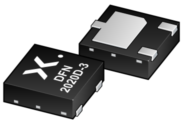


PBSS5250PAS-Q

50 V, 2 A PNP low VCEsat transistor

28 August 2024

Product data sheet

1. General description

PNP low V_{CEsat} transistor in a DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- 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
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

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

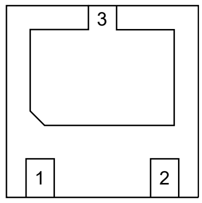
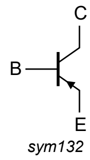
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-50	V
I_C	collector current			-	-	-2	A
h_{FE}	DC current gain	V_{CE} = -2 V; I_C = -0.1 A; T_{amb} = 25 °C		200	-	-	

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5250PAS-Q	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	SOT1061D

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5250PAS-Q	G5

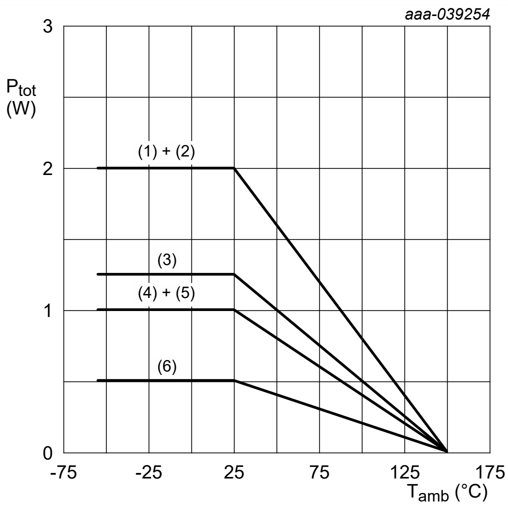
8. Limiting values

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	$T_{amb} \leq 25$ °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^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 copper, tin-plated, mounting pad for collector 6 cm^2.
[5] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.
[6] Device mounted on a FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm^2.



(1) Ceramic PCB, single-sided copper, standard footprint
(2) FR4 PCB, 4-layer copper, 1 cm^2
(3) FR4 PCB, single-sided copper, 6 cm^2
(4) FR4 PCB, single-sided copper, 1 cm^2
(5) FR4 PCB, 4-layer copper, standard footprint
(6) FR4 PCB, single-sided copper, standard footprint

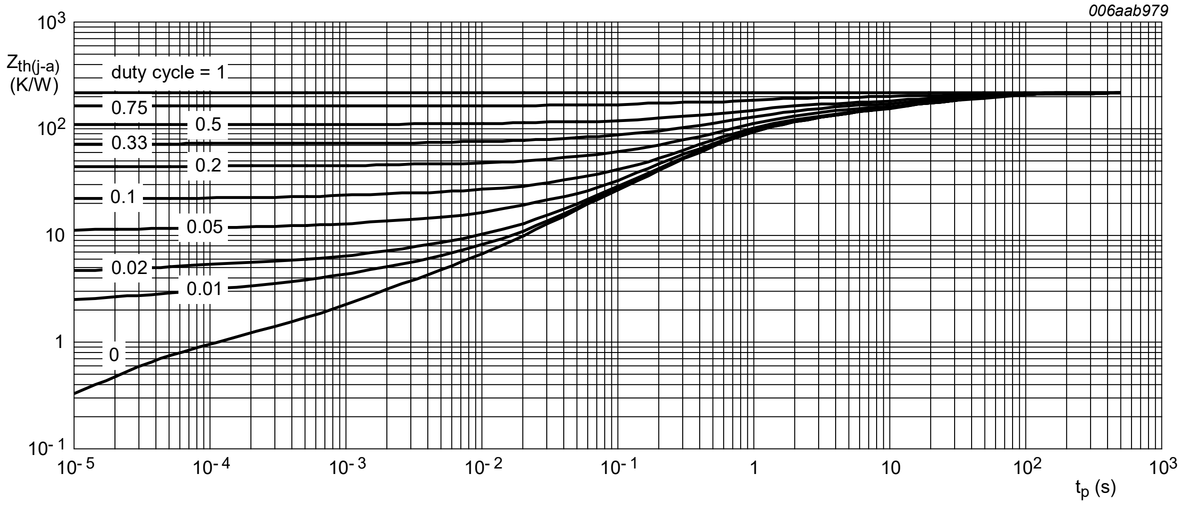
Fig. 1. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

