# THE DATASHEET OF

# IPB100N12S305ATMA1

## OptiMOS™-T Power-Transistor

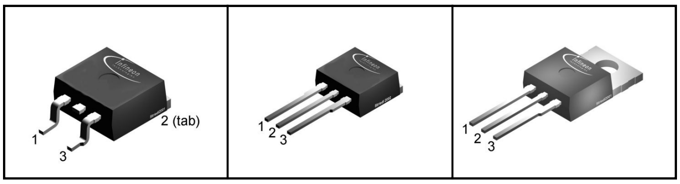
**Product Summary**

| | | |
|---|---|---|
| $V_{DS}$ | 120 | V |
| $R_{DS(on),max}$ (SMD version) | 4.8 | mΩ |
| $I_D$ | 100 | A |

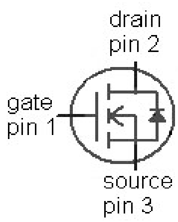
### Features

- OptiMOS™ - power MOSFET for automotive applications
- 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-TO263-3-2 PG-TO262-3-1 PG-TO220-3-1




| Type | Package | Marking |
|---|---|---|
| IPB100N12S3-05 | PG-TO263-3-2 | 3PN1205 |
| IPI100N12S3-05 | PG-TO262-3-1 | 3PN1205 |
| IPP100N12S3-05 | PG-TO220-3-1 | 3PN1205 |




**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 | 100 | A |
| | | $T_C$=100 °C, $V_{GS}$=10 V[2)] | 100 | |
| Pulsed drain current[2)] | $I_{D,pulse}$ | $T_C$=25 °C | 400 | |
| Avalanche energy, single pulse[2)] | $E_{AS}$ | $I_D$=50A | 1445 | mJ |
| Avalanche current, single pulse | $I_{AS}$ | - | 100 | A |
| Gate source voltage | $V_{GS}$ | - | ±20 | V |
| Power dissipation | $P_{tot}$ | $T_C$=25 °C | 300 | W |
| Operating and storage temperature | $T_j$, $T_{stg}$ | - | -55 ... +175 | °C |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Thermal characteristics**[2)] | | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | - | 0.5 | 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[3)] | - | - | 40 | |

**Electrical characteristics,** at $T_j$=25 °C, unless otherwise specified

| Parameter | Symbol | Conditions | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$=0 V, $I_D$= 1 mA | 120 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=240µA | 2.0 | 3.0 | 4.0 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=120 V, $V_{GS}$=0 V, $T_j$=25 °C | - | 0.01 | 1 | µA |
| | | $V_{DS}$=120 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, $I_D$=100A | - | 4.3 | 5.1 | mΩ |
| | | $V_{GS}$=10V, $I_D$=100A, SMD version | - | 4.0 | 4.8 | |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics**[2)] | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 8900 | 11570 | pF |
| Output capacitance | $C_{oss}$ | | - | 2520 | 3276 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 220 | 330 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=20V, $V_{GS}$=10V, $I_D$=80A, $R_G$=3.5Ω | - | 34 | - | ns |
| Rise time | $t_r$ | | - | 17 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 60 | - | |
| Fall time | $t_f$ | | - | 20 | - | |
| **Gate Charge Characteristics**[2)] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=96V, $I_D$=100A, $V_{GS}$=0 to 10V | - | 46 | 61 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 34 | 51 | |
| Gate charge total | $Q_g$ | | - | 139 | 185 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.5 | - | V |
| **Reverse Diode** | | | | | | |
| Diode continous forward current[2)] | $I_S$ | $T_C$=25°C | - | - | 100 | A |
| Diode pulse current[2)] | $I_{S,pulse}$ | | - | - | 400 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_F$=100A, $T_j$=25°C | 0.6 | 1 | 1.2 | V |
| Reverse recovery time[2)] | $t_{rr}$ | $V_R$=60V, $I_F$=50A, $di_F/dt$=100A/µs | - | 108 | - | ns |
| Reverse recovery charge[2)] | $Q_{rr}$ | | - | 380 | - | nC |

