

**Description**

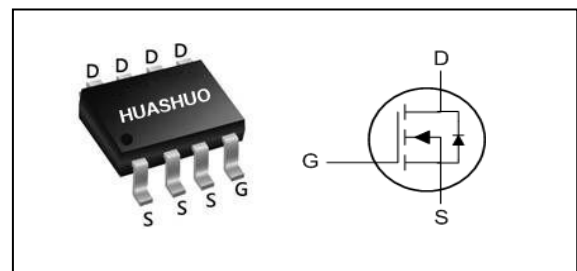
- Advanced Trench MOS Technology
- Low Gate Charge
- Low  $R_{DS(ON)}$
- 100% EAS Guaranteed
- Green Device Available

**Product Summary**

|                  |     |            |
|------------------|-----|------------|
| $V_{DS}$         | 60  | V          |
| $R_{DS(ON),typ}$ | 7.2 | m $\Omega$ |
| $I_D$            | 15  | A          |

**Application**

- Motor Control.
- DC/DC Converter.
- Synchronous rectifier applications.

**SOP-8 Pin Configuration**

**Absolute Maximum Ratings**

| Symbol                      | Parameter                                  | Rating     | Units            |
|-----------------------------|--|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | 60         | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current <sup>1</sup>      | 15         | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current <sup>1</sup>      | 11         | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>          | 56         | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup> | 26.5       | mJ               |
| $I_{AS}$                    | Avalanche Current                          | 23         | A                |
| $P_D@T_A=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>       | 3.1        | 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> | ---  | 75   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 40   | $^\circ\text{C/W}$ |

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol              | Parameter                                      | Conditions   | Min. | Typ. | Max. | Unit |
|---------------------|--|--|------|------|------|------|
| B <sub>V</sub> DSS  | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA   | 60   | ---  | ---  | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =15A  | ---  | 7.2  | 8.5  | mΩ   |
|                     |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A   | ---  | 11.5 | 14.5 |      |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                 | 1.2  | ---  | 2.3  | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                          | ---  | ---  | 1    | uA   |
|                     |  | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                          | ---  | ---  | 5    |      |
| I <sub>GSS</sub>    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   | ---  | ---  | ±100 | nA   |
| R <sub>g</sub>      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz   | ---  | 1.3  | ---  | Ω    |
| Q <sub>g</sub>      | Total Gate Charge (4.5V)                       | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A                          | ---  | 15   | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             |  | ---  | 3.5  | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                              |  | ---  | 4.2  | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                             | V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω,<br>I <sub>D</sub> =15A | ---  | 7    | ---  | ns   |
| T <sub>r</sub>      | Rise Time                                      |  | ---  | 4.5  | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                            |  | ---  | 26   | ---  |      |
| T <sub>f</sub>      | Fall Time                                      |  | ---  | 5    | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz  | ---  | 1270 | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                             |  | ---  | 478  | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   |  | ---  | 40   | ---  |      |

**Diode Characteristics**

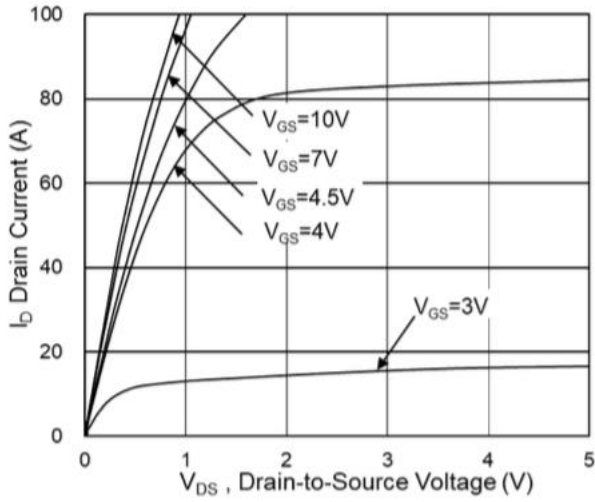
| Symbol          | Parameter                                | Conditions   | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current <sup>1,5</sup> | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current            | ---  | ---  | 5    | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup>       | V <sub>GS</sub> =0V, I <sub>S</sub> =A, T <sub>J</sub> =25°C | ---  | ---  | 1    | V    |

