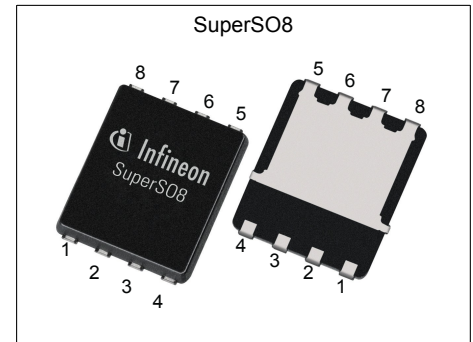


# MOSFET

## OptiMOS™ Power-MOSFET, 30 V

### Features

- Optimized SyncFET for high performance buck converter
- Integrated monolithic Schottky-like diode
- Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5$  V
- Superior thermal resistance
- N-channel
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

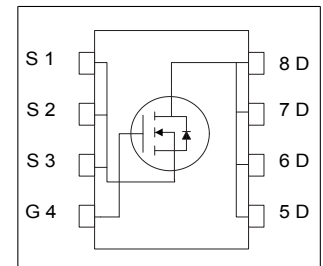


### Product validation

Qualified according to JEDEC Standard

**Table 1 Key Performance Parameters**

| Parameter        | Value | Unit       |
|------------------|-------|------------|
| $V_{DS}$         | 30    | V          |
| $R_{DS(on),max}$ | 3.7   | m $\Omega$ |
| $I_D$            | 78    | A          |
| $Q_{OSS}$        | 12    | nC         |
| $Q_G(0V..10V)$   | 17    | nC         |



| Type / Ordering Code | Package    | Marking  | Related Links |
|----------------------|------------|----------|---------------|
| ISC037N03L5IS        | PG-TDSON-8 | 037N03LI | -             |

## Table of Contents

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## 1 Maximum ratings

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

**Table 2 Maximum ratings**

| Parameter                                     | Symbol            | Values |      |      | Unit | Note / Test Condition                                                                                                                                                                                                                                           |
|-----------------------------------------------|-------------------|--------|------|------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                               |                   | Min.   | Typ. | Max. |      |                                                                                                                                                                                                                                                                 |
| Continuous drain current                      | $I_D$             | -      | -    | 78   | A    | $V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=4.5\text{ V}$ , $T_C=25\text{ °C}$<br>$V_{GS}=4.5\text{ V}$ , $T_C=100\text{ °C}$<br>$V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=50\text{ K/W}^1)$ |
|                                               |                   | -      | -    | 49   |      |                                                                                                                                                                                                                                                                 |
|                                               |                   | -      | -    | 66   |      |                                                                                                                                                                                                                                                                 |
|                                               |                   | -      | -    | 41   |      |                                                                                                                                                                                                                                                                 |
|                                               |                   | -      | -    | 20   |      |                                                                                                                                                                                                                                                                 |
| Pulsed drain current <sup>2)</sup>            | $I_{D,pulse}$     | -      | -    | 312  | A    | $T_C=25\text{ °C}$                                                                                                                                                                                                                                              |
| Avalanche current, single pulse <sup>3)</sup> | $I_{AS}$          | -      | -    | 30   | A    | $T_C=25\text{ °C}$                                                                                                                                                                                                                                              |
| Avalanche energy, single pulse                | $E_{AS}$          | -      | -    | 14   | mJ   | $I_D=30\text{ A}$ , $R_{GS}=25\text{ }\Omega$                                                                                                                                                                                                                   |
| Gate source voltage                           | $V_{GS}$          | -20    | -    | 20   | V    | -                                                                                                                                                                                                                                                               |
| Power dissipation                             | $P_{tot}$         | -      | -    | 37   | W    | $T_C=25\text{ °C}$<br>$T_A=25\text{ °C}$ , $R_{thJA}=50\text{ K/W}^1)$                                                                                                                                                                                          |
|                                               |                   | -      | -    | 2.5  |      |                                                                                                                                                                                                                                                                 |
| Operating and storage temperature             | $T_j$ , $T_{stg}$ | -55    | -    | 150  | °C   | IEC climatic category;<br>DIN IEC 68-1: 55/150/56                                                                                                                                                                                                               |

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

| Parameter                                                   | Symbol     | Values |      |      | Unit | Note / Test Condition |
|-------------------------------------------------------------|------------|--------|------|------|------|-----------------------|
|                                                             |            | Min.   | Typ. | Max. |      |                       |
| Thermal resistance, junction - case, bottom                 | $R_{thJC}$ | -      | -    | 3.4  | K/W  | -                     |
| Thermal resistance, junction - case, top                    | $R_{thJC}$ | -      | -    | 20   | K/W  | -                     |
| Device on PCB, 6 cm <sup>2</sup> cooling area <sup>1)</sup> | $R_{thJA}$ | -      | -    | 50   | K/W  | -                     |

<sup>1)</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>2)</sup> See figure 3 for more detailed information

