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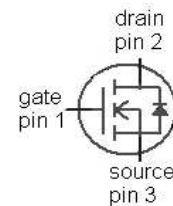
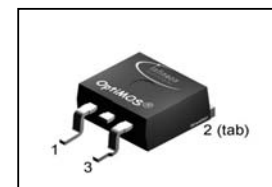


**OptiMOS®2 Power-Transistor**
**Features**

- Ideal for high-frequency dc/dc converters
- Qualified according to JEDEC<sup>1)</sup> for target applications
- N-channel - Logic level
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Very low on-resistance  $R_{DS(on)}$
- Superior thermal resistance
- 175 °C operating temperature
- $dv/dt$  rated
- Pb-free lead plating; RoHS compliant

**Product Summary**

|                  |     |            |
|------------------|-----|------------|
| $V_{DS}$         | 30  | V          |
| $R_{DS(on),max}$ | 6.3 | m $\Omega$ |
| $I_D$            | 50  | A          |

**PG-TO263-3**


| Type       | Package   | Marking |
|------------|-----------|---------|
| IPB06N03LB | P-TO263-3 | 06N03LB |

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

| Parameter                           | Symbol            | Conditions  | Value       | Unit              |
|-------------------------------------|-------------------|---|-------------|-------------------|
| Continuous drain current            | $I_D$             | $T_C=25\text{ °C}^{2)}$   | 50          | A                 |
|                                     |                   | $T_C=100\text{ °C}$   | 50          |                   |
| Pulsed drain current                | $I_{D,pulse}$     | $T_C=25\text{ °C}^{3)}$   | 200         |                   |
| Avalanche energy, single pulse      | $E_{AS}$          | $I_D=50\text{ A}$ , $R_{GS}=25\ \Omega$   | 164         | mJ                |
| Reverse diode $dv/dt$               | $dv/dt$           | $I_D=50\text{ A}$ , $V_{DS}=20\text{ V}$ ,<br>$di/dt=200\text{ A}/\mu\text{s}$ ,<br>$T_{j,max}=175\text{ °C}$ | 6           | kV/ $\mu\text{s}$ |
| Gate source voltage <sup>4)</sup>   | $V_{GS}$          |   | $\pm 20$    | V                 |
| Power dissipation                   | $P_{tot}$         | $T_C=25\text{ °C}$  | 83          | W                 |
| Operating and storage temperature   | $T_j$ , $T_{stg}$ |   | -55 ... 175 | °C                |
| IEC climatic category; DIN IEC 68-1 |                   |   | 55/175/56   |                   |

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

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

**Thermal characteristics**

|                                     |            |  |   |   |     |     |
|-------------------------------------|------------|--|---|---|-----|-----|
| Thermal resistance, junction - case | $R_{thJC}$ |  | - | - | 1.8 | K/W |
| SMD version, device on PCB          | $R_{thJA}$ | minimal footprint                            | - | - | 62  |     |
|                                     |            | 6 cm <sup>2</sup> cooling area <sup>5)</sup> | - | - | 40  |     |

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

|                                 |               |  |     |     |     |               |
|---------------------------------|---------------|--|-----|-----|-----|---------------|
| Drain-source breakdown voltage  | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$                       | 30  | -   | -   | V             |
| Gate threshold voltage          | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=40\text{ }\mu\text{A}$                 | 1.2 | 1.6 | 2   |               |
| Zero gate voltage drain current | $I_{DSS}$     | $V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$  | -   | 0.1 | 1   | $\mu\text{A}$ |
|                                 |               | $V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$ | -   | 10  | 100 |               |
| Gate-source leakage current     | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                    | -   | 10  | 100 | nA            |
|                                 | $R_{DS(on)}$  | $V_{GS}=4.5\text{ V}, I_D=30\text{ A}$                     | -   | 7.4 | 9.3 | m $\Omega$    |
|                                 |               | $V_{GS}=10\text{ V}, I_D=50\text{ A}$                      | -   | 5.3 | 6.3 |               |
| Gate resistance                 | $R_G$         |  | -   | 1.2 | -   | $\Omega$      |
| Transconductance                | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=30\text{ A}$            | -   | 58  | -   | S             |

<sup>2)</sup> Current is limited by bondwire; with an  $R_{thJC}=1.8\text{ K/W}$  the chip is able to carry 86 A.

