

OptiMOS™ -P Power-Transistor
Features

- P-Channel
- Enhancement mode
- Logic level
- 150°C operating temperature
- Avalanche rated; RoHS compliant
- Vgs=25V, specially suited for notebook applications
- Halogen-free according to IEC61249-2-21
- Pb-free lead plating; RoHS compliant

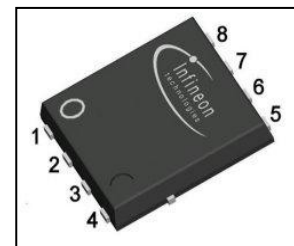
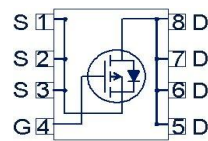


Halogen-Free

Product Summary

| | | |
|------------------|-------|----|
| V_{DS} | -30 | V |
| $R_{DS(on),max}$ | 13 | mΩ |
| I_D | -22.5 | A |

PG-TDSON-8



| Type | Package | Marking | Lead free | Packing |
|---------------|------------|----------|-----------|---------|
| BSC130P03LS G | PG-TDSON-8 | 130P03LS | Yes | Dry |

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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|----------------|---|--------------|------|
| Continuous drain current | I_D | $T_C=25\text{ °C}$ | -22,5 | A |
| | | $T_C=70\text{ °C}$ | -22,5 | |
| | | $T_A=25\text{ °C}^{(1)}$ | -12 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C=25\text{ °C}^{(2)}$ | -90 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=-22.5\text{ A}$, $R_{GS}=25\text{ Ω}$ | 148 | mJ |
| Gate source voltage | V_{GS} | | ±25 | V |
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 69 | W |
| | | $T_A=25\text{ °C}^{(1)}$ | 2,5 | |
| Operating and storage temperature | T_j, T_{stg} | | -55 ... 150 | °C |
| ESD class | | JESD22-A114-HBM | 1C (1kV-2kV) | |
| Soldering temperature | | | 260 °C | |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | |

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

Thermal characteristics

| | | | | | | |
|--|------------|--|---|---|-----|-----|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 1,8 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | 6 cm ² cooling area ¹⁾ | - | - | 50 | |

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

| | | | | | | |
|----------------------------------|---------------|--|------|------|------|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}$, $I_D=-250\mu\text{A}$ | -30 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}$, $I_D=-150\mu\text{A}$ | -2,2 | -1,5 | -1 | |
| 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 | μA |
| | | $V_{DS}=-30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$ | - | -10 | -100 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=-25\text{ V}$, $V_{DS}=0\text{ V}$ | - | -10 | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=-10\text{ V}$, $I_D=-22.5\text{ A}$ | - | 9,4 | 13,0 | m Ω |
| Gate resistance | R_G | | - | 3,8 | - | Ω |
| Transconductance | g_{fs} | $ V_{DS} >2 I_D R_{DS(on)max}$, $I_D=-22.5\text{ A}$ | 20 | 39 | - | S |

¹⁾ 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.

²⁾ See Figure 3.

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

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|--|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=-15\text{ V},$ $f=1\text{ MHz}$ | - | 2760 | 3670 | pF |
| Output capacitance | C_{oss} | | - | 857 | 1140 | |
| Reverse transfer capacitance | C_{rss} | | - | 690 | 1000 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=-15\text{ V}, V_{GS}=-10\text{ V},$ $I_D=22.5\text{ A},$ $R_G=6\ \Omega$ | - | 11,4 | 17,1 | ns |
| Rise time | t_r | | - | 65,6 | 98,4 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 43,5 | 65,3 | |
| Fall time | t_f | | - | 35,1 | 52,7 | |

