



# BC846BNH

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

4 May 2021

Product data sheet

## 1. General description

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

NPN/NPN complement: BC846BSH

PNP/PNP complement: BC856BSH

## 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
- High-temperature applications up to 175 °C

## 3. Applications

- General-purpose switching and amplification

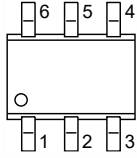
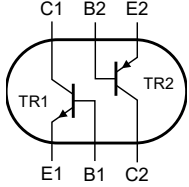
## 4. Quick reference data

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
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}; T_{amb} = 25\text{ °C}$	200	300	450	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 <p>TSSOP6 (SOT363)</p>	 <p>sym139</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
BC846BPNH	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[1]
BC846BPNH	7H%

[1] % = placeholder for manufacturing site code

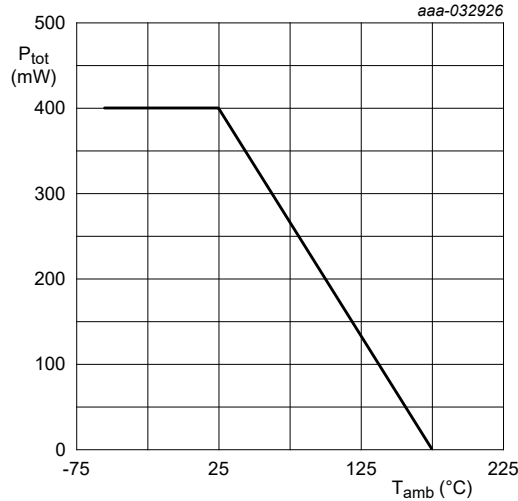
## 8. Limiting values

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	-	7	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]	270	mW
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	400	mW
$T_j$	junction temperature		-	175	°C
$T_{amb}$	ambient temperature		-55	175	°C
$T_{stg}$	storage temperature		-65	175	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided, 35  $\mu$ m copper, tin-plated and standard footprint.



FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint

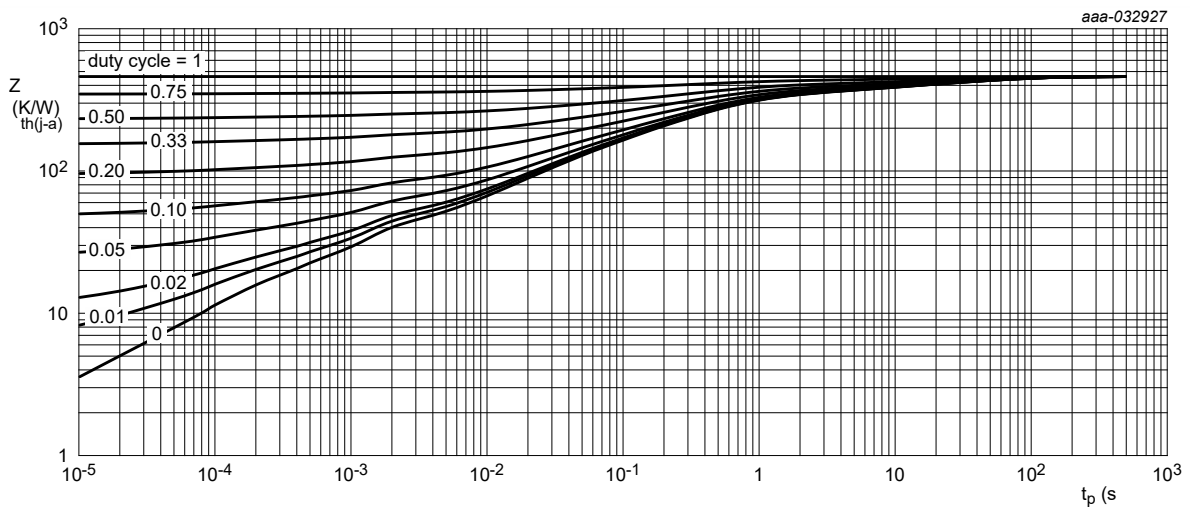
Fig. 1. Per device: Power derating curve

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	556	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point			-	-	170	K/W
<b>Per device</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	375	K/W

[1] Device mounted on an FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint.



FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint

Fig. 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor with negative polarity</b>						
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	80	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}; I_B = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	65	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0 \text{ A}; I_E = 100 \mu\text{A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	7	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	15	nA
		$V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 7 \text{ V}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	300	450	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	50	100	mV
		$I_C = 100 \text{ mA}; I_B = 5 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	200	300	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[1]	750	850	mV
		$I_C = 100 \text{ mA}; I_B = 5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	875	-	mV
$V_{BE}$	base-emitter voltage	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	655	700	mV
		$V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	705	770	mV
$f_T$	transition frequency	$V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; f = 100 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	MHz
NF	noise figure	$V_{CE} = 5 \text{ V}; I_C = 0.2 \text{ mA}; R_S = 2 \text{ k}\Omega; f = 10 \text{ Hz to } 15.7 \text{ kHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	1.7	-	dB
<b>TR1 (NPN)</b>						
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	1.2	-	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5 \text{ V}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	11	-	pF
NF	noise figure	$V_{CE} = 5 \text{ V}; I_C = 0.2 \text{ mA}; R_S = 2 \text{ k}\Omega; f = 1 \text{ kHz}; B = 200 \text{ Hz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	3.1	-	dB
<b>TR2 (PNP)</b>						
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	1.8	-	pF
$C_e$	emitter capacitance	$V_{EB} = -0.5 \text{ V}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	8.5	-	pF
NF	noise figure	$V_{CE} = -5 \text{ V}; I_C = -0.2 \text{ mA}; R_S = 2 \text{ k}\Omega; f = 1 \text{ kHz}; B = 200 \text{ Hz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	3.3	-	dB

[1]  $V_{BEsat}$  decreases by about 1.7 mV/K with increasing temperature.

[2]  $V_{BE}$  decreases by about 2 mV/K with increasing temperature.

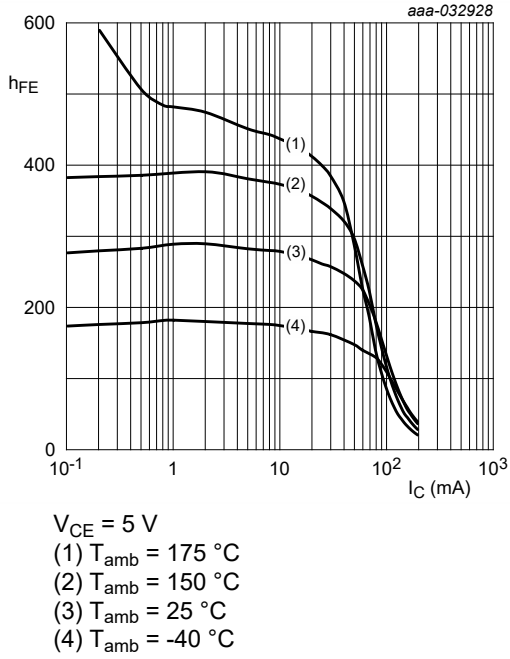


Fig. 3. TR1 (NPN): DC current gain as a function of collector current; typical values

