

## MOSFET

### 650V CoolMOS™ CM8 Power Transistor

The CoolMOS™ 8th generation platform is a revolutionary technology for high voltage power MOSFETs, designed according to the superjunction (SJ) principle and pioneered by Infineon Technologies. The 650V CoolMOS™ CM8 series is the successor to the 650V CoolMOS™ 7 Family and is enhancing Infineon's WBG offering. It combines the benefits of a fast switching SJ MOSFET with excellent ease of use, e.g low ringing tendency, implemented fast body diode (CFD) for all products with outstanding robustness against hard commutation and excellent ESD capability. Furthermore, extremely low switching and conduction losses of CM8, make switching applications even more efficient.

### Features

- Best in class 650V SJ MOSFET performance
- Suitable for hard and soft switching topologies thanks to an outstanding commutation ruggedness
- Integrated fast body diode and ESD protection
- .XT interconnection technology for best in class thermal performance

### Benefits

- Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
- Simplified thermal management due to our advanced die attach technique
- Increased power density solutions enabled by using products with smaller footprint and higher manufacturing quality due state of the art ESD protection
- Suitable for a wide variety of applications and power ranges

### Potential applications

- Power supplies and converters
- PFC stages & LLC resonant converters
- High efficiency switching applications
- e.g. Datacenter, AI Server, Telecom Power Supply

### Product validation

Fully qualified according to JEDEC for Industrial Applications

Please note: For MOSFET paralleling the use of ferrite beads on the gate or separate totem poles is generally recommended.

**Table 1** Key performance parameters

| Parameter            | Value | Unit |
|----------------------|-------|------|
| $V_{DS} @ T_{j,max}$ | 700   | V    |
| $R_{DS(on),max}$     | 18    | mΩ   |
| $Q_{g,typ}$          | 173   | nC   |
| $I_{D,pulse}$        | 505   | A    |
| $E_{oss} @ 400V$     | 19.6  | μJ   |
| Body diode $di_F/dt$ | 1300  | A/μs |
| ESD class (HBM)      | 2     |      |

| Type / Ordering code | Package     | Marking  | Related links  |
|----------------------|-------------|----------|----------------|
| IPDQ65R018CM8        | PG-HDSOP-22 | 65R018C8 | see Appendix A |

Q-DPAK

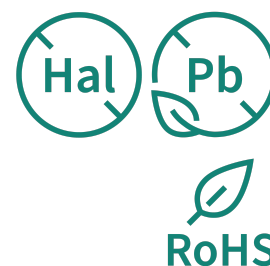
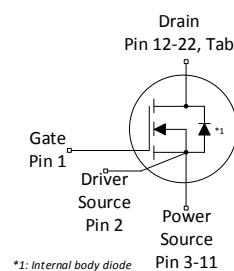
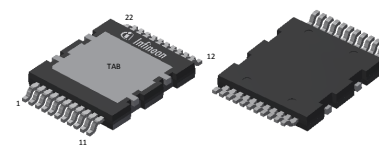




Table of contents

Description ..... 1

Maximum ratings ..... 3

Thermal characteristics ..... 4

Electrical characteristics ..... 5

Electrical characteristics diagrams ..... 7

Test circuits ..... 11

Package outlines ..... 12

Appendix A ..... 15

Revision history ..... 16

Trademarks ..... 16

Disclaimer ..... 16

# 1 Maximum ratings

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

**Table 2 Maximum ratings**

| Parameter                               | Symbol        | Values |      |           | Unit             | Note / Test condition                                                                        |
|-----------------------------------------|---------------|--------|------|-----------|------------------|----------------------------------------------------------------------------------------------|
|                                         |               | Min.   | Typ. | Max.      |                  |                                                                                              |
| Continuous drain current <sup>1)</sup>  | $I_D$         | -      | -    | 127<br>80 | A                | $T_C=25^\circ\text{C}$<br>$T_C=100^\circ\text{C}$                                            |
| Pulsed drain current <sup>2)</sup>      | $I_{D,pulse}$ | -      | -    | 505       | A                | $T_C=25^\circ\text{C}$                                                                       |
| Avalanche energy, single pulse          | $E_{AS}$      | -      | -    | 297       | mJ               | $I_D=6.7\text{A}$ ; $V_{DD}=50\text{V}$ ; see table 10                                       |
| Avalanche energy, repetitive            | $E_{AR}$      | -      | -    | 1.48      | mJ               |                                                                                              |
| Avalanche current, single pulse         | $I_{AS}$      | -      | -    | 6.7       | A                | -                                                                                            |
| MOSFET dv/dt ruggedness                 | dv/dt         | -      | -    | 120       | V/ns             | $V_{DS}=0\ldots 400\text{V}$                                                                 |
| Gate source voltage (static)            | $V_{GS}$      | -20    | -    | 20        | V                | static;                                                                                      |
| Gate source voltage (dynamic)           | $V_{GS}$      | -30    | -    | 30        | V                | AC ( $f>1\text{ Hz}$ )                                                                       |
| Power dissipation                       | $P_{tot}$     | -      | -    | 625       | W                | $T_C=25^\circ\text{C}$                                                                       |
| Storage temperature                     | $T_{stg}$     | -55    | -    | 150       | $^\circ\text{C}$ | -                                                                                            |
| Operating junction temperature          | $T_j$         | -55    | -    | 150       | $^\circ\text{C}$ |                                                                                              |
| Extended operating junction temperature | $T_j$         | 150    | -    | 175       | $^\circ\text{C}$ | $\leq 50\text{ h}$ in the application lifetime                                               |
| Mounting torque                         | -             | -      | -    | -         | Ncm              | -                                                                                            |
| Continuous diode forward current        | $I_S$         | -      | -    | 127       | A                | $T_C=25^\circ\text{C}$                                                                       |
| Diode pulse current <sup>2)</sup>       | $I_{S,pulse}$ | -      | -    | 505       | A                |                                                                                              |
| Reverse diode dv/dt <sup>3)</sup>       | dv/dt         | -      | -    | 70        | V/ns             | $V_{DS}=0\ldots 400\text{V}$ , $I_{SD}\leq 127\text{A}$ , $T_j=25^\circ\text{C}$ see table 8 |
| Maximum diode commutation speed         | $di_F/dt$     | -      | -    | 1300      | A/ $\mu\text{s}$ |                                                                                              |
| Insulation withstand voltage            | $V_{ISO}$     | -      | -    | n.a.      | V                | $V_{rms}$ , $T_C=25^\circ\text{C}$ , $t=1\text{min}$                                         |

