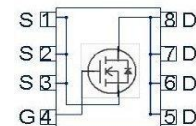


OptiMOS™3 M-Series Power-MOSFET
Features

- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM_{SW} for High Frequency SMPS
- 100% avalanche tested
- N-channel
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Qualified according to JEDEC¹⁾ for target applications
- Superior thermal resistance
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

Product Summary

| | | | |
|------------------|-----------------------|-----|----|
| V_{DS} | | 30 | V |
| $R_{DS(on),max}$ | $V_{GS}=10\text{ V}$ | 3.5 | mΩ |
| | $V_{GS}=4.5\text{ V}$ | 4.3 | |
| I_D | | 40 | A |

PG-TSDSON-8


| Type | Package | Marking |
|---------------|-------------|---------|
| BSZ035N03MS G | PG-TSDSON-8 | 035N03M |

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

| Parameter | Symbol | Conditions | Value | Unit |
|---|---------------|--|-------|------|
| Continuous drain current | I_D | $V_{GS}=10\text{ V}, T_C=25\text{ °C}$ | 40 | A |
| | | $V_{GS}=10\text{ V}, T_C=100\text{ °C}$ | 40 | |
| | | $V_{GS}=4.5\text{ V}, T_C=25\text{ °C}$ | 40 | |
| | | $V_{GS}=4.5\text{ V}, T_C=100\text{ °C}$ | 40 | |
| | | $V_{GS}=4.5\text{ V}, T_A=25\text{ °C}, R_{thJA}=60\text{ K/W}^2)$ | 18 | |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 160 | |
| Avalanche current, single pulse ⁴⁾ | I_{AS} | $T_C=25\text{ °C}$ | 20 | |
| Avalanche energy, single pulse | E_{AS} | $I_D=20\text{ A}, R_{GS}=25\text{ Ω}$ | 150 | 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} | $T_C=25\text{ °C}$ | 69 | W |
| | | $T_A=25\text{ °C}$, $R_{\text{thJA}}=60\text{ K/W}^2)$ | 2.1 | |
| 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

| Parameter | Symbol | Conditions | min. | typ. | max. | Unit |
|-------------------------------------|-------------------|--|------|------|------|------|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 1.8 | K/W |
| Device on PCB | R_{thJA} | 6 cm ² cooling area ²⁾ | - | - | 60 | |

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

Static characteristics

| Parameter | Symbol | Conditions | min. | typ. | max. | Unit |
|----------------------------------|-----------------------------|---|------|------|------|---------------|
| Drain-source breakdown voltage | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}$, $I_{\text{D}}=1\text{ mA}$ | 30 | - | - | V |
| Gate threshold voltage | $V_{\text{GS(th)}}$ | $V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=250\text{ }\mu\text{A}$ | 1 | - | 2 | |
| Zero gate voltage drain current | I_{DSS} | $V_{\text{DS}}=30\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=25\text{ °C}$ | - | 0.1 | 1 | μA |
| | | $V_{\text{DS}}=30\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=125\text{ °C}$ | - | 10 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{\text{GS}}=16\text{ V}$, $V_{\text{DS}}=0\text{ V}$ | - | 10 | 100 | nA |
| Drain-source on-state resistance | $R_{\text{DS(on)}}$ | $V_{\text{GS}}=4.5\text{ V}$, $I_{\text{D}}=20\text{ A}$ | - | 3.4 | 4.3 | m Ω |
| | | $V_{\text{GS}}=10\text{ V}$, $I_{\text{D}}=20\text{ A}$ | - | 2.9 | 3.5 | |
| Gate resistance | R_{G} | | 0.9 | 1.8 | 3.2 | Ω |
| Transconductance | g_{fs} | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$, $I_{\text{D}}=30\text{ A}$ | 47 | 94 | - | 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

