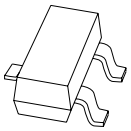


2PB709BRL; 2PB709BSL

50 V, 200 mA PNP general-purpose transistors

Rev. 1 — 28 June 2010 Product data sheet

1. Product profile

1.1 General description

PNP general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		NPN complement
	NXP	JEDEC	
2PB709BRL	SOT23	TO-236AB	2PD601BRL
2PB709BSL			2PD601BSL

1.2 Features and benefits

- Collector current $I_C \leq -200$ mA
- Two current gain selections
- AEC-Q101 qualified
- Small SMD plastic package

1.3 Applications

- General-purpose switching and amplification

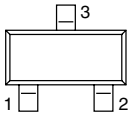
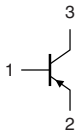
1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	−50	V
I_C	collector current		-	-	−200	mA
h_{FE}	DC current gain	V_{CE} = −10 V; I_C = −2 mA	210	-	460	
	h_{FE} group R		210	-	340	
	h_{FE} group S		290	-	460	

2. Pinning information

Table 3. Pinning

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

sym013

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
2PB709BRL	-	plastic surface-mounted package; 3 leads	SOT23
2PB709BSL			

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
2PB709BRL	MN*
2PB709BSL	MP*

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

5. Limiting values

Table 6. Limiting values

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

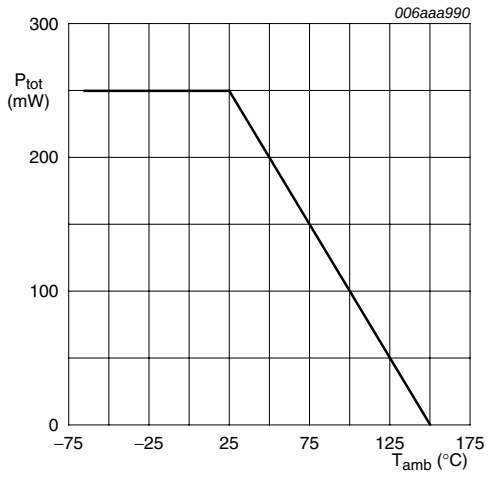
Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	−60	V
V_{CEO}	collector-emitter voltage	open base	-	−50	V
V_{EBO}	emitter-base voltage	open collector	-	−6	V
I_C	collector current		-	−200	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	−250	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms	-	−200	mA

Table 6. 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]	-	250	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

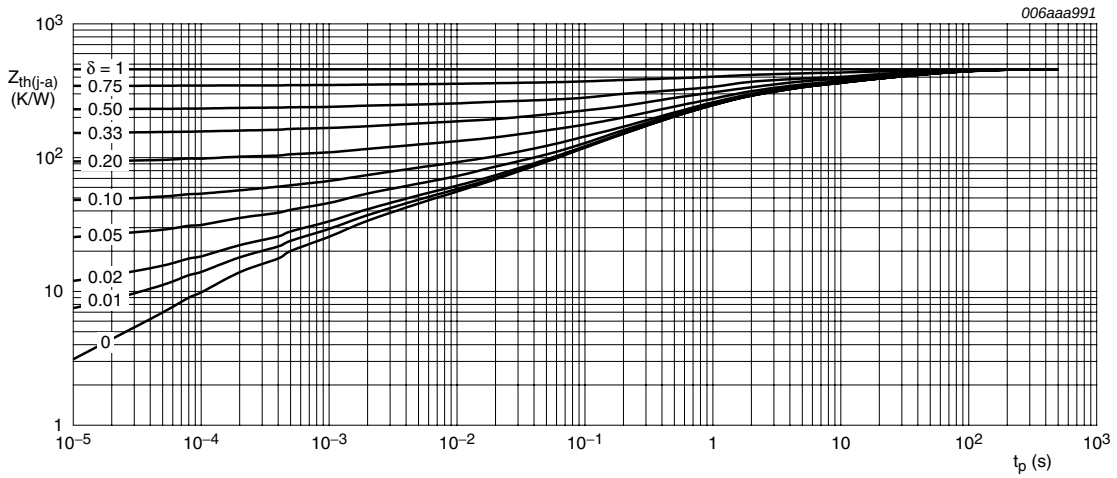
Fig 1. Power derating curve

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	500	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	140	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

