

MOSFET

OptiMOS™ 6 Power-Transistor, 60 V

Features

- Optimized for high performance SMPS
- Optimized for Synchronous rectification
- N-channel, logic level
- Very low on-resistance $R_{DS(on)}$
- Superior thermal resistance
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

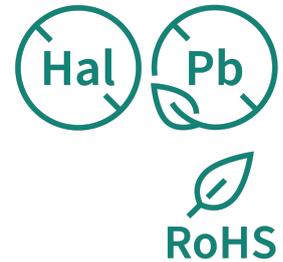
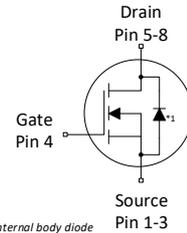
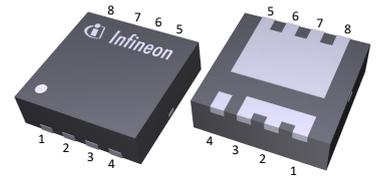
Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|---------------------|-------|------|
| V_{DS} | 60 | V |
| $R_{DS(on),max}$ | 2.3 | mΩ |
| I_D | 149 | A |
| Q_{oss} | 50 | nC |
| Q_G | 22 | nC |
| Q_{rr} (1000A/μs) | 126 | nC |

PG-TSDSON-8 FL



| Type/Ordering Code | Package | Marking | Related Links |
|--------------------|-------------|---------|---------------|
| ISZ023N06LM6 | PG-TSDSON-8 | 023N6L6 | - |



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1 Maximum ratings

unless otherwise specified

Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note/ Test Condition |
|--|----------------|--------|------|------------------------|------|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current ¹⁾ | I_D | - | - | 149 105 94 24 | A | $V_{GS}=10\text{ V}, T_C=25\text{ °C}$ $V_{GS}=10\text{ V}, T_C=100\text{ °C}$ $V_{GS}=4.5\text{ V}, T_C=100\text{ °C}$ $V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=60\text{ °C/W}^2)$ |
| Pulsed drain current ³⁾ | $I_{D,pulse}$ | - | - | 596 | A | $T_C=25\text{ °C}$ |
| Avalanche energy, single pulse ⁴⁾ | E_{AS} | - | - | 148 | mJ | $I_D=20\text{ A}, R_{GS}=25\text{ }\Omega$ |
| Gate source voltage | V_{GS} | -20 | - | 20 | V | - |
| Power dissipation | P_{tot} | - | - | 100 2.5 | W | $T_C=25\text{ °C}$ $T_A=25\text{ °C}, R_{thJA}=60\text{ °C/W}^2)$ |
| Operating and storage temperature | T_j, T_{stg} | -55 | - | 175 | °C | - |

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

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 Diagram 3 for more detailed information

⁴⁾ See Diagram 13 for more detailed information

2 Thermal characteristics

Table 3 Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note/ Test Condition |
|---|------------|--------|------|------|------|----------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | R_{thJC} | - | 0.75 | 1.5 | °C/W | - |
| Thermal resistance, junction - ambient, 6 cm ² cooling area ⁵⁾ | R_{thJA} | - | - | 60 | °C/W | - |

⁵⁾ 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 Electrical characteristics

unless otherwise specified

Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note/ Test Condition |
|----------------------------------|---------------|--------|--------------|------------|---------------|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 60 | - | - | V | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 1.1 | 1.7 | 2.3 | V | $V_{DS}=V_{GS}, I_D=38\text{ }\mu\text{A}$ |
| Zero gate voltage drain current | I_{DSS} | - | 0.1 10 | 1.0 100 | μA | $V_{DS}=48\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$ $V_{DS}=48\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$ |
| Gate-source leakage current | I_{GSS} | - | 10 | 100 | nA | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 2.03 2.60 | 2.3 2.9 | m Ω | $V_{GS}=10\text{ V}, I_D=20\text{ A}$ $V_{GS}=4.5\text{ V}, I_D=10\text{ A}$ |
| Gate resistance | R_G | - | 0.75 | - | Ω | - |
| Transconductance ⁶⁾ | g_{fs} | 55 | 110 | - | S | $ V_{DS} \geq 2 I_D R_{DS(on)max}, I_D=20\text{ A}$ |

⁶⁾ Defined by design. Not subject to production test.

