DATA SHEET

BGY113A; BGY113B
UHF amplifier modules

Preliminary specification
Supersedes data of April 1994
File under Discrete Semiconductors, SC09

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Philips
Semiconductors

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FEATURES

- 7.5 V nominal supply voltage
- 7 W output power
- Easy control of output power by DC voltage.

APPLICATIONS

- Hand-held communication equipment operating in the frequency bands 400 to 440 MHz and 430 to 470 MHz respectively.

DESCRIPTION

The BGY113A and BGY113B are four-stage UHF amplifier modules in a 7-lead SOT288D package. The modules consist of four NPN silicon planar transistor dies mounted together with matching and bias circuit components on a metallized ceramic substrate. The modules produce an output power of 7 W into a load of 50 Ω with an RF drive power of 1 mW.

PINNING - SOT288D

PIN	DESCRIPTION
1	RF input
2	V_{S1}
3	V_C
4	V_{S2}
5	V_{S3}
6	V_{S4}
7	RF output
Flange	ground

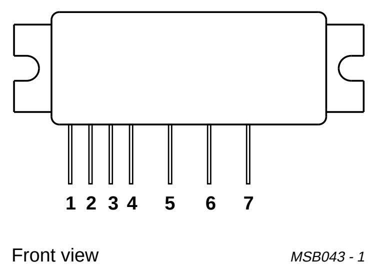


Fig.1 Simplified outline.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C.

TYPE NUMBER	MODE OF OPERATION	f (MHz)	V_S (V)	P_L (W)	G_p (dB)	η (%)	Z_S; Z_L (Ω)
BGY113A	CW	400 to 440	7.5	≥7	≥38.5	≥40	50
BGY113B	CW	430 to 470	7.5	≥7	≥38.5	≥40	50

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

LIMITING VALUES

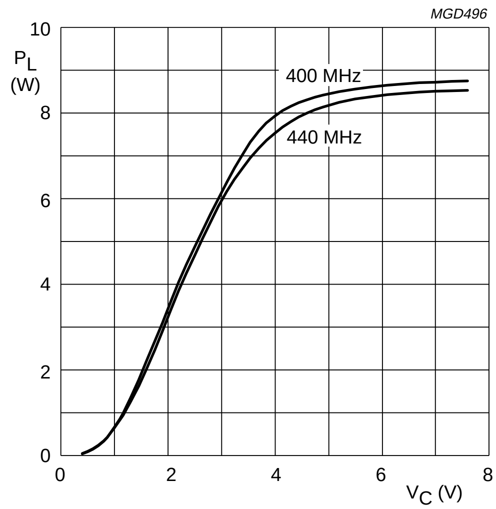
In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_{S1}	DC supply voltage	–	9	V
V_{S2}	DC supply voltage	–	9	V
V_{S3}	DC supply voltage	–	9	V
V_{S4}	DC supply voltage	–	9	V
V_C	DC control voltage	–	7.5	V
P_D	input drive power	–	5	mW
P_L	load power	–	9	W
T_{stg}	storage temperature	–40	+100	°C
T_{mb}	operating mounting base temperature	–30	+90	°C

