

英飞凌MOSFET功率晶体管

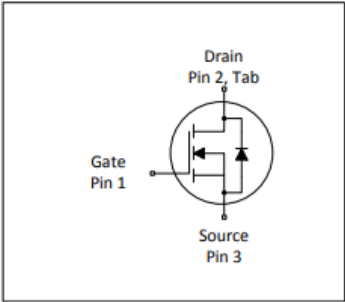
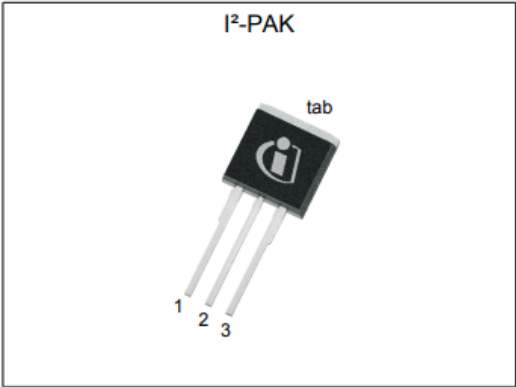
英飞凌 IPI076N15N5 OptiMOS™5 150 V 功率晶体管

特性

- 出色的栅极电荷  $\times R_{DS(on)}$  乘积 (FOM)
- 极低的导通电阻  $R_{DS(on)}$
- 极低的反向恢复电荷 ( $Q_{rr}$ )
- 工作温度 175°C
- 无铅镀层；符合RoHS标准
- 符合 JEDEC <sup>1)</sup> 的目标应用要求
- 非常适合高频开关和同步整流
- 符合 IEC61249-2-21 标准的无卤素

表 1 主要性能参数

| Parameter        | Value | Unit |
|------------------|-------|------|
| $V_{DS}$         | 150   | V    |
| $R_{DS(on),max}$ | 7.6   | mΩ   |
| $I_D$            | 112   | A    |
| $Q_{rr}$         | 96    | nC   |



| Type / Ordering Code | Package    | Marking  | Related Links |
|----------------------|------------|----------|---------------|
| IPI076N15N5          | PG-TO262-3 | 076N15N5 | -             |

<sup>1)</sup> J-STD20 和 JESD22

本数据手册的原文使用英文撰写。为方便起见，英飞凌提供了译文；由于翻译过程中可能使用了自动化工具，英飞凌不保证译文的准确性。为确认准确性，请务必访问 [infineon.com](http://infineon.com) 参考最新的英文版本（控制文档）。



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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                     | $I_D$          | -      | -    | 112<br>79 | A    | $T_C = 25\text{ °C}$<br>$T_C = 100\text{ °C}$      |
| Pulsed drain current <sup>1)</sup>           | $I_{D,pulse}$  | -      | -    | 448       | A    | $T_C = 25\text{ °C}$                               |
| Avalanche energy, single pulse <sup>2)</sup> | $E_{AS}$       | -      | -    | 130       | mJ   | $I_D = 100\text{ A}$ , $R_{GS} = 25\text{ }\Omega$ |
| Gate source voltage                          | $V_{GS}$       | -20    | -    | 20        | V    | -                                                  |
| Power dissipation                            | $P_{tot}$      | -      | -    | 214       | W    | $T_C = 25\text{ °C}$                               |
| Operating and storage temperature            | $T_j, T_{stg}$ | -55    | -    | 175       | °C   | IEC climatic category; DIN<br>IEC 68-1: 55/175/56  |

## 2 热特性

表 3 热特性

| Parameter                                                 | Symbol     | Values |      |      | Unit | Note / Test Condition |
|-----------------------------------------------------------|------------|--------|------|------|------|-----------------------|
|                                                           |            | Min.   | Typ. | Max. |      |                       |
| Thermal resistance, junction - case                       | $R_{thJC}$ | -      | 0.4  | 0.7  | K/W  | -                     |
| Thermal resistance, junction - ambient, minimal footprint | $R_{thJA}$ | -      | -    | 62   | K/W  | -                     |

## 3 电气特性

表 4 静态特性

| Parameter                        | Symbol        | Values |            |            | Unit          | Note / Test Condition                                                                                                                             |
|----------------------------------|---------------|--------|------------|------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |               | Min.   | Typ.       | Max.       |               |                                                                                                                                                   |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | 150    | -          | -          | V             | $V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$                                                                                                       |
| Gate threshold voltage           | $V_{GS(th)}$  | 3.0    | 3.8        | 4.6        | V             | $V_{DS} = V_{GS}$ , $I_D = 160\text{ }\mu\text{A}$                                                                                                |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | 0.1<br>10  | 1<br>100   | $\mu\text{A}$ | $V_{DS} = 120\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ °C}$<br>$V_{DS} = 120\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 125\text{ °C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | 1          | 100        | nA            | $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$                                                                                                    |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 5.9<br>6.4 | 7.6<br>8.4 | m $\Omega$    | $V_{GS} = 10\text{ V}$ , $I_D = 56\text{ A}$<br>$V_{GS} = 8\text{ V}$ , $I_D = 28\text{ A}$                                                       |
| Gate resistance <sup>3)</sup>    | $R_G$         | -      | 1.1        | 1.7        | $\Omega$      | -                                                                                                                                                 |
| Transconductance                 | $g_{fs}$      | 45     | 90         | -          | S             | $ V_{DS}  > 2 I_D R_{DS(on)max}$ , $I_D = 56\text{ A}$                                                                                            |

