

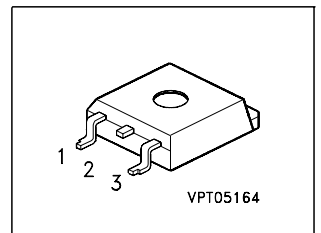
## SIPMOS<sup>®</sup> Power-Transistor

### Features

- P-Channel
- Enhancement mode
- Avalanche rated
- $dv/dt$  rated
- 175°C operating temperature
- ° Pb-free lead plating: RoHS compliant
- ° Halogen-free according to IEC61249-2-21
- ° Qualified according to AEC Q101

### Product Summary

|                                  |              |       |          |
|----------------------------------|--------------|-------|----------|
| Drain source voltage             | $V_{DS}$     | -60   | V        |
| Drain-source on-state resistance | $R_{DS(on)}$ | 0.023 | $\Omega$ |
| Continuous drain current         | $I_D$        | -80   | A        |



| Type        | Package    | Lead free |
|-------------|------------|-----------|
| SPB80P06P G | PG-TO263-3 | Yes       |

| Pin 1 | PIN 2/4 | PIN 3 |
|-------|---------|-------|
| G     | D       | S     |

**Maximum Ratings**, at  $T_j = 25\text{ °C}$ , unless otherwise specified

| Parameter                                                                                                                                  | Symbol                   | Value      | Unit              |
|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------|-------------------|
| Continuous drain current<br>$T_C = 25\text{ °C}$ , <sup>1)</sup><br>$T_C = 100\text{ °C}$                                                  | $I_D$                    | -80<br>-64 | A                 |
| Pulsed drain current<br>$T_C = 25\text{ °C}$                                                                                               | $I_{D\text{ puls}}$      | -320       |                   |
| Avalanche energy, single pulse<br>$I_D = -80\text{ A}$ , $V_{DD} = -25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$                             | $E_{AS}$                 | 823        | mJ                |
| Avalanche energy, periodic limited by $T_{j\text{max}}$                                                                                    | $E_{AR}$                 | 34         |                   |
| Reverse diode $dv/dt$<br>$I_S = -80\text{ A}$ , $V_{DS} = -48$ , $di/dt = 200\text{ A}/\mu\text{s}$ ,<br>$T_{j\text{max}} = 175\text{ °C}$ | $dv/dt$                  | 6          | kV/ $\mu\text{s}$ |
| Gate source voltage                                                                                                                        | $V_{GS}$                 | $\pm 20$   | V                 |
| Power dissipation<br>$T_C = 25\text{ °C}$                                                                                                  | $P_{\text{tot}}$         | 340        | W                 |
| Operating and storage temperature                                                                                                          | $T_j$ , $T_{\text{stg}}$ | -55...+175 | °C                |
| IEC climatic category; DIN IEC 68-1                                                                                                        |                          | 55/175/56  |                   |

<sup>1</sup>Current limited by bondwire; with an  $R_{thJC} = 0.4\text{ K/W}$  the chip is able to carry  $I_D = -91\text{ A}$

**Thermal Characteristics**

| Parameter                                      | Symbol     | Values |      |      | Unit |
|------------------------------------------------|------------|--------|------|------|------|
|                                                |            | min.   | typ. | max. |      |
| Characteristics                                |            |        |      |      |      |
| Thermal resistance, junction - case            | $R_{thJC}$ | -      | -    | 0.4  | K/W  |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | -      | -    | 62   |      |
| SMD version, device on PCB:                    | $R_{thJA}$ |        |      |      |      |
| @ min. footprint                               |            | -      | -    | 62   |      |
| @ 6 cm <sup>2</sup> cooling area <sup>1)</sup> |            | -      | -    | 40   |      |

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

| Parameter                                                                                                                                                                                                    | Symbol        | Values |       |       | Unit          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|-------|-------|---------------|
|                                                                                                                                                                                                              |               | min.   | typ.  | max.  |               |
| Static Characteristics                                                                                                                                                                                       |               |        |       |       |               |
| Drain- source breakdown voltage<br>$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$                                                                                                                   | $V_{(BR)DSS}$ | -60    | -     | -     | V             |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D = -5.5\text{ mA}$                                                                                                                                          | $V_{GS(th)}$  | -2.1   | -3    | -4    |               |
| Zero gate voltage drain current<br>$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$<br>$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ | $I_{DSS}$     | -      | -0.1  | -1    | $\mu\text{A}$ |
|                                                                                                                                                                                                              |               | -      | -10   | -100  |               |
| Gate-source leakage current<br>$V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$                                                                                                                               | $I_{GSS}$     | -      | -10   | -100  | nA            |
| Drain-source on-state resistance<br>$V_{GS} = -10\text{ V}$ , $I_D = -64\text{ A}$                                                                                                                           | $R_{DS(on)}$  | -      | 0.021 | 0.023 | $\Omega$      |

