

PBSS4160K

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

Rev. 01 — 29 April 2004

Objective data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} (BISS) transistor in a SOT346 (SC59) plastic package. PNP complement: PBSS5160K.

1.2 Features

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency leading to less heat generation
- Reduces printed-circuit board area required
- Cost effective replacement of medium power transistor BCP55 and BCX55.

1.3 Applications

- Major application segments
 - ◆ Automotive 42 V power
 - ◆ Telecom infrastructure
 - ◆ Industrial
- Power management
 - ◆ DC-to-DC conversion
 - ◆ Supply line switching
- Peripheral driver
 - ◆ Driver in low supply voltage applications, e.g. lamps and LEDs
 - ◆ Inductive load driver, e.g. relays, buzzers and motors.

1.4 Quick reference data

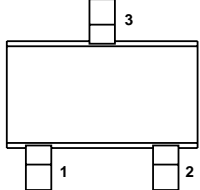
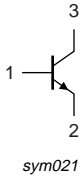
Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage		-	-	60	V
I_C	collector current (DC)		-	-	1	A
I_{CM}	peak collector current		-	-	2	A
R_{CEsat}	equivalent on-resistance		-	-	280	m Ω

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2. Pinning information

Table 2: Discrete pinning

Pin	Description	Simplified outline	Symbol
1	base	 <p>Top view</p>	 <p>sym021</p>
2	emitter		
3	collector		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PBSS4160K	-	plastic surface mounted package; 3 leads	SOT346

4. Marking

Table 4: Marking

Type number	Marking code ^[1]
PBSS4160K	*XB

[1] * = t: made in Malaysia.

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	-	80	V	
V_{CEO}	collector-emitter voltage	open base	-	60	V	
V_{EBO}	emitter-base voltage	open collector	-	5	V	
I_C	collector current (DC)		-	1	A	
I_{CM}	peak collector current	$t = 1$ ms or limited by $T_{j(max)}$	-	2	A	
I_B	base current (DC)		-	300	mA	
I_{BM}	peak base current	$t_p \leq 300$ μ s; $\delta \leq 0.02$	-	1	A	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	250	mW
			[2]	-	425	mW
T_j	junction temperature		-	150	°C	
T_{amb}	operating ambient temperature		-65	+150	°C	
T_{stg}	storage temperature		-65	+150	°C	

[1] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint.

[2] Device mounted on a ceramic circuit board, Al_2O_3 , standard footprint.

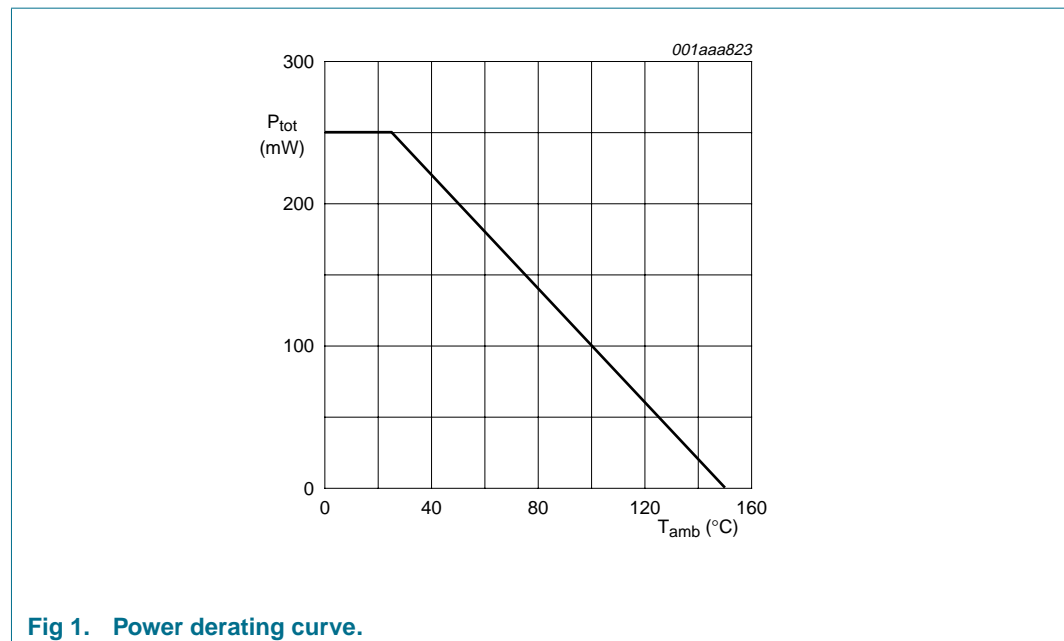


Fig 1. Power derating curve.

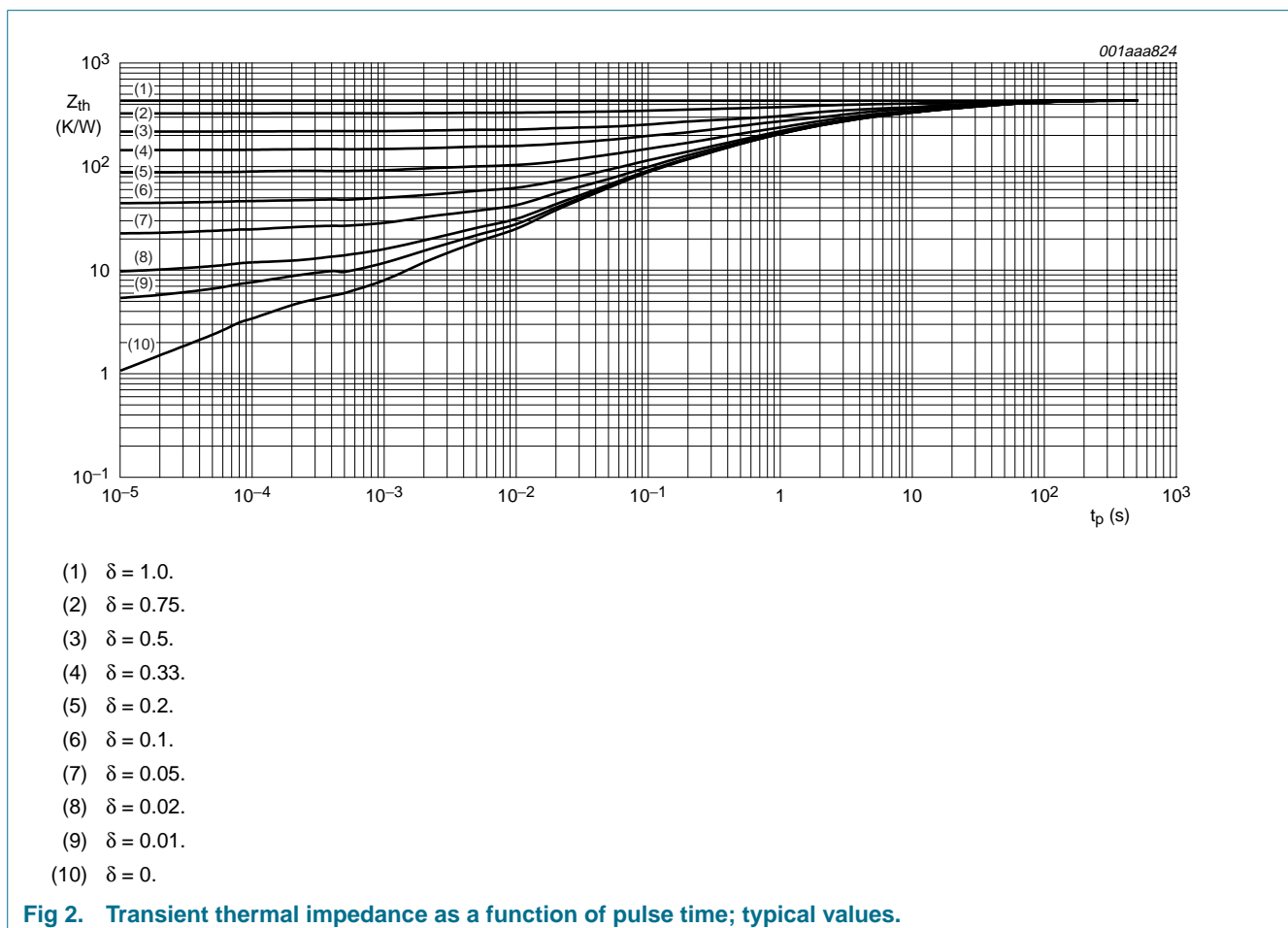
6. Thermal characteristics

Table 6: Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	500	K/W
			[2]	294	K/W

[1] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint.

[2] Device mounted on a ceramic circuit board, Al_2O_3 , standard footprint.

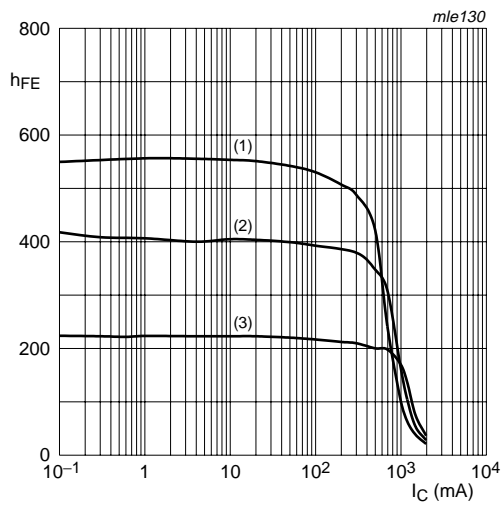


7. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 60\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 60\text{ V}; I_E = 0; T_j = 150^\circ\text{C}$	-	-	50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 60\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$	250	<tbid>	-	
		$V_{CE} = 5\text{ V}; I_C = 500\text{ mA}$	[1]	<tbid>	-	
		$V_{CE} = 5\text{ V}; I_C = 1\text{ A}$	[1]	<tbid>	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 100\text{ mA}; I_B = 1\text{ mA}$	-	<tbid>	110	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	-	<tbid>	150	mV
		$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1]	<tbid>	280	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 50\text{ mA}$	-	<tbid>	1.1	V
R_{CEsat}	equivalent on-resistance	$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1]	<tbid>	280	$\text{m}\Omega$
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = 5\text{ V}; I_C = 1\text{ A}$	-	<tbid>	0.9	V
f_T	transition frequency	$I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	150	220	-	MHz
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	5.5	10	pF

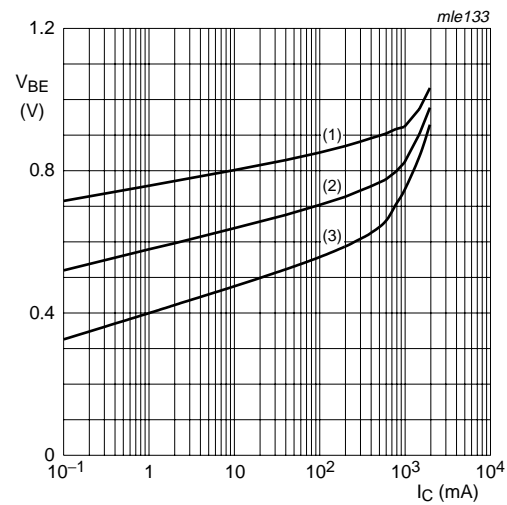
[1] Pulse test: $t_p \leq 300\ \mu\text{s}; \delta \leq 0.02$.



$V_{CE} = 5 \text{ V}$.

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

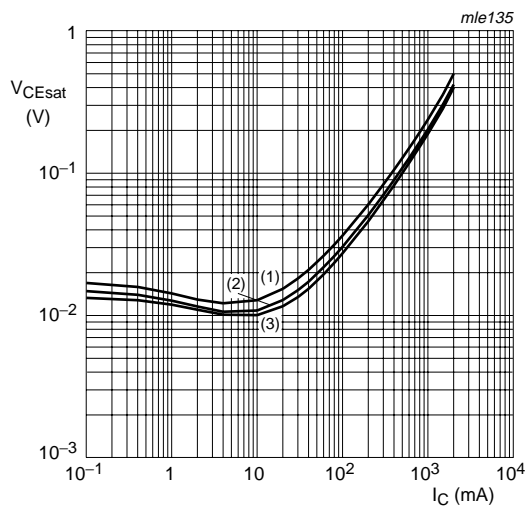
Fig 3. DC current gain as a function of collector current; typical values.



$V_{CE} = 5 \text{ V}$.

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

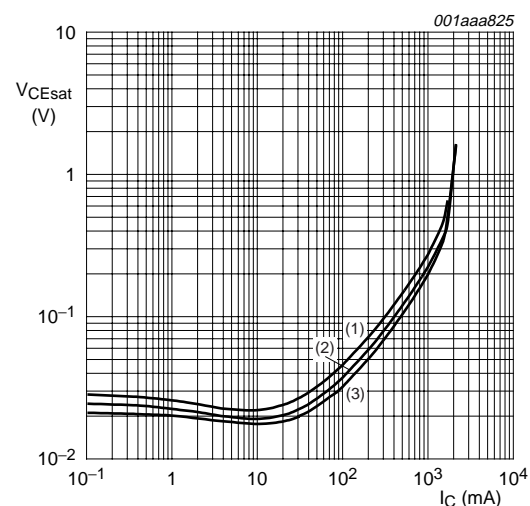
Fig 4. Base-emitter voltage as a function of collector current; typical values.



$I_C/I_B = 10$.

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

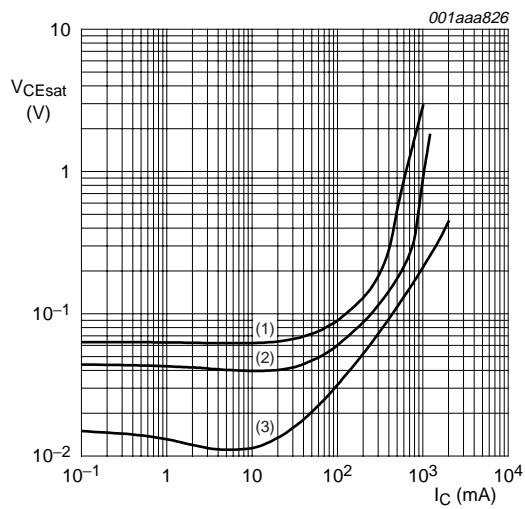
Fig 5. Collector-emitter saturation voltage as a function of collector current; typical values.



$I_C/I_B = 20$.

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

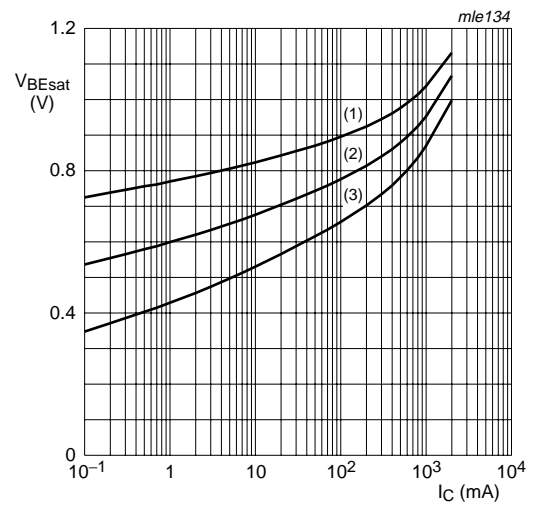
Fig 6. Collector-emitter saturation voltage as a function of collector current; typical values.



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

- (1) $I_C/I_B = 100$.
- (2) $I_C/I_B = 50$.
- (3) $I_C/I_B = 10$.

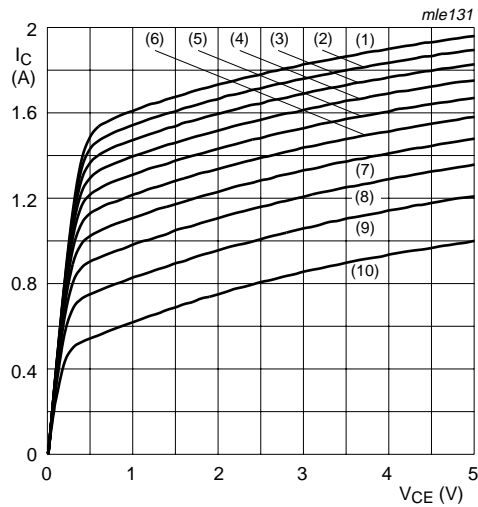
Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values.



$I_C/I_B = 20$.

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

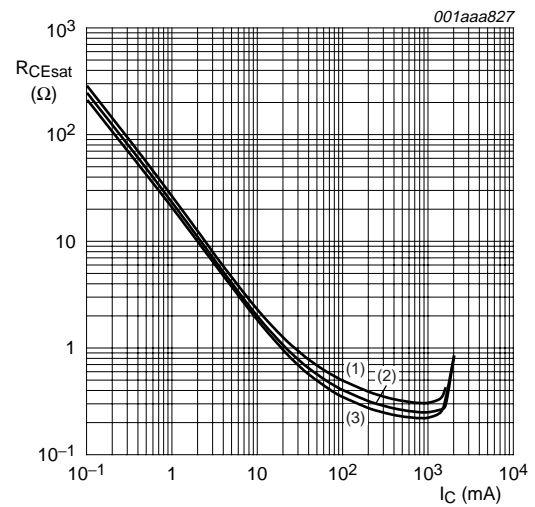
Fig 8. Base-emitter saturation voltage as a function of collector current; typical values.



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

- (1) $I_B = -60\text{ mA}$.
- (2) $I_B = -54\text{ mA}$.
- (3) $I_B = -48\text{ mA}$.
- (4) $I_B = -42\text{ mA}$.
- (5) $I_B = -36\text{ mA}$.
- (6) $I_B = -30\text{ mA}$.
- (7) $I_B = -24\text{ mA}$.
- (8) $I_B = -18\text{ mA}$.
- (9) $I_B = -12\text{ mA}$.
- (10) $I_B = -6\text{ mA}$.

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

8. Package outline

Plastic surface mounted package; 3 leads

SOT346

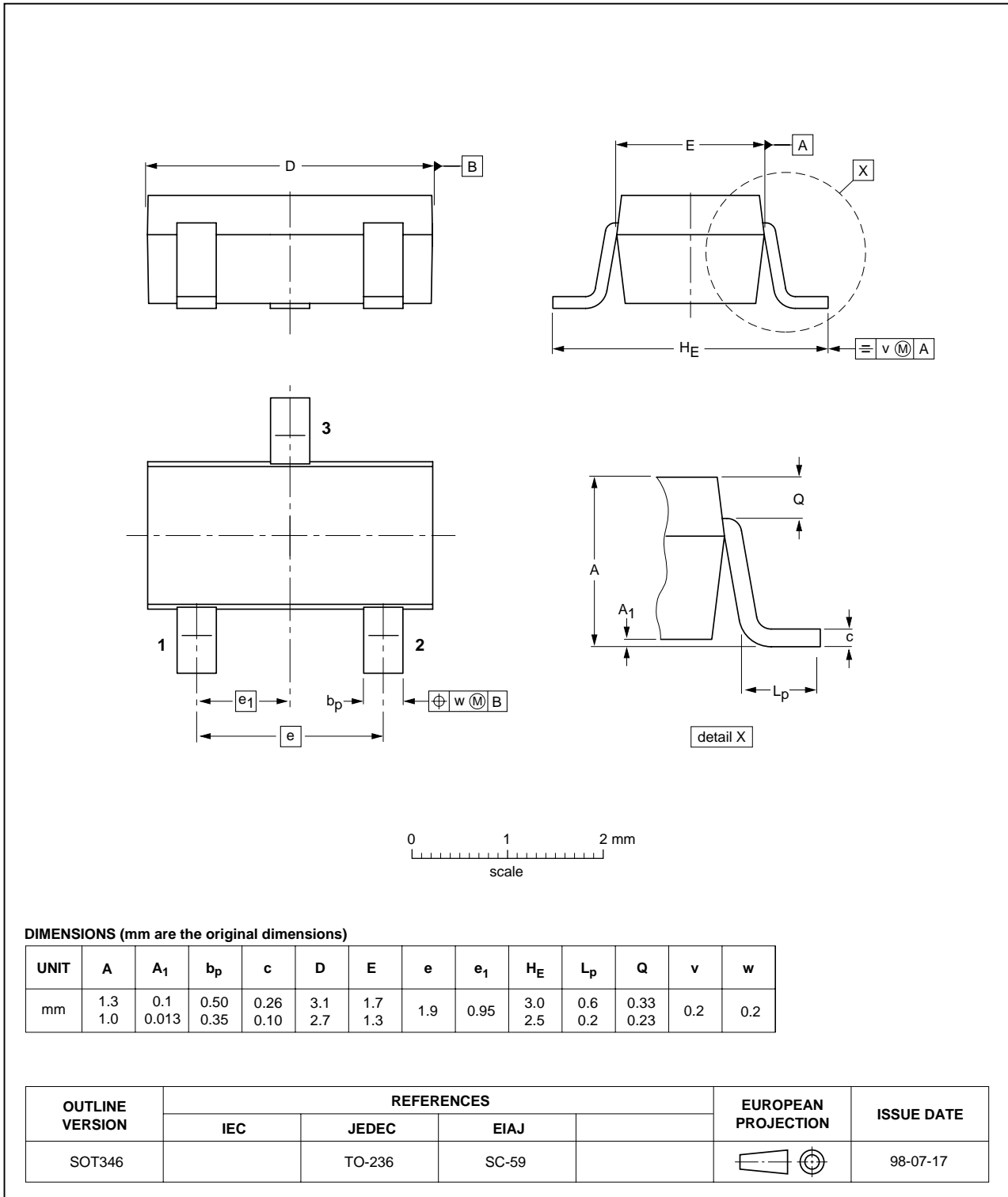


Fig 11. Package outline.

9. Revision history

Table 8: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
PBSS4160K_1	20040429	Objective data	-	9397 750 12702	-

10. Data sheet status

Level	Data sheet status ^[1]	Product status ^[2] ^[3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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