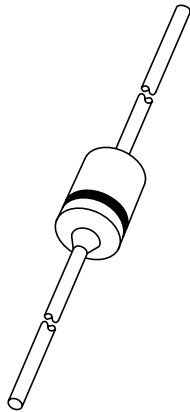


DATA SHEET



BYD31 series Fast soft-recovery controlled avalanche rectifiers

Product specification
Supersedes data of 1996 Jun 05

1996 Sep 18

Fast soft-recovery controlled avalanche rectifiers

BYD31 series

FEATURES

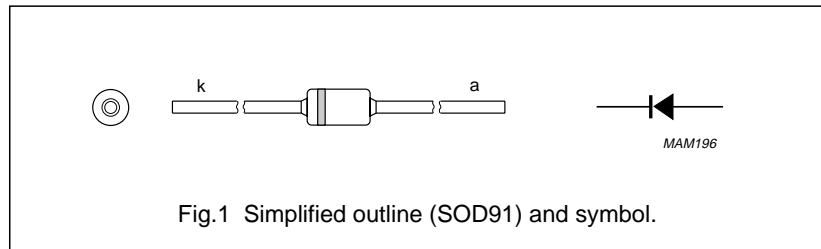
- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Guaranteed avalanche energy absorption capability
- Available in ammo-pack.

DESCRIPTION

Cavity free cylindrical glass package through ImplotecTM(1) technology. This package is hermetically sealed

and fatigue free as coefficients of expansion of all used parts are matched.

(1) Implotec is a trademark of Philips.



LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{RRM}	repetitive peak reverse voltage				
	BYD31D		—	200	V
	BYD31G		—	400	V
	BYD31J		—	600	V
	BYD31K		—	800	V
	BYD31M		—	1000	V
V_R	continuous reverse voltage				
	BYD31D		—	200	V
	BYD31G		—	400	V
	BYD31J		—	600	V
	BYD31K		—	800	V
	BYD31M		—	1000	V
$I_{F(AV)}$	average forward current	$T_{tp} = 55\text{ °C}$; lead length = 10 mm; see Fig.2; averaged over any 20 ms period; see also Fig.6	—	440	mA
		$T_{amb} = 60\text{ °C}$; PCB mounting (see Fig.11); see Fig.3; averaged over any 20 ms period; see also Fig.6	—	320	mA
I_{FRM}	repetitive peak forward current	$T_{tp} = 55\text{ °C}$; see Fig.4	—	4	A
		$T_{amb} = 60\text{ °C}$; see Fig.5	—	3	A
I_{FSM}	non-repetitive peak forward current	$t = 10\text{ ms}$ half sine wave; $T_j = T_{j\text{ max}}$ prior to surge; $V_R = V_{RRM\text{ max}}$	—	5	A

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SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
P_{RSM}	non-repetitive peak reverse power dissipation	$t = 20 \mu s$ half sine wave; $T_j = T_{jmax}$ prior to surge			
	BYD31D to J		–	100	W
	BYD31K and M		–	50	W
T_{stg}	storage temperature		–65	+175	°C
T_j	junction temperature	see Fig.7	–65	+175	°C

ELECTRICAL CHARACTERISTICS

$T_j = 25 \text{ °C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_F	forward voltage	$I_F = 0.5 \text{ A}$; $T_j = T_{jmax}$; see Fig.8	–	–	1.15	V
		$I_F = 0.5 \text{ A}$; see Fig.8	–	–	1.35	V
$V_{(BR)R}$	reverse avalanche breakdown voltage	$I_R = 0.1 \text{ mA}$				
			300	–	–	V
			500	–	–	V
			700	–	–	V
			900	–	–	V
			1100	–	–	V
I_R	reverse current	$V_R = V_{RRMmax}$; see Fig.9	–	–	1	μA
		$V_R = V_{RRMmax}$; $T_j = 165 \text{ °C}$; see Fig.9	–	–	75	μA
t_{rr}	reverse recovery time	when switched from $I_F = 0.5 \text{ A}$ to $I_R = 1 \text{ A}$; measured at $I_R = 0.25 \text{ A}$ see Fig.12	–	–	250	ns
			–	–	300	ns
C_d	diode capacitance	$f = 1 \text{ MHz}$; $V_R = 0 \text{ V}$; see Fig.10	–	9	–	pF
$\left \frac{dI_R}{dt} \right $	maximum slope of reverse recovery current	when switched from $I_F = 1 \text{ A}$ to $V_R \geq 30 \text{ V}$ and $dI_F/dt = -1 \text{ A}/\mu s$; see Fig.13	–	–	6	$A/\mu s$
			–	–	5	$A/\mu s$

