



# BF1205C

Dual N-channel dual gate MOS-FET

Rev. 3 — 7 September 2011

Product data sheet

## 1. Product profile

### 1.1 General description

The BF1205C is a combination of two dual gate MOS-FET amplifiers with shared source and gate 2 leads and an integrated switch. The integrated switch is operated by the gate 1 bias of amplifier b.

The source and substrate are interconnected. Internal bias circuits enable DC stabilization and a very good cross-modulation performance during AGC. Integrated diodes between the gates and source protect against excessive input voltage surges. The transistor has a SOT363 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 MOS-FET unless otherwise specified.

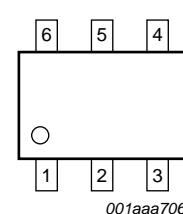
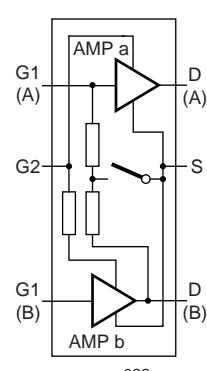
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage		-	-	6	V
$I_D$	drain current (DC)		-	-	30	mA
$P_{tot}$	total power dissipation	$T_{sp} \leq 107 \text{ }^{\circ}\text{C}$	[1]	-	180	mW
$ y_{fs} $	forward transfer admittance	$f = 1 \text{ MHz}$				
		amplifier a; $I_D = 19 \text{ mA}$	26	31	41	$\text{mS}$
		amplifier b; $I_D = 13 \text{ mA}$	28	33	43	$\text{mS}$
$C_{ig1-ss}$	input capacitance at gate 1	$f = 1 \text{ MHz}$				
		amplifier a	-	2.2	2.7	$\text{pF}$
		amplifier b	-	2.0	2.5	$\text{pF}$
$C_{rss}$	reverse transfer capacitance	$f = 1 \text{ MHz}$	-	20	-	$\text{fF}$
$NF$	noise figure	amplifier a; $f = 400 \text{ MHz}$	-	1.3	1.9	$\text{dB}$
		amplifier b; $f = 800 \text{ MHz}$	-	1.4	2.1	$\text{dB}$
$X_{mod}$	cross-modulation	input level for $k = 1 \text{ \%}$ at $40 \text{ dB AGC}$				
		amplifier a	100	105	-	$\text{dB}\mu\text{V}$
		amplifier b	100	103	-	$\text{dB}\mu\text{V}$
$T_j$	junction temperature		-	-	150	$^{\circ}\text{C}$

[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	gate 1 (a)		
2	gate 2		
3	gate 1 (b)		
4	drain (b)		
5	source		
6	drain (a)		

### 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BF1205C	-	plastic surface mounted package; 6 leads	SOT363

### 4. Marking

**Table 4. Marking**

Type number	Marking code <sup>[1]</sup>
BF1205C	M6*

[1] \* = p or -: 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).*

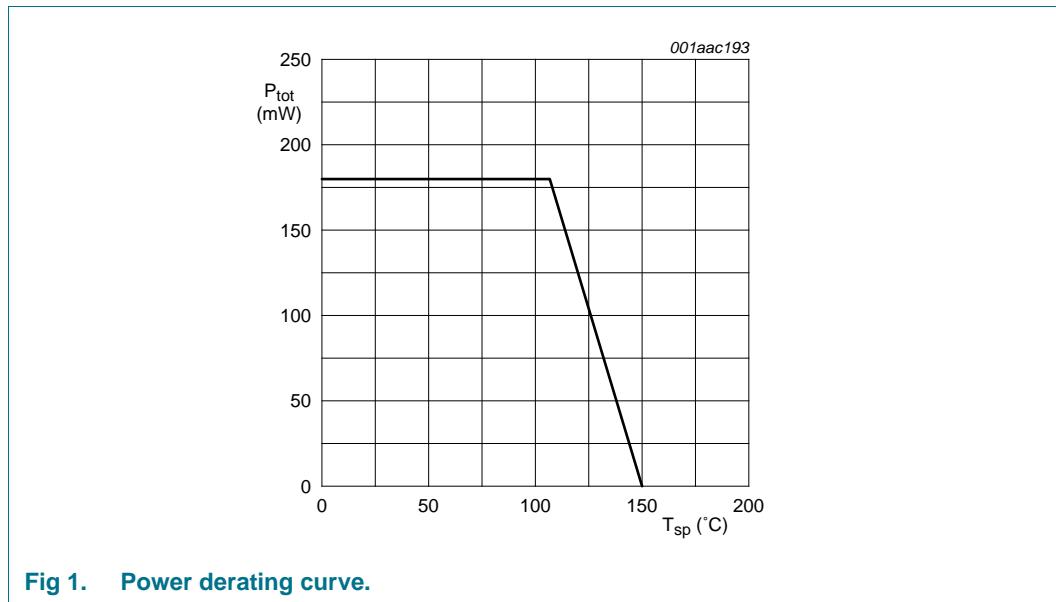
Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per MOS-FET</b>					
$V_{DS}$	drain-source voltage		-	6	V
$I_D$	drain current (DC)		-	30	mA
$I_{G1}$	gate 1 current		-	$\pm 10$	mA
$I_{G2}$	gate 2 current		-	$\pm 10$	mA
$P_{tot}$	total power dissipation	$T_{sp} \leq 107^\circ\text{C}$	[1]	-	180 mW
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$

