

## OptiMOS™ Power-Transistor

### Features

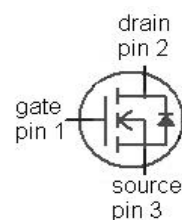
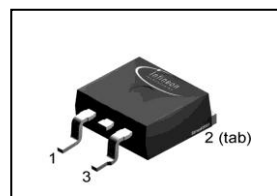
- Optimized for synchronous rectification
- 100% avalanche tested
- Superior thermal resistance
- N-channel, normal level
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



### Product Summary

|                  |     |    |
|------------------|-----|----|
| $V_{DS}$         | 60  | V  |
| $R_{DS(on),max}$ | 2.6 | mΩ |
| $I_D$            | 100 | A  |
| $Q_{oss}$        | 65  | nC |
| $Q_g(0V..10V)$   | 56  | nC |

PG-TO263-3



| Type       | Package    | Marking |
|------------|------------|---------|
| IPB026N06N | PG-TO263-3 | 026N06N |

**Maximum ratings**, at  $T_J=25\text{ °C}$ , unless otherwise specified

| Parameter                                    | Symbol        | Conditions                                                           | Value | Unit |
|----------------------------------------------|---------------|----------------------------------------------------------------------|-------|------|
| Continuous drain current                     | $I_D$         | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$                            | 100   | A    |
|                                              |               | $V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$                           | 100   |      |
|                                              |               | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$ , $R_{thJA}=50\text{ K/W}$ | 25    |      |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$ | $T_C=25\text{ °C}$                                                   | 400   |      |
| Avalanche energy, single pulse <sup>3)</sup> | $E_{AS}$      | $I_D=100\text{ A}$ , $R_{GS}=25\text{ Ω}$                            | 110   | mJ   |
| Gate source voltage                          | $V_{GS}$      |                                                                      | ±20   | V    |

<sup>1)</sup> J-STD20 and JESD22

<sup>2)</sup> See figure 3 for more detailed information

<sup>3)</sup> See figure 13 for more detailed information

<sup>4)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

Maximum ratings, at  $T_j=25\text{ °C}$ , unless otherwise specified

| Parameter                           | Symbol                | Conditions                                              | Value       | Unit |
|-------------------------------------|-----------------------|---------------------------------------------------------|-------------|------|
| Power dissipation                   | $P_{\text{tot}}$      | $T_C=25\text{ °C}$                                      | 136         | W    |
|                                     |                       | $T_A=25\text{ °C}$ ,<br>$R_{\text{thJA}}=50\text{ K/W}$ | 3.0         |      |
| Operating and storage temperature   | $T_j, T_{\text{stg}}$ |                                                         | -55 ... 175 | °C   |
| IEC climatic category; DIN IEC 68-1 |                       |                                                         | 55/175/56   |      |

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

#### Thermal characteristics

|                                     |                   |                                              |   |   |     |     |
|-------------------------------------|-------------------|----------------------------------------------|---|---|-----|-----|
| Thermal resistance, junction - case | $R_{\text{thJC}}$ | bottom                                       | - | - | 1.1 | K/W |
| Device on PCB                       | $R_{\text{thJA}}$ | minimal footprint                            | - | - | 62  |     |
|                                     |                   | 6 cm <sup>2</sup> cooling area <sup>4)</sup> | - | - | 40  |     |

Electrical characteristics, at  $T_j=25\text{ °C}$ , unless otherwise specified

#### Static characteristics

|                                  |                             |                                                                                        |     |     |      |               |
|----------------------------------|-----------------------------|----------------------------------------------------------------------------------------|-----|-----|------|---------------|
| Drain-source breakdown voltage   | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}$ , $I_{\text{D}}=1\text{ mA}$                                | 60  | -   | -    | V             |
| Gate threshold voltage           | $V_{\text{GS(th)}}$         | $V_{\text{DS}}=V_{\text{GS}}$ , $I_{\text{D}}=75\text{ }\mu\text{A}$                   | 2.1 | 2.8 | 3.3  |               |
| Zero gate voltage drain current  | $I_{\text{DSS}}$            | $V_{\text{DS}}=60\text{ V}$ , $V_{\text{GS}}=0\text{ V}$ ,<br>$T_j=25\text{ °C}$       | -   | 0.5 | 1    | $\mu\text{A}$ |
|                                  |                             | $V_{\text{DS}}=60\text{ V}$ , $V_{\text{GS}}=0\text{ V}$ ,<br>$T_j=125\text{ °C}$      | -   | 10  | 100  |               |
| Gate-source leakage current      | $I_{\text{GSS}}$            | $V_{\text{GS}}=20\text{ V}$ , $V_{\text{DS}}=0\text{ V}$                               | -   | 10  | 100  | nA            |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$         | $V_{\text{GS}}=10\text{ V}$ , $I_{\text{D}}=100\text{ A}$                              | -   | 2.3 | 2.6  | m $\Omega$    |
|                                  |                             | $V_{\text{GS}}=6\text{ V}$ , $I_{\text{D}}=25\text{ A}$                                | -   | 3.0 | 3.9  |               |
| Gate resistance                  | $R_{\text{G}}$              |                                                                                        | -   | 1.3 | 1.95 | $\Omega$      |
| Transconductance                 | $g_{\text{fs}}$             | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$ ,<br>$I_{\text{D}}=100\text{ A}$ | 80  | 160 | -    | S             |

