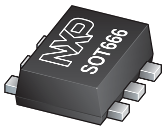



# BF1206F

## Dual N-channel dual gate MOSFET

**Rev. 2 — 7 September 2011** **Product data sheet**

## 1. Product profile

### 1.1 General description

The BF1206F is a combination of two different dual gate MOSFET amplifiers with shared source and gate2 leads.

The source and substrate are interconnected. Internal bias circuits enable Direct Current (DC) stabilization and a very good cross-modulation performance during Automatic Gain Control (AGC). Integrated diodes between the gates and source protect against excessive input voltage surges. The transistor is encapsulated in a SOT666 micro-miniature plastic package.

**CAUTION**

This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features and benefits

- Two low noise gain controlled amplifiers in a single package
- Superior cross-modulation performance during AGC
- High forward transfer admittance
- High forward transfer admittance to input capacitance ratio
- Suited for 3 volt applications

### 1.3 Applications

- Gain controlled low noise amplifiers for Very High Frequency (VHF) and Ultra High Frequency (UHF) applications with 3 V supply voltage, such as digital and analog television tuners

### 1.4 Quick reference data

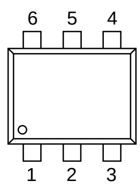
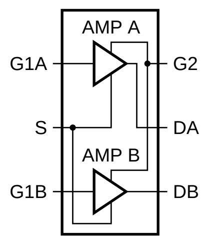
**Table 1. Quick reference data**

*Per MOSFET unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage (DC) | | - | - | 6 | V |
| $I_D$ | drain current (DC) | | - | - | 30 | mA |
| $\|y_{fs}\|$ | forward transfer admittance | $I_D$ = 4 mA | | | | |
| | | amplifier A | 17 | 22 | 32 | mS |
| | | amplifier B | 17 | 22 | 32 | mS |
| $C_{iss(G1)}$ | input capacitance at gate1 | $I_D$ = 4 mA; f = 100 MHz | | | | |
| | | amplifier A | - | 2.4 | 2.9 | pF |
| | | amplifier B | - | 1.7 | 2.2 | pF |
| NF | noise figure | $I_D$ = 4 mA | | | | |
| | | amplifier A; f = 400 MHz | - | 1.0 | 1.6 | dB |
| | | amplifier B; f = 800 MHz | - | 1.0 | 1.6 | dB |
| Xmod | cross modulation | input level for k = 1 % at 40 dB AGC | | | | |
| | | amplifier A | 92 | 97 | - | dBμV |
| | | amplifier B | 93 | 98 | - | dBμV |

## 2. Pinning information

**Table 2. Discrete pinning**

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| 1 | gate1 (AMP A) |   |   |
| 2 | source | | |
| 3 | gate1 (AMP B) | | |
| 4 | drain (AMP B) | | |
| 5 | drain (AMP A) | | |
| 6 | gate2 | | |

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BF1206F | - | plastic surface mounted package; 6 leads | SOT666 |

## 4. Marking

**Table 4. Marking**

| Type number | Marking code |
|---|---|
| BF1206F | 2N |

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| **Per MOSFET** | | | | | |
| $V_{DS}$ | drain-source voltage (DC) | | - | 6 | V |
| $I_D$ | drain current (DC) | | - | 30 | mA |
| $I_{G1}$ | gate1 current | | - | ±10 | mA |
| $I_{G2}$ | gate2 current | | - | ±10 | mA |
| $P_{tot}$ | total power dissipation | $T_{sp} \leq 107$ °C [1] | - | 180 | mW |
| $T_{stg}$ | storage temperature | | −65 | +150 | °C |
| $T_j$ | junction temperature | | - | 150 | °C |

[1] $T_{sp}$ is the temperature at the solder point of the source lead.

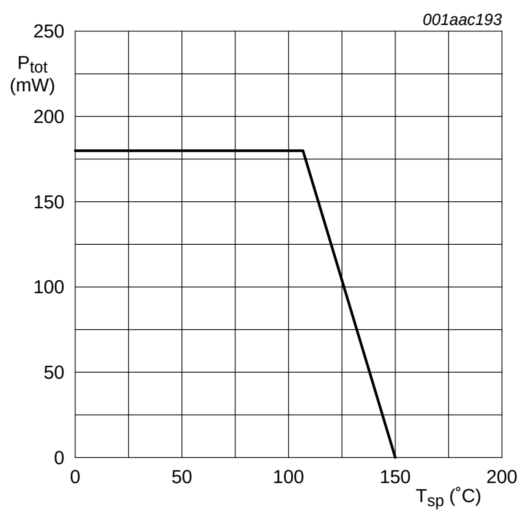



**Fig 1. Power derating curve**

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | Typ | Unit |
|---|---|---|---|---|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | 240 | K/W |

# 7. Static characteristics

**Table 7. Static characteristics**
*$T_j$ = 25 °C.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per MOSFET; unless otherwise specified** | | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{G1-S} = V_{G2-S} = 0$ V; $I_D = 10$ μA | | | | | |
| | | amplifier A | | 6 | - | - | V |
| | | amplifier B | | 6 | - | - | V |
| $V_{(BR)G1-SS}$ | gate1-source breakdown voltage | $V_{GS} = V_{DS} = 0$ V; $I_{G1-S} = 10$ mA | | 6 | - | 10 | V |
| $V_{(BR)G2-SS}$ | gate2-source breakdown voltage | $V_{GS} = V_{DS} = 0$ V; $I_{G2-S} = 10$ mA | | 6 | - | 10 | V |
| $V_{F(S-G1)}$ | forward source-gate1 voltage | $V_{G2-S} = V_{DS} = 0$ V; $I_{S-G1} = 10$ mA | | 0.5 | - | 1.5 | V |
| $V_{F(S-G2)}$ | forward source-gate2 voltage | $V_{G1-S} = V_{DS} = 0$ V; $I_{S-G2} = 10$ mA | | 0.5 | - | 1.5 | V |
| $V_{G1-S(th)}$ | gate1-source threshold voltage | $V_{DS} = 5$ V; $V_{G2-S} = 4$ V; $I_D = 100$ μA | | 0.3 | - | 1.0 | V |
| $V_{G2-S(th)}$ | gate2-source threshold voltage | $V_{DS} = 5$ V; $V_{G1-S} = 5$ V; $I_D = 100$ μA | | 0.35 | - | 1.0 | V |
| $I_{DSX}$ | drain cut-off current | $V_{G2-S} = 2.5$ V; $V_{DS} = 2.8$ V | [1] | | | | |
| | | amplifier A; $R_{G1} = 270$ kΩ | | 3 | - | 6.5 | mA |
| | | amplifier B; $R_{G1} = 220$ kΩ | | 3 | - | 6.5 | mA |
| $I_{G1-S}$ | gate1 cut-off current | $V_{G1-S} = 5$ V; $V_{G2-S} = V_{DS} = 0$ V | | | | | |
| | | amplifier A | | - | - | 50 | nA |
| | | amplifier B | | - | - | 50 | nA |
| $I_{G2-S}$ | gate2 cut-off current | $V_{G2-S} = 5$ V; $V_{G1-S} = V_{DS} = 0$ V; | | - | - | 20 | nA |

[1] $R_{G1}$ connects gate 1 to $V_{GG} = 2.8$ V.