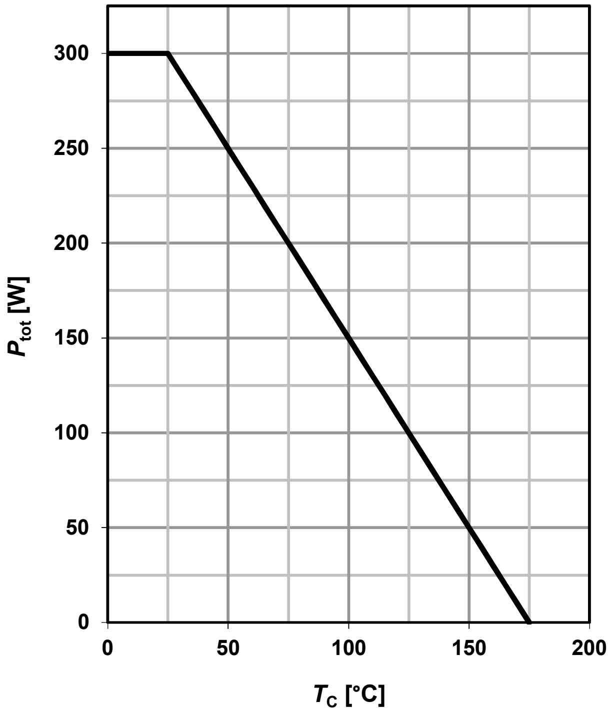
1) Current is limited by bondwire; with an $R_{thJC}$ = 0.5K/W the chip is able to carry 165A at 25°C. For detailed information see Application Note ANPS071E

2) Defined 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.

