



# 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 |
|----------------------------|----------|----------|----------------|
|                            | Nexperia | 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

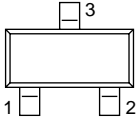
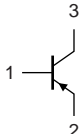
### 1.4 Quick reference data

Table 2. Quick reference data

| Symbol    | Parameter                 | Conditions                                       | Min | Typ | Max  | Unit |
|-----------|---------------------------|--|-----|-----|------|------|
| $V_{CE0}$ | collector-emitter voltage | open base  | -   | -   | -45  | V    |
| $I_C$     | collector current         |  | -   | -   | -100 | mA   |
| $h_{FE}$  | DC current gain           | $V_{CE} = -10\text{ V};$<br>$I_C = -2\text{ mA}$ |     |     |      |      |
|           | $h_{FE}$ group R          |  | 210 | -   | 340  |      |
|           | $h_{FE}$ group S          |  | 290 | -   | 460  |      |

## 2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline  | Graphic symbol  |
|-----|-------------|---|---|
| 1   | base        |  | <br>sym013 |
| 2   | emitter     |   |   |
| 3   | collector   |   |   |

## 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**  
 $T_{amb} = 25^{\circ}\text{C}$  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 | $V_{CB} = -10\text{ V}$ ; $I_E = I_e = 0\text{ A}$ ;<br>$f = 1\text{ MHz}$ | -   | -   | 5   | pF   |

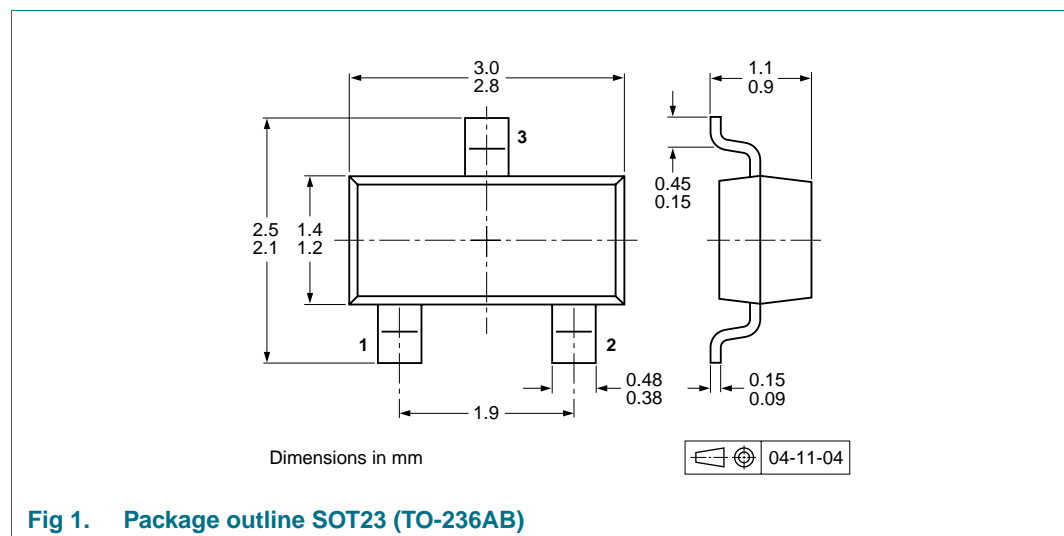
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