<sup>1)</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

| Parameter                                                                                     | Symbol       | Values |      |      | Unit |
|-----------------------------------------------------------------------------------------------|--------------|--------|------|------|------|
|                                                                                               |              | min.   | typ. | max. |      |
| Dynamic Characteristics                                                                       |              |        |      |      |      |
| Transconductance<br>$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(ON)max}$ , $I_D = -64$ A             | $g_{fs}$     | 18     | 36   | -    | S    |
| Input capacitance<br>$V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz                            | $C_{iss}$    | -      | 4026 | 5033 | pF   |
| Output capacitance<br>$V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz                           | $C_{oss}$    | -      | 1252 | 1565 |      |
| Reverse transfer capacitance<br>$V_{GS} = 0$ V, $V_{DS} = -25$ V, $f = 1$ MHz                 | $C_{rss}$    | -      | 437  | 546  |      |
| Turn-on delay time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -64$ A,<br>$R_G = 1 \Omega$  | $t_{d(ON)}$  | -      | 24   | 36   | ns   |
| Rise time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -64$ A,<br>$R_G = 1 \Omega$           | $t_r$        | -      | 18   | 27   |      |
| Turn-off delay time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -64$ A,<br>$R_G = 1 \Omega$ | $t_{d(OFF)}$ | -      | 56   | 84   |      |
| Fall time<br>$V_{DD} = -30$ V, $V_{GS} = -10$ V, $I_D = -64$ A,<br>$R_G = 1 \Omega$           | $t_f$        | -      | 30   | 45   |      |

**Electrical Characteristics, at  $T_j = 25\text{ °C}$ , unless otherwise specified**

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**Dynamic Characteristics**

|                                                                                                           |                 |   |      |     |    |
|-----------------------------------------------------------------------------------------------------------|-----------------|---|------|-----|----|
| Gate to source charge<br>$V_{DD} = -48\text{ V}$ , $I_D = -80\text{ A}$                                   | $Q_{gs}$        | - | 27.4 | 41  | nC |
| Gate to drain charge<br>$V_{DD} = -48\text{ V}$ , $I_D = -80\text{ A}$                                    | $Q_{gd}$        | - | 50   | 75  |    |
| Gate charge total<br>$V_{DD} = -48\text{ V}$ , $I_D = -80\text{ A}$ , $V_{GS} = 0\text{ to }-10\text{ V}$ | $Q_g$           | - | 115  | 173 |    |
| Gate plateau voltage<br>$V_{DD} = -48\text{ V}$ , $I_D = -80\text{ A}$                                    | $V_{(plateau)}$ | - | -6.2 | -   | V  |

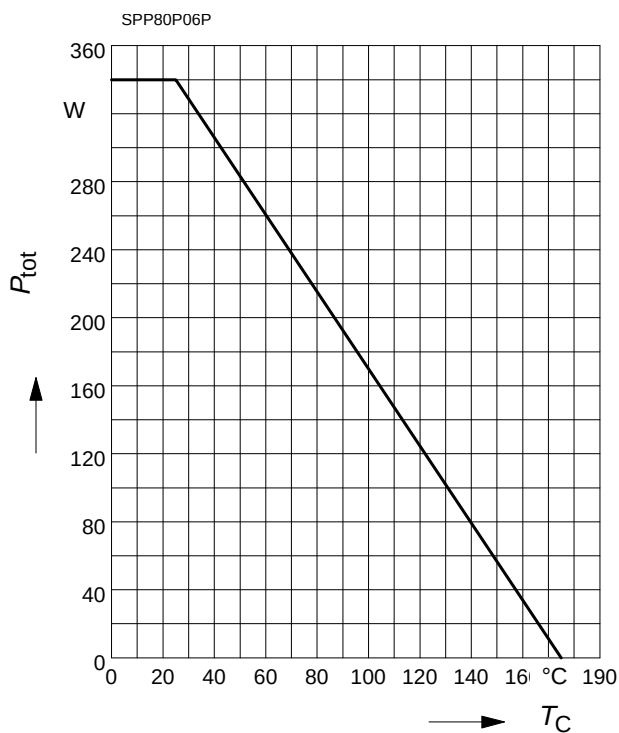
| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**Reverse Diode**

|                                                                                                      |          |   |      |      |    |
|------------------------------------------------------------------------------------------------------|----------|---|------|------|----|
| Inverse diode continuous forward current<br>$T_C = 25\text{ °C}$                                     | $I_S$    | - | -    | -80  | A  |
| Inverse diode direct current, pulsed<br>$T_C = 25\text{ °C}$                                         | $I_{SM}$ | - | -    | -320 |    |
| Inverse diode forward voltage<br>$V_{GS} = 0\text{ V}$ , $I_F = -80\text{ A}$                        | $V_{SD}$ | - | -1.2 | -1.6 | V  |
| Reverse recovery time<br>$V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$   | $t_{rr}$ | - | 117  | 175  | ns |
| Reverse recovery charge<br>$V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ | $Q_{rr}$ | - | 420  | 630  | nC |

