



PBSS4330PAS

30 V, 3 A NPN low V_{CEsat} transistor

12 October 2023

Product data sheet

1. General description

NPN low V_{CEsat} 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.

PNP complement: PBSS5330PAS

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- 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

3. Applications

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

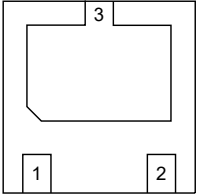
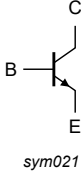
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	30	V
I _C	collector current		-	-	3	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms	-	-	5	A
R _{CEsat}	collector-emitter saturation resistance	I _C = 3 A; I _B = 300 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	75	100	mΩ

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		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4330PAS	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
PBSS4330PAS	E1

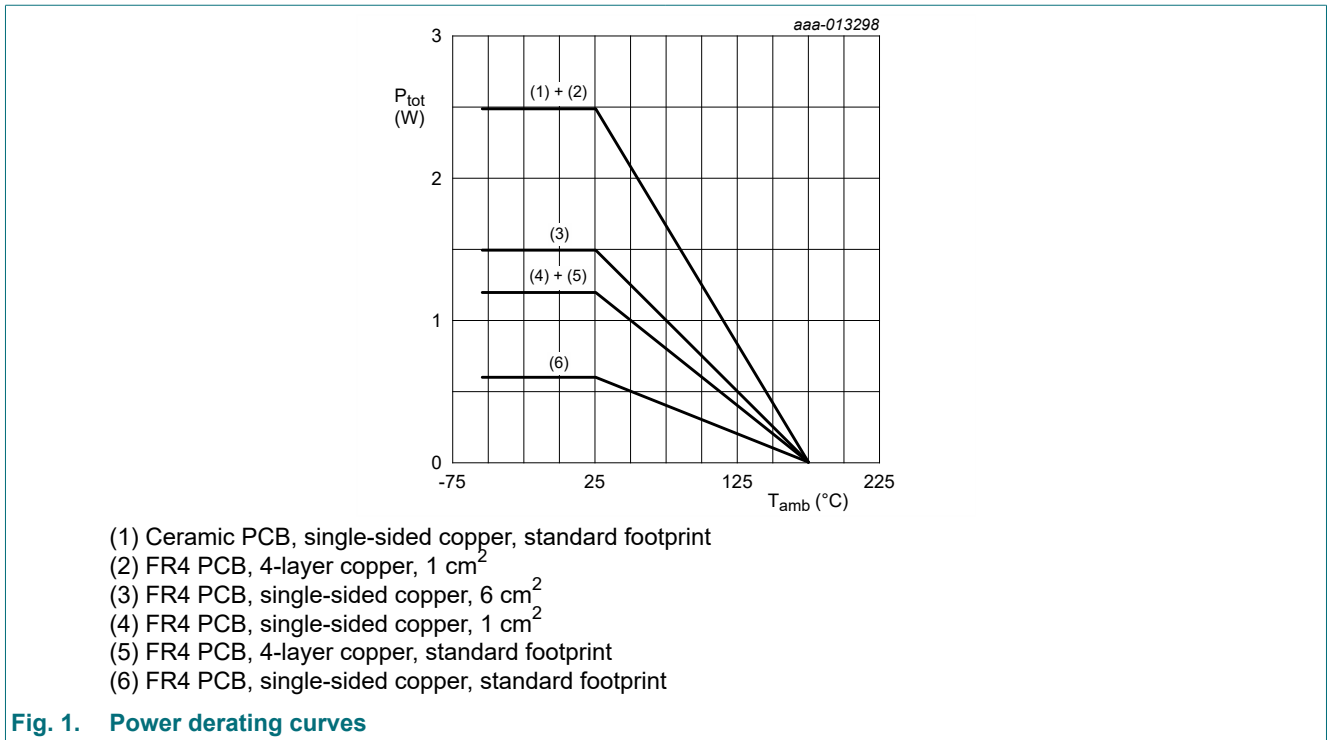
8. Limiting values

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	-	30	V	
V_{EBO}	emitter-base voltage	open collector	-	6	V	
I_C	collector current		-	3	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	5	A	
I_B	base current		-	500	mA	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	600	mW
			[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 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.
- [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 cm².
- [5] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
- [6] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm².



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 copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².
- [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 cm².
- [5] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
- [6] Device mounted on a FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm².

