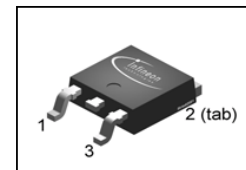
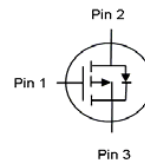


**OptiMOS™ P3 Power-Transistor**
**Features**

- single P-Channel (Logic Level)
- Enhancement mode
- Qualified according JEDEC<sup>1)</sup> for target applications
- 175 °C operating temperature
- Pb-free; RoHS compliant
- applications: load switch, HS-switch


**Product Summary**

|                  |                 |     |    |
|------------------|-----------------|-----|----|
| $V_{DS}$         |                 | -30 | V  |
| $R_{DS(on),max}$ | $V_{GS} = 10V$  | 4.2 | mΩ |
|                  | $V_{GS} = 4.5V$ | 6.8 |    |
| $I_D$            |                 | -70 | A  |

**PG-TO252-3**


| Type          | Package    | Marking | Lead free | Packing |
|---------------|------------|---------|-----------|---------|
| IPD042P03L3 G | PG-TO252-3 | 042P03L | Yes       | non dry |

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

| Parameter                           | Symbol         | Conditions                                  | Value                    | Unit |
|-------------------------------------|----------------|---|--------------------------|------|
| Continuous drain current            | $I_D$          | $T_C=25\text{ °C}$                          | -70                      | A    |
|                                     |                | $T_C=100\text{ °C}$                         | -70                      |      |
| Pulsed drain current                | $I_{D,pulse}$  | $T_C=25\text{ °C}^{2)}$                     | -280                     |      |
| Avalanche energy, single pulse      | $E_{AS}$       | $I_D=-70\text{ A}, R_{GS}=25\text{ }\Omega$ | 269                      | mJ   |
| Gate source voltage                 | $V_{GS}$       |   | $\pm 20$                 | V    |
| Power dissipation                   | $P_{tot}$      | $T_C=25\text{ °C}$                          | 150                      | W    |
| Operating and storage temperature   | $T_j, T_{stg}$ |   | -55 ... 175              | °C   |
| ESD class                           |                | JESD22-A114 HBM                             | class 2 ( 2 kV - < 4 kV) |      |
| Soldering temperature               |                |   | 260                      | °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. |      |
| <b>Thermal characteristics</b>         |            |  |        |      |      |      |
| Thermal resistance, junction - case    | $R_{thJC}$ |  | -      | -    | 1.0  | K/W  |
| Thermal resistance, junction - ambient | $R_{thJA}$ | 6 cm <sup>2</sup> cooling area <sup>2)</sup> | -      | -    | 50   |      |

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

**Static characteristics**

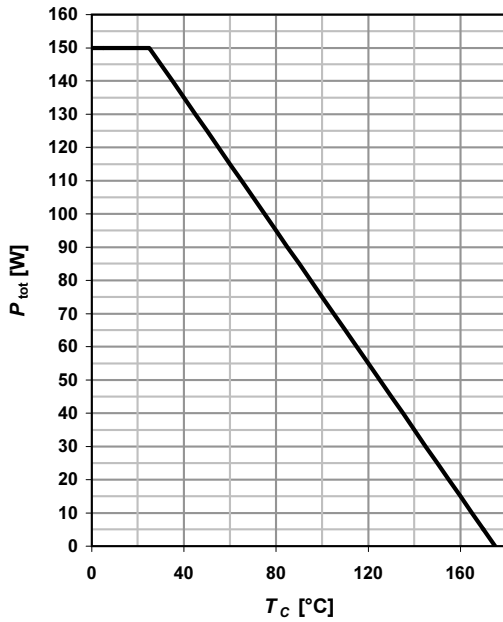
|                                  |               |   |      |      |      |               |
|----------------------------------|---------------|---|------|------|------|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=-250\mu\text{A}$                                | -30  | -    | -    | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=-270\mu\text{A}$                                    | -2.0 | -1.5 | -1.0 |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=-30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$  | -    | -    | -1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=-30\text{ V}, V_{GS}=0\text{ V}, T_j=175\text{ }^\circ\text{C}$ | -    | -    | -300 |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=-20\text{ V}, V_{DS}=0\text{ V}$                                | -    | -10  | -100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=-4.5\text{ V}, I_D=-70\text{ A}$                                | -    | 4.6  | 6.8  | m $\Omega$    |
|                                  |               | $V_{GS}=-10\text{ V}, I_D=-70\text{ A}$                                 | -    | 3.5  | 4.2  |               |
| Gate resistance                  | $R_G$         |   | -    | 2.4  | -    | $\Omega$      |
| Transconductance                 | $g_{fs}$      | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=-70\text{ A}$                        | 65   | 130  | -    | S             |

