



PDTC143/114/124/144EQB series

50 V, 100 mA NPN resistor-equipped transistors

Rev. 1 — 1 October 2021

Product data sheet

1. General description

100 mA NPN Resistor-Equipped Transistor (RET) family in an ultra small DFN1110D-3 (SOT8015) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

Type number	R1	R2	Package		PNP complement:
	k Ω	k Ω	Nexperia	JEDEC	
PDTC143EQB	4.7	4.7	SOT8015	MO-340BA	PDTA143EQB
PDTC114EQB	10	10			PDTA114EQB
PDTC124EQB	22	22			PDTA124EQB
PDTC144EQB	47	47			PDTA144EQB

2. Features and benefits

- 100 mA output current capability
- Built-in resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- Low package height of 0.5 mm
- Suitable for Automatic Optical Inspection (AOI) of solder joint

3. Applications

- Digital applications
- Cost saving alternative for BC847 series in digital applications
- Controlling IC inputs
- Switching loads

4. Quick reference data

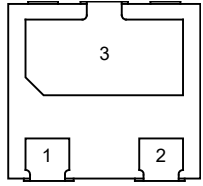
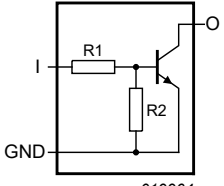
Table 2. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	50	V
I_O	output current		-	-	100	mA

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I	input (base)	 Transparent top view	 aaa-019964
2	GND	GND (emitter)		
3	O	output (collector)		

6. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
PDTC143EQB	DFN1110D-3	plastic leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.65 mm pitch; body: 1.1 x 1.0 x 0.48 mm	SOT8015
PDTC114EQB			
PDTC124EQB			
PDTC144EQB			

7. Marking

Table 5. Marking

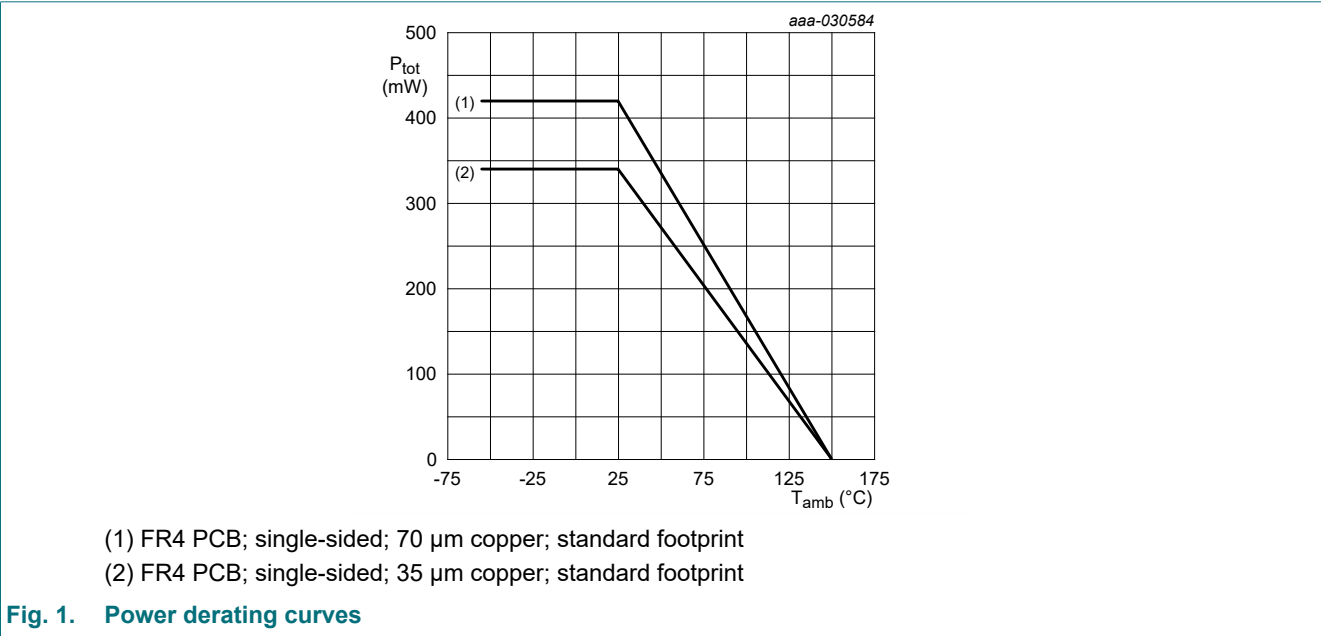
Type number	Marking code
PDTC143EQB	E6
PDTC114EQB	D9
PDTC124EQB	E4
PDTC144EQB	E9

8. Limiting values

Table 6. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).
T_{amb} = 25 °C unless otherwise specified.

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				
	PDTC143EQB		-10	+30	V
	PDTC114EQB		-10	+40	V
	PDTC124EQB		-10	+40	V
	PDTC144EQB		-10	+40	V
I _O	output current		-	100	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1] -	340	mW
			[2] -	420	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; 35 µm copper; tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB; single-sided; 70 µm copper; tin-plated and standard footprint.



9. Thermal characteristics

Table 7. Thermal characteristics
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	368	K/W
			[2]	-	-	298	K/W

- [1] Device mounted on an FR4 PCB; single-sided; 35 μm copper; tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB; single-sided; 70 μm copper; tin-plated and standard footprint.

