

OptiMOS™ Power-Transistor
Features

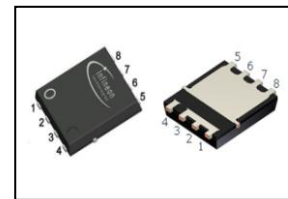
- Optimized for high performance SMPS, e.g. sync. rec.
- 100% avalanche tested
- Superior thermal resistance
- N-channel
- Qualified according to JEDEC¹⁾ for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Higher solder joint reliability due to enlarged source interconnection

Product Summary

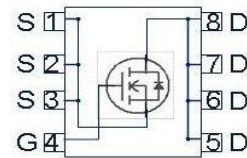
| | | |
|------------------|------|------------|
| V_{DS} | 60 | V |
| $R_{DS(on),max}$ | 1.45 | m Ω |
| I_D | 100 | A |
| Q_{OSS} | 100 | nC |
| $Q_G(0V..10V)$ | 89 | nC |

PG-TDSON-8 FL

enlarged source interconnection



| Type | Package | Marking |
|-------------|---------------|----------|
| BSC014N06NS | PG-TDSON-8 FL | 014N06NS |


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

| Parameter | Symbol | Conditions | Value | Unit |
|--|---------------|---|----------|------|
| Continuous drain current | I_D | $V_{GS}=10\text{ V}, T_C=25\text{ }^\circ\text{C}$ | 100 | A |
| | | $V_{GS}=10\text{ V}, T_C=100\text{ }^\circ\text{C}$ | 100 | |
| | | $V_{GS}=10\text{ V}, T_C=25\text{ }^\circ\text{C}, R_{thJA}=50\text{ K/W}^2)$ | 30 | |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | $T_C=25\text{ }^\circ\text{C}$ | 400 | |
| Avalanche energy, single pulse ⁴⁾ | E_{AS} | $I_D=50\text{ A}, R_{GS}=25\text{ }\Omega$ | 580 | mJ |
| Gate source voltage | V_{GS} | | ± 20 | V |

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.

³⁾ See figure 3 for more detailed information

⁴⁾ See figure 13 for more detailed information

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

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|-----------------------|--|-------------|------|
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 156 | 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 | - | - | 0.8 | 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 | $V_{(\text{BR})\text{DSS}}$ | $V_{\text{GS}}=0\text{ V}$, $I_{\text{D}}=1\text{ mA}$ | 60 | - | - | V |
| Gate threshold voltage | $V_{\text{GS(th)}}$ | $V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=120\text{ }\mu\text{A}$ | 2.1 | 2.8 | 3.3 | |
| Zero gate voltage drain current | I_{DSS} | $V_{\text{DS}}=60\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=25\text{ °C}$ | - | 0.5 | 1 | μA |
| | | $V_{\text{DS}}=60\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=125\text{ °C}$ | - | 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 | $R_{\text{DS(on)}}$ | $V_{\text{GS}}=10\text{ V}$, $I_{\text{D}}=50\text{ A}$ | - | 1.2 | 1.45 | m Ω |
| | | $V_{\text{GS}}=6\text{ V}$, $I_{\text{D}}=12.5\text{ A}$ | - | 1.6 | 2.2 | |
| Gate resistance | R_{G} | | - | 2 | 3 | Ω |
| Transconductance | g_{fs} | $ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$, $I_{\text{D}}=50\text{ A}$ | 75 | 150 | - | S |

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

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|---|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$ $f=1\text{ MHz}$ | - | 6500 | 8125 | pF |
| Output capacitance | C_{oss} | | - | 1500 | 1875 | |
| Reverse transfer capacitance | C_{rss} | | - | 59 | 118 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=30\text{ A},$ $R_{G,ext}, ext=2\ \Omega$ | - | 23 | - | ns |
| Rise time | t_r | | - | 10 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 43 | - | |
| Fall time | t_f | | - | 11 | - | |