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

### 6. Thermal characteristics

**Table 6. Thermal characteristics**

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



## 7. Static characteristics

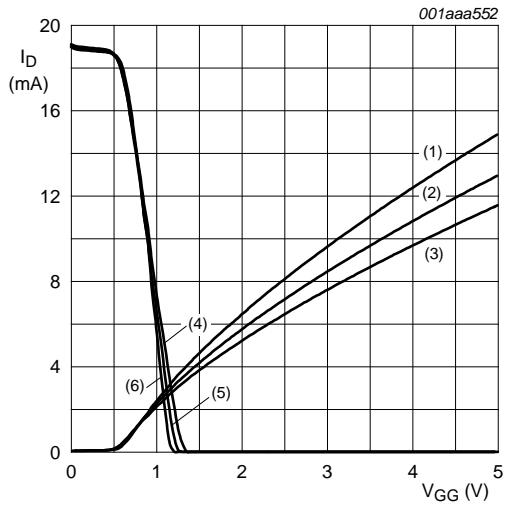
**Table 7. Static characteristics**

T<sub>j</sub> = 25 °C.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per MOS-FET; unless otherwise specified</b>						
V <sub>(BR)DSS</sub>	drain-source breakdown voltage	V <sub>G1-S</sub> = V <sub>G2-S</sub> = 0 V; I <sub>D</sub> = 10 µA amplifier a amplifier b	6	-	-	V
V <sub>(BR)G1-SS</sub>	gate 1-source breakdown voltage	V <sub>GS</sub> = V <sub>DS</sub> = 0 V; I <sub>G1-S</sub> = 10 mA	6	-	10	V
V <sub>(BR)G2-SS</sub>	gate 2-source breakdown voltage	V <sub>GS</sub> = V <sub>DS</sub> = 0 V; I <sub>G2-S</sub> = 10 mA	6	-	10	V
V <sub>(F)S-G1</sub>	forward source-gate 1 voltage	V <sub>G2-S</sub> = V <sub>DS</sub> = 0 V; I <sub>S-G1</sub> = 10 mA	0.5	-	1.5	V
V <sub>(F)S-G2</sub>	forward source-gate 2 voltage	V <sub>G1-S</sub> = V <sub>DS</sub> = 0 V; I <sub>S-G2</sub> = 10 mA	0.5	-	1.5	V
V <sub>G1-S(th)</sub>	gate 1-source threshold voltage	V <sub>DS</sub> = 5 V; V <sub>G2-S</sub> = 4 V; I <sub>D</sub> = 100 µA	0.3	-	1.0	V
V <sub>G2-S(th)</sub>	gate 2-source threshold voltage	V <sub>DS</sub> = 5 V; V <sub>G1-S</sub> = 5 V; I <sub>D</sub> = 100 µA	0.4	-	1.0	V
I <sub>DSX</sub>	drain-source current	V <sub>G2-S</sub> = 4 V; V <sub>DS(b)</sub> = 5 V; R <sub>G1</sub> = 150 kΩ amplifier a; V <sub>DS(a)</sub> = 5 V amplifier b	[1] 14	-	24	mA
I <sub>G1-S</sub>	gate 1 cut-off current	V <sub>G2-S</sub> = V <sub>DS(a)</sub> = 0 V amplifier a; V <sub>G1-S(a)</sub> = 5 V; I <sub>D(b)</sub> = 0 A amplifier b; V <sub>G1-S(b)</sub> = 5 V; V <sub>DS(b)</sub> = 0 V	-	-	50	nA
I <sub>G2-S</sub>	gate 2 cut-off current	V <sub>G2-S</sub> = 4 V; V <sub>G1-S(a)</sub> = V <sub>DS(a)</sub> = V <sub>DS(b)</sub> = 0 V; V <sub>G1-S(b)</sub> = 0 V;	-	-	20	nA

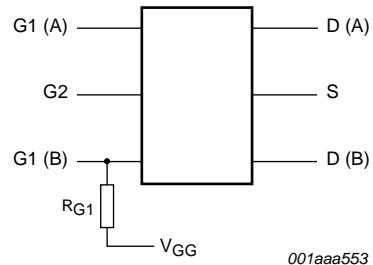
[1] R<sub>G1</sub> connects gate 1 (b) to V<sub>GG</sub> = 0 V (see [Figure 3](#)).

[2] R<sub>G1</sub> connects gate 1 (b) to V<sub>GG</sub> = 5 V (see [Figure 3](#)).



- (1)  $I_{D(b)}$ ;  $R_{G1} = 120 \text{ k}\Omega$ .
- (2)  $I_{D(b)}$ ;  $R_{G1} = 150 \text{ k}\Omega$ .
- (3)  $I_{D(b)}$ ;  $R_{G1} = 180 \text{ k}\Omega$ .
- (4)  $I_{D(a)}$ ;  $R_{G1} = 180 \text{ k}\Omega$ .
- (5)  $I_{D(a)}$ ;  $R_{G1} = 150 \text{ k}\Omega$ .
- (6)  $I_{D(a)}$ ;  $R_{G1} = 120 \text{ k}\Omega$ .

**Fig 2. Drain currents of MOS-FET a and b as function of  $V_{GG}$ .**



$V_{GG} = 5 \text{ V}$ : amplifier a is off; amplifier b is on  
 $V_{GG} = 0 \text{ V}$ : 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<sup>[1]</sup>**

Common source;  $T_{amb} = 25 \text{ }^\circ\text{C}$ ;  $V_{G2-S} = 4 \text{ V}$ ;  $V_{DS} = 5 \text{ V}$ ;  $I_D = 19 \text{ mA}$ .

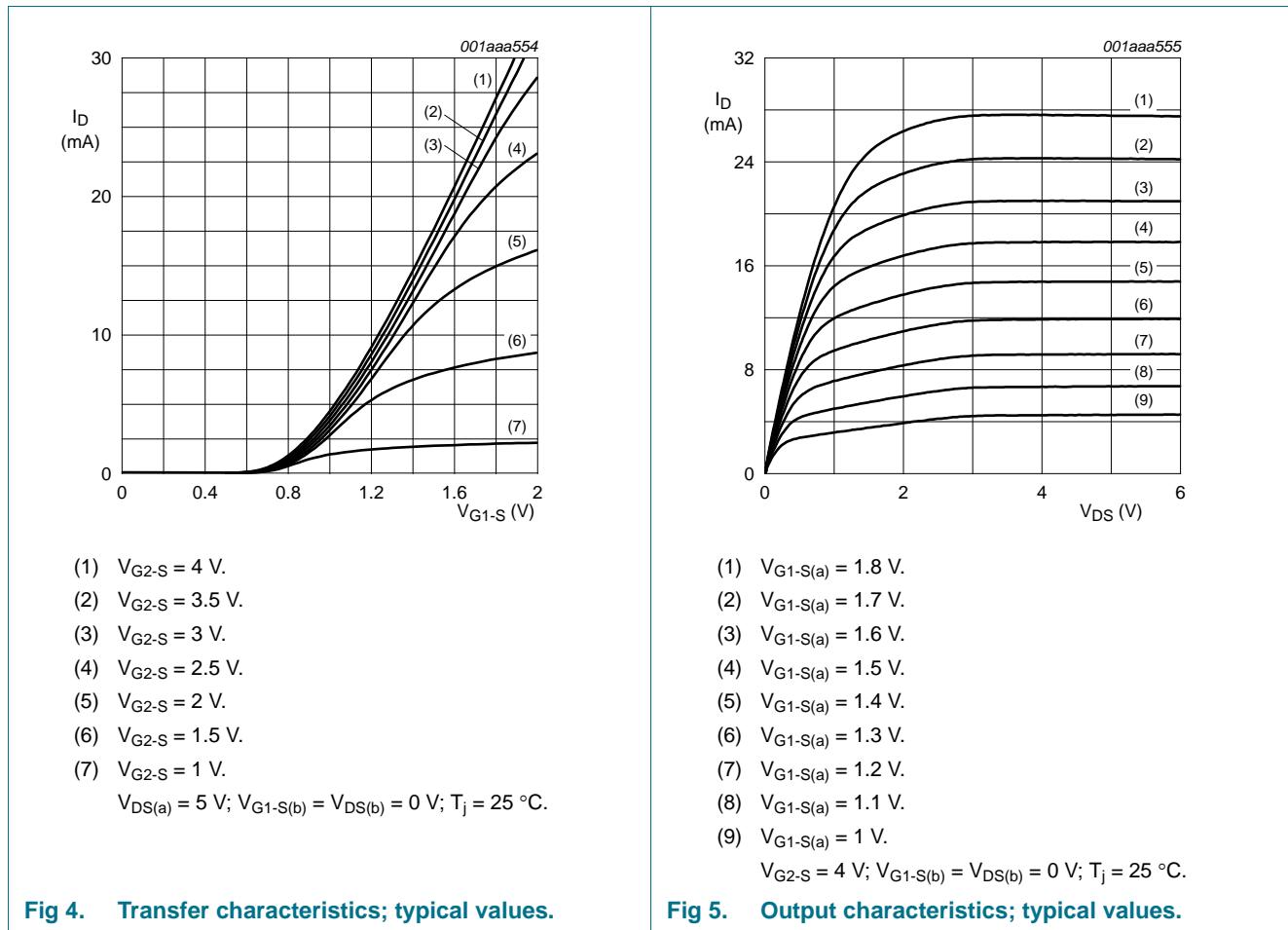
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$ y_{fs} $	forward transfer admittance	$T_j = 25 \text{ }^\circ\text{C}$	26	31	41	$\text{mS}$
$C_{ig1-ss}$	input capacitance at gate 1	$f = 1 \text{ MHz}$	-	2.2	2.7	$\text{pF}$
$C_{ig2-ss}$	input capacitance at gate 2	$f = 1 \text{ MHz}$	-	3.0	-	$\text{pF}$
$C_{oss}$	output capacitance	$f = 1 \text{ MHz}$	-	0.9	-	$\text{pF}$
$C_{rss}$	reverse transfer capacitance	$f = 1 \text{ MHz}$	-	20	-	$\text{fF}$
$G_{tr}$	power gain	$B_S = B_{S(\text{opt})}$ ; $B_L = B_{L(\text{opt})}$				
		$f = 200 \text{ MHz}$ ; $G_S = 2 \text{ mS}$ ; $G_L = 0.5 \text{ mS}$	31	35	39	$\text{dB}$
		$f = 400 \text{ MHz}$ ; $G_S = 2 \text{ mS}$ ; $G_L = 1 \text{ mS}$	26	30	34	$\text{dB}$
		$f = 800 \text{ MHz}$ ; $G_S = 3.3 \text{ mS}$ ; $G_L = 1 \text{ mS}$	21	25	29	$\text{dB}$
NF	noise figure	$f = 11 \text{ MHz}$ ; $G_S = 20 \text{ mS}$ ; $B_S = 0 \text{ S}$	-	3.0	-	$\text{dB}$
		$f = 400 \text{ MHz}$ ; $Y_S = Y_{S(\text{opt})}$	-	1.3	1.9	$\text{dB}$
		$f = 800 \text{ MHz}$ ; $Y_S = Y_{S(\text{opt})}$	-	1.4	2.1	$\text{dB}$