| Parameter | Symbol | Conditions | Values |      |      | Unit |
|-----------|--------|------------|--------|------|------|------|
|           |        |            | min.   | typ. | max. |      |

### Dynamic characteristics

|                              |              |                                                                                                     |   |      |      |    |
|------------------------------|--------------|-----------------------------------------------------------------------------------------------------|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$<br>$f=1\text{ MHz}$                                        | - | 4100 | 5125 | pF |
| Output capacitance           | $C_{oss}$    |                                                                                                     | - | 980  | 1225 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                                                     | - | 39   | 78   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=100\text{ A},$<br>$R_{G,ext,ext}=3\text{ }\Omega$ | - | 17   | -    | ns |
| Rise time                    | $t_r$        |                                                                                                     | - | 15   | -    |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                                                     | - | 30   | -    |    |
| Fall time                    | $t_f$        |                                                                                                     | - | 8    | -    |    |

### Gate Charge Characteristics<sup>5)</sup>

|                              |               |                                                                             |   |     |    |    |
|------------------------------|---------------|-----------------------------------------------------------------------------|---|-----|----|----|
| Gate to source charge        | $Q_{gs}$      | $V_{DD}=30\text{ V}, I_D=100\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 20  | -  | nC |
| Gate charge at threshold     | $Q_{g(th)}$   |                                                                             | - | 11  | -  |    |
| Gate to drain charge         | $Q_{gd}$      |                                                                             | - | 11  | 15 |    |
| Switching charge             | $Q_{sw}$      |                                                                             | - | 19  | -  |    |
| Gate charge total            | $Q_g$         |                                                                             | - | 56  | 66 |    |
| Gate plateau voltage         | $V_{plateau}$ |                                                                             | - | 4.8 | -  | V  |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$<br>$V_{GS}=0\text{ to }10\text{ V}$                  | - | 49  | -  | nC |
| Output charge                | $Q_{oss}$     | $V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$                                     | - | 65  | -  |    |

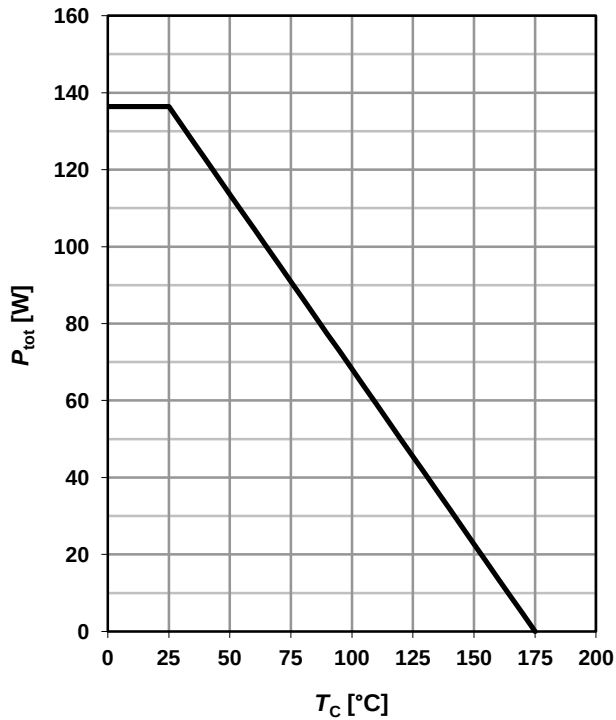
### Reverse Diode

|                                  |               |                                                                            |   |     |     |    |
|----------------------------------|---------------|----------------------------------------------------------------------------|---|-----|-----|----|
| Diode continuous forward current | $I_S$         | $T_C=25\text{ }^\circ\text{C}$                                             | - | -   | 100 | A  |
| Diode pulse current              | $I_{S,pulse}$ |                                                                            | - | -   | 400 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=100\text{ A},$<br>$T_J=25\text{ }^\circ\text{C}$   | - | 1.0 | 1.2 | V  |
| Reverse recovery time            | $t_{rr}$      | $V_R=30\text{ V}, I_F=100\text{ A},$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 55  | 88  | ns |
| Reverse recovery charge          | $Q_{rr}$      |                                                                            | - | 73  | -   | nC |

