



# PBSS5360PAS

60 V, 3 A PNP low V<sub>CEsat</sub> transistor

u1E1bFbf

Product data sheet

## 1. General description

PNP low V<sub>CEsat</sub> transistor, encapsulated in an ultra thin DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package with medium power capability and visible and solderable side pads.

NPN complement: PBSS4360PAS

## 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>
- High collector current gain (h<sub>FE</sub>) at high I<sub>C</sub>
- High efficiency due to less heat generation
- High temperature applications up to 175 °C
- Reduced Printed-Circuit Board (PCB) area 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

### 2.1. Applications

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

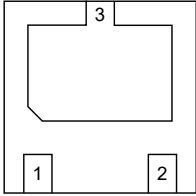
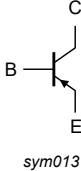
## 3. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	-60	V
I <sub>C</sub>	collector current		-	-	-3	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	-	-6	A
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = -3 A; I <sub>B</sub> = -300 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	87	150	mΩ

## 4. 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>sym013</p>
2	E	emitter		
3	C	collector		

## 5. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PBSS5360PAS</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>

## 6. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5360PAS	EA

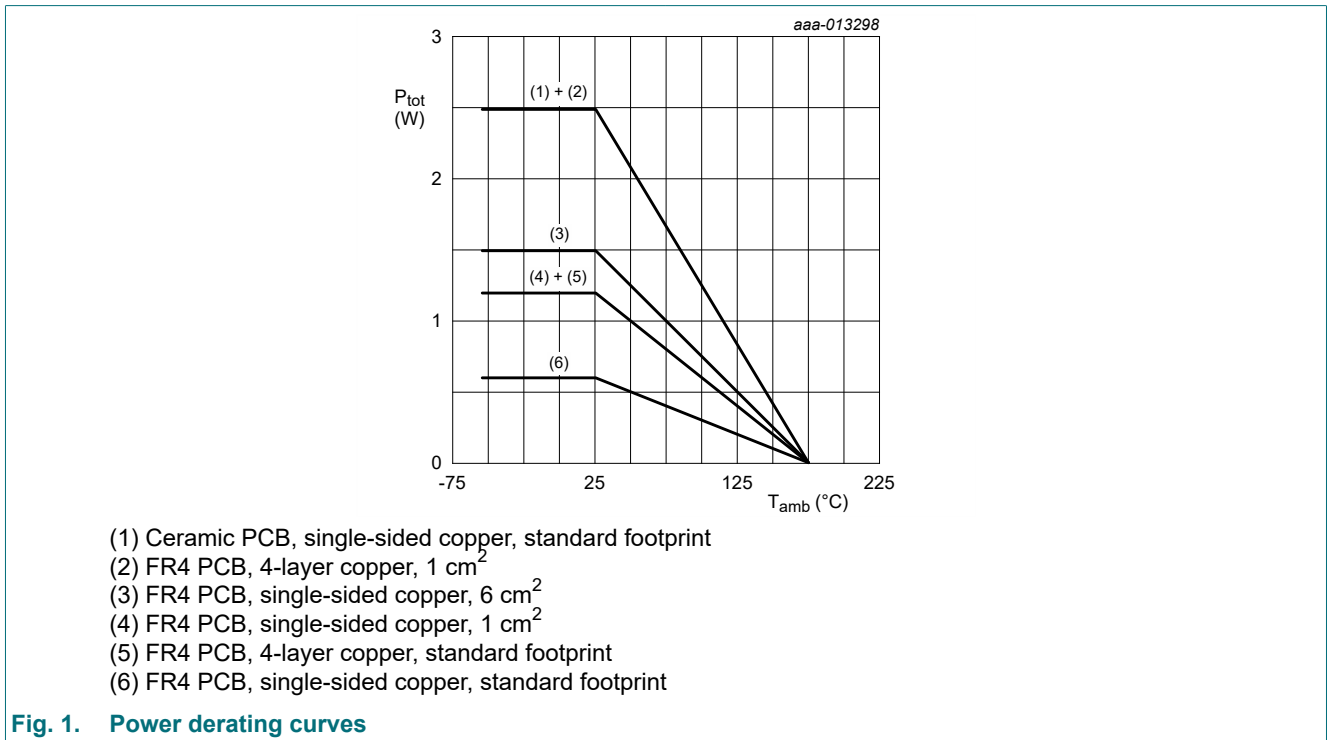
## 7. Limiting values

**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	-	-80	V	
$V_{CEO}$	collector-emitter voltage	open base	-	-60	V	
$V_{EBO}$	emitter-base voltage	open collector	-	-8	V	
$I_C$	collector current		-	-3	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-6	A	
$I_B$	base current		-	-500	mA	
$I_{BM}$	peak base current		-	-1	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.6	W
			[2] [3]	-	1.2	W
			[4]	-	1.5	W
			[5] [6]	-	2.5	W
$T_j$	junction temperature		-	175	°C	
$T_{amb}$	ambient temperature		-55	175	°C	
$T_{stg}$	storage temperature		-65	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, 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 an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>.
- [6] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.



