

PBLS1501Y; PBLS1501V

15 V PNP BISS loadswitch

Rev. 02 — 24 August 2009

Product data sheet

1. Product profile

1.1 General description

Low V_{CEsat} PNP transistor and NPN resistor-equipped transistor in one package.

Table 1. Product overview

Type number	Package	
	NXP	JEITA
PBLS1501Y	SOT363	SC-88
PBLS1501V	SOT666	-

1.2 Features

- Low V_{CEsat} (BISS) transistor and resistor-equipped transistor in one package
- Low 'threshold' voltage (< 1 V) compared to MOSFET
- Low drive power required
- Space-saving solution
- Reduction of component count

1.3 Applications

- Supply line switches
- Battery charger switches
- High-side switches for LEDs, drivers and backlights
- Portable equipment

1.4 Quick reference data

Table 2. Quick reference data

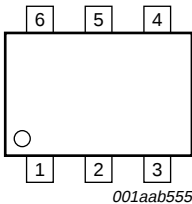
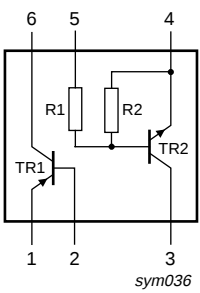
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TR1; PNP: low V_{CEsat} transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	-15	V
I_C	collector-current (DC)		-	-	-500	mA
R_{CEsat}	equivalent on-resistance	$I_C = -500$ mA; $I_B = -50$ mA	-	300	500	m Ω
TR2; NPN: resistor-equipped transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	50	V

Table 2. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _O	output current (DC)		-	-	100	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	

2. Pinning information

Table 3. Discrete pinning

Pin	Description	Simplified outline	Symbol
1	emitter TR1	 001aab555	 sym036
2	base TR1		
3	output (collector) TR2		
4	GND (emitter) TR2		
5	input (base) TR2		
6	collector TR1		

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PBLS1501Y	SC-88	plastic surface mounted package; 6 leads	SOT363
PBLS1501V	-	plastic surface mounted package; 6 leads	SOT666

4. Marking

Table 5. Marking

Type number	Marking code ^[1]
PBLS1501Y	*C1
PBLS1501V	C1

[1] * = -: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

5. Limiting values

Table 6. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
Transistor TR1: PNP					
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	$t_p \leq 1 \text{ ms}; \delta \leq 0.02$	-	-1	A
I_B	base current (DC)		-	-50	mA
I_{BM}	peak base current	$t_p \leq 1 \text{ ms}; \delta \leq 0.02$	-	-100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$ [1]	-	200	mW
Transistor TR2: NPN					
V_{CBO}	collector-base voltage	open emitter	-	50	V
V_{CEO}	collector-emitter voltage	open base	-	50	V
V_{EBO}	emitter-base voltage	open collector	-	10	V
V_i	input voltage				
	positive		-	+12	V
	negative		-	-10	V
I_O	output current (DC)		-	100	mA
I_{CM}	peak collector current		-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$ [1]	-	200	mW
Per device					
P_{tot}	total power dissipation		-	300	mW
T_{stg}	storage temperature		-65	+150	$^\circ\text{C}$
T_j	junction temperature		-	150	$^\circ\text{C}$
T_{amb}	ambient temperature		-65	+150	$^\circ\text{C}$

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

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT363		[1]	-	416	K/W
	SOT666		[1][2]	-	416	K/W

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

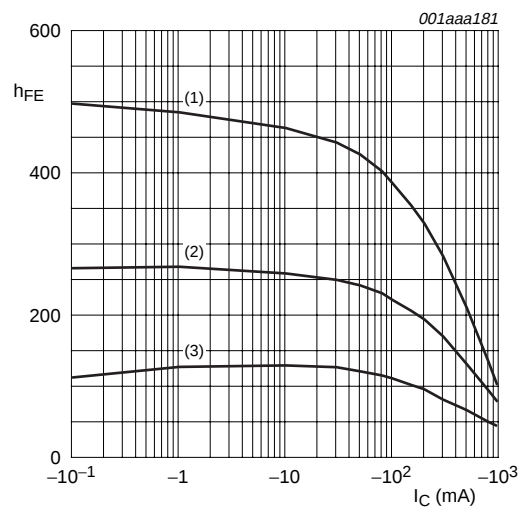
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

