



PBSS5160PAP

60 V, 1 A PNP/PNP low V_{CEsat} (BISS) transistor

23 January 2013

Product data sheet

1. General description

PNP/PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a leadless medium power DFN2020-6 (SOT1118) Surface-Mounted Device (SMD) plastic package.

NPN/PNP complement: PBSS4160PANP. NPN/NPN complement: PBSS4160PAN.

2. Features and benefits

- Very low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High collector current gain h_{FE} at high I_C
- Reduced Printed-Circuit Board (PCB) requirements
- High energy efficiency due to less heat generation
- AEC-Q101 qualified

3. Applications

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

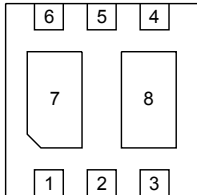
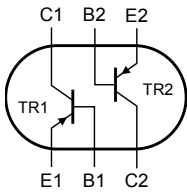
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---|--|-----|-----|------|------|
| Per transistor | | | | | | |
| V _{CEO} | collector-emitter voltage | open base | - | - | -60 | V |
| I _C | collector current | | - | - | -1 | A |
| I _{CM} | peak collector current | single pulse; t _p ≤ 1 ms | - | - | -1.5 | A |
| Per transistor | | | | | | |
| R _{CEsat} | collector-emitter saturation resistance | I _C = -0.5 A; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | - | 360 | mΩ |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|---------------|--|---|
| 1 | E1 | emitter TR1 |  <p>Transparent top view DFN2020-6 (SOT1118)</p> |  <p>sym138</p> |
| 2 | B1 | base TR1 | | |
| 3 | C2 | collector TR2 | | |
| 4 | E2 | emitter TR2 | | |
| 5 | B2 | base TR2 | | |
| 6 | C1 | collector TR1 | | |
| 7 | C1 | collector TR1 | | |
| 8 | C2 | collector TR2 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|-----------|--|---------|
| | Name | Description | Version |
| PBSS5160PAP | DFN2020-6 | plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body 2 x 2 x 0.65 mm | SOT1118 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBSS5160PAP | 2L |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------------------|---------------------------|-------------------------------|-----|------|------|
| Per transistor | | | | | |
| 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 | | - | -1 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | -1.5 | A |
| I_B | base current | | - | -0.3 | A |

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-------------------|-------------------------|-------------------------------|-----|-----|------|------|
| I_{BM} | peak base current | single pulse; $t_p \leq 1$ ms | | - | -1 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 370 | mW |
| | | | [2] | - | 570 | mW |
| | | | [3] | - | 530 | mW |
| | | | [4] | - | 700 | mW |
| | | | [5] | - | 450 | mW |
| | | | [6] | - | 760 | mW |
| | | | [7] | - | 700 | mW |
| | | | [8] | - | 1450 | mW |
| Per device | | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 510 | mW |
| | | | [2] | - | 780 | mW |
| | | | [3] | - | 730 | mW |
| | | | [4] | - | 960 | mW |
| | | | [5] | - | 620 | mW |
| | | | [6] | - | 1040 | mW |
| | | | [7] | - | 960 | mW |
| | | | [8] | - | 2000 | 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 PCB, single-sided 35 μ m copper strip line, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided 35 μ m copper strip line, tin-plated, mounting pad for collector 1 cm².

[3] Device mounted on 4-layer PCB 35 μ m copper strip line, tin-plated and standard footprint.

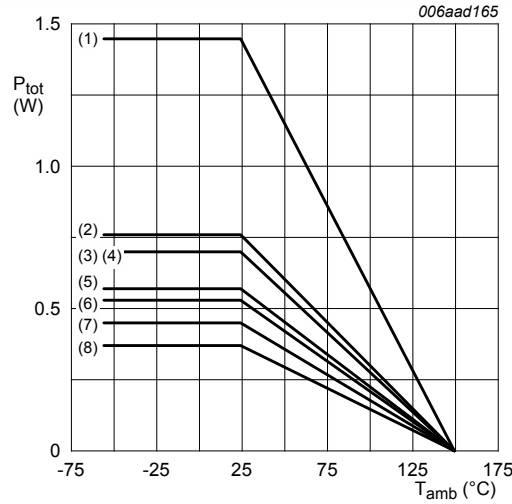
[4] Device mounted on 4-layer PCB 35 μ m copper strip line, tin-plated, mounting pad for collector 1 cm².

[5] Device mounted on an FR4 PCB, single-sided 70 μ m copper strip line, tin-plated and standard footprint.

[6] Device mounted on an FR4 PCB, single-sided 70 μ m copper strip line, tin-plated, mounting pad for collector 1 cm².

[7] Device mounted on 4-layer PCB 70 μ m copper strip line, tin-plated and standard footprint.

[8] Device mounted on 4-layer PCB 70 μ m copper strip line, tin-plated, mounting pad for collector 1 cm².



