

BF1208

Dual N-channel dual gate MOSFET

Rev. 01 — 16 March 2005

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

- 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

PHILIPS

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	$T_{sp} \leq 109\text{ }^{\circ}\text{C}$	[1]	-	180	mW
$ y_{fs} $	forward transfer admittance	$f = 1\text{ MHz}$				
		amplifier A; $I_D = 19\text{ mA}$	26	31	41	mS
		amplifier B; $I_D = 13\text{ mA}$	28	33	43	mS
$C_{iss}(G1)$	input capacitance at gate1	$f = 1\text{ MHz}$				
		amplifier A	-	2.2	2.7	pF
		amplifier B	-	2.0	2.5	pF
C_{rss}	reverse transfer capacitance	$f = 1\text{ MHz}$	-	20	-	fF
NF	noise figure	amplifier A; $f = 400\text{ MHz}$	-	1.3	1.9	dB
		amplifier B; $f = 800\text{ MHz}$	-	1.4	2.1	dB
Xmod	cross-modulation	input level for $k = 1\text{ \%}$ at 40 dB AGC				
		amplifier A	100	105	-	dB μ V
		amplifier B	100	103	-	dB μ 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	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	$T_{sp} \leq 109\text{ °C}$ [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.

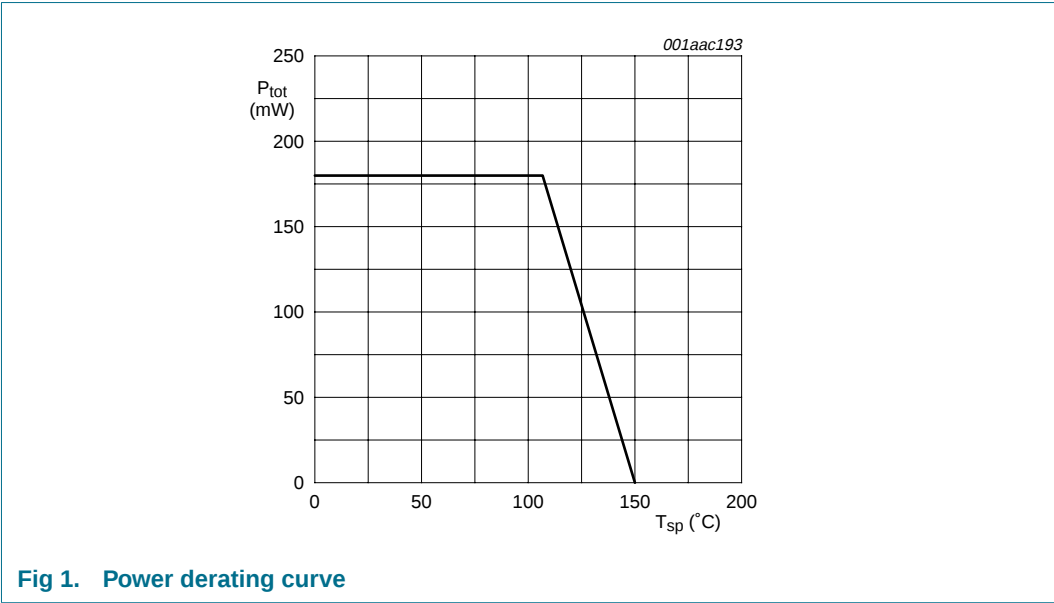


Fig 1. Power derating curve

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

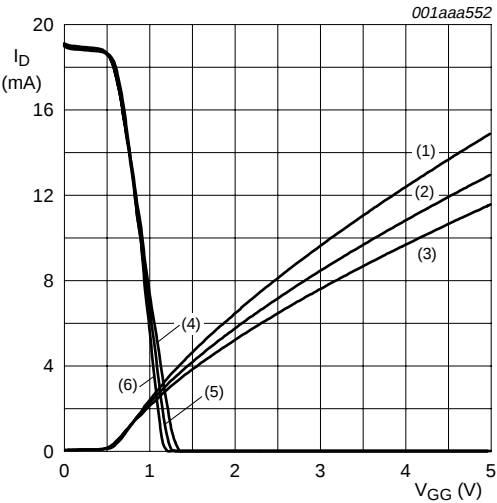
Table 7: Static characteristics

$T_j = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per MOSFET; unless otherwise specified						
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{G1-S} = V_{G2-S} = 0\text{ V}$; $I_D = 10\text{ }\mu\text{A}$				
		amplifier A	6	-	-	V
		amplifier B	6	-	-	V
$V_{(BR)G1-SS}$	gate1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0\text{ V}$; $I_{G1-S} = 10\text{ mA}$	6	-	10	V
$V_{(BR)G2-SS}$	gate2-source breakdown voltage	$V_{G1-S} = V_{DS} = 0\text{ V}$; $I_{G2-S} = 10\text{ mA}$	6	-	10	V
$V_{F(S-G1)}$	forward source-gate1 voltage	$V_{G2-S} = V_{DS} = 0\text{ V}$; $I_{S-G1} = 10\text{ mA}$	0.5	-	1.5	V
$V_{F(S-G2)}$	forward source-gate2 voltage	$V_{G1-S} = V_{DS} = 0\text{ V}$; $I_{S-G2} = 10\text{ mA}$	0.5	-	1.5	V
$V_{G1-S(th)}$	gate1-source threshold voltage	$V_{DS} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 100\text{ }\mu\text{A}$	0.3	-	1.0	V
$V_{G2-S(th)}$	gate2-source threshold voltage	$V_{DS} = 5\text{ V}$; $V_{G1-S} = 5\text{ V}$; $I_D = 100\text{ }\mu\text{A}$	0.4	-	1.0	V
I_{DSX}	drain-source current	$V_{G2-S} = 4\text{ V}$; $V_{DS(B)} = 5\text{ V}$; $R_{G1} = 150\text{ k}\Omega$				
		amplifier A; $V_{DS(A)} = 5\text{ V}$	[1] 14	-	24	mA
		amplifier B; $V_{DS(B)} = 5\text{ V}$	[2] 9	-	17	mA
I_{G1-S}	gate1 cut-off current	$V_{G2-S} = V_{DS(A)} = 0\text{ V}$				
		amplifier A; $V_{G1-S(A)} = 5\text{ V}$; $I_{D(B)} = 0\text{ A}$	-	-	50	nA
		amplifier B; $V_{G1-S(B)} = 5\text{ V}$; $V_{DS(B)} = 0\text{ V}$	-	-	50	nA
I_{G2-S}	gate2 cut-off current	$V_{G2-S} = 4\text{ V}$; $V_{G1-S(B)} = 0\text{ V}$;	-	-	20	nA
		$V_{G1-S(A)} = V_{DS(A)} = V_{DS(B)} = 0\text{ V}$				

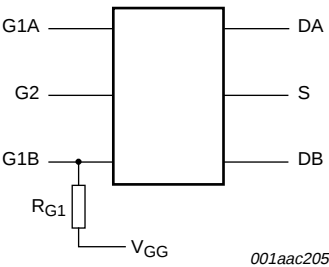
[1] R_{G1} connects gate1 (B) to $V_{GG} = 0\text{ V}$ (see [Figure 3](#)).

