

## MOSFET

### 600V CoolMOS™ CM8 Power Transistor

Built on Infineon's world-class super-junction MOSFET platform with an integrated fast body diode, making it suitable for a wide range of applications. It enables highest power density at lowest possible system cost with superior reliability. It is enhancing Infineon's WBG offering and the successor of the 600 V CoolMOS™ 7 MOSFET family.

### Features

- Best-In-Class SJ Mosfet Performance
- Address broad hard and soft switching applications with outstanding commutation ruggedness
- Integrated fast body diode and ESD protection
- .XT interconnection technology for best-in-class thermal performance

### Benefits

- Provides the best price performance ratio with Best-In-Class SJ Mosfet Performance
- Ease of use and shorter design in cycle
- Enable multiple topologies
- 14-42% lower  $R_{th}$  for improved thermal performance

### Potential applications

- Datacenter, AI server, Telecom Power Supply
- Micro and Residential Hybrid Inverter
- Portable and Residential Energy Storage, UPS
- EV Charging, Light electric vehicles, Electric Forklift
- High Voltage Solid State Power Distribution
- Home & Professional Tools
- Charger, Adapters, TV and Console SMPS

### 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 |
|----------------------|-------|------|
| $V_{DS} @ T_{j,max}$ | 650   | V    |
| $R_{DS(on),max}$     | 120   | mΩ   |
| $Q_{g,typ}$          | 24    | nC   |
| $I_{D,pulse}$        | 68    | A    |
| $E_{oss} @ 400V$     | 3.4   | μJ   |
| Body diode $di_F/dt$ | 1300  | A/μs |
| ESD class (HBM)      | 2     |      |

| Type / Ordering code | Package   | Marking  | Related links  |
|----------------------|-----------|----------|----------------|
| IPT60R120CM8         | PG-HSOF-8 | 60R120C8 | see Appendix A |

TOLL

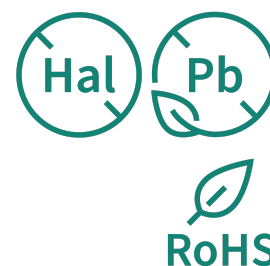
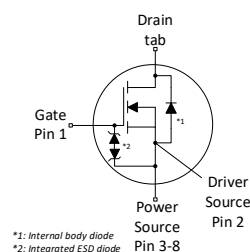
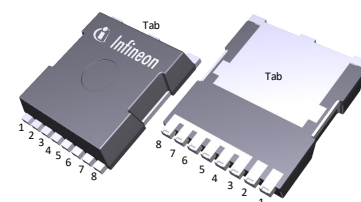




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# 1 Maximum ratings

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>  | $I_D$         | -      | -    | 24   | A                | $T_C = 25^\circ\text{C}$                                                                         |
| Continuous drain current                | $I_D$         | -      | -    | 15   | A                | $T_C = 100^\circ\text{C}$                                                                        |
| Pulsed drain current <sup>2)</sup>      | $I_{D,pulse}$ | -      | -    | 68   | A                | $T_C = 25^\circ\text{C}$                                                                         |
| Avalanche energy, single pulse          | $E_{AS}$      | -      | -    | 40   | mJ               | $I_D = 2.2\text{A}$ ; $V_{DD} = 50\text{V}$ ; see table 10                                       |
| Avalanche energy, repetitive            | $E_{AR}$      | -      | -    | 0.20 | mJ               |                                                                                                  |
| Avalanche current, single pulse         | $I_{AS}$      | -      | -    | 2.2  | A                | -                                                                                                |
| MOSFET dv/dt ruggedness                 | dv/dt         | -      | -    | 120  | V/ns             | $V_{DS} = 0 \dots 400\text{V}$                                                                   |
| 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                       | $P_{tot}$     | -      | -    | 154  | 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        | $I_S$         | -      | -    | 24   | A                | $T_C = 25^\circ\text{C}$                                                                         |
| Diode pulse current <sup>2)</sup>       | $I_{S,pulse}$ | -      | -    | 68   | A                |                                                                                                  |
| Reverse diode dv/dt <sup>3)</sup>       | dv/dt         | -      | -    | 70   | V/ns             | $V_{DS} = 0 \dots 400\text{V}$ , $I_{SD} \leq 24\text{A}$ , $T_j = 25^\circ\text{C}$ see table 8 |
| Maximum diode commutation speed         | $di_F/dt$     | -      | -    | 1300 | A/ $\mu\text{s}$ |                                                                                                  |
| Insulation withstand voltage            | $V_{ISO}$     | -      | -    | n.a. | V                | $V_{rms}$ , $T_C = 25^\circ\text{C}$ , $t = 1\text{min}$                                         |

<sup>1)</sup> Limited by  $T_{j,max}$ .