<sup>1)</sup> 请参见图 3

<sup>2)</sup> 请参见图 13

<sup>3)</sup> 由设计标定, 不受制于生产测试。

表 5 动态特性

| Parameter                                  | Symbol       | Values |      |      | Unit | Note / Test Condition                                                                        |
|--------------------------------------------|--------------|--------|------|------|------|----------------------------------------------------------------------------------------------|
|                                            |              | Min.   | Typ. | Max. |      |                                                                                              |
| Input capacitance <sup>1)</sup>            | $C_{iss}$    | -      | 3600 | 4700 | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=75\text{ V}$ , $f=1\text{ MHz}$                                |
| Output capacitance <sup>1)</sup>           | $C_{oss}$    | -      | 900  | 1200 | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=75\text{ V}$ , $f=1\text{ MHz}$                                |
| Reverse transfer capacitance <sup>1)</sup> | $C_{rss}$    | -      | 21   | 37   | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=75\text{ V}$ , $f=1\text{ MHz}$                                |
| Turn-on delay time                         | $t_{d(on)}$  | -      | 14   | -    | ns   | $V_{DD}=75\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=56\text{ A}$ ,<br>$R_{G,ext}=1.6\ \Omega$ |
| Rise time                                  | $t_r$        | -      | 4    | -    | ns   | $V_{DD}=75\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=56\text{ A}$ ,<br>$R_{G,ext}=1.6\ \Omega$ |
| Turn-off delay time                        | $t_{d(off)}$ | -      | 20   | -    | ns   | $V_{DD}=75\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=56\text{ A}$ ,<br>$R_{G,ext}=1.6\ \Omega$ |
| Fall time                                  | $t_f$        | -      | 4    | -    | ns   | $V_{DD}=75\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=56\text{ A}$ ,<br>$R_{G,ext}=1.6\ \Omega$ |

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              | $Q_{gs}$      | -      | 21   | -    | nC   | $V_{DD}=75\text{ V}$ , $I_D=56\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate to drain charge <sup>1)</sup> | $Q_{gd}$      | -      | 10   | 15   | nC   | $V_{DD}=75\text{ V}$ , $I_D=56\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge                   | $Q_{sw}$      | -      | 17   | -    | nC   | $V_{DD}=75\text{ V}$ , $I_D=56\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total <sup>1)</sup>    | $Q_g$         | -      | 49   | 61   | nC   | $V_{DD}=75\text{ V}$ , $I_D=56\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate plateau voltage               | $V_{plateau}$ | -      | 5.7  | -    | V    | $V_{DD}=75\text{ V}$ , $I_D=56\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge <sup>1)</sup>        | $Q_{oss}$     | -      | 136  | 181  | nC   | $V_{DD}=75\text{ V}$ , $V_{GS}=0\text{ V}$                                  |

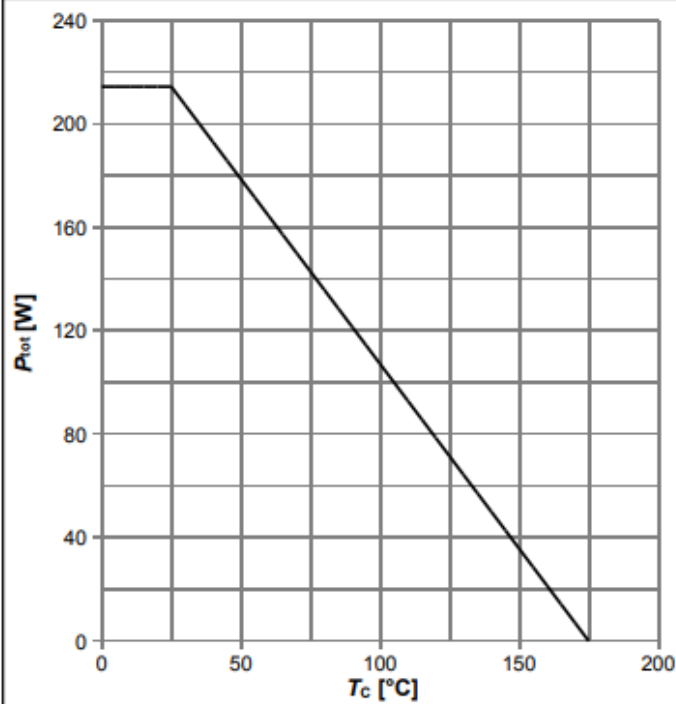
表 7 反向二极管

| Parameter                             | Symbol        | Values |      |      | Unit | Note / Test Condition                                                      |
|---------------------------------------|---------------|--------|------|------|------|----------------------------------------------------------------------------|
|                                       |               | Min.   | Typ. | Max. |      |                                                                            |
| Diode continuous forward current      | $I_S$         | -      | -    | 112  | A    | $T_C=25\text{ }^\circ\text{C}$                                             |
| Diode pulse current                   | $I_{S,pulse}$ | -      | -    | 448  | A    | $T_C=25\text{ }^\circ\text{C}$                                             |
| Diode forward voltage                 | $V_{SD}$      | -      | 0.89 | 1.1  | V    | $V_{GS}=0\text{ V}$ , $I_F=56\text{ A}$ , $T_J=25\text{ }^\circ\text{C}$   |
| Reverse recovery time <sup>1)</sup>   | $t_{rr}$      | -      | 69   | 138  | ns   | $V_R=75\text{ V}$ , $I_F=56\text{ A}$ , $di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge <sup>1)</sup> | $Q_{rr}$      | -      | 96   | 192  | nC   | $V_R=75\text{ V}$ , $I_F=56\text{ A}$ , $di_F/dt=100\text{ A}/\mu\text{s}$ |

