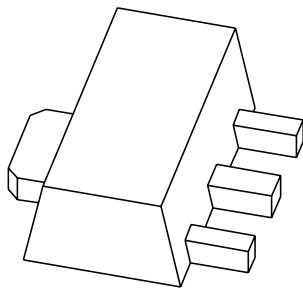


# DATA SHEET



**PBSS4330X**  
30 V, 3 A  
NPN low  $V_{CEsat}$  (BISS) transistor

Product data sheet  
Supersedes data of 2003 Nov 28

2004 Dec 06

# 30 V, 3 A

## NPN low $V_{CEsat}$ (BISS) transistor

PBSS4330X

### FEATURES

- SOT89 (SC-62) package
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability:  $I_C$  and  $I_{CM}$
- Higher efficiency leading to less heat generation
- Reduced printed-circuit board requirements.

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
$V_{CEO}$	collector-emitter voltage	30	V
$I_C$	collector current (DC)	3	A
$I_{CM}$	peak collector current	5	A
$R_{CEsat}$	equivalent on-resistance	100	$m\Omega$

### APPLICATIONS

- Power management
  - DC/DC converters
  - Supply line switching
  - Battery charger
  - LCD backlighting.
- Peripheral drivers
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load driver (e.g. relays, buzzers and motors).

### PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

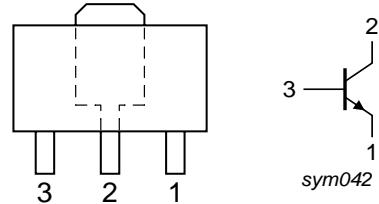


Fig.1 Simplified outline (SOT89) and symbol.

### DESCRIPTION

NPN low  $V_{CEsat}$  transistor in a SOT89 plastic package.

### MARKING

TYPE NUMBER	MARKING CODE <sup>(1)</sup>
PBSS4330X	*1R

### Note

1. \* = p: Made in Hong Kong.
- \* = t: Made in Malaysia.
- \* = W: Made in China.

### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS4330X	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

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**LIMITING VALUES**

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

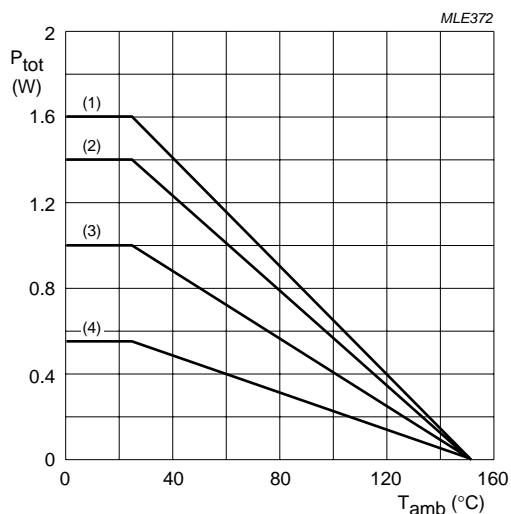
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	50	V
$V_{CEO}$	collector-emitter voltage	open base	–	30	V
$V_{EBO}$	emitter-base voltage	open collector	–	6	V
$I_C$	collector current (DC)	note 4	–	3	A
$I_{CM}$	peak collector current	limited by $T_{j(max)}$	–	5	A
$I_B$	base current (DC)		–	0.5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^{\circ}\text{C}$ note 1 note 2 note 3 note 4		550 1 1.4 1.6	mW W W W
$T_{stg}$	storage temperature		–65	+150	$^{\circ}\text{C}$
$T_j$	junction temperature		–	150	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature		–65	+150	$^{\circ}\text{C}$

**Notes**

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1  $\text{cm}^2$ .
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6  $\text{cm}^2$ .
4. Device mounted on a ceramic printed-circuit board 7  $\text{cm}^2$ , single-sided copper, tin-plated.

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- (1) Ceramic PCB; 7 cm<sup>2</sup> mounting pad for collector.
- (2) FR4 PCB; 6 cm<sup>2</sup> copper mounting pad for collector.
- (3) FR4 PCB; 1 cm<sup>2</sup> copper mounting pad for collector.
- (4) Standard footprint.

Fig.2 Power derating curves.

