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Kind regards,

Team Nexperia

# PDTA123J series

**PNP resistor-equipped transistors;  
R1 = 2.2 kΩ, R2 = 47 kΩ**

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

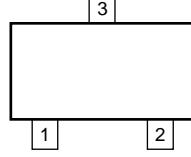
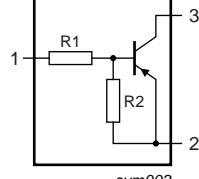
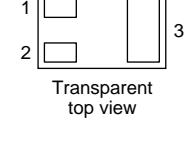
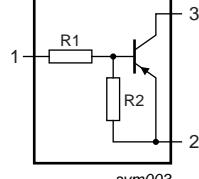
**Table 2. Quick reference data**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-50	V
$I_O$	output current		-	-	-100	mA
R1	bias resistor 1 (input)		1.54	2.20	2.86	kΩ
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)		
2	GND (emitter)		
3	output (collector)	 006aaa144	 sym003
<b>SOT883</b>			
1	input (base)		
2	GND (emitter)		
3	output (collector)	 Transparent top view	 sym003

## 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 $1.0 \times 0.6 \times 0.5 \text{ mm}$	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**

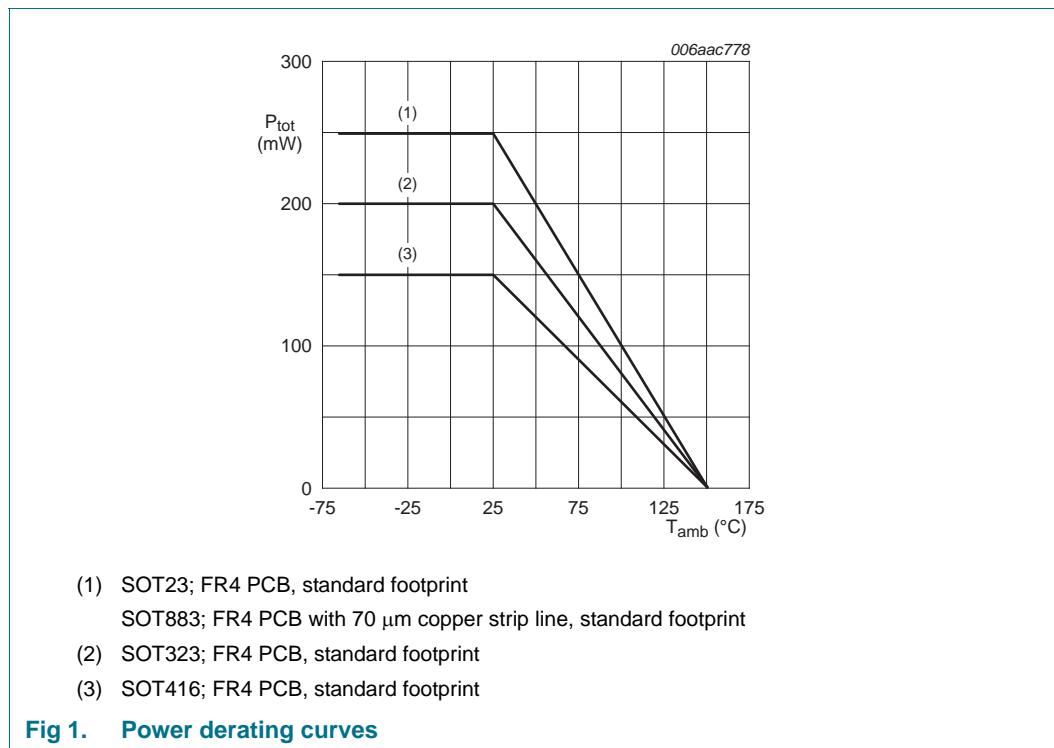
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	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				
	positive		-	+5	V
	negative		-	-12	V
$I_O$	output current		-	-100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1 \text{ ms}$	-	-100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$			
	PDTA123JE (SOT416)		[1][2]	-	mW
	PDTA123JM (SOT883)		[2][3]	-	mW
	PDTA123JT (SOT23)		[1]	-	mW
	PDTA123JU (SOT323)		[1]	-	mW
$T_j$	junction temperature		-	150	$^\circ\text{C}$
$T_{amb}$	ambient temperature		-65	+150	$^\circ\text{C}$
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$

[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  $\mu\text{m}$  copper strip line, standard footprint.



