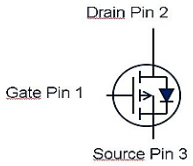
## *SIPMOS*® Small-Signal-Transistor

### Features

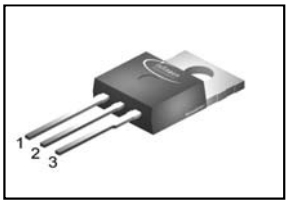
- P-Channel
- Enhancement mode
- Avalanche rated
- d*v*/d*t* rated
- 175°C operating temperature
- Pb-free lead finishing; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Qualified according to AEC Q101

### Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | -60 | V |
| $R_{DS(on),max}$ | 0.13 | Ω |
| $I_D$ | -18.7 | A |




PG-TO220-3-1




| Type | Package | Tape and reel information | Marking | Lead free |
|---|---|---|---|---|
| SPP18P06PH | PG-TO220-3 | 50pcs/tube | 18P06P | Yes |

**Maximum ratings,** at $T_j$=25 °C, unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| | | | steady state | |
| Continuous drain current | $I_D$ | $T_A$=25 °C | -18.7 | A |
| | | $T_A$=100 °C | -13.2 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_A$=25 °C | -74.8 | |
| Avalanche energy, single pulse | $E_{AS}$ | $I_D$=18.7 A, $R_{GS}$=25 Ω | 151 | mJ |
| Avalanche energy, periodic limited by $T_{jmax}$ | $E_{AR}$ | | 8 | |
| Reverse diode d*v*/d*t* | d*v*/d*t* | $I_D$=18.7 A, $V_{DS}$=48 V, d*i*/d*t*=-200 A/µs, $T_{j,max}$=175 °C | -6 | kV/µs |
| Gate source voltage | $V_{GS}$ | | ±20 | V |
| Power dissipation | $P_{tot}$ | $T_A$=25 °C[1)] | 81.1 | W |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | "-55 ... +175" | °C |
| ESD class | | | Class 1C( >1000V <2000V) | |
| Soldering temperature | | | 260 °C | |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | |

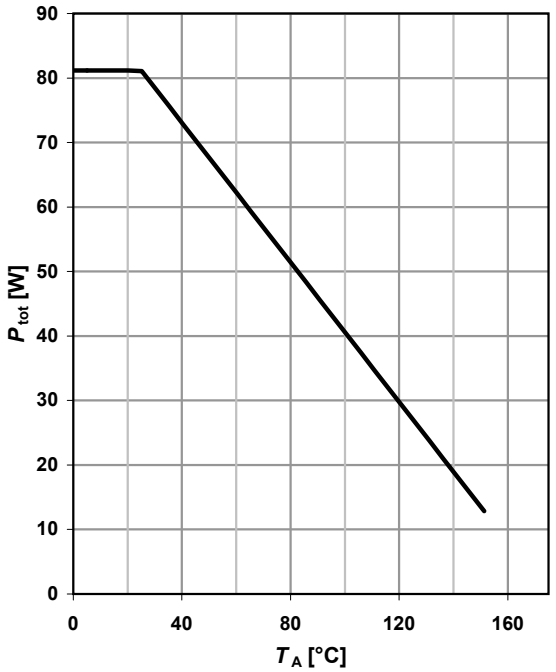
| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Thermal characteristics** | | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | | - | - | 1.85 | K/W |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | | - | - | 62 | |
| SMD version, device on PCB: | $R_{thJA}$ | minimal footprint | - | - | 62 | K/W |
| | | 6 $cm^2$ cooling area[1)] | - | - | 40 | |
| **Electrical characteristics,** at $T_j$=25 °C, unless otherwise specified | | | | | | |
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$=0 V, $I_D$=-250 µA | -60 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=-1000 µA | -2.1 | 2.7 | -4 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=-60 V, $V_{GS}$=0 V, $T_j$=25 °C | - | -0.1 | -1 | µA |
| | | $V_{DS}$=-60 V, $V_{GS}$=0 V, $T_j$=150 °C | - | -10 | -100 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=-20 V, $V_{DS}$=0 V | - | -10 | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=-10 V, $I_D$=-13.2 A | - | 102 | 130 | mΩ |
| Transconductance | $g_{fs}$ | $\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, $I_D$=-13.2 A | 5 | 10 | - | S |

[1)] Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6 $cm^2$ (one layer, 70 µm thick) copper area for drain connection. PCB is vertical without blown air.

