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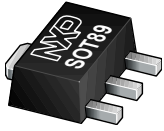
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Kind regards,

Team Nexperia



PBHV9040X

500 V, 0.25 A PNP high-voltage low VCEsat (BISS) transistor

9 December 2013

Product data sheet

1. General description

PNP high-voltage low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT89 (SC-62) medium power and flat lead Surface-Mounted Device (SMD) plastic package.

NPN complement: PBHV8540X.

2. Features and benefits

- High voltage
- 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
- AEC-Q101 qualified

3. Applications

- Electronic ballast for fluorescent lighting
- LED driver for LED chain module
- LCD backlighting
- High Intensity Discharge (HID) front lighting
- Automotive motor management
- Hook switch for wired telecom
- Switch mode power supply

4. Quick reference data

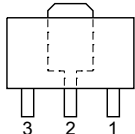
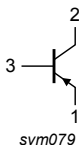
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	-500	V
V_{CEO}	collector-emitter voltage	open base	-	-	-400	V
I_C	collector current		-	-	-0.25	A
h_{FE}	DC current gain	$V_{CE} = -10\text{ V}; I_C = -50\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$	100	200	-	



5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 <p style="text-align: center;">SOT89</p>	 <p style="text-align: center;"><i>sym079</i></p>
2	C	collector		
3	B	base		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV9040X	SOT89	plastic surface-mounted package; die pad for good heat transfer; 3 leads	SOT89

7. Marking

Table 4. Marking codes

Type number	Marking code
PBHV9040X	%4E

[1] % = placeholder for manufacturing site code

8. Limiting values

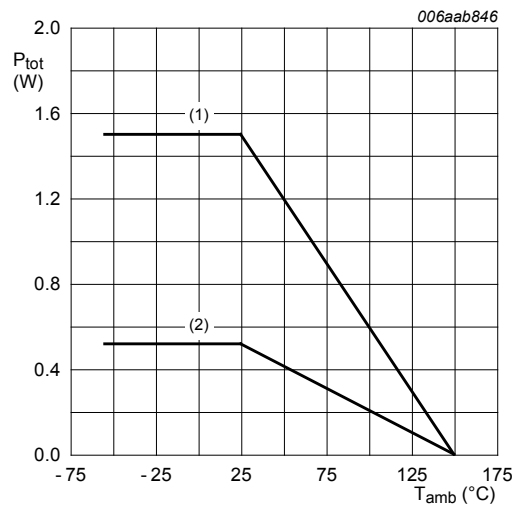
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	-500	V	
V_{CEO}	collector-emitter voltage	open base	-	-400	V	
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0$ V	-	-500	V	
V_{EBO}	emitter-base voltage	open collector	-	-6	V	
I_C	collector current		-	-0.25	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-0.5	A	
I_{BM}	peak base current		-	-200	mA	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.52	W
			[2]	-	1.5	W
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 6 cm².



(1) FR4 PCB, mounting pad for collector 6 cm²

(2) FR4 PCB, standard footprint

Fig. 1. Power derating curves

9. 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]	-	-	240	K/W
			[2]	-	-	83	K/W
R _{th(j-sp)}	thermal resistance from junction to solder point			-	-	20	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 6 cm².

