



### General 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.

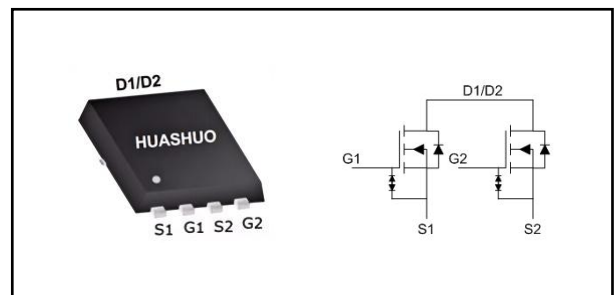
### Product Summary

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

### Features

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

### 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 <sup>1</sup> | 12         | A           |
| $I_D@T_A=70^{\circ}C$ | Continuous Drain Current <sup>1</sup> | 9.6        | A           |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>     | 72         | A           |
| $P_D@T_A=25^{\circ}C$ | Total Power Dissipation <sup>3</sup>  | 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 <sup>1</sup> | 95   | $^{\circ}C/W$ |



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

**Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

| Symbol                       | Parameter                                      | Conditions                                                 | Min. | Typ.  | Max.    | Unit                |
|------------------------------|------------------------------------------------|------------------------------------------------------------|------|-------|---------|---------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                               | 20   | ---   | ---     | V                   |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=1mA$                | ---  | 0.014 | ---     | $V/^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=4.5V$ , $I_D=3A$                                   | ---  | 8     | 9.5     | $m\Omega$           |
|                              |                                                | $V_{GS}=4.0V$ , $I_D=3A$                                   | ---  | 8.5   | 9.8     | $m\Omega$           |
|                              |                                                | $V_{GS}=3.1V$ , $I_D=3A$                                   | ---  | 10.5  | 12.5    | $m\Omega$           |
|                              |                                                | $V_{GS}=2.5V$ , $I_D=3A$                                   | ---  | 12    | 15      | $m\Omega$           |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                           | 0.5  | 0.7   | 1.5     | V                   |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                            | ---  | -2.09 | ---     | $mV/^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=16V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$        | ---  | ---   | 1       | $\mu A$             |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 8V$ , $V_{DS}=0V$                              | ---  | ---   | $\pm 5$ | $\mu A$             |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                       | ---  | 1.83  | ---     | $\Omega$            |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=10A$                   | ---  | 13    | ---     | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                            | ---  | 2.3   | ---     |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                            | ---  | 7.2   | ---     |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=4.5V$ , $R_G=6\Omega$ ,<br>$I_D=6A$ | ---  | 22    | ---     | ns                  |
| $T_r$                        | Rise Time                                      |                                                            | ---  | 85    | ---     |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                            | ---  | 125   | ---     |                     |
| $T_f$                        | Fall Time                                      |                                                            | ---  | 46    | ---     |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=10V$ , $V_{GS}=0V$ , $F=1MHz$                      | ---  | 735   | ---     | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                            | ---  | 256   | ---     |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                            | ---  | 230   | ---     |                     |

**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                      | Max. | Unit |
|----------|------------------------------------------|-------------------------------------------------|------|------|
| $I_S$    | Continuous Source Current <sup>1,6</sup> | $V_G=V_D=0V$ , Force Current                    | 12   | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$ | 1.2  | V    |

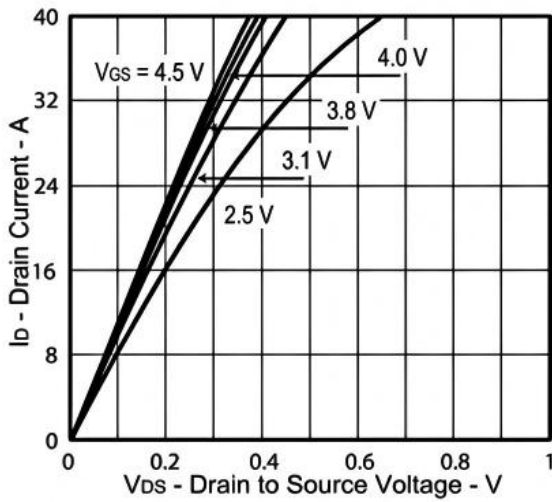
Note :

- 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  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature.
- 4.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