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note/ Test Condition |
|--|--------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Input capacitance ⁷⁾ | C_{iss} | - | 3200 | 4200 | pF | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$ |
| Output capacitance ⁷⁾ | C_{oss} | - | 870 | 1100 | pF | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$ |
| Reverse transfer capacitance ⁷⁾ | C_{rss} | - | 21 | 37 | pF | $V_{GS}=0\text{ V}, V_{DS}=30\text{ V}, f=1\text{ MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 5.9 | - | ns | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}, R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time | t_r | - | 1.5 | - | ns | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}, R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 21.1 | - | ns | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}, R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time | t_f | - | 2.9 | - | ns | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V}, I_D=20\text{ A}, R_{G,ext}=1.6\text{ }\Omega$ |

⁷⁾ Defined by design. Not subject to production test.

Table 6 Gate charge characteristics ⁸⁾

| Parameter | Symbol | Values | | | Unit | Note/ Test Condition |
|------------------------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 8.6 | - | nC | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge at threshold | $Q_{g(th)}$ | - | 5.5 | - | nC | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate to drain charge ⁹⁾ | Q_{gd} | - | 6.0 | 9 | nC | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Switching charge | Q_{sw} | - | 9.1 | - | nC | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total ⁹⁾ | Q_g | - | 22 | 28 | nC | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate plateau voltage | $V_{plateau}$ | - | 2.7 | - | V | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total ⁹⁾ | Q_g | - | 46 | 61 | nC | $V_{DD}=30\text{ V}$, $I_D=20\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$ |
| Output charge ⁹⁾ | Q_{oss} | - | 50 | 67 | nC | $V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$ |

⁸⁾ See "Gate charge waveforms" for parameter definition

⁹⁾ Defined by design. Not subject to production test.

Table 7 Reverse diode

| Parameter | Symbol | Values | | | Unit | Note/ Test Condition |
|--|---------------|--------|------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | I_S | - | - | 90 | A | $T_C=25\text{ °C}$ |
| Diode pulse current | $I_{S,pulse}$ | - | - | 596 | A | $T_C=25\text{ °C}$ |
| Diode forward voltage | V_{SD} | - | 0.80 | 1.0 | V | $V_{GS}=0\text{ V}$, $I_F=20\text{ A}$, $T_j=25\text{ °C}$ |
| Reverse recovery time ¹⁰⁾ | t_{rr} | - | 29 | 58 | ns | $V_R=30\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge ¹⁰⁾ | Q_{rr} | - | 23 | 46 | nC | $V_R=30\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery time ¹⁰⁾ | t_{rr} | - | 19 | 38 | ns | $V_R=30\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=1000\text{ A}/\mu\text{s}$ |
| Reverse recovery charge ¹⁰⁾ | Q_{rr} | - | 126 | 252 | nC | $V_R=30\text{ V}$, $I_F=20\text{ A}$, $di_F/dt=1000\text{ A}/\mu\text{s}$ |

¹⁰⁾ Defined by design. Not subject to production test.

