



**THE DATASHEET OF
PBSS4330PA,115**





PBSS4330PA

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

7 April 2015

Product data sheet

1. General description

NPN low V_{CEsat} Breakthrough In Small Signal (BISS) transistor, encapsulated in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package with medium power capability.

PNP complement: PBSS5330PA.

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- Exposed heat sink for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with medium power capability

3. Applications

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

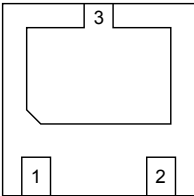
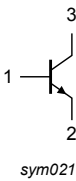
4. Quick reference data

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; $t_p \leq 1$ ms	-	-	5	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 3$ A; $I_B = 300$ mA; pulsed; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_{amb} = 25$ °C	-	75	100	m Ω

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>Transparent top view</p> <p>DFN2020-3 (SOT1061)</p>	 <p>sym021</p>
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4330PA	DFN2020-3	DFN2020-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm	SOT1061

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4330PA	AH

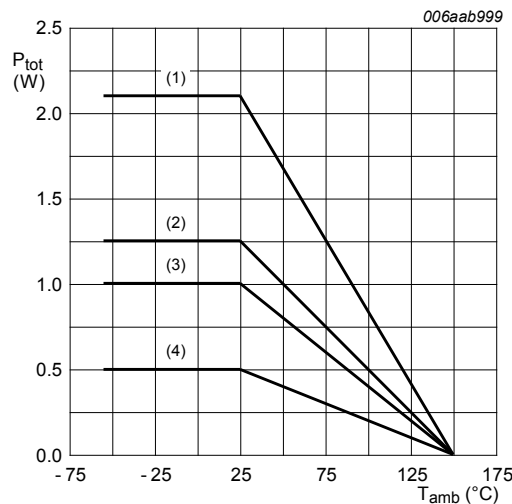
8. Limiting values

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]	-	500	mW
			[2]	-	1	W
			[3]	-	1.25	W
			[4]	-	2.1	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.



- (1) Ceramic PCB, Al₂O₃, standard footprint
- (2) FR4 PCB, mounting pad for collector 6 cm²
- (3) FR4 PCB, mounting pad for collector 1 cm²
- (4) FR4 PCB, 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]	-	-	125	K/W
			[3]	-	-	100	K/W
			[4]	-	-	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, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

