

## N-Ch 100V Fast Switching MOSFETs

### General Description

- 100% EAS Guaranteed
- Green Device Available
- Super Low  $R_{DS(ON)}$
- Advanced high cell density Trench technology

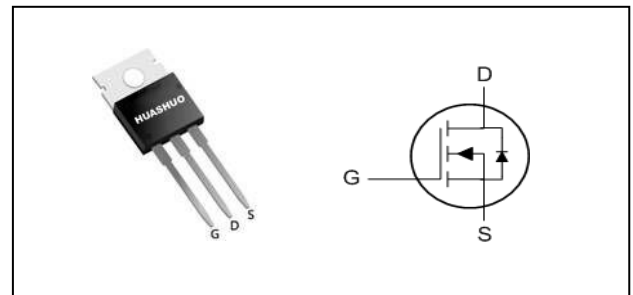
### Applications

- MOTOR Driver.
- BMS.
- High frequency switching and synchronous rectification.

### Product Summary

|                  |     |           |
|------------------|-----|-----------|
| $V_{DS}$         | 100 | V         |
| $R_{DS(ON),typ}$ | 4.7 | $m\Omega$ |
| $I_D$            | 120 | A         |

### TO220 Pin Configuration



### Absolute Maximum Ratings

| Symbol                | Parameter                                      | Rating     | Units      |
|-----------------------|--|------------|------------|
| $V_{DS}$              | Drain-Source Voltage                           | 100        | V          |
| $V_{GS}$              | Gate-Source Voltage                            | $\pm 20$   | V          |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 120        | A          |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 100        | A          |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>              | 480        | A          |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>     | 196        | mJ         |
| $I_{AS}$              | Avalanche Current                              | 28         | A          |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>           | 227        | 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>    | ---  | 0.5  | $^\circ C/W$ |

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

| Symbol       | Parameter                                      | Conditions                                       | Min. | Typ. | Max.      | Unit      |
|--------------|--|--|------|------|-----------|-----------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V, I_D=250\mu A$                        | 100  | ---  | ---       | V         |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=30A$                            | ---  | 4.7  | 5.5       | $m\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage                         | $V_{GS}=V_{DS}, I_D=250\mu A$                    | 2.0  | 3.0  | 4.0       | V         |
| $I_{DSS}$    | Drain-Source Leakage Current                   | $V_{DS}=100V, V_{GS}=0V, T_J=25^\circ C$         | ---  | ---  | 1         | $\mu A$   |
|              |  | $V_{DS}=100V, V_{GS}=0V, T_J=125^\circ C$        | ---  | ---  | 10        |           |
| $I_{GSS}$    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V, V_{DS}=0V$                      | ---  | ---  | $\pm 100$ | nA        |
| $g_{fs}$     | Forward Transconductance                       | $V_{DS}=5V, I_D=30A$                             | ---  | 50   | ---       | S         |
| $R_g$        | Gate Resistance                                | $V_{DS}=0V, V_{GS}=0V, f=1MHz$                   | ---  | 1    | ---       | $\Omega$  |
| $Q_g$        | Total Gate Charge (10V)                        | $V_{DS}=50V, V_{GS}=10V, I_D=20A$                | ---  | 72   | ---       | nC        |
| $Q_{gs}$     | Gate-Source Charge                             |  | ---  | 28   | ---       |           |
| $Q_{gd}$     | Gate-Drain Charge                              |  | ---  | 15   | ---       |           |
| $T_{d(on)}$  | Turn-On Delay Time                             | $V_{DD}=50V, V_{GS}=10V, R_G=3.0\Omega, I_D=20A$ | ---  | 35   | ---       | ns        |
| $T_r$        | Rise Time                                      |  | ---  | 18   | ---       |           |
| $T_{d(off)}$ | Turn-Off Delay Time                            |  | ---  | 45   | ---       |           |
| $T_f$        | Fall Time                                      |  | ---  | 55   | ---       |           |
| $C_{iss}$    | Input Capacitance                              | $V_{DS}=50V, V_{GS}=0V, f=1MHz$                  | ---  | 4725 | ---       | pF        |
| $C_{oss}$    | Output Capacitance                             |  | ---  | 609  | ---       |           |
| $C_{rss}$    | Reverse Transfer Capacitance                   |  | ---  | 14   | ---       |           |

