PDTB1xxxT series

500 mA, 50 V PNP resistor-equipped transistors

Rev. 1 — 13 May 2014 Product data sheet

1. Product profile

1.1 General description

PNP Resistor-Equipped Transistor (RET) family in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package			NPN complement	Package configuration
	Nexperia	JEITA	JEDEC		
PDTB143ET	SOT23	TO-236AB	-	PDTD143ET	small
PDTB143XT				PDTD143XT	
PDTB114ET				PDTD114ET	

1.2 Features

- 500 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- ± 10 % resistor ratio tolerance
- AEC-Q101 qualified
- High temperature applications up to 175 °C

1.3 Applications

- IC inputs control
- Cost-saving alternative to BC807 or BC817 series transistors in digital applications
- Switching loads

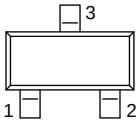
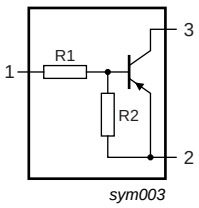
1.4 Quick reference data

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		-	-	–500	mA
R1	bias resistor 1 (input)					
	PDTB143ET			4.7		kΩ
	PDTB143XT			4.7		kΩ
	PDTB114ET			10		kΩ
R2	bias resistor 2 (base-emitter)					
	PDTB143ET			4.7		kΩ
	PDTB143XT			10		kΩ
	PDTB114ET			10		kΩ

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	input (base)		
2	GND (emitter)		
3	output (collector)		

sym003

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTB1xxxT series	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

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4. Marking

Table 5. Marking codes

Type number	Marking code[1]
PDTB143ET	*4X
PDTB143XT	*4Y
PDTB114ET	*09

[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			
	PDTB143ET		-	–10	V
	PDTB143XT		-	–7	V
	PDTB114ET		-	–10	V
V_I	input voltage				
	PDTB143ET		–30	+10	V
	PDTB143XT		–30	+7	V
	PDTB114ET		–50	+10	V
I_O	output current		-	–500	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C [1]	-	320	mW
		[2]	-	460	mW
T_j	junction temperature		-	175	°C
T_{amb}	ambient temperature		–55	+175	°C
T_{stg}	storage temperature		–55	+175	°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.

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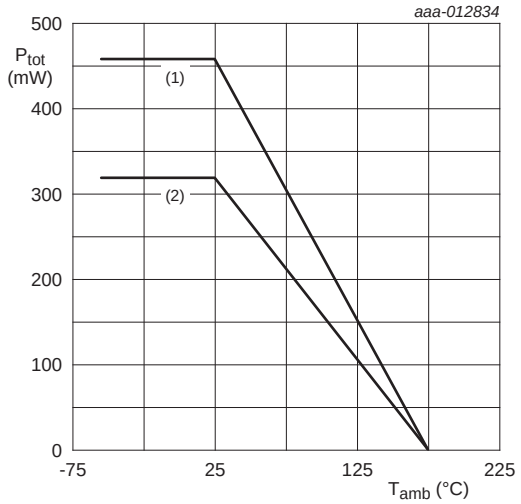

(1) FR4 PCB, 4-layer copper, standard footprint

(2) FR4 PCB, single-sided copper, standard footprint.

Fig 1. Power derating curves

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]	-	-	470	K/W
			[2]	-	-	327	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.

