

Single N-channel MOSFET

ELM4N6016FTA-T

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

■General description

ELM4N6016FTA-T uses advanced trench technology to provide excellent $R_{ds(on)}$, low gate charge and low gate threshold voltage.

■Features

- $V_{ds}=60V$
- $I_d=38A$ ($V_{gs}=10V$)
- $R_{ds(on)} = 12m\Omega$ ($V_{gs}=10V$)
- $R_{ds(on)} = 15m\Omega$ ($V_{gs}=4.5V$)

■Maximum absolute ratings

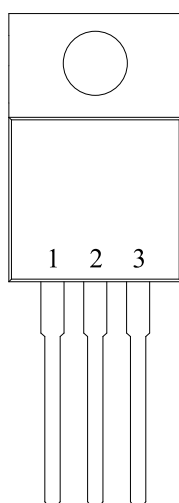
Parameter		Symbol	Limit	Unit	Note
Drain-source voltage		V_{ds}	60	V	
Gate-source voltage		V_{gs}	± 20	V	
Continuous drain current ($V_{gs}=10V$)	$T_c=25^\circ C$	I_d	38.0	A	1
	$T_c=100^\circ C$		24.0		
	$T_a=25^\circ C$		9.2		
	$T_a=70^\circ C$		7.5		
Pulsed drain current		I_{dm}	95	A	2
Single pulsed avalanche energy		E_{as}	72.2	mJ	3
Avalanche current		I_{as}	38	A	
Total power dissipation	$T_c=25^\circ C$	P_d	34.7	W	4
	$T_a=25^\circ C$		2.0		
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	$R_{\theta ja}$	--	62.0	$^\circ C/W$	1
Thermal resistance junction-case	$R_{\theta jc}$	--	3.6		

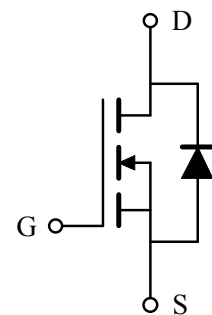
■Pin configuration

TO-220F(TOP VIEW)



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	
BV _{dss} Temperature coefficient	$\frac{\Delta BV_{dss}}{\Delta T_j}$	Reference to 25°C, I _d =1mA	--	0.052	--	V/°C	
Static drain-source on-resistance	R _{ds(on)}	V _{gs} =10V, I _d =30A	--	--	12	mΩ	2
		V _{gs} =4.5V, I _d =15A	--	--	15		
Gate threshold voltage	V _{gs(th)}	V _{gs} =V _{ds} , I _d =250μA	1.2	--	2.5	V	
V _{gs(th)} Temperature coefficient	ΔV _{gs(th)}		--	-5.76	--	mV/°C	
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	
Forward transconductance	G _{fs}	V _{ds} =5V, I _d =30A	--	42	--	S	
Continuous source current	I _s	V _{gs} =V _{ds} =0V, Force current	--	--	38	A	1, 5
Pulsed source current	I _{sm}		--	--	95	A	2, 5
Diode forward voltage	V _{sd}	V _{gs} =0V, I _s =1A	--	--	1.2	V	2
DYNAMIC PARAMETERS							
Input capacitance	C _{iss}	V _{ds} =15V, V _{gs} =0V, f=1MHz	--	3240	--	pF	
Output capacitance	C _{oss}		--	210	--	pF	
Reverse transfer capacitance	C _{rss}		--	146	--	pF	
Gate resistance	R _g	V _{ds} =0V, V _{gs} =0V, f=1MHz	--	1.5	--	Ω	
SWITCHING PARAMETERS							
Total gate charge (4.5V)	Q _g	V _{ds} =48V, V _{gs} =4.5V I _d =15A	--	28.7	--	nC	
Gate-source charge	Q _{gs}		--	10.5	--	nC	
Gate-drain charge	Q _{gd}		--	9.9	--	nC	
Turn-on delay time	t _{d(on)}	V _{dd} =30V, V _{gs} =10V R _{gen} =3.3Ω, I _d =15A	--	10.4	--	ns	
Turn-on rise time	t _r		--	9.2	--	ns	
Turn-off delay time	t _{d(off)}		--	63.0	--	ns	
Turn-off fall time	t _f		--	4.8	--	ns	
Reverse recovery time	t _{rr}	I _f =15A, di/dt=100A/μs	--	18	--	nS	
Reverse recovery charge	Q _{rr}		--	14	--	nC	

