



BSR33PAS-Q

80 V, 1 A PNP medium power transistor

9 September 2024

Product data sheet

1. General description

PNP medium power transistors in an ultra thin DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package with medium power capability and Side-Wettable Flanks (SWF).

2. Features and benefits

- High collector current capability I_C and I_{CM}
- Reduced Printed-Circuit Board (PCB) area requirements
- Leadless small SMD plastic package with solderable side pads
- Exposed heatsink for excellent thermal and electrical conductivity
- Suitable for Automatic Optical Inspection (AOI) of solder point
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Linear voltage regulators
- High-side switches
- Battery-driven devices
- MOSFET drivers
- Amplifiers

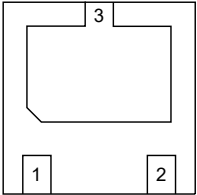
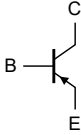
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	-80	V
I_C	collector current		-	-	-1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-2	A
h_{FE}	DC current gain	$V_{CE} = -5$ V; $I_C = -100$ mA; pulsed; $t_p \leq 300$ μ s; $\delta \leq 0.01$; $T_{amb} = 25$ °C	100	-	300	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 Transparent top view DFN2020D-3 (SOT1061D)	 006aaa231
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BSR33PAS-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
BSR33PAS-Q	G3

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		-	-90	V
V _{CEO}	collector-emitter voltage	open base		-	-80	V
V _{EBO}	emitter-base voltage	open collector		-	-5	V
I _C	collector current			-	-1	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	-2	A
I _{BM}	peak base current			-	-200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	0.48	W
			[2]	-	1	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 Printed-Circuit Board (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 cm².

