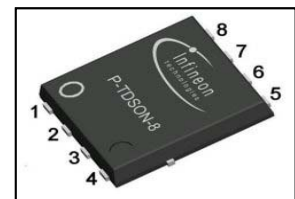


OptiMOS[®] 2 Power-Transistor
Features

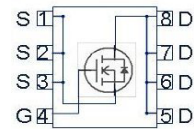
- Fast switching MOSFET for SMPS
- Optimized technology for notebook DC/DC converters
- Qualified according to JEDEC¹⁾ for target applications
- N-channel
- Logic level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- Avalanche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

Product Summary

| | | |
|------------------|-----|------------|
| V_{DS} | 30 | V |
| $R_{DS(on),max}$ | 9.4 | m Ω |
| I_D | 35 | A |

P-TDSON-8


| Type | Package | Ordering Code | Marking |
|--------------|-----------|---------------|---------|
| BSC094N03S G | P-TDSON-8 | Q67042 S4291 | 094N03S |


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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|----------------|---|-------------|-------------------|
| Continuous drain current | I_D | $T_C=25\text{ }^\circ\text{C}$ | 35 | A |
| | | $T_C=100\text{ }^\circ\text{C}$ | 35 | |
| | | $T_A=25\text{ }^\circ\text{C}$, $R_{thJA}=45\text{ K/W}^2$ | 14.6 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_C=25\text{ }^\circ\text{C}^3$ | 140 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=35\text{ A}$, $R_{GS}=25\text{ }\Omega$ | 90 | mJ |
| Reverse diode dv/dt | dv/dt | $I_D=40\text{ A}$, $V_{DS}=24\text{ V}$, $di/dt=200\text{ A}/\mu\text{s}$, $T_{j,max}=150\text{ }^\circ\text{C}$ | 6 | kV/ μs |
| Gate source voltage | V_{GS} | | ± 20 | V |
| Power dissipation | P_{tot} | $T_C=25\text{ }^\circ\text{C}$ | 52 | W |
| | | $T_A=25\text{ }^\circ\text{C}$, $R_{thJA}=45\text{ K/W}^2$ | 2.8 | |
| Operating and storage temperature | T_j, T_{stg} | | -55 ... 150 | $^\circ\text{C}$ |
| 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} | | - | - | 2.4 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | minimal footprint | - | - | 62 | |
| | | 6 cm ² cooling area ²⁾ | - | - | 45 | |

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

| | | | | | | |
|----------------------------------|---------------|--|-----|------|-----|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$ | 30 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=25\text{ }\mu\text{A}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$ | - | 0.1 | 1 | μA |
| | | $V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$ | - | 10 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$ | - | 10 | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=4.5\text{ V}, I_D=30\text{ A}$ | - | 11.2 | 14 | m Ω |
| | | $V_{GS}=10\text{ V}, I_D=35\text{ A}$ | - | 7.8 | 9.4 | |
| Gate resistance | R_G | | - | 1 | - | Ω |
| Transconductance | g_{fs} | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=35\text{ A}$ | 26 | 53 | - | S |

¹⁾J-STD20 and JESD22

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.

²⁾ See figure 3

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

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$ | - | 1350 | 1800 | pF |
| Output capacitance | C_{oss} | | - | 480 | 640 | |
| Reverse transfer capacitance | C_{rss} | | - | 64 | 96 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$ $I_D=17.5\text{ A}, R_G=2.7\ \Omega$ | - | 4.5 | 6.8 | ns |
| Rise time | t_r | | - | 3.8 | 5.7 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 18 | 27 | |
| Fall time | t_f | | - | 3.0 | 4.5 | |

Gate Charge Characteristics³⁾

| | | | | | | |
|------------------------------|---------------|---|---|-----|-----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=15\text{ V}, I_D=17.5\text{ A},$ $V_{GS}=0\text{ to }5\text{ V}$ | - | 4.3 | 5.7 | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 2.2 | 2.9 | |
| Gate to drain charge | Q_{gd} | | - | 2.8 | 4.2 | |
| Switching charge | Q_{sw} | | - | 4.9 | 7.0 | |
| Gate charge total | Q_g | | - | 10 | 14 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 3.2 | - | |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }5\text{ V}$ | - | 9 | 12 | nC |
| Output charge | Q_{oss} | $V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$ | - | 11 | 14 | |

