

DATA SHEET

**PMBF4391; PMBF4392;
PMBF4393**
N-channel FETs

Product specification

April 1995



N-channel FETs

PMBF4391; PMBF4392; PMBF4393

DESCRIPTION

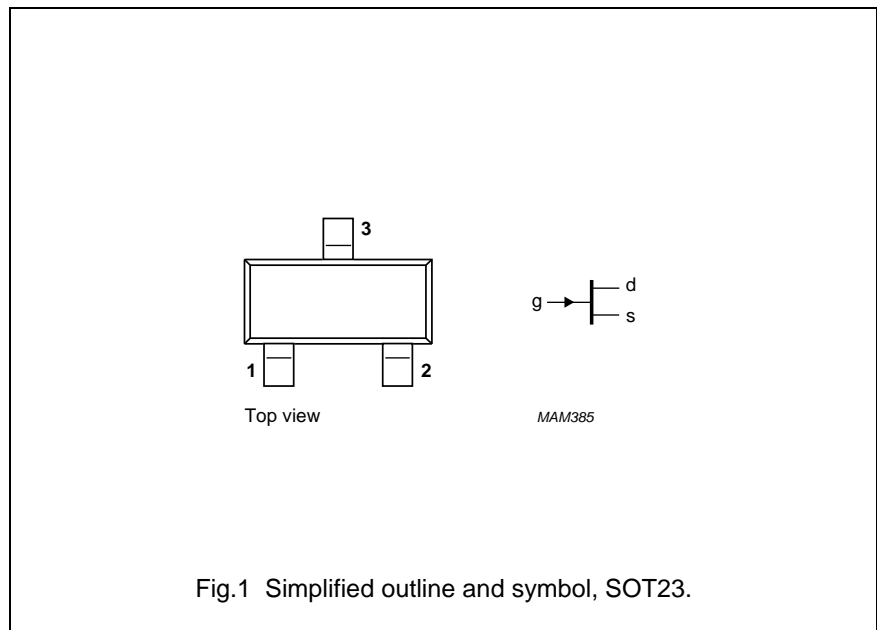
Symmetrical silicon n-channel depletion type junction field-effect transistors on a plastic microminiature envelope intended for application in thick and thin-film circuits. The transistors are intended for low-power chopper or switching applications in industry.

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

| | | PMBF4391 | | PMBF4392 | PMBF4393 | |
|--|--------------|----------|-----|----------|----------|----------|
| Drain-source voltage | $\pm V_{DS}$ | max. | 40 | 40 | 40 | V |
| Drain current | | | | | | |
| $V_{DS} = 20\text{ V}; V_{GS} = 0$ | I_{DSS} | > | 50 | 25 | 5 | mA |
| Gate-source cut-off voltage | | | | | | |
| $V_{DS} = 20\text{ V}; I_D = 1\text{ nA}$ | $-V_{(P)GS}$ | > | 4 | 2 | 0.5 | V |
| | | < | 10 | 5 | 3 | V |
| Drain-source resistance (on) at $f = 1\text{ kHz}$ | | | | | | |
| $I_D = 0; V_{GS} = 0$ | $R_{ds\ on}$ | < | 30 | 60 | 100 | Ω |
| Feedback capacitance at $f = 1\text{ MHz}$ | | | | | | |
| $-V_{GS} = 12\text{ V}; V_{DS} = 0$ | C_{rs} | < | 3.5 | 3.5 | 3.5 | pF |
| Turn-off time | | | | | | |
| $V_{DD} = 10\text{ V}; V_{GS} = 0$ | | | | | | |
| $I_D = 12\text{ mA}; -V_{GSM} = 12\text{ V}$ | t_{off} | < | 20 | — | — | ns |
| $I_D = 6\text{ mA}; -V_{GSM} = 7\text{ V}$ | t_{off} | < | — | 35 | — | ns |
| $I_D = 3\text{ mA}; -V_{GSM} = 5\text{ V}$ | t_{off} | < | — | — | 50 | ns |

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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 $T_{amb} = 40\text{ °C}$ ⁽¹⁾ | P_{tot} | max. | 250 mW |
| Storage temperature range | T_{stg} | | -65 to +150 °C |
| Junction temperature | T_j | max. | 150 °C |

THERMAL RESISTANCE

| | | | |
|---|---------------|---|---------|
| From junction to ambient ⁽¹⁾ | $R_{th\ j-a}$ | = | 430 K/W |
|---|---------------|---|---------|

CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified

Gate-source voltage

| | | | |
|---------------------------------|--------------|---|---|
| $I_G = 1\text{ mA}; V_{DS} = 0$ | $V_{GSon} <$ | 1 | V |
|---------------------------------|--------------|---|---|

Gate-source cut-off current

| | | | |
|---|--------------|-----|---------------|
| $V_{DS} = 0\text{ V}; -V_{GS} = 20\text{ V}$ | $-I_{GSS} <$ | 0.1 | nA |
| $V_{DS} = 0\text{ V}; -V_{GS} = 20\text{ V}; T_{amb} = 150\text{ °C}$ | $-I_{GSS} <$ | 0.2 | μA |

Drain current

| | | | | | | |
|------------------------------------|-----------|---|-----|----|----|----|
| $V_{DS} = 20\text{ V}; V_{GS} = 0$ | I_{DSS} | > | 50 | 25 | 5 | mA |
| | | < | 150 | 75 | 30 | mA |

Gate-source breakdown voltage

| | | | | | |
|---|------------------|----|----|----|---|
| $-I_G = 1\text{ }\mu\text{A}; V_{DS} = 0$ | $-V_{(BR)GSS} >$ | 40 | 40 | 40 | V |
|---|------------------|----|----|----|---|

Gate-source cut-off voltage

| | | | | | |
|---|----------------|----|---|-----|---|
| $I_D = 1\text{ nA}; V_{DS} = 20\text{ V}$ | $-V_{(P)GS} >$ | 4 | 2 | 0.5 | V |
| | $-V_{(P)GS} <$ | 10 | 5 | 3 | V |

Drain-source voltage (on)

| | | | | | |
|----------------------------------|--------------|-----|-----|-----|---|
| $I_D = 12\text{ mA}; V_{GS} = 0$ | $V_{DSon} <$ | 0.4 | – | – | V |
| $I_D = 6\text{ mA}; V_{GS} = 0$ | $V_{DSon} <$ | – | 0.4 | – | V |
| $I_D = 3\text{ mA}; V_{GS} = 0$ | $V_{DSon} <$ | – | – | 0.4 | V |

Drain-source resistance (on)

| | | | | | |
|---|----------------|----|---|-----|----------|
| $I_D = 0; V_{GS} = 0; f = 1\text{ kHz}; T_{amb} = 25\text{ °C}$ | $r_{ds\ on} <$ | 30 | – | 100 | Ω |
|---|----------------|----|---|-----|----------|

Drain cut-off current

| | | | | | | |
|-------------------------|---|-------------|-----|-----|-----|---------------|
| $-V_{GS} = 12\text{ V}$ | $V_{DS} = 20\text{ V}$ | $I_{DSX} <$ | 0.1 | – | – | nA |
| $-V_{GS} = 7\text{ V}$ | | $I_{DSX} <$ | – | 0.1 | – | nA |
| $-V_{GS} = 5\text{ V}$ | | $I_{DSX} <$ | – | – | 0.1 | nA |
| $-V_{GS} = 12\text{ V}$ | $V_{DS} = 20\text{ V}; T_{amb} = 150\text{ °C}$ | $I_{DSX} <$ | 0.2 | – | – | μA |
| $-V_{GS} = 7\text{ V}$ | | $I_{DSX} <$ | – | 0.2 | – | μA |
| $-V_{GS} = 5\text{ V}$ | | $I_{DSX} <$ | – | – | 0.2 | μA |

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y-parameters (common source)

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

| | | PMBF4391 | PMBF4392 | PMBF4393 | |
|---|----------------|----------|----------|----------|----------|
| Input capacitance | C_{is} | < 14 | 14 | 14 | pF |
| Feedback capacitance | | | | | |
| - $V_{GS} = 12\text{ V}$; $V_{DS} = 0$ | C_{rs} | < 3.5 | - | - | pF |
| - $V_{GS} = 7\text{ V}$; $V_{DS} = 0$ | C_{rs} | < - | 3.5 | - | pF |
| - $V_{GS} = 5\text{ V}$; $V_{DS} = 0$ | C_{rs} | < - | - | 3.5 | pF |
| Switching times | | | | | |
| $V_{DD} = 10\text{ V}$; $V_{DS} = 0$ | | | | | |
| Conditions I_D and $-V_{GSoff}$ | I_D | = 12 | 6 | 3 | mA |
| | $-V_{GS\ off}$ | = 12 | 7 | 5 | V |
| | R_L | = 750 | 1550 | 3150 | Ω |
| Rise time | t_r | < 5 | 5 | 5 | ns |
| Turn on time | t_{on} | < 15 | 15 | 15 | ns |
| Fall time | t_f | < 15 | 20 | 30 | ns |
| Turn off time | t_{off} | < 20 | 35 | 50 | ns |

Note

1. Mounted on a ceramic substrate of 8 mm × 10 mm × 0,7 mm.

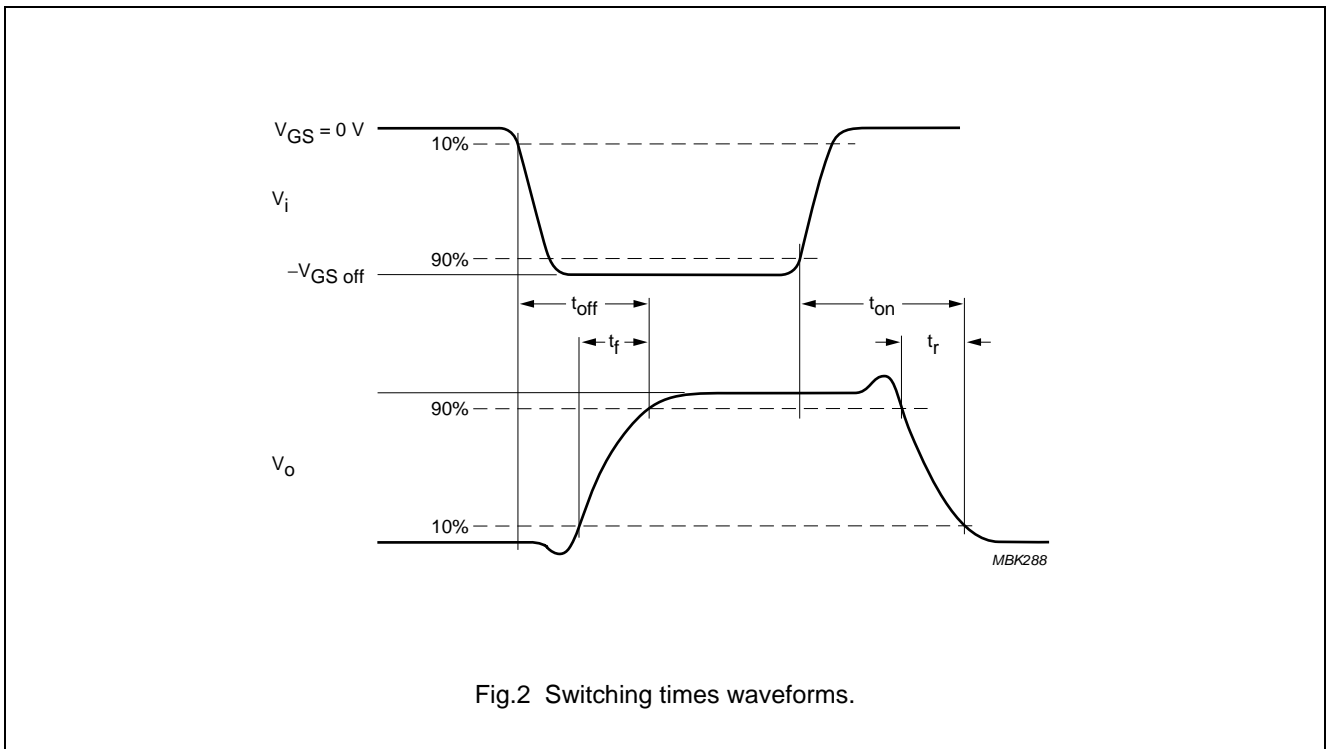


Fig.2 Switching times waveforms.

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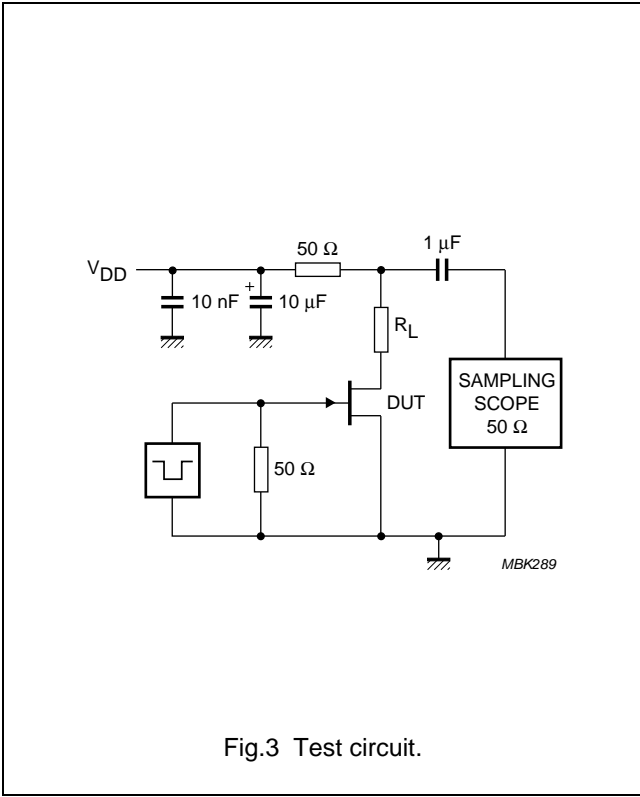


Fig.3 Test circuit.

Pulse generator:

- $t_r < 0.5 \text{ ns}$
- $t_f < 0.5 \text{ ns}$
- $t_p = 100 \text{ } \mu\text{s}$
- $\delta = 0.01$

Oscilloscope:

- $R_i = 50 \text{ } \Omega$

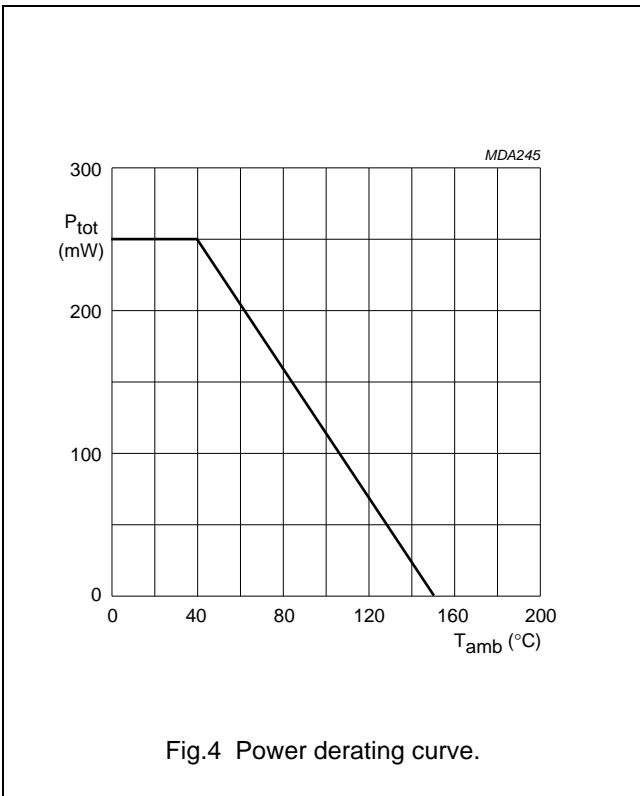


Fig.4 Power derating curve.

