



**THE DATASHEET OF  
PBHV8540T-QR**





# PBHV8540T-Q

500 V, 0.5 A NPN high-voltage low V<sub>CEsat</sub> transistor

16 March 2022

Product data sheet

## 1. General description

NPN high-voltage low V<sub>CEsat</sub> transistor in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package. PNP complement: PBHV9040T-Q.

## 2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage V<sub>CEsat</sub>
- High collector current capability I<sub>C</sub> and I<sub>CM</sub>
- High collector current gain (h<sub>FE</sub>) at high collector current
- Small SMD plastic package
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 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 (SMPS)

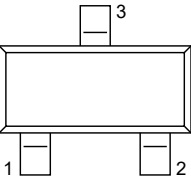
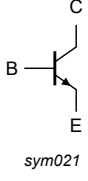
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CESM</sub>	collector-emitter peak voltage	V <sub>BE</sub> = 0 V	-	-	500	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	400	V
I <sub>C</sub>	collector current		-	-	0.5	A
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 10 V; I <sub>C</sub> = 50 mA; T <sub>amb</sub> = 25 °C	100	200	-	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p style="text-align: center;">SOT23</p>	 <p style="text-align: center;">sym021</p>
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV8540T-Q	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 <sup>[1]</sup>
PBHV8540T-Q	W4%

[1] % = placeholder for manufacturing site code

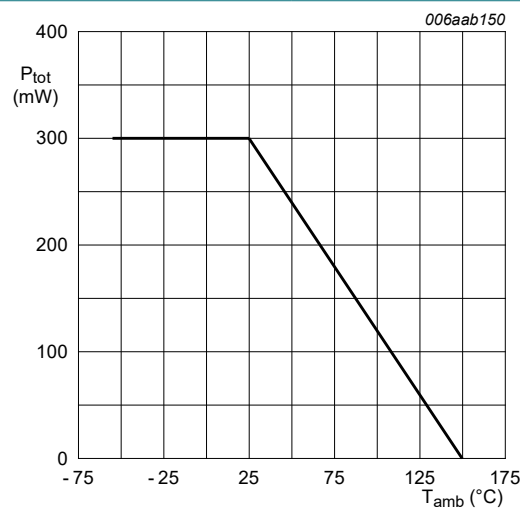
## 8. Limiting values

**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	-	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		-	0.5	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	1	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

