

英飞凌MOSFET功率晶体管

英飞凌IPD130N10F2S StrongIRFET™ 2 100 V 功率晶体管

特性

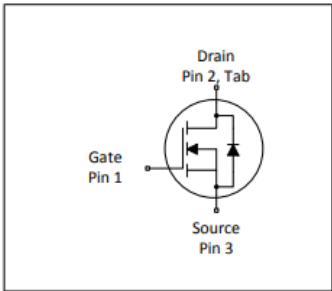
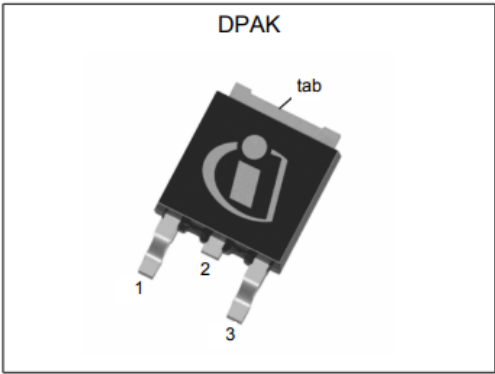
- 针对各种应用进行了优化
- N沟道，正常电平
- 100%雪崩测试
- 无铅镀层；符合RoHS标准
- 符合 IEC61249-2-21 标准的无卤素

产品验证

符合 JEDEC 标准。

表 1 主要性能参数

| Parameter        | Value | Unit |
|------------------|-------|------|
| $V_{DS}$         | 100   | V    |
| $R_{DS(on),max}$ | 13.0  | mΩ   |
| $I_D$            | 52    | A    |
| $Q_{oss}$        | 26    | nC   |
| $Q_G$            | 18.6  | nC   |



RoHS

| Type / Ordering Code | Package    | Marking  | Related Links |
|----------------------|------------|----------|---------------|
| IPD130N10NF2S        | PG-TO252-3 | 130N10NS | -             |

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## 1 最大额定值

除非另有规定,  $T_A = 25\text{ °C}$

表 2 最大额定值

| Parameter                                    | Symbol            | Values |      |                      | Unit | Note / Test Condition                                                                                                                                                                                              |
|----------------------------------------------|-------------------|--------|------|----------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              |                   | Min.   | Typ. | Max.                 |      |                                                                                                                                                                                                                    |
| Continuous drain current <sup>1)</sup>       | $I_D$             | -      | -    | 52<br>37<br>32<br>11 | A    | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=6\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=50\text{ °C/W}^{2)}$ |
| Pulsed drain current <sup>3)</sup>           | $I_{D,pulse}$     | -      | -    | 208                  | A    | $T_C=25\text{ °C}$                                                                                                                                                                                                 |
| Avalanche energy, single pulse <sup>4)</sup> | $E_{AS}$          | -      | -    | 31                   | mJ   | $I_D=25\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                                                                                                                      |
| Gate source voltage                          | $V_{GS}$          | -20    | -    | 20                   | V    | -                                                                                                                                                                                                                  |
| Power dissipation                            | $P_{tot}$         | -      | -    | 71<br>3.0            | W    | $T_C=25\text{ °C}$<br>$T_A=25\text{ °C}$ , $R_{thJA}=50\text{ °C/W}^{2)}$                                                                                                                                          |
| Operating and storage temperature            | $T_j$ , $T_{stg}$ | -55    | -    | 175                  | °C   | -                                                                                                                                                                                                                  |

## 2 热特性

表 3 热特性

| Parameter                                                                            | Symbol     | Values |      |      | Unit | Note / Test Condition |
|--------------------------------------------------------------------------------------|------------|--------|------|------|------|-----------------------|
|                                                                                      |            | Min.   | Typ. | Max. |      |                       |
| Thermal resistance, junction - case                                                  | $R_{thJC}$ | -      | -    | 2.1  | °C/W | -                     |
| Thermal resistance, junction - ambient, 6 cm <sup>2</sup> cooling area <sup>2)</sup> | $R_{thJA}$ | -      | -    | 50   | °C/W | -                     |
| Thermal resistance, junction - ambient, minimal footprint                            | $R_{thJA}$ | -      | -    | 75   | °C/W | -                     |

<sup>1)</sup>额定值指产品仅具有数据表指定的绝对最大值, 保持外壳温度符合规定要求。其他外壳温度请参见图 2。需要根据实际环境条件降低额定值。

<sup>2)</sup>器件置于 40 mm x 40 mm x 1.5 mm 环氧树脂印刷电路板 FR4 上, 配有 6 cm<sup>2</sup> (一层, 70 μm 厚) 铜面积用于漏极连接。印刷电路板在静止空气中垂直放置。

