

PDTC123JU,115 Datasheet



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DiGi Electronics Part Number	PDTC123JU,115-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	PDTC123JU,115
Description	TRANS PREBIAS NPN 50V SOT323
Detailed Description	Pre-Biased Bipolar Transistor (BJT) NPN - Pre-Biased 50 V 100 mA 200 mW Surface Mount SOT-323



Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

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Purchase and inquiry

Manufacturer Product Number:

PDTC123JU,115

Series:

-

Transistor Type:

NPN - Pre-Biased

Voltage - Collector Emitter Breakdown (Max):

50 V

Resistor - Emitter Base (R2):

47 kOhms

Vce Saturation (Max) @ Ib, Ic:

100mV @ 250µA, 5mA

Power - Max:

200 mW

Package / Case:

SC-70, SOT-323

Base Product Number:

PDTC123

Manufacturer:

Nexperia USA Inc.

Product Status:

Active

Current - Collector (Ic) (Max):

100 mA

Resistor - Base (R1):

2.2 kOhms

DC Current Gain (hFE) (Min) @ Ic, Vce:

100 @ 10mA, 10V

Current - Collector Cutoff (Max):

1µA

Mounting Type:

Surface Mount

Supplier Device Package:

SOT-323

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.21.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



PDTC123JU

50 V, 100 mA NPN resistor-equipped transistor;
R1 = 2.2 k Ω , R2 = 47 k Ω

1 April 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: PDTA123JU

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

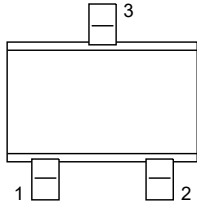
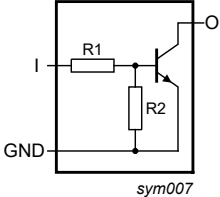
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base		-	-	50	V
I _O	output current			-	-	100	mA
R1	bias resistor 1 (input)		[1]	1.54	2.2	2.86	k Ω
R2/R1	bias resistor ratio		[1]	17	21	26	

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

50 V, 100 mA NPN resistor-equipped transistor; R1 = 2.2 kΩ, R2 = 47 kΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I	input (base)	 <p>SC-70 (SOT323)</p>	 <p>sym007</p>
2	GND	ground (emitter)		
3	O	output (collector)		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PDTC123JU	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]
PDTC123JU	%49

[1] % = placeholder for manufacturing site code

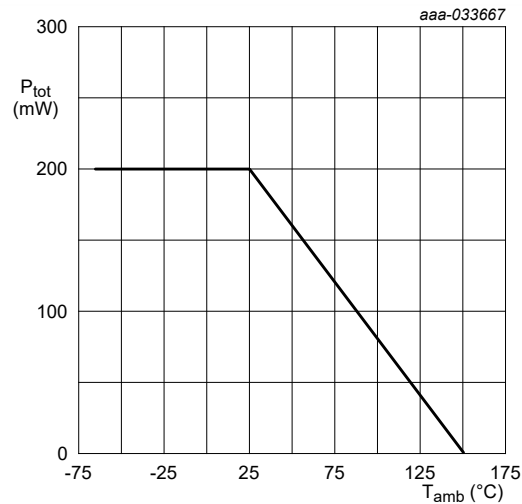
50 V, 100 mA NPN resistor-equipped transistor; R1 = 2.2 kΩ, R2 = 47 kΩ

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		-5	12	V
I_O	output current		-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[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.



FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint

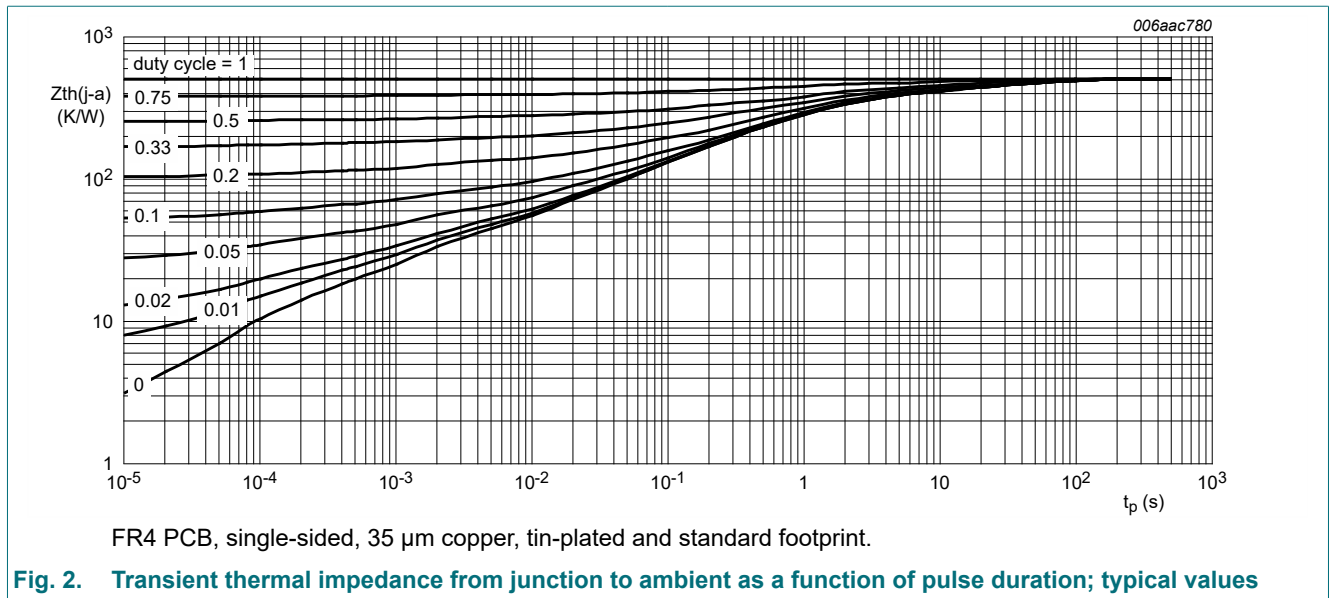
Fig. 1. Power derating curve

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.

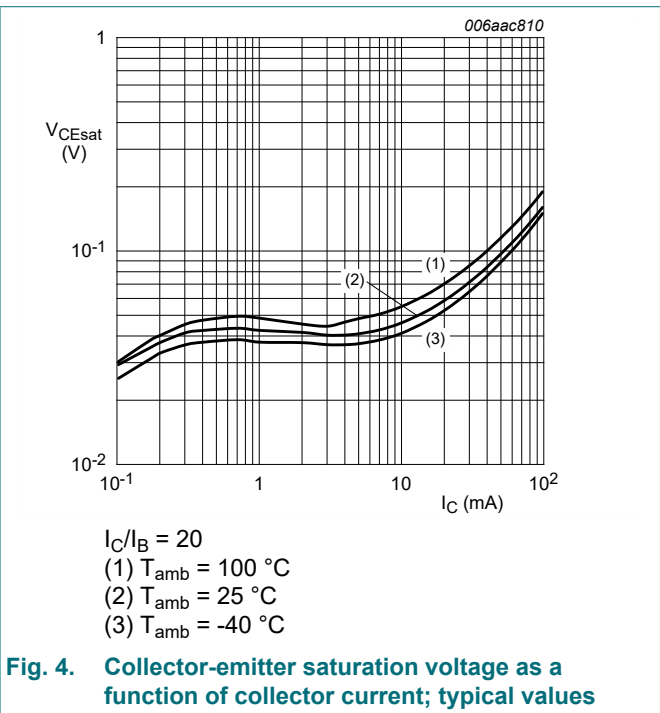
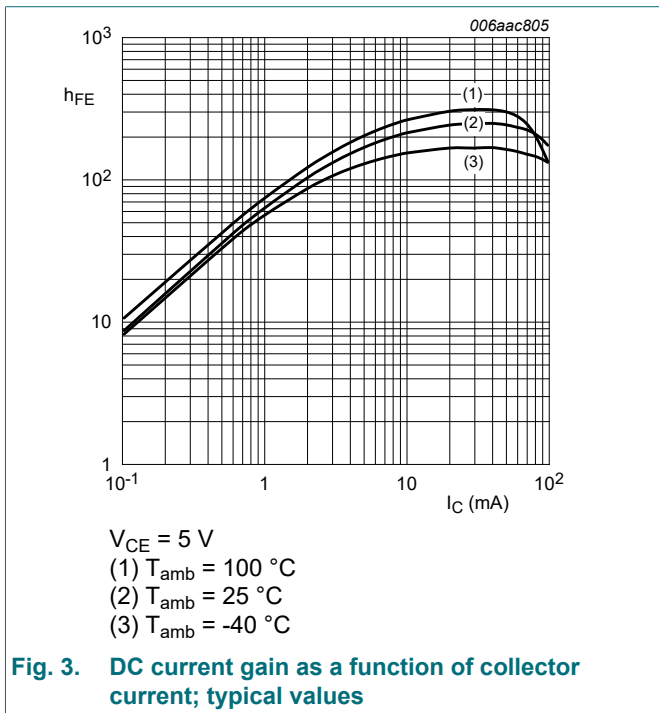