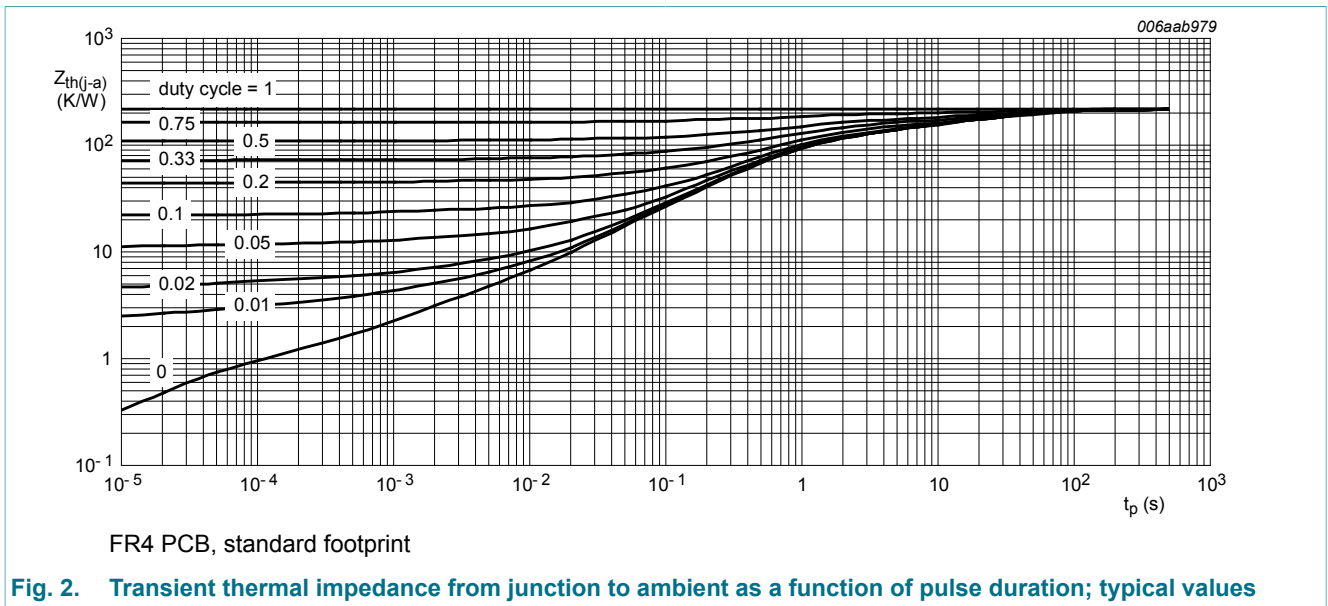
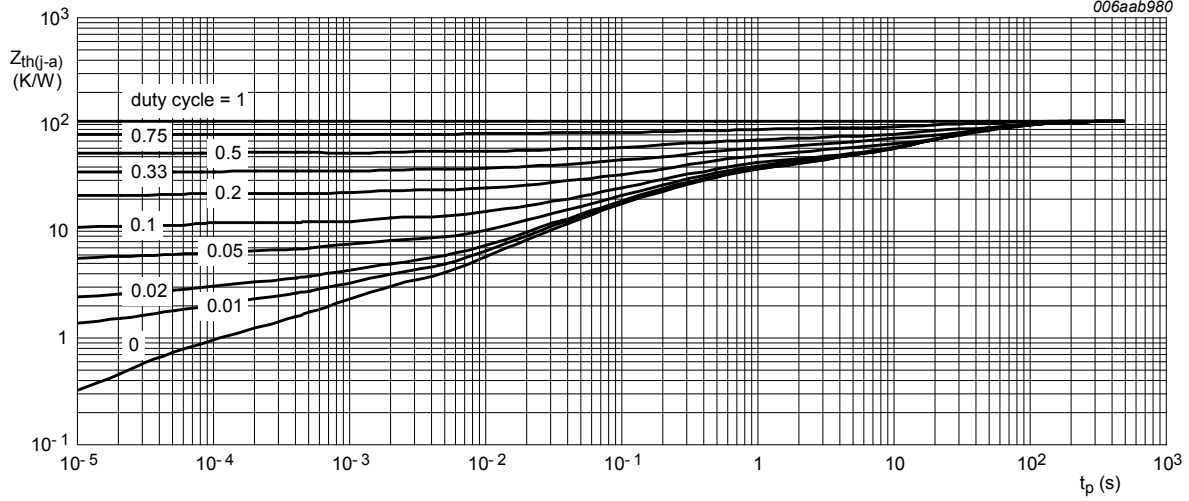
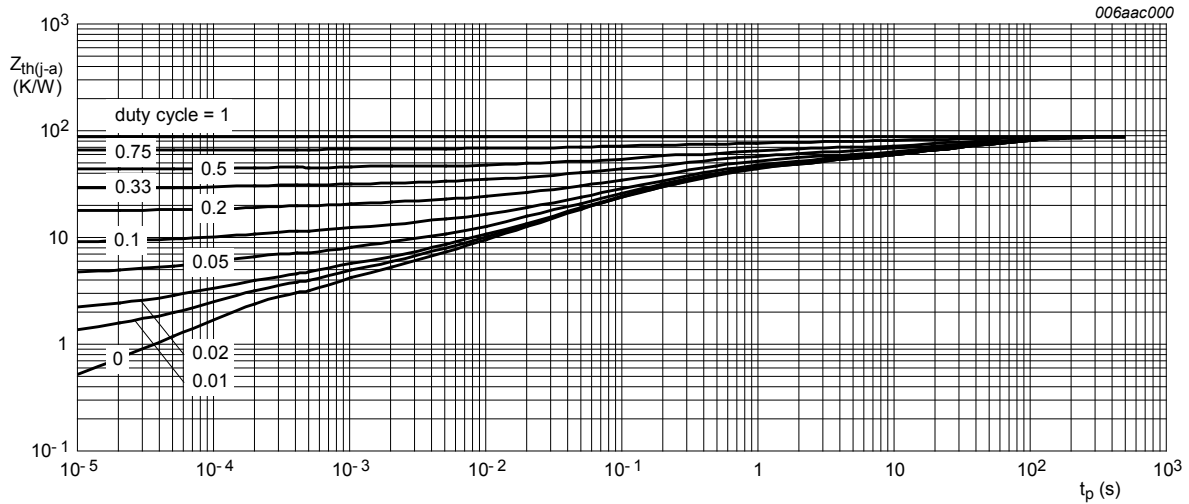


