

SIPMOS® Power-Transistor

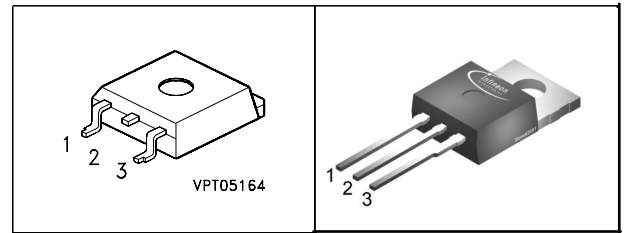
Features

- P-Channel □
- Enhancement mode □
- Avalanche rated □
- dv/dt rated □
- 175°C operating temperature □
- Pb-free lead plating; RoHS compliant □
- Qualified according to AEC Q101



Product Summary

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



| Type | Package | Lead free |
|-------------|------------|-----------|
| SPP80P06P G | PG-TO220-3 | Yes |
| 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 $T_C = 25\text{ °C}$, 1) $T_C = 100\text{ °C}$ | I_D | -80 -64 | A |
| Pulsed drain current $T_C = 25\text{ °C}$ | $I_D \text{ puls}$ | -320 | |
| Avalanche energy, single pulse $I_D = -80\text{ A}$, $V_{DD} = -25\text{ V}$, $R_{GS} = 25\text{ }\Omega$ | E_{AS} | 823 | mJ |
| Avalanche energy, periodic limited by T_{jmax} | E_{AR} | 34 | |
| Reverse diode dv/dt $I_S = -80\text{ A}$, $V_{DS} = -48$, $di/dt = 200\text{ A}/\mu\text{s}$, $T_{jmax} = 175\text{ °C}$ | dv/dt | 6 | kV/ μs |
| Gate source voltage | V_{GS} | ± 20 | V |
| Power dissipation $T_C = 25\text{ °C}$ | P_{tot} | 340 | W |
| Operating and storage temperature | T_j, T_{stg} | -55...+175 | $^{\circ}\text{C}$ |
| IEC climatic category; DIN IEC 68-1 | | 55/175/56 | |

¹Current 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: @ min. footprint @ 6 cm ² cooling area ¹⁾ | R_{thJA} | - | - | 62 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 $V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$ | $V_{(BR)DSS}$ | -60 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = -5.5\text{ mA}$ | $V_{GS(th)}$ | -2.1 | -3 | -4 | |
| Zero gate voltage drain current $V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25\text{ °C}$ $V_{DS} = -60\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 150\text{ °C}$ | I_{DSS} | - | -0.1 -10 | -1 -100 | μA |
| Gate-source leakage current $V_{GS} = -20\text{ V}$, $V_{DS} = 0\text{ V}$ | I_{GSS} | - | -10 | -100 | nA |
| Drain-source on-state resistance $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$ | $R_{DS(on)}$ | - | 0.021 | 0.023 | Ω |

¹Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm 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 $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = -64\text{ A}$ | g_{fs} | 18 | 36 | - | S |
| Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$ | C_{iss} | - | 4026 | 5033 | pF |
| Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$ | C_{oss} | - | 1252 | 1565 | |
| Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$ | C_{rss} | - | 437 | 546 | |
| Turn-on delay time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$ | $t_{d(on)}$ | - | 24 | 36 | ns |
| Rise time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$ | t_r | - | 18 | 27 | |
| Turn-off delay time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$ | $t_{d(off)}$ | - | 56 | 84 | |
| Fall time $V_{DD} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_D = -64\text{ A}$, $R_G = 1\ \Omega$ | t_f | - | 30 | 45 | |

