

PDTA143/114/124/144EQA 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	Package NXP	NPN complement
PDTA143EQA	4.7 k Ω	4.7 k Ω	DFN1010D-3 (SOT1215)	PDTC143EQA
PDTA114EQA	10 k Ω	10 k Ω		PDTC114EQA
PDTA124EQA	22 k Ω	22 k Ω		PDTC124EQA
PDTA144EQA	47 k Ω	47 k Ω		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

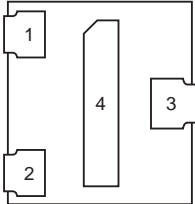
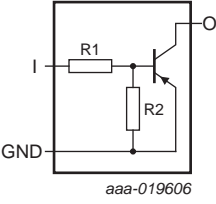
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	-50	V
I _O	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>	 <p>aaa-019606</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

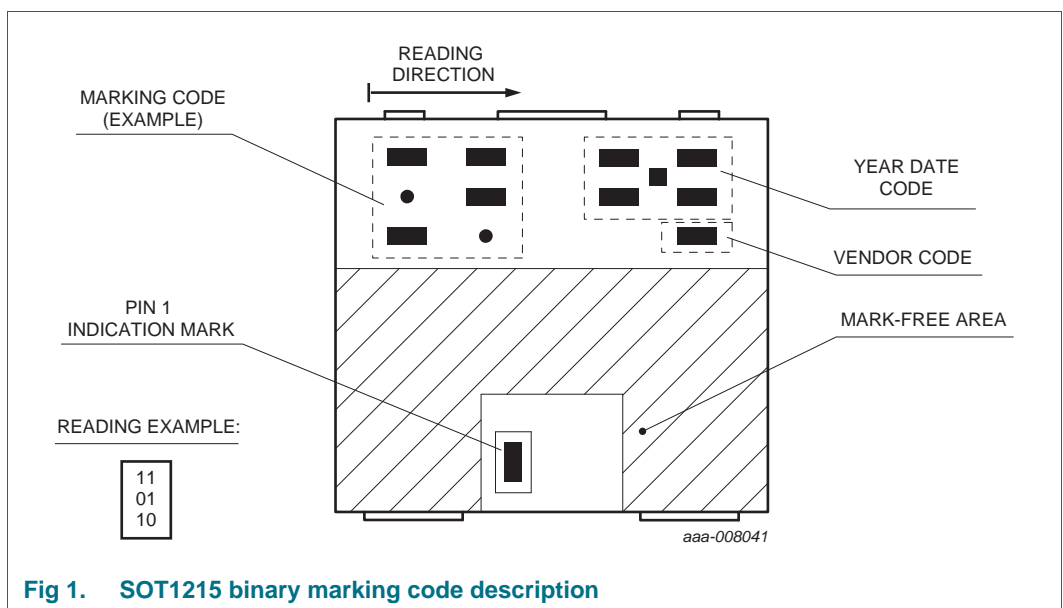


Fig 1. SOT1215 binary marking code description

5. Limiting values

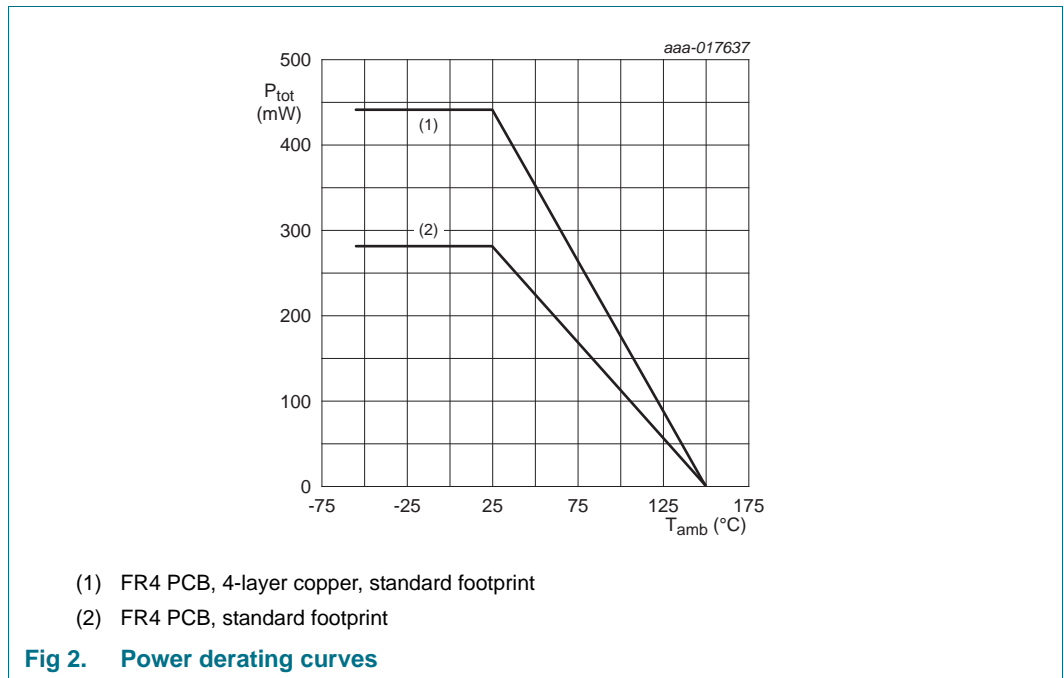
Table 6. Limiting values

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} ≤ 25 °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.

