

PBSS4620PA

20 V, 6 A NPN low V_{CEsat} (BISS) transistor

Rev. 01 — 18 May 2010

Product data sheet

1. Product profile

1.1 General description

NPN 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.

PNP complement: PBSS5620PA.

1.2 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

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

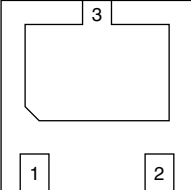
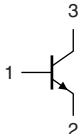
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---|----------------------------------|-------|-----|-----|------------|
| V_{CEO} | collector-emitter voltage | open base | - | - | 20 | V |
| I_C | collector current | | - | - | 6 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | - | 7 | A |
| R_{CEsat} | collector-emitter saturation resistance | $I_C = 6$ A; $I_B = 300$ mA | [1] - | 33 | 46 | m Ω |

[1] Pulse test: $t_p \leq 300$ μ s; $\delta \leq 0.02$.



2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|---|---|
| 1 | base |  <p>Transparent top view</p> |  <p>sym021</p> |
| 2 | emitter | | |
| 3 | collector | | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PBSS4620PA | HUSON3 | plastic thermal enhanced ultra thin small outline package; no leads; three terminals; body 2 × 2 × 0.65 mm | SOT1061 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS4620PA | A6 |

5. Limiting values

Table 5. Limiting values

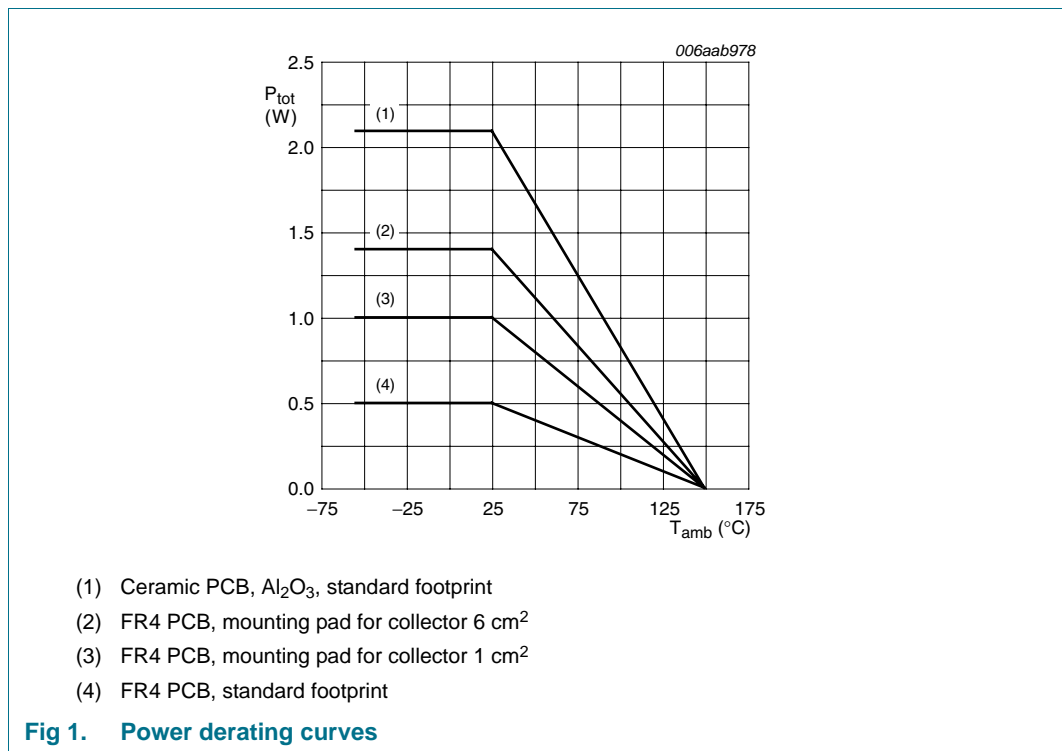
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|-----------|---------------------------|----------------------------------|-----|-----|------|----|
| V_{CBO} | collector-base voltage | open emitter | - | 20 | V | |
| V_{CEO} | collector-emitter voltage | open base | - | 20 | V | |
| V_{EBO} | emitter-base voltage | open collector | - | 6 | V | |
| I_C | collector current | | - | 6 | A | |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | 7 | A | |
| I_B | base current | | - | 600 | mA | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 500 | mW |
| | | | [2] | - | 1 | W |
| | | | [3] | - | 1.4 | W |
| | | | [4] | - | 2.1 | W |

Table 5. Limiting values ...continued
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|----------------------|------------|-----|------|------|
| 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.



