



# PBSS5250PAS

50 V, 2 A PNP low V<sub>CEsat</sub> transistor

16 May 2024

Product data sheet

## 1. General description

PNP low V<sub>CEsat</sub> transistor in a DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Low collector-emitter saturation voltage V<sub>CEsat</sub>
- High collector current capability: I<sub>C</sub> and I<sub>CM</sub>
- Higher efficiency leading to less heat generation
- Reduced printed-circuit board requirements
- Leadless small SMD plastic package with solderable side pads
- Exposed heat sink for excellent thermal and electrical conductivity
- Suitable for Automatic Optical Inspection (AOI) of solder joint

## 3. Applications

- Loadswitch
  - Battery-driven devices
  - Power management
  - Charging circuits
- Power switches (e.g. motors, fans)

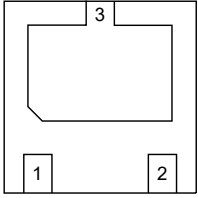
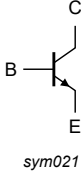
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	-50	V
I <sub>C</sub>	collector current		-	-	-2	A
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = -2 V; I <sub>C</sub> = -0.1 A; T <sub>amb</sub> = 25 °C	200	-	-	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>Transparent top view DFN2020D-3 (SOT1061D)</p>	 <p>sym021</p>
2	E	emitter		
2	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PBSS5250PAS</a>	DFN2020D-3	plastic, leadless thermal enhanced ultra thin small outline package with side-wettable flanks (SWF); no leads; 3 terminals; 1.3 mm pitch; 2 mm x 2 mm x 0.65 mm body	<a href="#">SOT1061D</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5250PAS	G5