1) Limited by  $T_{j,max}$

2) Pulse width  $t_p$  limited by  $T_{j,max}$

3) Identical low side and high side switch with identical  $R_G$

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

| Parameter                                              | Symbol     | Values |      |      | Unit | Note / Test condition                                                                                                                                                  |
|--------------------------------------------------------|------------|--------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                        |            | Min.   | Typ. | Max. |      |                                                                                                                                                                        |
| Thermal resistance, junction - case                    | $R_{thJC}$ | -      | -    | 0.2  | K/W  | -                                                                                                                                                                      |
| Thermal resistance, junction - ambient                 | $R_{thJA}$ | -      | -    | 62   | K/W  | device on PCB, minimal footprint                                                                                                                                       |
| Thermal resistance, junction - ambient for SMD version | $R_{thJA}$ | -      | 45   | 55   | K/W  | Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm <sup>2</sup> (one layer, 70μm thickness) copper area. Tap exposed to air. PCB is vertical without air stream cooling. |
| Soldering temperature, reflow soldering allowed        | $T_{sold}$ | -      | -    | 260  | °C   | reflow MSL1                                                                                                                                                            |

### 3 Electrical characteristics

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

**Table 4 Static characteristics**

| Parameter                        | Symbol        | Values |                |            | Unit     | Note / Test condition                                                                             |
|----------------------------------|---------------|--------|----------------|------------|----------|---------------------------------------------------------------------------------------------------|
|                                  |               | Min.   | Typ.           | Max.       |          |                                                                                                   |
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | 650    | -              | -          | V        | $V_{GS}=0V, I_D=1mA$                                                                              |
| Gate threshold voltage           | $V_{(GS)th}$  | 3.7    | 4.2            | 4.7        | V        | $V_{DS}=V_{GS}, I_D=1.48mA$                                                                       |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | -<br>244       | 2<br>-     | $\mu A$  | $V_{DS}=650V, V_{GS}=0V, T_j=25^\circ\text{C}$<br>$V_{DS}=650V, V_{GS}=0V, T_j=150^\circ\text{C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | -              | 0.1        | $\mu A$  | $V_{GS}=20V, V_{DS}=0V$                                                                           |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 0.015<br>0.033 | 0.018<br>- | $\Omega$ | $V_{GS}=10V, I_D=55.6A, T_j=25^\circ\text{C}$<br>$V_{GS}=10V, I_D=55.6A, T_j=150^\circ\text{C}$   |
| Gate resistance                  | $R_G$         | -      | 1              | -          | $\Omega$ | $f=1MHz$                                                                                          |

**Table 5 Dynamic characteristics**

| Parameter                                                  | Symbol       | Values |      |      | Unit | Note / Test condition                                                  |
|------------------------------------------------------------|--------------|--------|------|------|------|------------------------------------------------------------------------|
|                                                            |              | Min.   | Typ. | Max. |      |                                                                        |
| Input capacitance                                          | $C_{iss}$    | -      | 8290 | -    | pF   | $V_{GS}=0V, V_{DS}=400V, f=250kHz$                                     |
| Output capacitance                                         | $C_{oss}$    | -      | 91   | -    | pF   |                                                                        |
| Effective output capacitance, energy related <sup>4)</sup> | $C_{o(er)}$  | -      | 245  | -    | pF   | $V_{GS}=0V, V_{DS}=0...400V$                                           |
| Effective output capacitance, time related <sup>5)</sup>   | $C_{o(tr)}$  | -      | 2702 | -    | pF   | $I_D=\text{constant}, V_{GS}=0V, V_{DS}=0...400V$                      |
| Turn-on delay time                                         | $t_{d(on)}$  | -      | 33.5 | -    | ns   | $V_{DD}=400V, V_{GS}=13V, I_D=29.7A,$<br>$R_G=1.8\Omega$ ; see table 9 |
| Rise time                                                  | $t_r$        | -      | 10.5 | -    | ns   |                                                                        |
| Turn-off delay time                                        | $t_{d(off)}$ | -      | 145  | -    | ns   |                                                                        |
| Fall time                                                  | $t_f$        | -      | 5.1  | -    | ns   |                                                                        |

<sup>4)</sup>  $C_{o(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 400V

<sup>5)</sup>  $C_{o(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 400V

**Table 6 Gate charge characteristics**

| Parameter             | Symbol        | Values |      |      | Unit | Note / Test condition                             |
|-----------------------|---------------|--------|------|------|------|---------------------------------------------------|
|                       |               | Min.   | Typ. | Max. |      |                                                   |
| Gate to source charge | $Q_{gs}$      | -      | 48   | -    | nC   | $V_{DD}=400V$ , $I_D=29.7A$ , $V_{GS}=0$ to $10V$ |
| Gate to drain charge  | $Q_{gd}$      | -      | 54   | -    | nC   |                                                   |
| Gate charge total     | $Q_g$         | -      | 173  | -    | nC   |                                                   |
| Gate plateau voltage  | $V_{plateau}$ | -      | 5.8  | -    | V    |                                                   |

**Table 7 Reverse diode characteristics**

| Parameter                     | Symbol    | Values |      |      | Unit    | Note / Test condition                                            |
|-------------------------------|-----------|--------|------|------|---------|------------------------------------------------------------------|
|                               |           | Min.   | Typ. | Max. |         |                                                                  |
| Diode forward voltage         | $V_{SD}$  | -      | 0.9  | -    | V       | $V_{GS}=0V$ , $I_F=29.7A$ , $T_j=25^\circ C$                     |
| Reverse recovery time         | $t_{rr}$  | -      | 180  | 225  | ns      | $V_R=400V$ , $I_F=29.7A$ , $di_F/dt=100A/\mu s$ ;<br>see table 8 |
| Reverse recovery charge       | $Q_{rr}$  | -      | 1.54 | 2.31 | $\mu C$ |                                                                  |
| Peak reverse recovery current | $I_{rrm}$ | -      | 16.4 | -    | A       |                                                                  |