<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”

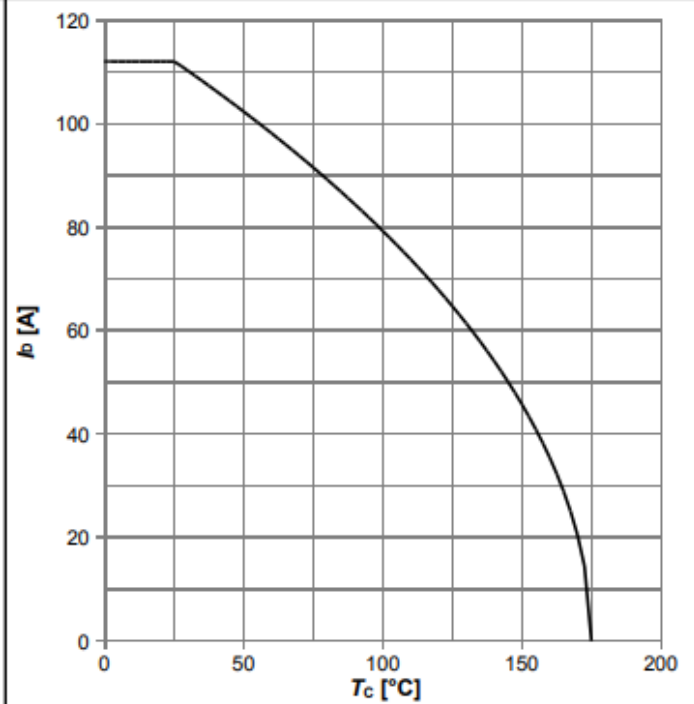
## 4 电气特性图

Diagram 1: Power dissipation



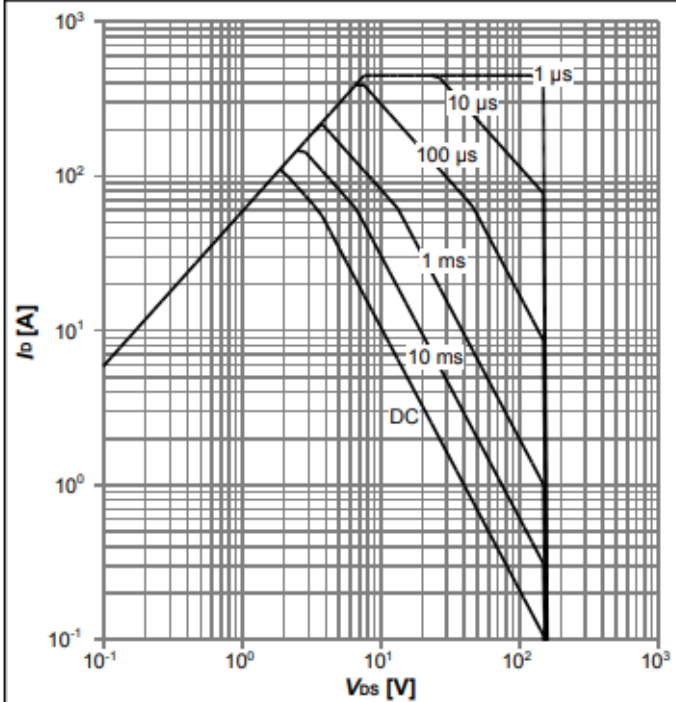
$$P_{tot}=f(T_c)$$

Diagram 2: Drain current



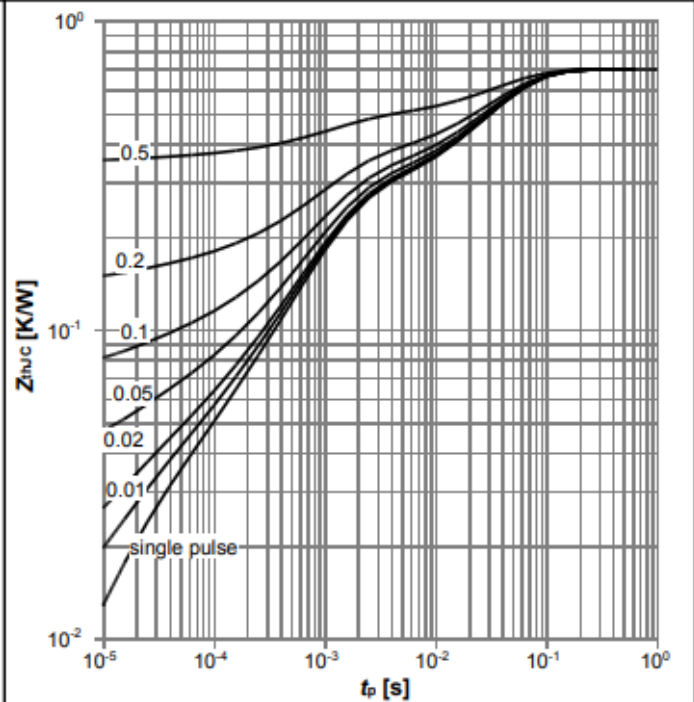
$$I_D=f(T_c); V_{GS} \geq 10 \text{ V}$$

