

## N-Ch 40V Fast Switching MOSFETs

### Features:

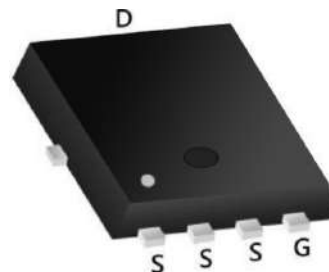
- ★ 100% UIS Tested
- ★ Advanced Trench Technology
- ★ Low Gate Charge
- ★ High Current Capability
- ★ RoHS and Halogen-Free Compliant

### Applications:

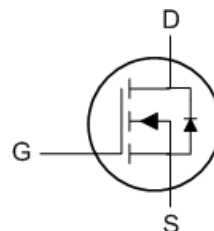
- SMPS Synchronous Rectification
- DC/DC Converters
- Or-ing

### Product Summary

| BVDSS | RDSON | ID   |
|-------|-------|------|
| 40V   | 1.8mΩ | 100A |



PRPAK5X6 Pin Configuration



### Absolute Maximum Ratings

| Symbol                      | Parameter                                      | Rating     | Units            |
|-----------------------------|------------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                           | 40         | V                |
| $V_{GS}$                    | Gate-Source Voltage                            | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 100        | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 82         | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>              | 400        | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>     | 400        | mJ               |
| $I_{AS}$                    | Avalanche Current                              | 40         | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>           | 83         | W                |
| $T_{STG}$                   | Storage Temperature Range                      | -55 to 150 | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range           | -55 to 150 | $^\circ\text{C}$ |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit               |
|-----------------|--------------------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 50   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 1.5  | $^\circ\text{C/W}$ |

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

| Symbol       | Parameter                                      | Conditions                                       | Min. | Typ. | Max.      | Unit      |
|--------------|------------------------------------------------|--------------------------------------------------|------|------|-----------|-----------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V, I_D=250\mu A$                        | 40   | ---  | ---       | V         |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=20A$                            | ---  | 1.5  | 1.8       | $m\Omega$ |
|              |                                                | $V_{GS}=4.5V, I_D=20A$                           | ---  | 2.0  | 2.6       |           |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}, I_D=250\mu A$                    | 1.2  | 1.6  | 2.2       | V         |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=32V, V_{GS}=0V, T_J=25^\circ\text{C}$    | ---  | ---  | 1         | $\mu A$   |
|              |                                                | $V_{DS}=32V, V_{GS}=0V, T_J=55^\circ\text{C}$    | ---  | ---  | 5         |           |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V, V_{DS}=0V$                      | ---  | ---  | $\pm 100$ | nA        |
| $g_{fs}$     | Forward Transconductance                       | $V_{DS}=5V, I_D=20A$                             | ---  | 53   | ---       | S         |
| $R_g$        | Gate Resistance                                | $V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$            | ---  | 1.0  | ---       | $\Omega$  |
| $Q_g$        | Total Gate Charge (4.5V)                       | $V_{DS}=15V, V_{GS}=10V, I_D=20A$                | ---  | 45   | ---       | nC        |
| $Q_{gs}$     | Gate-Source Charge                             |                                                  | ---  | 12   | ---       |           |
| $Q_{gd}$     | Gate-Drain Charge                              |                                                  | ---  | 18.5 | ---       |           |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega, I_D=20A$ | ---  | 18.5 | ---       | ns        |
| $T_r$        | Rise Time                                      |                                                  | ---  | 9    | ---       |           |
| $T_{d(off)}$ | Turn-Off Delay Time                            |                                                  | ---  | 58.5 | ---       |           |
| $T_f$        | Fall Time                                      |                                                  | ---  | 32   | ---       |           |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=20V, V_{GS}=0V, f=1\text{MHz}$           | ---  | 3972 | ---       | pF        |
| $C_{oss}$    | Output Capacitance                             |                                                  | ---  | 1119 | ---       |           |
| $C_{rss}$    | Reverse Transfer Capacitance                   |                                                  | ---  | 82   | ---       |           |