4 Electrical characteristics diagrams

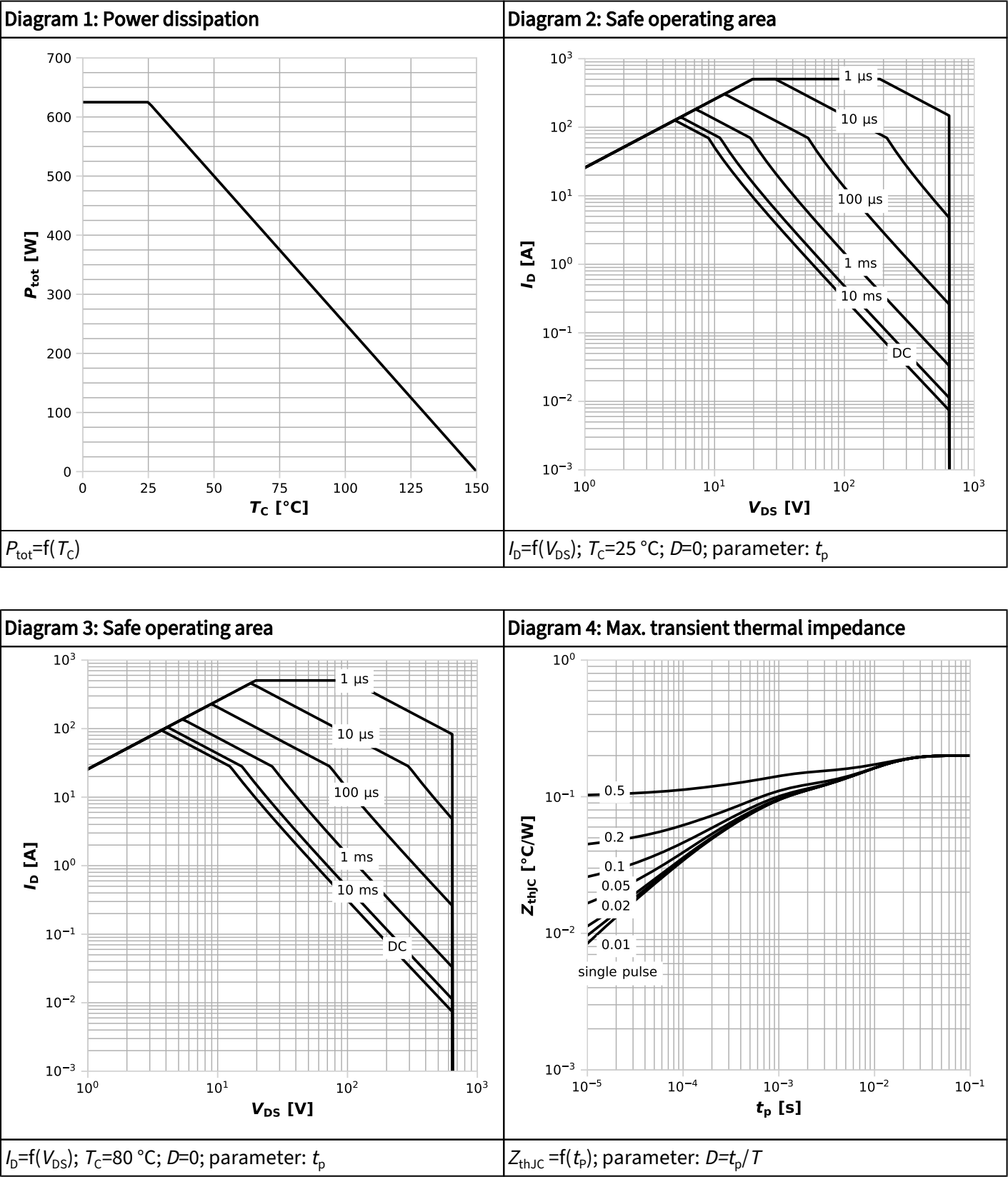
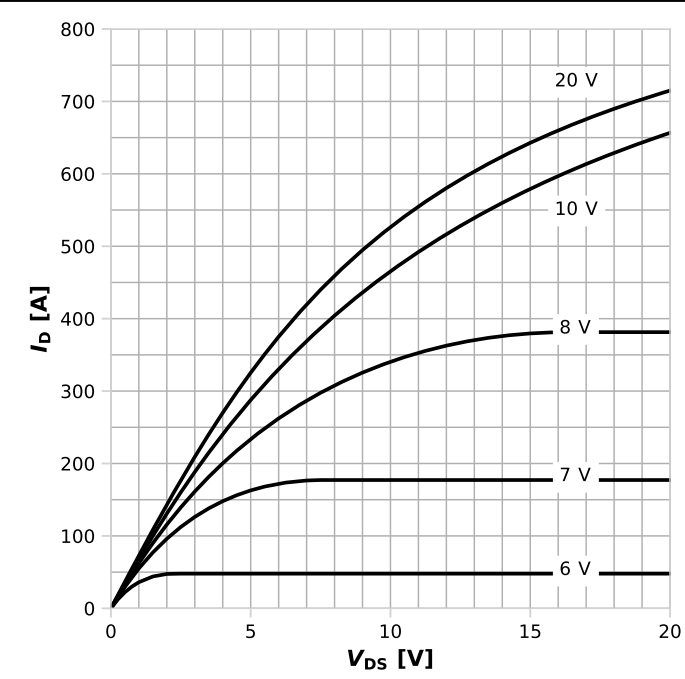
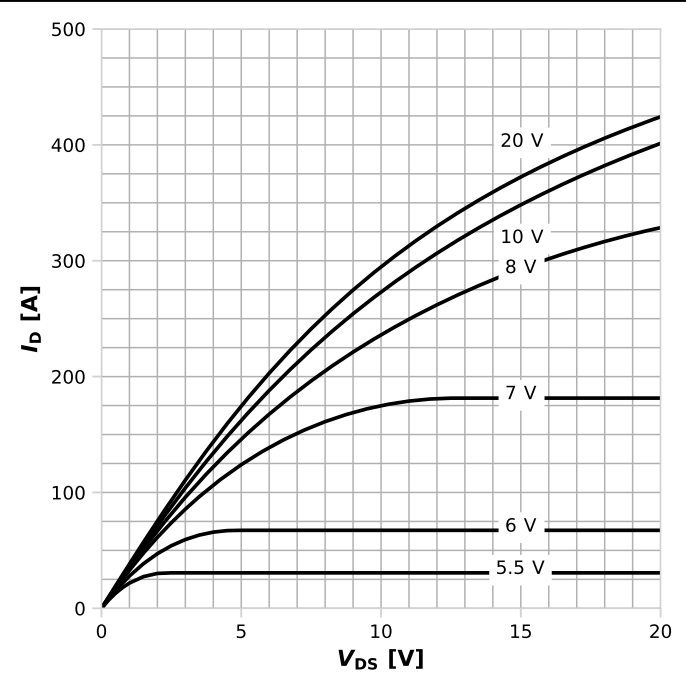


Diagram 5: Typ. output characteristics



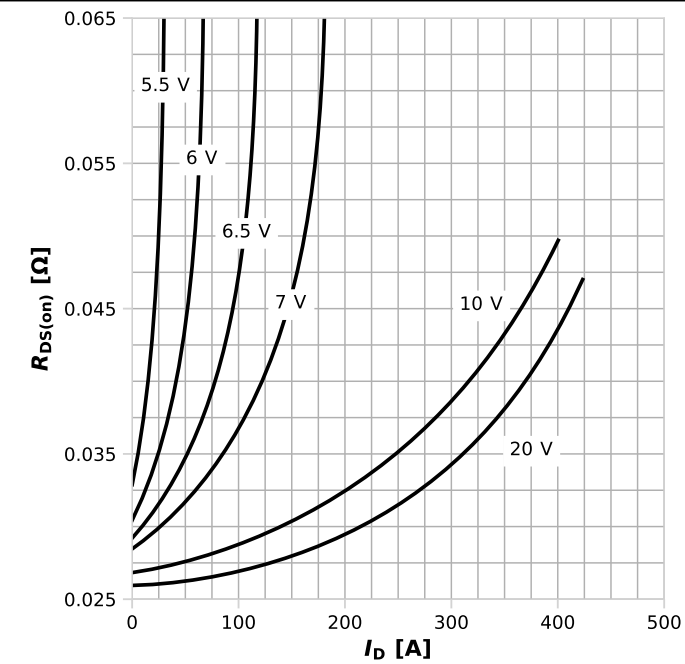
$I_D = f(V_{DS})$ ;  $T_j = 25\text{ °C}$ ; parameter:  $V_{GS}$

Diagram 6: Typ. output characteristics



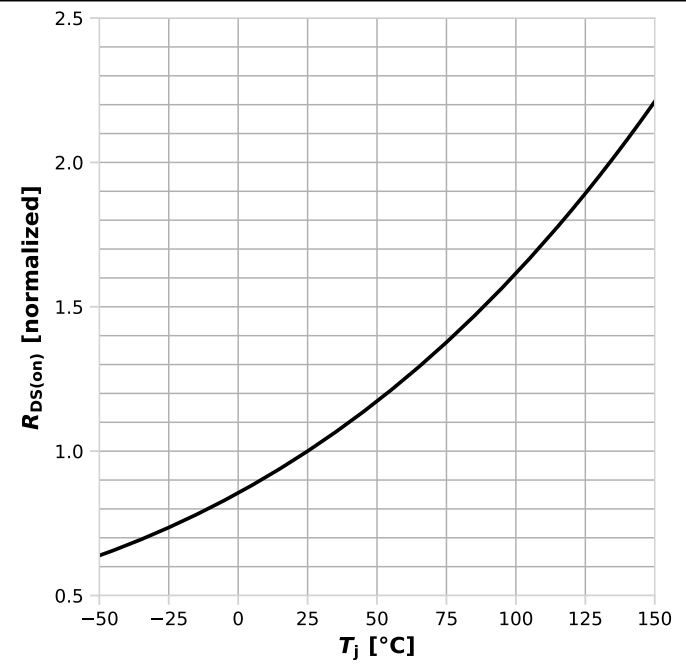
$I_D = f(V_{DS})$ ;  $T_j = 125\text{ °C}$ ; parameter:  $V_{GS}$

Diagram 7: Typ. drain-source on-state resistance



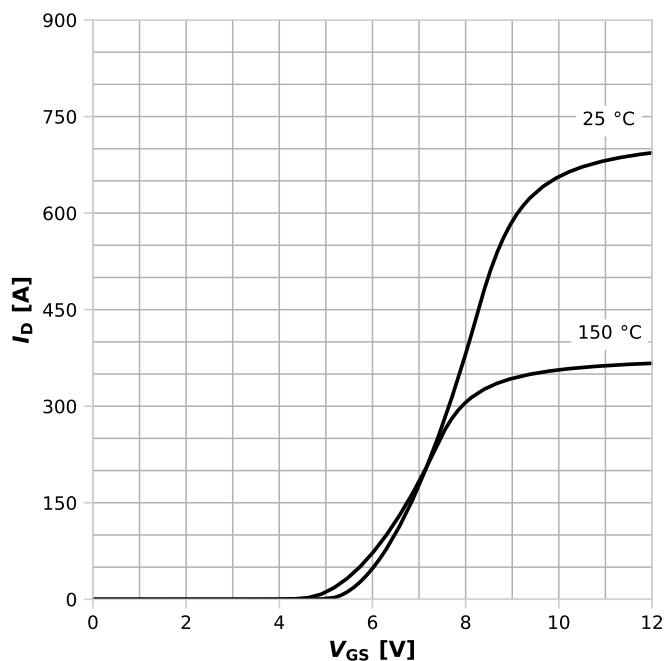
$R_{DS(on)} = f(I_D)$ ;  $T_j = 125\text{ °C}$ ; parameter:  $V_{GS}$

Diagram 8: Drain-source on-state resistance



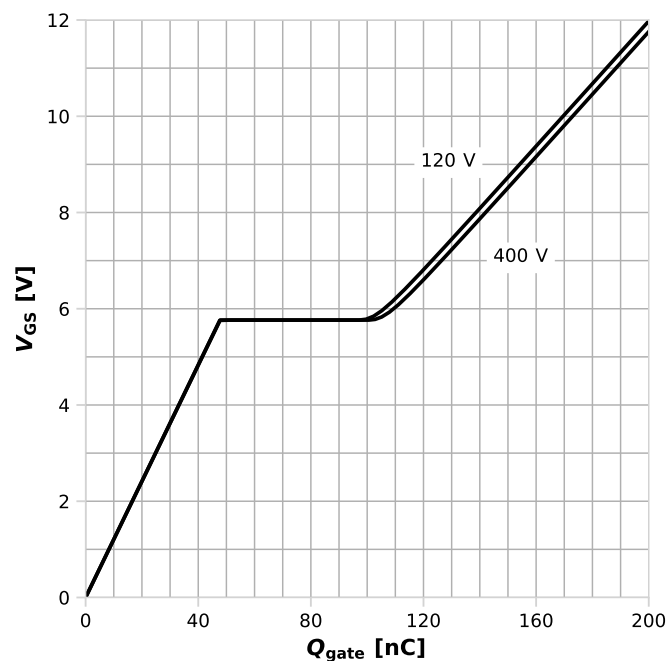
$R_{DS(on)} = f(T_j)$ ;  $I_D = 55.6\text{ A}$ ;  $V_{GS} = 10\text{ V}$

**Diagram 9: Typ. transfer characteristics**



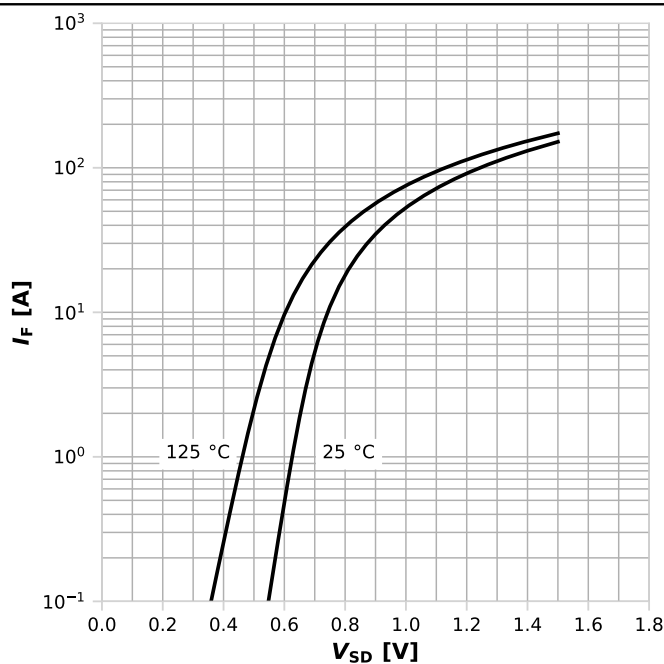
$I_D = f(V_{GS})$ ;  $V_{DS} = 20V$ ; parameter:  $T_j$

**Diagram 10: Typ. gate charge**



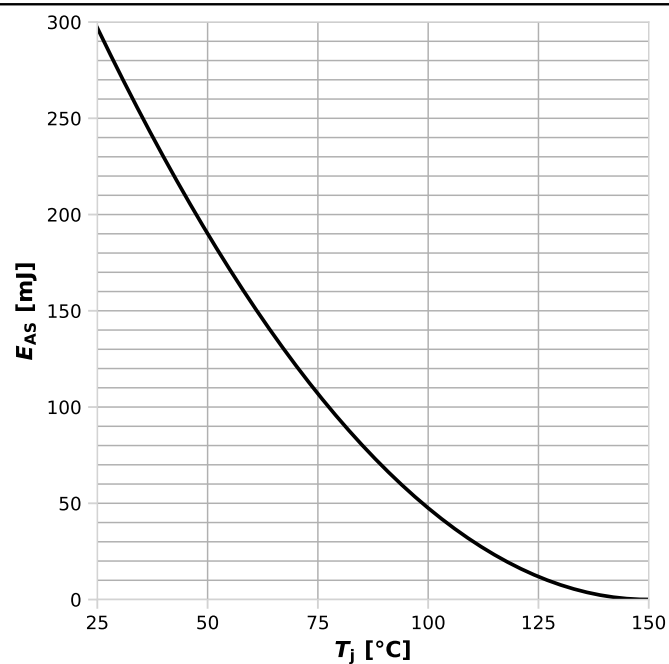
$V_{GS} = f(Q_{gate})$ ;  $I_D = 29.7$  A pulsed; parameter:  $V_{DD}$

**Diagram 11: Forward characteristics of reverse diode**



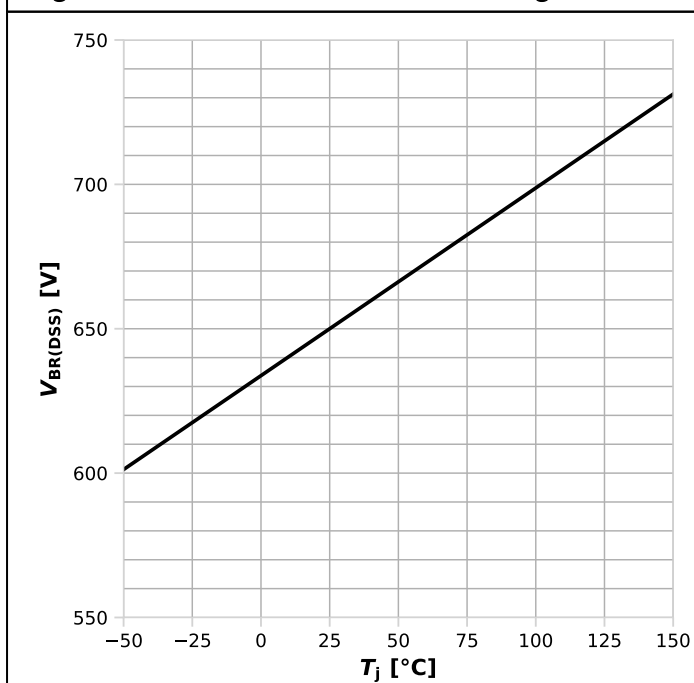
$I_F = f(V_{SD})$ ; parameter:  $T_j$

**Diagram 12: Avalanche energy**



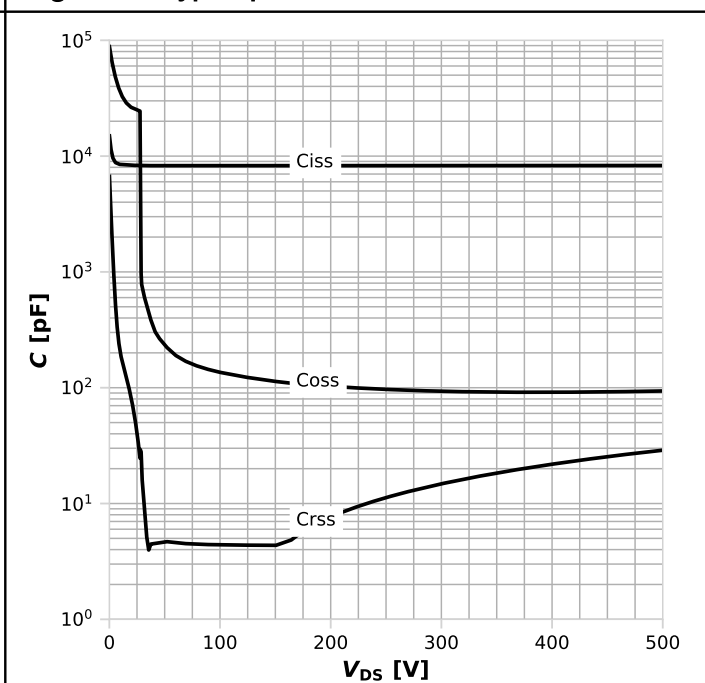
$E_{AS} = f(T_j)$ ;  $I_D = 6.7$  A;  $V_{DD} = 50$  V

**Diagram 13: Drain-source breakdown voltage**



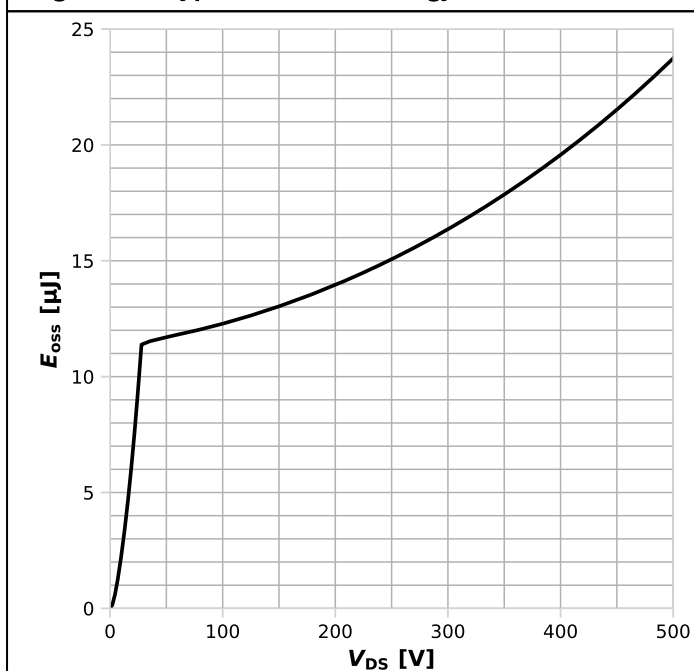
$$V_{BR(DSS)} = f(T_j); I_D = 10 \text{ mA}$$

**Diagram 14: Typ. capacitances**



$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 250 \text{ kHz}$$

**Diagram 15: Typ. Coss stored energy**



$$E_{oss} = f(V_{DS})$$

5 Test circuits

Table 8 Diode characteristics

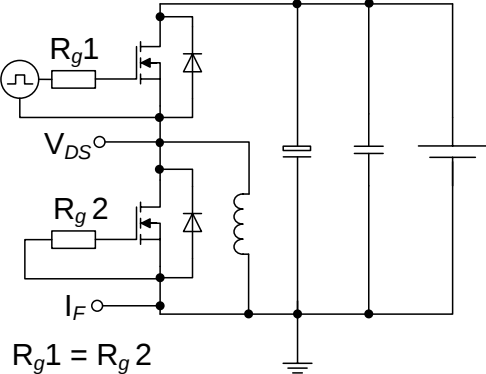
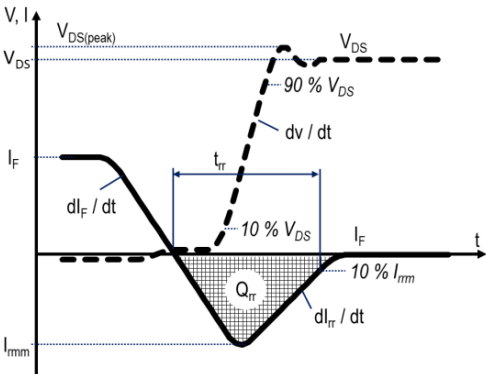
| Test circuit for diode characteristics                                                                                | Diode recovery waveform                                                            |
|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|  <p><math>R_{g1} = R_{g2}</math></p> |  |

Table 9 Switching times (ss)

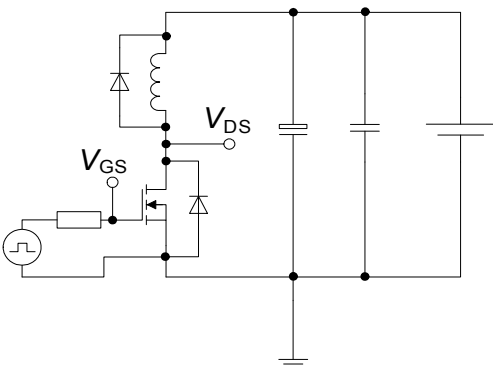
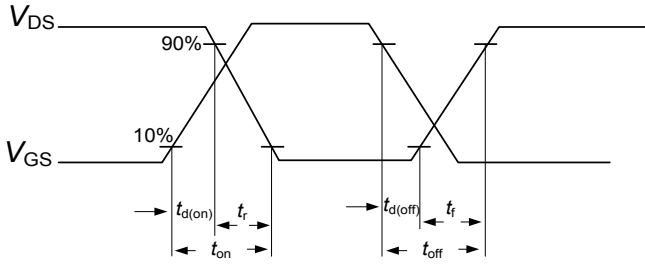
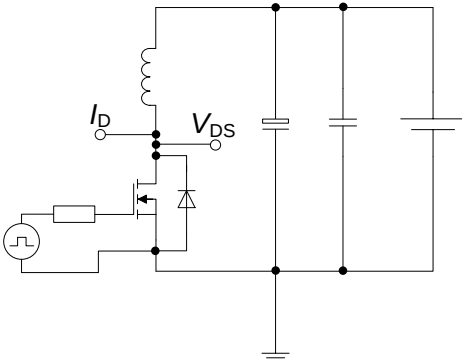
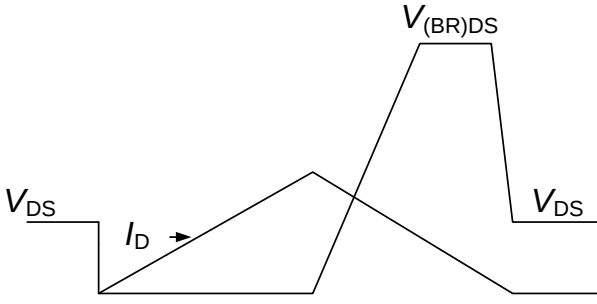
| Switching times test circuit for inductive load                                     | Switching times waveform                                                             |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |

Table 10 Unclamped inductive load (ss)

| Unclamped inductive load test circuit                                               | Unclamped inductive waveform                                                         |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |

6 Package outlines

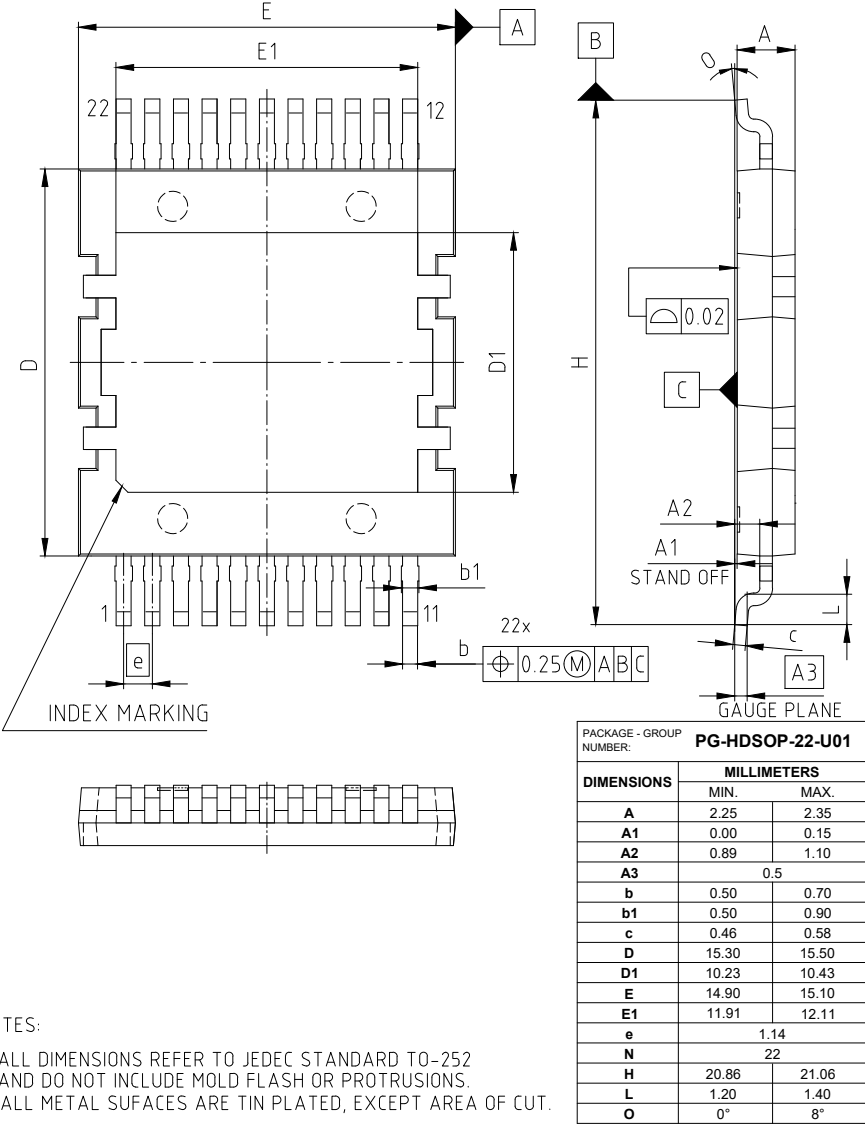
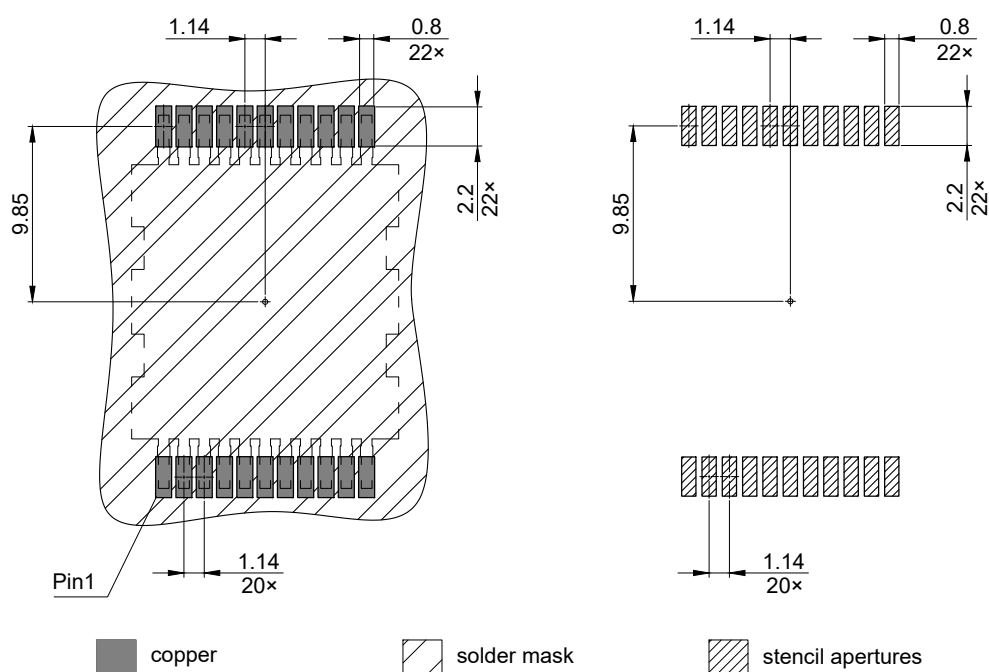
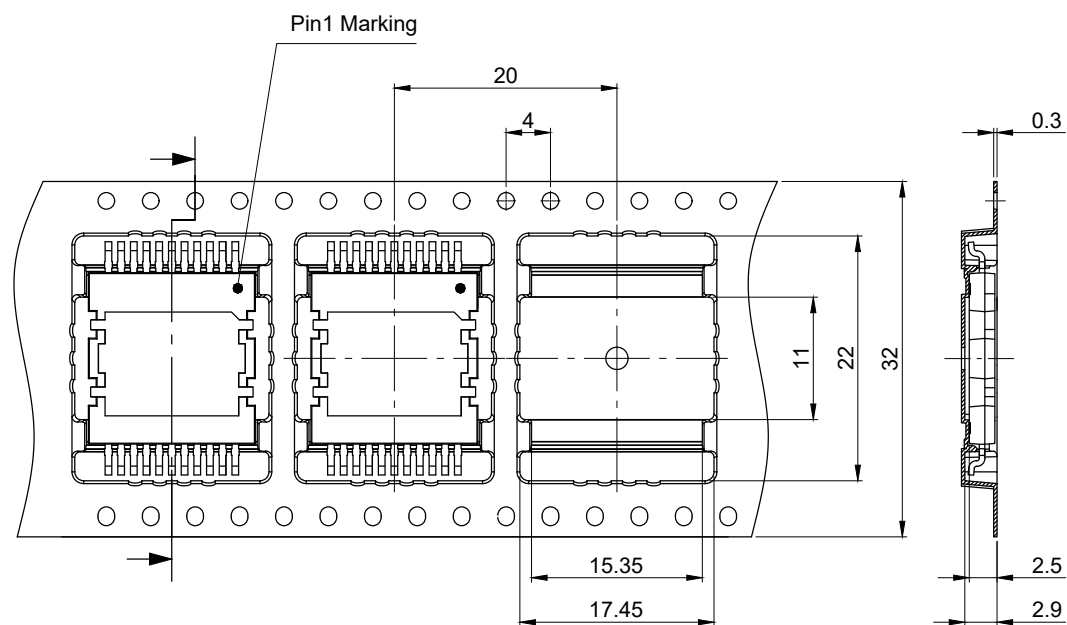


