WINSOURCE ELECTRONICS

# THE DATASHEET OF

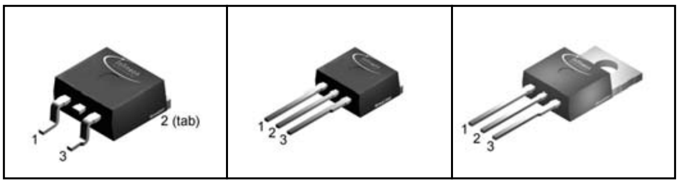
# IPP70N10S312AKSA1

# OptiMOS®-T Power-Transistor

**Product Summary**

| | | |
|---|---|---|
| $V_{DS}$ | 100 | V |
| $R_{DS(on),max}$ (SMD version) | 11.3 | mΩ |
| $I_D$ | 70 | A |

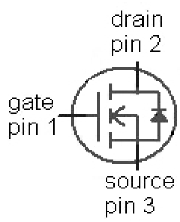
PG-TO263-3-2 PG-TO262-3-1 PG-TO220-3-1




**Features**

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

| Type | Package | Marking |
|---|---|---|
| IPB70N10S3-12 | PG-TO263-3-2 | 3N1012 |
| IPI70N10S3-12 | PG-TO262-3-1 | 3N1012 |
| IPP70N10S3-12 | PG-TO220-3-1 | 3N1012 |




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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous drain current | $I_D$ | $T_C$=25 °C, $V_{GS}$=10 V | 70 | A |
| | | $T_C$=100 °C, $V_{GS}$=10 V[2)] | 48 | |
| Pulsed drain current[1)] | $I_{D,pulse}$ | $T_C$=25 °C | 280 | |
| Avalanche energy, single pulse[1)] | $E_{AS}$ | $I_D$=35A | 410 | mJ |
| Avalanche current, single pulse | $I_{AS}$ | | 70 | A |
| Gate source voltage | $V_{GS}$ | | ±20 | V |
| Power dissipation | $P_{tot}$ | $T_C$=25 °C | 125 | 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 | $R_{thJC}$ | | - | - | 1.2 | K/W |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | | - | - | 62 | |
| SMD version, device on PCB | $R_{thJA}$ | minimal footprint | - | - | 62 | |
| | | 6 $cm^2$ cooling area[2] | - | - | 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 | 100 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=83µA | 2.0 | 3.0 | 4.0 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=80 V, $V_{GS}$=0 V, $T_j$=25 °C | - | 0.01 | 1 | µA |
| | | $V_{DS}$=80 V, $V_{GS}$=0 V, $T_j$=125 °C[2] | - | 1 | 100 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=20V, $V_{DS}$=0V | - | - | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=10V, $I_D$=70A | - | 9.7 | 11.6 | mΩ |
| | | $V_{GS}$=10V, $I_D$=70A, SMD version | - | 9.4 | 11.3 | |

