



PQM9H9

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

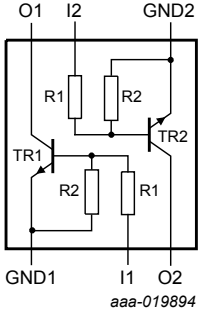
Table 1. Quick reference data

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.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 Transparent top view DFN1010B-6 (SOT1216)	 aaa-019894
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

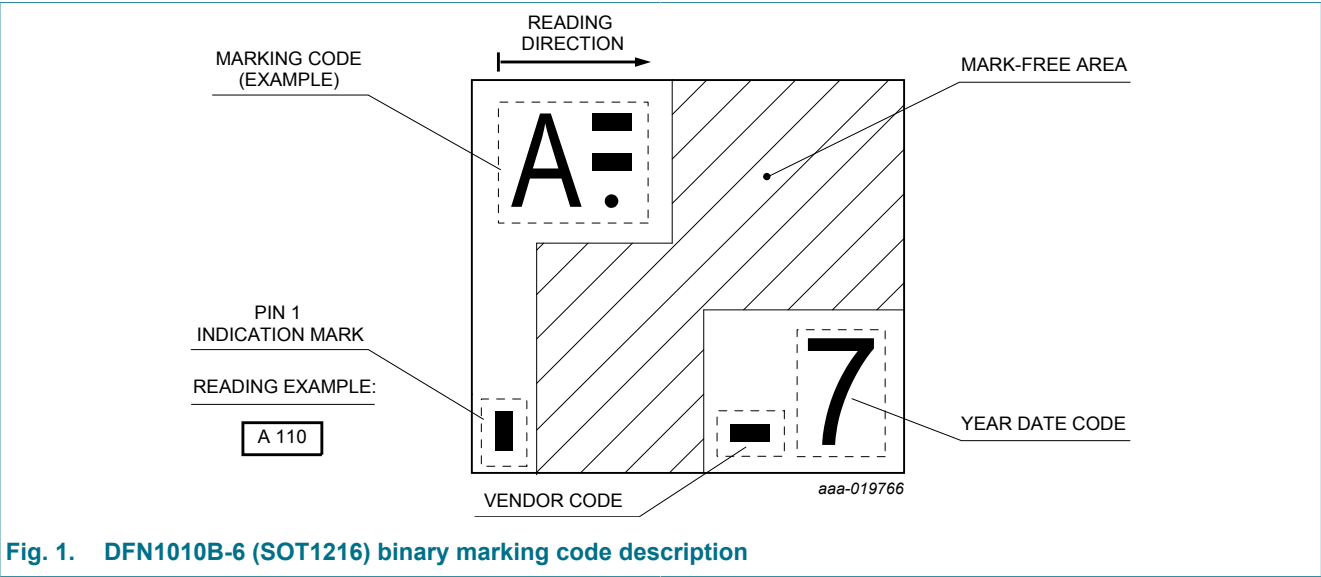
Table 3. Ordering information

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

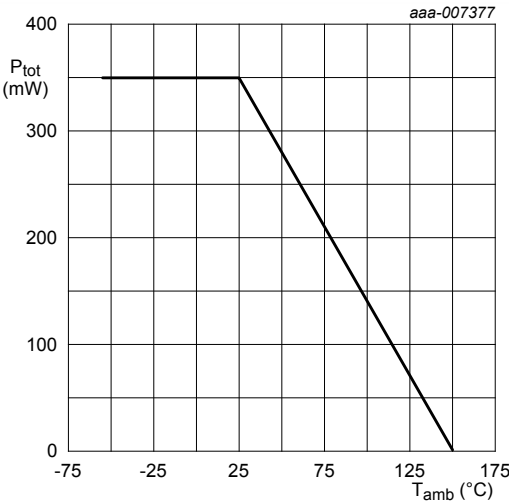


8. Limiting values

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

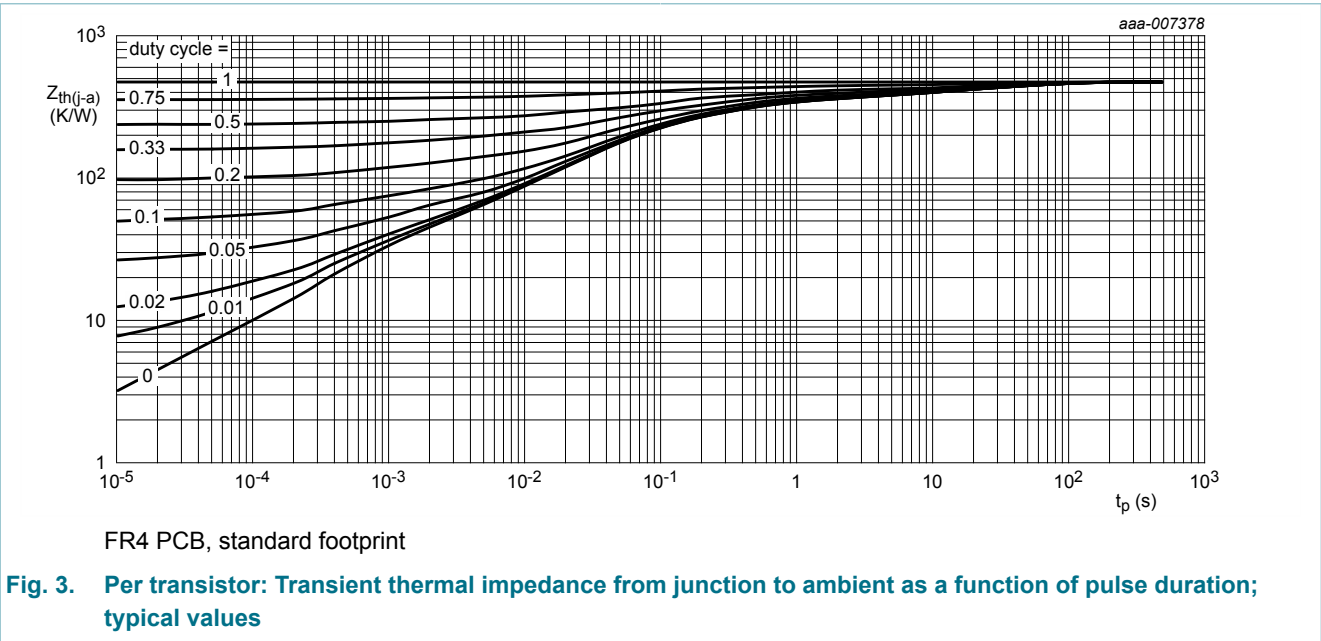
Fig. 2. Per device: Power derating curve

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)	$V_{CB} = 50\text{ V}$; $I_E = 0\text{ A}$; $T_{amb} = 25\text{ °C}$		-	-	100	nA
I_{CEO}	collector-emitter cut-off current (base open)	$V_{CE} = 30\text{ V}$; $I_B = 0\text{ A}$; $T_{amb} = 25\text{ °C}$		-	-	1	μA
		$V_{CE} = 30\text{ V}$; $I_B = 0\text{ A}$; $T_{amb} = 150\text{ °C}$		-	-	5	μA
I_{EBO}	emitter-base cut-off current (collector open)	$V_{EB} = 5\text{ V}$; $I_C = 0\text{ A}$; $T_{amb} = 25\text{ °C}$		-	-	150	μA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}$; $I_C = 5\text{ mA}$; $T_{amb} = 25\text{ °C}$		100	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 5\text{ mA}$; $I_B = 0.25\text{ mA}$; $T_{amb} = 25\text{ °C}$		-	-	100	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}$; $I_C = 100\text{ μA}$; $T_{amb} = 25\text{ °C}$		-	0.7	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}$; $I_C = 10\text{ mA}$; $T_{amb} = 25\text{ °C}$		1.4	0.8	-	V
R1	bias resistor 1	$T_{amb} = 25\text{ °C}$	[1]	7	10	13	kΩ
R2/R1	bias resistor ratio		[1]	3.7	4.7	5.7	
C_C	collector capacitance	$V_{CB} = 10\text{ V}$; $I_E = 0\text{ A}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ °C}$		-	-	2.5	pF
f_T	transition frequency	$V_{CE} = 5\text{ V}$; $I_C = 10\text{ mA}$; $f = 100\text{ MHz}$; $T_{amb} = 25\text{ °C}$	[2]	-	230	-	MHz

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

[2] Characteristics of built-in transistor

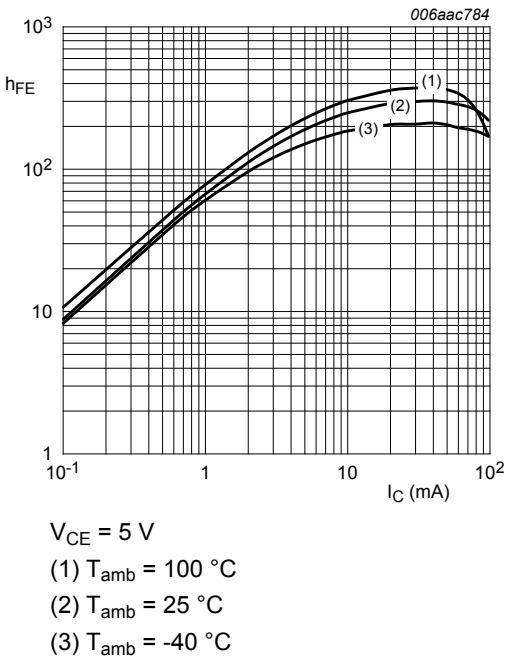


Fig. 4. DC current gain as a function of collector current; typical values

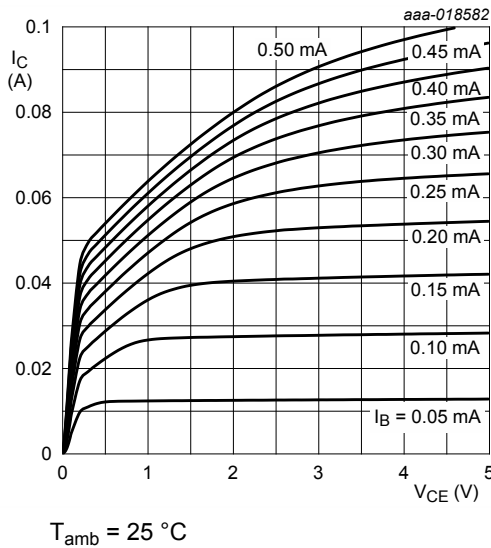


Fig. 5. Collector current as a function of collector-emitter voltage; typical values

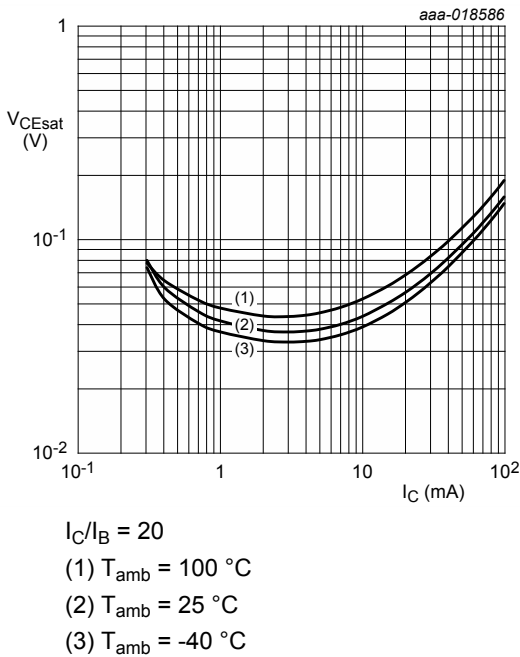


Fig. 6. Collector-emitter saturation voltage as a function of collector current; typical values

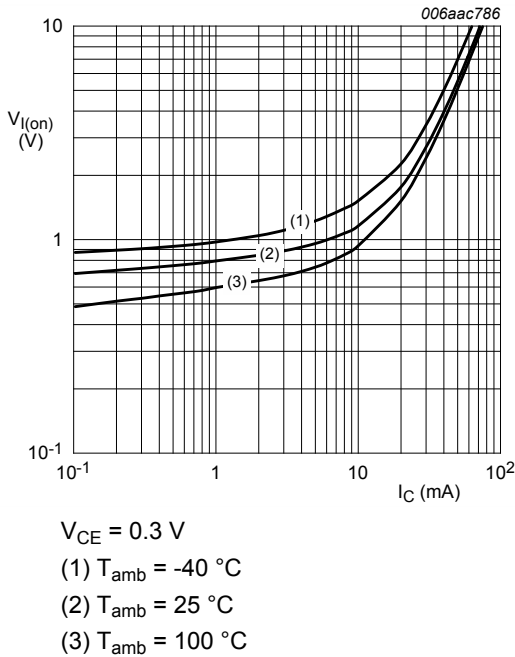


Fig. 7. On-state input voltage as a function of collector current; typical values

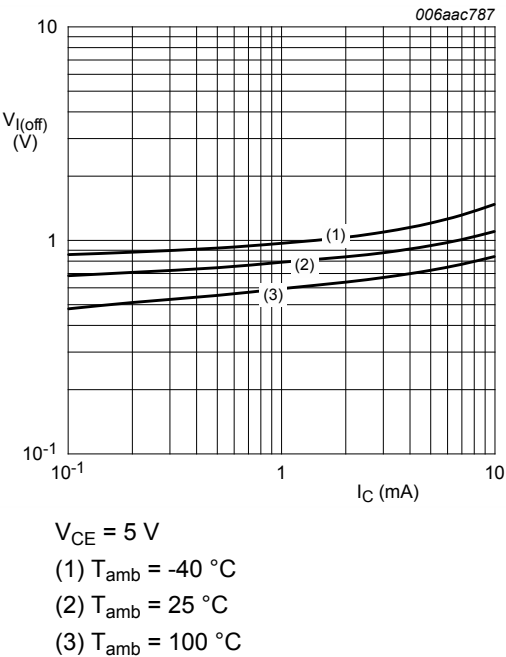


Fig. 8. Off-state input voltage as a function of collector current; typical values

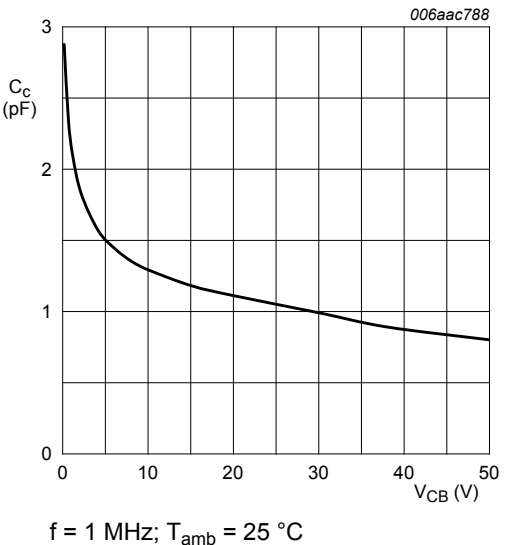


Fig. 9. Collector capacitance as a function of collector-base voltage; typical values

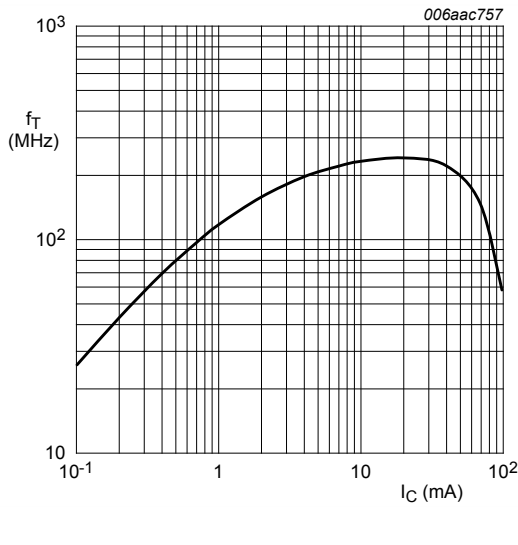


Fig. 10. Transition frequency as a function of collector current; typical values of built-in transistor

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.

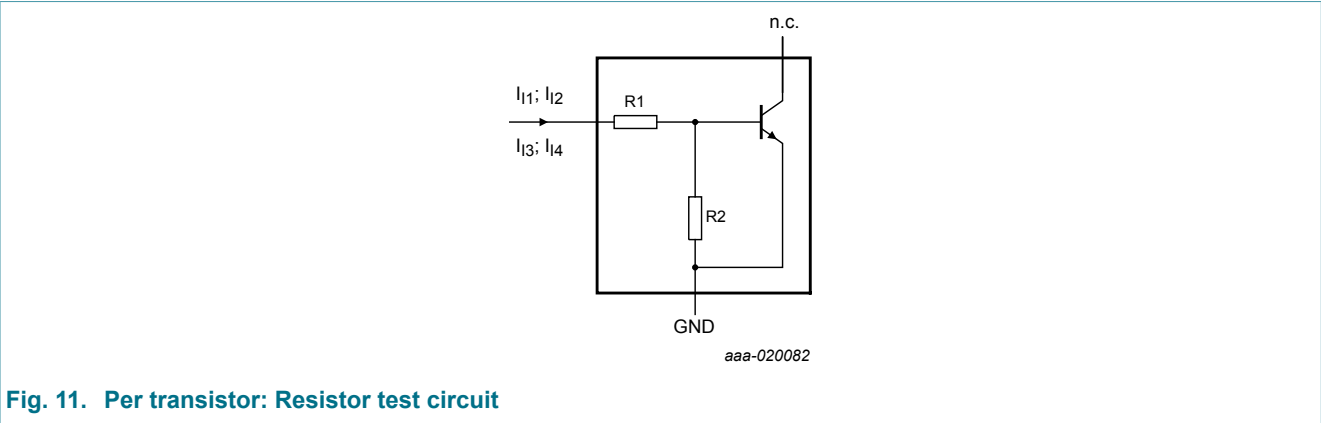
11.2 Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R1 = \frac{V(I_{I2}) - V(I_{I1})}{I_{I2} - I_{I1}}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R2}{R1} = \frac{V(I_{I4}) - V(I_{I3})}{R1 \cdot (I_{I4} - I_{I3})} - 1$$

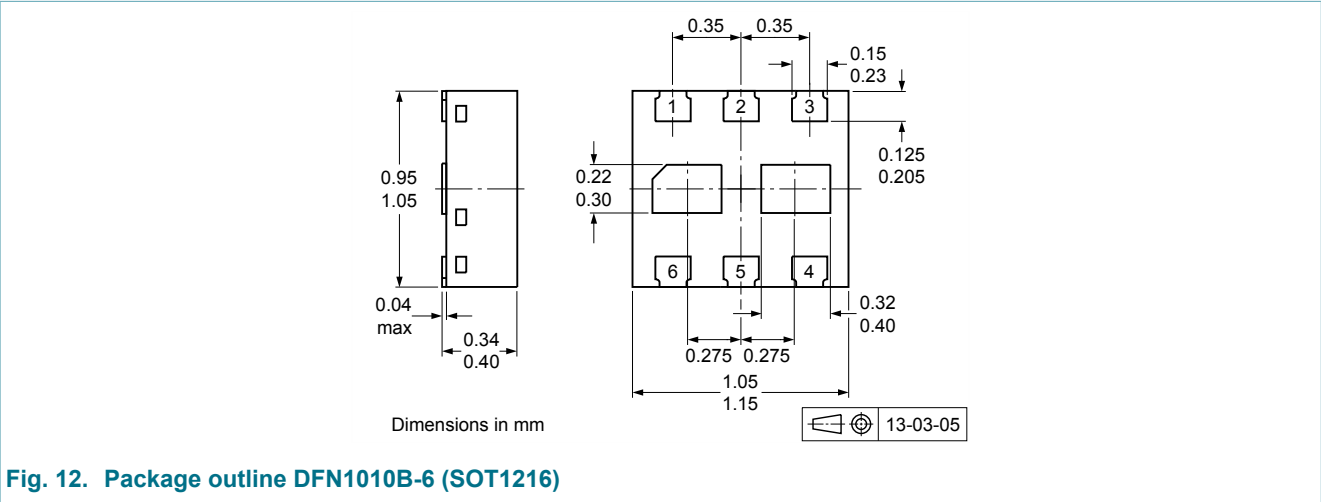


11.3 Resistor test conditions

Table 8. Resistor test conditions

R1 (kΩ)	R2 (kΩ)	Test conditions				
		I _{I1}	I _{I2}	I _{I3}	I _{I4}	
10	47	90 μA	140 μA	-55 μA	-105 μA	

12. Package outline



13. Soldering

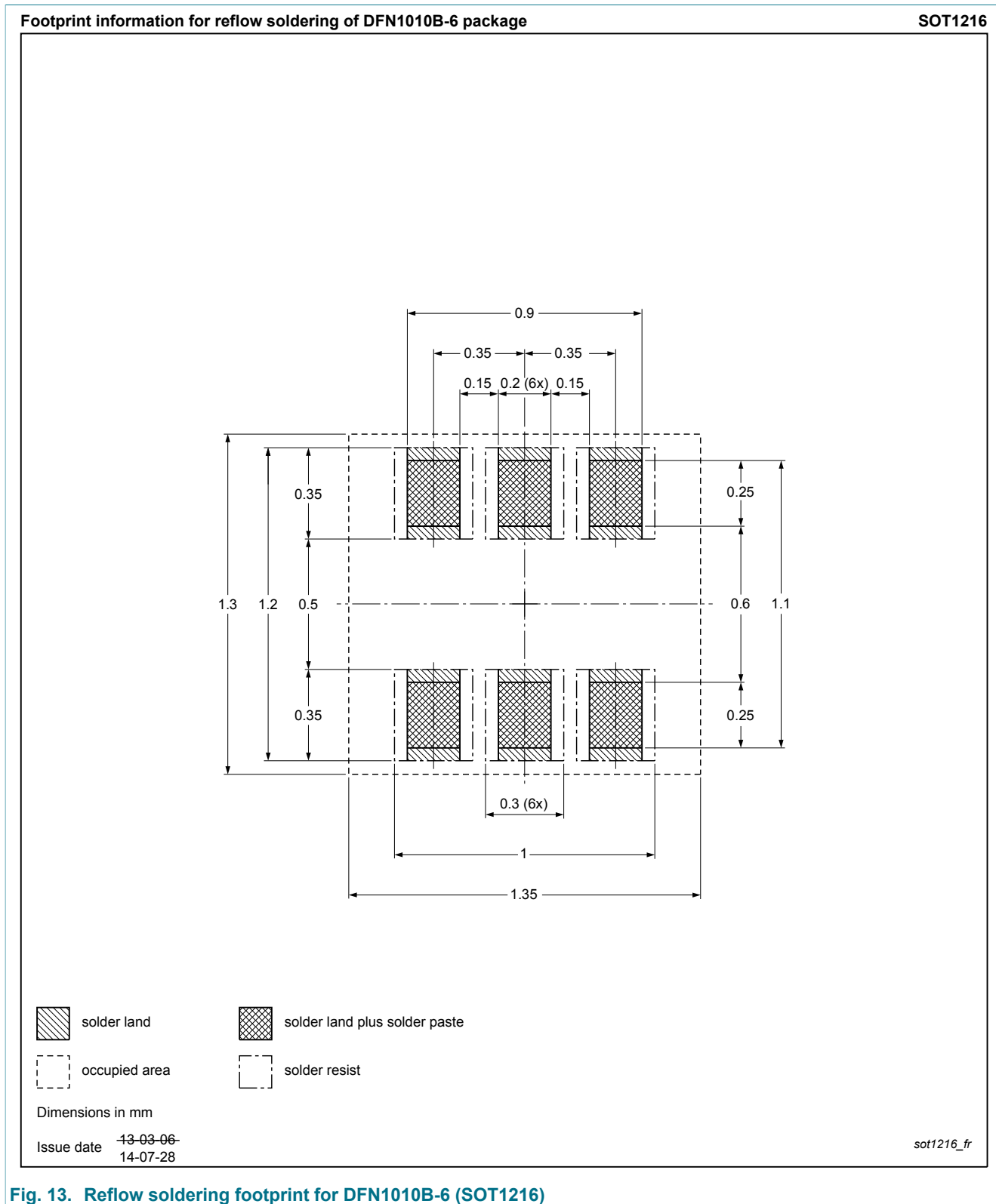


Fig. 13. Reflow soldering footprint for DFN1010B-6 (SOT1216)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PQMH9 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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