



PDTA143X/123J/143Z/114Y/124XQC series

50 V, 100 mA PNP resistor-equipped transistors

Rev. 1 — 30 September 2021

Product data sheet

1. General description

100 mA PNP Resistor-Equipped Transistor (RET) family in an ultra small DFN1412D-3 (SOT8009) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

| Type number | R1 | R2 | Package | | NPN complement: |
|-------------|------------|------------|----------|----------|-----------------|
| | k Ω | k Ω | Nexperia | JEDEC | |
| PDTA143XQC | 4.7 | 10 | SOT8009 | MO-340CA | PDTC143XQC |
| PDTA123JQC | 2.2 | 47 | | | PDTC123JQC |
| PDTA143ZQC | 4.7 | 47 | | | PDTC143ZQC |
| PDTA114YQC | 10 | 47 | | | PDTC114YQC |
| PDTA124XQC | 22 | 47 | | | PDTC124XQC |

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 BC857 series in digital applications
- Controlling IC inputs
- Switching loads

4. Quick reference data

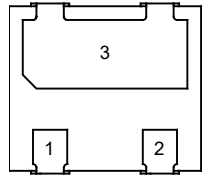
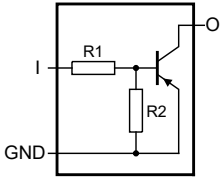
Table 2. Quick reference data

$T_{amb} = 25\text{ }^{\circ}\text{C}$ 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) |  <p>Transparent top view</p> |  <p>aaa-019606</p> |
| 2 | GND | GND (emitter) | | |
| 3 | O | output (collector) | | |

6. Ordering information

Table 4. Ordering information

| Type number | Package | | |
|-------------|------------|--|---------|
| | Name | Description | Version |
| PDTA143XQC | DFN1412D-3 | plastic leadless ultra small outline package with side-wettable flanks (SWF); 3 terminals; 0.8 mm pitch; body: 1.4 x 1.2 x 0.48 mm | SOT8009 |
| PDTA123JQC | | | |
| PDTA143ZQC | | | |
| PDTA114YQC | | | |
| PDTA124XQC | | | |

7. Marking

Table 5. Marking

| Type number | Marking code |
|-------------|--------------|
| PDTA143XQC | 8F |
| PDTA123JQC | 8C |
| PDTA143ZQC | 8G |
| PDTA114YQC | 8B |
| PDTA124XQC | 6F |

8. Limiting values

Table 6. Limiting values

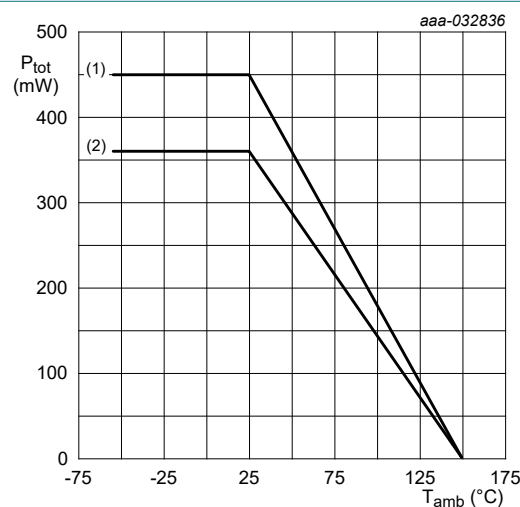
In accordance with the Absolute Maximum Rating System (IEC 60134).

$T_{amb} = 25\text{ °C}$ 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 | | | | | |
| | PDTA143XQC | open collector | - | -7 | V | |
| | PDTA123JQC | | - | -5 | V | |
| | PDTA143ZQC | | - | -5 | V | |
| | PDTA114YQC | | - | -6 | V | |
| | PDTA124XQC | | - | -7 | V | |
| V_i | input voltage | | | | | |
| | PDTA143XQC | | -30 | +7 | V | |
| | PDTA123JQC | | -12 | +5 | V | |
| | PDTA143ZQC | | -30 | +5 | V | |
| | PDTA114YQC | | -40 | +6 | V | |
| | PDTA124XQC | | -40 | +7 | V | |
| I_O | output current | | - | -100 | mA | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] | - | 360 | mW |
| | | | [2] | - | 450 | 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.



(1) FR4 PCB; single-sided; 70 μm copper; standard footprint

(2) FR4 PCB; single-sided; 35 μm copper; standard footprint

Fig. 1. Power derating curves

9. Thermal characteristics

Table 7. Thermal characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|---|-------------|-----|-----|-----|------|-----|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 348 | K/W |
| | | | [2] | - | - | 278 | 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.