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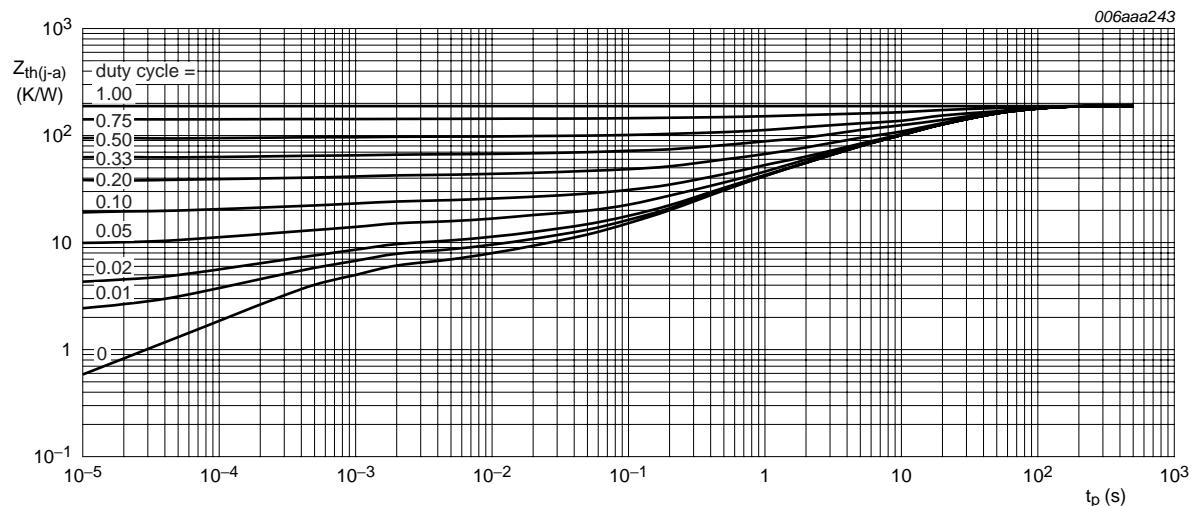
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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air note 1 note 2 note 3 note 4	225 125 90 80	K/W
$R_{th(j-s)}$	thermal resistance from junction to soldering point		16	K/W

## Notes

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.
4. Device mounted on a ceramic printed-circuit board 7 cm<sup>2</sup>, single-sided copper, tin-plated.

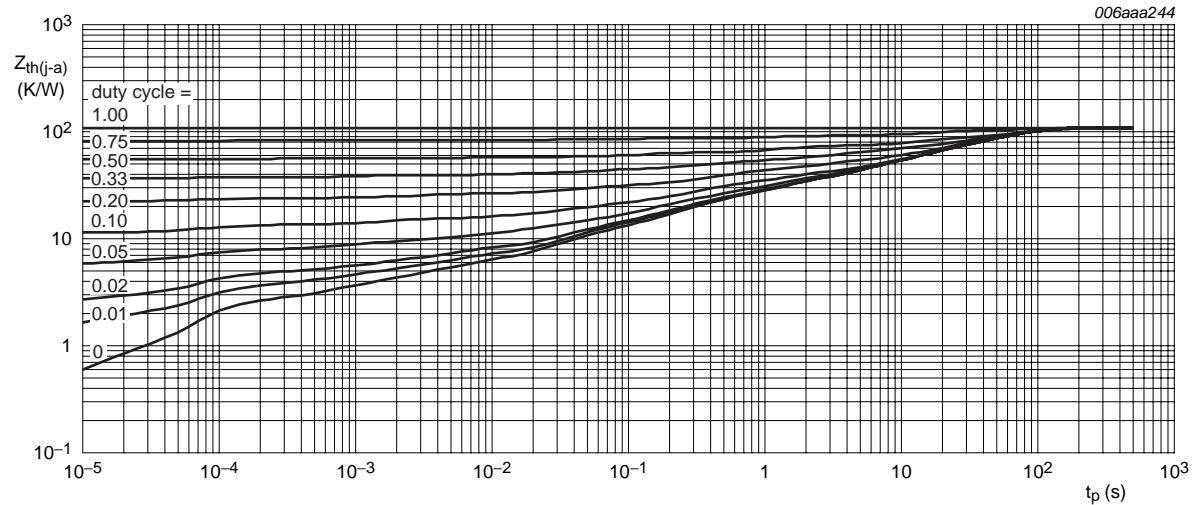


Mounted on FR4 printed-circuit board; standard footprint.

