



# 2PD602AQL; 2PD602ARL; 2PD602ASL

50 V, 500 mA NPN general-purpose transistors

Rev. 01 — 27 October 2008

Product data sheet

## 1. Product profile

### 1.1 General description

NPN 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  |          | PNP complement |
|----------------------------|----------|----------|----------------|
|                            | Nexperia | JEDEC    |                |
| 2PD602AQL                  | SOT23    | TO-236AB | -              |
| 2PD602ARL                  |          |          | 2PB710ARL      |
| 2PD602ASL                  |          |          | 2PB710ASL      |
| 2PD602AQL/DG               | SOT23    | TO-236AB | -              |
| 2PD602ARL/DG               |          |          | 2PB710ARL/DG   |
| 2PD602ASL/DG               |          |          | 2PB710ASL/DG   |

[1] /DG: halogen-free

### 1.2 Features

- General-purpose transistors
- Three 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         |            | -   | -   | 500 | mA   |

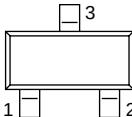
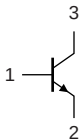
Table 2. Quick reference data ...continued

| Symbol   | Parameter        | Conditions                                       | Min | Typ | Max | Unit |
|----------|------------------|--------------------------------------------------|-----|-----|-----|------|
| $h_{FE}$ | DC current gain  | $V_{CE} = 10\text{ V};$<br>$I_C = 150\text{ mA}$ | [1] |     |     |      |
|          | $h_{FE}$ group Q |                                                  | 85  | -   | 170 |      |
|          | $h_{FE}$ group R |                                                  | 120 | -   | 240 |      |
|          | $h_{FE}$ group S |                                                  | 170 | -   | 340 |      |

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

2. Pinning information

Table 3. Pinning

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

*sym021*

3. Ordering information

Table 4. Ordering information

| Type number[1] | Package |                                          |         |
|----------------|---------|------------------------------------------|---------|
|                | Name    | Description                              | Version |
| 2PD602AQL      | -       | plastic surface-mounted package; 3 leads | SOT23   |
| 2PD602ARL      |         |                                          |         |
| 2PD602ASL      |         |                                          |         |
| 2PD602AQL/DG   | -       | plastic surface-mounted package; 3 leads | SOT23   |
| 2PD602ARL/DG   |         |                                          |         |
| 2PD602ASL/DG   |         |                                          |         |

[1] /DG: halogen-free

4. Marking

Table 5. Marking codes

| Type number | Marking code[1] |
|-------------|-----------------|
| 2PD602AQL   | SH*             |
| 2PD602ARL   | SG*             |
| 2PD602ASL   | SF*             |

Table 5. Marking codes ...continued

| Type number  | Marking code <sup>[1]</sup> |
|--------------|-----------------------------|
| 2PD602AQL/DG | SX*                         |
| 2PD602ARL/DG | SW*                         |
| 2PD602ASL/DG | SV*                         |

- [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                      | -   | 5    | V    |
| $I_C$     | collector current         |                                     | -   | 500  | mA   |
| $I_{CM}$  | peak collector current    | single pulse;<br>$t_p \leq 1$ ms    | -   | 1    | A    |
| $I_{BM}$  | peak base current         | single pulse;<br>$t_p \leq 1$ ms    | -   | 200  | mA   |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25$ °C <sup>[1]</sup> | -   | 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 <sup>[1]</sup> | -   | -   | 500 | K/W  |

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

## 7. Characteristics

**Table 8. Characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$  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            |
|             |                                      | $V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | -       | -   | 5   | $\mu\text{A}$ |
| $I_{EBO}$   | emitter-base cut-off current         | $V_{EB} = 4\text{ V}; I_C = 0\text{ A}$                                     | -       | -   | 10  | nA            |
| $h_{FE}$    | DC current gain                      | $V_{CE} = 10\text{ V}; I_C = 500\text{ mA}$                                 | [1] 40  | -   | -   |               |
|             | $h_{FE}$ group Q                     | $V_{CE} = 10\text{ V}; I_C = 150\text{ mA}$                                 | [1] 85  | -   | 170 |               |
|             | $h_{FE}$ group R                     | $V_{CE} = 10\text{ V}; I_C = 150\text{ mA}$                                 | [1] 120 | -   | 240 |               |
|             | $h_{FE}$ group S                     | $V_{CE} = 10\text{ V}; I_C = 150\text{ mA}$                                 | [1] 170 | -   | 340 |               |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = 300\text{ mA}; I_B = 30\text{ mA}$                                   | [1] -   | -   | 600 | mV            |
| $f_T$       | transition frequency                 | $V_{CE} = 10\text{ V}; I_C = 50\text{ mA}; f = 100\text{ MHz}$              | [1]     |     |     |               |
|             | $h_{FE}$ group Q                     |                                                                             | 140     | -   | -   | MHz           |
|             | $h_{FE}$ group R                     |                                                                             | 160     | -   | -   | MHz           |
|             | $h_{FE}$ group S                     |                                                                             | 180     | -   | -   | MHz           |
| $C_c$       | collector capacitance                | $V_{CB} = 10\text{ V}; I_E = I_C = 0\text{ A}; f = 1\text{ MHz}$            | -       | -   | 15  | pF            |

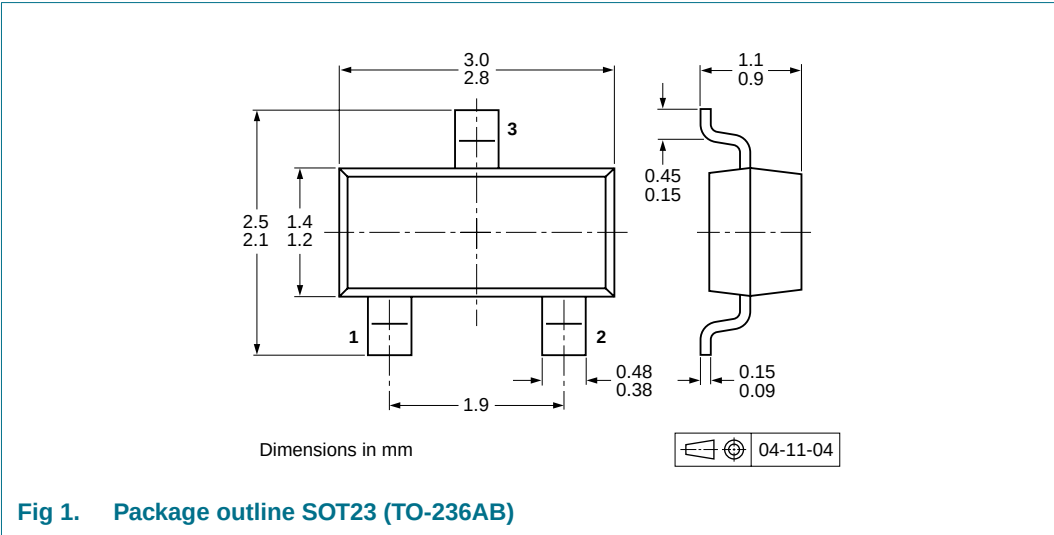
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .

## 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

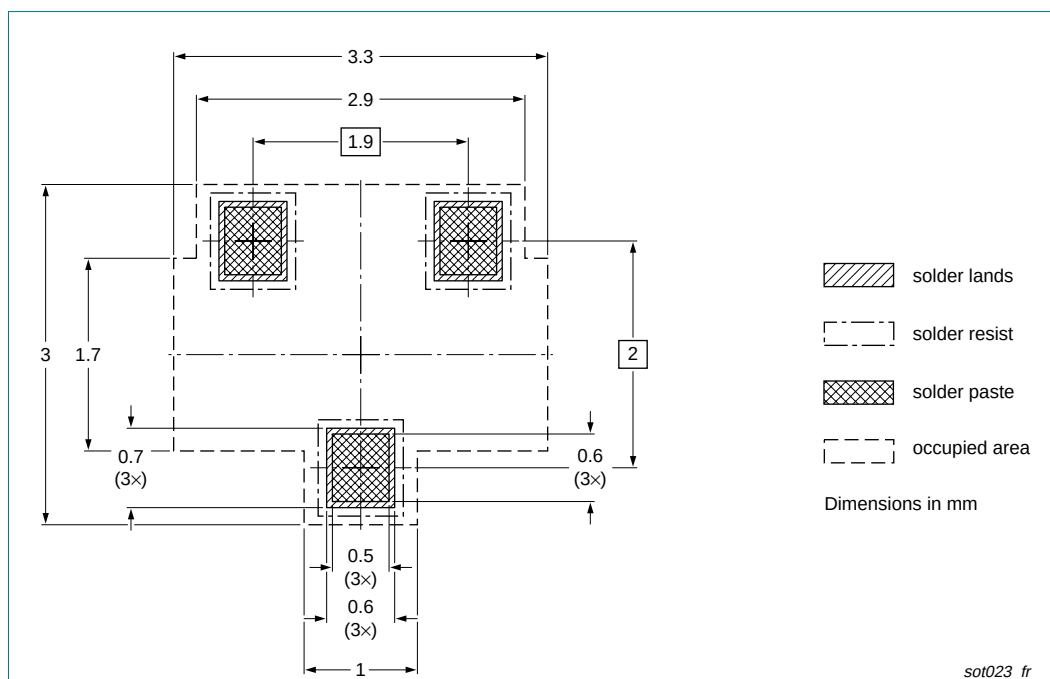
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number <sup>[2]</sup> | Package | Description                    | Packing quantity |       |
|----------------------------|---------|--------------------------------|------------------|-------|
|                            |         |                                | 3000             | 10000 |
| 2PD602AQL                  | SOT23   | 4 mm pitch, 8 mm tape and reel | -215             | -235  |
| 2PD602ARL                  |         |                                |                  |       |
| 2PD602ASL                  |         |                                |                  |       |
| 2PD602AQL/DG               | SOT23   | 4 mm pitch, 8 mm tape and reel | -215             | -235  |
| 2PD602ARL/DG               |         |                                |                  |       |
| 2PD602ASL/DG               |         |                                |                  |       |

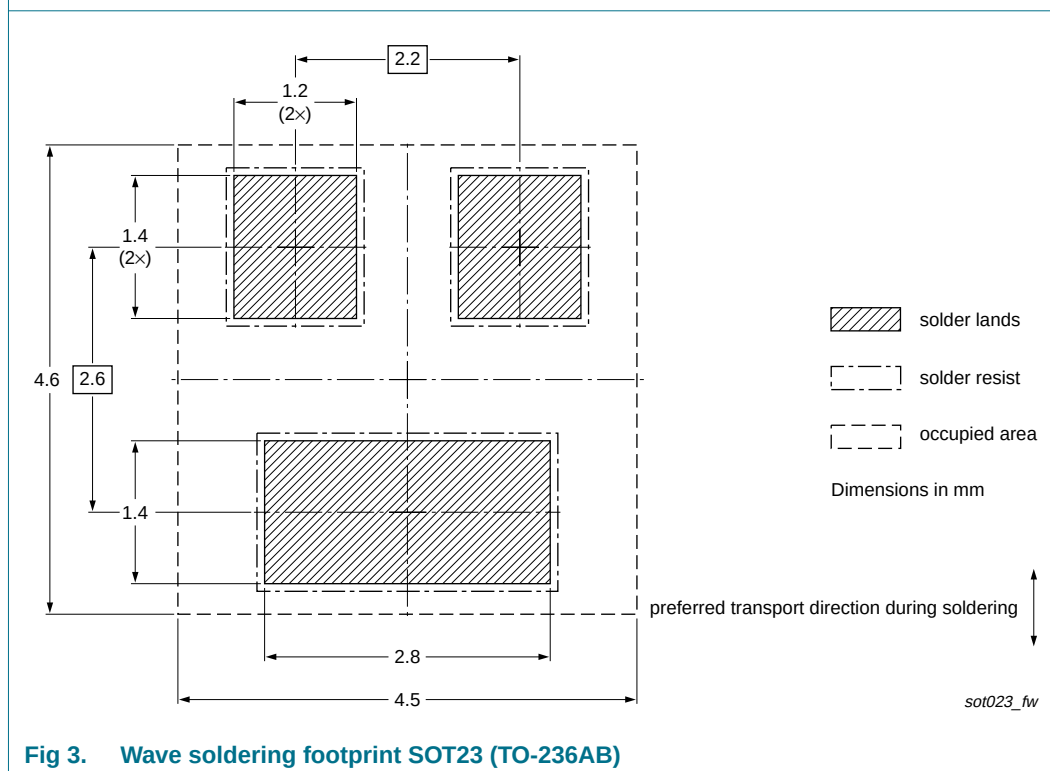
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] /DG: halogen-free

## 11. Soldering



**Fig 2. Reflow soldering footprint SOT23 (TO-236AB)**



**Fig 3. Wave soldering footprint SOT23 (TO-236AB)**

12. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status  | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| 2PD602AXL_1 | 20081027     | 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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