

BLF4G20LS-110B

UHF power LDMOS transistor

Rev. 01 — 10 January 2006 Product data sheet

1. Product profile

1.1 General description

110 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz.

Table 1: Typical performance

f = 1930 MHz to 1990 MHz; T_{case} = 25 °C; I_{Dq} = 650 mA; unless otherwise specified; in a class-AB production test circuit; typical values

Mode of operation	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)	$ACPR_{400}$ (dBc)	$ACPR_{600}$ (dBc)	EVM_{rms} (%)
CW	28	100	13.4	49	-	-	-
GSM EDGE	28	48 (AV)	13.8	38.5	–61 [1]	–74 [2]	2.1

[1] $ACPR_{400}$ at 30 kHz resolution bandwidth.

[2] $ACPR_{600}$ at 30 kHz resolution bandwidth.

CAUTION



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

1.2 Features

- Typical GSM EDGE performance at a frequency of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I_{Dq} of 650 mA:
  - Load power = 48 W (AV)
  - Gain = 13.8 dB (typ)
  - Efficiency = 38.5 % (typ)
  - $ACPR_{400}$ = –61 dBc (typ)
  - $ACPR_{600}$ = –74 dBc (typ)
  - EVM_{rms} = 2.1 % (typ)
- Easy power control
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use

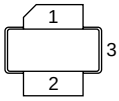
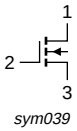
PHILIPS

1.3 Applications

- RF power amplifiers for GSM, GSM EDGE and CDMA base stations and multicarrier applications in the 1800 MHz to 2000 MHz frequency range.

2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	drain		
2	gate		
3	source [1]		

sym039

[1] Connected to flange

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BLF4G20LS-110B	-	earless flanged LDMOST ceramic package; 2 leads	SOT502B

4. Limiting values

Table 4: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	65	V
V_{GS}	gate-source voltage		–0.5	+15	V
I_D	drain current		-	12	A
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	200	°C

5. Thermal characteristics

Table 5: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	T_{case} = 80 °C				
		P_L = 40 W	-	0.62	0.71	K/W
		P_L = 100 W	-	0.52	0.61	K/W

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

6. Characteristics

Table 6: Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.9 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	2.5	3.1	3.5	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 900 mA	2.7	3.2	3.7	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	3	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 6 V; V_{DS} = 10 V	27	30	-	A
I_{GSS}	gate leakage current	V_{GS} = ±15 V; V_{DS} = 0 V	-	-	300	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 10 A	-	9.0	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 6 V; I_D = 6 A	-	90	-	mΩ
C_{rs}	feedback capacitance	V_{GS} = 0 V; V_{DS} = 28 V; f = 1 MHz	-	2.5	-	pF

7. Application information

Table 7: Application information

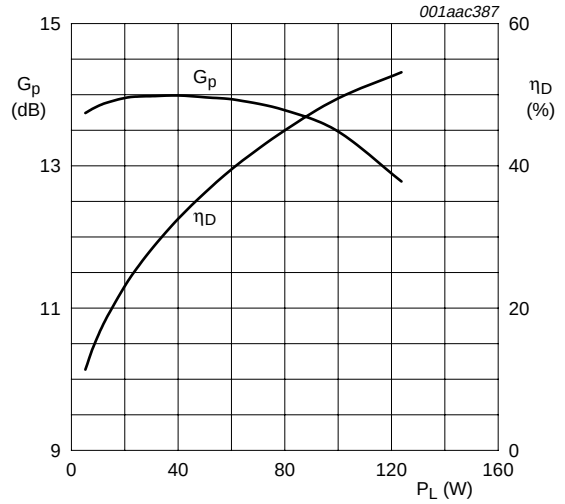
Mode of operation: GSM EDGE; f = 1930 MHz and 1990 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 48 W	13	13.8	-	dB
IRL	input return loss	$P_{L(AV)}$ = 48 W	-	–10	–6.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 48 W	36	38.5	-	%
$ACPR_{400}$	adjacent channel power ratio (400 kHz)	$P_{L(AV)}$ = 48 W	-	–61	–58	dBc
$ACPR_{600}$	adjacent channel power ratio (600 kHz)	$P_{L(AV)}$ = 48 W	-	–74	–71	dBc
EVM_{rms}	rms EDGE signal distortion error	$P_{L(AV)}$ = 48 W	-	2.1	3.3	%
EVM_M	peak EDGE signal distortion error	$P_{L(AV)}$ = 48 W	-	7.0	10	%

