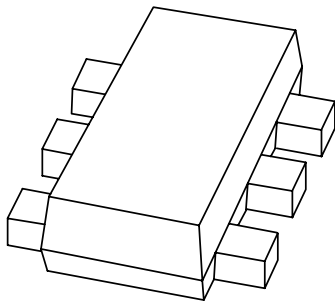


# DATA SHEET



## **PBSS2515VPN**

15 V low  $V_{CE(sat)}$  NPN/PNP  
transistor

Product data sheet  
Supersedes data of 2001 Nov 07

2005 Jan 11

**15 V low  $V_{CE(sat)}$  NPN/PNP transistor****PBSS2515VPN****FEATURES**

- 300 mW total power dissipation
- Very small  $1.6 \times 1.2$  mm ultra thin package
- Excellent coplanarity due to straight leads
- Low collector-emitter saturation voltage
- High current capability
- Improved thermal behaviour due to flat lead
- Replaces two SC75/SC89 packaged low  $V_{CEsat}$  transistors on same PCB area
- Reduces required PCB area
- Reduced pick and place costs.

**APPLICATION**

- General purpose switching and muting
- Low frequency driver circuits
- LCD backlighting
- Audio frequency general purpose amplifier applications
- Battery driven equipment (mobile phones, video cameras and hand-held devices).

**DESCRIPTION**

NPN/PNP low  $V_{CEsat}$  transistor pair in a SOT666 plastic package.

**MARKING**

| TYPE NUMBER | MARKING CODE |
|-------------|--------------|
| PBSS2515VPN | N8           |

**QUICK REFERENCE DATA**

| SYMBOL      | PARAMETER                 | MAX. | UNIT       |
|-------------|---------------------------|------|------------|
| $V_{CEO}$   | collector-emitter voltage | 15   | V          |
| $I_{CM}$    | peak collector current    | 1    | A          |
| $R_{CEsat}$ | equivalent on-resistance  | <500 | m $\Omega$ |

**PINNING**

| PIN  | DESCRIPTION        |
|------|--------------------|
| 1, 4 | emitter TR1; TR2   |
| 2, 5 | base TR1; TR2      |
| 6, 3 | collector TR1; TR2 |

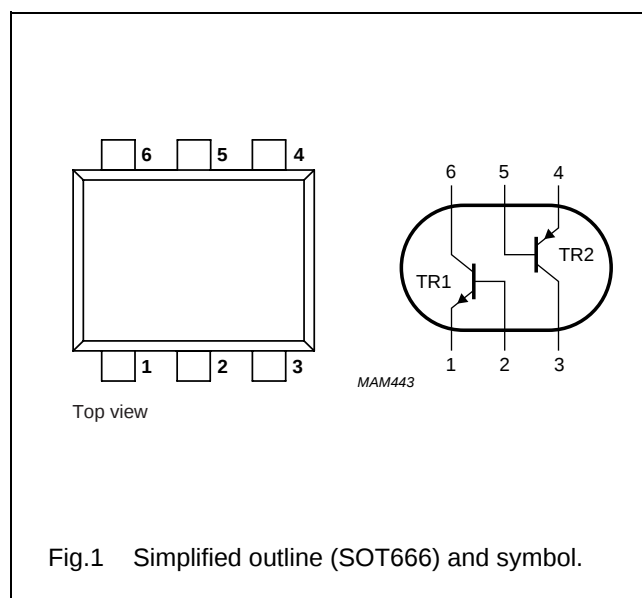


Fig.1 Simplified outline (SOT666) and symbol.