Fig.3 Transient thermal impedance as a function of pulse time; typical values.

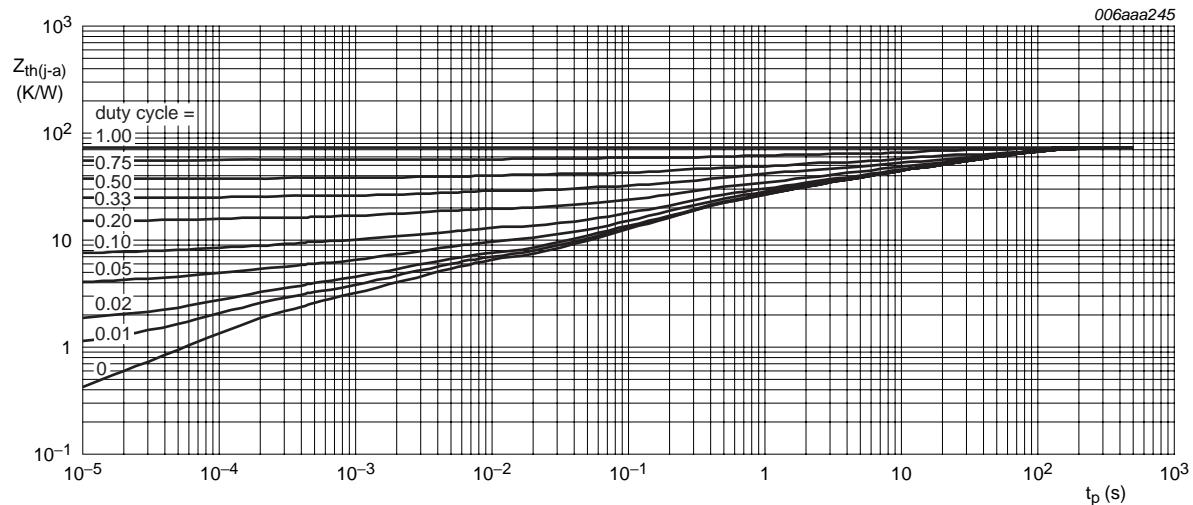
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Mounted on FR4 printed-circuit board; mounting pad for collector  $1 \text{ cm}^2$ .

Fig.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector  $6 \text{ cm}^2$ .

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

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

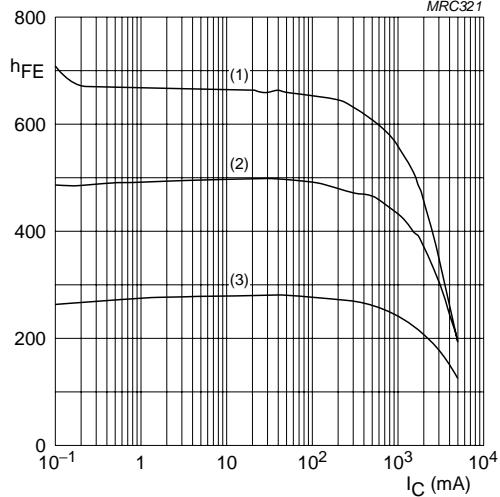
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	—	—	100	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150^\circ\text{C}$	—	—	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 30\text{ V}; V_{BE} = 0\text{ V}$	—	—	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	$V_{CE} = 2\text{ V}$				
		$I_C = 0.1\text{ A}$	300	—	—	
		$I_C = 0.5\text{ A}$	300	—	—	
		$I_C = 1\text{ A}; \text{note 1}$	270	—	700	
		$I_C = 2\text{ A}; \text{note 1}$	230	—	—	
		$I_C = 3\text{ A}; \text{note 1}$	180	—	—	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 0.5\text{ A}; I_B = 50\text{ mA}$	—	—	60	mV
		$I_C = 1\text{ A}; I_B = 50\text{ mA}$	—	—	110	mV
		$I_C = 2\text{ A}; I_B = 100\text{ mA}$	—	—	220	mV
		$I_C = 3\text{ A}; I_B = 300\text{ mA}; \text{note 1}$	—	—	300	mV
$R_{CEsat}$	equivalent on-resistance	$I_C = 3\text{ A}; I_B = 300\text{ mA}; \text{note 1}$	—	80	100	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 2\text{ A}; I_B = 100\text{ mA}$	—	—	1.1	V
		$I_C = 3\text{ A}; I_B = 300\text{ mA}; \text{note 1}$	—	—	1.2	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 2\text{ V}; I_C = 1\text{ A}$	1.0	—	—	V
$f_T$	transition frequency	$I_C = 100\text{ mA}; V_{CE} = 5\text{ V}; f = 100\text{ MHz}$	100	—	—	MHz
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	—	—	30	pF

