

# MOSFET

## OptiMOS™ 6 Power-Transistor, 100 V

### Features

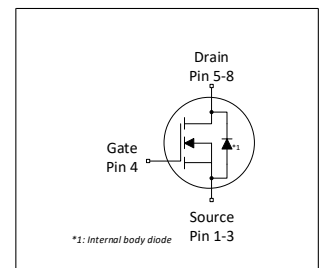
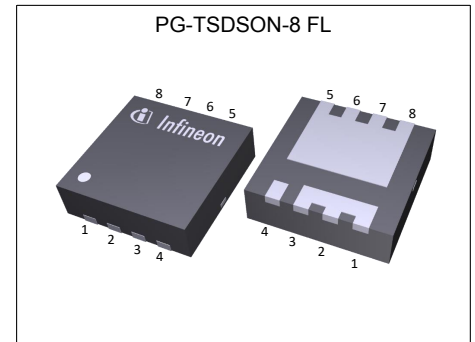
- N-channel, normal level
- Very low on-resistance  $R_{DS(on)}$
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Very low reverse recovery charge ( $Q_{rr}$ )
- High avalanche energy rating
- 175°C operating temperature
- Optimized for high frequency switching and synchronous rectification
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- MSL 1 classified according to J-STD-020

### Product validation

Fully qualified according to JEDEC for Industrial Applications

**Table 1 Key Performance Parameters**

| Parameter            | Value | Unit       |
|----------------------|-------|------------|
| $V_{DS}$             | 100   | V          |
| $R_{DS(on),max}$     | 8.04  | m $\Omega$ |
| $I_D$                | 75    | A          |
| $Q_{oss}$            | 35    | nC         |
| $Q_G(0V...10V)$      | 19    | nC         |
| $Q_{rr}(100A/\mu s)$ | 31    | nC         |



| Type / Ordering Code | Package        | Marking | Related Links |
|----------------------|----------------|---------|---------------|
| ISZ080N10NM6         | PG-TSDSON-8 FL | 080N1N6 | -             |

## Table of Contents

|   |    |
|---|----|
| Description .....                         | 1  |
| Maximum ratings .....                     | 3  |
| Thermal characteristics .....             | 3  |
| Electrical characteristics .....          | 4  |
| Electrical characteristics diagrams ..... | 6  |
| Package Outlines .....                    | 10 |
| Revision History .....                    | 11 |
| Trademarks .....                          | 11 |
| Disclaimer .....                          | 11 |

## 1 Maximum ratings

at  $T_A=25\text{ °C}$ , unless otherwise specified

**Table 2 Maximum ratings**

| Parameter                                     | Symbol            | Values |      |                      | Unit | Note / Test Condition  |
|---|-------------------|--------|------|----------------------|------|--|
|   |                   | Min.   | Typ. | Max.                 |      |  |
| Continuous drain current <sup>1)</sup>        | $I_D$             | -      | -    | 75<br>53<br>48<br>13 | A    | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=8\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=50\text{ °C/W}^2)$ |
| Pulsed drain current <sup>3)</sup>            | $I_{D,pulse}$     | -      | -    | 300                  | A    | $T_A=25\text{ °C}$   |
| Avalanche current, single pulse <sup>4)</sup> | $I_{AS}$          | -      | -    | 50                   | A    | $T_C=25\text{ °C}$   |
| Avalanche energy, single pulse                | $E_{AS}$          | -      | -    | 283                  | mJ   | $I_D=7\text{ A}$ , $R_{GS}=25\text{ }\Omega$   |
| Gate source voltage                           | $V_{GS}$          | -20    | -    | 20                   | V    | -  |
| Power dissipation                             | $P_{tot}$         | -      | -    | 100<br>3.0           | W    | $T_C=25\text{ °C}$<br>$T_A=25\text{ °C}$ , $R_{thJA}=50\text{ °C/W}^2)$  |
| Operating and storage temperature             | $T_j$ , $T_{stg}$ | -55    | -    | 175                  | °C   | -  |

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

| Parameter  | Symbol     | Values |      |      | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|-----------------------|
|  |            | Min.   | Typ. | Max. |      |                       |
| Thermal resistance, junction - case, bottom                            | $R_{thJC}$ | -      | 0.77 | 1.5  | °C/W | -                     |
| Thermal resistance, junction - case, top                               | $R_{thJC}$ | -      | -    | 20   | °C/W | -                     |
| Thermal resistance, junction - ambient, 6 cm <sup>2</sup> cooling area | $R_{thJA}$ | -      | -    | 50   | °C/W | -                     |

<sup>1)</sup> 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.

<sup>2)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

<sup>3)</sup> See Diagram 3 for more detailed information

<sup>4)</sup> See Diagram 13 for more detailed information

### 3 Electrical characteristics

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

**Table 4 Static characteristics**

| Parameter                        | Symbol        | Values |            |            | Unit          | Note / Test Condition  |
|----------------------------------|---------------|--------|------------|------------|---------------|--|
|                                  |               | Min.   | Typ.       | Max.       |               |  |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | 100    | -          | -          | V             | $V_{GS}=0\text{ V}$ , $I_D=1\text{ mA}$  |
| Gate threshold voltage           | $V_{GS(th)}$  | 2.3    | 2.8        | 3.3        | V             | $V_{DS}=V_{GS}$ , $I_D=36\text{ }\mu\text{A}$  |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | 0.1<br>10  | 1.0<br>100 | $\mu\text{A}$ | $V_{DS}=80\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$<br>$V_{DS}=80\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}^{1)}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | 10         | 100        | nA            | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$   |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 7.1<br>8.6 | 8.04<br>10 | m $\Omega$    | $V_{GS}=10\text{ V}$ , $I_D=20\text{ A}$<br>$V_{GS}=8\text{ V}$ , $I_D=10\text{ A}$  |
| Gate resistance                  | $R_G$         | 0.6    | 1.2        | 1.8        | $\Omega$      | -  |
| Transconductance                 | $g_{fs}$      | 15     | 30         | -          | S             | $ V_{DS} \geq 2 I_D /R_{DS(on)max}$ , $I_D=20\text{ A}$  |

