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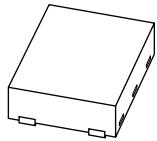
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Kind regards,

Team Nexperia



PBSS5560PA

60 V, 5 A PNP low V_{CEsat} (BISS) transistor

Rev. 01 — 21 April 2010

Product data sheet

1. Product profile

1.1 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: PBSS4560PA.

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

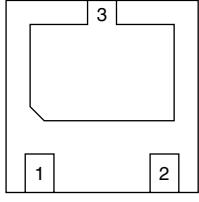
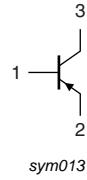
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|-----------------------------------------|--------------------------------------------------|-----|-----|-----|------------------|
| V_{CEO} | collector-emitter voltage | open base | - | - | -60 | V |
| I_C | collector current | | - | - | -5 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1 \text{ ms}$ | - | - | -6 | A |
| R_{CEsat} | collector-emitter saturation resistance | $I_C = -5 \text{ A};$ $I_B = -250 \text{ mA}$ | [1] | - | 55 | $\text{m}\Omega$ |

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



2. Pinning information

Table 2. Pinning

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

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|------------------------------------------------------------------------------------------------------------------------|---------|
| | Name | Description | Version |
| PBSS5560PA | HUSON3 | plastic thermal enhanced ultra thin small outline package; no leads; three terminals; body $2 \times 2 \times 0.65$ mm | SOT1061 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS5560PA | AC |

5. Limiting values

Table 5. Limiting values

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

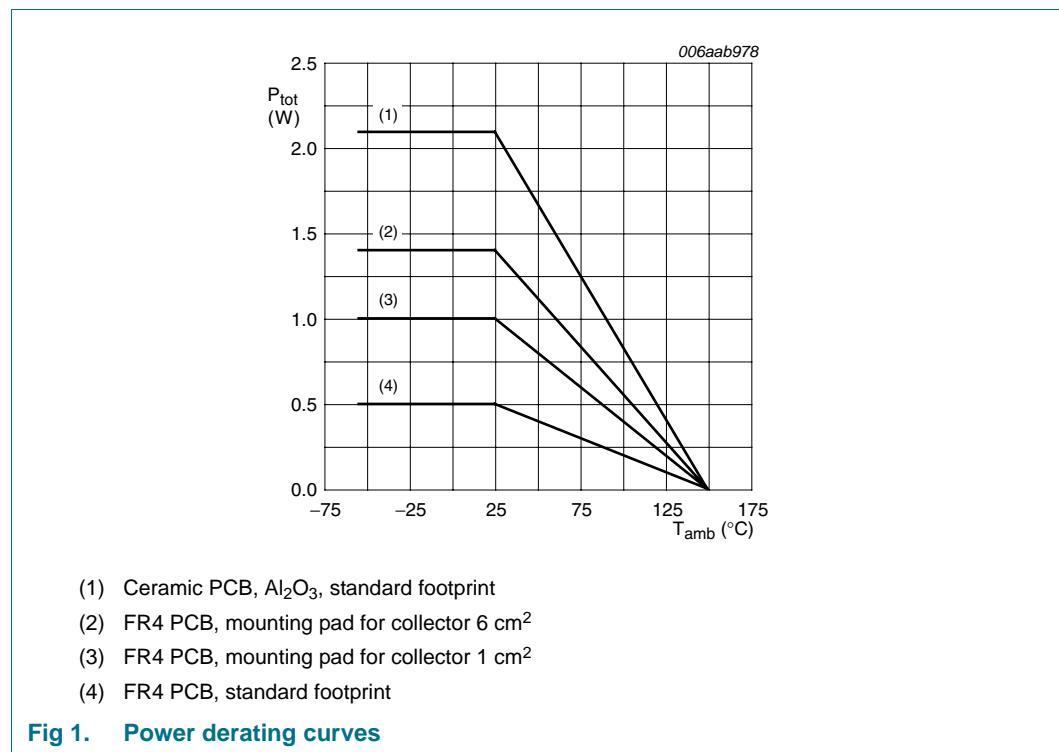
| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|---------------------------|----------------------------------|-----|------|------|
| V_{CBO} | collector-base voltage | open emitter | - | -60 | V |
| V_{CEO} | collector-emitter voltage | open base | - | -60 | V |
| V_{EBO} | emitter-base voltage | open collector | - | -7 | V |
| I_C | collector current | | - | -5 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | -6 | 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 cm^2 .[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2 .[4] Device mounted on a ceramic PCB, Al_2O_3 , standard footprint.