Gate Charge Characteristics³⁾

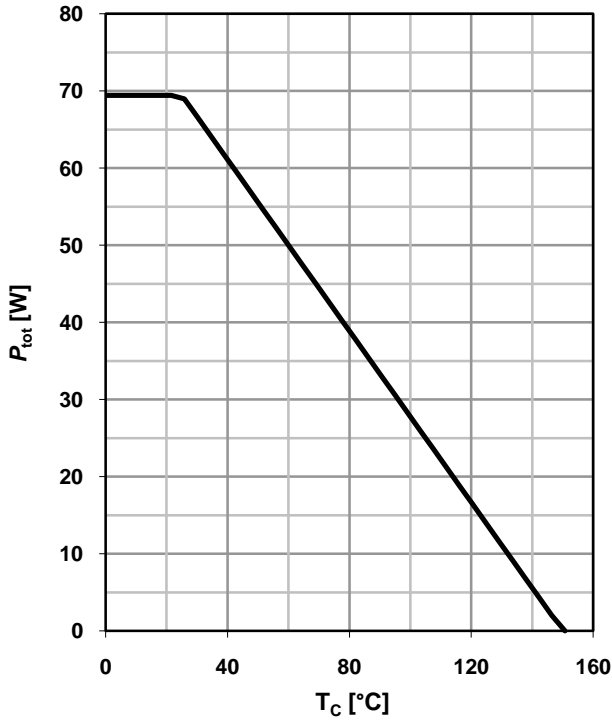
| | | | | | | |
|--------------------------|---------------|--|---|-------|-------|----|
| Gate to source charge | Q_{gs} | $V_{DD}=-24\text{ V}, I_D=22.5\text{ A},$ $V_{GS}=0\text{ to }-10\text{ V}$ | - | -7,7 | -10,3 | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | -4,3 | -5,7 | |
| Gate to drain charge | Q_{gd} | | - | -20,5 | -30,8 | |
| Switching charge | Q_{sw} | | - | -24,0 | -35,4 | |
| Gate charge total | Q_g | | - | -54,9 | -73,1 | |
| Gate plateau voltage | $V_{plateau}$ | | - | -2,9 | - | V |
| Output charge | Q_{oss} | $V_{DD}=-15\text{ V}, V_{GS}=0\text{ V}$ | - | -14,8 | - | |

Reverse Diode

| | | | | | | |
|----------------------------------|---------------|--|---|------|------|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 22,5 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | -90 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=-22.5\text{ A},$ $T_j=25\text{ }^\circ\text{C}$ | - | -0,9 | -1,2 | V |
| Reverse recovery time | t_{rr} | $V_R=15\text{ V}, I_F= I_S ,$ $di_F/dt=100\text{ A}/\mu\text{s}$ | - | 33 | - | ns |
| Reverse recovery charge | Q_{rr} | | - | 24 | - | nC |

