

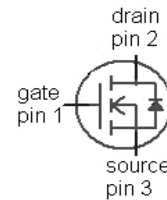
OptiMOS™ Power-Transistor
Features

- Low gate charge for fast switching applications
- N-channel enhancement - normal level
- 175 °C operating temperature
- Avalanche rated
- Pb-free lead plating, RoHS compliant
- Halogen-free according to IEC61249-2-21


Product Summary

| | | |
|-----------------------------|-----|----|
| V_{DS} | 60 | V |
| $R_{DS(on),max}$ SMDversion | 7.7 | mΩ |
| I_D | 80 | A |

| Type | IPB080N06N G | IPP080N06N G |
|----------------|--------------|--------------|
| | | |
| Package | P-TO263-3-2 | P-TO220-3-1 |
| Marking | 080N06N | 080N06N |


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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|----------------|---|-------------|-------|
| Continuous drain current | I_D | $T_C=25\text{ °C}^{1)}$ | 80 | A |
| | | $T_C=100\text{ °C}$ | 76 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C=25\text{ °C}^{2)}$ | 320 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=80\text{ A}, R_{GS}=25\text{ Ω}$ | 448 | mJ |
| Reverse diode dv/dt | dv/dt | $I_D=80\text{ A}, V_{DS}=48\text{ V},$ $di/dt=200\text{ A/μs},$ $T_{j,max}=175\text{ °C}$ | 6 | kV/μs |
| Gate source voltage | V_{GS} | | ±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 | |

¹⁾ Current is limited by bondwire; with an $R_{thJC}=0.7\text{ K/W}$ the chip is able to carry 107 A.

²⁾ See figure 3

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

Thermal characteristics

| | | | | | | |
|-------------------------------------|------------|--|---|---|-----|-----|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 0.7 | K/W |
| SMD version, device on PCB | R_{thJA} | minimal footprint | - | - | 62 | |
| | | 6 cm ² cooling area ³⁾ | - | - | 40 | |

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

| | | | | | | |
|----------------------------------|---------------|--|-----|------|-----|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$ | 60 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=150\text{ }\mu\text{A}$ | 2.1 | 3.0 | 4 | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS}=60\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$ | - | 0.01 | 1 | μA |
| | | $V_{DS}=60\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$ | - | 1 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=20\text{ V}, V_{DS}=60\text{ V}$ | - | 1 | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=10\text{ V}, I_D=80\text{ A},$ | - | 6.5 | 8 | m Ω |
| | | $V_{GS}=10\text{ V}, I_D=80\text{ A},$ SMD version | - | 6.2 | 7.7 | |
| Gate resistance | R_G | | - | 1.5 | - | Ω |
| Transconductance | g_{fs} | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=80\text{ A}$ | 47 | 94 | - | S |

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.

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

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$ $f=1\text{ MHz}$ | - | 2600 | 3500 | pF |
| Output capacitance | C_{oss} | | - | 660 | 880 | |
| Reverse transfer capacitance | C_{rss} | | - | 160 | 240 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=80\text{ A}, R_G=3.3\ \Omega$ | - | 14 | 20 | ns |
| Rise time | t_r | | - | 15 | 23 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 32 | 50 | |
| Fall time | t_f | | - | 14 | 20 | |

Gate Charge Characteristics⁴⁾

| | | | | | | |
|--------------------------|---------------|--|---|-----|----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=30\text{ V}, I_D=80\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 14 | 19 | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 8 | 10 | |
| Gate to drain charge | Q_{gd} | | - | 29 | 43 | |
| Switching charge | Q_{sw} | | - | 35 | 52 | |
| Gate charge total | Q_g | | - | 70 | 93 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.4 | - | V |
| Output charge | Q_{oss} | $V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$ | | 26 | 35 | |