[2] R_{G1} connects gate1 (B) to $V_{GG} = 5\text{ V}$ (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 MOSFET A and B as a function of gate1 supply voltage



$V_{GG} = 5\text{ V}$: 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 [\[1\]](#)
Common source; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 19\text{ mA}$; unless otherwise specified.

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

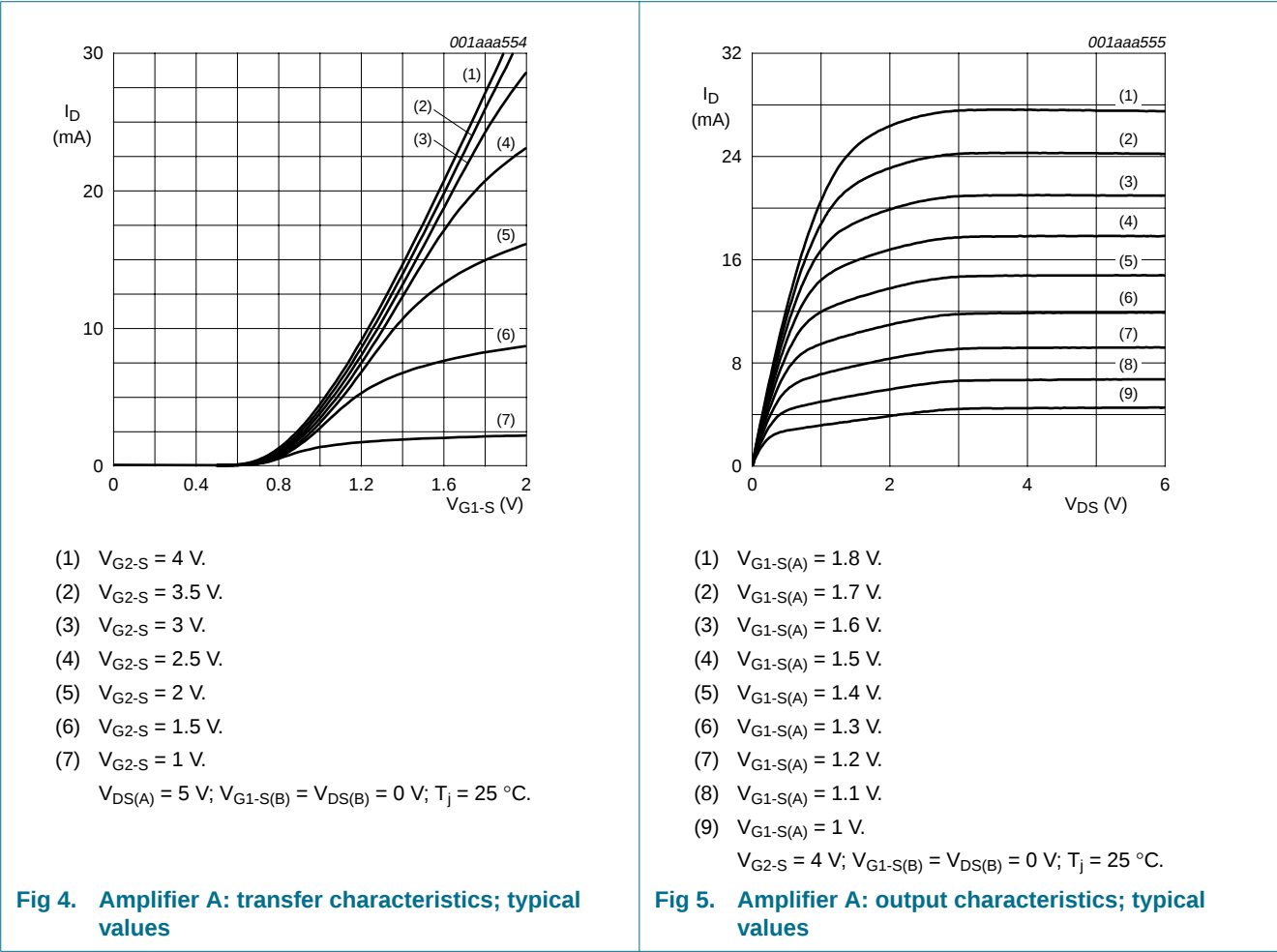


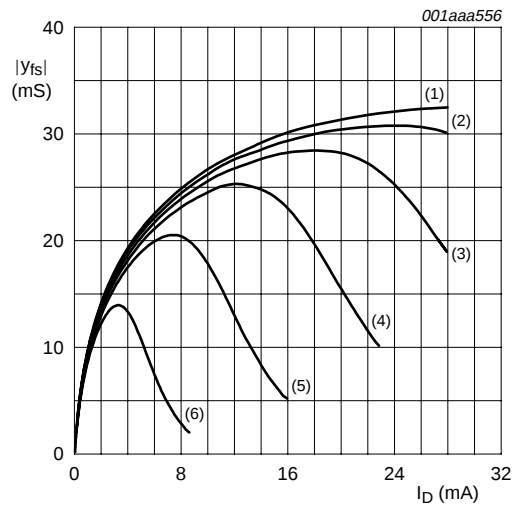
Table 8: Dynamic characteristics for amplifier A [\[1\]](#) ...continued
Common source; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 19\text{ mA}$; unless otherwise specified.