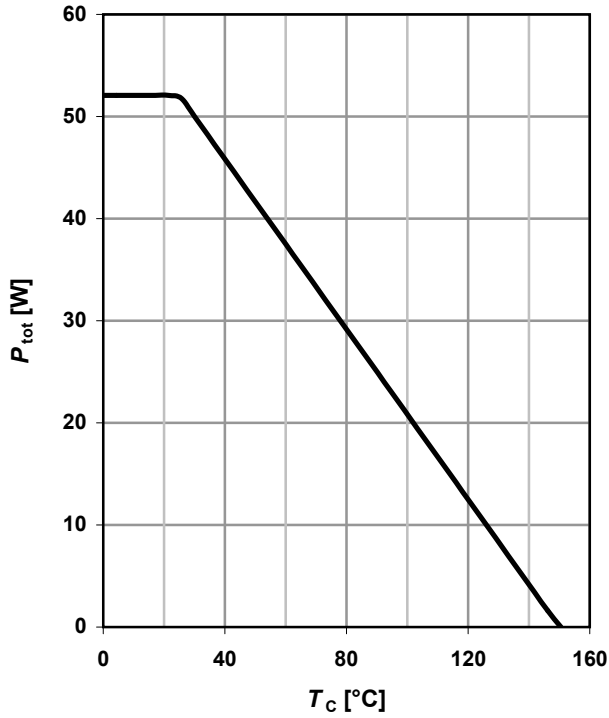
Reverse Diode

| | | | | | | |
|----------------------------------|---------------|---|---|------|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 35 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 140 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=35\text{ A},$ $T_j=25\text{ }^\circ\text{C}$ | - | 0.93 | 1.2 | V |
| Reverse recovery charge | Q_{rr} | $V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$ | - | - | 10 | nC |

³⁾ See figure 16 for gate charge parameter definition

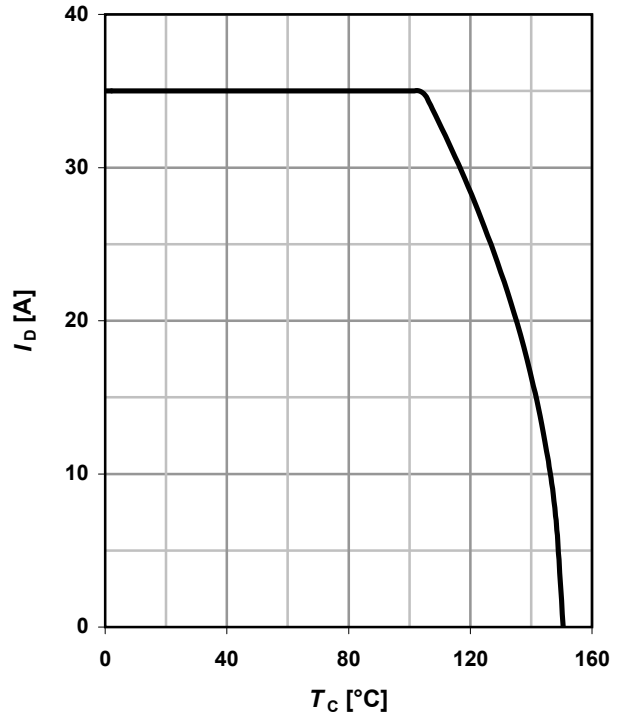
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

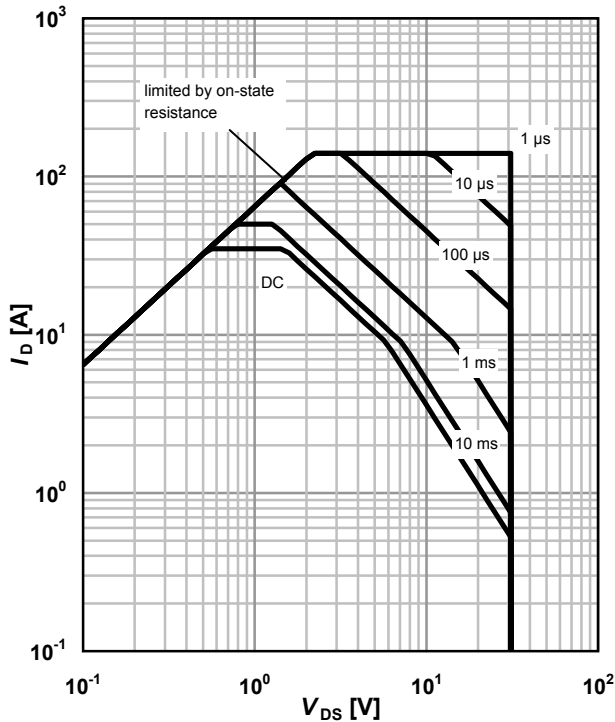
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



