

DATA SHEET

PSMN005-25D

N-channel logic level
TrenchMOS^(TM) transistor

Product specification

October 1999



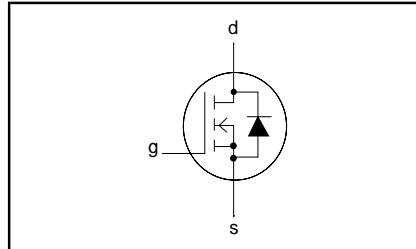
N-channel logic level TrenchMOS^(TM) transistor

PSMN005-25D

FEATURES

- 'Trench' technology
- Very low on-state resistance
- Fast switching
- Logic level compatible

SYMBOL



QUICK REFERENCE DATA

| |
|-------------------------------------------------------------|
| $V_{DSS} = 25\text{ V}$ |
| $I_D = 75\text{ A}$ |
| $R_{DS(ON)} \leq 5.8\text{ m}\Omega (V_{GS} = 10\text{ V})$ |
| $R_{DS(ON)} \leq 7.5\text{ m}\Omega (V_{GS} = 5\text{ V})$ |

GENERAL DESCRIPTION

SiliconMAX products use the latest Philips Trench technology to achieve the lowest possible on-state resistance in each package at each voltage rating.

Applications:-

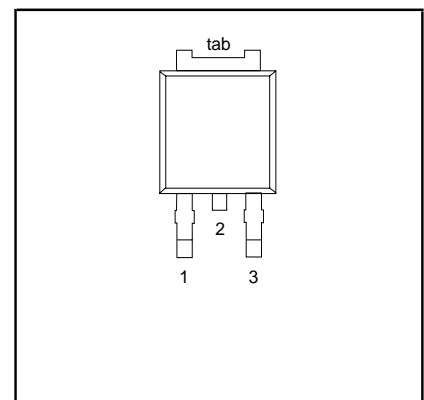
- d.c. to d.c. converters
- switched mode power supplies

The PSMN005-25D is supplied in the SOT428 (Dpak) surface mounting package.

PINNING

| PIN | DESCRIPTION |
|-----|--------------------|
| 1 | gate |
| 2 | drain ¹ |
| 3 | source |
| tab | drain |

SOT428 (DPAK)



LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|----------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------|-----------------|------------------|
| V_{DSS} | Drain-source voltage | $T_j = 25\text{ }^\circ\text{C}$ to $175\text{ }^\circ\text{C}$ | - | 25 | V |
| V_{DGR} | Drain-gate voltage | $T_j = 25\text{ }^\circ\text{C}$ to $175\text{ }^\circ\text{C}$; $R_{GS} = 20\text{ k}\Omega$ | - | 25 | V |
| V_{GS} | Continuous gate-source voltage | | - | ± 15 | V |
| V_{GSM} | Peak pulsed gate-source voltage | $T_j \leq 150\text{ }^\circ\text{C}$ | - | ± 20 | V |
| I_D | Continuous drain current | $T_{mb} = 25\text{ }^\circ\text{C}$; $V_{GS} = 5\text{ V}$ $T_{mb} = 100\text{ }^\circ\text{C}$; $V_{GS} = 5\text{ V}$ | - | 75 ² | A |
| I_{DM} | Pulsed drain current | $T_{mb} = 25\text{ }^\circ\text{C}$ | - | 240 | A |
| P_D | Total power dissipation | $T_{mb} = 25\text{ }^\circ\text{C}$ | - | 125 | W |
| T_j, T_{stg} | Operating junction and storage temperature | | - 55 | 175 | $^\circ\text{C}$ |

¹ It is not possible to make connection to pin 2 of the SOT428 package.

² Continuous current rating limited by package.

