

# DATA SHEET

## **BFR30; BFR31** N-channel field-effect transistors

Product specification  
Supersedes data of April 1991  
File under Discrete Semiconductors, SC07

1997 Dec 05

N-channel field-effect transistors

BFR30; BFR31

DESCRIPTION

Planar epitaxial symmetrical junction N-channel field-effect transistor in a plastic SOT23 package.

APPLICATIONS

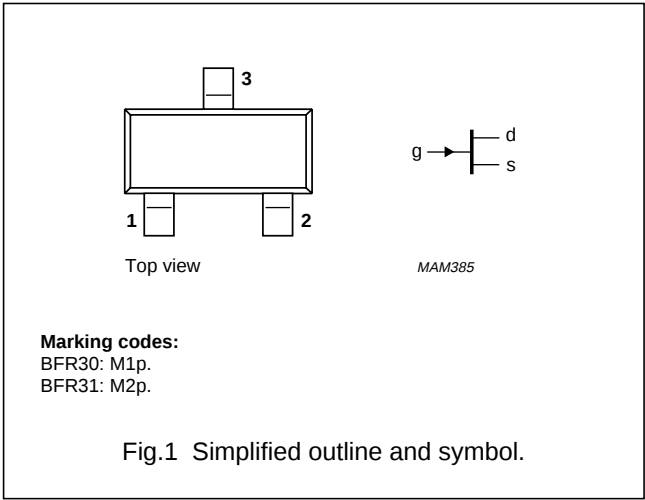
- Low level general purpose amplifiers in thick and thin-film circuits.

PINNING - SOT23

| PIN | SYMBOL | DESCRIPTION           |
|-----|--------|-----------------------|
| 1   | d      | drain <sup>(1)</sup>  |
| 2   | s      | source <sup>(1)</sup> |
| 3   | g      | gate                  |

Note

1. Drain and source are interchangeable.



CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

QUICK REFERENCE DATA

| SYMBOL     | PARAMETER                         | CONDITIONS                                                  | MIN. | MAX. | UNIT |
|------------|-----------------------------------|-------------------------------------------------------------|------|------|------|
| $V_{DS}$   | drain-source voltage              |                                                             | –    | ±25  | V    |
| $V_{GSO}$  | gate-source voltage               | open drain                                                  | –    | –25  | V    |
| $P_{tot}$  | total power dissipation           | $T_{amb} \leq 40\text{ }^{\circ}\text{C}$                   | –    | 250  | mW   |
| $I_{DSS}$  | drain current                     | $V_{GS} = 0; V_{DS} = 10\text{ V}$                          |      |      |      |
|            | BFR30                             |                                                             | 4    | 10   | mA   |
|            | BFR31                             |                                                             | 1    | 5    | mA   |
| $ y_{fs} $ | common-source transfer admittance | $I_D = 1\text{ mA}; V_{DS} = 10\text{ V}; f = 1\text{ kHz}$ |      |      |      |
|            | BFR30                             |                                                             | 1    | 4    | mS   |
|            | BFR31                             |                                                             | 1.5  | 4.5  | mS   |

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LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL           | PARAMETER                      | CONDITIONS                                  | MIN. | MAX. | UNIT |
|------------------|--------------------------------|---------------------------------------------|------|------|------|
| V <sub>DS</sub>  | drain-source voltage           |                                             | –    | ±25  | V    |
| V <sub>DGO</sub> | drain-gate voltage             | open source                                 | –    | –25  | V    |
| V <sub>GSO</sub> | gate-source voltage            | open drain                                  | –    | –25  | V    |
| I <sub>D</sub>   | drain current                  |                                             | –    | 10   | mA   |
| I <sub>G</sub>   | forward gate current (DC)      |                                             | –    | 5    | mA   |
| P <sub>tot</sub> | total power dissipation        | T <sub>amb</sub> ≤ 40 °C; note 1; see Fig.2 | –    | 250  | mW   |
| T <sub>stg</sub> | storage temperature            |                                             | –65  | +150 | °C   |
| T <sub>j</sub>   | operating junction temperature |                                             | –    | 150  | °C   |