Gate Charge Characteristics⁵⁾

| | | | | | | |
|------------------------------|---------------|--|---|-----|-----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=30\text{ V}, I_D=50\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 28 | - | nC |
| Gate charge at threshold | $Q_{g(th)}$ | | - | 18 | - | |
| Gate to drain charge | Q_{gd} | | - | 16 | 21 | |
| Switching charge | Q_{sw} | | - | 26 | - | |
| Gate charge total | Q_g | | - | 89 | 104 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 4.3 | - | |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | $V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 78 | - | nC |
| Output charge | Q_{oss} | $V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$ | - | 100 | - | |

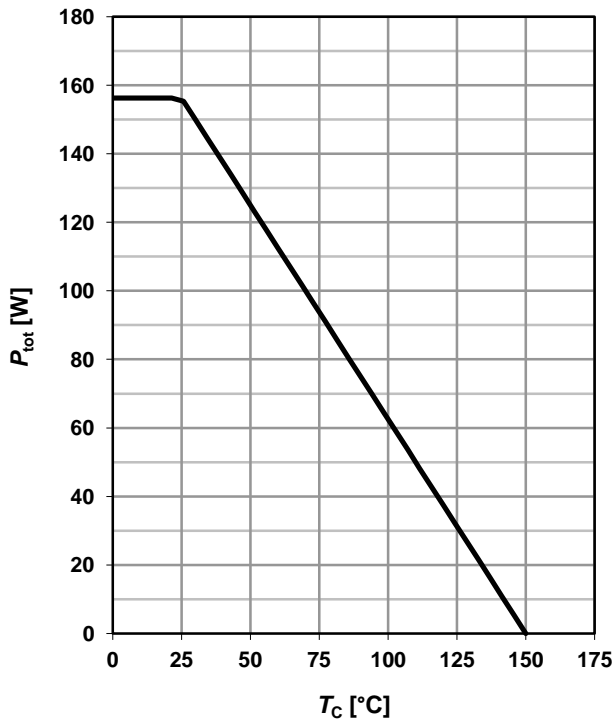
Reverse Diode

| | | | | | | |
|----------------------------------|---------------|---|---|-----|-----|----|
| Diode continuous forward current | I_S | $T_C=25\text{ }^\circ\text{C}$ | - | - | 100 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 400 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=50\text{ A},$ $T_j=25\text{ }^\circ\text{C}$ | - | 0.8 | 1.2 | V |
| Reverse recovery time | t_{rr} | $V_R=30\text{ V}, I_F=50\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$ | - | 52 | 83 | ns |
| Reverse recovery charge | Q_{rr} | | - | 139 | - | |