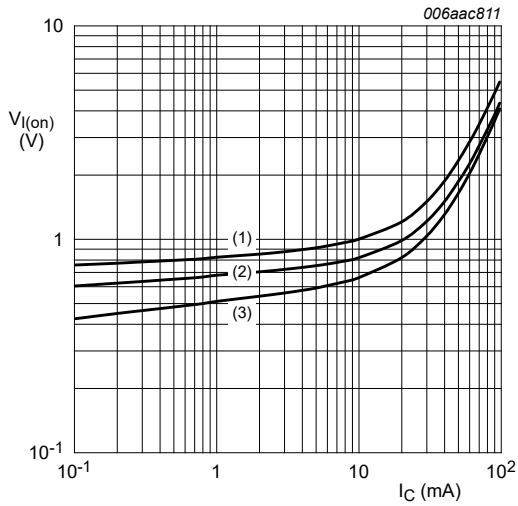
10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu A; I_E = 0 A; T_{amb} = 25 \text{ }^\circ C$	50	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}; I_B = 0 A; T_{amb} = 25 \text{ }^\circ C$	50	-	-	V	
I_{CBO}	collector-base cut-off current	$V_{CB} = 50 \text{ V}; I_E = 0 A; T_{amb} = 25 \text{ }^\circ C$	-	-	100	nA	
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30 \text{ V}; I_B = 0 A; T_{amb} = 25 \text{ }^\circ C$	-	-	1	μA	
		$V_{CE} = 30 \text{ V}; I_B = 0 A; T_j = 150 \text{ }^\circ C$	-	-	5	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}; I_C = 0 A; T_{amb} = 25 \text{ }^\circ C$	-	-	180	μA	
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$	100	-	-		
V_{CEsat}	collector-emitter saturation voltage	$I_C = 5 \text{ mA}; I_B = 0.25 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$	-	-	100	mV	
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5 \text{ V}; I_C = 100 \mu A; T_{amb} = 25 \text{ }^\circ C$	-	0.6	0.5	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3 \text{ V}; I_C = 5 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$	1.1	0.75	-	V	
R1	bias resistor 1 (input)		[1]	1.54	2.2	2.86	kΩ
R2/R1	bias resistor ratio		[1]	17	21	26	
C_c	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 A; i_e = 0 A; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ C$	-	-	2.5	pF	
f_T	transition frequency	$V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ C$	[2]	-	230	-	MHz

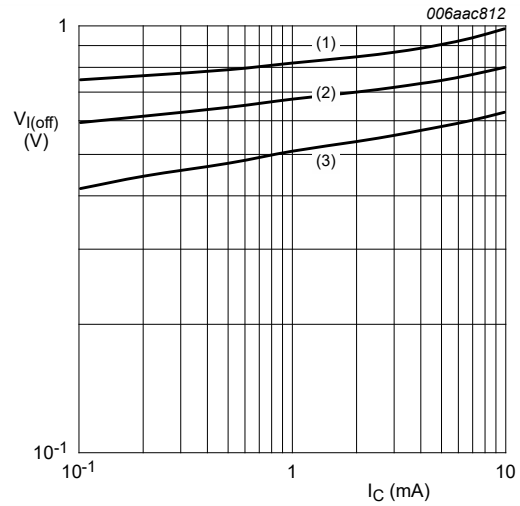
- [1] See "Section 11: Test information" for resistor calculation and test conditions.
 [2] Characteristics of built-in transistor.





