

# DATA SHEET

**mifare<sup>®</sup>**

**MF RD700**

**PEGODA Contactless Smart Card  
Reader**

Preliminary Product Specification

November 2001

Revision 1.0

PUBLIC

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# MIFARE<sup>®</sup> Pegoda Contactless Card Reader

# MF RD700

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# MIFARE<sup>®</sup> Pegoda Contactless Card Reader

# MF RD700

## 1 GENERAL INFORMATION

### 1.1 Scope

This document describes the basic functionality and the electrical specifications of the MF RD700 'Pegoda' reader.

This contactless reader is designed for an easy reader adaptation to a PC to use this device for test and application purposes. Furthermore this reader can be taken as a reference design for new reader development based on the MF RC 500 reader IC.

### 1.2 General Description

The MIFARE<sup>®</sup> Pegoda reader, the MF RD700, is a new contactless reader based on the MF RC500 reader IC. The MF RC500 is member of a new family for highly integrated reader ICs for contactless communication at 13.56 MHz.

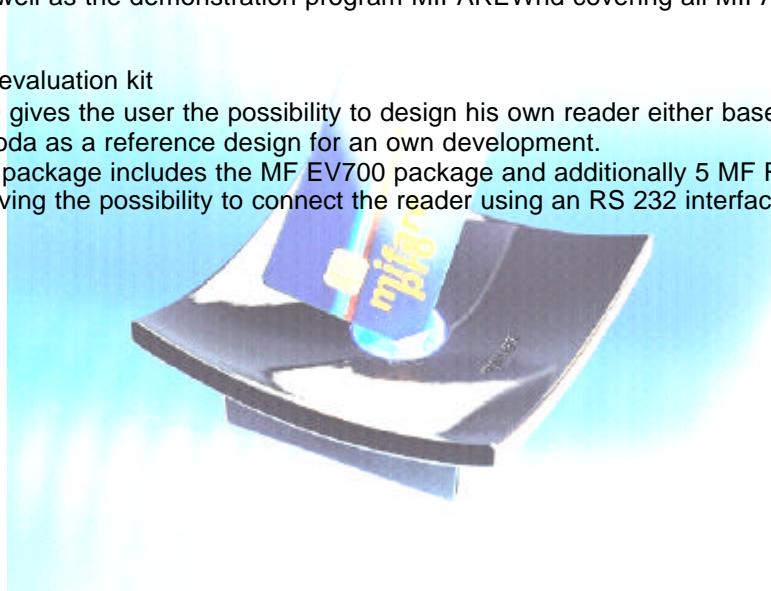
All layers of ISO14443A as well as the MIFARE<sup>®</sup> classic protocol are supported.

The Pegoda reader is designed to fulfil several requirements.

It covers all functionality of the MF RC500 to be able to use this reader as a reference design for a new hardware design based on the MF RC500 reader IC and is designed for easy PC adaptation and application development as well.

The Pegoda is the basic component for 2 evaluation kits:

- MF EV700 evaluation kit.  
This kit is ready to use the Pegoda reader to develop a PC based application.  
This package includes the Pegoda reader, a complete documentation including software libraries and description as well as the demonstration program MIFAREWnd covering all MIFARE and ISO 14443A commands.
- MF EV800 full evaluation kit  
The MF EV800 gives the user the possibility to design his own reader either based on the Pegoda or taking the Pegoda as a reference design for an own development.  
The MFEV800 package includes the MF EV700 package and additionally 5 MF RC500 samples and a reader PCB having the possibility to connect the reader using an RS 232 interface.



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### 1.3 Features

- contactless smart card reader
- based on the MF RM 700 reader module containing the MF RC 500 reader IC
- contactless operating frequency 13.56 MHz
- Supports MIFARE<sup>®</sup> Dual Interface Card ICs and ISO 14443A part 1- 4
- Supports MIFARE<sup>®</sup> Classic protocol
- typical operating distance: 75mm
- CE and FCC compliant
- USB host interface
- USB bus powered 5 VDC power supply
- Unique serial number of each reader device
- supported by Windows 2000 and Windows 98

### 1.4 Ordering Information

The MF RD 700 'Pegoda' is available in 2 evaluation kits.