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] | - | - | 250 | K/W |
| | | | [2] | - | - | 125 | K/W |
| | | | [3] | - | - | 90 | 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.

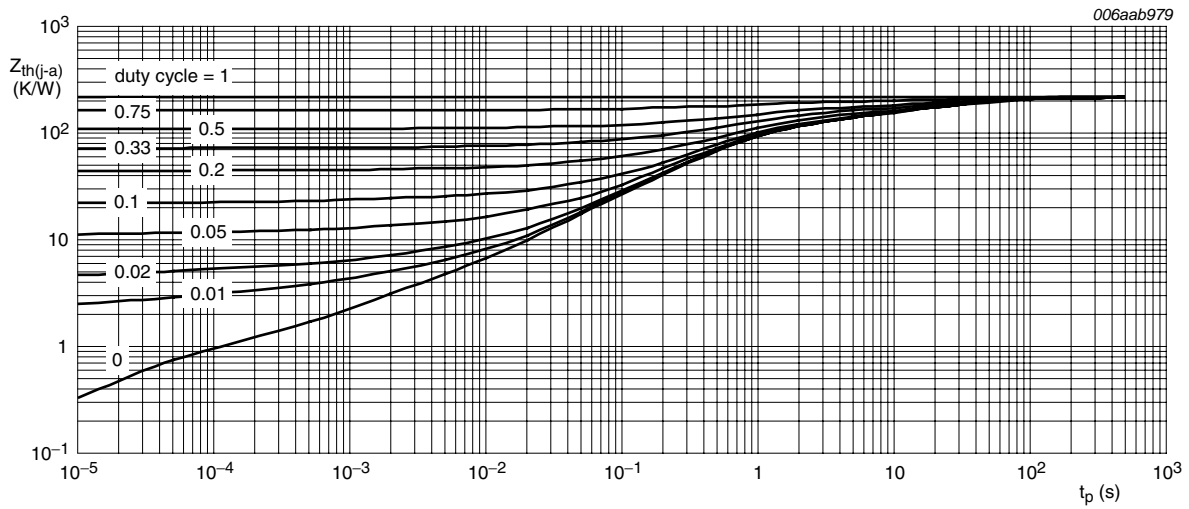


Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

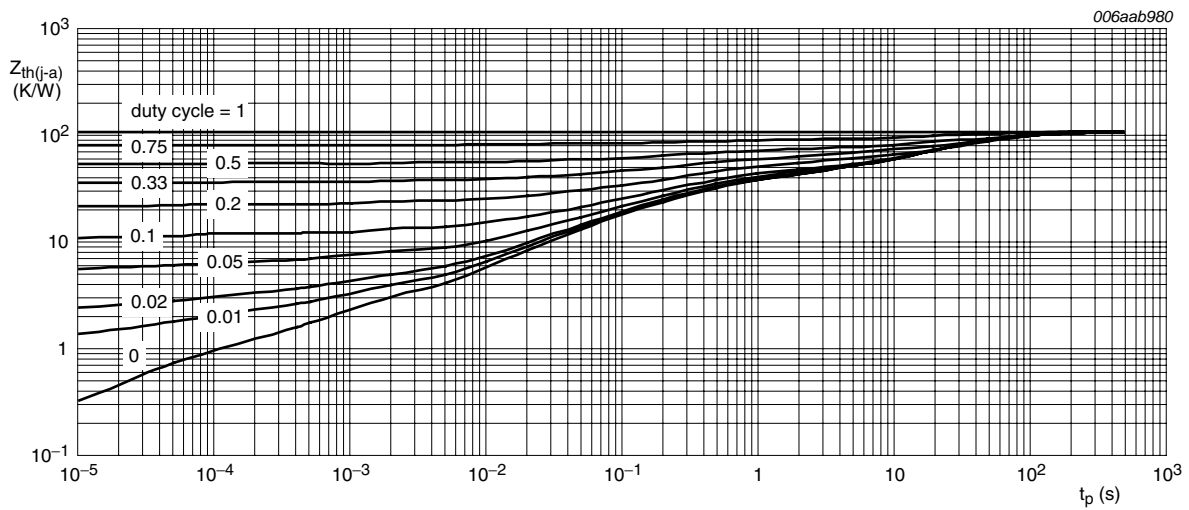
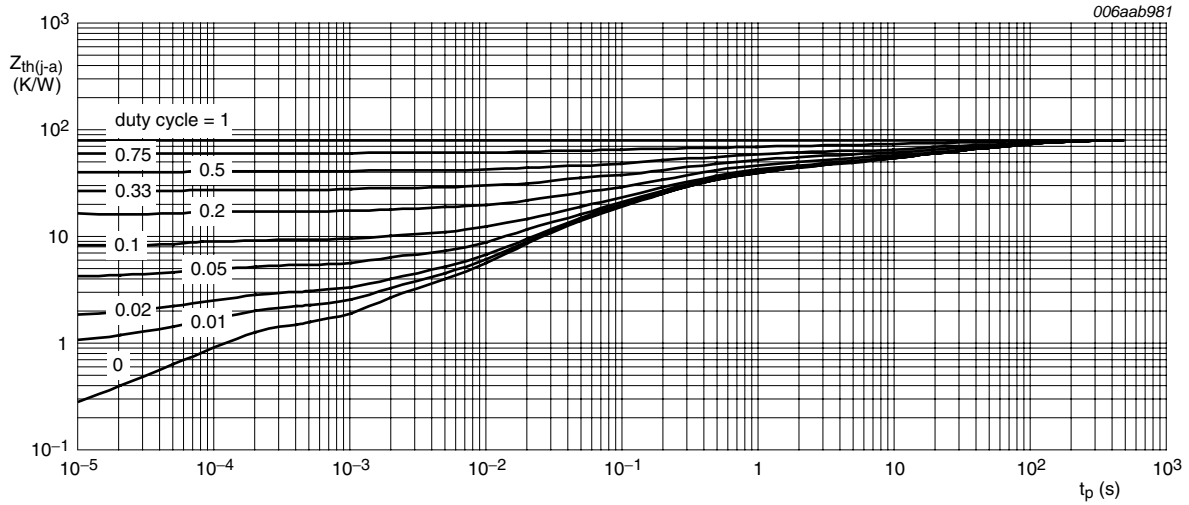
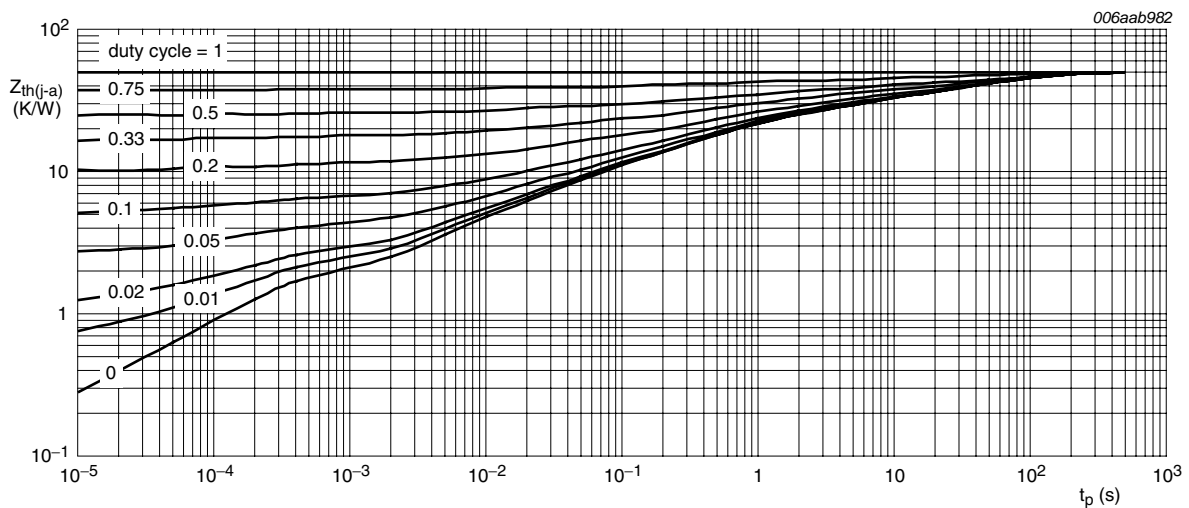


Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



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



Ceramic PCB, Al₂O₃, standard footprint

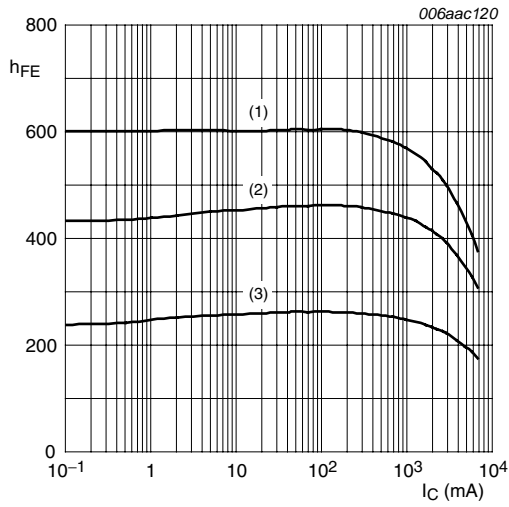
Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

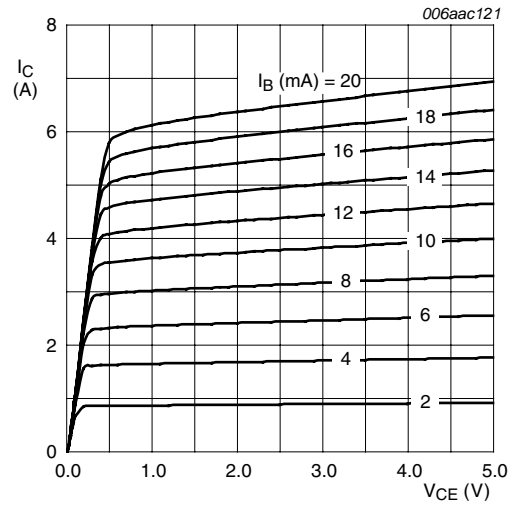
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|-------------|---|---|-----|-----|------|---------------|------------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = 16\text{ V}; I_E = 0\text{ A}$ | - | - | 100 | nA | |
| | | $V_{CB} = 16\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | 50 | μA | |
| I_{CES} | collector-emitter cut-off current | $V_{CE} = 16\text{ V}; V_{BE} = 0\text{ V}$ | - | - | 100 | nA | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}$ | - | - | 100 | nA | |
| h_{FE} | DC current gain | $V_{CE} = 2\text{ V}$ | [1] | | | | |
| | | $I_C = 0.5\text{ A}$ | 280 | 440 | - | | |
| | | $I_C = 1\text{ A}$ | 270 | 430 | - | | |
| | | $I_C = 2\text{ A}$ | 260 | 415 | - | | |
| | | $I_C = 6\text{ A}$ | 200 | 330 | - | | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 0.5\text{ A}; I_B = 50\text{ mA}$ | [1] | - | 20 | 30 | mV |
| | | $I_C = 1\text{ A}; I_B = 50\text{ mA}$ | [1] | - | 37 | 55 | mV |
| | | $I_C = 1\text{ A}; I_B = 10\text{ mA}$ | [1] | - | 50 | 70 | mV |
| | | $I_C = 2\text{ A}; I_B = 20\text{ mA}$ | [1] | - | 85 | 120 | mV |
| | | $I_C = 3\text{ A}; I_B = 30\text{ mA}$ | [1] | - | 120 | 170 | mV |
| | | $I_C = 4\text{ A}; I_B = 400\text{ mA}$ | [1] | - | 135 | 185 | mV |
| | | $I_C = 6\text{ A}; I_B = 300\text{ mA}$ | [1] | - | 200 | 275 | mV |
| R_{CEsat} | collector-emitter saturation resistance | $I_C = 6\text{ A}; I_B = 300\text{ mA}$ | [1] | - | 33 | 46 | $\text{m}\Omega$ |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 1\text{ A}; I_B = 10\text{ mA}$ | [1] | - | 0.75 | 0.9 | V |
| | | $I_C = 6\text{ A}; I_B = 300\text{ mA}$ | [1] | - | 0.97 | 1.1 | V |
| V_{BEon} | base-emitter turn-on voltage | $V_{CE} = 2\text{ V}; I_C = 2\text{ A}$ | [1] | - | 0.74 | 0.9 | V |
| t_d | delay time | $V_{CC} = 9\text{ V}; I_C = 2\text{ A}; I_{Bon} = 0.1\text{ A}; I_{Boff} = -0.1\text{ A}$ | - | 25 | - | ns | |
| t_r | rise time | | - | 55 | - | ns | |
| t_{on} | turn-on time | | - | 80 | - | ns | |
| t_s | storage time | | - | 285 | - | ns | |
| t_f | fall time | | - | 50 | - | ns | |
| t_{off} | turn-off time | | - | 335 | - | ns | |
| f_T | transition frequency | $V_{CE} = 10\text{ V}; I_C = 100\text{ mA}; f = 100\text{ MHz}$ | 50 | 80 | - | MHz | |
| C_c | collector capacitance | $V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$ | - | 80 | 95 | pF | |

