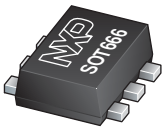



# BF1208

## Dual N-channel dual gate MOSFET

Rev. 2 — 7 September 2011 Product data sheet

## 1. Product profile

### 1.1 General description

The BF1208 is a combination of two dual gate MOSFET amplifiers with shared source and gate2 leads and an integrated switch. The integrated switch is operated by the gate1 bias of amplifier B.

The source and substrate are interconnected. Internal bias circuits enable 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 has 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. One with a fully integrated bias and one with a partly integrated bias
- Internal switch to save external components
- Superior cross-modulation performance during AGC
- High forward transfer admittance
- High forward transfer admittance to input capacitance ratio

### 1.3 Applications

- Gain controlled low noise amplifiers for VHF and UHF applications with 5 V supply voltage
  - digital and analog television tuners
  - professional communication equipment

## 1.4 Quick reference data

**Table 1. Quick reference data**

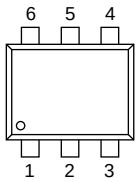
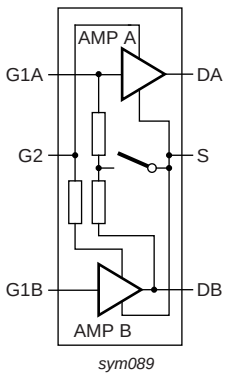
*Per MOSFET unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage (DC) | | | - | - | 6 | V |
| $I_D$ | drain current (DC) | | | - | - | 30 | mA |
| $P_{tot}$ | total power dissipation | $T_{sp} \leq 109$ °C | [1] | - | - | 180 | mW |
| $\|y_{fs}\|$ | forward transfer admittance | f = 1 MHz | | | | | |
| | | amplifier A; $I_D$ = 19 mA | | 26 | 31 | 41 | mS |
| | | amplifier B; $I_D$ = 13 mA | | 28 | 33 | 43 | mS |
| $C_{iss(G1)}$ | input capacitance at gate1 | f = 1 MHz | | | | | |
| | | amplifier A | | - | 2.2 | 2.7 | pF |
| | | amplifier B | | - | 2.0 | 2.5 | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 1 MHz | | - | 20 | - | fF |
| NF | noise figure | amplifier A; f = 400 MHz | | - | 1.3 | 1.9 | dB |
| | | amplifier B; f = 800 MHz | | - | 1.4 | 2.1 | dB |
| Xmod | cross-modulation | input level for k = 1 % at 40 dB AGC | | | | | |
| | | amplifier A | | 100 | 105 | - | dBμV |
| | | amplifier B | | 100 | 103 | - | dBμV |
| $T_j$ | junction temperature | | | - | - | 150 | °C |

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

# 2. Pinning information

**Table 2. Discrete pinning**

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

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BF1208 | - | plastic surface mounted package; 6 leads | SOT666 |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| BF1208 | 2L |

## 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 | $T_{sp} \leq 109$ °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 soldering point of the source lead.

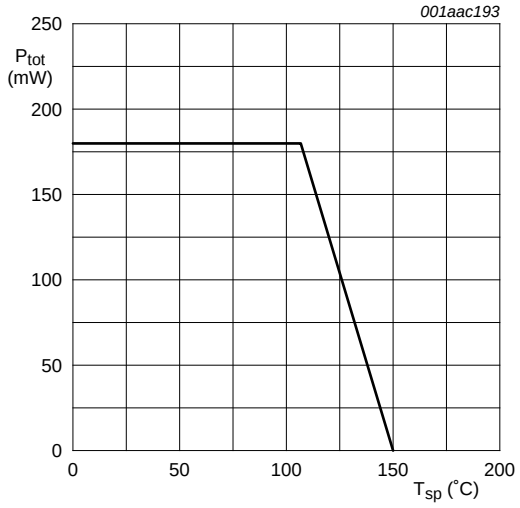



**Fig 1. Power derating curve**

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | Typ | Unit |
|---|---|---|---|---|
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | 225 | K/W |

## 7. Static characteristics

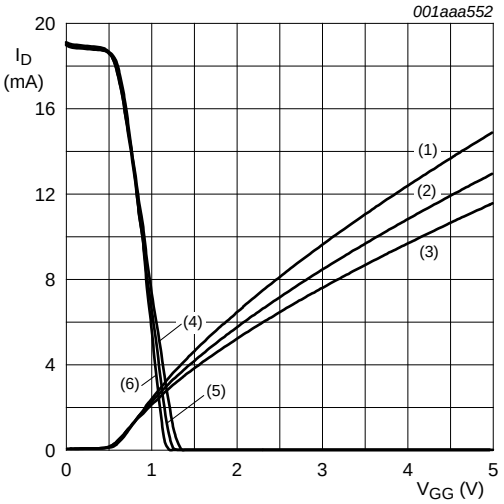
**Table 7. Static characteristics**

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

| 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 | $V_{G2-S}$ = $V_{DS}$ = 0 V; $I_{G1-S}$ = 10 mA | | 6 | - | 10 | V |
| $V_{(BR)G2-SS}$ | gate2-source breakdown voltage | $V_{G1-S}$ = $V_{DS}$ = 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 | | 0.4 | - | 1.0 | V |
| $I_{DSX}$ | drain-source current | $V_{G2-S}$ = 4 V; $V_{DS(B)}$ = 5 V; $R_{G1}$ = 150 kΩ | | | | | |
| | | amplifier A; $V_{DS(A)}$ = 5 V | [1] | 14 | - | 24 | mA |
| | | amplifier B; $V_{DS(B)}$ = 5 V | [2] | 9 | - | 17 | mA |
| $I_{G1-S}$ | gate1 cut-off current | $V_{G2-S}$ = $V_{DS(A)}$ = 0 V | | | | | |
| | | amplifier A; $V_{G1-S(A)}$ = 5 V; $I_{D(B)}$ = 0 A | | - | - | 50 | nA |
| | | amplifier B; $V_{G1-S(B)}$ = 5 V; $V_{DS(B)}$ = 0 V | | - | - | 50 | nA |
| $I_{G2-S}$ | gate2 cut-off current | $V_{G2-S}$ = 4 V; $V_{G1-S(B)}$ = 0 V; $V_{G1-S(A)}$ = $V_{DS(A)}$ = $V_{DS(B)}$ = 0 V | | - | - | 20 | nA |

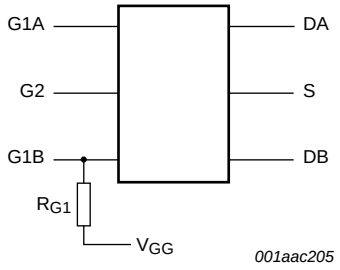
[1] $R_{G1}$ connects gate1 (B) to $V_{GG}$ = 0 V (see Figure 3).

[2] $R_{G1}$ connects gate1 (B) to $V_{GG}$ = 5 V (see Figure 3).




(1) $I_{D(B)}$; $R_{G1}$ = 120 kΩ.
(2) $I_{D(B)}$; $R_{G1}$ = 150 kΩ.
(3) $I_{D(B)}$; $R_{G1}$ = 180 kΩ.
(4) $I_{D(A)}$; $R_{G1}$ = 180 kΩ.
(5) $I_{D(A)}$; $R_{G1}$ = 150 kΩ.
(6) $I_{D(A)}$; $R_{G1}$ = 120 kΩ.