# 8. Dynamic characteristics

## 8.1 Dynamic characteristics for amplifier A

**Table 8. Dynamic characteristics for amplifier A**
*Common source; $T_{amb}$ = 25 °C; $V_{G2-S}$ = 2.5 V; $V_{DS}$ = 2.8 V; $I_D$ = 4 mA.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $\lvert y_{fs} \rvert$ | forward transfer admittance | $T_j = 25$ °C | | 17 | 22 | 32 | mS |
| $C_{iss(G1)}$ | input capacitance at gate1 | f = 100 MHz | [1] | - | 2.4 | 2.9 | pF |
| $C_{iss(G2)}$ | input capacitance at gate2 | f = 100 MHz | [1] | - | 3.2 | - | pF |
| $C_{oss}$ | output capacitance | f = 100 MHz | [1] | - | 1.1 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 100 MHz | [1] | - | 15 | 30 | fF |
| $G_{tr}$ | transducer power gain | $B_S = B_{S(opt)}$; $B_L = B_{L(opt)}$ | [1] | | | | |
| | | f = 200 MHz; $G_S = 2$ mS; $G_L = 0.5$ mS | | - | 31 | - | dB |
| | | f = 400 MHz; $G_S = 2$ mS; $G_L = 1$ mS | | - | 28 | - | dB |
| | | f = 800 MHz; $G_S = 3.3$ mS; $G_L = 1$ mS | | - | 23 | - | dB |
| NF | noise figure | f = 11 MHz; $G_S = 20$ mS; $B_S = 0$ | | - | 3.5 | - | dB |
| | | f = 400 MHz; $Y_S = Y_{S(opt)}$ | | - | 1.0 | 1.6 | dB |
| | | f = 800 MHz; $Y_S = Y_{S(opt)}$ | | - | 1.1 | 1.7 | dB |

**Table 8. Dynamic characteristics for amplifier A** *…continued*

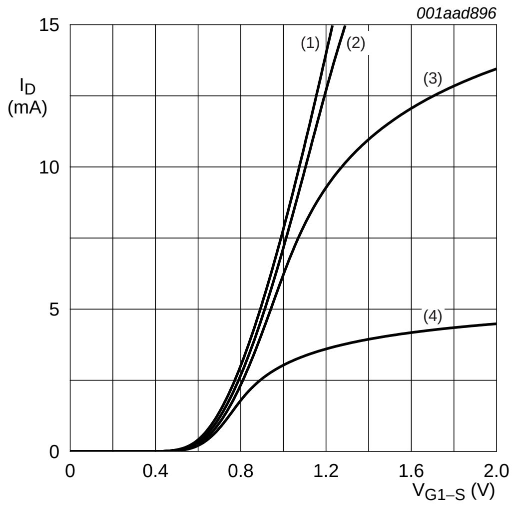
*Common source; $T_{amb}$ = 25 °C; $V_{G2-S}$ = 2.5 V; $V_{DS}$ = 2.8 V; $I_D$ = 4 mA.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Xmod | cross modulation | input level for k = 1 %; $f_w$ = 50 MHz; $f_{unw}$ = 60 MHz | [2] | | | | |
| | | at 0 dB AGC | | 88 | - | - | dBμV |
| | | at 10 dB AGC | | - | 85 | - | dBμV |
| | | at 40 dB AGC | | 92 | 97 | - | dBμV |

[1] Calculated from measured S-parameters.

[2] Measured in Figure 32 test circuit.

### 8.1.1 Graphs for amplifier A




(1) $V_{G2-S}$ = 2.5 V.

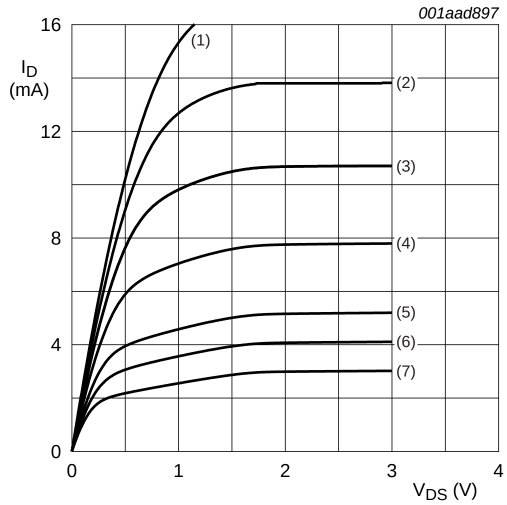
(2) $V_{G2-S}$ = 2.0 V.

(3) $V_{G2-S}$ = 1.5 V.

(4) $V_{G2-S}$ = 1.0 V.

$V_{DS(A)}$ = 2.8 V; $T_j$ = 25 °C.

**Fig 2. Amplifier A: transfer characteristics; typical values**




(1) $V_{G1-S(A)}$ = 1.4 V.

(2) $V_{G1-S(A)}$ = 1.3 V.

(3) $V_{G1-S(A)}$ = 1.2 V.

(4) $V_{G1-S(A)}$ = 1.0 V.

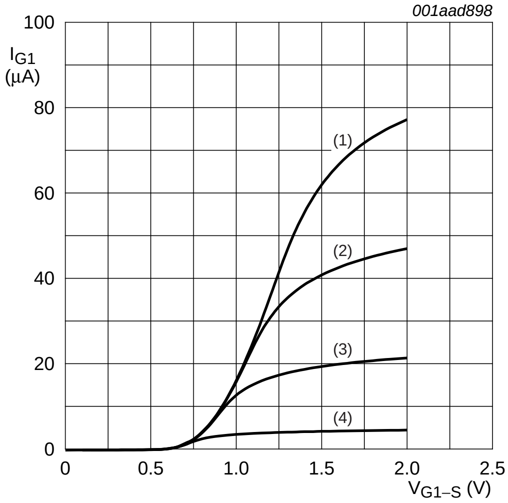
(5) $V_{G1-S(A)}$ = 0.9 V.

(6) $V_{G1-S(A)}$ = 0.85 V.

(7) $V_{G1-S(A)}$ = 0.8 V.

$V_{G2-S}$ = 2.5 V; $T_j$ = 25 °C.

**Fig 3. Amplifier A: output characteristics; typical values**




(1) $V_{G2\text{-}S}$ = 2.5 V.

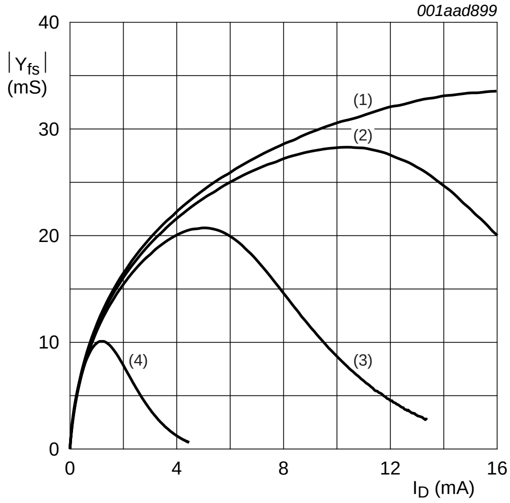
(2) $V_{G2\text{-}S}$ = 2.0 V.

(3) $V_{G2\text{-}S}$ = 1.5 V.

(4) $V_{G2\text{-}S}$ = 1.0 V.

$V_{DS(A)}$ = 2.8 V; $T_j$ = 25 °C.

**Fig 4. Amplifier A: gate1 current as a function of gate1 voltage; typical values**




(1) $V_{G2\text{-}S}$ = 2.5 V.