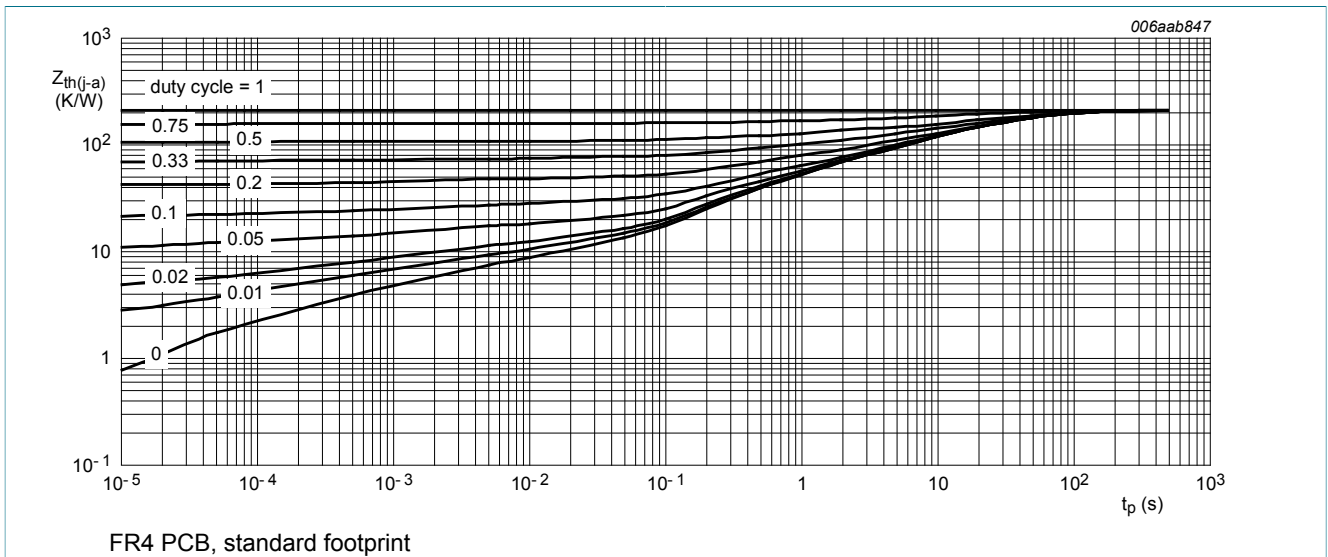


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

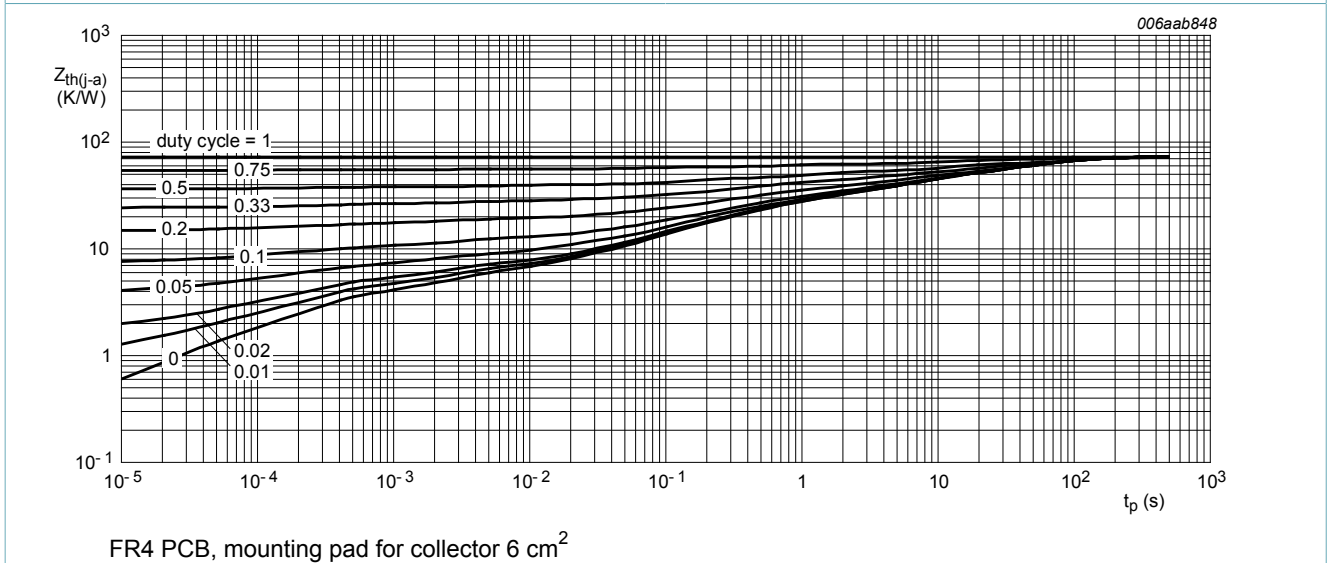


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = -320 V; I _E = 0 A; T _{amb} = 25 °C	-	-	-100	nA
		V _{CB} = -320 V; I _E = 0 A; T _j = 150 °C	-	-	-10	μA
I _{CES}	collector-emitter cut-off current	V _{CE} = -320 V; V _{BE} = 0 V; T _{amb} = 25 °C	-	-	-100	nA
I _{EBO}	emitter-base cut-off current	V _{EB} = -4 V; I _C = 0 A; T _{amb} = 25 °C	-	-	-100	nA
h _{FE}	DC current gain	V _{CE} = -10 V; I _C = -50 mA; T _{amb} = 25 °C	100	200	-	
		V _{CE} = -10 V; I _C = -100 mA; T _{amb} = 25 °C	80	200	-	
		V _{CE} = -10 V; I _C = -250 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	10	25	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -100 mA; I _B = -20 mA; T _{amb} = 25 °C	-	-110	-200	mV