**Table 5 Dynamic characteristics**

| Parameter                                  | Symbol       | Values |      |      | Unit | Note / Test Condition  |
|--|--------------|--------|------|------|------|--|
|  |              | Min.   | Typ. | Max. |      |  |
| Input capacitance                          | $C_{iss}$    | -      | 1400 | 1800 | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$                                      |
| Output capacitance <sup>1)</sup>           | $C_{oss}$    | -      | 310  | 390  | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$                                      |
| Reverse transfer capacitance <sup>1)</sup> | $C_{rss}$    | -      | 9    | 13   | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=50\text{ V}$ , $f=1\text{ MHz}$                                      |
| Turn-on delay time                         | $t_{d(on)}$  | -      | 6.4  | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=10\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Rise time                                  | $t_r$        | -      | 1.5  | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=10\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Turn-off delay time                        | $t_{d(off)}$ | -      | 10.7 | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=10\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |
| Fall time                                  | $t_f$        | -      | 4.3  | -    | ns   | $V_{DD}=50\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=10\text{ A}$ ,<br>$R_{G,ext}=1.6\text{ }\Omega$ |

**Table 6 Gate charge characteristics<sup>2)</sup>**

| Parameter                              | Symbol        | Values |      |      | Unit | Note / Test Condition   |
|--|---------------|--------|------|------|------|---|
|  |               | Min.   | Typ. | Max. |      |   |
| Gate to source charge <sup>1)</sup>    | $Q_{gs}$      | -      | 6.4  | 8.5  | nC   | $V_{DD}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge at threshold <sup>1)</sup> | $Q_{g(th)}$   | -      | 3.9  | 4.9  | nC   | $V_{DD}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate to drain charge <sup>1)</sup>     | $Q_{gd}$      | -      | 3.4  | 5.1  | nC   | $V_{DD}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Switching charge                       | $Q_{sw}$      | -      | 5.9  | -    | nC   | $V_{DD}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total <sup>1)</sup>        | $Q_g$         | -      | 19   | 24   | nC   | $V_{DD}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate plateau voltage                   | $V_{plateau}$ | -      | 4.6  | -    | V    | $V_{DD}=50\text{ V}$ , $I_D=10\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$ |
| Gate charge total, sync. FET           | $Q_{g(sync)}$ | -      | 17   | -    | nC   | $V_{DS}=0.1\text{ V}$ , $V_{GS}=0\text{ to }10\text{ V}$                    |
| Output charge <sup>1)</sup>            | $Q_{oss}$     | -      | 35   | 44   | nC   | $V_{DS}=50\text{ V}$ , $V_{GS}=0\text{ V}$                                  |

<sup>1)</sup> Defined by design. Not subject to production test.

<sup>2)</sup> See "Gate charge waveforms" for parameter definition

**Table 7 Reverse diode**

| Parameter                             | Symbol        | Values |      |      | Unit | Note / Test Condition   |
|---------------------------------------|---------------|--------|------|------|------|---|
|                                       |               | Min.   | Typ. | Max. |      |   |
| Diode continuous forward current      | $I_S$         | -      | -    | 75   | A    | $T_C=25\text{ °C}$  |
| Diode pulse current                   | $I_{S,pulse}$ | -      | -    | 300  | A    | $T_C=25\text{ °C}$  |
| Diode forward voltage                 | $V_{SD}$      | -      | 0.82 | 1.0  | V    | $V_{GS}=0\text{ V}, I_F=20\text{ A}, T_j=25\text{ °C}$                |
| Reverse recovery time <sup>1)</sup>   | $t_{rr}$      | -      | 31.5 | 47   | ns   | $V_R=50\text{ V}, I_F=10\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$  |
| Reverse recovery charge <sup>1)</sup> | $Q_{rr}$      | -      | 31   | 46.5 | nC   | $V_R=50\text{ V}, I_F=10\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$  |
| Reverse recovery time <sup>1)</sup>   | $t_{rr}$      | -      | 18   | 27   | ns   | $V_R=50\text{ V}, I_F=10\text{ A}, di_F/dt=1000\text{ A}/\mu\text{s}$ |
| Reverse recovery charge <sup>1)</sup> | $Q_{rr}$      | -      | 140  | 210  | nC   | $V_R=50\text{ V}, I_F=10\text{ A}, di_F/dt=1000\text{ A}/\mu\text{s}$ |

<sup>1)</sup> Defined by design. Not subject to production test.

