



PBSS5330PA

30 V, 3 A PNP low V_{CEsat} (BISS) transistor

7 April 2015

Product data sheet

1. General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor, encapsulated in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package with medium power capability.

NPN complement: PBSS4330PA.

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- Exposed heat sink for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with medium power capability

3. Applications

- Loadswitch
- Battery-driven devices
- Power management
- Charging circuits
- Power switches (e.g. motors, fans)

4. Quick reference data

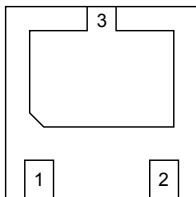
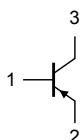
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|---|--|-----|-----|-----|------|
| V _{CEO} | collector-emitter voltage | open base | - | - | -30 | V |
| I _C | collector current | | - | - | -3 | A |
| I _{CM} | peak collector current | single pulse; t _p ≤ 1 ms | - | - | -5 | A |
| R _{CEsat} | collector-emitter saturation resistance | I _C = -3 A; I _B = -300 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02 ; T _{amb} = 25 °C | - | 75 | 107 | mΩ |



5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|---|
| 1 | B | base |  <p>Transparent top view</p> <p>DFN2020-3 (SOT1061)</p> |  <p>sym013</p> |
| 2 | E | emitter | | |
| 3 | C | collector | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|-----------|---|---------|
| | Name | Description | Version |
| PBSS5330PA | DFN2020-3 | DFN2020-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm | SOT1061 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS5330PA | AJ |

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

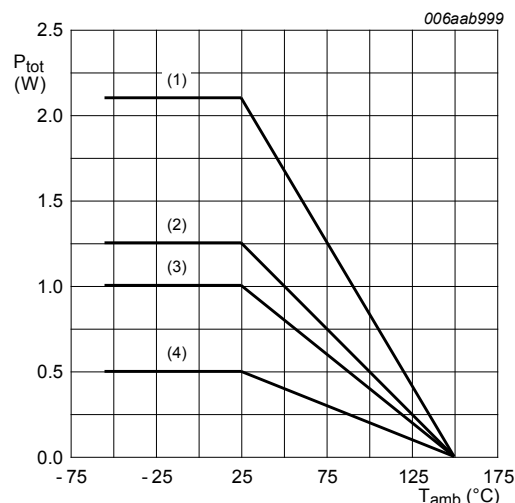
| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------|---------------------------|-------------------------------|-----|-----|------|------|
| V_{CBO} | collector-base voltage | open emitter | | - | -30 | V |
| V_{CEO} | collector-emitter voltage | open base | | - | -30 | V |
| V_{EBO} | emitter-base voltage | open collector | | - | -6 | V |
| I_C | collector current | | | - | -3 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | | - | -5 | A |
| I_B | base current | | | - | -500 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 500 | mW |
| | | | [2] | - | 1 | W |
| | | | [3] | - | 1.25 | W |
| | | | [4] | - | 2.1 | W |
| 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 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 cm².

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².

[4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.



(1) Ceramic PCB, Al₂O₃, standard footprint

(2) FR4 PCB, mounting pad for collector 6 cm²

(3) FR4 PCB, mounting pad for collector 1 cm²

(4) FR4 PCB, standard footprint

Fig. 1. Power derating curves

9. 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] | - | - | 250 | K/W |
| | | | [2] | - | - | 125 | K/W |
| | | | [3] | - | - | 100 | K/W |
| | | | [4] | - | - | 60 | 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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

