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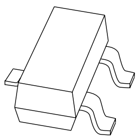


PBHV9040T

500 V, 0.25 A PNP high-voltage low V_{CEsat} (BISS) transistor

Rev. 02 — 15 January 2009 **Product data sheet**

1. Product profile

1.1 General description

PNP high-voltage low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBHV8540T.

1.2 Features

- High voltage
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- AEC-Q101 qualified

1.3 Applications

- Electronic ballast for fluorescent lighting
- LED driver for LED chain module
- LCD backlighting
- High Intensity Discharge (HID) front lighting
- Automotive motor management
- Hook switch for wired telecom
- Switch mode power supply

1.4 Quick reference data

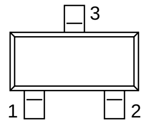
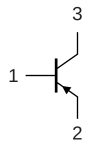
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CESM}	collector-emitter peak voltage	V_{BE} = 0 V	-	-	–500	V
V_{CEO}	collector-emitter voltage	open base	-	-	–400	V
I_C	collector current		-	-	–0.25	A
h_{FE}	DC current gain	V_{CE} = –10 V; I_C = –50 mA	100	200	-	

founded by Philips

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		 sym013
2	emitter		
3	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV9040T	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBHV9040T	W5*

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

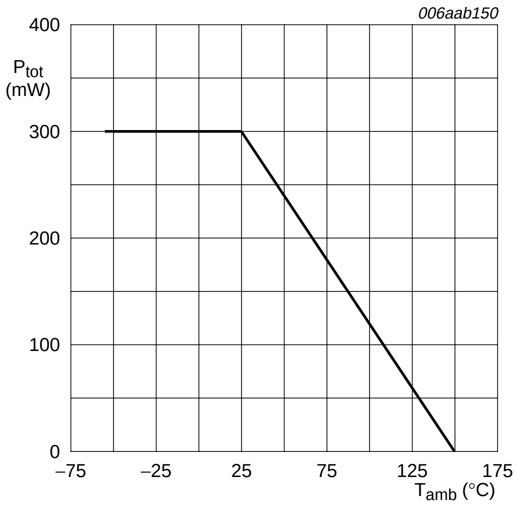
5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	–500	V
V_{CEO}	collector-emitter voltage	open base		-	–400	V
V_{CESM}	collector-emitter peak voltage	V_{BE} = 0 V		-	–500	V
V_{EBO}	emitter-base voltage	open collector		-	–6	V
I_C	collector current			-	–0.25	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	–0.5	A
I_{BM}	peak base current	single pulse; $t_p \leq$ 1 ms		-	–200	mA
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	300	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	+150	°C
T_{stg}	storage temperature			–65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



FR4 PCB, standard footprint

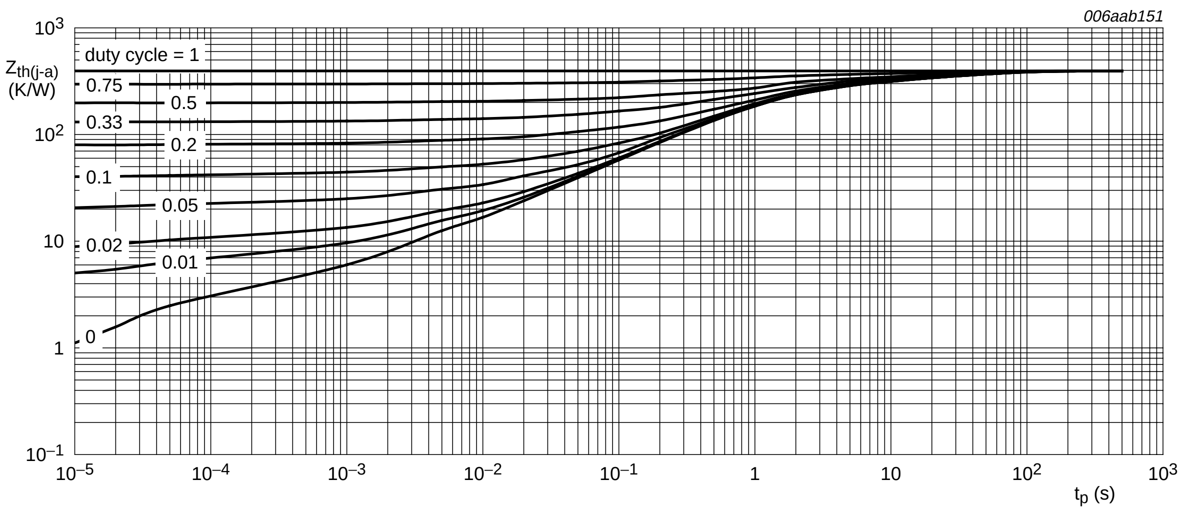
Fig 1. Power derating curve

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	70	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