- (1) 4-layer PCB 70 μm, mounting pad for collector 1 cm²
- (2) FR4 PCB 70 μm, mounting pad for collector 1 cm²
- (3) 4-layer PCB 70 μm, standard footprint
- (4) 4-layer PCB 35 μm, mounting pad for collector 1 cm²
- (5) FR4 PCB 35 μm, mounting pad for collector 1 cm²
- (6) 4-layer PCB 35 μm, standard footprint
- (7) FR4 PCB 70 μm, standard footprint
- (8) FR4 PCB 35 μm, standard footprint

Fig. 1. Per transistor: power derating curves

9. Thermal characteristics

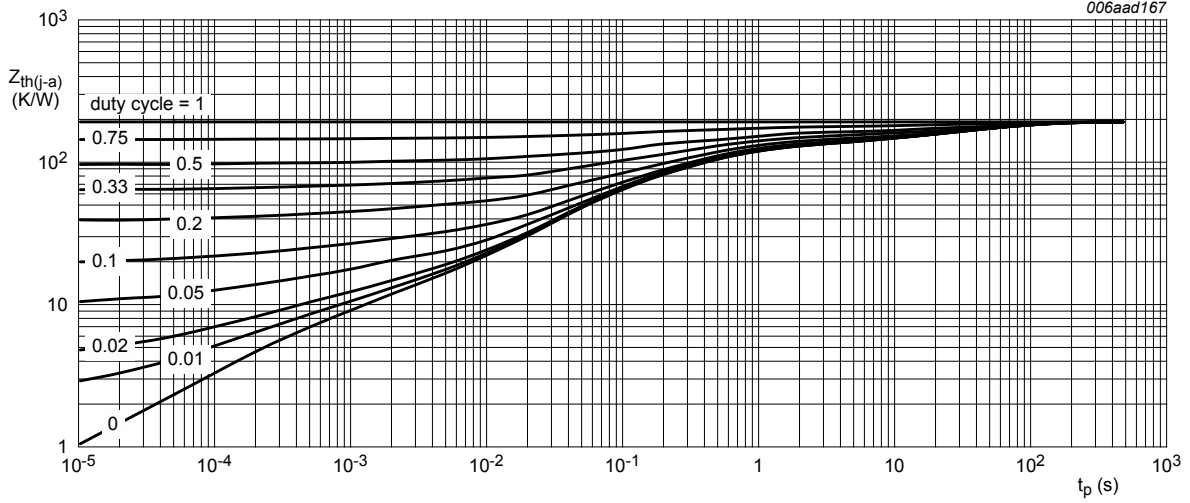
Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|-----------------------|--|-------------|-----|-----|-----|------|-----|
| Per transistor | | | | | | | |
| R _{th(j-a)} | thermal resistance from junction to ambient | in free air | [1] | - | - | 338 | K/W |
| | | | [2] | - | - | 219 | K/W |
| | | | [3] | - | - | 236 | K/W |
| | | | [4] | - | - | 179 | K/W |
| | | | [5] | - | - | 278 | K/W |
| | | | [6] | - | - | 164 | K/W |
| | | | [7] | - | - | 179 | K/W |
| | | | [8] | - | - | 86 | K/W |
| R _{th(j-sp)} | thermal resistance from junction to solder point | | - | - | 30 | K/W | |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|----------------------|---|-------------|-----|-----|-----|-----|------|
| Per device | | | | | | | |
| R _{th(j-a)} | thermal resistance from junction to ambient | in free air | [1] | - | - | 245 | K/W |
| | | | [2] | - | - | 160 | K/W |
| | | | [3] | - | - | 171 | K/W |
| | | | [4] | - | - | 130 | K/W |
| | | | [5] | - | - | 202 | K/W |
| | | | [6] | - | - | 120 | K/W |
| | | | [7] | - | - | 130 | K/W |
| | | | [8] | - | - | 63 | K/W |

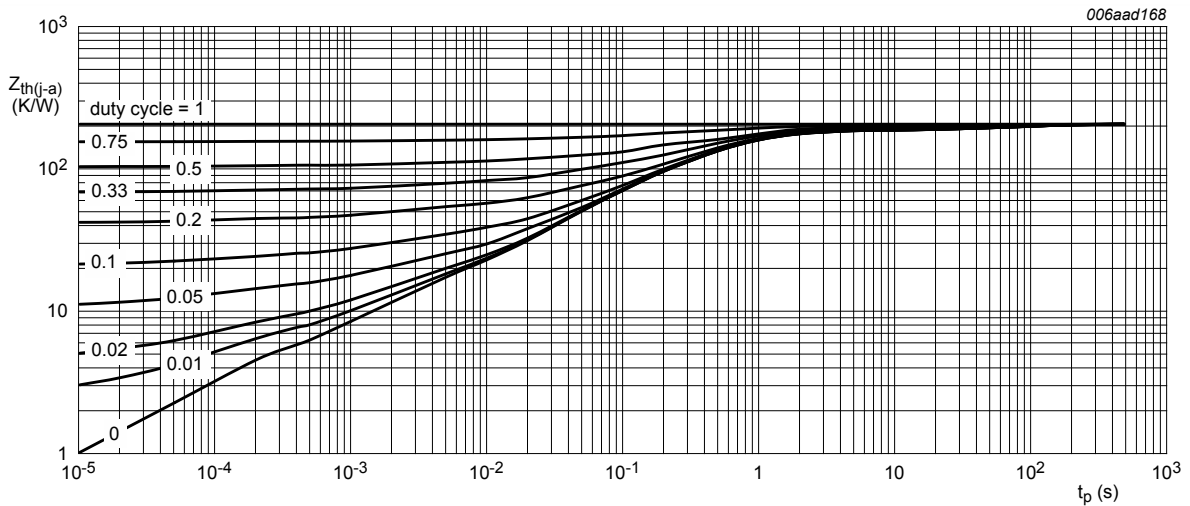
- [1] Device mounted on an FR4 PCB, single-sided 35 µm copper strip line, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided 35 µm copper strip line, tin-plated, mounting pad for collector 1 cm².
- [3] Device mounted on 4-layer PCB 35 µm copper strip line, tin-plated and standard footprint.
- [4] Device mounted on 4-layer PCB 35 µm copper strip line, tin-plated, mounting pad for collector 1 cm².
- [5] Device mounted on an FR4 PCB, single-sided 70 µm copper strip line, tin-plated and standard footprint.
- [6] Device mounted on an FR4 PCB, single-sided 70 µm copper strip line, tin-plated, mounting pad for collector 1 cm².
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- [8] Device mounted on 4-layer PCB 70 µm copper strip line, tin-plated, mounting pad for collector 1 cm².