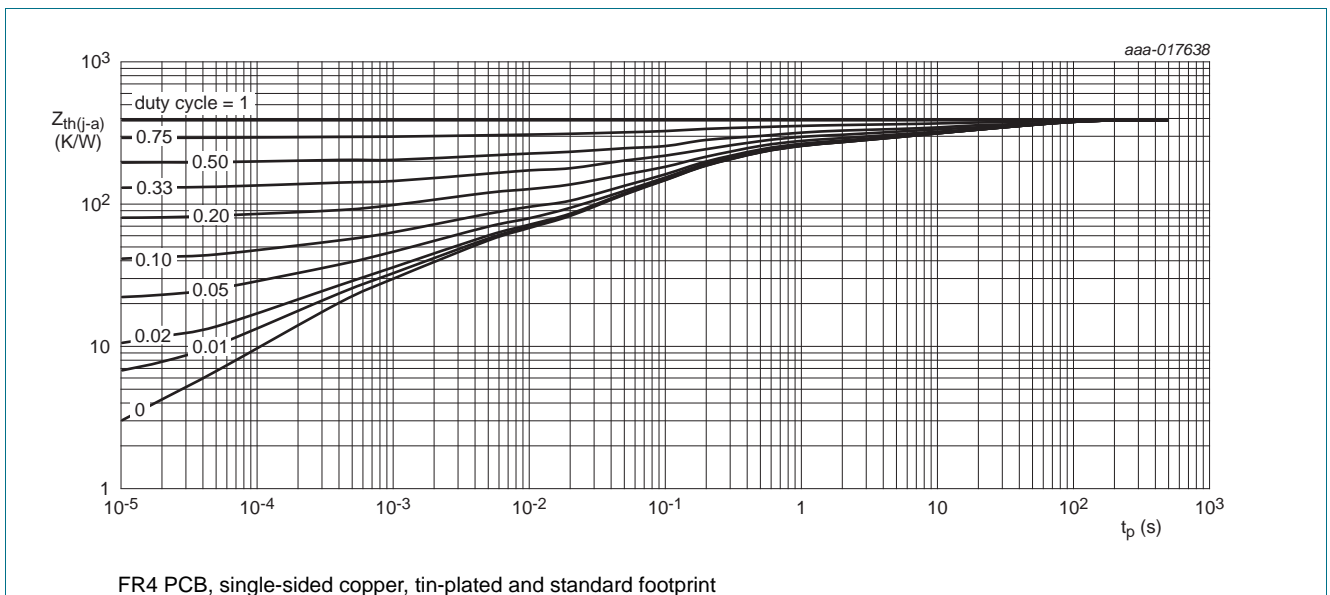


Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

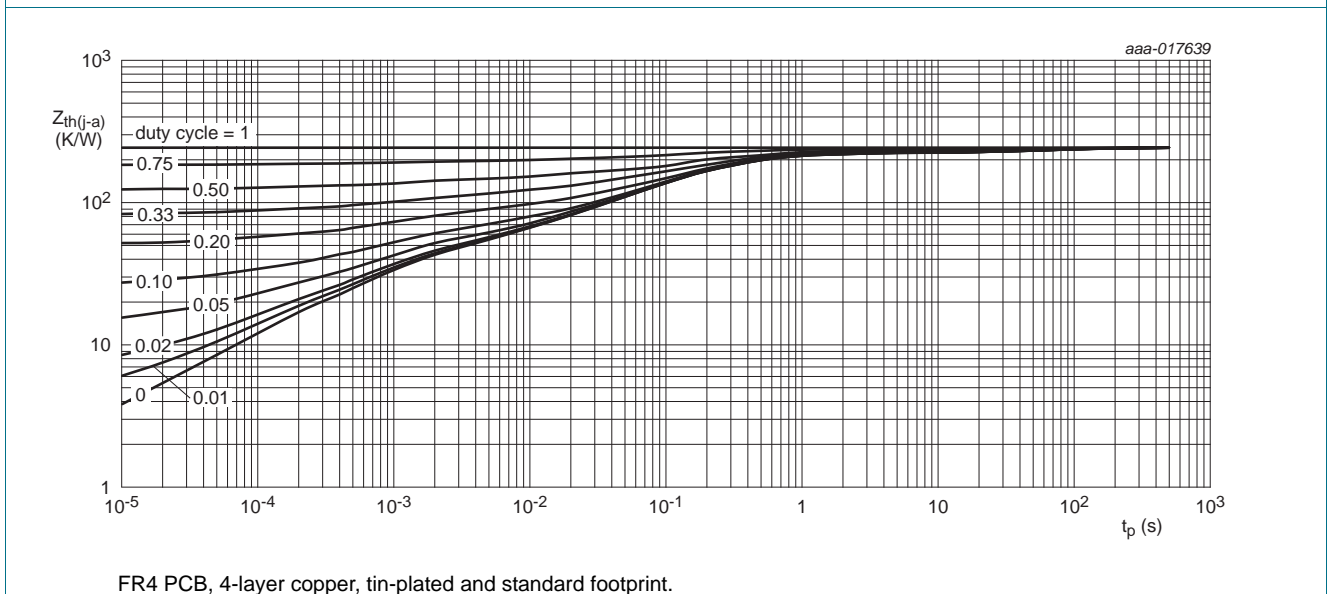


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

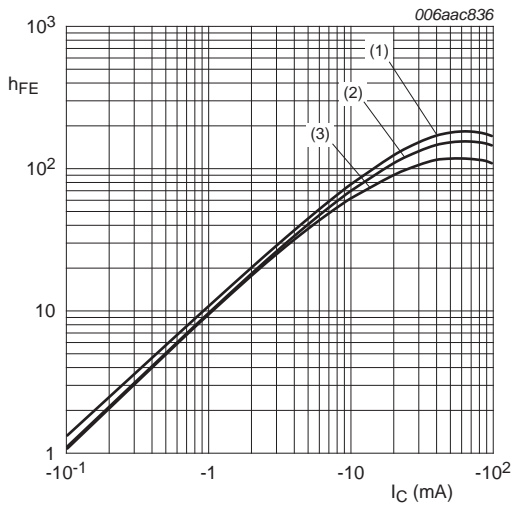
7. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = -50 V; I _E = 0 A	-	-	-100	nA
I _{CEO}	collector-emitter cut off current	V _{CE} = -30; I _B = 0 A;	-	-	-1	μA
		V _{CE} = -30; I _B = 0 A; T _j = 150 °C	-	-	-5	μA
I _{EBO}	emitter-base cut-off current					
	PDTA143EQA	V _{EB} = -5 V; I _C = 0 A	-	-	-900	μA
	PDTA114EQA		-	-	-400	μA
	PDTA124EQA		-	-	-180	μA
PDTA144EQA	-		-	-90	μA	
h _{FE}	DC current gain					
	PDTA143EQA	V _{CE} = -5 V; I _C = -10 mA	30	-	-	
	PDTA114EQA	V _{CE} = -5 V; I _C = -5 mA	30	-	-	
	PDTA124EQA	V _{CE} = -5 V; I _C = -5 mA	60	-	-	
	PDTA144EQA	V _{CE} = -5 V; I _C = -5 mA	80	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -10 mA; I _B = -0.5 mA	-	-	-150	mV