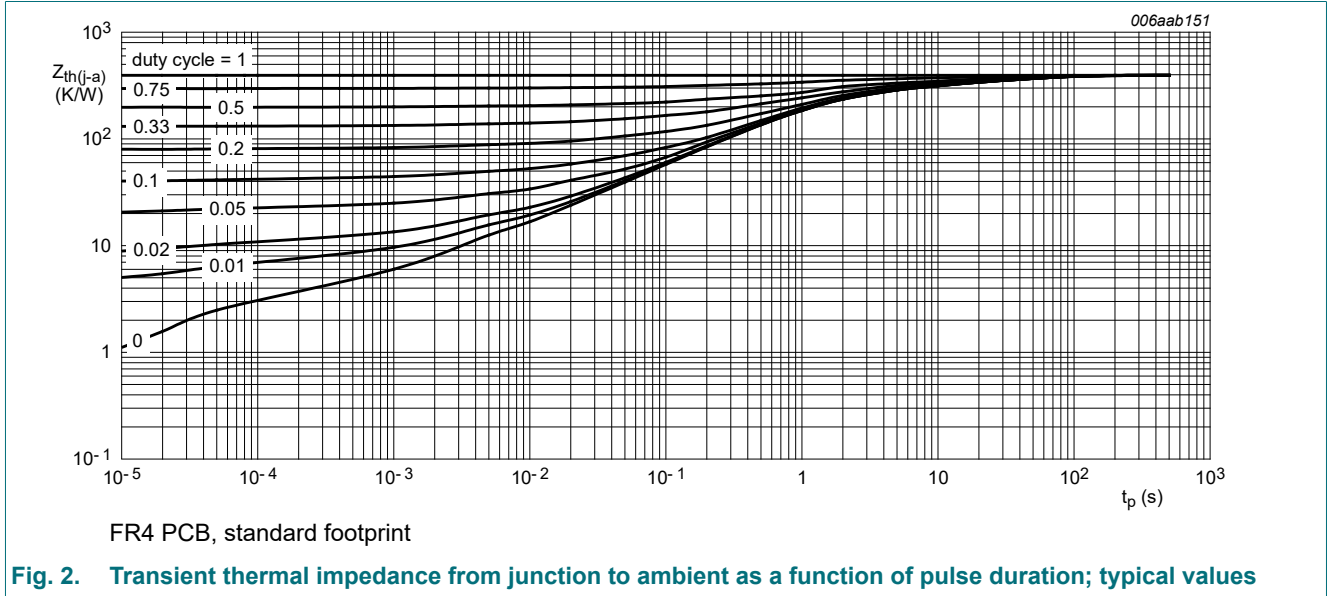
**Fig. 1. Power derating curve**

### 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

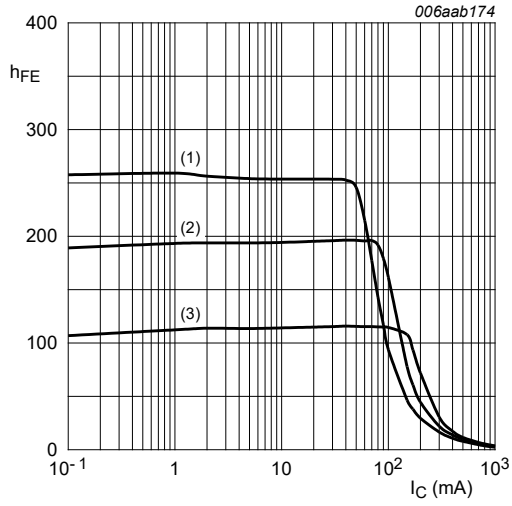
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



## 10. Characteristics

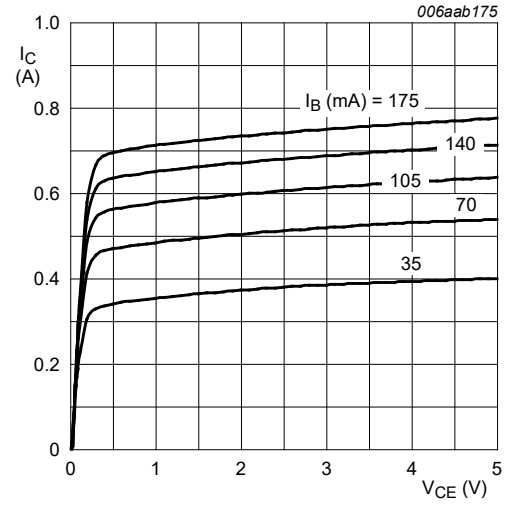
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 320 \text{ V}; I_E = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{CB} = 320 \text{ V}; I_E = 0 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 320 \text{ V}; V_{BE} = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 4 \text{ V}; I_C = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 10 \text{ V}; I_C = 50 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	100	200	-	
		$V_{CE} = 10 \text{ V}; I_C = 100 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	80	150	-	
		$V_{CE} = 10 \text{ V}; I_C = 300 \text{ mA}; \text{pulsed}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	10	20	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 100 \text{ mA}; I_B = 10 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	100	200	mV
		$I_C = 100 \text{ mA}; I_B = 20 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	60	90	mV
		$I_C = 300 \text{ mA}; I_B = 60 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	135	250	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 300 \text{ mA}; I_B = 60 \text{ mA}; \text{pulsed}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	-	0.91	1.1	V
$t_d$	delay time	$V_{CC} = 6 \text{ V}; I_C = 0.5 \text{ A}; I_{Bon} = 0.1 \text{ A}; I_{Boff} = -0.1 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	50	-	ns
$t_r$	rise time		-	6200	-	ns
$t_{on}$	turn-on time		-	6250	-	ns
$t_s$	storage time		-	800	-	ns
$t_f$	fall time		-	2200	-	ns
$t_{off}$	turn-off time		-	3000	-	ns
$f_T$	transition frequency		$V_{CE} = 10 \text{ V}; I_C = 100 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	30	-
$C_c$	collector capacitance	$V_{CB} = 20 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	4	-	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5 \text{ V}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	165	-	pF