## 6. Thermal characteristics

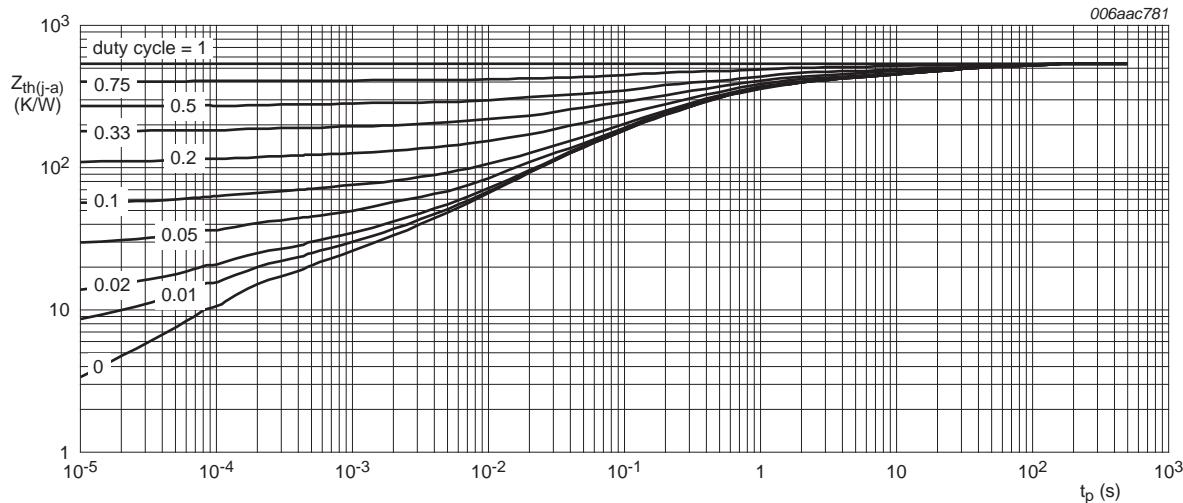
**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{\text{th}(\text{j-a})}$	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.

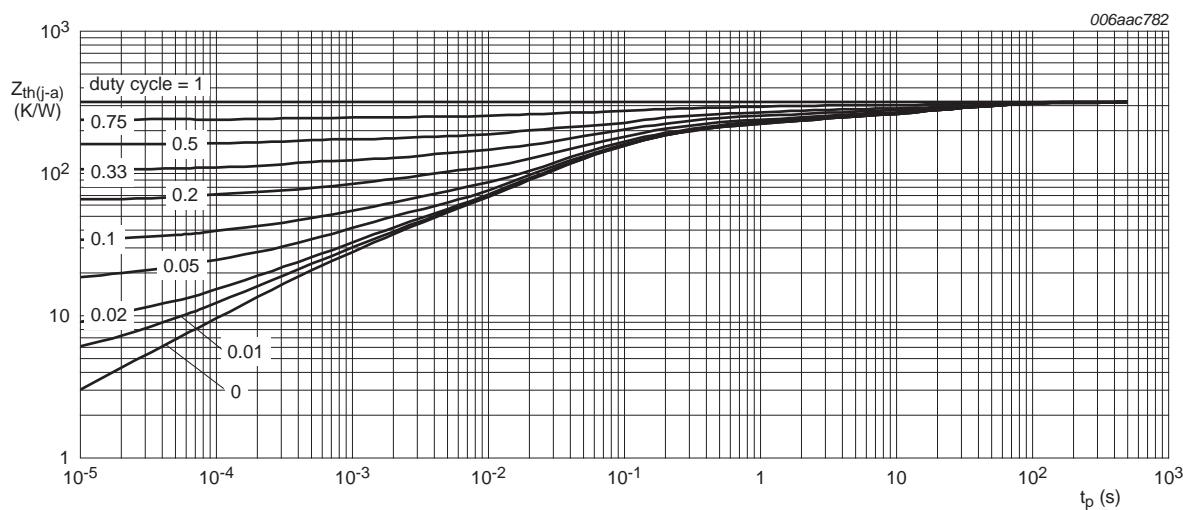
[2] Reflow soldering is the only recommended soldering method.

