

Single N-channel MOSFET

ELM4NA6056FNA-N

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

■General description

ELM4NA6056FNA-N uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate resistance.

■Features

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

■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	$T_c=25^\circ C$	I_d	58	A	1, 6
	$T_c=100^\circ C$		37		
Pulsed drain current		I_{dm}	250	A	2
Single pulse avalanche energy		EAS	26.5	mJ	3
Avalanche current		I_{as}	23	A	
Total power dissipation	$T_c=25^\circ C$	P_d	50	W	4
Storage temperature range		T_{stg}	- 55 to 150	$^\circ C$	
Operating junction temperature		T_j	- 55 to 150	$^\circ C$	

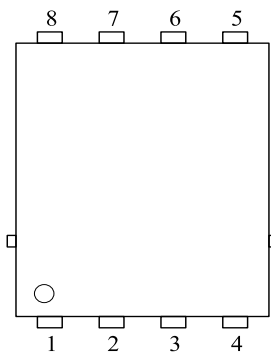
■Thermal characteristics

Parameter		Symbol	Typ.	Max.	Unit	Note
Thermal resistance junction-ambient	$t \leq 10s$	$R_{\theta ja}$	--	25.0	$^\circ C/W$	1
	Steady state		--	60.0		
Thermal resistance junction-case		$R_{\theta jc}$	--	2.5		1

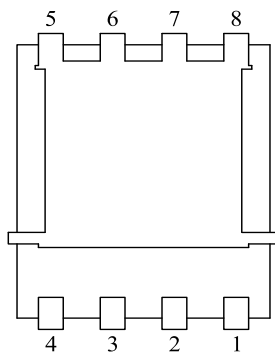
■Pin configuration

PRPAK8-5×6

(TOP VIEW)

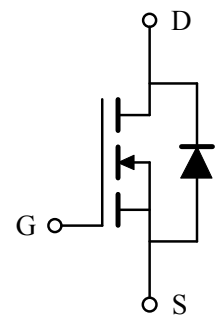


(BOTTOM VIEW)



Pin No.	Pin name
1	SOURCE
2	SOURCE
3	SOURCE
4	GATE
5	DRAIN
6	DRAIN
7	DRAIN
8	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=15A	--	7.0	8.5	mΩ	2
		Vgs=4.5V, Id=15A	--	10.5	12.5		
Gate threshold voltage	Vgs(th)	Vgs=Vds, Id=250μA	1.2	--	2.3	V	
Drain-source leakage current	Idss	Vds=48V Vgs=0V	--	--	1	μA	
		Tj=55°C	--	--	5		
Gate-source leakage current	Igss	Vgs=±20V, Vds=0V	--	--	±100	nA	
Continuous source current	Is	Vgs=Vds=0V, Force current	--	--	30	A	1,5,6
Diode forward voltage	Vsd	Vgs=0V, Is=1A	--	--	1.2	V	2
DYNAMIC PARAMETERS							
Input capacitance	Ciss	Vds=30V, Vgs=0V, f=1MHz	--	1270	--	pF	
Output capacitance	Coss		--	479	--	pF	
Reverse transfer capacitance	Crss		--	40	--	pF	
Gate resistance	Rg	Vds=0V, Vgs=0V, f=1MHz	--	1.3	--	Ω	
SWITCHING PARAMETERS							
Total gate charge (10V)	Qg	Vds=30V, Vgs=10V Id=15A	--	15.0	--	nC	
Gate-source charge	Qgs		--	3.5	--	nC	
Gate-drain charge	Qgd		--	4.2	--	nC	
Turn-on delay time	td(on)	Vdd=30V, Vgs=10V Rgen=3.3Ω, Id=15A	--	7.0	--	ns	
Turn-on rise time	tr		--	4.5	--	ns	
Turn-off delay time	td(off)		--	26.0	--	ns	
Turn-off fall time	tf	If=15A, di/dt=100A/μs	--	5.0	--	ns	
Reverse recovery time	trr		--	22	--	nS	
Reverse recovery charge	Qrr		--	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 Tj(max.)=150°C.
3. The EAS data shows Max. rating . The test condition is Vdd=50V, Vgs=10V, L=0.1mH, Ias=23A.
4. The power dissipation is limited by 150°C junction temperature.
5. The data is theoretically the same as Id and Idm, in real applications, should be limited by total power dissipation.
6. The maximum current rating is package limited.