### 4 Electrical characteristics diagrams

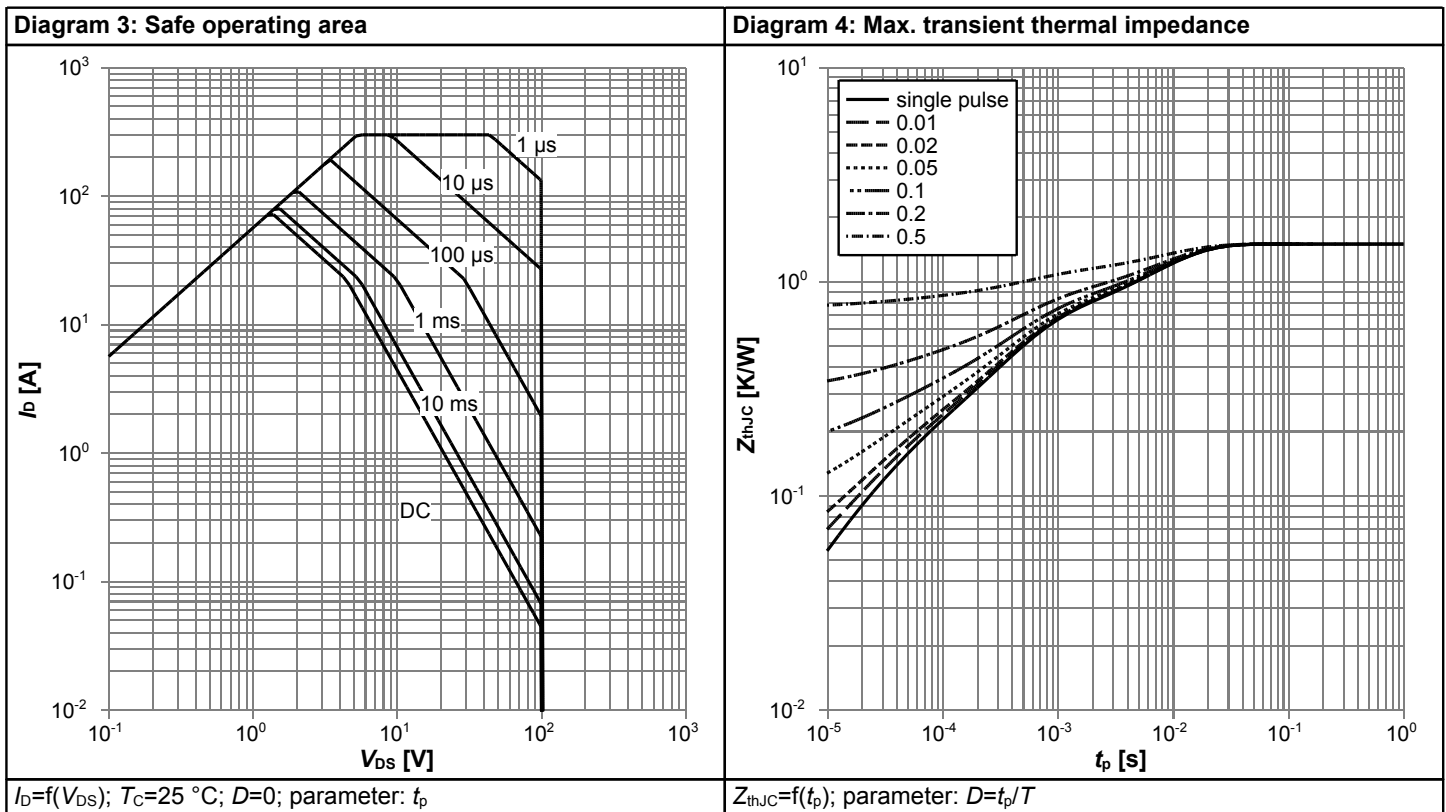