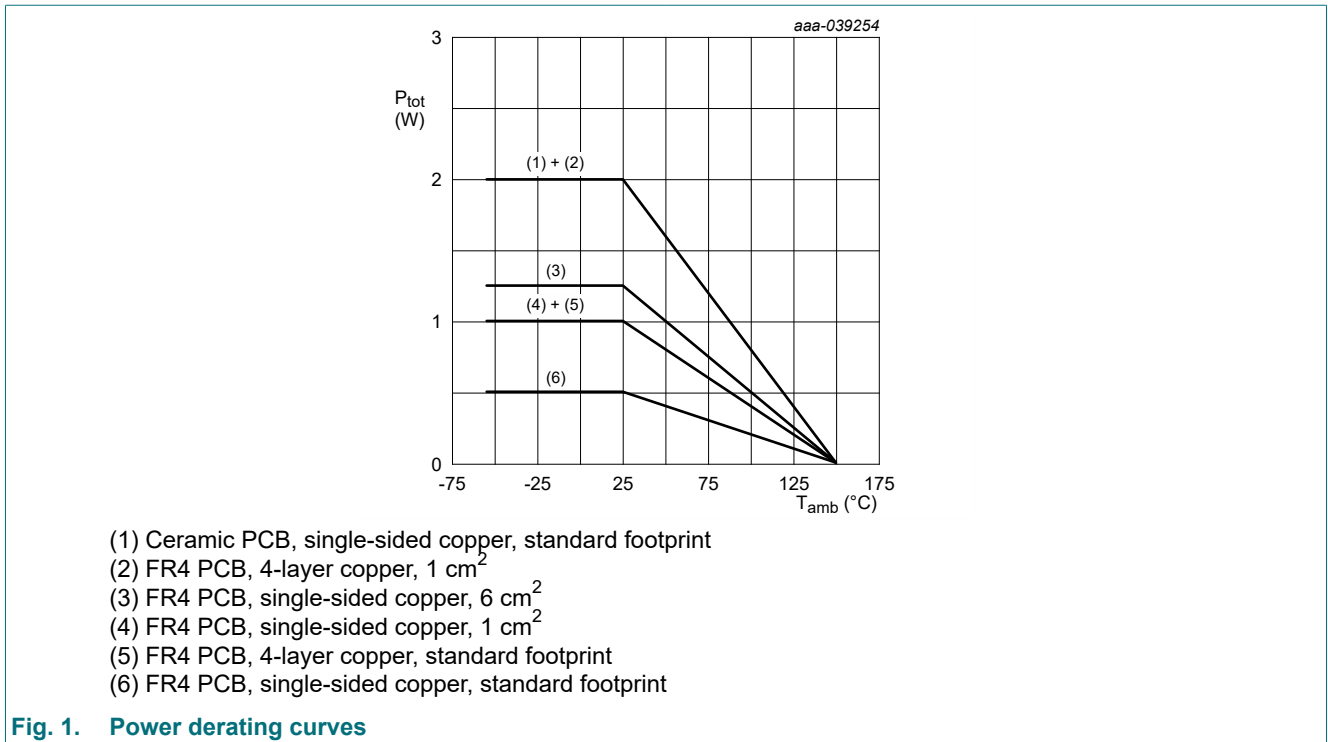
## 8. Limiting values

**Table 5. 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		-	-5	V
$I_C$	collector current			-	-2	A
$I_{CM}$	peak collector current	limited by $T_{j(max)}$		-	-5	A
$I_B$	base current			-	-0.5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	0.5	W
			[2] [3]	-	1	W
			[4]	-	1.2	W
			[5] [6]	-	2	W
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-65	150	°C
$T_{stg}$	storage temperature			-65	150	°C

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.
- [5] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub> standard footprint.
- [6] Device mounted on a FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>.



## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2] [3]	-	-	125	K/W
			[4]	-	-	100	K/W
			[5] [6]	-	-	60	K/W

- [1] Device mounted on an FR4 PCB, single-sided, 35  $\mu\text{m}$  copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided, 35  $\mu\text{m}$  copper, tin-plated, mounting pad for collector 1  $\text{cm}^2$ .
- [3] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 PCB, single-sided, 35  $\mu\text{m}$  copper, tin-plated, mounting pad for collector 6  $\text{cm}^2$ .
- [5] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.
- [6] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1  $\text{cm}^2$ .