V _{BEsat}	base-emitter saturation voltage	I _C = -100 mA; I _B = -20 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-1	-1.1	V
t _d	delay time	V _{CC} = -2 V; I _C = -0.15 A; I _{Bon} = -0.03 A; I _{Boff} = 0.03 A; T _{amb} = 25 °C	-	9	-	ns
t _r	rise time		-	1810	-	ns
t _{on}	turn-on time		-	1819	-	ns
t _s	storage time		-	715	-	ns
t _f	fall time		-	1085	-	ns
t _{off}	turn-off time		-	1800	-	ns
f _T	transition frequency		V _{CE} = -10 V; I _C = -10 mA; f = 100 MHz; T _{amb} = 25 °C	-	55	-
C _c	collector capacitance	V _{CB} = -20 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C	-	7	-	pF
C _e	emitter capacitance	V _{EB} = -0.5 V; I _C = 0 A; i _c = 0 A; f = 1 MHz; T _{amb} = 25 °C	-	150	-	pF

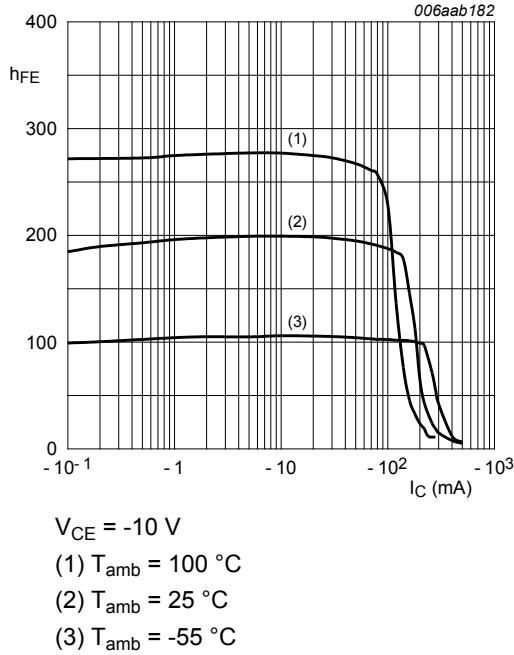


Fig. 4. DC current gain as a function of collector current; typical values

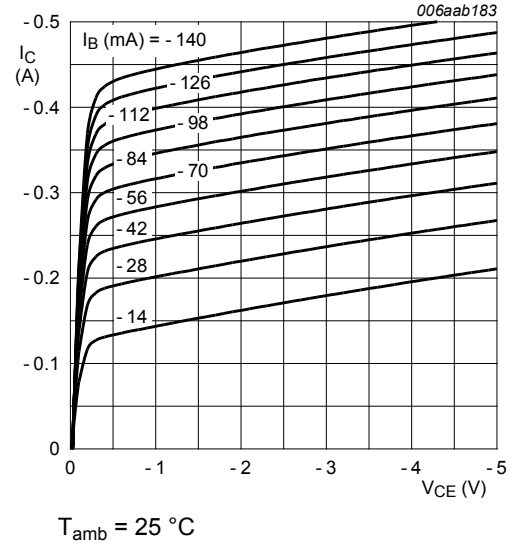


Fig. 5. Collector current as a function of collector-emitter voltage; typical values