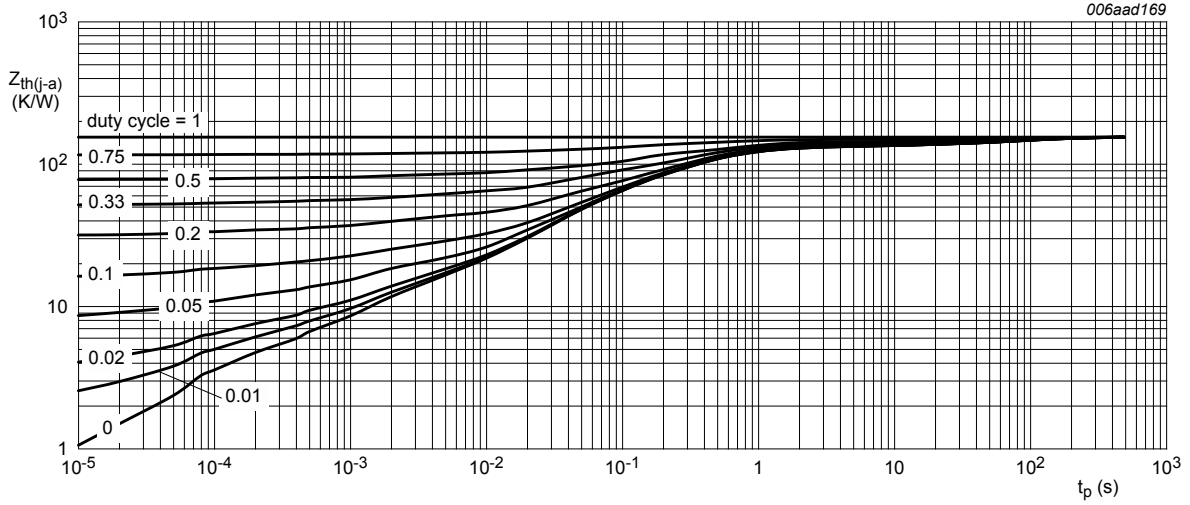
FR4 PCB 35 μm , mounting pad for collector 1 cm^2

