

PDTA124E series

PNP resistor-equipped transistors;
R1 = 22 k Ω , R2 = 22 k Ω

Rev. 8 — 25 November 2011

Product data sheet

1. Product profile

1.1 General description

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

Table 1. Product overview

Type number	Package			NPN complement	Package configuration
	NXP	JEITA	JEDEC		
PDTA124EE	SOT416	SC-75	-	PDTC124EE	ultra small
PDTA124EM	SOT883	SC-101	-	PDTC124EM	leadless ultra small
PDTA124ET	SOT23	-	TO-236AB	PDTC124ET	small
PDTA124EU	SOT323	SC-70	-	PDTC124EU	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 applications 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

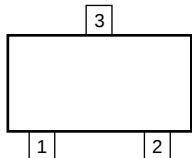
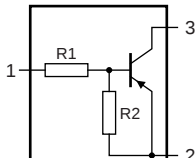
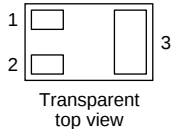
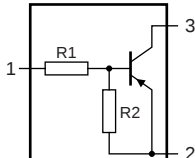
Table 2. Quick reference data

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)		15.4	22	28.6	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	



2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
SOT23; SOT323; SOT416			
1	input (base)	 006aaa144	 sym003
2	GND (emitter)		
3	output (collector)		
SOT883			
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
PDTA124EE	SC-75	plastic surface-mounted package; 3 leads	SOT416
PDTA124EM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
PDTA124ET	-	plastic surface-mounted package; 3 leads	SOT23
PDTA124EU	SC-70	plastic surface-mounted package; 3 leads	SOT323

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PDTA124EE	05
PDTA124EM	DH
PDTA124ET	*05
PDTA124EU	*05

[1] * = placeholder for manufacturing site code

5. Limiting values

Table 6. Limiting values

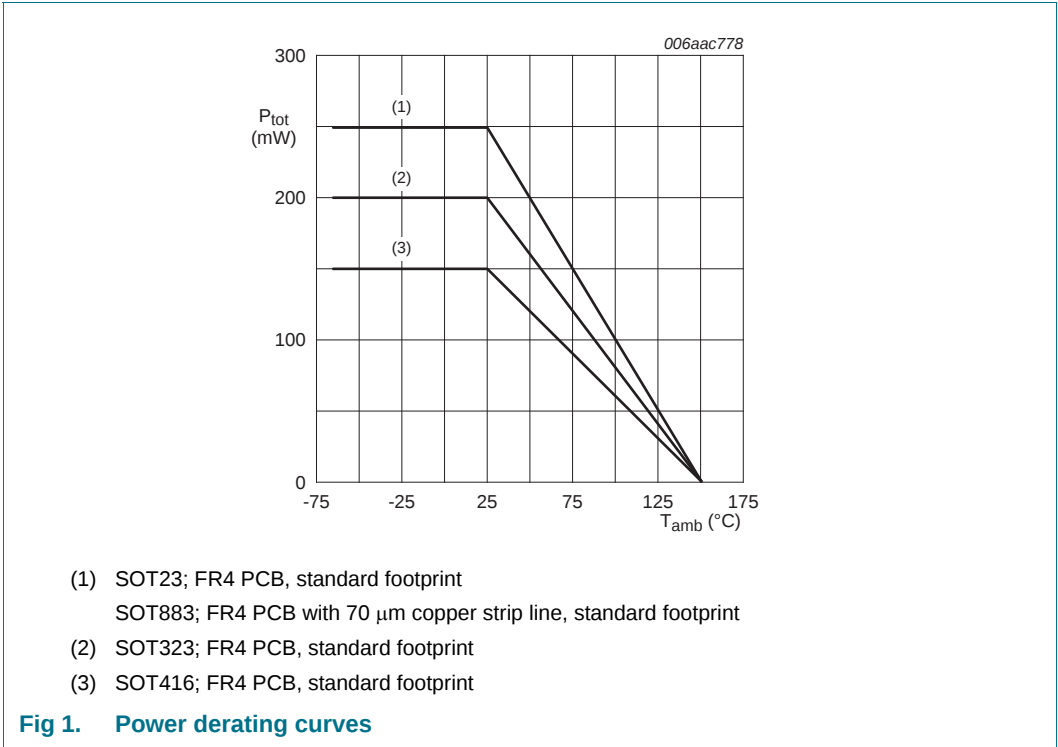
In accordance with the Absolute Maximum Rating System (IEC 60134).