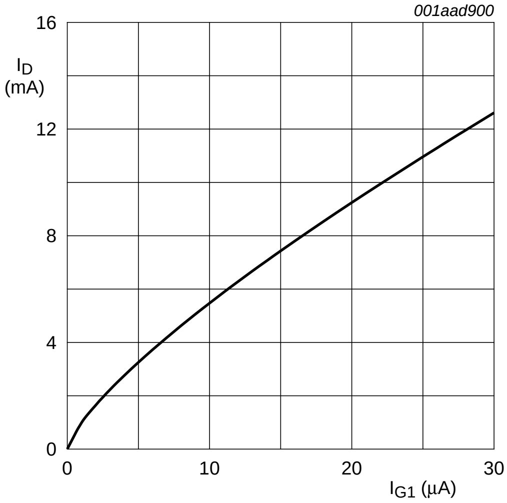
(2) $V_{G2\text{-}S}$ = 2.0 V.

(3) $V_{G2\text{-}S}$ = 1.5 V.

(4) $V_{G2\text{-}S}$ = 1.0 V.

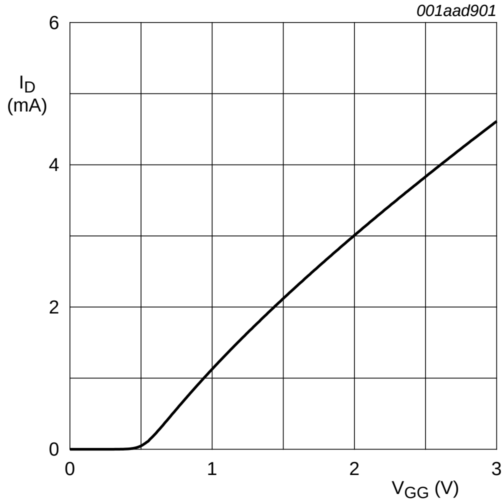
$V_{DS(A)}$ = 2.8 V; $T_j$ = 25 °C.

**Fig 5. Amplifier A: forward transfer admittance as a function of drain current; typical values**



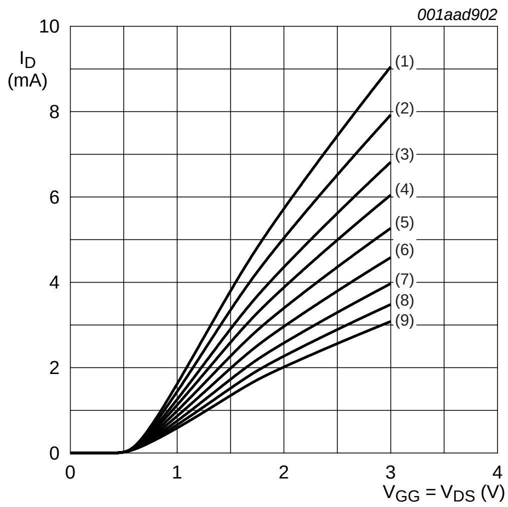

$V_{DS(A)}$ = 2.8 V; $V_{G2\text{-}S}$ = 2.5 V, $T_{amb}$ = 25 °C.

**Fig 6. Amplifier A: drain current as a function of gate1 current; typical values**




$V_{DS(A)}$ = 2.8 V; $V_{G2}$ = 2.5 V; $R_{G1(A)}$ = 270 kΩ; see Figure 32.

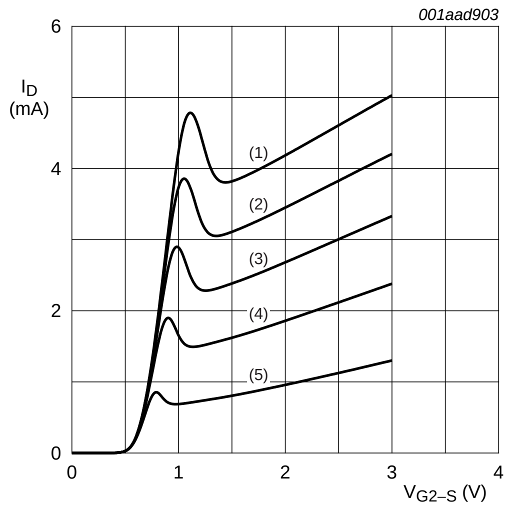
**Fig 7. Amplifier A: drain current as a function of gate1 supply voltage (=$V_{GG}$); typical values**




(1) $R_{G1}$ = 100 kΩ.
(2) $R_{G1}$ = 120 kΩ.
(3) $R_{G1}$ = 150 kΩ.
(4) $R_{G1}$ = 180 kΩ.
(5) $R_{G1}$ = 220 kΩ.
(6) $R_{G1}$ = 270 kΩ.
(7) $R_{G1}$ = 330 kΩ.
(8) $R_{G1}$ = 390 kΩ.
(9) $R_{G1}$ = 470 kΩ.

$V_{G2\text{-}S}$ = 2.5 V; $T_j$ = 25 °C; see Figure 32.

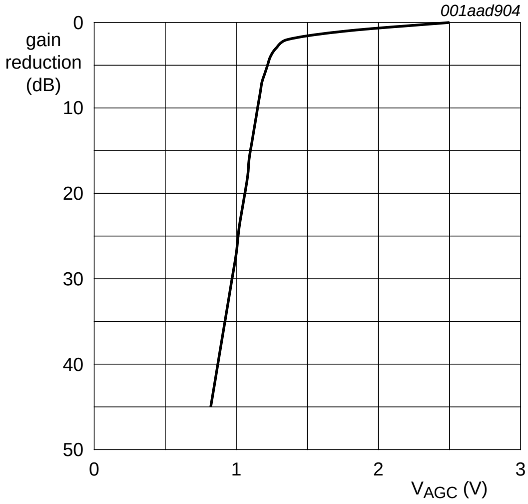
**Fig 8. Amplifier A: drain current as a function of $V_{DS}$ and $V_{GG}$; typical values**




(1) $V_{GG}$ = 1.0 V
(2) $V_{GG}$ = 1.5 V
(3) $V_{GG}$ = 2.0 V
(4) $V_{GG}$ = 2.5 V
(5) $V_{GG}$ = 3.0 V

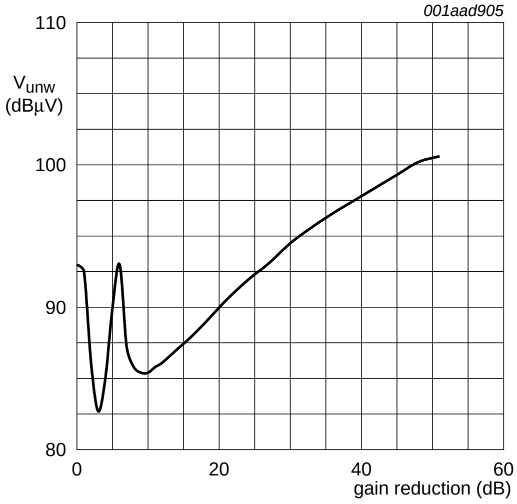
$T_j$ = 25 °C; $R_{G1(A)}$ = 270 kΩ (connected to $V_{GG}$); see Figure 32.

**Fig 9. Amplifier A: drain current as a function of gate2 voltage; typical values**



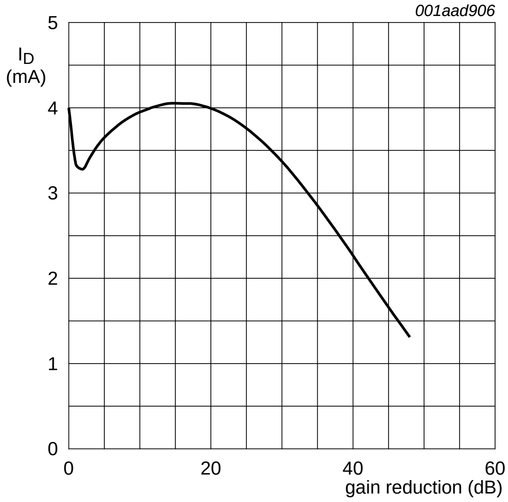

$V_{DS(A)}$ = 2.8 V; $V_{GG}$ = 2.8 V; $I_{D(nom)}$ = 4 mA; $T_{amb}$ = 25 °C.

