



# BF861A; BF861B; BF861C

N-channel junction FETs

Rev. 04 — 24 September 2004

Product data sheet

## 1. Product profile

### 1.1 General description

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

#### CAUTION



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

### 1.2 Features

- High transfer admittance
- Low feedback capacitance
- Low input capacitance
- Low noise.

### 1.3 Applications

- Preamplifiers for AM tuners in car radios.

### 1.4 Quick reference data

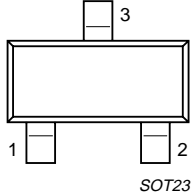

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage (DC)		-	-	25	V
$I_{DSS}$	drain current					
	BF861A	$V_{GS} = 0\text{ V}; V_{DS} = 8\text{ V}$	2	-	6.5	mA
	BF861B	$V_{GS} = 0\text{ V}; V_{DS} = 8\text{ V}$	6	-	15	mA
	BF861C	$V_{GS} = 0\text{ V}; V_{DS} = 8\text{ V}$	12	-	25	mA
$P_{tot}$	total power dissipation	up to $T_{amb} = 25\text{ °C}$	-	-	250	mW
$ y_{fs} $	forward transfer admittance;					
	BF861A	$V_{GS} = 0\text{ V}; V_{DS} = 8\text{ V}$	12	-	20	mS
	BF861B	$V_{GS} = 0\text{ V}; V_{DS} = 8\text{ V}$	16	-	25	mS
	BF861C	$V_{GS} = 0\text{ V}; V_{DS} = 8\text{ V}$	20	-	30	mS
$C_{iss}$	input capacitance	$f = 1\text{ MHz}$	-	-	10	pF
$C_{rss}$	reverse transfer capacitance	$f = 1\text{ MHz}$	-	-	2.7	pF

# PHILIPS

## 2. Pinning information

Table 2: Discrete pinning

Pin	Description	Simplified outline	Symbol
1	source		 sym053
2	drain		
3	gate		

## 3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BF861A	-	plastic surface mounted package; 3 leads	SOT23
BF861B	-	plastic surface mounted package; 3 leads	SOT23
BF861C	-	plastic surface mounted package; 3 leads	SOT23

## 4. Marking

Table 4: Marking codes

Type number	Marking code <sup>[1]</sup>
BF861A	28*
BF861B	29*
BF861C	30*

[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).

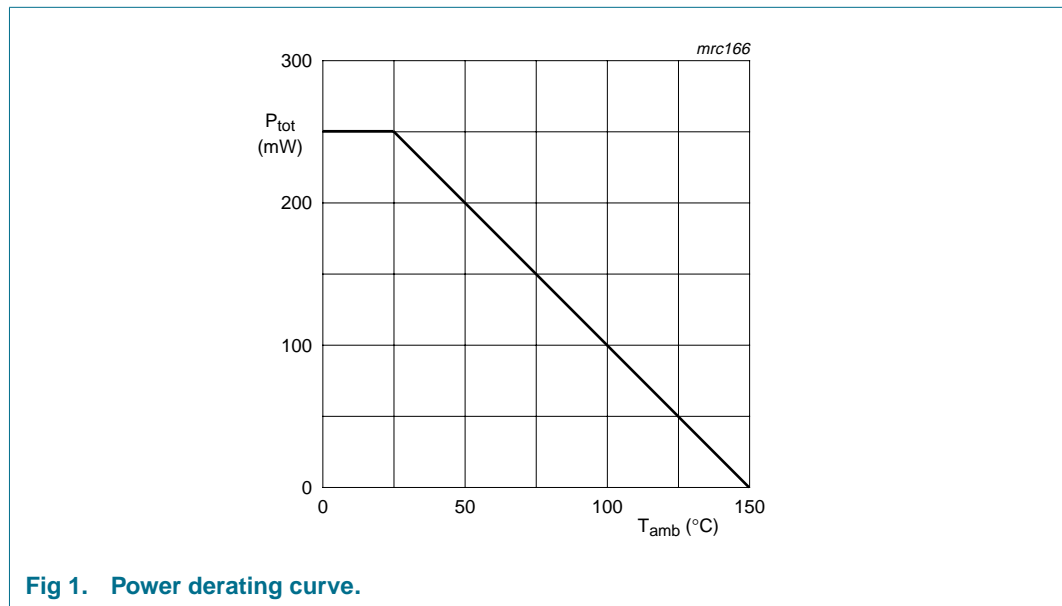
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage (DC)		-	25	V
$V_{GSO}$	gate-source voltage	open drain	-	25	V
$V_{DGO}$	drain-gate voltage (DC)	open source	-	25	V
$I_G$	forward gate current (DC)		-	10	mA

