



PGMH9

NPN/NPN resistor-equipped transistors;
R1 = 10 k Ω , R2 = 47 k Ω

4 November 2015

Product data sheet

1. General description

NPN/NPN Resistor-Equipped Transistors (RET) in a leadless ultra small DFN1010B-6 (SOT1216) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Low package height of 0.37 mm
- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified

3. Applications

- Low current peripheral driver
- Control of IC inputs
- Replaces general-purpose transistors in digital applications
- Mobile applications

4. Quick reference data

Table 1. Quick reference data

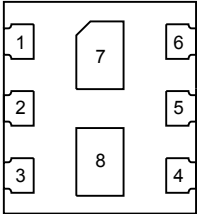
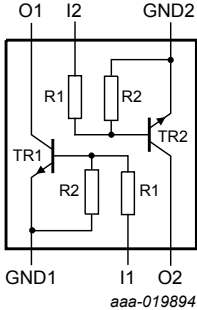
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Per transistor							
V _{CEO}	collector-emitter voltage	open base	-	-	50	V	
I _O	output current		-	-	100	mA	
Per transistor							
R1	bias resistor 1	T _{amb} = 25 °C	[1]	7	10	13	k Ω
R2/R1	bias resistor ratio		[1]	3.7	4.7	5.7	

[1] See section "Test information" for resistor calculation and test conditions.

NPN/NPN resistor-equipped transistors; R1 = 10 kΩ, R2 = 47 kΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 <p>Transparent top view DFN1010B-6 (SOT1216)</p>	 <p>aaa-019894</p>
2	I1	input (base) TR1		
3	O2	output (collector) TR2		
4	GND2	GND (emitter) TR2		
5	I2	input (base) TR2		
6	O1	output (collector) TR1		
7	O1	output (collector) TR1		
8	O2	output (collector) TR2		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PQMH9	DFN1010B-6	DFN1010B-6: plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals	SOT1216

7. Marking

Table 4. Marking codes

Type number	Marking code
PQMH9	A 101

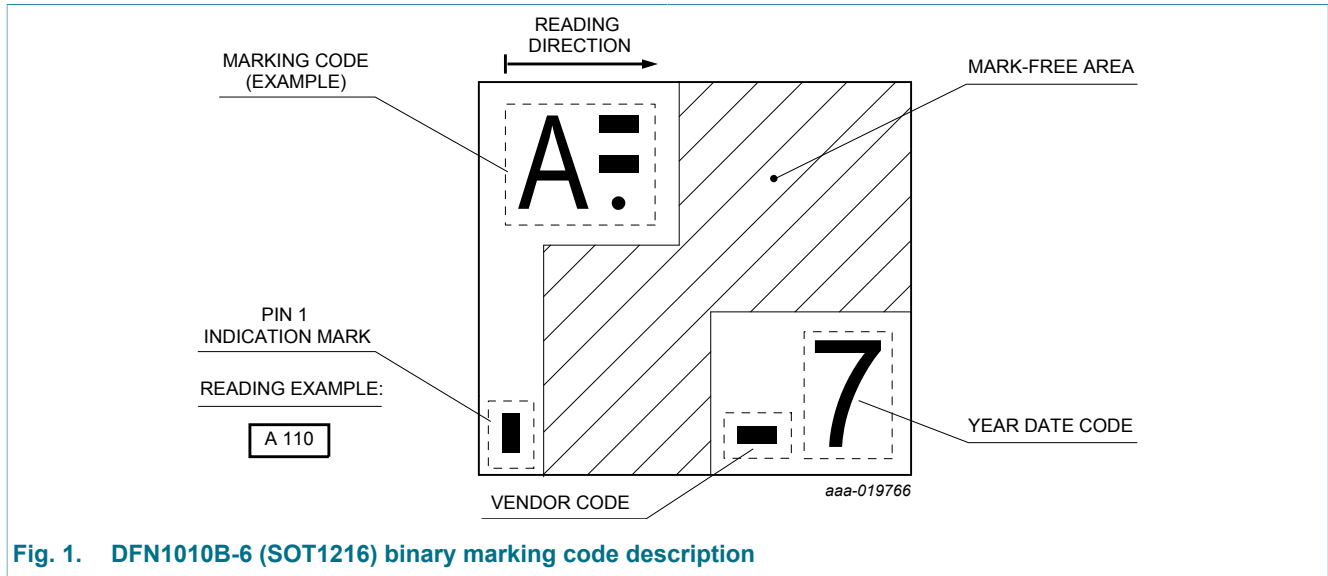


Fig. 1. DFN1010B-6 (SOT1216) binary marking code description

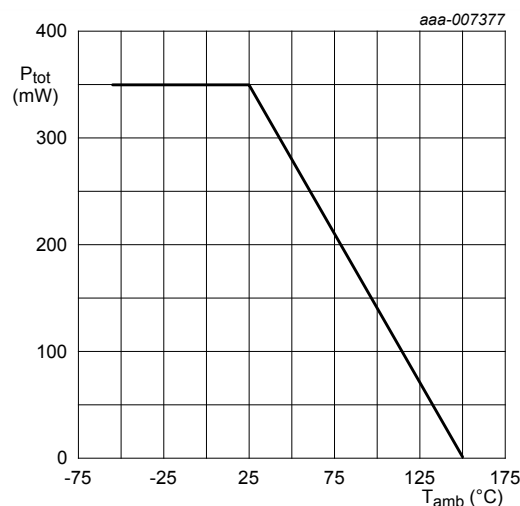
8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
V _{CBO}	collector-base voltage	open emitter		-	50	V
V _{CEO}	collector-emitter voltage	open base		-	50	V
V _{EBO}	emitter-base voltage	open collector		-	6	V
V _I	input voltage	positive		-	40	V
		negative		-	-6	V
I _O	output current			-	100	mA
I _{CM}	peak collector current	t _p ≤ 1 ms; single pulse		-	100	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	230	mW
Per device						
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	350	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.



FR4 PCB, standard footprint

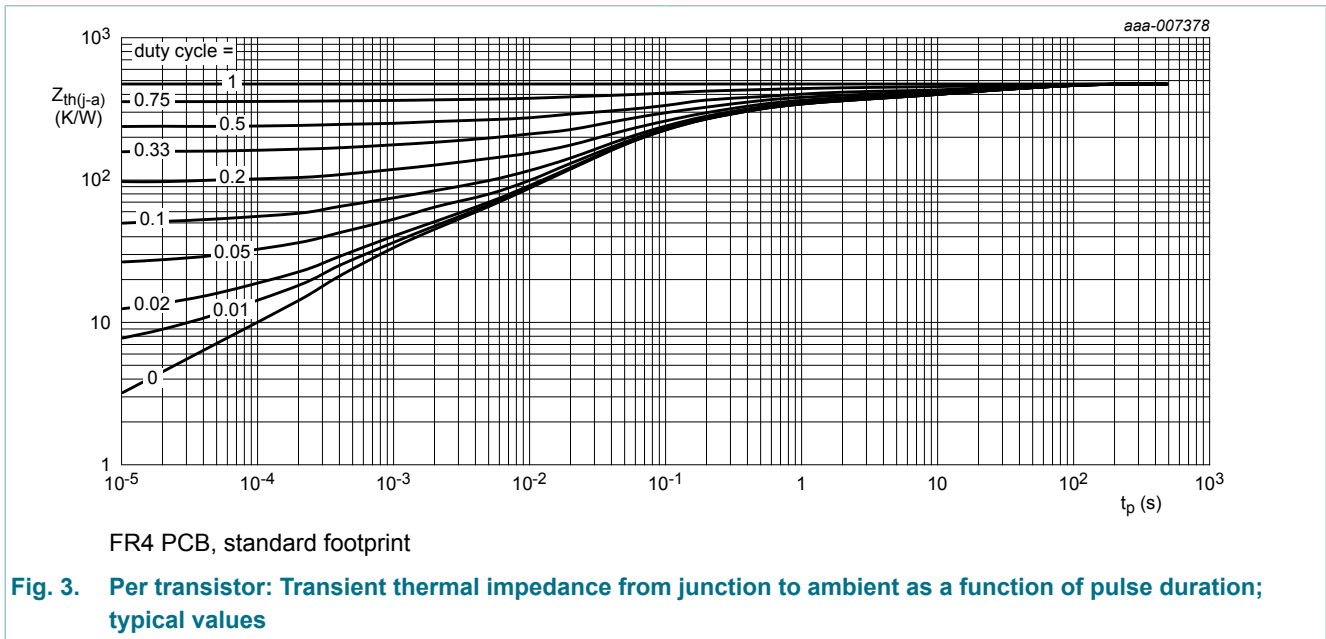
Fig. 2. Per device: Power derating curve

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	543	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	357	K/W

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



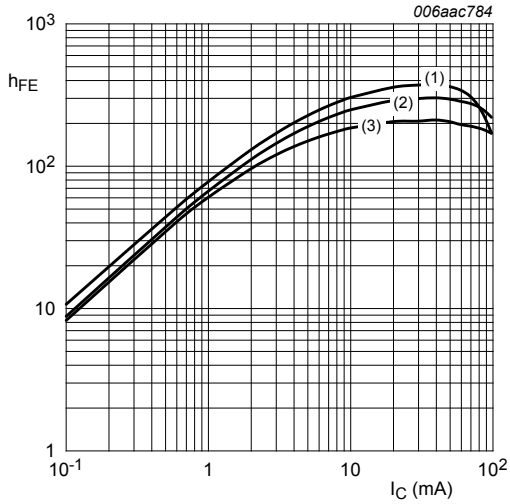
10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
I _{CBO}	collector-base cut-off current (emitter open)	V _{CB} = 50 V; I _E = 0 A; T _{amb} = 25 °C		-	-	100	nA
I _{CEO}	collector-emitter cut-off current (base open)	V _{CE} = 30 V; I _B = 0 A; T _{amb} = 25 °C		-	-	1	μ A
		V _{CE} = 30 V; I _B = 0 A; T _{amb} = 150 °C		-	-	5	μ A
I _{EBO}	emitter-base cut-off current (collector open)	V _{EB} = 5 V; I _C = 0 A; T _{amb} = 25 °C		-	-	150	μ A
h _{FE}	DC current gain	V _{CE} = 5 V; I _C = 5 mA; T _{amb} = 25 °C		100	-	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 5 mA; I _B = 0.25 mA; T _{amb} = 25 °C		-	-	100	mV
V _{I(off)}	off-state input voltage	V _{CE} = 5 V; I _C = 100 μ A; T _{amb} = 25 °C		-	0.7	0.5	V
V _{I(on)}	on-state input voltage	V _{CE} = 0.3 V; I _C = 10 mA; T _{amb} = 25 °C		1.4	0.8	-	V
R1	bias resistor 1	T _{amb} = 25 °C	[1]	7	10	13	k Ω
R2/R1	bias resistor ratio		[1]	3.7	4.7	5.7	
C _C	collector capacitance	V _{CB} = 10 V; I _E = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	-	2.5	pF
f _T	transition frequency	V _{CE} = 5 V; I _C = 10 mA; f = 100 MHz; T _{amb} = 25 °C	[2]	-	230	-	MHz

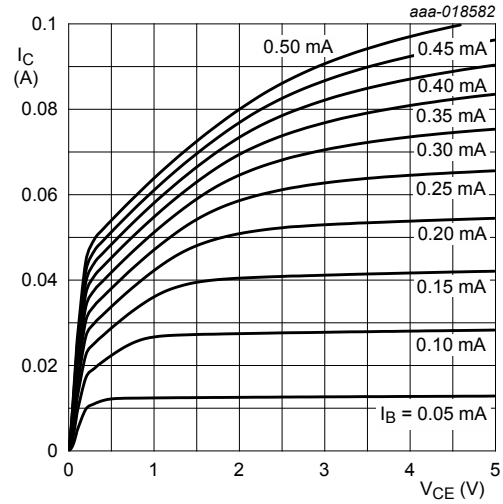
[1] See section "Test information" for resistor calculation and test conditions.

[2] Characteristics of built-in transistor



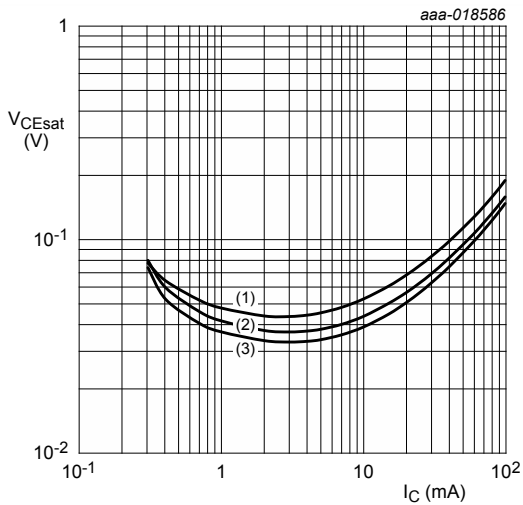
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

Fig. 4. DC current gain as a function of collector current; typical values



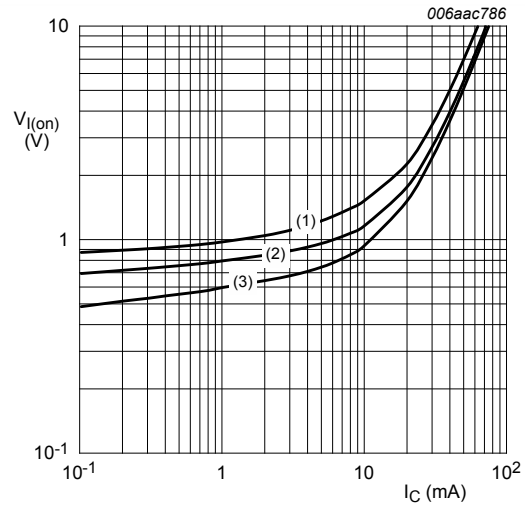
$T_{amb} = 25\text{ °C}$

Fig. 5. Collector current as a function of collector-emitter voltage; typical values



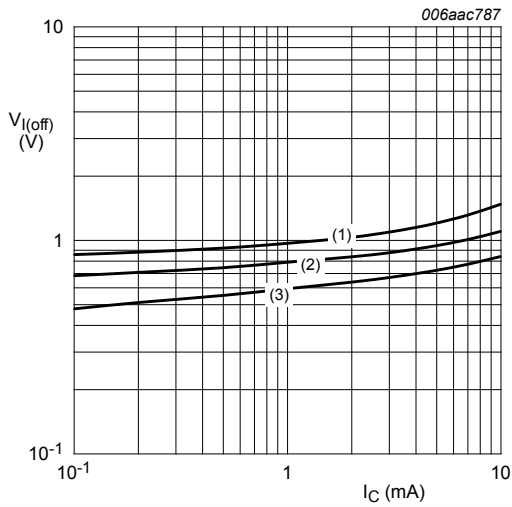
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

Fig. 6. Collector-emitter saturation voltage as a function of collector current; typical values



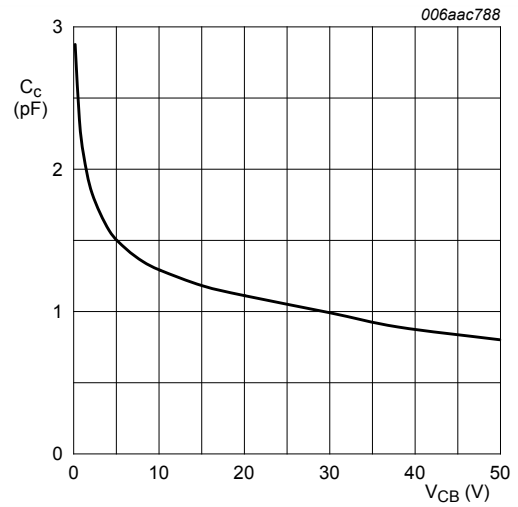
$V_{CE} = 0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 7. On-state input voltage as a function of collector current; typical values



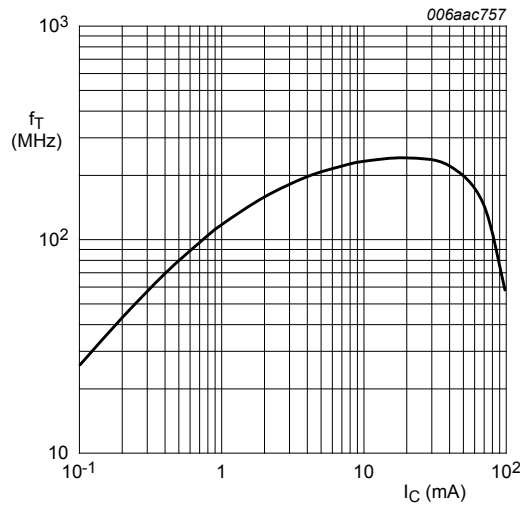
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 8. Off-state input voltage as a function of collector current; typical values



$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

Fig. 9. Collector capacitance as a function of collector-base voltage; typical values



$V_{CE} = 5\text{ V}; T_{amb} = 25\text{ °C}$

Fig. 10. Transition frequency as a function of collector current; typical values of built-in transistor

11. Test information

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.

11.2 Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R1 = \frac{V(I12) - V(I11)}{I12 - I11}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R2}{R1} = \frac{V(I14) - V(I13)}{R1 \cdot (I14 - I13)} - 1$$

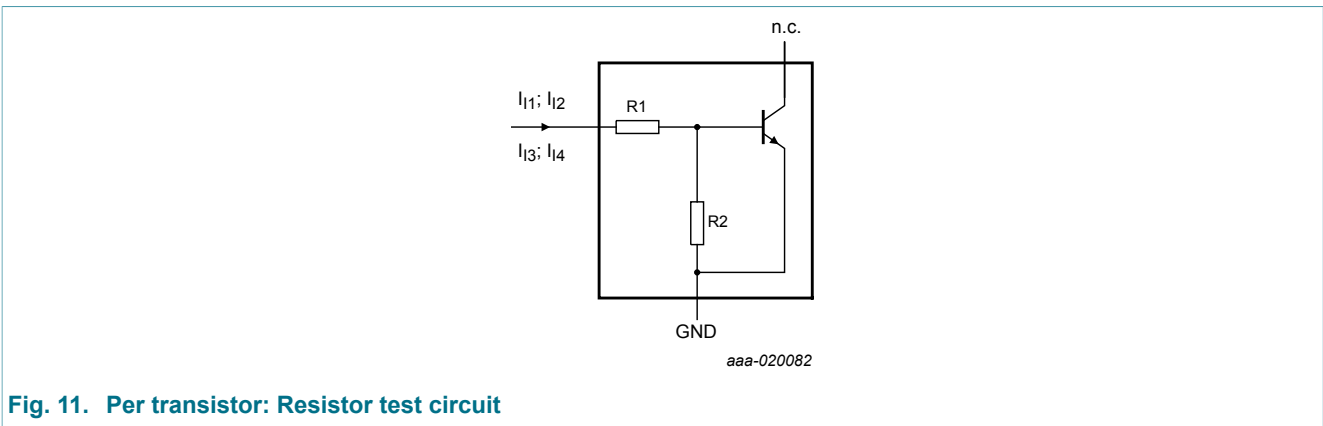


Fig. 11. Per transistor: Resistor test circuit

11.3 Resistor test conditions

Table 8. Resistor test conditions

R1 (kΩ)	R2 (kΩ)	Test conditions			
		I ₁₁	I ₁₂	I ₁₃	I ₁₄
10	47	90 μA	140 μA	-55 μA	-105 μA

12. Package outline

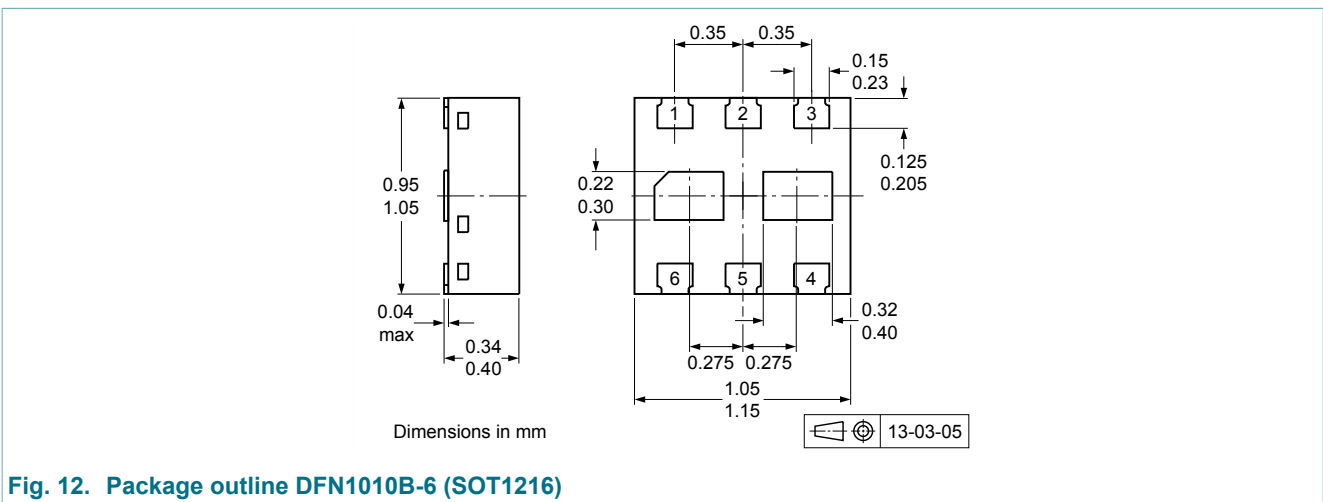


Fig. 12. Package outline DFN1010B-6 (SOT1216)

13. Soldering

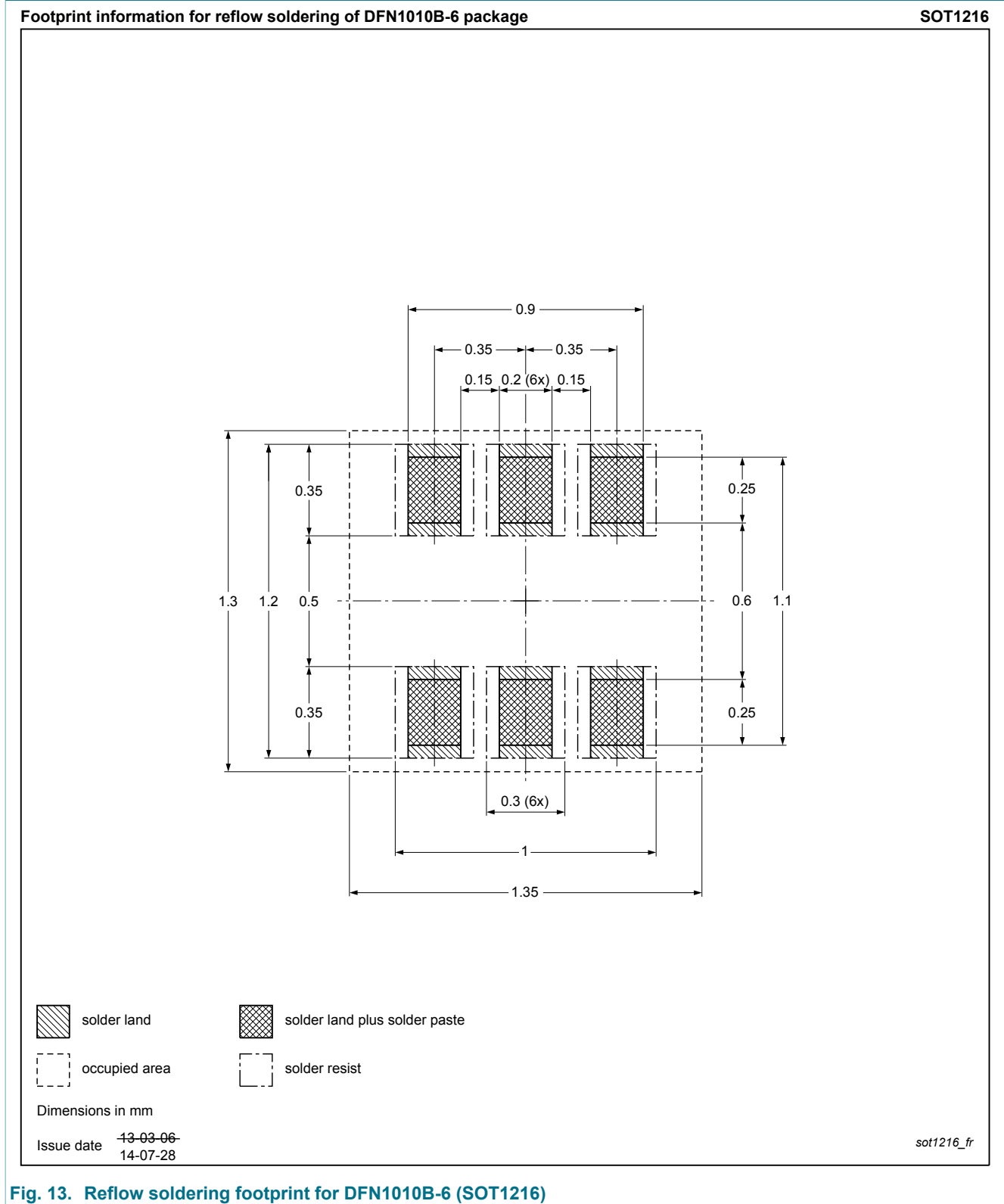


Fig. 13. Reflow soldering footprint for DFN1010B-6 (SOT1216)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PQM9 v.1	20151104	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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- [2] The term 'short data sheet' is explained in section "Definitions".
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16. Contents

1	General description	1
2	Features and benefits	1
3	Applications	1
4	Quick reference data	1
5	Pinning information	2
6	Ordering information	2
7	Marking	3
8	Limiting values	4
9	Thermal characteristics	5
10	Characteristics	6
11	Test information	8
11.1	Quality information	8
11.2	Resistor calculation	9
11.3	Resistor test conditions	9
12	Package outline	9
13	Soldering	10
14	Revision history	11
15	Legal information	12
15.1	Data sheet status	12
15.2	Definitions	12
15.3	Disclaimers	12
15.4	Trademarks	13

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