<sup>3)</sup>详细信息请参见图 3

<sup>4)</sup>详细信息请参见图 13

### 3 电气特性

除非另有规定,  $T_j = 25\text{ }^{\circ}\text{C}$

表 4 静态特性

| Parameter                        | Symbol        | Values |              |              | Unit             | Note / Test Condition                                                                                                                                             |
|----------------------------------|---------------|--------|--------------|--------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |               | Min.   | Typ.         | Max.         |                  |                                                                                                                                                                   |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | 100    | -            | -            | V                | $V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$                                                                                                                           |
| Gate threshold voltage           | $V_{GS(th)}$  | 2.2    | 3.0          | 3.8          | V                | $V_{DS}=V_{GS}$ , $I_D=30\text{ }\mu\text{A}$                                                                                                                     |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | 0.1<br>10    | 1<br>100     | $\mu\text{A}$    | $V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ }^{\circ}\text{C}$<br>$V_{DS}=100\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ }^{\circ}\text{C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | 10           | 100          | nA               | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$                                                                                                                        |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 11.2<br>13.7 | 13.0<br>16.8 | $\text{m}\Omega$ | $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$<br>$V_{GS}=6\text{ V}$ , $I_D=15\text{ A}$                                                                               |
| Gate resistance                  | $R_G$         | -      | 0.9          | -            | $\Omega$         | -                                                                                                                                                                 |
| Transconductance <sup>1)</sup>   | $g_{fs}$      | 25     | -            | -            | S                | $ V_{DS}  \geq 2 I_D /R_{DS(on)max}$ , $I_D=30\text{ A}$                                                                                                          |

表 5 动态特性

| Parameter                    | Symbol       | Values |      |      | Unit | Note / Test Condition                                                                              |
|------------------------------|--------------|--------|------|------|------|----------------------------------------------------------------------------------------------------|
|                              |              | Min.   | Typ. | Max. |      |                                                                                                    |
| Input capacitance            | $C_{iss}$    | -      | 1300 | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$                                      |
| Output capacitance           | $C_{oss}$    | -      | 210  | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$                                      |
| Reverse transfer capacitance | $C_{rss}$    | -      | 10   | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$                                      |
| Turn-on delay time           | $t_{d(on)}$  | -      | 9    | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time                    | $t_r$        | -      | 15   | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time          | $t_{d(off)}$ | -      | 13   | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time                    | $t_f$        | -      | 4    | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |

表 6 栅极电荷特性<sup>2)</sup>

| Parameter                       | Symbol        | Values |      |      | Unit | Note / Test Condition                                                       |
|---------------------------------|---------------|--------|------|------|------|-----------------------------------------------------------------------------|
|                                 |               | Min.   | Typ. | Max. |      |                                                                             |
| Gate to source charge           | $Q_{gs}$      | -      | 6.3  | -    | nC   | $V_{DD}=50\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge at threshold        | $Q_{g(th)}$   | -      | 3.9  | -    | nC   | $V_{DD}=50\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate to drain charge            | $Q_{gd}$      | -      | 4.0  | -    | nC   | $V_{DD}=50\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge                | $Q_{sw}$      | -      | 6.5  | -    | nC   | $V_{DD}=50\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total <sup>1)</sup> | $Q_g$         | -      | 18.6 | 28   | nC   | $V_{DD}=50\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate plateau voltage            | $V_{plateau}$ | -      | 4.9  | -    | V    | $V_{DD}=50\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge                   | $Q_{oss}$     | -      | 26   | -    | nC   | $V_{DS}=50\text{ V}$ , $V_{GS}=0\text{ V}$                                  |

<sup>1)</sup>由设计标定, 不受制于生产测试。

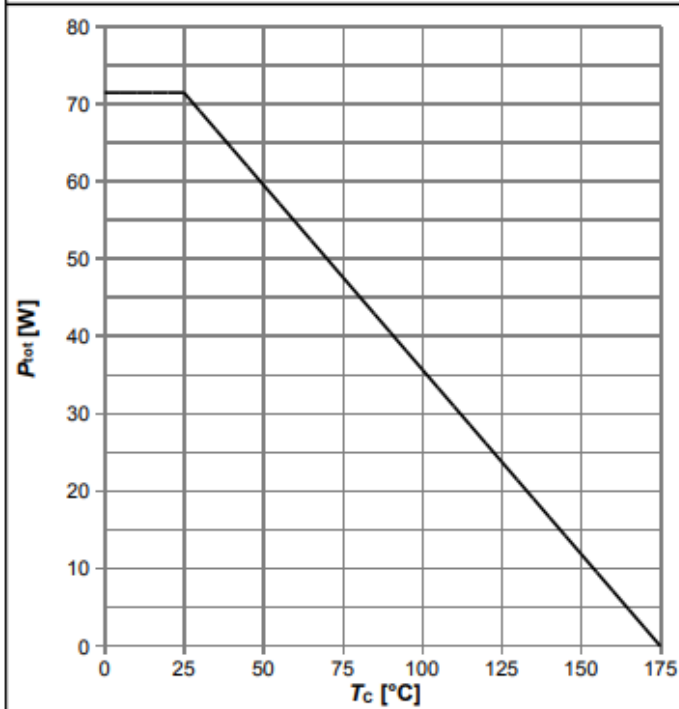
<sup>2)</sup>参数定义 请参见“栅极充电波形”