**Table 5: Limiting values ...continued**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$P_{tot}$	total power dissipation	up to $T_{amb} = 25\text{ °C}$ [1]	-	250	mW
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	operating junction temperature		-	150	°C

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



**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.

## 7. Characteristics

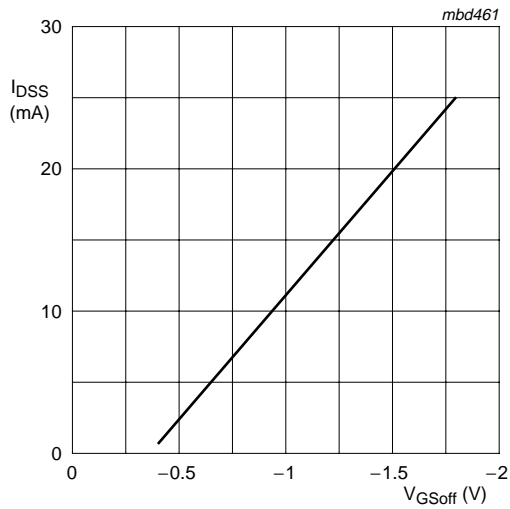
**Table 7: Characteristics**

$T_j = 25\text{ °C}$ ;  $V_{DS} = 8\text{ V}$ ;  $V_{GS} = 0\text{ V}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)GSS}$	gate-source breakdown voltage	$I_G = -1\text{ }\mu\text{A}$	-25	-	-	V

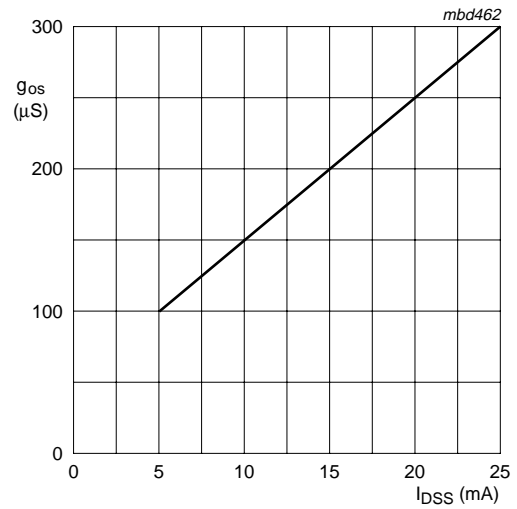
**Table 7: Characteristics ...continued** $T_j = 25\text{ }^\circ\text{C}$ ;  $V_{DS} = 8\text{ V}$ ;  $V_{GS} = 0\text{ V}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{GSoff}$	gate-source cut-off voltage					
	BF861A	$I_D = 1\text{ }\mu\text{A}$	-0.2	-	-1	V
	BF861B	$I_D = 1\text{ }\mu\text{A}$	-0.5	-	-1.5	V
	BF861C	$I_D = 1\text{ }\mu\text{A}$	-0.8	-	-2	V
$V_{GSS}$	gate-source forward voltage	$V_{DS} = 0\text{ V}$ ; $I_G = 1\text{ mA}$	-	-	1	V
$I_{DSS}$	drain current					
	BF861A		2	-	6.5	mA
	BF861B		6	-	15	mA
	BF861C		12	-	25	mA
$I_{GSS}$	gate cut-off current	$V_{GS} = -20\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	-1	nA
$ y_{fs} $	forward transfer admittance					
	BF861A		12	-	20	mS
	BF861B		16	-	25	mS
	BF861C		20	-	30	mS
$g_{os}$	common source output conductance					
	BF861A		-	-	200	$\mu\text{S}$
	BF861B		-	-	250	$\mu\text{S}$
	BF861C		-	-	300	$\mu\text{S}$
$C_{iss}$	input capacitance	$f = 1\text{ MHz}$	-	-	10	pF
$C_{rss}$	reverse transfer capacitance	$f = 1\text{ MHz}$	-	2.1	2.7	pF
$V_n/\sqrt{B}$	equivalent input noise voltage	$V_{GS} = 0\text{ V}$ ; $f = 1\text{ MHz}$	-	1.5	-	nV/ $\sqrt{\text{Hz}}$



$V_{DS} = 8$  V.

