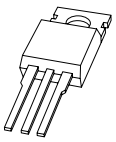


BT151 series

Thyristors

Rev. 03 — 7 June 2004 Product data sheet

1. Product profile

1.1 General description

Passivated thyristors in a SOT78 plastic package.

1.2 Features

- High thermal cycling performance
- High bidirectional blocking voltage capability.

1.3 Applications

- Motor control
- Industrial and domestic lighting, heating and static switching.

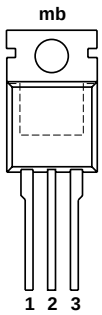
1.4 Quick reference data

- V_{DRM}, V_{RRM} ≤ 800 V (BT151-800R)
- V_{DRM}, V_{RRM} ≤ 650 V (BT151-650R)
- V_{DRM}, V_{RRM} ≤ 500 V (BT151-500R)
- $I_{T(RMS)}$ ≤ 12 A
- $I_{T(AV)}$ ≤ 7.5 A
- I_{TSM} ≤ 120 A.

2. Pinning information

Table 1: Discrete pinning

Pin	Description	Simplified outline	Symbol
1	cathode (k)		
2	anode (a)		
3	gate (g)		
mb	mounting base; connected to anode (a)		



SOT78 (TO-220AB)

sym037

PHILIPS

3. Ordering information

Table 2: Ordering information

Type number	Package		
	Name	Description	Version
BT151-500R	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78
BT151-650R			
BT151-800R			