Type	12NC	Description
<b>MF EV700</b>	9352 699 27122	<b>evaluation kit containing:</b> MF RD700 Pegoda reader, documentation and software CD
<b>MF EV800</b>	9352 699 28122	<b>full evaluation kit containing:</b> MF RD700 Pegoda reader documentation and software CD MF RM700 reader module PCB with RS232 connector 5 MF RC 500 samples Card size antenna directly matched 50 Ohm matching circuit adapter

Table 1-1: MF RD700 Ordering Information

# MIFARE<sup>®</sup> Pegoda Contactless Card Reader

# MF RD700

## 2 FUNCTIONAL UNITS

### 2.1 MF RD700 Pegoda Block Diagram

The Pegoda reader, the MF RD700, is divided in two parts:

- MF RM700: reader module. This reader module is the basic print including the MF RC500, a  $\mu$ -Controller and all interfaces to a host. Please refer to the data sheet 'MIFARE<sup>®</sup> MF RM700 Contactless reader module'.
- MF AN700: a flexible Pegoda antenna. Please refer to the application note 'MIFARE<sup>®</sup> MF RM 700 Antenna and matching adapter description'.

Figure 1 shows the Pegoda's basic functional components.

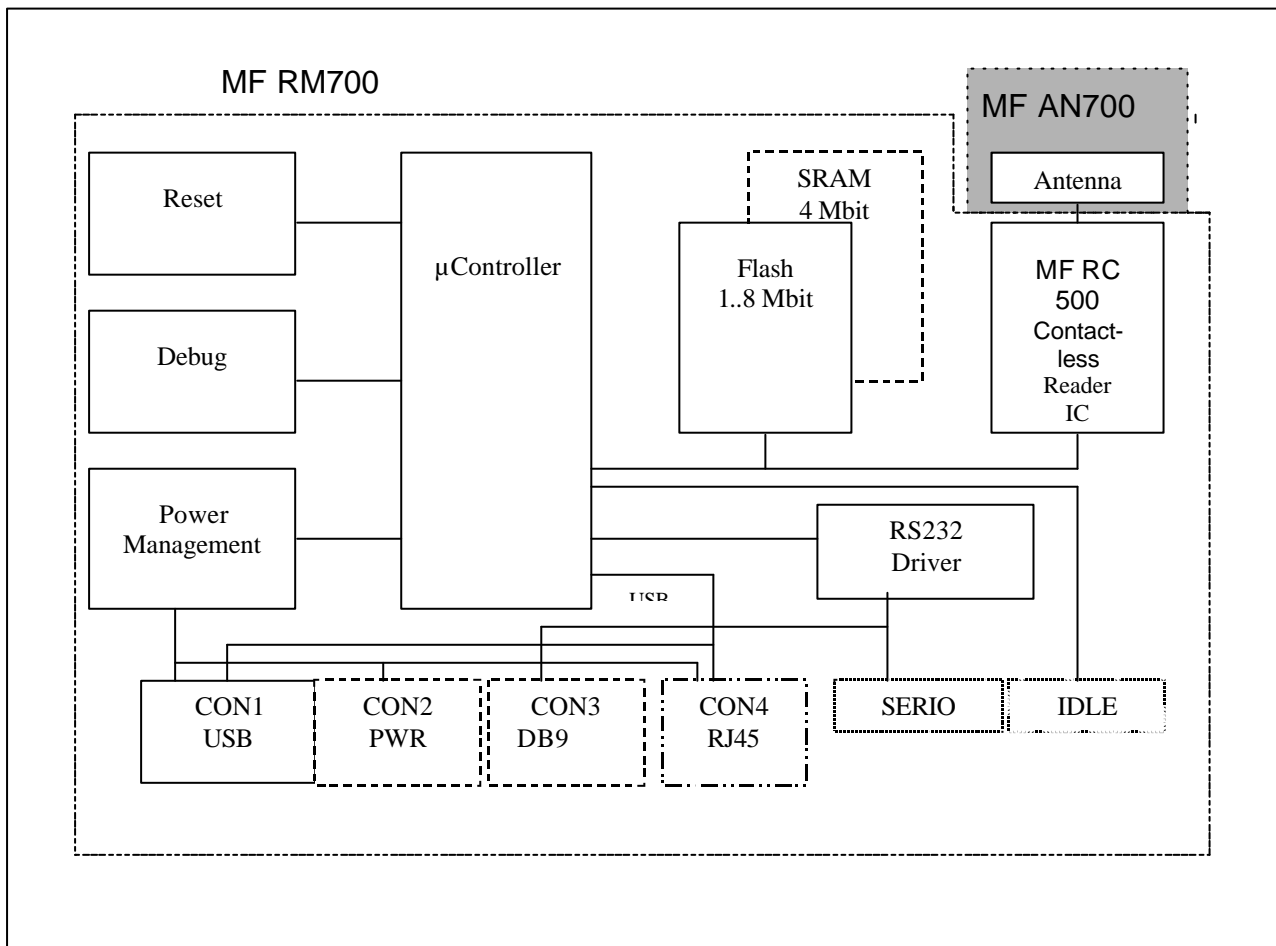


Figure 1. MF RD700 Block-Diagram

The Pegoda reader is designed to offer the user a great freedom to design an application. Several functional blocks can be identified.