Note

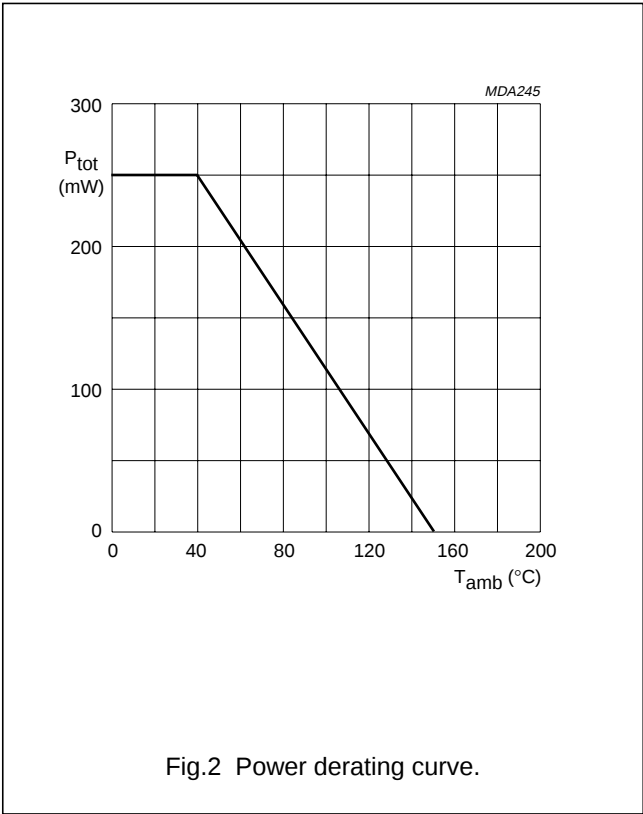
1. Mounted on a ceramic substrate of 8 × 10 × 0.7 mm.

THERMAL CHARACTERISTICS

| SYMBOL              | PARAMETER                                   | CONDITIONS | VALUE | UNIT |
|---------------------|---------------------------------------------|------------|-------|------|
| R <sub>th j-a</sub> | thermal resistance from junction to ambient | note 1     | 430   | K/W  |

Note

1. Mounted on a ceramic substrate of 8 × 10 × 0.7 mm.



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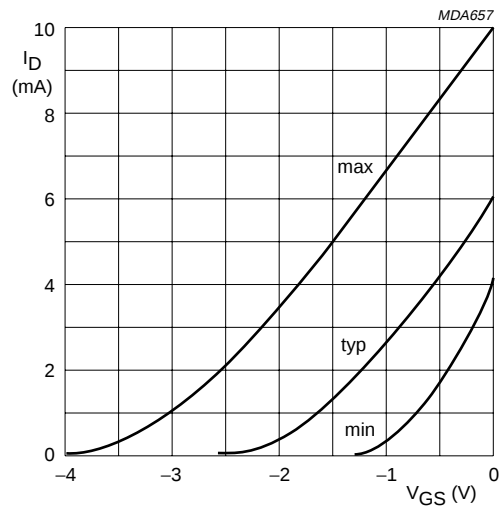
## CHARACTERISTICS

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

| SYMBOL      | PARAMETER                                           | CONDITIONS                                                                                                                                    | MIN.        | MAX.       | UNIT                           |
|-------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|--------------------------------|
| $I_{GSS}$   | gate cut-off current                                | $V_{DS} = 0$ ; $V_{GS} = -10\text{ V}$                                                                                                        | –           | –0.2       | nA                             |
| $I_{DSS}$   | drain current<br>BFR30<br>BFR31                     | $V_{GS} = 0$ ; $V_{DS} = 10\text{ V}$                                                                                                         | 4<br>1      | 10<br>5    | mA<br>mA                       |
| $V_{GS}$    | gate-source voltage<br>BFR30<br>BFR31               | $I_D = 1\text{ mA}$ ; $V_{DS} = 10\text{ V}$                                                                                                  | –0.7<br>0   | –3<br>–1.3 | V<br>V                         |
| $V_{GS}$    | gate-source voltage<br>BFR30<br>BFR31               | $I_D = 50\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$                                                                                        | –<br>–      | –4<br>–2   | V<br>V                         |
| $V_{GSoff}$ | gate-source cut-off voltage<br>BFR30<br>BFR31       | $I_D = 0.5\text{ nA}$ ; $V_{DS} = 10\text{ V}$                                                                                                | –<br>–      | –5<br>–2.5 | V<br>V                         |
| $ y_{fs} $  | common-source transfer admittance<br>BFR30<br>BFR31 | $I_D = 1\text{ mA}$ ; $V_{DS} = 10\text{ V}$ ; $f = 1\text{ kHz}$ ;<br>$T_{amb} = 25\text{ }^{\circ}\text{C}$                                 | 1<br>1.5    | 4<br>4.5   | mS<br>mS                       |
| $ y_{fs} $  | common-source transfer admittance<br>BFR30<br>BFR31 | $I_D = 200\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$ ; $f = 1\text{ kHz}$ ;<br>$T_{amb} = 25\text{ }^{\circ}\text{C}$                      | 0.5<br>0.75 | –<br>–     | mS<br>mS                       |
| $ y_{os} $  | common source output admittance<br>BFR30<br>BFR31   | $I_D = 1\text{ mA}$ ; $V_{DS} = 10\text{ V}$ ; $f = 1\text{ kHz}$                                                                             | –<br>–      | 40<br>25   | $\mu\text{S}$<br>$\mu\text{S}$ |
| $ y_{os} $  | common source output admittance<br>BFR30<br>BFR31   | $I_D = 200\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$ ; $f = 1\text{ kHz}$                                                                  | –<br>–      | 20<br>15   | $\mu\text{S}$<br>$\mu\text{S}$ |
| $C_{is}$    | input capacitance                                   | $V_{DS} = 10\text{ V}$ ; $f = 1\text{ MHz}$<br>$I_D = 1\text{ mA}$<br>$I_D = 0.2\text{ nA}$                                                   | –<br>–      | 4<br>4     | pF<br>pF                       |
| $C_{rs}$    | feedback capacitance                                | $V_{DS} = 10\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$<br>$I_D = 1\text{ mA}$<br>$I_D = 200\text{ }\mu\text{A}$ | –<br>–      | 1.5<br>1.5 | pF<br>pF                       |
| $V_n$       | equivalent input noise voltage                      | $I_D = 200\text{ }\mu\text{A}$ ; $V_{DS} = 10\text{ V}$ ;<br>$B = 0.6\text{ to }100\text{ Hz}$                                                | –           | 0.5        | $\mu\text{V}$                  |