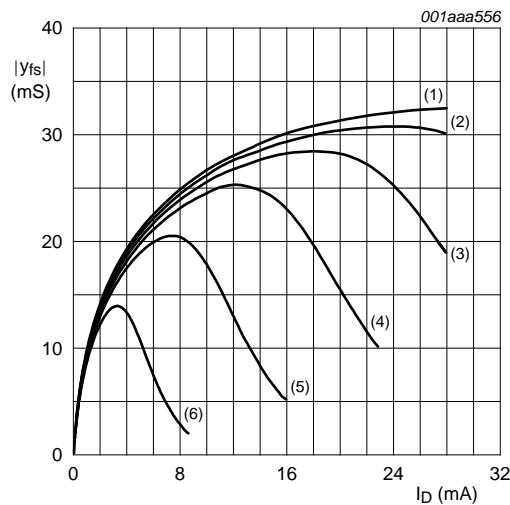
**Table 8. Dynamic characteristics for amplifier a** [1] ...continuedCommon source;  $T_{amb} = 25^\circ\text{C}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $V_{DS} = 5\text{ V}$ ;  $I_D = 19\text{ mA}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$X_{mod}$	cross-modulation	input level for $k = 1\%$ ; $f_w = 50\text{ MHz}$ ; $f_{unw} = 60\text{ MHz}$ [2]				
		at 0 dB AGC	90	-	-	$\text{dB}\mu\text{V}$
		at 10 dB AGC	-	90	-	$\text{dB}\mu\text{V}$
		at 20 dB AGC	-	99	-	$\text{dB}\mu\text{V}$
		at 40 dB AGC	100	105	-	$\text{dB}\mu\text{V}$

[1] For the MOS-FET not in use:  $V_{G1-S(b)} = 0\text{ V}$ ;  $V_{DS(b)} = 0\text{ V}$ .[2] Measured in [Figure 33](#) test circuit.

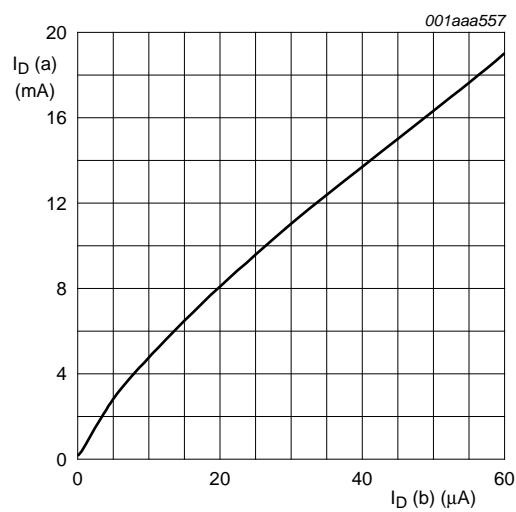
### 8.1.1 Graphs for amplifier a





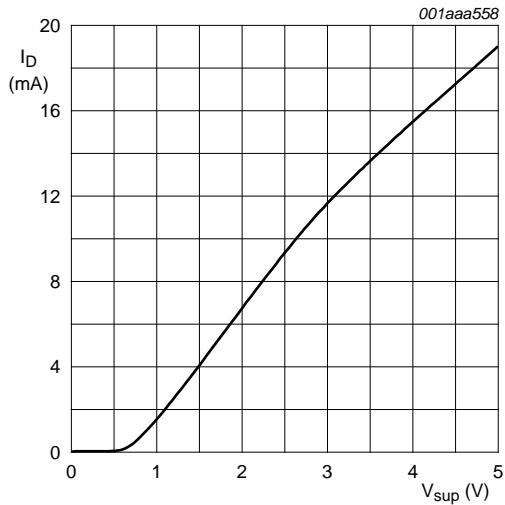
(1)  $V_{G2-S} = 4$  V.  
 (2)  $V_{G2-S} = 3.5$  V.  
 (3)  $V_{G2-S} = 3$  V.  
 (4)  $V_{G2-S} = 2.5$  V.  
 (5)  $V_{G2-S} = 2$  V.  
 (6)  $V_{G2-S} = 1.5$  V.  
 $V_{DS(a)} = 5$  V;  $V_{G1-S(b)} = V_{DS(b)} = 0$  V;  $T_j = 25$  °C.

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



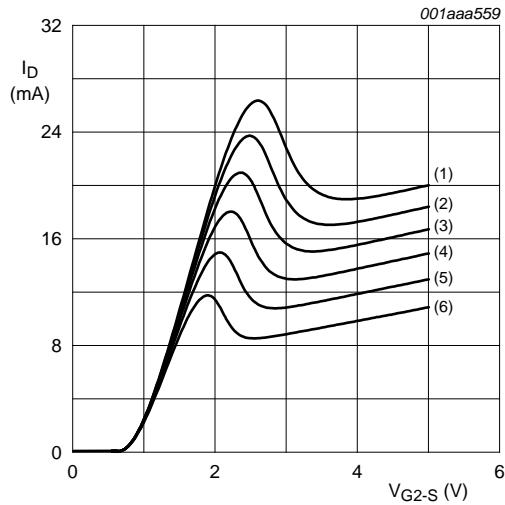
$V_{DS(a)} = 5$  V;  $V_{G2-S} = 4$  V;  $V_{DS(b)} = 5$  V;  $V_{G1-S(b)} = 0$  V;  
 $T_j = 25$  °C.

**Fig 7. Drain current as a function of internal G1 current (current in pin drain (b) if MOS-FET (b) is switched off); typical values.**



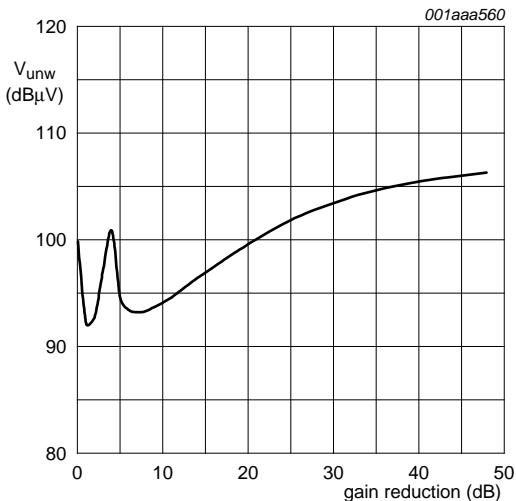
$V_{DS(a)} = V_{DS(b)} = V_{supply}$ ,  $V_{G2-S} = 4$  V,  $T_j = 25$  °C,  
 $R_{G1(b)} = 150$  kΩ (connected to ground); see [Figure 3](#).

