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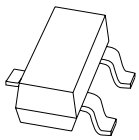
Team Nexperia



PBSS5140T

40 V, 1 A PNP low V_{CEsat} BISS transistor

Rev. 04 — 29 July 2008 Product data sheet

1. Product profile

1.1 General description

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

NPN complement: PBSS4140T.

1.2 Features

- 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
- High efficiency due to less heat generation

1.3 Applications

- General-purpose switching and muting
- LCD backlighting
- Supply line switching circuits
- Battery-driven equipment (mobile phones, video cameras and handheld devices)

1.4 Quick reference data

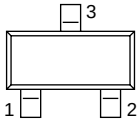
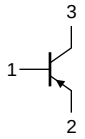
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	–40	V
I_C	collector current			-	-	–1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	–2	A
R_{CEsat}	collector-emitter saturation resistance	I_C = –500 mA; I_B = –50 mA	[1]	-	300	< 500	mΩ

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

2. Pinning information

Table 2. Pinning

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

006aab259

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5140T	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS5140T	*2H

[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	-	–40	V
V_{CEO}	collector-emitter voltage	open base	-	–40	V
V_{EBO}	emitter-base voltage	open collector	-	–5	V
I_C	collector current		-	–1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	–2	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms	-	–1	A

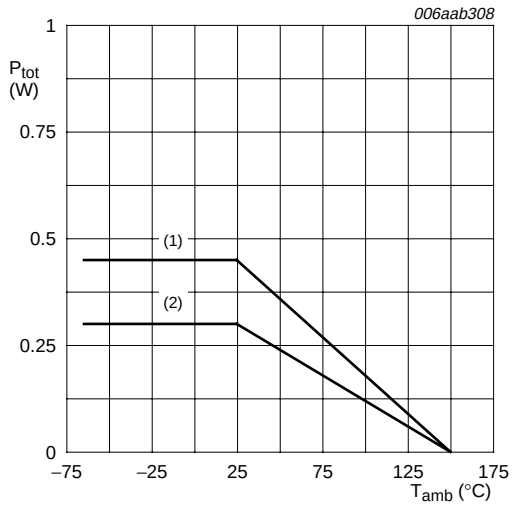
Table 5. Limiting values *…continued*

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
			[1]	-	300	mW
			[2]	-	450	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–65	+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.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.



