

## Features

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

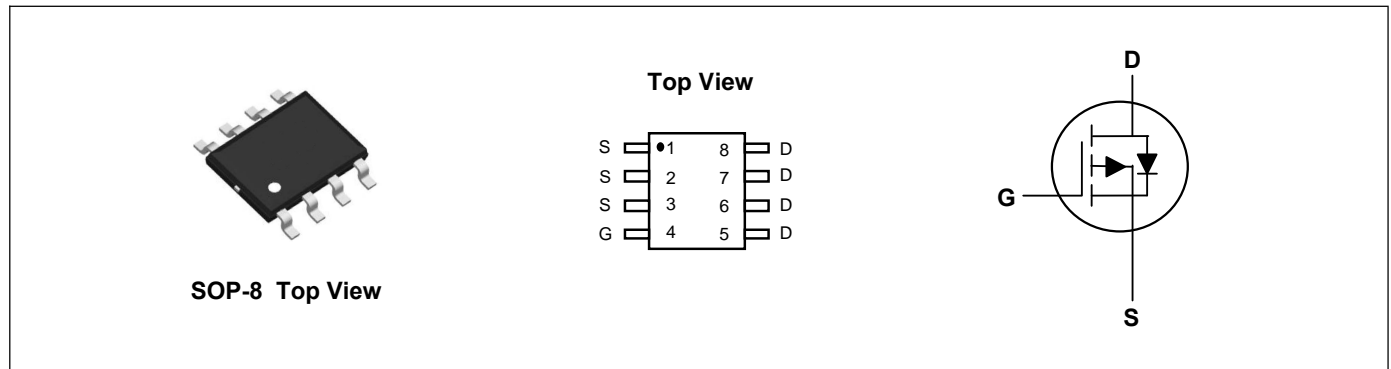
## Applications

- High Frequency Point-of-Load, Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

## Product Summary



|                                   |      |            |
|-----------------------------------|------|------------|
| $V_{DS}$                          | -40  | V          |
| $I_D$                             | -7.5 | A          |
| $R_{DS(ON)}$ (at $V_{GS}=-10V$ )  | 40   | m $\Omega$ |
| $R_{DS(ON)}$ (at $V_{GS}=-4.5V$ ) | 70   | m $\Omega$ |



## Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

| Parameter                                   | Symbol                        | Rating     | Units            |
|---|-------------------------------|------------|------------------|
| Drain-Source Voltage                        | $V_{DS}$                      | -40        | V                |
| Gate-Source Voltage                         | $V_{GS}$                      | $\pm 20$   | V                |
| Continuous Drain Current, $V_{GS} @ -10V^1$ | $I_D @ T_C=25^\circ\text{C}$  | -7.5       | A                |
| Continuous Drain Current, $V_{GS} @ -10V^1$ | $I_D @ T_C=100^\circ\text{C}$ | -5.7       | A                |
| Pulsed Drain Current <sup>2</sup>           | $I_{DM}$                      | -15        | A                |
| Single Pulse Avalanche Energy <sup>3</sup>  | EAS                           | 36         | mJ               |
| Avalanche Current                           | $I_{AS}$                      | -27.2      | A                |
| Total Power Dissipation <sup>4</sup>        | $P_D @ T_C=25^\circ\text{C}$  | 3.1        | W                |
| Storage Temperature Range                   | $T_{STG}$                     | -55 to 150 | $^\circ\text{C}$ |
| Operating Junction Temperature Range        | $T_J$                         | -55 to 150 | $^\circ\text{C}$ |

## Thermal Characteristics

| Parameter  | Symbol          | Typ | Max | Unit               |
|--|-----------------|-----|-----|--------------------|
| Thermal Resistance Junction-Ambient <sup>1</sup> | $R_{\theta JA}$ | --- | 85  | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-Case <sup>1</sup>    | $R_{\theta JC}$ | --- | 40  | $^\circ\text{C/W}$ |