<sup>5)</sup> See figure 16 for gate charge parameter definition

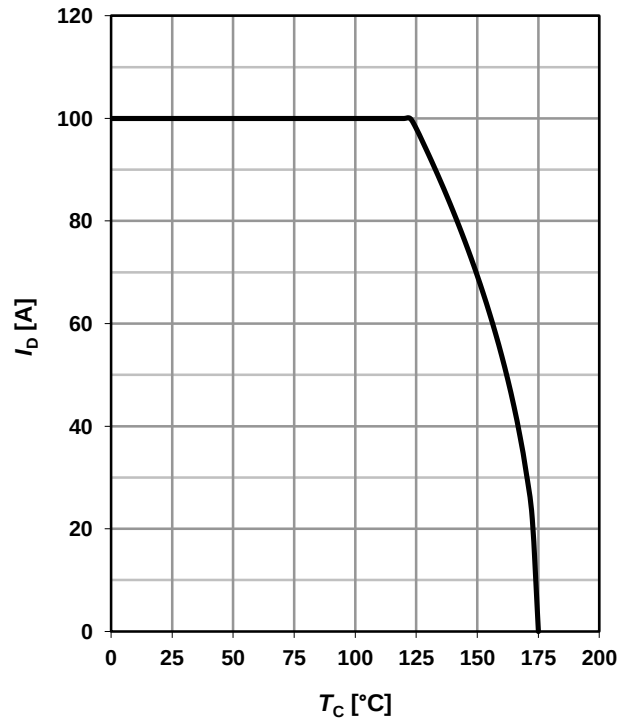
## 1 Power dissipation

$$P_{\text{tot}} = f(T_C)$$



## 2 Drain current

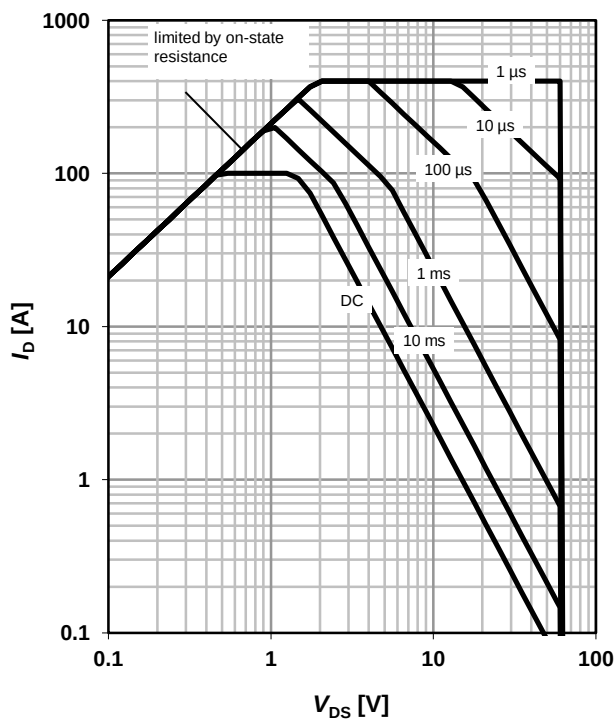
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