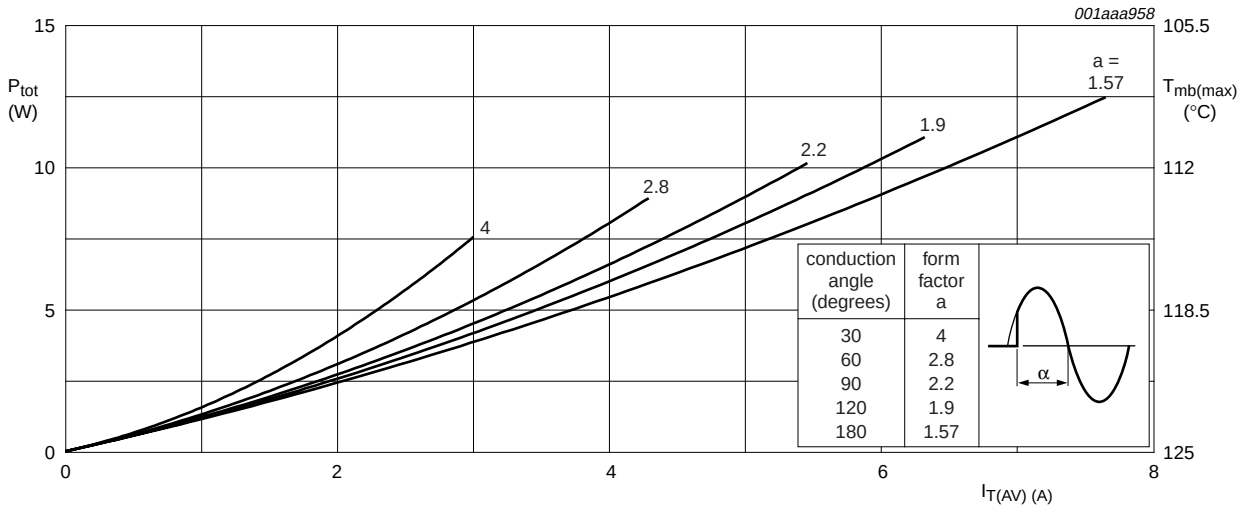
4. Limiting values

Table 3: Limiting values

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

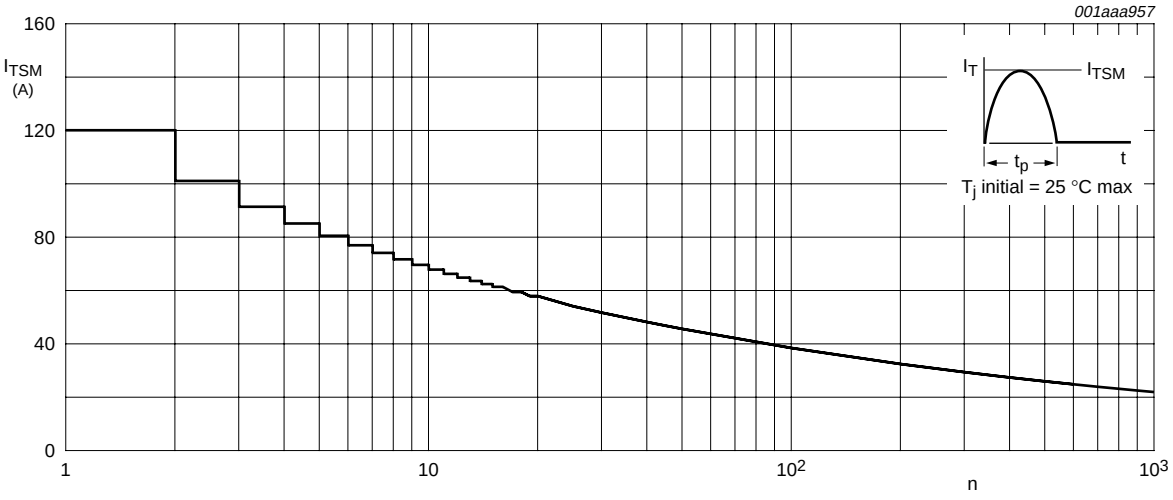
Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}, V_{RRM}	repetitive peak off-state voltage					
	BT151-500R		[1]	-	500	V
	BT151-650R		[1]	-	650	V
	BT151-800R			-	800	V
$I_{T(AV)}$	average on-state current	half sinewave; $T_{mb} \leq 109$ °C; Figure 1		-	7.5	A
$I_{T(RMS)}$	RMS on-state current	all conduction angles; Figure 4 and Figure 5		-	12	A
I_{TSM}	non-repetitive peak on-state current	half sinewave; $T_j = 25$ °C prior to surge; Figure 2 and Figure 3				
		t = 10 ms		-	120	A
		t = 8.3 ms		-	132	A
I^2t	I^2t for fusing	t = 10 ms		-	72	A^2s
dI_T/dt	repetitive rate of rise of on-state current after triggering	$I_{TM} = 20$ A; $I_G = 50$ mA; dI_G/dt 50 mA/µs		-	50	A/µs
I_{GM}	peak gate current			-	2	A
V_{RGM}	peak reverse gate voltage			-	5	V
P_{GM}	peak gate power			-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		-	0.5	W
T_{stg}	storage temperature			–40	+150	°C
T_j	junction temperature			-	125	°C

[1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/µs.



