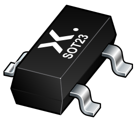

PBHV9050T

500 V, 150 mA PNP high-voltage low VCEsat transistor

12 October 2023 — Product data sheet

1. General description

PNP high-voltage low V_{CEsat} transistor in a SOT23 small Surface-Mounted Device (SMD) plastic package.

NPN complement: PMBTA45

2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and $_{ICM}$
- High collector current gain (h_{FE}) at high I_C

3. Applications

- Electronic ballasts
- LED driver for LED chain module
- LCD backlighting
- Flyback converters
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

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		-	-	-500	V
I_C	collector current			-	-	-0.15	A
h_{FE}	DC current gain	V_{CE} = -10 V; I_C = -50 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		80	160	300	

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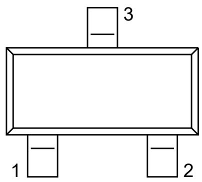
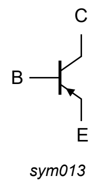
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 **SOT23**	
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV9050T	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBHV9050T	LL%

[1] % = placeholder for manufacturing site code

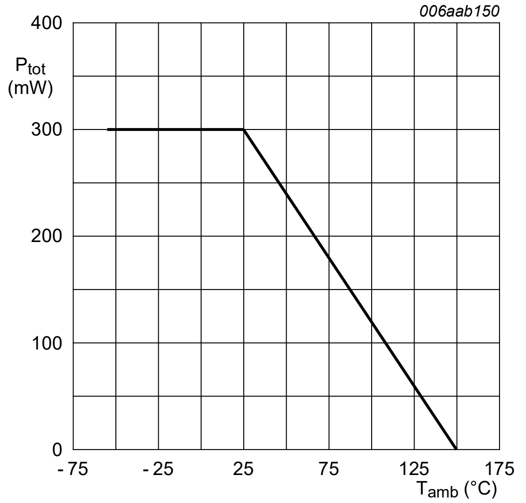
8. Limiting values

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		-	-500	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			-	-0.15	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-0.5	A
I_{BM}	peak base current			-	-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 PCB, single-sided copper, tin-plated and standard footprint.



FR4 PCB, standard footprint

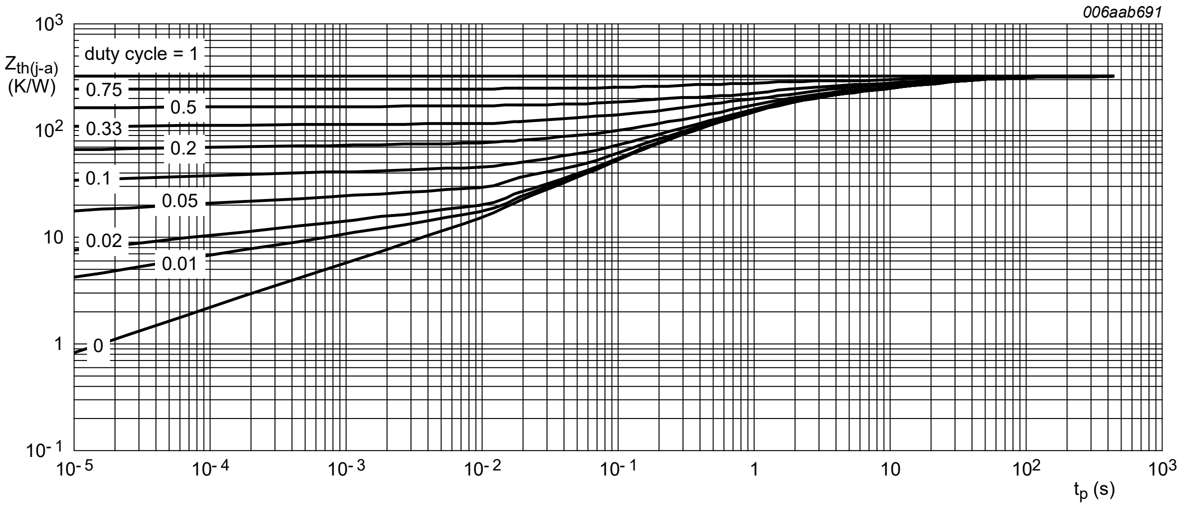
Fig. 1. Power derating curve

9. 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.