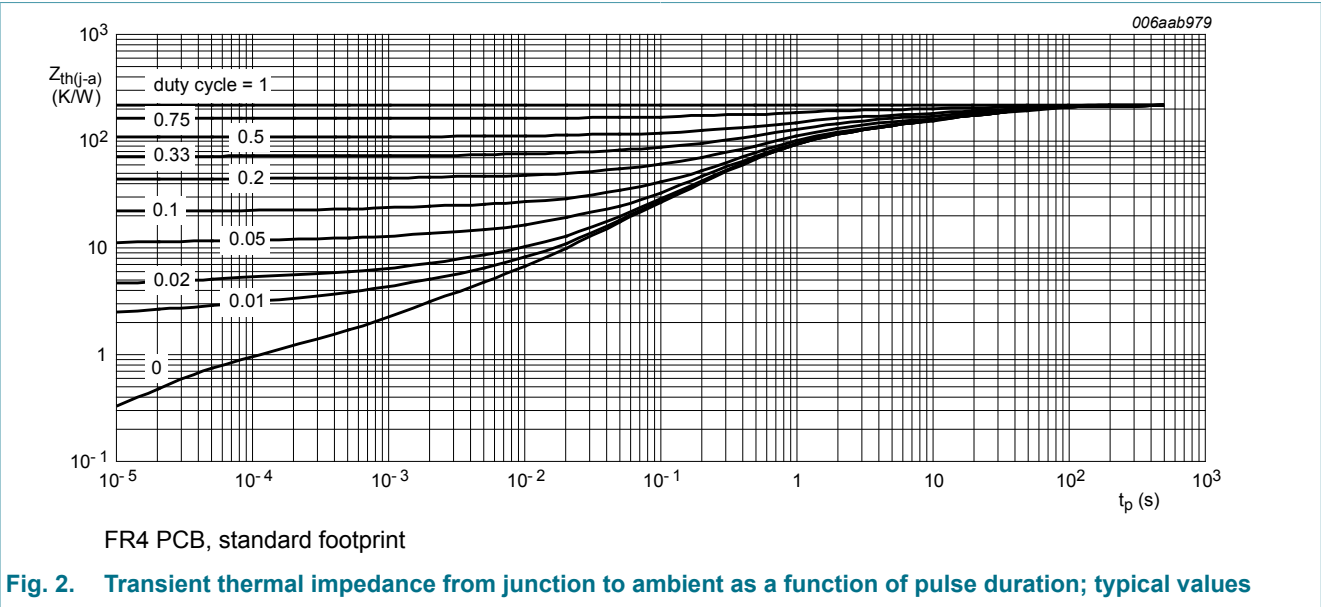
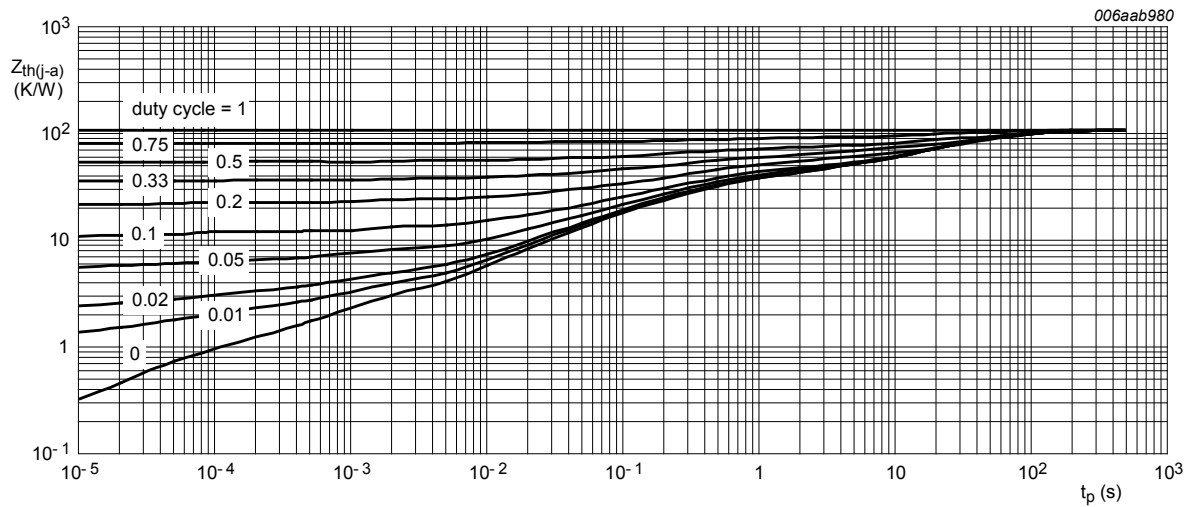
