## OptiMOS® Power-Transistor

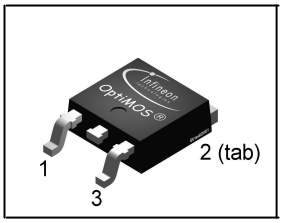
### Feature

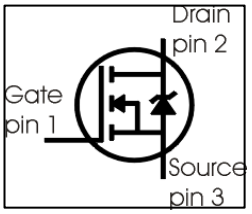
- N-Channel
- Enhancement mode
- Logic Level
- Low On-Resistance $R_{DS(on)}$
- Excellent Gate Charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- d*v*/d*t* rated
- ° Pb-free lead plating; RoHS compliant

### Product Summary

| | | |
|---|---|---|
| $V_{DS}$ | 30 | V |
| $R_{DS(on)}$ | 10 | mΩ |
| $I_D$ | 30 | A |

PG-TO252-3




| Type | Package | Marking |
|---|---|---|
| SPD30N03S2L-10G | PG-TO252-3 | 2N03L10 |

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

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Continuous drain current[1)]<br>$T_C$=25°C | $I_D$ | <br>30<br>30 | A |
| Pulsed drain current<br>$T_C$=25°C | $I_{D\ puls}$ | 120 | |
| Avalanche energy, single pulse<br>$I_D$=30 A , $V_{DD}$=25V, $R_{GS}$=25Ω | $E_{AS}$ | 150 | mJ |
| Repetitive avalanche energy, limited by $T_{jmax}$[2)] | $E_{AR}$ | 10 | |
| Reverse diode d*v*/d*t*<br>$I_S$=30A, $V_{DS}$=24V, d*i*/d*t*=200A/µs, $T_{jmax}$=175°C | d*v*/d*t* | 6 | kV/µs |
| Gate source voltage | $V_{GS}$ | ±20 | V |
| Power dissipation<br>$T_C$=25°C | $P_{tot}$ | 100 | W |
| Operating and storage temperature | $T_j$ , $T_{stg}$ | -55... +175 | °C |
| IEC climatic category; DIN IEC 68-1 | | 55/175/56 | |

## Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Characteristics** | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | 1 | 1.5 | K/W |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | - | - | 100 | |
| SMD version, device on PCB: | $R_{thJA}$ | | | | |
| @ min. footprint | | - | - | 75 | |
| @ 6 cm$^2$ cooling area [3] | | - | - | 50 | |

## Electrical Characteristics, at $T_j$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | min. | typ. | max. | |
| **Static Characteristics** | | | | | |
| Drain-source breakdown voltage<br>$V_{GS}$=0V, $I_D$=1mA | $V_{(BR)DSS}$ | 30 | - | - | V |
| Gate threshold voltage, $V_{GS}$ = $V_{DS}$<br>$I_D$=50µA | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current | $I_{DSS}$ | | | | µA |
| $V_{DS}$=30V, $V_{GS}$=0V, $T_j$=25°C | | - | 0.01 | 1 | |
| $V_{DS}$=30V, $V_{GS}$=0V, $T_j$=125°C | | - | 10 | 100 | |
| Gate-source leakage current<br>$V_{GS}$=20V, $V_{DS}$=0V | $I_{GSS}$ | - | 1 | 100 | nA |
| Drain-source on-state resistance<br>$V_{GS}$=4.5V, $I_D$=30A | $R_{DS(on)}$ | - | 11.2 | 14.6 | Ω |
| Drain-source on-state resistance<br>$V_{GS}$=10V, $I_D$=30 | $R_{DS(on)}$ | - | 7.8 | 10 | mΩ |

[1]Current limited by bondwire ; with an $R_{thJC}$ = 1.5K/W the chip is able to carry $I_D$= 76A at 25°C, for detailed information see app.-note ANPS071E available at *www.infineon.com/optimos*

[2]Defined by design. Not subject to production test.

[3]Device 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.