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

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

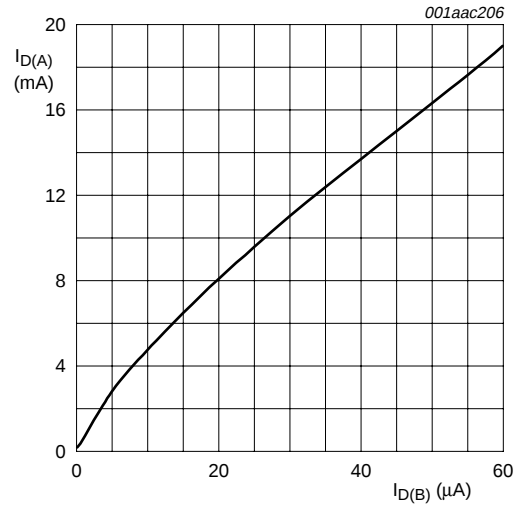
8.1.1 Graphics for amplifier A





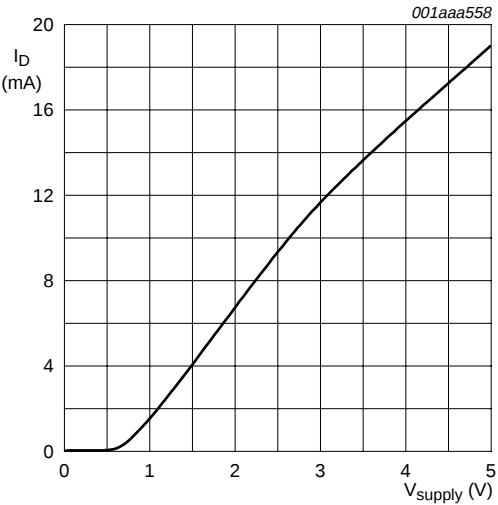
- (1) $V_{G2-S} = 4 \text{ V}$.
 - (2) $V_{G2-S} = 3.5 \text{ V}$.
 - (3) $V_{G2-S} = 3 \text{ V}$.
 - (4) $V_{G2-S} = 2.5 \text{ V}$.
 - (5) $V_{G2-S} = 2 \text{ V}$.
 - (6) $V_{G2-S} = 1.5 \text{ V}$.
- $V_{DS(A)} = 5 \text{ V}$; $V_{G1-S(B)} = V_{DS(B)} = 0 \text{ V}$; $T_j = 25^\circ\text{C}$.

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



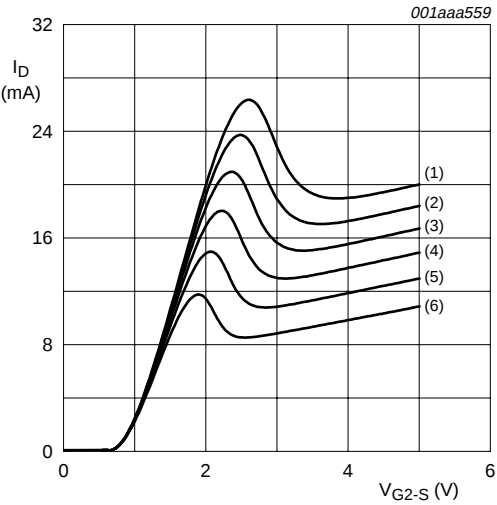
$V_{DS(A)} = 5 \text{ V}$; $V_{G2-S} = 4 \text{ V}$; $V_{DS(B)} = 5 \text{ V}$;
 $V_{G1-S(B)} = 0 \text{ V}$; $T_j = 25^\circ\text{C}$.
 $I_{D(B)}$ = internal G1 current = current in pin drain (B) if
MOSFET (B) is switched off.

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



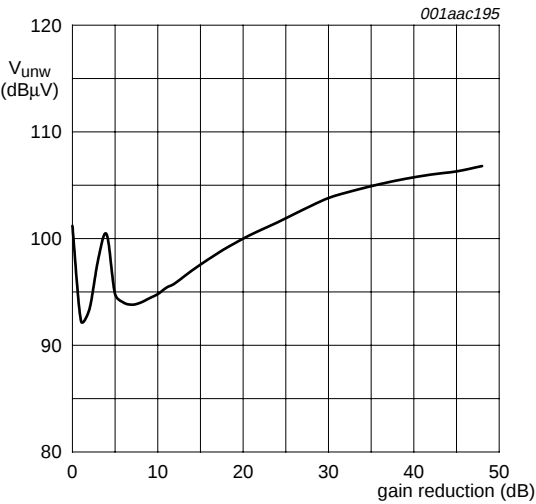
$V_{DS(A)} = V_{DS(B)} = V_{supply}$; $V_{G2-S} = 4\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$;
 $R_{G1} = 150\text{ k}\Omega$ (connected to ground); see [Figure 3](#).

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



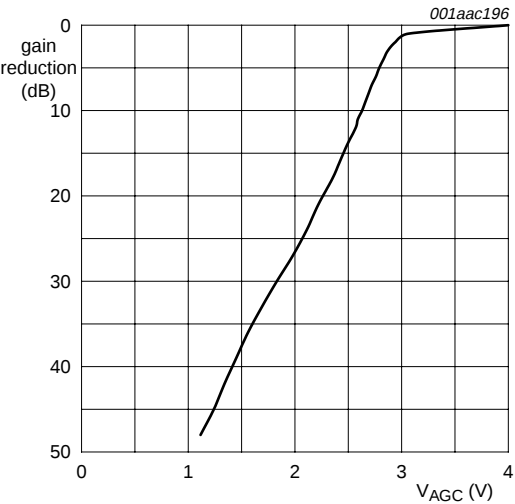
- (1) $V_{DS(B)} = 5\text{ V}$.
 - (2) $V_{DS(B)} = 4.5\text{ V}$.
 - (3) $V_{DS(B)} = 4\text{ V}$.
 - (4) $V_{DS(B)} = 3.5\text{ V}$.
 - (5) $V_{DS(B)} = 3\text{ V}$.
 - (6) $V_{DS(B)} = 2.5\text{ V}$.
- $V_{DS(A)} = 5\text{ V}$; $V_{G1-S(B)} = 0\text{ V}$; gate1 (A) = open;
 $T_j = 25\text{ }^{\circ}\text{C}$.

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



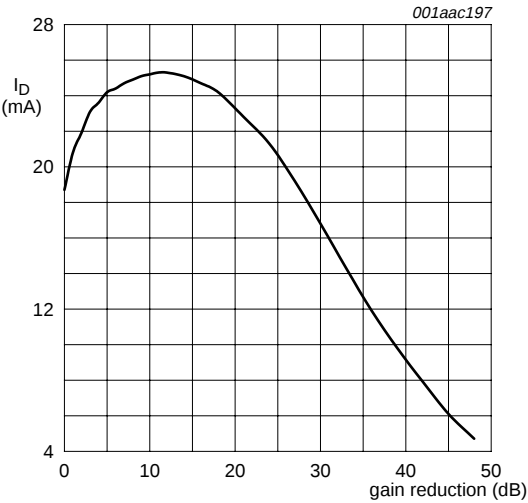
$V_{DS(A)} = V_{DS(B)} = 5\text{ V}$; $V_{G1-S(B)} = 0\text{ V}$; $f_w = 50\text{ MHz}$;
 $f_{unw} = 60\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; see [Figure 33](#).