Figure 1 Outline PG-HDSOP-22, dimensions in mm



All dimensions are in units mm

**Figure 2** Footprint drawing PG-HDSOP-22, dimensions in mm



All dimensions are in units mm

The drawing is in compliance with ISO 128-30, Projection Method 1 [  ]

**Figure 3** Packaging variant PG-HDSOP-22, dimensions in mm

## 7 Appendix A

**Table 11**    **Related links**

- [IFX CoolMOS CM8 Webpage](#)
- [IFX CoolMOS CM8 application note](#)
- [IFX CoolMOS CM8 simulation model](#)
- [IFX Design tools](#)

## Revision history

IPDQ65R018CM8

### Revision 2024-12-19, Rev. 2.0

Previous revisions

| Revision | Date       | Subjects (major changes since last revision) |
|----------|------------|----------------------------------------------|
| 2.0      | 2024-12-19 | Release of final version                     |

### Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

**We Listen to Your Comments** Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to: [erratum@infineon.com](mailto:erratum@infineon.com)

### Published by

Infineon Technologies AG  
81726 München, Germany  
© 2024 Infineon Technologies AG  
All Rights Reserved.

### Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

### Information

For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

### Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [MOSFETs](#) category:*

*Click to view products by [Infineon](#) manufacturer:*

Other Similar products are found below :

[MCH3443-TL-E](#) [MCH6422-TL-E](#) [PMV32UP215](#) [NTNS3A92PZT5G](#) [2SK2464-TL-E](#) [2SK3818-DL-E](#) [2SJ277-DL-E](#) [2SK2267\(Q\)](#)  
[AON6932A](#) [TS19452CS RL](#) [EFC2J004NUZTDG](#) [743-9](#) [US6M2GTR](#) [IRF40H233XTMA1](#) [STU5N65M6](#) [DMN13M9UCA6-7](#)  
[STU7N60DM2](#) [2N7002W-G](#) [NTMFS006N08MC](#) [NTTFS5C680NLTAG](#) [IPB45P03P4L11ATMA2](#) [NVTFS6H880NLWFTAG](#)  
[NTMC083NP10M5L](#) [NTTFS022N15MC](#) [NVMFS5C420NLWFT1G](#) [BXP4N65F](#) [BXP2N20L](#) [BXP2N65D](#) [NTD5C632NLT4G](#)  
[NTMYS2D1N04CLTWG](#) [NVD360N65S3T4G](#) [NVMTS1D1N04CTXG](#) [CJAC130SN06L](#) [HSBA6054](#) [HSBB6054](#) [HSBB0210](#) [HSBB0056](#)  
[HSBA6901](#) [BSC004NE2LS5](#) [BSZ075N08NS5](#) [LBSS138DW1T1G](#) [AP0903G](#) [SSM10N954L,EFF\(S](#) [2SK3878\(STA1,E,S\)](#)  
[TPN6R303NC,LQ\(S](#) [AP3N5R0MT](#) [AP6NA3R2MT](#) [AP3C023AMT](#) [AP6242](#) [HSBB3909](#)