**Fig 8.** Drain current of amplifier a as a function of supply voltage of a and b amplifier; typical values.



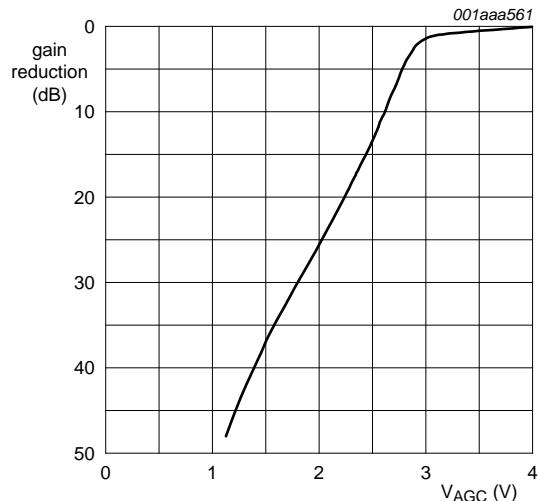
(1)  $V_{DS(b)} = 5$  V.  
(2)  $V_{DS(b)} = 4.5$  V.  
(3)  $V_{DS(b)} = 4$  V.  
(4)  $V_{DS(b)} = 3.5$  V.  
(5)  $V_{DS(b)} = 3$  V.  
(6)  $V_{DS(b)} = 2.5$  V.  
 $V_{DS(a)} = 5$  V;  $V_{G1-S(b)} = 0$  V; gate 1 (a) = open;  
 $T_j = 25$  °C.

**Fig 9.** Drain current as a function of gate 2 and drain supply voltage; typical values.



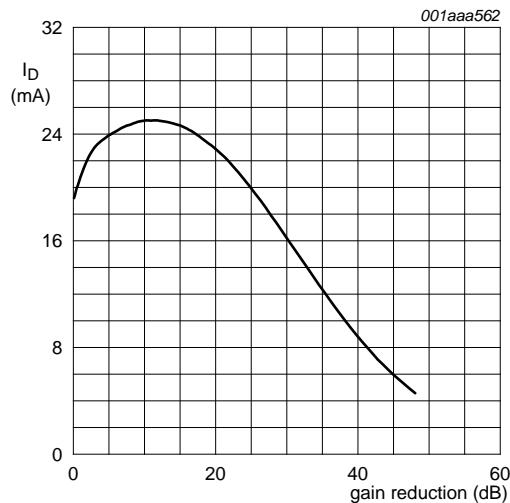
$V_{DS(a)} = V_{DS(b)} = 5$  V;  $V_{G1-S(b)} = 0$  V;  $f_w = 50$  MHz;  
 $f_{unw} = 60$  MHz;  $T_{amb} = 25$  °C; see [Figure 33](#).

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



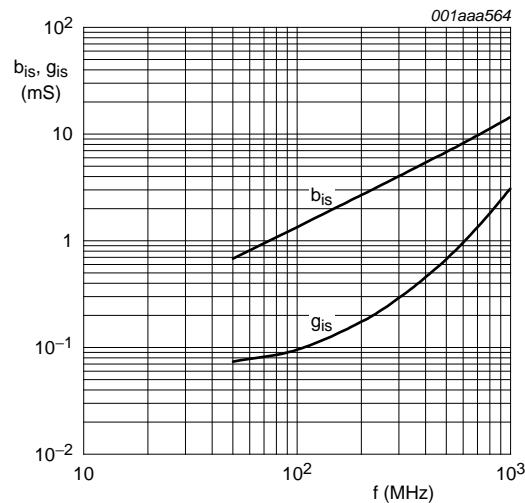
$V_{DS(a)} = V_{DS(b)} = 5$  V;  $V_{G1-S(b)} = 0$  V;  $f = 50$  MHz; see [Figure 33](#).

**Fig 11.** Gain reduction as a function of AGC voltage; typical values.



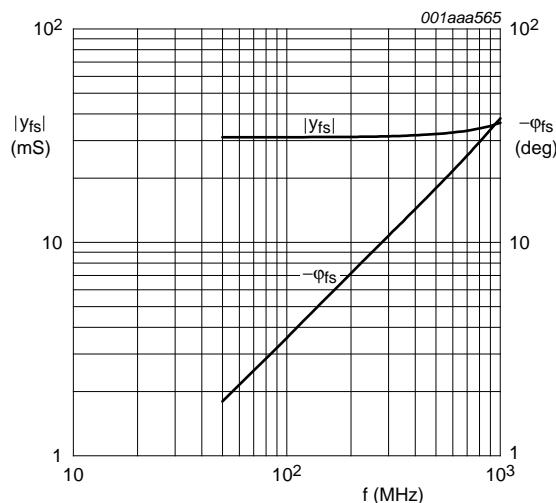
$V_{DS(a)} = V_{DS(b)} = 5$  V;  $V_{G1-S(b)} = 0$  V;  $f = 50$  MHz;  
 $T_{amb} = 25$  °C; see [Figure 33](#).

**Fig 12. Drain current as a function of gain reduction; typical values.**



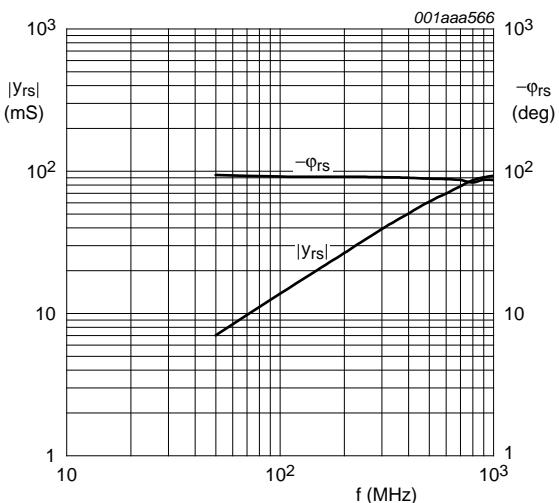
$V_{DS(a)} = 5$  V;  $V_{G2-S(a)} = 4$  V;  $V_{DS(b)} = V_{G1-S(b)} = 0$  V;  
 $I_{D(a)} = 19$  mA.

**Fig 13. Input admittance as a function of frequency; typical values.**



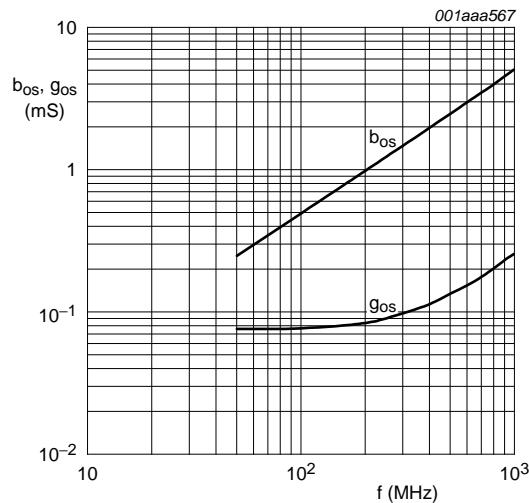
$V_{DS(a)} = 5$  V;  $V_{G2-S(a)} = 4$  V;  $V_{DS(b)} = V_{G1-S(b)} = 0$  V;  
 $I_{D(a)} = 19$  mA.