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



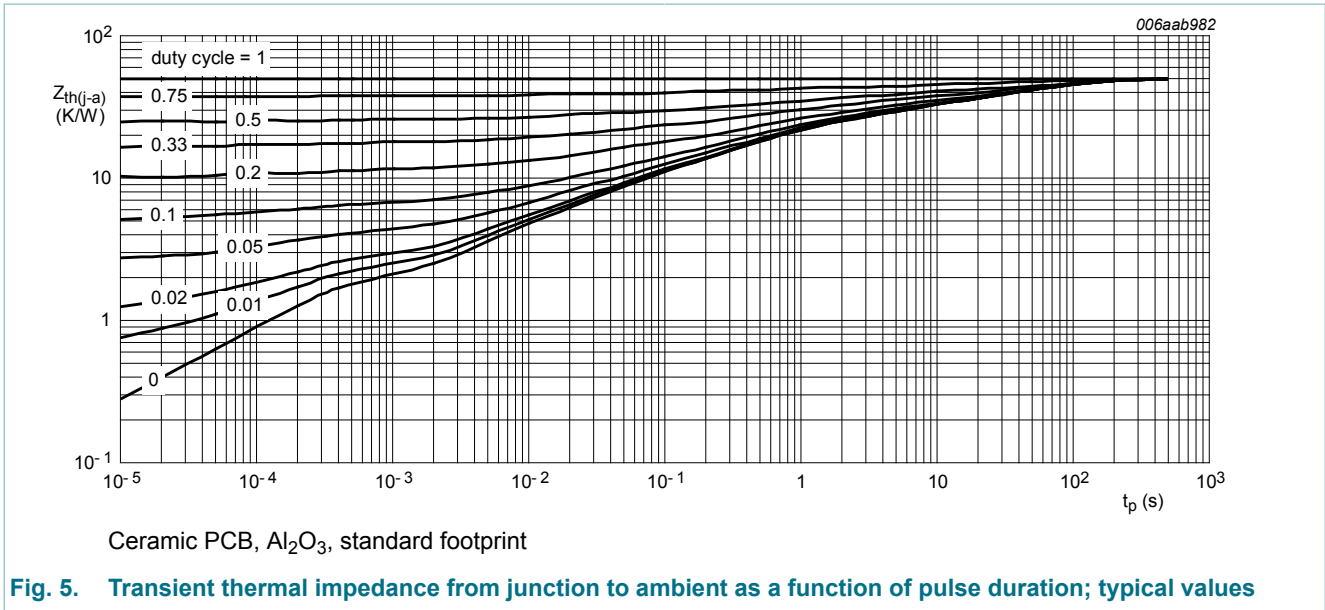
FR4 PCB, mounting pad for collector 1 cm²