7.1 Ruggedness in class-AB operation

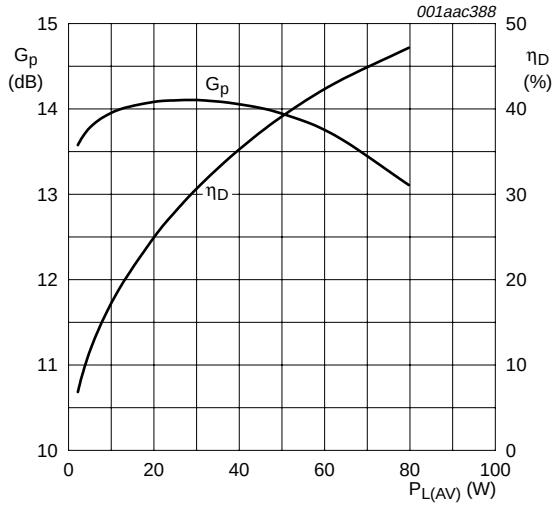
The BLF4G20LS-110B is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 650 mA; P_L = 110 W (CW); f = 1990 MHz.

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.



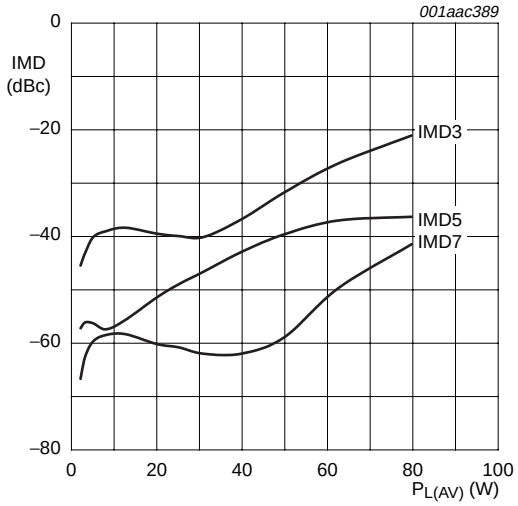
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 1. One-tone CW power gain and drain efficiency as functions of load power; typical values



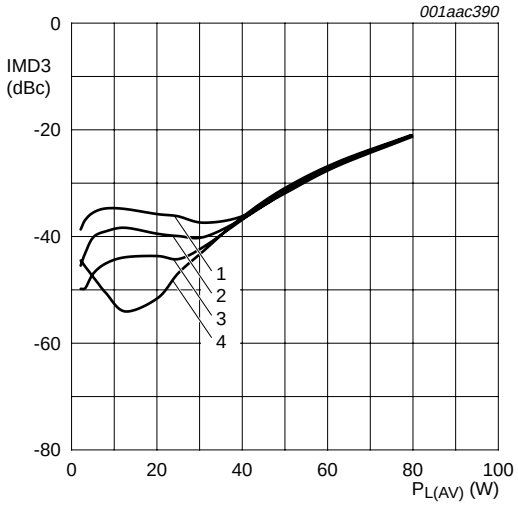
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 2. Two-tone CW power gain and drain efficiency as functions of average load power; typical values



V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 3. Intermodulation distortion as a function of average load power; typical values

