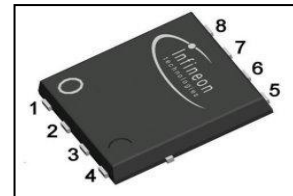


OptiMOS™3 Power-Transistor
Features

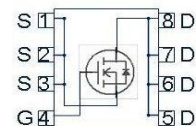
- Fast switching MOSFET for SMPS
- Optimized technology for DC/DC converters
- Qualified according to JEDEC¹⁾ for target applications
- N-channel; Logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- 100% Avalanche tested
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product Summary

| | | |
|------------------|-----|----|
| V_{DS} | 40 | V |
| $R_{DS(on),max}$ | 5.9 | mΩ |
| I_D | 73 | A |

PG-TDSON-8


| Type | Package | Marking |
|---------------|------------|----------|
| BSC059N04LS G | PG-TDSON-8 | 059N04LS |


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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---------------|--|-------|------|
| Continuous drain current | I_D | $V_{GS}=10\text{ V}, T_C=25\text{ °C}$ | 73 | A |
| | | $V_{GS}=10\text{ V}, T_C=100\text{ °C}$ | 46 | |
| | | $V_{GS}=4.5\text{ V}, T_C=25\text{ °C}$ | 62 | |
| | | $V_{GS}=4.5\text{ V}, T_C=100\text{ °C}$ | 39 | |
| | | $V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=50\text{ K/W}^2$ | 16 | |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 292 | |
| Avalanche current, single pulse ⁴⁾ | I_{AS} | $T_C=25\text{ °C}$ | 50 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=50\text{ A}, R_{GS}=25\text{ Ω}$ | 25 | mJ |
| Gate source voltage | V_{GS} | | ±20 | V |

¹⁾ J-STD20 and JESD22

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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|-----------------------|--|-------------|------|
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 50 | W |
| | | $T_A=25\text{ °C}$, $R_{\text{thJA}}=50\text{ K/W}^2)$ | 2.5 | |
| Operating and storage temperature | T_j, T_{stg} | | -55 ... 150 | °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} | bottom | - | - | 2.5 | K/W |
| | | top | | | 20 | |
| Device on PCB | R_{thJA} | 6 cm ² cooling area ²⁾ | - | - | 50 | |

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

Static characteristics

| | | | | | | |
|----------------------------------|-----------------------------|---|-----|-----|-----|---------------|
| Drain-source breakdown voltage | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}, I_{\text{D}}=1\text{ mA}$ | 40 | - | - | V |
| Gate threshold voltage | $V_{\text{GS}(\text{th})}$ | $V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=23\text{ }\mu\text{A}$ | 1.2 | - | 2 | |
| Zero gate voltage drain current | I_{DSS} | $V_{\text{DS}}=40\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=25\text{ °C}$ | - | 0.1 | 1 | μA |
| | | $V_{\text{DS}}=40\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=125\text{ °C}$ | - | 10 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{\text{GS}}=20\text{ V}, V_{\text{DS}}=0\text{ V}$ | - | 10 | 100 | nA |
| Drain-source on-state resistance | $R_{\text{DS}(\text{on})}$ | $V_{\text{GS}}=4.5\text{ V}, I_{\text{D}}=40\text{ A}$ | - | 6.8 | 8.5 | m Ω |
| | | $V_{\text{GS}}=10\text{ V}, I_{\text{D}}=50\text{ A}$ | - | 4.9 | 5.9 | |
| Gate resistance | R_{G} | | - | 1.4 | - | Ω |
| Transconductance | g_{fs} | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS}(\text{on})\text{max}}, I_{\text{D}}=50\text{ A}$ | 48 | 96 | - | S |

²⁾ 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.

³⁾ See figure 3 for more detailed information

⁴⁾ See figure 13 for more detailed information

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

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|--|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=20\text{ V}, f=1\text{ MHz}$ | - | 2400 | 3200 | pF |
| Output capacitance | C_{oss} | | - | 540 | 720 | |
| Reverse transfer capacitance | C_{rss} | | - | 28 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=20\text{ V}, V_{GS}=10\text{ V}, I_D=30\text{ A}, R_G=1.6\ \Omega$ | - | 5.6 | - | ns |
| Rise time | t_r | | - | 3.4 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 23 | - | |
| Fall time | t_f | | - | 3.8 | - | |

