

PBLS4004Y; PBLS4004V

40 V PNP BISS loadswitch

Rev. 03 — 16 February 2009

Product data sheet

1. Product profile

1.1 General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor and NPN Resistor-Equipped Transistor (RET) in one package.

Table 1. Product overview

Type number	Package	
	NXP	JEITA
PBLS4004Y	SOT363	SC-88
PBLS4004V	SOT666	-

1.2 Features

- Low V_{CEsat} (BISS) 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	-	-	-40	V
I_C	collector current		-	-	-500	mA
R_{CEsat}	collector-emitter saturation resistance	$I_C = -500$ mA; $I_B = -50$ mA	[1] -	440	700	m Ω
TR2; NPN resistor-equipped transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	50	V

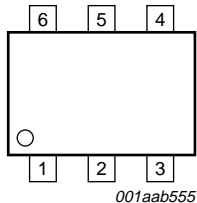
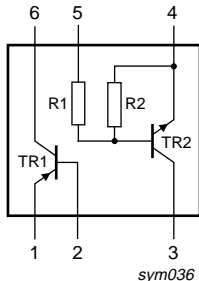
Table 2. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_O	output current		-	-	100	mA
R1	bias resistor 1 (input)		15.4	22	28.6	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	

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

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	emitter TR1		
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		Version
	Name	Description	
PBLS4004Y	SC-88	plastic surface-mounted package; 6 leads	SOT363
PBLS4004V	-	plastic surface-mounted package; 6 leads	SOT666

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PBLS4004Y	S4*
PBLS4004V	K4

[1] * = -: made in Hong Kong
 * = p: 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
TR1; PNP low V_{CEsat} transistor					
V_{CBO}	collector-base voltage	open emitter	-	-40	V
V_{CEO}	collector-emitter voltage	open base	-	-40	V
V_{EBO}	emitter-base voltage	open collector	-	-6	V
I_C	collector current		-	-500	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-1	A
I_B	base current		-	-50	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms	-	-100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	200	mW
TR2; NPN resistor-equipped transistor					
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		-	+40	V
	negative		-	-10	V
I_O	output current		-	100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	200	mW
Per device					
P_{tot}	total power dissipation		-	300	mW
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-65	+150	°C
T_{stg}	storage temperature		-65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), 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 an FR4 PCB, single-sided copper, tin-plated and standard footprint.

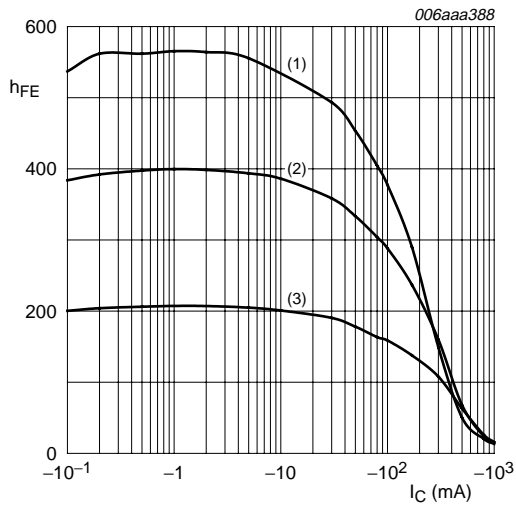
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics
T_{amb} = 25 °C unless otherwise specified.

