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Kind regards,

Team Nexperia

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

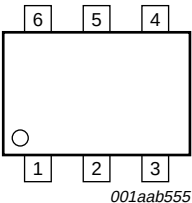
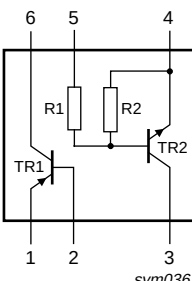
Table 2. Quick reference data ...continued

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

[1] Pulse test: t_p ≤ 300 μs; δ ≤ 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		
	Name	Description	Version
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.

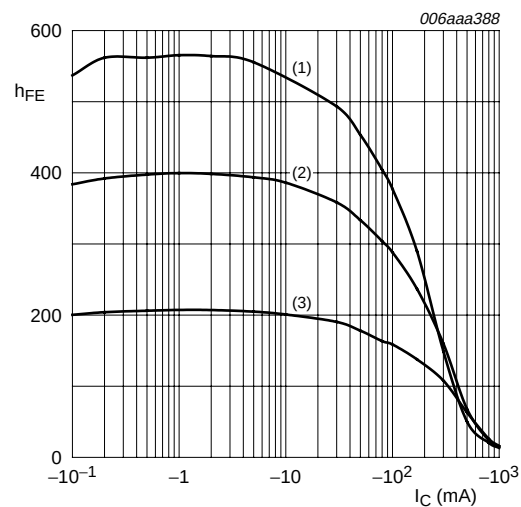
7. Characteristics

Table 8. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TR1; PNP low V_{CEsat} transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = -40\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-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]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$	-	-	-50	mV
		$I_C = -100\text{ mA}; I_B = -5\text{ mA}$	-	-	-130	mV
		$I_C = -200\text{ mA}; I_B = -10\text{ mA}$	-	-	-200	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1]	-	-	-350	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1]	-	440	700	$\text{m}\Omega$
V_{BEsat}	base-emitter saturation voltage	$I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1]	-	-	-1.2	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$ [1]	-	-	-1.1	V
f_T	transition frequency	$I_C = -100\text{ mA}; V_{CE} = -5\text{ V}; f = 100\text{ MHz}$	100	300	-	MHz
C_c	collector capacitance	$V_{CB} = -10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$	-	-	10	pF
TR2; NPN resistor-equipped transistor						
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	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	180	μA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$	60	-	-	
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	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}$	-	1.1	0.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 5\text{ mA}$	2.5	1.7	-	V
R1	bias resistor 1 (input)		15.4	22	28.6	$\text{k}\Omega$
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

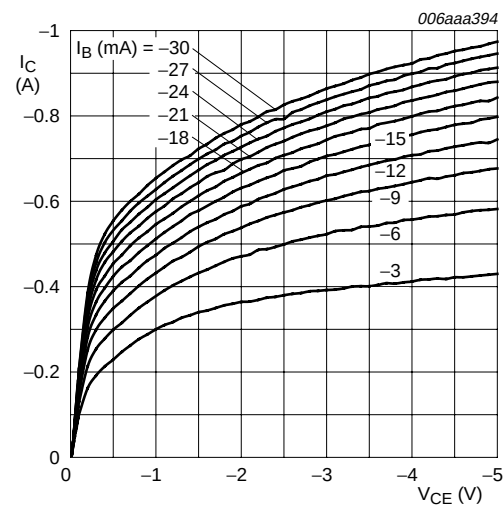
[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.



$V_{CE} = -2\text{ V}$

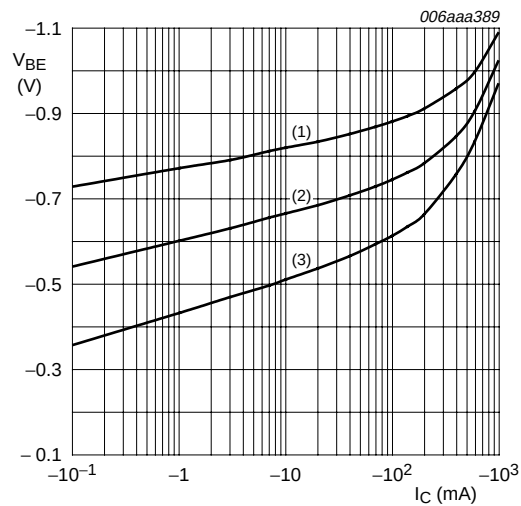
- (1) $T_{amb} = 100^\circ\text{C}$
- (2) $T_{amb} = 25^\circ\text{C}$
- (3) $T_{amb} = -55^\circ\text{C}$