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		-	+10	V
	negative		-	-40	V
I_O	output current		-	-100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C			
	PDTA124EE (SOT416)	[1] [2]	-	150	mW
	PDTA124EM (SOT883)	[2] [3]	-	250	mW
	PDTA124ET (SOT23)	[1]	-	250	mW
	PDTA124EU (SOT323)	[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 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.



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				
	PDTA124EE (SOT416)	[1][2]	-	-	830	K/W
	PDTA124EM (SOT883)	[2][3]	-	-	500	K/W
	PDTA124ET (SOT23)	[1]	-	-	500	K/W
	PDTA124EU (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 PDTA124EE (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 PDTA124EM (SOT883); typical values



FR4 PCB, standard footprint

Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration for PDTA124ET (SOT23); typical values



FR4 PCB, standard footprint

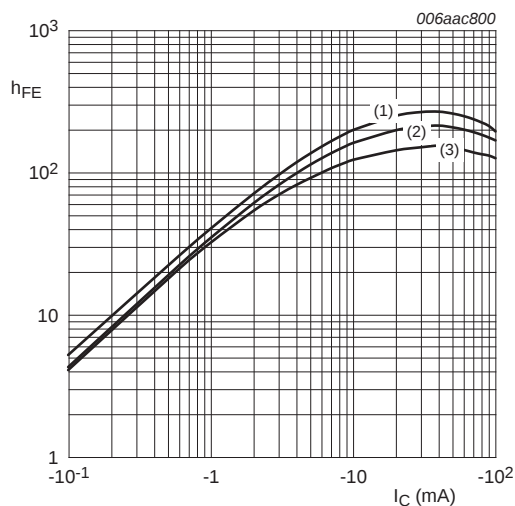
Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration for PDTA124EU (SOT323); typical values

7. Characteristics

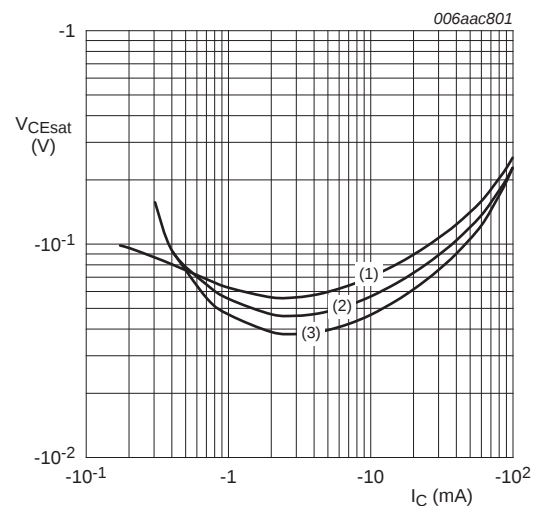
Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

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	$V_{CE} = -30\text{ V}$; $I_B = 0\text{ A}$	-	-	-100	nA
		$V_{CE} = -30\text{ V}$; $I_B = 0\text{ A}$; $T_j = 150\text{ °C}$	-	-	-5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\text{ V}$; $I_C = 0\text{ A}$	-	-	-180	μA
h_{FE}	DC current gain	$V_{CE} = -5\text{ V}$; $I_C = -5\text{ mA}$	60	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}$; $I_B = -0.5\text{ mA}$	-	-	-150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5\text{ V}$; $I_C = -100\text{ μA}$	-	-1.1	-0.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = -0.3\text{ V}$; $I_C = -5\text{ mA}$	-2.5	-1.7	-	V
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = -10\text{ V}$; $I_E = I_C = 0\text{ A}$; $f = 1\text{ MHz}$	-	-	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