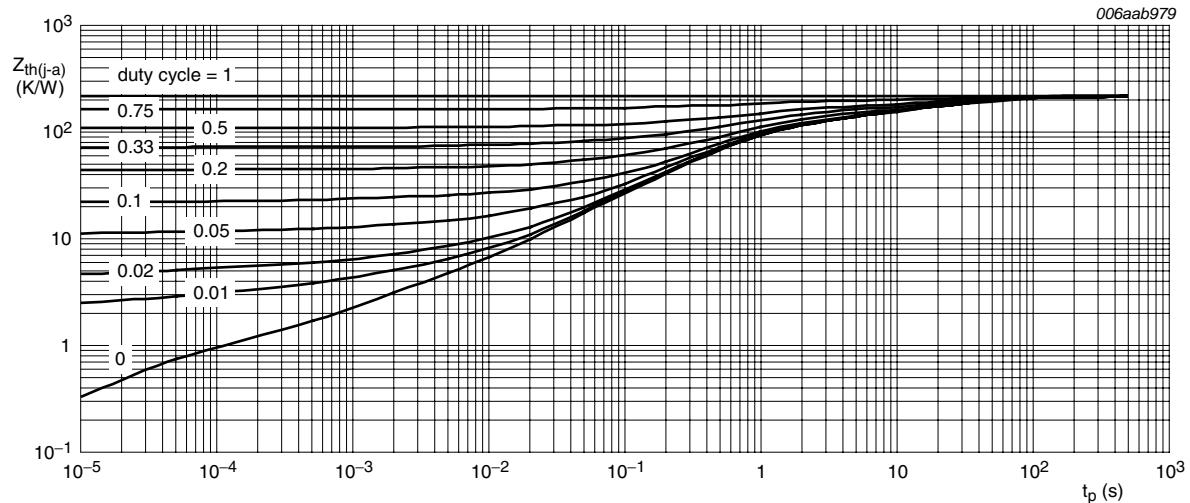
6. Thermal characteristics

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 |

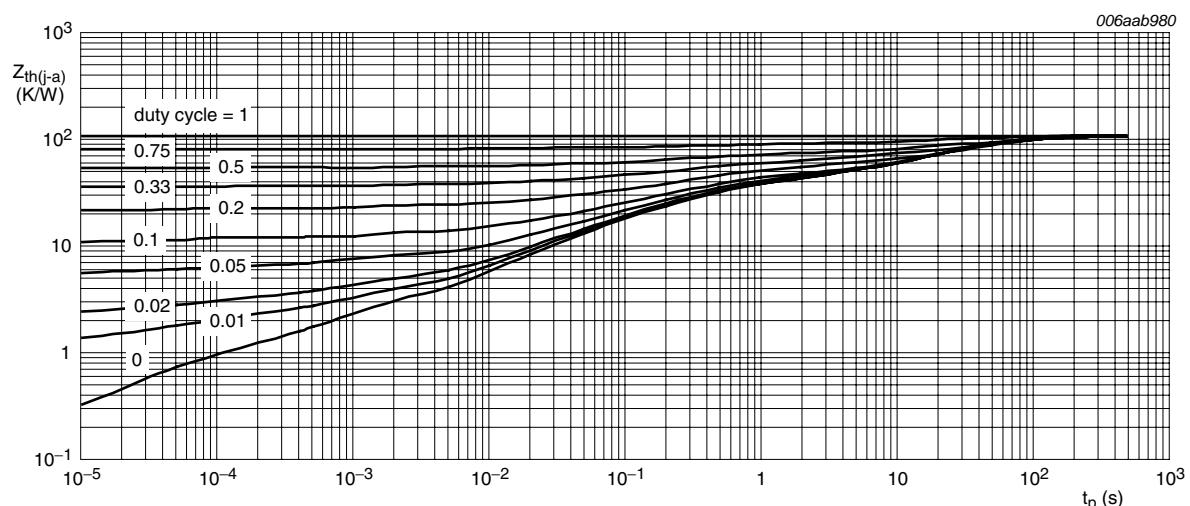
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2 .[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2 .[4] Device mounted on a ceramic PCB, Al_2O_3 , standard footprint.