FR4 PCB, standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

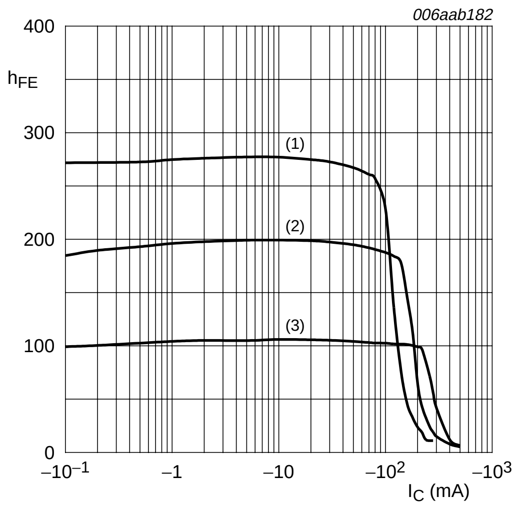
7. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = –320 V; I_E = 0 A		-	-	–100	nA
		V_{CB} = –320 V; I_E = 0 A; T_j = 150 °C		-	-	–10	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = –320 V; V_{BE} = 0 V		-	-	–100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = –4 V; I_C = 0 A		-	-	–100	nA
h_{FE}	DC current gain	V_{CE} = –10 V					
		I_C = –50 mA		100	200	-	
		I_C = –100 mA		80	200	-	
		I_C = –250 mA	[1]	10	25	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –100 mA; I_B = –20 mA		-	–110	–200	mV
V_{BEsat}	base-emitter saturation voltage	I_C = –100 mA; I_B = –20 mA	[1]	-	–1	–1.1	V
f_T	transition frequency	V_{CE} = –10 V; I_E = –10 mA; f = 100 MHz		-	55	-	MHz
C_c	collector capacitance	V_{CB} = –20 V; I_E = i_e = 0 A; f = 1 MHz		-	7	-	pF
C_e	emitter capacitance	V_{EB} = –0.5 V; I_C = i_c = 0 A; f = 1 MHz		-	150	-	pF
t_d	delay time	V_{CC} = –2 V; I_C = –0.15 A; I_{Bon} = –0.03 A; I_{Boff} = 0.03 A		-	9	-	ns
t_r	rise time			-	1810	-	ns
t_{on}	turn-on time			-	1819	-	ns
t_s	storage time			-	715	-	ns
t_f	fall time			-	1085	-	ns
t_{off}	turn-off time			-	1800	-	ns

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



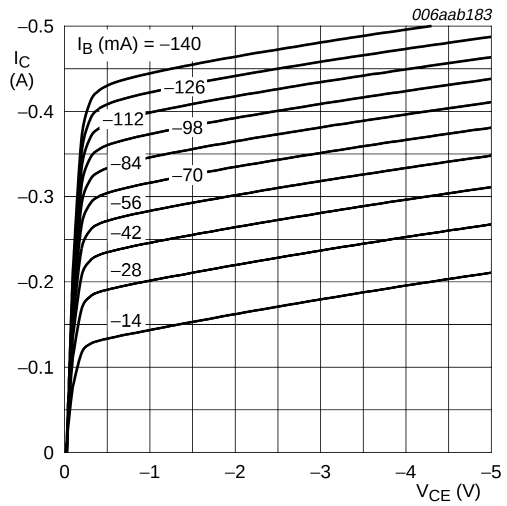
V_{CE} = −10 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