**Fig 10. Amplifier A: typical gain reduction as a function of the AGC voltage; typical values**



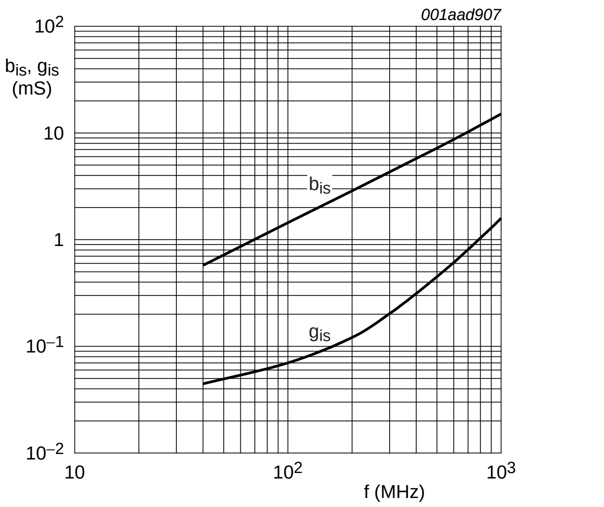

$V_{DS(A)}$ = 2.8 V; $V_{GG}$ = 2.8 V; $V_{G2(nom)}$ = 2.5 V; $f_w$ = 50 MHz; $f_{unw}$ = 60 MHz; $I_{D(nom)}$ = 4 mA; $T_{amb}$ = 25 °C.

**Fig 11. Amplifier A: unwanted voltage for 1 % cross-modulation as a function of gain reduction; typical values**



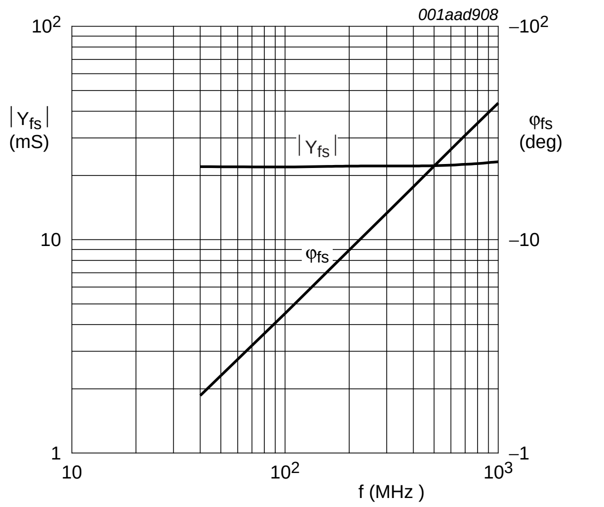

$V_{DS(A)}$ = 2.8 V; $V_{GG}$ = 2.8 V; $V_{G2(nom)}$ = 2.5 V; $R_{G1(A)}$ = 270 kΩ; f = 50 MHz; $T_{amb}$ = 25 °C.

**Fig 12. Amplifier A: typical drain current as a function of gain reduction; typical values**



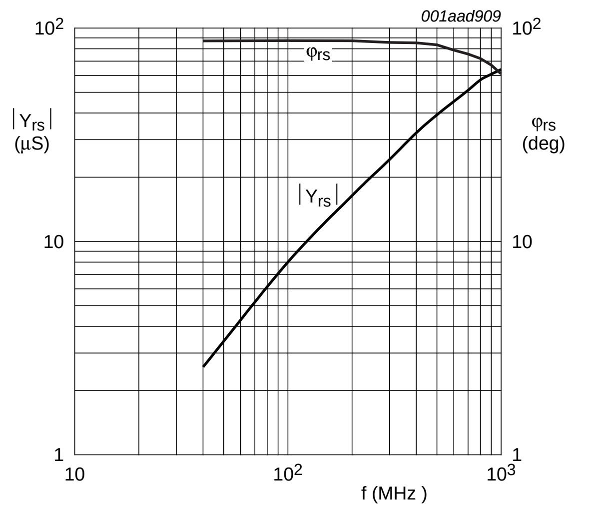

$V_{DS(A)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(B)}$ = 0 V; $I_{D(A)}$ = 4 mA.

**Fig 13. Amplifier A: input admittance and phase as a function of frequency; typical values**



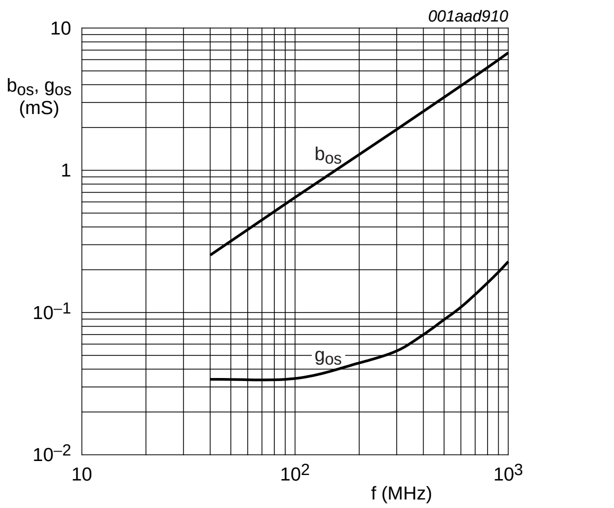

$V_{DS(A)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(B)}$ = 0 V; $I_{D(A)}$ = 4 mA.

**Fig 14. Amplifier A: forward transfer admittance and phase as a function of frequency; typical values**




$V_{DS(A)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(B)}$ = 0 V; $I_{D(A)}$ = 4 mA.

**Fig 15. Amplifier A: reverse transfer admittance and phase as a function of frequency: typical values**




$V_{DS(A)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(B)}$ = 0 V; $I_{D(A)}$ = 4 mA.

**Fig 16. Amplifier A: output admittance and phase as a function of frequency; typical values**

### 8.1.2 Scattering parameters for amplifier A

**Table 9. Scattering parameters for amplifier A**

*$V_{DS(A)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $I_{D(A)}$ = 4 mA; $V_{DS(B)}$ = 0 V; $V_{G1-S(B)}$ = 0 V; $T_{amb}$ = 25 °C; typical values.*

| f (MHz) | $s_{11}$ | | $s_{21}$ | | $s_{12}$ | | $s_{22}$ | |
|---|---|---|---|---|---|---|---|---|
| | Magnitude (ratio) | Angle (deg) | Magnitude (ratio) | Angle (deg) | Magnitude (ratio) | Angle (deg) | Magnitude (ratio) | Angle (deg) |
| 50 | 0.9923 | −4.11 | 2.18 | 174.68 | 0.00038 | 102.27 | 0.995 | −1.83 |
| 100 | 0.9930 | −8.29 | 2.18 | 169.51 | 0.00080 | 85.65 | 0.996 | −3.75 |
| 200 | 0.9877 | −16.41 | 2.16 | 159.20 | 0.00161 | 80.93 | 0.995 | −7.49 |
| 300 | 0.9802 | −24.48 | 2.12 | 149.04 | 0.00233 | 76.76 | 0.994 | −11.22 |
| 400 | 0.9705 | −32.34 | 2.07 | 138.99 | 0.00303 | 73.21 | 0.992 | −14.96 |
| 500 | 0.9596 | −39.91 | 2.01 | 129.15 | 0.00354 | 69.83 | 0.989 | −18.68 |
| 600 | 0.9483 | −47.34 | 1.94 | 119.45 | 0.00394 | 67.19 | 0.987 | −22.39 |
| 700 | 0.9361 | −54.59 | 1.87 | 109.95 | 0.00426 | 65.26 | 0.984 | −26.11 |
| 800 | 0.9239 | −61.64 | 1.79 | 100.69 | 0.00453 | 63.89 | 0.981 | −29.82 |
| 900 | 0.9129 | −68.28 | 1.72 | 91.66 | 0.00457 | 64.06 | 0.979 | −33.57 |
| 1000 | 0.9018 | −74.57 | 1.64 | 82.86 | 0.00456 | 65.60 | 0.976 | −37.31 |

