



## 30V N&P-Channel Trench Power MOSFET

### General Description

The SJP4606 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as  $\pm 4.5V$ . This device is suitable for use as a wide variety of applications.

### Features

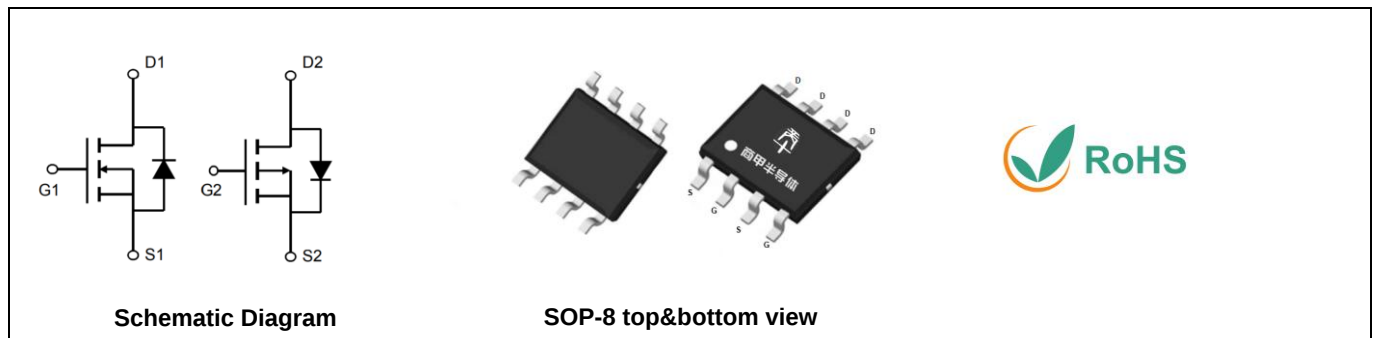
- Low Gate Charge
- High Power and current handing capability
- Lead free product is acquired

### Application

- Battery Protection
- Power Management
- Load Switch

### Key Performance Parametes

| Parameter         | Value | Value | Unit       |
|-------------------|-------|-------|------------|
| $V_{DS}$          | 30    | -30   | V          |
| $R_{DS(ON\_TYP)}$ | 12    | 30    | m $\Omega$ |
| $I_D$             | 11.2  | -7    | A          |
| $Q_G$             | 14    | 16    | nC         |



### Package Marking and Ordering Information

| Device/Ordering Code | Marking | Package | Packing | Reel Size | Tape width | Quantity |
|----------------------|---------|---------|---------|-----------|------------|----------|
| SJP4606              | SJP4606 | SOP-8   | Tape    | \         | \          | 4000 Pcs |

**Table 1. Absolute Maximum Ratings ( $T_A=25^{\circ}C$  unless otherwise noted)**

| Symbol           | Parameter                                         | N Limit    | P Limit  | Unit        |
|------------------|---------------------------------------------------|------------|----------|-------------|
| $V_{DS}$         | Drain-Source Voltage ( $V_{GS}=0V$ )              | 30         | -30      | V           |
| $V_{GS}$         | Gate-Source Voltage ( $V_{DS}=0V$ )               | $\pm 20$   | $\pm 20$ | V           |
| $I_D$            | Drain Current-Continuous( $T_A=25^{\circ}C$ )     | 11.2       | -7       | A           |
|                  | Drain Current-Continuous( $T_A=100^{\circ}C$ )    | 7.1        | -4.4     | A           |
| $I_{DM}$ (pluse) | Drain Current-Continuous@ Current-Pulsed (Note 1) | 44.8       | -28      | A           |
| $P_D$            | Maximum Power Dissipation( $T_A=25^{\circ}C$ )    | 3          | 2.9      | W           |
|                  | Maximum Power Dissipation( $T_A=100^{\circ}C$ )   | 1.2        | 1.2      | W           |
| $E_{AS}$         | Avalanche energy (Note 2)                         | 36         | 30       | mJ          |
| $T_J, T_{STG}$   | Operating Junction and Storage Temperature Range  | -55 To 150 |          | $^{\circ}C$ |