<sup>2)</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                               | $C_{iss}$     | $V_{GS}=0\text{ V}, V_{DS}=-15\text{ V},$<br>$f=1\text{ MHz}$                         | -      | 9290 | 12400 | pF   |
| Output capacitance                              | $C_{oss}$     |   | -      | 3570 | 4750  |      |
| Reverse transfer capacitance                    | $C_{rss}$     |   | -      | 150  | 220   |      |
| Turn-on delay time                              | $t_{d(on)}$   | $V_{DD}=-15\text{ V}, V_{GS}=-10\text{ V},$<br>$I_D=-70\text{ A},$<br>$R_G=6\ \Omega$ | -      | 21   | 33    | ns   |
| Rise time                                       | $t_r$         |   | -      | 167  | 251   |      |
| Turn-off delay time                             | $t_{d(off)}$  |   | -      | 89   | 134   |      |
| Fall time                                       | $t_f$         |   | -      | 22   | 33    |      |
| <b>Gate Charge Characteristics<sup>3)</sup></b> |               |   |        |      |       |      |
| Gate to source charge                           | $Q_{gs}$      | $V_{DD}=-15\text{ V}, I_D=-70\text{ A},$<br>$V_{GS}=0\text{ to }-10\text{ V}$         | -      | 31   | 41    | nC   |
| Gate charge at threshold                        | $Q_{g(th)}$   |   | -      | 15   | 20    |      |
| Gate to drain charge                            | $Q_{gd}$      |   | -      | 14   | 21    |      |
| Switching charge                                | $Q_{sw}$      |   | -      | 30   | 42    |      |
| Gate charge total                               | $Q_g$         |   | -      | 131  | 175   |      |
| Gate plateau voltage                            | $V_{plateau}$ |   | -      | 3.3  | -     |      |
| Output charge                                   | $Q_{oss}$     | $V_{DD}=-15\text{ V}, V_{GS}=0\text{ V}$  | -      | 84   | 111   | nC   |
| <b>Reverse Diode</b>                            |               |   |        |      |       |      |
| Diode continuous forward current                | $I_S$         | $T_C=25\text{ }^\circ\text{C}$  | -      | -    | 70    | A    |
| Diode pulse current                             | $I_{S,pulse}$ |   | -      | -    | 280   |      |
| Diode forward voltage                           | $V_{SD}$      | $V_{GS}=0\text{ V}, I_F=-70\text{ A},$<br>$T_J=25\text{ }^\circ\text{C}$              | -      | -    | -1.1  | V    |
| Reverse recovery time                           | $t_{rr}$      | $V_R=15\text{ V}, I_F= I_S ,$<br>$di_F/dt=100\text{ A}/\mu\text{s}$                   | -      | 54   | 68    | ns   |
| Reverse recovery charge                         | $Q_{rr}$      |   | -      | 61   | 76    |      |

