

# BF545A; BF545B; BF545C

## N-channel silicon junction field-effect transistors

Rev. 4 — 15 September 2011 Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.3 Applications

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

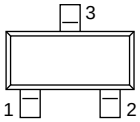
### 1.4 Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | | - | - | ±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; $V_{DS}$ = 15 V | | | | |
| | | BF545A | 2 | - | 6.5 | mA |
| | | BF545B | 6 | - | 15 | mA |
| | | BF545C | 12 | - | 25 | mA |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | - | - | 250 | mW |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $V_{GS}$ = 0 V; $V_{DS}$ = 15 V | 3 | - | 6.5 | mS |

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| 1 | source (s) |  |  |
| 2 | drain (d) | | |
| 3 | gate (g) | | |





## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BF545A | - | plastic surface mounted package; 3 leads | SOT23 |
| BF545B | | | |
| BF545C | | | |

## 4. Marking

**Table 4. Marking**

| Type number | Marking code[1] |
|---|---|
| BF545A | 20* |
| BF545B | 21* |
| BF545C | 22* |

[1] * = p: made in Hong Kong.
* = t: made in Malaysia.
* = W: made in China.


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## 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) | | | - | ±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 | $T_{amb} \leq 25$ °C | [1] | - | 250 | mW |
| $T_{stg}$ | storage temperature | | | –65 | +150 | °C |
| $T_j$ | junction temperature | | | - | 150 | °C |

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

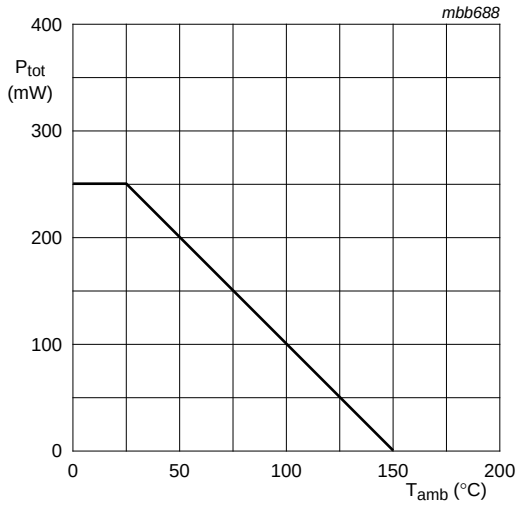



**Fig 1. Power derating curve.**

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

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

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


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## 7. Static characteristics

**Table 7. 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 V | –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; $V_{DS}$ = 15 V | | | | |
| | | BF545A | 2 | - | 6.5 | mA |
| | | BF545B | 6 | - | 15 | mA |
| | | BF545C | 12 | - | 25 | mA |
| $I_{GSS}$ | gate-source leakage current | $V_{GS}$ = –20 V; $V_{DS}$ = 0 V | - | –0.5 | –1000 | pA |
| | | $V_{GS}$ = –20 V; $V_{DS}$ = 0 V; $T_j$ = 125 °C | - | - | –100 | nA |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $V_{GS}$ = 0 V; $V_{DS}$ = 15 V | 3 | - | 6.5 | mS |
| $\lvert y_{os} \rvert$ | common source output admittance | $V_{GS}$ = 0 V; $V_{DS}$ = 15 V | - | 40 | - | μS |


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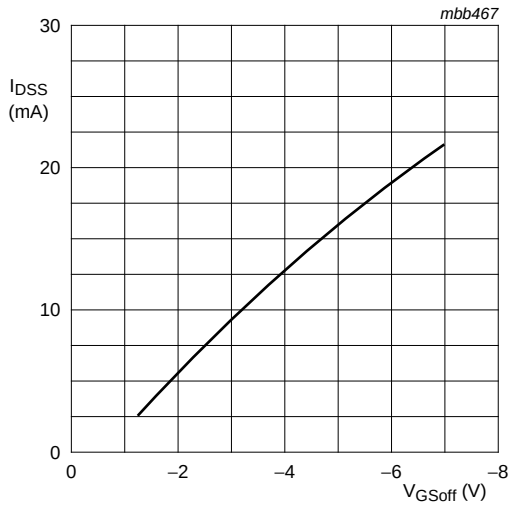
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## 8. Dynamic characteristics