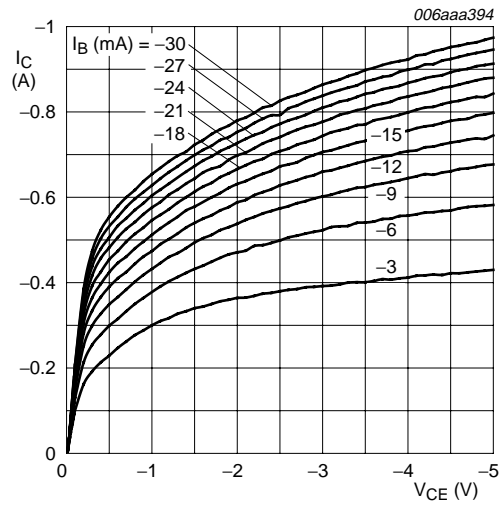
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
TR1; PNP low V_{CEsat} transistor							
I _{CBO}	collector-base cut-off current	V _{CB} = -40 V; I _E = 0 A	-	-	-100	nA	
		V _{CB} = -40 V; I _E = 0 A; T _j = 150 °C	-	-	-50	μA	
I _{EBO}	emitter-base cut-off current	V _{EB} = -5 V; I _C = 0 A	-	-	-100	nA	
h _{FE}	DC current gain	V _{CE} = -2 V; I _C = -10 mA	200	-	-		
		V _{CE} = -2 V; I _C = -100 mA	[1]	150	-	-	
		V _{CE} = -2 V; I _C = -500 mA	[1]	40	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -10 mA; I _B = -0.5 mA	-	-	-50	mV	
		I _C = -100 mA; I _B = -5 mA	-	-	-130	mV	
		I _C = -200 mA; I _B = -10 mA	-	-	-200	mV	
		I _C = -500 mA; I _B = -50 mA	[1]	-	-	-350	mV
R _{CEsat}	collector-emitter saturation resistance	I _C = -500 mA; I _B = -50 mA	[1]	-	440	700	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = -500 mA; I _B = -50 mA	[1]	-	-	-1.2	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = -2 V; I _C = -100 mA	[1]	-	-	-1.1	V
f _T	transition frequency	I _C = -100 mA; V _{CE} = -5 V; f = 100 MHz	100	300	-	MHz	
C _c	collector capacitance	V _{CB} = -10 V; I _E = i _e = 0 A; f = 1 MHz	-	-	10	pF	
TR2; NPN resistor-equipped transistor							
I _{CBO}	collector-base cut-off current	V _{CB} = 50 V; I _E = 0 A	-	-	100	nA	
I _{CEO}	collector-emitter cut-off current	V _{CE} = 30 V; I _B = 0 A	-	-	1	μA	
		V _{CE} = 30 V; I _B = 0 A; T _j = 150 °C	-	-	50	μA	
I _{EBO}	emitter-base cut-off current	V _{EB} = 5 V; I _C = 0 A	-	-	180	μA	
h _{FE}	DC current gain	V _{CE} = 5 V; I _C = 5 mA	60	-	-		
V _{CEsat}	collector-emitter saturation voltage	I _C = 10 mA; I _B = 0.5 mA	-	-	150	mV	
V _{I(off)}	off-state input voltage	V _{CE} = 5 V; I _C = 100 μA	-	1.1	0.8	V	
V _{I(on)}	on-state input voltage	V _{CE} = 0.3 V; I _C = 5 mA	2.5	1.7	-	V	
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ	
R2/R1	bias resistor ratio		0.8	1	1.2		
C _c	collector capacitance	V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz	-	-	2.5	pF	

 [1] Pulse test: t_p ≤ 300 μs; δ ≤ 0.02.



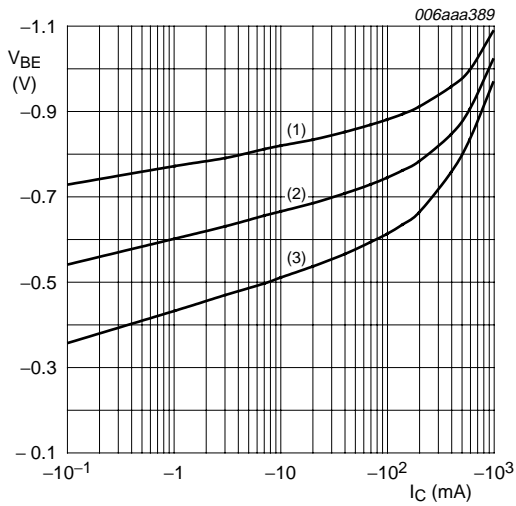
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