4 Electrical characteristics diagrams

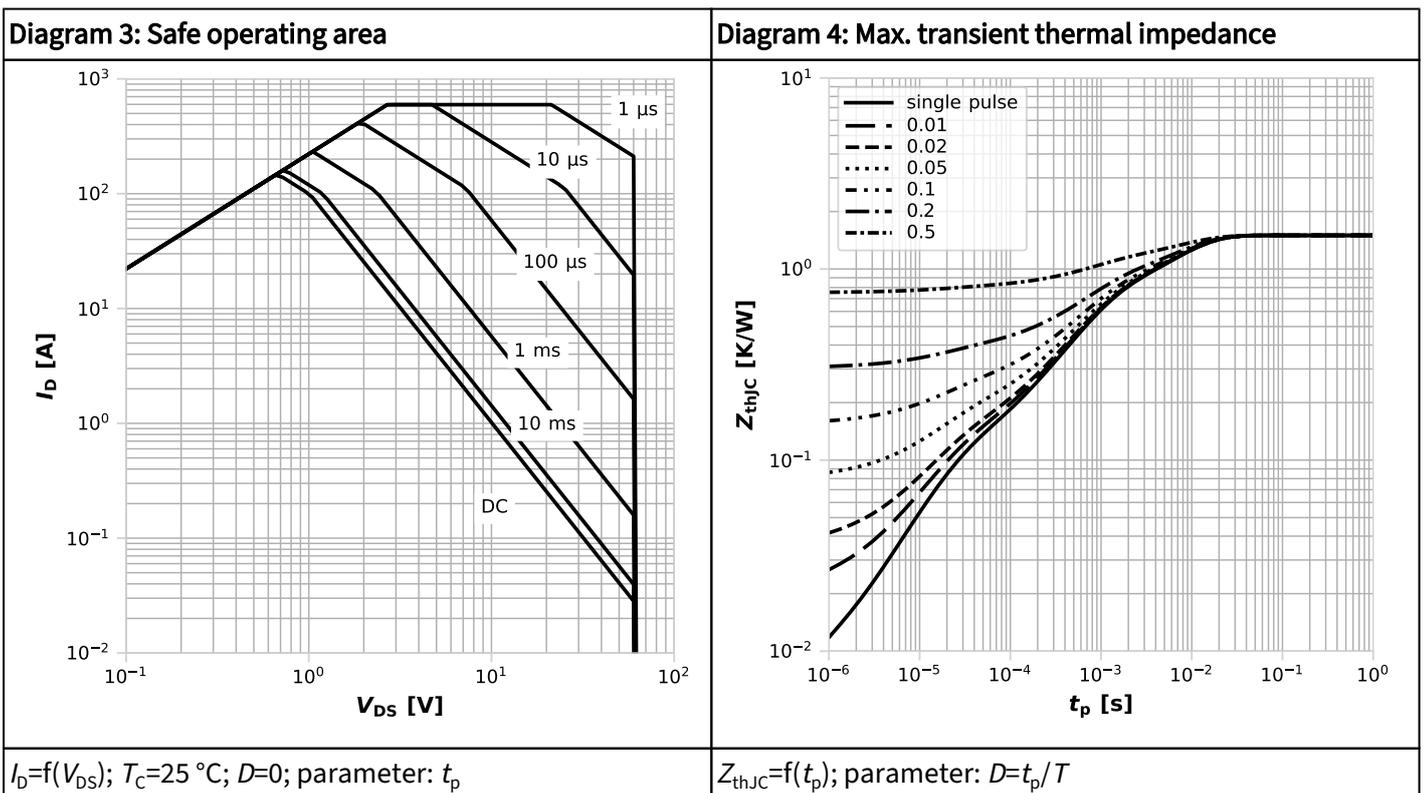
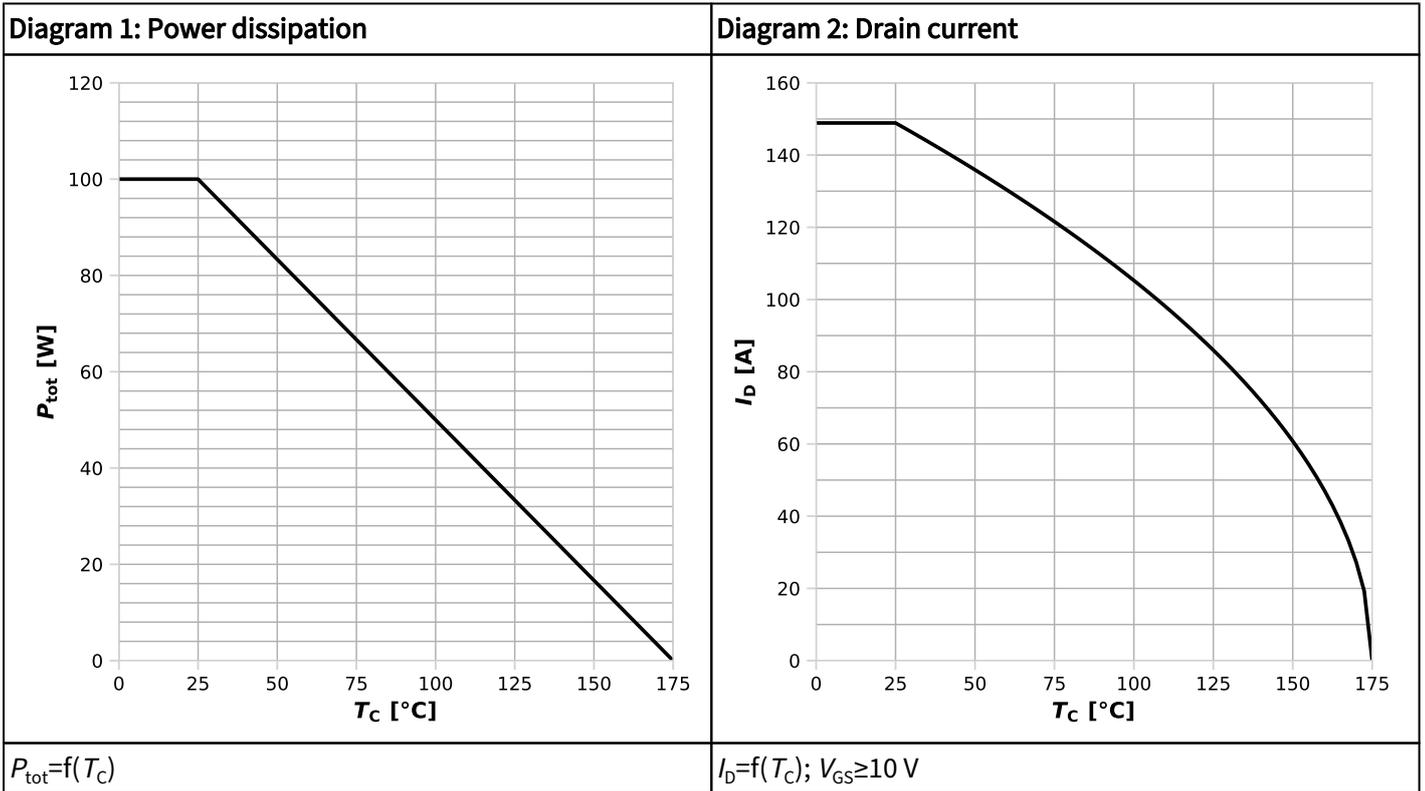