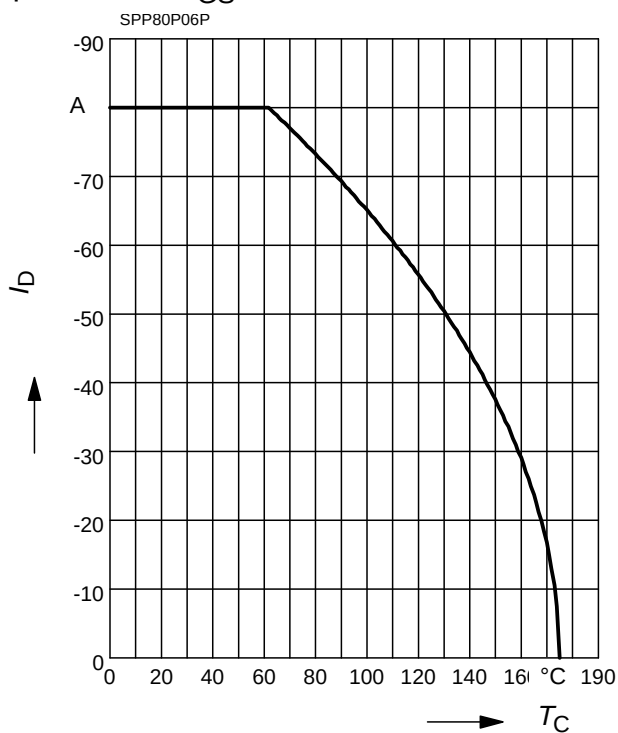
**Power dissipation**

$$P_{\text{tot}} = f(T_C)$$


**Drain current**

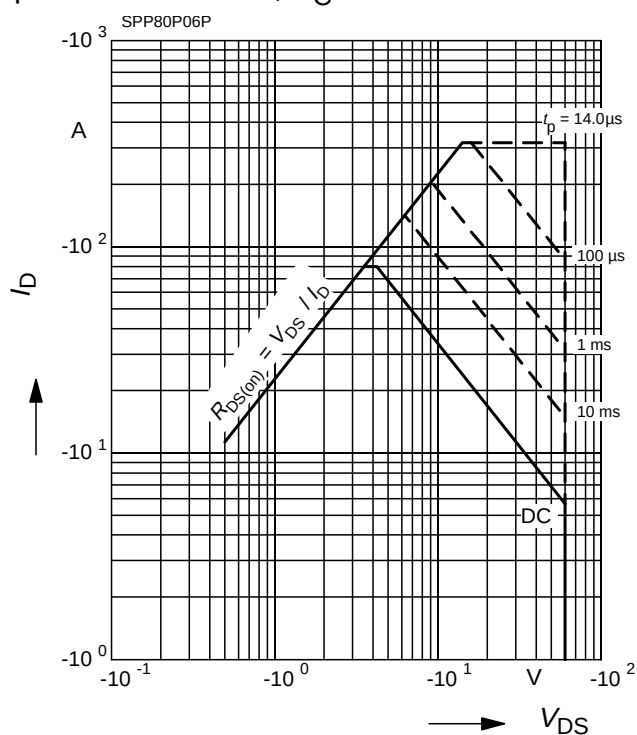
$$I_D = f(T_C)$$

parameter:  $V_{GS} \geq 10 \text{ V}$


**Safe operating area**

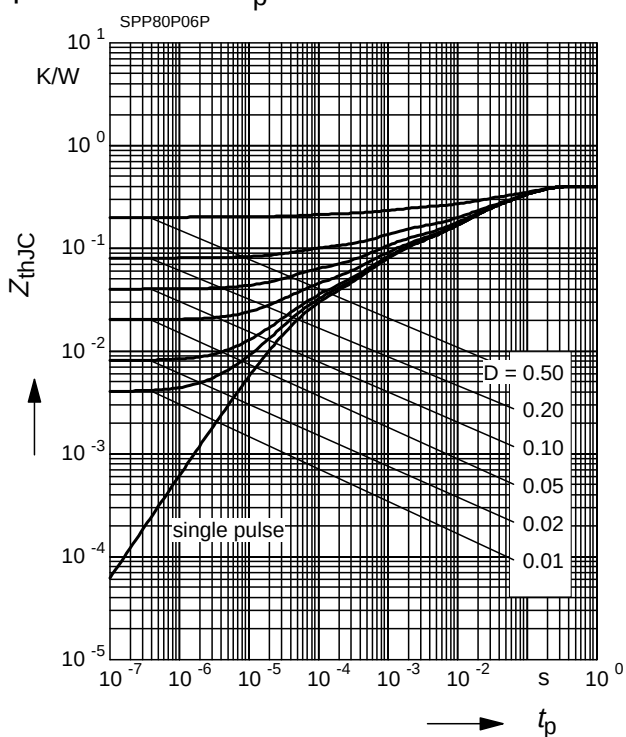
$$I_D = f(V_{DS})$$

parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$


**Transient thermal impedance**

$$Z_{\text{thJC}} = f(t_p)$$

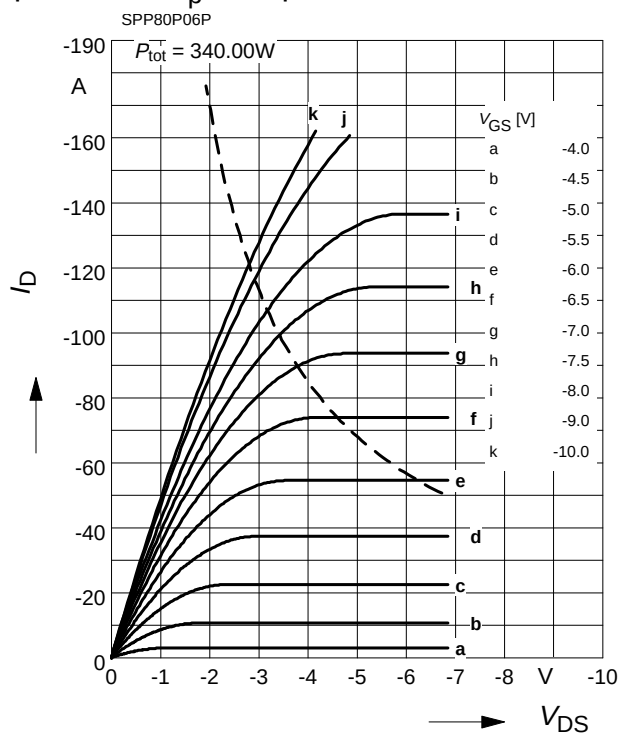