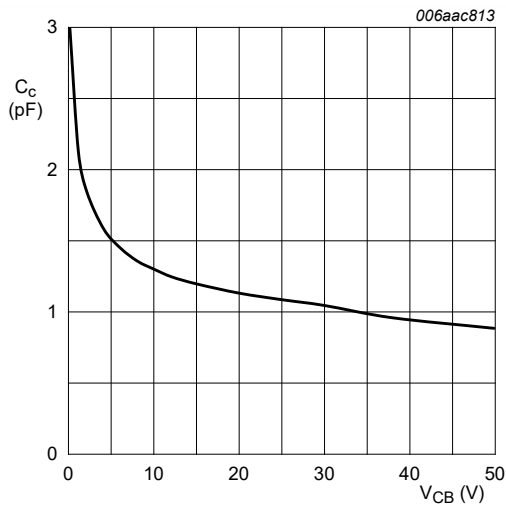
$V_{CE} = 0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



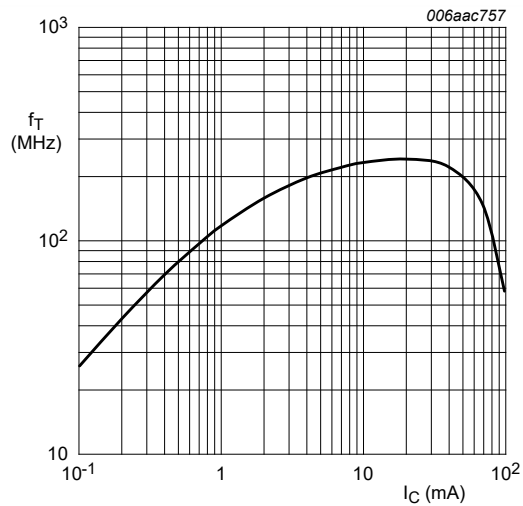
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



$f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

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



$V_{CE} = 5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

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)

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

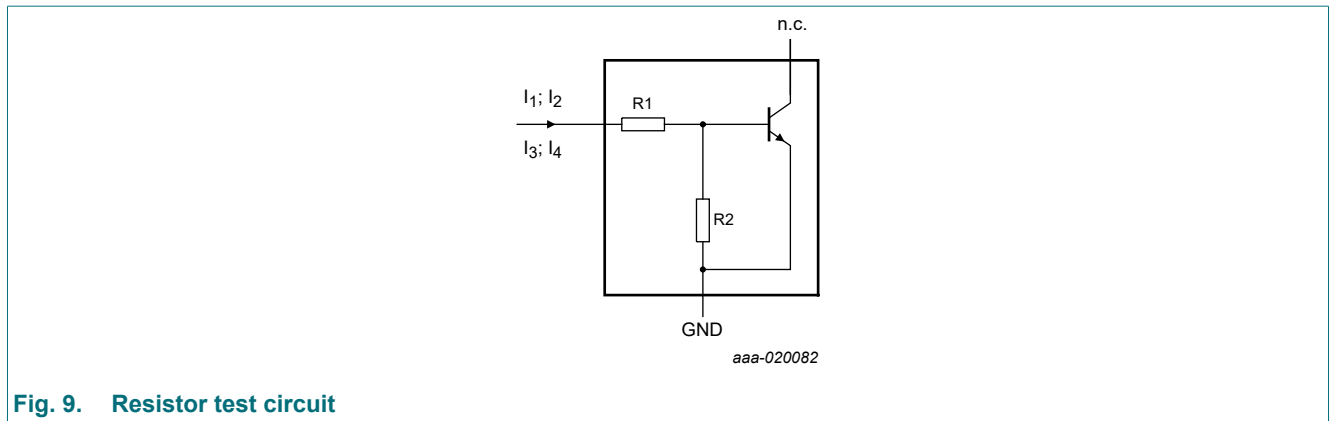


Fig. 9. Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I ₁	I ₂	I ₃	I ₄
PDTC123JU	2.2	47	90 μA	140 μA	-55 μA	-105 μA