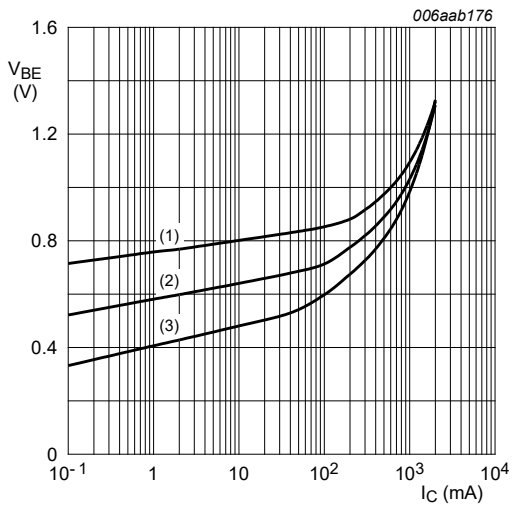
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = 100^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = -55^\circ C$

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



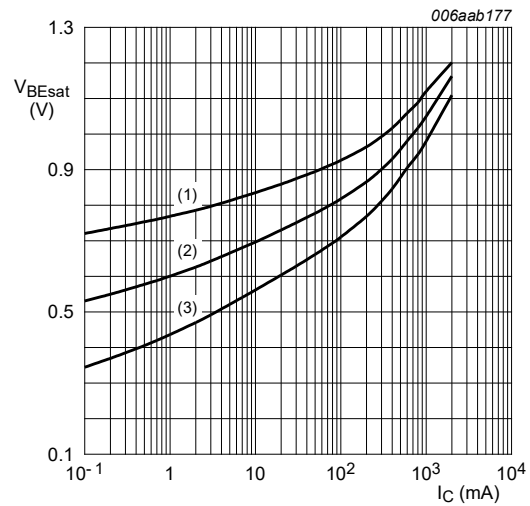
$T_{amb} = 25^\circ C$

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



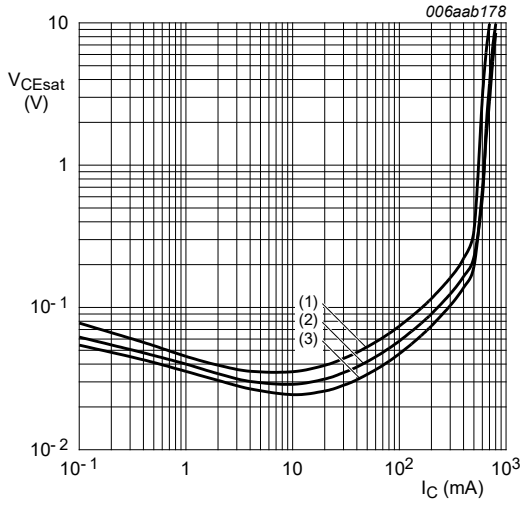
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = -55^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



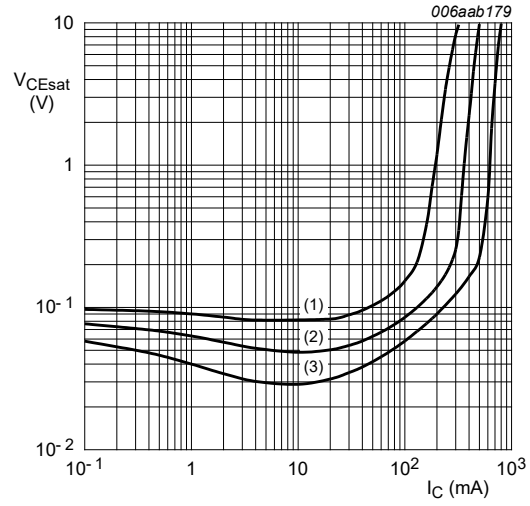
$I_C/I_B = 5$   
 (1)  $T_{amb} = -55^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



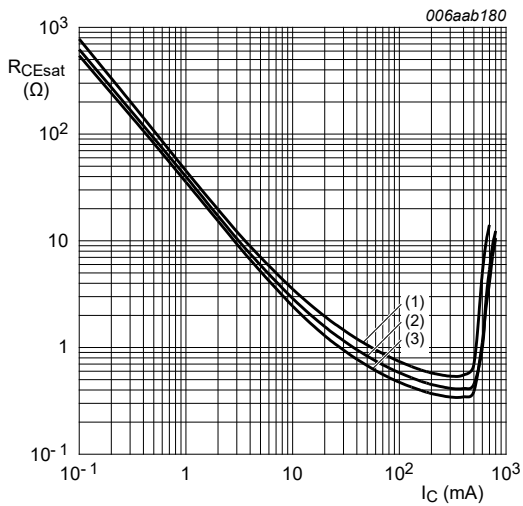
$I_C/I_B = 5$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