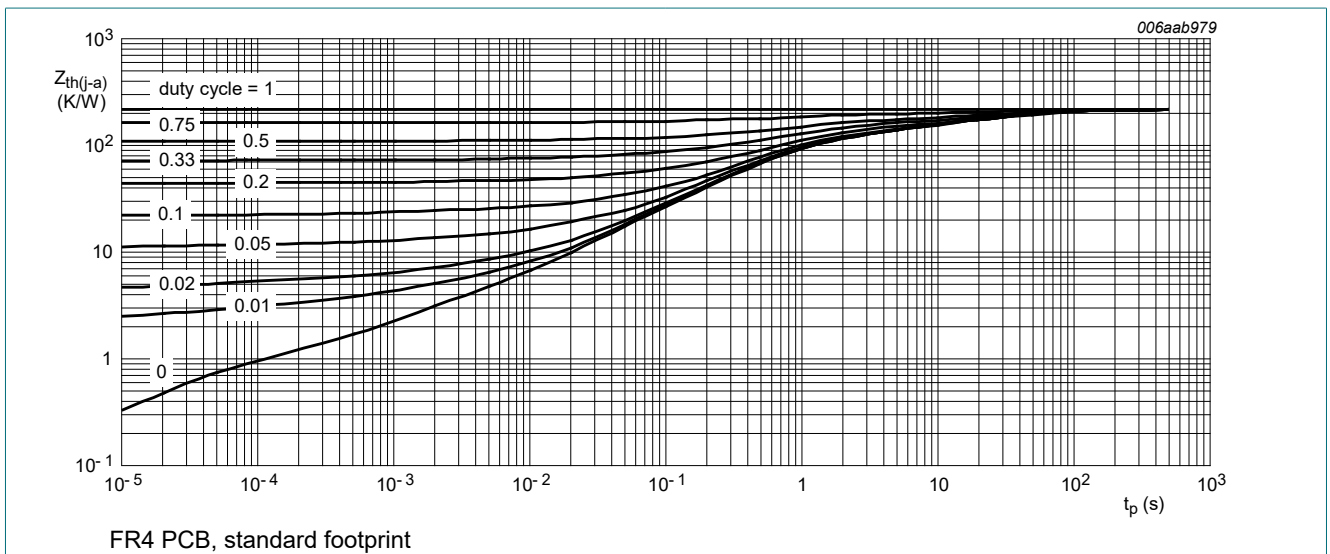


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

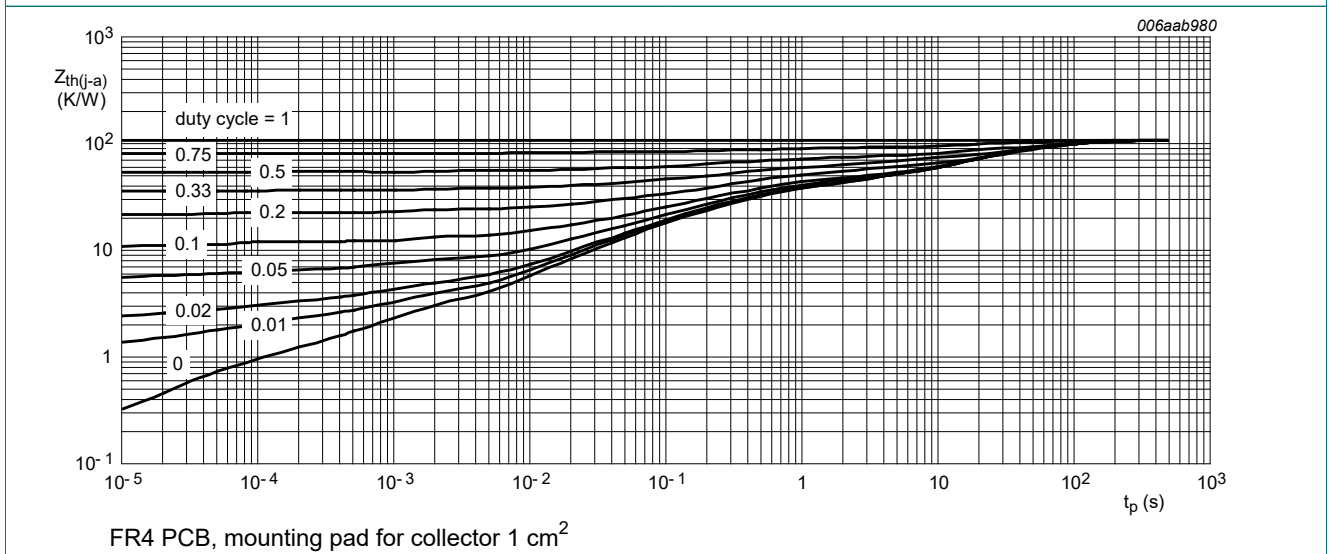
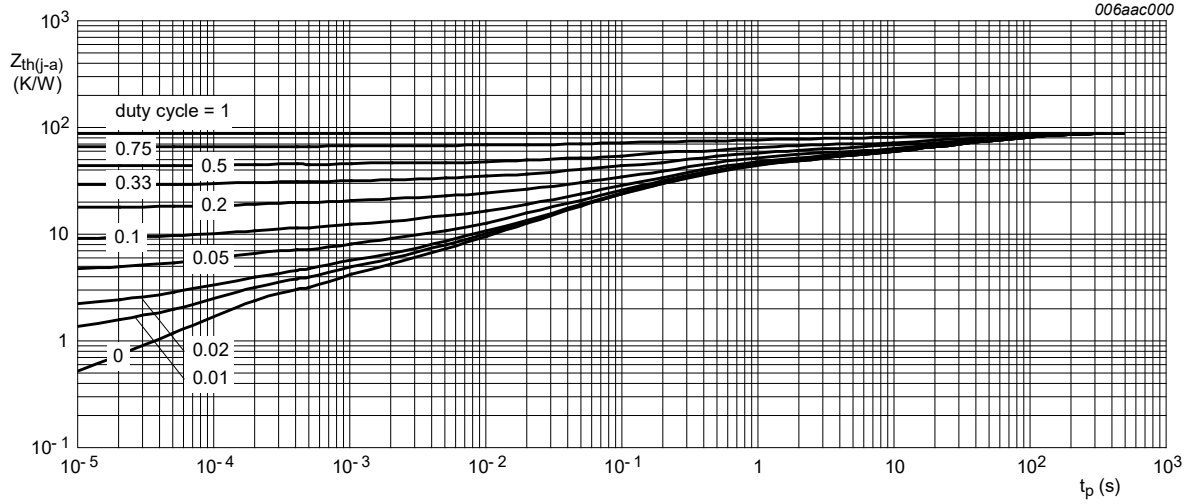