Fig. 3. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values



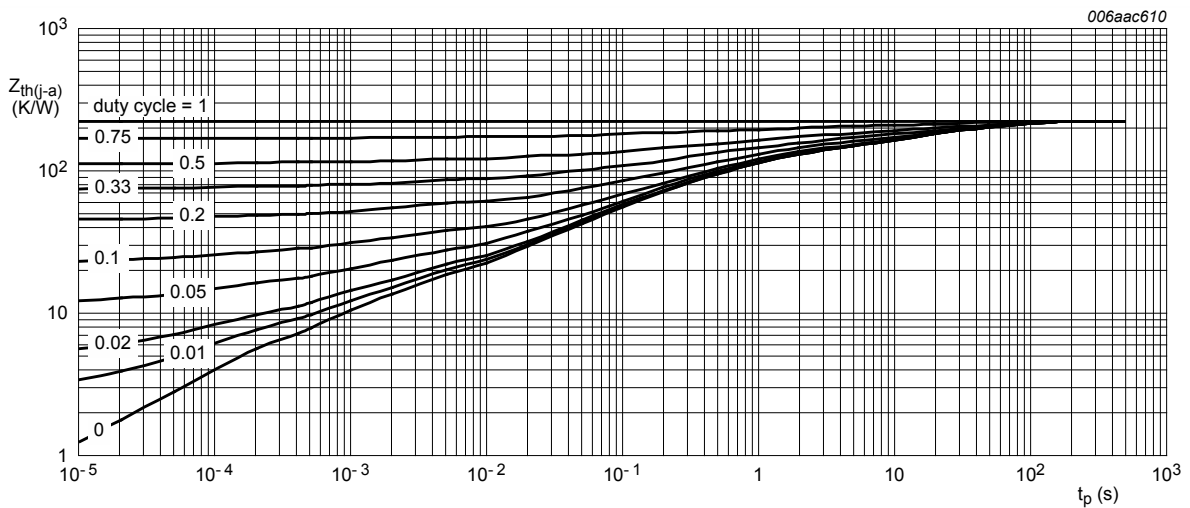
4-layer PCB 35 μm , standard footprint

Fig. 4. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values



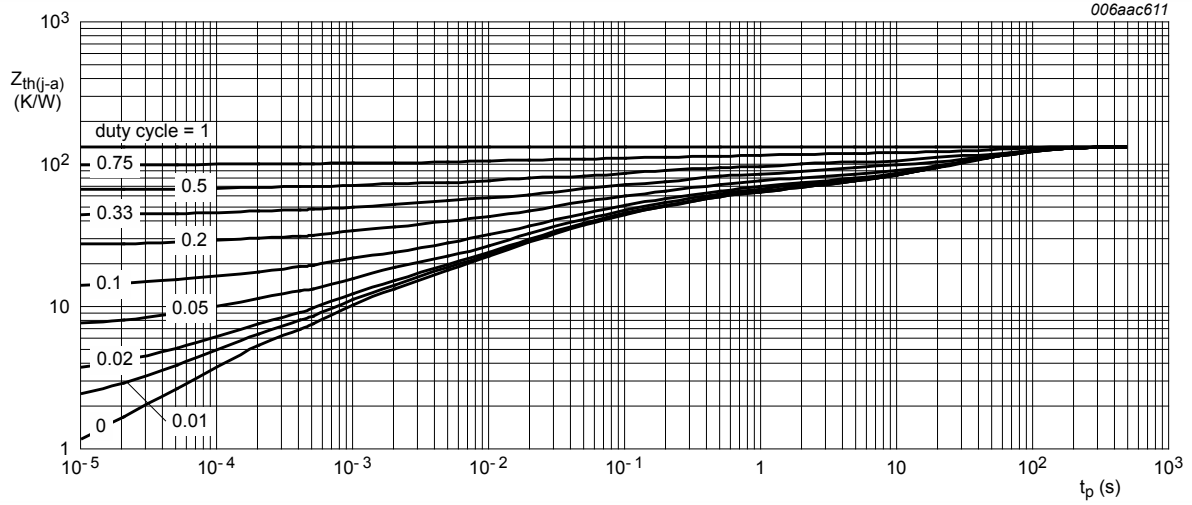
4-layer PCB 35 μ m, mounting pad for collector 1 cm²