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■ Typical electrical and thermal characteristics

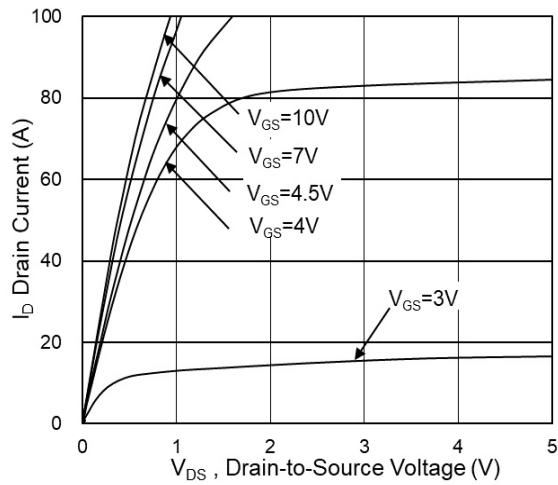


Fig.1 Typical Output Characteristics

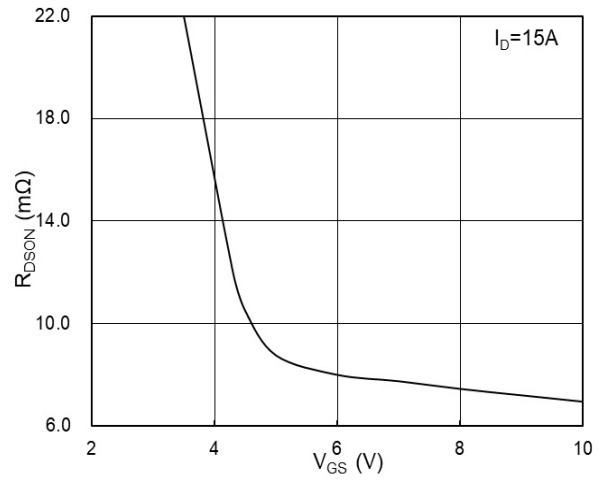


Fig.2 On-Resistance vs G-S Voltage

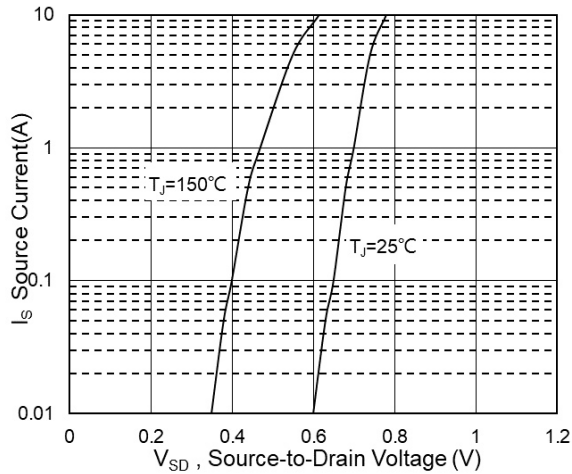


Fig.3 Source Drain Forward Characteristics

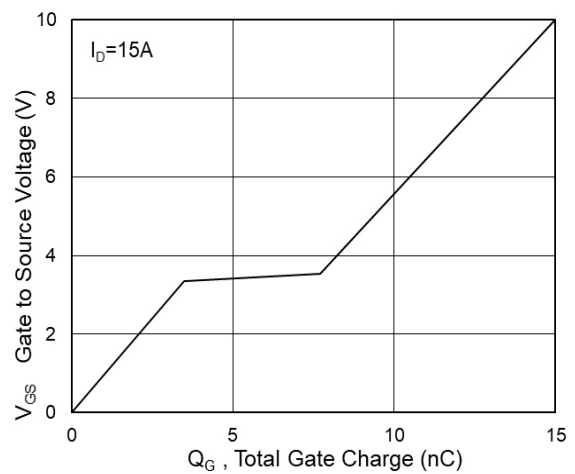


Fig.4 Gate-Charge Characteristics

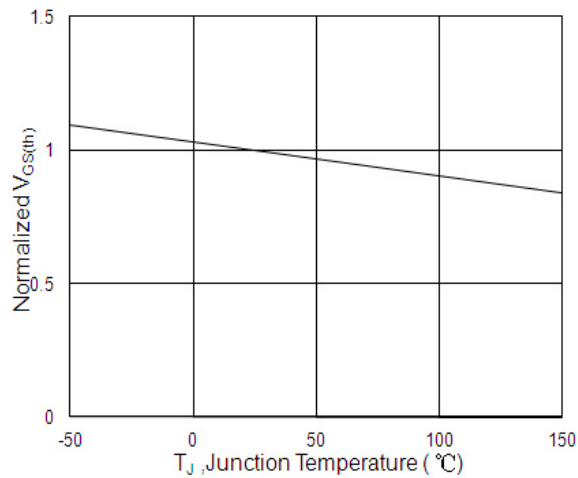


Fig.5 Normalized $V_{GS(th)}$ vs T_J

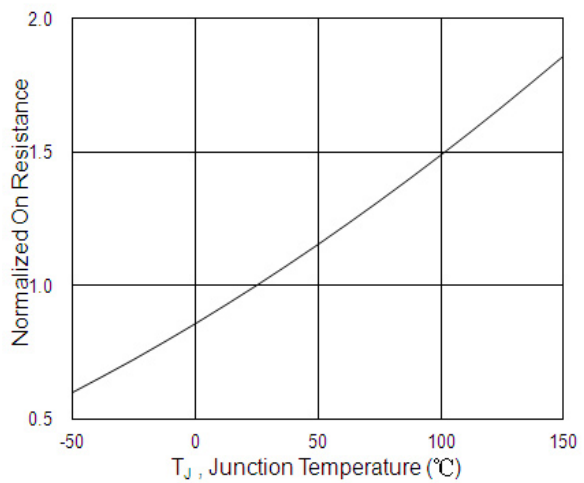


Fig.6 Normalized $R_{DS(on)}$ vs T_J

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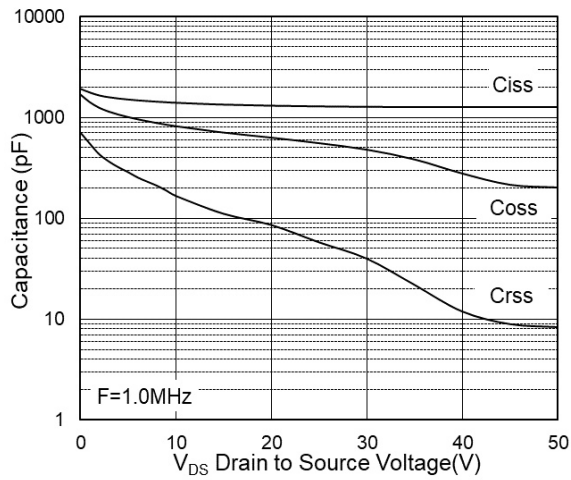