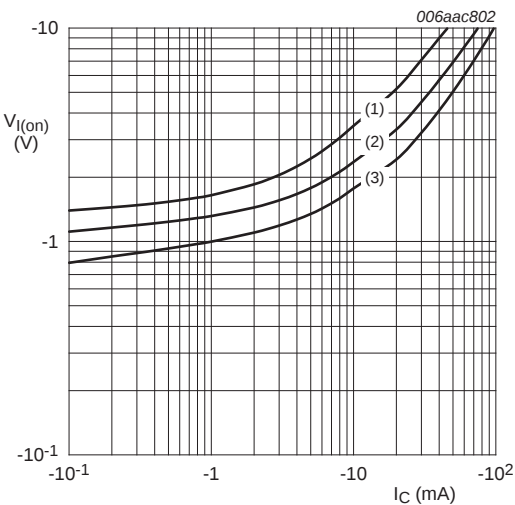

 $V_{CE} = -5\text{ V}$

- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -40\text{ °C}$

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

 $I_C/I_B = 20$

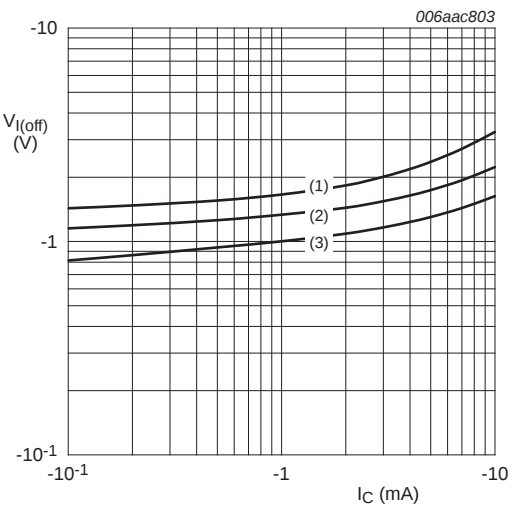
- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -40\text{ °C}$

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



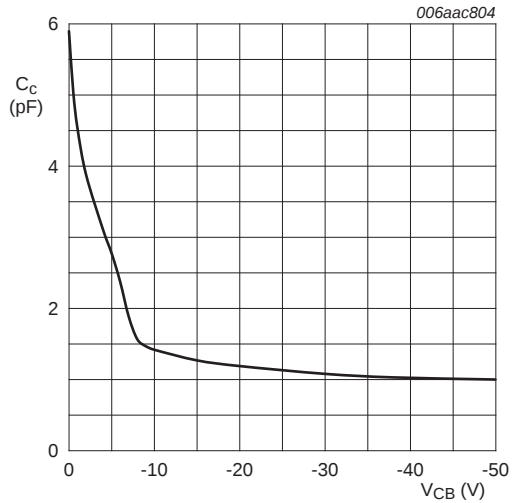
- $V_{CE} = -0.3\text{ V}$
- (1) $T_{amb} = -40^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 100^\circ\text{C}$

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



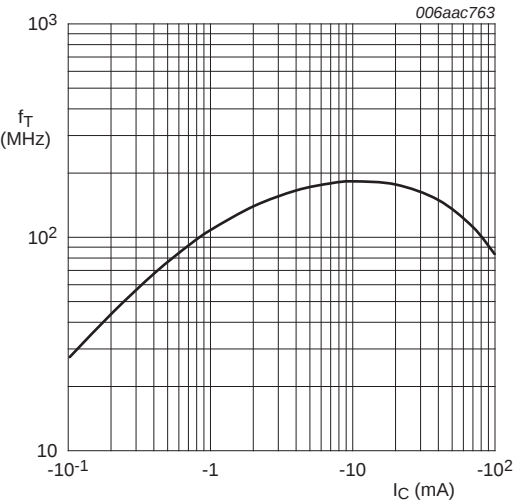
- $V_{CE} = -5\text{ V}$
- (1) $T_{amb} = -40^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 100^\circ\text{C}$

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



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

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



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

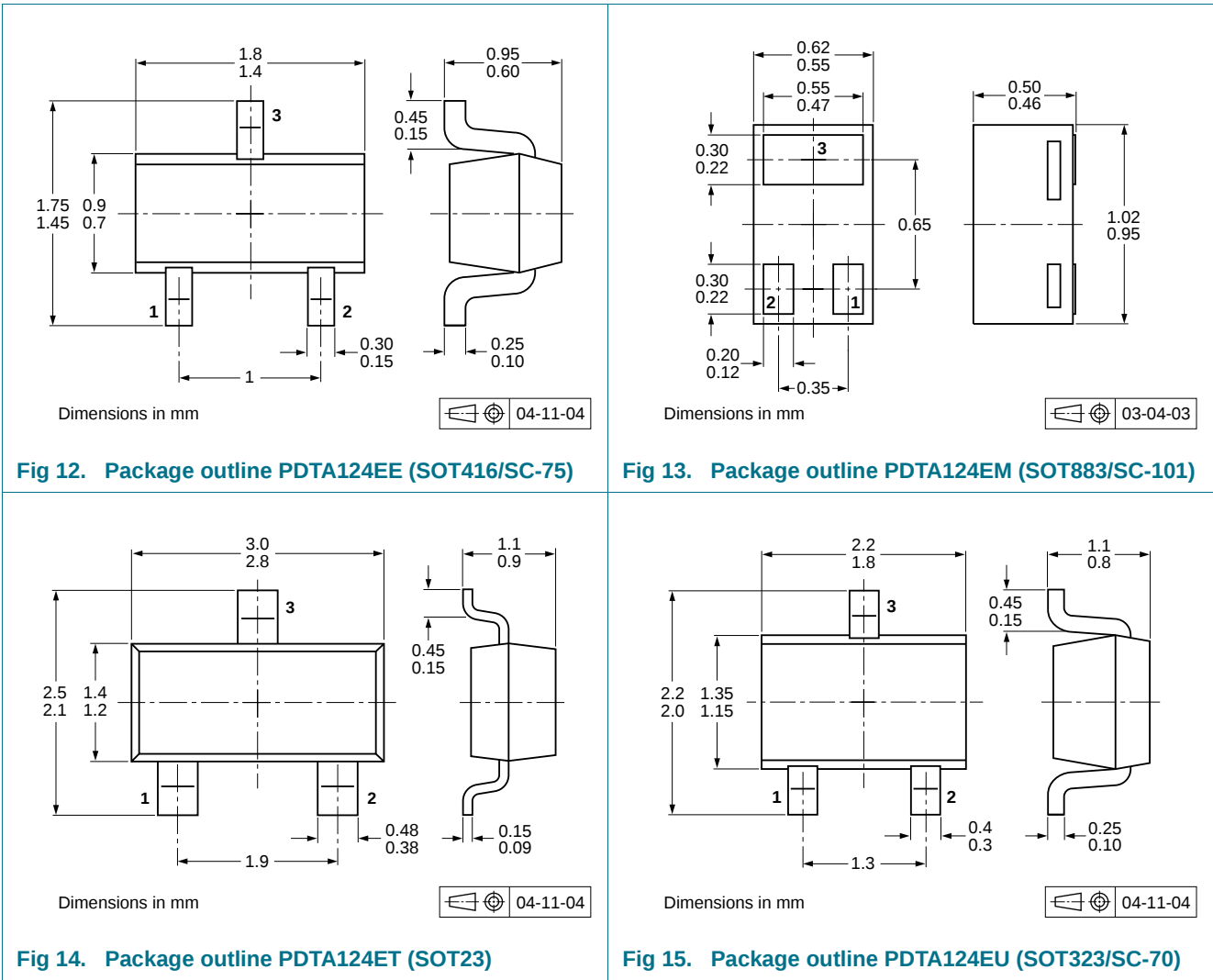
Fig 11. Transition frequency as a function of collector current; typical values of built-in transistor