表 7 反向二极管

| Parameter                        | Symbol        | Values |      |      | Unit | Note / Test Condition                                                      |
|----------------------------------|---------------|--------|------|------|------|----------------------------------------------------------------------------|
|                                  |               | Min.   | Typ. | Max. |      |                                                                            |
| Diode continuous forward current | $I_S$         | -      | -    | 49   | A    | $T_C=25\text{ °C}$                                                         |
| Diode pulse current              | $I_{S,pulse}$ | -      | -    | 208  | A    | $T_C=25\text{ °C}$                                                         |
| Diode forward voltage            | $V_{SD}$      | -      | 0.92 | 1.2  | V    | $V_{GS}=0\text{ V}$ , $I_F=30\text{ A}$ , $T_J=25\text{ °C}$               |
| Reverse recovery time            | $t_{rr}$      | -      | 26   | -    | ns   | $V_R=50\text{ V}$ , $I_F=30\text{ A}$ , $di_F/dt=500\text{ A}/\mu\text{s}$ |
| Reverse recovery charge          | $Q_{rr}$      | -      | 135  | -    | nC   | $V_R=50\text{ V}$ , $I_F=30\text{ A}$ , $di_F/dt=500\text{ A}/\mu\text{s}$ |

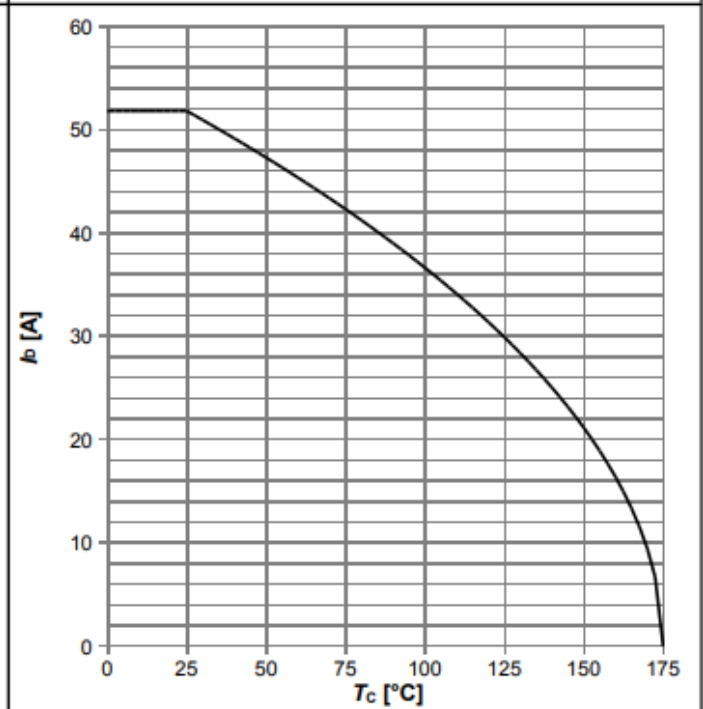
## 4 电气特性图

Diagram 1: Power dissipation



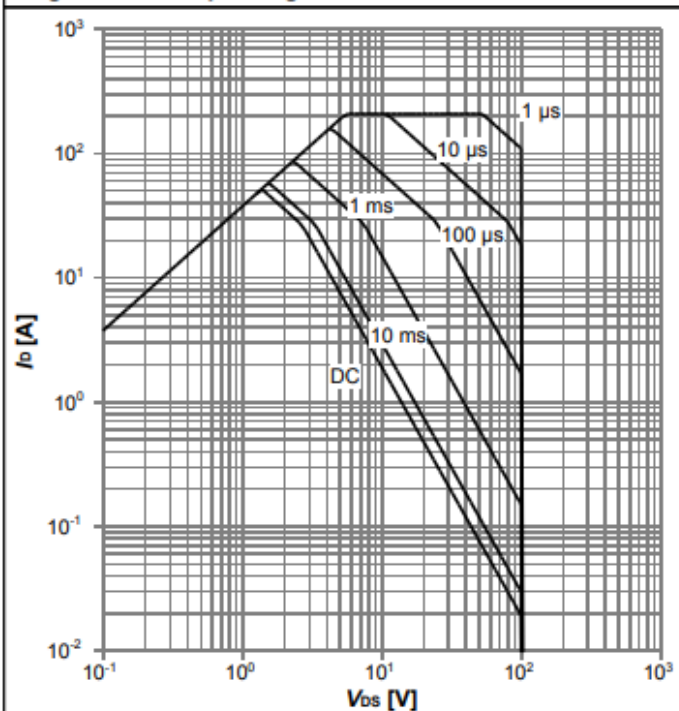
$$P_{tot}=f(T_c)$$

Diagram 2: Drain current



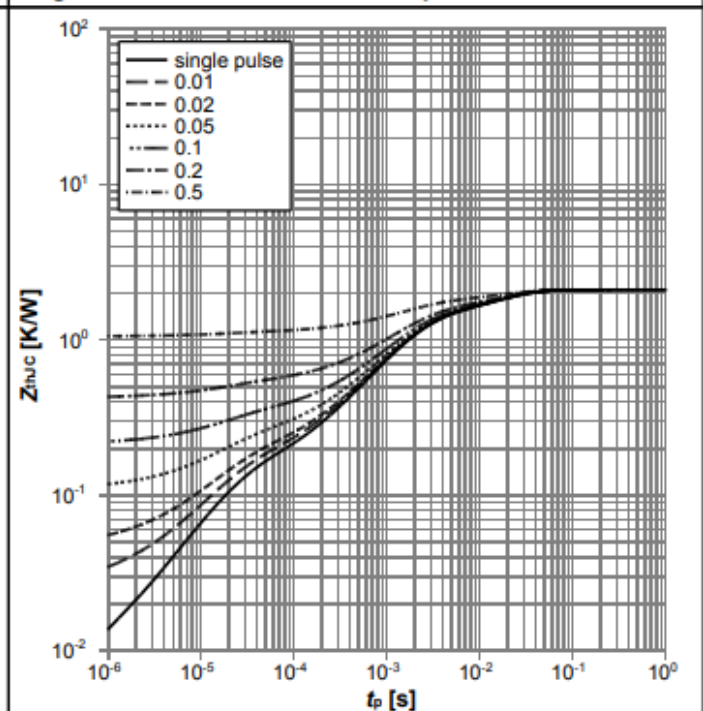
$$I_D=f(T_c); V_{GS} \geq 10 \text{ V}$$