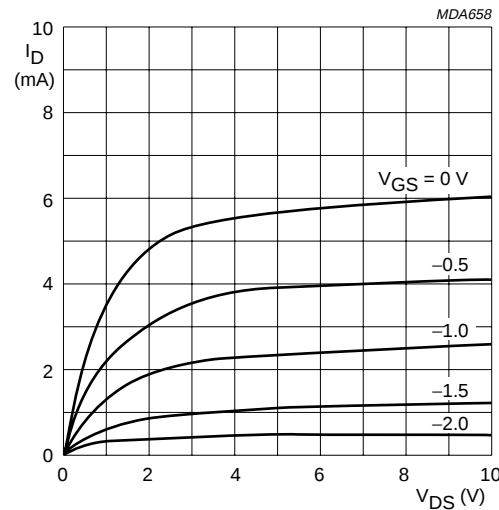
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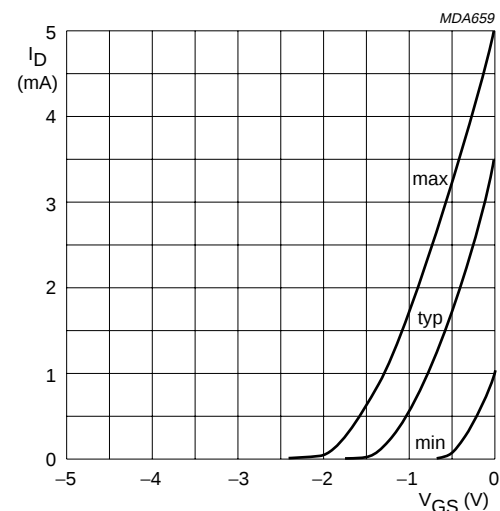
**BFR30.**  
 $V_{DS} = 10\text{ V}; T_j = 25\text{ }^{\circ}\text{C}.$

Fig.3 Input characteristics.



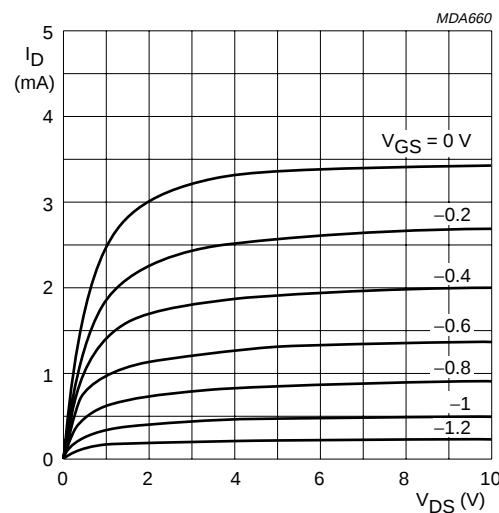
**BFR30.**  
 $T_j = 25\text{ }^{\circ}\text{C}.$

Fig.4 Output characteristics; typical values.



**BFR31.**  
 $V_{DS} = 10\text{ V}; T_j = 25\text{ }^{\circ}\text{C}.$

Fig.5 Input characteristics.