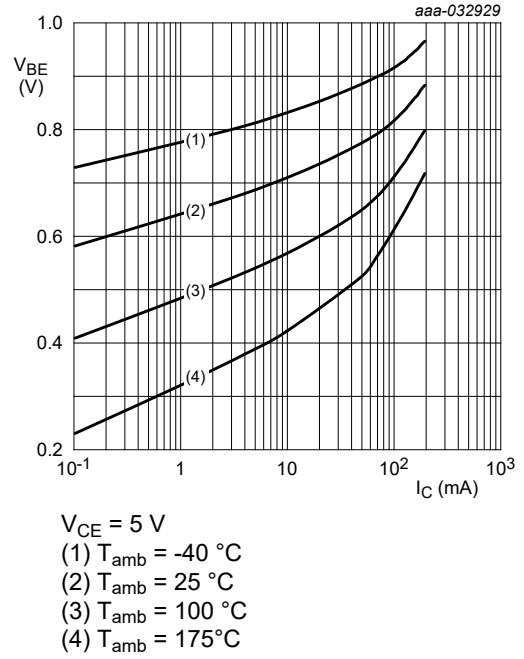


Fig. 4. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values

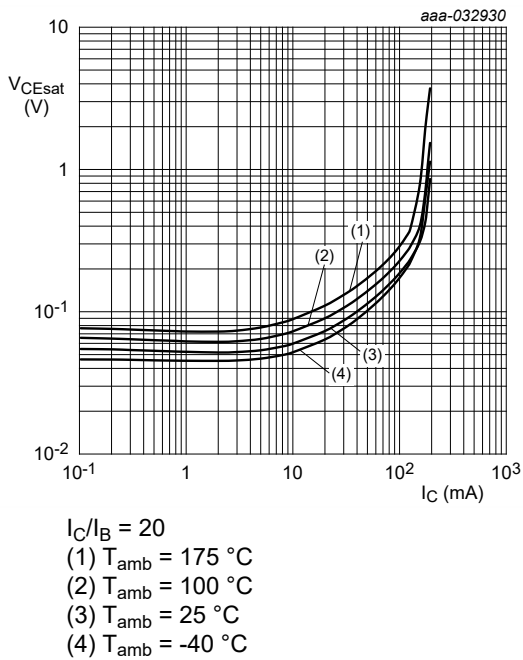


Fig. 5. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values

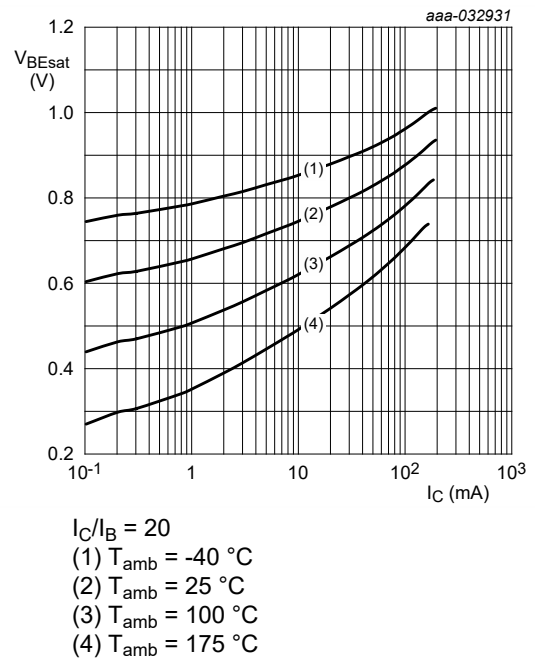


Fig. 6. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values

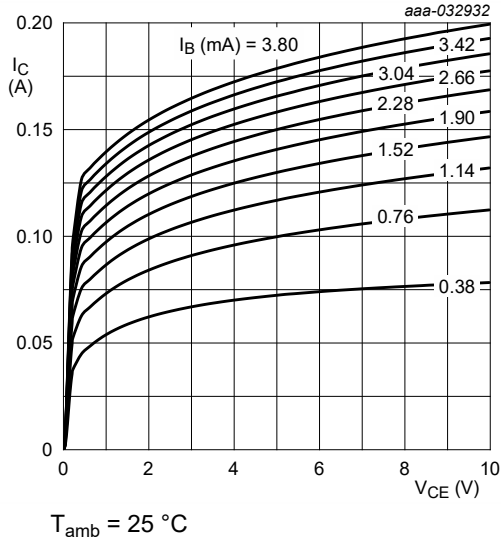


Fig. 7. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values

