



PDTB123YU

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

10 March 2025

Product data sheet

1. General description

PNP Resistor-Equipped Transistor (RET) in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

NPN complement: PDTD123YU

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
- High temperature applications up to 175 °C
- AEC-Q101 qualified

3. Applications

- Cost-saving alternative for BC807 series in digital applications
- Control of IC inputs
- Switching loads

4. Quick reference data

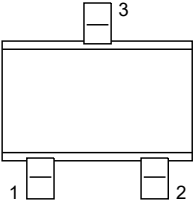
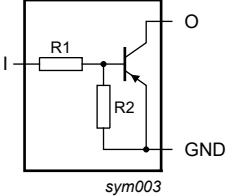
Table 1. Quick reference data

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	k Ω
R2/R1	bias resistor ratio		4.1	4.55	5	

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I	input (base)	 SC-70 (SOT323)	 sym003
2	G	GND (emitter)		
3	O	output (collector)		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PDTB123YU	SC-70	plastic, surface-mounted package; 3 leads; 1.3 mm pitch; 2 mm x 1.25 mm x 0.95 mm body	SOT323

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PDTB123YU	ZK%

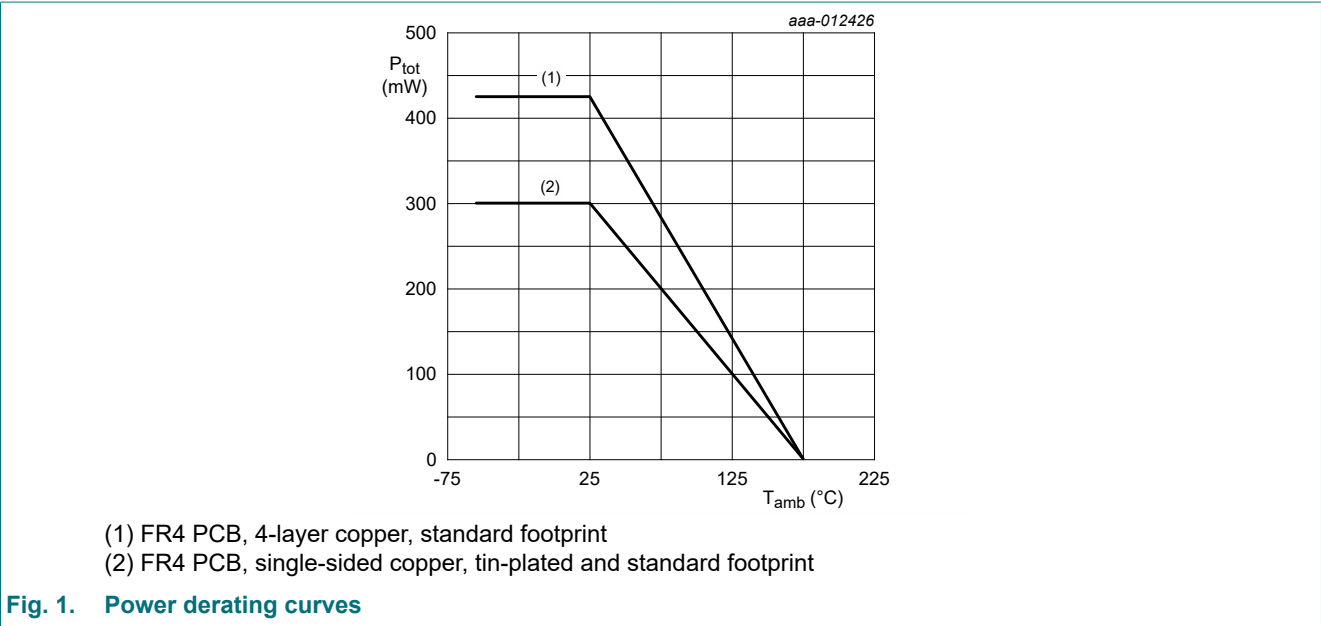
[1] % = placeholder for manufacturing site code

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			-12	5	V
I _O	output current			-	-500	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	300	mW
		T _{amb} ≤ 25 °C	[2]	-	425	mW
T _j	junction temperature			-	175	°C
T _{amb}	ambient temperature			-55	175	°C
T _{stg}	storage temperature			-55	175	°C

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, 4-layer 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
			[2]	-	-	353	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

