# OptiMOS®-T2 Power-Transistor

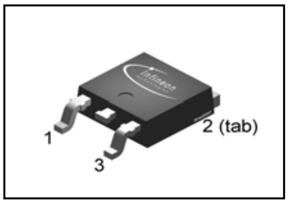
**Product Summary**

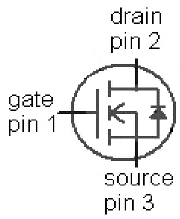
| | | |
|---|---|---|
| $V_{DS}$ | 30 | V |
| $R_{DS(on),max}$ | 2.2 | mΩ |
| $I_D$ | 90 | A |

**Features**

- N-channel - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- Ultra low Rds(on)
- 100% Avalanche tested

PG-TO252-3-11




| Type | Package | Marking |
|---|---|---|
| IPD90N03S4L-02 | PG-TO252-3-11 | 4N03L02 |

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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous drain current[1)] | $I_D$ | $T_C$=25 °C, $V_{GS}$=10 V | 90 | A |
| | | $T_C$=100 °C, $V_{GS}$=10 V[2)] | 90 | |
| Pulsed drain current[2)] | $I_{D,pulse}$ | $T_C$=25 °C | 360 | |
| Avalanche energy, single pulse | $E_{AS}$ | $I_D$=90 A | 240 | mJ |
| Avalanche current, single pulse | $I_{AS}$ | $T_C$=25 °C | 90 | A |
| Gate source voltage | $V_{GS}$ | - | ±16 | V |
| Power dissipation | $P_{tot}$ | $T_C$=25 °C | 136 | 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**[2)] | | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | - | 1.1 | 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 | $V_{(BR)DSS}$ | $V_{GS}$=0 V, $I_D$= 1 mA | 30 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=90 µA | 1.0 | 1.5 | 2.2 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=30 V, $V_{GS}$=0 V, $T_j$=25 °C | - | 0.01 | 1 | µA |
| | | $V_{DS}$=30 V, $V_{GS}$=0 V, $T_j$=125 °C[2)] | - | 10 | 1000 | |
| | | $V_{DS}$=18 V, $V_{GS}$=0 V, $T_j$=85 °C[2)] | - | 5 | 60 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=16 V, $V_{DS}$=0 V | - | 1 | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=4.5 V, $I_D$=45 A | - | 2.2 | 2.6 | mΩ |
| | | $V_{GS}$=10 V, $I_D$=90 A | - | 1.8 | 2.2 | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics**[2)] | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0 V, $V_{DS}$=25 V, $f$=1 MHz | - | 7500 | 9750 | pF |
| Output capacitance | $C_{oss}$ | | - | 1900 | 2500 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 100 | 200 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=15 V, $V_{GS}$=10 V, $I_D$=90 A, $R_G$=3.5 Ω | - | 14 | - | ns |
| Rise time | $t_r$ | | - | 9 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 62 | - | |
| Fall time | $t_f$ | | - | 13 | - | |
| **Gate Charge Characteristics**[2)] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=24 V, $I_D$=90 A, $V_{GS}$=0 to 10 V | - | 22 | 30 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 14 | 28 | |
| Gate charge total | $Q_g$ | | - | 110 | 140 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 3.1 | - | V |
| **Reverse Diode** | | | | | | |
| Diode continous forward current[2)] | $I_S$ | $T_C$=25 °C | - | - | 90 | A |
| Diode pulse current[2)] | $I_{S,pulse}$ | | - | - | 360 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=90 A, $T_j$=25 °C | 0.6 | 0.9 | 1.3 | V |
| Reverse recovery time[2)] | $t_{rr}$ | $V_R$=15 V, $I_F$=$I_S$, d$i_F$/d$t$=100 A/µs | - | 120 | - | ns |
| Reverse recovery charge[2)] | $Q_{rr}$ | | - | 100 | - | nC |

