

## Important notice

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Kind regards,

Team Nexperia

# PDTA123J series

PNP resistor-equipped transistors;  
R1 = 2.2 k $\Omega$ , R2 = 47 k $\Omega$

Rev. 5 — 21 December 2011

Product data sheet

## 1. Product profile

### 1.1 General description

PNP Resistor-Equipped Transistor (RET) family in small Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number	Package			NPN complement	Package configuration
	NXP	JEITA	JEDEC		
PDTA123JE	SOT416	SC-75	-	PDTC123JE	ultra small
PDTA123JM	SOT883	SC-101	-	PDTC123JM	leadless ultra small
PDTA123JT	SOT23	-	TO-236AB	PDTC123JT	small
PDTA123JU	SOT323	SC-70	-	PDTC123JU	very small

### 1.2 Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified

### 1.3 Applications

- Digital application in automotive and industrial segments
- Control of IC inputs
- Cost-saving alternative for BC847/857 series in digital applications
- Switching loads

### 1.4 Quick reference data

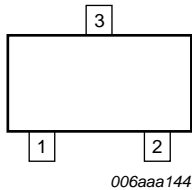
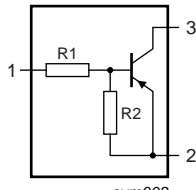
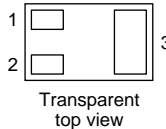
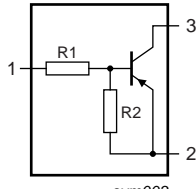
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	-50	V
I <sub>O</sub>	output current		-	-	-100	mA
R1	bias resistor 1 (input)		1.54	2.20	2.86	k $\Omega$
R2/R1	bias resistor ratio		17	21	26	



## 2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>SOT23; SOT323; SOT416</b>			
1	input (base)	 006aaa144	 sym003
2	GND (emitter)		
3	output (collector)		
<b>SOT883</b>			
1	input (base)	 Transparent top view	 sym003
2	GND (emitter)		
3	output (collector)		

## 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTA123JE	SC-75	plastic surface-mounted package; 3 leads	SOT416
PDTA123JM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
PDTA123JT	-	plastic surface-mounted package; 3 leads	SOT23
PDTA123JU	SC-70	plastic surface-mounted package; 3 leads	SOT323

## 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
PDTA123JE	27
PDTA123JM	DG
PDTA123JT	*23
PDTA123JU	*43

[1] \* = placeholder for manufacturing site code.

## 5. Limiting values

**Table 6. Limiting values**

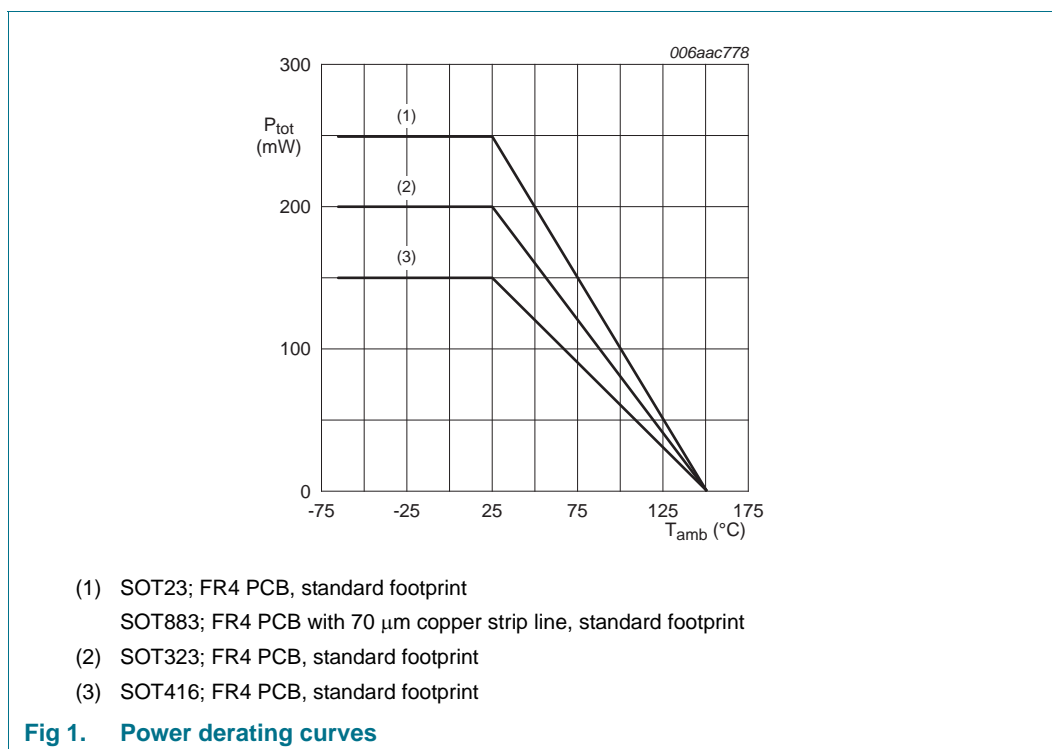
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CBO</sub>	collector-base voltage	open emitter	-	-50	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-50	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	-10	V
V <sub>I</sub>	input voltage				
	positive		-	+5	V
	negative		-	-12	V
I <sub>O</sub>	output current		-	-100	mA
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	-100	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C			
	PDTA123JE (SOT416)		[1][2]	150	mW
	PDTA123JM (SOT883)		[2][3]	250	mW
	PDTA123JT (SOT23)		[1]	250	mW
	PDTA123JU (SOT323)		[1]	200	mW
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	storage temperature		-65	+150	°C

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

[2] Reflow soldering is the only recommended soldering method.

