

### Description

The SX65N06DF uses advanced technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = 60V$   $I_D = 65A$

$R_{DS(ON)} < 10m\Omega$  @  $V_{GS}=10V$

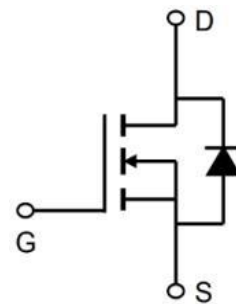
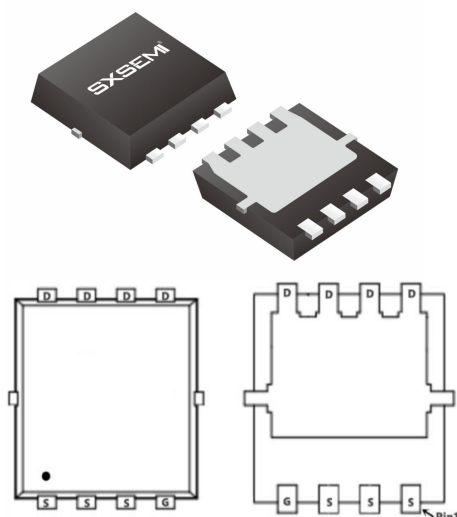
### Application

Battery protection

Load switch

Uninterruptible power supply

### PDFN3\*3-8L



### Absolute Maximum Ratings@ $T_J=25^\circ C$ (unless otherwise specified)

| Symbol               | Parameter                              | Value      | Unit         |
|----------------------|----------------------------------------|------------|--------------|
| $V_{DS}$             | Drain source voltage                   | 60         | V            |
| $V_{GS}$             | Gate source voltage                    | $\pm 20$   | V            |
| $I_D@T_A=25^\circ C$ | Continuous drain current               | 65         | A            |
| $I_D@T_A=70^\circ C$ | Continuous drain current               | 31         | A            |
| $I_{DM}$             | Pulsed drain current                   | 65         | A            |
| $P_D@T_A=25^\circ C$ | Power dissipation                      | 60         | W            |
| EAS                  | Single pulsed avalanche energy         | 30         | mJ           |
| TSTG                 | Storage Temperature Range              | -55 to 150 | $^\circ C$   |
| $T_J$                | Operation and storage temperature      | -55 to 150 | $^\circ C$   |
| $R_{\theta JC}$      | Thermal resistance, junction-case      | 2.1        | $^\circ C/W$ |
| $R_{\theta JA}$      | Thermal resistance, junction-ambient5) | 85         | $^\circ C/W$ |