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



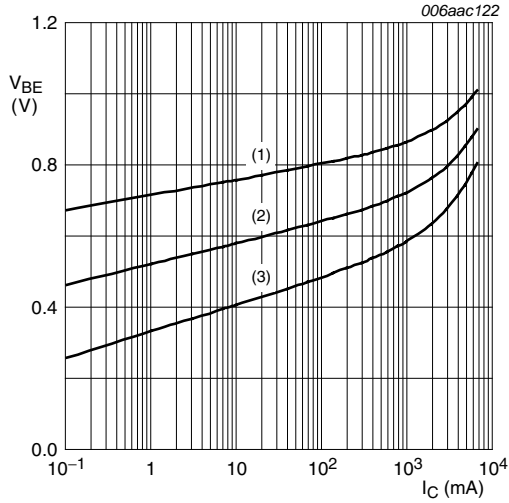
$V_{CE} = 2 V$
 (1) $T_{amb} = 100^\circ C$
 (2) $T_{amb} = 25^\circ C$
 (3) $T_{amb} = -55^\circ C$

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



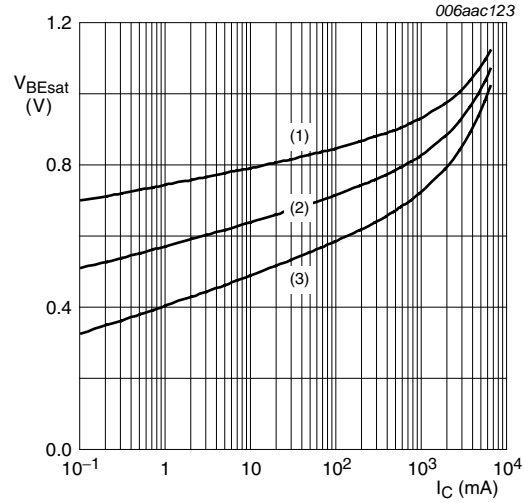
$T_{amb} = 25^\circ C$

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



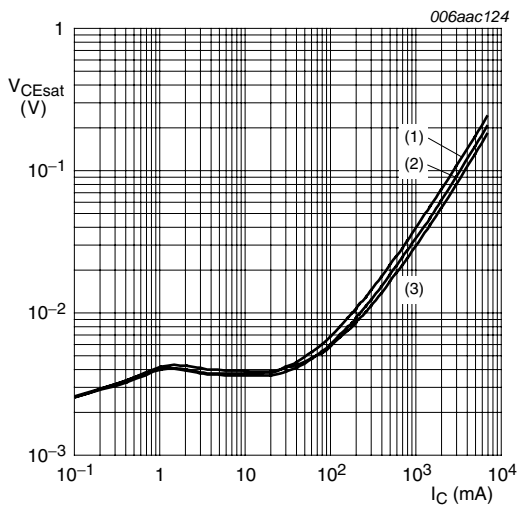
$V_{CE} = 2 V$
 (1) $T_{amb} = -55^\circ C$
 (2) $T_{amb} = 25^\circ C$
 (3) $T_{amb} = 100^\circ C$

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



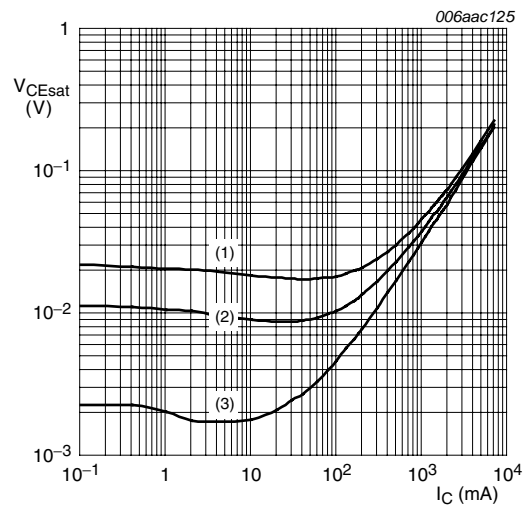
$I_C/I_B = 20$
 (1) $T_{amb} = -55^\circ C$
 (2) $T_{amb} = 25^\circ C$
 (3) $T_{amb} = 100^\circ C$