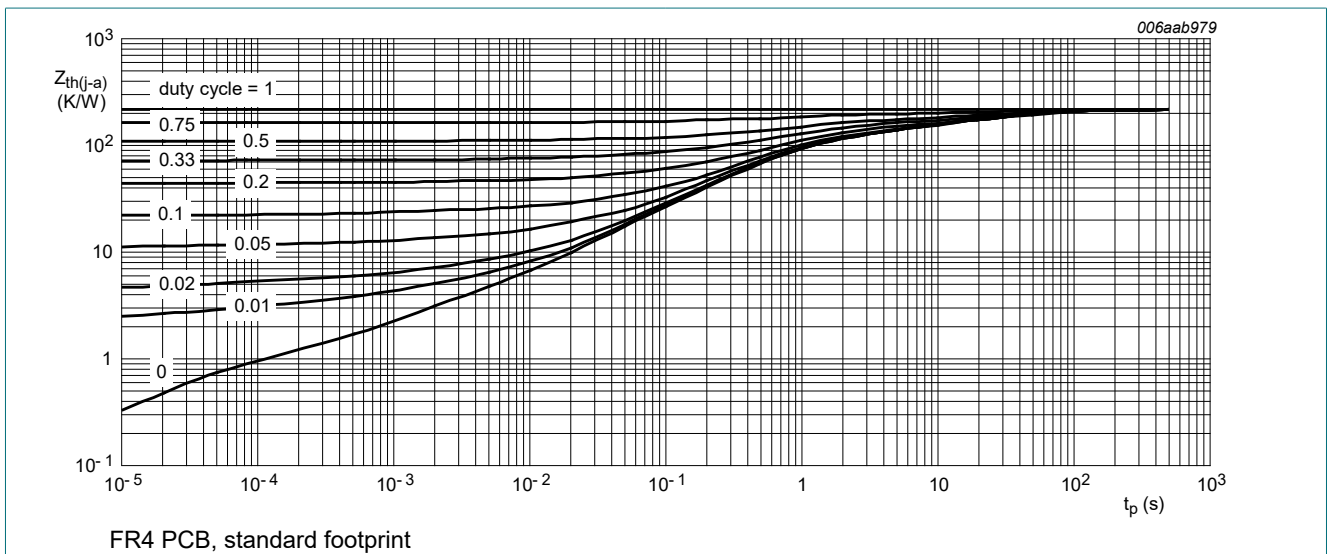


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

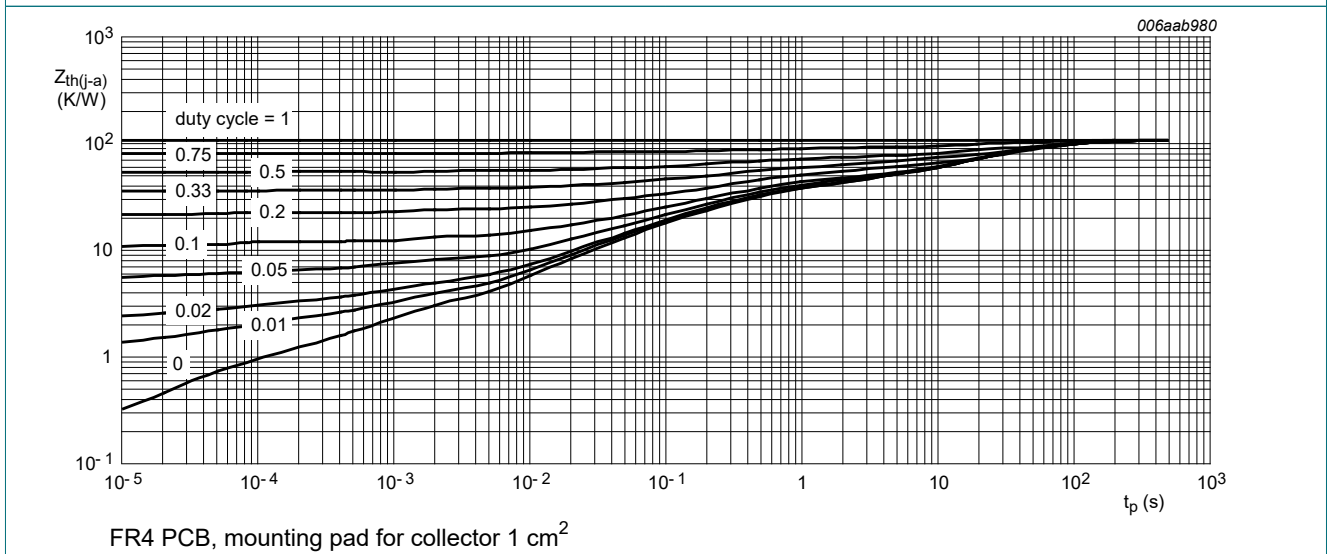


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

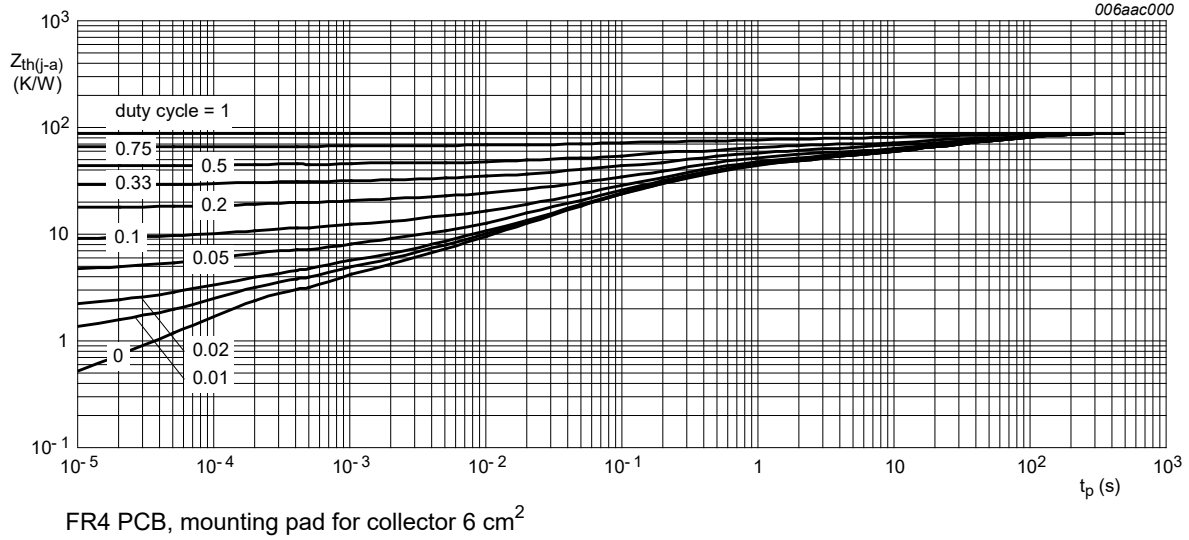


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

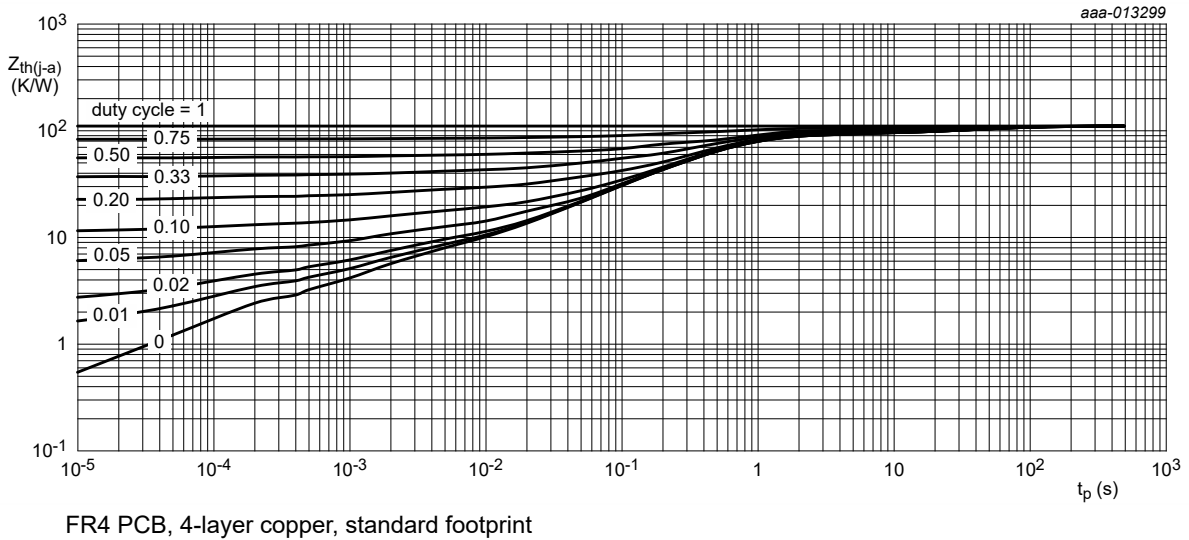


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

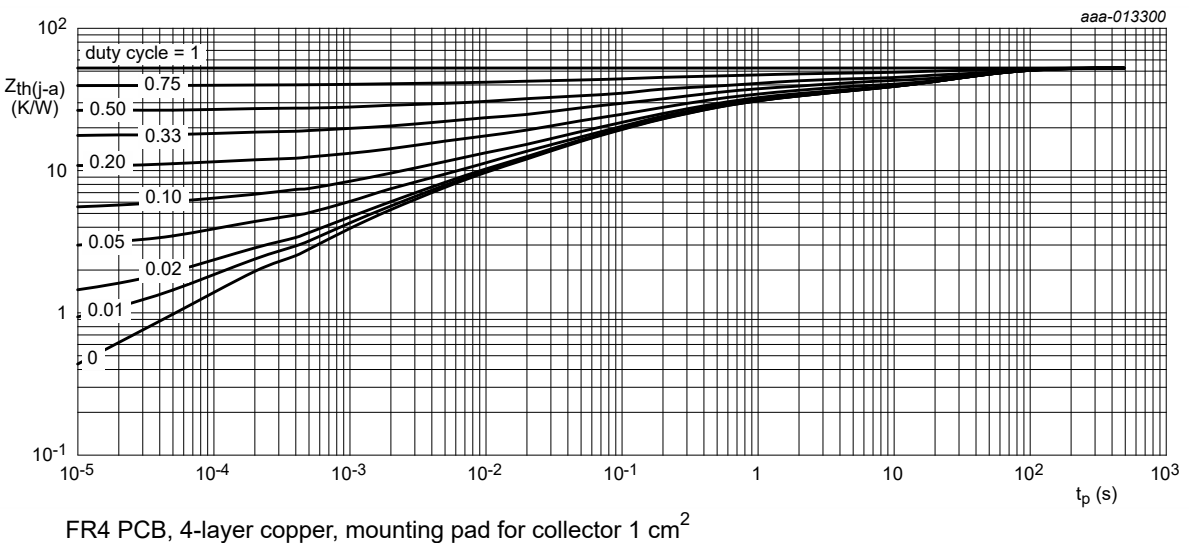
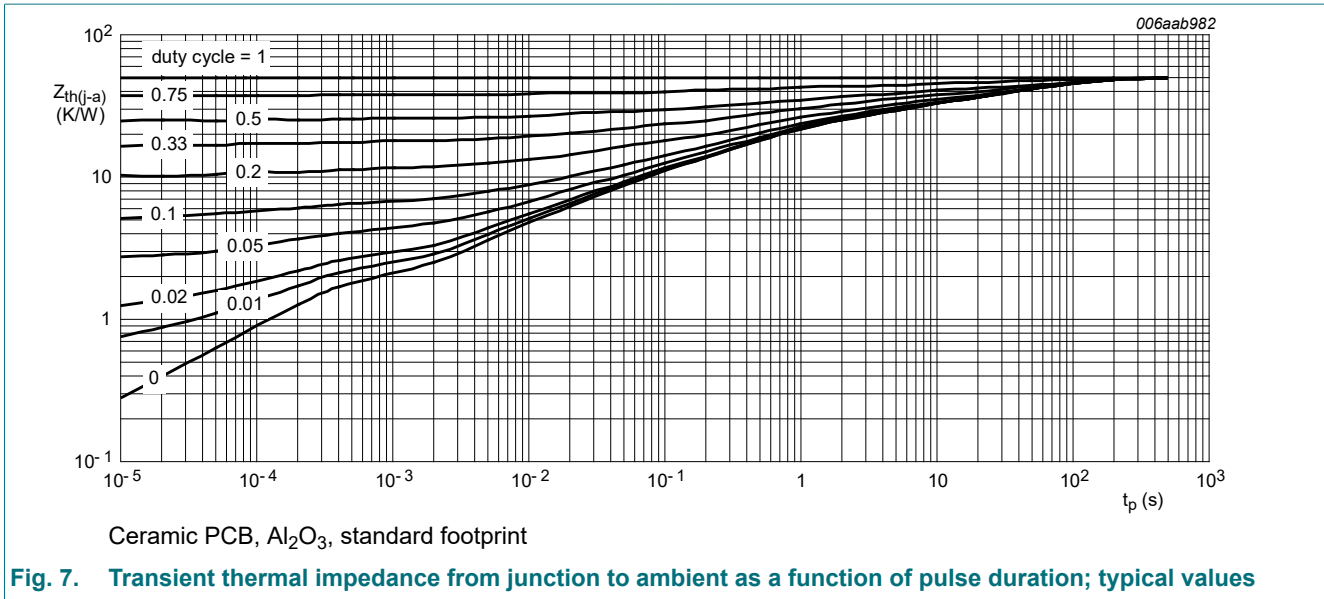


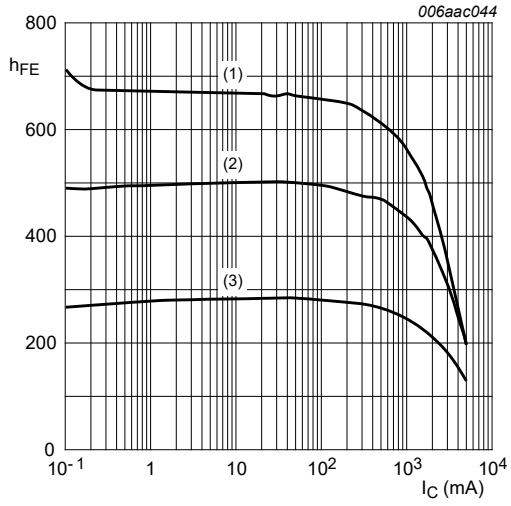
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

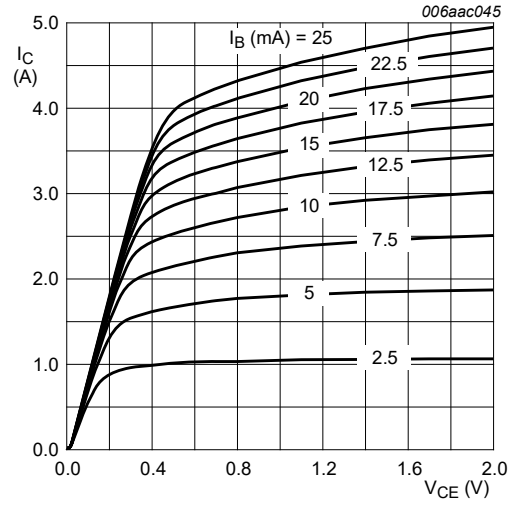
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100 \mu\text{A}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -2 \text{ mA}; I_B = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_E = -100 \mu\text{A}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-5	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -50 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
		$V_{CB} = -50 \text{ V}; I_E = 0 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	-	-50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5 \text{ V}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -50 \text{ V}; V_{BE} = 0 \text{ V}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2 \text{ V}; I_C = -0.1 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}; I_C = -0.5 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}; I_C = -1 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}; I_C = -2 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -0.5 \text{ A}; I_B = -50 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-90	mV
		$I_C = -1 \text{ A}; I_B = -50 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-250	mV
		$I_C = -2 \text{ A}; I_B = -100 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-380	mV
		$I_C = -2 \text{ A}; I_B = -200 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-320	mV
$R_{CEsat}$	collector-emitter saturation resistance		-	-	160	m $\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -2 \text{ A}; I_B = -100 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-1.1	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -2 \text{ V}; I_C = -1 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-1.1	-	-	V
$f_T$	transition frequency	$V_{CE} = -5 \text{ V}; I_C = -100 \text{ mA}; f = 100 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	35	pF



