Single N-channel MOSFET

ELM4N6056FDA-N

■General description

ELM4N6056FDA-N uses advanced trench technology to provide excellent Rds(on), low gate charge and low gate threshold voltage.

■Features

- Vds=60V
- Id=58A (Vgs=10V)
- Rds(on) = 8.5mΩ (Vgs=10V)
- Rds(on) = 12.5mΩ (Vgs=4.5V)

■Maximum absolute ratings

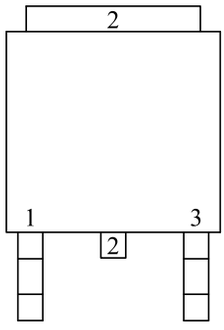
Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		Vds	60	V	
Gate-source voltage		Vgs	±20	V	
Continuous drain current (Vgs=10V)	Tc=25°C	Id	58.0	A	1, 6
	Tc=100°C		36.6		
Pulsed drain current		Idm	125	A	2
Single pulse avalanche energy		Eas	26.5	mJ	3
Avalanche current		Ias	23	A	
Power dissipation	Tc=25°C	Pd	52	W	4
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 (Steady state)	Rθja	-	60.0	°C/W	1
Thermal resistance junction-case ambient	Rθjc	-	2.4	°C/W	1

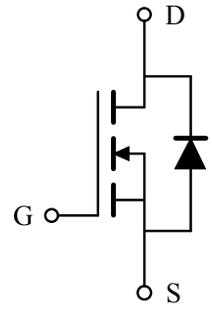
■Pin configuration

TO-252(TOP VIEW)



Pin No.	Pin name
1	GATE
2	DRAIN
3	SOURCE

■Circuit



■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	
Drain-source leakage current	Idss	Vds=48V, Vgs=0V	-	-	1	μA	
		Vds=48V, Vgs=0V, Tj=55°C	-	-	5		
Gate-body leakage current	Igss	Vgs=±20V, Vds=0V	-	-	±100	nA	
Gate threshold voltage	Vgs(th)	Vds=Vgs, Id=250μA	1.2	-	2.3	V	
Static drain-source on-resistance	Rds(on)	Vgs=10V, Id=20A	-	7.5	8.5	mΩ	2
		Vgs=4.5V, Id=15A	-	11.0	12.5		
Diode forward voltage	Vsd	Vgs=0V, Is=1A	-	-	1.2	V	2
Max. body-diode continuous current	Is	Vgs=Vds=0V, Force current	-	-	30	A	1,5,6
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	-	1.4	-	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)	Vds=30V, Vgs=10V, Id=15A Rgen=3.3Ω	-	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		-	5.0	-	ns	
Reverse recovery time	trr	If=15A, di/dt=100A/μs	-	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=25V, 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.