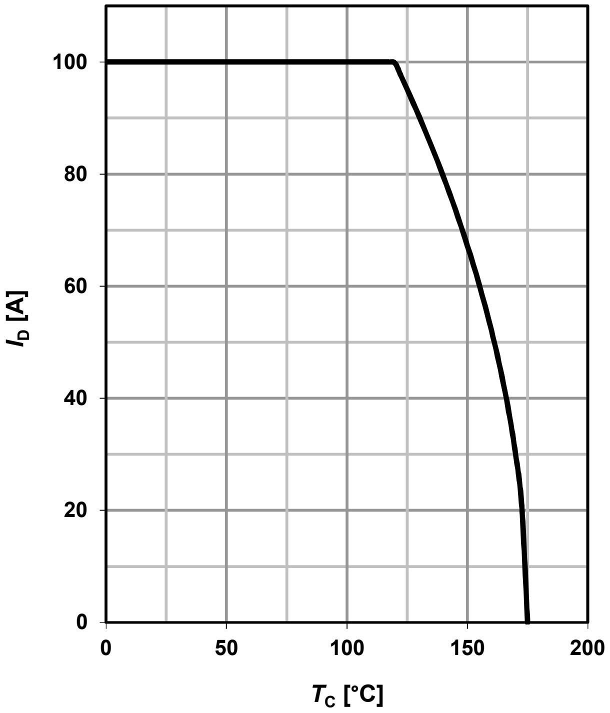
**1 Power dissipation**

$P_{tot} = f(T_C)$; $V_{GS} = 10$ V




**2 Drain current**

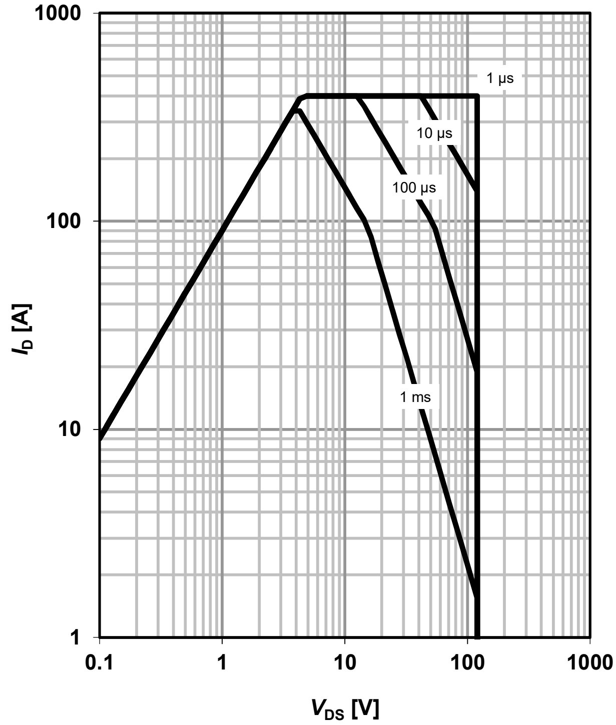
$I_D = f(T_C)$; $V_{GS} = 10$ V; SMD




**3 Safe operating area**

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

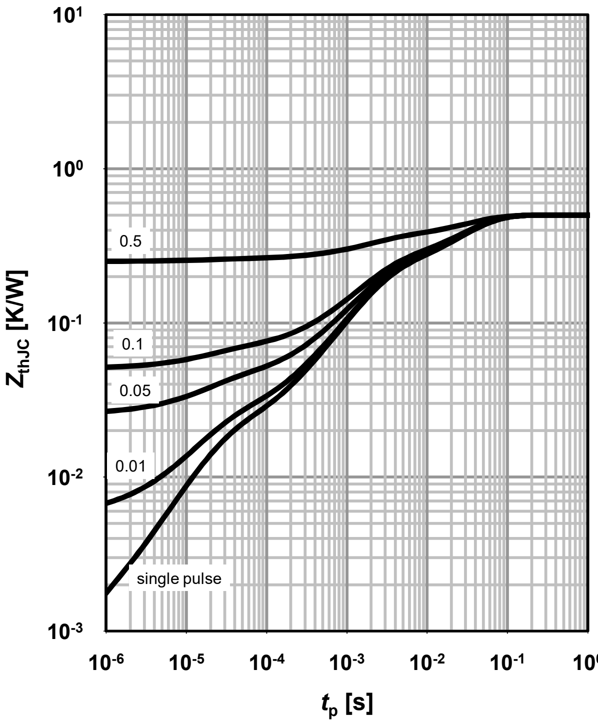
parameter: $t_p$




**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

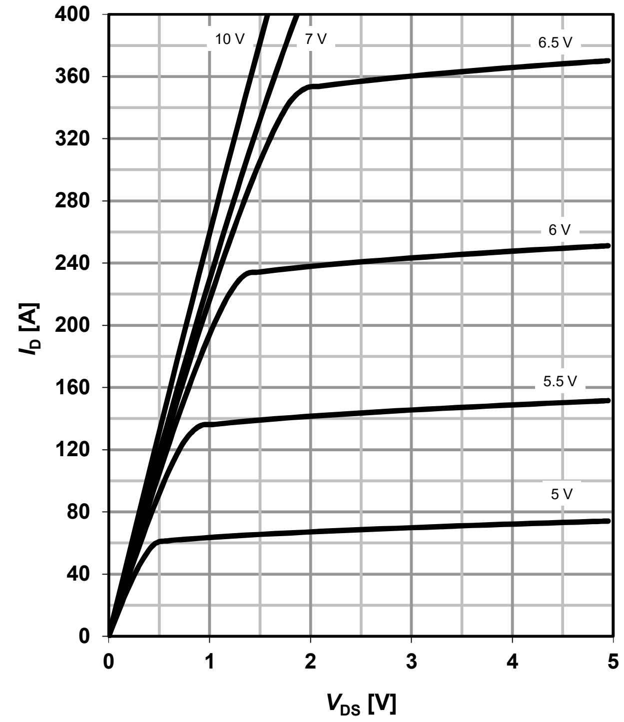
parameter: $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS})$; $T_j = 25$ °C; SMD

