

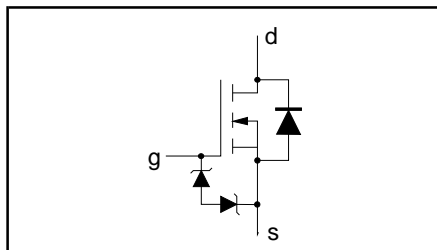
TrenchMOS™ transistor Logic level FET

PHB11N06LT, PHD11N06LT

FEATURES

- 'Trench' technology
- Very low on-state resistance
- Fast switching
- Stable off-state characteristics
- High thermal cycling performance
- Low thermal resistance

SYMBOL



QUICK REFERENCE DATA

| |
|---|
| $V_{DSS} = 55\text{ V}$ |
| $I_D = 11\text{ A}$ |
| $R_{DS(ON)} \leq 150\text{ m}\Omega (V_{GS} = 5\text{ V})$ |
| $R_{DS(ON)} \leq 130\text{ m}\Omega (V_{GS} = 10\text{ V})$ |

GENERAL DESCRIPTION

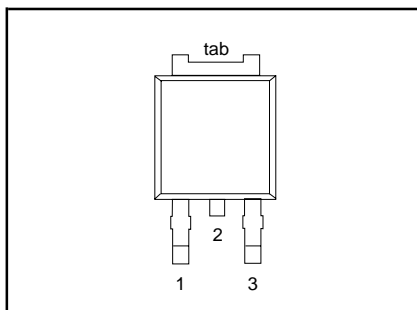
N-channel enhancement mode, logic level, field-effect power transistor in a plastic envelope using 'trench' technology. The device has very low on-state resistance. It is intended for use in dc to dc converters and general purpose switching applications.

The PHB11N06LT is supplied in the SOT404 surface mounting package.
The PHD11N06LT is supplied in the SOT428 surface mounting package.

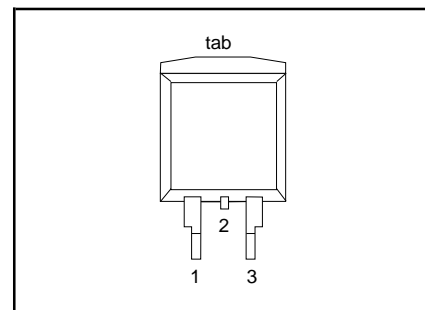
PINNING

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

SOT428



SOT404



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 $175\text{ }^\circ\text{C}$ | - | 55 | V |
| V_{DGR} | Drain-gate voltage | $T_j = 25\text{ }^\circ\text{C}$ to $175\text{ }^\circ\text{C}$; $R_{GS} = 20\text{ k}\Omega$ | - | 55 | V |
| V_{GS} | Gate-source voltage | | - | ± 13 | V |
| I_D | Continuous drain current | $T_{mb} = 25\text{ }^\circ\text{C}$ | - | 11 | A |
| | | $T_{mb} = 100\text{ }^\circ\text{C}$ | - | 7.6 | A |
| I_{DM} | Pulsed drain current | $T_{mb} = 25\text{ }^\circ\text{C}$ | - | 44 | A |
| P_D | Total power dissipation | $T_{mb} = 25\text{ }^\circ\text{C}$ | - | 36 | W |
| T_j, T_{stg} | Operating junction and storage temperature | | - 55 | 175 | $^\circ\text{C}$ |

¹ It is not possible to make contact to pin 2 of the SOT404 or SOT428 package

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ESD LIMITING VALUE

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|--------|---|--|------|------|------|
| V_C | Electrostatic discharge capacitor voltage, all pins | Human body model (100 pF, 1.5 k Ω) | - | 2 | kV |

THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|----------------|--|---|----------|--------|------------|
| $R_{th\ j-mb}$ | Thermal resistance junction to mounting base | | - | 4.17 | K/W |
| $R_{th\ j-a}$ | Thermal resistance junction to ambient | SOT78 package, in free air SOT428 and SOT404 package, pcb mounted, minimum footprint | 60 50 | - - | K/W 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 | $V_{GS} = 0\text{ V}; I_D = 0.25\text{ mA};$ $T_j = -55^\circ\text{C}$ | 55 50 | - - | - - | V V |
| $V_{(BR)GSS}$ | Gate-source breakdown voltage | $I_G = \pm 1\text{ mA};$ | 10 | - | - | V |
| $V_{GS(TO)}$ | Gate threshold voltage | $V_{DS} = V_{GS}; I_D = 1\text{ mA}$ $T_j = 175^\circ\text{C}$ $T_j = -55^\circ\text{C}$ | 1.0 0.5 - | 1.5 - | 2.0 - 2.3 | V V V |
| $R_{DS(ON)}$ | Drain-source on-state resistance | $V_{GS} = 10\text{ V}; I_D = 5.5\text{ A}$ $V_{GS} = 5\text{ V}; I_D = 5.5\text{ A}$ $T_j = 175^\circ\text{C}$ | - - - | 100 120 250 | 130 150 315 | m Ω m Ω m Ω |
| g_{fs} | Forward transconductance | $V_{DS} = 25\text{ V}; I_D = 5.5\text{ A}$ $T_j = 175^\circ\text{C}$ | 4 | 10 | - | S |
| I_{GSS} | Gate source leakage current | $V_{GS} = \pm 5\text{ V}; V_{DS} = 0\text{ V}$ $T_j = 175^\circ\text{C}$ | - | 0.02 | 1 | μA μA |
| I_{DSS} | Zero gate voltage drain current | $V_{DS} = 55\text{ V}; V_{GS} = 0\text{ V};$ $T_j = 175^\circ\text{C}$ | - | 0.05 | 10 | μA μA |
| $Q_{g(tot)}$ | Total gate charge | $I_D = 11\text{ A}; V_{DD} = 44\text{ V}; V_{GS} = 5\text{ V}$ | - | 6.1 | - | nC |
| Q_{gs} | Gate-source charge | | - | 1.3 | - | nC |
| Q_{gd} | Gate-drain (Miller) charge | | - | 3.2 | - | nC |
| $t_{d\ on}$ | Turn-on delay time | $V_{DD} = 30\text{ V}; I_D = 5\text{ A};$ $V_{GS} = 5\text{ V}; R_G = 10\ \Omega$ | - | 6 | 16 | ns |
| t_r | Turn-on rise time | Resistive load | - | 23 | 35 | ns |
| $t_{d\ off}$ | Turn-off delay time | | - | 18 | 30 | ns |
| t_f | Turn-off fall time | | - | 18 | 30 | ns |
| L_d | Internal drain inductance | Measured from 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 | $V_{GS} = 0\text{ V}; V_{DS} = 25\text{ V}; f = 1\text{ MHz}$ | - | 250 | 330 | pF |
| C_{oss} | Output capacitance | | - | 34 | 50 | pF |
| C_{rss} | Feedback capacitance | | - | 35 | 50 | pF |

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

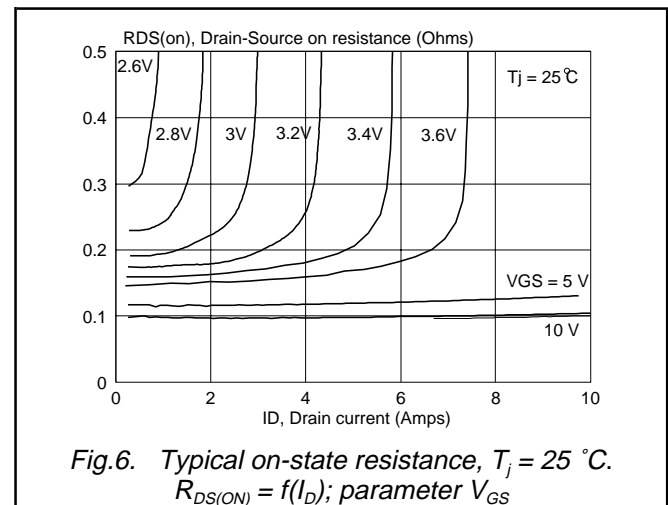
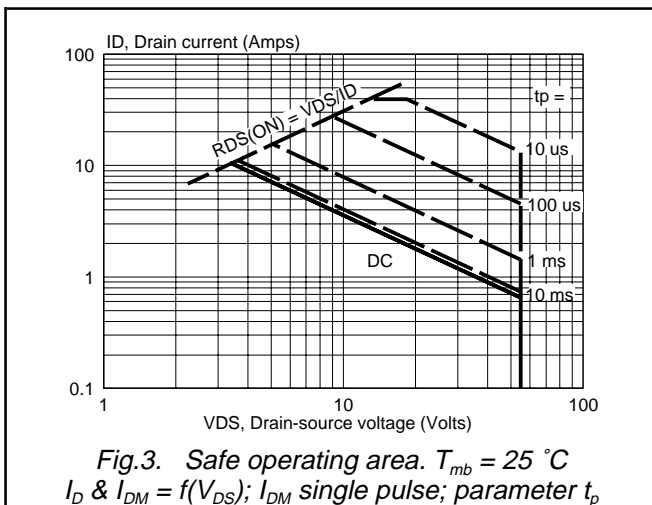
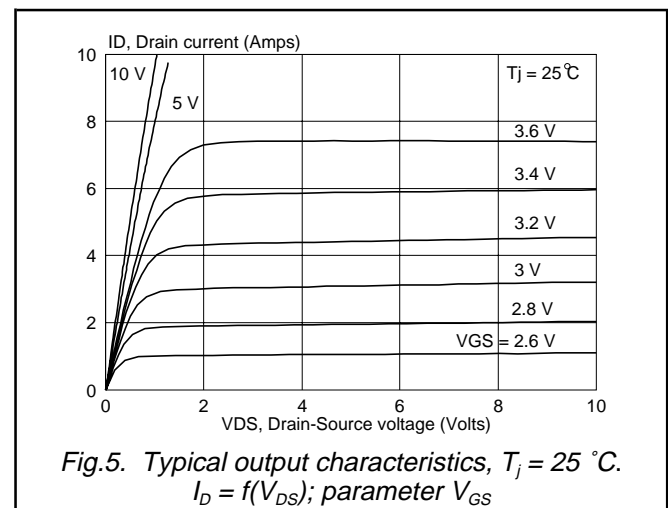
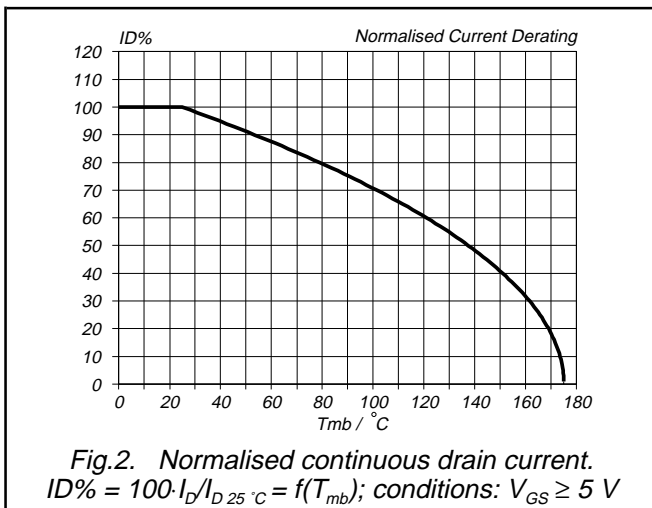
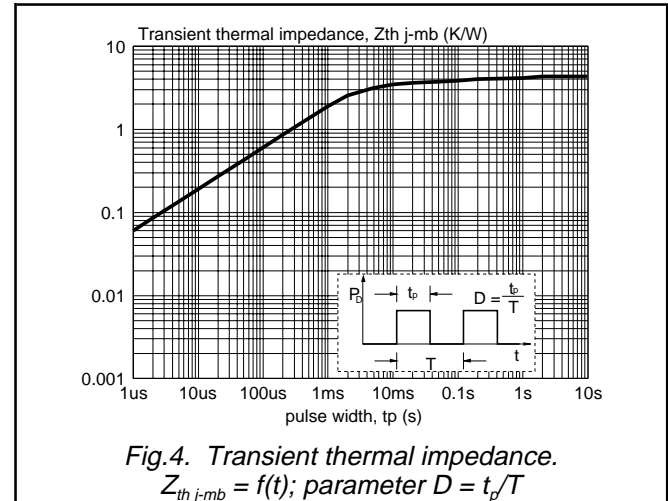
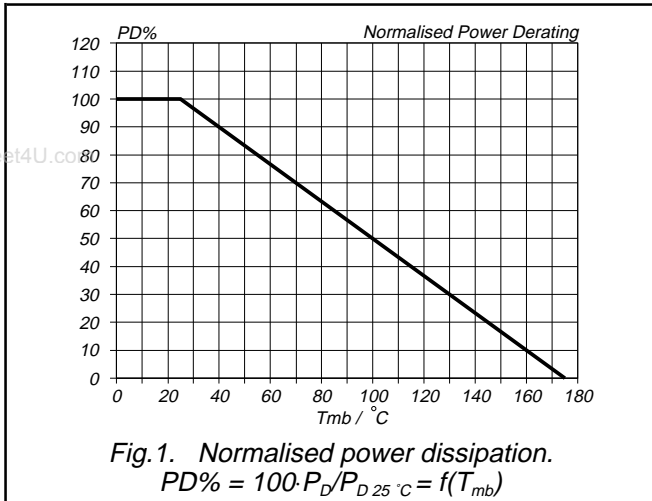
| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|----------|--|---|------|------|------|------|
| I_S | Continuous source current (body diode) | | - | - | 11 | A |
| I_{SM} | Pulsed source current (body diode) | | - | - | 44 | A |
| V_{SD} | Diode forward voltage | $I_F = 11\text{ A}; V_{GS} = 0\text{ V}$ | - | 0.95 | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_F = 11\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s};$ $V_{GS} = 0\text{ V}; V_R = 30\text{ V}$ | - | 34 | - | ns |
| Q_{rr} | Reverse recovery charge | | - | 57 | - | nC |

AVALANCHE LIMITING VALUE

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|---|---|------|------|------|
| W_{DSS} | Drain-source non-repetitive unclamped inductive turn-off energy | $I_D \leq 10\text{ A}; V_{DD} \leq 25\text{ V}; V_{GS} = 5\text{ V};$ $R_{GS} = 50\ \Omega; T_{mb} = 25^\circ\text{C}$ | - | 10 | mJ |

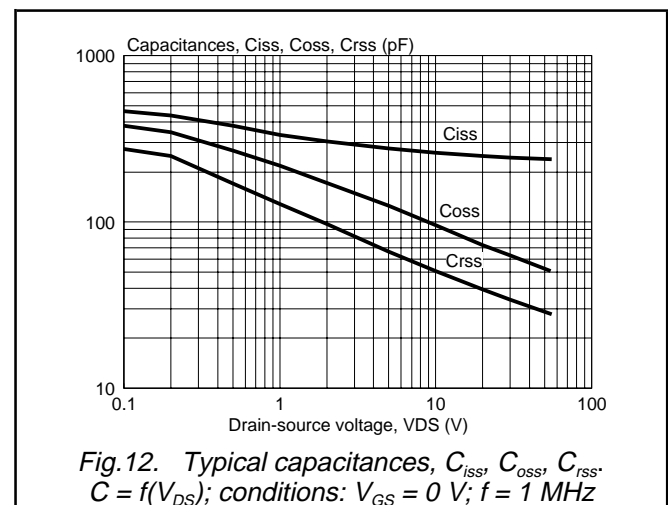
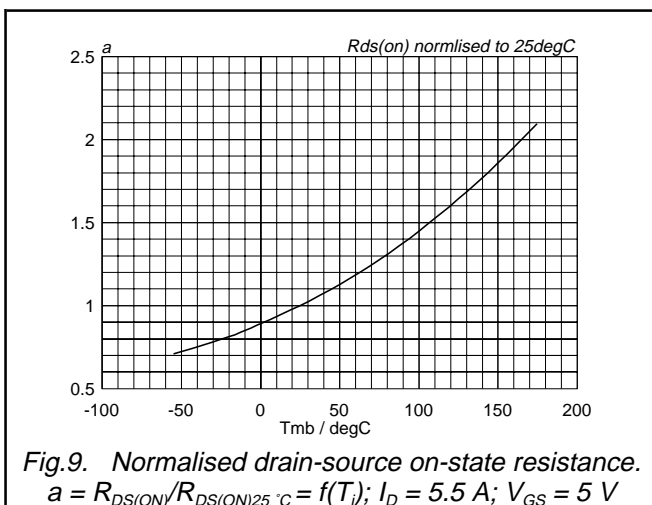
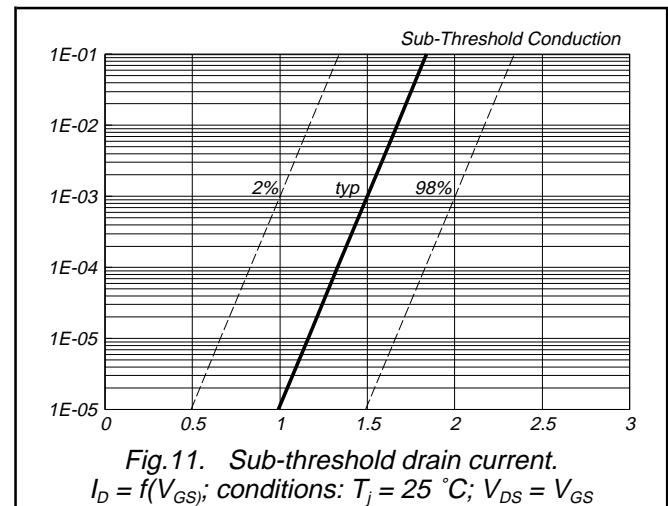
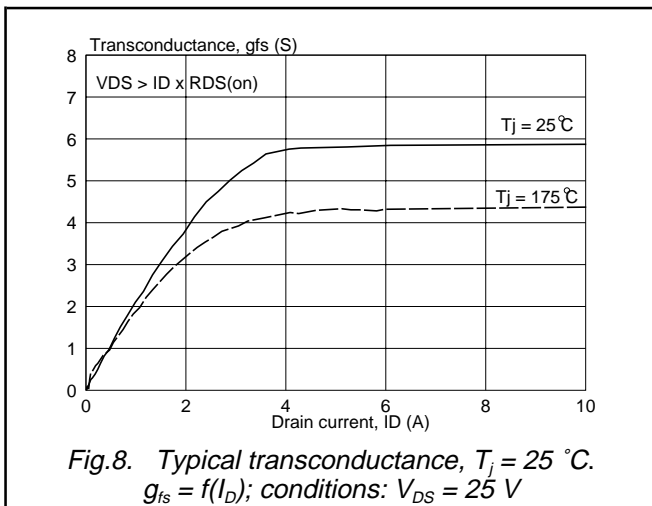
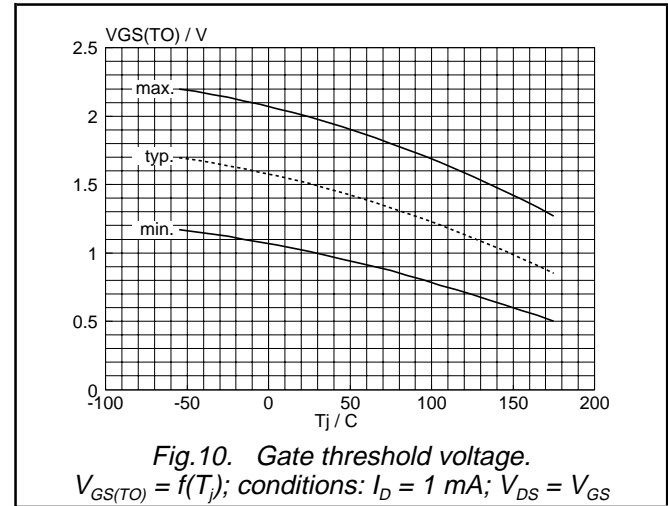
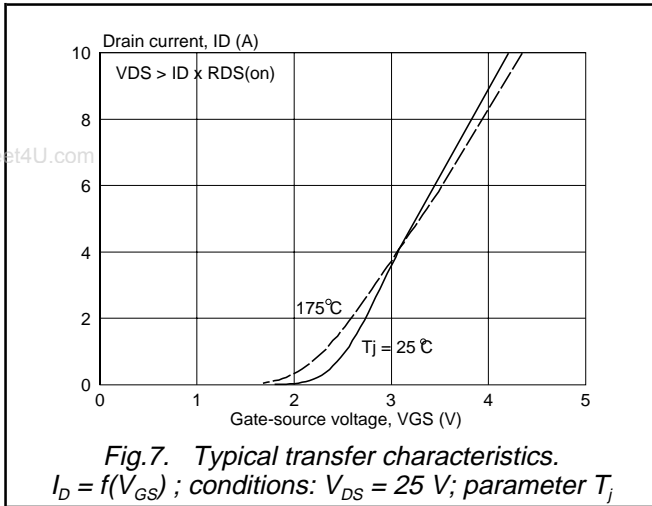
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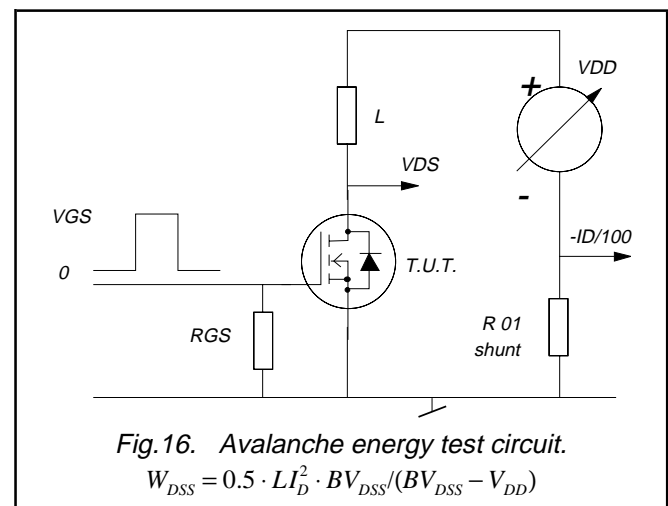
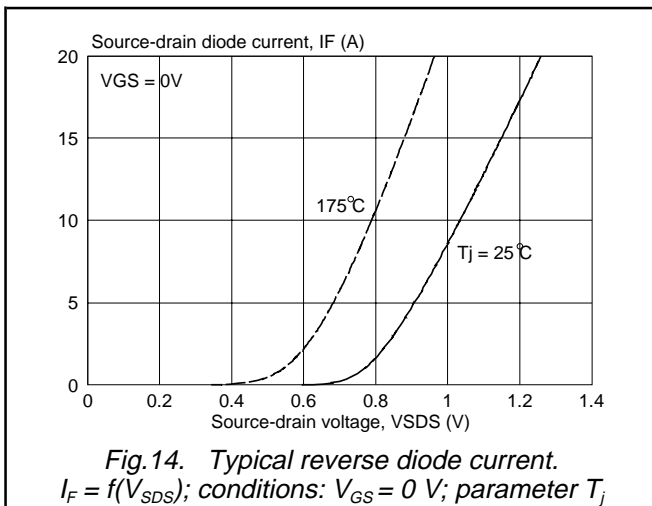
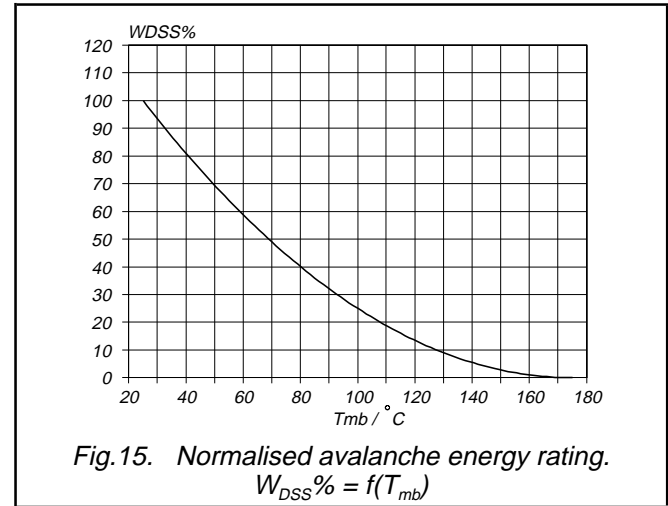
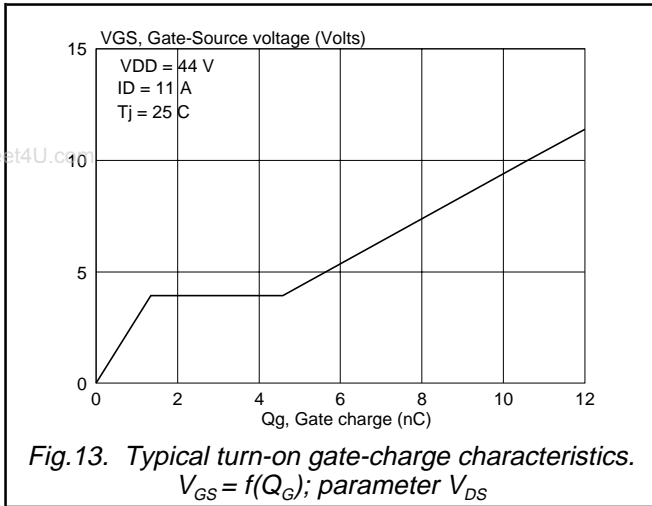
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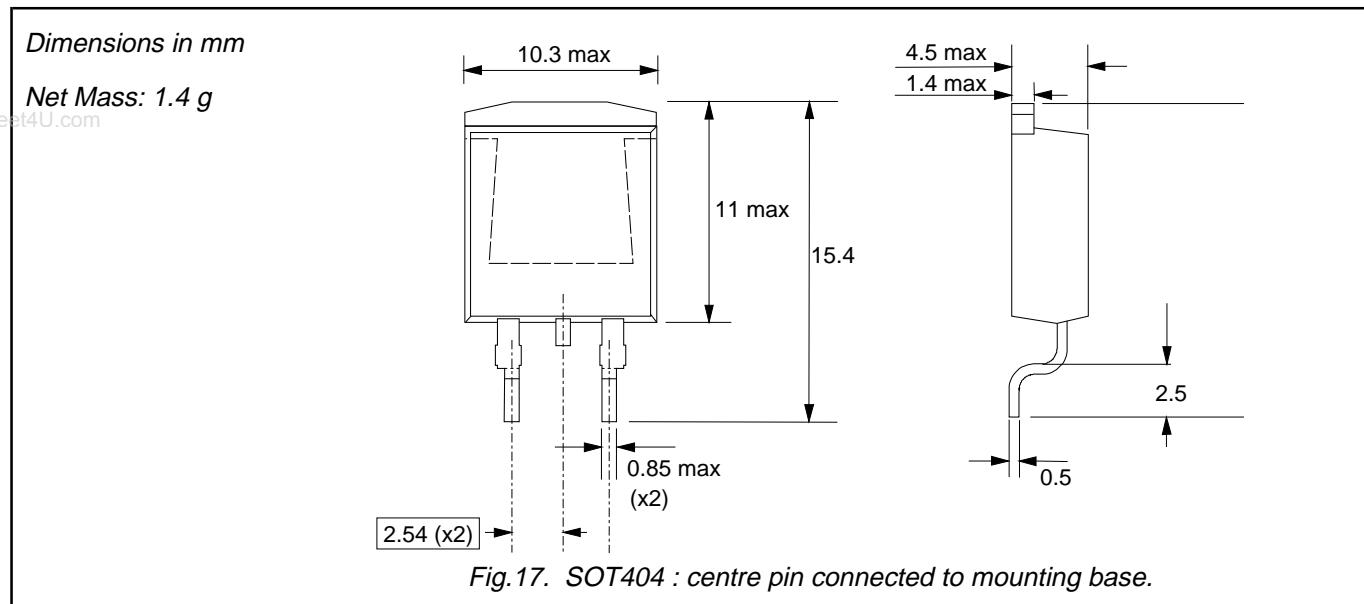
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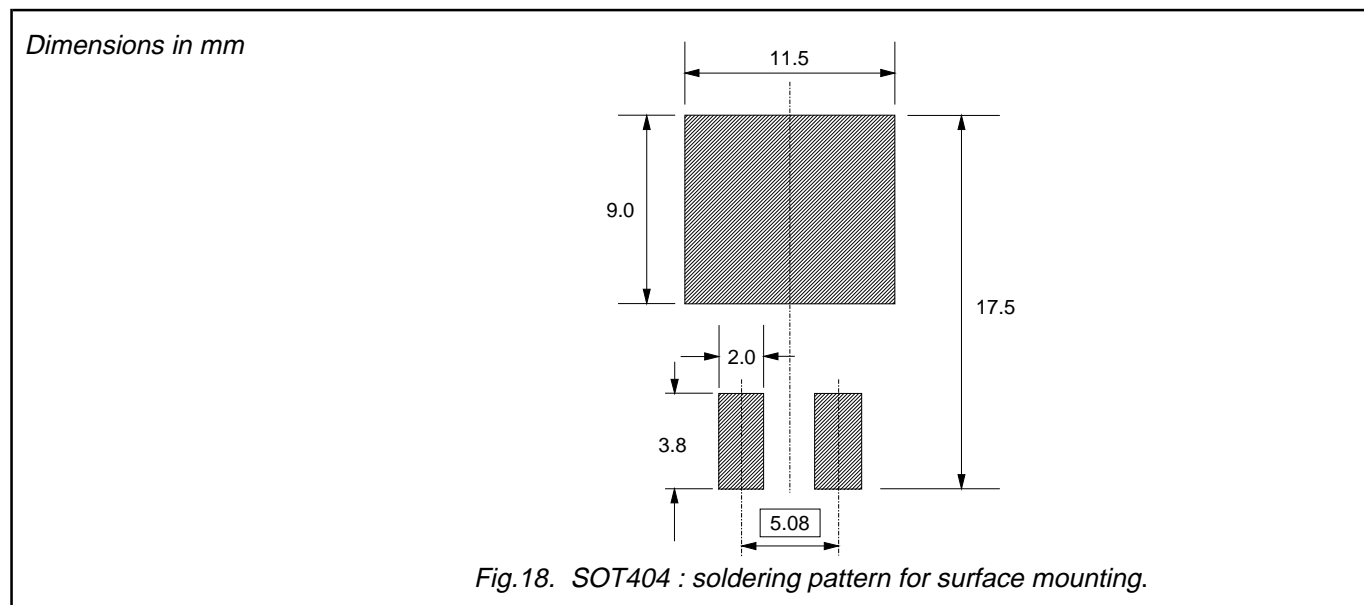
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MECHANICAL DATA



MOUNTING INSTRUCTIONS



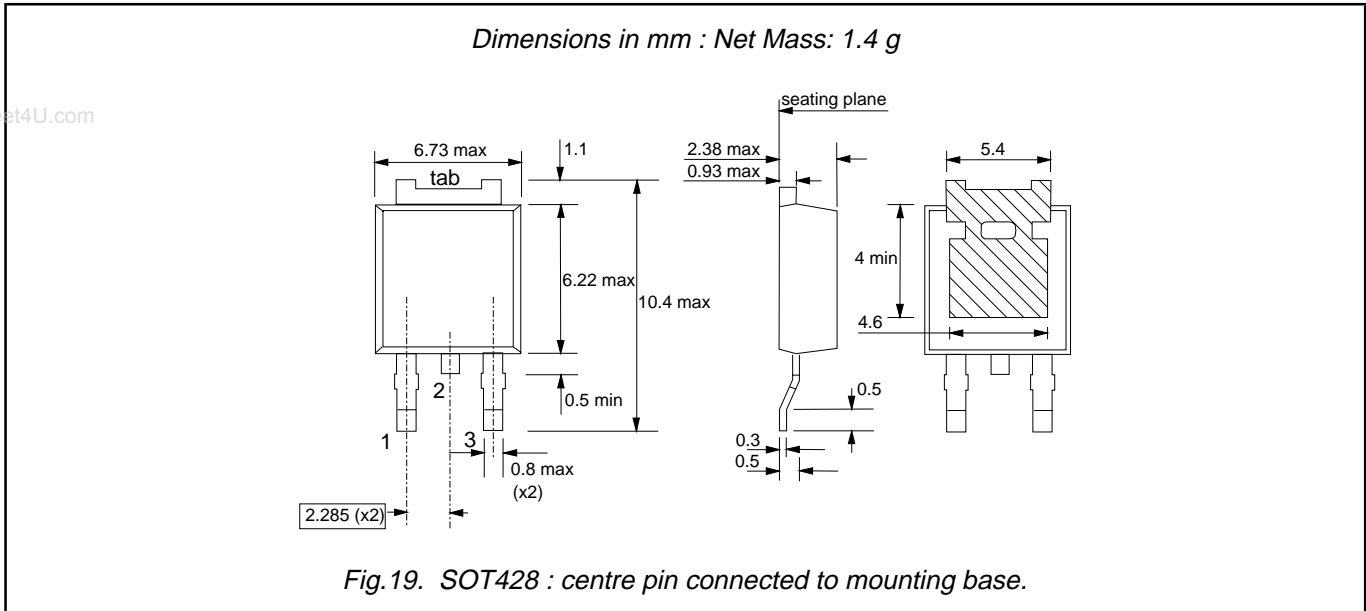
Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Epoxy meets UL94 V0 at 1/8".

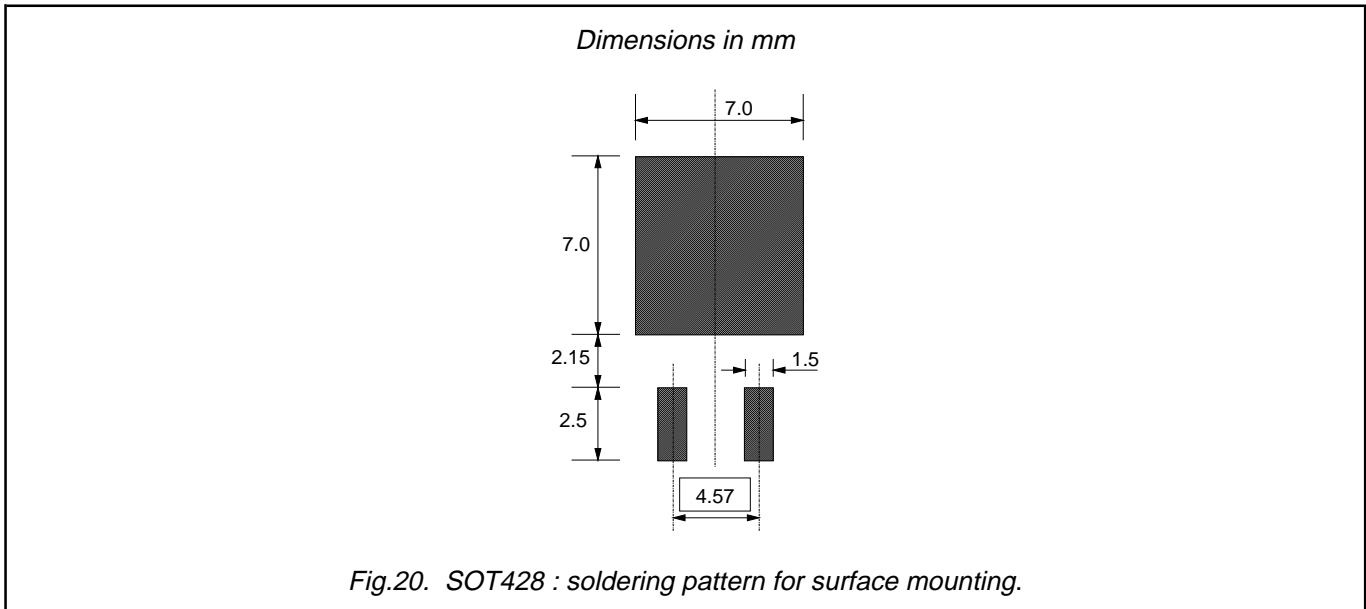
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DEFINITIONS

| | |
|--|---|
| 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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