## 8.2 Noise data for amplifier A

**Table 10. Noise data for amplifier A**

*$V_{DS(A)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $I_{D(A)}$ = 4 mA.*

| f (MHz) | $NF_{min}$ (dB) | $\Gamma_{opt}$ | | $r_n$ (ratio) |
|---|---|---|---|---|
| | | ratio | (deg) | |
| 400 | 1.0 | 0.78 | 26 | 0.84 |
| 800 | 1.1 | 0.87 | 53 | 0.87 |

## 8.3 Dynamic characteristics for amplifier B

**Table 11. Dynamic characteristics for amplifier B**

*Common source; $T_{amb}$ = 25 °C; $V_{G2-S}$ = 2.5 V; $V_{DS}$ = 2.8 V; $I_D$ = 4 mA.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $\|y_{fs}\|$ | forward transfer admittance | $T_j$ = 25 °C | | - | 22 | - | mS |
| $C_{iss(G1)}$ | input capacitance at gate1 | f = 100 MHz | [1] | - | 1.7 | 2.2 | pF |
| $C_{iss(G2)}$ | input capacitance at gate2 | f = 100 MHz | [1] | - | 4.0 | - | pF |
| $C_{oss}$ | output capacitance | f = 100 MHz | [1] | - | 0.85 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 100 MHz | [1] | - | 30 | 45 | fF |
| $G_{tr}$ | transducer power gain | $B_S = B_{S(opt)}$; $B_L = B_{L(opt)}$ | [1] | | | | |
| | | f = 200 MHz; $G_S$ = 2 mS; $G_L$ = 0.5 mS | | - | 32 | - | dB |
| | | f = 400 MHz; $G_S$ = 2 mS; $G_L$ = 1 mS | | - | 29 | - | dB |
| | | f = 800 MHz; $G_S$ = 3.3 mS; $G_L$ = 1 mS | | - | 25 | - | dB |
| NF | noise figure | f = 11 MHz; $G_S$ = 20 mS; $B_S$ = 0 | | - | 4.5 | - | dB |
| | | f = 400 MHz; $Y_S = Y_{S(opt)}$ | | - | 0.9 | 1.5 | dB |
| | | f = 800 MHz; $Y_S = Y_{S(opt)}$ | | - | 1.0 | 1.6 | dB |

**Table 11. Dynamic characteristics for amplifier B** *...continued*

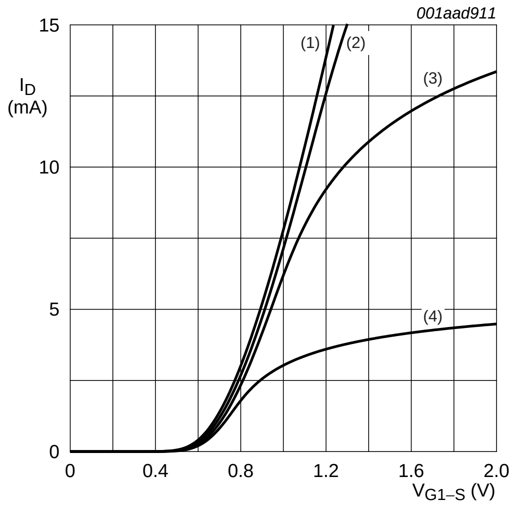
*Common source; $T_{amb}$ = 25 °C; $V_{G2\text{-}S}$ = 2.5 V; $V_{DS}$ = 2.8 V; $I_D$ = 4 mA.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Xmod | cross modulation | input level for k = 1 %; $f_w$ = 50 MHz; $f_{unw}$ = 60 MHz [2] | | | | |
| | | at 0 dB AGC | 89 | - | - | dBμV |
| | | at 10 dB AGC | - | 85 | - | dBμV |
| | | at 40 dB AGC | 93 | 98 | - | dBμV |

[1] Calculated from measured S-parameters.

[2] Measured in Figure 32 test circuit.

### 8.3.1 Graphs for amplifier B




(1) $V_{G2\text{-}S}$ = 2.5 V.

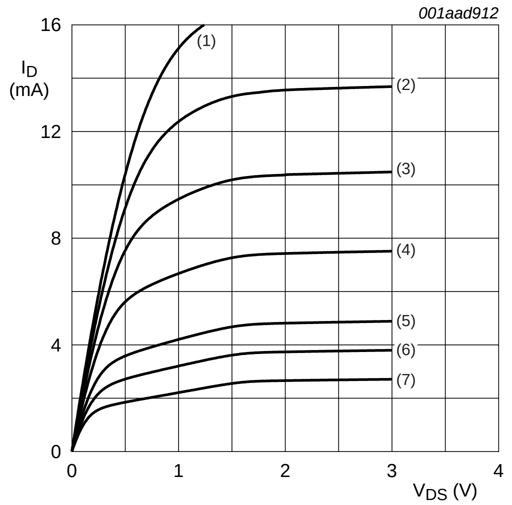
(2) $V_{G2\text{-}S}$ = 2.0 V.

(3) $V_{G2\text{-}S}$ = 1.5 V.

(4) $V_{G2\text{-}S}$ = 1.0 V.

$V_{DS(B)}$ = 2.8 V; $T_j$ = 25 °C.

**Fig 17. Amplifier B: transfer characteristics; typical values**




(1) $V_{G1\text{-}S(B)}$ = 1.3 V.

(2) $V_{G1\text{-}S(B)}$ = 1.2 V.

(3) $V_{G1\text{-}S(B)}$ = 1.1 V.

(4) $V_{G1\text{-}S(B)}$ = 1.0 V.

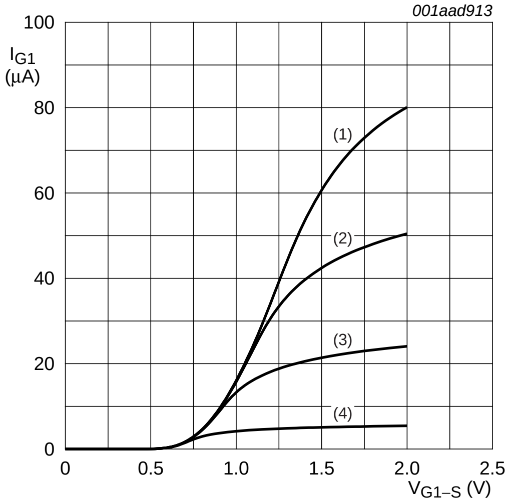
(5) $V_{G1\text{-}S(B)}$ = 0.9 V.

(6) $V_{G1\text{-}S(B)}$ = 0.85 V.

(7) $V_{G1\text{-}S(B)}$ = 0.8 V.

$V_{G2\text{-}S}$ = 2.5 V; $T_j$ = 25 °C.

**Fig 18. Amplifier B: output characteristics; typical values**




(1) $V_{G2\text{-}S}$ = 2.5 V.