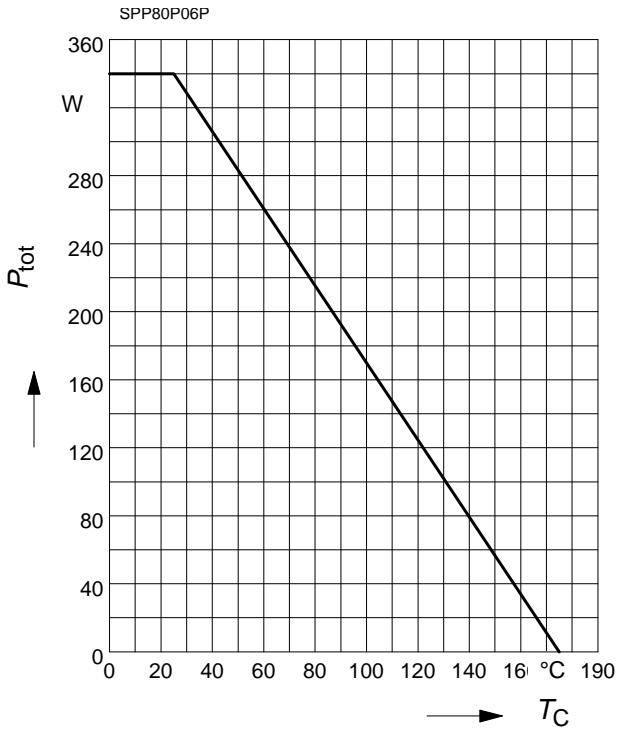
Electrical Characteristics, at $T_j = 25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|-----------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Dynamic Characteristics | | | | | |
| Gate to source charge $V_{DD} = -48\text{ V}, I_D = -80\text{ A}$ | Q_{gs} | - | 27.4 | 41 | nC |
| Gate to drain charge $V_{DD} = -48\text{ V}, I_D = -80\text{ A}$ | Q_{gd} | - | 50 | 75 | |
| Gate charge total $V_{DD} = -48\text{ V}, I_D = -80\text{ A}, V_{GS} = 0\text{ to }-10\text{ V}$ | Q_g | - | 115 | 173 | |
| Gate plateau voltage $V_{DD} = -48\text{ V}, I_D = -80\text{ A}$ | $V_{(plateau)}$ | - | -6.2 | - | V |

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

Power dissipation

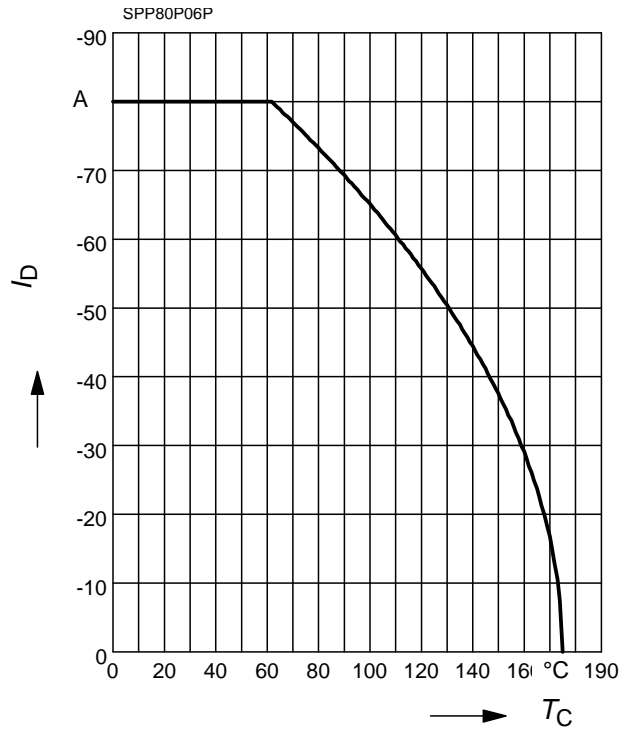
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

