



# BC847BPN-Q

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

17 June 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.

## 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

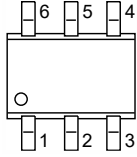
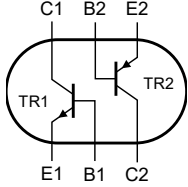
## 4. Quick reference data

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	-	-	45	V
$I_C$	collector current		-	-	100	mA
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	200	-	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
BC847BPN-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>
BC847BPN-Q	13%

[1] % = placeholder for manufacturing site code

## 8. Limiting values

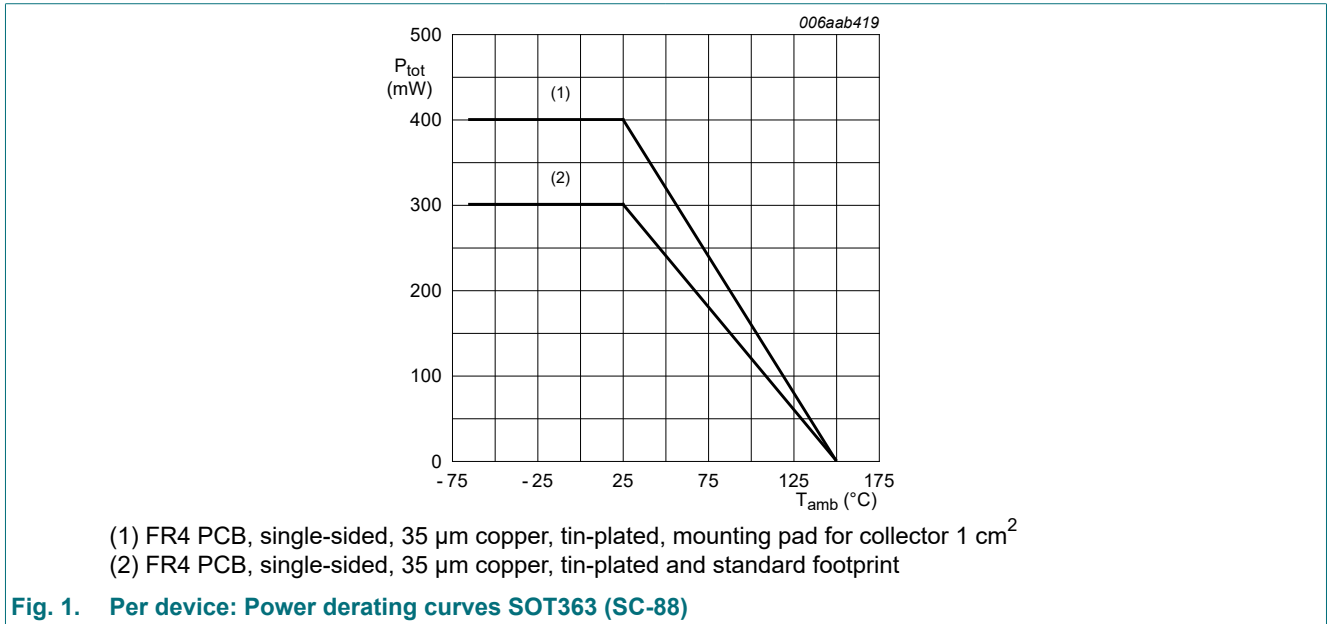
**Table 5. Limiting values**

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		-	50	V
$V_{CEO}$	collector-emitter voltage	open base		-	45	V
$V_{EBO}$	emitter-base voltage	open collector		-	5	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]	-	220	mW
			[2]	-	250	mW
<b>Per device</b>						
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	300	mW
			[2]	-	400	mW
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-65	150	°C
$T_{stg}$	storage temperature			-65	150	°C

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

[2] Device mounted on an FR4 PCB, single-sided, 35 µm copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



