



# PNTA143/114/124/144EQA series

50 V, 100 mA PNP resistor-equipped transistors

Rev. 1 — 18 December 2015

Product data sheet

## 1. Product profile

### 1.1 General description

100 mA PNP Resistor-Equipped Transistor (RET) family in a leadless ultra small DFN1010D-3 (SOT1215) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

Table 1. Product overview

Type number	R1	R2	Nexperia	NPN complement
PNTA143EQA	4.7 k $\Omega$	4.7 k $\Omega$	DFN1010D-3 (SOT1215)	PDTC143EQA
PNTA114EQA	10 k $\Omega$	10 k $\Omega$		PDTC114EQA
PNTA124EQA	22 k $\Omega$	22 k $\Omega$		PDTC124EQA
PNTA144EQA	47 k $\Omega$	47 k $\Omega$		PDTC144EQA

### 1.2 Features and benefits

- 100 mA output current capability
- built-in bias resistors
- simplifies circuit design
- reduces component count
- reduced pick and place costs
- low package height of 0.37 mm
- AEC-Q101 qualified
- suitable for Automatic Optical Inspection (AOI) of solder joint

### 1.3 Applications

- digital applications
- cost saving alternative for BC847/BC857 series in digital applications
- controlling IC inputs
- switching loads

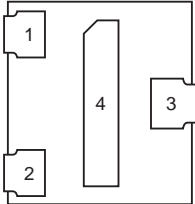
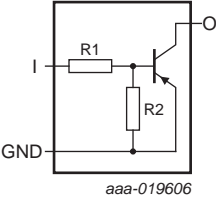
### 1.4 Quick reference data

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

## 2. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I	input (base)	 <p>Transparent top view</p>	
2	GND	GND (emitter)		
3	O	output (collector)		
4	O	output (collector)		

## 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTA143EQA	DFN1010D-3	plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body: 1.1 × 1.0 × 0.37 mm	SOT1215
PDTA114EQA			
PDTA124EQA			
PDTA144EQA			

## 4. Marking

Table 5. Marking codes

Type number	Marking code
PDTA143EQA	10 10 11
PDTA114EQA	11 01 11
PDTA124EQA	10 11 10
PDTA144EQA	10 01 11

### 4.1 Binary marking code description

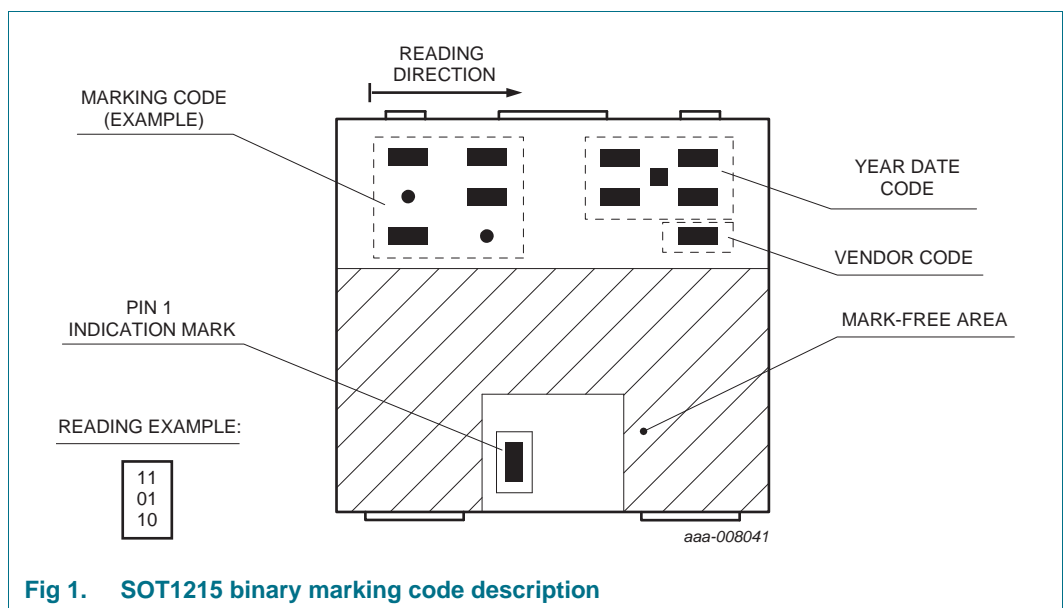


Fig 1. SOT1215 binary marking code description

## 5. Limiting values

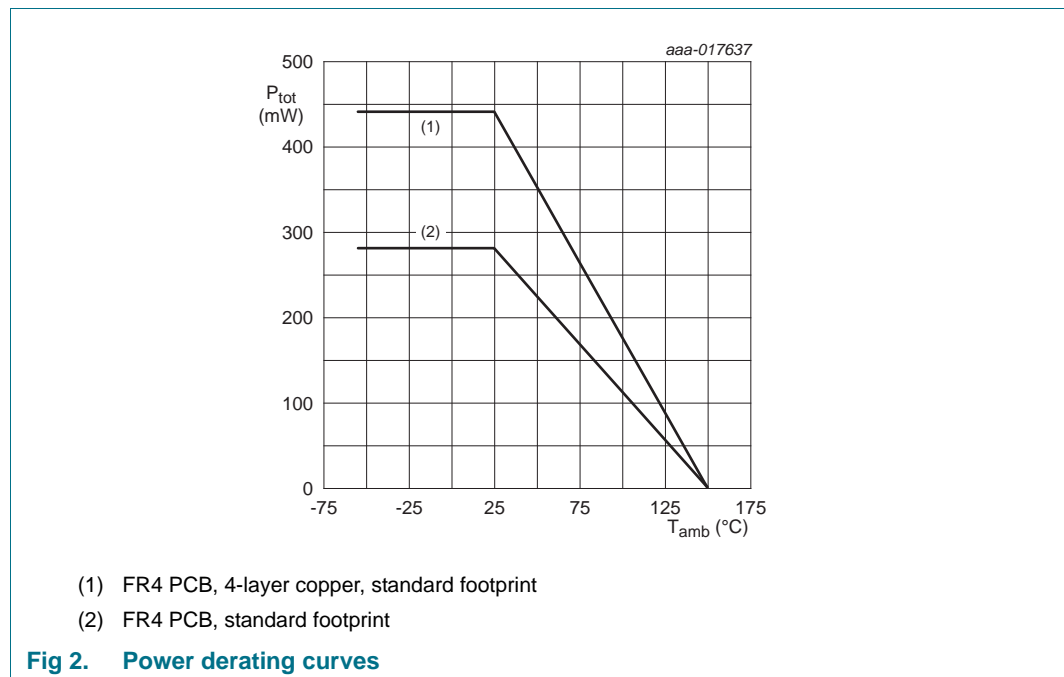
**Table 6. Limiting values**

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					
	PDTA143EQA		-30	+10	V	
	PDTA114EQA		-40	+10	V	
	PDTA124EQA		-40	+10	V	
PDTA144EQA		-40	+10	V		
$I_O$	output current		-	-100	mA	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	280	mW
			[2]	-	440	mW
$T_j$	junction temperature		-	150	°C	
$T_{amb}$	ambient temperature		-55	+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] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