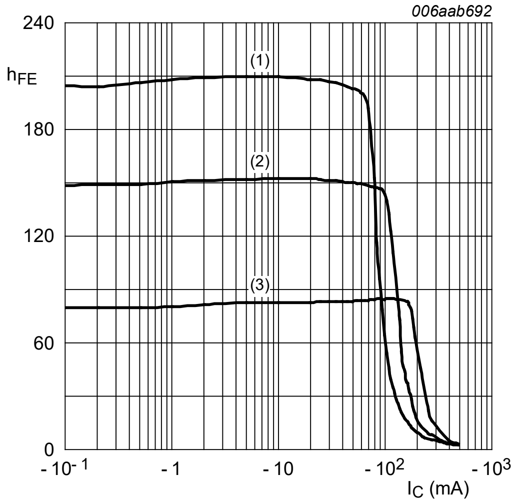
FR4 PCB, standard footprint

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

10. Characteristics

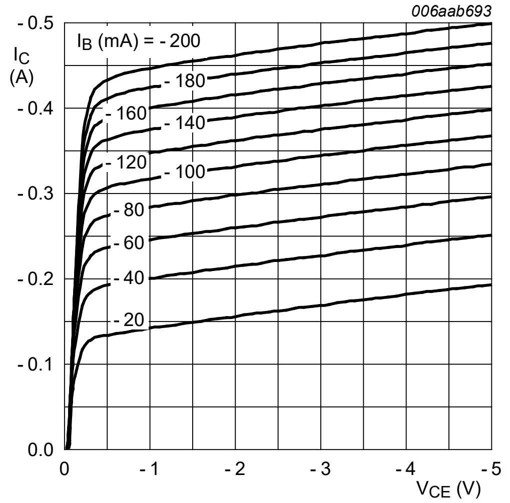
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -360 V; I_E = 0 A; T_{amb} = 25 °C		-	-	-100	nA
		V_{CB} = -360 V; I_E = 0 A; T_j = 150 °C		-	-	-10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	-100	nA
I_{CES}	collector-emitter cut-off current	V_{CE} = -360 V; V_{BE} = 0 V; T_{amb} = 25 °C		-	-	-100	nA
h_{FE}	DC current gain	V_{CE} = -10 V; I_C = -10 mA; T_{amb} = 25 °C		100	160	300	
		V_{CE} = -10 V; I_C = -50 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		80	160	300	
V_{CEsat}	collector-emitter saturation voltage	I_C = -20 mA; I_B = -2 mA; T_{amb} = 25 °C		-	-115	-200	mV
		I_C = -50 mA; I_B = -10 mA; T_{amb} = 25 °C		-	-95	-200	mV
V_{BEsat}	base-emitter saturation voltage	I_C = -50 mA; I_B = -10 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	-0.75	-0.9	V
t_d	delay time	V_{CC} = -20 V; I_C = -0.05 A; I_{Bon} = -5 mA; I_{Boff} = 10 mA; T_{amb} = 25 °C		-	75	-	ns
t_r	rise time			-	1600	-	ns
t_{on}	turn-on time			-	1675	-	ns
t_s	storage time			-	1200	-	ns
t_f	fall time			-	550	-	ns
t_{off}	turn-off time			-	1750	-	ns
f_T	transition frequency	V_{CE} = -10 V; I_C = -10 mA; f = 100 MHz; T_{amb} = 25 °C		-	50	-	MHz
C_c	collector capacitance	V_{CB} = -20 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	6	-	pF
C_e	emitter capacitance	V_{EB} = -0.5 V; I_C = 0 A; i_c = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	170	-	pF