Note :

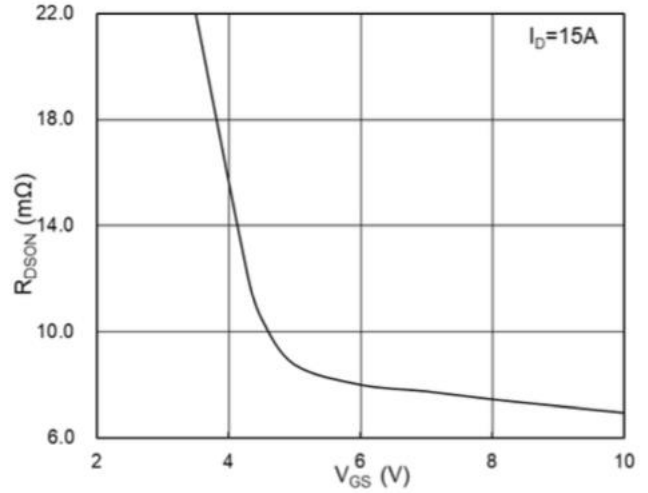
- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=23A
- 4.The power 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.



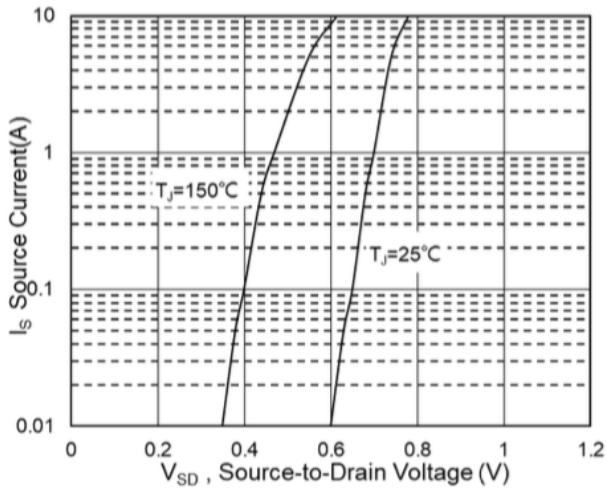
**Typical Characteristics**



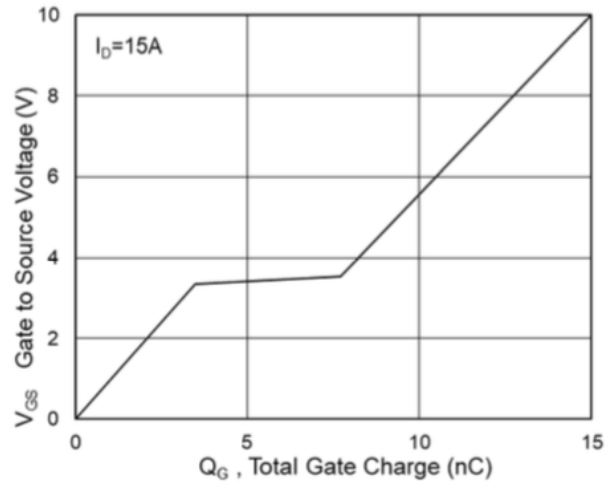
**Fig.1 Typical Output Characteristics**



