



# PMBT2907AQA

60V, 600 mA PNP switching transistor

21 September 2018

Product data sheet

## 1. General description

PNP switching transistor in an ultra small DFN1010D-3 (SOT1215) leadless Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

NPN complement: PMBT2222AQA

## 2. Features and benefits

- High current (max. 600 mA)
- Low voltage (max. 60V)
- Leadless ultra small SMD plastic package
- Low package height of 0.37 mm
- Suitable for Automatic Optical Inspection (AOI) of solder joint
- AEC-Q101 qualified

## 3. Applications

- Switching and linear applications
- Mobile applications

## 4. Quick reference data

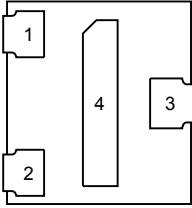
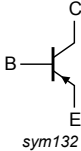
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{CEO}$	collector-emitter voltage	open base	-	-	-60	V	
$I_C$	collector current		-	-	-600	mA	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-800	mA	
$h_{FE}$	DC current gain	$V_{CE} = -10$ V; $I_C = -150$ mA	[1]	100	-	300	
		$V_{CE} = -10$ V; $I_C = -500$ mA	[1]	50	-	-	

[1] Pulsed test:  $t_p \leq 300$   $\mu$ s;  $\delta \leq 0.02$

## 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>	 <p>sym132</p>
2	E	emitter		
3	C	collector		
4	C	collector		

## 6. Ordering information

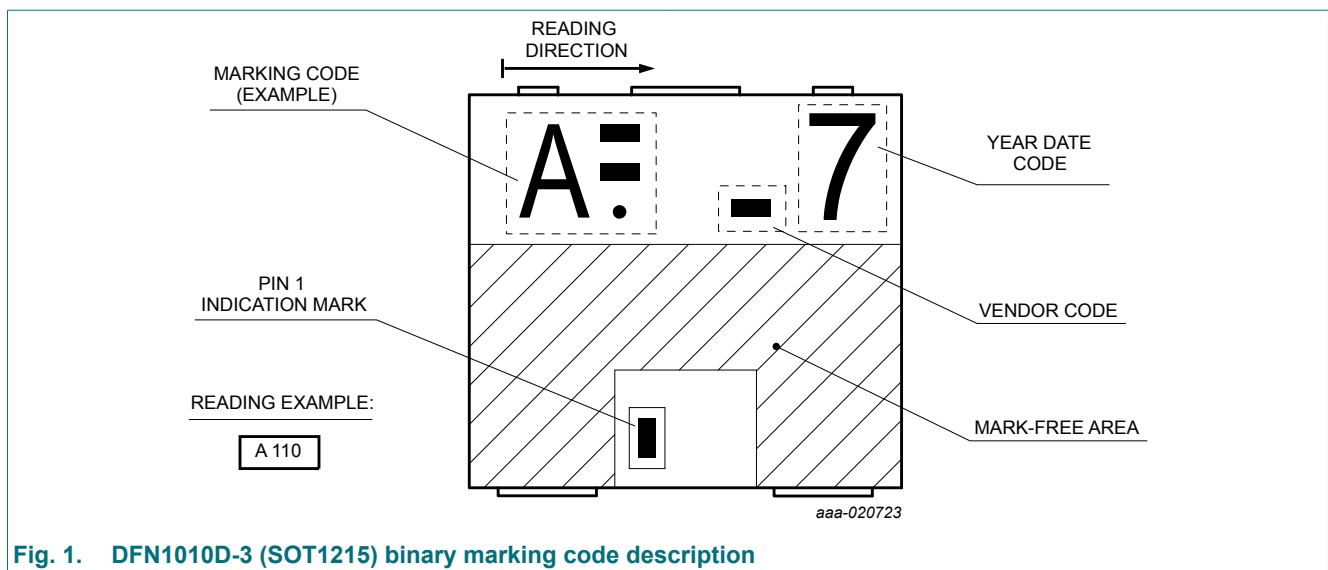
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMBT2907AQA	DFN1010D-3	plastic, leadless thermal enhanced ultra thin small outline package; 3 terminals; 0.75 mm pitch; 1.1 mm x 1 mm x 0.37 mm body	SOT1215

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMBT2907AQA	X 101



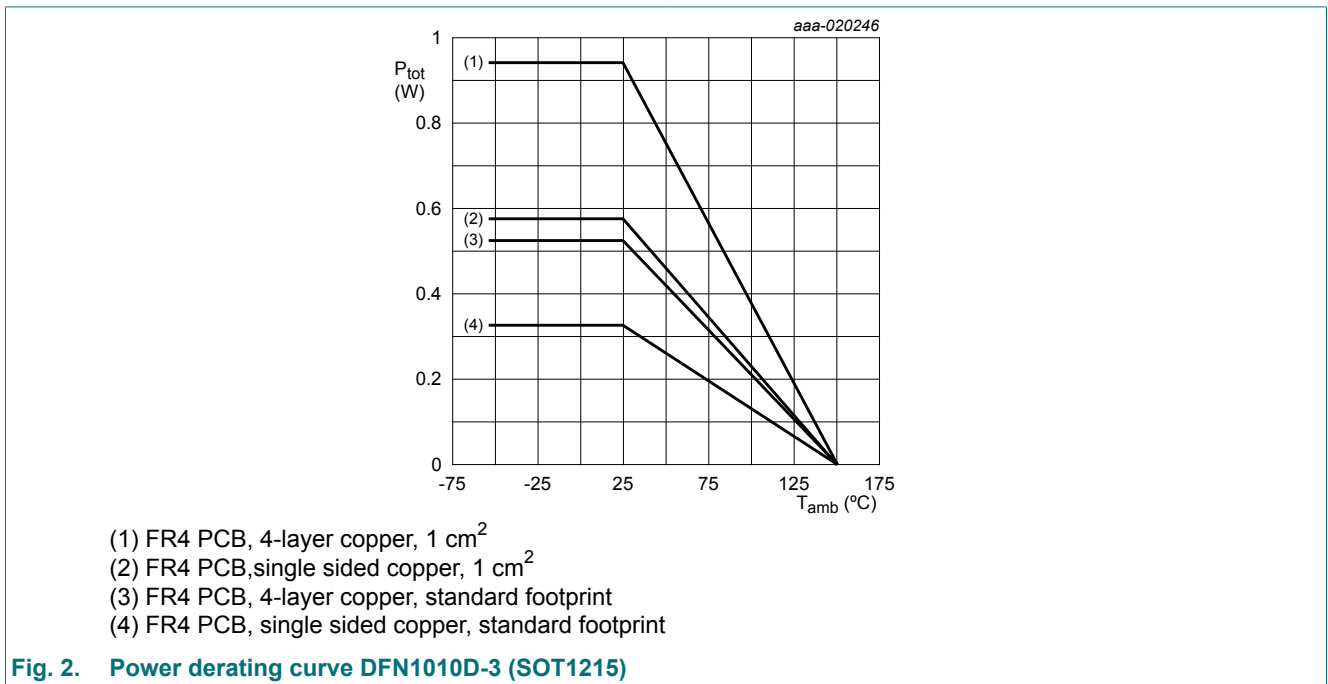
## 8. Limiting values

**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		-	-60	V
$V_{CEO}$	collector-emitter voltage	open base		-	-60	V
$V_{EBO}$	emitter-base voltage	open collector		-	-5	V
$I_C$	collector current			-	-600	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	-800	mA
$I_{BM}$	peak base current			-	-200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	325	mW
			[2]	-	575	mW
			[3]	-	525	mW
			[4]	-	940	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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 Printed-Circuit Board (PCB), 4-layer copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 Printed-Circuit Board (PCB), 4-layer copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.



**Fig. 2. Power derating curve DFN1010D-3 (SOT1215)**

## 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]	-	-	385	K/W
			[2]	-	-	218	K/W
			[3]	-	-	239	K/W
			[4]	-	-	133	K/W

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

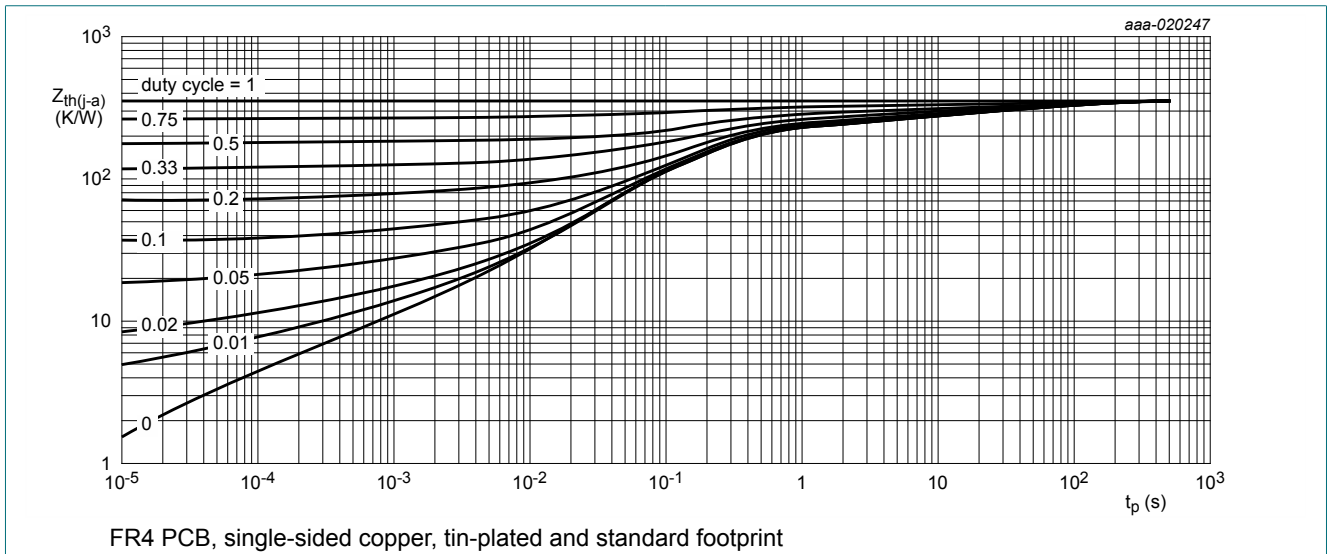


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

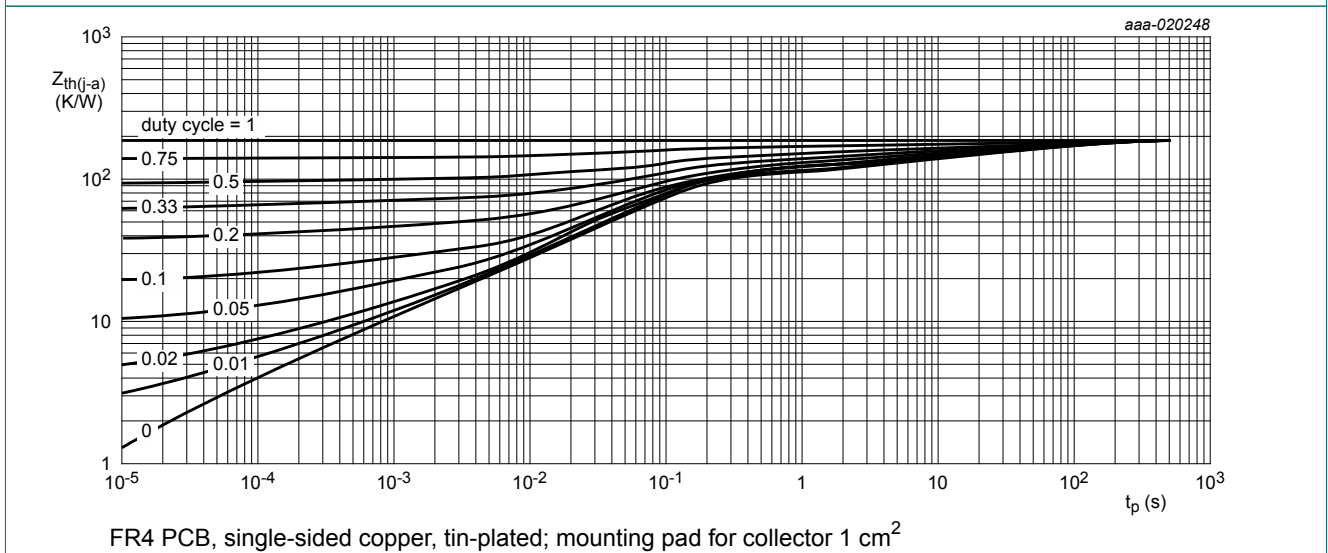


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

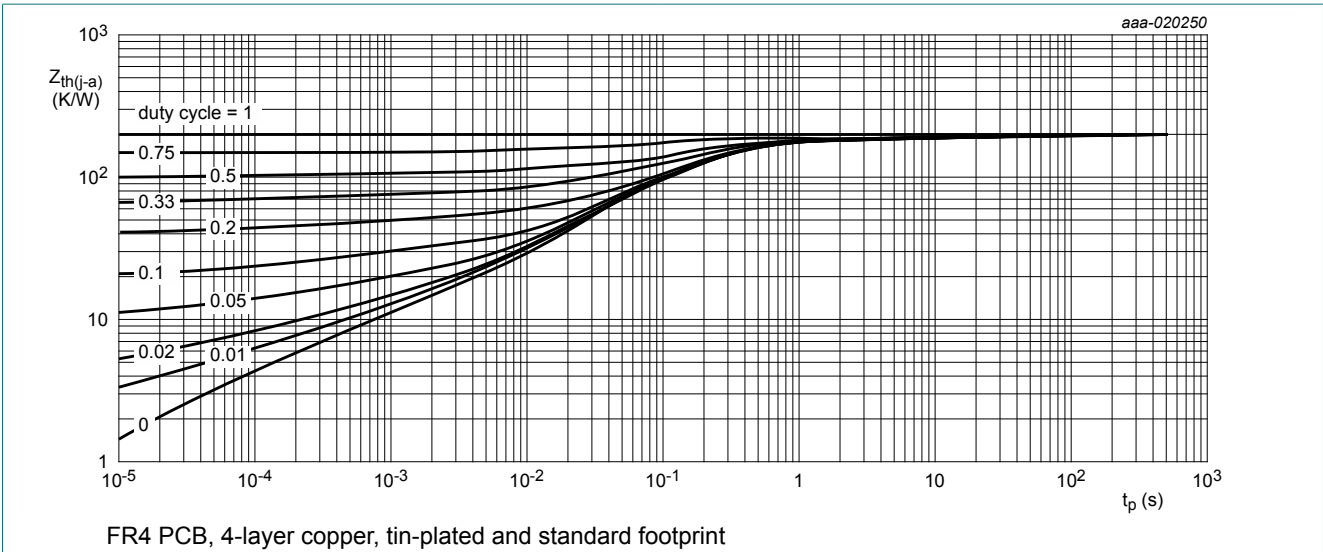


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

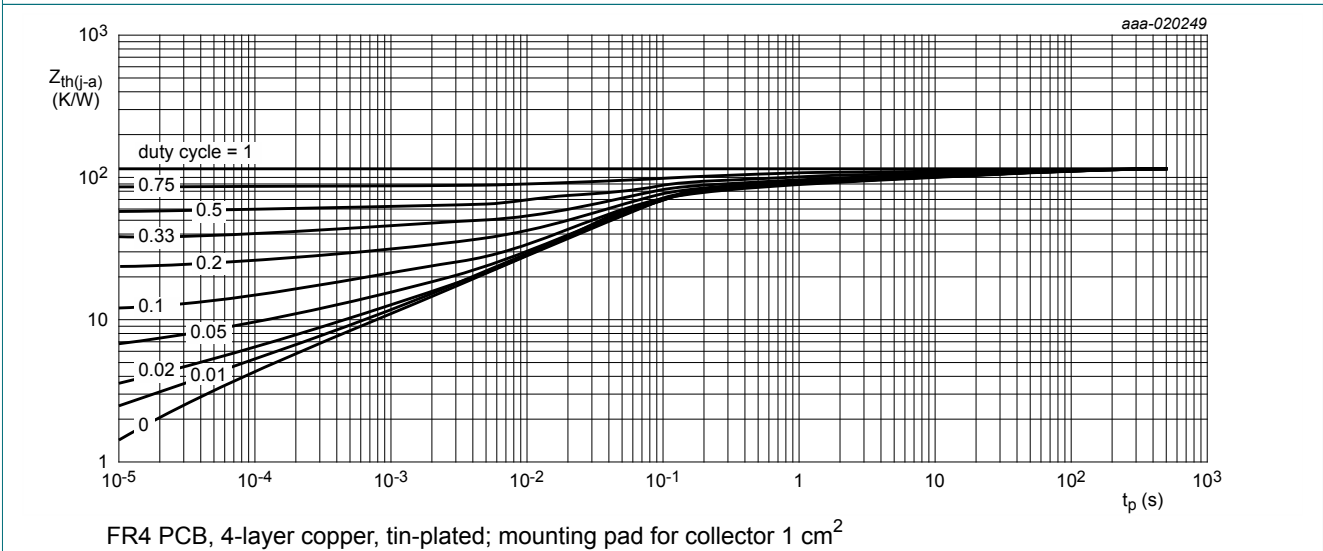


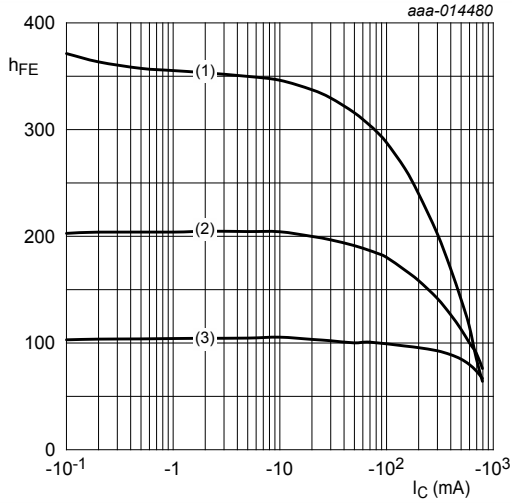
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

**Table 7. Characteristics**
 $T_{amb} = 25\text{ °C}$  unless otherwise specified

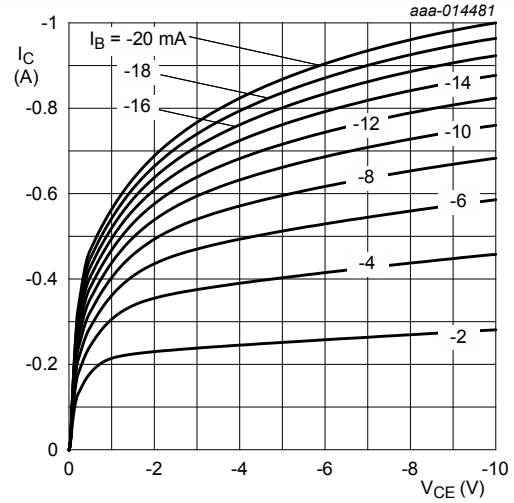
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100\ \mu\text{A}$ ; $I_E = 0\ \text{A}$	-60	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -2\ \text{mA}$ ; $I_B = 0\ \text{A}$	-60	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0\ \text{A}$ ; $I_E = -100\ \mu\text{A}$	-5	-	-	V	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -50\ \text{V}$ ; $I_E = 0\ \text{A}$	-	-	-10	nA	
		$V_{CB} = -50\ \text{V}$ ; $I_E = 0\ \text{A}$ ; $T_j = 125\text{ °C}$	-	-	-10	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\ \text{V}$ ; $I_C = 0\ \text{A}$	-	-	-50	nA	
$h_{FE}$	DC current gain	$V_{CE} = -10\ \text{V}$ ; $I_C = -100\ \mu\text{A}$	75	-	-		
		$V_{CE} = -10\ \text{V}$ ; $I_C = -1\ \text{mA}$	100	-	-		
		$V_{CE} = -10\ \text{V}$ ; $I_C = -10\ \text{mA}$	100	-	-		
		$V_{CE} = -10\ \text{V}$ ; $I_C = -150\ \text{mA}$	[1]	100	-	300	
		$V_{CE} = -10\ \text{V}$ ; $I_C = -500\ \text{mA}$	[1]	50	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -150\ \text{mA}$ ; $I_B = -15\ \text{mA}$	[1]	-	-400	mV	
		$I_C = -500\ \text{mA}$ ; $I_B = -50\ \text{mA}$	[1]	-	-1.6	V	
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -150\ \text{mA}$ ; $I_B = -15\ \text{mA}$	[1]	-	-1.3	V	
		$I_C = -500\ \text{mA}$ ; $I_B = -50\ \text{mA}$	[1]	-	-2.6	V	
$t_d$	delay time	$I_C = -150\ \text{mA}$ ; $I_{B(on)} = -15\ \text{mA}$ ; $I_{B(off)} = 15\ \text{mA}$	-	-	15	ns	
$t_r$	rise time		-	-	30	ns	
$t_{on}$	turn-on time		-	-	45	ns	
$t_s$	storage time		-	-	300	ns	
$t_f$	fall time		-	-	65	ns	
$t_{off}$	turn-off time		-	-	365	ns	
$C_c$	collector capacitance		$V_{CB} = -10\ \text{V}$ ; $I_E = 0\ \text{A}$ ; $i_e = 0\ \text{A}$ ; $f = 1\ \text{MHz}$	-	-	8	pF
$C_e$	emitter capacitance	$V_{EB} = -2\ \text{V}$ ; $I_C = 0\ \text{A}$ ; $i_c = 0\ \text{A}$ ; $f = 1\ \text{MHz}$	-	-	30	pF	
$f_T$	transition frequency	$V_{CE} = -20\ \text{V}$ ; $I_C = -50\ \text{mA}$ ; $f = 100\ \text{MHz}$	[1]	210	-	MHz	

[1] Pulsed test:  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$



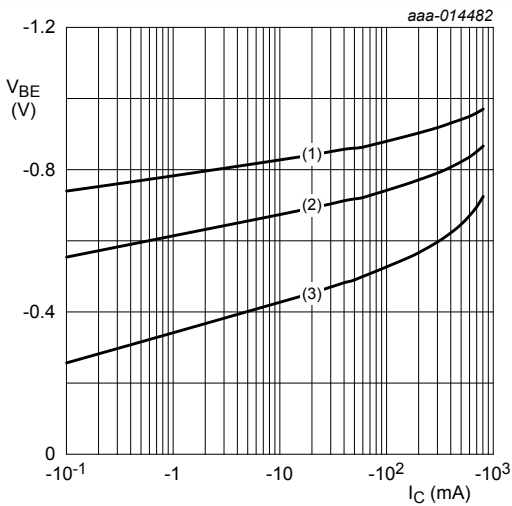
$V_{CE} = -10\text{ V}$   
 (1)  $T_{amb} = 150^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = -55^\circ\text{C}$

Fig. 7. DC current gain as a function of collector current; typical values



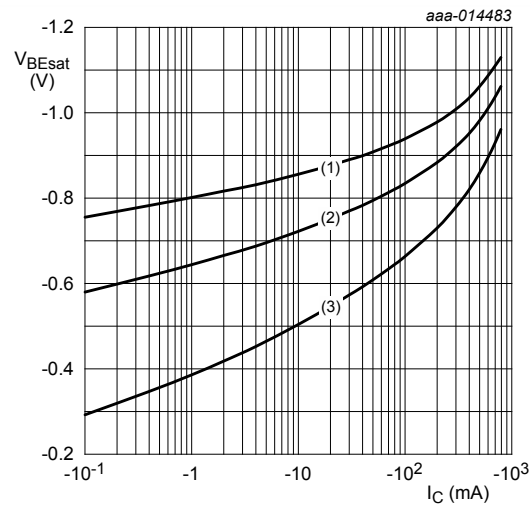
$T_{amb} = 25^\circ\text{C}$

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



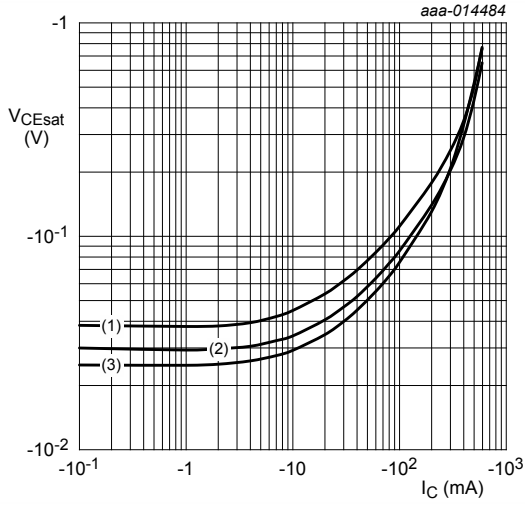
$V_{CE} = -10\text{ V}$   
 (1)  $T_{amb} = -55^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = 150^\circ\text{C}$

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



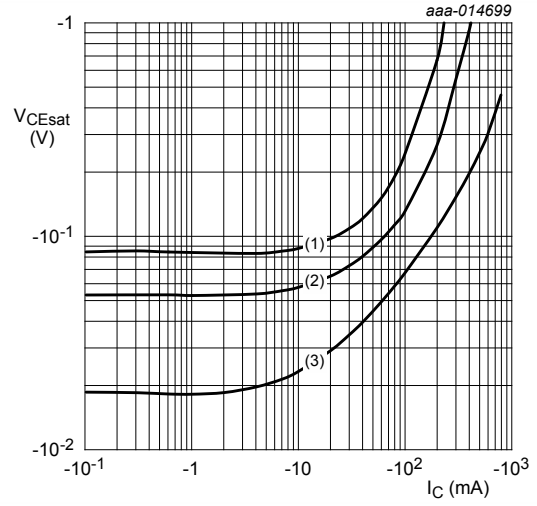
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55^\circ\text{C}$   
 (2)  $T_{amb} = 25^\circ\text{C}$   
 (3)  $T_{amb} = 150^\circ\text{C}$

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



$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

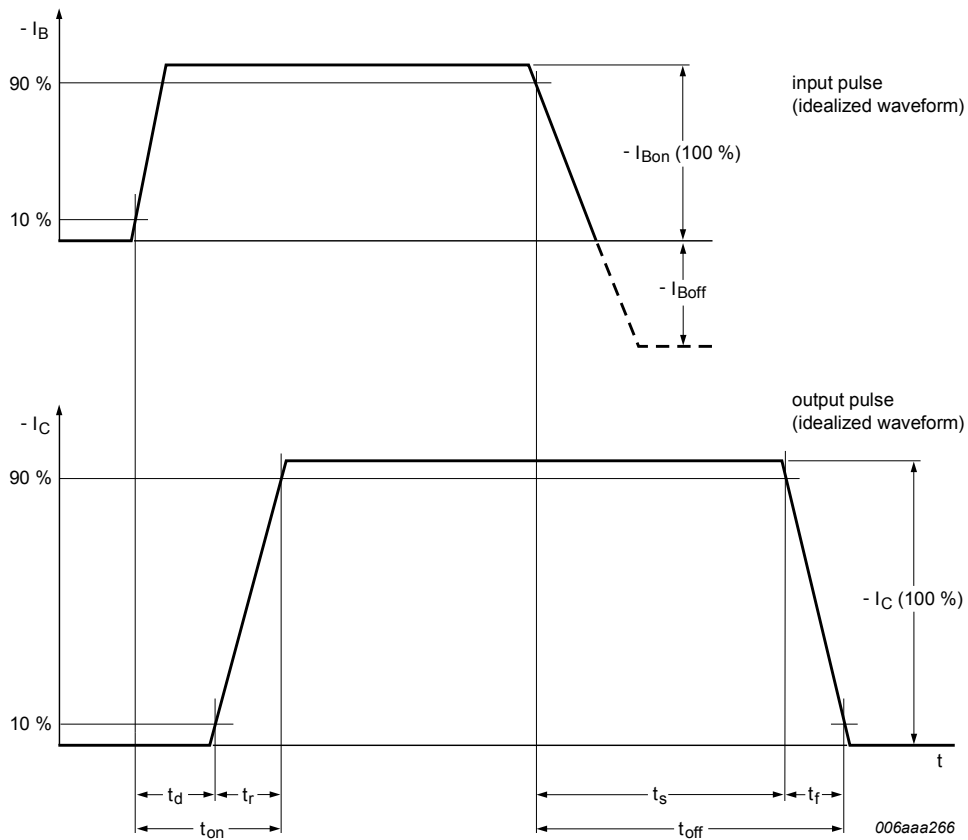
**Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values**



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

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

### 11. Test information



**Fig. 13. Transistor switching time definition**

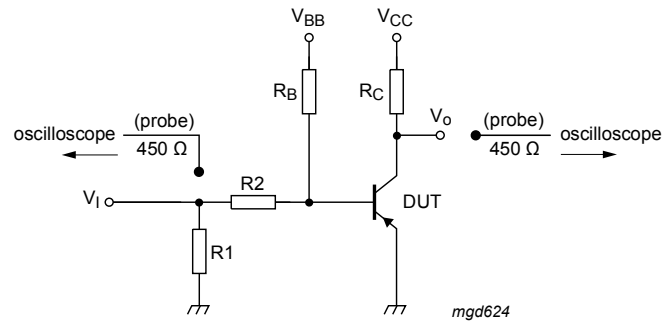


Fig. 14. Test circuit for switching times

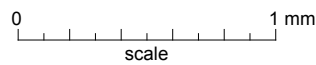
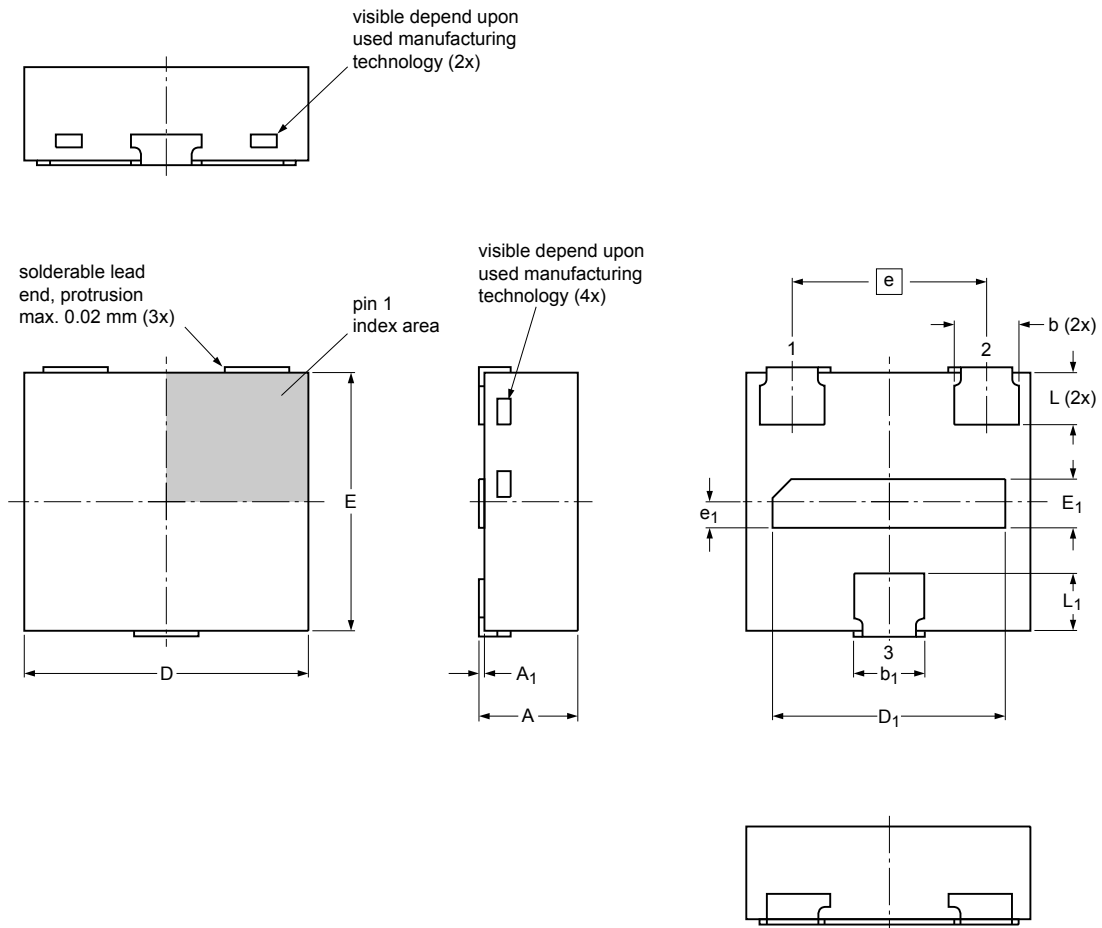
### Quality information

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

DFN1010D-3: plastic thermal enhanced ultra thin small outline package; no leads;  
3 terminals; body: 1.1 x 1.0 x 0.37 mm

SOT1215



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub>	D	D <sub>1</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	min 0.34		0.22	0.245	1.05	0.87	0.95	0.16			0.17	0.195
	nom 0.37		0.25	0.275	1.10	0.90	1.00	0.19	0.75	0.1	0.20	0.225
	max 0.40	0.04	0.30	0.325	1.15	0.95	1.05	0.24			0.25	0.275

Note

1. Dimension A is including plating thickness.

sot1215\_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOT1215					13-03-05 13-03-06

Fig. 15. Package outline DFN1010D-3 (SOT1215)

### 13. Soldering

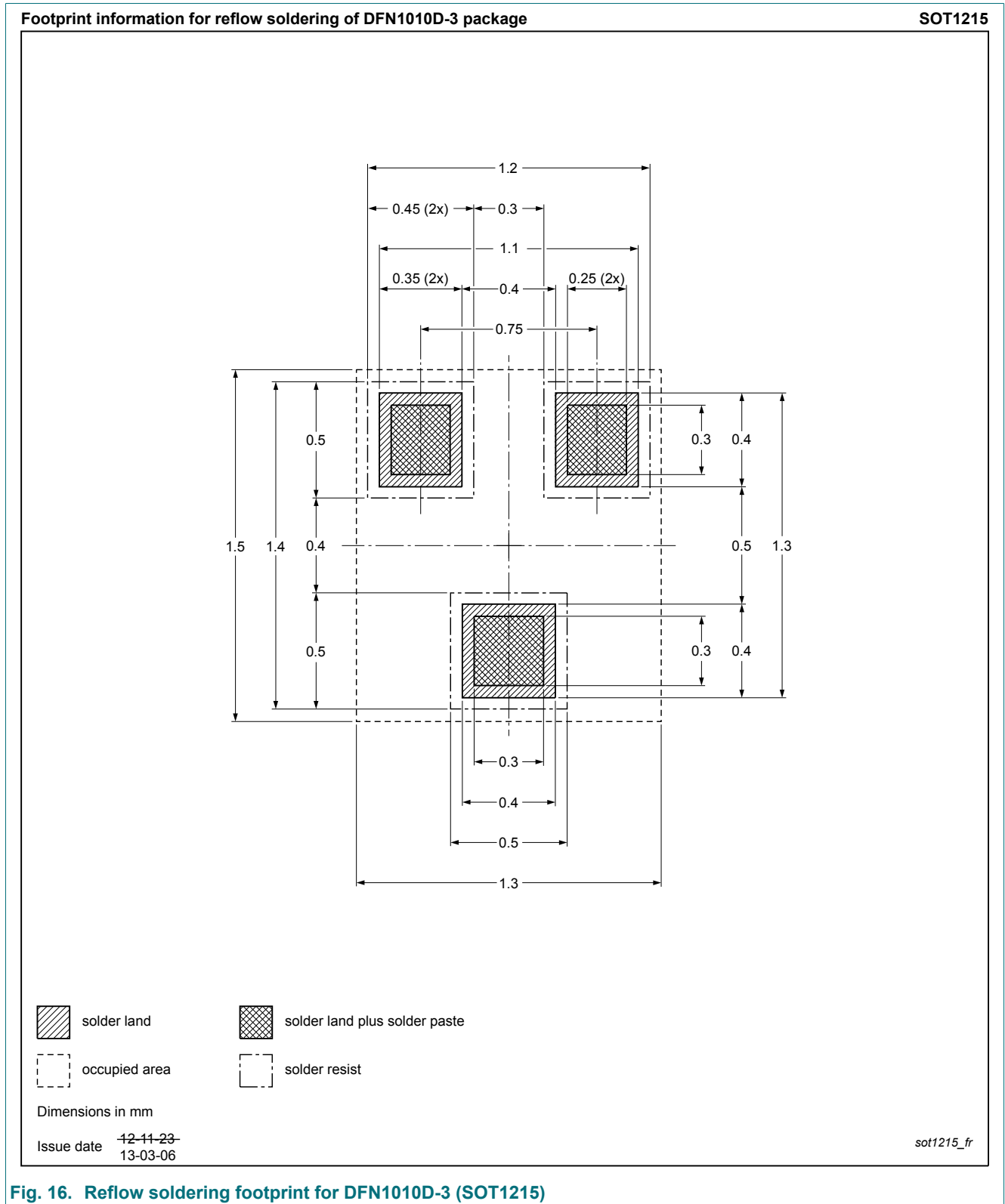


Fig. 16. Reflow soldering footprint for DFN1010D-3 (SOT1215)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMBT2907AQA v.1	20180921	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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