parameter:  $D = t_p / T$



**Typ. output characteristic**

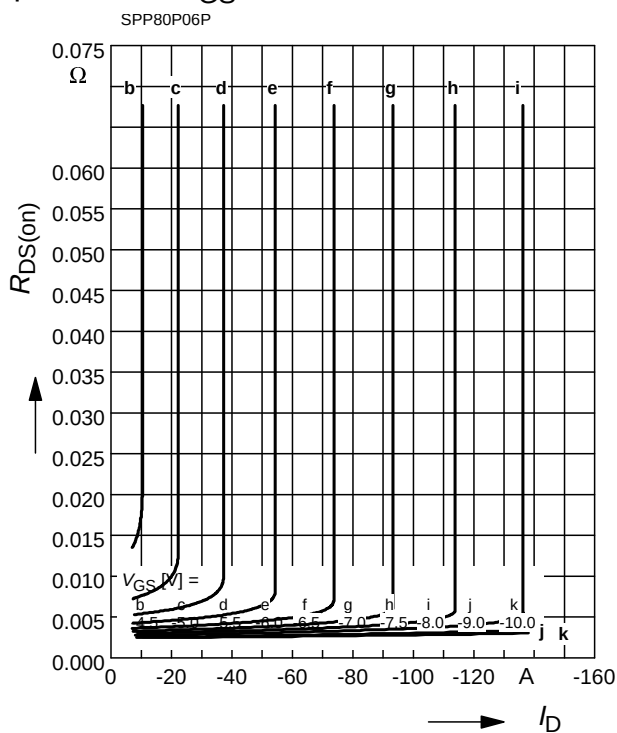
$$I_D = f(V_{DS}); T_J = 25^\circ\text{C}$$

parameter:  $t_p = 80 \mu\text{s}$


**Typ. drain-source-on-resistance**

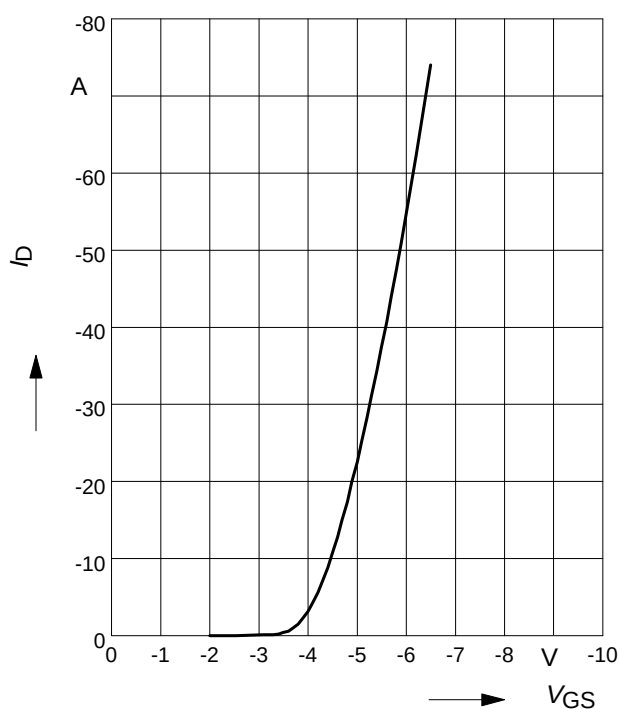
$$R_{DS(on)} = f(I_D)$$

parameter:  $V_{GS}$


**Typ. transfer characteristics  $I_D = f(V_{GS})$** 

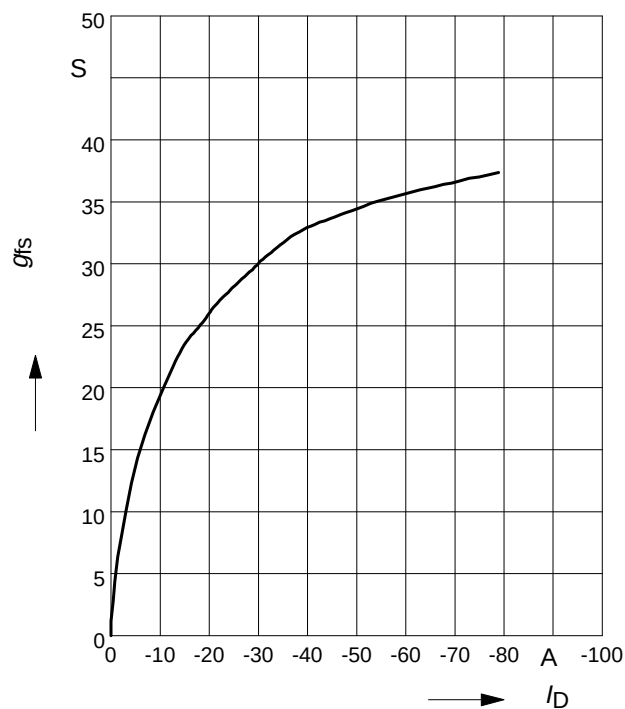
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

