



# 2PB709ARL; 2PB709ASL

45 V, 100 mA PNP general-purpose transistors

Rev. 01 — 12 November 2008

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 <sup>[1]</sup> | Package |          | NPN complement |
|----------------------------|---------|----------|----------------|
|                            | NXP     | JEDEC    |                |
| 2PB709ARL                  | SOT23   | TO-236AB | 2PD601ARL      |
| 2PB709ASL                  |         |          | 2PD601ASL      |
| 2PB709ARL/DG               | SOT23   | TO-236AB | 2PD601ARL/DG   |
| 2PB709ASL/DG               |         |          | 2PD601ASL/DG   |

[1] /DG: halogen-free

### 1.2 Features

- General-purpose transistors
- Two current gain selections
- AEC-Q101 qualified
- Small SMD plastic package

### 1.3 Applications

- General-purpose switching and amplification

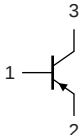
### 1.4 Quick reference data

Table 2. Quick reference data

| Symbol    | Parameter                 | Conditions                         | Min | Typ | Max  | Unit |
|-----------|---------------------------|------------------------------------|-----|-----|------|------|
| $V_{CEO}$ | collector-emitter voltage | open base                          | -   | -   | -45  | V    |
| $I_C$     | collector current         |                                    | -   | -   | -100 | mA   |
| $h_{FE}$  | DC current gain           | $V_{CE} = -10$ V;<br>$I_C = -2$ mA |     |     |      |      |
|           | $h_{FE}$ 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 <sup>[1]</sup> | Package |                                          |         |
|----------------------------|---------|------------------------------------------|---------|
|                            | Name    | Description                              | Version |
| 2PB709ARL                  | -       | plastic surface-mounted package; 3 leads | SOT23   |
| 2PB709ASL                  |         |                                          |         |
| 2PB709ARL/DG               |         |                                          |         |
| 2PB709ASL/DG               |         |                                          |         |

[1] /DG: halogen-free

## 4. Marking

Table 5. Marking codes

| Type number  | Marking code <sup>[1]</sup> |
|--------------|-----------------------------|
| 2PB709ARL    | SN*                         |
| 2PB709ASL    | SL*                         |
| 2PB709ARL/DG | SS*                         |
| 2PB709ASL/DG | SZ*                         |

[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                     | -   | -45  | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                        | -   | -45  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                   | -   | -6   | V    |
| $I_C$     | collector current         |                                  | -   | -100 | mA   |
| $I_{CM}$  | peak collector current    | single pulse;<br>$t_p \leq 1$ ms | -   | -200 | mA   |
| $I_{BM}$  | peak base current         | single pulse;<br>$t_p \leq 1$ ms | -   | -100 | mA   |
| $P_{tot}$ | 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.

## 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  |

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

## 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       | $V_{CB} = -45$ V; $I_E = 0$ A                    | -   | -   | -10  | nA   |
|             |                                      | $V_{CB} = -45$ V; $I_E = 0$ A;<br>$T_j = 150$ °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                  |     |     |      |      |
|             | $h_{FE}$ group R                     |                                                  | 210 | -   | 340  |      |
|             | $h_{FE}$ group S                     |                                                  | 290 | -   | 460  |      |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = -100$ mA;<br>$I_B = -10$ mA               | [1] | -   | -500 | mV   |

Table 8. Characteristics ...continued  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol | Parameter             | Conditions                                                             | Min | Typ | Max | Unit |
|--------|-----------------------|------------------------------------------------------------------------|-----|-----|-----|------|
| $f_T$  | transition frequency  | $V_{CE} = -10\text{ V}; I_C = -1\text{ mA};$<br>$f = 100\text{ MHz}$   |     |     |     |      |
|        | $h_{FE}$ group R      |                                                                        | 70  | -   | -   | MHz  |
|        | $h_{FE}$ group S      |                                                                        | 80  | -   | -   | MHz  |
| $C_c$  | collector capacitance | $V_{CB} = -10\text{ V}; I_E = I_C = 0\text{ A};$<br>$f = 1\text{ MHz}$ | -   | -   | 5   | pF   |

