



## PRODUCT DATA SHEET



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**Datasheet**



**Resources**

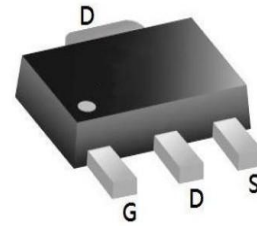


**Samples**

Please note: Please check the JINGAO Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.jg-semi.cn](http://www.jg-semi.cn). Please email any questions regarding the system integration to [JINGAO\\_questions@jgsemi.com](mailto:JINGAO_questions@jgsemi.com).

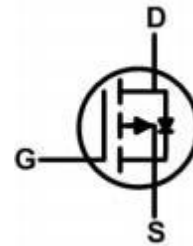
### Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| -60V  | 66mΩ  | -5A |



**SOT89-3L**

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



### Absolute Maximum Ratings

| Symbol                   | Parameter                                   | Rating     | Units |
|--------------------------|---------------------------------------------|------------|-------|
| $V_{DS}$                 | Drain-Source Voltage                        | -60        | V     |
| $V_{GS}$                 | Gate-Source Voltage                         | $\pm 20$   | V     |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -5.0       | A     |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -3.2       | A     |
| $I_{DM}$                 | Pulsed Drain Current <sup>2</sup>           | -25        | A     |
| EAS                      | Single Pulse Avalanche Energy <sup>3</sup>  | 18         | mJ    |
| $I_{AS}$                 | Avalanche Current                           | ---        | A     |
| $P_D @ T_A = 25^\circ C$ | Total Power Dissipation <sup>4</sup>        | 36         | W     |
| $T_{STG}$                | Storage Temperature Range                   | -55 to 150 | °C    |
| $T_J$                    | Operating Junction Temperature Range        | -55 to 150 | °C    |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit |
|-----------------|--------------------------------------------------|------|------|------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | ---  | °C/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 3.6  | °C/W |

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

| Symbol                              | Parameter                                      | Conditions                                                                              | Min. | Typ.  | Max. | Unit   |
|-------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------|------|-------|------|--------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                             | -60  | ---   | ---  | V      |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C, I <sub>D</sub> =-1mA                                                 | ---  | -0.03 | ---  | V/ °C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-3A                                              | ---  | 87    | 110  | mΩ     |
|                                     |                                                | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A                                             | ---  | 108   | 140  |        |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                               | -1.1 | -1.7  | -2.5 | V      |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |                                                                                         | ---  | ---   | ---  | mV/ °C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                        | ---  | ---   | 1    | uA     |
|                                     |                                                | V <sub>DS</sub> =-60V, 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     |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A                                               | ---  | ---   | ---  | S      |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                        | ---  | ---   | ---  | Ω      |
| Q <sub>g</sub>                      | Total Gate Charge (-4.5V)                      | V <sub>DS</sub> =-30V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A                      | ---  | 18    | ---  | nC     |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |                                                                                         | ---  | 4     | ---  |        |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |                                                                                         | ---  | 5.2   | ---  |        |
| 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, I <sub>D</sub> =-3A | ---  | 9     | ---  | ns     |
| T <sub>r</sub>                      | Rise Time                                      |                                                                                         | ---  | 15    | ---  |        |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |                                                                                         | ---  | 33    | ---  |        |
| T <sub>f</sub>                      | Fall Time                                      |                                                                                         | ---  | 12    | ---  |        |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =-25V, V <sub>GS</sub> =0V, f=1MHz                                      | ---  | 978   | ---  | pF     |
| C <sub>oss</sub>                    | Output Capacitance                             |                                                                                         | ---  | 51    | ---  |        |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |                                                                                         | ---  | 39    | ---  |        |