**ORDERING INFORMATION**

| TYPE NUMBER | PACKAGE |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | NAME    | DESCRIPTION                              | VERSION |
| PBSS2515VPN | –       | plastic surface mounted package; 6 leads | SOT666  |

15 V low  $V_{CE(sat)}$  NPN/PNP transistor

## PBSS2515VPN

**LIMITING VALUES**

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

| SYMBOL                                                               | PARAMETER                     | CONDITIONS                           | MIN. | MAX. | UNIT |
|----------------------------------------------------------------------|-------------------------------|--------------------------------------|------|------|------|
| <b>Per transistor; for the PNP transistor with negative polarity</b> |                               |                                      |      |      |      |
| $V_{CBO}$                                                            | collector-base voltage        | open emitter                         | –    | 15   | V    |
| $V_{CEO}$                                                            | collector-emitter voltage     | open base                            | –    | 15   | V    |
| $V_{EBO}$                                                            | emitter-base voltage          | open collector                       | –    | 6    | V    |
| $I_C$                                                                | collector current (DC)        |                                      | –    | 500  | mA   |
| $I_{CM}$                                                             | peak collector current        |                                      | –    | 1    | A    |
| $I_{BM}$                                                             | peak base current             |                                      | –    | 100  | mA   |
| $P_{tot}$                                                            | total power dissipation       | $T_{amb} \leq 25\text{ °C}$ ; note 1 | –    | 200  | mW   |
| $T_{stg}$                                                            | storage temperature           |                                      | –65  | +150 | °C   |
| $T_j$                                                                | junction temperature          |                                      | –    | 150  | °C   |
| $T_{amb}$                                                            | operating ambient temperature |                                      | –65  | +150 | °C   |
| <b>Per device</b>                                                    |                               |                                      |      |      |      |
| $P_{tot}$                                                            | total power dissipation       | $T_{amb} \leq 25\text{ °C}$ ; note 1 | –    | 300  | mW   |

**Note**

1. Transistor mounted on an FR4 printed-circuit board.

**THERMAL CHARACTERISTICS**

| SYMBOL        | PARAMETER                                   | CONDITIONS    | VALUE | UNIT |
|---------------|---------------------------------------------|---------------|-------|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | notes 1 and 2 | 416   | K/W  |