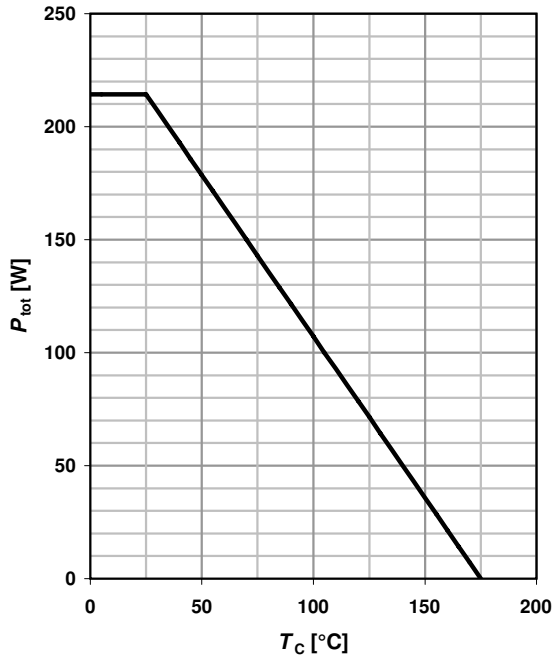
Reverse Diode

| | | | | | | |
|----------------------------------|---------------|---|---|------|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 80 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 320 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=80\text{ A},$ $T_j=25\text{ }^\circ\text{C}$ | - | 0.91 | 1.3 | V |
| Reverse recovery time | t_{rr} | $V_R=30\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$ | - | 53 | 65 | ns |
| Reverse recovery charge | Q_{rr} | | - | 85 | 110 | nC |

⁴⁾ See figure 16 for gate charge parameter definition

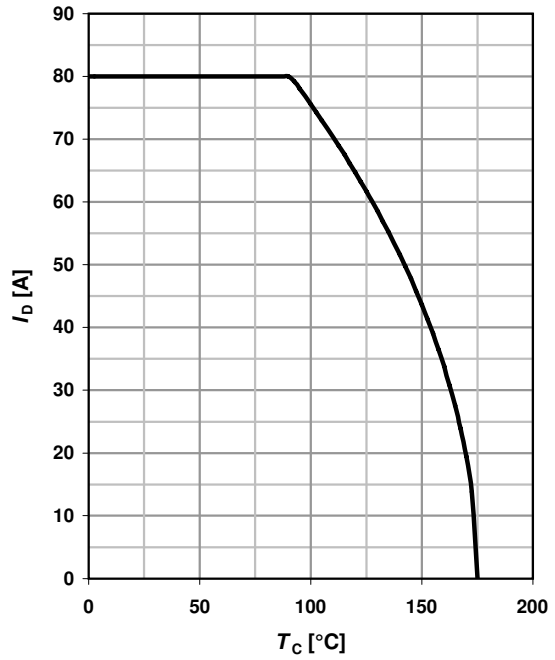
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

