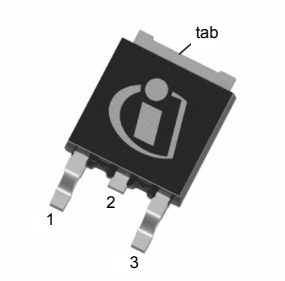
# MOSFET

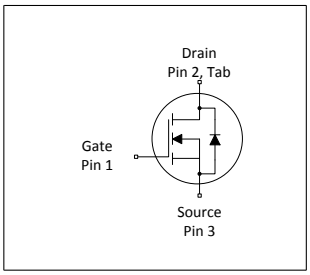
## OptiMOS™3 Power-Transistor, 30 V

DPAK




### Features

- Fast switching MOSFET for SMPS
- Optimized technology for DC/DC converters
- Qualified according to JEDEC[1] for target applications
- N-channel, logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Avalanche rated
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21




### Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 30 | V |
| $R_{DS(on),max}$ | 7.5 | mΩ |
| $I_D$ | 50 | A |

| Type / Ordering Code | Package | Marking | Related Links |
|---|---|---|---|
| IPD075N03L G | PG-TO252-3 | 075N03L | - |

[1] J-STD20 and JESD22

## Table of Contents

# 1 Maximum ratings

at $T_A$=25 °C, unless otherwise specified

## Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current | $I_D$ | -<br>-<br>-<br>- | -<br>-<br>-<br>- | 50<br>43<br>49<br>35 | A | $V_{GS}$=10 V, $T_C$=25 °C<br>$V_{GS}$=10 V, $T_C$=100 °C<br>$V_{GS}$=4.5 V, $T_C$=25 °C<br>$V_{GS}$=4.5 V, $T_C$=100 °C |
| Pulsed drain current[1] | $I_{D,pulse}$ | - | - | 350 | A | $T_C$=25 °C |
| Avalanche current, single pulse[2] | $I_{AS}$ | - | - | 50 | A | $T_C$=25 °C |
| Avalanche energy, single pulse | $E_{AS}$ | - | - | 50 | mJ | $I_D$=12 A, $R_{GS}$=25 Ω |
| Gate source voltage | $V_{GS}$ | -20 | - | 20 | V | - |
| Power dissipation | $P_{tot}$ | - | - | 47 | W | $T_C$=25 °C |
| Operating and storage temperature | $T_j$, $T_{stg}$ | -55 | - | 175 | °C | IEC climatic category;<br>DIN IEC 68-1: 55/175/56 |

# 2 Thermal characteristics

## Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 3.2 | K/W | - |
| SMD version, device on PCB, minimal footprint | $R_{thJA}$ | - | - | 75 | K/W | - |
| SMD version, device on PCB, 6 cm² cooling area[3] | $R_{thJA}$ | - | - | 50 | K/W | - |

[1] See figure 3 for more detailed information
[2] See figure 13 for more detailed information
[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.

# 3 Electrical characteristics

at $T_j$=25 °C, unless otherwise specified

## Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 30 | - | - | V | $V_{GS}$=0 V, $I_D$=1 mA |
| Gate threshold voltage | $V_{GS(th)}$ | 1 | - | 2.2 | V | $V_{DS}$=$V_{GS}$, $I_D$=250 µA |
| Zero gate voltage drain current | $I_{DSS}$ | -<br>- | 0.1<br>10 | 1<br>100 | µA | $V_{DS}$=30 V, $V_{GS}$=0 V, $T_j$=25 °C<br>$V_{DS}$=30 V, $V_{GS}$=0 V, $T_j$=125 °C |
| Gate-source leakage current | $I_{GSS}$ | - | 10 | 100 | nA | $V_{GS}$=20 V, $V_{DS}$=0 V |
| Drain-source on-state resistance[1] | $R_{DS(on)}$ | -<br>- | 9.1<br>6.3 | 11.4<br>7.5 | mΩ | $V_{GS}$=4.5 V, $I_D$=30 A<br>$V_{GS}$=10 V, $I_D$=30 A |
| Gate resistance | $R_G$ | - | 1.3 | - | Ω | - |
| Transconductance | $g_{fs}$ | 30 | 61 | - | S | \|$V_{DS}$\|>2\|$I_D$\|$R_{DS(on)max}$, $I_D$=30 A |

## Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance[2] | $C_{iss}$ | - | 1400 | 1900 | pF | $V_{GS}$=0 V, $V_{DS}$=15 V, $f$=1 MHz |
| Output capacitance[2] | $C_{oss}$ | - | 580 | 770 | pF | $V_{GS}$=0 V, $V_{DS}$=15 V, $f$=1 MHz |
| Reverse transfer capacitance[2] | $C_{rss}$ | - | 29 | 44 | pF | $V_{GS}$=0 V, $V_{DS}$=15 V, $f$=1 MHz |
| Turn-on delay time | $t_{d(on)}$ | - | 4.3 | - | ns | $V_{DD}$=15 V, $V_{GS}$=10 V, $I_D$=30 A, $R_G$=1.6 Ω |
| Rise time | $t_r$ | - | 3.6 | - | ns | $V_{DD}$=15 V, $V_{GS}$=10 V, $I_D$=30 A, $R_G$=1.6 Ω |
| Turn-off delay time | $t_{d(off)}$ | - | 17 | - | ns | $V_{DD}$=15 V, $V_{GS}$=10 V, $I_D$=30 A, $R_G$=1.6 Ω |
| Fall time | $t_f$ | - | 2.8 | - | ns | $V_{DD}$=15 V, $V_{GS}$=10 V, $I_D$=30 A, $R_G$=1.6 Ω |