V _{I(off)}	off-state input voltage					
	PDTA143EQA	V _{CE} = -5 V; I _C = -100 μA	-	-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 V; I _C = -20 mA	-2.5	-1.9	-	V
	PDTA114EQA	V _{CE} = -0.3 V; I _C = -10 mA	-2.5	-1.8	-	V
	PDTA124EQA	V _{CE} = -0.3 V; I _C = -5 mA	-2.5	-1.7	-	V
	PDTA144EQA	V _{CE} = -0.3 V; I _C = -2 mA	-3	-1.6	-	V
R1	bias resistor 1 (input)		[1]			
	PDTA143EQA		3.3	4.7	6.1	kΩ
	PDTA114EQA		7	10	13	kΩ
	PDTA124EQA		15.4	22	28.6	kΩ
	PDTA144EQA		33	47	61	kΩ
R2/R1	bias resistor ratio	[1]	0.8	1	1.2	
C _c	collector capacitance	V _{CB} = -10 V; I _E = I _e = 0 A; f = 1 MHz	-	-	3	pF
f _T	transition frequency	V _{CE} = -5 V; I _C = -10 mA; f = 100 MHz	[2]	180	-	MHz

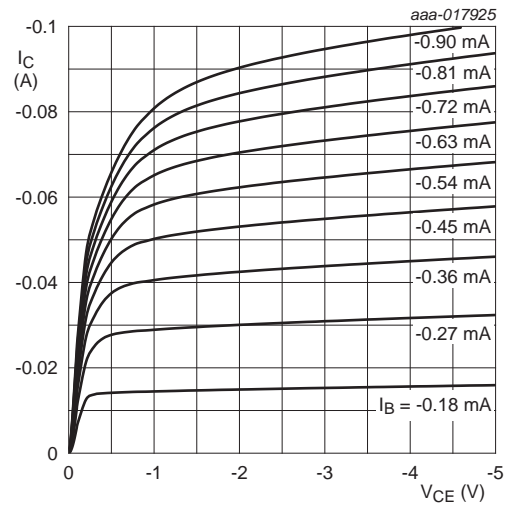
[1] See section test information for resistor calculation and test conditions.

[2] Characteristics of built-in transistor.



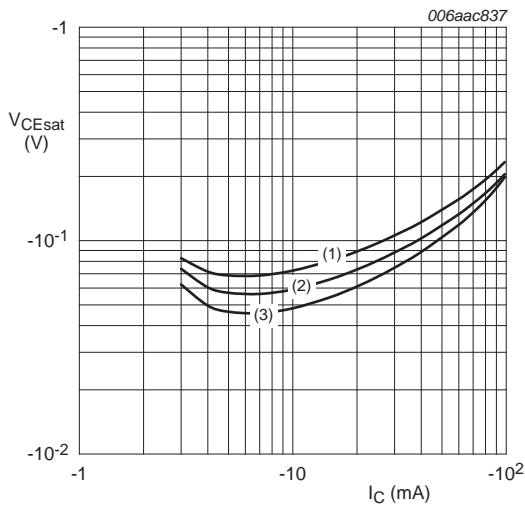
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