<sup>2)</sup> Pulse width  $t_p$  limited by  $T_{j,max}$

<sup>3)</sup> 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                     | $R_{thJC}$ | -      | -    | 0.81 | K/W  | -                                                                                                                                                                                   |
| Thermal resistance, junction - ambient                  | $R_{thJA}$ | -      | -    | 62   | K/W  | device on PCB, minimal footprint                                                                                                                                                    |
| Thermal resistance, junction - ambient for SMD version  | $R_{thJA}$ | -      | -    | -    | K/W  | Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm <sup>2</sup> (one layer, 70μm thickness) copper area for drain connection and cooling. PCB is vertical without air stream cooling. |
| Soldering temperature, wave- & 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   | $V_{(BR)DSS}$ | 600    | -             | -          | V        | $V_{GS}=0V, I_D=1mA$                                                                              |
| Gate threshold voltage           | $V_{(GS)th}$  | 3.7    | 4.2           | 4.7        | V        | $V_{DS}=V_{GS}, I_D=0.2mA$                                                                        |
| Zero gate voltage drain current  | $I_{DSS}$     | -      | -<br>31.2     | 1<br>-     | $\mu A$  | $V_{DS}=600V, V_{GS}=0V, T_j=25^\circ\text{C}$<br>$V_{DS}=600V, V_{GS}=0V, T_j=150^\circ\text{C}$ |
| Gate-source leakage current      | $I_{GSS}$     | -      | -             | 1.2        | $\mu A$  | $V_{GS}=20V, V_{DS}=0V$                                                                           |
| Drain-source on-state resistance | $R_{DS(on)}$  | -      | 0.100<br>0.22 | 0.120<br>- | $\Omega$ | $V_{GS}=10V, I_D=8.3A, T_j=25^\circ\text{C}$<br>$V_{GS}=10V, I_D=8.3A, T_j=150^\circ\text{C}$     |
| Gate resistance                  | $R_G$         | -      | 9.8           | -          | $\Omega$ | $f=1MHz$                                                                                          |

**Table 5 Dynamic characteristics**

| Parameter                                                  | Symbol       | Values |      |      | Unit | Note / Test condition                                                  |
|------------------------------------------------------------|--------------|--------|------|------|------|------------------------------------------------------------------------|
|                                                            |              | Min.   | Typ. | Max. |      |                                                                        |
| Input capacitance                                          | $C_{iss}$    | -      | 1045 | -    | pF   | $V_{GS}=0V, V_{DS}=400V, f=250kHz$                                     |
| Output capacitance                                         | $C_{oss}$    | -      | 15   | -    | pF   |                                                                        |
| Effective output capacitance, energy related <sup>4)</sup> | $C_{o(er)}$  | -      | 42   | -    | pF   | $V_{GS}=0V, V_{DS}=0...400V$                                           |
| Effective output capacitance, time related <sup>5)</sup>   | $C_{o(tr)}$  | -      | 421  | -    | pF   | $I_D=\text{constant}, V_{GS}=0V, V_{DS}=0...400V$                      |
| Turn-on delay time                                         | $t_{d(on)}$  | -      | 16.5 | -    | ns   | $V_{DD}=400V, V_{GS}=13V, I_D=4.0A,$<br>$R_G=10.0\Omega$ ; see table 9 |
| Rise time                                                  | $t_r$        | -      | 6    | -    | ns   |                                                                        |
| Turn-off delay time                                        | $t_{d(off)}$ | -      | 89.5 | -    | ns   |                                                                        |
| Fall time                                                  | $t_f$        | -      | 10.6 | -    | 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 | $Q_{gs}$      | -      | 6    | -    | nC   | $V_{DD}=400V$ , $I_D=4.0A$ , $V_{GS}=0$ to $10V$ |
| Gate to drain charge  | $Q_{gd}$      | -      | 9    | -    | nC   |                                                  |
| Gate charge total     | $Q_g$         | -      | 24   | -    | nC   |                                                  |
| Gate plateau voltage  | $V_{plateau}$ | -      | 6.1  | -    | V    |                                                  |

**Table 7 Reverse diode characteristics**

| Parameter                     | Symbol    | Values |       |       | Unit    | Note / Test condition                                           |
|-------------------------------|-----------|--------|-------|-------|---------|-----------------------------------------------------------------|
|                               |           | Min.   | Typ.  | Max.  |         |                                                                 |
| Diode forward voltage         | $V_{SD}$  | -      | 0.9   | -     | V       | $V_{GS}=0V$ , $I_F=4.0A$ , $T_j=25^\circ C$                     |
| Reverse recovery time         | $t_{rr}$  | -      | 69.53 | 86.91 | ns      | $V_R=400V$ , $I_F=4.0A$ , $di_F/dt=100A/\mu s$ ;<br>see table 8 |
| Reverse recovery charge       | $Q_{rr}$  | -      | 0.24  | 0.36  | $\mu C$ |                                                                 |
| Peak reverse recovery current | $I_{rrm}$ | -      | 6.87  | -     | A       |                                                                 |

