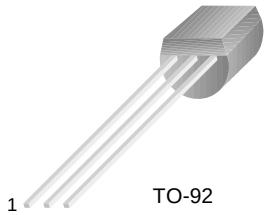
FAIRCHILD
SEMICONDUCTOR®

# BF245A/BF245B/BF245C

## N-Channel Amplifiers

- This device is designed for VHF/UHF amplifiers.
- Sourced from process 50.




TO-92

1. Gate 2. Source 3. Drain

## Absolute Maximum Ratings $T_a$=25°C unless otherwise noted

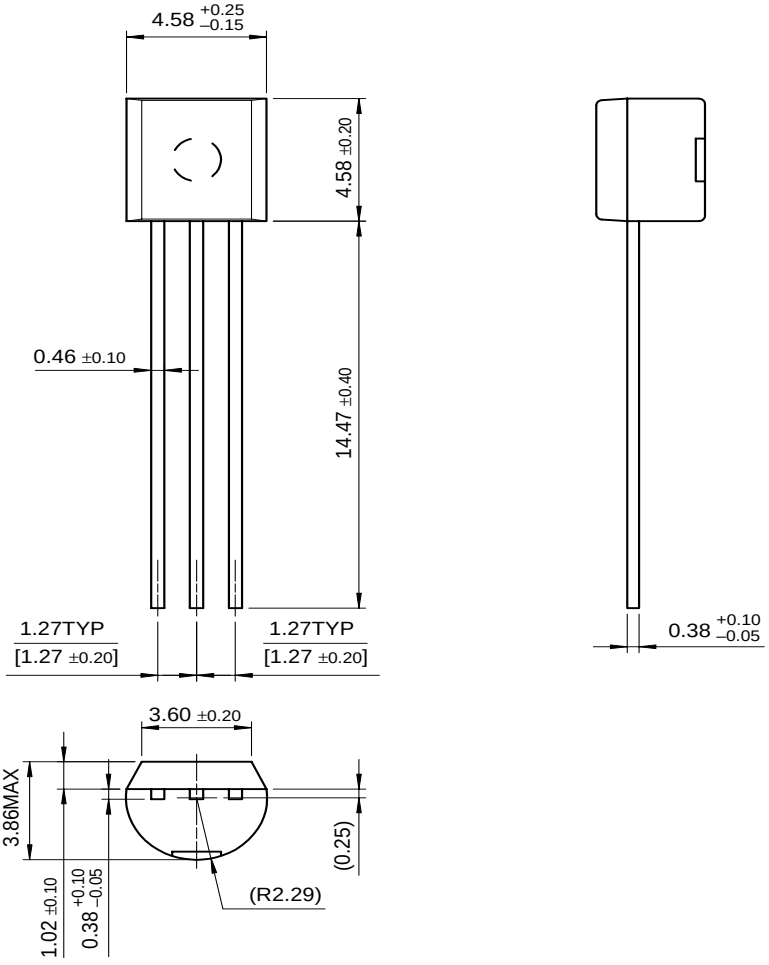
| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{DG}$ | Drain-Gate Voltage | 30 | V |
| $V_{GS}$ | Gate-Source Voltage | -30 | V |
| $I_{GF}$ | Forward Gate Current | 10 | mA |
| $P_D$ | Total Device Dissipation @$T_A$=25°C<br>Derate above 25°C | 350<br>2.8 | mW<br>mW/°C |
| $T_{J,}$ $T_{STG}$ | Operating and Storage Junction Temperature Range | - 55 ~ 150 | °C |

## Electrical Characteristics $T_a$=25°C unless otherwise noted

| Symbol | Parameter | | Test Condition | Min. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $V_{(BR)GSS}$ | Gate-Source Breakdown Voltage | | $V_{DS}$ = 0, $I_G$ = 1μA | -30 | | V |
| $V_{GS}$ | Gate-Source | BF245A | $V_{DS}$ = 15V, $I_D$ = 200μA | -0.4 | -2.2 | V |
| | | BF245B | | -1.6 | -3.8 | |
| | | BF245C | | -3.2 | -7.5 | |
| $V_{GS}$(off) | Gate-Source Cut-off Voltage | | $V_{DS}$ = 15V, $I_D$ = 10nA | -0.5 | -8 | V |
| $I_{GSS}$ | Gate Reverse Current | | $V_{GS}$ = -20V, $V_{GS}$ = 0 | | -5 | nA |
| **On Characteristics** | | | | | | |
| $I_{DSS}$ | Zero-Gate Voltage Drain Current | | | | | |
| | | BF245A | $V_{GS}$ = 15V, $V_{GS}$ = 0 | 2 | 6.5 | mA |
| | | BF245B | | 6 | 15 | |
| | | BF245C | | 12 | 25 | |
| **On Characteristics** | | | | | | |
| $g_{fs}$ | Common Source Forward Transconductance | | $V_{GS}$ = 15V, $V_{GS}$ = 0, f = 1KHz | 3 | 6.5 | mmhos |