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

| Parameter                                      | Symbol                              | Conditions  | Min  | Typ    | Max  | Unit  |
|--|-------------------------------------|---|------|--------|------|-------|
| Drain-Source Breakdown Voltage                 | BV <sub>DSS</sub>                   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA   | -40  | ---    | ---  | V     |
| BV <sub>DSS</sub> Temperature Coefficient      | ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | Reference to 25°C, I <sub>D</sub> =-1mA   | ---  | -0.012 | ---  | V/°C  |
| Static Drain-Source On-Resistance <sup>2</sup> | R <sub>DS(ON)</sub>                 | V <sub>GS</sub> =-10V, I <sub>D</sub> =-6A  | ---  | ---    | 40   | mΩ    |
|  |                                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A   | ---  | ---    | 70   | mΩ    |
| Gate Threshold Voltage                         | V <sub>GS(th)</sub>                 | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                               | -1.0 | ---    | -2.5 | V     |
| V <sub>GS(th)</sub> Temperature Coefficient    | ΔV <sub>GS(th)</sub>                |   | ---  | 4.32   | ---  | mV/°C |
| Drain-Source Leakage Current                   | I <sub>DSS</sub>                    | V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                        | ---  | ---    | 1    | uA    |
|  |                                     | V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                        | ---  | ---    | 5    | uA    |
| Gate-Source Leakage Current                    | I <sub>GSS</sub>                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V  | ---  | ---    | ±100 | nA    |
| Forward Transconductance                       | g <sub>fs</sub>                     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-6A   | ---  | 12     | ---  | S     |
| Gate Resistance                                | R <sub>g</sub>                      | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz  | ---  | 13     | ---  | Ω     |
| Total Gate Charge (-4.5V)                      | Q <sub>g</sub>                      | V <sub>DS</sub> =-20V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-6A                      | ---  | 9      | ---  | nC    |
| Gate-Source Charge                             | Q <sub>gs</sub>                     |   | ---  | 2.54   | ---  |       |
| Gate-Drain Charge                              | Q <sub>gd</sub>                     |   | ---  | 3.1    | ---  |       |
| Turn-On Delay Time                             | T <sub>d(on)</sub>                  | V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-1A | ---  | 19.2   | ---  | ns    |
| Rise Time                                      | T <sub>r</sub>                      |   | ---  | 12.8   | ---  |       |
| Turn-Off Delay Time                            | T <sub>d(off)</sub>                 |   | ---  | 48.6   | ---  |       |
| Fall Time                                      | T <sub>f</sub>                      |   | ---  | 4.6    | ---  |       |
| Input Capacitance                              | C <sub>iss</sub>                    | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                                      | ---  | 1004   | ---  | pF    |
| Output Capacitance                             | C <sub>oss</sub>                    |   | ---  | 108    | ---  |       |
| Reverse Transfer Capacitance                   | C <sub>rss</sub>                    |   | ---  | 80     | ---  |       |

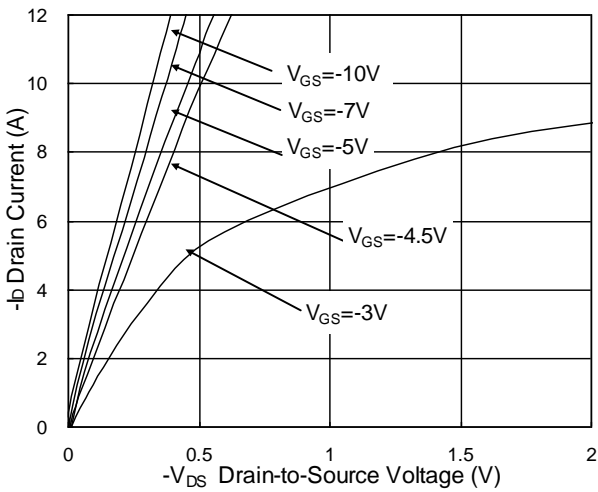
**Drain-Source Diode Characteristics**

| Parameter                                | Symbol          | Conditions   | Min | Typ | Max  | Unit |
|--|-----------------|--|-----|-----|------|------|
| Continuous Source Current <sup>1,5</sup> | I <sub>S</sub>  | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current              | --- | --- | -7.5 | A    |
| Pulsed Source Current <sup>2,5</sup>     | I <sub>SM</sub> |  | --- | --- | -15  | A    |
| Diode Forward Voltage <sup>2</sup>       | V <sub>SD</sub> | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C | --- | --- | -1   | V    |