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



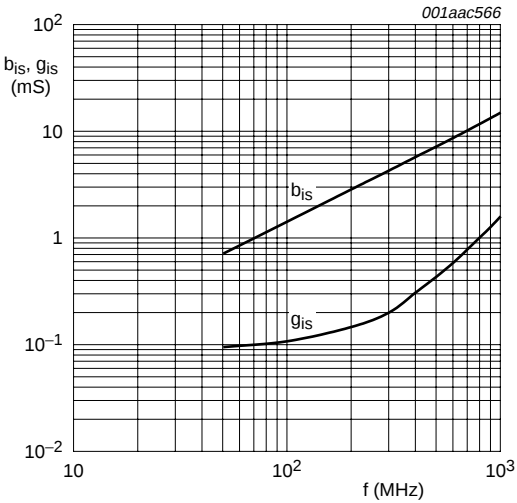
$V_{DS(A)} = V_{DS(B)} = 5\text{ V}$; $V_{G1-S(B)} = 0\text{ V}$; $f = 50\text{ MHz}$;
see [Figure 33](#).

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



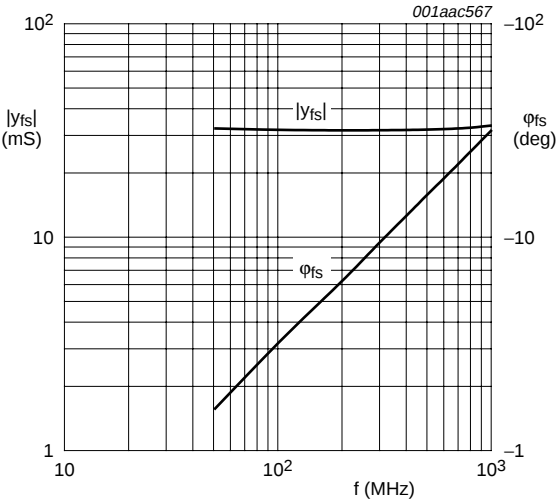
$V_{DS(A)} = V_{DS(B)} = 5\text{ V}$; $V_{G1-S(B)} = 0\text{ V}$; $f = 50\text{ MHz}$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; see [Figure 33](#).

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



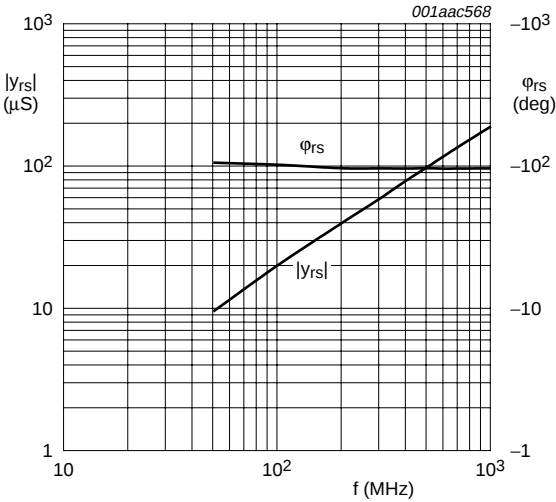
$V_{DS(A)} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $V_{DS(B)} = V_{G1-S(B)} = 0\text{ V}$;
 $I_{D(A)} = 19\text{ mA}$

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



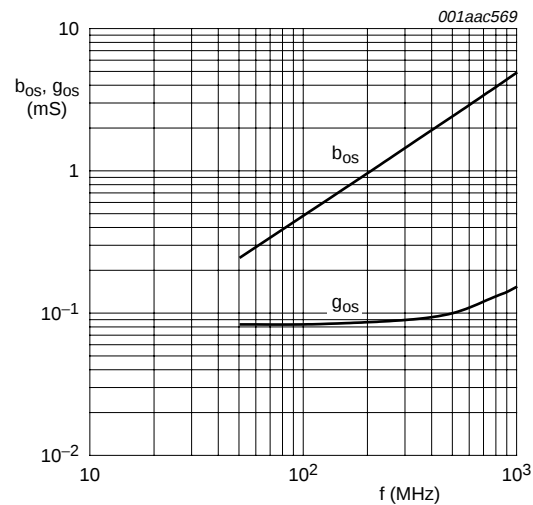
$V_{DS(A)} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $V_{DS(B)} = V_{G1-S(B)} = 0\text{ V}$;
 $I_{D(A)} = 19\text{ mA}$

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



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

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



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

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

$V_{DS(A)} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_{D(A)} = 19\text{ mA}$; $V_{DS(B)} = 0\text{ V}$; $V_{G1-S(B)} = 0\text{ V}$; $T_{amb} = 25\text{ °C}$; 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

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

f (MHz)	NF _{min} (dB)	Γ _{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; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 13\text{ mA}$; unless otherwise specified.

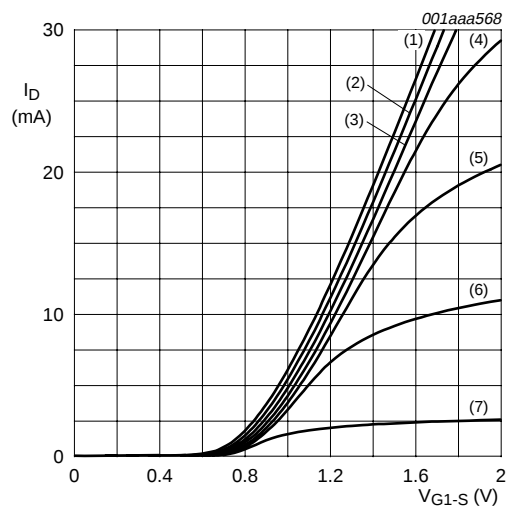
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$ y_{fs} $	forward transfer admittance	$T_J = 25\text{ }^{\circ}\text{C}$	28	33	43	mS
$C_{iss}(G1)$	input capacitance at gate1	$f = 1\text{ MHz}$	-	2.0	2.5	pF
$C_{iss}(G2)$	input capacitance at gate2	$f = 1\text{ MHz}$	-	3.4	-	pF
C_{oss}	output capacitance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