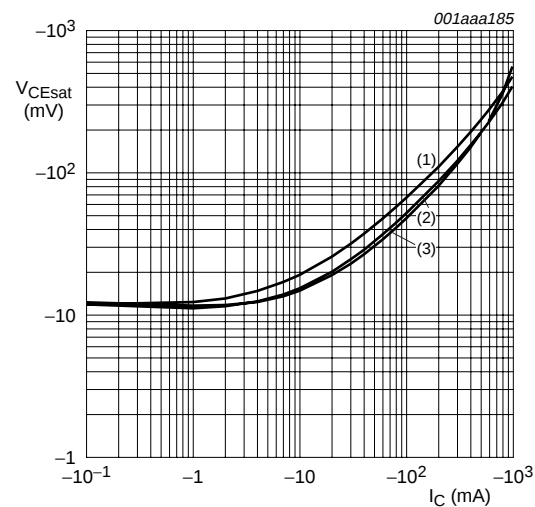
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Transistor TR1: PNP						
I_{CBO}	collector-base cut-off current	$V_{CB} = -15\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -15\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = -15\text{ V}; V_{BE} = 0\text{ V}$	-	-	-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	$V_{CE} = -2\text{ V}; I_C = -10\text{ mA}$	200	-	-	
		$V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$	[1] 150	-	-	
		$V_{CE} = -2\text{ V}; I_C = -500\text{ mA}$	[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
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-	-250	mV
R_{CEsat}	equivalent on-resistance	$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	300	500	$\text{m}\Omega$
V_{BEsat}	base-emitter saturation voltage	$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-	-1.1	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$	[1] -	-	-0.9	V
f_T	transition frequency	$V_{CE} = -5\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz}$	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
Transistor TR2: NPN						
I_{CBO}	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30\text{ V}; I_B = 0\text{ A}$	-	-	1	μA
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	2	mA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 20\text{ mA}$	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$	-	1.2	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	2	1.6	-	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	$\text{k}\Omega$
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$	-	-	2.5	pF

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



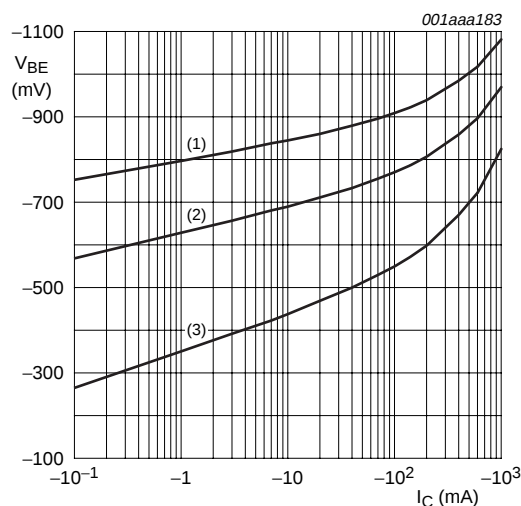
- $V_{CE} = -2\text{ V}$
- (1) $T_{amb} = 150^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = -55^\circ\text{C}$

Fig 1. TR1(PNP): DC current gain as a function of collector current; typical values



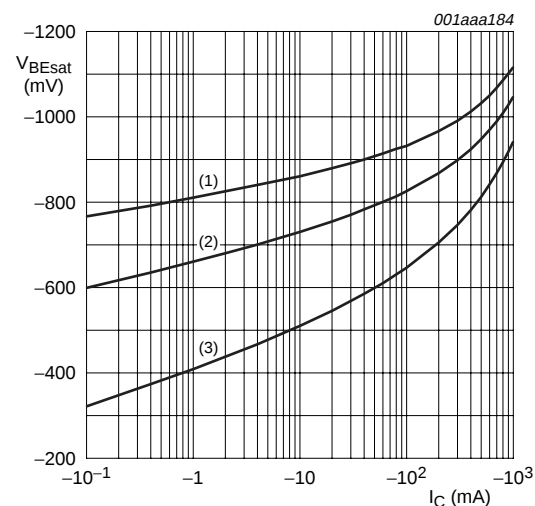
- $I_C/I_B = 20$
- (1) $T_{amb} = 150^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = -55^\circ\text{C}$

Fig 2. TR1(PNP): Collector-emitter saturation voltage as a function of collector current; typical values



- $V_{CE} = -2\text{ V}$
- (1) $T_{amb} = -55^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 150^\circ\text{C}$

Fig 3. TR1(PNP): Base-emitter voltage as a function of collector current; typical values



- $I_C/I_B = 20$
- (1) $T_{amb} = 150^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = -55^\circ\text{C}$