**Fast soft-recovery
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BYD31 series**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-tp}$	thermal resistance from junction to tie-point	lead length = 10 mm	180	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	250	K/W

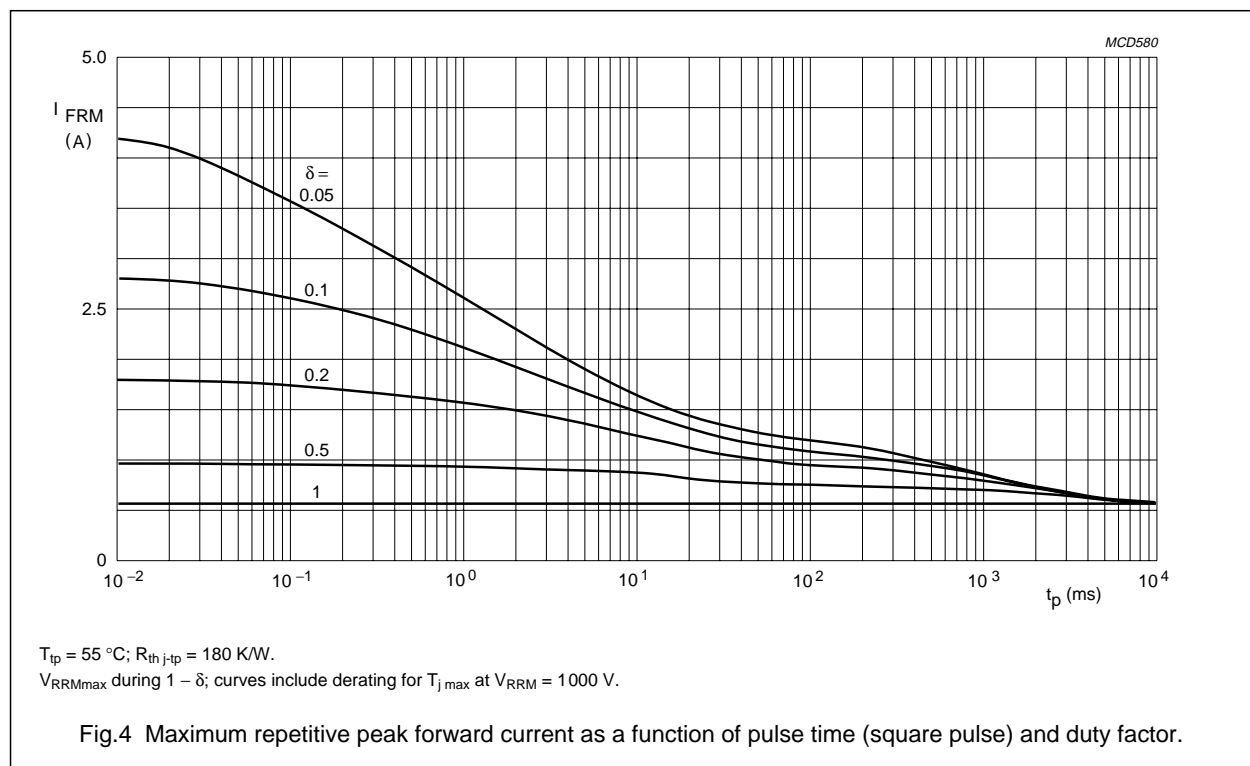
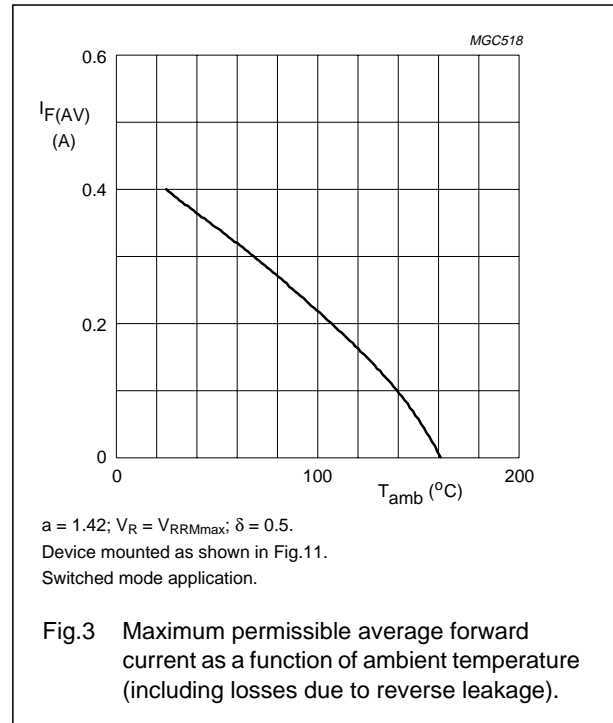
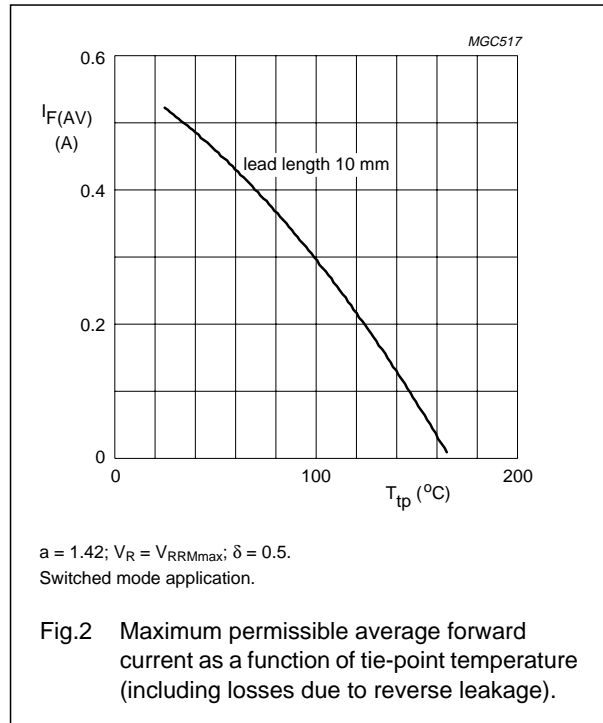
Note