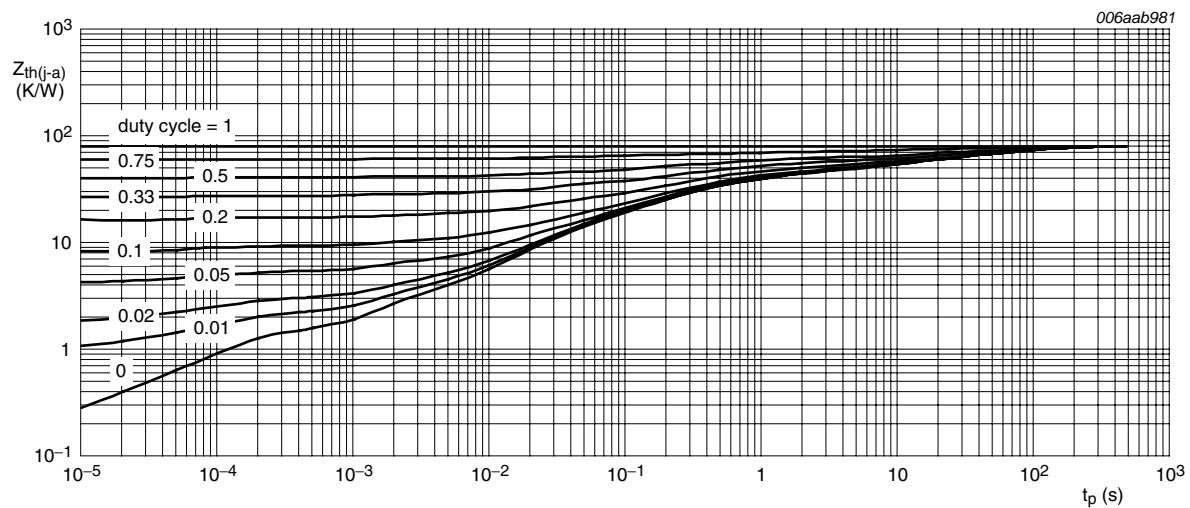
FR4 PCB, standard footprint

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



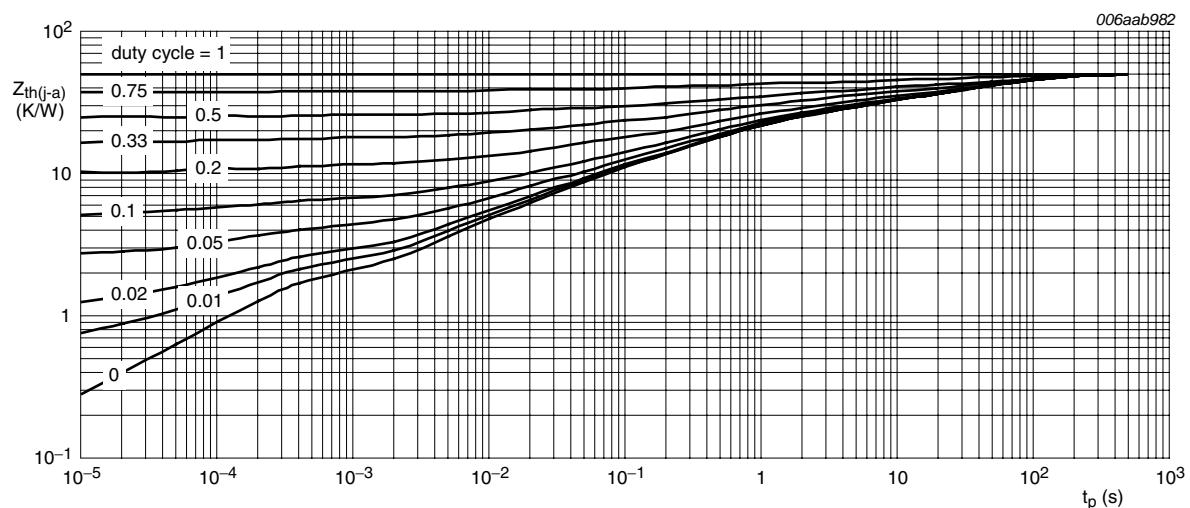
FR4 PCB, mounting pad for collector 1 cm^2

