## OptiMOS™-T Power-Transistor

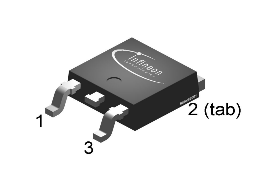
### Product Summary

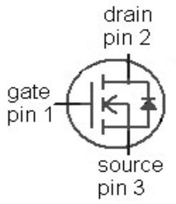
| | | |
|---|---|---|
| $V_{DS}$ | 100 | V |
| $R_{DS(on),max}$ | 31 | mΩ |
| $I_D$ | 30 | A |

### Features

- N-channel - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- RoHS compliant
- 100% Avalanche tested

PG-TO252-3-11




| Type | Package | Marking |
|---|---|---|
| IPD30N10S3L-34 | PG-TO252-3-11 | 3N10L34 |

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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous drain current | $I_D$ | $T_C$=25°C, $V_{GS}$=10V | 30 | A |
| | | $T_C$=100°C, $V_{GS}$=10V[1)] | 20 | |
| Pulsed drain current[1)] | $I_{D,pulse}$ | $T_C$=25°C | 120 | |
| Avalanche energy, single pulse[1)] | $E_{AS}$ | $I_D$=15A | 138 | mJ |
| Avalanche current, single pulse | $I_{AS}$ | | 30 | A |
| Gate source voltage[2)] | $V_{GS}$ | | ±20 | V |
| Power dissipation | $P_{tot}$ | $T_C$=25°C | 57 | W |
| Operating and storage temperature | $T_j$, $T_{stg}$ | | -55 ... +175 | °C |
| IEC climatic category; DIN IEC 68-1 | | | 55/175/56 | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Thermal characteristics**[1] | | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | | - | - | 2.6 | K/W |
| SMD version, device on PCB | $R_{thJA}$ | minimal footprint | - | - | 62 | |
| | | 6 $cm^2$ cooling area[3] | - | - | 40 | |
| **Electrical characteristics,** at $T_j$=25 °C, unless otherwise specified | | | | | | |
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(Br)DSS}$ | $V_{GS}$=0V, $I_D$= 1mA | 100 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=29µA | 1.2 | 1.7 | 2.4 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=80V, $V_{GS}$=0V, $T_j$=25°C | - | 0.01 | 0.1 | µA |
| | | $V_{DS}$=80V, $V_{GS}$=0V, $T_j$=125°C[1] | - | 1 | 10 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=20V, $V_{DS}$=0V | - | - | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=4.5V, $I_D$=30A | - | 32.2 | 41.8 | mΩ |
| | | $V_{GS}$=10 V, $I_D$=30 A | - | 25.8 | 31.0 | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics**[1] | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 1520 | 1976 | pF |
| Output capacitance | $C_{oss}$ | | - | 380 | 494 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 45 | 68 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=20V, $V_{GS}$=10V, $I_D$=30A, $R_G$=3.5Ω | - | 6 | - | ns |
| Rise time | $t_r$ | | - | 4 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 18 | - | |
| Fall time | $t_f$ | | - | 3 | - | |
| **Gate Charge Characteristics**[1] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=80V, $I_D$=30A, $V_{GS}$=0 to 10V | - | 5 | 7 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 4 | 6 | |
| Gate charge total | $Q_g$ | | - | 24 | 31 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 3.7 | - | V |
| **Reverse Diode** | | | | | | |
| Diode continous forward current[1] | $I_S$ | $T_C$=25°C | - | - | 30 | A |
| Diode pulse current[1] | $I_{S,pulse}$ | | - | - | 120 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_F$=30A, $T_j$=25°C | 0.6 | 1 | 1.2 | V |
| Reverse recovery time[1] | $t_{rr}$ | $V_R$=50V, $I_F$=$I_S$, d$i_F$/d$t$=100A/µs | - | 72 | - | ns |
| Reverse recovery charge[1] | $Q_{rr}$ | | - | 150 | - | nC |