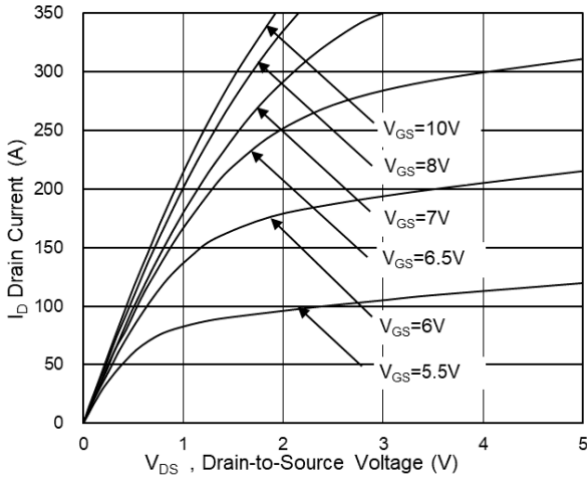
**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                  | Min. | Typ. | Max. | Unit |
|----------|--|---|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,5</sup> | $V_G=V_D=0V, \text{Force Current}$          | ---  | ---  | 120  | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V, I_S=50A, T_J=25^\circ C$        | ---  | ---  | 1.3  | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=30A, di/dt=100A/\mu s, T_J=25^\circ C$ | ---  | 70   | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |   | ---  | 170  | ---  | nC   |

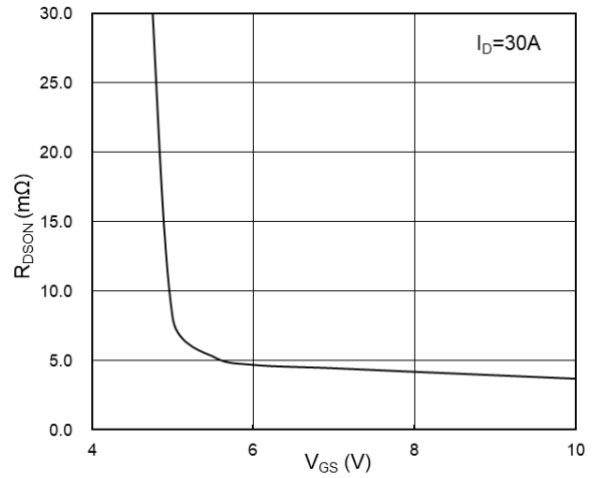
Note :

- 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  $V_{DD}=25V, V_{GS}=10V, L=0.5mH, I_{AS}=28A$
- 4.The power dissipation is limited by 150 $^\circ C$  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.