**Fig. 1. Power derating curves**

## 8. 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 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 an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>.

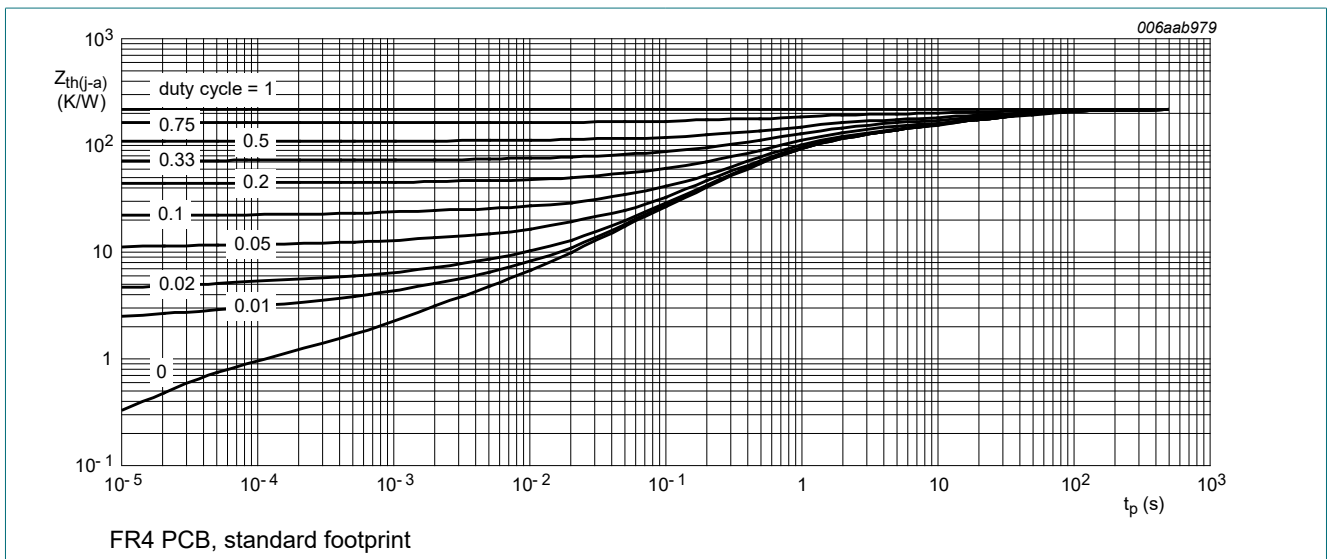


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