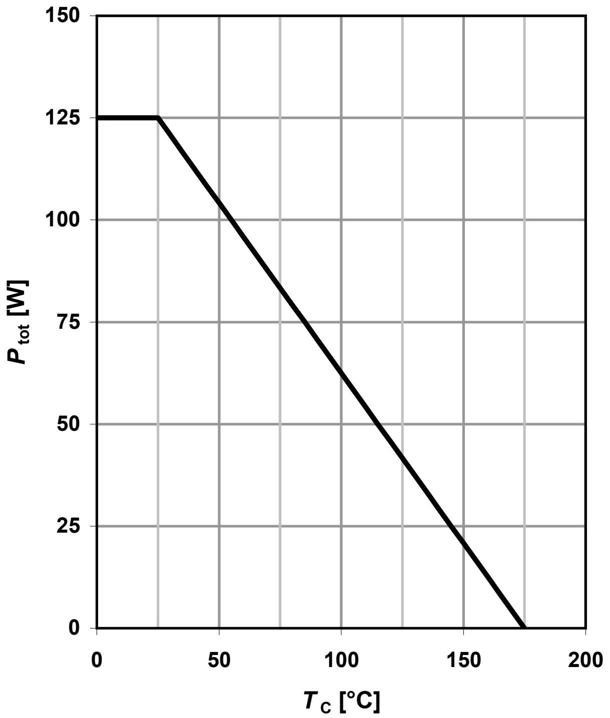
| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics**[1] | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 3350 | 4355 | pF |
| Output capacitance | $C_{oss}$ | | - | 940 | 1222 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 105 | 158 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=20 V, $V_{GS}$=10 V, $I_D$=70 A, $R_G$=3.5 Ω | - | 17 | - | ns |
| Rise time | $t_r$ | | - | 8 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 25 | - | |
| Fall time | $t_f$ | | - | 8 | - | |
| **Gate Charge Characteristics**[1] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=80 V, $I_D$=70 A, $V_{GS}$=0 to 10 V | - | 17 | 23 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 12 | 19 | |
| Gate charge total | $Q_g$ | | - | 51 | 66 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.5 | - | V |
| **Reverse Diode** | | | | | | |
| Diode continous forward current[1] | $I_S$ | $T_C$=25°C | - | - | 70 | A |
| Diode pulse current[1] | $I_{S,pulse}$ | | - | - | 280 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=70 A, $T_j$=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 | - | 100 | - | ns |
| Reverse recovery charge[1] | $Q_{rr}$ | | - | 265 | - | nC |

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

[2] 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.

