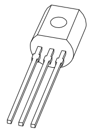


BT149 series

Thyristors logic level

Rev. 04 — 20 August 2004 **Product data sheet**

1. Product profile

1.1 General description

Passivated, sensitive gate thyristors in a SOT54 plastic package.

1.2 Features

- Designed to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

1.3 Applications

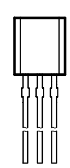
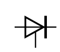
- General purpose switching and phase control.

1.4 Quick reference data

- V_{DRM}, V_{RRM} ≤ 200 V (BT149B)
- V_{DRM}, V_{RRM} ≤ 400 V (BT149D)
- V_{DRM}, V_{RRM} ≤ 600 V (BT149G)
- $I_{T(RMS)}$ ≤ 0.8 A
- $I_{T(AV)}$ ≤ 0.5 A
- I_{TSM} ≤ 8 A.

2. Pinning information

Table 1: Discrete pinning

Pin	Description	Simplified outline	Symbol
1	cathode (k)	 **SOT54 (TO-92)**	
2	gate (g)		
3	anode (a)		

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3. Ordering information

Table 2: Ordering information

Type number	Package		
	Name	Description	Version
BT149B	-	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BT149D			
BT149G			

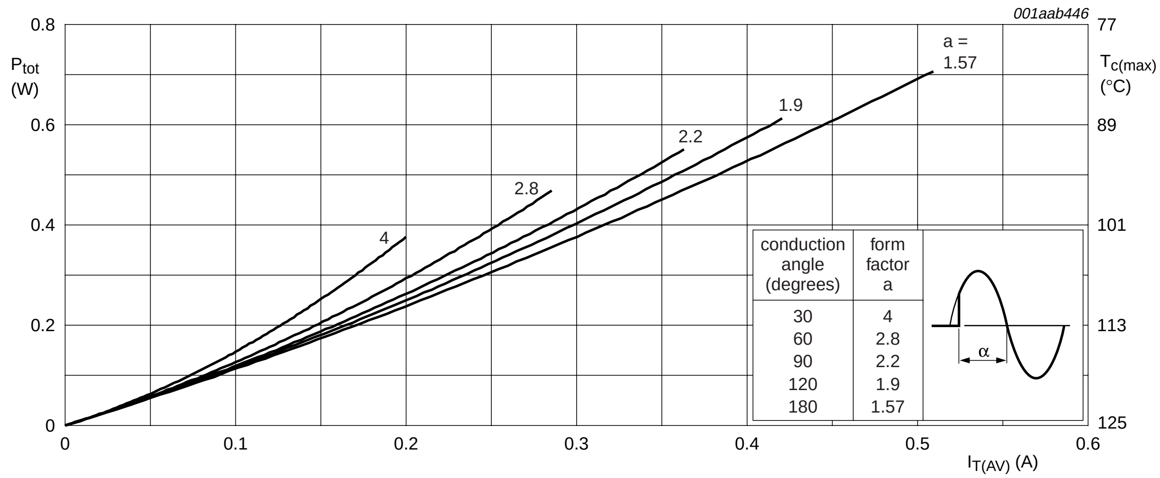
4. Limiting values

Table 3: Limiting values

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

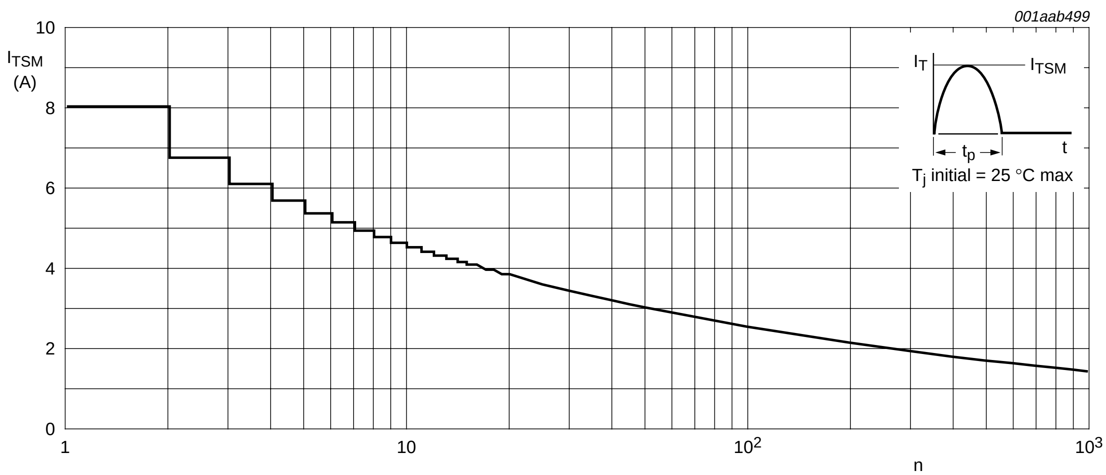
Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}, V_{RRM}	repetitive peak off-state voltage				
	BT149B	[1]	-	200	V
	BT149D	[1]	-	400	V
	BT149G	[1]	-	600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83$ °C; see Figure 1	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	all conduction angles; see Figure 4 and 5	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_j = 25$ °C prior to surge; see Figure 2 and 3			
		t = 10 ms	-	8	A
		t = 8.3 ms	-	9	A
I^2t	I^2t for fusing	t = 10 ms	-	0.32	A^2s
dI_T/dt	repetitive rate of rise of on-state current after triggering	$I_{TM} = 2$ A; $I_G = 10$ mA; $dI_G/dt = 100$ mA/µs	-	50	A/µs
I_{GM}	peak gate current		-	1	A
V_{GM}	peak gate voltage		-	5	V
V_{RGM}	peak reverse gate voltage		-	5	V
P_{GM}	peak gate power		-	2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	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.