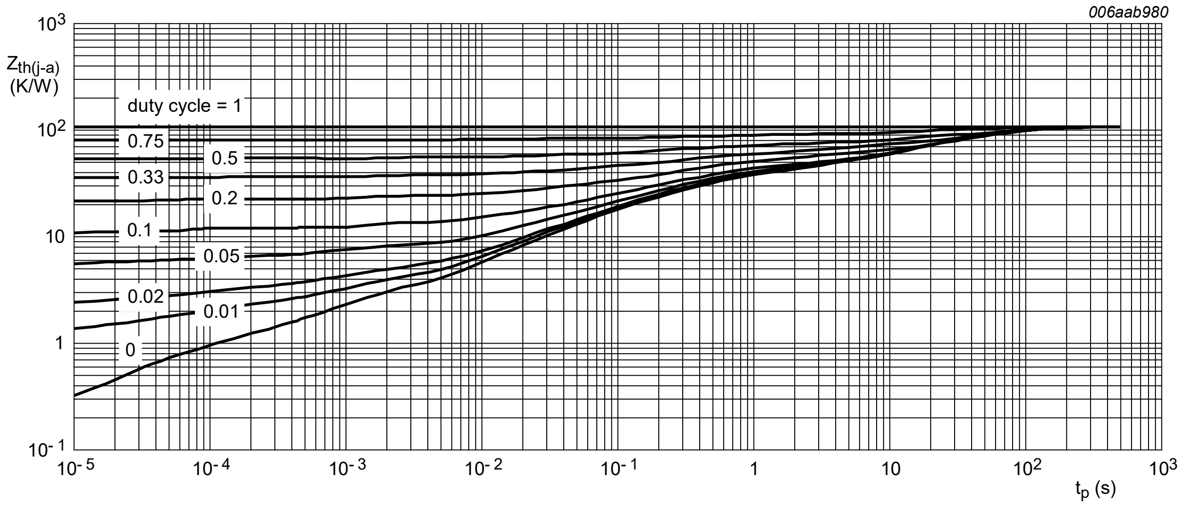
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2] [3]	-	-	125	K/W
			[4]	-	-	100	K/W
			[5] [6]	-	-	60	K/W

[1] Device mounted on an FR4 PCB, single-sided, 35 µm copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided, 35 µm copper, tin-plated, mounting pad for collector 1 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 µm copper, tin-plated, mounting pad for collector 6 cm^2.
[5] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.
[6] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm^2.