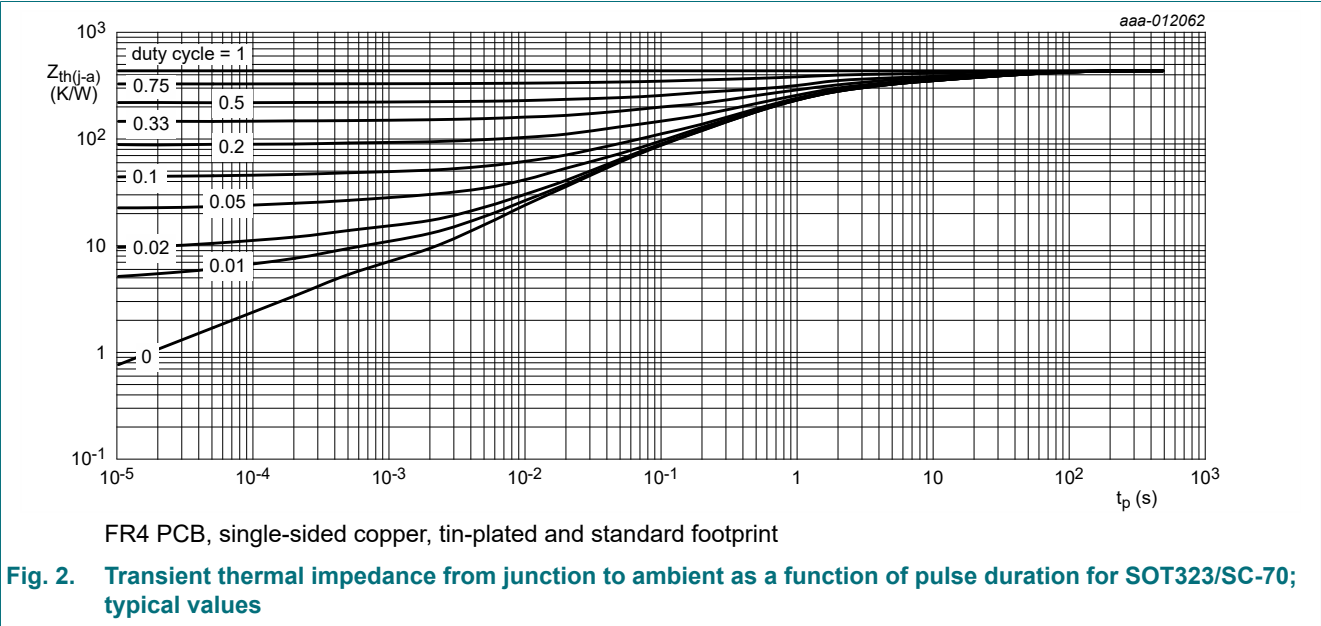


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT323/SC-70; typical values

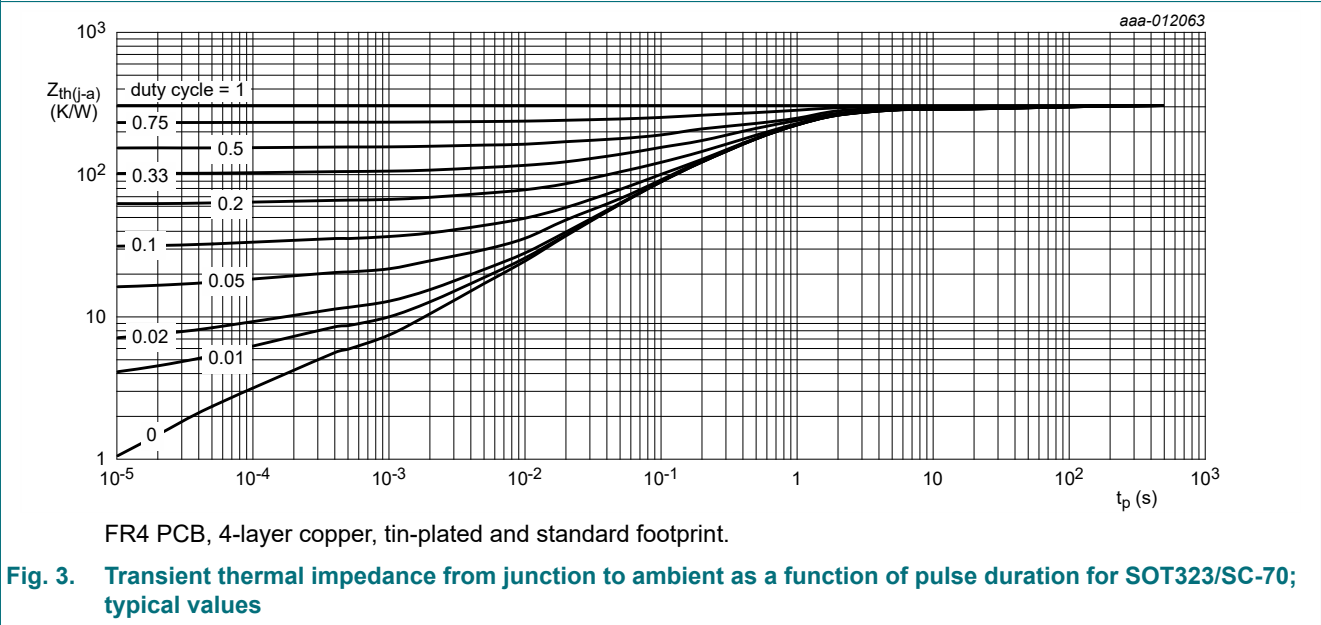


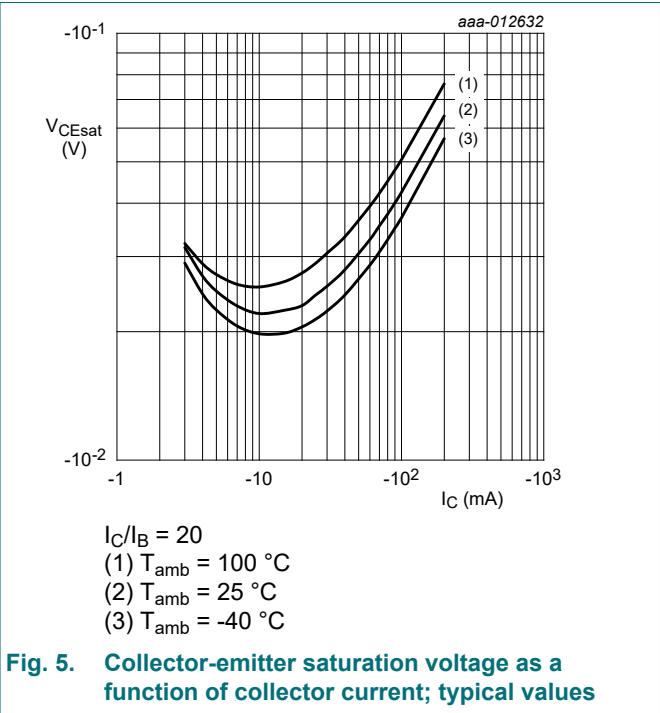
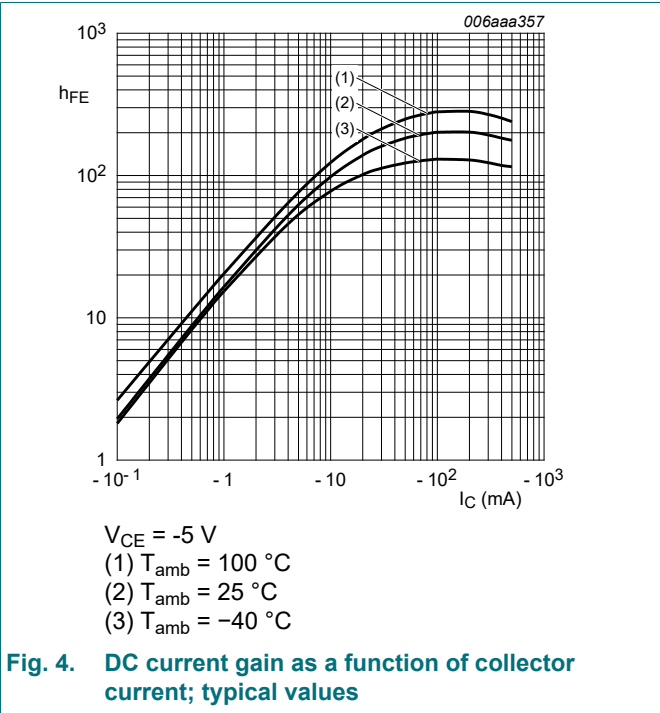
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT323/SC-70; typical values

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		-	-	-100	mV
V _{I(off)}	off-state input voltage	V _{CE} = -5 V; I _C = -100 μA; T _{amb} = 25 °C		-0.4	-0.65	-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 = 1 MHz; T _{amb} = 25 °C		-	11	-	pF
f _T	transition frequency	V _{CE} = -5 V; I _C = -50 mA; f = 100 MHz; T _{amb} = 25 °C	[1]	-	140	-	MHz

[1] Characteristics of built-in transistor.



