# DATA SHEET

# BF545A; BF545B; BF545C
## N-channel silicon junction field-effect transistors

Product specification
1996 Jul 29
Supersedes data of April 1995
File under Discrete Semiconductors, SC07

Philips Semiconductors

PHILIPS

# N-channel silicon junction field-effect transistors

# BF545A; BF545B; BF545C

## FEATURES

- Low leakage level (typ. 500 fA)
- High gain
- Low cut-off voltage (max. 2.2 V for BF545A).

## APPLICATIONS

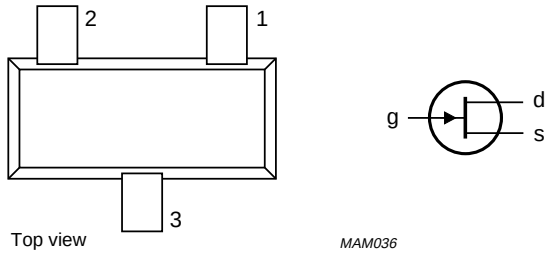
- Impedance converters in e.g. electret microphones and infra-red detectors
- VHF amplifiers in oscillators and mixers.

## DESCRIPTION

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

## PINNING - SOT23

| PIN | SYMBOL | DESCRIPTION |
|---|---|---|
| 1 | s | source |
| 2 | d | drain |
| 3 | g | gate |




**Marking codes:**
BF545A: M65.
BF545B: M66.
BF545C: M67.

Fig.1 Simplified outline and symbol.

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | | – | ±30 | V |
| $V_{GSoff}$ | gate-source cut-off voltage | $I_D$ = 1 μA; $V_{DS}$ = 15 V | –0.4 | –7.8 | V |
| $I_{DSS}$ | drain current | $V_{GS}$ = 0; $V_{DS}$ = 15 V | | | |
| | BF545A | | 2 | 6.5 | mA |
| | BF545B | | 6 | 15 | mA |
| | BF545C | | 12 | 25 | mA |
| $P_{tot}$ | total power dissipation | up to $T_{amb}$ = 25 °C | – | 250 | mW |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $V_{GS}$ = 0; $V_{DS}$ = 15 V | 3 | 6.5 | mS |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | | – | ±30 | V |
| $V_{GSO}$ | gate-source voltage | open drain | – | –30 | V |
| $V_{GDO}$ | gate-drain voltage (DC) | open source | – | –30 | V |
| $I_G$ | forward gate current (DC) | | – | 10 | mA |
| $P_{tot}$ | total power dissipation | up to $T_{amb}$ = 25 °C; note 1 | – | 250 | mW |
| $T_{stg}$ | storage temperature | | –65 | 150 | °C |
| $T_j$ | operating junction temperature | | – | 150 | °C |

**Note**

1. Device mounted on an FR4 printed-circuit board, maximum lead length 4 mm; mounting pad for the drain lead 10 mm$^2$.

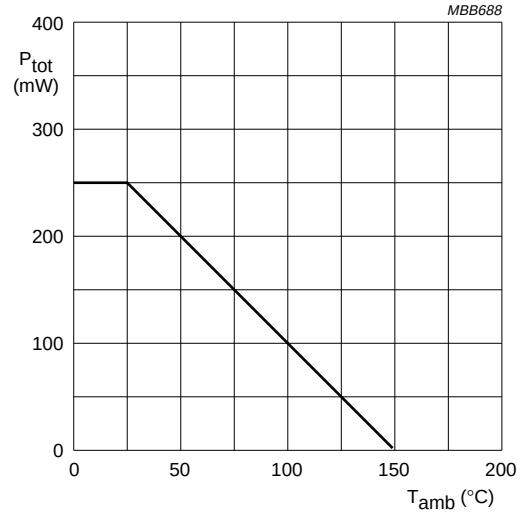



Fig.2 Power derating curve.

## THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | VALUE | UNIT |
|---|---|---|---|
| $R_{th\ j\text{-}a}$ | thermal resistance from junction to ambient; note 1 | 500 | K/W |

**Note**

1. Device mounted on an FR4 printed-circuit board, maximum lead length 4 mm; mounting pad for the drain lead 10 $mm^2$.

## STATIC CHARACTERISTICS

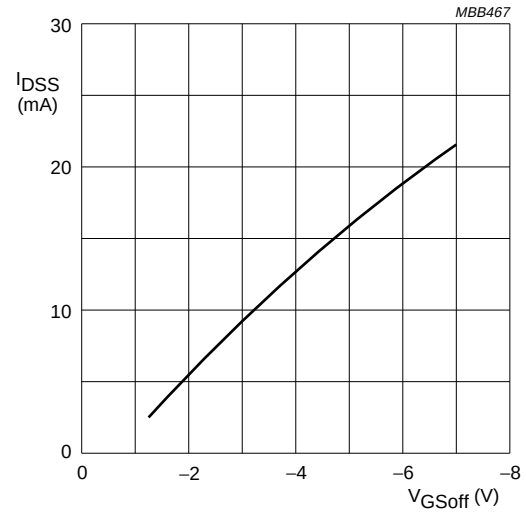
$T_j$ = 25 °C; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V_{(BR)GSS}$ | gate-source breakdown voltage | $I_G$ = –1 μA; $V_{DS}$ = 0 | –30 | – | – | V |
| $V_{GSoff}$ | gate-source cut-off voltage | $I_D$ = 200 μA; $V_{DS}$ = 15 V | | | | |
| | BF545A | | –0.4 | – | –2.2 | V |
| | BF545B | | –1.6 | – | –3.8 | V |
| | BF545C | | –3.2 | – | –7.8 | V |
| | | $I_D$ = 1 μA; $V_{DS}$ = 15 V | –0.4 | – | –7.5 | V |
| $I_{DSS}$ | drain current | $V_{GS}$ = 0; $V_{DS}$ = 15 V | | | | |
| | BF545A | | 2 | – | 6.5 | mA |
| | BF545B | | 6 | – | 15 | mA |
| | BF545C | | 12 | – | 25 | mA |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = –20 V; $V_{DS}$ = 0 | – | –0.5 | –1000 | pA |
| | | $V_{GS}$ = –20 V; $V_{DS}$ = 0; $T_j$ = 125 °C | – | – | –100 | nA |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $V_{GS}$ = 0; $V_{DS}$ = 15 V | 3 | – | 6.5 | mS |
| $\lvert y_{os} \rvert$ | common source output admittance | $V_{GS}$ = 0; $V_{DS}$ = 15 V | – | 40 | – | μS |

## DYNAMIC CHARACTERISTICS

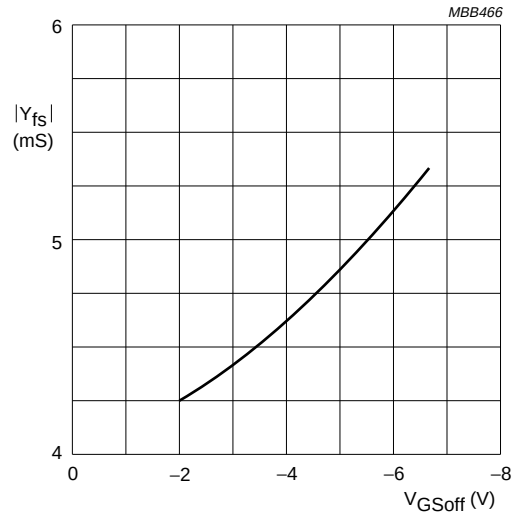
$T_{amb}$ = 25 °C; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | TYP. | UNIT |
|---|---|---|---|---|
| $C_{is}$ | input capacitance | $V_{DS}$ = 15 V; $V_{GS}$ = –10 V; f = 1 MHz | 1.7 | pF |
| | | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 1 MHz | 3 | pF |
| $C_{rs}$ | reverse transfer capacitance | $V_{DS}$ = 15 V; $V_{GS}$ = –10 V; f = 1 MHz | 0.8 | pF |
| | | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 1 MHz | 0.9 | pF |
| $g_{is}$ | common source input conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 100 MHz | 15 | µS |
| | | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 450 MHz | 300 | µS |
| $g_{fs}$ | common source transfer conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 100 MHz | 2 | mS |
| | | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 450 MHz | 1.8 | mS |
| $g_{rs}$ | common source reverse conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 100 MHz | –6 | µS |
| | | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 450 MHz | –40 | µS |
| $g_{os}$ | common source output conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 100 MHz | 30 | µS |
| | | $V_{DS}$ = 10 V; $I_D$ = 1 mA; f = 450 MHz | 60 | µS |