CHARACTERISTICS

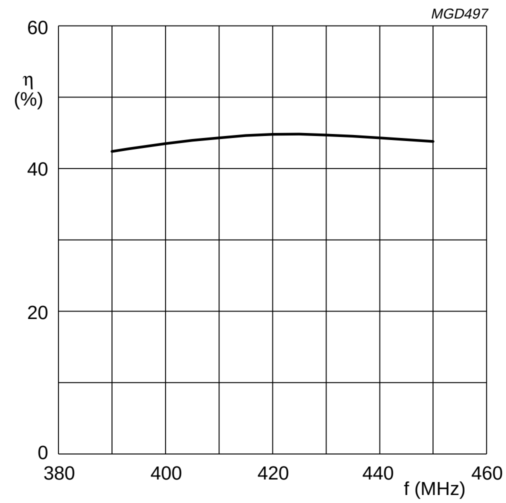
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_{S1} = V_{S2} = V_{S3} = V_{S4} = 7.5$ V; $V_C \leq 7.5$ V; $T_{mb} = 25$ °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
f	frequency					
	BGY113A		400	–	440	MHz
	BGY113B		430	–	470	MHz
$I_{Q3} + I_{Q4}$	total leakage current	$V_{S1} = V_{S2} = V_C = 0$; $P_D = 0$	–	–	0.2	mA
P_L	load power	$V_C = 7.5$ V	7	–	–	W
G_p	power gain	adjust V_C for $P_L = 7$ W	38.5	–	–	dB
η	efficiency	adjust V_C for $P_L = 7$ W	40	45	–	%
H_2	second harmonic	adjust V_C for $P_L = 7$ W	–	–	–40	dBc
H_3	third harmonic	adjust V_C for $P_L = 7$ W	–	–	–40	dBc
$VSWR_{in}$	input VSWR	adjust V_C for $P_L = 7$ W	–	–	2 : 1	
	control range	$V_C = 0$ to 7.5 V; $P_D = 1$ mW	10	–	–	dB
	stability	$P_D = 0.5$ to 2 mW; $V_{S1} = V_{S2} = V_{S3} = V_{S4} = 5$ to 9 V; adjust V_C for $P_L \leq 9$ W; VSWR ≤ 6 : 1 through all phases	–	–	–60	dBc
	ruggedness	$V_{S1} = V_{S2} = V_{S3} = V_{S4} = 9$ V; adjust V_C for $P_L = 9$ W; VSWR ≤ 10 : 1 through all phases	no degradation			



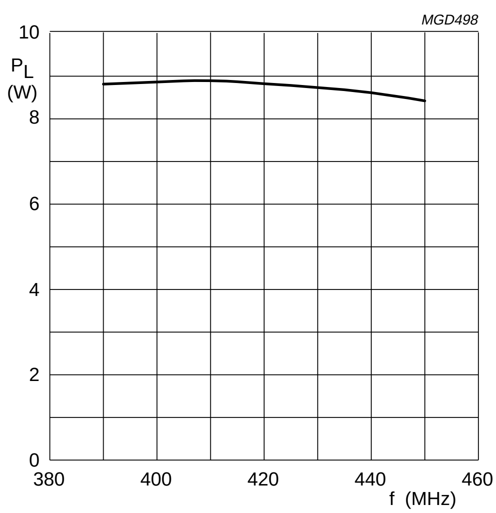
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $T_{mb} = 25$ °C.

Fig.2 Load power as a function of control voltage; BGY113A; typical values.



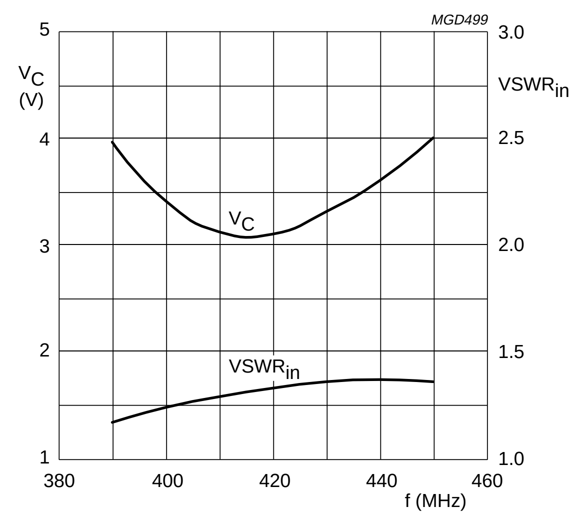
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $P_L = 7$ W; $T_{mb} = 25$ °C.

Fig.3 Efficiency as a function of frequency; BGY113A; typical values.



