

OptiMOS™3 Power-Transistor

Features

- Optimized for dc-dc conversion
- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target application
- Halogen-free according to IEC61249-2-21

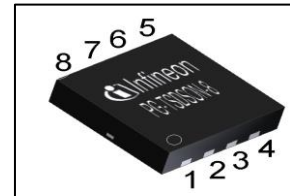


Halogen-Free

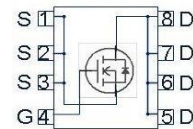
Product Summary

| | | |
|------------------|-----|----|
| V_{DS} | 250 | V |
| $R_{DS(on),max}$ | 425 | mΩ |
| I_D | 5 | A |

PG-TSDSON-8



| Type | Package | Marking |
|----------------|-------------|---------|
| BSZ42DN25NS3 G | PG-TSDSON-8 | 42DN25N |



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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|-------------------|---|-------------|-------|
| Continuous drain current | I_D | $T_C=25\text{ °C}$ | 5 | A |
| | | $T_C=100\text{ °C}$ | 3.5 | |
| Pulsed drain current ²⁾ | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 20 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=2.5\text{ A}$, $R_{GS}=25\text{ Ω}$ | 40 | mJ |
| Reverse diode dv/dt | dv/dt | | 10 | kV/μs |
| Gate source voltage | V_{GS} | | ±20 | V |
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 33.8 | W |
| Operating and storage temperature | T_j , T_{stg} | | -55 ... 150 | °C |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | |

¹⁾ J-STD20 and JESD22

²⁾ see figure 3

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

Thermal characteristics

| | | | | | | |
|--|------------|--|---|---|-----|-----|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 3.7 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | 6 cm ² cooling area ³⁾ | - | - | 60 | |

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

Static characteristics

| | | | | | | |
|----------------------------------|---------------|--|-----|-----|-----|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$ | 250 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}$, $I_D=13\text{ }\mu\text{A}$ | 2 | 3 | 4 | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS}=200\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ | - | 0.1 | 1 | μA |
| | | $V_{DS}=200\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$ | - | 10 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$ | - | 1 | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=10\text{ V}$, $I_D=2.5\text{ A}$ | - | 371 | 425 | m Ω |
| Gate resistance | R_G | | - | 1.7 | - | Ω |
| Transconductance | g_{fs} | $ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=2.5\text{ A}$ | 3 | 6 | - | 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} | $V_{GS}=0\text{ V}, V_{DS}=100\text{ V},$ $f=1\text{ MHz}$ | - | 320 | 430 | pF |
| Output capacitance | C_{oss} | | - | 21 | 28 | |
| Reverse transfer capacitance | C_{rss} | | - | 5.1 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=100\text{ V},$ $V_{GS}=10\text{ V}, I_D=2.5\text{ A},$ $R_{G,ext}=1.6\ \Omega$ | - | 3 | - | ns |
| Rise time | t_r | | - | 2 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 8 | - | |
| Fall time | t_f | | - | 5 | - | |

Gate Charge Characteristics⁴⁾

| | | | | | | |
|-----------------------|---------------|--|---|-----|-----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=101\text{ V}, I_D=2.5\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 1.4 | - | nC |
| Gate to drain charge | Q_{gd} | | - | 0.8 | - | |
| Switching charge | Q_{sw} | | - | 1.2 | - | |
| Gate charge total | Q_g | | - | 4.2 | 5.5 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 4.4 | - | V |
| Output charge | Q_{oss} | $V_{DD}=100\text{ V}, V_{GS}=0\text{ V}$ | - | 7 | 9 | nC |

