



# PBSS5130QA

30 V, 1 A PNP low  $V_{CEsat}$  (BISS) transistor

28 August 2013

Product data sheet

## 1. General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a leadless ultra small DFN1010D-3 (SOT1215) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

NPN complement: PBSS4130QA.

## 2. Features and benefits

- Very 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 energy efficiency due to less heat generation
- Reduced Printed-Circuit Board (PCB) area requirements
- Solderable side pads
- AEC-Q101 qualified

## 3. Applications

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

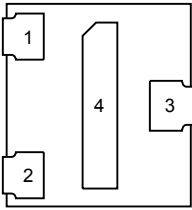
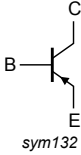
## 4. Quick reference data

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		-	-	-1	A
$I_{CM}$	peak collector current	$t_p \leq 1$ ms; pulsed	-	-	-1.5	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -1$ A; $I_B = -100$ mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C	-	160	240	m $\Omega$

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>Transparent top view DFN1010D-3 (SOT1215)</p>	
2	E	emitter		
3	C	collector		
4	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5130QA	DFN1010D-3	plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals	SOT1215

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5130QA	00 10 10

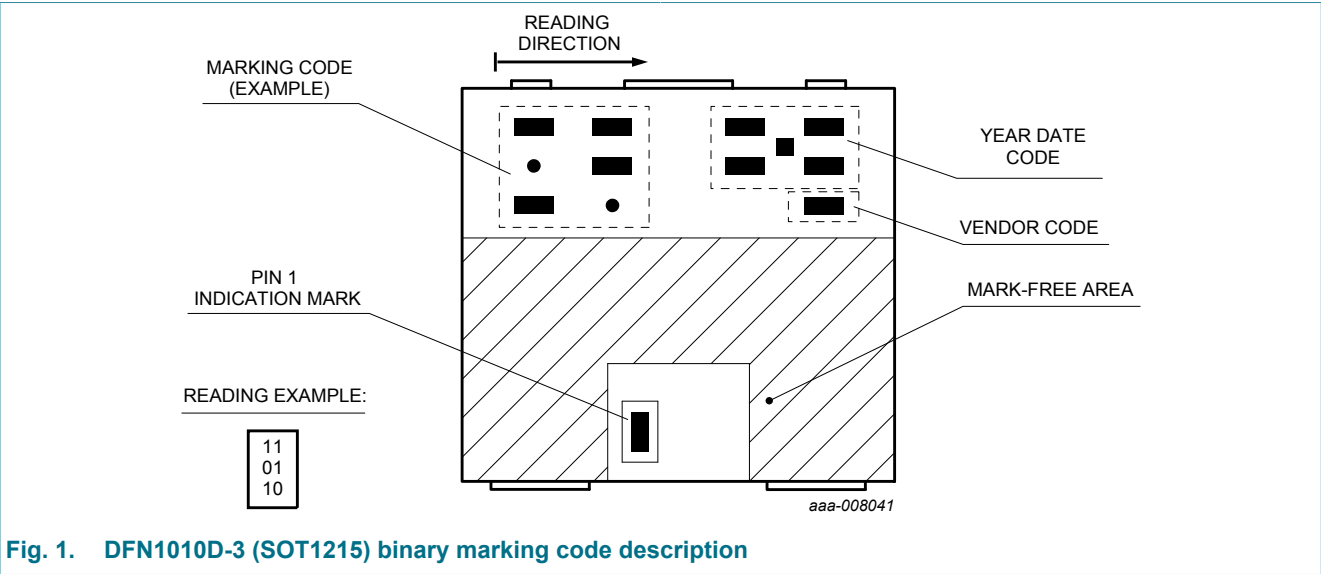


Fig. 1. DFN1010D-3 (SOT1215) binary marking code description

## 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		-	-30	V
$V_{CEO}$	collector-emitter voltage	open base		-	-30	V
$V_{EBO}$	emitter-base voltage	open collector		-	-7	V
$I_C$	collector current			-	-1	A
$I_{CM}$	peak collector current	$t_p \leq 1$ ms; pulsed		-	-1.5	A
$I_B$	base current			-	-0.3	A
$I_{BM}$	peak base current	$t_p \leq 1$ ms; pulsed		-	-1	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	325	mW
			[2]	-	600	mW
			[3]	-	740	mW
			[4]	-	540	mW
			[5]	-	1000	mW
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C

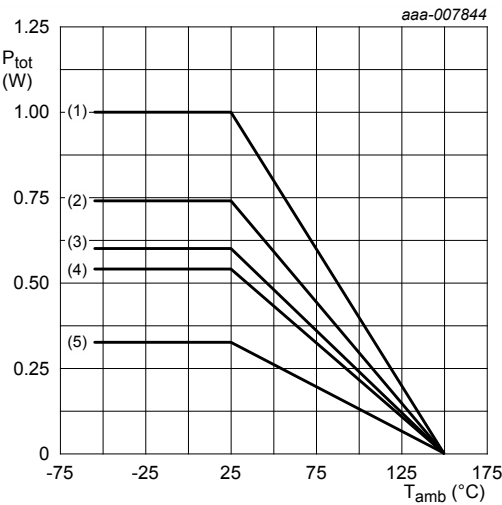
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated mounting pad for collector 1 cm<sup>2</sup>.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated mounting pad for collector 6 cm<sup>2</sup>.

[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated mounting pad for collector 1 cm<sup>2</sup>.



- (1) FR4 PCB, 4-layer copper, 1 cm<sup>2</sup>
- (2) FR4 PCB, single-sided copper, 6 cm<sup>2</sup>
- (3) FR4 PCB, single-sided copper, 1 cm<sup>2</sup>
- (4) FR4 PCB, 4-layer copper, standard footprint
- (5) FR4 PCB, single-sided copper, standard footprint

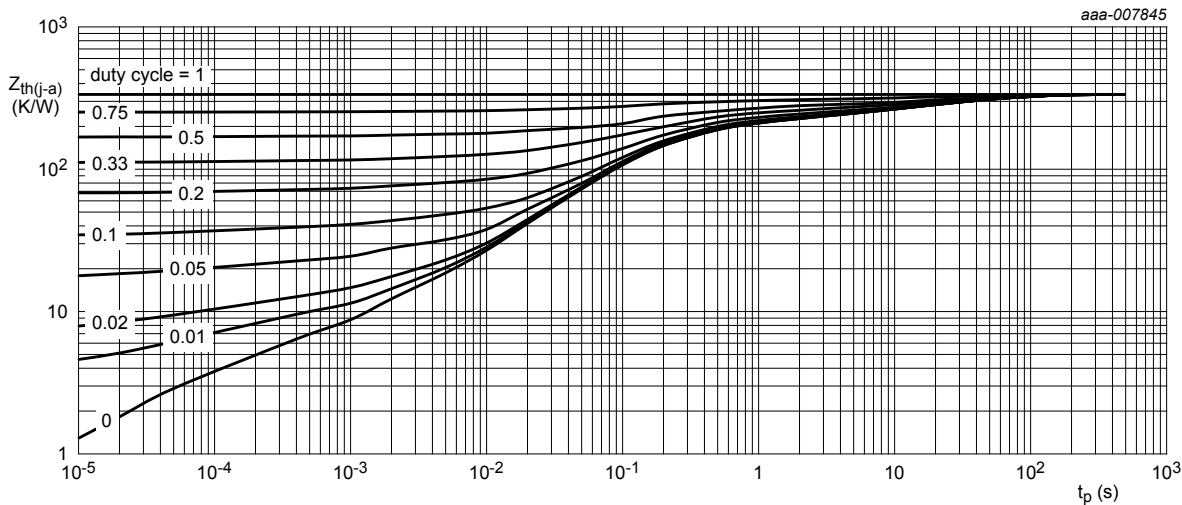
Fig. 2. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

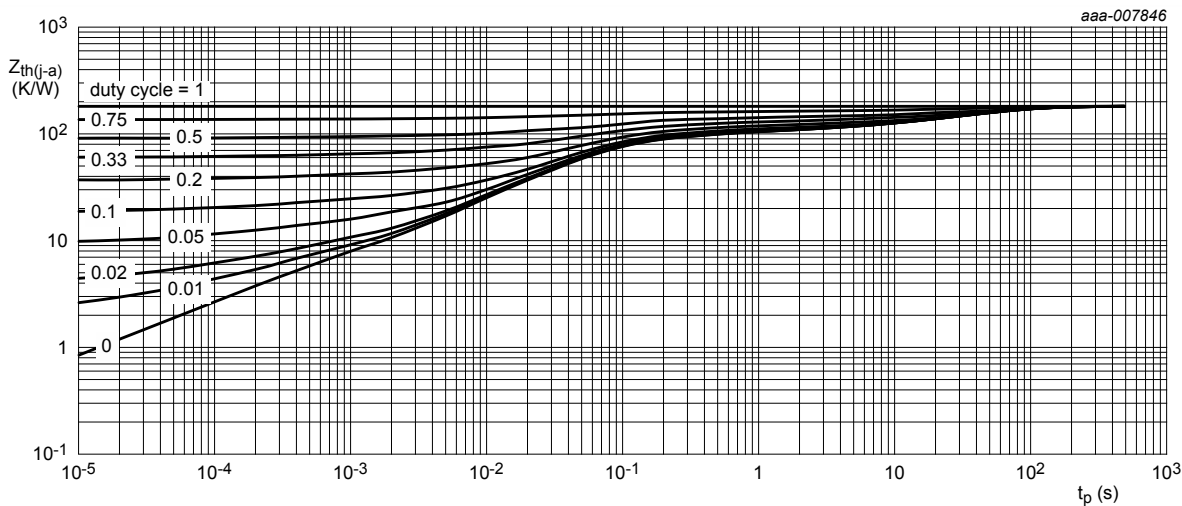
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	385	K/W
			[2]	-	-	209	K/W
			[3]	-	-	169	K/W
			[4]	-	-	232	K/W
			[5]	-	-	125	K/W

- [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, single-sided copper, tin-plated mounting pad for collector 6 cm<sup>2</sup>.
- [4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated mounting pad for collector 1 cm<sup>2</sup>.



FR4 PCB, single-sided copper, standard footprint

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



FR4 PCB, single-sided copper, 1 cm<sup>2</sup>

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

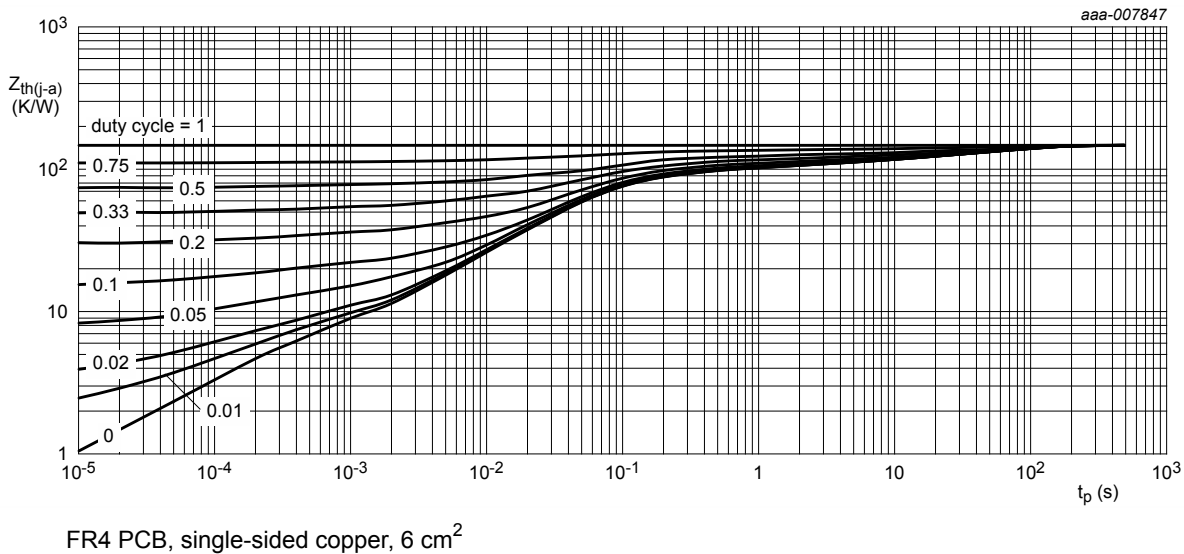


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

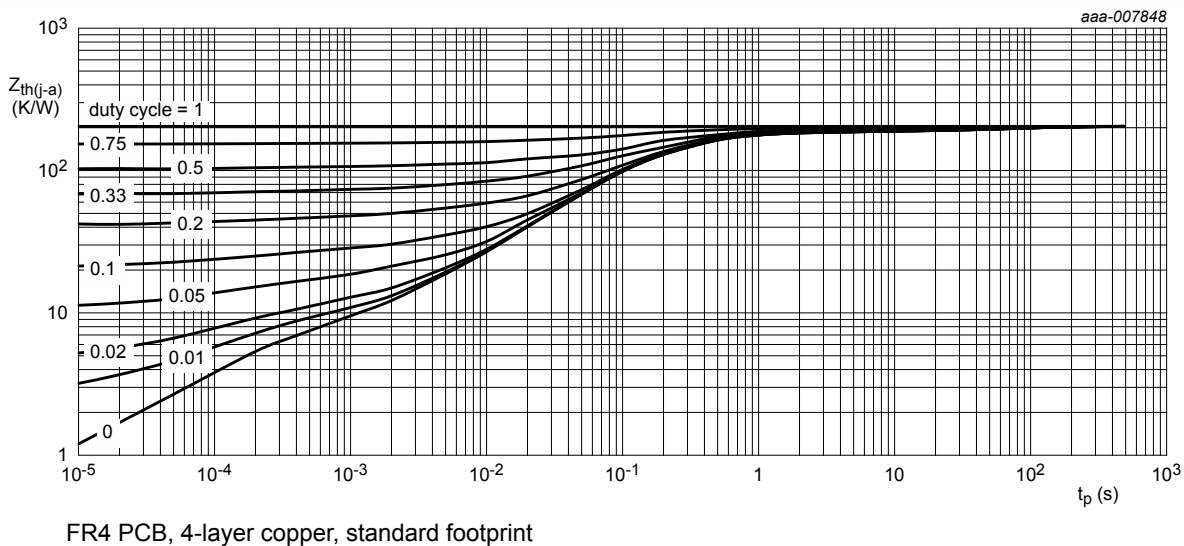
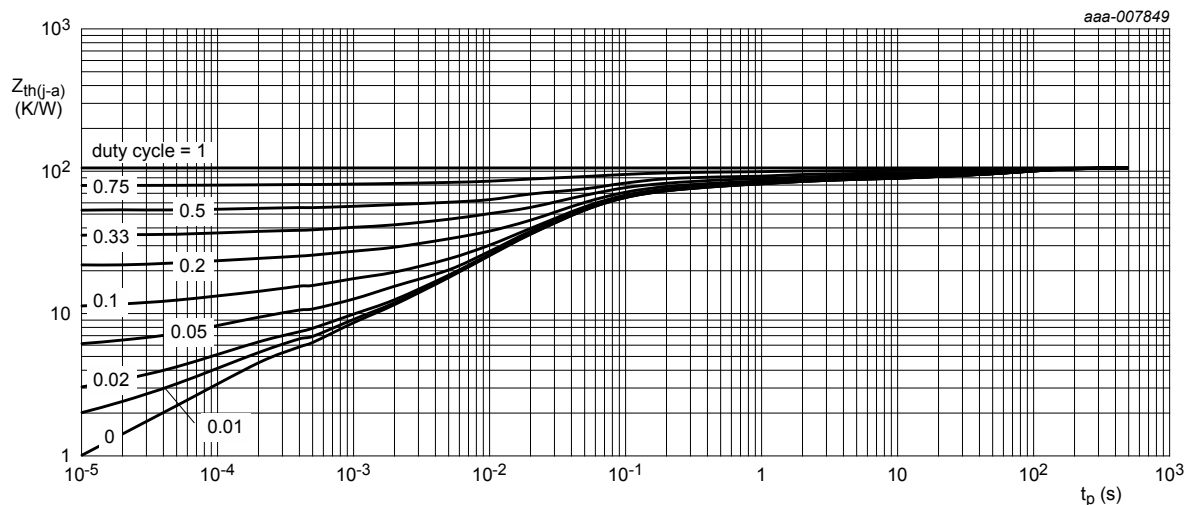


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

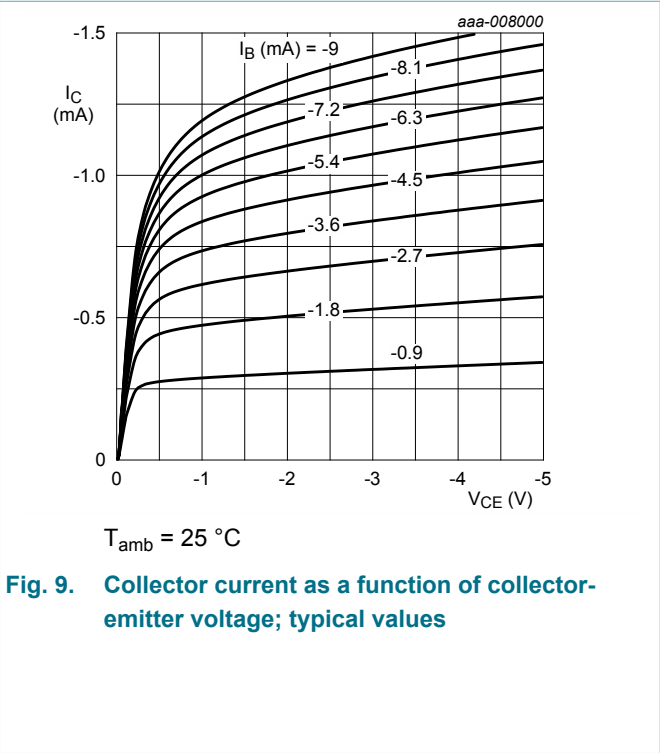
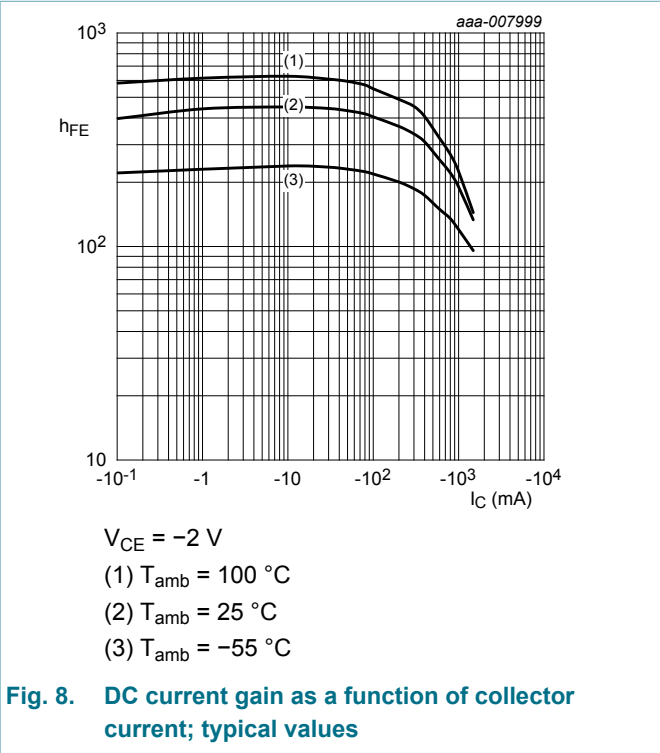
FR4 PCB, 4-layer copper, 1 cm<sup>2</sup>**Fig. 7. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 10. Characteristics

**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -24\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-100	nA
		$V_{CB} = -24\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -24\text{ V}; V_{BE} = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-100	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2\text{ V}; I_C = -100\text{ mA}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}; \text{pulsed}$	250	425	-	
		$V_{CE} = -2\text{ V}; I_C = -500\text{ mA}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}; \text{pulsed}$	180	295	-	
		$V_{CE} = -2\text{ V}; I_C = -1\text{ A}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}; \text{pulsed}$	130	200	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -500\text{ mA}; I_B = -50\text{ mA}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-85	-130	mV
		$I_C = -1\text{ A}; I_B = -50\text{ mA}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-180	-260	mV
		$I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-160	-240	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -1\text{ A}; I_B = -100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	160	240	m $\Omega$

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = -500 mA; I <sub>B</sub> = -50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02 ; T <sub>amb</sub> = 25 °C	-	-0.88	-1	V
		I <sub>C</sub> = -1 A; I <sub>B</sub> = -50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02 ; T <sub>amb</sub> = 25 °C	-	-0.93	-1.05	V
		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	-	-0.96	-1.1	V
V <sub>BEon</sub>	base-emitter turn-on voltage	V <sub>CE</sub> = -2 V; I <sub>C</sub> = -0.5 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02 ; T <sub>amb</sub> = 25 °C	-	-0.78	-0.9	V
t <sub>d</sub>	delay time	V <sub>CC</sub> = -10 V; I <sub>C</sub> = -0.5 A; I <sub>Bon</sub> = -25 mA; I <sub>Boff</sub> = 25 mA; T <sub>amb</sub> = 25 °C	-	10	-	ns
t <sub>r</sub>	rise time		-	30	-	ns
t <sub>on</sub>	turn-on time		-	40	-	ns
t <sub>s</sub>	storage time		-	270	-	ns
t <sub>f</sub>	fall time		-	45	-	ns
t <sub>off</sub>	turn-off time		-	315	-	ns
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = -10 V; I <sub>C</sub> = -50 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C	120	170	-	MHz
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	-	14	16	pF





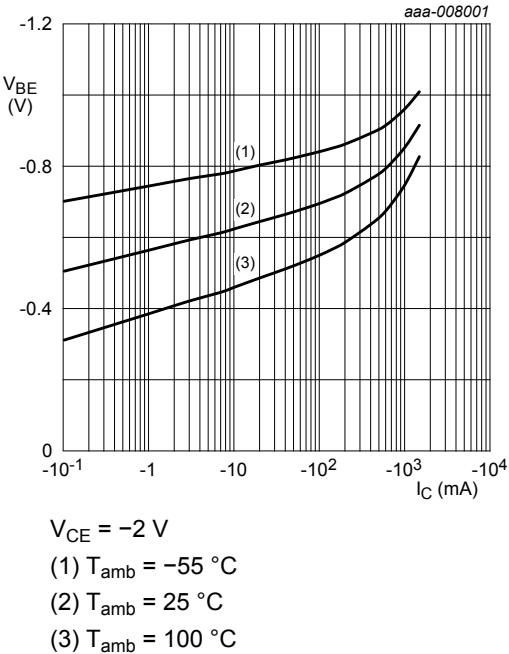


Fig. 10. Base-emitter voltage as a function of collector current; typical values

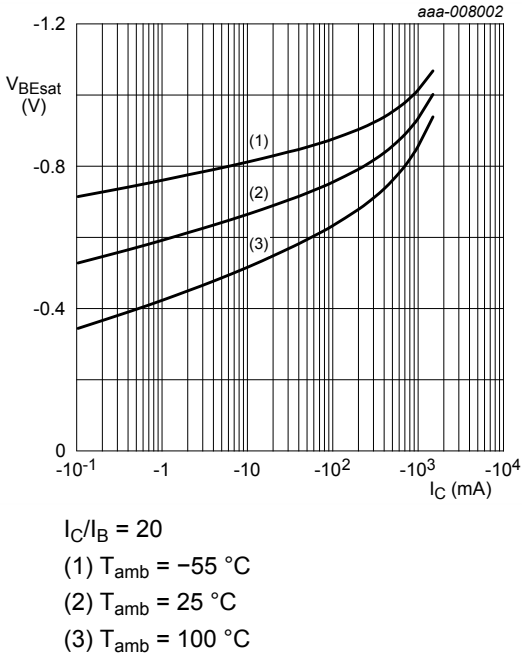


Fig. 11. Base-emitter saturation voltage as a function of collector current; typical values

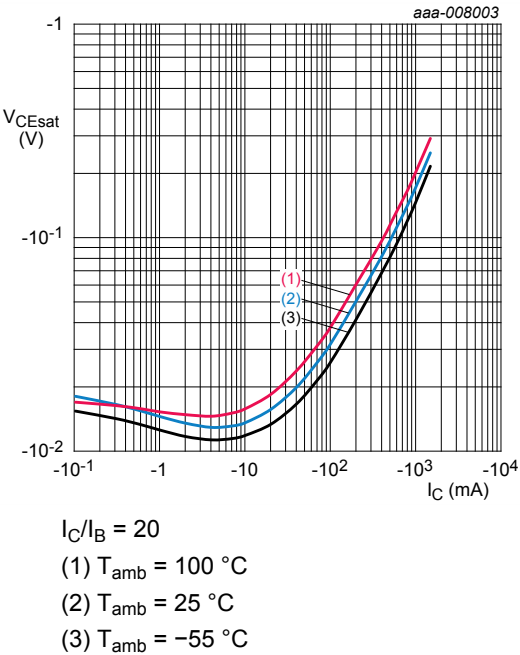


Fig. 12. Collector-emitter saturation voltage as a function of collector current; typical values

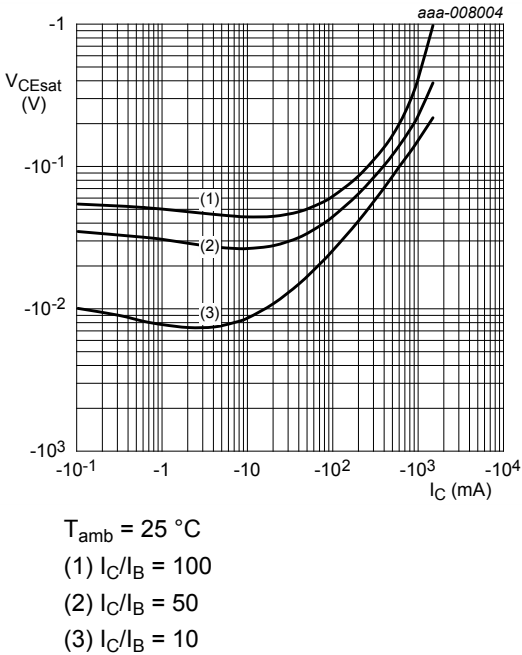
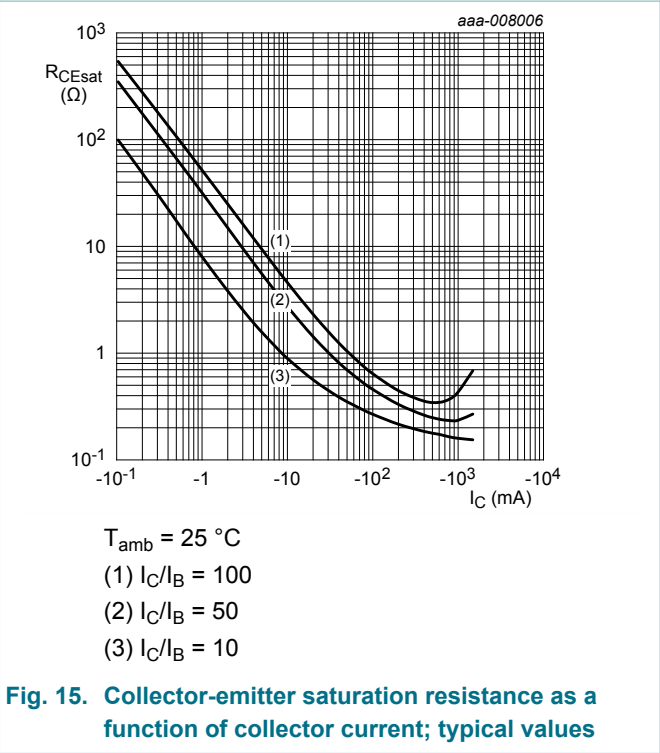
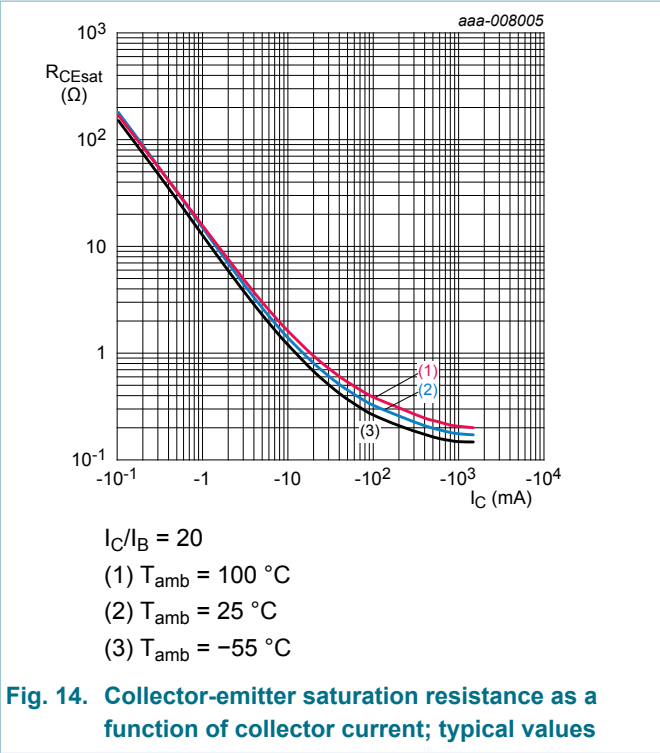


Fig. 13. Collector-emitter saturation voltage as a function of collector current; typical values



11. Test information

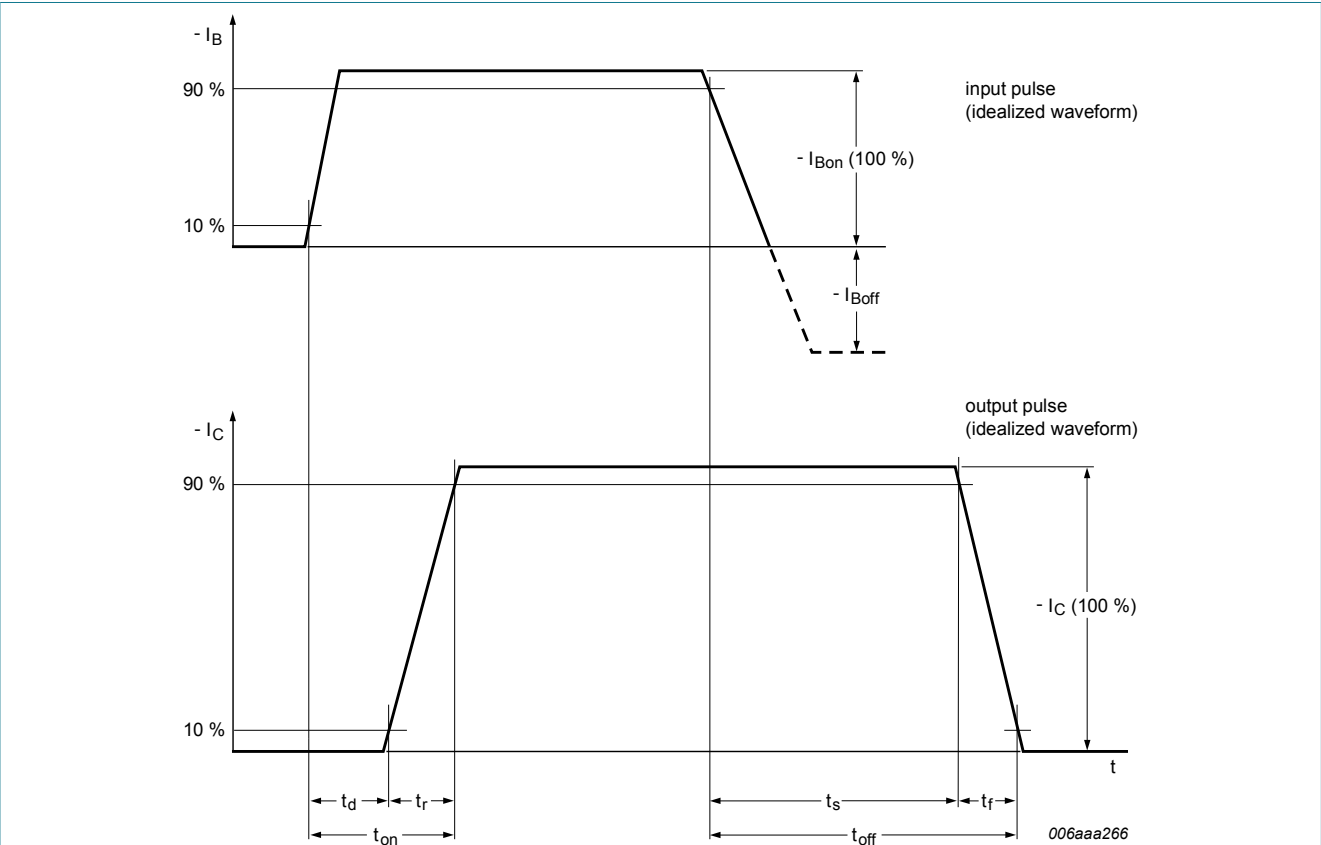


Fig. 16. BISS transistor switching time definition

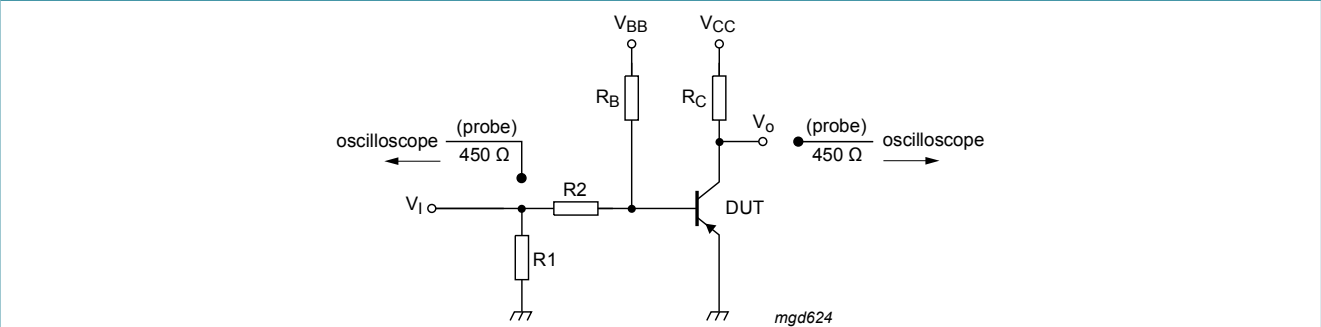


Fig. 17. Test circuit for switching times

11.1 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

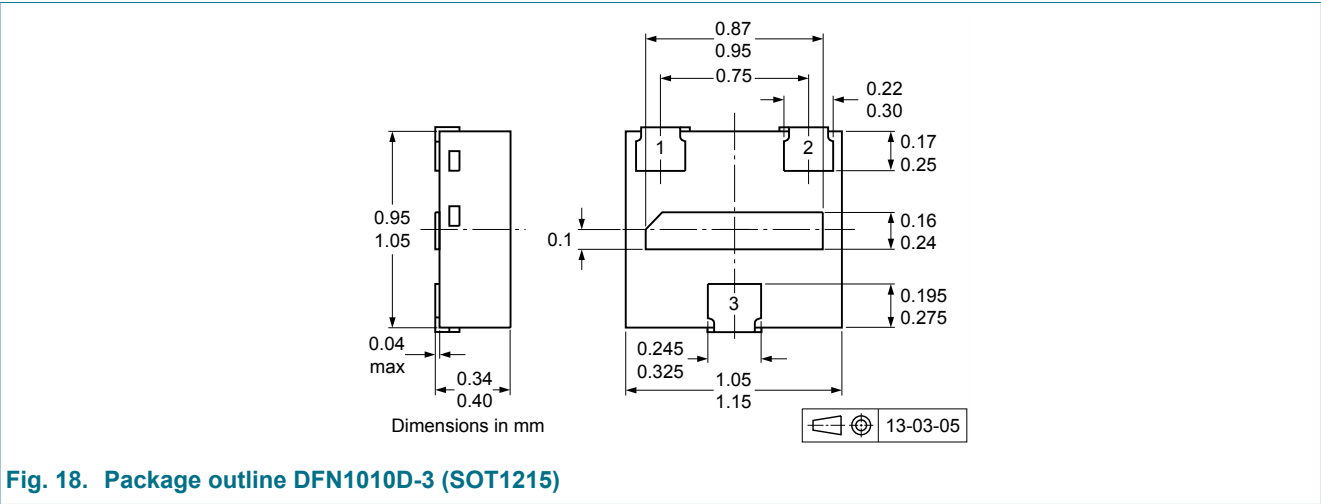


Fig. 18. Package outline DFN1010D-3 (SOT1215)

13. Soldering

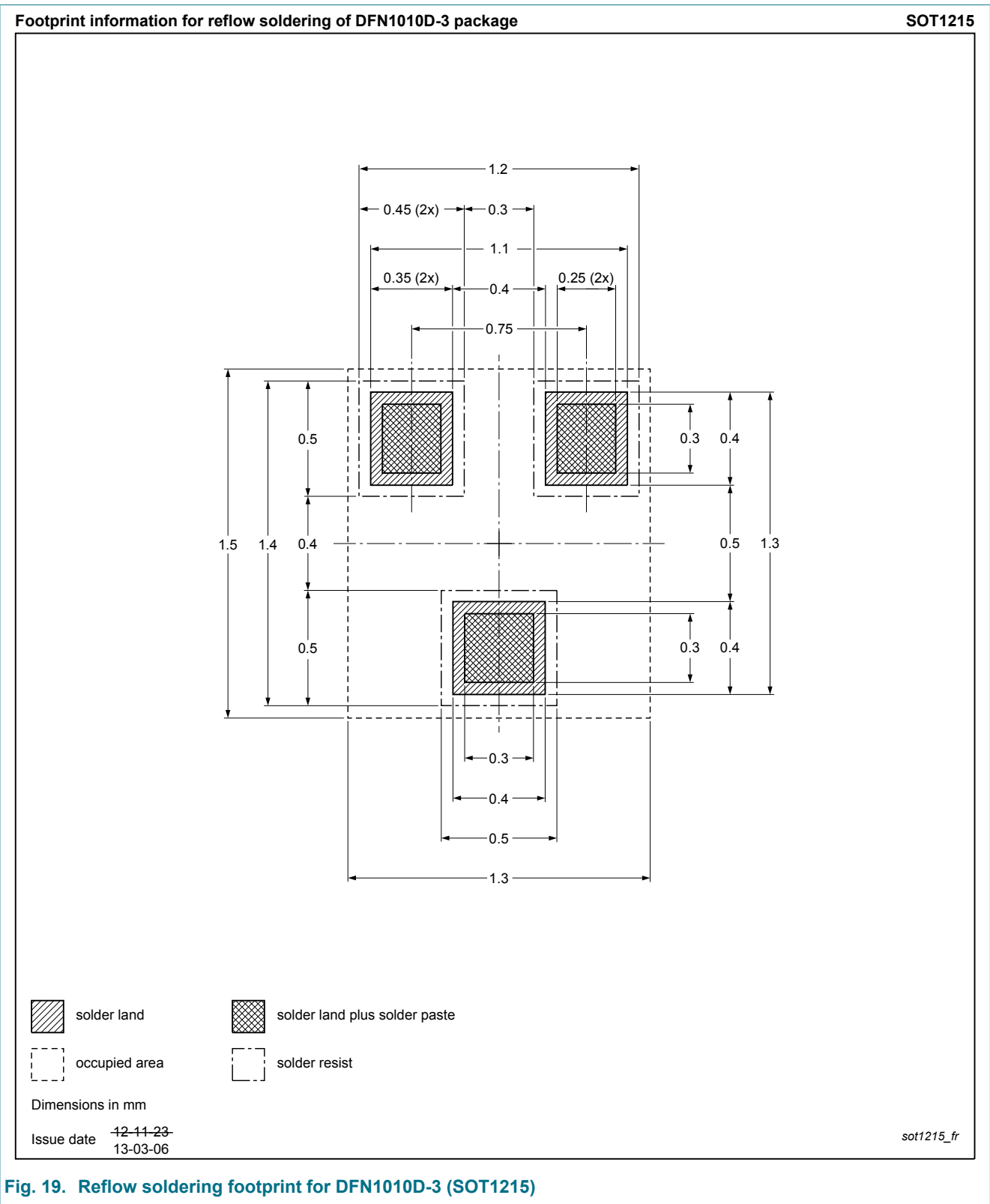


Fig. 19. Reflow soldering footprint for DFN1010D-3 (SOT1215)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5130QA v.1	20130828	Product data sheet	-	-

## 15. Legal information

### 15.1 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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