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AVALANCHE ENERGY LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|----------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| E_{AS} | Non-repetitive avalanche energy | Unclamped inductive load, $I_{AS} = 75$ A; $t_p = 100$ μ s; T_j prior to avalanche = 25°C; $V_{DD} \leq 15$ V; $R_{GS} = 50$ Ω ; $V_{GS} = 5$ V | - | 120 | mJ |
| I_{AS} | Non-repetitive avalanche current | | - | 75 | A |

THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|----------------|----------------------------------------------|------------------------------------------------|------|------|------|------|
| $R_{th\ j-mb}$ | Thermal resistance junction to mounting base | | - | - | 1.2 | K/W |
| $R_{th\ j-a}$ | Thermal resistance junction to ambient | SOT428 package, pcb mounted, minimum footprint | - | 50 | - | K/W |

ELECTRICAL CHARACTERISTICS $T_j = 25^\circ\text{C}$ unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------|---------------|------------------|----------------------------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0$ V; $I_D = 0.25$ mA; $T_j = -55^\circ\text{C}$ | 25 23 | - - | - - | V V |
| $V_{GS(TO)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$; $I_D = 1$ mA $T_j = 175^\circ\text{C}$ | 1 0.5 | 1.5 - | 2 - | V V |
| $R_{DS(ON)}$ | Drain-source on-state resistance | $V_{GS} = 10$ V; $I_D = 25$ A $V_{GS} = 5$ V; $I_D = 25$ A $V_{GS} = 5$ V; $I_D = 25$ A; $T_j = 175^\circ\text{C}$ | - - - | 5 6.2 - | 5.8 7.5 14 | m Ω m Ω m Ω |
| I_{GSS} | Gate source leakage current | $V_{GS} = \pm 10$ V; $V_{DS} = 0$ V | - | 0.02 | 100 | nA |
| I_{DSS} | Zero gate voltage drain current | $V_{DS} = 25$ V; $V_{GS} = 0$ V; $T_j = 175^\circ\text{C}$ | - | 0.05 | 10 500 | μ A μ A |
| $Q_{g(tot)}$ | Total gate charge | $I_D = 75$ A; $V_{DD} = 15$ V; $V_{GS} = 5$ V | - | 60 | - | nC |
| Q_{gs} | Gate-source charge | | - | 8 | - | nC |
| Q_{gd} | Gate-drain (Miller) charge | | - | 32 | - | nC |
| $t_{d\ on}$ | Turn-on delay time | $V_{DD} = 15$ V; $R_D = 0.6$ Ω ; $V_{GS} = 10$ V; $R_G = 10$ Ω Resistive load | - | 21 | - | ns |
| t_r | Turn-on rise time | | - | 170 | - | ns |
| $t_{d\ off}$ | Turn-off delay time | | - | 270 | - | ns |
| t_f | Turn-off fall time | | - | 216 | - | ns |
| L_d | Internal drain inductance | Measured tab to centre of die | - | 3.5 | - | nH |
| L_s | Internal source inductance | Measured from source lead to source bond pad | - | 7.5 | - | nH |
| C_{iss} | Input capacitance | $V_{GS} = 0$ V; $V_{DS} = 20$ V; $f = 1$ MHz | - | 3500 | - | pF |
| C_{oss} | Output capacitance | | - | 970 | - | pF |
| C_{fss} | Feedback capacitance | | - | 640 | - | pF |