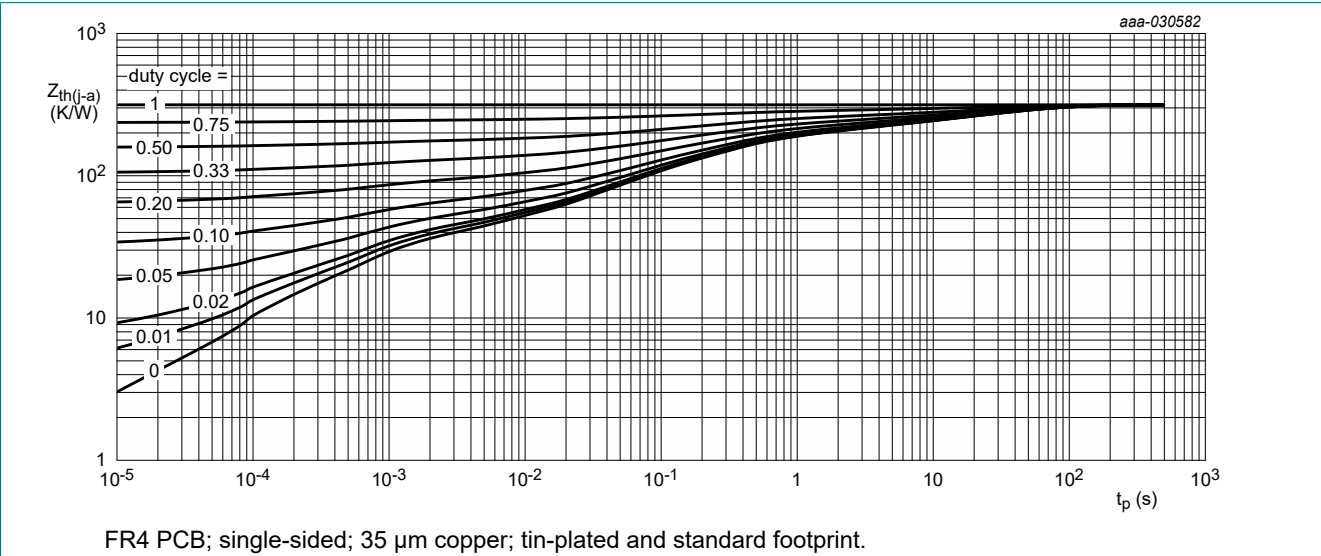


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

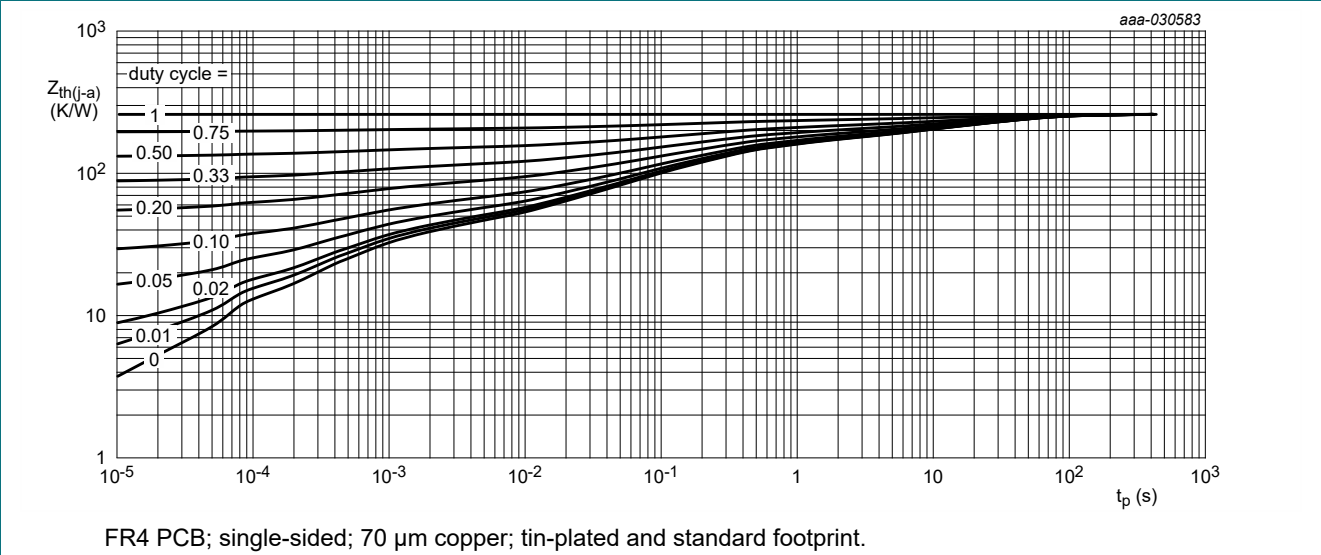


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{(BR)CBO}	collector-base breakdown voltage	I _C = 100 μA; I _E = 0 A		50	-	-	V
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = 2 mA; I _B = 0 A		50	-	-	V
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 V; I _B = 0 A		-	-	100	nA
		V _{CE} = 30 V; I _B = 0 A; T _j = 150 °C		-	-	5	μA
I _{EBO}	emitter-base cut-off current						
	PDTC143EQB	V _{EB} = 5 V; I _C = 0 A		-	-	900	μA
	PDTC114EQB			-	-	400	μA
	PDTC124EQB			-	-	180	μA
	PDTC144EQB					90	μA
h _{FE}	DC current gain						
	PDTC143EQB	V _{CE} = 5 V; I _C = 10 mA		30	-	-	
	PDTC114EQB	V _{CE} = 5 V; I _C = 5 mA		30	-	-	
	PDTC124EQB			60	-	-	
	PDTC144EQB			80	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 10 mA; I _B = 0.5 mA		-	-	100	mV
V _{I(off)}	off-state input voltage						
	PDTC143EQB	V _{CE} = 5 V ; I _C = 100 μA		-	1.1	0.5	V
	PDTC114EQB			-	1.1	0.8	V
	PDTC124EQB			-	1.1	0.8	V
	PDTC144EQB			-	1.2	0.8	V
V _{I(on)}	on-state input voltage						
	PDTC143EQB	V _{CE} = 0.3 V ; I _C = 20 mA		2.5	1.9	-	V
	PDTC114EQB	V _{CE} = 0.3 V ; I _C = 10 mA		2.5	1.8	-	V
	PDTC124EQB	V _{CE} = 0.3 V ; I _C = 5 mA		2.5	1.7	-	V
	PDTC144EQB	V _{CE} = 0.3 V ; I _C = 2 mA		3.0	1.6	-	V
R1	bias resistor 1 (input)						
	PDTC143EQB		[1]	3.3	4.7	6.1	kΩ
	PDTC114EQB			7	10	13	kΩ
	PDTC124EQB			15.4	22	28.6	kΩ
	PDTC144EQB			33	47	61	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2		
f _T	transition frequency	V _{CE} = 5 V; I _C = 10 mA; f = 100 MHz	[2]	-	230	-	MHz
C _c	collector capacitance	V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz		-	-	2.5	pF

[1] See "Section 11: Test information" for resistor calculation and test conditions