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

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|--|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=15\text{ V}, f=1\text{ MHz}$ | - | 4300 | 5700 | pF |
| Output capacitance | C_{oss} | | - | 1200 | 1600 | |
| Reverse transfer capacitance | C_{rss} | | - | 89 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=15\text{ V}, V_{GS}=10\text{ V}, I_D=30\text{ A}, R_{G,ext}=1.6\ \Omega$ | - | 10 | - | ns |
| Rise time | t_r | | - | 5.8 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 38 | - | |
| Fall time | t_f | | - | 4.8 | - | |

Gate Charge Characteristics⁵⁾

| | | | | | | |
|------------------------------|---------------|--|---|-----|-----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=15\text{ V}, I_D=30\text{ A}, V_{GS}=0\text{ to }4.5\text{ V}$ | - | 12 | 16 | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 6.9 | 9.2 | |
| Gate to drain charge | Q_{gd} | | - | 5.9 | 9.9 | |
| Switching charge | Q_{sw} | | - | 11 | 17 | |
| Gate charge total | Q_g | | - | 27 | 35 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 2.8 | - | V |
| Gate charge total | Q_g | $V_{DD}=15\text{ V}, I_D=30\text{ A}, V_{GS}=0\text{ to }10\text{ V}$ | - | 56 | 74 | nC |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V}, V_{GS}=0\text{ to }4.5\text{ V}$ | - | 23 | 31 | |
| Output charge | Q_{oss} | $V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$ | - | 32 | 43 | |

Reverse Diode

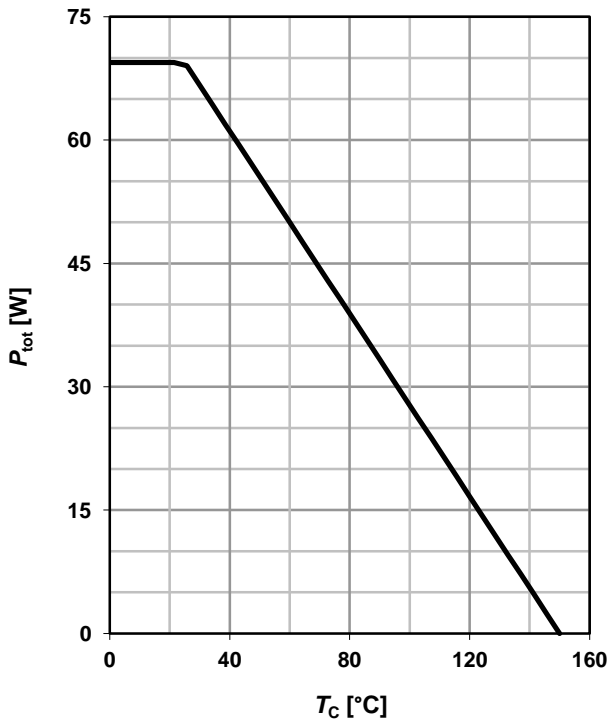
| | | | | | | |
|----------------------------------|---------------|--|---|------|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 40 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 160 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=20\text{ A}, T_j=25\text{ }^\circ\text{C}$ | - | 0.81 | 1.1 | V |
| Reverse recovery charge | Q_{rr} | $V_R=15\text{ V}, I_F=I_S, di_F/dt=400\text{ A}/\mu\text{s}$ | - | - | 20 | nC |