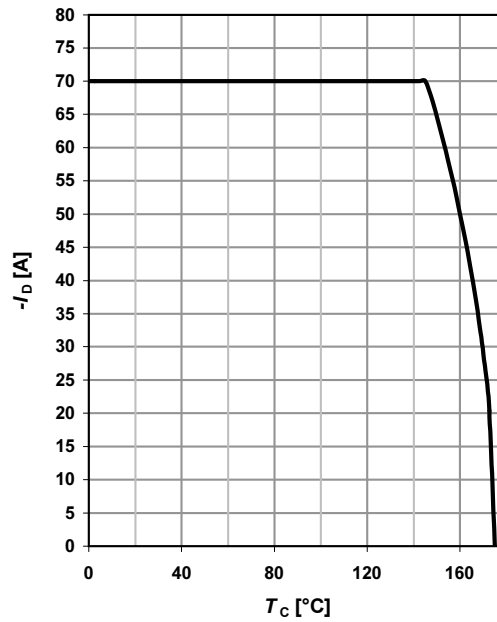
**1 Power dissipation**

$$P_{tot} = f(T_C); t_p \leq 10 \text{ s}$$



**2 Drain current**

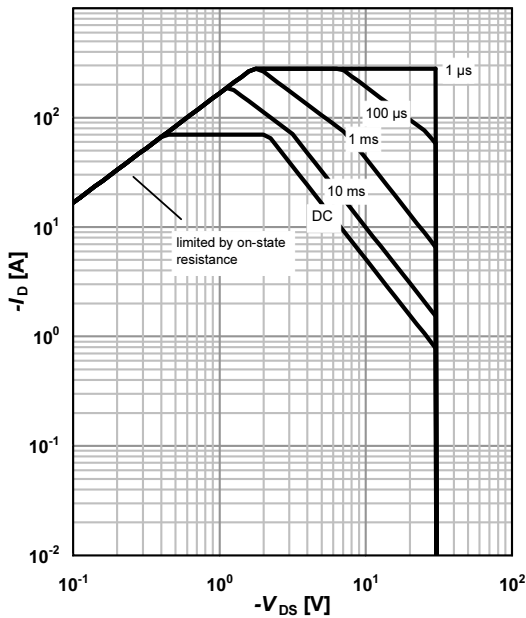
$$I_D = f(T_C); |V_{GS}| \geq 10 \text{ V}; t_p \leq 10 \text{ s}$$



**3 Safe operating area**

$$I_D = f(V_{DS}); T_C = 25 \text{ °C}^1; D = 0$$

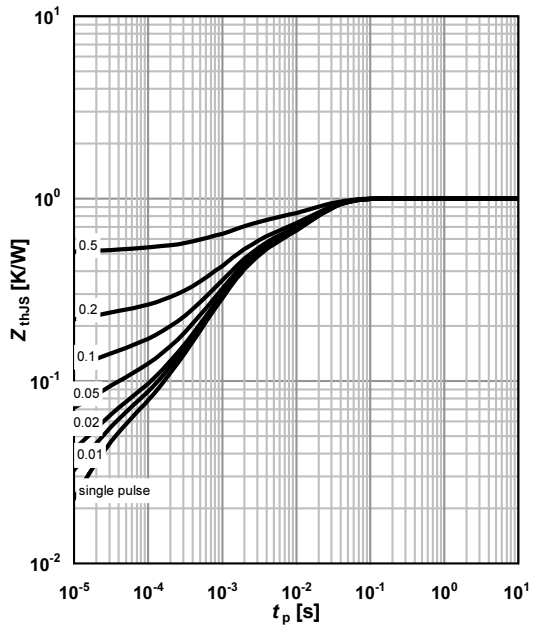
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

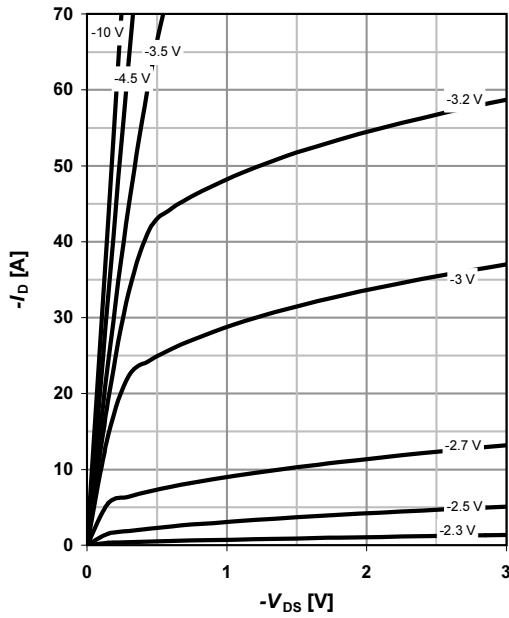
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