Diagram 3: Safe operating area



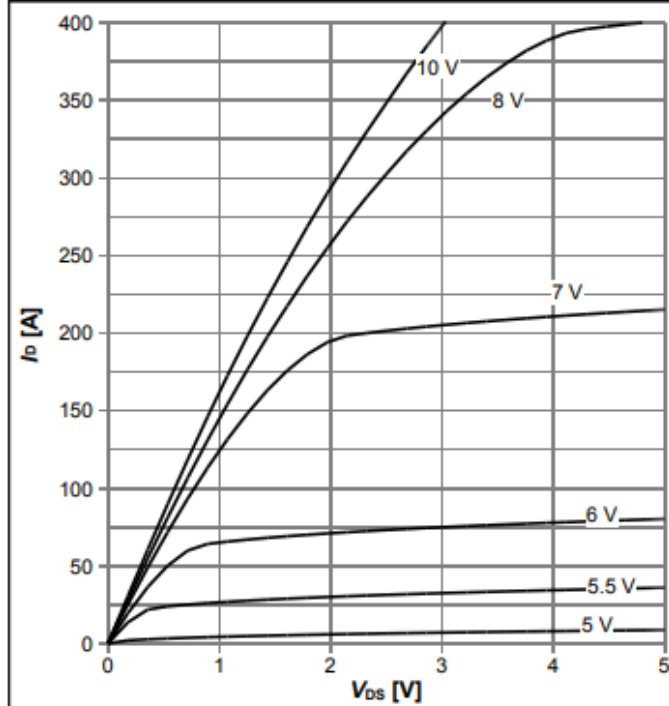
$$I_D=f(V_{DS}); T_c=25 \text{ °C}; D=0; \text{ parameter: } t_p$$

Diagram 4: Max. transient thermal impedance



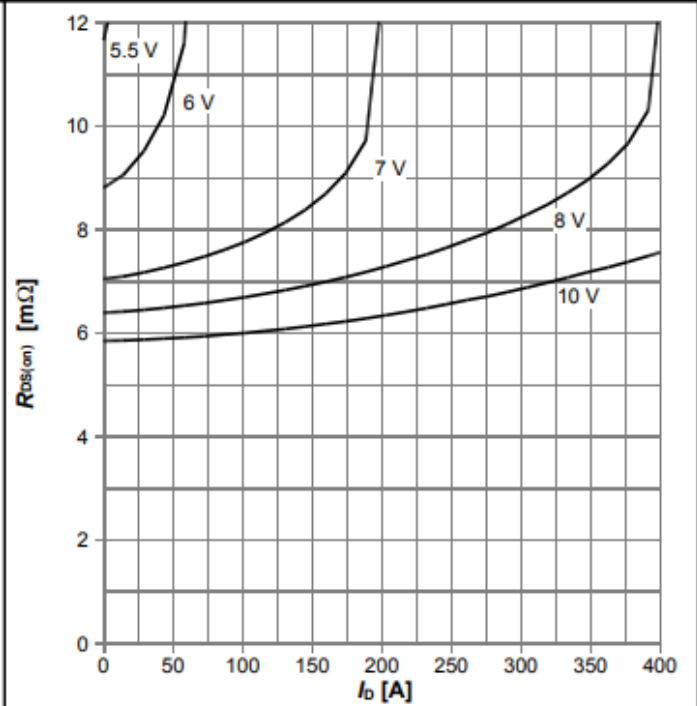
$$Z_{thJC}=f(t_p); \text{ parameter: } D=t_p/T$$

Diagram 5: Typ. output characteristics



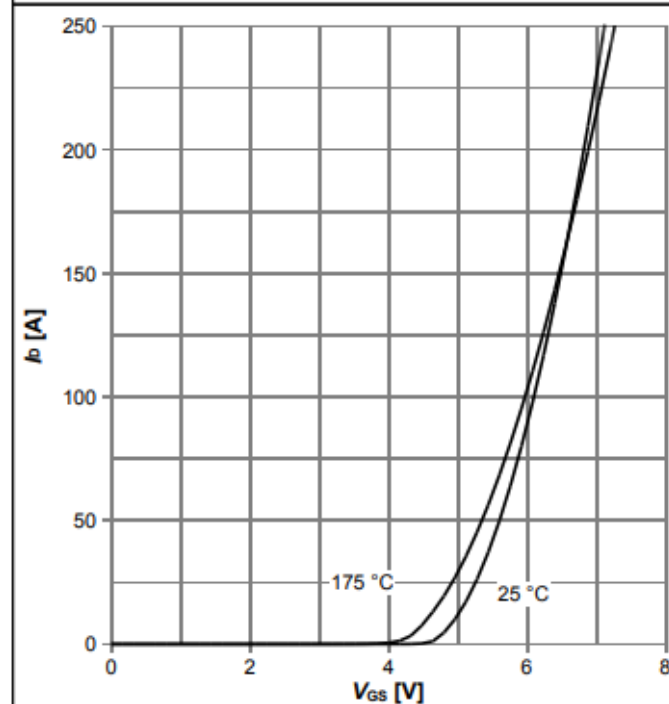
$I_D = f(V_{DS}); T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 6: Typ. drain-source on resistance