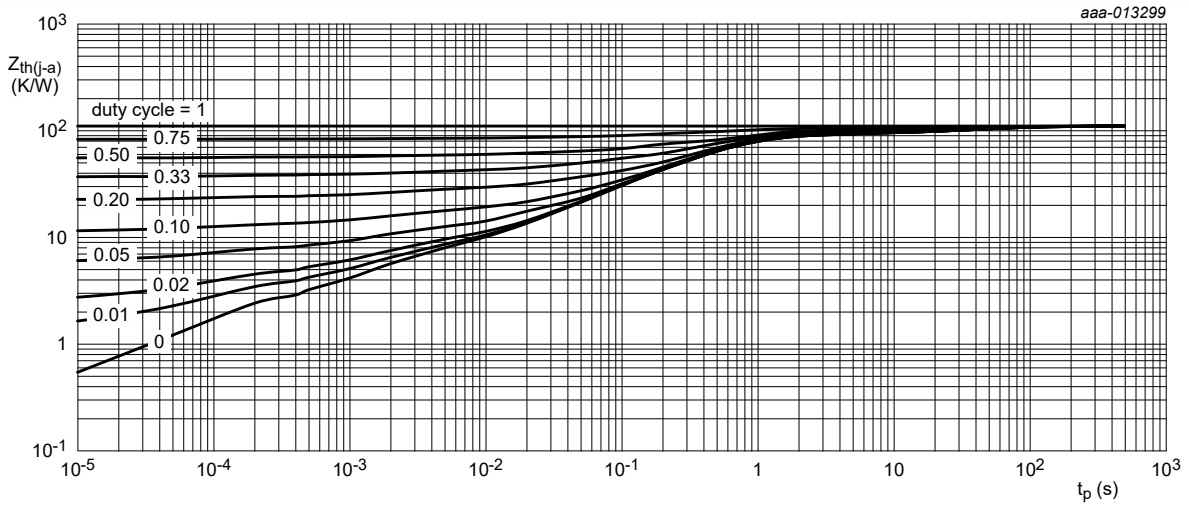


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



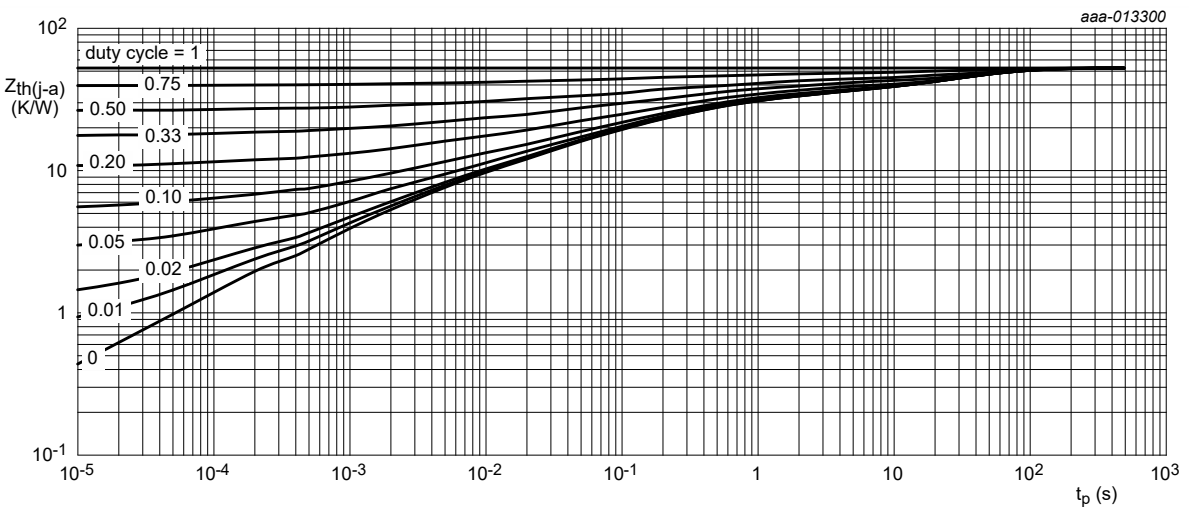
FR4 PCB, mounting pad for collector 6 cm²