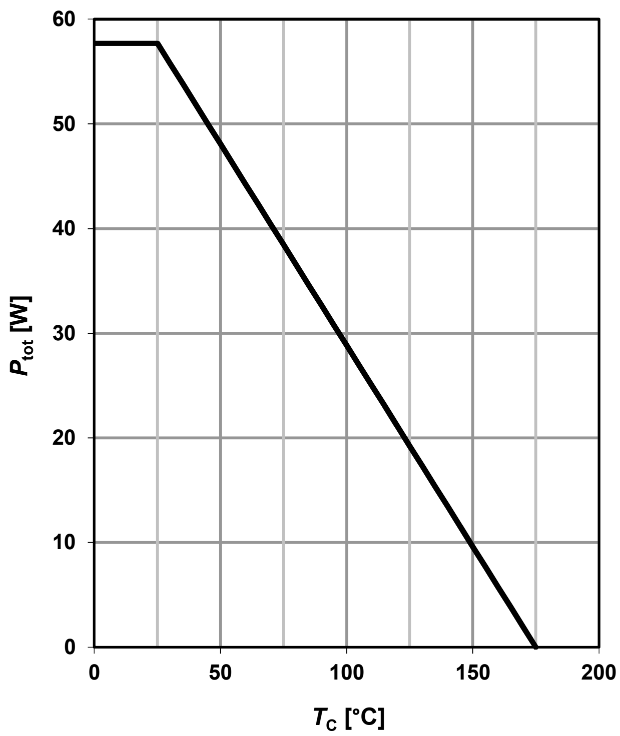
[1] Defined by design. Not subject to production test.

[2] -5V to -20V for max. 168 non-consecutive hours.