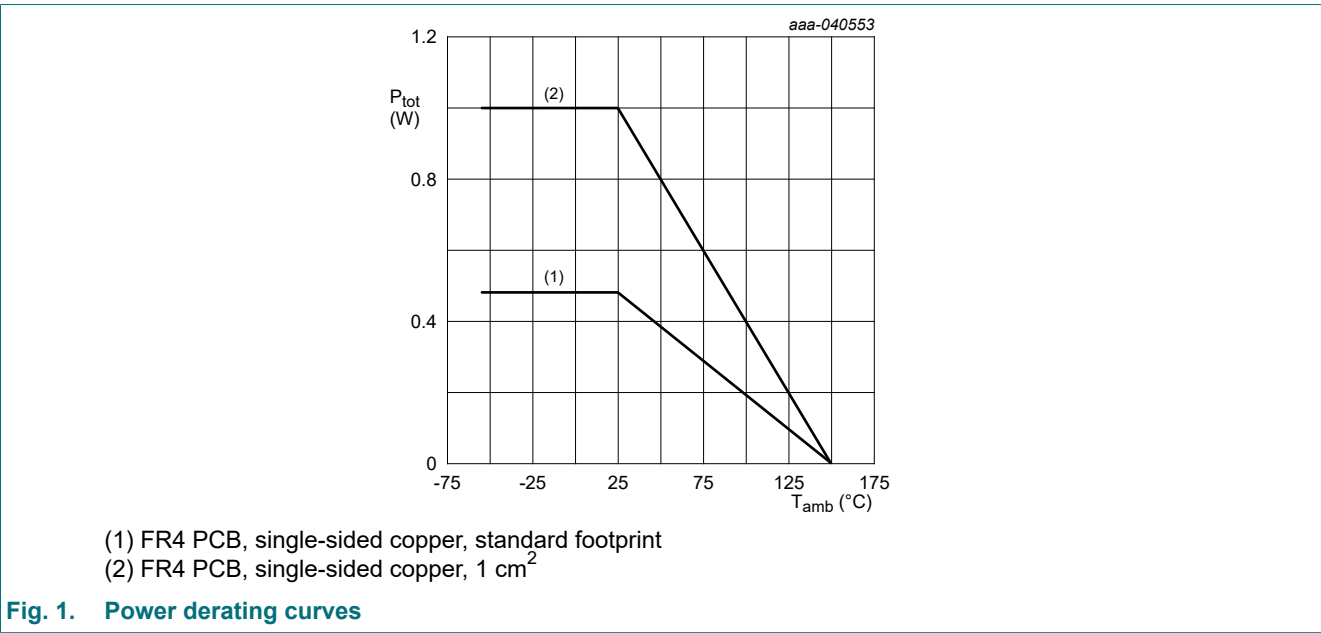


Fig. 1. Power derating curves

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]	-	-	260	K/W
			[2]	-	-	125	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	12	K/W

- [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 cm².

