Rochester Electronics®

Datasheet

PART NUMBER

BLA0912-250-ROC

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

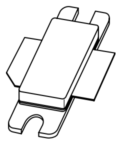
- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
  - Class Q Military
  - Class V Space Level

Qualified Suppliers List of Distributors (QSLD)

- Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.



BLA0912-250

Avionics LDMOS transistor

Rev. 02 — 22 July 2004 Product data sheet

1. Product profile

1.1 General description

Silicon N-channel enhancement mode lateral D-MOS transistor encapsulated in a 2-lead SOT502A flange package with a ceramic cap. The common source is connected to the mounting flange.

1.2 Features

- High power gain
- Easy power control
- Excellent ruggedness
- Source on mounting base eliminates DC isolators, reducing common mode inductance.

1.3 Applications

- Avionics transmitter applications in the 960 MHz to 1215 MHz frequency range such as Mode-S, TCAS and JTIDS, DME or TACAN.

1.4 Quick reference data

Table 1: Quick reference data

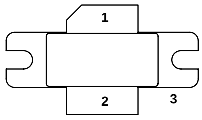
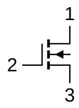
Typical RF performance measured in common source class-AB circuit at P_L = 250 W and 960 MHz to 1215 MHz frequency band. T_h = 25 °C; Z_{th} = 0.15 K/W; unless specified otherwise.

Mode of operation	Conditions	V_{DS} (V)	P_L (W)	G_p (dB)	ΔG_p (dB)	η_D (%)	Pulse droop (dB)	t_r (ns)	t_f (ns)	$Z_{th(j-h)}$ (K/W)	φ_R (deg)
All modes	t_p = 100 μs; δ = 10 %	36	250	13.5	0.8	50	0.1	25	6	0.18	±5
TCAS: 1030 MHz to 1090 MHz	t_p = 32 μs; δ = 0.1 %	36	250	14.0	0.8	50	0	25	6	0.07	±5
Mode-S: 1030 MHz to 1090 MHz	t_p = 128 μs; δ = 2 %	36	250	13.5	0.8	50	0.1	25	6	0.15	±5
	t_p = 340 μs; δ = 1 %	36	250	13.5	0.8	50	0.2	25	6	0.20	±5
JTIDS: 960 MHz to 1215 MHz	t_p = 3.3 ms; δ = 22 %	36	200	13.0	1.2	45	0.2	25	6	0.45	±5

PHILIPS

2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	drain	 Top view	 *sym039*
2	gate		
3	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
BLA0912-250	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A

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 (DC)		-	75	V
V_{GS}	gate-source voltage (DC)		-	±22	V
P_{tot}	total power dissipation	$T_h \leq 25$ °C; $t_p = 50$ μs; $\delta = 2$ %	-	700	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	200	°C

5. Thermal characteristics

Table 5: Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-h)}$	thermal impedance from junction to heatsink	$T_h = 25$ °C [1]	0.18	K/W

[1] Thermal resistance is determined under RF operating conditions; $t_p = 100$ μs, $\delta = 10$ %.

6. Characteristics

Table 6: Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 3 mA	75	-	-	V
V_{GSth}	gate-source threshold voltage	V_{DS} = 10 V; I_D = 300 mA	4	-	5	V
I_{DSS}	drain-source leakage current	V_{GS} = 0 V; V_{DS} = 36 V	-	-	1	µA
I_{DSX}	on-state drain current	V_{GS} = V_{GSth} + 9 V; V_{DS} = 10 V	45	-	-	A
I_{GSS}	gate-source leakage current	V_{GS} = 20 V; V_{DS} = 0 V	-	-	1	µA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 10 A	-	9	-	S
R_{DSon}	drain-source on-state resistance	V_{GS} = 9 V; I_D = 10 A	-	60	-	mΩ

7. Application information

Table 7: Application information

RF performance in common source class-AB circuit; T_h = 25 °C; Z_{th} = 0.15 K/W; unless specified otherwise.

