



## Description

The HAON7401 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS} = -30V$   $I_D = -50A$

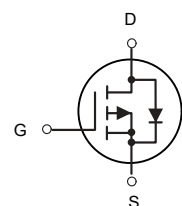
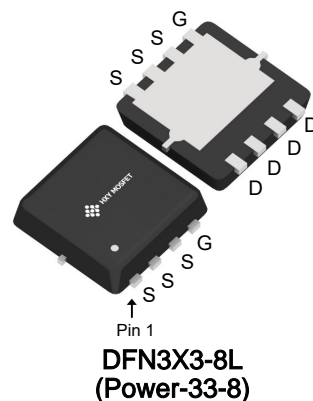
$R_{DS(ON)} < 13m\Omega$  @  $V_{GS} = -10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



P-Channel MOSFET

## Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HAON7401	DFN3X3-8L(Power-33-8)	HXY MOSFET	5000

## Absolute Maximum Ratings (TC=25°C unless otherwise specified)

Symbol	Parameter	Rating		Units
		10s	Steady State	
$V_{DS}$	Drain-Source Voltage	-30		V
$V_{GS}$	Gate-Source Voltage	$\pm 20$		V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-50		A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-27		A
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-14.3	-9	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-11.4	-7.2	A
IDM	Pulsed Drain Current <sup>2</sup>	-130		A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	125		mJ
IAS	Avalanche Current	-50		A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation <sup>4</sup>	37		W
$P_D @ T_A = 25^\circ C$	Total Power Dissipation <sup>4</sup>	4.2	1.67	W
TSTG	Storage Temperature Range	-55 to 150		°C
$T_J$	Operating Junction Temperature Range	-55 to 150		°C



R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup>	75	°C/W
R <sub>θJA</sub>	Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤ 10s)	30	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	3.36	°C/W

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-30	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BVDSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.0232	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-30A	---	9	13	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A	---	16	22	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.2	---	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	4.6	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	-5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-30A	---	30	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	9	---	Ω
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A	---	22	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	8.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	7.2	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3 Ω, I <sub>D</sub> =-15A	---	8	---	ns
T <sub>r</sub>	Rise Time		---	73.7	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	61.8	---	
T <sub>f</sub>	Fall Time		---	24.4	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz	---	2215	---	pF
C <sub>oss</sub>	Output Capacitance		---	310	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	237	---	
I <sub>S</sub>	Continuous Source Current <sup>1,5</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-42	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,5</sup>		---	---	-130	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =-15A, dI/dt=100A/μs, T <sub>J</sub> =25°C	---	19	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge	T <sub>J</sub> =25°C	---	9	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width ≤ 300us duty cycle≤2%
- 3.The EAS data shows Max. rating . The test condition is V<sub>DD</sub> =-25V V<sub>GS</sub> =-10V,L=0.1mH,I<sub>AS</sub>=-50A,
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.