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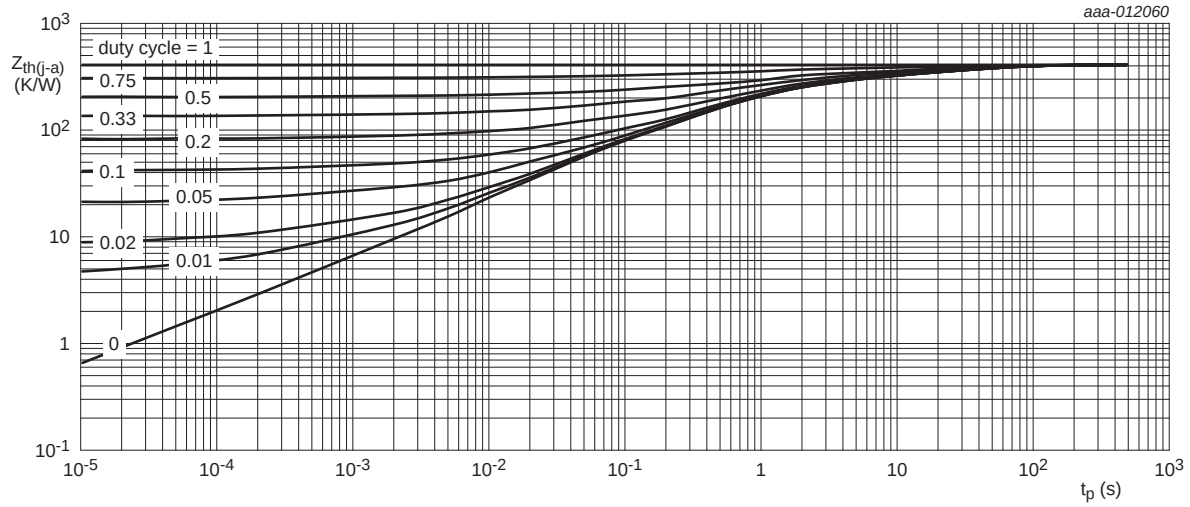
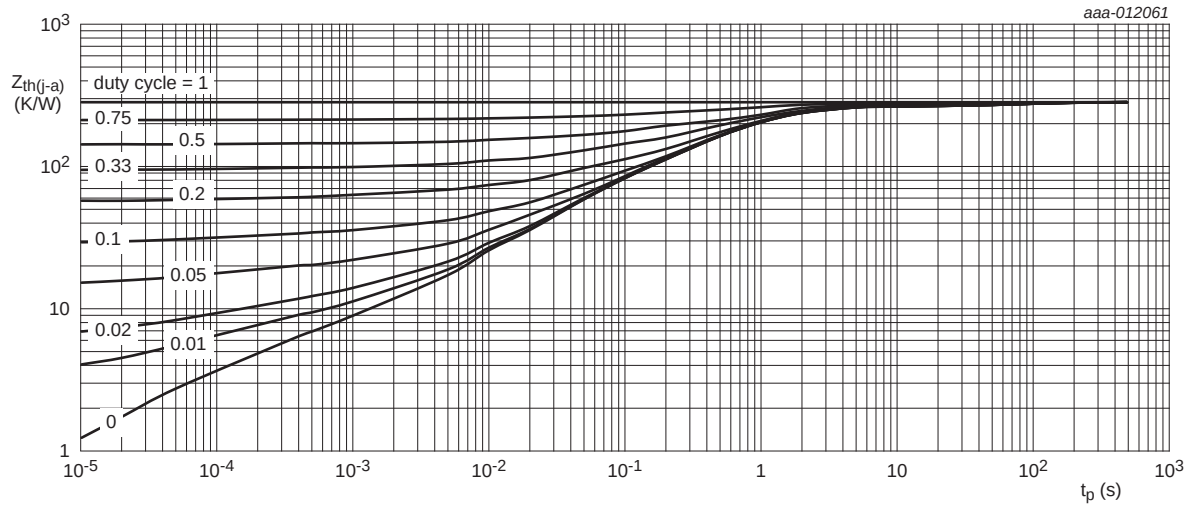


FR4 PCB, single-sided copper, tin-plated and standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT23/TO-236AB; typical values



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 for SOT23/TO-236AB; typical values

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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} = –40 V; I_E = 0 A	-	-	–100	nA
		V_{CB} = –50 V; I_E = 0 A	-	-	–100	nA
I_{CEO}	collector-emitter cut-off current	V_{CE} = –50 V; I_B = 0 A	-	-	–0.5	μA
I_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A				
	PDTB143ET		-	-	–0.9	mA
	PDTB143XT		-	-	–0.6	mA
	PDTB114ET		-	-	–0.4	mA
h_{FE}	DC current gain	V_{CE} = –5 V; I_C = –50 mA				
	PDTB143ET		60	-	-	
	PDTB143XT		70	-	-	
	PDTB114ET		70	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –50 mA; I_B = –2.5 mA	-	-	–100	mV
$V_{I(off)}$	off-state input voltage	V_{CE} = –5 V; I_C = –100 μA				
	PDTB143ET		–0.6	–0.9	–1.5	V
	PDTB143XT		–0.5	–0.75	–1.1	V
	PDTB114ET		–0.6	–1.0	–1.5	V
$V_{I(on)}$	on-state input voltage	V_{CE} = –0.3 V; I_C = –20 mA				
	PDTB143ET		–1.0	–1.7	–2.2	V
	PDTB143XT		–1.0	–1.4	–2.0	V
	PDTB114ET		–1.0	–2.2	–3.0	V
R1	bias resistor 1 (input)					
	PDTB143ET		3.3	4.7	6.1	kΩ
	PDTB143XT		3.3	4.7	6.1	kΩ
	PDTB114ET		7.0	10	13	kΩ
R2/R1	bias resistor ratio					
	PDTB143ET		0.9	1.0	1.1	
	PDTB143XT		1.91	2.13	2.34	
	PDTB114ET		0.9	1.0	1.1	
C_c	collector capacitance	V_{CB} = –10 V; $I_E = i_e$ = 0 A; f = 1 MHz	-	11	-	pF
f_T	transition frequency	V_{CE} = –5 V; I_C = –50 mA; f = 100 MHz [1]	-	140	-	MHz

[1] Characteristics of built-in transistor.