## 3 Safe operating area

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

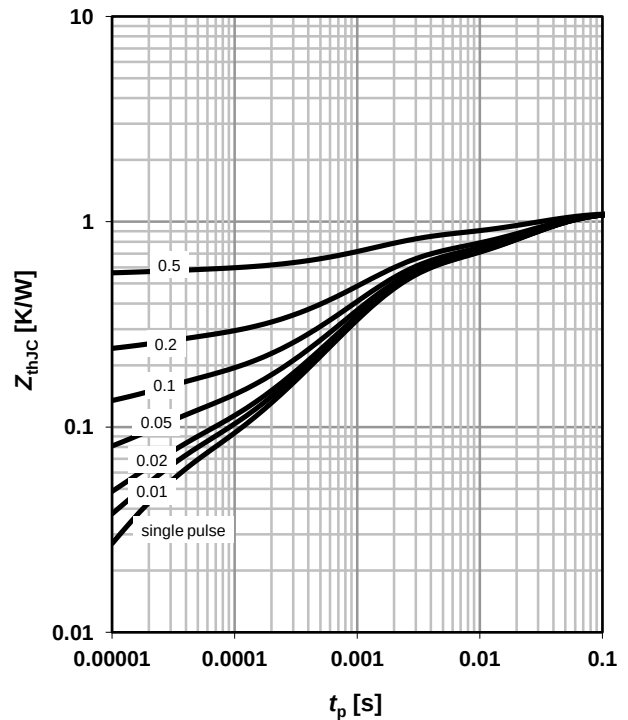
parameter:  $t_p$



## 4 Max. transient thermal impedance

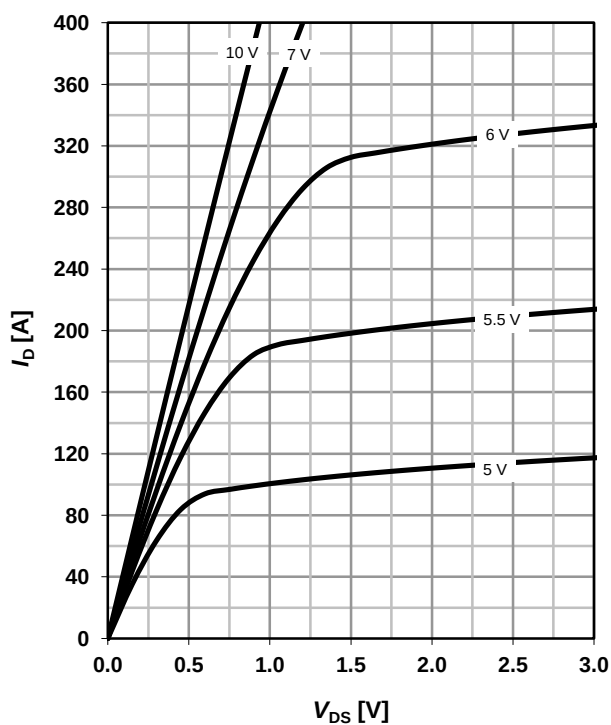
$$Z_{\text{thJC}} = f(t_p)$$

parameter:  $D = t_p/T$



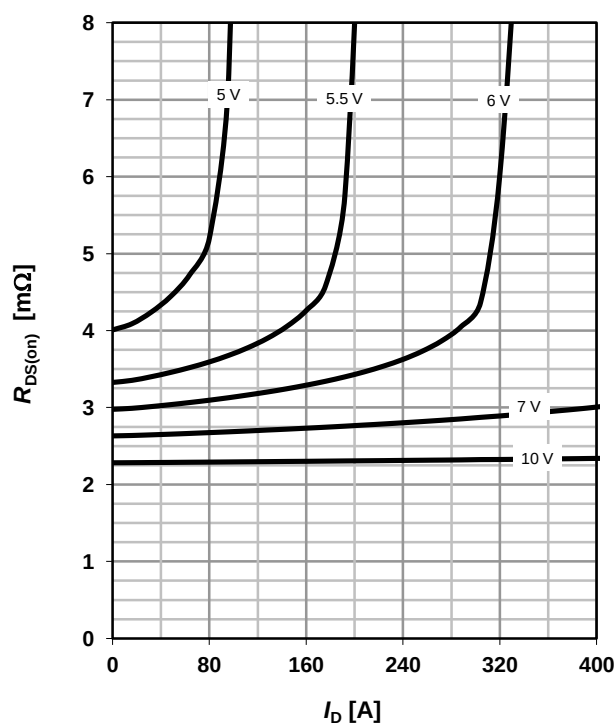
## 5 Typ. output characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}$ 