## Package Dimensions

TO-92




Dimensions in Millimeters

## TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | | |
|---|---|---|---|---|
| ACEx™ | FACT™ | ImpliedDisconnect™ | PACMAN™ | SPM™ |
| ActiveArray™ | FACT Quiet series™ | ISOPLANAR™ | POP™ | Stealth™ |
| Bottomless™ | FAST® | LittleFET™ | Power247™ | SuperSOT™-3 |
| CoolFET™ | FASTr™ | MicroFET™ | PowerTrench® | SuperSOT™-6 |
| *CROSSVOLT*™ | FRFET™ | MicroPak™ | QFET™ | SuperSOT™-8 |
| DOME™ | GlobalOptoisolator™ | MICROWIRE™ | QS™ | SyncFET™ |
| EcoSPARK™ | GTO™ | MSX™ | QT Optoelectronics™ | TinyLogic® |
| $E^2$CMOS™ | HiSeC™ | MSXPro™ | Quiet Series™ | TruTranslation™ |
| EnSigna™ | $I^2C$™ | OCX™ | RapidConfigure™ | UHC™ |
| Across the board. Around the world.™ | | OCXPro™ | RapidConnect™ | UltraFET® |
| The Power Franchise™ | | OPTOLOGIC® | SILENT SWITCHER® | VCX™ |
| Programmable Active Droop™ | | OPTOPLANAR™ | SMART START™ | |

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| No Identification Needed | Full Production | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only. |

# DATA SHEET

# BF245A; BF245B; BF245C
## N-channel silicon field-effect transistors

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

1996 Jul 30

Philips
Semiconductors

PHILIPS

# N-channel silicon field-effect transistors BF245A; BF245B; BF245C

## FEATURES

- Interchangeability of drain and source connections
- Frequencies up to 700 MHz.

## APPLICATIONS

- LF, HF and DC amplifiers.

## DESCRIPTION

General purpose N-channel symmetrical junction field-effect transistors in a plastic TO-92 variant package.

| CAUTION |
|---|
| The device is supplied in an antistatic package. The gate-source input must be protected against static discharge during transport or handling. |

## PINNING

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

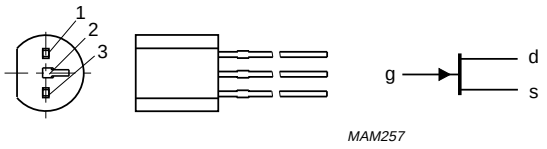



Fig.1 Simplified outline (TO-92 variant) and symbol.

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | | – | – | ±30 | V |
| $V_{GSoff}$ | gate-source cut-off voltage | $I_D$ = 10 nA; $V_{DS}$ = 15 V | –0.25 | – | –8 | V |
| $V_{GSO}$ | gate-source voltage | open drain | – | – | –30 | V |
| $I_{DSS}$ | drain current | $V_{DS}$ = 15 V; $V_{GS}$ = 0 | | | | |
| | BF245A | | 2 | – | 6.5 | mA |
| | BF245B | | 6 | – | 15 | mA |
| | BF245C | | 12 | – | 25 | mA |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = 75 °C | – | – | 300 | mW |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 1 kHz; $T_{amb}$ = 25 °C | 3 | – | 6.5 | mS |
| $C_{rs}$ | reverse transfer capacitance | $V_{DS}$ = 20 V; $V_{GS}$ = –1 V; f = 1 MHz; $T_{amb}$ = 25 °C | – | 1.1 | – | pF |

## 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 |
| $V_{GDO}$ | gate-drain voltage | open source | – | –30 | V |
| $V_{GSO}$ | gate-source voltage | open drain | – | –30 | V |
| $I_D$ | drain current | | – | 25 | mA |
| $I_G$ | gate current | | – | 10 | mA |
| $P_{tot}$ | total power dissipation | up to $T_{amb}$ = 75 °C; | – | 300 | mW |
| | | up to $T_{amb}$ = 90 °C; note 1 | – | 300 | mW |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | operating junction temperature | | – | 150 | °C |

**Note**

1. Device mounted on a printed-circuit board, minimum lead length 3 mm, mounting pad for drain lead minimum 10 mm × 10 mm.

## THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---|---|---|---|---|
| $R_{th\ j\text{-}a}$ | thermal resistance from junction to ambient | in free air | 250 | K/W |
| | thermal resistance from junction to ambient | | 200 | K/W |

## STATIC CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | 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 | $I_D$ = 10 nA; $V_{DS}$ = 15 V | –0.25 | –8.0 | V |
| $V_{GS}$ | gate-source voltage | $I_D$ = 200 μA; $V_{DS}$ = 15 V | | | |
| | BF245A | | –0.4 | –2.2 | V |
| | BF245B | | –1.6 | –3.8 | V |
| | BF245C | | –3.2 | –7.5 | V |
| $I_{DSS}$ | drain current | $V_{DS}$ = 15 V; $V_{GS}$ = 0; note 1 | | | |
| | BF245A | | 2 | 6.5 | mA |
| | BF245B | | 6 | 15 | mA |
| | BF245C | | 12 | 25 | mA |
| $I_{GSS}$ | gate cut-off current | $V_{GS}$ = –20 V; $V_{DS}$ = 0 | – | –5 | nA |
| | | $V_{GS}$ = –20 V; $V_{DS}$ = 0; $T_j$ = 125 °C | – | –0.5 | μA |

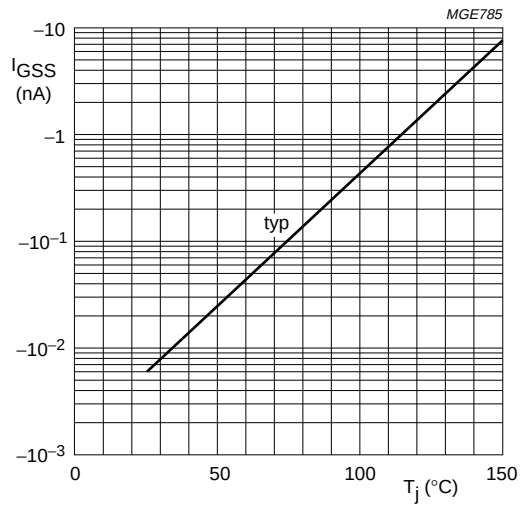
**Note**

1. Measured under pulse conditions: $t_p$ = 300 μs; $\delta \leq 0.02$.

## DYNAMIC CHARACTERISTICS

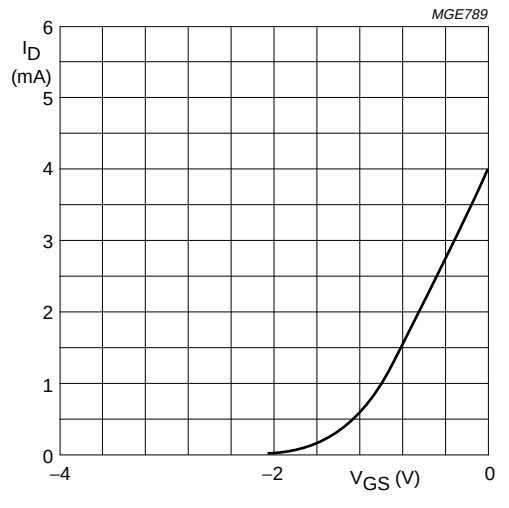
Common source; $T_{amb}$ = 25 °C; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $C_{is}$ | input capacitance | $V_{DS}$ = 20 V; $V_{GS}$ = –1 V; f = 1 MHz | – | 4 | – | pF |
| $C_{rs}$ | reverse transfer capacitance | $V_{DS}$ = 20 V; $V_{GS}$ = –1 V; f = 1 MHz | – | 1.1 | – | pF |
| $C_{os}$ | output capacitance | $V_{DS}$ = 20 V; $V_{GS}$ = –1 V; f = 1 MHz | – | 1.6 | – | pF |
| $g_{is}$ | input conductance | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 200 MHz | – | 250 | – | µS |
| $g_{os}$ | output conductance | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 200 MHz | – | 40 | – | µS |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 1 kHz | 3 | – | 6.5 | mS |
| | | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 200 MHz | – | 6 | – | mS |
| $\lvert y_{rs} \rvert$ | reverse transfer admittance | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 200 MHz | – | 1.4 | – | mS |
| $\lvert y_{os} \rvert$ | output admittance | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 1 kHz | – | 25 | – | µS |
| $f_{gfs}$ | cut-off frequency | $V_{DS}$ = 15 V; $V_{GS}$ = 0; $g_{fs}$ = 0.7 of its value at 1 kHz | – | 700 | – | MHz |
| F | noise figure | $V_{DS}$ = 15 V; $V_{GS}$ = 0; f = 100 MHz; $R_G$ = 1 kΩ (common source); input tuned to minimum noise | – | 1.5 | – | dB |