3 Safe operating area

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

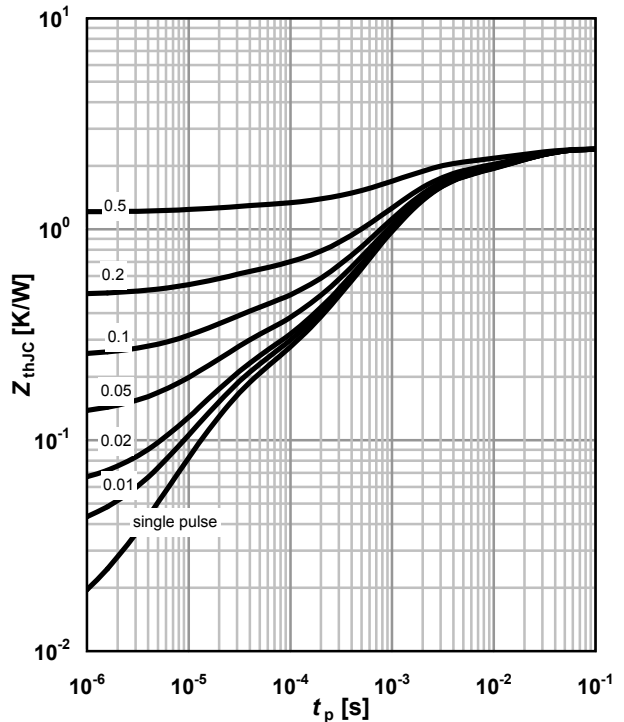
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