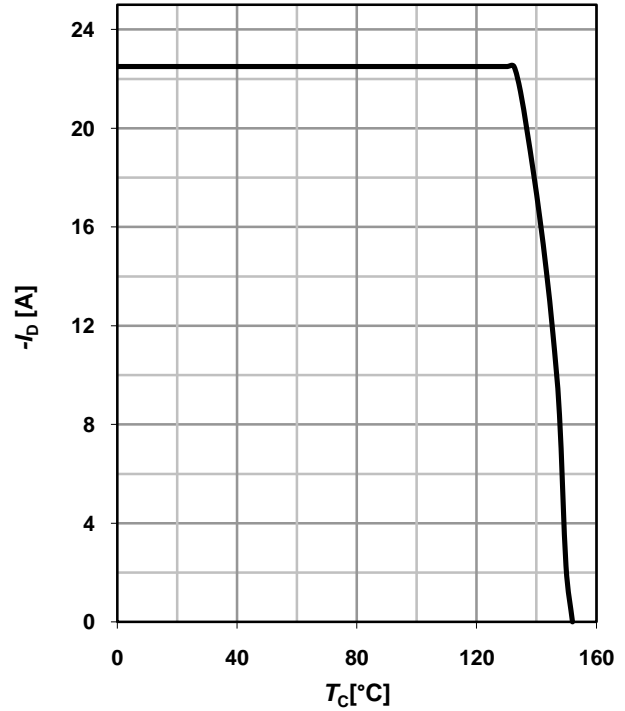
1 Power dissipation

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



2 Drain current

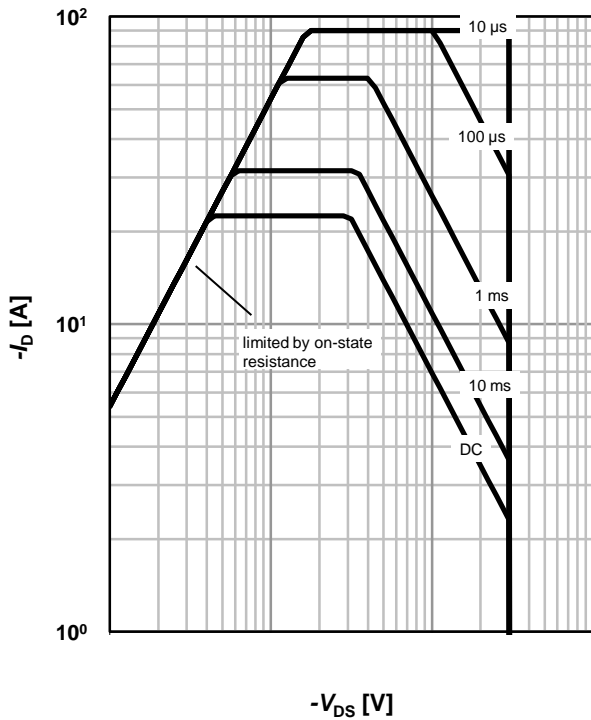
$I_D=f(T_C); |V_{GS}| \geq 10 \text{ V}; t_p \leq 10 \text{ s}$



3 Safe operating area

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

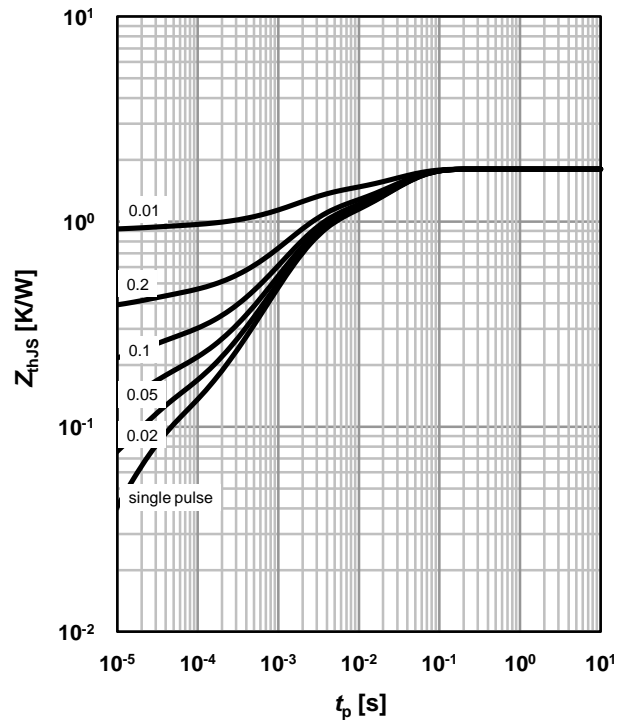
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJS}=f(t_p)$

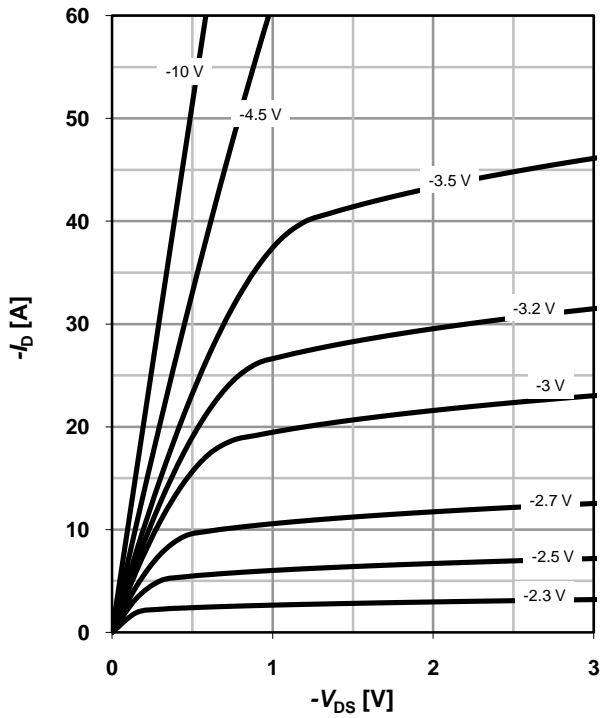
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