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



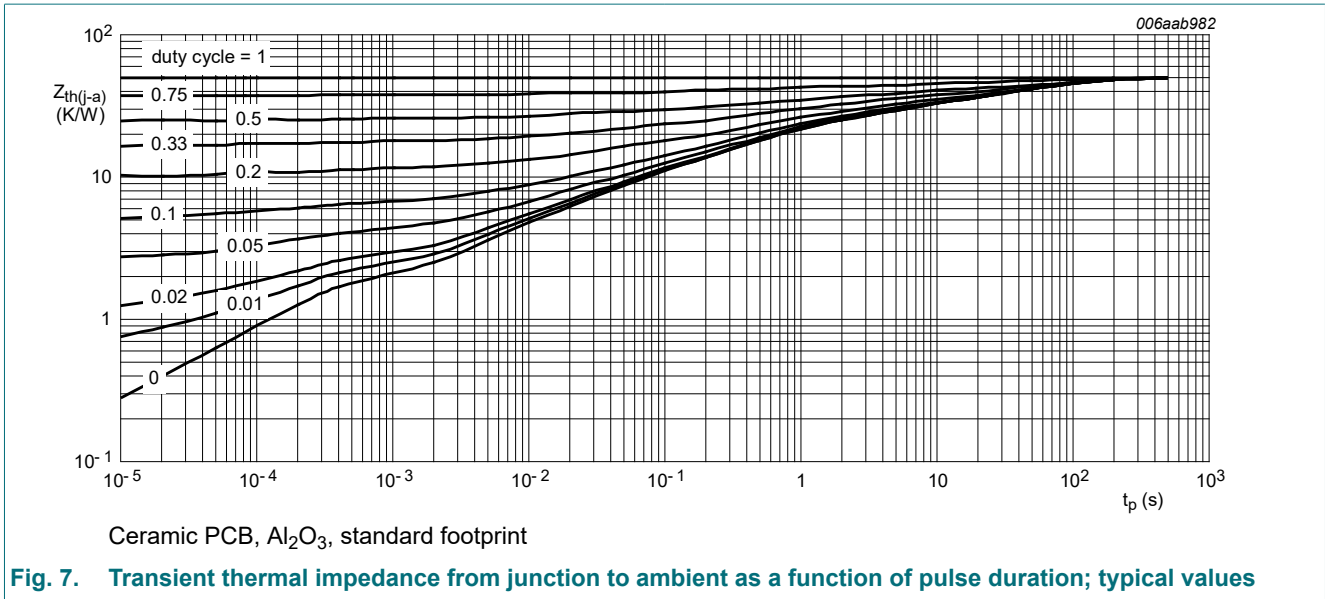
FR4 PCB, 4-layer copper, standard footprint

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 cm²

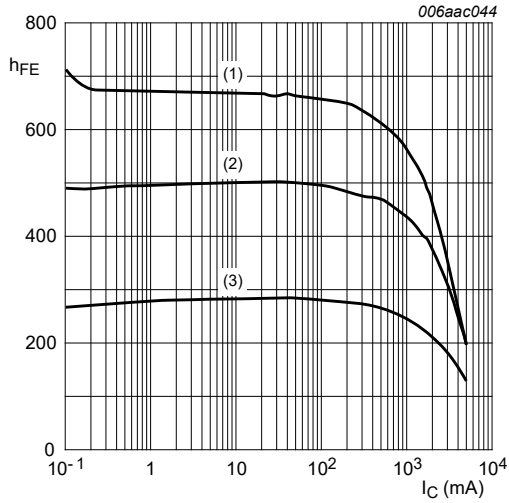
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