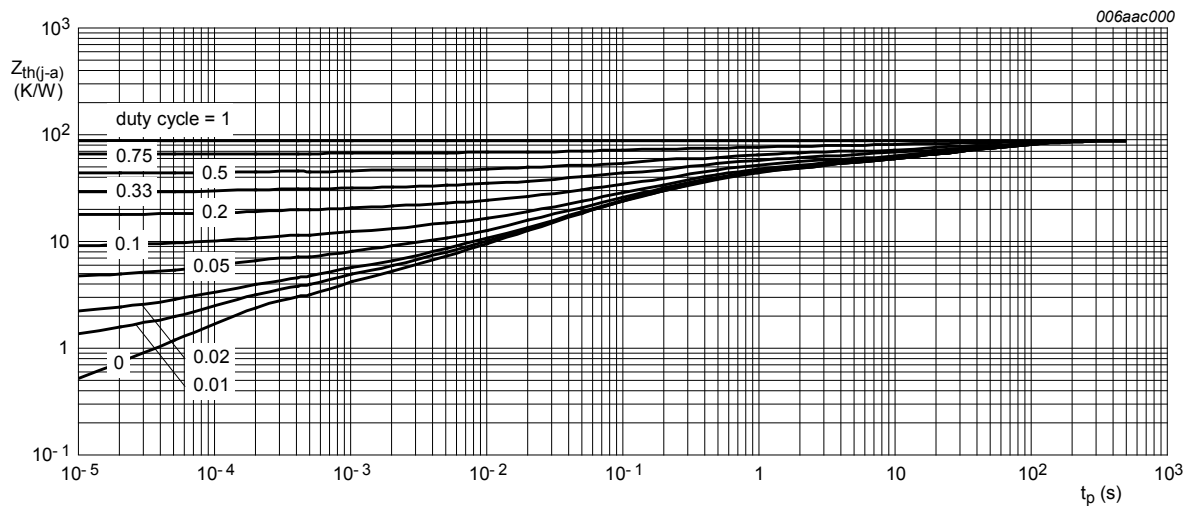