**Fig 2. Drain currents of MOSFET A and B as a function of gate1 supply voltage**




$V_{GG}$ = 5 V: amplifier A is off; amplifier B is on.
$V_{GG}$ = 0 V: amplifier A is on; amplifier B is off.

**Fig 3. Functional diagram**

# 8. Dynamic characteristics

## 8.1 Dynamic characteristics for amplifier A

**Table 8. Dynamic characteristics for amplifier A[1]**

*Common source; $T_{amb}$ = 25 °C; $V_{G2-S}$ = 4 V; $V_{DS}$ = 5 V; $I_D$ = 19 mA; unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $\|y_{fs}\|$ | forward transfer admittance | $T_j$ = 25 °C | 26 | 31 | 41 | mS |
| $C_{iss(G1)}$ | input capacitance at gate1 | f = 1 MHz | - | 2.2 | 2.7 | pF |
| $C_{iss(G2)}$ | input capacitance at gate2 | f = 1 MHz | - | 3.0 | - | pF |
| $C_{oss}$ | output capacitance | f = 1 MHz | - | 0.9 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 1 MHz | - | 20 | - | fF |
| $G_{tr}$ | power gain | $B_S = B_{S(opt)}$; $B_L = B_{L(opt)}$ | | | | |
| | | f = 200 MHz; $G_S$ = 2 mS; $G_L$ = 0.5 mS | 32 | 36 | 40 | dB |
| | | f = 400 MHz; $G_S$ = 2 mS; $G_L$ = 1 mS | 28 | 32 | 36 | dB |
| | | f = 800 MHz; $G_S$ = 3.3 mS; $G_L$ = 1 mS | 23 | 27 | 32 | dB |
| NF | noise figure | f = 11 MHz; $G_S$ = 20 mS; $B_S$ = 0 S | - | 3.0 | - | dB |
| | | f = 400 MHz; $Y_S = Y_{S(opt)}$ | - | 1.3 | 1.9 | dB |
| | | f = 800 MHz; $Y_S = Y_{S(opt)}$ | - | 1.4 | 2.1 | dB |

**Table 8. Dynamic characteristics for amplifier A[1] *...continued***

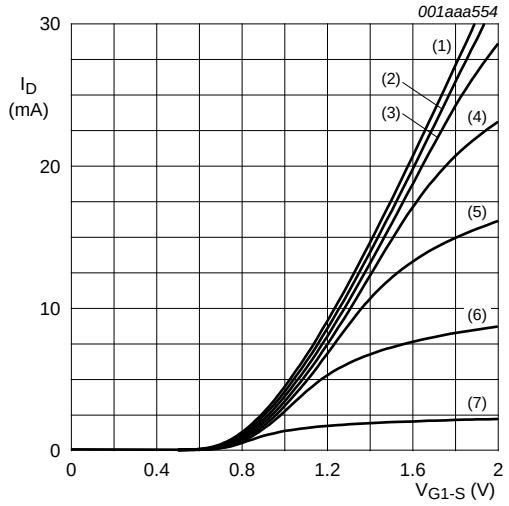
*Common source; $T_{amb}$ = 25 °C; $V_{G2-S}$ = 4 V; $V_{DS}$ = 5 V; $I_D$ = 19 mA; unless otherwise specified.*

| 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 | | 90 | - | - | dBμV |
| | | at 10 dB AGC | | - | 90 | - | dBμV |
| | | at 20 dB AGC | | - | 99 | - | dBμV |
| | | at 40 dB AGC | | 100 | 105 | - | dBμV |

[1] For the MOSFET not in use: $V_{G1-S(B)}$ = 0 V; $V_{DS(B)}$ = 0 V.

[2] Measured in Figure 33 test circuit.

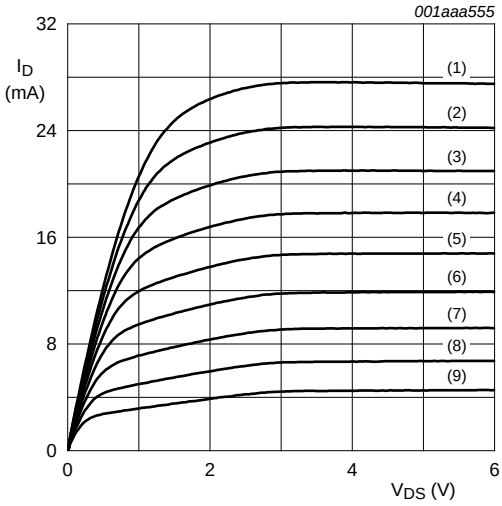
### 8.1.1 Graphics for amplifier A




(1) $V_{G2-S}$ = 4 V.
(2) $V_{G2-S}$ = 3.5 V.
(3) $V_{G2-S}$ = 3 V.
(4) $V_{G2-S}$ = 2.5 V.
(5) $V_{G2-S}$ = 2 V.
(6) $V_{G2-S}$ = 1.5 V.
(7) $V_{G2-S}$ = 1 V.

$V_{DS(A)}$ = 5 V; $V_{G1-S(B)}$ = $V_{DS(B)}$ = 0 V; $T_j$ = 25 °C.

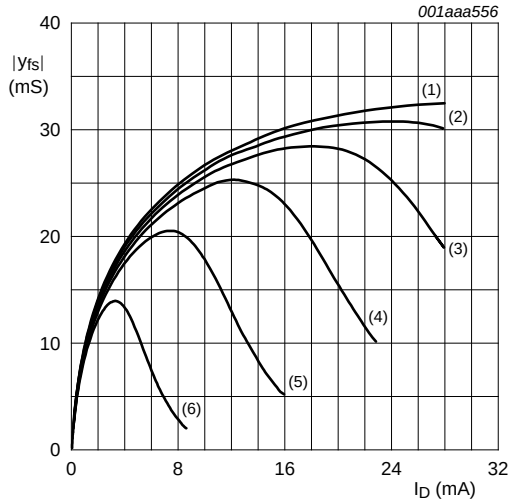
**Fig 4. Amplifier A: transfer characteristics; typical values**




(1) $V_{G1-S(A)}$ = 1.8 V.
(2) $V_{G1-S(A)}$ = 1.7 V.
(3) $V_{G1-S(A)}$ = 1.6 V.
(4) $V_{G1-S(A)}$ = 1.5 V.
(5) $V_{G1-S(A)}$ = 1.4 V.
(6) $V_{G1-S(A)}$ = 1.3 V.
(7) $V_{G1-S(A)}$ = 1.2 V.
(8) $V_{G1-S(A)}$ = 1.1 V.
(9) $V_{G1-S(A)}$ = 1 V.

$V_{G2-S}$ = 4 V; $V_{G1-S(B)}$ = $V_{DS(B)}$ = 0 V; $T_j$ = 25 °C.