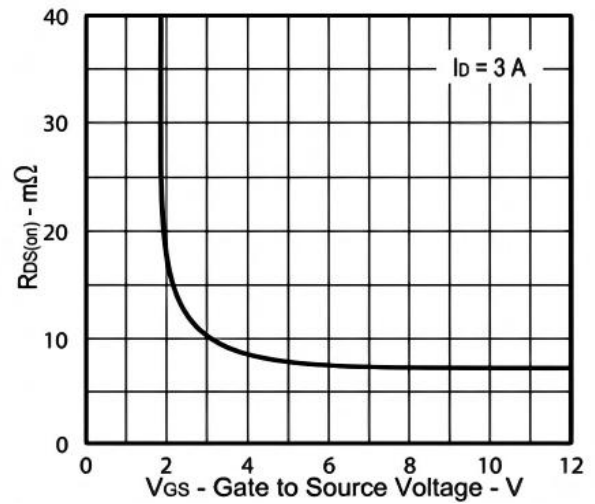


**N-Ch 20V Fast Switching MOSFETs**

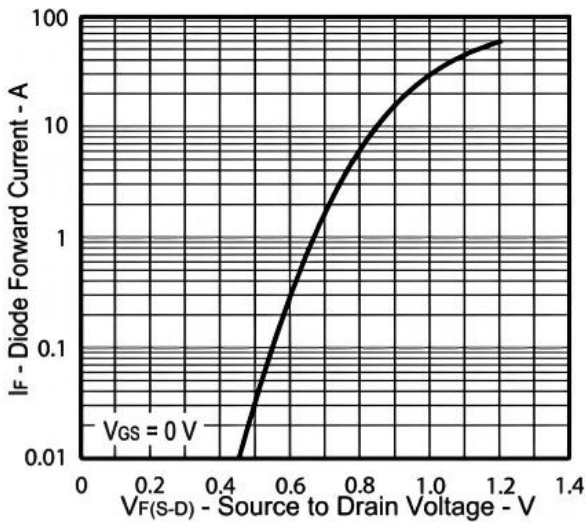
**Typical Characteristics**



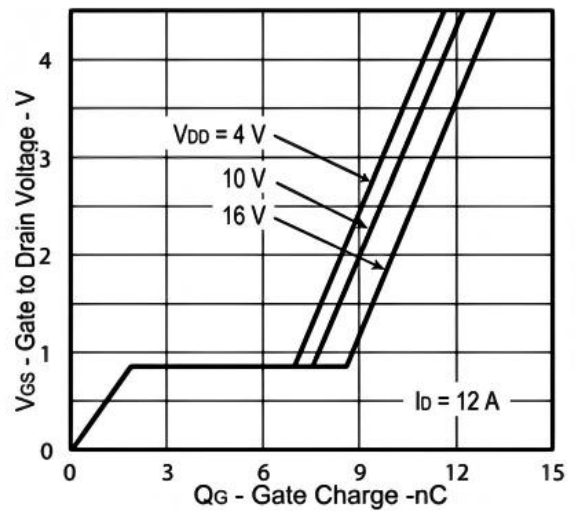
**Fig.1 Typical Output Characteristics**



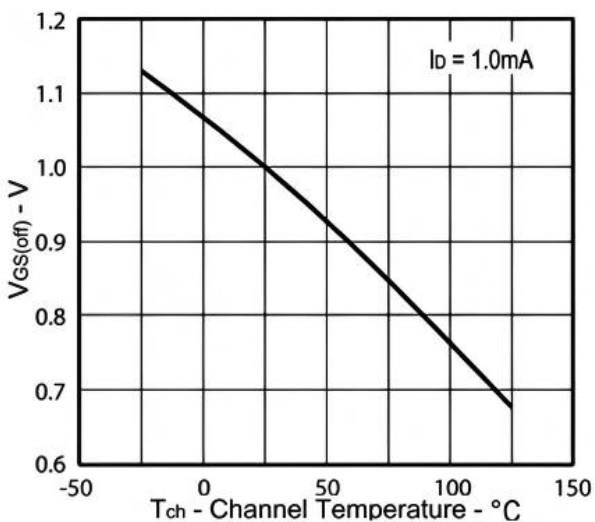
**Fig.2 On-Resistance vs. Gate-Source Voltage**



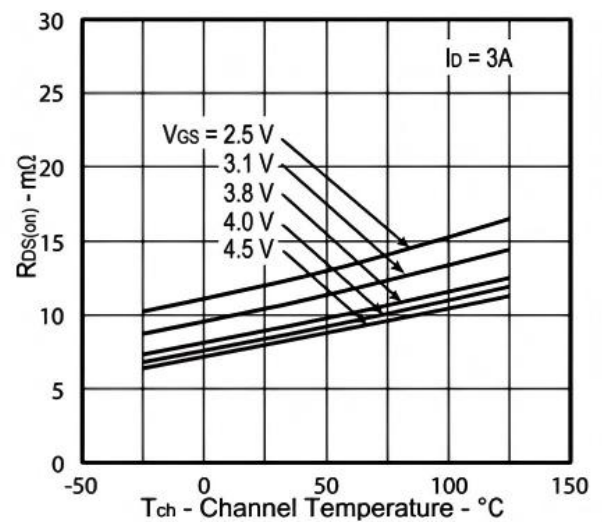
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