12. Package outline

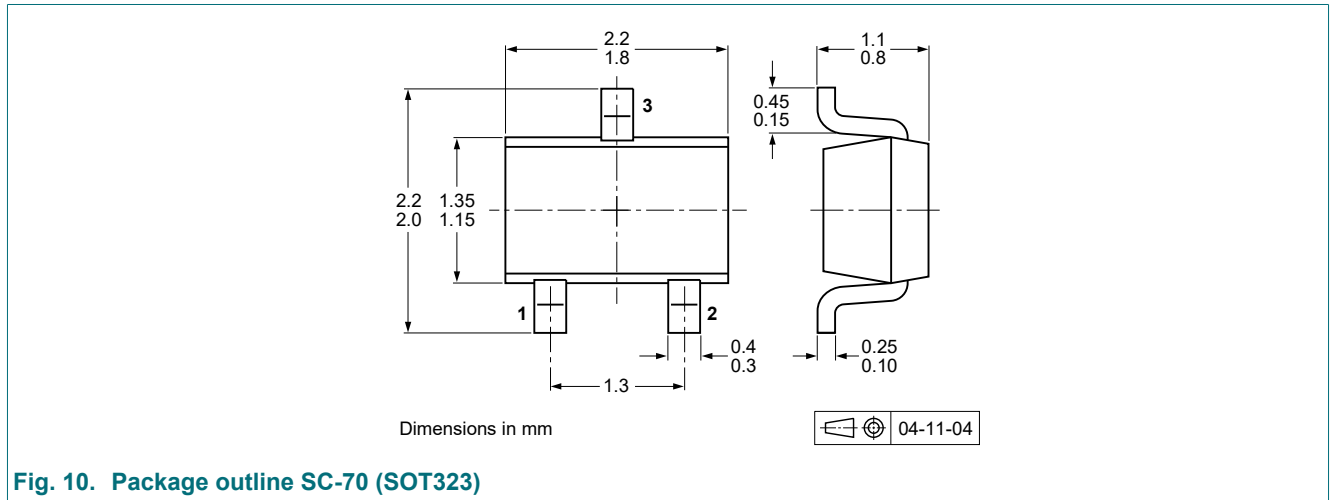


Fig. 10. Package outline SC-70 (SOT323)