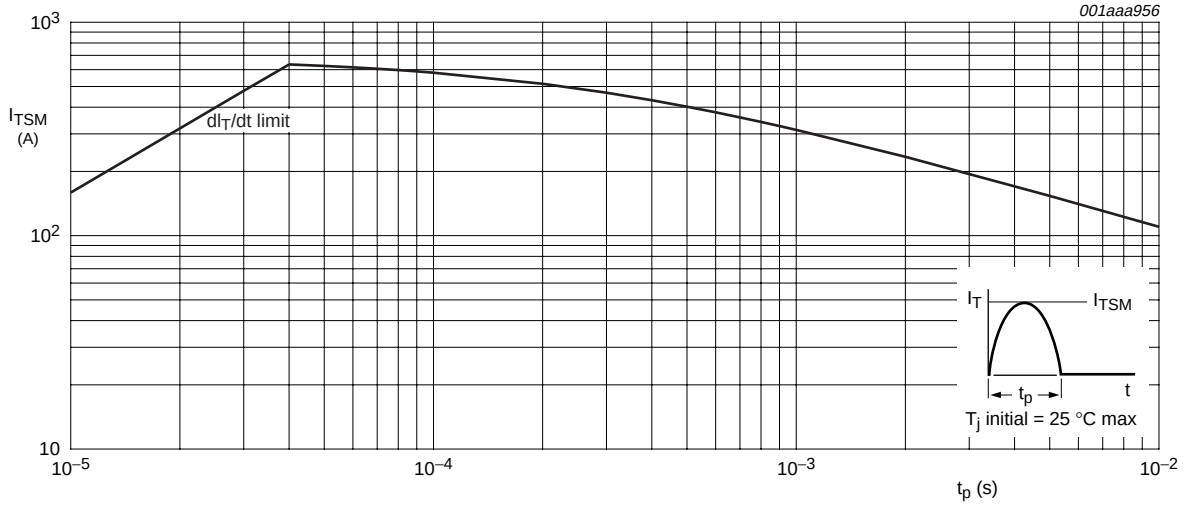
a = form factor = $I_{T(RMS)}/I_{T(AV)}$.

Fig 1. Total power dissipation as a function of average on-state current; maximum values.



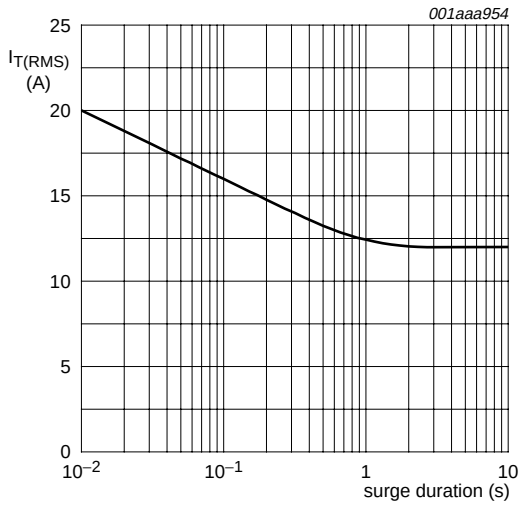
f = 50 Hz.

Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values.



$t_p \leq 10$ ms.

Fig 3. Non-repetitive peak on-state current as a function of pulse width; maximum values.



f = 50 Hz; $T_{mb} \leq 109$ °C.

Fig 4. RMS on-state current as a function of surge duration; maximum values.

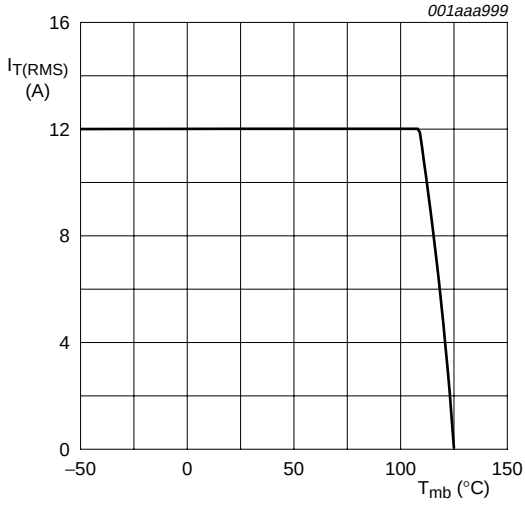


Fig 5. RMS on-state current as a function of mounting base temperature; maximum values.