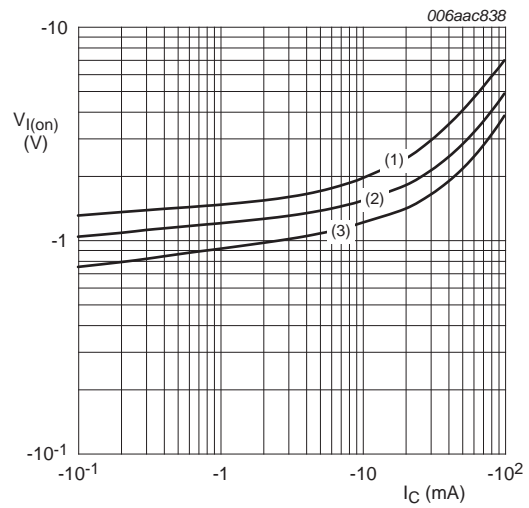
$T_{amb} = 25 \text{ }^\circ\text{C}$

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



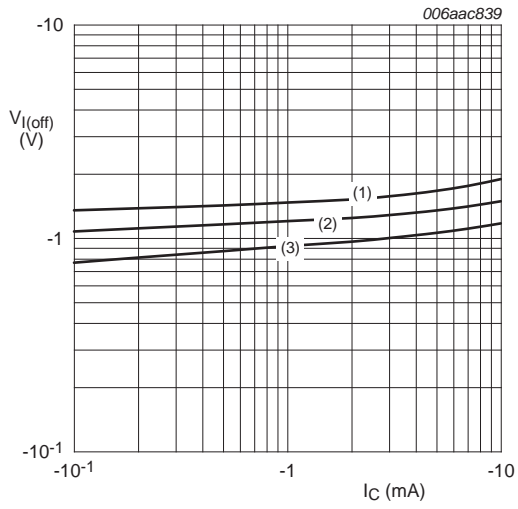
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



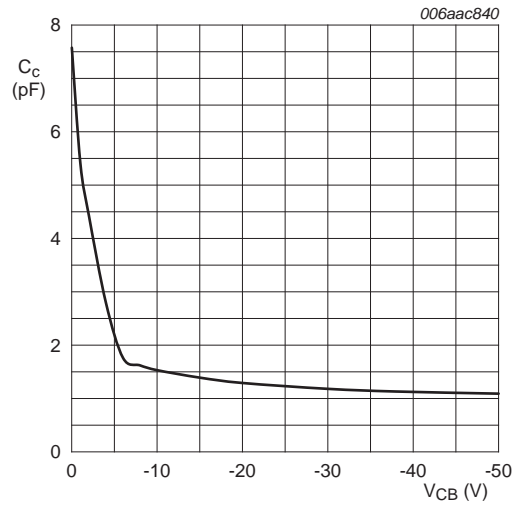
$V_{CE} = -0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



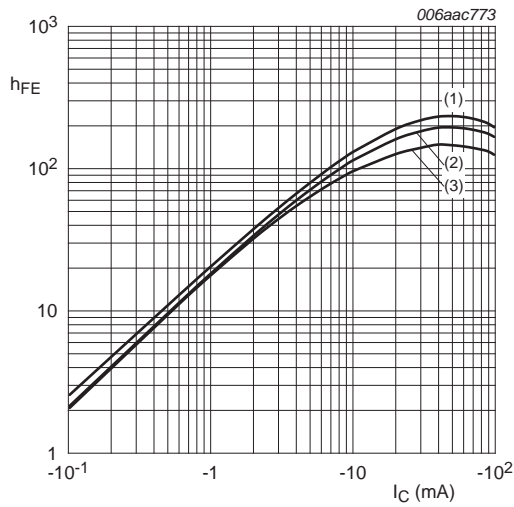
- $V_{CE} = -5\text{ V}$
- (1) $T_{amb} = -40\text{ °C}$
 - (2) $T_{amb} = 25\text{ °C}$
 - (3) $T_{amb} = 100\text{ °C}$

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



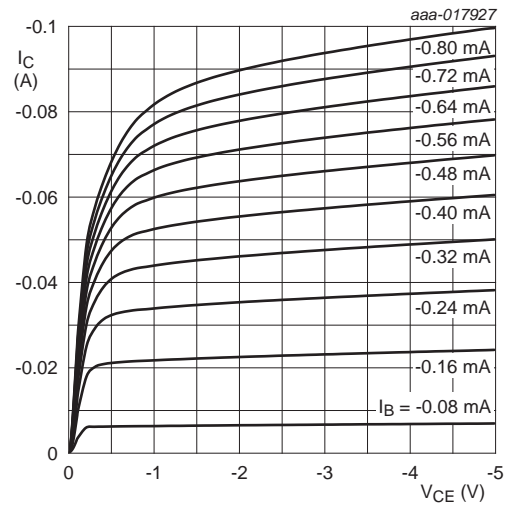
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



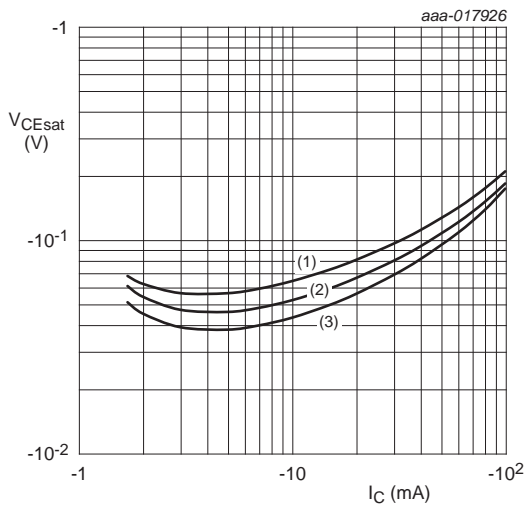
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