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



FR4 PCB, mounting pad for collector 6 cm^2

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



Ceramic PCB, Al_2O_3 , standard footprint

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

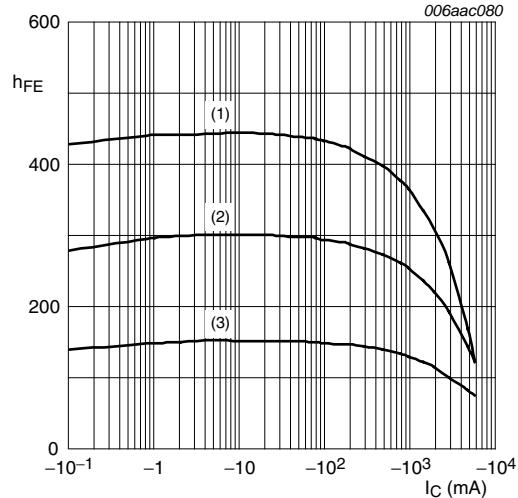
7. Characteristics

Table 7. Characteristics

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

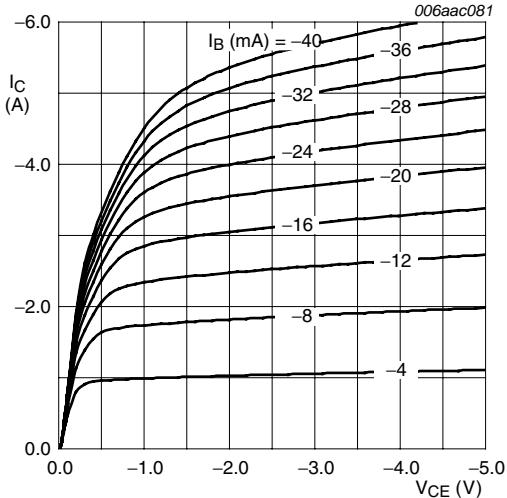
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|-------------|-----------------------------------------|--------------------------------------------------------------------|-----|-----|-------|---------------|------------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -48\text{ V}; I_E = 0\text{ A}$ | - | - | -100 | nA | |
| | | $V_{CB} = -48\text{ V}; I_E = 0\text{ A}; T_j = 150^\circ\text{C}$ | - | - | -50 | μA | |
| I_{CES} | collector-emitter cut-off current | $V_{CE} = -48\text{ V}; V_{BE} = 0\text{ V}$ | - | - | -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] | | | | |
| | | $I_C = -0.5\text{ A}$ | 180 | 265 | - | | |
| | | $I_C = -1\text{ A}$ | 170 | 245 | - | | |
| | | $I_C = -2\text{ A}$ | 150 | 215 | - | | |
| | | $I_C = -5\text{ A}$ | 90 | 135 | - | | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -0.5\text{ A}; I_B = -50\text{ mA}$ | [1] | - | -35 | -55 | mV |
| | | $I_C = -1\text{ A}; I_B = -50\text{ mA}$ | [1] | - | -65 | -105 | mV |
| | | $I_C = -1\text{ A}; I_B = -10\text{ mA}$ | [1] | - | -145 | -230 | mV |
| | | $I_C = -4\text{ A}; I_B = -400\text{ mA}$ | [1] | - | -180 | -300 | mV |
| | | $I_C = -5\text{ A}; I_B = -250\text{ mA}$ | [1] | - | -280 | -450 | mV |
| R_{CEsat} | collector-emitter saturation resistance | $I_C = -5\text{ A}; I_B = -250\text{ mA}$ | [1] | - | 55 | 90 | $\text{m}\Omega$ |
| V_{BEsat} | base-emitter saturation voltage | $I_C = -1\text{ A}; I_B = -10\text{ mA}$ | [1] | - | -0.75 | -0.9 | V |
| | | $I_C = -5\text{ A}; I_B = -250\text{ mA}$ | [1] | - | -0.95 | -1.1 | V |
| V_{BEon} | base-emitter turn-on voltage | $V_{CE} = -2\text{ V}; I_C = -2\text{ A}$ | [1] | - | -0.75 | -0.9 | V |
| t_d | delay time | $V_{CC} = -9\text{ V}; I_C = -2\text{ A}$ | - | 20 | - | ns | |
| t_r | rise time | $I_{Bon} = -0.1\text{ A}; I_{Boff} = 0.1\text{ A}$ | - | 68 | - | ns | |
| t_{on} | turn-on time | | - | 88 | - | ns | |
| t_s | storage time | | - | 350 | - | ns | |
| t_f | fall time | | - | 60 | - | ns | |
| t_{off} | turn-off time | | - | 410 | - | ns | |
| f_T | transition frequency | $V_{CE} = -10\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz}$ | 55 | 90 | - | MHz | |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$ | - | 65 | 80 | pF | |