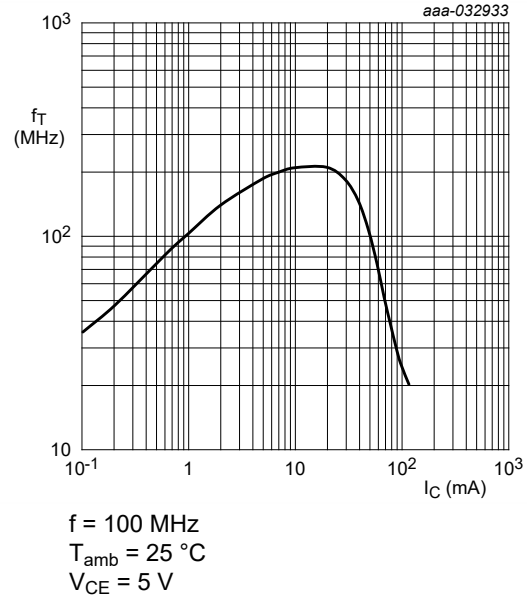


Fig. 8. TR1 (NPN): Transition frequency as a function of collector current; typical values

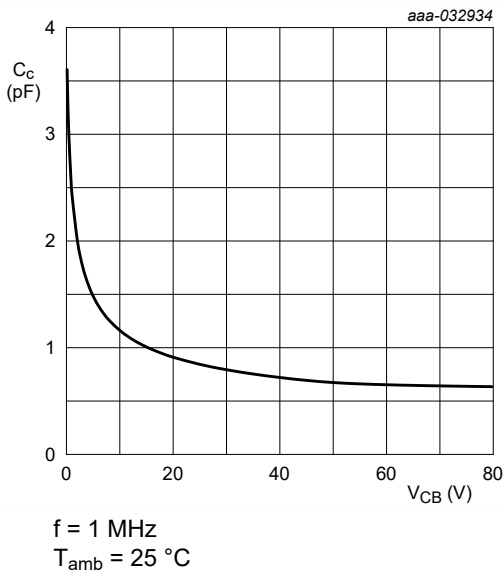


Fig. 9. TR1 (NPN): Collector capacitance as a function of collector-base voltage; typical values

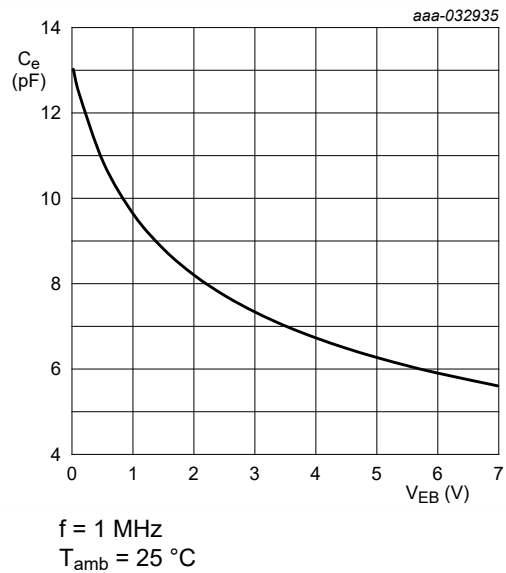


Fig. 10. TR1 (NPN): Emitter capacitance as a function of emitter-base voltage; typical values