parameter:  $t_p = 80 \mu\text{s}$


**Typ. forward transconductance**

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

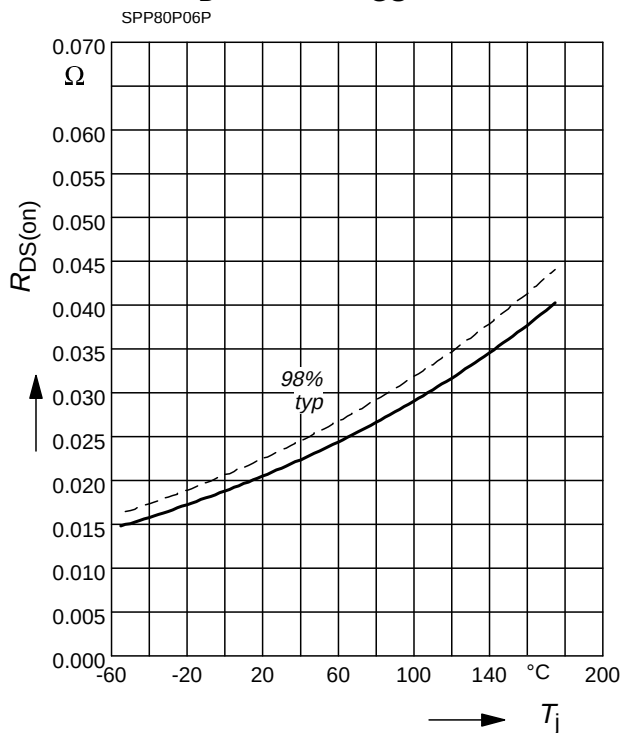
parameter:  $g_{fs}$



**Drain-source on-state resistance**

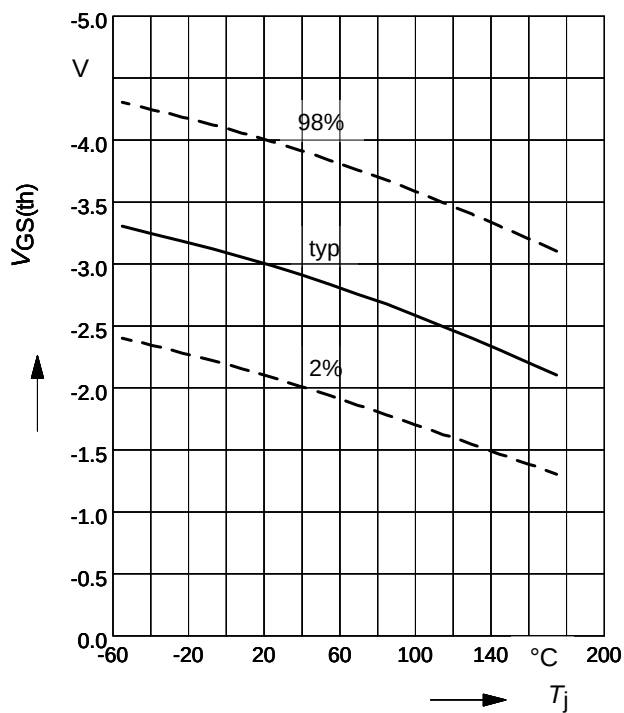
$$R_{DS(on)} = f(T_j)$$

parameter:  $I_D = -64$  A,  $V_{GS} = -10$  V


**Gate threshold voltage**

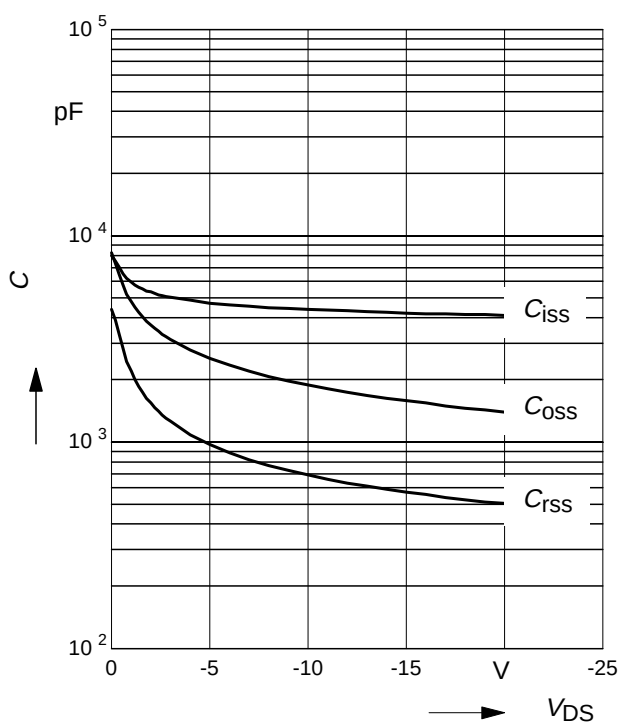
$$V_{GS(th)} = f(T_j)$$

parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -5.5$  mA