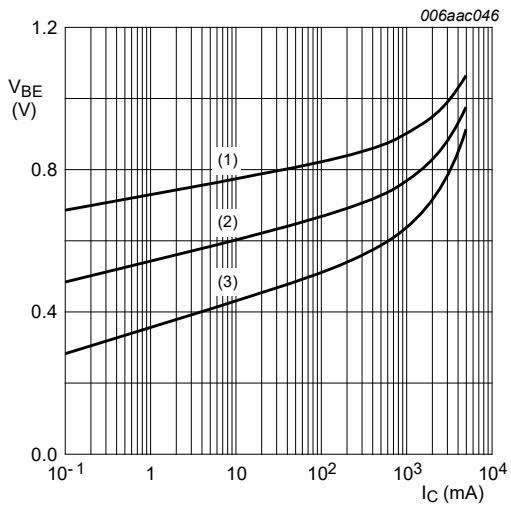
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 8. DC current gain as a function of collector current; typical values**



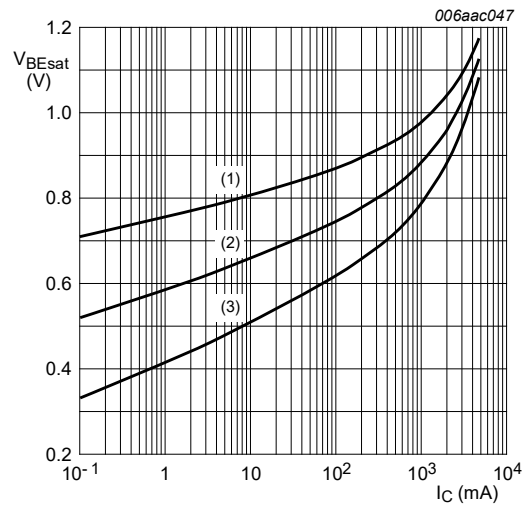
$T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig. 9. Collector current as a function of collector-emitter voltage; typical values**



$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

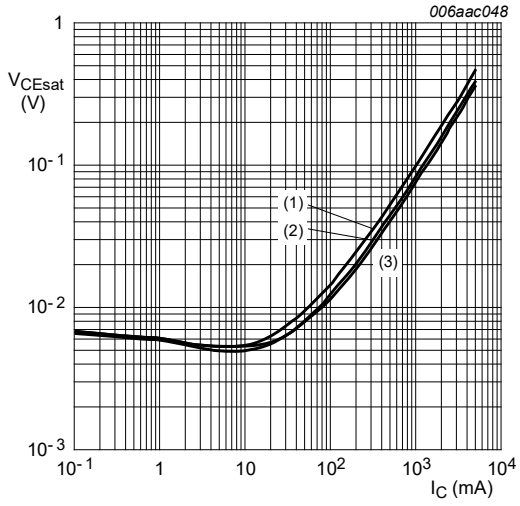
**Fig. 10. Base-emitter voltage as a function of collector current; typical values**