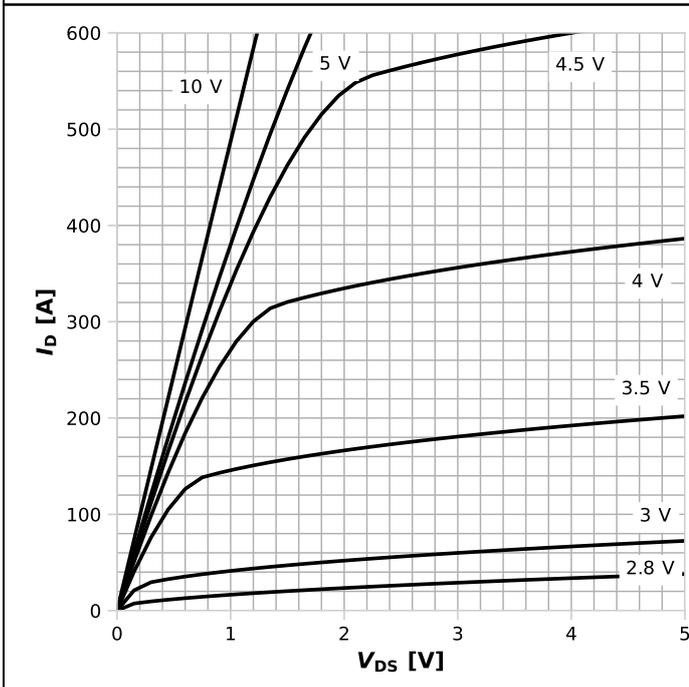
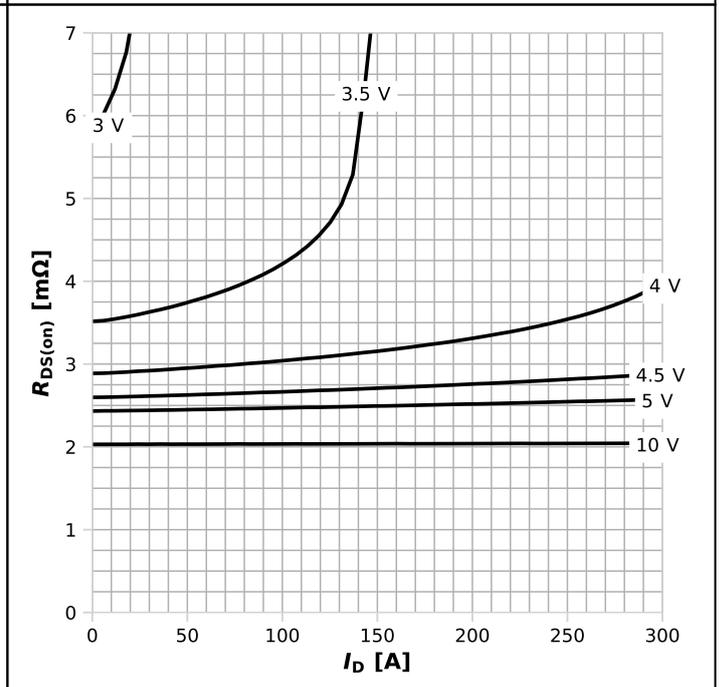