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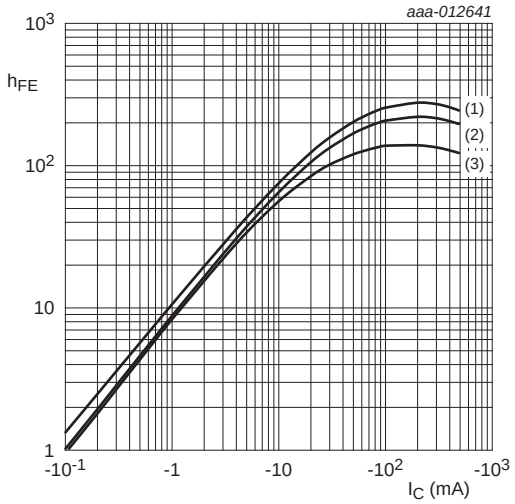


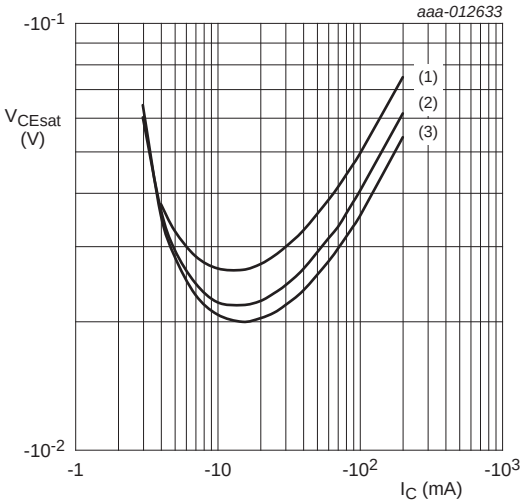
V_{CE} = –5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –40 °C

Fig 4. PDTB143ET: DC current gain as a function of collector current; typical values



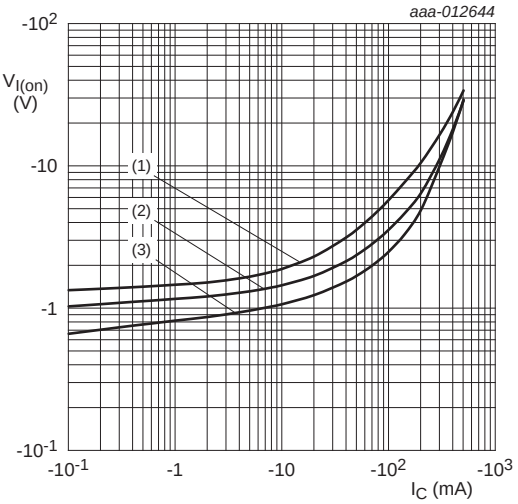
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –40 °C

Fig 5. PDTB143ET: Collector-emitter saturation voltage as a function of collector current; typical values



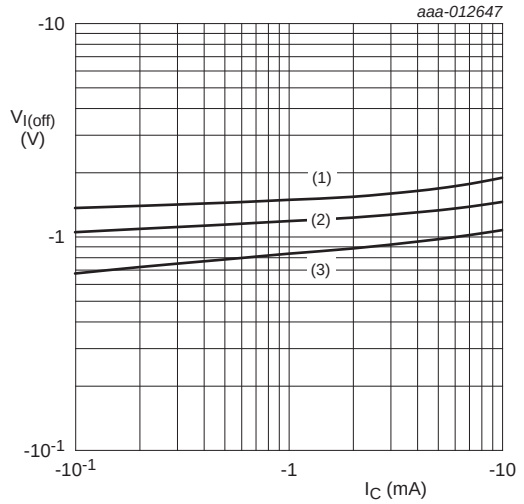
V_{CE} = –0.3 V

(1) T_{amb} = –40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 6. PDTB143ET: 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 7. PDTB143ET: Off-state input voltage as a function of collector current; typical values

