

## Product Summary

| $V_{(BR)DSS}$ | $R_{DS(on)TYP}$ | $I_D$ |
|---------------|-----------------|-------|
| 20V           | 10mΩ@4.5V       | 7A    |
|               | 13mΩ@2.5V       |       |



**合肥矽普半导体**

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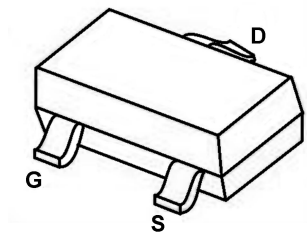
## Feature

- High power and current handing capability
- Surface mount package

## Application

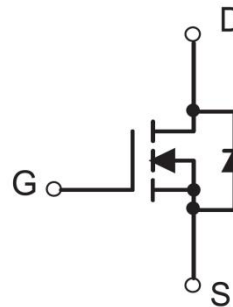
- Battery Switch
- DC/DC Converter

## Package

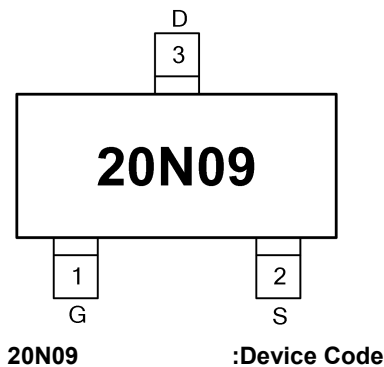


SOT-23-3L

## Circuit diagram



## Marking



## Order Information

| Device    | Package   | Unit/Tape |
|-----------|-----------|-----------|
| SP20N09T1 | SOT-23-3L | 3000      |

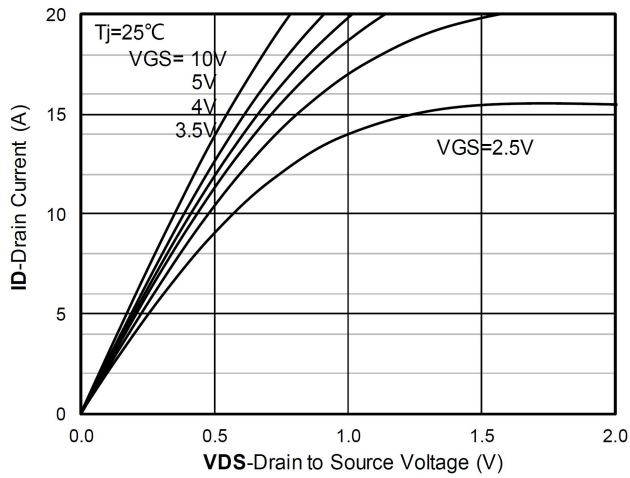
**Absolute maximum ratings (Ta=25°C, unless otherwise noted)**

| Parameter                              | Symbol          | Value      | Unit |
|----------------------------------------|-----------------|------------|------|
| Drain-Source Voltage                   | $V_{DS}$        | 20         | V    |
| Gate-Source Voltage                    | $V_{GS}$        | $\pm 12$   | V    |
| Continuous Drain Current               | $I_D$           | 7          | A    |
| Pulse Drain Current Tested             | $I_{DM}$        | 28         | A    |
| Power Dissipation                      | $P_D$           | 1.25       | W    |
| Thermal Resistance Junction-to-Ambient | $R_{\theta JA}$ | 100        | °C/W |
| Storage Temperature Range              | $T_{STG}$       | -55 to 150 | °C   |
| Operating Junction Temperature Range   | $T_J$           | -55 to 150 | °C   |

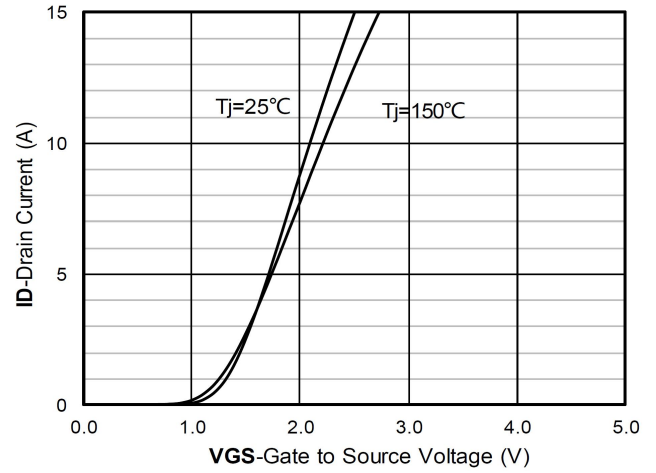
**Electrical characteristics (Ta=25°C, unless otherwise noted)**