Gate Charge Characteristics⁵⁾

| | | | | | | |
|------------------------------|---------------|--|---|-----|----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=20\text{ V}, I_D=30\text{ A}, V_{GS}=0\text{ to }10\text{ V}$ | - | 7.6 | - | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 3.8 | - | |
| Gate to drain charge | Q_{gd} | | - | 3.2 | - | |
| Switching charge | Q_{sw} | | - | 7.0 | - | |
| Gate charge total | Q_g | | - | 30 | 40 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 3.2 | - | |
| Gate charge total | Q_g | $V_{DD}=20\text{ V}, I_D=30\text{ A}, V_{GS}=0\text{ to }4.5\text{ V}$ | - | 14 | 19 | nC |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V}, V_{GS}=0\text{ to }10\text{ V}$ | - | 28 | - | |
| Output charge | Q_{oss} | $V_{DD}=20\text{ V}, V_{GS}=0\text{ V}$ | - | 20 | - | |

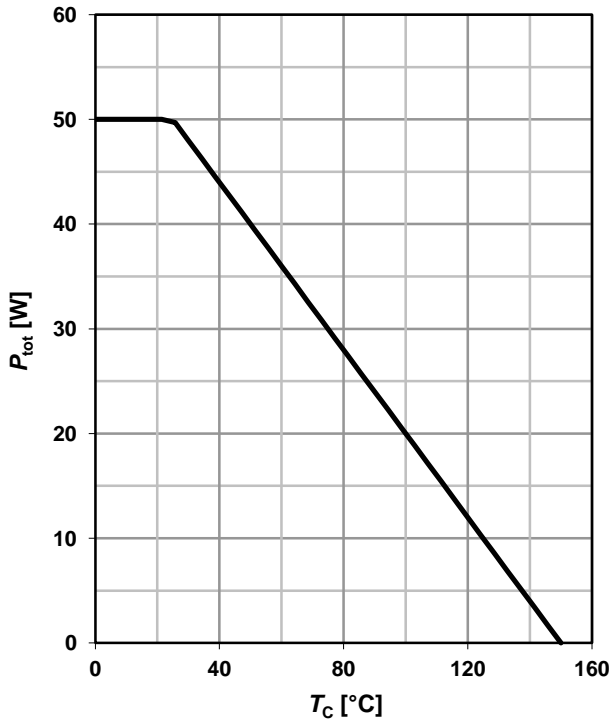
Reverse Diode

| | | | | | | |
|----------------------------------|---------------|--|---|------|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 42 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 292 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=50\text{ A}, T_J=25\text{ }^\circ\text{C}$ | - | 0.88 | 1.2 | V |
| Reverse recovery charge | Q_{rr} | $V_R=20\text{ V}, I_F=I_S, di_F/dt=400\text{ A}/\mu\text{s}$ | - | 23 | - | nC |

⁵⁾ See figure 16 for gate charge parameter definition

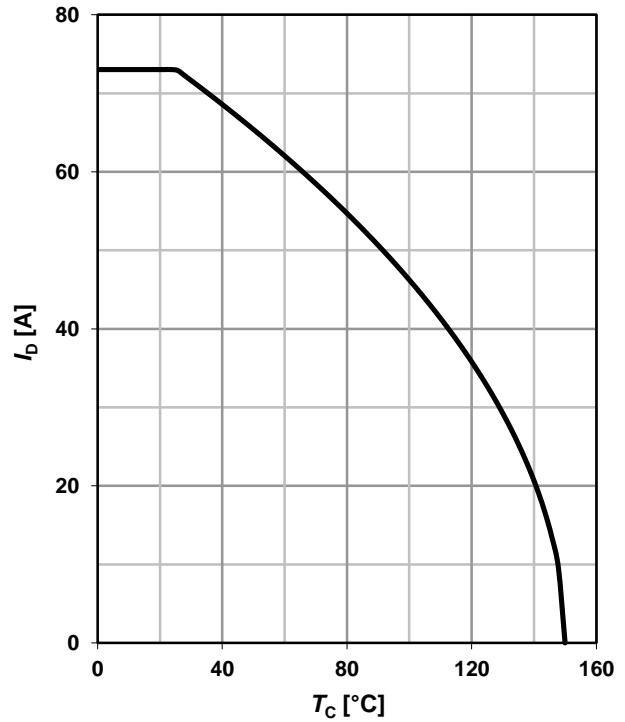
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