⁴⁾ See figure 13 for more detailed information

⁵⁾ See figure 16 for gate charge parameter definition

1 Power dissipation

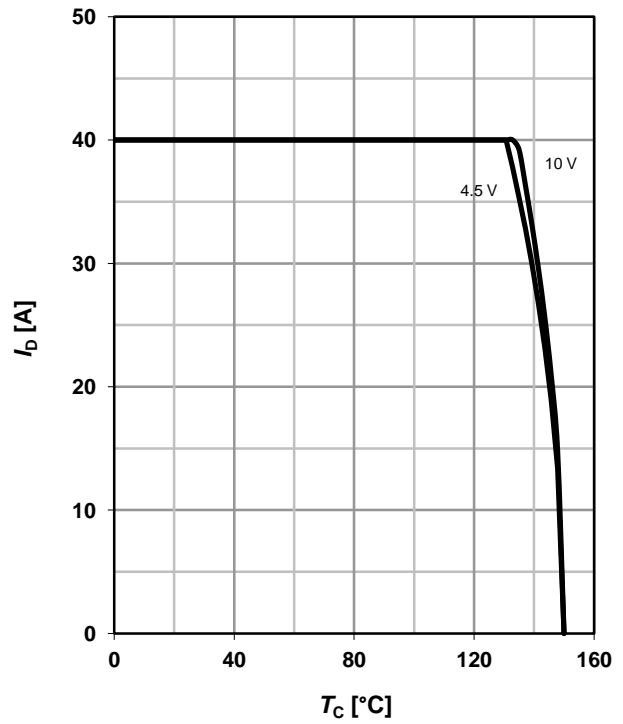
$P_{tot}=f(T_C)$



2 Drain current

$I_D=f(T_C)$

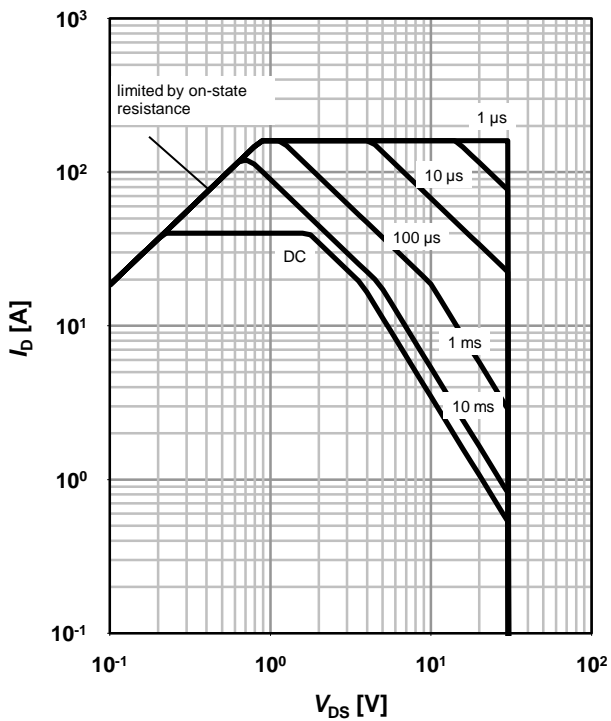
parameter: V_{GS}