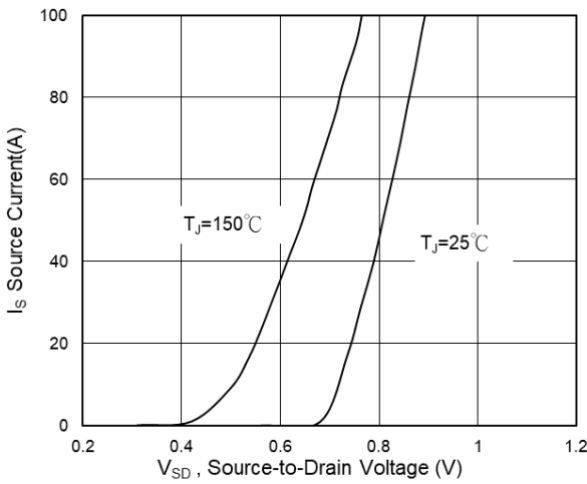
### Typical Characteristics



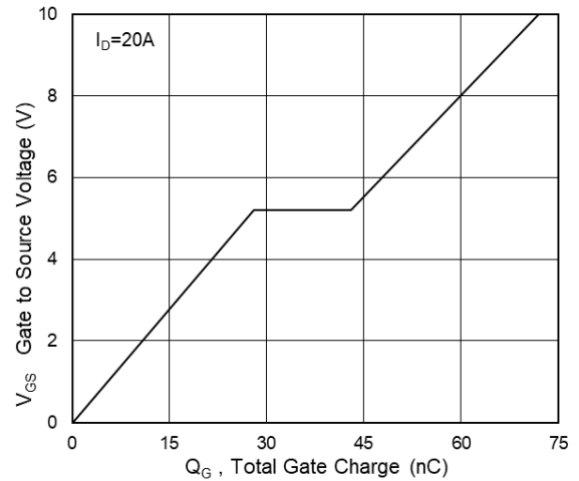
**Fig.1 Typical Output Characteristics**



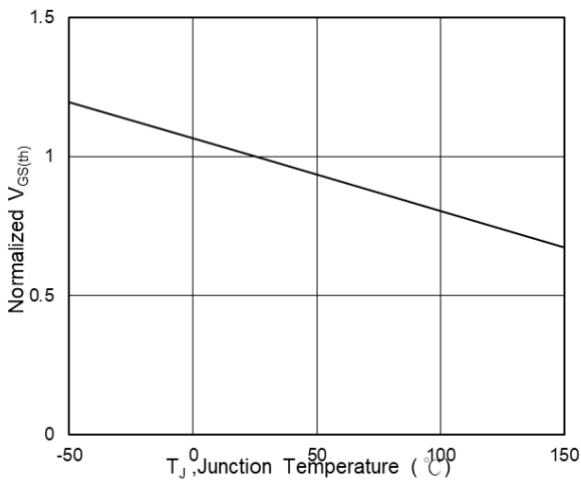
**Fig.2 On-Resistance vs G-S Voltage**



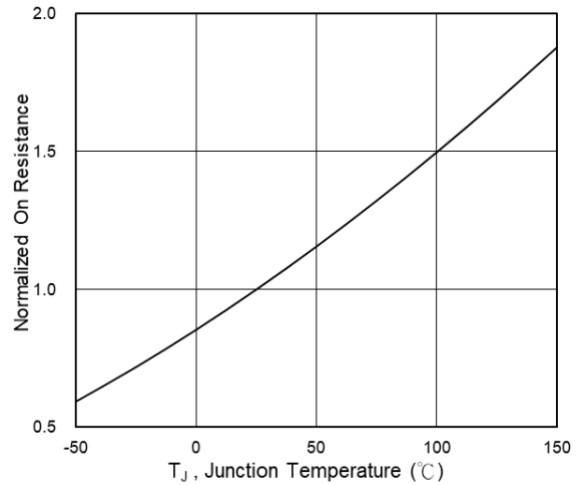
**Fig.3 Source Drain Forward Characteristics**