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

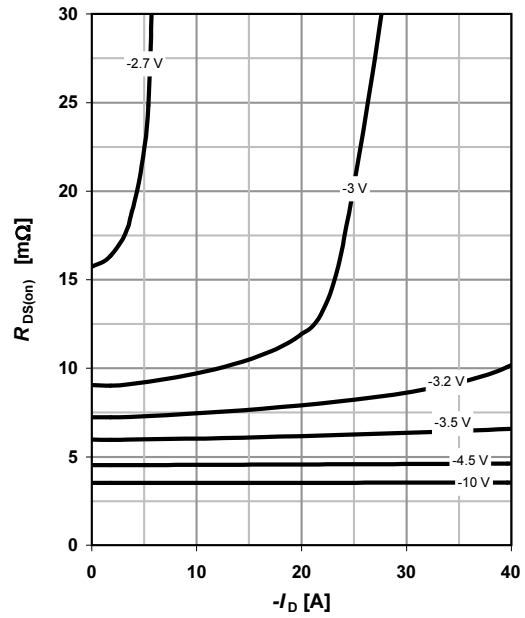
parameter:  $V_{GS}$



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

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

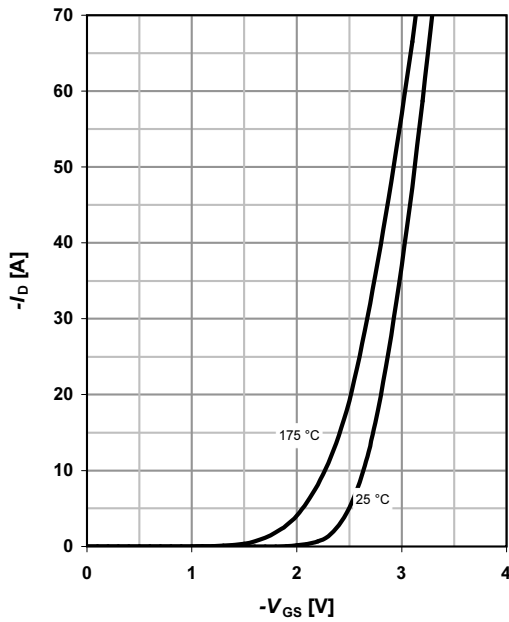
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

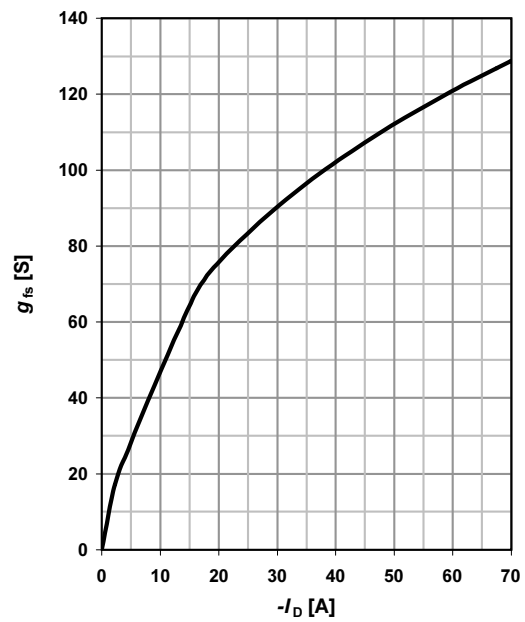
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