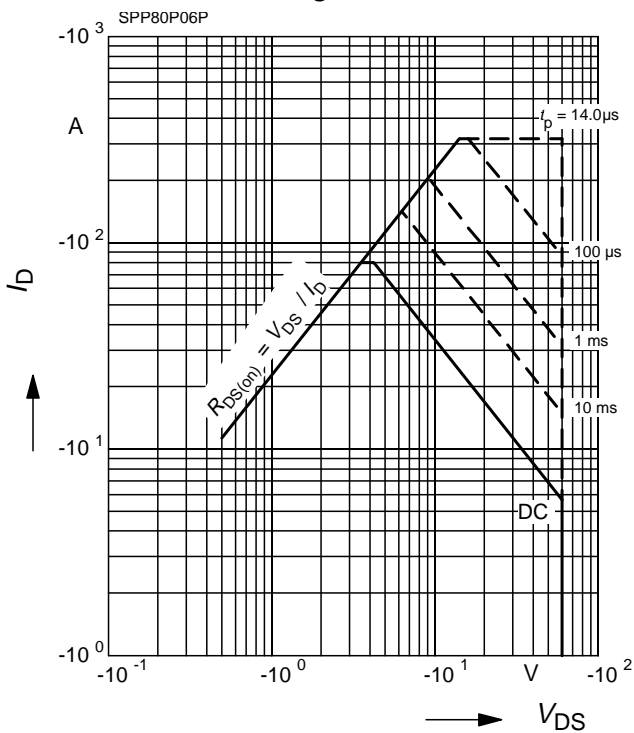
parameter: $V_{GS} \geq 10\text{ V}$



Safe operating area

$I_D = f(V_{DS})$

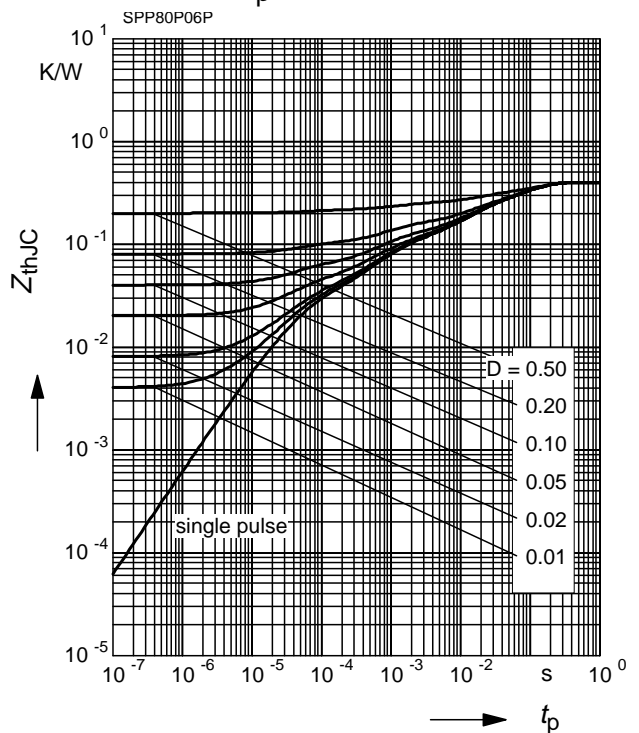
parameter: $D = 0, T_C = 25\text{ °C}$



Transient thermal impedance

$Z_{thJC} = f(t_p)$

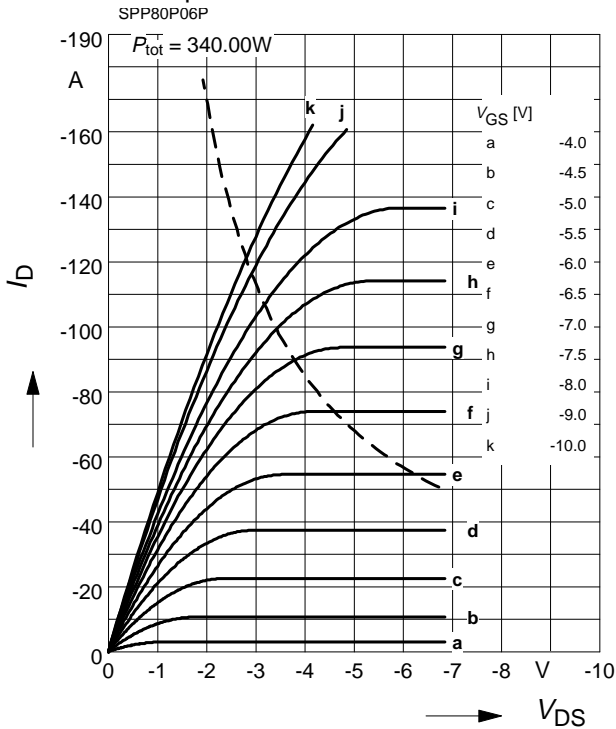
parameter: $D = t_p/T$



Typ. output characteristic

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

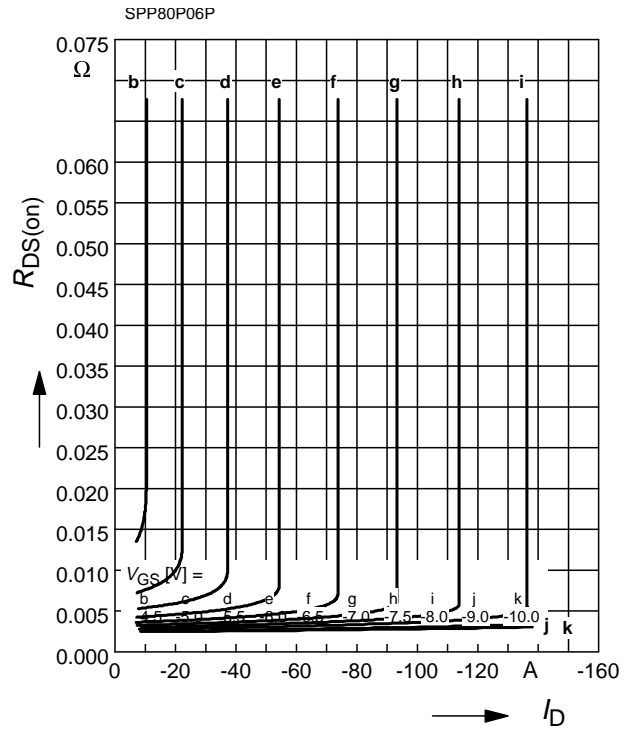