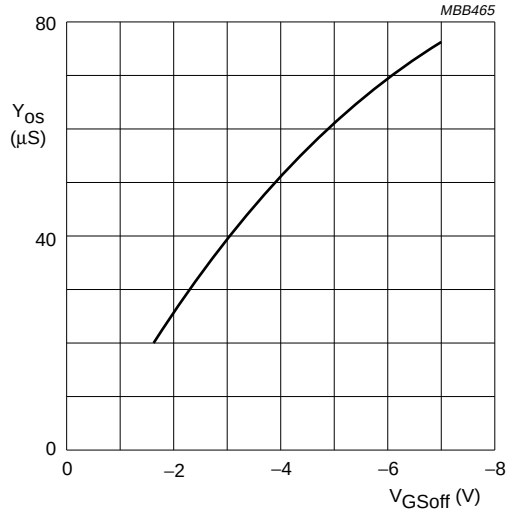

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.3 Drain current as a function of gate-source cut-off voltage; typical values.



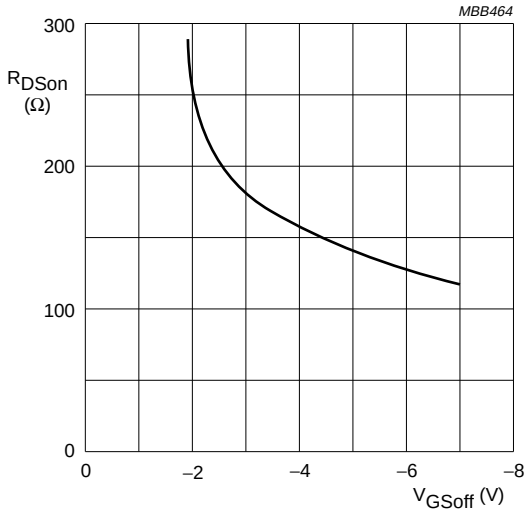

$V_{DS}$ = 15 V; $V_{GS}$ = 0; $T_j$ = 25 °C.

Fig.4 Forward transfer admittance as a function of gate-source cut-off voltage; typical values.



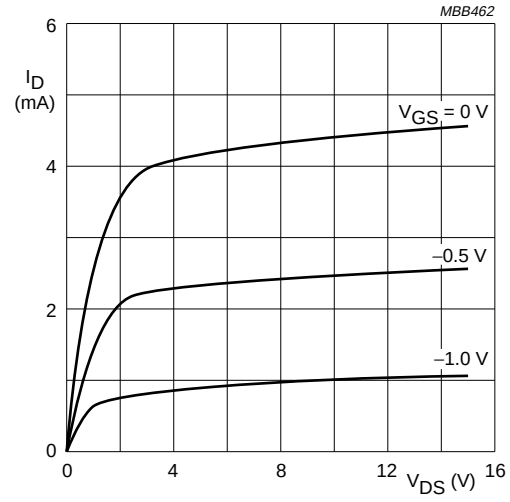

$V_{DS}$ = 15 V; $V_{GS}$ = 0; $T_j$ = 25 °C.

Fig.5 Common-source output admittance as a function of gate-source cut-off voltage; typical values.



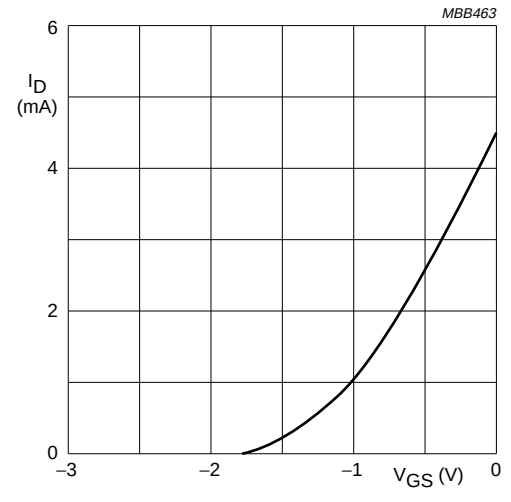

$V_{DS}$ = 100 mV; $V_{GS}$ = 0; $T_j$ = 25 °C.