(1) FR4 PCB, mounting pad for collector 1 cm^2

(2) FR4 PCB, standard footprint

Fig 1. Power derating curves

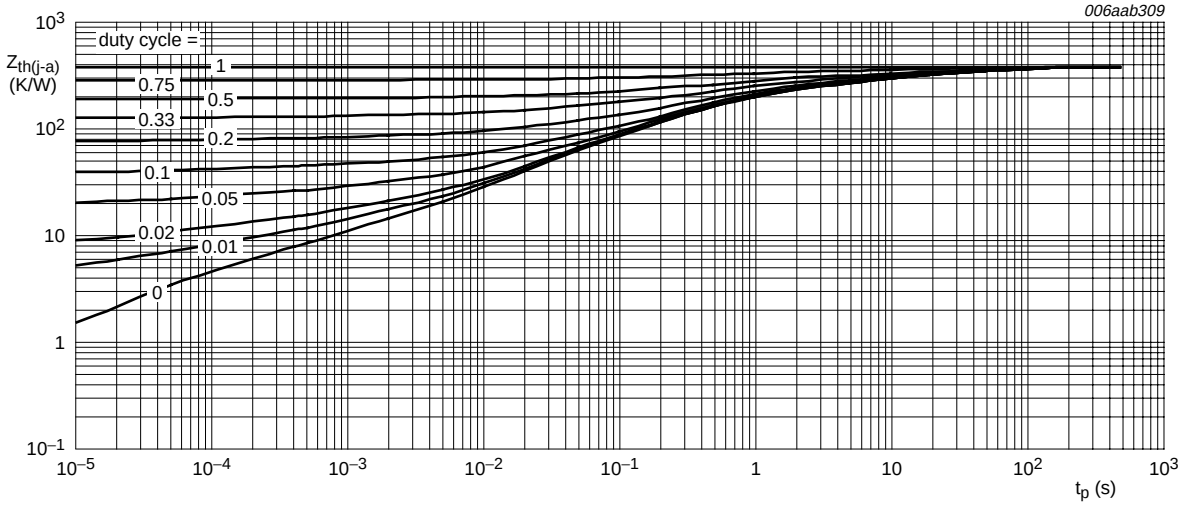
6. Thermal characteristics

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
			[2]	-	-	278	K/W

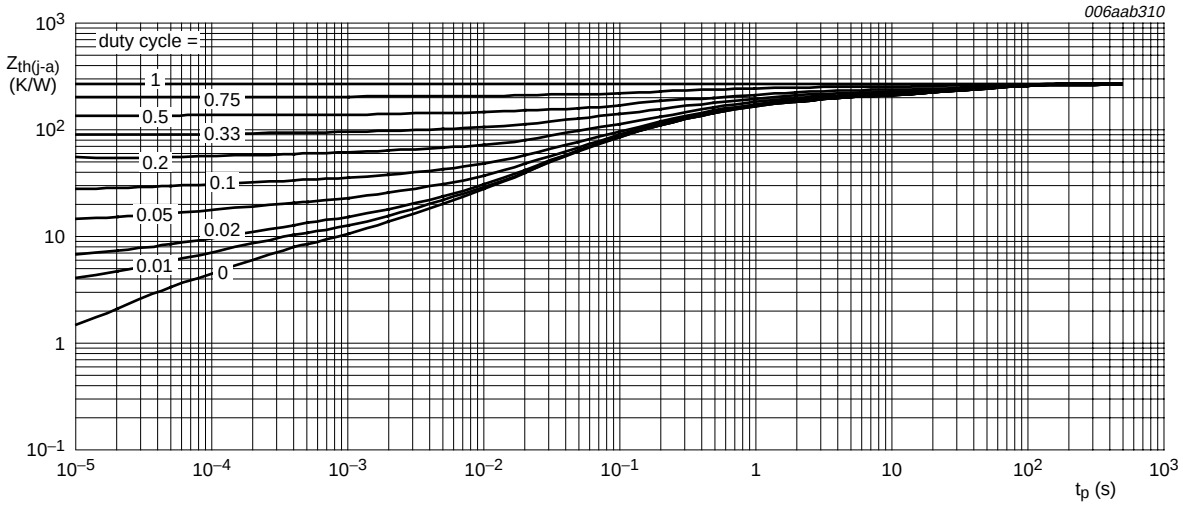
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.



FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm^2

Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

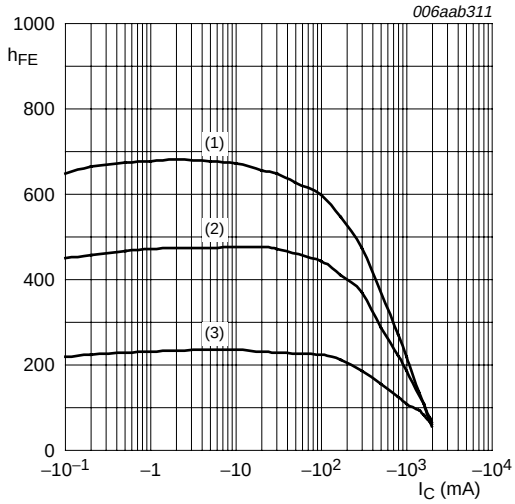
7. Characteristics

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} = –40 V; I_E = 0 A		-	-	–100	nA
		V_{CB} = –40 V; I_E = 0 A; T_j = 150 °C		-	-	–50	µA
I_{CEO}	collector-emitter cut-off current	V_{CE} = –30 V; I_B = 0 A		-	-	–100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A		-	-	–100	nA
h_{FE}	DC current gain	V_{CE} = –5 V; I_C = –1 mA		300	-	-	
		V_{CE} = –5 V; I_C = –100 mA		300	-	800	
		V_{CE} = –5 V; I_C = –500 mA	[1]	250	-	-	
		V_{CE} = –5 V; I_C = –1 A	[1]	160	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –100 mA; I_B = –1 mA		-	-	–200	mV
		I_C = –500 mA; I_B = –50 mA	[1]	-	-	–250	mV
		I_C = –1 A; I_B = –100 mA	[1]	-	-	–500	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = –500 mA; I_B = –50 mA	[1]	-	300	< 500	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = –1 A; I_B = –50 mA	[1]	-	-	–1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = –5 V; I_C = –1 A		-	-	–1	V
t_d	delay time	V_{CC} = –10 V; I_C = –0.5 A; I_{Bon} = –25 mA; I_{Boff} = 25 mA		-	10	-	ns
t_r	rise time			-	31	-	ns
t_{on}	turn-on time			-	41	-	ns
t_s	storage time			-	195	-	ns
t_f	fall time			-	65	-	ns
t_{off}	turn-off time			-	260	-	ns
f_T	transition frequency	V_{CE} = –10 V; I_C = –50 mA; f = 100 MHz		150	-	-	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz		-	-	12	pF

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



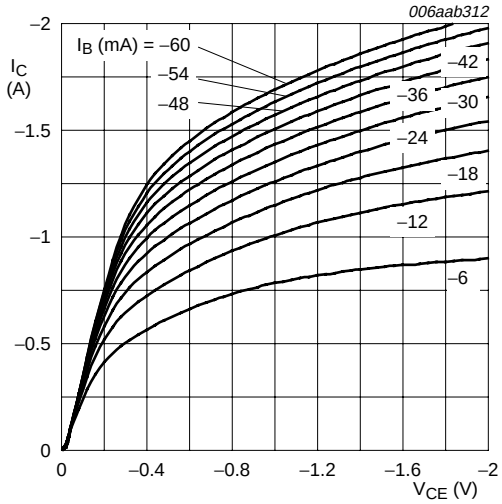
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

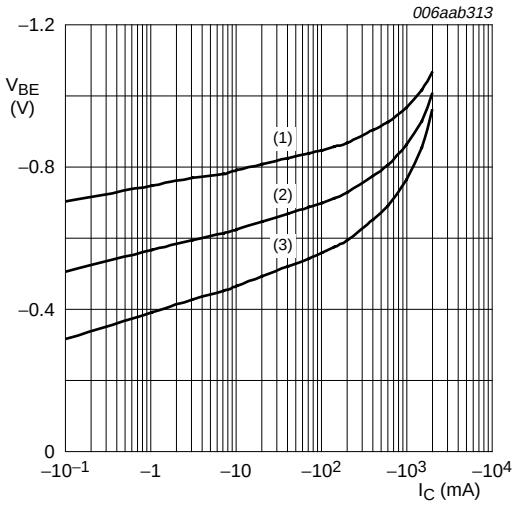
(3) T_{amb} = −55 °C

Fig 4. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

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



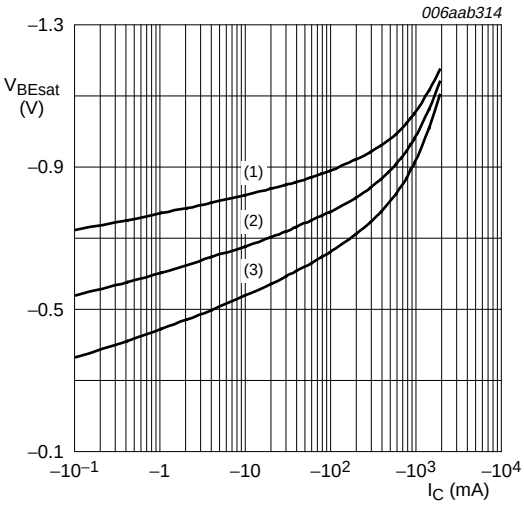
V_{CE} = −5 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



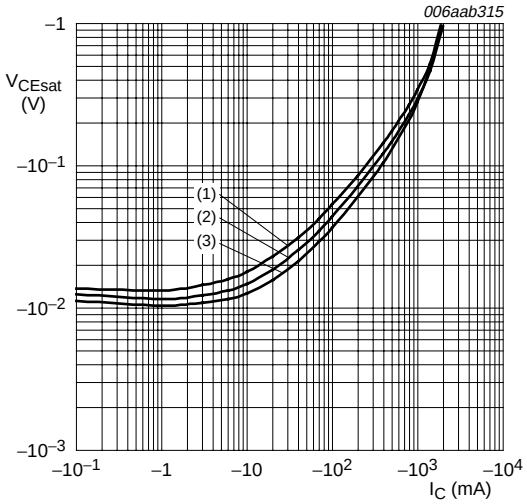
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