Diagram 3: Safe operating area



$$I_D=f(V_{DS}); T_c=25^\circ\text{C}; D=0; \text{parameter: } t_p$$

Diagram 4: Max. transient thermal impedance



$$Z_{thJC}=f(t_p); \text{parameter: } D=t_p/T$$

Diagram 5: Typ. output characteristics

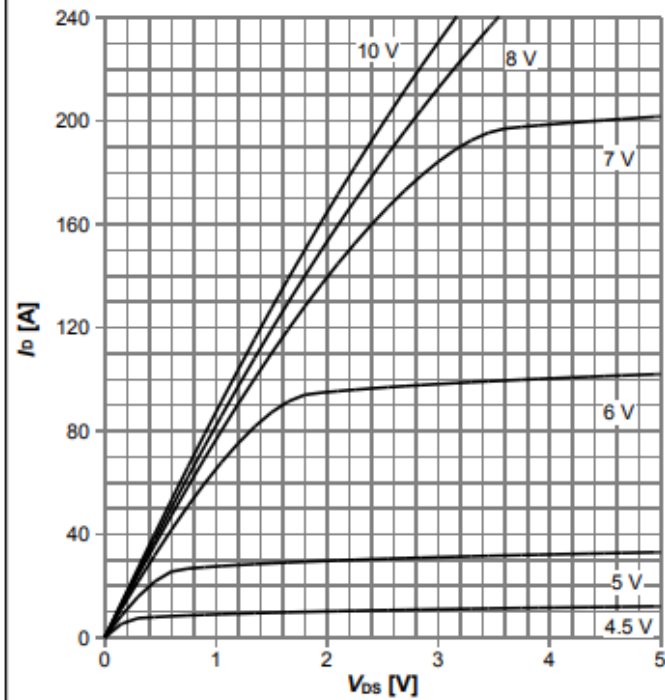


Diagram 6: Typ. drain-source on resistance