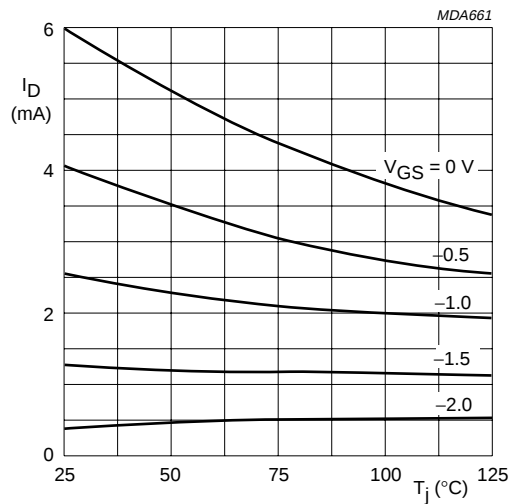


**BFR31.**  
 $T_j = 25\text{ }^{\circ}\text{C}.$

Fig.6 Output characteristics; typical values.

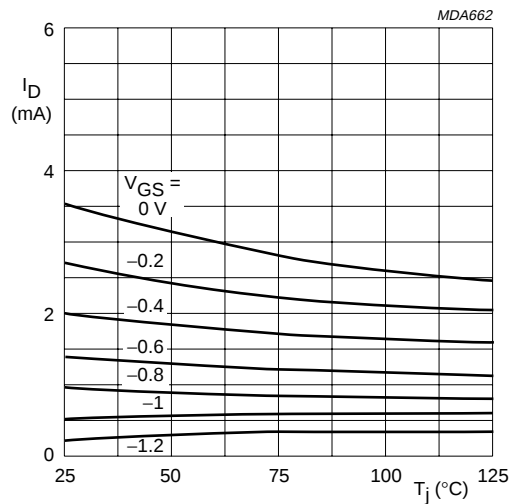
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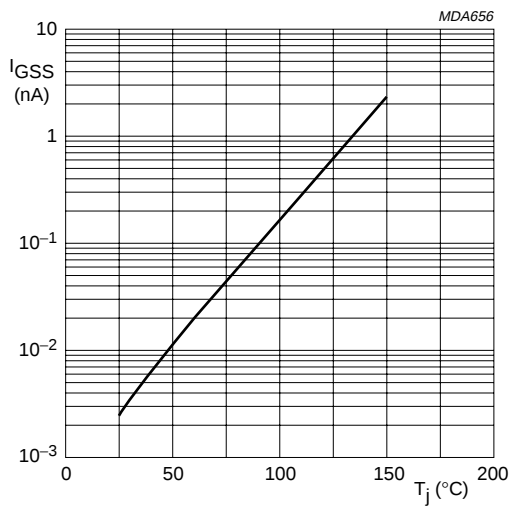
**BFR30.**  
 $V_{DS} = 10\text{ V}.$

Fig.7 Drain current as a function of junction temperature; typical values.



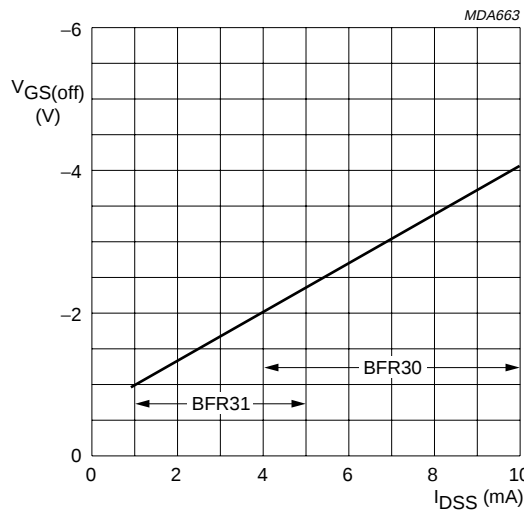
**BFR31.**  
 $V_{DS} = 10\text{ V}.$

Fig.8 Drain current as a function of junction temperature; typical values.



$V_{GS} = -10\text{ V}; V_{DS} = 0.$

Fig.9 Gate cut-off current as a function of junction temperature; typical values.