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

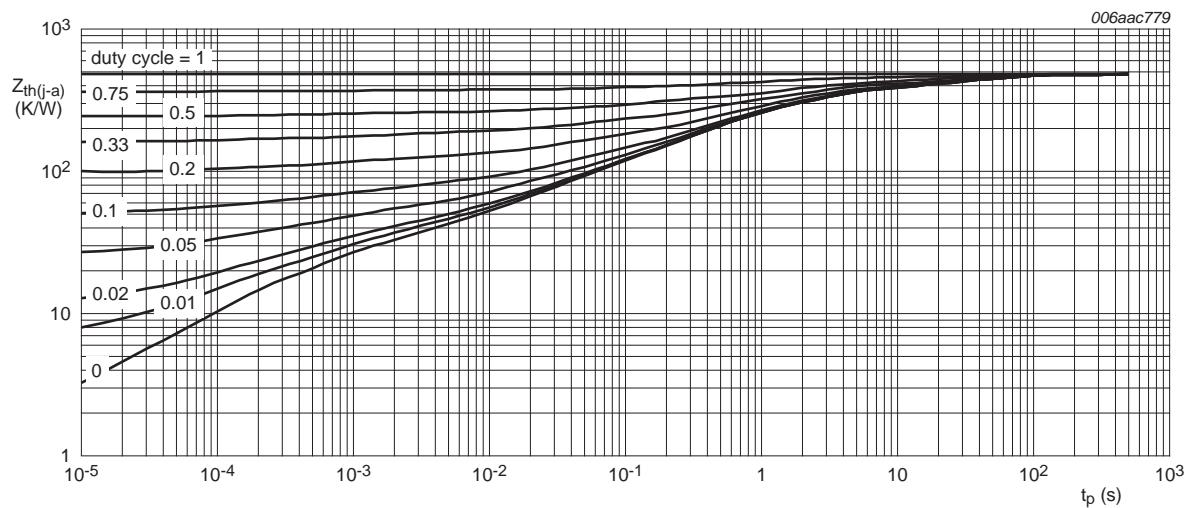


FR4 PCB, standard footprint

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

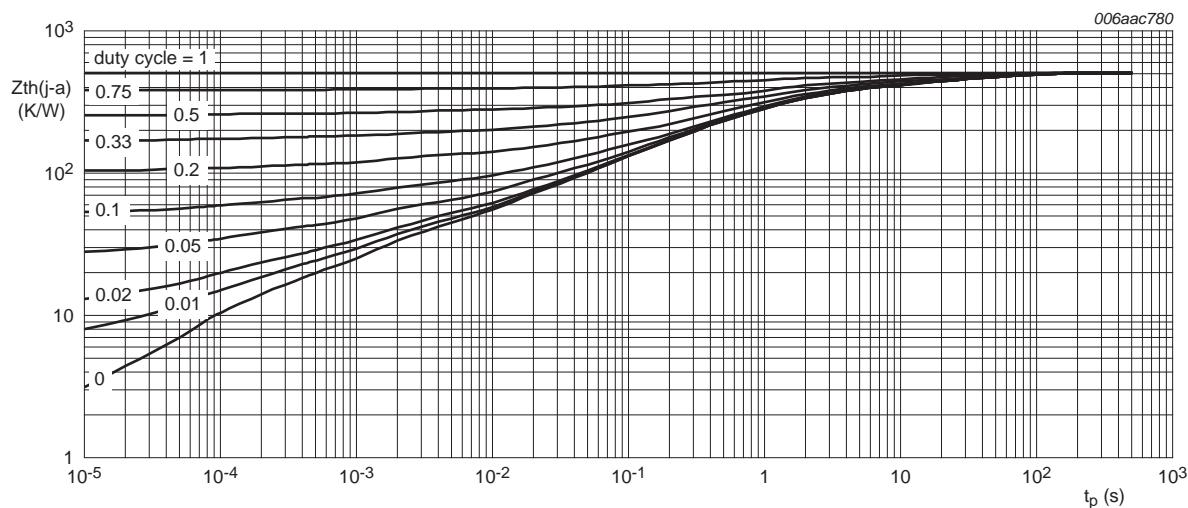
FR4 PCB, 70  $\mu\text{m}$  copper strip line