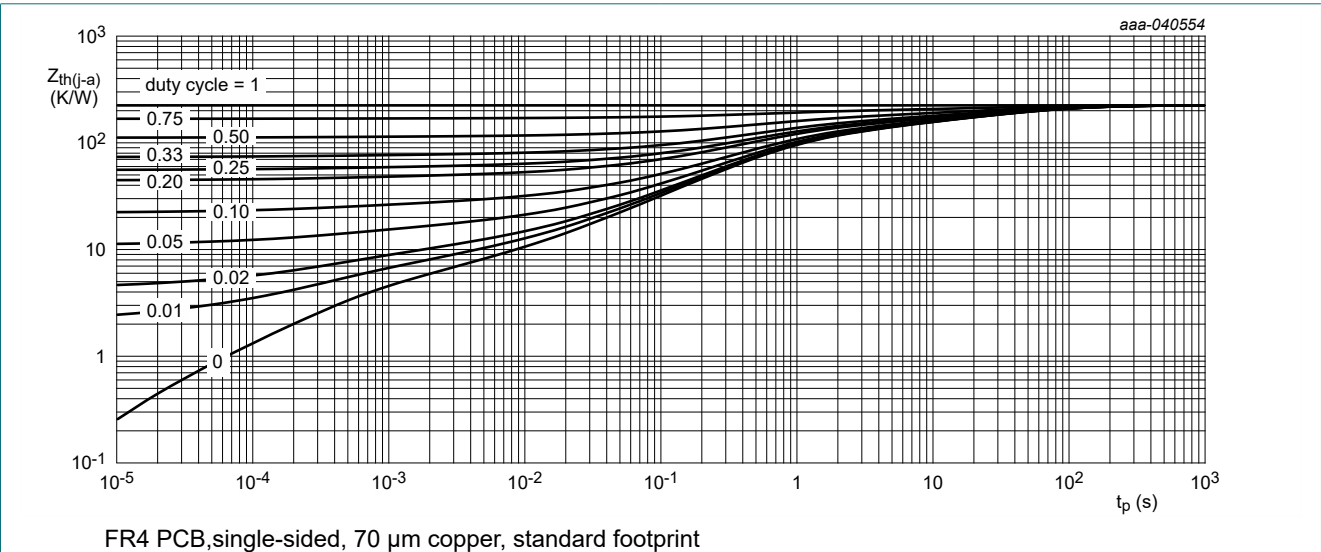


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