4 Electrical characteristics diagrams

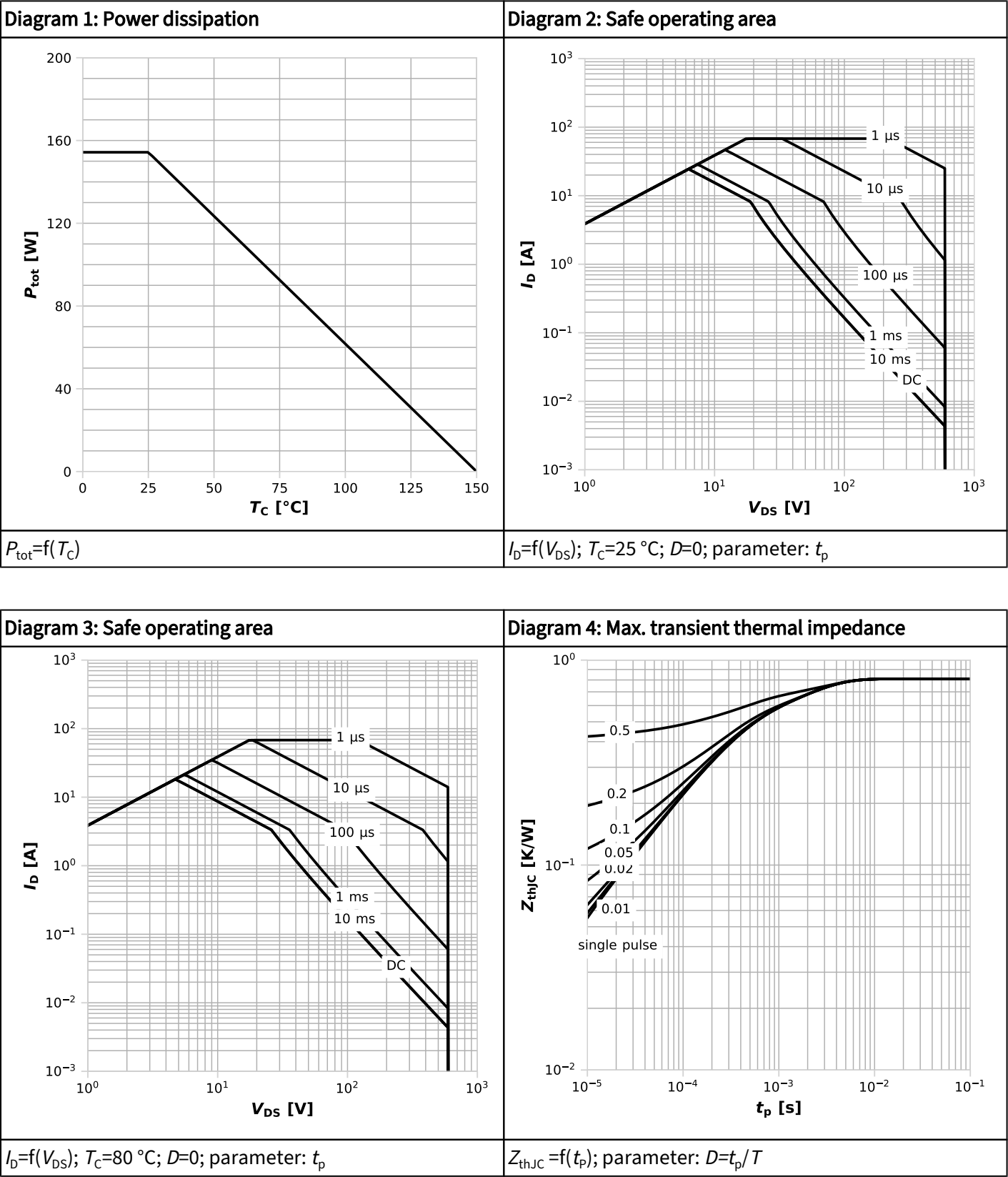
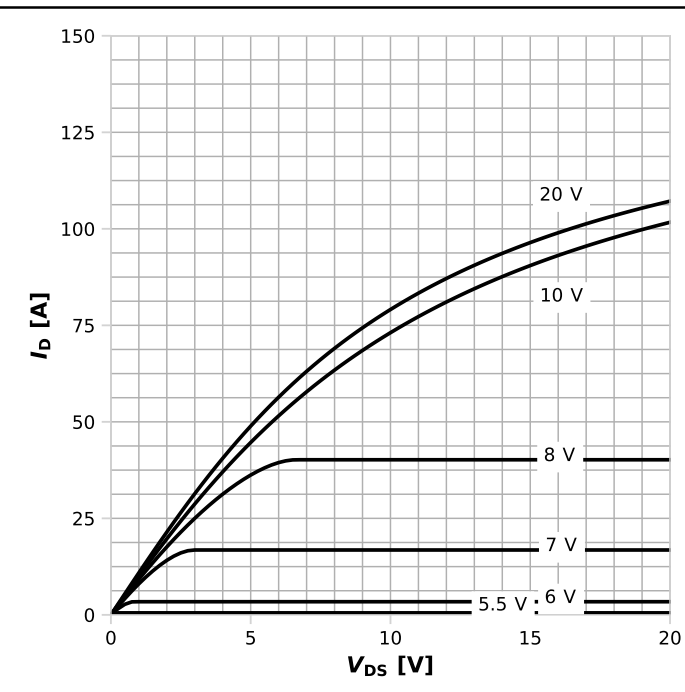
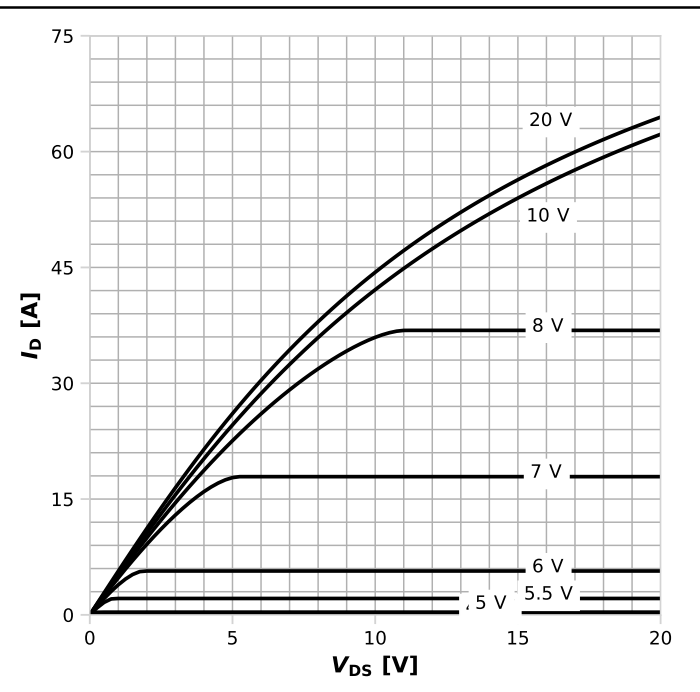


Diagram 5: Typ. output characteristics



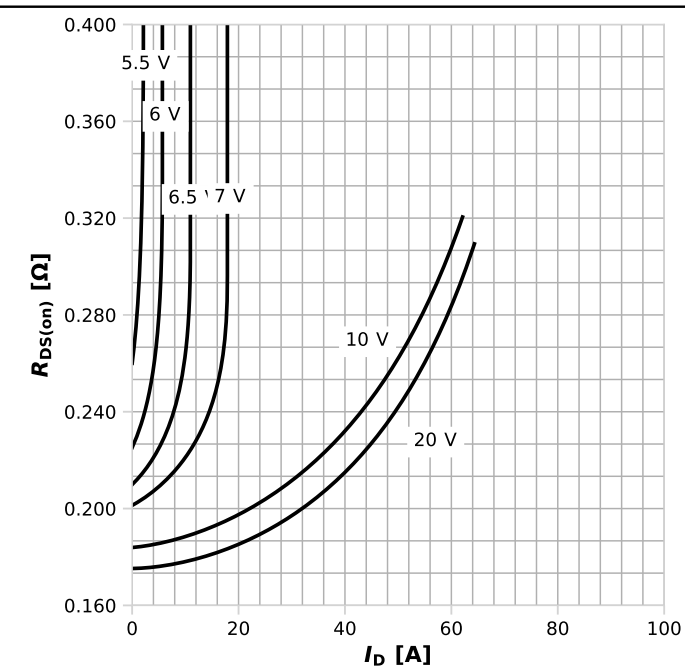
$I_D = f(V_{DS})$ ;  $T_j = 25\text{ °C}$ ; parameter:  $V_{GS}$

Diagram 6: Typ. output characteristics



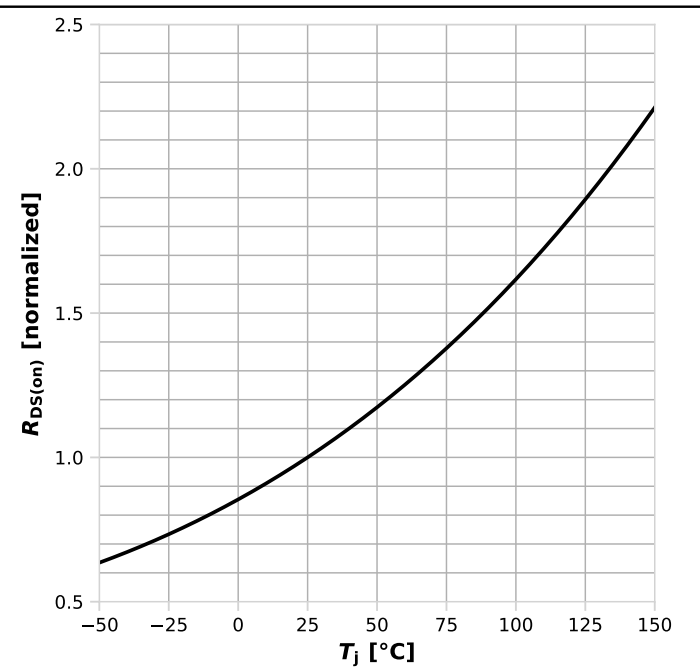
$I_D = f(V_{DS})$ ;  $T_j = 125\text{ °C}$ ; parameter:  $V_{GS}$

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



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

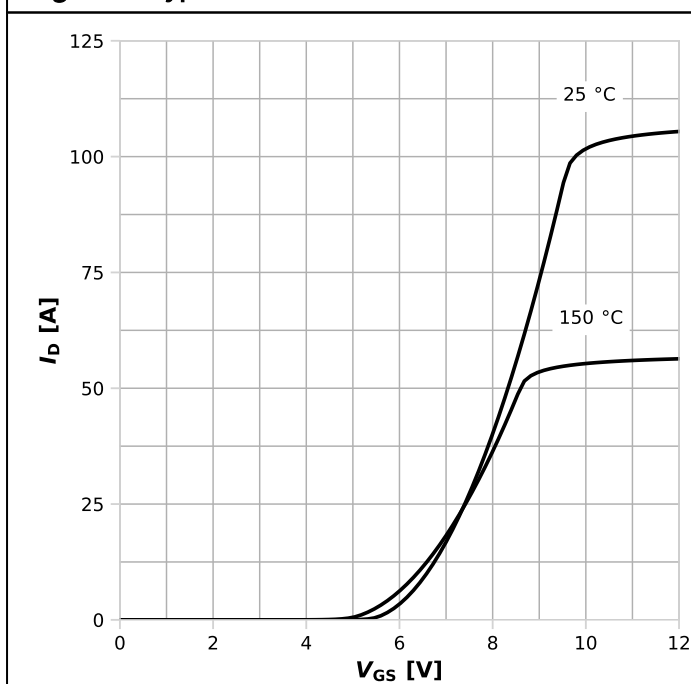
Diagram 8: Drain-source on-state resistance



$R_{DS(on)} = f(T_j)$ ;  $I_D = 8.3\text{ A}$ ;  $V_{GS} = 10\text{ V}$

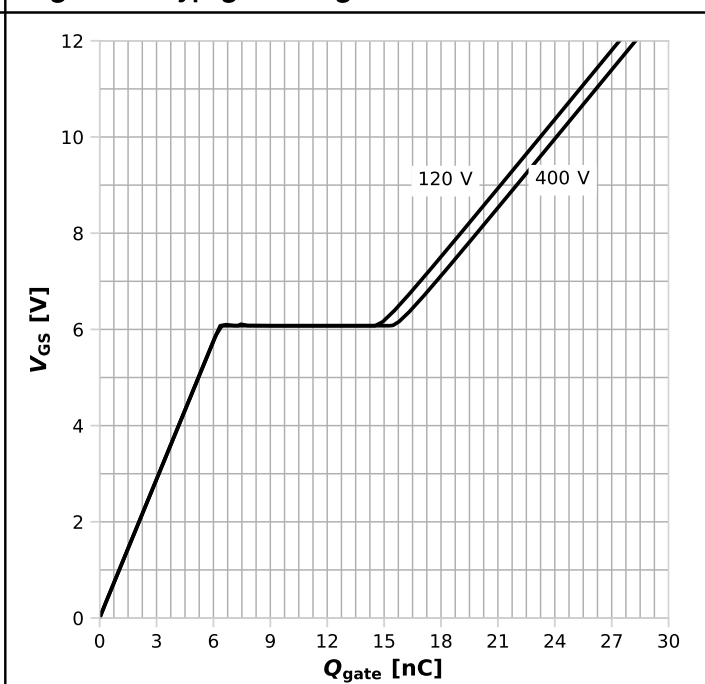


**Diagram 9: Typ. transfer characteristics**



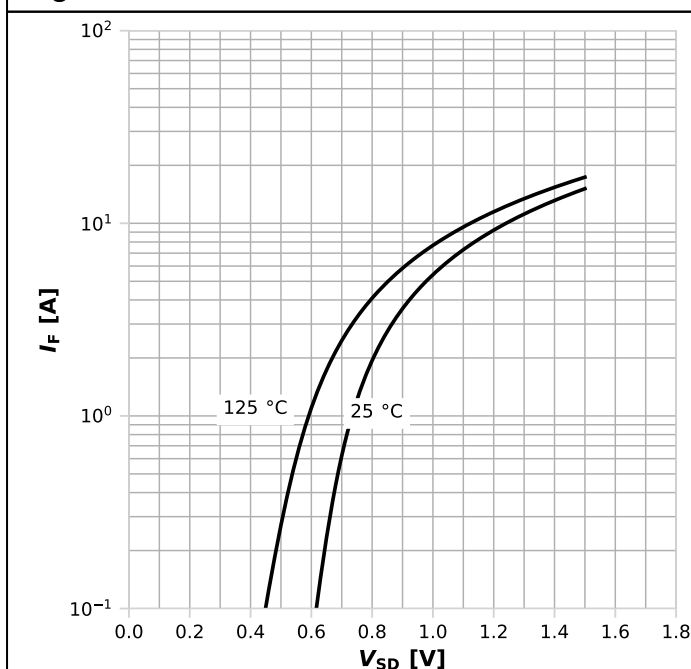
$I_D = f(V_{GS})$ ;  $V_{DS} = 20V$ ; parameter:  $T_j$

**Diagram 10: Typ. gate charge**



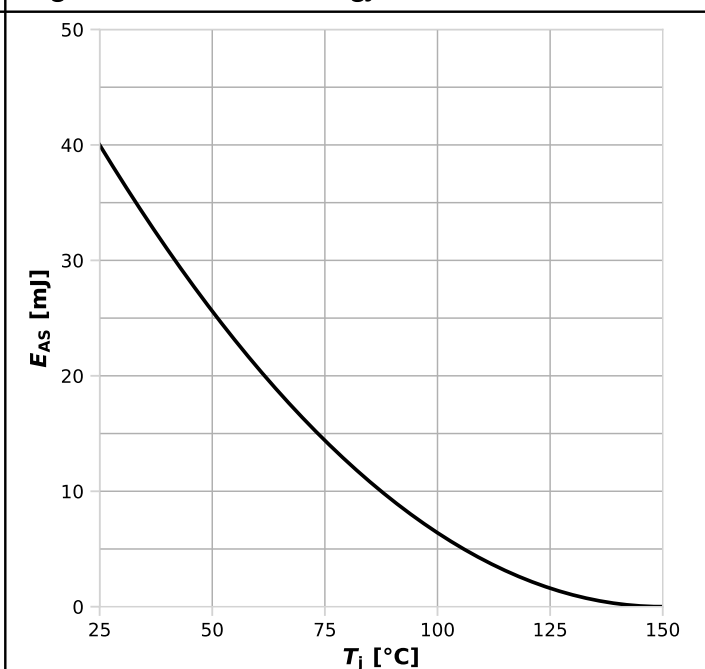
$V_{GS} = f(Q_{gate})$ ;  $I_D = 4.0$  A pulsed; parameter:  $V_{DD}$

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



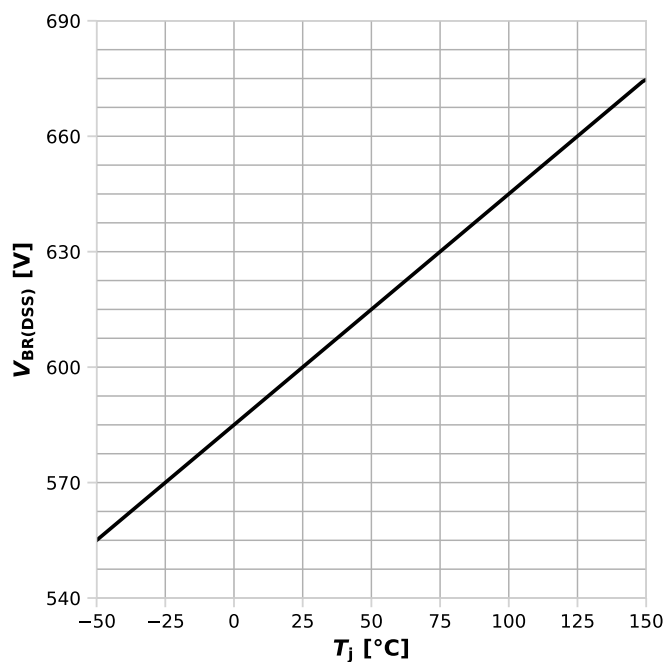
$I_F = f(V_{SD})$ ; parameter:  $T_j$

**Diagram 12: Avalanche energy**



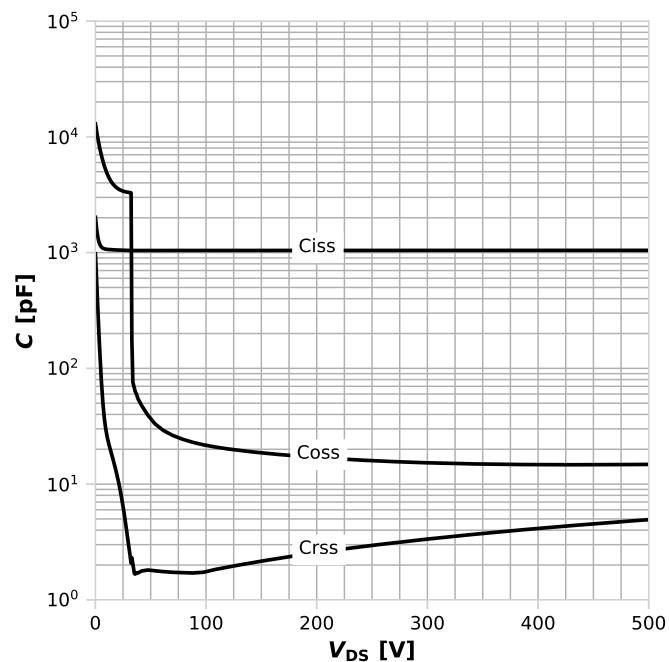
$E_{AS} = f(T_j)$ ;  $I_D = 2.2$  A;  $V_{DD} = 50$  V

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



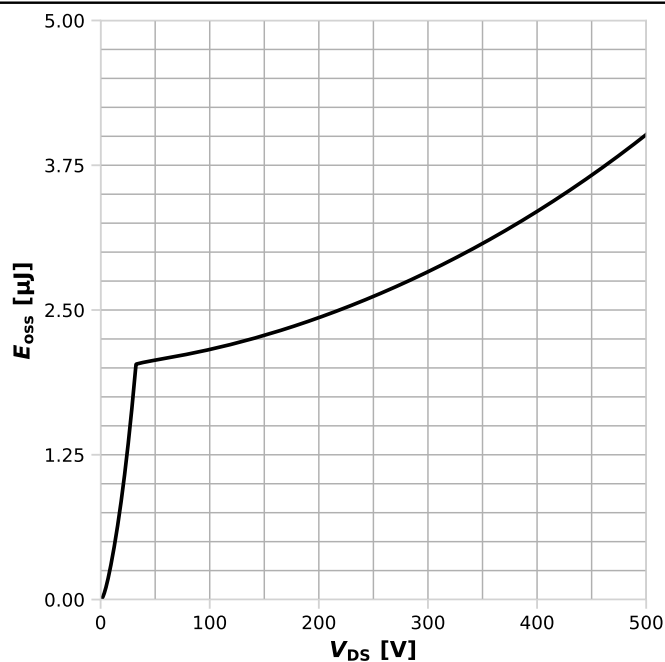
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$

**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

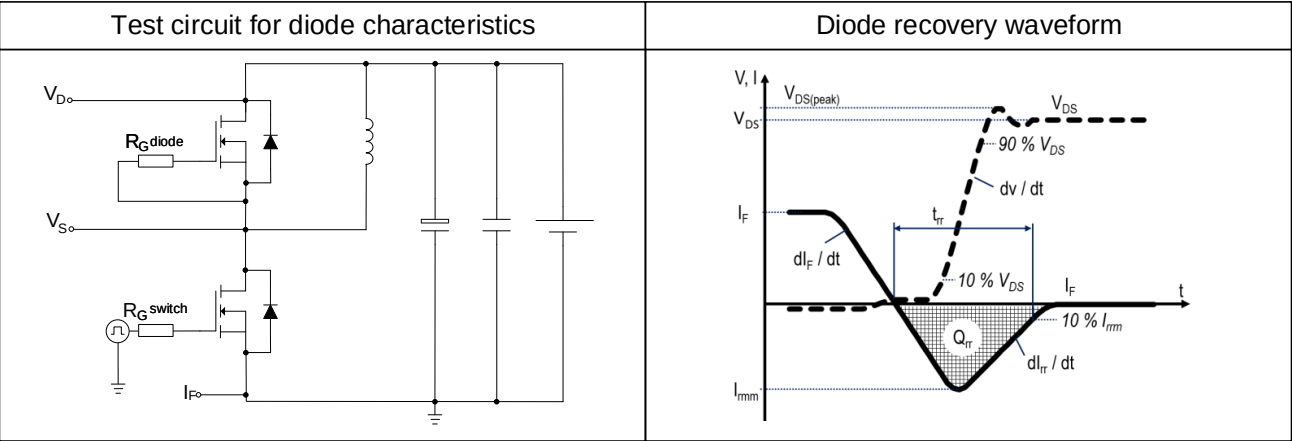


Table 9 Switching times

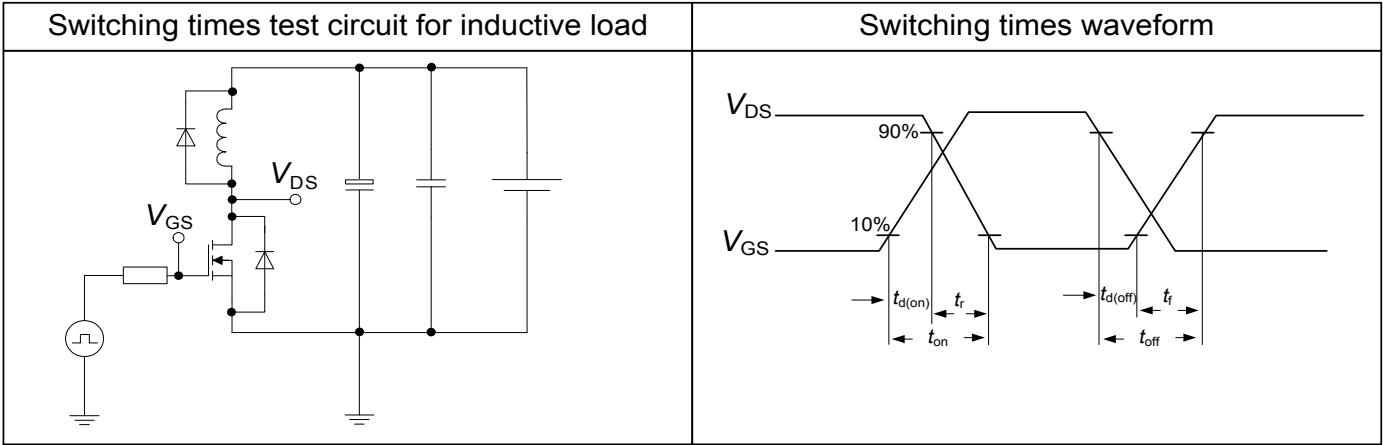
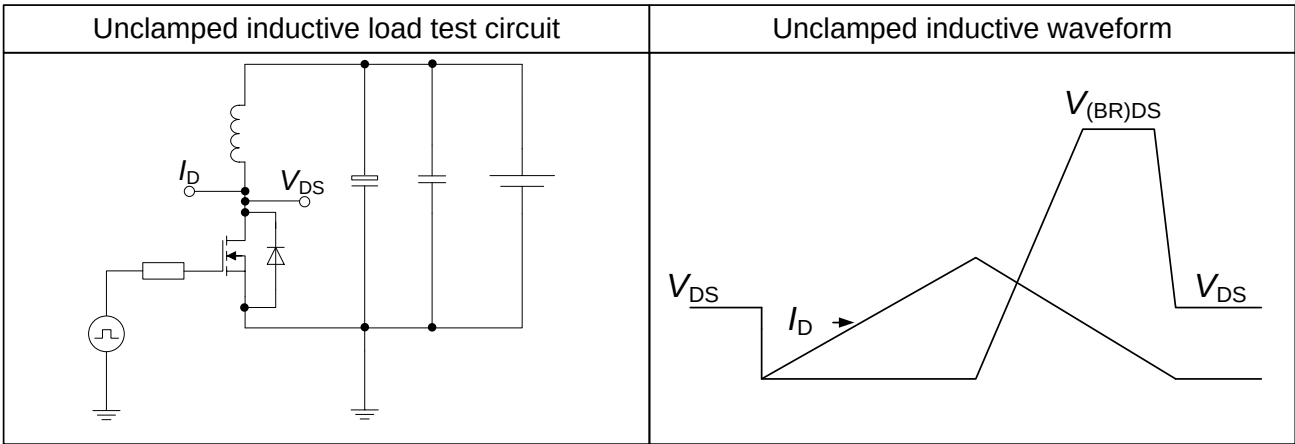
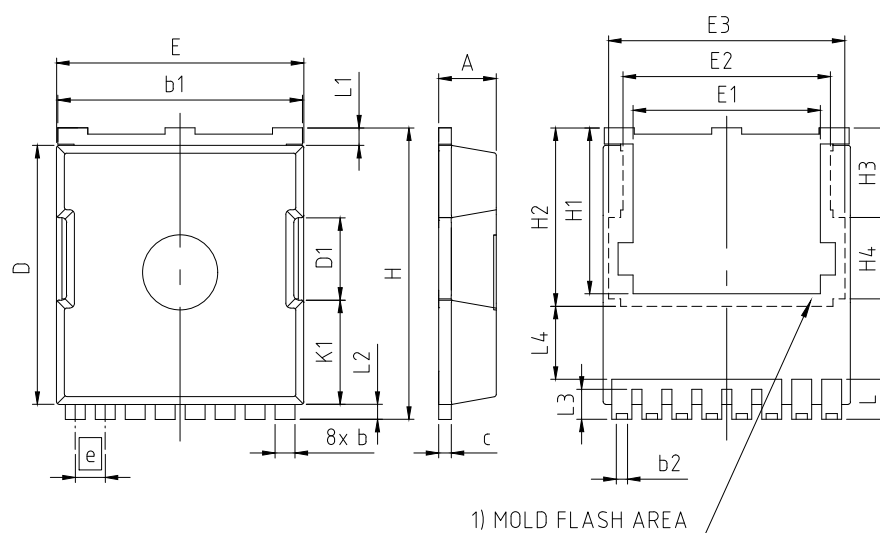