## Table 6 Gate charge characteristics[3]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | $Q_{gs}$ | - | 4.6 | - | nC | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate charge at threshold | $Q_{g(th)}$ | - | 2.2 | - | nC | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate to drain charge | $Q_{gd}$ | - | 2.1 | - | nC | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Switching charge | $Q_{sw}$ | - | 4.4 | - | nC | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate charge total | $Q_g$ | - | 8.7 | - | nC | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate plateau voltage | $V_{plateau}$ | - | 3.3 | - | V | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 4.5 V |
| Gate charge total | $Q_g$ | - | 18 | - | - | $V_{DD}$=15 V, $I_D$=30 A, $V_{GS}$=0 to 10 V |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | - | 7.6 | - | nC | $V_{DS}$=0.1 V, $V_{GS}$=0 to 4.5 V |
| Output charge | $Q_{oss}$ | - | 15 | - | - | $V_{DD}$=15 V, $V_{GS}$=0 V |

[1] Measured from drain tab to source pin
[2] Defined by design. Not subject to production test
[3] See ″Gate charge waveforms″ for parameter definition

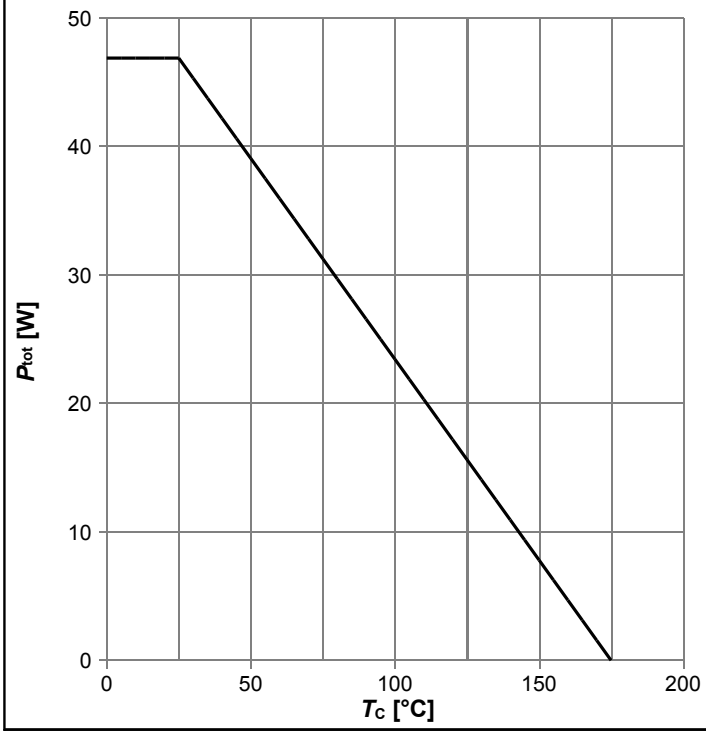
## Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | $I_S$ | - | - | 42 | A | $T_C$=25 °C |
| Diode pulse current | $I_{S,pulse}$ | - | - | 350 | A | $T_C$=25 °C |
| Diode forward voltage | $V_{SD}$ | - | 0.89 | 1.1 | V | $V_{GS}$=0 V, $I_F$=30 A, $T_j$=25 °C |
| Reverse recovery charge[1)] | $Q_{rr}$ | - | - | 10 | nC | $V_R$=15 V, $I_F$=$I_S$, d$i_F$/d$t$=400 A/µs |