Diagram 5: Typ. output characteristics



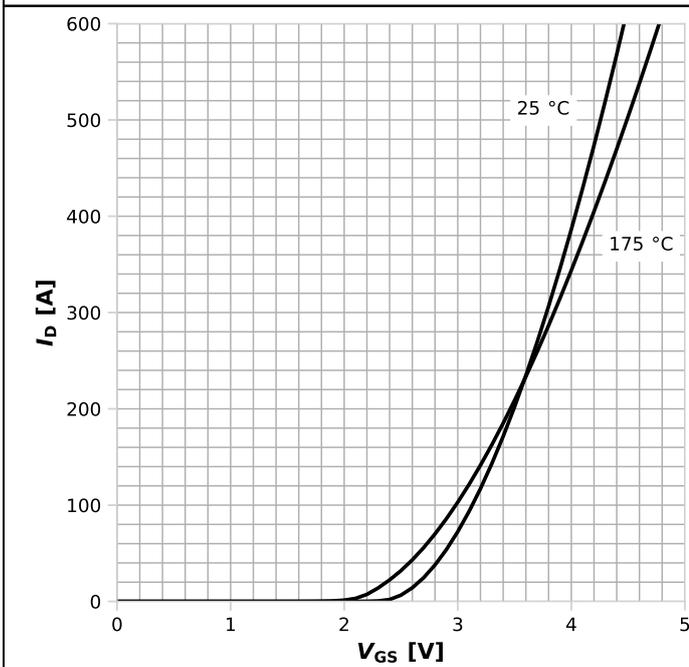
$I_D = f(V_{DS}), T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



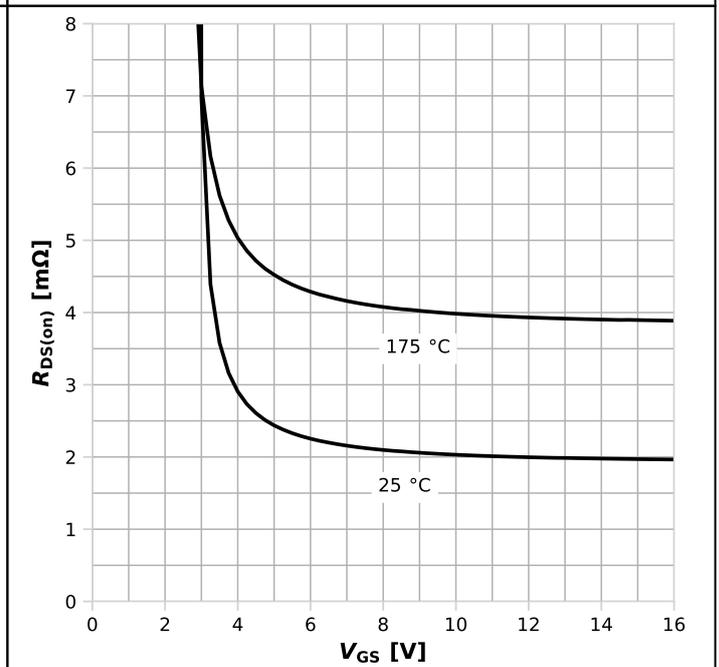
$R_{DS(on)} = f(I_D), T_j = 25\text{ °C};$ parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



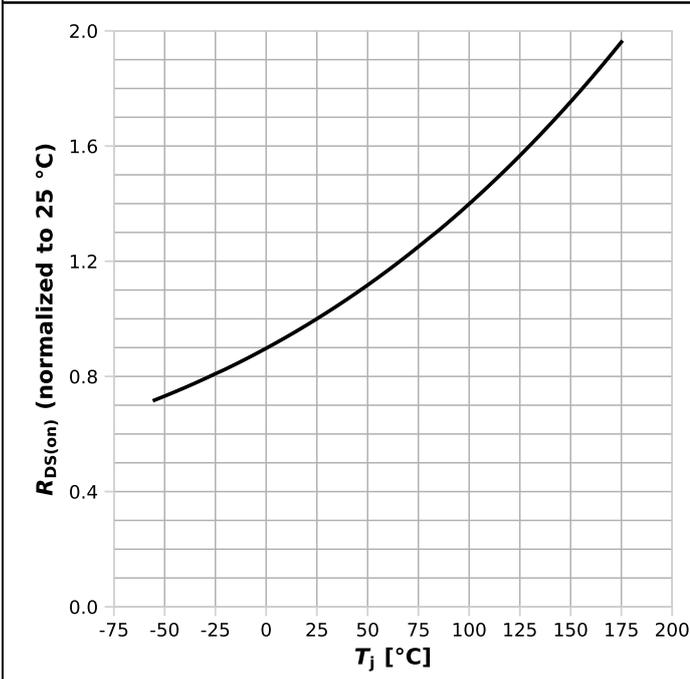
$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max};$ parameter: T_j