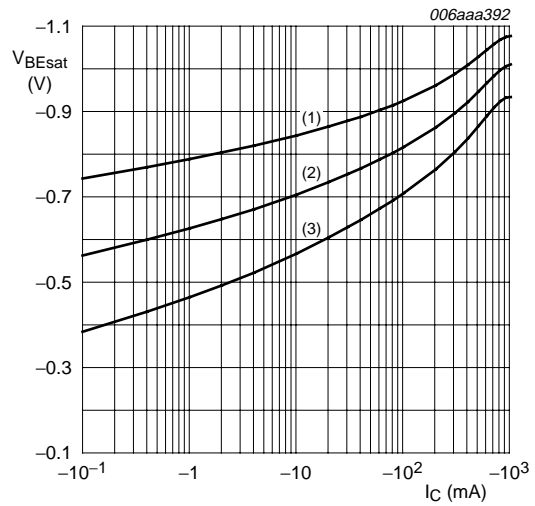
$T_{amb} = 25\text{ °C}$

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



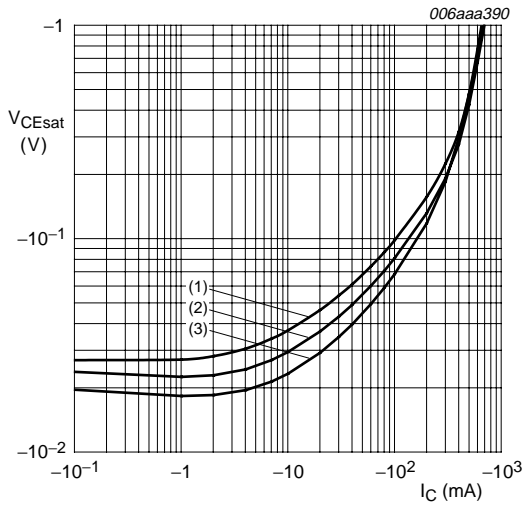
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



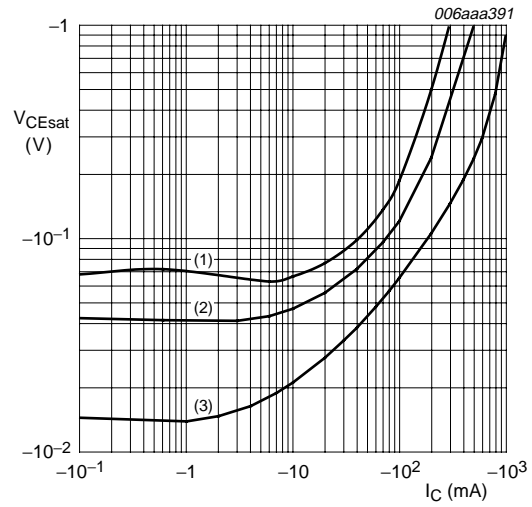
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



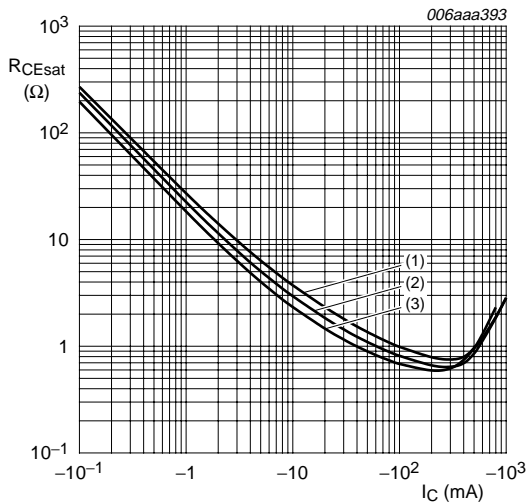
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