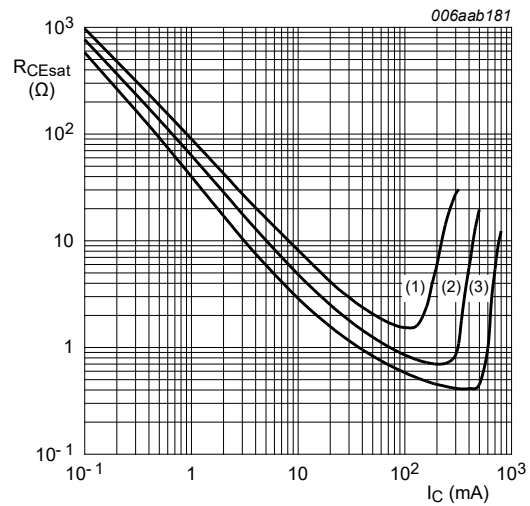
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 20$   
 (2)  $I_C/I_B = 10$   
 (3)  $I_C/I_B = 5$

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



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

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



$T_{amb} = 25\text{ °C}$   
 (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

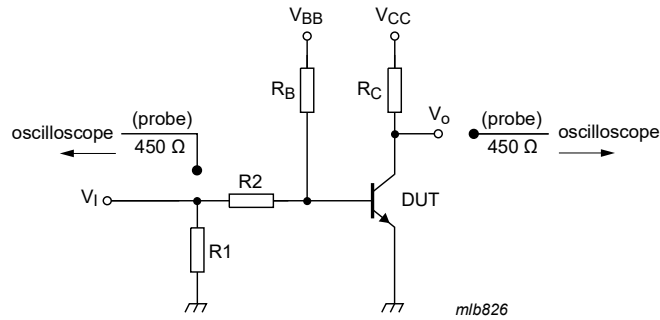


Fig. 11. Test circuit for switching times