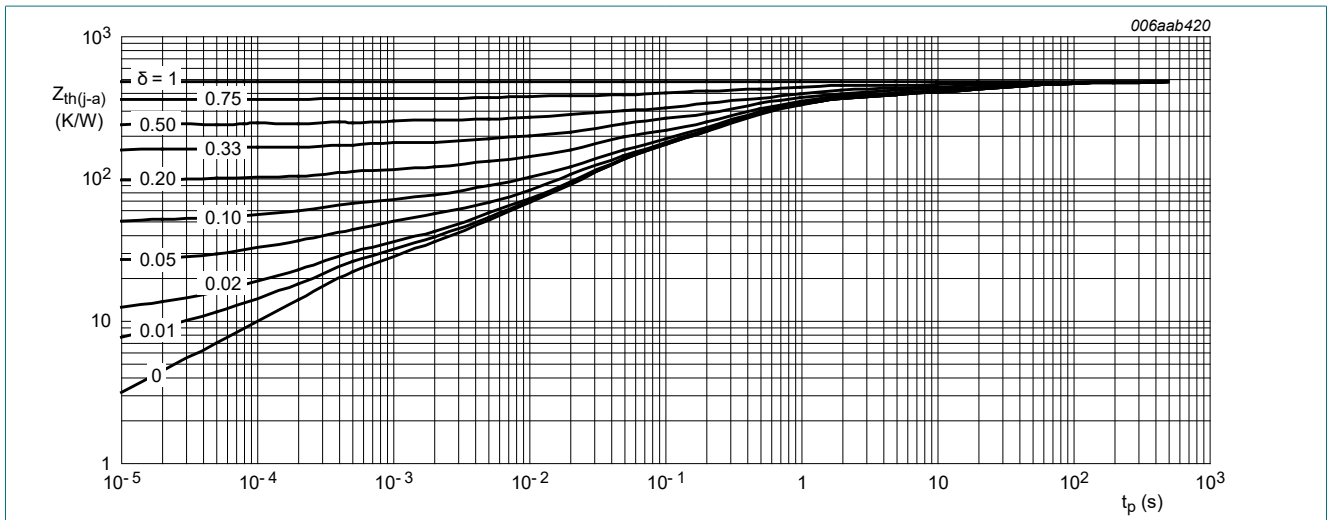
## 9. Thermal characteristics

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]	-	-	568	K/W
			[2]	-	-	500	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
			[2]	-	-	313	K/W

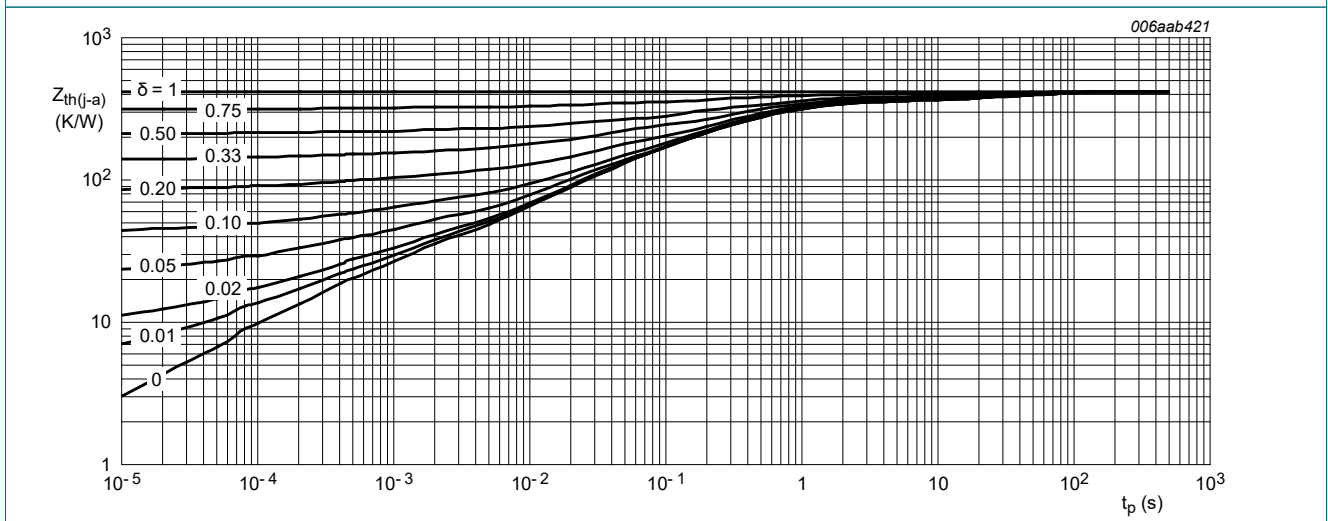
[1] Device mounted on an FR4 PCB, single-sided, 35  $\mu$ m copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided, 35  $\mu$ m copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