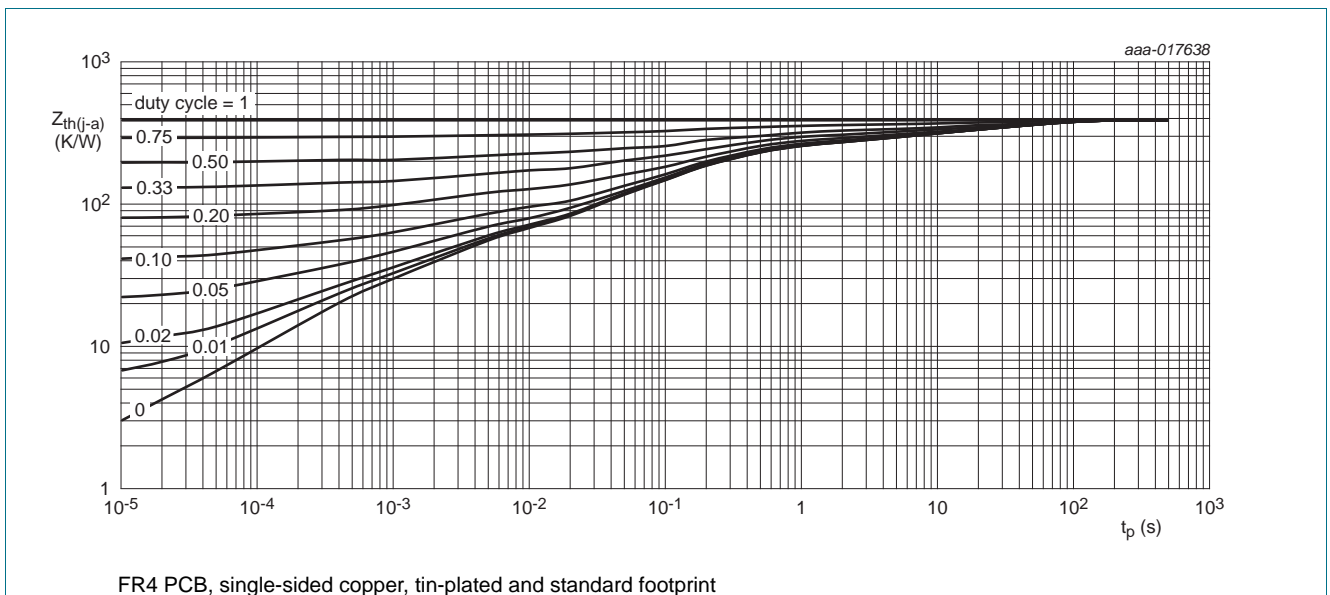


## 6. Thermal characteristics

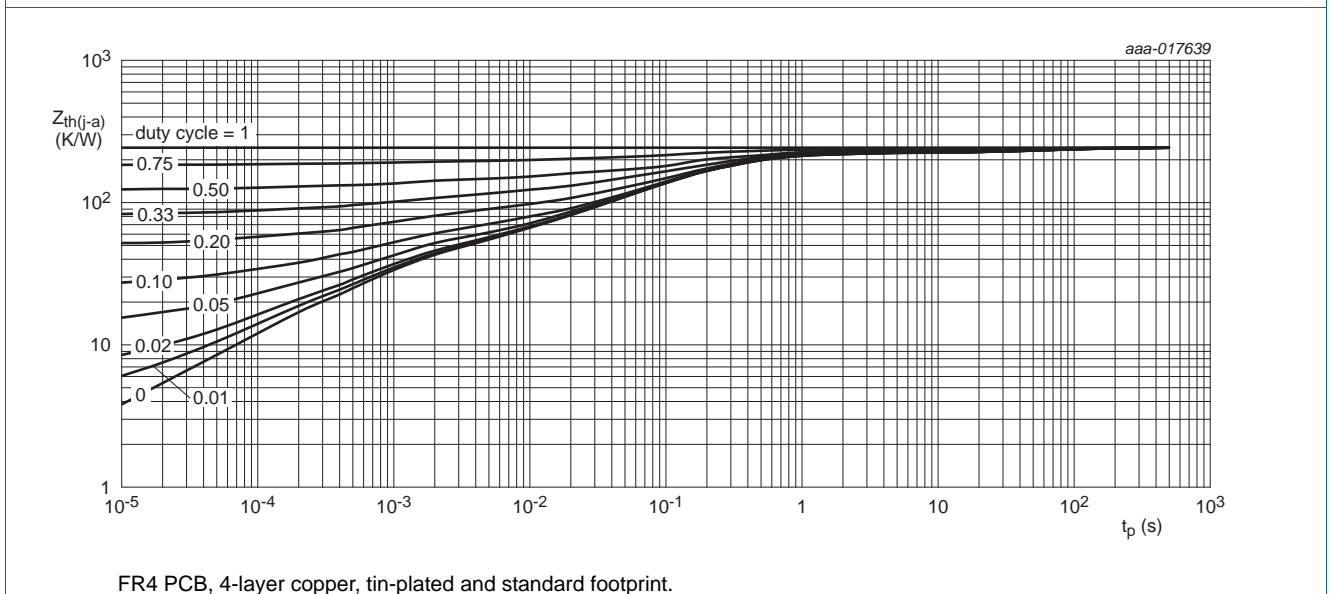
**Table 7. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	446	K/W
			[2]	-	284	K/W

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.



