



## P-Ch 200V Fast Switching MOSFETs

### Description

The HSP25P20 uses advanced trench MOSFET technology to provide excellent  $R_{DS(ON)}$  and gate charge for use in a wide variety of other applications.

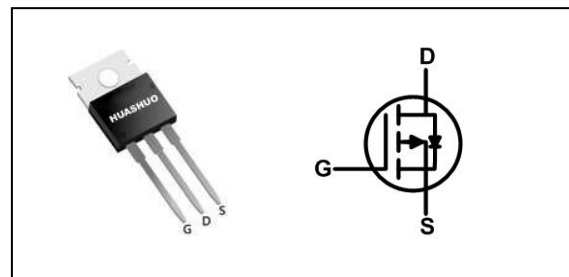
The HSP25P20 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

- 100% EAS Guaranteed
- Green Device Available
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

### Product Summary

|                  |      |            |
|------------------|------|------------|
| $V_{DS}$         | -200 | V          |
| $R_{DS(ON),typ}$ | 300  | m $\Omega$ |
| $I_D$            | -25  | A          |

### TO220 Pin Configuration



### Absolute Maximum Ratings

| Symbol                | Parameter                                   | Rating     | Units      |
|-----------------------|---|------------|------------|
| $V_{DS}$              | Drain-Source Voltage                        | -200       | V          |
| $V_{GS}$              | Gate-Source Voltage                         | $\pm 20$   | V          |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ -10V^1$ | -25        | A          |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -15        | A          |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>           | -53        | A          |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>  | 120        | mJ         |
| $I_{AS}$              | Avalanche Current                           | 22         | A          |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>        | 100        | 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  | Typ. | Max. | Unit         |
|-----------------|--|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 62   | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 1.25 | $^\circ C/W$ |



**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   | -200 | ---  | ---   | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V , I <sub>D</sub> =-6A  | ---  | 300  | 350   | mΩ   |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                    | -2.0 | -2.8 | -4.0  | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-160V , 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> = ± 20V , V <sub>DS</sub> =0V  | ---  | ---  | ± 100 | nA   |
| g <sub>fs</sub>     | Forward Transconductance                       | V <sub>DS</sub> =-10V , I <sub>D</sub> =-6A  | ---  | 23   | ---   | S    |
| Q <sub>g</sub>      | Total Gate Charge                              | V <sub>DS</sub> =-100V , V <sub>GS</sub> =-10V , I <sub>D</sub> =-6A                         | ---  | 56   | ---   | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             |  | ---  | 11   | ---   |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                              |  | ---  | 8.5  | ---   |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                             | V <sub>DD</sub> =-100V , V <sub>GS</sub> =-10V , R <sub>G</sub> =6Ω ,<br>I <sub>D</sub> =-6A | ---  | 33   | ---   | ns   |
| T <sub>r</sub>      | Rise Time                                      |  | ---  | 19   | ---   |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                            |  | ---  | 149  | ---   |      |
| T <sub>f</sub>      | Fall Time                                      |  | ---  | 50   | ---   |      |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>DS</sub> =-75V , V <sub>GS</sub> =0V , f=1MHz   | ---  | 3600 | ---   | pF   |
| C <sub>oss</sub>    | Output Capacitance                             |  | ---  | 455  | ---   |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   |  | ---  | 186  | ---   |      |

**Diode Characteristics**

| Symbol          | Parameter                                | Conditions   | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current <sup>1,5</sup> | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current               | ---  | ---  | -25  | 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 | ---  | ---  | -1.3 | 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 EAS data shows Max. rating . The test condition is V<sub>DD</sub>=-75V,V<sub>GS</sub>=-10V,L=0.5mH,I<sub>AS</sub>=-22A
- 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

