# DATA SHEET

# BF861A; BF861B; BF861C
## N-channel junction FETs

Product specification
Supersedes data of 1995 Apr 14
File under Discrete Semiconductors, SC07

1997 Sep 04

Philips
Semiconductors

PHILIPS

# N-channel junction FETs BF861A; BF861B; BF861C

## FEATURES

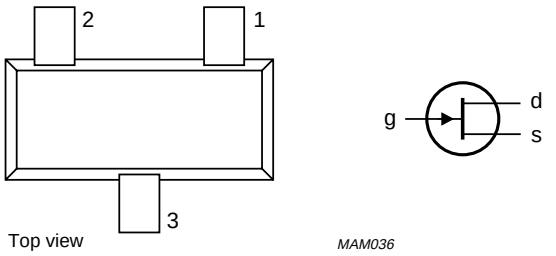
- High transfer admittance
- Low input capacitance
- Low feedback capacitance
- Low noise.

## APPLICATIONS

- Preamplifiers for AM tuners in car radios.

## DESCRIPTION

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




**Marking codes:**
BF861A: M33.
BF861B: M34.
BF861C: M35.

Fig.1 Simplified outline and symbol.

## PINNING - SOT23

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

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

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage (DC) | | – | 25 | V |
| $I_{DSS}$ | drain current | $V_{GS}$ = 0; $V_{DS}$ = 8 V | | | |
| | BF861A | | 2 | 6.5 | mA |
| | BF861B | | 6 | 15 | mA |
| | BF861C | | 12 | 25 | mA |
| $P_{tot}$ | total power dissipation | up to $T_{amb}$ = 25 °C | – | 250 | mW |
| $\|y_{fs}\|$ | forward transfer admittance | $V_{GS}$ = 0; $V_{DS}$ = 8 V | | | |
| | BF861A | | 12 | 20 | mS |
| | BF861B | | 16 | 25 | mS |
| | BF861C | | 20 | 30 | mS |
| $C_{iss}$ | input capacitance | f = 1 MHz | – | 10 | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 1 MHz | – | 2.7 | pF |

**LIMITING VALUES**

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

| 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 |
| $P_{tot}$ | 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.

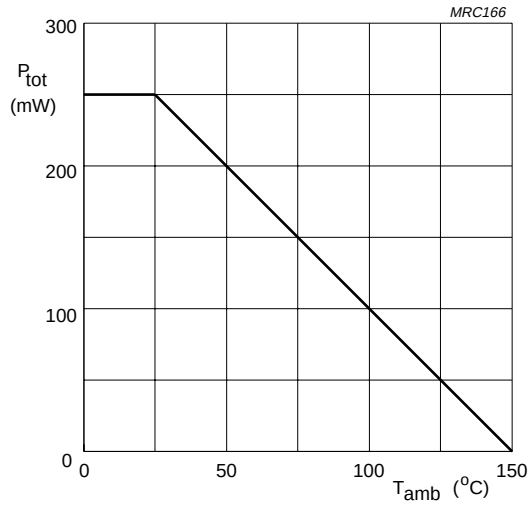



Fig.2 Power derating curve.