FR4 PCB, single-sided, 35  $\mu$ m 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



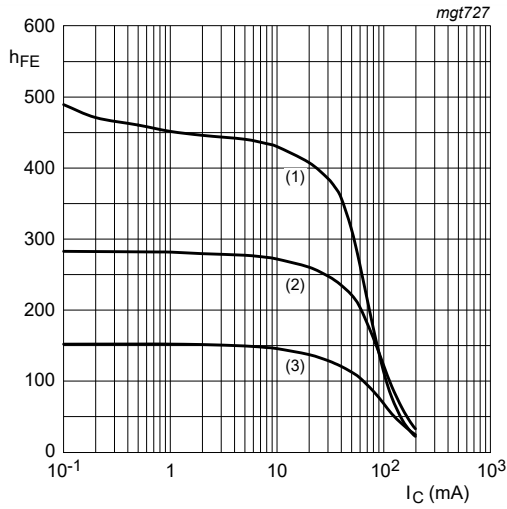
FR4 PCB, single-sided, 35  $\mu$ m copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>

Fig. 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

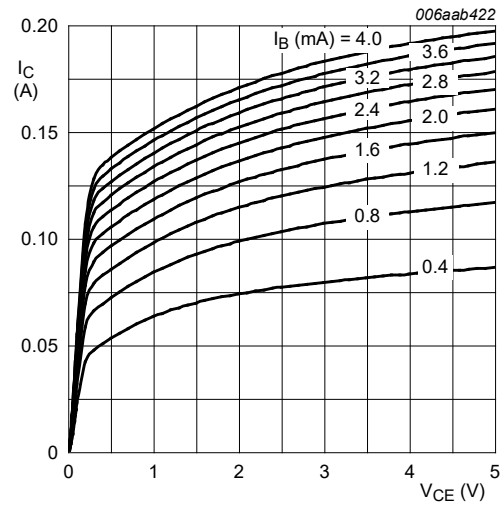
Table 7. Characteristics

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	$I_C = 100 \mu\text{A}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}; I_B = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0 \text{ A}; I_E = 100 \mu\text{A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	5	-	-	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	$V_{EB} = 5 \text{ V}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	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	-	450	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	mV
		$I_C = 100 \text{ mA}; I_B = 5 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	300	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	755	-	mV
$V_{BE}$	base-emitter voltage	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	580	655	700	mV
			600	655	750	mV
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	1.5	pF
			-	-	2.2	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
			-	10	-	pF
$f_T$	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



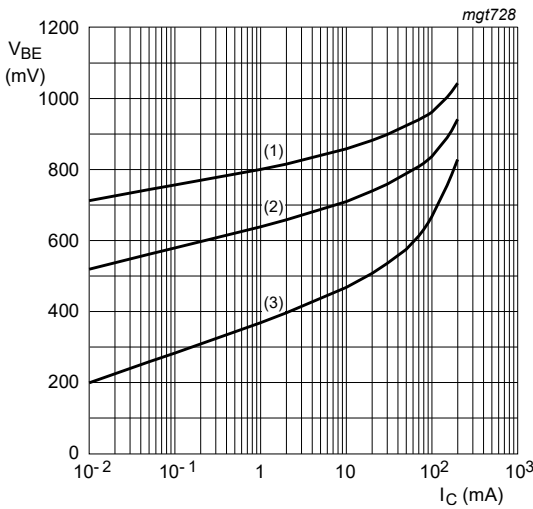
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