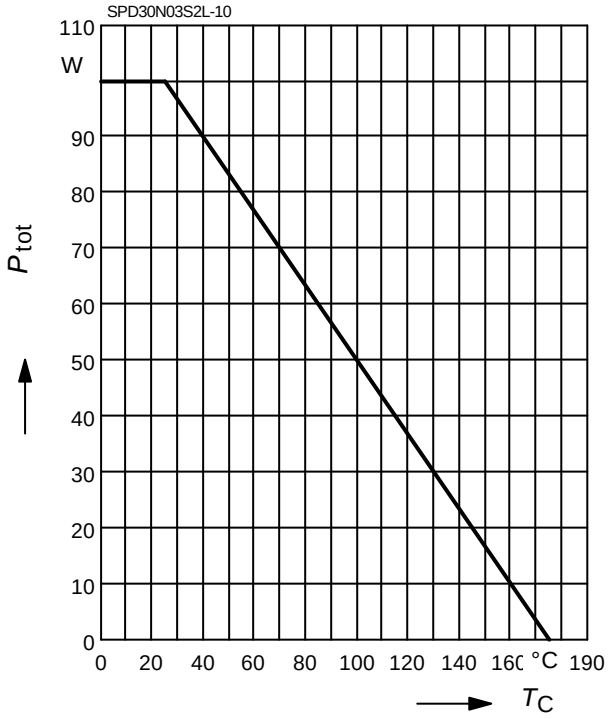
## Electrical Characteristics

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic Characteristics** | | | | | | |
| Transconductance | $g_{fs}$ | $V_{DS}\geq 2*I_D*R_{DS(on)max}$, $I_D$=30A | 23.8 | 47.5 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 1160 | 1550 | pF |
| Output capacitance | $C_{oss}$ | | - | 450 | 600 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 120 | 175 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=15V, $V_{GS}$=10V, $I_D$=30A, $R_G$=5.4Ω | - | 6.1 | 9.2 | ns |
| Rise time | $t_r$ | | - | 13 | 20 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 27 | 41 | |
| Fall time | $t_f$ | | - | 17 | 26 | |
| **Gate Charge Characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=24V, $I_D$=30A | - | 3.7 | 4.9 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 10.9 | 16.3 | |
| Gate charge total | $Q_g$ | $V_{DD}$=24V, $I_D$=30A, $V_{GS}$=0 to 10V | - | 31.4 | 41.8 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD}$=24V, $I_D$=30A | - | 3.4 | - | V |
| **Reverse Diode** | | | | | | |
| Inverse diode continuous forward current | $I_S$ | $T_C$=25°C | - | - | 30 | A |
| Inv. diode direct current, pulsed | $I_{SM}$ | | - | - | 120 | |
| Inverse diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_F$=30A | - | 0.9 | 1.2 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=-V, $I_F$=$I_S$, $di_F/dt$=100A/µs | - | 31 | 39 | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 29 | 37 | nC |