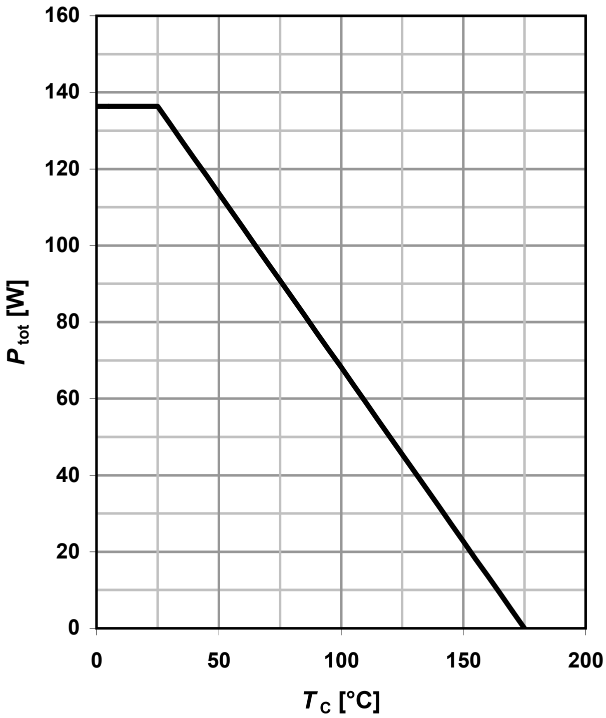
1) Current is limited by bondwire; with an $R_{thJC}$ = 1.1K/W the chip is able to carry 200A at 25°C. For detailed information see Application Note ANPS071E at *www.infineon.com/optimos*

2) Specified by design. Not subject to production test.

3) Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm$^2$ (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

