PMBF4391; PMBF4392; PMBF4393
N-channel FETs
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DESCRIPTION
Symmetrical silicon n-channel depletion type junction field-effect transistors on a plastic microminiature envelope intended for application in thick and thin-film circuits. The transistors are intended for low-power chopper or switching applications in industry.

PINNING
1 = drain
2 = source
3 = gate

Note
1. Drain and source are interchangeable.

Marking code
PMBF4391 = p6J
PMBF4392 = p6K
PMBF4393 = p6G

QUICK REFERENCE DATA

<table>
<thead>
<tr>
<th></th>
<th>PMBF4391</th>
<th>PMBF4392</th>
<th>PMBF4393</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-source voltage</td>
<td>± V_DS</td>
<td>max.</td>
<td>40</td>
</tr>
<tr>
<td>Drain current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V_DS = 20 V; V_GS = 0</td>
<td>I_DSS</td>
<td>&gt; 50</td>
<td>25</td>
</tr>
<tr>
<td>Gate-source cut-off voltage</td>
<td>V_P(GS)</td>
<td>&gt; 4</td>
<td>2</td>
</tr>
<tr>
<td>V_DS = 20 V; I_D = 1 nA</td>
<td></td>
<td>&lt; 10</td>
<td>5</td>
</tr>
<tr>
<td>Drain-source resistance (on) at f = 1 kHz</td>
<td>R_DS on</td>
<td>&lt; 30</td>
<td>60</td>
</tr>
<tr>
<td>Feedback capacitance at f = 1 MHz</td>
<td>C_RS</td>
<td>&lt; 3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>Turn-off time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V_DD = 10 V; V_GS = 0</td>
<td>t_off</td>
<td>&lt; 20</td>
<td>–</td>
</tr>
<tr>
<td>I_D = 12 mA; V_GSM = 12 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_D = 6 mA; V_GSM = 7 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_D = 3 mA; V_GSM = 5 V</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 1 Simplified outline and symbol, SOT23.
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RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Drain-source voltage: \( \pm V_{DS} \) max. 40 V
- Drain-gate voltage: \( V_{DGO} \) max. 40 V
- Gate-source voltage: \(-V_{GSO}\) max. 40 V
- Gate current (DC): \( I_G \) max. 50 mA
- Total power dissipation up to \( T_{amb} = 40 \, ^\circ C \): \( P_{tot} \) max. 250 mW
- Storage temperature range: \( T_{stg} \) -65 to +150 \(^\circ\)C
- Junction temperature: \( T_J \) max. 150 \(^\circ\)C

THERMAL RESISTANCE
From junction to ambient\(^{(1)}\)

\[ R_{thj-a} = 430 \, K/W \]

CHARACTERISTICS
\( T_J = 25 \, ^\circ\)C unless otherwise specified

- Gate-source voltage
  \( I_G = 1 \, mA; \, V_{DS} = 0 \)
  \( V_{GSon} < 1 \, V \)

- Gate-source cut-off current
  \( V_{DS} = 0 \, V; \, -V_{GS} = 20 \, V \)
  \( -I_{GSS} < 0.1 \, nA \)
  \( V_{DS} = 0 \, V; \, -V_{GS} = 20 \, V; \, T_{amb} = 150 \, ^\circ C \)
  \( -I_{GSS} < 0.2 \, \mu A \)

| Drain current \( V_{DS} = 20 \, V; \, V_{GS} = 0 \) |
|-----------------------------------|----------------|----------------|
| \( I_{DSS} \) | PMBF4391 | PMBF4392 | PMBF4393 |
| > 50 mA | 25 mA | 5 mA |
| < 150 mA | 75 mA | 30 mA |

- Gate-source breakdown voltage
  \( -I_G = 1 \, \mu A; \, V_{DS} = 0 \)
  \( -V_{GBR}GSS > 40 \, \mu A \)

- Gate-source cut-off voltage
  \( -I_D = 1 \, nA; \, V_{DS} = 20 \, V \)
  \( -V_{PI}GS > 4 \, \mu A \)

- Drain-source current (on)
  \( I_D = 12 \, mA; \, V_{GS} = 0 \)
  \( V_{DSon} < 0.4 \, V \)
  \( I_D = 6 \, mA; \, V_{GS} = 0 \)
  \( V_{DSon} < 0.4 \, V \)
  \( I_D = 3 \, mA; \, V_{GS} = 0 \)
  \( V_{DSon} < 0.4 \, V \)

- Drain-source resistance (on)
  \( I_D = 0; \, V_{GS} = 0; \, f = 1 \, kHz; \, T_{amb} = 25 \, ^\circ C \)
  \( r_{ds\, on} < 30 \, \Omega \)

