

Single N-channel MOSFET

ELM4N6056FDA-N

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

■General description

ELM4N6056FDA-N uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate threshold voltage.

■Features

- $V_{ds}=60V$
- $I_d=58A$ ($V_{gs}=10V$)
- $R_{ds(on)} = 8.5m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} = 12.5m\Omega$ ($V_{gs}=4.5V$)

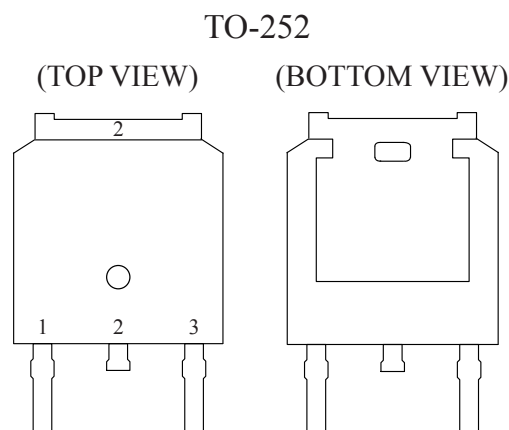
■Maximum absolute ratings

Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		V_{ds}	60	V	
Gate-source voltage		V_{gs}	± 20	V	
Continuous drain current ($V_{gs}=10V$)	$T_c=25^{\circ}C$	I_d	58.0	A	1, 6
	$T_c=100^{\circ}C$		36.6		
Pulsed drain current		I_{dm}	125	A	2
Single pulse avalanche energy		E_{as}	26.5	mJ	3
Avalanche current		I_{as}	23	A	
Total power dissipation	$T_c=25^{\circ}C$	P_d	52	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

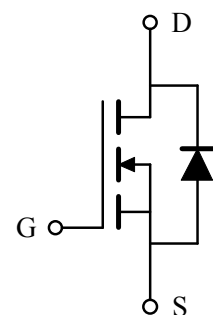
Parameter	Symbol	Typ.	Max.	Unit	Note
Thermal resistance junction-ambient (Steady state)	$R_{\theta ja}$	-	60.0	$^{\circ}C/W$	1
Thermal resistance junction-case ambient	$R_{\theta jc}$	-	2.4	$^{\circ}C/W$	1

■Pin configuration



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	60	-	-	V	
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V, I _d =20A	-	7.5	8.5	mΩ	2
		V _{gs} =4.5V, I _d =15A	-	11.0	12.5		
Gate threshold voltage	V _{gs(th)}	V _{ds} =V _{gs} , I _d =250μA	1.2	-	2.3	V	
Drain-source leakage current	I _{dss}	V _{ds} =48V, V _{gs} =0V	-	-	1	μA	
		V _{ds} =48V, V _{gs} =0V, T _j =55°C	-	-	5		
Gate-source leakage current	I _{gss}	V _{gs} =±20V, V _{ds} =0V	-	-	±100	nA	
Continuous source current	I _s	V _{gs} =V _{ds} =0V, Force current	-	-	30	A	1,5,6
Diode forward voltage	V _{sd}	V _{gs} =0V, I _s =1A	-	-	1.2	V	2
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{ds} =30V, V _{gs} =0V, f=1MHz	-	1270	-	pF	
Output capacitance	C _{oss}		-	479	-	pF	
Reverse transfer capacitance	C _{rss}		-	40	-	pF	
Gate resistance	R _g	V _{ds} =0V, V _{gs} =0V, f=1MHz	-	1.4	-	Ω	
SWITCHING PARAMETERS							
Total gate charge (10V)	Q _g	V _{ds} =30V, V _{gs} =10V, I _d =15A	-	15.0	-	nC	
Gate-source charge	Q _{gs}		-	3.5	-	nC	
Gate-drain charge	Q _{gd}		-	4.2	-	nC	
Turn-on delay time	t _{d(on)}	V _{dd} =30V, V _{gs} =10V R _{gen} =3.3Ω, I _d =15A	-	7.0	-	ns	
Turn-on rise time	t _r		-	4.5	-	ns	
Turn-off delay time	t _{d(off)}		-	26.0	-	ns	
Turn-off fall time	t _f	I _f =15A, di/dt=100A/μs	-	5.0	-	ns	
Reverse recovery time	t _{rr}		-	22	-	nS	
Reverse recovery charge	Q _{rr}		-	72	-	nC	

NOTE :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. Single pulse width limited by junction temperature T_j(max)=150°C.
3. The Eas data shows Max. rating . The test condition is V_{dd}=25V, V_{gs}=10V, L=0.1mH, I_{as}=23A.
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.
6. The maximum current rating is package limited.