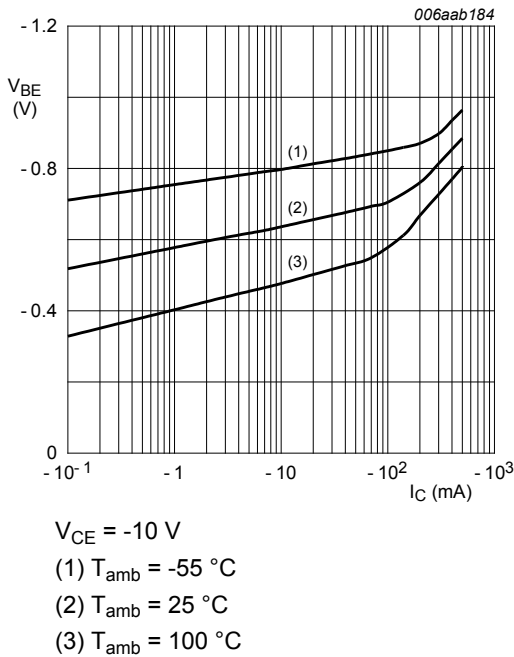


Fig. 6. Base-emitter voltage as a function of collector current; typical values

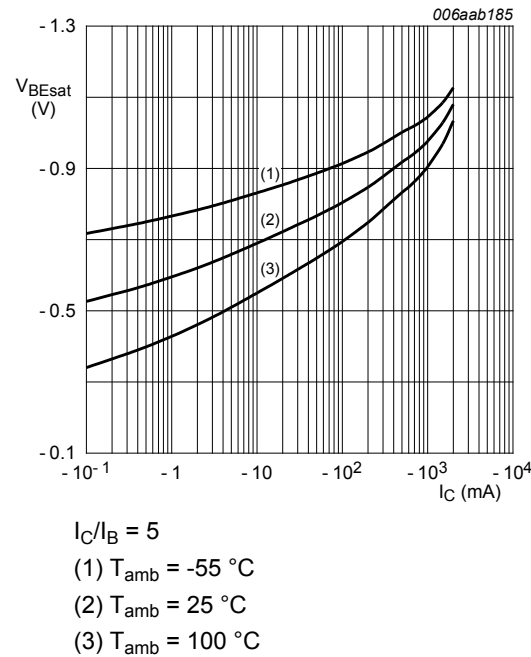
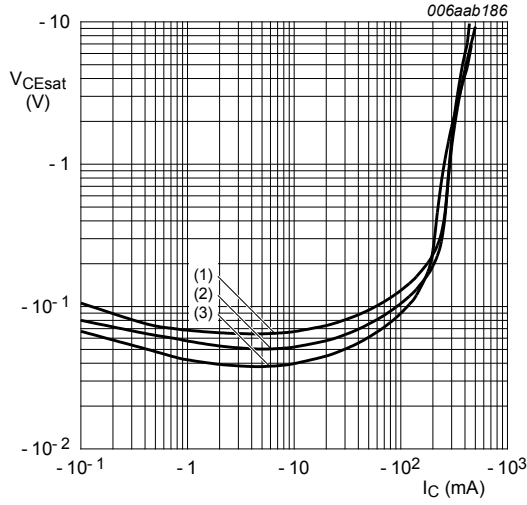


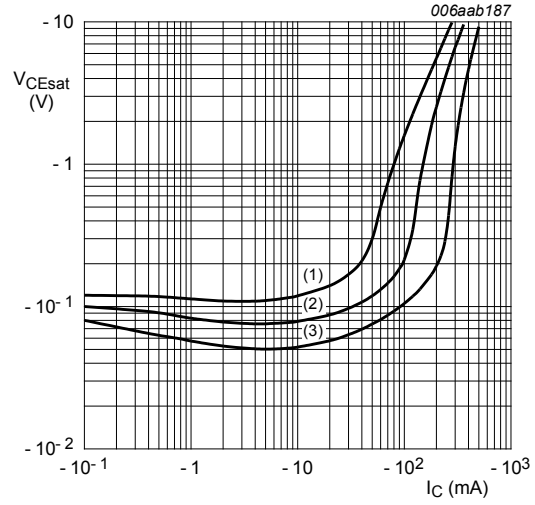
Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values

500 V, 0.25 A PNP high-voltage low VCEsat (BISS) transistor



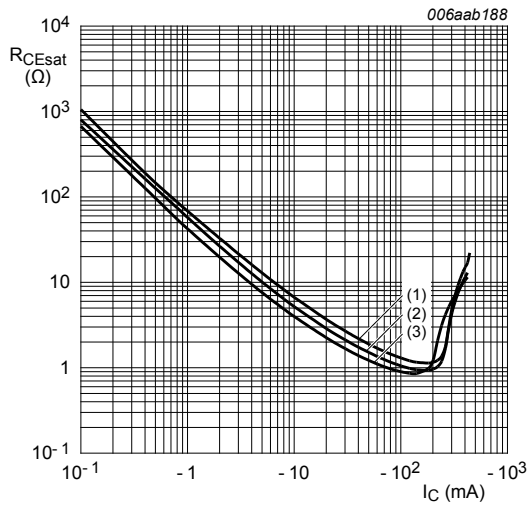
$I_C/I_B = 5$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