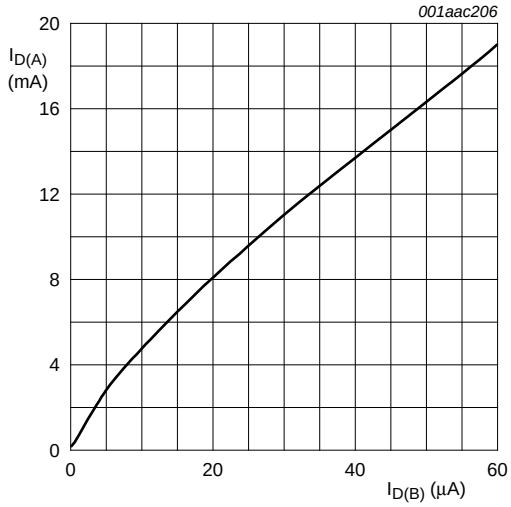
**Fig 5. Amplifier A: output characteristics; typical values**




(1) $V_{G2\text{-}S}$ = 4 V.
(2) $V_{G2\text{-}S}$ = 3.5 V.
(3) $V_{G2\text{-}S}$ = 3 V.
(4) $V_{G2\text{-}S}$ = 2.5 V.
(5) $V_{G2\text{-}S}$ = 2 V.
(6) $V_{G2\text{-}S}$ = 1.5 V.

$V_{DS(A)}$ = 5 V; $V_{G1\text{-}S(B)}$ = $V_{DS(B)}$ = 0 V; $T_j$ = 25 °C.

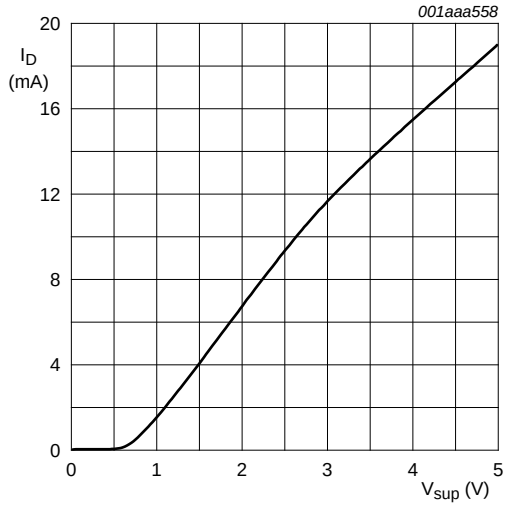
**Fig 6. Amplifier A: forward transfer admittance as a function of drain current; typical values**




$V_{DS(A)}$ = 5 V; $V_{G2\text{-}S}$ = 4 V; $V_{DS(B)}$ = 5 V; $V_{G1\text{-}S(B)}$ = 0 V; $T_j$ = 25 °C.

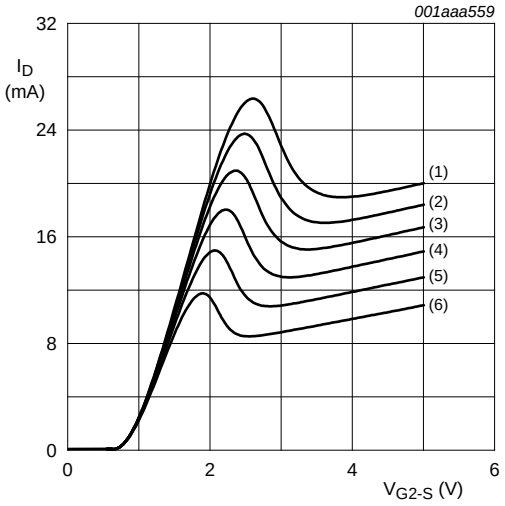
$I_{D(B)}$ = internal G1 current = current in pin drain (B) if MOSFET (B) is switched off.

**Fig 7. Amplifier A: drain current as a function of internal G1 current; typical values**




$V_{DS(A)} = V_{DS(B)} = V_{supply}$; $V_{G2-S}$ = 4 V; $T_j$ = 25 °C; $R_{G1}$ = 150 kΩ (connected to ground); see Figure 3.

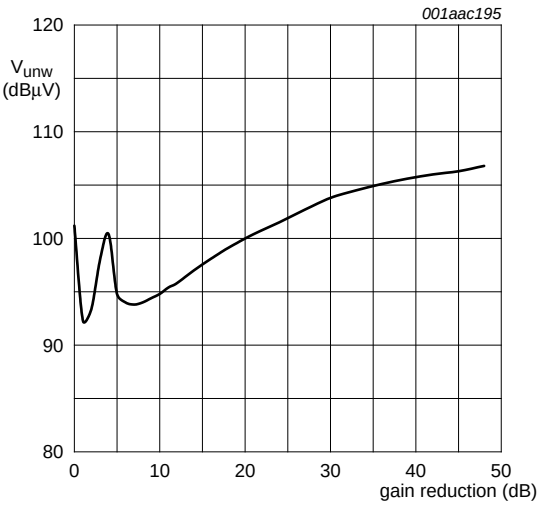
**Fig 8. Amplifier A: drain current of amplifier A as a function of supply voltage of A and B amplifier; typical values**




(1) $V_{DS(B)}$ = 5 V.
(2) $V_{DS(B)}$ = 4.5 V.
(3) $V_{DS(B)}$ = 4 V.
(4) $V_{DS(B)}$ = 3.5 V.
(5) $V_{DS(B)}$ = 3 V.
(6) $V_{DS(B)}$ = 2.5 V.

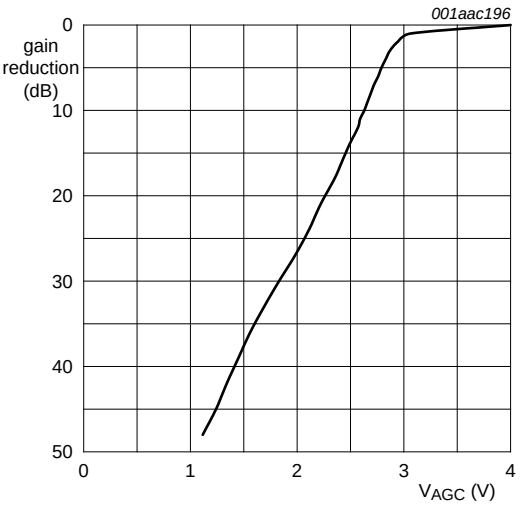
$V_{DS(A)}$ = 5 V; $V_{G1-S(B)}$ = 0 V; gate1 (A) = open; $T_j$ = 25 °C.

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



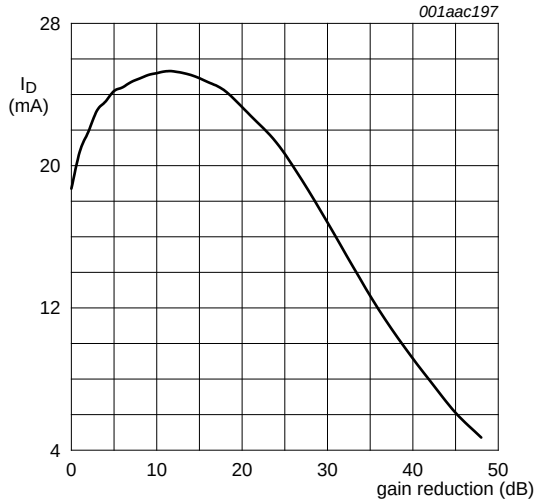

$V_{DS(A)} = V_{DS(B)}$ = 5 V; $V_{G1-S(B)}$ = 0 V; $f_w$ = 50 MHz; $f_{unw}$ = 60 MHz; $T_{amb}$ = 25 °C; see Figure 33.