[2] Characteristics of built-in transistor

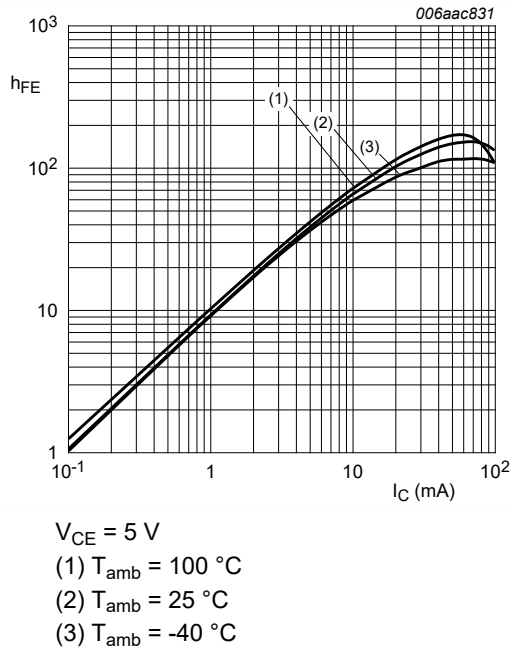


Fig. 4. PDTC143EQB: DC current gain as a function of collector current; typical values

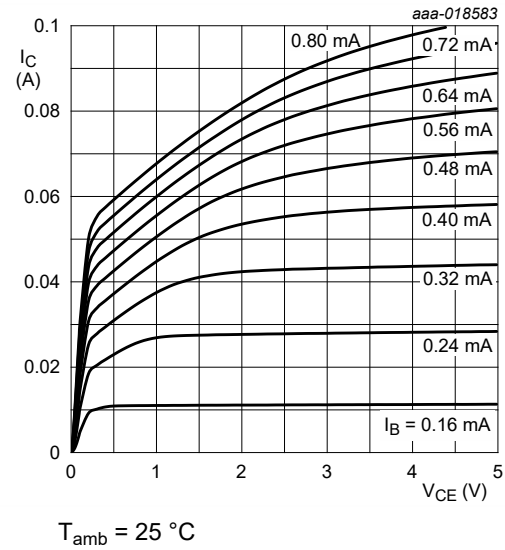


Fig. 5. PDTC143EQB: Collector current as a function of collector-emitter voltage; typical values

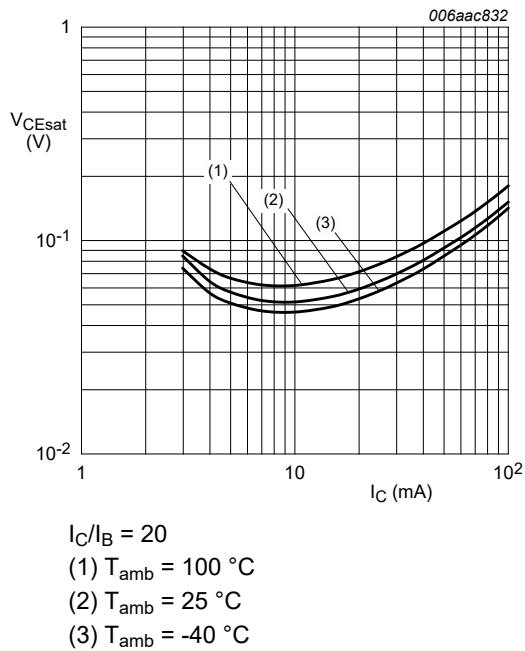


Fig. 6. PDTC143EQB: Collector-emitter saturation voltage as a function of collector current; typical values

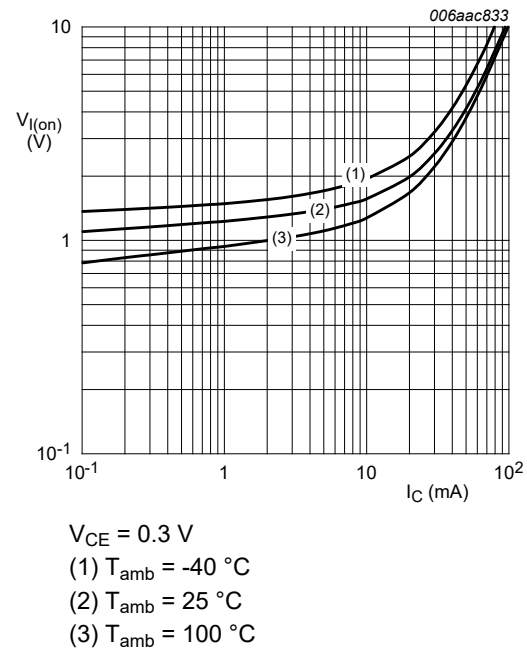


Fig. 7. PDTC143EQB: On-state input voltage as a function of collector current; typical values

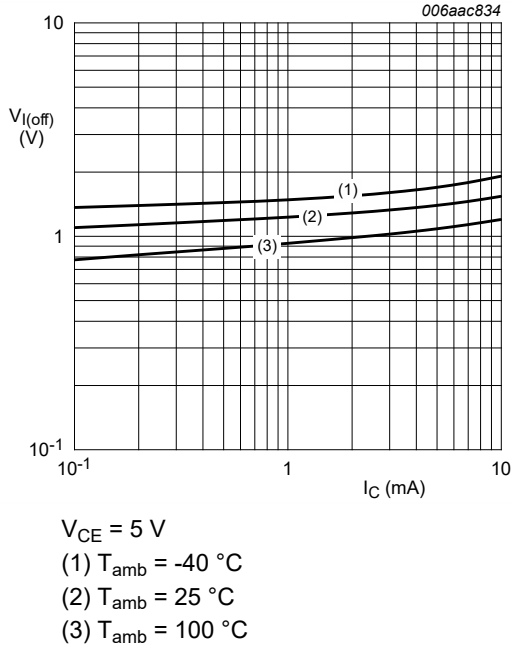


Fig. 8. PDTC143EQB: Off-state input voltage as a function of collector current; typical values

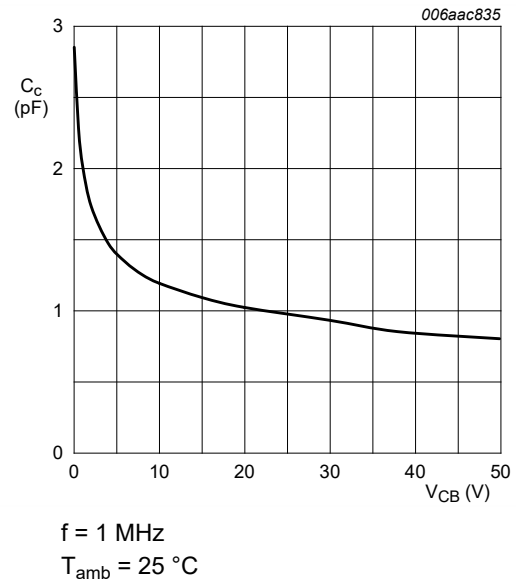


Fig. 9. PDTC143EQB: Collector capacitance as a function of collector-base voltage; typical values