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



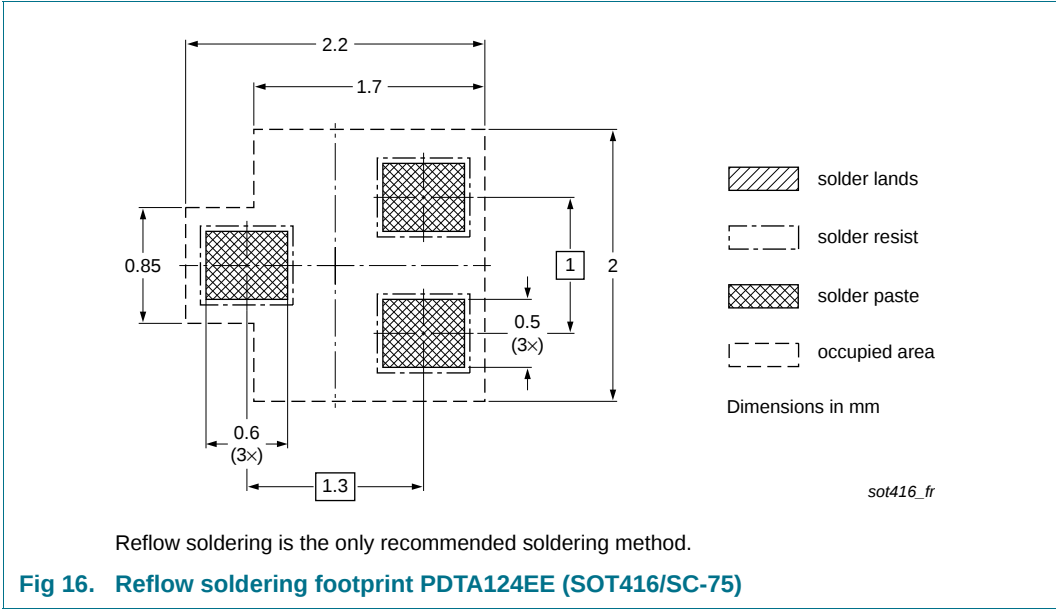
10. Packing information

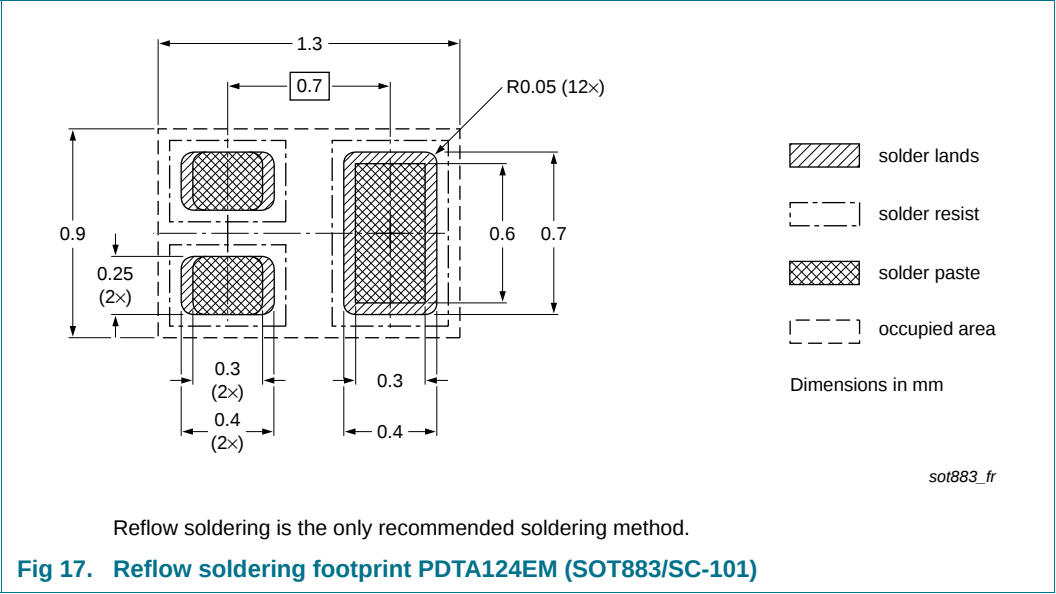
Table 9. Packing methods
The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