**Note**

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

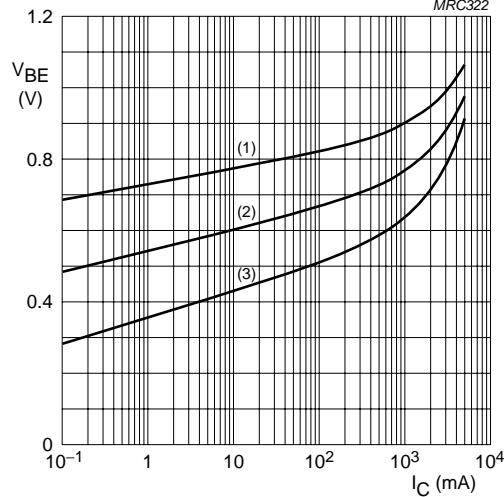
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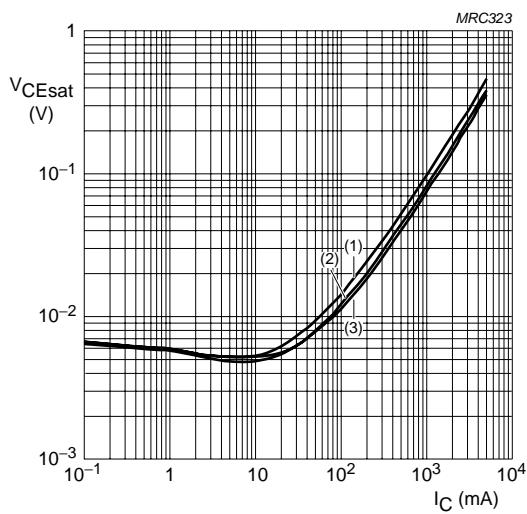
$V_{CE} = 2$  V.  
 (1)  $T_{amb} = 100$  °C.  
 (2)  $T_{amb} = 25$  °C.  
 (3)  $T_{amb} = -55$  °C.

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



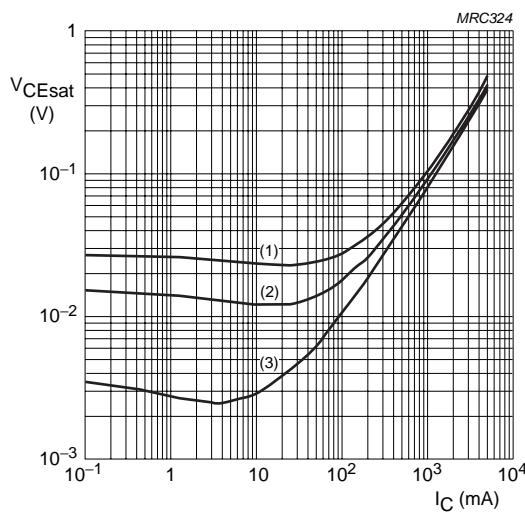
$V_{CE} = 2$  V.  
 (1)  $T_{amb} = -55$  °C.  
 (2)  $T_{amb} = 25$  °C.  
 (3)  $T_{amb} = 100$  °C.

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



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

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

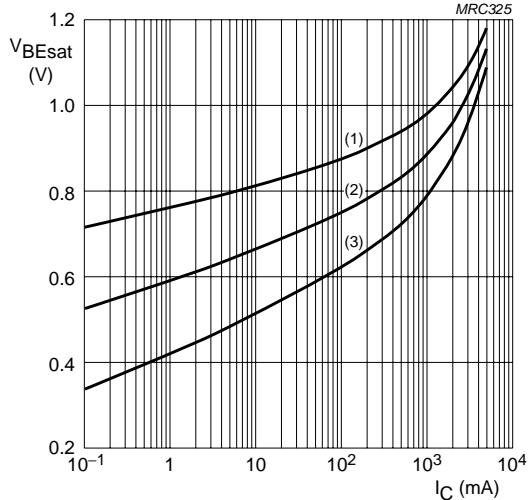


$T_{amb} = 25$  °C.  
 (1)  $I_C/I_B = 100$ .  
 (2)  $I_C/I_B = 50$ .  
 (3)  $I_C/I_B = 10$ .