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



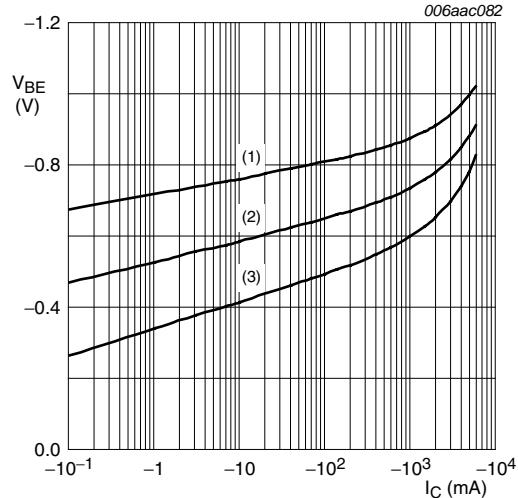
$V_{CE} = -2 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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



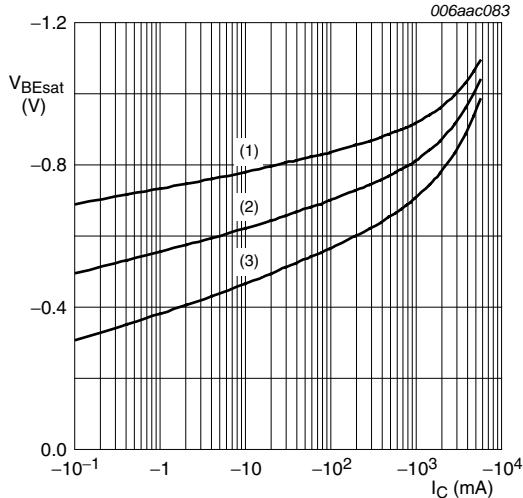
$T_{amb} = 25 \text{ }^{\circ}\text{C}$

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



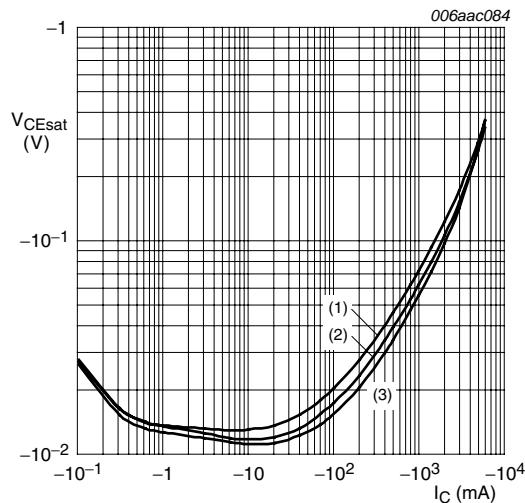
$V_{CE} = -2 \text{ V}$
 (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