**Table 2. Thermal Characteristic**

| Symbol          | Parameter                                | N Max | P Max | Unit          |
|-----------------|------------------------------------------|-------|-------|---------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to- Ambient | 42.3  | 43    | $^{\circ}C/W$ |



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Table 3. N-Channel Electrical Characteristics ( $T_J=25^{\circ}\text{C}$  unless otherwise noted)

| Symbol                             | Parameter                                  | Conditions                                                                           | Min | Typ  | Max  | Unit |
|------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------|-----|------|------|------|
| On/Off States                      |                                            |                                                                                      |     |      |      |      |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage             | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                            | 30  |      |      | V    |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current            | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =25℃                        |     |      | 1    | μA   |
|                                    |                                            | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V T <sub>J</sub> =125℃                       |     |      | 100  | μA   |
| I <sub>GSS</sub>                   | Gate-Body Leakage Current                  | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                           |     |      | ±100 | nA   |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage                     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                             | 1.0 |      | 2.5  | V    |
| g <sub>FS</sub>                    | Forward Transconductance                   | V <sub>DS</sub> =5V, I <sub>D</sub> =3A                                              |     | 6.4  |      | S    |
| R <sub>DS(ON)</sub>                | Drain-Source On-State Resistance           | V <sub>GS</sub> =10V, I <sub>D</sub> =3A T <sub>J</sub> =25℃                         |     | 12   | 15   | mΩ   |
| R <sub>DS(ON)</sub>                | Drain-Source On-State Resistance           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A T <sub>J</sub> =25℃                        |     | 18.1 | 24.1 | mΩ   |
| Dynamic Characteristics            |                                            |                                                                                      |     |      |      |      |
| C <sub>iss</sub>                   | Input Capacitance                          | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1.0MHz                                  |     | 600  |      | pF   |
| C <sub>oss</sub>                   | Output Capacitance                         |                                                                                      |     | 75   |      | pF   |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance               |                                                                                      |     | 61   |      | pF   |
| R <sub>g</sub>                     | Gate resistance                            | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz                                   |     | 1.2  |      | Ω    |
| Switching Parameters               |                                            |                                                                                      |     |      |      |      |
| t <sub>d(on)</sub>                 | Turn-on Delay Time                         | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =5Ω, R <sub>GEN</sub> =3Ω |     | 4.5  |      | nS   |
| t <sub>r</sub>                     | Turn-on Rise Time                          |                                                                                      |     | 2.5  |      | nS   |
| t <sub>d(off)</sub>                | Turn-Off Delay Time                        |                                                                                      |     | 14.5 |      | nS   |
| t <sub>f</sub>                     | Turn-Off Fall Time                         |                                                                                      |     | 3.5  |      | nS   |
| Q <sub>g</sub>                     | Total Gate Charge                          | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =3A                       |     | 14   |      | nC   |
| Q <sub>gs</sub>                    | Gate-Source Charge                         |                                                                                      |     | 2    |      | nC   |
| Q <sub>gd</sub>                    | Gate-Drain Charge                          |                                                                                      |     | 3    |      | nC   |
| Source-Drain Diode Characteristics |                                            |                                                                                      |     |      |      |      |
| I <sub>SD</sub>                    | Source-Drain Current (Body Diode)          |                                                                                      |     |      | 11.2 | A    |
| V <sub>SD</sub>                    | Forward on Voltage <small>(Note 3)</small> | V <sub>GS</sub> =0V, I <sub>S</sub> =3A                                              |     |      | 1.2  | V    |
| t <sub>rr</sub>                    | Reverse Recovery Time                      | I <sub>F</sub> =3A, dI/dt=500A/μs                                                    |     | 10   |      | ns   |
| Q <sub>rr</sub>                    | Reverse Recovery Charge                    | I <sub>F</sub> =3A, dI/dt=500A/μs                                                    |     | 5    |      | nC   |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

Notes 2.EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, R_g=25\Omega, L=0.5\text{mH}$ .

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.