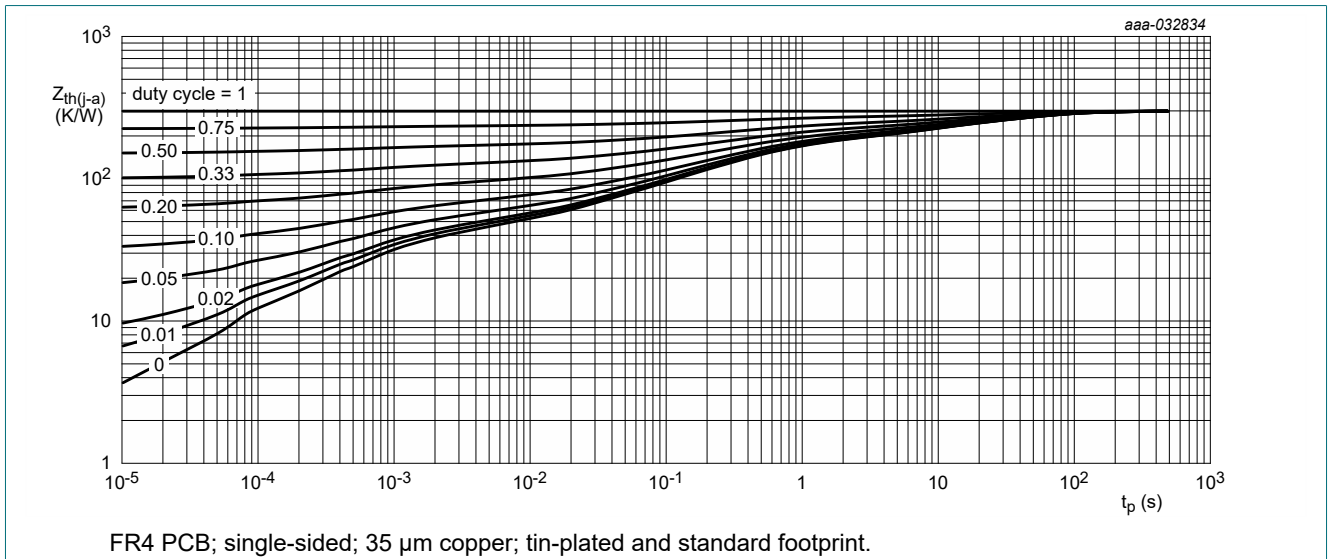


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

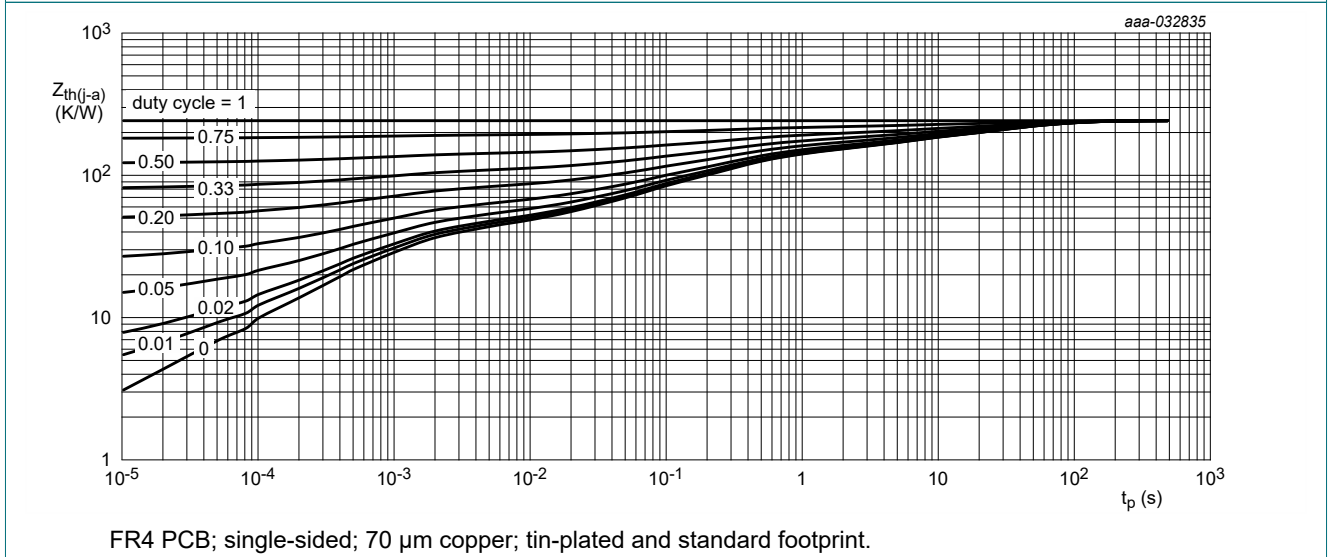


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

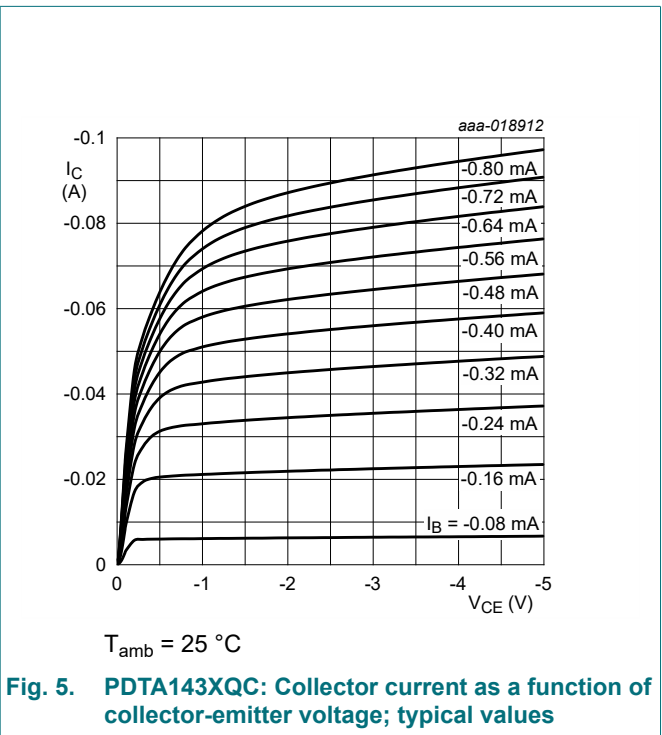
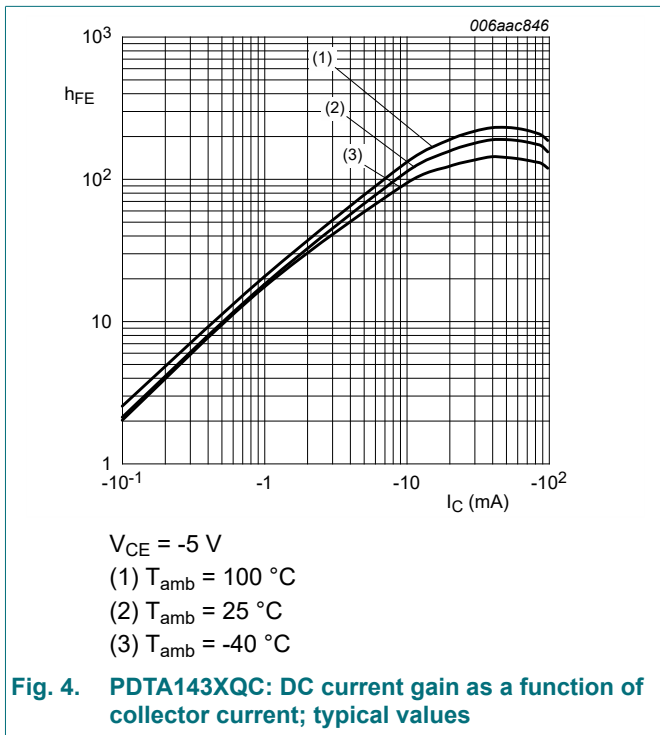
Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|--------------------------------------|--|------|-------|------|---------------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = -100\ \mu\text{A}$; $I_E = 0\ \text{A}$ | -50 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = -2\ \text{mA}$; $I_B = 0\ \text{A}$ | -50 | - | - | V |
| 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 | | | | | |
| | PDTA143XQC | $V_{EB} = -5\ \text{V}$; $I_C = 0\ \text{A}$ | - | - | -600 | μA |
| | PDTA123JQC | | - | - | -180 | μA |
| | PDTA143ZQC | | - | - | -170 | μA |
| | PDTA114YQC | | | | -150 | μA |
| | PDTA124XQC | | | | -120 | μA |
| | | | | | | |
| h_{FE} | DC current gain | | | | | |
| | PDTA143XQC | $V_{CE} = -5\ \text{V}$; $I_C = -10\ \text{mA}$ | 50 | - | - | |
| | PDTA123JQC | | 100 | - | - | |
| | PDTA143ZQC | | 100 | - | - | |
| | PDTA114YQC | $V_{CE} = -5\ \text{V}$; $I_C = -5\ \text{mA}$ | 100 | - | - | |
| | PDTA124XQC | | 80 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | | | | | |
| | PDTA143XQC | $I_C = -10\ \text{mA}$; $I_B = -0.5\ \text{mA}$ | - | - | -100 | mV |
| | PDTA123JQC | | - | - | -100 | mV |
| | PDTA143ZQC | $I_C = -5\ \text{mA}$; $I_B = -0.25\ \text{mA}$ | - | - | -100 | mV |
| | PDTA114YQC | | - | - | -100 | mV |
| | PDTA124XQC | $I_C = -10\ \text{mA}$; $I_B = -0.5\ \text{mA}$ | - | - | -100 | mV |
| $V_{I(off)}$ | off-state input voltage | | | | | |
| | PDTA143XQC | $V_{CE} = -5\ \text{V}$; $I_C = -100\ \mu\text{A}$ | - | -0.9 | -0.3 | V |
| | PDTA123JQC | | - | -0.6 | -0.5 | V |
| | PDTA143ZQC | | - | -0.6 | -0.5 | V |
| | PDTA114YQC | | - | -0.7 | -0.5 | V |
| | PDTA124XQC | | - | -0.8 | -0.5 | V |
| | | | | | | |
| $V_{I(on)}$ | on-state input voltage | | | | | |
| | PDTA143XQC | $V_{CE} = -0.3\ \text{V}$; $I_C = -20\ \text{mA}$ | -2.5 | -1.5 | - | V |
| | PDTA123JQC | $V_{CE} = -0.3\ \text{V}$; $I_C = -5\ \text{mA}$ | -1.1 | -0.75 | - | V |
| | PDTA143ZQC | $V_{CE} = -0.3\ \text{V}$; $I_C = -5\ \text{mA}$ | -1.3 | -0.9 | - | V |
| | PDTA114YQC | $V_{CE} = -0.3\ \text{V}$; $I_C = -1\ \text{mA}$ | -1.4 | -0.8 | - | V |
| | PDTA124XQC | $V_{CE} = -0.3\ \text{V}$; $I_C = -2\ \text{mA}$ | -2 | -1.1 | - | V |

