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Kind regards,

Team Nexperia
BSP130
N-channel enhancement mode vertical D-MOS transistor

Product specification
Suppresses data of 1997 Jun 23

2001 Dec 11
N-channel enhancement mode vertical D-MOS transistor

BSP130

FEATURES
- Direct interface to C-MOS, TTL, etc.
- High-speed switching
- No secondary breakdown.

APPLICATIONS
- Line current interruptor in telephone sets
- Relay, high-speed and line transformer drivers.

DESCRIPTION
N-channel enhancement mode vertical D-MOS transistor in a SOT223 package.

QUICK REFERENCE DATA

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{DS}</td>
<td>drain-source voltage (DC)</td>
<td>−</td>
<td>300</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>I_D</td>
<td>drain current (DC)</td>
<td>−</td>
<td>350</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_{amb} ≤ 25 °C</td>
<td>1.5</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>V_{GSO}</td>
<td>gate-source voltage</td>
<td>open drain</td>
<td>−</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>R_{DSon}</td>
<td>drain-source on-state resistance</td>
<td>I_D = 250 mA; V_{GS} = 10 V</td>
<td>−</td>
<td>6</td>
<td>Ω</td>
</tr>
<tr>
<td>V_{GSoff}</td>
<td>gate-source cut-off voltage</td>
<td>I_D = 1 mA; V_{DS} = V_{GS}</td>
<td>0.8</td>
<td>2</td>
<td>V</td>
</tr>
</tbody>
</table>

LIMITING VALUES
In accordance with the Absolute Maximum Rating System (IEC 60134).

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{DS}</td>
<td>drain-source voltage (DC)</td>
<td>−</td>
<td>300</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>V_{GSO}</td>
<td>gate-source voltage (DC) open drain</td>
<td>−</td>
<td>±20</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>I_D</td>
<td>drain current (DC)</td>
<td>−</td>
<td>350</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>I_{DM}</td>
<td>peak drain current</td>
<td>−</td>
<td>1.4</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_{amb} ≤ 25 °C; note 1</td>
<td>−</td>
<td>1.5</td>
<td>W</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td>−55</td>
<td>+150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T_{j}</td>
<td>junction temperature</td>
<td>−</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

Note
1. Device mounted on an epoxy printed-circuit board, 40 x 40 x 1.5 mm, mounting pad for the drain tab minimum 6 cm².
N-channel enhancement mode
vertical D-MOS transistor

THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th,j-a}$</td>
<td>thermal resistance from junction to ambient; note 1</td>
<td>83.3</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Note
1. Device mounted on an epoxy printed-circuit board, 40 x 40 x 1.5 mm, mounting pad for the drain tab minimum 6 cm$^2$.

STATIC CHARACTERISTICS

$T_j = 25 \degree C$ unless otherwise specified.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{(BR)DSS}$</td>
<td>drain-source breakdown voltage</td>
<td>$I_D = 10 \mu A$; $V_{GS} = 0$</td>
<td>300</td>
<td>–</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>$I_{GSS}$</td>
<td>gate-source leakage current</td>
<td>$V_{GS} = \pm 20 V$; $V_{DS} = 0$</td>
<td>–</td>
<td>–</td>
<td>$\pm 100$</td>
<td>nA</td>
</tr>
<tr>
<td>$V_{GSSh}$</td>
<td>gate-source threshold voltage</td>
<td>$I_D = 1 mA$; $V_{DS} = V_{GS}$</td>
<td>0.8</td>
<td>–</td>
<td>2</td>
<td>V</td>
</tr>
<tr>
<td>$R_{DSon}$</td>
<td>drain-source on-state resistance</td>
<td>$I_D = 20 mA$; $V_{GS} = 2.4 V$</td>
<td>–</td>
<td>4.8</td>
<td>10</td>
<td>$\Omega$</td>
</tr>
<tr>
<td>&amp;</td>
<td></td>
<td>$I_D = 250 mA$; $V_{GS} = 10 V$</td>
<td>–</td>
<td>3.7</td>
<td>6</td>
<td>$\Omega$</td>
</tr>
<tr>
<td>$I_{DSS}$</td>
<td>drain-source leakage current</td>
<td>$V_{DS} = 240 V$; $V_{GS} = 0$</td>
<td>–</td>
<td>–</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$</td>
<td>Y_{fs}</td>
<td>$</td>
<td>transfer admittance</td>
<td>$I_D = 250 mA$; $V_{DS} = 25 V$</td>
<td>200</td>
<td>690</td>
</tr>
<tr>
<td>$C_{iss}$</td>
<td>input capacitance</td>
<td>$V_{DS} = 25 V$; $V_{GS} = 0$; $f = 1$ MHz</td>
<td>–</td>
<td>100</td>
<td>120</td>
<td>pF</td>
</tr>
<tr>
<td>$C_{oss}$</td>
<td>output capacitance</td>
<td>$V_{DS} = 25 V$; $V_{GS} = 0$; $f = 1$ MHz</td>
<td>–</td>
<td>21</td>
<td>30</td>
<td>pF</td>
</tr>
<tr>
<td>$C_{rss}$</td>
<td>feedback capacitance</td>
<td>$V_{DS} = 25 V$; $V_{GS} = 0$; $f = 1$ MHz</td>
<td>–</td>
<td>10</td>
<td>15</td>
<td>pF</td>
</tr>
</tbody>
</table>