⁵⁾ See figure 16 for gate charge parameter definition

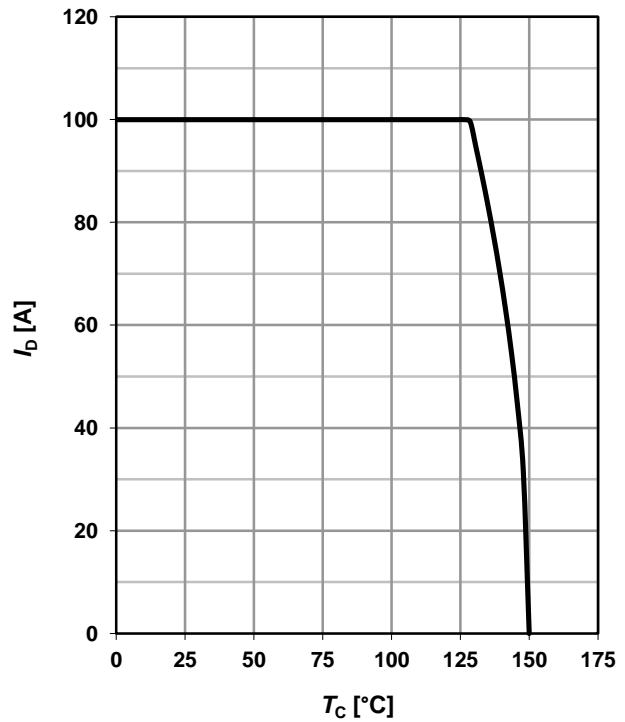
1 Power dissipation

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



2 Drain current

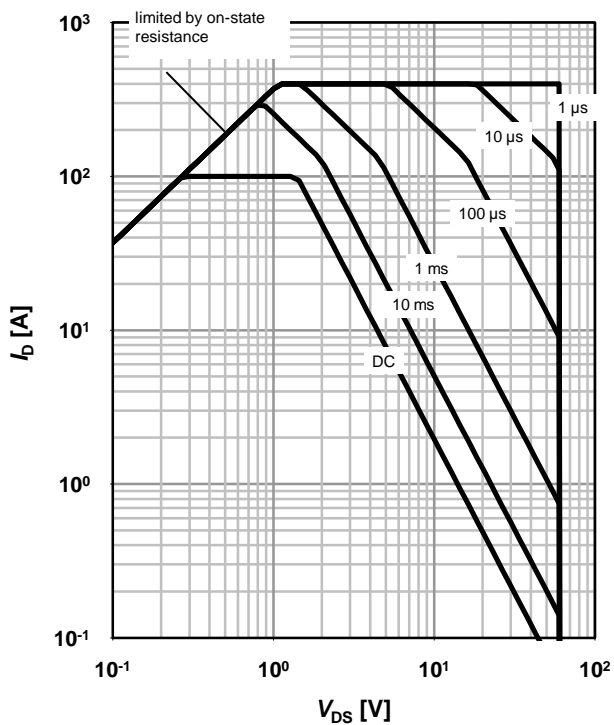
$$I_D=f(T_C); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

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

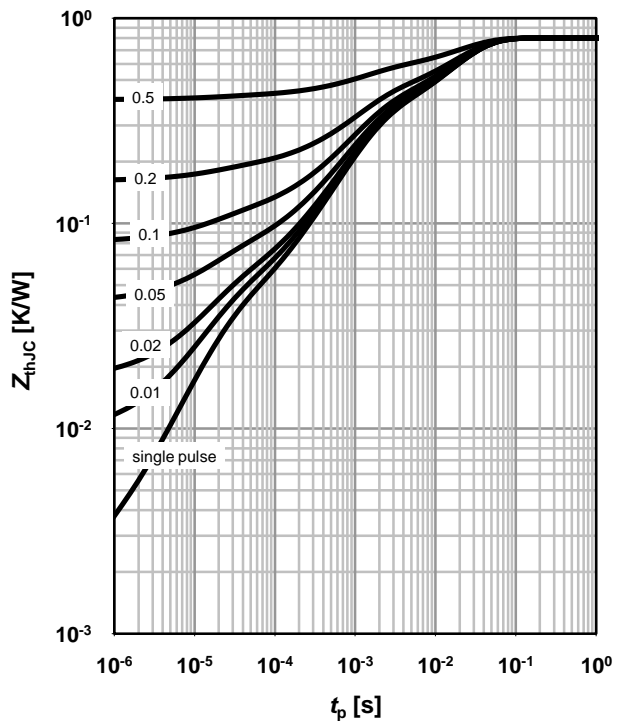
parameter: t_p



4 Max. transient thermal impedance

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

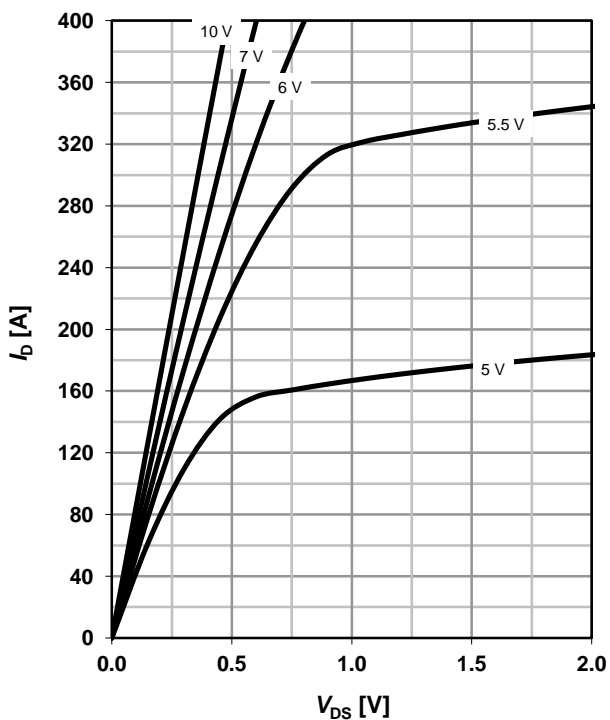
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