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

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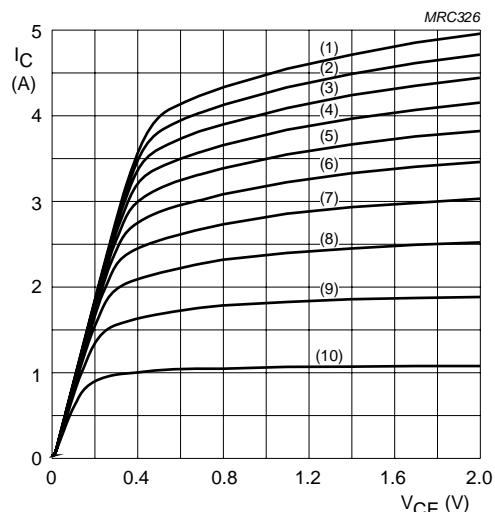
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$I_C/I_B = 20$ .

(1)  $T_{amb} = -55$  °C.  
 (2)  $T_{amb} = 25$  °C.  
 (3)  $T_{amb} = 100$  °C.

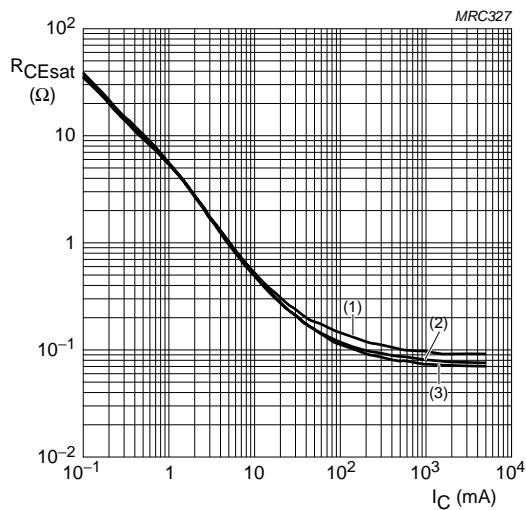
Fig.10 Base-emitter saturation voltage as a function of collector current; typical values.



$T_{amb} = 25$  °C.

(1)  $I_B = 25.0$  mA. (4)  $I_B = 17.5$  mA. (8)  $I_B = 7.5$  mA.  
 (2)  $I_B = 22.5$  mA. (5)  $I_B = 15.0$  mA. (9)  $I_B = 5.0$  mA.  
 (3)  $I_B = 20.0$  mA. (6)  $I_B = 12.5$  mA. (10)  $I_B = 2.5$  mA.  
 (7)  $I_B = 10.0$  mA.

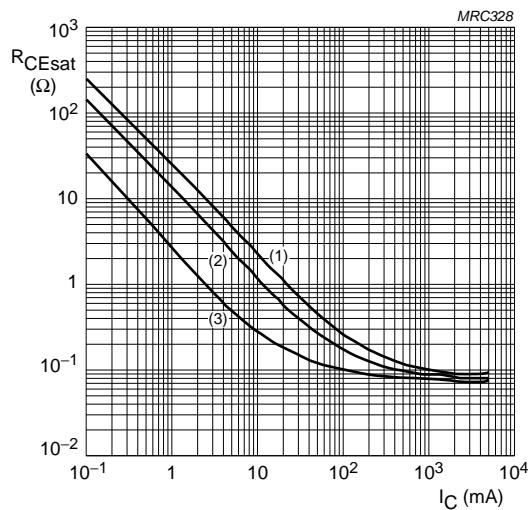
Fig.11 Collector current as a function of collector-emitter voltage; typical values.



$I_C/I_B = 20$ .

(1)  $T_{amb} = 100$  °C. (2)  $T_{amb} = 25$  °C. (3)  $T_{amb} = -55$  °C.

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



$T_{amb} = 25$  °C.

(1)  $I_C/I_B = 10$ . (2)  $I_C/I_B = 5$ . (3)  $I_C/I_B = 1$ .

Fig.13 Equivalent on-resistance as a function of collector current; typical values.