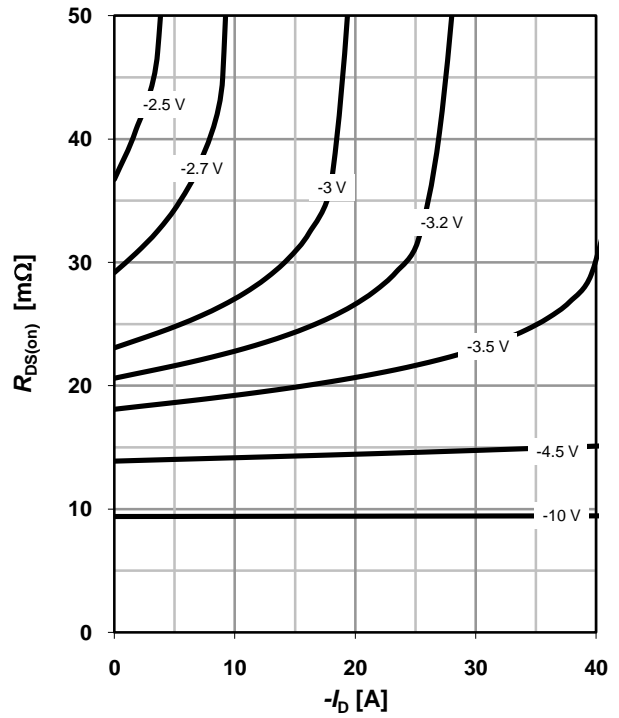
parameter: V_{GS}



6 Typ. drain-source on resistance

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

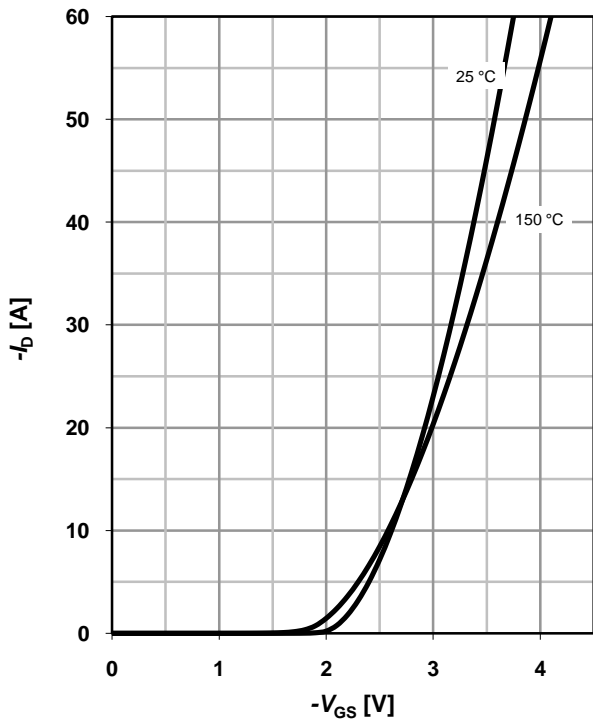
parameter: V_{GS}



7 Typ. transfer characteristics

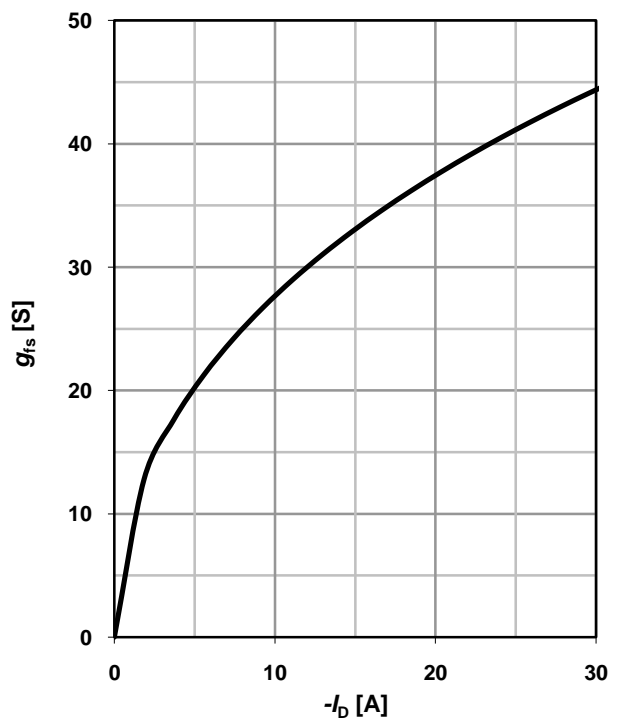
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