[3] Device mounted on an FR4 PCB with 70  $\mu$ m copper strip line, standard footprint.



## 6. Thermal characteristics

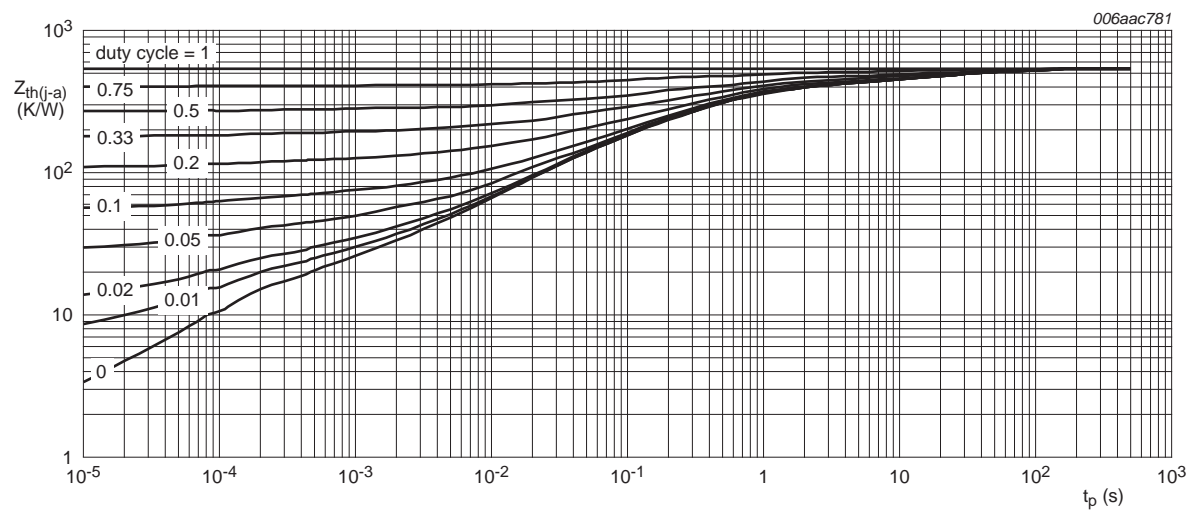
**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PDTA123JE (SOT416)	[1][2]	-	-	830	K/W
	PDTA123JM (SOT883)	[2][3]	-	-	500	K/W
	PDTA123JT (SOT23)	[1]	-	-	500	K/W
	PDTA123JU (SOT323)	[1]	-	-	625	K/W

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

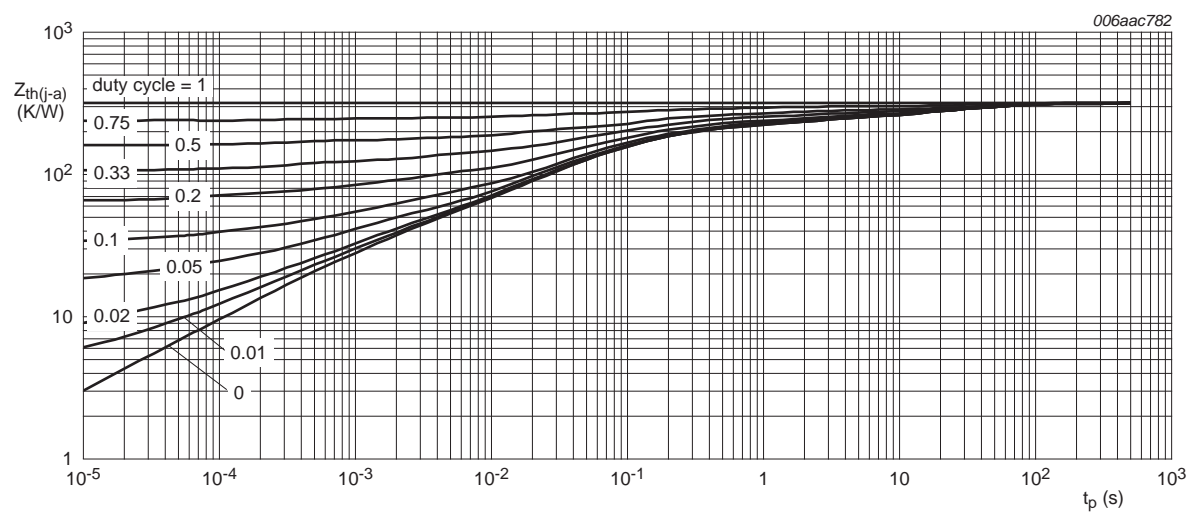
[2] Reflow soldering is the only recommended soldering method.