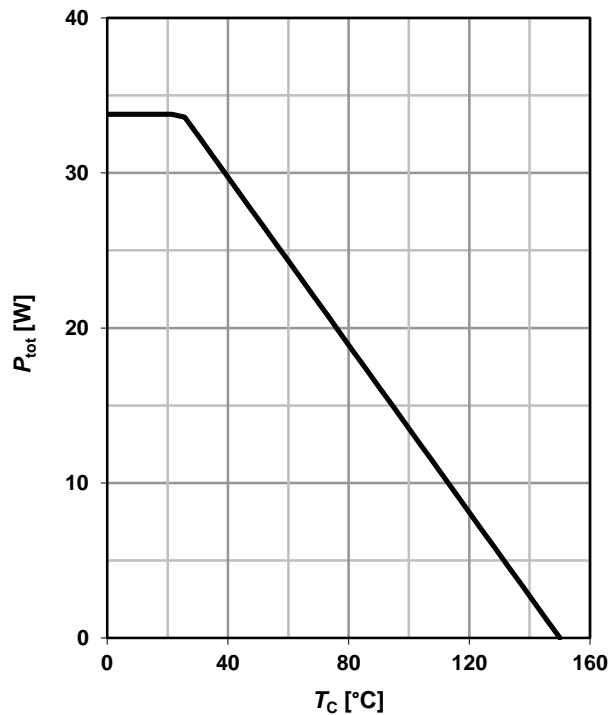
Reverse Diode

| | | | | | | |
|----------------------------------|---------------|--|---|-----|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ °C}$ | - | - | 5.0 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 20 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=5\text{ A},$ $T_j=25\text{ °C}$ | - | 0.9 | 1.2 | V |
| Reverse recovery time | t_{rr} | $V_R=100\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$ | - | 70 | - | ns |
| Reverse recovery charge | Q_{rr} | | - | 159 | - | nC |

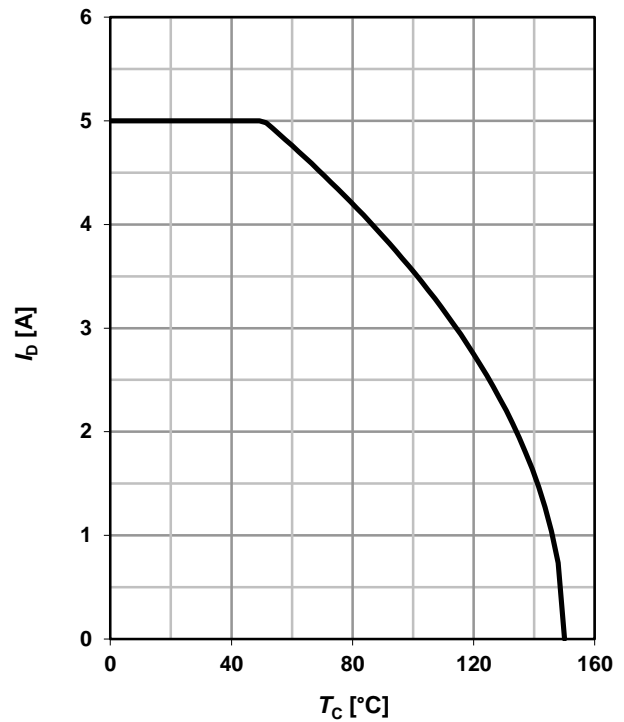
⁴⁾ See figure 16 for gate charge parameter definition