Table 10 Unclamped inductive load



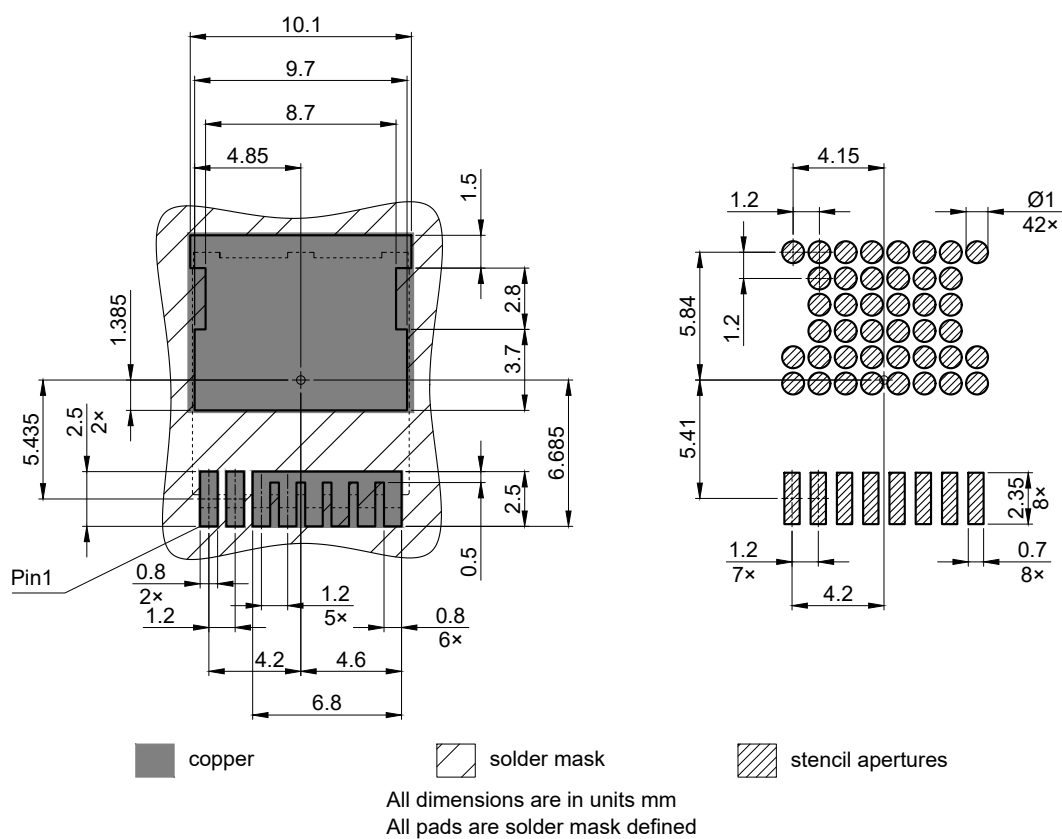
## 6 Package outlines

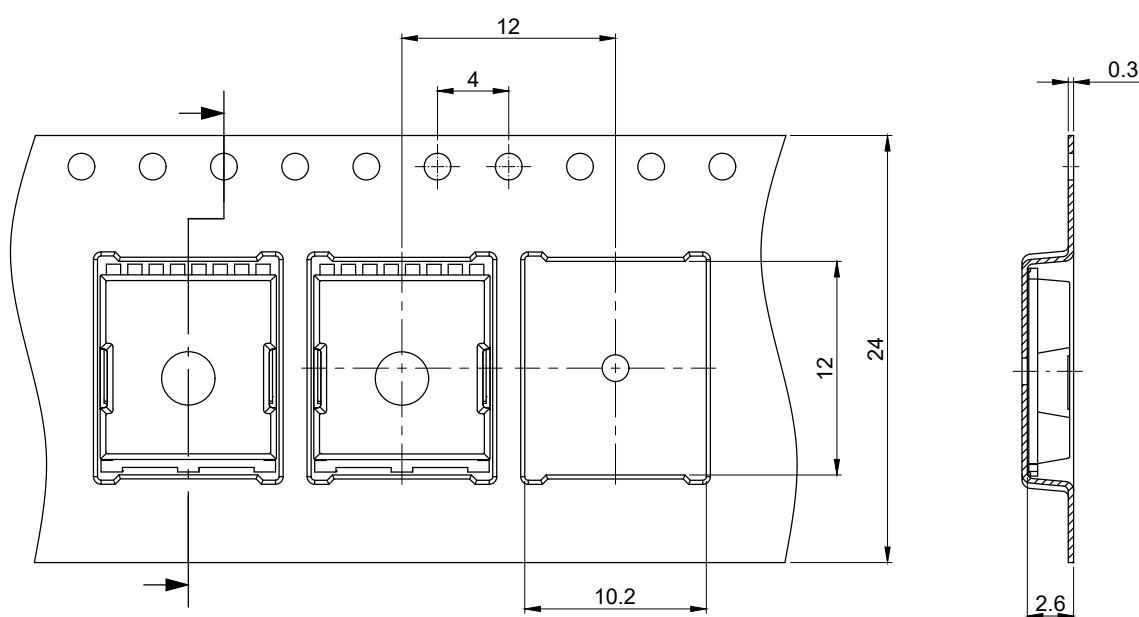


| PACKAGE - GROUP<br>NUMBER: PG-HSOF-8-U02 |             |       |
|------------------------------------------|-------------|-------|
| DIMENSIONS                               | MILLIMETERS |       |
|                                          | MIN.        | MAX.  |
| A                                        | 2.20        | 2.40  |
| b                                        | 0.70        | 0.90  |
| b1                                       | 9.70        | 9.90  |
| b2                                       | 0.42        | 0.50  |
| c                                        | 0.40        | 0.60  |
| D                                        | 10.28       | 10.58 |
| D1                                       | 3.30        |       |
| E                                        | 9.70        | 10.10 |
| E1                                       | 7.50        |       |
| E2                                       | 8.50        |       |
| E3                                       | 9.46        |       |
| e                                        | 1.20 (BSC)  |       |
| H                                        | 11.48       | 11.88 |
| H1                                       | 6.55        | 6.95  |
| H2                                       | 7.15        |       |
| H3                                       | 3.59        |       |
| H4                                       | 3.26        |       |
| N                                        | 8           |       |
| K1                                       | 4.18        |       |
| L                                        | 1.40        | 1.80  |
| L1                                       | 0.50        | 0.90  |
| L2                                       | 0.50        | 0.70  |
| L3                                       | 1.00        | 1.30  |
| L4                                       | 2.62        | 2.81  |

1) PARTIALLY COVERED WITH MOLD FLASH

**Figure 1** Outline PG-HSOF-8, dimensions in mm


**Figure 2 Footprint drawing PG-HSOF-8, 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-HSOF-8, 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

IPT60R120CM8

### 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                     |

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