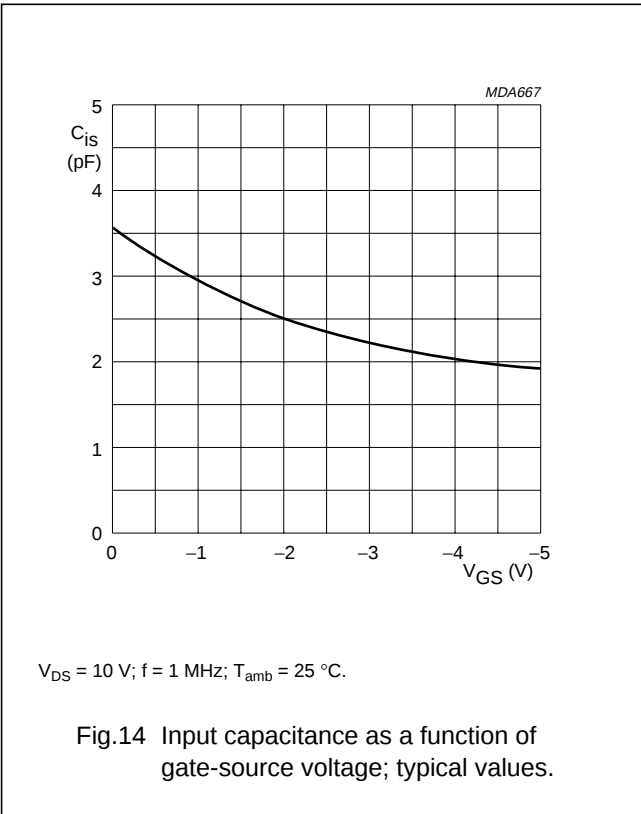
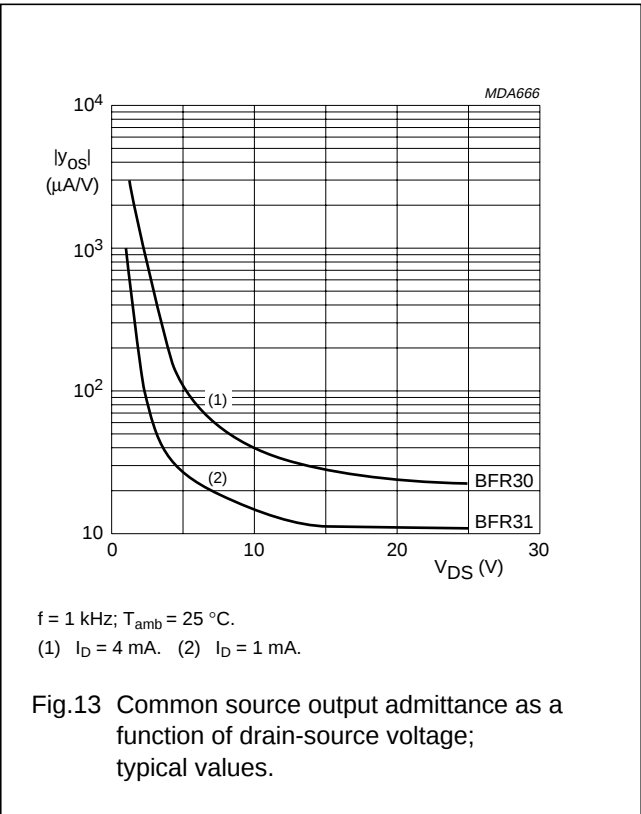
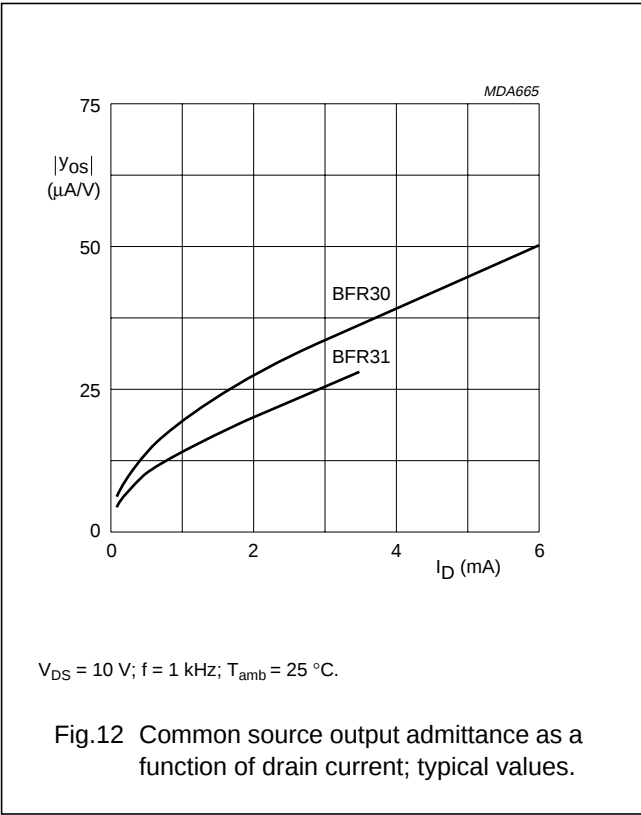
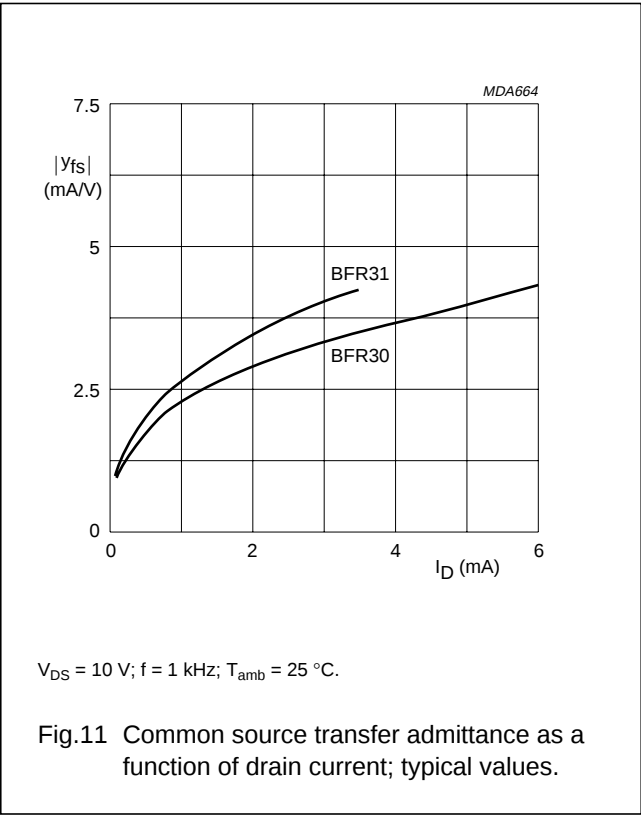