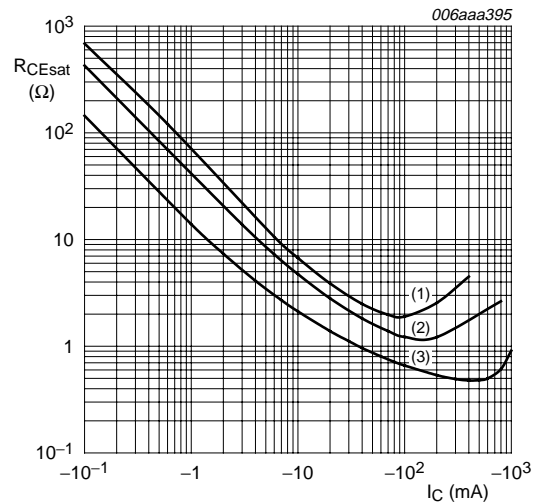
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

Fig 6. TR1 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



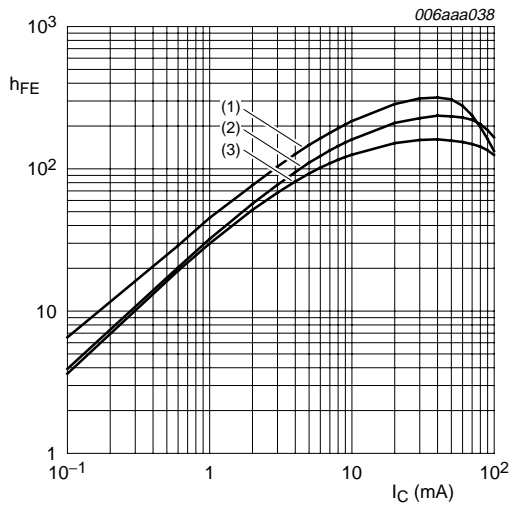
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



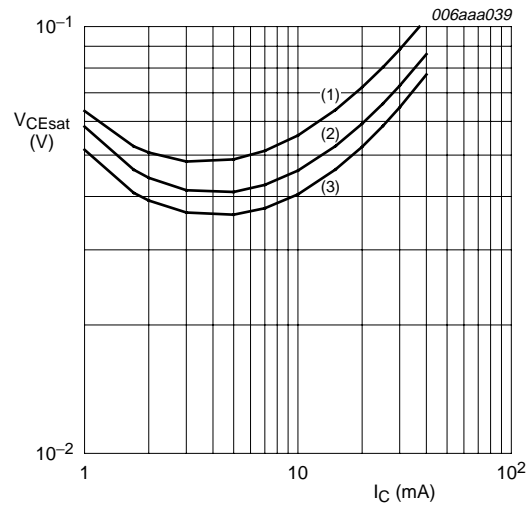
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

Fig 8. TR1 (PNP): Collector-emitter saturation resistance as a function of collector current; typical values



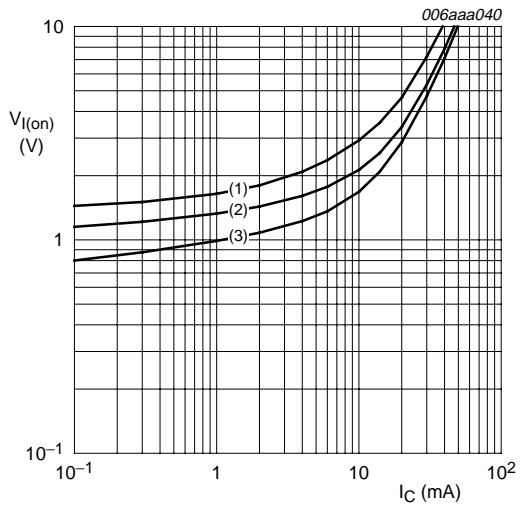
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