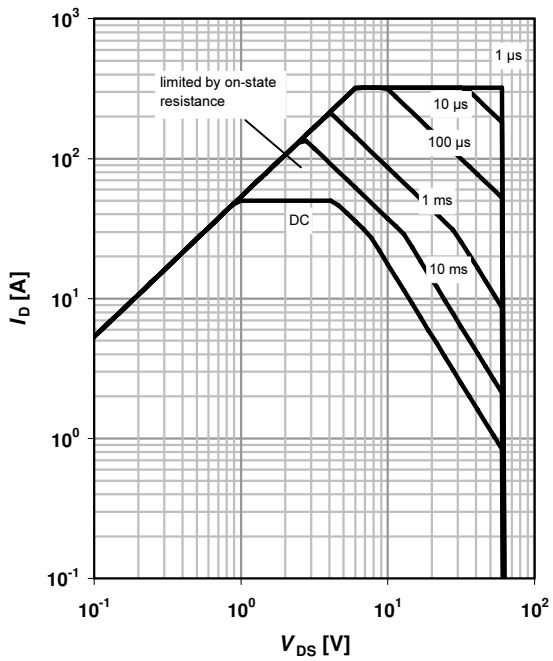
$I_D=f(T_C); V_{GS} \geq 10 V$



3 Safe operating area

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

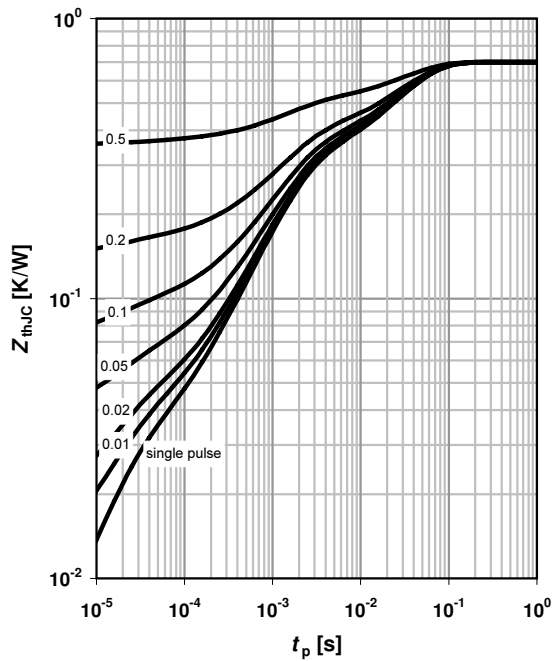
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