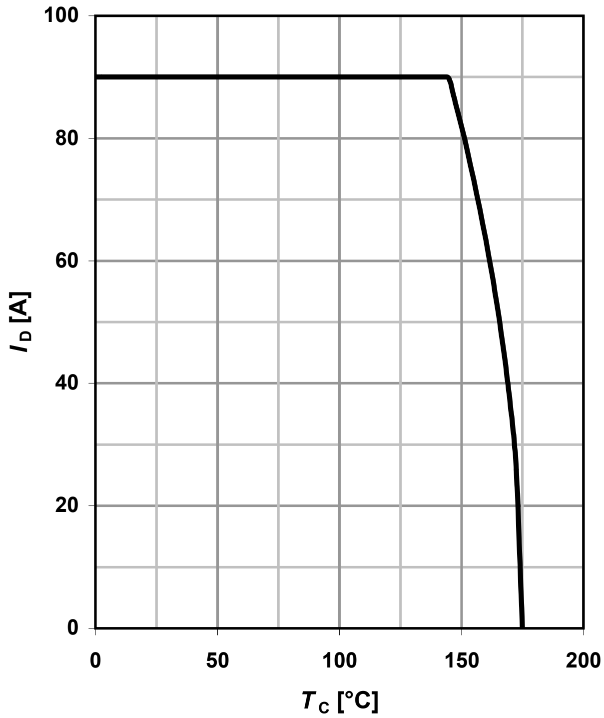
**1 Power dissipation**

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




**2 Drain current**

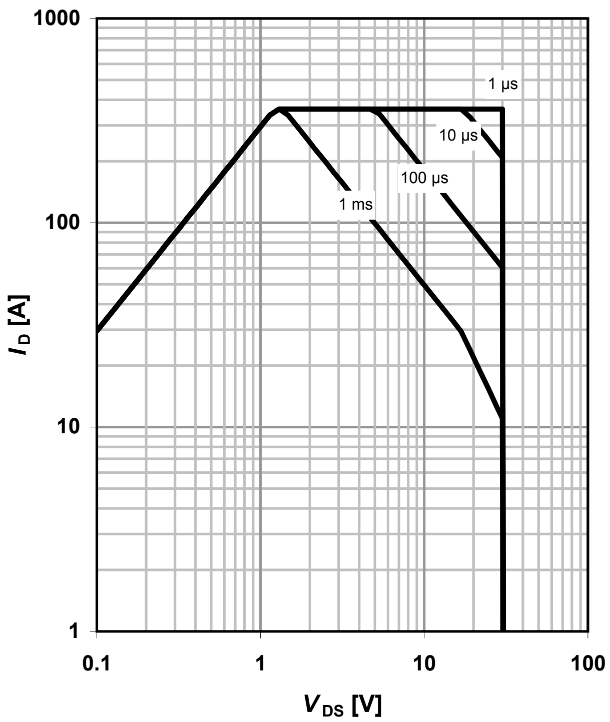
$I_D = f(T_C)$; $V_{GS} \geq 6$ V




**3 Safe operating area**

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

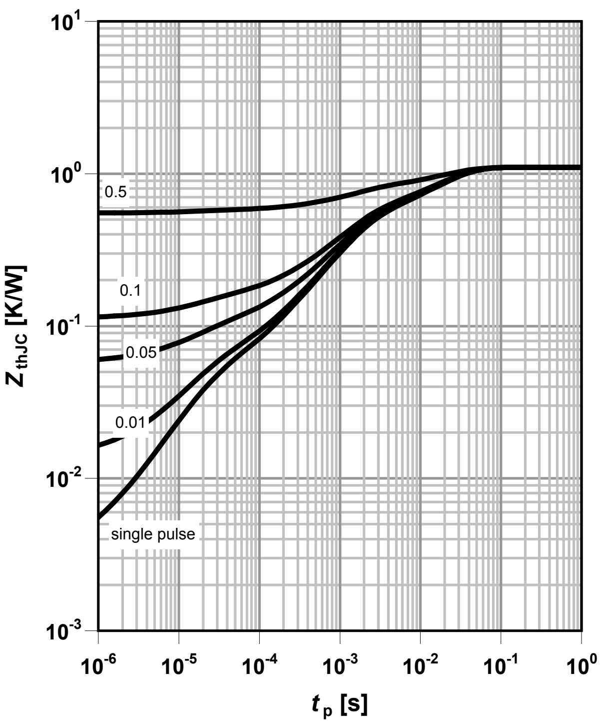
parameter: $t_p$




**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

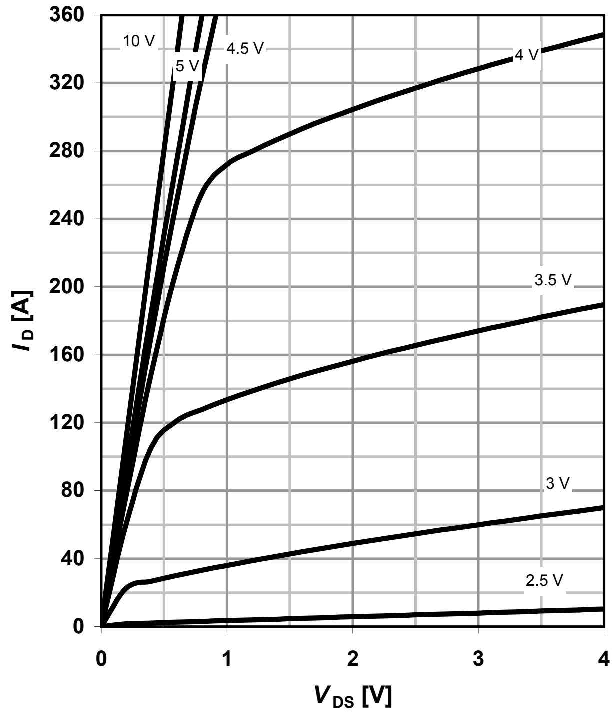
parameter: $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS})$; $T_j = 25\ °C$