**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**

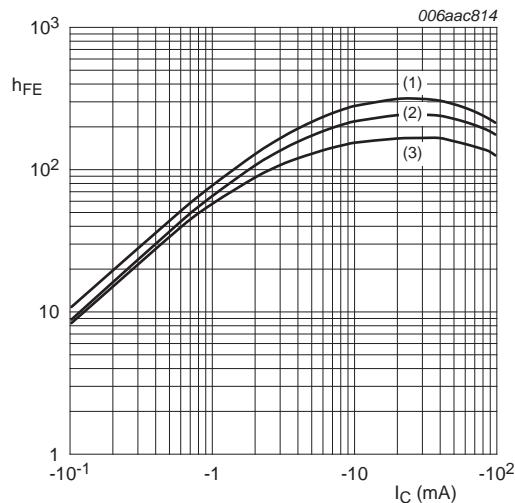
## 7. Characteristics

**Table 8. Characteristics**

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

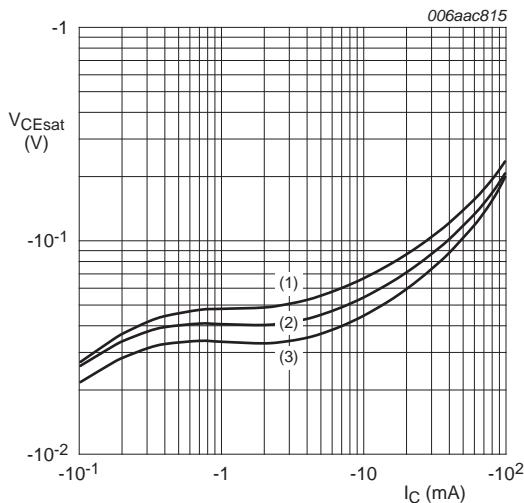
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -50 \text{ V}$ ; $I_E = 0 \text{ A}$	-	-	-100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = -30 \text{ V}$ ; $I_B = 0 \text{ A}$	-	-	-1	$\mu\text{A}$
		$V_{CE} = -30 \text{ V}$ ; $I_B = 0 \text{ A}$ ; $T_j = 150 \text{ }^{\circ}\text{C}$	-	-	-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	$V_{CE} = -5 \text{ V}$ ; $I_C = -100 \mu\text{A}$	-	-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	$\text{k}\Omega$
$R2/R1$	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	$V_{CE} = -5 \text{ V}$ ; $I_C = -10 \text{ mA}$ ; $f = 100 \text{ MHz}$	[1]	-	180	MHz

[1] Characteristics of built-in transistor.



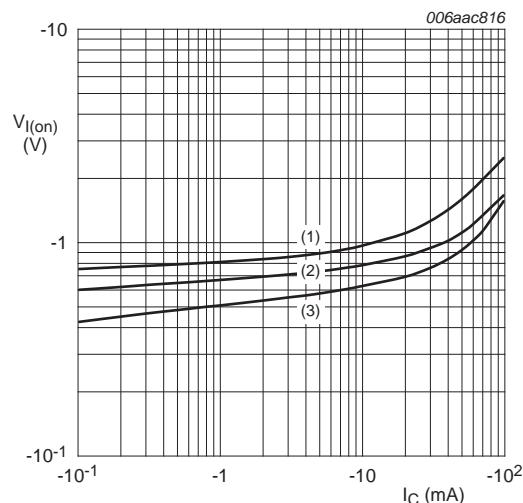
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



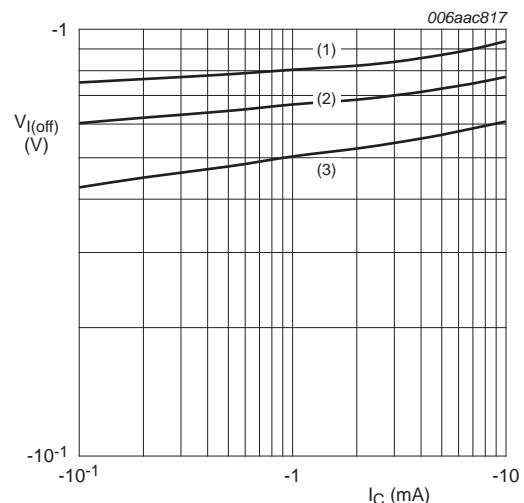
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



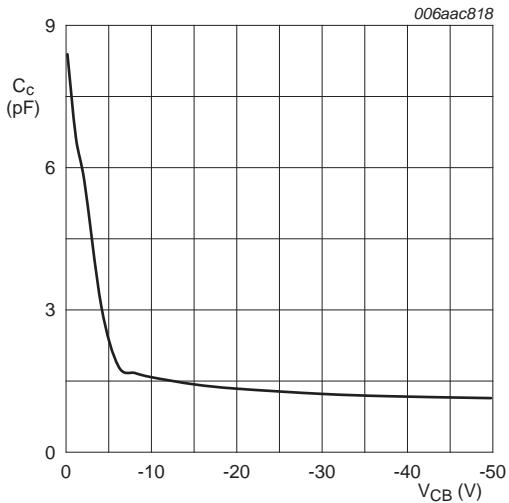
$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