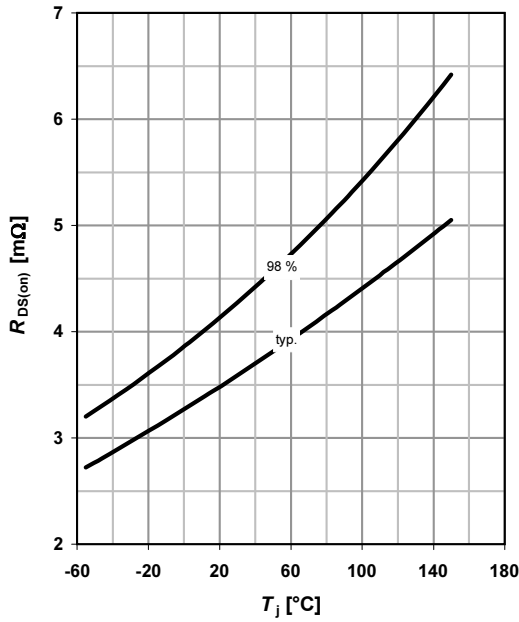
**8 Typ. forward transconductance**

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



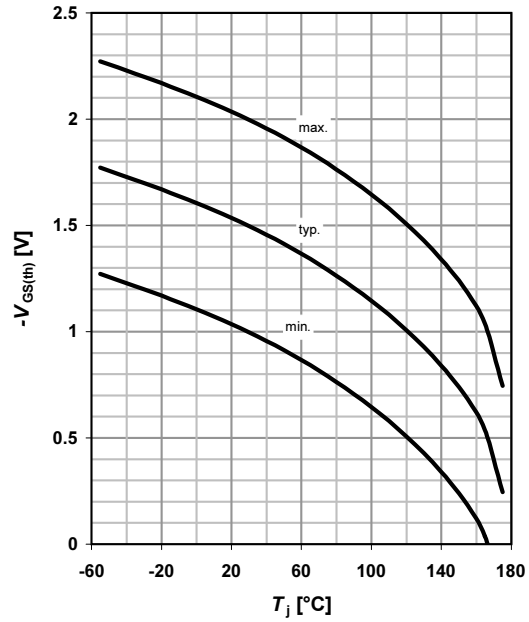
**9 Drain-source on-state resistance**

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



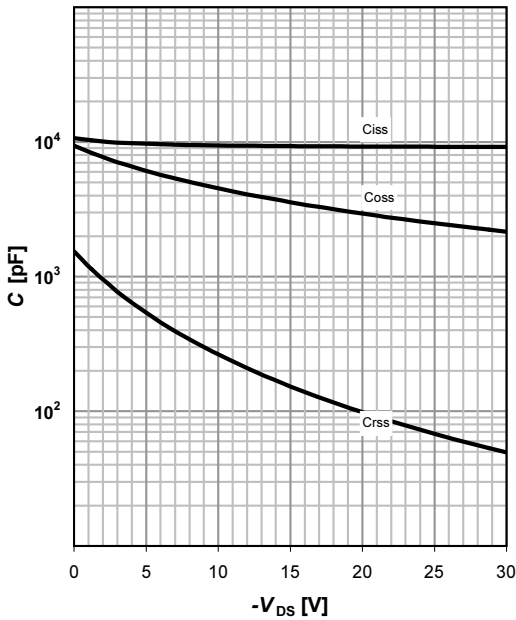
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -270 \mu\text{A}$



**11 Typ. capacitances**

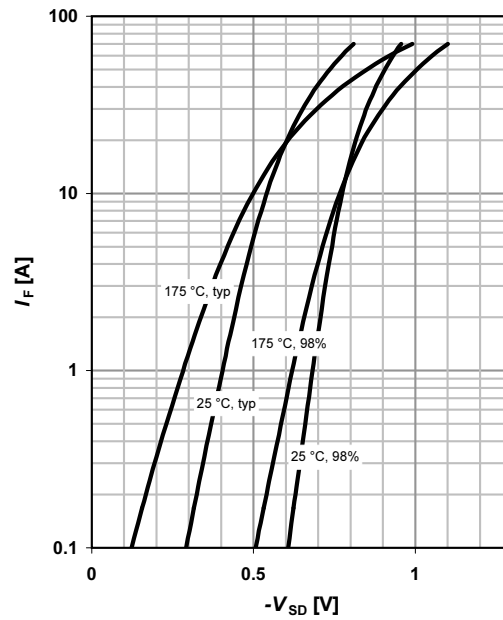
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