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



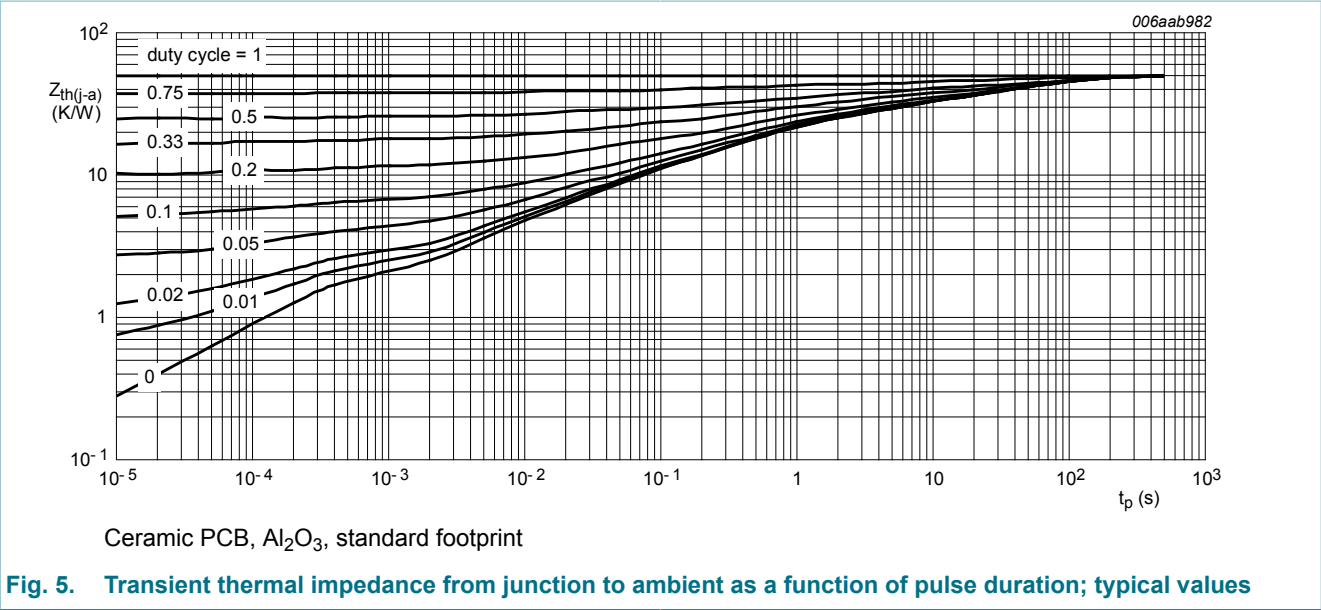
FR4 PCB, mounting pad for collector 1 cm²