[3] Device mounted on an FR4 PCB with 70 μm copper strip line, standard footprint.



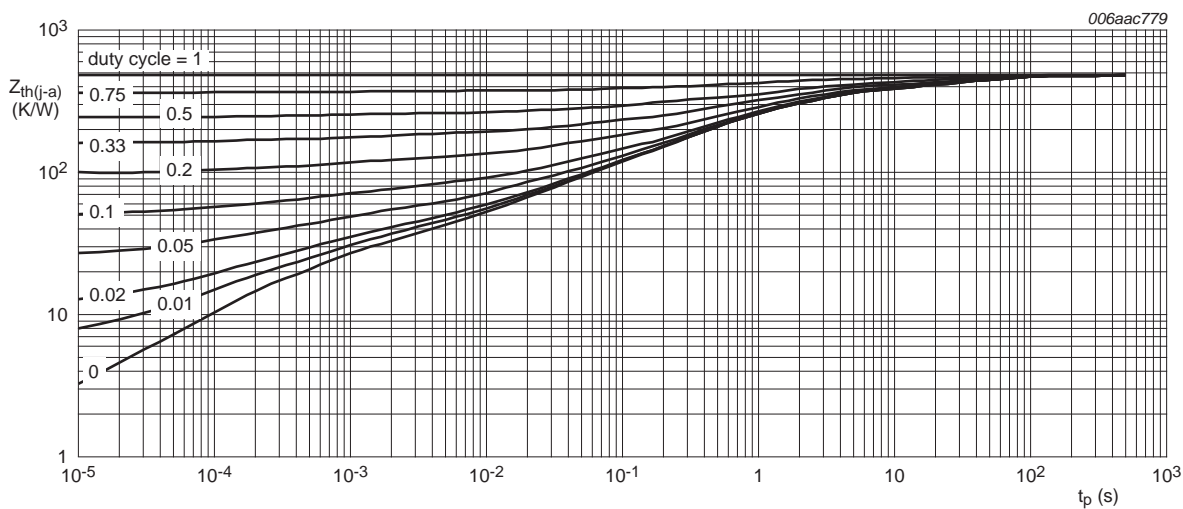
FR4 PCB, standard footprint

**Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration for PDTA123JE (SOT416); typical values**



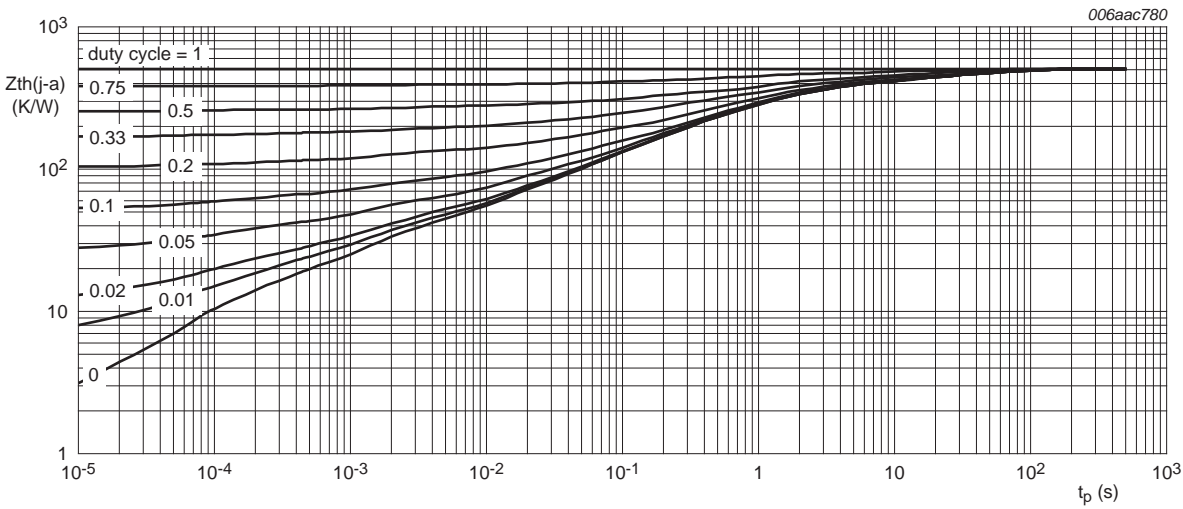
FR4 PCB, 70 μm copper strip line

**Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration for PDTA123JM (SOT883); typical values**



FR4 PCB, standard footprint

Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration for PDTA123JT (SOT23); typical values



FR4 PCB, standard footprint

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration for PDTA123JU (SOT323); typical values