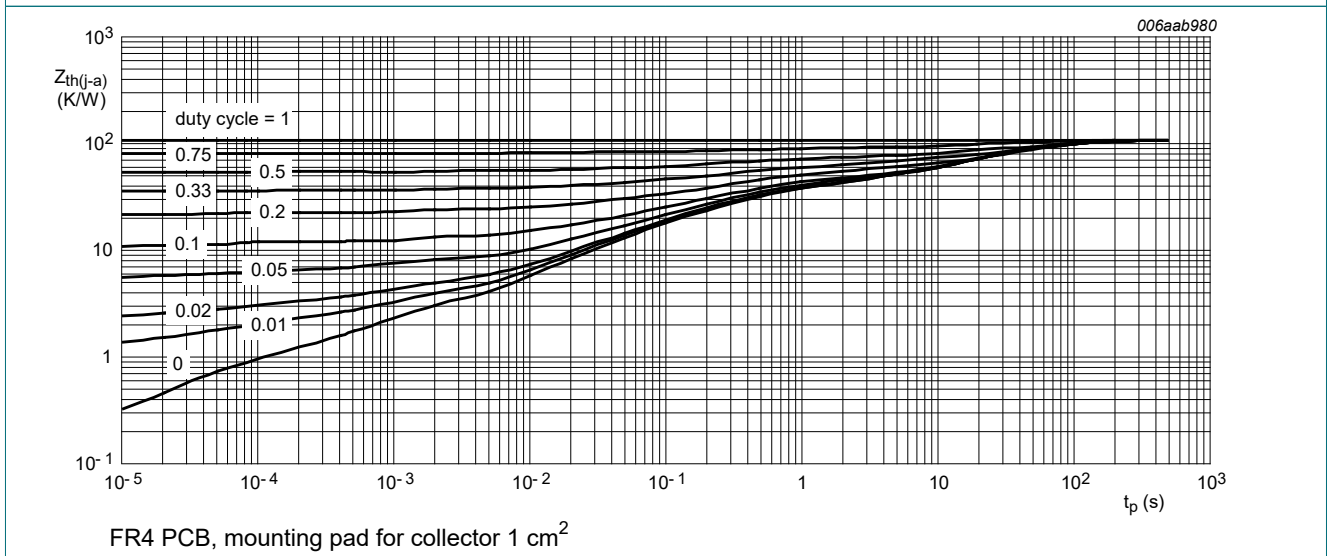
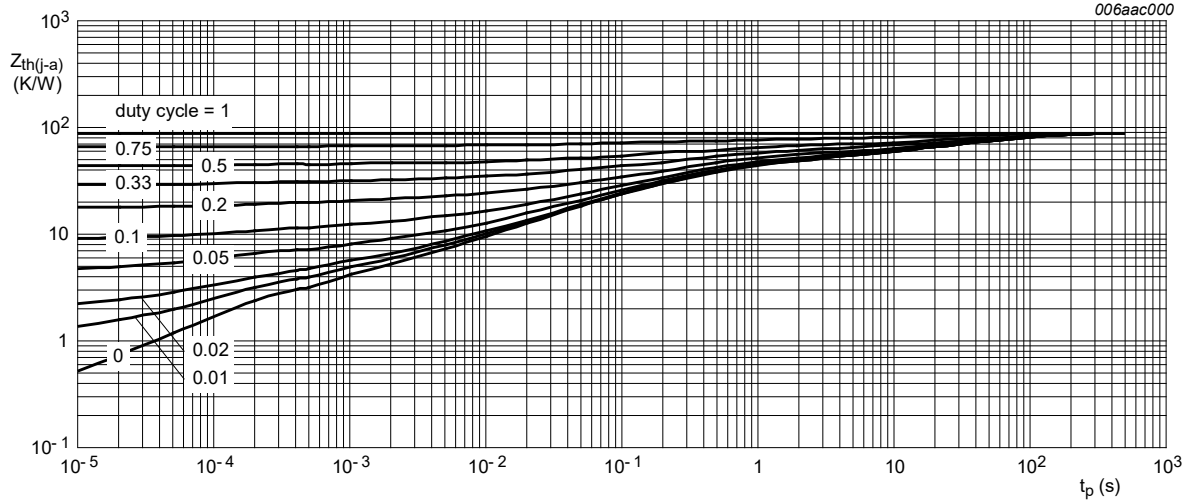
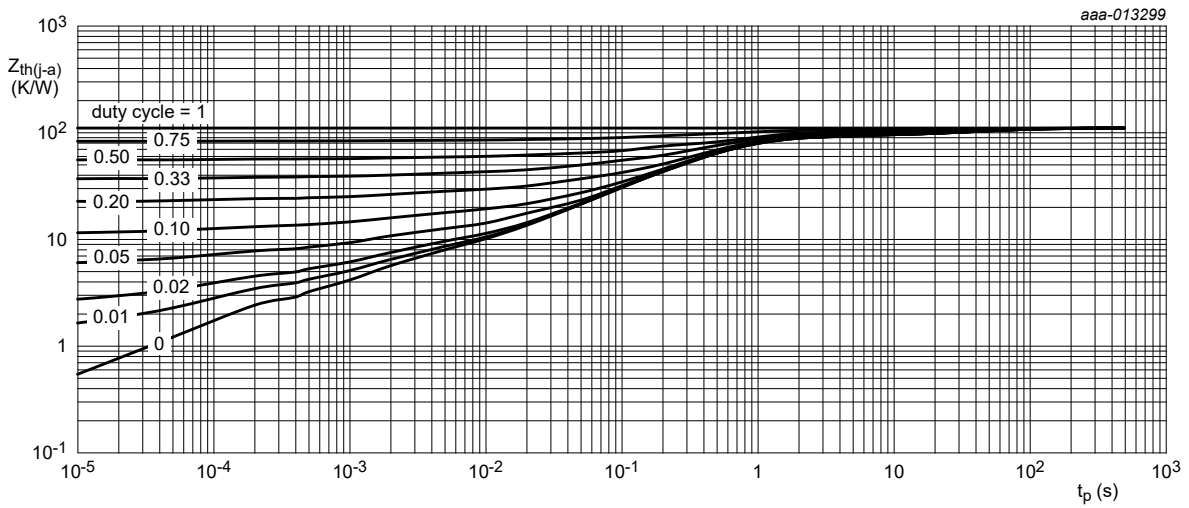


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



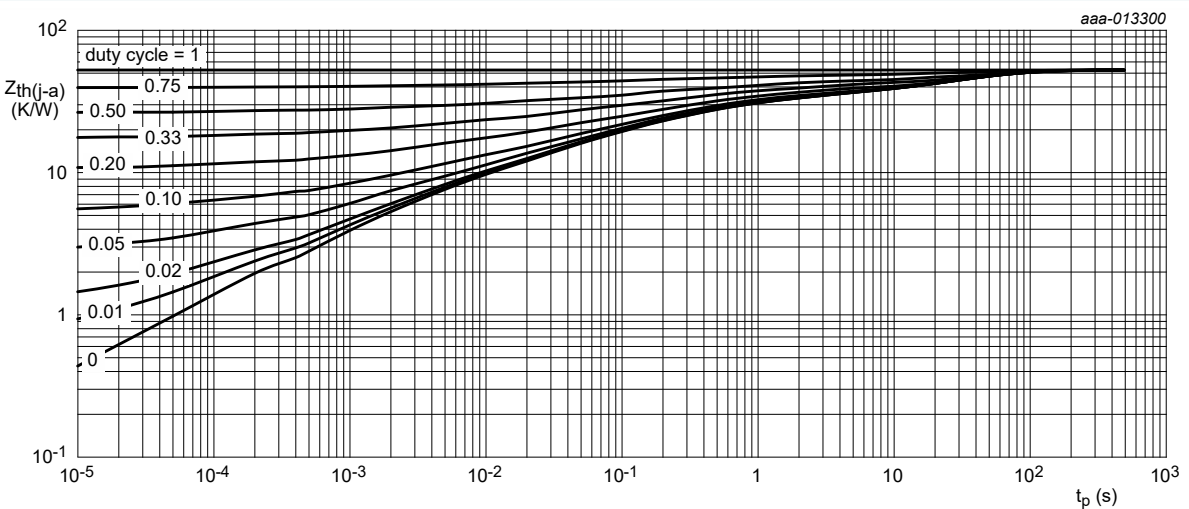
FR4 PCB, mounting pad for collector 6 cm<sup>2</sup>