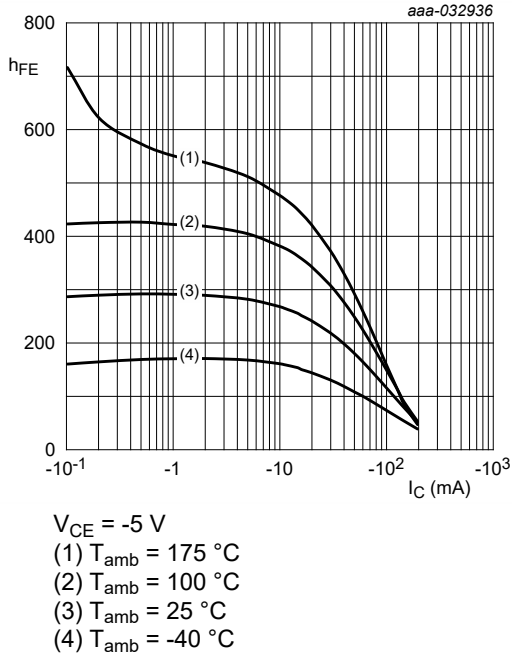


Fig. 11. TR2 (PNP): DC current gain as a function of collector current; typical values

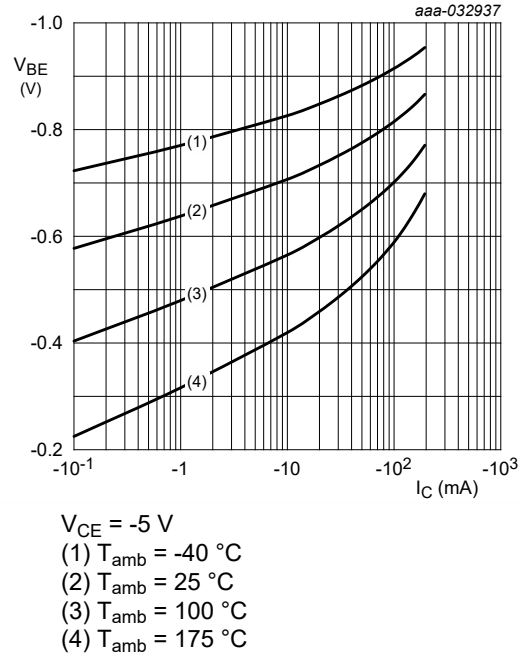


Fig. 12. TR2 (PNP): Base-emitter voltage as a function of collector current; typical value

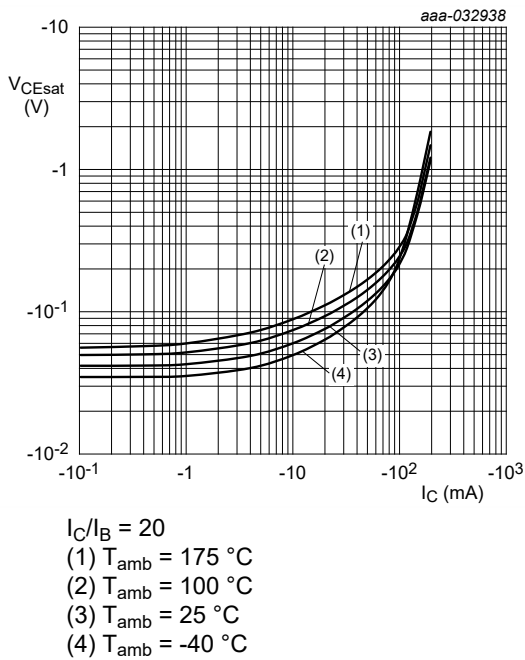


Fig. 13. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

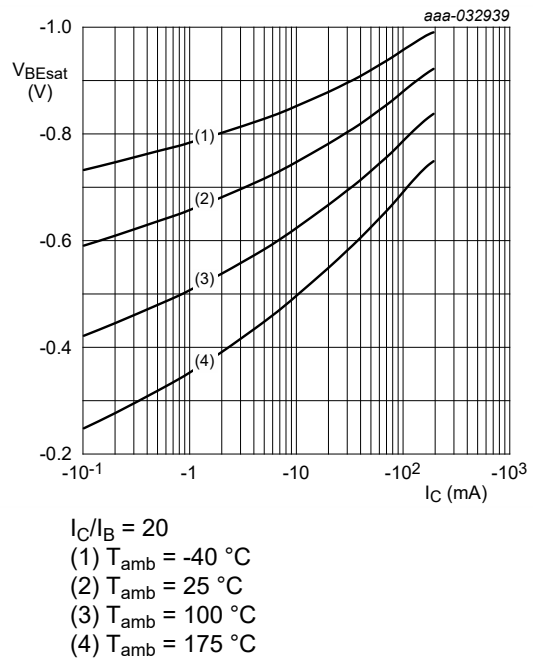


Fig. 14. TR2 (PNP): Base-emitter saturation voltage as a function of collector current; typical values

