



PDTC124EU

50 V, 100 mA NPN resistor-equipped transistor;
R1 = 22 k Ω , R2 = 22 k Ω

6 June 2023

Product data sheet

1. General description

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

PNP complement: PDTA124EU

2. Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs

3. Applications

- Digital application in industrial segments
- Cost-saving alternative for BC847 series in digital applications
- Controlling IC inputs
- Switching loads

4. Quick reference data

Table 1. Quick reference data

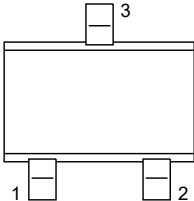
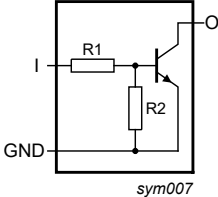
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base		-	-	50	V
I _O	output current			-	-	100	mA
R1	bias resistor 1 (input)		[1]	15.4	22	28.6	k Ω
R2/R1	bias resistor ratio		[1]	0.8	1	1.2	

[1] See "Section 11: Test information" for resistor calculation and test conditions.

50 V, 100 mA NPN resistor-equipped transistor; R1 = 22 kΩ, R2 = 22 kΩ

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PDTC124EU	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]
PDTC124EU	%06

[1] % = placeholder for manufacturing site code

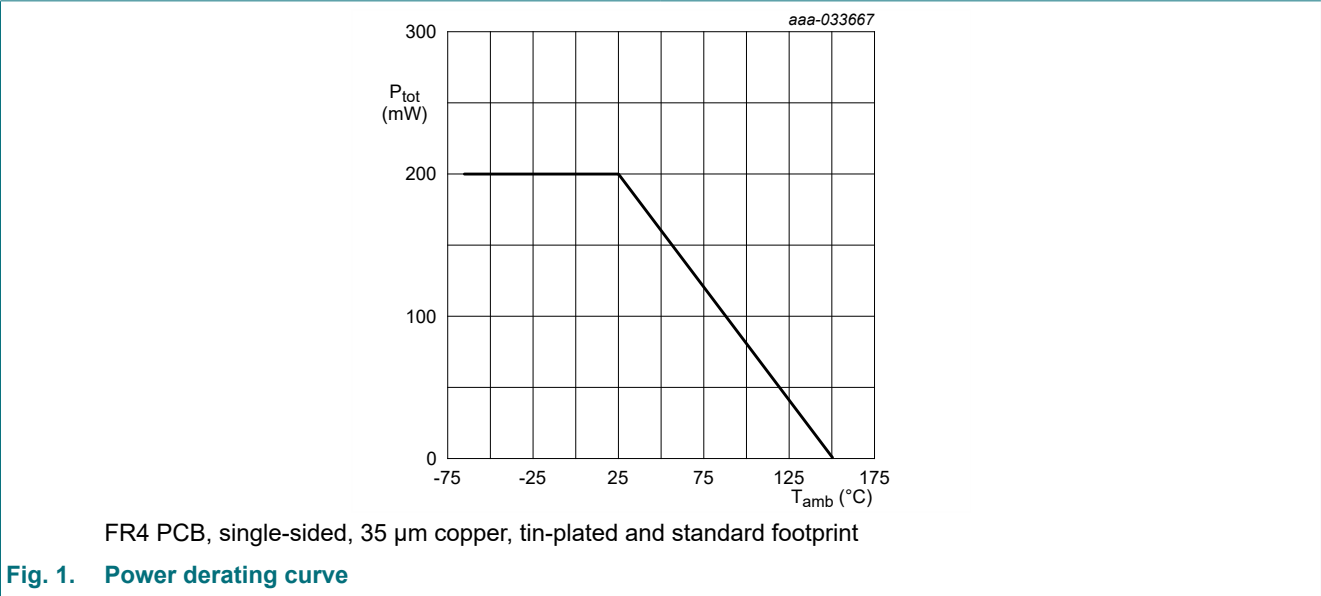
8. Limiting values

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		-	10	V
V _I	input voltage			-10	40	V
I _O	output current			-	100	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	200	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, 35 μm copper, tin-plated and standard footprint.