## Typical Characteristics

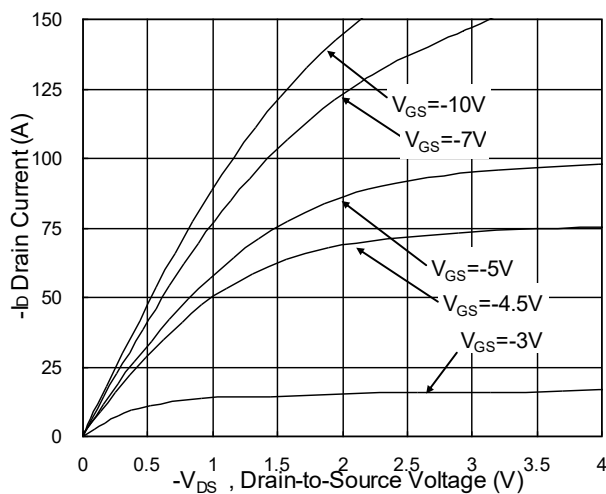


Fig.1 Typical Output Characteristics

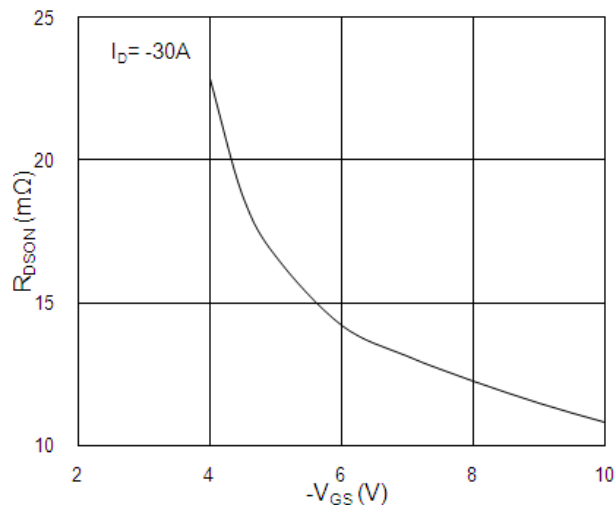


Fig.2 On-Resistance vs. G-S Voltage

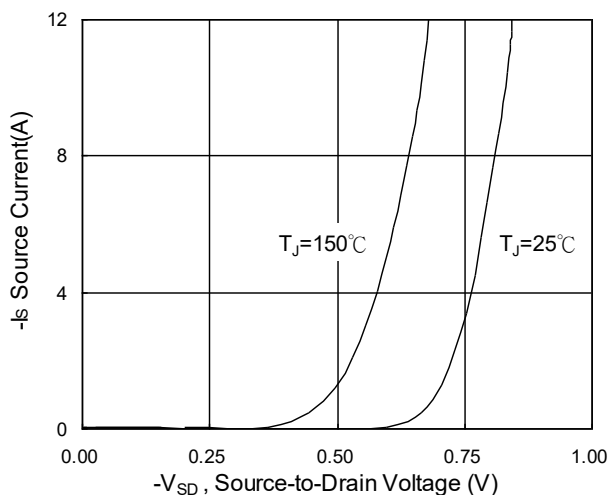


Fig.3 Forward Characteristics of Reverse

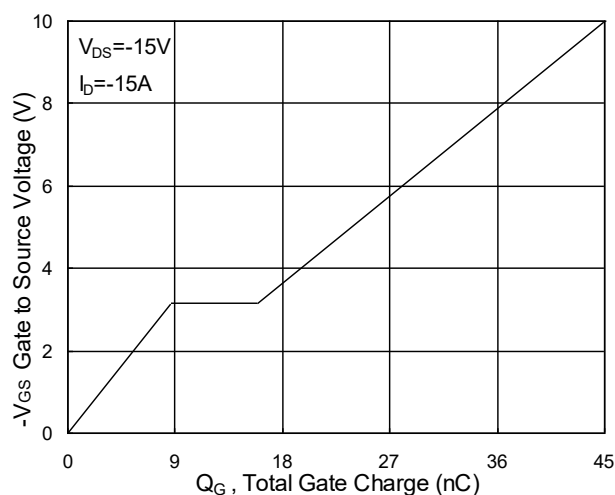


Fig.4 Gate-Charge Characteristics

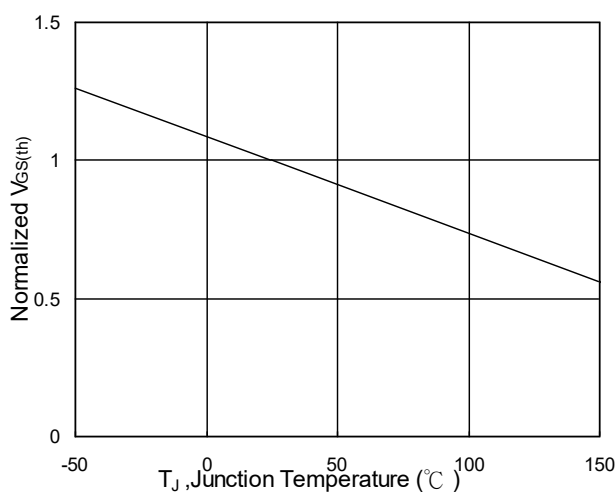