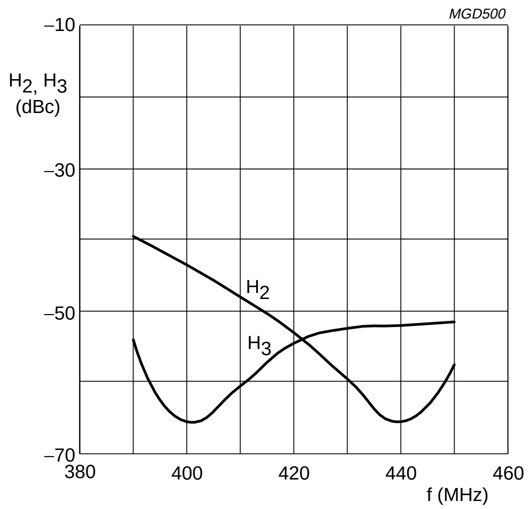
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 7.5$ V; $T_{mb} = 25$ °C.

Fig.4 Load power as a function of frequency; BGY113A; typical values.



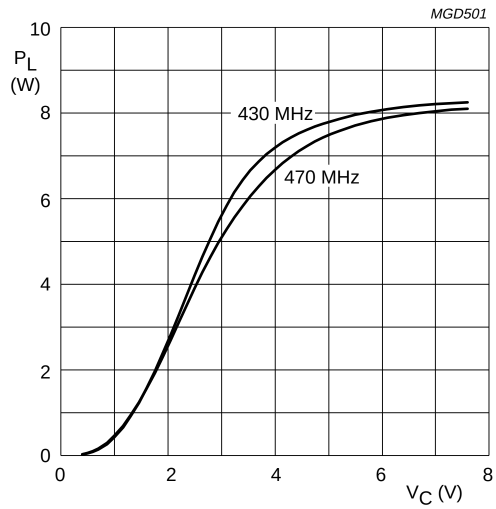
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $P_L = 7$ W; $T_{mb} = 25$ °C.

Fig.5 Control voltage and input VSWR as functions of frequency; BGY113A; typical values.



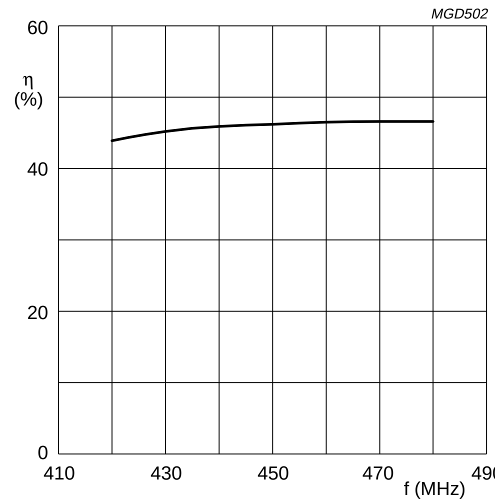
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $P_L = 7$ W; $T_{mb} = 25$ °C.

Fig.6 Harmonics as a function of frequency; BGY113A; typical values.



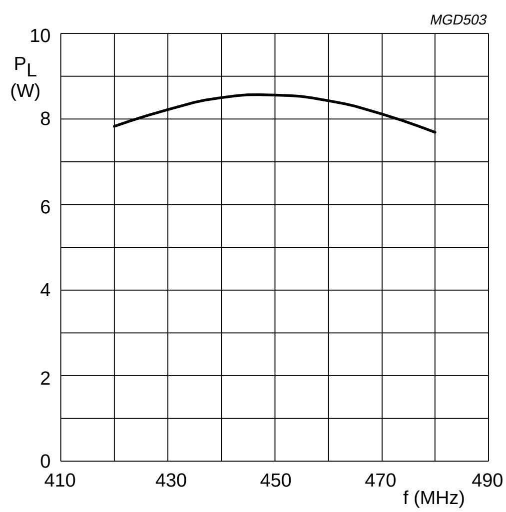
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $T_{mb} = 25$ °C.