3 Safe operating area

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

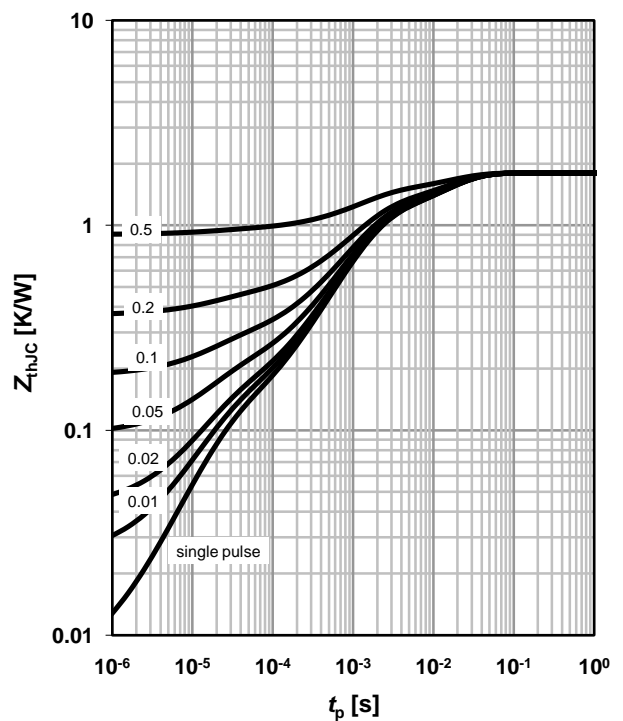
parameter: t_p



4 Max. transient thermal impedance

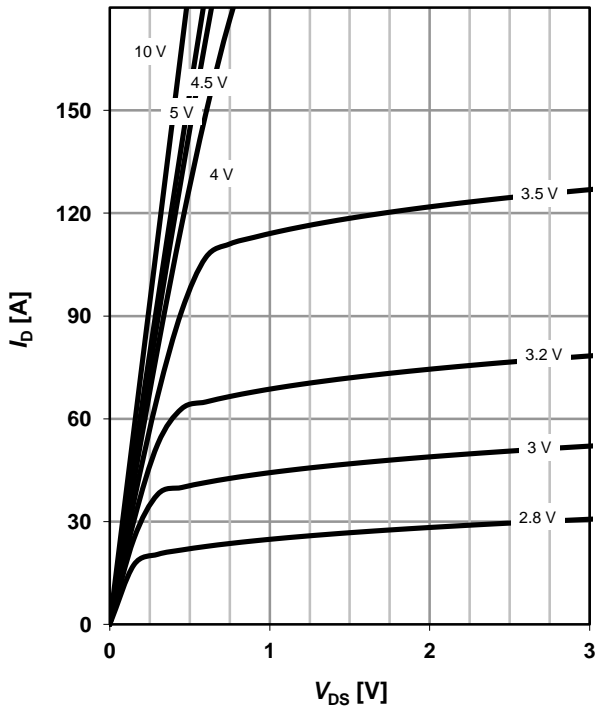
$Z_{thJC}=f(t_p)$

parameter: $D=t_p/T$