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

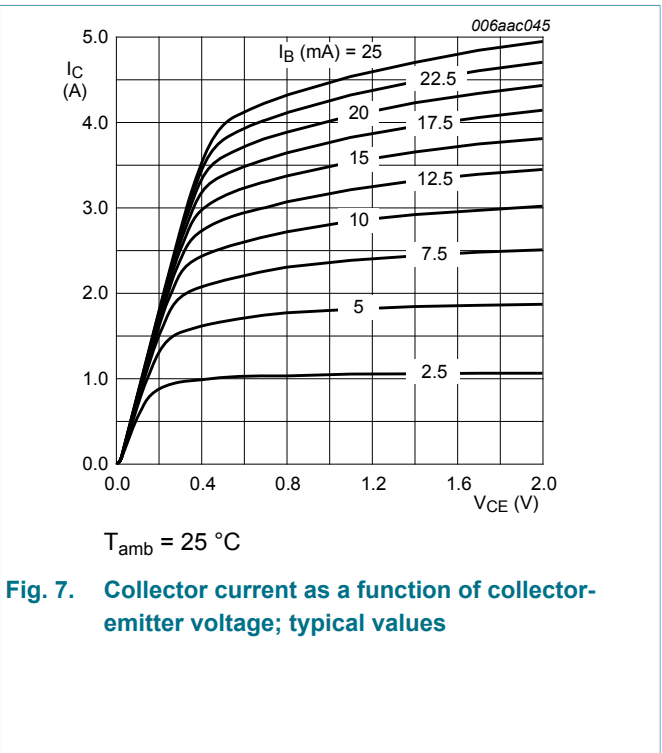
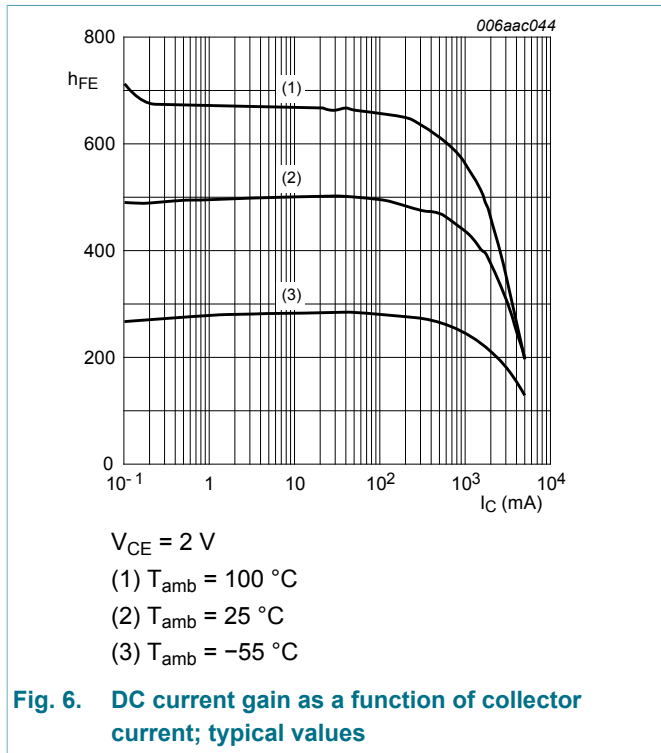


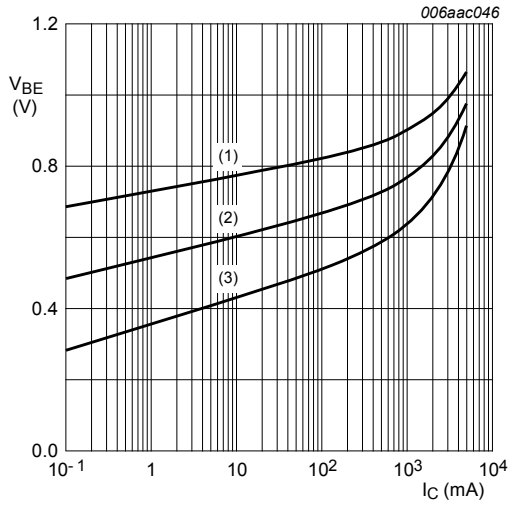
10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = 30 V; I _E = 0 A; T _{amb} = 25 °C	-	-	100	nA
		V _{CB} = 30 V; I _E = 0 A; T _j = 150 °C	-	-	50	μA
I _{CES}	collector-emitter cut-off current	V _{CE} = 24 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 = 0.5 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	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