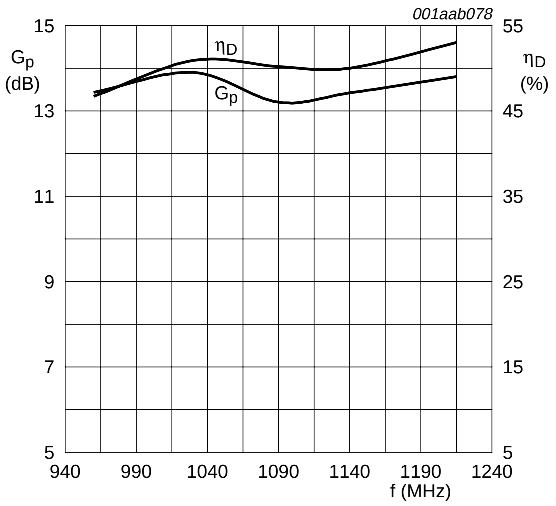
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage		-	-	36	V
f	frequency		960	-	1215	MHz
P_L	load power	t_p = 100 µs; δ = 10 %	250	-		W
G_p	power gain	P_{OUT} = 250 W	12	13		dB
η_D	drain efficiency	t_p = 100 µs; δ = 10 %	40	50		%
Z_{th}	thermal impedance	t_p = 100 µs; δ = 10 %	-	-	0.2	K/W
t_r	rise time		-	25	50	ns
t_f	fall time		-	6	25	ns
	pulse droop	t_p = 100 µs; δ = 10 %	-	0.1	0.5	dB
	spurious	$VSWR_L$ = 2:1	-	-	–60	dBc
T_h	heatsink temperature		–55	-	+70	°C

7.1 Ruggedness in class-AB operation

The BLA0912-250 is capable of withstanding a load mismatch corresponding to VSWR = 5:1 through all phases under the following conditions: V_{DS} = 36 V; f = 960 MHz to 1215 MHz at rated load power.

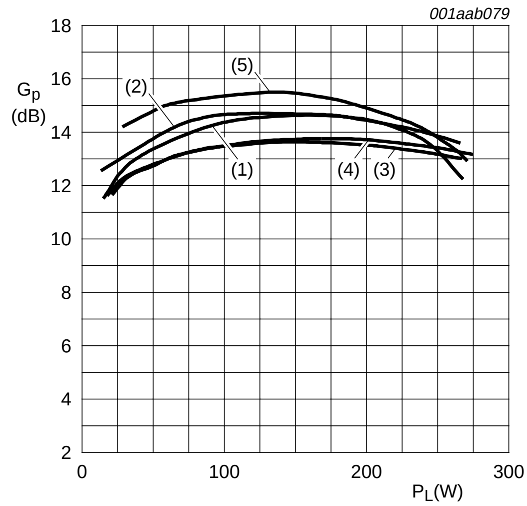
Table 8: Typical impedance values

Frequency (MHz)	Z_S (Ω)	Z_L (Ω)
960	0.89 – j1.70	1.53 – j1.13
1030	1.37 – j1.23	1.47 – j0.99
1090	2.09 – j1.27	1.38 – j0.85
1140	2.40 – j1.97	1.30 – j0.71
1215	1.51 – j2.61	1.17 – j0.47



T_h = 25 °C; V_{DS} = 36 V; I_{DQ} = 150 mA; class-AB; t_p = 100 µs; δ = 10 %.

Fig 1. Power gain and drain efficiency as function of frequency; typical values.



T_h = 25 °C; V_{DS} = 36 V; I_{DQ} = 150 mA; class-AB; t_p = 100 µs; δ = 10 %.

(1) f = 960 MHz.

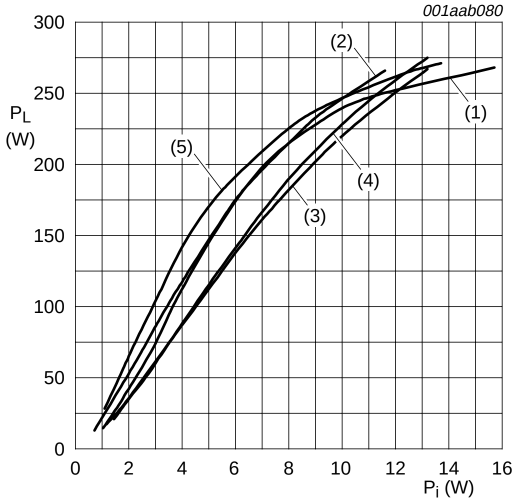
(2) f = 1030 MHz.