Diagram 8: Typ. drain-source on resistance



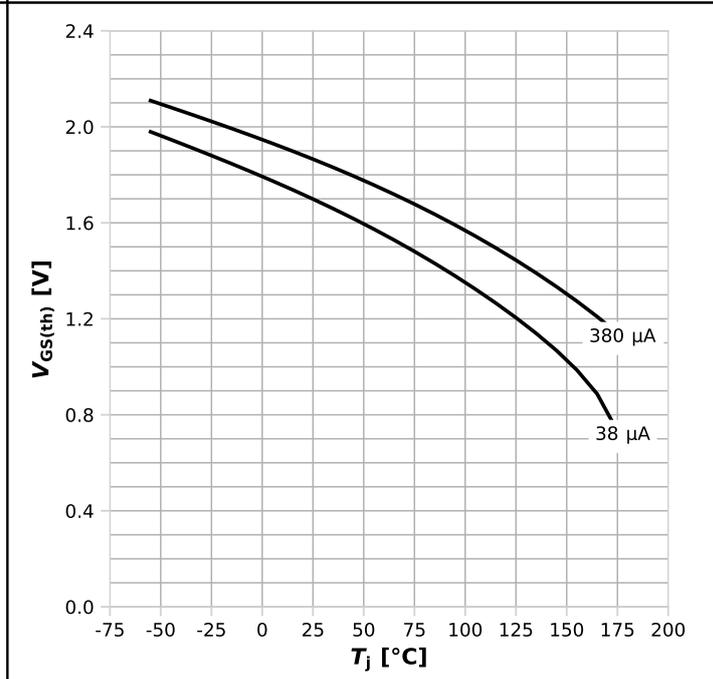
$R_{DS(on)} = f(V_{GS}), I_D = 20\text{ A};$ parameter: T_j

Diagram 9: Normalized drain-source on resistance



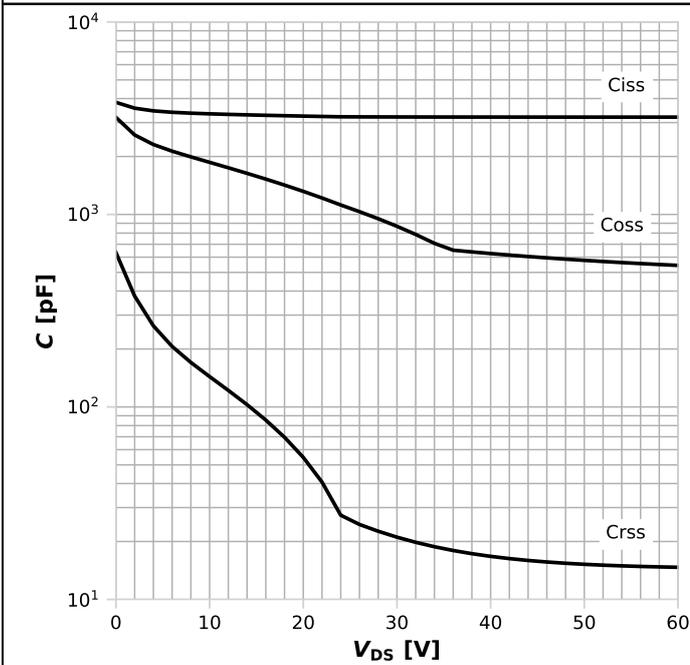
$R_{DS(on)}=f(T_j), I_D=20\text{ A}, V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



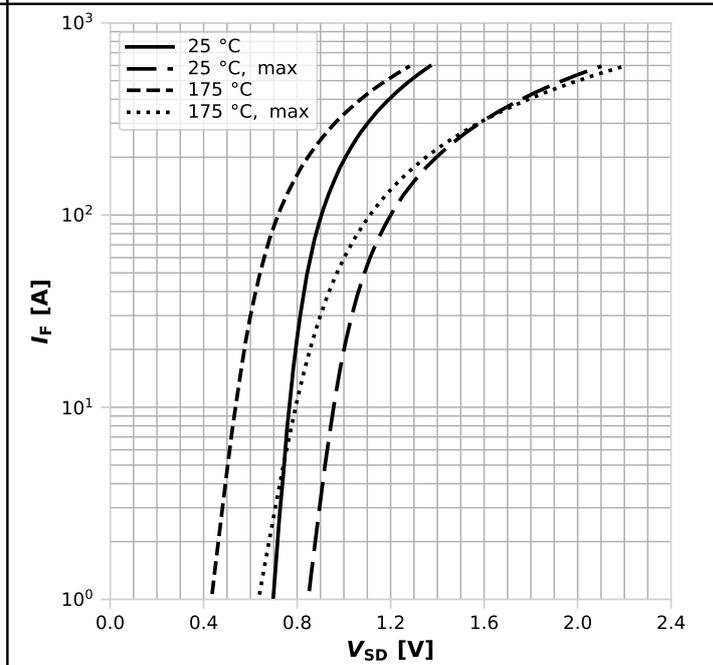
$V_{GS(th)}=f(T_j), V_{GS}=V_{DS};$ parameter: I_D