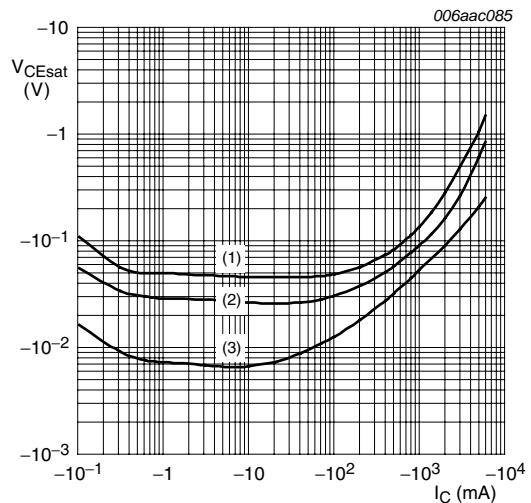
$I_C/I_B = 20$
 (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



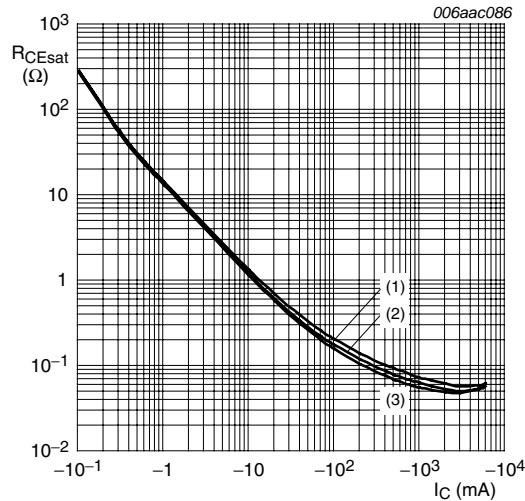
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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



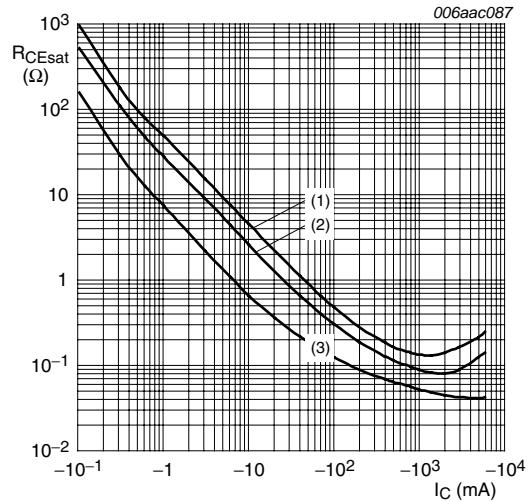
$T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