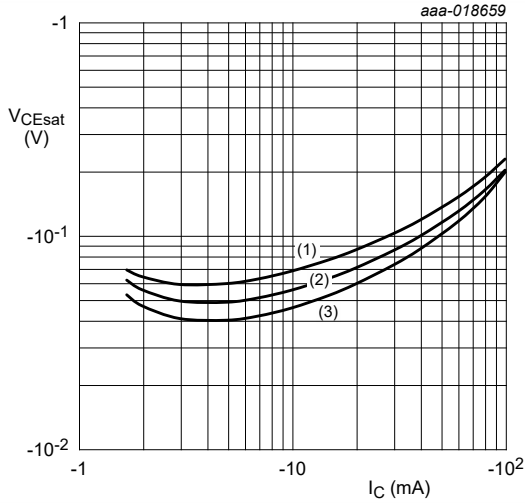
50 V, 100 mA PNP resistor-equipped transistors

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------|-------------------------|---|---------|------|------|------|
| R1 | bias resistor 1 (input) | | | | | |
| | PDTA143XQC | | [1] 3.3 | 4.7 | 6.1 | kΩ |
| | PDTA123JQC | | 1.54 | 2.2 | 2.86 | kΩ |
| | PDTA143ZQC | | 3.3 | 4.7 | 6.1 | kΩ |
| | PDTA114YQC | | 7 | 10 | 13 | kΩ |
| PDTA124XQC | | 15.4 | 22 | 28.6 | kΩ | |
| R2/R1 | bias resistor ratio | | | | | |
| | PDTA143XQC | | [1] 1.7 | 2.13 | 2.6 | |
| | PDTA123JQC | | 17 | 21 | 26 | |
| | PDTA143ZQC | | 8 | 10 | 12 | |
| | PDTA114YQC | | 3.7 | 4.7 | 5.7 | |
| PDTA124XQC | | 1.7 | 2.13 | 2.6 | | |
| f_T | transition frequency | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; f = 100\text{ MHz}$ | [2] - | 180 | - | MHz |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$ | - | - | 3 | pF |

- [1] See "Section 11: Test information" for resistor calculation and test conditions
- [2] Characteristics of built-in transistor



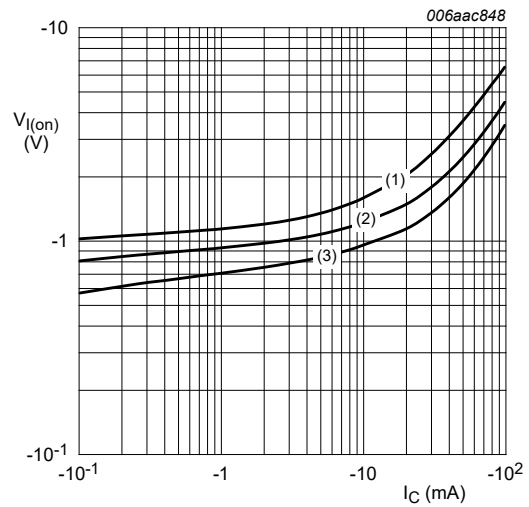
50 V, 100 mA PNP resistor-equipped transistors



$I_C/I_B = 20$

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

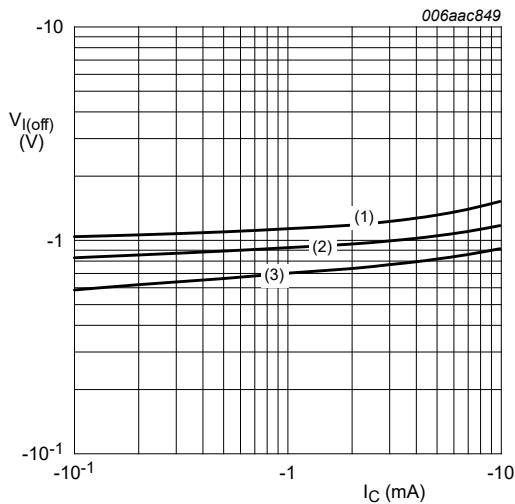
Fig. 6. PDTA143XQC: Collector-emitter saturation voltage as a function of collector current; typical values



$V_{CE} = -0.3\text{ V}$

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

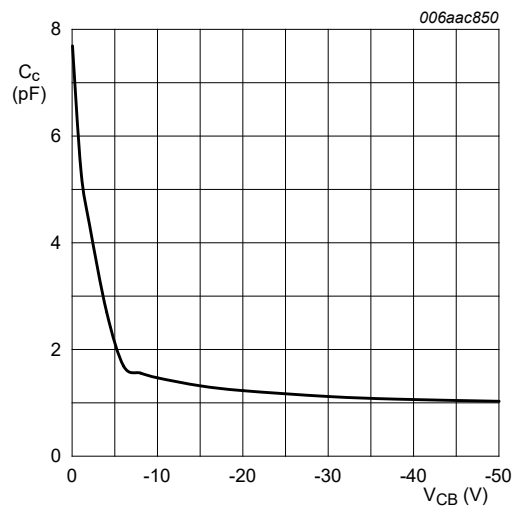
Fig. 7. PDTA143XQC: On-state input voltage as a function of collector current; typical values



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

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

Fig. 8. PDTA143XQC: Off-state input voltage as a function of collector current; typical values



$f = 1\text{ MHz}$

$T_{amb} = 25\text{ °C}$

Fig. 9. PDTA143XQC: Collector capacitance as a function of collector-base voltage; typical values

50 V, 100 mA PNP resistor-equipped transistors

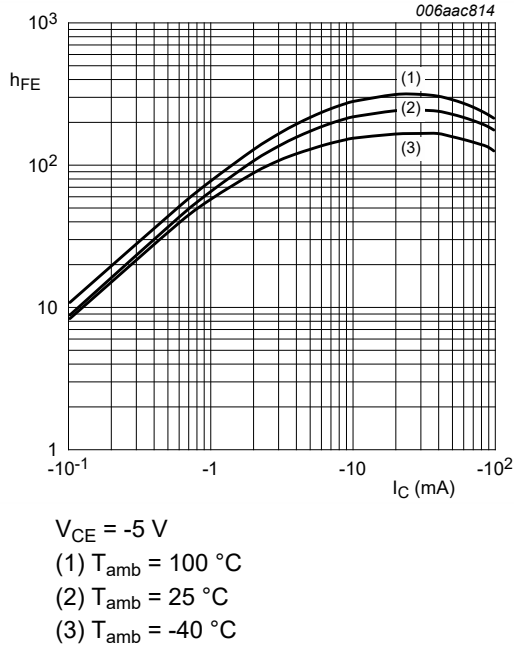


Fig. 10. PDTA123JQC: DC current gain as a function of collector current; typical values