1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer $\geq 40\ \mu\text{m}$, see Fig.11.
For more information please refer to the *"General Part of associated Handbook"*.

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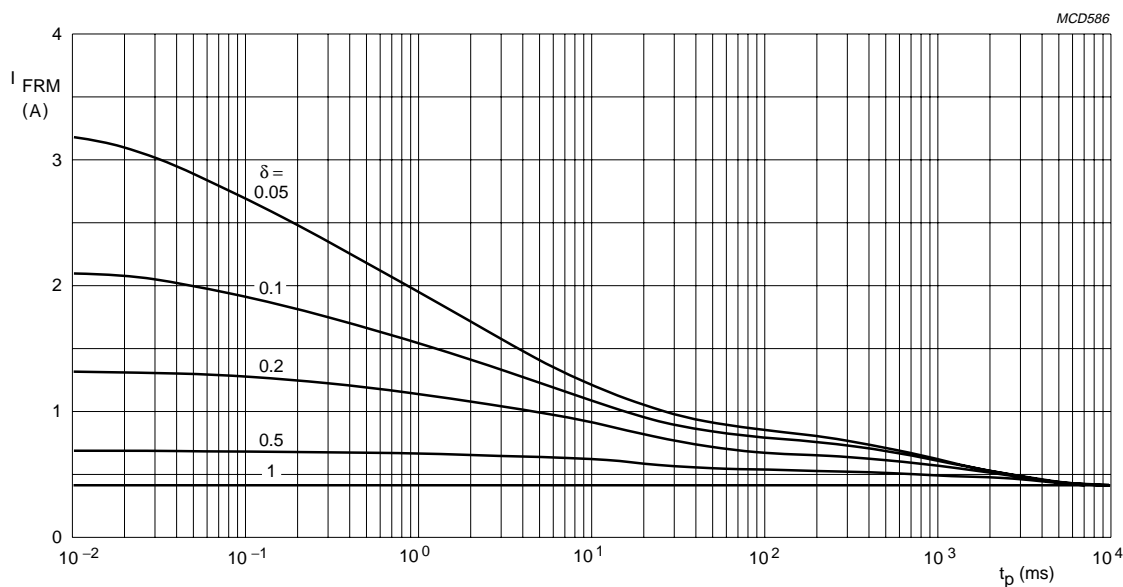
BYD31 series

GRAPHICAL DATA



Fast soft-recovery controlled avalanche rectifiers

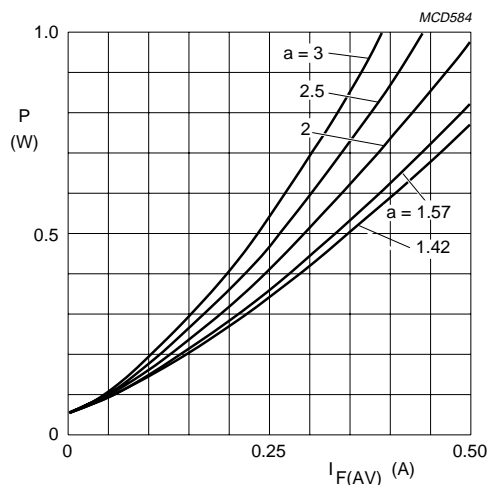
BYD31 series



$T_{amb} = 60^\circ\text{C}$; $R_{th j-a} = 250 \text{ K/W}$.

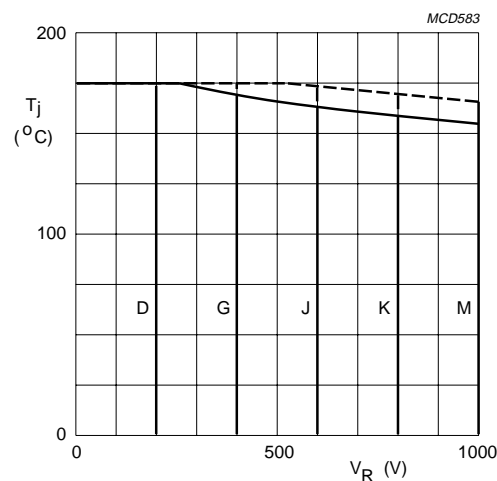
V_{RRMmax} during $1 - \delta$; curves include derating for T_{jmax} at $V_{RRM} = 1000 \text{ V}$.

Fig.5 Maximum repetitive peak forward current as a function of pulse time (square pulse) and duty factor.



$a = I_{F(RMS)}/I_{F(AV)}$; $V_R = V_{RRMmax}$; $\delta = 0.5$.

Fig.6 Maximum steady state power dissipation (forward plus leakage current losses, excluding switching losses) as a function of average forward current.