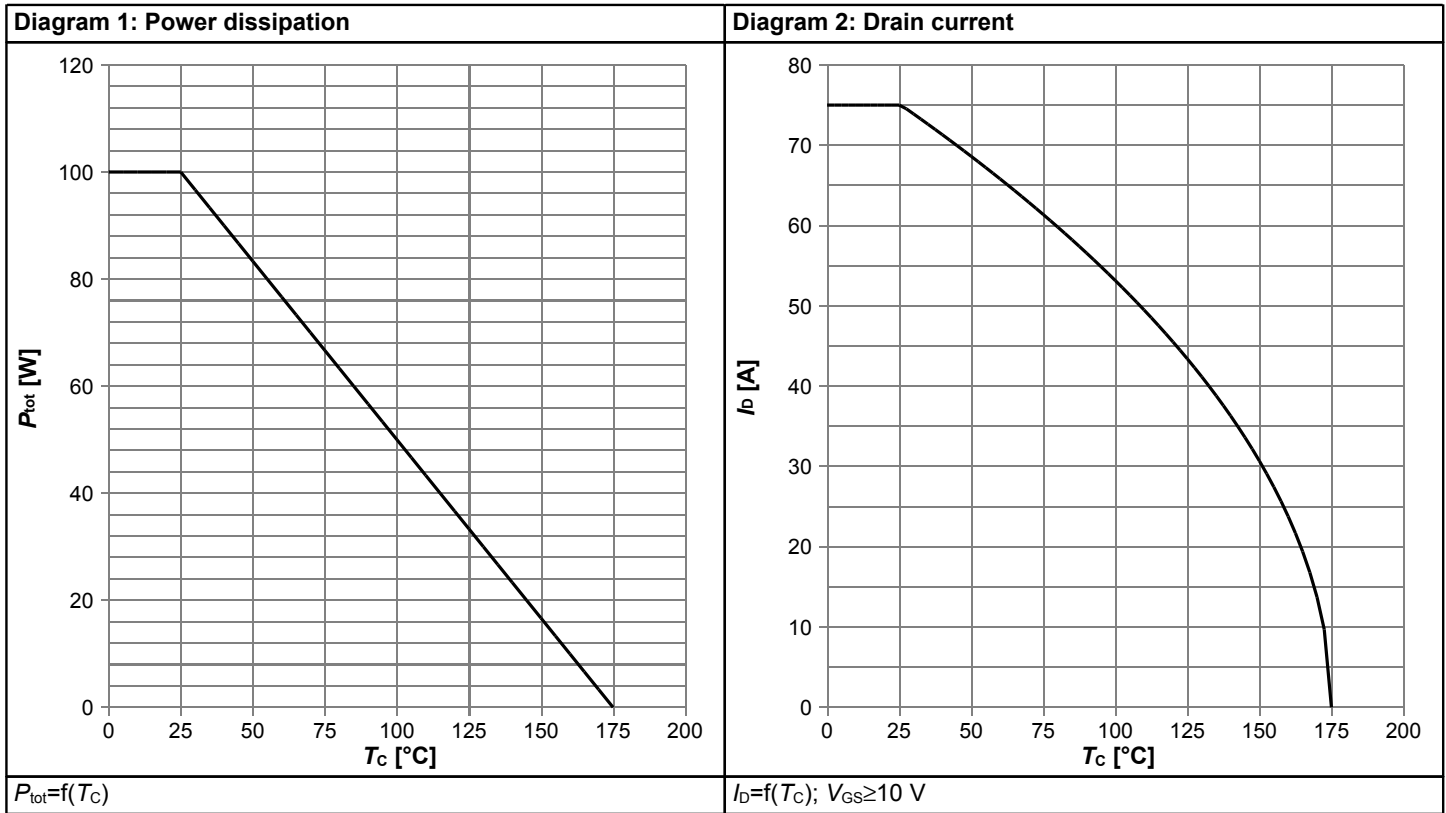
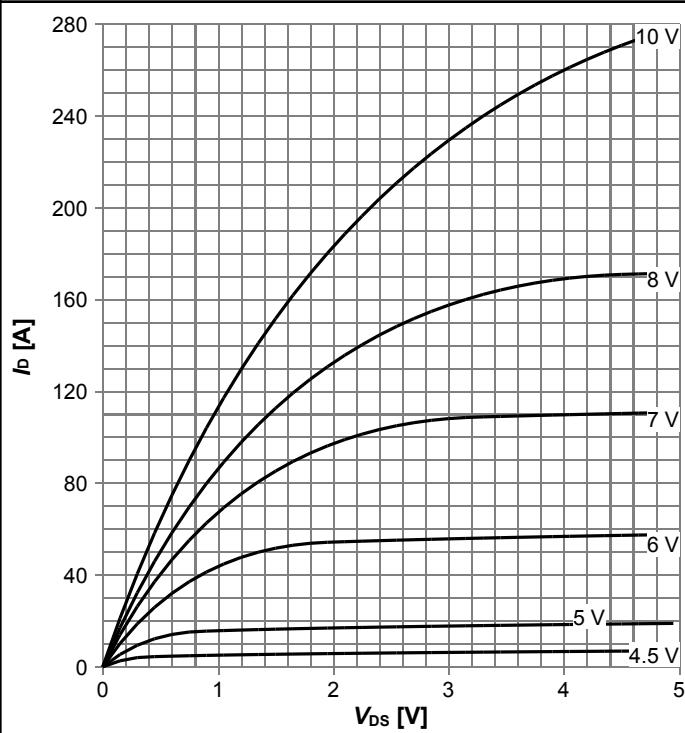
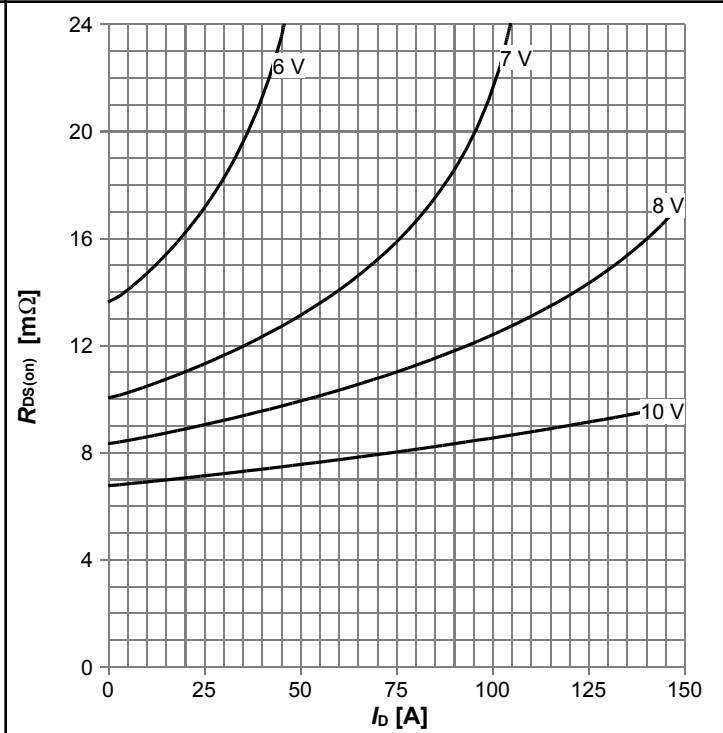