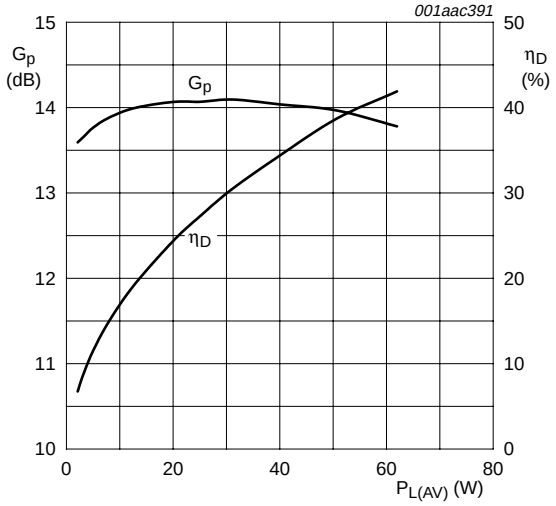


V_{DS} = 28 V; T_{case} = 25 °C; f = 1990 MHz

(1) I_{Dq} = 550 mA
(2) I_{Dq} = 650 mA
(3) I_{Dq} = 750 mA
(4) I_{Dq} = 850 mA

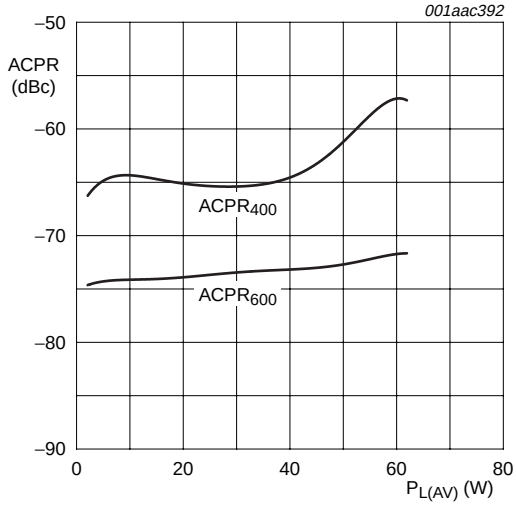
Fig 4. Third order intermodulation distortion as a function of average load power; typical values

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.



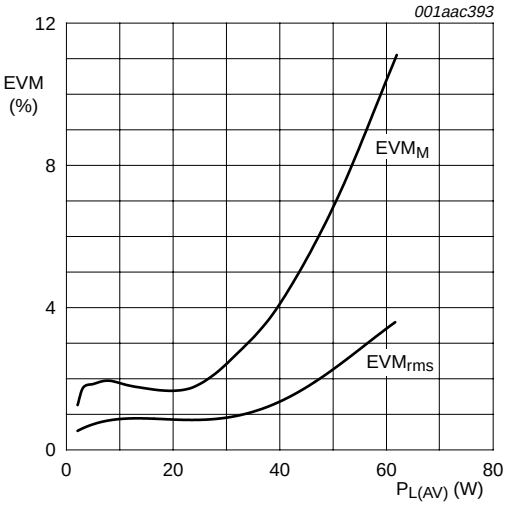
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 5. GSM EDGE power gain and drain efficiency as functions of average load power; typical values



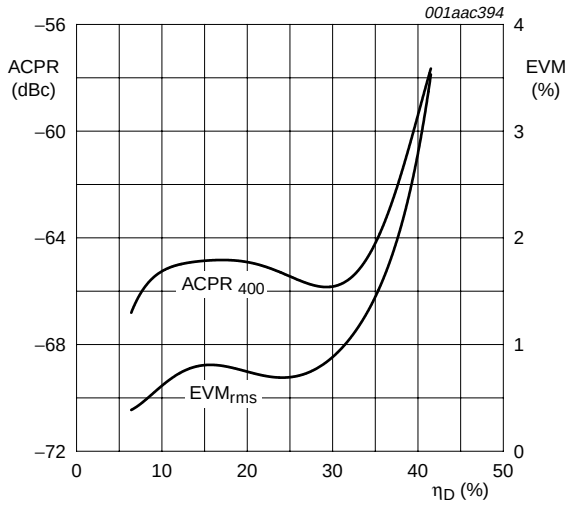
V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 6. GSM EDGE ACPR at 400 kHz and at 600 kHz as a function of average load power; typical values