**Notes**

1. Transistor mounted on an FR4 printed-circuit board.
2. The only recommended soldering method is reflow soldering.

15 V low  $V_{CE(sat)}$  NPN/PNP transistor

## PBSS2515VPN

## CHARACTERISTICS

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

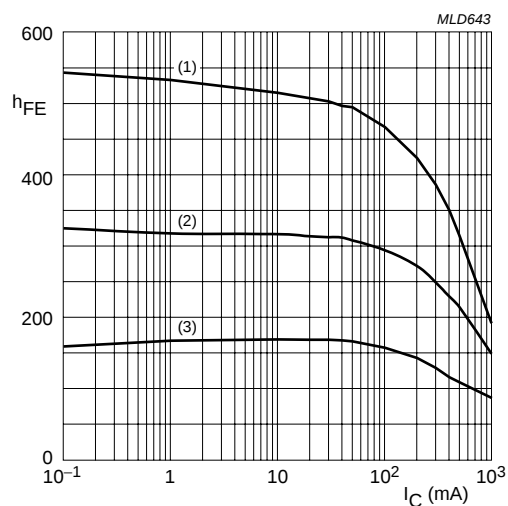
| SYMBOL                                                               | PARAMETER                            | CONDITIONS                                                                  | MIN. | TYP. | MAX. | UNIT             |
|----------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------|------|------|------|------------------|
| <b>Per transistor; for the PNP transistor with negative polarity</b> |                                      |                                                                             |      |      |      |                  |
| $I_{CBO}$                                                            | collector-base cut-off current       | $V_{CB} = 15\text{ V}; I_E = 0\text{ A}$                                    | –    | –    | 100  | nA               |
|                                                                      |                                      | $V_{CB} = 15\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | –    | –    | 50   | $\mu\text{A}$    |
| $I_{EBO}$                                                            | emitter-base cut-off current         | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}$                                     | –    | –    | 100  | nA               |
| $h_{FE}$                                                             | DC current gain                      | $V_{CE} = 2\text{ V}; I_C = 10\text{ mA}$                                   | 200  | –    | –    |                  |
|                                                                      |                                      | $V_{CE} = 2\text{ V}; I_C = 100\text{ mA}; \text{note 1}$                   | 150  | –    | –    |                  |
|                                                                      |                                      | $V_{CE} = 2\text{ V}; I_C = 500\text{ mA}; \text{note 1}$                   | 90   | –    | –    |                  |
| $V_{CEsat}$                                                          | collector-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$                                   | –    | –    | 25   | mV               |
|                                                                      |                                      | $I_C = 200\text{ mA}; I_B = 10\text{ mA}$                                   | –    | –    | 150  | mV               |
|                                                                      |                                      | $I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$                    | –    | –    | 250  | mV               |
| $R_{CEsat}$                                                          | equivalent on-resistance             | $I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$                    | –    | 300  | <500 | $\text{m}\Omega$ |
| $V_{BEsat}$                                                          | base-emitter saturation voltage      | $I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$                    | –    | –    | 1.1  | V                |
| $V_{BE}$                                                             | base-emitter turn-on voltage         | $V_{CE} = 2\text{ V}; I_C = 100\text{ mA}; \text{note 1}$                   | –    | –    | 0.9  | V                |
| <b>NPN transistor</b>                                                |                                      |                                                                             |      |      |      |                  |
| $f_T$                                                                | transition frequency                 | $I_C = 100\text{ mA}; V_{CE} = 5\text{ V}; f = 100\text{ MHz}$              | 250  | 420  | –    | MHz              |
| $C_c$                                                                | collector capacitance                | $V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$            | –    | 4.4  | 6    | pF               |
| <b>PNP transistor</b>                                                |                                      |                                                                             |      |      |      |                  |
| $f_T$                                                                | transition frequency                 | $I_C = -100\text{ mA}; V_{CE} = -5\text{ V}; f = 100\text{ MHz}$            | 100  | 280  | –    | MHz              |
| $C_c$                                                                | collector capacitance                | $V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$           | –    | –    | 10   | pF               |

## Note

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

15 V low  $V_{CE(sat)}$  NPN/PNP transistor

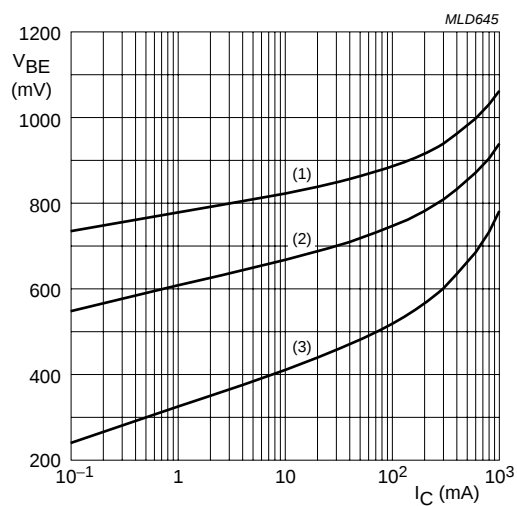
## PBSS2515VPN



TR1 (NPN)  $V_{CE} = 2$  V.

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

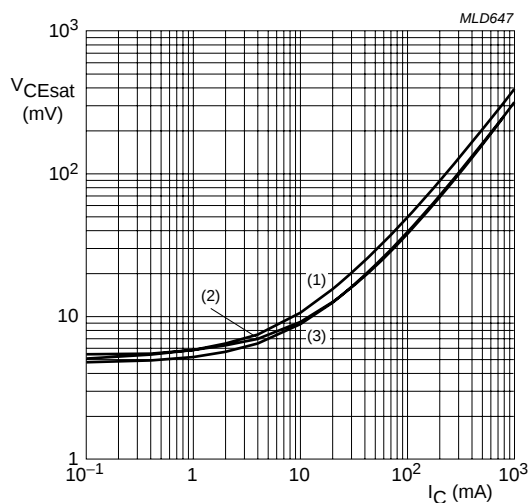
Fig.2 DC current gain as a function of collector current; typical values.