<sup>3)</sup> See figure 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            | $V_{(BR)DSS}$       | 30     | -    | -    | V          | $V_{GS}=0\text{ V}$ , $I_D=10\text{ mA}$                                                                       |
| Breakdown voltage temperature coefficient | $dV_{(BR)DSS}/dT_j$ | -      | 15   | -    | mV/K       | $I_D=10\text{ mA}$ , referenced to $25\text{ °C}$                                                              |
| Gate threshold voltage                    | $V_{GS(th)}$        | 1.2    | -    | 2    | V          | $V_{DS}=V_{GS}$ , $I_D=250\text{ }\mu\text{A}$                                                                 |
| Zero gate voltage drain current           | $I_{DSS}$           | -      | -    | 0.5  | mA         | $V_{DS}=24\text{ V}$ , $V_{GS}=0\text{ V}$<br>$V_{DS}=24\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$ |
| Gate-source leakage current               | $I_{GSS}$           | -      | 10   | 100  | nA         | $V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$                                                                     |
| Drain-source on-state resistance          | $R_{DS(on)}$        | -      | 4.2  | 5.2  | m $\Omega$ | $V_{GS}=4.5\text{ V}$ , $I_D=30\text{ A}$<br>$V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$                          |
| Gate resistance                           | $R_G$               | -      | 0.9  | -    | $\Omega$   | -                                                                                                              |
| Transconductance                          | $g_{fs}$            | 43     | 86   | -    | S          | $ V_{DS} >2 I_D R_{DS(on)max}$ , $I_D=30\text{ A}$                                                             |

**Table 5 Dynamic characteristics**

| Parameter                    | Symbol       | Values |      |      | Unit | Note / Test Condition                                                                        |
|------------------------------|--------------|--------|------|------|------|----------------------------------------------------------------------------------------------|
|                              |              | Min.   | Typ. | Max. |      |                                                                                              |
| Input capacitance            | $C_{iss}$    | -      | 1100 | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=15\text{ V}$ , $f=1\text{ MHz}$                                |
| Output capacitance           | $C_{oss}$    | -      | 460  | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=15\text{ V}$ , $f=1\text{ MHz}$                                |
| Reverse transfer capacitance | $C_{rss}$    | -      | 64   | -    | pF   | $V_{GS}=0\text{ V}$ , $V_{DS}=15\text{ V}$ , $f=1\text{ MHz}$                                |
| Turn-on delay time           | $t_{d(on)}$  | -      | 3.3  | -    | ns   | $V_{DD}=15\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_G=1.6\text{ }\Omega$ |
| Rise time                    | $t_r$        | -      | 4.4  | -    | ns   | $V_{DD}=15\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_G=1.6\text{ }\Omega$ |
| Turn-off delay time          | $t_{d(off)}$ | -      | 16   | -    | ns   | $V_{DD}=15\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_G=1.6\text{ }\Omega$ |
| Fall time                    | $t_f$        | -      | 3.0  | -    | ns   | $V_{DD}=15\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ ,<br>$R_G=1.6\text{ }\Omega$ |

**Table 6 Gate charge characteristics<sup>1)</sup>**

| Parameter                    | Symbol        | Values |      |      | Unit | Note / Test Condition                                                        |
|------------------------------|---------------|--------|------|------|------|------------------------------------------------------------------------------|
|                              |               | Min.   | Typ. | Max. |      |                                                                              |
| Gate to source charge        | $Q_{GS}$      | -      | 2.9  | -    | nC   | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge at threshold     | $Q_{g(th)}$   | -      | 1.7  | -    | nC   | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate to drain charge         | $Q_{gd}$      | -      | 2.9  | -    | nC   | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Switching charge             | $Q_{sw}$      | -      | 4.1  | -    | nC   | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total            | $Q_g$         | -      | 8.5  | -    | nC   | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate plateau voltage         | $V_{plateau}$ | -      | 2.7  | -    | V    | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }4.5\text{ V}$ |
| Gate charge total            | $Q_g$         | -      | 17   | -    | nC   | $V_{DD}=15\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$  |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | -      | 6.8  | -    | nC   | $V_{DS}=0.1\text{ V}$ , $V_{GS}=0\text{ to }4.5\text{ V}$                    |
| Output charge                | $Q_{oss}$     | -      | 12   | -    | nC   | $V_{DD}=15\text{ V}$ , $V_{GS}=0\text{ V}$                                   |

<sup>1)</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 | $I_S$         | -      | -    | 37   | A    | $T_C=25\text{ °C}$                                           |
| Diode pulse current              | $I_{S,pulse}$ | -      | -    | 148  | A    | $T_C=25\text{ °C}$                                           |
| Diode forward voltage            | $V_{SD}$      | -      | 0.56 | 0.7  | V    | $V_{GS}=0\text{ V}, I_F=3\text{ A}, T_j=25\text{ °C}$        |
| Reverse recovery charge          | $Q_{rr}$      | -      | 2    | -    | nC   | $V_R=15\text{ V}, I_F=I_S, di_F/dt=400\text{ A}/\mu\text{s}$ |