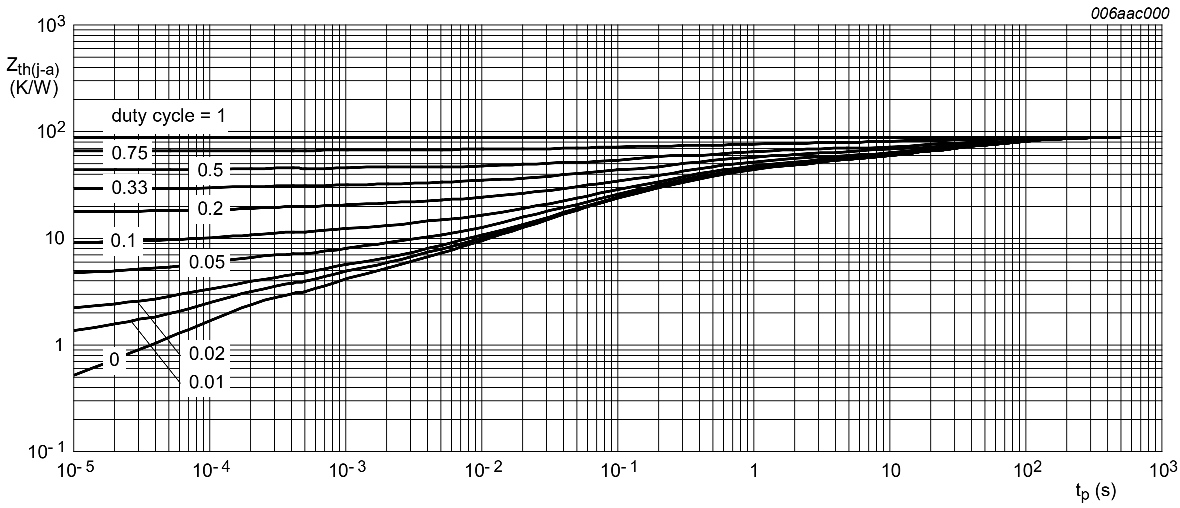
FR4 PCB, standard footprint

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



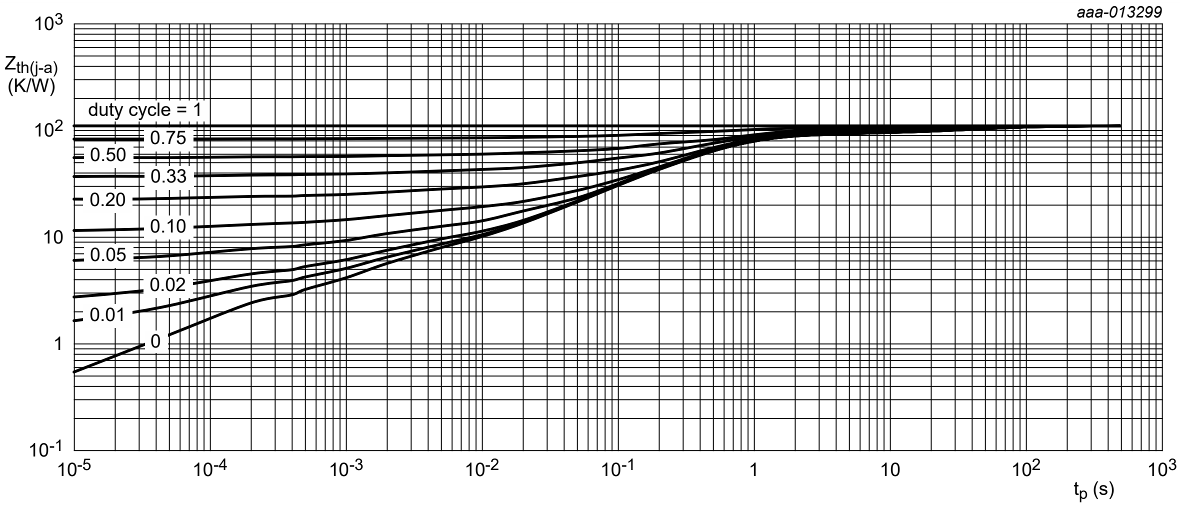
FR4 PCB, mounting pad for collector 1 cm^2