## THERMAL CHARACTERISTICS

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

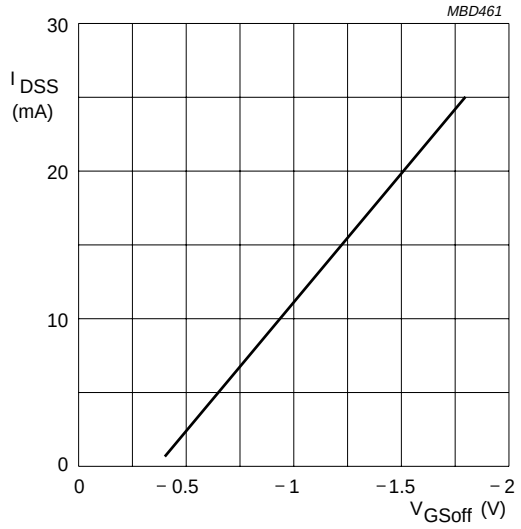
**Note**

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

## CHARACTERISTICS

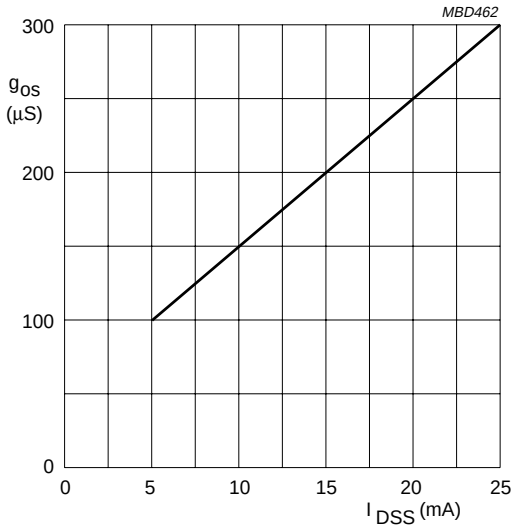
$T_j$ = 25 °C; $V_{DS}$ = 8 V; $V_{GS}$ = 0; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V_{(BR)GSS}$ | gate-source breakdown voltage | $I_G$ = −1 μA | −25 | – | – | V |
| $V_{GSoff}$ | gate-source cut-off voltage | $I_D$ = 1 μA | | | | |
| | BF861A | | −0.2 | – | −1 | V |
| | BF861B | | −0.5 | – | −1.5 | V |
| | BF861C | | −0.8 | – | −2 | V |
| $V_{GSS}$ | gate-source forward voltage | $V_{DS}$ = 0; $I_G$ = 1 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 V; $V_{DS}$ = 0 | – | – | −1 | nA |
| $\lvert y_{fs} \rvert$ | forward transfer admittance | | | | | |
| | BF861A | | 12 | – | 20 | mS |
| | BF861B | | 16 | – | 25 | mS |
| | BF861C | | 20 | – | 30 | mS |
| $g_{os}$ | common source output conductance | | | | | |
| | BF861A | | – | – | 200 | μS |
| | BF861B | | – | – | 250 | μS |
| | BF861C | | – | – | 300 | μS |
| $C_{iss}$ | input capacitance | f = 1 MHz | – | – | 10 | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 1 MHz | – | 2.1 | 2.7 | pF |
| $V_n/\sqrt{B}$ | equivalent input noise voltage | $V_{GS}$ = 0; f = 1 MHz | – | 1.5 | – | nV/√Hz |



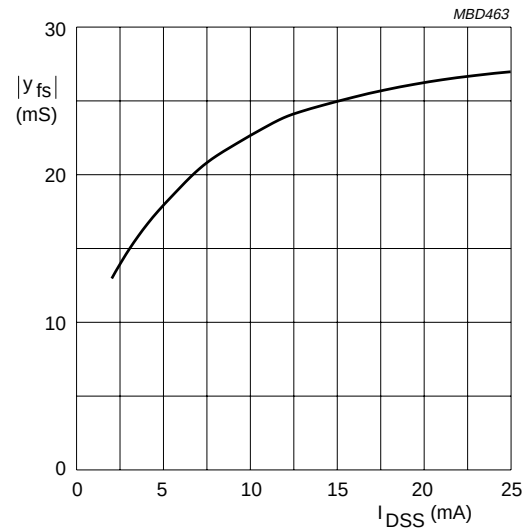

$V_{DS}$ = 8 V.

