

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

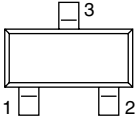
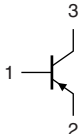
Table 2. Quick reference data

| 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 | $T_{amb} \leq 25\text{ °C}$ | [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.

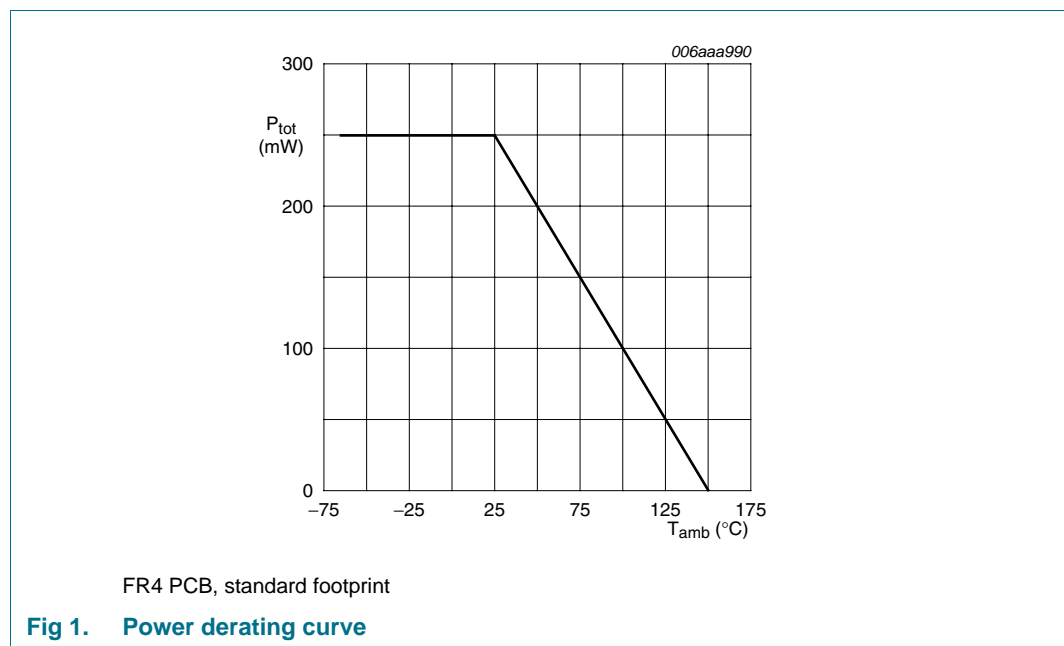


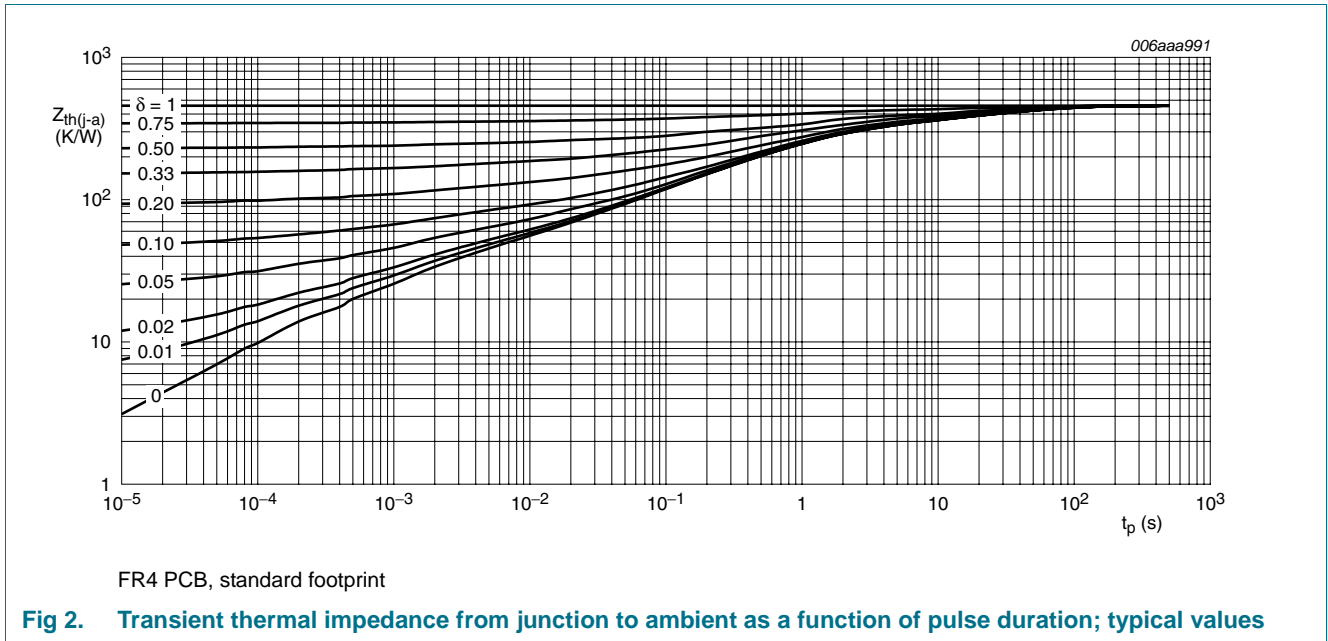
Fig 1. Power derating curve

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.