[3] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

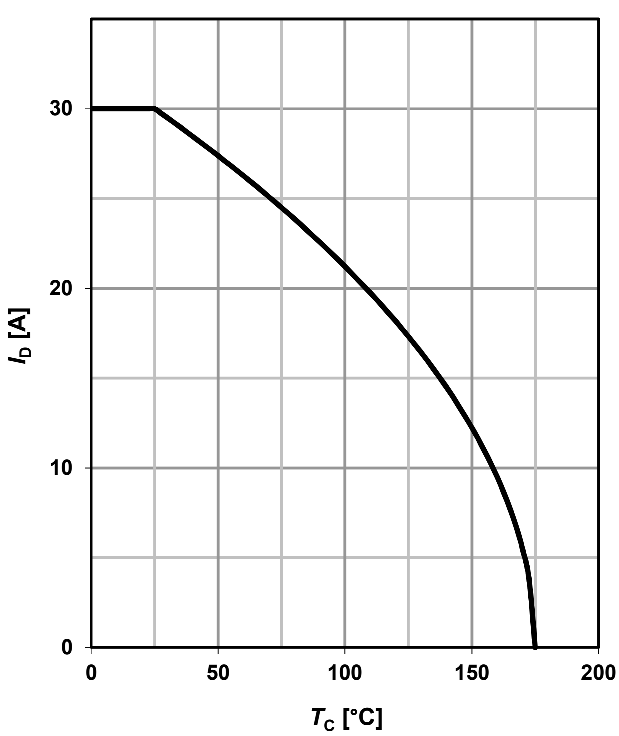
**1 Power dissipation**

$P_{tot} = f(T_C)$; $V_{GS} \geq 6$ V




**2 Drain current**

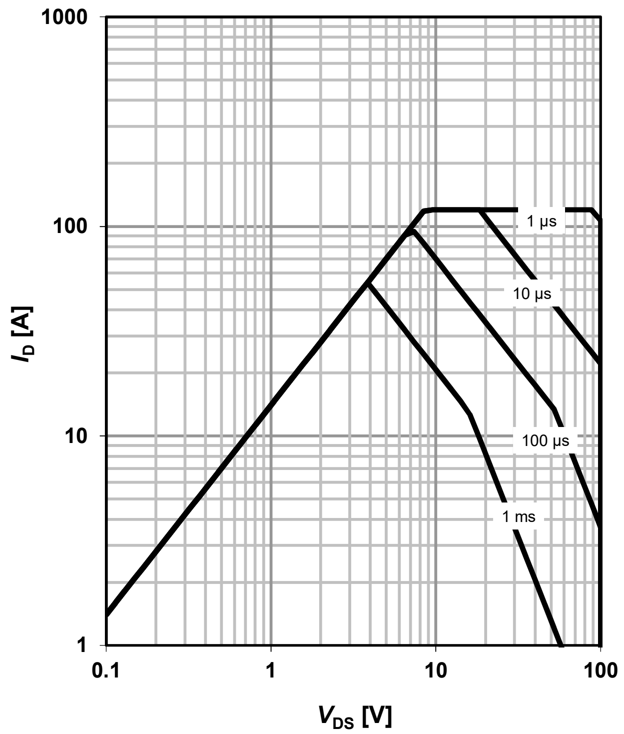
$I_D = f(T_C)$; $V_{GS} \geq 6$ V




**3 Safe operating area**

$I_D = f(V_{DS})$; $T_C = 25$ °C; $D = 0$

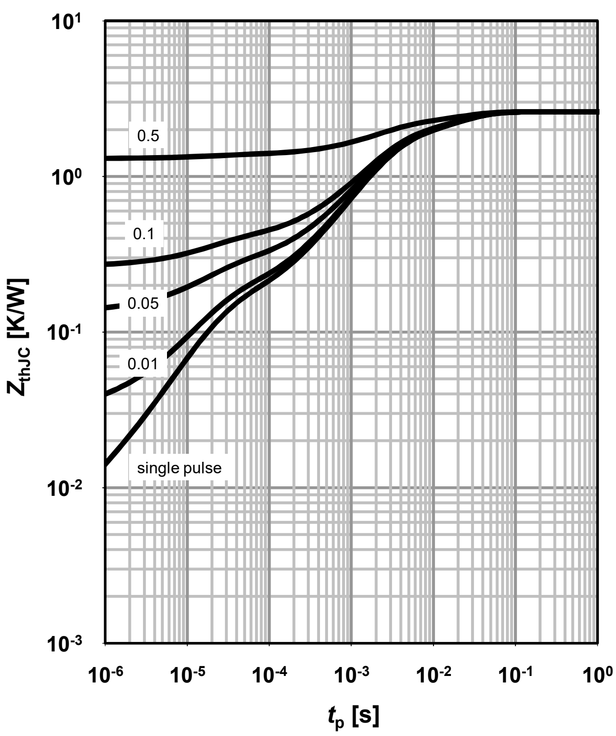
parameter: $t_p$




**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

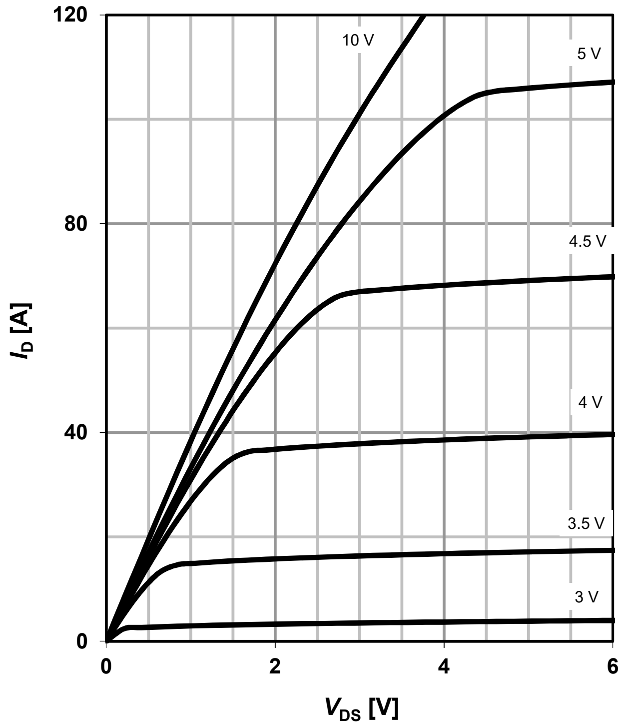
parameter: $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS})$; $T_j = 25\ °C$