**Table 8. Dynamic characteristics**

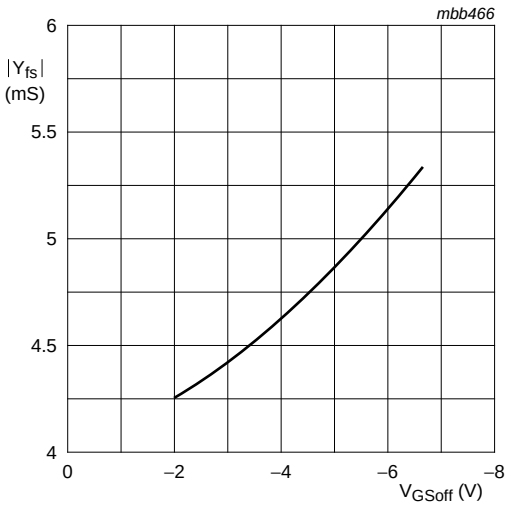
*$T_{amb}$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | input capacitance | $V_{DS}$ = 15 V; f = 1 MHz | | | | |
| | | $V_{GS}$ = −10 V | - | 1.7 | - | pF |
| | | $V_{GS}$ = 0 V | - | 3 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | $V_{DS}$ = 15 V; f = 1 MHz | | | | |
| | | $V_{GS}$ = −10 V | - | 0.8 | - | pF |
| | | $V_{GS}$ = 0 V | - | 0.9 | - | pF |
| $g_{is}$ | common source input conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA | | | | |
| | | f = 100 MHz | - | 15 | - | µS |
| | | f = 450 MHz | - | 300 | - | µS |
| $g_{fs}$ | common source transfer conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA | | | | |
| | | f = 100 MHz | - | 2 | - | mS |
| | | 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 |
| | | f = 450 MHz | - | −40 | - | µS |
| $g_{os}$ | common source output conductance | $V_{DS}$ = 10 V; $I_D$ = 1 mA | | | | |
| | | f = 100 MHz | - | 30 | - | µS |
| | | f = 450 MHz | - | 60 | - | µS |




$V_{DS}$ = 15 V; $T_j$ = 25 °C.

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

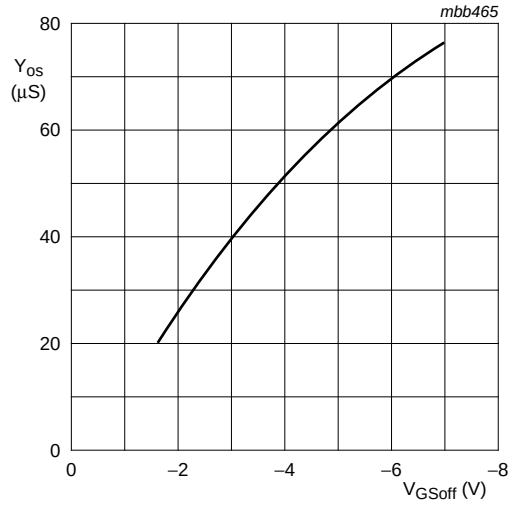



$V_{DS}$ = 15 V; $V_{GS}$ = 0 V; $T_j$ = 25 °C.