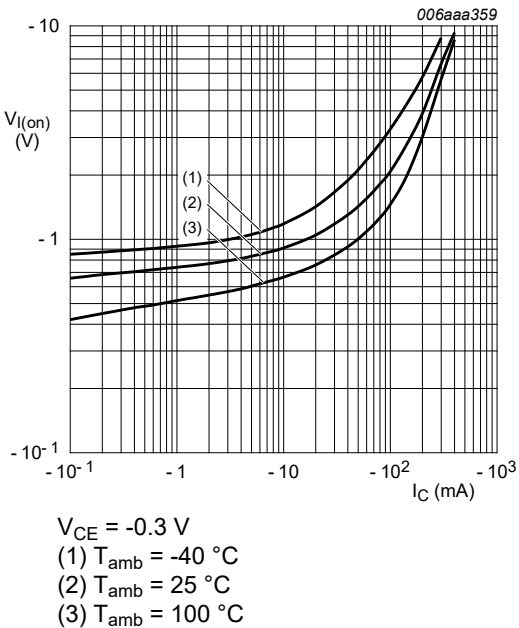


Fig. 6. On-state input voltage as a function of collector current; typical values

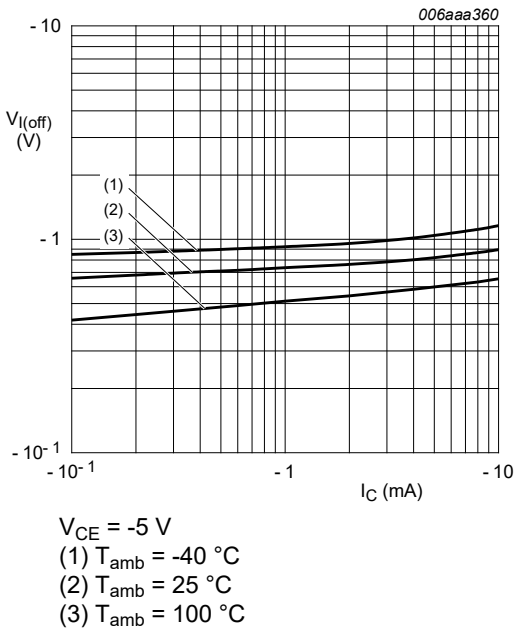


Fig. 7. Off-state input voltage as a function of collector current; typical values

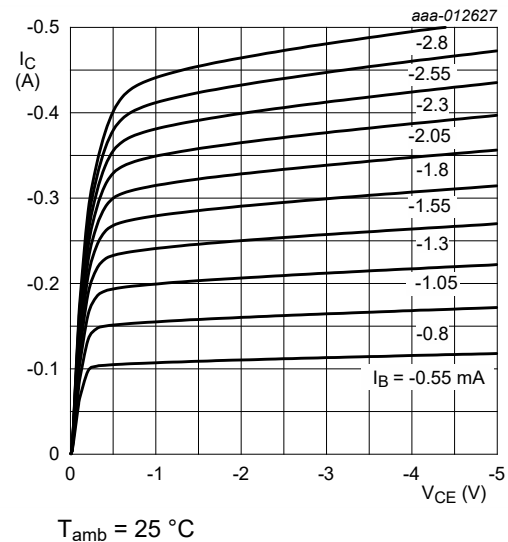


Fig. 8. Collector current as a function of collector-emitter voltage, typical values