## 7. Characteristics

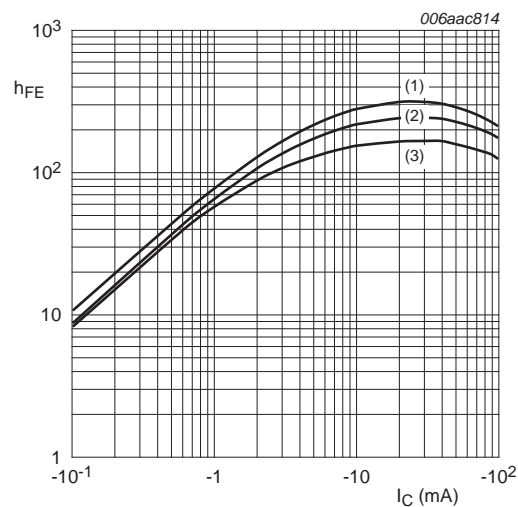
**Table 8. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	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	$\mu\text{A}$
		$V_{CE} = -30\text{ V}$ ; $I_B = 0\text{ A}$ ; $T_j = 150\text{ }^{\circ}\text{C}$	-	-	-5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}$ ; $I_C = 0\text{ A}$	-	-	-180	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V}$ ; $I_C = -10\text{ mA}$	100	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -5\text{ mA}$ ; $I_B = -0.25\text{ mA}$	-	-	-100	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5\text{ V}$ ; $I_C = -100\text{ }\mu\text{A}$	-	-0.6	-0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = -0.3\text{ V}$ ; $I_C = -5\text{ mA}$	-1.1	-0.75	-	V
R1	bias resistor 1 (input)		1.54	2.20	2.86	kΩ
R2/R1	bias resistor ratio		17	21	26	
$C_c$	collector capacitance	$V_{CB} = -10\text{ V}$ ; $I_E = I_E = 0\text{ A}$ ; $f = 1\text{ MHz}$	-	-	3	pF
$f_T$	transition frequency	$V_{CE} = -5\text{ V}$ ; $I_C = -10\text{ mA}$ ; [1]	-	180	-	MHz

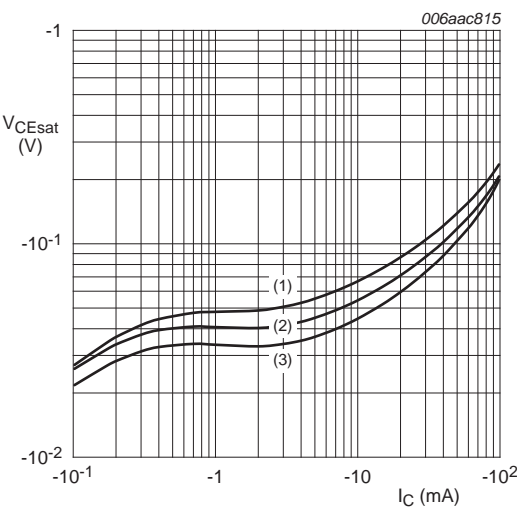
[1] Characteristics of built-in transistor.





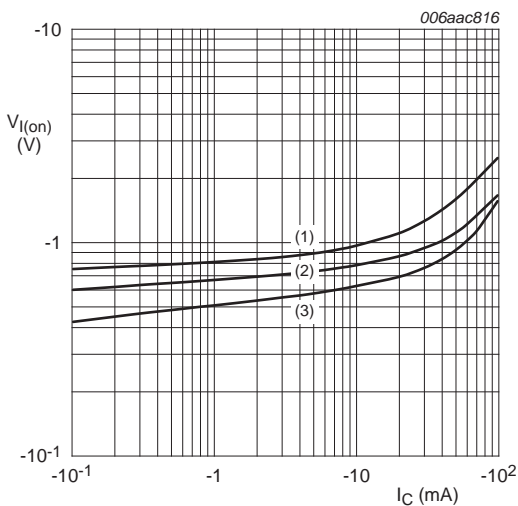
$V_{CE} = -5\text{ V}$   
(1)  $T_{amb} = 100^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -40^\circ\text{C}$

Fig 6. DC current gain as a function of collector current; typical values



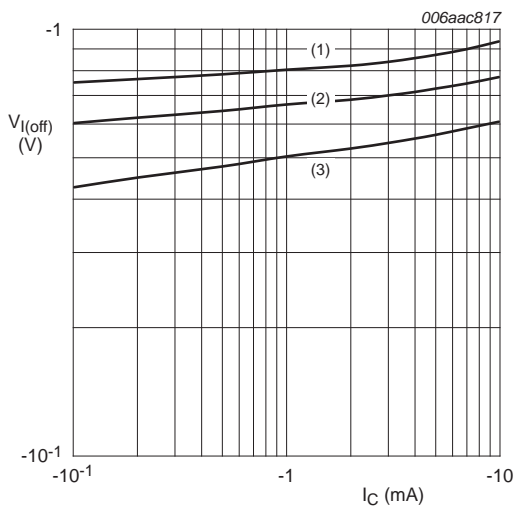
$I_C/I_B = 20$   
(1)  $T_{amb} = 100^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -40^\circ\text{C}$

Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values



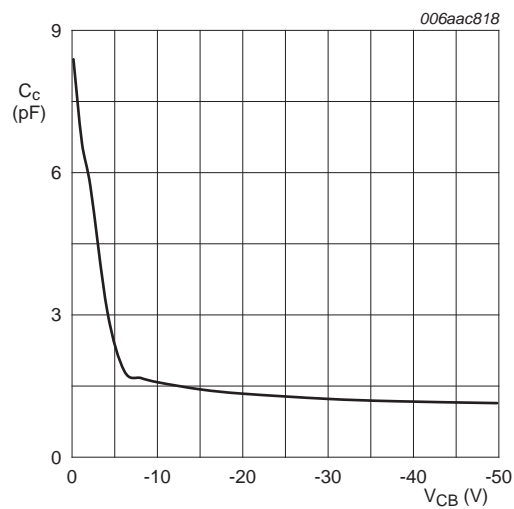
$V_{CE} = -0.3\text{ V}$   
(1)  $T_{amb} = -40^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = 100^\circ\text{C}$

Fig 8. On-state input voltage as a function of collector current; typical values



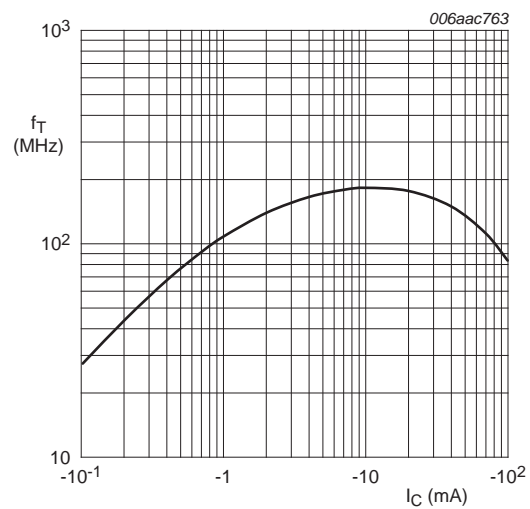
$V_{CE} = -5\text{ V}$   
(1)  $T_{amb} = -40^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = 100^\circ\text{C}$

Fig 9. Off-state input voltage as a function of collector current; typical values



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

Fig 10. Collector capacitance as a function of collector-base voltage; typical values



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

Fig 11. Transition frequency as a function of collector current; typical values of built-in transistor

## 8. Test information

### 8.1 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.

## 9. Package outline

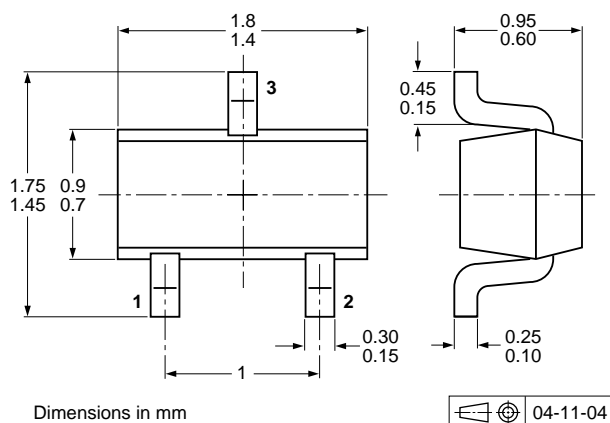


Fig 12. Package outline PDTA123JE (SOT416/SC-75)

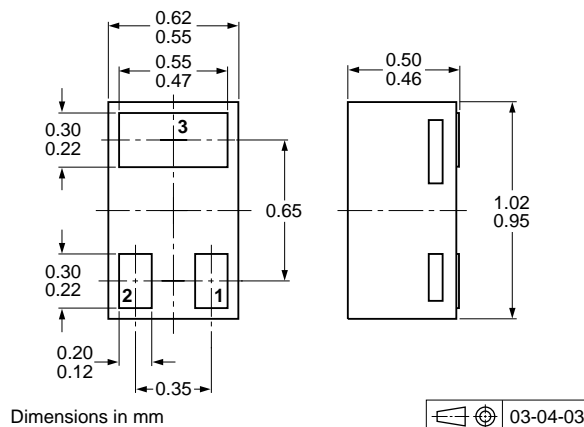


Fig 13. Package outline PDTA123JM (SOT883/SC-101)

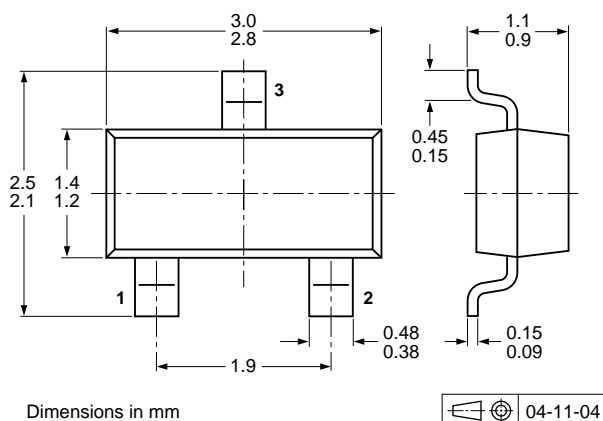


Fig 14. Package outline PDTA123JT (SOT23)

