

**TM70N04NF**

**N-Channel Enhancement Mosfet**

**General Description**

- Low  $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

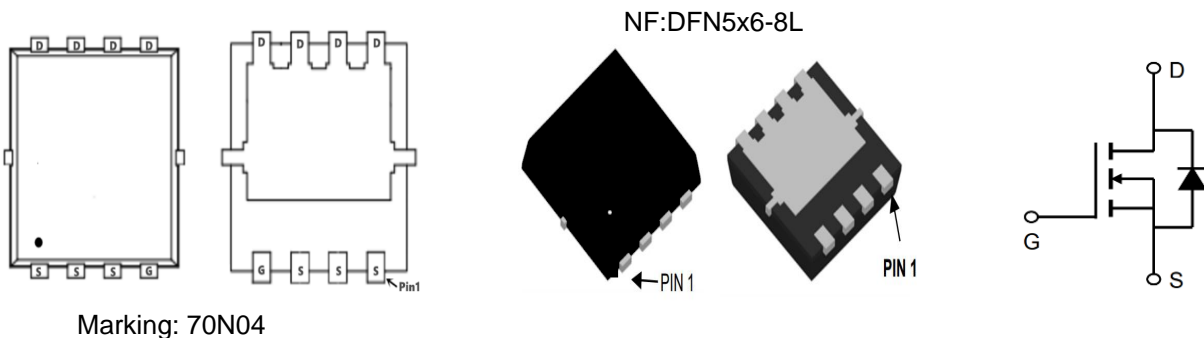
**Applications**

- Load switch
- PWM

**General Features**

$V_{DS} = 40V$   $I_D = 70A$   
 $R_{DS(ON)} = 9m\Omega(\text{typ.}) @ V_{GS} = 10V$

- 100% UIS Tested
- 100%  $R_g$  Tested



**Absolute Maximum Ratings** ( $T_C = 25^\circ C$  unless otherwise noted)

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current- $T_C = 25^\circ C$	70	A
	Continuous Drain Current- $T_C = 100^\circ C$	44	
	Pulsed Drain Current	280	
$E_{AS}$	Single Pulse Avalanche Energy	76	mJ
$P_D$	Power Dissipation	72.3	W
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ C$

**Thermal Data**

Symbol	Parameter	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case <sup>2</sup>	1.73	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction to mbient	62	$^\circ C/W$



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Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250 μA	40	---	---	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> =0V, V <sub>DS</sub> =40V	---	---	1	μA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0A	---	---	±100	nA
<b>On Characteristics<sup>3</sup></b>						
V <sub>GS(th)</sub>	GATE-Source Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250 μA	1.2	1.6	2.5	V
R <sub>DS(on)</sub>	Drain-Source On Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	9	12	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A	---	10	14	
G <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =10A	---	13	---	S
<b>Dynamic Characteristics<sup>4</sup></b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	---	1278	2200	pF
C <sub>oss</sub>	Output Capacitance		---	135	250	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	87	170	
<b>Switching Characteristics<sup>4</sup></b>						
t <sub>d(on)</sub>	Turn-On Delay Time 3, 4	V <sub>DD</sub> =15V, I <sub>D</sub> =1A, R <sub>G</sub> =3.3Ω V <sub>GS</sub> =10V	---	13.2	25	ns
t <sub>r</sub>	Rise Time 3, 4		---	2.2	5	ns
t <sub>d(off)</sub>	Turn-Off Delay Time 3, 4		---	72	130	ns
t <sub>f</sub>	Fall Time 3, 4		---	4.5	10	ns
Q <sub>g</sub>	Total Gate Charge 3, 4		---	19.7	30	nC
Q <sub>gs</sub>	Gate-Source Charge 3, 4 3, 4	V <sub>GS</sub> =10V, V <sub>DS</sub> =20V, I <sub>D</sub> =10A	---	2.8	4.2	nC
Q <sub>gd</sub>	Gate-Drain "Miller" Charge 3, 4		---	5.1	7.6	nC
<b>Drain-Source Diode Characteristics</b>						
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>SD</sub>	Source-Drain Diode Forward Voltage <sup>3</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A	---	---	1	V
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	70	A
I <sub>sm</sub>	Pulsed Source Current		---	---	140	A
T <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, dI/dt=100A/μs T <sub>J</sub> =25°C	---	17	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge		---	2.8	---	nC

## Notes:

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=39A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

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Typical Performance Characteristics