Fig 4. TR1(PNP): Base-emitter saturation voltage as a function of collector current; typical values

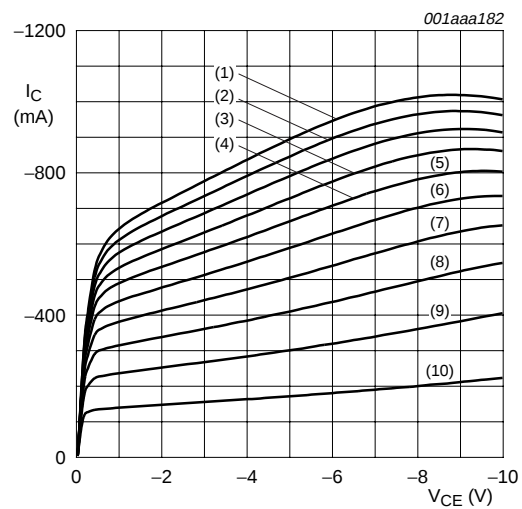


Fig 5. TR1(PNP): Collector current as a function of collector-emitter voltage; typical values

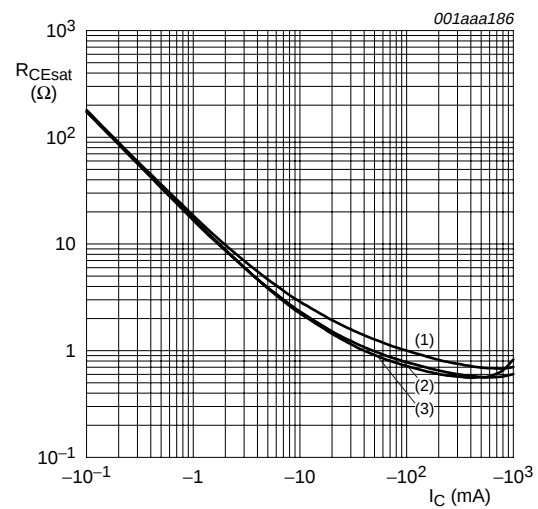
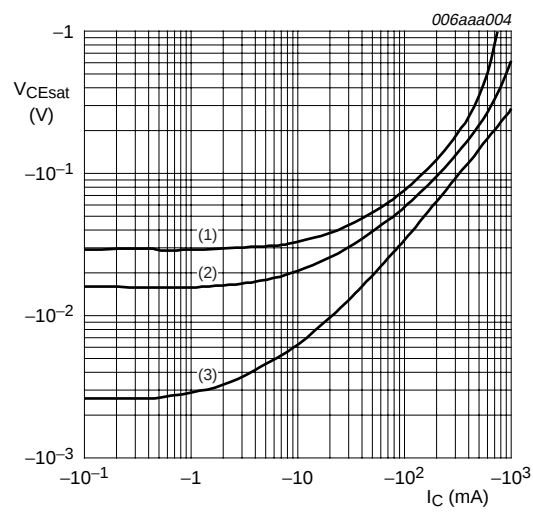
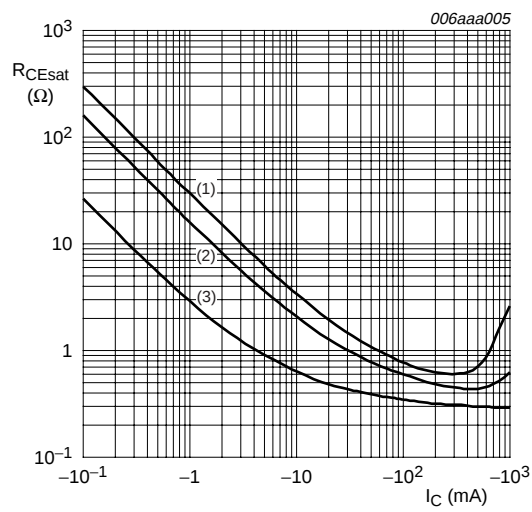


Fig 6. TR1(PNP): Equivalent on-resistance as a function of collector current; typical values