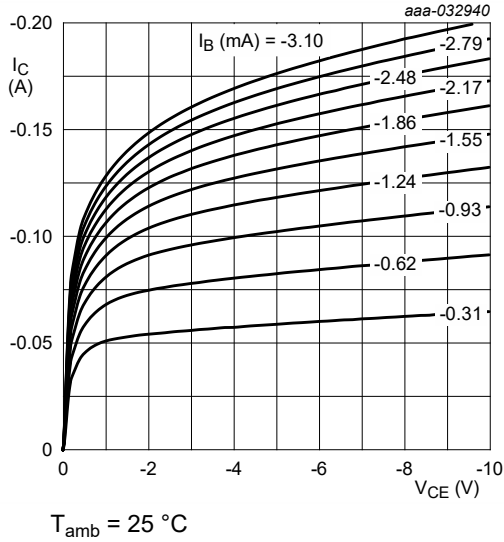


Fig. 15. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values

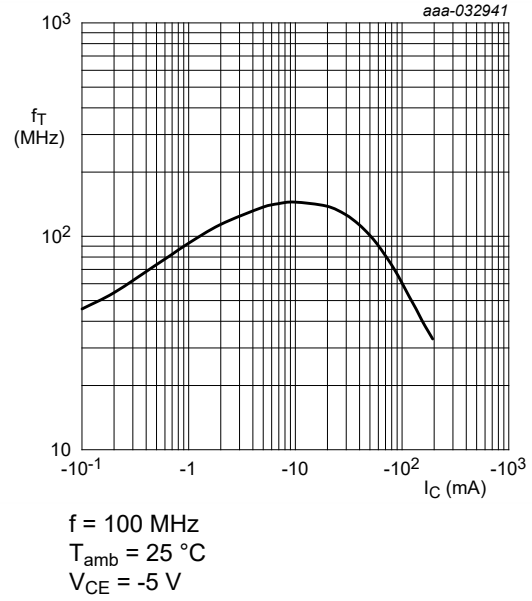


Fig. 16. TR2 (PNP): Transition frequency as a function of collector current; typical values

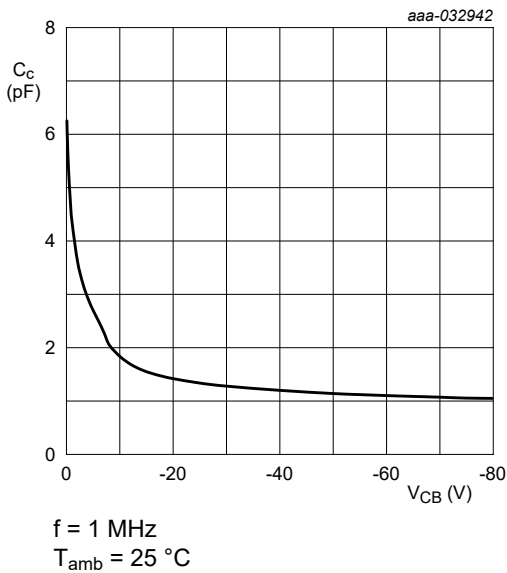


Fig. 17. TR2 (PNP): Collector capacitance as a function of collector-base voltage; typical values