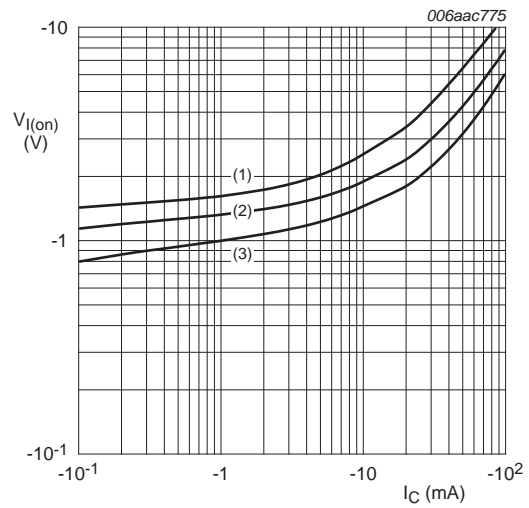
$T_{amb} = 25\text{ °C}$

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



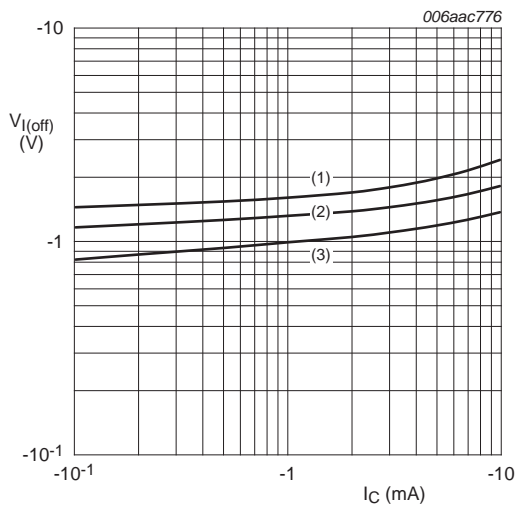
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



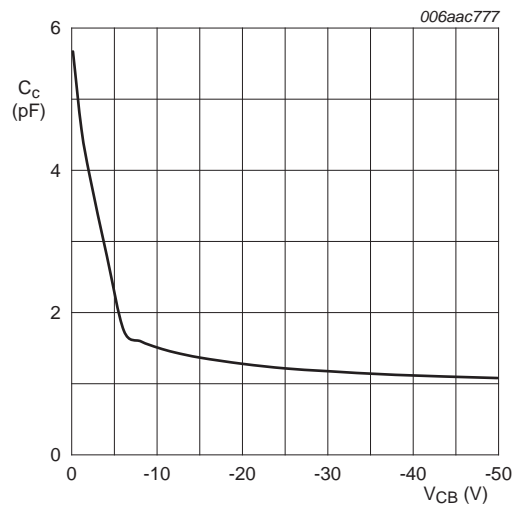
$V_{CE} = -0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



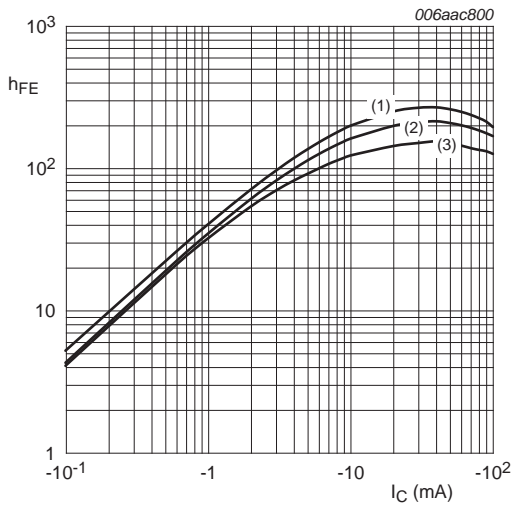
- $V_{CE} = -5$ V
- (1) $T_{amb} = -40$ °C
 - (2) $T_{amb} = 25$ °C
 - (3) $T_{amb} = 100$ °C

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



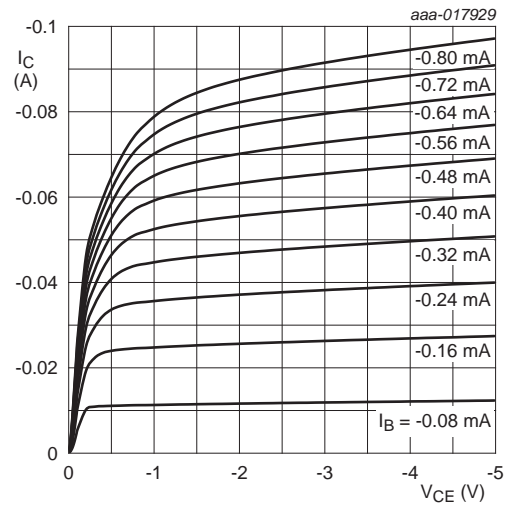
$f = 1$ MHz; $T_{amb} = 25$ °C

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



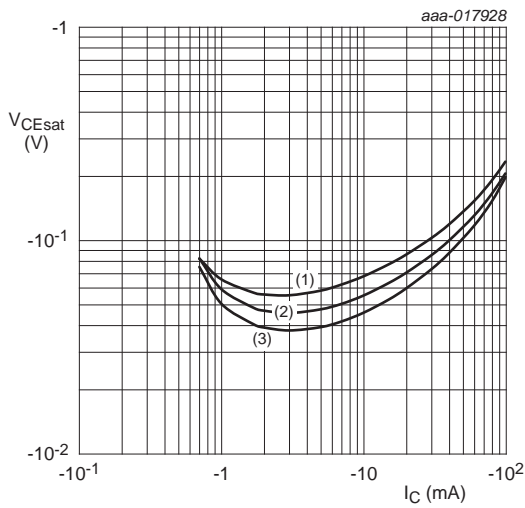
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