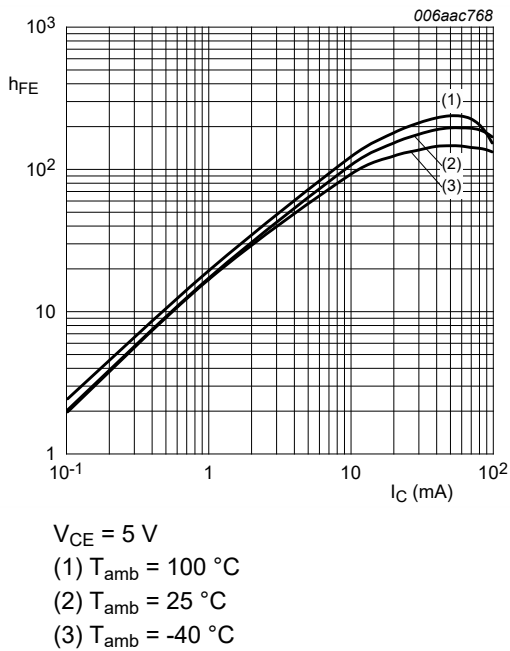


Fig. 10. PDTC114EQB: DC current gain as a function of collector current; typical values

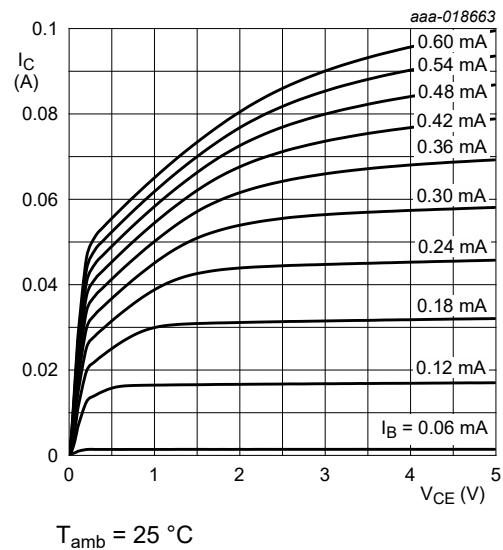


Fig. 11. PDTC114EQB: Collector current as a function of collector-emitter voltage; typical values

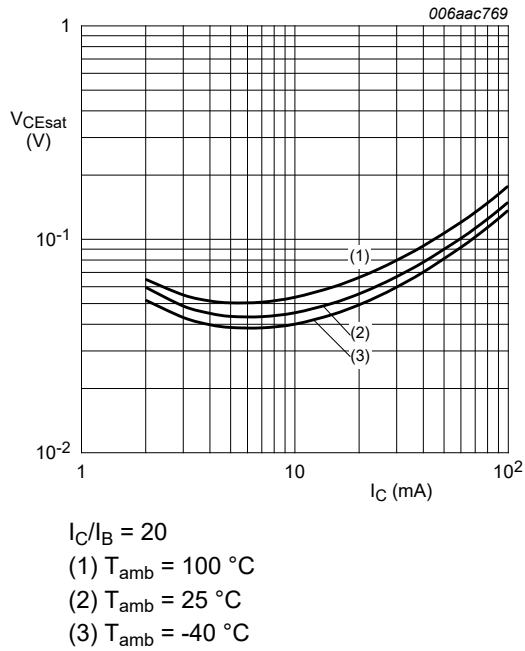


Fig. 12. PDTC114EQB: Collector-emitter saturation voltage as a function of collector current; typical values

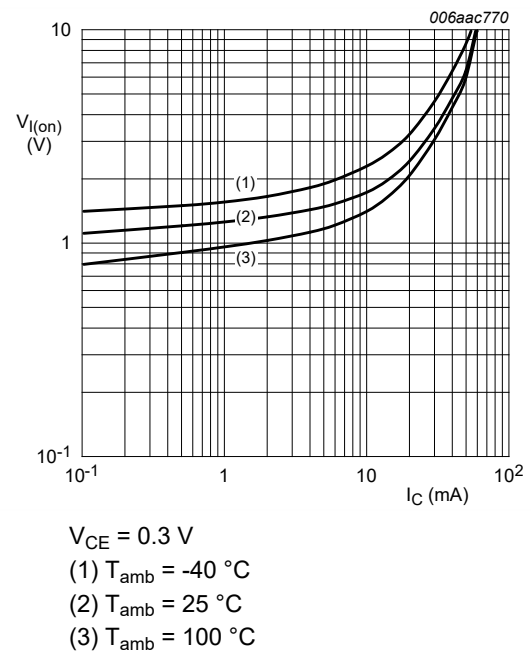


Fig. 13. PDTC114EQB: On-state input voltage as a function of collector current; typical values

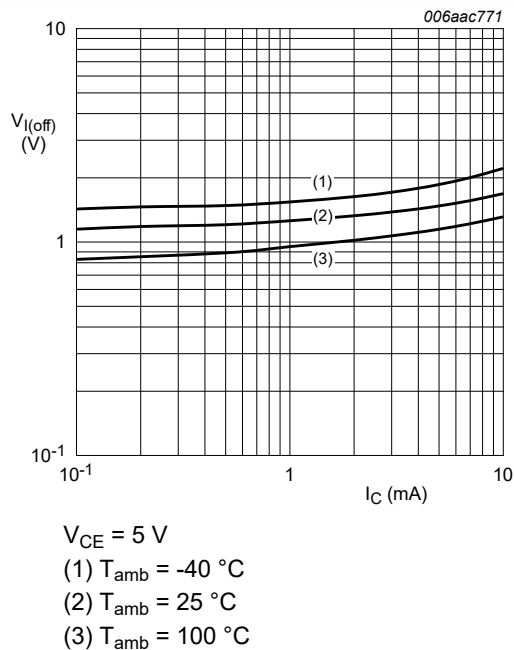


Fig. 14. PDTC114EQB: Off-state input voltage as a function of collector current; typical values