## N-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

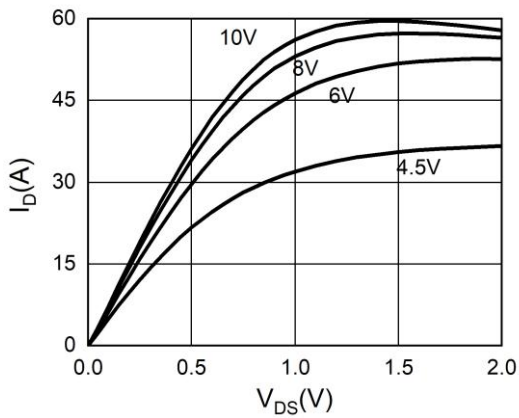


Figure 2. Transfer Characteristics

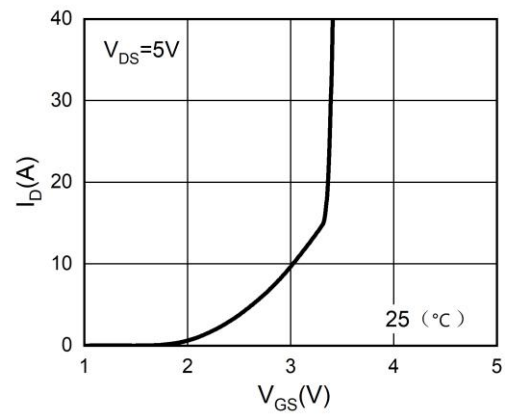


Figure 3. Power Dissipation

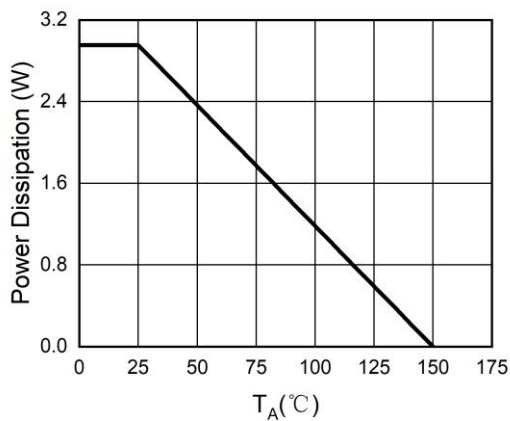
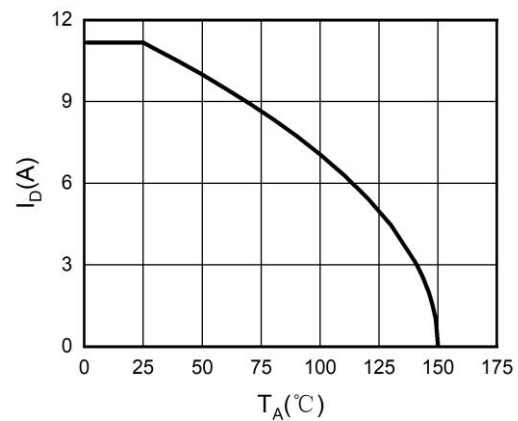
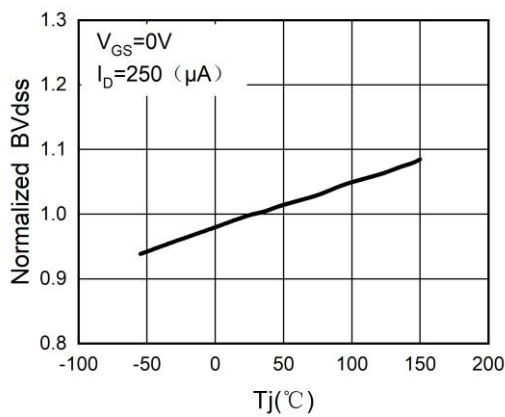
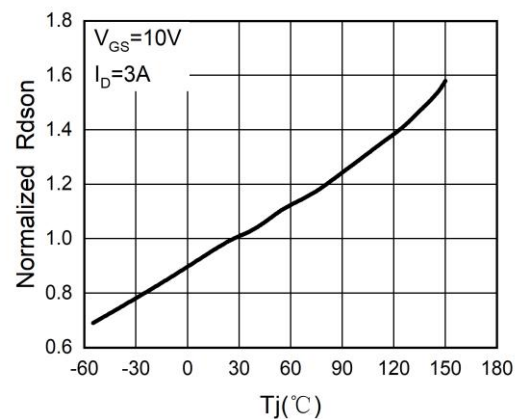