Fig. 5. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values



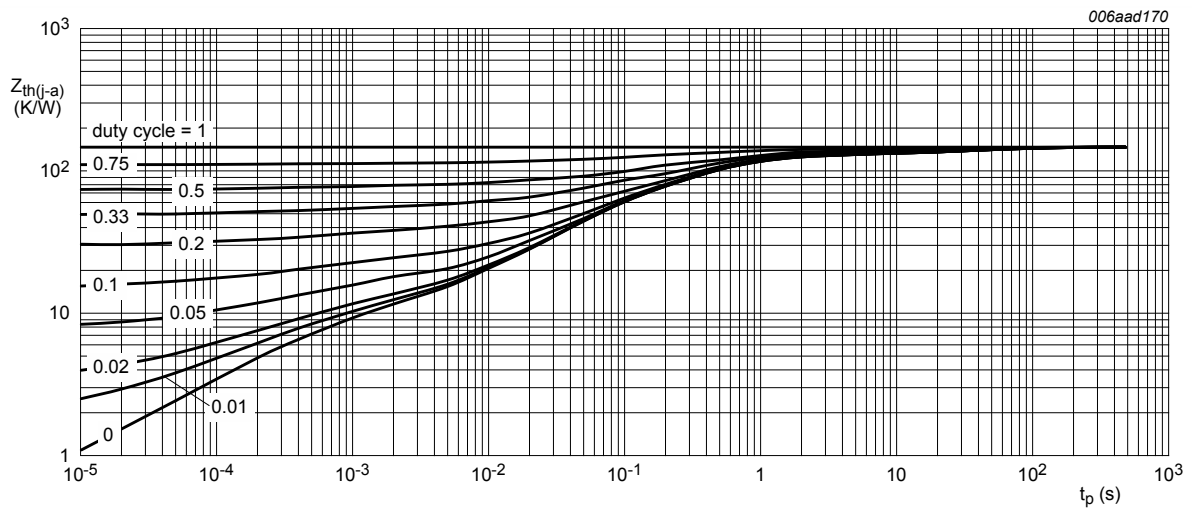
FR4 PCB 70 μ m, standard footprint

Fig. 6. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values



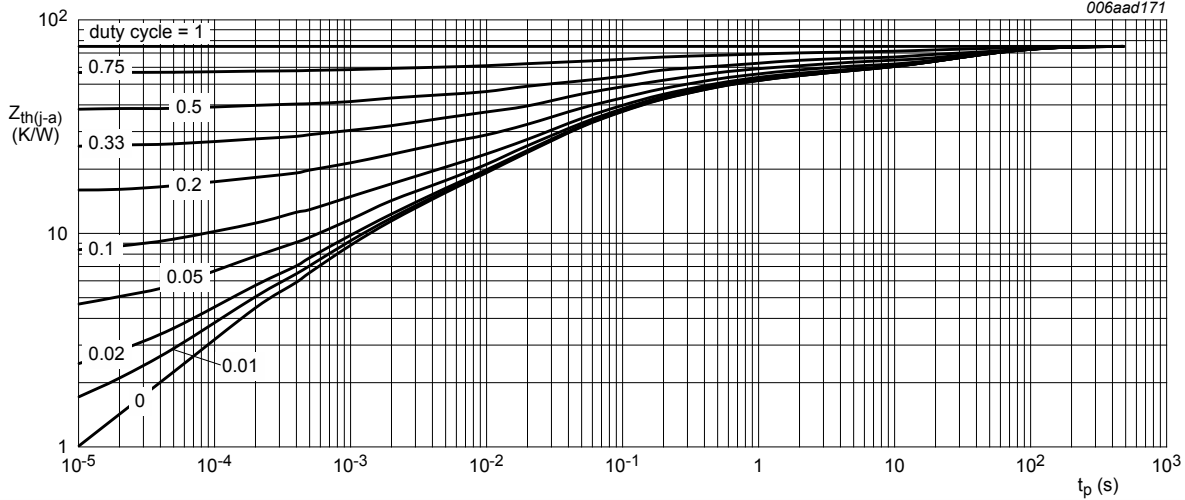
FR4 PCB 70 μm , mounting pad for collector 1 cm^2

Fig. 7. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values



4-layer PCB 70 μm , standard footprint

Fig. 8. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values



4-layer PCB 70 μm, mounting pad for collector 1 cm²

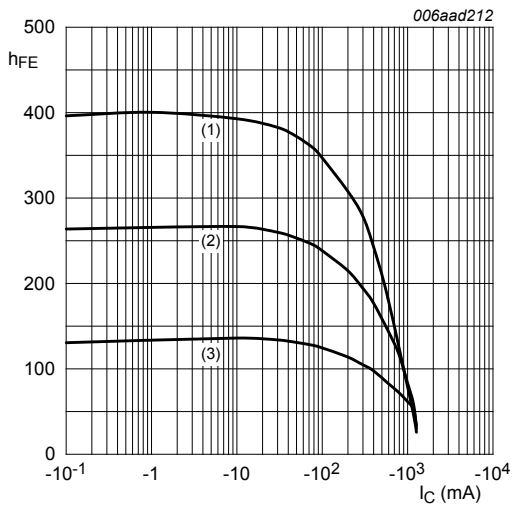
Fig. 9. Per transistor: transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

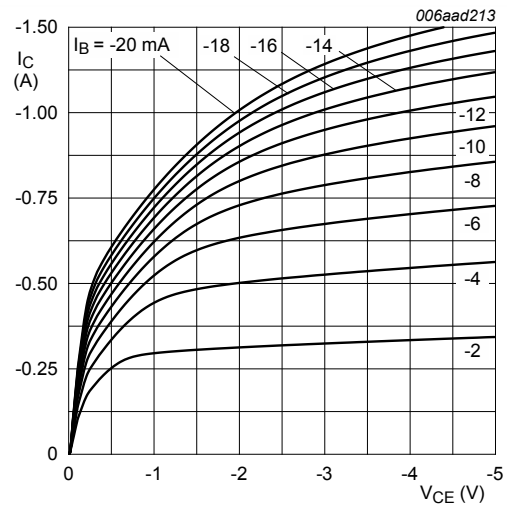
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---|--|-----|------|------|------|
| Per transistor | | | | | | |
| I _{CBO} | collector-base cut-off current | V _{CB} = -48 V; I _E = 0 A; T _{amb} = 25 °C | - | - | -100 | nA |
| | | V _{CB} = -48 V; I _E = 0 A; T _j = 150 °C | - | - | -50 | μA |
| I _{EBO} | emitter-base cut-off current | V _{EB} = -5 V; I _C = 0 A; T _{amb} = 25 °C | - | - | -100 | nA |
| h _{FE} | DC current gain | V _{CE} = -2 V; I _C = -100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | 170 | 245 | - | |
| | | V _{CE} = -2 V; I _C = -500 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | 120 | 170 | - | |
| | | V _{CE} = -2 V; I _C = -1 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | 70 | 100 | - | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = -500 mA; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | -125 | -180 | mV |
| | | I _C = -1 A; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | -390 | -550 | mV |
| | | I _C = -1 A; I _B = -100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | -240 | -340 | mV |
| R _{CEsat} | collector-emitter saturation resistance | I _C = -0.5 A; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C | - | - | 360 | mΩ |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------------|---|--|-----|------|------|
| V_{BEsat} | base-emitter saturation voltage | $I_C = -50\text{ mA}; I_B = -50\text{ mA}; \text{pulsed}; t_p \leq 300\ \mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -1 | V |
| | | $I_C = -1\text{ A}; I_B = -50\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -1 | V |
| | | $I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\ \mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -1.1 | V |
| V_{BEon} | base-emitter turn-on voltage | $V_{CE} = -2\text{ V}; I_C = -0.5\text{ A}; \text{pulsed}; t_p \leq 300\ \mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -0.9 | V |
| t_d | delay time | $V_{CC} = -10\text{ V}; I_C = -0.5\text{ A}; I_{Bon} = -25\text{ mA}; I_{Boff} = 25\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | 15 | - | ns |
| t_r | rise time | | - | 40 | - | ns |
| t_{on} | turn-on time | | - | 55 | - | ns |
| t_s | storage time | | - | 95 | - | ns |
| t_f | fall time | | - | 40 | - | ns |
| t_{off} | turn-off time | | - | 135 | - | ns |
| f_T | transition frequency | | $V_{CE} = -10\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | 65 | 125 | - |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | 9.5 | 13 | 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. 10. DC current gain as a function of collector current; typical values