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



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

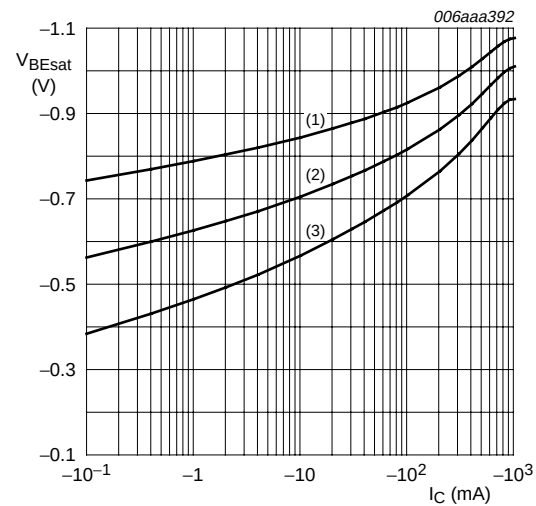
Fig 2. TR1 (PNP): Collector current as a function of collector-emitter voltage; typical values



$V_{CE} = -2\text{ V}$

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

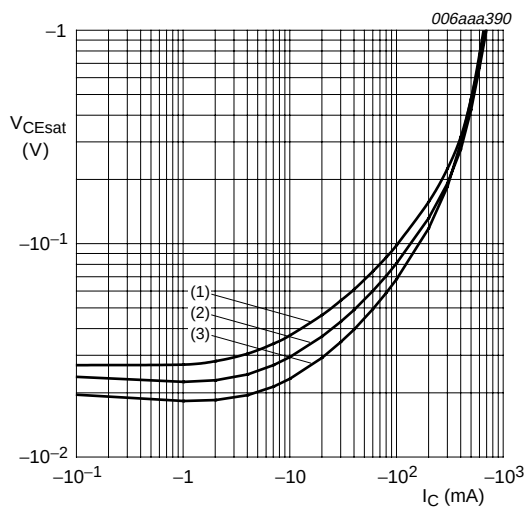
Fig 3. TR1 (PNP): Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 20$

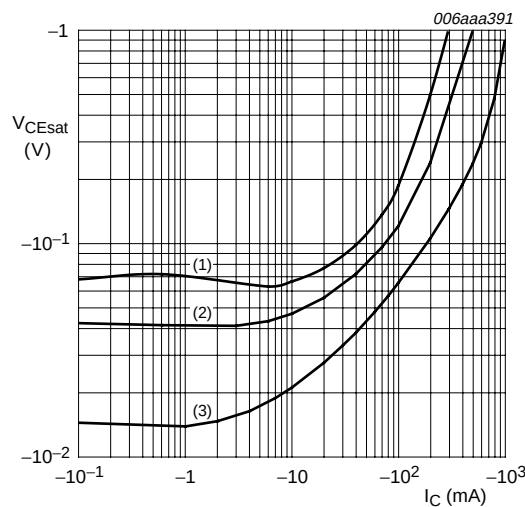
- (1) $T_{amb} = -55^\circ\text{C}$
- (2) $T_{amb} = 25^\circ\text{C}$
- (3) $T_{amb} = 100^\circ\text{C}$

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



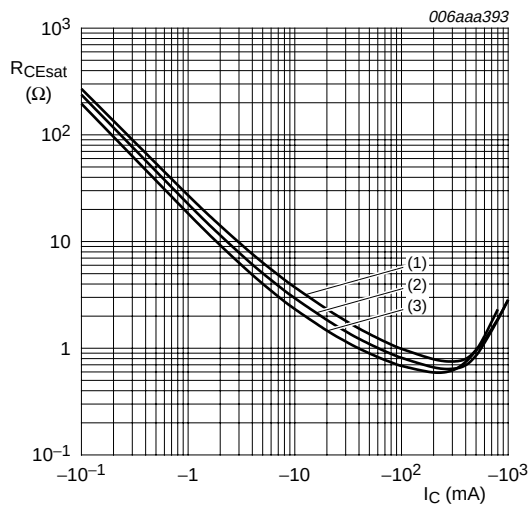
- $I_C/I_B = 20$
- (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