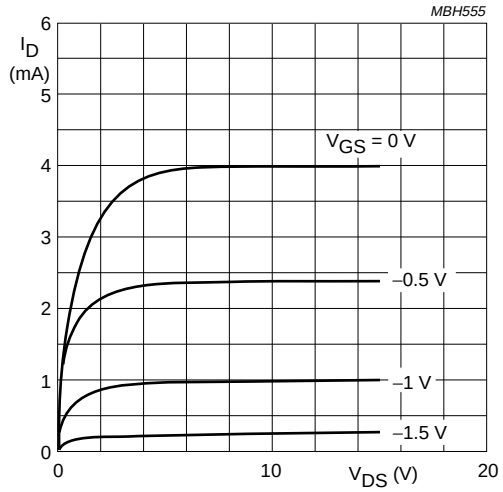

$V_{DS}$ = 0; $V_{GS}$ = –20 V.

Fig.2 Gate leakage current as a function of junction temperature; typical values.



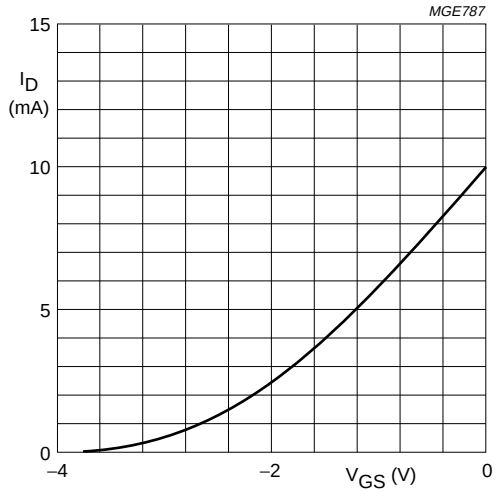

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.3 Transfer characteristics for BF245A; typical values.



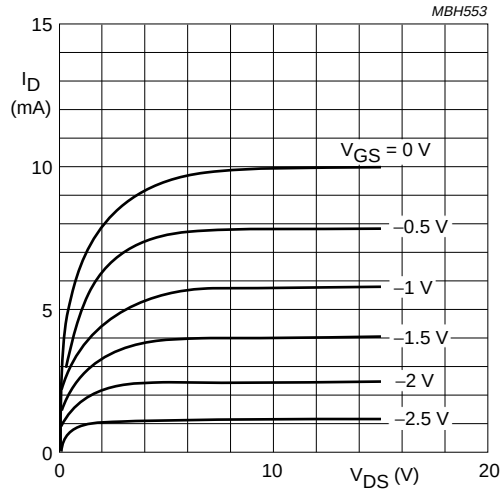

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.4 Output characteristics for BF245A; typical values.



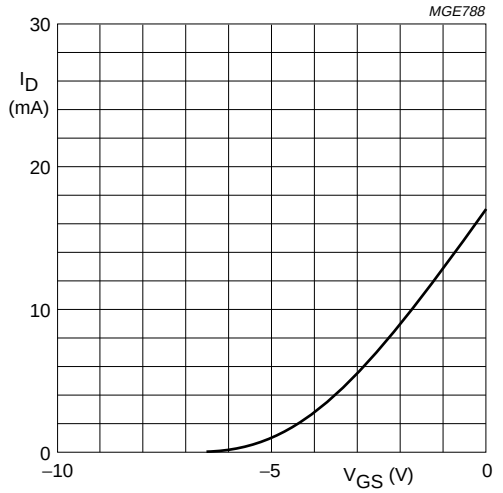

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.5 Transfer characteristics for BF245B; typical values.