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Figure 6	-	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	60	-	K/W

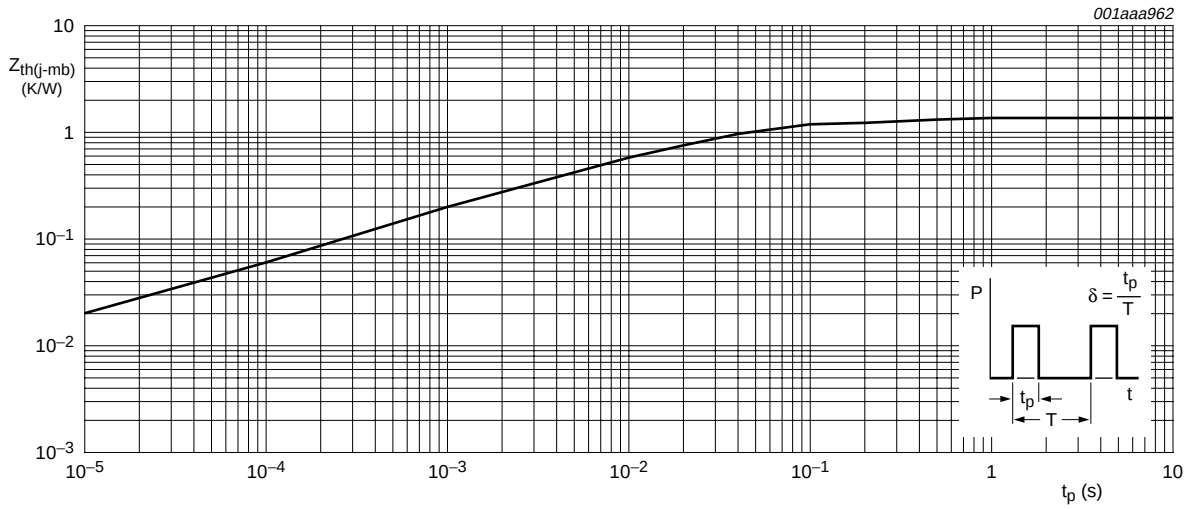


Fig 6. Transient thermal impedance as a function of pulse width.

6. Characteristics

Table 5: Characteristics

T_j = 25 °C unless otherwise stated

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; Figure 8	-	2	15	mA
I_L	latching current	V_D = 12 V; I_{GT} = 0.1 A; Figure 10	-	10	40	mA
I_H	holding current	V_D = 12 V; I_{GT} = 0.1 A; Figure 11	-	7	20	mA
V_T	on-state voltage	I_T = 23 A; Figure 9	-	1.4	1.75	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; Figure 7	-	0.6	1.5	V
		$V_D = V_{DRM(max)}$; I_T = 0.1 A; T_j = 125 °C	0.25	0.4	-	V
I_D, I_R	off-state leakage current	$V_D = V_{DRM(max)}$; $V_R = V_{RRM(max)}$; T_j = 125 °C	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	critical rate of rise of off-state voltage	V_{DM} = 67% $V_{DRM(max)}$; T_j = 125 °C; exponential waveform; Figure 12				
		gate open circuit	50	130	-	V/µs
		R_{GK} = 100 Ω	200	1000	-	V/µs
t_{gt}	gate controlled turn-on time	I_{TM} = 40 A; $V_D = V_{DRM(max)}$; I_G = 0.1 A; dI_G/dt = 5 A/µs	-	2	-	µs
t_q	circuit commuted turn-on time	V_D = 67% $V_{DRM(max)}$; T_j = 125 °C; I_{TM} = 20 A; V_R = 25 V; dI_{TM}/dt = 30 A/µs; dV_D/dt = 50 V/µs; R_{GK} = 100 Ω	-	70	-	µs

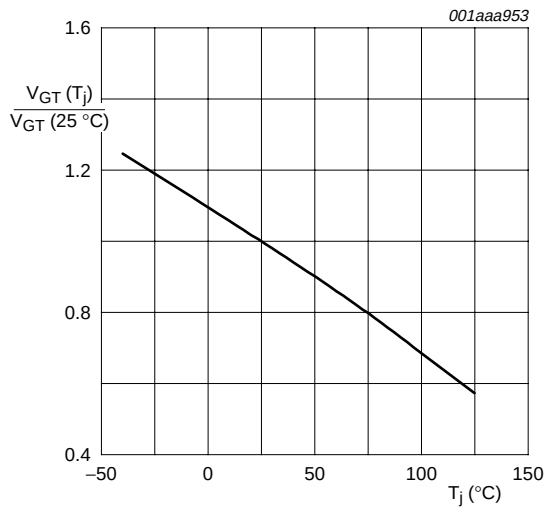


Fig 7. Normalized gate trigger voltage as a function of junction temperature.