Figure 1. Output Characteristics

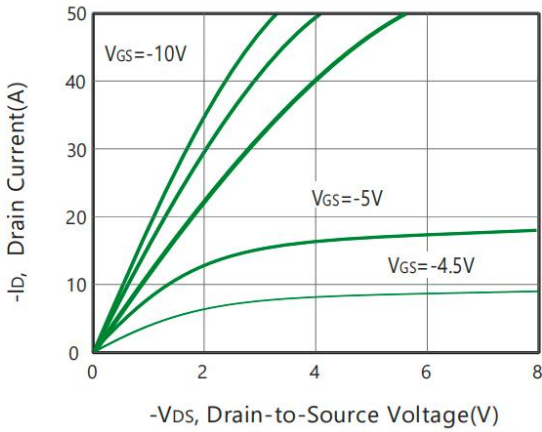


Figure 2. Body Diode Forward Voltage Variation with Source Current

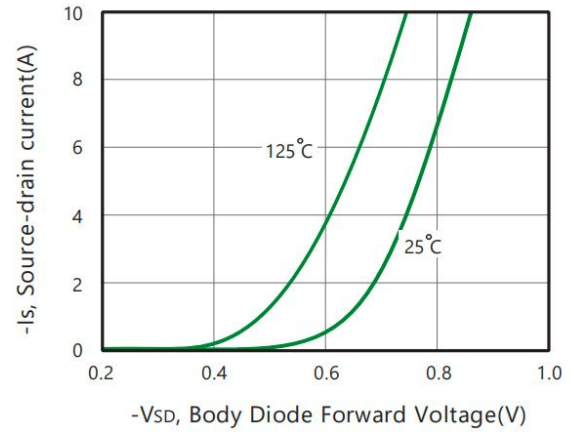


Figure 3. On-Resistance vs. Gate-Source Voltage

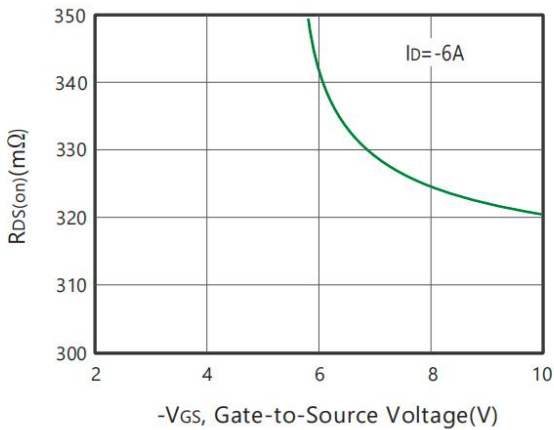


Figure 4. On-Resistance Variation with Drain Current and Temperature

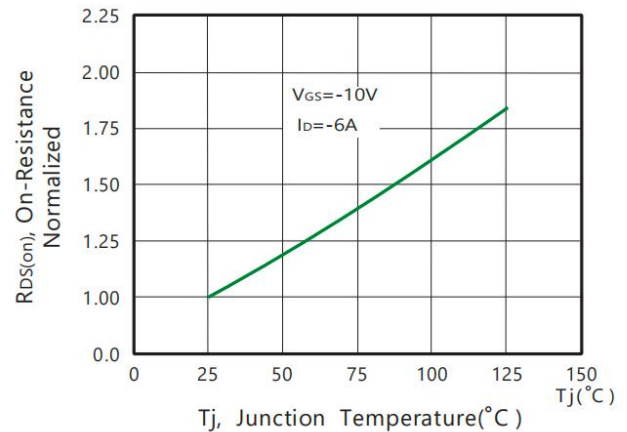


Figure 5. Gate Threshold Variation with Temperature

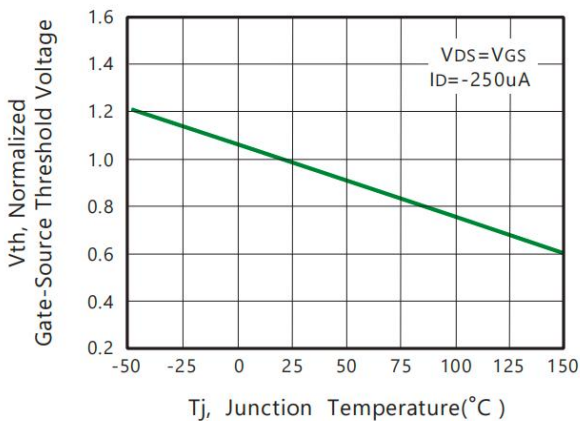


Figure 6. Gate Charge

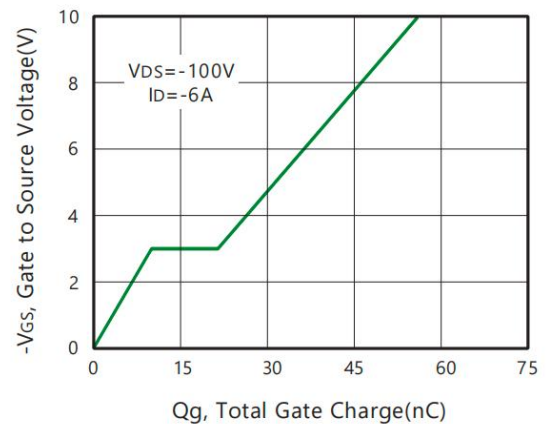




Figure 7. Capacitance

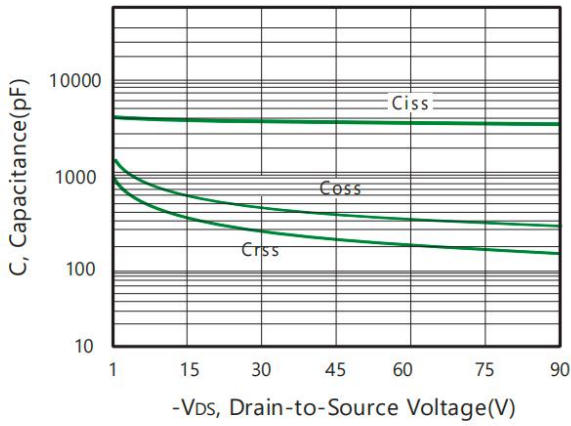


Figure 8. Maximum Safe Operating Area

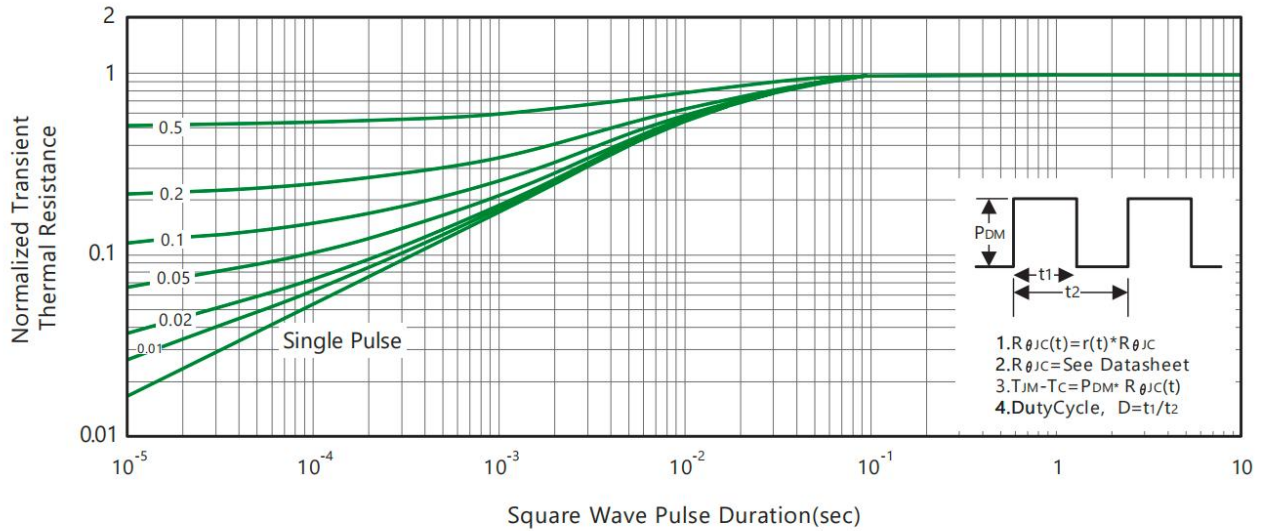
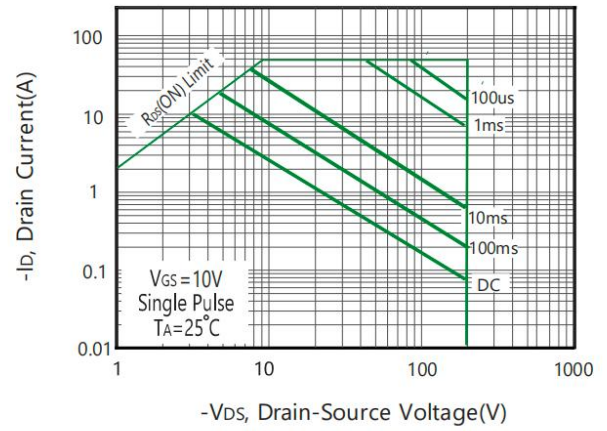
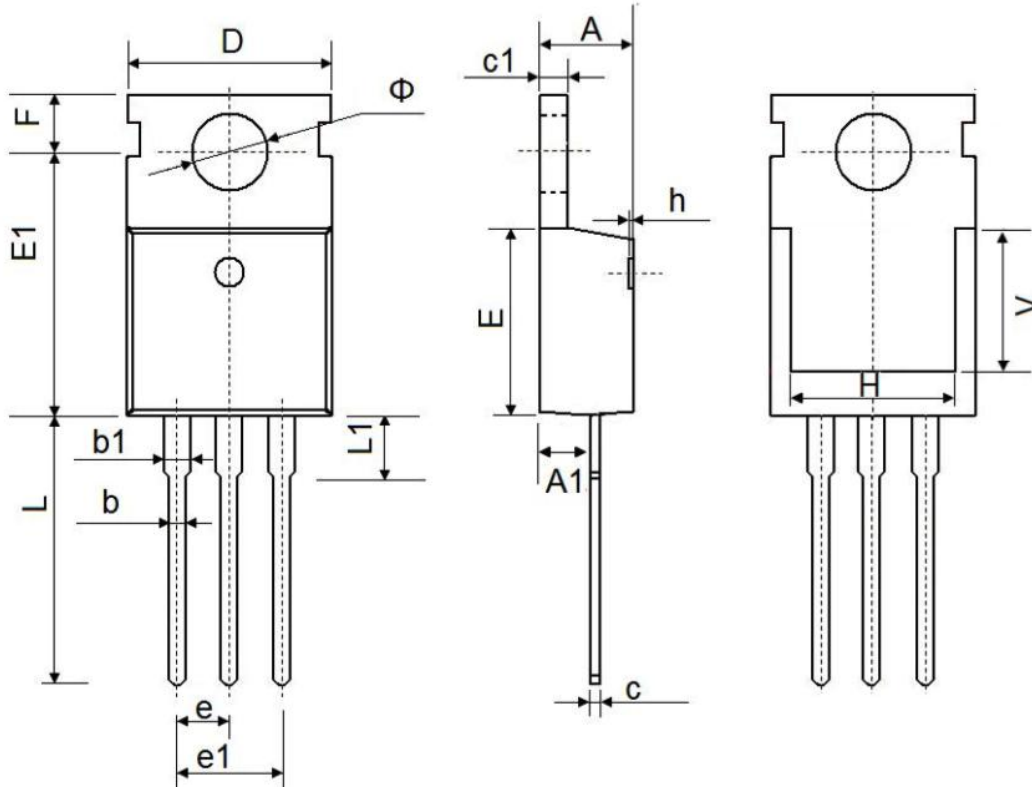


Figure 9. Normalized Thermal Transient Impedance Curve



**TO-220 Package Information**



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 4.300                     | 4.700  | 0.169                | 0.185 |
| A1     | 2.200                     | 2.600  | 0.087                | 0.102 |
| b      | 0.700                     | 0.950  | 0.028                | 0.037 |
| b1     | 1.170                     | 1.410  | 0.046                | 0.056 |
| c      | 0.450                     | 0.650  | 0.018                | 0.026 |
| c1     | 1.200                     | 1.400  | 0.047                | 0.055 |
| D      | 9.600                     | 10.400 | 0.378                | 0.409 |
| E      | 8.8500                    | 9.750  | 0.348                | 0.384 |
| E1     | 12.650                    | 12.950 | 0.498                | 0.510 |
| e      | 2.540 TYP.                |        | 0.100TYP.            |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.650                     | 2.950  | 0.104                | 0.116 |
| H      | 7.900                     | 8.100  | 0.311                | 0.319 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 12.750                    | 14.300 | 0.502                | 0.563 |
| L1     | 2.850                     | 3.950  | 0.112                | 0.156 |
| V      | 7.500 REF.                |        | 0.295 REF.           |       |
| Φ      | 3.400                     | 4.000  | 0.134                | 0.157 |

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