Type number	Package	Description	Packing quantity		
			3000	5000	10000
PDTA124EE	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
PDTA124EM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
PDTA124ET	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
PDTA124EU	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





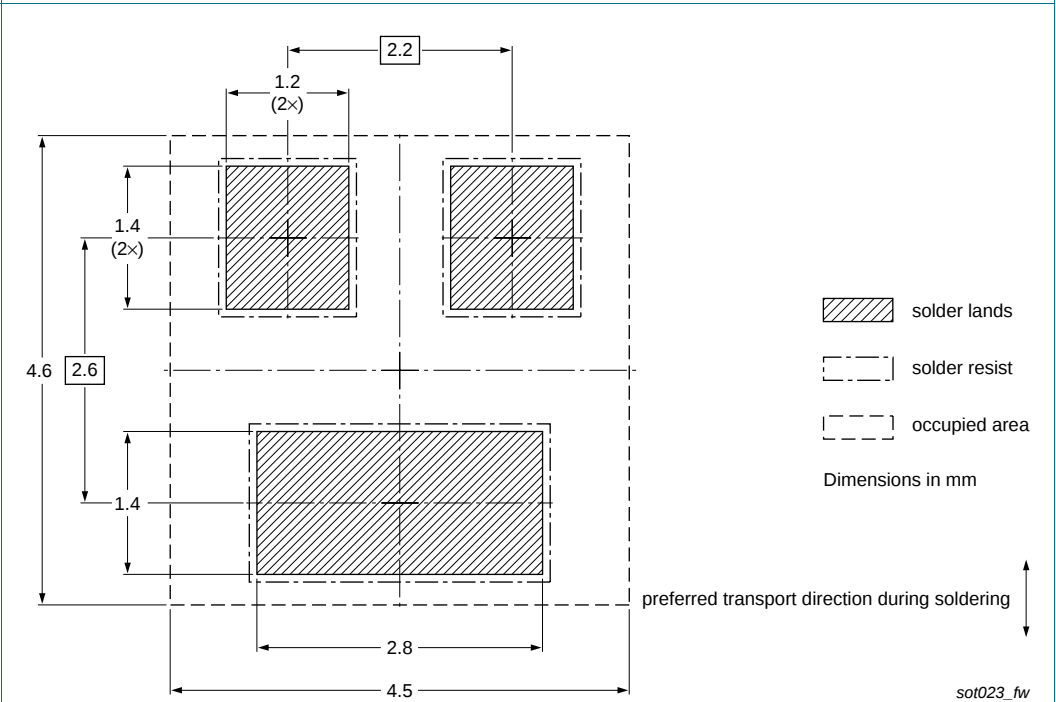
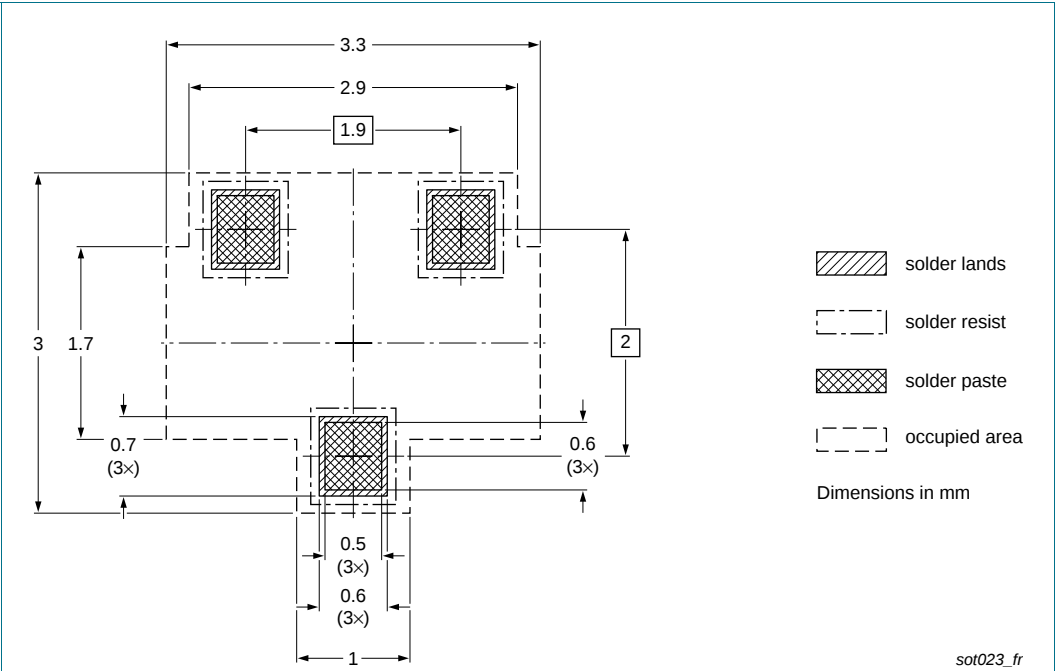