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



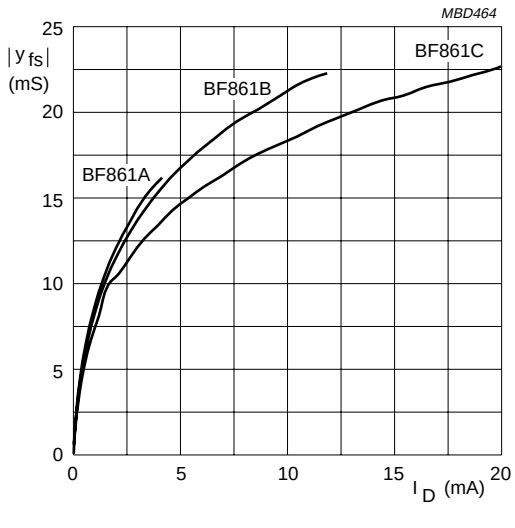

$V_{DS}$ = 8 V.
$V_{GS}$ = 0.

Fig.4 Common-source output conductance as a function of drain current; typical values.



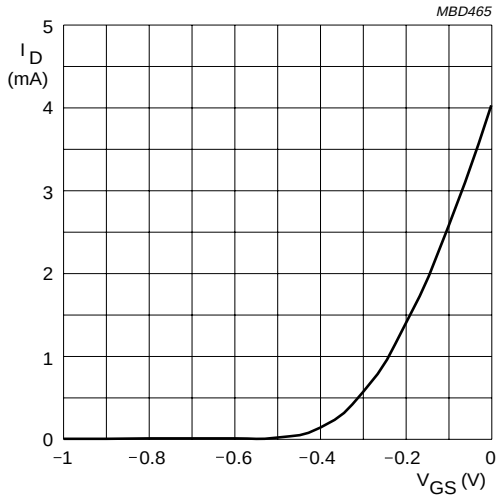

$V_{DS}$ = 8 V.
$V_{GS}$ = 0.

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




$V_{DS}$ = 8 V.

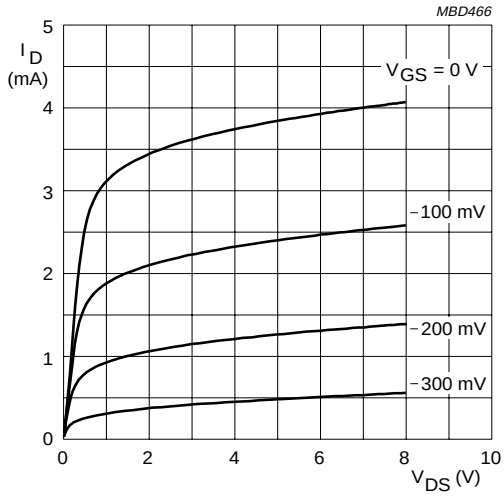
Fig.6 Forward transfer admittance as a function of drain current; typical values.




**BF861A**

$V_{DS}$ = 8 V.

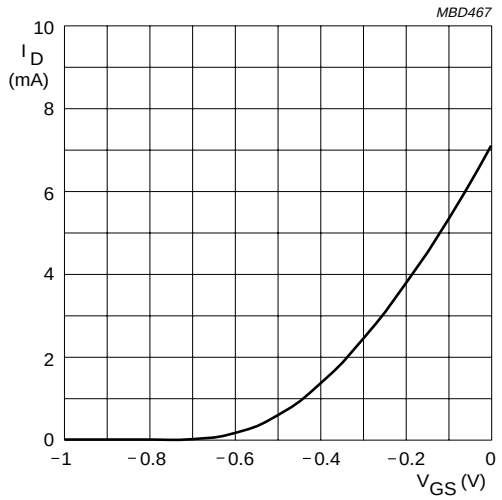
Fig.7 Typical input characteristics.




**BF861A**

$V_{DS}$ = 8 V.