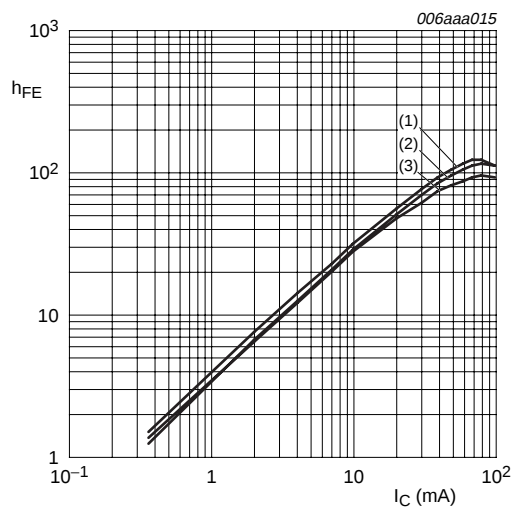
$T_{amb} = 25\text{ }^{\circ}\text{C}$
(1) $I_C/I_B = 100$
(2) $I_C/I_B = 50$
(3) $I_C/I_B = 10$

Fig 7. TR1(PNP): Collector-emitter saturation voltage as a function of collector current; typical values



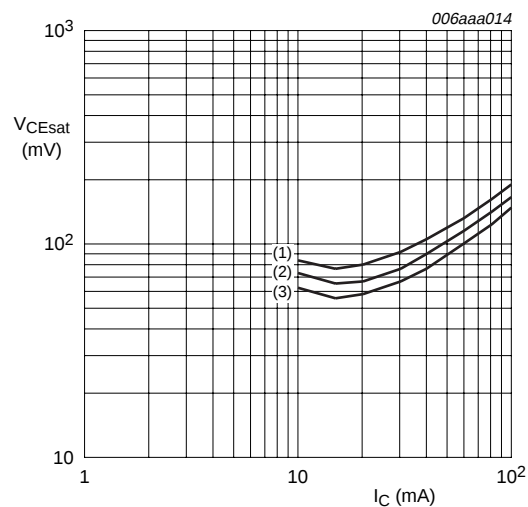
$T_{amb} = 25\text{ }^{\circ}\text{C}$
(1) $I_C/I_B = 100$
(2) $I_C/I_B = 50$
(3) $I_C/I_B = 10$

Fig 8. TR1(PNP): Equivalent on-resistance as a function of collector current; typical values



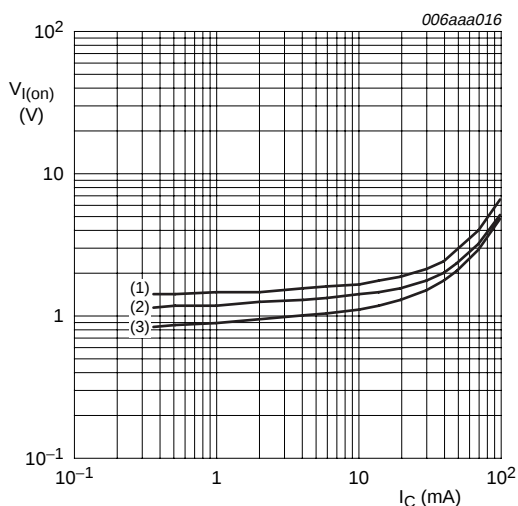
- $V_{CE} = 5\text{ V}$
- (1) $T_{amb} = 150^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = -40^\circ\text{C}$

Fig 9. TR2(NPN): DC current gain as a function of collector current; typical values



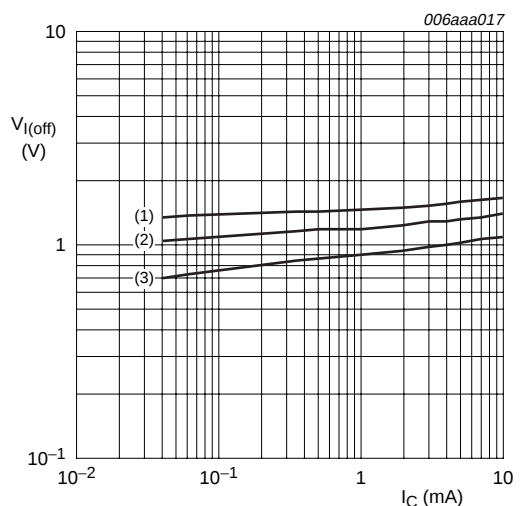
- $I_C/I_B = 20$
- (1) $T_{amb} = 100^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = -40^\circ\text{C}$

Fig 10. TR2(NPN): Collector-emitter saturation voltage as a function of collector current; typical values



- $V_{CE} = 0.3\text{ V}$
- (1) $T_{amb} = -40^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 100^\circ\text{C}$

Fig 11. TR2(NPN): On-state input voltage as a function of collector current; typical values



- $V_{CE} = 5\text{ V}$
- (1) $T_{amb} = -40^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 100^\circ\text{C}$