parameter:  $V_{GS}$ 


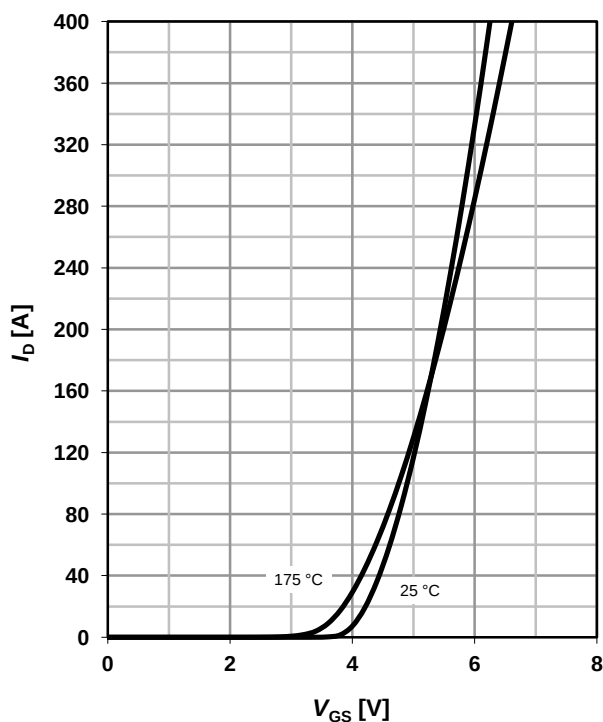
## 6 Typ. drain-source on resistance

 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$ 

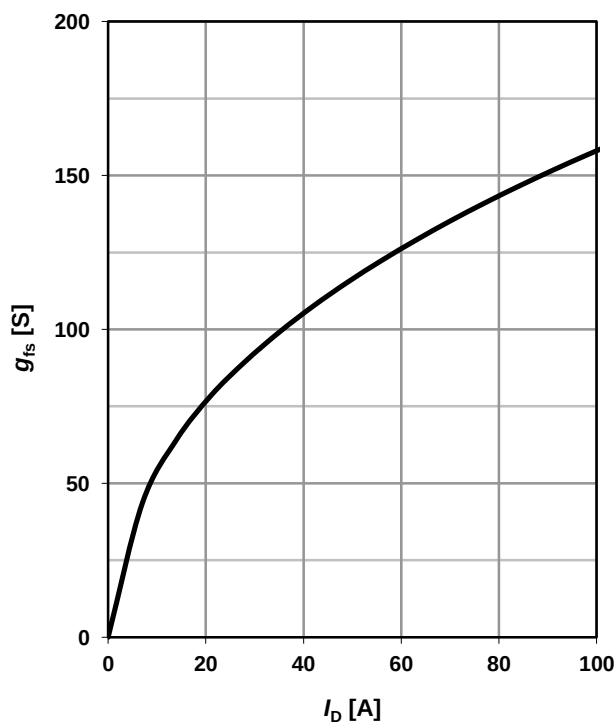
parameter:  $V_{GS}$ 


## 7 Typ. transfer characteristics

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

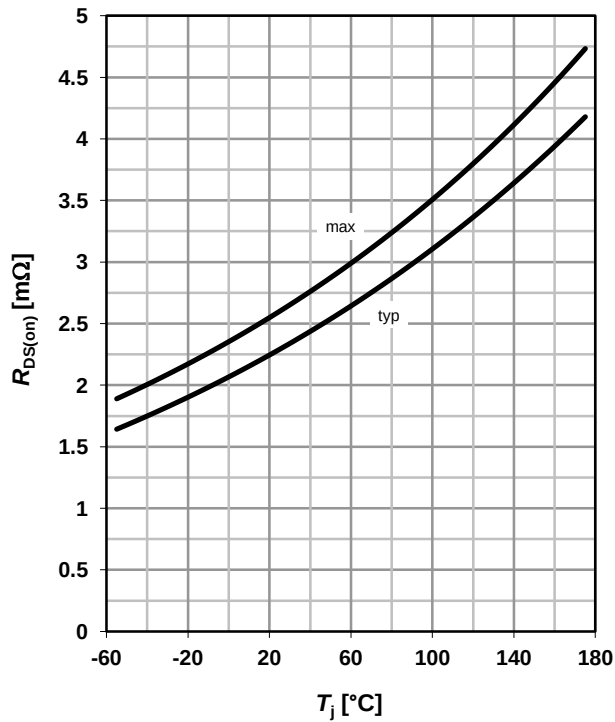
parameter:  $T_j$ 


## 8 Typ. forward transconductance

 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$ 