NOTE :

1. The data tested by surface mounted on a 1 inch² 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_{dd}=25V, V_{gs}=10V, L=0.1mH, I_{as}=38A.
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.

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■ Typical characteristics

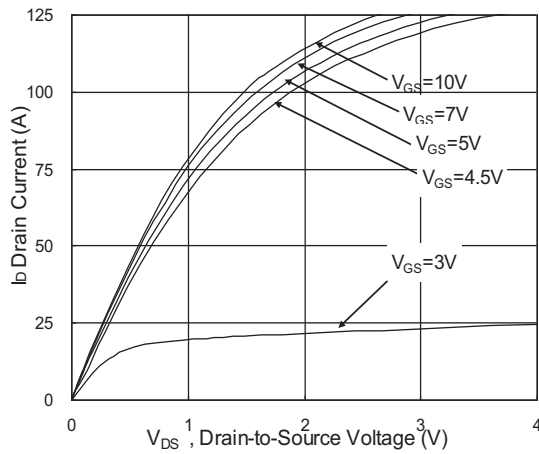


Fig.1 Typical Output Characteristics

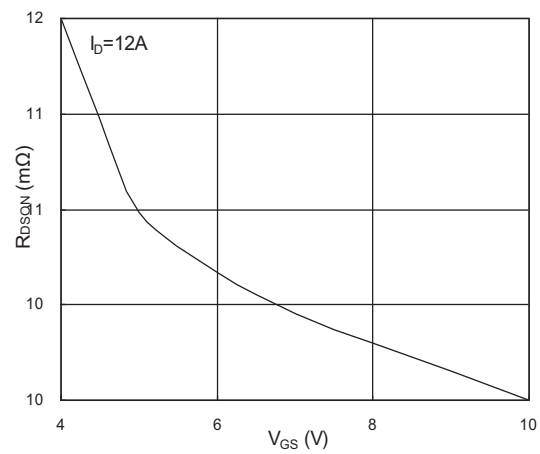


Fig.2 On-Resistance vs. Gate-Source Voltage

