PDTB123YT

50 V, 500 mA PNP resistor-equipped transistor; R1 = 2.2 kΩ, R2 = 10 kΩ

1 January 2023 **Product data sheet**

1. General description

PNP Resistor-Equipped Transistor (RET) in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complement: PDTD123YT

2. Features and benefits

- 500 mA output current capability
- Reduces pick and place costs
- Built-in bias resistors
- ±10 % resistor ratio tolerance
- Simplifies circuit design
- Reduces component count

3. Applications

- Digital application in automotive and industrial segments
- Cost-saving alternative for BC807 series in digital applications
- Control of IC inputs
- Switching loads

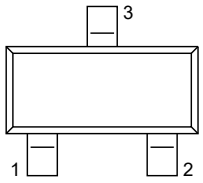
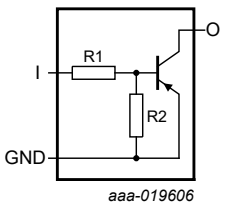
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-50	V
I_O	output current			-	-	-500	mA
R1	bias resistor 1 (input)	T_{amb} = 25 °C		1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio			4.1	4.55	5	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I	input (base)		
2	GND	ground (emitter)		
3	O	output (collector)		

SOT23

aaa-019606

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PDTB123YT	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PDTB123YT	%7Y

[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		-	-50	V
V_{CEO}	collector-emitter voltage	open base		-	-50	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
V_I	input voltage	positive		-	5	V
		negative		-	-20	V
I_O	output current			-	-500	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	250	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.

9. Thermal characteristics

Table 6. Thermal characteristics

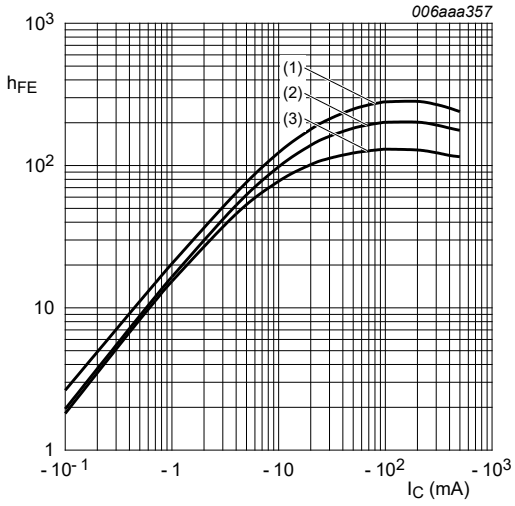
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	500	K/W

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

10. Characteristics

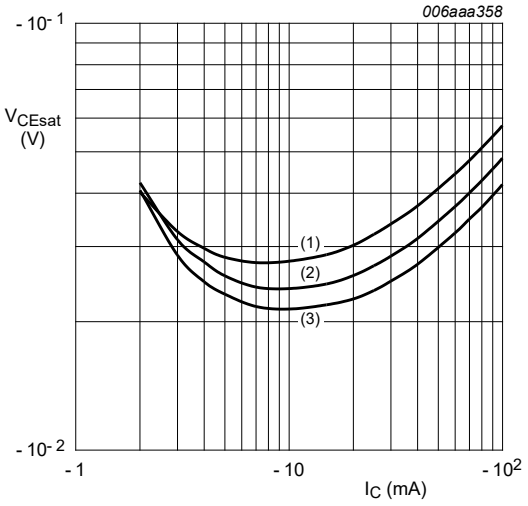
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -40 V; I_E = 0 A; T_{amb} = 25 °C		-	-	-100	nA
		V_{CB} = -50 V; I_E = 0 A; T_{amb} = 25 °C		-	-	-100	nA
I_{CEO}	collector-emitter cut-off current	V_{CE} = -50 V; I_B = 0 A; T_{amb} = 25 °C		-	-	-0.5	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	-0.65	mA
h_{FE}	DC current gain	V_{CE} = -5 V; I_C = -50 mA; T_{amb} = 25 °C		70	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -50 mA; I_B = -2.5 mA; T_{amb} = 25 °C		-	-	-300	mV
$V_{I(off)}$	off-state input voltage	V_{CE} = -5 V; I_C = -100 µA; T_{amb} = 25 °C		-0.4	-0.6	-1	V
$V_{I(on)}$	on-state input voltage	V_{CE} = -0.3 V; I_C = -20 mA; T_{amb} = 25 °C		-0.5	-1	-1.4	V
R1	bias resistor 1 (input)	T_{amb} = 25 °C		1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio			4.1	4.55	5	
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 100 MHz; T_{amb} = 25 °C		-	11	-	pF