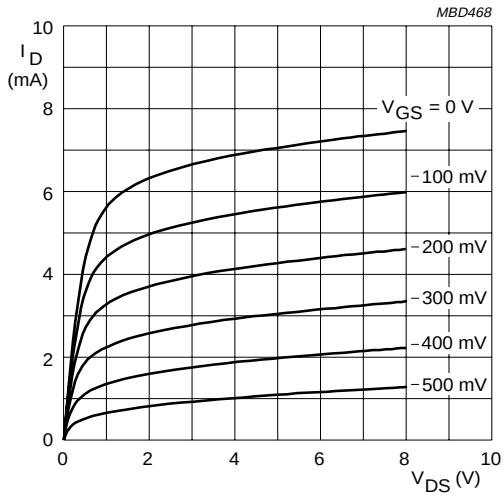
Fig.8 Typical output characteristics.




**BF861B**

$V_{DS}$ = 8 V.

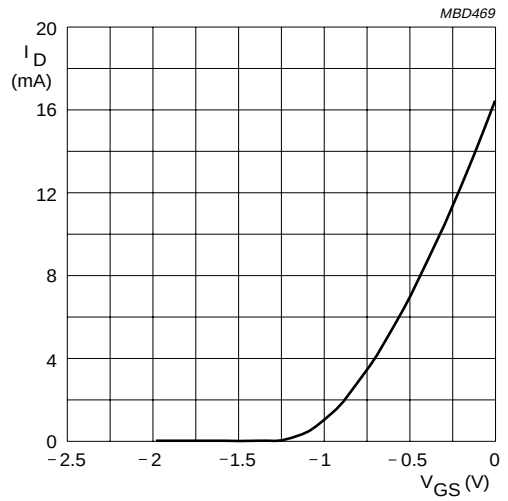
Fig.9 Typical input characteristics.




**BF861B**

$V_{DS}$ = 8 V.

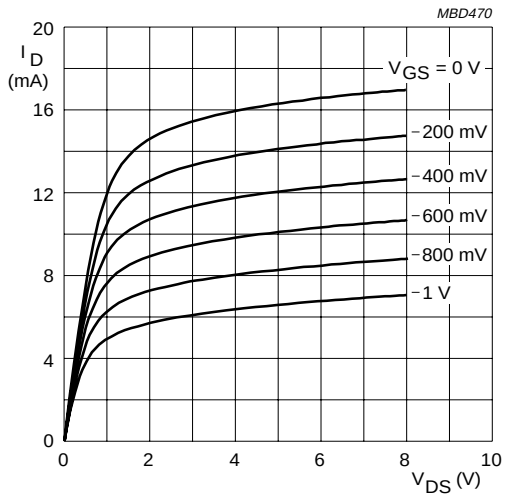
Fig.10 Typical output characteristics.




**BF861C**

$V_{DS}$ = 8 V.

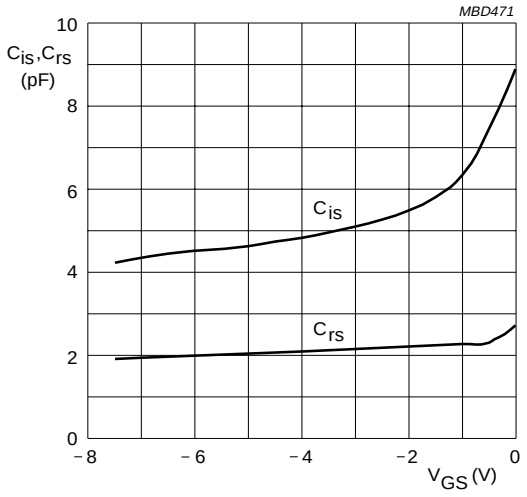
Fig.11 Typical input characteristics.