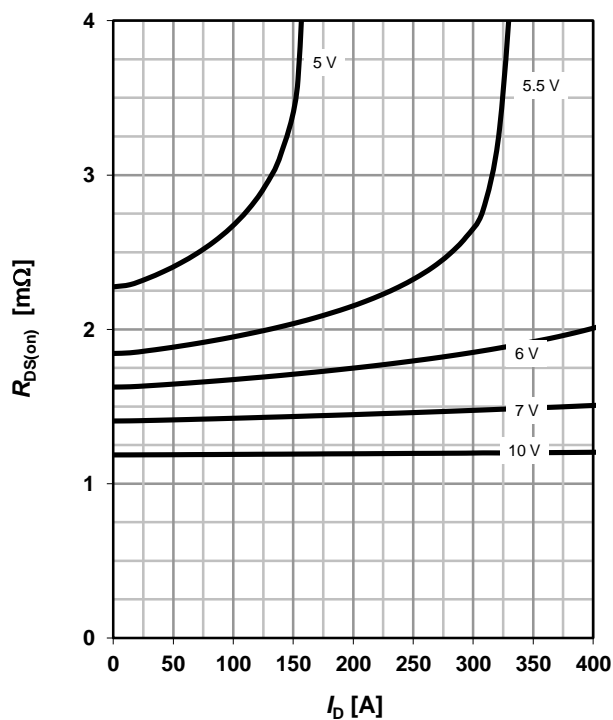
parameter: V_{GS}



6 Typ. drain-source on resistance

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

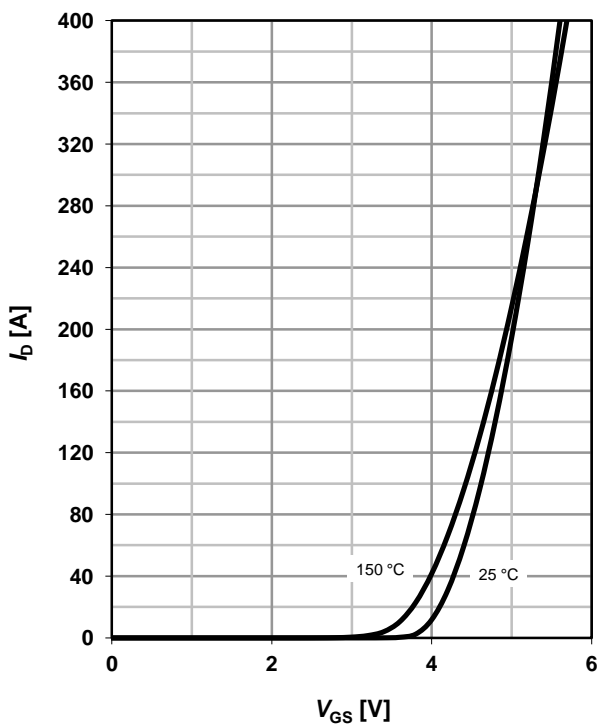
parameter: V_{GS}



7 Typ. transfer characteristics

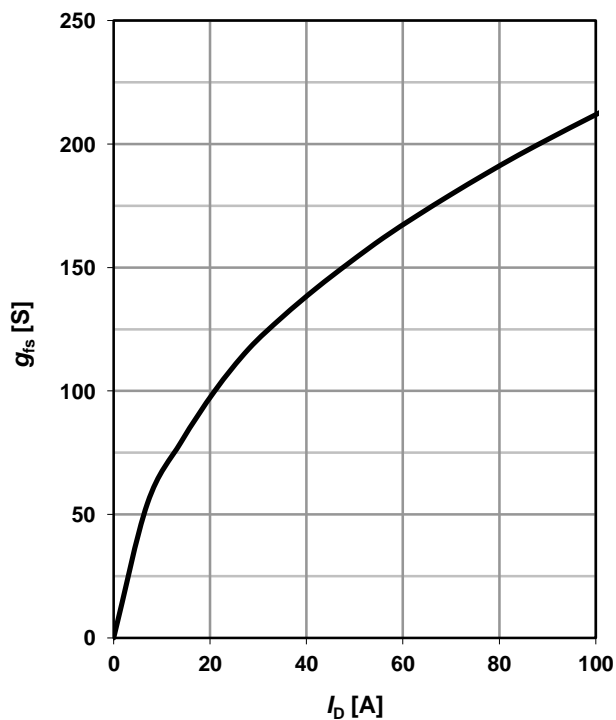
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