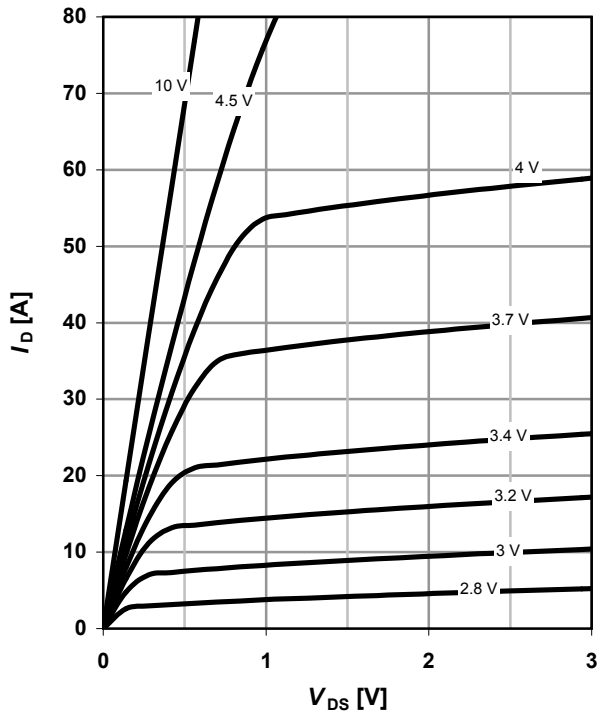
parameter: $D=t_p/T$



5 Typ. output characteristics

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

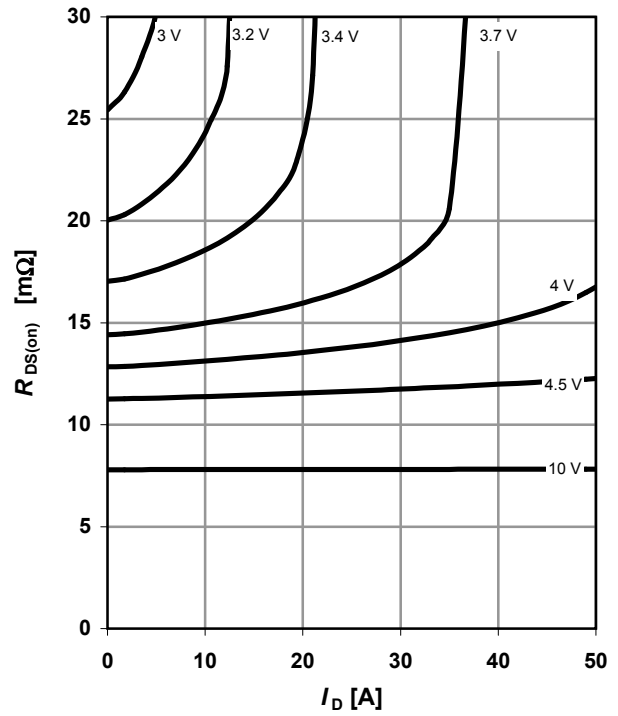
parameter: V_{GS}



6 Typ. drain-source on resistance

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

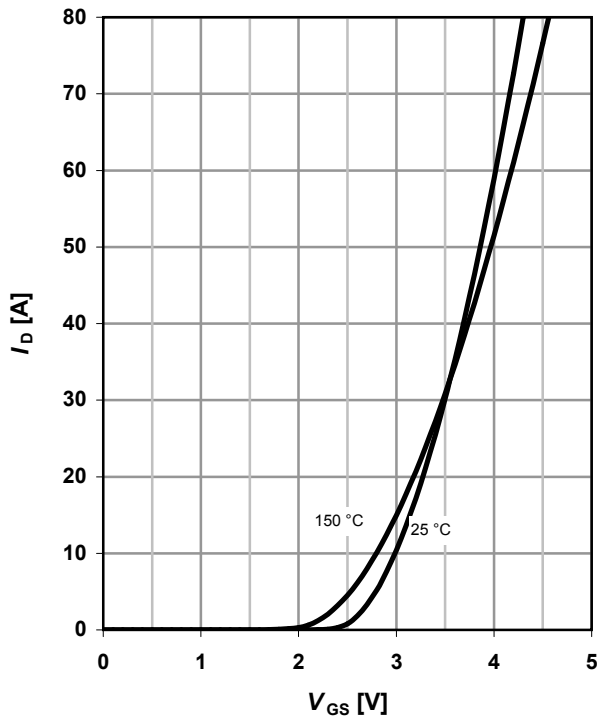
parameter: V_{GS}



7 Typ. transfer characteristics

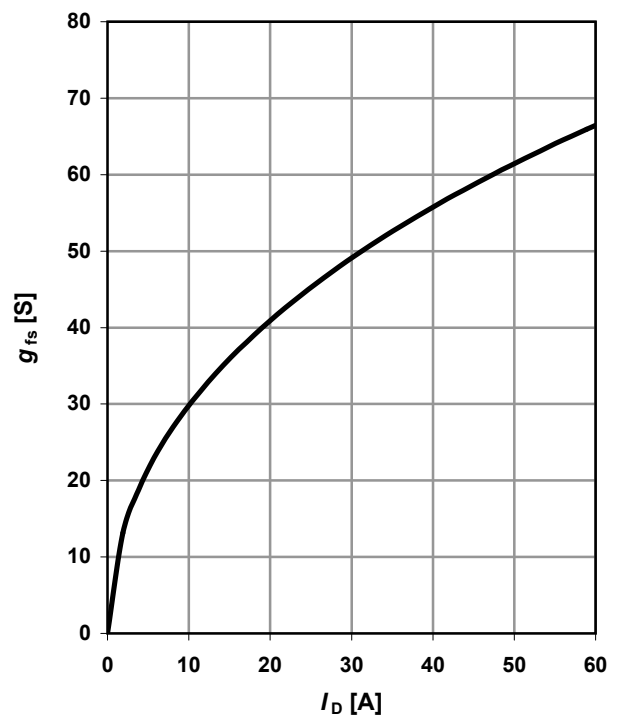
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