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

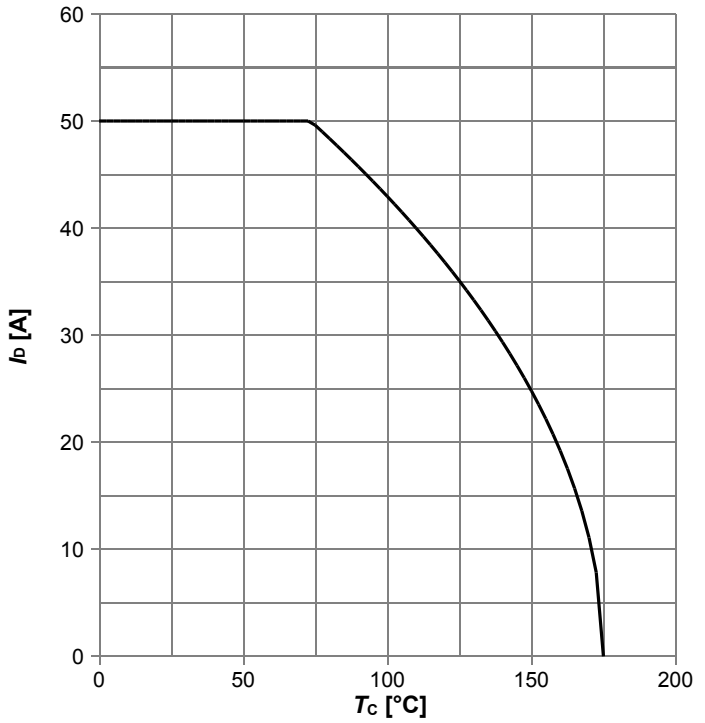
# 4 Electrical characteristics diagrams

**Diagram 1: Power dissipation**



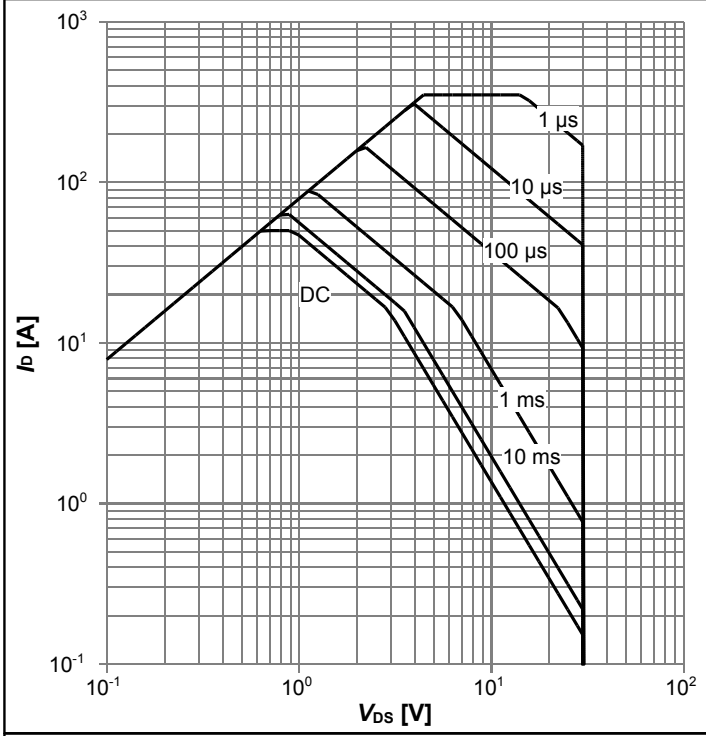

$P_{tot}=f(T_C)$

**Diagram 2: Drain current**



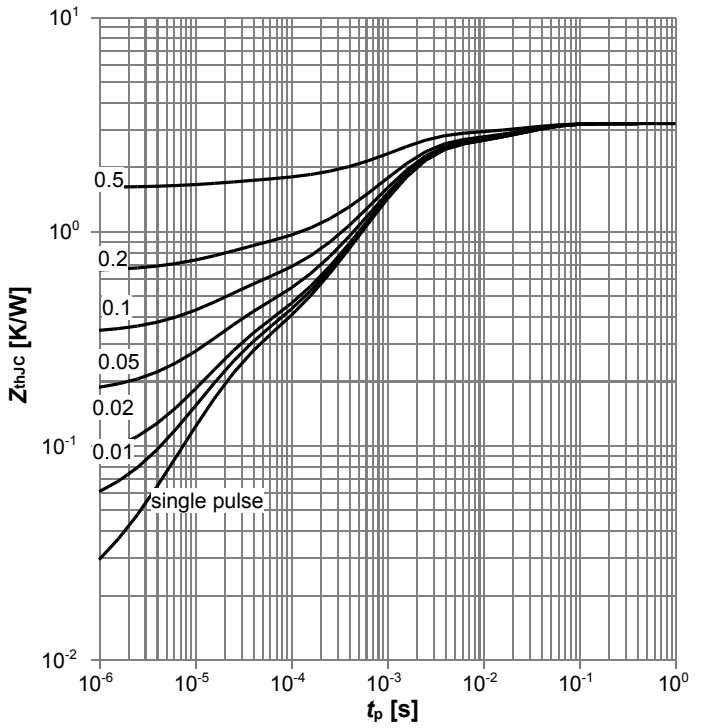

$I_D=f(T_C)$; $V_{GS}\geq 10$ V

**Diagram 3: Safe operating area**



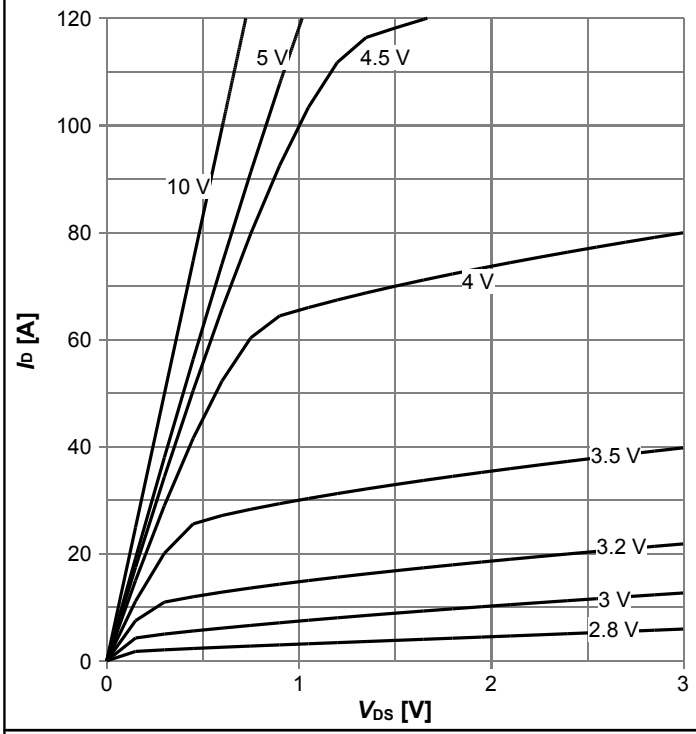