**Fig 10. Amplifier A: unwanted voltage for 1 % cross-modulation as a function of gain reduction; typical values**



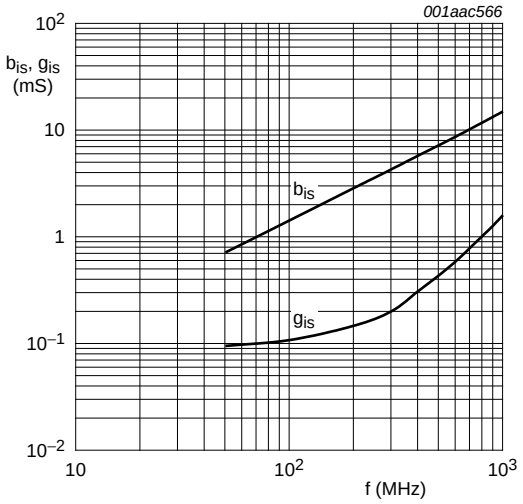

$V_{DS(A)} = V_{DS(B)}$ = 5 V; $V_{G1-S(B)}$ = 0 V; f = 50 MHz; see Figure 33.

**Fig 11. Amplifier A: gain reduction as a function of AGC voltage; typical values**



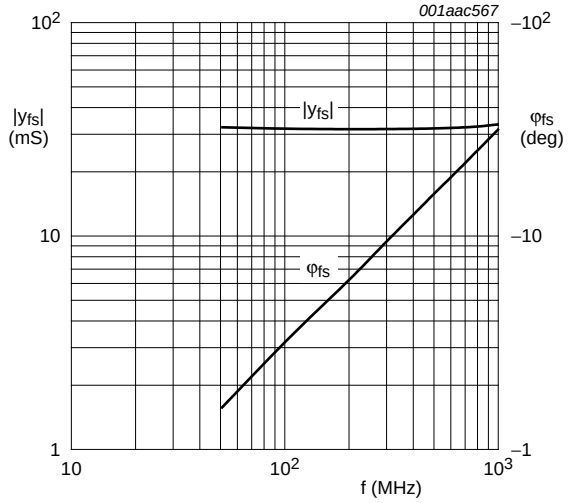

$V_{DS(A)} = V_{DS(B)} = 5$ V; $V_{G1-S(B)} = 0$ V; f = 50 MHz; $T_{amb} = 25$ °C; see Figure 33.

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



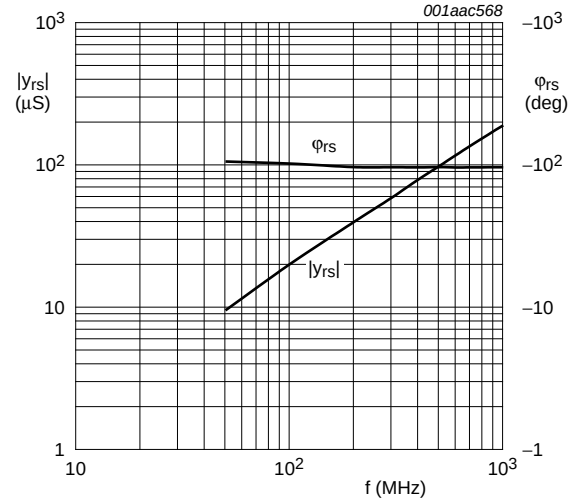

$V_{DS(A)} = 5$ V; $V_{G2-S} = 4$ V; $V_{DS(B)} = V_{G1-S(B)} = 0$ V; $I_{D(A)} = 19$ mA

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



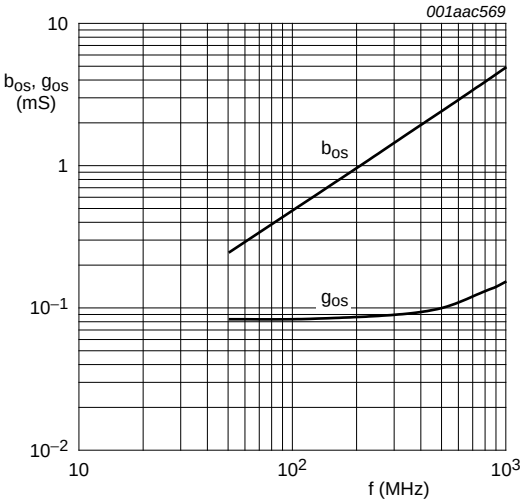

$V_{DS(A)} = 5$ V; $V_{G2-S} = 4$ V; $V_{DS(B)} = V_{G1-S(B)} = 0$ V; $I_{D(A)} = 19$ mA

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




$V_{DS(A)} = 5$ V; $V_{G2-S} = 4$ V; $V_{DS(B)} = V_{G1-S(B)} = 0$ V; $I_{D(A)} = 19$ mA

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




$V_{DS(A)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(B)}$ = $V_{G1-S(B)}$ = 0 V; $I_{D(A)}$ = 19 mA

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

### 8.1.2 Scattering parameters for amplifier A

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

*$V_{DS(A)}$ = 5 V; $V_{G2-S}$ = 4 V; $I_{D(A)}$ = 19 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 | 0.991 | −3.86 | 3.08 | 175.91 | 0.0009 | 77.41 | 0.992 | −1.41 |
| 100 | 0.990 | −7.73 | 3.03 | 171.76 | 0.0019 | 78.10 | 0.991 | −2.81 |
| 200 | 0.986 | −15.43 | 2.99 | 163.68 | 0.0037 | 78.39 | 0.990 | −5.57 |
| 300 | 0.980 | −22.98 | 2.94 | 155.54 | 0.0054 | 73.53 | 0.989 | −8.34 |
| 400 | 0.970 | −30.44 | 2.89 | 147.55 | 0.0070 | 68.74 | 0.986 | −11.08 |
| 500 | 0.960 | −37.60 | 2.82 | 139.76 | 0.0085 | 63.64 | 0.983 | −13.78 |
| 600 | 0.948 | −44.62 | 2.75 | 132.16 | 0.0098 | 59.62 | 0.980 | −16.45 |
| 700 | 0.935 | −51.44 | 2.67 | 124.70 | 0.0110 | 55.09 | 0.977 | −19.10 |
| 800 | 0.921 | −58.04 | 2.58 | 117.39 | 0.0120 | 50.79 | 0.973 | −21.69 |
| 900 | 0.908 | −64.41 | 2.50 | 110.20 | 0.0128 | 46.62 | 0.970 | −24.28 |
| 1000 | 0.894 | −70.49 | 2.40 | 103.31 | 0.0135 | 42.78 | 0.967 | −26.87 |

### 8.1.3 Noise data for amplifier A

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

*$V_{DS(A)}$ = 5 V; $V_{G2-S}$ = 4 V; $I_{D(A)}$ = 19 mA; $V_{DS(B)}$ = 0 V; $V_{G1-S(B)}$ = 0 V; $T_{amb}$ = 25 °C; typical values; unless otherwise specified.*

| f (MHz) | $NF_{min}$ (dB) | $\Gamma_{opt}$ | | $r_n$ (Ω) |
|---|---|---|---|---|
| | | ratio | (deg) | |
| 400 | 1.3 | 0.718 | 16.06 | 0.683 |
| 800 | 1.4 | 0.677 | 37.59 | 0.681 |