| Parameter                          | Symbol            | Conditions                     | Min. | Typ. | Max. | Unit |
|------------------------------------|-------------------|--------------------------------|------|------|------|------|
| Static Characteristics             |                   |                                |      |      |      |      |
| Drain-Source Breakdown Voltage     | BV <sub>DSS</sub> | VGS=0V , ID=250μA              | 20   | -    | -    | V    |
| Drain-Source Leakage Current       | IDSS              | VDS=16V , VGS=0V               | -    | -    | 1    | uA   |
| Gate-Source Leakage Current        | IGSS              | VGS=±12V , VDS=0V              | -    | -    | ±100 | nA   |
| Gate Threshold Voltage             | VGS(th)           | VDS=VGS , ID=250μA             | 0.5  | 0.7  | 1.5  | V    |
| Static Drain-Source On-Resistance  | RDS(ON)           | VGS=4.5V, ID=6A                | -    | 10   | 13   | mΩ   |
|                                    |                   | VGS=2.5V, ID=5A                | -    | 13   | 18   |      |
| Dynamic characteristics            |                   |                                |      |      |      |      |
| Input Capacitance                  | Ciss              | VDS=10V , VGS=0V , f=1MHz      | -    | 900  | -    | pF   |
| Output Capacitance                 | Coss              |                                | -    | 162  | -    |      |
| Reverse Transfer Capacitance       | Crss              |                                | -    | 105  | -    |      |
| Total Gate Charge                  | Qg                | VDS=10V , VGS=10V , ID=20A     | -    | 15   | -    | nC   |
| Gate-Source Charge                 | Qgs               |                                | -    | 1.8  | -    |      |
| Gate-Drain Charge                  | Qgd               |                                | -    | 2.8  | -    |      |
| Switching Characteristics          |                   |                                |      |      |      |      |
| Turn-On Delay Time                 | td(on)            | VDD=10V VGS=10V , RG=3Ω, ID=5A | -    | 4.5  | -    | nS   |
| Turn-On Rise Time                  | tr                |                                | -    | 9.2  | -    |      |
| Turn-Off Delay Time                | td(off)           |                                | -    | 18.7 | -    |      |
| Turn-Off Fall Time                 | tf                |                                | -    | 3.3  | -    |      |
| Source-Drain Diode characteristics |                   |                                |      |      |      |      |
| Diode Forward Voltage              | VSD               | VGS=0V , IS=1A , TJ=25℃        | -    | -    | 1.2  | V    |

