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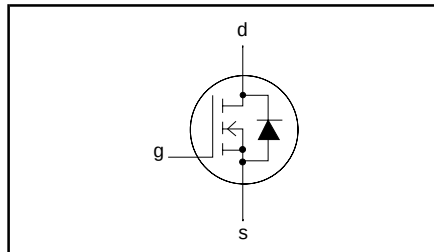
If you have any questions related to the data sheet, please contact our nearest sales office via e-mail or telephone (details via **[salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)**). Thank you for your cooperation and understanding,

Kind regards,

Team Nexperia

**N-channel TrenchMOS™ transistor****PHT6NQ10T****FEATURES**

- 'Trench' technology
- Low on-state resistance
- Fast switching
- Low thermal resistance

**SYMBOL****QUICK REFERENCE DATA**

$$V_{DSS} = 100 \text{ V}$$

$$I_D = 6.5 \text{ A}$$

$$R_{DS(ON)} \leq 90 \text{ m}\Omega$$

**GENERAL DESCRIPTION**

N-channel enhancement mode field-effect transistor in a plastic envelope using 'trench' technology.

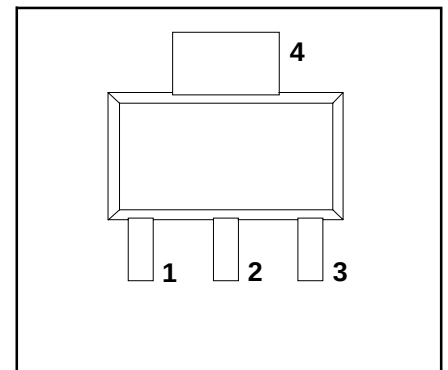
**Applications:-**

- Motor and relay drivers
- d.c. to d.c. converters

The PHT6NQ10T is supplied in the SOT223 surface mounting package.

**PINNING**

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | gate        |
| 2   | drain       |
| 3   | source      |
| 4   | drain (tab) |

**SOT223****LIMITING VALUES**

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

| SYMBOL         | PARAMETER                                  | CONDITIONS                                                                      | MIN. | MAX.     | UNIT             |
|----------------|--------------------------------------------|---------------------------------------------------------------------------------|------|----------|------------------|
| $V_{DSS}$      | Drain-source voltage                       | $T_j = 25^\circ\text{C}$ to $150^\circ\text{C}$                                 | -    | 100      | V                |
| $V_{DGR}$      | Drain-gate voltage                         | $T_j = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GS} = 20 \text{ k}\Omega$ | -    | 100      | V                |
| $V_{GS}$       | Gate-source voltage                        |                                                                                 | -    | $\pm 20$ | V                |
| $I_D$          | Continuous drain current (dc)              | $T_{sp} = 25^\circ\text{C}$                                                     | -    | 6.5      | A                |
|                |                                            | $T_{amb} = 25^\circ\text{C}$                                                    | -    | 3        | A                |
| $I_D$          | Continuous drain current (dc)              | $T_{sp} = 100^\circ\text{C}$                                                    | -    | 4.1      | A                |
|                |                                            | $T_{amb} = 100^\circ\text{C}$                                                   | -    | 1.9      | A                |
| $I_{DM}$       | Pulsed drain current                       |                                                                                 | -    | 26       | A                |
| $P_D$          | Total power dissipation                    | $T_{sp} = 25^\circ\text{C}$                                                     | -    | 8.3      | W                |
|                |                                            | $T_{amb} = 25^\circ\text{C}$                                                    | -    | 1.8      | W                |
| $T_j, T_{stg}$ | Operating junction and storage temperature |                                                                                 | - 65 | 150      | $^\circ\text{C}$ |

**THERMAL RESISTANCES**

| SYMBOL         | PARAMETER                                   | CONDITIONS                 | TYP. | MAX. | UNIT |
|----------------|---------------------------------------------|----------------------------|------|------|------|
| $R_{th j-sp}$  | Thermal resistance junction to solder point | surface mounted, FR4 board | 12   | 15   | K/W  |
| $R_{th j-amb}$ | Thermal resistance junction to ambient      | surface mounted, FR4 board | 70   | -    | K/W  |

## N-channel TrenchMOS™ transistor

PHT6NQ10T

**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   | $V_{GS} = 0\text{ V}$ ; $I_D = 0.25\text{ mA}$ ;<br>$T_j = -55^\circ\text{C}$                       | 100<br>89     | -       | -         | V<br>V                         |
| $V_{GS(TO)}$  | Gate threshold voltage           | $V_{DS} = V_{GS}$ ; $I_D = 1\text{ mA}$ ;<br>$T_j = 150^\circ\text{C}$<br>$T_j = -55^\circ\text{C}$ | 2<br>1.2<br>- | 3<br>-  | 4<br>-    | V<br>V<br>V                    |
| $R_{DS(ON)}$  | Drain-source on-state resistance | $V_{GS} = 10\text{ V}$ ; $I_D = 3\text{ A}$ ;<br>$T_j = 150^\circ\text{C}$                          | -<br>-        | 57<br>- | 90<br>216 | m $\Omega$<br>m $\Omega$       |
| $I_{GSS}$     | Gate source leakage current      | $V_{GS} = \pm 10\text{ V}$ ; $V_{DS} = 0\text{ V}$                                                  | -             | 10      | 100       | nA                             |
| $I_{DSS}$     | Zero gate voltage drain current  | $V_{DS} = 100\text{ V}$ ; $V_{GS} = 0\text{ V}$ ;<br>$T_j = 150^\circ\text{C}$                      | -             | 0.05    | 10<br>500 | $\mu\text{A}$<br>$\mu\text{A}$ |
| $Q_{g(tot)}$  | Total gate charge                | $I_D = 6\text{ A}$ ; $V_{DD} = 80\text{ V}$ ; $V_{GS} = 10\text{ V}$                                | -             | 21      | -         | nC                             |
| $Q_{gs}$      | Gate-source charge               |                                                                                                     | -             | 2.5     | -         | nC                             |
| $Q_{gd}$      | Gate-drain (Miller) charge       |                                                                                                     | -             | 8.2     | -         | nC                             |
| $t_{d\ on}$   | Turn-on delay time               | $V_{DD} = 50\text{ V}$ ; $R_D = 8.2\ \Omega$ ;<br>$V_{GS} = 10\text{ V}$ ; $R_G = 5.6\ \Omega$      | -             | 6       | -         | ns                             |
| $t_r$         | Turn-on rise time                | Resistive load                                                                                      | -             | 15      | -         | ns                             |
| $t_{d\ off}$  | Turn-off delay time              |                                                                                                     | -             | 20      | -         | ns                             |
| $t_f$         | Turn-off fall time               |                                                                                                     | -             | 10      | -         | ns                             |
| $L_d$         | Internal drain inductance        | Measured tab to centre of die                                                                       | -             | 2.5     | -         | nH                             |
| $L_s$         | Internal source inductance       | Measured from source lead to source bond pad                                                        | -             | 5       | -         | nH                             |
| $C_{ISS}$     | Input capacitance                | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 25\text{ V}$ ; $f = 1\text{ MHz}$                                 | -             | 633     | -         | pF                             |
| $C_{OSS}$     | Output capacitance               |                                                                                                     | -             | 103     | -         | pF                             |
| $C_{RSS}$     | Feedback capacitance             |                                                                                                     | -             | 61      | -         | pF                             |

**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) | $T_{sp} = 25^\circ\text{C}$                                                                                 | -    | -    | 5.5  | A    |
| $I_{SM}$ | Pulsed source current (body diode)     |                                                                                                             | -    | -    | 26   | A    |
| $V_{SD}$ | Diode forward voltage                  | $I_F = 6\text{ A}$ ; $V_{GS} = 0\text{ V}$                                                                  | -    | 0.8  | 1.2  | V    |
| $t_{rr}$ | Reverse recovery time                  | $I_F = 6\text{ A}$ ; $-dI_F/dt = 100\text{ A}/\mu\text{s}$ ;<br>$V_{GS} = 0\text{ V}$ ; $V_R = 25\text{ V}$ | -    | 55   | -    | ns   |
| $Q_{rr}$ | Reverse recovery charge                |                                                                                                             | -    | 135  | -    | nC   |

N-channel TrenchMOS<sup>TM</sup> transistor

## PHT6NQ10T

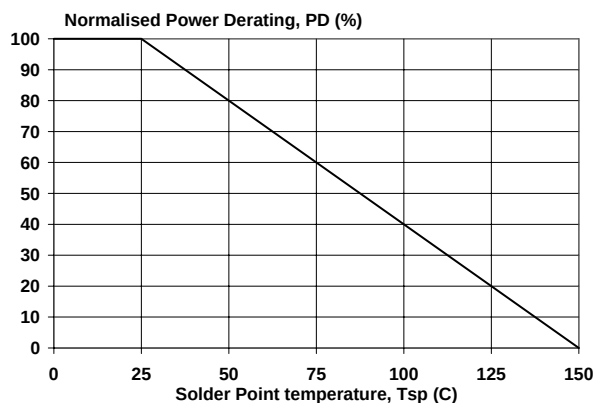


Fig.1. Normalised power dissipation.  
 $PD\% = 100 \cdot P_D / P_{D\ 25^\circ\text{C}} = f(T_{sp})$

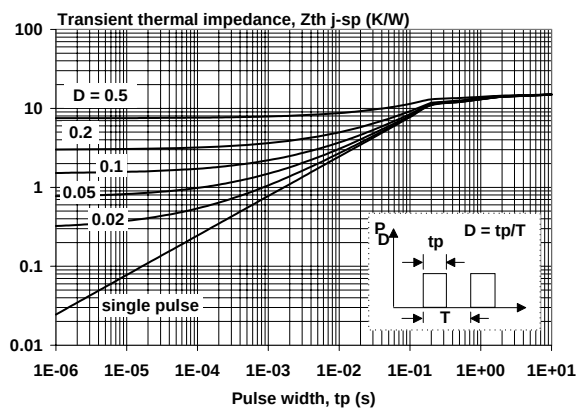


Fig.4. Transient thermal impedance.  
 $Z_{th\ j-sp} = f(t)$ ; parameter  $D = t_p/T$

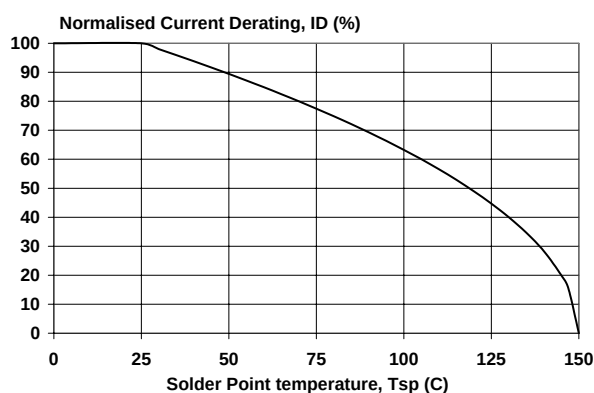


Fig.2. Normalised continuous drain current.  
 $ID\% = 100 \cdot I_D / I_{D\ 25^\circ\text{C}} = f(T_{sp})$ ;  $V_{GS} \geq 10\text{ V}$

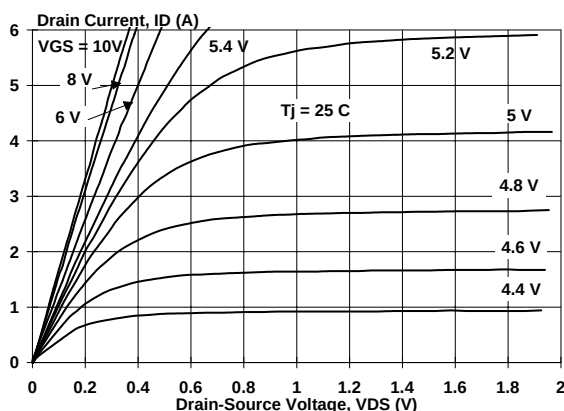


Fig.5. Typical output characteristics,  $T_j = 25^\circ\text{C}$ .  
 $I_D = f(V_{DS})$

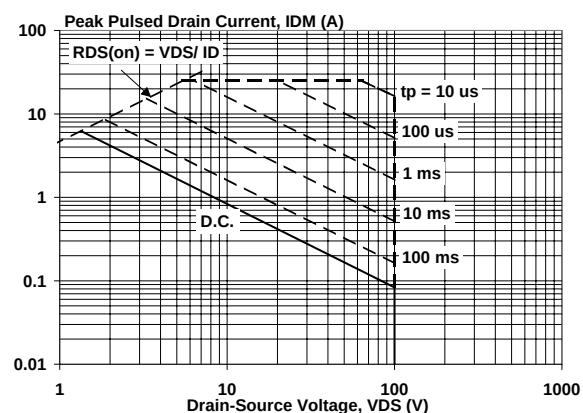


Fig.3. Safe operating area  
 $I_D \text{ \& } I_{DM} = f(V_{DS})$ ;  $I_{DM}$  single pulse; parameter  $t_p$

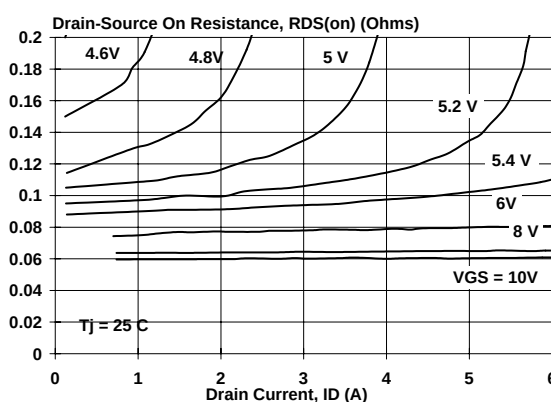
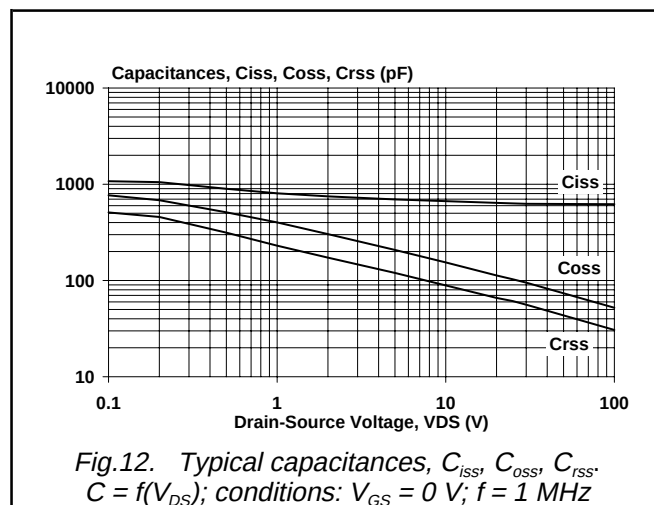
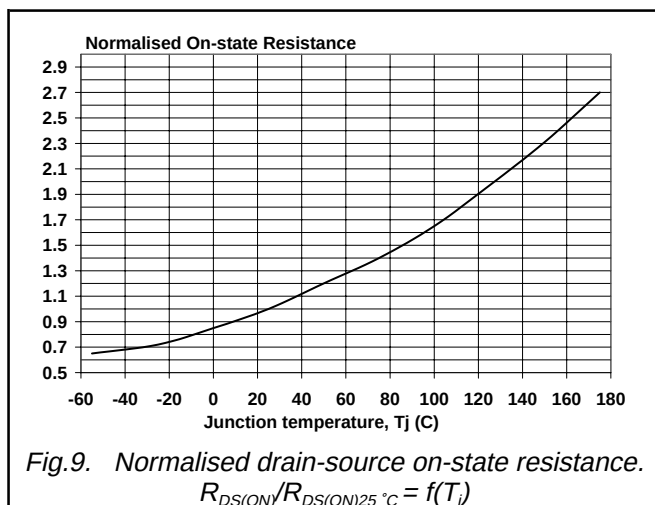
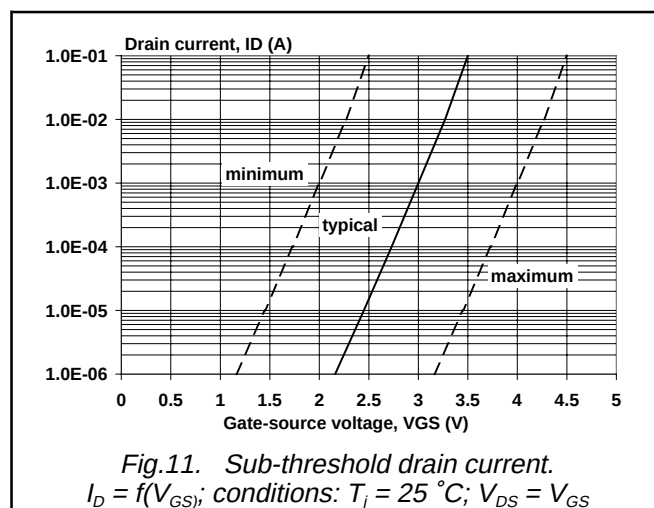
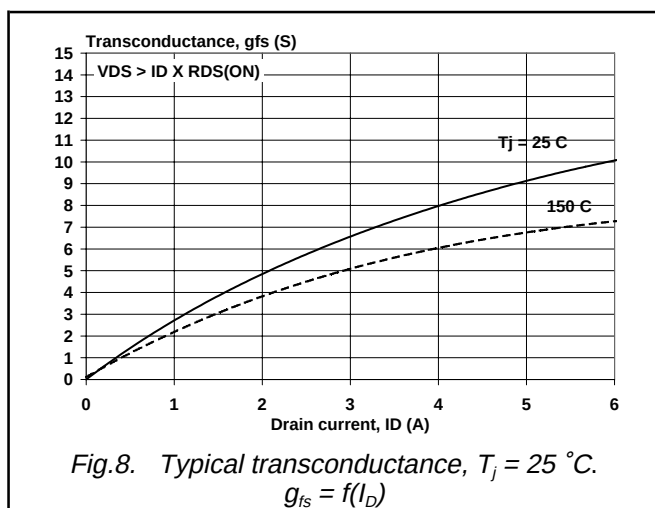
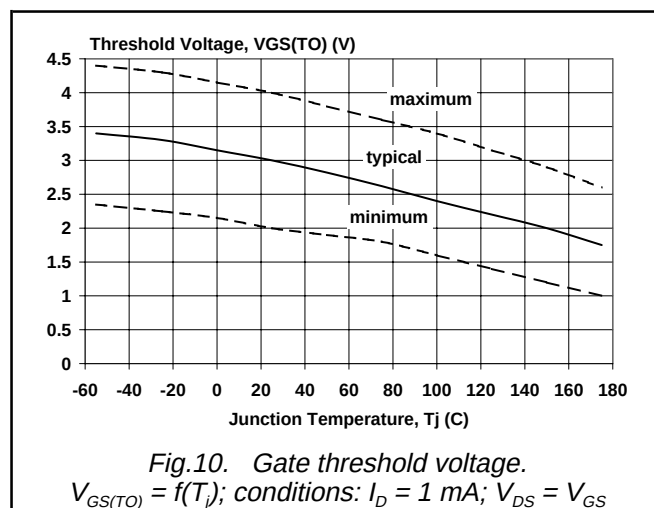
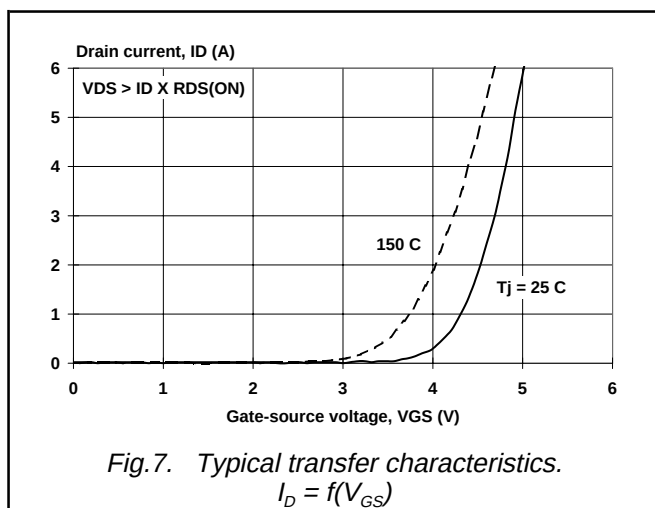


Fig.6. Typical on-state resistance,  $T_j = 25^\circ\text{C}$ .  
 $R_{DS(ON)} = f(I_D)$

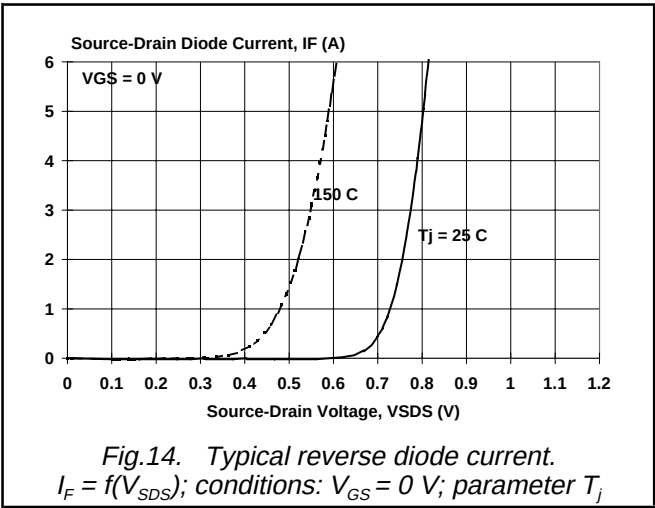
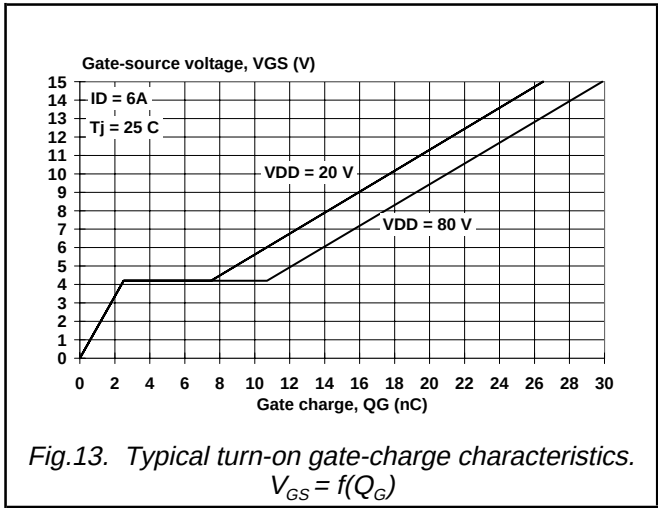
N-channel TrenchMOS<sup>TM</sup> transistor