## 8.2 Dynamic characteristics for amplifier B

**Table 11. Dynamic characteristics for amplifier B[1]**

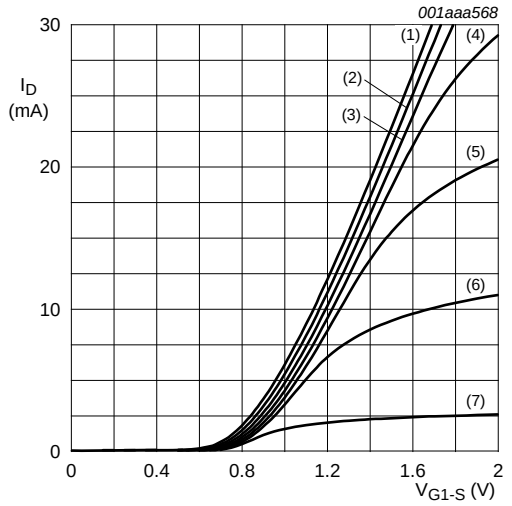
*Common source; $T_{amb}$ = 25 °C; $V_{G2-S}$ = 4 V; $V_{DS}$ = 5 V; $I_D$ = 13 mA; unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $\|y_{fs}\|$ | forward transfer admittance | $T_j$ = 25 °C | 28 | 33 | 43 | mS |
| $C_{iss(G1)}$ | input capacitance at gate1 | f = 1 MHz | - | 2.0 | 2.5 | pF |
| $C_{iss(G2)}$ | input capacitance at gate2 | f = 1 MHz | - | 3.4 | - | pF |
| $C_{oss}$ | output capacitance | f = 1 MHz | - | 0.85 | - | pF |
| $C_{rss}$ | reverse transfer capacitance | f = 1 MHz | - | 20 | - | fF |
| $G_{tr}$ | power gain | $B_S = B_{S(opt)}$; $B_L = B_{L(opt)}$ | | | | |
| | | f = 200 MHz; $G_S$ = 2 mS; $G_L$ = 0.5 mS | 33 | 37 | 41 | dB |
| | | f = 400 MHz; $G_S$ = 2 mS; $G_L$ = 1 mS | 30 | 34 | 38 | dB |
| | | f = 800 MHz; $G_S$ = 3.3 mS; $G_L$ = 1 mS | 29 | 33 | 37 | dB |
| NF | noise figure | f = 11 MHz; $G_S$ = 20 mS; $B_S$ = 0 S | - | 5 | - | dB |
| | | f = 400 MHz; $Y_S = Y_{S(opt)}$ | - | 1.3 | 1.9 | dB |
| | | f = 800 MHz; $Y_S = Y_{S(opt)}$ | - | 1.4 | 2.1 | dB |
| Xmod | cross-modulation | input level for k = 1 %; $f_w$ = 50 MHz; $f_{unw}$ = 60 MHz [2] | | | | |
| | | at 0 dB AGC | 90 | - | - | dBμV |
| | | at 10 dB AGC | - | 88 | - | dBμV |
| | | at 20 dB AGC | - | 94 | - | dBμV |
| | | at 40 dB AGC | 100 | 103 | - | dBμV |

[1] For the MOSFET not in use: $V_{G1-S(A)}$ = 0 V; $V_{DS(A)}$ = 0 V.

[2] Measured in Figure 34 test circuit.

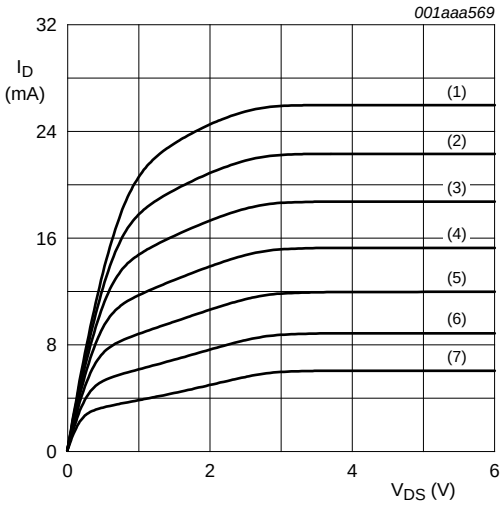
### 8.2.1 Graphics for amplifier B




(1) $V_{G2-S}$ = 4 V.
(2) $V_{G2-S}$ = 3.5 V.
(3) $V_{G2-S}$ = 3 V.
(4) $V_{G2-S}$ = 2.5 V.
(5) $V_{G2-S}$ = 2 V.
(6) $V_{G2-S}$ = 1.5 V.
(7) $V_{G2-S}$ = 1 V.

$V_{DS(B)}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C.

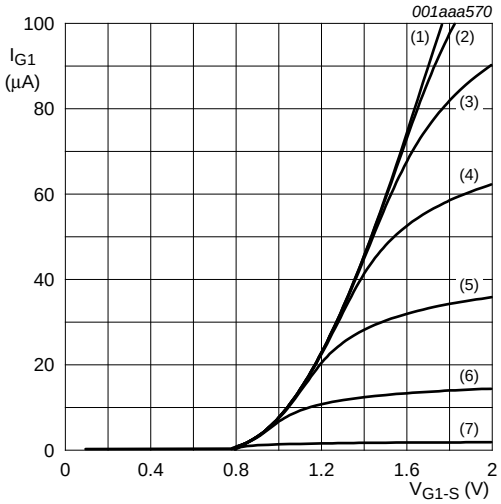
**Fig 17. Amplifier B: transfer characteristics; typical values**




(1) $V_{G1-S(B)}$ = 1.6 V.
(2) $V_{G1-S(B)}$ = 1.5 V.
(3) $V_{G1-S(B)}$ = 1.4 V.
(4) $V_{G1-S(B)}$ = 1.3 V.
(5) $V_{G1-S(B)}$ = 1.2 V.
(6) $V_{G1-S(B)}$ = 1.1 V.
(7) $V_{G1-S(B)}$ = 1 V.

$V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C.

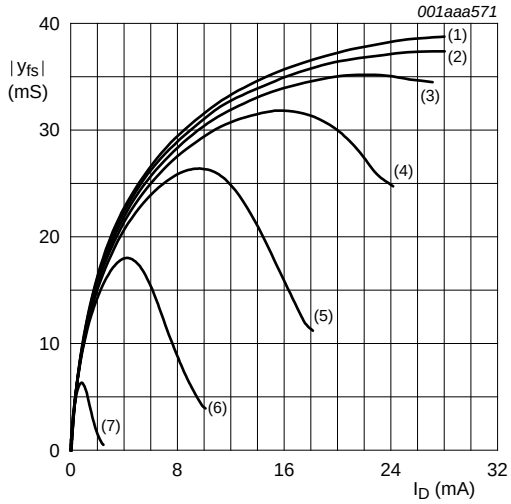
**Fig 18. Amplifier B: output characteristics; typical values**




(1) $V_{G2-S}$ = 4 V.
(2) $V_{G2-S}$ = 3.5 V.
(3) $V_{G2-S}$ = 3 V.
(4) $V_{G2-S}$ = 2.5 V.
(5) $V_{G2-S}$ = 2 V.
(6) $V_{G2-S}$ = 1.5 V.
(7) $V_{G2-S}$ = 1 V.

$V_{DS(B)}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C.