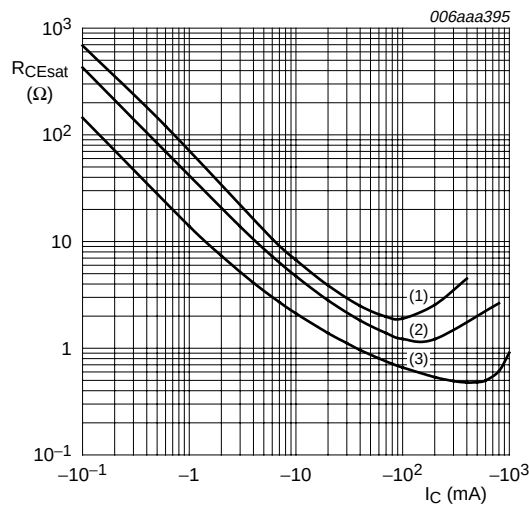
- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 10$

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



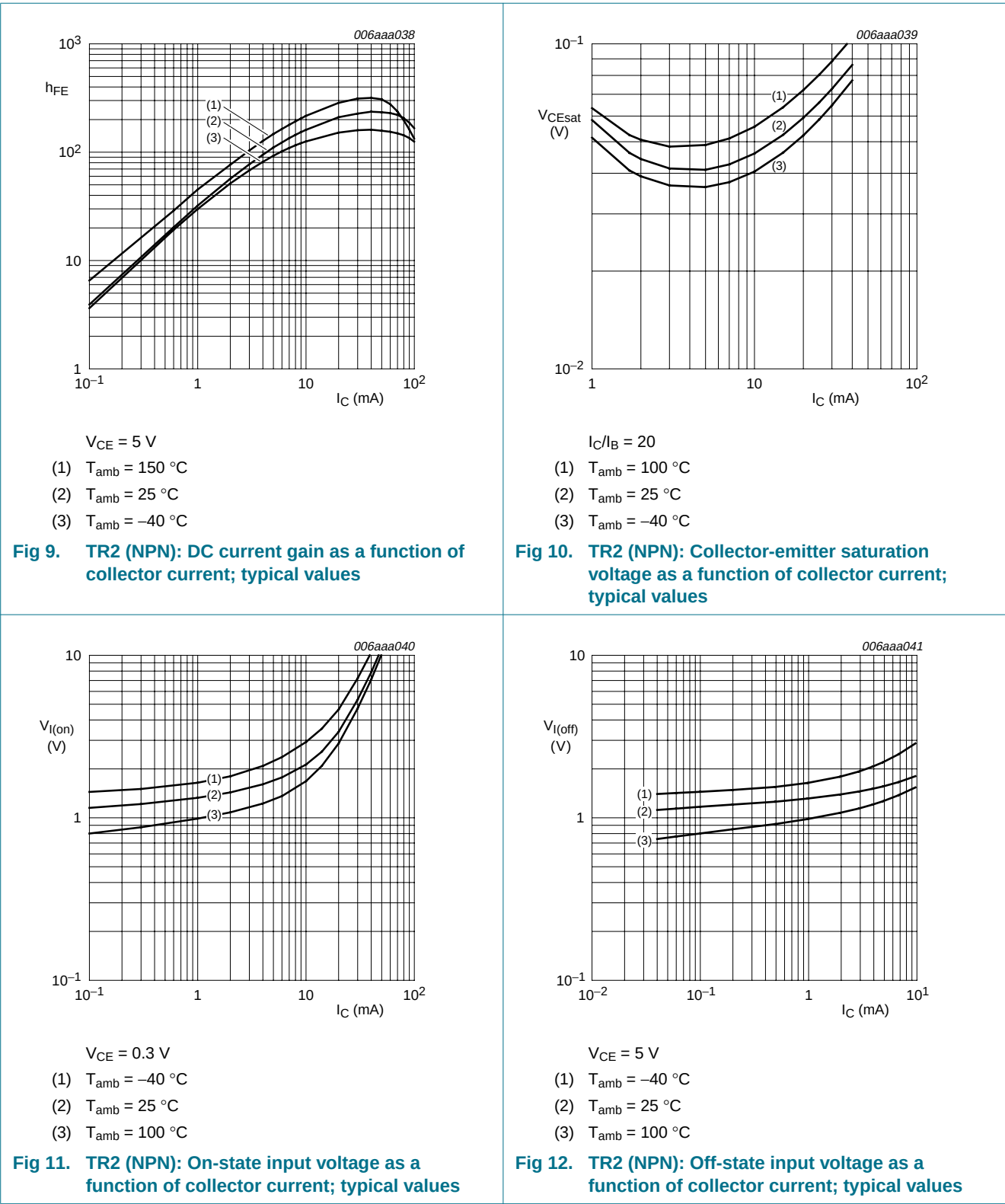
- $I_C/I_B = 20$
- (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 7. TR1 (PNP): Collector-emitter saturation 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 8. TR1 (PNP): Collector-emitter saturation resistance as a function of collector current; typical values