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

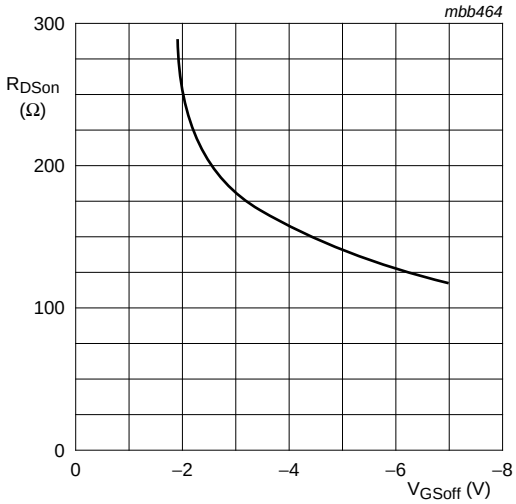

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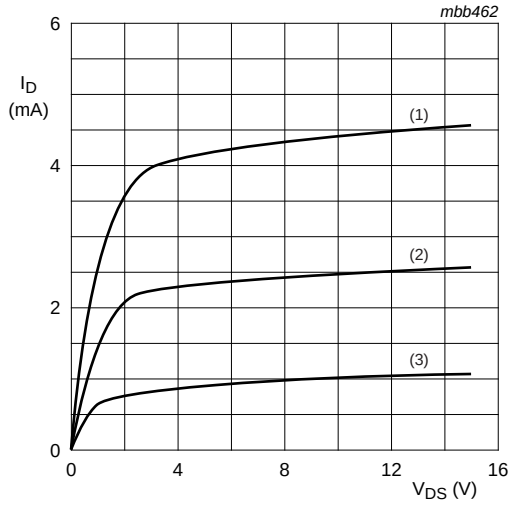

$V_{DS}$ = 15 V; $V_{GS}$ = 0 V; $T_j$ = 25 °C.

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




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

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




**BF545A**

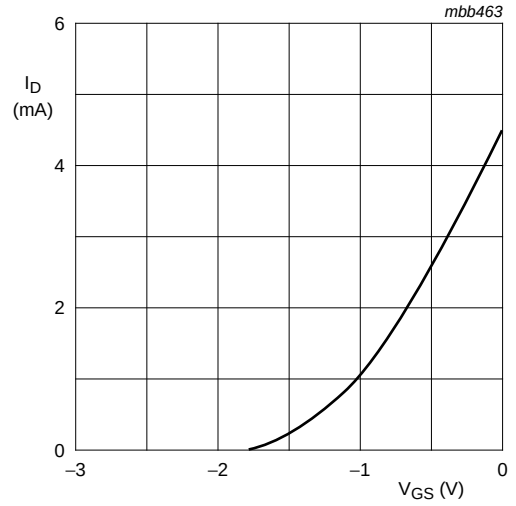
$T_j$ = 25 °C.

(1) $V_{GS}$ = 0 V.

(2) $V_{GS}$ = −0.5 V.

(3) $V_{GS}$ = −1.0 V.

**Fig 6. Typical output characteristics.**



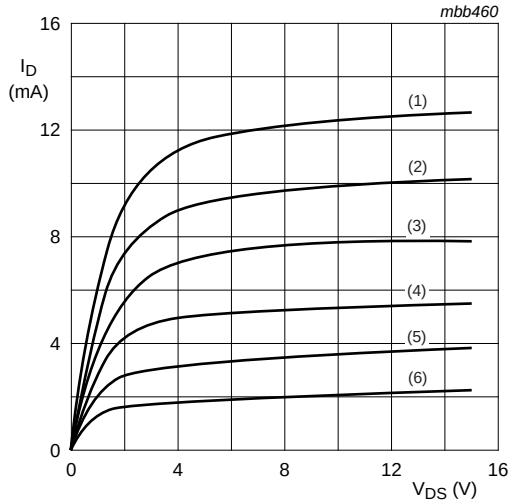

**BF545A**

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

**Fig 7. Typical input characteristics.**


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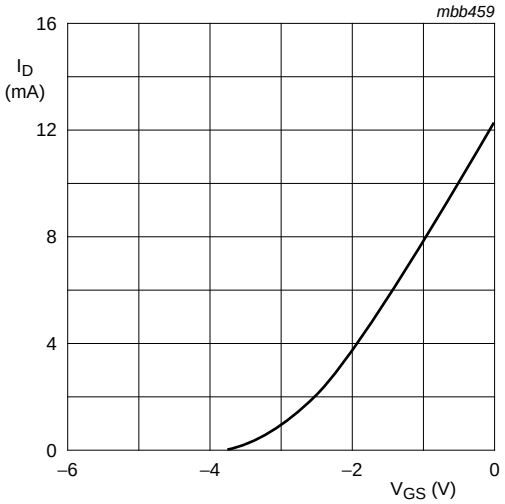