### 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.

## 12. Package outline

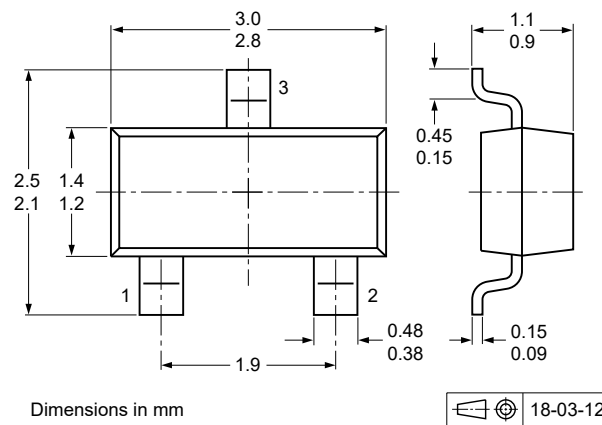


Fig. 12. Package outline SOT23

### 13. Soldering

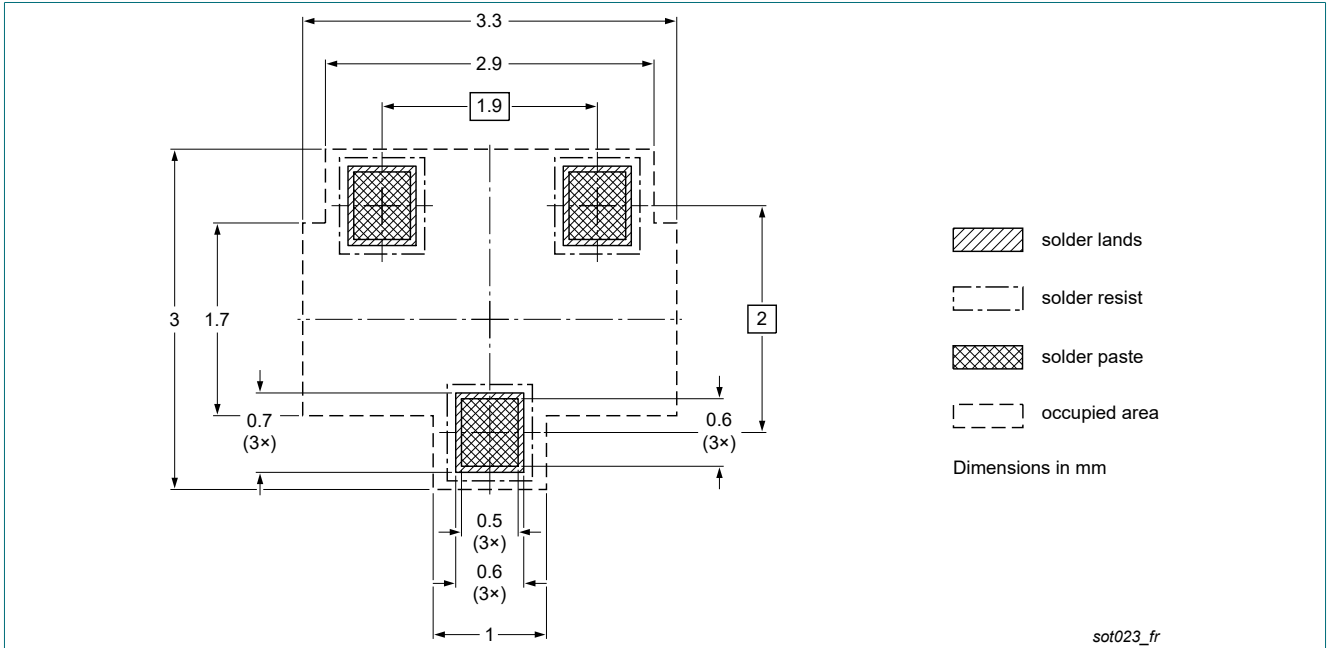


Fig. 13. Reflow soldering footprint for SOT23

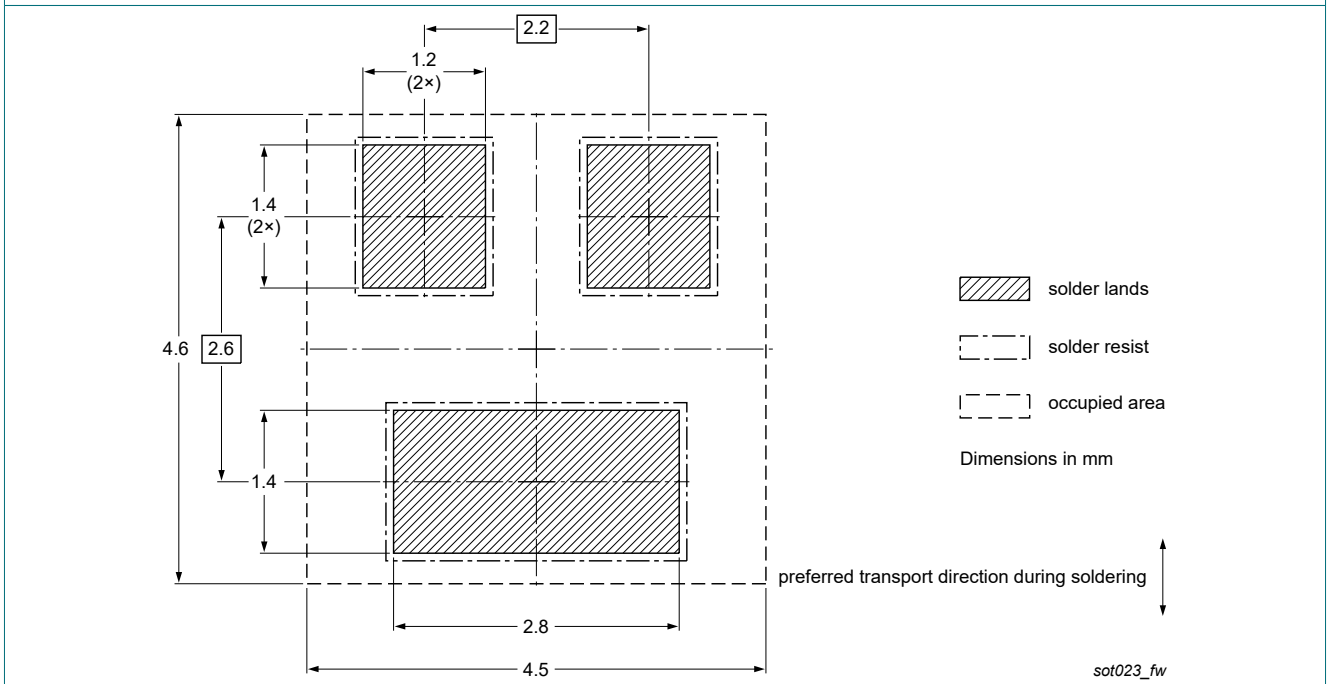


Fig. 14. Wave soldering footprint for SOT23

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV8540T-Q v.1	20220316	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.

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