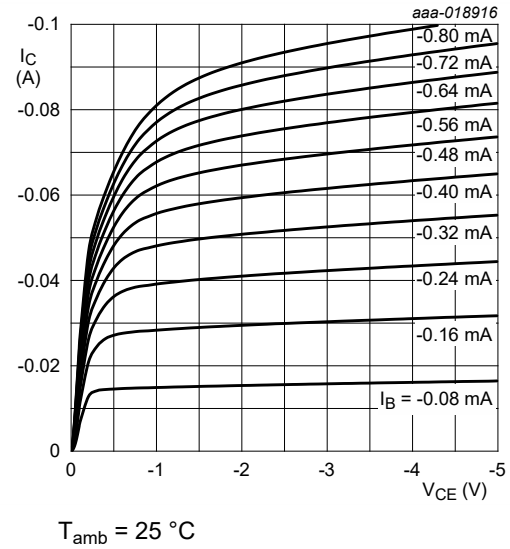


Fig. 11. PDTA123JQC: Collector current as a function of collector-emitter voltage; typical values

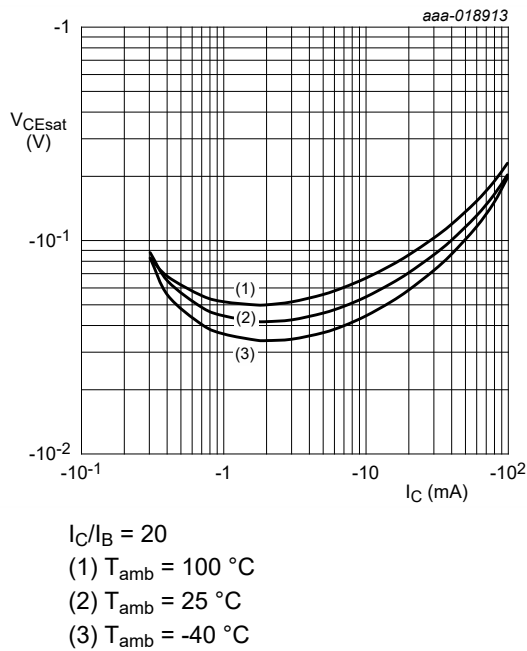


Fig. 12. PDTA123JQC: Collector-emitter saturation voltage as a function of collector current; typical values

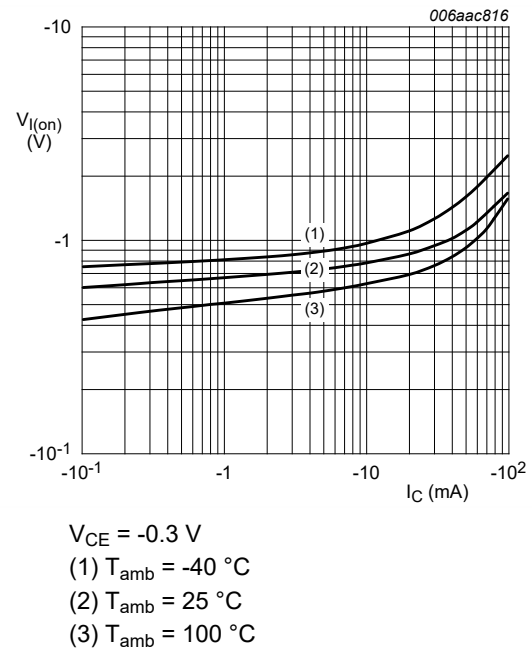
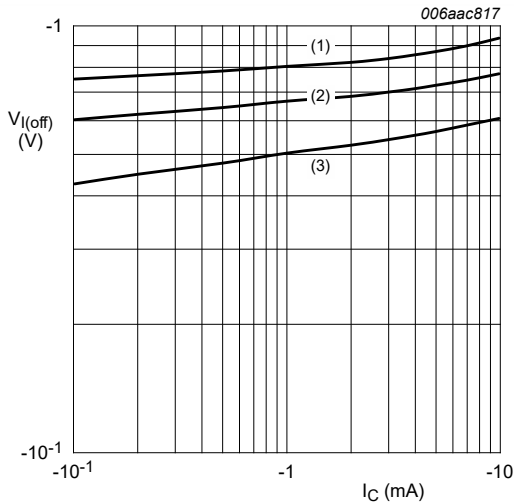


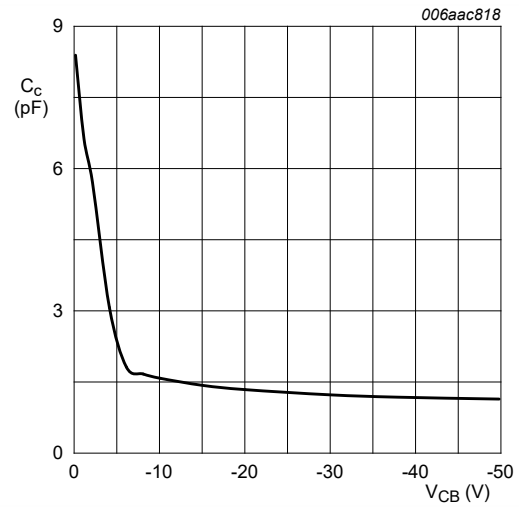
Fig. 13. PDTA123JQC: On-state input voltage as a function of collector current; typical values

50 V, 100 mA PNP resistor-equipped transistors



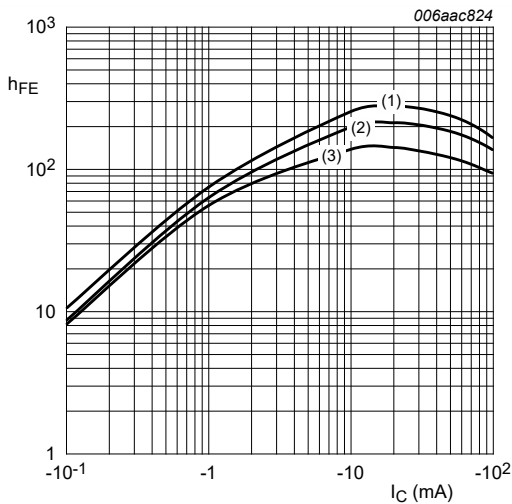
$V_{CE} = -5 V$
 (1) $T_{amb} = -40\text{ }^\circ C$
 (2) $T_{amb} = 25\text{ }^\circ C$
 (3) $T_{amb} = 100\text{ }^\circ C$

Fig. 14. PDTA123JQC: Off-state input voltage as a function of collector current; typical values



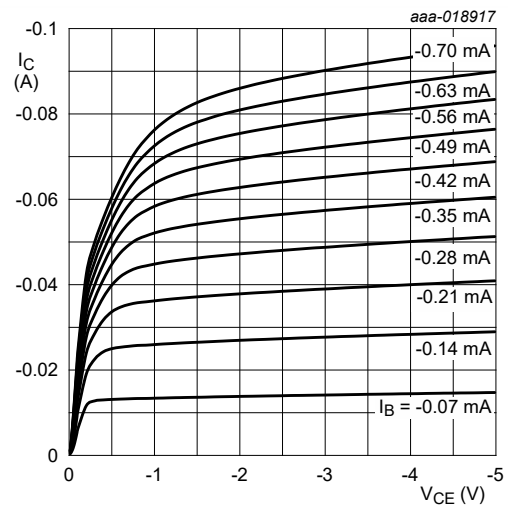
$f = 1\text{ MHz}$
 $T_{amb} = 25\text{ }^\circ C$

Fig. 15. PDTA123JQC: Collector capacitance as a function of collector-base voltage; typical values