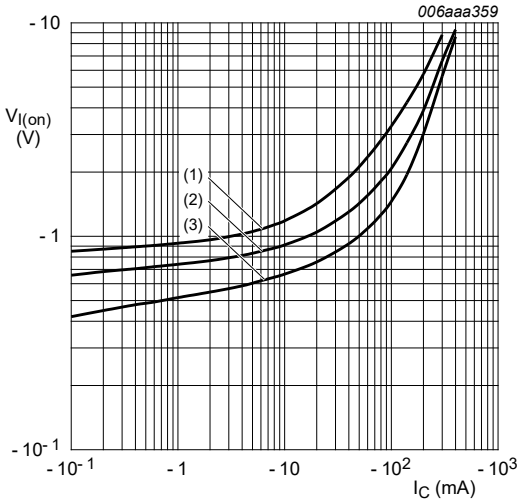
V_{CE} = -5 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −40 °C

Fig. 1. DC current gain as a function of collector current; typical values



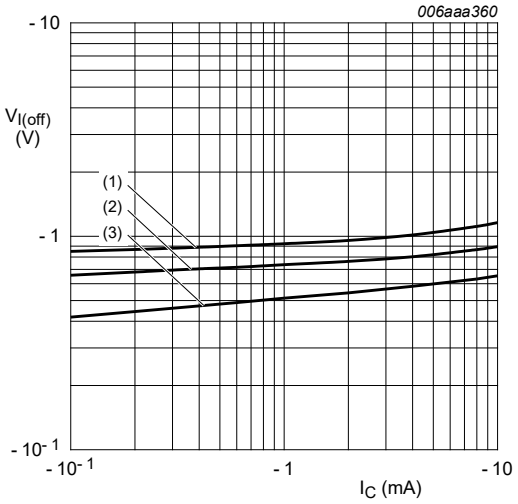
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −40 °C

Fig. 2. Collector-emitter saturation voltage as a function of collector current; typical values



V_{CE} = -0.3 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig. 3. On-state input voltage as a function of collector current; typical values



V_{CE} = -5 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig. 4. Off-state input voltage as a function of collector current; typical values

11. Test information

Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R_1 = \frac{V(I_2) - V(I_1)}{I_2 - I_1}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R2}{R1} = \frac{V(I_4) - V(I_3)}{R1 \cdot (I_4 - I_3)} - 1$$

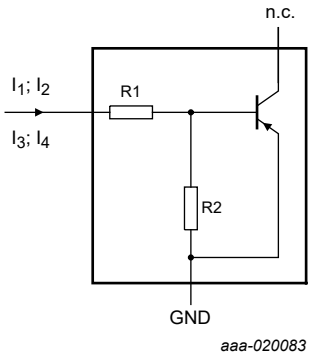


Fig. 5. PNP transistor: Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I_1	I_2	I_3	I_4
PDTB123YT	2.2	10	-0.7 mA	-0.8 mA	0.45 mA	0.55 mA