## 1 Power dissipation

$P_{tot} = f(T_C)$

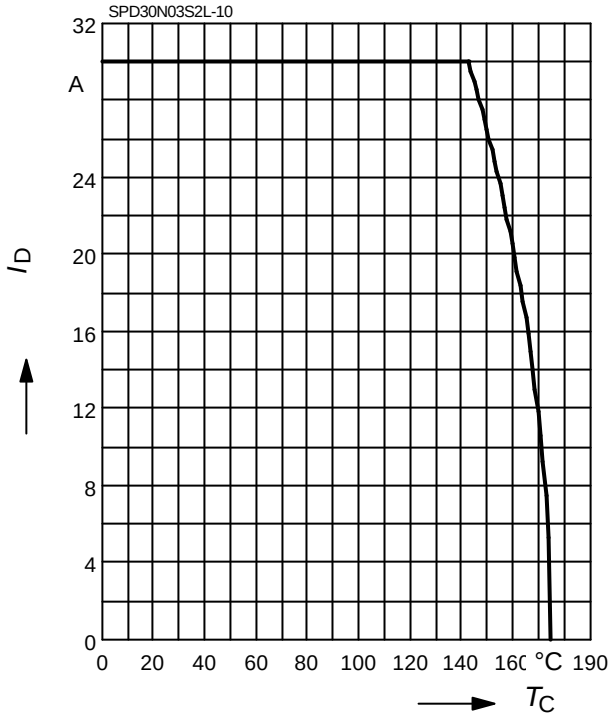
parameter: $V_{GS} \geq 4$ V




## 2 Drain current

$I_D = f(T_C)$

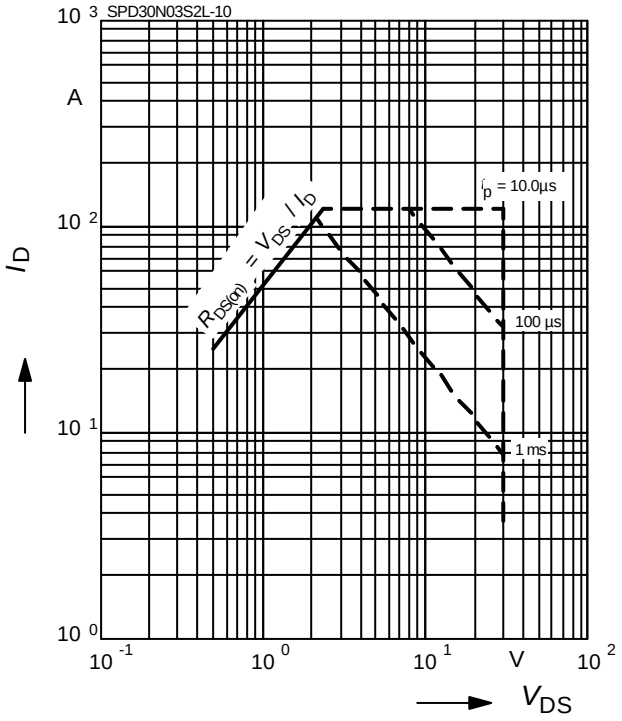
parameter: $V_{GS} \geq 10$ V




## 3 Safe operating area

$I_D = f(V_{DS})$

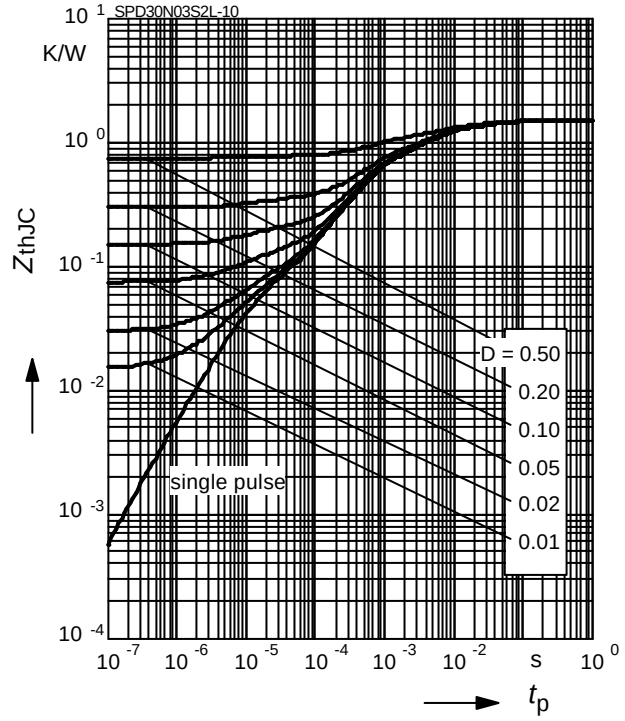
parameter : $D = 0$ , $T_C = 25$ °C




## 4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

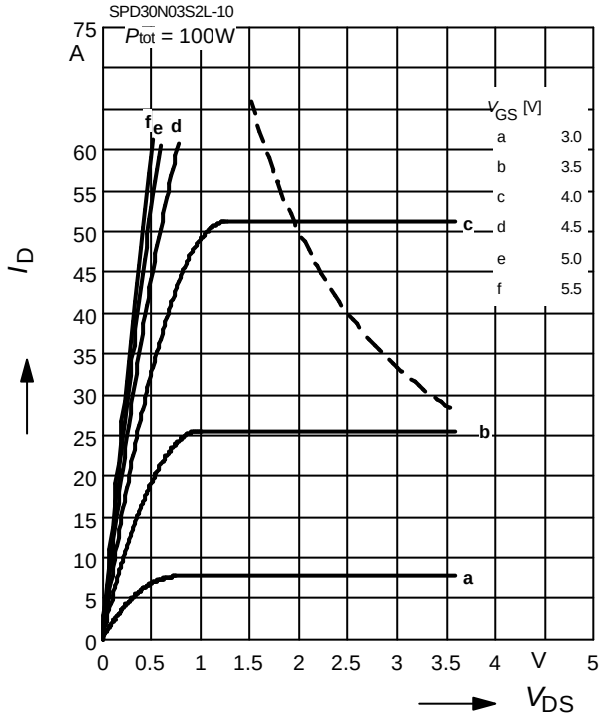