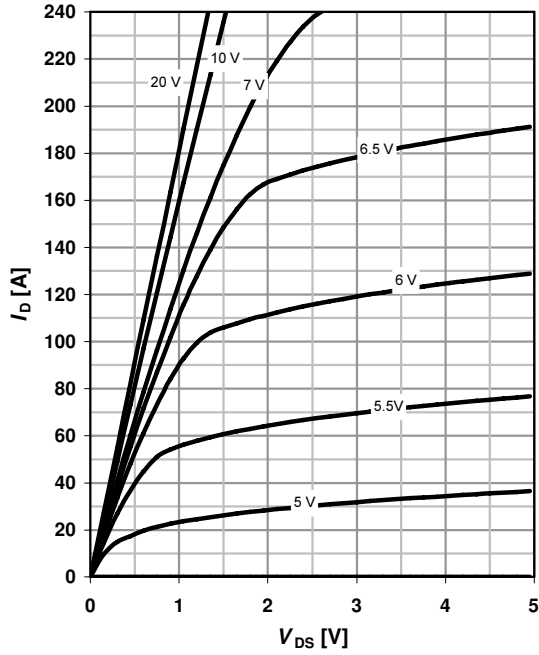
parameter: $D=t_p/T$



5 Typ. output characteristics

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

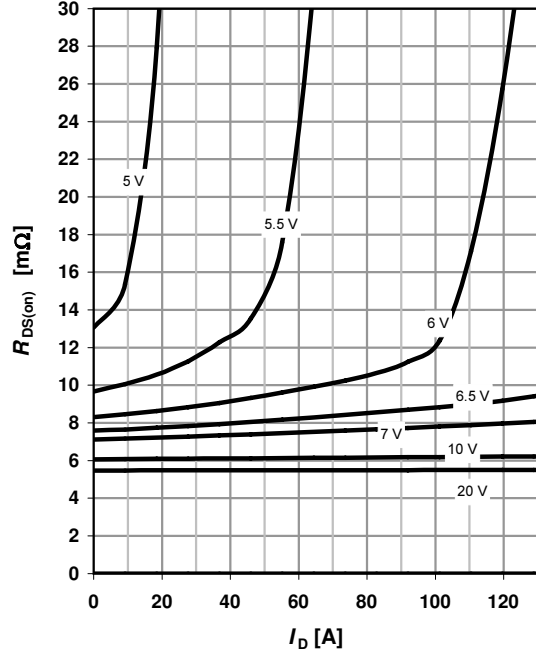
parameter: V_{GS}



6 Typ. drain-source on resistance

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

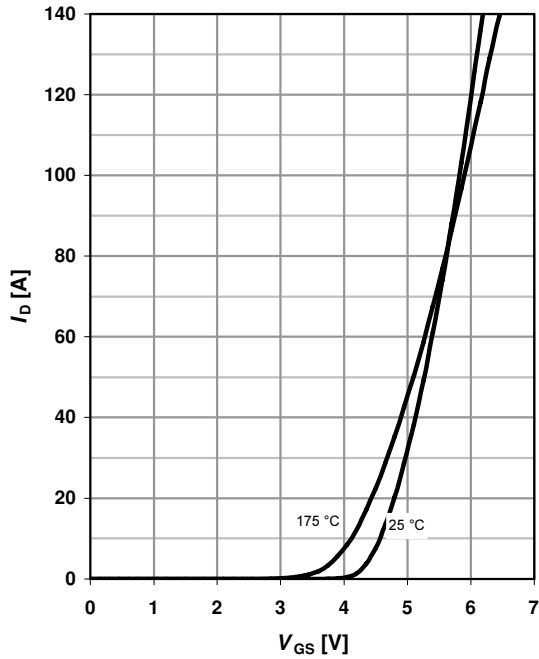
parameter: V_{GS}



7 Typ. transfer characteristics

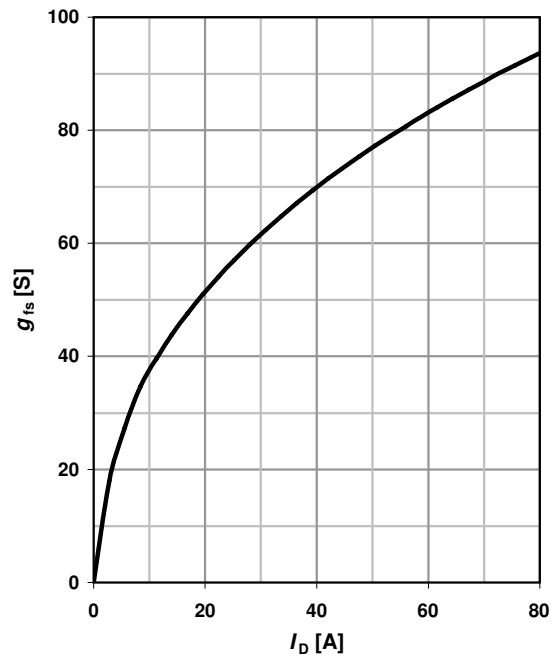
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



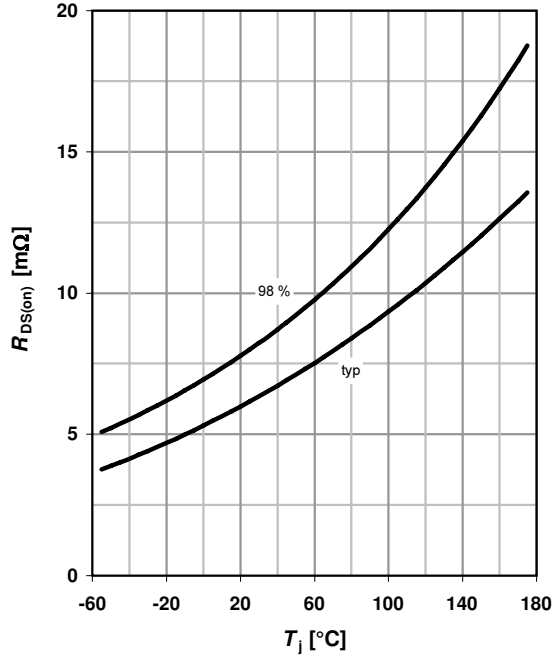
8 Typ. forward transconductance

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



9 Drain-source on-state resistance

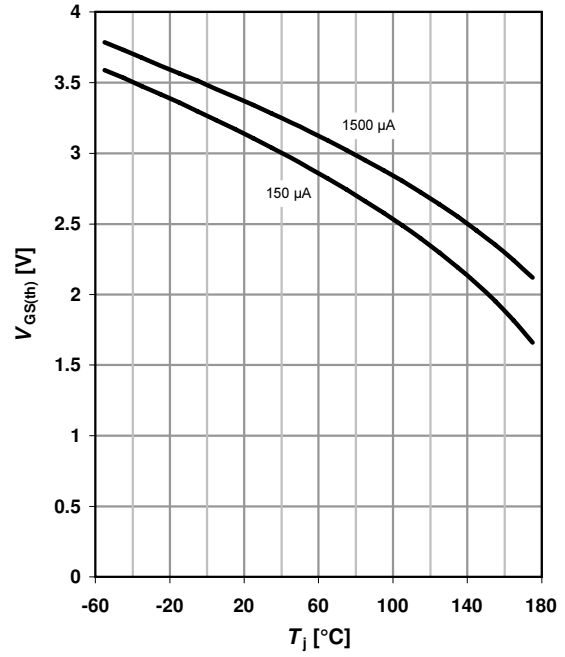
$R_{DS(on)} = f(T_j); I_D = 80 \text{ A}; V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