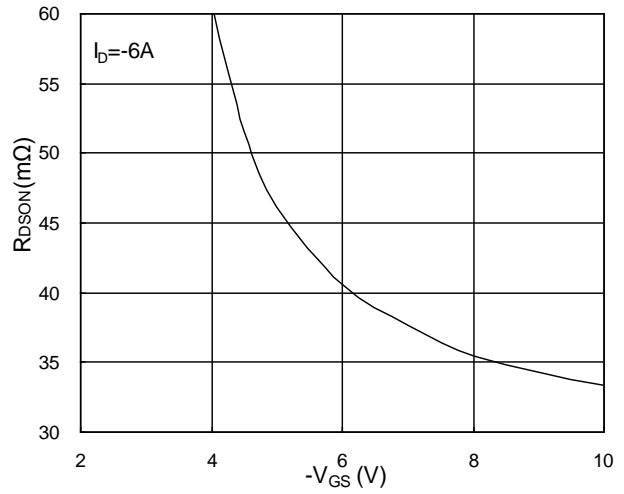
**Note:**

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 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>=-25V, V<sub>GS</sub>=-10V, L=0.1mH, I<sub>AS</sub>=-27.2A
- 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.

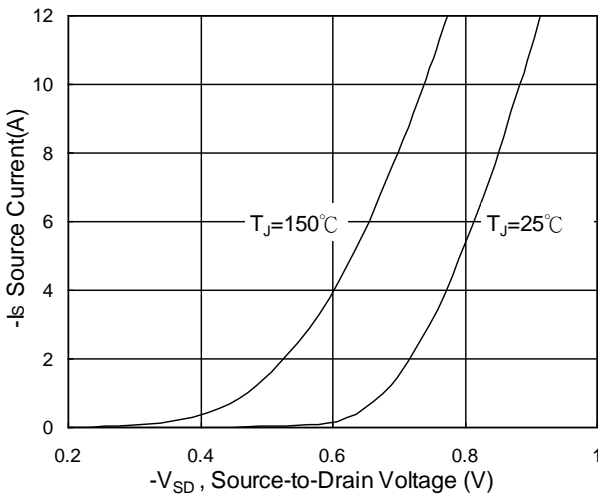
**Typical Characteristics**



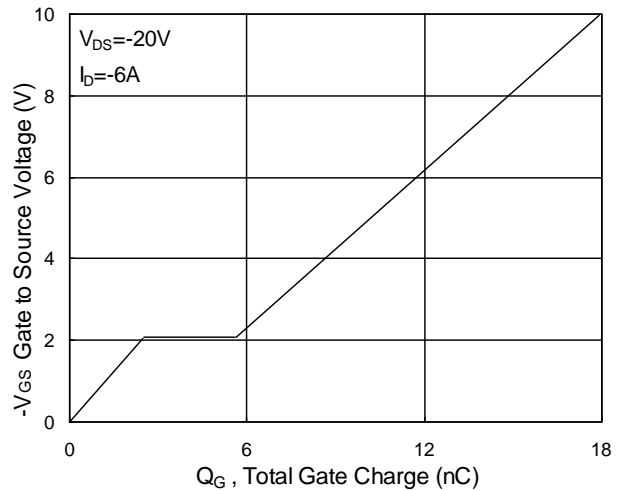
**Fig.1 Typical Output Characteristics**