1 Power dissipation

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

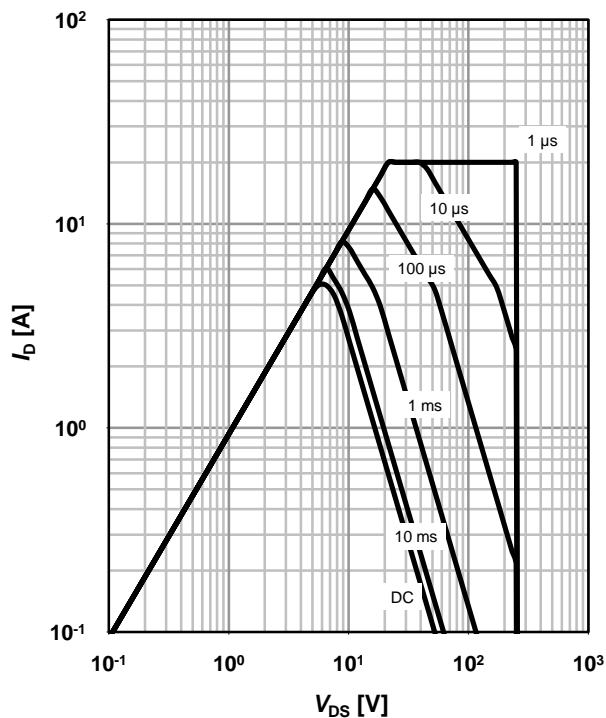

2 Drain current

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


3 Safe operating area

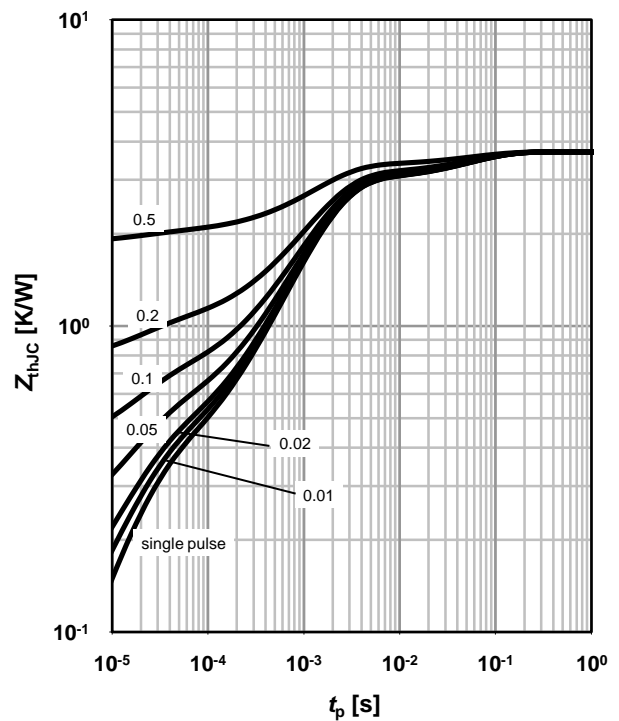
$$I_D = f(V_{DS}); T_C = 25^\circ\text{C}; D = 0$$