Fig.6 Drain-source on-resistance as a function of gate-source cut-off voltage; typical values.



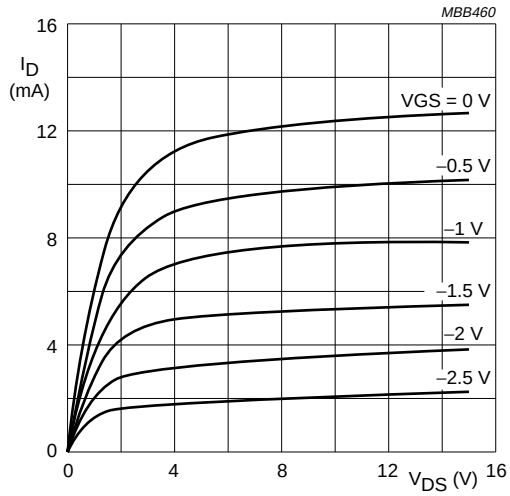

$T_j$ = 25 °C.

Fig.7 Typical output characteristics; BF545A.



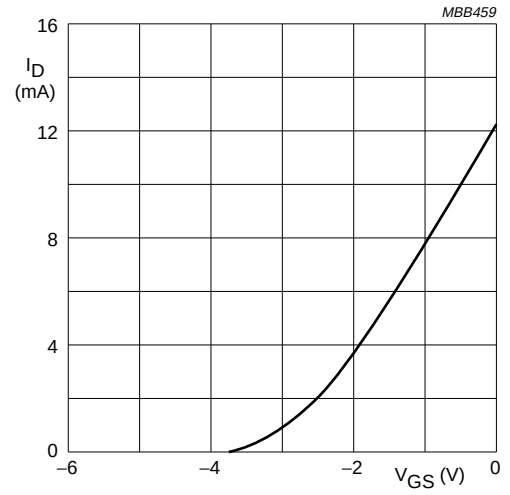

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.8 Typical input characteristics; BF545A.



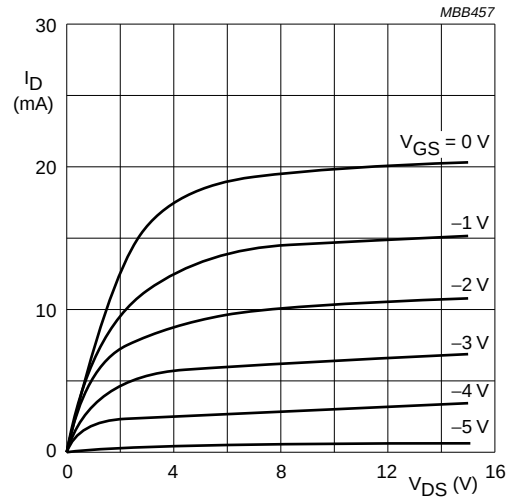

$T_j$ = 25 °C.

Fig.9 Typical output characteristics; BF545B.



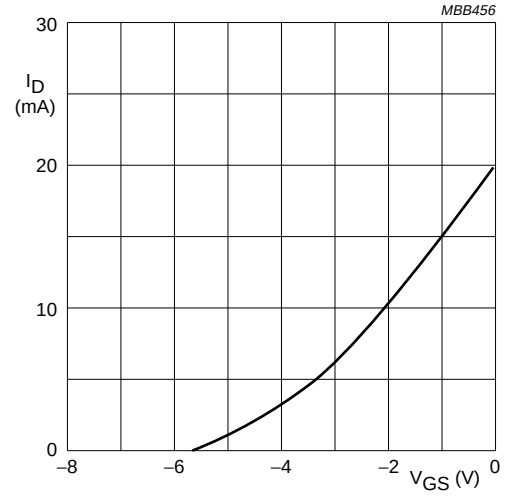

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.10 Typical input characteristics; BF545B.