**Typ. capacitances**

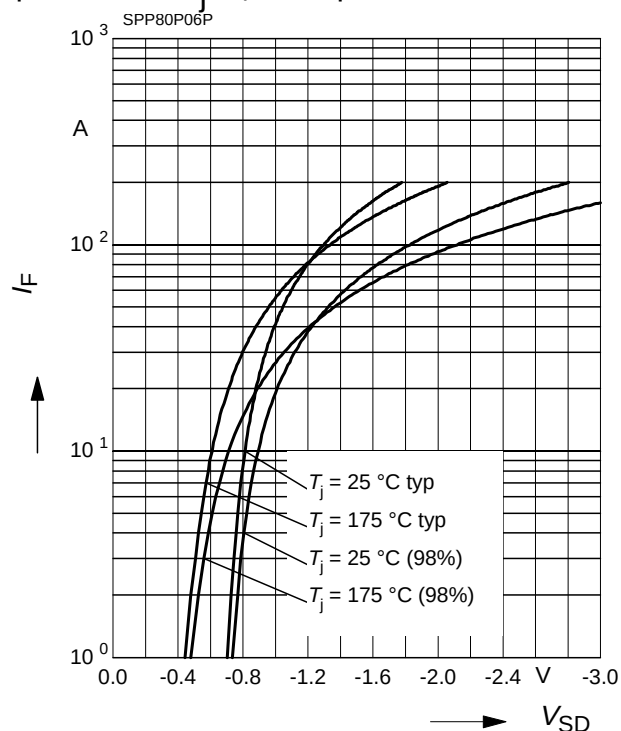
$$C = f(V_{DS})$$

parameter:  $V_{GS}=0$ V,  $f=1$  MHz


**Forward characteristics of reverse diode**

$$I_F = f(V_{SD})$$

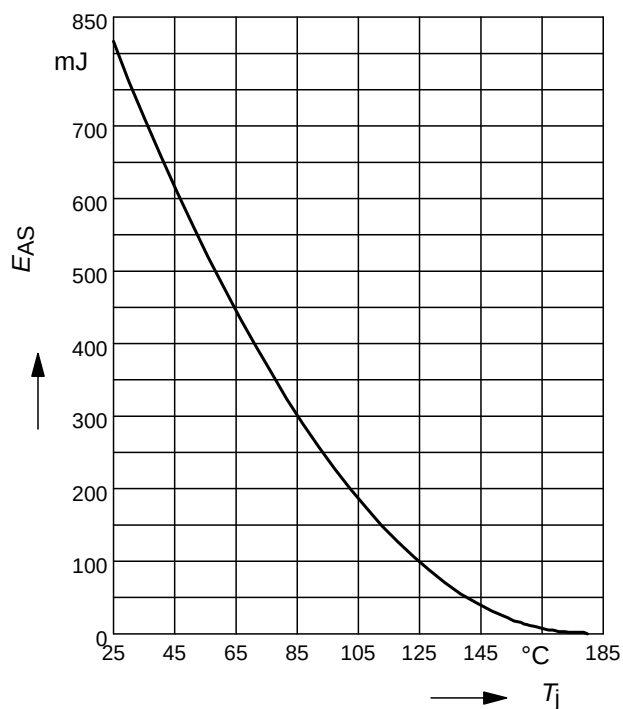
parameter:  $T_j$ ,  $t_p = 80$   $\mu$ s



**Avalanche energy**

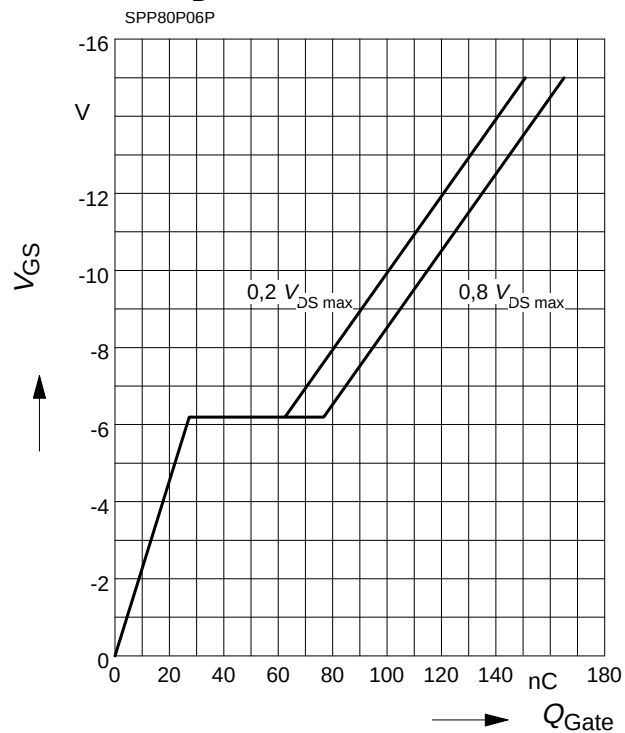
$$E_{AS} = f(T_j)$$

para.:  $I_D = -80\text{ A}$  ,  $V_{DD} = -25\text{ V}$  ,  $R_{GS} = 25\ \Omega$