parameter: t_p


4 Max. transient thermal impedance

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

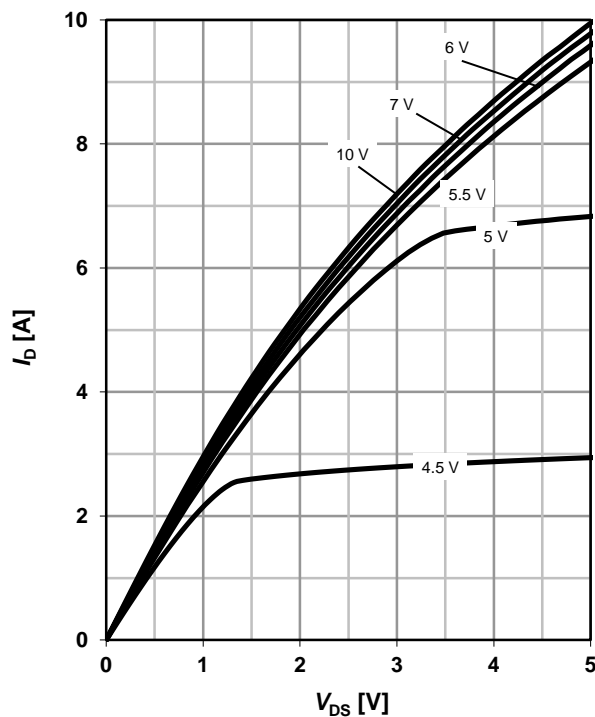
parameter: $D = t_p / T$



5 Typ. output characteristics

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

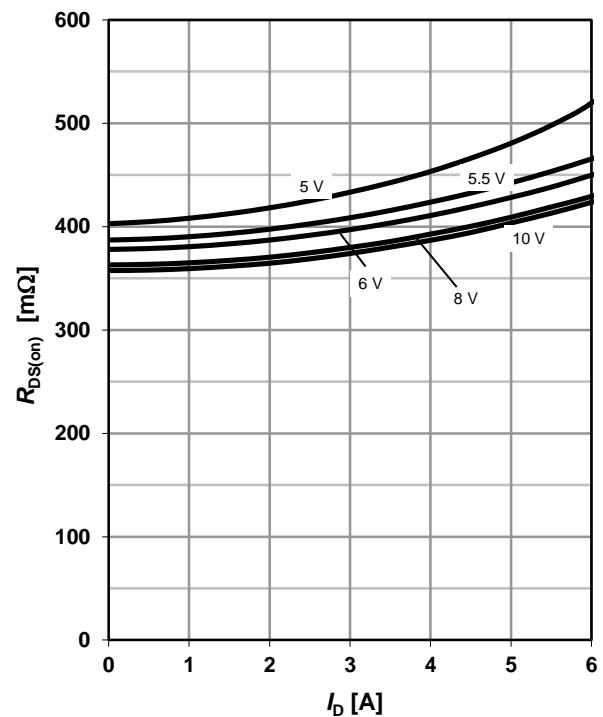
parameter: V_{GS}



6 Typ. drain-source on resistance

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

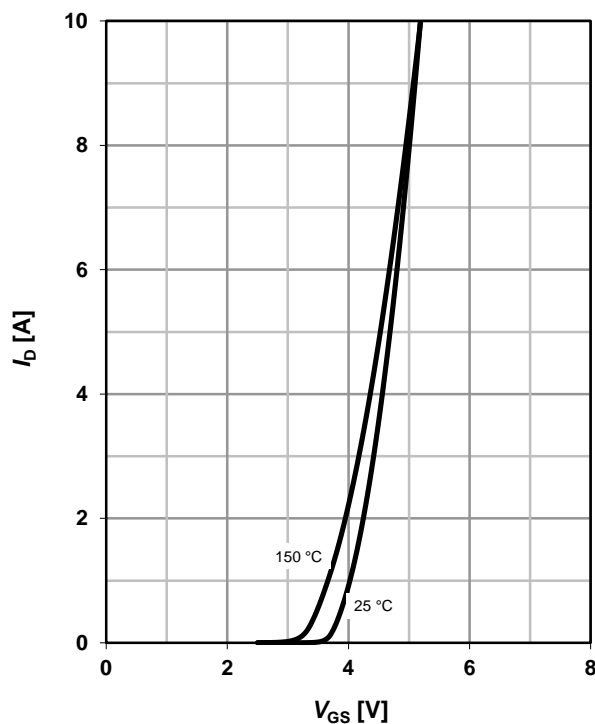
parameter: V_{GS}



7 Typ. transfer characteristics

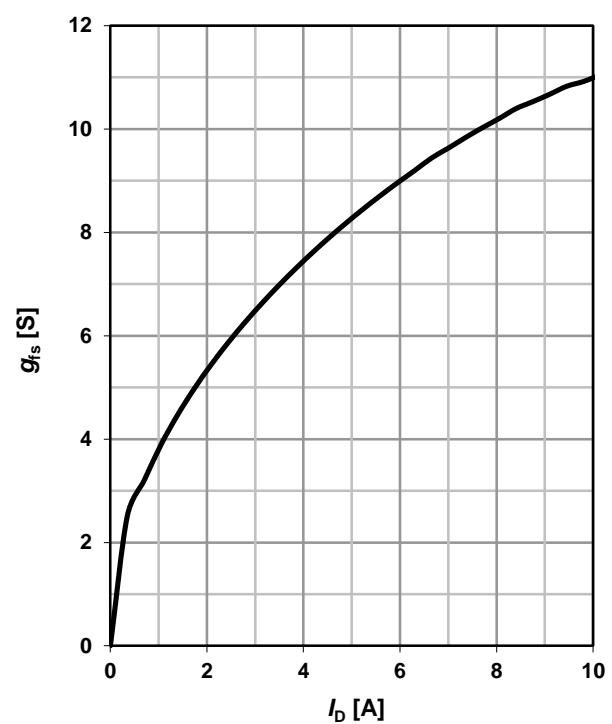
$$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)\max}$$