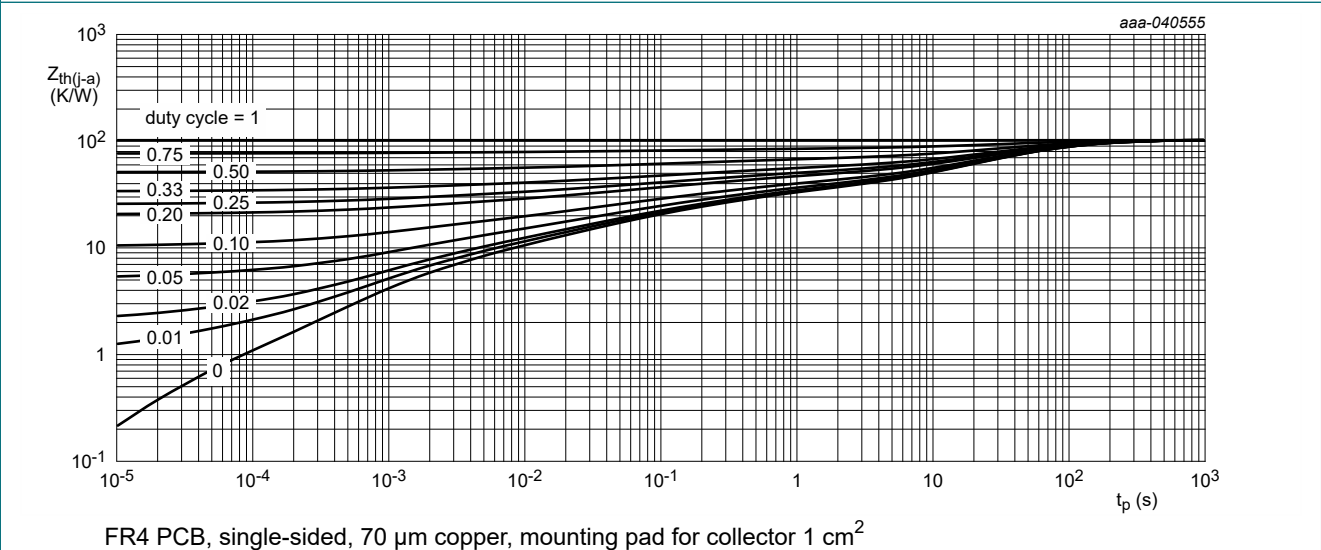
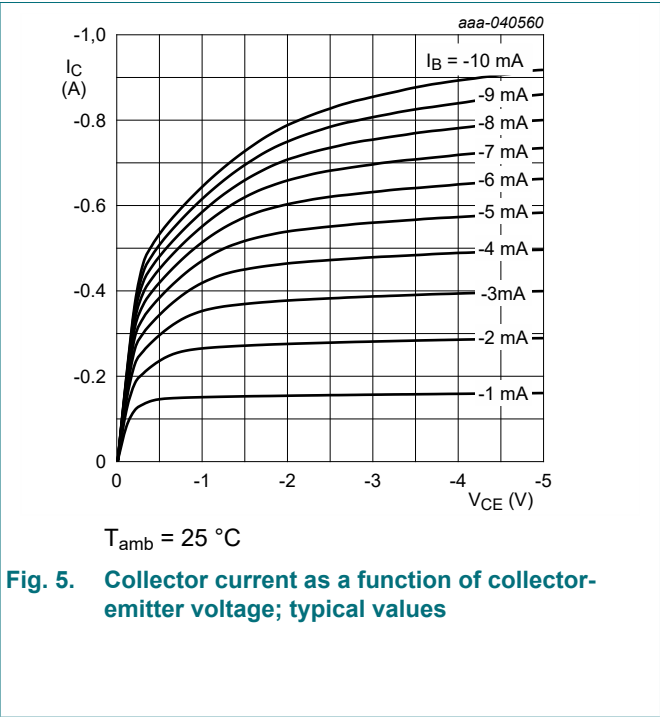
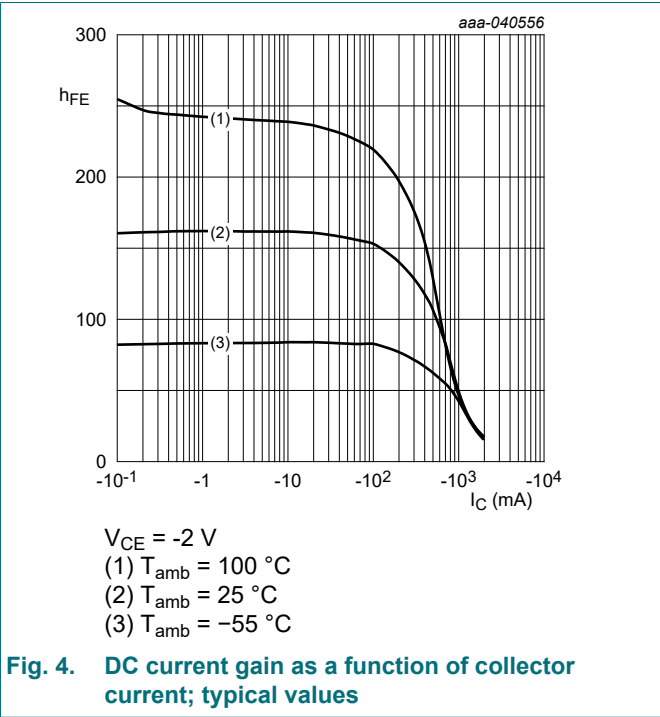