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

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

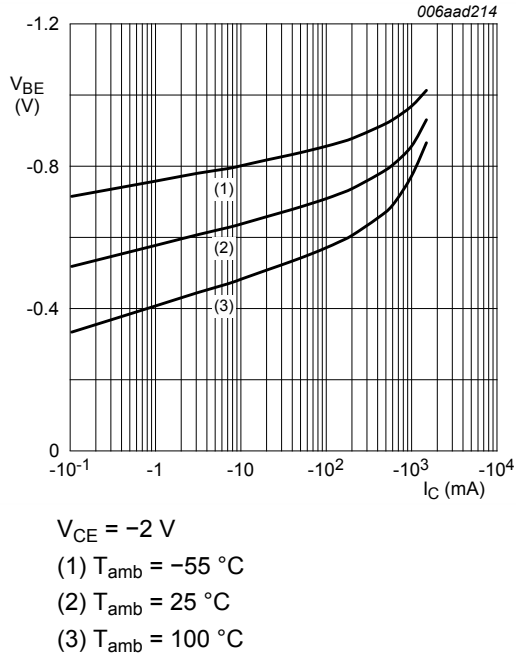


Fig. 12. Base-emitter voltage as a function of collector current; typical values

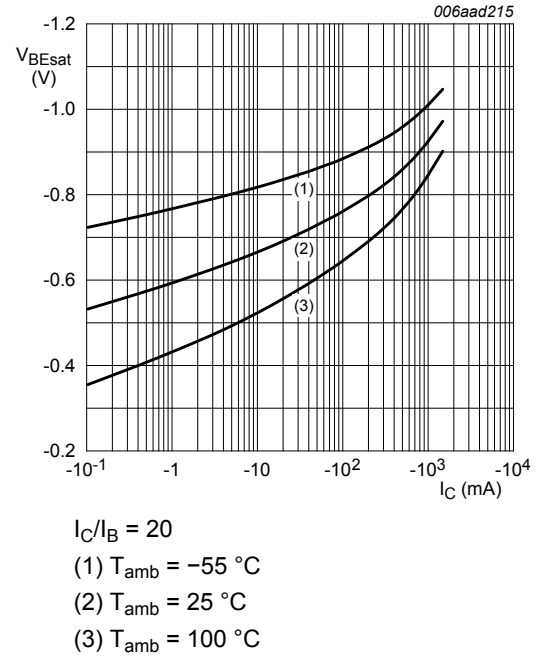


Fig. 13. Base-emitter saturation voltage as a function of collector current; typical values

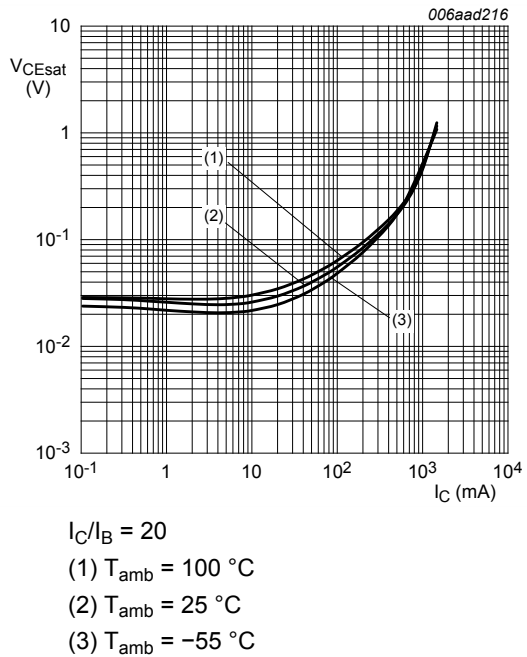


Fig. 14. Collector-emitter saturation voltage as a function of collector current; typical values