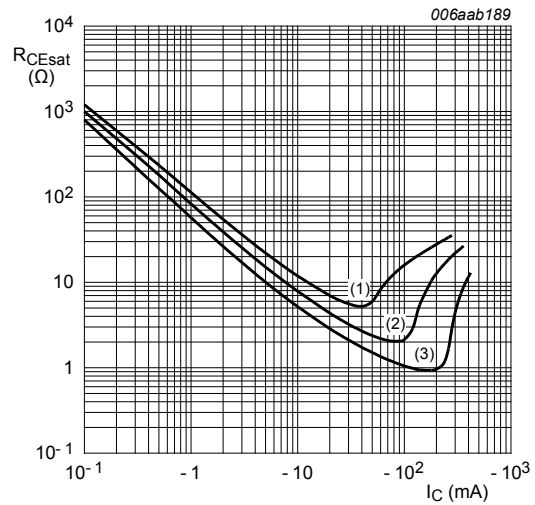
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 20$
 (2) $I_C/I_B = 10$
 (3) $I_C/I_B = 5$

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



$I_C/I_B = 5$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 20$
 (2) $I_C/I_B = 10$
 (3) $I_C/I_B = 5$

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

11. Test information

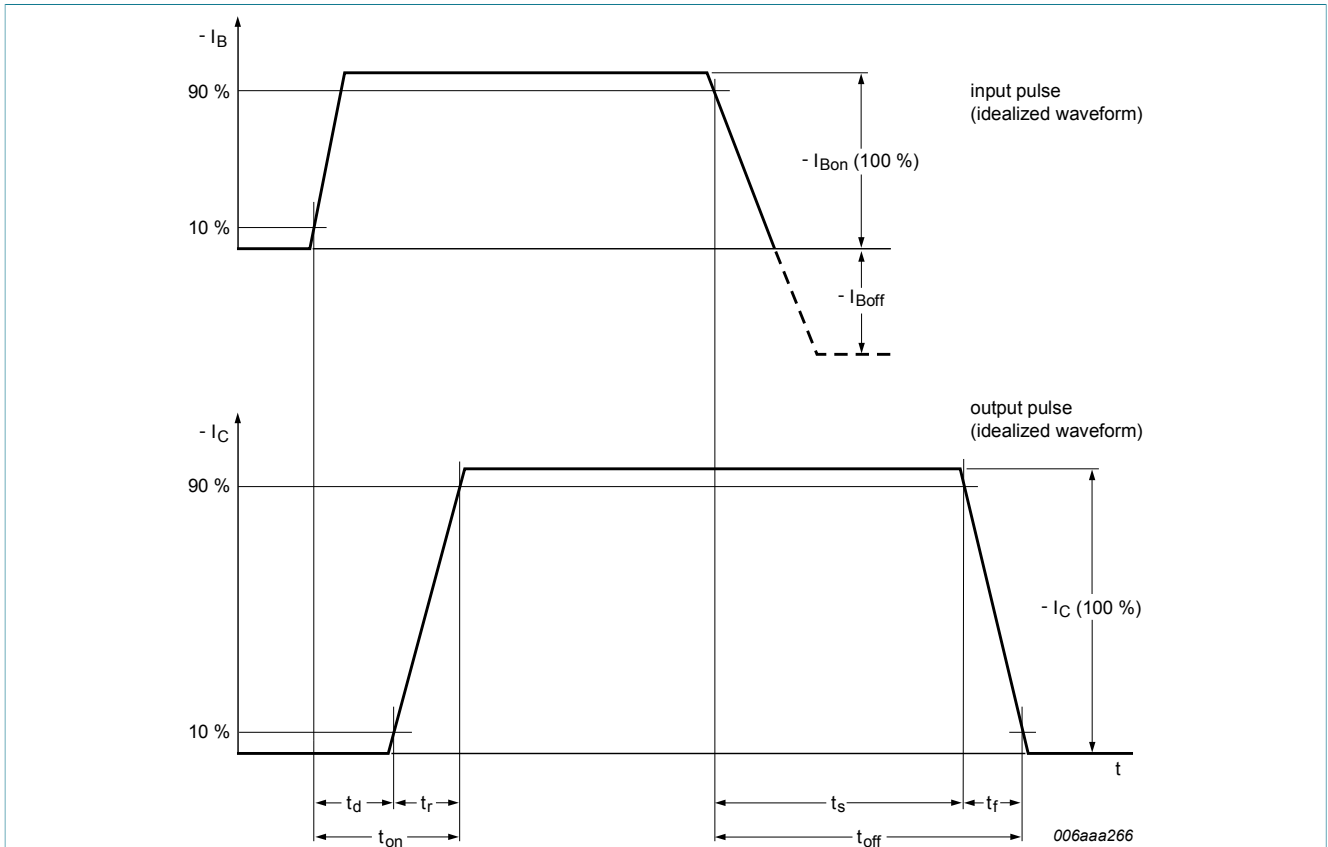


Fig. 12. BISS transistor switching time definition

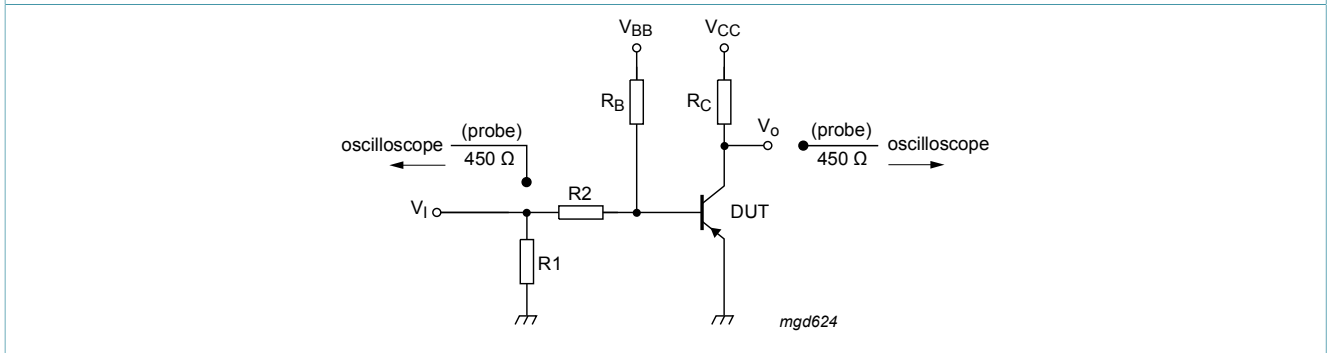