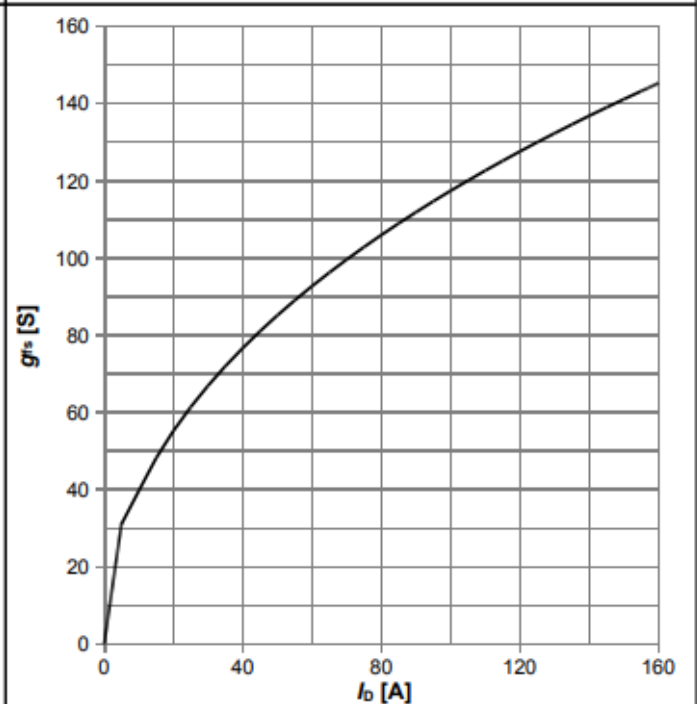
$R_{DS(on)} = f(I_D); T_J = 25^\circ\text{C}; \text{parameter: } V_{GS}$

Diagram 7: Typ. transfer characteristics



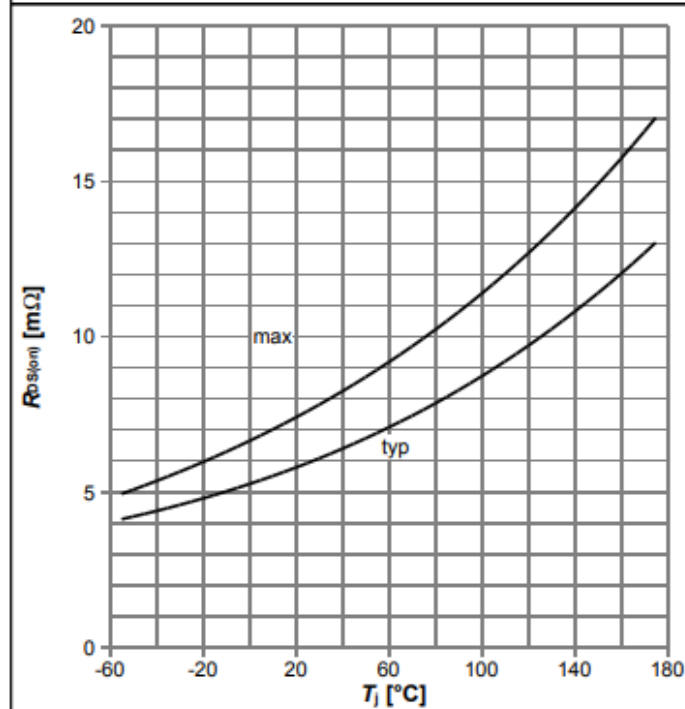
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}; \text{parameter: } T_J$

Diagram 8: Typ. forward transconductance



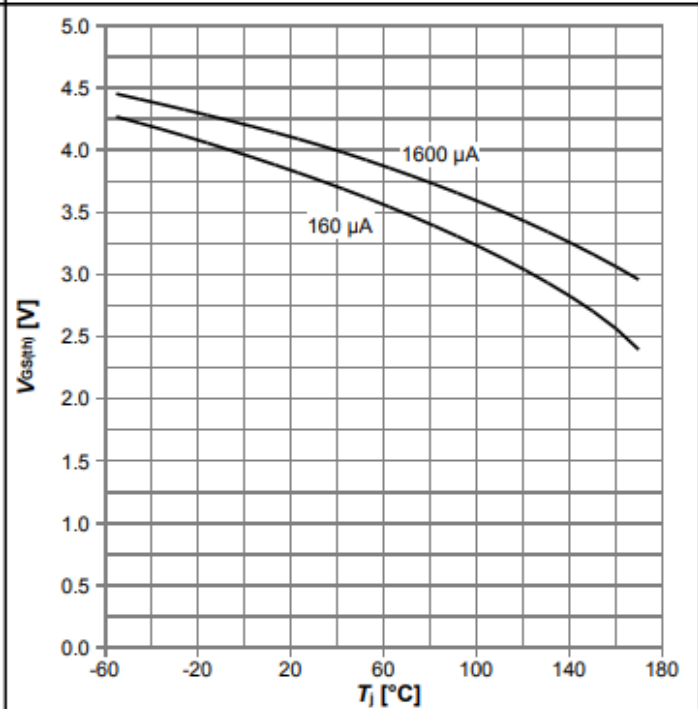
$g_{fs} = f(I_D); T_J = 25^\circ\text{C}$