**BF545B**

$T_j$ = 25 °C.

(1) $V_{GS}$ = 0 V.
(2) $V_{GS}$ = −0.5 V.
(3) $V_{GS}$ = −1.0 V.
(4) $V_{GS}$ = −1.5 V.
(5) $V_{GS}$ = −2.0 V.
(6) $V_{GS}$ = −2.5 V.

**Fig 8. Typical output characteristics.**



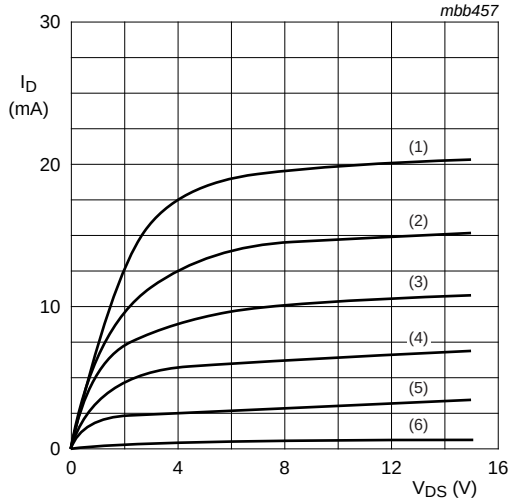

**BF545B**

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

**Fig 9. Typical input characteristics.**


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**BF545C**

$T_j$ = 25 °C.

(1) $V_{GS}$ = 0 V.

(2) $V_{GS}$ = −1.0 V.

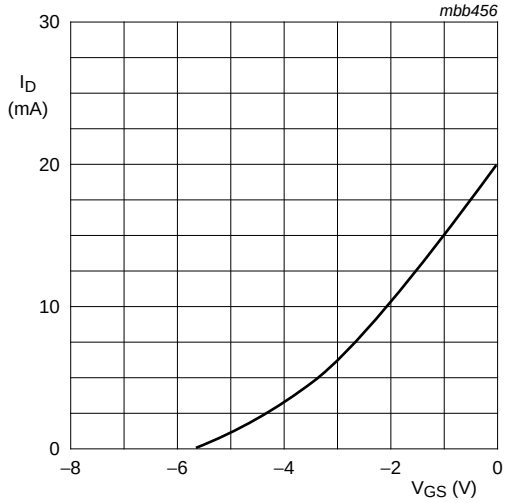
(3) $V_{GS}$ = −2.0 V.

(4) $V_{GS}$ = −3.0 V.

(5) $V_{GS}$ = −4.0 V.

(6) $V_{GS}$ = −5.0 V.