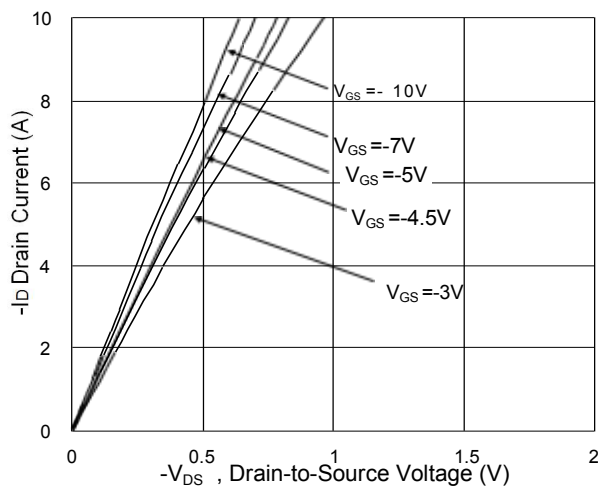
**Diode Characteristics**

| 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              | ---  | ---  | -5.0 | A    |
| I <sub>SM</sub> | Pulsed Source Current <sup>2,5</sup>     |                                                                | ---  | ---  | -25  | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup>       | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C | ---  | ---  | -1.2 | V    |

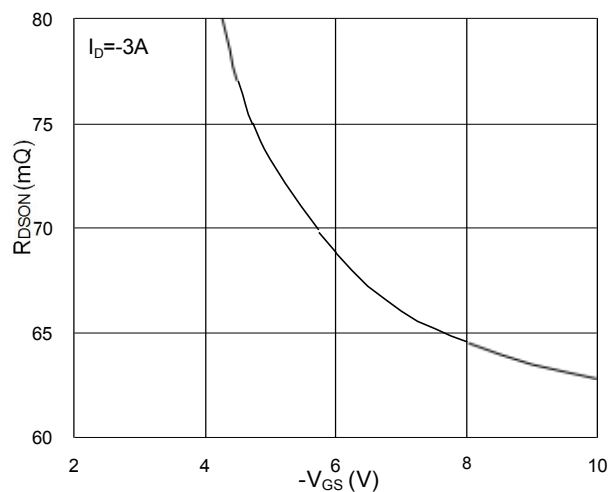
Note :

- 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
- 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.

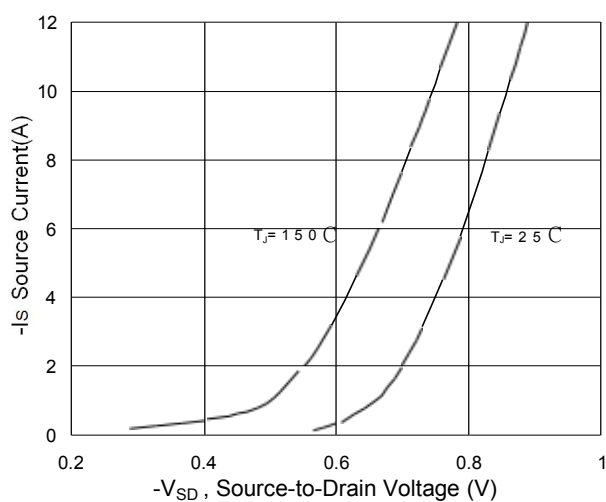
### Typical Characteristics



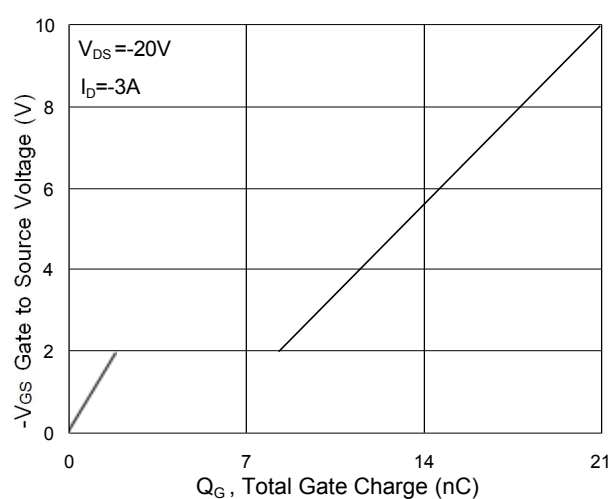
**Fig.1 Typical Output Characteristics**