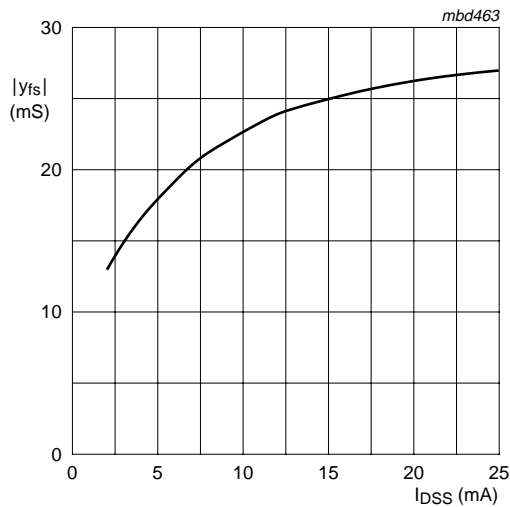
Fig 2. Drain current as a function of gate-source cut-off voltage; typical values.



$V_{DS} = 8$  V.

$V_{GS} = 0$  V.

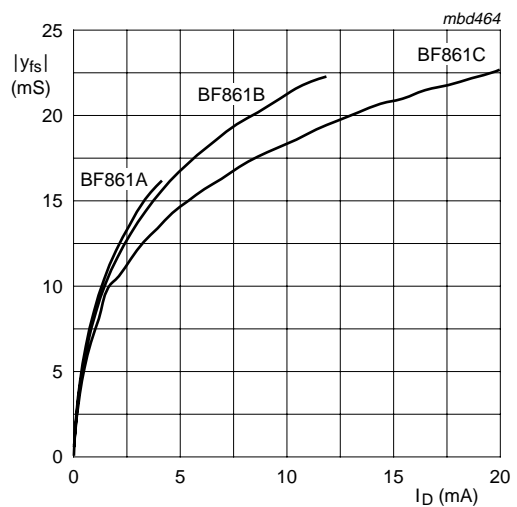
Fig 3. Common-source output conductance as a function of drain current; typical values.



$V_{DS} = 8$  V.

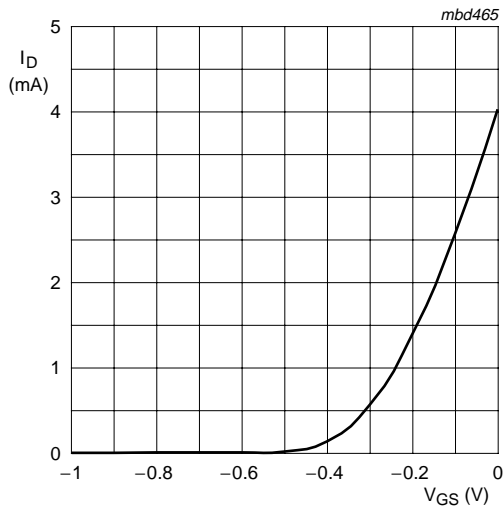
$V_{GS} = 0$  V.

Fig 4. Forward transfer admittance as a function of drain current; typical values.



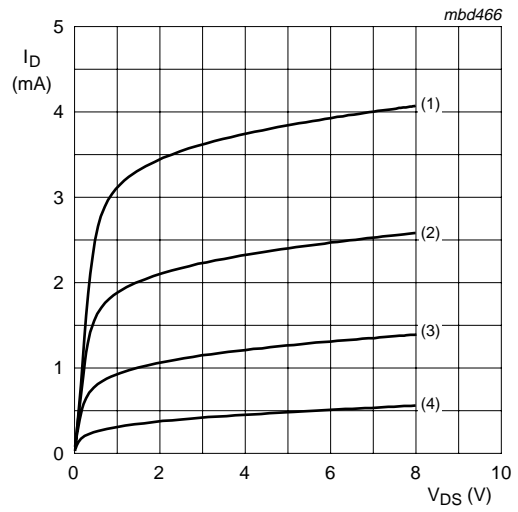
$V_{DS} = 8$  V.