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



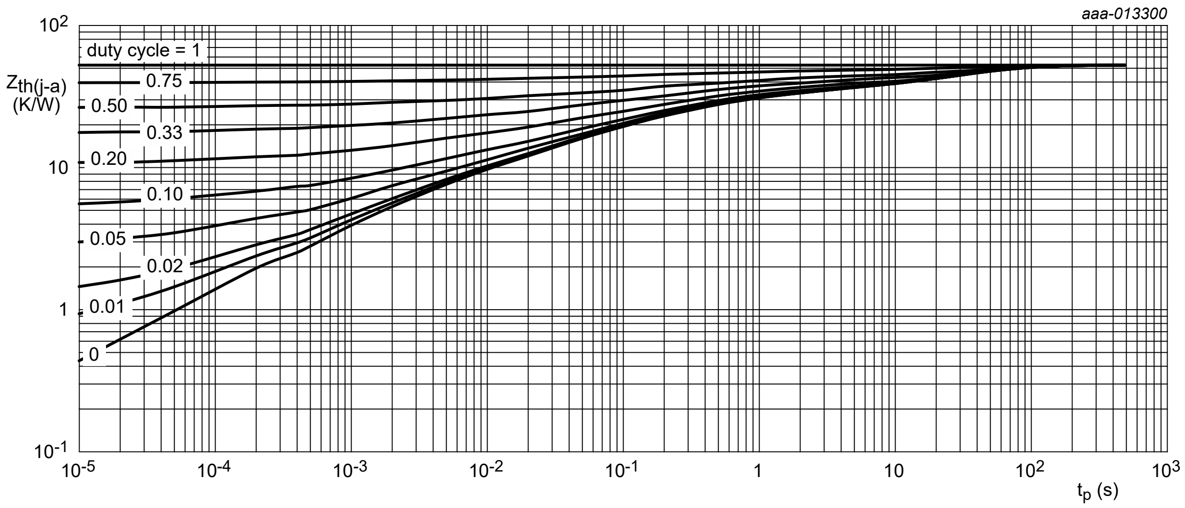
FR4 PCB, mounting pad for collector 6 cm^2

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



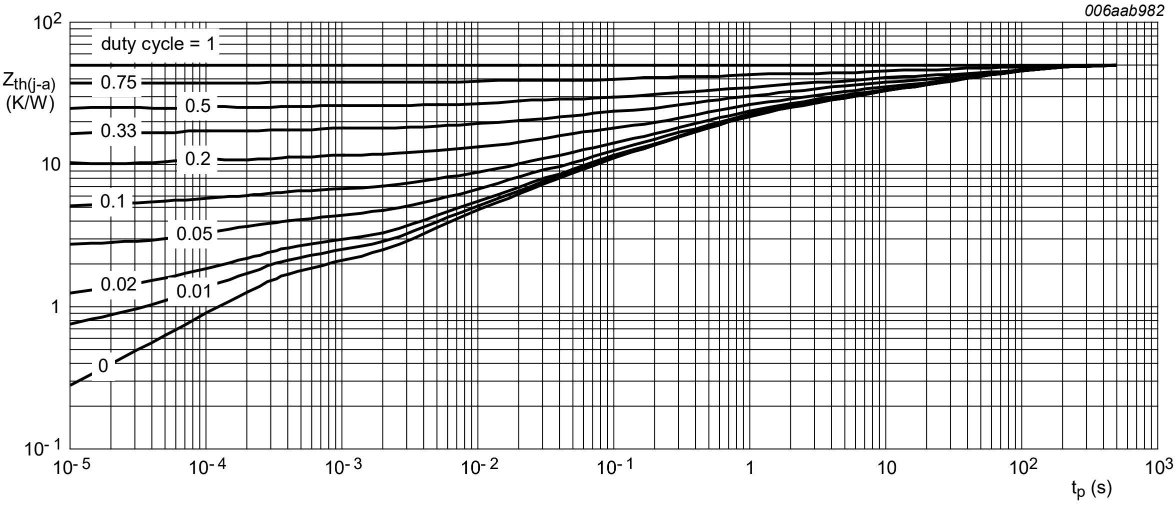
FR4 PCB, 4-layer copper, standard footprint

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



FR4 PCB, 4-layer copper, mounting pad for collector 1 cm^2

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



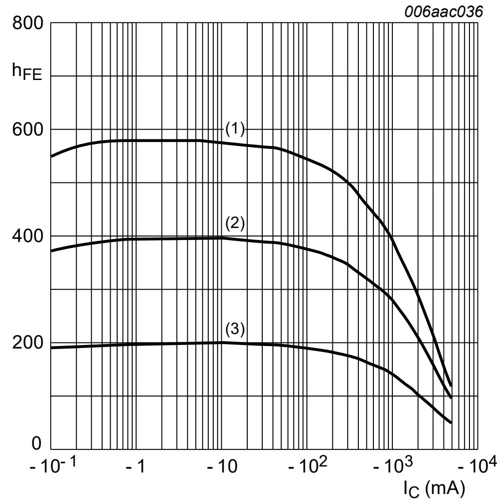
Ceramic PCB, Al_2O_3, standard footprint