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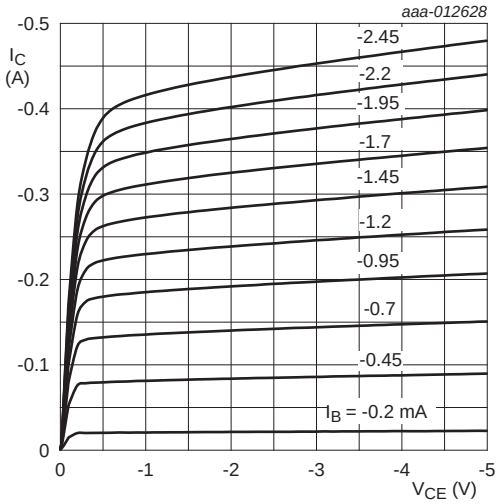
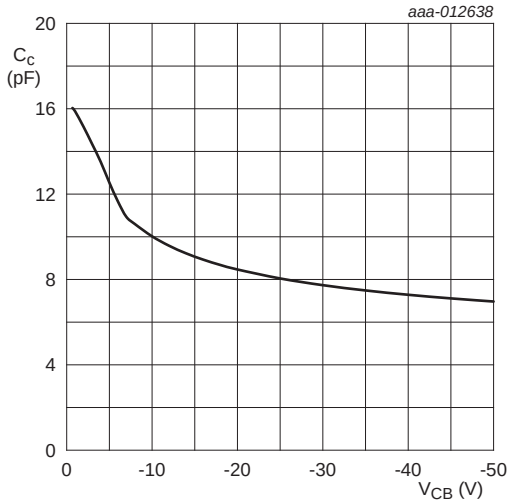


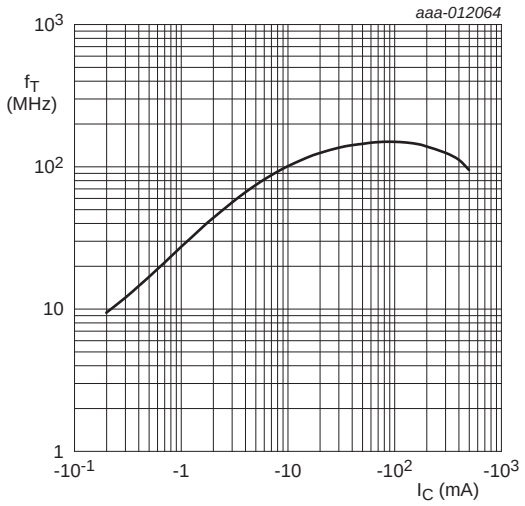
T_{amb} = 25 °C

Fig 8. PDTB143ET: Collector current as a function of collector-emitter voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig 9. PDTB143ET: Collector capacitance as a function of collector-base voltage; typical values



V_{CE} = −5 V; T_{amb} = 25 °C

Fig 10. PDTB143ET: Transition frequency as a function of collector current; typical values of built-in transistor

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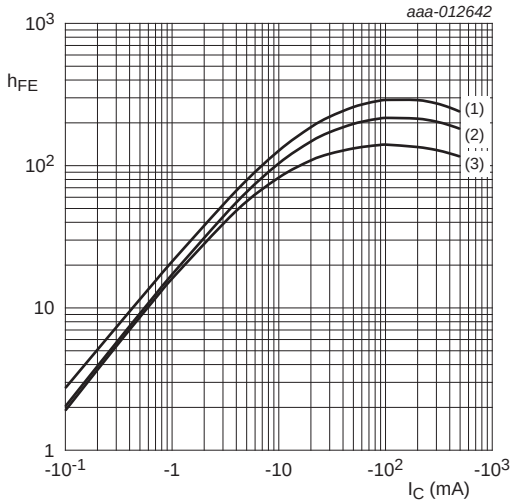


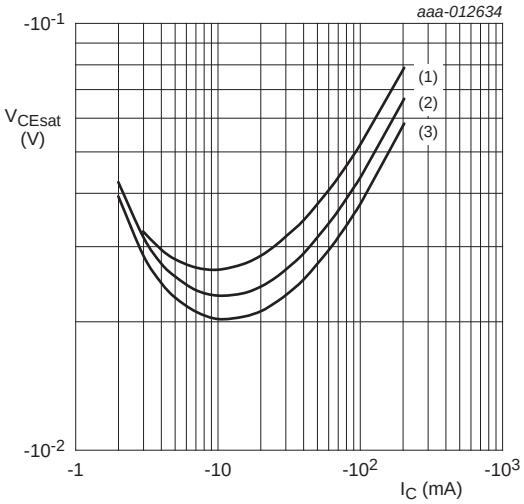
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