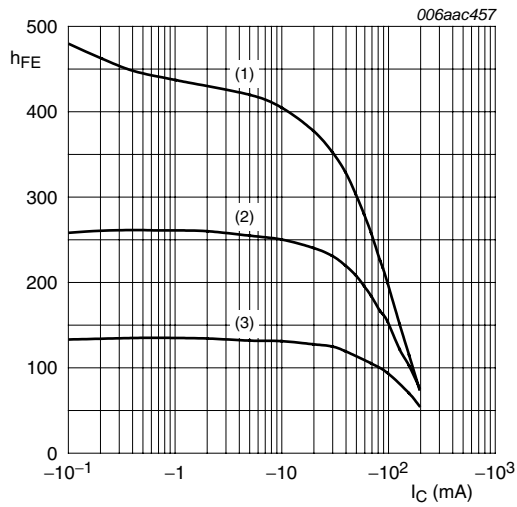
7. Characteristics

Table 8. Characteristics

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

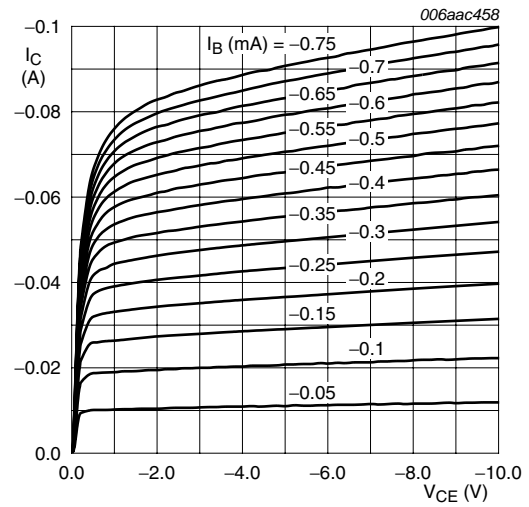
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|--------------------------------------|---|-----|-----|------|---------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -60\text{ V}; I_E = 0\text{ A}$ | - | - | -10 | nA |
| | | $V_{CB} = -60\text{ V}; I_E = 0\text{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

[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.



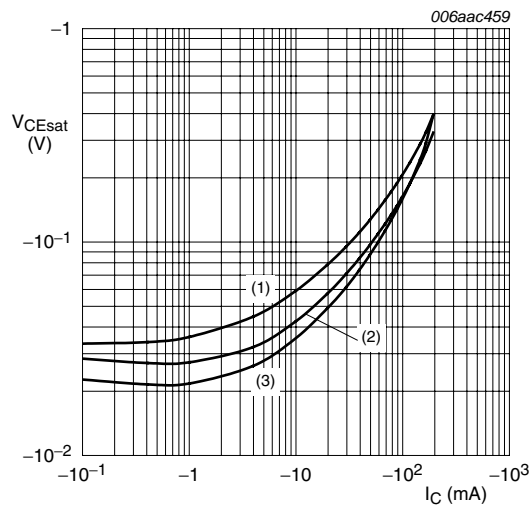
$V_{CE} = -10\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