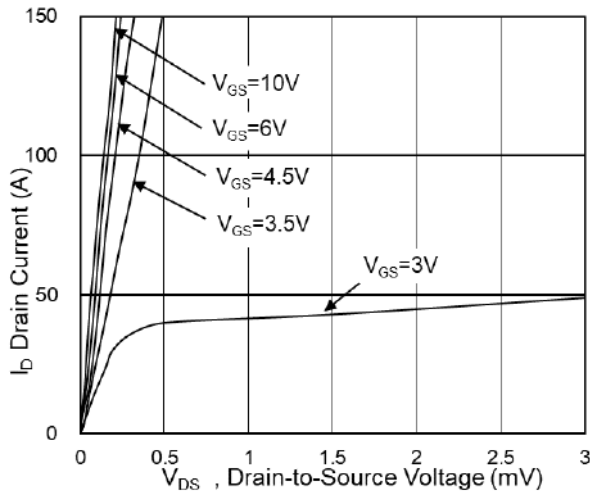
**Diode Characteristics**

| 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    |

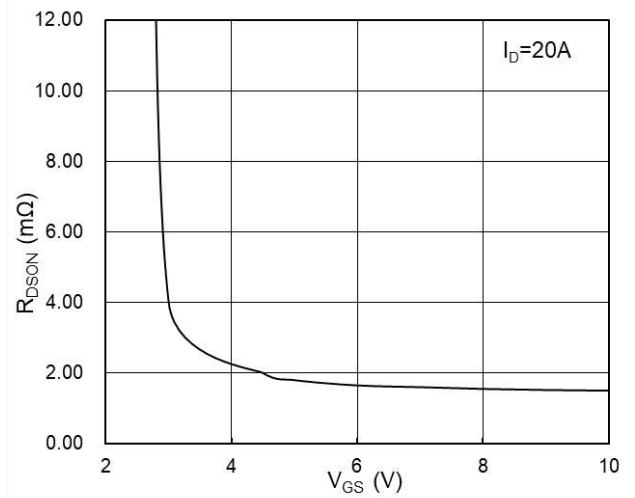
Note :

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  $V_{DD}=25V, V_{GS}=10V, L=0.5mH, I_{AS}=40A$
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.

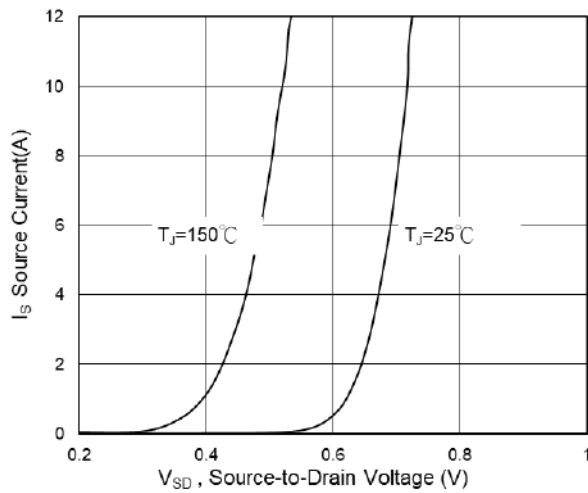
## Typical Characteristics



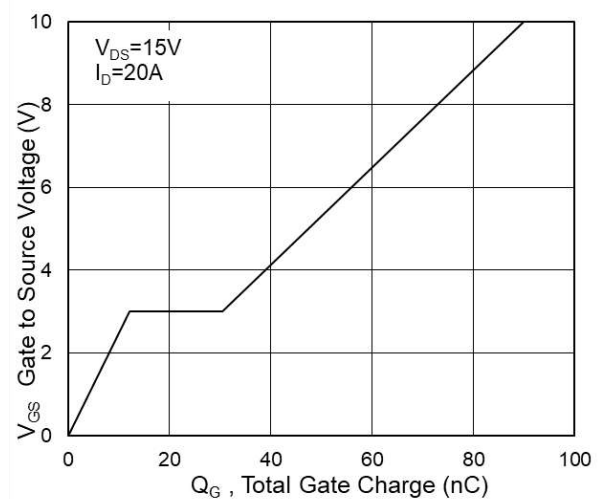
**Fig.1 Typical Output Characteristics**