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Core component of the Pegoda is the MF RC500, the highly integrated ISO 14443A reader IC. For detailed information concerning the MF RC 500 refers to the data sheet: '*MIFARE MF RC500 Highly integrated ISO 14443 reader IC*'.

The RC 500 is used as an analog front-end unit to communicate via the antenna to a contactless chip card. All relevant data coding to send and receive data according to the ISO 14443A is done internally by the MF RC 500. The MF RC500 itself is controlled by a 16 bit  $\mu$ -controller using an internal clock frequency of 36MHz generated by an external 8 MHz quartz oscillator.

The  $\mu$ -controller handles the communication to the host PC via USB. The  $\mu$ -Controller translates the serial protocol via USB into remote function calls and executes the appropriate command. To be able to implement the complete MIFARE Classic protocol and the ISO 14443-4 open protocol commands and to handle the host communication a 4 Mbit Flash Ram is implemented.

The design of the reader offers the possibility to update the firmware without hardware adaptation.

Note: This document is not intended to give detailed information concerning the MF RM700 and the MF AN700. Please refer to the related documents in the full evaluation package MF EV800.

**MIFARE<sup>®</sup> Pegoda Contactless Card Reader**

**MF RD700**

**2.2 USB Type B Plug**

The USB type B plug is the default configuration of the Pegoda reader to connect the reader to a host PC. This cable is part of the MF EV700 and MF EV800.

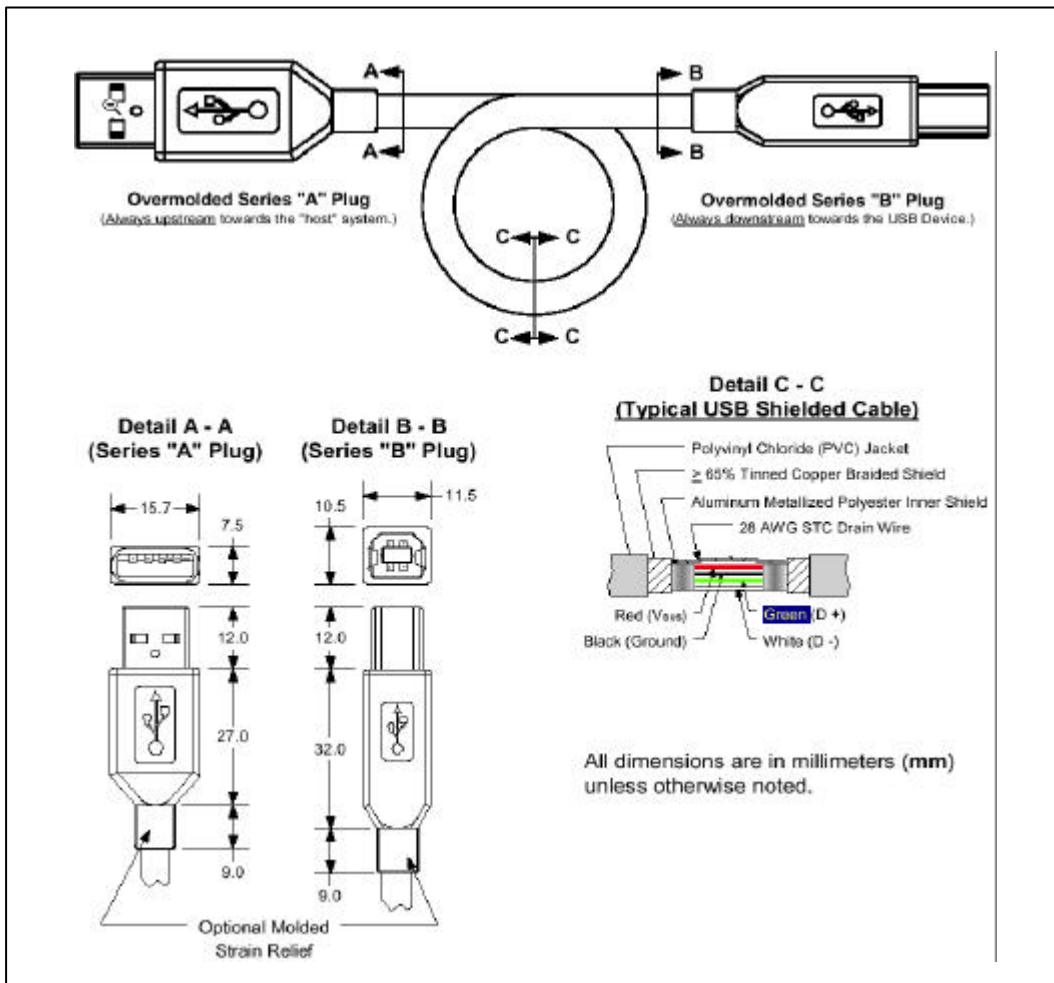


Figure 2. USB Type B connectors

The default configuration uses the USB cable to communicate to the Pegoda as well as to supply the 5 V supply voltage.