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

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



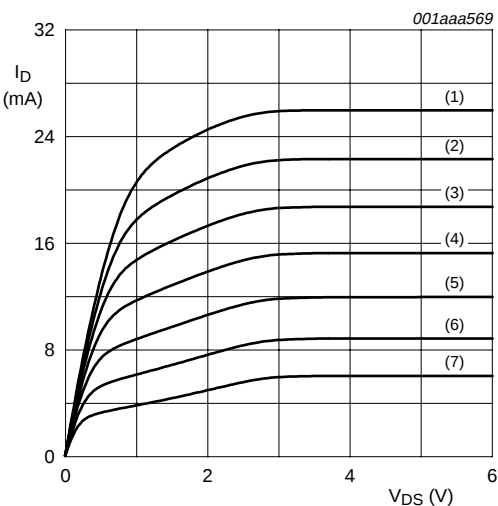
8.2.1 Graphics for amplifier B



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

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

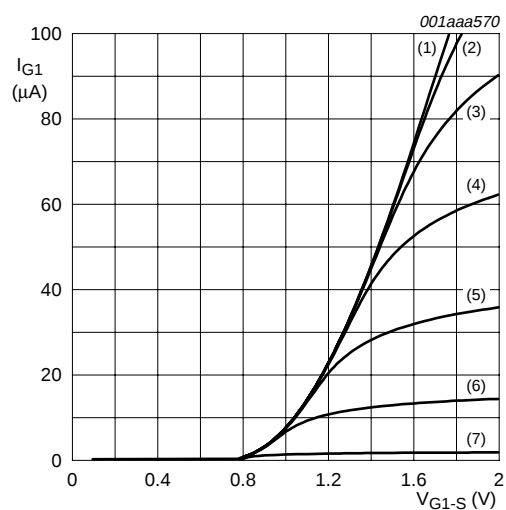
Fig 17. Amplifier B: transfer characteristics; typical values



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

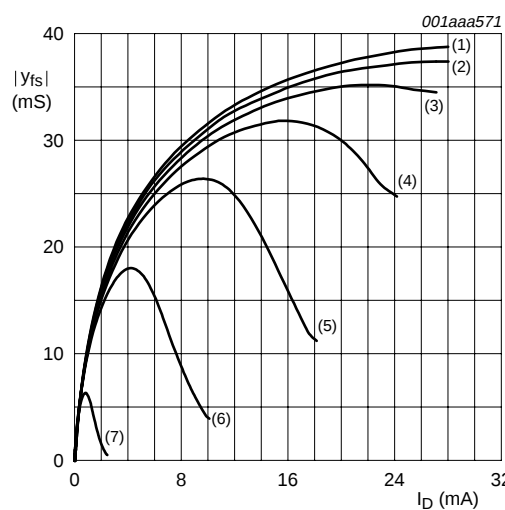
$V_{G2-S} = 4 \text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0 \text{ V}$; $T_j = 25 \text{ }^{\circ}\text{C}$.

Fig 18. Amplifier B: output characteristics; typical values



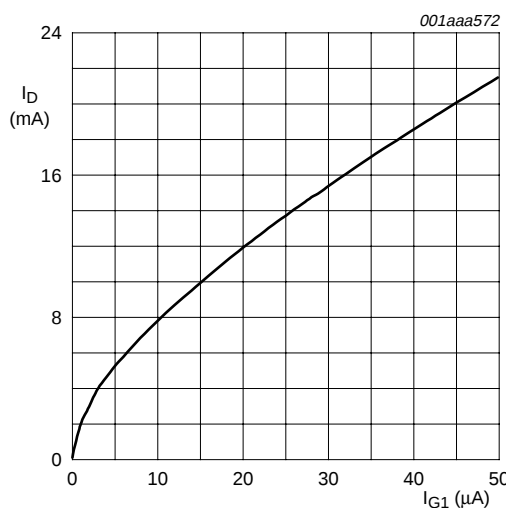
(1) $V_{G2-S} = 4\text{ V}$.
(2) $V_{G2-S} = 3.5\text{ V}$.
(3) $V_{G2-S} = 3\text{ V}$.
(4) $V_{G2-S} = 2.5\text{ V}$.
(5) $V_{G2-S} = 2\text{ V}$.
(6) $V_{G2-S} = 1.5\text{ V}$.
(7) $V_{G2-S} = 1\text{ V}$.
 $V_{DS(B)} = 5\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$.

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



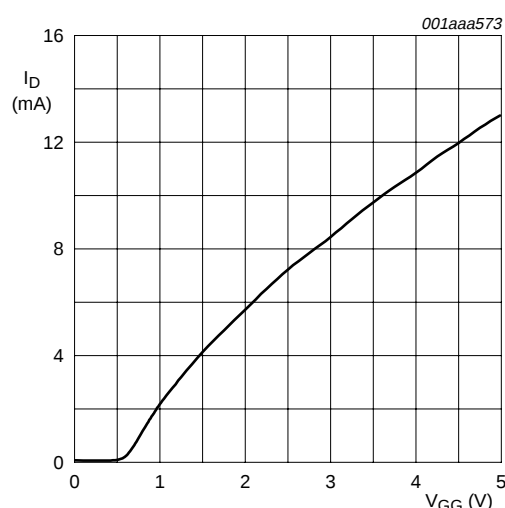
(1) $V_{G2-S} = 4\text{ V}$.
(2) $V_{G2-S} = 3.5\text{ V}$.
(3) $V_{G2-S} = 3\text{ V}$.
(4) $V_{G2-S} = 2.5\text{ V}$.
(5) $V_{G2-S} = 2\text{ V}$.
(6) $V_{G2-S} = 1.5\text{ V}$.
(7) $V_{G2-S} = 1\text{ V}$.
 $V_{DS(B)} = 5\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$.

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



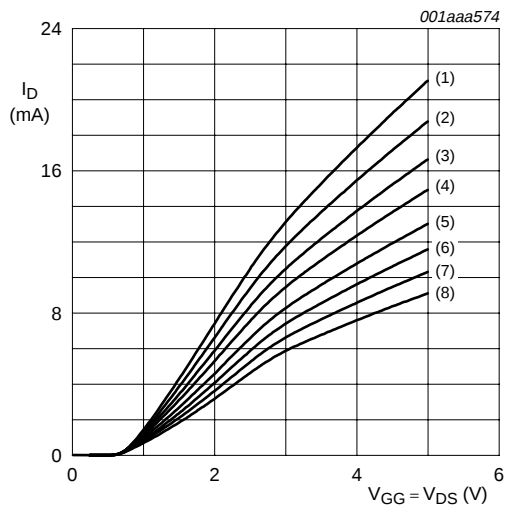
$V_{DS(B)} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$;
 $T_j = 25\text{ }^{\circ}\text{C}$.