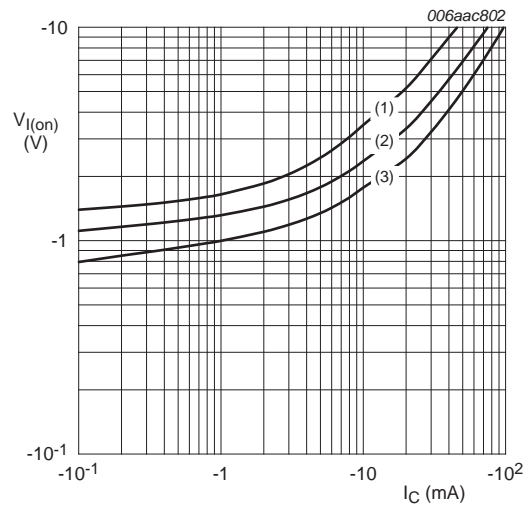
$T_{amb} = 25 \text{ }^\circ\text{C}$

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



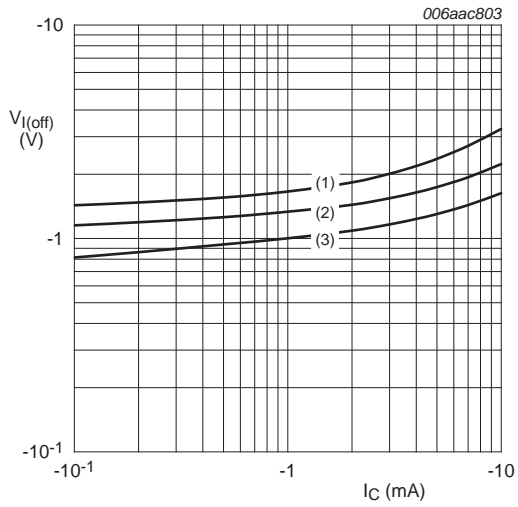
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



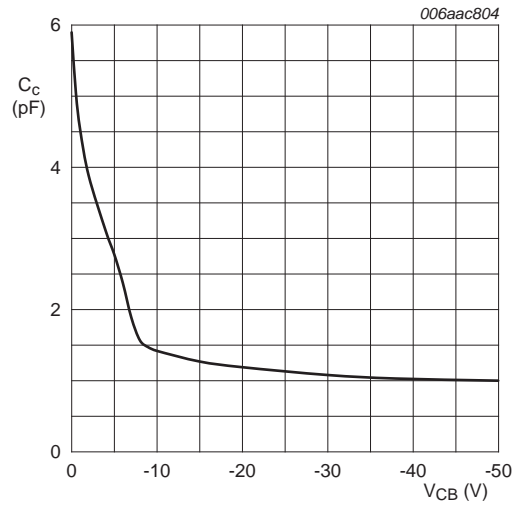
$V_{CE} = -0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



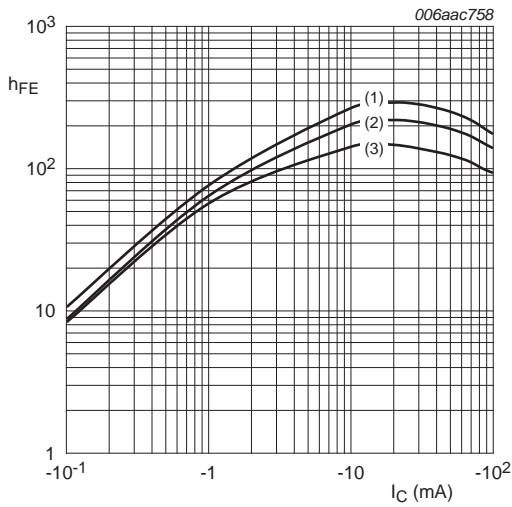
- $V_{CE} = -5\text{ V}$
- (1) $T_{amb} = -40\text{ °C}$
 - (2) $T_{amb} = 25\text{ °C}$
 - (3) $T_{amb} = 100\text{ °C}$

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



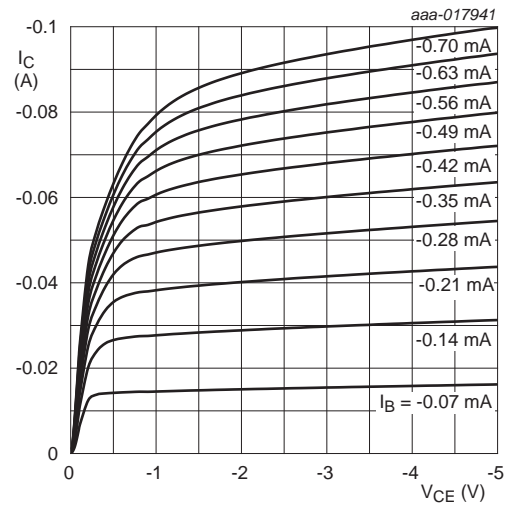
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



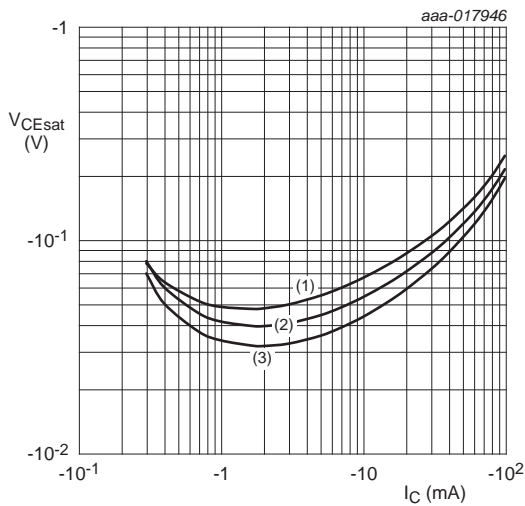
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