(3) f = 1090 MHz.

(4) f = 1140 MHz.

(5) f = 1215 MHz.

Fig 2. Power gain as function of load power; typical values.



T_h = 25 °C; V_{DS} = 36 V; I_{DQ} = 150 mA; class-AB; t_p = 100 µs; δ = 10 %.

(1) f = 960 MHz.

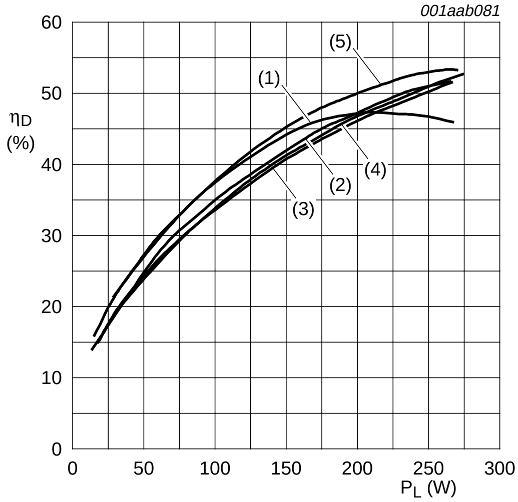
(2) f = 1030 MHz.

(3) f = 1090 MHz.

(4) f = 1140 MHz.

(5) f = 1215 MHz.

Fig 3. Load power as function of input power; typical values.



T_h = 25 °C; V_{DS} = 36 V; I_{DQ} = 150 mA; class-AB; t_p = 100 µs; δ = 10 %.

(1) f = 960 MHz.

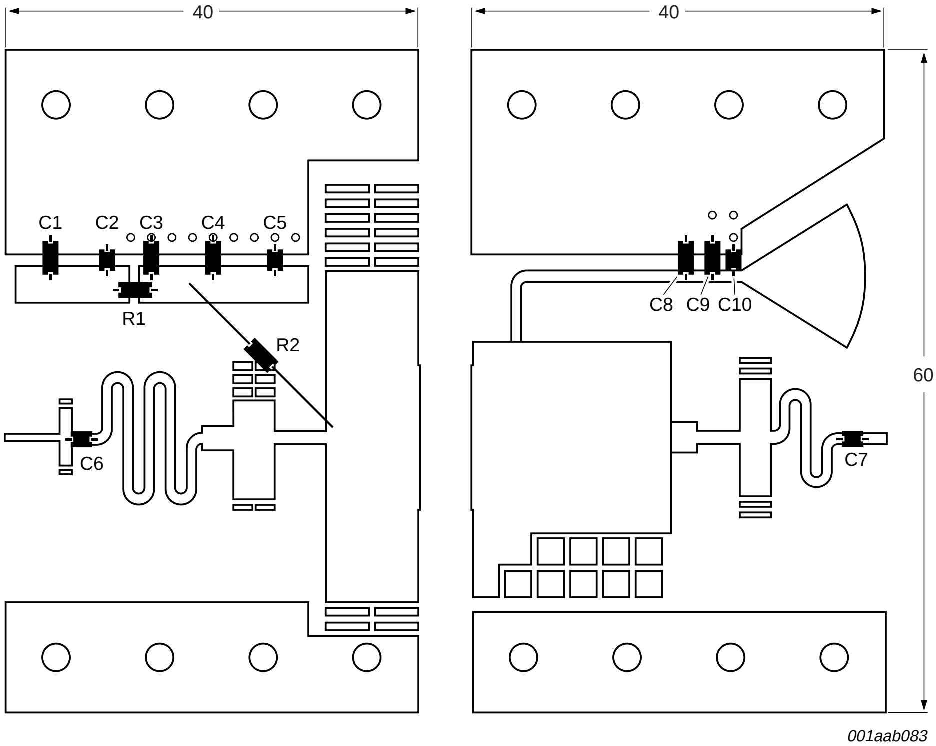
(2) f = 1030 MHz.

(3) f = 1090 MHz.

(4) f = 1140 MHz.

(5) f = 1215 MHz.

Fig 4. Efficiency as function of load power; typical values.



Dimensions in mm.

See Table 9 for list of components.

Fig 5. Component layout for class-AB test circuit.