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



**Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

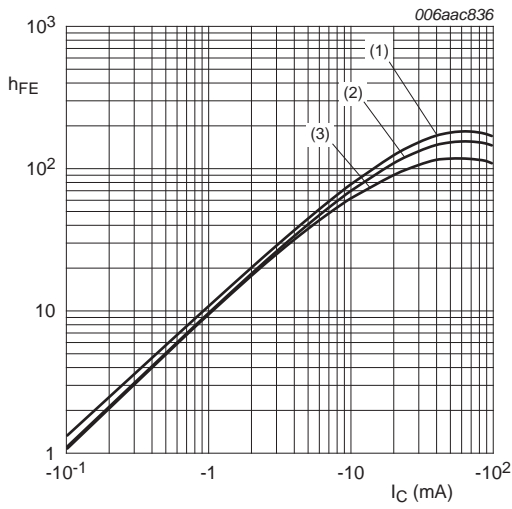
## 7. Characteristics

**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	$V_{CE} = -30; I_B = 0\text{ A};$	-	-	-1	$\mu\text{A}$
		$V_{CE} = -30; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current					
	PDTA143EQA	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-900	$\mu\text{A}$
	PDTA114EQA		-	-	-400	$\mu\text{A}$
	PDTA124EQA		-	-	-180	$\mu\text{A}$
PDTA144EQA	-		-	-90	$\mu\text{A}$	
$h_{FE}$	DC current gain					
	PDTA143EQA	$V_{CE} = -5\text{ V}; I_C = -10\text{ mA}$	30	-	-	
	PDTA114EQA	$V_{CE} = -5\text{ V}; I_C = -5\text{ mA}$	30	-	-	
	PDTA124EQA	$V_{CE} = -5\text{ V}; I_C = -5\text{ mA}$	60	-	-	
	PDTA144EQA	$V_{CE} = -5\text{ V}; I_C = -5\text{ mA}$	80	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$	-	-	-150	mV
$V_{I(off)}$	off-state input voltage					
	PDTA143EQA	$V_{CE} = -5\text{ V}; I_C = -100\text{ }\mu\text{A}$	-	-1.1	-0.5	V
	PDTA114EQA		-	-1.1	-0.8	V
	PDTA124EQA		-	-1.1	-0.8	V
PDTA144EQA	-		-1.2	-0.8	V	
$V_{I(on)}$	on-state input voltage					
	PDTA143EQA	$V_{CE} = -0.3\text{ V}; I_C = -20\text{ mA}$	-2.5	-1.9	-	V
	PDTA114EQA	$V_{CE} = -0.3\text{ V}; I_C = -10\text{ mA}$	-2.5	-1.8	-	V
	PDTA124EQA	$V_{CE} = -0.3\text{ V}; I_C = -5\text{ mA}$	-2.5	-1.7	-	V
	PDTA144EQA	$V_{CE} = -0.3\text{ V}; I_C = -2\text{ mA}$	-3	-1.6	-	V
R1	bias resistor 1 (input)		[1]			
	PDTA143EQA		3.3	4.7	6.1	k $\Omega$
	PDTA114EQA		7	10	13	k $\Omega$
	PDTA124EQA		15.4	22	28.6	k $\Omega$
	PDTA144EQA		33	47	61	k $\Omega$
R2/R1	bias resistor ratio	[1]	0.8	1	1.2	
$C_c$	collector capacitance	$V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	3	pF
$f_T$	transition frequency	$V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; f = 100\text{ MHz}$	[2]	180	-	MHz

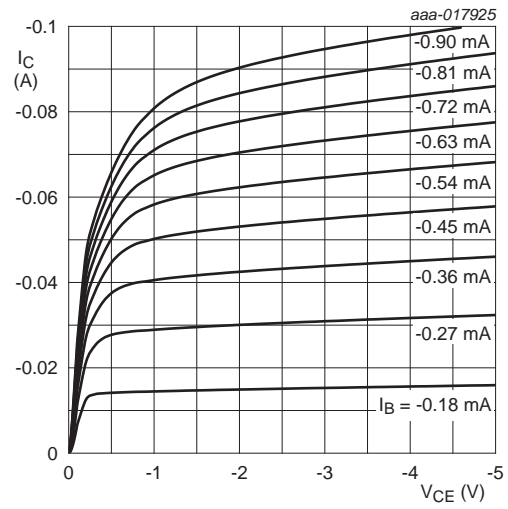
[1] See section test information for resistor calculation and test conditions.

[2] Characteristics of built-in transistor.



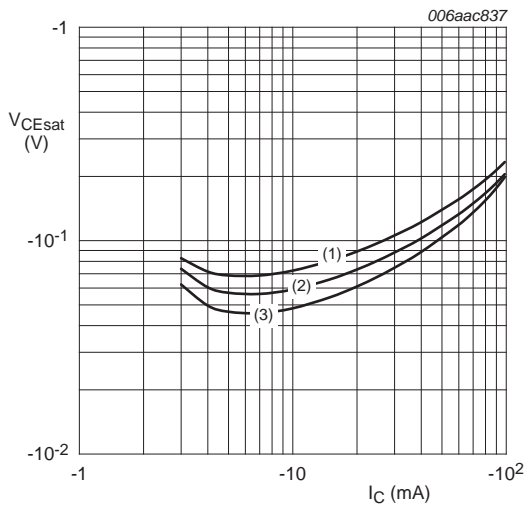
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 5. PDTA143EQA: DC current gain as a function of collector current; typical values**



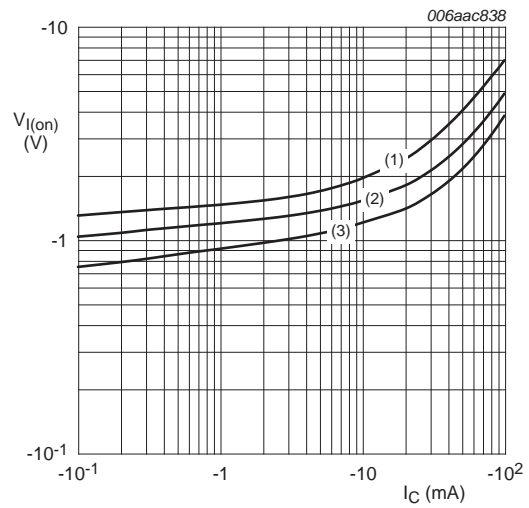
$T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig 6. PDTA143EQA: Collector current as a function of collector-emitter voltage; typical values**