Fig.7 Load power as a function of control voltage; BGY113B; typical values.



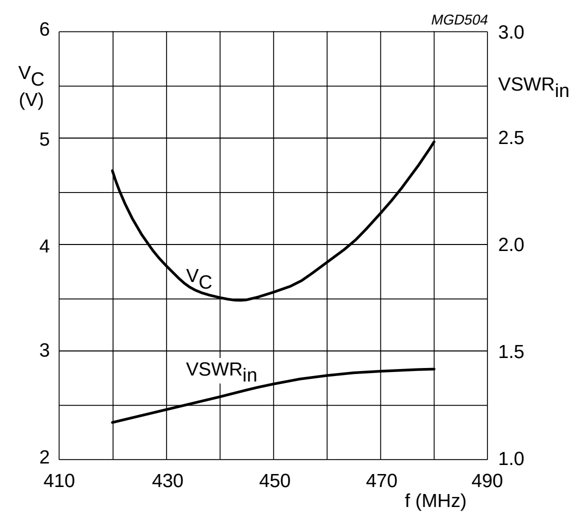
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $P_L = 7$ W; $T_{mb} = 25$ °C.

Fig.8 Efficiency as a function of frequency; BGY113B; typical values.



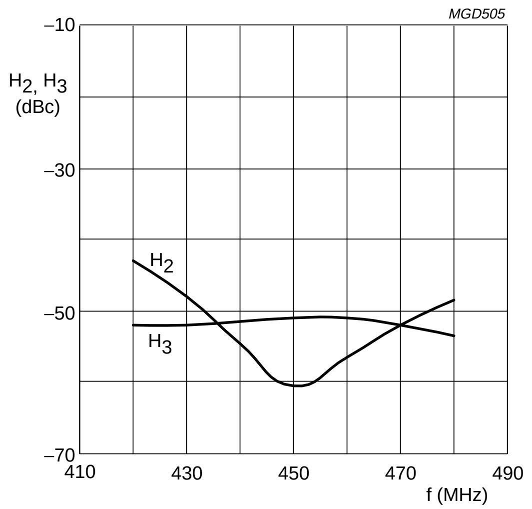
$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_C = 7.5$ V; $T_{mb} = 25$ °C.

Fig.9 Load power as a function of frequency; BGY113B; typical values.



$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $P_L = 7$ W; $T_{mb} = 25$ °C.

Fig.10 Control voltage and input VSWR as functions of frequency; BGY113B; typical values.



$Z_S = Z_L = 50\ \Omega$; $P_D = 1$ mW; $V_S = 7.5$ V; $P_L = 7$ W; $T_{mb} = 25$ °C.

Fig.11 Harmonics as a function of frequency; BGY113B; typical values.