Diagram 11: Typ. capacitances



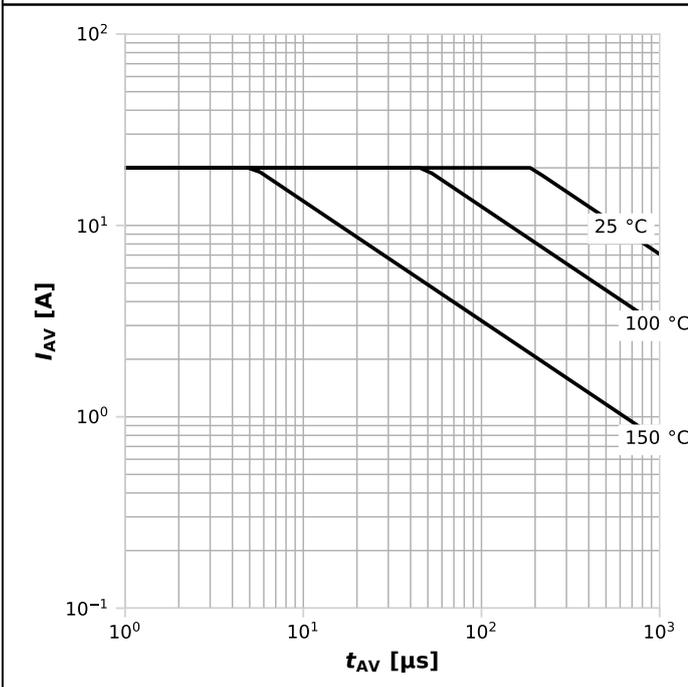
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$

Diagram 12: Forward characteristics of reverse diode



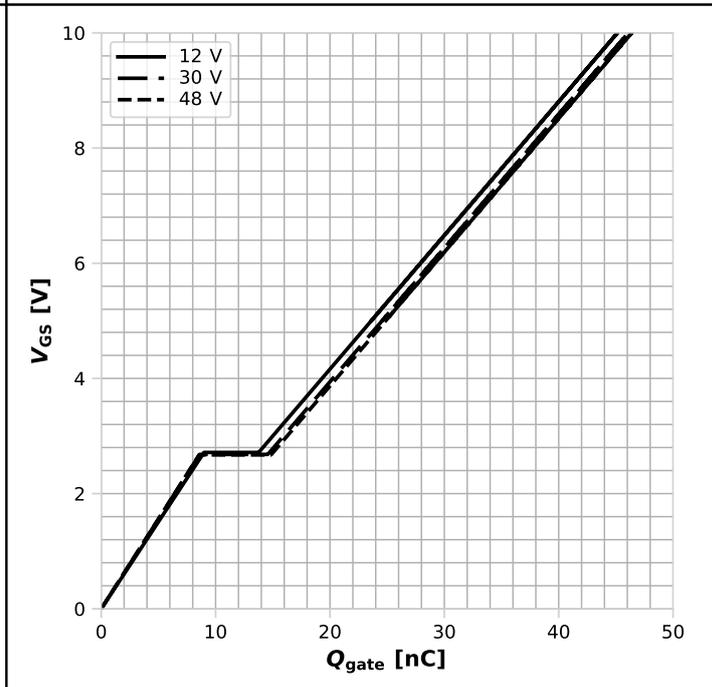
$I_F=f(V_{SD});$ parameter: T_j

Diagram 13: Avalanche characteristics



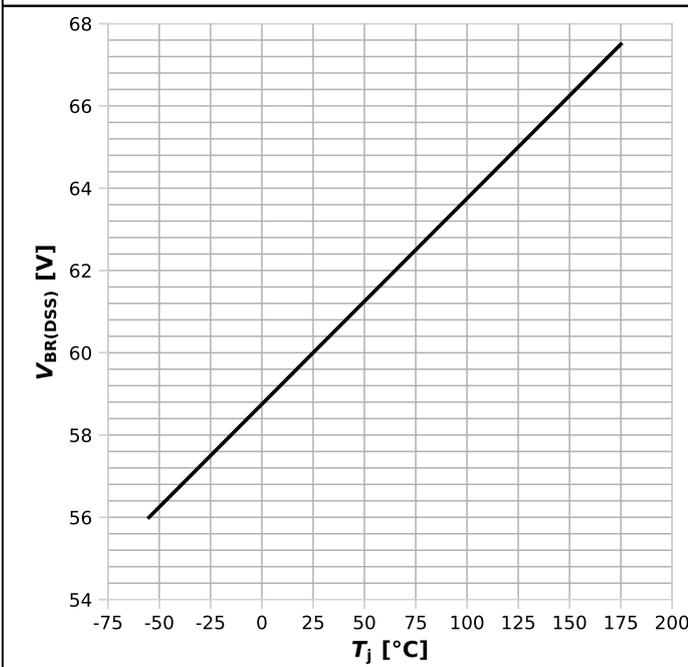
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$; parameter: $T_{j,start}$