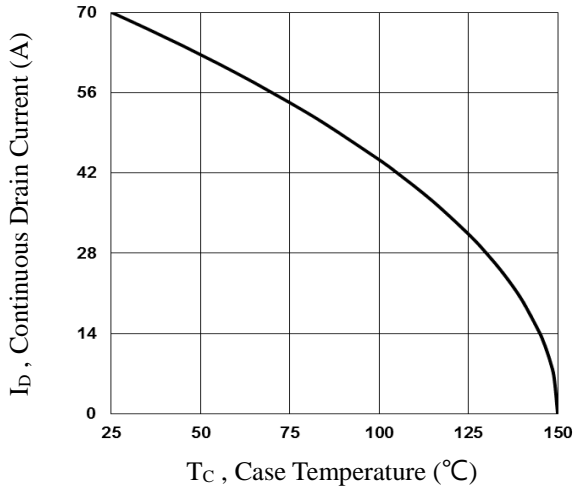


Fig.1 Continuous Drain Current vs. T<sub>c</sub>

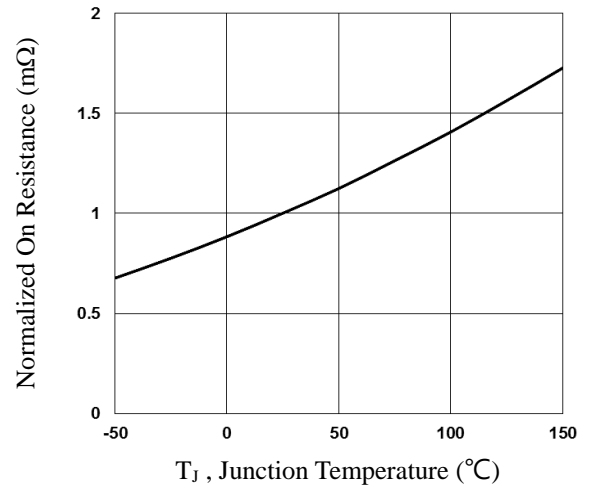


Fig.2 Normalized R<sub>DS(on)</sub> vs. T<sub>j</sub>

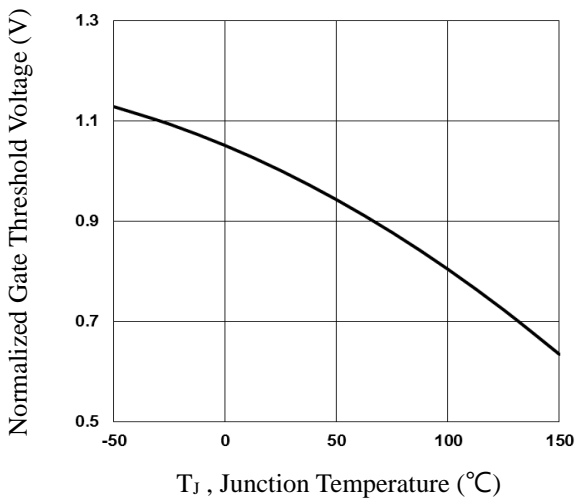


Fig.3 Normalized V<sub>th</sub> vs. T<sub>j</sub>

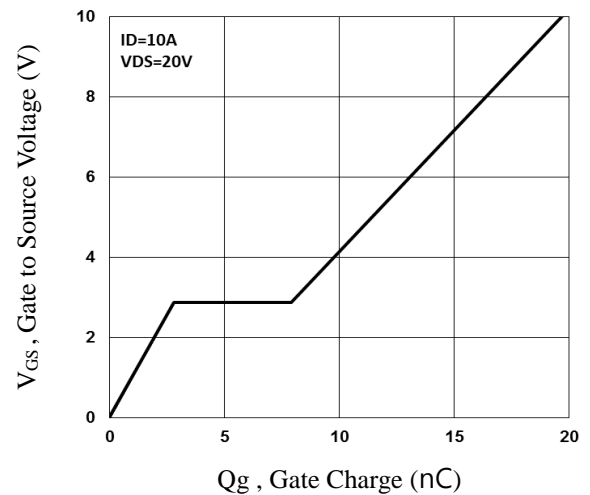


Fig.4 Gate Charge Waveform

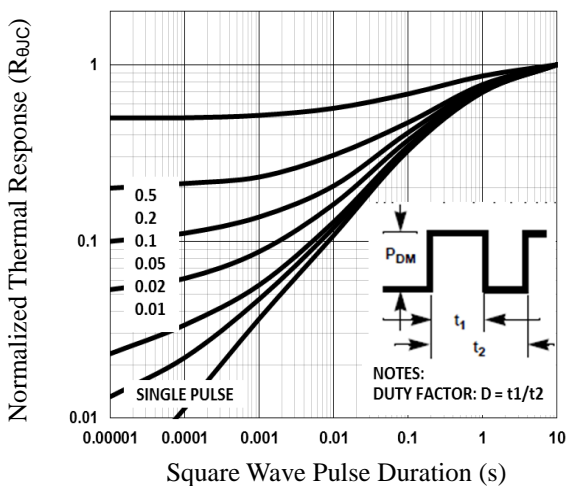


Fig.5 Normalized Transient Impedance

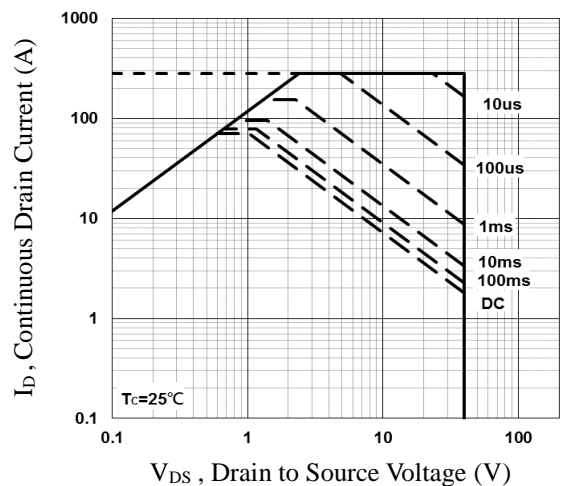


Fig.6 Maximum Safe Operation Area

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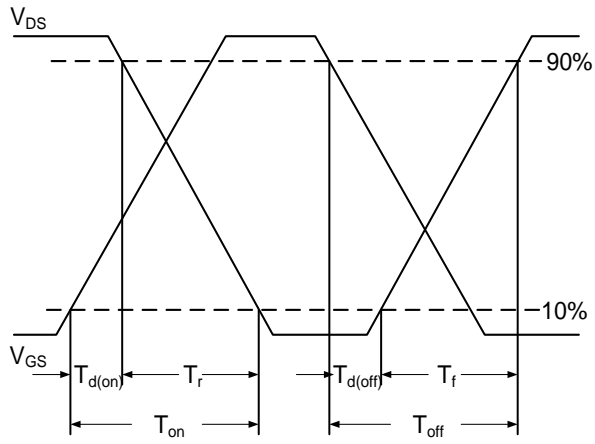