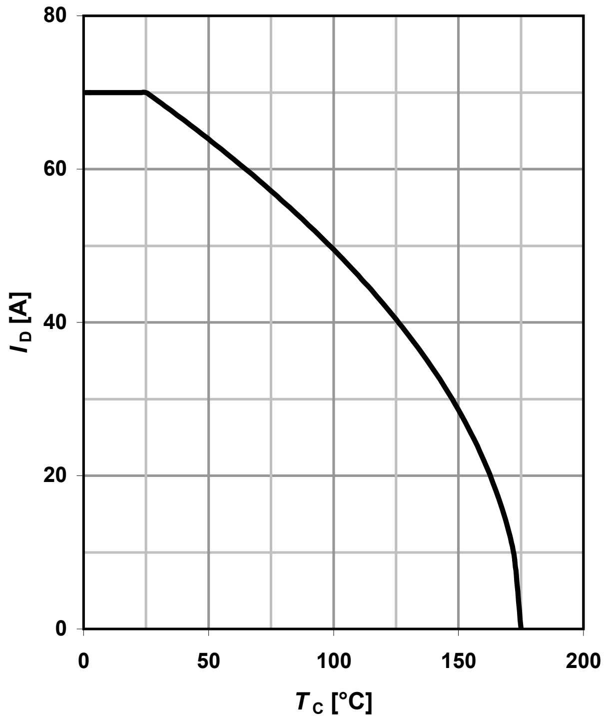
**1 Power dissipation**

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




**2 Drain current**

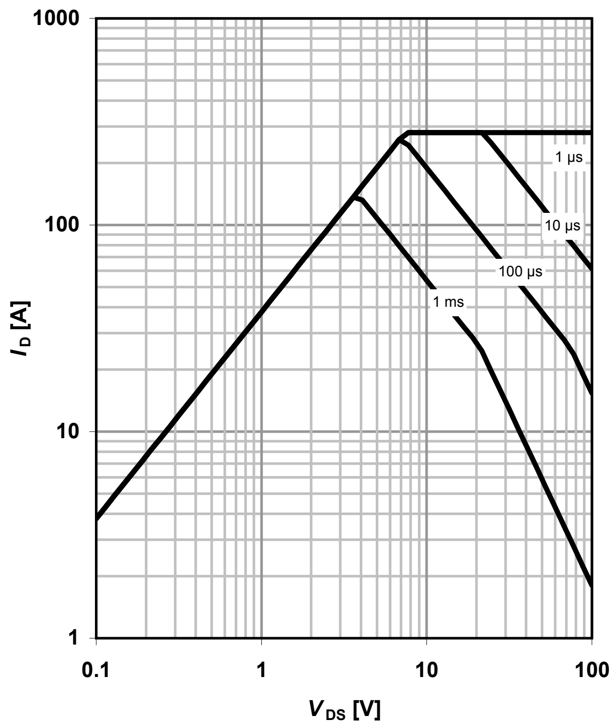
$I_D = f(T_C)$; $V_{GS} \geq 6$ V; SMD




**3 Safe operating area**

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

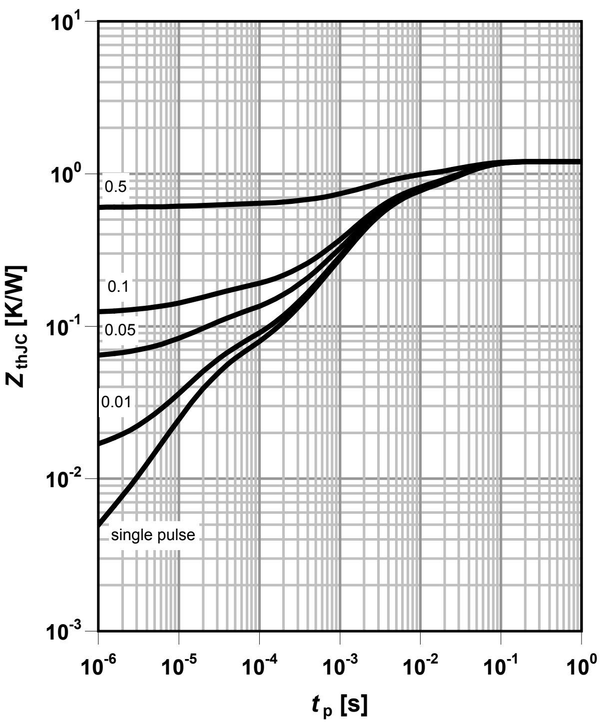
parameter: $t_p$




**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

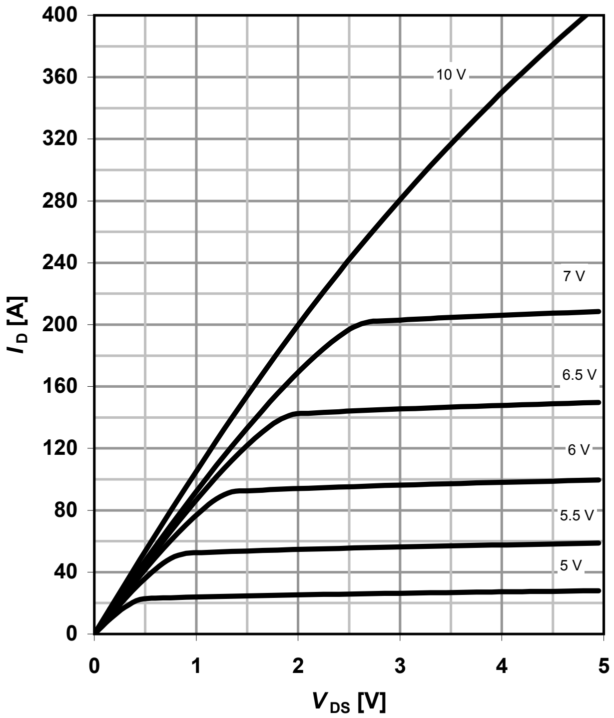
parameter: $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS})$; $T_j = 25$ °C; SMD