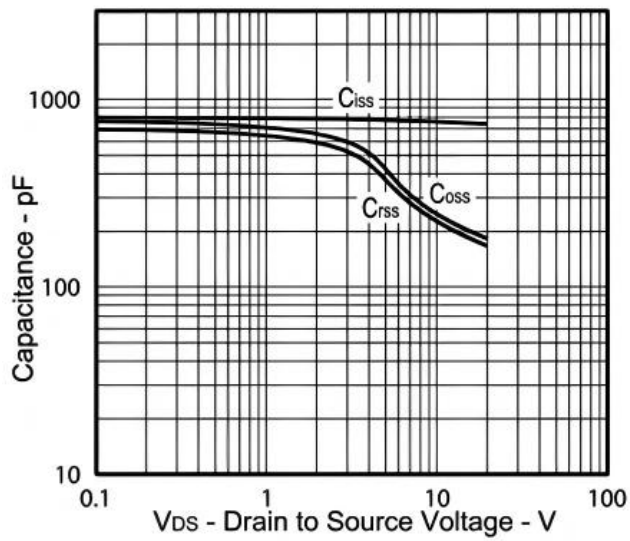
**Fig.5  $V_{GS(th)}$  vs.  $T_{CH}$**



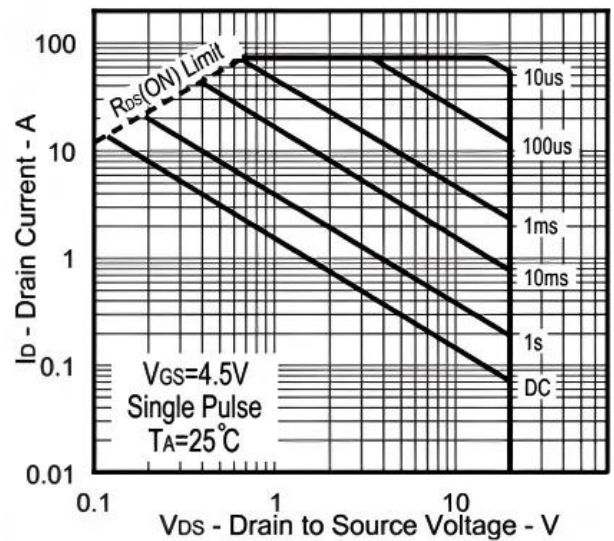
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_{CH}$**