■Typical characteristics

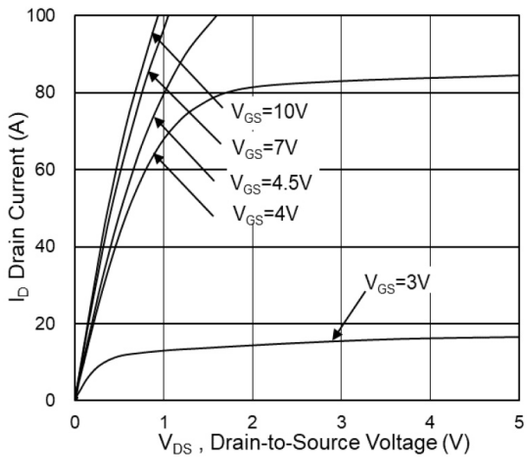


Fig.1 Typical Output Characteristics

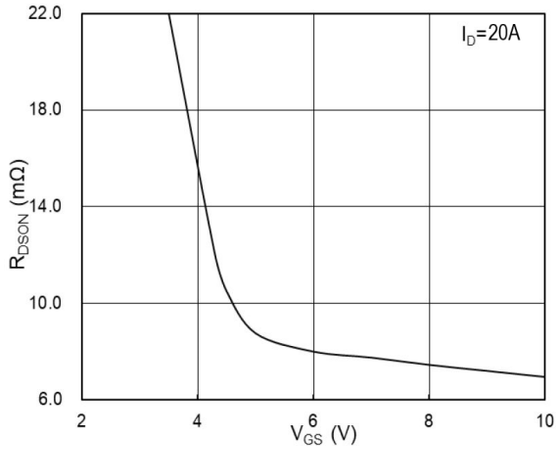


Fig.2 On-Resistance vs G-S Voltage

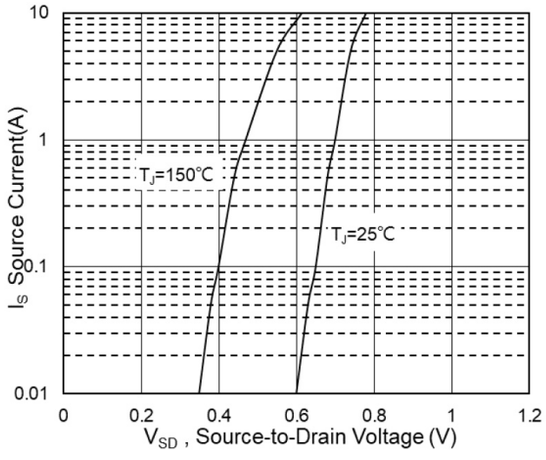


Fig.3 Source Drain Forward Characteristics

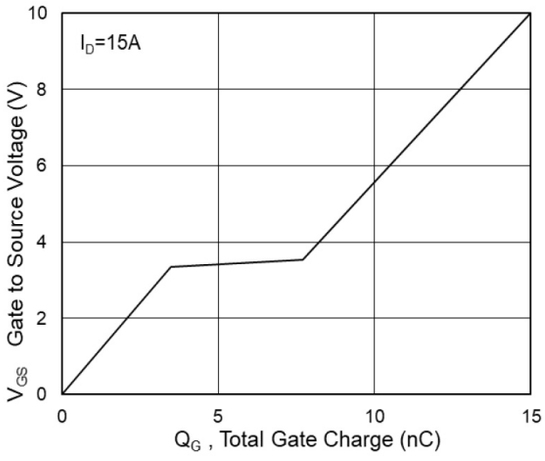


Fig.4 Gate-Charge Characteristics

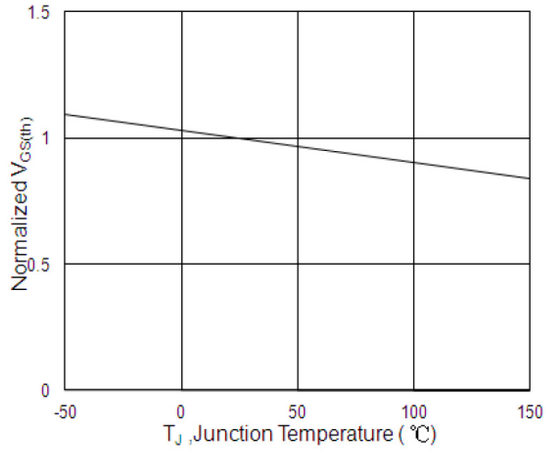


Fig.5 Normalized $V_{GS(th)}$ vs T_J