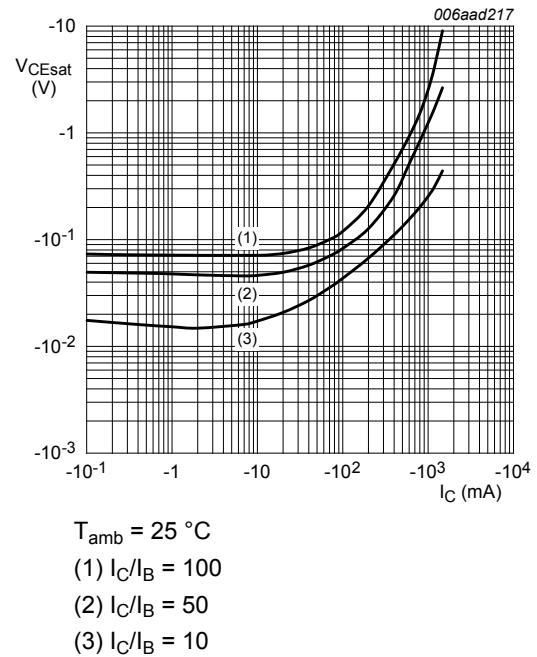
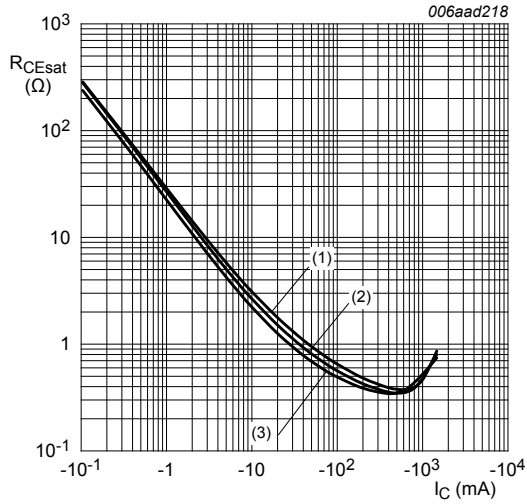
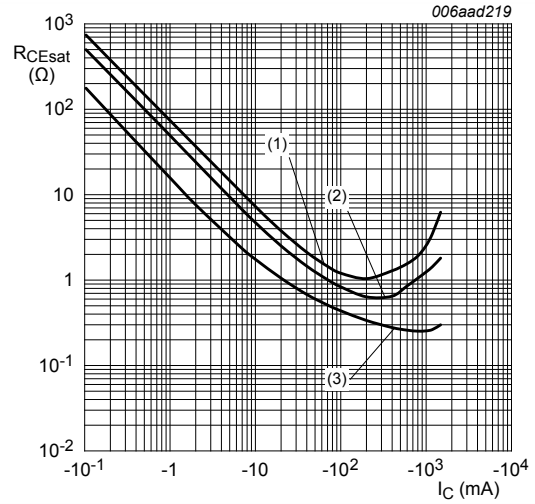


Fig. 15. Collector-emitter saturation voltage as a function of collector current; typical values



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

Fig. 16. 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. 17. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