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for collector 6 cm²

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

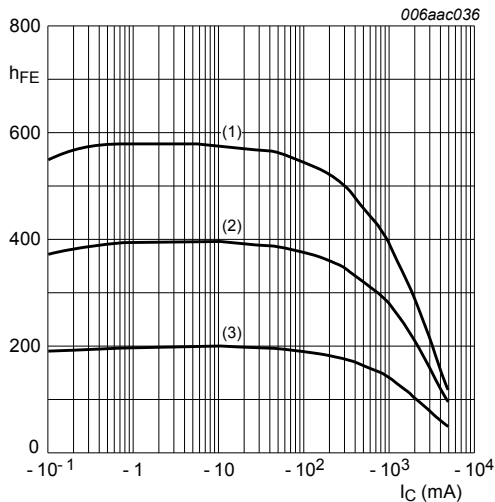


10. Characteristics

Table 7. Characteristics

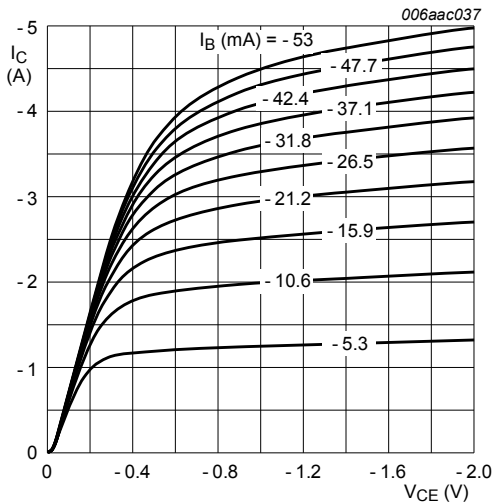
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---|---|-----|-------|------|---------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | - | -100 | nA |
| | | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | -50 | μA |
| I_{CES} | collector-emitter cut-off current | $V_{CE} = -24\text{ V}; V_{BE} = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | - | -100 | nA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | - | -100 | nA |
| h_{FE} | DC current gain | $V_{CE} = -2\text{ V}; I_C = -0.5\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | 200 | 320 | - | |
| | | $V_{CE} = -2\text{ V}; I_C = -1\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | 175 | 280 | 450 | |
| | | $V_{CE} = -2\text{ V}; I_C = -2\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | 140 | 210 | - | |
| | | $V_{CE} = -2\text{ V}; I_C = -3\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | 100 | 160 | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -0.5\text{ A}; I_B = -50\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -45 | -70 | mV |
| | | $I_C = -1\text{ A}; I_B = -50\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -90 | -130 | mV |
| | | $I_C = -2\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -170 | -240 | mV |
| | | $I_C = -3\text{ A}; I_B = -300\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -230 | -320 | mV |
| R_{CEsat} | collector-emitter saturation resistance | $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | 75 | 107 | m Ω |
| V_{BEsat} | base-emitter saturation voltage | $I_C = -2\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -0.89 | -1.1 | V |
| | | $I_C = -3\text{ A}; I_B = -300\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -0.97 | -1.2 | V |
| V_{BEon} | base-emitter turn-on voltage | $V_{CE} = -2\text{ V}; I_C = -1\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | -0.75 | -1 | V |
| t_d | delay time | $V_{CC} = -9\text{ V}; I_C = -2\text{ A}; I_{Bon} = -0.1\text{ A}; I_{Boff} = 0.1\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | 11 | - | ns |
| t_r | rise time | | - | 59 | - | ns |
| t_{on} | turn-on time | | - | 70 | - | ns |
| t_s | storage time | | - | 165 | - | ns |
| t_f | fall time | | - | 35 | - | ns |
| t_{off} | turn-off time | | - | 200 | - | ns |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------------------|--|-----|-----|-----|------|
| f_T | transition frequency | $V_{CE} = -5\text{ V}$; $I_C = -100\text{ mA}$; $f = 100\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$ | 100 | 165 | - | MHz |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}$; $I_E = 0\text{ A}$; $i_e = 0\text{ A}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | 38 | 45 | pF |