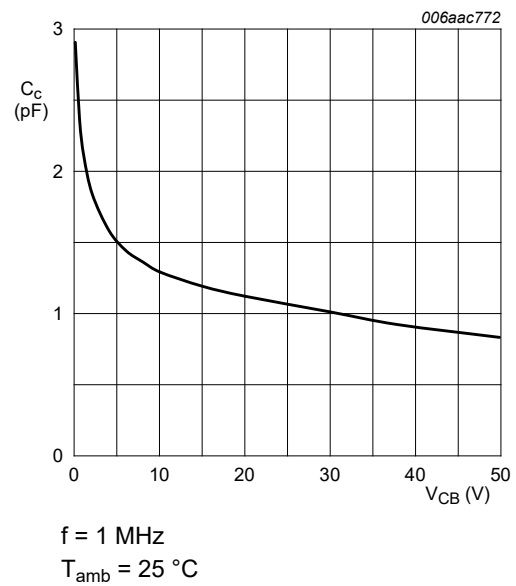


Fig. 15. PDTC114EQB: Collector capacitance as a function of collector-base voltage; typical values

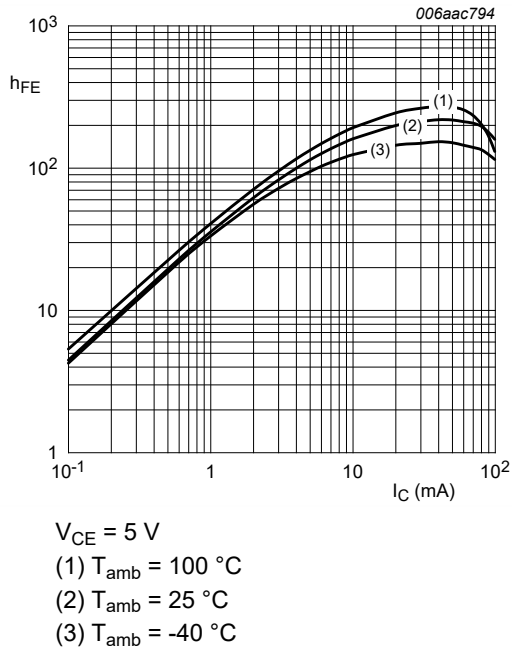


Fig. 16. PDTC124EQB: DC current gain as a function of collector current; typical values

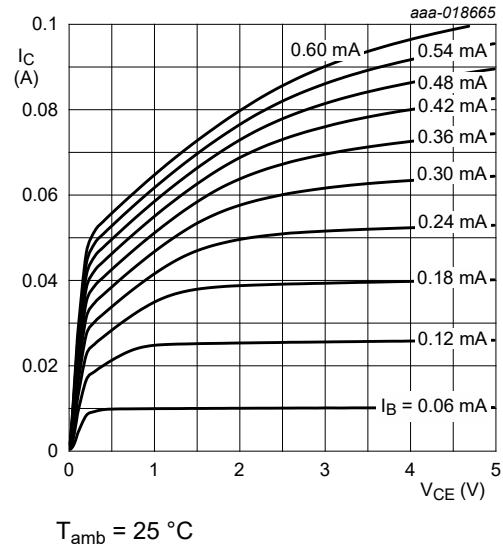


Fig. 17. PDTC124EQB: Collector current as a function of collector-emitter voltage; typical values

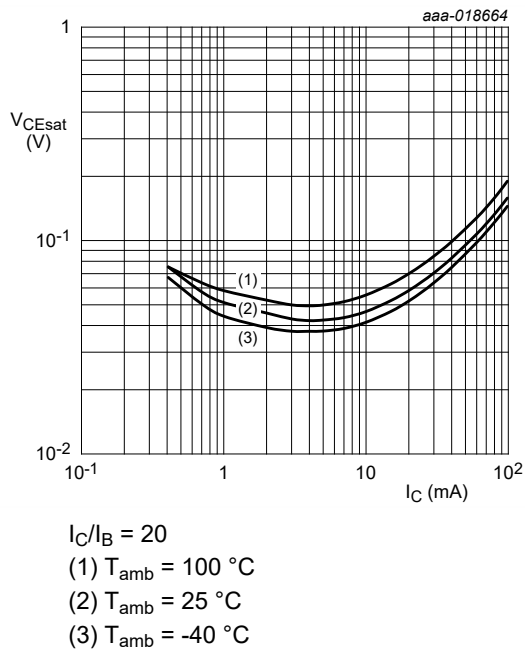


Fig. 18. PDTC124EQB: Collector-emitter saturation voltage as a function of collector current; typical values

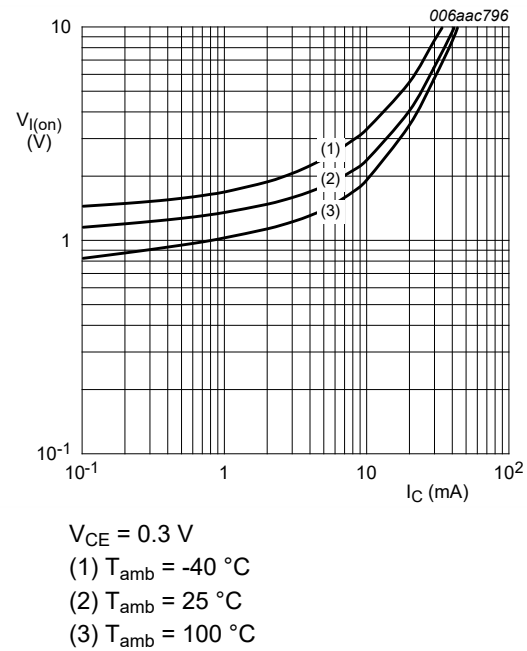


Fig. 19. PDTC124EQB: On-state input voltage as a function of collector current; typical values

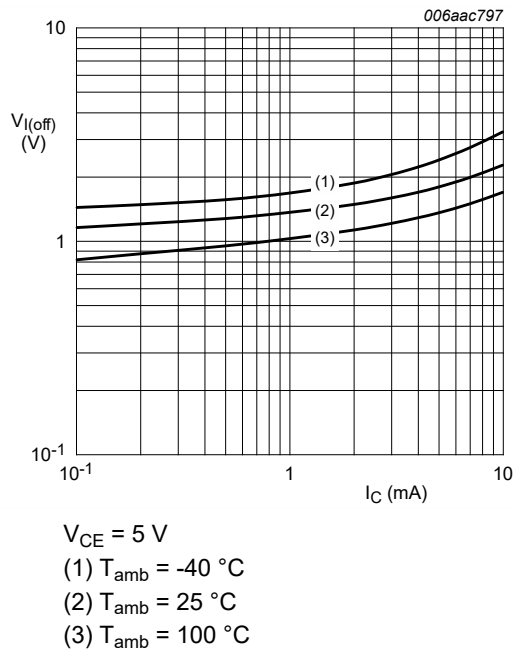


Fig. 20. PDTC124EQB: Off-state input voltage as a function of collector current; typical values