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



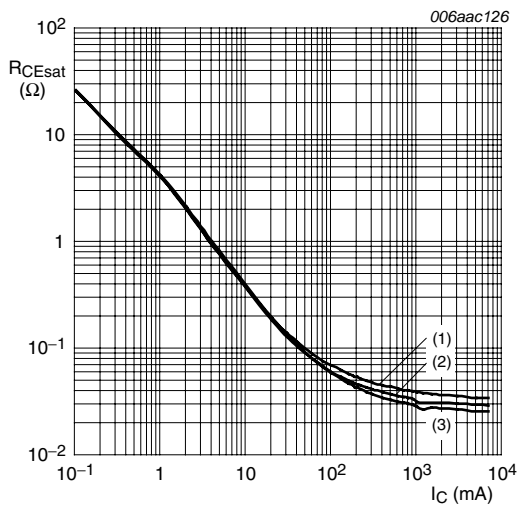
- $I_C/I_B = 20$
- (1) $T_{amb} = 100\text{ °C}$
 - (2) $T_{amb} = 25\text{ °C}$
 - (3) $T_{amb} = -55\text{ °C}$

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



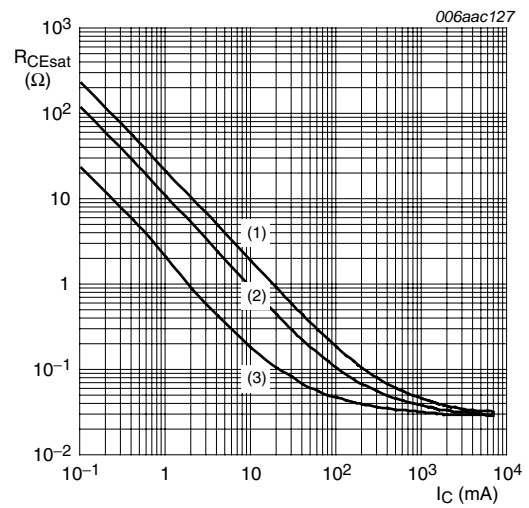
- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 10$

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



- $I_C/I_B = 20$
- (1) $T_{amb} = 100\text{ °C}$
 - (2) $T_{amb} = 25\text{ °C}$
 - (3) $T_{amb} = -55\text{ °C}$