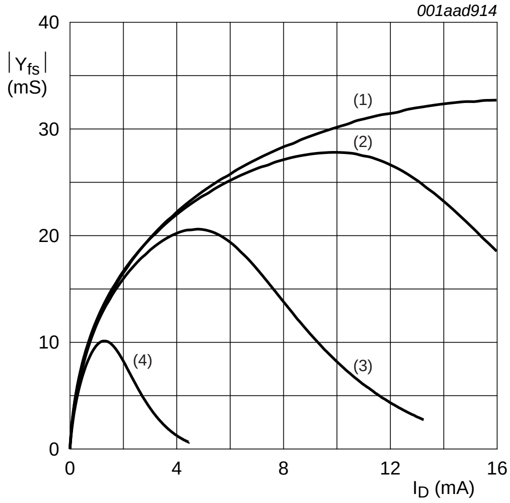
(2) $V_{G2\text{-}S}$ = 2.0 V.

(3) $V_{G2\text{-}S}$ = 1.5 V.

(4) $V_{G2\text{-}S}$ = 1.0 V.

$V_{DS(B)}$ = 2.8 V; $T_j$ = 25 °C.

**Fig 19. Amplifier B: gate1 current as a function of gate1 voltage; typical values**




(1) $V_{G2\text{-}S}$ = 2.5 V.

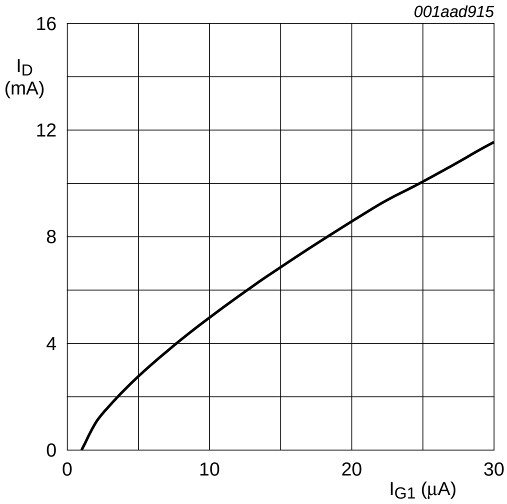
(2) $V_{G2\text{-}S}$ = 2.0 V.

(3) $V_{G2\text{-}S}$ = 1.5 V.

(4) $V_{G2\text{-}S}$ = 1.0 V.

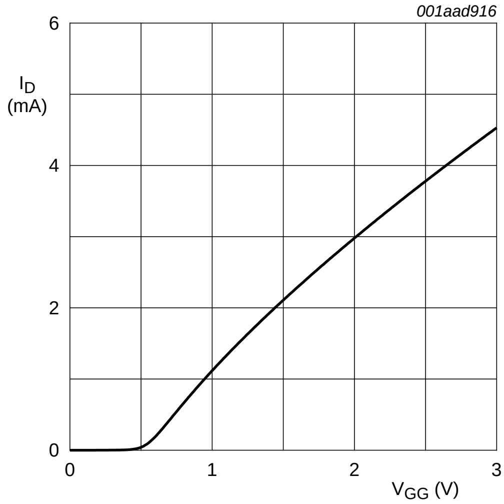
$V_{DS(B)}$ = 2.8 V; $T_j$ = 25 °C.

**Fig 20. Amplifier B: forward transfer admittance as a function of drain current; typical values**



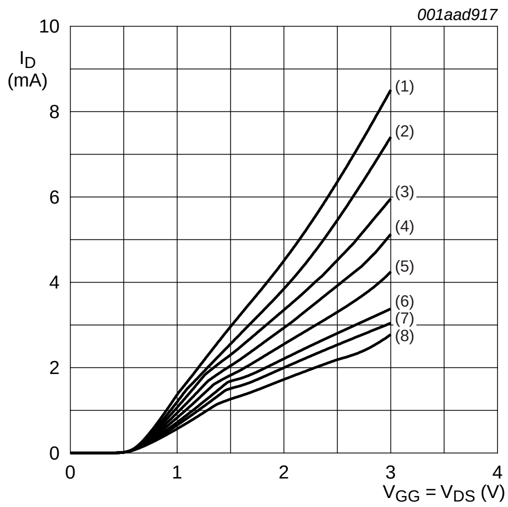

$V_{DS(B)}$ = 2.8 V; $V_{G2\text{-}S}$ = 2.5 V, $T_{amb}$ = 25 °C.

**Fig 21. Amplifier B: drain current as a function of gate1 current; typical values**




$V_{DS(B)}$ = 2.8 V; $V_{G2\text{-}S}$ = 2.5 V; $R_{G1(B)}$ = 220 kΩ; see Figure 32.

**Fig 22. Amplifier B: drain voltage as a function of gate1 supply voltage (=$V_{GG}$); typical values**




(1) $R_{G1} = 120\ k\Omega$.

(2) $R_{G1} = 150\ k\Omega$.

(3) $R_{G1} = 180\ k\Omega$.

(4) $R_{G1} = 220\ k\Omega$.

(5) $R_{G1} = 270\ k\Omega$.

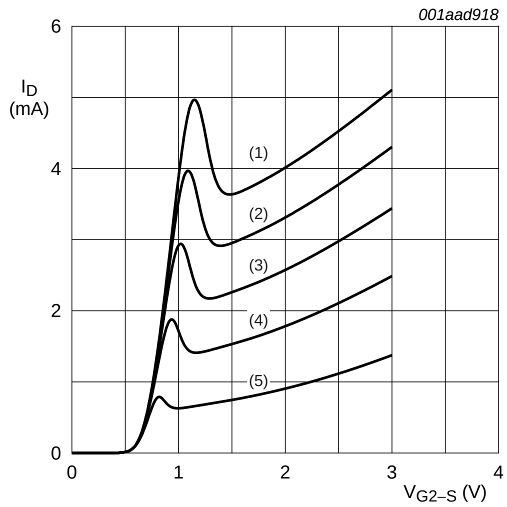
(6) $R_{G1} = 330\ k\Omega$.

(7) $R_{G1} = 390\ k\Omega$.

(8) $R_{G1} = 470\ k\Omega$.

$V_{G2\text{-}S} = 2.5$ V; $R_{G1(B)}$ connected to $V_{GG}$; see Figure 32.

**Fig 23. Amplifier B: drain current as a function of $V_{DS}$ and $V_{GG}$; typical values**




(1) $V_{GG} = 3.0$ V.

(2) $V_{GG} = 2.5$ V.

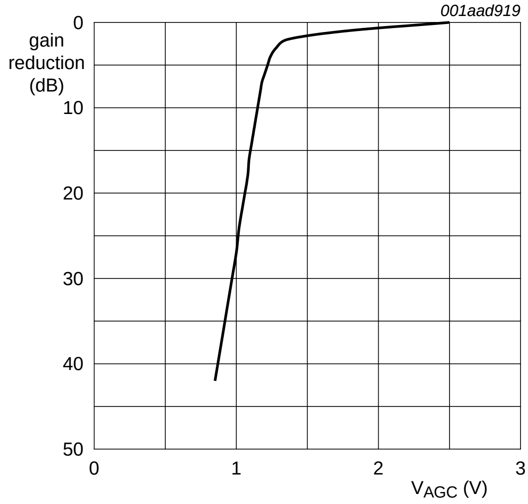
(3) $V_{GG} = 2.0$ V.

(4) $V_{GG} = 1.5$ V.

(5) $V_{GG} = 1.0$ V.