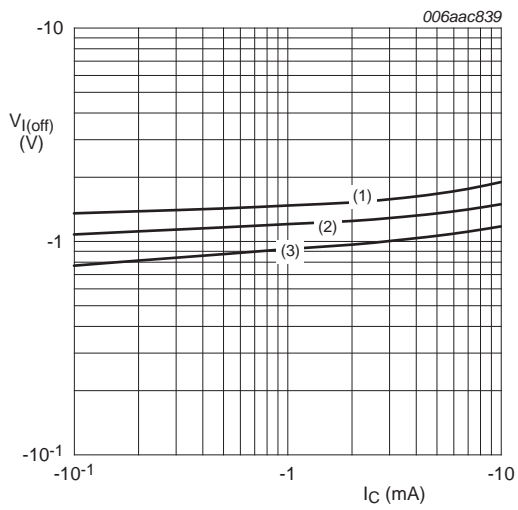
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 7. PDTA143EQA: Collector-emitter saturation voltage as a function of collector current; typical values**



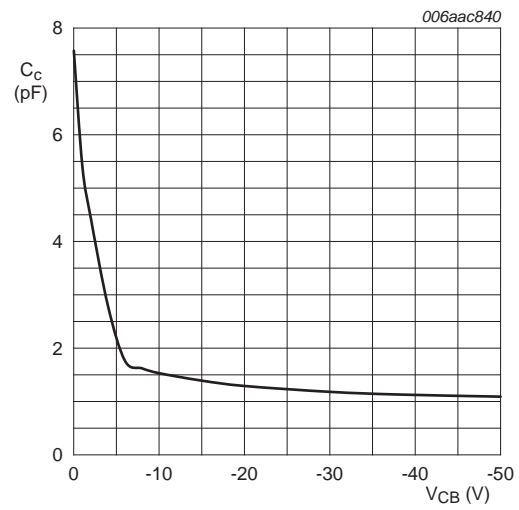
$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

**Fig 8. PDTA143EQA: On-state input voltage as a function of collector current; typical values**



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

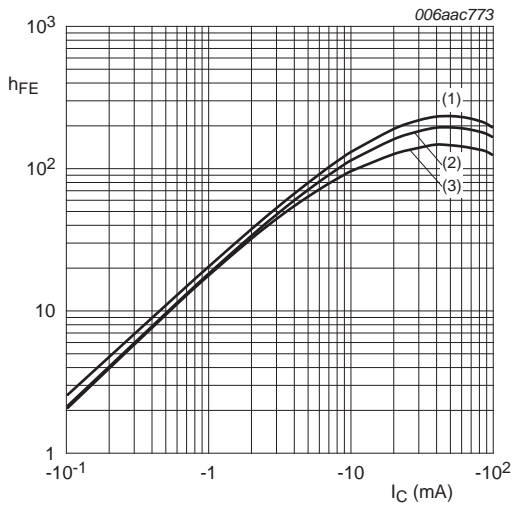
**Fig 9. PDTA143EQA: Off-state input voltage as a function of collector current; typical values**



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

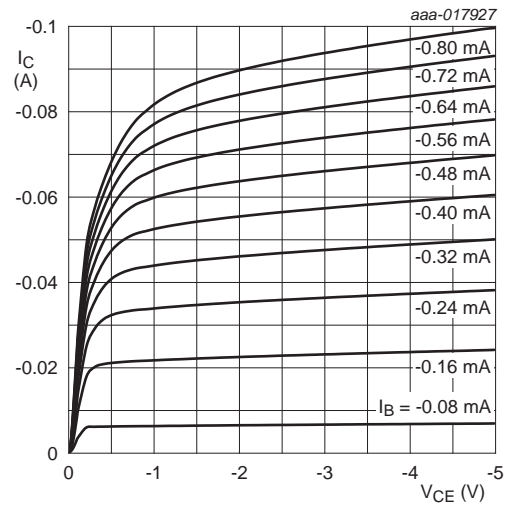
**Fig 10. PDTA143EQA: Collector capacitance as a function of collector-base voltage; typical values**





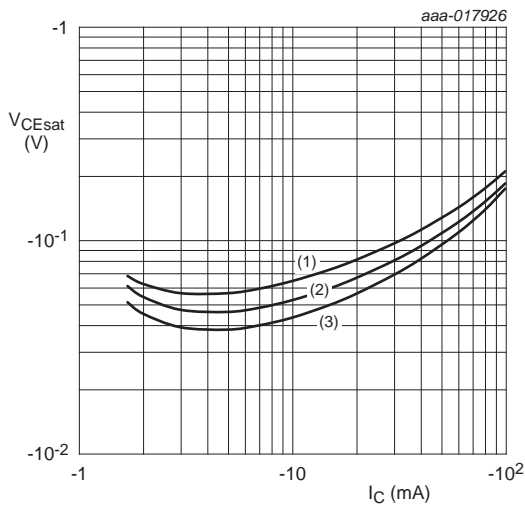
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 11. PDTA114EQA: DC current gain as a function of collector current; typical values**



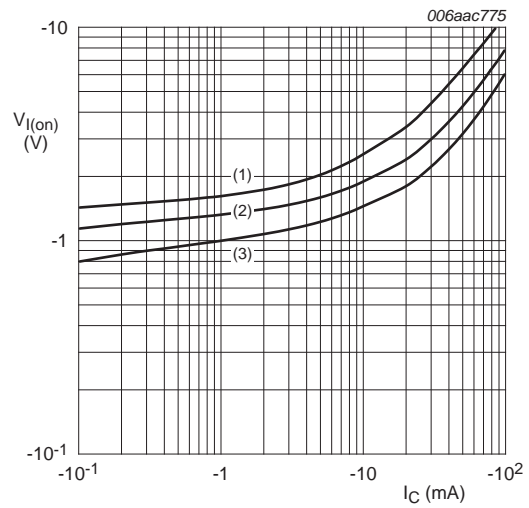
$T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig 12. PDTA114EQA: Collector current as a function of collector-emitter voltage; typical values**