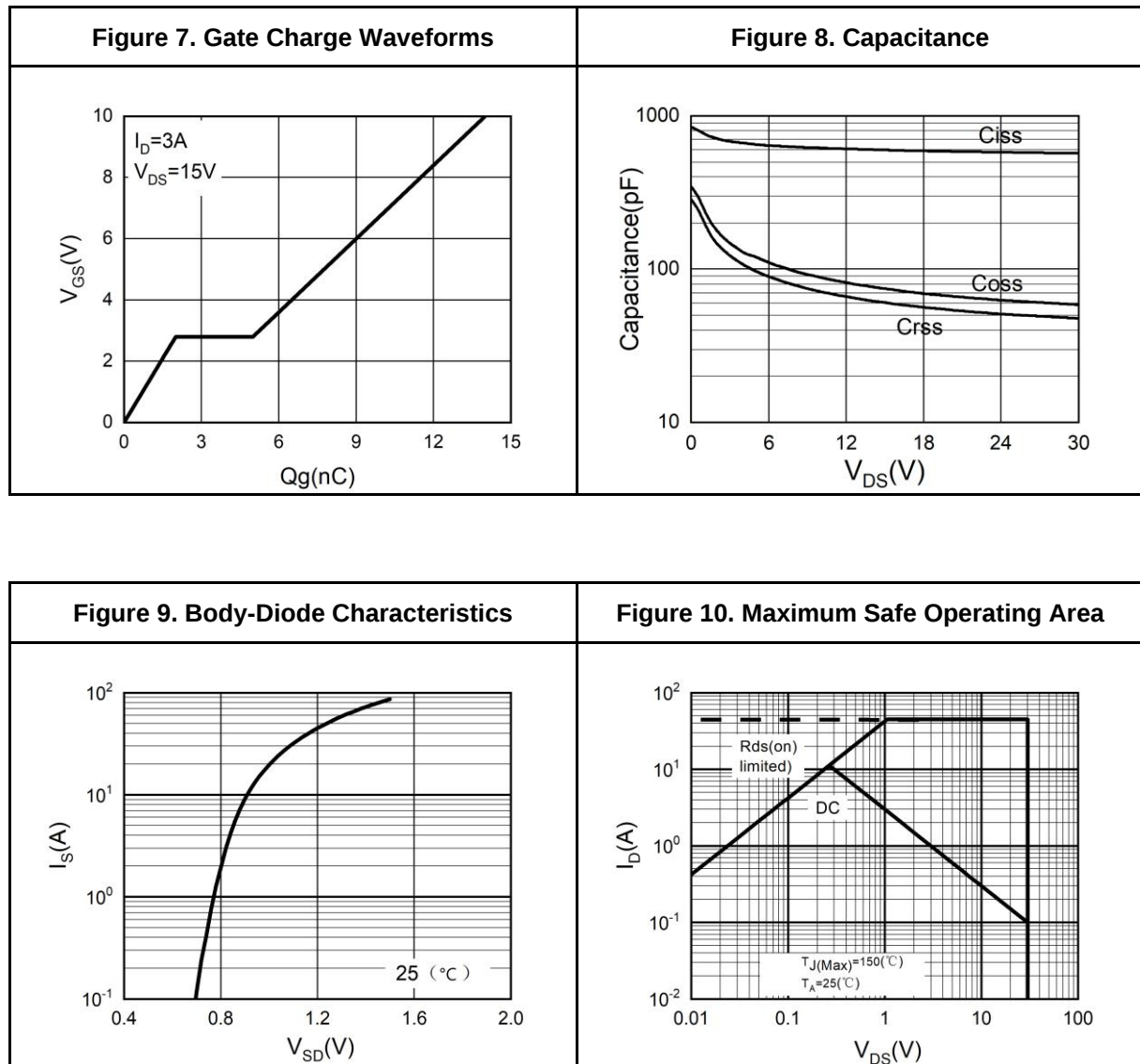
Figure 4. Drain Current

Figure 5.  $BV_{DSS}$  vs Junction TemperatureFigure 6.  $R_{DS(ON)}$  vs Junction Temperature



