

## General Description

- 100% UIS Tested
- Advanced SGT MOS Technology
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

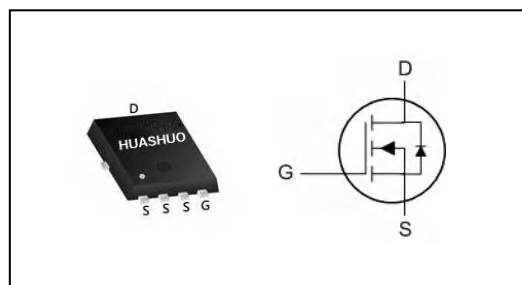
## Product Summary

|                  |      |            |
|------------------|------|------------|
| $V_{DS}$         | 30   | V          |
| $R_{DS(ON),typ}$ | 0.48 | m $\Omega$ |
| $I_D$            | 330  | A          |

## Applications

- Power Management in Desktop Computer
- DC/DC Converters

## PRPAK5X6 Pin Configuration



## Absolute Maximum Ratings

| Symbol                 | Parameter                                      | Rating     | Units       |
|------------------------|------------------------------------------------|------------|-------------|
| $V_{DS}$               | Drain-Source Voltage                           | 30         | V           |
| $V_{GS}$               | Gate-Source Voltage                            | $\pm 20$   | V           |
| $I_D@T_C=25^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 330        | A           |
| $I_D@T_C=100^{\circ}C$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 205        | A           |
| $I_D@T_A=25^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 45         | A           |
| $I_D@T_A=70^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 35         | A           |
| $I_D@T_A=100^{\circ}C$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 28         | A           |
| $I_{DM}$               | Pulsed Drain Current <sup>2</sup>              | 700        | A           |
| EAS                    | Single Pulse Avalanche Energy <sup>3</sup>     | 105        | mJ          |
| $I_{AS}$               | Avalanche Current                              | 45         | A           |
| $P_D@T_C=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>           | 125        | W           |
| $P_D@T_A=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>           | 2.3        | 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> | ---  | 55   | $^{\circ}C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 1.0  | $^{\circ}C/W$ |



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

| Symbol       | Parameter                                      | Conditions                                     | Min. | Typ. | Max.      | Unit      |
|--------------|------------------------------------------------|------------------------------------------------|------|------|-----------|-----------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V, I_D=250\mu A$                      | 30   | ---  | ---       | V         |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=30A$                          | ---  | 0.48 | 0.8       | $m\Omega$ |
|              |                                                | $V_{GS}=4.5V, I_D=30A$                         | ---  | 0.77 | 1.2       |           |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}, I_D=250\mu A$                  | 1.2  | 1.7  | 2.2       | V         |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=24V, V_{GS}=0V, T_J=25^\circ\text{C}$  | ---  | ---  | 1         | $\mu A$   |
|              |                                                | $V_{DS}=24V, V_{GS}=0V, T_J=55^\circ\text{C}$  | ---  | ---  | 5         |           |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V, V_{DS}=0V$                    | ---  | ---  | $\pm 100$ | nA        |
| $R_g$        | Gate Resistance                                | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$          | ---  | 2.5  | ---       | $\Omega$  |
| $Q_g$        | Total Gate Charge (10V)                        | $V_{DS}=15V, V_{GS}=10V, I_D=30A$              | ---  | 155  | ---       | nC        |
| $Q_g$        | Total Gate Charge (4.5V)                       |                                                | ---  | 80   | ---       |           |
| $Q_{gs}$     | Gate-Source Charge                             |                                                | ---  | 26   | ---       |           |
| $Q_{gd}$     | Gate-Drain Charge                              |                                                | ---  | 30   | ---       |           |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DD}=20V, V_{GS}=10V, R_G=3\Omega, I_D=30A$ | ---  | 16   | ---       | ns        |
| $T_r$        | Rise Time                                      |                                                | ---  | 59   | ---       |           |
| $T_{d(off)}$ | Turn-Off Delay Time                            |                                                | ---  | 135  | ---       |           |
| $T_f$        | Fall Time                                      |                                                | ---  | 114  | ---       |           |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$         | ---  | 8987 | ---       | pF        |
| $C_{oss}$    | Output Capacitance                             |                                                | ---  | 3930 | ---       |           |
| $C_{rss}$    | Reverse Transfer Capacitance                   |                                                | ---  | 728  | ---       |           |