Diagram 9: Drain-source on-state resistance



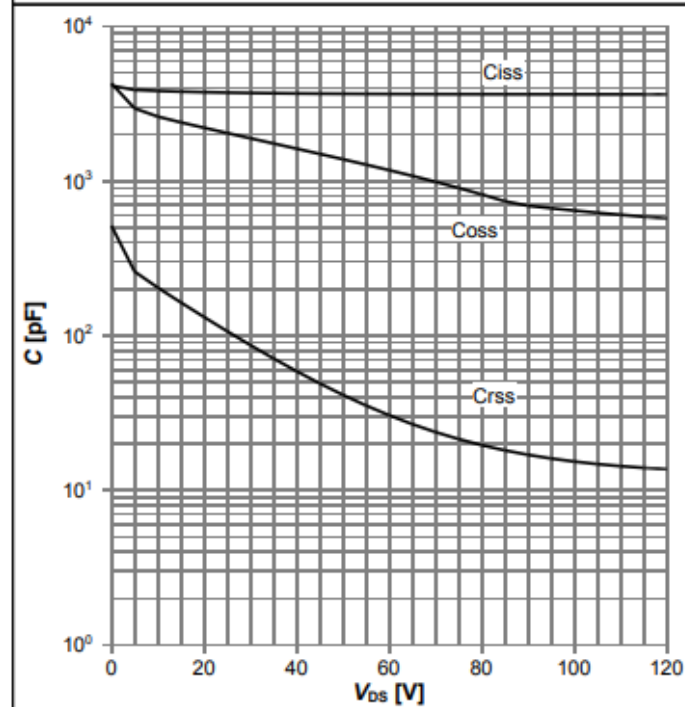
$R_{DS(on)} = f(T_J); I_D = 56 \text{ A}; V_{GS} = 10 \text{ V}$

Diagram 10: Typ. gate threshold voltage



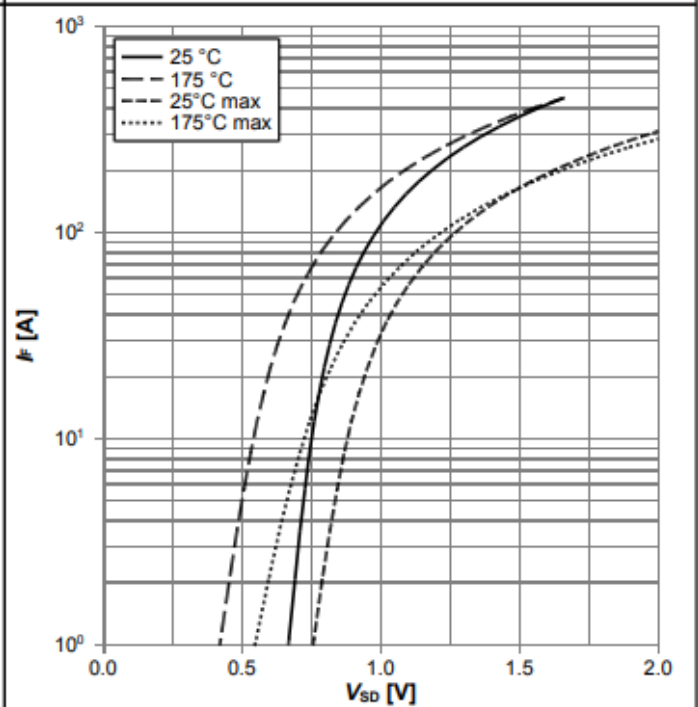
$V_{GS(th)} = f(T_J); V_{GS} = V_{DS}; \text{parameter: } I_D$

Diagram 11: Typ. capacitances



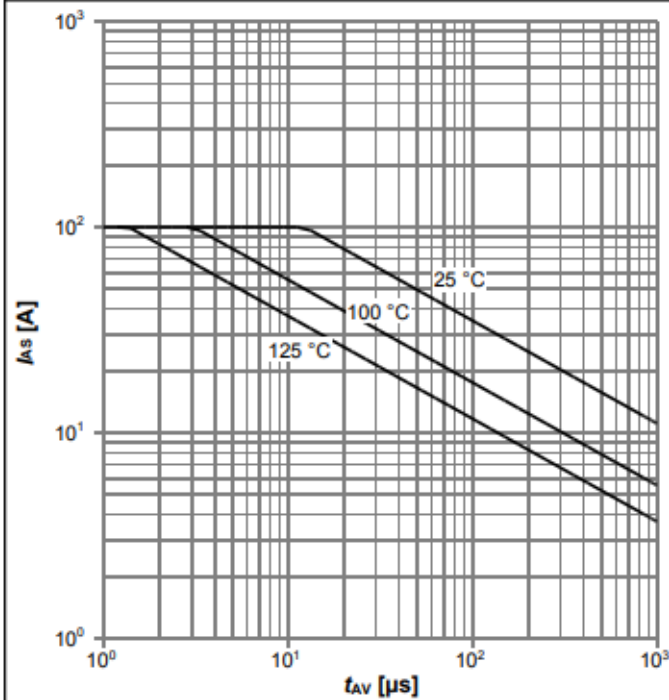
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