parameter: $t_p = 80 \mu\text{s}$



Typ. drain-source-on-resistance

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

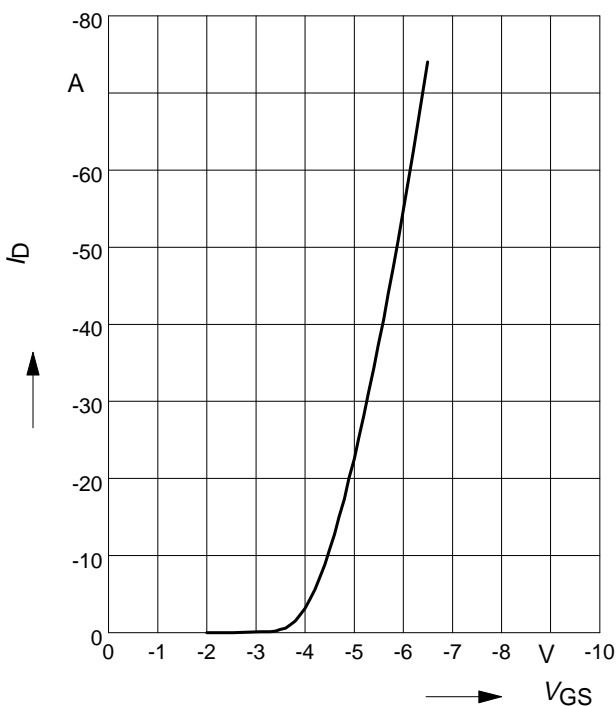
parameter: V_{GS}



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

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

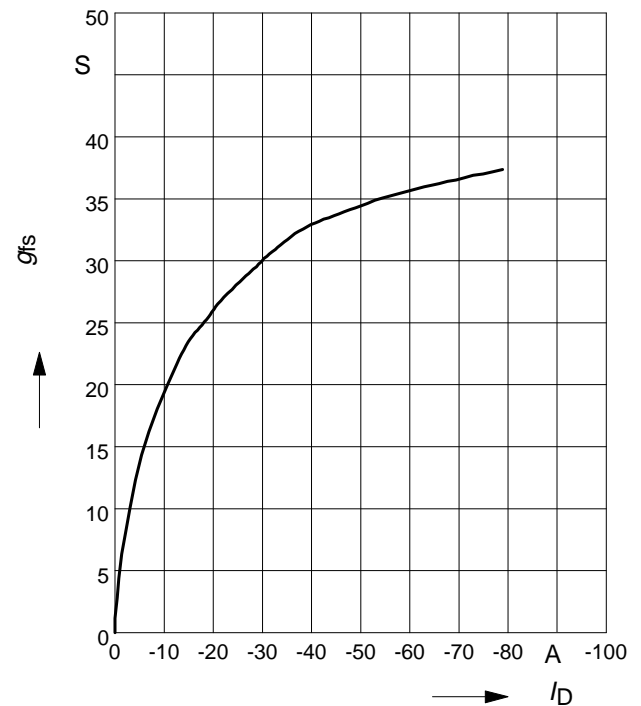
parameter: $t_p = 80 \mu\text{s}$



Typ. forward transconductance

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