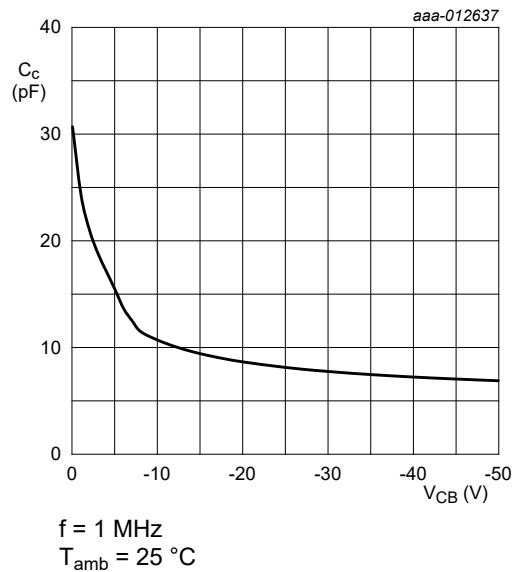
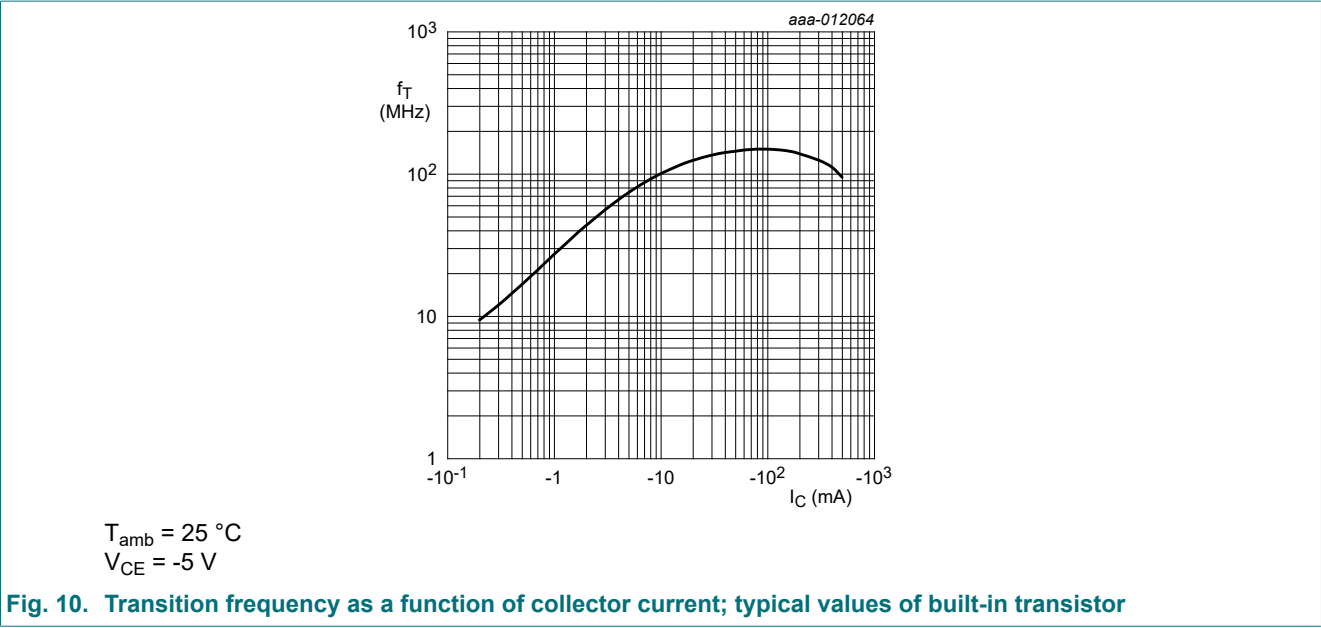


Fig. 9. Collector capacitance as a function of collector-base voltage; typical values

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



11. Test information

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.

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)

