

**Description**

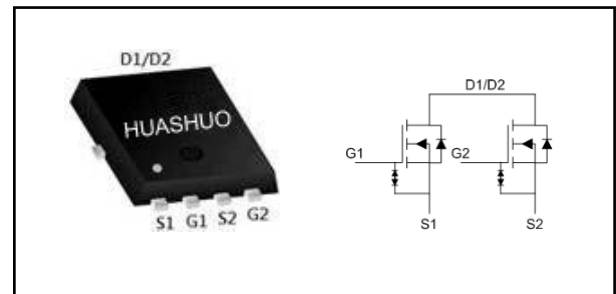
The HSBE2738 is the low RDSON trench N-CH MOSFETs with robust ESD protection. This product is suitable for Lithium-ion battery pack applications.

The HSBE2738 meet the RoHS and Green Product requirement with full function reliability approved.

- Low drain-source ON resistance
- Green Device Available
- ESD Protected Embedded

**Product Summary**

$V_{DS}$	20	V
$R_{DS(ON),max}$	9.5	m $\Omega$
$I_D$	12	A

**PRPAK3X3 NEP Pin Configuration**

**Absolute Maximum Ratings**

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D@T_A=25^\circ C$	Continuous Drain Current <sub>1</sub>	12	A
$I_D@T_A=70^\circ C$	Continuous Drain Current <sub>1</sub>	9.6	A
$I_{DM}$	Pulsed Drain Current <sub>2</sub>	72	A
$P_D@T_A=25^\circ C$	Total Power Dissipation <sub>3</sub>	1.47	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

**Thermal Data**

Symbol	Parameter	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sub>1</sub>	95	$^\circ C/W$



**N-Ch 20V Fast Switching MOSFETs**

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
B <sub>V</sub> DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	20	---	---	V
ΔB <sub>V</sub> DSS/ΔT <sub>J</sub>	B <sub>V</sub> DSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.014	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A	---	8	9.5	mΩ
		V <sub>GS</sub> =4.0V, I <sub>D</sub> =3A	---	8.5	9.8	mΩ
		V <sub>GS</sub> =3.1V, I <sub>D</sub> =3A	---	10.5	12.5	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A	---	12	15	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	0.5	---	1.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-2.09	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V	---	---	±5	uA
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	1.83	---	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> =10A	---	13	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	2.3	---	
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> =4.5V, R <sub>G</sub> =6Ω, I <sub>D</sub> =6A	---	22	---	ns
T <sub>r</sub>	Rise Time		---	85	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	125	---	
T <sub>f</sub>	Fall Time		---	46	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1MHz	---	735	---	pF
C <sub>oss</sub>	Output Capacitance		---	256	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	230	---	

**Diode Characteristics**

Symbol	Parameter	Conditions	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	12	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	1.2	V

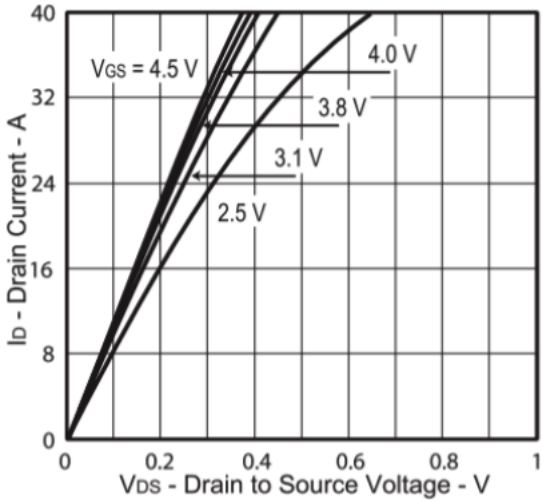
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature.
- 4.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.