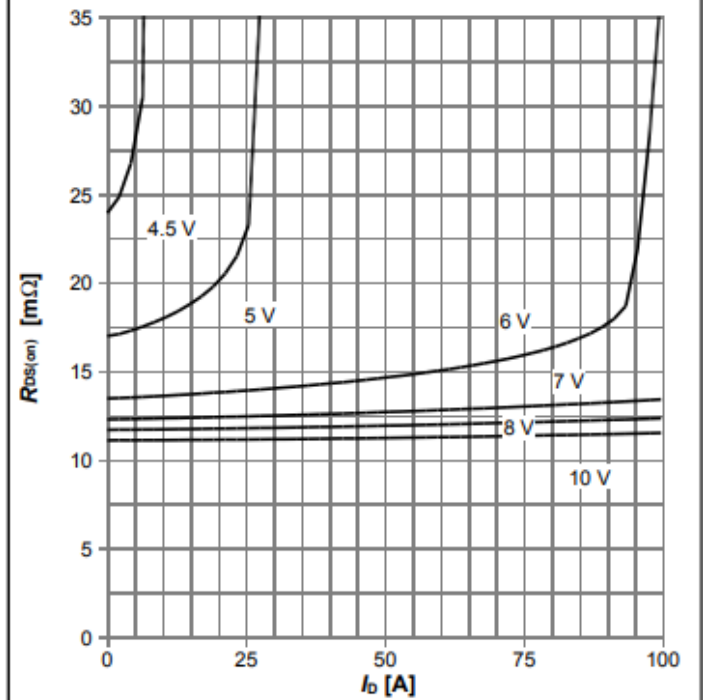


Diagram 7: Typ. transfer characteristics

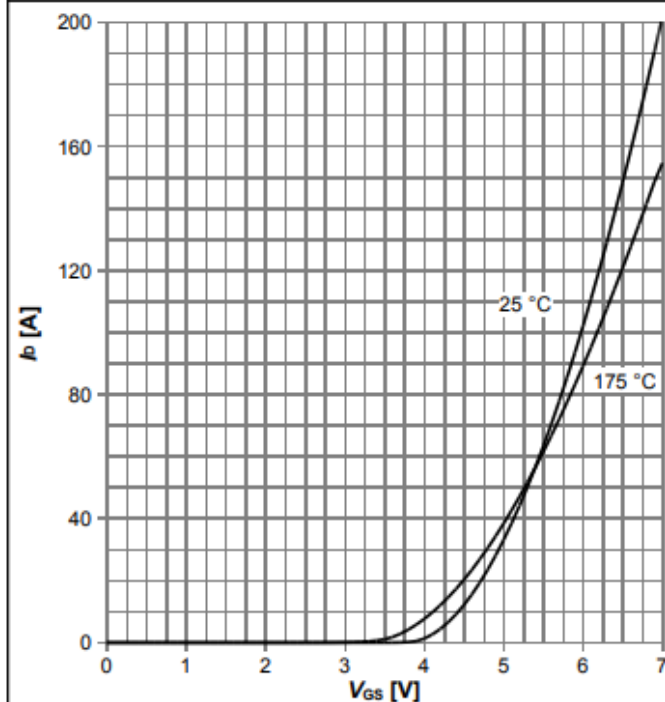


Diagram 8: Typ. drain-source on resistance

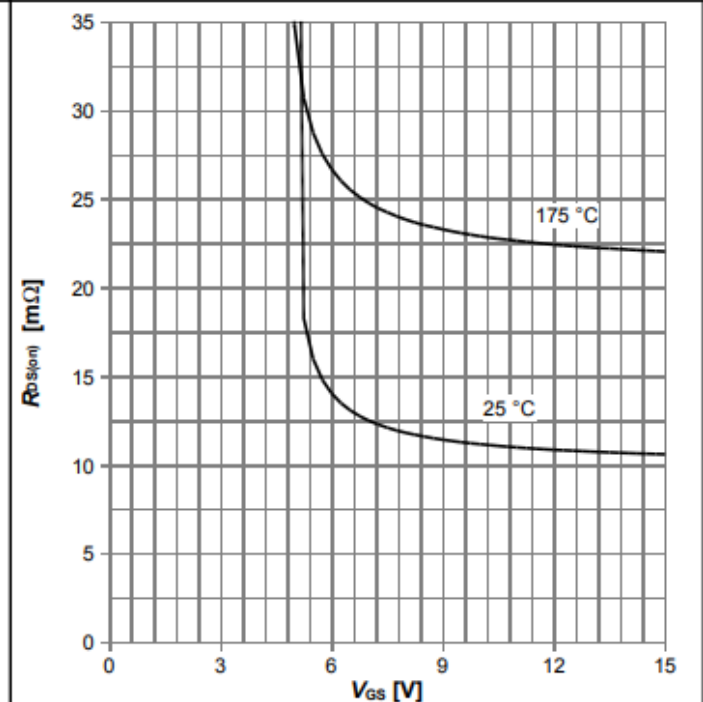
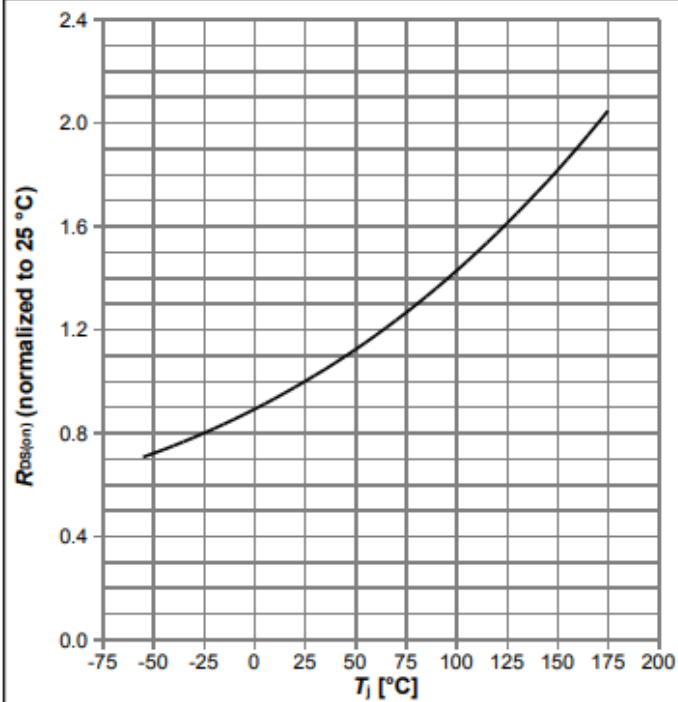
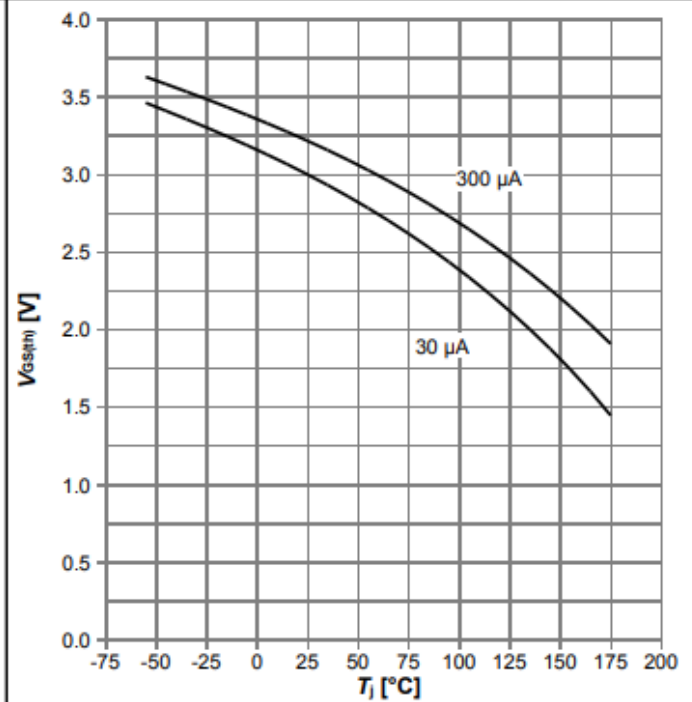