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



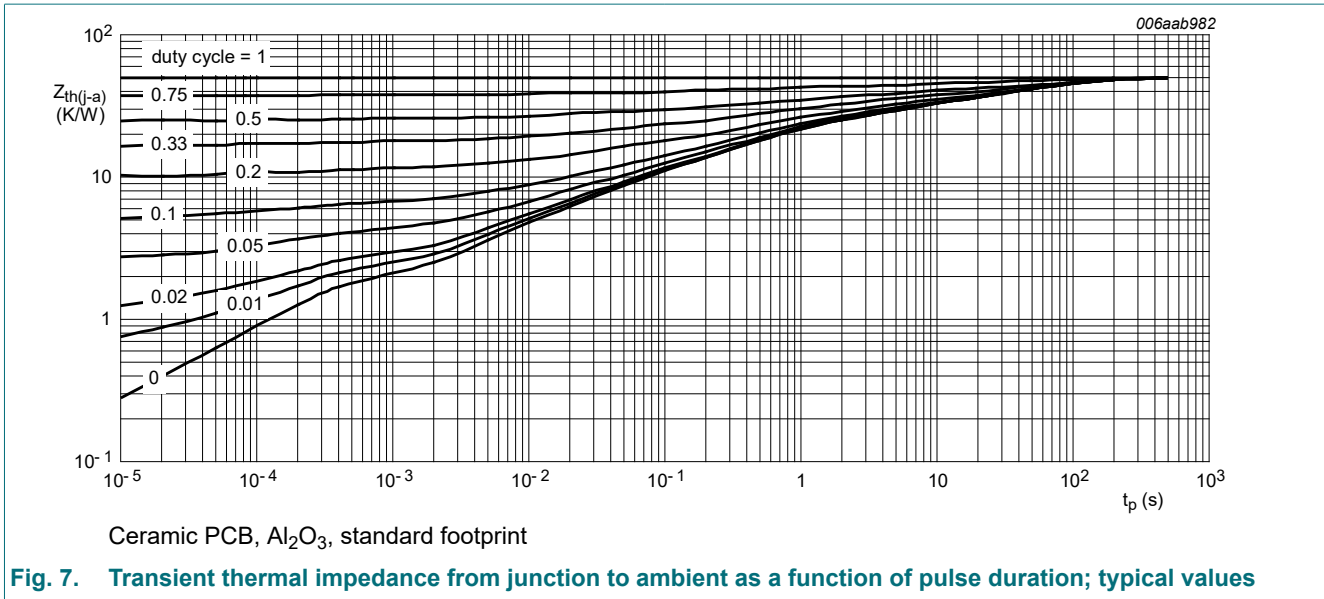
FR4 PCB, 4-layer copper, standard footprint

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<sup>2</sup>

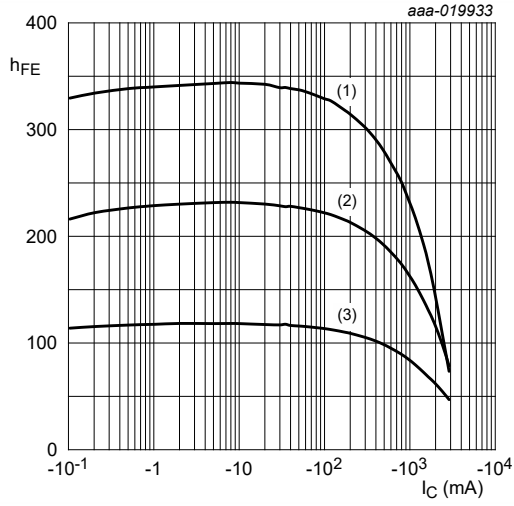
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 9. Characteristics