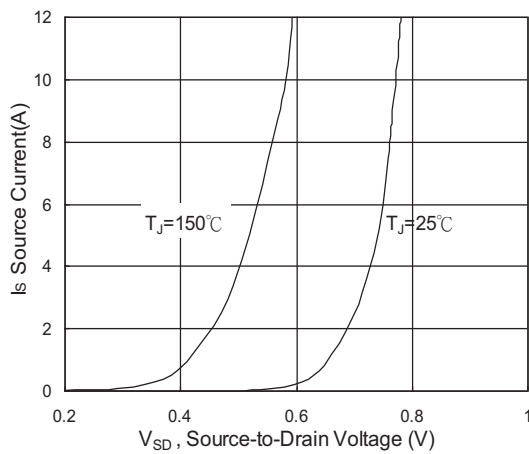


Fig.3 Forward Characteristics of Reverse

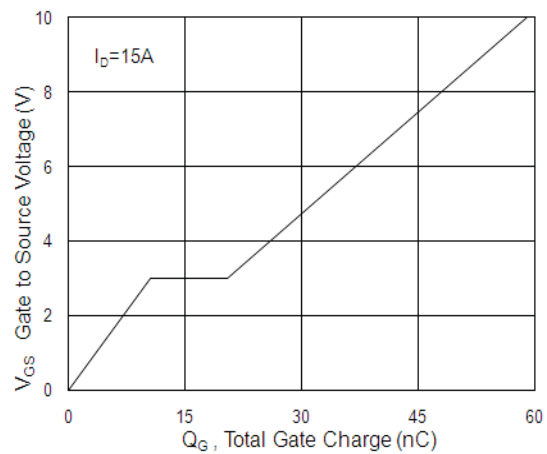


Fig.4 Gate-Charge Characteristics

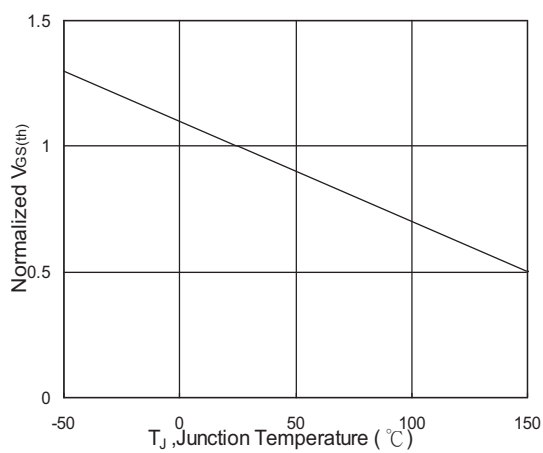


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

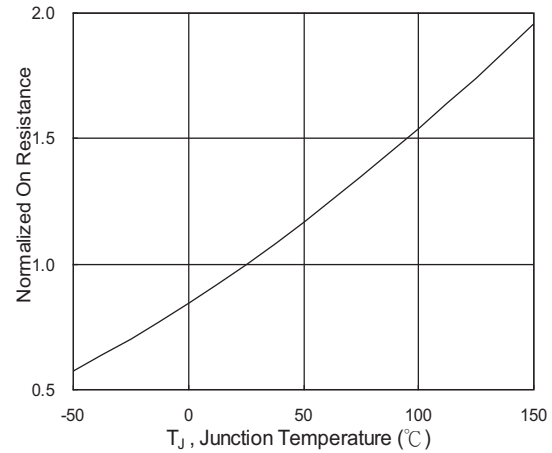


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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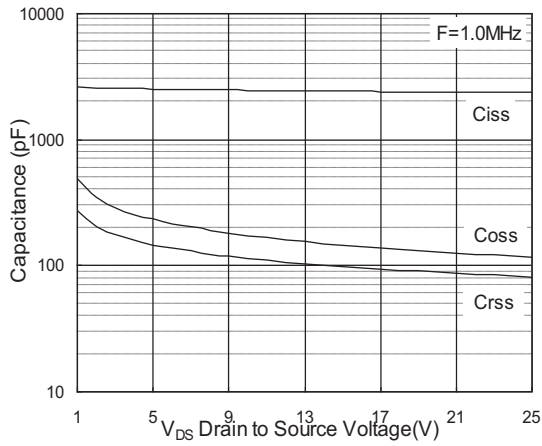