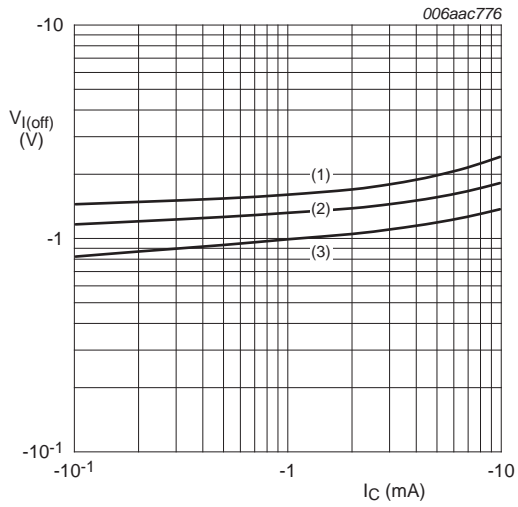
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 13. PDTA114EQA: Collector-emitter saturation voltage as a function of collector current; typical values**



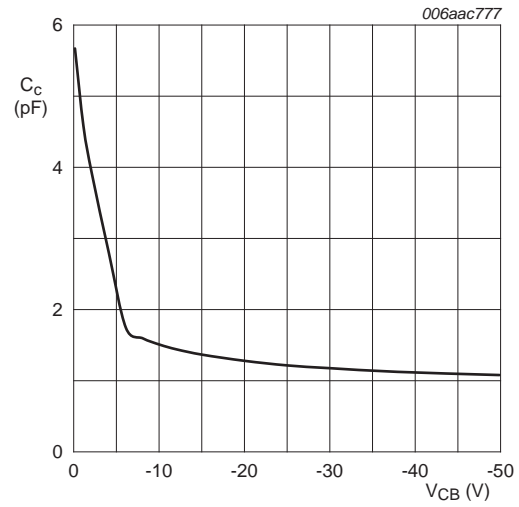
$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

**Fig 14. PDTA114EQA: On-state input voltage as a function of collector current; typical values**



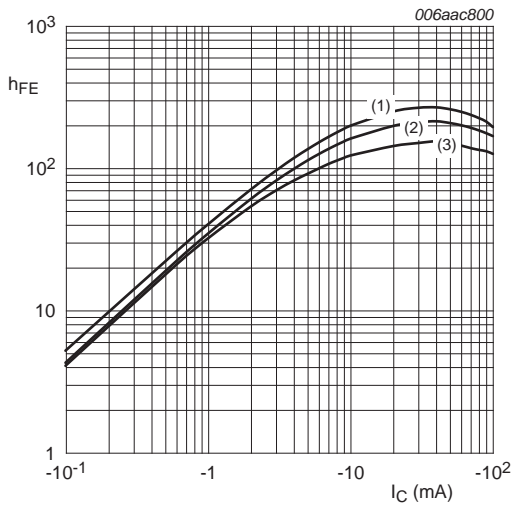
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = -40\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

**Fig 15. PDTA114EQA: Off-state input voltage as a function of collector current; typical values**



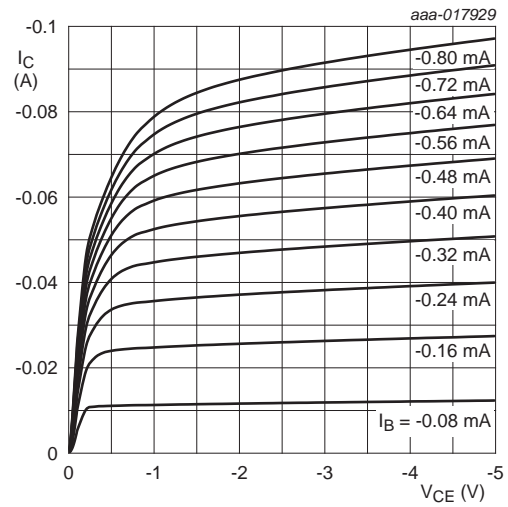
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

**Fig 16. PDTA114EQA: Collector capacitance as a function of collector-base voltage; typical values**



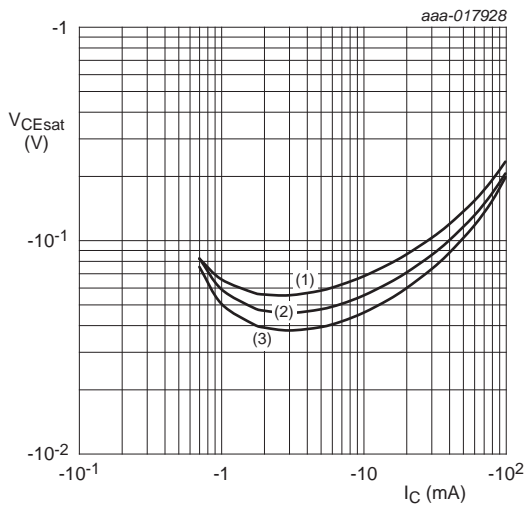
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 17. PDTA124EQA: DC current gain as a function of collector current; typical values**



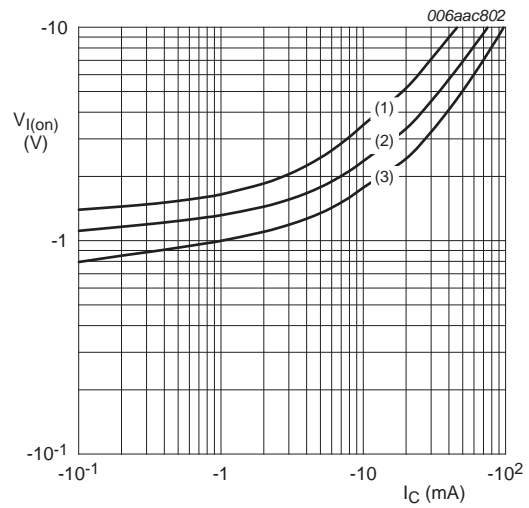
$T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig 18. PDTA124EQA: Collector current as a function of collector-emitter voltage; typical values**