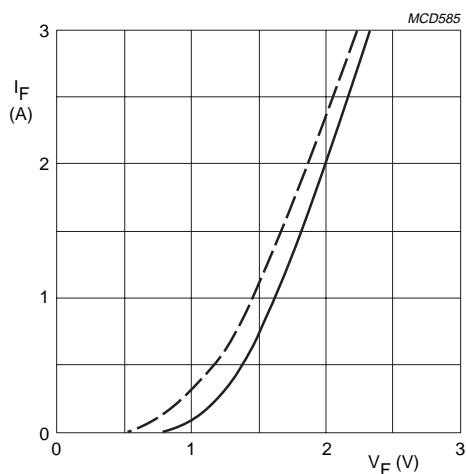
Solid line = V_R .

Dotted line = V_{RRM} ; $\delta = 0.5$.

Fig.7 Maximum permissible junction temperature as a function of reverse voltage.

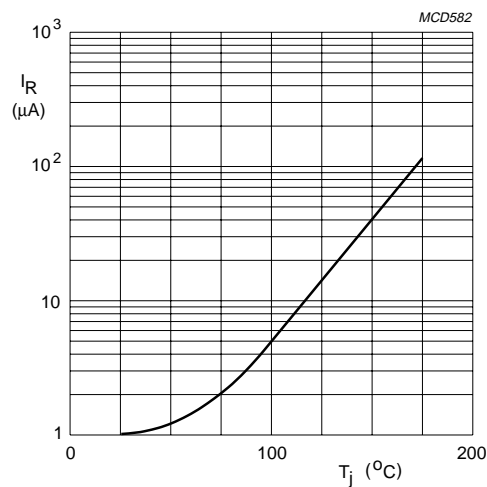
Fast soft-recovery controlled avalanche rectifiers

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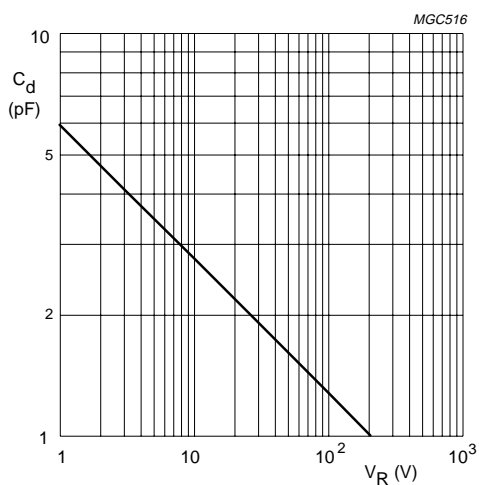
Dotted line: $T_j = 175\text{ }^{\circ}\text{C}$.
Solid line: $T_j = 25\text{ }^{\circ}\text{C}$.

Fig.8 Forward current as a function of forward voltage; maximum values.



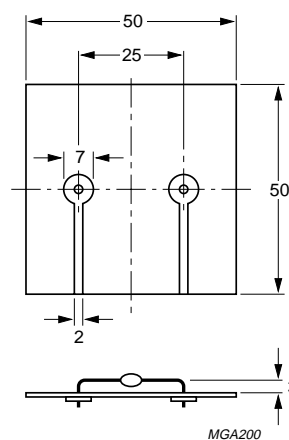
$V_R = V_{RRMmax}$.

Fig.9 Reverse current as a function of junction temperature; maximum values.



$f = 1\text{ MHz}$; $T_j = 25\text{ }^{\circ}\text{C}$.

Fig.10 Diode capacitance as a function of reverse voltage; typical values.

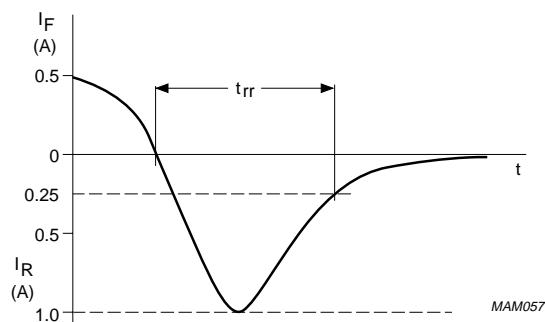
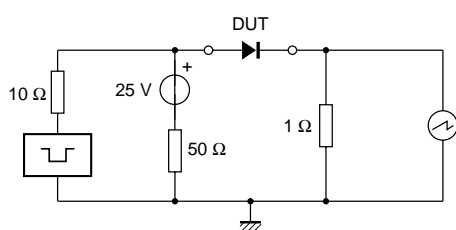


Dimensions in mm.