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

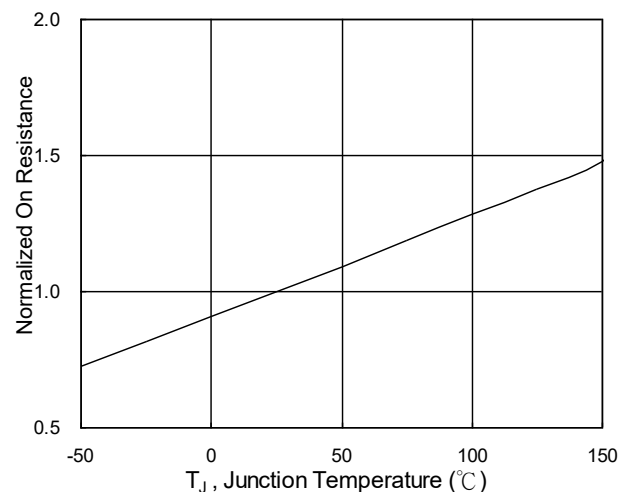


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

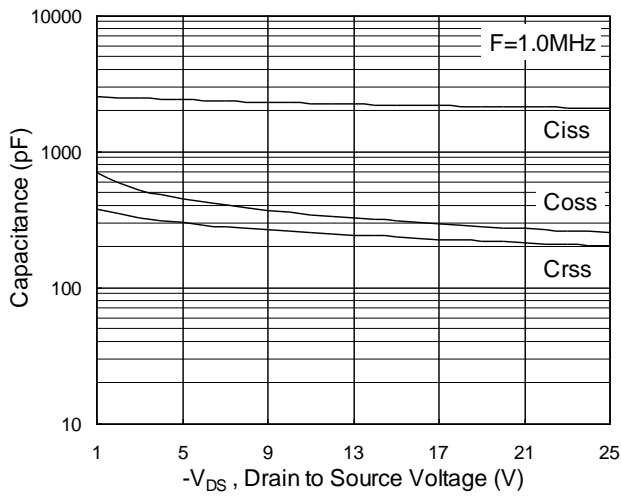


Fig.7 Capacitance

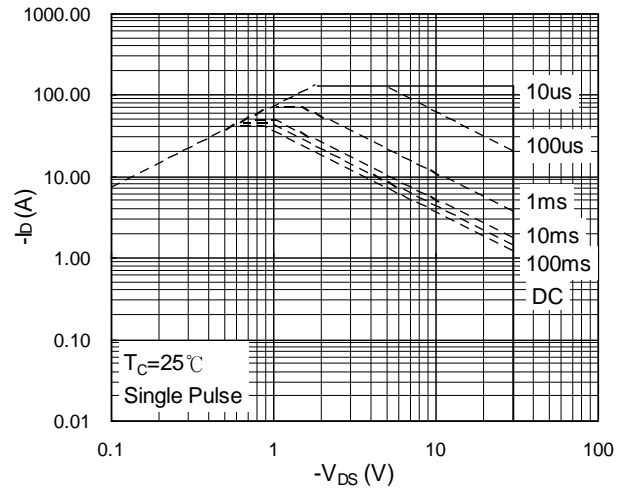


Fig.8 Safe Operating Area

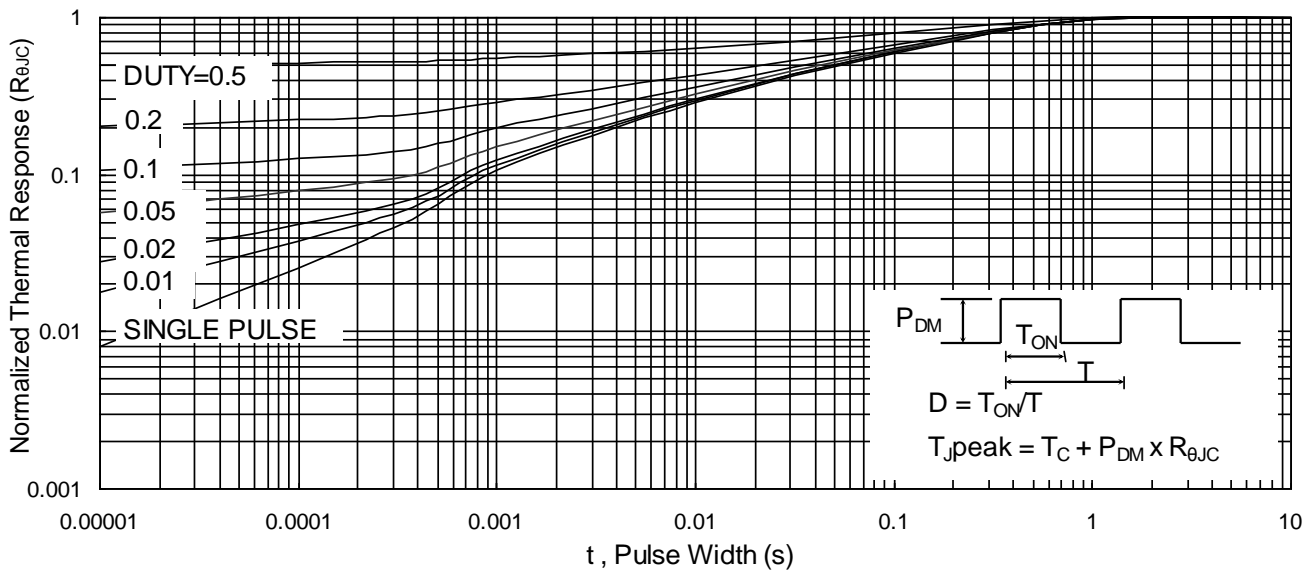


Fig.9 Normalized Maximum Transient Thermal Impedance