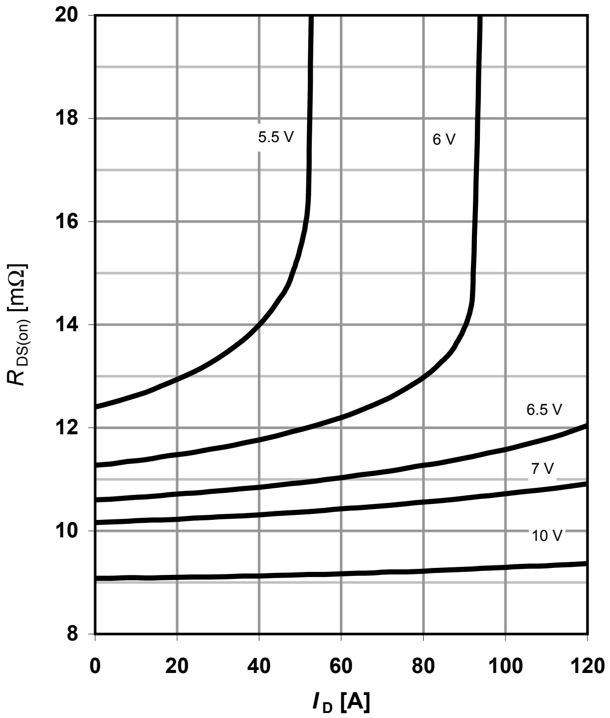
parameter: $V_{GS}$




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

$R_{DS(on)} = f(I_D)$; $T_j = 25$ °C; SMD

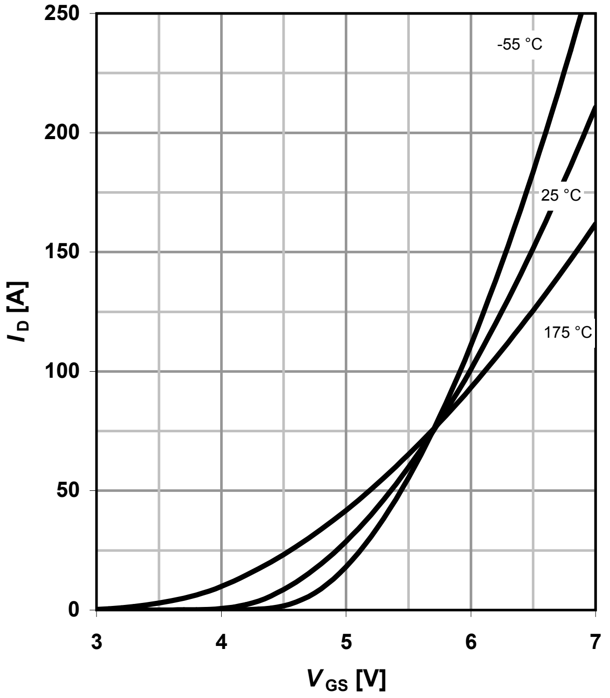
parameter: $V_{GS}$




**7 Typ. transfer characteristics**

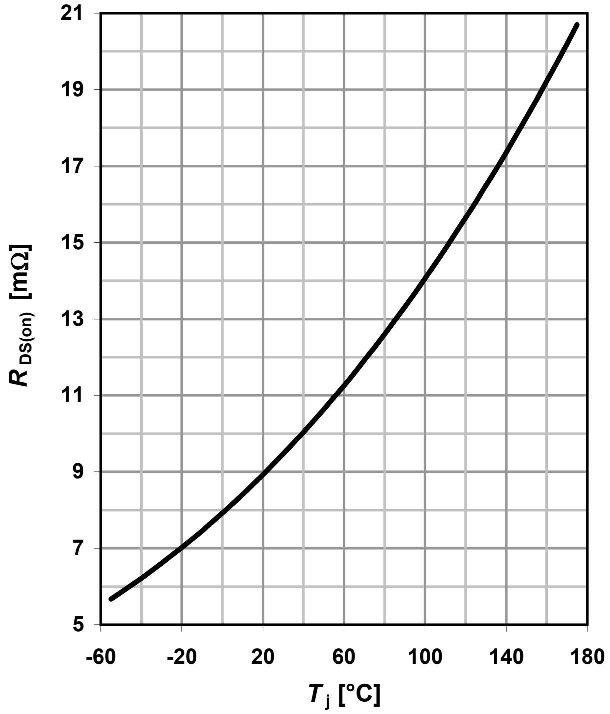
$I_D = f(V_{GS})$; $V_{DS} = 6$V

parameter: $T_j$




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