PHT6NQ10T



N-channel TrenchMOS™ transistor

PHT6NQ10T



MECHANICAL DATA

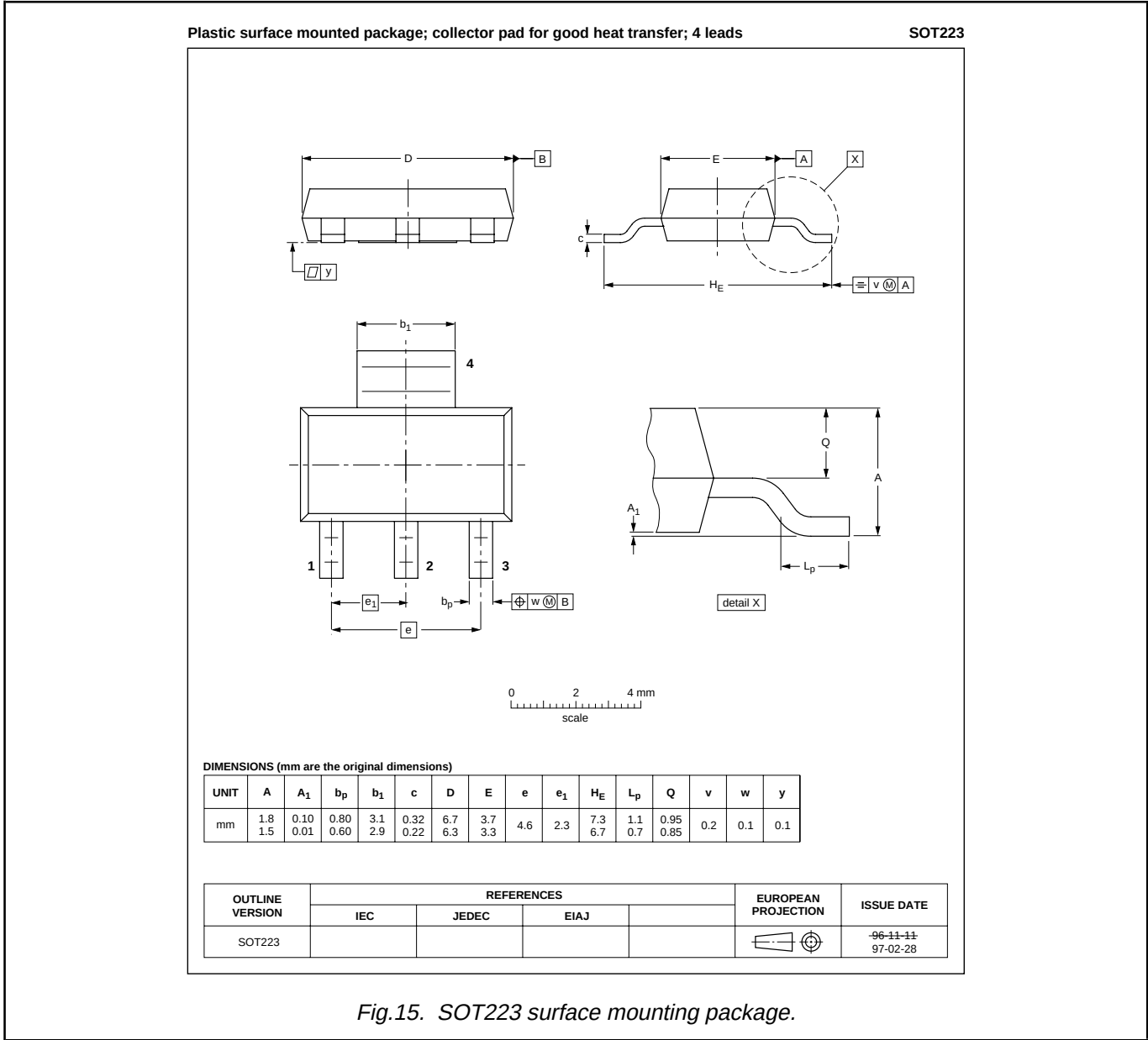


Fig.15. SOT223 surface mounting package.

- 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 Discrete Semiconductor Packages, Data Handbook SC18.
  - 3. Epoxy meets UL94 V0 at 1/8".

N-channel TrenchMOS<sup>TM</sup> transistor

PHT6NQ10T

**DEFINITIONS**

| <b>Data sheet status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 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.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                       |
| 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. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                        |                                                                                       |
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