parameter : $D = t_p/T$



## 5 Typ. output characteristic

$I_D = f(V_{DS})$; $T_j$=25°C

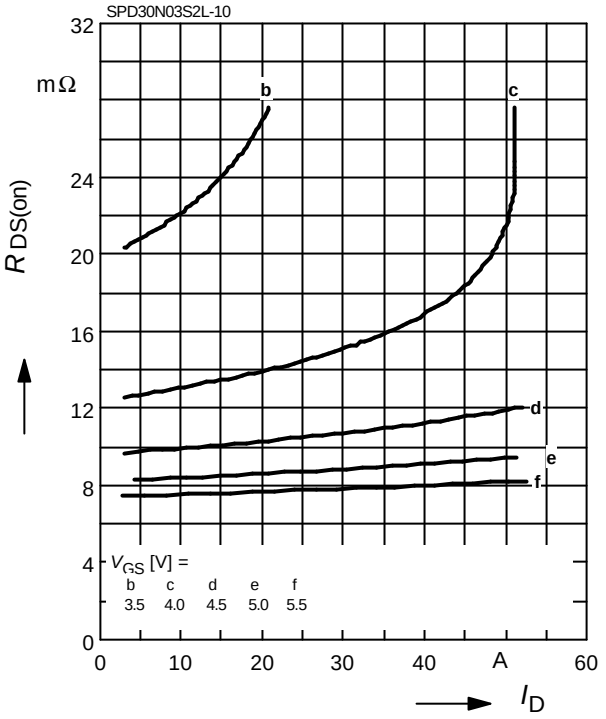
parameter: $t_p$ = 80 µs




## 6 Typ. drain-source on resistance

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

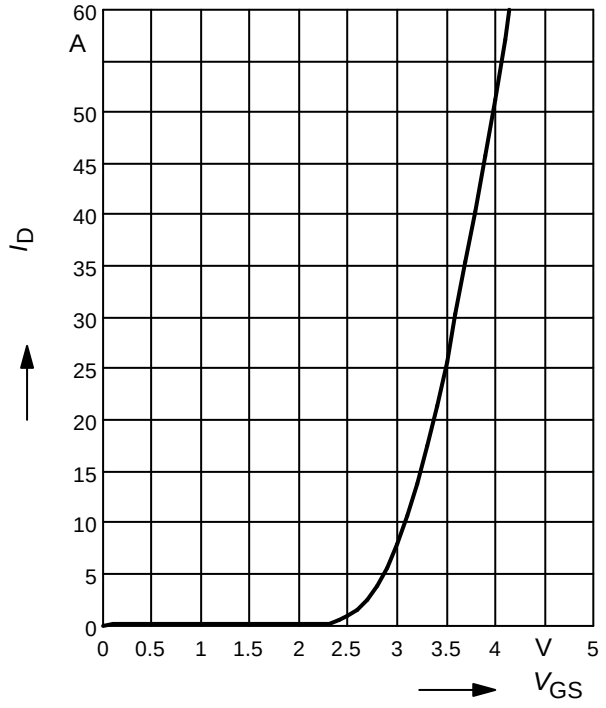
parameter: $V_{GS}$




## 7 Typ. transfer characteristics

$I_D = f(V_{GS})$; $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