Fig 5. Forward transfer admittance as a function of drain current; typical values.



$V_{DS} = 8 \text{ V.}$

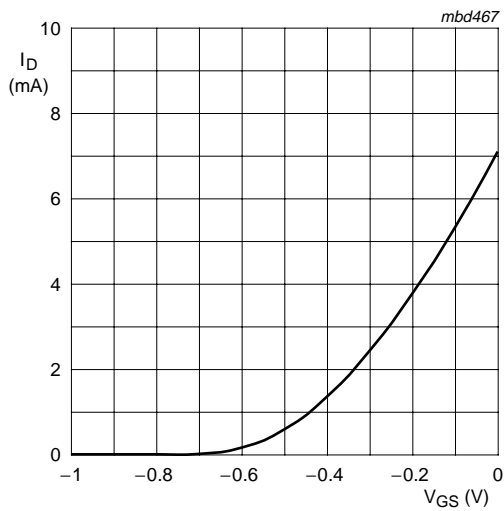
**Fig 6. Typical input characteristics; BF861A.**



$V_{DS} = 8 \text{ V.}$

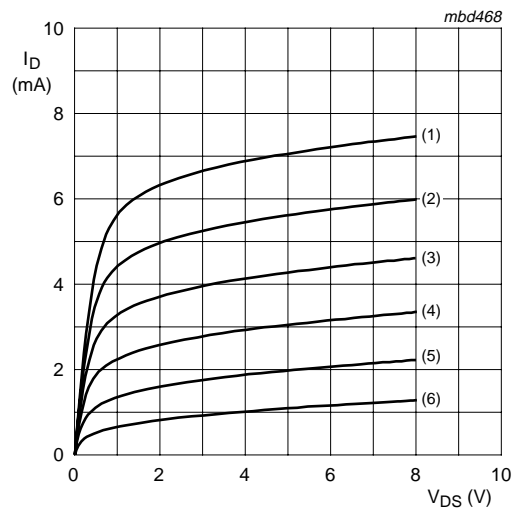
- (1)  $V_{GS} = 0 \text{ V.}$
- (2)  $V_{GS} = -100 \text{ mV.}$
- (3)  $V_{GS} = -200 \text{ mV.}$
- (4)  $V_{GS} = -300 \text{ mV.}$

**Fig 7. Typical output characteristics: BF861A.**



$V_{DS} = 8 \text{ V.}$

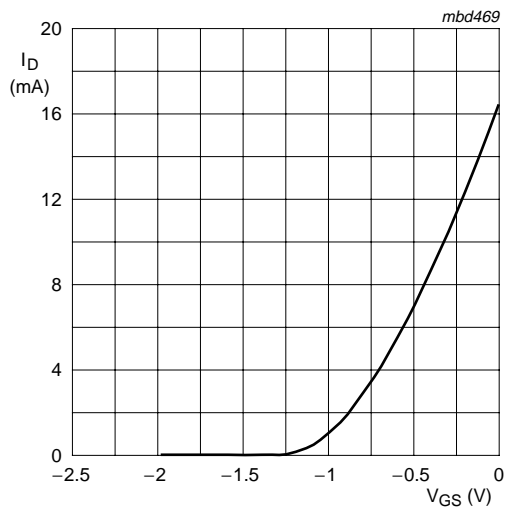
**Fig 8. Typical input characteristics; BF861B.**



$V_{DS} = 8 \text{ V.}$

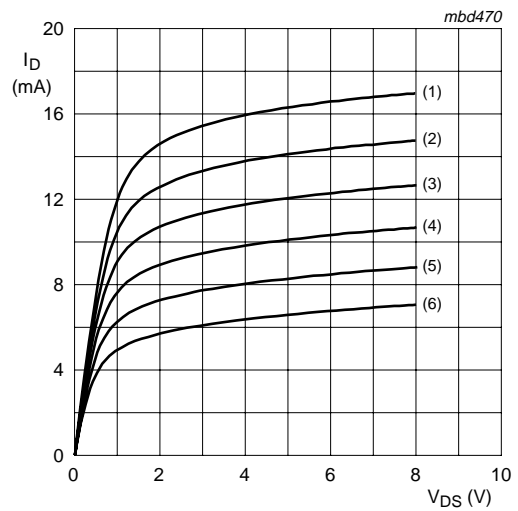
- (1)  $V_{GS} = 0 \text{ V.}$
- (2)  $V_{GS} = -100 \text{ mV.}$
- (3)  $V_{GS} = -200 \text{ mV.}$
- (4)  $V_{GS} = -300 \text{ mV.}$
- (5)  $V_{GS} = -400 \text{ mV.}$
- (6)  $V_{GS} = -500 \text{ mV.}$