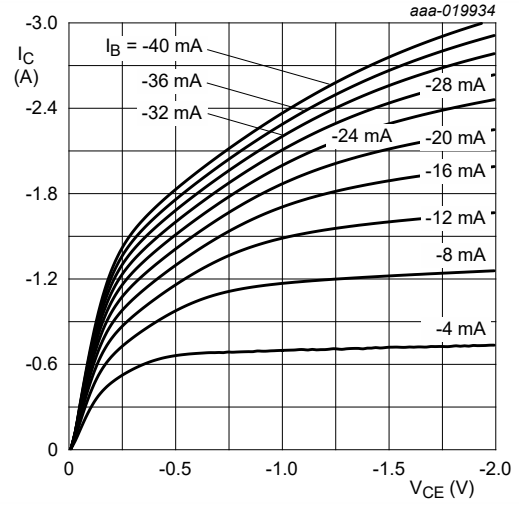
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = -64 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	-100	nA
		V <sub>CB</sub> = -64 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C	-	-	-50	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = -6.4 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	-100	nA
I <sub>CES</sub>	collector-emitter cut-off current	V <sub>CE</sub> = -48 V; V <sub>BE</sub> = 0 V; T <sub>amb</sub> = 25 °C	-	-	-100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	150	250	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -500 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	130	220	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -2 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	120	200	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -3 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	100	160	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = -0.5 A; I <sub>B</sub> = -50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-55	-100	mV
		I <sub>C</sub> = -1 A; I <sub>B</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-95	-170	mV
		I <sub>C</sub> = -2 A; I <sub>B</sub> = -200 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-170	-320	mV
		I <sub>C</sub> = -3 A; I <sub>B</sub> = -300 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-260	-450	mV
R <sub>CEsat</sub>	collector-emitter saturation resistance		-	87	150	mΩ
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = -2 A; I <sub>B</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-0.9	-1	V
V <sub>BEon</sub>	base-emitter turn-on voltage	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -1 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-0.8	-1	V
t <sub>d</sub>	delay time	I <sub>C</sub> = -2 A; I <sub>Bon</sub> = -0.1 A; I <sub>Boff</sub> = 0.1 A; T <sub>amb</sub> = 25 °C	-	12	-	ns
t <sub>r</sub>	rise time		-	95	-	ns
t <sub>on</sub>	turn-on time		-	107	-	ns
t <sub>s</sub>	storage time		-	160	-	ns
t <sub>f</sub>	fall time		-	50	-	ns
t <sub>off</sub>	turn-off time		-	210	-	ns
f <sub>T</sub>	transition frequency		V <sub>CE</sub> = -10 V; I <sub>C</sub> = -100 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C	65	120	-
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = -10 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C	-	28	32	pF



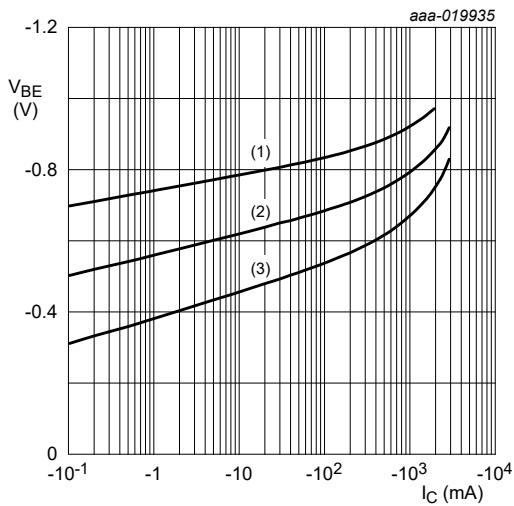
$V_{CE} = -2 V$   
 (1)  $T_{amb} = 100^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = -55^\circ C$

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



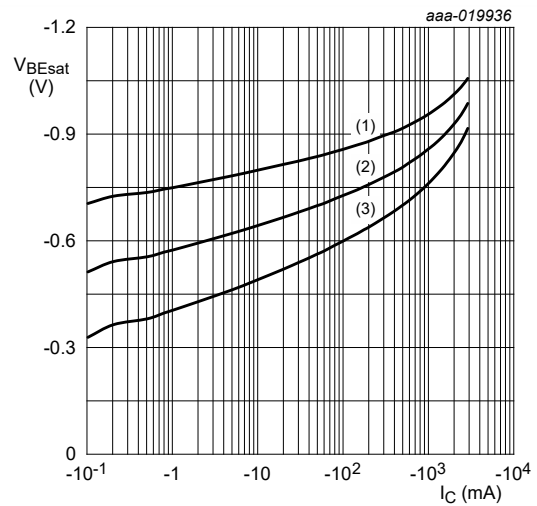
$T_{amb} = 25^\circ C$

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



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

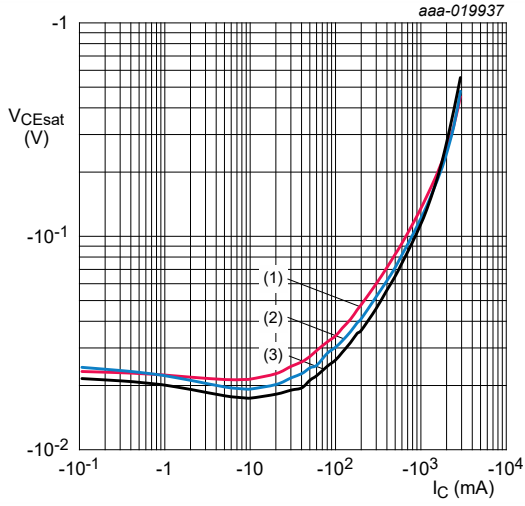
Fig. 10. Base-emitter voltage as a function of collector current; typical values