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

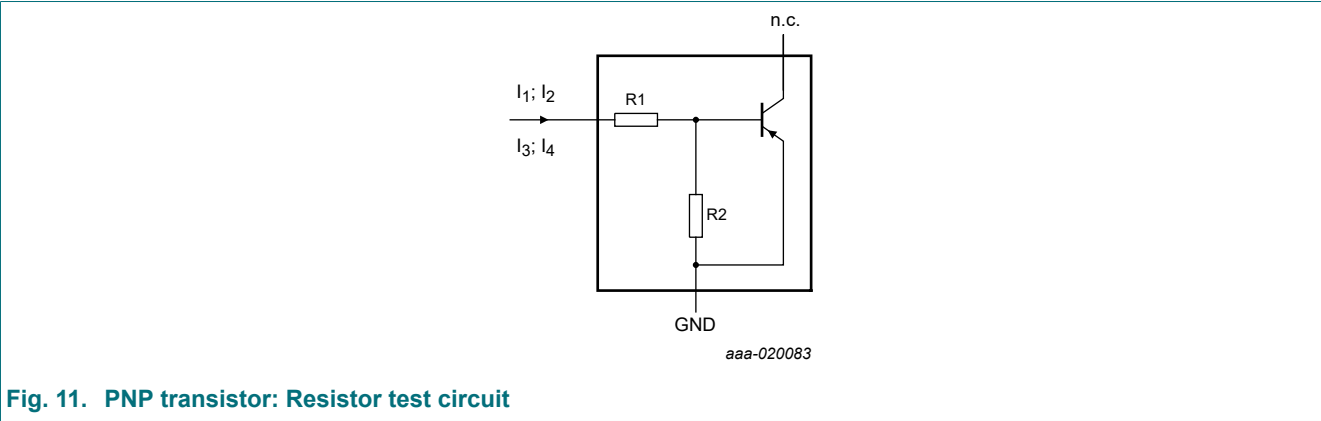


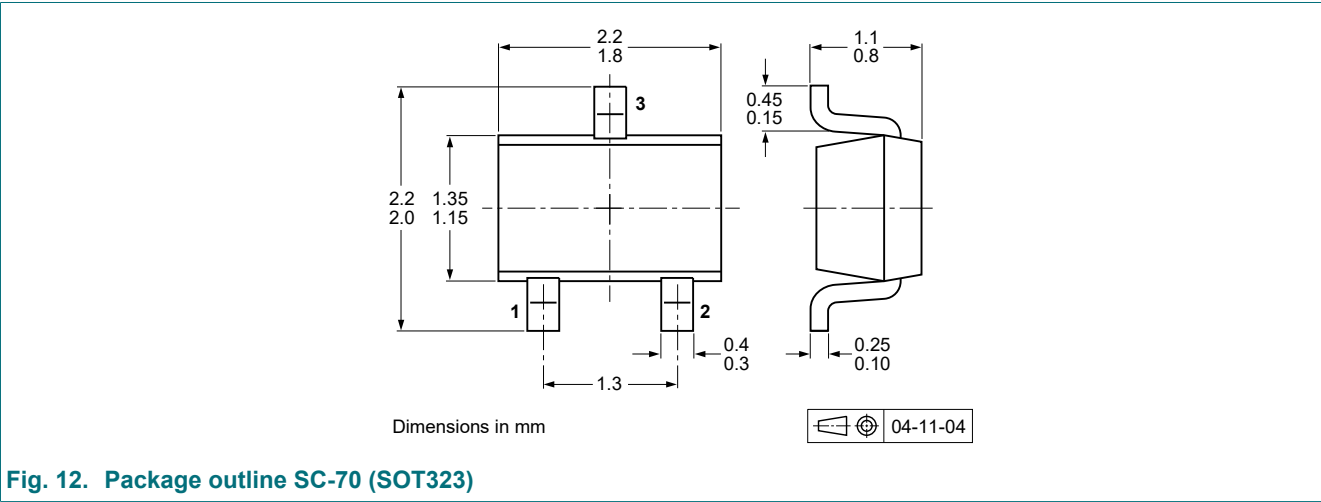
Fig. 11. PNP transistor: Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I ₁	I ₂	I ₃	I ₄
PDTB123YU	2.2	10	-0.7 mA	-0.8 mA	0.45 mA	0.55 mA