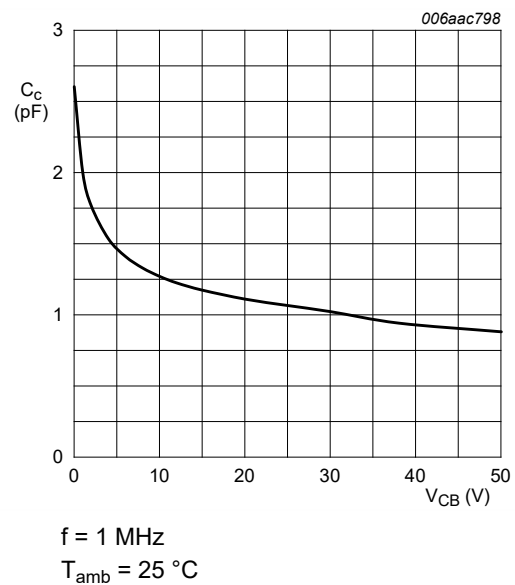


Fig. 21. PDTC124EQB: Collector capacitance as a function of collector-base voltage; typical values

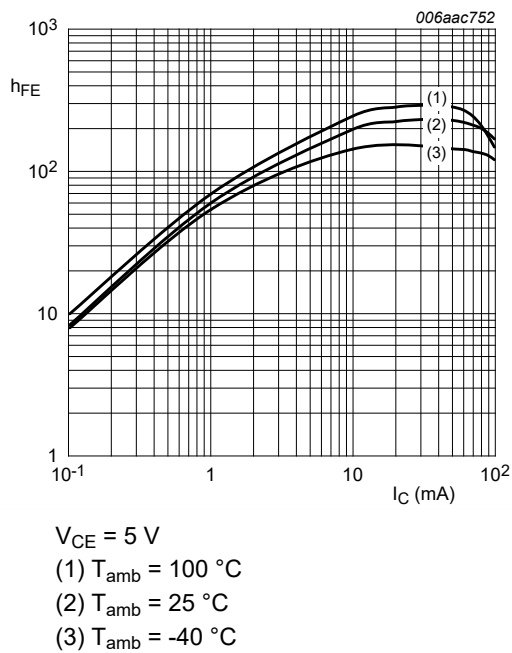


Fig. 22. PDTC144EQB: DC current gain as a function of collector current; typical values

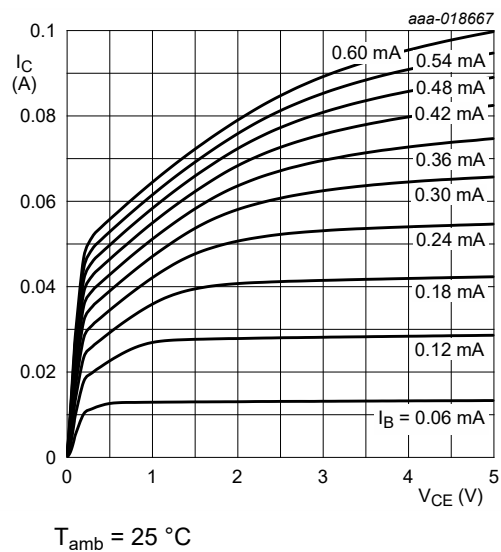


Fig. 23. PDTC144EQB: Collector current as a function of collector-emitter voltage; typical values

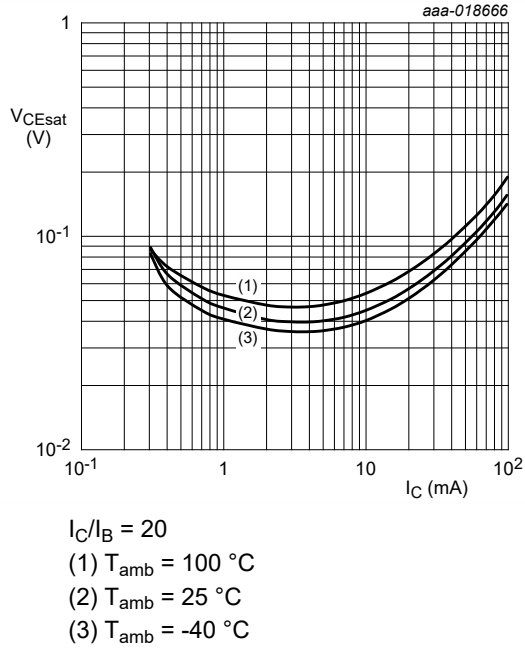


Fig. 24. PDTC144EQB: Collector-emitter saturation voltage as a function of collector current; typical values

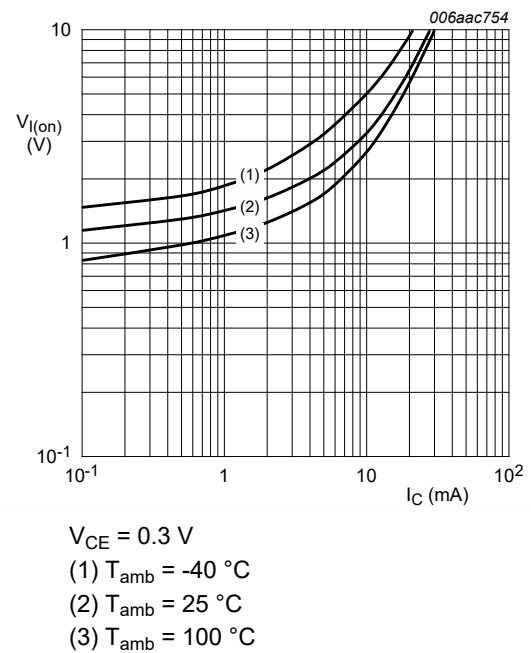


Fig. 25. PDTC144EQB: On-state input voltage as a function of collector current; typical values