Fig 11. PDTB143XT: DC current gain as a function of collector current; typical values



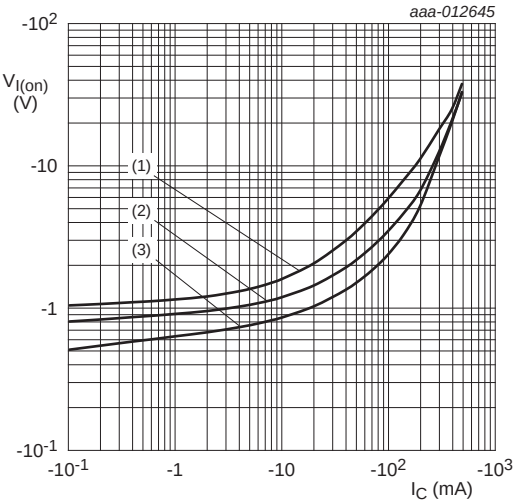
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

Fig 12. PDTB143XT: Collector-emitter saturation voltage as a function of collector current; typical values



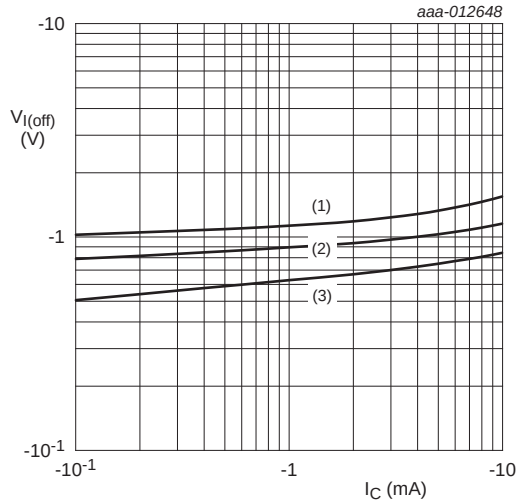
V_{CE} = −0.3 V

(1) T_{amb} = −40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 13. PDTB143XT: 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 14. PDTB143XT: Off-state input voltage as a function of collector current; typical values

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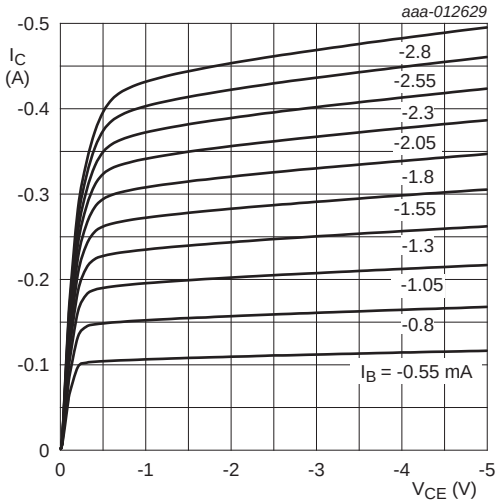
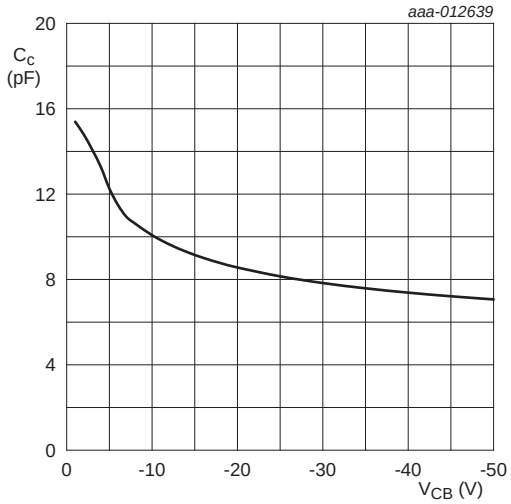