TR1 (NPN)  $V_{CE} = 2$  V.

- (1)  $T_{amb} = -55$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = 150$  °C.

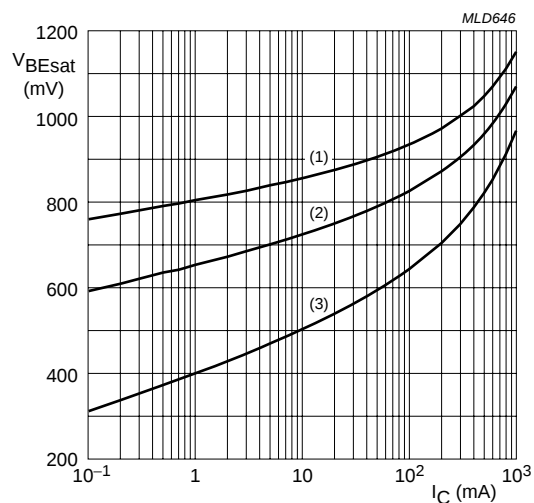
Fig.3 Base-emitter voltage as a function of collector current; typical values.



TR1 (NPN)  $I_C/I_B = 20$ .

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

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



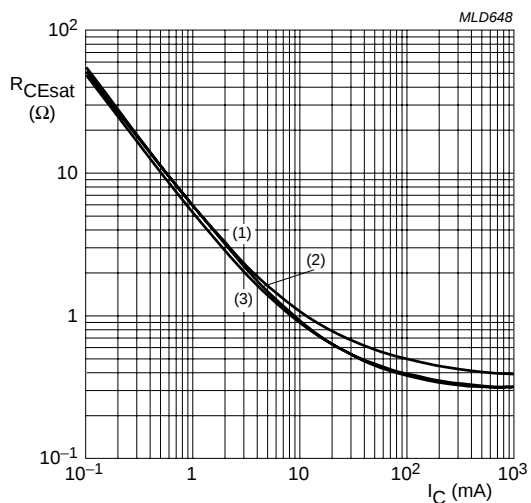
TR1 (NPN)  $I_C/I_B = 20$ .

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

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

15 V low  $V_{CE(sat)}$  NPN/PNP transistor

## PBSS2515VPN



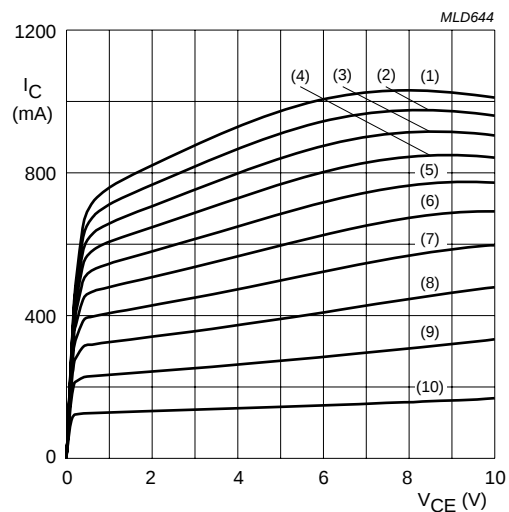
**TR1 (NPN)**  $I_C/I_B = 20$ .

(1)  $T_{amb} = 150\text{ °C}$ .

(2)  $T_{amb} = 25\text{ °C}$ .

(3)  $T_{amb} = -55\text{ °C}$ .

Fig.6 Equivalent on-resistance as a function of collector current; typical values.



**TR1 (NPN)**  $T_{amb} = 25\text{ °C}$ .

(1)  $I_B = 4.6\text{ mA}$ .

(2)  $I_B = 4.14\text{ mA}$ .

(3)  $I_B = 3.68\text{ mA}$ .

(4)  $I_B = 3.22\text{ mA}$ .

(5)  $I_B = 2.76\text{ mA}$ .

(6)  $I_B = 2.3\text{ mA}$ .

(7)  $I_B = 1.84\text{ mA}$ .