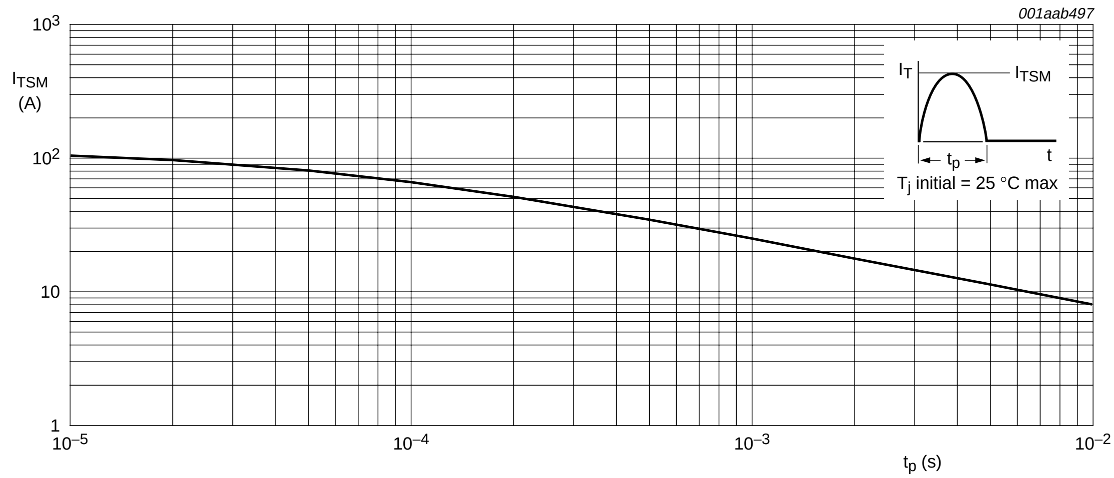
a = form factor = $I_{T(RMS)}/I_{T(AV)}$.

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



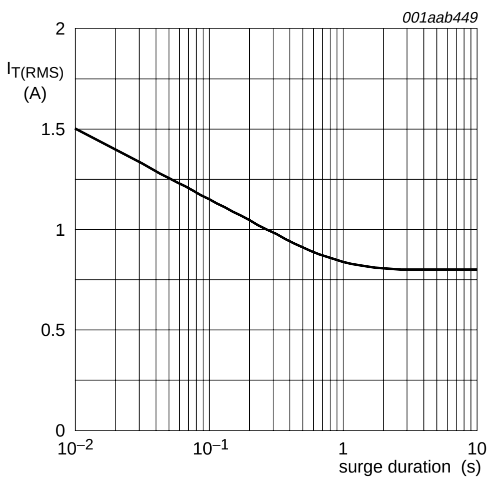
f = 50 Hz.

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



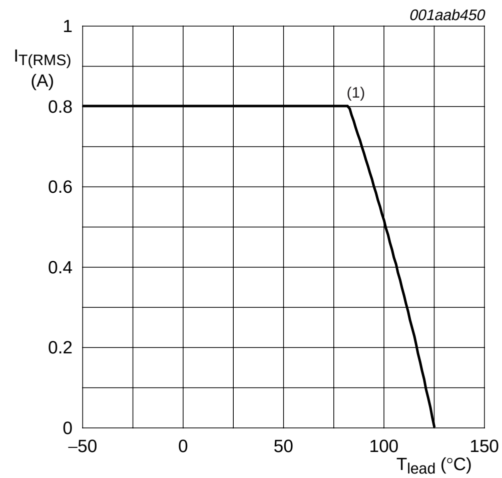
$t_p \leq 10$ ms.