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current (emitter open)	$V_{CB} = -60\text{ V}$; $I_E = 0\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-100	nA
		$V_{CB} = -60\text{ V}$; $I_E = 0\text{ A}$; $T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{EBO}	emitter-base cut-off current (collector open)	$V_{EB} = -5\text{ V}$; $I_C = 0\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-100	nA
h_{FE}	DC current gain	$V_{CE} = -5\text{ V}$; $I_C = -100\text{ }\mu\text{A}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	30	-	-	
		$V_{CE} = -5\text{ V}$; $I_C = -100\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	100	-	300	
		$V_{CE} = -5\text{ V}$; $I_C = -500\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	50	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -150\text{ mA}$; $I_B = -15\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-0.25	V
		$I_C = -500\text{ mA}$; $I_B = -50\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-0.5	V
V_{BEsat}	base-emitter saturation voltage	$I_C = -150\text{ mA}$; $I_B = -15\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-1	V
		$I_C = -500\text{ mA}$; $I_B = -50\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-1.2	V
f_T	transition frequency	$V_{CE} = -10\text{ V}$; $I_C = -50\text{ mA}$; $f = 100\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	100	-	-	MHz



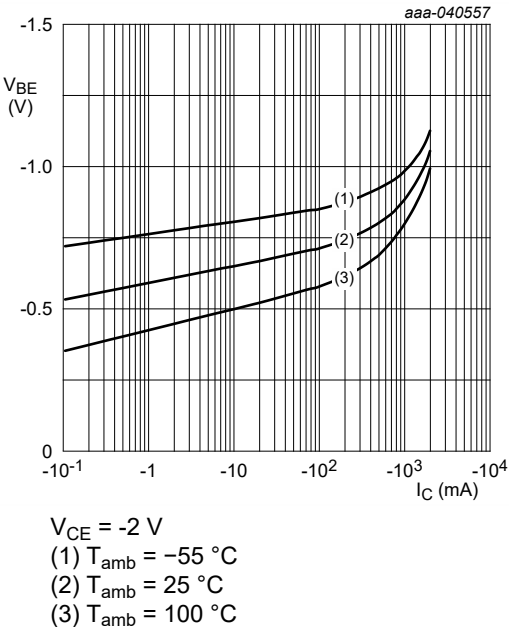


Fig. 6. Base-emitter voltage as a function of collector current; typical values

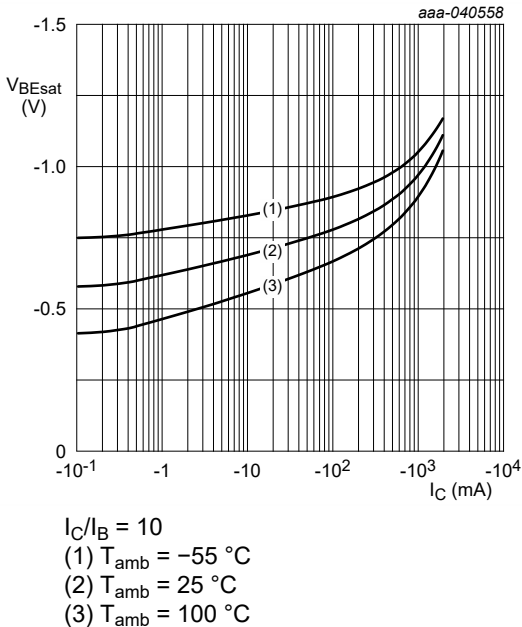


Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values

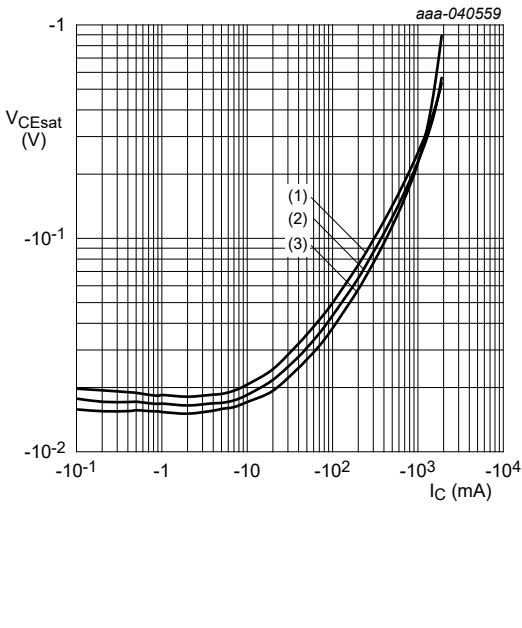


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

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

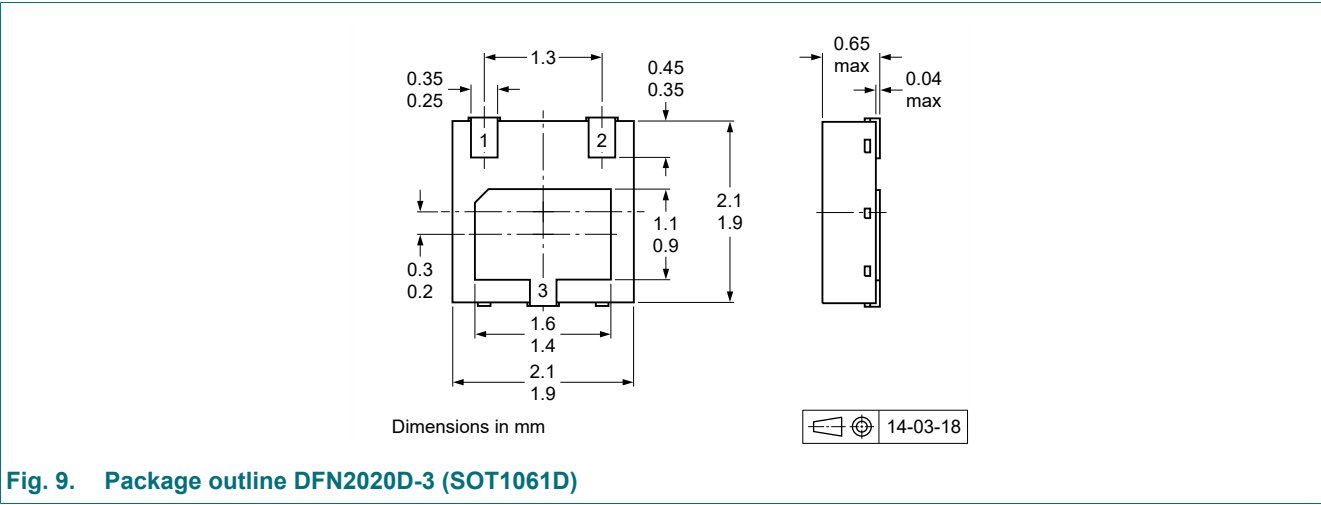


Fig. 9. Package outline DFN2020D-3 (SOT1061D)