Diagram 14: Typ. gate charge



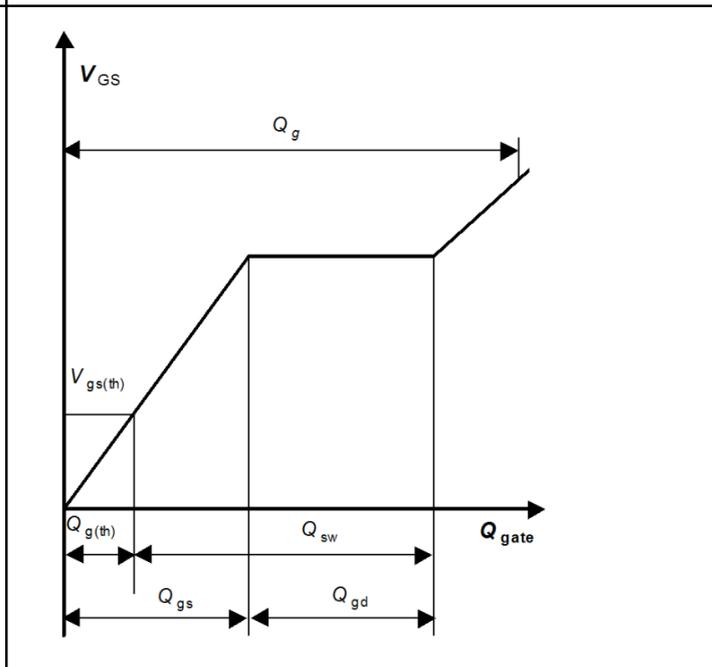
$V_{GS}=f(Q_{gate}), I_D=20 \text{ A pulsed}, T_j=25 \text{ °C}$; parameter: V_{DD}

Diagram 15: Min. drain-source breakdown voltage



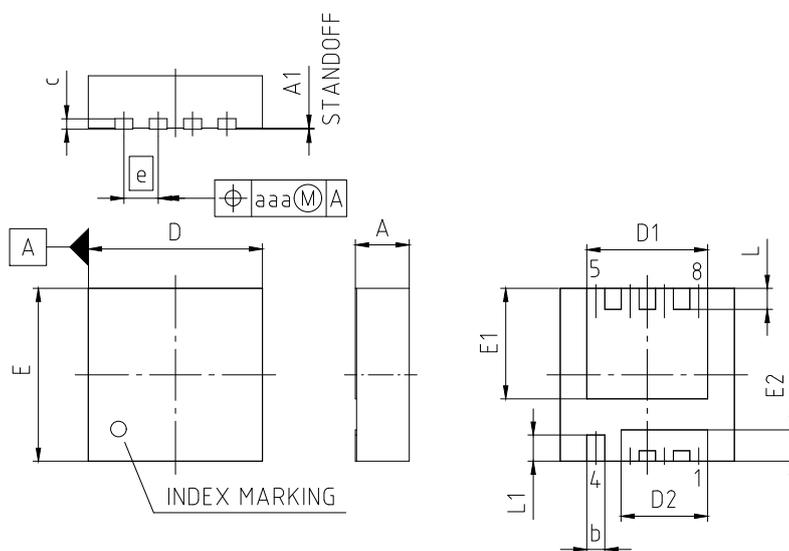
$V_{BR(DSS)}=f(T_j); I_D=10 \text{ mA}$

Gate charge waveforms



-

5 Package Outlines



| PACKAGE - GROUP NUMBER: PG-TSDSON-8-U03 | | |
|---|-------------|------|
| DIMENSIONS | MILLIMETERS | |
| | MIN. | MAX. |
| A | 0.90 | 1.10 |
| A1 | 0 | 0.05 |
| b | 0.24 | 0.44 |
| c | 0.10 | 0.30 |
| D | 3.20 | 3.40 |
| D1 | 2.19 | 2.39 |
| D2 | 1.54 | 1.74 |
| E | 3.20 | 3.40 |
| E1 | 2.01 | 2.21 |
| E2 | 0.50 | 0.70 |
| e | 0.65 | |
| L | 0.30 | 0.50 |
| L1 | 0.40 | 0.60 |
| aaa | 0.06 | |
| N | 8 | |

NOTE:
 DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSION OR GATE BURRS

Figure 1 Outline PG-TSDSON-8, dimensions in mm

Revision History

ISZ023N06LM6

Revision 2024-05-07, Rev. 2.0

Previous Revision

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0 | 2024-05-07 | Release of final |

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