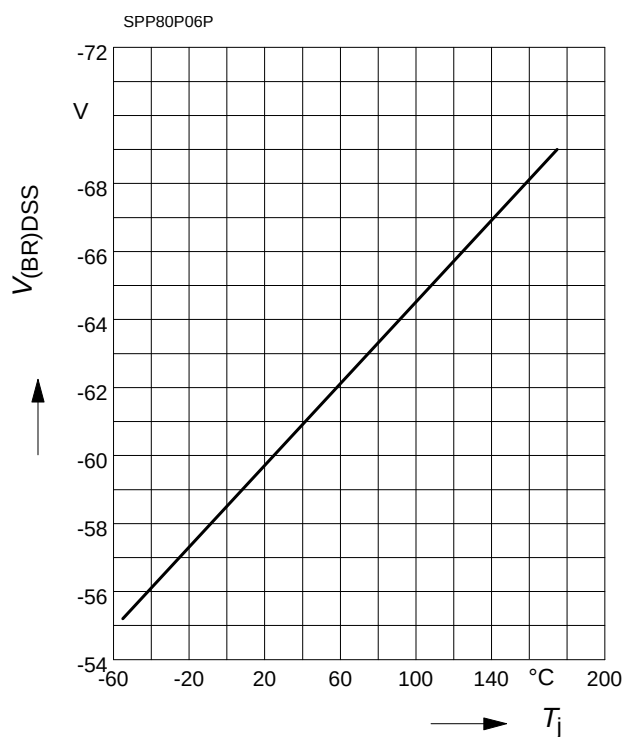

**Typ. gate charge**

$$V_{GS} = f(Q_{Gate})$$

parameter:  $I_D = -80\text{ A}$  pulsed

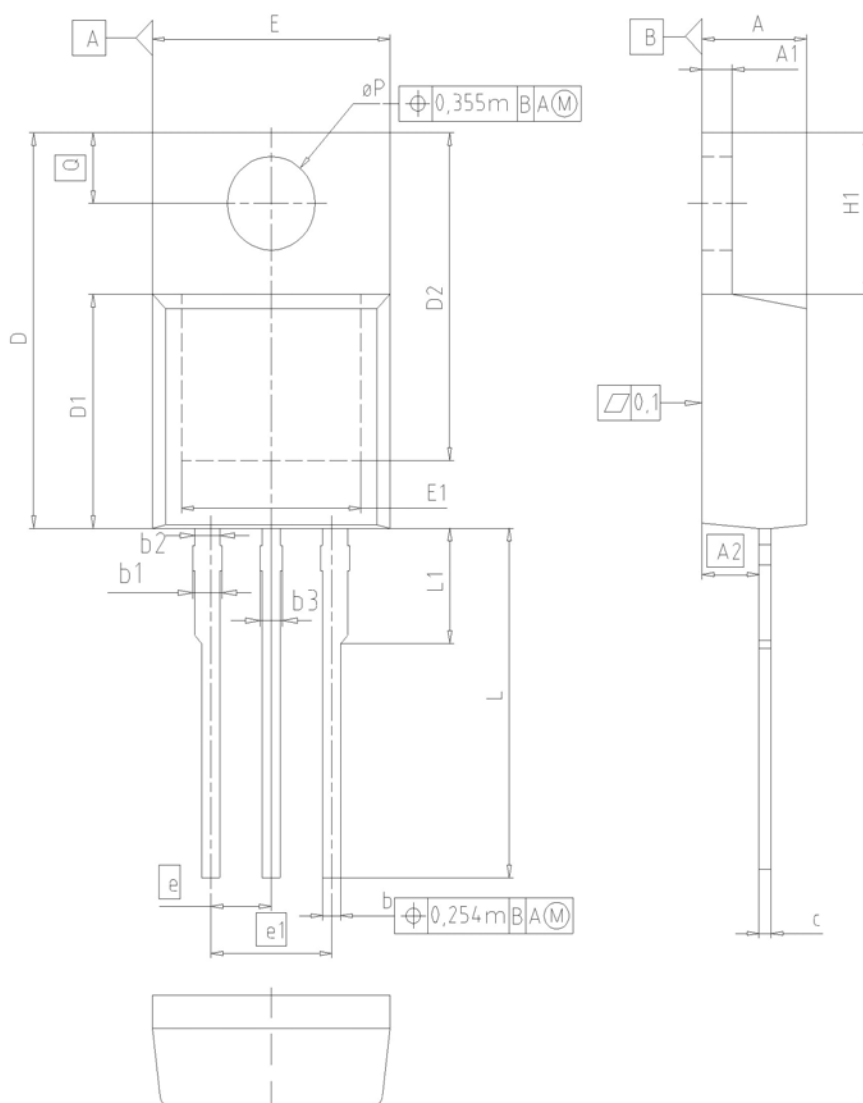

**Drain-source breakdown voltage**

$$V_{(BR)DSS} = f(T_j)$$





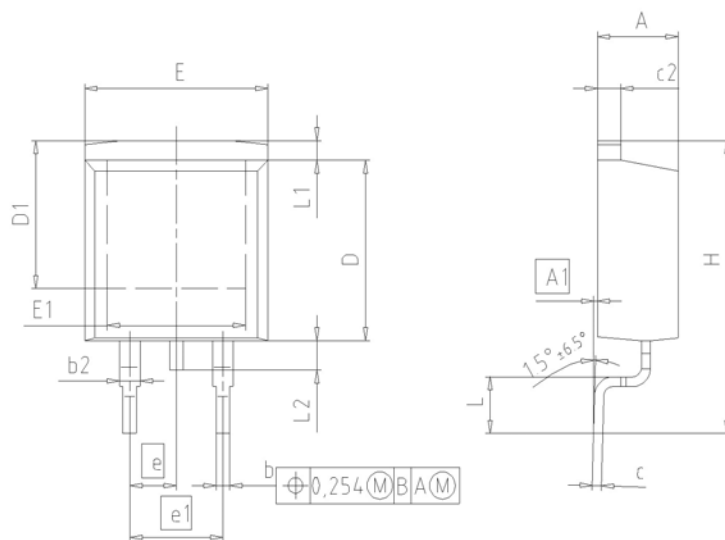
## PG-TO220-3



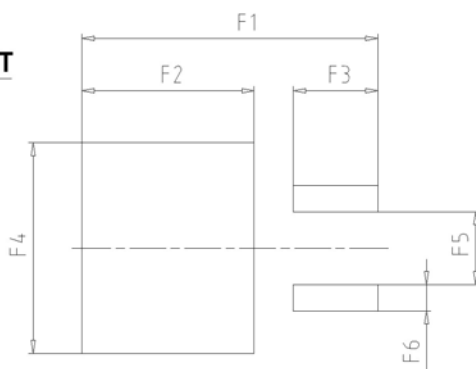
| DIM      | MILLIMETERS |       | INCHES |       |
|----------|-------------|-------|--------|-------|
|          | MIN         | MAX   | MIN    | MAX   |
| A        | 4.30        | 4.57  | 0.169  | 0.180 |
| A1       | 1.17        | 1.40  | 0.046  | 0.055 |
| A2       | 2.15        | 2.72  | 0.085  | 0.107 |
| b        | 0.65        | 0.86  | 0.026  | 0.034 |
| b1       | 0.95        | 1.40  | 0.037  | 0.055 |
| b2       | 0.95        | 1.15  | 0.037  | 0.045 |
| b3       | 0.65        | 1.15  | 0.026  | 0.045 |
| c        | 0.33        | 0.60  | 0.013  | 0.024 |
| D        | 14.81       | 15.95 | 0.583  | 0.628 |
| D1       | 8.51        | 9.45  | 0.335  | 0.372 |
| D2       | 12.19       | 13.10 | 0.480  | 0.516 |
| E        | 9.70        | 10.36 | 0.382  | 0.408 |
| E1       | 6.50        | 8.60  | 0.256  | 0.339 |
| e        | 2.54        |       | 0.100  |       |
| e1       | 5.08        |       | 0.200  |       |
| N        | 3           |       | 3      |       |
| H1       | 5.90        | 6.90  | 0.232  | 0.272 |
| L        | 13.00       | 14.00 | 0.512  | 0.551 |
| L1       | -           | 4.80  | -      | 0.189 |
| $\phi P$ | 3.60        | 3.89  | 0.142  | 0.153 |
| Q        | 2.60        | 3.00  | 0.102  | 0.118 |