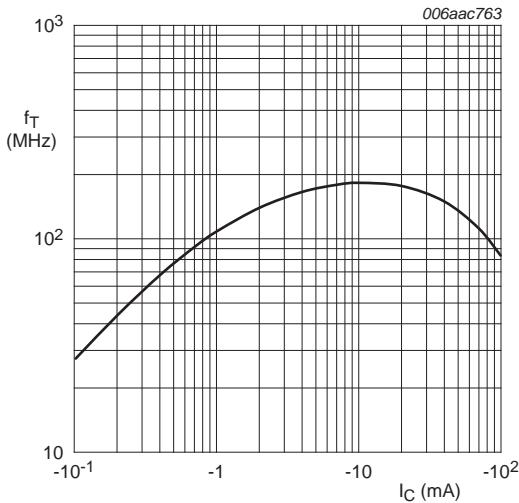
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$

**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**



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

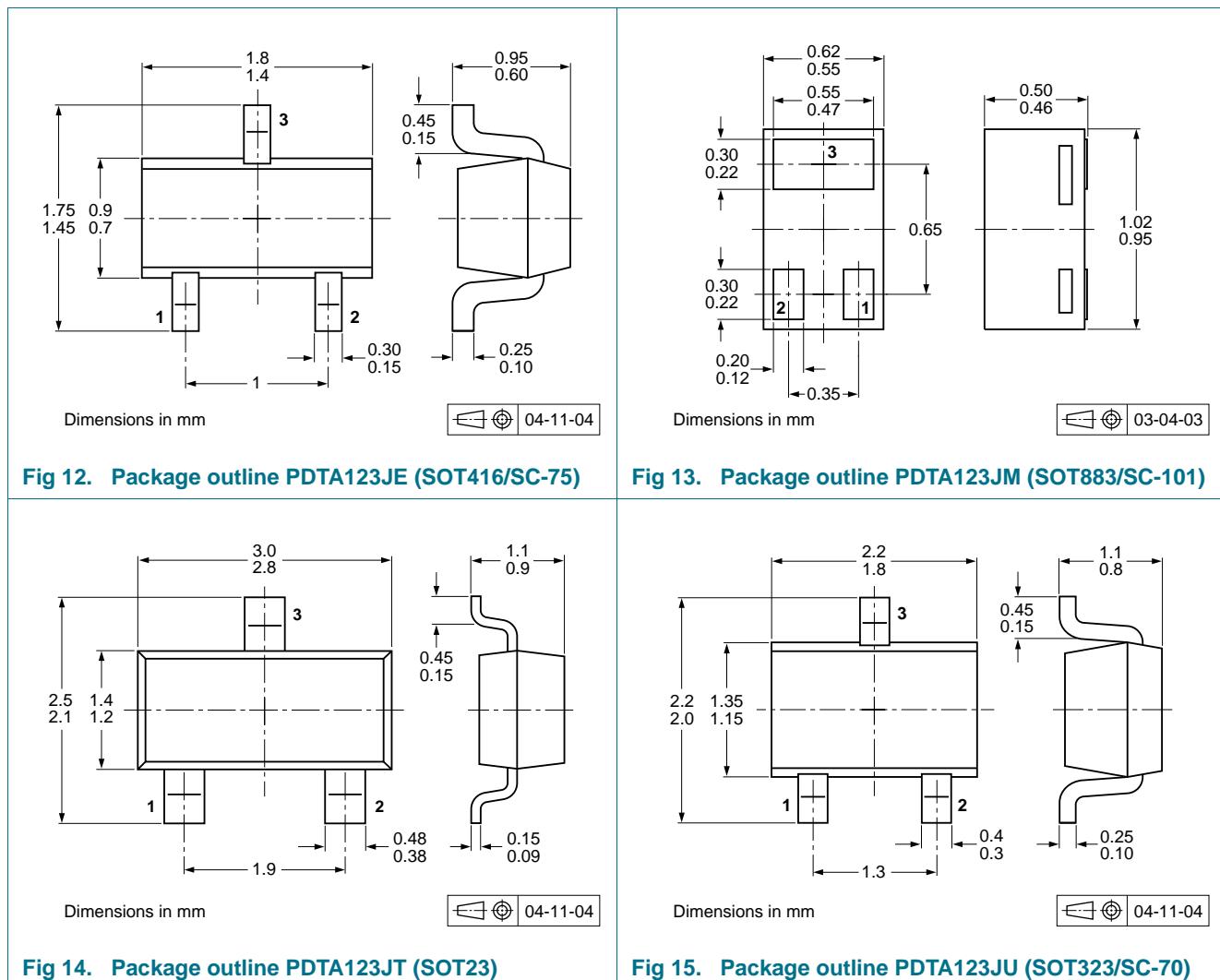
**Fig 11. Transition frequency as a function of collector current; typical values of built-in transistor**