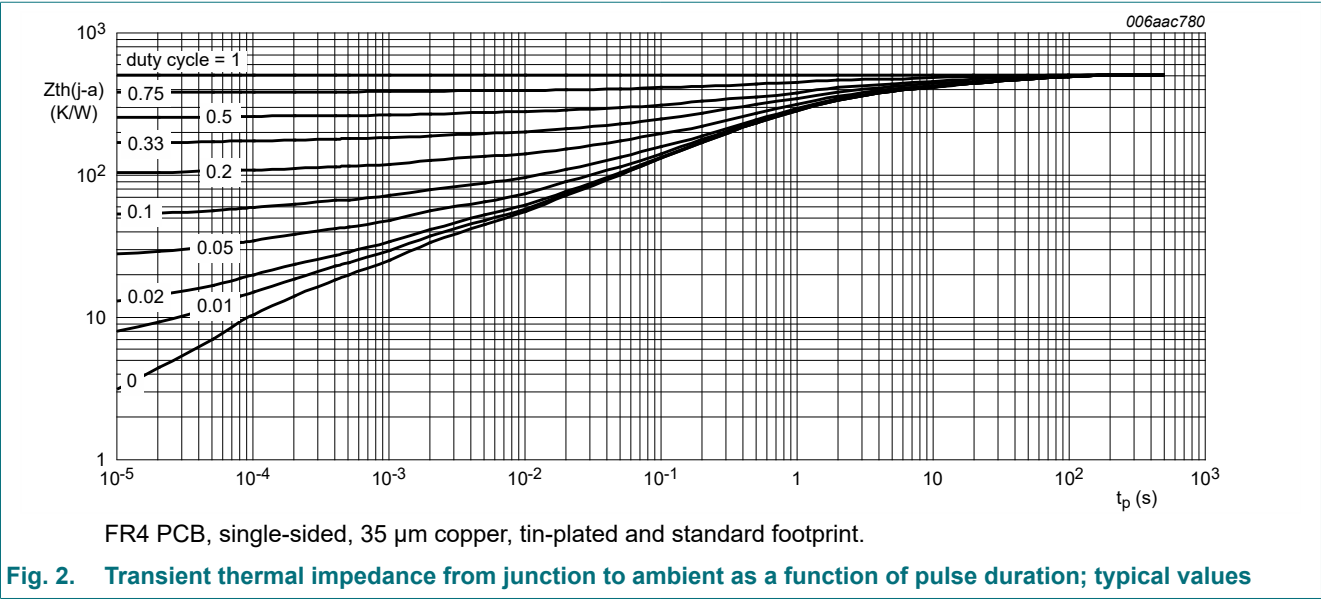


9. Thermal characteristics

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]	-	-	625	K/W

[1] Device mounted on an FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint.

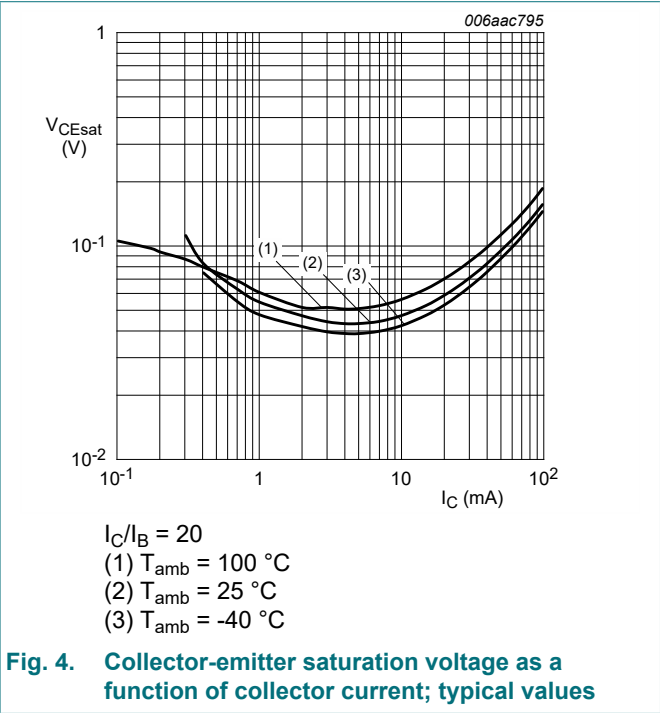
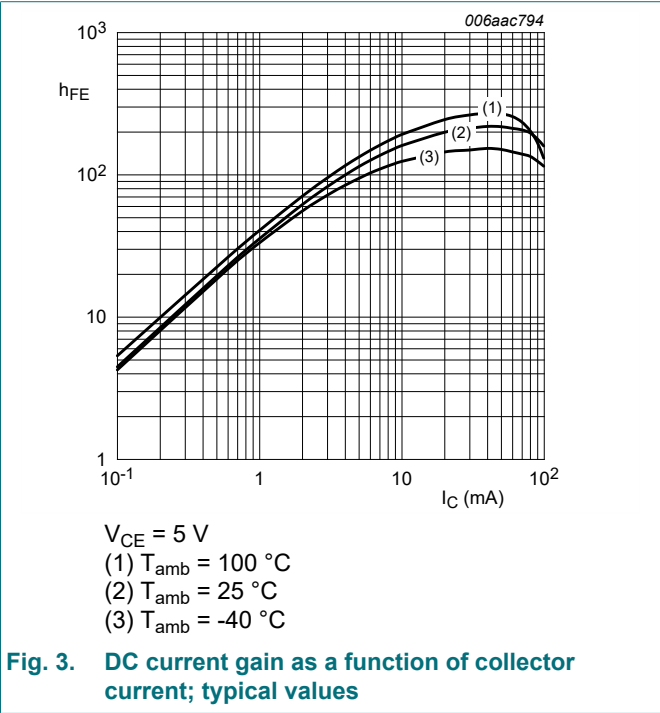