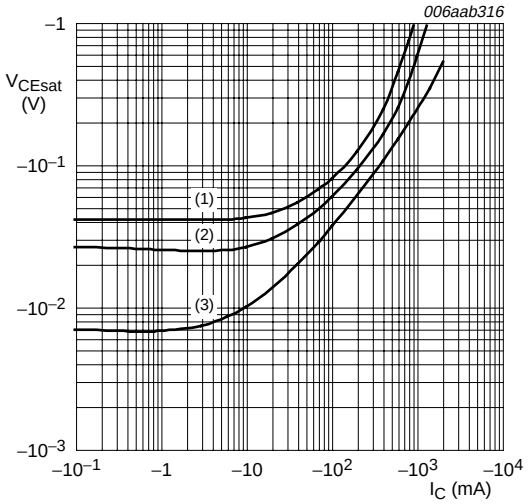
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



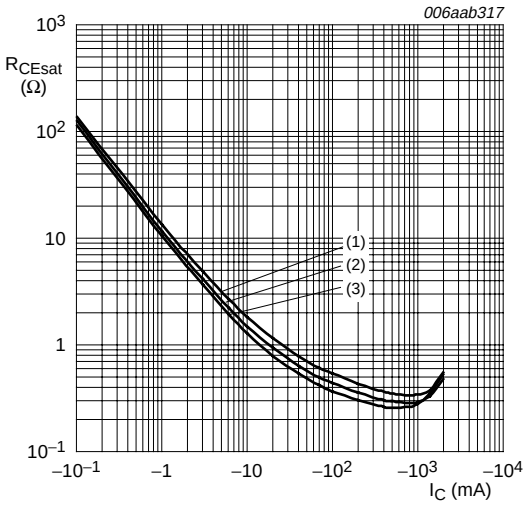
T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

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



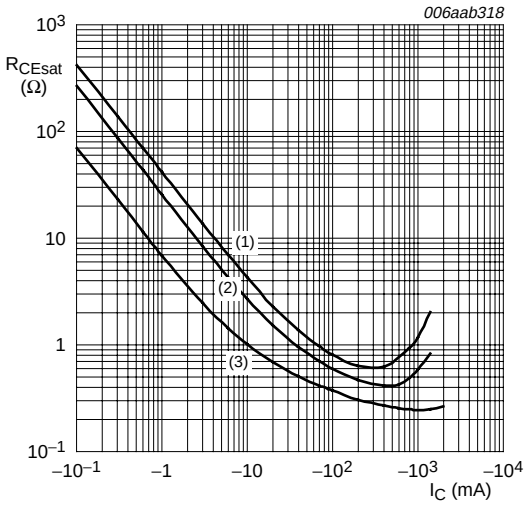
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