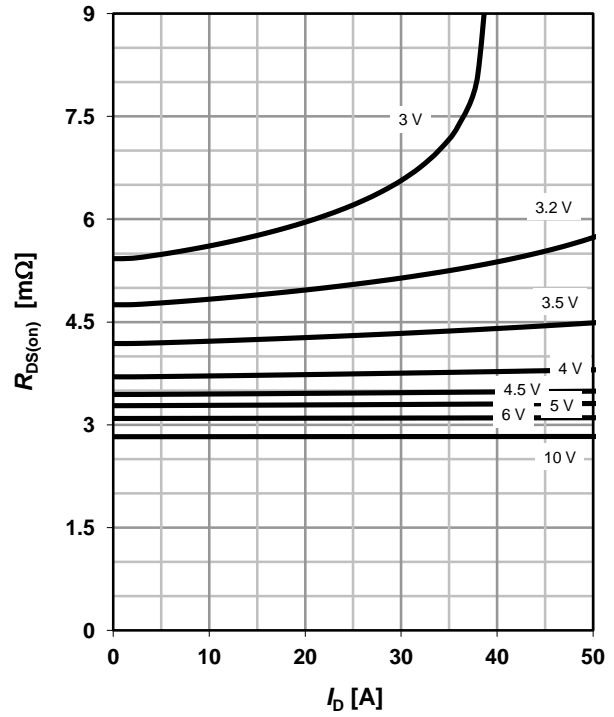


5 Typ. output characteristics

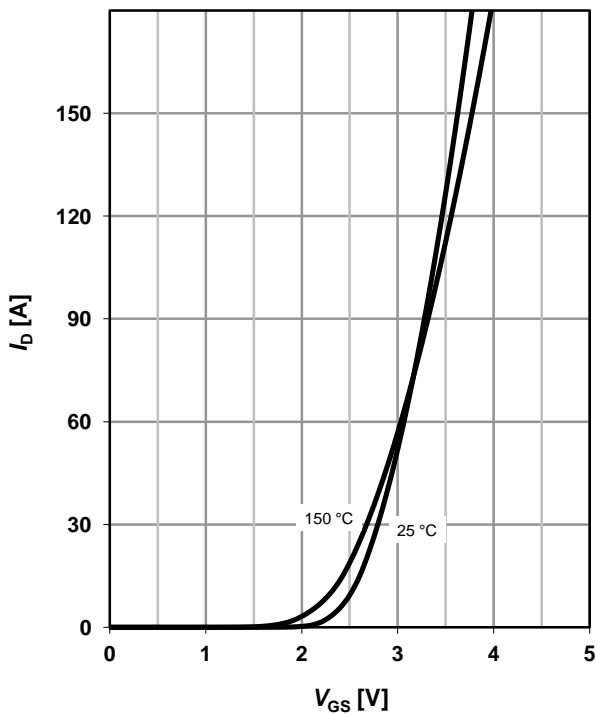
$$I_D = f(V_{DS}); T_j = 25\text{ °C}$$

 parameter: V_{GS}

6 Typ. drain-source on resistance

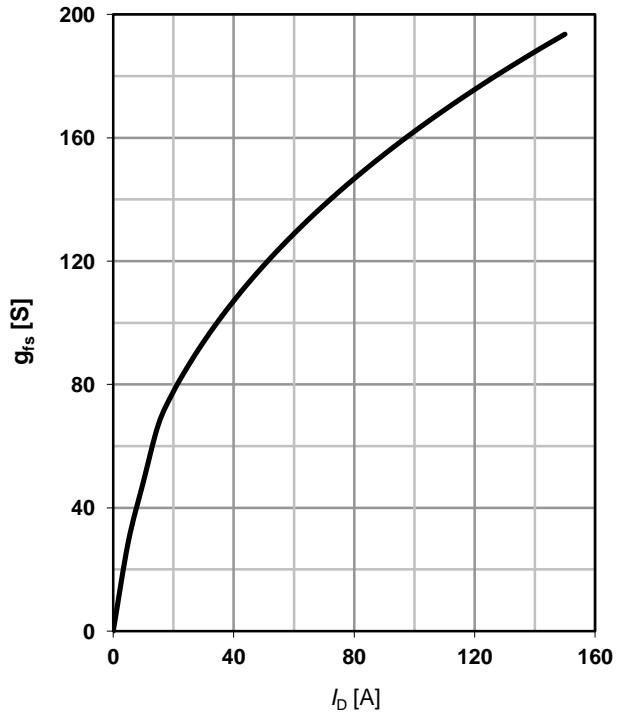
$$R_{DS(on)} = f(I_D); T_j = 25\text{ °C}$$