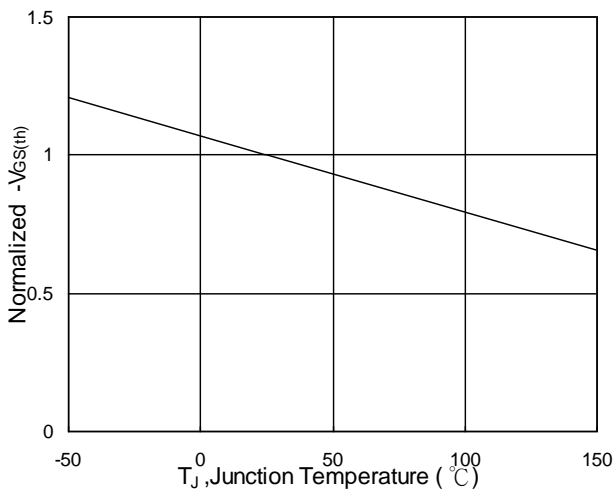
**Fig.2 On-Resistance v.s Gate-Source**



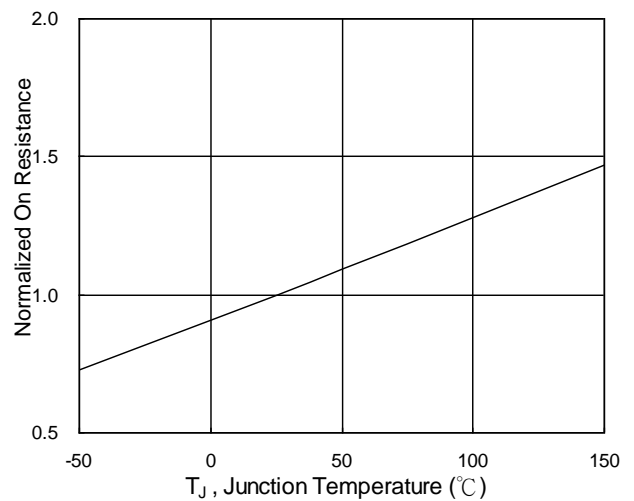
**Fig.3 Forward Characteristics of Reverse**



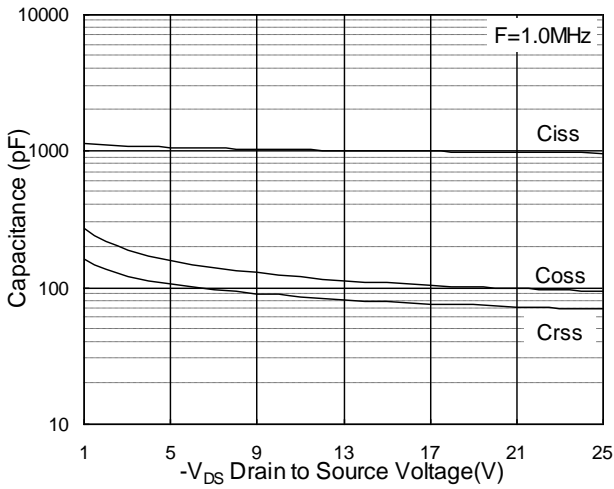
**Fig.4 Gate-Charge Characteristics**



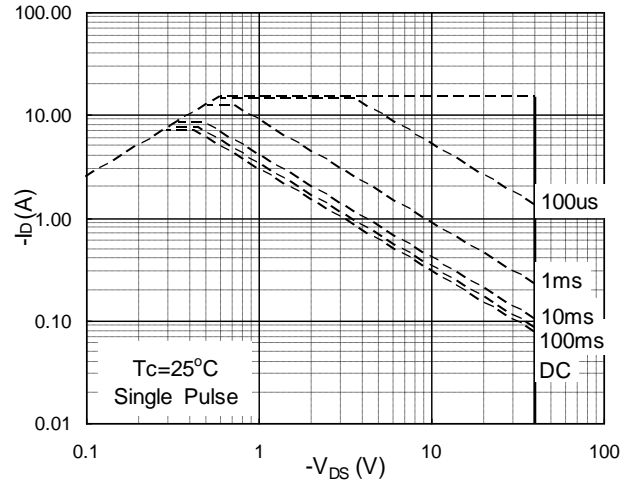
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



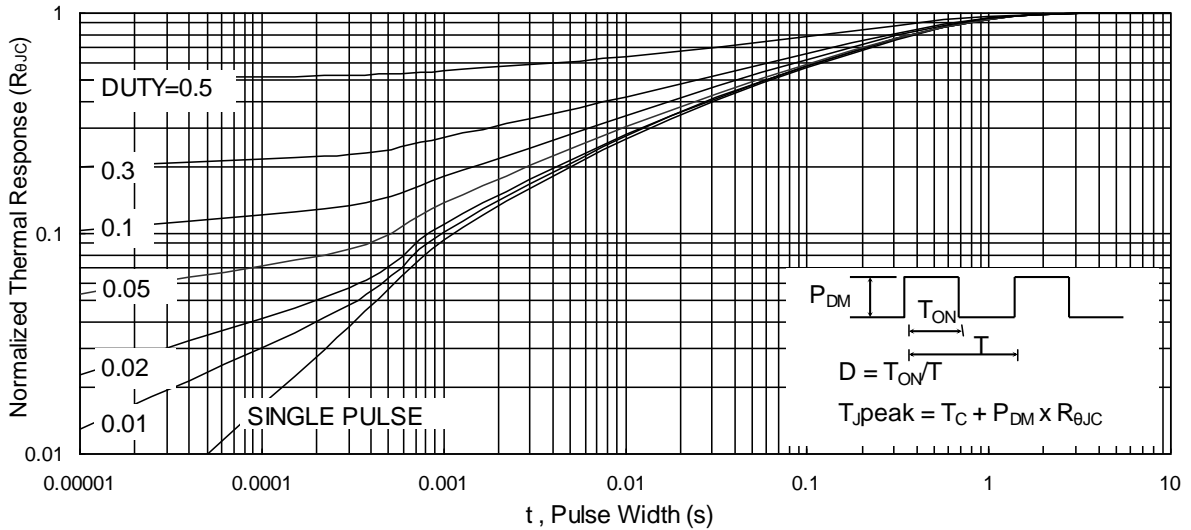
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