Diagram 9: Normalized drain-source on resistance



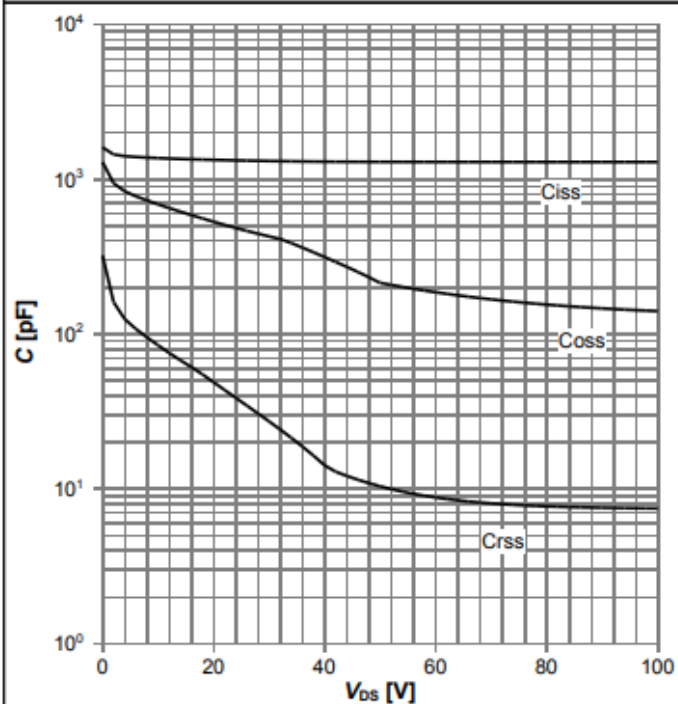
$$R_{DS(on)} = f(T_j), I_D = 30 \text{ A}, V_{GS} = 10 \text{ V}$$

Diagram 10: Typ. gate threshold voltage



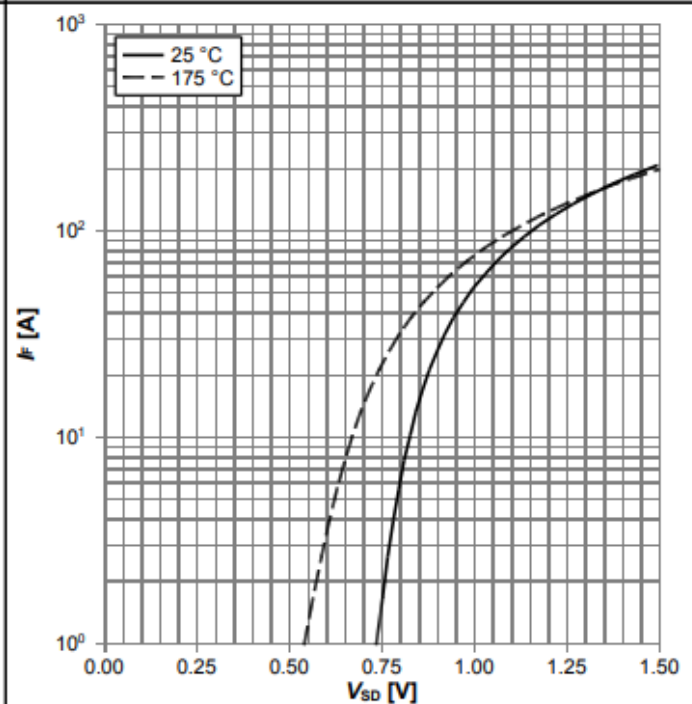
$$V_{GS(th)} = f(T_j), V_{GS} = V_{DS}; \text{ parameter: } I_D$$