parameter: T_j



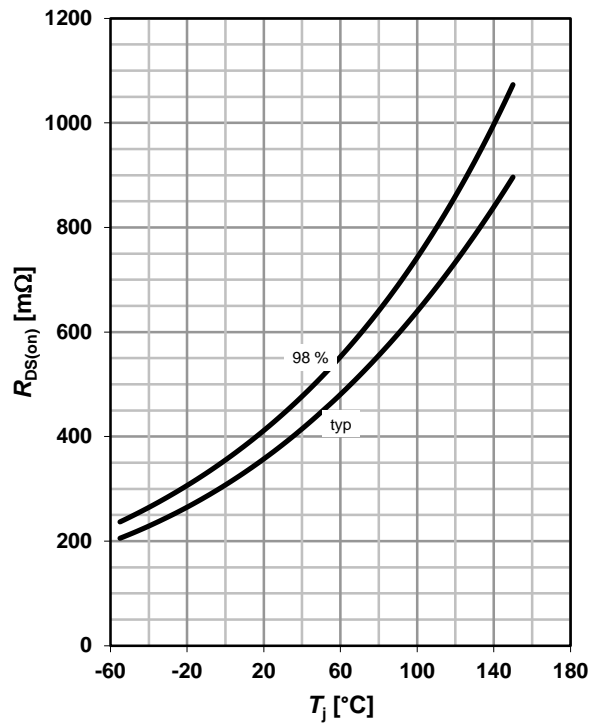
8 Typ. forward transconductance

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



9 Drain-source on-state resistance

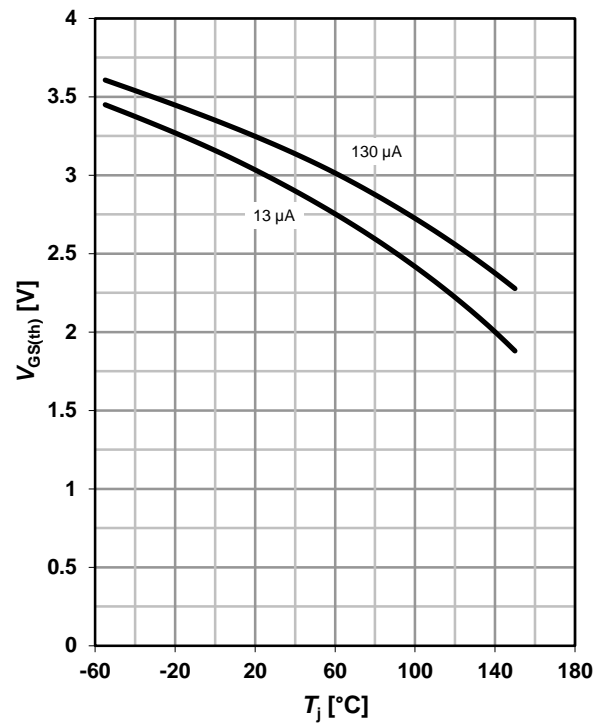
$$R_{DS(on)} = f(T_j); I_D = 2.5 \text{ A}; V_{GS} = 10 \text{ V}$$



10 Typ. gate threshold voltage

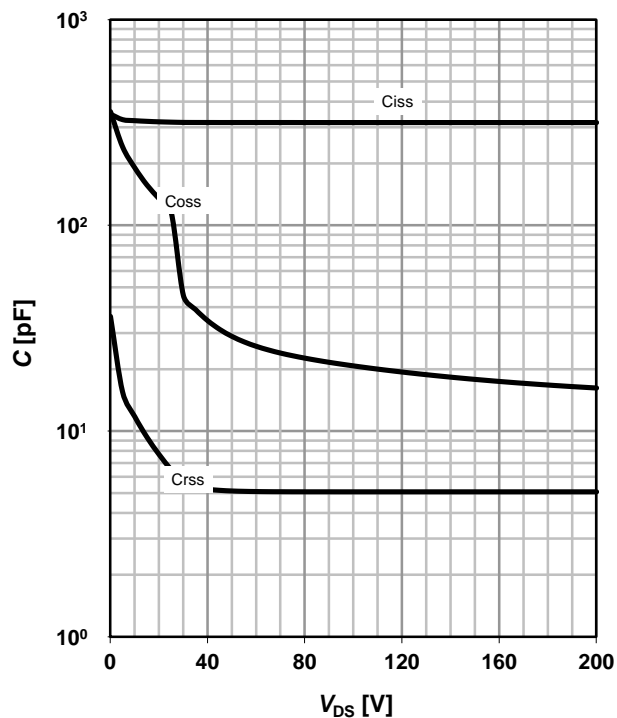
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