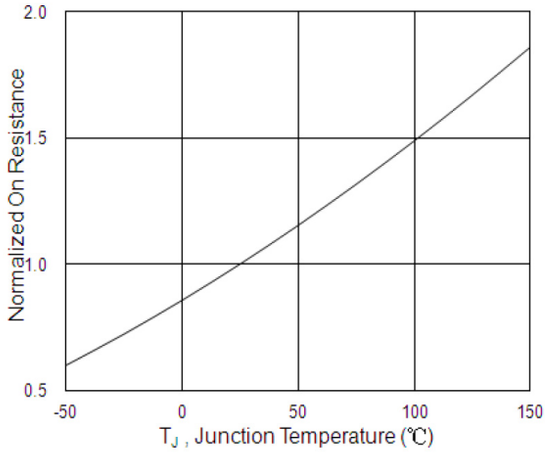


Fig.6 Normalized R_{DSON} vs T_J

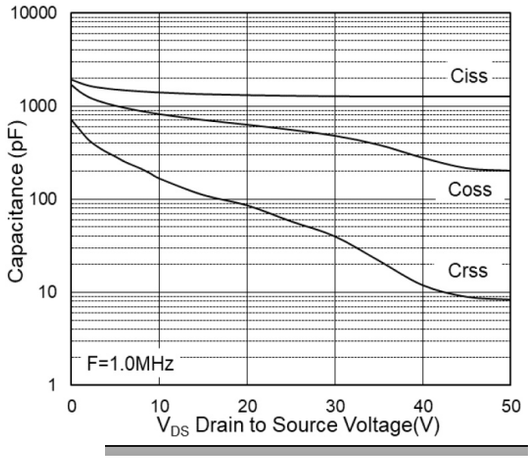


Fig.7 Capacitance

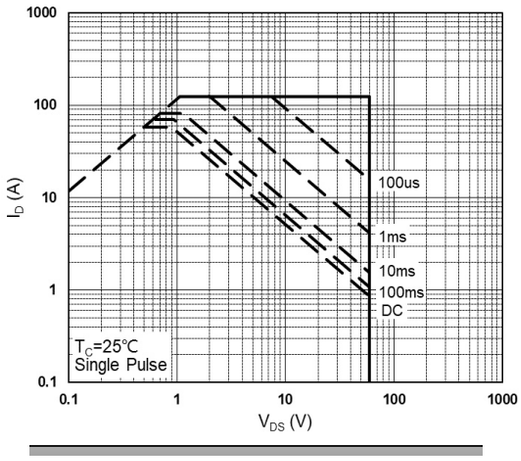


Fig.8 Safe Operating Area

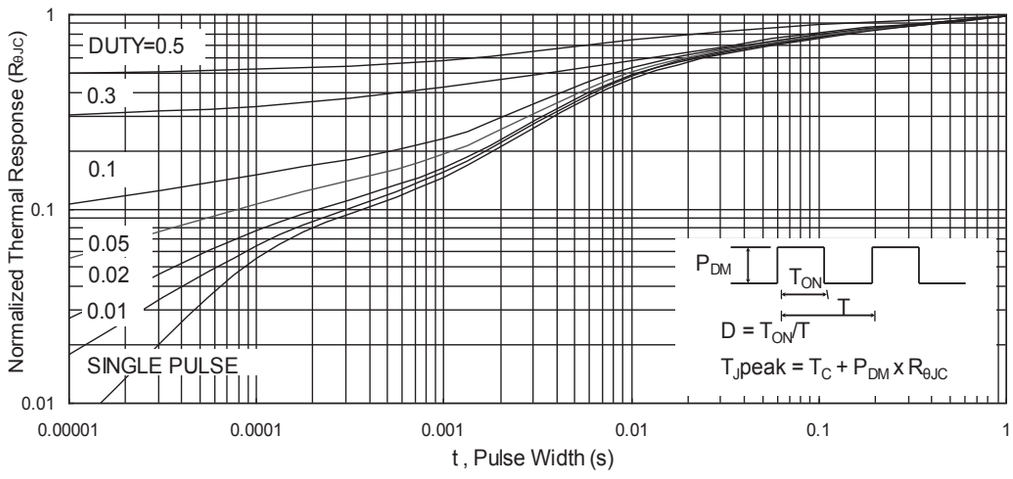


Fig.9 Normalized Maximum Transient Thermal Impedance

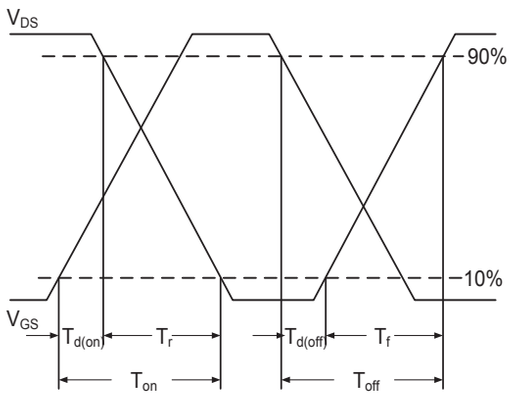


Fig.10 Switching Time Waveform

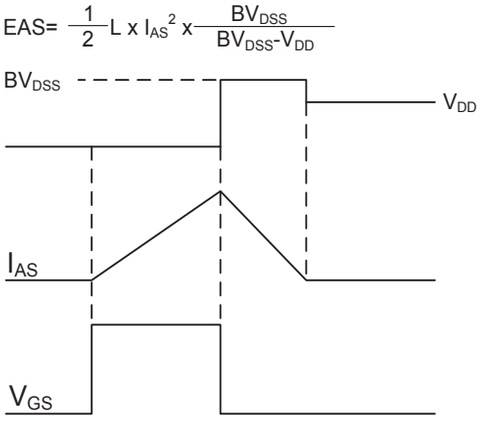


Fig.11 Unclamped Inductive Switching Waveform