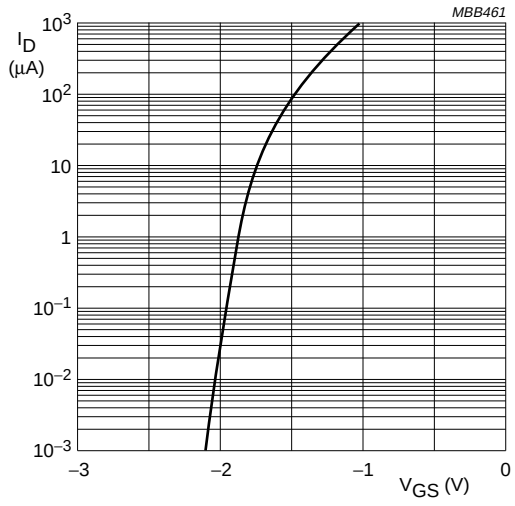

$T_j$ = 25 °C.

Fig.11 Typical output characteristics; BF545C.



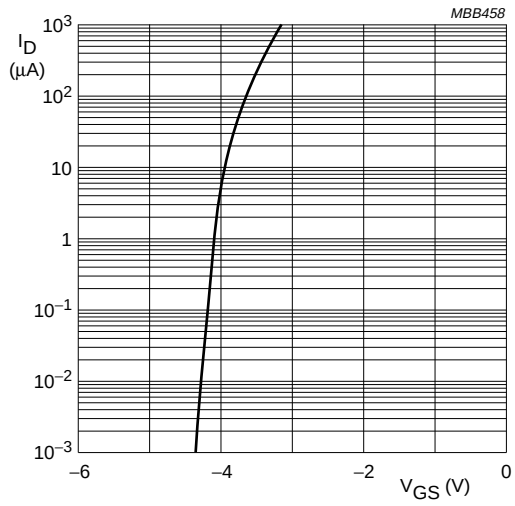

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.12 Typical input characteristics; BF545C.



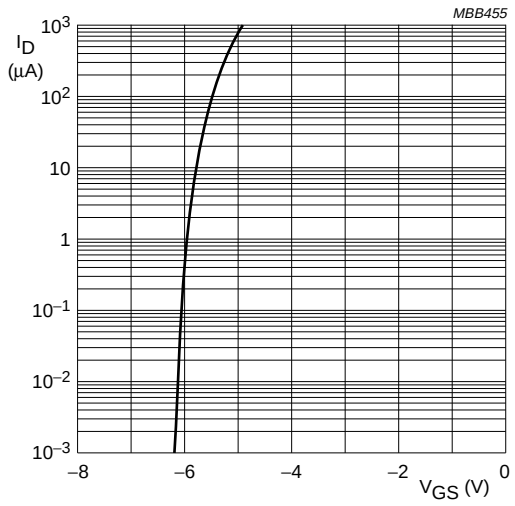

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.13 Drain current as a function of gate-source voltage; typical values for BF545A.



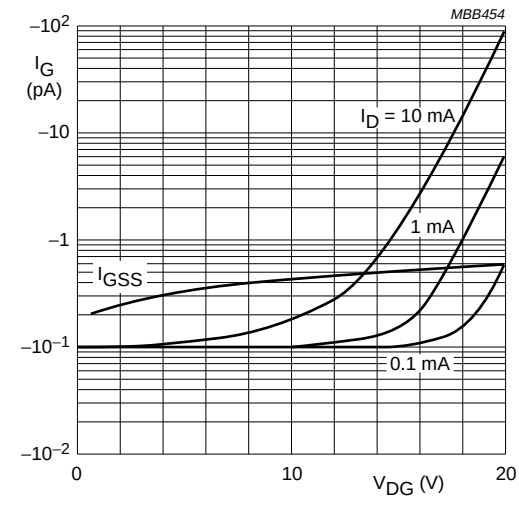

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.14 Drain current as a function of gate-source voltage; typical values for BF545B.