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**2.3 Power Supply**

The MF RD700 is a bus powered 5 V USB device. No external power supply has to be connected to start to work with the Pegoda.

**Notes:**

In order to fulfil the USB specification version 1.1, the reader module behaves after power on like a low power device. Having sent an activate command, the Pegoda is activated and the reader module switches to an idle state resulting in an increased power consumption.



**MIFARE<sup>®</sup> Pegoda Contactless Card Reader****MF RD700****3 ELECTRICAL CHARACTERISTICS****3.1 Operating Condition Range**

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
T <sub>amb</sub>	Ambient Temperature	-	-10	+25	+70	°C
VDD	DC Supply Voltage	DVSS = 0V	4.5	5.0	5.5	V

*Table 3-1: Operating Condition Range***3.2 Current Consumption**

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
I <sub>DVDD</sub>	Supply Current	StandBy	-	70	-	mA
I <sub>DVDD</sub>	Supply Current	Idle, RF off	-	160	-	mA
I <sub>DVDD</sub>	Supply Current	Idle, RF on	-	250	-	mA

*Table 3-2: Current Consumption***3.3 Operating distance**

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
OD	operating distance	measured from the middle of the reader surface	-	0-75	-	mm

*Table 3-3. Operating Distance***3.4 Interface Characteristics****3.4.1 USB-CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
USB-baud	USB- baudrate	cable length max. 3 m	-	12	-	Mbaud

*Table 3-4USB Characteristics*

Note: The FCC and CE certification are only valid when the USB cable is equipped with the shielding components.

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**4 ELECTROMAGNETIC COMPATIBILITY**

The MF RD700 fulfils the following requirements of electromagnetic compatibility:

FCC, Part 15 and CE.

**4.1 FCC Class A Declaration of Conformity**

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio or television reception. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio and television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

**Caution!**

The Federal Communications Commission warns the users that changes or modifications to the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Accessories: This equipment has been tested and found to comply with the limits of a Class A digital device. The accessories associated with this equipment are as follows:

- Shielded video cable

These accessories are required to be used in order to ensure compliance with FCC rules.

**4.2 FCC Declaration of Conformity of a Class A Digital Device**

We,

Philips Semiconductors Gratkorn GmbH

Mikronweg 1

8010 Gratkorn, Austria

declare that the product

MF RD 700,

FCC ID OWR40089

is in conformity with Part 15 of the FCC Rules.

**MIFARE<sup>®</sup> Pegoda Contactless Card Reader****MF RD700**

Operation of this product is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

**4.3 CE Declaration of Conformity**

This Information Technology Equipment has been tested and found to comply with the following European directives:

Harmonised Standards applied	Description
EN 300 330: (2001-06)	Air interface of the radio systems pursuant to § 3(2) (Article 3(2))
EN 60950:1992	Health and safety requirements pursuant to § 3 (1) 1. (Article 3(1) a)
EN 301 489-9 :(2000-09)	Protection requirements concerning electromagnetic compatibility § 3(1)2,(Article 3(1)(b))

Manufacturer's Name: Philips Semiconductors Gratkorn GmbH

Manufacturer's Address: Mikronweg 1, A-8101 Gratkorn, Austria

Type of Equipment: Contactless Smart card reader

Model No.: MF RD700

Philips Semiconductors hereby declare that the equipment specified above conforms to the above Directive(s) and Standard(s), and said equipment is in conformity with the relevant harmonised standards as mentioned above.