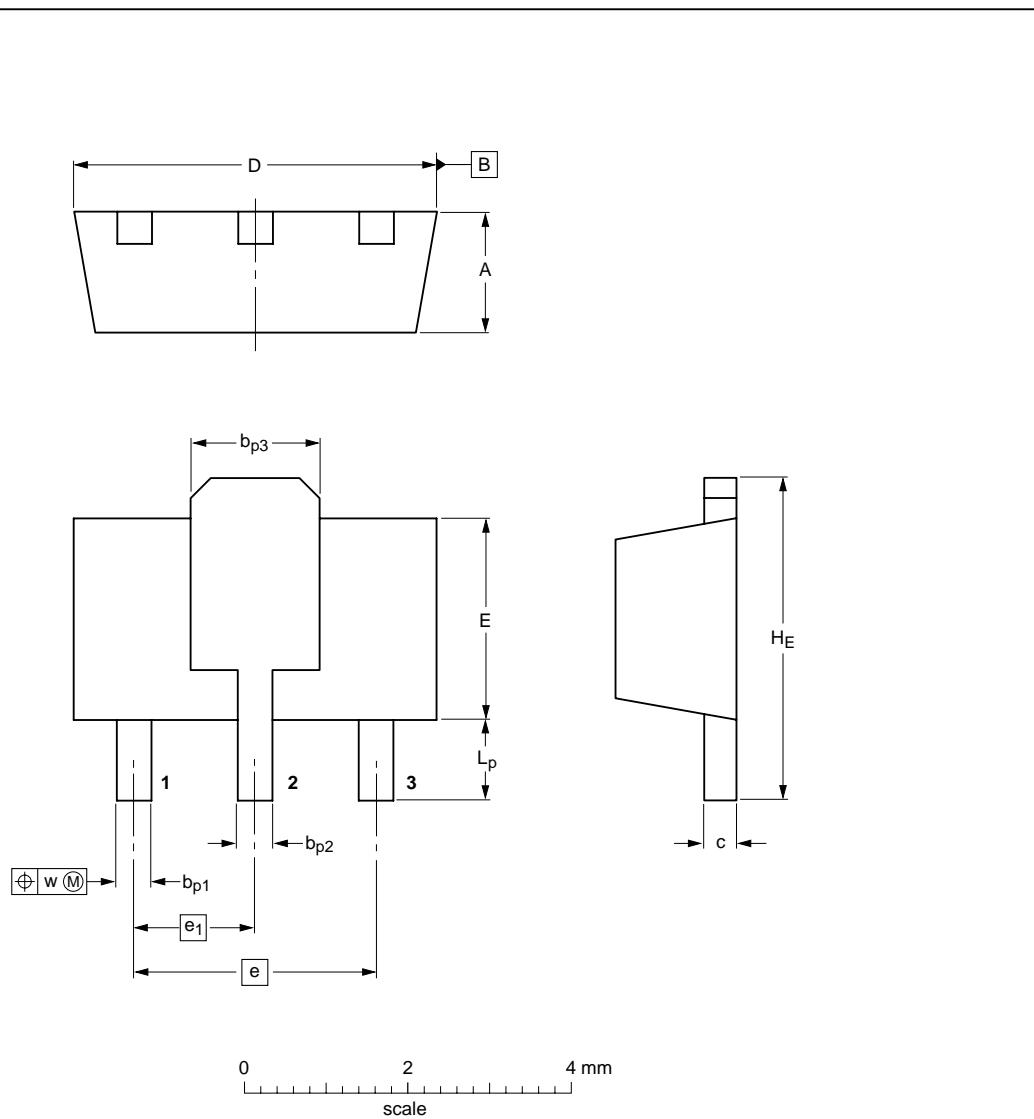
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## PACKAGE OUTLINE

Plastic surface-mounted package; collector pad for good heat transfer; 3 leads

SOT89



## DIMENSIONS (mm are the original dimensions)

UNIT	A	$b_{p1}$	$b_{p2}$	$b_{p3}$	c	D	E	e	$e_1$	$H_E$	$L_p$	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT89		TO-243	SC-62			-04-08-03-06-03-16

# 30 V, 3 A

## NPN low $V_{CEsat}$ (BISS) transistor

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### 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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## **Contact information**

For additional information please visit: <http://www.nxp.com>

For sales offices addresses send e-mail to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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