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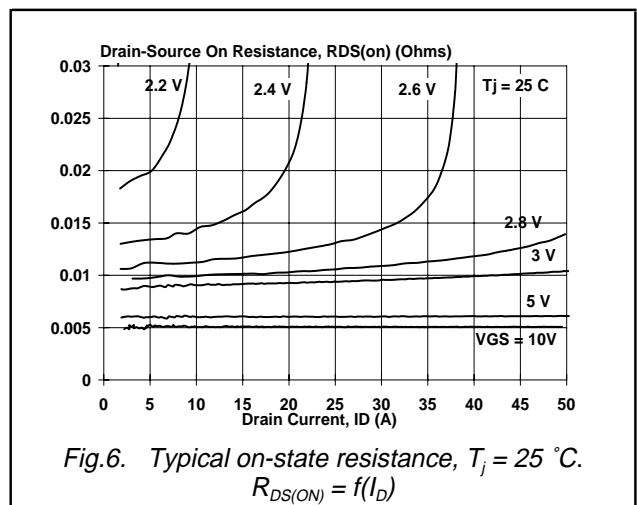
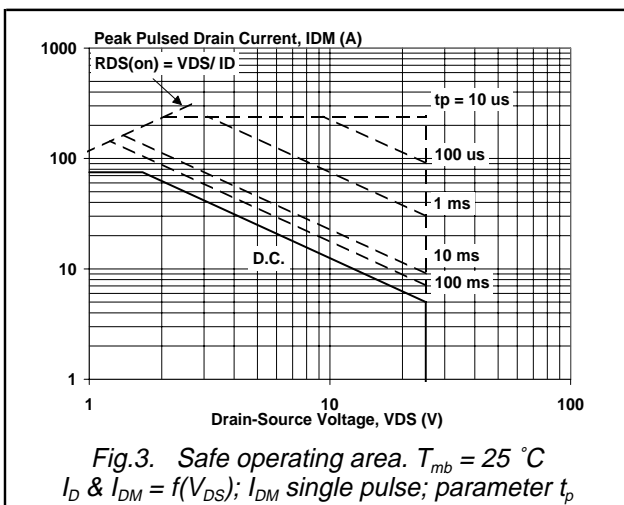
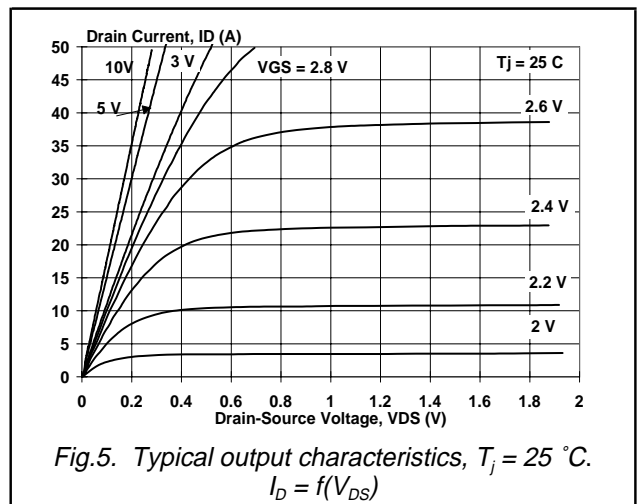
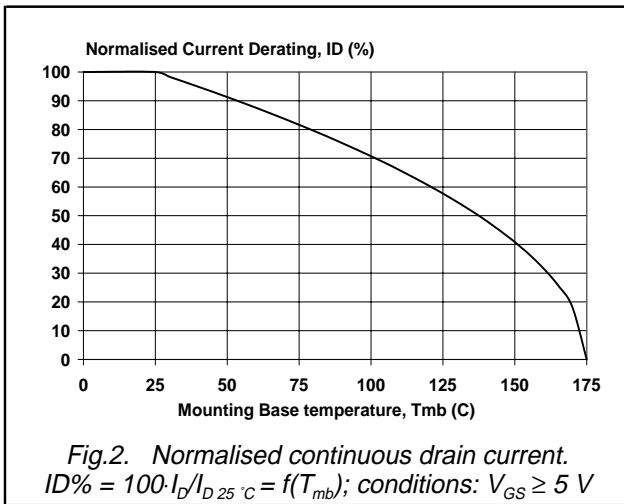
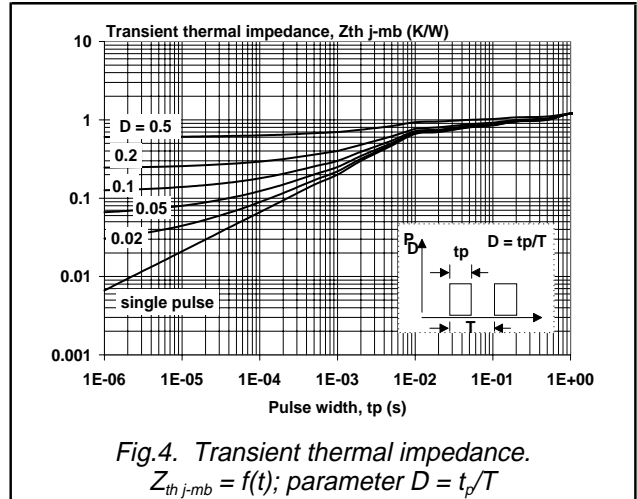
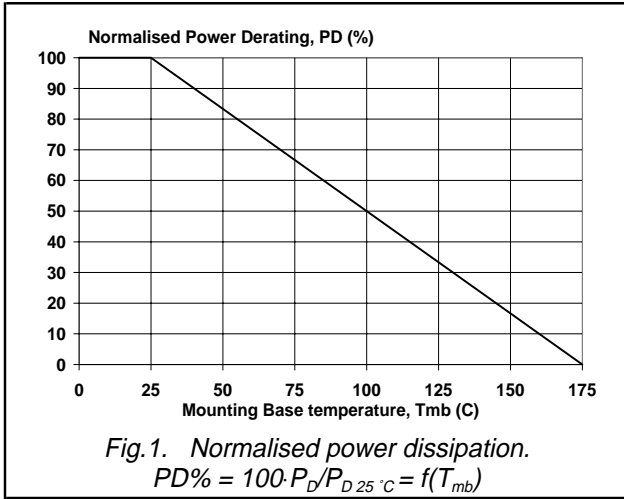
REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS $T_j = 25^\circ\text{C}$ unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|----------|----------------------------------------|-------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| I_S | Continuous source current (body diode) | | - | - | 75 | A |
| I_{SM} | Pulsed source current (body diode) | | - | - | 240 | A |
| V_{SD} | Diode forward voltage | $I_F = 25\text{ A}; V_{GS} = 0\text{ V}$ | - | 0.95 | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_F = 25\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s};$ $V_{GS} = 0\text{ V}; V_R = 25\text{ V}$ | - | 140 | - | ns |
| Q_{rr} | Reverse recovery charge | | - | 0.27 | - | μC |