13. Soldering

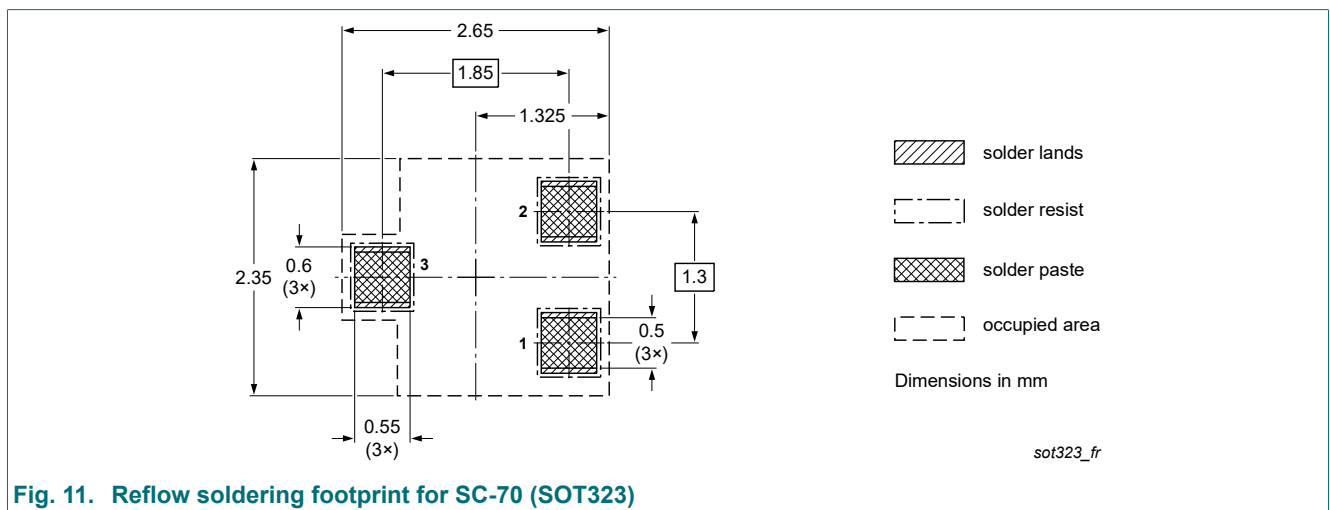


Fig. 11. Reflow soldering footprint for SC-70 (SOT323)

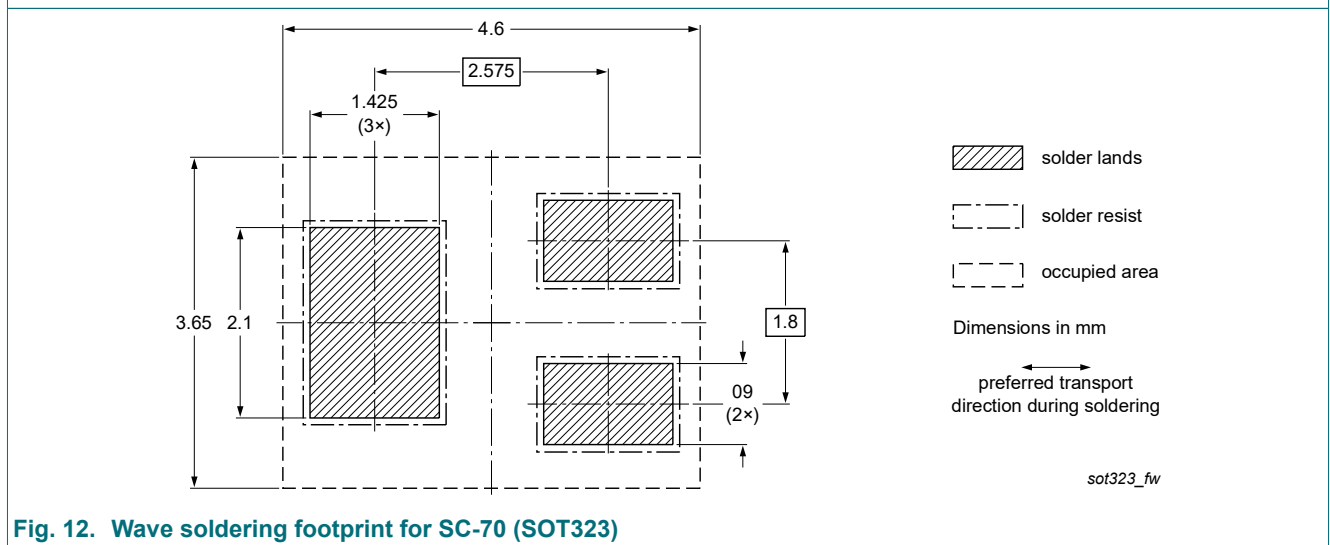


Fig. 12. Wave soldering footprint for SC-70 (SOT323)

50 V, 100 mA NPN resistor-equipped transistor; R1 = 2.2 k Ω , R2 = 47 k Ω

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PDTC123JU v.8	20230401	Product data sheet	-	PDTC123J_SER v.7
Modification:	<ul style="list-style-type: none"> Family data sheet reduced to single type data sheet. 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. Packing information removed. 			
PDTC123J_SER v.7	20111221	Product data sheet	-	PDTC123J_SER v.6
PDTC123J_SER v.6	20111215	Product data sheet	-	PDTC123J_SERIES v.5
PDTC123J_SERIES v.5	20040813	Product data sheet	-	PDTC123J_SERIES v.4
PDTC123J_SERIES v.4	20030410	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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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