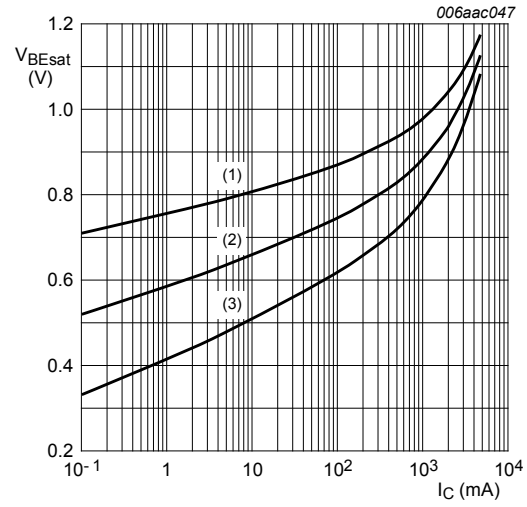
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
f_T	transition frequency	$V_{CE} = 5\text{ V}; I_C = 100\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$	100	210	-	MHz
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$	-	21	30	pF





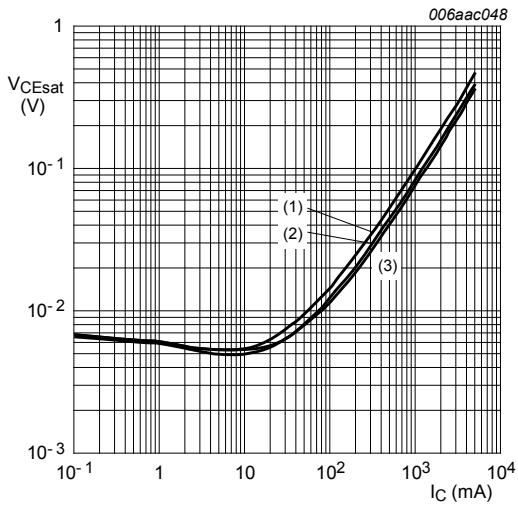
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



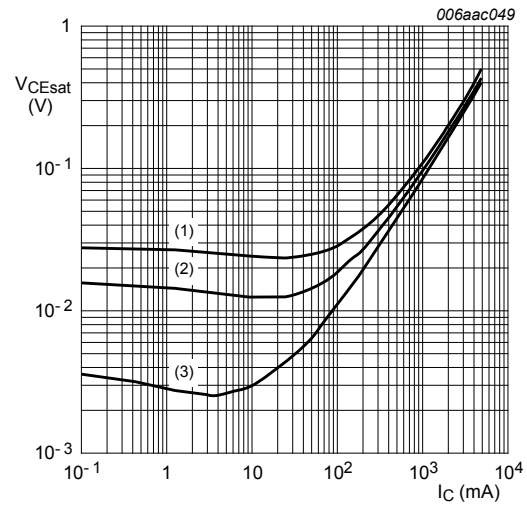
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



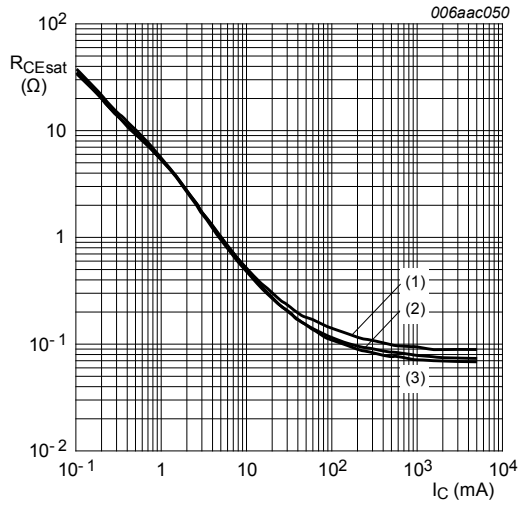
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



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

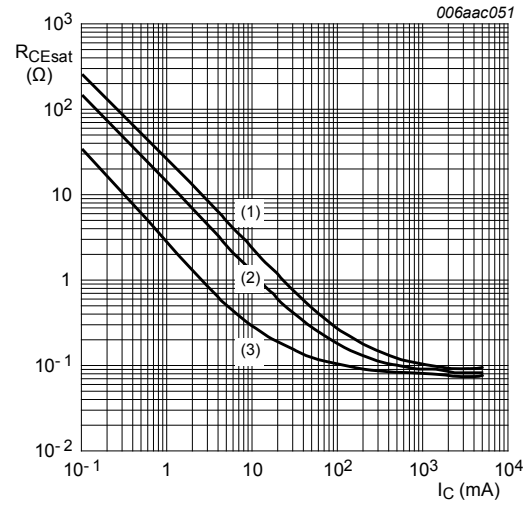
Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$