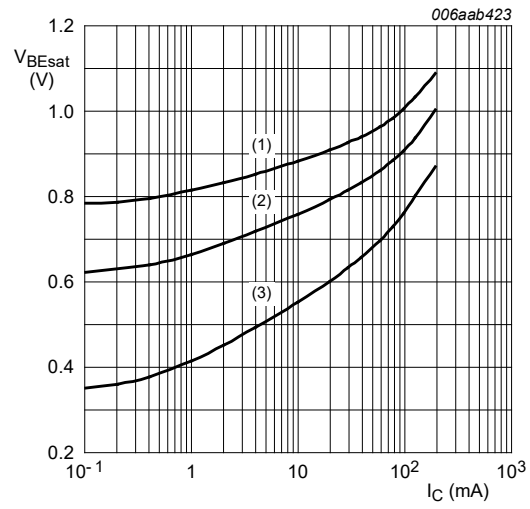
$T_{amb} = 25\text{ °C}$

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



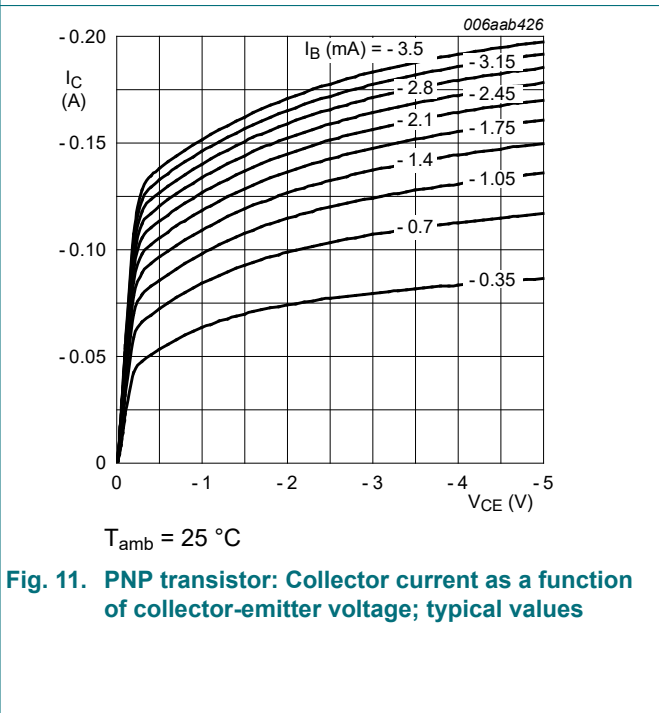
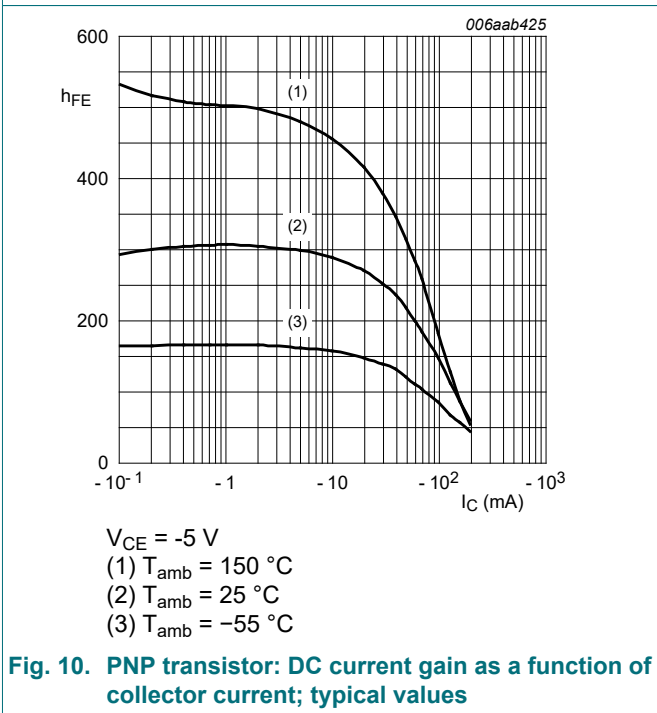
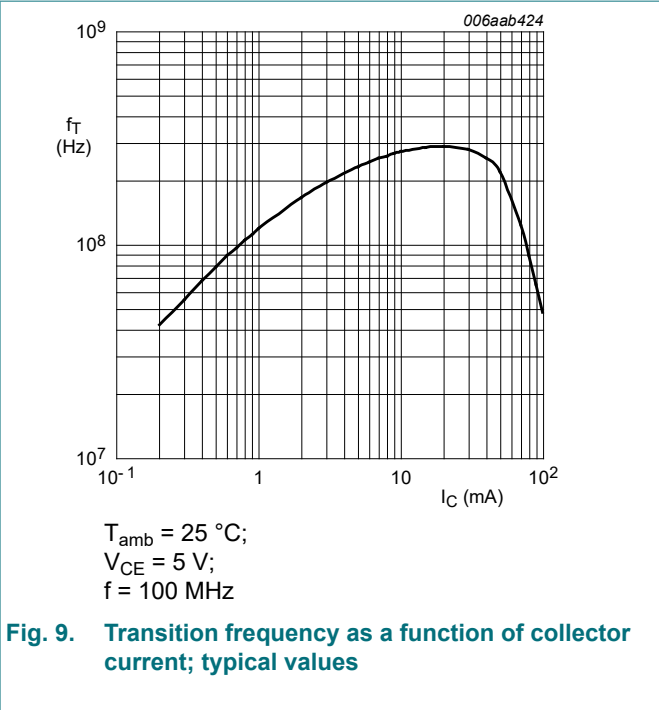
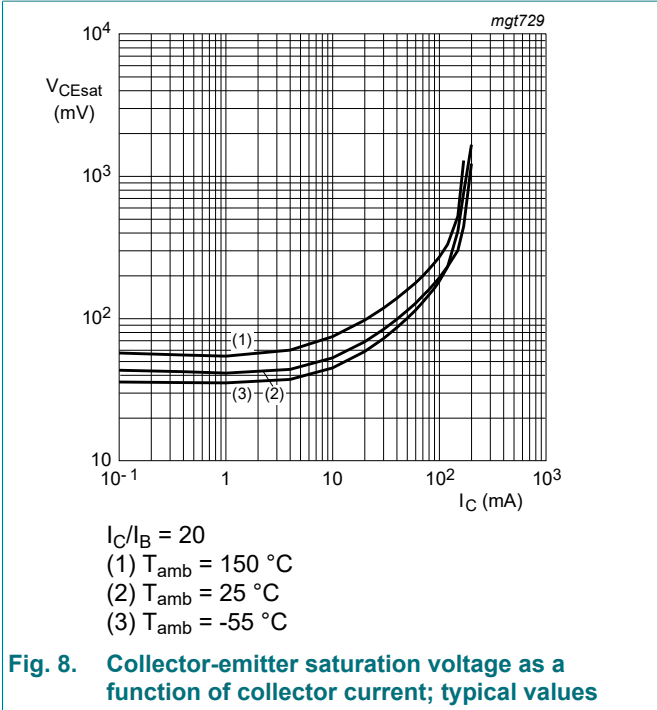
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