### 4 Electrical characteristics diagrams

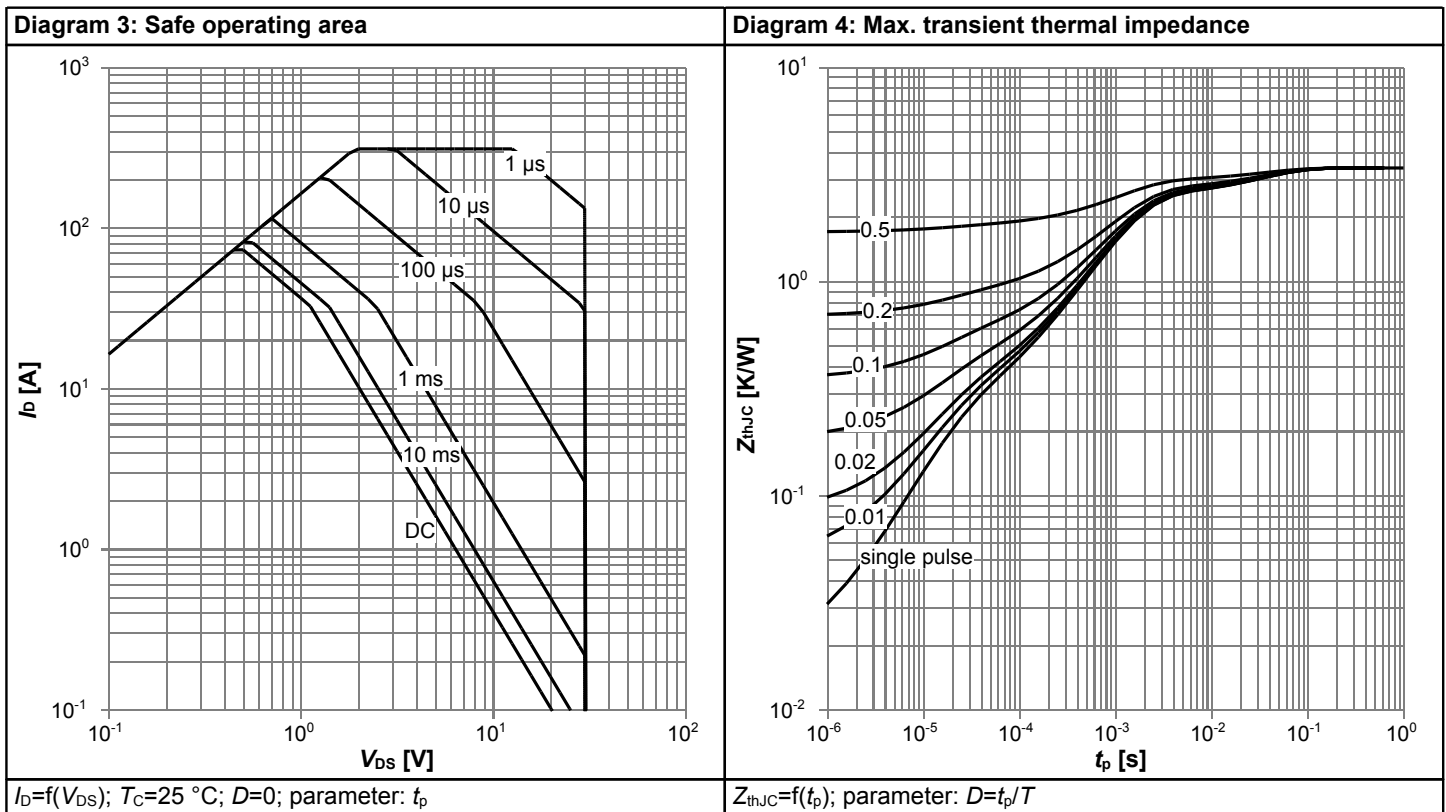
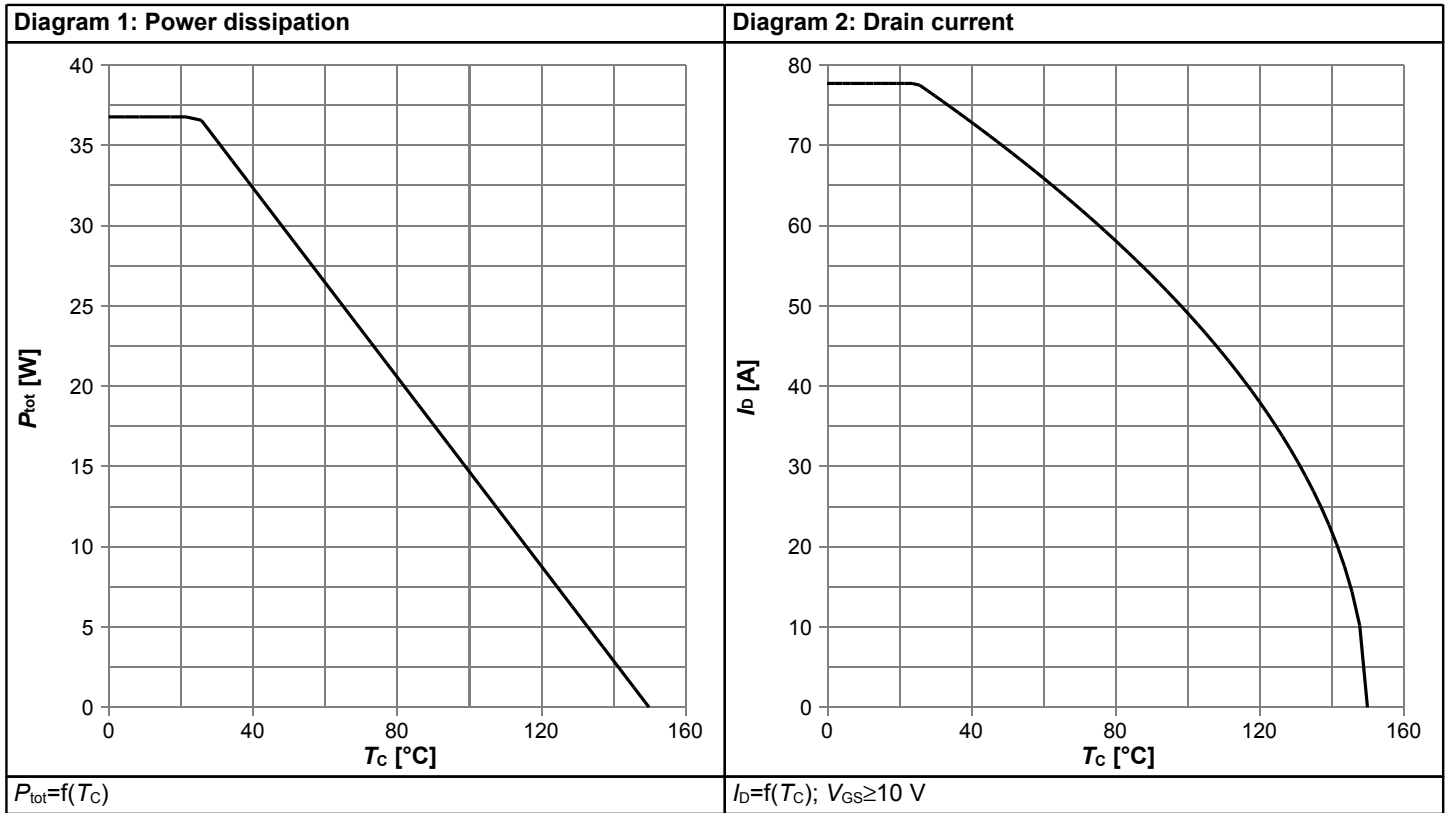
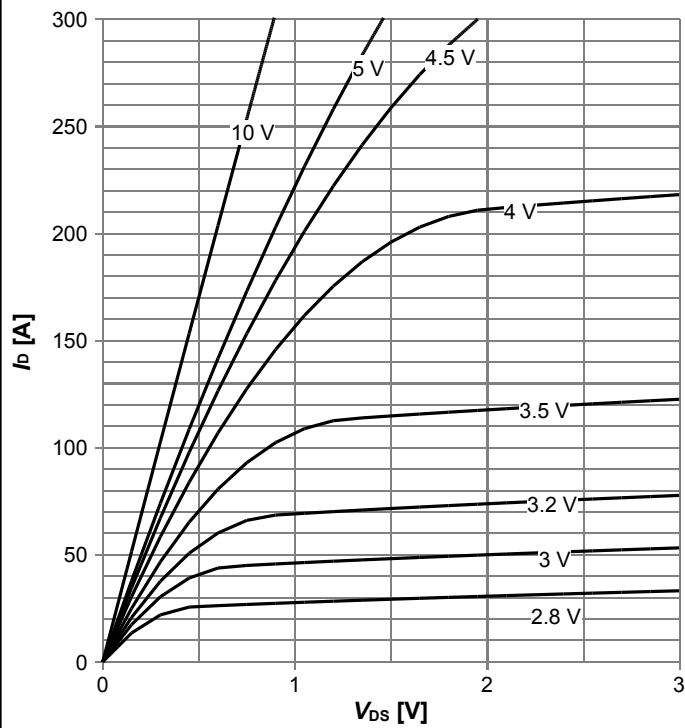
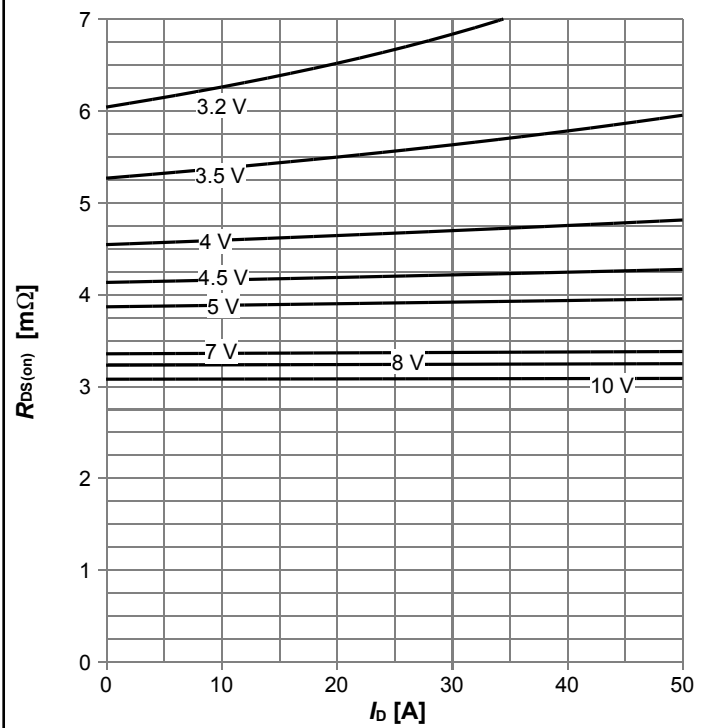