Fig 20. Reflow soldering footprint PDTA124EU (SOT323/SC-70)

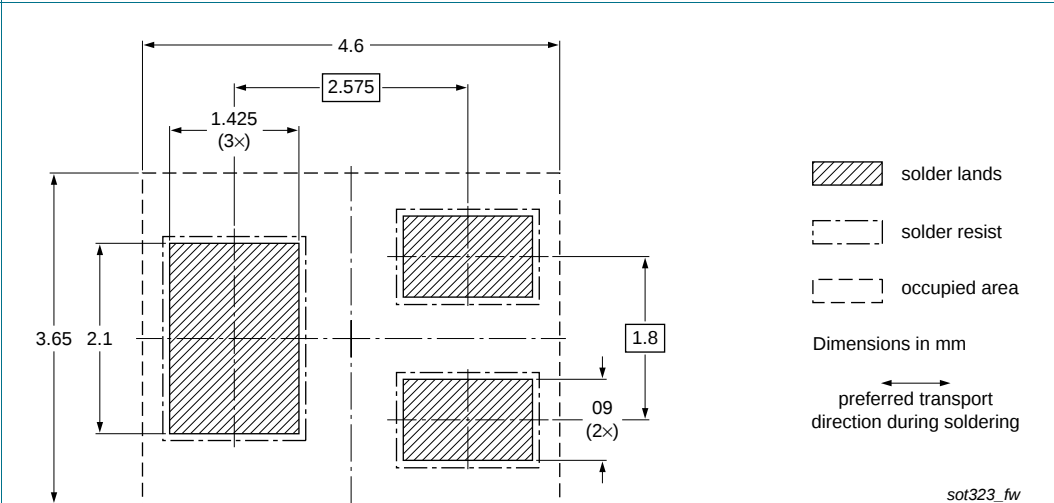


Fig 21. Wave soldering footprint PDTA124EU (SOT323/SC-70)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTA124E_SER v.8	20111125	Product data sheet	-	PDTA124E_SERIES v.7
Modifications:	• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type numbers PDTA124EEF, PDTA124EK and PDTA124ES removed. • Section 1 "Product profile": updated • Section 3 "Ordering information": added • Section 4 "Marking": updated • Figure 1 to 11: added • Section 6 "Thermal characteristics": updated • Table 8 "Characteristics": $V_{i(on)}$ redefined to $V_{i(on)}$ on-state input voltage, $V_{i(off)}$ redefined to $V_{i(off)}$ off-state input voltage, I_{CEO} updated, f_T added • Section 8 "Test information": added • Section 9 "Package outline": superseded by minimized package outline drawings • Section 10 "Packing information": added • Section 11 "Soldering": added • Section 13 "Legal information": updated			
PDTA124E_SERIES v.7	20040805	Product data sheet	-	PDTA124E_SERIES v.6
PDTA124E_SERIES v.6	20030414	Product specification	-	-

13. Legal information

13.1 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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Date of release: 25 November 2011

Document identifier: PDTA124E_SER

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