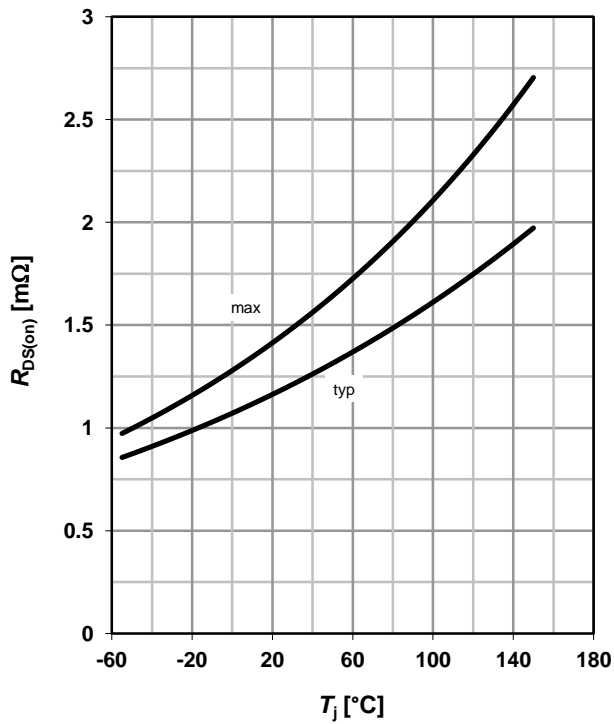
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