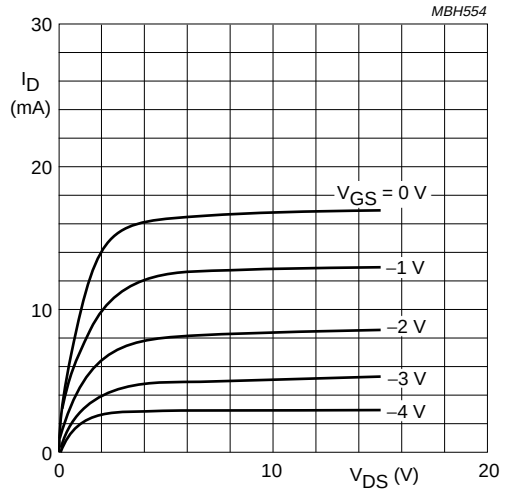

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.6 Output characteristics for BF245B; typical values.



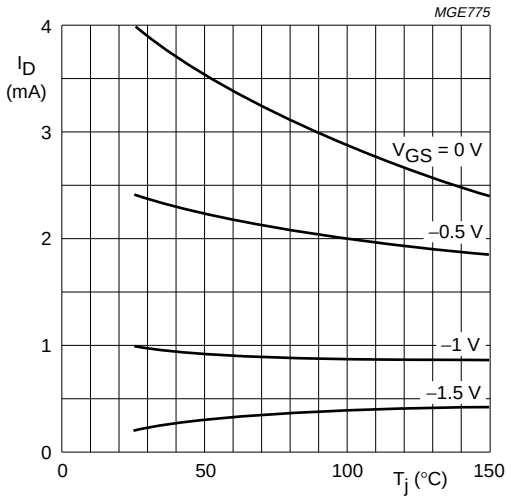

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.7 Transfer characteristics for BF245C; typical values.



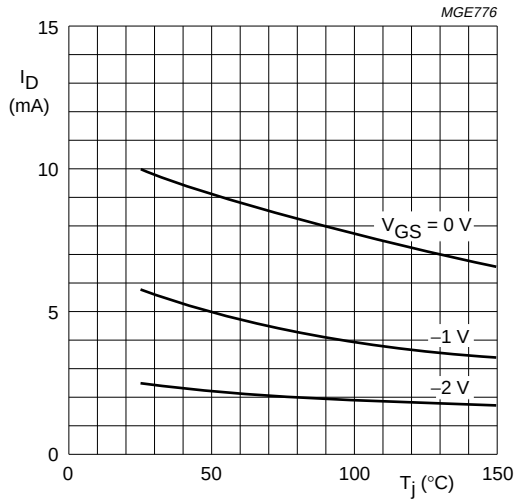

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.8 Output characteristics for BF245C; typical values.



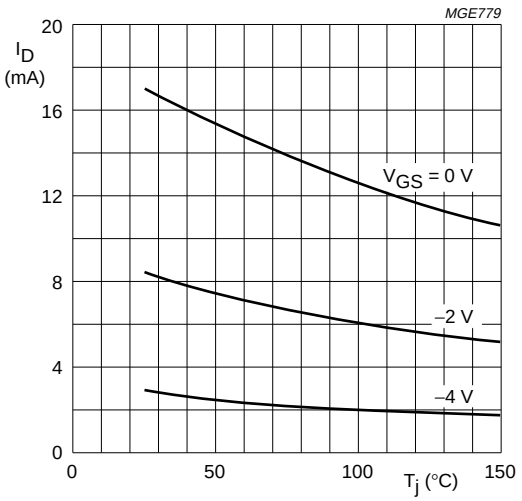

$V_{DS}$ = 15 V.

Fig.9 Drain current as a function of junction temperature; typical values for BF245A.