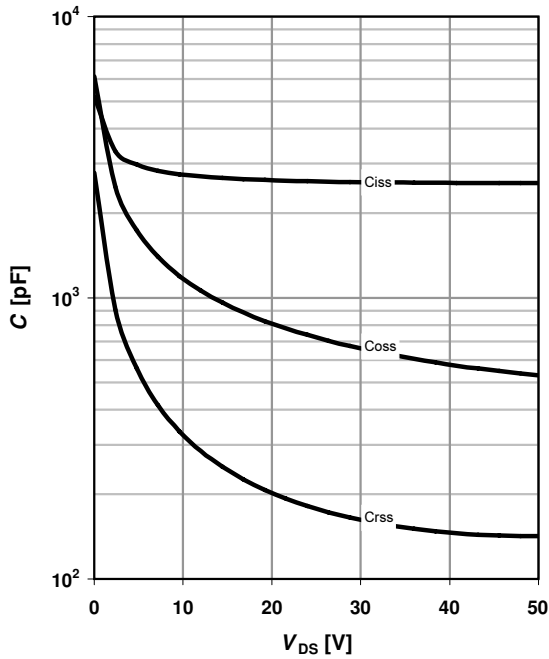
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter: I_D



11 Typ. capacitances

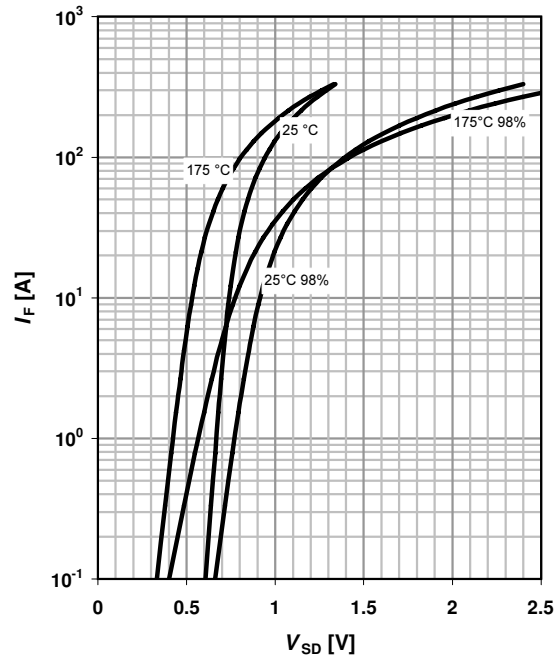
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