11 Typ. capacitances

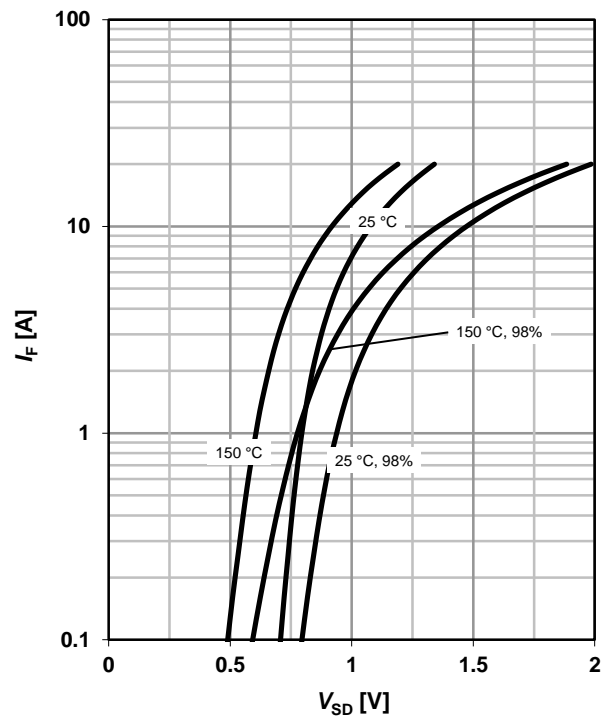
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Forward characteristics of reverse diode