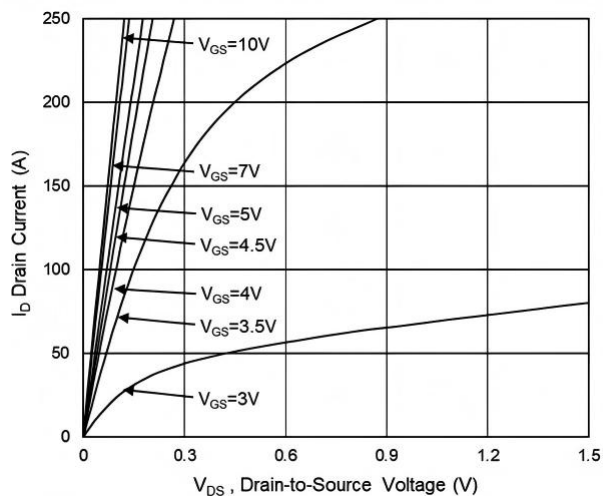
**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                        | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|---------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,6</sup> | $V_G=V_D=0V$ , Force Current                      | ---  | ---  | 100  | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$         | ---  | ---  | 1.2  | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=30A, dI/dt=100A/\mu s, T_J=25^\circ\text{C}$ | ---  | 104  | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                   | ---  | 183  | ---  | nC   |

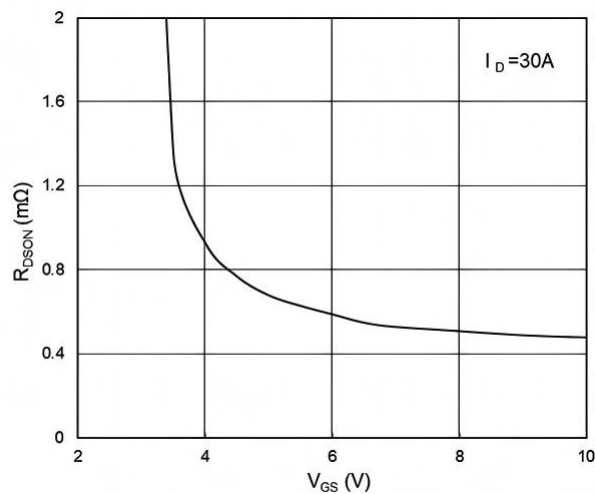
Note :

- 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 EAS data shows Max. rating . The test condition is  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=45A$
- 4.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.
- 6.Package limitation current is 100A.

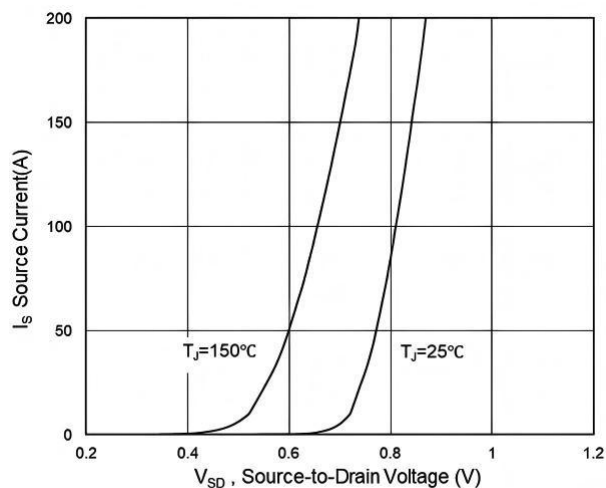
## Typical Characteristics



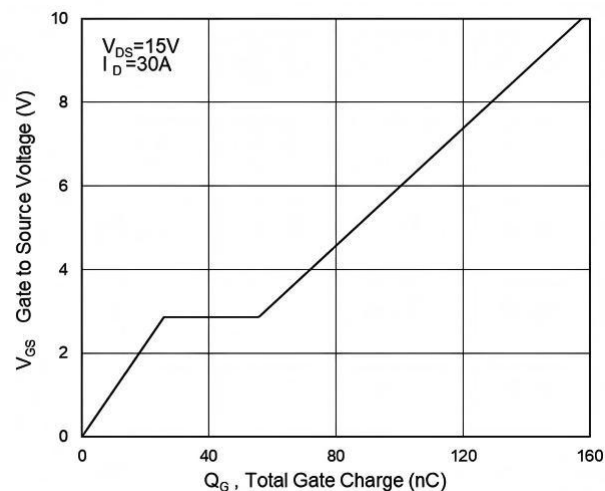
**Fig.1 Typical Output Characteristics**