Fig.11 Device mounted on a printed-circuit board.

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Input impedance oscilloscope: 1 M Ω , 22 pF; $t_r \leq 7$ ns.
Source impedance: 50 Ω ; $t_r \leq 15$ ns.

Fig.12 Test circuit and reverse recovery time waveform and definition.

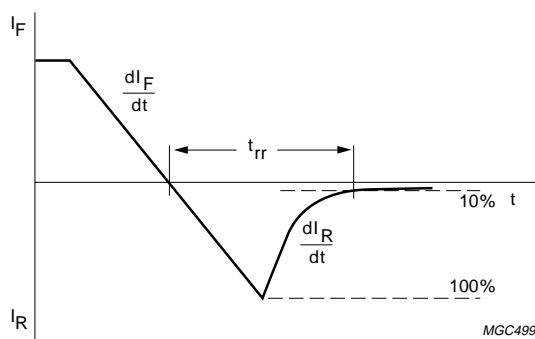
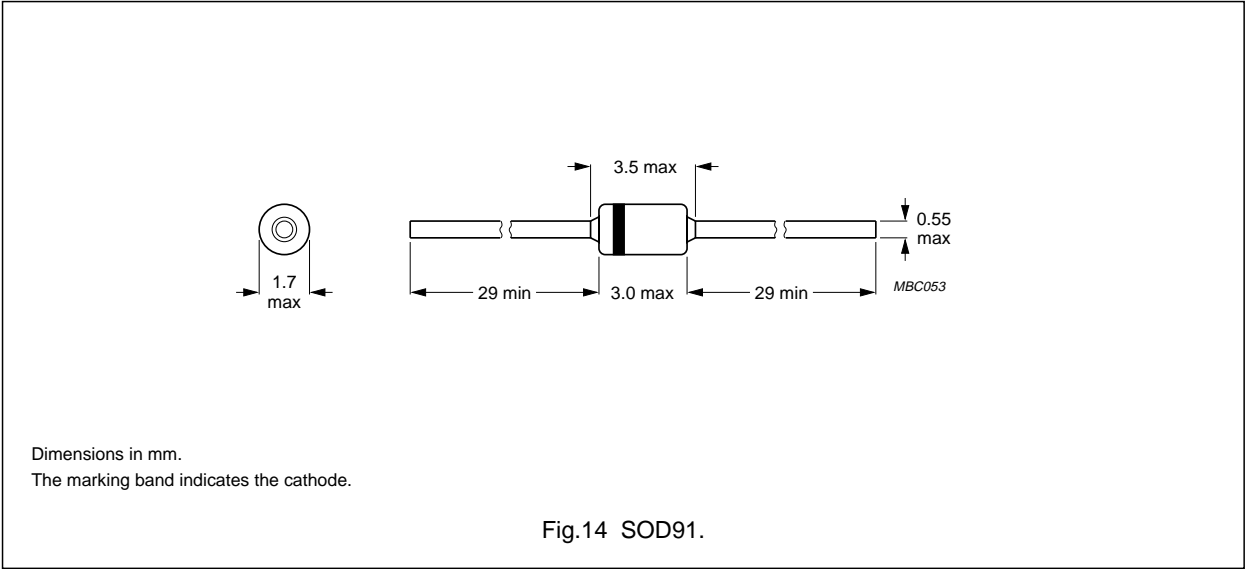


Fig.13 Reverse recovery definitions.

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PACKAGE OUTLINE



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.