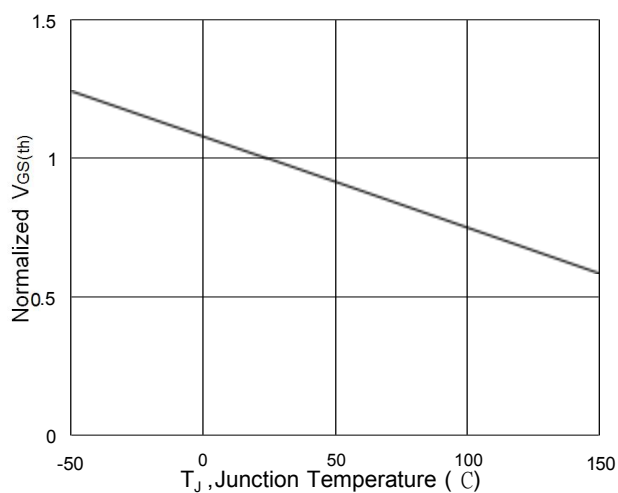
**Fig.2 On-Resistance v.s Gate-Source**



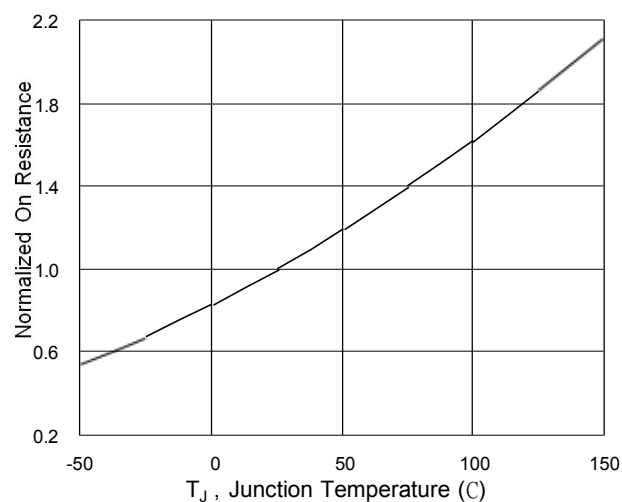
**Fig.3 Forward Characteristics of Reverse**