Diagram 11: Typ. capacitances



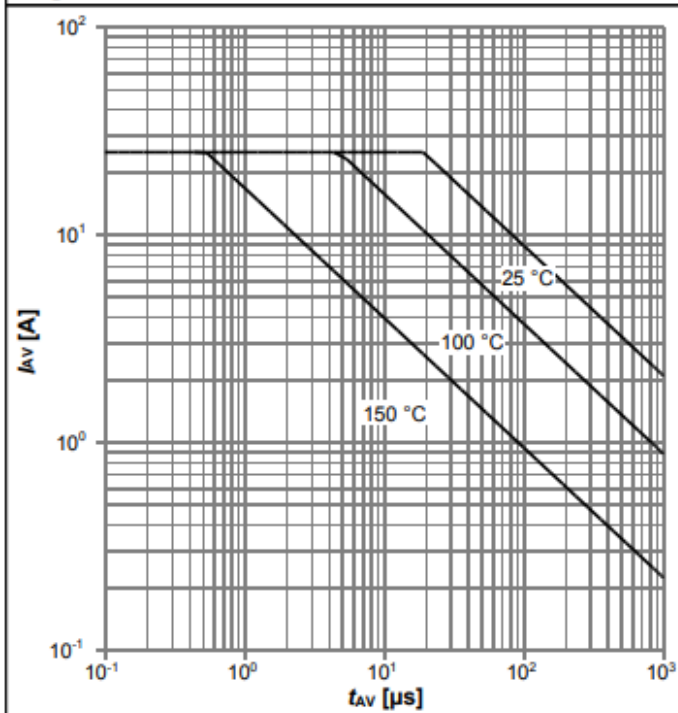
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$

Diagram 12: Typ. forward characteristics of reverse diode



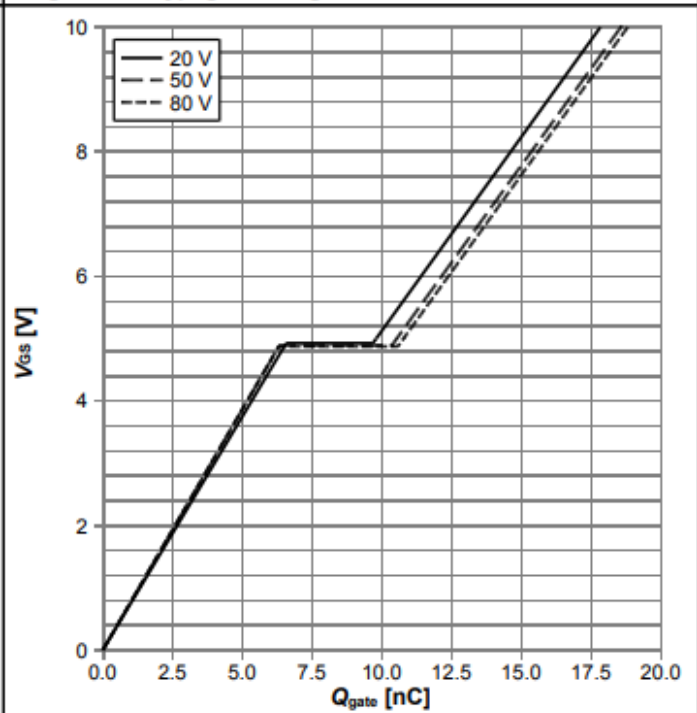
$$I_R = f(V_{SD}); \text{ parameter: } T_j$$

Diagram 13: Avalanche characteristics



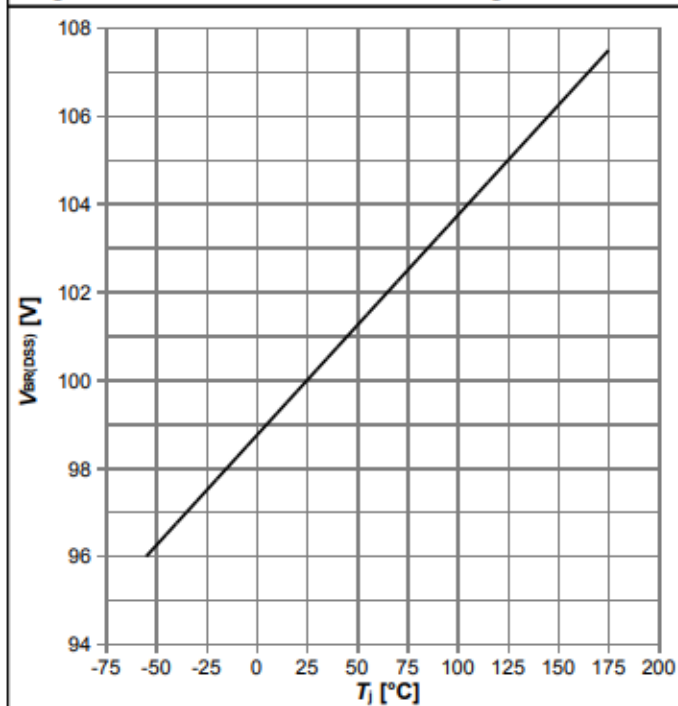
$I_{AS}=f(t_{AV})$ ;  $R_{GS}=25\ \Omega$ ; parameter:  $T_{J,start}$