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

Fig. 12. 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. 13. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

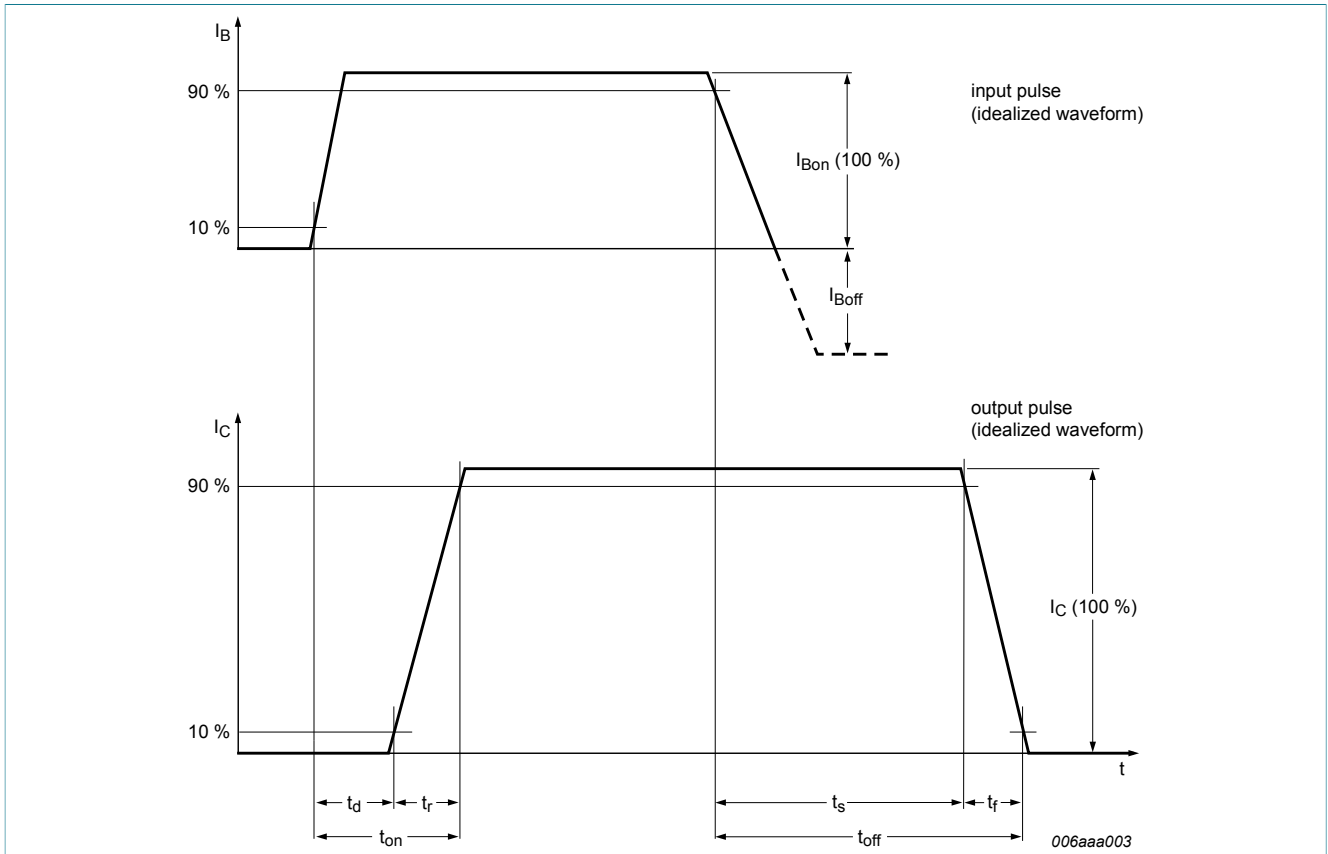