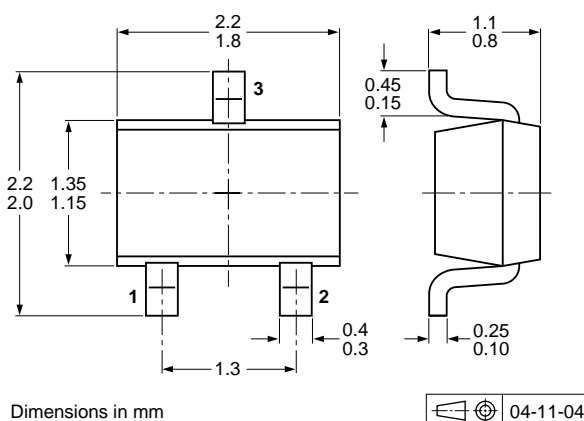


Fig 15. Package outline PDTA123JU (SOT323/SC-70)

## 10. Packing information

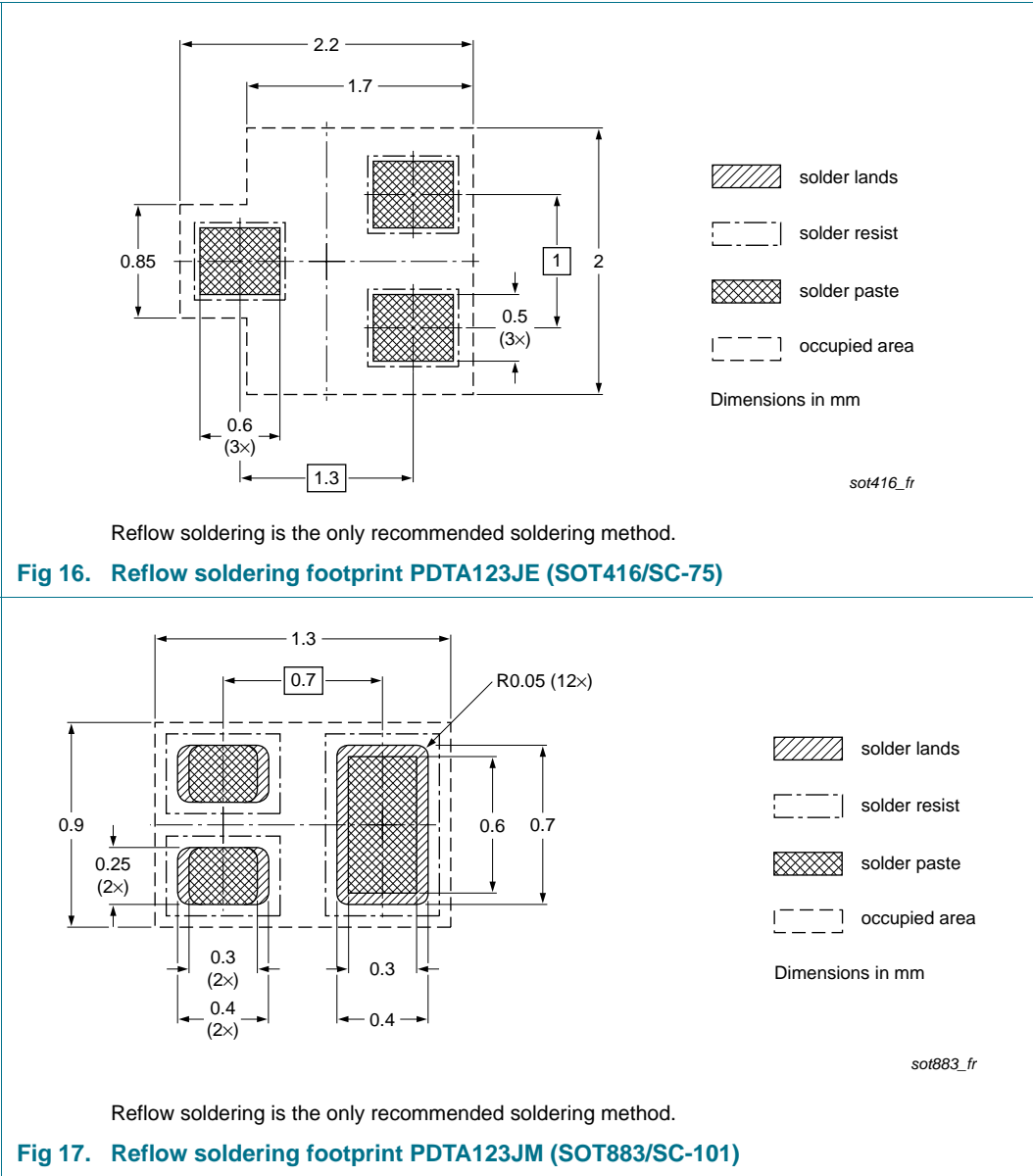
Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity	
			3000	10000
PDTA123JE	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135
PDTA123JM	SOT883	2 mm pitch, 8 mm tape and reel	-	-315
PDTA123JT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
PDTA123JU	SOT323	4 mm pitch, 8 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 14](#).