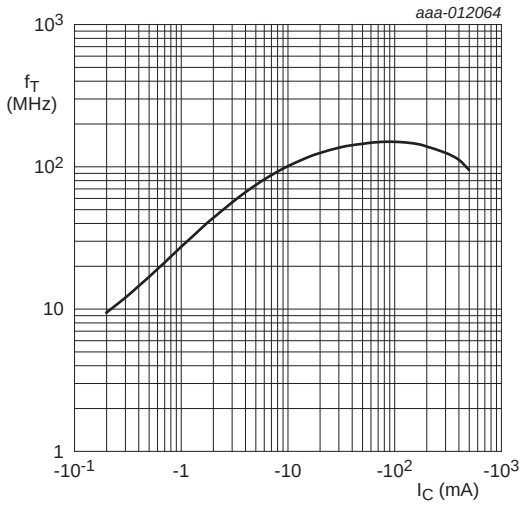
T_{amb} = 25 °C

Fig 15. PDTB143XT: Collector current as a function of collector-emitter voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig 16. PDTB143XT: Collector capacitance as a function of collector-base voltage; typical values



V_{CE} = −5 V; T_{amb} = 25 °C

Fig 17. PDTB143XT: Transition frequency as a function of collector current; typical values of built-in transistor

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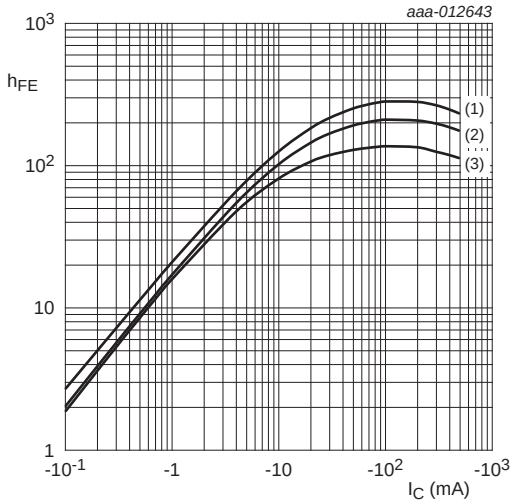


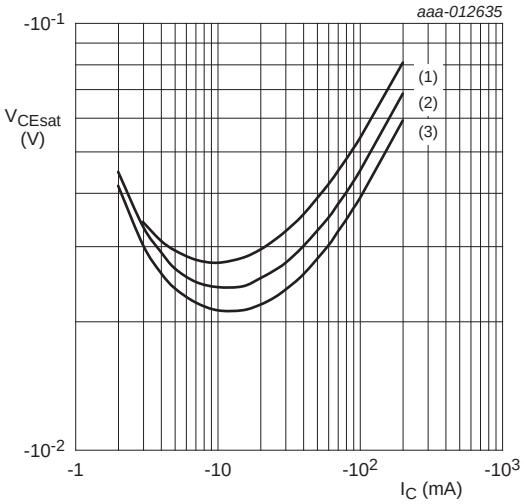
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

Fig 18. PDTB114ET: DC current gain as a function of collector current; typical values



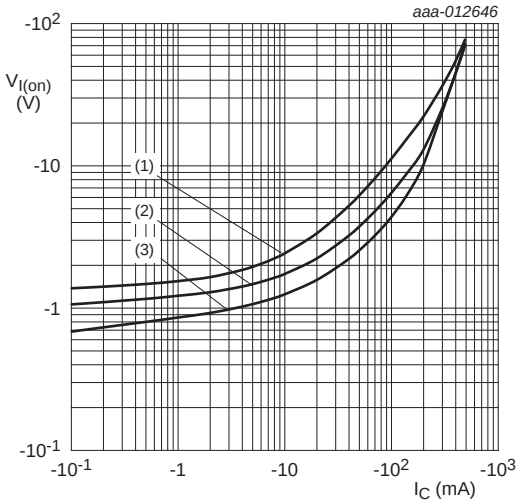
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

Fig 19. PDTB114ET: Collector-emitter saturation voltage as a function of collector current; typical values



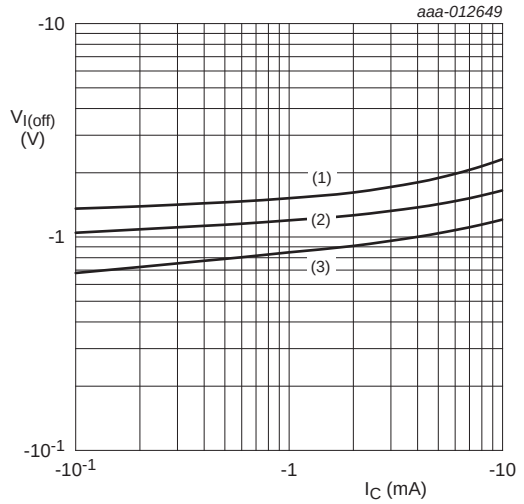
V_{CE} = −0.3 V

(1) T_{amb} = −40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 20. PDTB114ET: 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 21. PDTB114ET: Off-state input voltage as a function of collector current; typical values