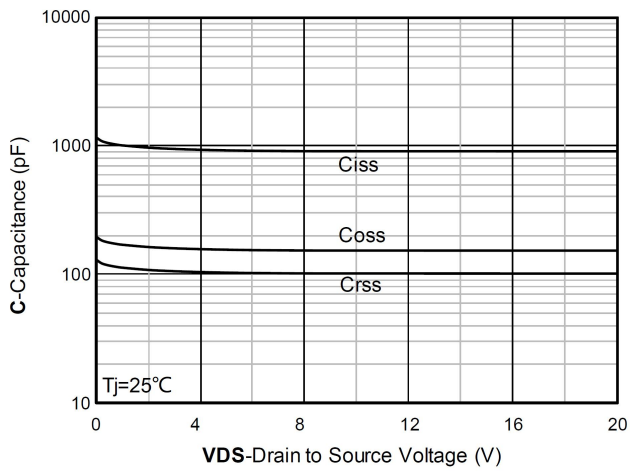
## Typical Characteristics



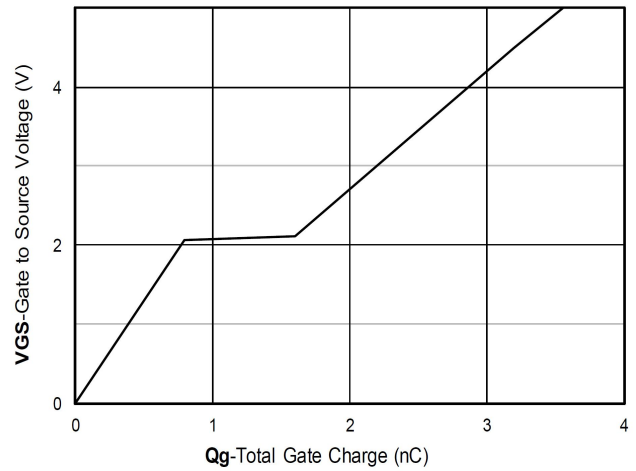
Output Characteristics



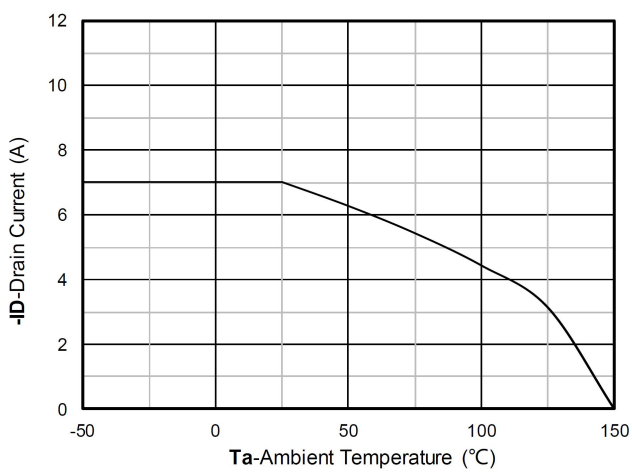
Transfer Characteristics



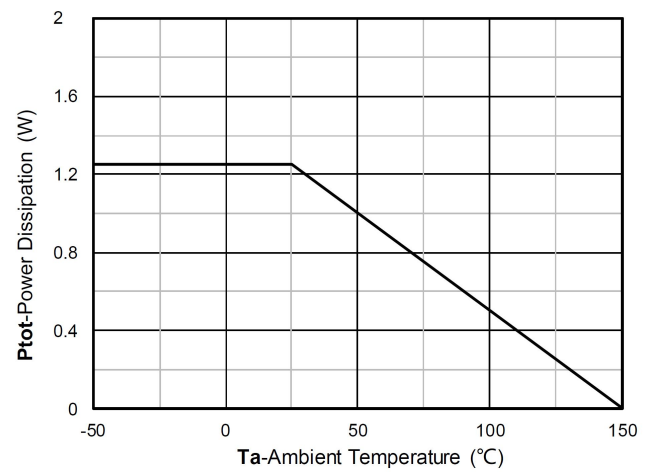
Capacitance Characteristics



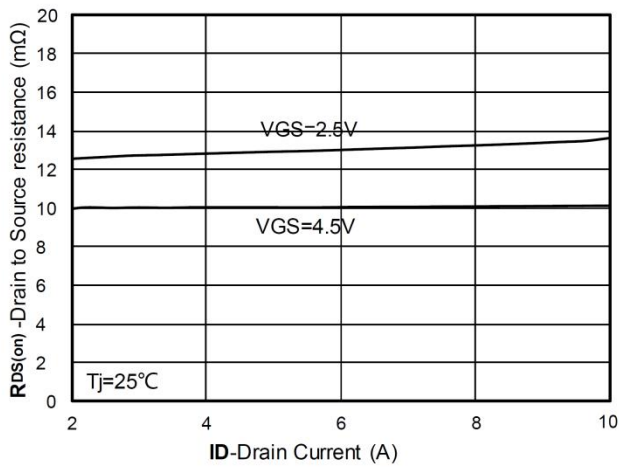