11. Soldering



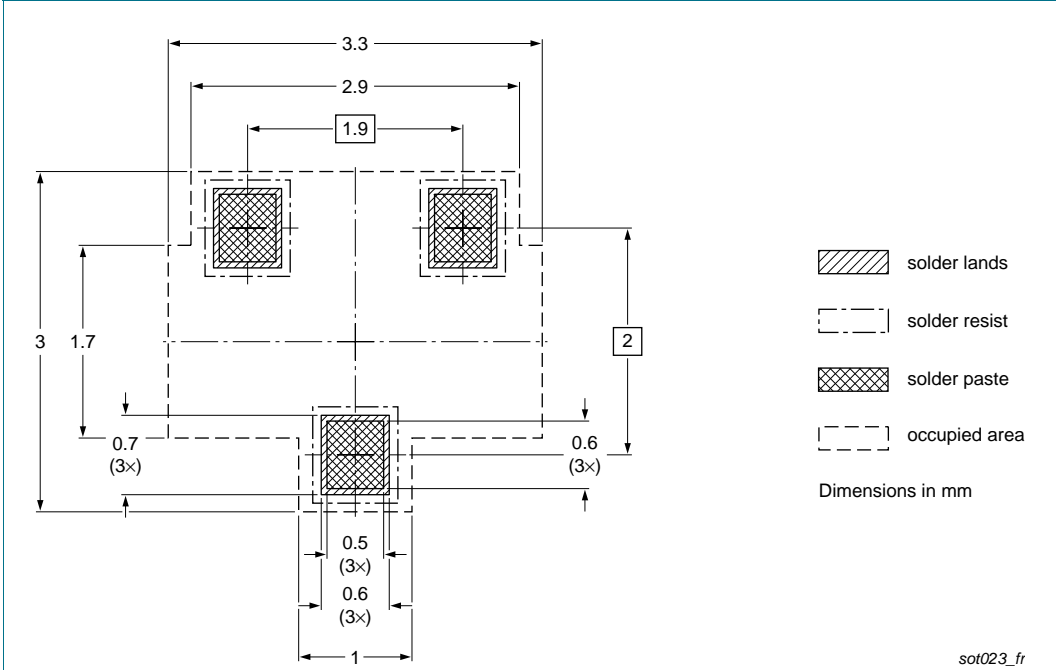


Fig 18. Reflow soldering footprint PDTA123JT (SOT23)