(8)  $I_B = 1.38\text{ mA}$ .

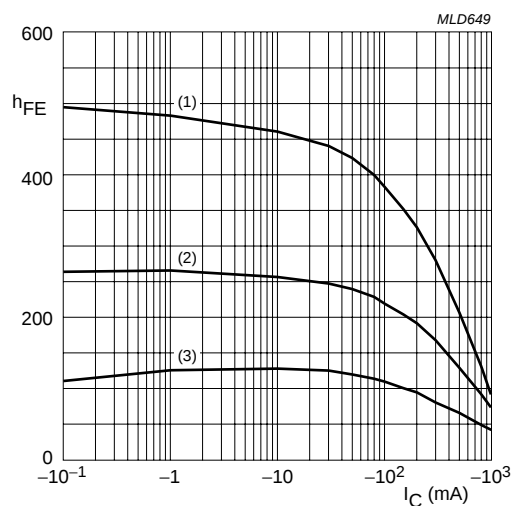
(9)  $I_B = 0.92\text{ mA}$ .

(10)  $I_B = 0.46\text{ mA}$ .

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

15 V low  $V_{CE(sat)}$  NPN/PNP transistor

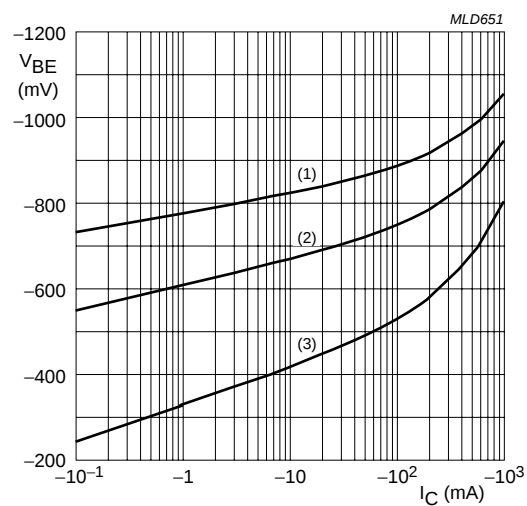
## PBSS2515VPN



TR2 (PNP)  $V_{CE} = -2$  V.

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

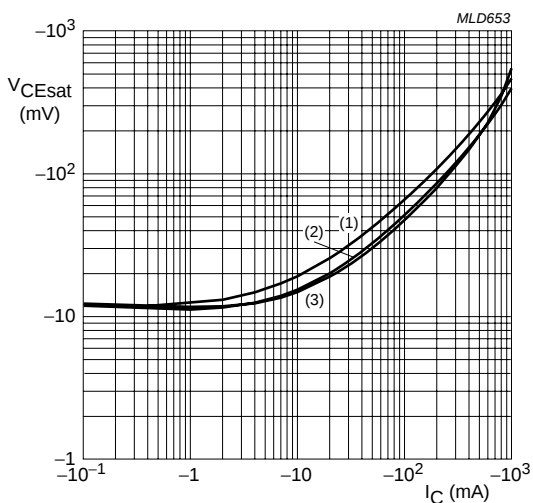
Fig.8 DC current gain as a function of collector current; typical values.



TR2 (PNP)  $V_{CE} = -2$  V.

- (1)  $T_{amb} = -55$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = 150$  °C.

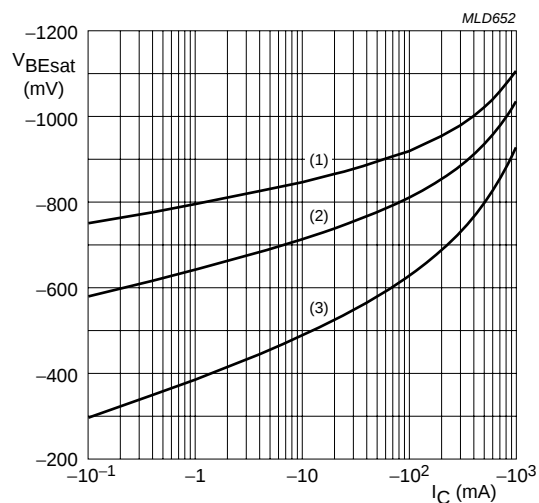
Fig.9 Base-emitter voltage as a function of collector current; typical values.