Diagram 5: Typ. output characteristics



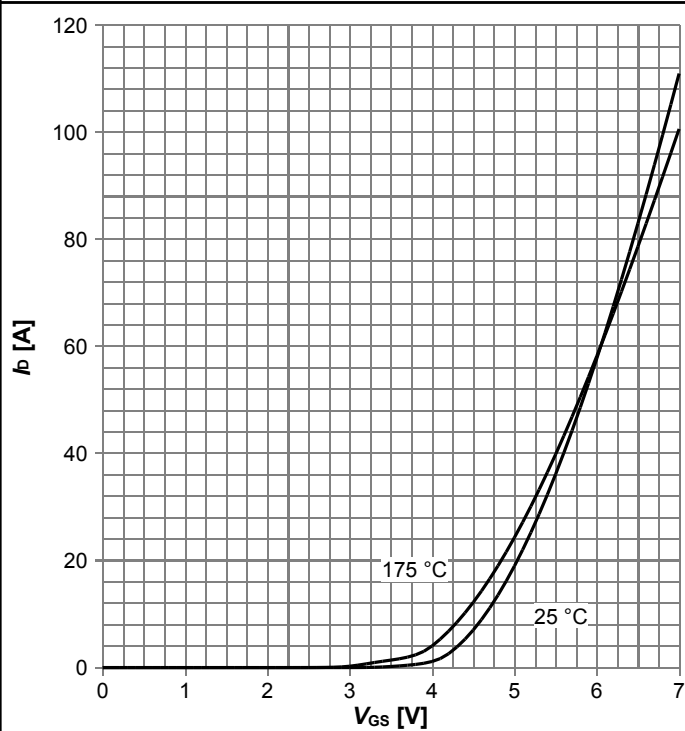
$I_D = f(V_{DS}), T_j = 25^\circ\text{C};$  parameter:  $V_{GS}$

Diagram 6: Typ. drain-source on resistance



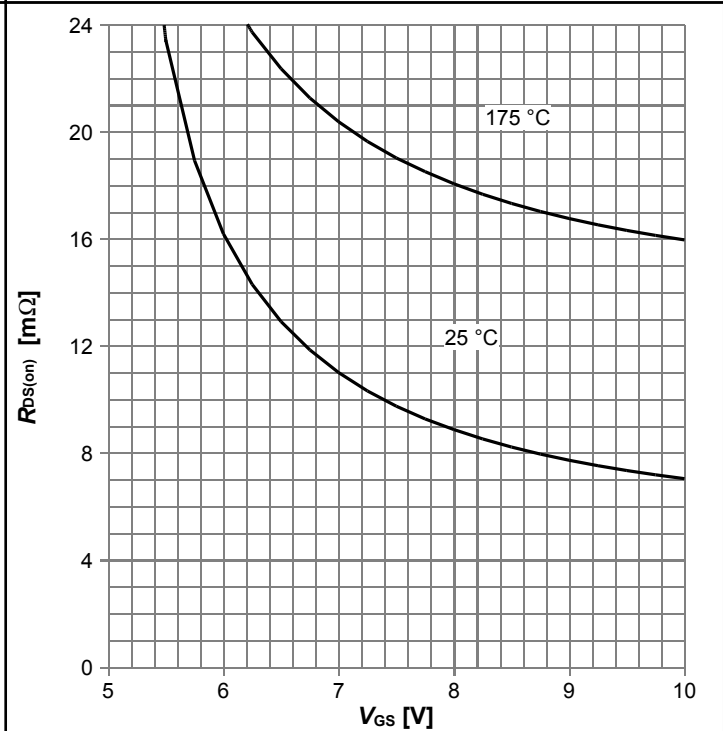
$R_{DS(on)} = f(I_D), T_j = 25^\circ\text{C};$  parameter:  $V_{GS}$

Diagram 7: Typ. transfer characteristics



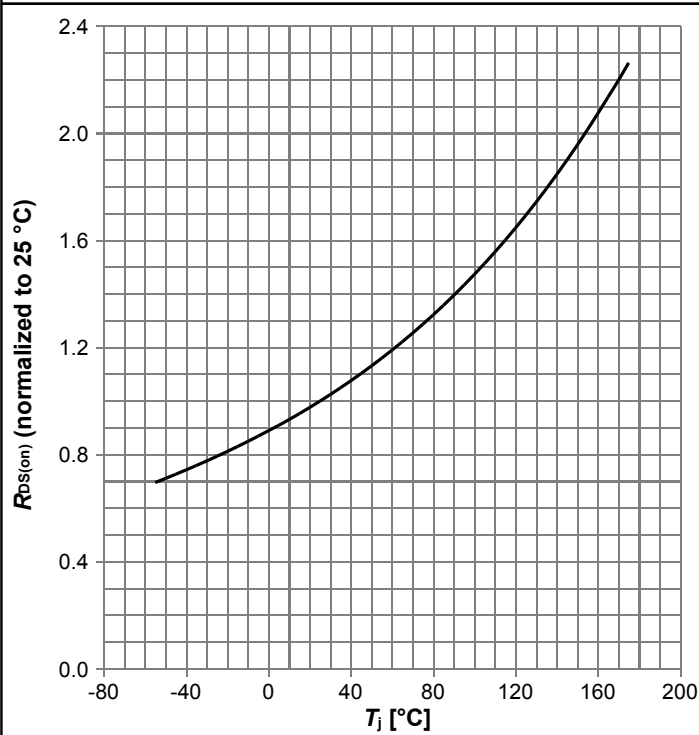
$I_D = f(V_{GS}), |V_{DS}| > 2|I_D|R_{DS(on)max};$  parameter:  $T_j$

