



# BC847QAPN

45 V, 100 mA NPN/PNP general-purpose transistor

19 July 2013

Product data sheet

## 1. General description

NPN/PNP general-purpose transistor in a leadless ultra small DFN1010B-6 (SOT1216) Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified
- Low package height of 0.37 mm

## 3. Applications

- General-purpose switching and amplification
- Mobile applications

## 4. Quick reference data

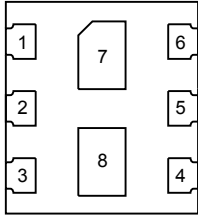
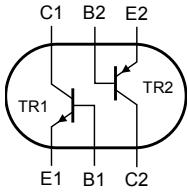
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor with negative polarity</b>						
$V_{CEO}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current		-	-	100	mA
<b>Per transistor; for the PNP transistor with negative polarity</b>						
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	200	-	450	



### 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 <p>Transparent top view <b>DFN1010B-6 (SOT1216)</b></p>	 <p>sym139</p>
2	B1	base TR1		
3	C2	collector TR2		
4	E2	emitter TR2		
5	B2	base TR2		
6	C1	collector TR1		
7	C1	collector TR1		
8	C2	collector TR2		

### 6. Ordering information

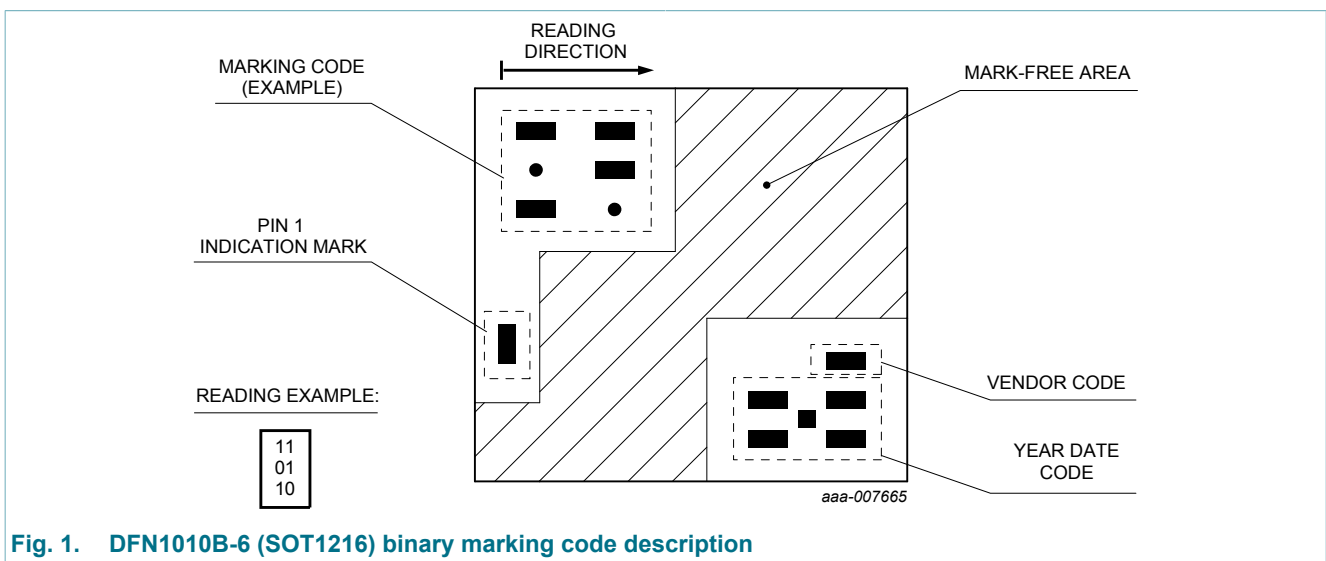
Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BC847QAPN	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
BC847QAPN	01 00 00



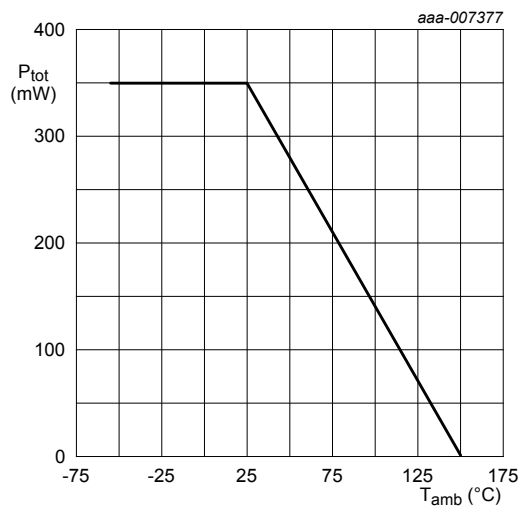
## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
<b>Per transistor; for the PNP transistor with negative polarity</b>						
V <sub>CB0</sub>	collector-base voltage	open emitter		-	50	V
V <sub>CEO</sub>	collector-emitter voltage	open base		-	45	V
V <sub>EBO</sub>	emitter-base voltage	open collector		-	6	V
I <sub>C</sub>	collector current			-	100	mA
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms		-	200	mA
I <sub>BM</sub>	peak base current			-	100	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	230	mW
<b>Per device</b>						
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	350	mW
T <sub>j</sub>	junction temperature			-	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	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

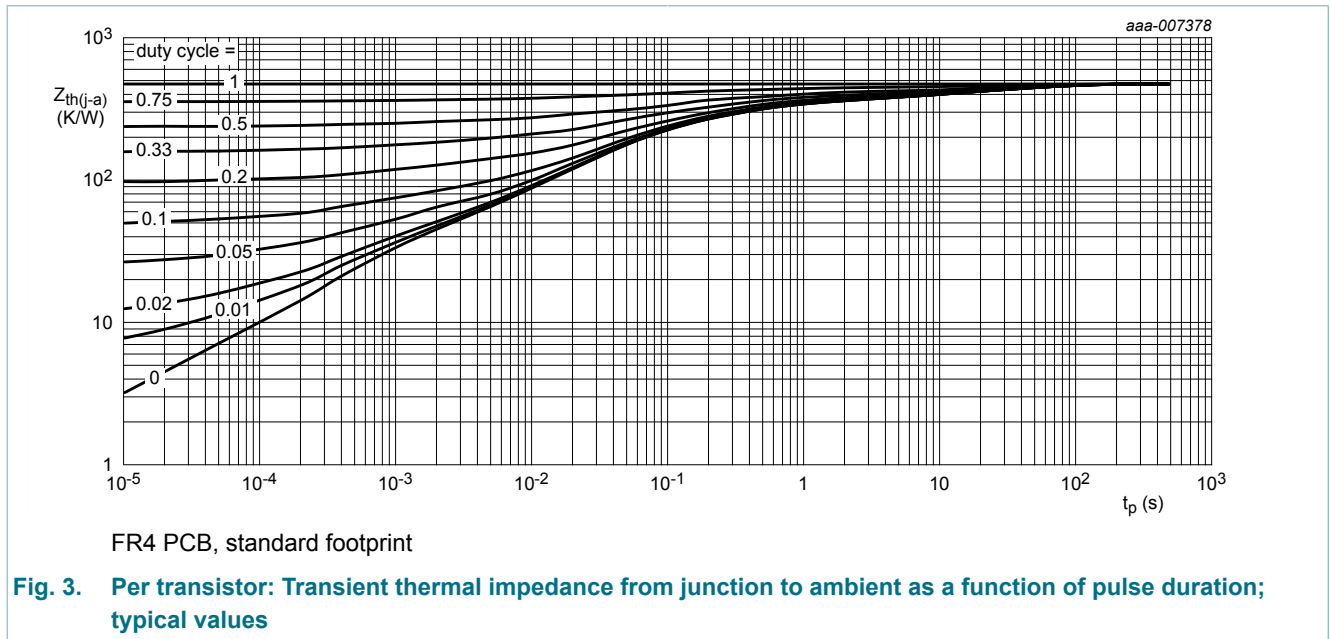
**Fig. 2. Per device: Power derating curve**

## 9. Thermal characteristics

Table 6. Thermal characteristics

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

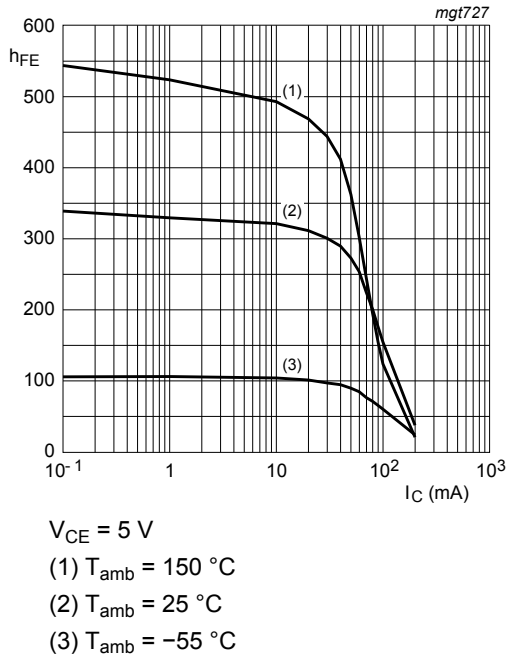
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



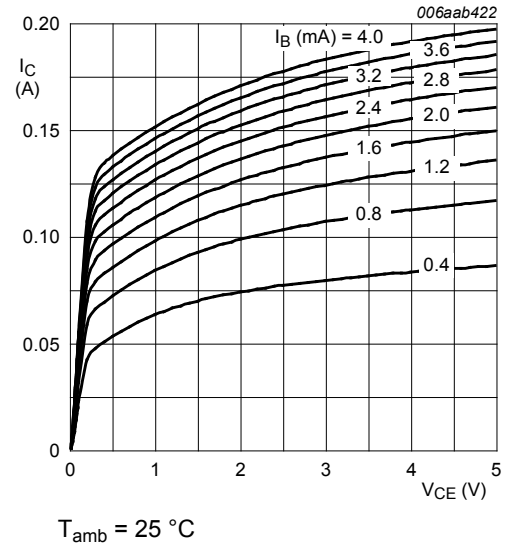
## 10. Characteristics

Table 7. Characteristics

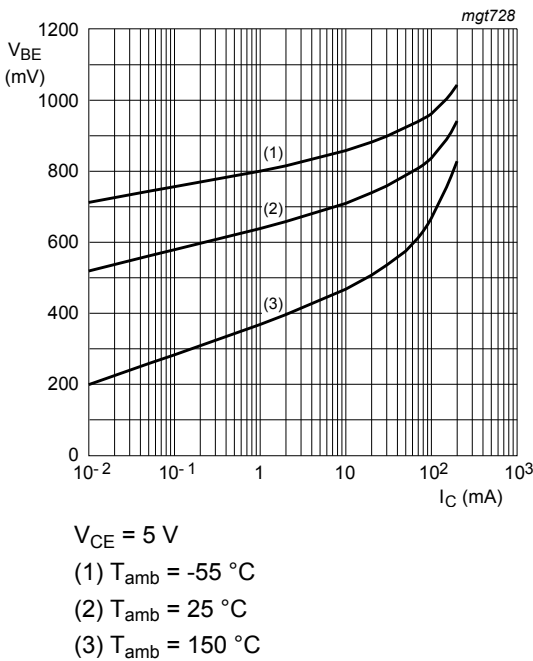
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor with negative polarity</b>						
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	15	nA
		V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C	-	-	5	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C	200	-	450	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C	-	-	100	mV
		I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	300	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C	-	760	-	mV
		I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	900	-	mV
V <sub>BE</sub>	base-emitter voltage	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C	600	660	725	mV
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; T <sub>amb</sub> = 25 °C	-	710	820	mV
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = 10 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C	-	-	4	pF
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C	100	-	-	MHz
NF	noise figure	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 0.2 mA; R <sub>S</sub> = 2 kΩ; f = 1 MHz; B = 200 Hz; T <sub>amb</sub> = 25 °C	-	-	10	dB
<b>TR1 (NPN)</b>						
C <sub>e</sub>	emitter capacitance	V <sub>EB</sub> = 0.5 V; I <sub>C</sub> = 0 A; i <sub>c</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C	-	11	-	pF
<b>TR2 (PNP)</b>						
C <sub>e</sub>	emitter capacitance	V <sub>EB</sub> = -0.5 V; I <sub>C</sub> = 0 A; i <sub>c</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C	-	10	-	pF



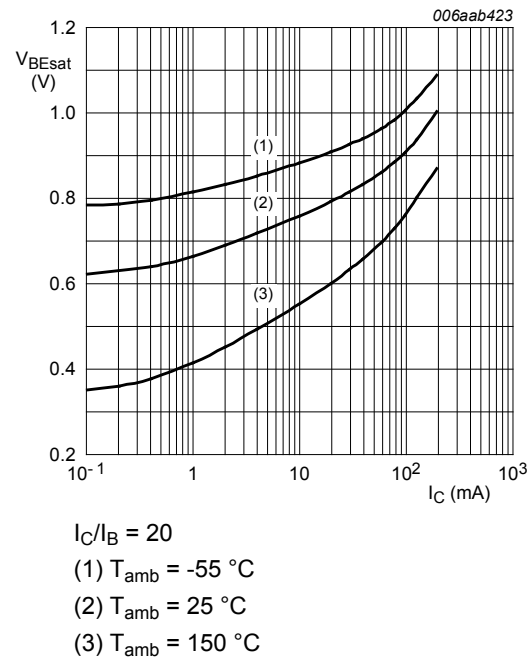
**Fig. 4. NPN transistor: DC current gain as a function of collector current; typical values**



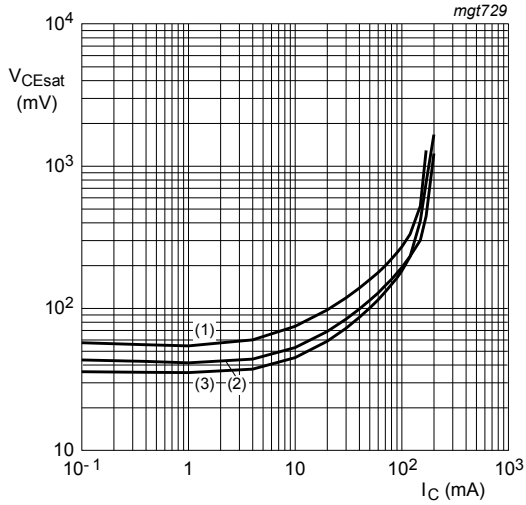
**Fig. 5. NPN transistor: Collector current as a function of collector-emitter voltage; typical values**



**Fig. 6. NPN transistor: Base-emitter voltage as a function of collector current; typical values**

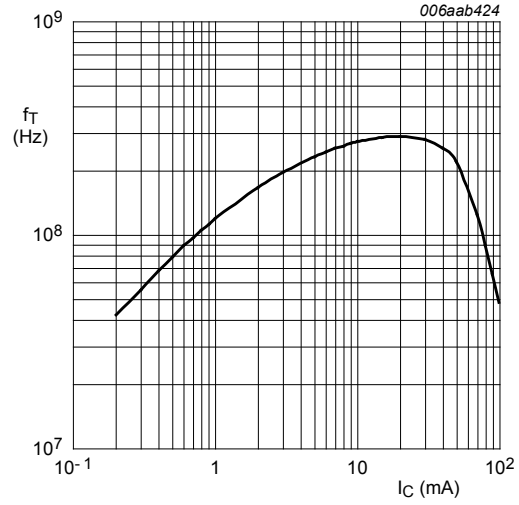


**Fig. 7. NPN transistor: Collector-emitter saturation voltage as a function of collector current; typical values**



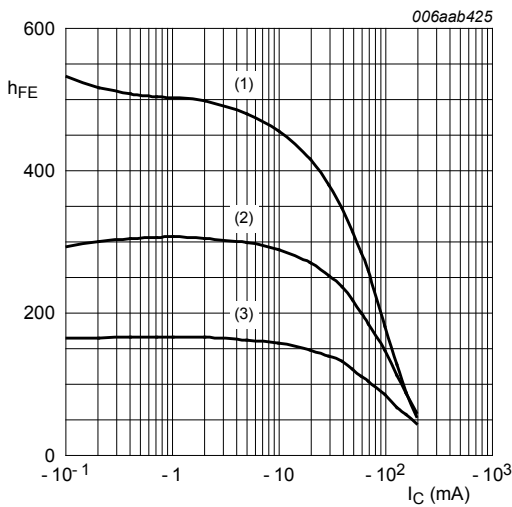
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

**Fig. 8. NPN transistor: Collector-emitter saturation voltage as a function of collector current; typical values**



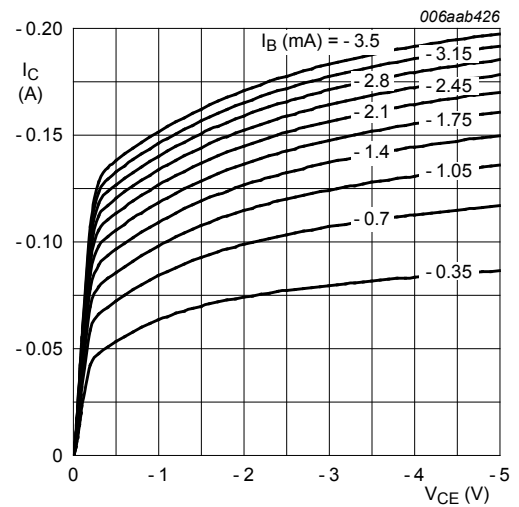
$T_{amb} = 25\text{ }^\circ\text{C};$   
 $V_{CE} = 5\text{ V};$   
 $f = 100\text{ MHz}$

**Fig. 9. Transition frequency as a function of collector current; typical values**



$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



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

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

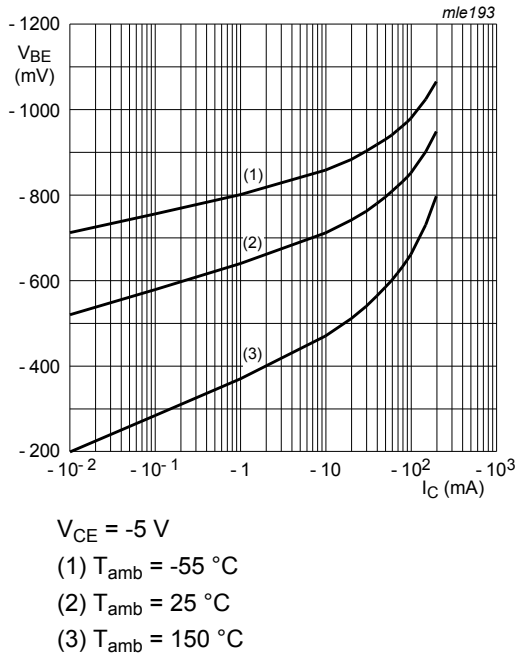


Fig. 12. PNP transistor: Base-emitter voltage as a function of collector current; typical values

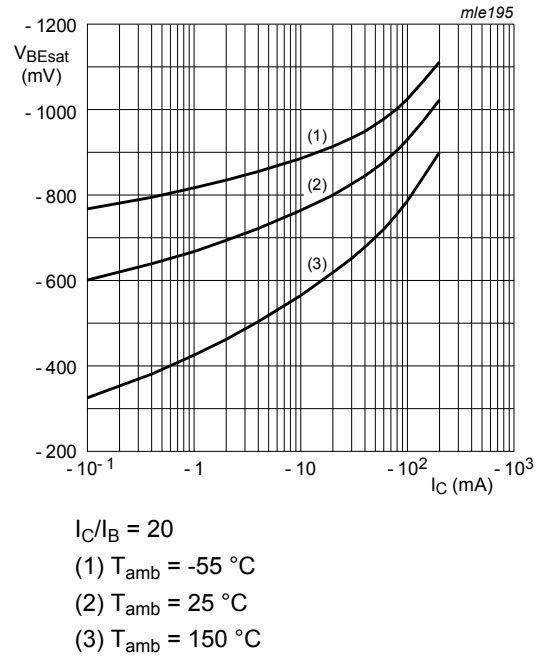


Fig. 13. PNP transistor: Collector-emitter saturation voltage as a function of collector current; typical values

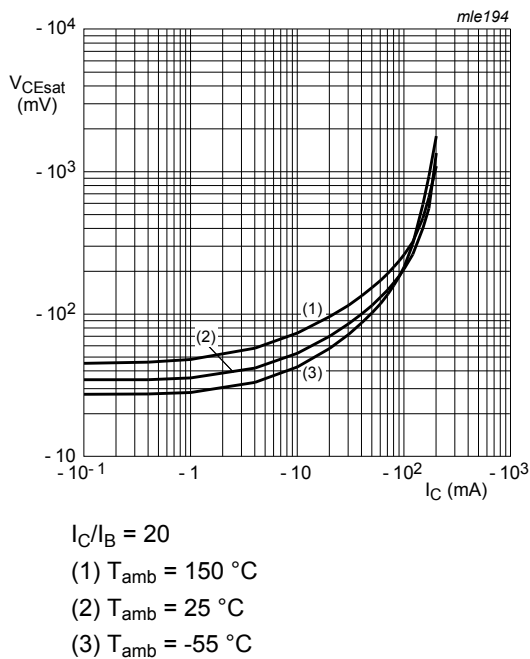


Fig. 14. PNP transistor: Collector-emitter saturation voltage as a function of collector current; typical values

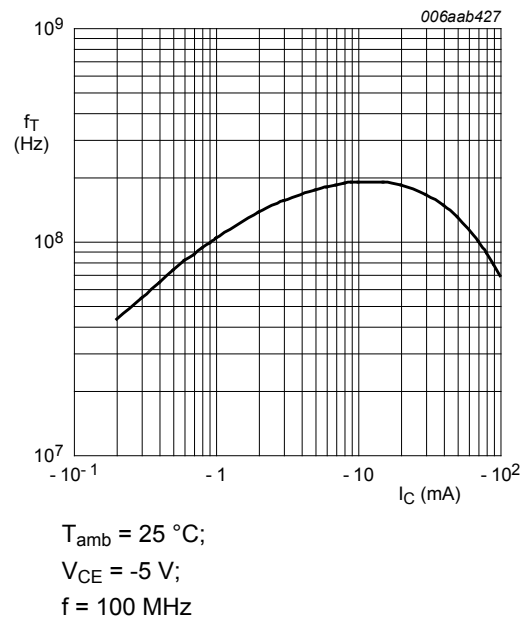


Fig. 15. PNP transistor: Transition frequency as a function of collector current; typical values

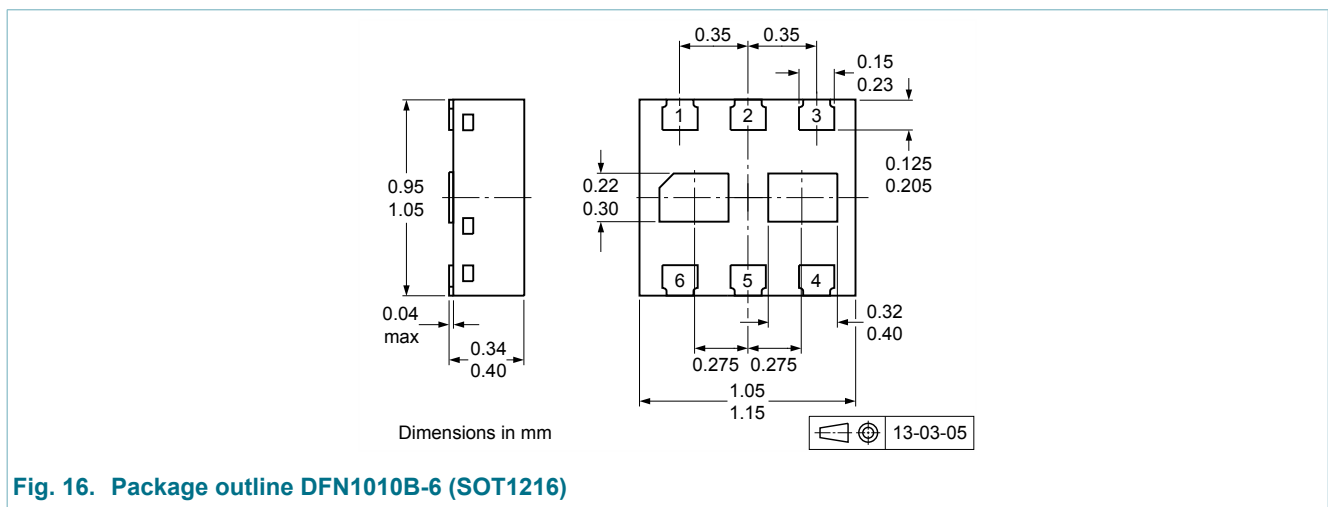


## 11. Test information

### 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

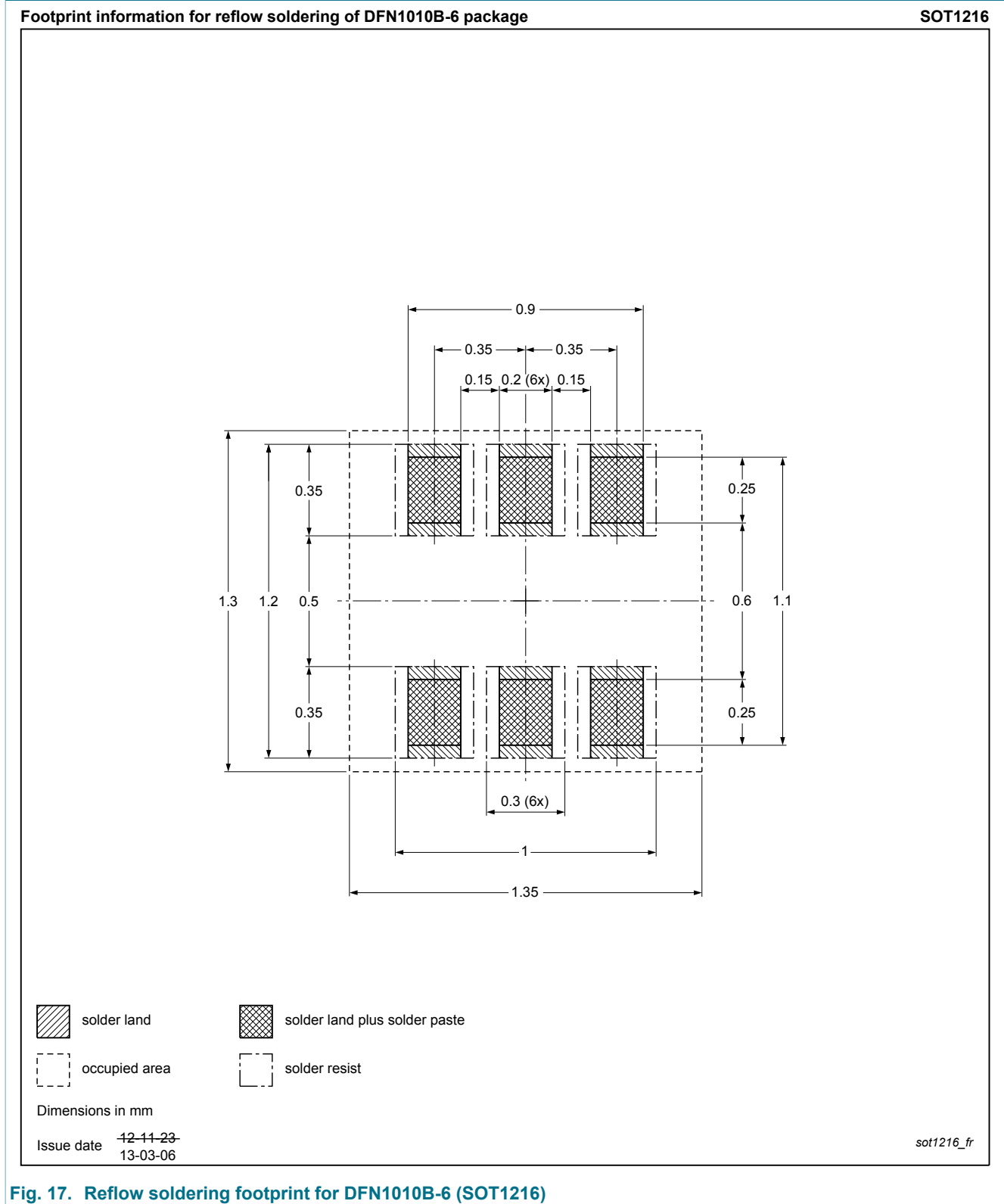


Fig. 17. Reflow soldering footprint for DFN1010B-6 (SOT1216)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC847QAPN v.1	20130718	Product data sheet	-	-

45 V, 100 mA NPN/PNP general-purpose transistor

## 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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