**Fig.4 Gate-Charge Characteristics**

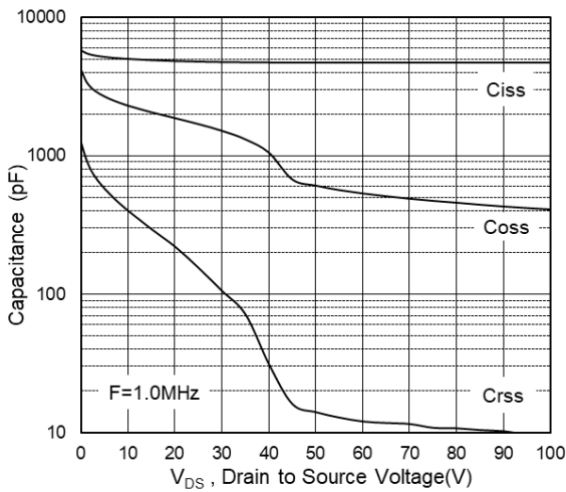


**Fig.5 Normalized  $V_{TH}$  vs  $T_J$**

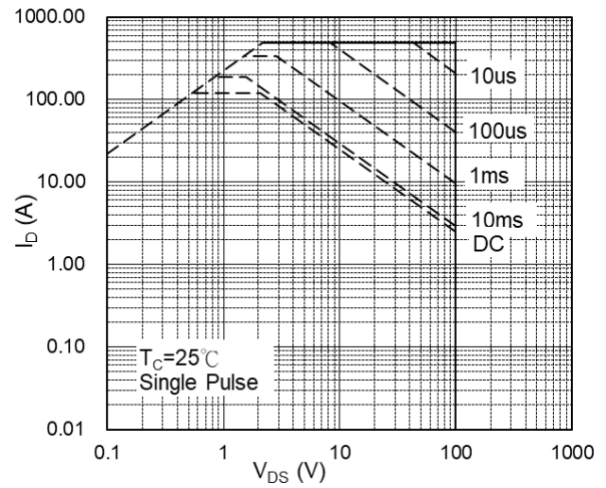


**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**

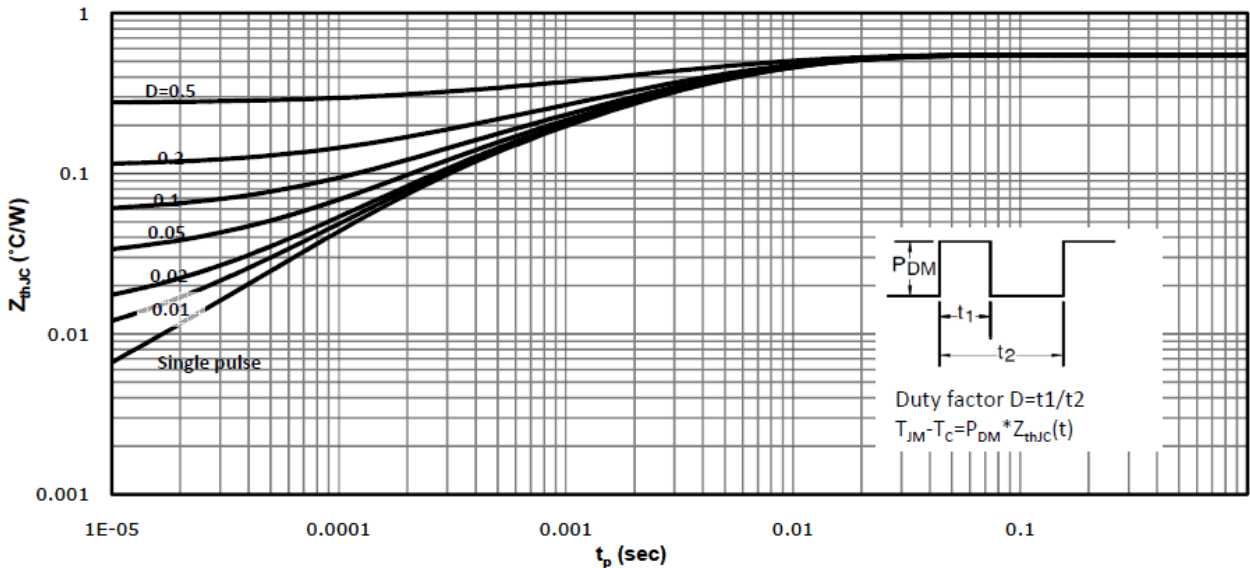
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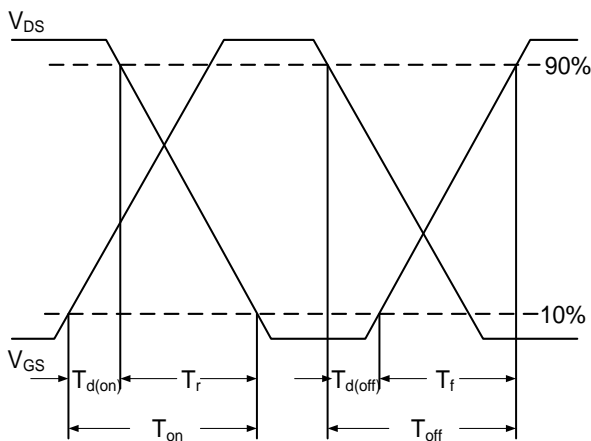
**Fig.7 Capacitance**



