



# PBSS5230T

30 V, 2 A PNP low  $V_{CEsat}$  (BISS) transistor

Rev. 2 — 4 June 2012

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a SOT23 small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4230T.

### 1.2 Features and benefits

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability:  $I_C$  and  $I_{CM}$
- Higher efficiency leading to less heat generation
- AEC-Q101 qualified

### 1.3 Applications

- DC-to-DC conversion
- Supply line switching
- Battery charger
- LCD backlighting
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver (e.g. relays, buzzers and motors)

### 1.4 Quick reference data

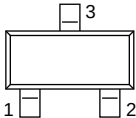
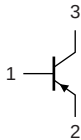
Table 1. Quick reference data

| Symbol      | Parameter                               | Conditions                                                                                              | Min | Typ | Max | Unit     |
|-------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------|-----|-----|-----|----------|
| $V_{CEO}$   | collector-emitter voltage               | open base                                                                                               | -   | -   | -30 | V        |
| $I_C$       | collector current                       |                                                                                                         | -   | -   | -2  | A        |
| $I_{CM}$    | peak collector current                  | single pulse; $t_p \leq 1$ ms                                                                           | -   | -   | -3  | A        |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = -500$ mA; $I_B = -50$ mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C | -   | 160 | 220 | $\Omega$ |



## 2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                        | Graphic symbol                                                                                    |
|-----|--------|-------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | B      | base        |  <p>SOT23 (TO-236AB)</p> |  <p>sym013</p> |
| 2   | E      | emitter     |                                                                                                           |                                                                                                   |
| 3   | C      | collector   |                                                                                                           |                                                                                                   |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package  |                                          |         |
|-------------|----------|------------------------------------------|---------|
|             | Name     | Description                              | Version |
| PBSS5230T   | TO-236AB | plastic surface-mounted package; 3 leads | SOT23   |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PBSS5230T   | %3G                         |

[1] % = placeholder for manufacturing site code

## 5. Limiting values

Table 5. 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                  | -              | -30  | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                     | -              | -30  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                | -              | -5   | V    |
| $I_C$     | collector current         |                               | -              | -2   | A    |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1$ ms | -              | -3   | A    |
| $I_B$     | base current              |                               | -              | -300 | mA   |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25$ °C          | <sup>[1]</sup> | 300  | mW   |
|           |                           |                               | <sup>[2]</sup> | 480  | mW   |
| $T_j$     | junction temperature      |                               | -              | 150  | °C   |
| $T_{amb}$ | ambient temperature       |                               | -65            | 150  | °C   |
| $T_{stg}$ | storage temperature       |                               | -65            | 150  | °C   |

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

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol        | Parameter                                   | Conditions  | Min | Typ | Max | Unit    |
|---------------|---------------------------------------------|-------------|-----|-----|-----|---------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | -   | -   | 417 K/W |
|               |                                             |             | [2] | -   | -   | 260 K/W |

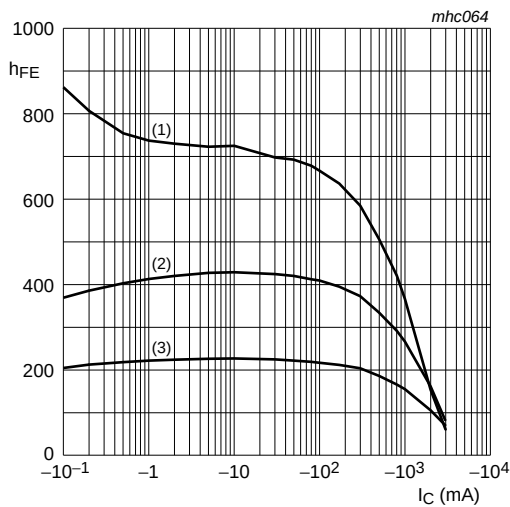
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 7. Characteristics