**Fig 14. Forward transfer admittance and phase as a function of frequency; typical values.**



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

**Fig 15. Reverse transfer admittance and phase as a function of frequency; typical values.**



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

Fig 16. 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.

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	Magnitude ratio	Angle (deg)	Magnitude ratio	Angle (deg)	Magnitude ratio	Angle (deg)	Magnitude ratio	Angle (deg)
50	0.992	-3.91	3.07	175.56	0.0007	83.61	0.992	-1.47
100	0.990	-7.76	3.06	171.18	0.0017	83.19	0.992	-2.93
200	0.982	-15.42	3.04	162.42	0.0026	78.19	0.990	-5.84
300	0.971	-22.99	3.01	153.79	0.0037	73.75	0.988	-8.71
400	0.956	-30.52	2.96	145.22	0.0047	69.82	0.985	-11.59
500	0.938	-37.83	2.90	136.78	0.0055	66.12	0.982	-14.48
600	0.917	-45.14	2.83	128.46	0.0061	62.11	0.979	-17.31
700	0.893	-52.31	2.76	120.20	0.0065	58.86	0.975	-20.14
800	0.867	-59.47	2.69	111.98	0.0068	58.28	0.972	-22.98
900	0.838	-66.23	2.60	103.90	0.0067	50.64	0.968	-25.85
1000	0.807	-73.10	2.52	95.875	0.0065	47.28	0.966	-28.74

### 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.

f (MHz)	F <sub>min</sub> (dB)	Γ <sub>opt</sub>		r <sub>n</sub> (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**

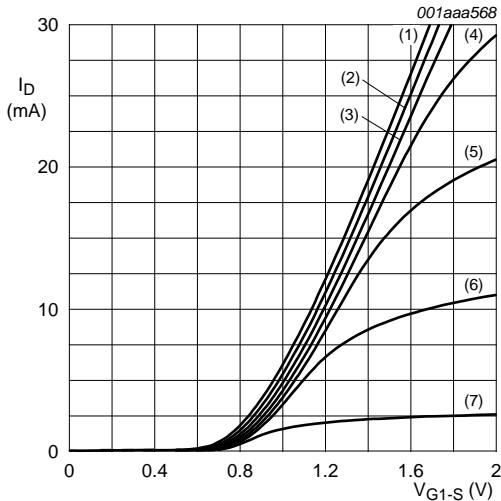
Common source;  $T_{amb} = 25^\circ\text{C}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $V_{DS} = 5\text{ V}$ ;  $I_D = 13\text{ mA}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$ y_{fs} $	forward transfer admittance	$T_j = 25^\circ\text{C}$	28	33	43	$\text{mS}$
$C_{ig1-ss}$	input capacitance at gate 1	$f = 1\text{ MHz}$	-	2.0	2.5	$\text{pF}$
$C_{ig2-ss}$	input capacitance at gate 2	$f = 1\text{ MHz}$	-	3.4	-	$\text{pF}$
$C_{oss}$	output capacitance	$f = 1\text{ MHz}$	-	0.85	-	$\text{pF}$
$C_{rss}$	reverse transfer capacitance	$f = 1\text{ MHz}$	-	20	-	$\text{fF}$
$G_{tr}$	power gain	$B_S = B_{S(\text{opt})}$ ; $B_L = B_{L(\text{opt})}$	[1]			
		$f = 200\text{ MHz}$ ; $G_S = 2\text{ mS}$ ; $G_L = 0.5\text{ mS}$	31	35	39	$\text{dB}$
		$f = 400\text{ MHz}$ ; $G_S = 2\text{ mS}$ ; $G_L = 1\text{ mS}$	28	32	36	$\text{dB}$
		$f = 800\text{ MHz}$ ; $G_S = 3.3\text{ mS}$ ; $G_L = 1\text{ mS}$	24	28	32	$\text{dB}$
NF	noise figure	$f = 11\text{ MHz}$ ; $G_S = 20\text{ mS}$ ; $B_S = 0\text{ S}$	-	5	-	$\text{dB}$
		$f = 400\text{ MHz}$ ; $Y_S = Y_{S(\text{opt})}$	-	1.3	1.9	$\text{dB}$
		$f = 800\text{ MHz}$ ; $Y_S = Y_{S(\text{opt})}$	-	1.4	2.1	$\text{dB}$
$X_{\text{mod}}$	cross-modulation	input level for $k = 1\%$ ; $f_w = 50\text{ MHz}$ ; $f_{\text{unw}} = 60\text{ MHz}$	[2]			
		at 0 dB AGC	90	-	-	$\text{dB}\mu\text{V}$
		at 10 dB AGC	-	88	-	$\text{dB}\mu\text{V}$
		at 20 dB AGC	-	94	-	$\text{dB}\mu\text{V}$
		at 40 dB AGC	100	103	-	$\text{dB}\mu\text{V}$

[1] For the MOS-FET not in use:  $V_{G1-S(a)} = 0\text{ V}$ ;  $V_{DS(a)} = 0\text{ V}$ .

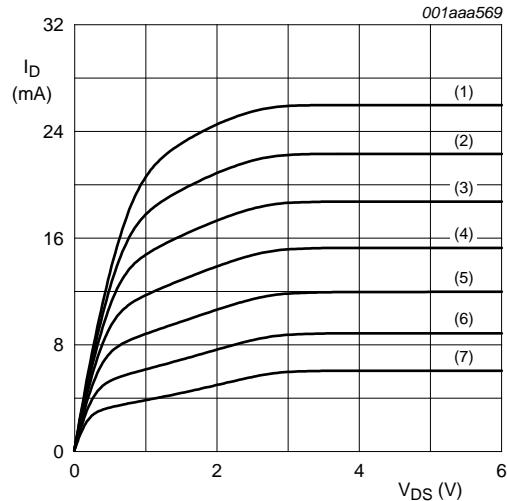
[2] Measured in [Figure 34](#) test circuit.

### 8.2.1 Graphs for amplifier b



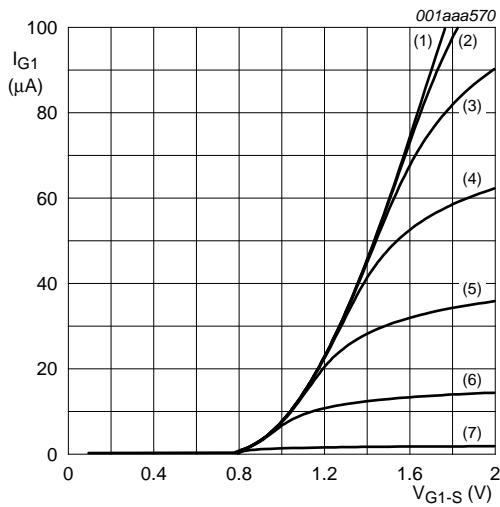
(1)  $V_{G2-S} = 4$  V.  
 (2)  $V_{G2-S} = 3.5$  V.  
 (3)  $V_{G2-S} = 3$  V.  
 (4)  $V_{G2-S} = 2.5$  V.  
 (5)  $V_{G2-S} = 2$  V.  
 (6)  $V_{G2-S} = 1.5$  V.  
 (7)  $V_{G2-S} = 1$  V.  
 $V_{DS(b)} = 5$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  $T_j = 25$  °C.