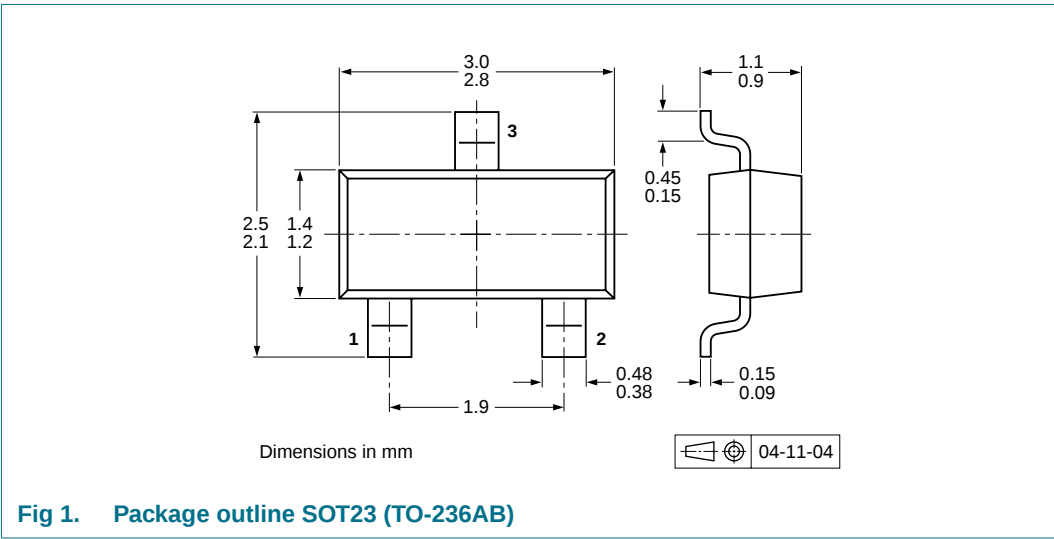
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .

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



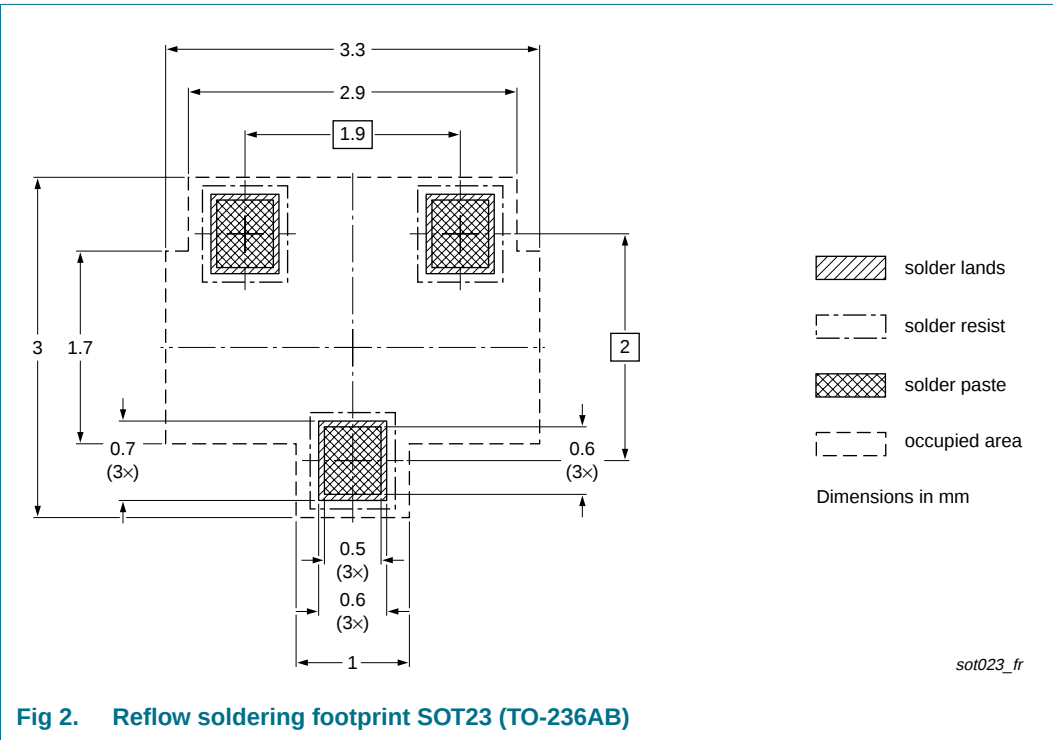
10. Packing information

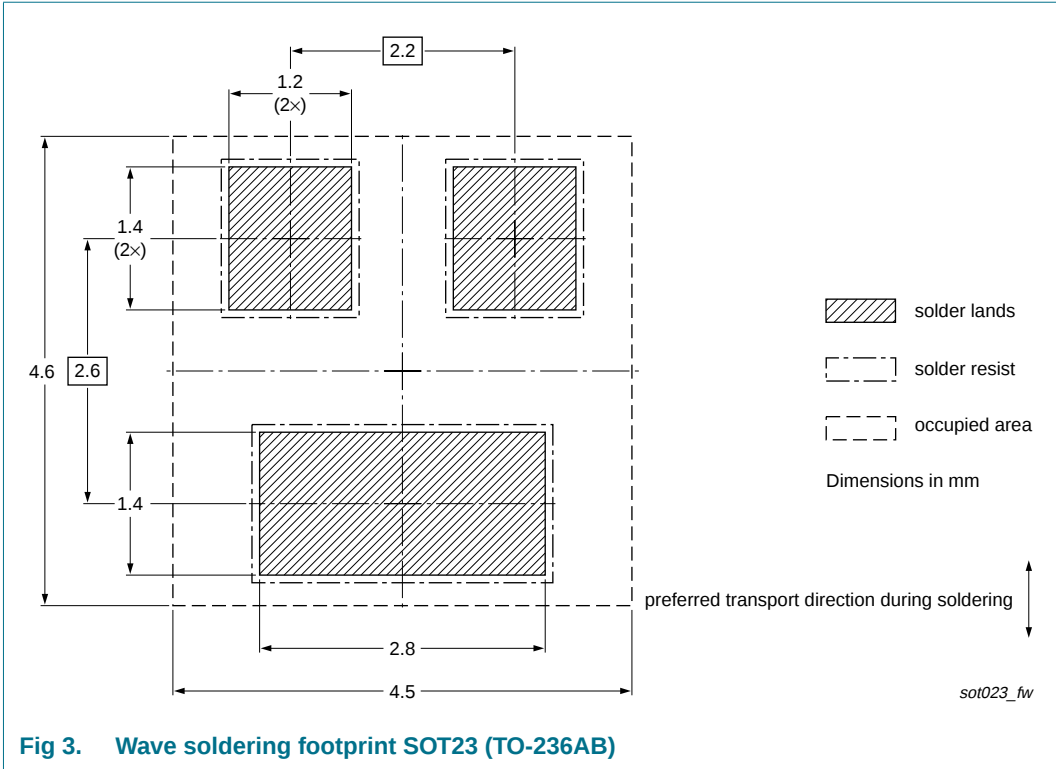
Table 9. Packing methods  
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number <sup>[2]</sup> | Package | Description                    | Packing quantity |       |
|----------------------------|---------|--------------------------------|------------------|-------|
|                            |         |                                | 3000             | 10000 |
| 2PB709ARL                  | SOT23   | 4 mm pitch, 8 mm tape and reel | -215             | -235  |
| 2PB709ASL                  |         |                                |                  |       |
| 2PB709ARL/DG               |         |                                |                  |       |
| 2PB709ASL/DG               |         |                                |                  |       |

[1] For further information and the availability of packing methods, see [Section 14](#).  
[2] /DG: halogen-free

11. Soldering





12. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status  | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| 2PB709AXL_1 | 20081112     | Product data sheet | -             | -          |

## 13. Legal information

### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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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