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



f = 50 Hz; $T_{lead} \leq 83$ °C.

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



(1) $T_{lead} = 83$ °C

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

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead		-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	printed-circuit board mounted; lead length = 4 mm	-	150	-	K/W

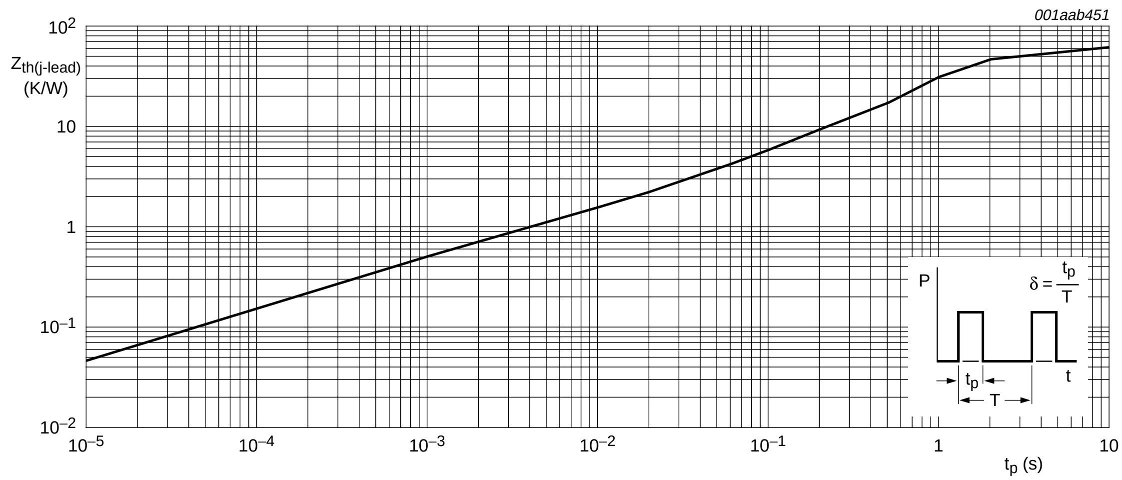


Fig 6. Transient thermal impedance as a function of pulse width.

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 = 10 mA; gate open circuit; see Figure 8	-	50	200	µA
I_L	latching current	V_D = 12 V; I_{GT} = 0.5 mA; R_{GK} = 1 kΩ; see Figure 10	-	2	6	mA
I_H	holding current	V_D = 12 V; I_{GT} = 0.5 mA; R_{GK} = 1 kΩ; see Figure 11	-	2	5	mA
V_T	on-state voltage	I_T = 1.2 A	-	1.25	1.7	V
V_{GT}	gate trigger voltage	I_T = 10 mA; gate open circuit; see Figure 7				
		V_D = 12 V	-	0.5	0.8	V
		$V_D = V_{DRM(max)}$; T_j = 125 °C	0.2	0.3	-	V
I_D, I_R	off-state leakage current	$V_D = V_{DRM(max)}$; $V_R = V_{RRM(max)}$; T_j = 125 °C; R_{GK} = 1 kΩ	-	0.05	0.1	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; see Figure 12				
		gate open circuit	-	25	-	V/µs
		R_{GK} = 1 kΩ	500	800	-	V/µs
t_{gt}	gate controlled turn-on time	I_{TM} = 2 A; $V_D = V_{DRM(max)}$; I_G = 10 mA; dI_G/dt = 0.1 A/µs	-	2	-	µs
t_q	circuit commuted turn-off time	V_D = 67 % $V_{DRM(max)}$; T_j = 125 °C; I_{TM} = 1.6 A; V_R = 35 V; dI_{TM}/dt = 30 A/µs; dV_D/dt = 2 V/µs; R_{GK} = 1 kΩ	-	100	-	µs

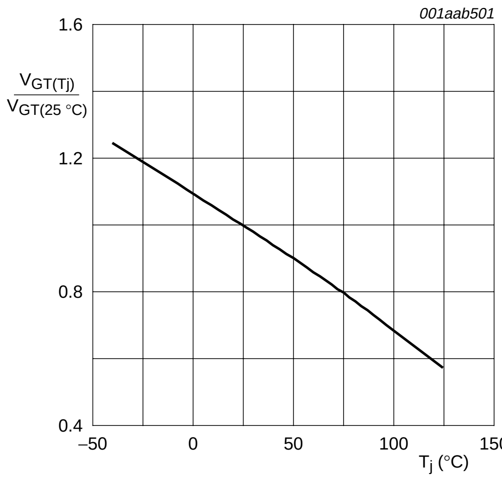


Fig 7. Normalized gate trigger voltage as a function of junction temperature.