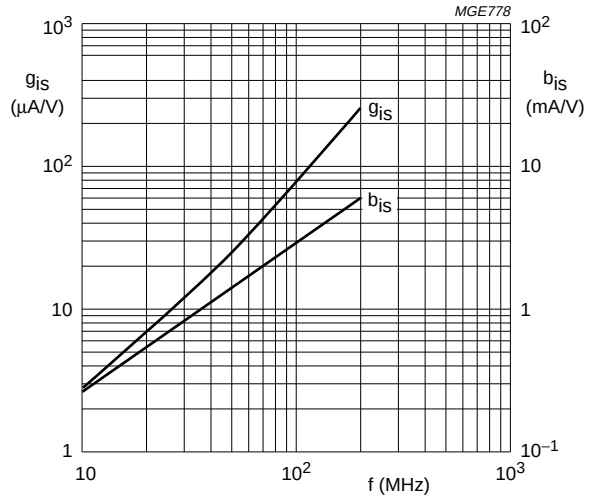

$V_{DS}$ = 15 V.

Fig.10 Drain current as a function of junction temperature; typical values for BF245B.



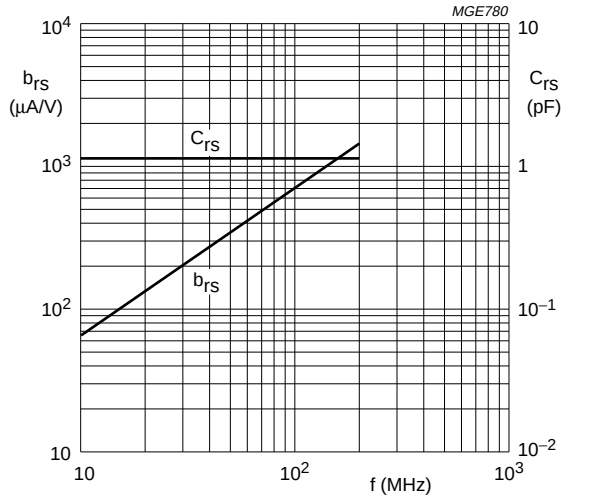

$V_{DS}$ = 15 V.

Fig.11 Drain current as a function of junction temperature; typical values for BF245C.



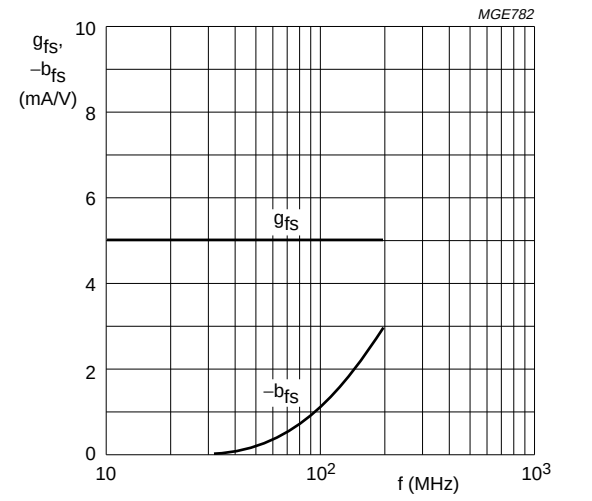

$V_{DS}$ = 15 V; $V_{GS}$ = 0; $T_{amb}$ = 25 °C.

Fig.12 Input admittance; typical values.



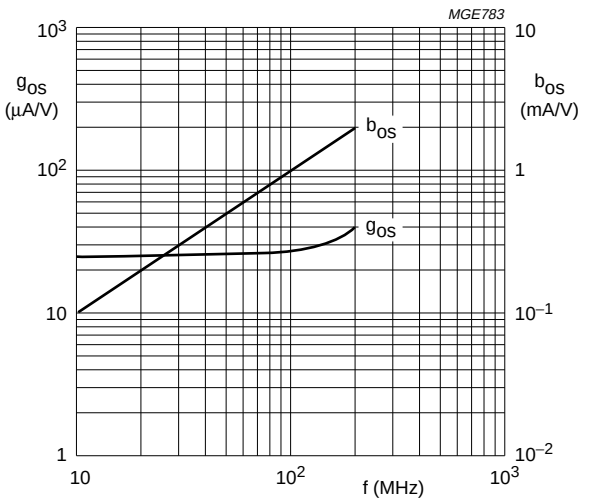

$V_{DS}$ = 15 V; $V_{GS}$ = 0; $T_{amb}$ = 25 °C.

Fig.13 Common source reverse admittance as a function of frequency; typical values.