## 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**

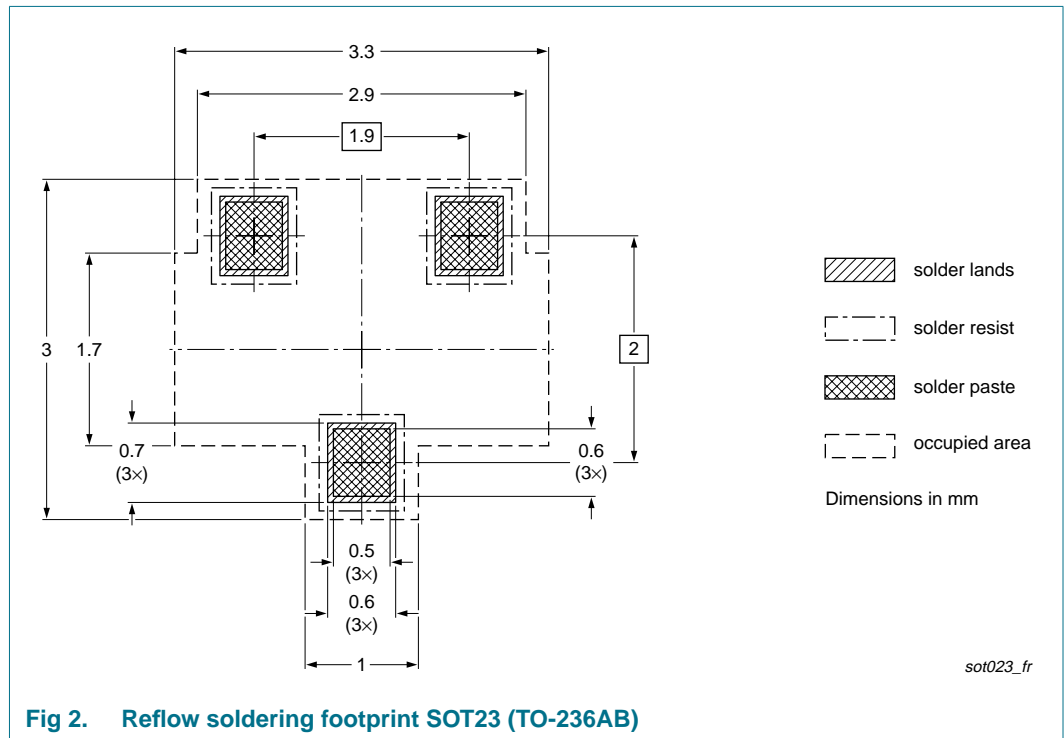
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

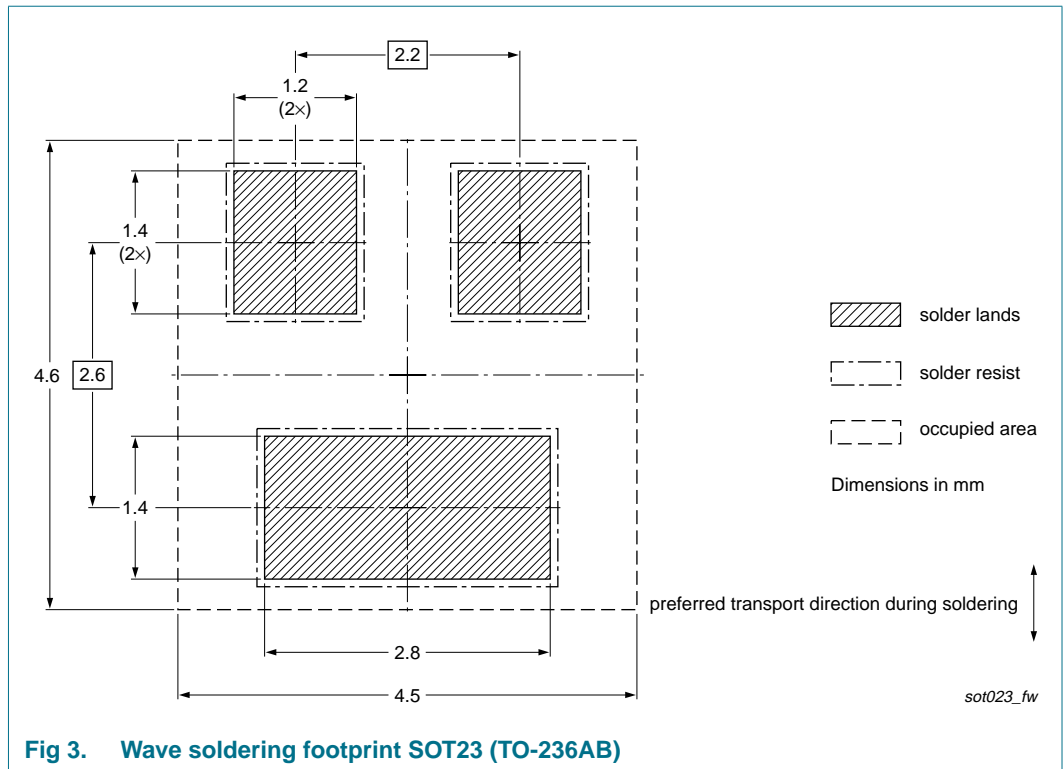
| Type number <sup>[2]</sup> | Package | Description                    | Packing quantity |       |
|----------------------------|---------|--------------------------------|------------------|-------|
|                            |         |                                | 3000             | 10000 |
| 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".

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