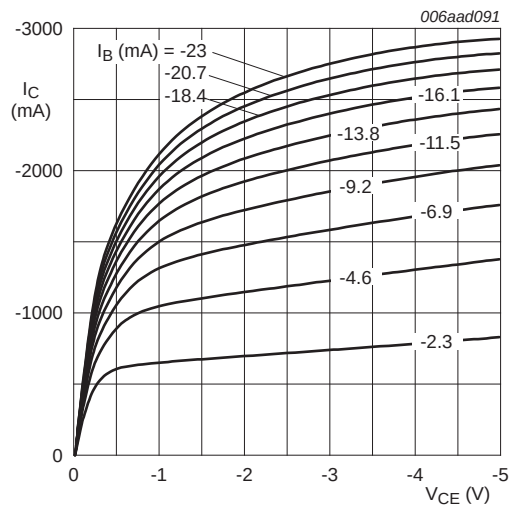
**Table 7. Characteristics**

| Symbol      | Parameter                               | Conditions                                                                                                                                          | Min | Typ  | Max   | Unit          |
|-------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-------|---------------|
| $I_{CBO}$   | collector-base cut-off current          | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                     | -   | -    | -100  | nA            |
|             |                                         | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$                                                                        | -   | -    | -50   | $\mu\text{A}$ |
| $I_{EBO}$   | emitter-base cut-off current            | $V_{EB} = -4\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                      | -   | -    | -100  | nA            |
| $h_{FE}$    | DC current gain                         | $V_{CE} = -2\text{ V}; I_C = -100\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                  | 300 | 450  | -     |               |
|             |                                         | $V_{CE} = -2\text{ V}; I_C = -1\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$   | 200 | 290  | -     |               |
|             |                                         | $V_{CE} = -2\text{ V}; I_C = -2\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$   | 100 | 180  | -     |               |
| $V_{CEsat}$ | collector-emitter saturation voltage    | $I_C = -500\text{ mA}; I_B = -50\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                   | -   | -70  | -110  | mV            |
|             |                                         | $I_C = -1\text{ A}; I_B = -50\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                      | -   | -140 | -225  | mV            |
|             |                                         | $I_C = -2\text{ A}; I_B = -200\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                     | -   | -240 | -350  | mV            |
| $R_{CEsat}$ | collector-emitter saturation resistance | $I_C = -500\text{ mA}; I_B = -50\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | -   | 160  | 220   | $\Omega$      |
| $V_{BEsat}$ | base-emitter saturation voltage         | $I_C = -2\text{ A}; I_B = -50\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$    | -   | -    | -1.1  | V             |
| $V_{BEon}$  | base-emitter turn-on voltage            | $V_{CE} = -2\text{ V}; I_C = -100\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                  | -   | -    | -0.75 | V             |
| $f_T$       | transition frequency                    | $V_{CE} = -10\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                             | 100 | 200  | -     | MHz           |
| $C_C$       | collector capacitance                   | $V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                 | -   | 23   | 28    | pF            |



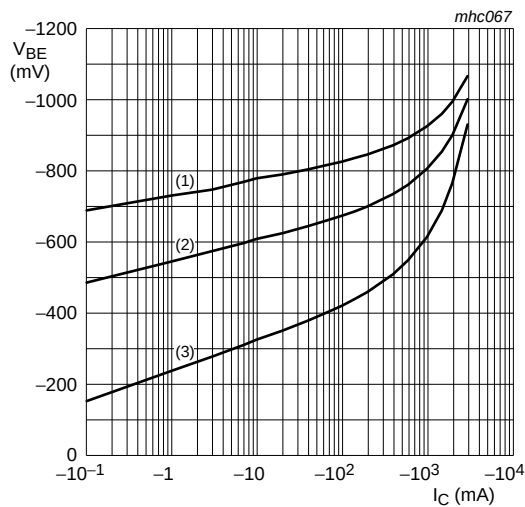
$V_{CE} = -2\text{ V}$   
(1)  $T_{amb} = 150^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -55^\circ\text{C}$

Fig 1. DC current gain as a function of collector current; typical values



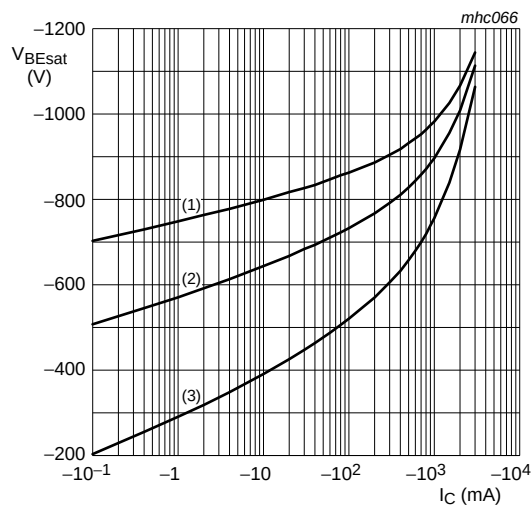
$T_{amb} = 25^\circ\text{C}$

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



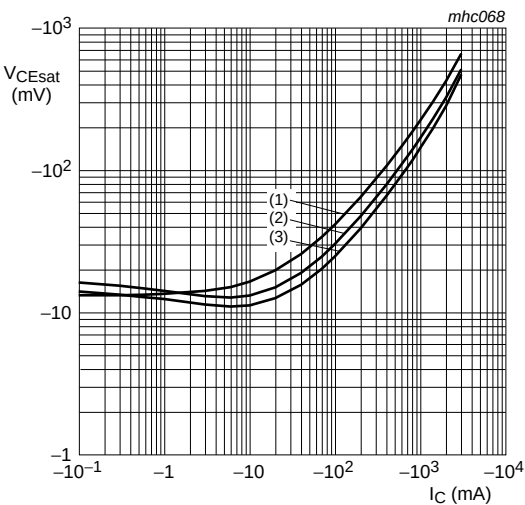
$V_{CE} = -2\text{ V}$   
(1)  $T_{amb} = -55^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = 150^\circ\text{C}$