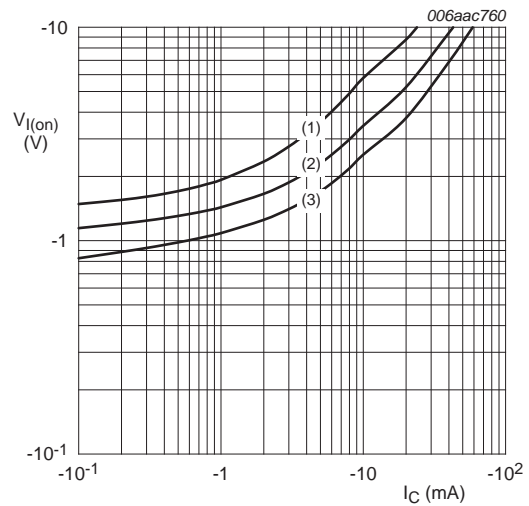
$T_{amb} = 25 \text{ }^\circ\text{C}$

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



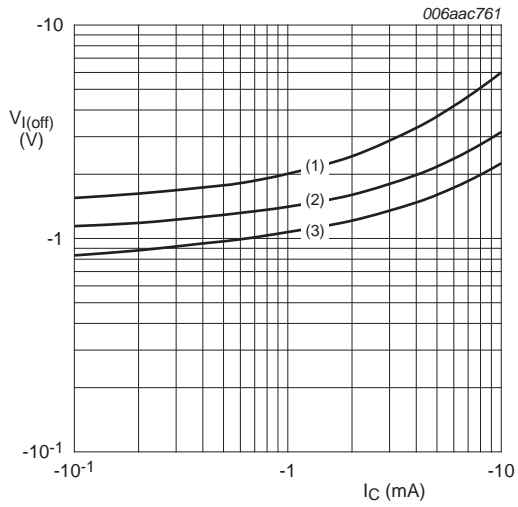
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



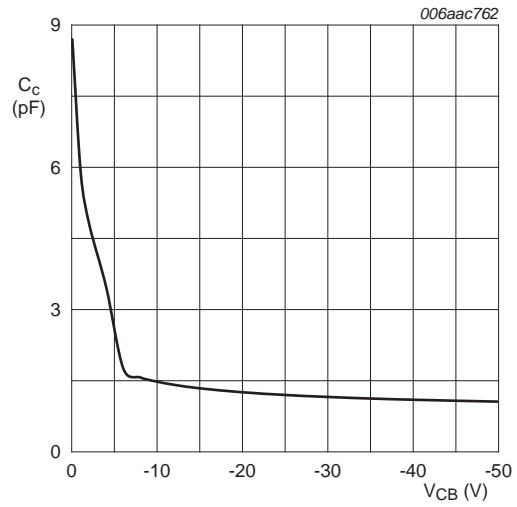
$V_{CE} = -0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



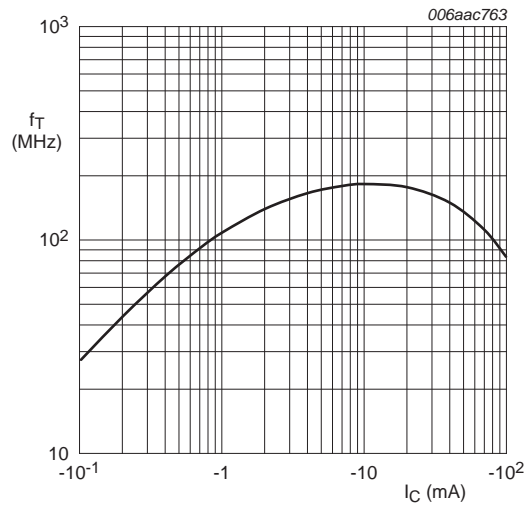
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



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

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



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

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):

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

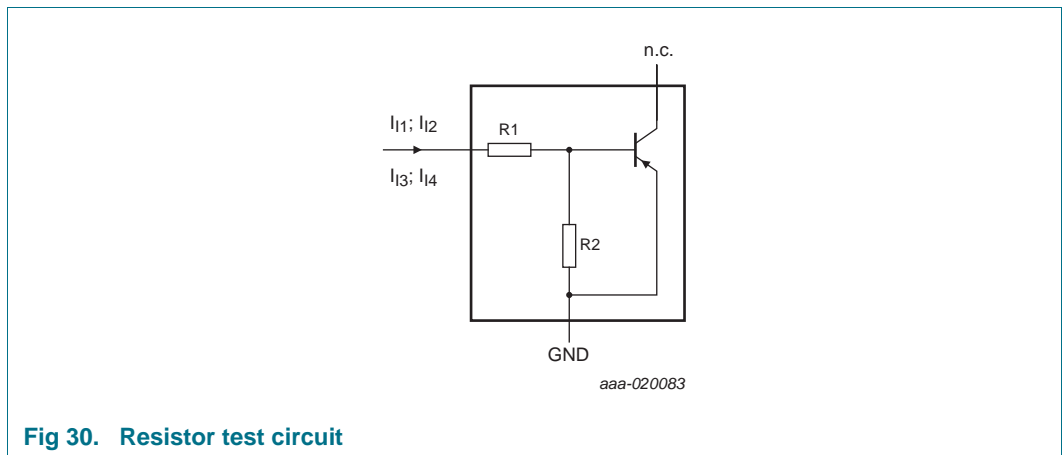


Fig 30. Resistor test circuit

8.3 Resistor test conditions

Table 9. Resistor test conditions

Type number	R1	R2	Test conditions			
	(kΩ)	(kΩ)	I _{I1}	I _{I2}	I _{I3}	I _{I4}
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