10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{(BR)CBO}	collector-base breakdown voltage	I _C = 100 μA; I _E = 0 A; T _{amb} = 25 °C		50	-	-	V
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = 2 mA; I _B = 0 A; T _{amb} = 25 °C		50	-	-	V
I _{CBO}	collector-base cut-off current	V _{CB} = 50 V; I _E = 0 A; T _{amb} = 25 °C		-	-	100	nA
I _{CEO}	collector-emitter cut-off current	V _{CE} = 30 V; I _B = 0 A; T _{amb} = 25 °C		-	-	100	nA
		V _{CE} = 30 V; I _B = 0 A; T _j = 150 °C		-	-	5	μA
I _{EBO}	emitter-base cut-off current	V _{EB} = 5 V; I _C = 0 A; T _{amb} = 25 °C		-	-	180	μA
h _{FE}	DC current gain	V _{CE} = 5 V; I _C = 5 mA; T _{amb} = 25 °C		60	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 10 mA; I _B = 0.5 mA; T _{amb} = 25 °C		-	-	150	mV
V _{I(off)}	off-state input voltage	V _{CE} = 5 V; I _C = 100 μA; T _{amb} = 25 °C		-	1.1	0.8	V
V _{I(on)}	on-state input voltage	V _{CE} = 0.3 V; I _C = 5 mA; T _{amb} = 25 °C		2.5	1.7	-	V
R1	bias resistor 1 (input)		[1]	15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		[1]	0.8	1	1.2	
C _c	collector capacitance	V _{CB} = 10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	-	2.5	pF
f _T	transition frequency	V _{CE} = 5 V; I _C = 10 mA; f = 100 MHz; T _{amb} = 25 °C	[2]	-	230	-	MHz

[1] See "Section 11: Test information" for resistor calculation and test conditions.
[2] Characteristics of built-in transistor.



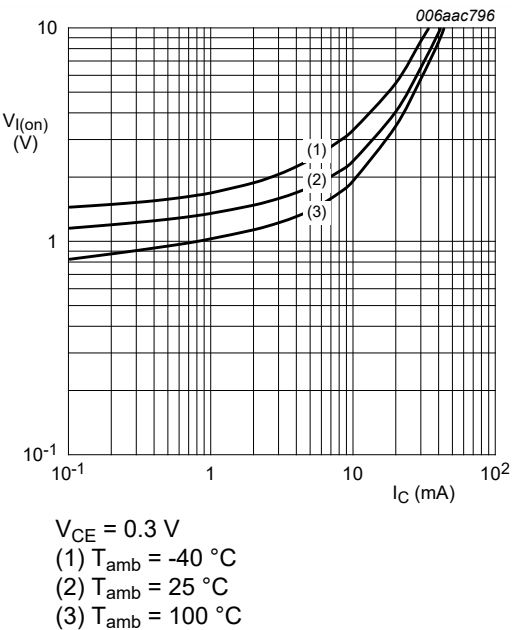


Fig. 5. On-state input voltage as a function of collector current; typical values