$V_{CE} = -2\text{ V}$
(1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



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

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

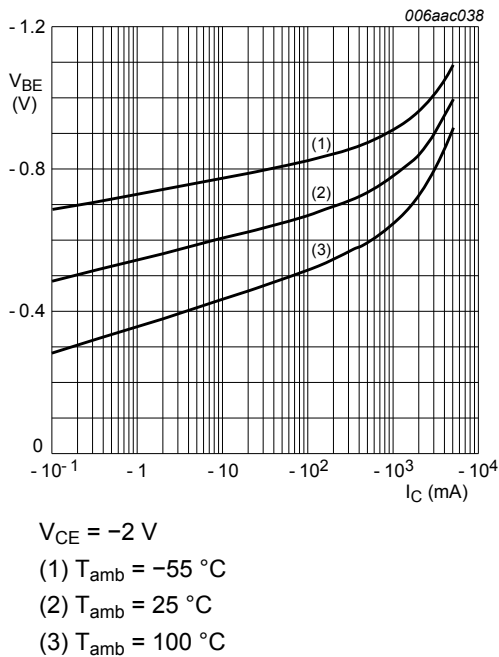


Fig. 8. Base-emitter voltage as a function of collector current; typical values

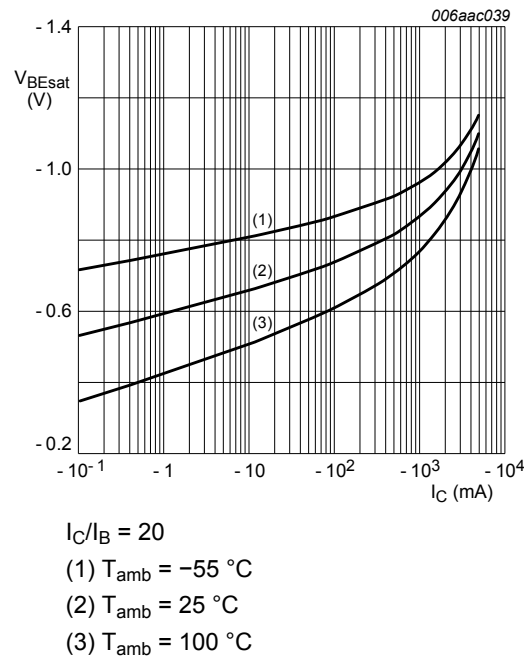


Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values

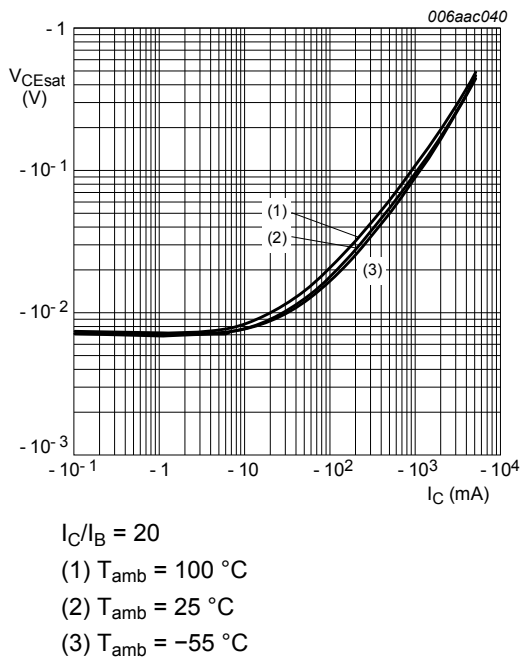


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

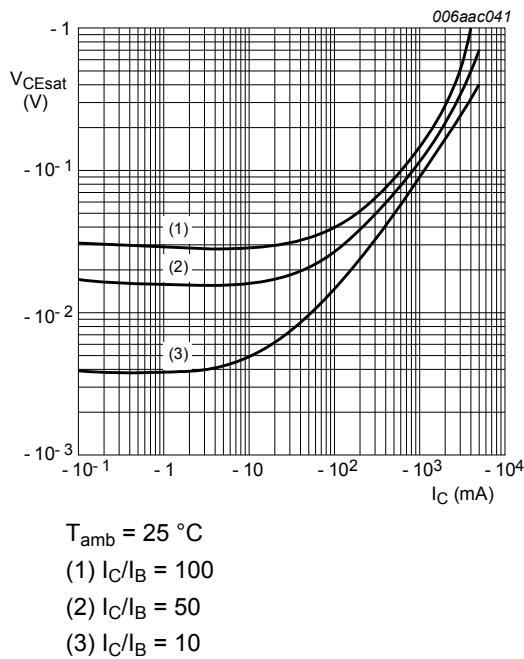


Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values

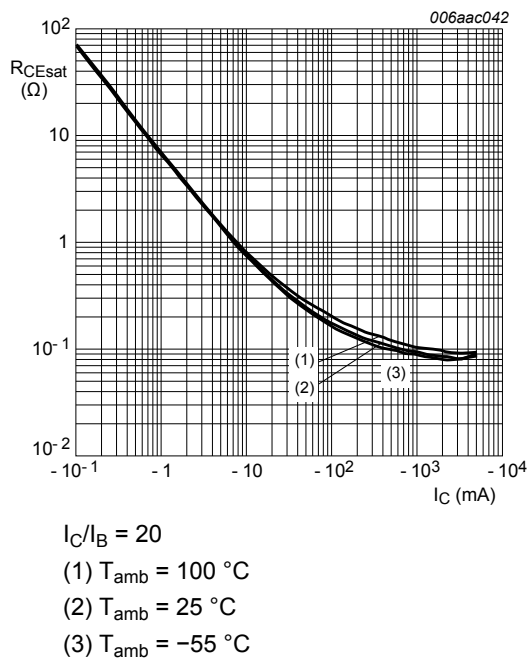


Fig. 12. Collector-emitter saturation resistance as a function of collector current; typical values