Fig.7 Capacitance

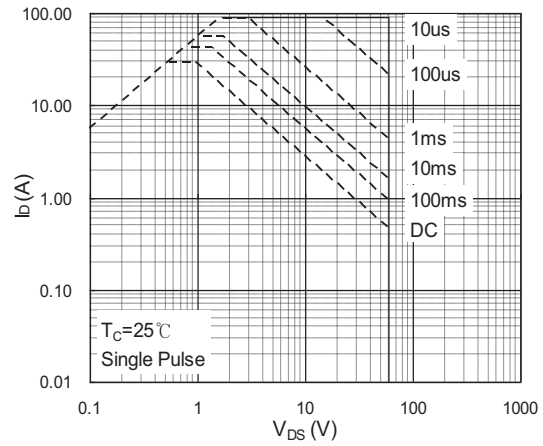


Fig.8 Safe Operating Area

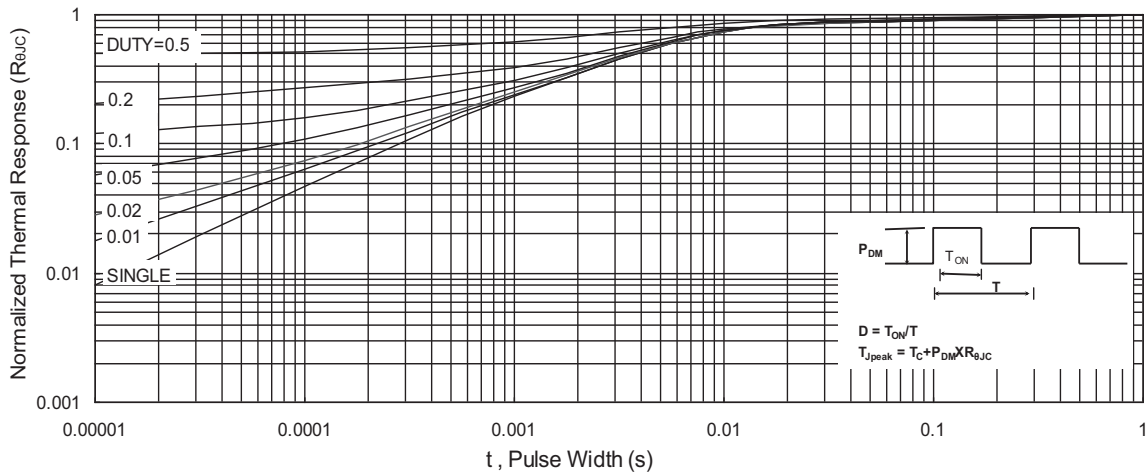


Fig.9 Normalized Maximum Transient Thermal Impedance

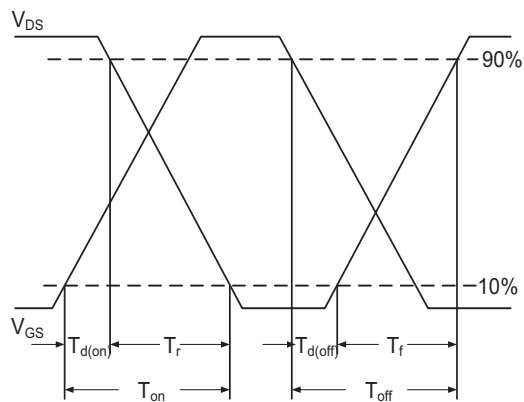


Fig.10 Switching Time Waveform

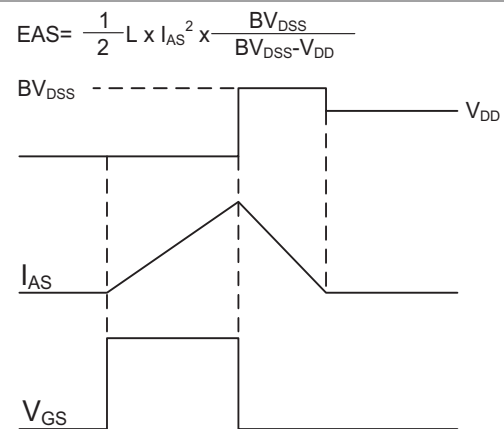


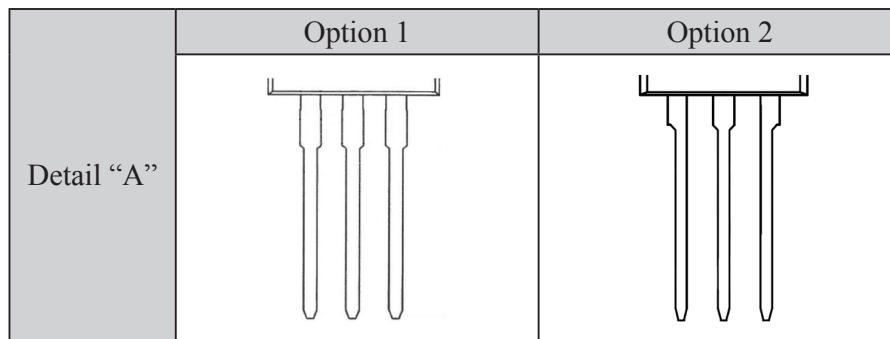
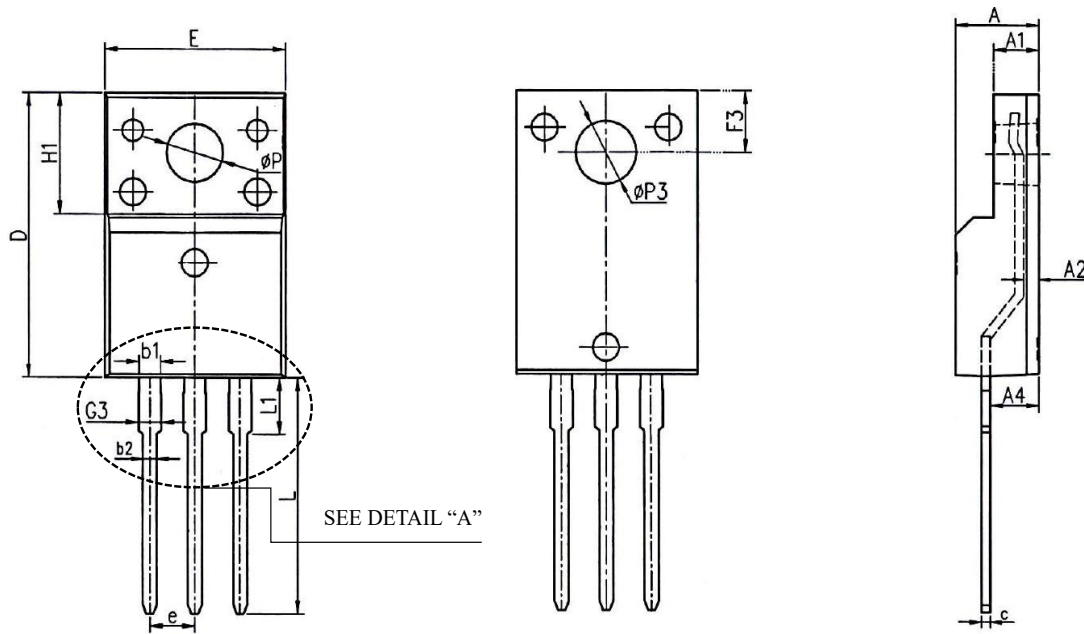
Fig.11 Unclamped Inductive Switching Waveform

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■TO-220F dimension (50pcs/tube)



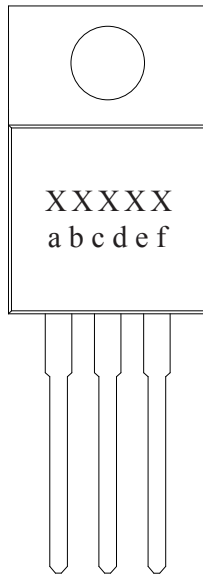
Sym.	Millimeters		Inches		Sym.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	4.50	4.90	0.177	0.193	ϕP	3.08	3.28	0.121	0.129
A1	2.34	2.74	0.092	0.108	L	12.68	13.28	0.499	0.523
A2	0.65	1.30	0.026	0.051	L1	1.70	3.65	0.067	0.144
A4	2.55	2.95	0.100	0.116	$\phi P3$	3.45 Ref		0.136 Ref	
c	0.40	0.74	0.016	0.029	F3	3.10	3.50	0.122	0.138
D	15.57	16.17	0.613	0.637	G3	1.10	1.50	0.043	0.059
E	9.96	10.40	0.392	0.409	b1	1.05	1.38	0.041	0.054
H1	6.48	6.88	0.255	0.271	b2	0.59	0.92	0.023	0.036
e	2.54 BSC		0.100 BSC						

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■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)