$I_D=f(V_{DS})$; $T_C$=25 °C; $D$=0; parameter: $t_p$

**Diagram 4: Max. transient thermal impedance**



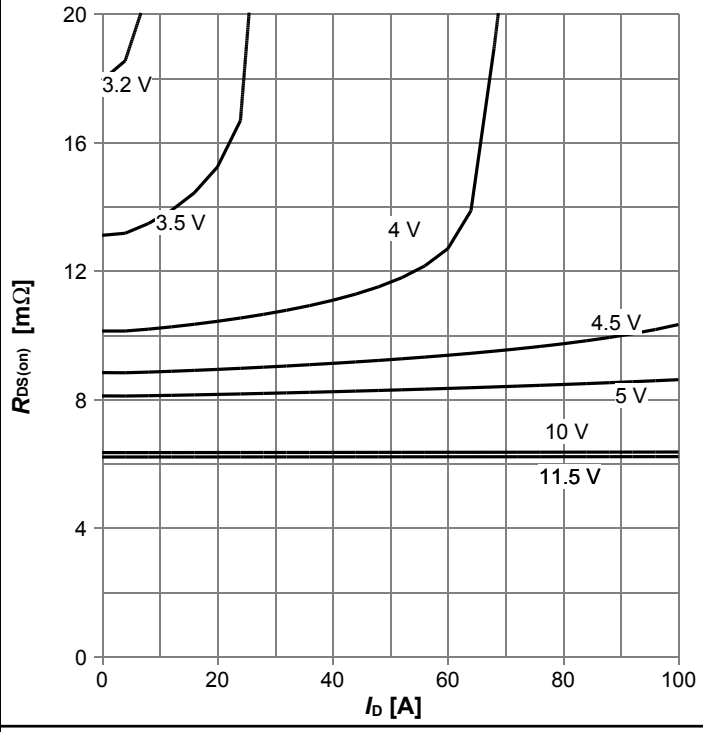

$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

**Diagram 5: Typ. output characteristics**



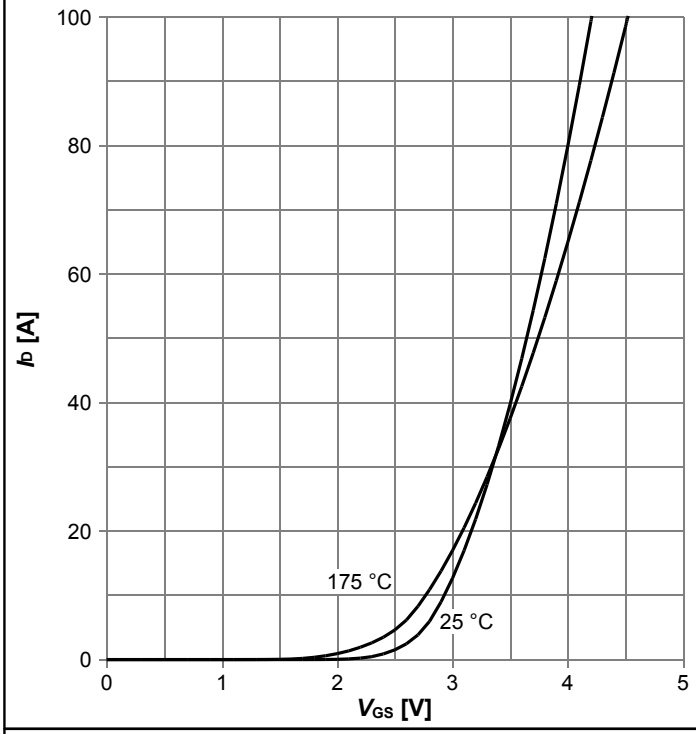

$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: $V_{GS}$