Fig 12. TR2(NPN): Off-state input voltage as a function of collector current; typical values

8. Package outline

Plastic surface-mounted package; 6 leads

SOT363

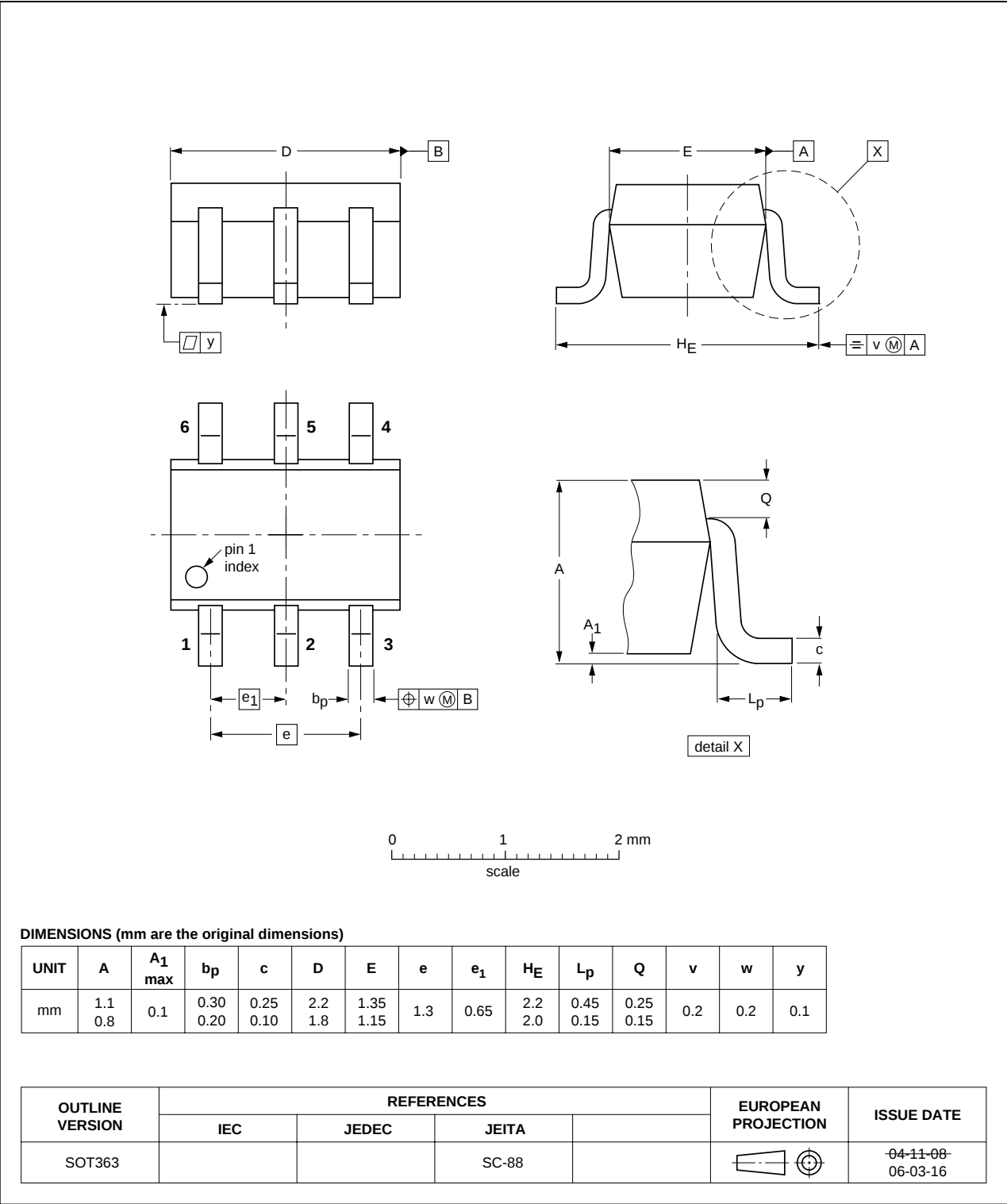


Fig 13. Package outline SOT363 (SC-88)