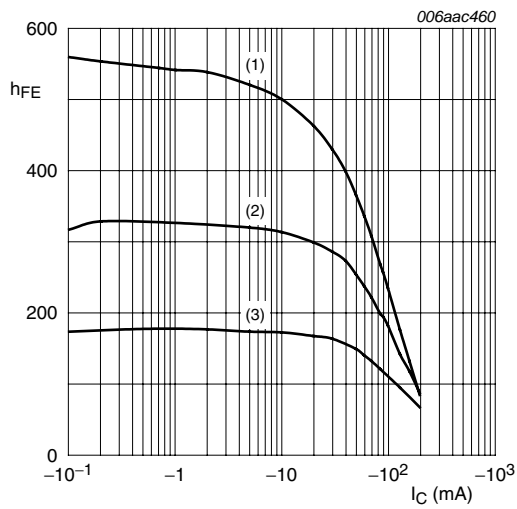
$T_{amb} = 25\text{ °C}$

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



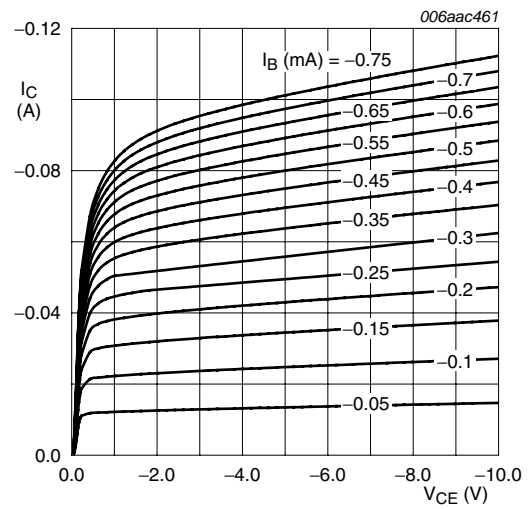
$I_C/I_B = 10$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



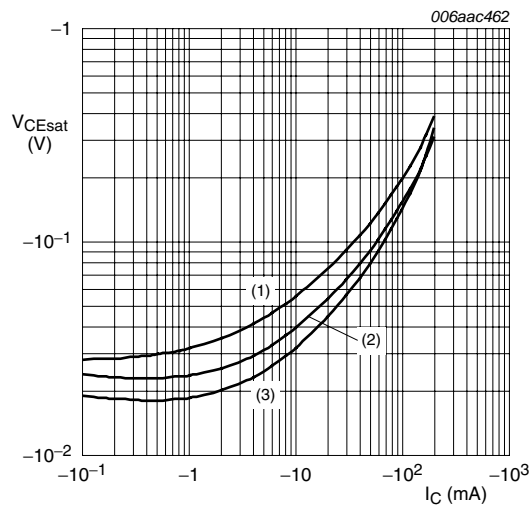
$V_{CE} = -10\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$

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



$I_C/I_B = 10$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

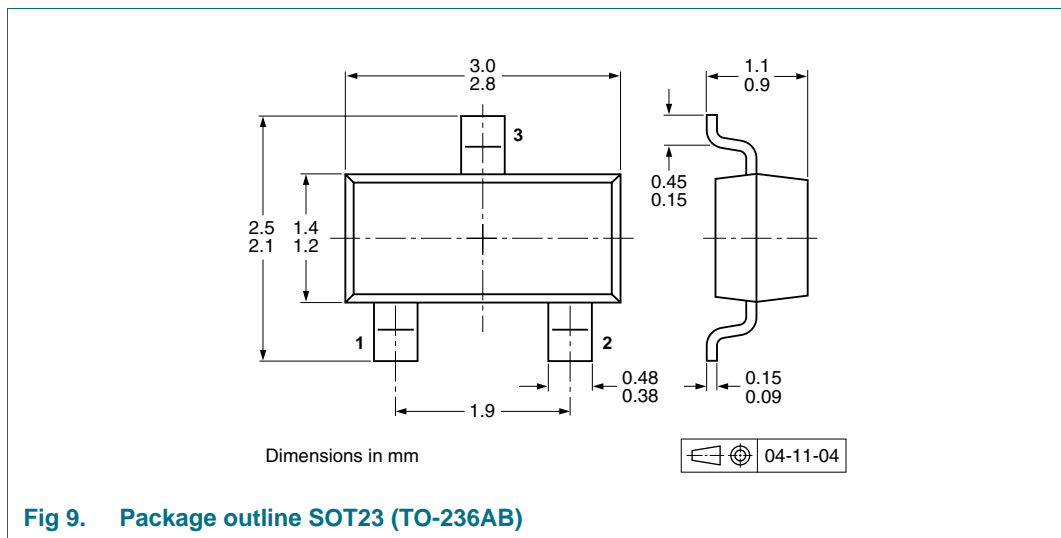
Fig 8. 2PB709BSL: Collector-emitter saturation voltage as a function of collector current; typical values