## 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



## 10. Packing information

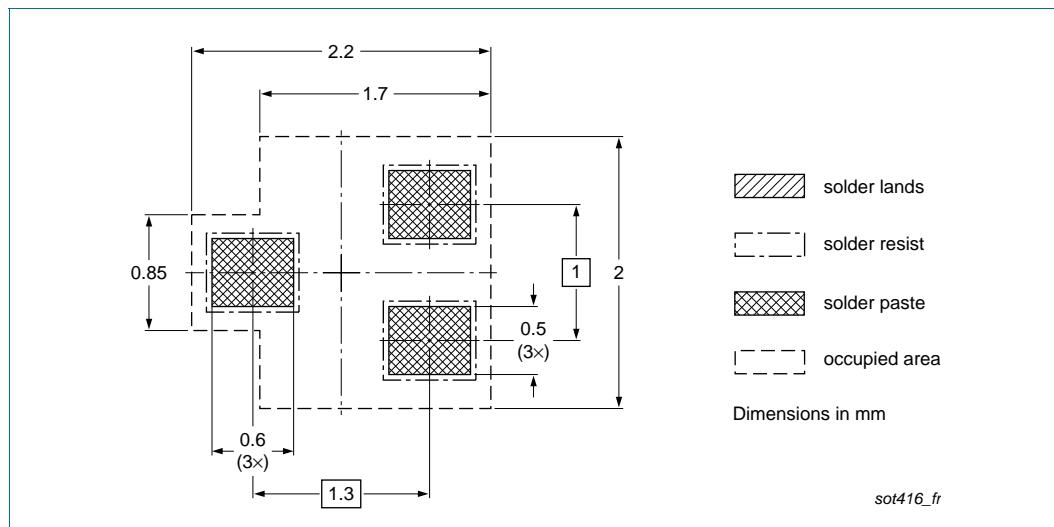
**Table 9. Packing methods**

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

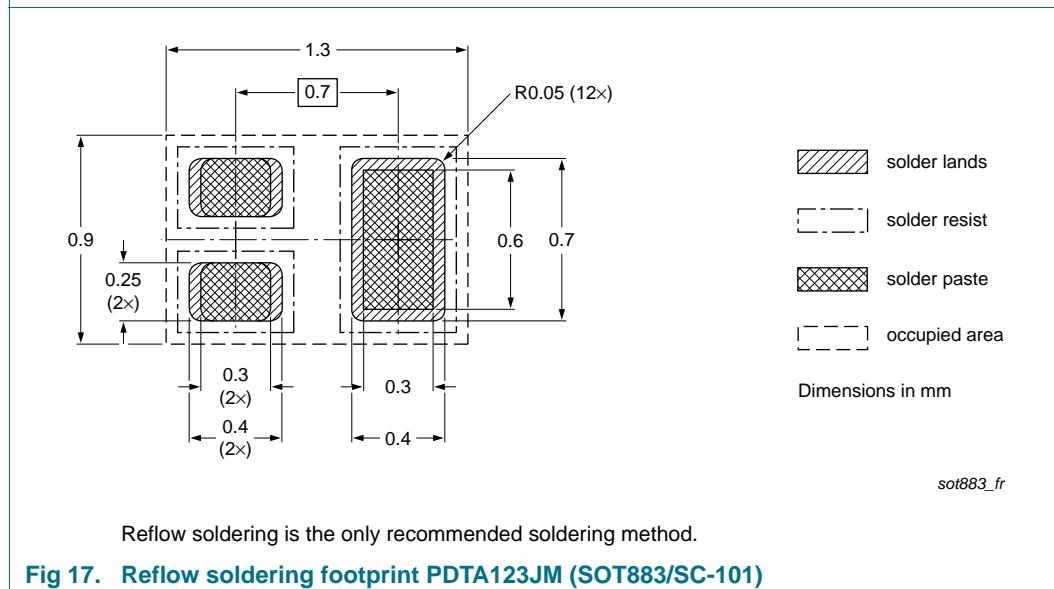
[1] For further information and the availability of packing methods, see [Section 14](#).

## 11. Soldering



Reflow soldering is the only recommended soldering method.

**Fig 16. Reflow soldering footprint PDTA123JE (SOT416/SC-75)**



Reflow soldering is the only recommended soldering method.