Diagram 5: Typ. output characteristics



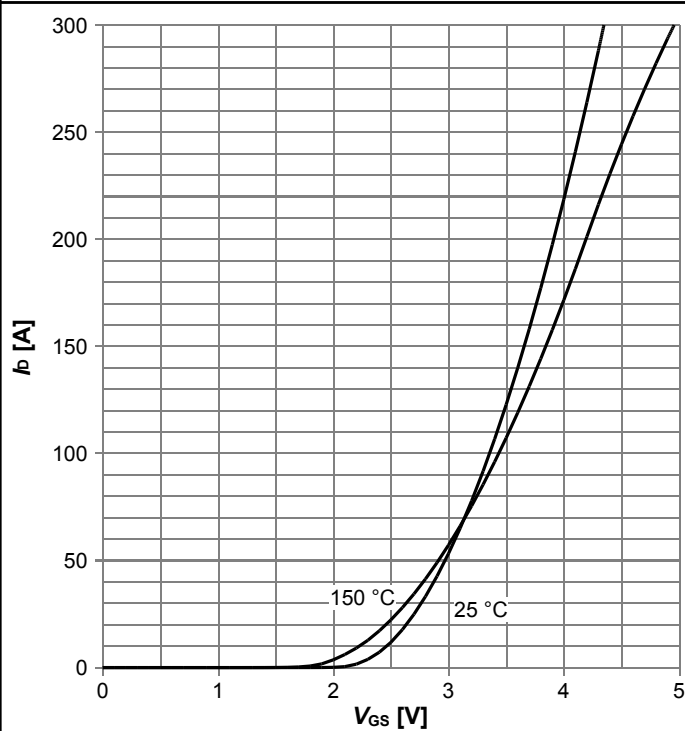
$I_D = f(V_{DS}); T_j = 25\text{ °C};$  parameter:  $V_{GS}$