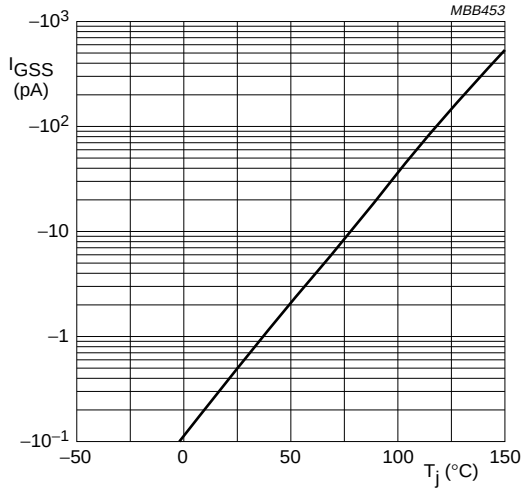

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.15 Drain current as a function of gate-source voltage; typical values for BF545C.



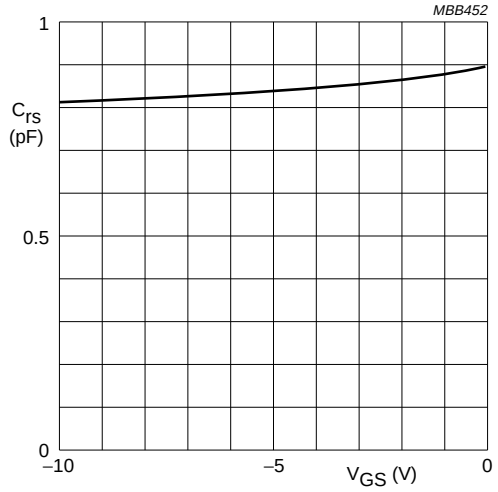

$I_D$ = 10 mA only for BF545B and BF545C; $T_j$ = 25 °C.

Fig.16 Gate current as a function of drain-gate voltage; typical values.



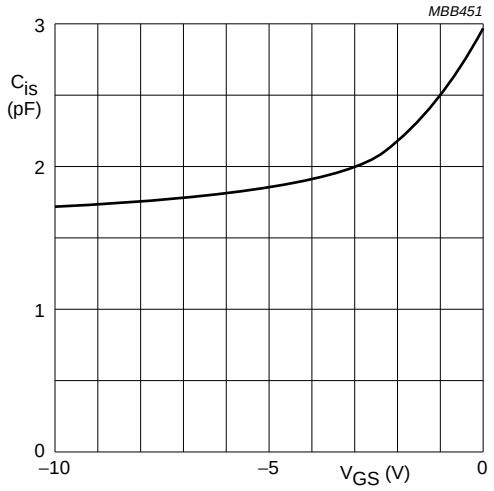

$V_{DS}$ = 0; $V_{GS}$ = −20 V.

Fig.17 Gate current as a function of junction temperature; typical values.



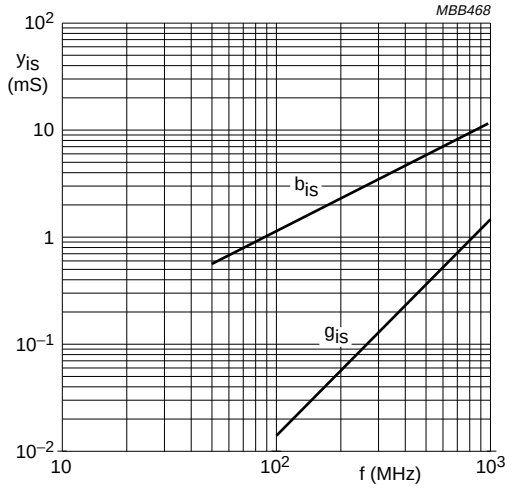

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.18 Reverse transfer capacitance as a function of gate-source voltage; typical values.



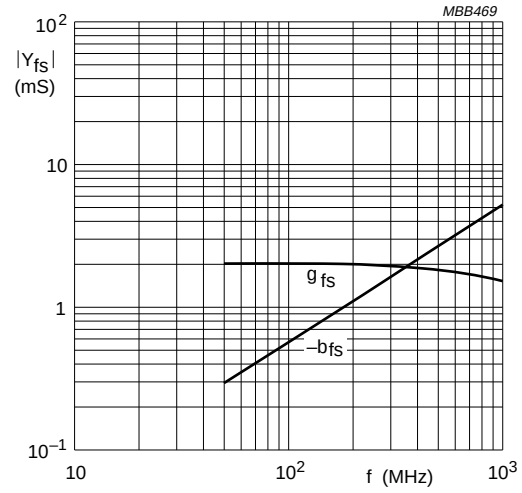

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.19 Typical input capacitance.