**Fig 17. Reflow soldering footprint PDTA123JM (SOT883/SC-101)**

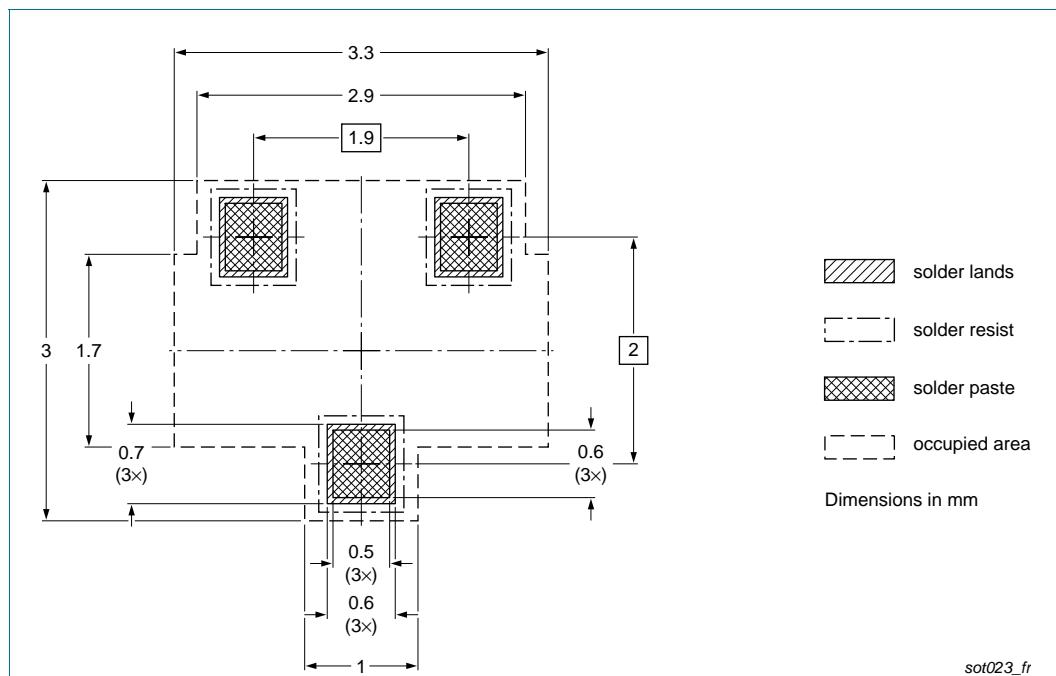


Fig 18. Reflow soldering footprint PDTA123JT (SOT23)

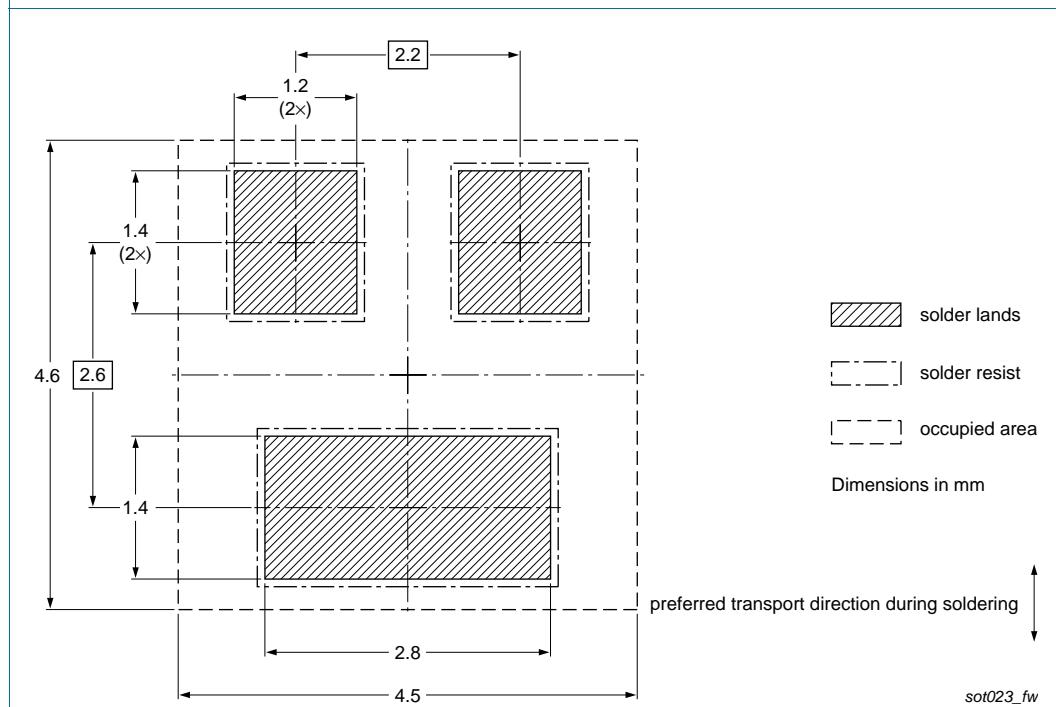


Fig 19. Wave soldering footprint PDTA123JT (SOT23)