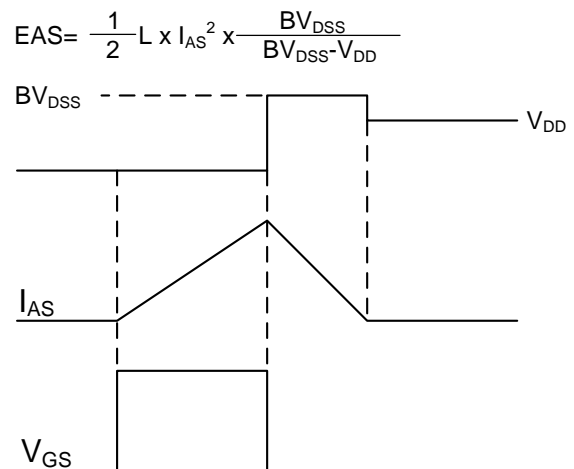
**Fig.8 Safe Operating Area**



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



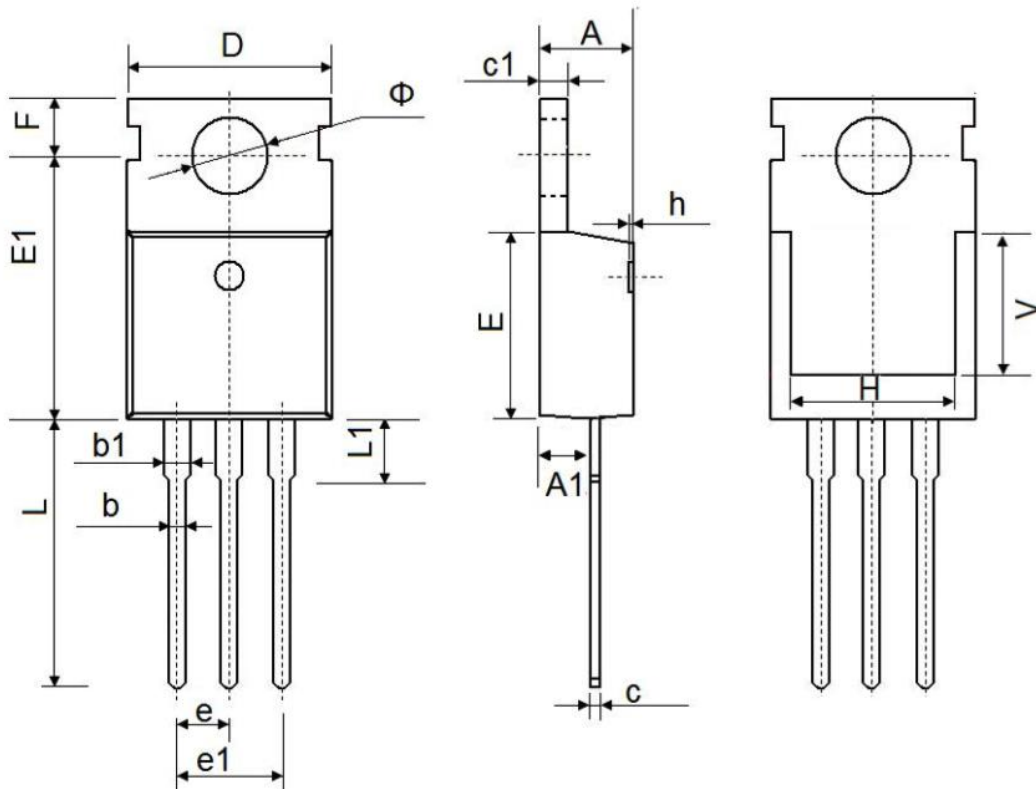
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**



**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 |