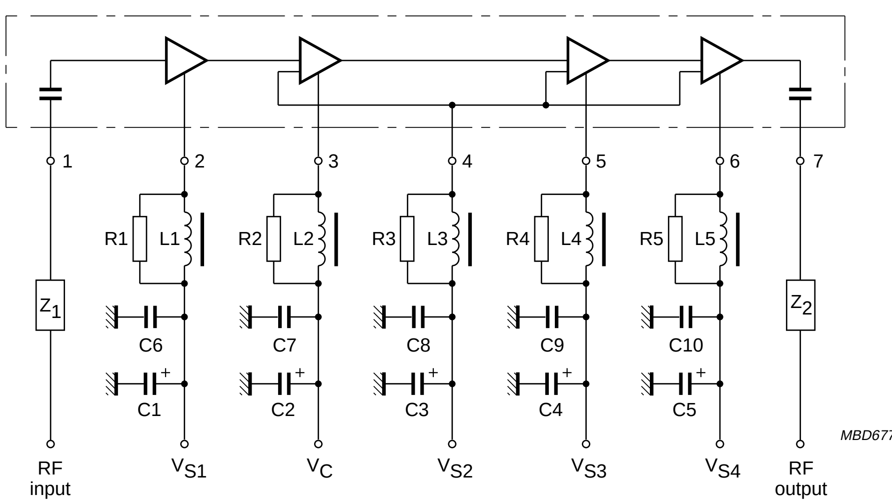
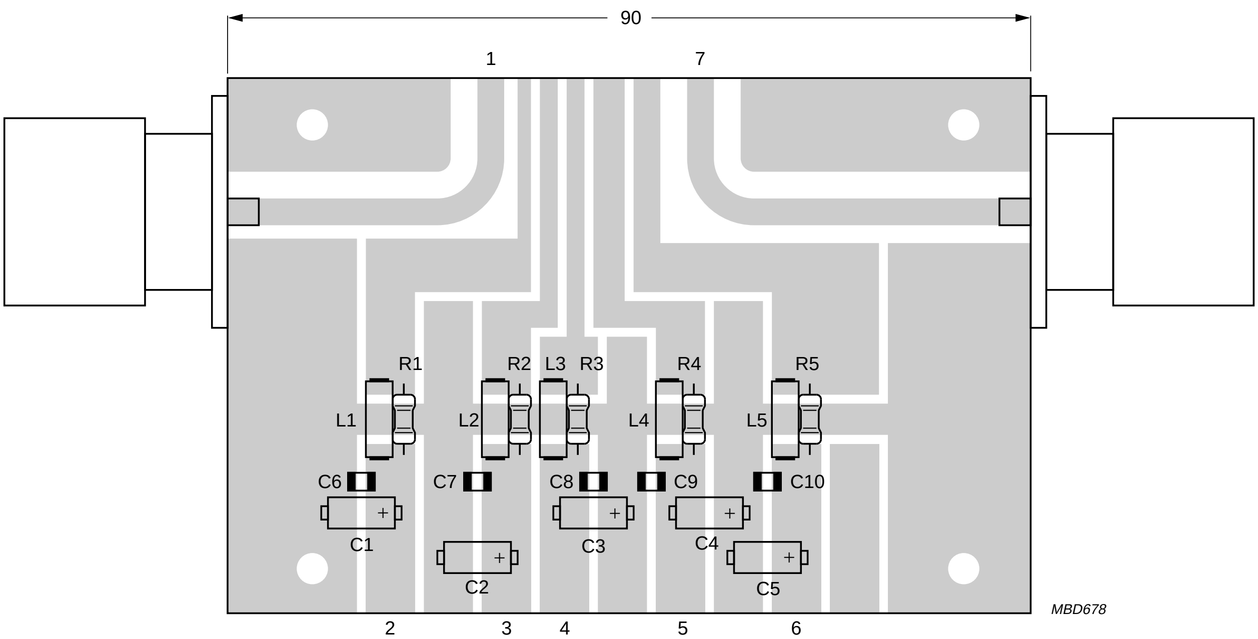


Fig.12 Test circuit.



Dimensions in mm.

Fig.13 Printed-circuit board component layout.

List of components (see Figs 12 and 13)

COMPONENT	DESCRIPTION	VALUE	CATALOGUE NO.
C1, C2, C3, C4, C5	electrolytic capacitor	1 µF; 63 V	2222 085 68108
C6, C7, C8, C9, C10	multilayer ceramic chip capacitor; X7R, 0805	18 nF	2222 910 16739
L1, L2, L3, L4, L5	Grade 4S2 Ferroxcube bead		4330 030 36300
R1, R2, R3, R4, R5	metal film resistor	10 Ω; 0.4 W	2322 195 13109
Z_1, Z_2	stripline; note 1	50 Ω	–

Note

1. The striplines are on a double copper-clad printed-circuit board with epoxy dielectric (ε_r = 4.7); thickness = $^1/_{16}$ inch.