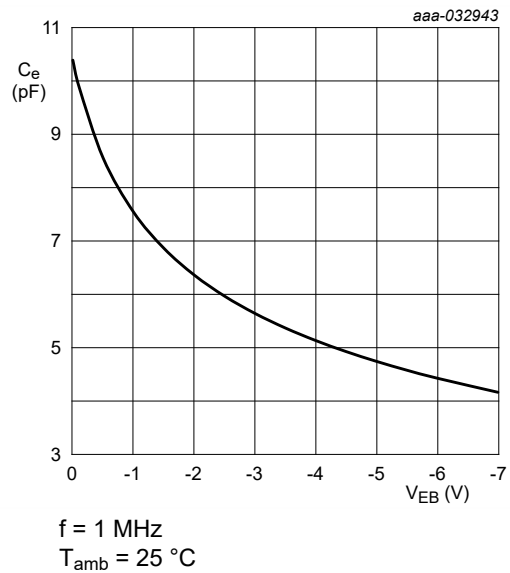


Fig. 18. TR2 (PNP): Emitter capacitance as a function of emitter-base voltage; typical values



## 11. Package outline

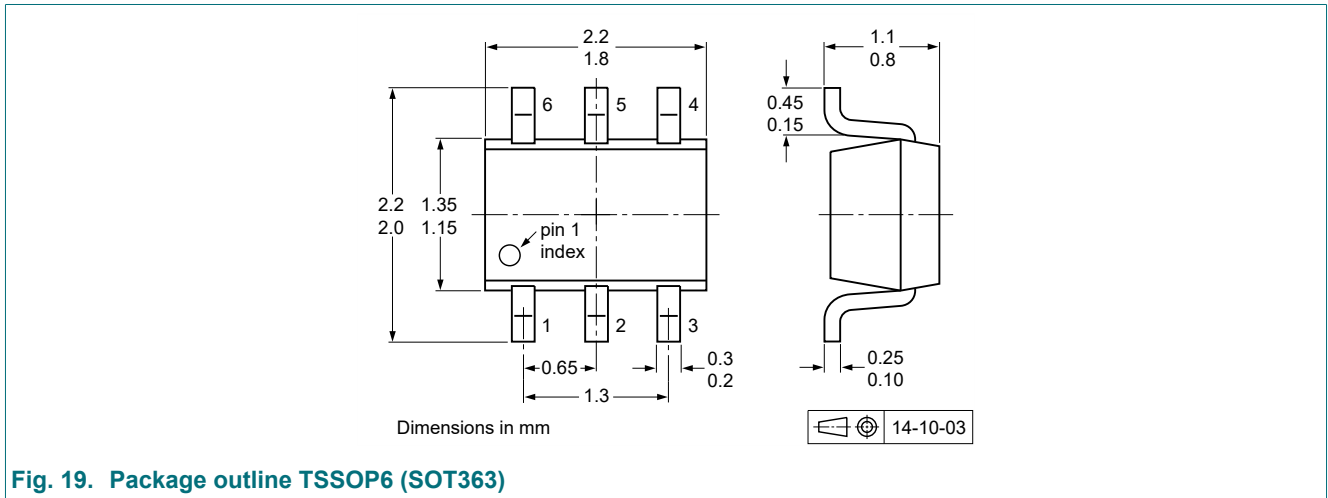


Fig. 19. Package outline TSSOP6 (SOT363)