parameter: g_{fs}

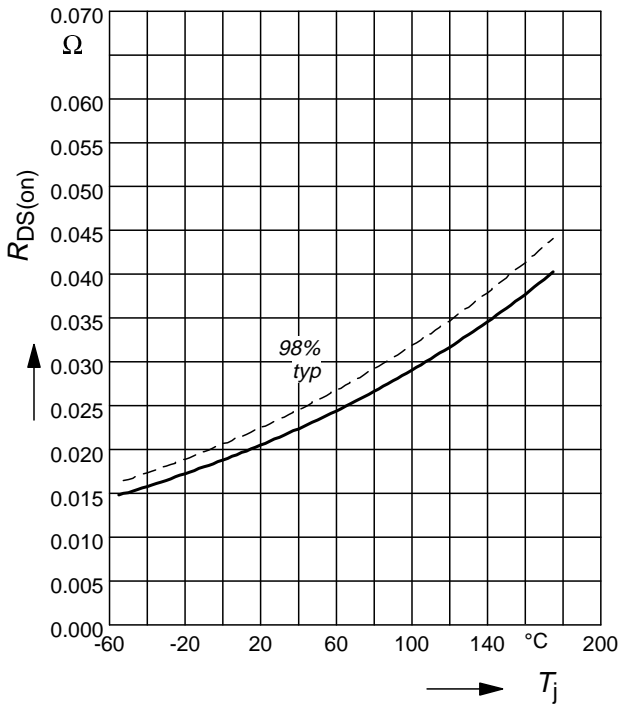


Drain-source on-state resistance

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

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

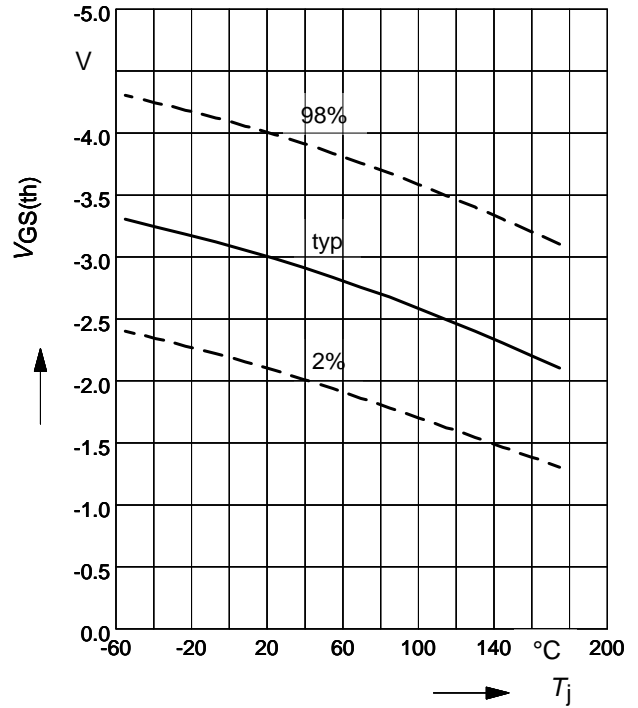
SPP80P06P



Gate threshold voltage

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

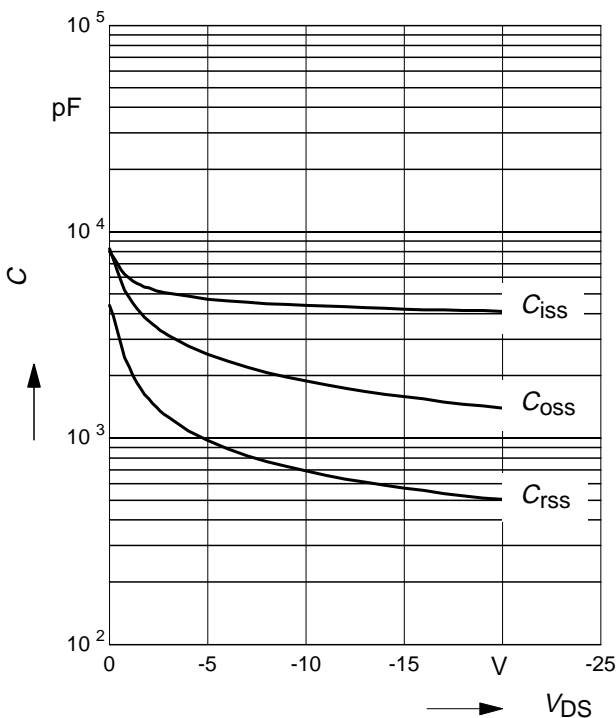
parameter: $V_{GS} = V_{DS}$, $I_D = -5.5 \text{ mA}$