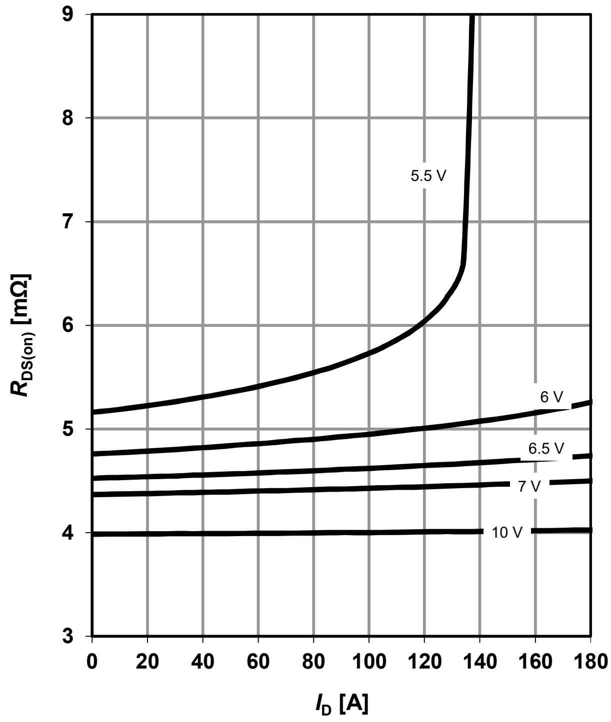
parameter: $V_{GS}$




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

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

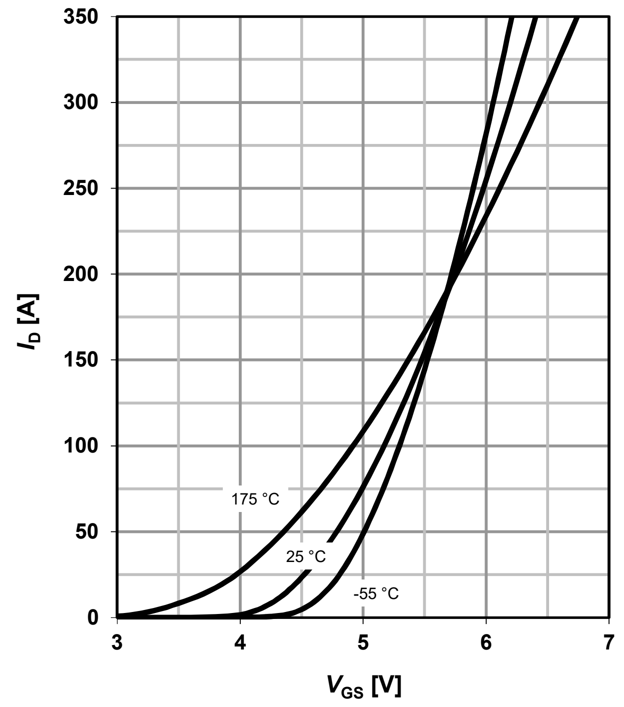
parameter: $V_{GS}$




**7 Typ. transfer characteristics**

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

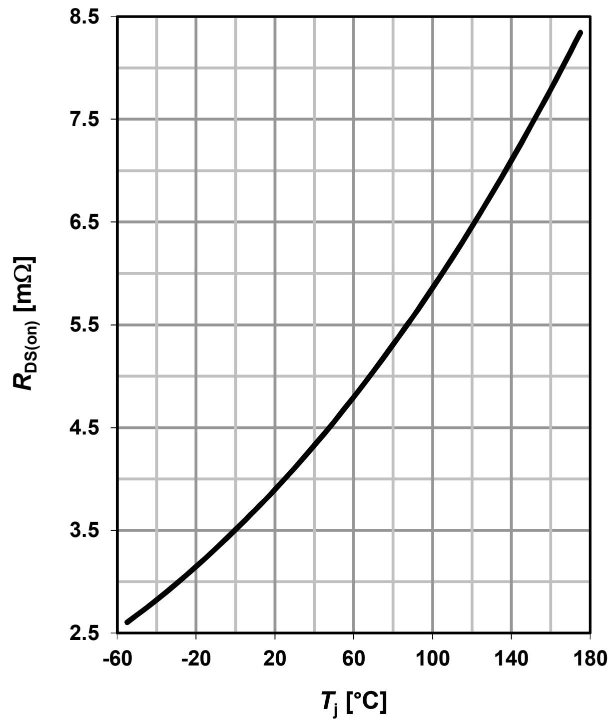
parameter: $T_j$




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