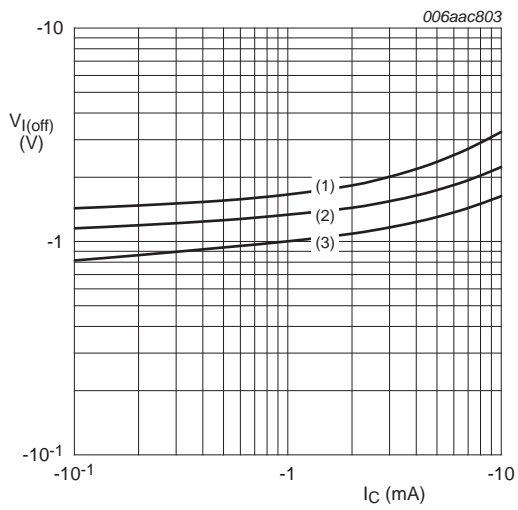
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 19. PDTA124EQA: Collector-emitter saturation voltage as a function of collector current; typical values**



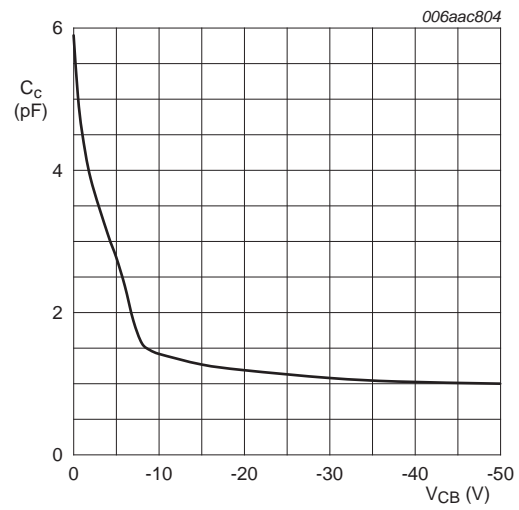
$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

**Fig 20. PDTA124EQA: On-state input voltage as a function of collector current; typical values**



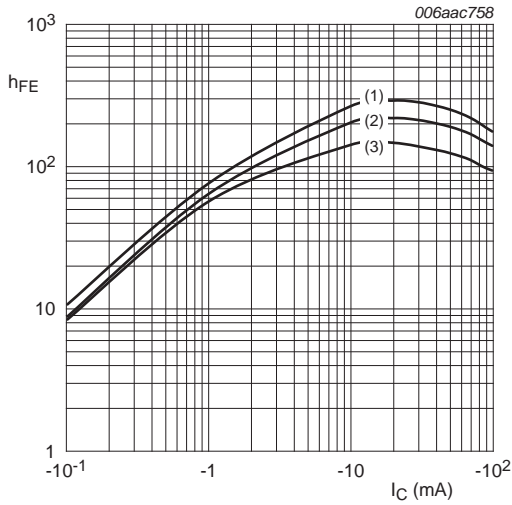
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = -40\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

**Fig 21. PDTA124EQA: Off-state input voltage as a function of collector current; typical values**



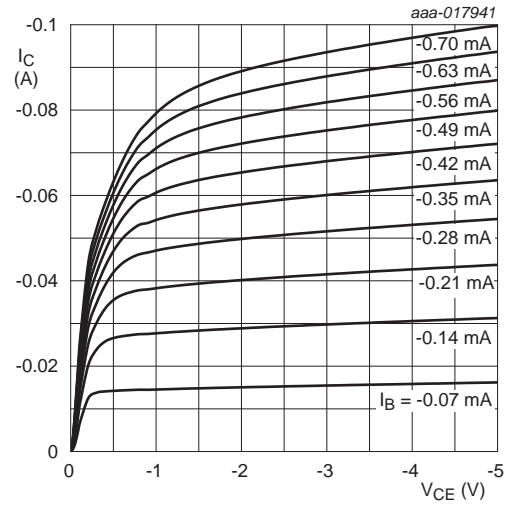
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

**Fig 22. PDTA124EQA: Collector capacitance as a function of collector-base voltage; typical values**



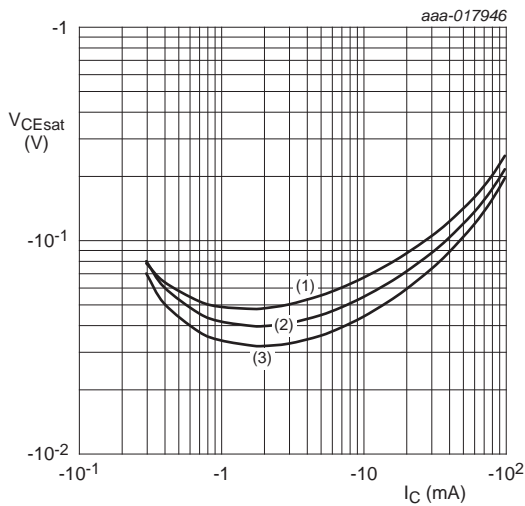
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 23. PDTA144EQA: DC current gain as a function of collector current; typical values**



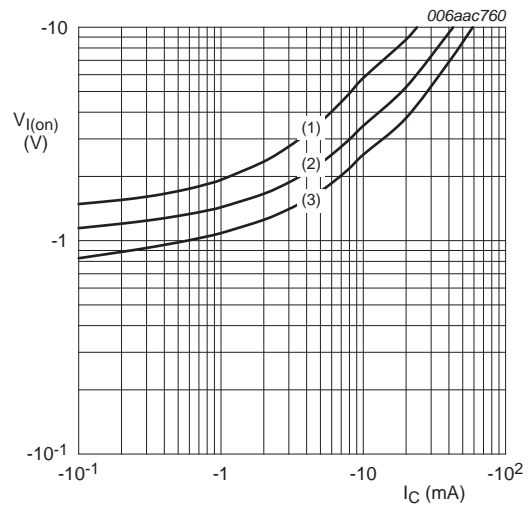
$T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig 24. PDTA144EQA: Collector current as a function of collector-emitter voltage; typical values**