Typ. capacitances

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

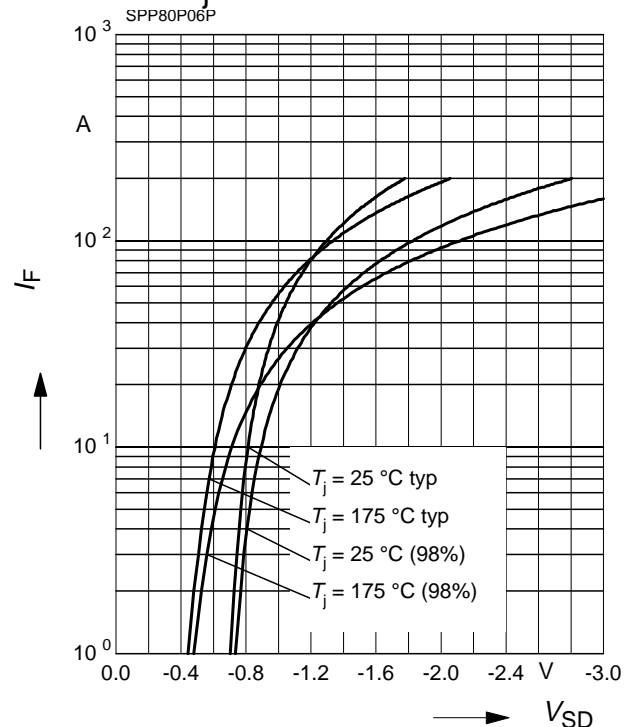
parameter: $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$