Gate Charge



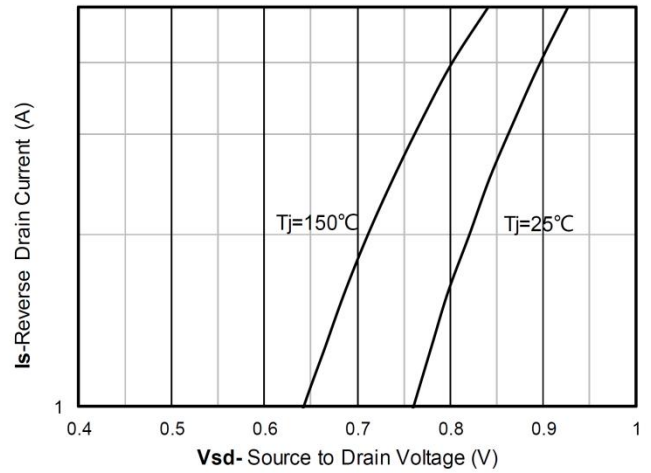
Current dissipation



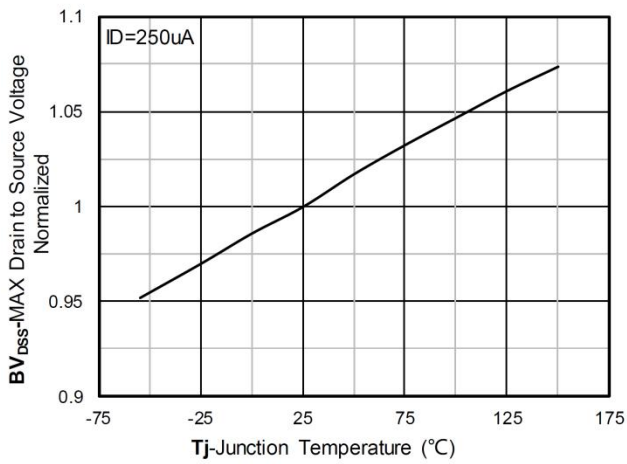
Power dissipation



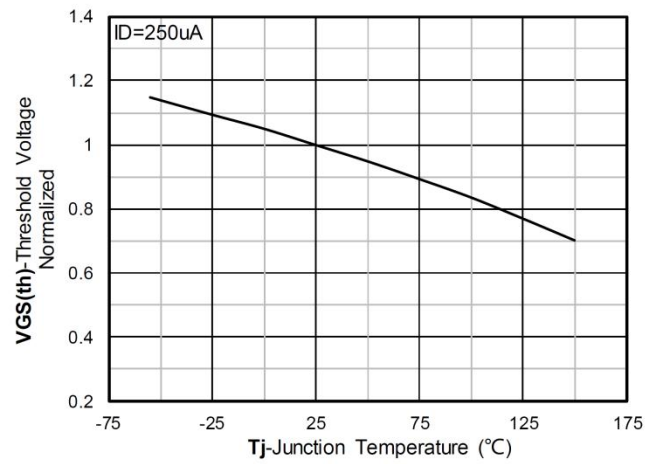
$R_{DS(on)}$  VS Drain Current



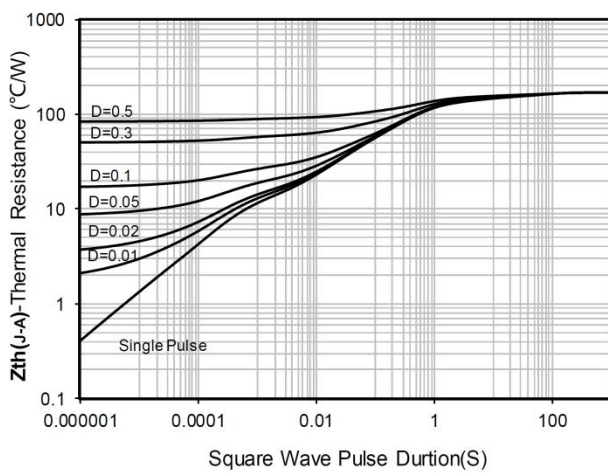
Forward characteristics of reverse diode