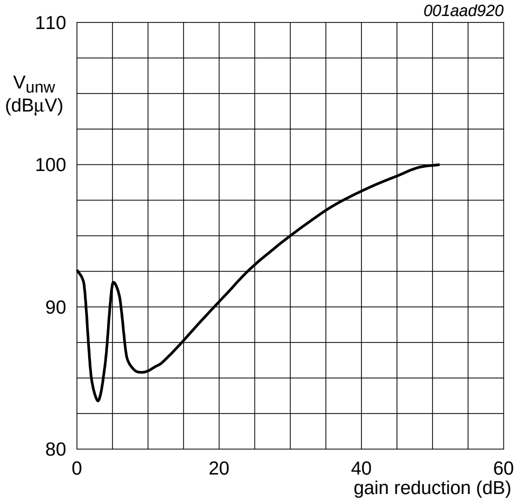
$R_{G1(B)} = 220\ k\Omega$; $T_j = 25$ °C; see Figure 32.

**Fig 24. Amplifier B: drain current as a function of gate2 voltage; typical values**



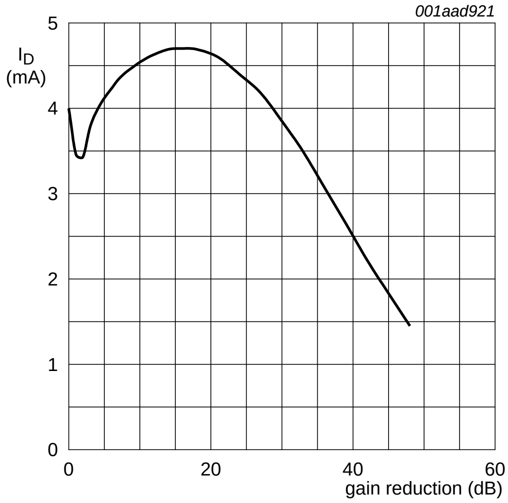

$V_{DS(A)} = 2.8$ V; $V_{G2(nom)} = 2.5$ V; $I_{D(nom)} = 4$ mA; $T_{amb} = 25$ °C.

**Fig 25. Amplifier B: typical gain reduction as a function of the AGC voltage; typical values**



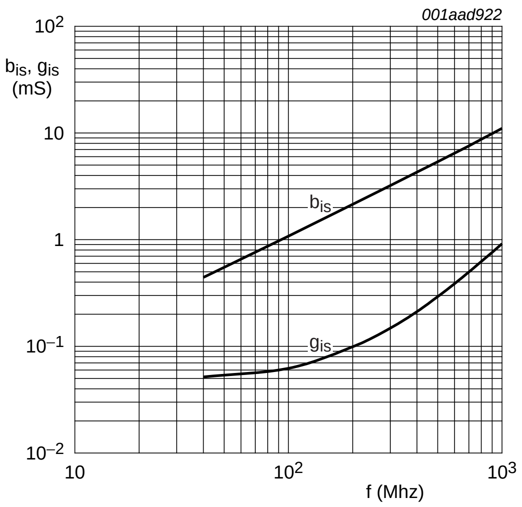

$V_{DS(B)} = 2.8$ V; $V_{G2} = 2.5$ V; $I_{D(nom)} = 4$ mA; $f_w = 50$ MHz; $f_{unw} = 60$ MHz; $T_{amb} = 25$ °C.

**Fig 26. Amplifier B: unwanted voltage for 1 % cross-modulation as a function of gain reduction; typical values**



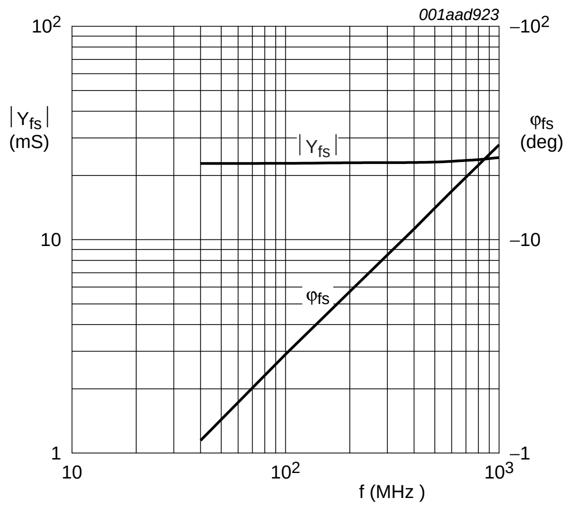

$V_{DS(B)} = V_{GG} = 2.8$ V; $V_{G2(nom)} = 2.5$ V; $R_{G1(B)} = 220$ kW; f = 50 MHz; $T_{amb} = 25$ °C.

**Fig 27. Amplifier B: typical drain current as a function of gain reduction; typical values**



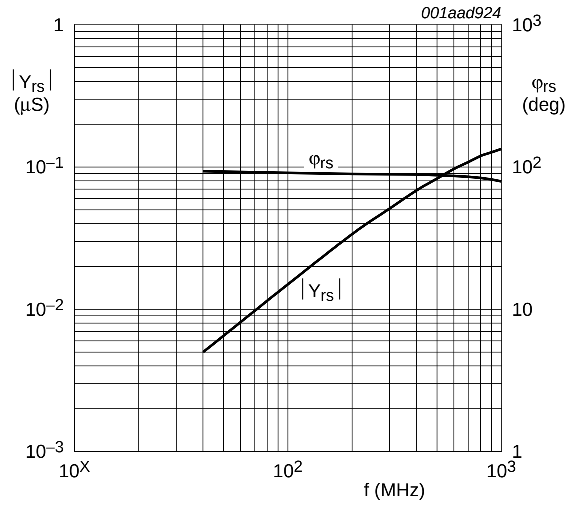

$V_{DS(B)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(A)}$ = 0 V; $I_{D(B)}$ = 4 mA.

**Fig 28. Amplifier B: input admittance and phase as a function of frequency; typical values**



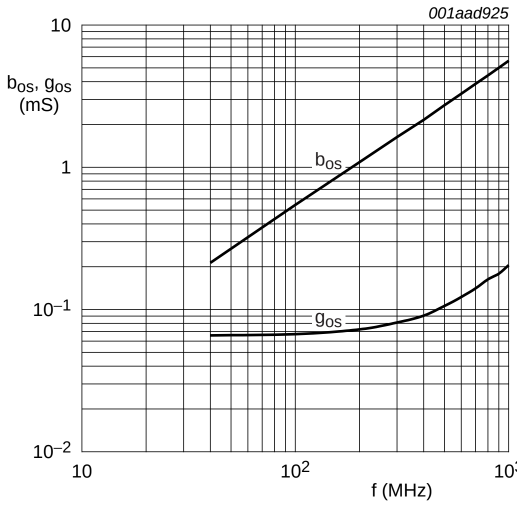

$V_{DS(B)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(A)}$ = 0 V; $I_{D(B)}$ = 4 mA.

**Fig 29. Amplifier B: forward transfer admittance and phase as a function of frequency; typical values**




$V_{DS(B)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(A)}$ = 0 V; $I_{D(B)}$ = 4 mA.

**Fig 30. Amplifier B: reverse transfer admittance and phase as a function of frequency: typical values**




$V_{DS(B)}$ = 2.8 V; $V_{G2-S}$ = 2.5 V; $V_{DS(A)}$ = 0 V; $I_{D(B)}$ = 4 mA.