MOUNTING RECOMMENDATIONS

To ensure a good thermal contact and to prevent mechanical stresses when bolted down, the flatness of the mounting base is designed to be typically better than 0.1 mm. The mounting area of the heatsink should be flat and free from burrs and loose particles. The heatsink should be rigid and not prone to bowing under thermal cycling conditions. The thickness of a solid heatsink should be not less than 5 mm to ensure a rigid assembly.

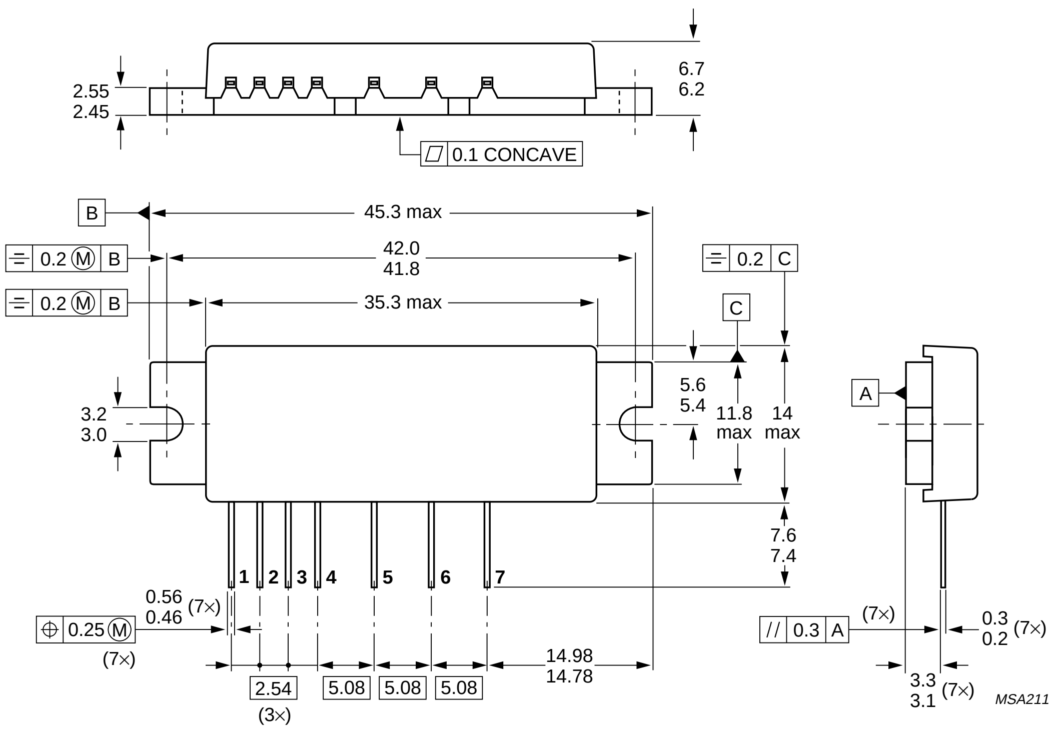
A thin, even layer of thermal compound should be used between the mounting base and the heatsink to achieve the best possible contact thermal resistance.
Excessive use of thermal compound will result in an increase in thermal resistance and possible bowing of the mounting-base; too little will also result in poor thermal conduction.

The module should be mounted to the heatsink using 3 mm bolts with flat washers. The bolts should first be tightened to “finger tight” and then further tightened in alternating steps to a maximum torque of 0.4 to 0.6 Nm.

Once mounted on the heatsink, the module leads can be soldered to the printed-circuit board. A soldering iron may be used up to a temperature of 250 °C for a maximum of 10 seconds at a distance of 2 mm from the plastic cap.

ESD precautions must be taken to protect the device from electro-static damage.

PACKAGE OUTLINE



Dimensions in mm.

Fig.14 SOT288D.

DEFINITIONS

Data Sheet Status	
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.
Limiting values	
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 sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
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 at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.