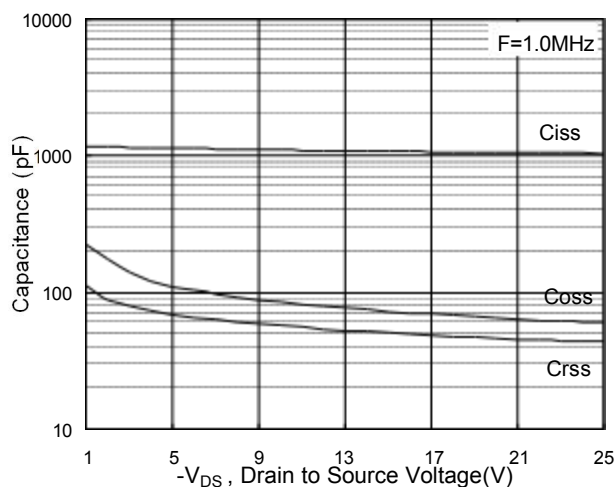
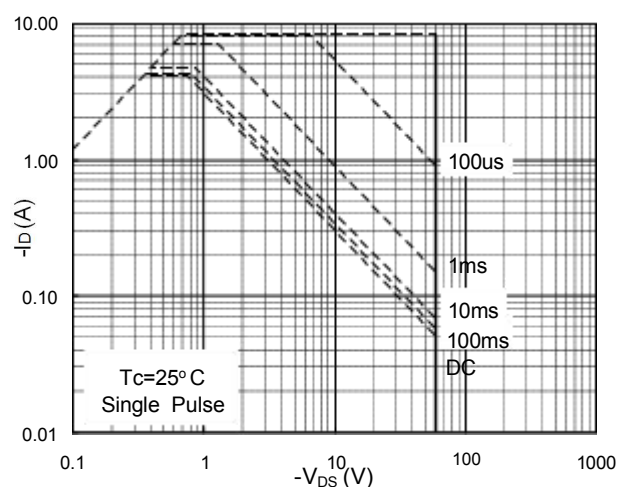
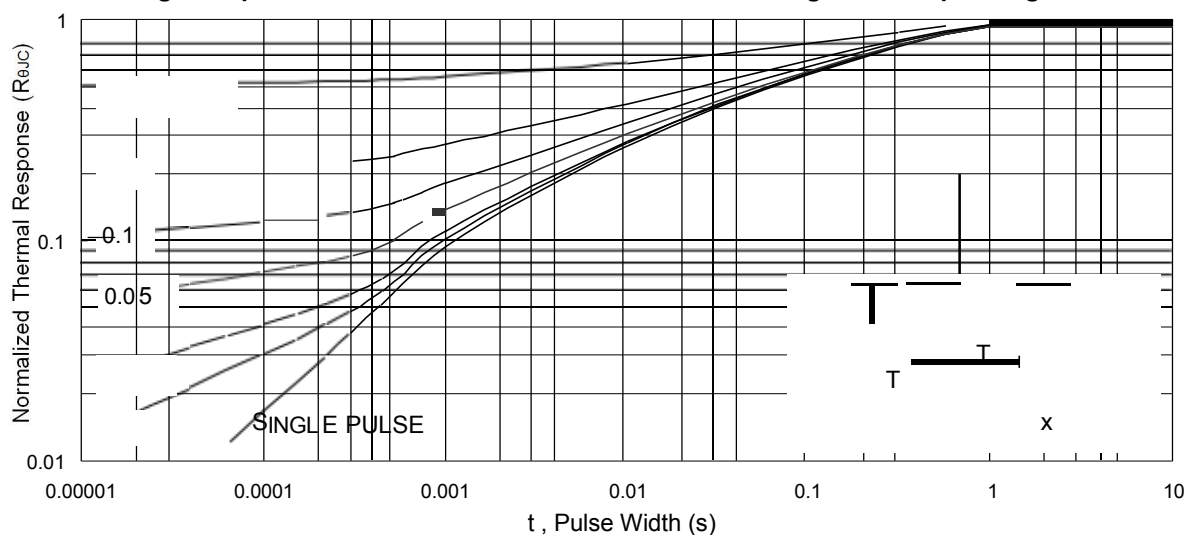
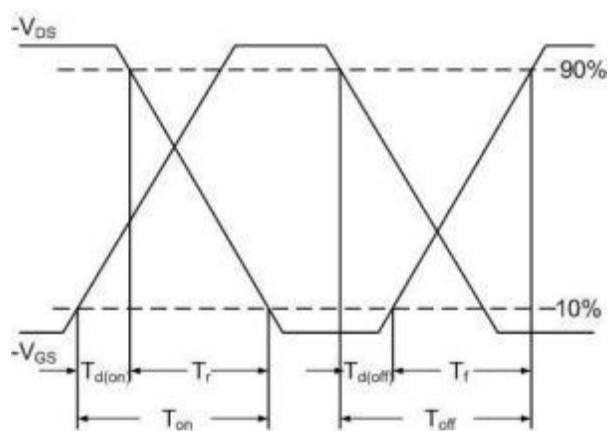
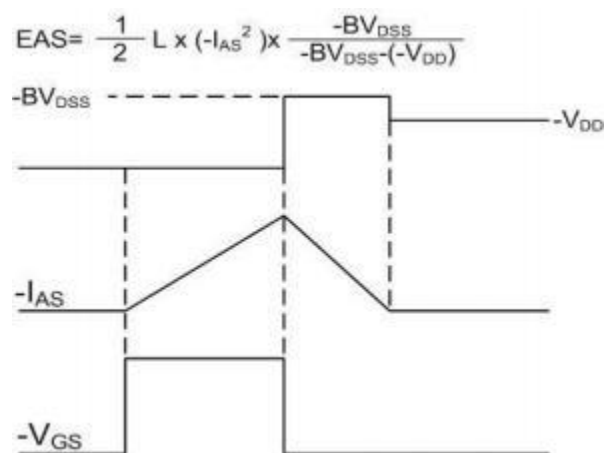
**Fig.4 Gate-Charge Characteristics**