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

| Symbol               | Parameter                        | Test condition                                                                                   | Min. | Typ.   | Max. | Unit |
|----------------------|----------------------------------|--------------------------------------------------------------------------------------------------|------|--------|------|------|
| BVDSS                | Drain-source breakdown voltage   | V <sub>GS</sub> =0 V, I <sub>D</sub> =250 μA                                                     | 60   | 68     |      | V    |
| VGS(th)              | Gate threshold voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA                                        | 1.2  | 1.5    | 2.5  | V    |
| RDS(ON)              | Drain-source on-state resistance | V <sub>GS</sub> =10 V, I <sub>D</sub> =20 A                                                      |      | 7.5    | 10   | mΩ   |
| RDS(ON)              | Drain-source on-state resistance | V <sub>GS</sub> =4.5 V, I <sub>D</sub> =10 A                                                     |      | 10     | 13   | mΩ   |
| IGSS                 | Gate-source leakage current      | V <sub>GS</sub> =±20 V                                                                           |      |        | ±100 | nA   |
| IDSS                 | Drain-source leakage current     | V <sub>DS</sub> =60 V, V <sub>GS</sub> =0 V                                                      |      |        | 1    | μA   |
| Ciss                 | Input capacitance                | V <sub>GS</sub> =0 V, V <sub>DS</sub> =50 V, f=100 kHz                                           |      | 1182.1 |      | pF   |
| Coss                 | Output capacitance               |                                                                                                  |      | 199.5  |      | pF   |
| Crss                 | Reverse transfer capacitance     |                                                                                                  |      | 4.1    |      | pF   |
| td(on)               | Turn-on delay time               | V <sub>GS</sub> =10 V,<br>V <sub>DS</sub> =50 V,<br>R <sub>G</sub> =2 Ω,<br>I <sub>D</sub> =10 A |      | 17.9   |      | ns   |
| t <sub>r</sub>       | Rise time                        |                                                                                                  |      | 4.0    |      | ns   |
| td(off)              | Turn-off delay time              |                                                                                                  |      | 34.9   |      | ns   |
| t <sub>f</sub>       | Fall time                        |                                                                                                  |      | 5.5    |      | ns   |
| Q <sub>g</sub>       | Total gate charge                | I <sub>D</sub> =10 A,<br>V <sub>DS</sub> =50 V,<br>V <sub>GS</sub> =10 V                         |      | 18.4   |      | nC   |
| Q <sub>gs</sub>      | Gate-source charge               |                                                                                                  |      | 3.3    |      | nC   |
| Q <sub>gd</sub>      | Gate-drain charge                |                                                                                                  |      | 3.1    |      | nC   |
| V <sub>plateau</sub> | Gate plateau voltage             |                                                                                                  |      | 2.8    |      | V    |
| I <sub>S</sub>       | Diode forward current            | V <sub>GS</sub> <V <sub>th</sub>                                                                 |      |        | 60   | A    |
| ISP                  | Pulsed source current            |                                                                                                  |      |        | 180  |      |
| VSD                  | Diode forward voltage            | I <sub>S</sub> =20 A, V <sub>GS</sub> =0 V                                                       |      |        | 1.3  | V    |
| t <sub>rr</sub>      | Reverse recovery time            | I <sub>S</sub> =10 A, di/dt=100 A/μs                                                             |      | 41.8   |      | ns   |
| Q <sub>rr</sub>      | Reverse recovery charge          |                                                                                                  |      | 36.1   |      | nC   |
| I <sub>rrm</sub>     | Peak reverse recovery current    |                                                                                                  |      | 1.4    |      | A    |

**Note**

- 1、 Calculated continuous current based on maximum allowable junction temperature.
- 2、 Repetitive rating; pulse width limited by max. junction temperature.
- 3、 Pd is based on max. junction temperature, using junction-case thermal resistance.
- 4、 V<sub>DD</sub>=50 V, R<sub>G</sub>=50 Ω, L=0.3 mH, starting T<sub>J</sub>=25 °C.
- 5、 The value of R<sub>θJA</sub> is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T<sub>a</sub>=25 °C.

## Typical Characteristics

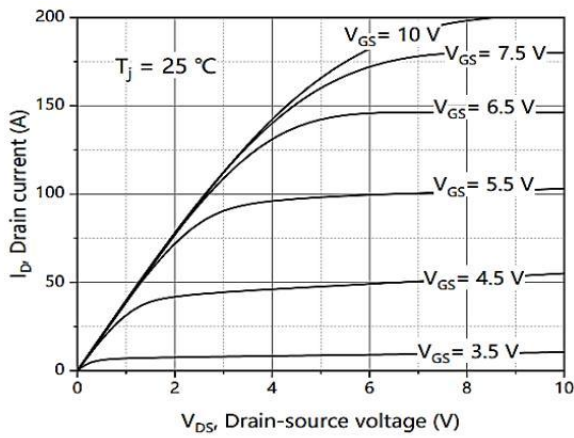


Figure 1. Typ. output characteristics

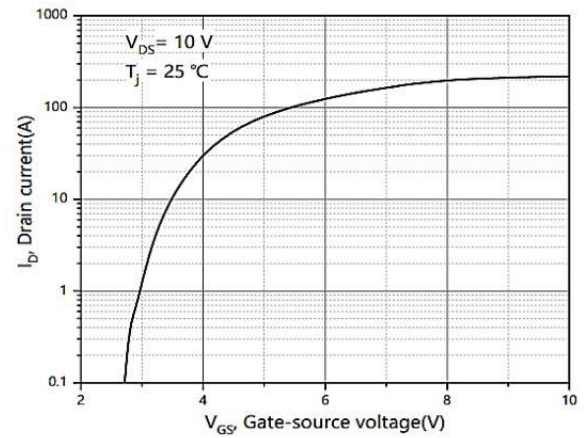


Figure 2. Typ. transfer characteristics

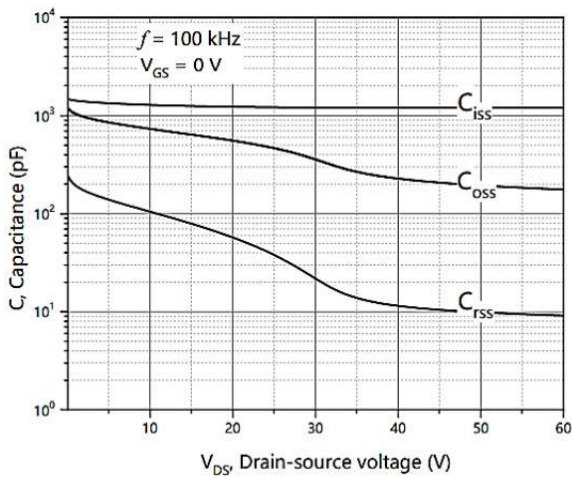


Figure 3. Typ. capacitances

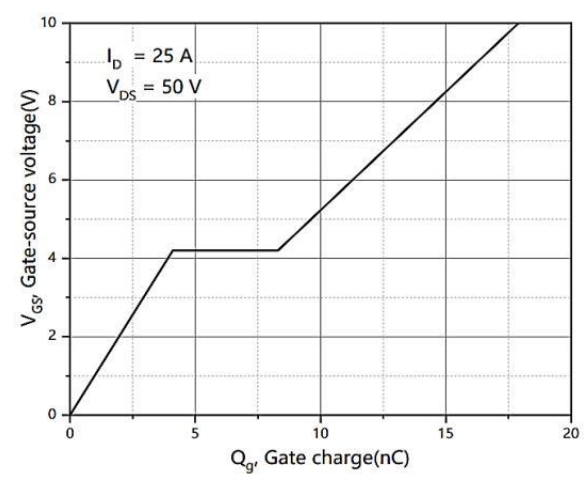


Figure 4. Typ. gate charge

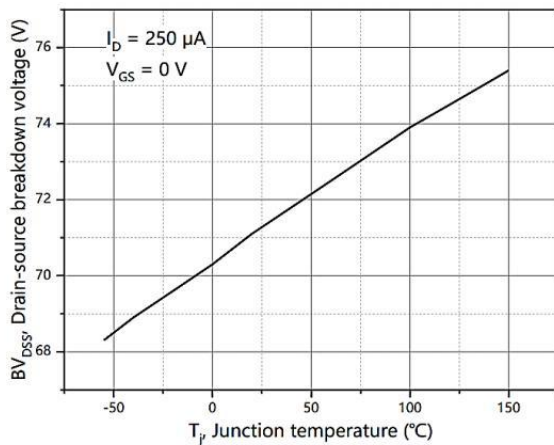


Figure 5. Drain-source breakdown voltage