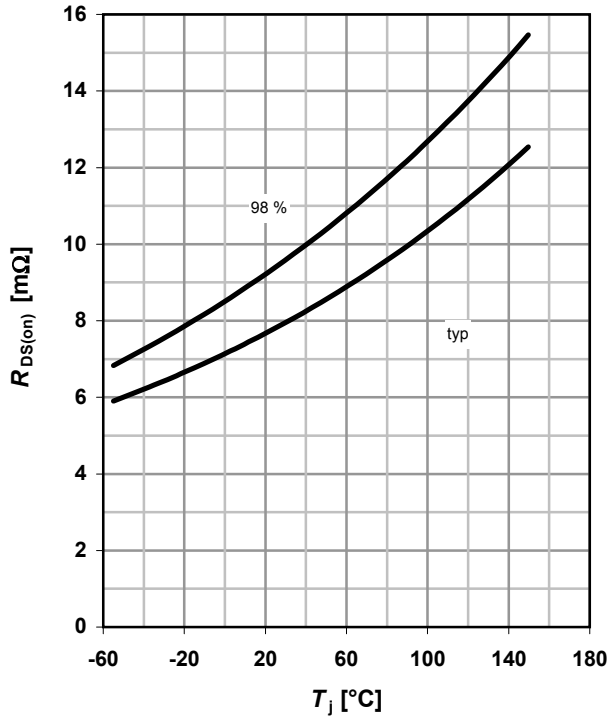
8 Typ. forward transconductance

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



9 Drain-source on-state resistance

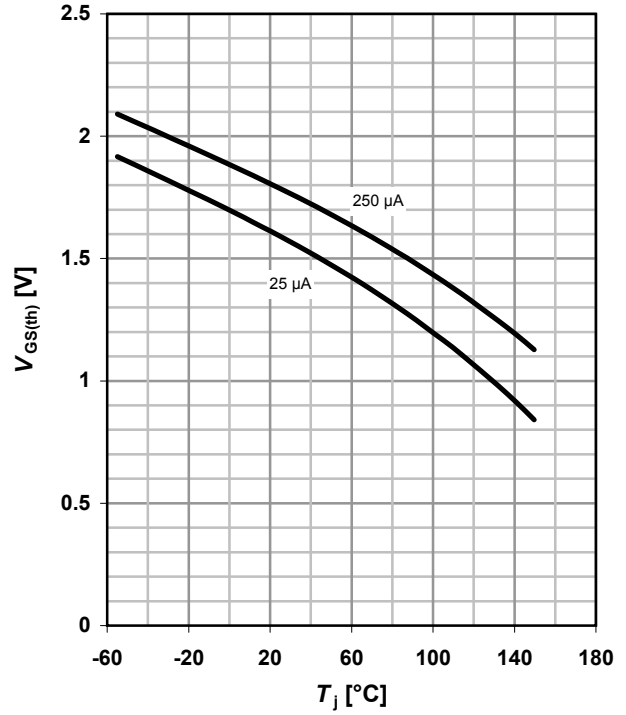
$R_{DS(on)}=f(T_j); I_D=35\text{ A}; V_{GS}=10\text{ V}$



10 Typ. gate threshold voltage

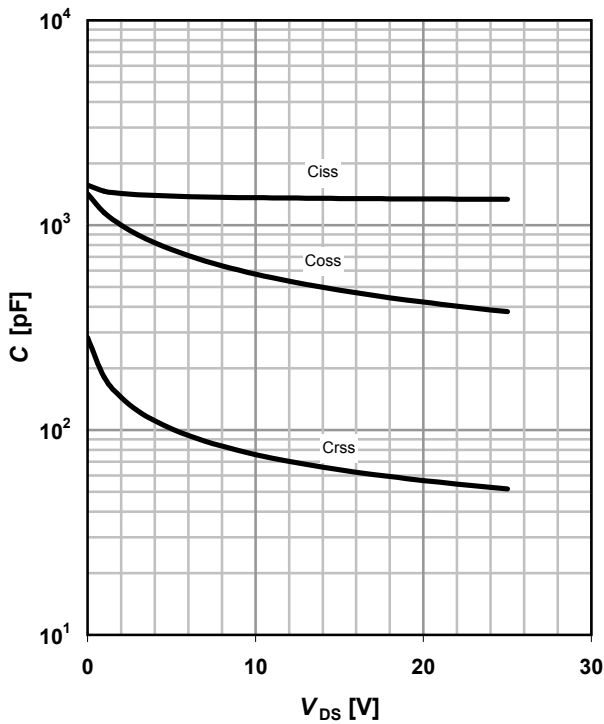
$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}$

parameter: I_D



11 Typ. capacitances

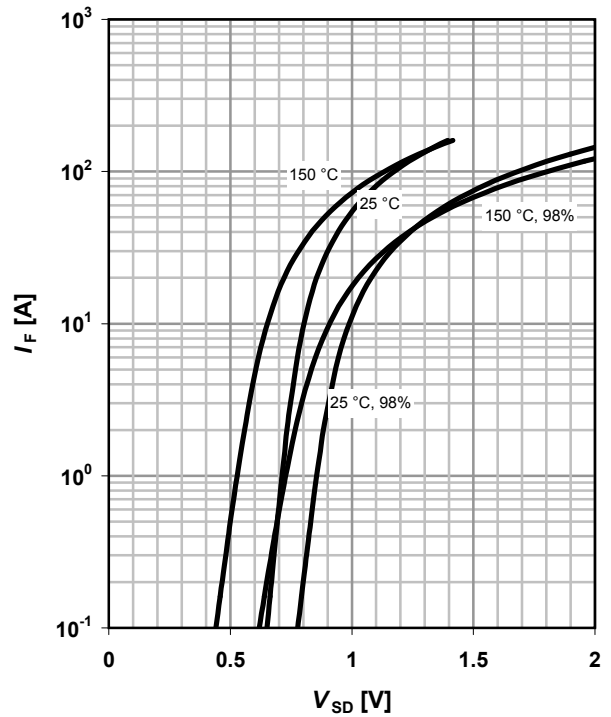
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