## 30V N&P-Channel Trench Power MOSFET

### N-Channel Typical Electrical And Thermal Characteristics (Curves)





## 30V N&P-Channel Trench Power MOSFET

**Table 4. P-Channel Electrical Characteristics ( $T_J=25^{\circ}\text{C}$  unless otherwise noted)**

| Symbol                             | Parameter                         | Conditions                                                                                  | Min | Typ  | Max  | Unit |
|------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------|-----|------|------|------|
| On/Off States                      |                                   |                                                                                             |     |      |      |      |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage    | V <sub>GS</sub> =0V I <sub>D</sub> =-250μA                                                  | -30 |      |      | V    |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current   | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V T <sub>J</sub> =25℃                              |     |      | -1   | μA   |
|                                    |                                   | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V T <sub>J</sub> =125℃                             |     |      | -100 | μA   |
| I <sub>GSS</sub>                   | Gate-Body Leakage Current         | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                  |     |      | ±100 | nA   |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage            | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                   | -1  |      | -2.5 | V    |
| g <sub>FS</sub>                    | Forward Transconductance          | V <sub>DS</sub> =-5V, I <sub>D</sub> =-2A                                                   |     | 4.8  |      | S    |
| R <sub>DS(ON)</sub>                | Drain-Source On-State Resistance  | V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A T <sub>J</sub> =25℃                              |     | 30   | 37.5 | mΩ   |
| R <sub>DS(ON)</sub>                | Drain-Source On-State Resistance  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.5A T <sub>J</sub> =25℃                           |     | 37.9 | 50.4 | mΩ   |
| Dynamic Characteristics            |                                   |                                                                                             |     |      |      |      |
| C <sub>iss</sub>                   | Input Capacitance                 | V <sub>DS</sub> =-15V,V <sub>GS</sub> =0V,<br>f=1.0MHz                                      |     | 617  |      | pF   |
| C <sub>oss</sub>                   | Output Capacitance                |                                                                                             |     | 79   |      | pF   |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance      |                                                                                             |     | 63   |      | pF   |
| R <sub>g</sub>                     | Gate resistance                   | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1.0MHz                                          |     | 6.5  |      | Ω    |
| Switching Parameters               |                                   |                                                                                             |     |      |      |      |
| t <sub>d(on)</sub>                 | Turn-on Delay Time                | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V,<br>R <sub>L</sub> =7.5Ω, R <sub>GEN</sub> =3Ω |     | 7.5  |      | nS   |
| t <sub>r</sub>                     | Turn-on Rise Time                 |                                                                                             |     | 5.5  |      | nS   |
| t <sub>d(off)</sub>                | Turn-Off Delay Time               |                                                                                             |     | 19   |      | nS   |
| t <sub>f</sub>                     | Turn-Off Fall Time                |                                                                                             |     | 7    |      | nS   |
| Q <sub>g</sub>                     | Total Gate Charge                 | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-15V, I <sub>D</sub> =-2A                           |     | 16   |      | nC   |
| Q <sub>gs</sub>                    | Gate-Source Charge                |                                                                                             |     | 2    |      | nC   |
| Q <sub>gd</sub>                    | Gate-Drain Charge                 |                                                                                             |     | 4    |      | nC   |
| Source-Drain Diode Characteristics |                                   |                                                                                             |     |      |      |      |
| I <sub>SD</sub>                    | Source-Drain Current (Body Diode) |                                                                                             |     |      | -7   | A    |
| V <sub>SD</sub>                    | Forward on Voltage (Note 3)       | V <sub>GS</sub> =0V, I <sub>S</sub> =-2A                                                    |     |      | -1.2 | V    |
| t <sub>rr</sub>                    | Reverse Recovery Time             | I <sub>F</sub> =3A, dI/dt=500A/μs                                                           |     | 15   |      | ns   |
| Q <sub>rr</sub>                    | Reverse Recovery Charge           | I <sub>F</sub> =3A, dI/dt=500A/μs                                                           |     | 10   |      | nC   |

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature.