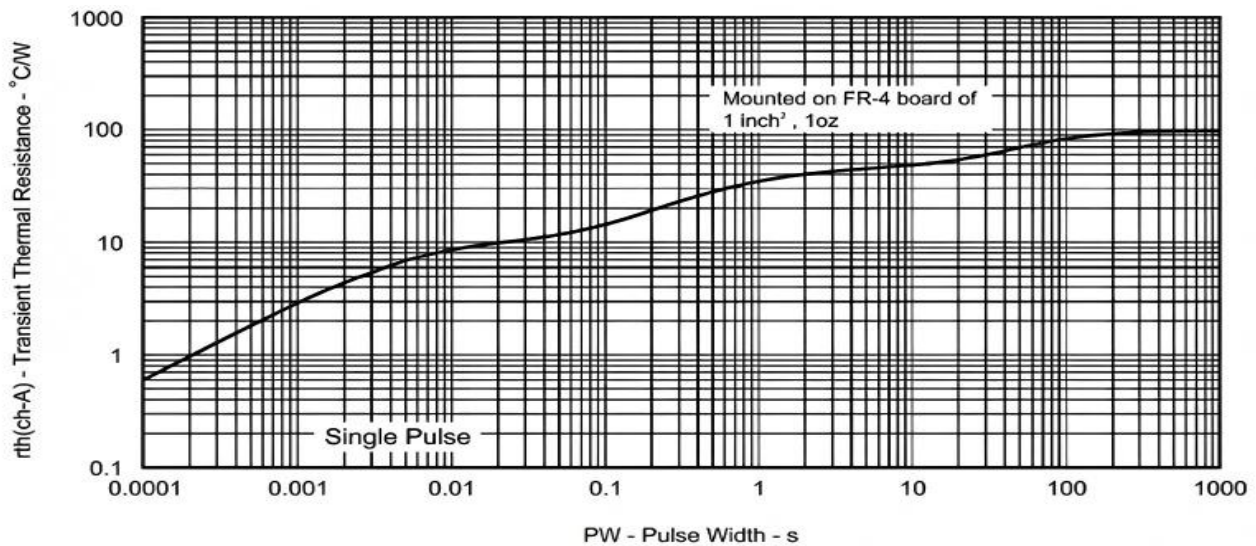
**N-Ch 20V Fast Switching MOSFETs**



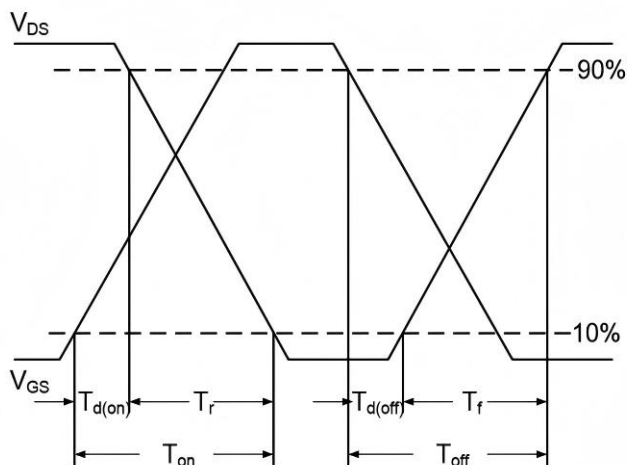
**Fig.7 Capacitance**



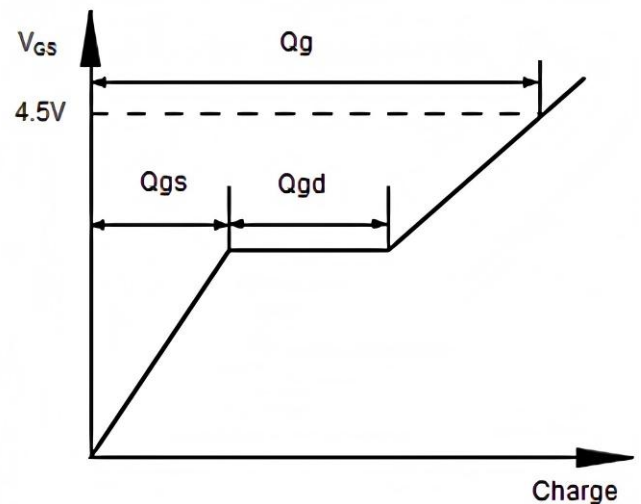
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



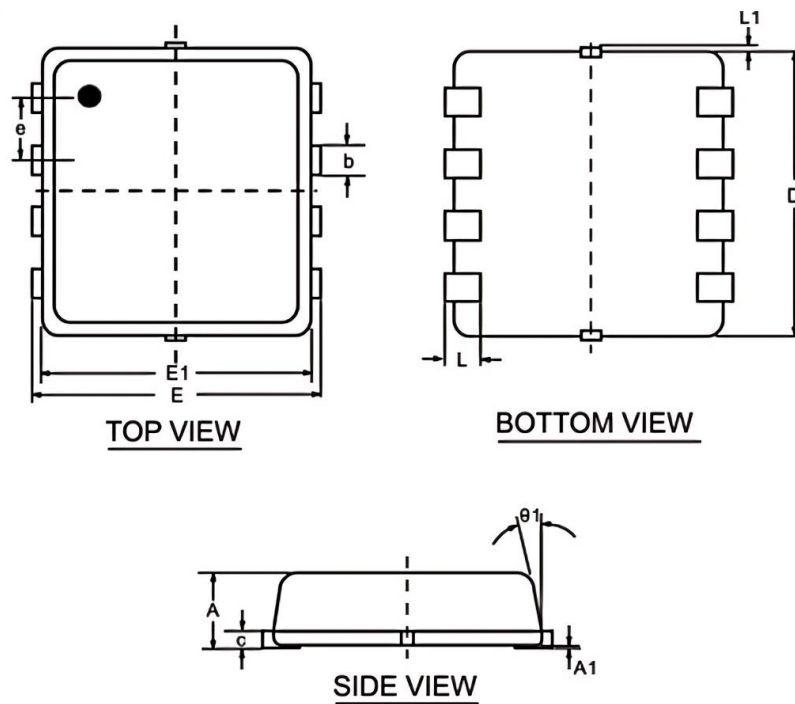
**Fig.11 Gate Charge Waveform**



## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSBE2730    | PRPAK3*3 NEP | 3000/Tape&Reel |

**PRPAK3\*3 NEP Package Outline**



| 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°   |



## HSBE2738 Marking:

