


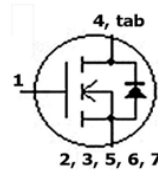
**OptiMOS™ 3 Power-Transistor**
**Features**

- Ideal for high frequency switching and sync. rec.
- Optimized technology for motor drive applications
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Very low on-resistance  $R_{DS(on)}$
- Superior thermal resistance
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Halogen-free according to IEC61249-2-21

**Product Summary**

|                  |     |            |
|------------------|-----|------------|
| $V_{DS}$         | 80  | V          |
| $R_{DS(on),max}$ | 3.0 | m $\Omega$ |
| $I_D$            | 160 | A          |

|                |   |
|----------------|---|
| <b>Type</b>    | IPB030N08N3 G   |
|                |  |
| <b>Package</b> | PG-TO263-7  |
| <b>Marking</b> | 030N08N   |



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

| Parameter                                    | Symbol            | Conditions                               | Value       | Unit |
|--|-------------------|--|-------------|------|
| Continuous drain current                     | $I_D$             | $T_C=25\text{ °C}^{2)}$                  | 160         | A    |
|  |                   | $T_C=100\text{ °C}$                      | 137         |      |
| Pulsed drain current <sup>2)</sup>           | $I_{D,pulse}$     | $T_C=25\text{ °C}$                       | 640         |      |
| Avalanche energy, single pulse <sup>3)</sup> | $E_{AS}$          | $I_D=100\text{ A}$ , $R_{GS}=25\ \Omega$ | 510         | mJ   |
| Gate source voltage                          | $V_{GS}$          |  | $\pm 20$    | V    |
| Power dissipation                            | $P_{tot}$         | $T_C=25\text{ °C}$                       | 214         | 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

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

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

| Parameter                              | Symbol     | Conditions                                   | Values |      |      | Unit |
|--|------------|--|--------|------|------|------|
|  |            |  | min.   | typ. | max. |      |
| <b>Thermal characteristics</b>         |            |  |        |      |      |      |
| Thermal resistance, junction - case    | $R_{thJC}$ |  | -      | -    | 0.7  | K/W  |
| Thermal resistance, junction - ambient | $R_{thJA}$ | minimal footprint                            | -      | -    | 62   | K/W  |
|  |            | 6 cm <sup>2</sup> cooling area <sup>4)</sup> | -      | -    | 40   |      |

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

|                                  |               |  |    |     |     |                  |
|----------------------------------|---------------|--|----|-----|-----|------------------|
| <b>Static characteristics</b>    |               |  |    |     |     |                  |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$                                   | 80 | -   | -   | V                |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=155\text{ }\mu\text{A}$                            | 2  | 2.8 | 3.5 |                  |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=80\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$  | -  | 0.1 | 1   | $\mu\text{A}$    |
|                                  |               | $V_{DS}=80\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$ | -  | 10  | 100 |                  |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$                                | -  | 1   | 100 | nA               |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=10\text{ V}, I_D=100\text{ A}$                                 | -  | 2.5 | 3.0 | $\text{m}\Omega$ |
|                                  |               | $V_{GS}=6\text{ V}, I_D=50\text{ A}$                                   | -  | 3.3 | 5.5 |                  |
| Gate resistance                  | $R_G$         |  | -  | 1.9 | -   | $\Omega$         |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=100\text{ A}$                       | 79 | 157 | -   | S                |

<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  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

| Parameter                      | Symbol       | Conditions   | Values |      |      | Unit |
|--------------------------------|--------------|--|--------|------|------|------|
|                                |              |  | min.   | typ. | max. |      |
| <b>Dynamic characteristics</b> |              |  |        |      |      |      |
| Input capacitance              | $C_{iss}$    | $V_{GS}=0\text{ V}, V_{DS}=40\text{ V},$<br>$f=1\text{ MHz}$                     | -      | 6100 | 8110 | pF   |
| Output capacitance             | $C_{oss}$    |  | -      | 1640 | 2180 |      |
| Reverse transfer capacitance   | $C_{rss}$    |  | -      | 59   | -    |      |
| Turn-on delay time             | $t_{d(on)}$  | $V_{DD}=40\text{ V}, V_{GS}=10\text{ V},$<br>$I_D=100\text{ A}, R_G=1.6\ \Omega$ | -      | 23   | -    | ns   |
| Rise time                      | $t_r$        |  | -      | 79   | -    |      |
| Turn-off delay time            | $t_{d(off)}$ |  | -      | 45   | -    |      |
| Fall time                      | $t_f$        |  | -      | 14   | -    |      |

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

|                       |               |   |   |     |     |    |
|-----------------------|---------------|---|---|-----|-----|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=40\text{ V}, I_D=100\text{ A},$<br>$V_{GS}=0\text{ to }10\text{ V}$ | - | 30  | -   | nC |
| Gate to drain charge  | $Q_{gd}$      |   | - | 18  | -   |    |
| Switching charge      | $Q_{sw}$      |   | - | 31  | -   |    |
| Gate charge total     | $Q_g$         |   | - | 88  | 117 |    |
| Gate plateau voltage  | $V_{plateau}$ |   | - | 5.0 | -   |    |
| Output charge         | $Q_{oss}$     | $V_{DD}=40\text{ V}, V_{GS}=0\text{ V}$                                     | - | 119 | 158 | nC |

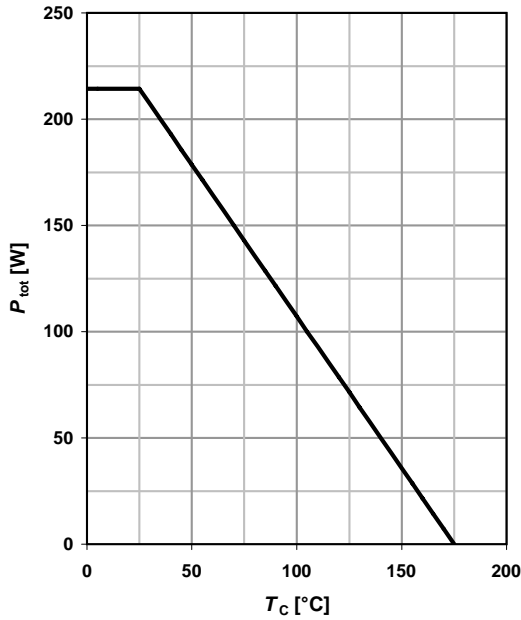
**Reverse Diode**

|                                  |               |   |   |     |     |    |
|----------------------------------|---------------|---|---|-----|-----|----|
| Diode continuous forward current | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | - | -   | 160 | A  |
| Diode pulse current              | $I_{S,pulse}$ |   | - | -   | 640 |    |
| 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            | $t_{rr}$      | $V_R=40\text{ V}, I_F=100\text{ A}$<br>$di_F/dt=100\text{ A}/\mu\text{s}$ | - | 73  | -   | ns |
| Reverse recovery charge          | $Q_{rr}$      |   | - | 136 | -   | nC |

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

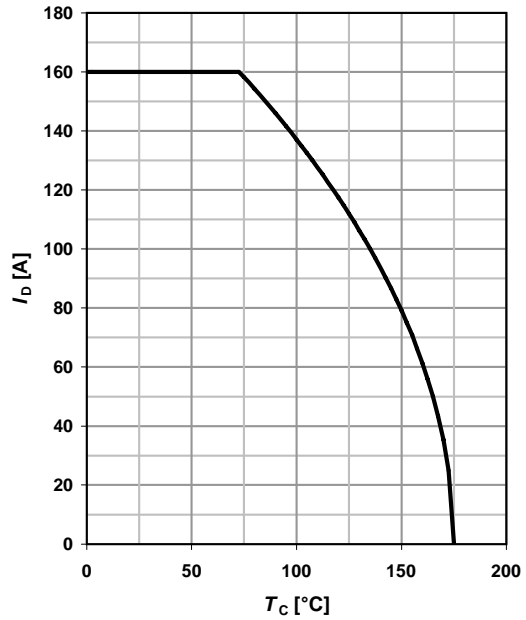
**1 Power dissipation**

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



**2 Drain current**

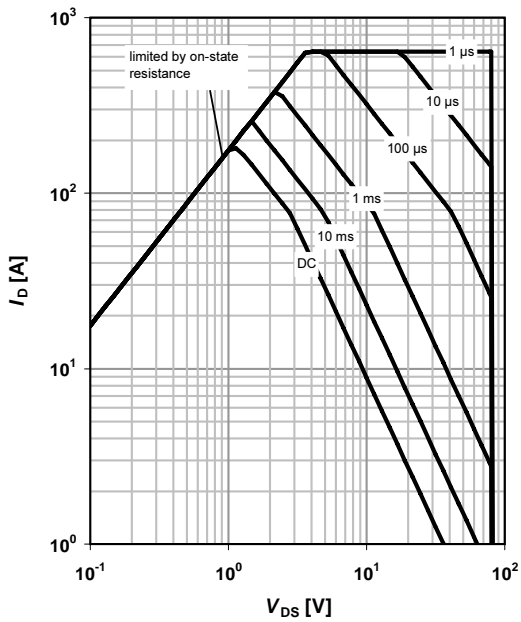
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



**3 Safe operating area**

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

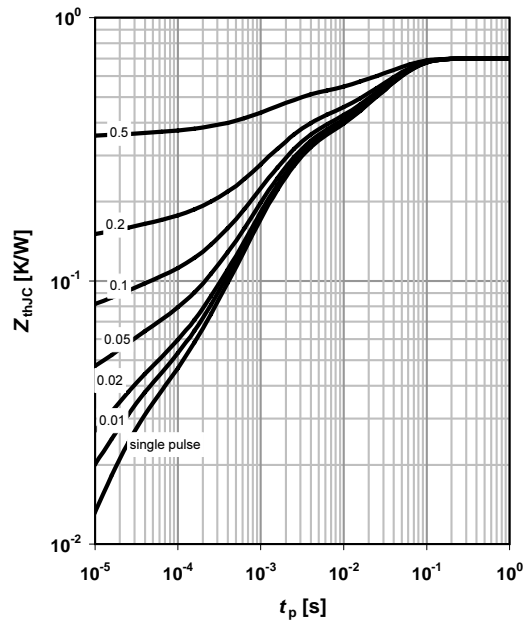
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

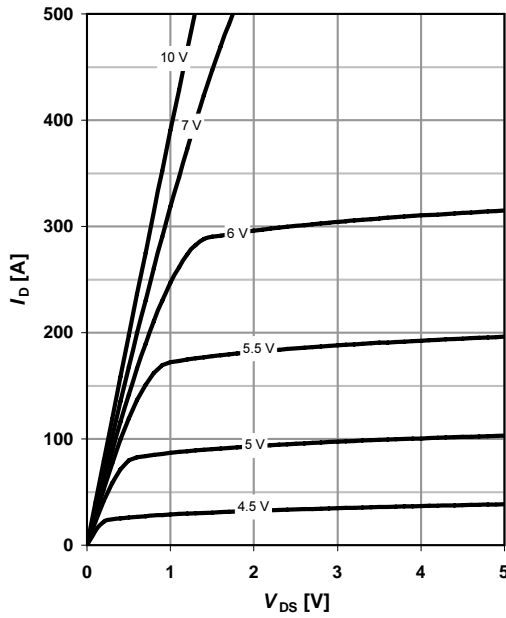
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

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

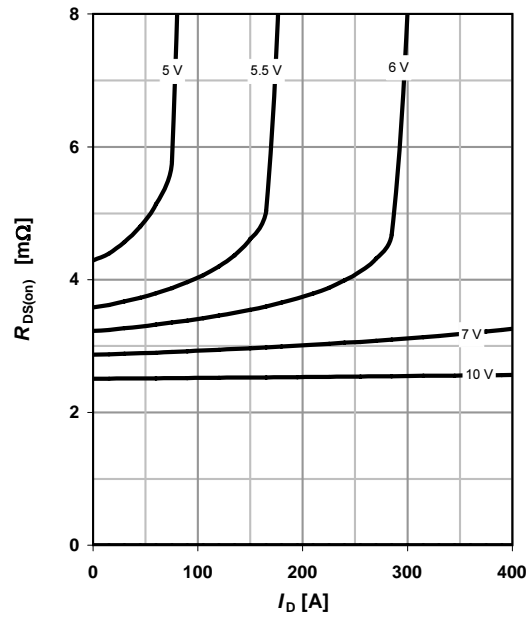
parameter:  $V_{GS}$



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

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

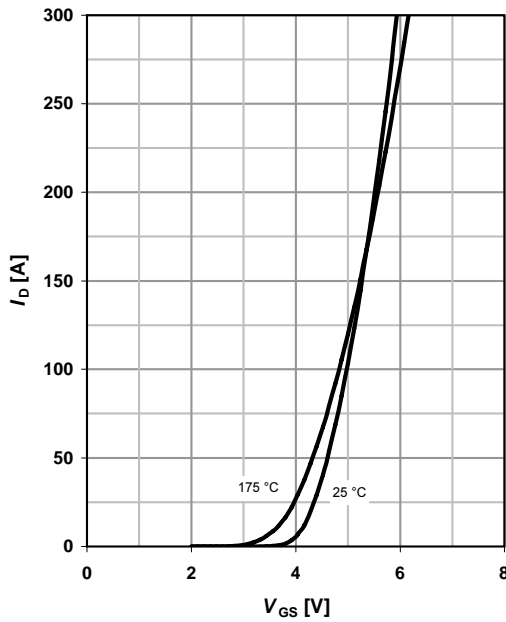
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

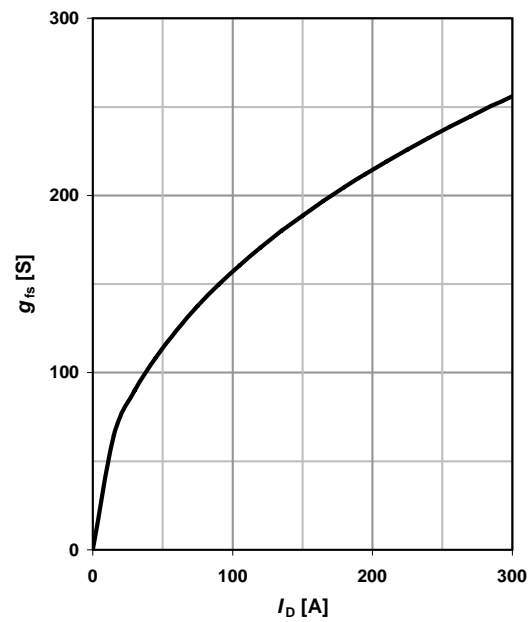
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



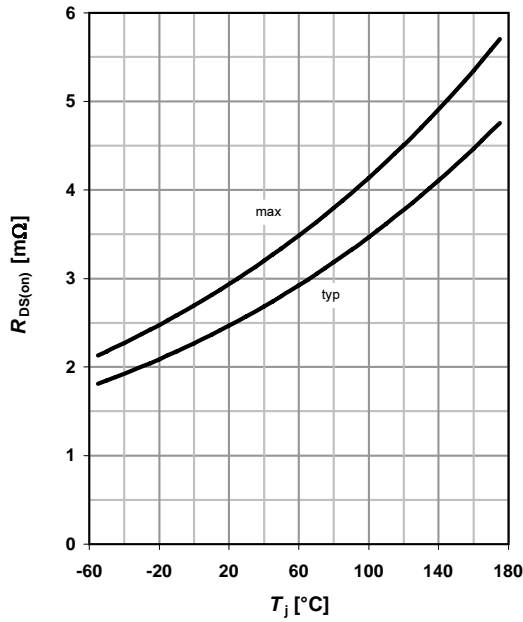
**8 Typ. forward transconductance**

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



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

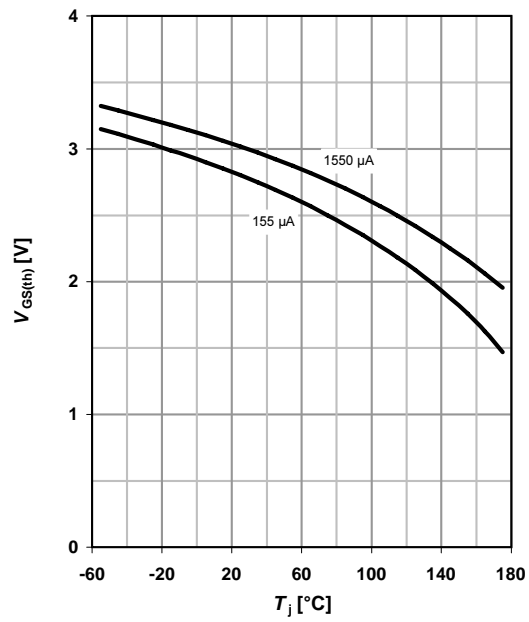
$R_{DS(on)} = f(T_j); I_D = 100 \text{ A}; V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

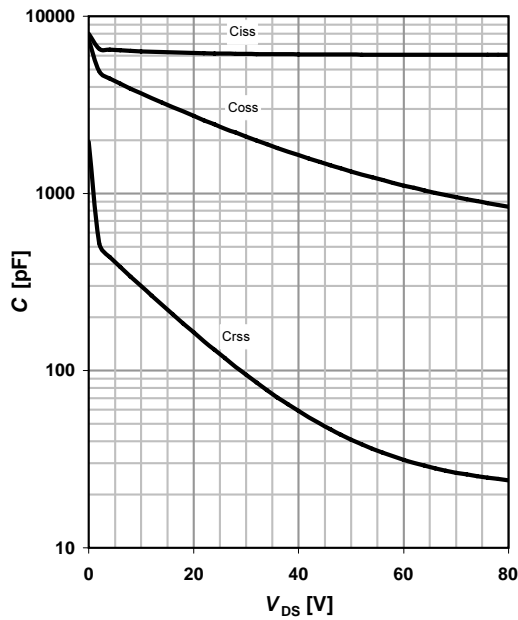
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**11 Typ. capacitances**

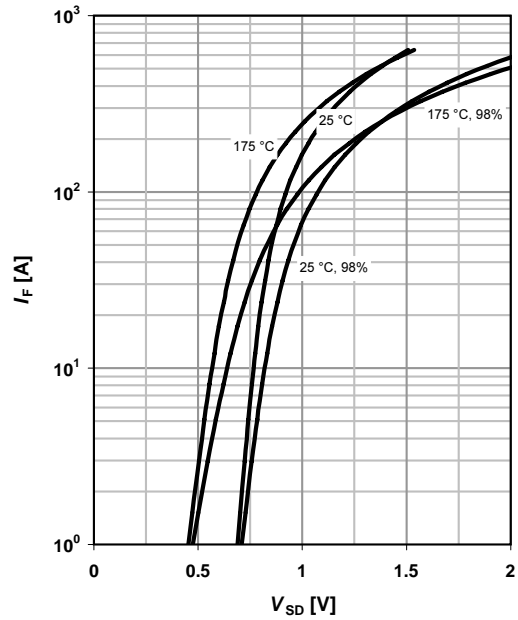
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

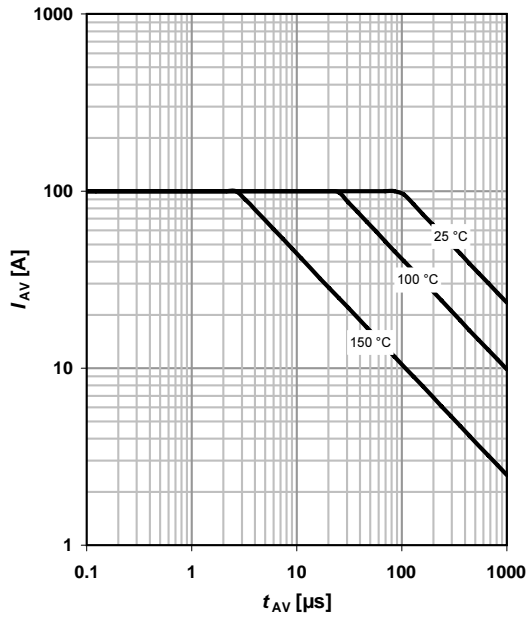
parameter:  $T_j$



**13 Avalanche characteristics**

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

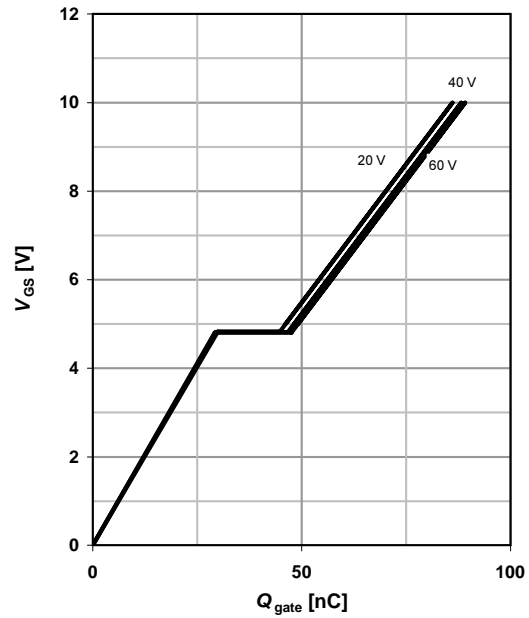
parameter:  $T_{j(\text{start})}$



**14 Typ. gate charge**

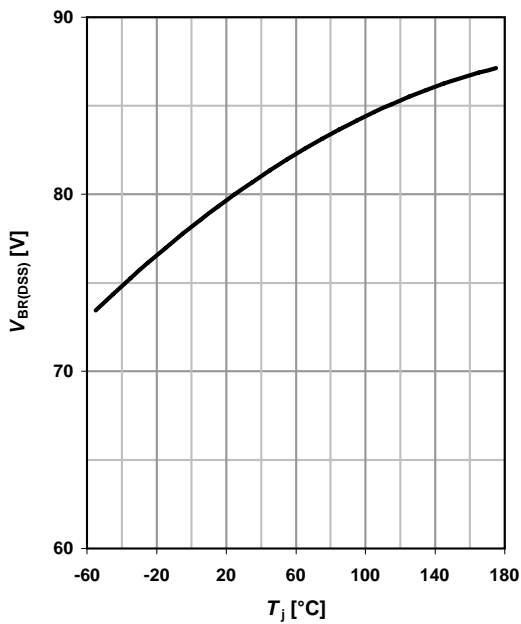
$V_{GS}=f(Q_{\text{gate}}); I_D=100 \text{ A pulsed}$

parameter:  $V_{DD}$

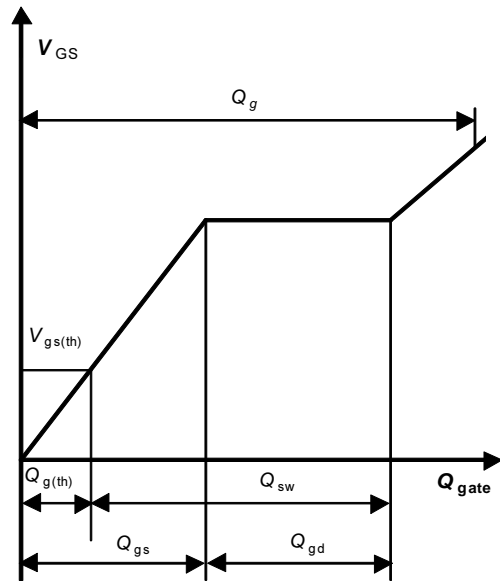


**15 Drain-source breakdown voltage**

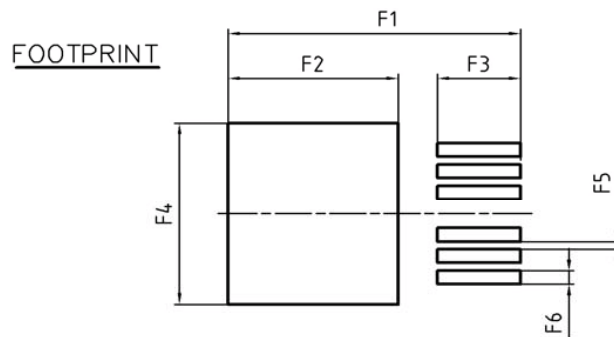
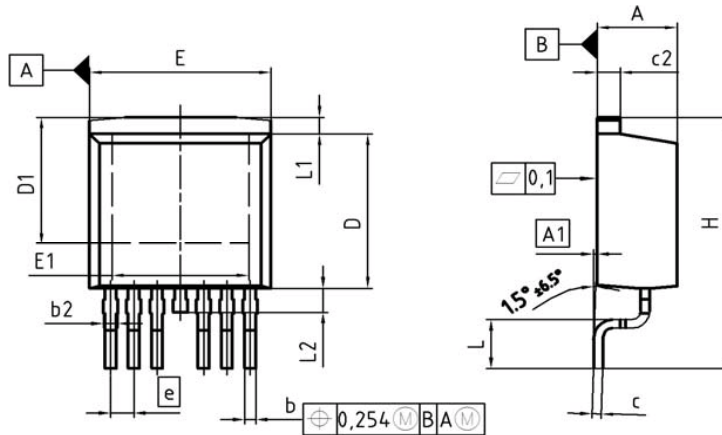
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$



**16 Gate charge waveforms**



PG-TO263-7 (D<sup>2</sup>-Pak)



| 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   | 0.50        | 0.70  | 0.020  | 0.028 |
| b2  | 0.50        | 1.00  | 0.020  | 0.039 |
| 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  | 6.90        | 7.90  | 0.272  | 0.311 |
| E   | 9.80        | 10.31 | 0.386  | 0.406 |
| E1  | 6.50        | 8.60  | 0.256  | 0.339 |
| e   | 1.27        |       | 0.050  |       |
| N   | 6           |       | 6      |       |
| 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  | 0.37        | 0.57  | 0.015  | 0.022 |
| F6  | 0.70        | 0.90  | 0.028  | 0.035 |

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