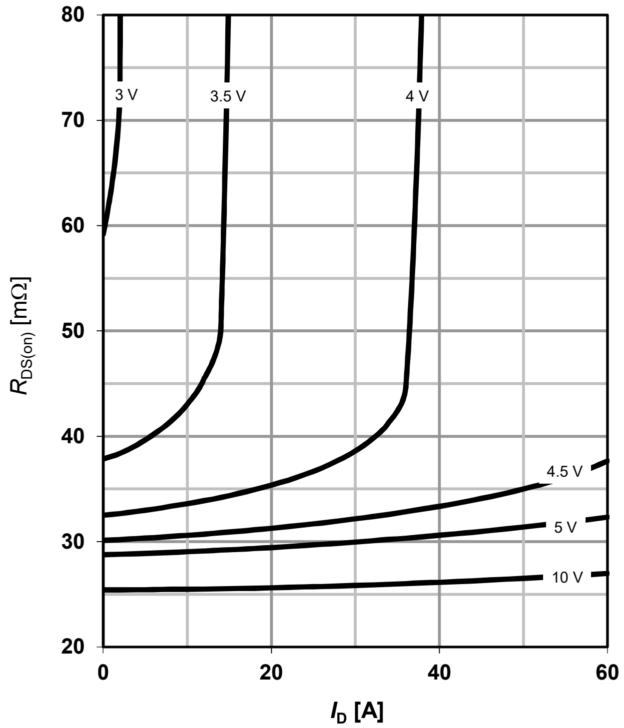
parameter: $V_{GS}$




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

$R_{DS(on)} = f(I_D)$; $T_j = 25\ °C$

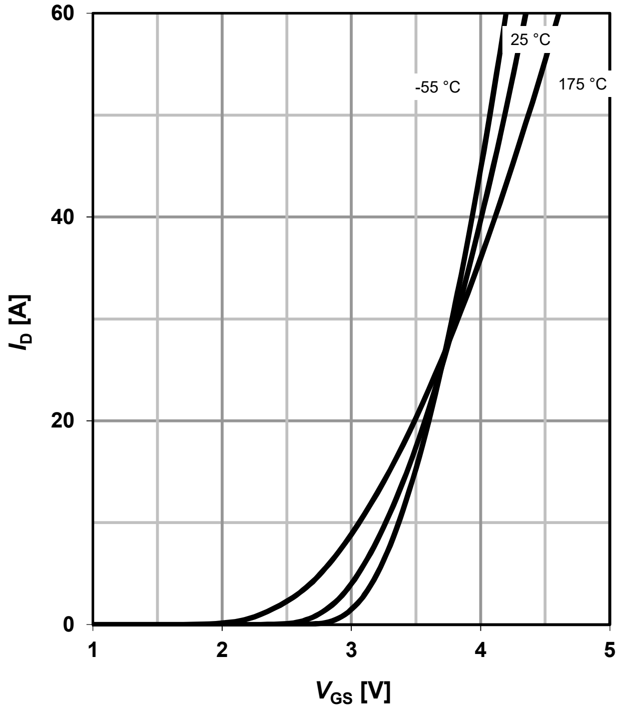
parameter: $V_{GS}$




**7 Typ. transfer characteristics**

$I_D = f(V_{GS})$; $V_{DS} = 6V$

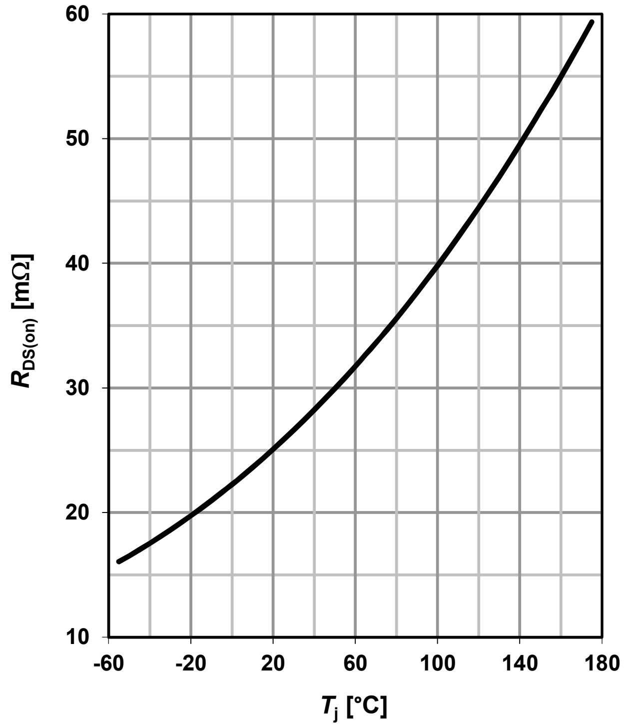
parameter: $T_j$




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