Diagram 6: Typ. drain-source on resistance



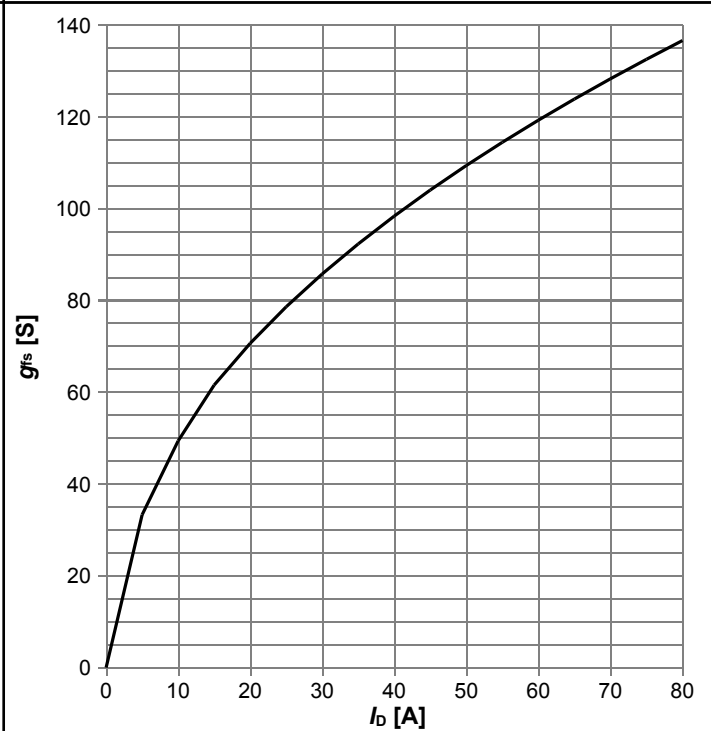
$R_{DS(on)} = f(I_D); T_j = 25\text{ °C};$  parameter:  $V_{GS}$

Diagram 7: Typ. transfer characteristics



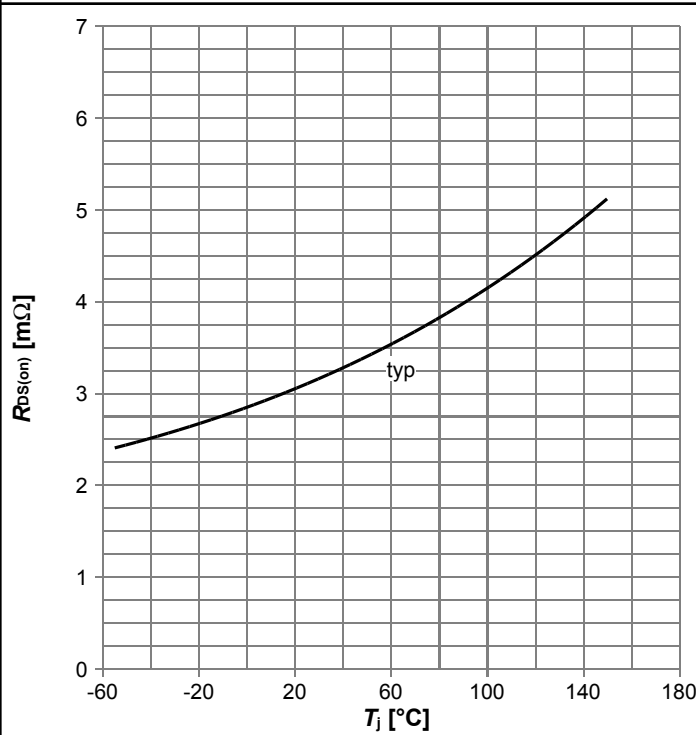
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max};$  parameter:  $T_j$

Diagram 8: Typ. forward transconductance



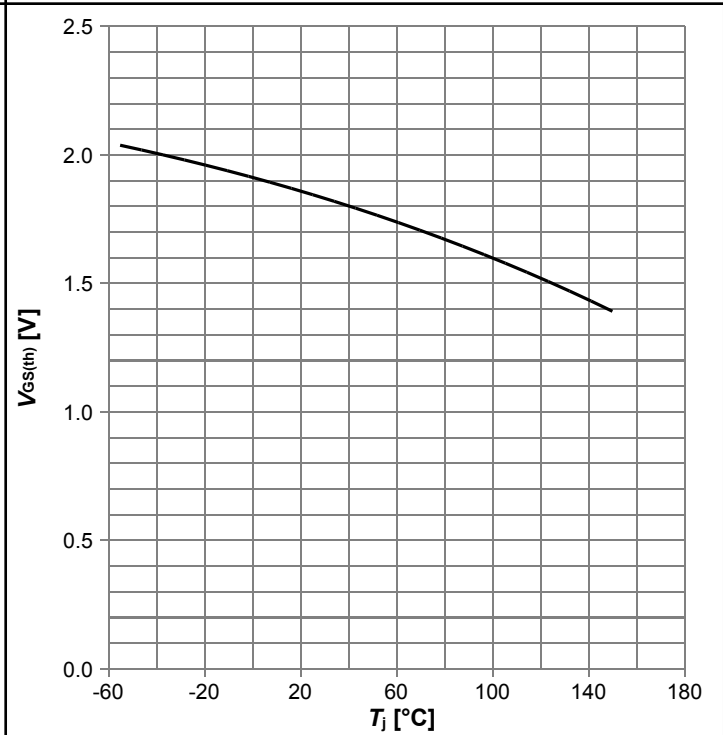
$g_{fs} = f(I_D); T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