$I_D = 0.5\text{ nA}; V_{DS} = 10\text{ V}; V_{GS} = 0; T_j = 25\text{ }^{\circ}\text{C}.$

Fig.10 Gate-source cut-off voltage as a function of drain current; typical values.

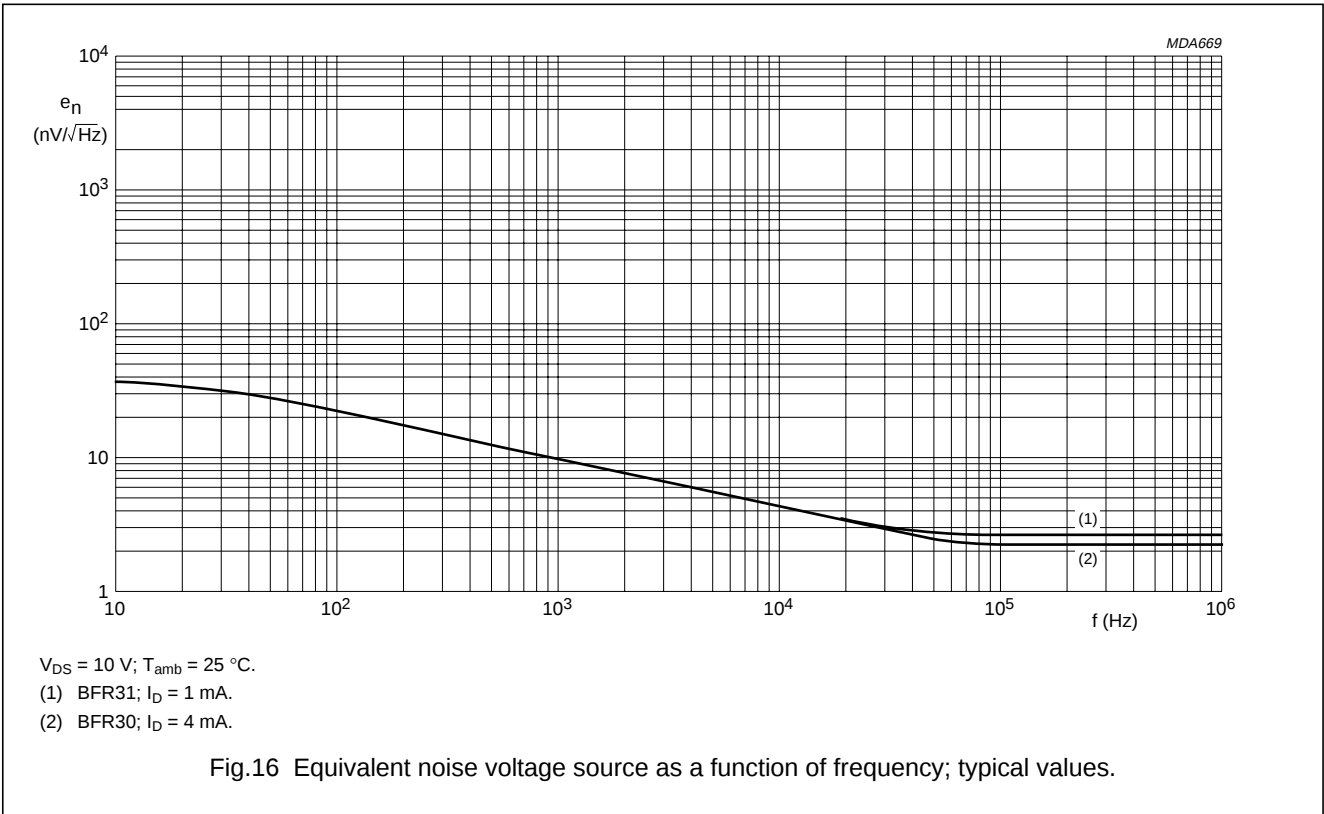
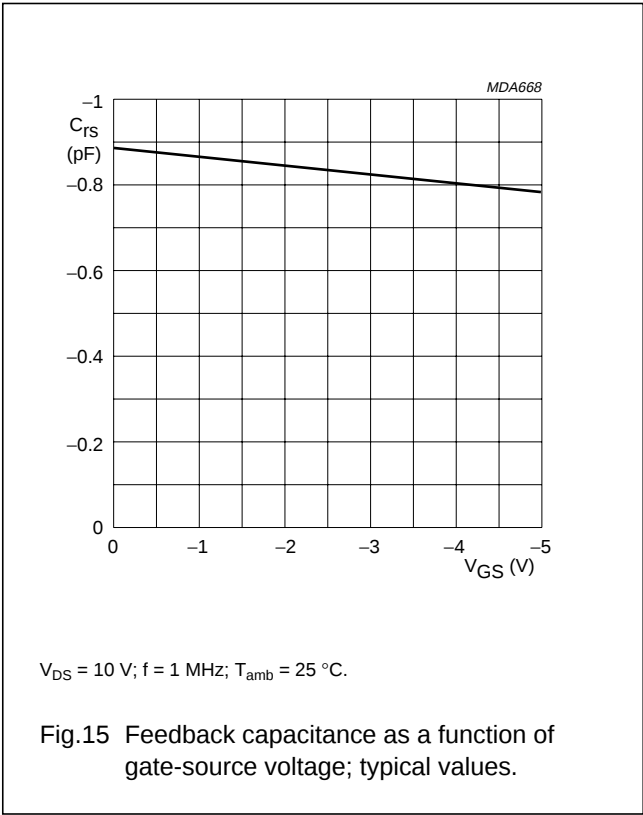