TR2 (PNP)  $I_C/I_B = 20$ .

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

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



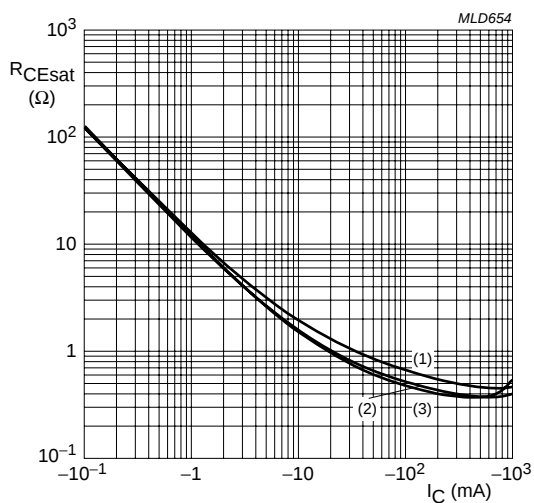
TR2 (PNP)  $I_C/I_B = 20$ .

- (1)  $T_{amb} = 150$  °C.
- (2)  $T_{amb} = 25$  °C.
- (3)  $T_{amb} = -55$  °C.

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

15 V low  $V_{CE(sat)}$  NPN/PNP transistor

## PBSS2515VPN



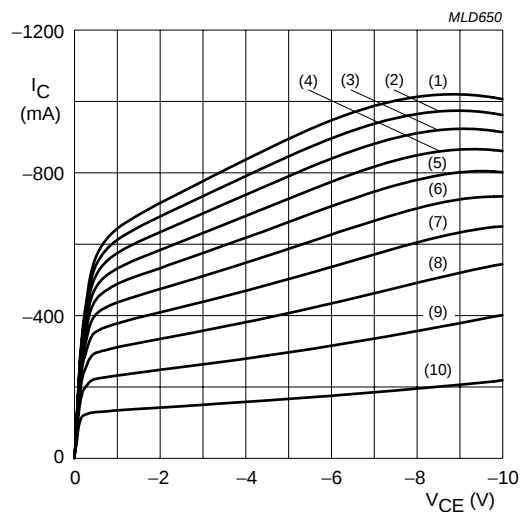
**TR2 (PNP)**  $I_C/I_B = 20$ .

(1)  $T_{amb} = 150\text{ °C}$ .

(2)  $T_{amb} = 25\text{ °C}$ .

(3)  $T_{amb} = -55\text{ °C}$ .

Fig.12 Equivalent on-resistance as a function of collector current; typical values.



**TR2 (PNP)**  $T_{amb} = 25\text{ °C}$ .

(1)  $I_B = -7\text{ mA}$ .

(6)  $I_B = -3.5\text{ mA}$ .

(2)  $I_B = -6.3\text{ mA}$ .

(7)  $I_B = -2.8\text{ mA}$ .

(3)  $I_B = -5.6\text{ mA}$ .

(8)  $I_B = -2.1\text{ mA}$ .

(4)  $I_B = -4.9\text{ mA}$ .

(9)  $I_B = -1.4\text{ mA}$ .

(5)  $I_B = -4.2\text{ mA}$ .

(10)  $I_B = -0.7\text{ mA}$ .