12 Forward characteristics of reverse diode

$I_F = f(V_{SD})$

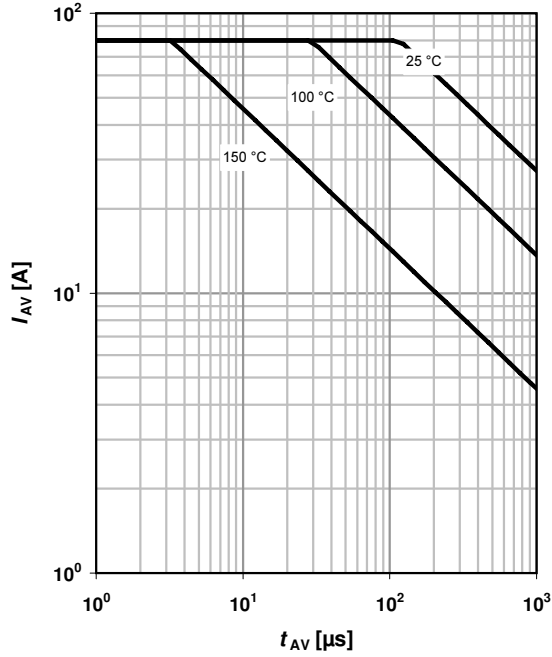
parameter: T_j



13 Avalanche characteristics

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

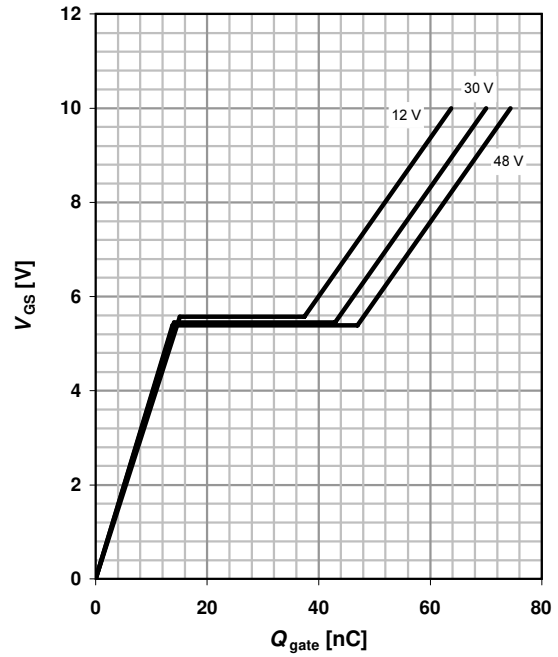
parameter: $T_{j(start)}$



14 Typ. gate charge

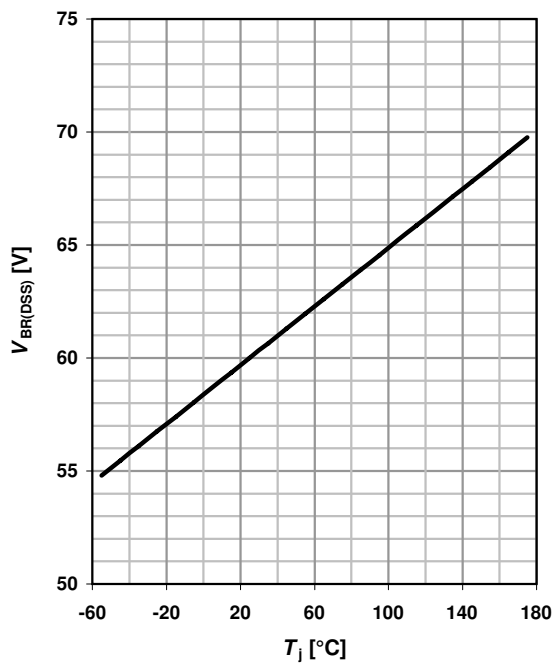
$V_{GS}=f(Q_{gate}); I_D=80 \text{ A pulsed}$