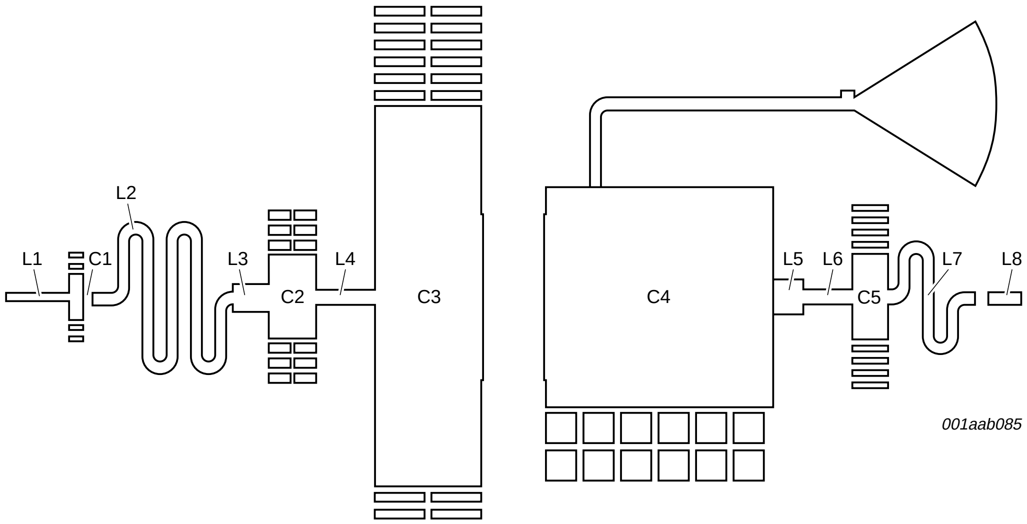
Table 9: List of components for class-AB test circuit (see Figure 5). [1]

Component	Description	Value		Catalogue no.
C1	multilayer ceramic chip capacitor	1 nF	[3]	
C2	multilayer ceramic chip capacitor	22 pF	[2]	
C3	multilayer ceramic chip capacitor	1 nF	[3]	
C4	KEMET tantalum SMD capacitor	47 µF		T491D476M020AS
C5	multilayer ceramic chip capacitor	56 pF	[2]	
C6	multilayer ceramic chip capacitor	22 pF	[2]	
C7	multilayer ceramic chip capacitor	47 pF	[2]	
C8	KEMET tantalum SMD capacitor	22 µF		T491D226M020AS
C9	multilayer ceramic chip capacitor	1 nF	[3]	
C10	multilayer ceramic chip capacitor	22 pF	[2]	
R1	SMD resistor (0805)	51 Ω		
R2	philips resistor	49.9 Ω		2333 156 14999

[1] Layout files are available on request in gerber and dxf format.

[2] American Technical Ceramics type 100A or capacitor of same quality.

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



See Table 10 for details of striplines.

Fig 6. Layout of class-AB test circuit.

Table 10: Layout details for class-AB test circuit (see Figure 6). [1]

Component	Description	Dimensions
Input circuit		
L1	stripline	5 mm × 0.8 mm
C1	stripline	1.2 mm × 3.5 mm
L2	stripline	cap. pad: 1 mm × 1 mm (1×)
		curve: width 0.8 mm; angle 90°; radius 0.8 mm (10×)
		vertical: 3.9 mm × 0.8 mm (2×)
		vertical: 9.4 mm × 0.8 mm (3×)
		horizontal: 0.5 mm × 0.8 mm (4×)
L3	stripline	3 mm × 2 mm
C2	stripline	4 mm × 6.5 mm
L4	stripline	5 mm × 1 mm
C3	stripline	8.8 mm × 30 mm + 0.2 mm × 13 mm
Output circuit		
C4	stripline	0.2 mm × 13 mm + 19 mm × 17.1 mm
L5	stripline	2.5 mm × 2.3 mm
L6	stripline	4 mm × 1 mm
C5	stripline	3 mm × 6.6 mm
L7	stripline	curve: width 0.8 mm; angle 90°; radius 0.8 mm (6×)
		vertical: 2.2 mm × 0.8 mm (2×)
		vertical: 6 mm × 0.8 mm (1×)
		horizontal: 1 mm × 0.8 mm (2×)
L8	stripline	2.5 mm × 0.8 mm