Forward characteristics of reverse diode

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

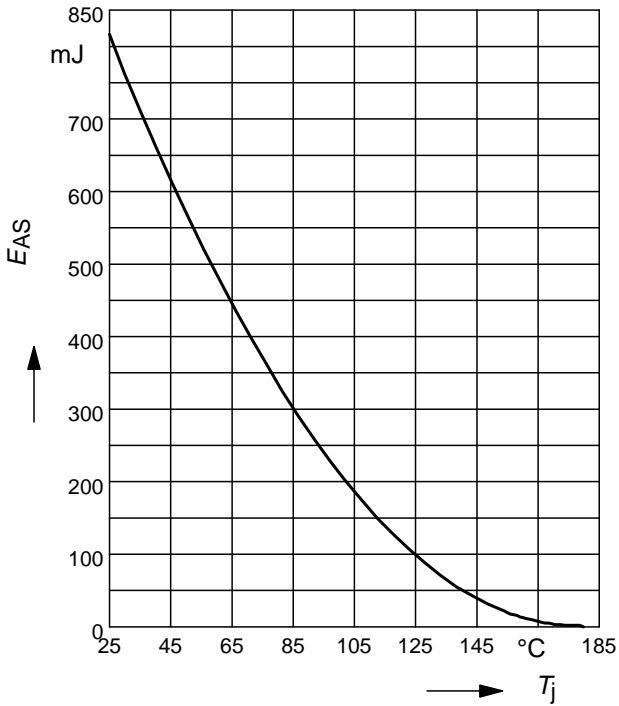
parameter: T_j , $t_p = 80 \mu\text{s}$



Avalanche energy

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

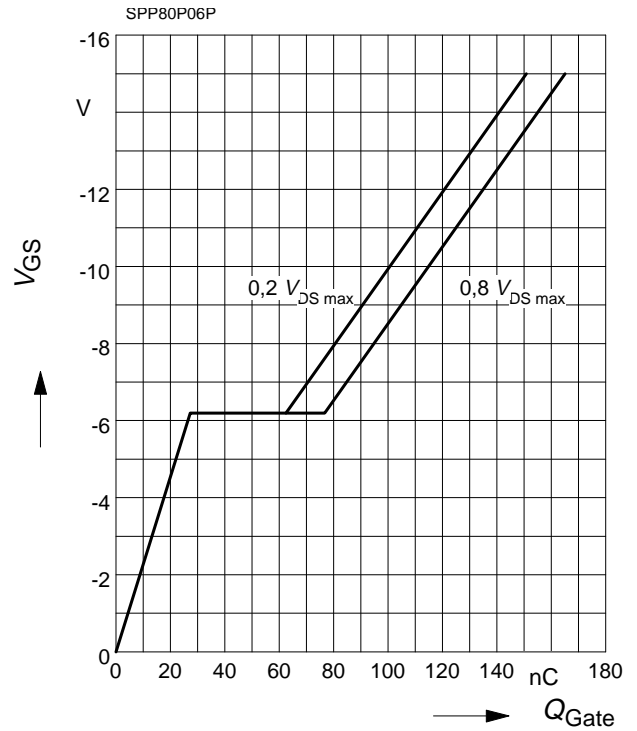
para.: $I_D = -80\text{ A}$, $V_{DD} = -25\text{ V}$, $R_{GS} = 25\ \Omega$