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0 V, $V_{DS}$=-25 V, $f$=1 MHz | - | 690 | 860 | pF |
| Output capacitance | $C_{oss}$ | | - | 230 | 290 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 95 | 120 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=-30 V, $V_{GS}$=-10 V, $I_D$=-13.2 A, $R_G$=2.7 Ω | - | 12.0 | 18.0 | ns |
| Rise time | $t_r$ | | - | 5.8 | 8.7 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 25 | 37 | |
| Fall time | $t_f$ | | - | 11 | 16.5 | |
| Gate Charge Characteristics | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=-48 V, $I_D$=-18.6 A, $V_{GS}$=0 to -10 V | - | -4.1 | -5.5 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | -11 | -17 | |
| Gate charge total | $Q_g$ | | - | -21 | -28 | |
| Gate plateau voltage | $V_{plateau}$ | | - | -5.94 | - | V |
| **Reverse Diode** | | | | | | |
| Diode continuous forward current | $I_S$ | $T_A$=25 °C | - | - | 18.60 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | -74.8 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=-18.6 A, $T_j$=25 °C | - | -0.99 | -1.33 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=30 V, $I_F$=$\|I_S\|$, $di_F/dt$=100 A/µs | - | 70 | 105 | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 139 | 208 | nC |

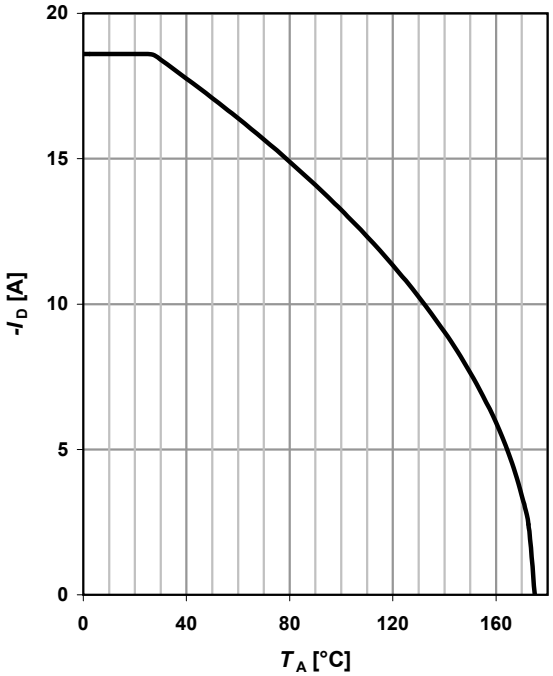
## 1 Power dissipation

$P_{tot}=f(T_A)$




## 2 Drain current

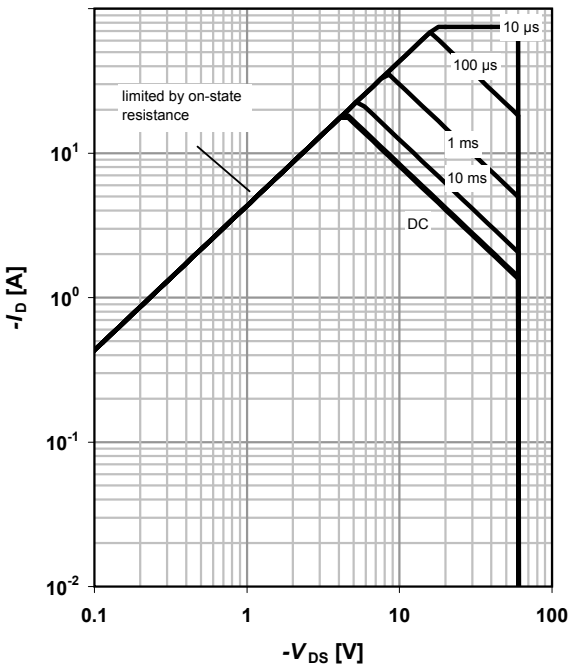