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

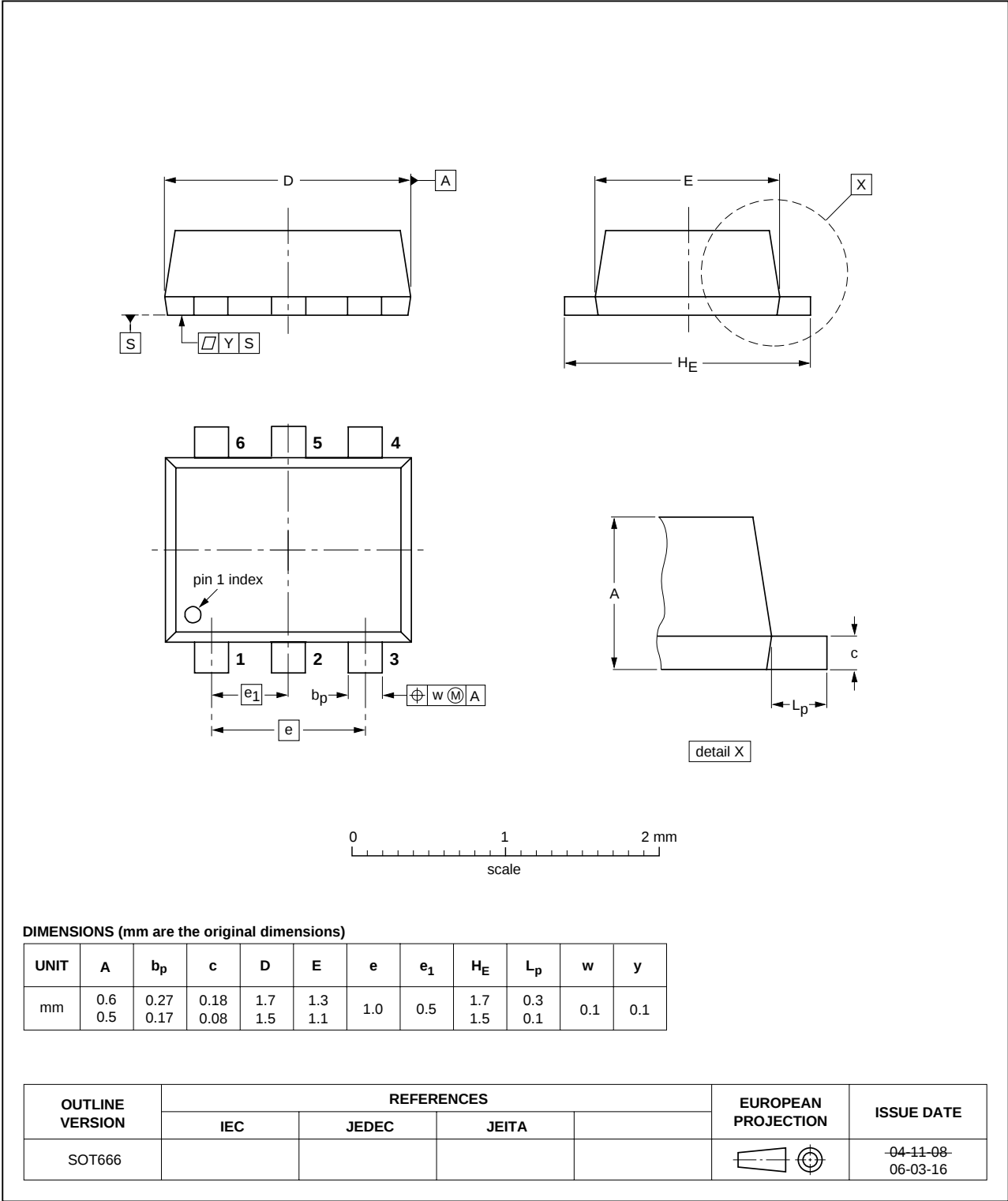
15 V low  $V_{CE(sat)}$  NPN/PNP transistor

PBSS2515VPN

PACKAGE OUTLINE

Plastic surface-mounted package; 6 leads

SOT666



15 V low  $V_{CE(sat)}$  NPN/PNP transistor

## PBSS2515VPN

## DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION                                                                            |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| Preliminary data sheet         | Qualification                 | This document contains data from the preliminary specification.                       |
| Product data sheet             | Production                    | This document contains the product specification.                                     |

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