$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

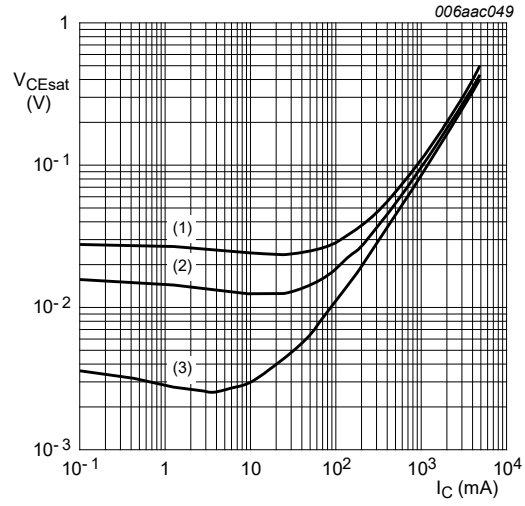
**Fig. 11. Base-emitter saturation voltage as a function of collector current; typical values**





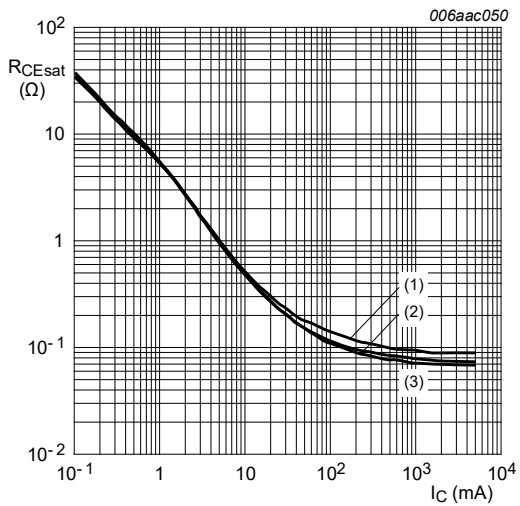
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



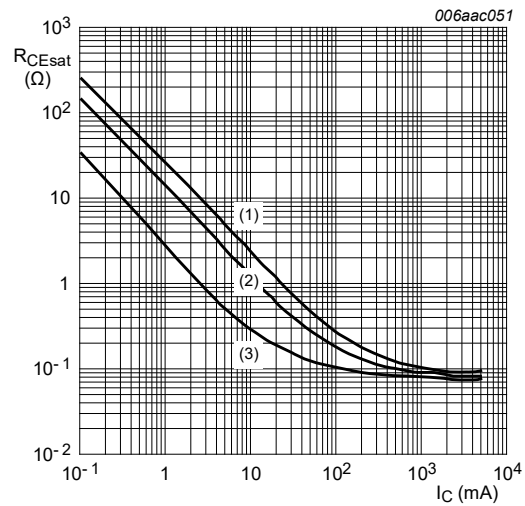
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

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



$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

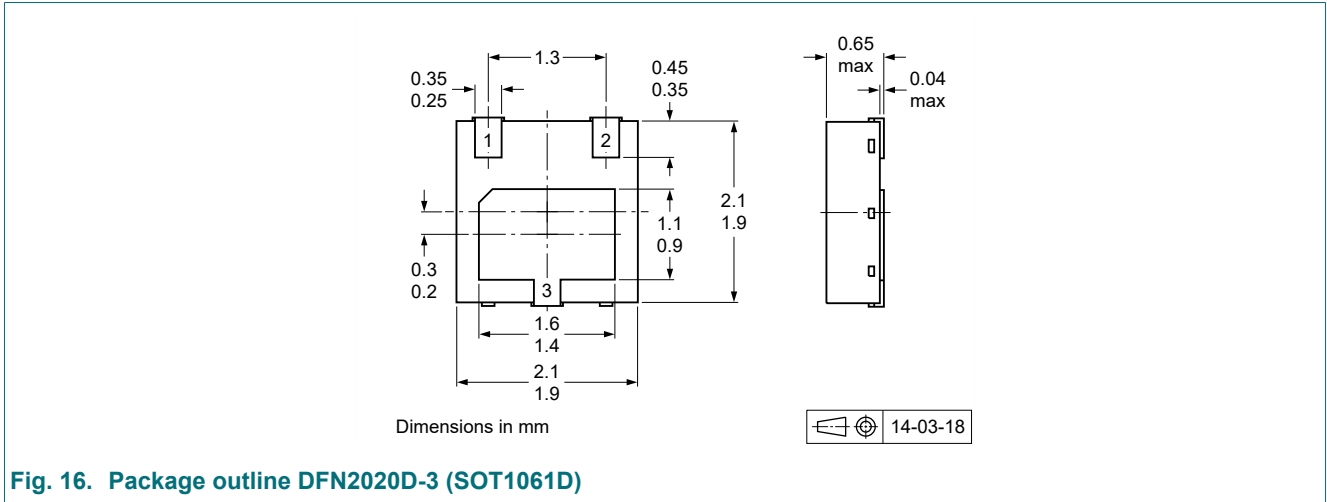
**Fig. 14. Collector-emitter saturation resistance as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