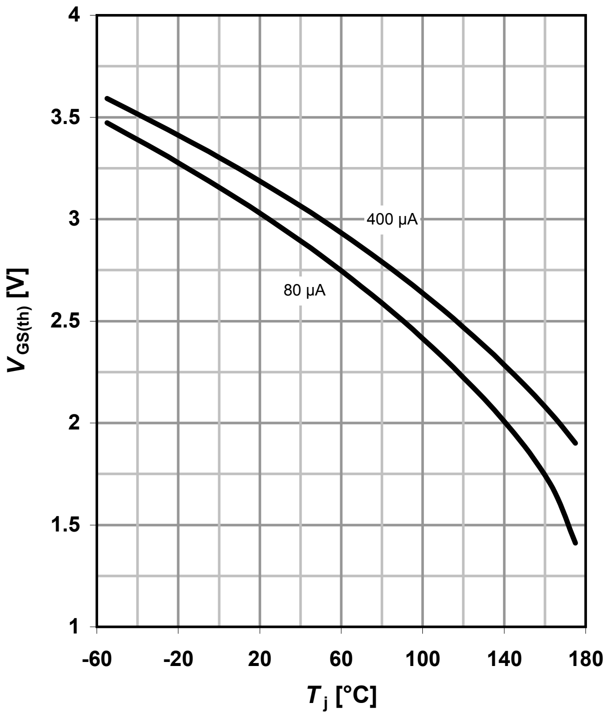
$R_{DS(on)} = f(T_j)$; $I_D = 70$ A; $V_{GS} = 10$ V; SMD



**9 Typ. gate threshold voltage**

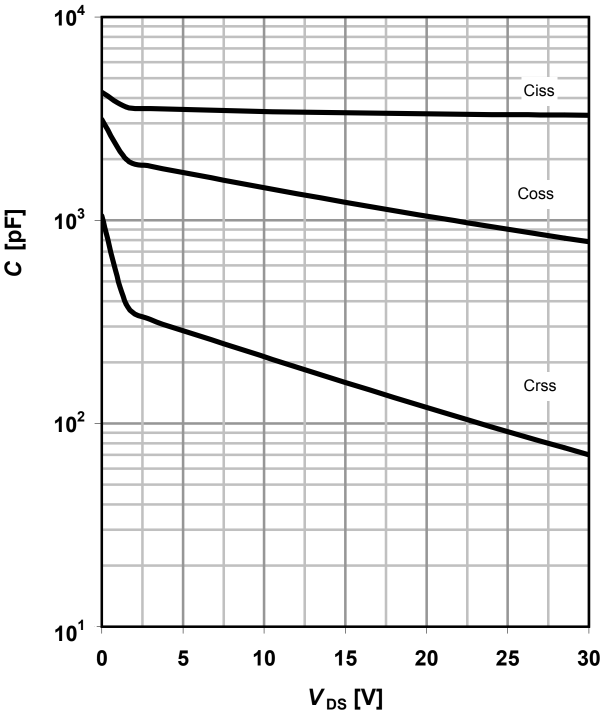
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

parameter: $I_D$




**10 Typ. capacitances**

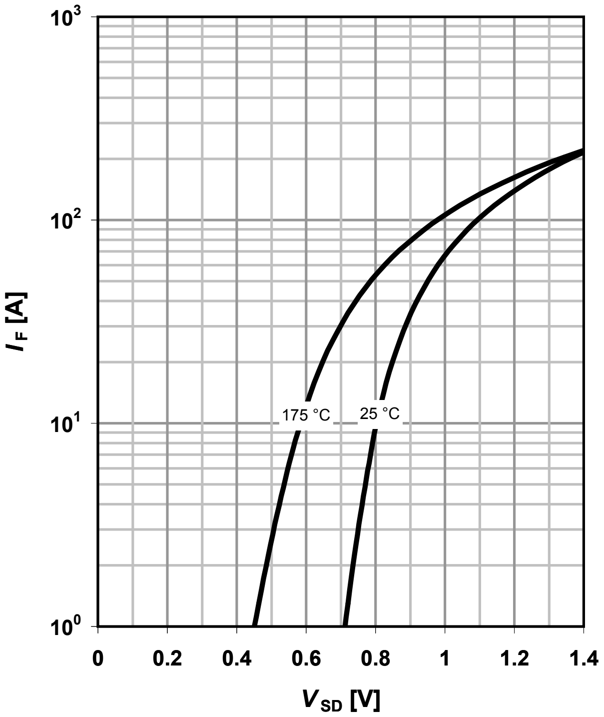
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz




**11 Typical forward diode characteristicis**

IF = $f(V_{SD})$

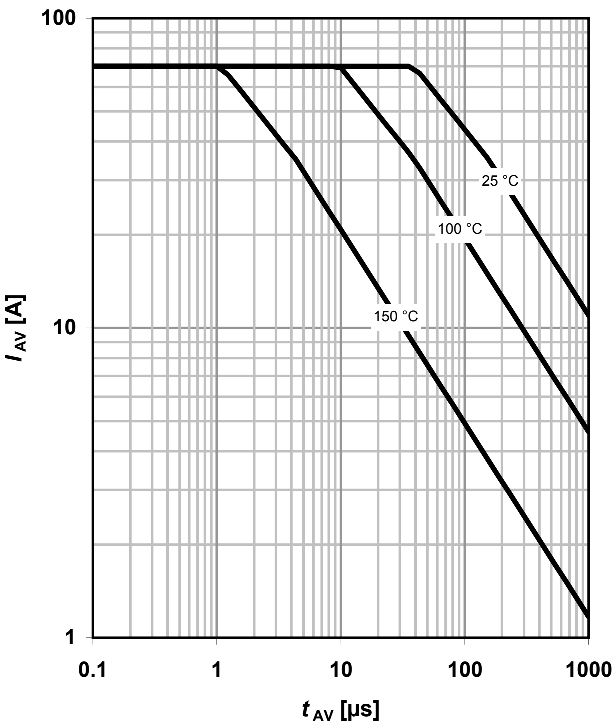
parameter: $T_j$




**12 Typ. avalanche characteristics**

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

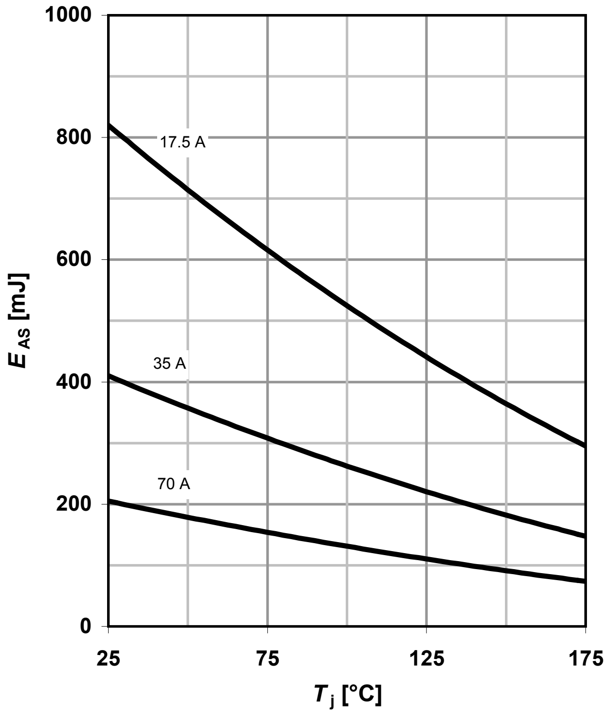
parameter: $T_{j(start)}$



**13 Typical avalanche energy**

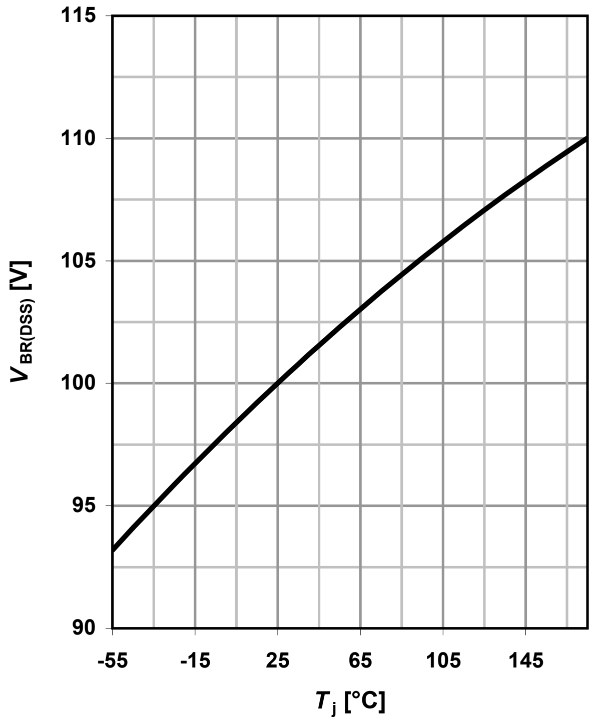
$E_{AS} = f(T_j)$

parameter: $I_D$




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

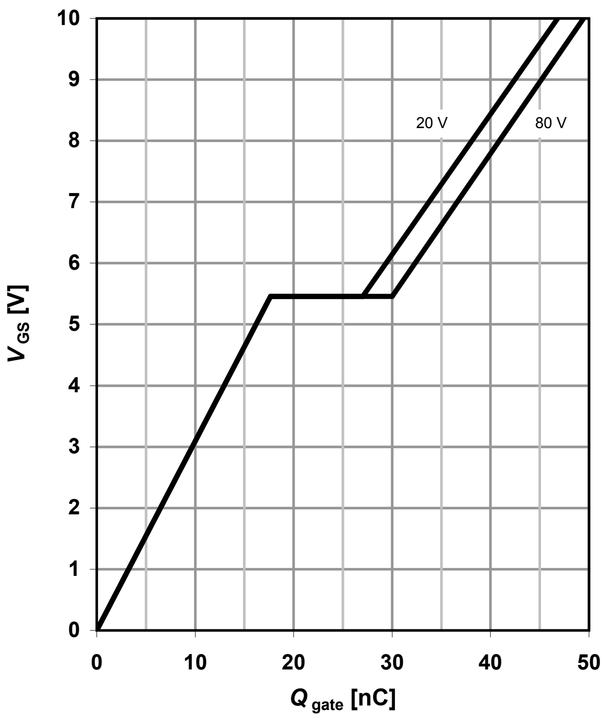
$V_{BR(DSS)} = f(T_j)$; $I_D = 1$ mA



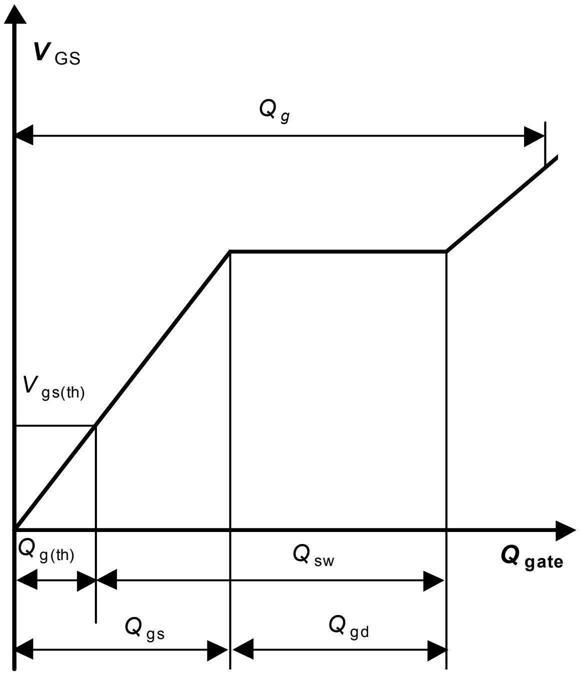

**15 Typ. gate charge**

$V_{GS} = f(Q_{gate})$; $I_D = 70$ A pulsed

parameter: $V_{DD}$




**16 Gate charge waveforms**



**Published by**
**Infineon Technologies AG**
**81726 Munich, Germany**



**Legal Disclaimer**
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

**Information**
For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (**www.infineon.com**).

**Warnings**
Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies Office.
Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History

| **Version** | Date | Changes |
| --- | --- | --- |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |