



# PMBFJ308; PMBFJ309; PMBFJ310

N-channel silicon field-effect transistors

Rev. 4 — 20 September 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Symmetrical N-channel silicon junction field-effect transistors in a SOT23 package.

#### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features and benefits

- Low noise
- Interchangeability of drain and source connections
- High gain.

### 1.3 Applications

- AM input stage in car radios
- VHF amplifiers
- Oscillators and mixers.

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol      | Parameter                   | Conditions                                         | Min | Typ | Max      | Unit |
|-------------|-----------------------------|----------------------------------------------------|-----|-----|----------|------|
| $V_{DS}$    | drain-source voltage        |                                                    | -   | -   | $\pm 25$ | V    |
| $V_{GSoff}$ | gate-source cut-off voltage |                                                    |     |     |          |      |
|             | PMBFJ308                    | $V_{DS} = 10\text{ V}; I_D = 1\text{ }\mu\text{A}$ | -1  | -   | -6.5     | V    |
|             | PMBFJ309                    | $V_{DS} = 10\text{ V}; I_D = 1\text{ }\mu\text{A}$ | -1  | -   | -4       | V    |
|             | PMBFJ310                    | $V_{DS} = 10\text{ V}; I_D = 1\text{ }\mu\text{A}$ | -2  | -   | -6.5     | V    |

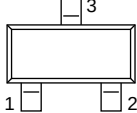


Table 1. Quick reference data ...continued

| Symbol     | Parameter                   | Conditions                                  | Min | Typ | Max | Unit |
|------------|-----------------------------|---------------------------------------------|-----|-----|-----|------|
| $I_{DSS}$  | drain current               |                                             |     |     |     |      |
|            | PMBFJ308                    | $V_{GS} = 0\text{ V}; V_{DS} = 10\text{ V}$ | 12  | -   | 60  | mA   |
|            | PMBFJ309                    | $V_{GS} = 0\text{ V}; V_{DS} = 10\text{ V}$ | 12  | -   | 30  | mA   |
|            | PMBFJ310                    | $V_{GS} = 0\text{ V}; V_{DS} = 10\text{ V}$ | 24  | -   | 60  | mA   |
| $P_{tot}$  | total power dissipation     | up to $T_{amb} = 25\text{ °C}$              | -   | -   | 250 | mW   |
| $ y_{fs} $ | forward transfer admittance | $V_{DS} = 10\text{ V}; I_D = 10\text{ mA}$  | 10  | -   | -   | mS   |

## 2. Pinning information

Table 2. Discrete pinning<sup>[1]</sup>

| Pin | Description | Simplified outline                                                                  | Symbol                                                                                        |
|-----|-------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | source      |  | <br>sym060 |
| 2   | drain       |                                                                                     |                                                                                               |
| 3   | gate        |                                                                                     |                                                                                               |

[1] Drain and source are interchangeable.

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| PMBFJ308    | -       | plastic surface mounted package; 3 leads | SOT23   |
| PMBFJ309    |         |                                          |         |
| PMBFJ310    |         |                                          |         |

## 4. Marking

Table 4. Marking

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PMBFJ308    | 48*                         |
| PMBFJ309    | 49*                         |
| PMBFJ310    | 50*                         |

[1] \* = p: Made in Hong Kong.

\* = t: Made in Malaysia.

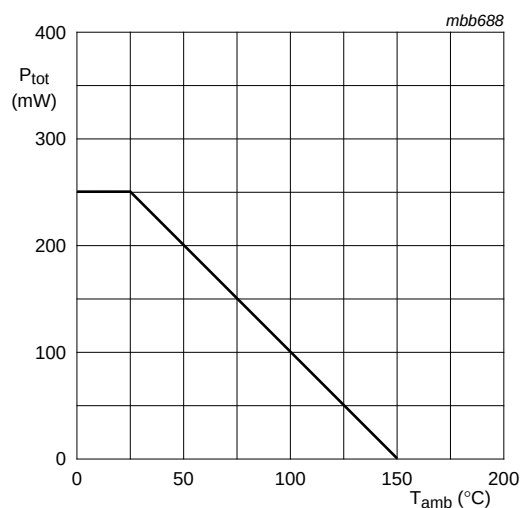
\* = W: Made in China.

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol    | Parameter                 | Conditions                                   | Min | Max      | Unit               |
|-----------|---------------------------|----------------------------------------------|-----|----------|--------------------|
| $V_{DS}$  | drain-source voltage (DC) |                                              | -   | $\pm 25$ | V                  |
| $V_{GSO}$ | gate-source voltage       | open drain                                   | -   | -25      | V                  |
| $V_{GDO}$ | gate-drain voltage        | open source                                  | -   | -25      | V                  |
| $I_G$     | forward gate current (DC) |                                              | -   | 50       | mA                 |
| $P_{tot}$ | total power dissipation   | up to $T_{amb} = 25\text{ }^{\circ}\text{C}$ | -   | 250      | mW                 |
| $T_{stg}$ | storage temperature       |                                              | -65 | +150     | $^{\circ}\text{C}$ |
| $T_j$     | junction temperature      |                                              | -   | 150      | $^{\circ}\text{C}$ |



**Fig 1. Power derating curve.**

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol        | Parameter                                   | Conditions | Typ                     | Unit |
|---------------|---------------------------------------------|------------|-------------------------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient |            | <a href="#">[1]</a> 500 | K/W  |

[1] Device mounted on an FR4 printed-circuit board.

## 7. Static characteristics

**Table 7. Static characteristics**

$T_j = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.

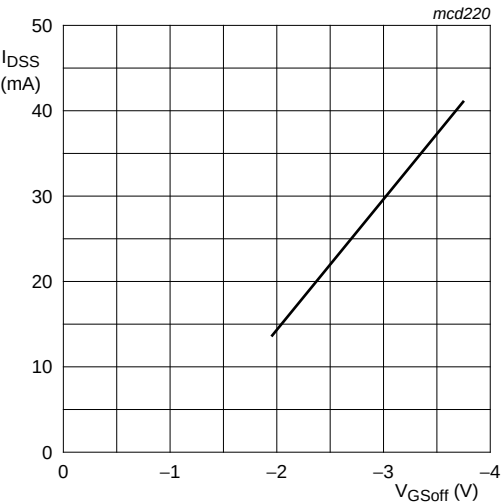
| Symbol        | Parameter                        | Conditions                                            | Min | Typ | Max  | Unit          |
|---------------|----------------------------------|-------------------------------------------------------|-----|-----|------|---------------|
| $V_{(BR)GSS}$ | gate-source breakdown voltage    | $I_G = -1\text{ }\mu\text{A}$ ; $V_{DS} = 0\text{ V}$ | -25 | -   | -    | V             |
| $V_{GSoff}$   | gate-source cut-off voltage      |                                                       |     |     |      | V             |
|               | PMBFJ308                         | $I_D = 1\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$ | -1  | -   | -6.5 | V             |
|               | PMBFJ309                         | $I_D = 1\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$ | -1  | -   | -4   | V             |
|               | PMBFJ310                         | $I_D = 1\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$ | -2  | -   | -6.5 | V             |
| $V_{GSS}$     | gate-source forward voltage      | $I_G = 1\text{ mA}$ ; $V_{DS} = 0\text{ V}$           | -   | -   | 1    | V             |
| $I_{DSS}$     | drain-source leakage current     |                                                       |     |     |      |               |
|               | PMBFJ308                         | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 10\text{ V}$        | 12  | -   | 60   | mA            |
|               | PMBFJ309                         | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 10\text{ V}$        | 12  | -   | 30   | mA            |
|               | PMBFJ310                         | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 10\text{ V}$        | 24  | -   | 60   | mA            |
| $I_{GSS}$     | gate-source leakage current      | $V_{GS} = -15\text{ V}$ ; $V_{DS} = 0\text{ V}$       | -   | -   | -1   | nA            |
| $R_{DSon}$    | drain-source on-state resistance | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 100\text{ mV}$      | -   | 50  | -    | $\Omega$      |
| $ y_{fs} $    | forward transfer admittance      | $I_D = 10\text{ mA}$ ; $V_{DS} = 10\text{ V}$         | 10  | -   | -    | mS            |
| $ y_{os} $    | common source output admittance  | $I_D = 10\text{ mA}$ ; $V_{DS} = 10\text{ V}$         | -   | -   | 250  | $\mu\text{S}$ |

## 8. Dynamic characteristics

**Table 8. Dynamic characteristics**

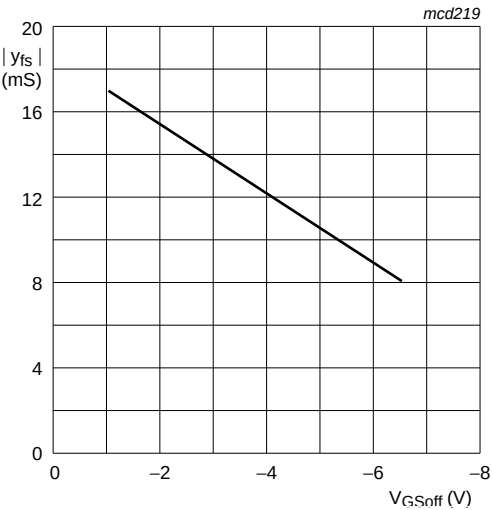
$T_j = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.

| Symbol    | Parameter                      | Conditions                                                           | Min | Typ  | Max | Unit                   |
|-----------|--------------------------------|----------------------------------------------------------------------|-----|------|-----|------------------------|
| $C_{iss}$ | input capacitance              | $V_{DS} = 10\text{ V}$                                               |     |      |     |                        |
|           |                                | $V_{GS} = -10\text{ V}$ ; $f = 1\text{ MHz}$                         | -   | 3    | 5   | pF                     |
|           |                                | $V_{GS} = 0\text{ V}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$       | -   | 6    | -   | pF                     |
| $C_{rss}$ | reverse transfer capacitance   | $V_{DS} = 0\text{ V}$ ; $V_{GS} = -10\text{ V}$ ; $f = 1\text{ MHz}$ | -   | 1.3  | 2.5 | pF                     |
| $g_{is}$  | input conductance              | $V_{DS} = 10\text{ V}$ ; $I_D = 10\text{ mA}$                        |     |      |     |                        |
|           |                                | $f = 100\text{ MHz}$                                                 | -   | 200  | -   | $\mu\text{S}$          |
|           |                                | $f = 450\text{ MHz}$                                                 | -   | 3    | -   | mS                     |
| $g_{fs}$  | transfer conductance           | $V_{DS} = 10\text{ V}$ ; $I_D = 10\text{ mA}$                        |     |      |     |                        |
|           |                                | $f = 100\text{ MHz}$                                                 | -   | 13   | -   | mS                     |
|           |                                | $f = 450\text{ MHz}$                                                 | -   | 12   | -   | mS                     |
| $g_{rs}$  | reverse conductance            | $V_{DS} = 10\text{ V}$ ; $I_D = 10\text{ mA}$                        |     |      |     |                        |
|           |                                | $f = 100\text{ MHz}$                                                 | -   | -30  | -   | $\mu\text{S}$          |
|           |                                | $f = 450\text{ MHz}$                                                 | -   | -450 | -   | $\mu\text{S}$          |
| $g_{os}$  | output conductance             | $V_{DS} = 10\text{ V}$ ; $I_D = 10\text{ mA}$                        |     |      |     |                        |
|           |                                | $f = 100\text{ MHz}$                                                 | -   | 150  | -   | $\mu\text{S}$          |
|           |                                | $f = 450\text{ MHz}$                                                 | -   | 400  | -   | $\mu\text{S}$          |
| $V_n$     | equivalent input noise voltage | $V_{DS} = 10\text{ V}$ ; $I_D = 10\text{ mA}$ ; $f = 100\text{ Hz}$  | -   | 6    | -   | nV/ $\sqrt{\text{Hz}}$ |



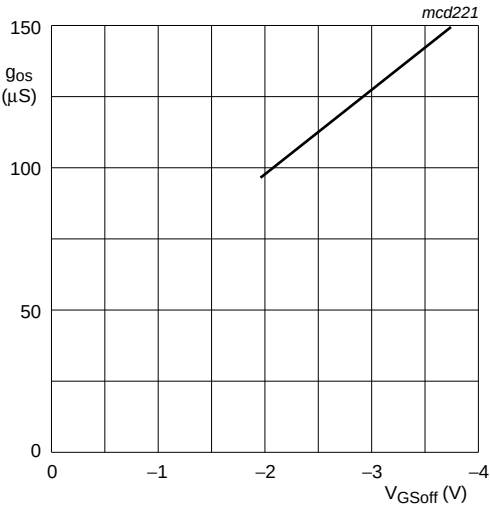
$V_{DS} = 10\text{ V}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$ .

Fig 2. Drain current as a function of gate-source cut-off voltage; typical values.



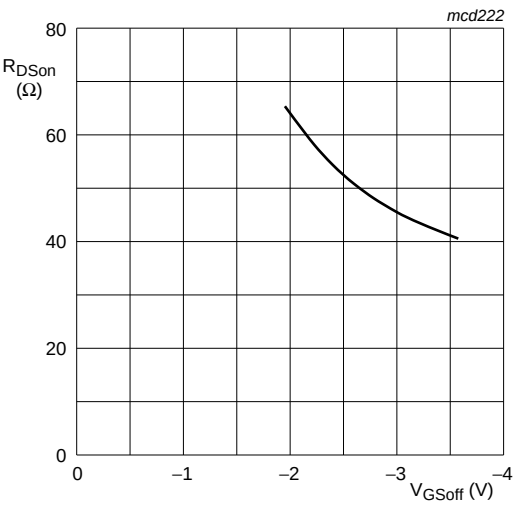
$V_{DS} = 10\text{ V}$ ;  $I_D = 10\text{ mA}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$ .

Fig 3. Forward transfer admittance as a function of gate-source cut-off voltage; typical values.



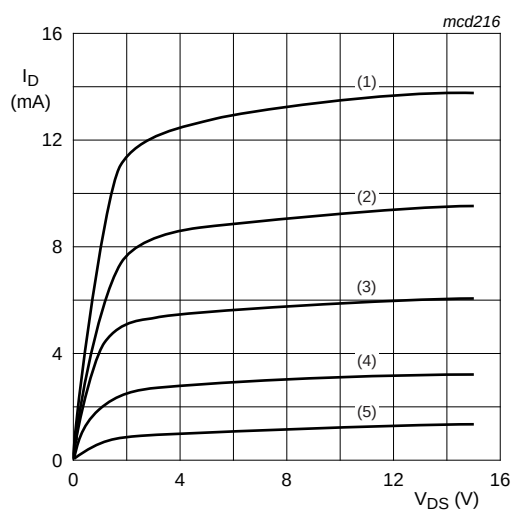
$V_{DS} = 10\text{ V}$ ;  $I_D = 10\text{ mA}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$ .

Fig 4. Common-source output conductance as a function of gate-source cut-off voltage; typical values.



$V_{DS} = 100\text{ mV}$ ;  $V_{GS} = 0\text{ V}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$ .

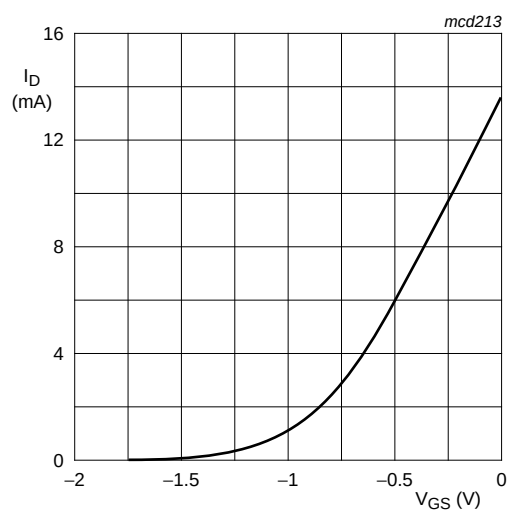
Fig 5. Drain-source on-state resistance as a function of gate-source cut-off voltage; typical values.



$T_j = 25\text{ }^{\circ}\text{C}$ .

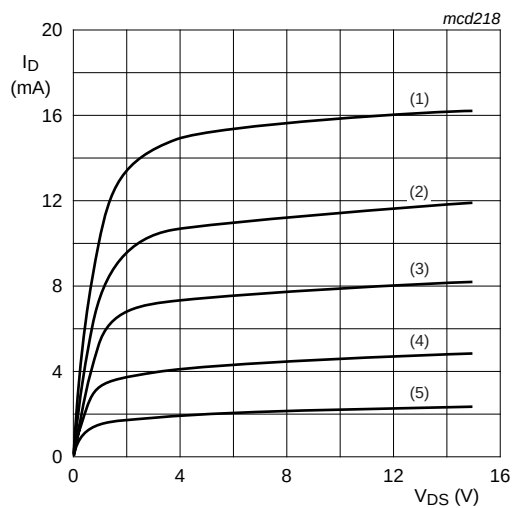
- (1)  $V_{GS} = 0\text{ V}$ .
- (2)  $V_{GS} = -0.25\text{ V}$ .
- (3)  $V_{GS} = -0.5\text{ V}$ .
- (4)  $V_{GS} = -0.75\text{ V}$ .
- (5)  $V_{GS} = -1\text{ V}$ .

**Fig 6. Typical output characteristics; PMBFJ308.**



$V_{DS} = 10\text{ V}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$ .

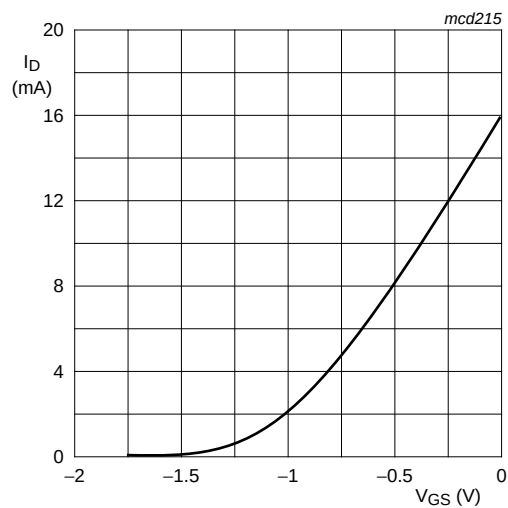
**Fig 7. Typical transfer characteristics; PMBFJ308.**



$T_j = 25\text{ }^{\circ}\text{C}$ .

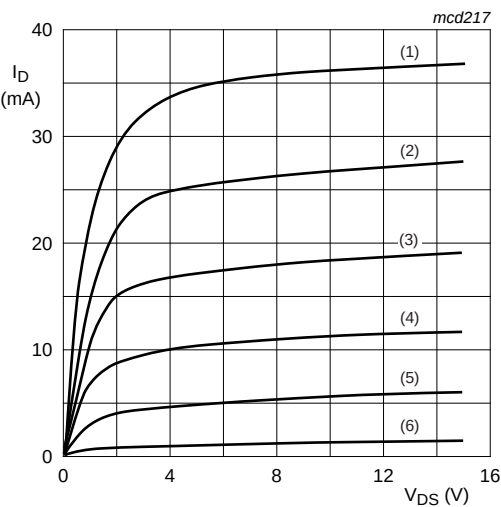
- (1)  $V_{GS} = 0\text{ V}$ .
- (2)  $V_{GS} = -0.25\text{ V}$ .
- (3)  $V_{GS} = -0.5\text{ V}$ .
- (4)  $V_{GS} = -0.75\text{ V}$ .
- (5)  $V_{GS} = -1\text{ V}$ .

**Fig 8. Typical output characteristics; PMBFJ309.**



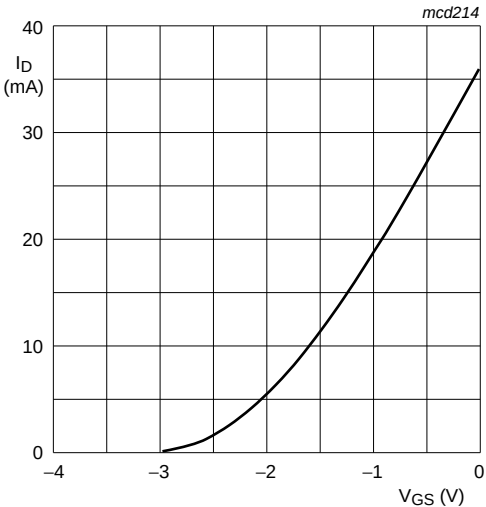
$V_{DS} = 10\text{ V}$ ;  $T_j = 25\text{ }^{\circ}\text{C}$ .

**Fig 9. Typical transfer characteristics; PMBFJ309.**



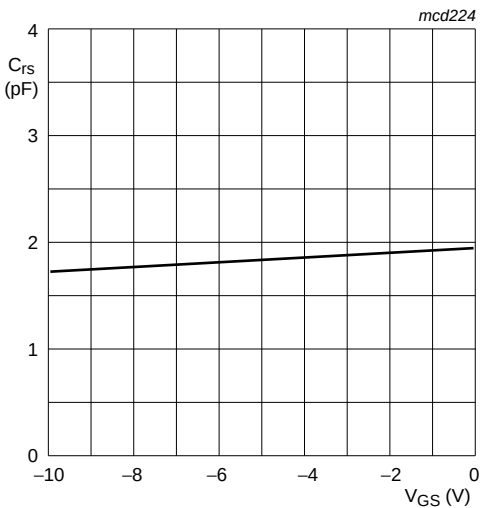
$T_j = 25\text{ }^{\circ}\text{C}.$   
(1)  $V_{GS} = 0\text{ V}.$   
(2)  $V_{GS} = -0.5\text{ V}.$   
(3)  $V_{GS} = -1\text{ V}.$   
(4)  $V_{GS} = -1.5\text{ V}.$   
(5)  $V_{GS} = -2\text{ V}.$   
(6)  $V_{GS} = -2.5\text{ V}.$

**Fig 10. Typical output characteristics; PMBFJ310.**



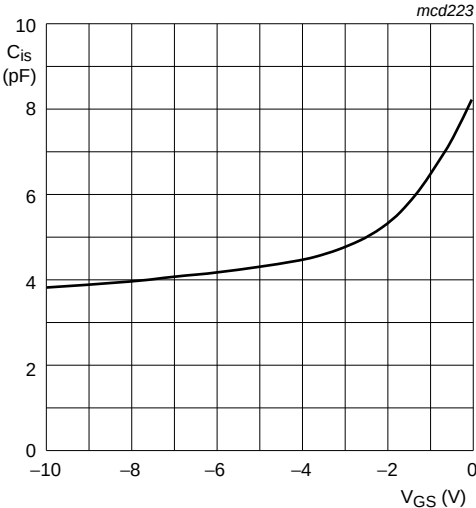
$V_{DS} = 10\text{ V}; T_j = 25\text{ }^{\circ}\text{C}.$

**Fig 11. Typical transfer characteristics; PMBFJ310.**



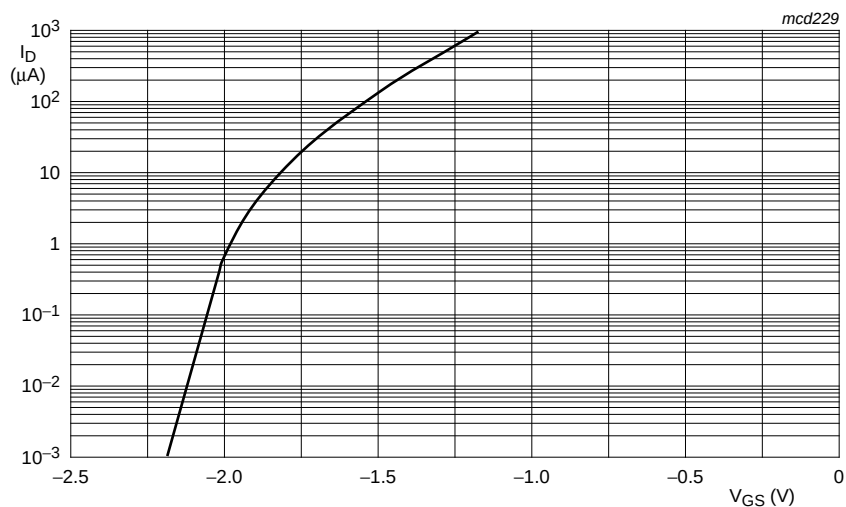
$V_{DS} = 10\text{ V}; T_j = 25\text{ }^{\circ}\text{C}.$

**Fig 12. Reverse transfer capacitance as a function of gate-source voltage; typical values.**



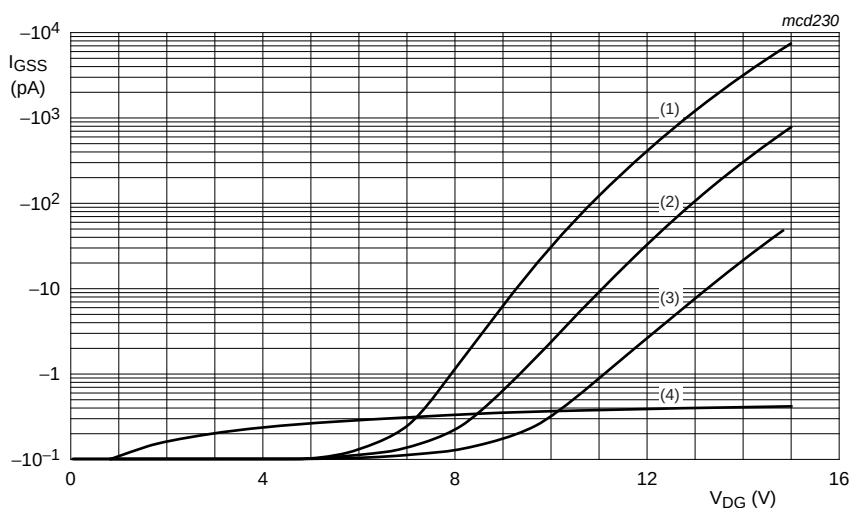
$V_{DS} = 10\text{ V}; T_j = 25\text{ }^{\circ}\text{C}.$

**Fig 13. Input capacitance as a function of gate-source voltage; typical values.**



$V_{DS} = 10 \text{ V}$ ;  $T_j = 25 \text{ }^{\circ}\text{C}$ .

**Fig 14. Drain current as a function of gate-source voltage; typical values.**



$T_j = 25 \text{ }^{\circ}\text{C}$ .

- (1)  $I_D = 10 \text{ mA}$ .
- (2)  $I_D = 1 \text{ mA}$ .
- (3)  $I_D = 100 \text{ } \mu\text{A}$ .
- (4)  $I_{GSS}$ .

**Fig 15. Gate current as a function of drain-gate voltage; typical values.**



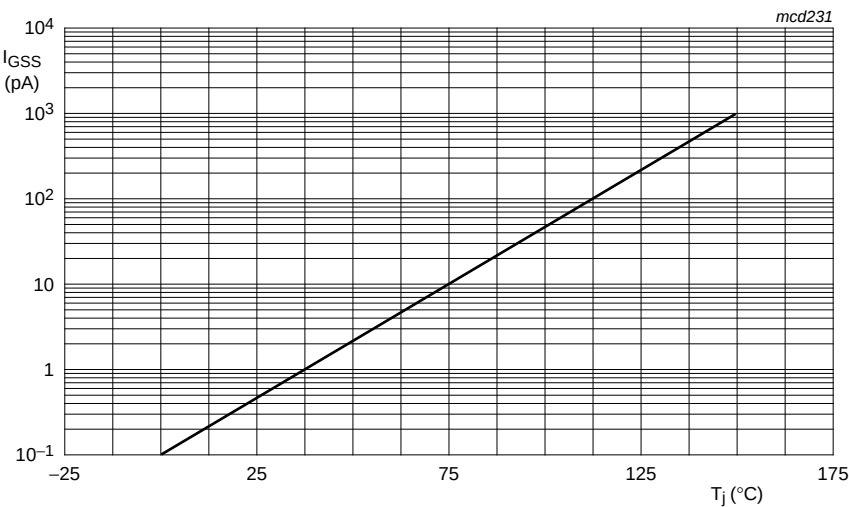
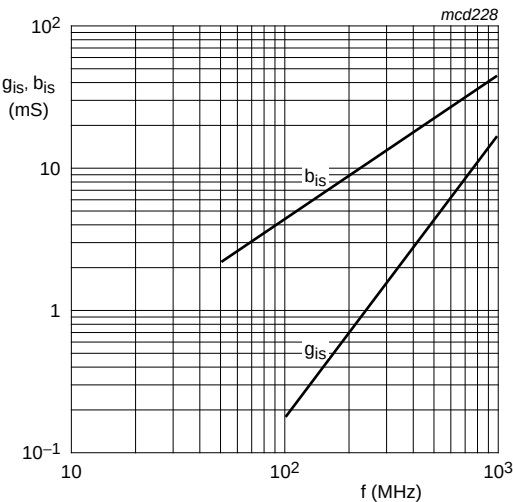
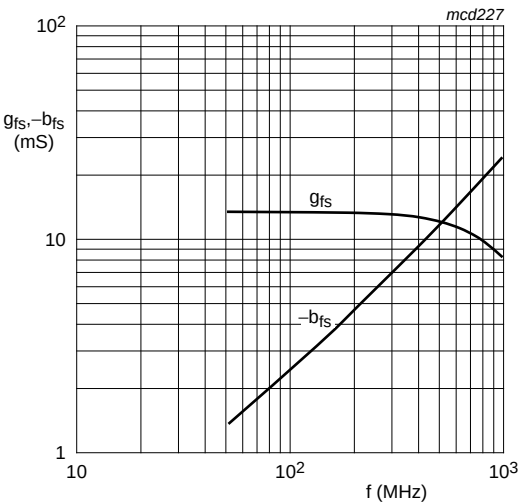


Fig 16. Gate current as a function of junction temperature; typical values.



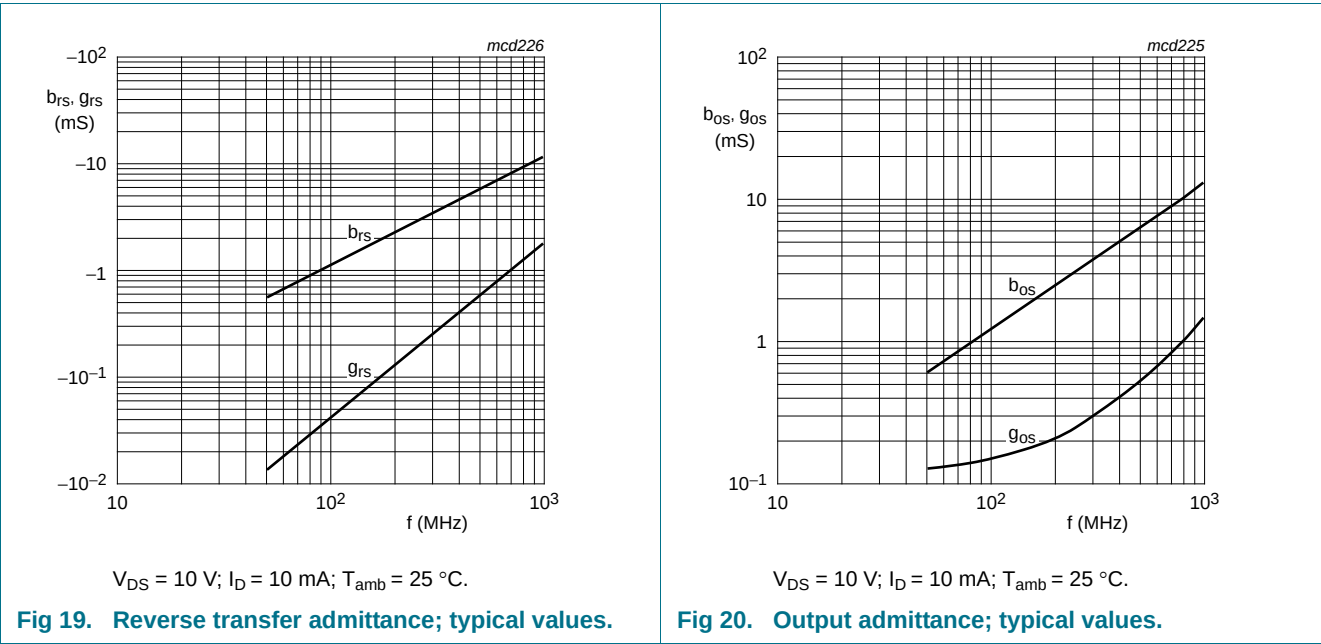
$V_{DS} = 10\text{ V}$ ;  $I_D = 10\text{ mA}$ ;  $T_{amb} = 25\text{ °C}$ .

Fig 17. Input admittance; typical values.



$V_{DS} = 10\text{ V}$ ;  $I_D = 10\text{ mA}$ ;  $T_{amb} = 25\text{ °C}$ .

Fig 18. Forward transfer admittance; typical values.