 parameter: V_{GS}

7 Typ. transfer characteristics

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

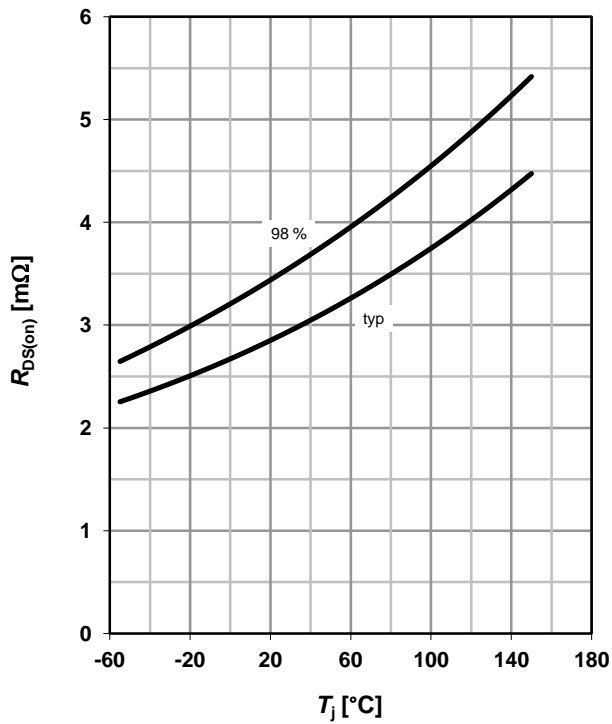
 parameter: T_j

8 Typ. forward transconductance

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

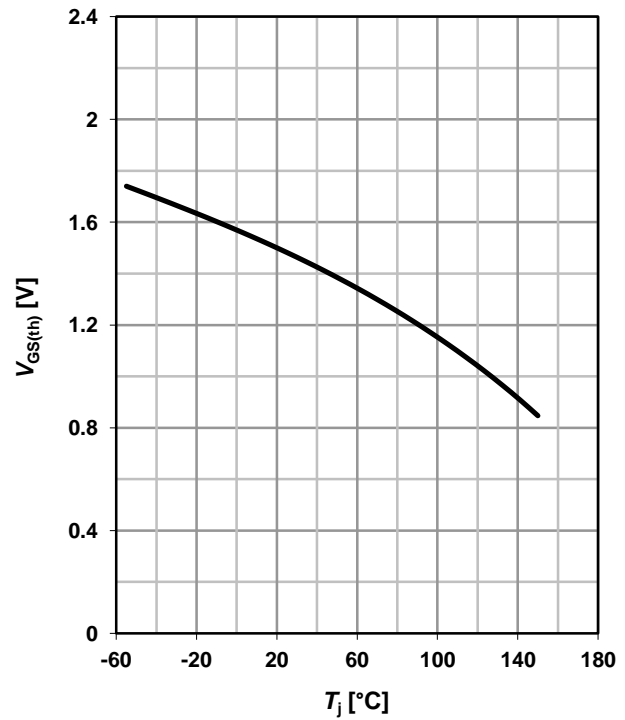


9 Drain-source on-state resistance

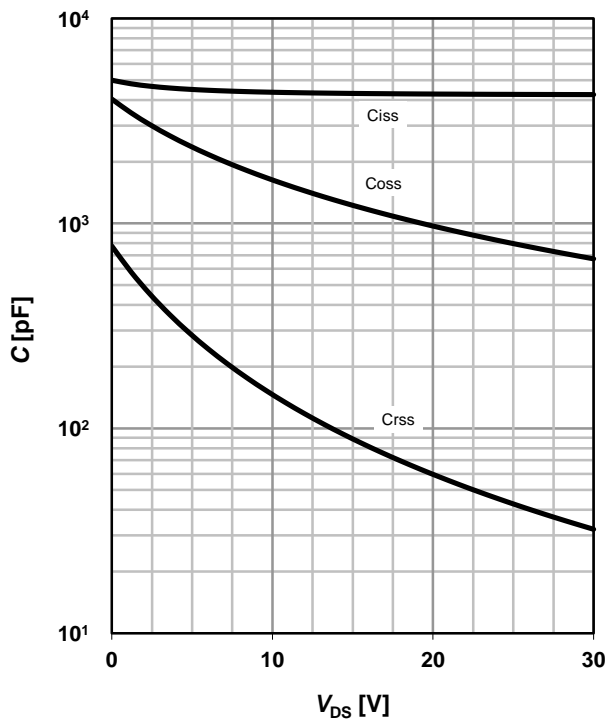
$$R_{DS(on)}=f(T_j); I_D=20\text{ A}; V_{GS}=10\text{ V}$$


10 Typ. gate threshold voltage

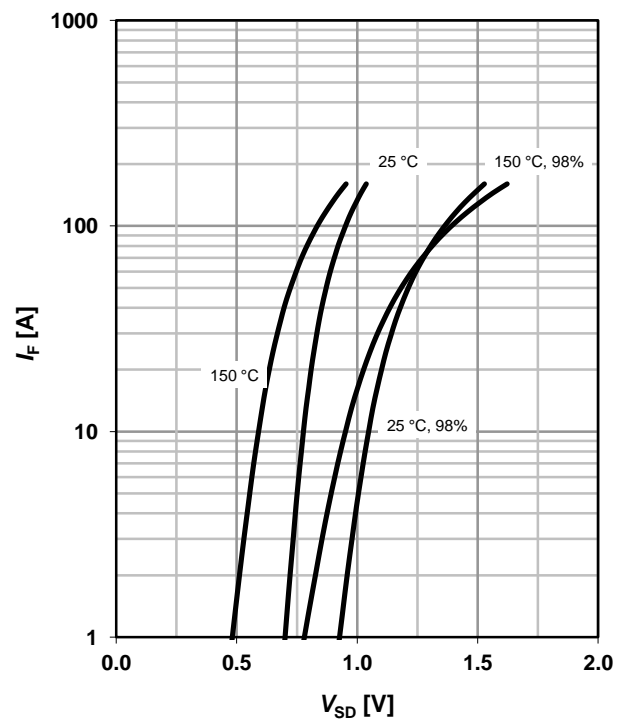
$$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=250\ \mu\text{A}$$