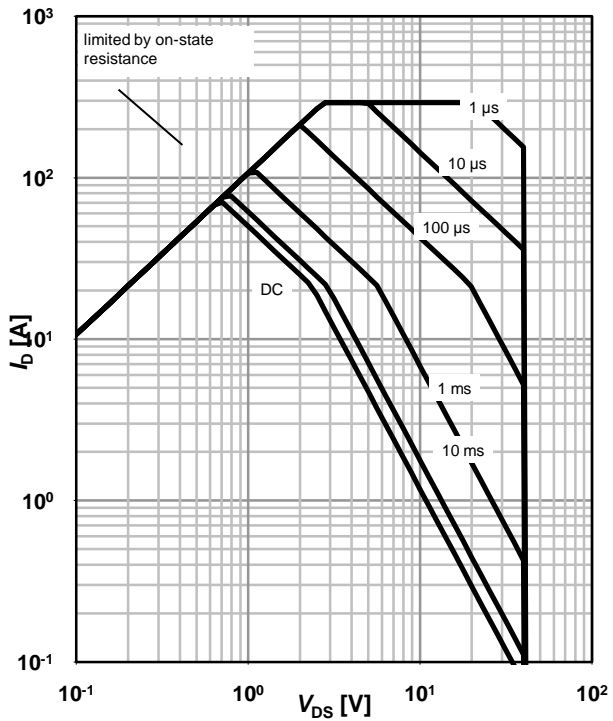
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



3 Safe operating area

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

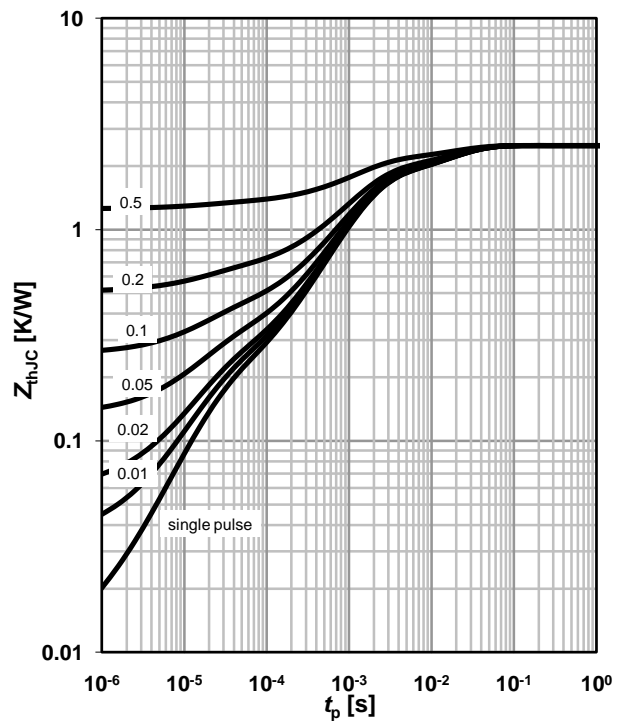
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

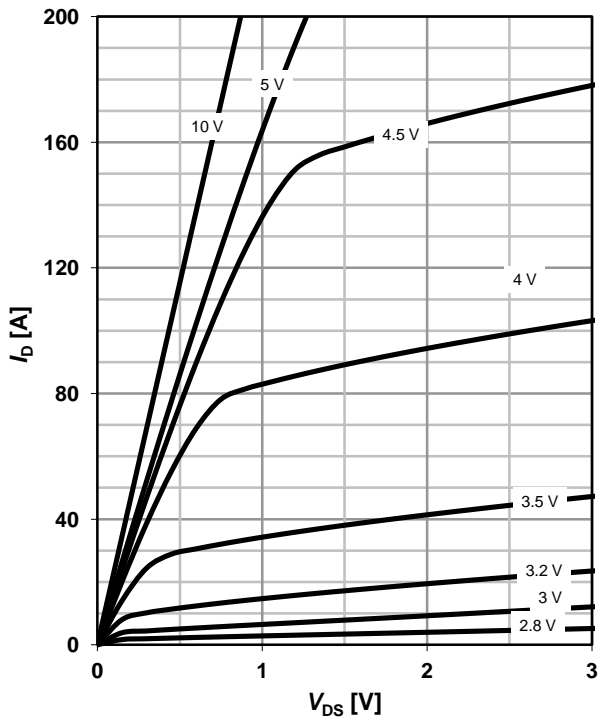
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