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**4.4 Mechanical Specification**

4.4.1 SIDE VIEW

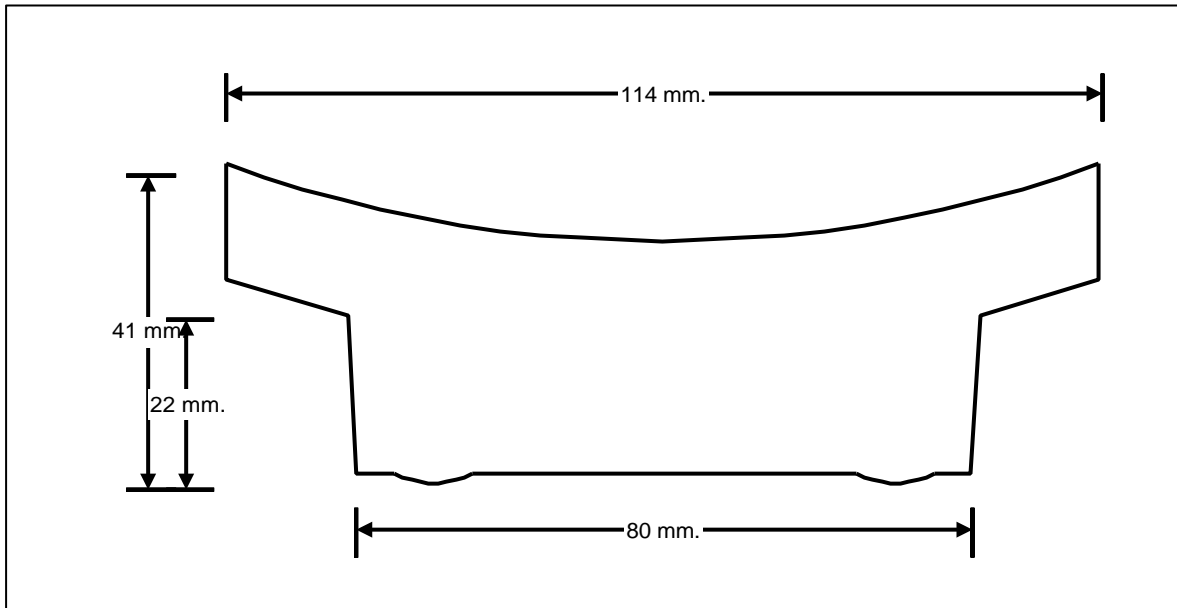


Figure 3. Side View

**MIFARE<sup>®</sup> Pegoda Contactless Card Reader**

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4.4.2 BOTTOM VIEW

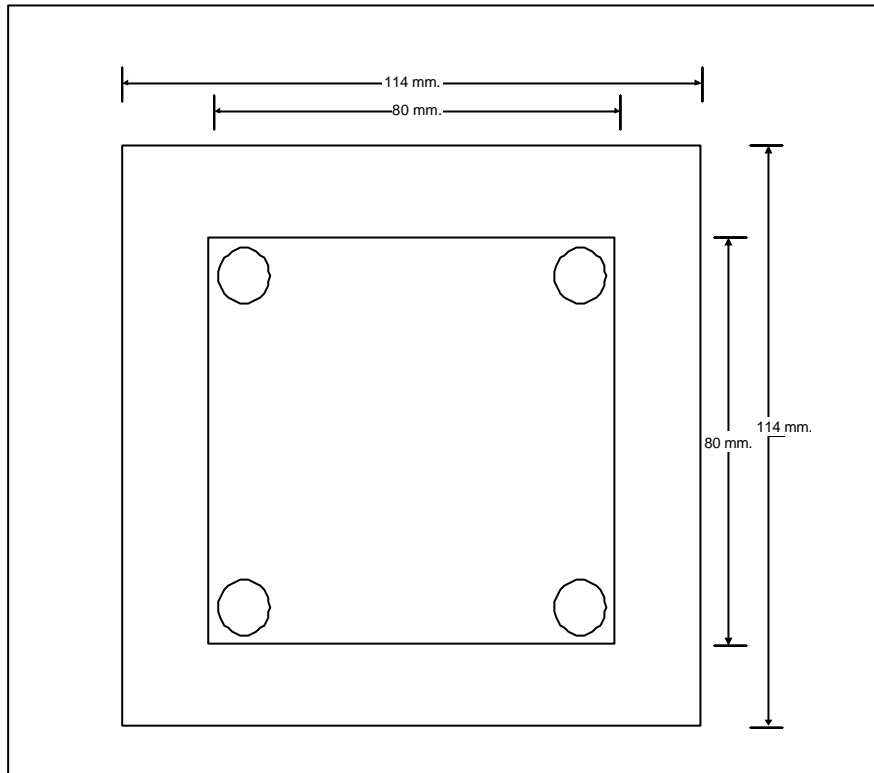


Figure 4. Bottom View

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**MF RD700**

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**5 REVISION HISTORY**

REVISION	DATE	CPCN	PAGE	DESCRIPTION
1.0	November	-	16	first published version

*Table 5-1: Document Revision History*

## Definitions

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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 section of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

## Life support applications

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 customers using or selling these products for use in such applications do so on their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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