**Diagram 6: Typ. drain-source on resistance**



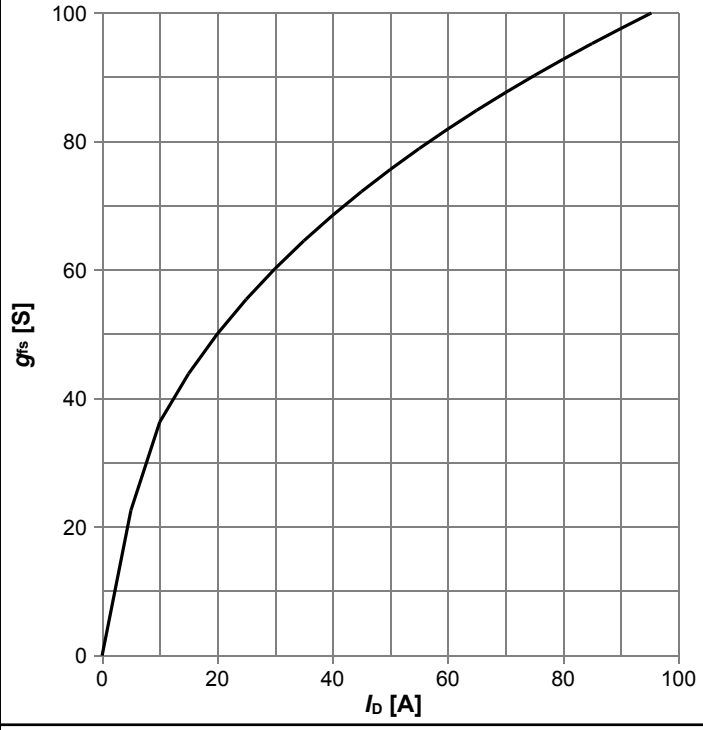

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: $V_{GS}$

**Diagram 7: Typ. transfer characteristics**



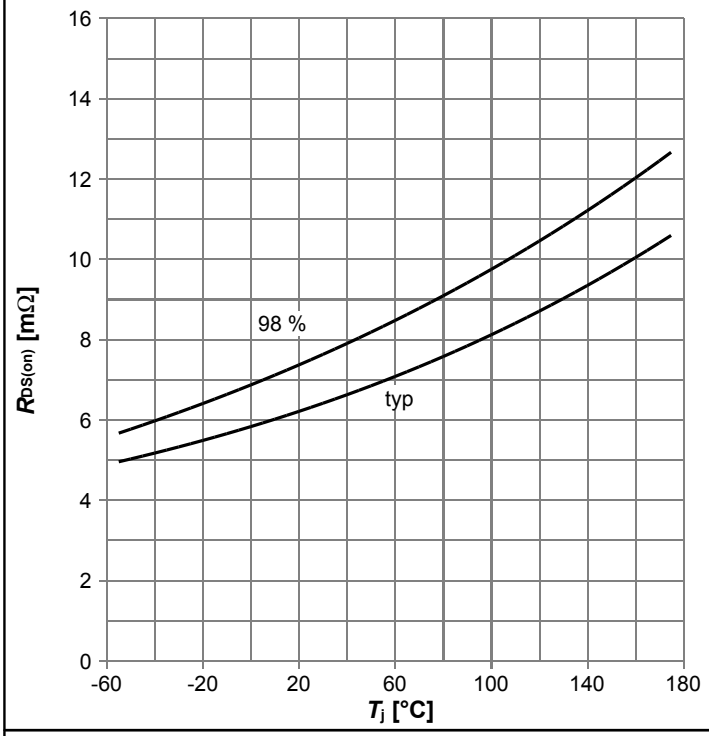

$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: $T_j$

**Diagram 8: Typ. forward transconductance**



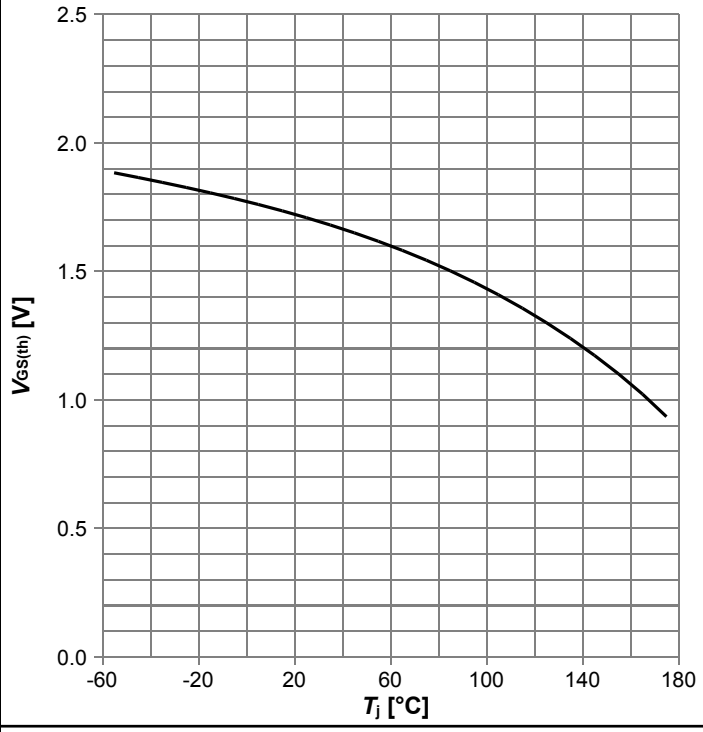