**Fig 10. Typical output characteristics.**



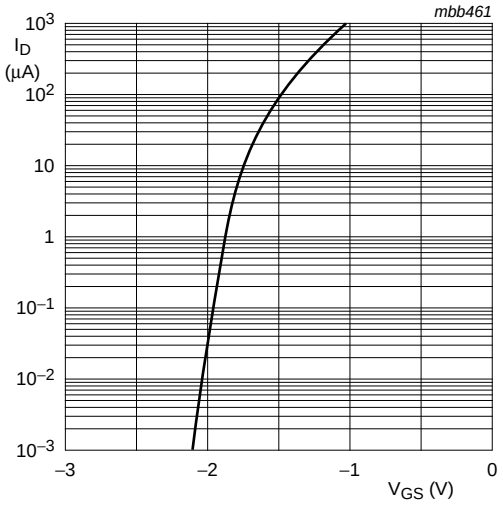

**BF545C**

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

**Fig 11. Typical input characteristics.**


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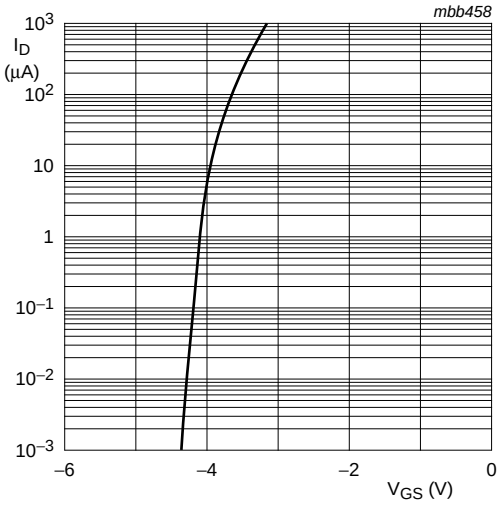
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**BF545A**

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

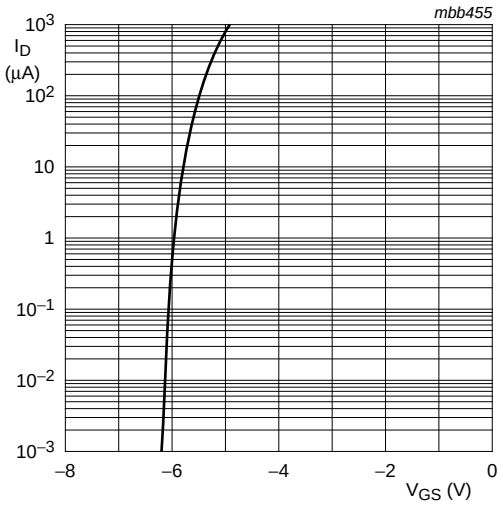
**Fig 12. Drain current as a function of gate-source voltage; typical values.**




**BF545B**

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

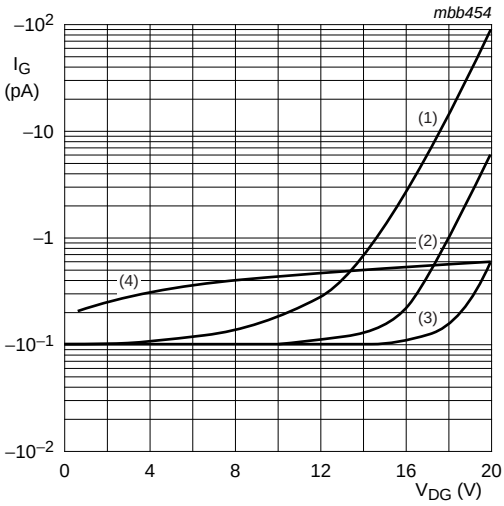
**Fig 13. Drain current as a function of gate-source voltage; typical values.**




**BF545C**

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

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




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

(1) $I_D$ = 10 mA.

(2) $I_D$ = 1 mA.

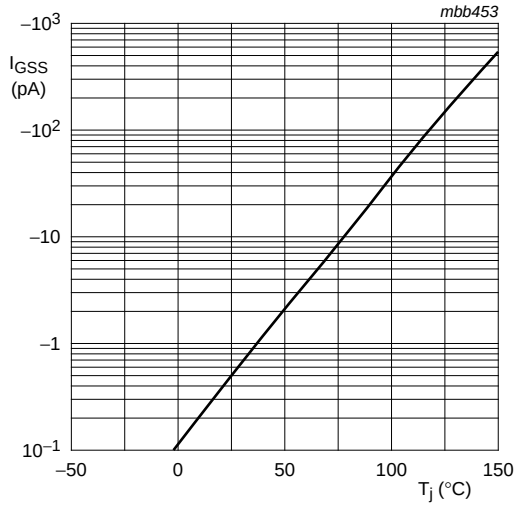
(3) $I_D$ = 0.1 mA.