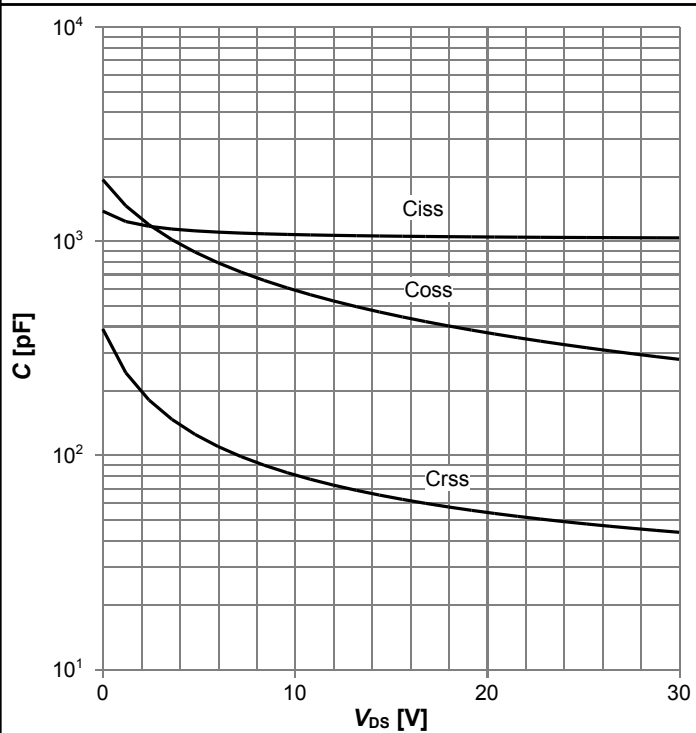
$R_{DS(on)}=f(T_j)$ ;  $I_D=30\text{ A}$ ;  $V_{GS}=10\text{ V}$

Diagram 10: Typ. gate threshold voltage



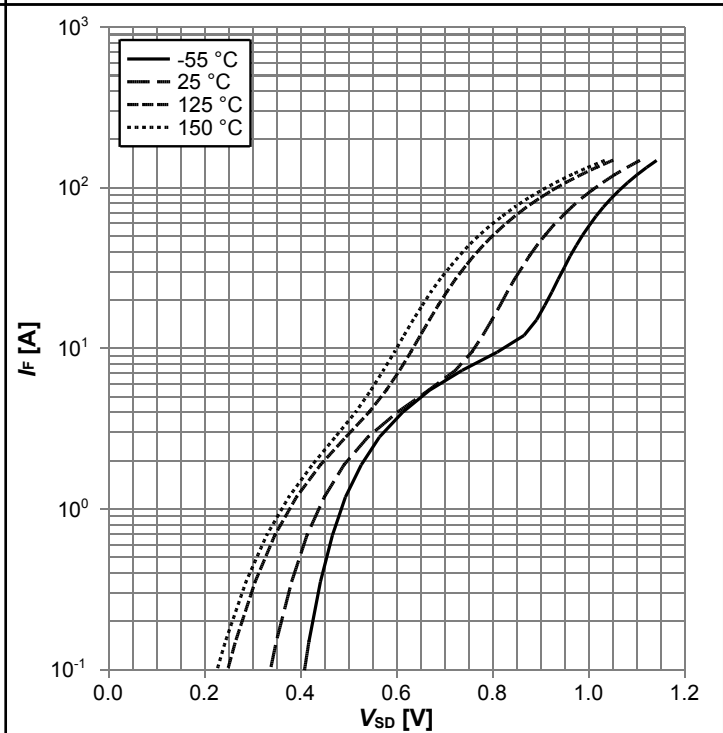
$V_{GS(th)}=f(T_j)$ ;  $V_{GS}=V_{DS}$ ;  $I_D=10\text{ mA}$