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



$V_{DS(B)} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$;
 $T_j = 25\text{ }^{\circ}\text{C}$; $R_{G1} = 150\text{ k}\Omega$ (connected to V_{GG}); see [Figure 3](#).

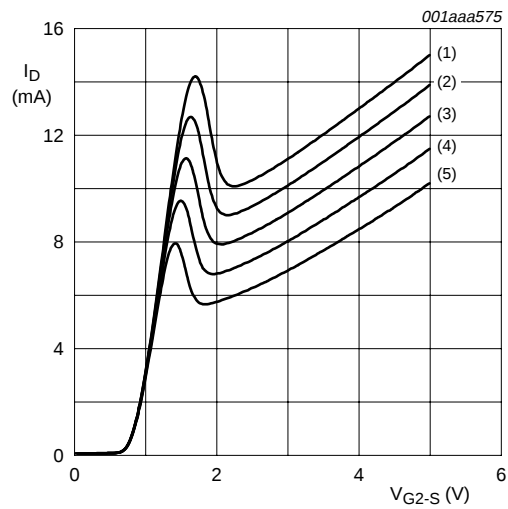
Fig 22. Amplifier B: drain current as a function of gate1 supply voltage; typical values



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

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

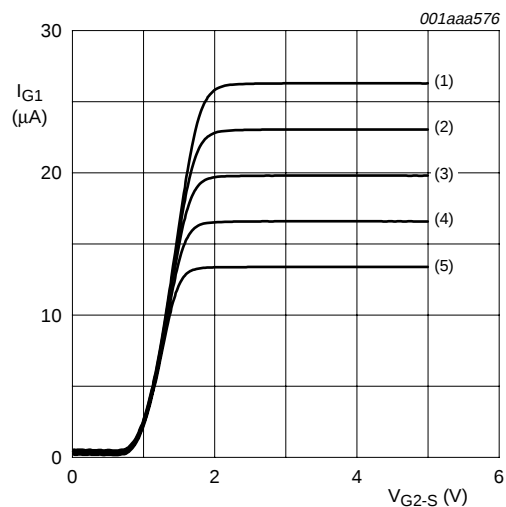
Fig 23. Amplifier B: drain current as a function of gate1 supply voltage and drain supply voltage; typical values



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

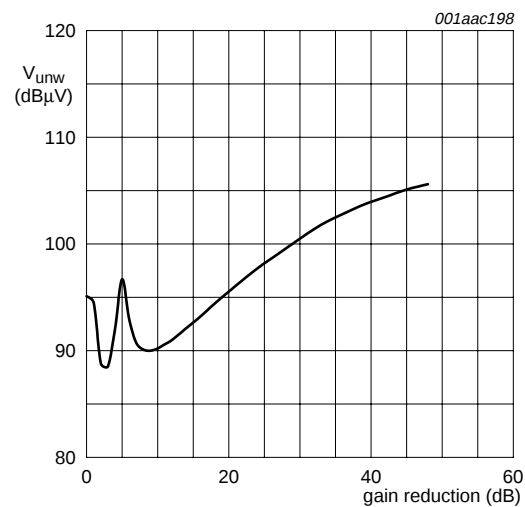
$V_{DS(B)} = 5 \text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$;
 $R_{G1} = 150 \text{ k}\Omega$ (connected to V_{GG}); see [Figure 3](#).

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



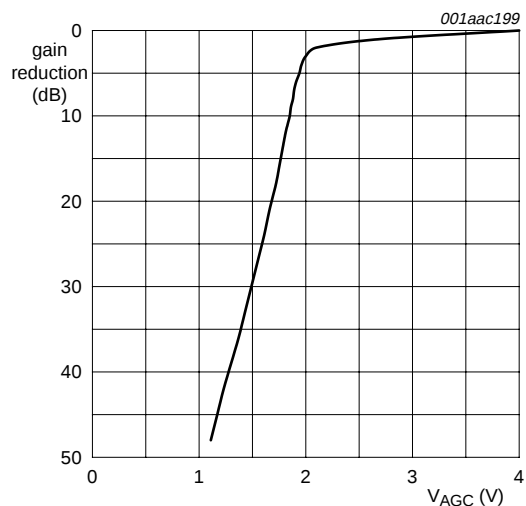
(1) $V_{GG} = 5.0\text{ V}$.
(2) $V_{GG} = 4.5\text{ V}$.
(3) $V_{GG} = 4.0\text{ V}$.
(4) $V_{GG} = 3.5\text{ V}$.
(5) $V_{GG} = 3.0\text{ V}$.
 $V_{DS(B)} = 5\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$;
 $R_{G1} = 150\text{ k}\Omega$ (connected to V_{GG}); see [Figure 3](#).

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



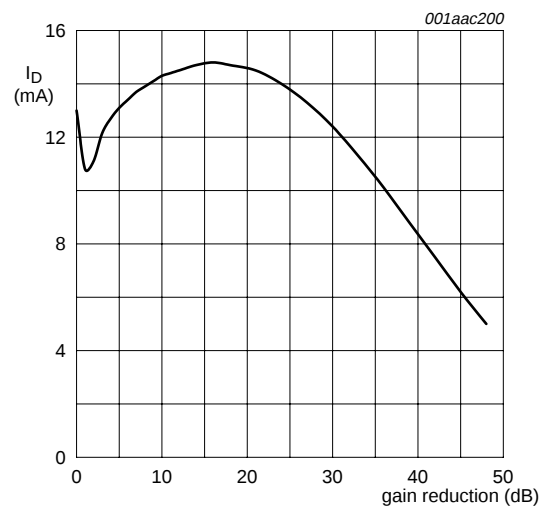
$V_{DS(B)} = 5\text{ V}$; $V_{GG} = 5\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$;
 $R_{G1} = 150\text{ k}\Omega$ (connected to V_{GG}); $f_w = 50\text{ MHz}$;
 $f_{unw} = 60\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$; see [Figure 34](#).