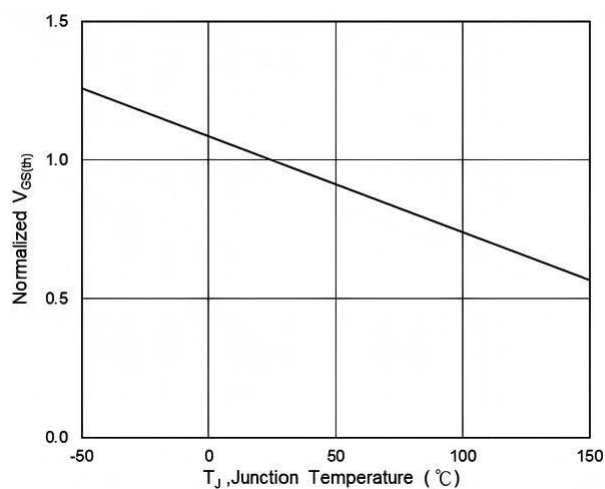
**Fig.2 On-Resistance vs G-S Voltage**



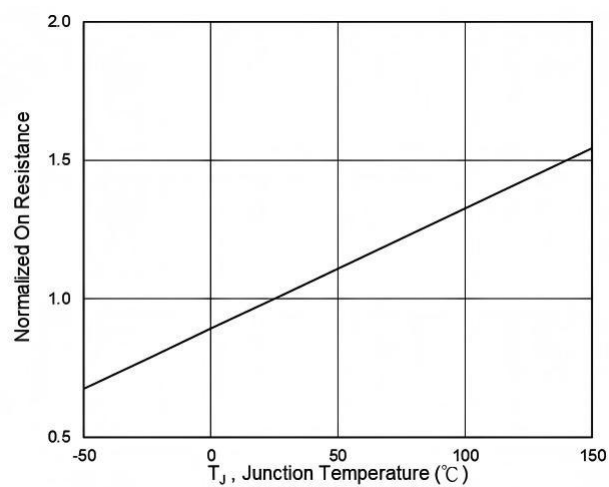
**Fig.3 Source Drain Forward Characteristics**