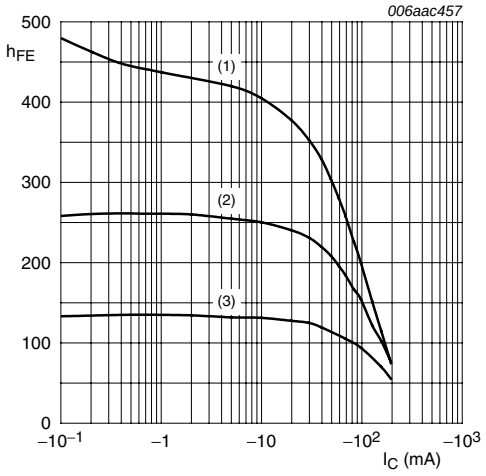
7. Characteristics

Table 8. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = –60 V; I_E = 0 A		-	-	–10	nA
		V_{CB} = –60 V; I_E = 0 A; T_j = 150 °C		-	-	–5	μA
I_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A		-	-	–10	nA
h_{FE}	DC current gain	V_{CE} = –10 V; I_C = –2 mA		210	-	460	
	h_{FE} group R			210	-	340	
	h_{FE} group S			290	-	460	
V_{CEsat}	collector-emitter saturation voltage	I_C = –100 mA; I_B = –10 mA	[1]	-	-	–250	mV
f_T	transition frequency	V_{CE} = –6 V; I_C = –10 mA; f = 100 MHz		100	200	-	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz		-	-	3	pF

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



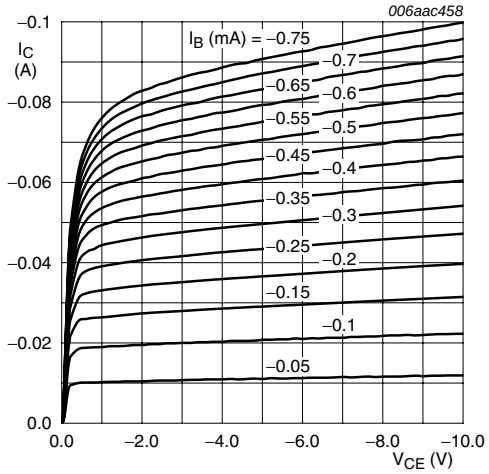
V_{CE} = −10 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

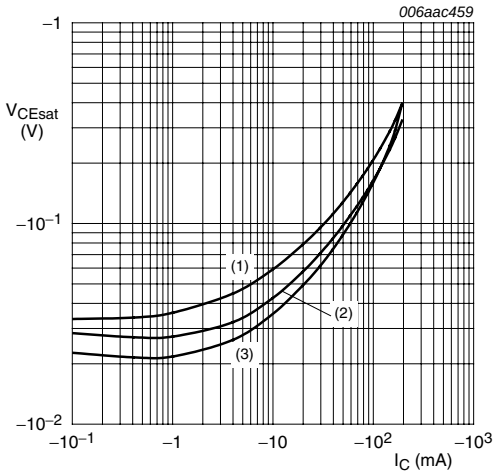
(3) T_{amb} = −55 °C

Fig 3. 2PB709BRL: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 4. 2PB709BRL: Collector current as a function of collector-emitter voltage; typical values



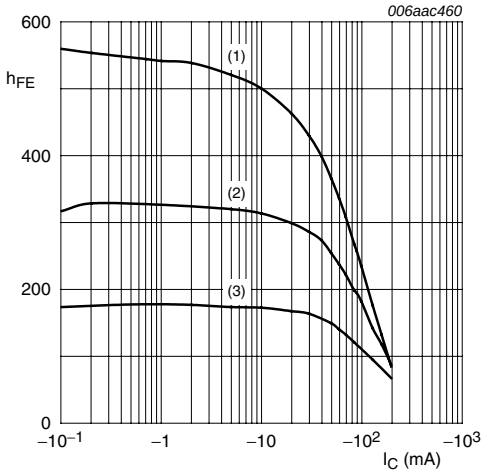
I_C/I_B = 10

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 5. 2PB709BRL: Collector-emitter saturation voltage as a function of collector current; typical values



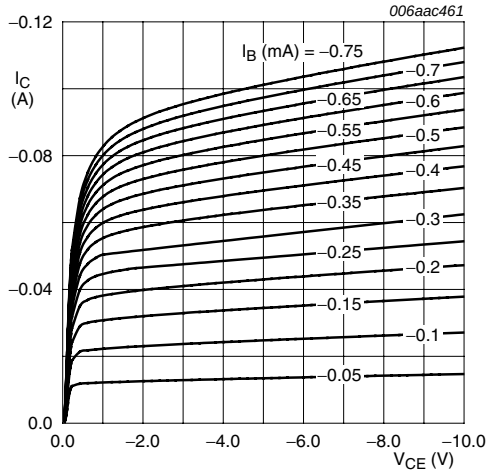
V_{CE} = −10 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

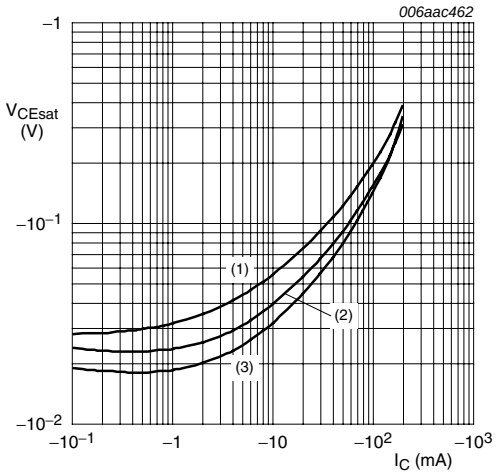
(3) T_{amb} = −55 °C

Fig 6. 2PB709BSL: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 7. 2PB709BSL: Collector current as a function of collector-emitter voltage; typical values