Diagram 11: Typ. capacitances



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

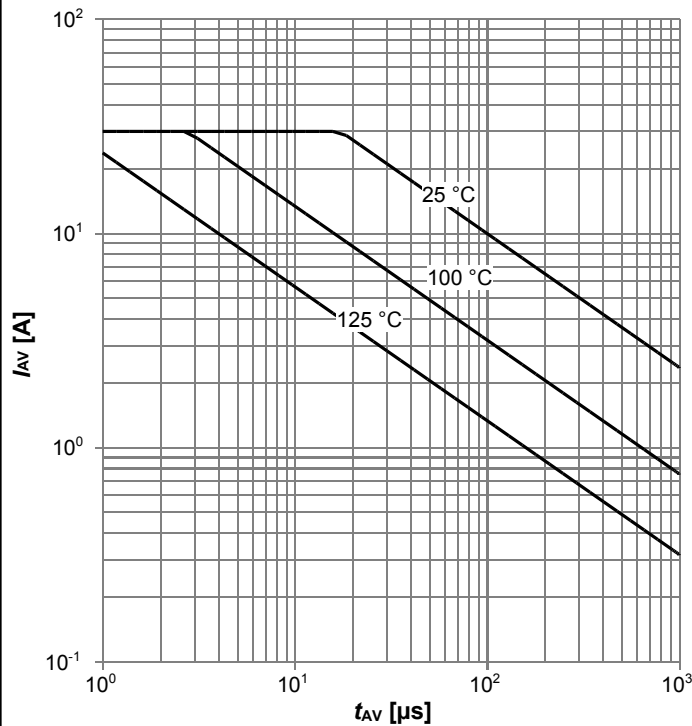
Diagram 12: Forward characteristics of reverse diode



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

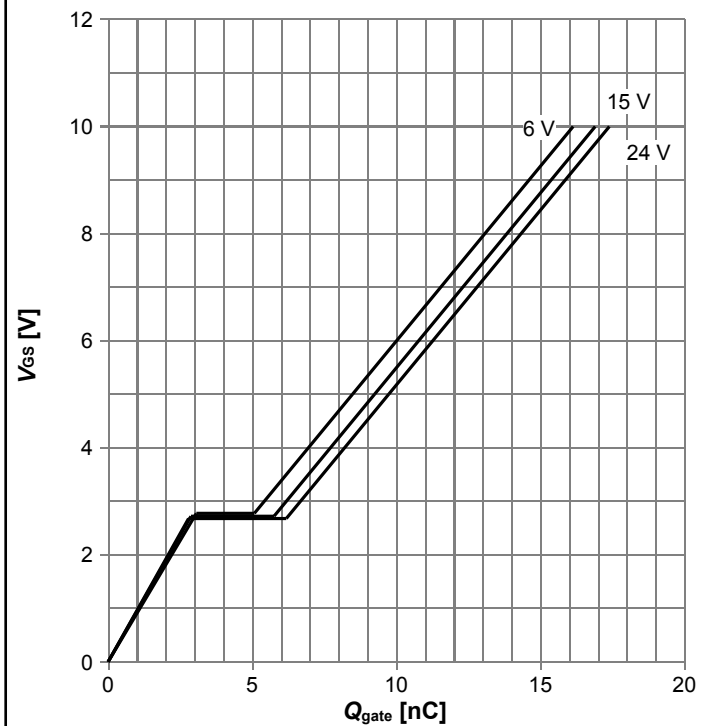


Diagram 13: Avalanche characteristics



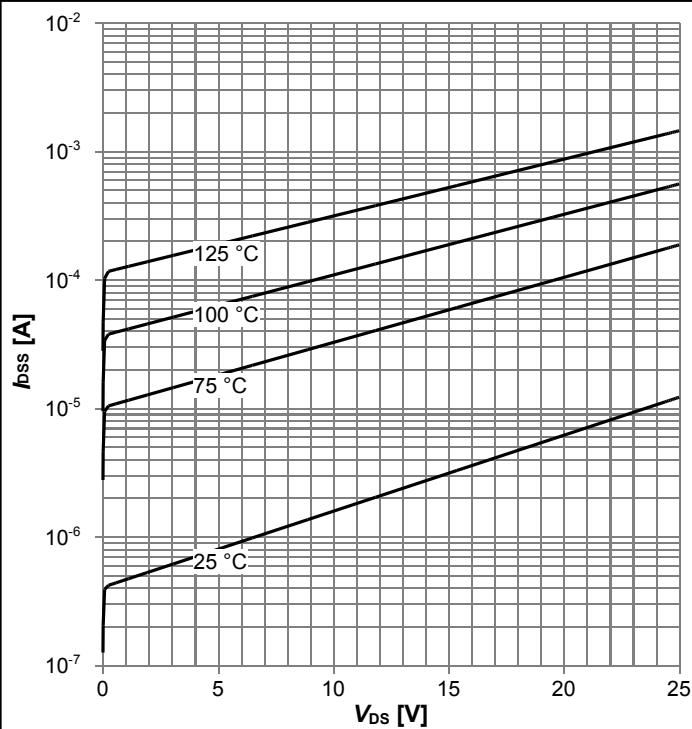
$I_{AS}=f(t_{AV})$ ;  $R_{GS}=25 \Omega$ ; parameter:  $T_{j(start)}$