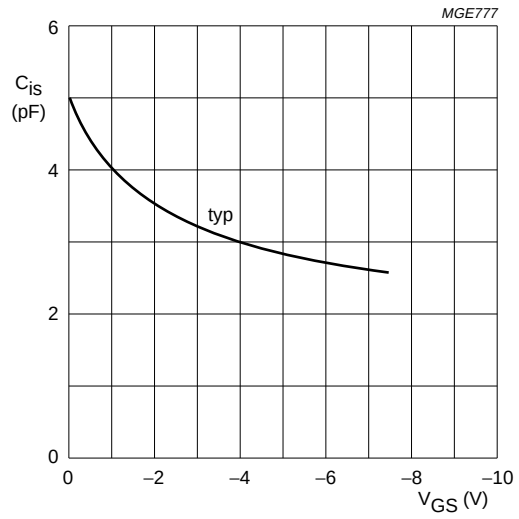

$V_{DS}$ = 15 V; $V_{GS}$ = 0; $T_{amb}$ = 25 °C.

Fig.14 Common-source forward transfer admittance as a function of frequency; typical values.



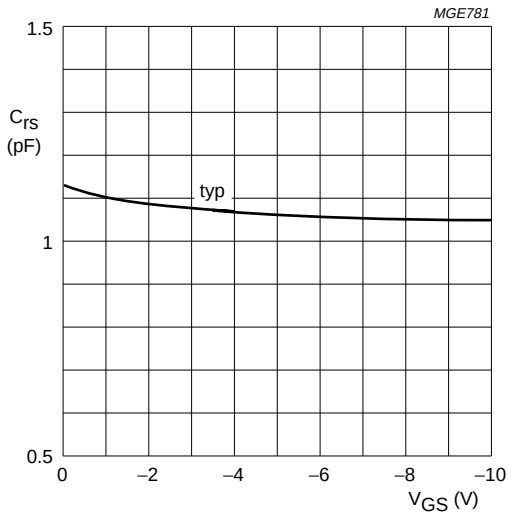

$V_{DS}$ = 15 V; $V_{GS}$ = 0; $T_{amb}$ = 25 °C.

Fig.15 Common-source output admittance as a function of frequency; typical values.



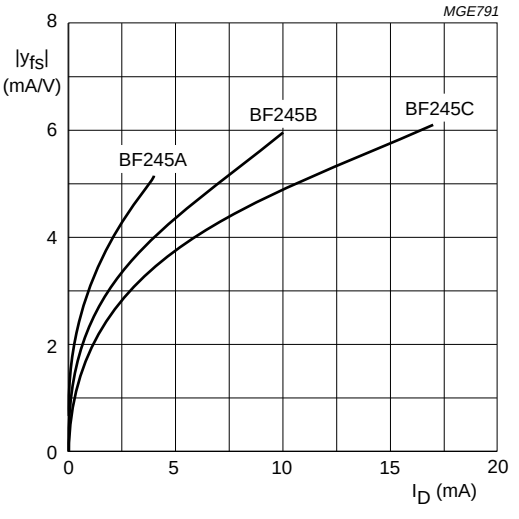

$V_{DS}$ = 20 V; f = 1 MHz; $T_{amb}$ = 25 °C.

Fig.16 Input capacitance as a function of gate-source voltage; typical values.



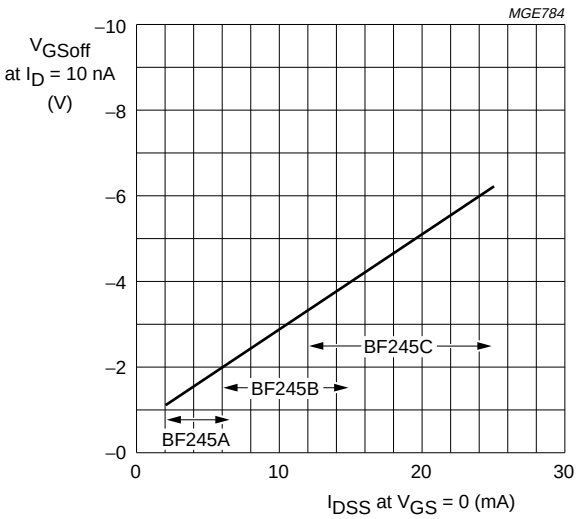

$V_{DS}$ = 20 V; f = 1 MHz; $T_{amb}$ = 25 °C.