V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 7. GSM EDGE rms EVM and peak EVM as functions of average load power; typical values

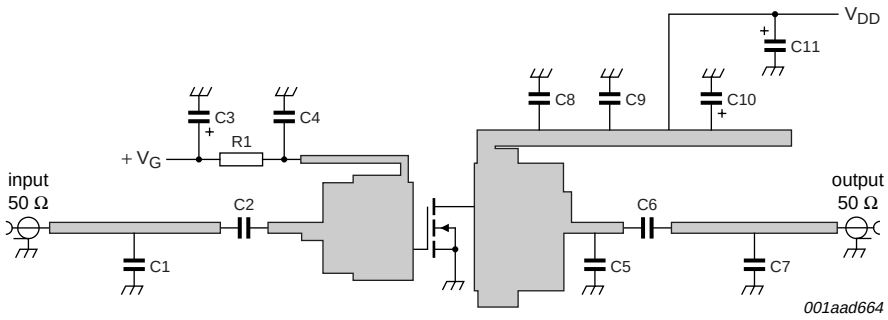


V_{DS} = 28 V; I_{Dq} = 650 mA; T_{case} = 25 °C;
f = 1990 MHz

Fig 8. GSM EDGE ACPR at 400 kHz and rms EVM as functions of drain efficiency; typical values

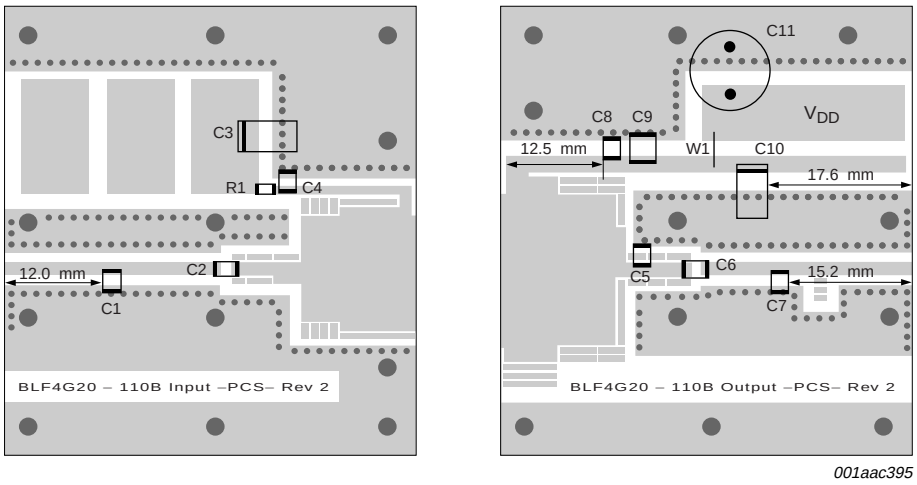
© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

8. Test information



See Table 8 for list of components.

Fig 9. Test circuit for operation at 1990 MHz



The striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm.

See Table 8 for list of components.

Fig 10. Component layout for 1990 MHz test circuit

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

Table 8: List of components (see Figure 10).