**Fig 31. Amplifier B: output admittance and phase as a function of frequency; typical values**

### 8.3.2 Scattering parameters for amplifier B

**Table 12. Scattering parameters for amplifier B**

*$V_{DS(B)}$ = 2.8 V; $V_{G2\text{-}S}$ = 2.5 V; $I_{D(B)}$ = 4 mA; $V_{DS(A)}$ = 0 V; $V_{G1\text{-}S(A)}$ = 0 V; $T_{amb}$ = 25 °C; typical values.*

| f (MHz) | $s_{11}$ | | $s_{21}$ | | $s_{12}$ | | $s_{22}$ | |
|---|---|---|---|---|---|---|---|---|
| | Magnitude (ratio) | Angle (deg) | Magnitude (ratio) | Angle (deg) | Magnitude (ratio) | Angle (deg) | Magnitude (ratio) | Angle (deg) |
| 50 | 0.9939 | −3.12 | 2.27 | 176.11 | 0.00089 | 94.68 | 0.993 | −1.62 |
| 100 | 0.9936 | −6.29 | 2.26 | 172.41 | 0.00170 | 84.37 | 0.993 | −3.23 |
| 200 | 0.9896 | −12.47 | 2.25 | 164.98 | 0.00336 | 81.29 | 0.992 | −6.44 |
| 300 | 0.9845 | −18.59 | 2.23 | 157.64 | 0.00503 | 77.17 | 0.990 | −9.65 |
| 400 | 0.9779 | −24.66 | 2.20 | 150.35 | 0.00642 | 73.23 | 0.988 | −12.85 |
| 500 | 0.9703 | −30.55 | 2.16 | 143.16 | 0.00769 | 69.72 | 0.986 | −16.00 |
| 600 | 0.9620 | −36.37 | 2.13 | 136.02 | 0.00873 | 66.28 | 0.983 | −19.18 |
| 700 | 0.9529 | −42.10 | 2.08 | 129.01 | 0.00967 | 63.19 | 0.980 | −22.37 |
| 800 | 0.9439 | −47.79 | 2.04 | 122.01 | 0.01024 | 60.51 | 0.977 | −25.50 |
| 900 | 0.9353 | −53.24 | 1.99 | 115.30 | 0.01058 | 58.52 | 0.975 | −28.66 |
| 1000 | 0.9266 | −58.46 | 1.94 | 108.64 | 0.01074 | 57.24 | 0.973 | −31.85 |

### 8.3.3 Noise data for amplifier B

**Table 13. Noise data for amplifier B**

*$V_{DS(B)}$ = 2.8 V; $V_{G2\text{-}S}$ = 2.5 V; $I_{D(B)}$ = 4 mA.*

| f (MHz) | $NF_{min}$ (dB) | $\Gamma_{opt}$ | | $r_n$ (ratio) |
|---|---|---|---|---|
| | | ratio | (deg) | |
| 400 | 0.9 | 0.8 | 19 | 0.9 |
| 800 | 1.0 | 0.83 | 46 | 0.96 |

## 9. Test information

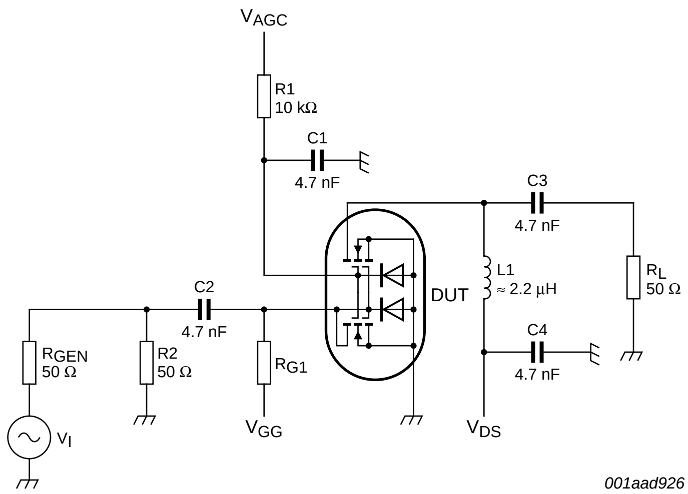
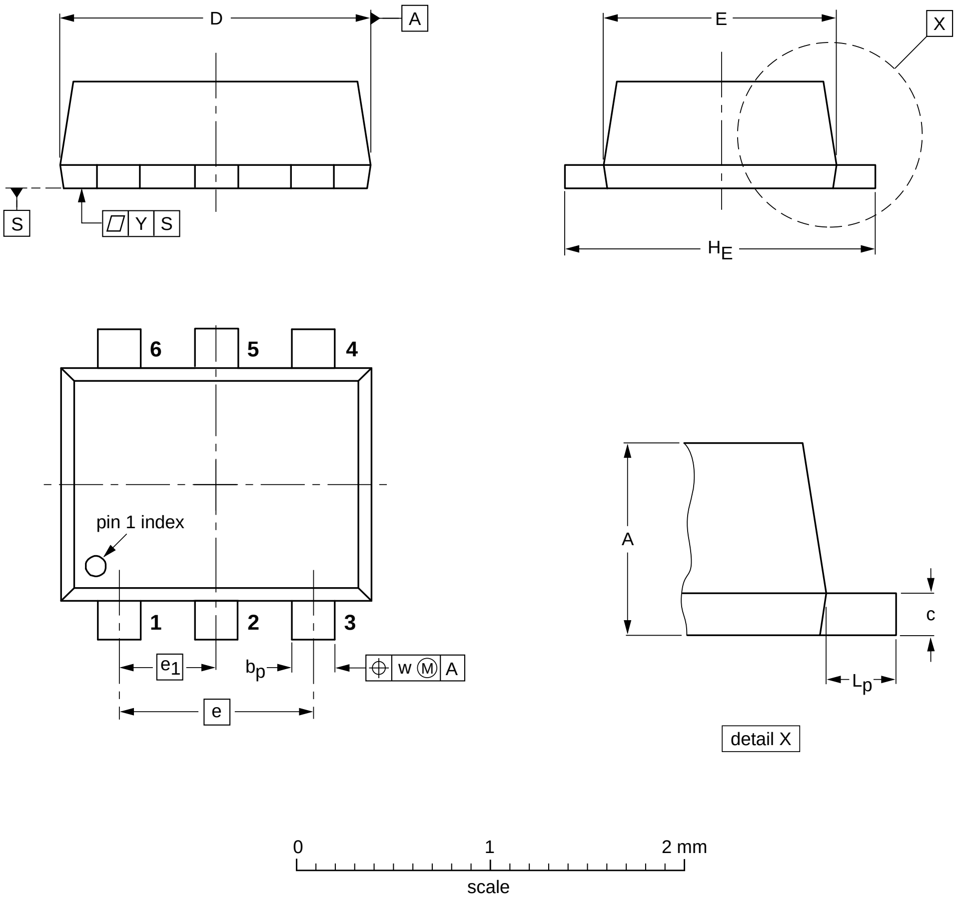



**Fig 32. Cross-modulation test setup (for one MOSFET)**

## 10. Package outline

**Plastic surface-mounted package; 6 leads** **SOT666**




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

| UNIT | A | $b_p$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | w | y |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 0.6<br>0.5 | 0.27<br>0.17 | 0.18<br>0.08 | 1.7<br>1.5 | 1.3<br>1.1 | 1.0 | 0.5 | 1.7<br>1.5 | 0.3<br>0.1 | 0.1 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT666 | | | | | | ~~04-11-08~~<br>06-03-16 |

**Fig 33. Package outline SOT666**

## 11. Revision history

**Table 14. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BF1206F v.2 | 20110907 | Product data sheet | - | BF1206F v.1 |
| 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. | | | |
| BF1206F v.1 | 20060130 | Product data sheet | - | - |

# 12. Legal information

## 12.1 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.

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## 14. Contents





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**Document identifier: BF1206F**