13. Soldering

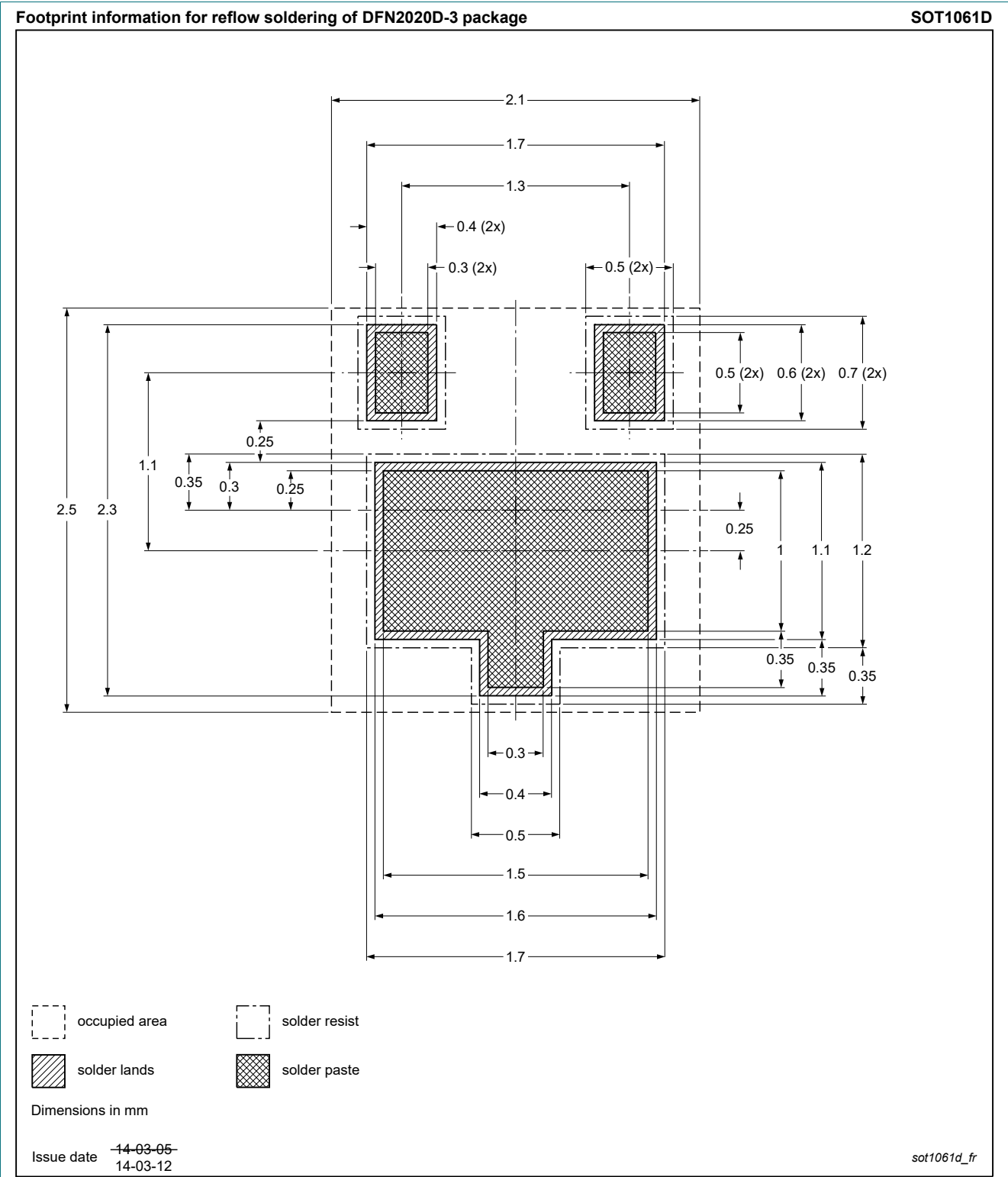


Fig. 10. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BSR33PAS-Q v.1	20240909	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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- [2] The term 'short data sheet' is explained in section "Definitions".
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