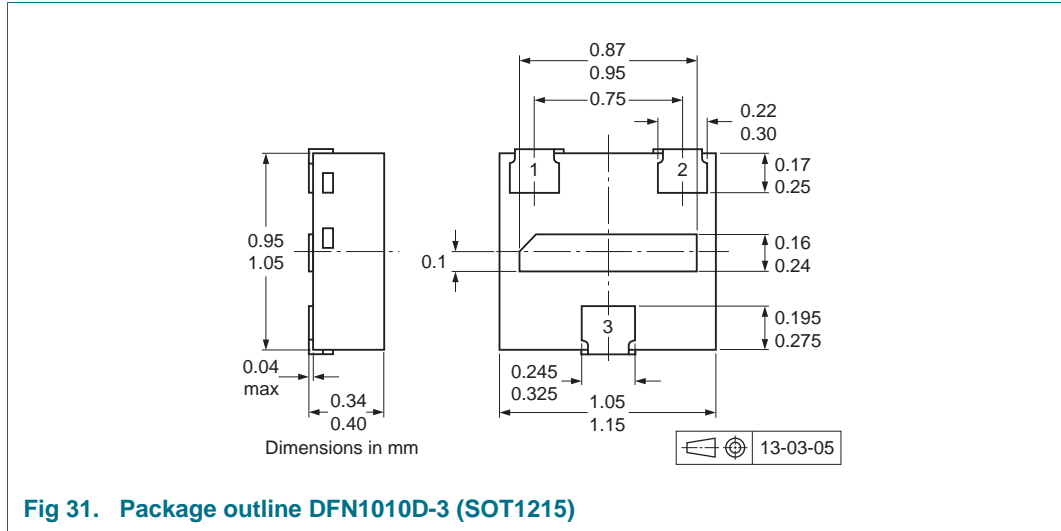


Fig 31. Package outline DFN1010D-3 (SOT1215)

10. Soldering

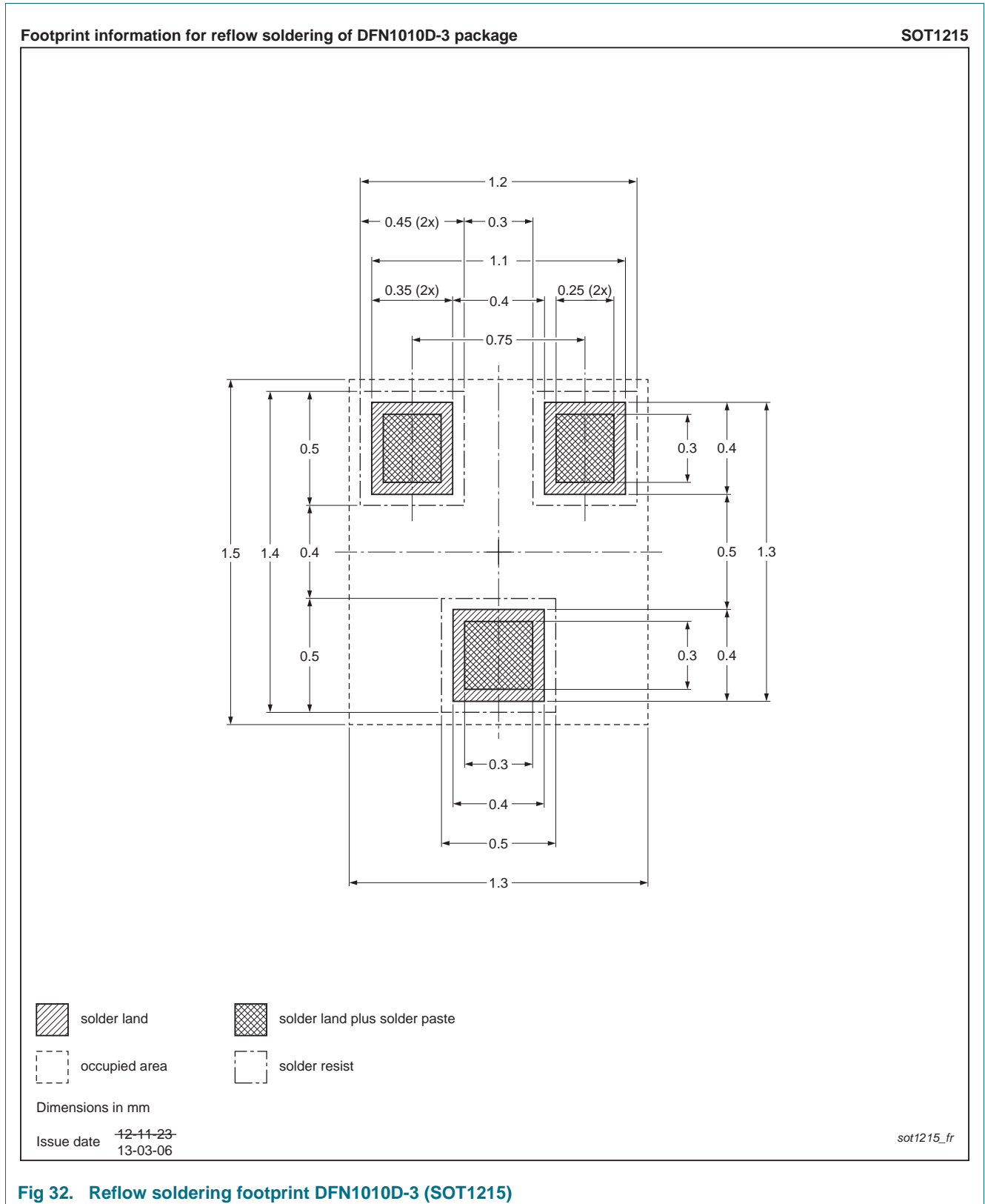


Fig 32. Reflow soldering footprint DFN1010D-3 (SOT1215)

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 ^{[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 URL <http://www.nxp.com>.

12.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

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