- Drain cut-off current
  \( V_{DS} = 20 \, V; \, T_{amb} = 25 \, ^\circ C \)
  \( -V_{GS} = 12 \, V \)
  \( I_{DSX} < 0.1 \, nA \)
  \( -V_{GS} = 7 \, V \)
  \( I_{DSX} < 0.1 \, nA \)
  \( -V_{GS} = 5 \, V \)
  \( I_{DSX} < 0.1 \, nA \)
  \( -V_{GS} = 12 \, V; \, T_{amb} = 150 \, ^\circ C \)
  \( I_{DSX} < 0.2 \, \mu A \)
  \( -V_{GS} = 7 \, V \)
  \( I_{DSX} < 0.2 \, \mu A \)
  \( -V_{GS} = 5 \, V \)
  \( I_{DSX} < 0.2 \, \mu A \)
y-parameters (common source)

\( V_{DS} = 20 \, \text{V}; \, V_{GS} = 0; \, f = 1 \, \text{MHz}; \, T_{\text{amb}} = 25 \, ^{\circ}\text{C} \)

<table>
<thead>
<tr>
<th></th>
<th>PMBF4391</th>
<th>PMBF4392</th>
<th>PMBF4393</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input capacitance</td>
<td>( C_{IS} )</td>
<td>&lt; 14</td>
<td>14</td>
</tr>
<tr>
<td>Feedback capacitance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( V_{GS} = 12 , \text{V} ) ; ( V_{DS} = 0 )</td>
<td>( C_{RS} )</td>
<td>&lt; 3.5</td>
<td>–</td>
</tr>
<tr>
<td>( V_{GS} = 7 , \text{V} ) ; ( V_{DS} = 0 )</td>
<td>( C_{RS} )</td>
<td>&lt; –</td>
<td>3.5</td>
</tr>
<tr>
<td>( V_{GS} = 5 , \text{V} ) ; ( V_{DS} = 0 )</td>
<td>( C_{RS} )</td>
<td>&lt; –</td>
<td>–</td>
</tr>
</tbody>
</table>

Switching times

\( V_{DD} = 10 \, \text{V} \) ; \( V_{DS} = 0 \)

<table>
<thead>
<tr>
<th>Conditions ( I_{D} ) and ( -V_{GS_{\text{off}}} )</th>
<th>PMBF4391</th>
<th>PMBF4392</th>
<th>PMBF4393</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{D} )</td>
<td>= 12</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>( -V_{GS_{\text{off}}} )</td>
<td>= 12</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>( R_{L} )</td>
<td>= 750</td>
<td>1550</td>
<td>3150</td>
</tr>
<tr>
<td>Rise time</td>
<td>( t_{r} )</td>
<td>&lt; 5</td>
<td>5</td>
</tr>
<tr>
<td>Turn on time</td>
<td>( t_{on} )</td>
<td>&lt; 15</td>
<td>15</td>
</tr>
<tr>
<td>Fall time</td>
<td>( t_{f} )</td>
<td>&lt; 15</td>
<td>20</td>
</tr>
<tr>
<td>Turn off time</td>
<td>( t_{off} )</td>
<td>&lt; 20</td>
<td>35</td>
</tr>
</tbody>
</table>

Note

1. Mounted on a ceramic substrate of 8 mm \( \times \) 10 mm \( \times \) 0.7 mm.
Pulse generator:
\[ t_r < 0.5 \text{ ns} \]
\[ t_f < 0.5 \text{ ns} \]
\[ t_p = 100 \ \mu\text{s} \]
\[ \delta = 0.01 \]

Oscilloscope:
\[ R_i = 50 \ \Omega \]

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Fig. 3 Test circuit.

Fig. 4 Power derating curve.
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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT23

DIMENSIONS (mm are the original dimensions)

<table>
<thead>
<tr>
<th>UNIT</th>
<th>A</th>
<th>A₁ max.</th>
<th>b_p</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>
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</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.1</td>
<td>0.90</td>
<td>0.48</td>
<td>0.38</td>
<td>0.15</td>
<td>0.09</td>
<td>3.0</td>
<td>2.8</td>
<td>1.4</td>
<td>1.2</td>
<td>1.9</td>
<td>0.95</td>
<td>2.5</td>
</tr>
</tbody>
</table>

OUTLINE VERSION

<table>
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<th>IEC</th>
<th>JEDEC</th>
<th>JEITA</th>
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</thead>
<tbody>
<tr>
<td>SOT23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO-236AB</td>
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</table>

EUROPEAN PROJECTION

ISSUE DATE

04-11-04
06-03-16

April 1995
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DATA SHEET STATUS

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<th>DOCUMENT STATUS(1)</th>
<th>PRODUCT STATUS(2)</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

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