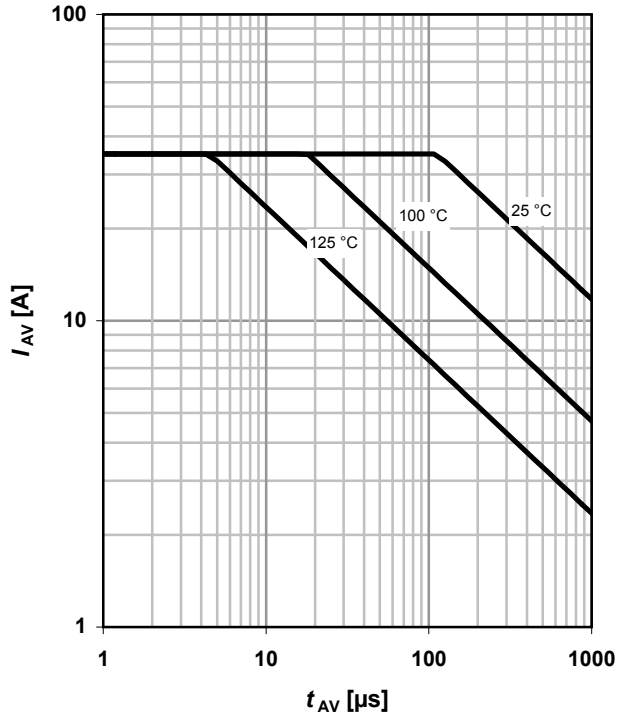
parameter: T_j



13 Avalanche characteristics

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

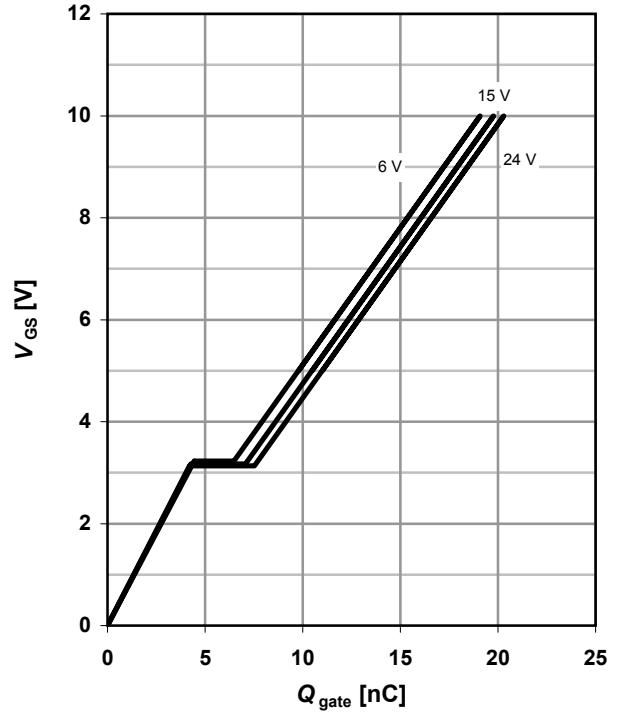
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

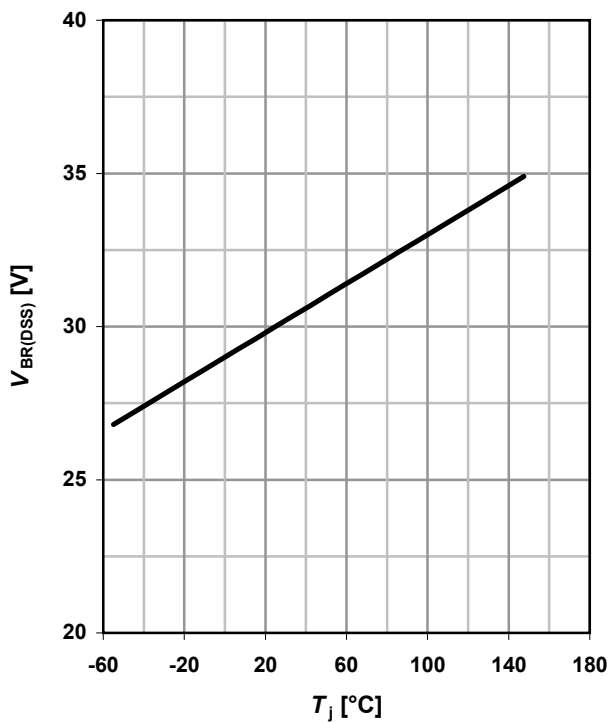
$V_{GS}=f(Q_{\text{gate}}); I_D=17.5 \text{ A pulsed}$