Switching times (see Figs 2 and 3)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_{on}$</td>
<td>turn-on time</td>
<td>$I_D = 250 mA$; $V_{DD} = 50 V$; $V_{GS} = 0$ to 10 V</td>
<td>–</td>
<td>6</td>
<td>10</td>
<td>ns</td>
</tr>
<tr>
<td>$t_{off}$</td>
<td>turn-off time</td>
<td>$I_D = 250 mA$; $V_{DD} = 50 V$; $V_{GS} = 10$ to 0 V</td>
<td>–</td>
<td>46</td>
<td>60</td>
<td>ns</td>
</tr>
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</table>
Philips Semiconductors

N-channel enhancement mode vertical D-MOS transistor

BSP130

Fig. 2 Switching times test circuit.

Fig. 3 Input and output waveforms.

Fig. 4 Power derating curve.

Fig. 5 Capacitance as a function of drain-source voltage; typical values.
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Fig. 6 Typical output characteristics.

Fig. 7 Typical transfer characteristics.

Fig. 8 Drain-source on-state resistance as a function of drain current; typical values.

Fig. 9 Drain-source on-state resistance as a function of gate-source voltage; typical values.
Fig. 10  Transient thermal resistance from junction to ambient as a function of pulse time.

\[ R_{th,j-a}(K/W) \]

\[ \begin{array}{c|c|c|c|c|c|}
\hline
\text{\(R_{th,j-a}\)} & \text{\(0.1\)} & \text{\(0.5\)} & \text{\(1.0\)} & \text{\(2.0\)} & \text{\(5.0\)} \\
\text{\(10^{-1}\)} & \text{\(10^{-2}\)} & \text{\(10^{-3}\)} & \text{\(10^{-4}\)} & \text{\(10^{-5}\)} & \text{\(10^{-6}\)} \\
\text{\(t_p\) (s)} & \text{\(10^{-1}\)} & \text{\(10^{-2}\)} & \text{\(10^{-3}\)} & \text{\(10^{-4}\)} & \text{\(10^{-5}\)} \\
\hline
\end{array} \]

\( \delta \) = 0.01; \( T_{amb} = 25 \, ^{\circ}C \).

(1) \( R_{DS(on)} \) limitation.

Fig. 11  SOAR curve.
Fig. 12 Temperature coefficient of drain-source on-state resistance; typical values.

$$k = \frac{R_{DS(on)} \text{ at } T_j}{R_{DS(on)} \text{ at } 25 \degree C}$$

Typical $R_{DS(on)}$:
1. $I_D = 250 \text{ mA; } V_{DS} = 10 \text{ V.}$
2. $I_D = 20 \text{ mA; } V_{DS} = 2.4 \text{ V.}$

Fig. 13 Temperature coefficient of gate-source threshold voltage; typical values.

$$k = \frac{V_{GS(th)} \text{ at } T_j}{V_{GS(th)} \text{ at } 25 \degree C}$$

Typical $V_{GS(th)}$ at 1 mA.
N-channel enhancement mode vertical D-MOS transistor

PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 4 leads

SOT223

DIMENSIONS (mm are the original dimensions)

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A</th>
<th>A1</th>
<th>b_p</th>
<th>b_1</th>
<th>c</th>
<th>D</th>
<th>E</th>
<th>e</th>
<th>e1</th>
<th>H_E</th>
<th>L_p</th>
<th>Q</th>
<th>v</th>
<th>w</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.8</td>
<td>0.10</td>
<td>0.80</td>
<td>3.1</td>
<td>0.32</td>
<td>6.7</td>
<td>3.7</td>
<td>4.6</td>
<td>2.3</td>
<td>7.3</td>
<td>1.1</td>
<td>0.95</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>1.5</td>
<td>0.01</td>
<td>0.60</td>
<td>2.9</td>
<td>0.22</td>
<td>6.3</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
<td>6.7</td>
<td>0.7</td>
<td>0.85</td>
<td></td>
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OUTLINE

VERSION

REFERENCES

IEC | JEDEC | EIAJ

EUROPEAN PROJECTION

ISSUE DATE

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2001 Dec 11
DATA SHEET STATUS

<table>
<thead>
<tr>
<th>DATA SHEET STATUS(1)</th>
<th>PRODUCT STATUS(2)</th>
<th>DEFINITIONS</th>
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<tr>
<td>Objective data</td>
<td>Development</td>
<td>This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.</td>
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<tr>
<td>Preliminary data</td>
<td>Qualification</td>
<td>This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.</td>
</tr>
<tr>
<td>Product data</td>
<td>Production</td>
<td>This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.</td>
</tr>
</tbody>
</table>

Notes
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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

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NOTES
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NOTES