Notes 2.EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=-30V, V_G=-10V, R_g=25\Omega, L=0.5\text{mH}$ .

Notes 3.Repetitive Rating: Pulse width limited by maximum junction temperature.



## P-Channel Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

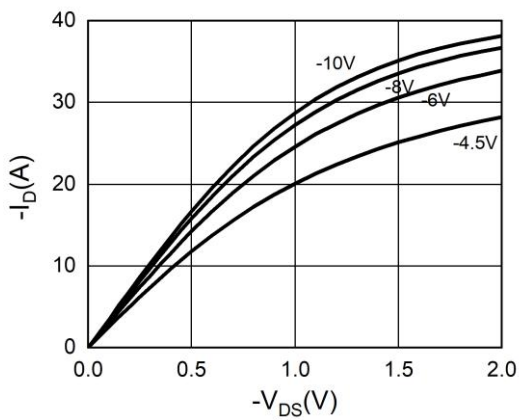


Figure 2. Transfer Characteristics

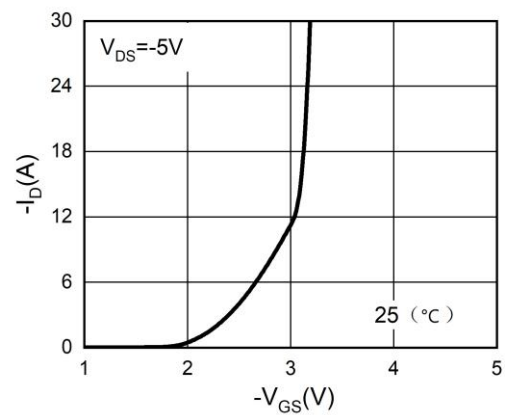


Figure 3. Power Dissipation

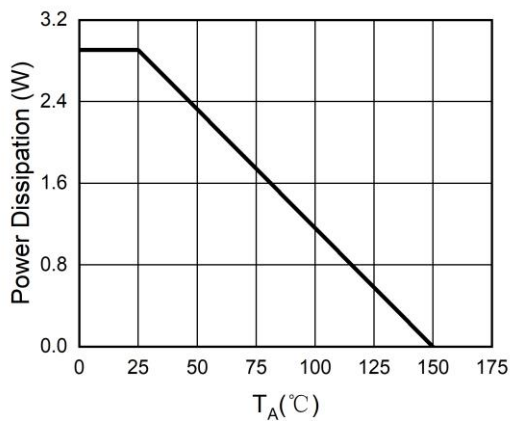
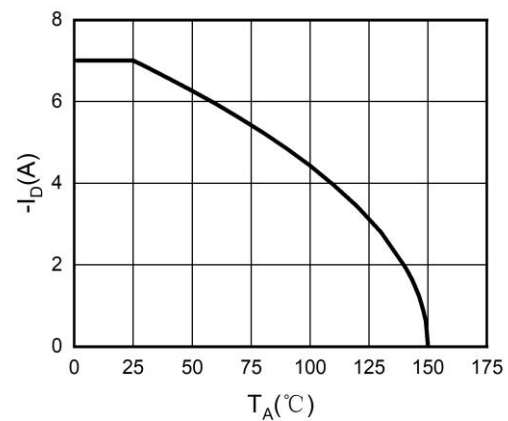
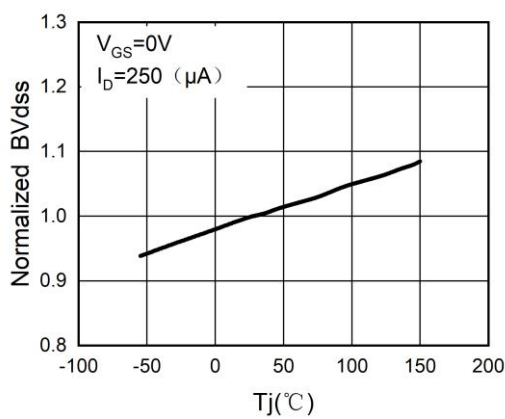
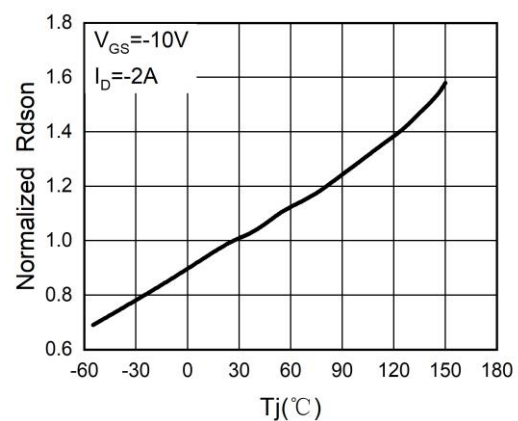