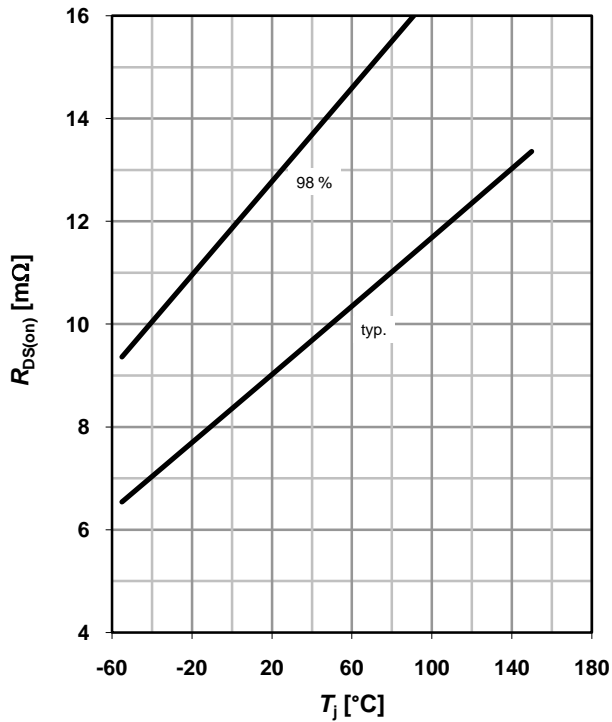
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



