80	0.250	0.268	θ	0°	10°	0°	10°
E1	4.32	4.95	0.170	0.195					

### ■ 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)