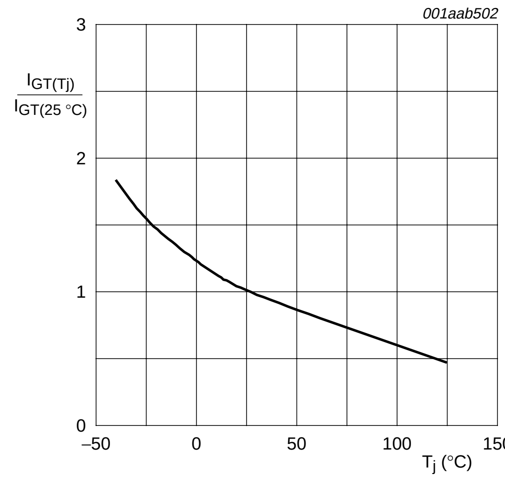
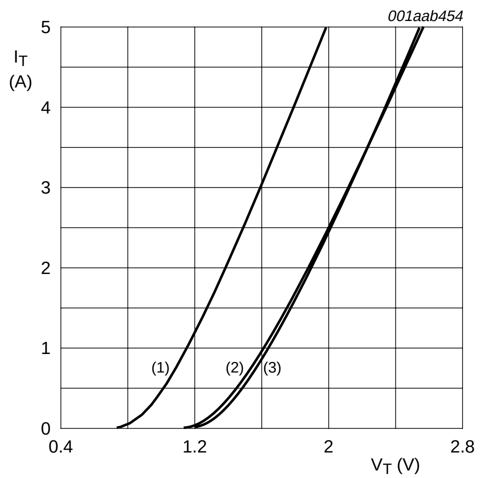


Fig 8. Normalized gate trigger current as a function of junction temperature.



V_O = 1.067 V.

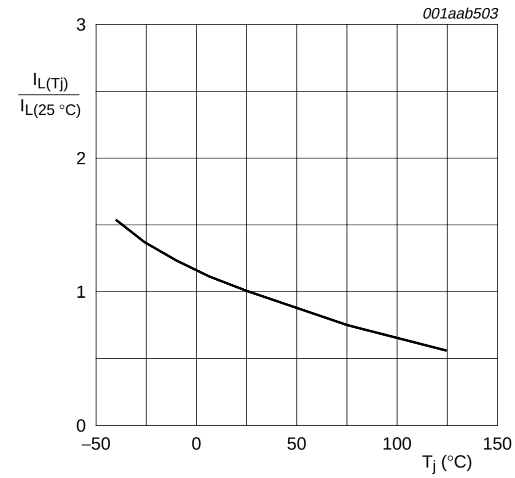
R_S = 0.187 Ω.

(1) T_j = 125 °C; typical values

(2) T_j = 125 °C; maximum values

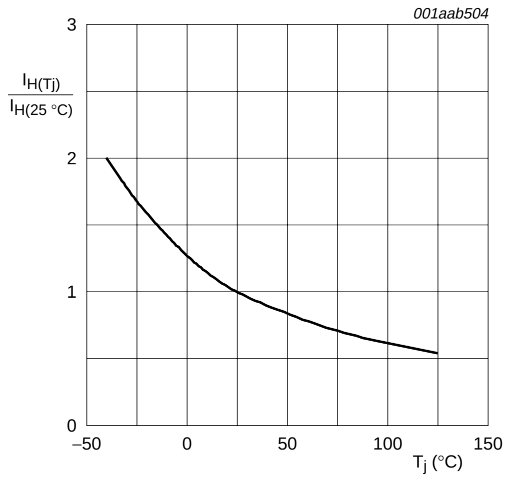
(3) T_j = 25 °C; maximum values

Fig 9. On-state current characteristics.