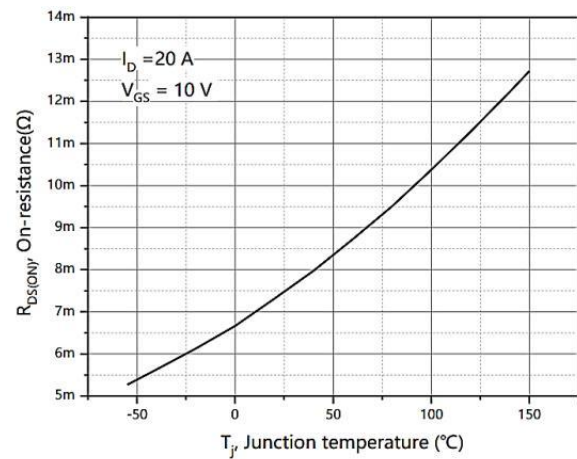
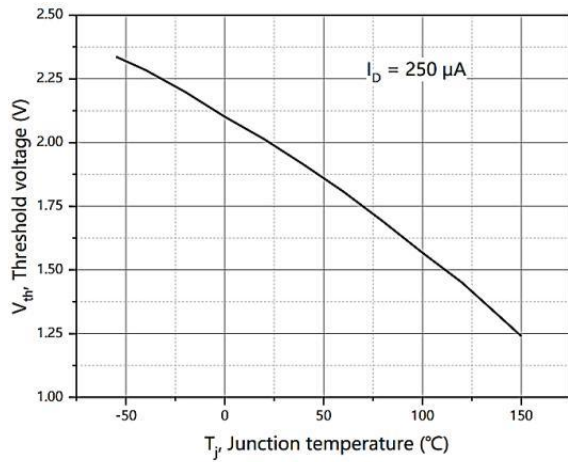
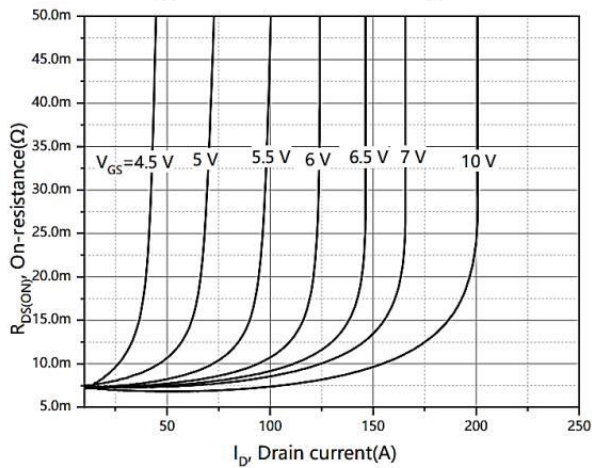


Figure 6. Drain-source on-state resistance

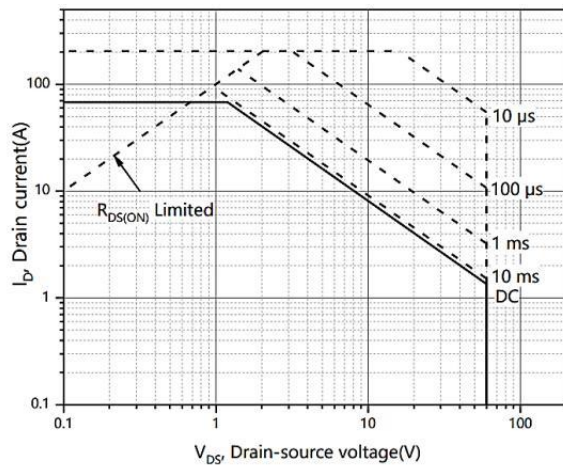
## Typical Characteristics



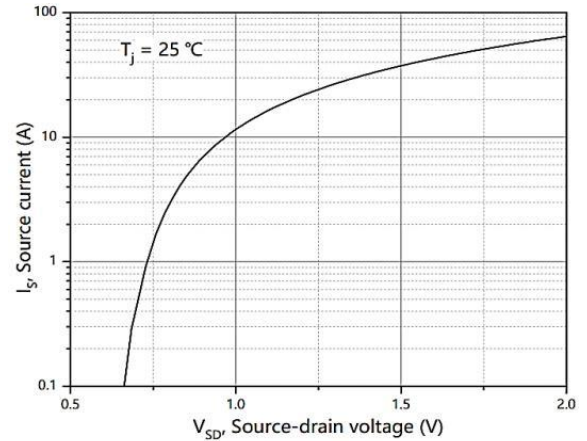
**Figure 7. Threshold voltage**



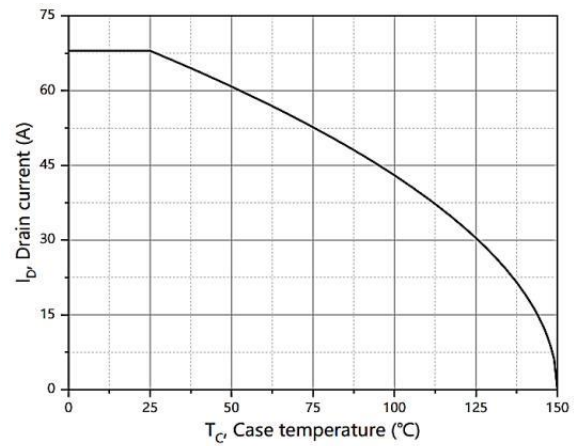
**Figure 9. Drain-source on-state resistance**