Plastic surface-mounted package; 6 leads

SOT666

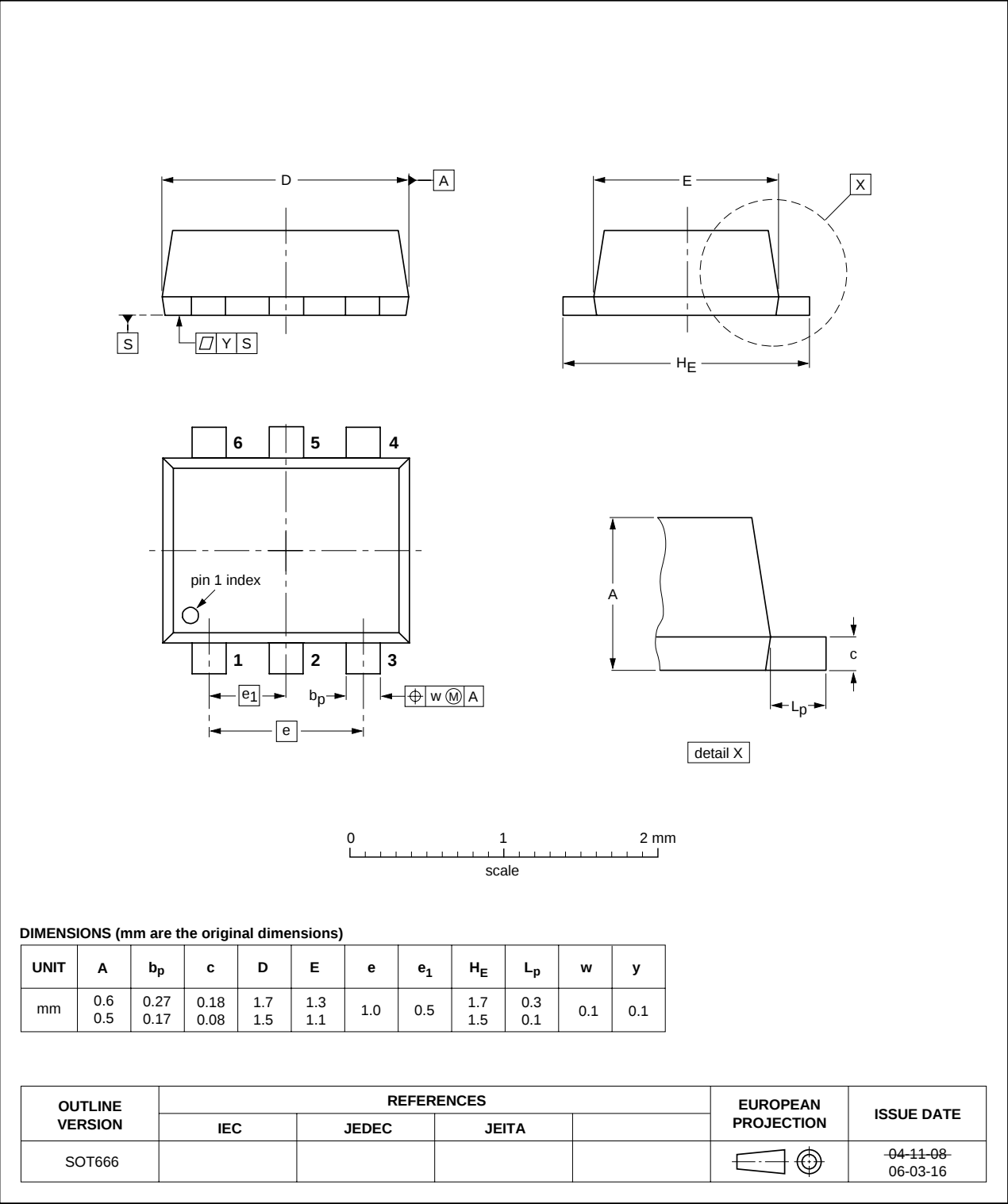


Fig 14. Package outline SOT666

9. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

Type number	Package	Description	Packing quantity		
			3000	4000	10000
PBL1501Y	SOT363	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-	-135
		4 mm pitch, 8 mm tape and reel; T2	^[3] -125	-	-165
PBL1501V	SOT666	4 mm pitch, 8 mm tape and reel	-	-115	-

[1] For further information and the availability of packing methods, see [Section 12](#).

[2] T1: normal taping

[3] T2: reverse taping

10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBLS1501Y_PBLS1501V_2	20090824	Product data sheet	-	PBLS1501Y_PBLS1501V_1
Modifications: - This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content. Table 3 “Discrete pinning”: amended Figure 13 “Package outline SOT363 (SC-88)”: updated Figure 14 “Package outline SOT666”: updated				
PBLS1501Y_PBLS1501V_1	20041105	Product data sheet	-	-

11. Legal information

11.1 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".

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