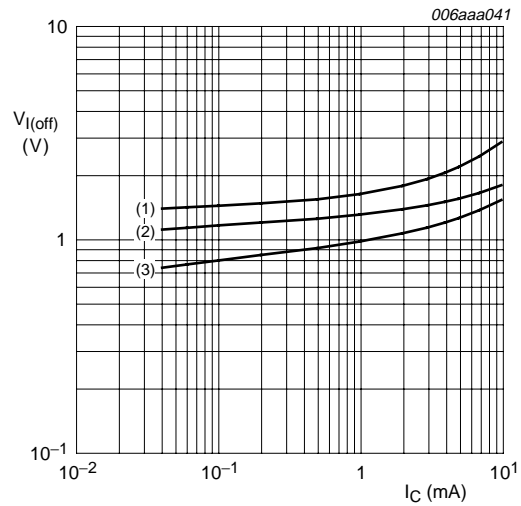
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



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

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



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

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

8. Package outline

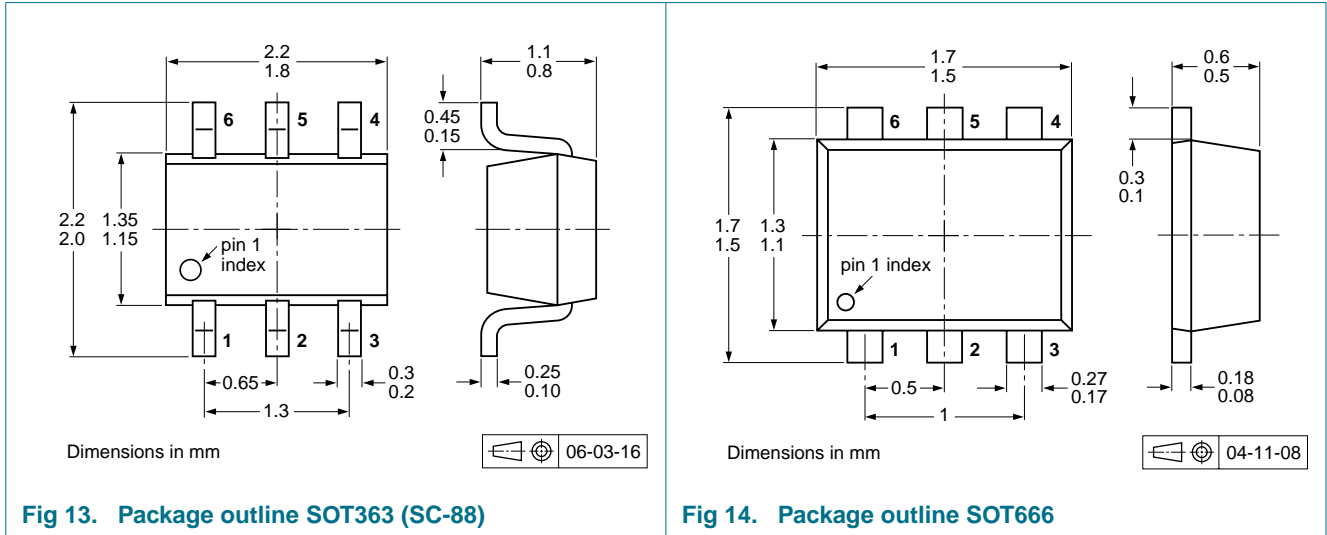


Fig 13. Package outline SOT363 (SC-88)

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	8000	10000
PBLS4004Y	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
PBLS4004V	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		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
PBL4004Y_PBL4004V_3	20090216	Product data sheet	-	PBL4004Y_PBL4004V_2
Modifications:				
				<ul style="list-style-type: none">• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.• Legal texts have been adapted to the new company name where appropriate.• Figure 5: y-axis value unit amended• Figure 6: y-axis value unit amended• Section 11 "Legal information": updated
PBL4004Y_PBL4004V_2	20050711	Product data sheet	-	PBL4004Y_PBL4004V_1
PBL4004Y_PBL4004V_1	20041213	Product data sheet	-	-

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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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