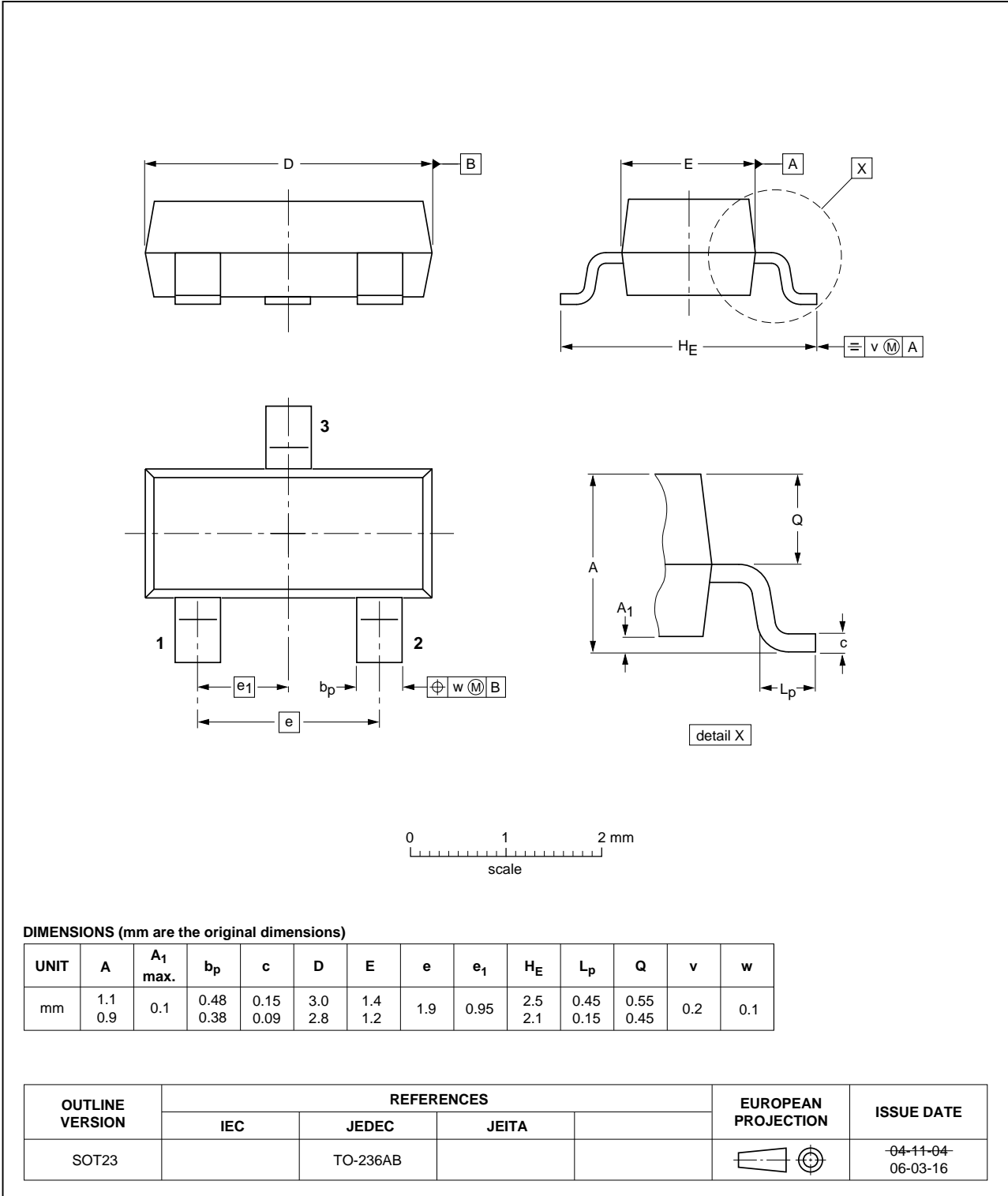
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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT23



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DATA SHEET STATUS

| DOCUMENT STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾ | DEFINITION |
|--------------------------------|-------------------------------|---|
| Objective data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary data sheet | Qualification | This document contains data from the preliminary specification. |
| Product data sheet | Production | This document contains the product specification. |

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