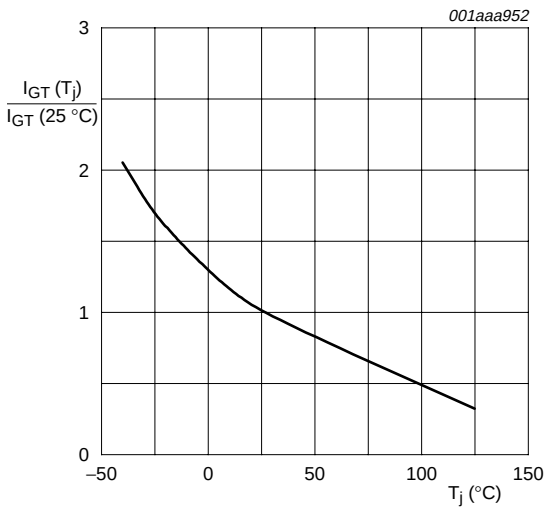
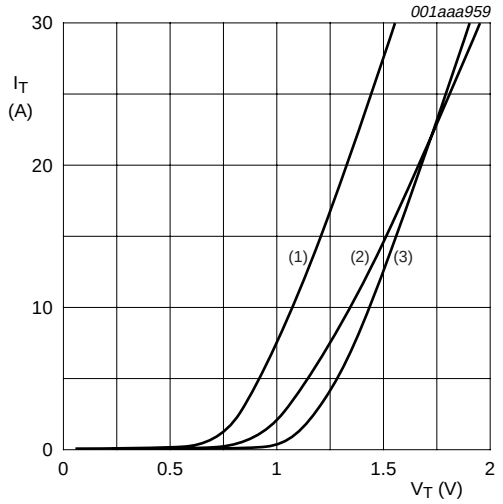


Fig 8. Normalized gate trigger current as a function of junction temperature.



V_O = 1.06 V.

R_S = 0.0304 Ω.

(1) T_j = 125 °C; typical values.

(2) T_j = 125 °C; maximum values.

(3) T_j = 25 °C; maximum values.

Fig 9. On-state current characteristics.

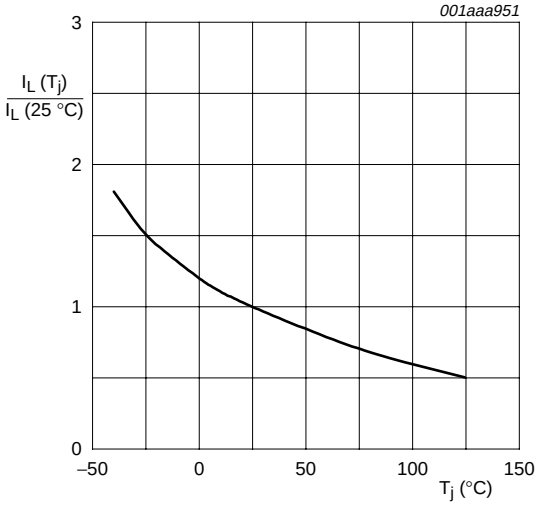


Fig 10. Normalized latching current as a function of junction temperature.