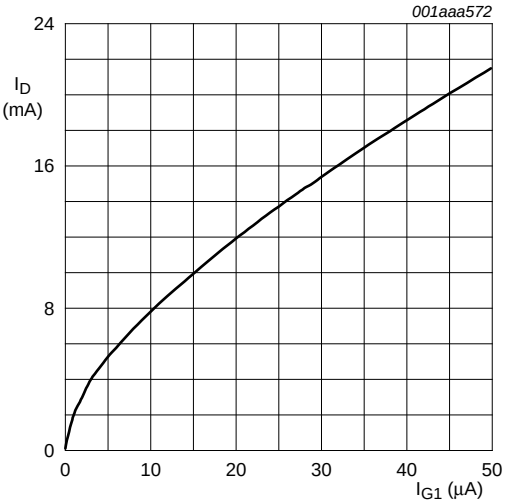
**Fig 19. Amplifier B: gate1 current as a function of gate1 voltage; typical values**




(1) $V_{G2-S}$ = 4 V.
(2) $V_{G2-S}$ = 3.5 V.
(3) $V_{G2-S}$ = 3 V.
(4) $V_{G2-S}$ = 2.5 V.
(5) $V_{G2-S}$ = 2 V.
(6) $V_{G2-S}$ = 1.5 V.
(7) $V_{G2-S}$ = 1 V.

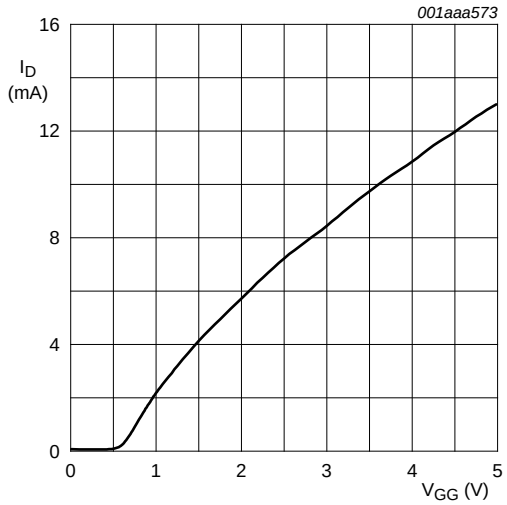
$V_{DS(B)}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C.

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



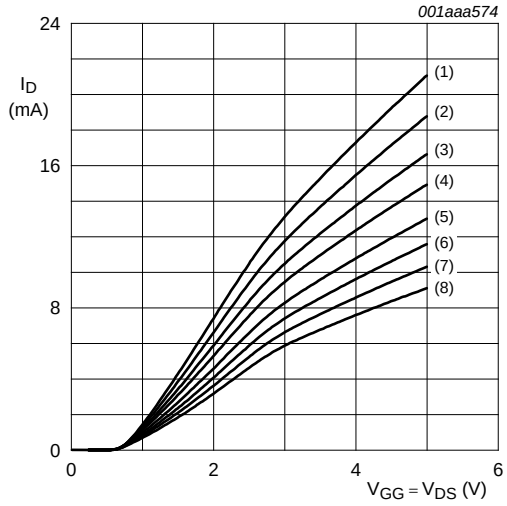

$V_{DS(B)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C.

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




$V_{DS(B)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C; $R_{G1}$ = 150 kΩ (connected to $V_{GG}$); see Figure 3.

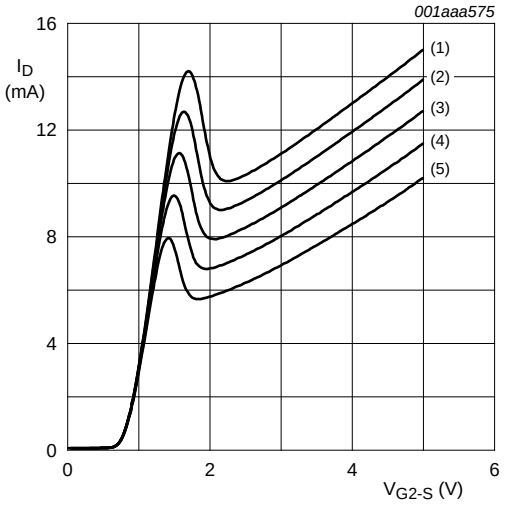
**Fig 22. Amplifier B: drain current as a function of gate1 supply voltage; typical values**




(1) $R_{G1}$ = 68 kΩ.
(2) $R_{G1}$ = 82 kΩ.
(3) $R_{G1}$ = 100 kΩ.
(4) $R_{G1}$ = 120 kΩ.
(5) $R_{G1}$ = 150 kΩ.
(6) $R_{G1}$ = 180 kΩ.
(7) $R_{G1}$ = 220 kΩ.
(8) $R_{G1}$ = 270 kΩ.

$V_{G2-S}$ = 4 V; $V_{DS(A)} = V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C; $R_{G1}$ is connected to $V_{GG}$; see Figure 3.

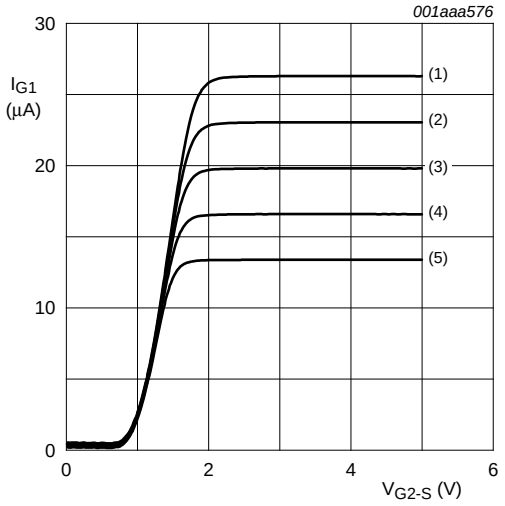
**Fig 23. Amplifier B: drain current as a function of gate1 supply voltage and drain supply voltage; typical values**




(1) $V_{GG}$ = 5.0 V.
(2) $V_{GG}$ = 4.5 V.
(3) $V_{GG}$ = 4.0 V.
(4) $V_{GG}$ = 3.5 V.
(5) $V_{GG}$ = 3.0 V.

$V_{DS(B)}$ = 5 V; $V_{DS(A)} = V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C; $R_{G1}$ = 150 kΩ (connected to $V_{GG}$); see Figure 3.

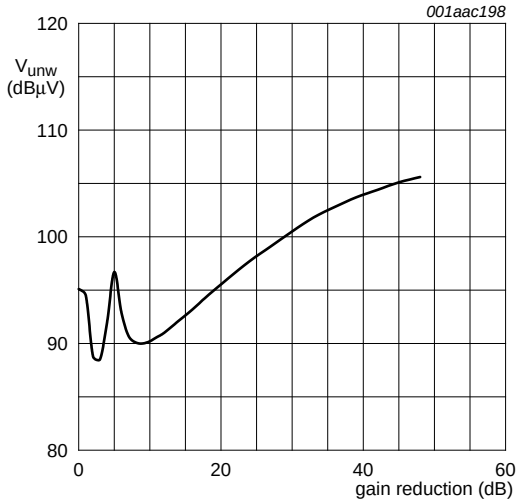
**Fig 24. Amplifier B: drain current as a function of gate2 voltage; typical values**




(1) $V_{GG}$ = 5.0 V.
(2) $V_{GG}$ = 4.5 V.
(3) $V_{GG}$ = 4.0 V.
(4) $V_{GG}$ = 3.5 V.
(5) $V_{GG}$ = 3.0 V.