**Fig.4 Gate-Charge Characteristics**

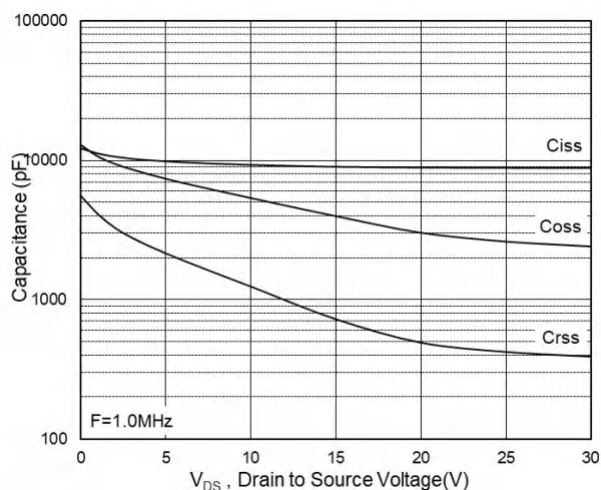


**Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$**

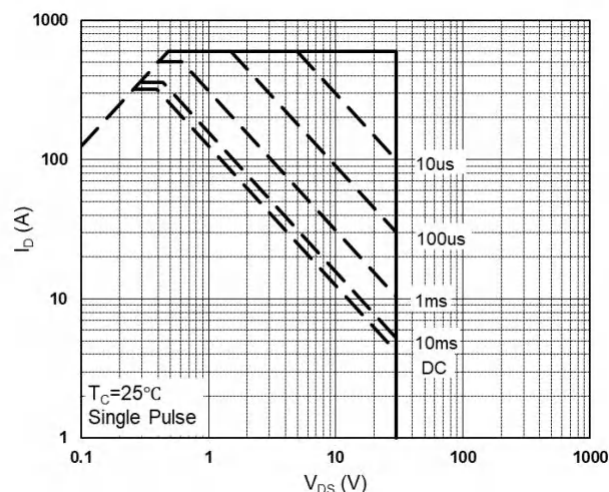


**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**

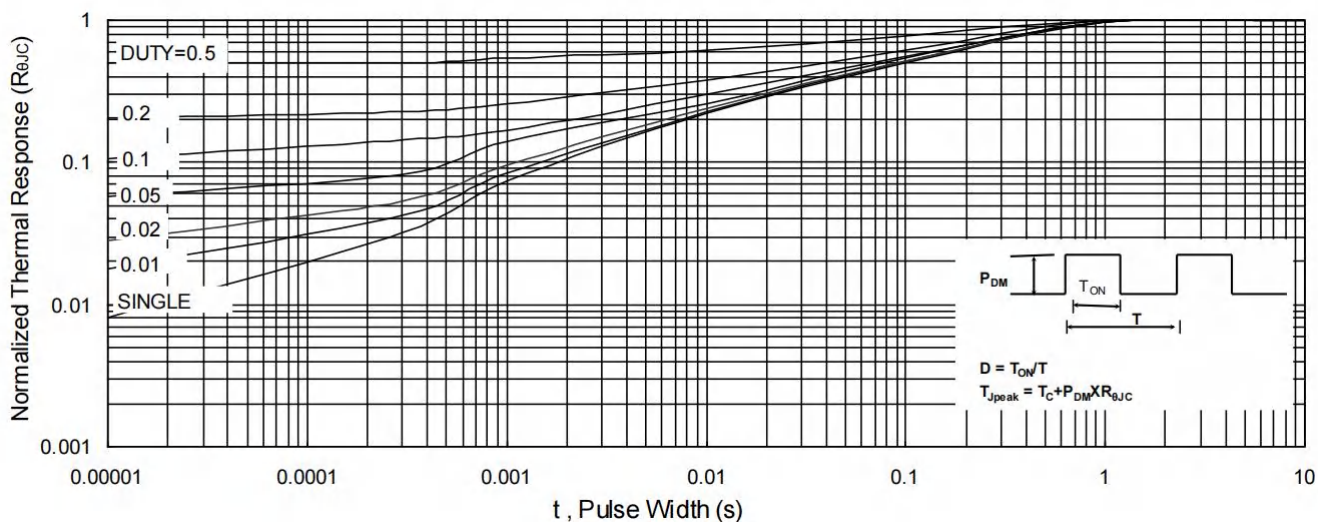
**N-Ch 30V Fast Switching MOSFETs**



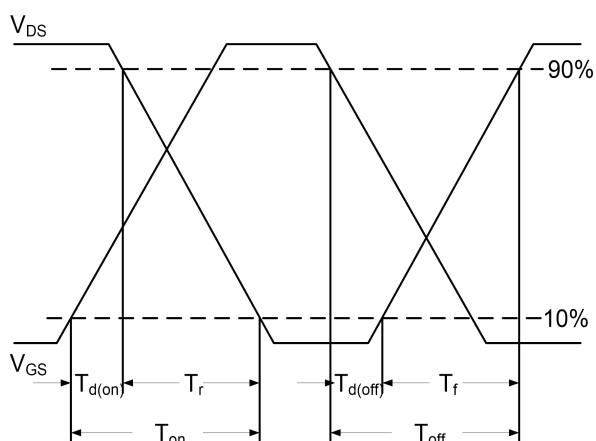
**Fig.7 Capacitance**



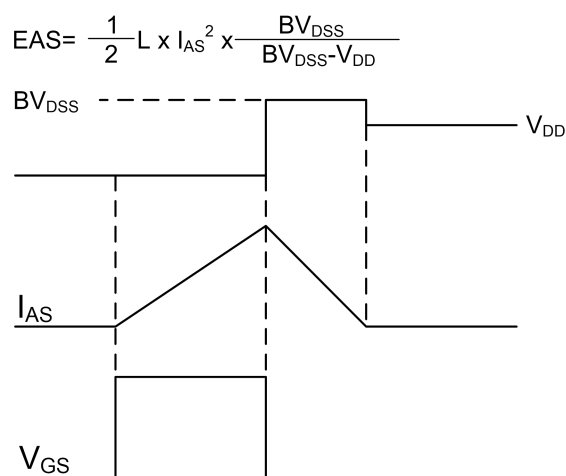
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**