11 Typ. capacitances

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


12 Forward characteristics of reverse diode

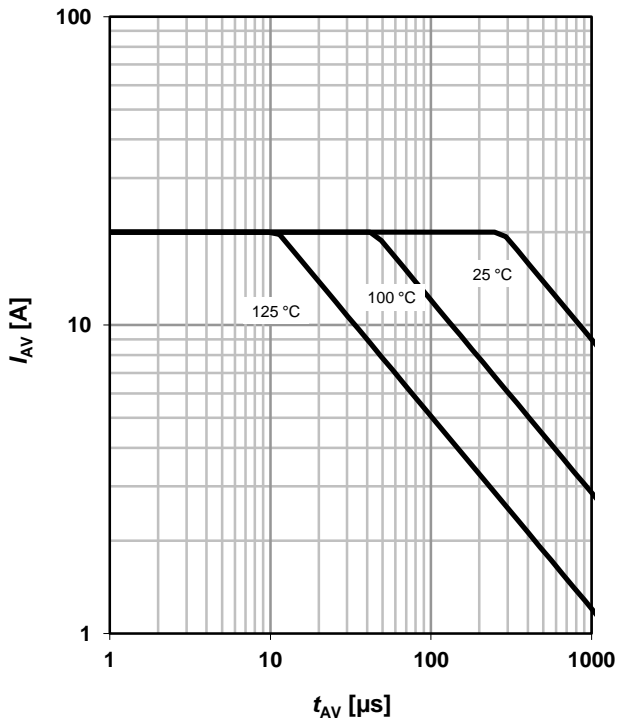
$$I_F=f(V_{SD})$$

 parameter: T_j


13 Avalanche characteristics

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

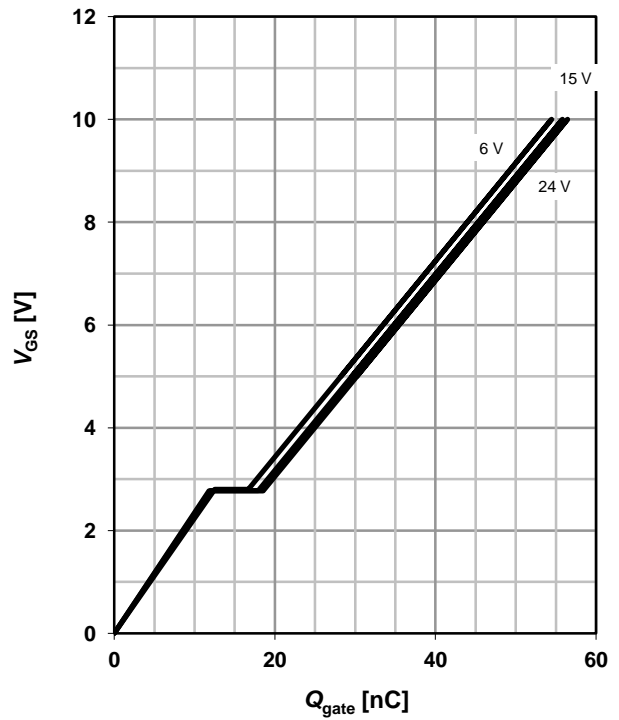
parameter: $T_{j(start)}$



14 Typ. gate charge