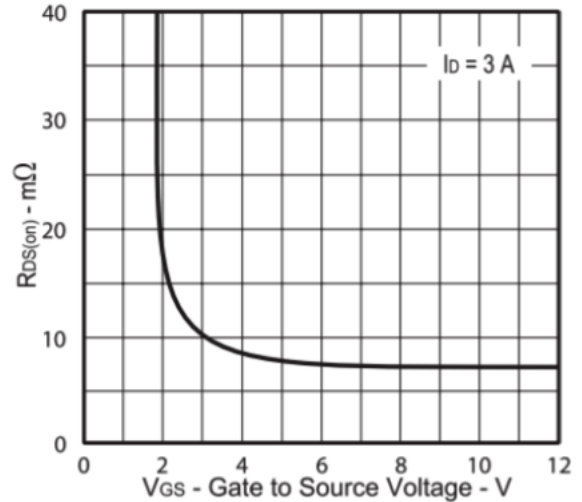


**N-Ch 20V Fast Switching MOSFETs**

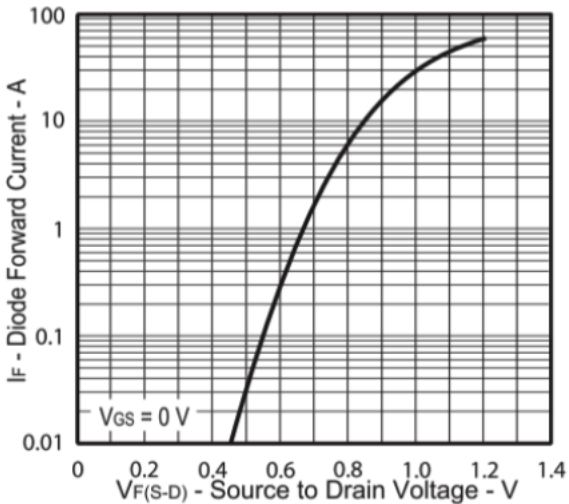
**Typical Characteristics**



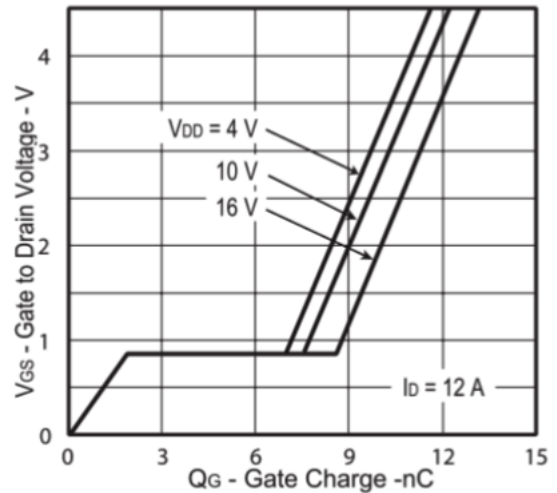
**Fig.1 Typical Output Characteristics**



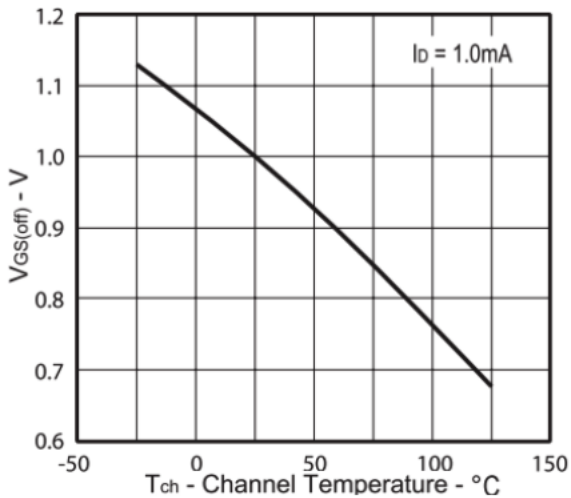
**Fig.2 On-Resistance vs. Gate-Source Voltage**



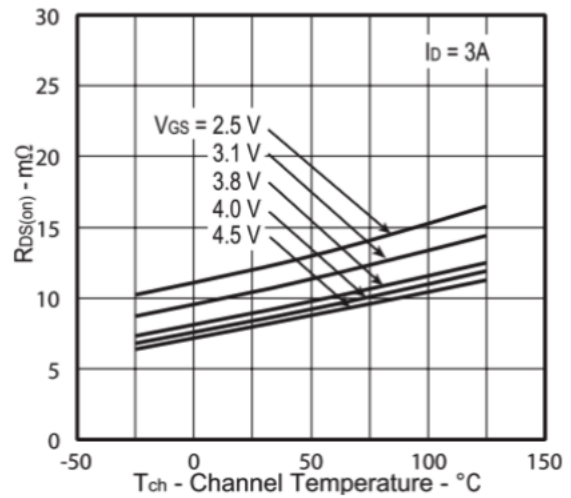
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