Fig. 14. BISS transistor switching time definition

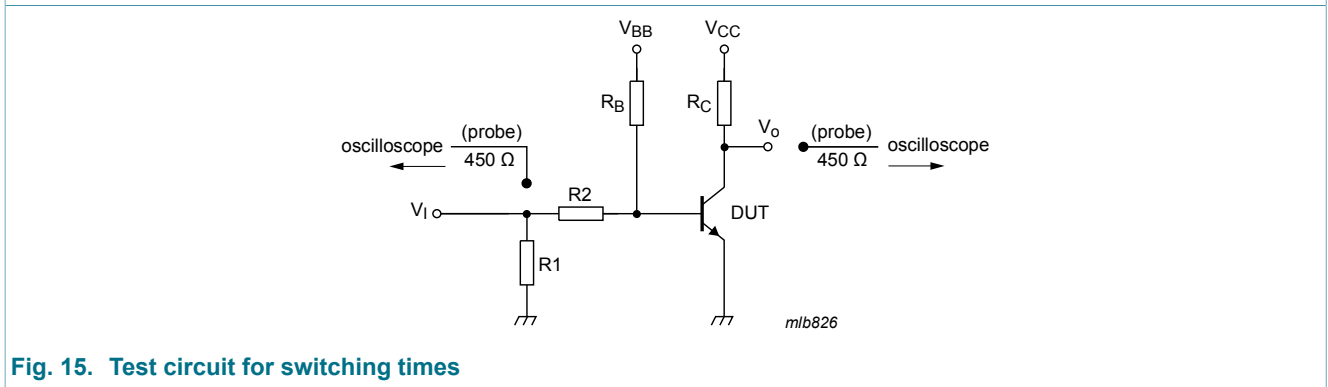


Fig. 15. Test circuit for switching times

12. Package outline

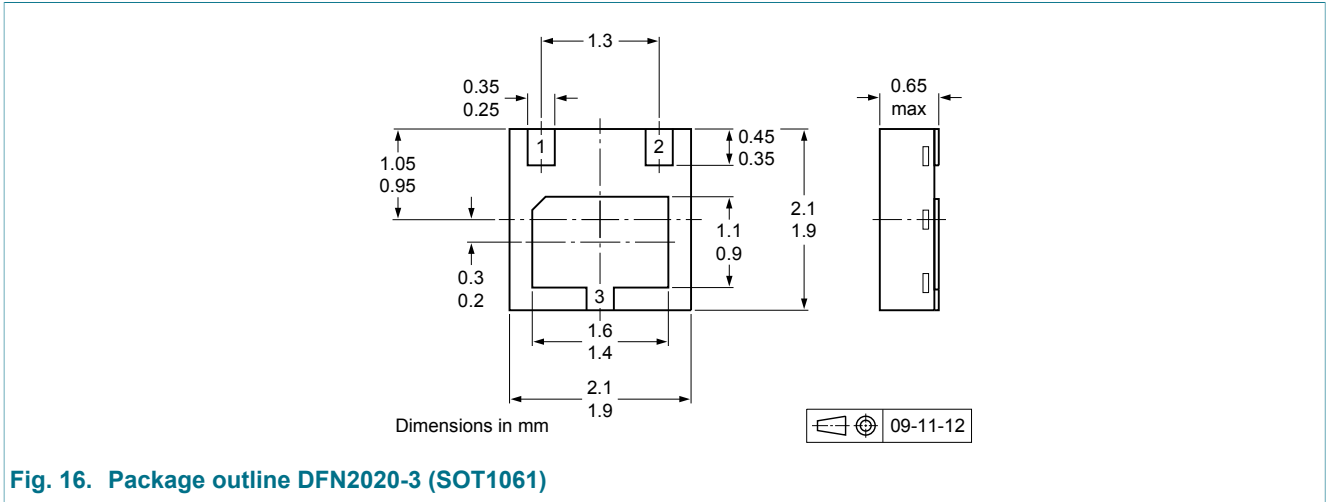


Fig. 16. Package outline DFN2020-3 (SOT1061)