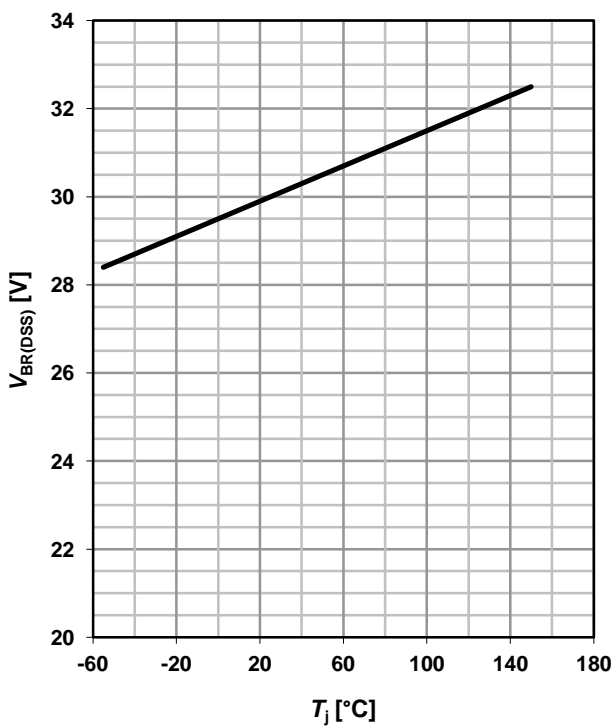
$V_{GS}=f(Q_{gate}); I_D=30 \text{ A pulsed}$

parameter: V_{DD}



15 Drain-source breakdown voltage

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

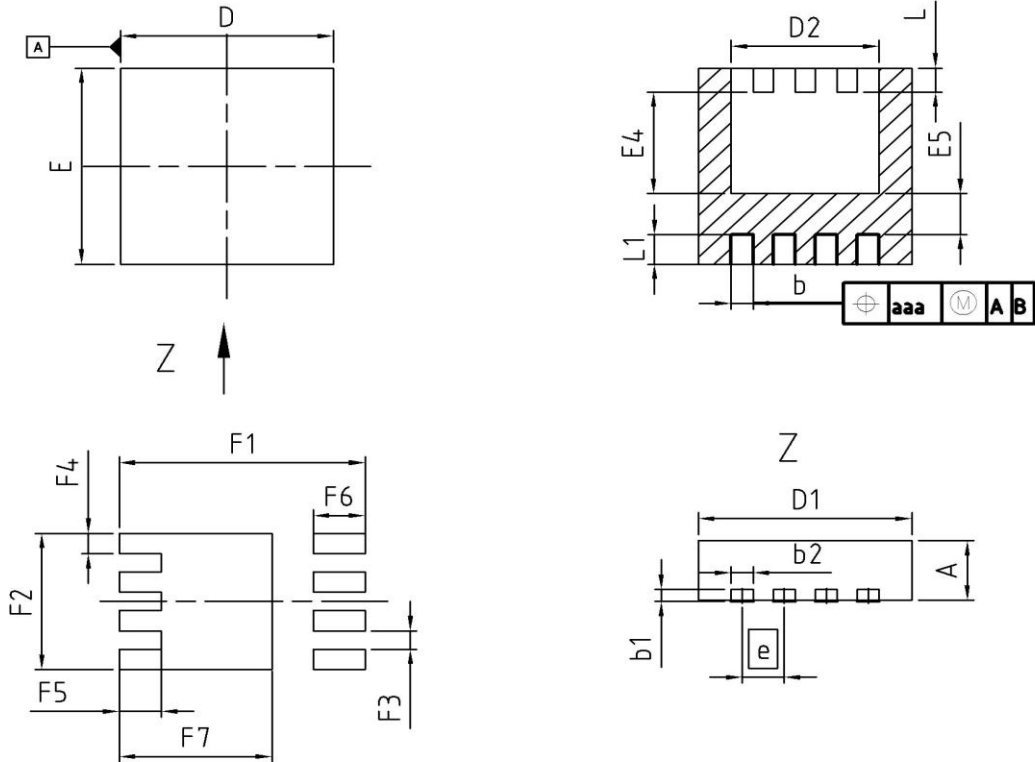


16 Gate charge waveforms



Package Outline

PG-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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