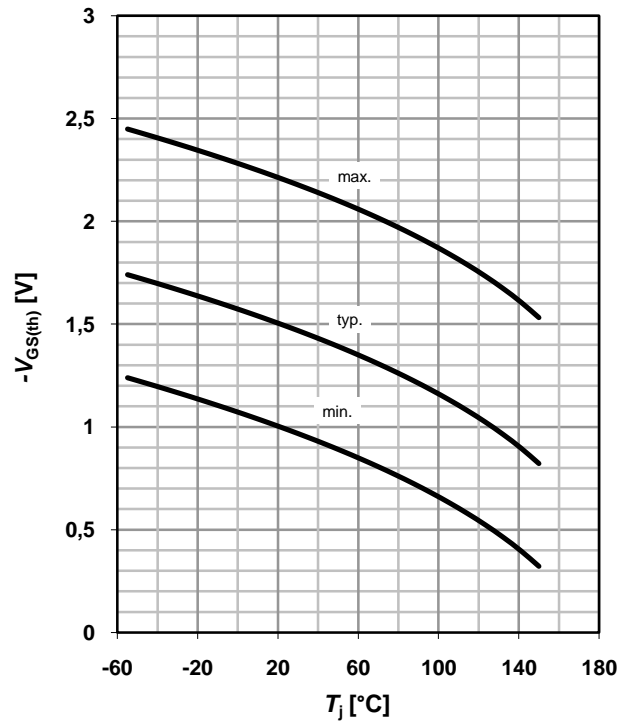
9 Drain-source on-state resistance

$R_{DS(on)}=f(T_j); I_D=-22.5\text{ A}; V_{GS}=-10\text{ V}$



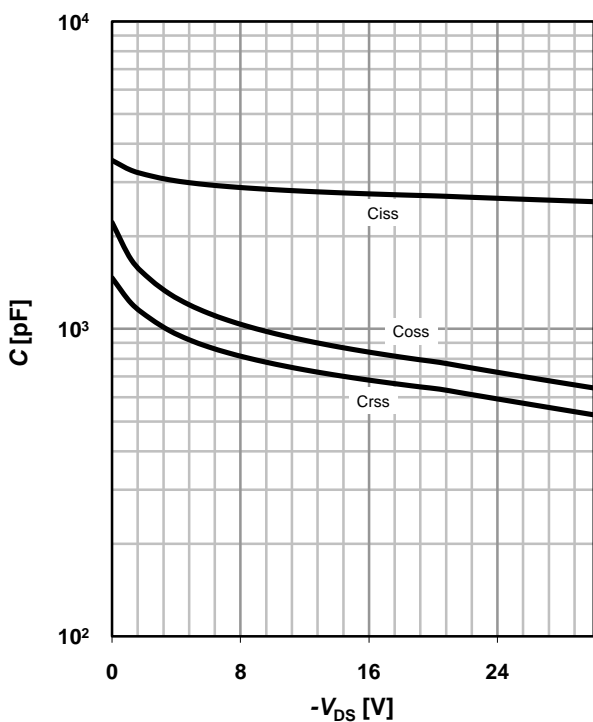
10 Typ. gate threshold voltage

$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=-150\text{ }\mu\text{A}$



11 Typ. capacitances

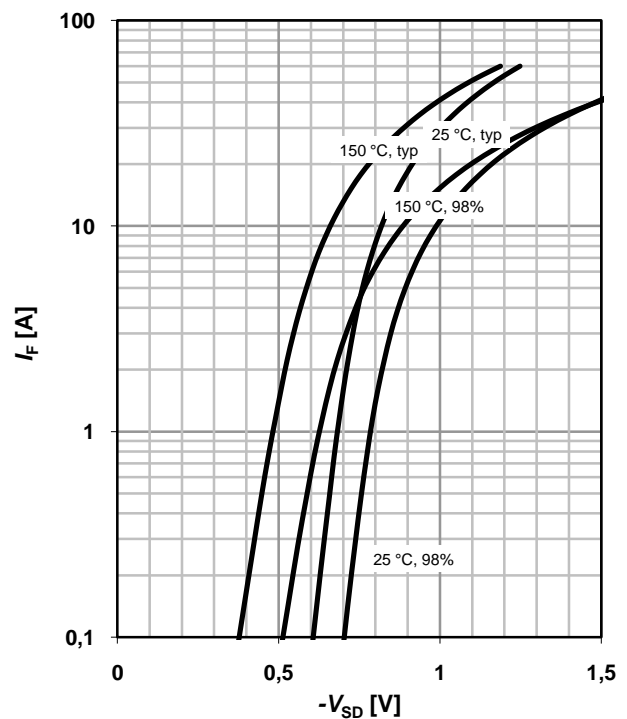
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

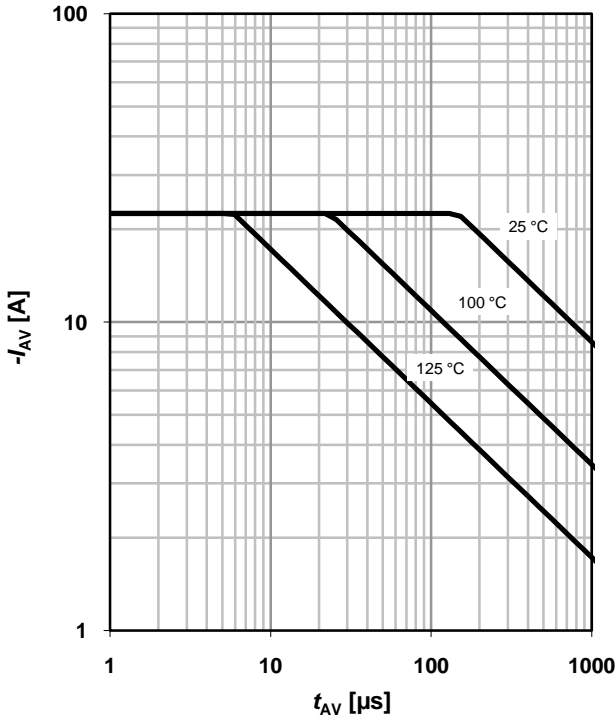
parameter: T_j



13 Avalanche characteristics

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

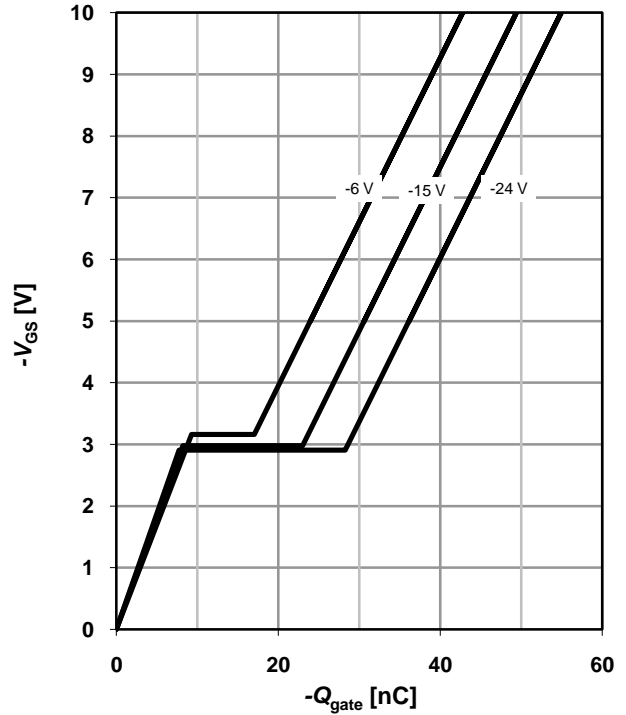
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