Fig. 7. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

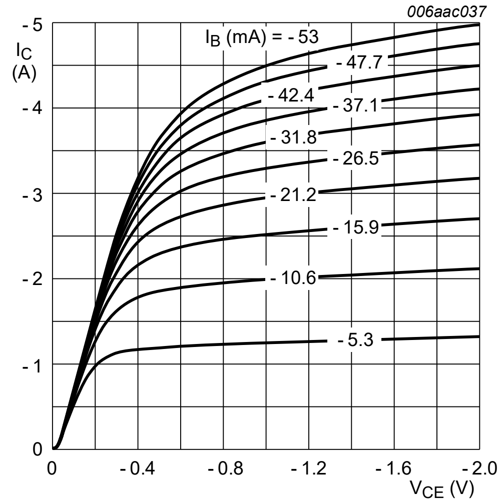
Table 7. Characteristics

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



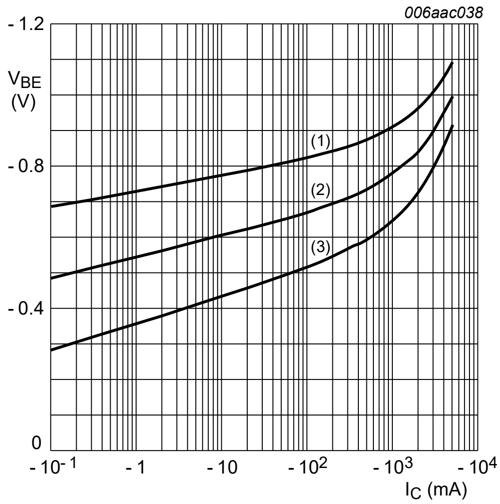
$V_{CE} = −2$ V
(1) $T_{amb} = 100$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = −55$ °C

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



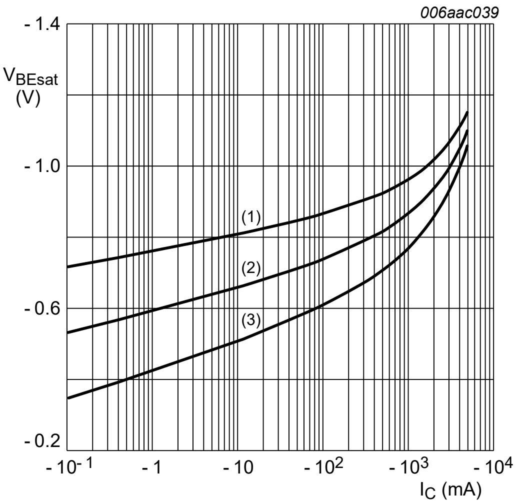
$T_{amb} = 25$ °C

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



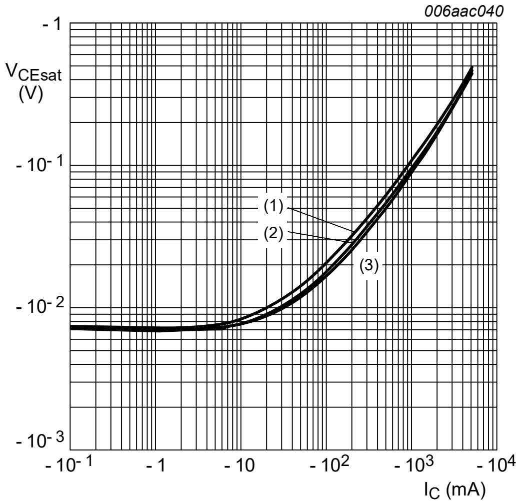
$V_{CE} = −2$ V
(1) $T_{amb} = −55$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = 100$ °C