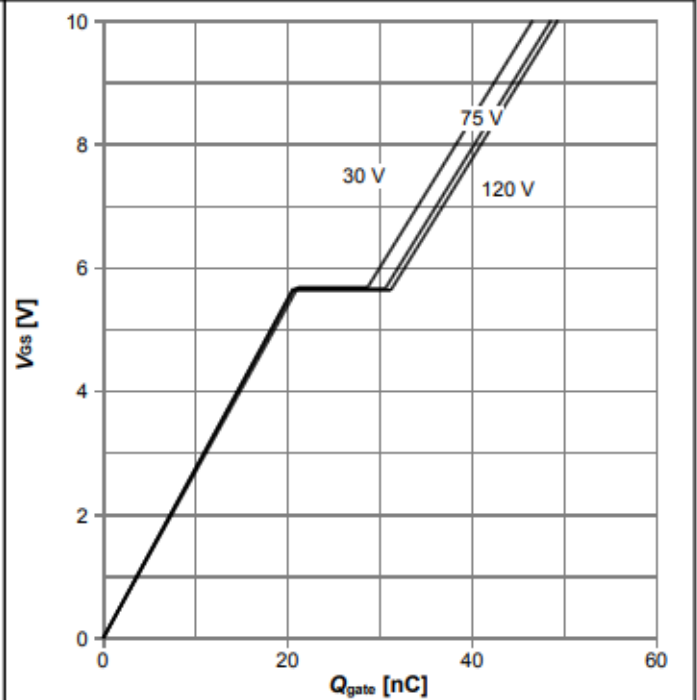
$I_F = f(V_{SD}); \text{parameter: } T_J$

Diagram 13: Avalanche characteristics



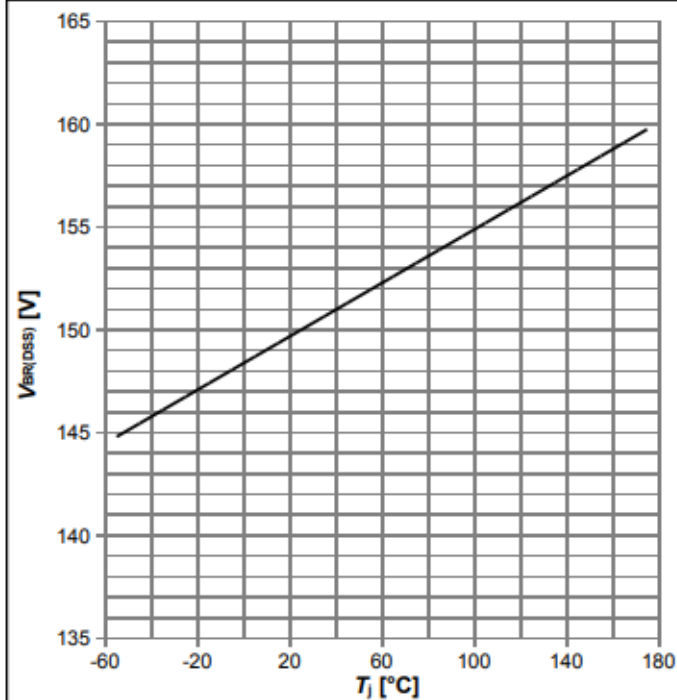
$I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega$ ; parameter:  $T_{j(start)}$

Diagram 14: Typ. gate charge



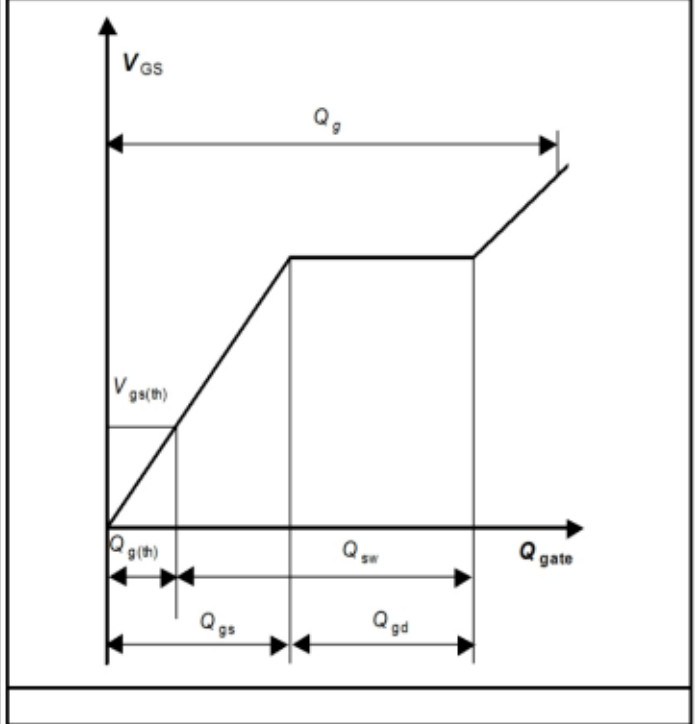
$V_{GS}=f(Q_{gate}); I_D=56\text{ A pulsed}$ ; parameter:  $V_{DD}$