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



- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 10$

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

8. Test information

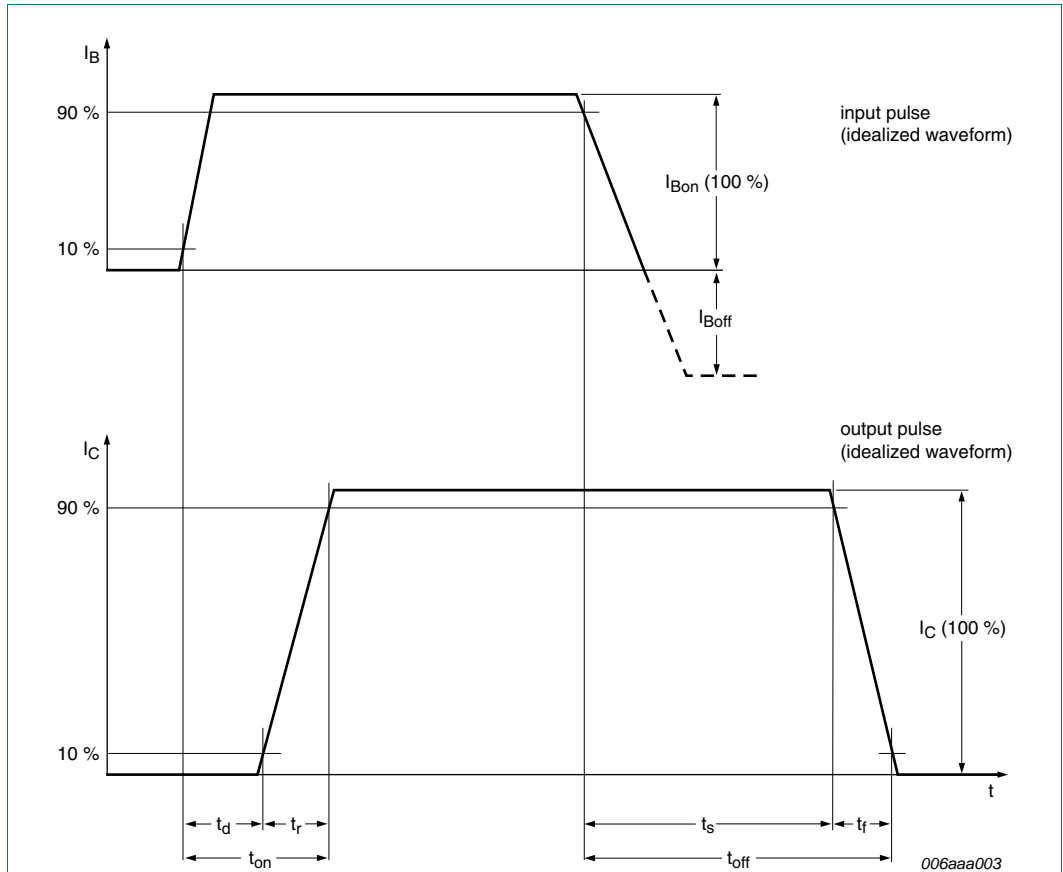


Fig 14. BISS transistor switching time definition

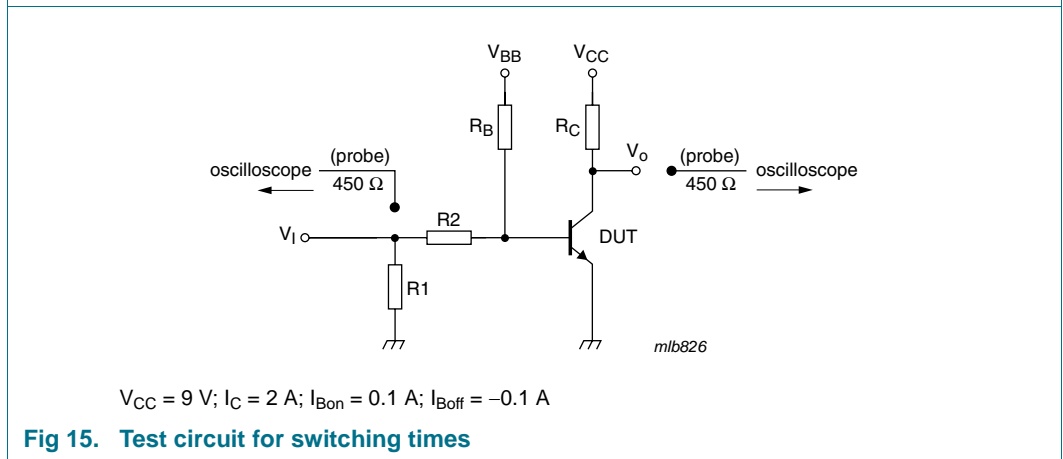
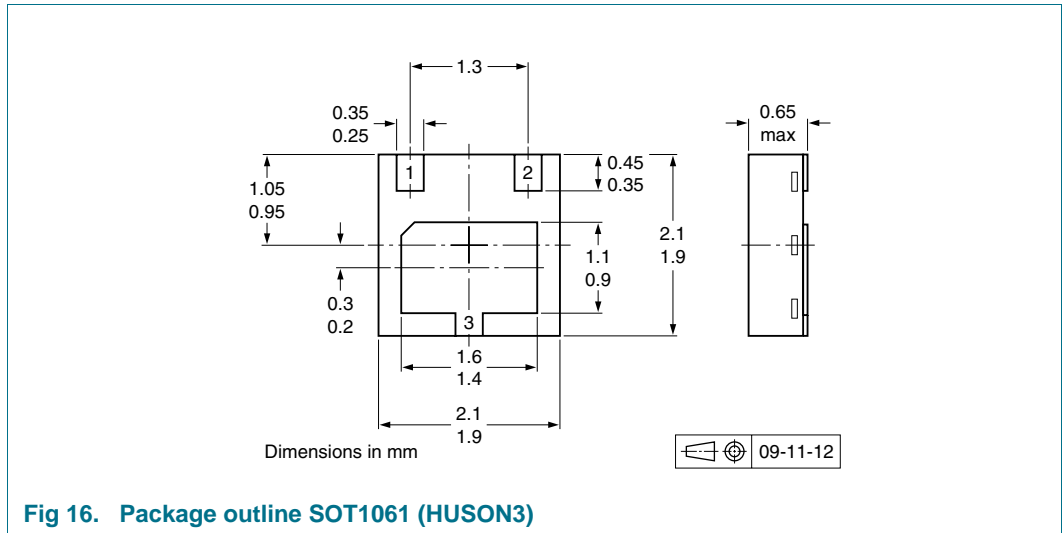