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



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

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



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

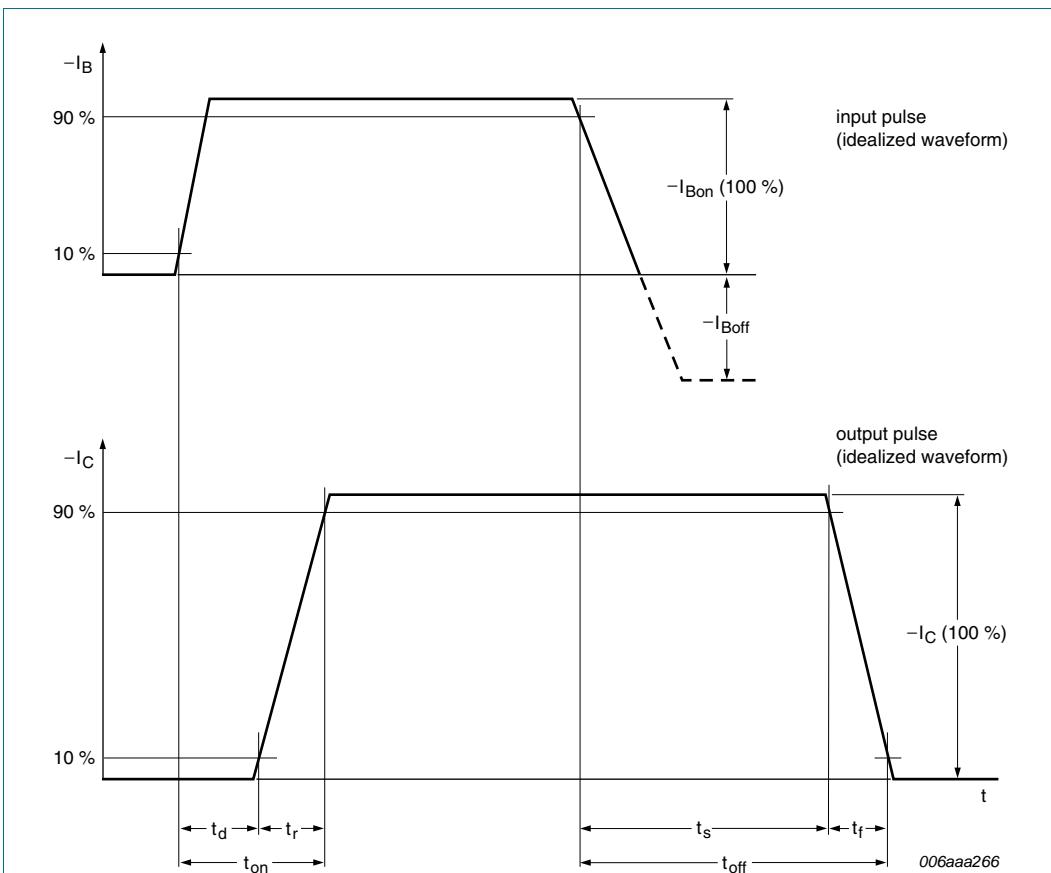
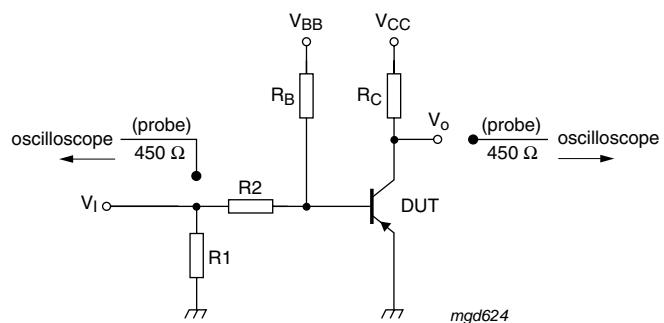


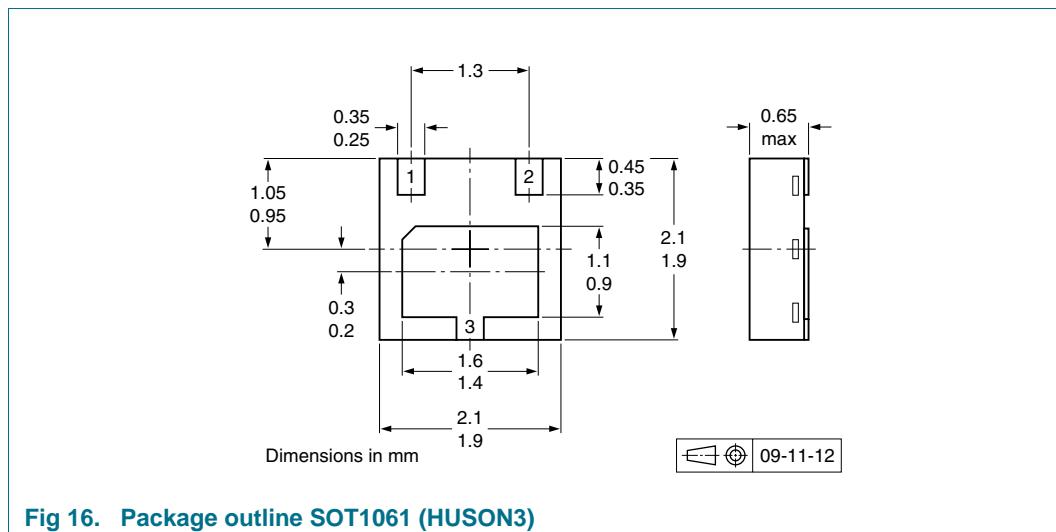
Fig 14. BISS transistor switching time definition