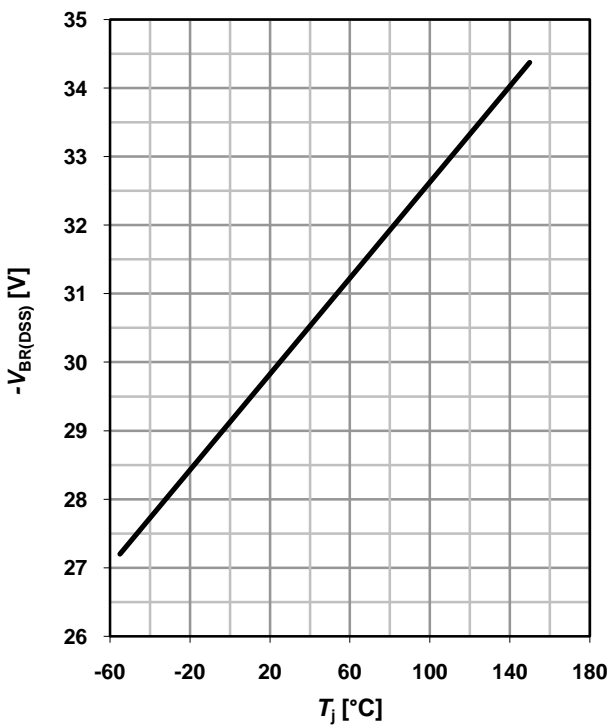
$V_{GS}=f(Q_{\text{gate}}); I_D=-22.5\ \text{A pulsed}$