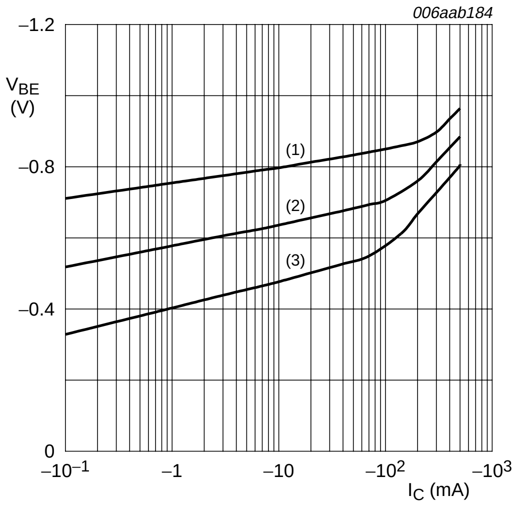
(3) T_{amb} = −55 °C

Fig 3. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 4. Collector current as a function of collector-emitter voltage; typical values



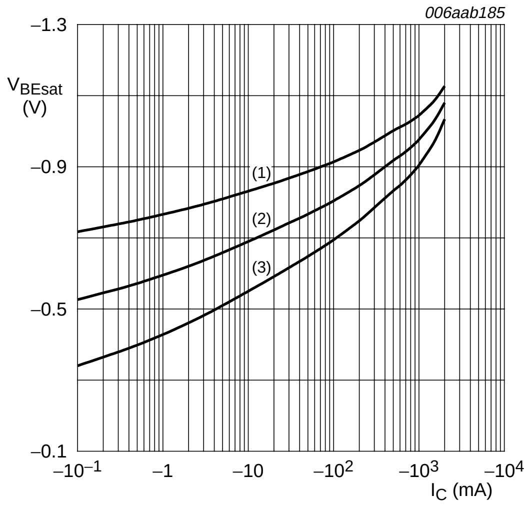
V_{CE} = −10 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 5. Base-emitter voltage as a function of collector current; typical values



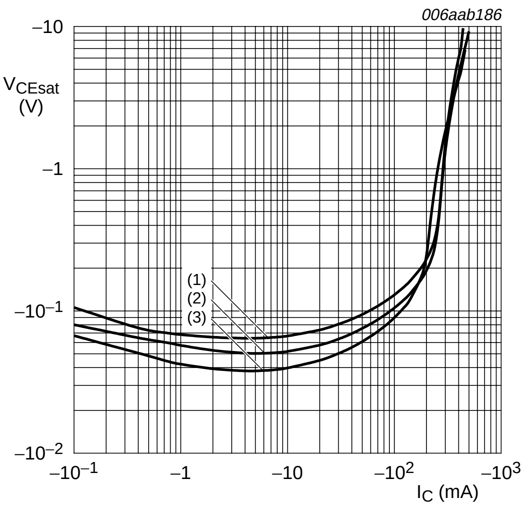
I_C/I_B = 5

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 6. Base-emitter saturation voltage as a function of collector current; typical values



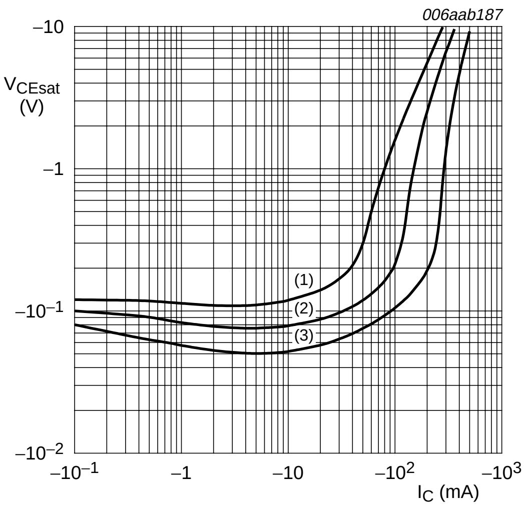
$I_C/I_B = 5$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values