<sup>3)</sup> See figure 3

<sup>4)</sup>  $T_{j,max}=150\text{ °C}$  and duty cycle  $D<0.25$  for  $V_{GS}<-5\text{ V}$

<sup>5)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

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

**Dynamic characteristics**

|                              |              |   |   |      |      |    |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$<br>$f=1\text{ MHz}$                    | - | 2092 | 2782 | pF |
| Output capacitance           | $C_{oss}$    |   | - | 745  | 991  |    |
| Reverse transfer capacitance | $C_{rss}$    |   | - | 97   | 145  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=25\text{ A}, R_G=2.7\ \Omega$ | - | 7    | 11   | ns |
| Rise time                    | $t_r$        |   | - | 5    | 8    |    |
| Turn-off delay time          | $t_{d(off)}$ |   | - | 25   | 38   |    |
| Fall time                    | $t_f$        |   | - | 4.0  | 6.0  |    |

**Gate Charge Characteristics<sup>6)</sup>**

|                              |               |   |   |     |     |    |
|------------------------------|---------------|---|---|-----|-----|----|
| Gate to source charge        | $Q_{gs}$      | $V_{DD}=15\text{ V}, I_D=25\text{ A},$<br>$V_{GS}=0\text{ to }5\text{ V}$ | - | 6.6 | 8.7 | nC |
| Gate charge at threshold     | $Q_{g(th)}$   |   | - | 3.3 | 4.5 |    |
| Gate to drain charge         | $Q_{gd}$      |   | - | 4.3 | 6.4 |    |
| Switching charge             | $Q_{sw}$      |   | - | 7.5 | 11  |    |
| Gate charge total            | $Q_g$         |   | - | 16  | 22  |    |
| Gate plateau voltage         | $V_{plateau}$ |   | - | 3.1 | -   |    |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$<br>$V_{GS}=0\text{ to }5\text{ V}$                 | - | 14  | 19  | nC |
| Output charge                | $Q_{oss}$     | $V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$                                   | - | 17  | 22  |    |

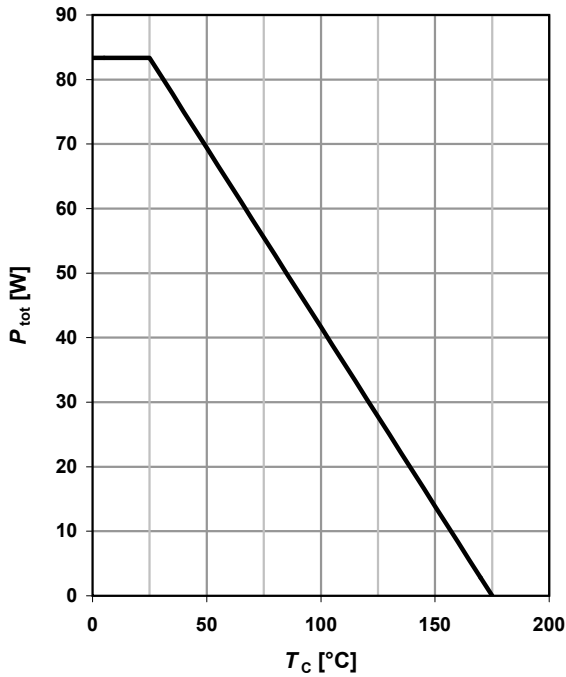
**Reverse Diode**

|                                  |               |   |   |      |     |    |
|----------------------------------|---------------|---|---|------|-----|----|
| Diode continuous forward current | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | - | -    | 50  | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | -    | 200 |    |
| Diode forward voltage            | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=50\text{ A},$<br>$T_j=25\text{ }^\circ\text{C}$ | - | 0.92 | 1.2 | V  |
| Reverse recovery charge          | $Q_{rr}$      | $V_R=15\text{ V}, I_F=I_S,$<br>$di_F/dt=400\text{ A}/\mu\text{s}$       | - | -    | 10  | nC |

<sup>6)</sup> See figure 16 for gate charge parameter definition

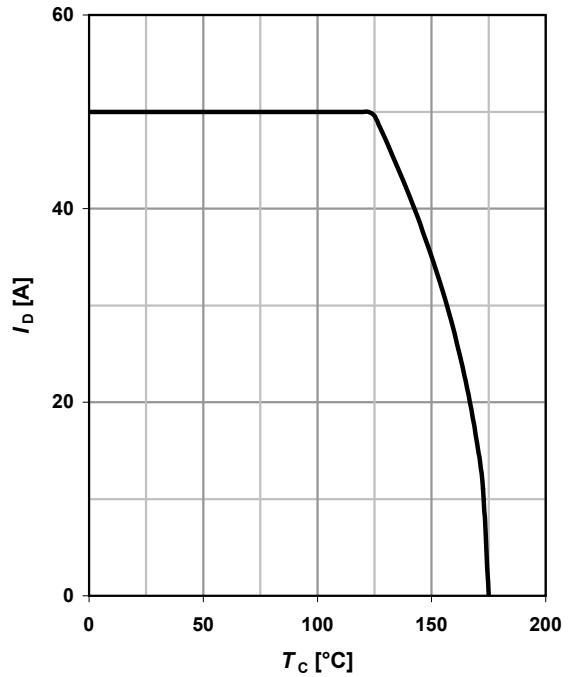
**1 Power dissipation**

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



**2 Drain current**

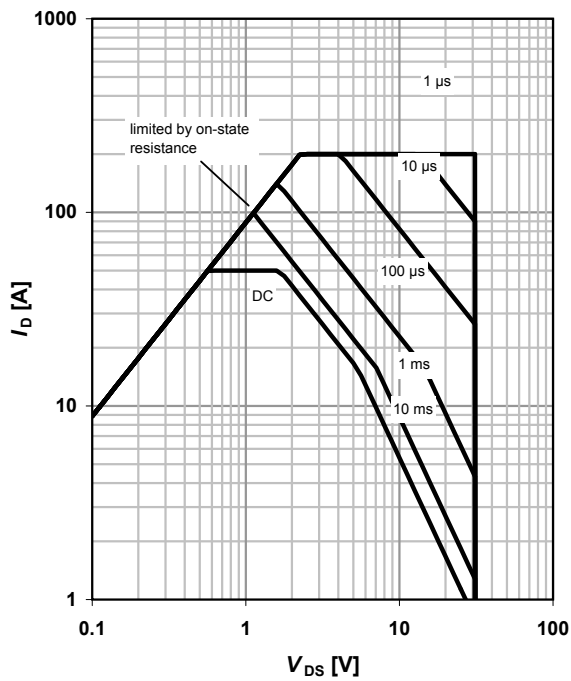
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



**3 Safe operating area**

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

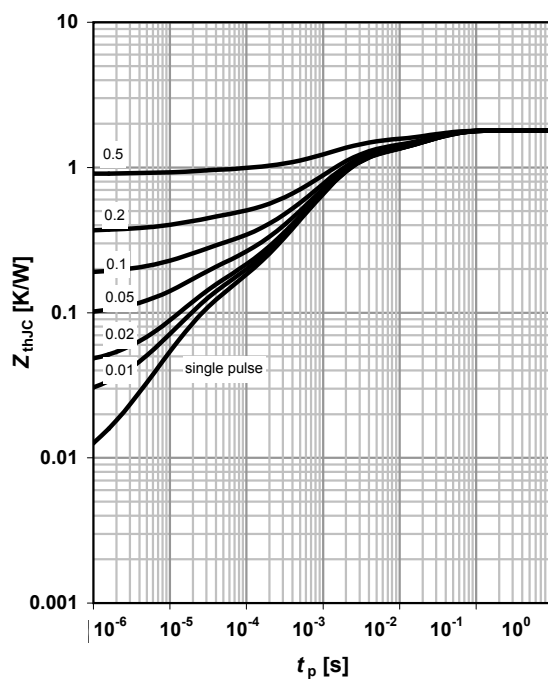
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

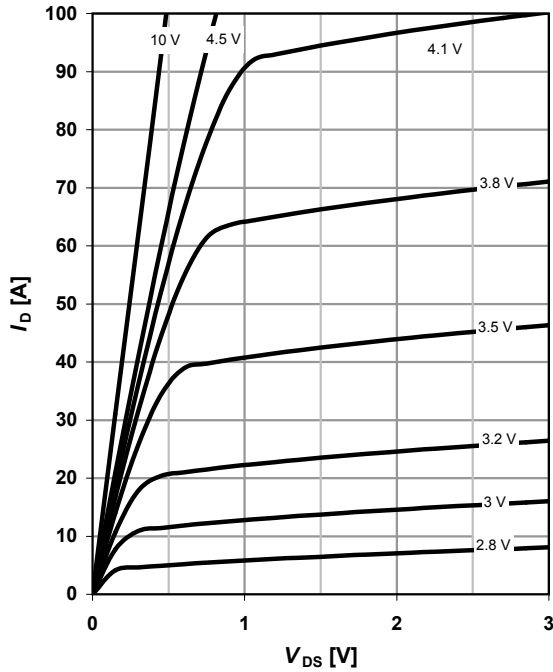
parameter:  $D = t_p / T$



**5 Typ. output characteristics**

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

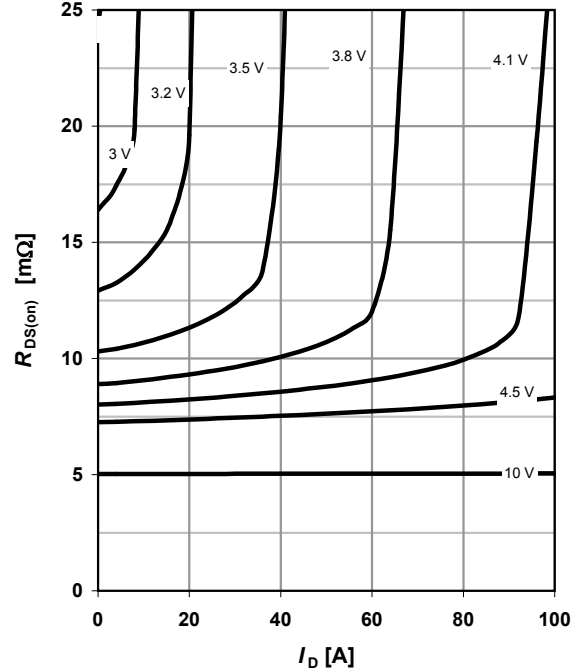
parameter:  $V_{GS}$



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

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

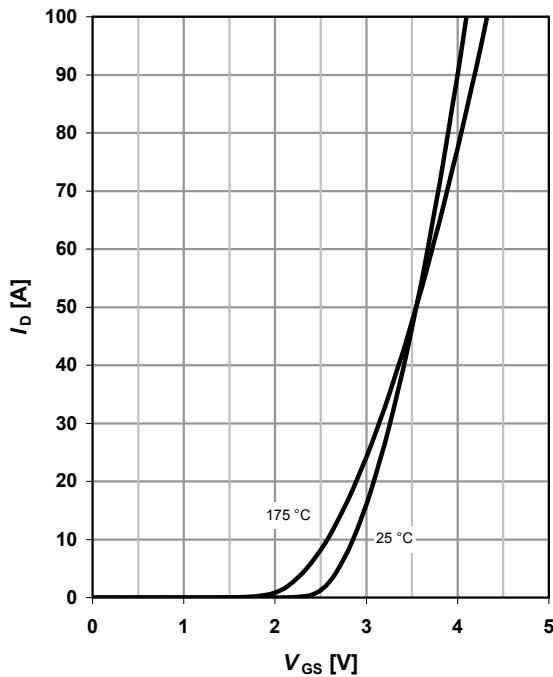
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

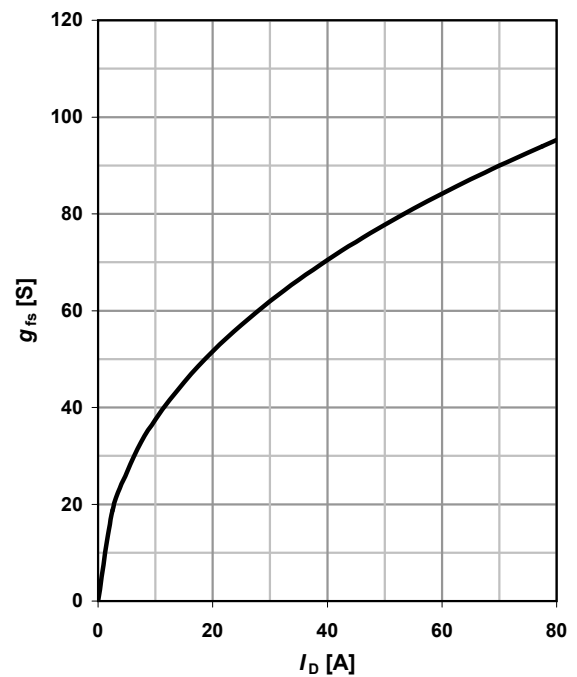
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



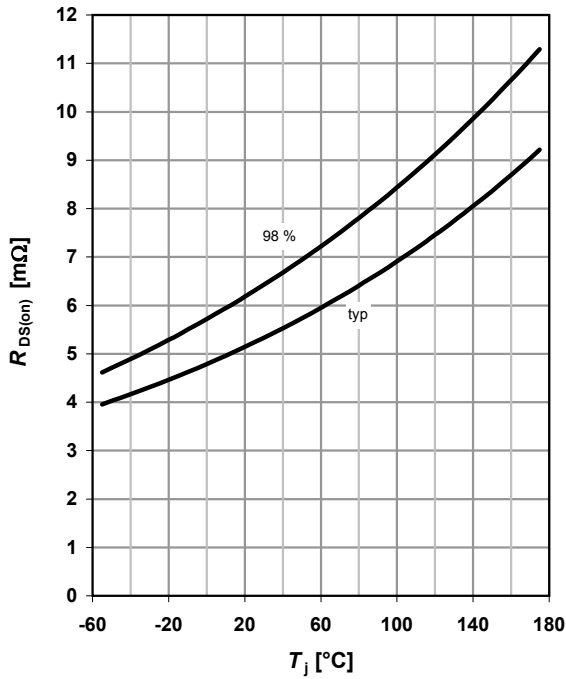
**8 Typ. forward transconductance**

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



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

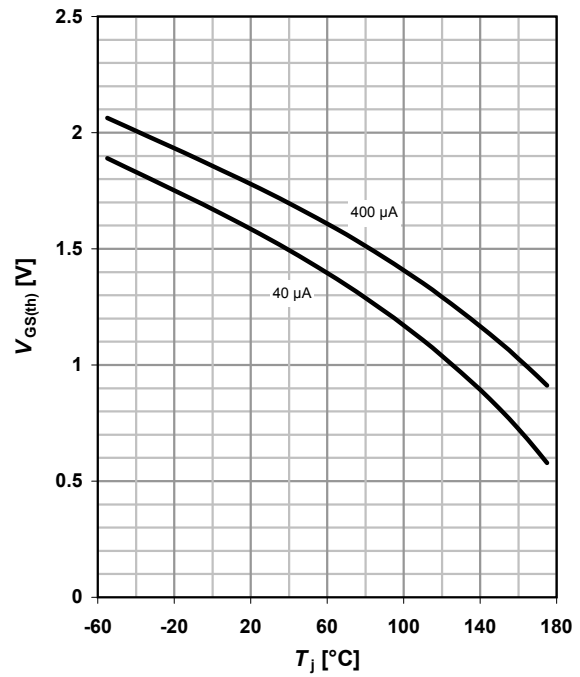
$R_{DS(on)} = f(T_j); I_D = 50 \text{ A}; V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

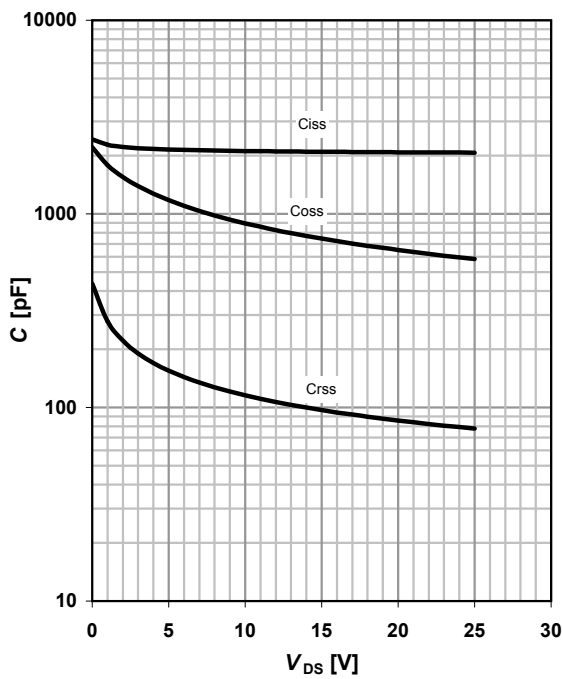
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**11 Typ. Capacitances**

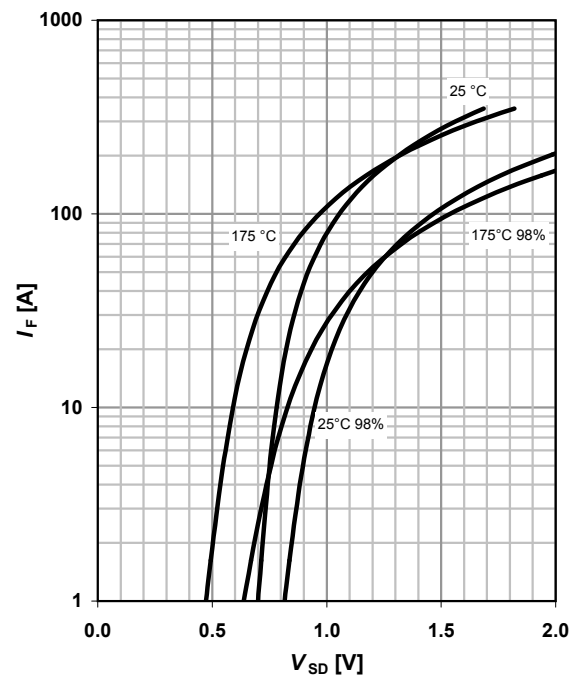
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