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

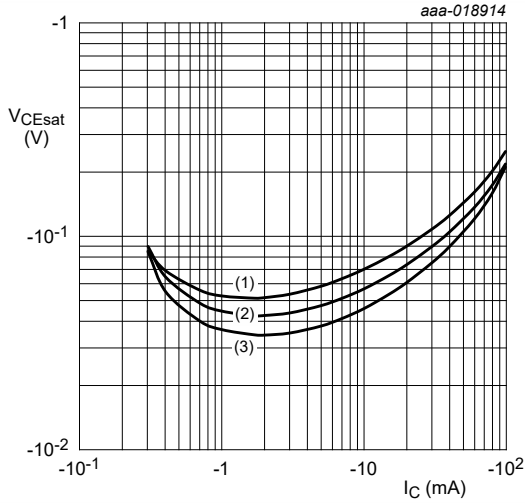
Fig. 16. PDTA143ZQC: DC current gain as a function of collector current; typical values



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

Fig. 17. PDTA143ZQC: Collector current as a function of collector-emitter voltage; typical values

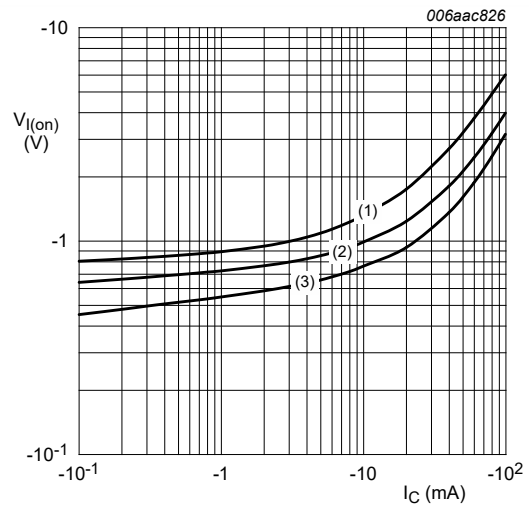
50 V, 100 mA PNP resistor-equipped transistors



$I_C/I_B = 20$

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

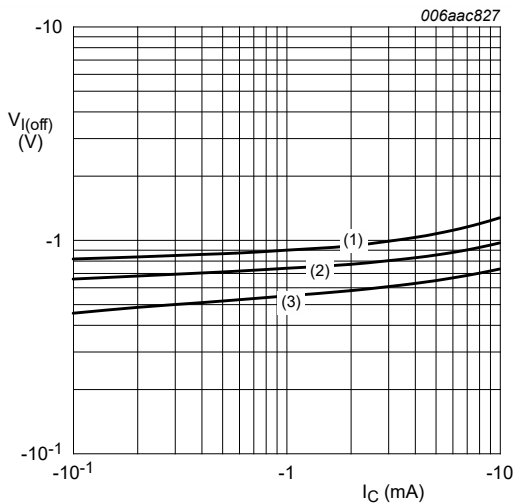
Fig. 18. PDTA143ZQC: Collector-emitter saturation voltage as a function of collector current; typical values



$V_{CE} = -0.3\text{ V}$

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

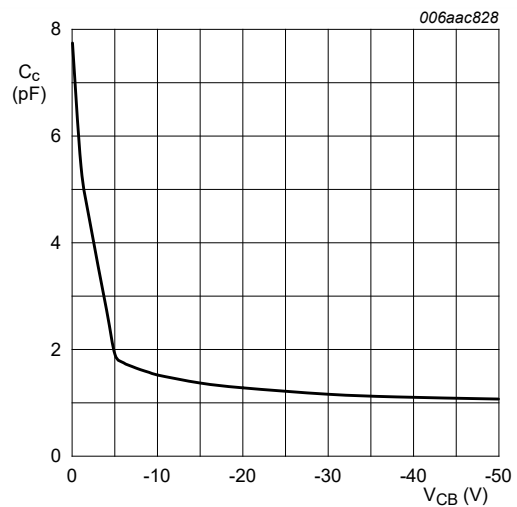
Fig. 19. PDTA143ZQC: On-state input voltage as a function of collector current; typical values



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

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

Fig. 20. PDTA143ZQC: Off-state input voltage as a function of collector current; typical values



$f = 1\text{ MHz}$

$T_{amb} = 25\text{ °C}$

Fig. 21. PDTA143ZQC: Collector capacitance as a function of collector-base voltage; typical values

50 V, 100 mA PNP resistor-equipped transistors

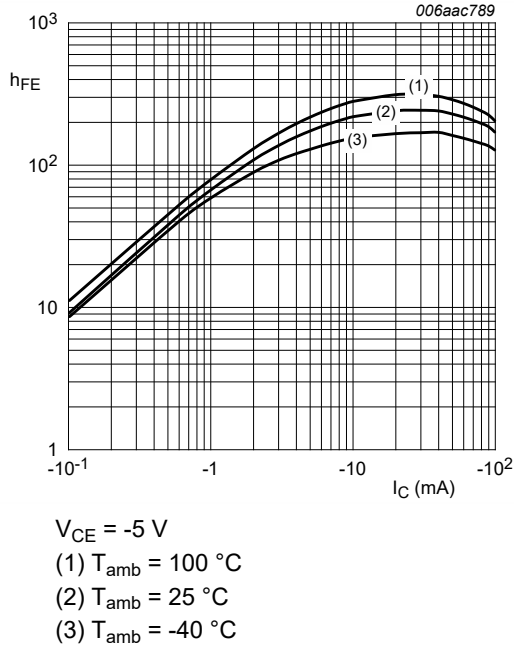


Fig. 22. PDTA114YQC: DC current gain as a function of collector current; typical values

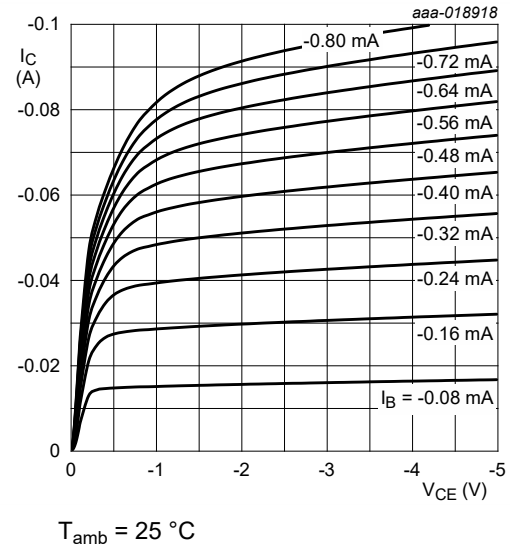


Fig. 23. PDTA114YQC: Collector current as a function of collector-emitter voltage; typical values

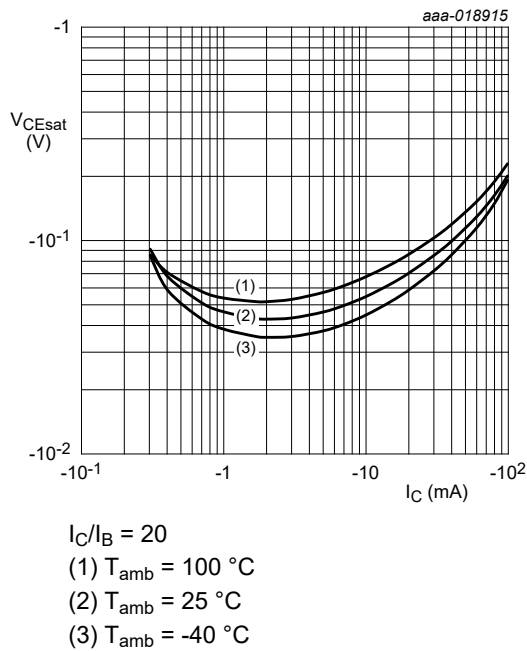


Fig. 24. PDTA114YQC: Collector-emitter saturation voltage as a function of collector current; typical values