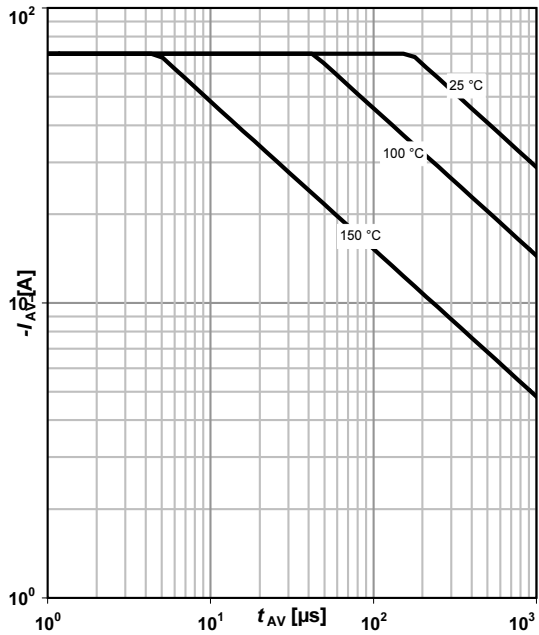
parameter:  $T_j$



**13 Avalanche characteristics**

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

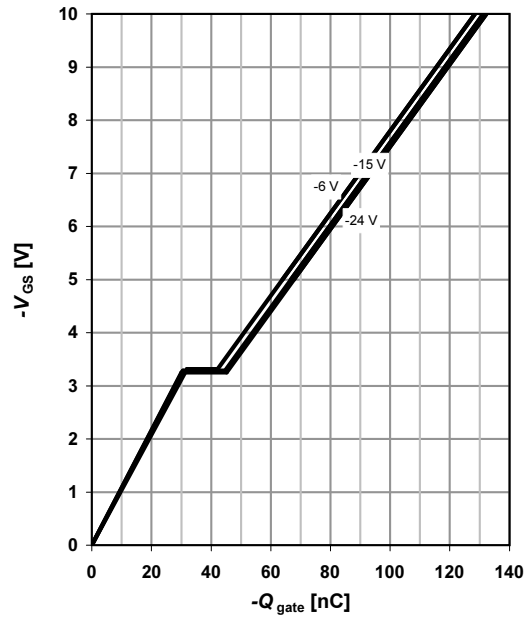
parameter:  $T_{j(\text{start})}$



**14 Typ. gate charge**

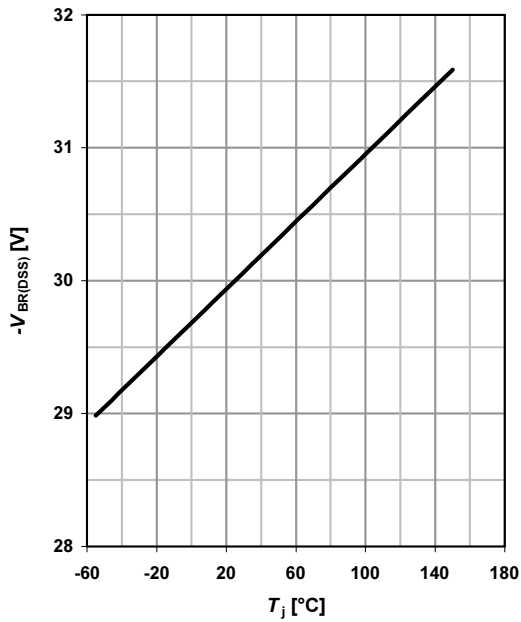
$V_{GS}=f(Q_{\text{gate}}); I_D=-70 \text{ A pulsed}$