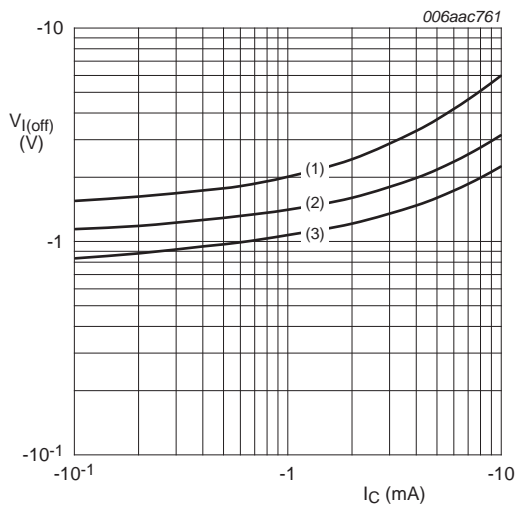
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 25. PDTA144EQA: Collector-emitter saturation voltage as a function of collector current; typical values**



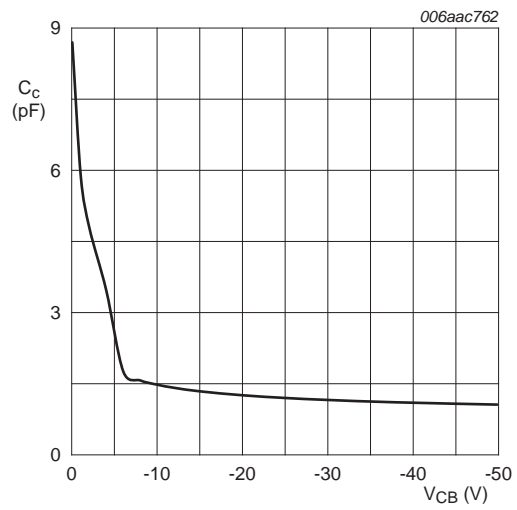
$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

**Fig 26. PDTA144EQA: On-state input voltage as a function of collector current; typical values**



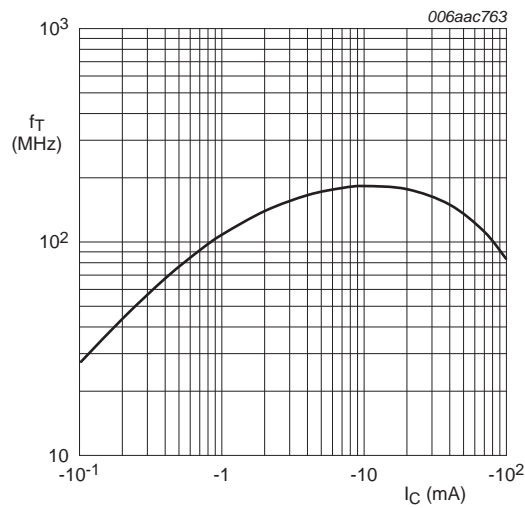
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^\circ\text{C}$

**Fig 27. PDTA144EQA: Off-state input voltage as a function of collector current; typical values**



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

**Fig 28. PDTA144EQA: Collector capacitance as a function of collector-base voltage; typical values**



$V_{CE} = -5 \text{ V}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig 29. 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.

### 8.2 Resistor calculation

- Calculation of bias resistor 1 (R1):

$$R1 = \frac{V(I_{I2}) - V(I_{I1})}{I_{I2} - I_{I1}}$$

- Calculation of bias resistor ratio (R2/R1):

$$\frac{R2}{R1} = \frac{V(I_{I4}) - V(I_{I3})}{R1 \cdot (I_{I4} - I_{I3})} - 1$$

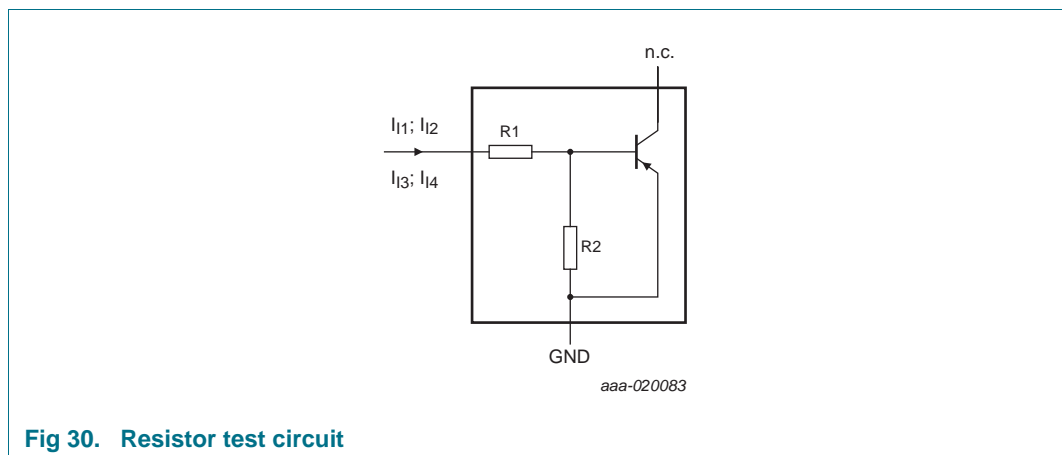


Fig 30. Resistor test circuit

### 8.3 Resistor test conditions

Table 9. Resistor test conditions

Type number	R1	R2	Test conditions			
	(kΩ)	(kΩ)	I <sub>I1</sub>	I <sub>I2</sub>	I <sub>I3</sub>	I <sub>I4</sub>
PDTA143EQA	4.7	4.7	-600 μA	-700 μA	600 μA	700 μA
PDTA114EQA	10	10	-350 μA	-450 μA	350 μA	450 μA
PDTA124EQA	22	22	-150 μA	-230 μA	150 μA	230 μA
PDTA144EQA	47	47	-55 μA	-105 μA	55 μA	105 μA