Fig.17 Reverse transfer capacitance as a function of gate-source voltage; typical values.



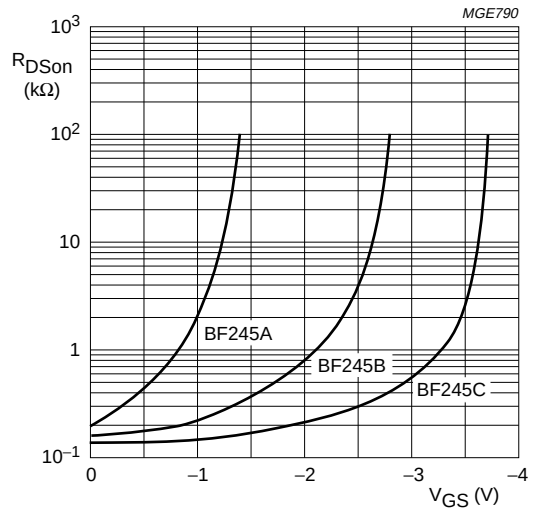

$V_{DS}$ = 15 V; f = 1 kHz; $T_{amb}$ = 25 °C.

Fig.18 Forward transfer admittance as a function of drain current; typical values.



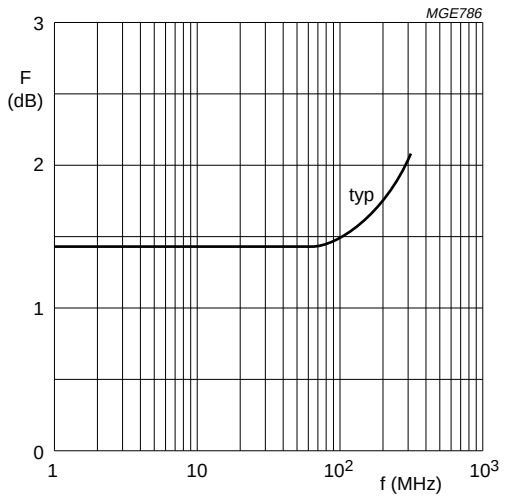

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

Fig.19 Gate-source cut-off voltage as a function of drain current; typical values.




$V_{DS}$ = 0; f = 1 kHz; $T_{amb}$ = 25 °C.

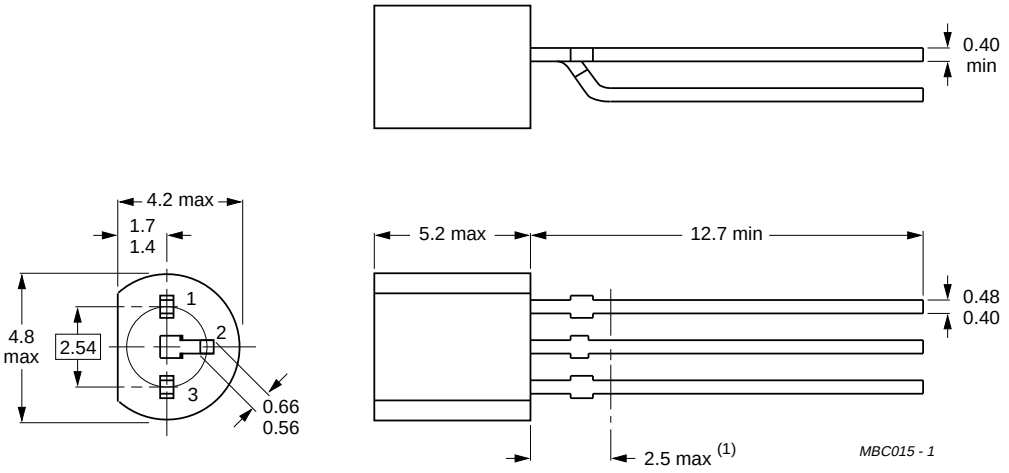
Fig.20 Drain-source on-state resistance as a function of gate-source voltage; typical values.




$V_{DS}$ = 15 V; $V_{GS}$ = 0; $R_G$ = 1 kΩ; $T_{amb}$ = 25 °C.
Input tuned to minimum noise.

Fig.21 Noise figure as a function of frequency; typical values.

**PACKAGE OUTLINE**




Dimensions in mm.

(1) Terminal dimensions within this zone are uncontrolled.

Fig.22 TO-92 variant.

## 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

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.