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■ Typical characteristics

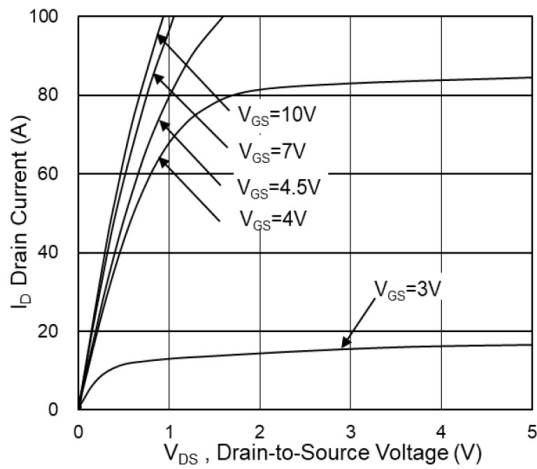


Fig.1 Typical Output Characteristics

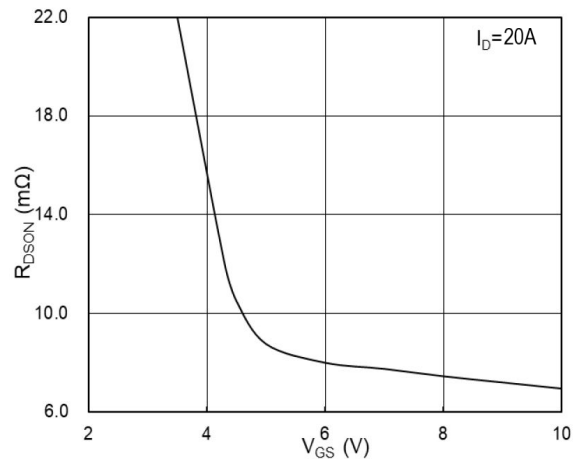


Fig.2 On-Resistance vs G-S Voltage

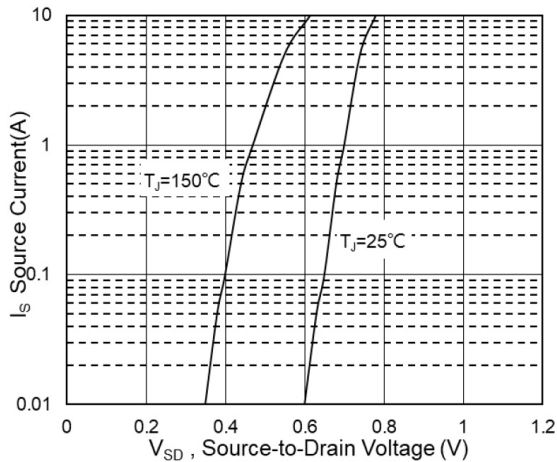


Fig.3 Source Drain Forward Characteristics

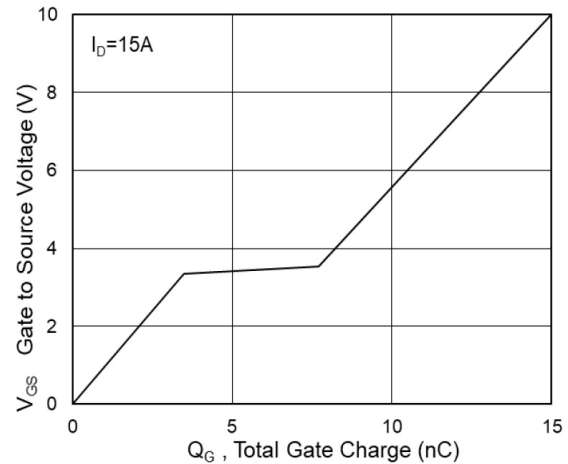


Fig.4 Gate-Charge Characteristics

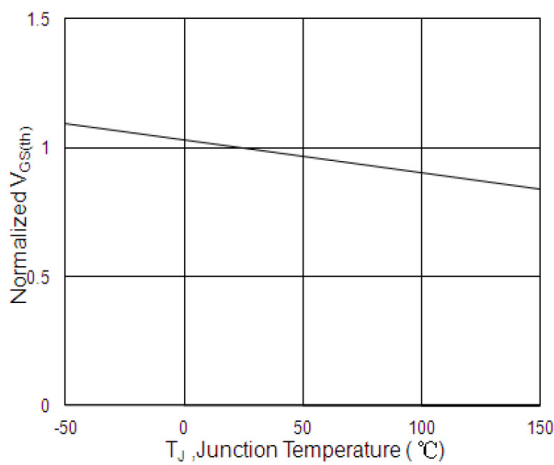


Fig.5 Normalized $V_{GS(th)}$ vs T_J

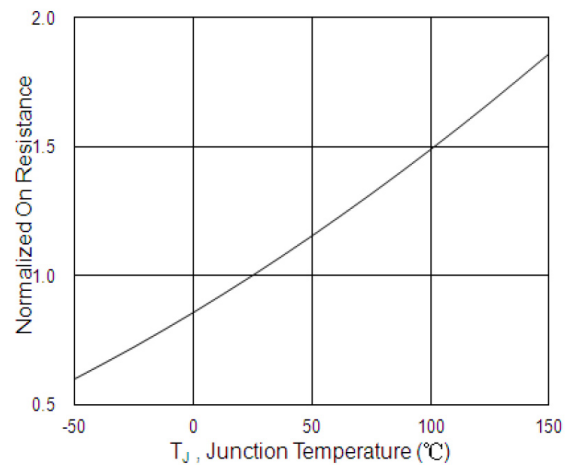


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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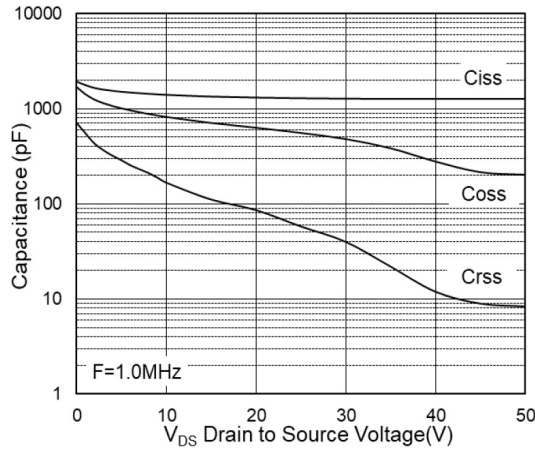