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



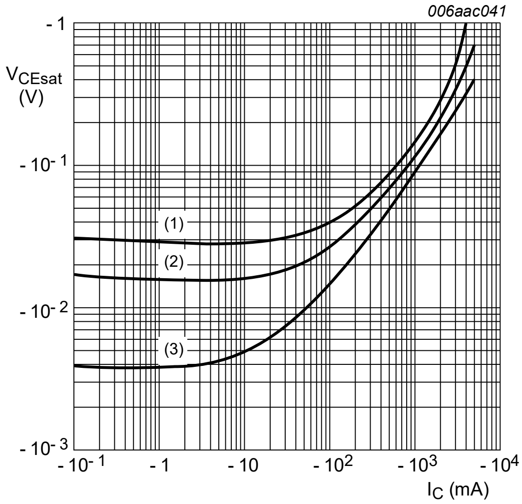
$I_C/I_B = 20$
(1) $T_{amb} = −55$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = 100$ °C

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



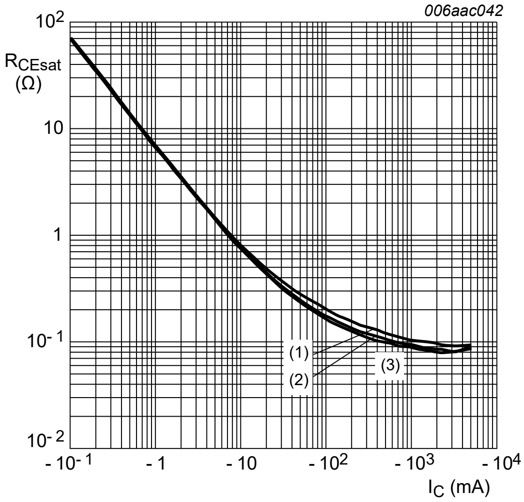
$I_C/I_B = 20$
(1) $T_{amb} = 100$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = -55$ °C

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



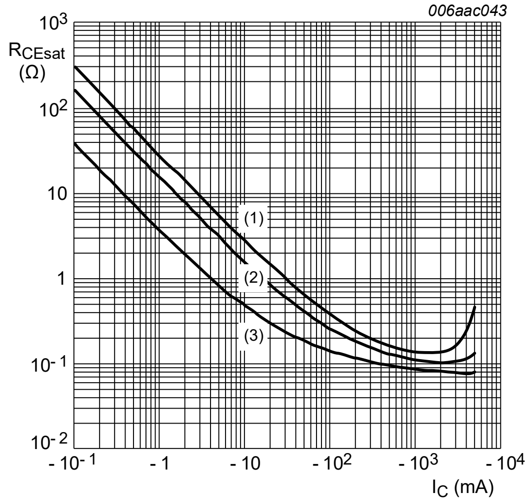
$T_{amb} = 25$ °C
(1) $I_C/I_B = 100$
(2) $I_C/I_B = 50$
(3) $I_C/I_B = 10$

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



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

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



$T_{amb} = 25$ °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. Test information

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.

12. Package outline

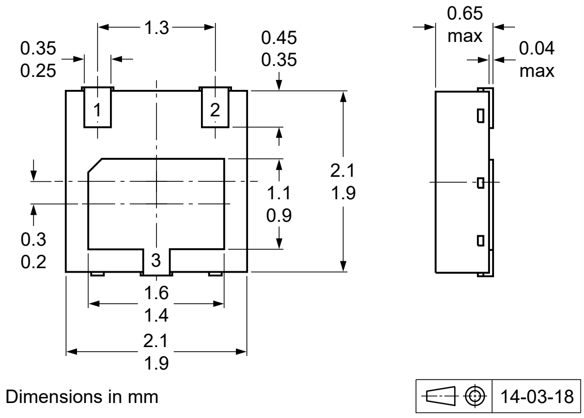


Fig. 16. Package outline DFN2020D-3 (SOT1061D)