Diagram 8: Typ. drain-source on resistance



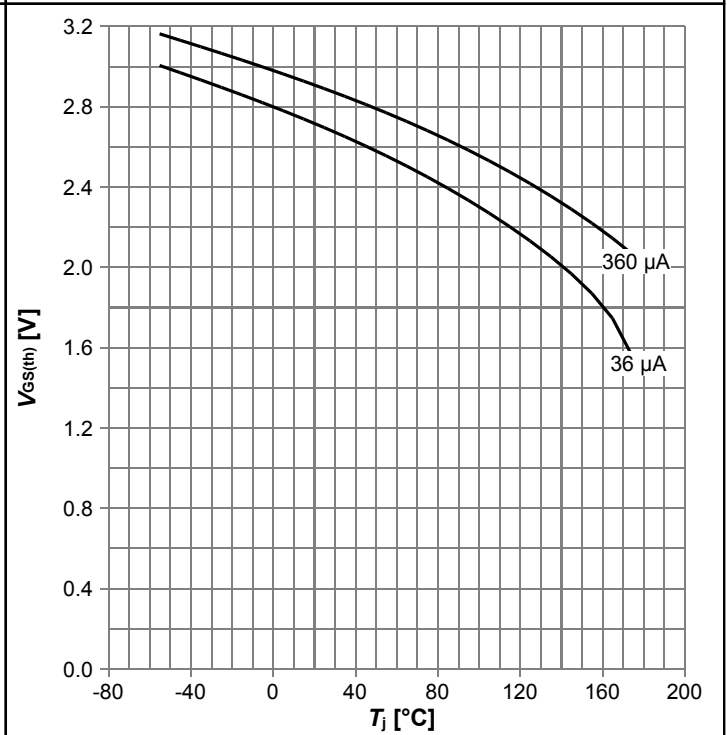
$R_{DS(on)} = f(V_{GS}), I_D = 20\text{ A};$  parameter:  $T_j$

Diagram 9: Normalized drain-source on resistance



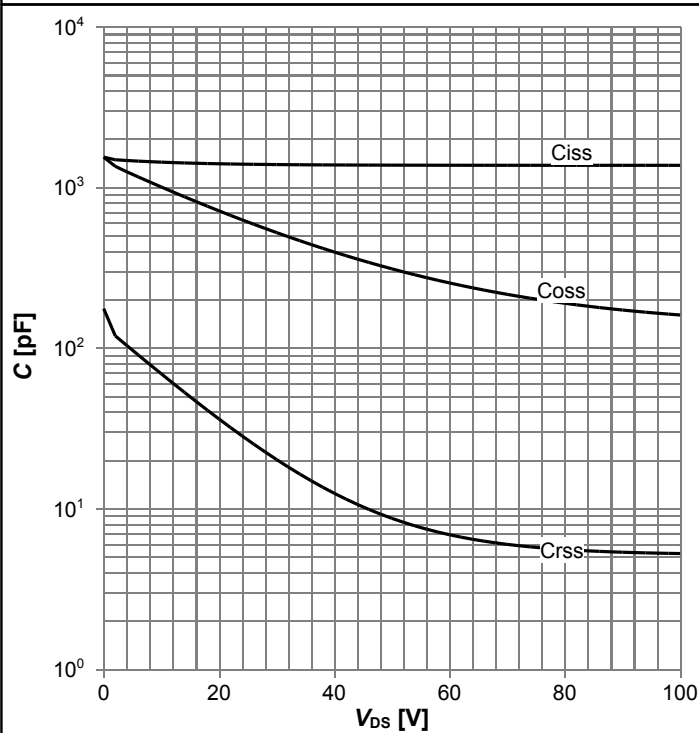
$R_{DS(on)}=f(T_j)$ ,  $I_D=20$  A,  $V_{GS}=10$  V

Diagram 10: Typ. gate threshold voltage



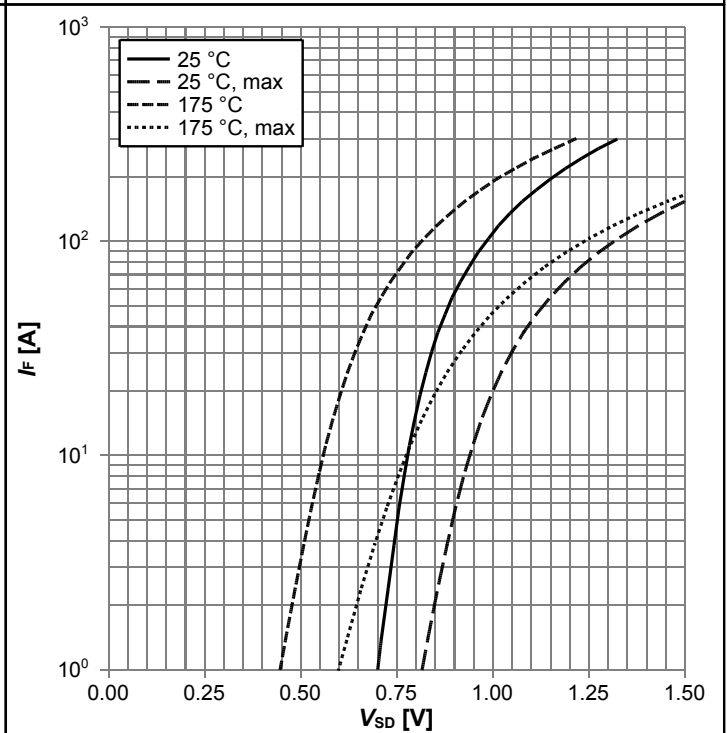
$V_{GS(th)}=f(T_j)$ ,  $V_{GS}=V_{DS}$ ; parameter:  $I_D$