$g_{fs}=f(I_D)$; $T_j=25$ °C

**Diagram 9: Drain-source on-state resistance**



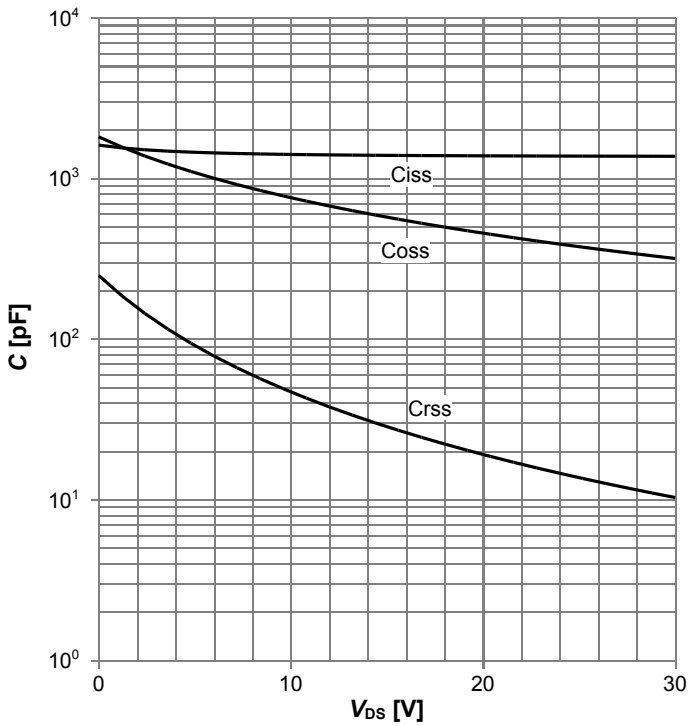

$R_{DS(on)}$=f($T_j$); $I_D$=30 A; $V_{GS}$=10 V

**Diagram 10: Typ. gate threshold voltage**



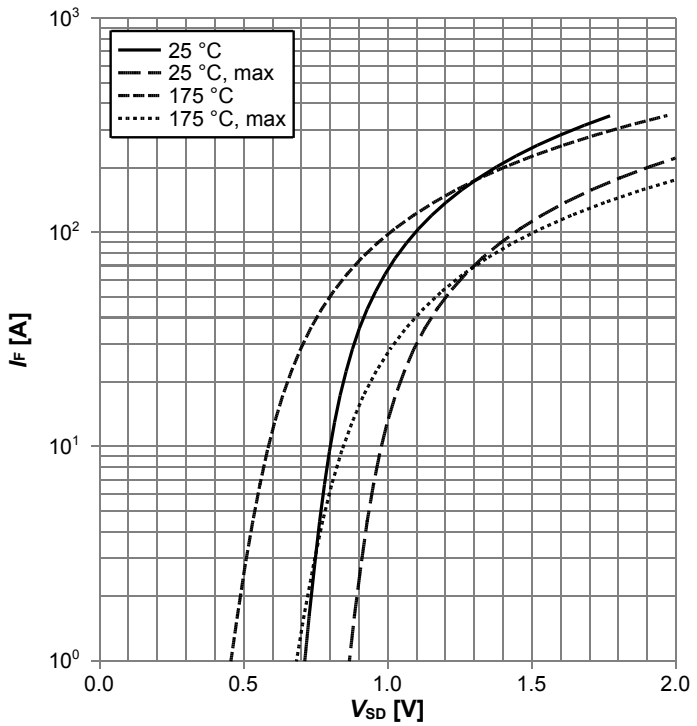

$V_{GS(th)}$=f($T_j$); $V_{GS}$=$V_{DS}$; $I_D$=250 µA

**Diagram 11: Typ. capacitances**



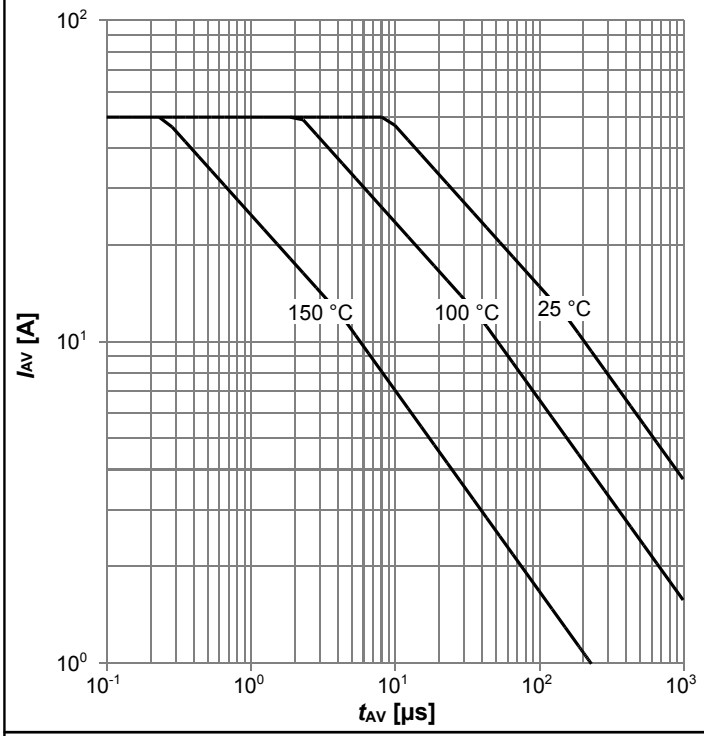