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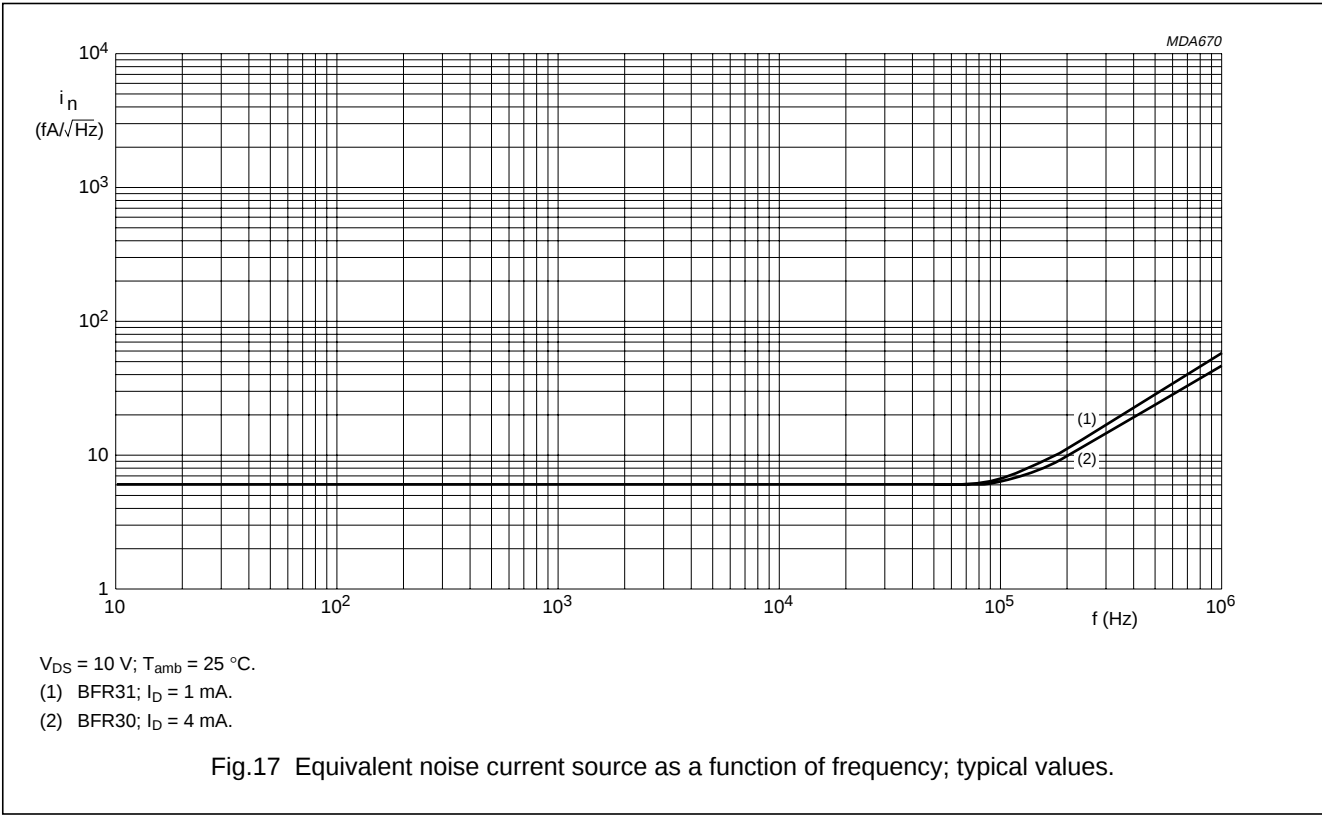
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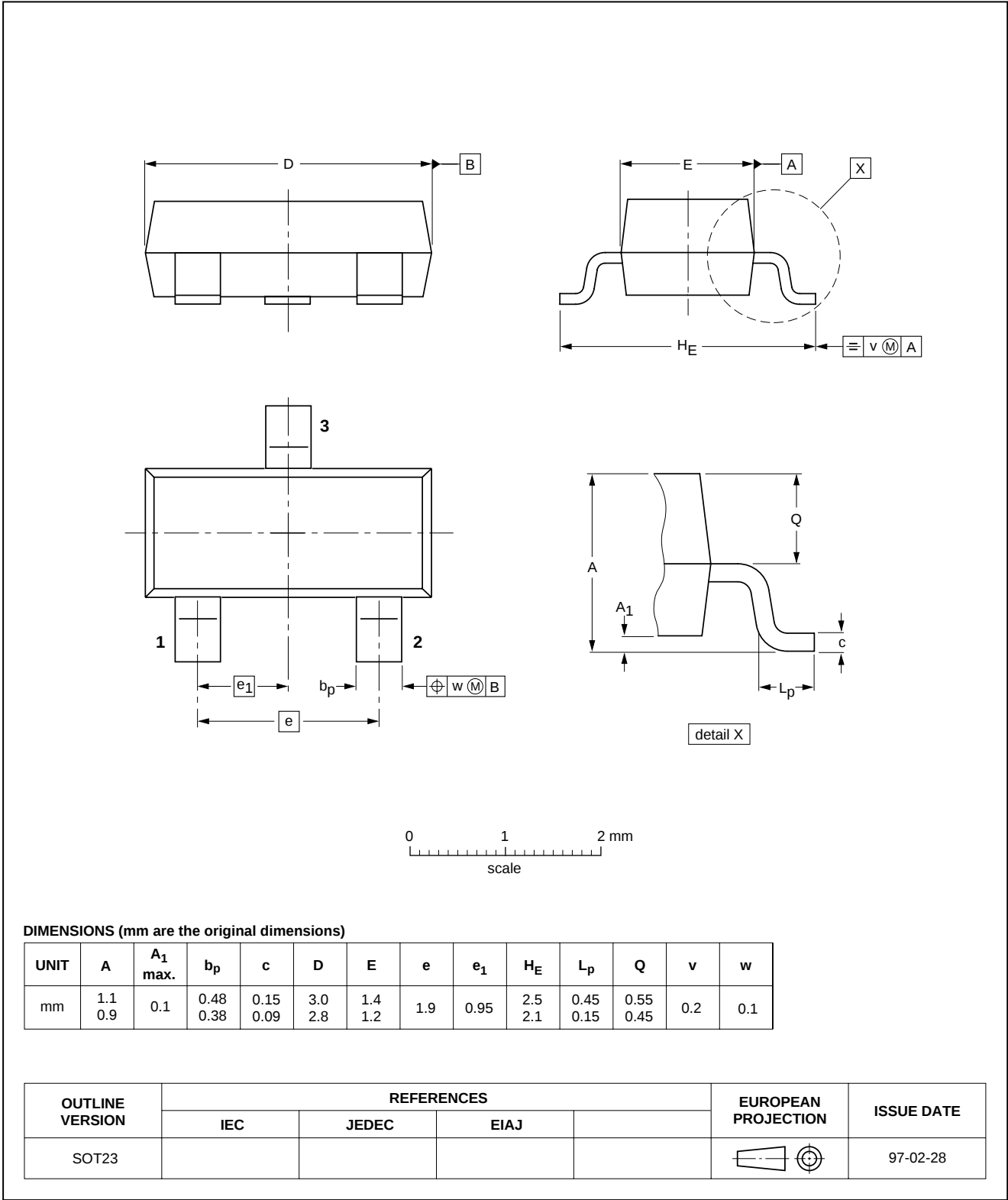
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



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**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 given are 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 the 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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