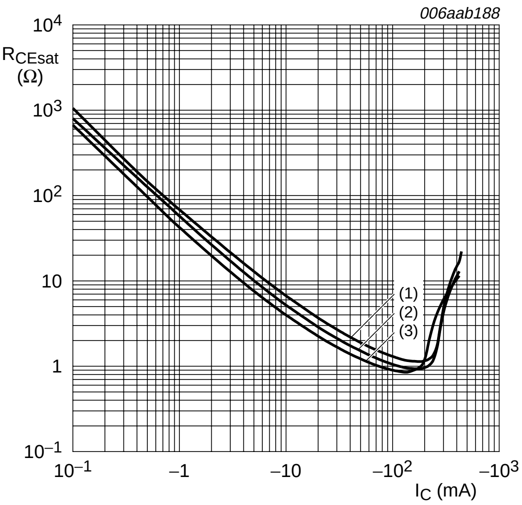
$T_{amb} = 25$ °C

(1) $I_C/I_B = 20$

(2) $I_C/I_B = 10$

(3) $I_C/I_B = 5$

Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values



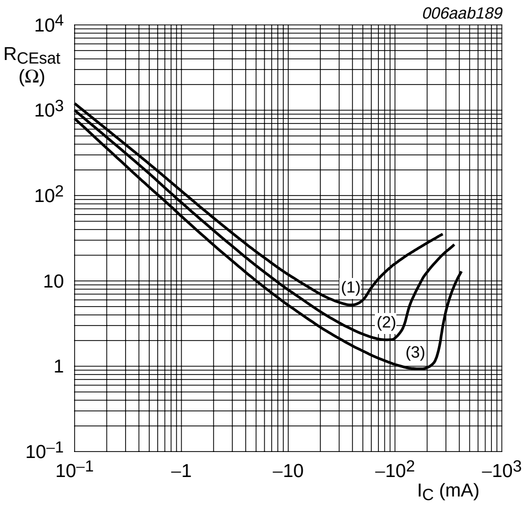
$I_C/I_B = 5$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

Fig 9. Collector-emitter saturation resistance as a function of collector current; typical values



$T_{amb} = 25$ °C

(1) $I_C/I_B = 20$

(2) $I_C/I_B = 10$

(3) $I_C/I_B = 5$

Fig 10. Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

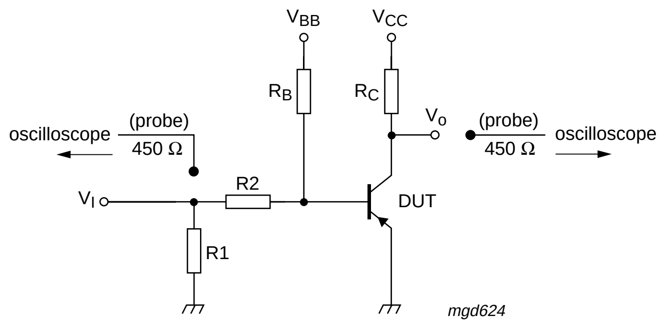


Fig 11. Test circuit for switching times

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

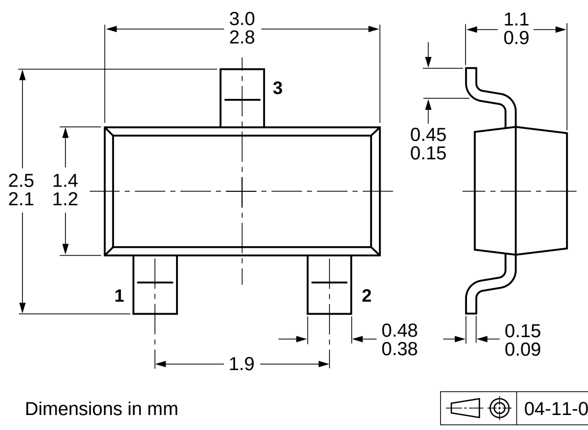


Fig 12. Package outline SOT23 (TO-236AB)

10. Packing information

Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity	
			3000	10000
PBHV9040T	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see Section 14.