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

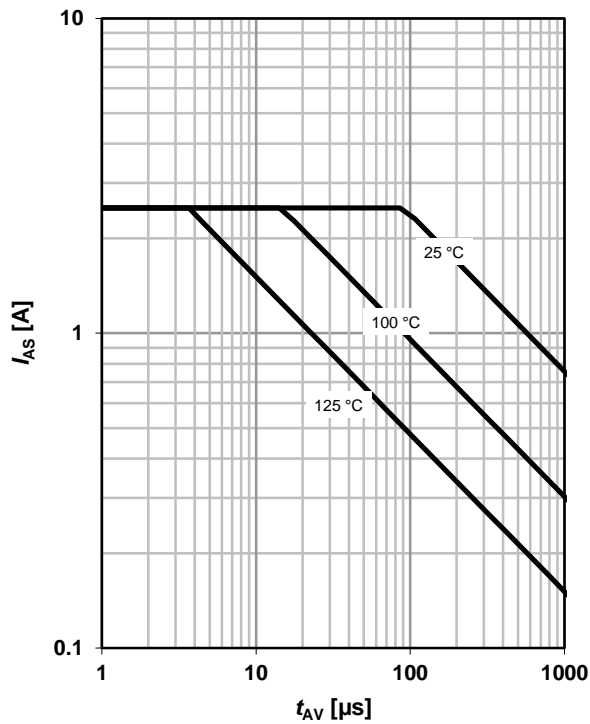
parameter: T_j



13 Avalanche characteristics

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

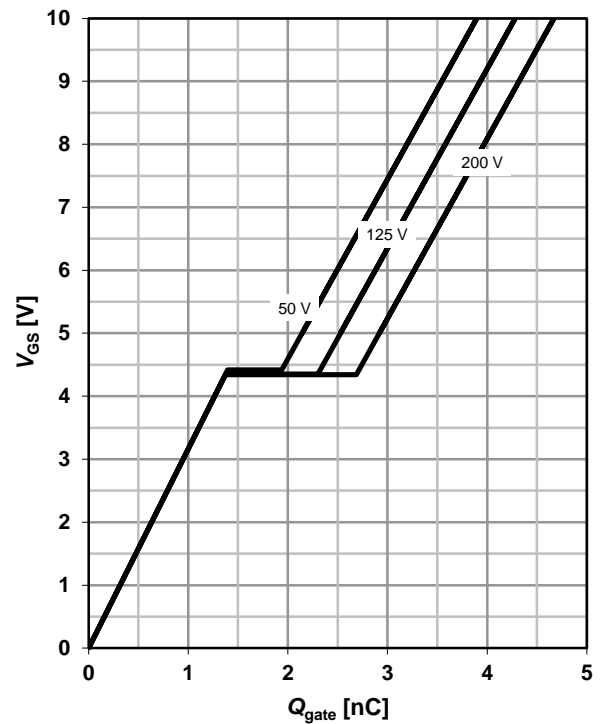
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

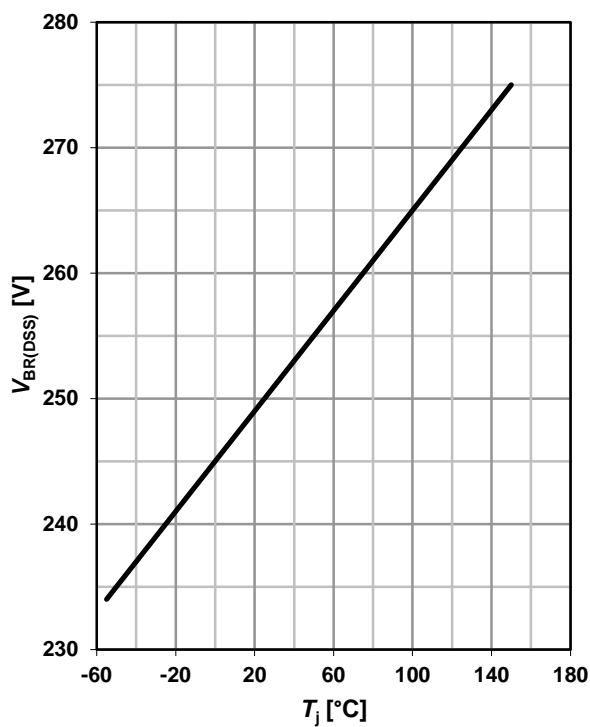
$$V_{GS}=f(Q_{\text{gate}}); I_D=2.5\ \text{A pulsed}$$