I_C/I_B = 10

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 8. 2PB709BSL: Collector-emitter saturation voltage as a function of collector current; typical values

8. Test information

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

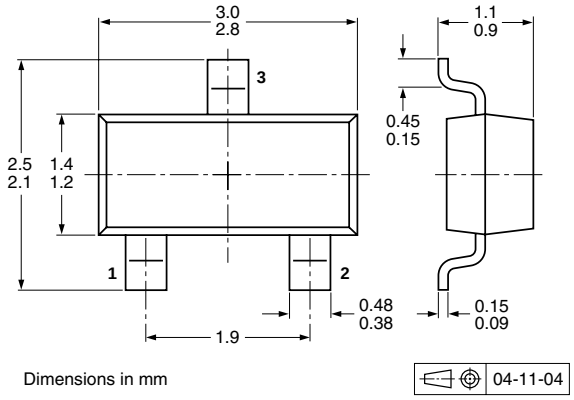


Fig 9. Package outline SOT23 (TO-236AB)

10. Packing information

Table 9. Packing methods

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

Type number	Package	Description	Packing quantity	
			3000	10000
2PB709BRL	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
2PB709BSL				

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

11. Soldering

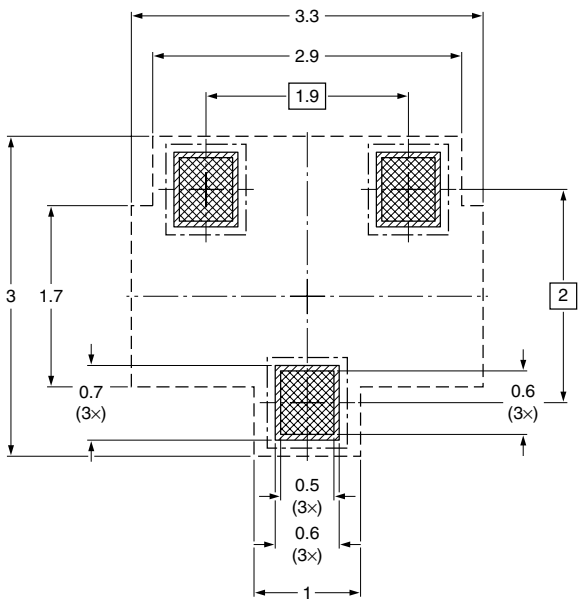


Fig 10. Reflow soldering footprint SOT23 (TO-236AB)

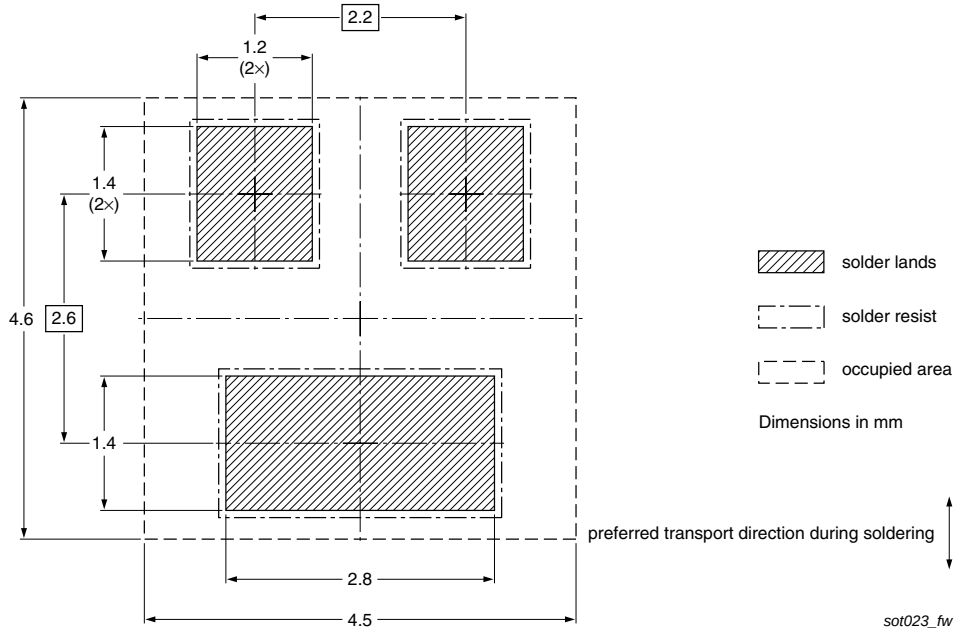


Fig 11. Wave soldering footprint SOT23 (TO-236AB)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
2PB709BRL_2PB709BSL v.1	20100628	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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Date of release: 28 June 2010
Document identifier: 2PB709BRL_2PB709BSL