|                             |
|-----------------------------|
| DOCUMENT NO.<br>Z8B00003318 |
| SCALE<br>0 2.5 5mm          |
| EUROPEAN PROJECTION         |
| ISSUE DATE<br>23-08-2007    |
| REVISION<br>05              |

PG-TO263-3



**FOOTPRINT**



| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 4.30        | 4.57  | 0.169  | 0.180 |
| A1  | 0.00        | 0.25  | 0.000  | 0.010 |
| b   | 0.65        | 0.85  | 0.026  | 0.033 |
| b2  | 0.95        | 1.15  | 0.037  | 0.045 |
| c   | 0.33        | 0.65  | 0.013  | 0.026 |
| c2  | 1.17        | 1.40  | 0.046  | 0.055 |
| D   | 8.51        | 9.45  | 0.335  | 0.372 |
| D1  | 7.10        | 7.90  | 0.280  | 0.311 |
| E   | 9.80        | 10.31 | 0.386  | 0.406 |
| E1  | 6.50        | 8.60  | 0.256  | 0.339 |
| e   | 2.54        |       | 0.100  |       |
| e1  | 5.08        |       | 0.200  |       |
| N   | 2           |       | 2      |       |
| H   | 14.61       | 15.88 | 0.575  | 0.625 |
| L   | 2.29        | 3.00  | 0.090  | 0.118 |
| L1  | 0.70        | 1.60  | 0.028  | 0.063 |
| L2  | 1.00        | 1.78  | 0.039  | 0.070 |
| F1  | 16.05       | 16.25 | 0.632  | 0.640 |
| F2  | 9.30        | 9.50  | 0.366  | 0.374 |
| F3  | 4.50        | 4.70  | 0.177  | 0.185 |
| F4  | 10.70       | 10.90 | 0.421  | 0.429 |
| F5  | 3.65        | 3.85  | 0.144  | 0.152 |
| F6  | 1.25        | 1.45  | 0.049  | 0.057 |

**DOCUMENT NO.**  
Z8B00003324

**SCALE**  
0 5 5  
7.5mm

**EUROPEAN PROJECTION**

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01

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