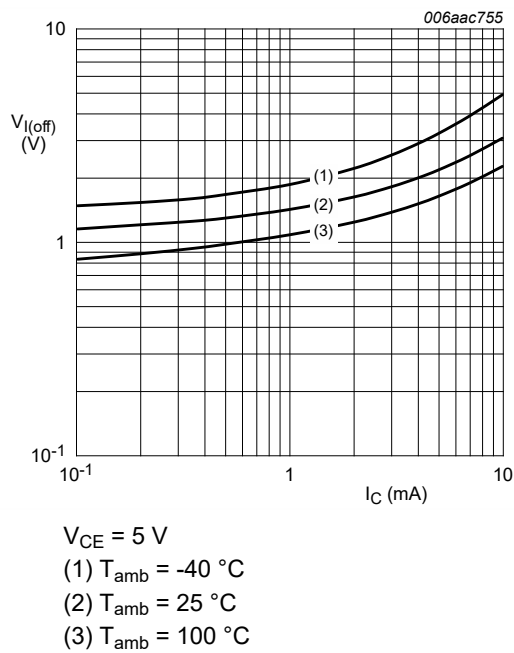


Fig. 26. PDTC144EQB: Off-state input voltage as a function of collector current; typical values

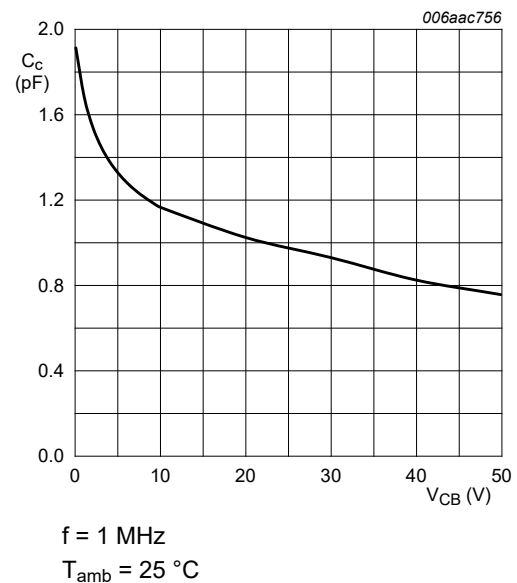
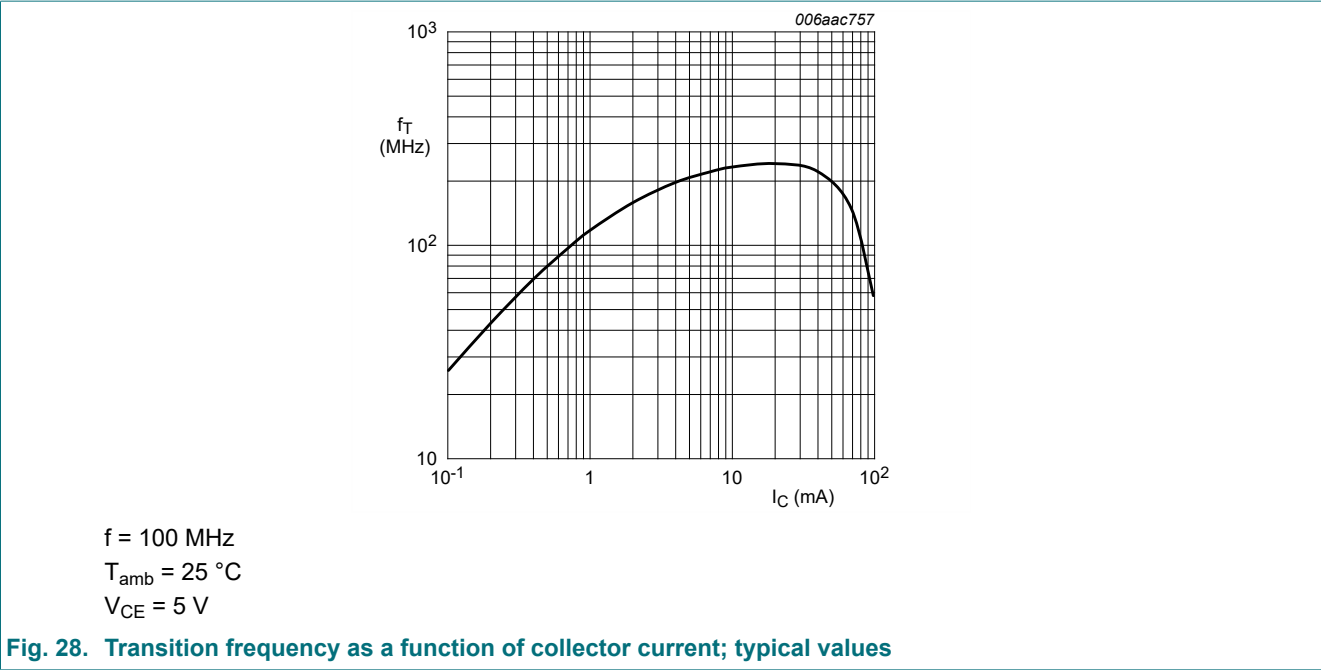


Fig. 27. PDTC144EQB: Collector capacitance as a function of collector-base voltage; typical values



11. Test information

Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R1 = \frac{V(I12) - V(I11)}{I12 - I11}$$
- Calculation of bias resistor ratio (R2/R1)