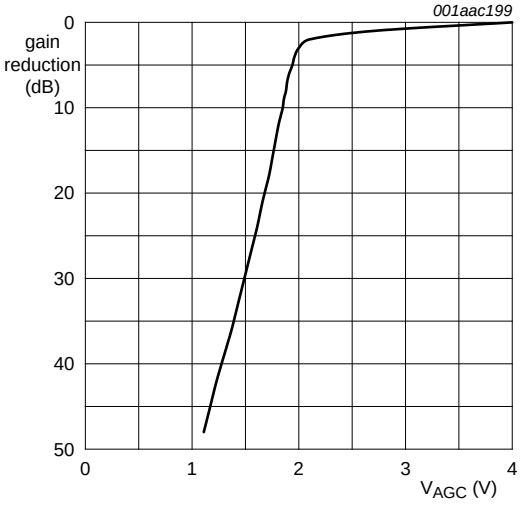
$V_{DS(B)}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $T_j$ = 25 °C; $R_{G1}$ = 150 kΩ (connected to $V_{GG}$); see Figure 3.

**Fig 25. Amplifier B: gate1 current as a function of gate2 voltage; typical values**



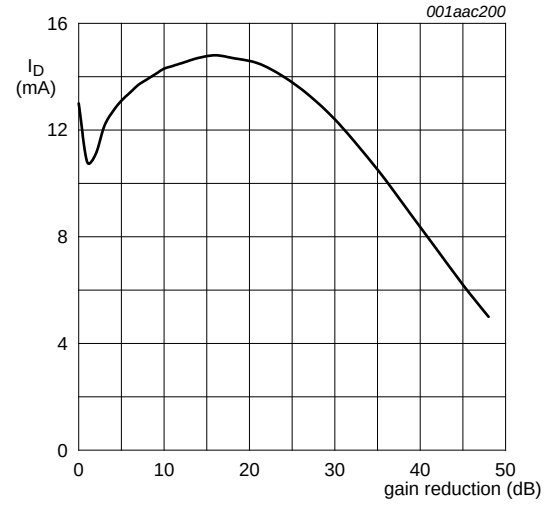

$V_{DS(B)}$ = 5 V; $V_{GG}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $R_{G1}$ = 150 kΩ (connected to $V_{GG}$); $f_w$ = 50 MHz; $f_{unw}$ = 60 MHz; $T_{amb}$ = 25 °C; see Figure 34.

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



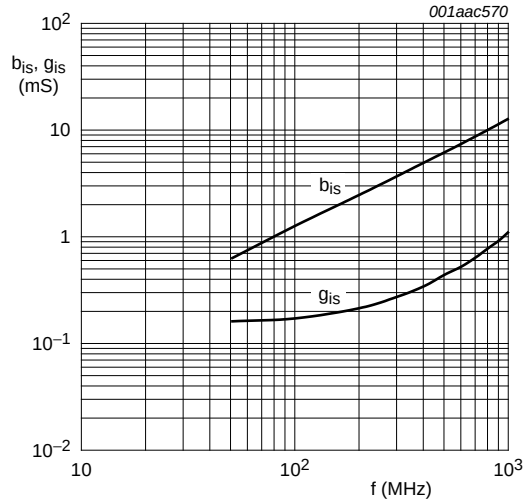

$V_{DS(B)}$ = 5 V; $V_{GG}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $R_{G1}$ = 150 kΩ (connected to $V_{GG}$); f = 50 MHz; $T_{amb}$ = 25 °C; see Figure 34.

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



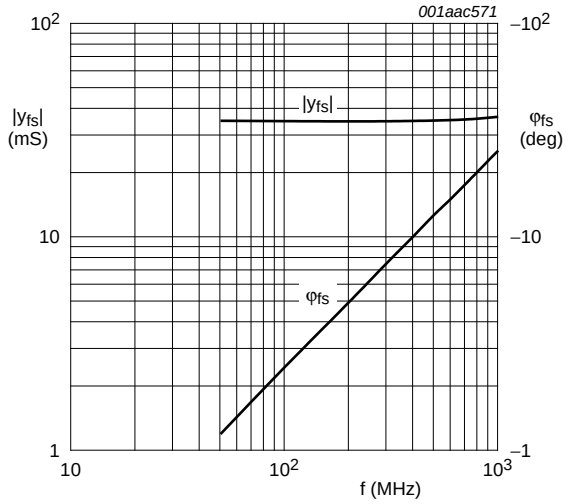

$V_{DS(B)}$ = 5 V; $V_{GG}$ = 5 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $R_{G1}$ = 150 kΩ (connected to $V_{GG}$); f = 50 MHz; $T_{amb}$ = 25 °C; see Figure 34.