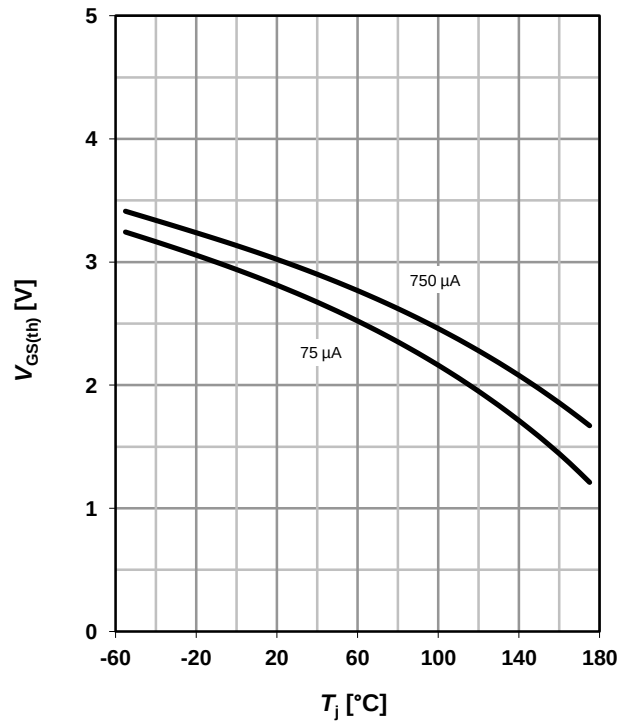
## 9 Drain-source on-state resistance

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



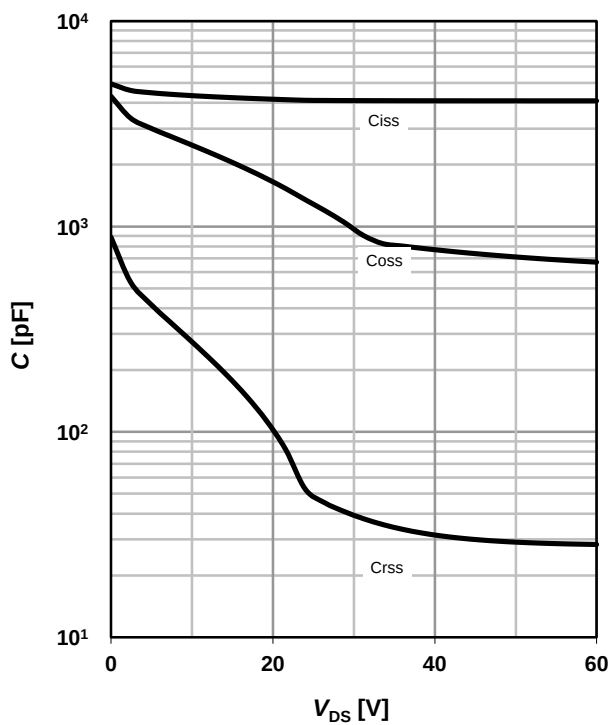
## 10 Typ. gate threshold voltage

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



## 11 Typ. capacitances

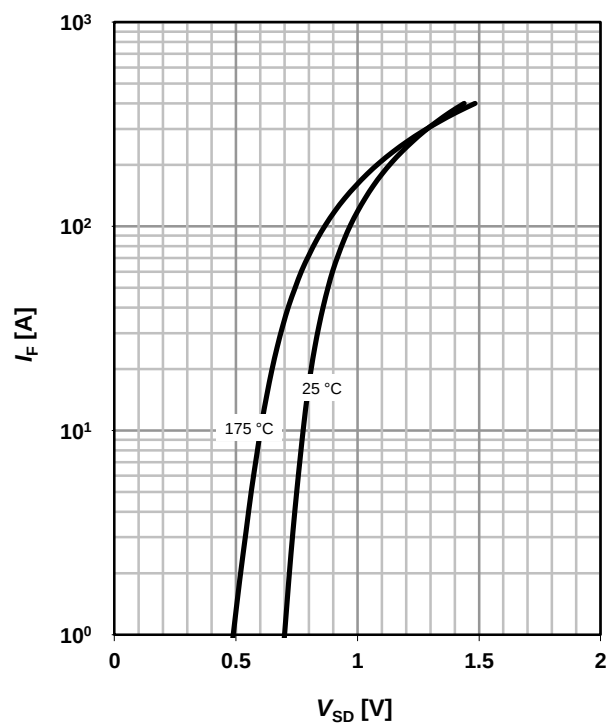
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