Diagram 15: Drain-source breakdown voltage

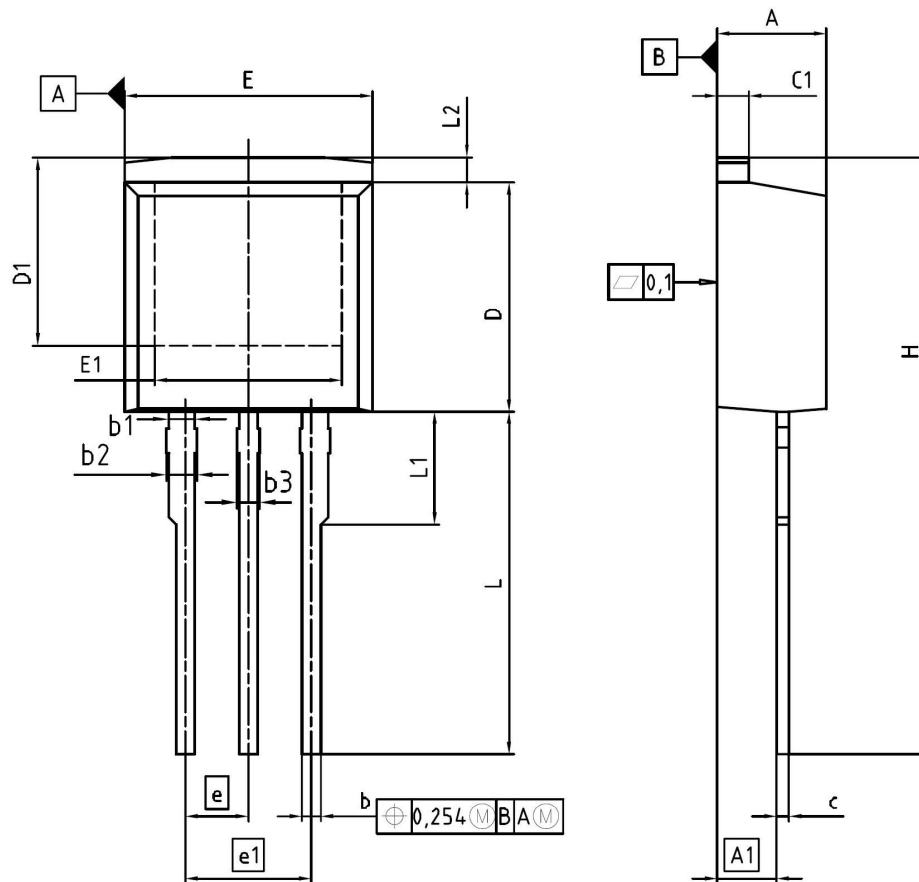


$V_{BR(DSS)}=f(T_j); I_D=1\text{ mA}$

Gate charge waveforms



## 5 封装外形



| DIM | MILLIMETERS |        | INCHES |       |
|-----|-------------|--------|--------|-------|
|     | MIN         | MAX    | MIN    | MAX   |
| A   | 4.300       | 4.572  | 0.169  | 0.180 |
| A1  | 2.150       | 2.718  | 0.085  | 0.107 |
| b   | 0.650       | 0.864  | 0.026  | 0.034 |
| b1  | 0.950       | 1.093  | 0.037  | 0.043 |
| b2  | 0.950       | 1.400  | 0.037  | 0.055 |
| b3  | 0.650       | 1.118  | 0.026  | 0.044 |
| c   | 0.330       | 0.600  | 0.013  | 0.024 |
| c1  | 1.170       | 1.400  | 0.046  | 0.055 |
| D   | 8.509       | 9.450  | 0.335  | 0.372 |
| D1  | 6.900       | -      | 0.272  | -     |
| E   | 9.700       | 10.363 | 0.382  | 0.408 |
| E1  | 6.500       | 8.600  | 0.256  | 0.339 |
| e   | 2.540       |        | 0.100  |       |
| e1  | 5.080       |        | 0.200  |       |
| N   | 3           |        | 3      |       |
| L   | 13.000      | 14.000 | 0.512  | 0.551 |
| L1  | -           | 4.800  | -      | 0.189 |
| L2  | -           | 1.727  | -      | 0.068 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| REFERENCE<br>Z8B00003325                                                                                     |
| SCALE<br>0 2.5 5mm                                                                                           |
| EUROPEAN PROJECTION<br> |
| ISSUE DATE<br>05-05-2006                                                                                     |
| REVISION<br>03                                                                                               |

图 1 PG-T0262-3 外形图, 尺寸单位为毫米/英寸

## 修订记录

IPI076N15N5

**Revision: 2016-03-03, Rev. 2.0**

### 历史修订版本

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 2.0      | 2016-03-03 | Release of final version                     |

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