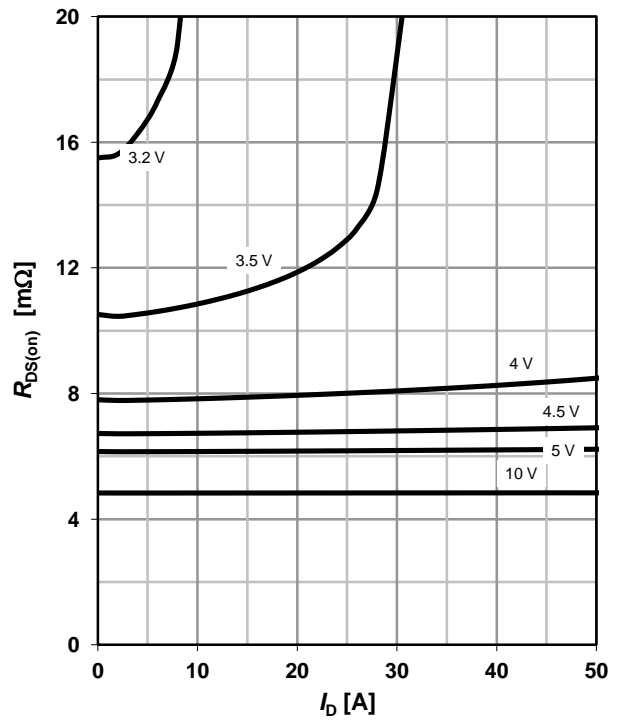
parameter: V_{GS}



6 Typ. drain-source on resistance

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

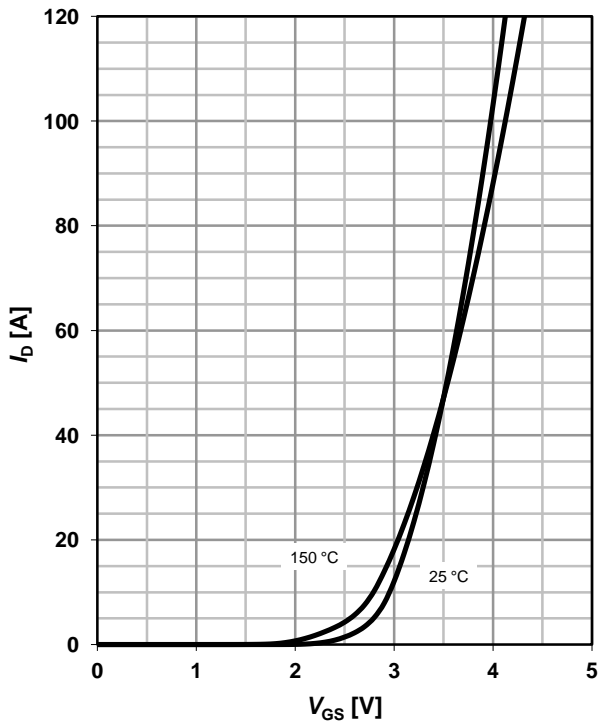
parameter: V_{GS}



7 Typ. transfer characteristics

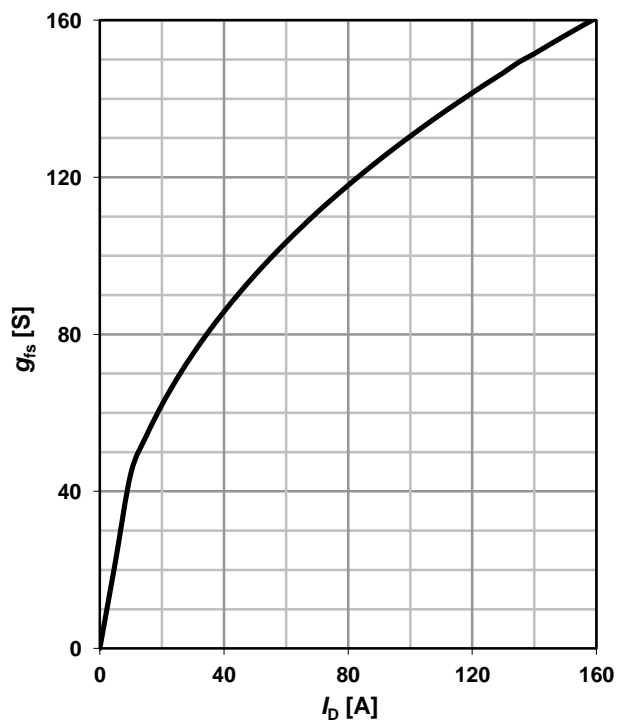
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



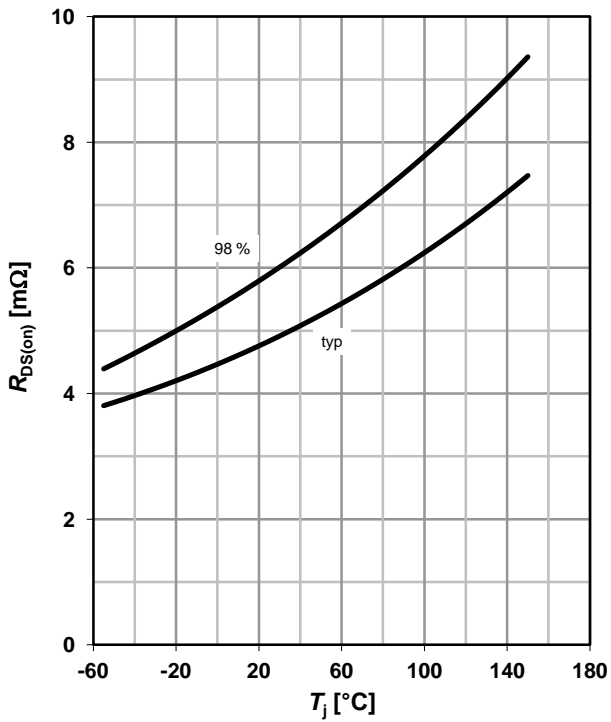
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