$I_D=f(T_A)$; $|V_{GS}|\geq 10$ V




## 3 Safe operating area

$I_D=f(V_{DS})$; $T_A=25$ °C[1)]; $D=0$

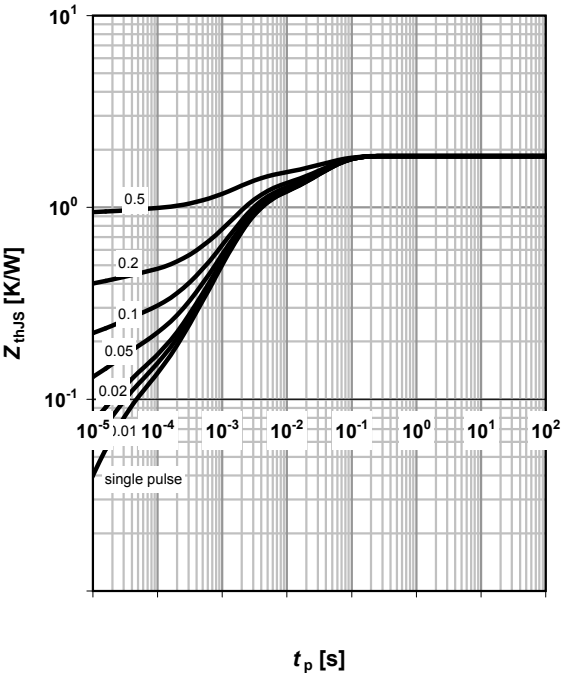
parameter: $t_p$




## 4 Max. transient thermal impedance

$Z_{thJA}=f(t_p)$

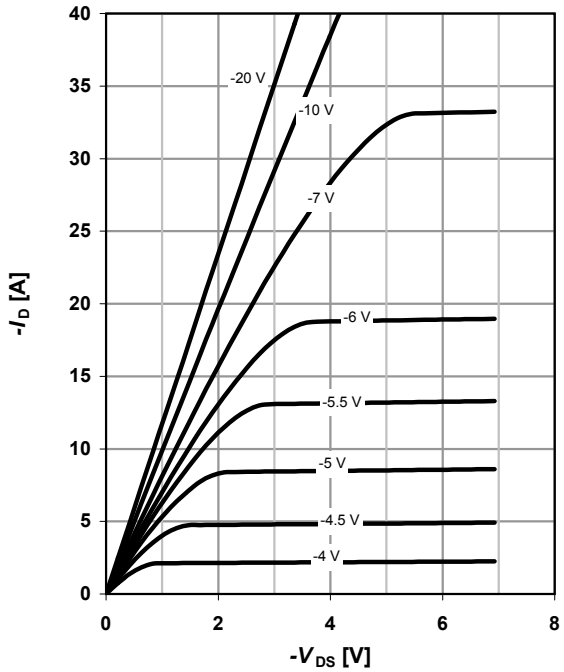
parameter: $D=t_p/T$



### 5 Typ. output characteristics

$I_D$=f($V_{DS}$); $T_j$=25 °C

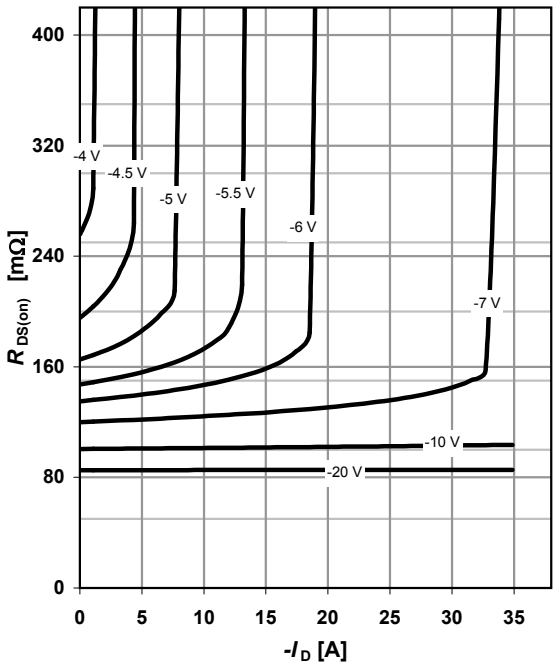
parameter: $V_{GS}$




### 6 Typ. drain-source on resistance

$R_{DS(on)}$=f($I_D$); $T_j$=25 °C

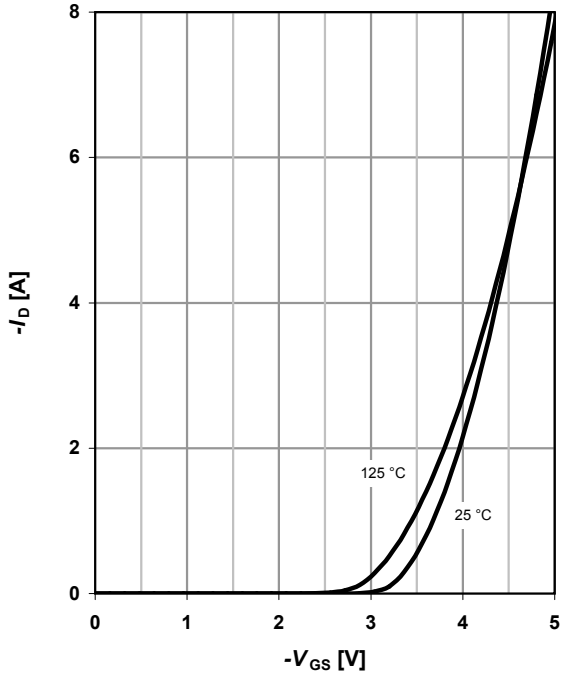
parameter: $V_{GS}$




### 7 Typ. transfer characteristics

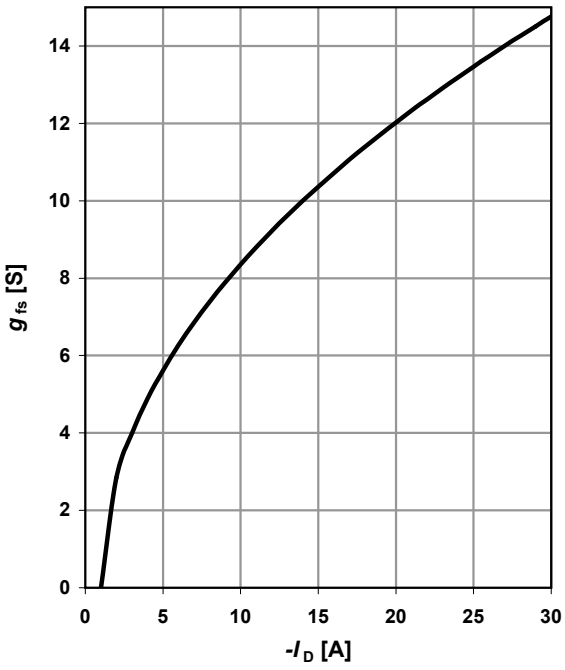
$I_D$=f($V_{GS}$); $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: $T_j$