Typ. gate charge

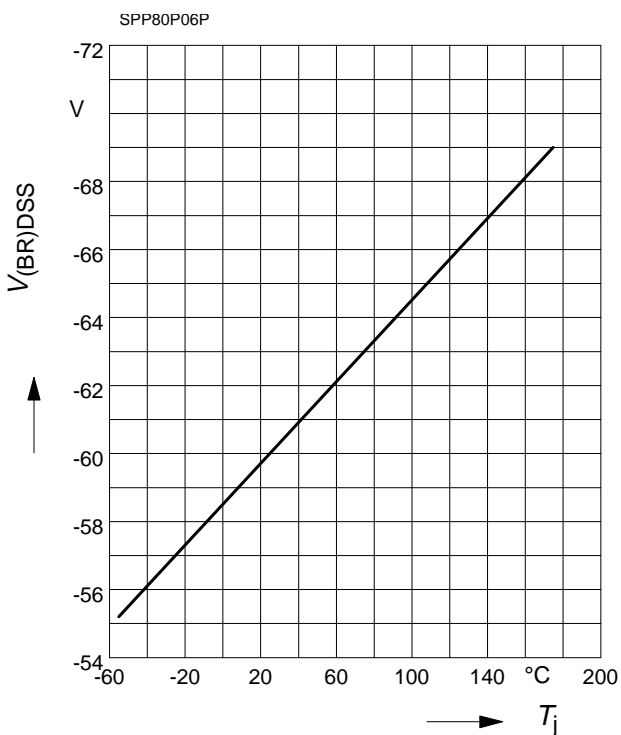
$$V_{GS} = f(Q_{Gate})$$

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

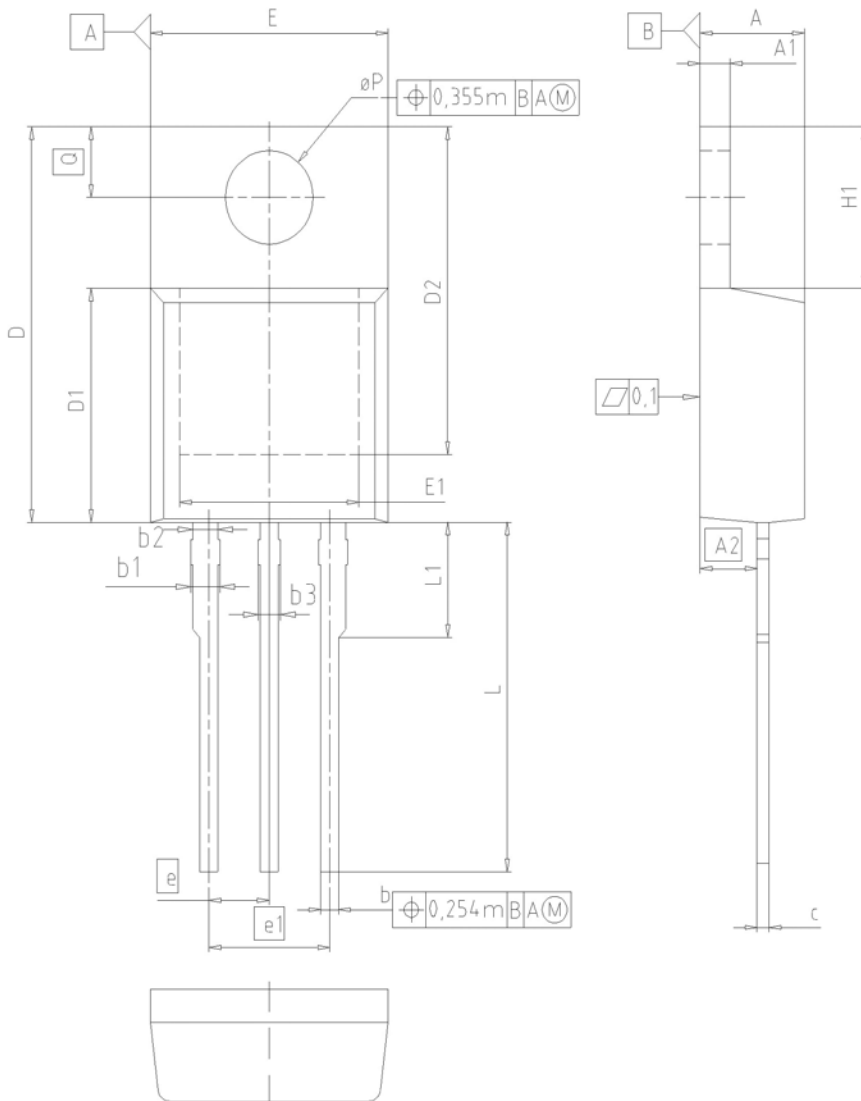


Drain-source breakdown voltage

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



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 |
| øP | 3.60 | 3.89 | 0.142 | 0.153 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |

DOCUMENT NO.
Z8B00003318

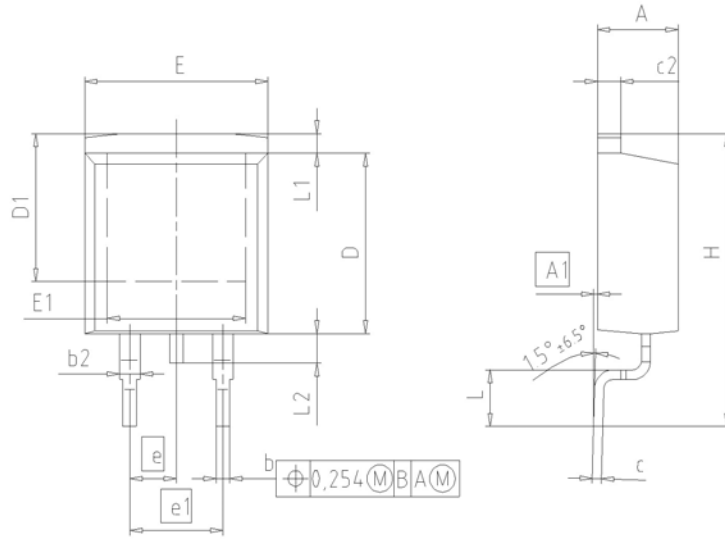
SCALE

EUROPEAN PROJECTION

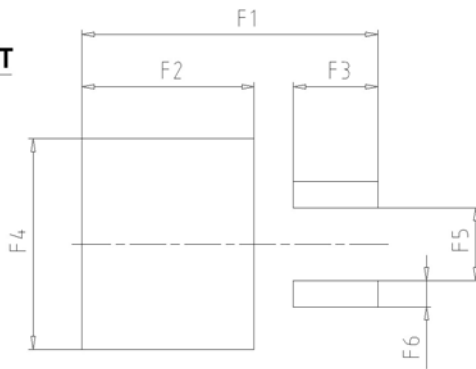
ISSUE DATE
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REVISION
05

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 |

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SCALE

7.5mm

EUROPEAN PROJECTION

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01

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