**Fig. 15. Collector-emitter saturation resistance as a function of collector current; typical values**

## 11. Package outline



## 12. Soldering

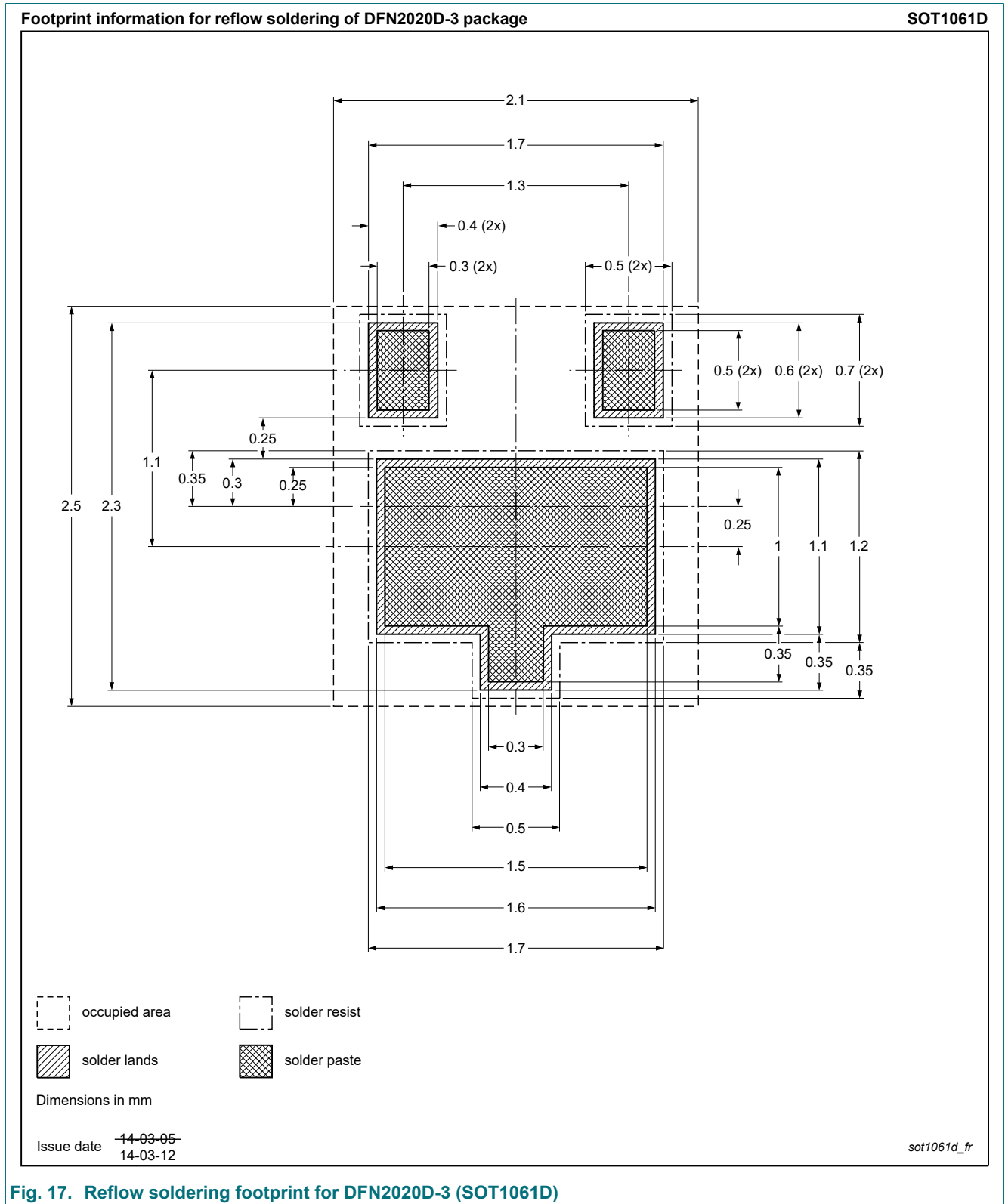


Fig. 17. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

### 13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5250PAS v.1	20240516	Product data sheet	-	-

## 14. 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.
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Date of release: 16 May 2024

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