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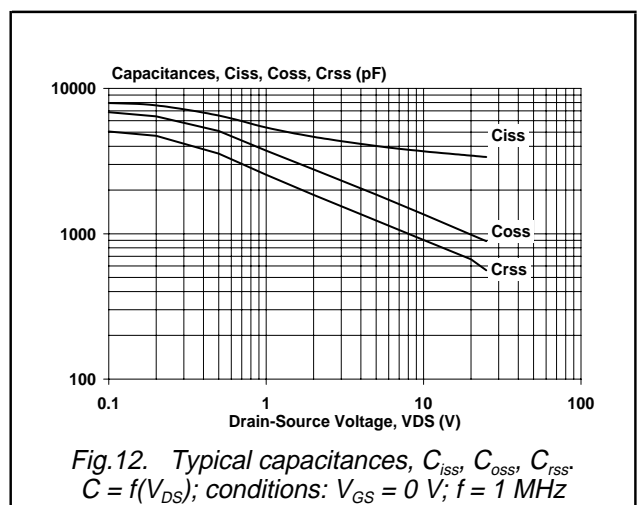
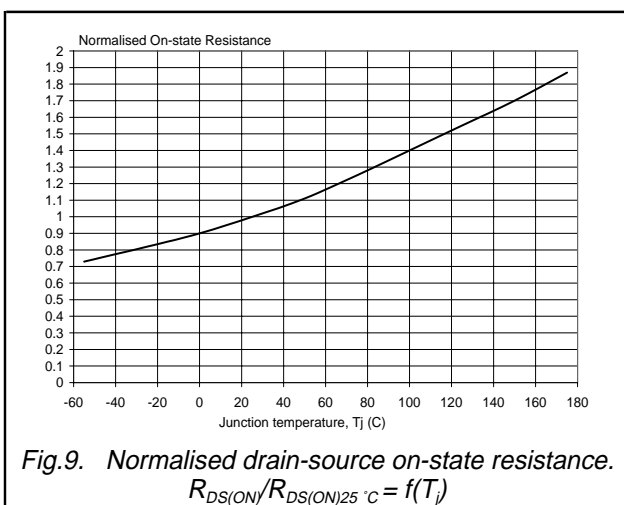
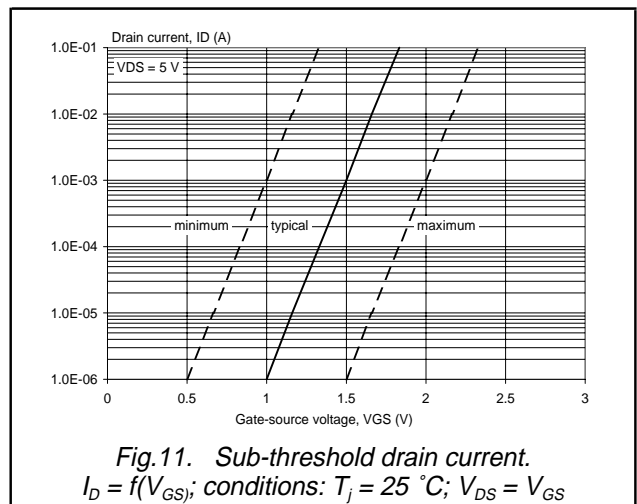
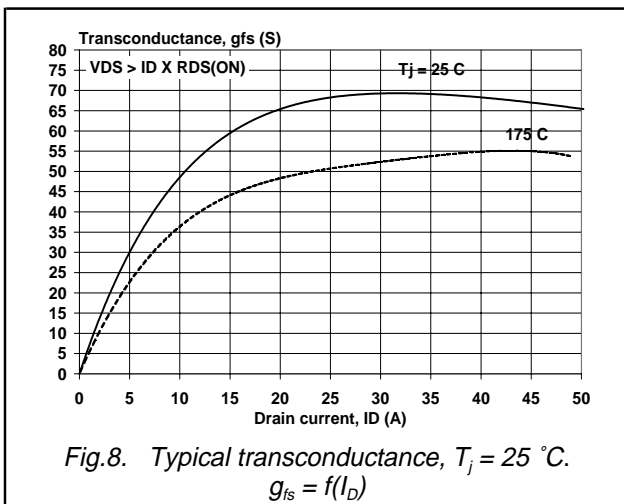
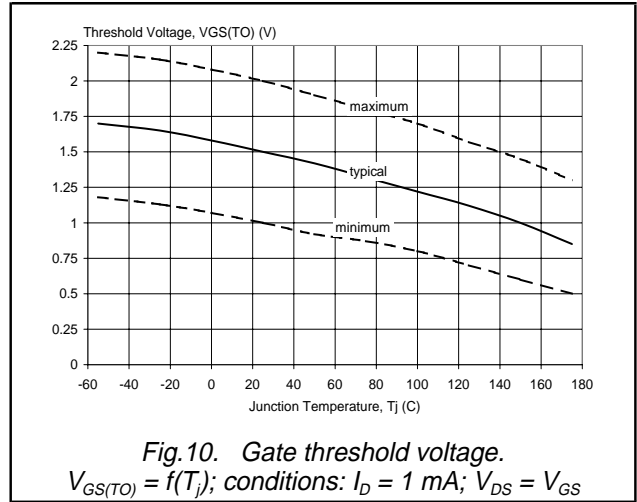
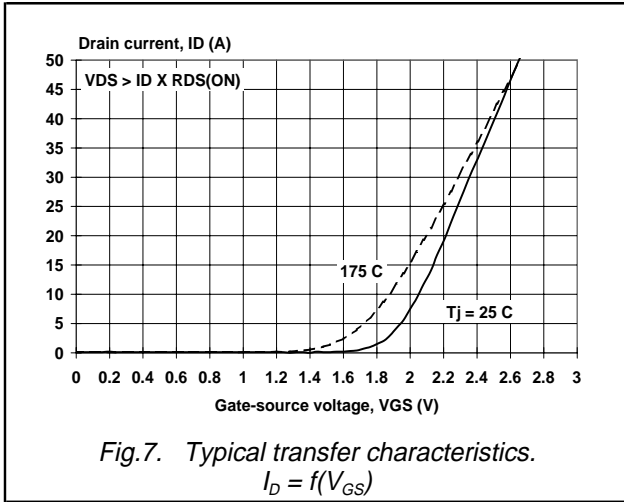
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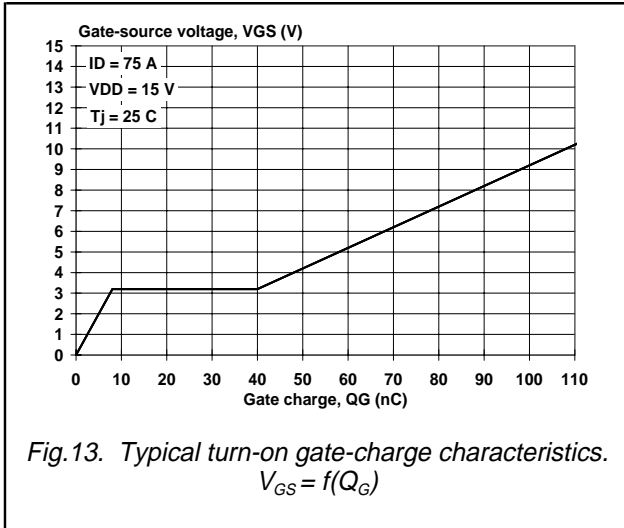


Fig.13. Typical turn-on gate-charge characteristics.
 $V_{GS} = f(Q_G)$

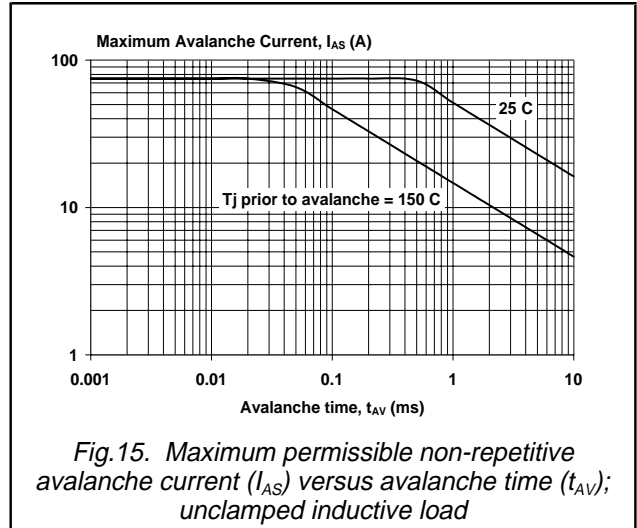


Fig.15. Maximum permissible non-repetitive avalanche current (I_{AS}) versus avalanche time (t_{AV}); unclamped inductive load

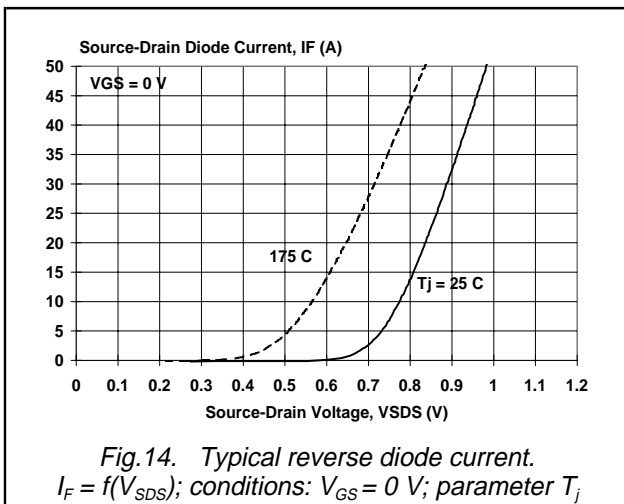


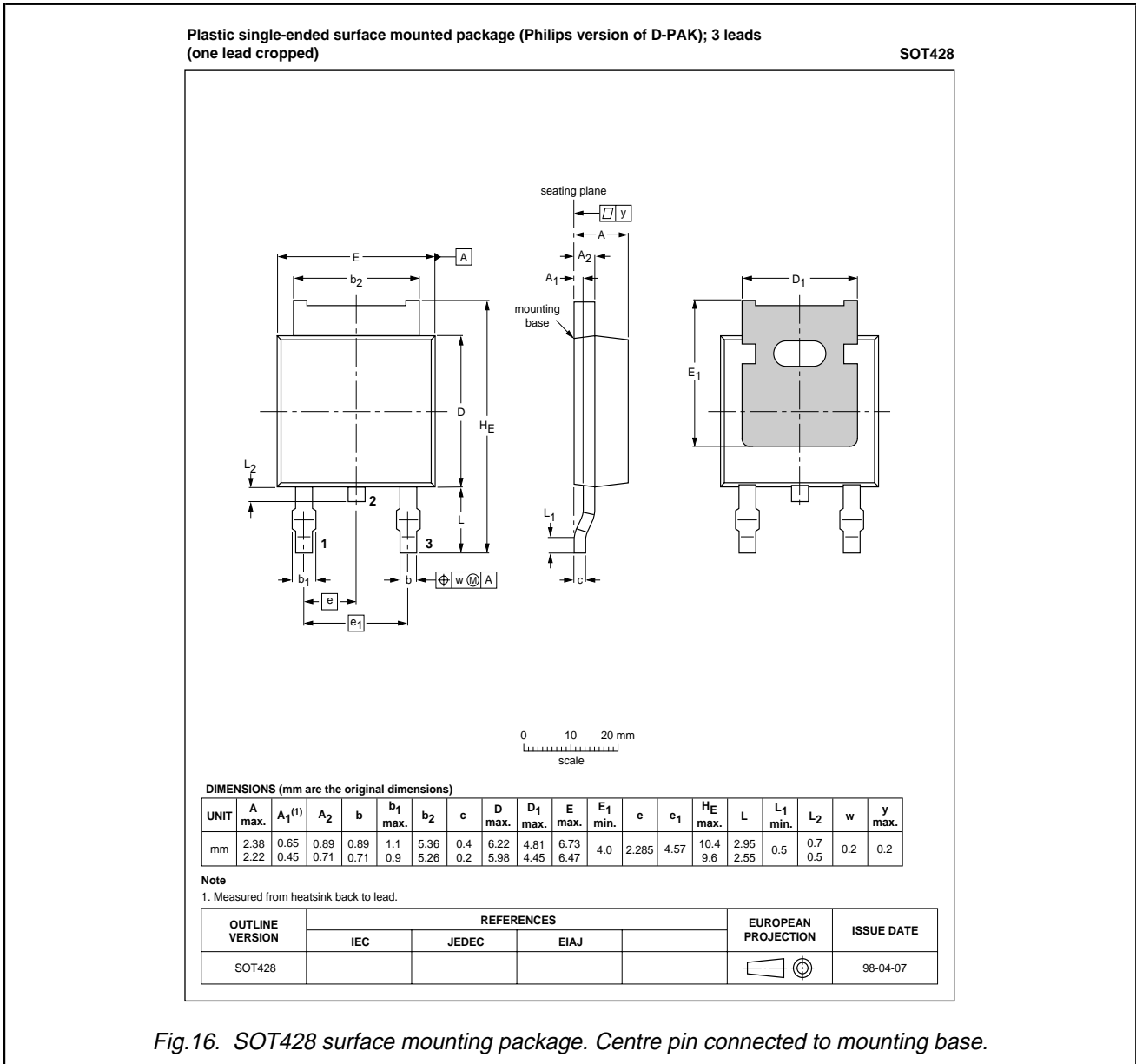
Fig.14. Typical reverse diode current.
 $I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j



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MECHANICAL DATA



Notes

1. This product is supplied in anti-static packaging. The gate-source input must be protected against static discharge during transport or handling.
2. Refer to SMD Footprint Design and Soldering Guidelines, Data Handbook SC18.
3. Epoxy meets UL94 V0 at 1/8".

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MOUNTING INSTRUCTIONS

Dimensions in mm

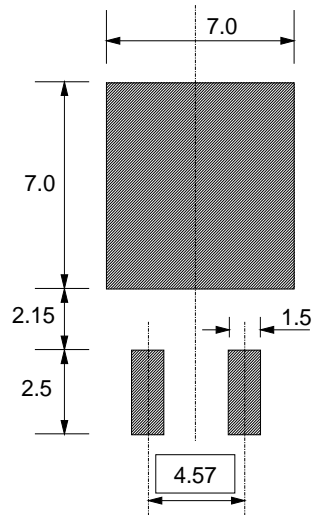


Fig.17. SOT428 : soldering pattern for surface mounting.

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DEFINITIONS

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Data sheet status | |
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Limiting values | |
| Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |
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