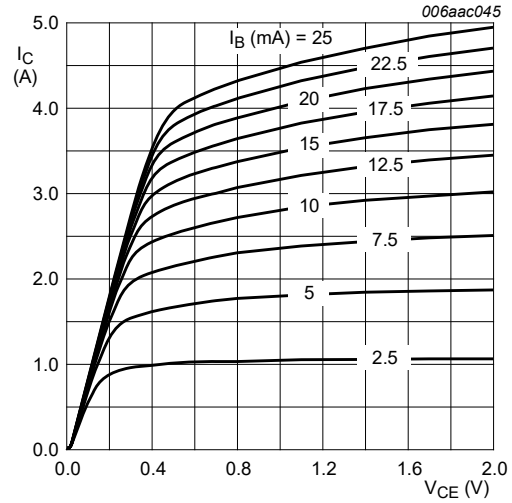
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = 24 V; I _E = 0 A; T _{amb} = 25 °C	-	-	100	nA
		V _{CB} = 24 V; I _E = 0 A; T _J = 150 °C	-	-	50	μA
I _{EBO}	emitter-base cut-off current	V _{EB} = 5 V; I _C = 0 A; T _{amb} = 25 °C	-	-	100	nA
I _{CES}	collector-emitter cut-off current	V _{CE} = 24 V; V _{BE} = 0 V; T _{amb} = 25 °C	-	-	100	nA
h _{FE}	DC current gain	V _{CE} = 2 V; I _C = 0.5 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	300	465	-	
		V _{CE} = 2 V; I _C = 1 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	270	435	700	
		V _{CE} = 2 V; I _C = 2 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	230	370	-	
		V _{CE} = 2 V; I _C = 3 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	180	310	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 0.5 A; I _B = 50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	40	60	mV
		I _C = 1 A; I _B = 50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	80	110	mV
		I _C = 2 A; I _B = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	155	220	mV
		I _C = 3 A; I _B = 300 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	220	300	mV
R _{CEsat}	collector-emitter saturation resistance	I _C = 3 A; I _B = 300 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	75	100	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = 2 A; I _B = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	0.95	1.1	V
		I _C = 3 A; I _B = 300 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	1.07	1.2	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = 2 V; I _C = 1 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	0.76	1	V
t _d	delay time	V _{CC} = 9 V; I _C = 2 A; I _{Bon} = 0.1 A; I _{Boff} = -0.1 A; T _{amb} = 25 °C	-	11	-	ns
t _r	rise time		-	52	-	ns
t _{on}	turn-on time		-	63	-	ns
t _s	storage time		-	230	-	ns
t _f	fall time		-	40	-	ns
t _{off}	turn-off time		-	270	-	ns
f _T	transition frequency		V _{CE} = 5 V; I _C = 100 mA; f = 100 MHz; T _{amb} = 25 °C	100	210	-
C _c	collector capacitance	V _{CB} = 10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C	-	21	30	pF



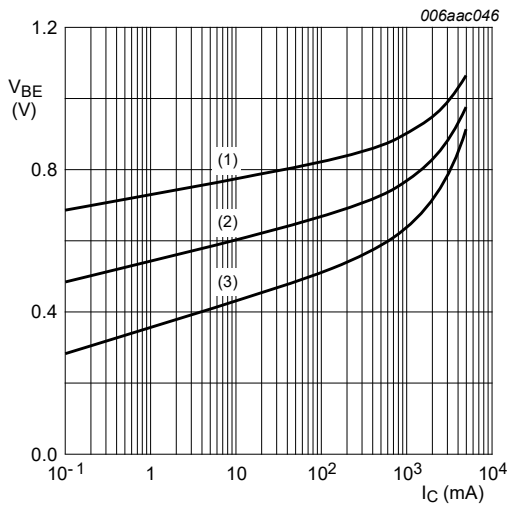
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



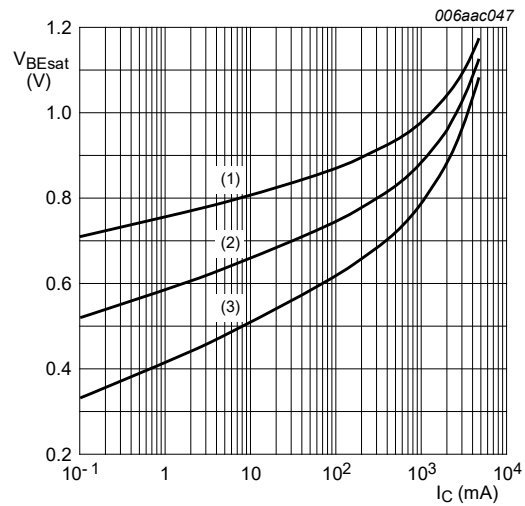
$T_{amb} = 25\text{ }^\circ\text{C}$

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



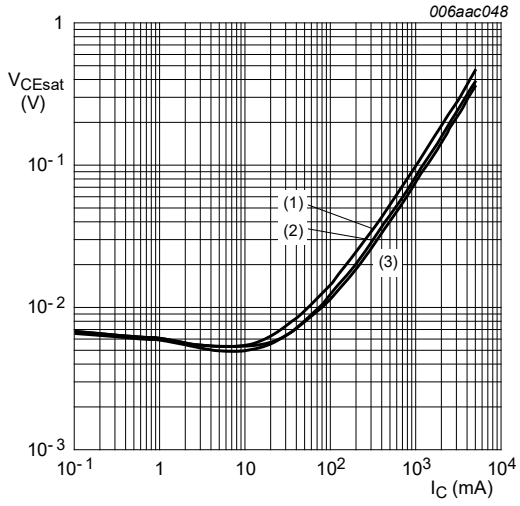
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