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



10. Packing information

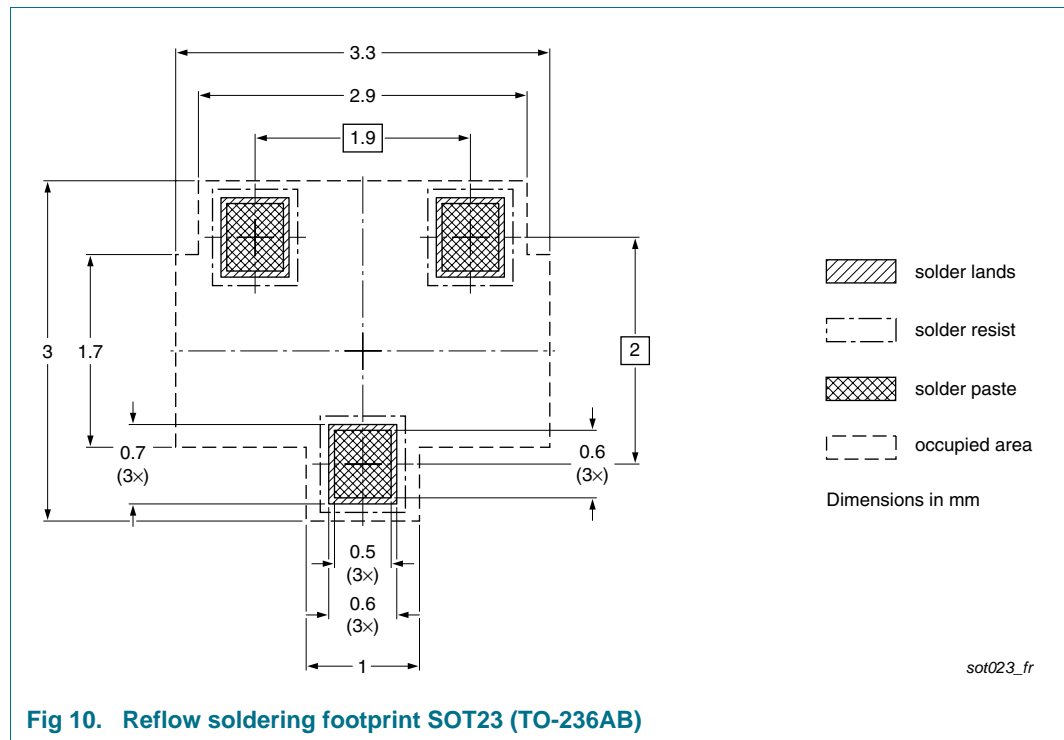
Table 9. Packing methods

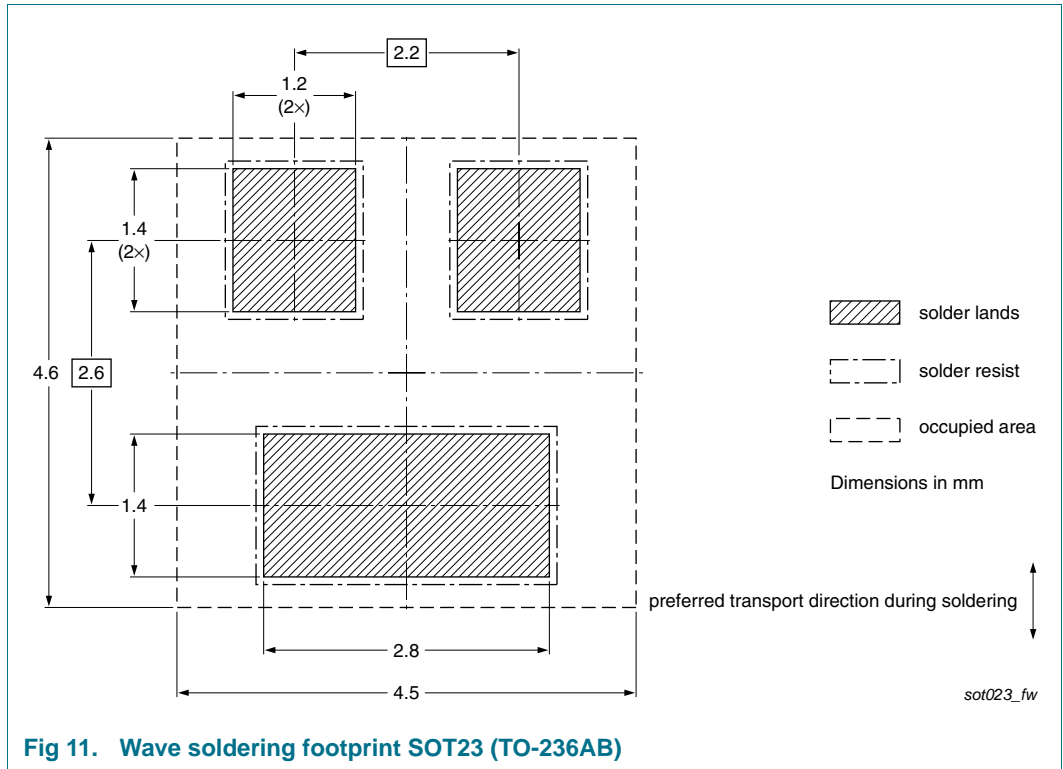
The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

| 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





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. |

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

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