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

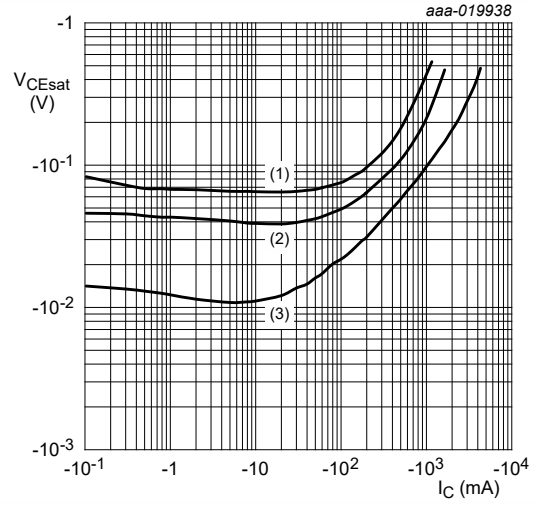
Fig. 11. Base-emitter saturation voltage as a function of collector current; typical values





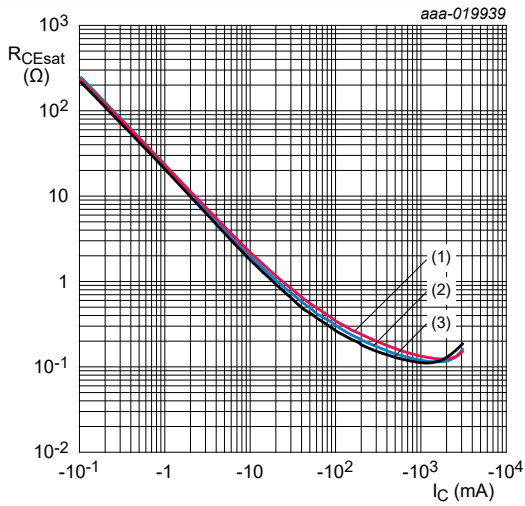
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = -55^\circ\text{C}$

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



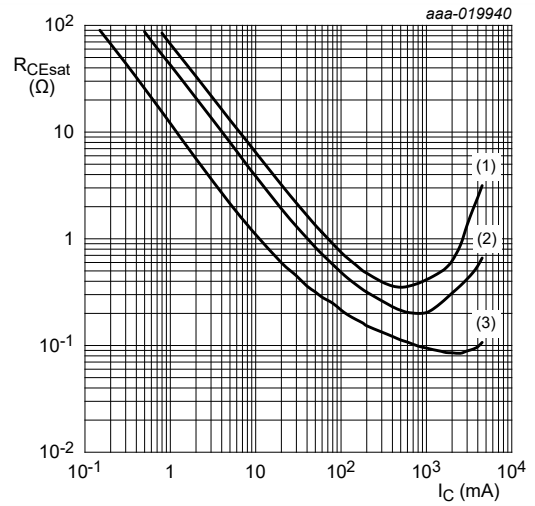
$T_{amb} = 25^\circ\text{C}$   
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