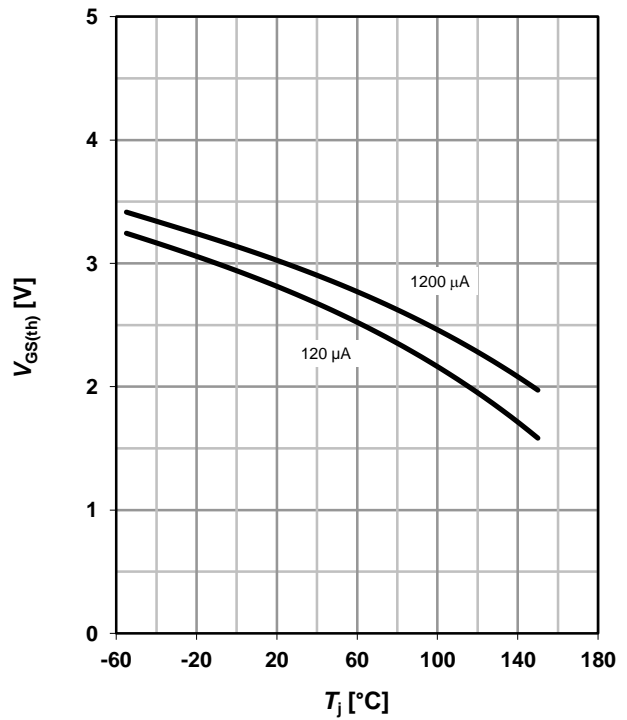
9 Drain-source on-state resistance

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



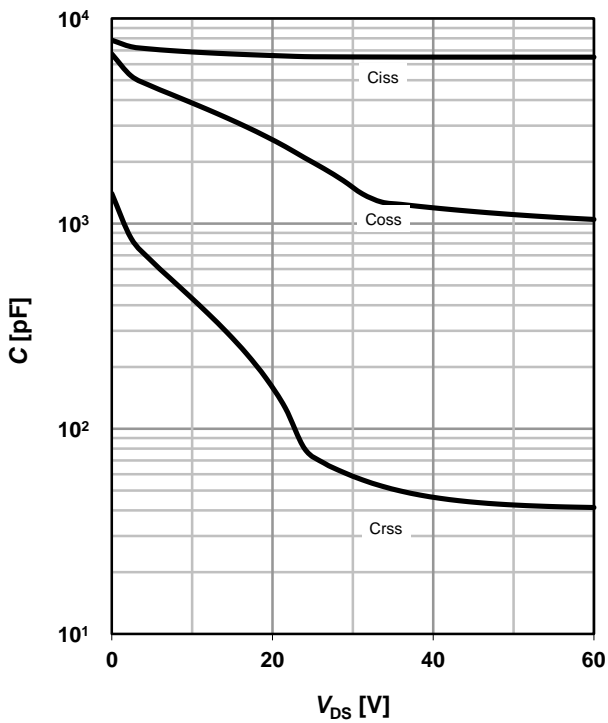
10 Typ. gate threshold voltage

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



11 Typ. capacitances

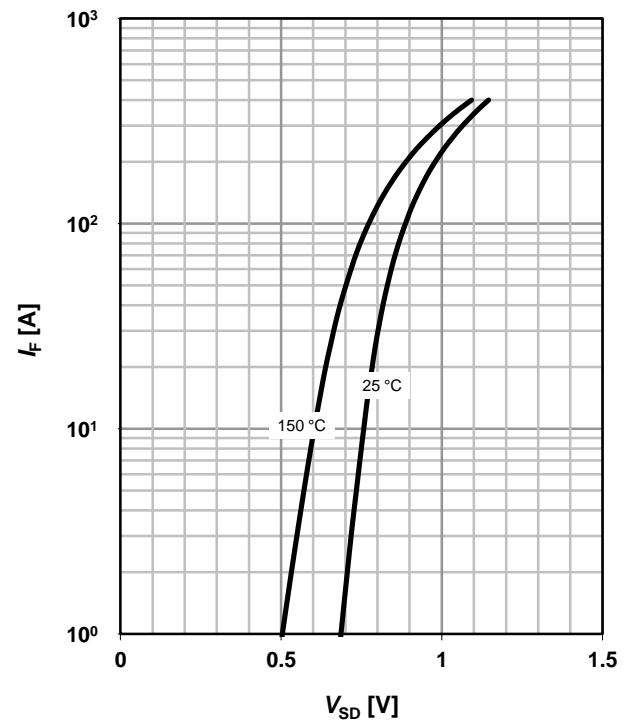
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$