parameter: V_{DD}

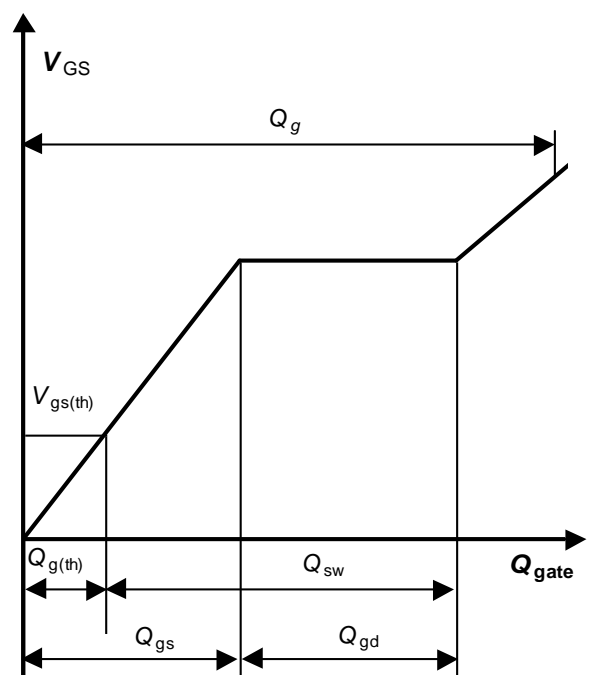


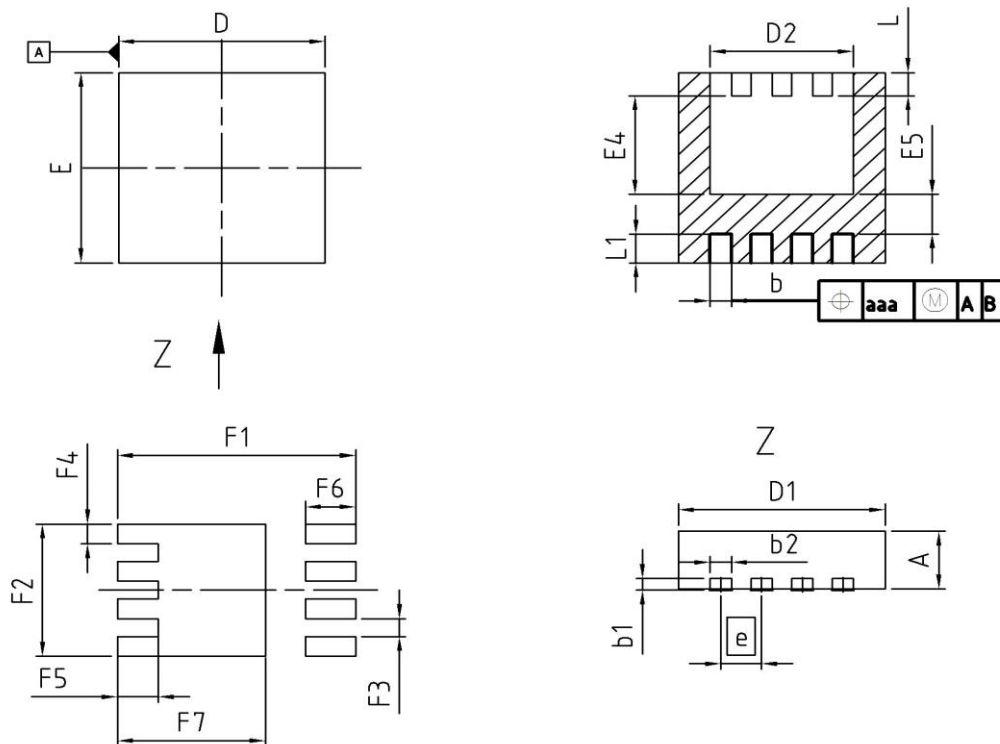
15 Drain-source breakdown voltage

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



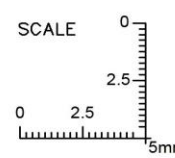
16 Gate charge waveforms

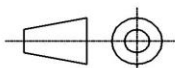


Package Outline:PG-TSDSON-8


| DIM | MILLIMETERS | | INCHES | |
|------|-------------|------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.10 | 0.035 | 0.043 |
| b | 0.24 | 0.44 | 0.009 | 0.017 |
| b1 | 0.10 | 0.30 | 0.004 | 0.012 |
| b2 | 0.20 | 0.44 | 0.008 | 0.017 |
| D=D1 | 3.20 | 3.40 | 0.126 | 0.134 |
| D2 | 2.15 | 2.45 | 0.085 | 0.096 |
| E | 3.20 | 3.40 | 0.126 | 0.134 |
| E4 | 1.60 | 1.81 | 0.063 | 0.071 |
| E5 | 0.59 | 0.86 | 0.023 | 0.034 |
| e | 0.65 | | 0.026 | |
| N | 8 | | 8 | |
| L | 0.30 | 0.56 | 0.012 | 0.022 |
| L1 | 0.33 | 0.60 | 0.013 | 0.024 |
| aaa | 0.25 | | 0.010 | |
| F1 | 3.80 | | 0.150 | |
| F2 | 2.29 | | 0.090 | |
| F3 | 0.31 | | 0.012 | |
| F4 | 0.34 | | 0.013 | |
| F5 | 0.65 | | 0.026 | |
| F6 | 0.80 | | 0.031 | |
| F7 | 2.36 | | 0.093 | |

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