$$\frac{R2}{R1} = \frac{V(I14) - V(I13)}{R1 \cdot (I14 - I13)} - 1$$

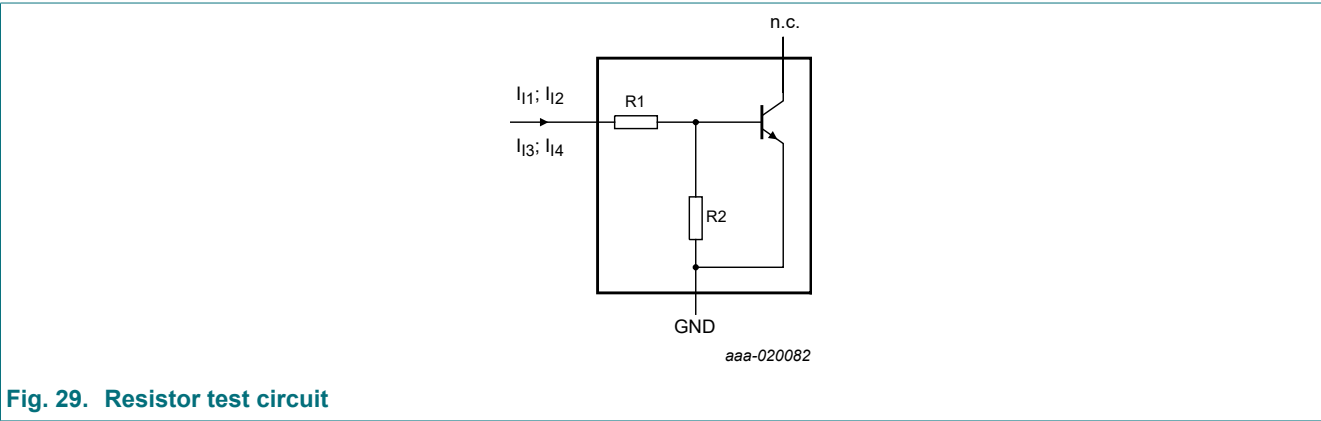


Fig. 29. Resistor test circuit

Resistor test conditions

Table 9. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I11	I12	I13	I14
PDTC143EQB	4.7	4.7	600 μA	700 μA	-600 μA	-700 μA
PDTC114EQB	10	10	350 μA	450 μA	-350 μA	-450 μA
PDTC124EQB	22	22	150 μA	230 μA	-150 μA	-230 μA
PDTC144EQB	47	47	55 μA	105 μA	-55 μA	-105 μA

12. Package outline

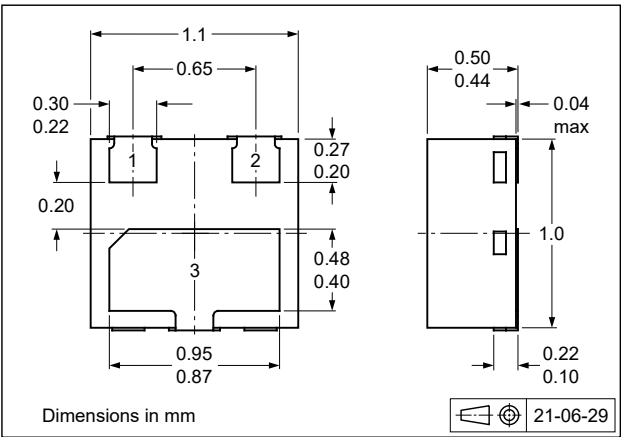


Fig. 30. Package outline DFN1110D-3 (SOT8015)

13. Soldering

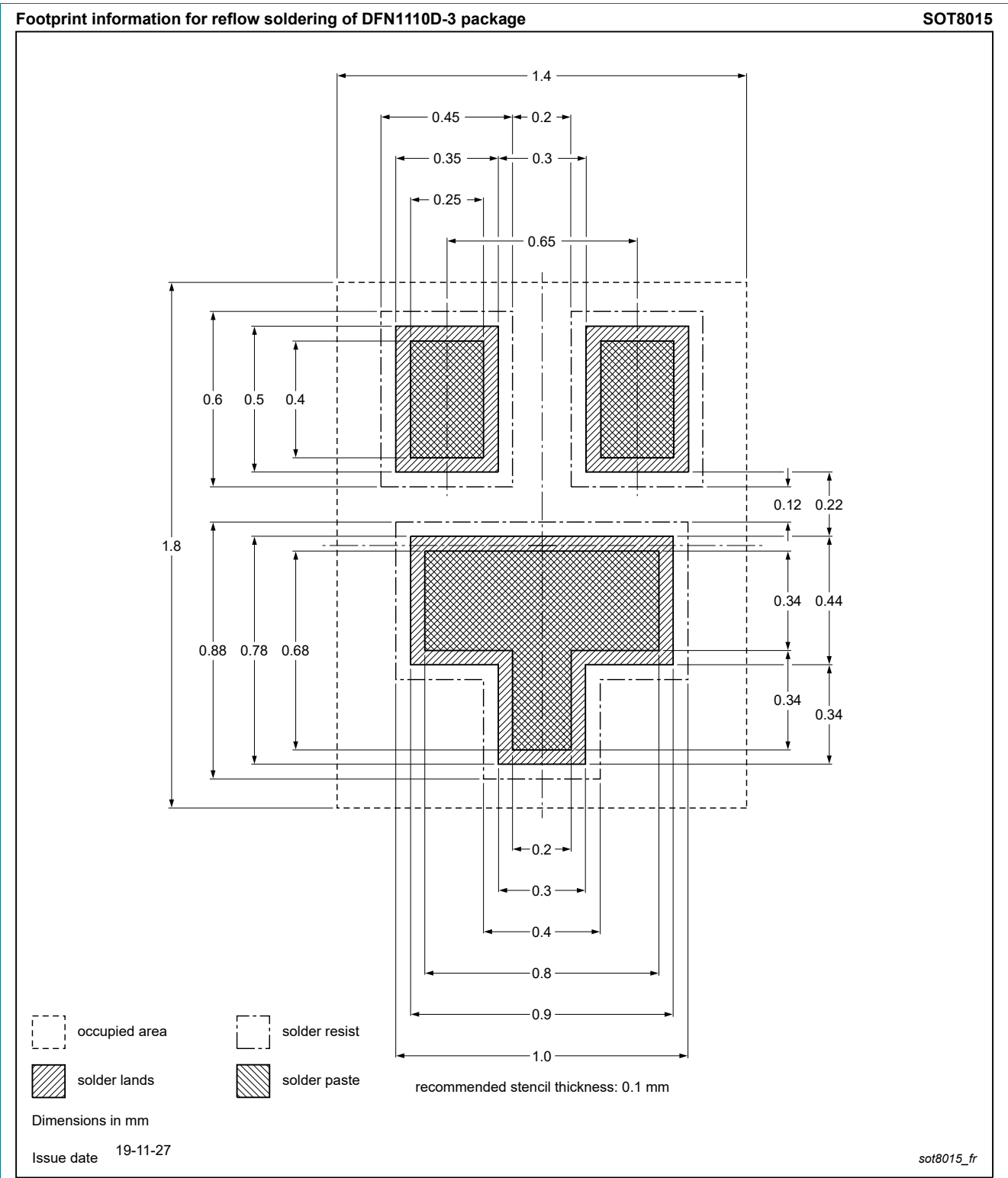


Fig. 31. Reflow soldering footprint DFN1110D-3 (SOT8015)

14. Revision history

Table 10. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PDTC143_114_124_144EQB_SER v.1	20211001	Product data sheet	-	-

15. Legal information

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.

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