**Fig 9. Typical output characteristics; BF861B.**



$V_{DS} = 8 \text{ V.}$

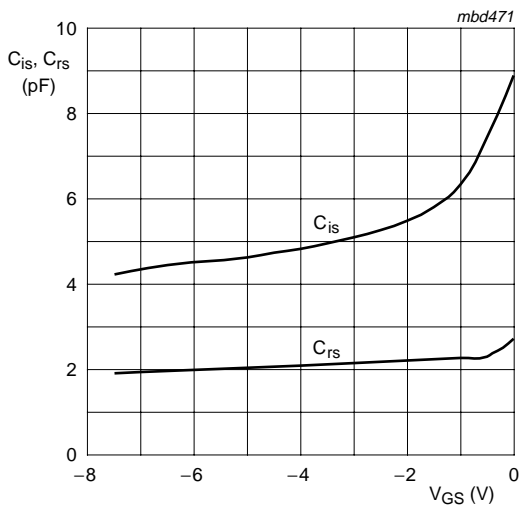
**Fig 10. Typical input characteristics; BF861C.**



$V_{DS} = 8 \text{ V.}$

- (1)  $V_{GS} = 0 \text{ V.}$
- (2)  $V_{GS} = -200 \text{ mV.}$
- (3)  $V_{GS} = -400 \text{ mV.}$
- (4)  $V_{GS} = -600 \text{ mV.}$
- (5)  $V_{GS} = -800 \text{ mV.}$
- (6)  $V_{GS} = -1 \text{ V.}$

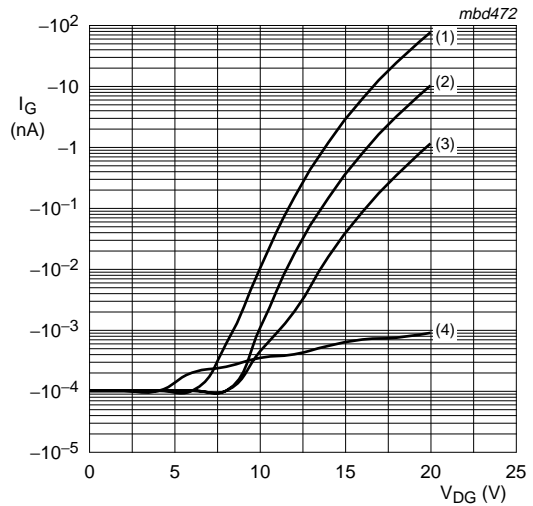
**Fig 11. Typical output characteristics; BF861C.**