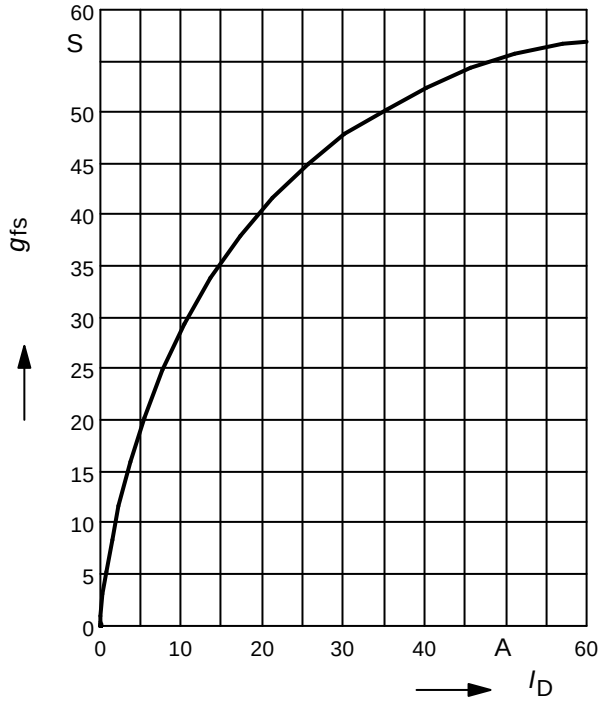
parameter: $t_p$ = 80 µs




## 8 Typ. forward transconductance

$g_{fs} = f(I_D)$; $T_j$=25°C

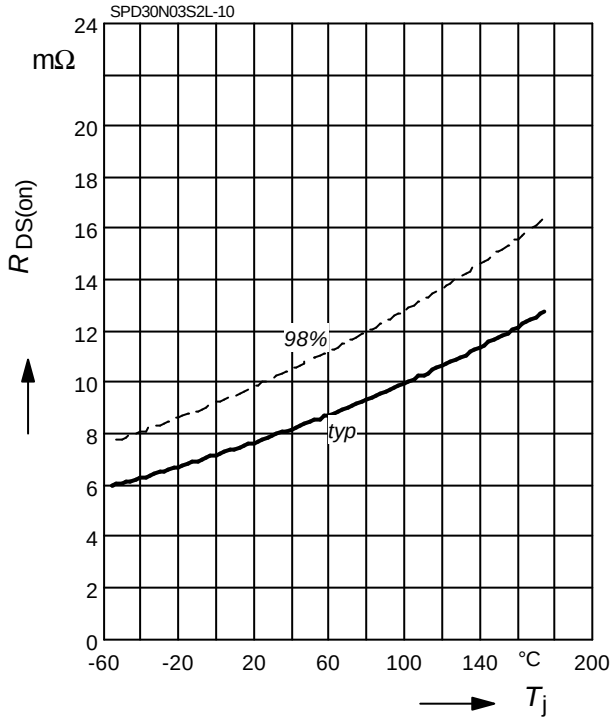
parameter: $g_{fs}$



## 9 Drain-source on-state resistance

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

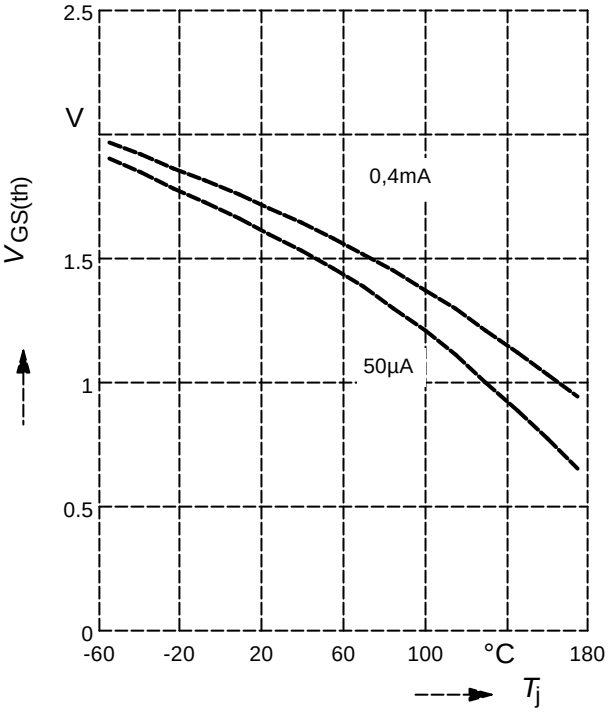
parameter : $I_D = 30$ , $V_{GS} = 10$ V