Diagram 14: Typ. gate charge



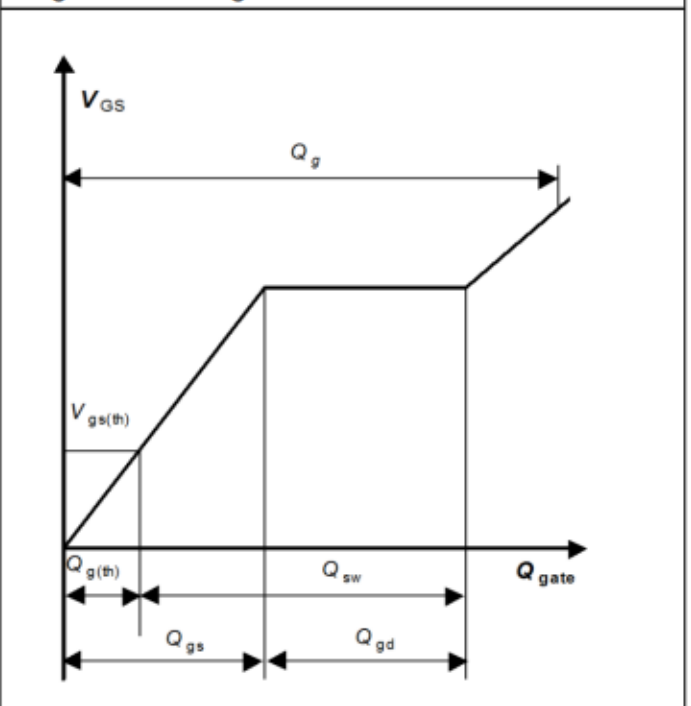
$V_{GS}=f(Q_{gate})$ ,  $I_D=30\text{ A}$  pulsed,  $T_J=25\text{ °C}$ ; parameter:  $V_{DD}$

Diagram 15: Drain-source breakdown voltage

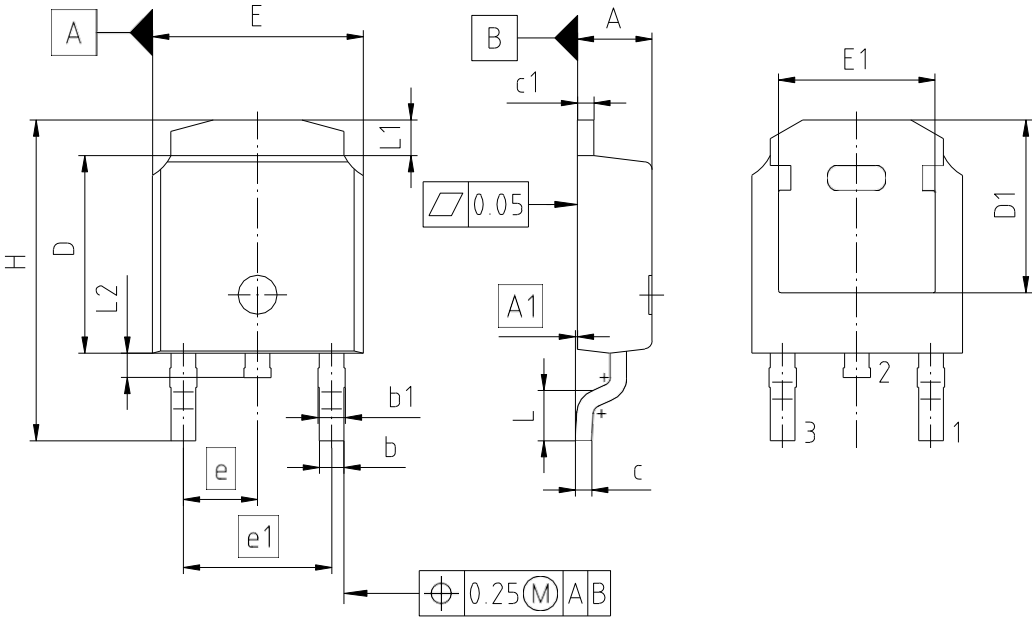


$V_{BR(DSS)}=f(T_J)$ ;  $I_D=1\text{ mA}$

Diagram Gate charge waveforms



5 封装外形



| PACKAGE - GROUP <b>PG-T0252-3-U01</b> |             |       |
|---------------------------------------|-------------|-------|
| NUMBER:                               |             |       |
| DIMENSIONS                            | MILLIMETERS |       |
|                                       | MIN.        | MAX.  |
| <b>A</b>                              | 2.18        | 2.39  |
| <b>A1</b>                             | 0.00        | 0.13  |
| <b>b</b>                              | 0.64        | 0.89  |
| <b>b1</b>                             | 0.76        | 1.14  |
| <b>c</b>                              | 0.46        | 0.61  |
| <b>c1</b>                             | 0.40        | 0.89  |
| <b>D</b>                              | 5.97        | 6.22  |
| <b>D1</b>                             | 5.21        | ---   |
| <b>E</b>                              | 6.35        | 6.73  |
| <b>E1</b>                             | 4.32        | ---   |
| <b>e</b>                              | 2.29        |       |
| <b>e1</b>                             | 4.58        |       |
| <b>N</b>                              | 3           |       |
| <b>H</b>                              | 9.40        | 10.41 |
| <b>L</b>                              | 1.40        | 1.78  |
| <b>L1</b>                             | 0.89        | 1.27  |
| <b>L2</b>                             | 0.50        | 1.02  |

图 1 PG-T0252-3 外形图，尺寸单位为毫米

## 修订记录

IPD130N10NF2S

**Revision: 2022-10-10, Rev. 2.2**

### 历史修订版本

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 2.0      | 2022-02-08 | Release of final version                     |
| 2.1      | 2022-05-24 | Update Diagram 15                            |
| 2.2      | 2022-10-10 | Update package outline drawing               |

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