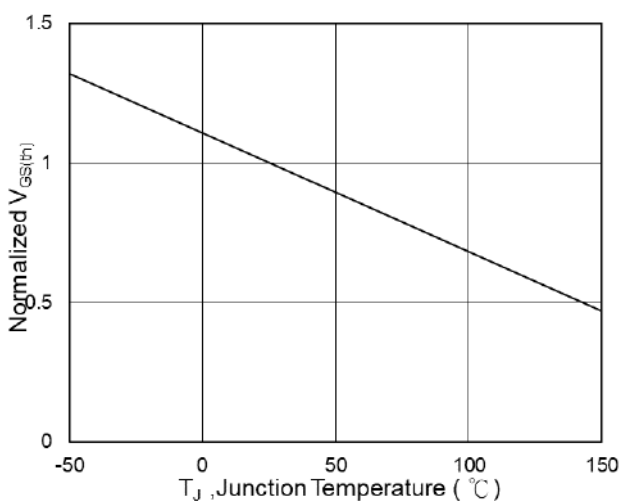
**Fig.2 On-Resistance vs G-S Voltage**



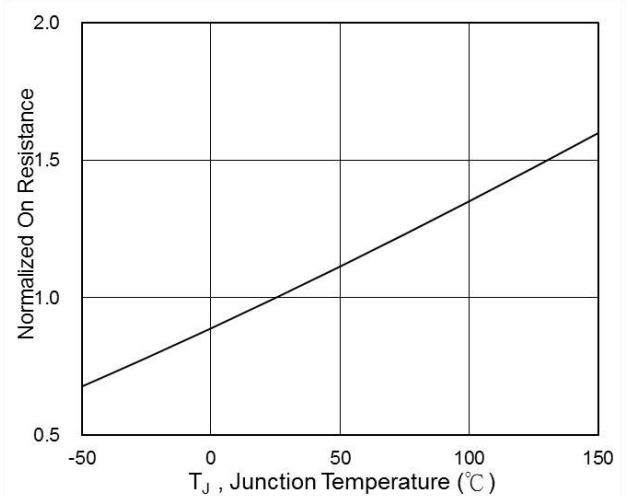
**Fig.3 Source Drain Forward Characteristics**



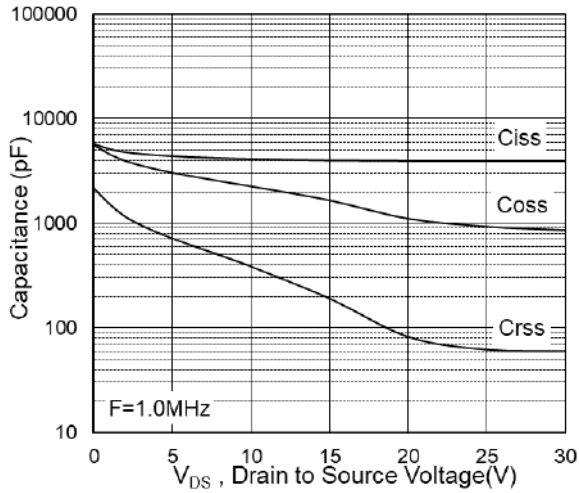
**Fig.4 Gate-Charge Characteristics**



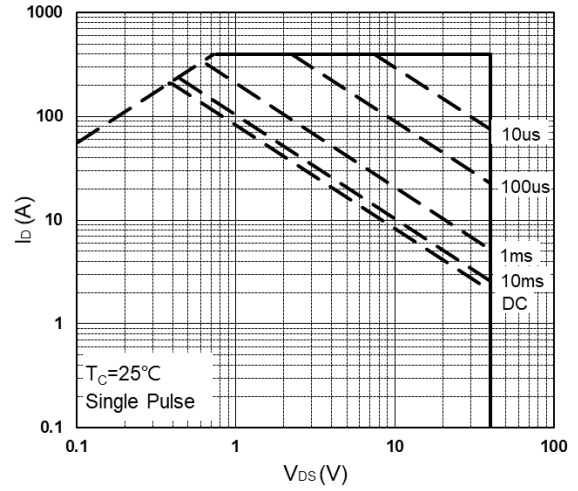
**Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$**