## 10 Typ. gate threshold voltage

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

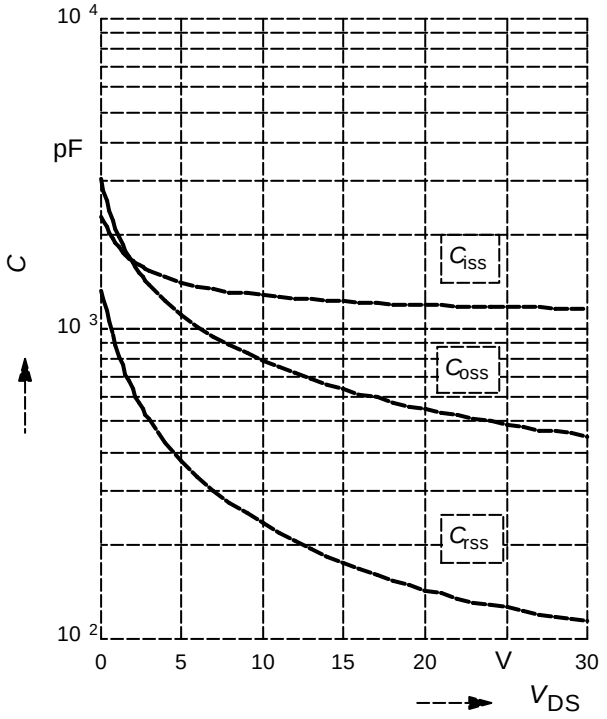
parameter: $V_{GS} = V_{DS}$




## 11 Typ. capacitances

$C = f(V_{DS})$

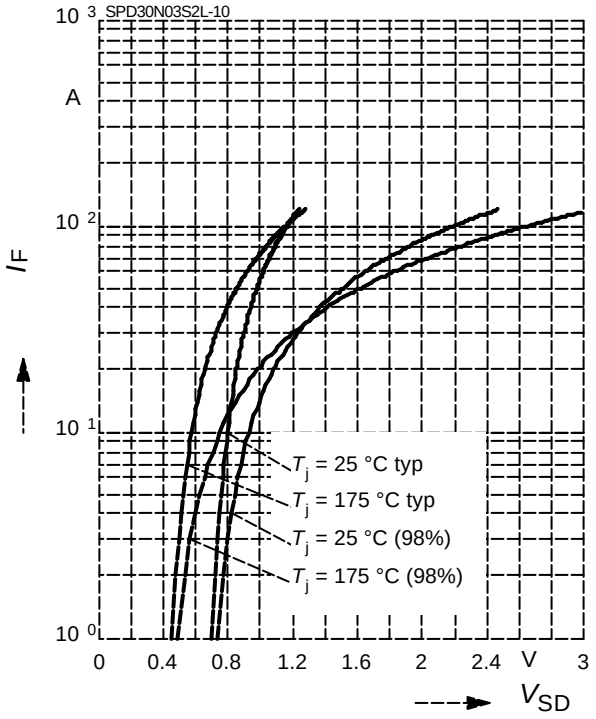
parameter: $V_{GS}$=0V, $f$=1 MHz




## 12 Forward character. of reverse diode

$I_F = f(V_{SD})$

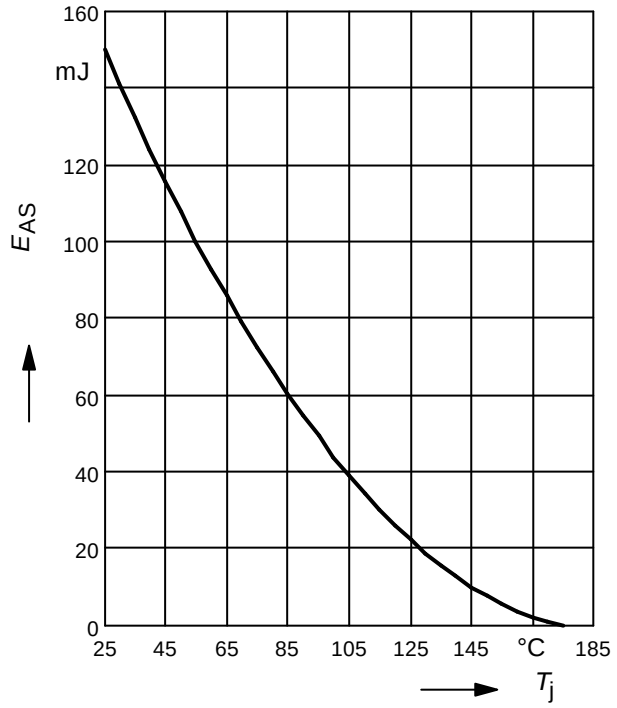
parameter: $T_j$ , tp = 80 µs



## 13 Typ. avalanche energy

$E_{AS} = f(T_j)$

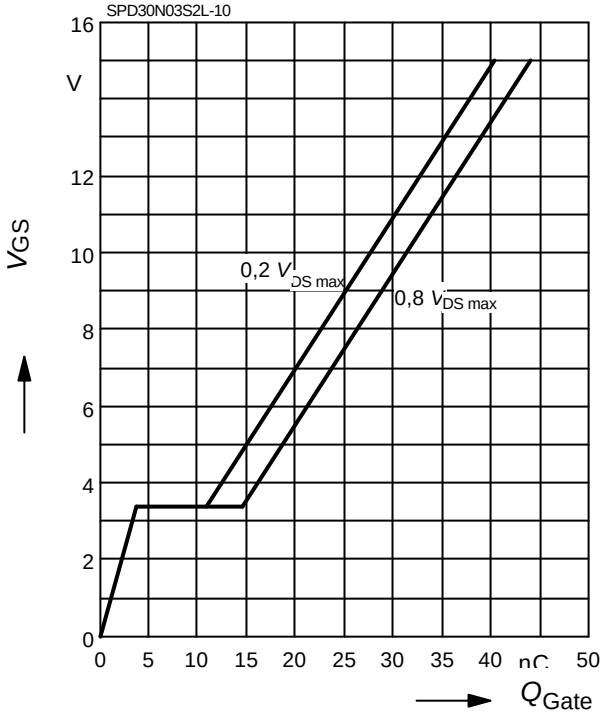
par.: $I_D = 30$ A , $V_{DD} = 25$ V, $R_{GS} = 25\ \Omega$