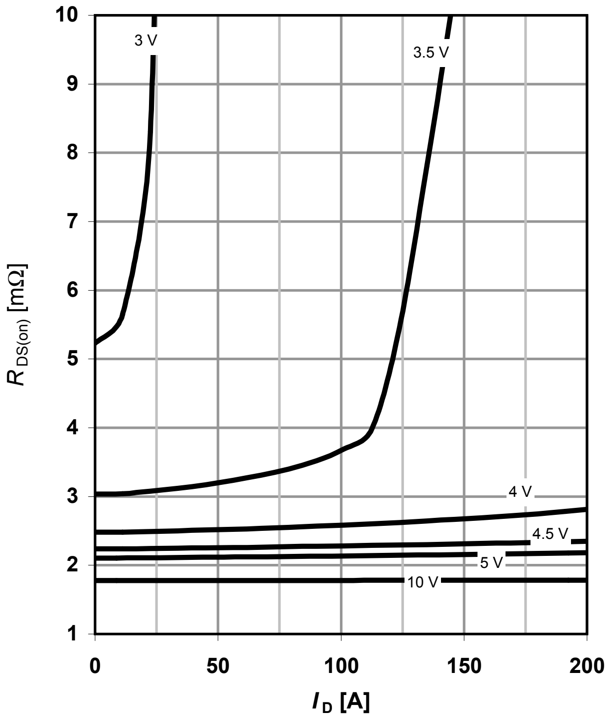
parameter: $V_{GS}$




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

$R_{DS(on)} = f(I_D)$; $T_j = 25\ °C$

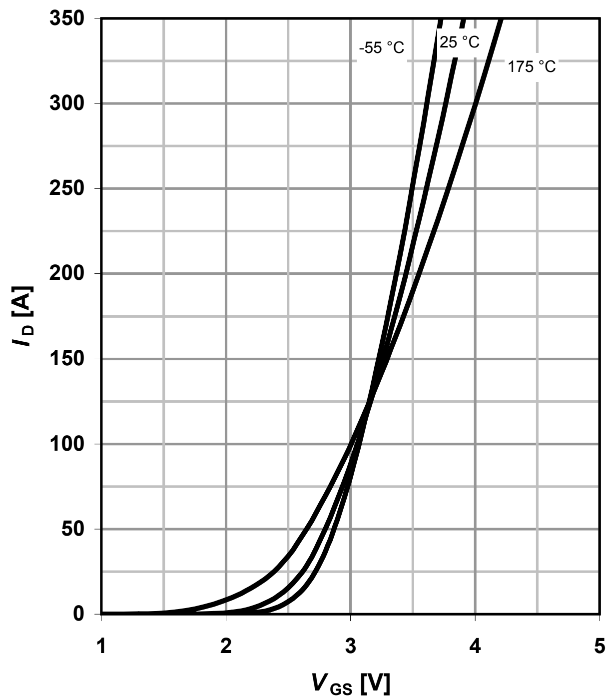
parameter: $V_{GS}$




**7 Typ. transfer characteristics**

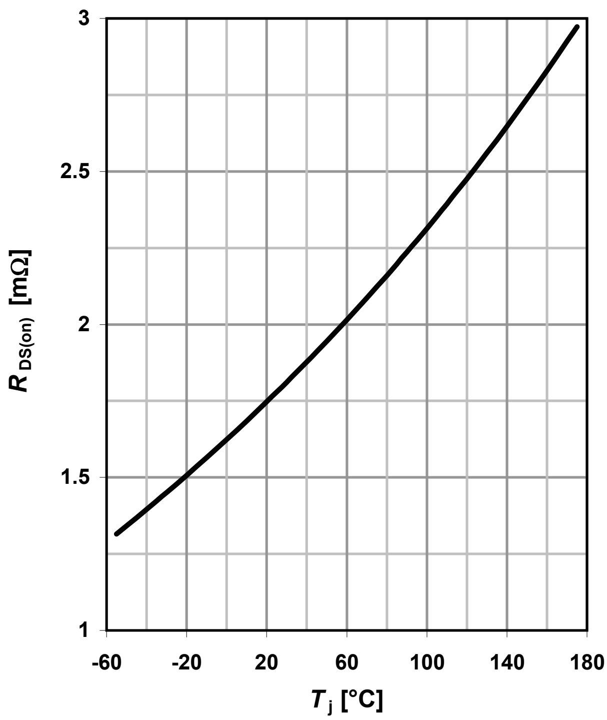
$I_D = f(V_{GS})$; $V_{DS} = 6V$

parameter: $T_j$




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