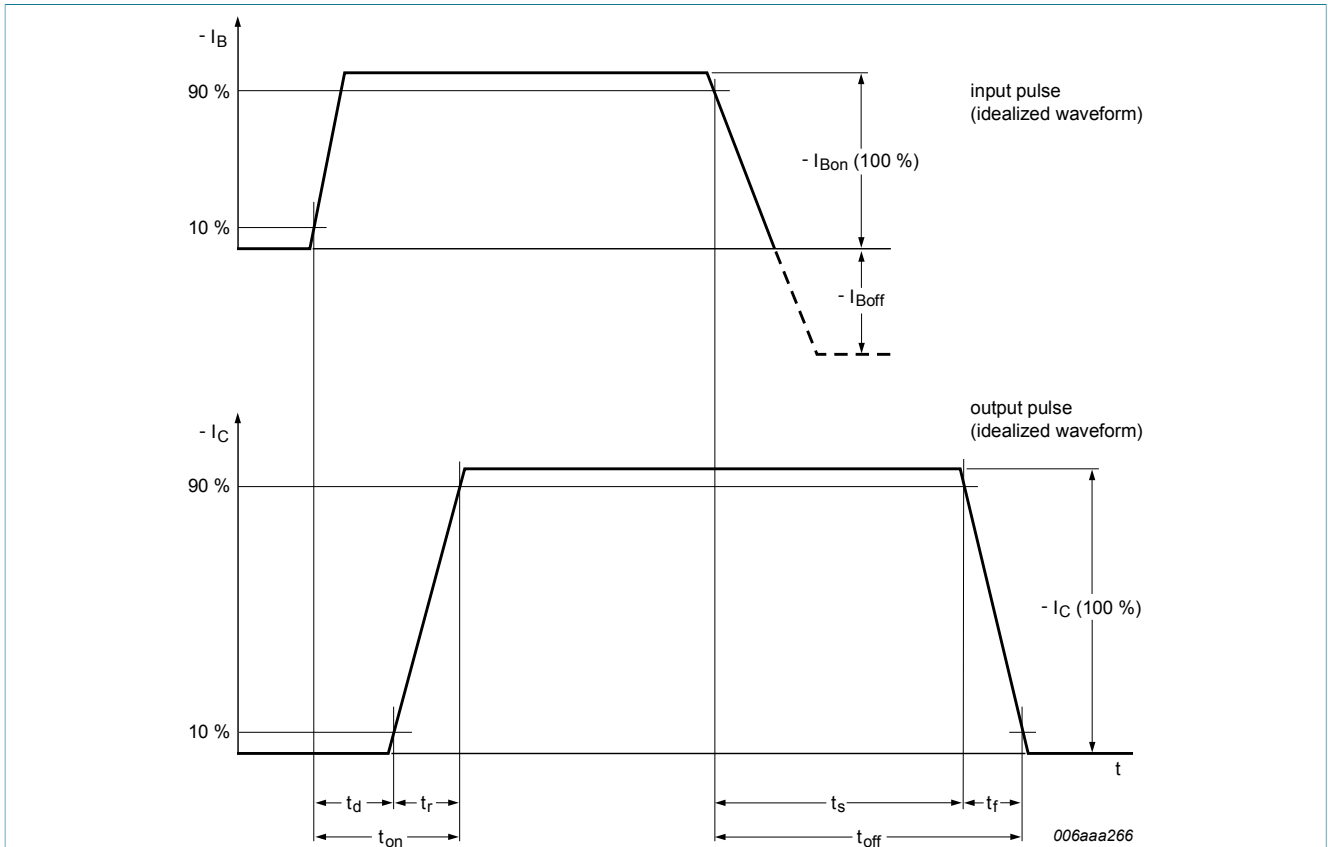


Fig. 18. BISS transistor switching time definition

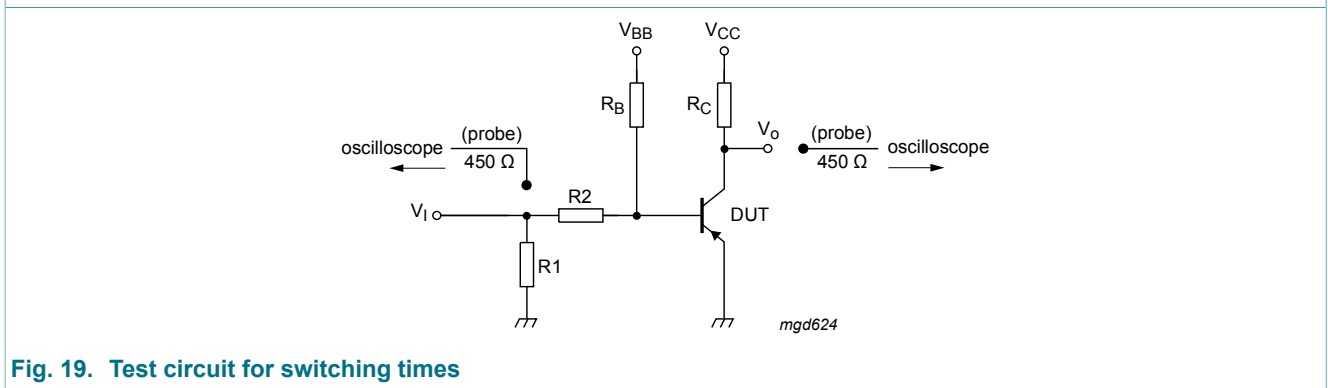


Fig. 19. Test circuit for switching times

11.1 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.

12. Package outline

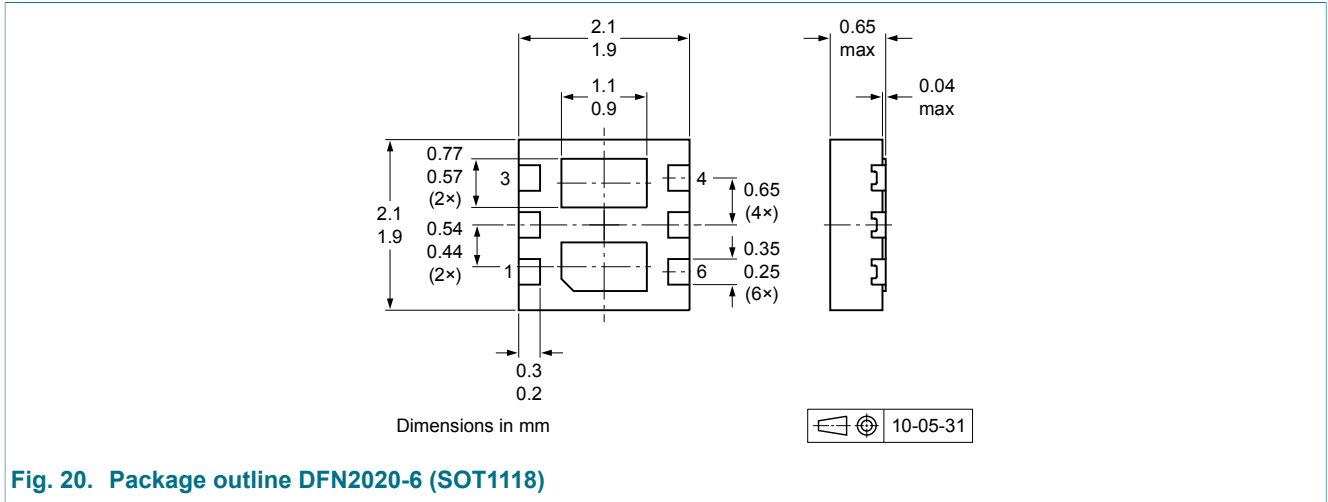


Fig. 20. Package outline DFN2020-6 (SOT1118)

13. Soldering



Fig. 21. Reflow soldering footprint for DFN2020-6 (SOT1118)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| PBSS5160PAP v.1 | 20130123 | Product data sheet | - | - |

15. Legal information

15.1 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. |

- [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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкуренеспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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