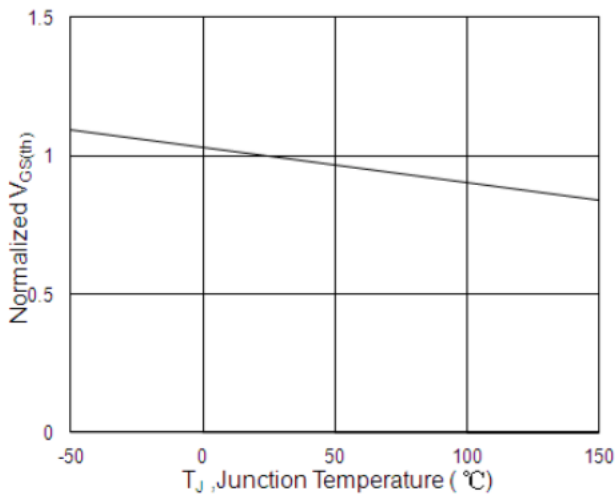
**Fig.2 On-Resistance vs. Gate-Source**



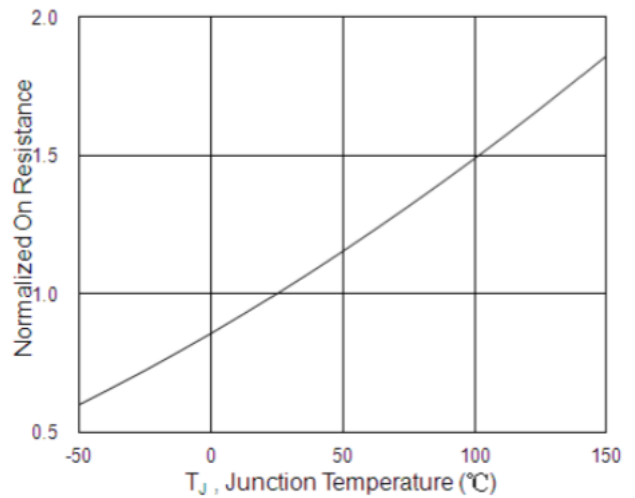
**Fig.3 Source Drain Forward Characteristics**



**Fig.4 Gate-Charge Characteristics**



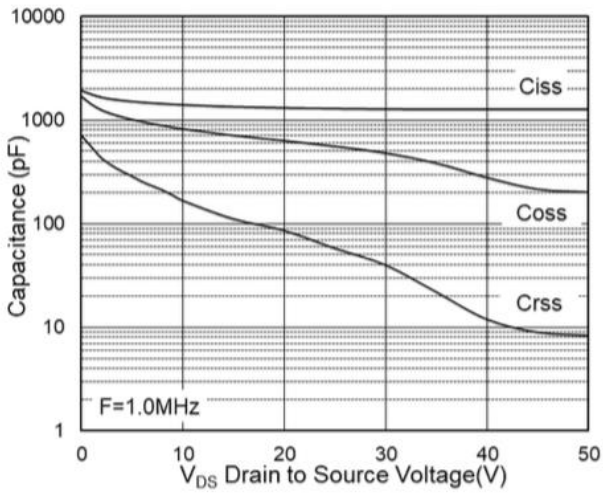
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



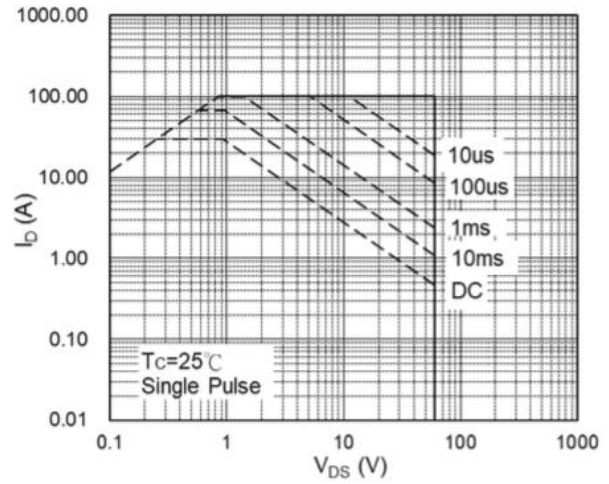
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