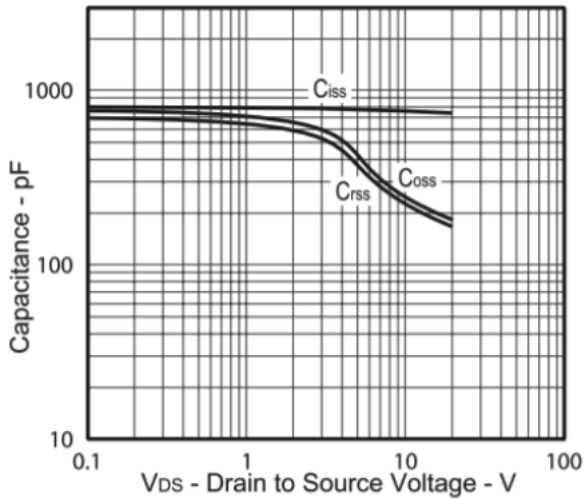
**Fig.5  $V_{GS(th)}$  vs.  $T_{Ch}$**



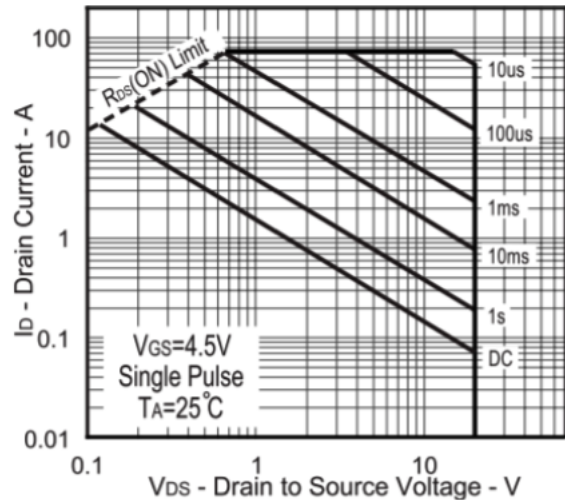
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_{Ch}$**