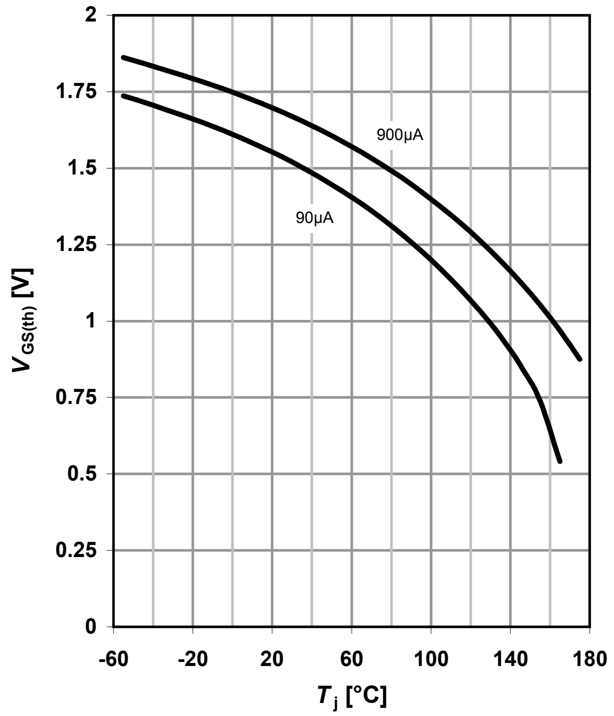
$R_{DS(on)} = f(T_j)$; $I_D = 90\ A$; $V_{GS} = 10\ V$



**9 Typ. gate threshold voltage**

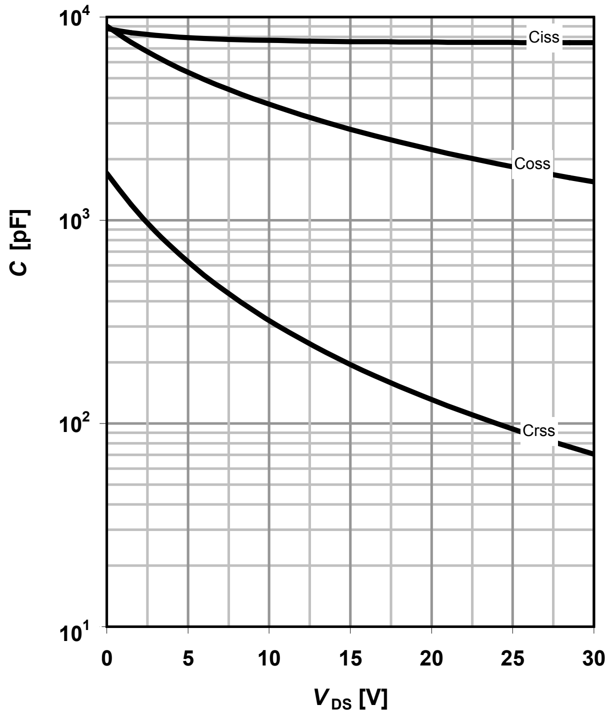
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

parameter: $I_D$




**10 Typ. capacitances**

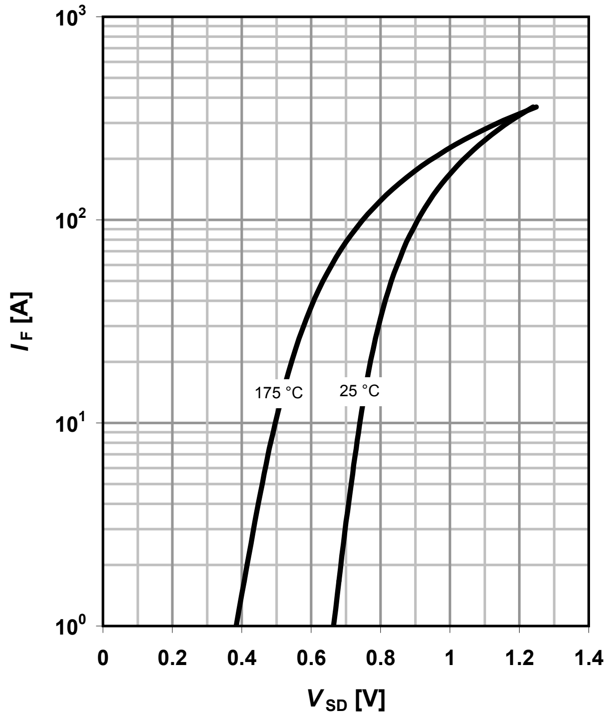
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz




**11 Typical forward diode characteristicis**

IF = f($V_{SD}$)

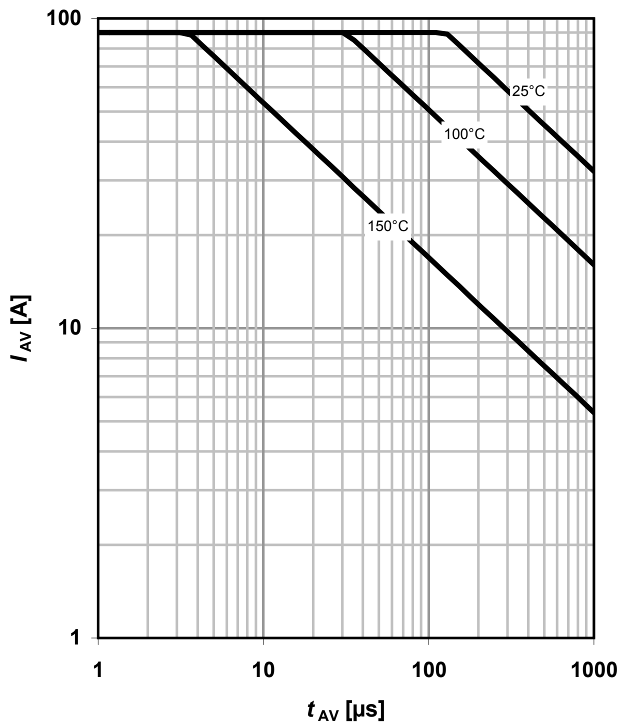
parameter: $T_j$




**12 Typ. avalanche characteristics**

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

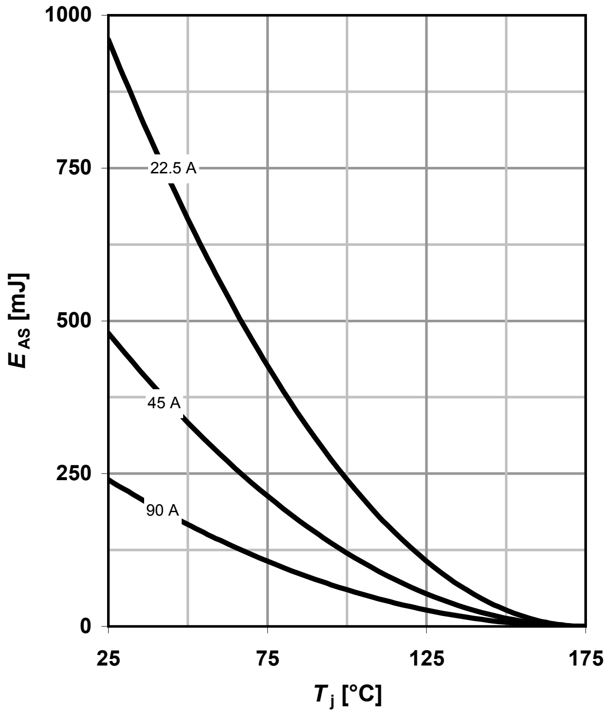
parameter: $T_{j(start)}$



**13 Typical avalanche energy**

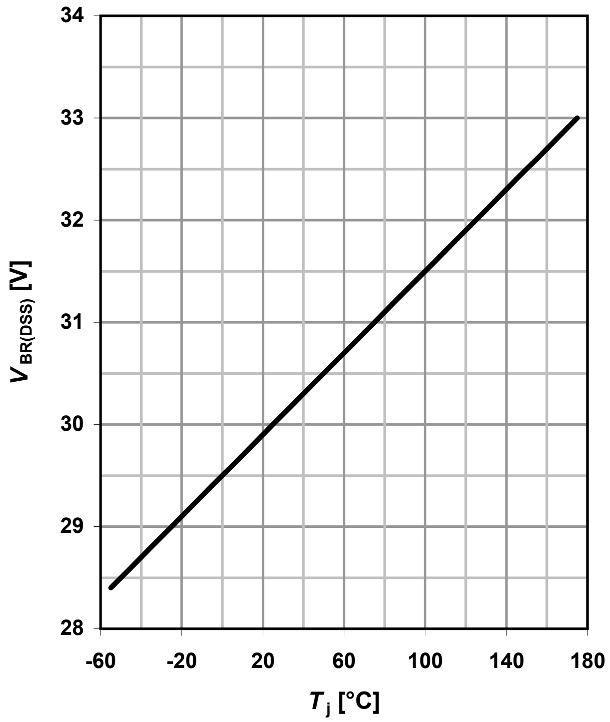
$E_{AS} = f(T_j)$

parameter: $I_D$




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

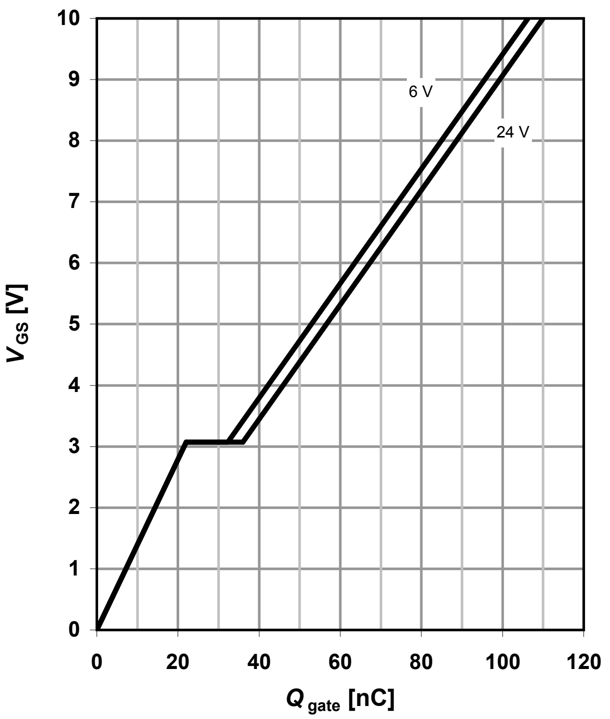