parameter: V_{DD}

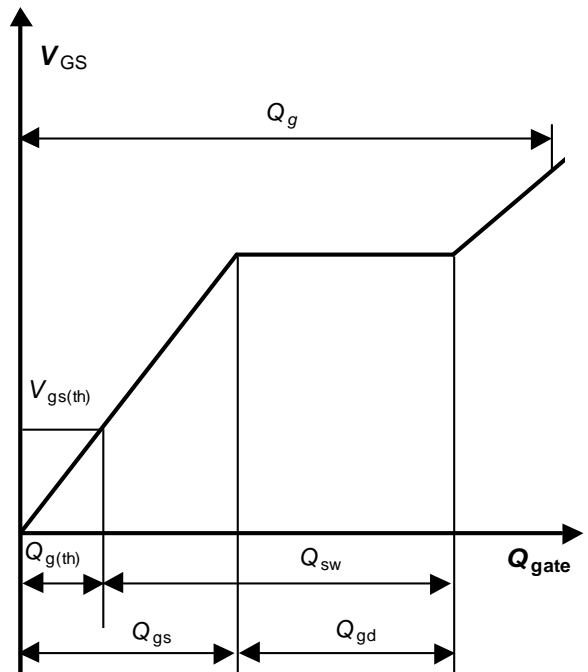


15 Drain-source breakdown voltage

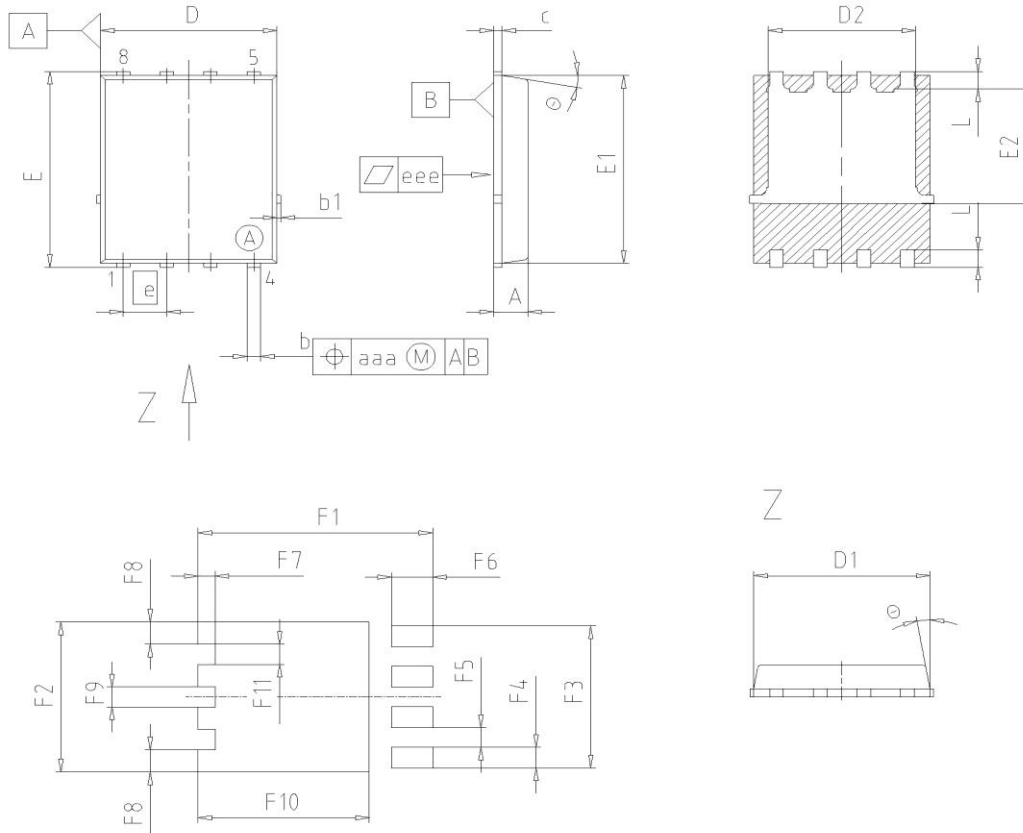
$V_{BR(DSS)}=f(T_j); I_D=-250\ \mu\text{A}$



16 Gate charge waveforms



Package Outline



| DIM | MILLIMETERS | | INCHES | |
|------|-------------|-------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.10 | 0.035 | 0.043 |
| b | 0.34 | 0.54 | 0.013 | 0.021 |
| b1 | 0.02 | 0.22 | 0.001 | 0.008 |
| c | 0.15 | 0.35 | 0.006 | 0.014 |
| D=D1 | 4.95 | 5.35 | 0.195 | 0.211 |
| D2 | 4.20 | 4.40 | 0.165 | 0.173 |
| E | 5.95 | 6.35 | 0.234 | 0.250 |
| E1 | 5.70 | 6.10 | 0.224 | 0.240 |
| E2 | 3.40 | 3.80 | 0.134 | 0.150 |
| e | 1.27 | | 0.050 | |
| N | 8 | | 8 | |
| L | 0.45 | 0.65 | 0.018 | 0.026 |
| □ | 8.5° | 11.5° | 8.5° | 11.5° |
| aaa | 0.25 | | 0.010 | |
| eee | 0.05 | | 0.002 | |
| F1 | 6.75 | 6.95 | 0.266 | 0.274 |
| F2 | 4.60 | 4.80 | 0.181 | 0.189 |
| F3 | 4.36 | 4.56 | 0.172 | 0.180 |
| F4 | 0.55 | 0.75 | 0.022 | 0.030 |
| F5 | 0.52 | 0.72 | 0.020 | 0.028 |
| F6 | 1.10 | 1.30 | 0.043 | 0.051 |
| F7 | 0.40 | 0.60 | 0.016 | 0.024 |
| F8 | 0.60 | 0.80 | 0.024 | 0.031 |
| F9 | 0.53 | 0.73 | 0.021 | 0.029 |
| F10 | 4.90 | 5.10 | 0.193 | 0.201 |
| F11 | 0.53 | 0.73 | 0.021 | 0.029 |

DOCUMENT NO.
Z8B00003332

SCALE

EUROPEAN PROJECTION

ISSUE DATE
08-03-2007

REVISION
03

Published by
Infineon Technologies AG
81726 Munich, Germany
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