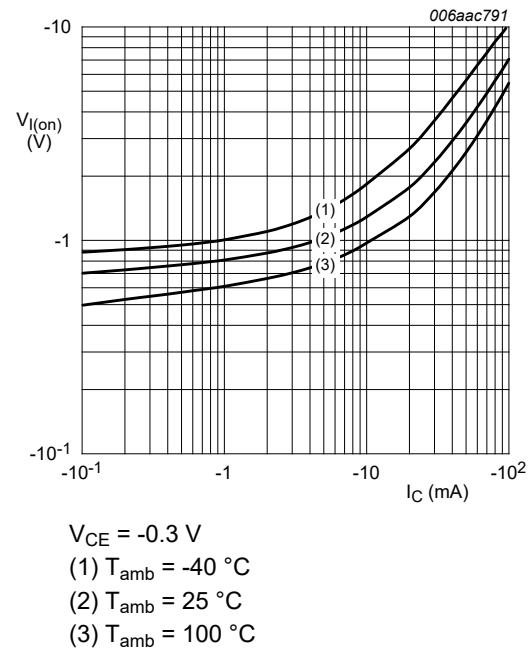
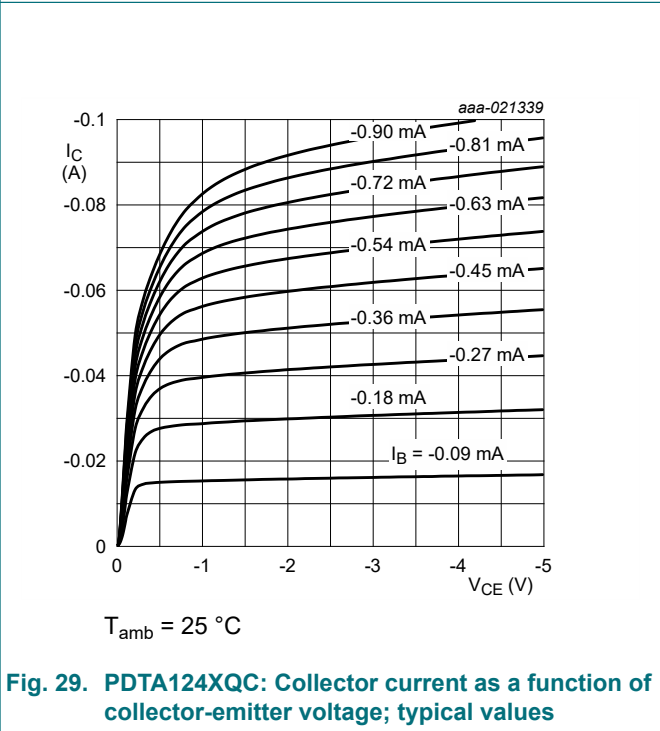
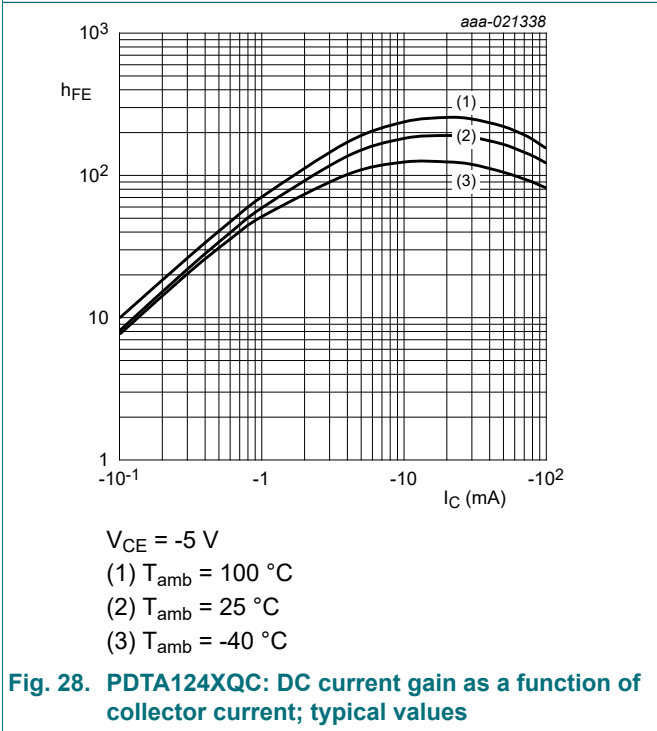
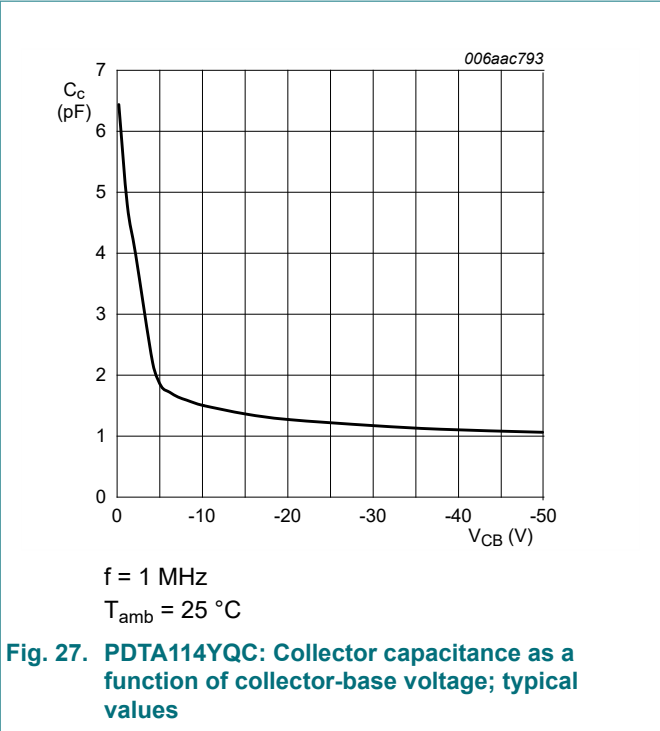
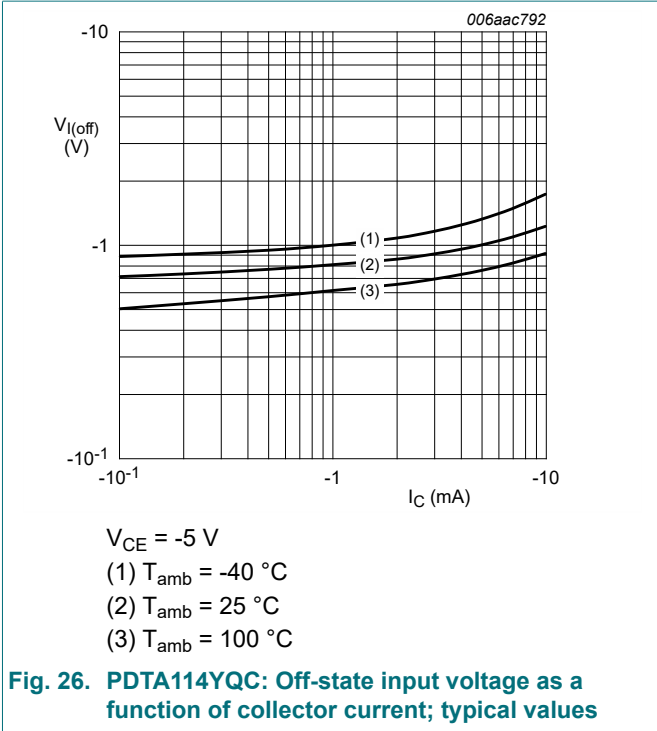
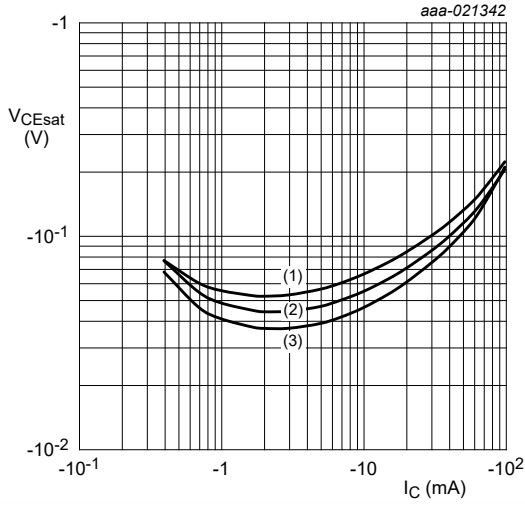