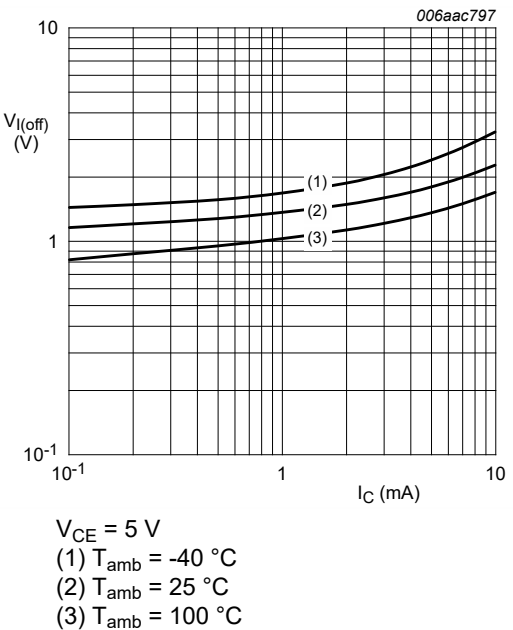


Fig. 6. Off-state input voltage as a function of collector current; typical values

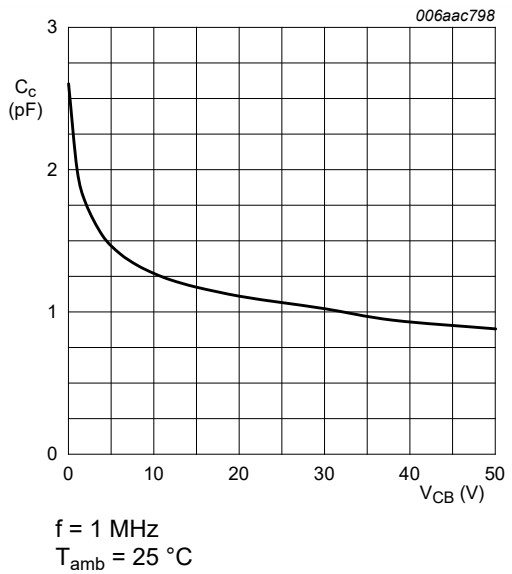


Fig. 7. Collector capacitance as a function of collector-base voltage; typical values

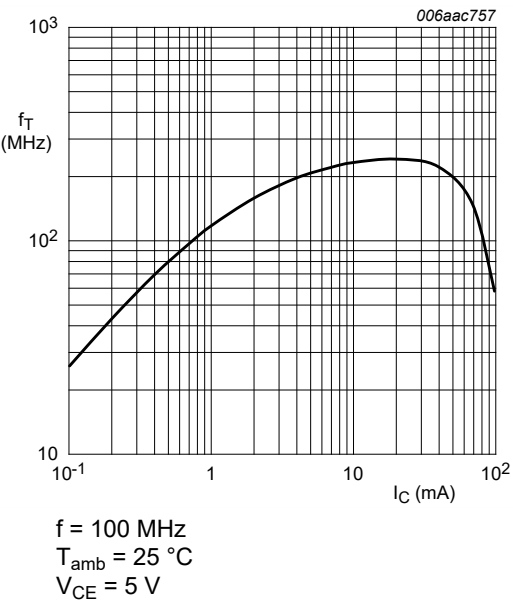


Fig. 8. Transition frequency as a function of collector current; typical values of built-in transistor