$V_{DS} = 8 \text{ V.}$

$f = 1 \text{ MHz.}$

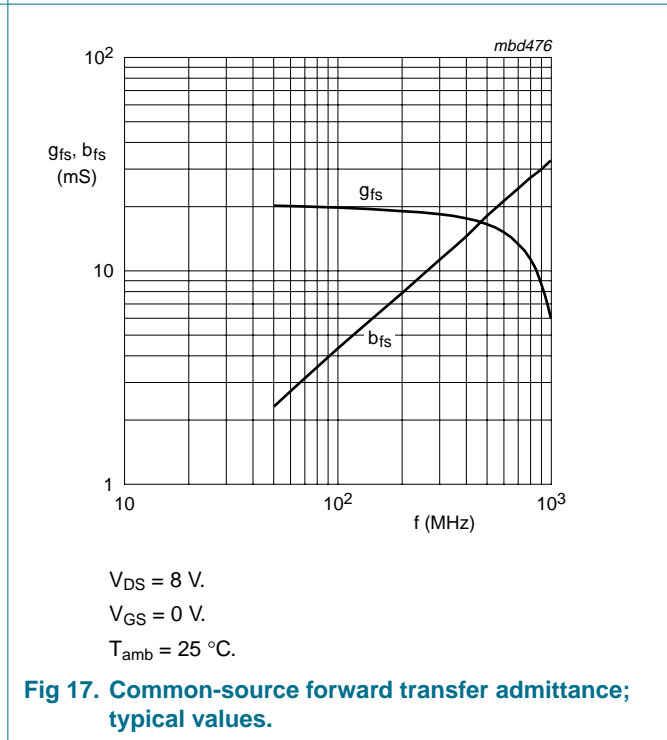
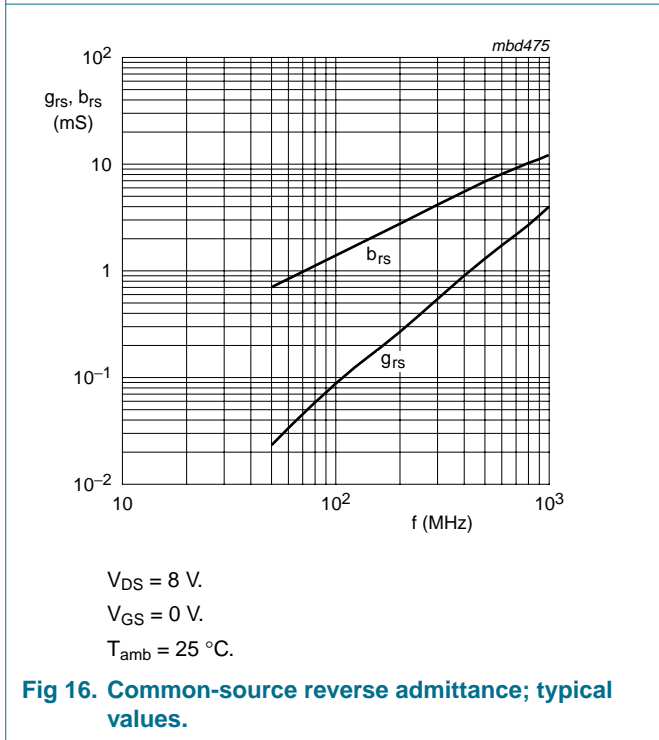
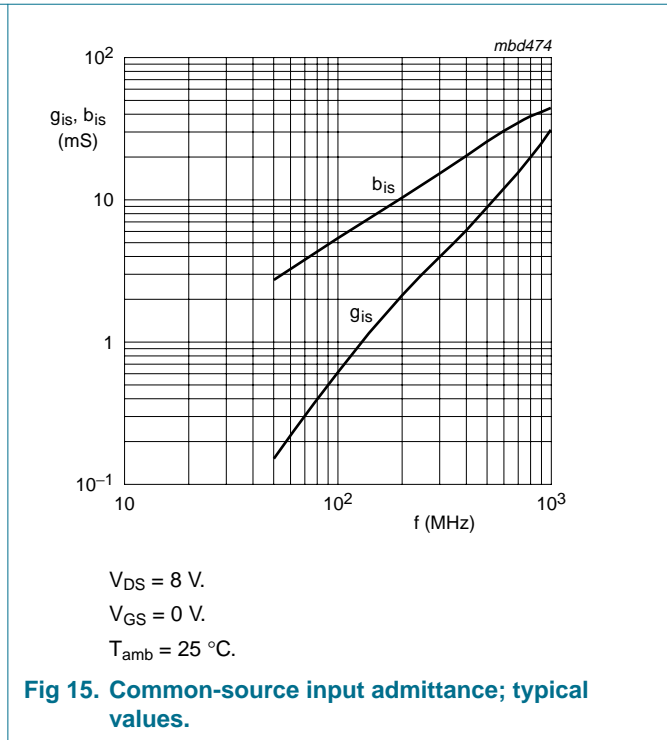
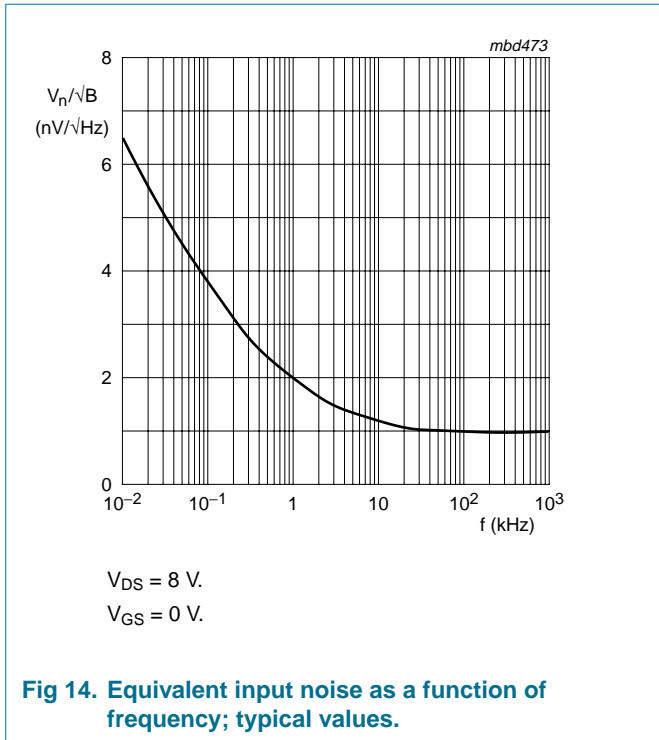
**Fig 12. Input and reverse transfer capacitance as functions of gate-source voltage; typical values.**