**Fig 17. 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.

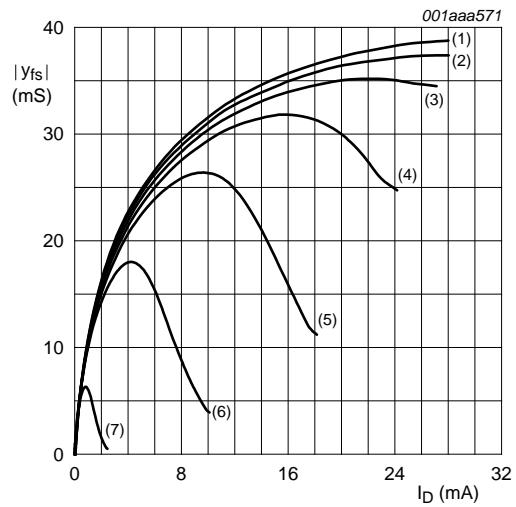
**Fig 18. Output characteristics; typical values.**



- (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.

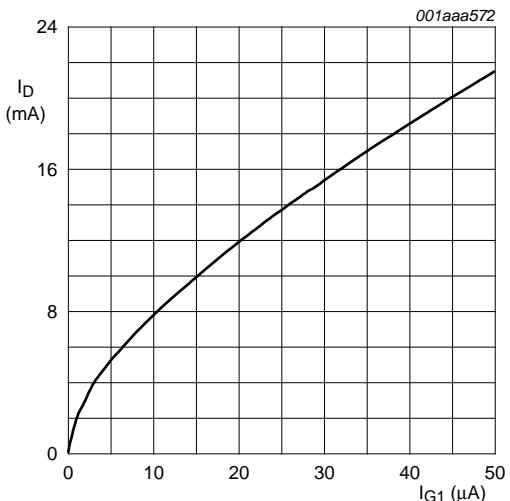
**Fig 19. Gate 1 current as a function of gate 1 voltage; typical values.**



- (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.

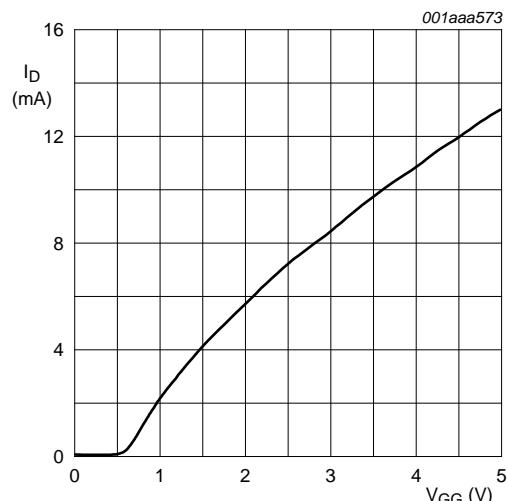
$V_{DS(b)} = 5$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  $T_j = 25$  °C.

**Fig 20. Forward transfer admittance as a function of drain current; typical values.**



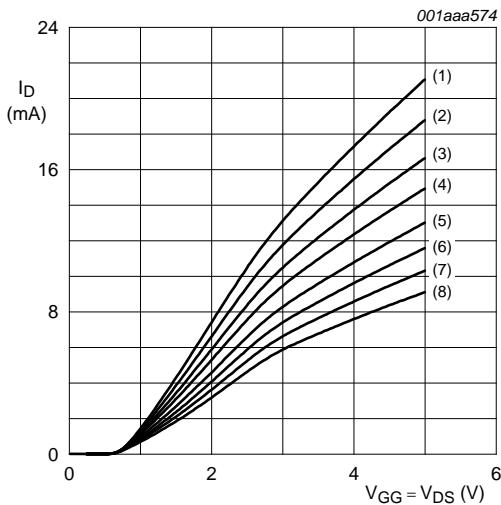
$V_{DS(b)} = 5$  V;  $V_{G2-S} = 4$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  $T_j = 25$  °C.

**Fig 21. Drain current as a function of gate 1 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;  $R_{G1(b)} = 150$  kΩ (connected to  $V_{GG}$ ); see Figure 3.

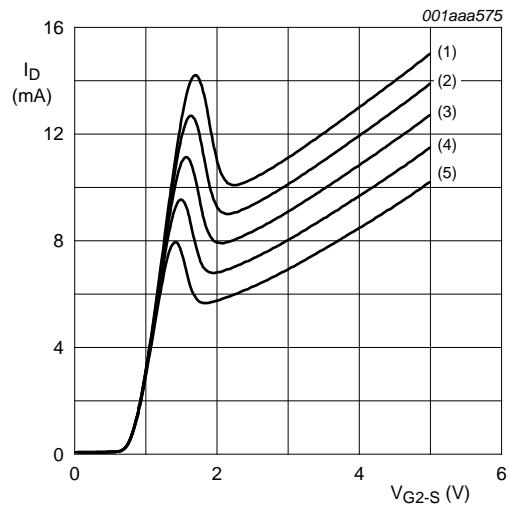
**Fig 22. Drain current as a function of gate 1 supply voltage ( $V_{GG}$ ); typical values.**



- (1)  $R_{G1(b)} = 68 \text{ k}\Omega$ .
- (2)  $R_{G1(b)} = 82 \text{ k}\Omega$ .
- (3)  $R_{G1(b)} = 100 \text{ k}\Omega$ .
- (4)  $R_{G1(b)} = 120 \text{ k}\Omega$ .
- (5)  $R_{G1(b)} = 150 \text{ k}\Omega$ .
- (6)  $R_{G1(b)} = 180 \text{ k}\Omega$ .
- (7)  $R_{G1(b)} = 220 \text{ k}\Omega$ .
- (8)  $R_{G1(b)} = 270 \text{ k}\Omega$ .

$V_{G2-S} = 4 \text{ V}$ ;  $V_{DS(a)} = V_{G1-S(a)} = 0 \text{ V}$ ;  $T_j = 25 \text{ }^\circ\text{C}$ ;  $R_{G1(b)}$  is connected to  $V_{GG}$ ; see [Figure 3](#).

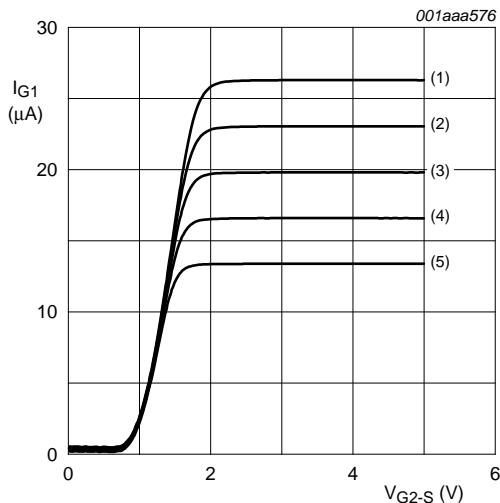
**Fig 23.** Drain current as a function of gate 1 ( $V_{GG}$ ), drain supply voltage and value of  $RG1$ ; typical values.



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

$V_{DS(b)} = 5 \text{ V}$ ;  $V_{DS(a)} = V_{G1-S(a)} = 0 \text{ V}$ ;  $T_j = 25 \text{ }^\circ\text{C}$ ;  $R_{G1(b)} = 150 \text{ k}\Omega$  (connected to  $V_{GG}$ ); see [Figure 3](#).

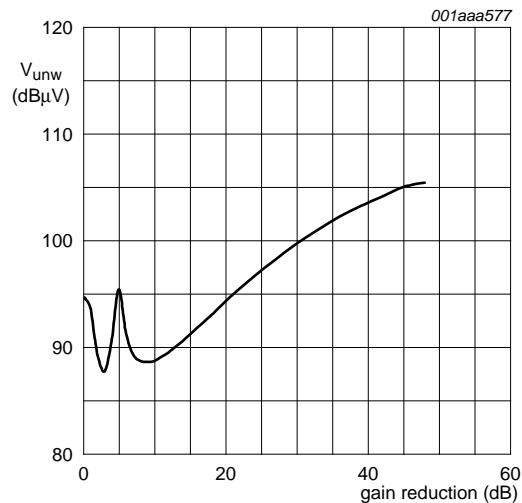
**Fig 24.** Drain current as a function of gate 2 voltage; typical values.