Diagram 14: Typ. gate charge



$V_{GS}=f(Q_{gate})$ ;  $I_D=30$  A pulsed; parameter:  $V_{DD}$

Diagram 15: Typ. drain-source leakage current



$I_{BSS}=f(V_{DS})$ ;  $V_{GS}=0$  V; parameter:  $T_j$

Diagram Gate charge waveforms



## 5 Package Outlines



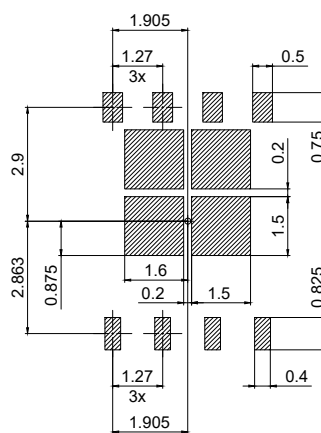
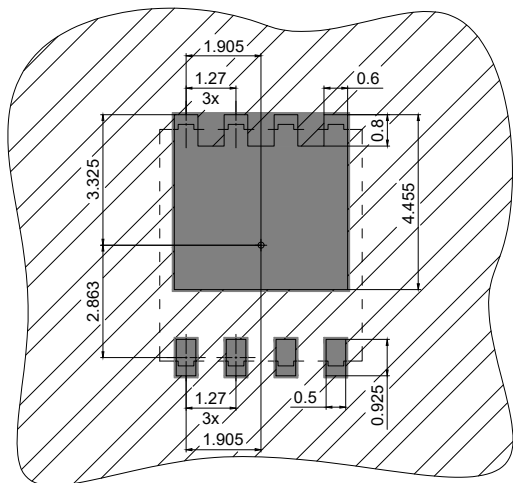
- 1) EXCLUDING MOLD FLASH
- 2) REMOVAL ON MOLD GATE  
INTRUSION 0.1 MM  
PROTRUSION 0.1 MM  
LEAD LENGTH UP TO ANTI FLASH LINE  
ALL METAL SURFACES ARE PLATED, EXCEPT AREA OF CUT

| DIMENSION | MILLIMETERS |      |
|-----------|-------------|------|
|           | MIN.        | MAX. |
| A         | 0.90        | 1.20 |
| A1        | 0.15        | 0.35 |
| b         | 0.34        | 0.54 |
| D         | 4.80        | 5.35 |
| D1        | 3.90        | 4.40 |
| D2        | 0.03        | 0.23 |
| E         | 5.70        | 6.10 |
| E1        | 5.90        | 6.42 |
| E2        | 3.88        | 4.31 |
| e         | 1.27        |      |
| L         | 0.45        | 0.71 |
| M         | 0.45        | 0.69 |

|                                    |
|------------------------------------|
| <b>DOCUMENT NO.</b><br>Z8B00003332 |
| <b>REVISION</b><br>07              |
| <b>SCALE 10:1</b><br>0 1 2 3mm     |
| <b>EUROPEAN PROJECTION</b><br>     |
| <b>ISSUE DATE</b><br>06.06.2019    |

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

PG-TDSON-8: Recommended Boardpads & Apertures



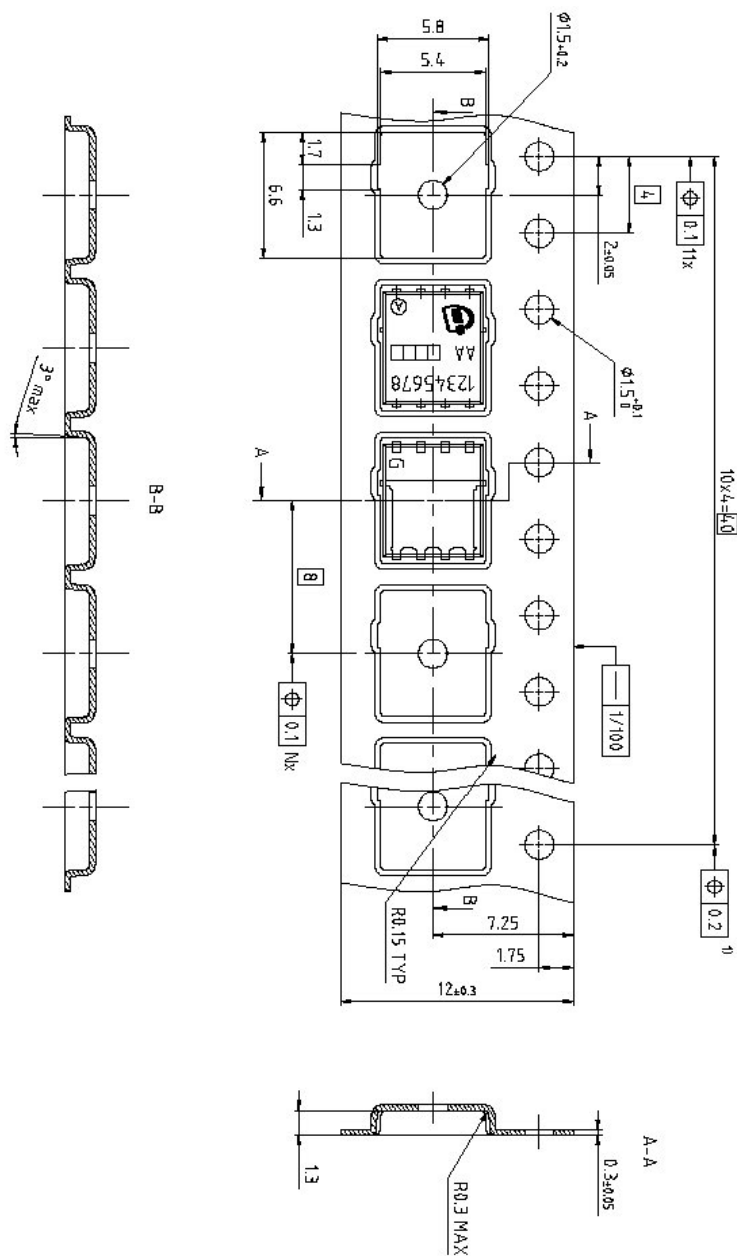
■ copper

▨ solder mask

▩ stencil apertures

all dimensions in mm

Figure 2 Outline Boardpads (TDSON-8), dimensions in mm



Dimension in mm

Figure 3 Outline Tape (TDSON-8)

## Revision History

ISC037N03L5IS

Revision: 2020-02-25, Rev. 2.0

### Previous Revision

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 2.0      | 2020-02-25 | Release of final version                     |

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