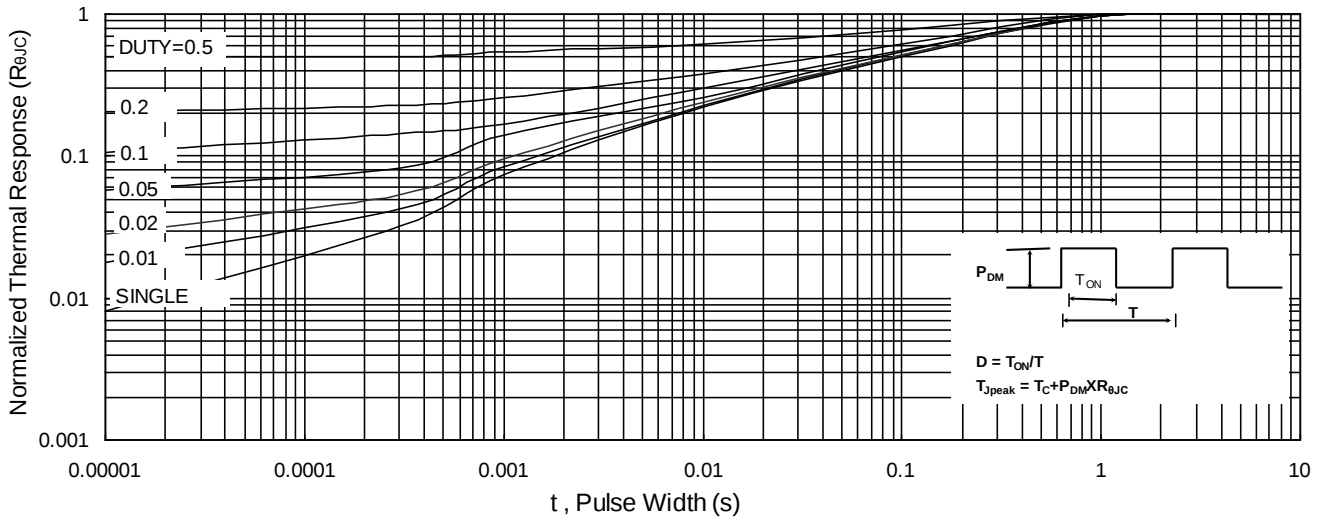
**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**



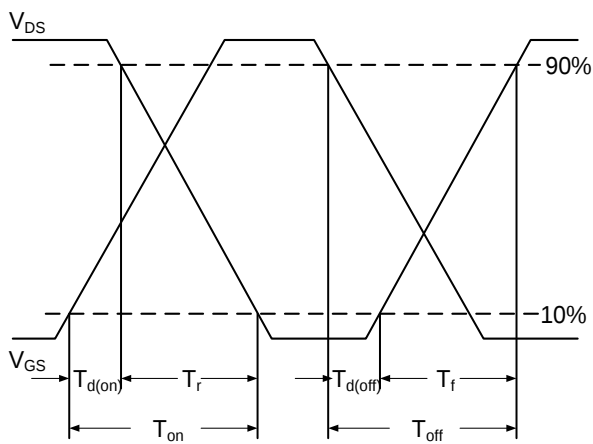
**Fig.7 Capacitance**



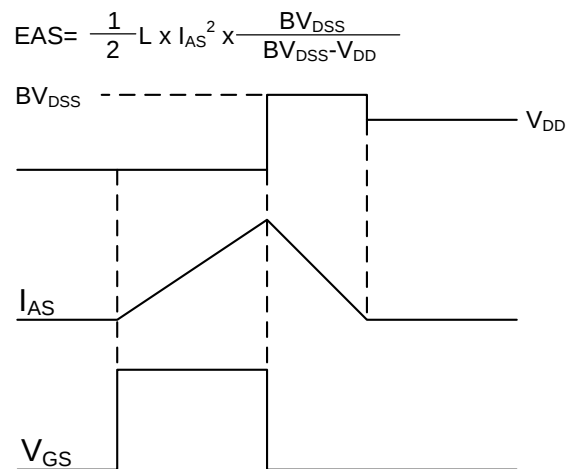
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**