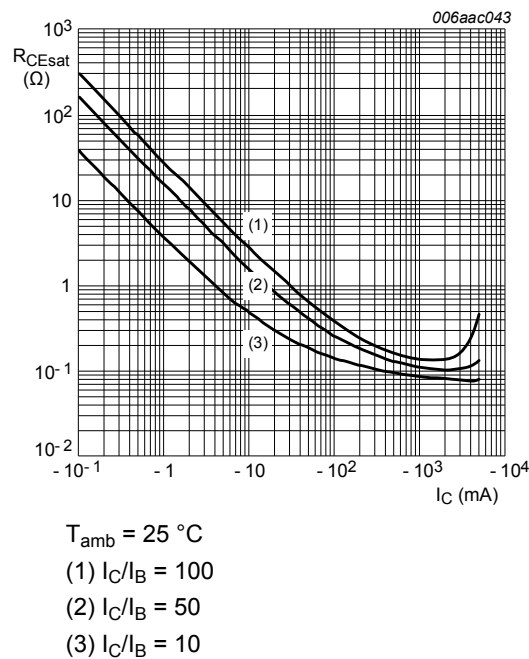


Fig. 13. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

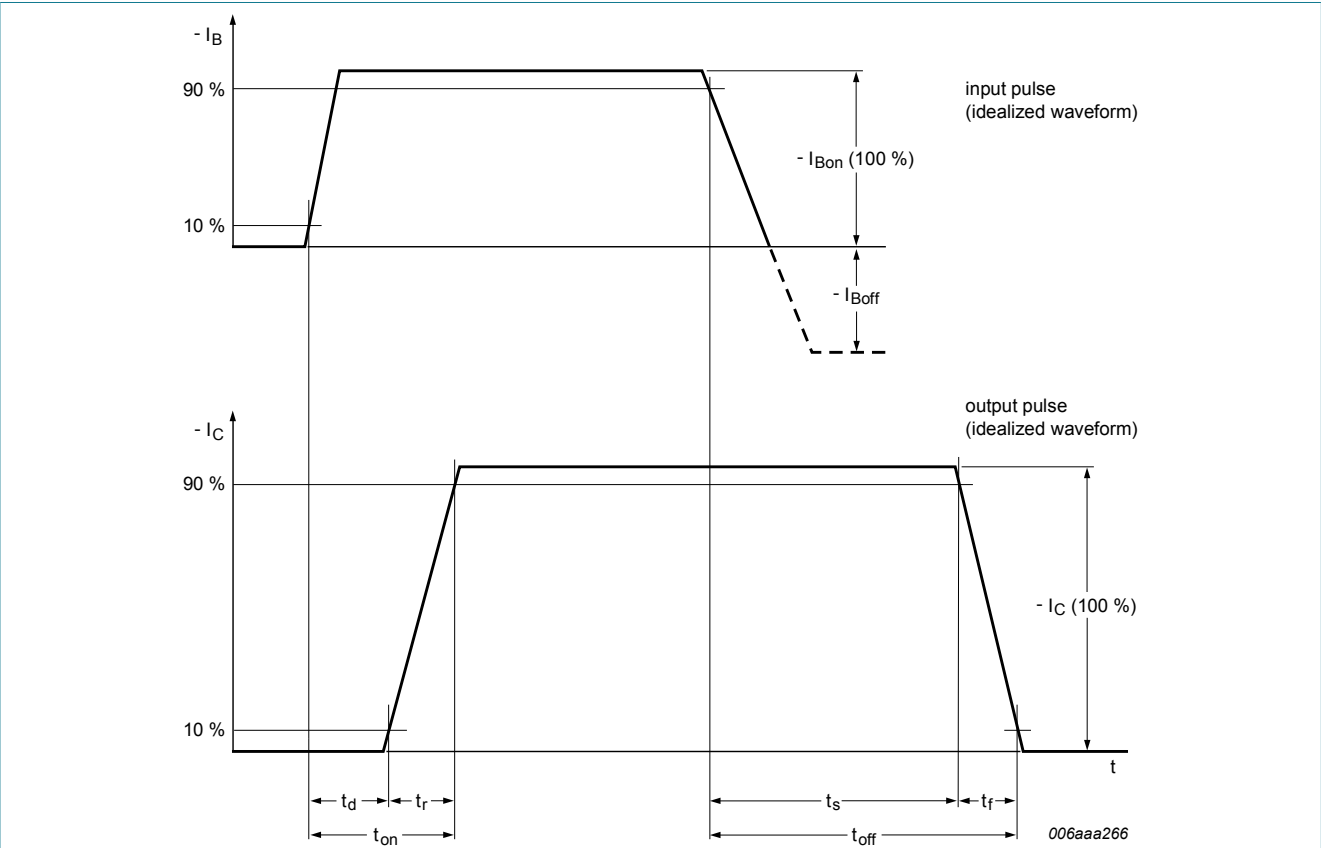


Fig. 14. BISS transistor switching time definition

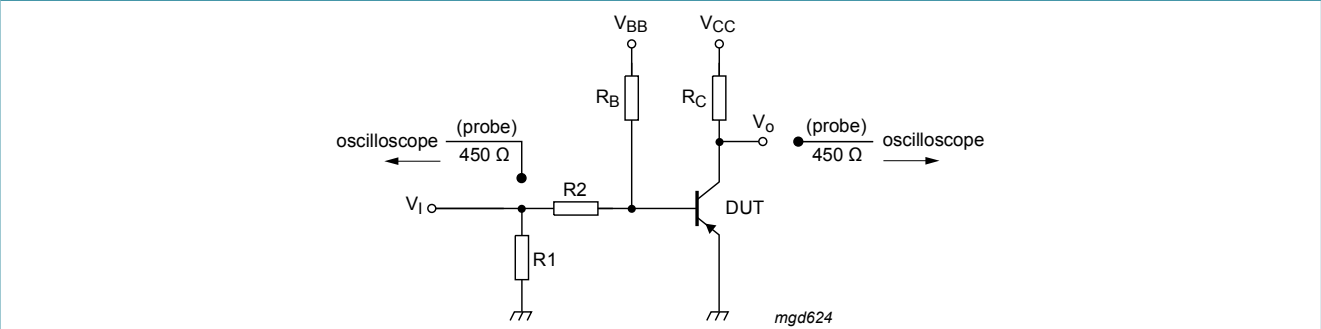


Fig. 15. Test circuit for switching times

12. Package outline

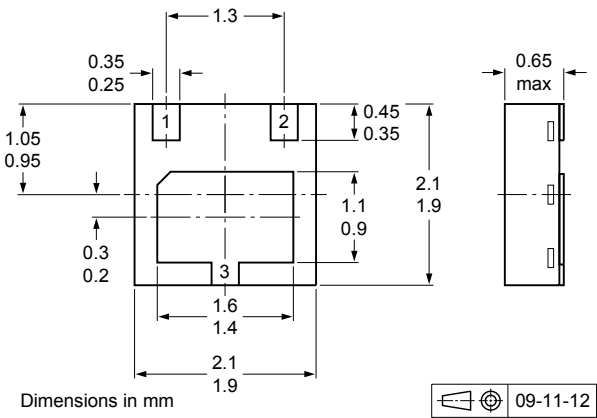


Fig. 16. Package outline DFN2020-3 (SOT1061)

13. Soldering

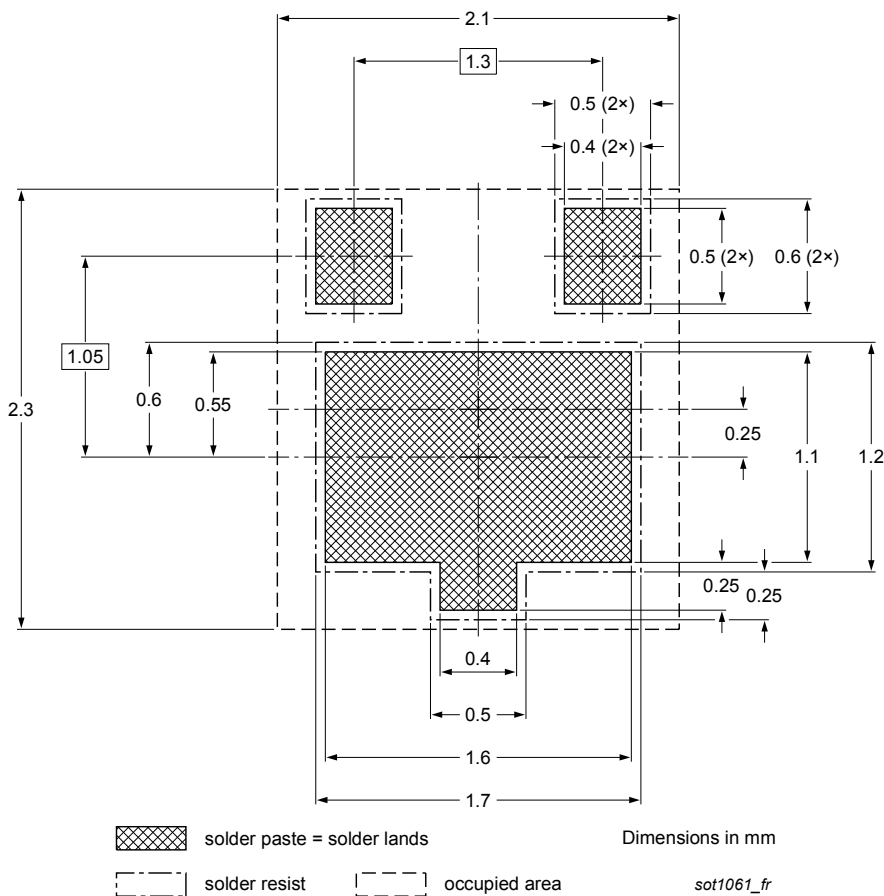


Fig. 17. Reflow soldering footprint for DFN2020-3 (SOT1061)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--|--------------------|---------------|----------------|
| PBSS5330PA v.2 | 20150407 | Product data sheet | - | PBSS5330PA v.1 |
| Modifications: | <ul style="list-style-type: none">Condition V_{CE} changed for parameter I_{CES} in Table 7, Characteristics | | | |
| PBSS5330PA v.1 | 20100419 | Product data sheet | - | - |

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| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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