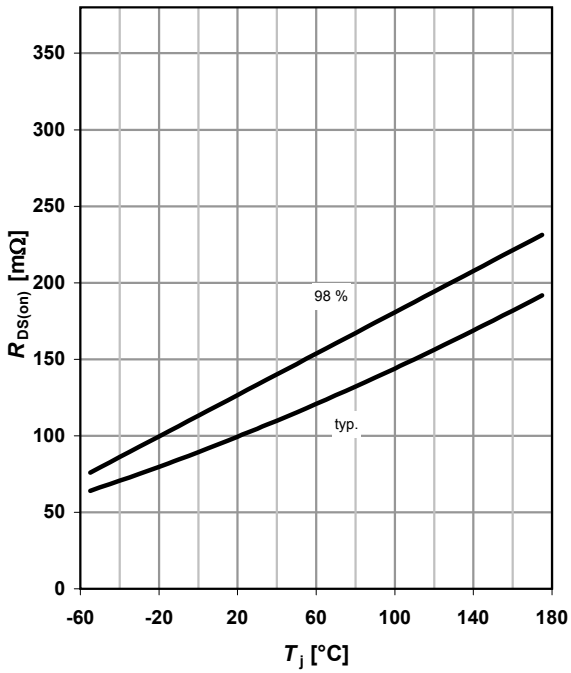

### 8 Typ. forward transconductance

$g_{fs}$=f($I_D$); $T_j$=25 °C



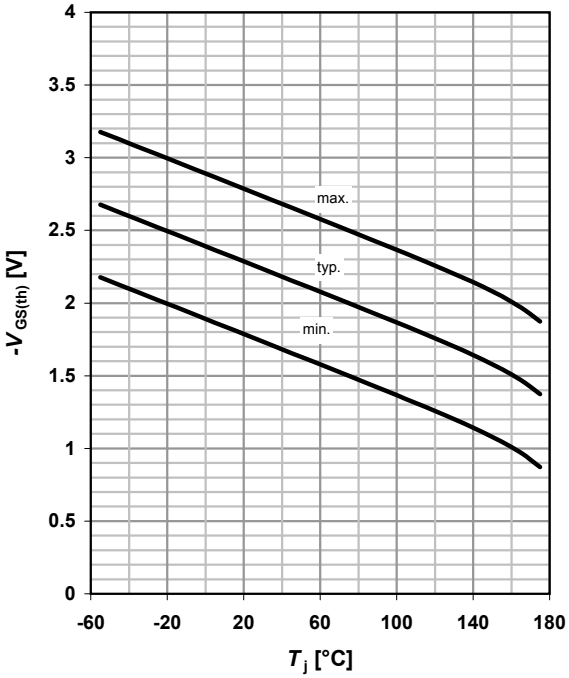
### 9 Drain-source on-state resistance

$R_{DS(on)}$=f($T_j$); $I_D$=-13.2 A; $V_{GS}$=-10 V



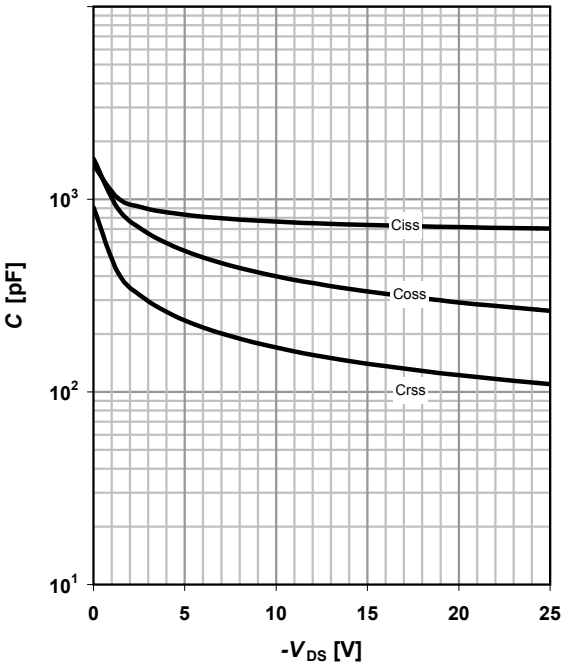

### 10 Typ. gate threshold voltage

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$; $I_D$=-1000 µA




### 11 Typ. capacitances

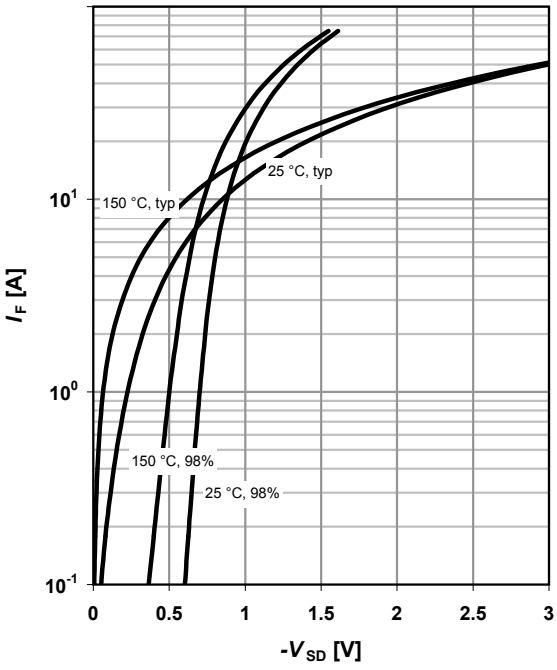
$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz




### 12 Forward characteristics of reverse diode

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

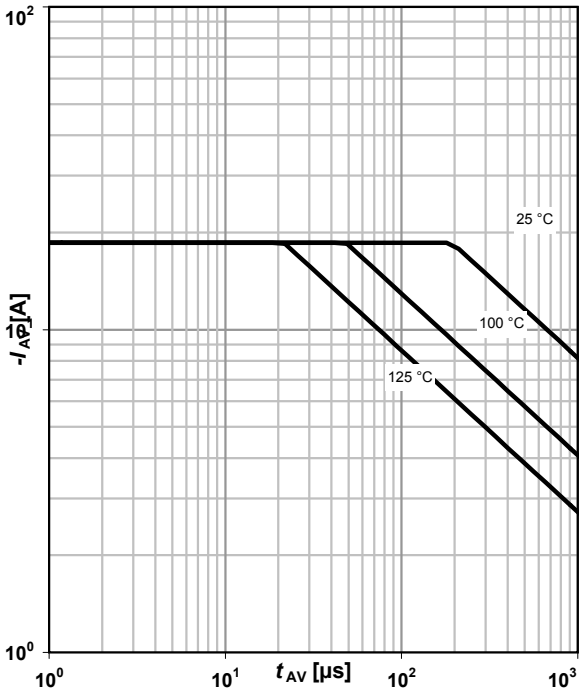
parameter: $T_j$



## 13 Avalanche characteristics

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω

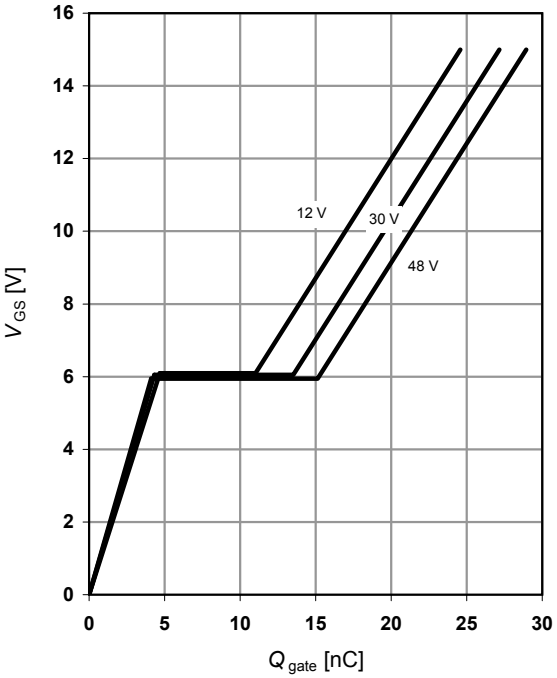
parameter: $T_{j(start)}$




## 14 Typ. gate charge

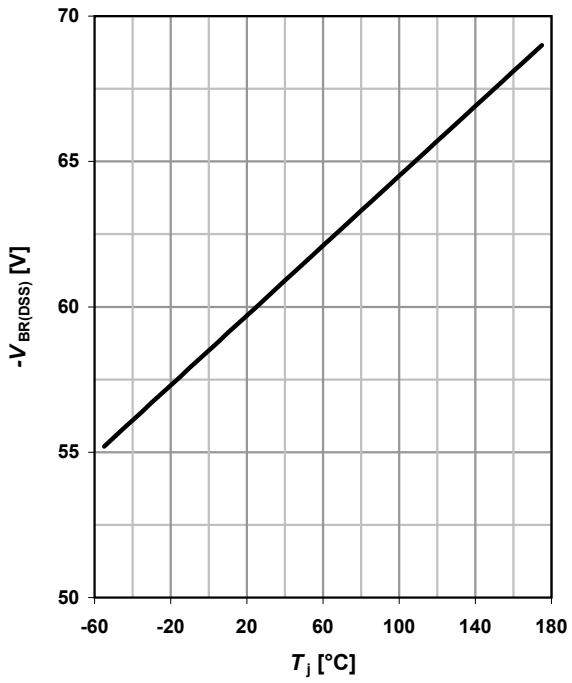
$V_{GS}$=f($Q_{gate}$); $I_D$=-18.6 A pulsed