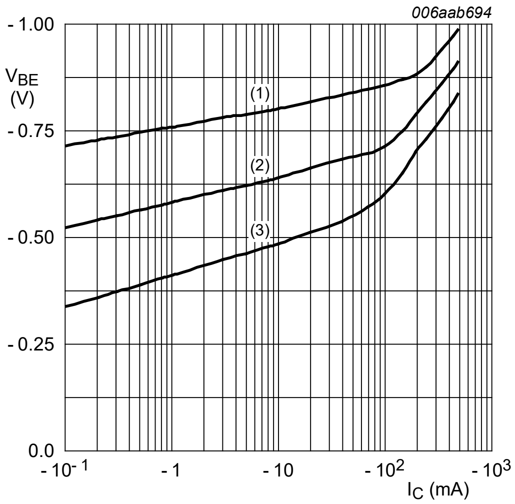
V_{CE} = -10 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



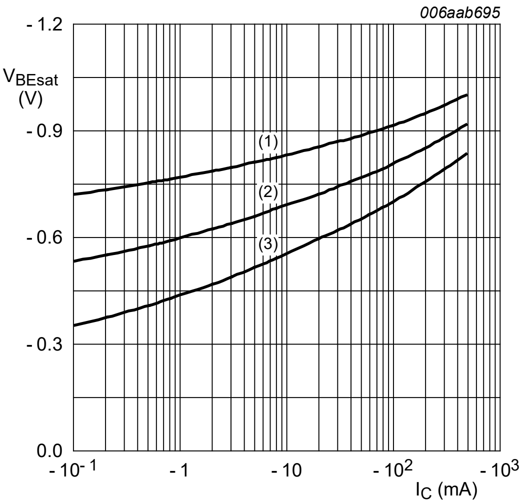
T_{amb} = 25 °C

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



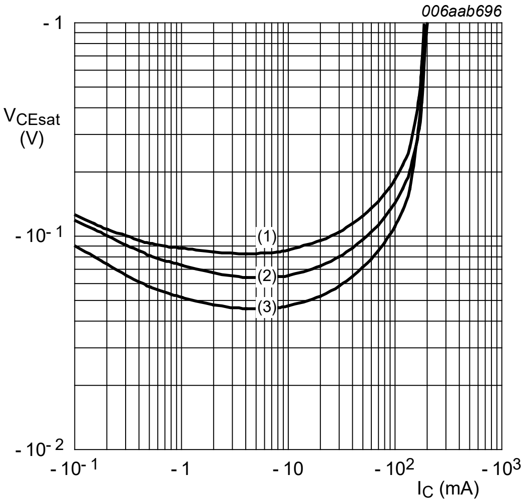
V_{CE} = -10 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



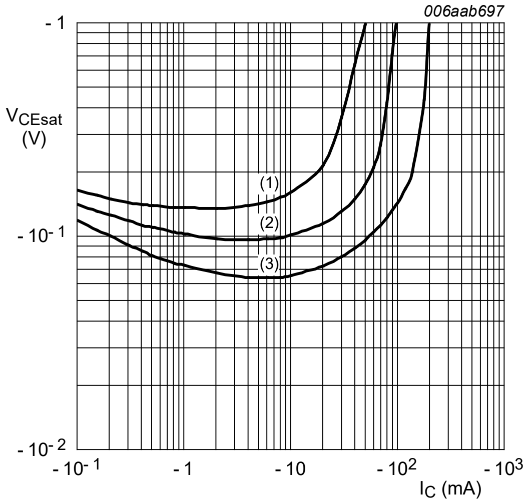
I_C/I_B = 5
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



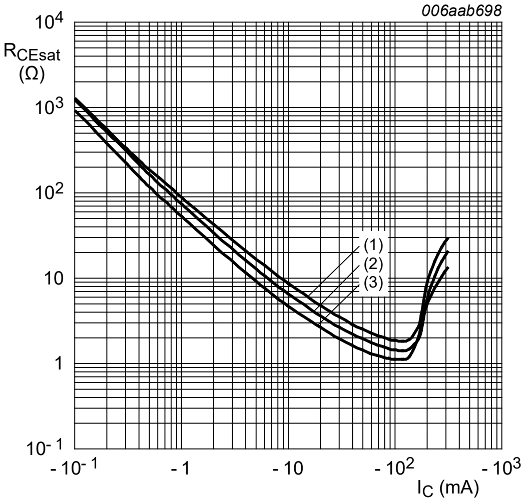
$I_C/I_B = 5$
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