Fig 15. Test circuit for switching times

9. Package outline



10. Packing information

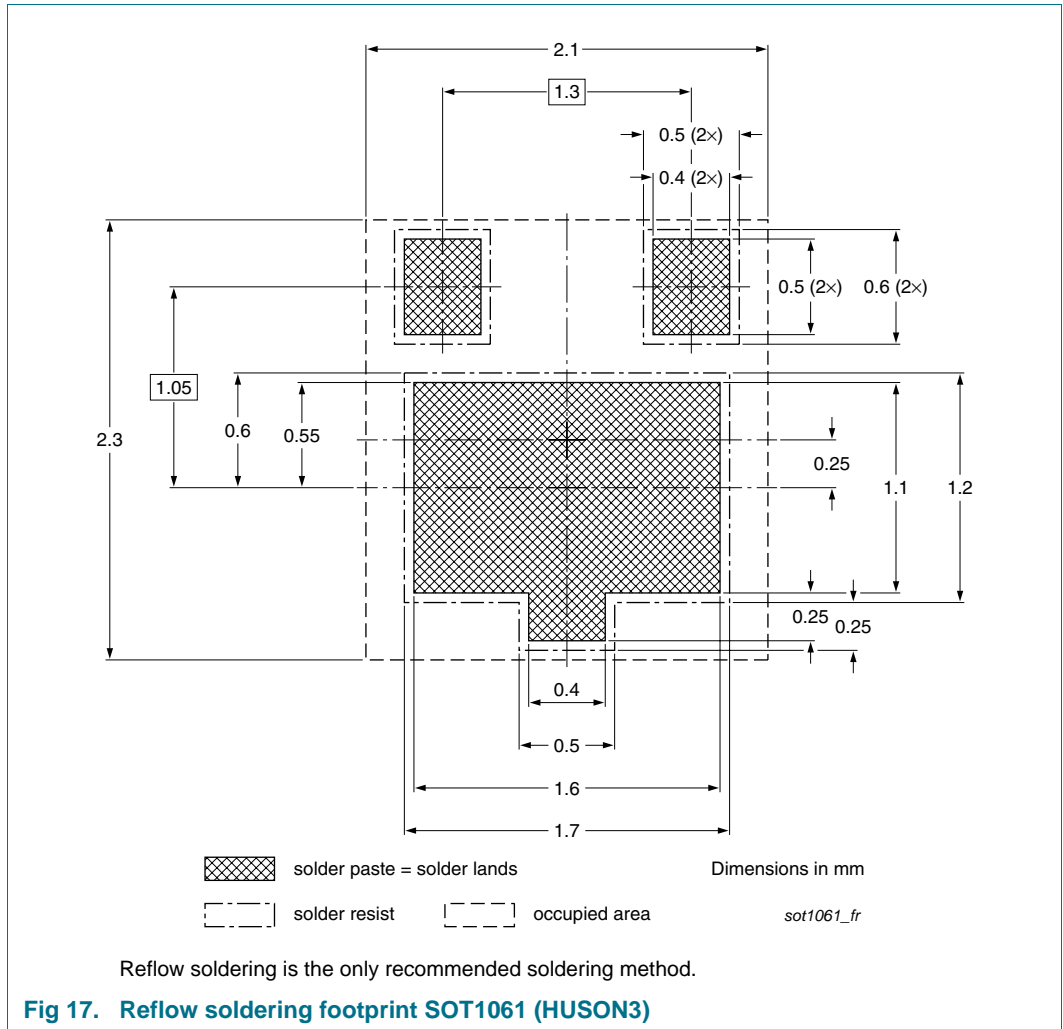
Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

| Type number | Package | Description | Packing quantity |
|-------------|---------|--------------------------------|------------------|
| PBSS4620PA | SOT1061 | 4 mm pitch, 8 mm tape and reel | 3000 |
| | | | -115 |

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

11. Soldering



12. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| PBSS4620PA v.1 | 20100518 | Product data sheet | - | - |

13. Legal information

13.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | 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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