(4) $I_{GSS}$.

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

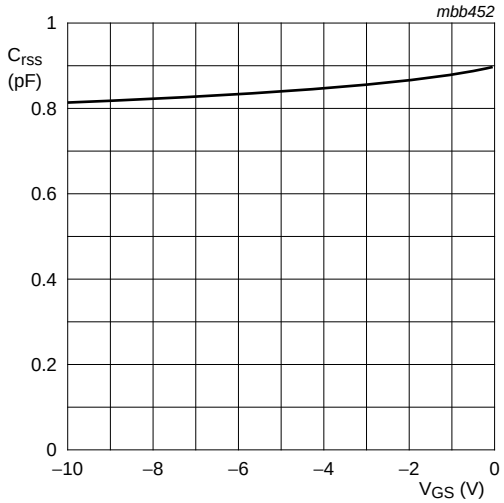

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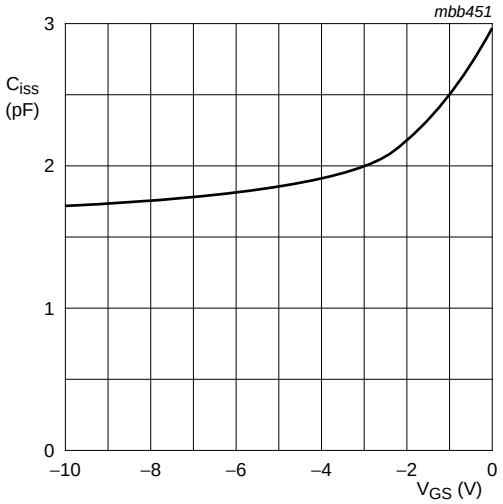

$V_{DS}$ = 0 V; $V_{GS}$ = −20 V.

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



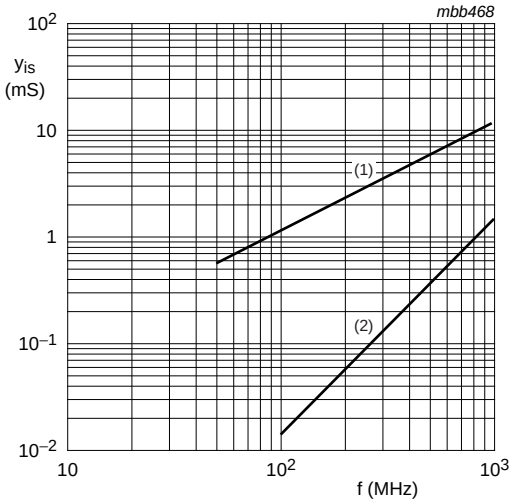

$V_{DS}$ = 15 V; $T_j$ = 25 °C.

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




$V_{DS}$ = 15 V; $T_j$ = 25 °C.

**Fig 18. Typical input capacitance.**




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

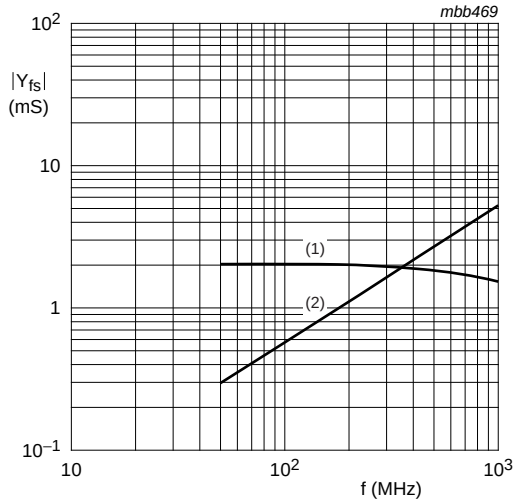
(1) $b_{is}$.