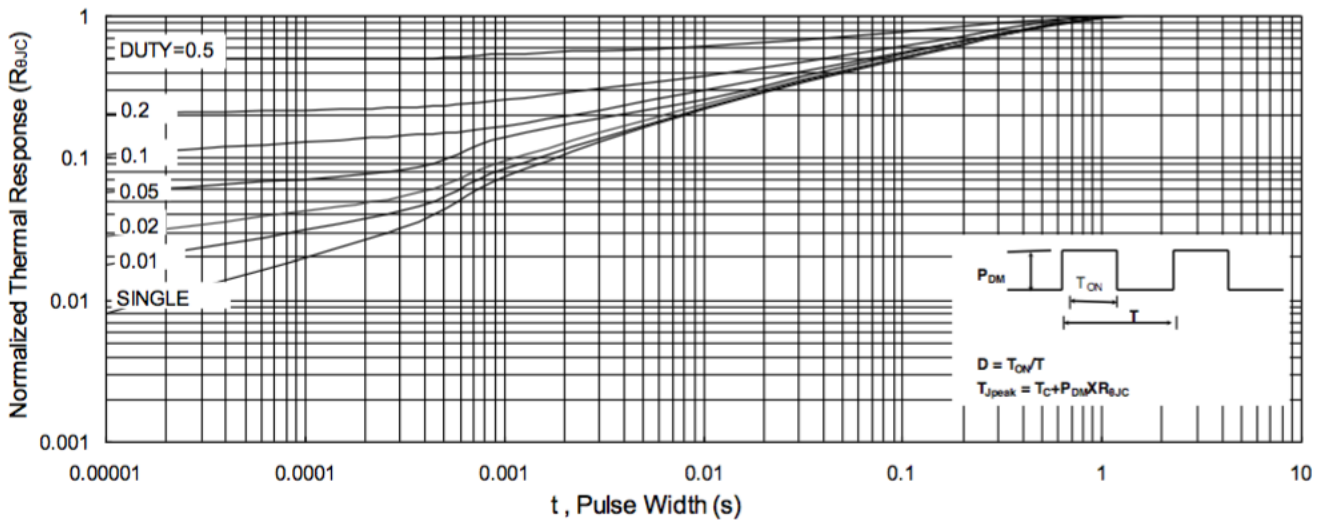
**N-Ch 60V Fast Switching MOSFETs**



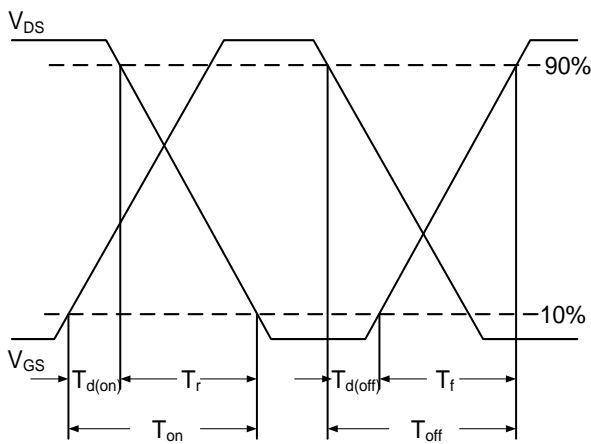
**Fig.7 Capacitance**



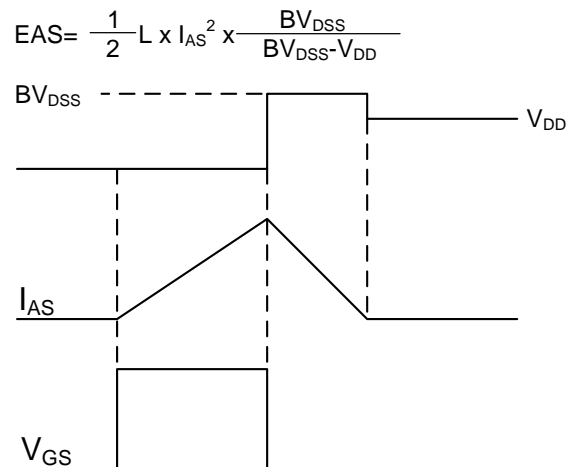
**Fig.8 Safe Operating Area**



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



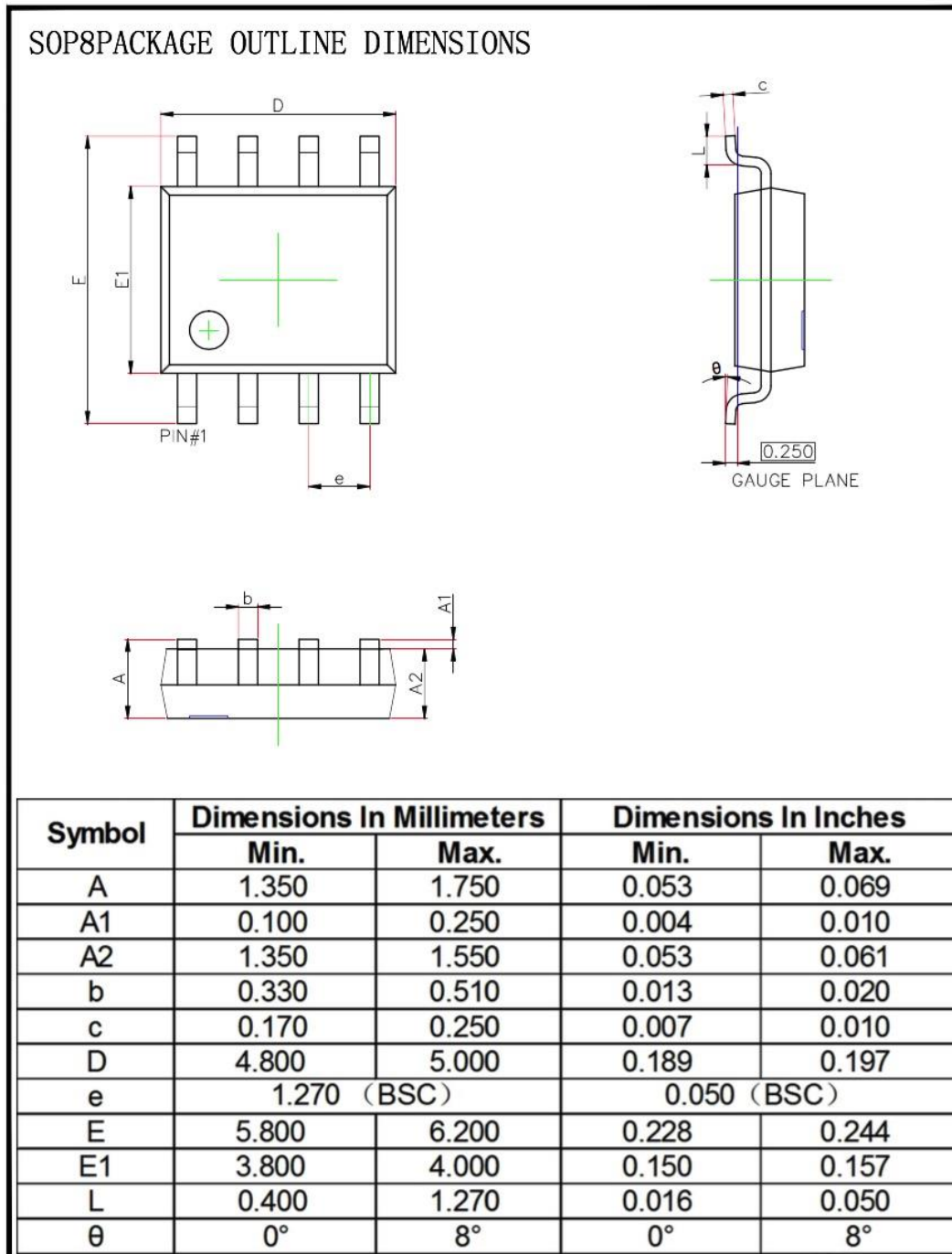
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

## Ordering Information

| Part Number | Package code | Packaging      |
|-------------|--------------|----------------|
| HSM6056     | SOP-8        | 2500/Tape&Reel |



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