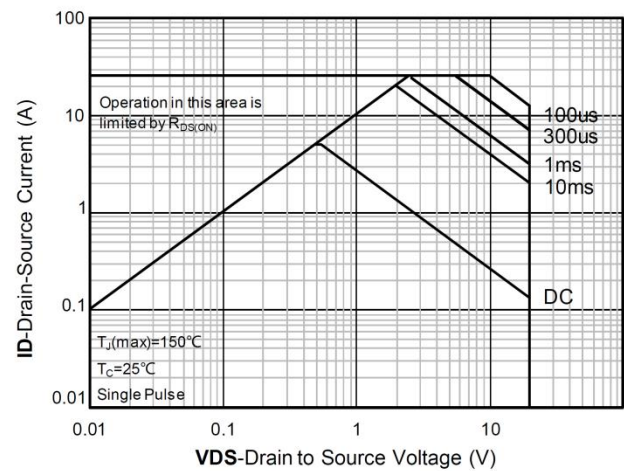
Normalized breakdown voltage



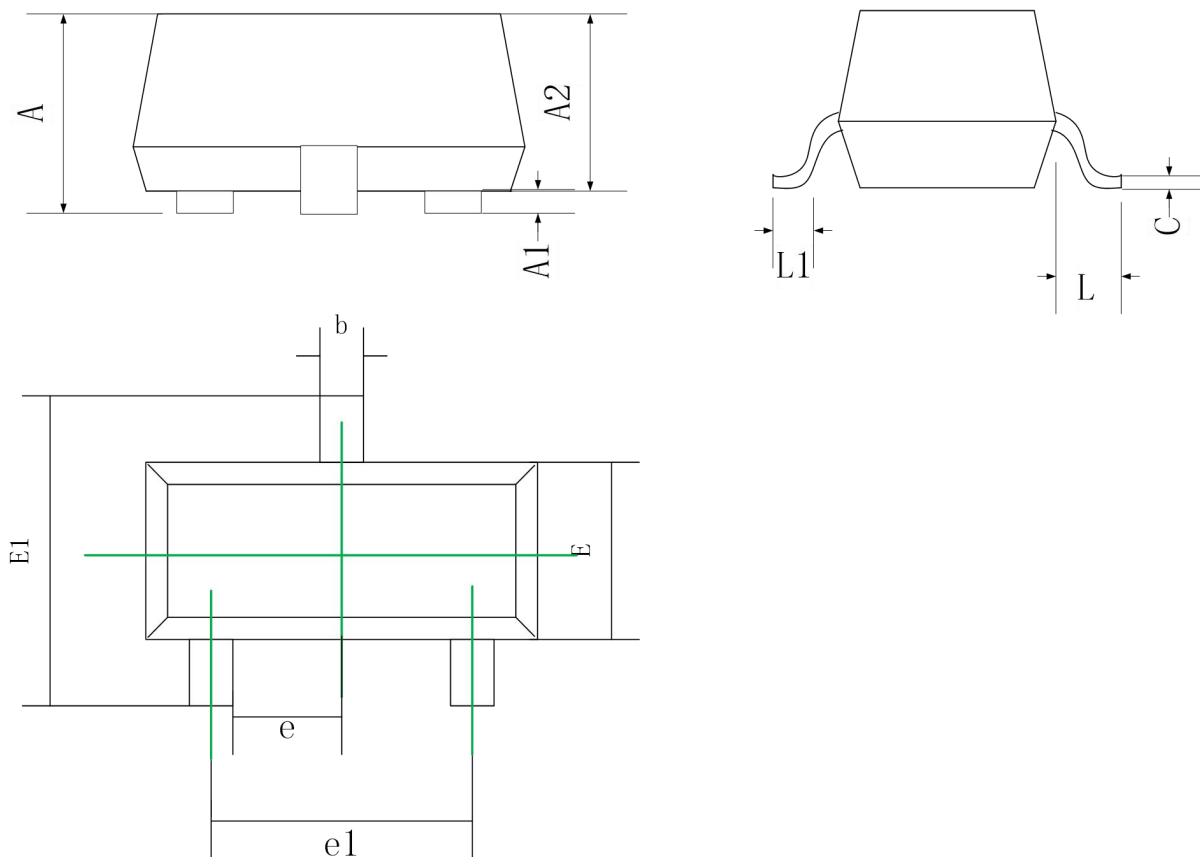
Normalized Threshold voltage



Maximum Transient Thermal Impedance



Safe Operation Area

**SOT-23-3L Package Information**


| Symbol   | Dimensions in millimeters |       |
|----------|---------------------------|-------|
|          | Min.                      | Max.  |
| A        | 1.050                     | 1.250 |
| A1       | 0.000                     | 0.100 |
| A2       | 1.050                     | 1.150 |
| b        | 0.300                     | 0.500 |
| c        | 0.100                     | 0.200 |
| D        | 2.820                     | 3.020 |
| E        | 1.500                     | 1.700 |
| E1       | 2.650                     | 2.950 |
| e        | 0.950 Typ.                |       |
| e1       | 1.800                     | 2.000 |
| L        | 0.300                     | 0.600 |
| $\theta$ | 0°                        | 8°    |