11. Test information

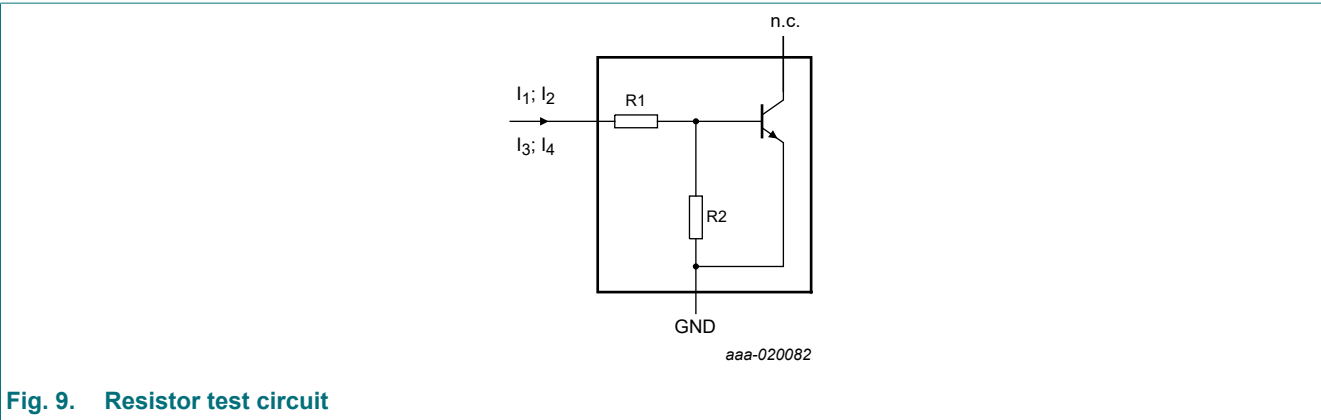
Resistor calculation

- 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)