## 12. Soldering

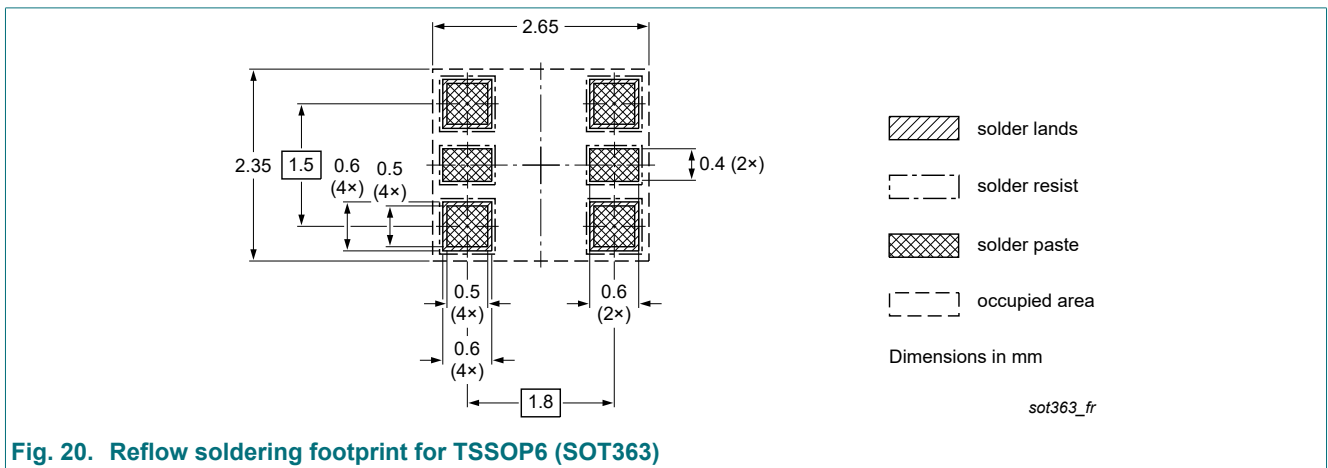


Fig. 20. Reflow soldering footprint for TSSOP6 (SOT363)

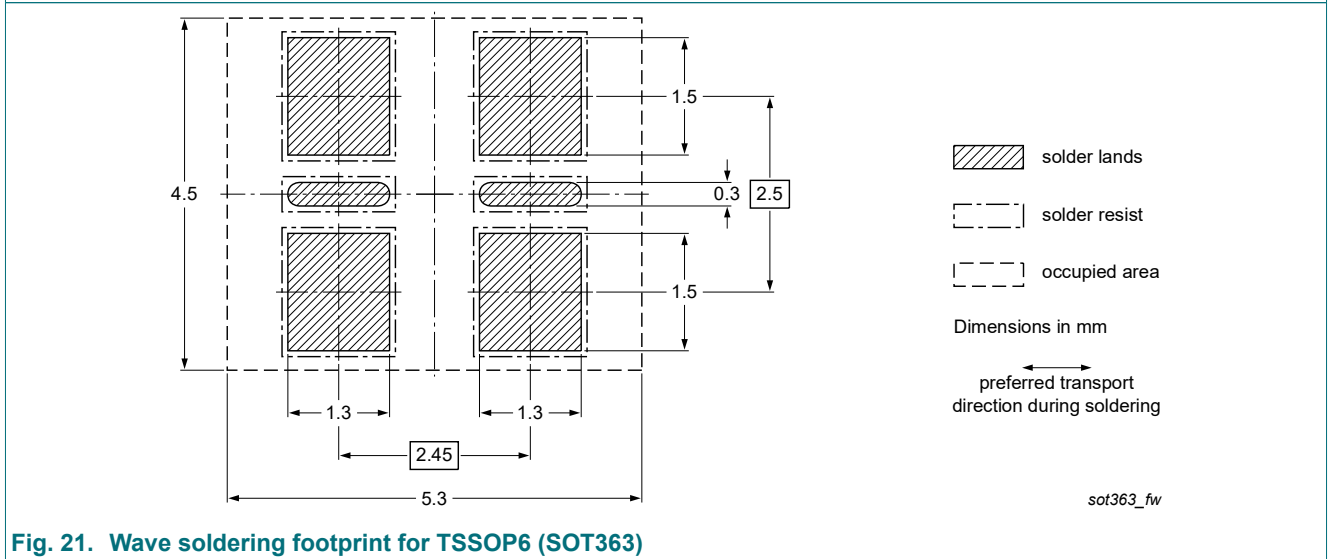


Fig. 21. Wave soldering footprint for TSSOP6 (SOT363)

## 13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC846BPNH v.1	20210504	Product data sheet	-	-

## 14. 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.

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Date of release: 4 May 2021

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