Fig.7 Capacitance

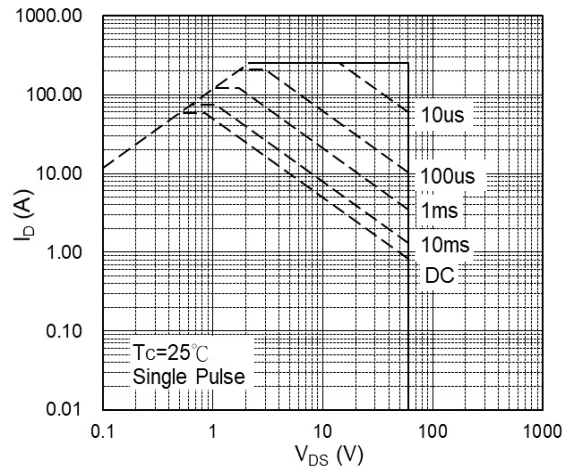


Fig.8 Safe Operating Area

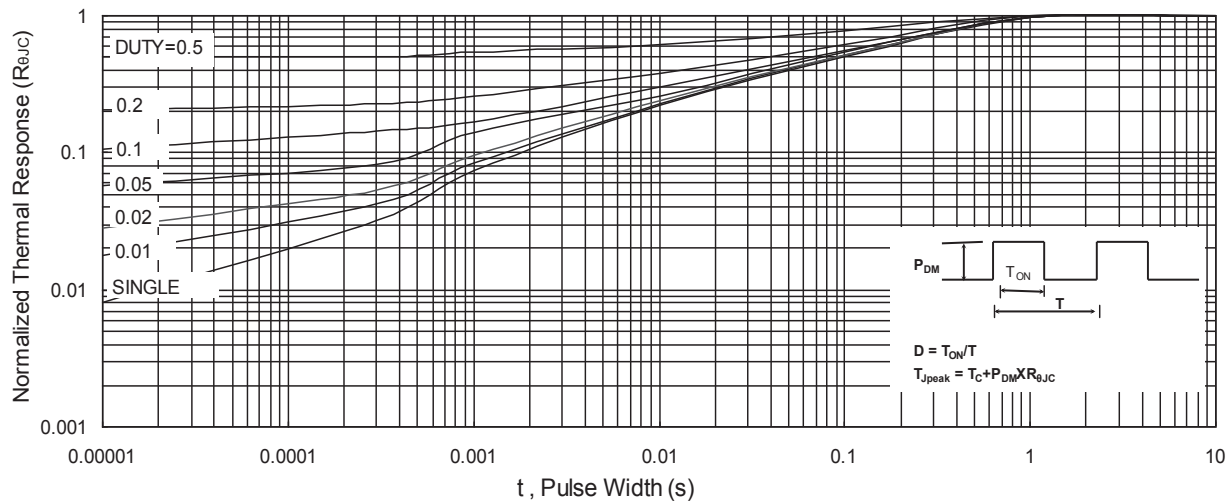


Fig.9 Normalized Maximum Transient Thermal Impedance

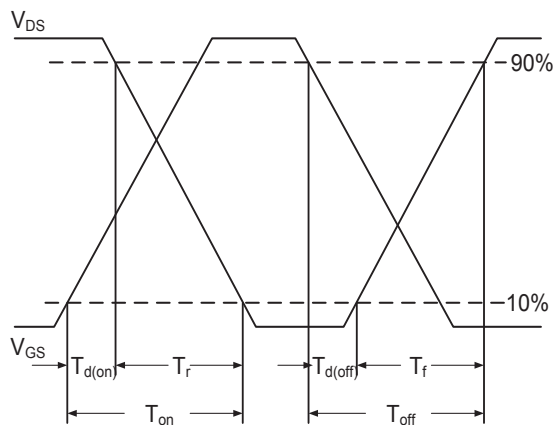


Fig.10 Switching Time Waveform

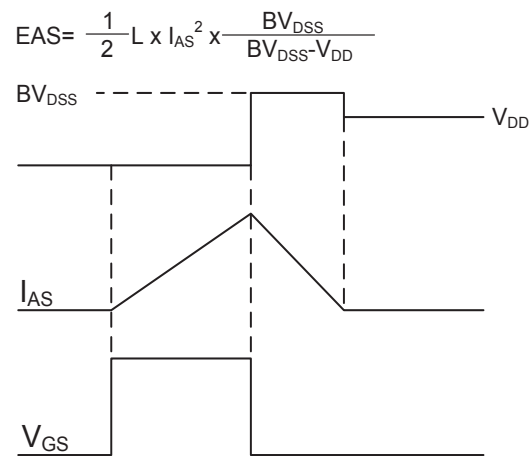


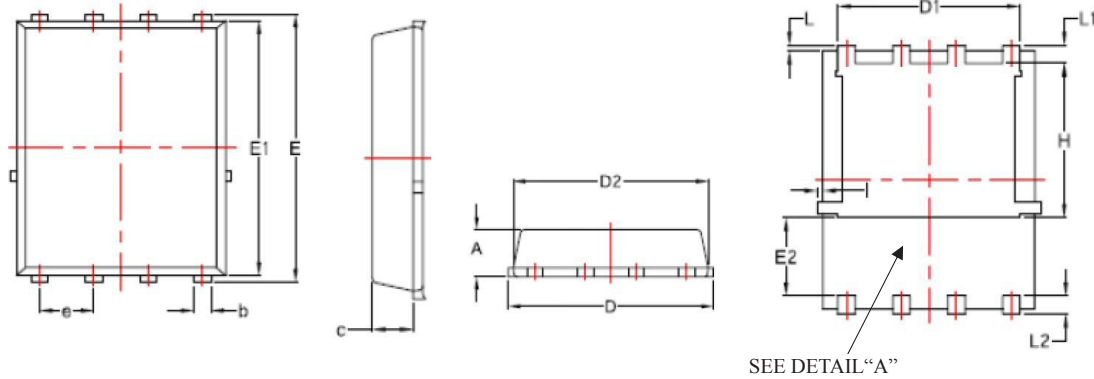
Fig.11 Unclamped Inductive Switching Waveform

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■PRPAK8-5×6 (Single) dimension (3,000pcs/reel)

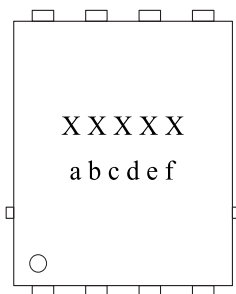


Detail “A”

	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	0.85	1.20	0.033	0.047	E2	1.10	--	0.043	--
b	0.30	0.51	0.012	0.020	e	1.27 BSC		0.050 BSC	
c	0.64	1.05	0.025	0.041	L	0.05	0.25	0.002	0.010
D	4.80	5.45	0.189	0.215	L1	0.38	0.68	0.015	0.027
D1	4.11	4.45	0.162	0.175	L2	0.30	0.71	0.012	0.028
D2	4.80	5.30	0.189	0.209	H	3.30	3.92	0.130	0.154
E	5.90	6.35	0.232	0.250	I	0.00	0.18	0.000	0.007
E1	5.45	6.06	0.215	0.239					

■Marking



Symbols	Content
XXXXX	Product code
a	Yearly code: 2019=K, 2020=L, 2021=M, 2022=N ...
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)