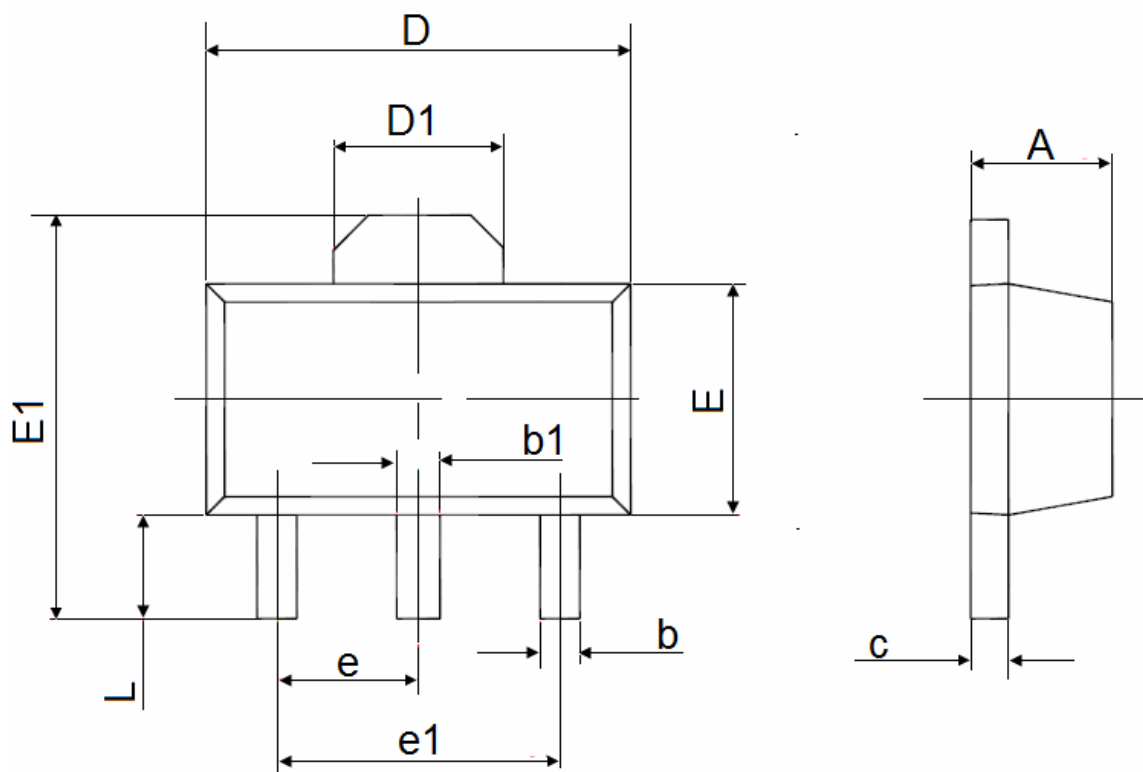


**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



**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 Waveform**

**SOT-89-3L Package Information**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.400                     | 1.600 | 0.055                | 0.063 |
| b      | 0.320                     | 0.520 | 0.013                | 0.020 |
| b1     | 0.400                     | 0.580 | 0.016                | 0.023 |
| c      | 0.350                     | 0.440 | 0.014                | 0.017 |
| D      | 4.400                     | 4.600 | 0.173                | 0.181 |
| D1     | 1.550 REF.                |       | 0.061 REF.           |       |
| E      | 2.300                     | 2.600 | 0.091                | 0.102 |
| E1     | 3.940                     | 4.250 | 0.155                | 0.167 |
| e      | 1.500 TYP.                |       | 0.060 TYP.           |       |
| e1     | 3.000 TYP.                |       | 0.118 TYP.           |       |
| L      | 0.900                     | 1.200 | 0.035                | 0.047 |

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