- (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.

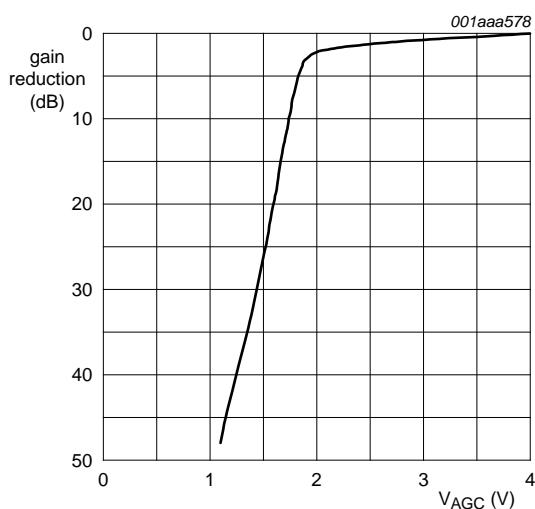
$V_{DS(b)} = 5$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  $T_j = 25$  °C;  
 $R_{G1(b)} = 150$  kΩ (connected to  $V_{GG}$ ); see [Figure 34](#).

**Fig 25. Gate 1 current as a function of gate 2 voltage; typical values.**



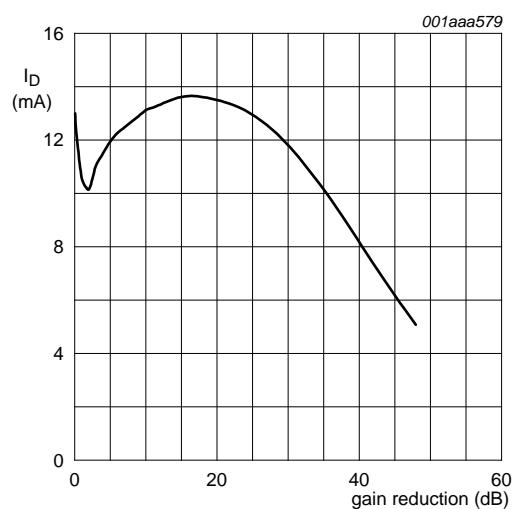
$V_{DS(b)} = 5$  V;  $V_{GG} = 5$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  
 $R_{G1(b)} = 150$  kΩ (connected to  $V_{GG}$ );  $f_w = 50$  MHz;  
 $f_{unw} = 60$  MHz;  $T_{amb} = 25$  °C; see [Figure 34](#).

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



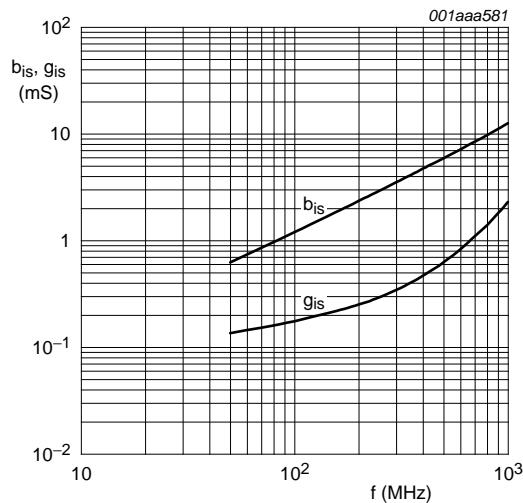
$V_{DS(b)} = 5$  V;  $V_{GG} = 5$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  
 $R_{G1(b)} = 150$  kΩ (connected to  $V_{GG}$ );  $f = 50$  MHz;  
 $T_{amb} = 25$  °C; see [Figure 34](#).

**Fig 27. Typical gain reduction as a function of AGC voltage.**



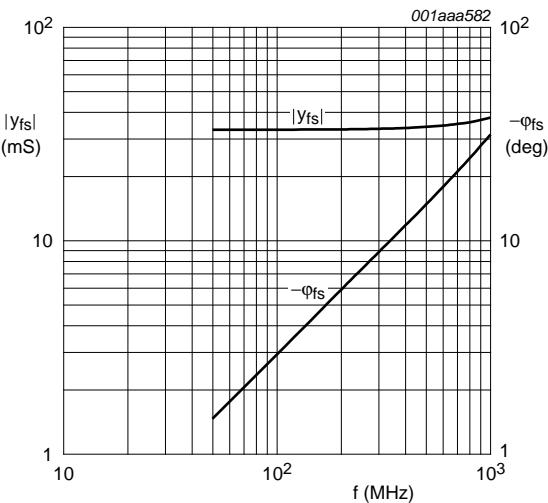
$V_{DS(b)} = 5$  V;  $V_{GG} = 5$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  
 $R_{G1(b)} = 150$  kΩ (connected to  $V_{GG}$ );  $f = 50$  MHz;  
 $T_{amb} = 25$  °C; see [Figure 34](#).

**Fig 28. Drain current as a function of gain reduction; typical values.**



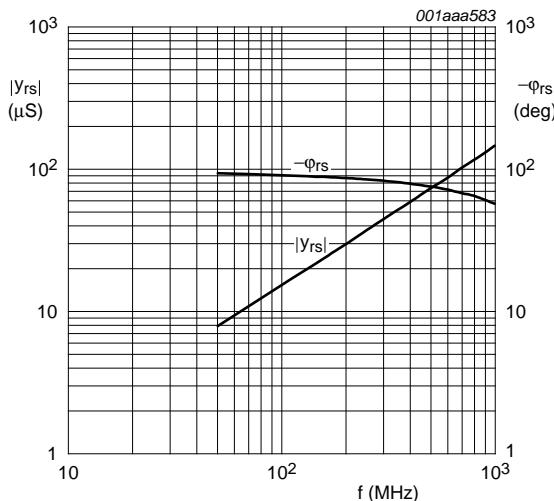
$V_{DS(b)} = 5$  V;  $V_{G2-S} = 4$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  $I_{D(b)} = 13$  mA.

**Fig 29. Input admittance as a function of frequency; typical values.**



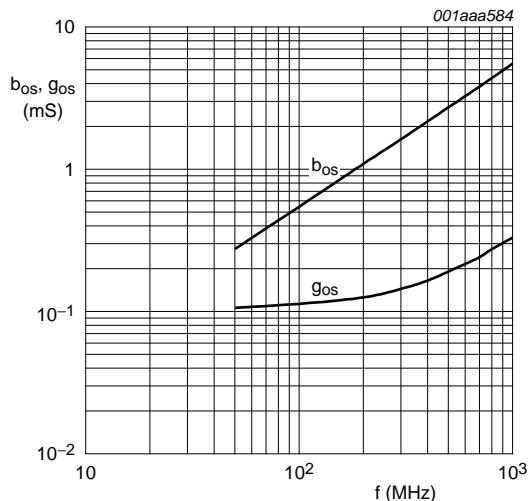
$V_{DS(b)} = 5$  V;  $V_{G2-S} = 4$  V;  $V_{DS(a)} = V_{G1-S(a)} = 0$  V;  $I_{D(b)} = 13$  mA.