parameter: $V_{DD}$

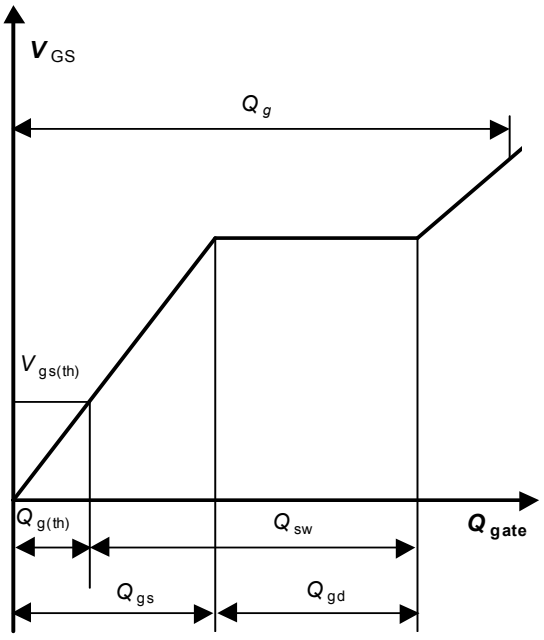



## 15 Drain-source breakdown voltage

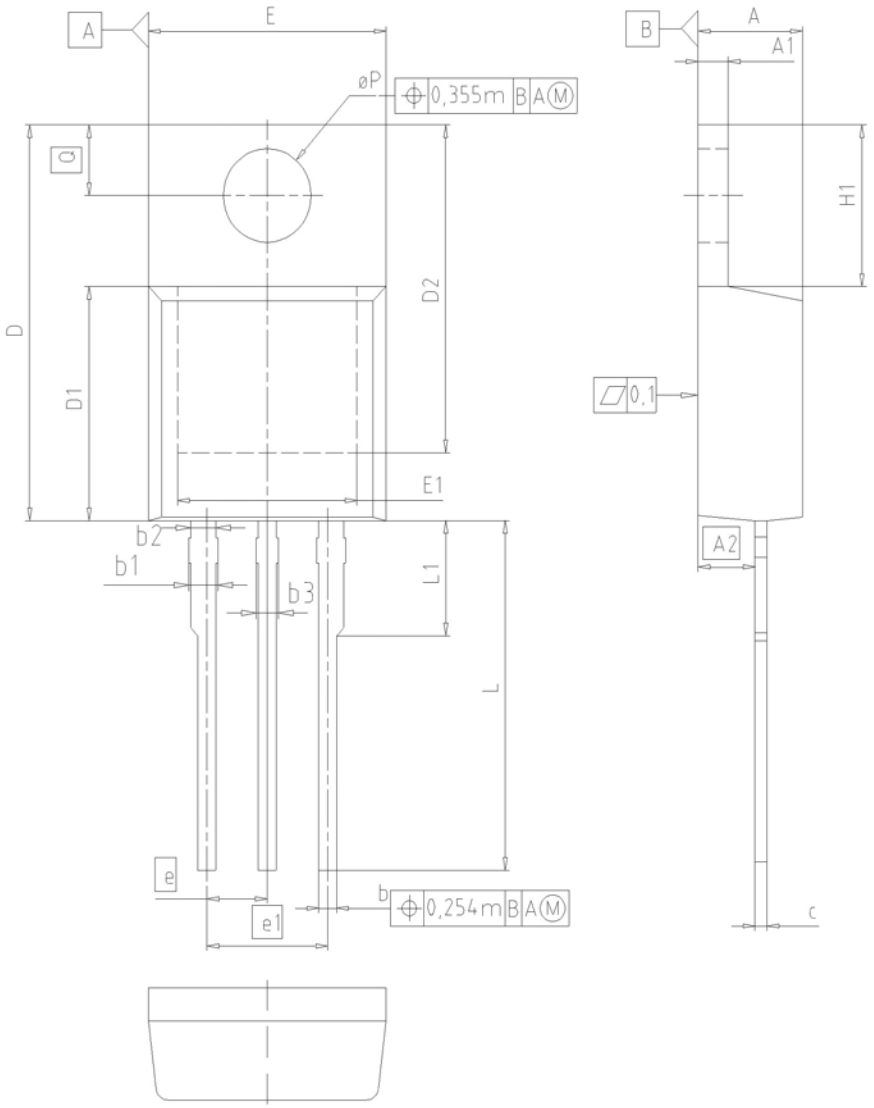
$V_{BR(DSS)}$=f($T_j$); $I_D$=-250 µA




## 16 Gate charge waveforms



**Package Outline: 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 |

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Z8B00003318

SCALE
0 2.5 5mm

EUROPEAN PROJECTION

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