## 14 Typ. gate charge

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

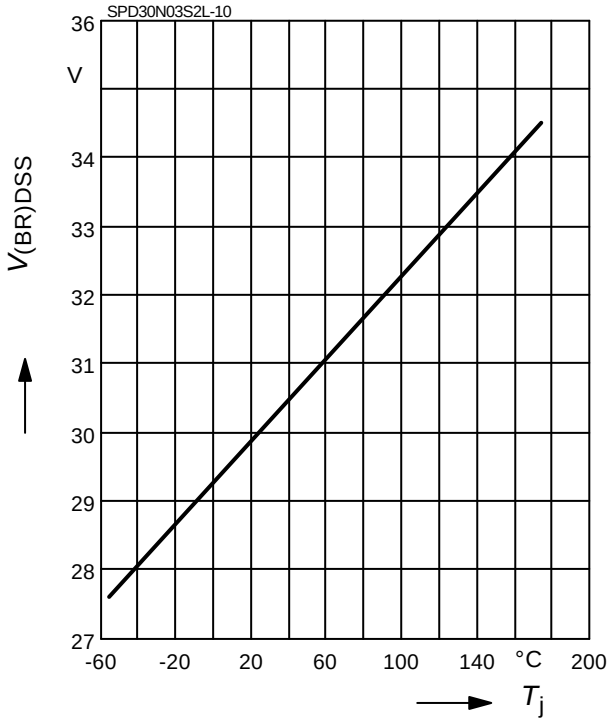
parameter: $I_D = 30$ A pulsed



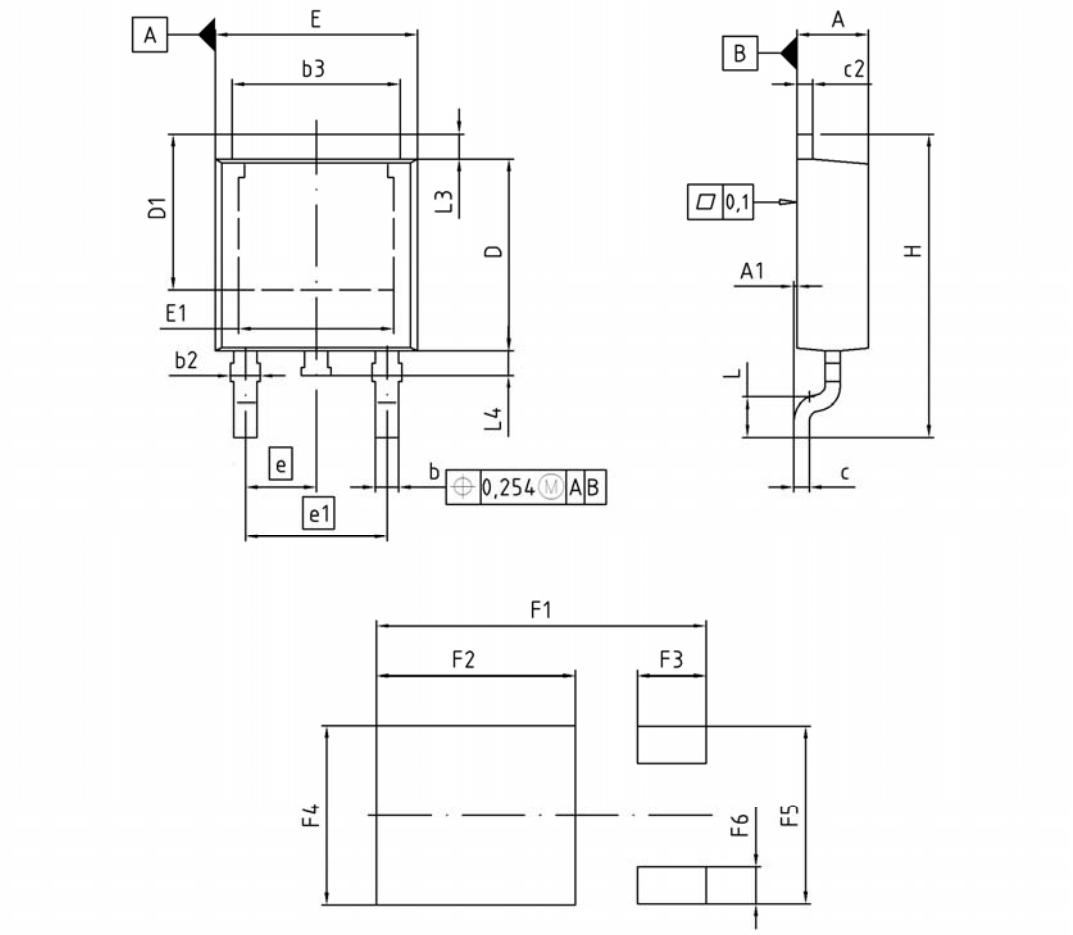

## 15 Drain-source breakdown voltage

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

parameter: $I_D$=10 mA



**Package outline: PG-TO252-3**




| DIM | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 2.16 | 2.41 | 0.085 | 0.095 |
| A1 | 0.00 | 0.15 | 0.000 | 0.006 |
| b | 0.64 | 0.89 | 0.025 | 0.035 |
| b2 | 0.65 | 1.15 | 0.026 | 0.045 |
| b3 | 5.00 | 5.50 | 0.197 | 0.217 |
| c | 0.46 | 0.60 | 0.018 | 0.024 |
| c2 | 0.46 | 0.98 | 0.018 | 0.039 |
| D | 5.97 | 6.22 | 0.235 | 0.245 |
| D1 | 5.02 | 5.84 | 0.198 | 0.230 |
| E | 6.40 | 6.73 | 0.252 | 0.265 |
| E1 | 4.70 | 5.21 | 0.185 | 0.205 |
| e | 2.29 | | 0.090 | |
| e1 | 4.57 | | 0.180 | |
| N | 3 | | 3 | |
| H | 9.40 | 10.48 | 0.370 | 0.413 |
| L | 1.18 | 1.70 | 0.046 | 0.067 |
| L3 | 0.90 | 1.25 | 0.035 | 0.049 |
| L4 | 0.51 | 1.00 | 0.020 | 0.039 |
| F1 | 10.50 | 10.70 | 0.413 | 0.421 |
| F2 | 6.30 | 6.50 | 0.248 | 0.256 |
| F3 | 2.10 | 2.30 | 0.083 | 0.091 |
| F4 | 5.70 | 5.90 | 0.224 | 0.232 |
| F5 | 5.66 | 5.86 | 0.223 | 0.231 |
| F6 | 1.10 | 1.30 | 0.043 | 0.051 |

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