Fig 11. Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

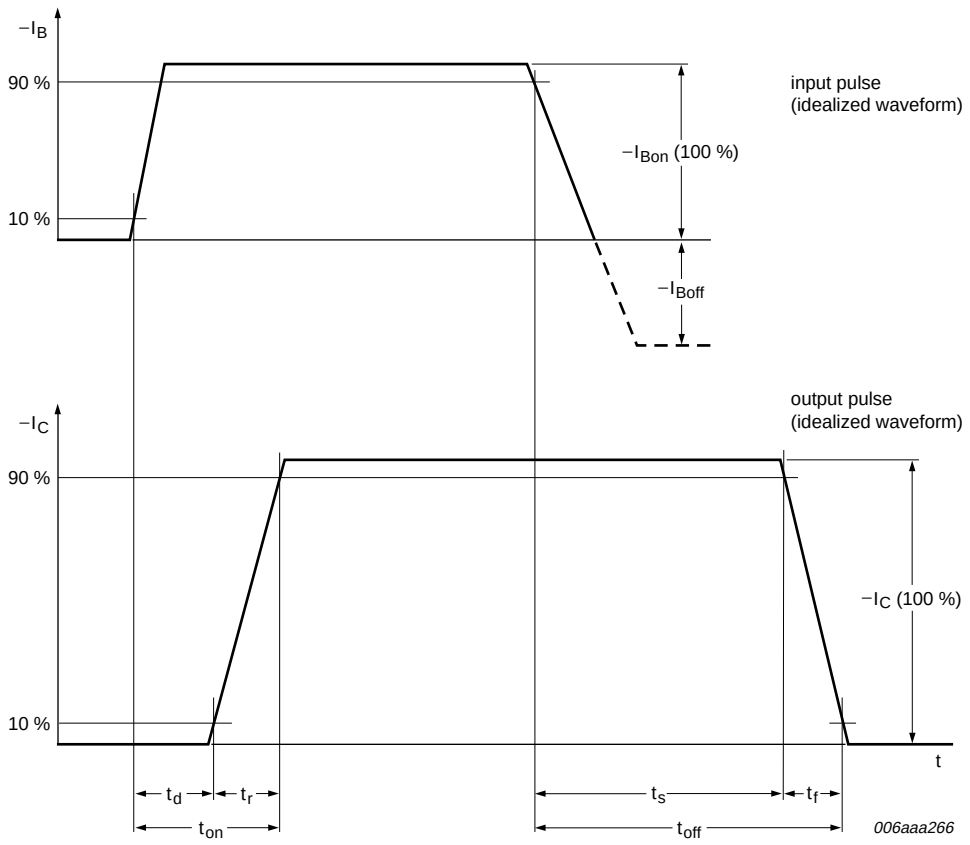
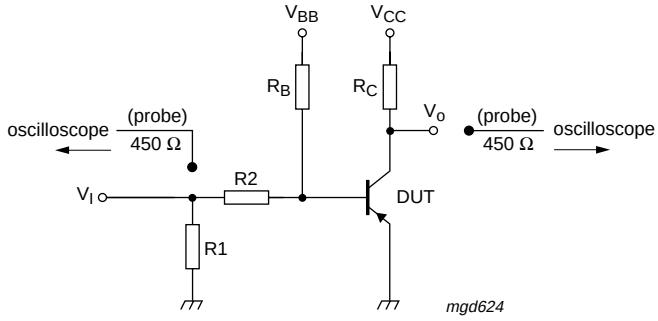


Fig 12. BISS transistor switching time definition



V_{CC} = −10 V; I_C = −0.5 A; I_{Bon} = −25 mA; I_{Boff} = 25 mA

Fig 13. Test circuit for switching times

9. Package outline

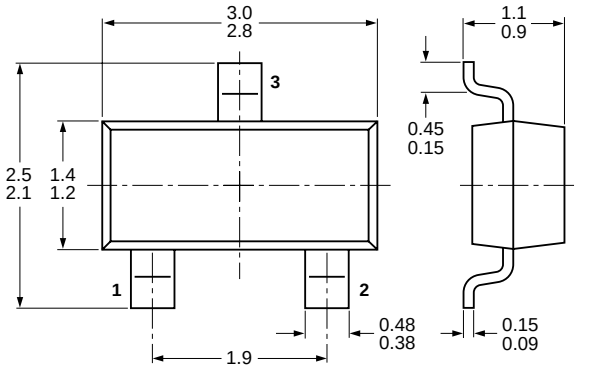


Fig 14. Package outline SOT23 (TO-236AB)

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
PBSS5140T	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