Fig.7 Capacitance

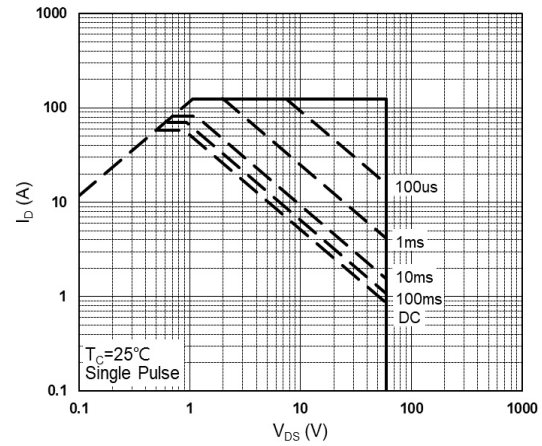


Fig.8 Safe Operating Area

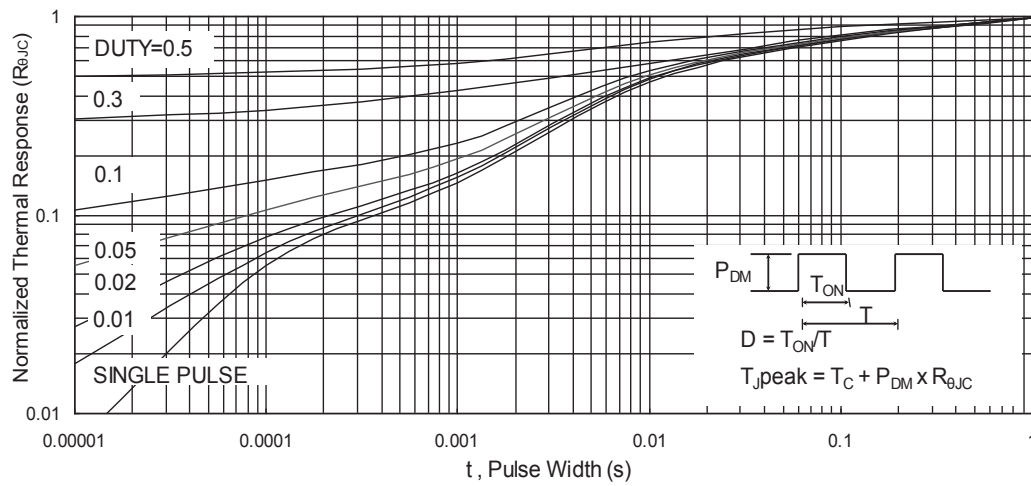


Fig.9 Normalized Maximum Transient Thermal Impedance

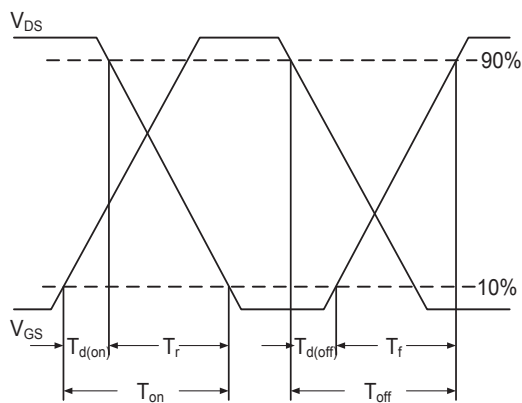


Fig.10 Switching Time Waveform

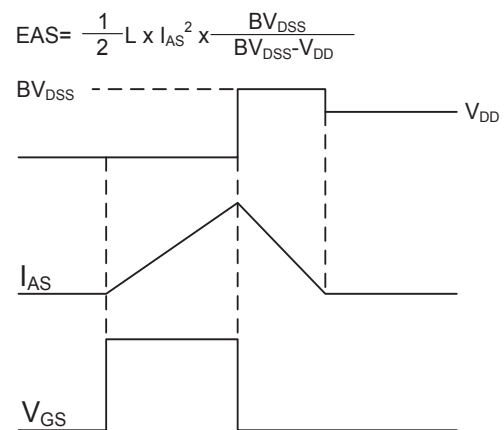


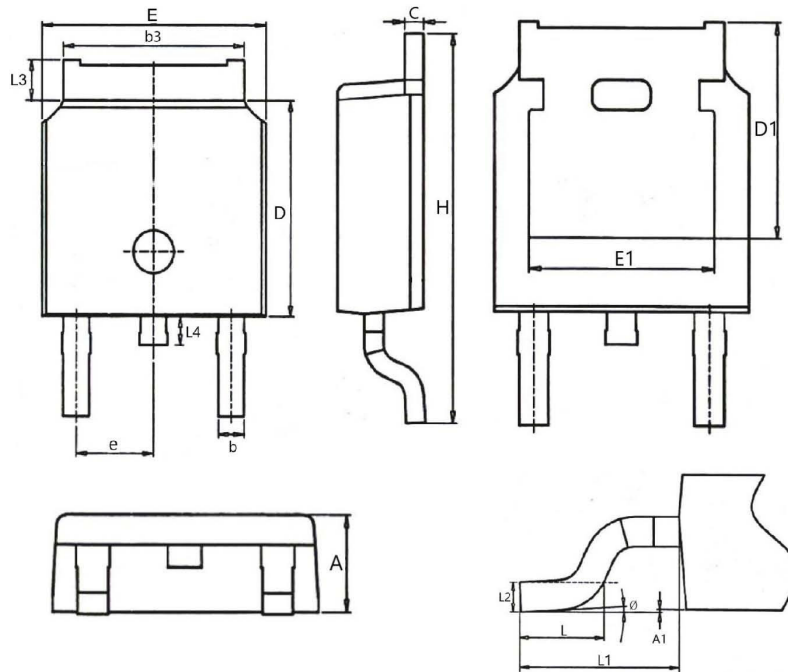
Fig.11 Unclamped Inductive Switching Waveform

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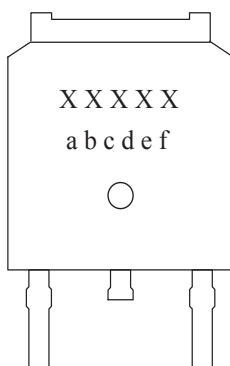
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■TO-252 dimension (2,500pcs/reel)



Symbols	Millimeters		Inches		Symbols	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	2.18	2.40	0.086	0.095	e	2.286BSC		0.09BSC	
A1	---	0.20	---	0.008	H	9.40	10.50	0.370	0.413
b	0.68	0.90	0.026	0.036	L	1.38	1.78	0.054	0.070
b3	4.95	5.46	0.194	0.215	L1	2.90REF		0.114REF	
c	0.43	0.89	0.017	0.035	L2	0.51BSC		0.020BSC	
D	5.97	6.22	0.235	0.245	L3	0.88	1.28	0.034	0.050
D1	5.300REF		0.209REF		L4	0.50	1.00	0.019	0.039
E	6.35	6.73	0.250	0.265	θ	0°	8°	0°	8°
E1	4.32	---	0.170	---					

■Marking



Symbols	Content
xxxxxx	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)