$R_{DS(on)} = f(T_j)$; $I_D = 30\ A$; $V_{GS} = 10\ V$

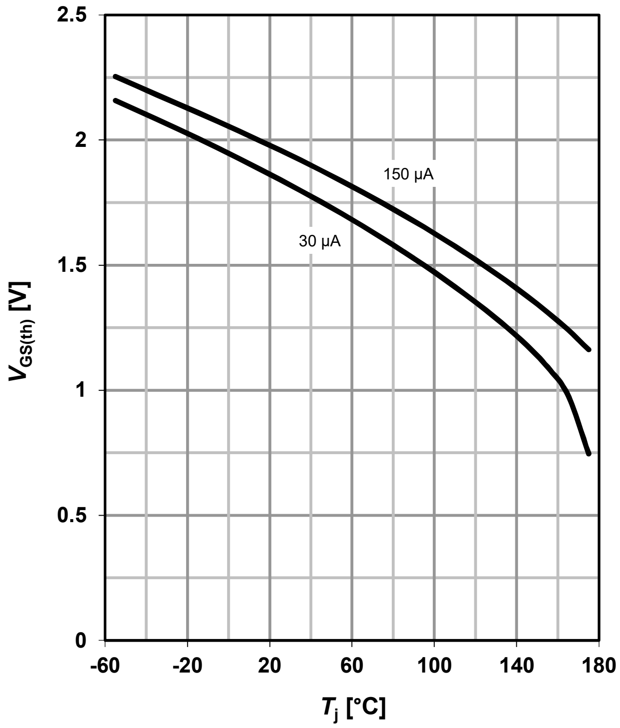
α = 0.56



## 9 Typ. gate threshold voltage

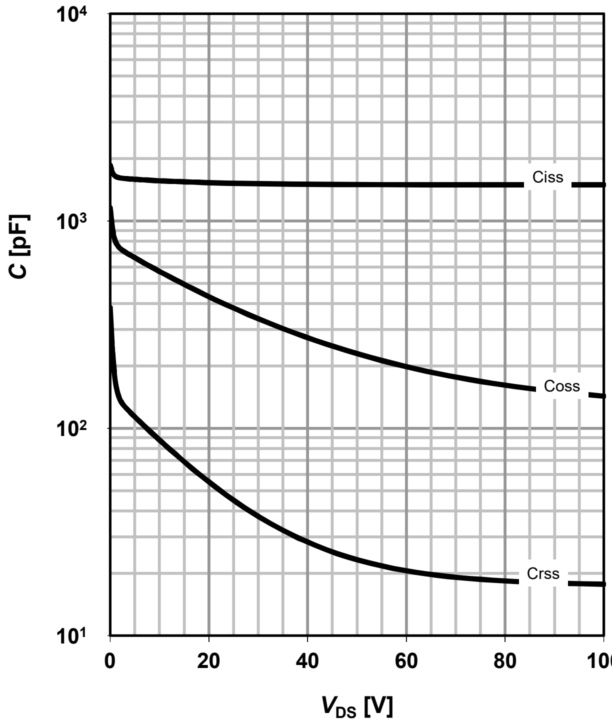
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

parameter: $I_D$




## 10 Typ. capacitances

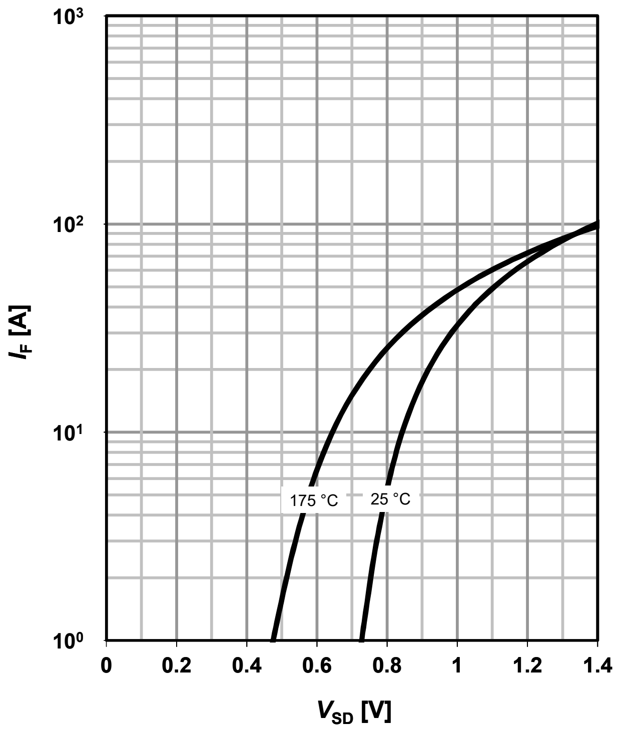
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz




## 11 Typical forward diode characteristicis

$I_F = f(V_{SD})$

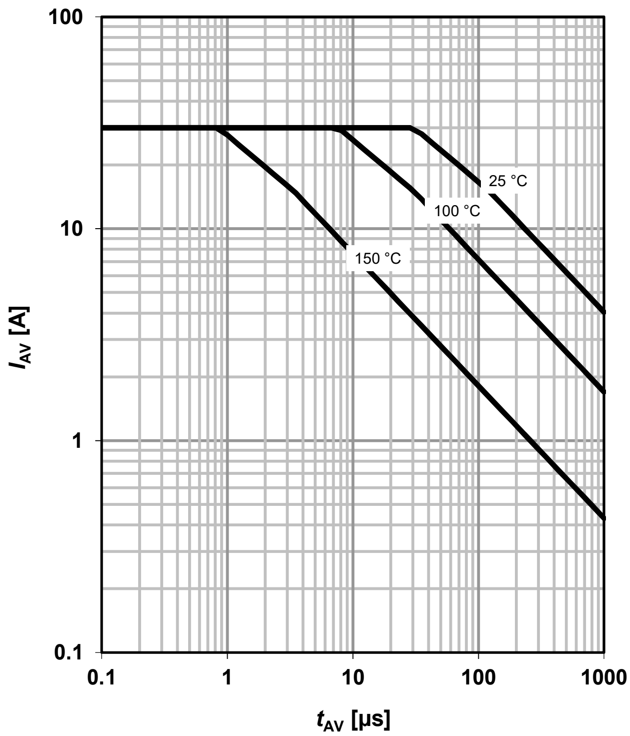
parameter: $T_j$




## 12 Typ. avalanche characteristics

$I_{AS} = f(t_{AV})$

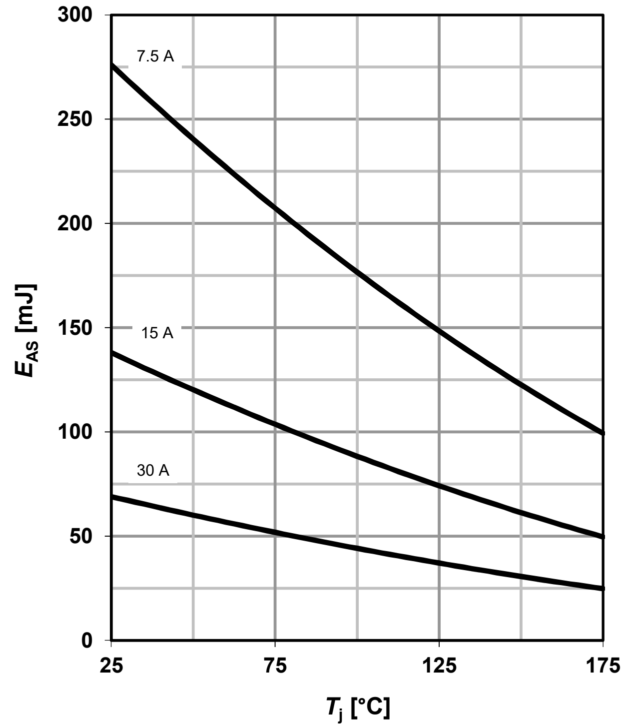
parameter: $T_{j(start)}$



**13 Typical avalanche energy**

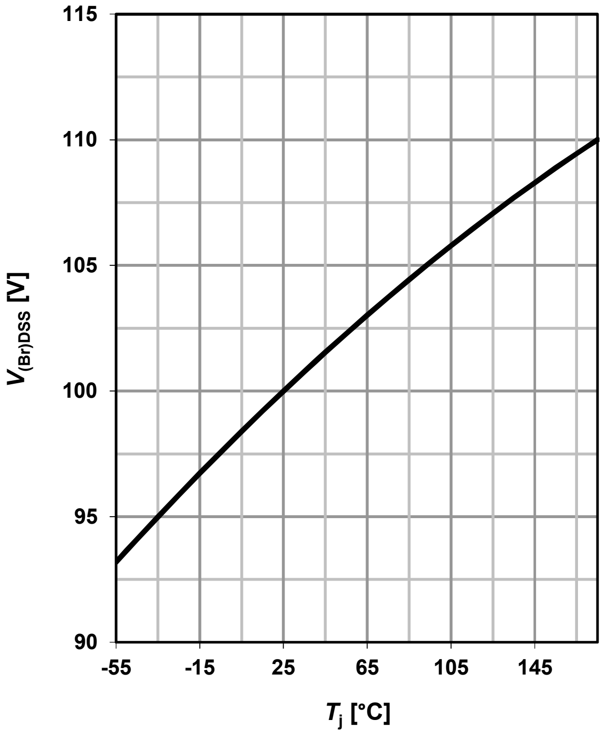
$E_{AS} = f(T_j)$

parameter: $I_D$




**14 Typ. drain-source breakdown voltage**

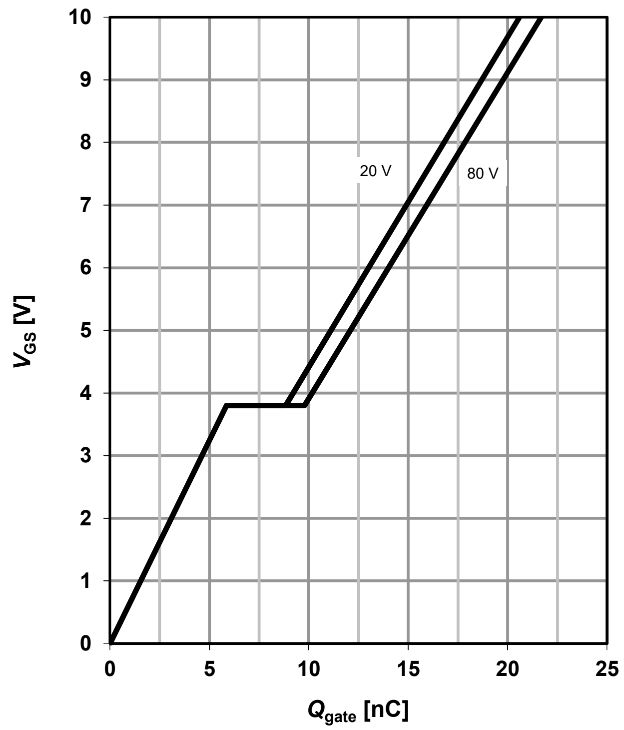
$V_{BR(DSS)} = f(T_j)$; $I_D = 1$ mA



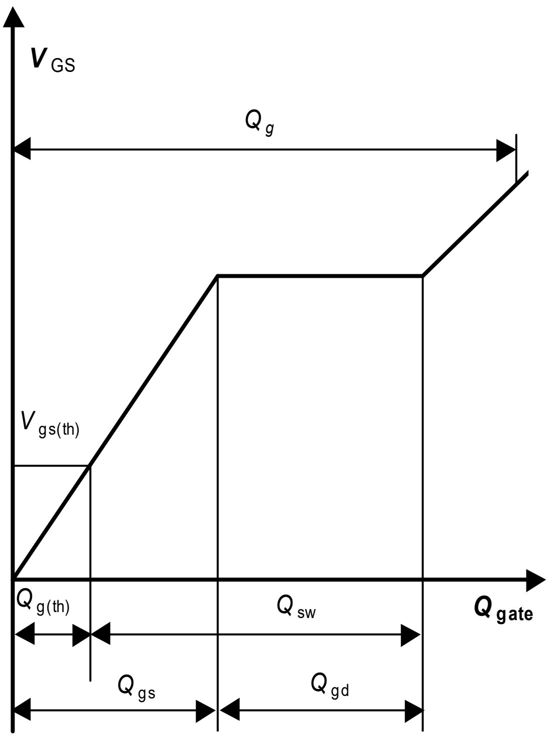

**15 Typ. gate charge**

$V_{GS} = f(Q_{gate})$; $I_D = 30$ A pulsed

parameter: $V_{DD}$




**16 Gate charge waveforms**



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Revision History

| **Version** | Date | Changes |
|---|---|---|
| Rev 1.1 | 2008-04-08 | Page 1: $V_{GS}$ changed from ±16V to ±20V |
| Rev 1.1 | 2008-04-08 | Page 3: Footnote [2)] added |
| Rev 1.2 | 2023-06-15 | Diagram 8 Typ. drain-source on-state resistance: used α value clarified |
| Rev 1.2 | 2023-06-15 | Ratings of Gate Source Voltage $V_{GS}$ refined in footnote [2)] |
| Rev 1.2 | 2023-06-15 | Corrected diagram 3 safe operating area |
| Rev 1.2 | 2023-06-15 | Corrected diagram 10 typical capacitances |