**Fig 30. 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. 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. 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;  $V_{G2-S} = 4$  V;  $I_{D(b)} = 13$  mA;  $V_{DS(a)} = 0$  V;  $V_{G1-S(a)} = 0$  V;  $T_{amb} = 25$  °C.

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	Magnitude ratio	Angle (deg)						
50	0.986	-3.66	3.26	175.93	0.0008	84.23	0.988	-1.65
100	0.982	-7.01	3.24	172.04	0.0015	84.91	0.988	-3.27
200	0.975	-13.71	3.22	164.24	0.0029	83.96	0.986	-6.50
300	0.966	-20.36	3.19	156.53	0.0042	82.86	0.984	-9.69
400	0.955	-27.04	3.15	148.86	0.0055	81.88	0.982	-12.88
500	0.943	-33.62	3.10	141.24	0.0066	80.92	0.978	-16.07
600	0.927	-40.16	3.05	133.70	0.0076	80.15	0.975	-19.21
700	0.909	-46.70	2.99	126.13	0.0086	79.68	0.972	-22.35
800	0.891	-52.07	2.92	118.64	0.0094	78.28	0.968	-25.52
900	0.868	-59.48	2.84	111.09	0.0100	78.28	0.965	-28.65
1000	0.846	-65.86	2.77	103.58	0.0107	78.15	0.961	-31.85

### 8.2.3 Noise data for amplifier b

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

$V_{DS(b)} = 5$  V;  $V_{G2-S} = 4$  V;  $I_{D(b)} = 13$  mA;  $V_{DS(a)} = 0$  V;  $V_{G1-S(a)} = 0$  V;  $T_{amb} = 25$  °C.

f (MHz)	F <sub>min</sub> (dB)	$\Gamma_{opt}$		r <sub>n</sub> (Ω)
		ratio	(deg)	
400	1.3	0.695	13.11	0.694
800	1.4	0.674	32.77	0.674

## 9. Test information

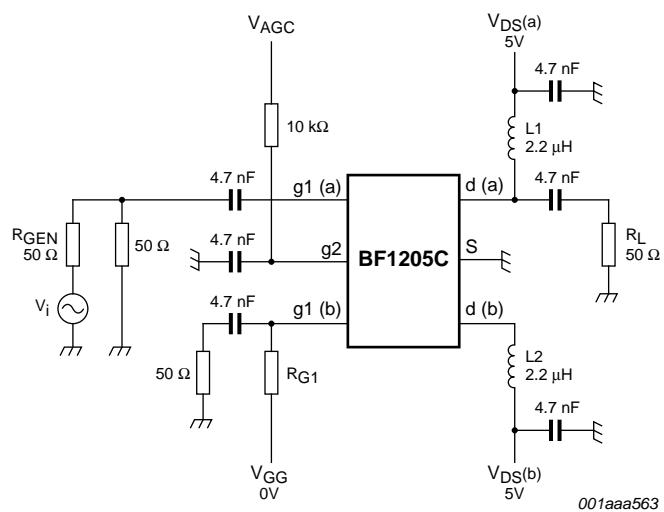


Fig 33. Cross-modulation test set-up for amplifier a.

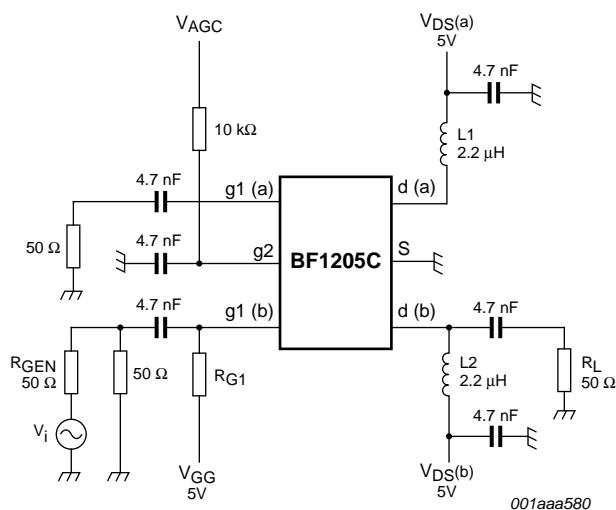
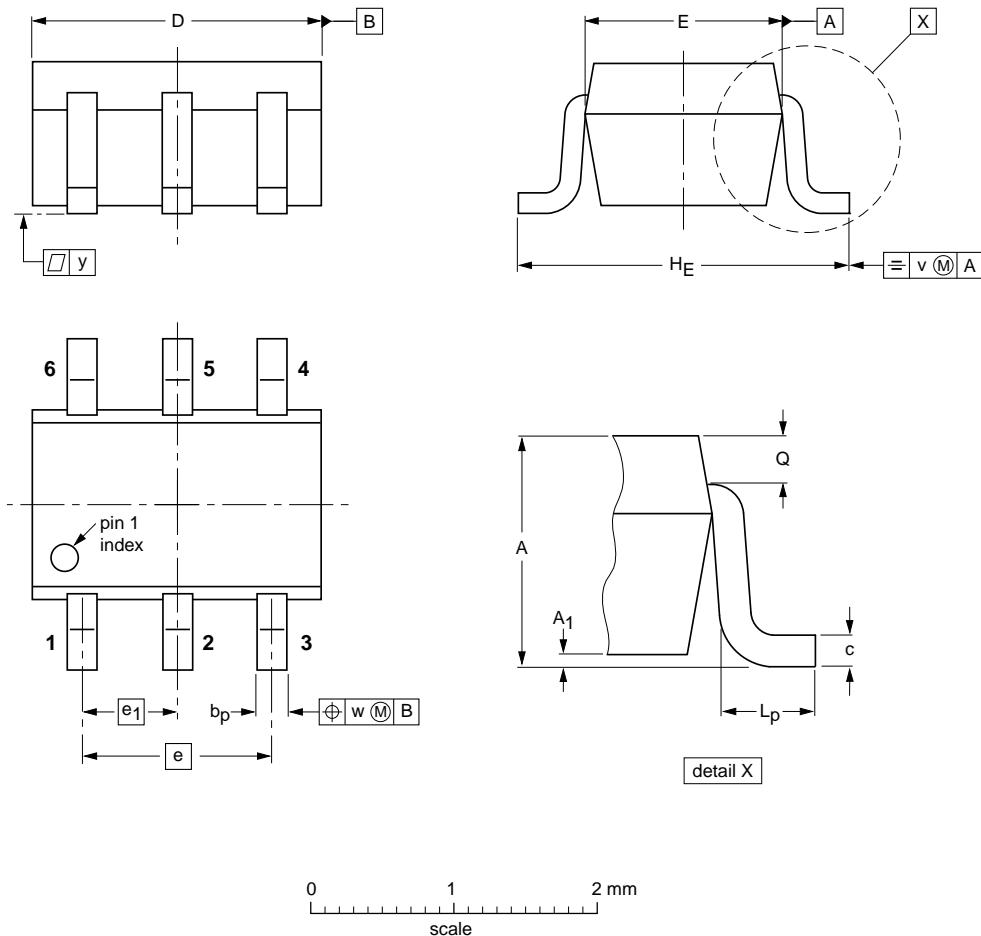


Fig 34. Cross-modulation test set-up for amplifier b.

## 10. Package outline

Plastic surface-mounted package; 6 leads

SOT363



### DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT363			SC-88			04-11-08 06-03-16

Fig 35. Package outline.

## 11. Revision history

**Table 14. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BF1205C v.3	20110907	Product data sheet	-	BF1205C v.2
Modifications:	<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li></ul>			
BF1205C v.2	20060815	Product data sheet	-	BF1205C v.1
BF1205C v.1 (9397 750 13005)	20040518	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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