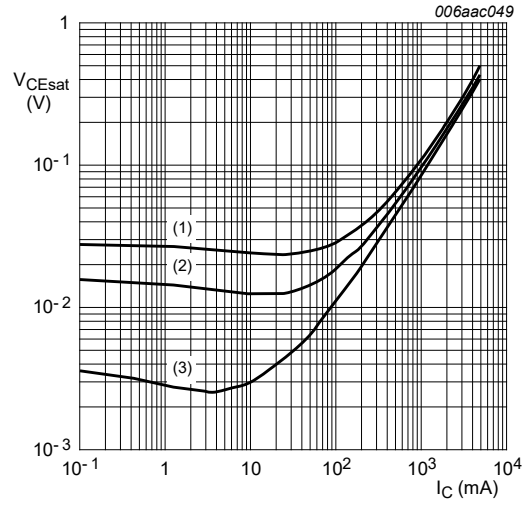
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



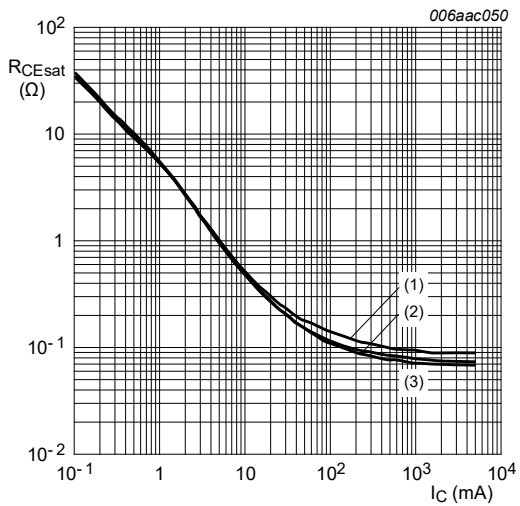
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



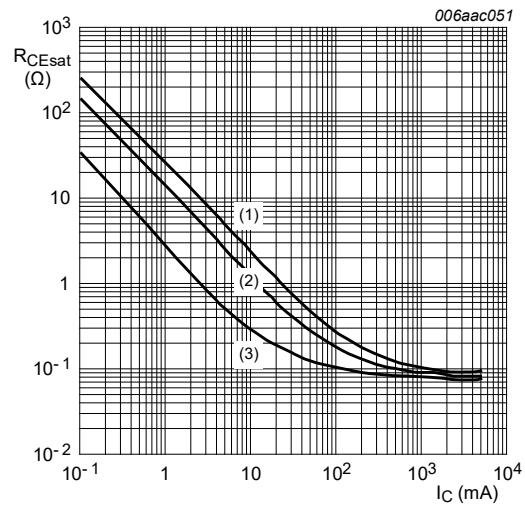
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