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



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

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



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

10. Test information

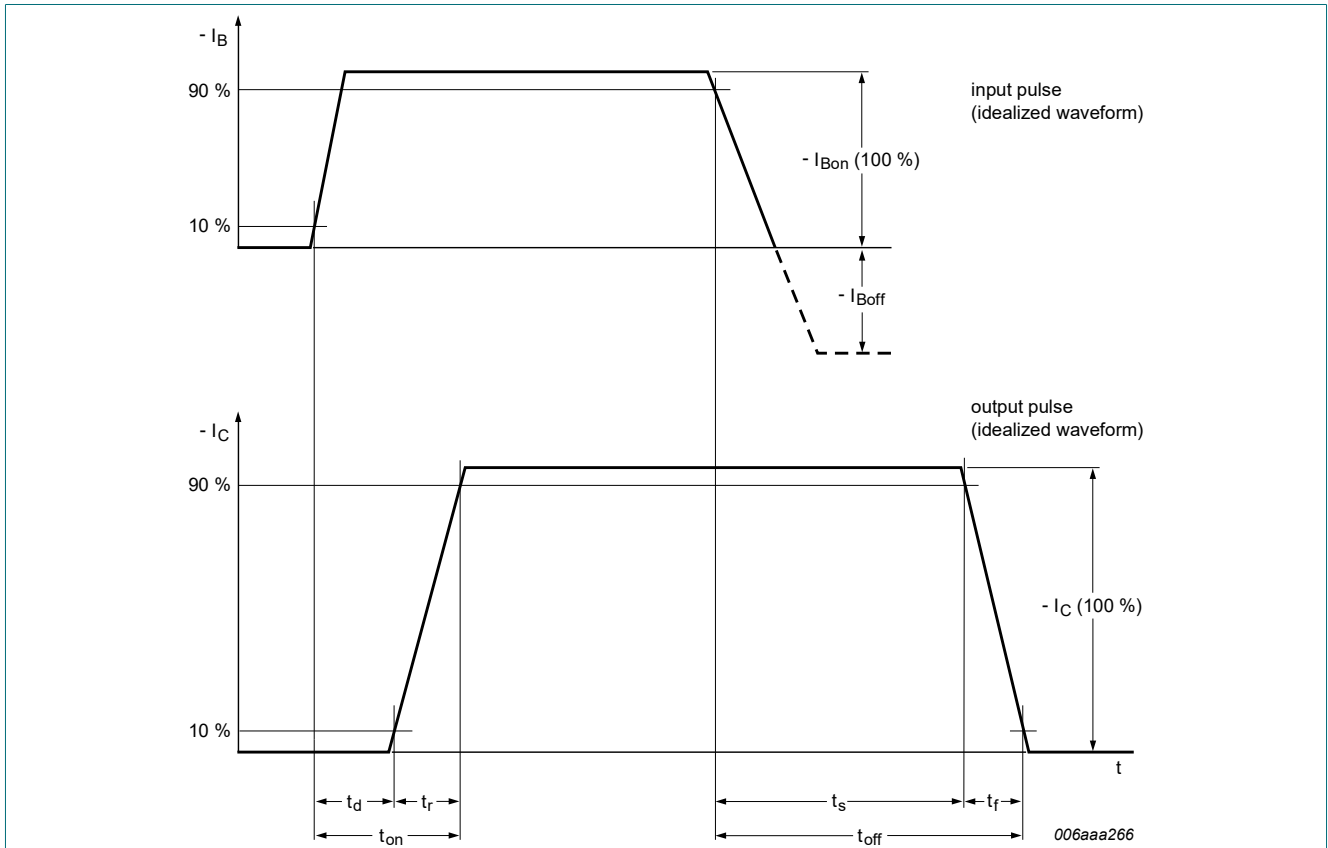


Fig. 16. BISS transistor switching time definition

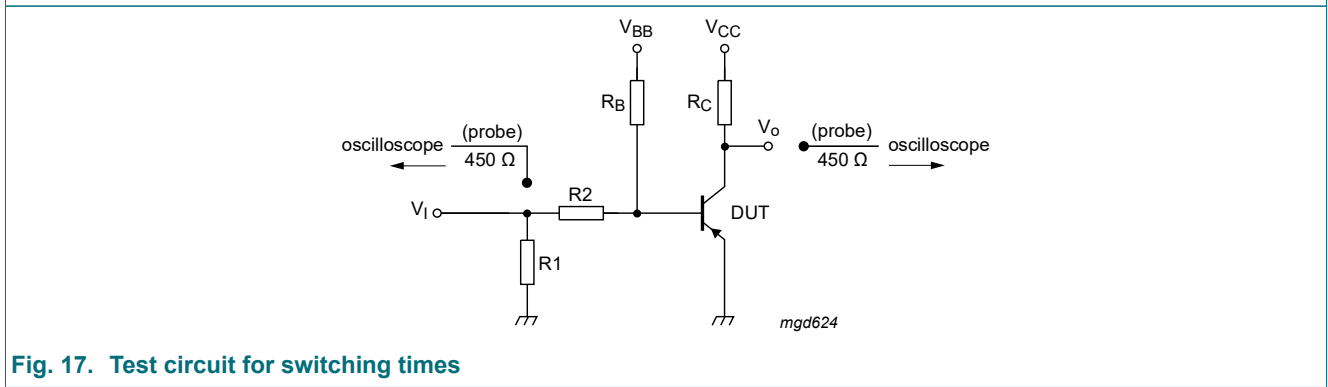
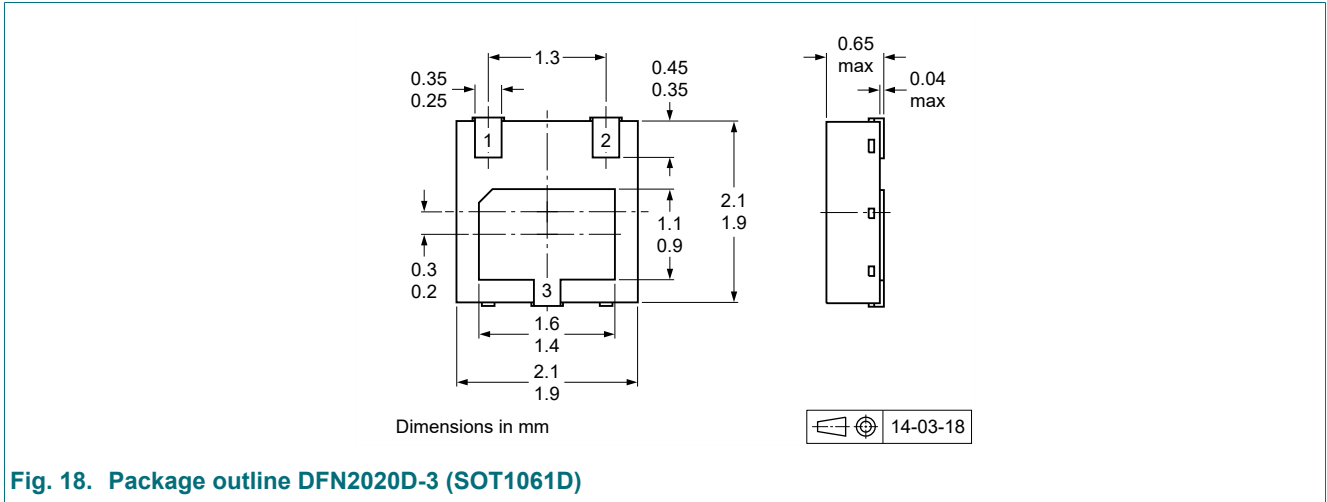