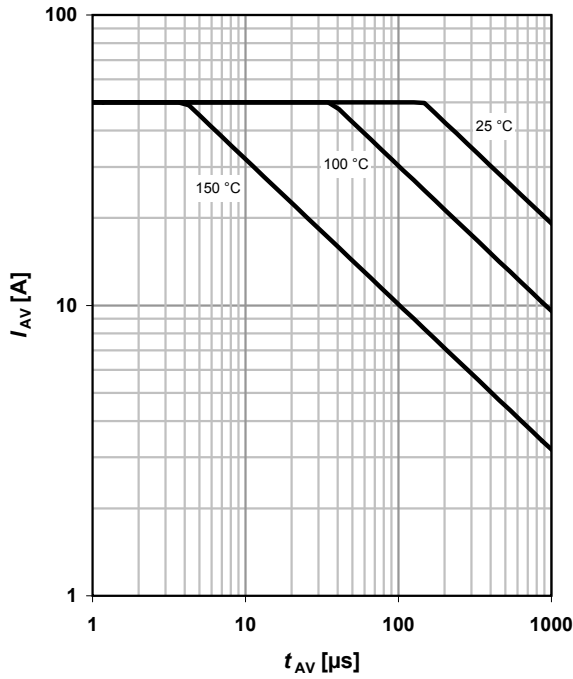
parameter:  $T_j$



**13 Avalanche characteristics**

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

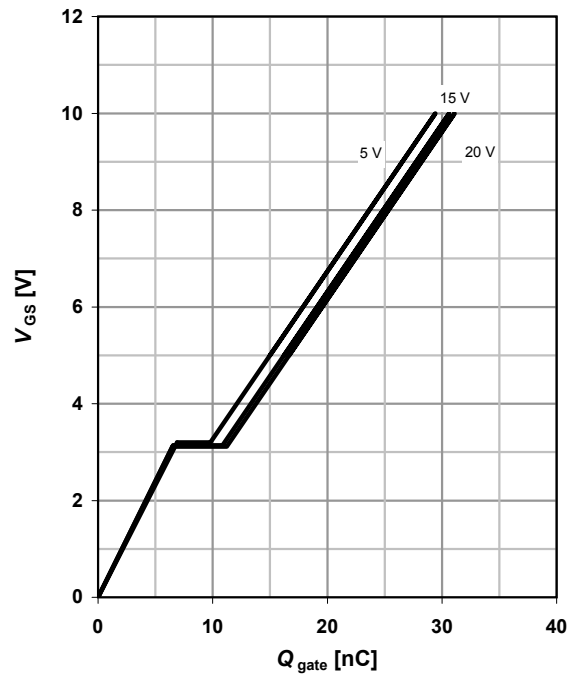
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

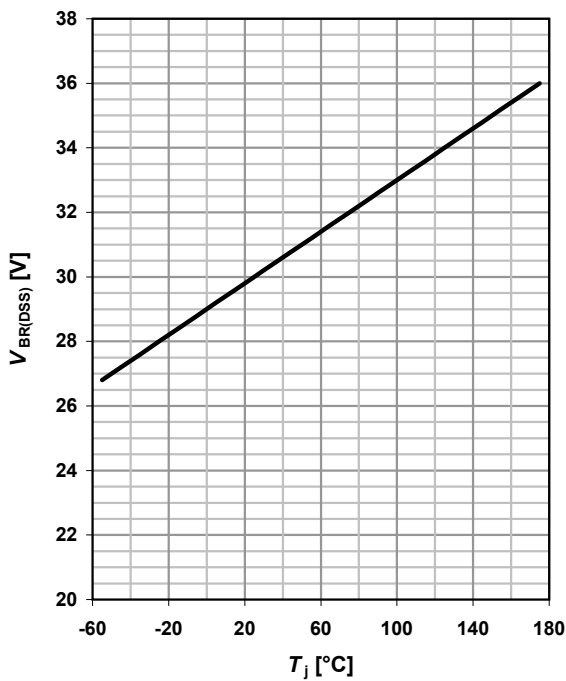
$V_{GS}=f(Q_{gate}); I_D=25 \text{ A pulsed}$