12. Package outline

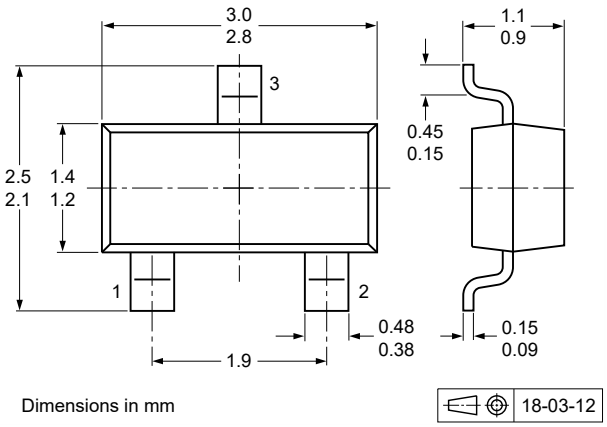


Fig. 6. Package outline SOT23

13. Soldering

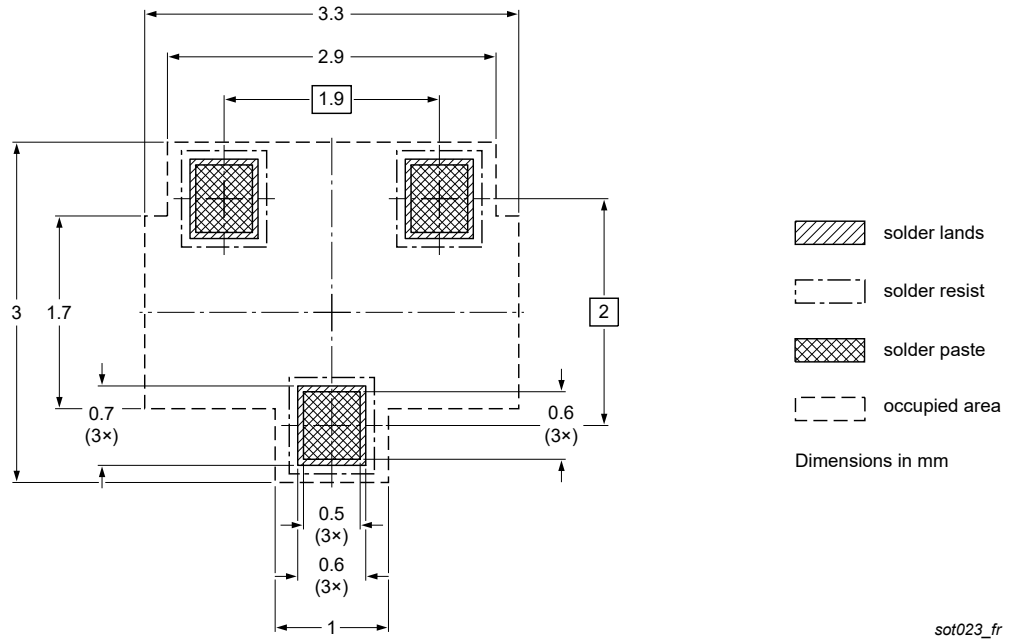


Fig. 7. Reflow soldering footprint for SOT23

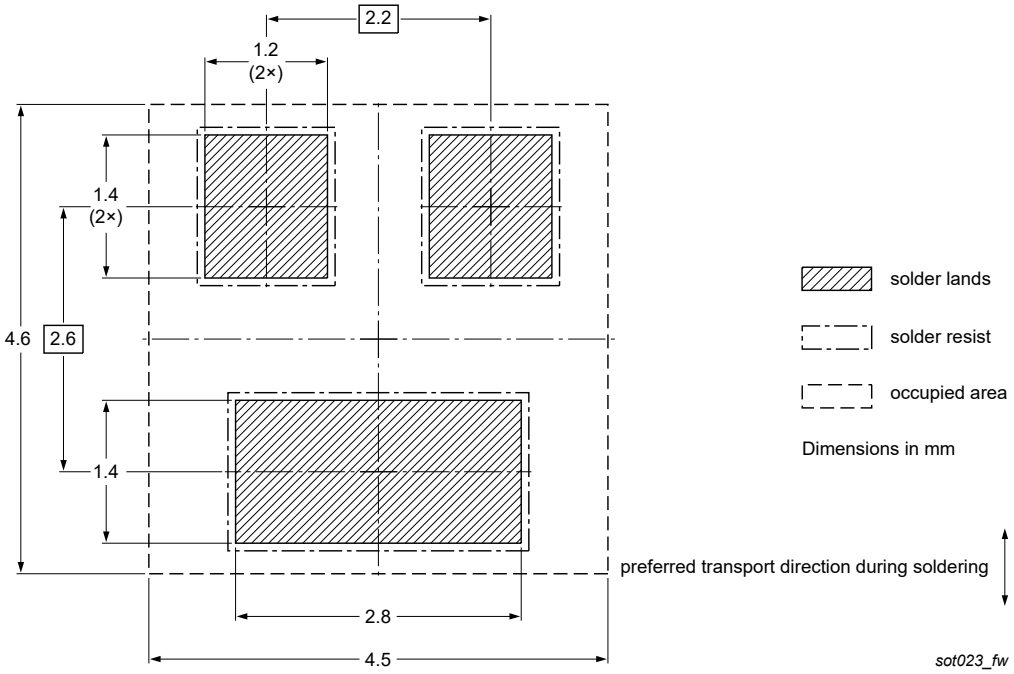


Fig. 8. Wave soldering footprint for SOT23

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PDTB123YT v.5	20230101	Product data sheet	-	PDTB123YT v.4
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Product changed to non automotive. Please refer to the automotive product(s) with -Q.			
PDTB123YT v.4	20201116	Product data sheet	-	PDTB123YT v.3
PDTB123YT v.3	20100923	Product data sheet	-	PDTB123YT_SER v.2
PDTB123YT_SER v.2	20091116	Product data sheet	-	PDTB123YT_SER v.1
PDTB123YT_SER v.1	20050427	Product data sheet	-	-

15. Legal information

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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