Diagram 11: Typ. capacitances



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

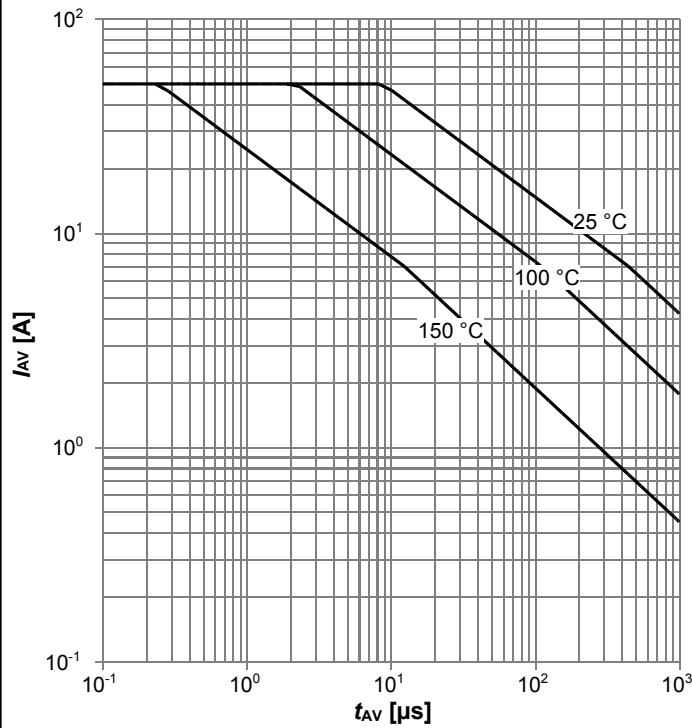
Diagram 12: Forward characteristics of reverse diode



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

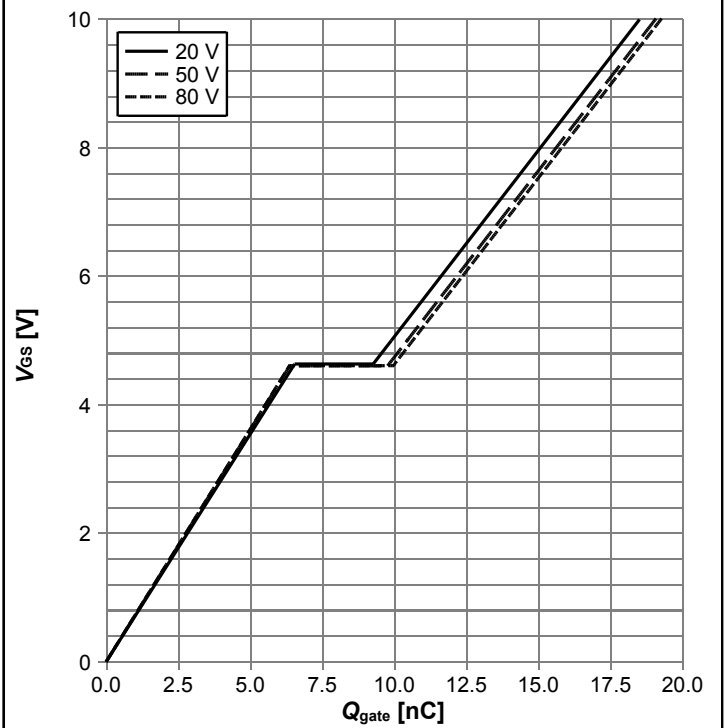


Diagram 13: Avalanche characteristics



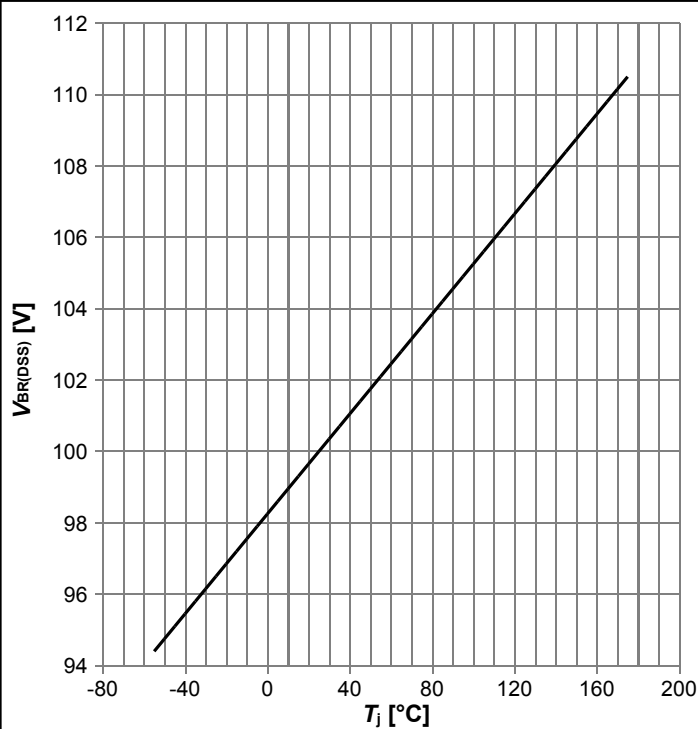
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$ ; parameter:  $T_{j,start}$