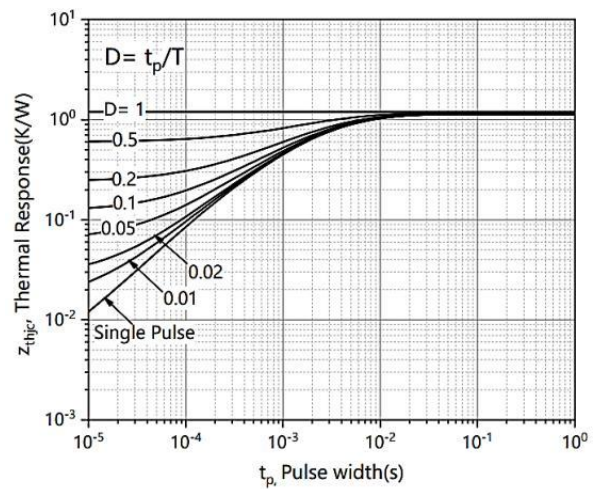
**Figure 11. Safe operation area  $T_C=25\text{ }^{\circ}\text{C}$**



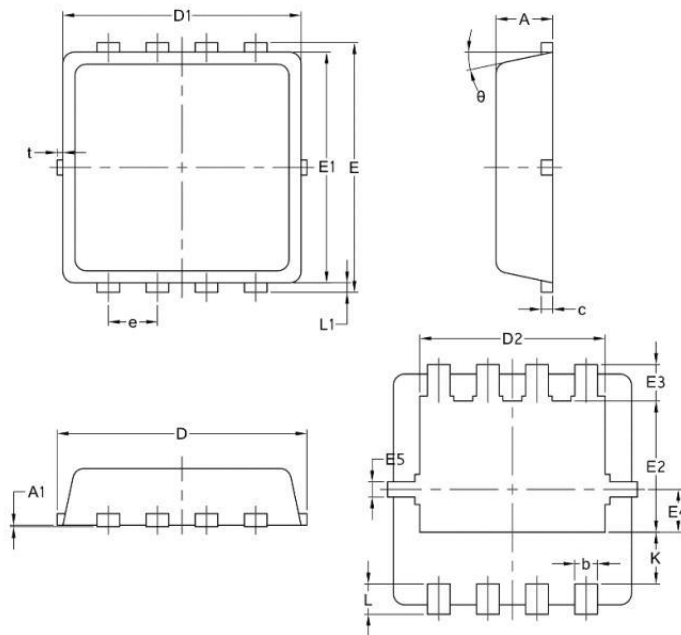
**Figure 8. Forward characteristic of body diode**



**Figure 10. Drain current**



**Figure 12. Max. transient thermal impedance**

**Package Mechanical Data-PDFN3\*3-8L-JQ Single**


| Symbol | Common |       |      |
|--------|--------|-------|------|
|        | mm     |       |      |
|        | Mim    | Nom   | Max  |
| A      | 0.70   | 0.75  | 0.85 |
| A1     | /      | /     | 0.05 |
| b      | 0.20   | 0.30  | 0.40 |
| c      | 0.10   | 0.152 | 0.25 |
| D      | 3.15   | 3.30  | 3.45 |
| D1     | 3.00   | 3.15  | 3.25 |
| D2     | 2.29   | 2.45  | 2.65 |
| E      | 3.15   | 3.30  | 3.45 |
| E1     | 2.90   | 3.05  | 3.20 |
| E2     | 1.54   | 1.74  | 1.94 |
| E3     | 0.28   | 0.48  | 0.65 |
| E4     | 0.37   | 0.57  | 0.77 |
| E5     | 0.10   | 0.20  | 0.30 |
| e      | 0.60   | 0.65  | 0.70 |
| K      | 0.59   | 0.69  | 0.89 |
| L      | 0.30   | 0.40  | 0.50 |
| L1     | 0.06   | 0.125 | 0.20 |
| t      | 0      | 0.075 | 0.13 |
| Φ      | 10     | 12    | 14   |

**Package Marking and Ordering Information**

| Product ID | Pack       | Marking | Qty(PCS) |
|------------|------------|---------|----------|
| TAPING     | PDFN3*3-8L |         | 5000     |