Fig. 25. PDTA114YQC: On-state input voltage as a function of collector current; typical values

50 V, 100 mA PNP resistor-equipped transistors

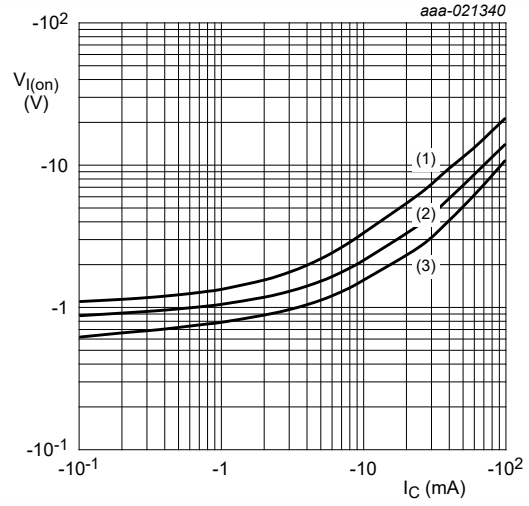


50 V, 100 mA PNP resistor-equipped transistors



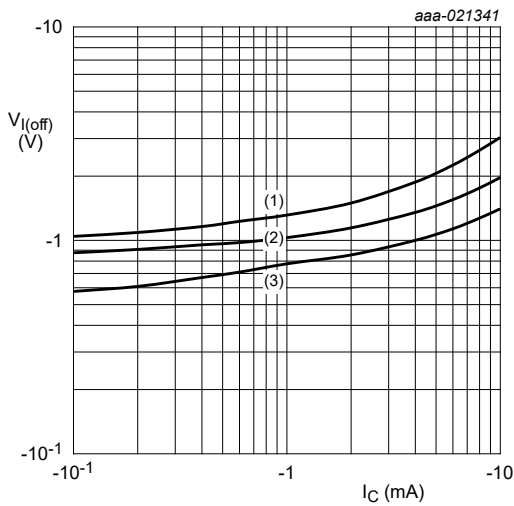
$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

Fig. 30. PDTA124XQC: Collector-emitter saturation voltage as a function of collector current; typical values



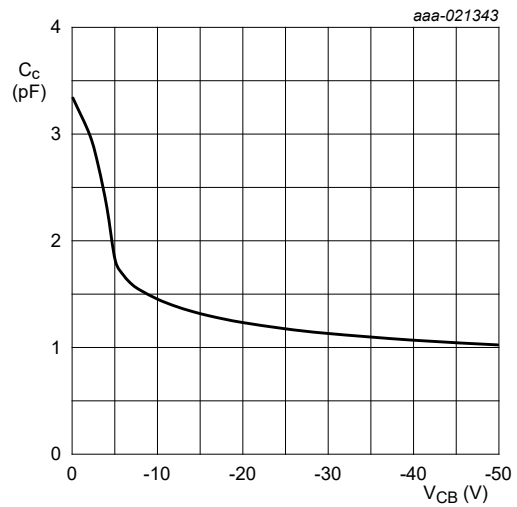
$V_{CE} = -0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 31. PDTA124XQC: 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) $T_{amb} = 100\text{ °C}$

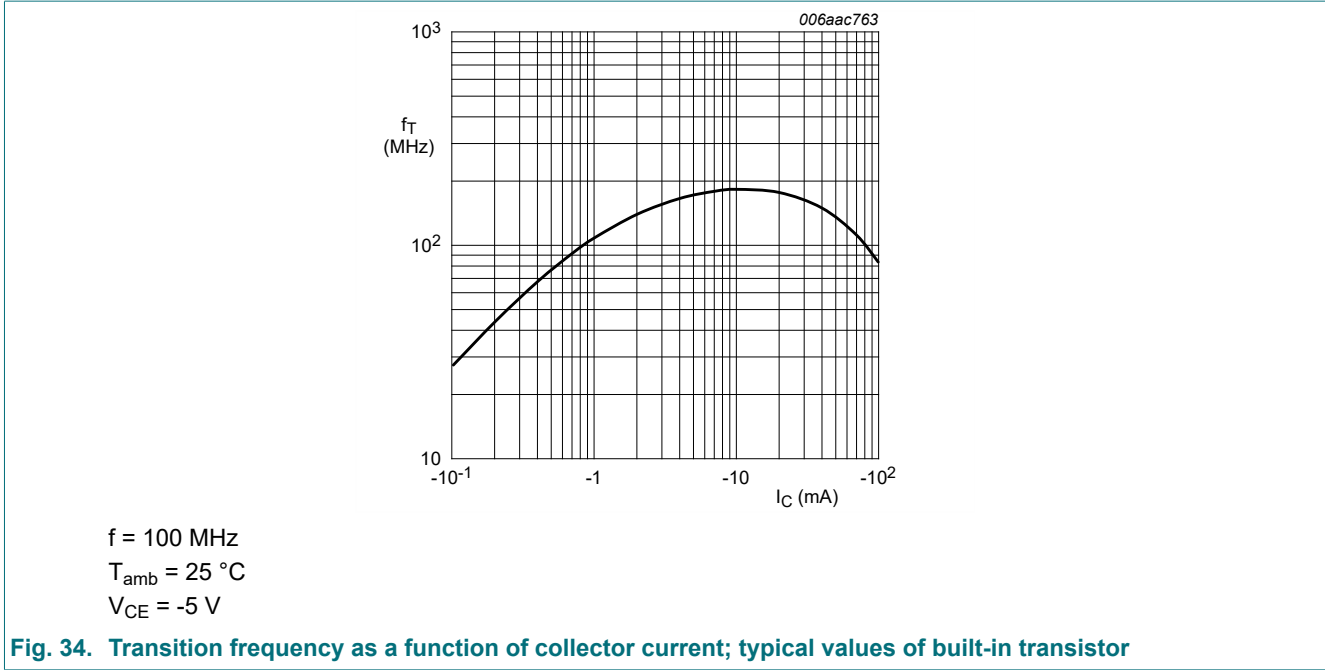
Fig. 32. PDTA124XQC: Off-state input voltage as a function of collector current; typical values



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

Fig. 33. PDTA124XQC: Collector capacitance as a function of collector-base voltage; typical values

50 V, 100 mA PNP resistor-equipped transistors



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)