**BF861C**

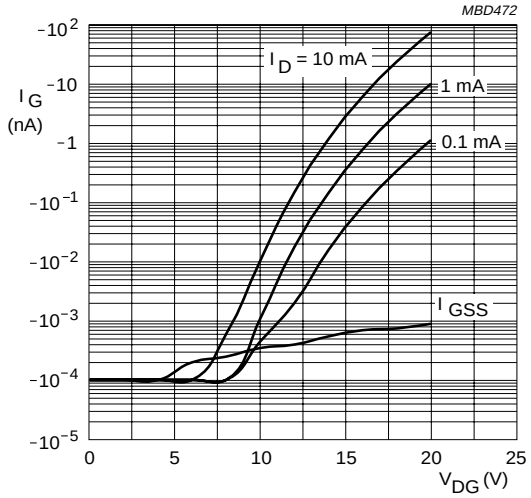
$V_{DS}$ = 8 V.

Fig.12 Typical output characteristics.



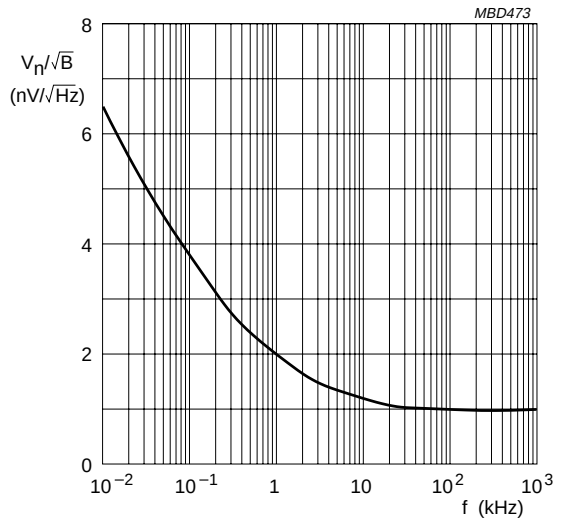

$V_{DS}$ = 8 V.
f = 1 MHz.

Fig.13 Input and reverse transfer capacitance as functions of gate-source voltage; typical values.



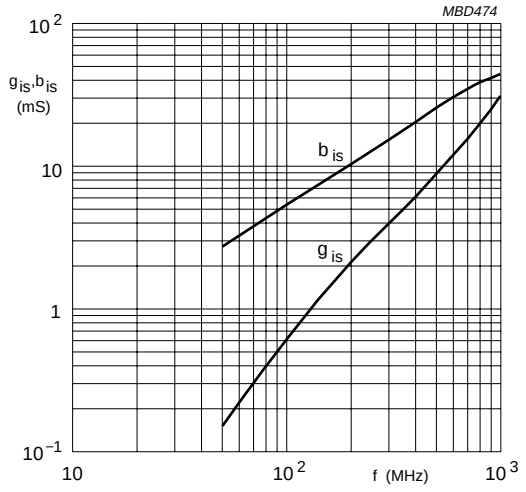

$V_{DS}$ = 8 V.

Fig.14 Gate current as a function of drain-gate voltage; typical values.



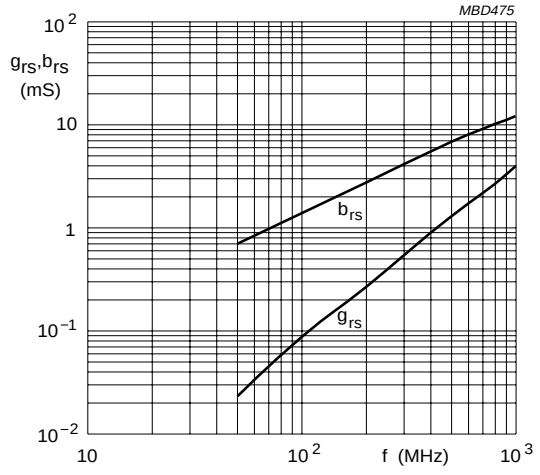

$V_{DS}$ = 8 V.
$V_{GS}$ = 0.

Fig.15 Equivalent input noise as a function of frequency; typical values.