13. Soldering

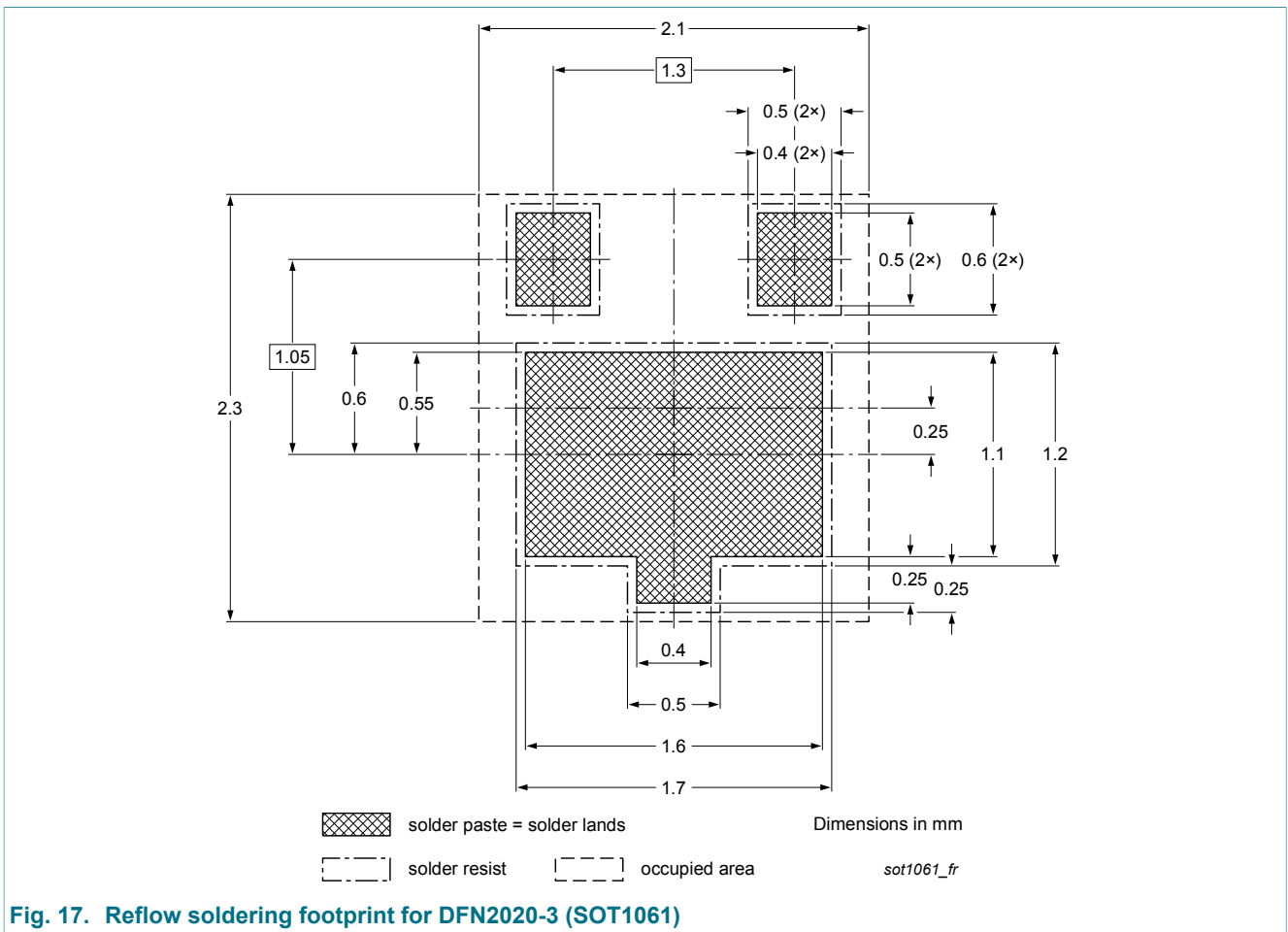


Fig. 17. Reflow soldering footprint for DFN2020-3 (SOT1061)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4330PA v.2	20150407	Product data sheet	-	PBSS4330PA v.1
Modifications:	<ul style="list-style-type: none">Condition V_{CE} changed for parameter I_{CES} in Table 7, Characteristics			
PBSS4330PA v.1	20100419	Product data sheet	-	-

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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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