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



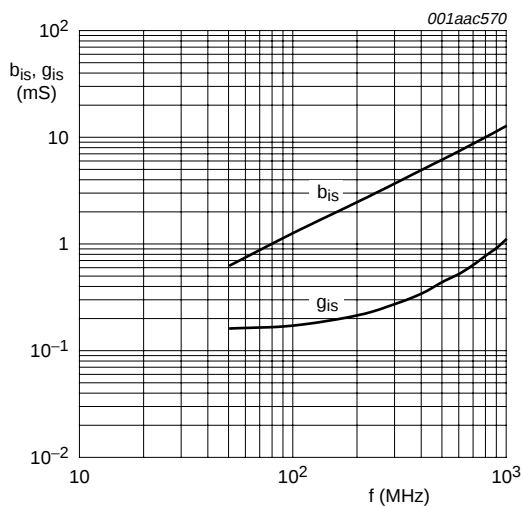
$V_{DS(B)} = 5\text{ V}$; $V_{GG} = 5\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$;
 $R_{G1} = 150\text{ k}\Omega$ (connected to V_{GG}); $f = 50\text{ MHz}$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; see [Figure 34](#).

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



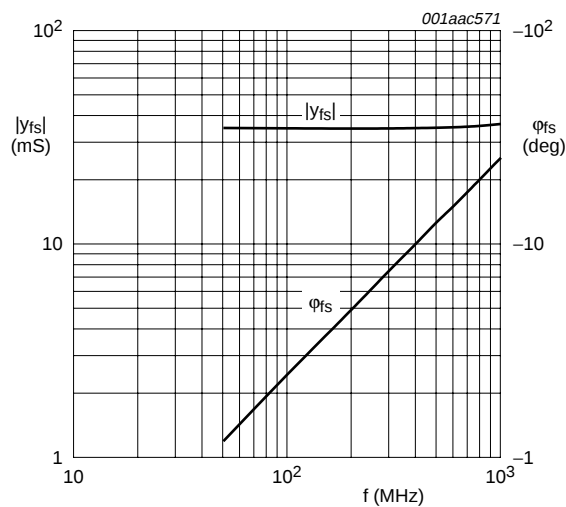
$V_{DS(B)} = 5\text{ V}$; $V_{GG} = 5\text{ V}$; $V_{DS(A)} = V_{G1-S(A)} = 0\text{ V}$;
 $R_{G1} = 150\text{ k}\Omega$ (connected to V_{GG}); $f = 50\text{ MHz}$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; see [Figure 34](#).

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



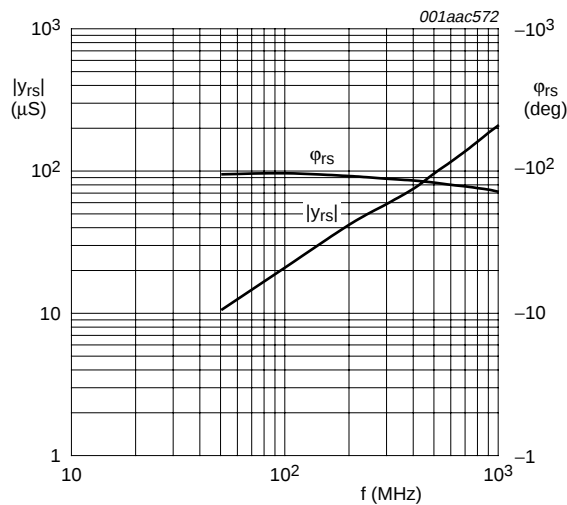
$V_{DS(B)} = 5\text{ V}; V_{G2-S} = 4\text{ V}; V_{DS(A)} = V_{G1-S(A)} = 0\text{ V};$
 $I_{D(B)} = 13\text{ mA}$

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



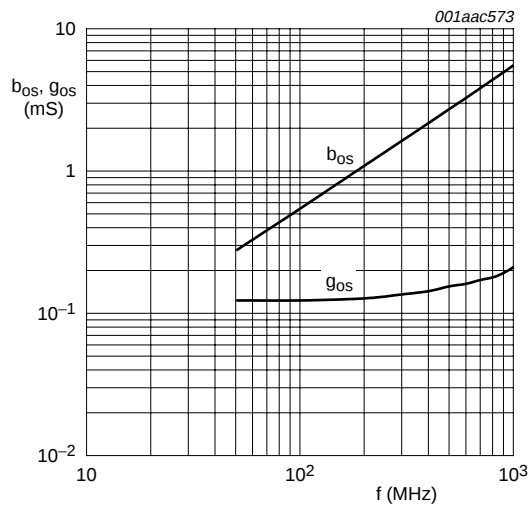
$V_{DS(B)} = 5\text{ V}; V_{G2-S} = 4\text{ V}; V_{DS(A)} = V_{G1-S(A)} = 0\text{ V};$
 $I_{D(B)} = 13\text{ mA}$