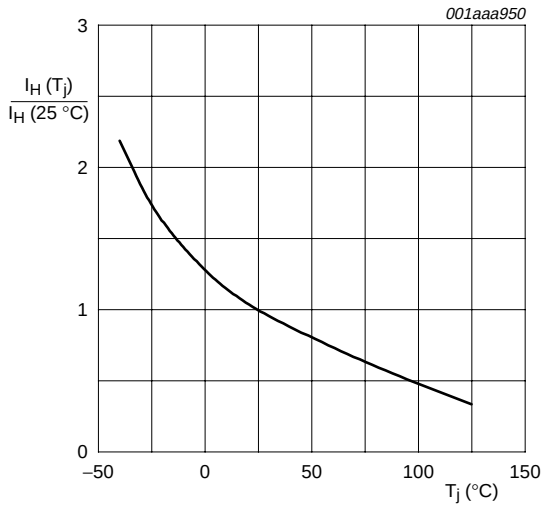
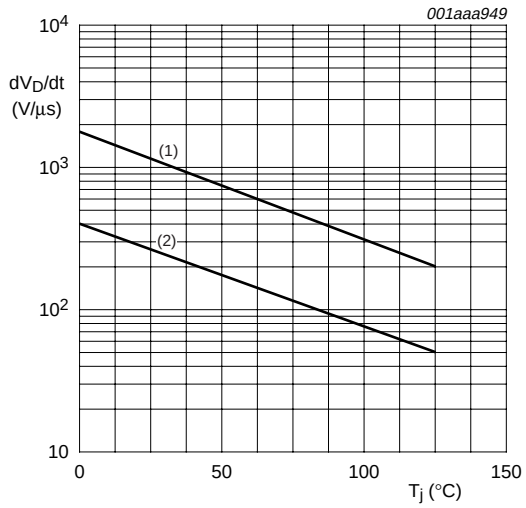


Fig 11. Normalized holding current as a function of junction temperature.



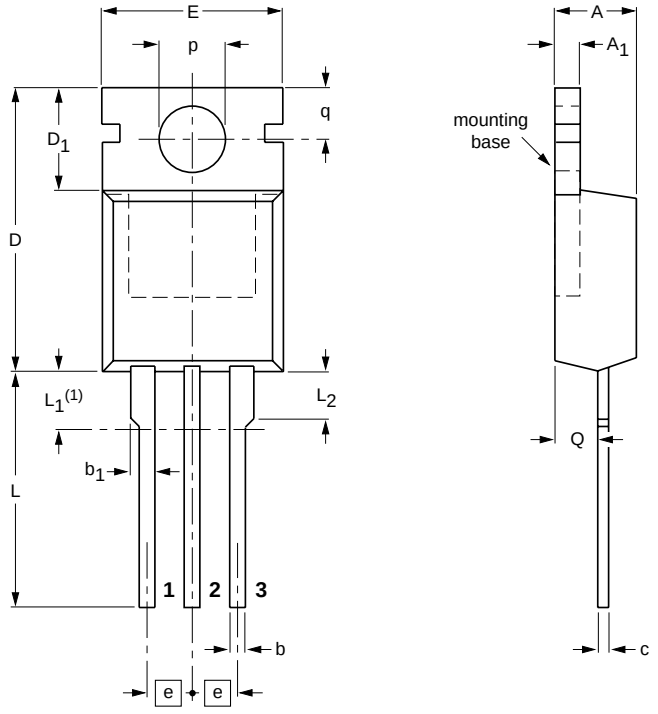
(1) R_{GK} = 100 Ω.

(2) Gate open circuit.

Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; minimum values.

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	c	D	D_1	E	e	L	L_1(1)	L_2 max.	p	q	Q
mm	4.5 4.1	1.39 1.27	0.9 0.6	1.3 1.0	0.7 0.4	15.8 15.2	6.4 5.9	10.3 9.7	2.54	15.0 13.5	3.30 2.79	3.0	3.8 3.6	3.0 2.7	2.6 2.2

Note

1. Terminals in this zone are not tinned.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			~~01-02-16~~ 03-01-22

Fig 13. Package outline

8. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
BT151_SERIES_3	20040607	Product specification	-	9397 750 13159	BT151_SERIES_2
Modifications:	• Converted from Lotus Manuscript format to TDM format				

9. 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).

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[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.

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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.

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