11. Soldering

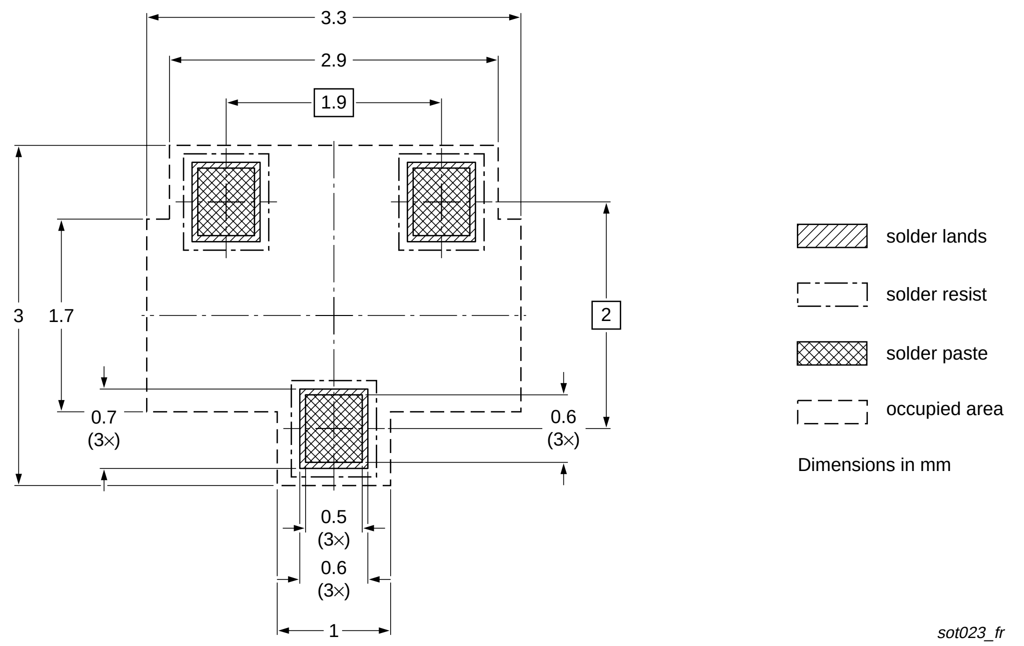


Fig 13. Reflow soldering footprint SOT23 (TO-236AB)

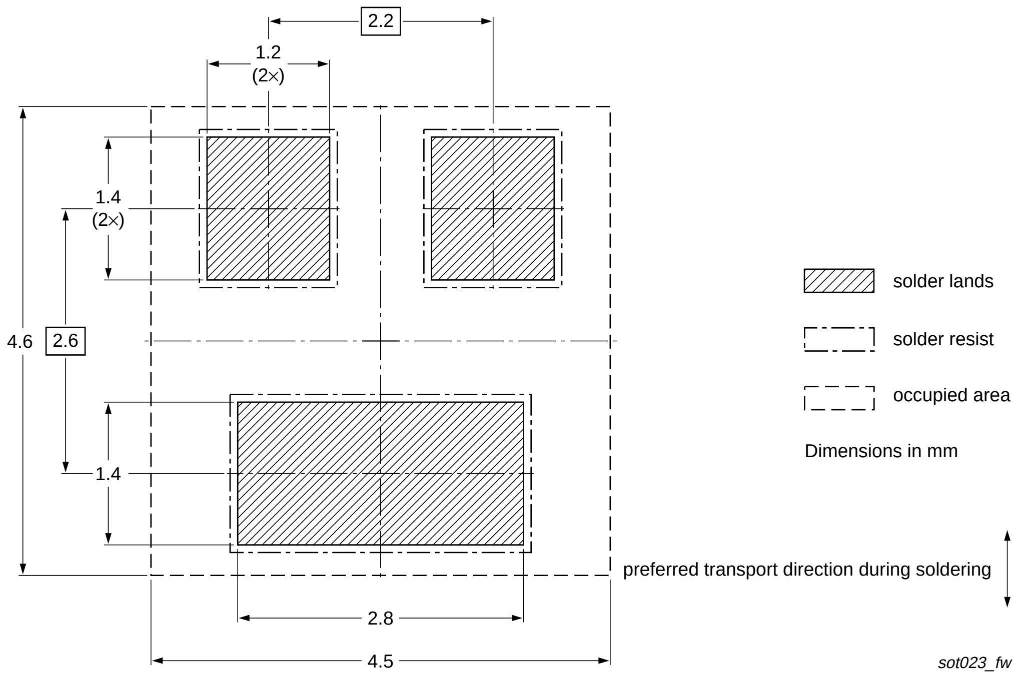


Fig 14. Wave soldering footprint SOT23 (TO-236AB)

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9040T_2	20090115	Product data sheet	-	PBHV9040T_1
Modifications:	• Table 5: I_{BM} value changed from –100 mA to –200 mA • Table 7: t_{off} value amended to 1800 ns • Section 13 “Legal information”: updated			
PBHV9040T_1	20080212	Product data sheet	-	-

13. Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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15. Contents

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Date of release: 15 January 2009

Document identifier: PBHV9040T_2