006aaa039

V_{CEsat} (V)

I_C (mA)

$I_C/I_B = 20$

- (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

006aaa040

$V_{I(on)}$ (V)

I_C (mA)

$V_{CE} = 0.3\text{ V}$

- (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

006aaa041

$V_{I(off)}$ (V)

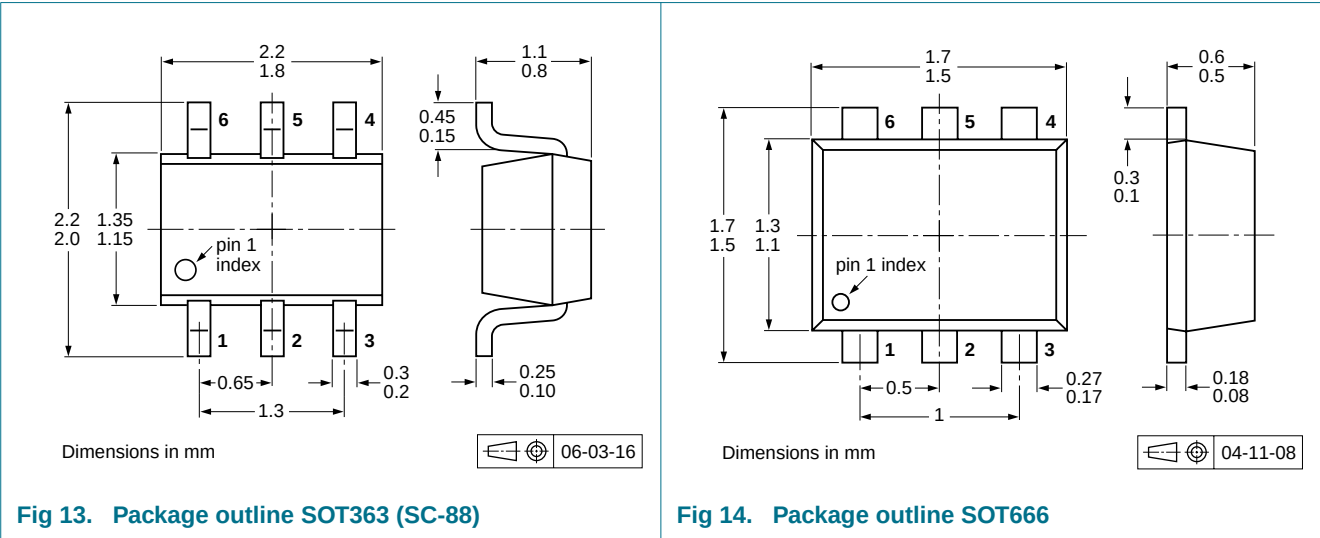
I_C (mA)

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

- (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



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
PBL54004Y_PBL54004V_3	20090216	Product data sheet	-	PBL54004Y_PBL54004V_2
Modifications:				
• 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				
PBL54004Y_PBL54004V_2	20050711	Product data sheet	-	PBL54004Y_PBL54004V_1
PBL54004Y_PBL54004V_1	20041213	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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13. Contents

1 Product profile 1

1.1 General description..... 1

1.2 Features 1

1.3 Applications 1

1.4 Quick reference data..... 1

2 Pinning information..... 2

3 Ordering information..... 2

4 Marking..... 2

5 Limiting values..... 3

6 Thermal characteristics..... 3

7 Characteristics..... 4

8 Package outline 8

9 Packing information..... 8

10 Revision history..... 9

11 Legal information..... 10

11.1 Data sheet status 10

11.2 Definitions..... 10

11.3 Disclaimers..... 10

11.4 Trademarks..... 10

12 Contact information..... 10

13 Contents 11



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