Fig. 13. Test circuit for switching times

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

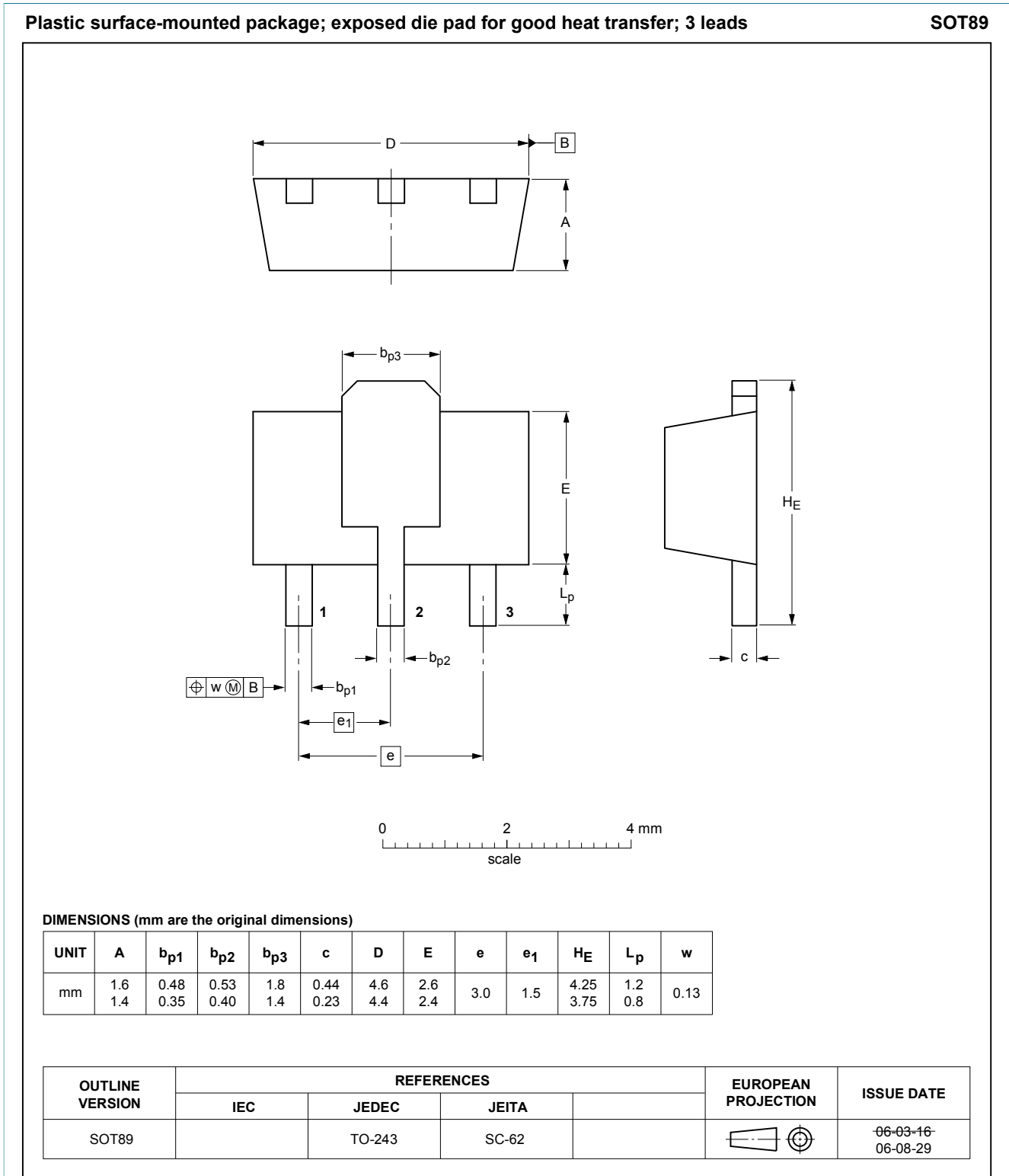


Fig. 14. Package outline SOT89

13. Soldering

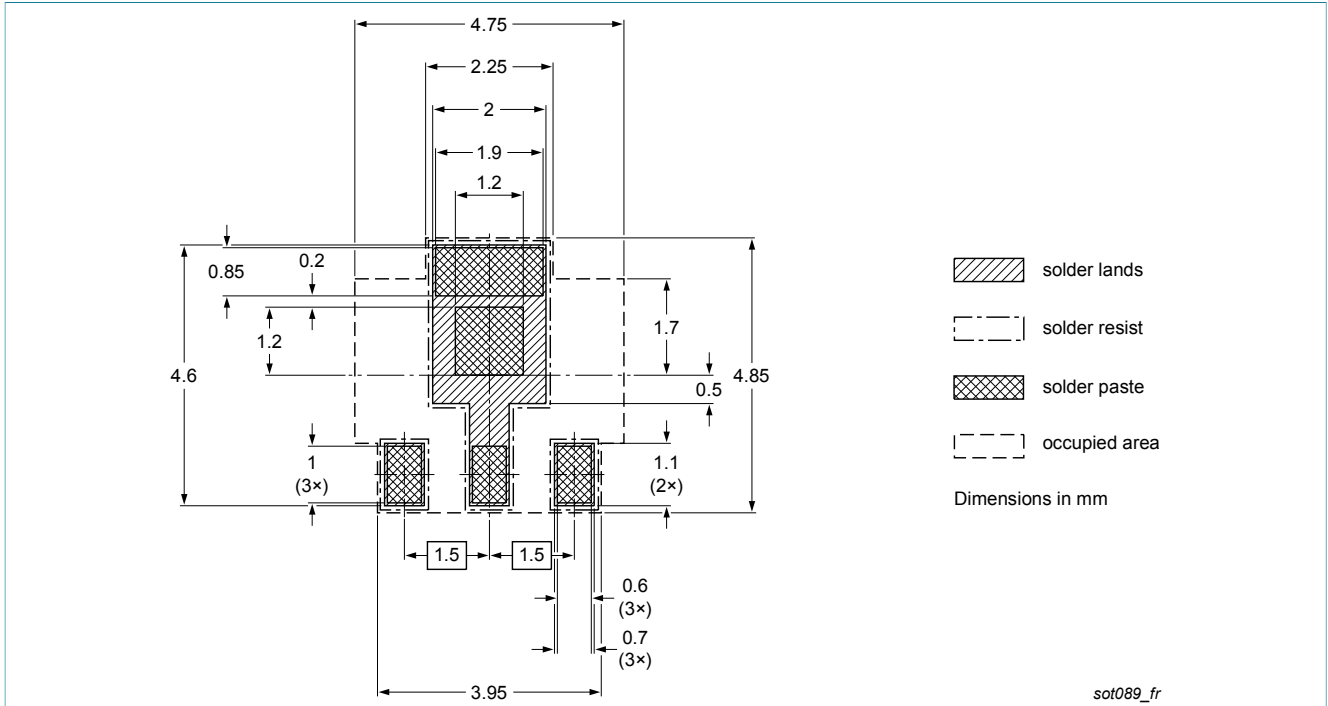


Fig. 15. Reflow soldering footprint for SOT89