$V_{CC} = -9$ V; $I_C = -2$ A; $I_{Bon} = -0.1$ A; $I_{Boff} = 0.1$ A

Fig 15. Test circuit for switching times

9. Package outline



10. Packing information

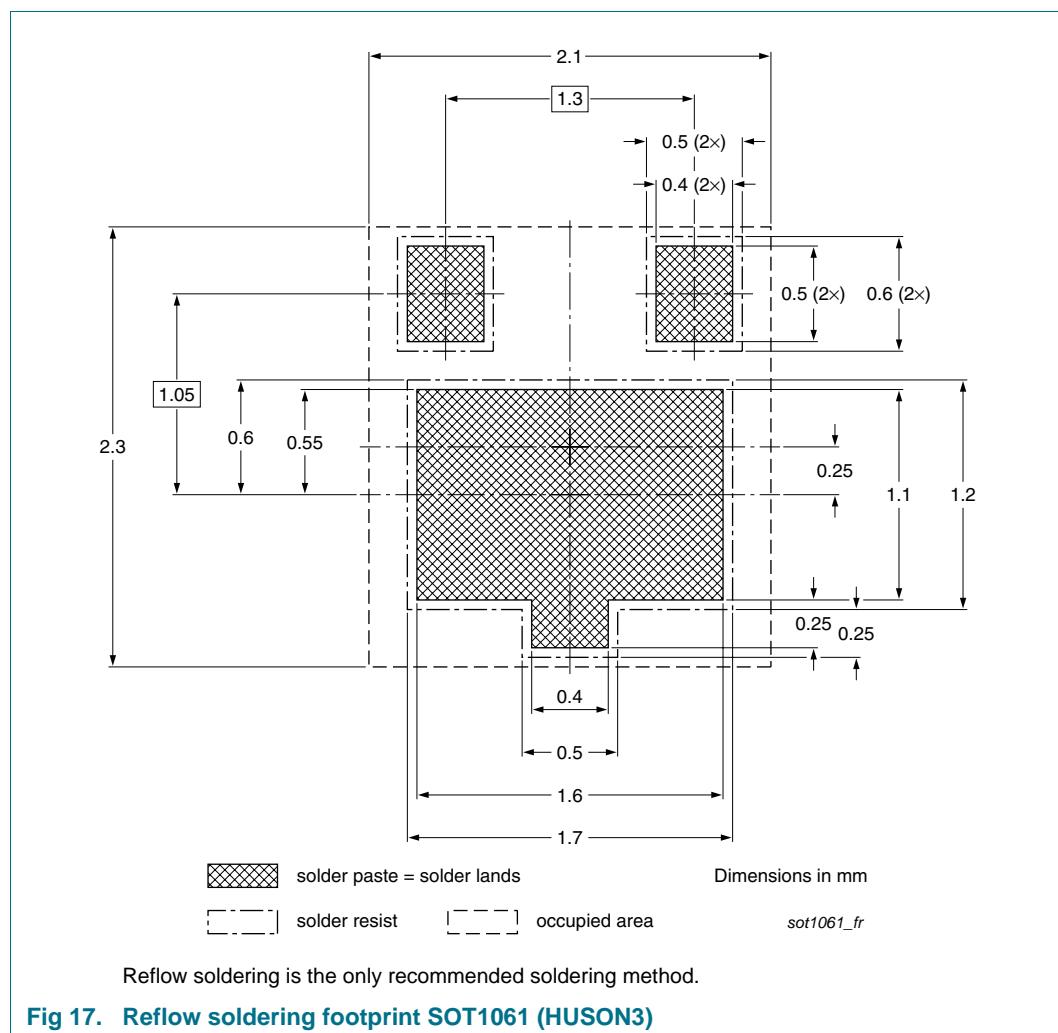
Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

| Type number | Package | Description | Packing quantity |
|-------------|---------|--------------------------------|------------------|
| PBSS5560PA | 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 |
|--------------|--------------|--------------------|---------------|------------|
| PBSS5560PA_1 | 20100421 | 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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[2] The term 'short data sheet' is explained in section "Definitions".

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