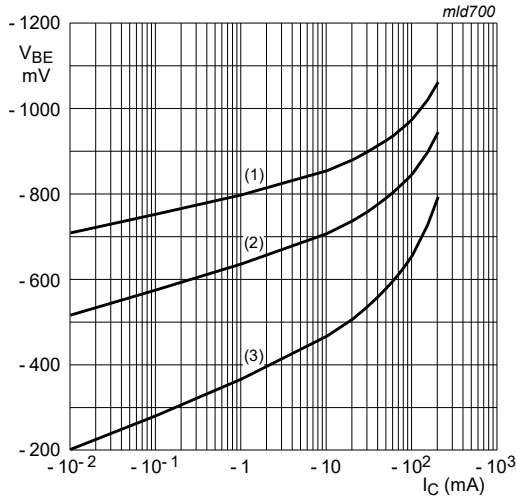
**Fig. 6. Base-emitter voltage as a function of collector current; typical values**



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

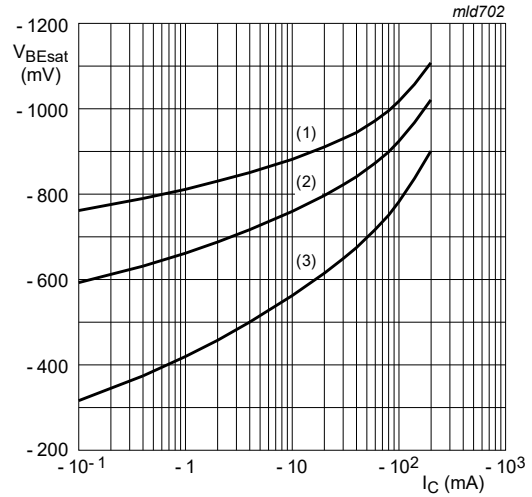
**Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values**





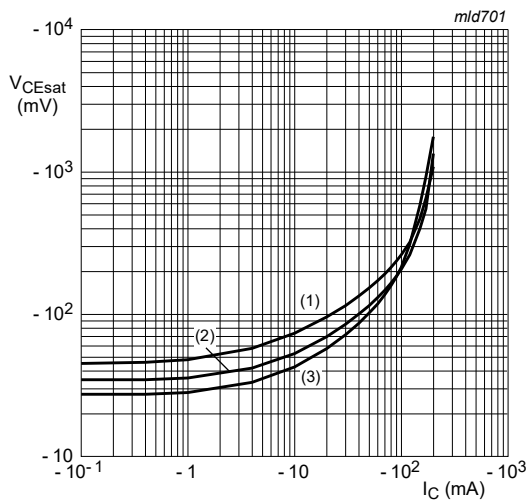
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

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



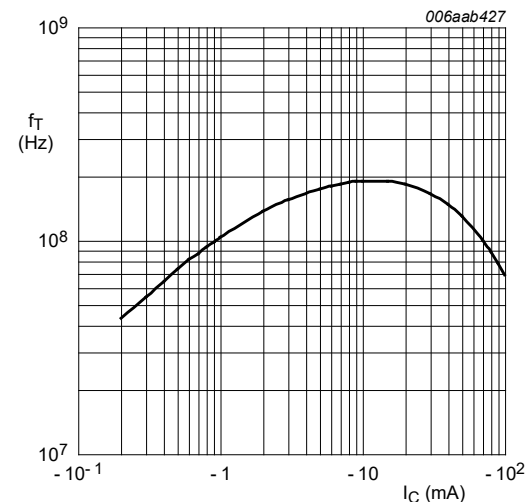
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

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



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

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



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

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

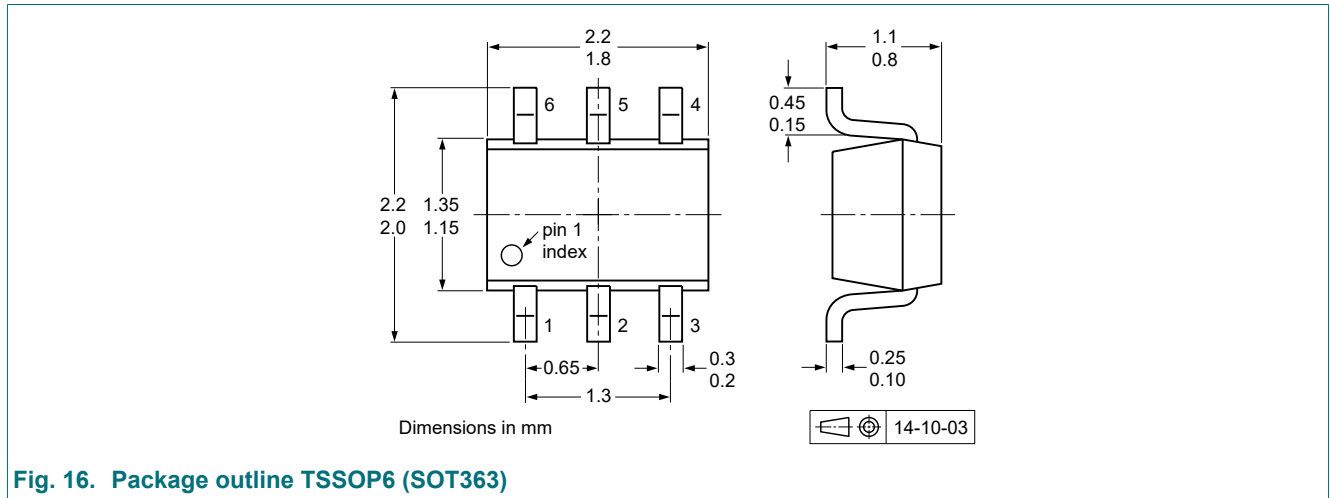


Fig. 16. Package outline TSSOP6 (SOT363)