12. Package outline



13. Soldering

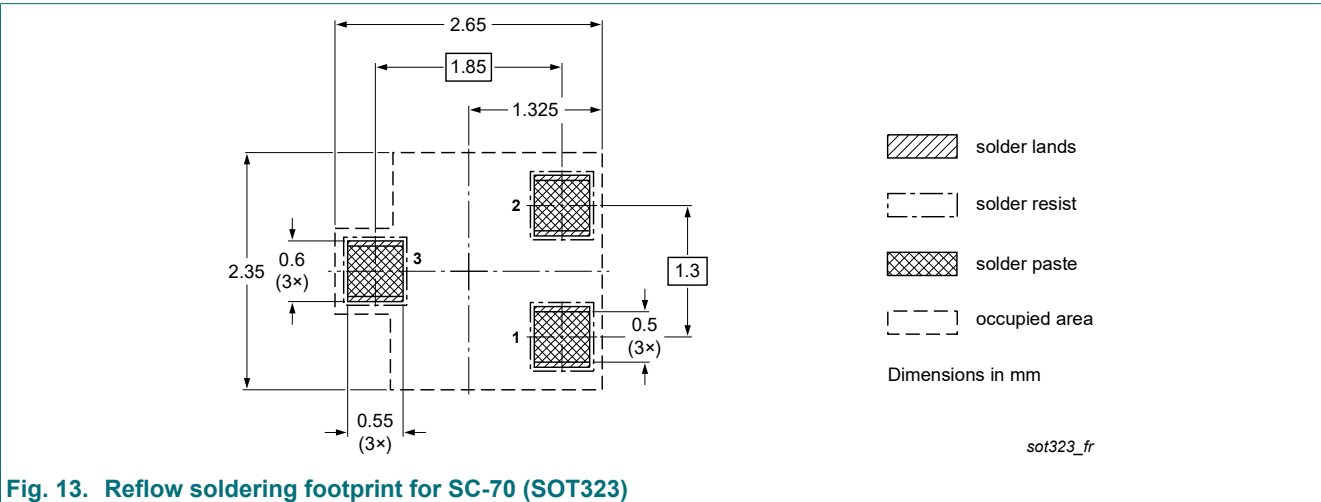


Fig. 13. Reflow soldering footprint for SC-70 (SOT323)

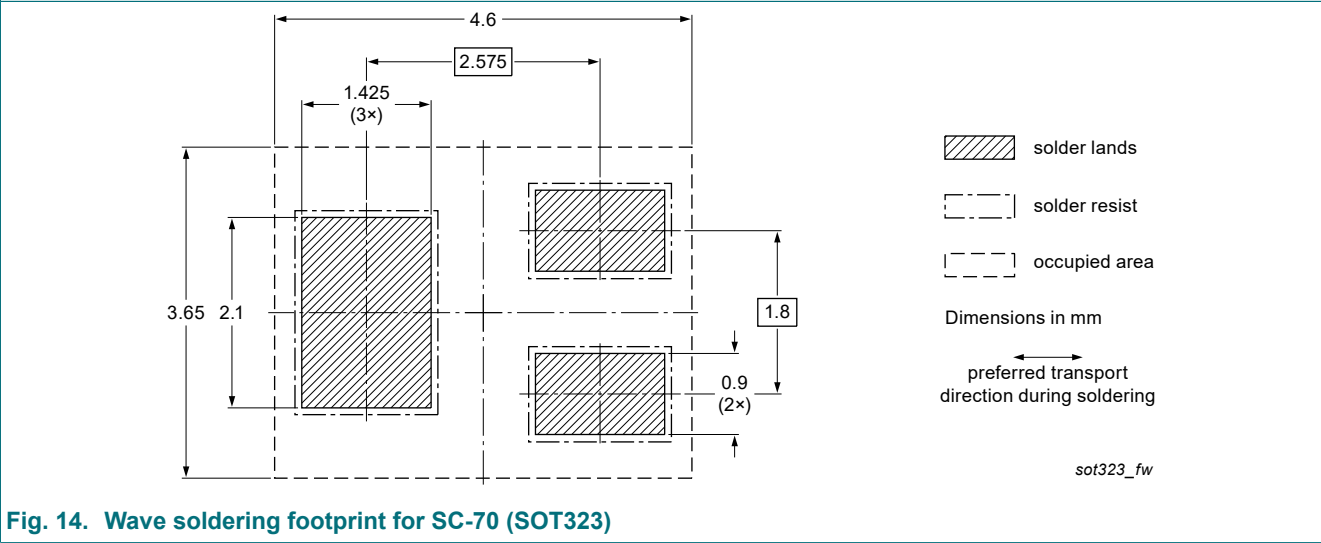


Fig. 14. Wave soldering footprint for SC-70 (SOT323)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PDTB123YU v.3	20250310	Product data sheet	-	PDTB123YU v.2
Modifications:	• Test information extended			
PDTB123YU v.2	20240408	Product data sheet	-	PDTB1XXXU_SER v.1
PDTB1XXXU_SER v.1	20140506	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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