$R_{DS(on)} = f(T_j)$; $I_D = 100$ A; $V_{GS} = 10$ V; SMD

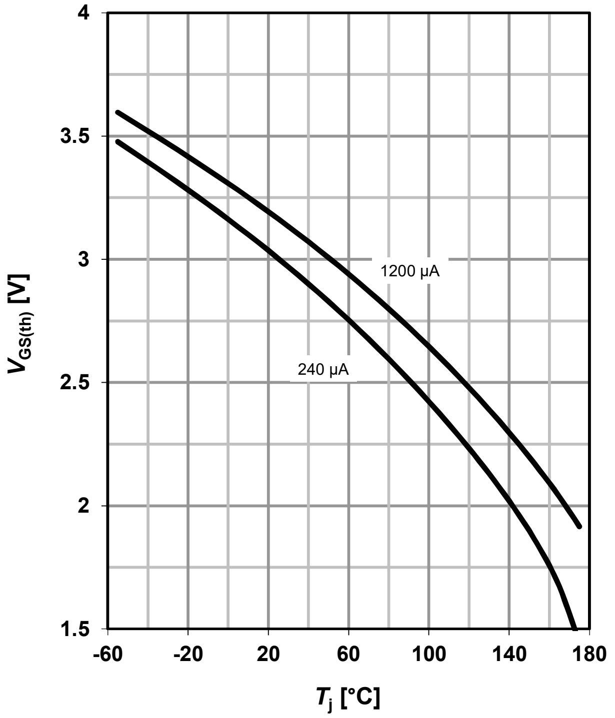
$\alpha = 0.4$



**9 Typ. gate threshold voltage**

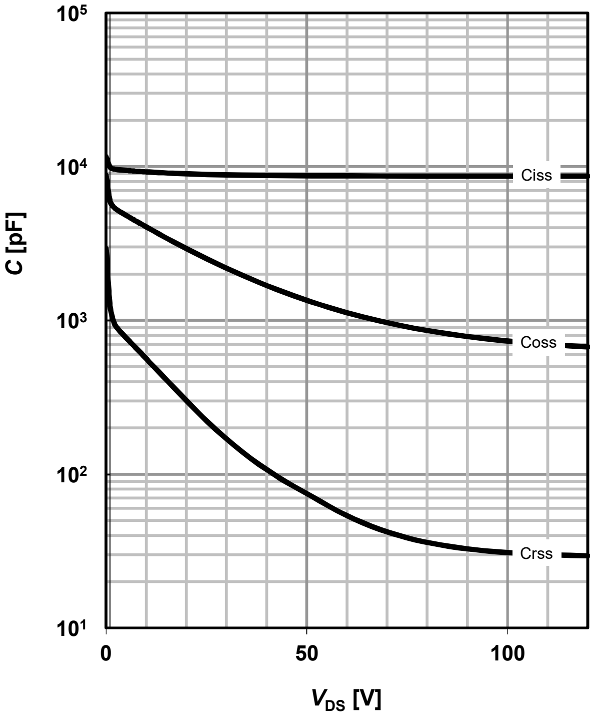
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

parameter: $I_D$




**10 Typ. capacitances**

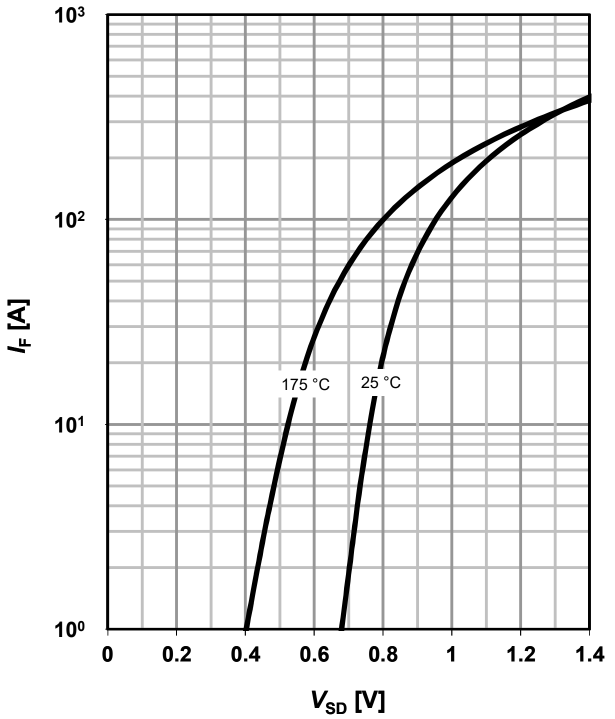
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz




**11 Typical forward diode characteristics**

$I_F = f(V_{SD})$

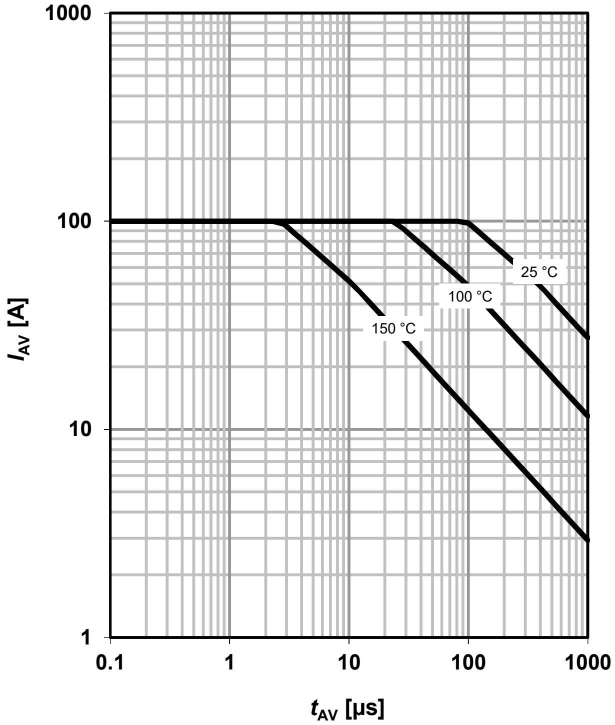
parameter: $T_j$




**12 Typ. avalanche characteristics**

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

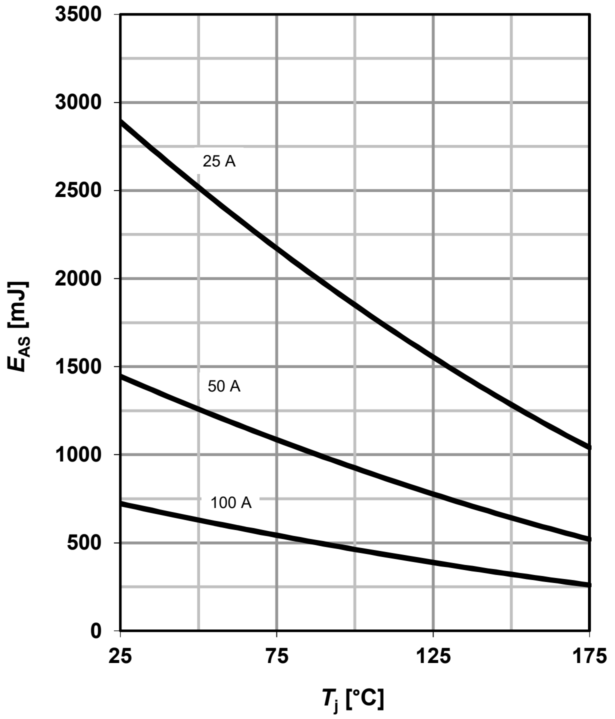
parameter: $T_{j(start)}$



**13 Typical avalanche energy**

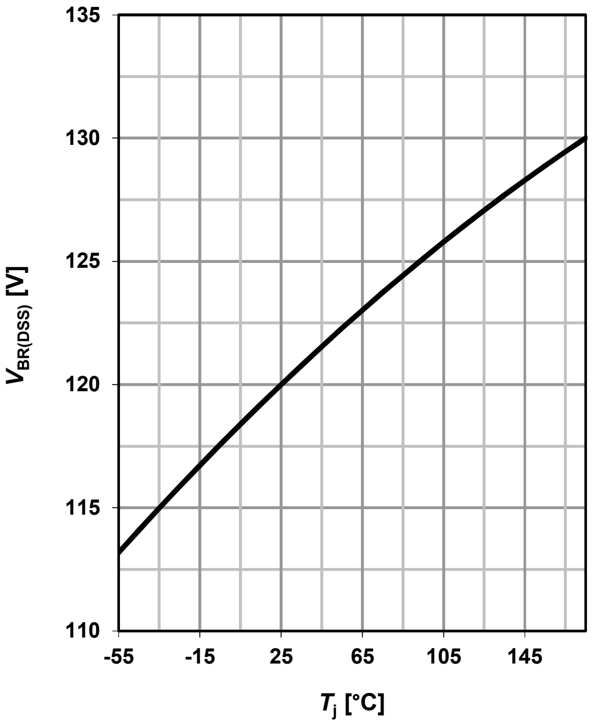
$E_{AS} = f(T_j)$

parameter: $I_D$




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

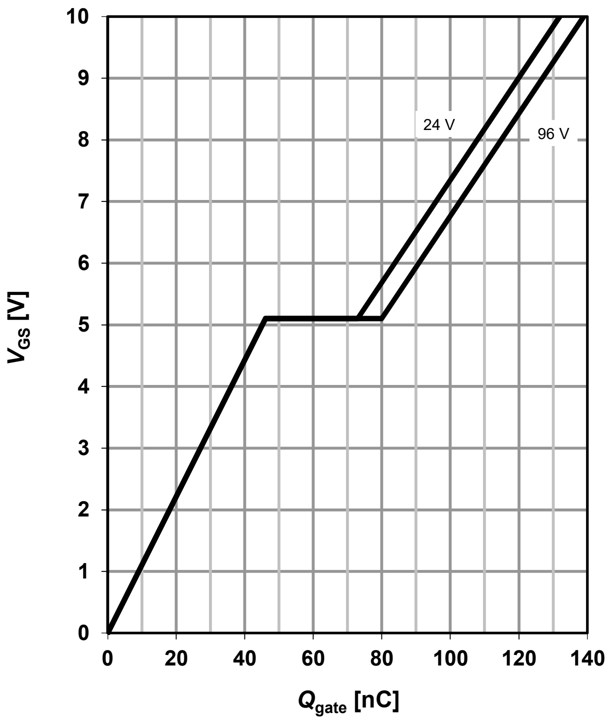
$V_{BR(DSS)} = f(T_j)$; $I_D = 1$ mA



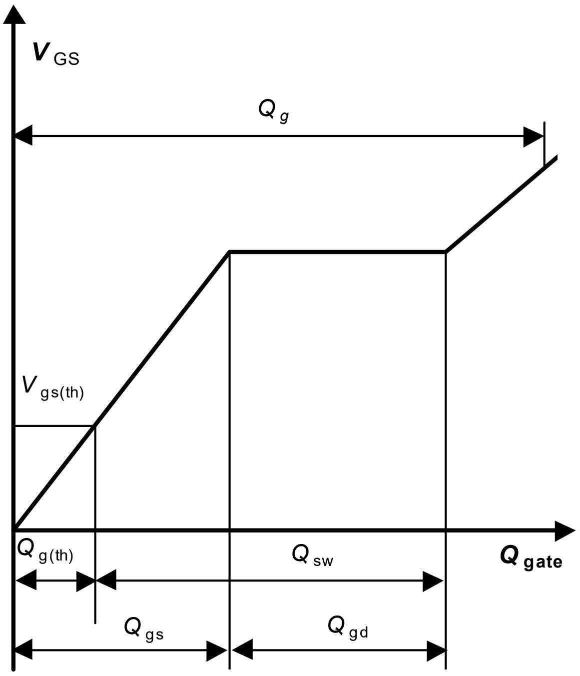

**15 Typ. gate charge**

$V_{GS} = f(Q_{gate})$; $I_D = 100$ A pulsed

parameter: $V_{DD}$




**16 Gate charge waveforms**



**Trademarks**

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2023-06-15**

**Published by**

**Infineon Technologies AG**

**81726 Munich, Germany**



**Do you have any questions about any aspect of this document?**

**Email:** erratum@infineon.com

**Document reference IPP_B_I100N12S3-05-Data-Sheet-11-Infineon**

**IMPORTANT NOTICE**

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, hints or any typical values stated herein and/or any information regarding the application of the product, 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.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications. The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

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

**WARNINGS**

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact the nearest Infineon Technologies Office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

Revision History

| **Version** | Date | Changes |
|---|---|---|
| Revision 1.0 | 2016-06-20 | Final Data Sheet |
| Revision 1.1 | 2023-06-15 | Diagram 8 Typ. drain-source on-state resistance: used α value clarified |
| Revision 1.1 | 2023-06-15 | Corrected diagram 10 typical capacitances |