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. Test information

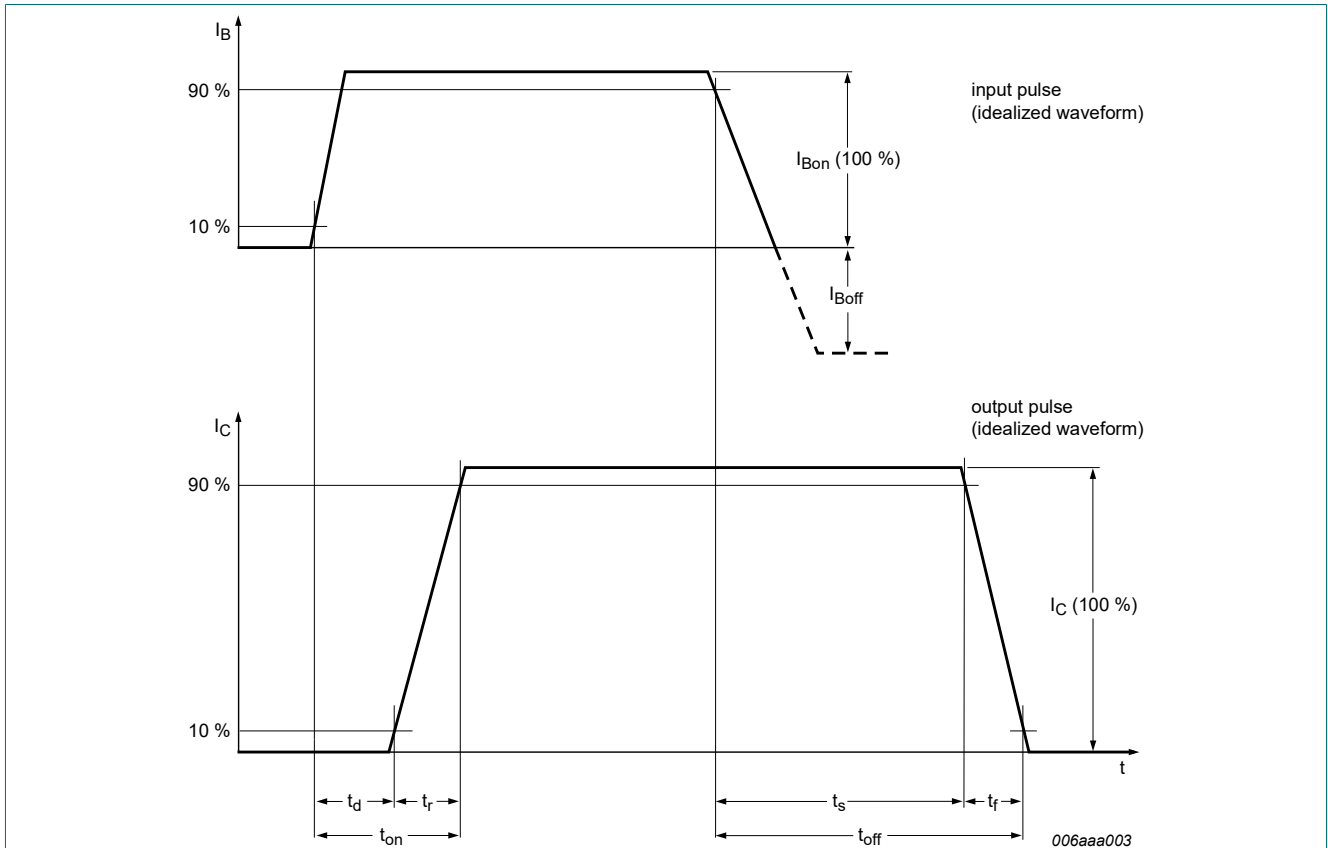


Fig. 16. Switching time definition

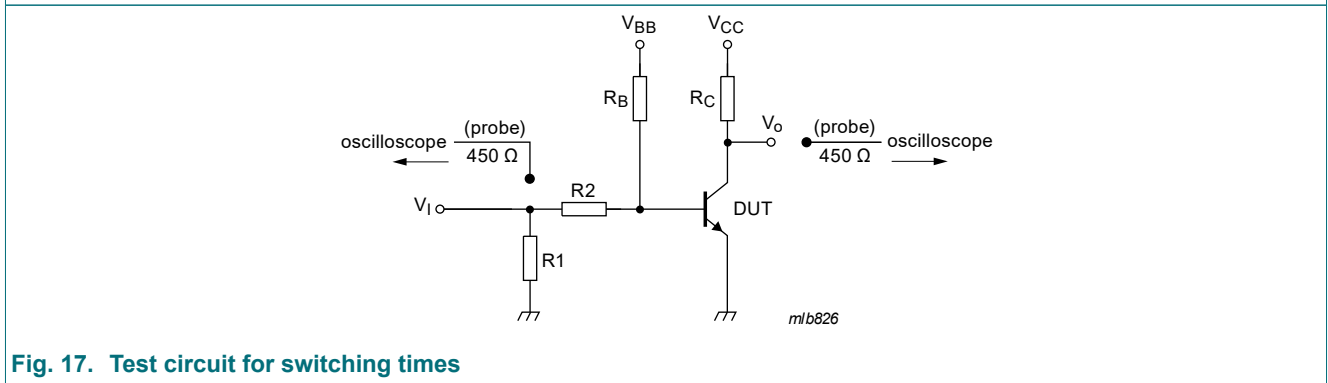


Fig. 17. Test circuit for switching times

12. Package outline

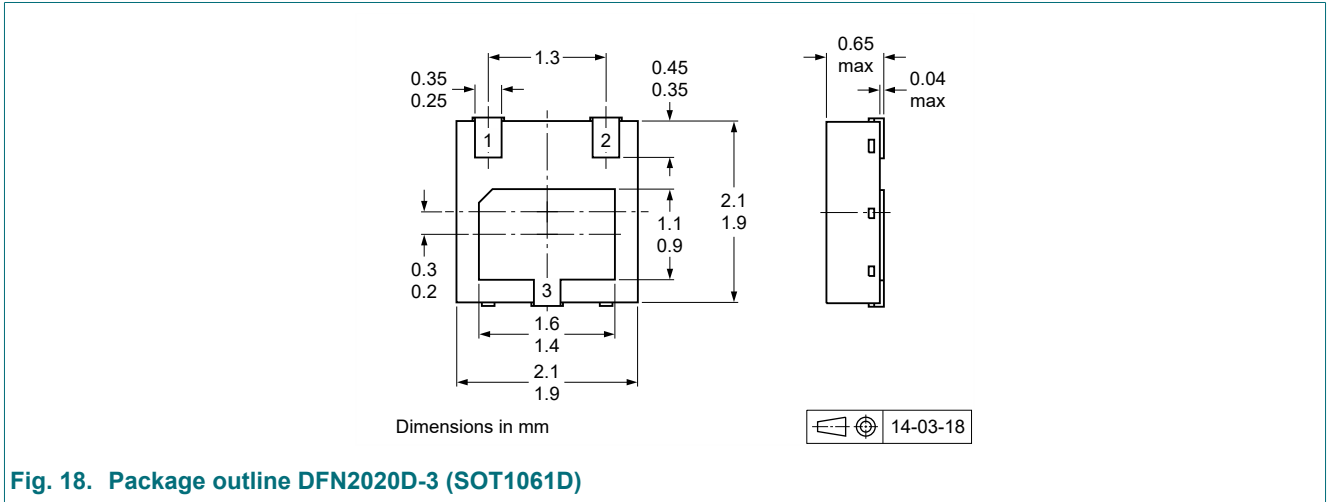


Fig. 18. Package outline DFN2020D-3 (SOT1061D)

13. Soldering