12 Forward characteristics of reverse diode

$I_F=f(V_{SD})$

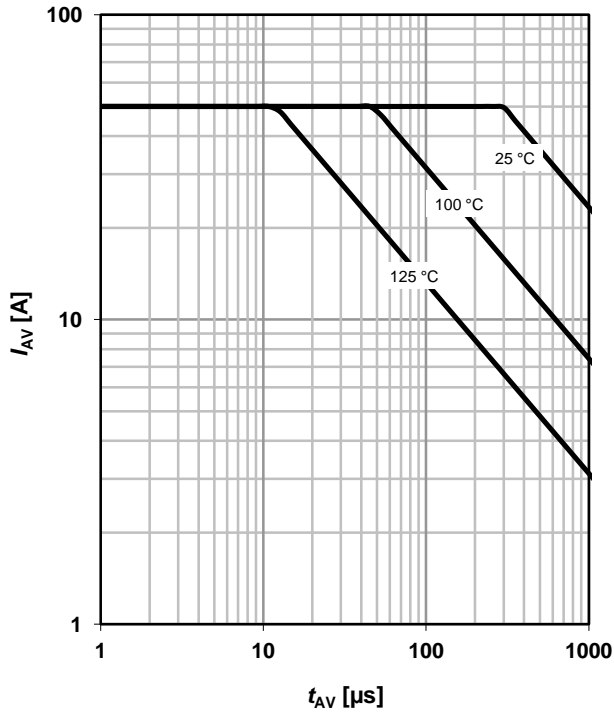
parameter: T_j



13 Avalanche characteristics

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

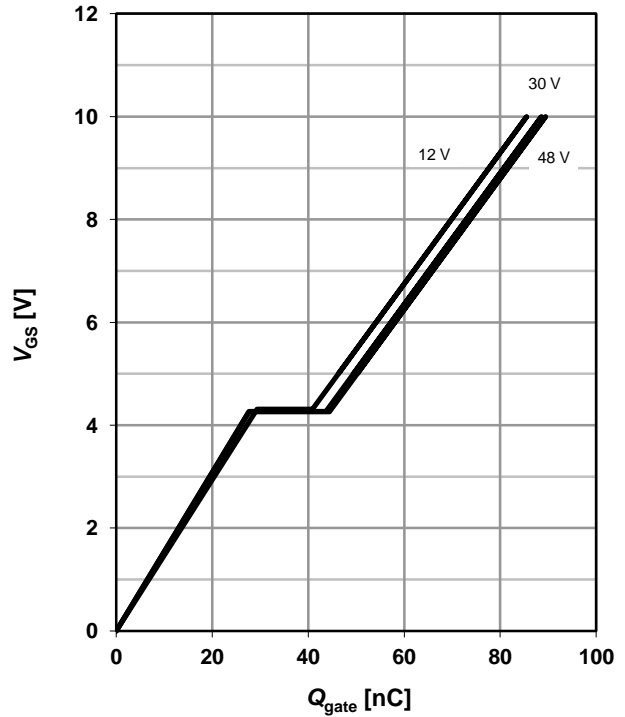
parameter: $T_{j(\text{start})}$



14 Typ. gate charge

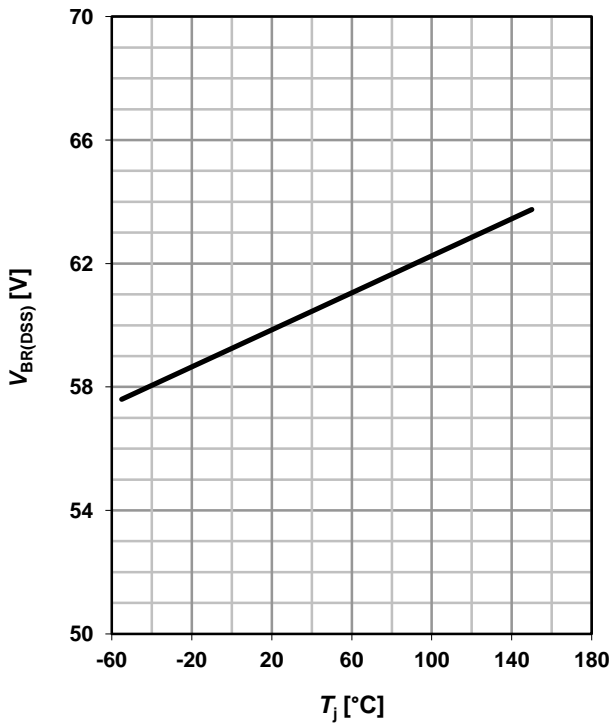
$V_{GS}=f(Q_{\text{gate}}); I_D=50 \text{ A pulsed}$