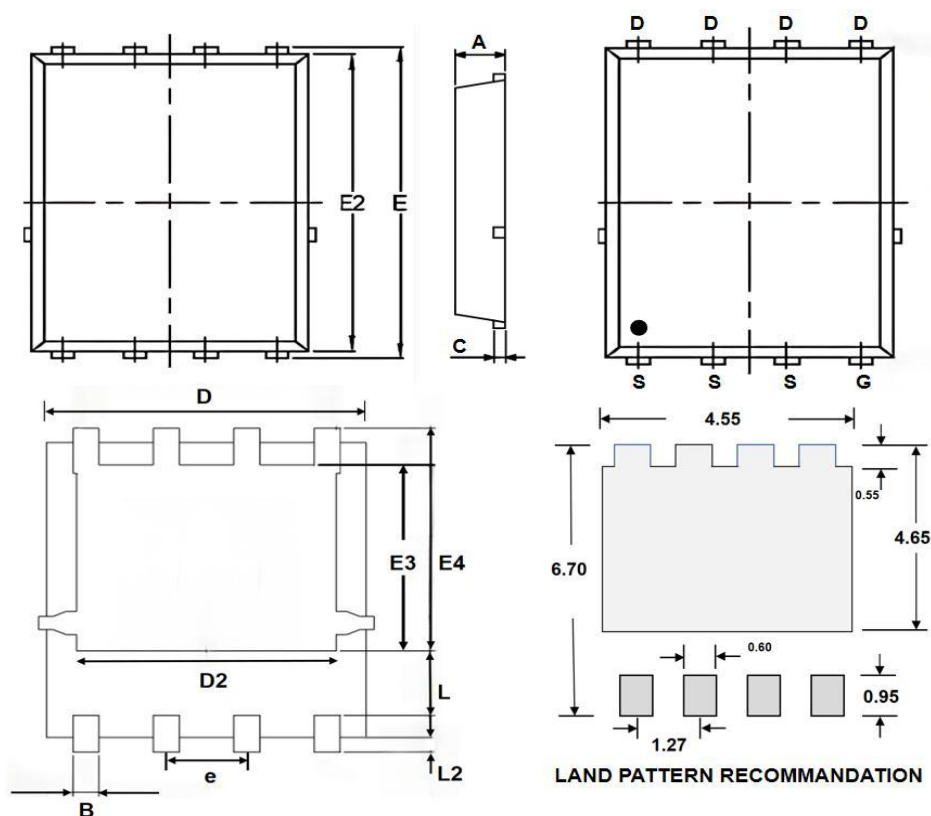


**Fig.11 Unclamped Inductive Switching Waveform**

## Ordering Information

| Part Number     | Package code    | Packaging                 |
|-----------------|-----------------|---------------------------|
| <b>HSBA3078</b> | <b>PRPAK5*6</b> | <b>3000/Tape&amp;Reel</b> |

**PRPAK5\*6 Package Outline**



| SYMBOLS | MILLIMETERS |      |      | INCHES |       |       |
|---------|-------------|------|------|--------|-------|-------|
|         | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A       | 0.80        | --   | 1.20 | 0.031  | --    | 0.047 |
| B       | 0.25        | --   | 0.51 | 0.012  | --    | 0.020 |
| C       | 0.15        | --   | 0.35 | 0.006  | --    | 0.014 |
| D       | 4.80        | --   | 5.45 | 0.189  | --    | 0.209 |
| D2      | 3.61        | --   | 4.35 | 0.142  | --    | 0.171 |
| E       | 5.90        | --   | 6.35 | 0.232  | --    | 0.250 |
| E2      | 5.42        | --   | 6.06 | 0.213  | --    | 0.232 |
| E3      | 3.23        | --   | 3.90 | 0.127  | --    | 0.154 |
| E4      | 3.69        | --   | 4.55 | 0.145  | --    | 0.179 |
| L       | 0.61        | --   | 1.80 | 0.024  | --    | 0.071 |
| L2      | 0.05        | --   | 0.36 | 0.002  | --    | 0.014 |
| e       | --          | 1.27 | --   | --     | 0.050 | --    |

## HSBA3078 Marking:

