

PQMD12

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

8 July 2015

Product data sheet

1. General description

NPN/PNP double 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

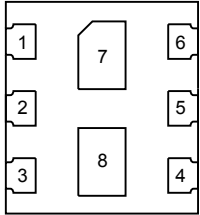
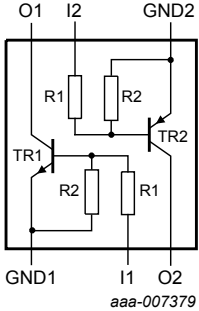
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor; for the PNP transistor with negative polarity						
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current		-	-	100	mA
Per transistor; for the PNP transistor with negative polarity						
R1	resistance 1	T _{amb} = 25 °C	33	47	61	k Ω
R2/R1	resistance ratio		0.8	1	1.2	

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-007379</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
PQMD12	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
PQMD12	11 00 00

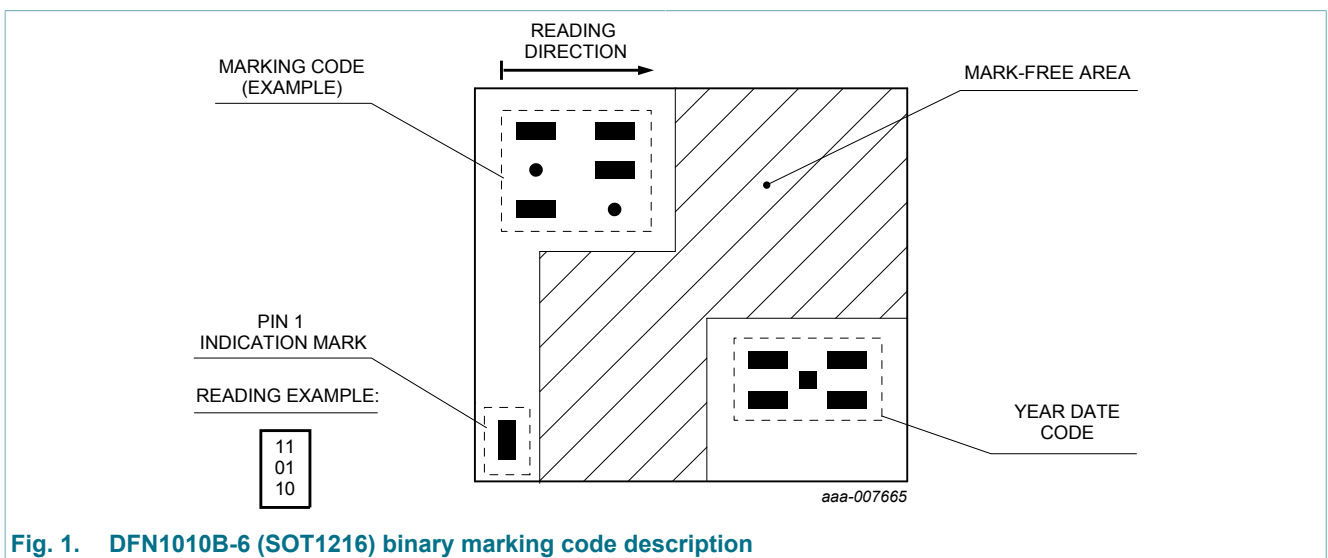


Fig. 1. DFN1010B-6 (SOT1216) binary marking code description

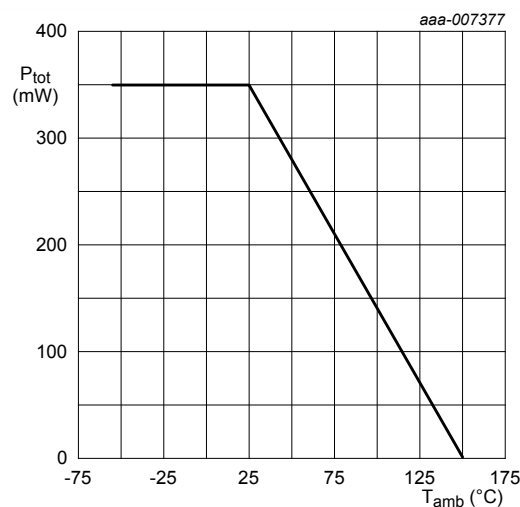
8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor; for the PNP transistor with negative polarity						
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		-	10	V
V _I	input voltage	TR1; positive		-	40	V
		TR1; negative		-	-10	V
		TR2; positive		-	10	V
		TR2; negative		-	-40	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

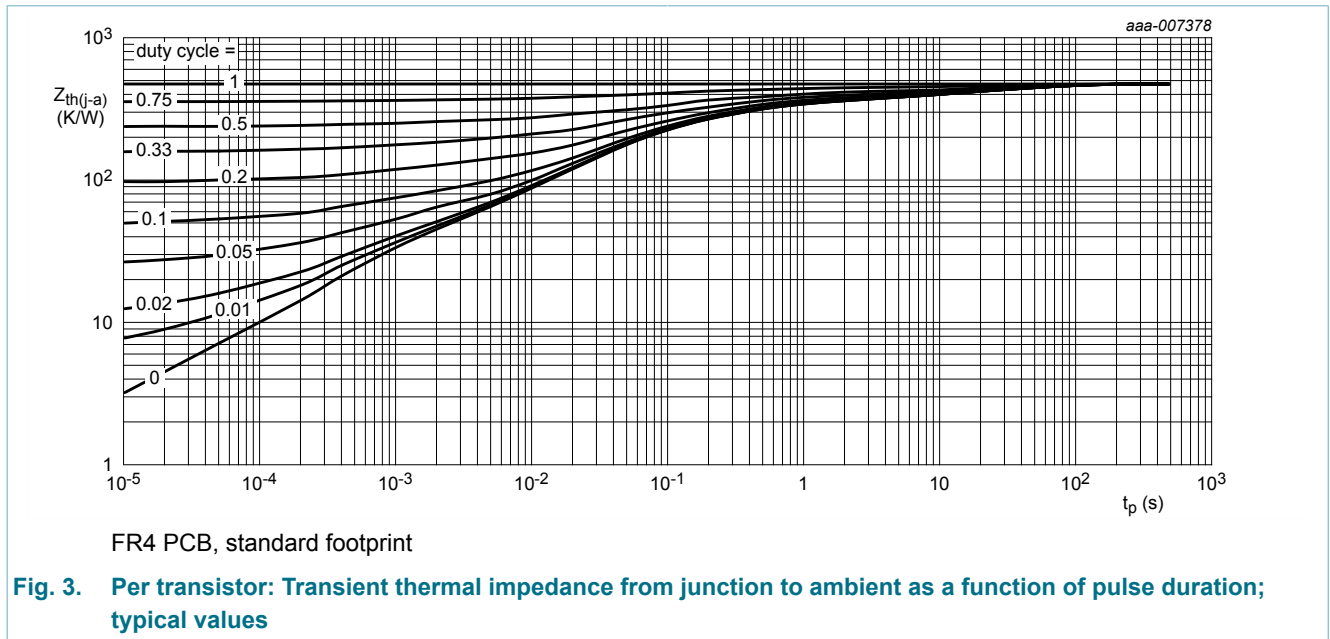
Fig. 2. Per device: Power derating curve

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.

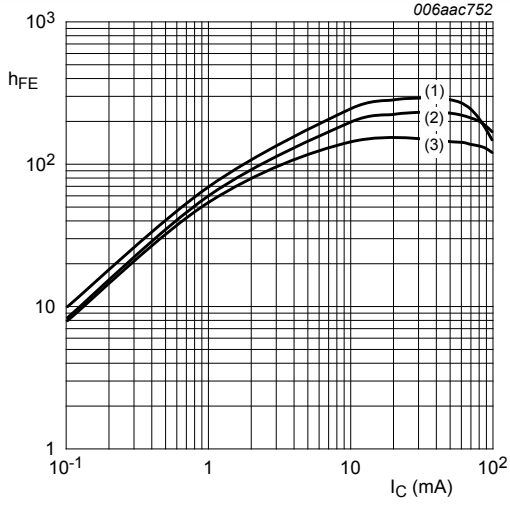


10. Characteristics

Table 7. Characteristics

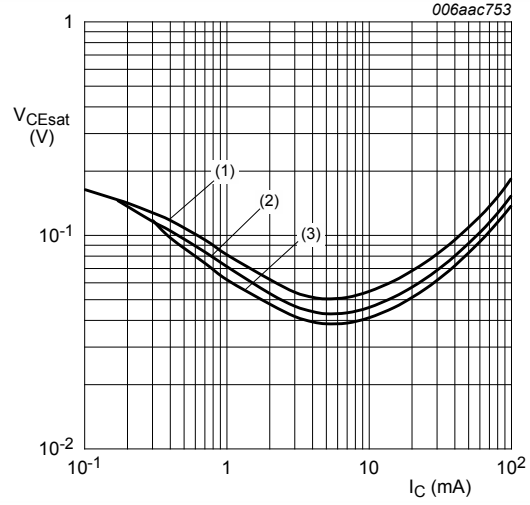
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
Per transistor; for the PNP transistor with negative polarity							
I_{CBO}	collector-base cut-off current (emitter open)	$V_{CB} = 50 \text{ V}; I_E = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA	
I_{CEO}	collector-emitter cut-off current (base open)	$V_{CE} = 30 \text{ V}; I_B = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	1	μA	
		$V_{CE} = 30 \text{ V}; I_B = 0 \text{ A}; T_{amb} = 150 \text{ }^\circ\text{C}$	-	-	5	μA	
I_{EBO}	emitter-base cut-off current (collector open)	$V_{EB} = 5 \text{ V}; I_C = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	90	μA	
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 5 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	80	-	-		
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	150	mV	
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5 \text{ V}; I_C = 100 \text{ } \mu\text{A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	1.2	0.8	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3 \text{ V}; I_C = 2 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	3	1.6	-	V	
R1	resistance 1	$T_{amb} = 25 \text{ }^\circ\text{C}$	33	47	61	kΩ	
R2/R1	resistance ratio		0.8	1	1.2		
C_C	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; \text{TR1 (NPN)}$	-	-	2.5	pF	
		$V_{CB} = -10 \text{ V}; I_E = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; \text{TR2 (PNP)}$	-	-	3	pF	
f_T	transition frequency	$V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; \text{TR1 (NPN)}$	[1]	-	230	-	MHz
		$V_{CE} = -5 \text{ V}; I_C = -10 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}; \text{TR2 (PNP)}$	[1]	-	180	-	MHz

[1] Characteristics of built-in transistor



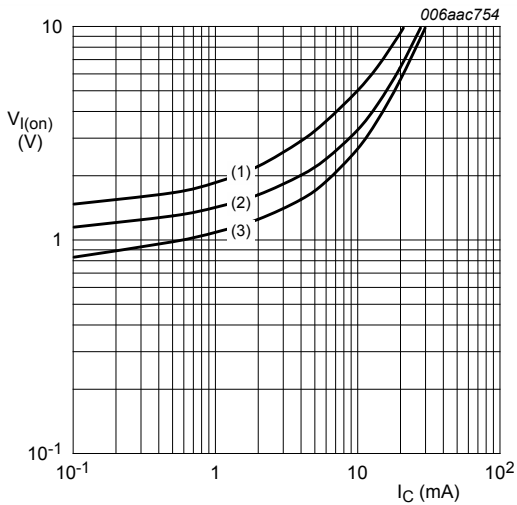
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



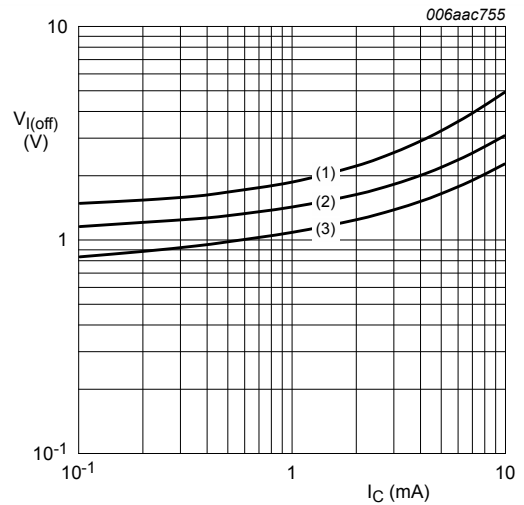
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



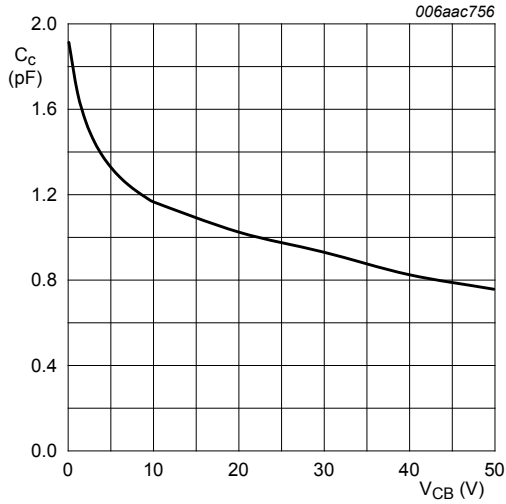
$V_{CE} = 0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 6. NPN transistor: On-state input voltage as a function of collector current; typical values



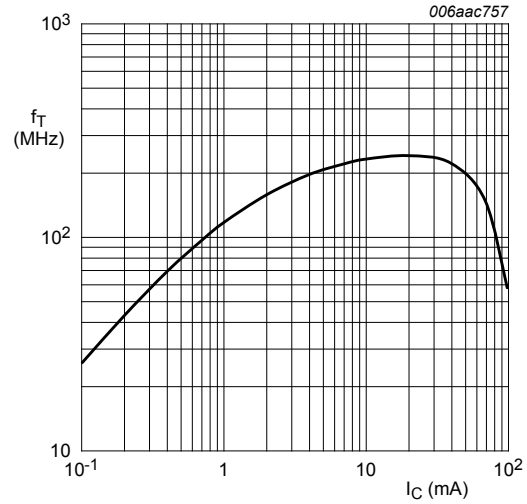
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 7. NPN transistor: Off-state input voltage as a function of collector current; typical values



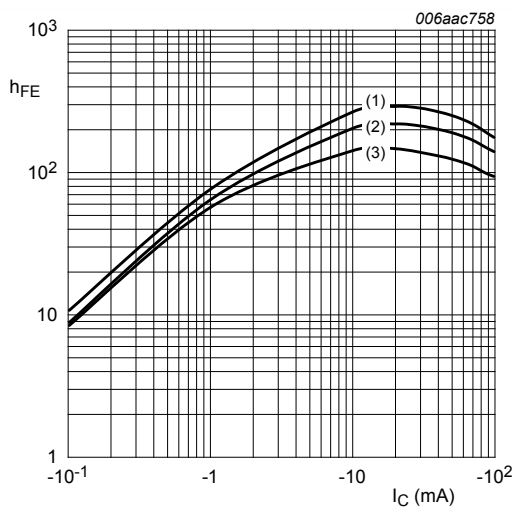
$f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

Fig. 8. NPN transistor: Collector capacitance as a function of collector-base voltage; typical values



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

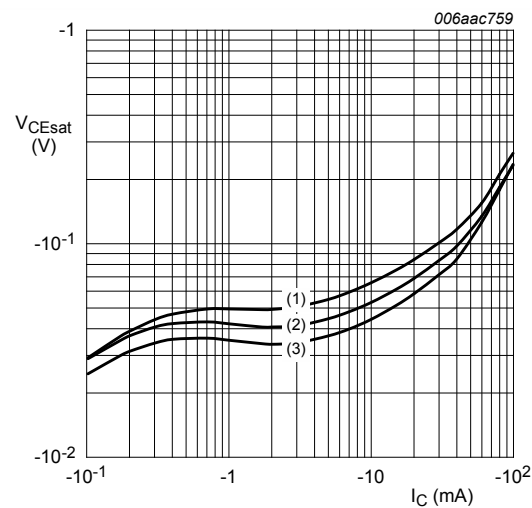
Fig. 9. NPN transistor: Transition frequency as a function of collector current; typical values of built-in transistor



$V_{\text{CE}} = -5 \text{ V}$

- (1) $T_{\text{amb}} = 100 \text{ }^\circ\text{C}$
- (2) $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$
- (3) $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$

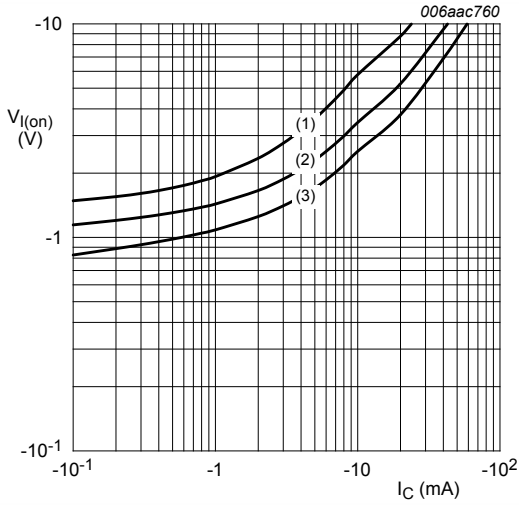
Fig. 10. PNP transistor: DC current gain as a function of collector current; typical values



$I_{\text{C}}/I_{\text{B}} = 20$

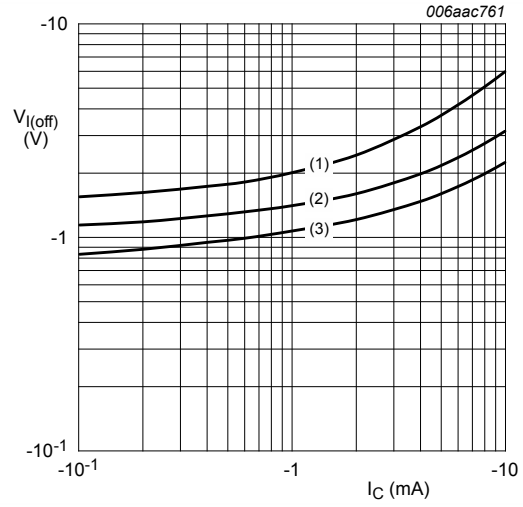
- (1) $T_{\text{amb}} = 100 \text{ }^\circ\text{C}$
- (2) $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$
- (3) $T_{\text{amb}} = -40 \text{ }^\circ\text{C}$

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



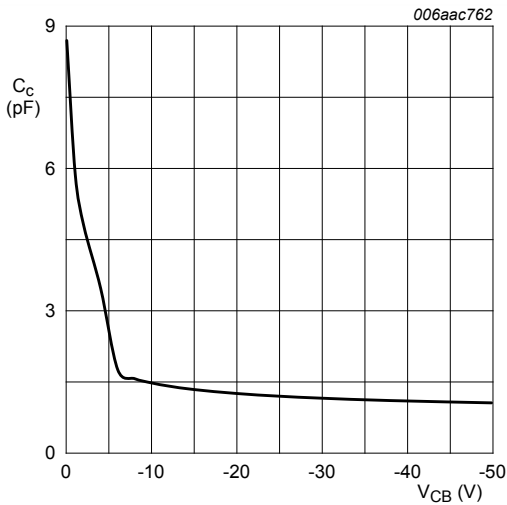
$V_{CE} = -0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig. 12. PNP transistor: On-state input voltage as a function of collector current; typical values



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

Fig. 13. PNP transistor: Off-state input voltage as a function of collector current; typical values



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

Fig. 14. PNP transistor: Collector capacitance as a function of collector-base voltage; typical values of built-in transistor

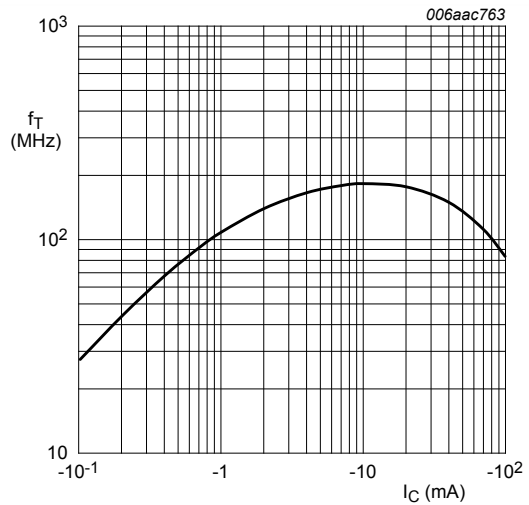


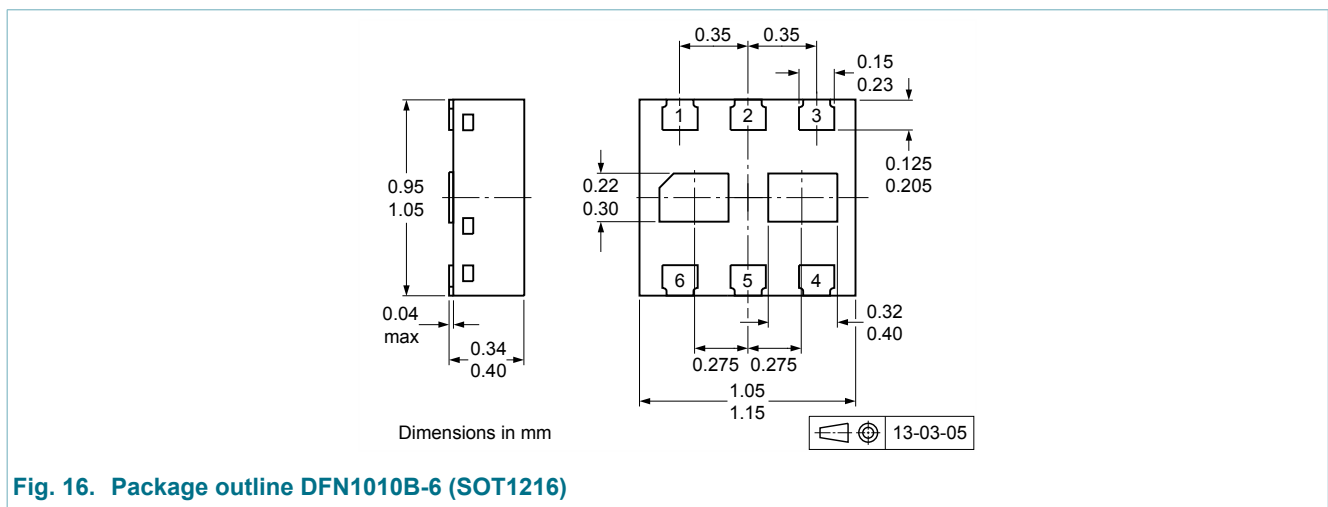
Fig. 15. PNP transistor: Transition frequency as a function of collector current; typical values of built-in transistor

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.

12. Package outline



13. Soldering

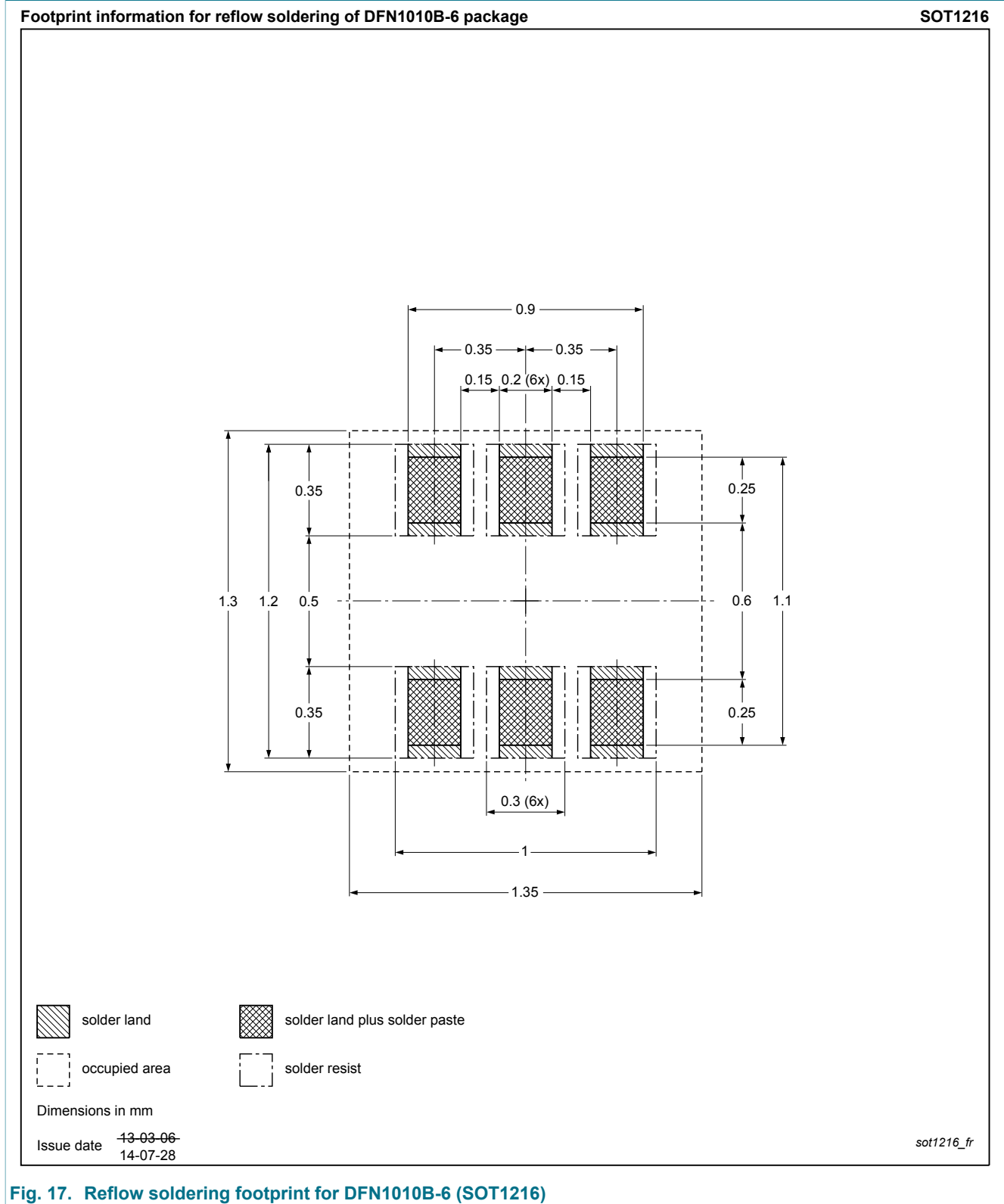


Fig. 17. Reflow soldering footprint for DFN1010B-6 (SOT1216)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PQMD12 v.2	20150708	Product data sheet	-	PQMD12 v.1
Modification:	<ul style="list-style-type: none">Change of binary marking code position.			
PQMD12 v.1	20130724	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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