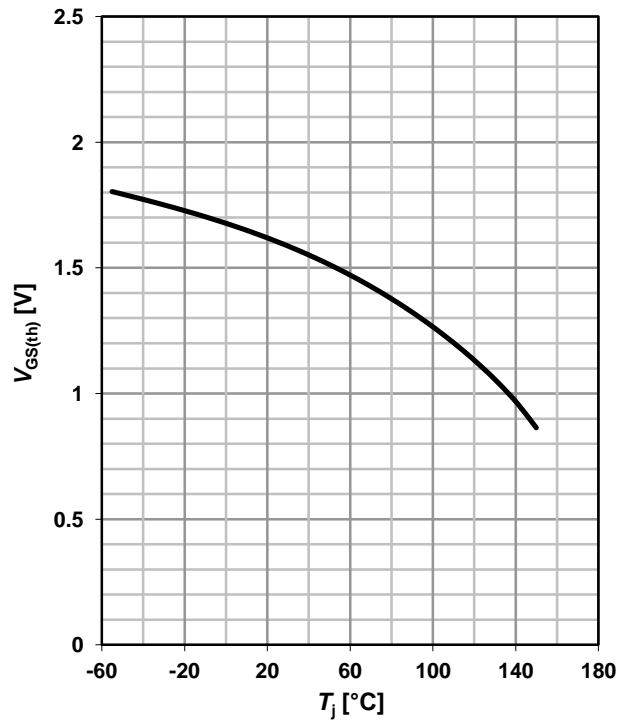
9 Drain-source on-state resistance

$R_{DS(on)}=f(T_j); I_D=50\text{ A}; V_{GS}=10\text{ V}$



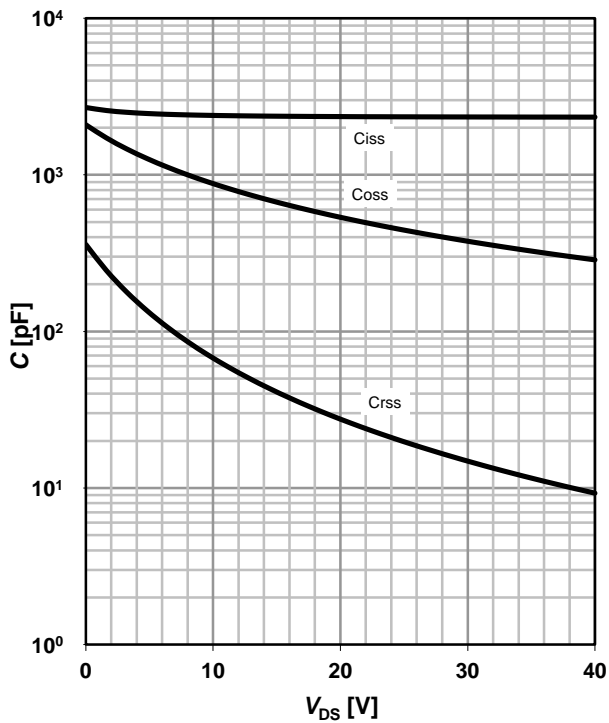
10 Typ. gate threshold voltage

$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=23\ \mu\text{A}$



11 Typ. capacitances

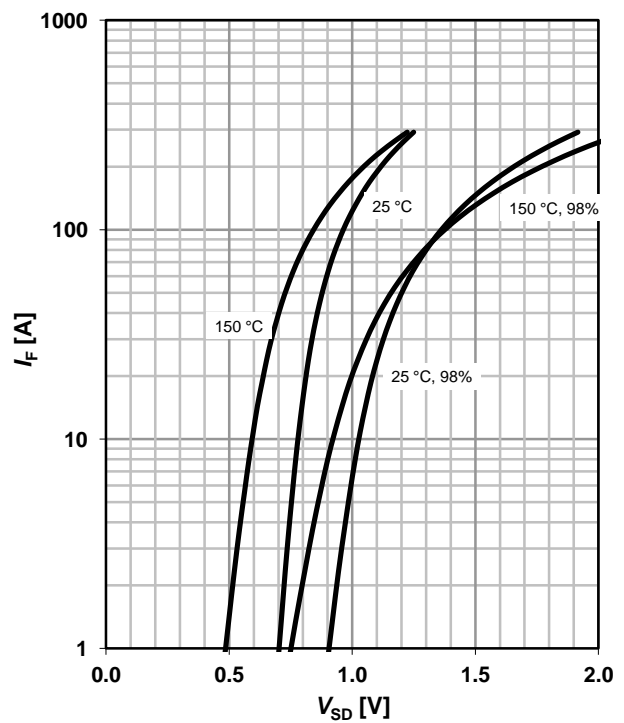
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