(2) $g_{is}$.

**Fig 19. Common-source input admittance; typical values.**


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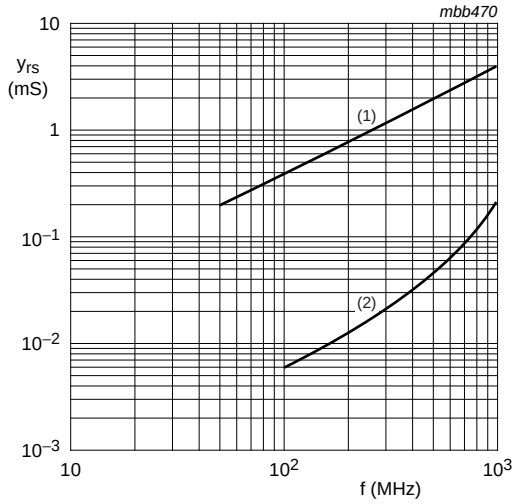



$V_{DS}$ = 10 V; $I_D$ = 1 mA; $T_{amb}$ = 25 °C.

(1) $g_{fs}$.

(2) $-b_{fs}$.

**Fig 20. Common-source forward transfer admittance; typical values.**

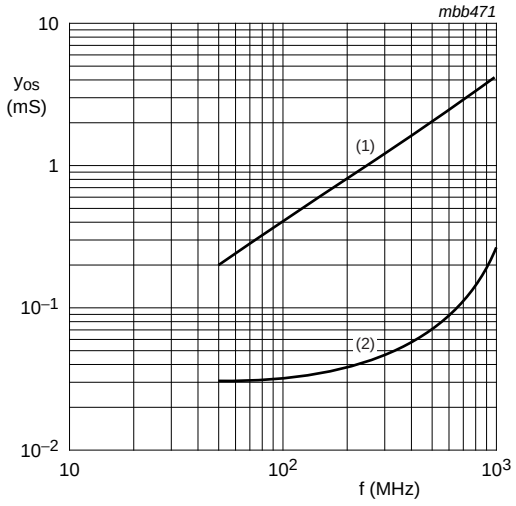



$V_{DS}$ = 10 V; $I_D$ = 1 mA; $T_{amb}$ = 25 °C.

(1) $-b_{rs}$.

(2) $-g_{rs}$.

**Fig 21. Common-source reverse transfer admittance; typical values.**




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

(1) $b_{os}$.

(2) $g_{os}$.