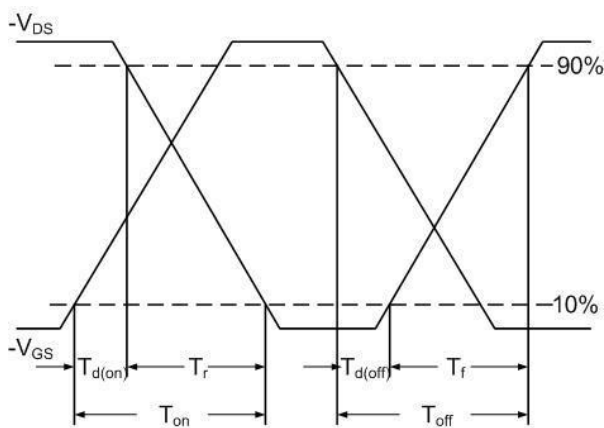


Fig.10 Switching Time Waveform

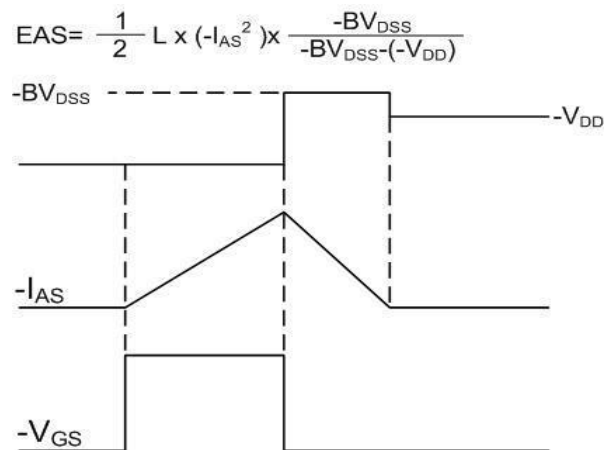
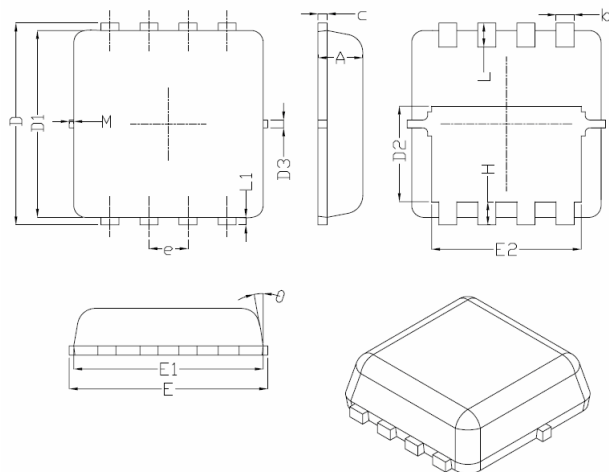


Fig.11 Unclamped Inductive Switching Waveform



## DFN3X3-8L(Power-33-8) Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
M	*	*	0.15
θ		10°	12°



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