Fig 3. Base-emitter voltage as a function of collector current; typical values



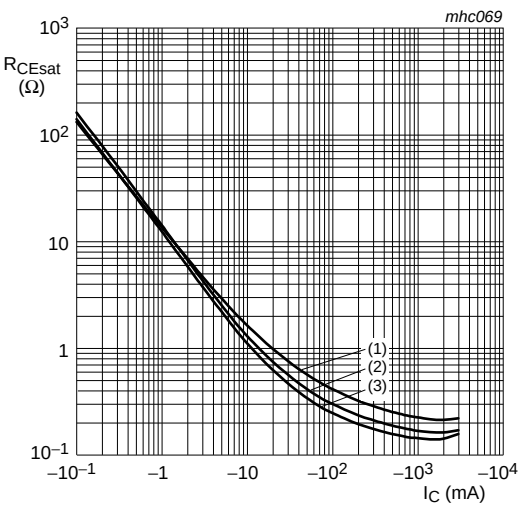
$I_C/I_B = 20$   
(1)  $T_{amb} = -55^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = 150^\circ\text{C}$

Fig 4. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



$I_C/I_B = 20$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 6. Collector-emitter saturation resistance 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

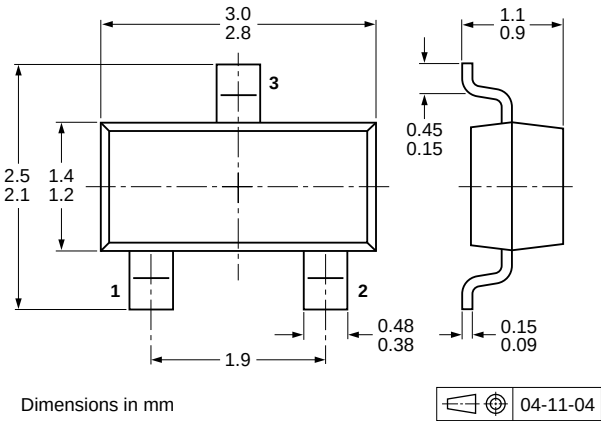


Fig 7. Package outline SOT23 (TO-236AB)