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



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

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



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

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

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

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

f (MHz)	NF _{min} (dB)	Γ _{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

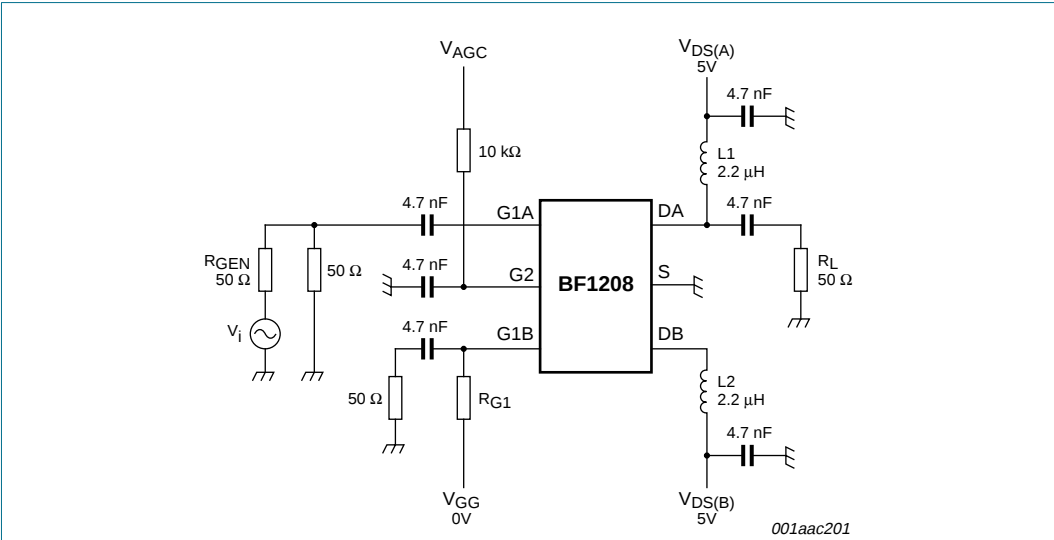


Fig 33. Cross-modulation test set-up for amplifier A

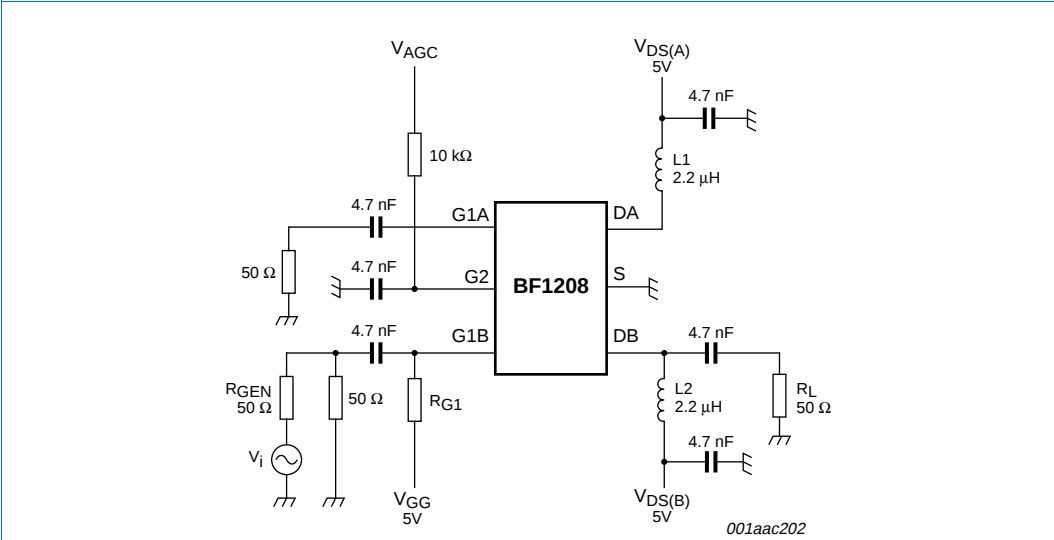


Fig 34. Cross-modulation test set-up for amplifier B

10. Package outline

Plastic surface mounted package; 6 leads

SOT666

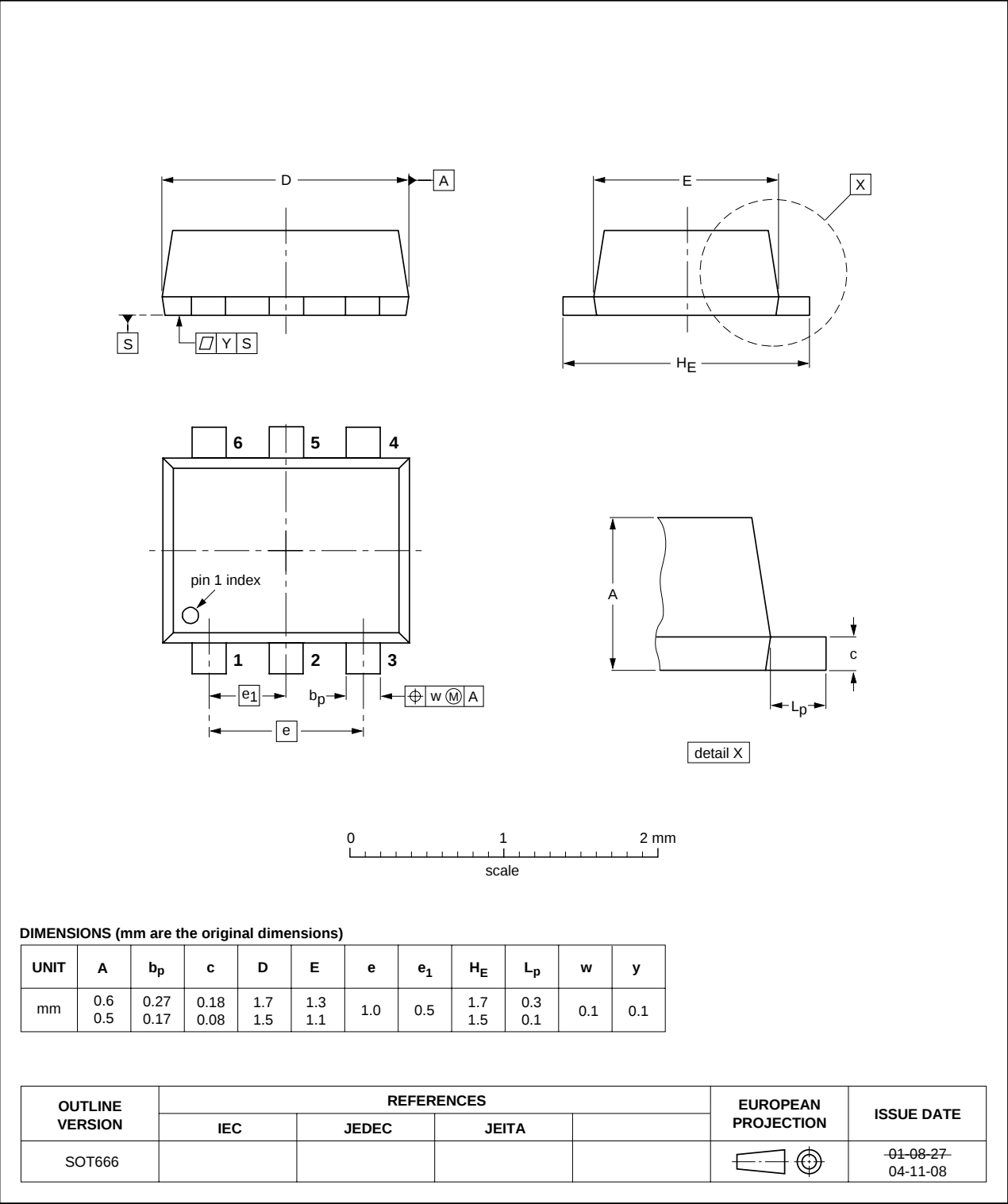


Fig 35. Package outline SOT666

11. Revision history

Table 14: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BF1208_1	20050316	Product data sheet	-	9397 750 14254	-

12. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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Date of release: 16 March 2005
Document number: 9397 750 14254

Published in The Netherlands