**Fig 28. Amplifier B: drain current as a function of gain reduction; typical values**



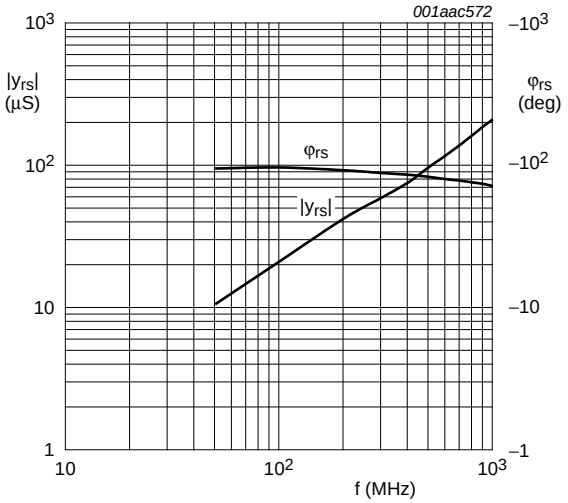

$V_{DS(B)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $I_{D(B)}$ = 13 mA

**Fig 29. Amplifier B: input admittance as a function of frequency; typical values**



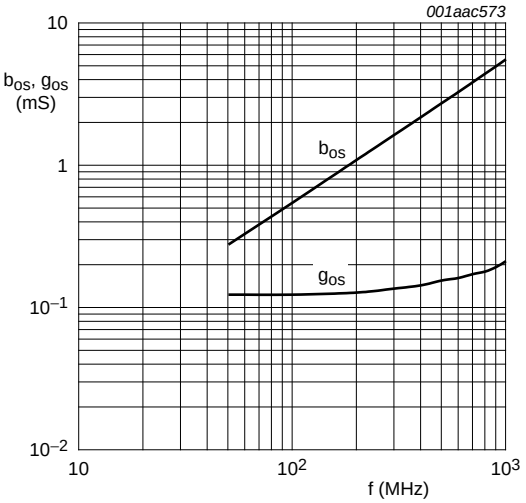

$V_{DS(B)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $I_{D(B)}$ = 13 mA

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




$V_{DS(B)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $I_{D(B)}$ = 13 mA

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




$V_{DS(B)}$ = 5 V; $V_{G2-S}$ = 4 V; $V_{DS(A)}$ = $V_{G1-S(A)}$ = 0 V; $I_{D(B)}$ = 13 mA

**Fig 32. Amplifier B: output admittance as a function of frequency; typical values**

### 8.2.2 Scattering parameters for amplifier B

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

*$V_{DS(B)}$ = 5 V; $V_{G2\text{-}S}$ = 4 V; $I_{D(B)}$ = 13 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 | 0.985 | −3.42 | 3.33 | 176.41 | 0.0010 | 87.55 | 0.988 | −1.60 |
| 100 | 0.984 | −6.96 | 3.31 | 172.70 | 0.0020 | 83.45 | 0.988 | −3.16 |
| 200 | 0.980 | −13.51 | 3.27 | 165.59 | 0.0039 | 82.84 | 0.987 | −6.31 |
| 300 | 0.975 | −20.07 | 3.23 | 158.42 | 0.0054 | 82.01 | 0.986 | −9.40 |
| 400 | 0.969 | −26.61 | 3.19 | 151.34 | 0.0068 | 79.73 | 0.984 | −12.46 |
| 500 | 0.961 | −32.89 | 3.14 | 144.33 | 0.0085 | 77.91 | 0.982 | −15.57 |
| 600 | 0.955 | −39.19 | 3.07 | 137.54 | 0.0100 | 76.31 | 0.980 | −18.62 |
| 700 | 0.945 | −45.39 | 3.00 | 130.72 | 0.0115 | 73.76 | 0.977 | −21.70 |
| 800 | 0.938 | −51.39 | 2.93 | 123.98 | 0.0131 | 71.58 | 0.974 | −24.76 |
| 900 | 0.930 | −57.36 | 2.85 | 117.31 | 0.0145 | 69.18 | 0.971 | −27.81 |
| 1000 | 0.920 | −63.10 | 2.77 | 110.39 | 0.0157 | 67.54 | 0.967 | −30.86 |

### 8.2.3 Noise data for amplifier B

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

*$V_{DS(B)}$ = 5 V; $V_{G2\text{-}S}$ = 4 V; $I_{D(B)}$ = 13 mA; $V_{DS(A)}$ = 0 V; $V_{G1\text{-}S(A)}$ = 0 V; $T_{amb}$ = 25 °C; typical values; unless otherwise specified.*

| f (MHz) | $NF_{min}$ (dB) | $\Gamma_{opt}$ | | $r_n$ (Ω) |
|---|---|---|---|---|
| | | ratio | (deg) | |
| 400 | 1.3 | 0.695 | 13.11 | 0.694 |
| 800 | 1.4 | 0.674 | 32.77 | 0.674 |

# 9. Test information

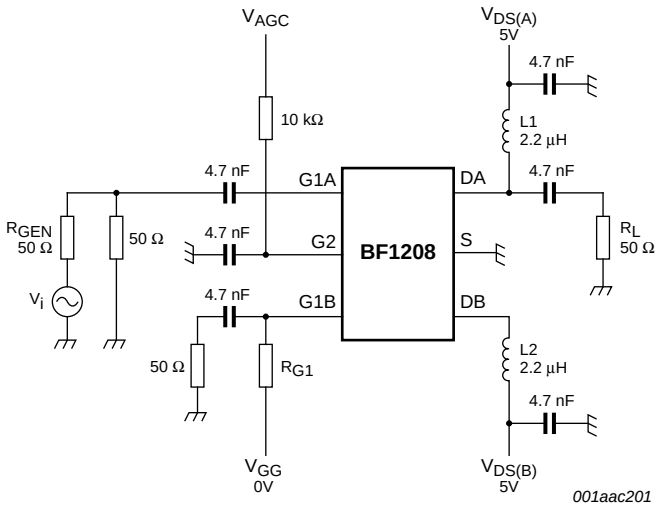



**Fig 33. Cross-modulation test set-up for amplifier A**

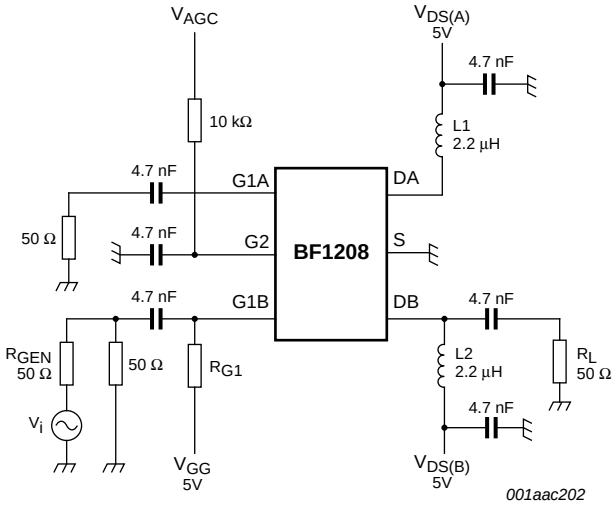
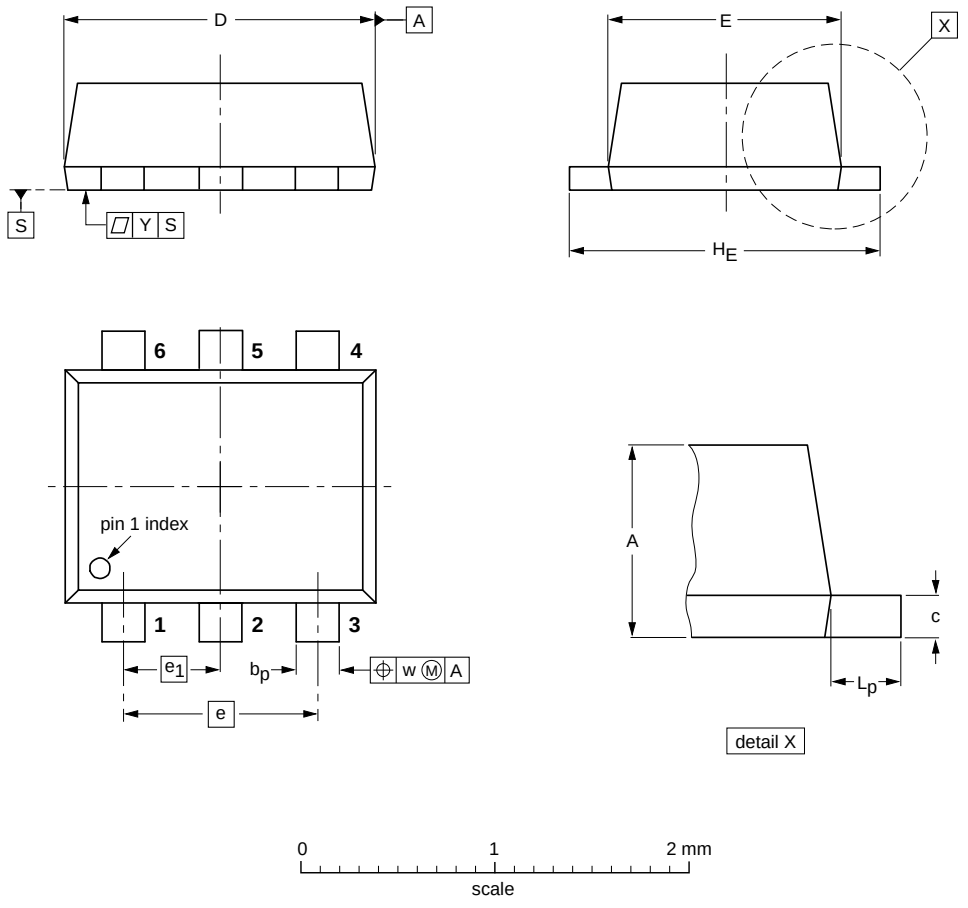



**Fig 34. Cross-modulation test set-up for amplifier B**

## 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 35. Package outline SOT666**

## 11. Revision history

**Table 14. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BF1208 v.2 | 20110907 | Product data sheet | - | BF1208 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. | | | |
| BF1208 v.1 (9397 750 14254) | 20050316 | 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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