parameter: V_{DD}

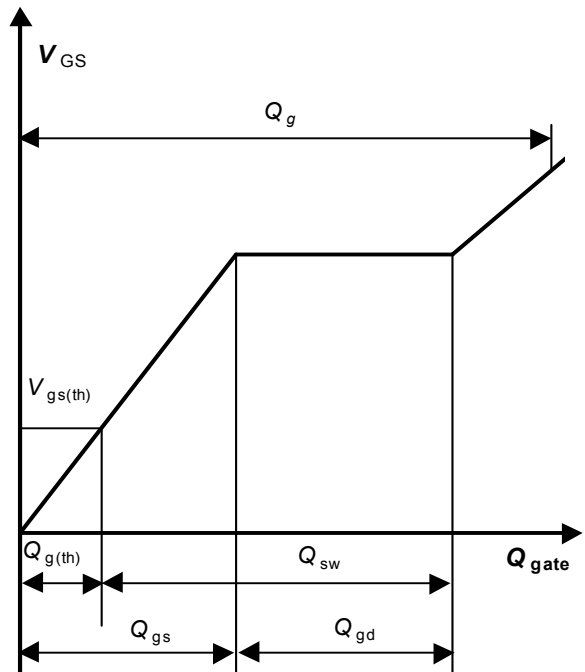


15 Drain-source breakdown voltage

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

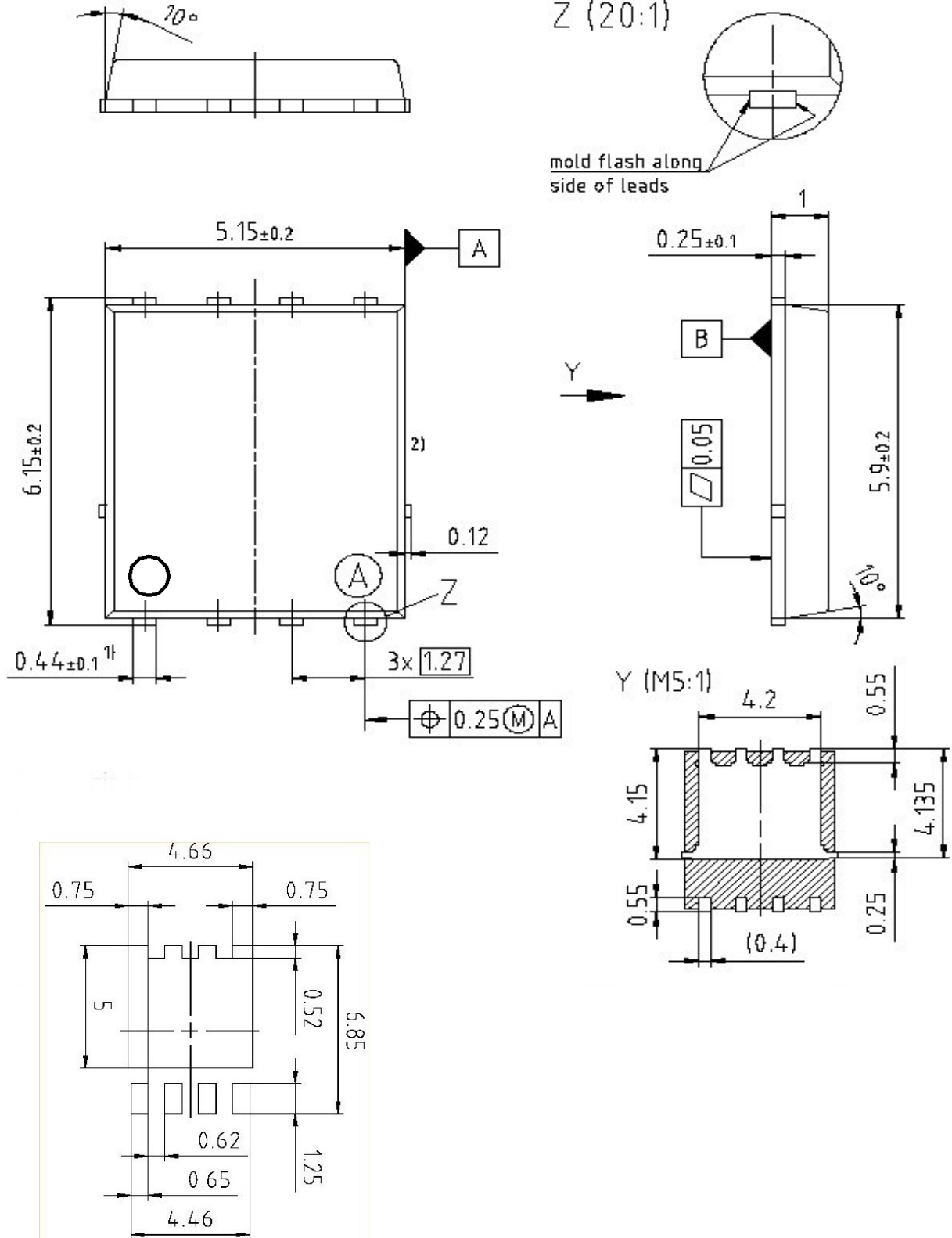


16 Gate charge waveforms