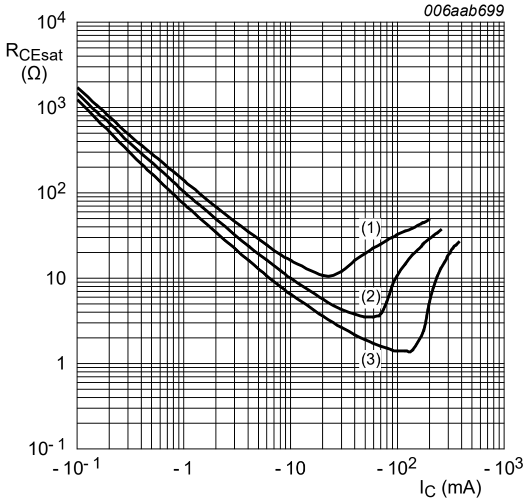
T_{amb} = 25 °C
(1) $I_C/I_B = 20$
(2) $I_C/I_B = 10$
(3) $I_C/I_B = 5$

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

11. Test information

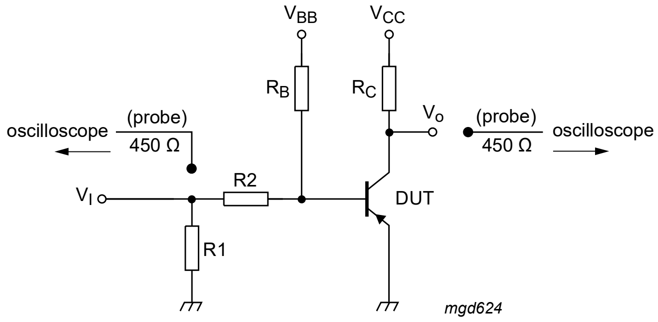


Fig. 11. Test circuit for switching times

12. Package outline

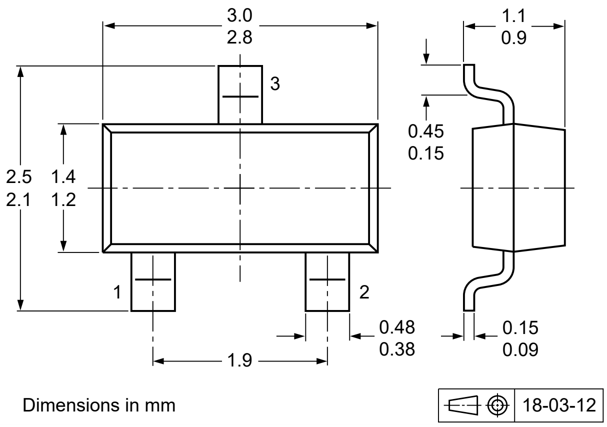


Fig. 12. Package outline SOT23

13. Soldering

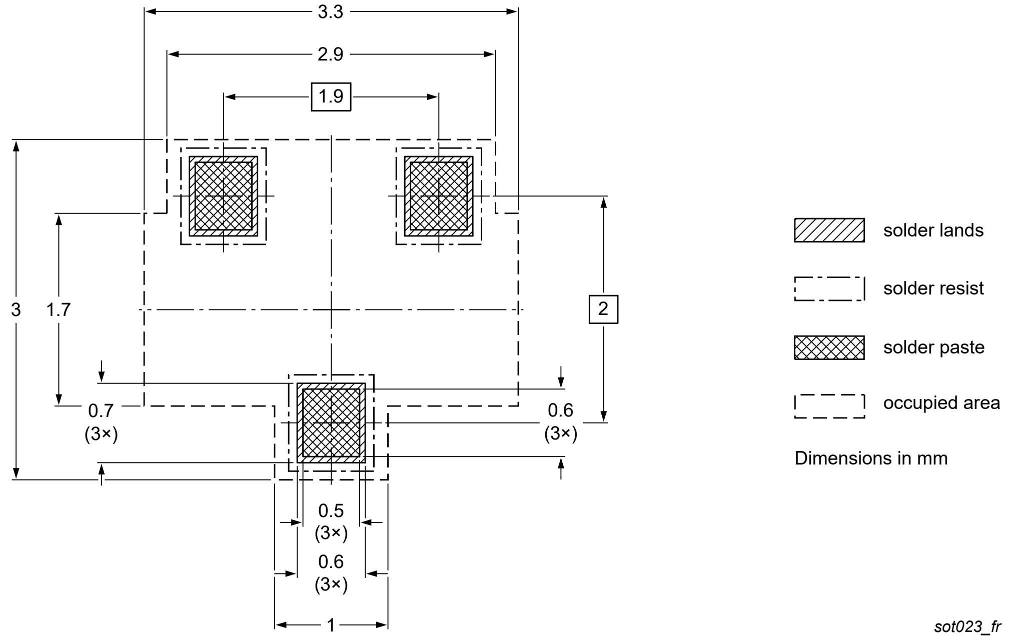


Fig. 13. Reflow soldering footprint for SOT23

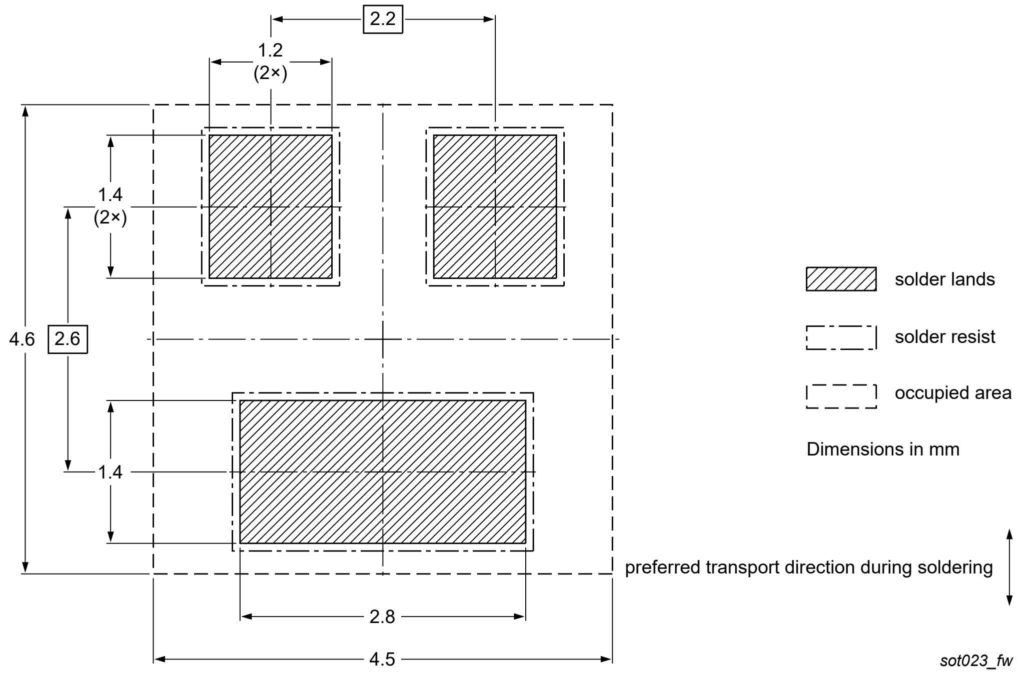


Fig. 14. Wave soldering footprint for SOT23

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9050T v.3	20231012	Product data sheet	-	PBHV9050T v.2
Modifications:	• Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PBHV9050T v.2	20220809	Product data sheet	-	PBHV9050T v.1
PBHV9050T v.1	20090916	Product data sheet	-	-

15. Legal information

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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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Date of release: 12 October 2023