## 12 Forward characteristics of reverse diode

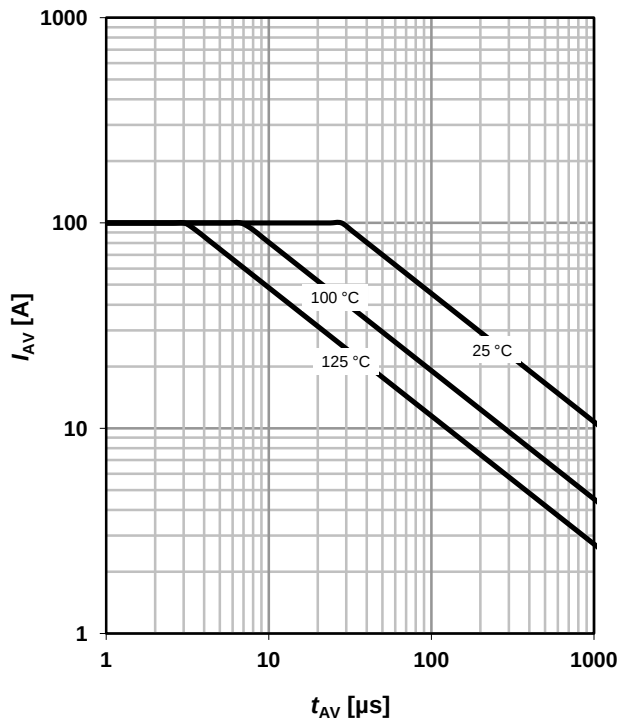
$$I_F = f(V_{SD})$$

parameter:  $T_j$



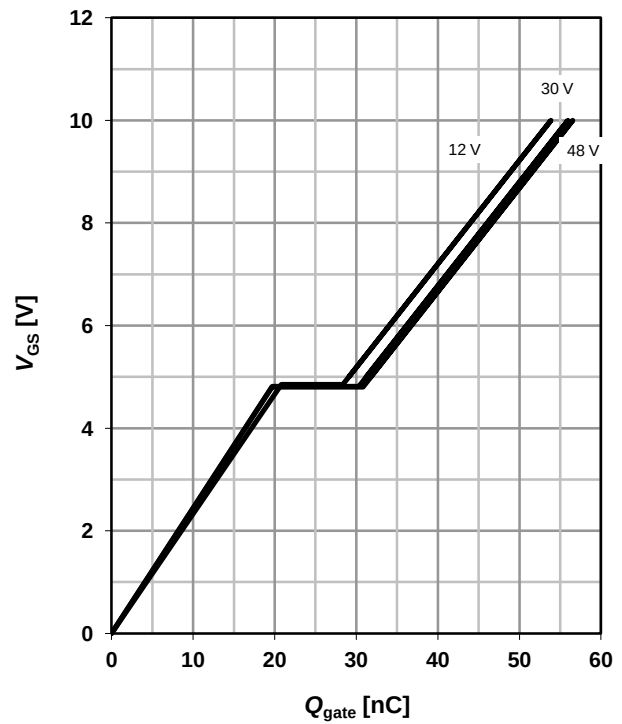
### 13 Avalanche characteristics

 $I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega$ 

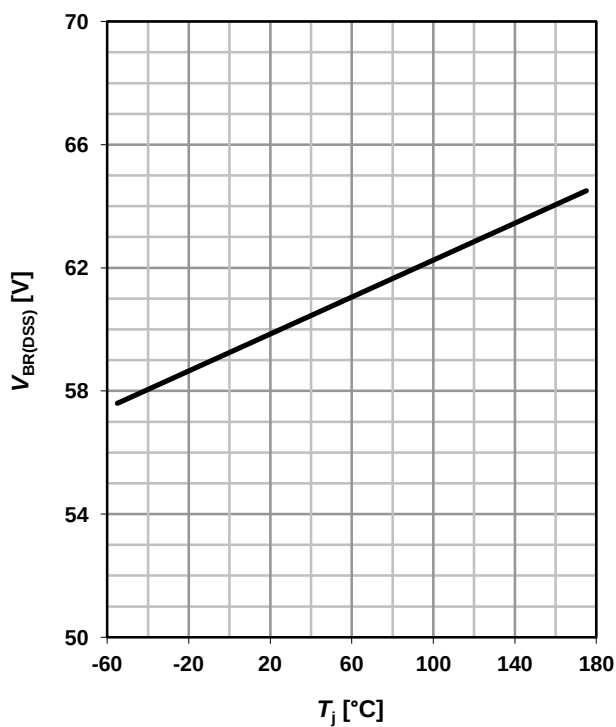
parameter:  $T_{j(\text{start})}$ 


### 14 Typ. gate charge

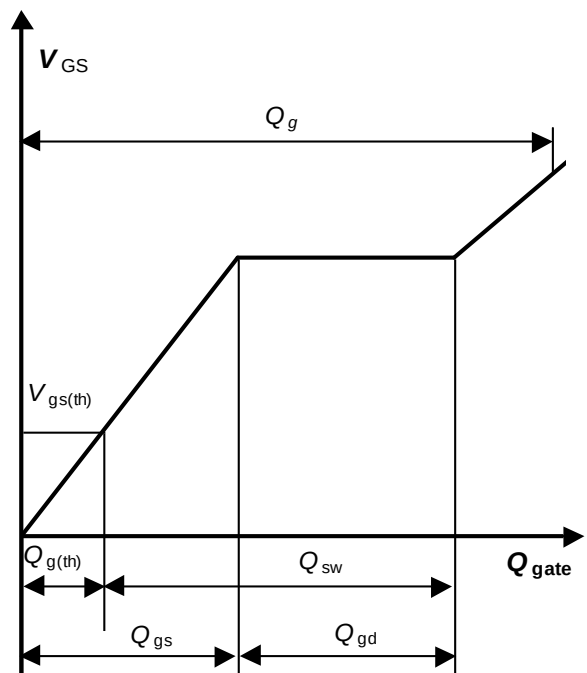
 $V_{GS}=f(Q_{gate}); I_D=100\ \text{A pulsed}$ 