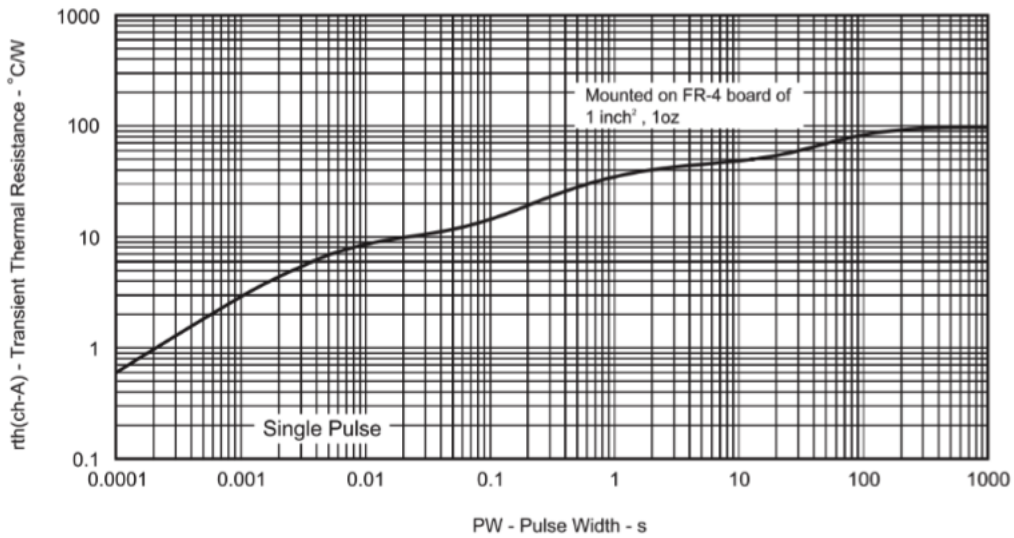
**N-Ch 20V Fast Switching MOSFETs**



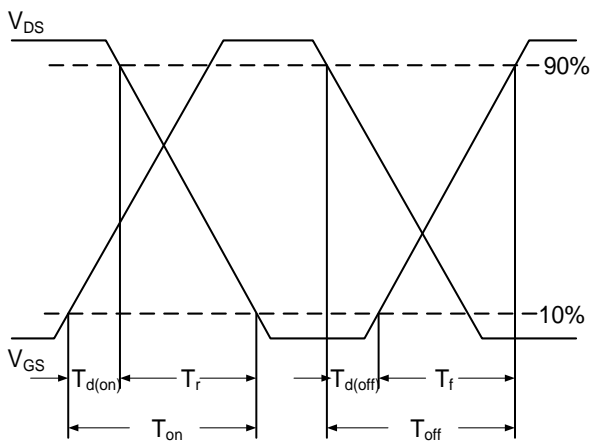
**Fig.7 Capacitance**



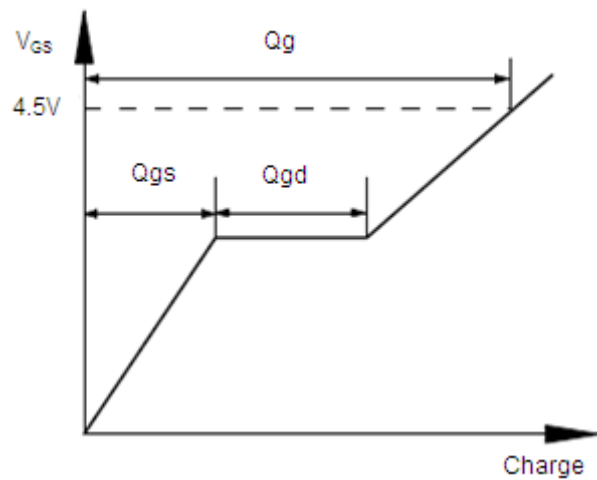
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



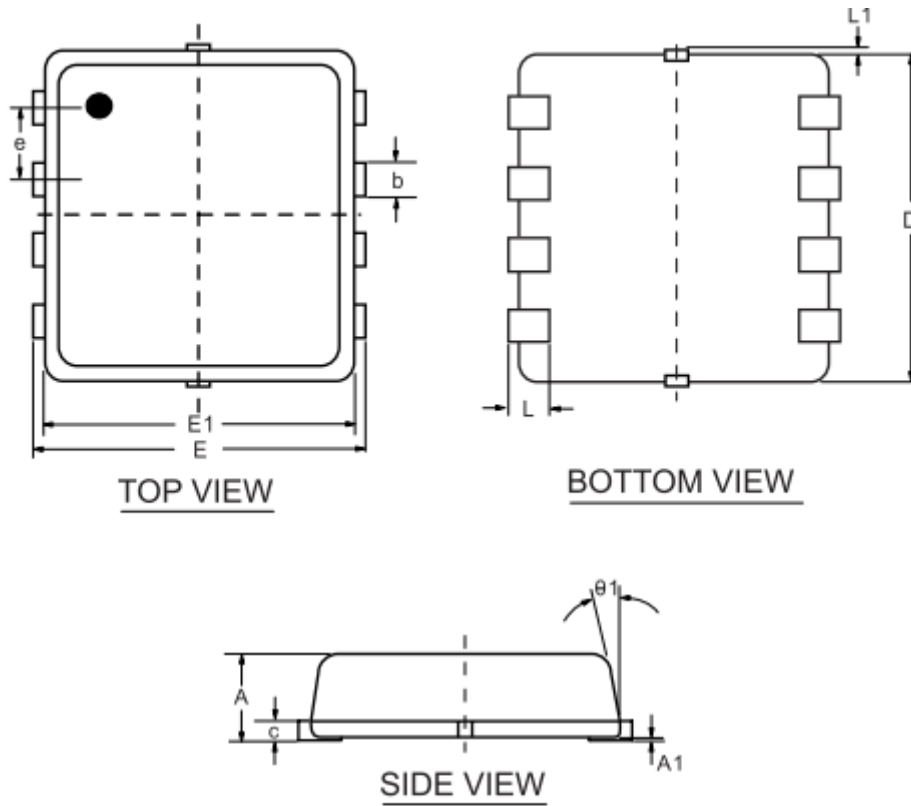
**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**



# PRPAK3X3 NEP Package Outline Dimensions



SYMBOLS	MILLIMETERS		
	MIN	NOM	MAX
A	0.700	0.800	0.900
A1	0.000	—	0.050
b	0.240	0.300	0.350
c	0.080	0.152	0.250
D	2.800	2.900	3.000
E	2.700	2.800	2.900
E1	2.200	2.300	2.400
e	0.650 BSC		
L	0.200	0.375	0.450
L1	0.000	—	0.100
$\theta 1$	0°	10°	12°