parameter: V_{DD}

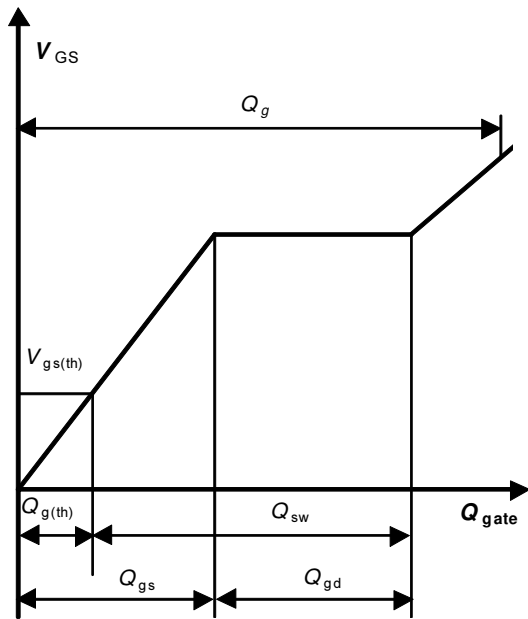


15 Drain-source breakdown voltage

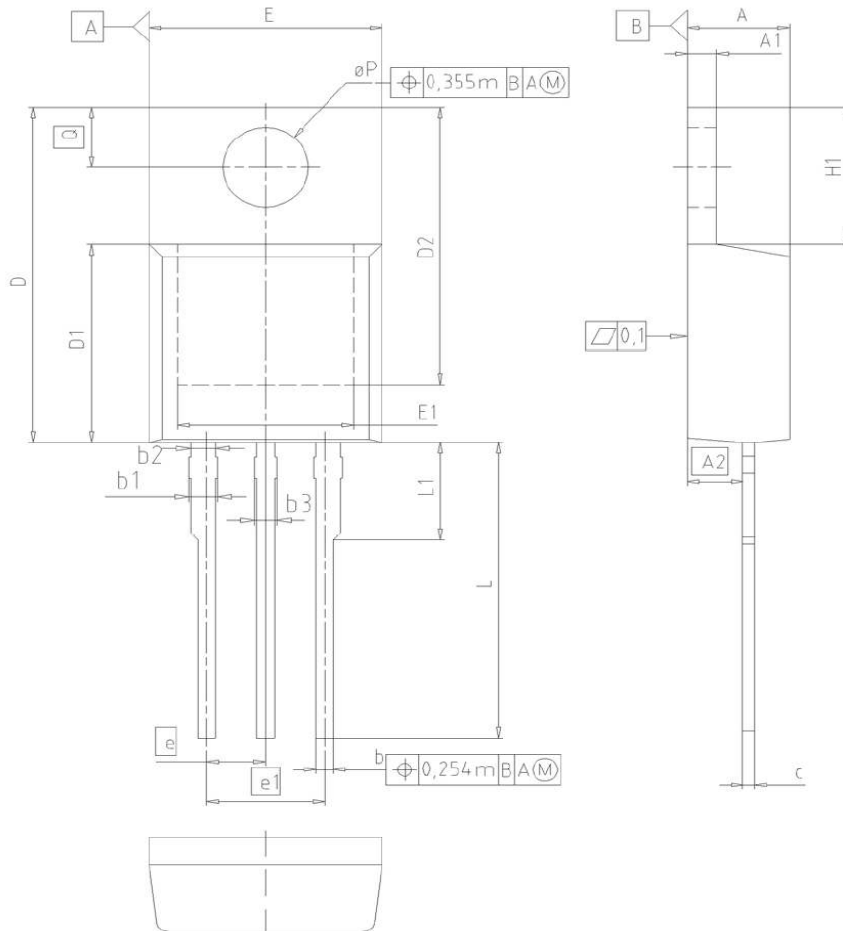
$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$



16 Gate charge waveforms



PG-TO220-3: Outline



| DIM | MILLIMETERS | | INCHES | |
|----------|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 4.30 | 4.57 | 0.169 | 0.180 |
| A1 | 1.17 | 1.40 | 0.046 | 0.055 |
| A2 | 2.15 | 2.72 | 0.085 | 0.107 |
| b | 0.65 | 0.86 | 0.026 | 0.034 |
| b1 | 0.95 | 1.40 | 0.037 | 0.055 |
| b2 | 0.95 | 1.15 | 0.037 | 0.045 |
| b3 | 0.65 | 1.15 | 0.026 | 0.045 |
| c | 0.33 | 0.80 | 0.013 | 0.024 |
| D | 14.81 | 15.95 | 0.583 | 0.628 |
| D1 | 8.51 | 9.45 | 0.335 | 0.372 |
| D2 | 12.19 | 13.10 | 0.480 | 0.516 |
| E | 9.70 | 10.36 | 0.382 | 0.408 |
| E1 | 6.50 | 8.60 | 0.256 | 0.339 |
| e | 2.54 | | 0.100 | |
| e1 | 5.08 | | 0.200 | |
| N | 3 | | 3 | |
| H1 | 5.90 | 6.90 | 0.232 | 0.272 |
| L | 13.00 | 14.00 | 0.512 | 0.551 |
| L1 | - | 4.80 | - | 0.189 |
| ϕP | 3.60 | 3.89 | 0.142 | 0.153 |
| Q | 2.60 | 3.00 | 0.102 | 0.118 |

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