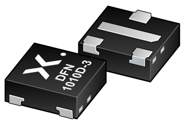


PMBT2222AQA

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

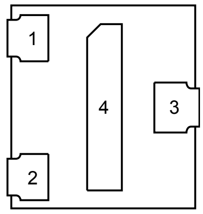
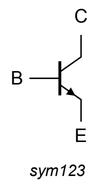
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	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: $t_p \leq 300$ µs; $\delta \leq 0.02$

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 Transparent top view DFN1010D-3 (SOT1215)	
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

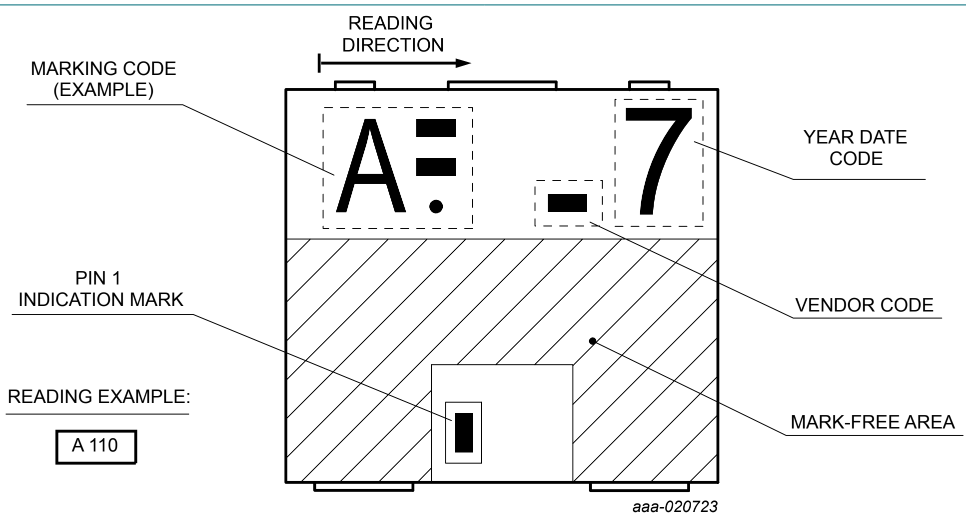


Fig. 1. DFN1010D-3 (SOT1215) binary marking code description

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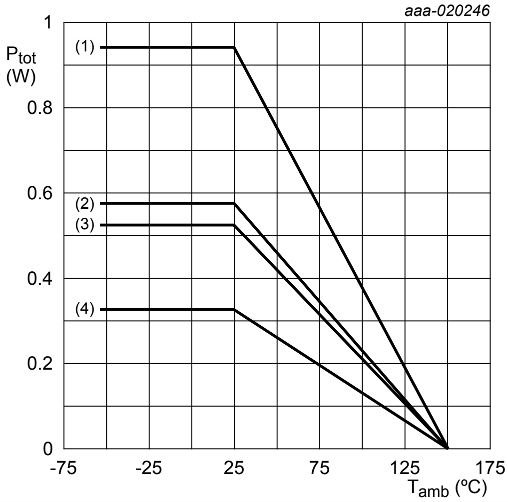
8. Limiting values

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 cm^2.
[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^2.



(1) FR4 PCB, 4-layer copper, 1 cm^2
(2) FR4 PCB,single sided copper, 1 cm^2
(3) FR4 PCB, 4-layer copper, standard footprint
(4) FR4 PCB, single sided copper, standard footprint

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

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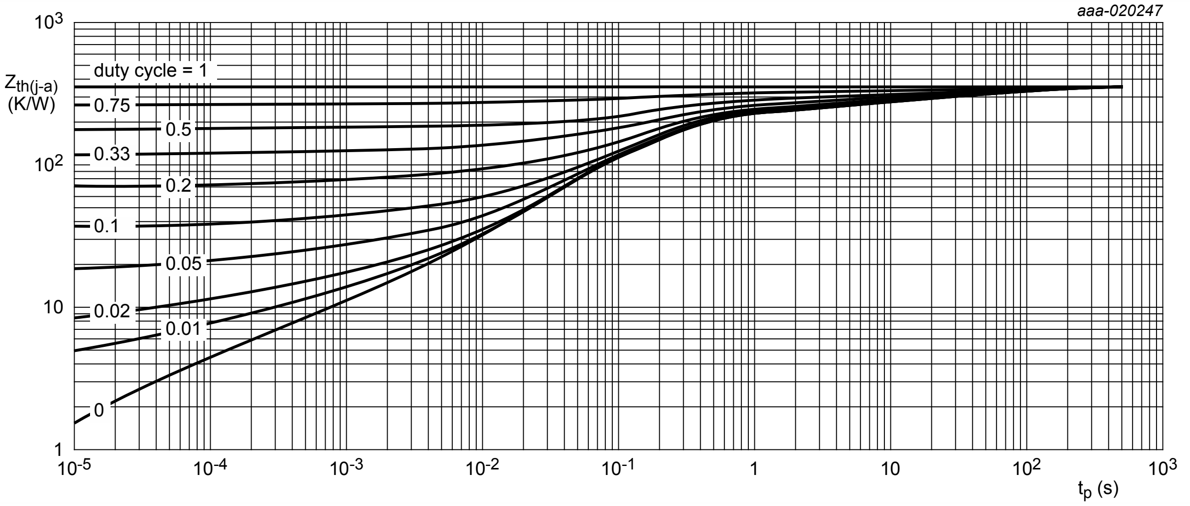
9. Thermal characteristics

Table 6. Thermal characteristics

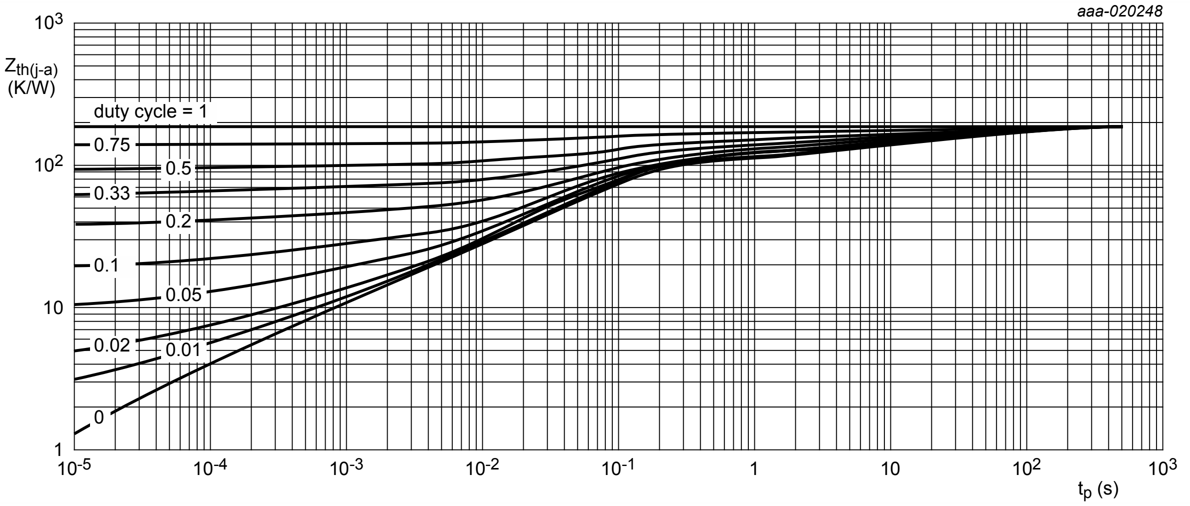
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	385	K/W
			[2]	-	-	218	K/W
			[3]	-	-	239	K/W
			[4]	-	-	133	K/W

[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 cm^2.
[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^2.



FR4 PCB, single-sided copper, tin-plated and standard footprint

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



FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm^2

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

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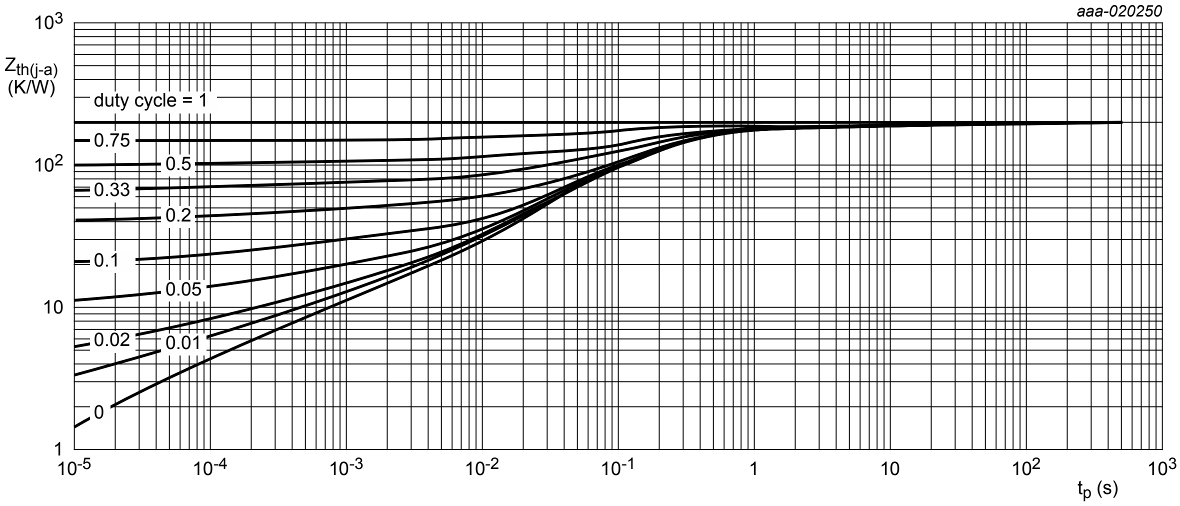
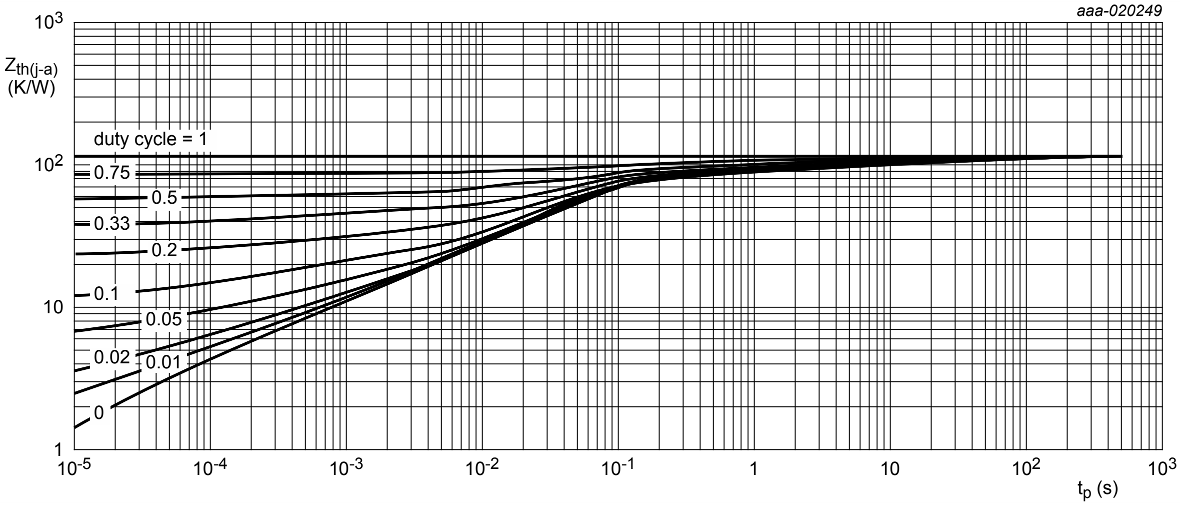


FR4 PCB, 4-layer copper, tin-plated and standard footprint

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 cm^2

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

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10. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A		75	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 2 mA; I_B = 0 A		40	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_C = 0 A; I_E = 100 µA		6	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 60 V; I_E = 0 A		-	-	10	nA
		V_{CB} = 60 V; I_E = 0 A; T_j = 125 °C		-	-	10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	10	nA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 100 µA		35	-	-	
		V_{CE} = 10 V; I_C = 1 mA		50	-	-	
		V_{CE} = 10 V; I_C = 10 mA		75	-	-	
		V_{CE} = 10 V; I_C = 10 mA; T_{amb} = -55 °C		35	-	-	
		V_{CE} = 10 V; I_C = 150 mA	[1]	100	-	300	
		V_{CE} = 1 V; I_C = 150 mA	[1]	50	-	-	
		V_{CE} = 10 V; I_C = 500 mA	[1]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA	[1]	-	-	300	mV
		I_C = 500 mA; I_B = 50 mA	[1]	-	-	1	V
V_{BEsat}	base-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA	[1]	0.6	-	1.2	V
		I_C = 500 mA; I_B = 50 mA	[1]	-	-	2	V
t_d	delay time	I_C = 150 mA; I_{Bon} = 15 mA; I_{Boff} = -15 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 V; I_E = 0 A; i_e = 0 A; f = 1 MHz		-	-	8	pF
C_e	emitter capacitance	V_{EB} = 500 mV; I_C = 0 A; i_c = 0 A; f = 1 MHz		-	-	25	pF
f_T	transition frequency	V_{CE} = 20 V; I_C = 20 mA; f = 100 MHz	[1]	-	340	-	MHz

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

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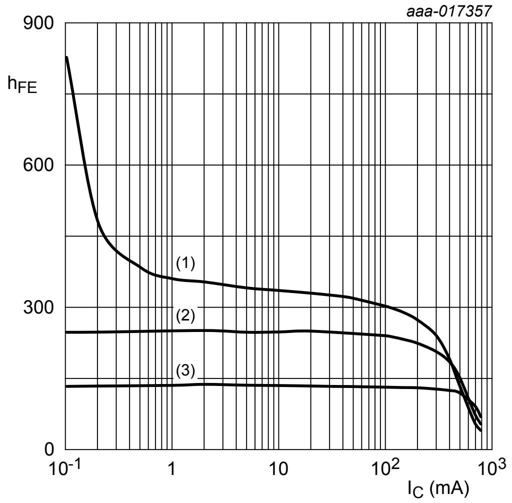
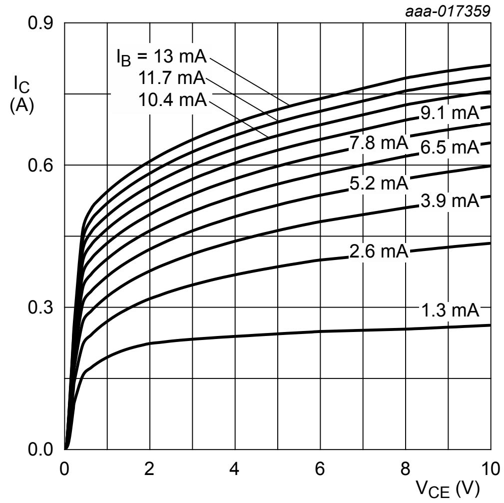


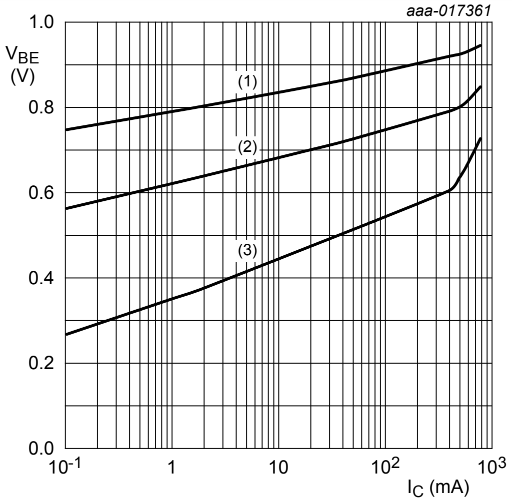
V_{CE} = 10 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



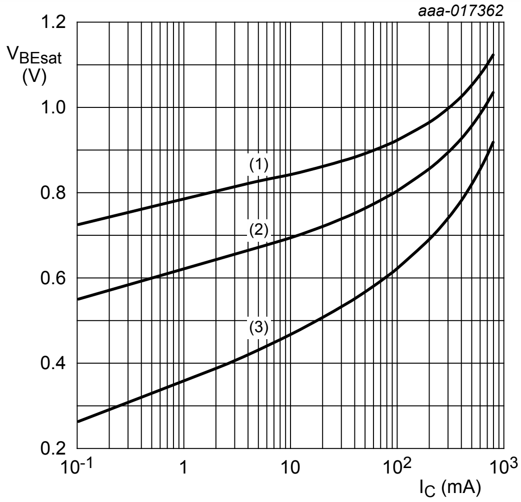
T_{amb} = 25 °C

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



V_{CE} = 10 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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

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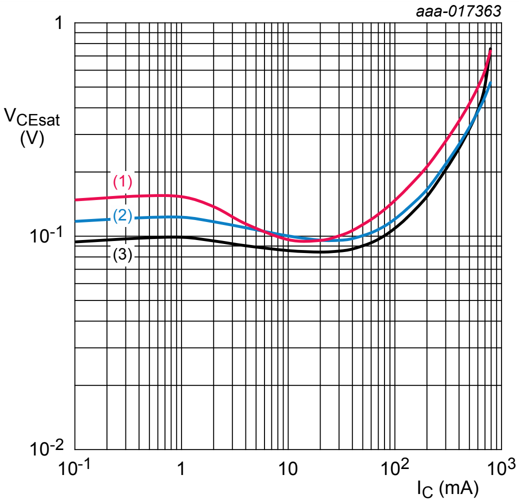
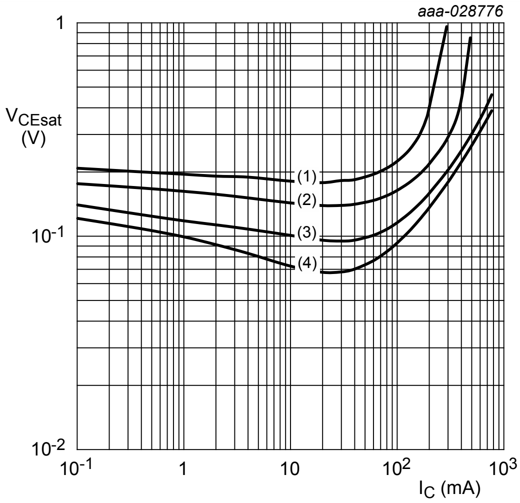


I_C/I_B = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C
(1) IC/IB = 100
(2) IC/IB = 50
(3) IC/IB = 20
(4) IC/IB = 10

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

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11. Test information

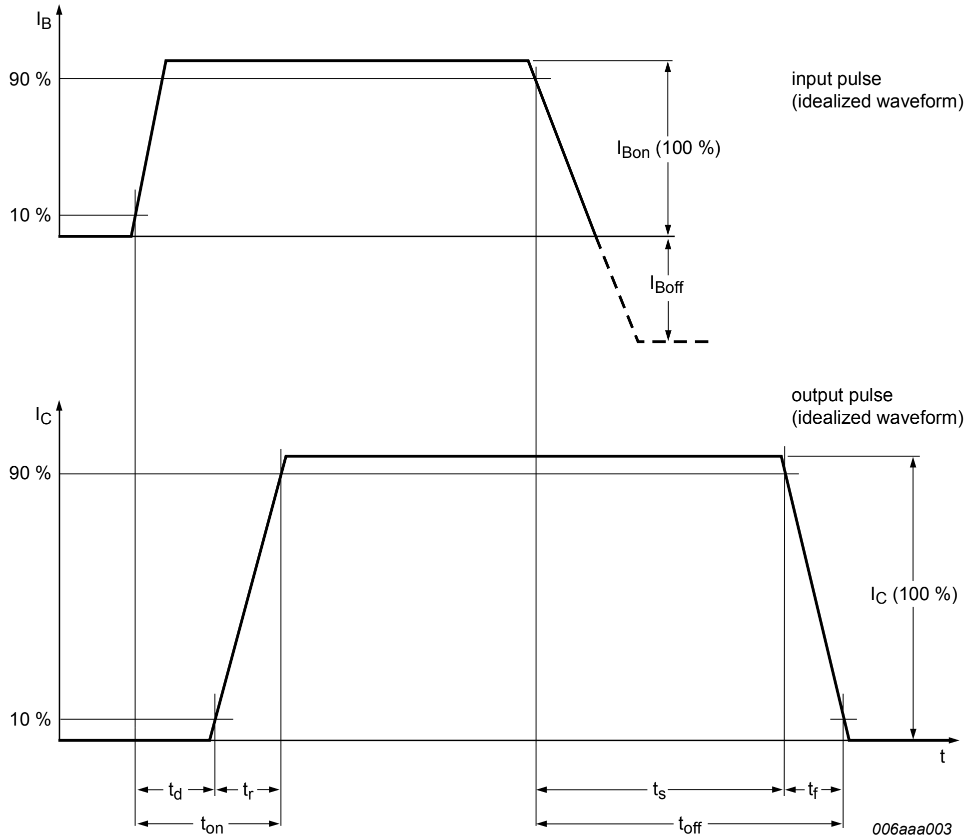

Fig. 13. Transistor switching time definition

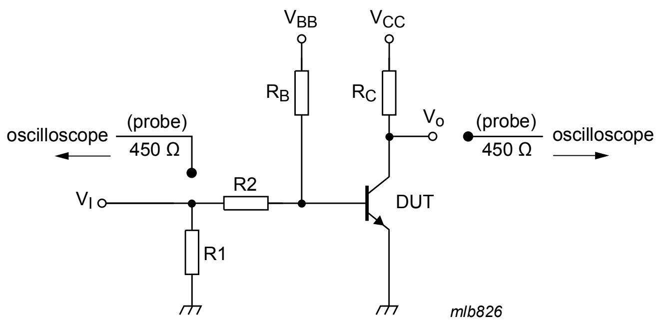

Fig. 14. Test circuit for switching times

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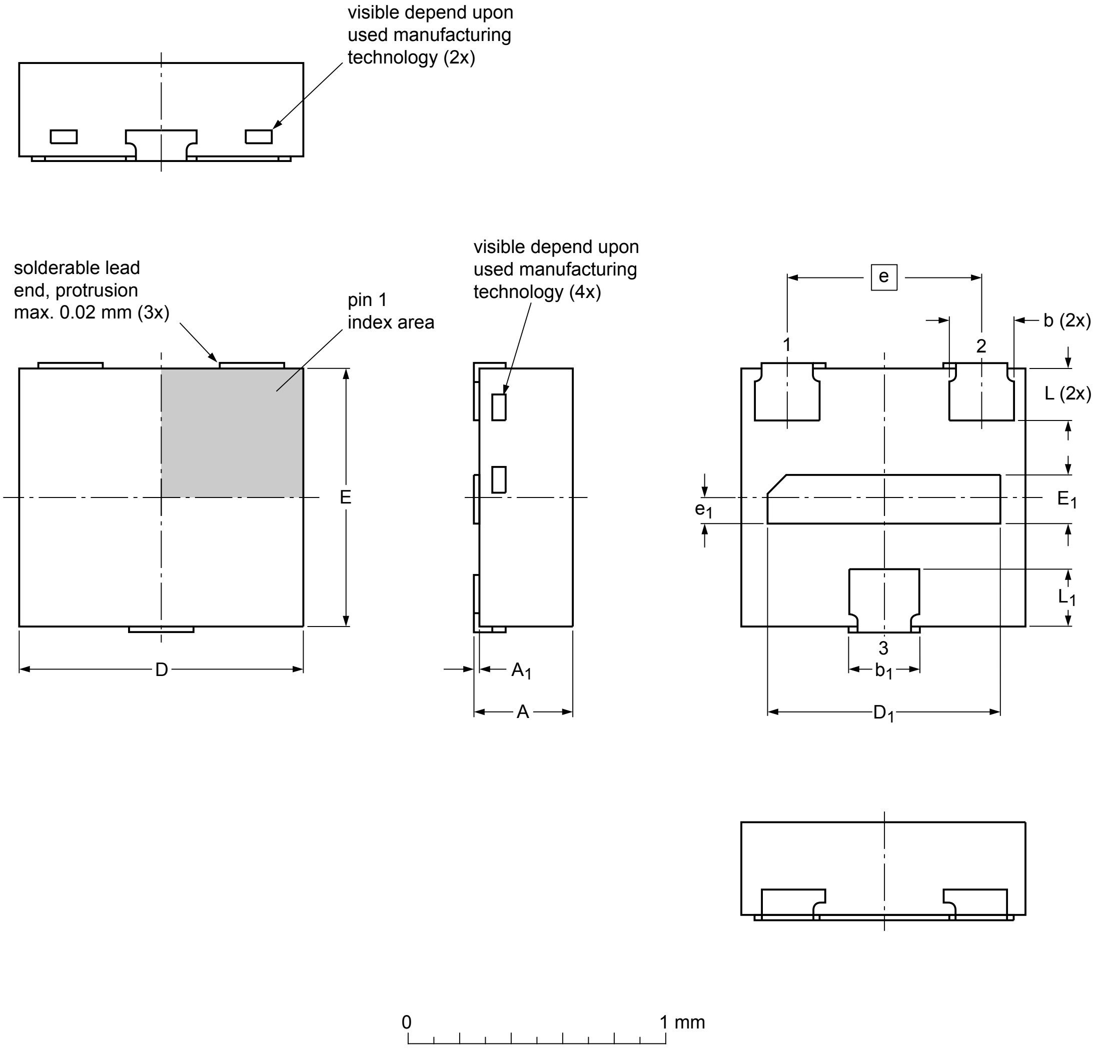
12. Package outline

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
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)

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13. Soldering

Footprint information for reflow soldering of DFN1010D-3 package **SOT1215**

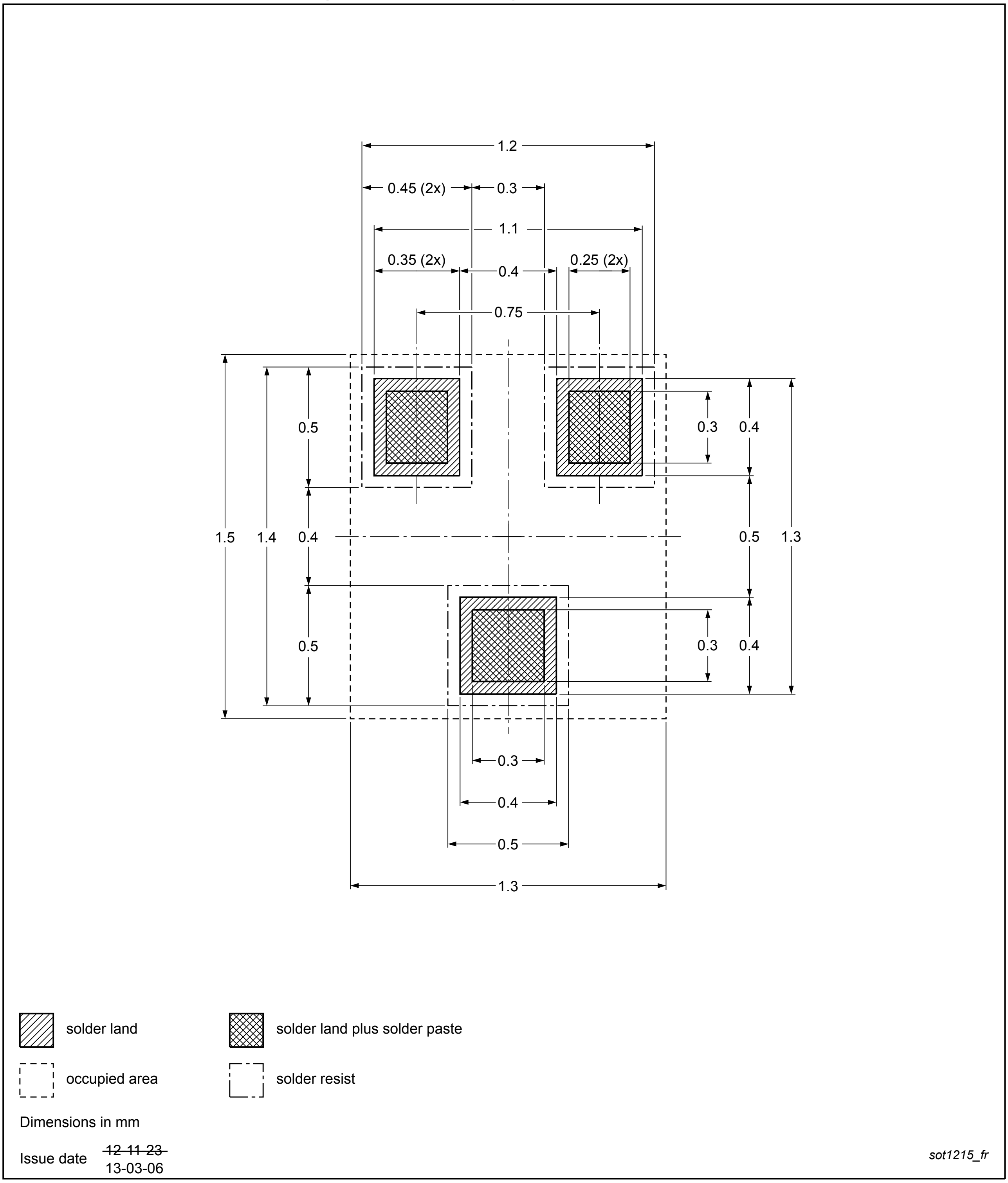

Fig. 16. Reflow soldering footprint for DFN1010D-3 (SOT1215)

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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	-	-

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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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Date of release: 21 September 2018