parameter: V_{DD}

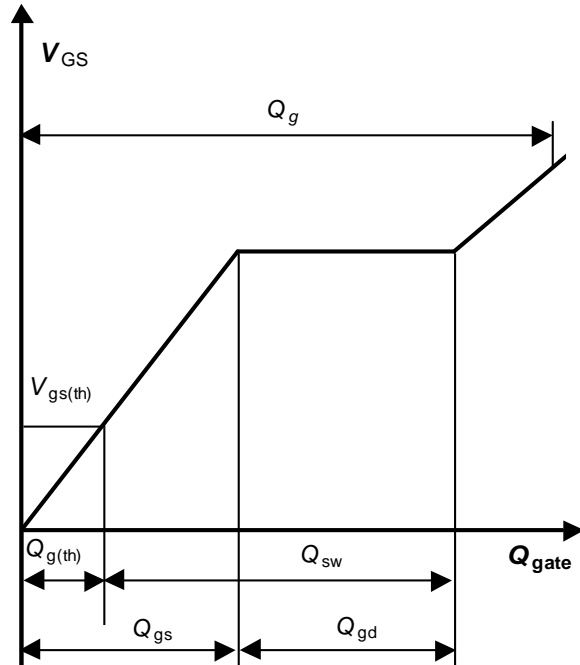


15 Drain-source breakdown voltage

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



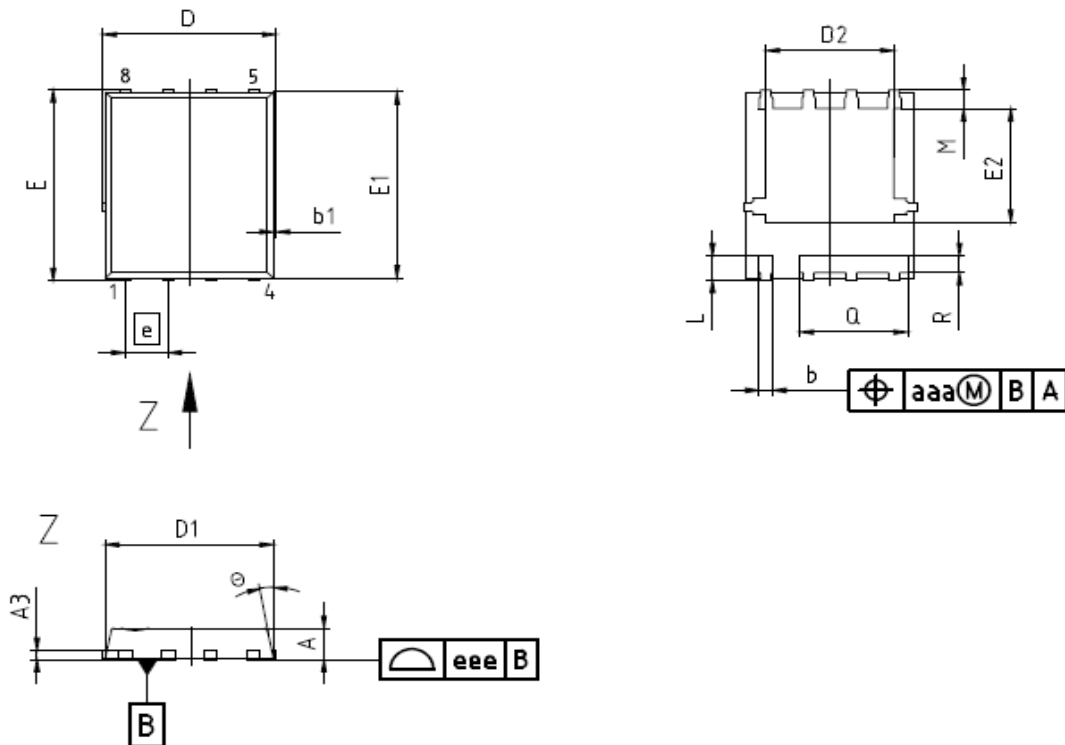
16 Gate charge waveforms



Package Outline

PG-TDSON-8 FL

PG-TDSON-8 FL: Outline



| DIM | MILLIMETERS | | INCHES | |
|-------|-------------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.90 | 1.10 | 0.035 | 0.043 |
| A3 | 0.25 (REF) | | 0.011 (REF) | |
| b | 0.34 | 0.54 | 0.013 | 0.021 |
| b1 | 0.02 | 0.22 | 0.001 | 0.009 |
| D | 5.15 (BSC) | | 0.203 (BSC) | |
| D1 | 5.00 (BSC) | | 0.197 (BSC) | |
| D2 | 3.70 | 4.40 | 0.146 | 0.173 |
| E | 6.15 (BSC) | | 0.242 (BSC) | |
| E1 | 6.00 (BSC) | | 0.236 (BSC) | |
| E2 | 3.40 | 3.80 | 0.134 | 0.150 |
| e | 1.27 (BSC) | | 0.050 (BSC) | |
| N | 8 | | 8 | |
| L | 0.74 | 0.84 | 0.029 | 0.033 |
| M | 0.45 | 0.66 | 0.018 | 0.026 |
| theta | 8.5° | 12° | 8.5° | 12° |
| Q | 3.15 | 3.25 | 0.124 | 0.128 |
| R | 0.48 | 0.58 | 0.019 | 0.023 |
| aaa | 0.25 | | 0.010 | |
| eee | 0.08 | | 0.003 | |

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