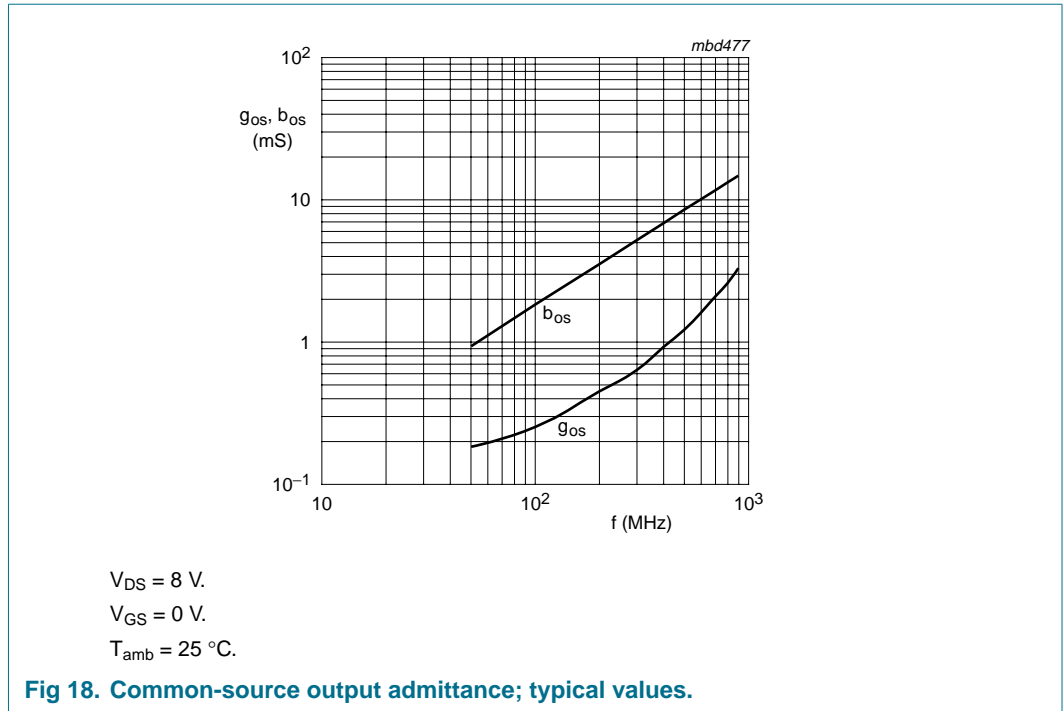
$V_{DS} = 8 \text{ V.}$

- (1)  $I_D = 10 \text{ mA.}$
- (2)  $I_D = 1 \text{ mA.}$
- (3)  $I_D = 0.1 \text{ mA.}$
- (4)  $I_D = I_{GSS}.$