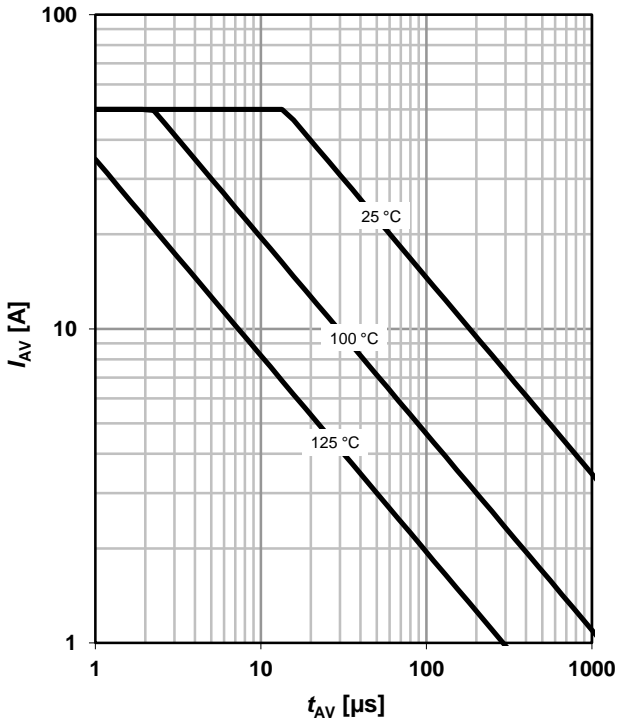
parameter: T_j



13 Avalanche characteristics

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

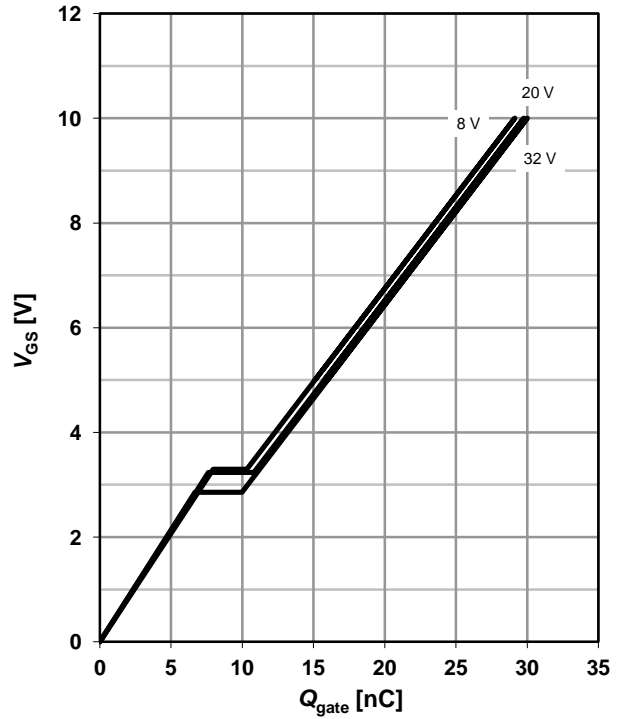
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

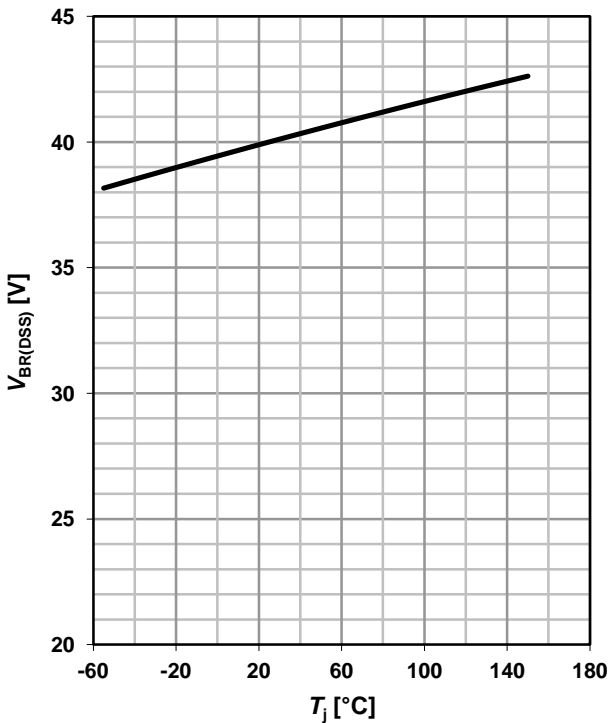
$V_{GS}=f(Q_{\text{gate}}); I_D=30 \text{ A pulsed}$