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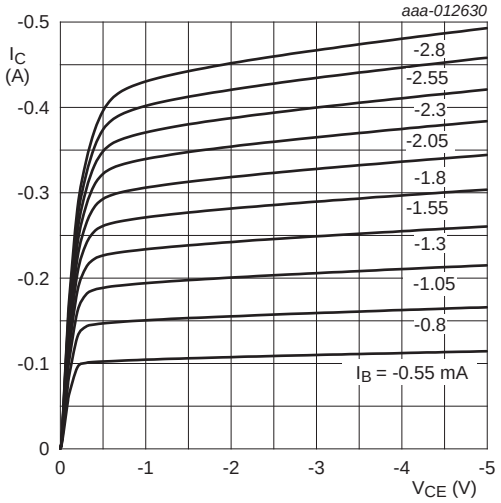
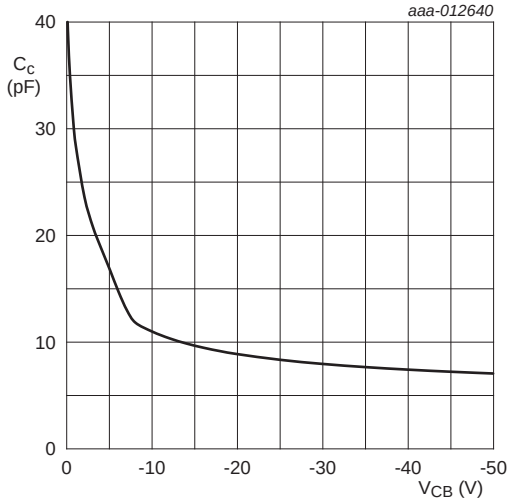


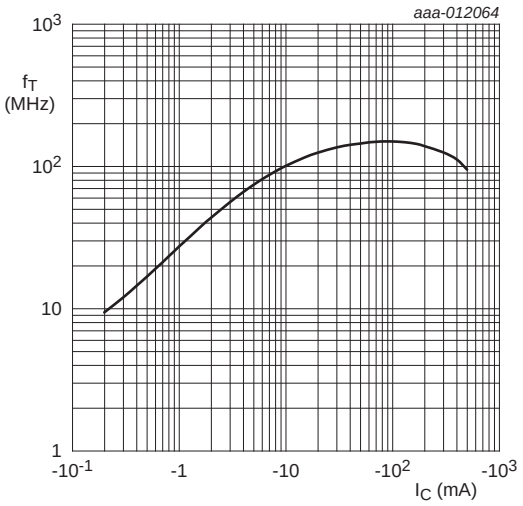
T_{amb} = 25 °C

Fig 22. PDTB114ET: Collector current as a function of collector-emitter voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig 23. PDTB114ET: Collector capacitance as a function of collector-base voltage; typical values of built-in transistor



V_{CE} = −5 V; T_{amb} = 25 °C

Fig 24. PDTB114ET: Transition frequency as a function of collector current; typical values of built-in transistor

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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

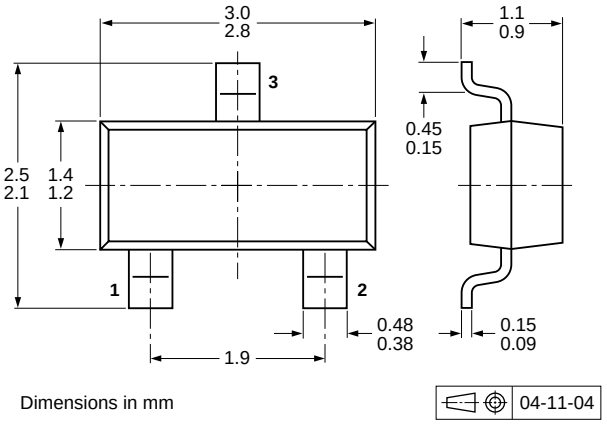

Fig 25. Package outline PDTB1xxxT series (SOT23/TO-236AB)