$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz

**Diagram 12: Forward characteristics of reverse diode**



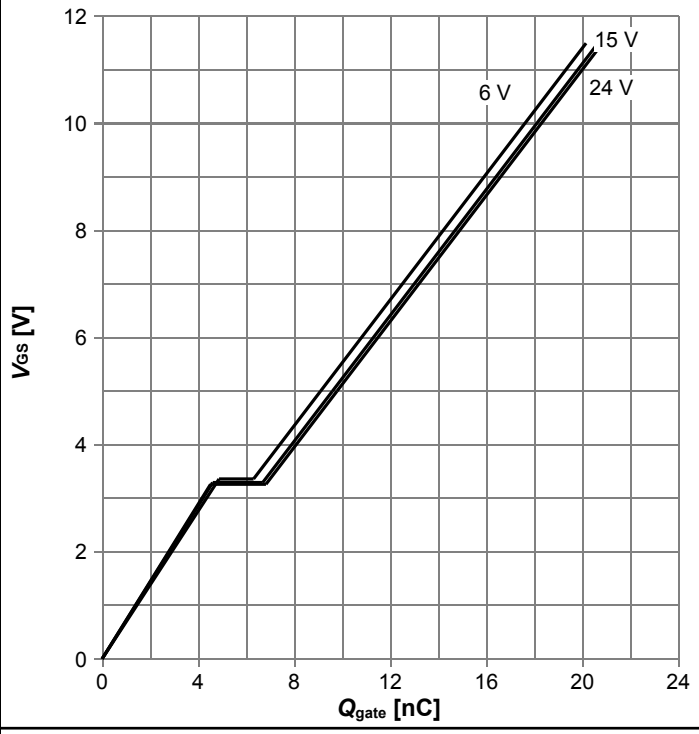

$I_F$=f($V_{SD}$); parameter: $T_j$

**Diagram 13: Avalanche characteristics**



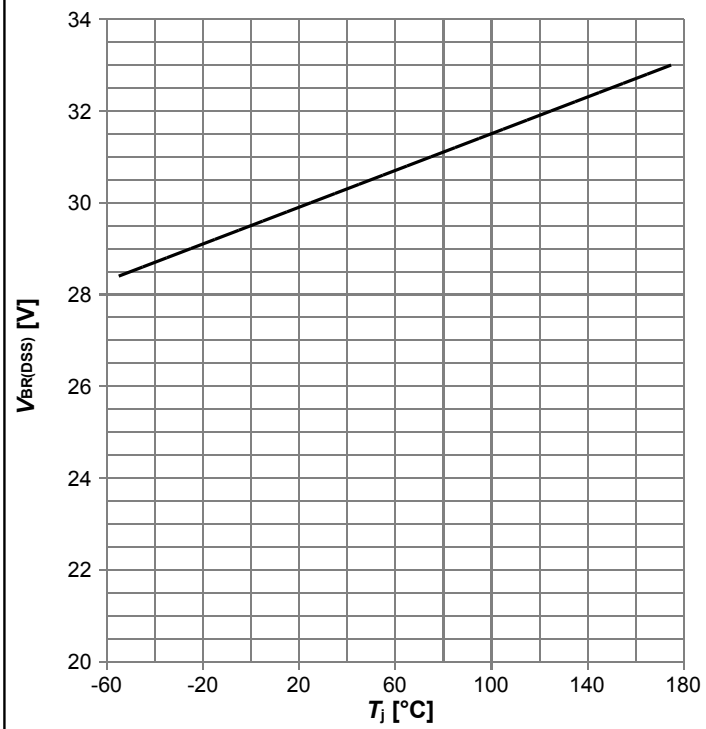

$I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω; parameter: $T_{j(start)}$