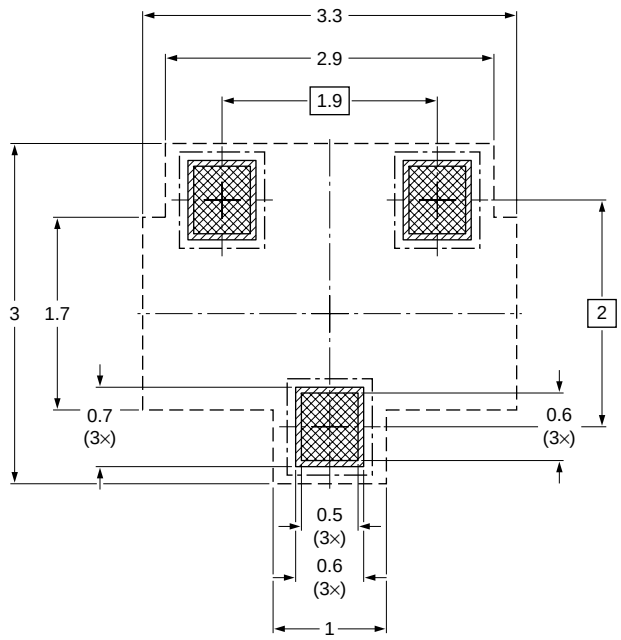


Fig 15. Reflow soldering footprint SOT23 (TO-236AB)

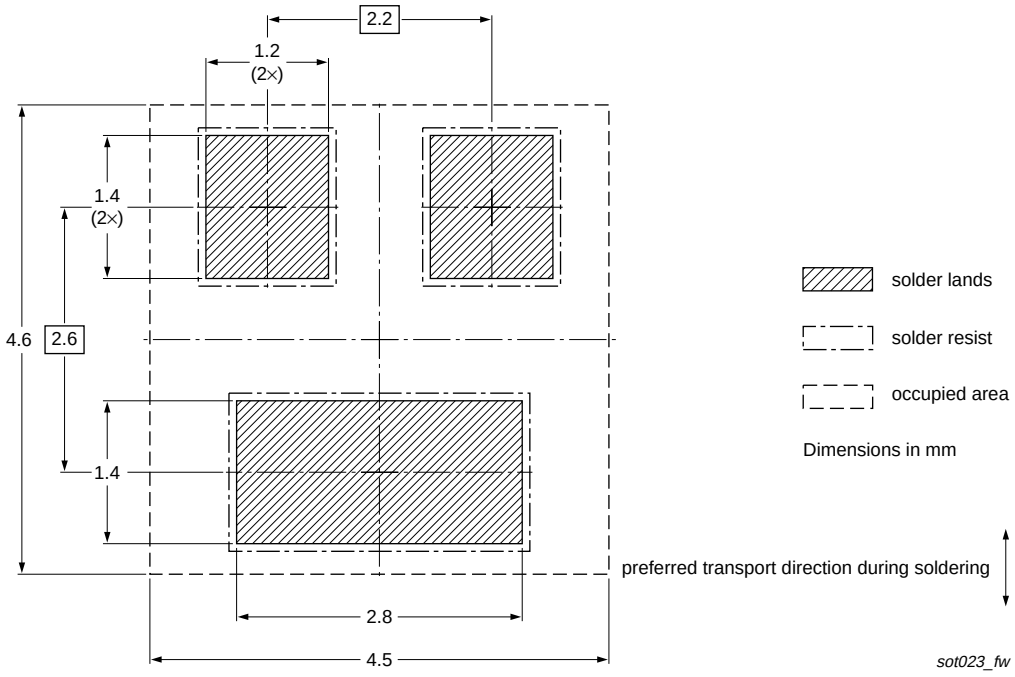


Fig 16. Wave soldering footprint SOT23 (TO-236AB)

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5140T_4	20080729	Product data sheet	-	PBSS5140T_3
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Table 4 “Marking codes”: marking code corrected • Table 5 “Limiting values”: conditions added for I_{CM} and I_{BM} • Figure 1, 2 and 3: added • Table 7: R_{CEsat} redefined to collector-emitter saturation resistance • Figure 4, 6, 8 and 10: updated • Figure 5, 7, 9 and 11: added • Section 8 “Test information”: added • Figure 14: superseded by minimized package outline drawing • Section 11 “Soldering”: added • Section 13 “Legal information”: updated			
PBSS5140T_3	20040107	Product specification	-	PBSS5140T_2
PBSS5140T_2	20010720	Product specification	-	PBSS5140T_1
PBSS5140T_1	20001116	Product specification	-	-

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".

[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 URL http://www.nxp.com.

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15. Contents

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