Diagram 14: Typ. gate charge



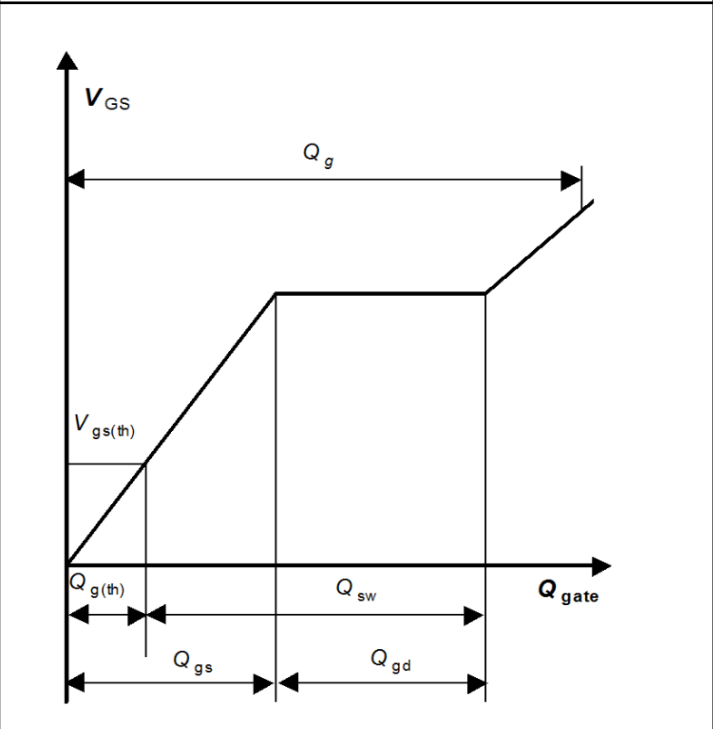
$V_{GS}=f(Q_{gate}), I_D=10$  A pulsed,  $T_j=25$  °C; parameter:  $V_{DD}$

Diagram 15: Drain-source breakdown voltage

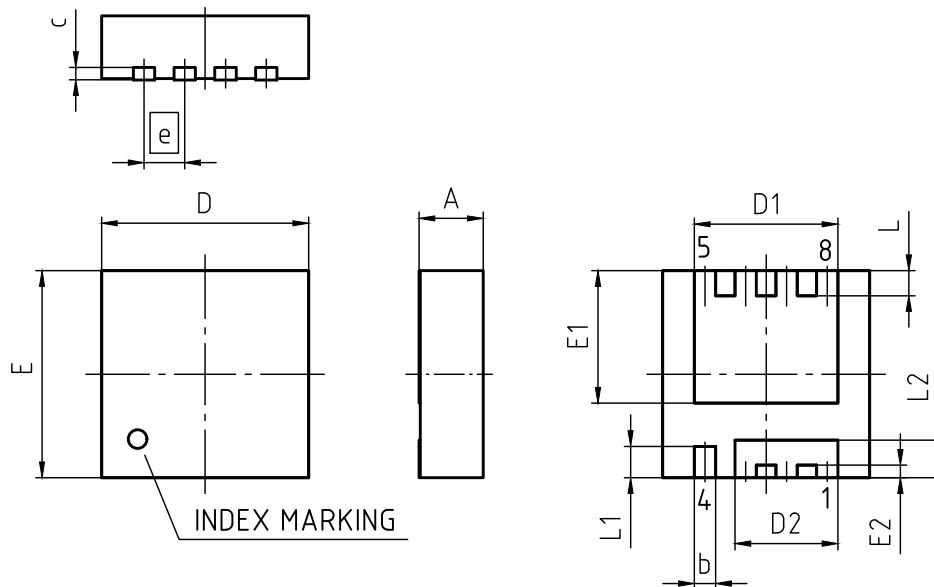


$V_{BR(DSS)}=f(T_j); I_D=10$  mA

Diagram Gate charge waveforms



## 5 Package Outlines



| PACKAGE - GROUP NUMBER: <b>PG-TSDSON-8-U03</b> |                  |      |
|--|------------------|------|
| REVISION: 03                                   | DATE: 20.10.2020 |      |
| DIMENSIONS                                     | MILLIMETERS      |      |
|  | MIN.             | MAX. |
| <b>A</b>                                       | 0.90             | 1.10 |
| <b>b</b>                                       | 0.24             | 0.44 |
| <b>c</b>                                       | (0.20)           |      |
| <b>D</b>                                       | 3.20             | 3.40 |
| <b>D1</b>                                      | 2.19             | 2.39 |
| <b>D2</b>                                      | 1.54             | 1.74 |
| <b>E</b>                                       | 3.20             | 3.40 |
| <b>E1</b>                                      | 2.01             | 2.21 |
| <b>E2</b>                                      | 0.10             | 0.30 |
| <b>e</b>                                       | 0.65             |      |
| <b>L</b>                                       | 0.30             | 0.50 |
| <b>L1</b>                                      | 0.40             | 0.60 |
| <b>L2</b>                                      | 0.50             | 0.70 |
| <b>aaa</b>                                     | 0.06             |      |

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

## Revision History

ISZ080N10NM6

**Revision: 2021-07-05, Rev. 2.0**

Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|--|
| 2.0      | 2021-07-05 | Release of final version                     |

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