**Diagram 14: Typ. gate charge**



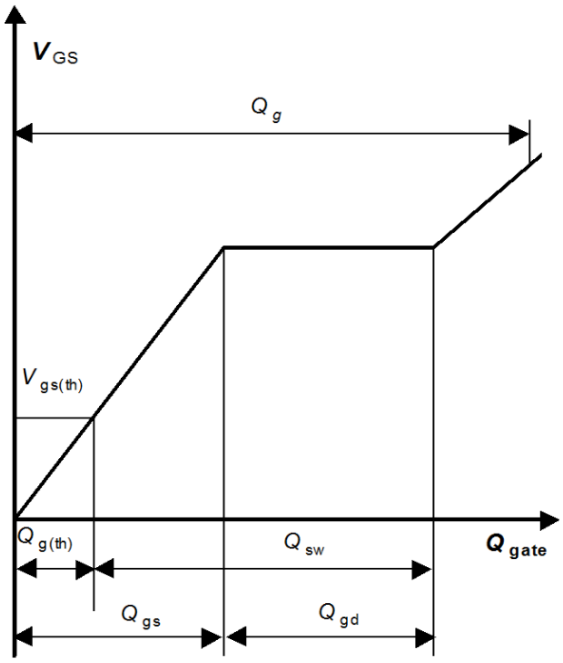

$V_{GS}$=f($Q_{gate}$); $I_D$=30 A pulsed; parameter: $V_{DD}$

**Diagram 15: Drain-source breakdown voltage**

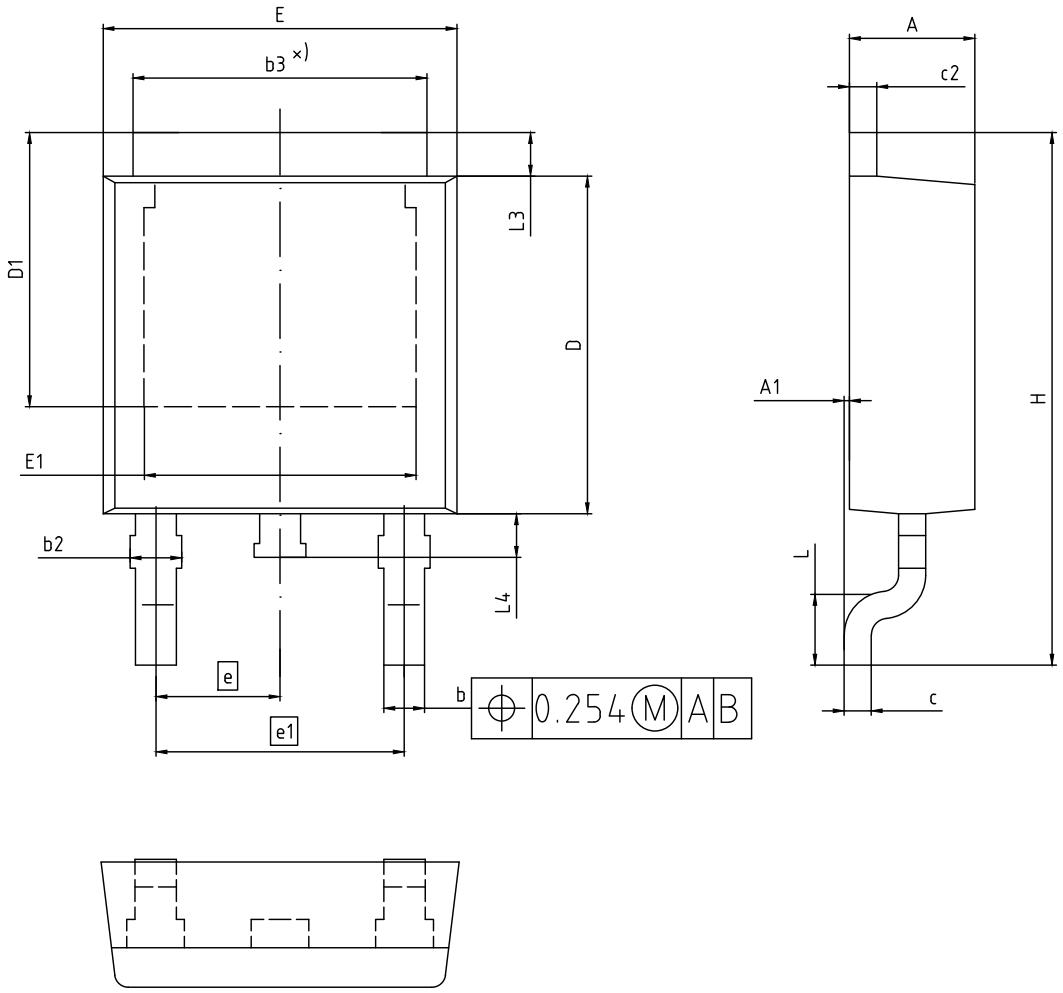



$V_{BR(DSS)}$=f($T_j$); $I_D$=1 mA

**Diagram Gate charge waveforms**



# 5 Package Outlines




ALL DIMENSIONS REFER TO JEDEC
STANDARD TO-252 AND DO NOT INCLUDE MOLD
FLASH OR PROTRUSIONS.

| DIMENSION | MILLIMETERS | |
|---|---|---|
| | MIN. | MAX. |
| **A** | 2.16 | 2.41 |
| **A1** | 0.00 | 0.15 |
| **b** | 0.64 | 0.89 |
| **b2** | 0.65 | 1.15 |
| **b3** | 4.95 | 5.50 |
| **c** | 0.46 | 0.61 |
| **c2** | 0.40 | 0.98 |
| **D** | 5.97 | 6.22 |
| **D1** | 5.02 | 5.84 |
| **E** | 6.35 | 6.73 |
| **E1** | 4.32 | 5.50 |
| **e** | 2.29 | |
| **e1** | 4.57 | |
| **N** | 3 | |
| **H** | 9.40 | 10.48 |
| **L** | 1.18 | 1.78 |
| **L3** | 0.89 | 1.27 |
| **L4** | 0.51 | 1.02 |

| | |
|---|---|
| **DOCUMENT NO.** | Z8B00003328 |
| **REVISION** | 07 |
| **SCALE:** | 10:1 |
| | 0 1 2mm |
| **EUROPEAN PROJECTION** | |
| **ISSUE DATE** | 01.04.2020 |

**Figure 1 Outline PG-TO252-3, dimensions in mm**

## Revision History

IPD075N03L G

**Revision: 2020-09-14, Rev. 2.2**

| Previous Revision | | |
|---|---|---|
| Revision | Date | Subjects (major changes since last revision) |
| 2.2 | 2020-09-14 | Update POD |



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