## 9. Package outline

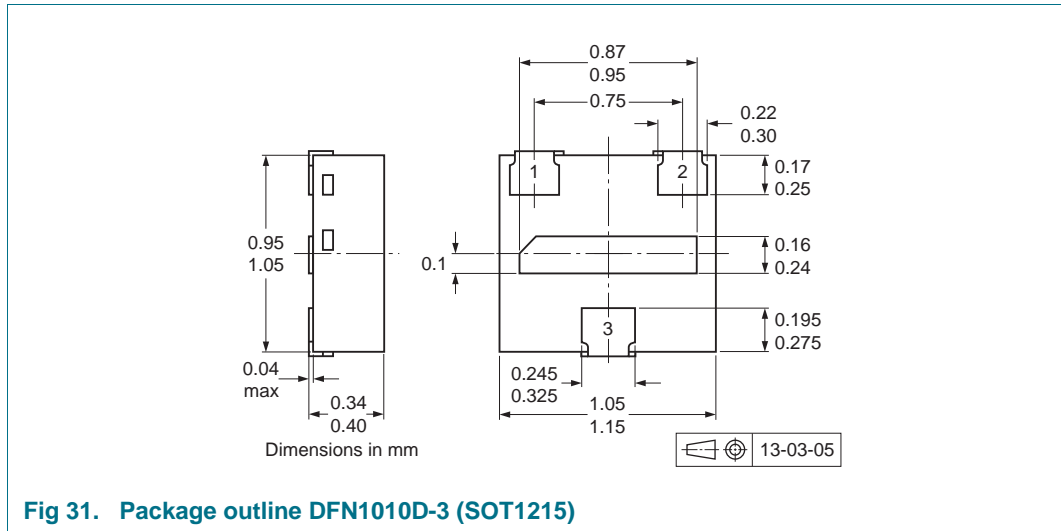
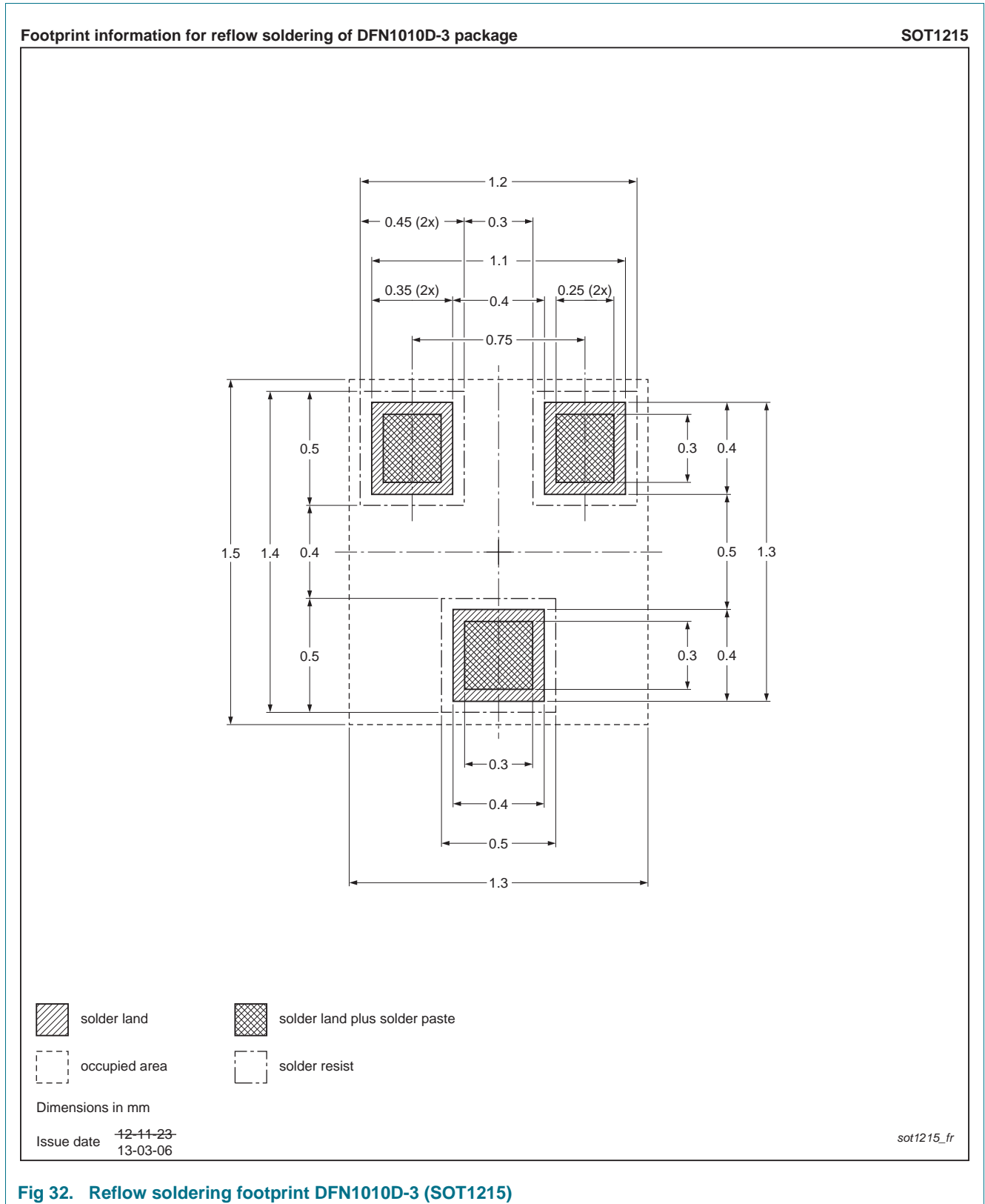


Fig 31. Package outline DFN1010D-3 (SOT1215)



**10. Soldering**



**Fig 32. Reflow soldering footprint DFN1010D-3 (SOT1215)**

## 11. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTA143/114/124/144EQA_SER v.1	20151218	Product data sheet	-	-

## 12. Legal information

### 12.1 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.
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[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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## 14. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>3</b>
4.1	Binary marking code description . . . . .	3
<b>5</b>	<b>Limiting values</b> . . . . .	<b>3</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>5</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>6</b>
<b>8</b>	<b>Test information</b> . . . . .	<b>15</b>
8.1	Quality information . . . . .	15
8.2	Resistor calculation . . . . .	15
8.3	Resistor test conditions . . . . .	15
<b>9</b>	<b>Package outline</b> . . . . .	<b>16</b>
<b>10</b>	<b>Soldering</b> . . . . .	<b>17</b>
<b>11</b>	<b>Revision history</b> . . . . .	<b>18</b>
<b>12</b>	<b>Legal information</b> . . . . .	<b>19</b>
12.1	Data sheet status . . . . .	19
12.2	Definitions . . . . .	19
12.3	Disclaimers . . . . .	19
12.4	Trademarks . . . . .	20
<b>13</b>	<b>Contact information</b> . . . . .	<b>20</b>
<b>14</b>	<b>Contents</b> . . . . .	<b>21</b>



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