$V_{BR(DSS)} = f(T_j)$; $I_D = 1$ mA



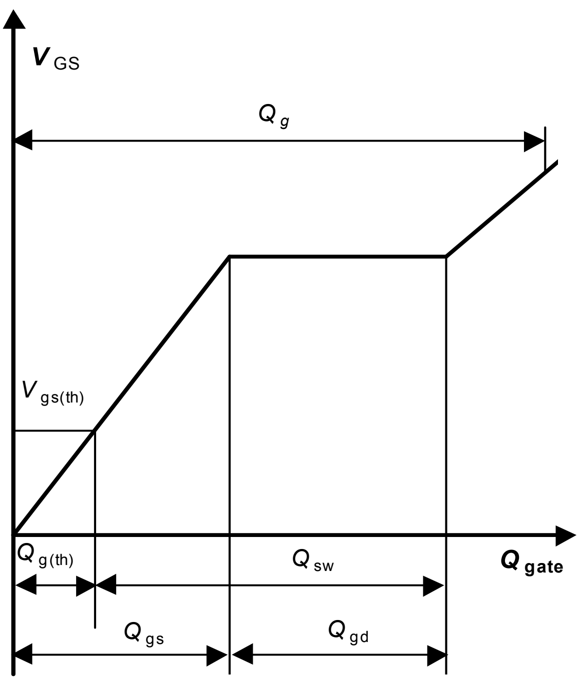

**15 Typ. gate charge**

$V_{GS} = f(Q_{gate})$; $I_D = 90$ A pulsed

parameter: $V_{DD}$




**16 Gate charge waveforms**



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Revision History

| **Version** | Date | Changes |
|---|---|---|
| Revision 3.0 | 18.03.2008 | Implementation of Vgs_max |
| Revision 3.0 | 18.03.2008 | Update of disclaimer |
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