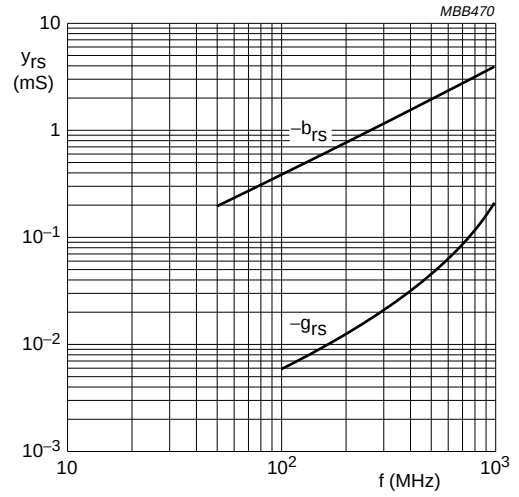

$V_{DS}$ = 10 V; $I_D$ = 1 mA; $T_{amb}$ = 25 °C.

Fig.20 Common-source input admittance; typical values.



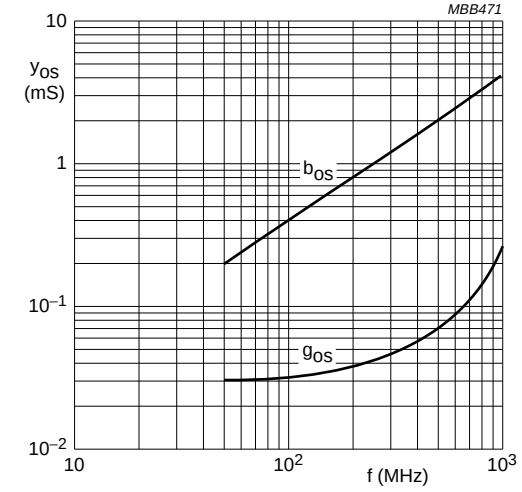

$V_{DS}$ = 10 V; $I_D$ = 1 mA; $T_{amb}$ = 25 °C.

Fig.21 Common-source forward transfer admittance; typical values.




$V_{DS}$ = 10 V; $I_D$ = 1 mA; $T_{amb}$ = 25 °C.

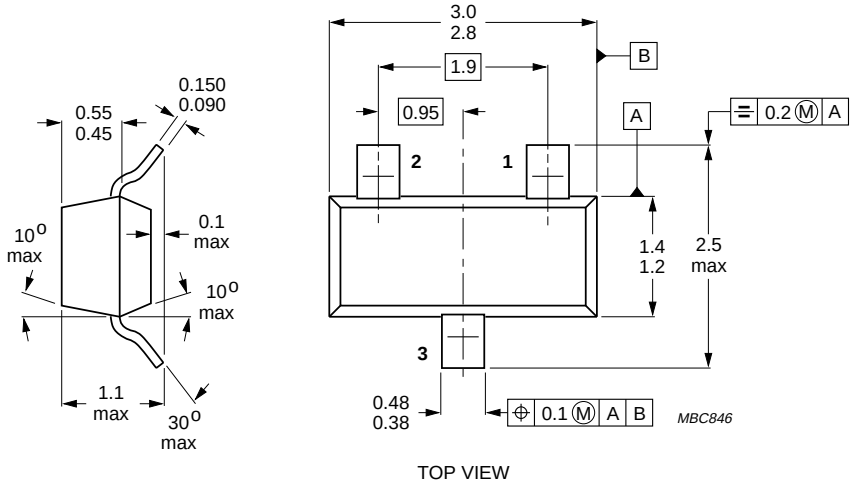
Fig.22 Common-source reverse transfer admittance; typical values.




$V_{DS}$ = 10 V; $I_D$ = 1 mA; $T_{amb}$ = 25 °C.

Fig.23 Common-source output admittance; typical values.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.24 SOT23.

## DEFINITIONS

| | |
|---|---|
| **Data Sheet Status** | |
| 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. |
| **Limiting values** | |
| 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. | |
| **Application information** | |
| Where application information is given, it is advisory and does not form part of the specification. | |

## LIFE SUPPORT APPLICATIONS

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