10. Soldering

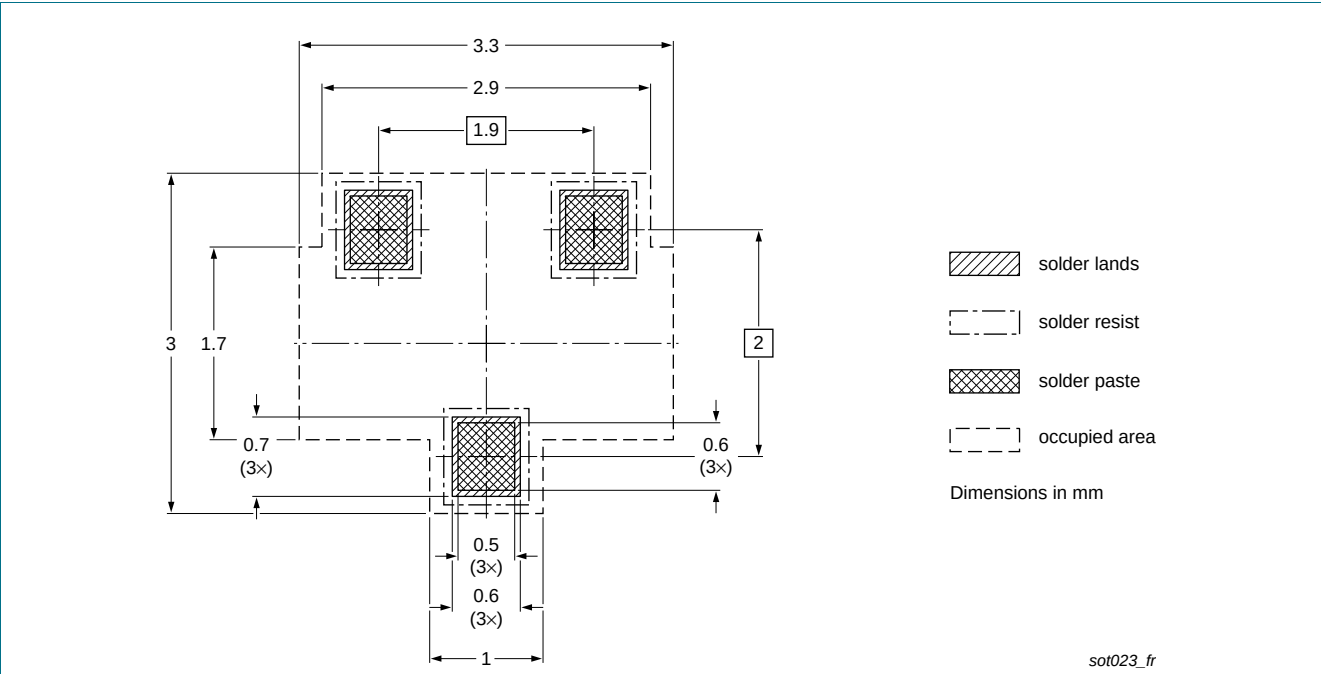


Fig 8. Reflow soldering footprint for SOT23 (TO-236AB)

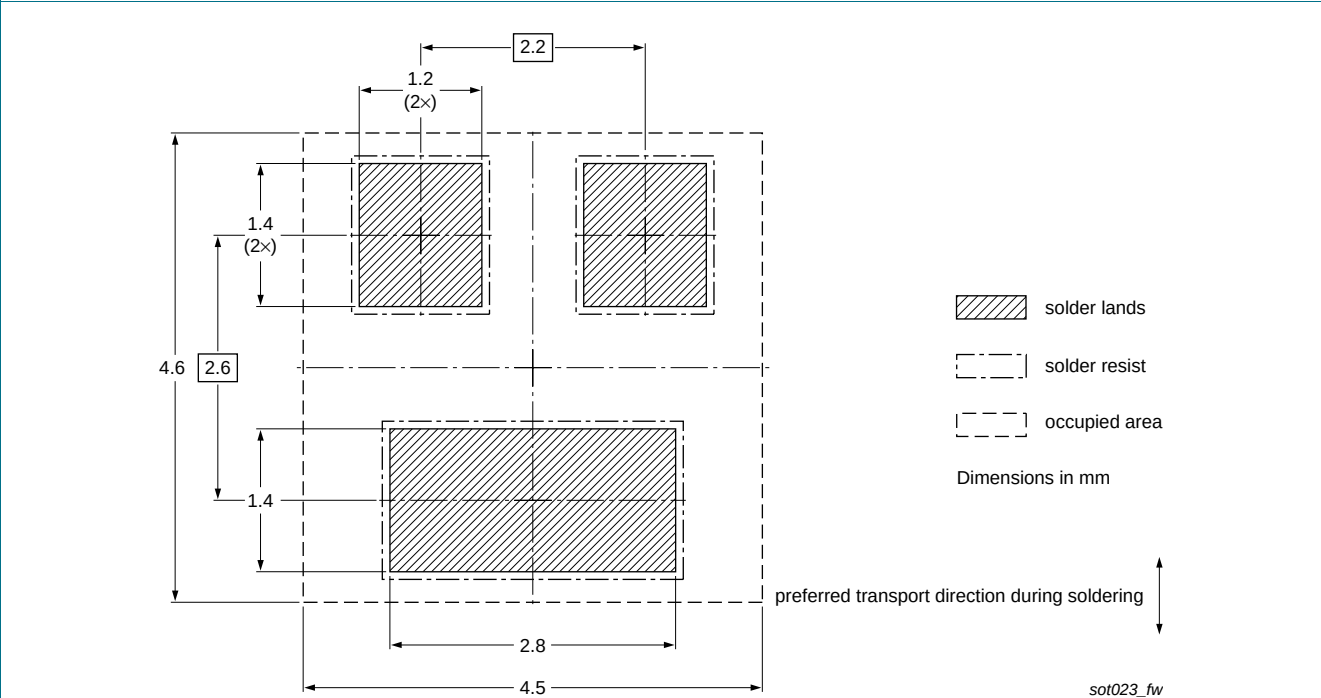


Fig 9. Wave soldering footprint for SOT23 (TO-236AB)

## 11. Revision history

Table 8. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Data sheet status  | Change notice | Supersedes    |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|---------------|
| PBSS5230T v.2  | 20120604                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | PBSS5230T v.1 |
| Modifications: | <ul style="list-style-type: none"><li>• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">1 "Product profile"</a>: updated</li><li>• <a href="#">4 "Marking"</a>: corrected</li><li>• <a href="#">Table 5.</a>: updated</li><li>• <a href="#">7 "Characteristics"</a>: V<sub>CEsat</sub> corrected, <a href="#">Fig 1.</a> to <a href="#">Fig 6.</a> added</li><li>• <a href="#">8 "Test information"</a>: added</li><li>• <a href="#">9 "Package outline"</a>: replaced by minimized package outline drawing</li><li>• <a href="#">10 "Soldering"</a>: added</li></ul> |                    |               |               |
| PBSS5230T v.1  | 20031218                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | -             |

## 12. Legal information

### 12.1 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.                                     |

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

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