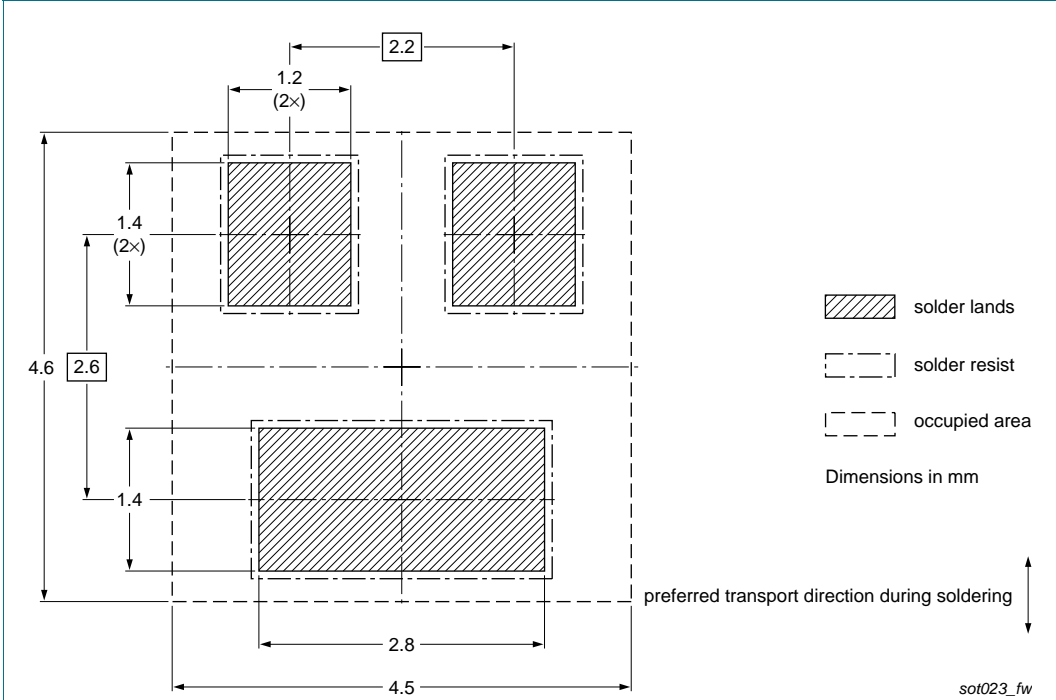
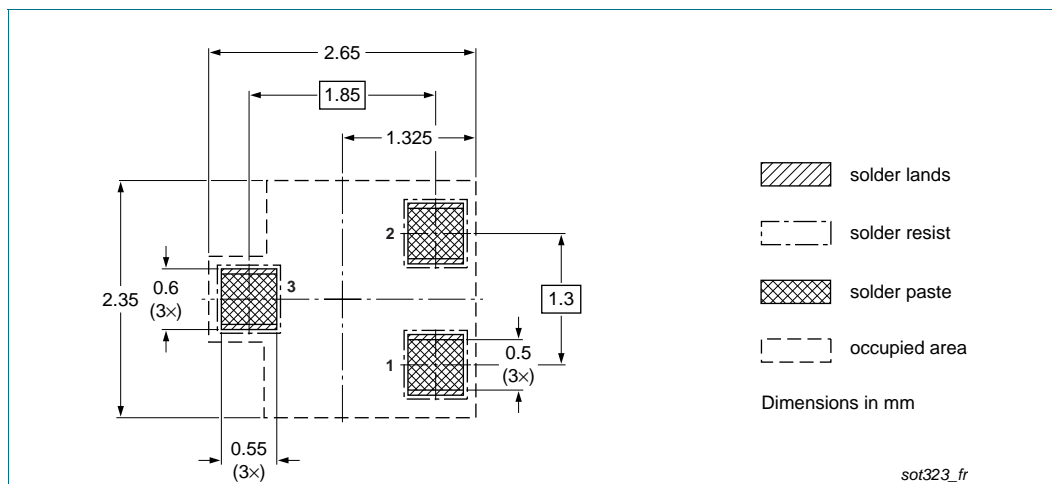
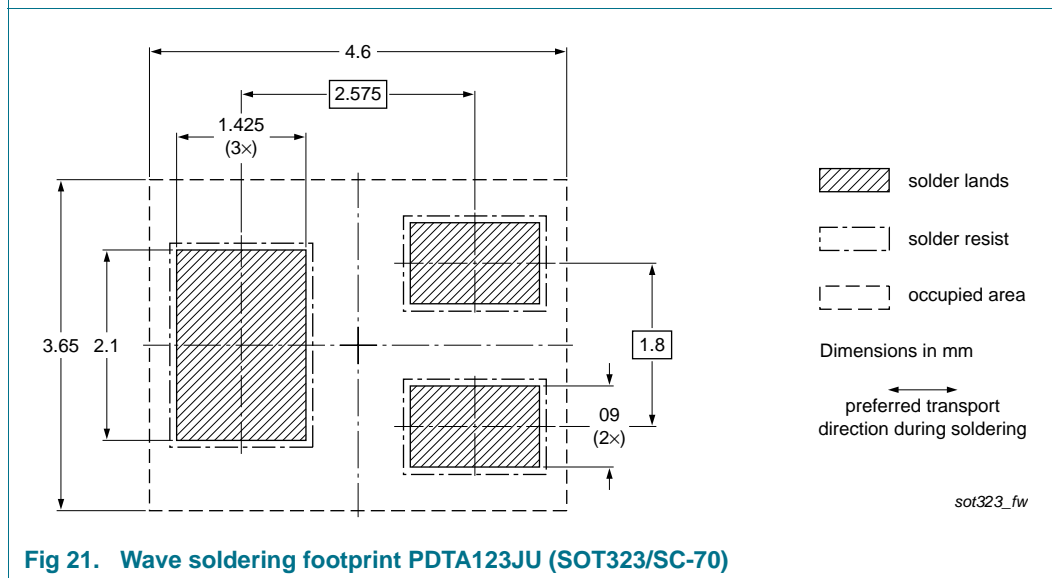


Fig 19. Wave soldering footprint PDTA123JT (SOT23)



**Fig 20. Reflow soldering footprint PDTA123JU (SOT323/SC-70)**



**Fig 21. Wave soldering footprint PDTA123JU (SOT323/SC-70)**

## 12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTA123J_SER v.5	20111221	Product data sheet	-	PDTA123J_SERIES v.4
Modifications: <ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• Type numbers PDTA123JEF, PDTA123JK and PDTA123JS removed</li> <li>• <a href="#">Section 1 "Product profile"</a>: amended</li> <li>• <a href="#">Figure 1</a> to <a href="#">11</a>: added</li> <li>• <a href="#">Table 8 "Characteristics"</a>: <math>V_{i(on)}</math> redefined to <math>V_{I(on)}</math> on-state input voltage, <math>V_{i(off)}</math> redefined to <math>V_{I(off)}</math> off-state input voltage, <math>I_{CEO}</math> updated and <math>f_T</math> added</li> <li>• <a href="#">Figure 12</a>, <a href="#">13</a>, <a href="#">14</a> and <a href="#">15</a>: superseded by minimized package outline drawings</li> <li>• <a href="#">Section 8 "Test information"</a>: added</li> <li>• <a href="#">Section 10 "Packing information"</a>: added</li> <li>• <a href="#">Section 11 "Soldering"</a>: added</li> <li>• <a href="#">Section 13 "Legal information"</a>: updated</li> </ul>				
PDTA123J_SERIES v.4	20040802	Product data sheet	-	PDTA123J_SERIES v.3
PDTA123J_SERIES v.3	20030414	Product specification	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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 URL <http://www.nxp.com>.

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**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

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