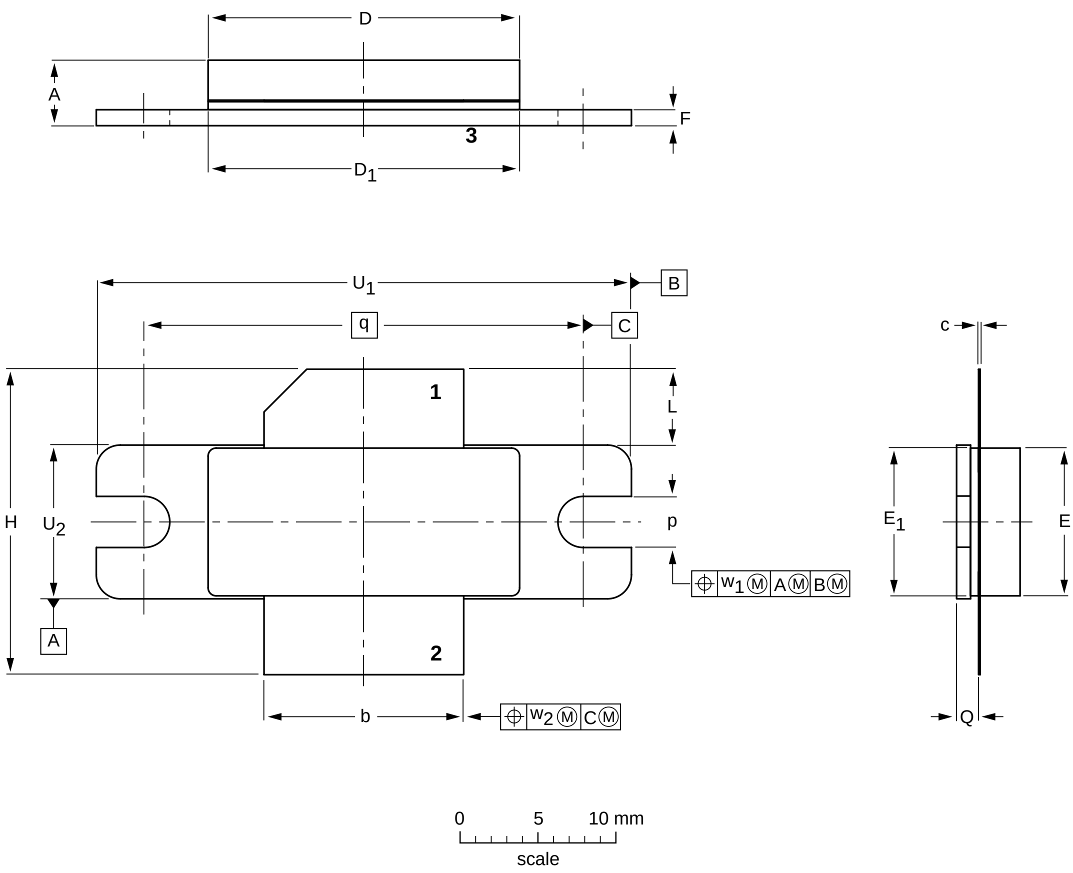
Table 10: Layout details for class-AB test circuit (see Figure 6). [1] *…continued*

Component	Description	Dimensions
1/4 λ line	stripline	curve: width 1 mm; angle 90°; radius 0.8 mm
		vertical: 5 mm × 1 mm
		horizontal: 19 mm × 1 mm
		tapered line: W_l = 1 mm; L = 12 mm; angle = 60°

[1] Striplines are on a Rodgers Duroid 6010 printed-circuit board (ε_r = 10.2); thickness = 0.64 mm.

8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads **SOT502A**



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

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	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	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
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	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						~~99-12-28~~ 03-01-10

Fig 7. Package outline.

9. Revision history

Table 11: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
BLA0912-250_2	20040722	Product data	-	9397 750 13275	BLA0912-250_N_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.				
BLA0912-250_N_1	20031024	Preliminary specification	-	9397 750 12224	-

10. 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.

11. 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 make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

12. 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.

13. 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**

14. Contents

Date of release: 22 July 2004

Document order number: 9397 750 13275

Published in The Netherlands