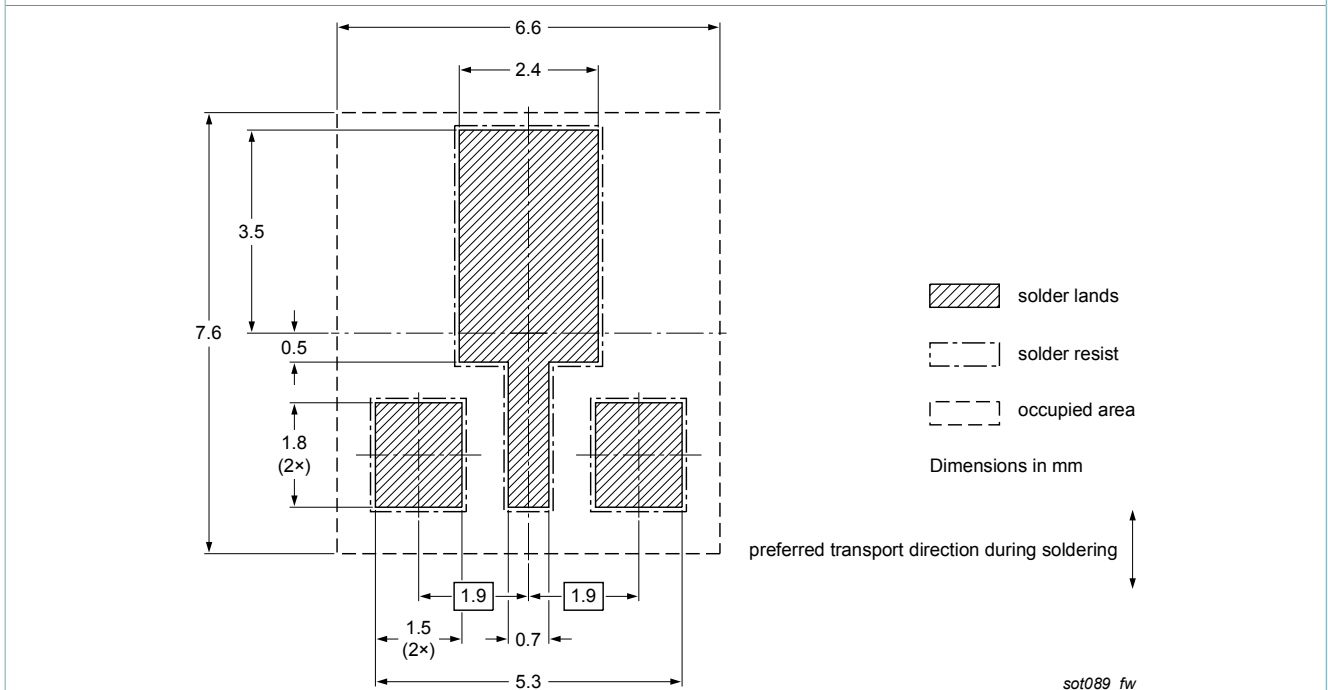


Fig. 16. Wave soldering footprint for SOT89

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9040X v.1	20131209	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.
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