9. Package outline

Plastic surface-mounted package; 3 leads SOT23

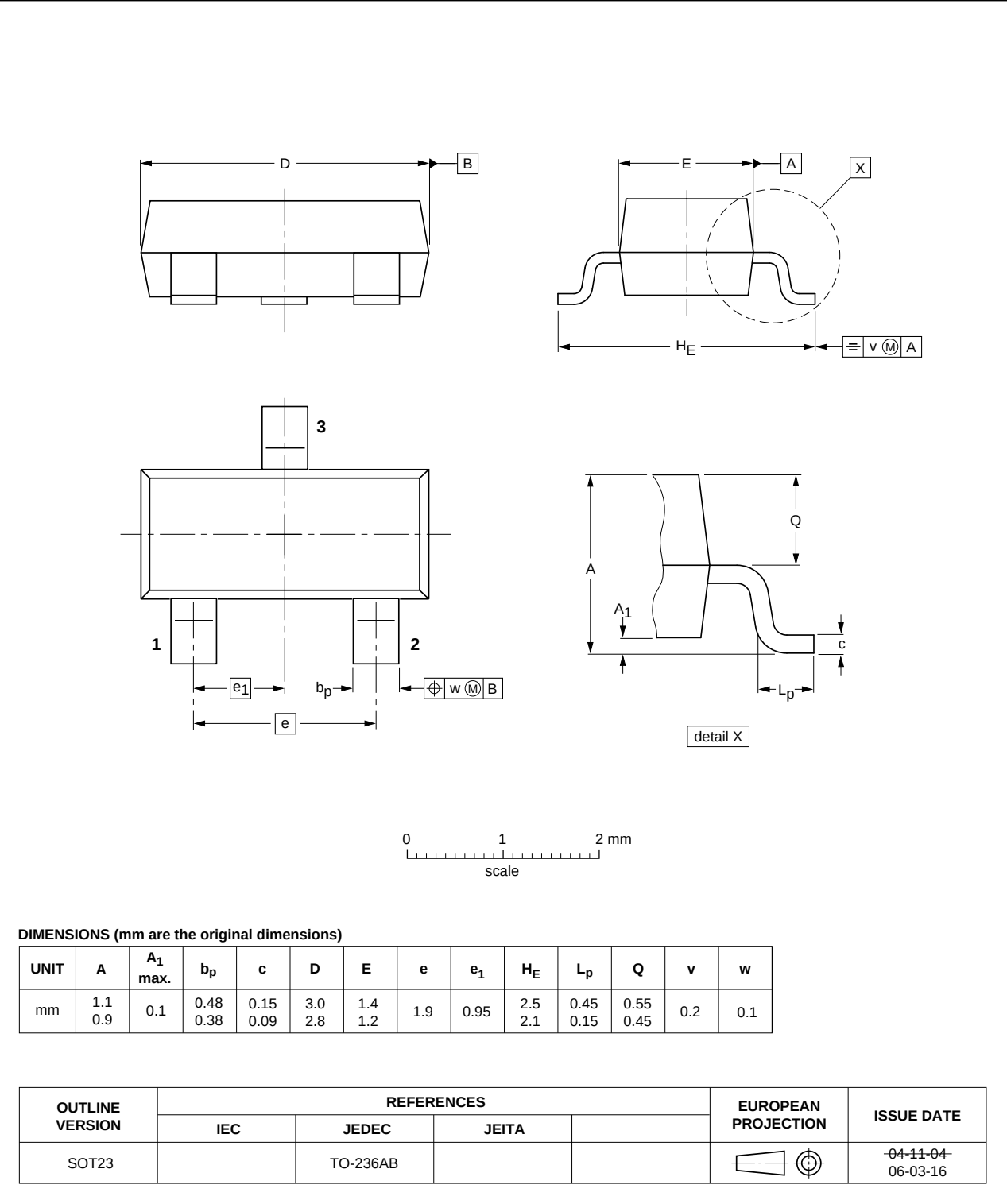


Fig 21. Package outline.

## 10. Revision history

**Table 9.** Revision history

| Document ID                              | Release date                                                                                                                                                                                                                                                                                                                         | Data sheet status     | Change notice | Supersedes           |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|----------------------|
| PMBFJ308_309_310 v.4                     | 20110920                                                                                                                                                                                                                                                                                                                             | Product data sheet    | -             | PMBFJ308_309_310 v.3 |
| Modifications:                           | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Package outline drawings have been updated to the latest version.</li></ul> |                       |               |                      |
| PMBFJ308_309_310 v.3<br>(9397 750 13403) | 20040723                                                                                                                                                                                                                                                                                                                             | Product data sheet    | -             | PMBFJ308_309_310 v.2 |
| PMBFJ308_309_310 v.2<br>(9397 750 01141) | 19960911                                                                                                                                                                                                                                                                                                                             | Product specification | -             | -                    |

## 11. Legal information

### 11.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the

product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

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## 12. Contact information

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