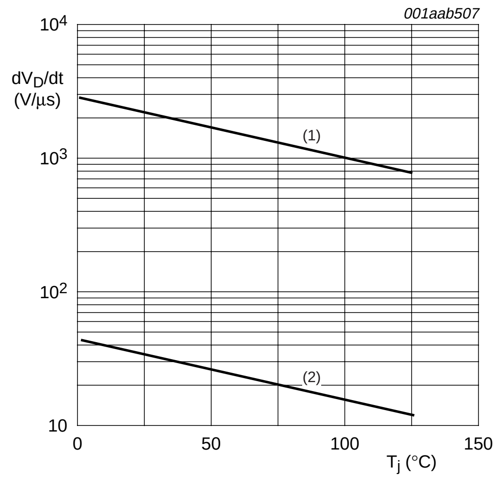
R_{GK} = 1 kΩ.

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



R_{GK} = 1 kΩ.

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



(1) R_{GK} = 1 kΩ.

(2) Gate open circuit.

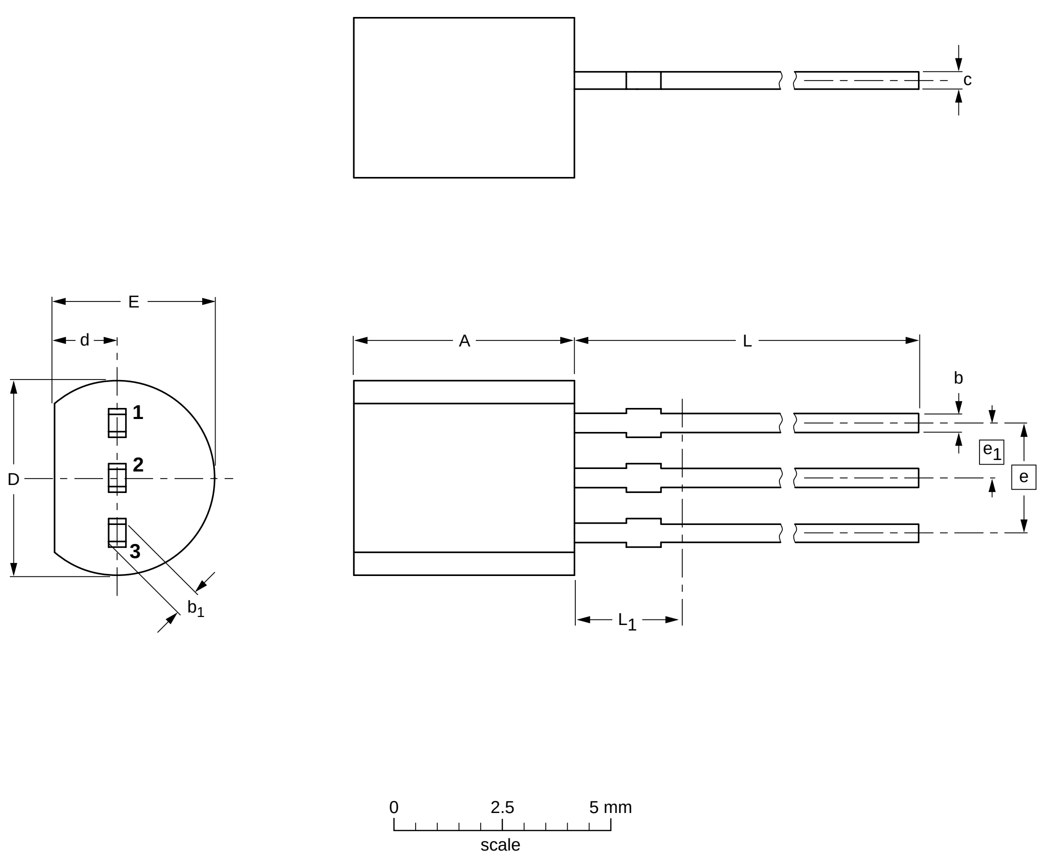
Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values.

7. Package information

Epoxy meets requirements of UL94 V-0 at ⅛ inch.

8. Package outline

Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	L_1(1) max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT54		TO-92	SC-43A			~~97-02-28~~ 04-06-28

Fig 13. Package outline.

9. Revision history

Table 6: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
BT149_SERIES_4	20040820	Product data sheet	-	9397 750 13508	BT149_SERIES_3
Modifications:	• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.				
BT149_SERIES_3	20010902	Product specification	-	not applicable	BT149_SERIES_2
BT149_SERIES_2	20010901	Product specification	-	not applicable	BT149_SERIES_1
BT149_SERIES_1	19970901	Product specification	-	not applicable	-

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.

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14. Contents

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