13. Soldering

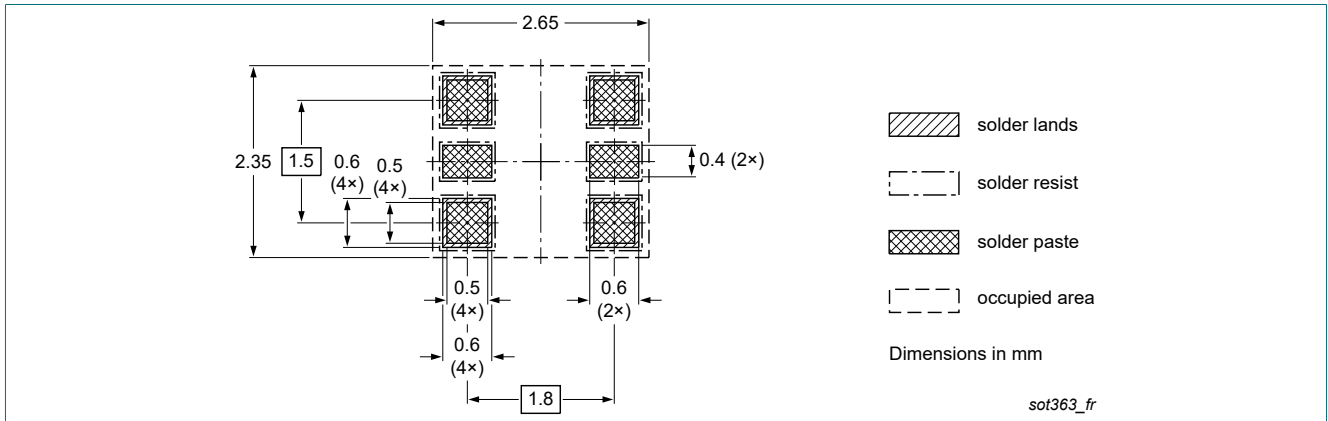


Fig. 17. Reflow soldering footprint for TSSOP6 (SOT363)

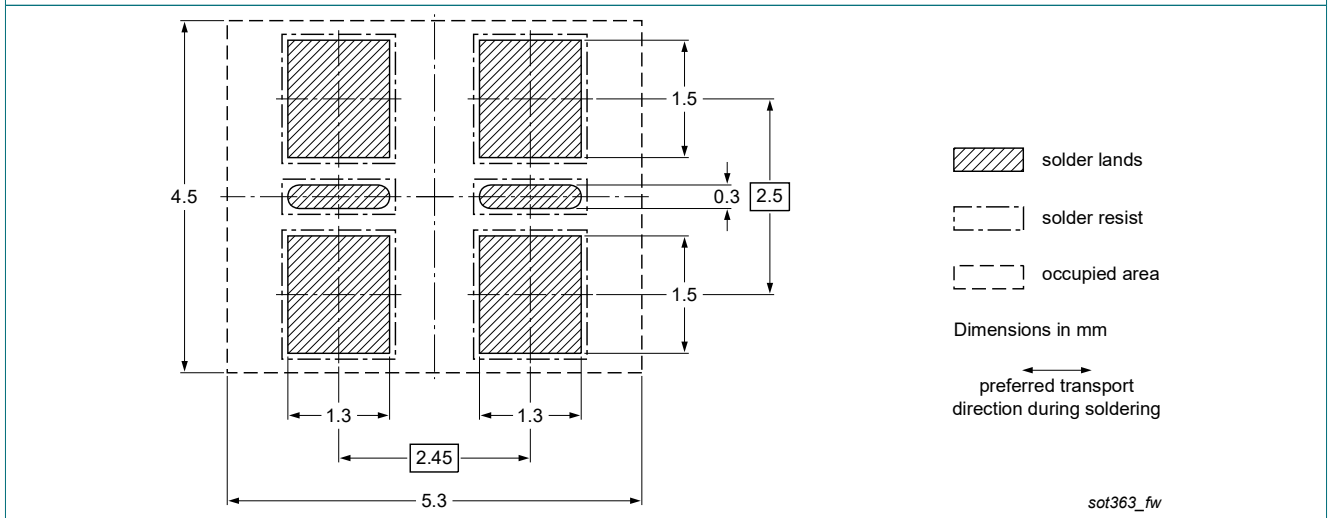


Fig. 18. Wave soldering footprint for TSSOP6 (SOT363)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC847BPN-Q v.1	20210617	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".
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