Fig.7 Switching Time Waveform

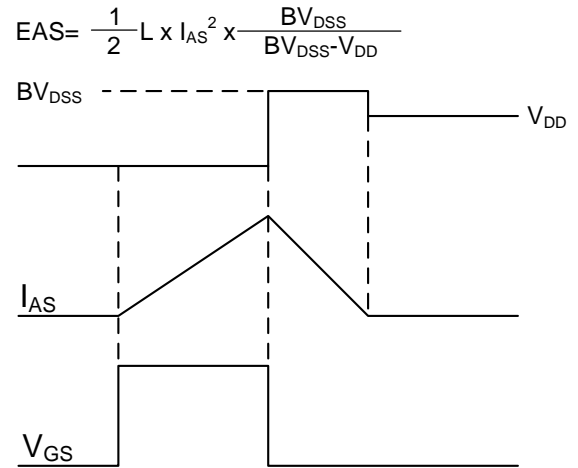
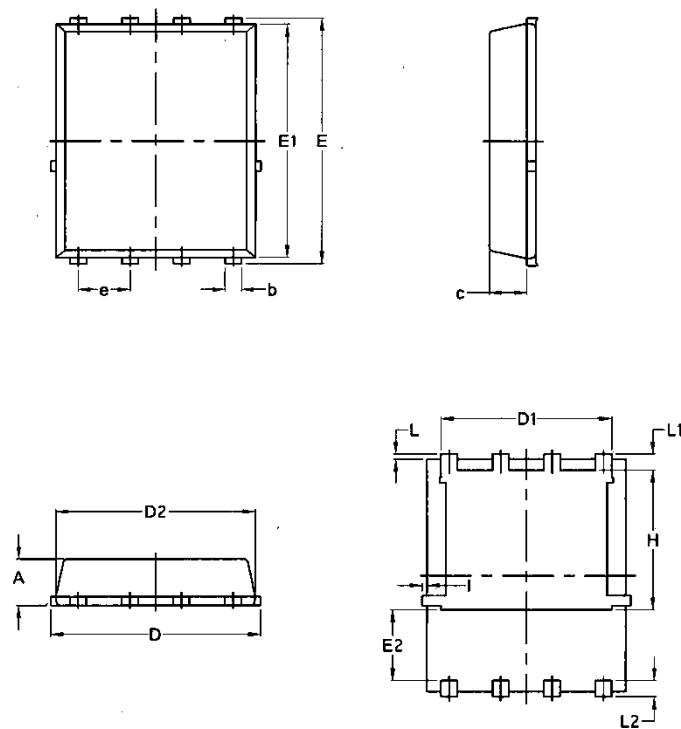


Fig.8 EAS Waveform



## Package Mechanical Data:DFN5x6-8L



Symbol	Common			
	mm		Inch	
	Min	Max	Min	Max
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.824	0.0970	0.0324	0.082
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.60	/	0.0630	/
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
H	3.30	3.50	0.1299	0.1378
I	/	0.18	/	0.0070

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