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

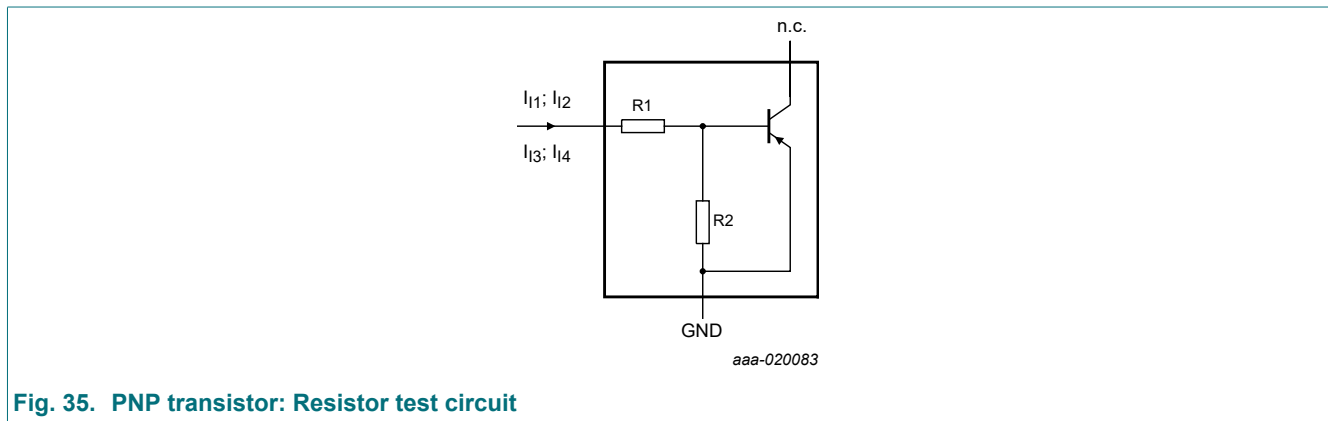


Fig. 35. PNP transistor: Resistor test circuit

Resistor test conditions

Table 9. Resistor test conditions

| Type number | R1 (kΩ) | R2 (kΩ) | Test conditions | | | |
|-------------|---------|---------|-----------------|-----------------|-----------------|-----------------|
| | | | I ₁₁ | I ₁₂ | I ₁₃ | I ₁₄ |
| PDTA143XQC | 4.7 | 10 | -350 μA | -450 μA | 350 μA | 450 μA |
| PDTA123JQC | 2.2 | 47 | -90 μA | -140 μA | 55 μA | 105 μA |
| PDTA143ZQC | 4.7 | 47 | -90 μA | -140 μA | 55 μA | 105 μA |
| PDTA114YQC | 10 | 47 | -90 μA | -140 μA | 55 μA | 105 μA |
| PDTA124XQC | 22 | 47 | -55 μA | -105 μA | 55 μA | 105 μA |

12. Package outline

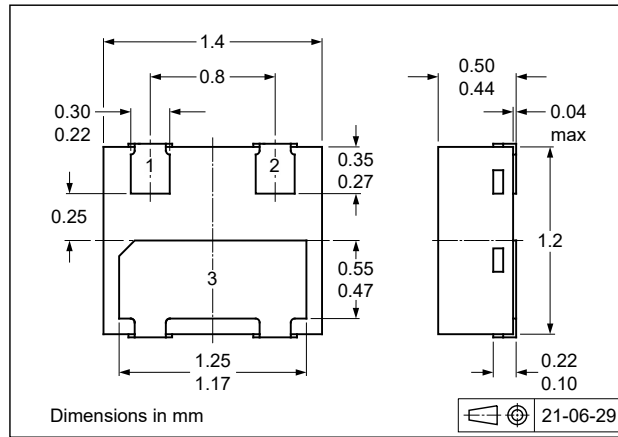


Fig. 36. Package outline DFN1412D-3 (SOT8009)

13. Soldering

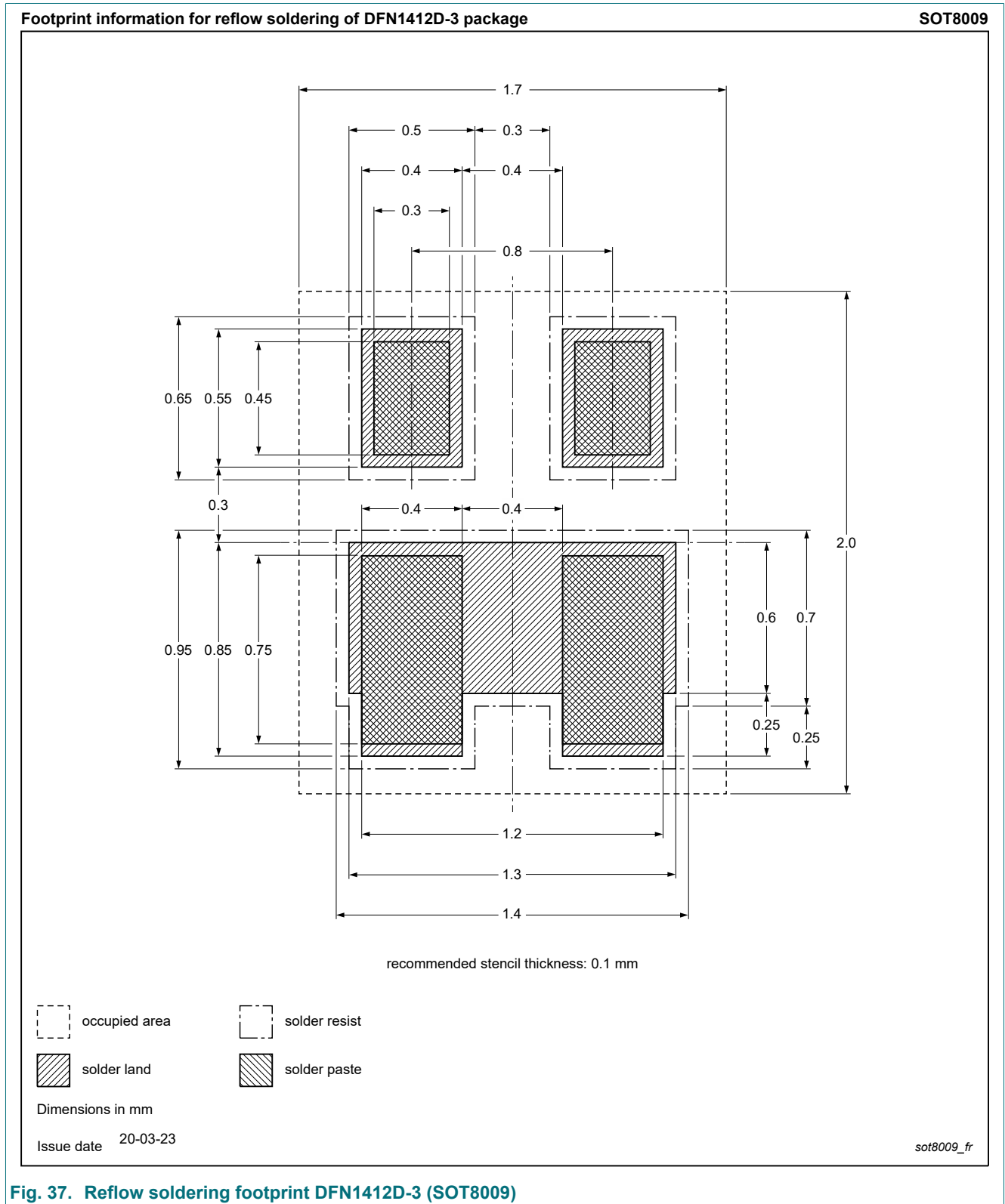


Fig. 37. Reflow soldering footprint DFN1412D-3 (SOT8009)

14. Revision history

Table 10. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------------------|--------------|--------------------|---------------|------------|
| PDTA143X_TO_124XQC_SER v.1 | 20210930 | 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. |

- [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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