parameter:  $V_{DD}$ 


### 15 Drain-source breakdown voltage

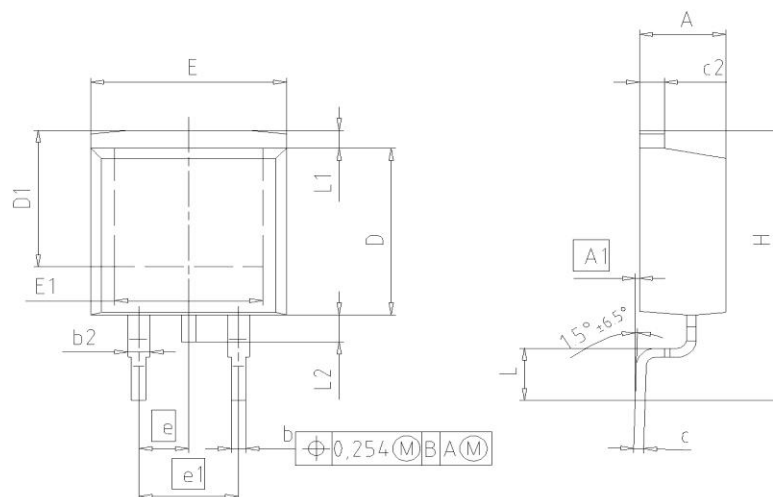
 $V_{BR(DSS)}=f(T_j); I_D=1\ \text{mA}$ 


### 16 Gate charge waveforms

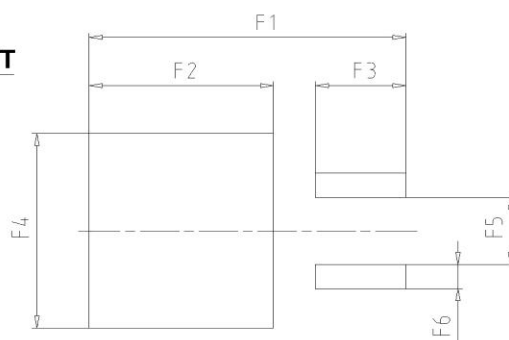


## Package Outline

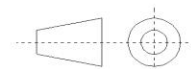
## PG-TO263-3



## FOOTPRINT



| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 4.30        | 4.57  | 0.169  | 0.180 |
| A1  | 0.00        | 0.25  | 0.000  | 0.010 |
| b   | 0.65        | 0.85  | 0.026  | 0.033 |
| b2  | 0.95        | 1.15  | 0.037  | 0.045 |
| c   | 0.33        | 0.65  | 0.013  | 0.026 |
| c2  | 1.17        | 1.40  | 0.046  | 0.055 |
| D   | 8.51        | 9.45  | 0.335  | 0.372 |
| D1  | 7.10        | 7.90  | 0.280  | 0.311 |
| E   | 9.80        | 10.31 | 0.386  | 0.406 |
| E1  | 6.50        | 8.60  | 0.256  | 0.339 |
| e   | 2.54        |       | 0.100  |       |
| e1  | 5.08        |       | 0.200  |       |
| N   | 2           |       | 2      |       |
| H   | 14.61       | 15.88 | 0.575  | 0.625 |
| L   | 2.29        | 3.00  | 0.090  | 0.118 |
| L1  | 0.70        | 1.60  | 0.028  | 0.063 |
| L2  | 1.00        | 1.78  | 0.039  | 0.070 |
| F1  | 16.05       | 16.25 | 0.632  | 0.640 |
| F2  | 9.30        | 9.50  | 0.366  | 0.374 |
| F3  | 4.50        | 4.70  | 0.177  | 0.185 |
| F4  | 10.70       | 10.90 | 0.421  | 0.429 |
| F5  | 3.65        | 3.85  | 0.144  | 0.152 |
| F6  | 1.25        | 1.45  | 0.049  | 0.057 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| DOCUMENT NO.<br>Z8B00003324                                                                                  |
| SCALE<br>0 5 5<br>7.5mm                                                                                      |
| EUROPEAN PROJECTION<br> |
| ISSUE DATE<br>30-08-2007                                                                                     |
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