**Fig 13. Gate current as a function of drain-gate voltage; typical values.**







**8. Package outline**

Plastic surface mounted package; 3 leads

SOT23

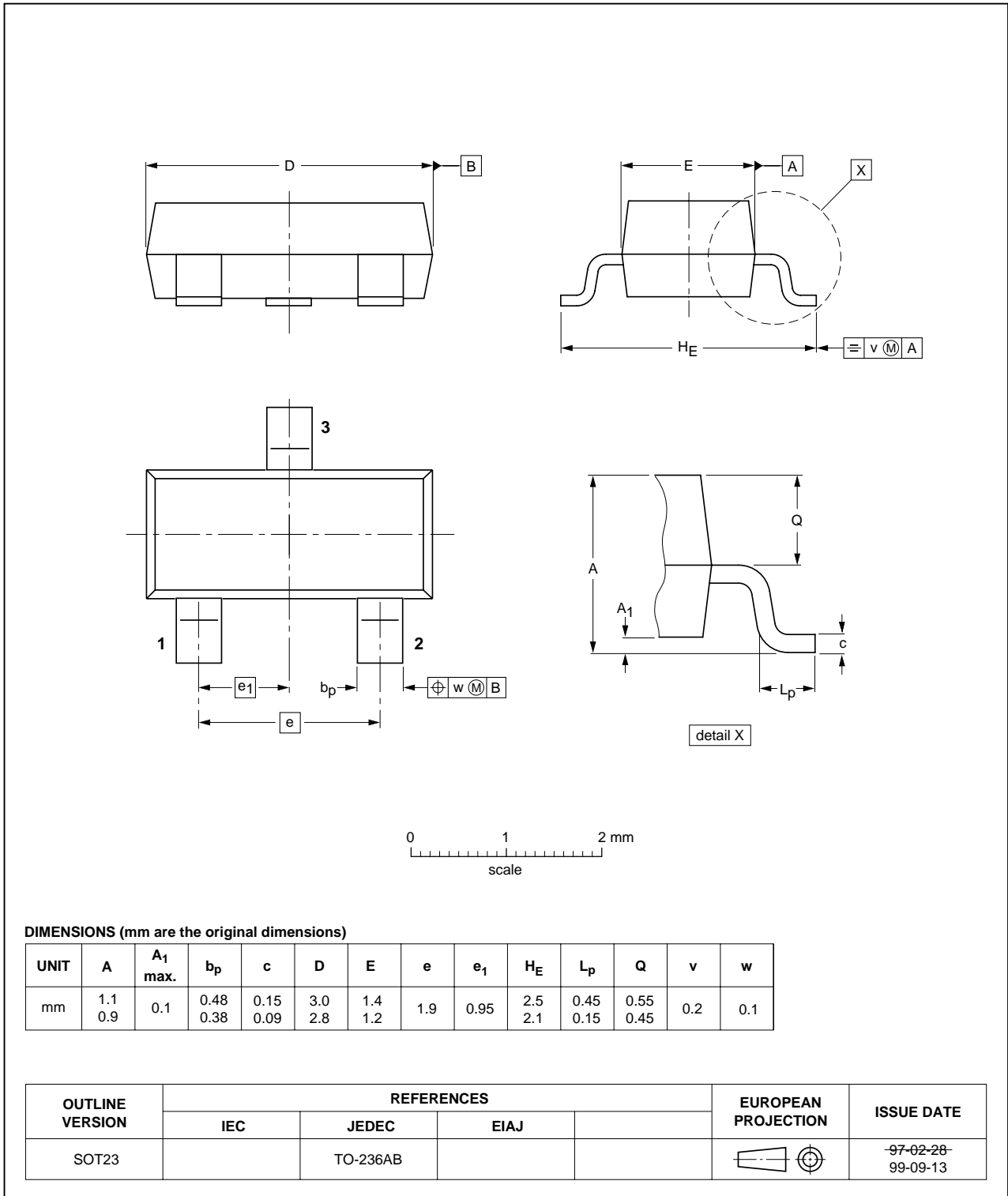


Fig 19. Package outline

## 9. Revision history

**Table 8: Revision history**

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
BF861A_BF861B_BF861C_4	20040924	Product data sheet	-	9397 750 13395	BF861_3
Modifications:					
			<ul style="list-style-type: none"><li>• Converted document to TDM format.</li><li>• Marking code changed and added as <a href="#">Table 4</a>.</li></ul>		
BF861_3	19970904	Product specification	-	9397 750 02667	BF861_2
BF861_2	19950414		-	-	BF861_1
BF861_1	19940829		-	-	-

## 10. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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