parameter:  $V_{DD}$

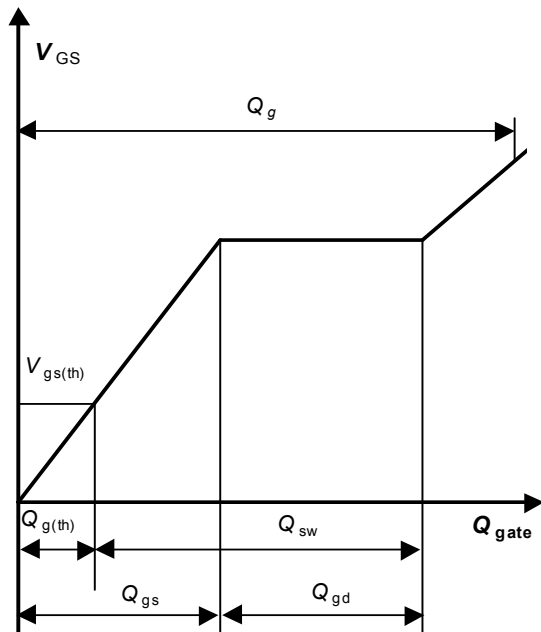


**15 Drain-source breakdown voltage**

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

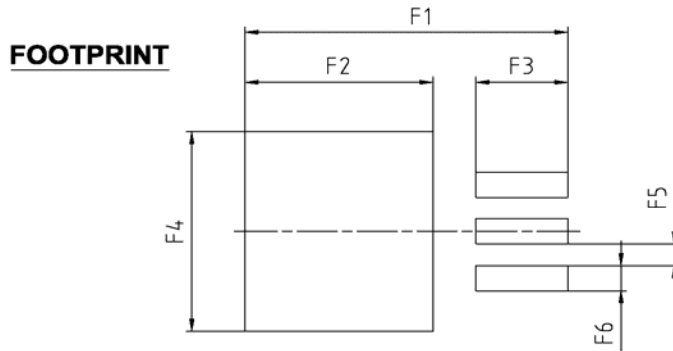
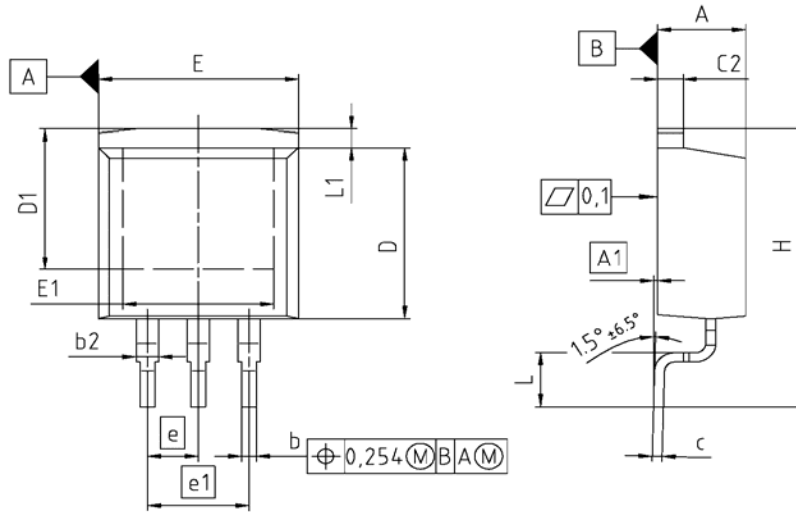


**16 Gate charge waveforms**





PG-TO263-3: Outline



| DIM | MILLIMETERS |        | INCHES |       |
|-----|-------------|--------|--------|-------|
|     | MIN         | MAX    | MIN    | MAX   |
| A   | 4.300       | 4.572  | 0.169  | 0.180 |
| A1  | 0.000       | 0.254  | 0.000  | 0.010 |
| b   | 0.650       | 0.850  | 0.026  | 0.033 |
| b2  | 0.950       | 1.321  | 0.037  | 0.052 |
| c   | 0.330       | 0.650  | 0.013  | 0.026 |
| c2  | 0.170       | 1.400  | 0.046  | 0.055 |
| D   | 8.509       | 9.450  | 0.335  | 0.372 |
| D1  | 7.100       | -      | 0.280  | -     |
| E   | 9.800       | 10.312 | 0.386  | 0.406 |
| E1  | 6.500       | -      | 0.256  | -     |
| e   | 2.540       |        | 0.100  |       |
| e1  | 5.080       |        | 0.200  |       |
| N   | 3           |        | 3      |       |
| H   | 14.605      | 15.875 | 0.575  | 0.625 |
| L   | 2.200       | 3.000  | 0.087  | 0.118 |
| L1  | -           | 1.600  | -      | 0.063 |
| F1  | 16.050      | 16.250 | 0.632  | 0.640 |
| F2  | 9.300       | 9.500  | 0.366  | 0.374 |
| F3  | 4.500       | 4.700  | 0.177  | 0.185 |
| F4  | 10.700      | 10.900 | 0.421  | 0.429 |
| F5  | 1.250       | 1.450  | 0.049  | 0.057 |
| F6  | 1.100       | 1.300  | 0.043  | 0.051 |

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