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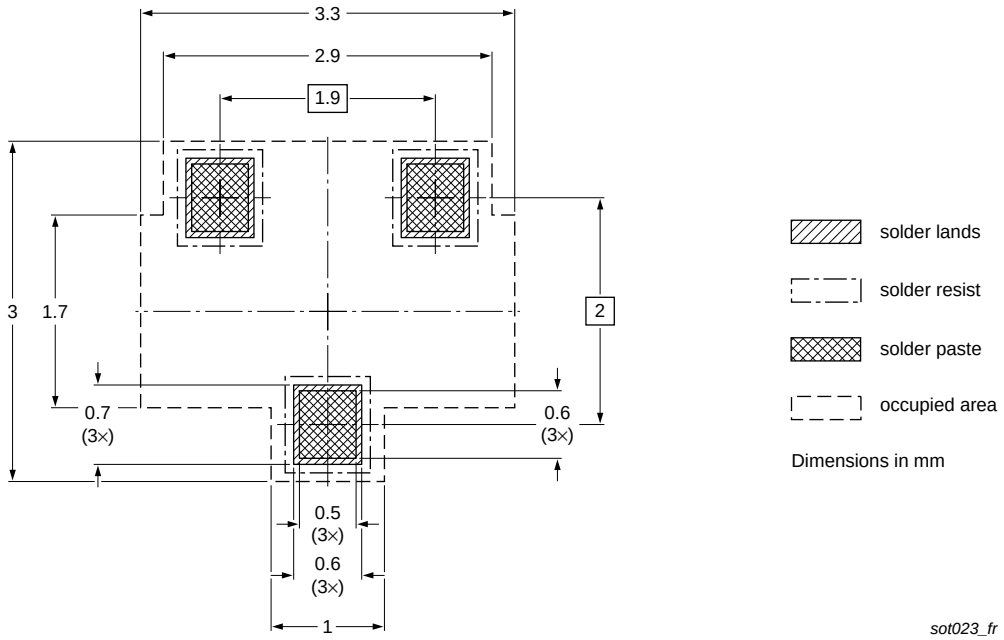
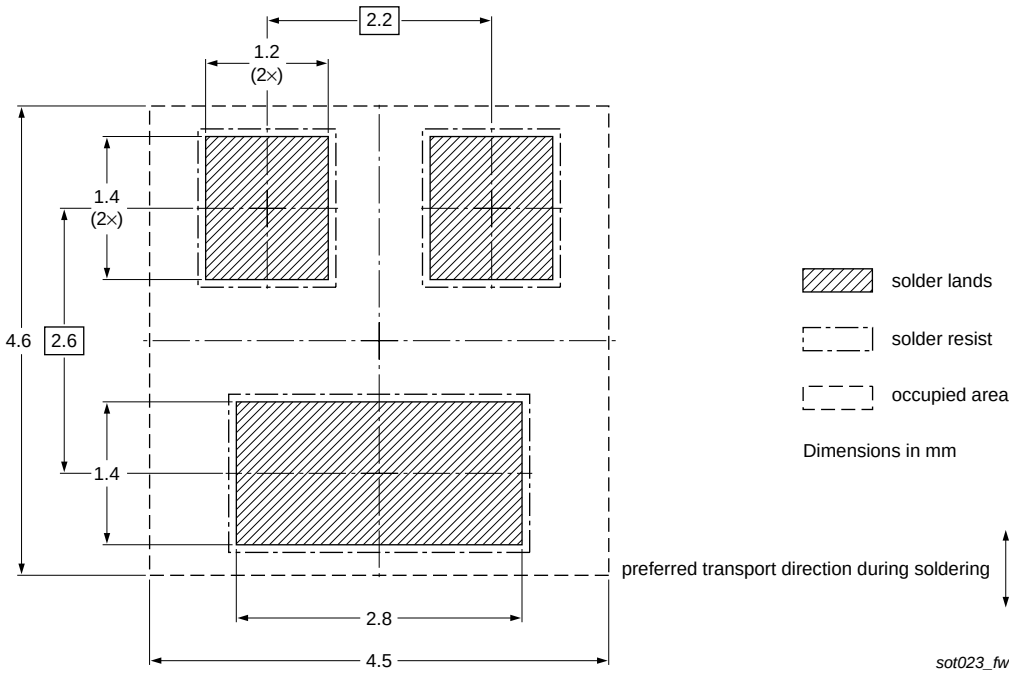
10. Soldering



Dimensions in mm

Fig 26. Reflow soldering footprint PDTB1xxxT series (SOT23/TO-236AB)



Dimensions in mm

Fig 27. Wave soldering footprint PDTB1xxxT series (SOT23/TO-236AB)

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11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PDTB1XXXT_SER v.1	20140513	Product data sheet	-	-

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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".

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13. Contact information

For more information, please visit: **http://www.nexperia.com**

For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

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