Fig. 17. Test circuit for switching times

## 11. Package outline



## 12. Soldering

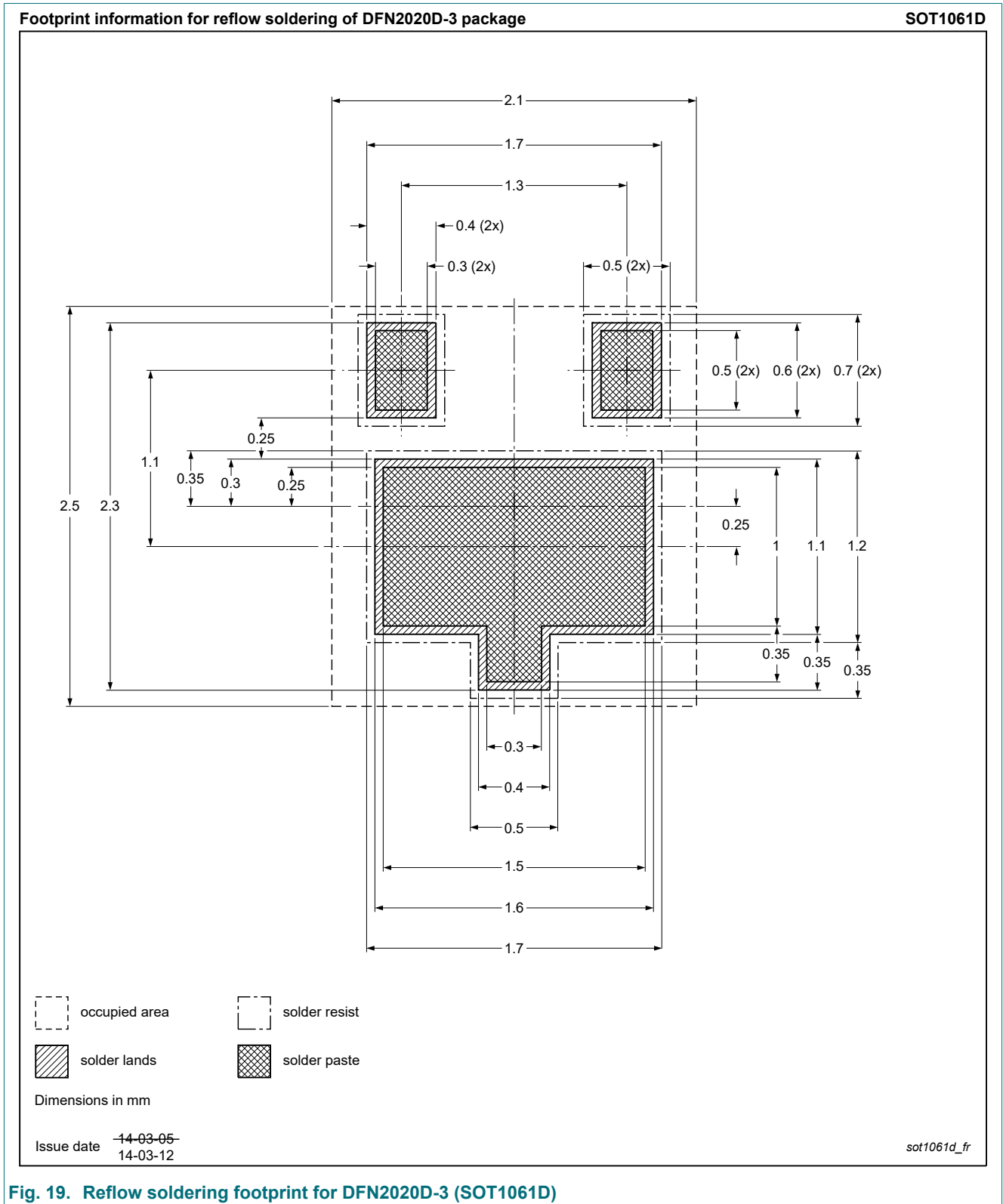


Fig. 19. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

## 13. Revision history

**Table 8. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5360PAS v.2	20230701	Product data sheet	-	PBSS5360PAS v.1
Modifications:	<ul style="list-style-type: none"><li>Product changed to non-automotive qualification. Please refer to <a href="https://www.nexperia.com">nexperia.com</a> for automotive (-Q) product alternative(s).</li></ul>			
PBSS5360PAS v.1	20151012	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.
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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