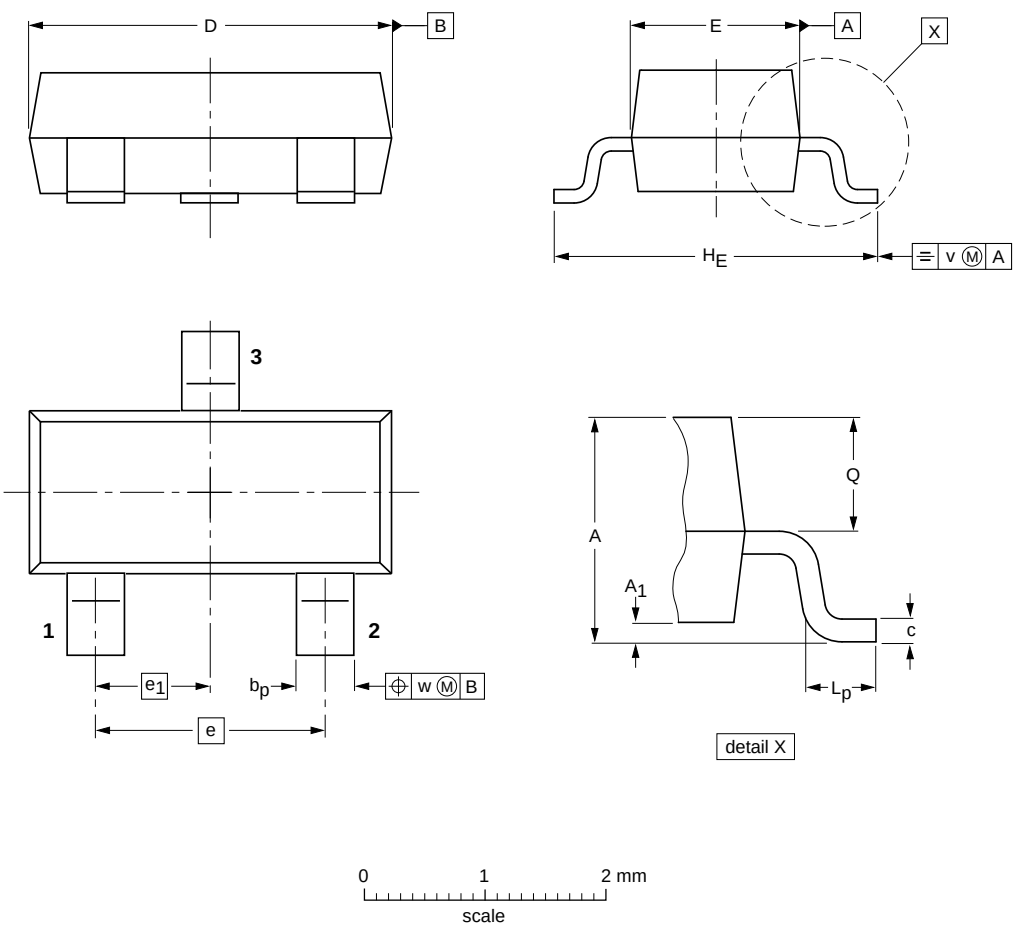
**Fig 22. Common-source output admittance; typical values.**


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## 9. Package outline

**Plastic surface-mounted package; 3 leads** **SOT23**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ max. | $b_p$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | Q | v | w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1<br>0.9 | 0.1 | 0.48<br>0.38 | 0.15<br>0.09 | 3.0<br>2.8 | 1.4<br>1.2 | 1.9 | 0.95 | 2.5<br>2.1 | 0.45<br>0.15 | 0.55<br>0.45 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT23 | | TO-236AB | | | | ~~04-11-04~~<br>06-03-16 |

**Fig 23. Package outline.**


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## 10. Revision history

**Table 9. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BF545A_BF545B_BF545C v.4 | 20110915 | Product data sheet | - | BF545A_BF545B_BF545C v.3 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Package outline drawings have been updated to the latest version. | | | |
| BF545A_BF545B_BF545C v.3 (9397 750 13391) | 20040805 | Product data sheet | - | BF545A-B-C v.2 |
| BF545A-B-C v.2 | 19960729 | Product specification | - | - |


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# 11. Legal information

## 11.1 Data sheet status

| Document status[1][2] | Product status[3] | 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.

## 11.2 Definitions

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## 13. Contents


| | | |
|---|---|---|
| **1** | **Product profile** | **1** |
| 1.1 | General description | 1 |
| 1.2 | Features and benefits | 1 |
| 1.3 | Applications | 1 |
| 1.4 | Quick reference data | 1 |
| **2** | **Pinning information** | **2** |
| **3** | **Ordering information** | **2** |
| **4** | **Marking** | **2** |
| **5** | **Limiting values** | **3** |
| **6** | **Thermal characteristics** | **3** |
| **7** | **Static characteristics** | **4** |
| **8** | **Dynamic characteristics** | **5** |
| **9** | **Package outline** | **12** |
| **10** | **Revision history** | **13** |
| **11** | **Legal information** | **14** |
| 11.1 | Data sheet status | 14 |
| 11.2 | Definitions | 14 |
| 11.3 | Disclaimers | 14 |
| 11.4 | Trademarks | 15 |
| **12** | **Contact information** | **15** |
| **13** | **Contents** | **16** |


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