parameter: V_{DD}

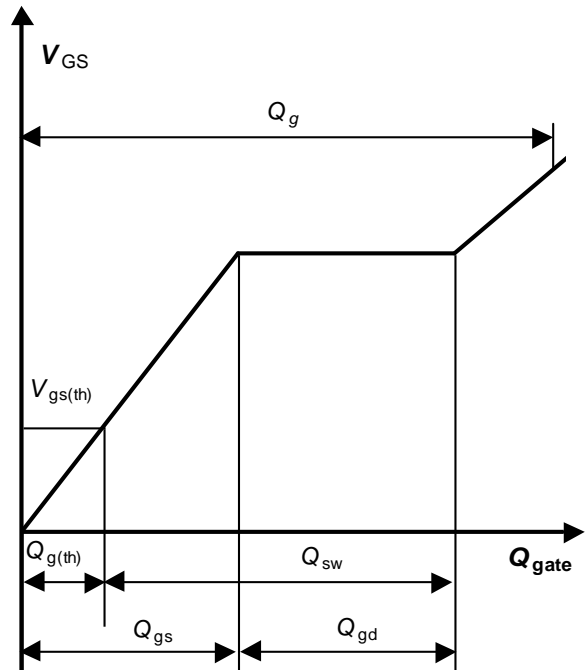


15 Drain-source breakdown voltage

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



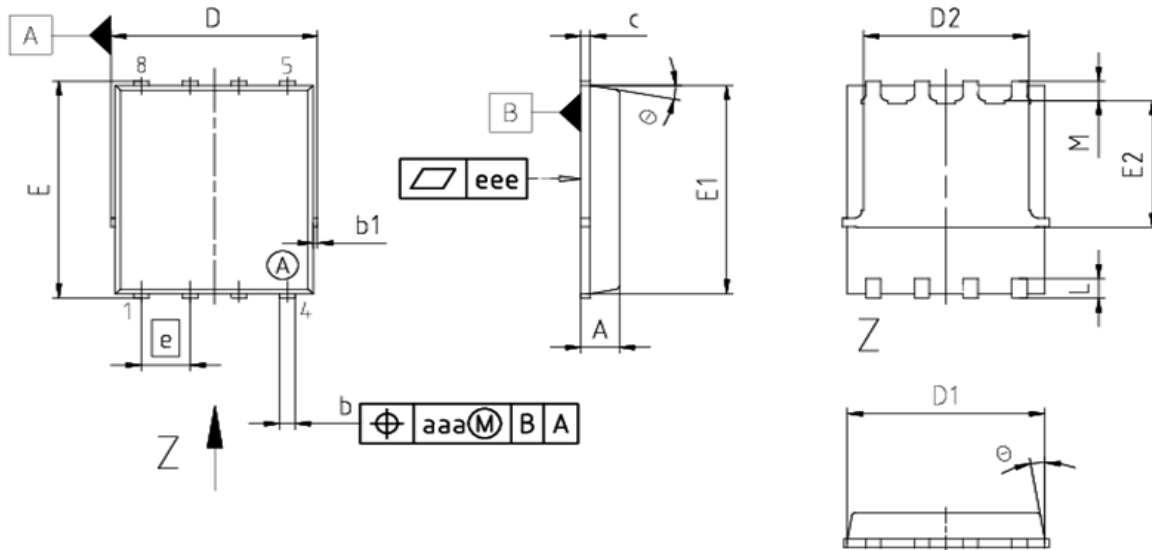
16 Gate charge waveforms



Package Outline

PG-TDSON-8

PG-TDSON-8-5: Outline



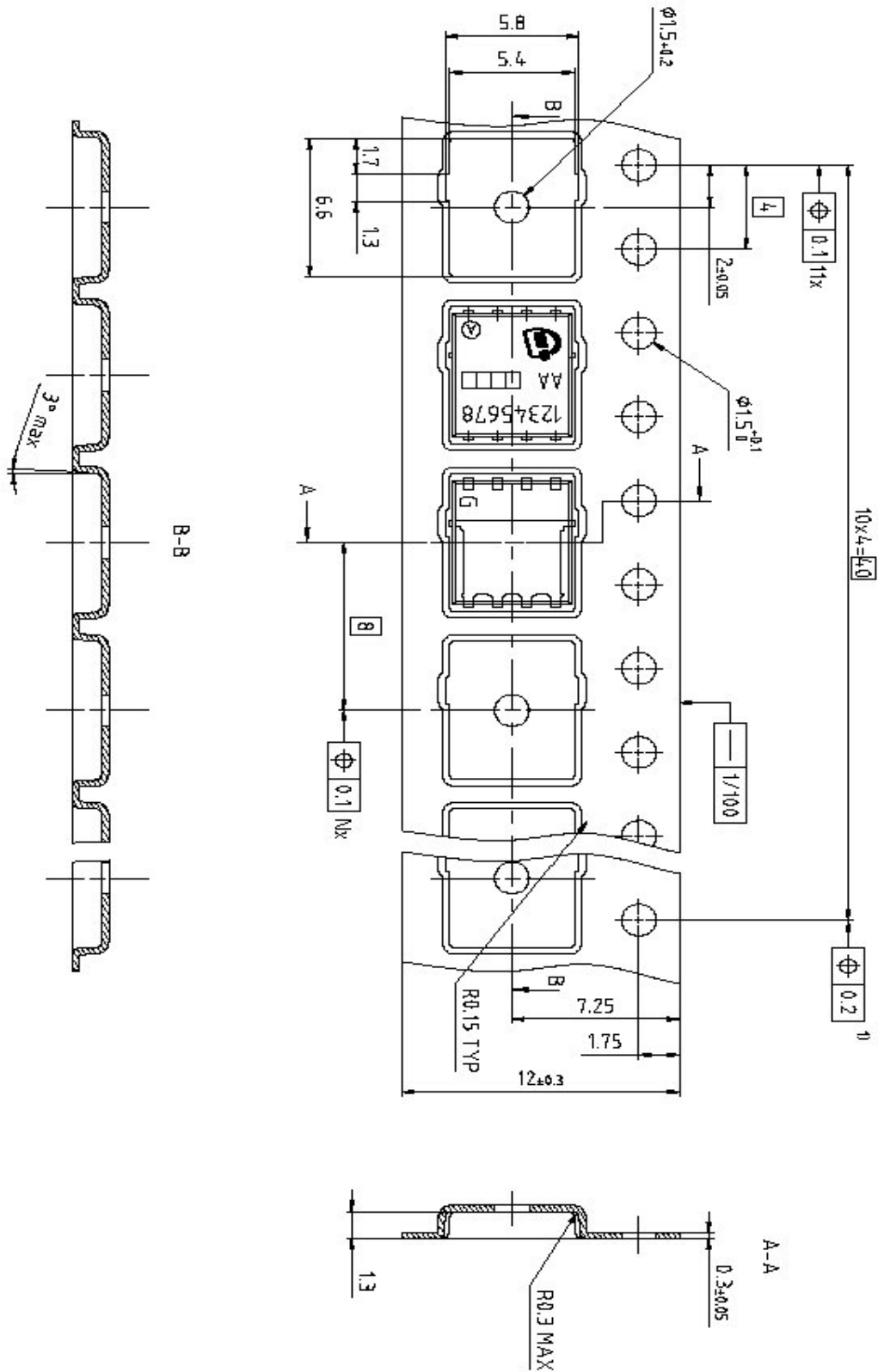
| DIM | MILLIMETERS | |
|-----|-------------|------|
| | MIN | MAX |
| A | 0.90 | 1.10 |
| b | 0.31 | 0.54 |
| b1 | 0.02 | 0.22 |
| c | 0.15 | 0.35 |
| D | 5.15 | 5.49 |
| D1 | 4.95 | 5.35 |
| D2 | 3.70 | 4.40 |
| E | 5.95 | 6.35 |
| E1 | 5.70 | 6.10 |
| E2 | 3.40 | 3.80 |
| e | 1.27 | |
| N | 8 | |
| L | 0.45 | 0.71 |
| M | 0.45 | 0.75 |
| ϕ | 8.5° | 12° |
| aaa | 0.25 | |
| eee | 0.08 | |

| |
|------------------------------------|
| DOCUMENT NO. Z8B00003332 |
| SCALE |
| EUROPEAN PROJECTION |
| ISSUE DATE 10-04-2013 |
| REVISION 04 |

Footprint

Package Outline

PG-TDSON-8: Tape



Dimensions in mm

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[SSM6P69NU,LF](#) [DMP22D4UFO-7B](#) [DMN1006UCA6-7](#)