$$\frac{R_2}{R_1} = \frac{V(I_4) - V(I_3)}{R_1 \cdot (I_4 - I_3)} - 1$$

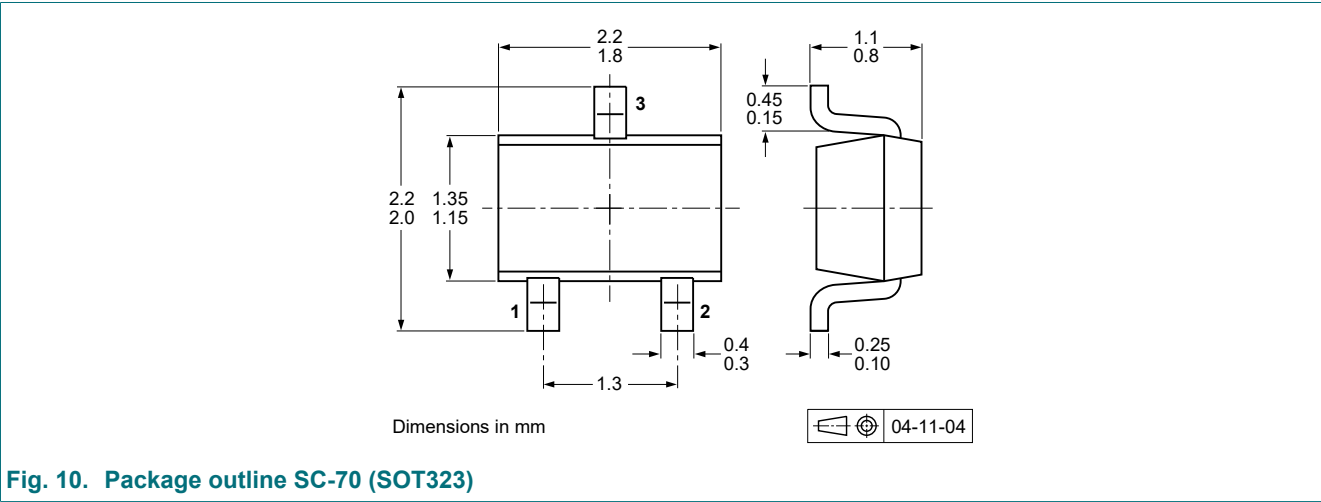


Resistor test conditions

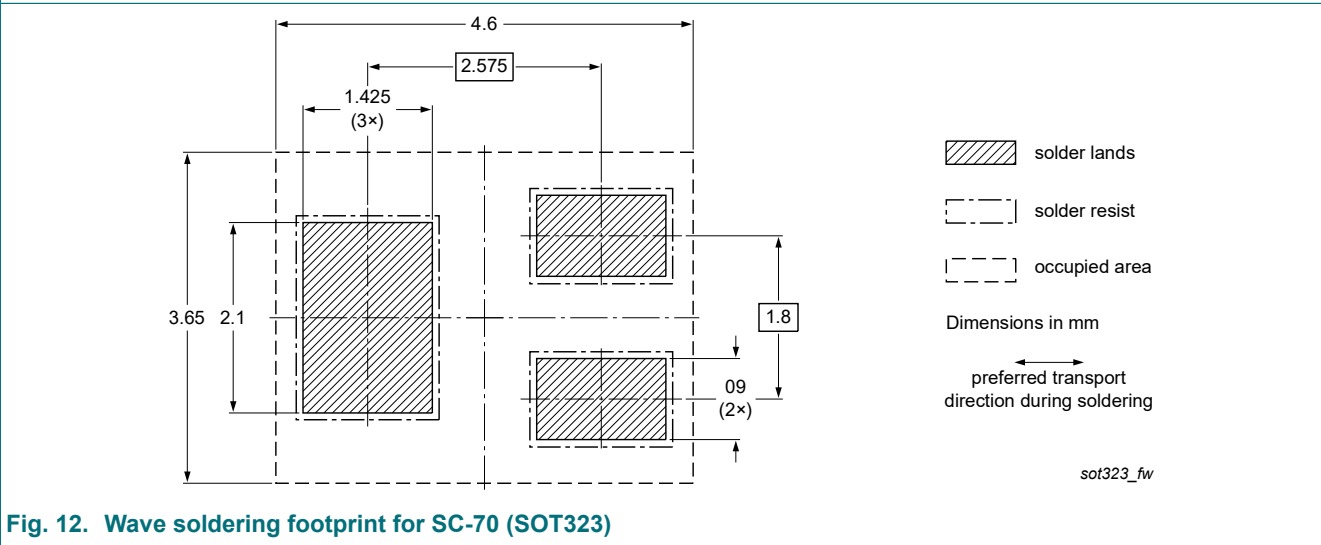
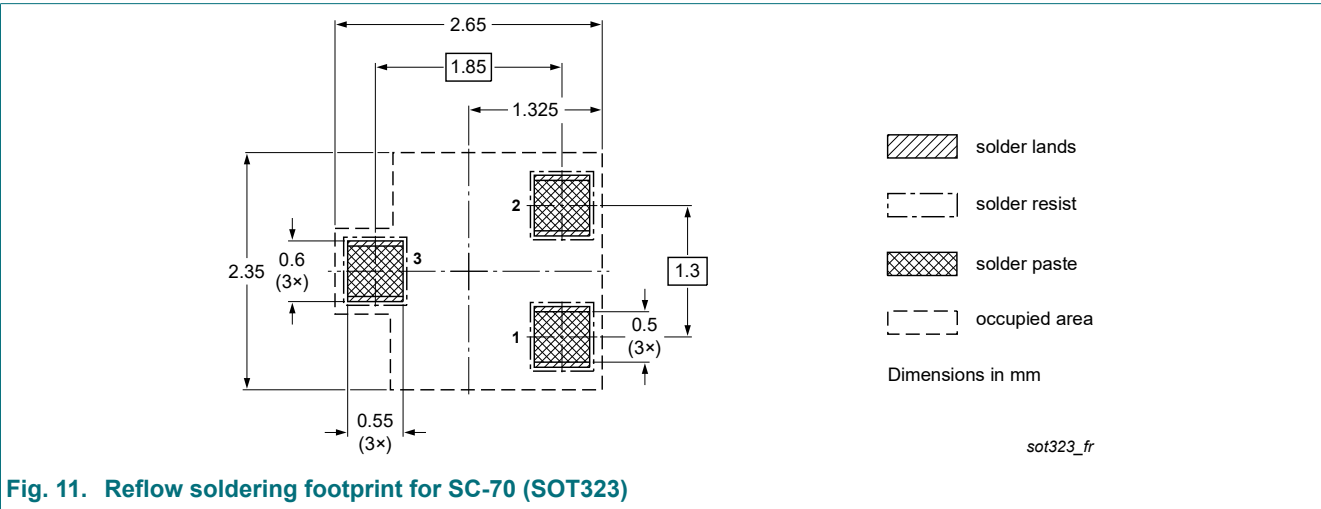
Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I1	I2	I3	I4
PDTC124EU	22	22	150 μA	230 μA	-150 μA	-230 μA

12. Package outline



13. Soldering



14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PDTC124EU v.9	20230606	Product data sheet	-	PDTC124E_SER v.8
Modification:	<ul style="list-style-type: none">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.Family data sheet reduced to single type data sheet.Packing information removed.			
PDTC124E_SER v.8	20111128	Product data sheet	-	PDTC124E_SERIES v.7
PDTC124E_SERIES v.7	20040817	Product data sheet	-	PDTC124E_SERIES v.6
PDTC124E_SERIES v.6	20030414	Product specification	-	-

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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Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information..... 2

6. Ordering information..... 2

7. Marking..... 2

8. Limiting values..... 3

9. Thermal characteristics..... 4

10. Characteristics..... 5

11. Test information..... 7

12. Package outline..... 8

13. Soldering..... 8

14. Revision history..... 9

15. Legal information..... 10

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