Package Outline

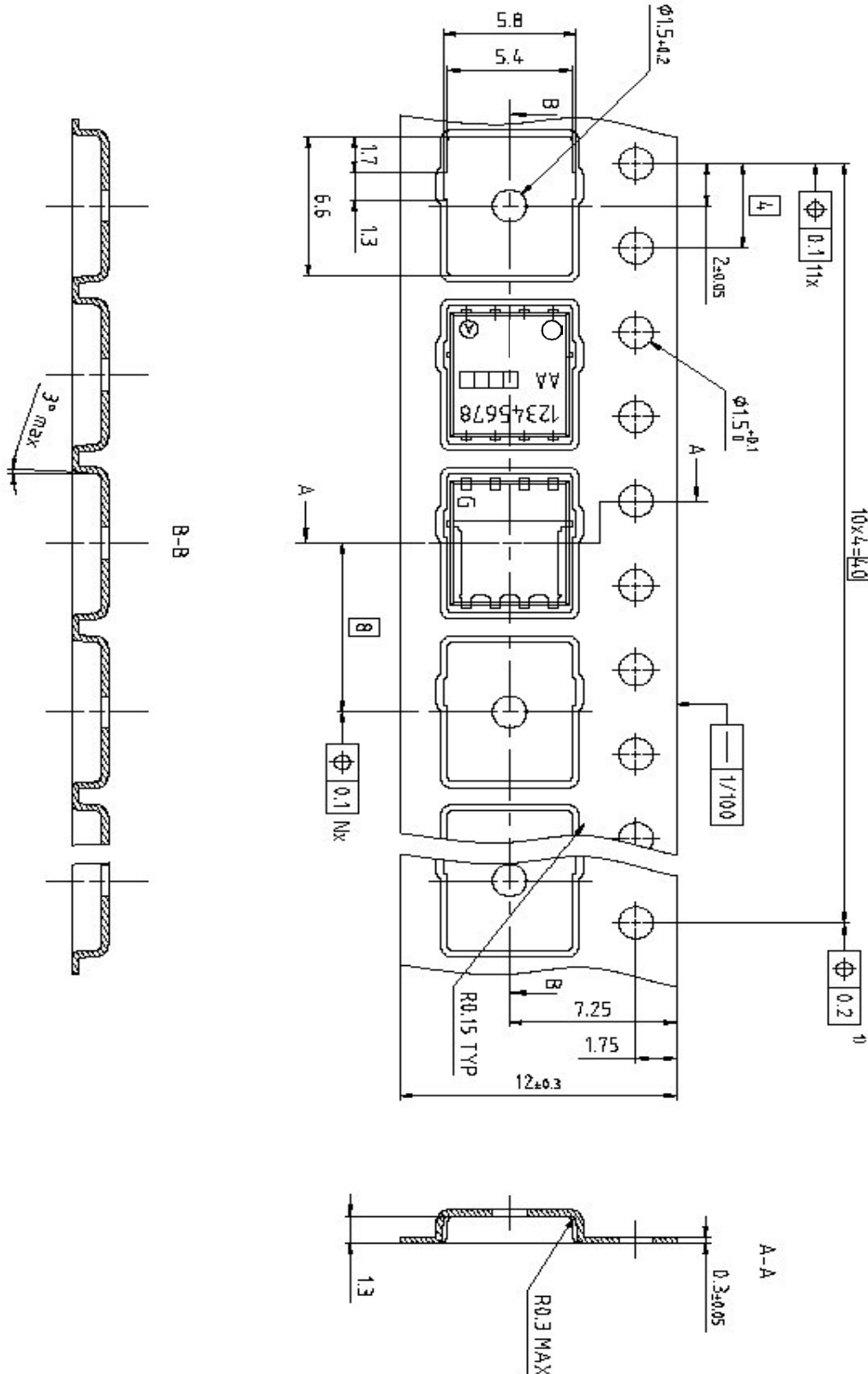
P-TDSON-8: Outline



Footprint
Dimensions in mm

Package Outline

P-TDSON-8: Tape



Dimensions in mm

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