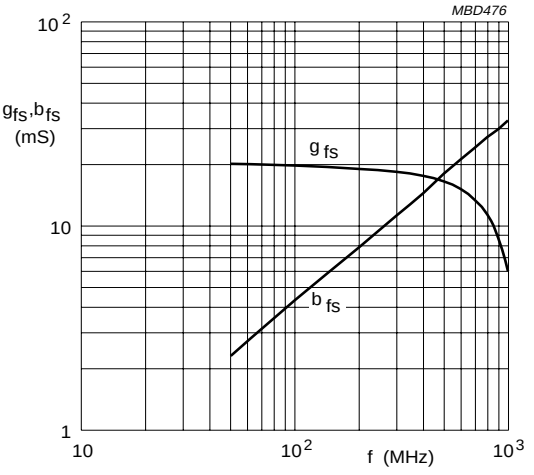

$V_{DS}$ = 8 V.
$V_{GS}$ = 0.
$T_{amb}$ = 25 °C.

Fig.16 Common-source input admittance; typical values.



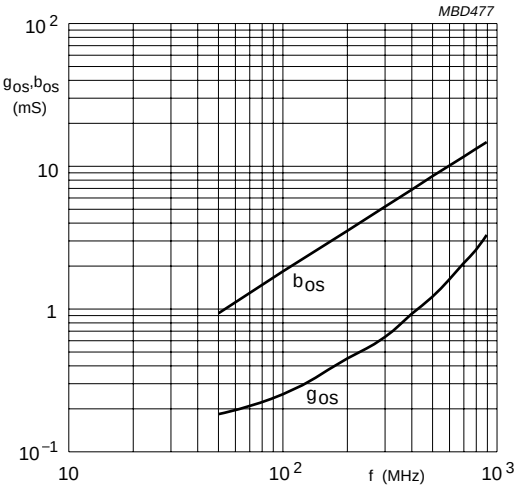

$V_{DS}$ = 8 V.
$V_{GS}$ = 0.
$T_{amb}$ = 25 °C.

Fig.17 Common-source reverse admittance; typical values.




$V_{DS}$ = 8 V.
$V_{GS}$ = 0.
$T_{amb}$ = 25 °C.

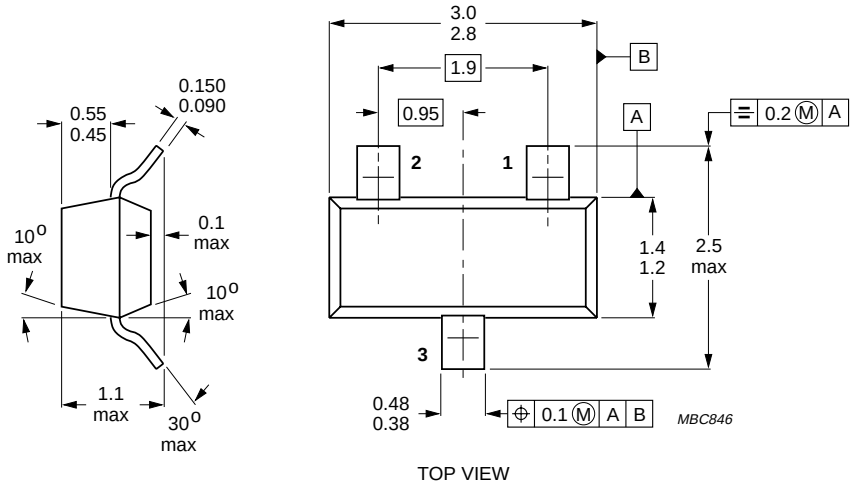
Fig.18 Common-source forward transfer admittance; typical values.




$V_{DS}$ = 8 V.
$V_{GS}$ = 0.
$T_{amb}$ = 25 °C.

Fig.19 Common-source output admittance; typical values.

**PACKAGE OUTLINE**




Dimensions in mm.

Fig.20 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. | |
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| Where application information is given, it is advisory and does not form part of the specification. | |

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