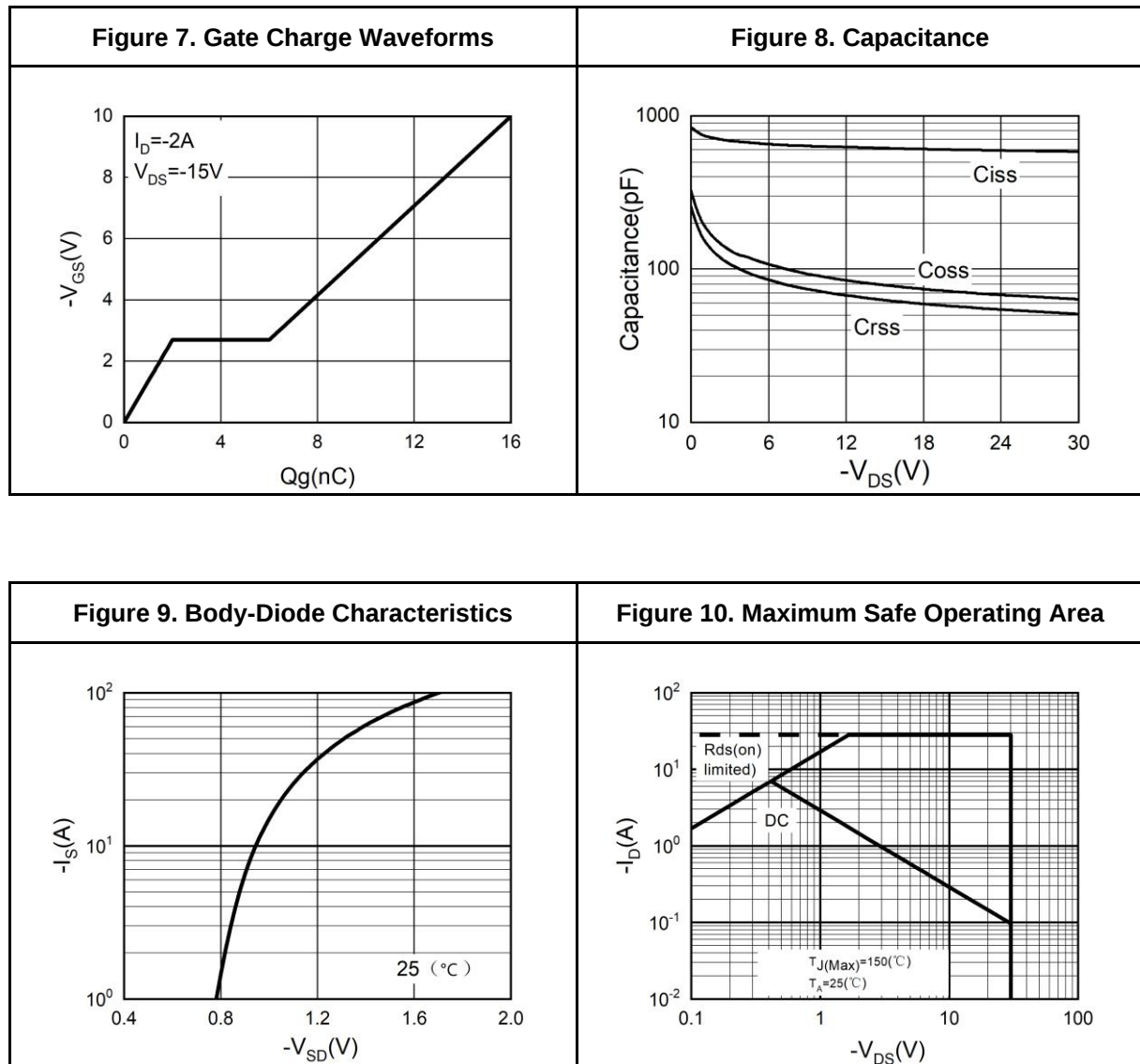
Figure 4. Drain Current

Figure 5.  $BV_{DSS}$  vs Junction TemperatureFigure 6.  $R_{DS(ON)}$  vs Junction Temperature



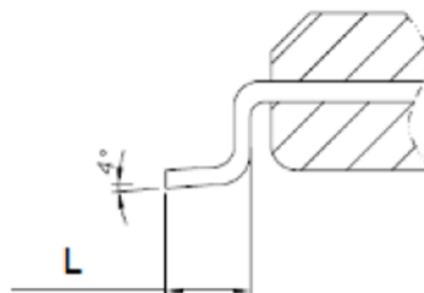
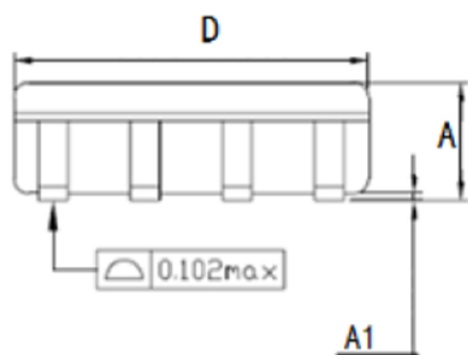
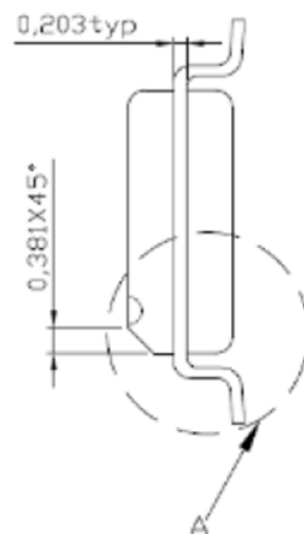
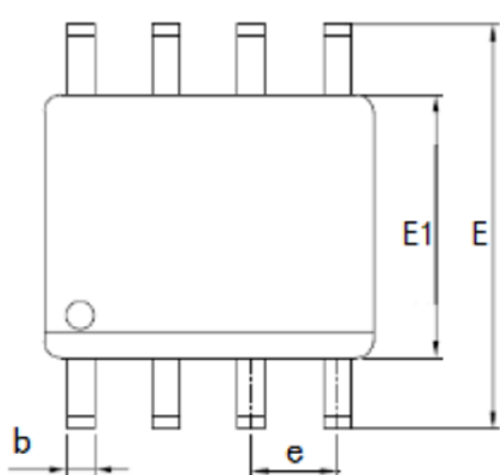
## 30V N&P-Channel Trench Power MOSFET

### P-Channel Typical Electrical And Thermal Characteristics (Curves)





## SOP-8 Package Information



A 局部放大

| Symbol | Dimensions In Millimeters |       |       |
|--------|---------------------------|-------|-------|
|        | Min.                      | Nom.  | Max   |
| A      | 1.35                      | 1.55  | 1.75  |
| A1     | 0.1                       | 0.15  | 0.2   |
| b      | 0.346                     | 0.406 | 0.466 |
| D      | 4.8                       | 4.89  | 4.98  |
| E      | 5.75                      | 6.00  | 6.25  |
| E1     | 3.81                      | 3.90  | 3.99  |
| e      | 1.27TYP                   |       |       |
| L      | 0.406                     | 0.838 | 1.27  |



## 30V N&P-Channel Trench Power MOSFET

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### Attention

This product described in this document can not be used in life support devices or systems, aircraft's control systems, and other applications whose failure can be reasonably expected to result in serious physical and/or material damage, apart from that when an application agreement is signed between customer and Wuxi Shangjia Semiconductor.

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