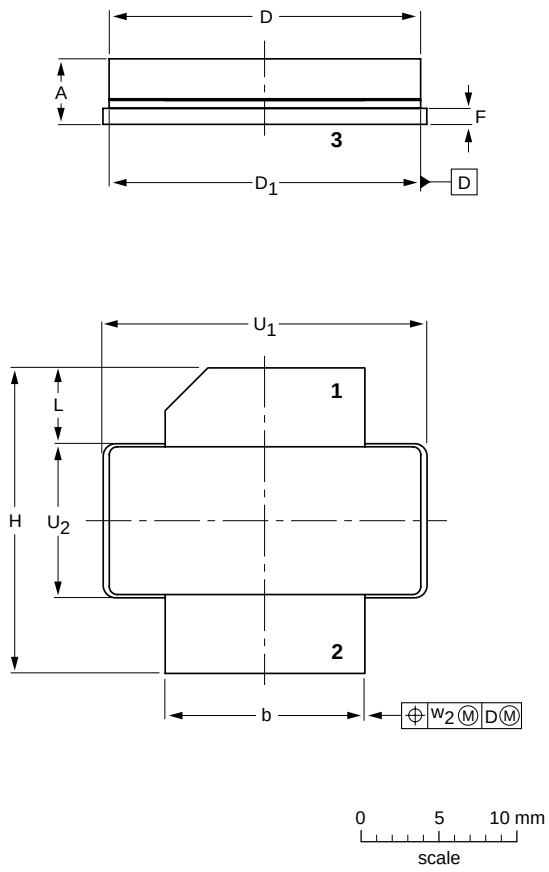
Component	Description	Value	Dimensions	Catalogue number
C1	multilayer ceramic chip capacitor [1]	0.1 pF		
C2, C4, C8	multilayer ceramic chip capacitor [1]	11 pF		
C3, C10	tantalum capacitor	10 μF		
C5	multilayer ceramic chip capacitor [1]	0.5 pF		
C6	multilayer ceramic chip capacitor [1]	8.2 pF		
C7	multilayer ceramic chip capacitor [1]	0.2 pF		
C9	multilayer ceramic chip capacitor	1 μF		1812X7R105KL2AB
C11	Philips electrolytic capacitor	220 μF; 35 V		
R1	Philips chip resistor	5.6 Ω	0603	
W1	hand made wire		5 mm	

[1] American Technical Ceramics type 100B or capacitor of same quality.

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

9. Package outline

Earless flanged LDMOST ceramic package; 2 leads **SOT502B**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	1.70 1.45	20.70 20.45	9.91 9.65	0.25
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						~~99-12-28~~ 03-01-10

Fig 11. Package outline SOT502B

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

10. Abbreviations

Table 9: Abbreviations

Acronym	Description
ACPR	Adjacent Channel Power Ratio
CDMA	Code Division Multiple Access
CW	Continuous Wave
EDGE	Enhanced Data rates for GSM Evolution
EVM	Error Vector Magnitude
GSM	Global System for Mobile communications
I_{Dq}	quiescent drain current
LDMOS	Laterally Diffused Metal Oxide Semiconductor
RF	Radio Frequency
VSWR	Voltage Standing Wave Ratio

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

11. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BLF4G20LS-110B_1	20060110	Product data sheet	-	9397 750 14548	-

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

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.

13. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

14. Disclaimers

Life support — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

15. Trademarks

Notice — All referenced brands, product names, service names and trademarks are the property of their respective owners.

16. Contact information

For additional information, please visit: **http://www.semiconductors.philips.com**

For sales office addresses, send an email to: **sales.addresses@www.semiconductors.philips.com**

© Koninklijke Philips Electronics N.V. 2006. All rights reserved.

17. Contents

1	**Product profile**	**1**
1.1	General description	1
1.2	Features	1
1.3	Applications	2
2	**Pinning information**	**2**
3	**Ordering information**	**2**
4	**Limiting values**	**2**
5	**Thermal characteristics**	**2**
6	**Characteristics**	**3**
7	**Application information**	**3**
7.1	Ruggedness in class-AB operation	3
8	**Test information**	**6**
9	**Package outline**	**8**
10	**Abbreviations**	**9**
11	**Revision history**	**10**
12	**Data sheet status**	**11**
13	**Definitions**	**11**
14	**Disclaimers**	**11**
15	**Trademarks**	**11**
16	**Contact information**	**11**

© Koninklijke Philips Electronics N.V. 2006

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 10 January 2006
Document number: 9397 750 14548

Published in The Netherlands