



# BC846BPN-Q

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

9 December 2021

Product data sheet

## 1. General description

NPN/PNP general-purpose transistor pair in a very small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package.

NPN/PNP complement: BC846BS-Q

PNP/PNP complement: BC856BS-Q

## 2. Features and benefits

- Low collector capacitance
- Low collector-emitter saturation voltage
- Closely matched current gain
- Reduces number of components and board space
- No mutual interference between the transistors
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- General-purpose switching and amplification

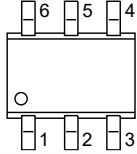
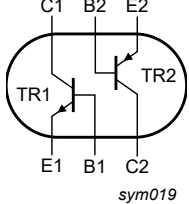
## 4. Quick reference data

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	-	-	65	V
$I_C$	collector current		-	-	100	mA
<b>TR1 (NPN)</b>						
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}; T_{amb} = 25\text{ °C}$	200	300	450	
<b>TR2 (PNP)</b>						
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V}; I_C = -2\text{ mA}; T_{amb} = 25\text{ °C}$	200	290	450	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 <p>TSSOP6 (SOT363)</p>	 <p>sym019</p>
2	B1	base TR1		
3	C2	collector TR2		
4	E2	emitter TR2		
5	B2	base TR2		
6	C1	collector TR1		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BC846BPN-Q	TSSOP6	plastic, surface-mounted package; 6 leads; 0.65 mm pitch; 2.1 mm x 1.25 mm x 0.95 mm body	SOT363

## 7. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
BC846BPN-Q	PJ%

[1] % = placeholder for manufacturing site code

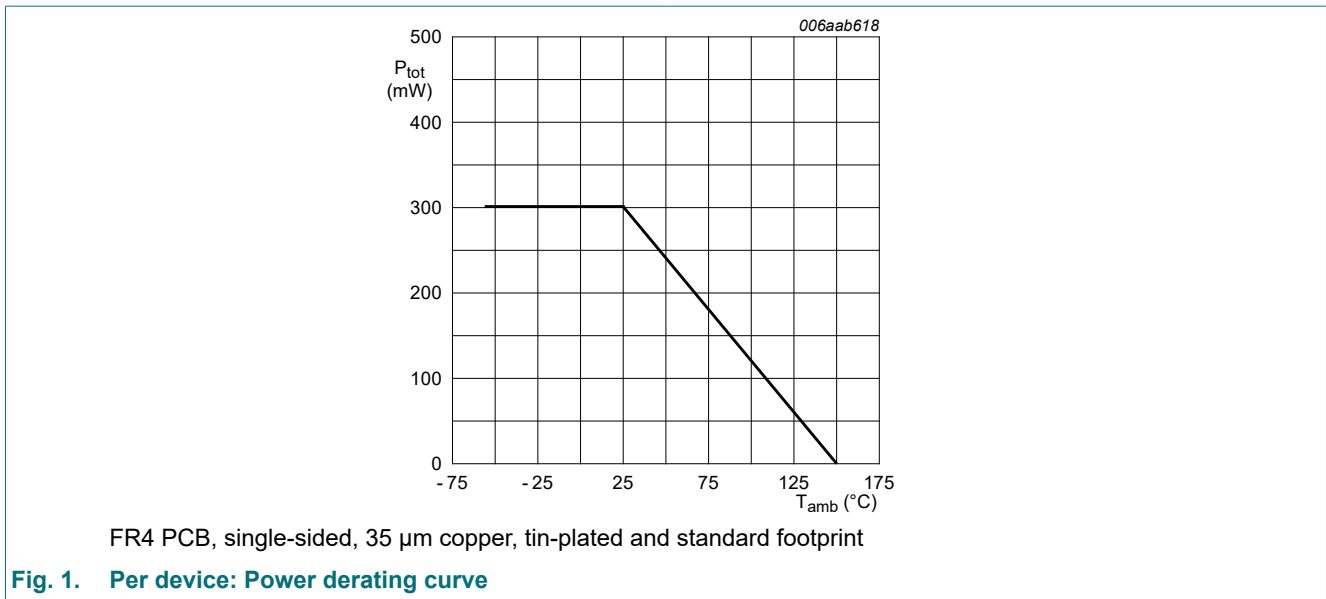
## 8. Limiting values

**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>						
$V_{CBO}$	collector-base voltage	open emitter		-	80	V
$V_{CEO}$	collector-emitter voltage	open base		-	65	V
$V_{EBO}$	emitter-base voltage	open collector		-	6	V
$I_C$	collector current			-	100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	200	mA
$I_{BM}$	peak base current			-	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	200	mW
<b>Per device</b>						
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	300	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.

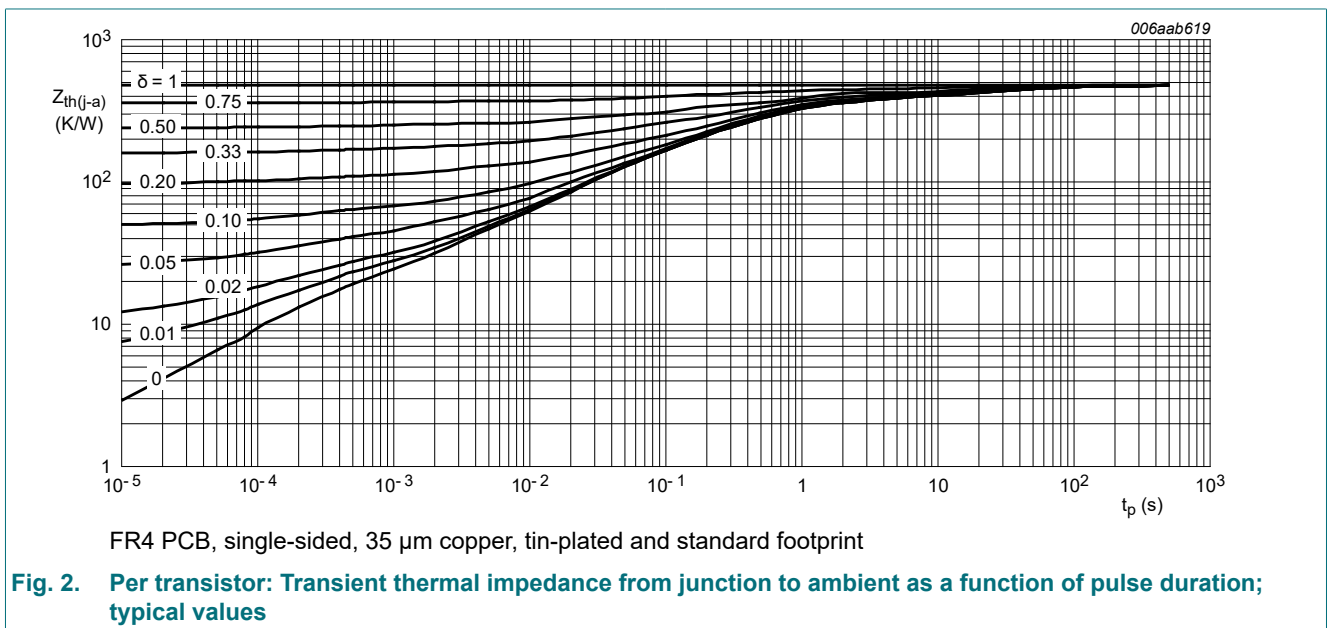


## 9. Thermal characteristics

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]	-	625	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	230	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	416	K/W

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



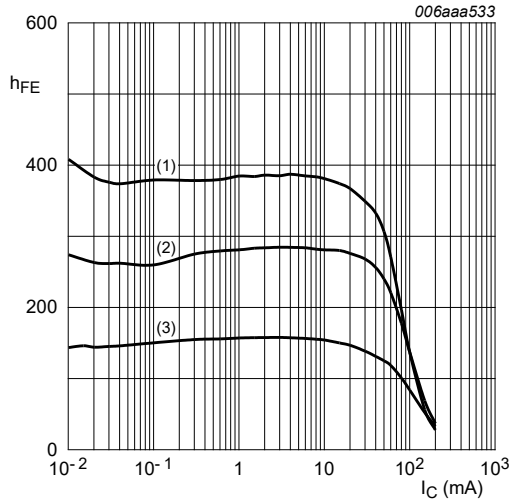
## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>TR1 (NPN)</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ °C}$	-	-	15	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	-	-	5	μA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 6\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ °C}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 10\text{ μA}; T_{amb} = 25\text{ °C}$	-	280	-	
		$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}; T_{amb} = 25\text{ °C}$	200	300	450	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}; T_{amb} = 25\text{ °C}$	-	55	100	mV
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}; T_{amb} = 25\text{ °C}$	-	200	300	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}; T_{amb} = 25\text{ °C}$	-	755	850	mV
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}; T_{amb} = 25\text{ °C}$	-	1000	-	mV

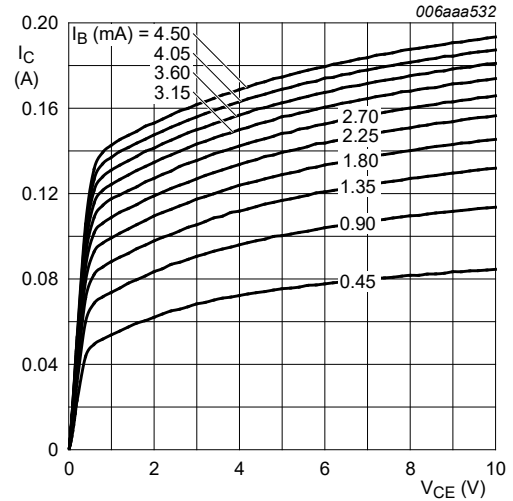
## 65 V, 100 mA NPN/PNP general-purpose transistor

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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	580	650	700	mV
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; T <sub>amb</sub> = 25 °C	-	-	770	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	-	1.9	-	pF
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
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 = 15.7 kHz; T <sub>amb</sub> = 25 °C	-	1.9	-	dB
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 0.2 mA; R <sub>S</sub> = 2 kΩ; f = 1 kHz; B = 200 Hz; T <sub>amb</sub> = 25 °C	-	3.1	-	dB
<b>TR2 (PNP)</b>						
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = -50 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	nA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = -6 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> = -10 μA; T <sub>amb</sub> = 25 °C	-	270	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -2 mA; T <sub>amb</sub> = 25 °C	200	290	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	-	-55	-100	mV
		I <sub>C</sub> = -100 mA; I <sub>B</sub> = -5 mA; T <sub>amb</sub> = 25 °C	-	-200	-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	-	-755	-850	mV
		I <sub>C</sub> = -100 mA; I <sub>B</sub> = -5 mA; 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	-650	-750	mV
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -10 mA; T <sub>amb</sub> = 25 °C	-	-	-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	-	2.3	-	pF
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
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -10 mA; f = 100 MHz; T <sub>j</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 = 15.7 kHz; T <sub>amb</sub> = 25 °C	-	1.6	-	dB
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -0.2 mA; R <sub>S</sub> = 2 kΩ; f = 1 kHz; B = 200 Hz; T <sub>amb</sub> = 25 °C	-	2.9	-	dB



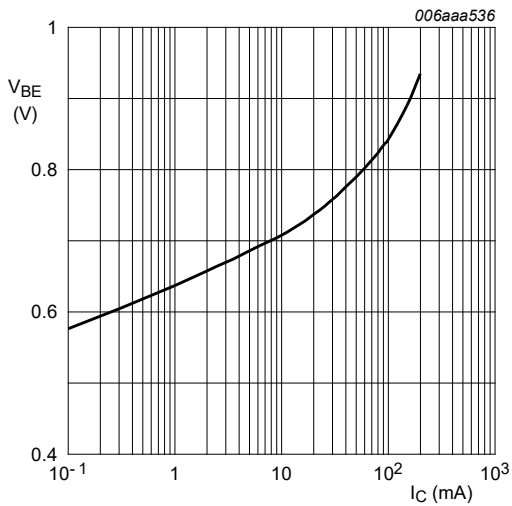
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 3. TR1 (NPN): DC current gain as a function of collector current; typical values**



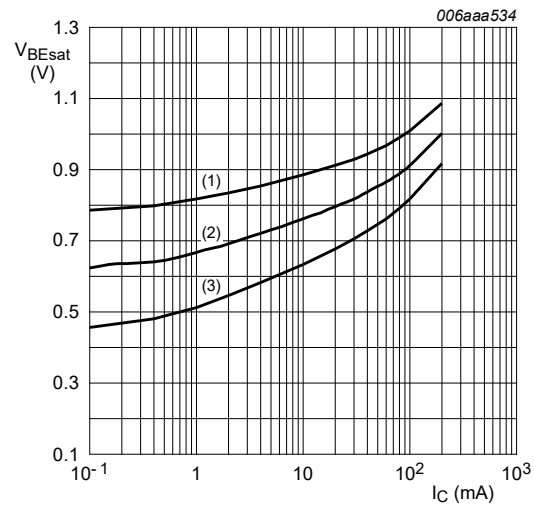
$T_{amb} = 25\text{ °C}$

**Fig. 4. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values**



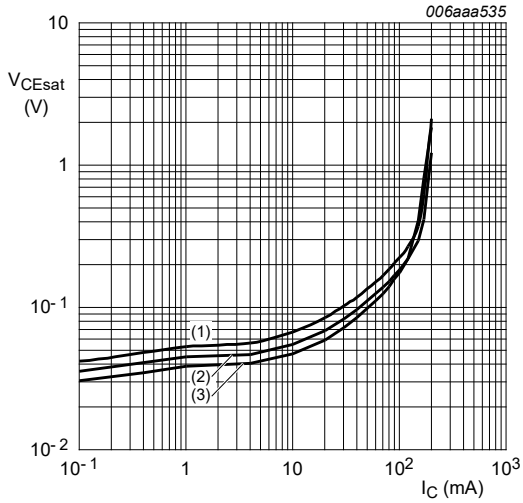
$V_{CE} = 5\text{ V}; T_{amb} = 25\text{ °C}$

**Fig. 5. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values**



$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig. 6. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

Fig. 7. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values

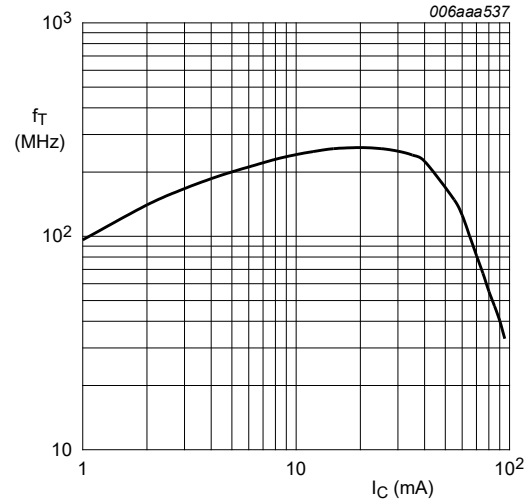


Fig. 8. TR1 (NPN): Transition frequency as a function of collector current; typical values

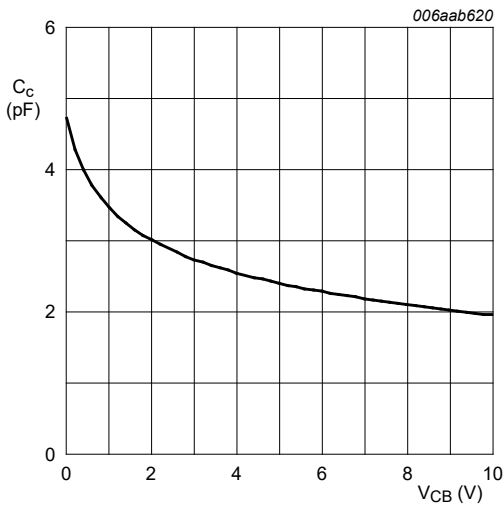


Fig. 9. TR1 (NPN): Collector capacitance as a function of collector-base voltage; typical values

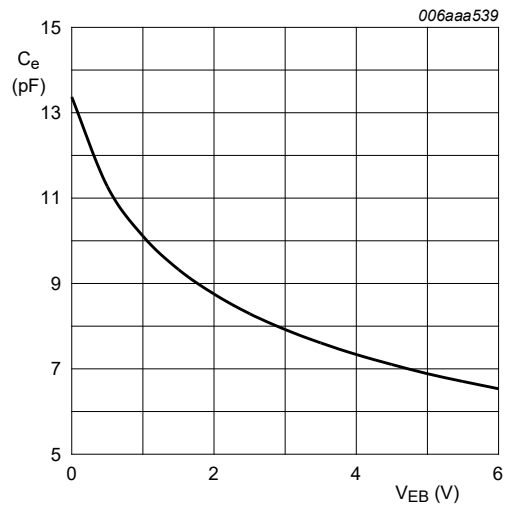
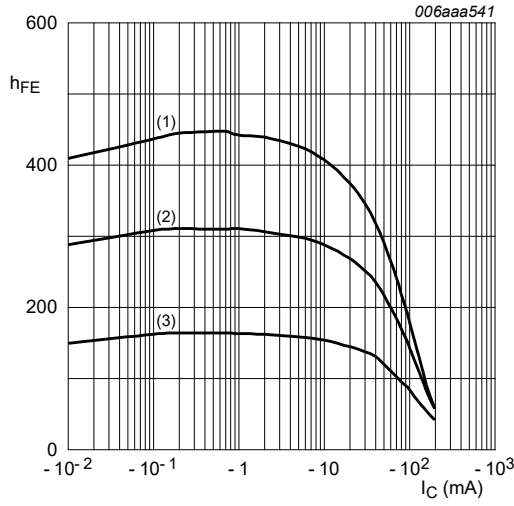
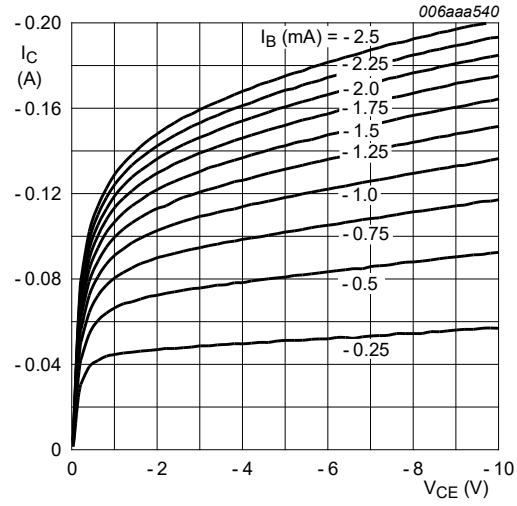


Fig. 10. TR1 (NPN): Emitter capacitance as a function of emitter-base voltage; typical values



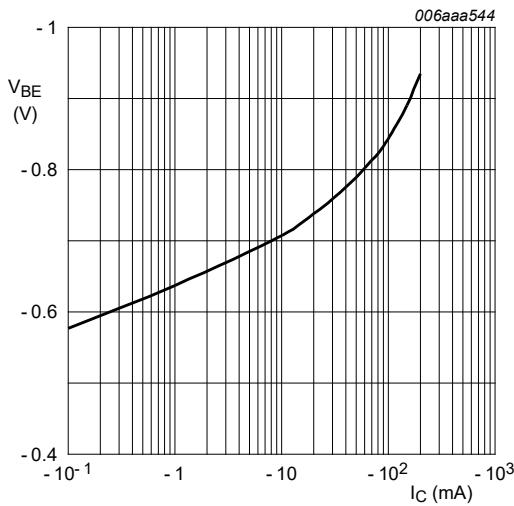
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

**Fig. 11. TR2 (PNP): DC current gain as a function of collector current; typical values**



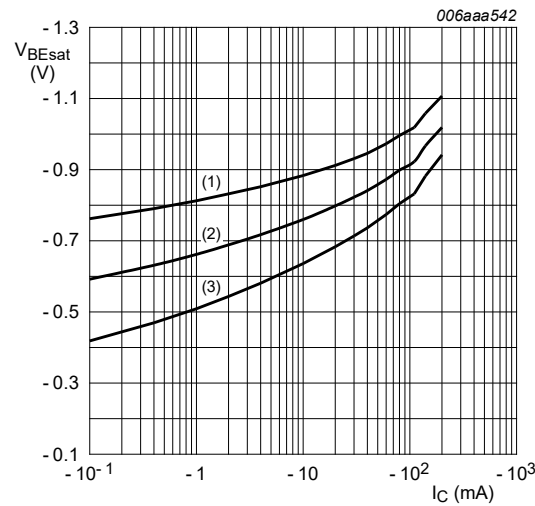
$T_{amb} = 25\text{ }^\circ\text{C}$

**Fig. 12. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values**



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

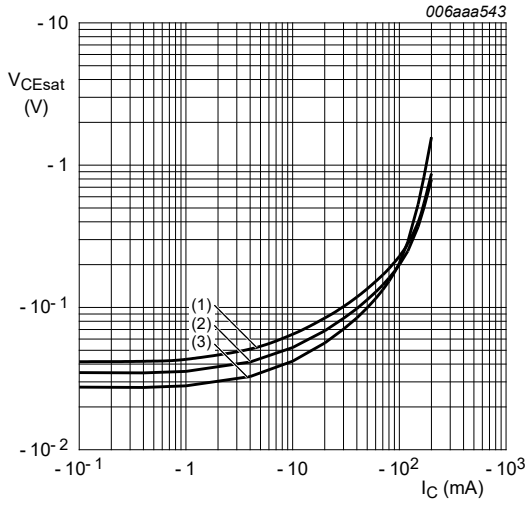
**Fig. 13. TR2 (PNP): Base-emitter voltage as a function of collector current; typical values**



$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

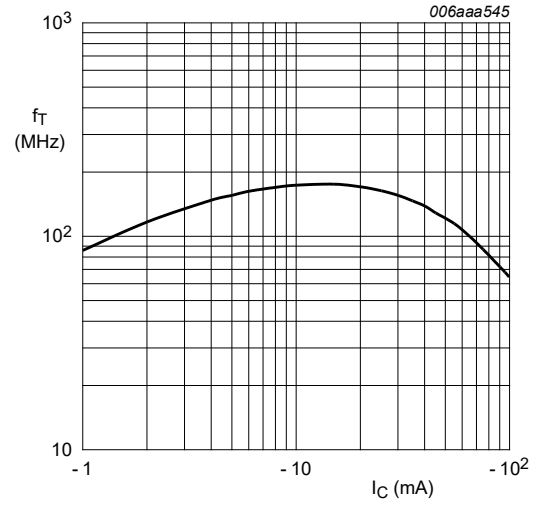
**Fig. 14. TR2 (PNP): Base-emitter saturation voltage as a function of collector current; typical values**





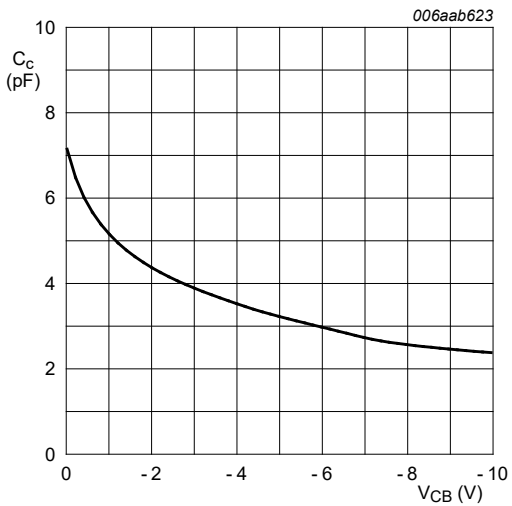
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

Fig. 15. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



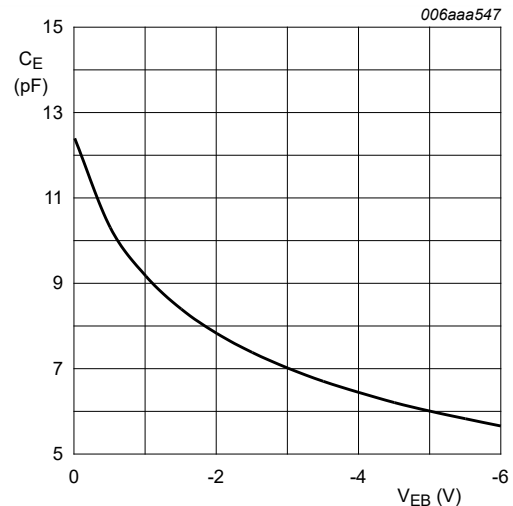
$V_{CE} = -5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

Fig. 16. TR2 (PNP): Transition frequency as a function of collector current; typical values



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

Fig. 17. TR2 (PNP): Collector capacitance as a function of collector-base voltage; typical values



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

Fig. 18. TR2 (PNP): Emitter capacitance as a function of emitter-base voltage; typical values

## 11. Test information

### 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

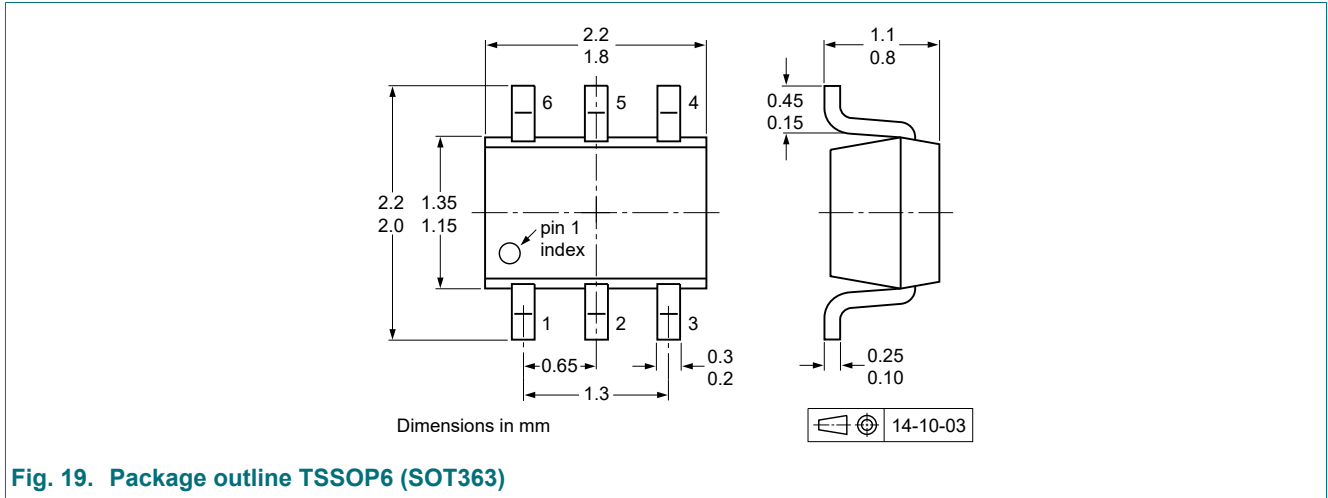


Fig. 19. Package outline TSSOP6 (SOT363)

## 13. Soldering

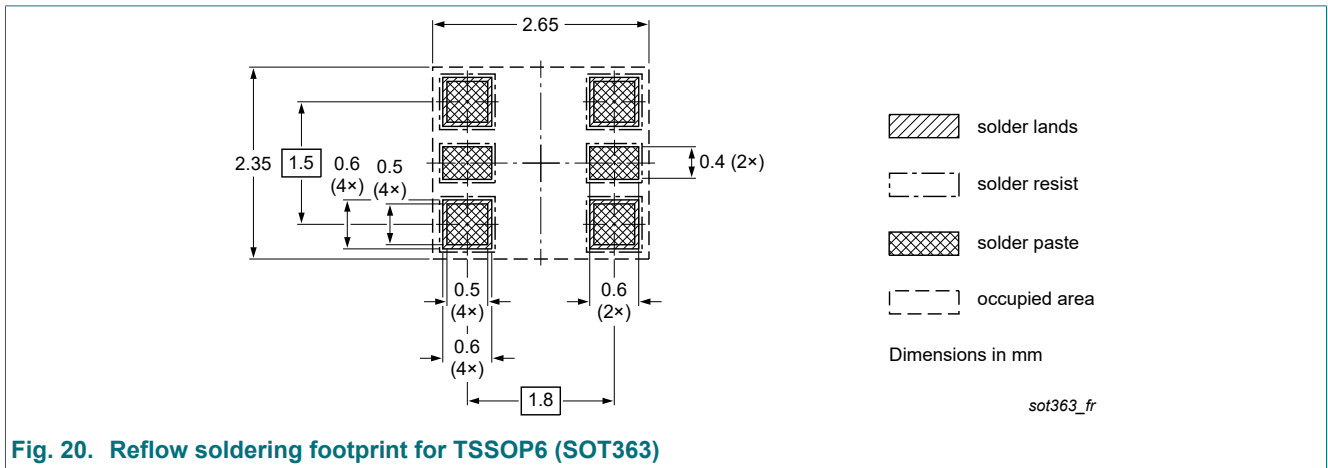


Fig. 20. Reflow soldering footprint for TSSOP6 (SOT363)

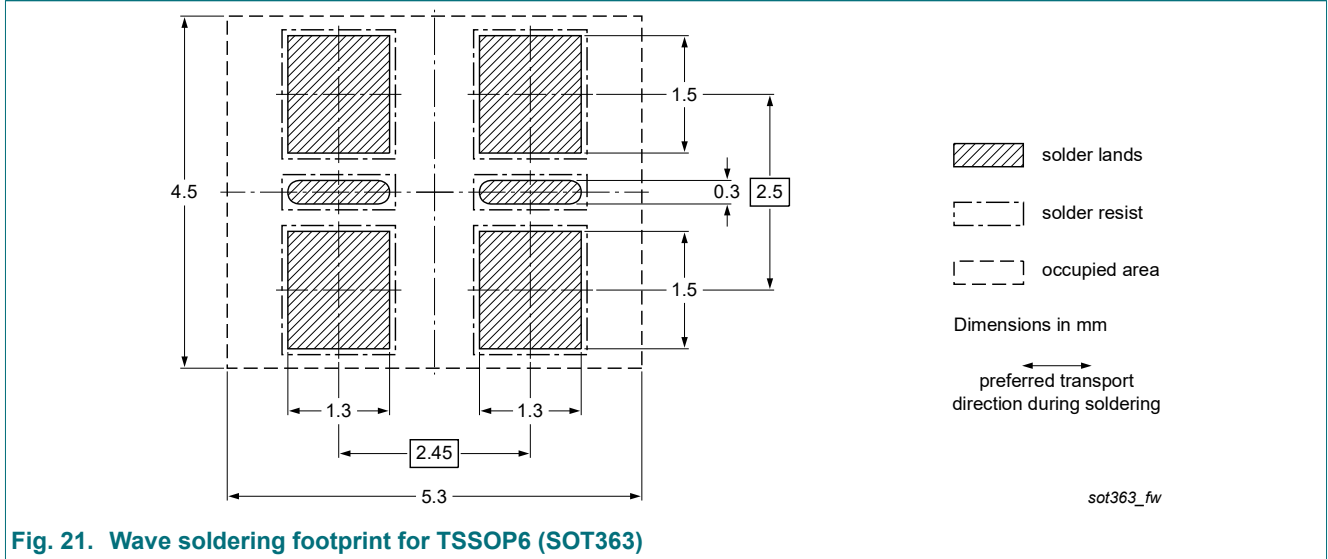


Fig. 21. Wave soldering footprint for TSSOP6 (SOT363)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC846BPN-Q v.1	20211209	Product data sheet	-	-

## 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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