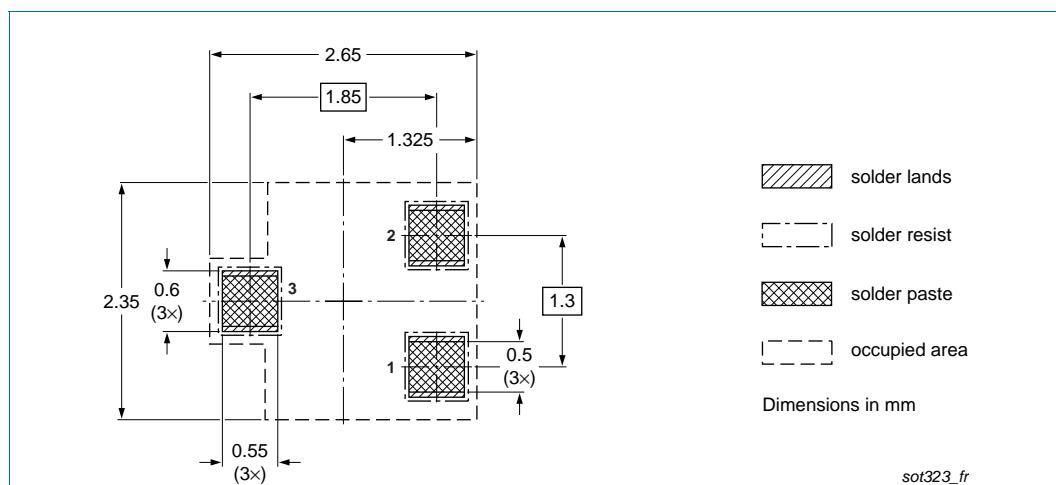


Fig 20. Reflow soldering footprint PDTA123JU (SOT323/SC-70)

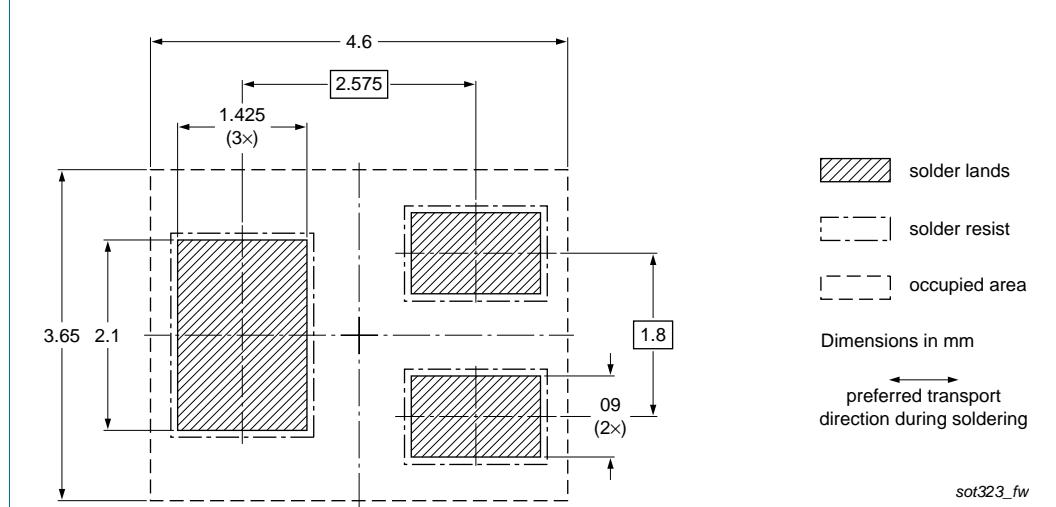


Fig 21. Wave soldering footprint PDTA123JU (SOT323/SC-70)

## 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><u>Section 1 "Product profile"</u>: amended</li> <li><u>Figure 1</u> to <u>11</u>: added</li> <li><u>Table 8 "Characteristics"</u>: <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><u>Figure 12, 13, 14</u> and <u>15</u>: superseded by minimized package outline drawings</li> <li><u>Section 8 "Test information"</u>: added</li> <li><u>Section 10 "Packing information"</u>: added</li> <li><u>Section 11 "Soldering"</u>: added</li> <li><u>Section 13 "Legal information"</u>: 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".

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