



PMBT2222AQA

40 V, 600 mA NPN switching transistor

21 September 2018

Product data sheet

1. General description

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

PNP complement: PMBT2907AQA

2. Features and benefits

- High current (max. 600 mA)
- Low voltage (max. 40V)
- Leadless ultra small SMD plastic package
- Low package height of 0.37 mm
- Suitable for Automatic Optical Inspection (AOI) of solder joint

3. Applications

- Switching and linear applications
- Mobile applications

4. Quick reference data

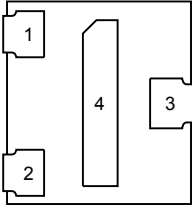
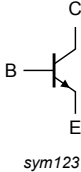
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CE0}	collector-emitter voltage	open base	-	-	40	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]	40	-	-

[1] Pulsed test: $t_p \leq 300$ μ 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>sym123</p>
2	E	emitter		
3	C	collector		
4	C	collector		

6. Ordering information

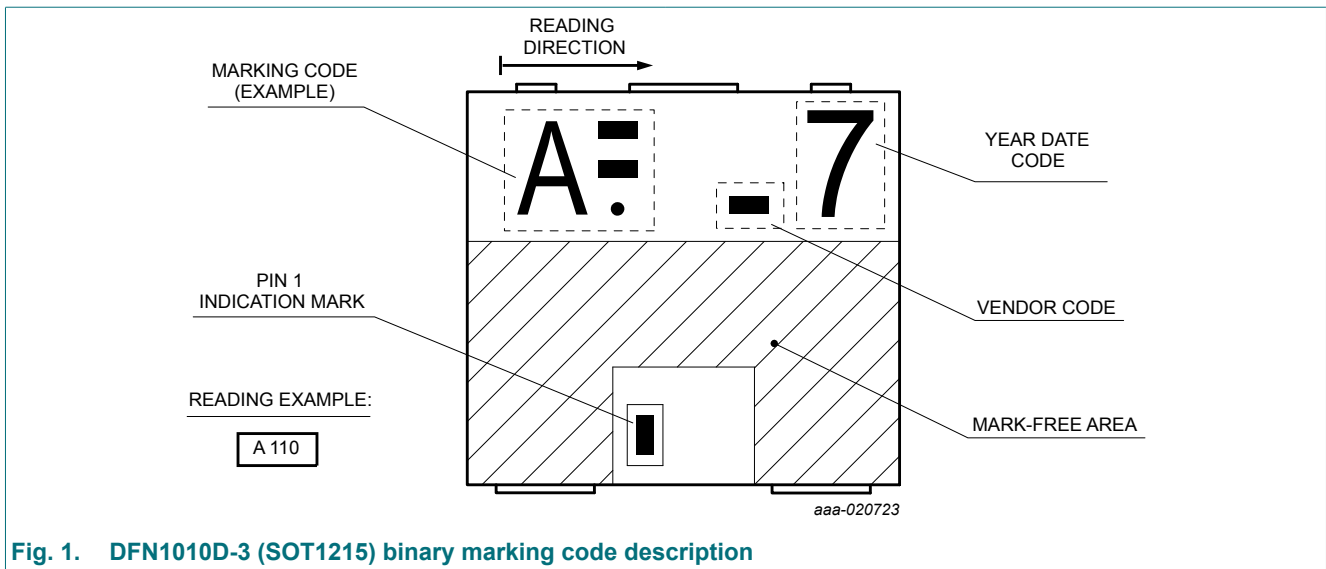
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMBT2222AQA	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
PMBT2222AQA	X 100



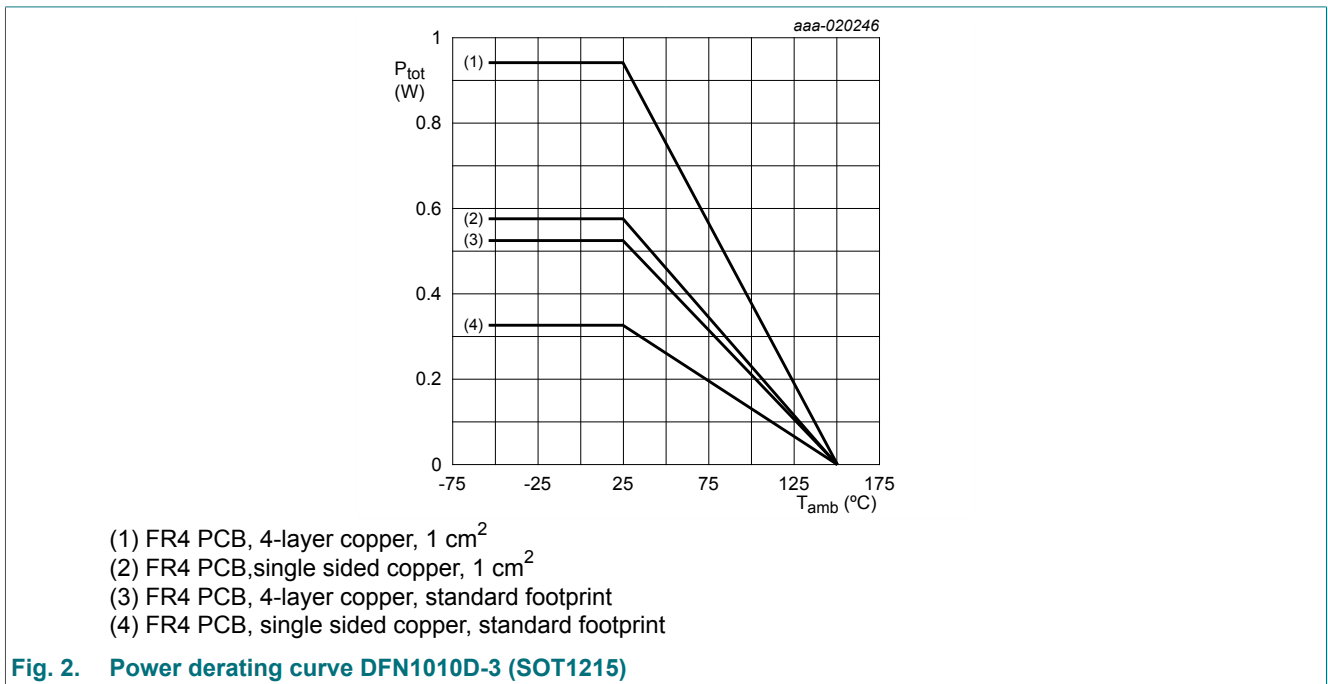
8. Limiting values

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		-	75	V
V_{CEO}	collector-emitter voltage	open base		-	40	V
V_{EBO}	emitter-base voltage	open collector		-	6	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 cm².
- [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 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]	-	-	385	K/W
			[2]	-	-	218	K/W
			[3]	-	-	239	K/W
			[4]	-	-	133	K/W

- [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 cm².
- [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 cm².

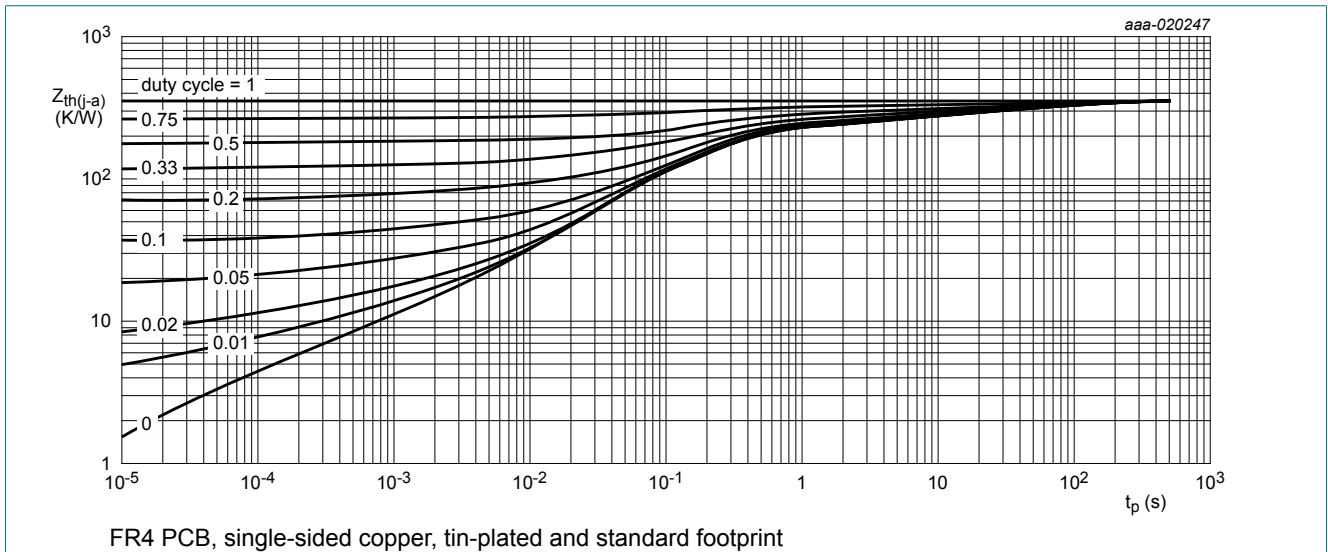


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

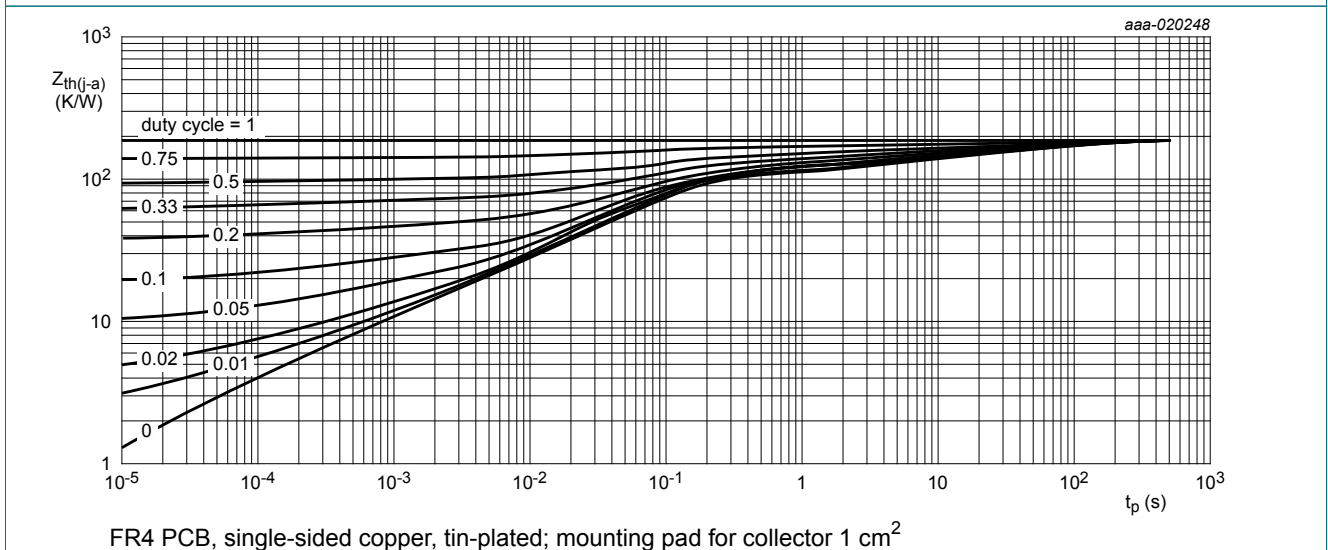
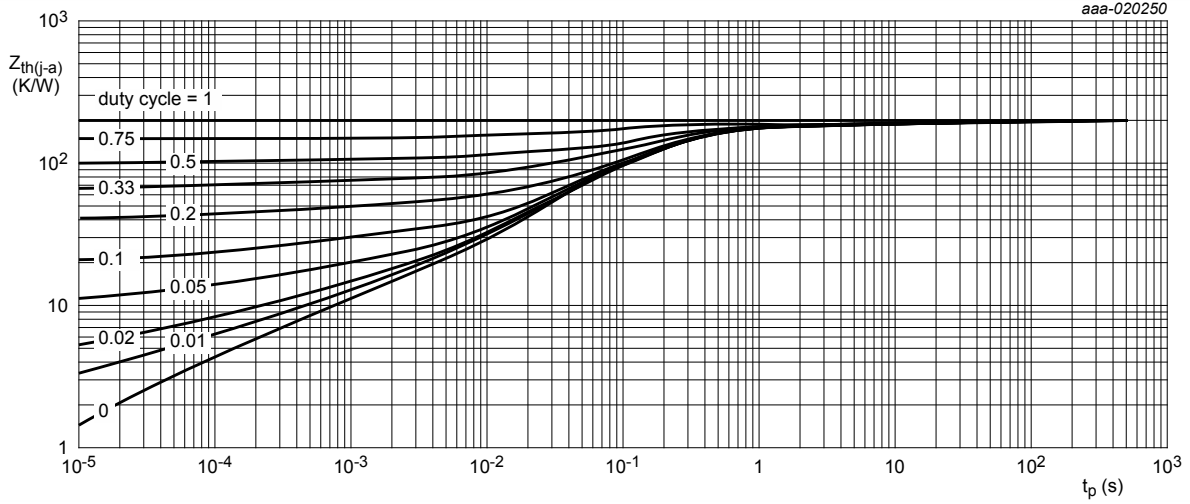
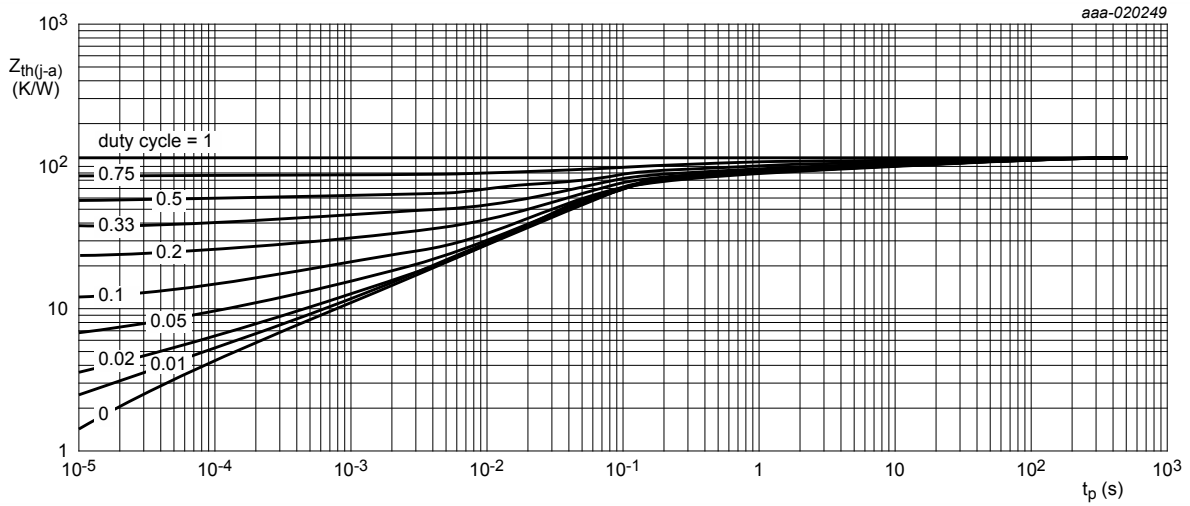


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, 4-layer copper, tin-plated and standard footprint

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



FR4 PCB, 4-layer copper, tin-plated; mounting pad for collector 1 cm²

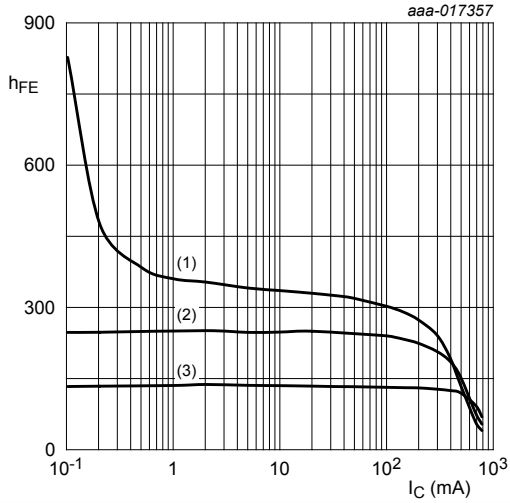
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

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

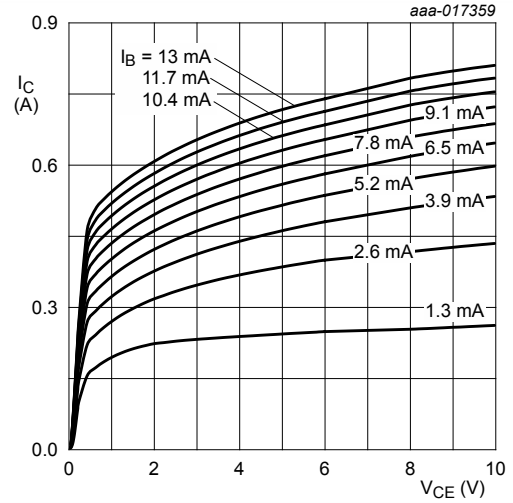
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}$; $I_E = 0\ \text{A}$	75	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}$; $I_B = 0\ \text{A}$	40	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0\ \text{A}$; $I_E = 100\ \mu\text{A}$	6	-	-	V	
I_{CBO}	collector-base cut-off current	$V_{CB} = 60\ \text{V}$; $I_E = 0\ \text{A}$	-	-	10	nA	
		$V_{CB} = 60\ \text{V}$; $I_E = 0\ \text{A}$; $T_j = 125\text{ °C}$	-	-	10	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\ \text{V}$; $I_C = 0\ \text{A}$	-	-	10	nA	
h_{FE}	DC current gain	$V_{CE} = 10\ \text{V}$; $I_C = 100\ \mu\text{A}$	35	-	-		
		$V_{CE} = 10\ \text{V}$; $I_C = 1\ \text{mA}$	50	-	-		
		$V_{CE} = 10\ \text{V}$; $I_C = 10\ \text{mA}$	75	-	-		
		$V_{CE} = 10\ \text{V}$; $I_C = 10\ \text{mA}$; $T_{amb} = -55\text{ °C}$	35	-	-		
		$V_{CE} = 10\ \text{V}$; $I_C = 150\ \text{mA}$	[1]	100	-	300	
		$V_{CE} = 1\ \text{V}$; $I_C = 150\ \text{mA}$	[1]	50	-	-	
		$V_{CE} = 10\ \text{V}$; $I_C = 500\ \text{mA}$	[1]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 150\ \text{mA}$; $I_B = 15\ \text{mA}$	[1]	-	-	300 mV	
		$I_C = 500\ \text{mA}$; $I_B = 50\ \text{mA}$	[1]	-	-	1 V	
V_{BEsat}	base-emitter saturation voltage	$I_C = 150\ \text{mA}$; $I_B = 15\ \text{mA}$	[1]	0.6	-	1.2 V	
		$I_C = 500\ \text{mA}$; $I_B = 50\ \text{mA}$	[1]	-	-	2 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		-	-	20	ns	
t_{on}	turn-on time		-	-	35	ns	
t_s	storage time		-	-	200	ns	
t_f	fall time		-	-	60	ns	
t_{off}	turn-off time		-	-	260	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	$V_{EB} = 500\ \text{mV}$; $I_C = 0\ \text{A}$; $i_c = 0\ \text{A}$; $f = 1\ \text{MHz}$	-	-	25	pF	
f_T	transition frequency	$V_{CE} = 20\ \text{V}$; $I_C = 20\ \text{mA}$; $f = 100\ \text{MHz}$	[1]	-	340	MHz	

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



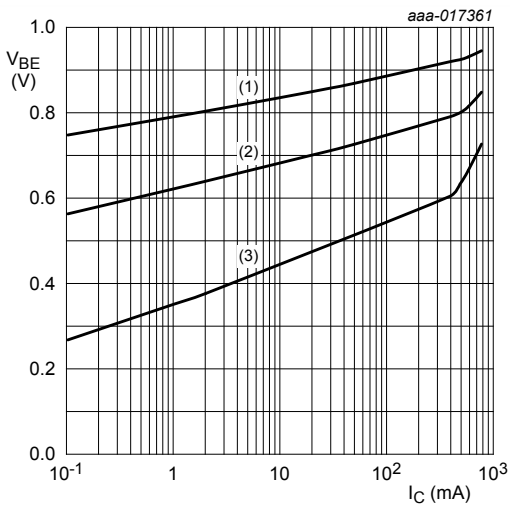
$V_{CE} = 10\text{ V}$
 (1) $T_{amb} = 100^\circ\text{C}$
 (2) $T_{amb} = 25^\circ\text{C}$
 (3) $T_{amb} = -55^\circ\text{C}$

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



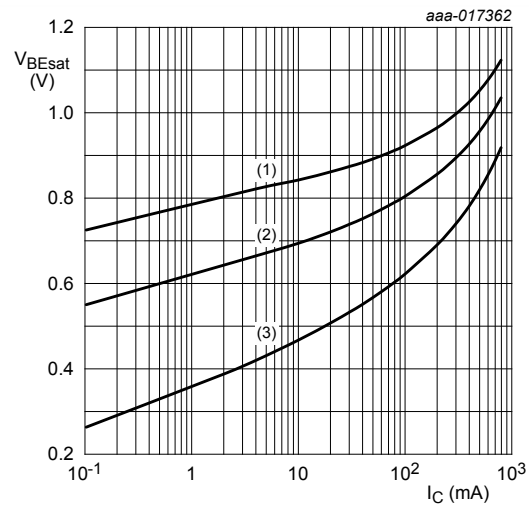
$T_{amb} = 25^\circ\text{C}$

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



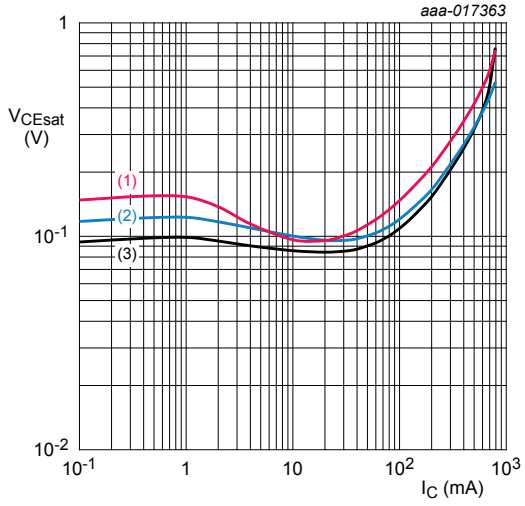
$V_{CE} = 10\text{ V}$
 (1) $T_{amb} = -55^\circ\text{C}$
 (2) $T_{amb} = 25^\circ\text{C}$
 (3) $T_{amb} = 150^\circ\text{C}$

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



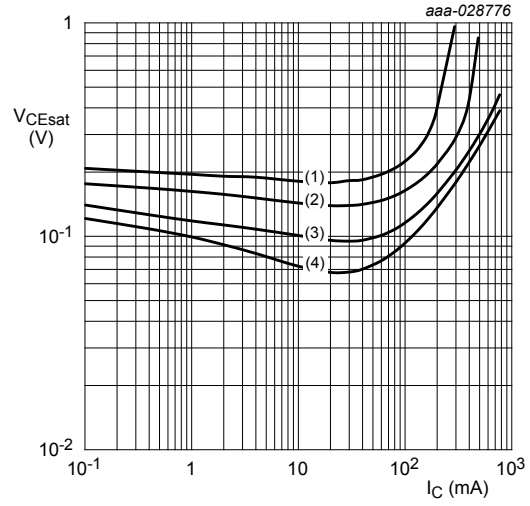
$I_C/I_B = 10$
 (1) $T_{amb} = -55^\circ\text{C}$
 (2) $T_{amb} = 25^\circ\text{C}$
 (3) $T_{amb} = 150^\circ\text{C}$

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) $I_C/I_B = 20$
 (4) $I_C/I_B = 10$

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

11. Test information

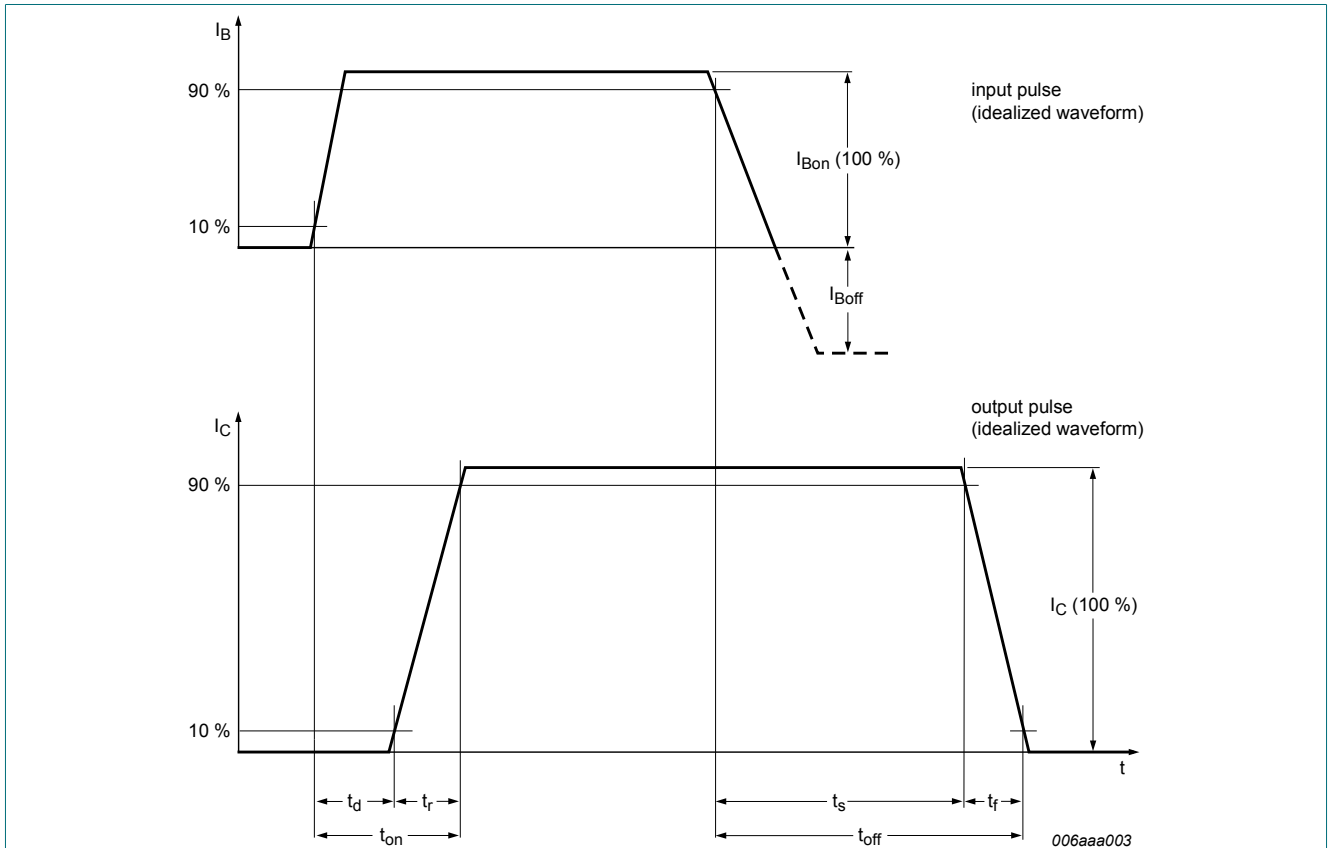


Fig. 13. Transistor switching time definition

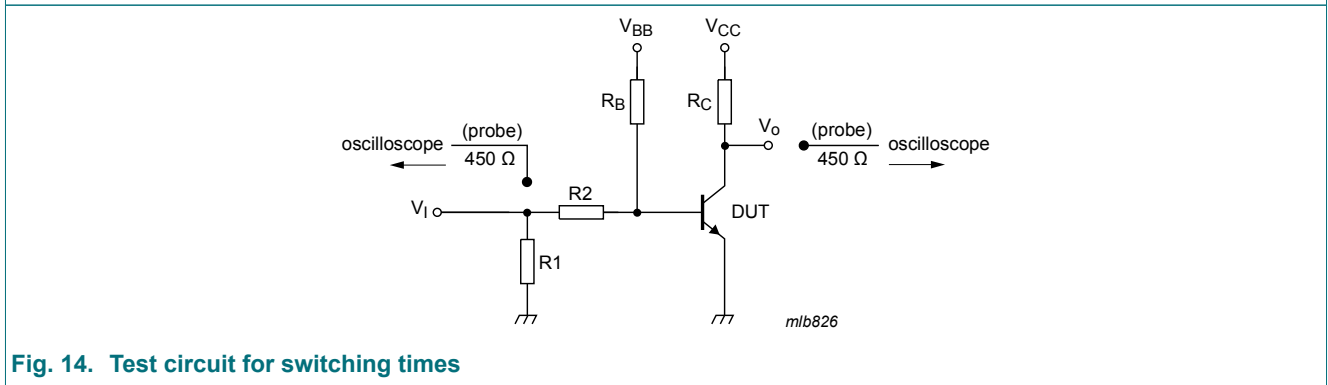
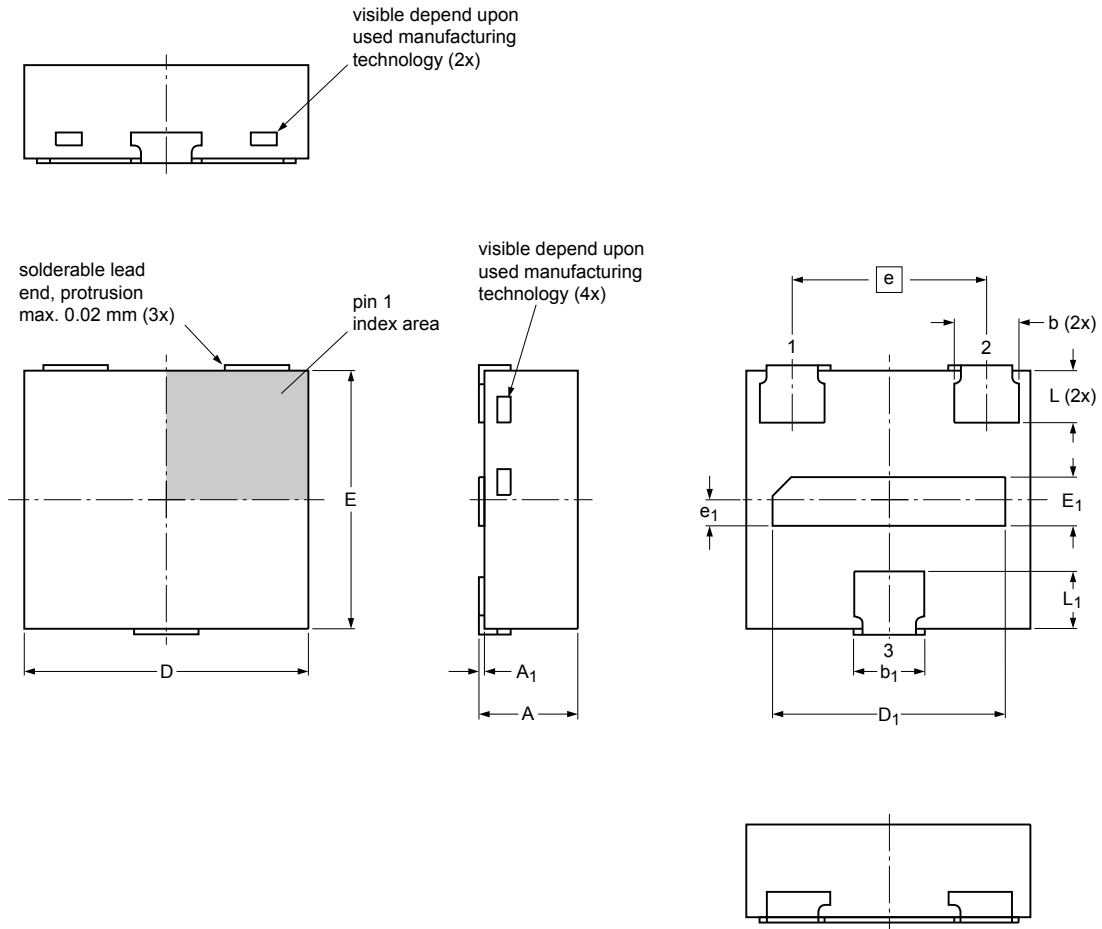


Fig. 14. Test circuit for switching times

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 ₁	b	b ₁	D	D ₁	E	E ₁	e	e ₁	L	L ₁
min	0.34		0.22	0.245	1.05	0.87	0.95	0.16			0.17	0.195
mm 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

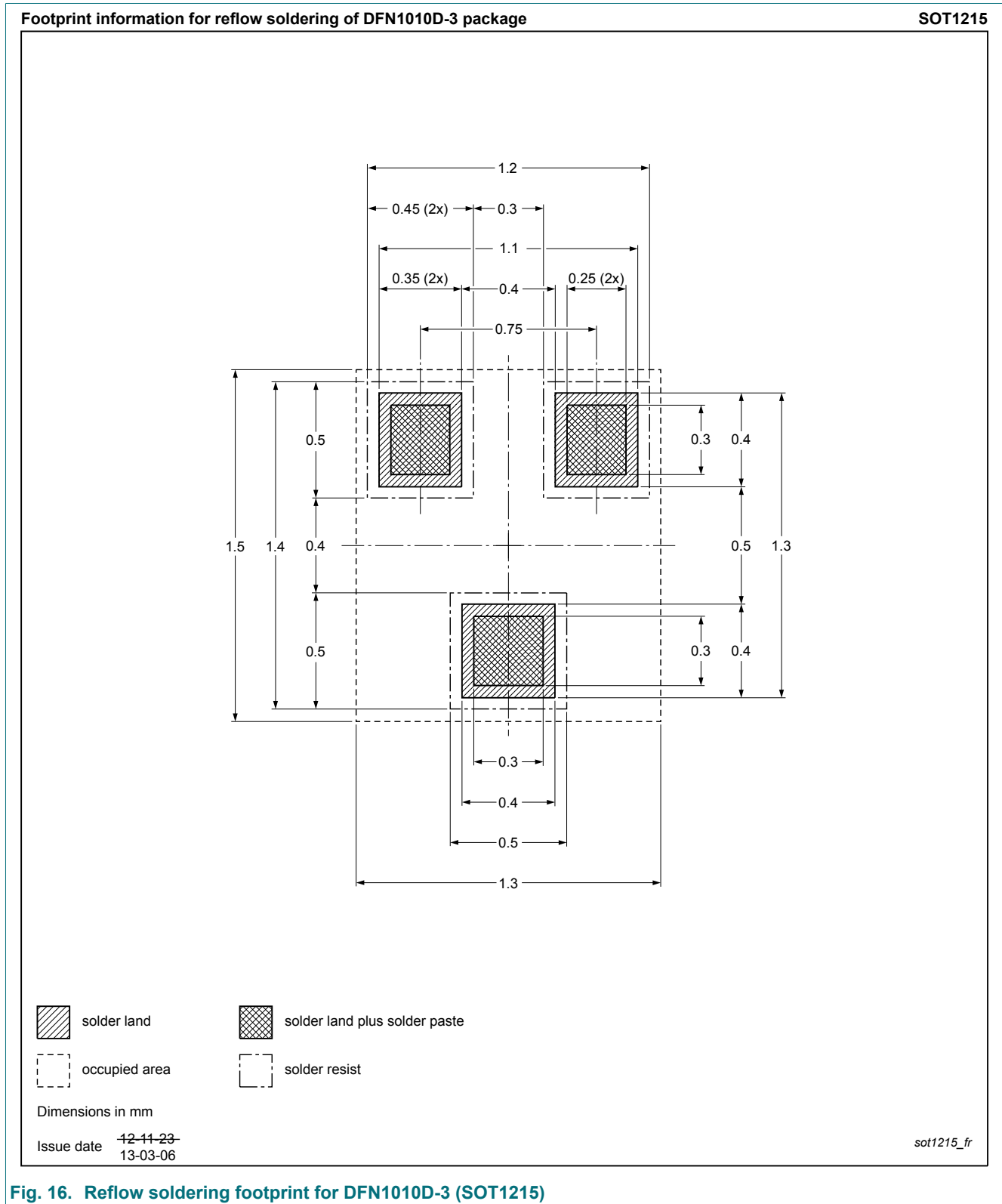


Fig. 16. Reflow soldering footprint for DFN1010D-3 (SOT1215)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMBT2222AQA 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 21 September 2018

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