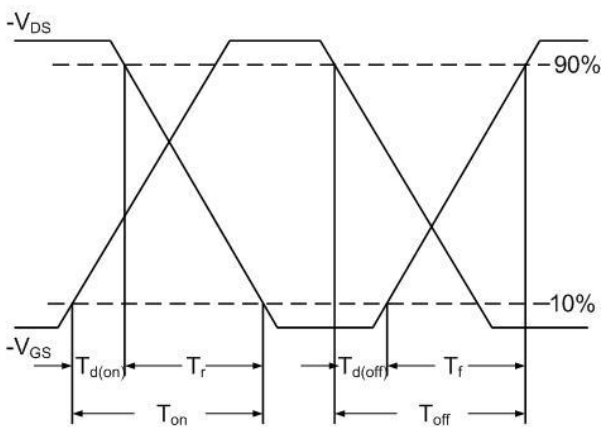
**Fig.7 Capacitance**



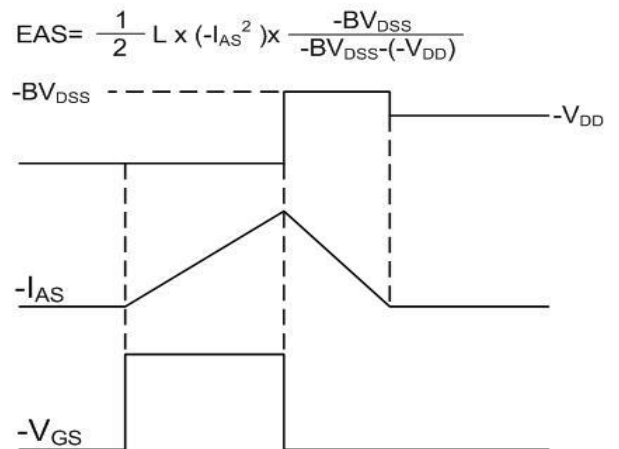
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Waveform**

**SOP-8 Package Outline Dimensions**



| Symbol               | Dimensions (unit:mm) |      |      | Symbol               | Dimensions (unit:mm) |      |      |
|----------------------|----------------------|------|------|----------------------|----------------------|------|------|
|                      | Min                  | Typ  | Max  |                      | Min                  | Typ  | Max  |
| <b>A</b>             | 1.35                 | 1.55 | 1.75 | <b>A<sub>1</sub></b> | 0.10                 | 0.18 | 0.25 |
| <b>A<sub>2</sub></b> | 1.25                 | 1.45 | 1.65 | <b>A<sub>3</sub></b> | --                   | 0.25 | --   |
| <b>b<sub>p</sub></b> | 0.36                 | 0.42 | 0.51 | <b>c</b>             | 0.19                 | 0.22 | 0.25 |
| <b>D</b>             | 4.70                 | 4.92 | 5.10 | <b>E</b>             | 3.80                 | 3.90 | 4.00 |
| <b>e</b>             | --                   | 1.27 | --   | <b>H<sub>E</sub></b> | 5.80                 | 6.00 | 6.20 |
| <b>L</b>             | --                   | 1.05 | --   | <b>L<sub>p</sub></b> | 0.40                 | 0.68 | 1.00 |
| <b>Q</b>             | 0.60                 | 0.65 | 0.73 | <b>v</b>             | --                   | 0.25 | --   |
| <b>w</b>             | --                   | 0.25 | --   | <b>y</b>             | --                   | 0.10 | --   |
| <b>Z</b>             | 0.30                 | 0.50 | 0.70 | <b>θ</b>             | 0°                   |      | 8°   |