13. Soldering

Footprint information for reflow soldering of DFN2020D-3 package **SOT1061D**

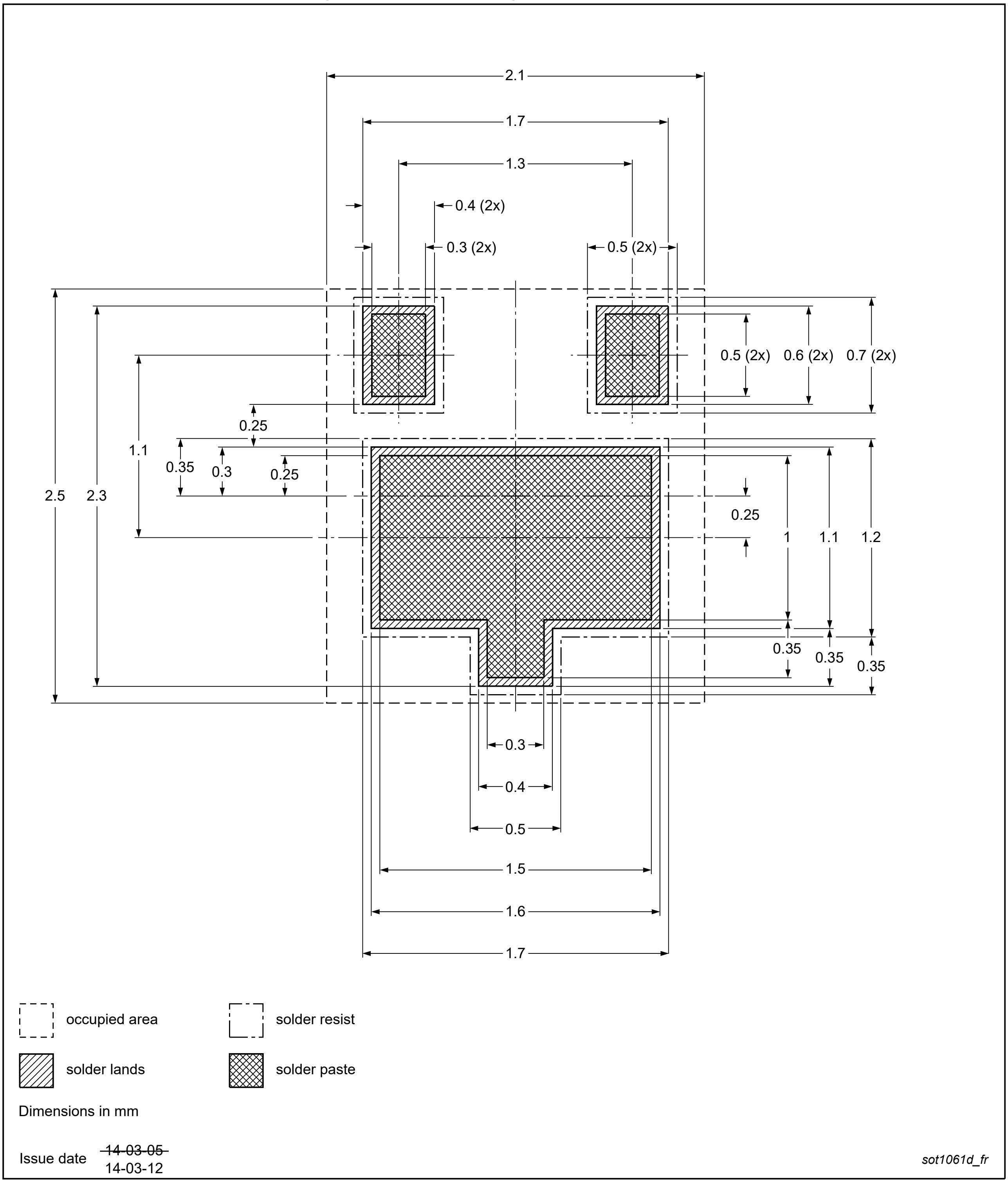


Fig. 17. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5250PAS-Q v.3	20240828	Product data sheet	-	PBSS5250PAS-Q v.2
Modifications:	• Pinning: Typo corrected			
PBSS5250PAS-Q v.2	20240807	Product data sheet	-	PBSS5250PAS-Q v.1
PBSS5250PAS-Q v.1	20240516	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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