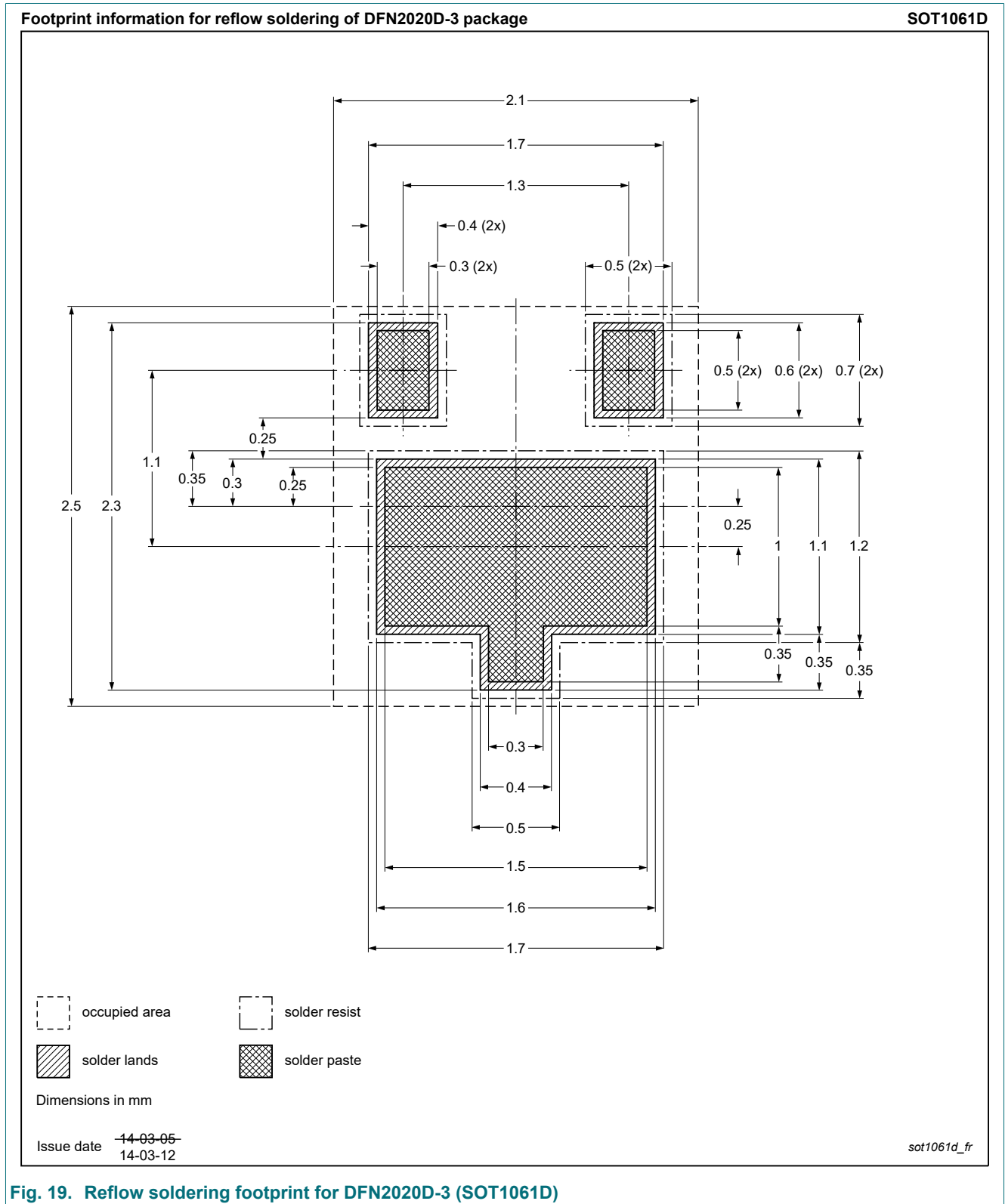


Fig. 19. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4330PAS v.2	20231012	Product data sheet	-	PBSS4330PAS v.1
Modifications:	<ul style="list-style-type: none">Product changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PBSS4330PAS v.1	20140911	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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