parameter:  $V_{DD}$

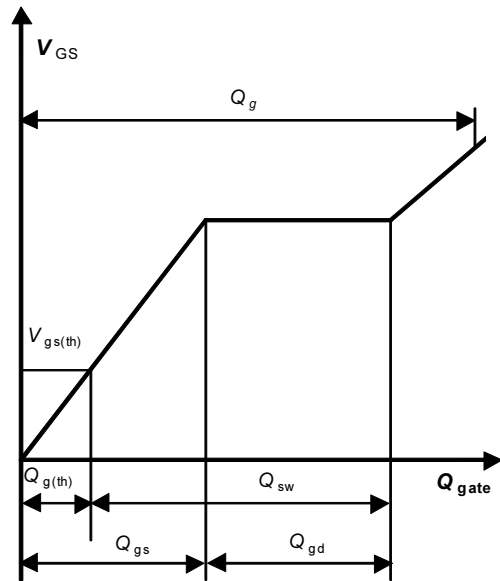


**15 Drain-source breakdown voltage**

$V_{BR(DSS)}=f(T_j); I_D=-250 \mu\text{A}$

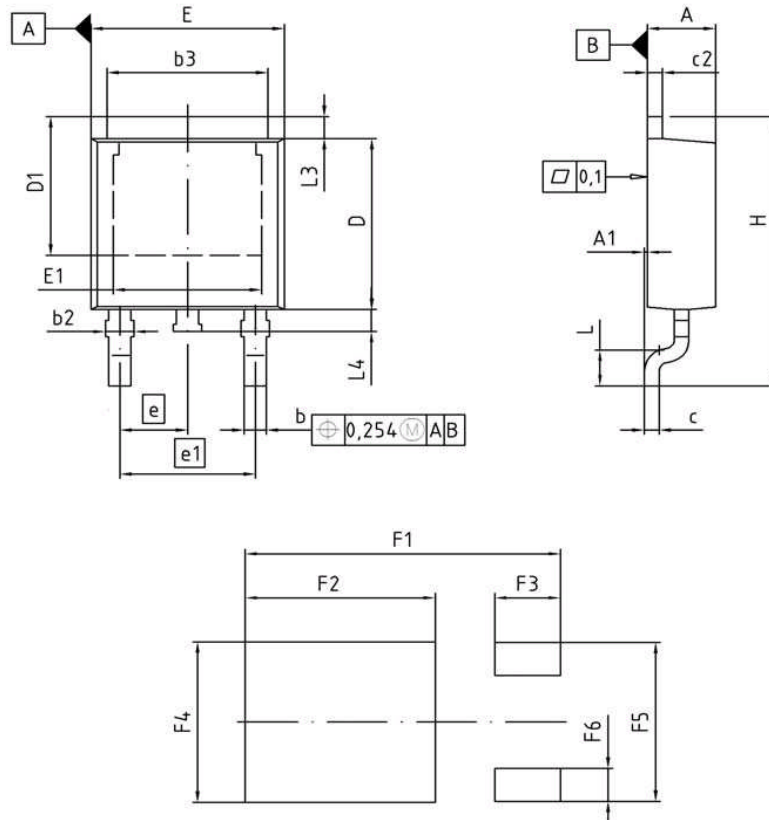


**16 Gate charge waveforms**



Package Outline

PG-TO252-3



| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 2.16        | 2.41  | 0.085  | 0.095 |
| A1  | 0.00        | 0.15  | 0.000  | 0.006 |
| b   | 0.64        | 0.89  | 0.025  | 0.035 |
| b2  | 0.65        | 1.15  | 0.026  | 0.045 |
| b3  | 5.00        | 5.50  | 0.197  | 0.217 |
| c   | 0.46        | 0.60  | 0.018  | 0.024 |
| c2  | 0.46        | 0.98  | 0.018  | 0.039 |
| D   | 5.97        | 6.22  | 0.235  | 0.245 |
| D1  | 5.02        | 5.84  | 0.198  | 0.230 |
| E   | 6.40        | 6.73  | 0.252  | 0.265 |
| E1  | 4.70        | 5.21  | 0.185  | 0.205 |
| e   | 2.29        |       | 0.090  |       |
| e1  | 4.57        |       | 0.180  |       |
| N   | 3           |       | 3      |       |
| H   | 9.40        | 10.48 | 0.370  | 0.413 |
| L   | 1.18        | 1.70  | 0.046  | 0.067 |
| L3  | 0.90        | 1.25  | 0.035  | 0.049 |
| L4  | 0.51        | 1.00  | 0.020  | 0.039 |
| F1  | 10.50       | 10.70 | 0.413  | 0.421 |
| F2  | 6.30        | 6.50  | 0.248  | 0.256 |
| F3  | 2.10        | 2.30  | 0.083  | 0.091 |
| F4  | 5.70        | 5.90  | 0.224  | 0.232 |
| F5  | 5.66        | 5.86  | 0.223  | 0.231 |
| F6  | 1.10        | 1.30  | 0.043  | 0.051 |

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