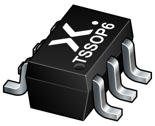

BC847BPNH-Q

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

6 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: BC847BSH-Q

PNP/PNP complement: BC857BSH-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
- High-temperature applications up to 175 °C
- 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
Per transistor; for the PNP transistor with negative polarity							
V_{CEO}	collector-emitter voltage	open base		-	-	45	V
I_C	collector current			-	-	100	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		200	300	450	

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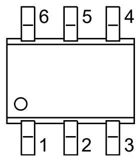
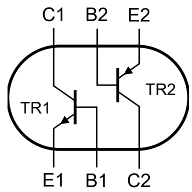
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 TSSOP6 (SOT363)	
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
BC847BPNH-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[1]
BC847BPNH-Q	7E%

[1] % = placeholder for manufacturing site code

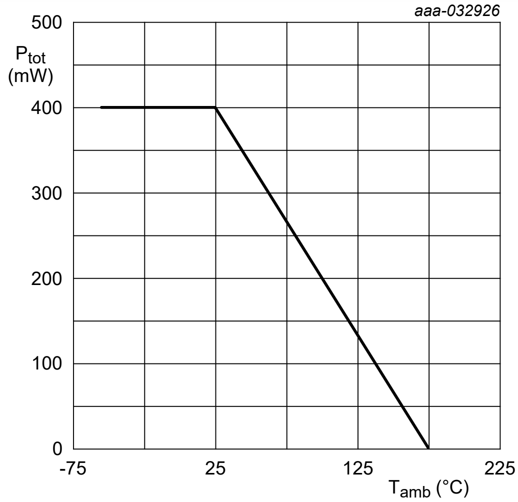
8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
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		-	45	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
Per device						
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 µm copper, tin-plated and standard footprint.



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

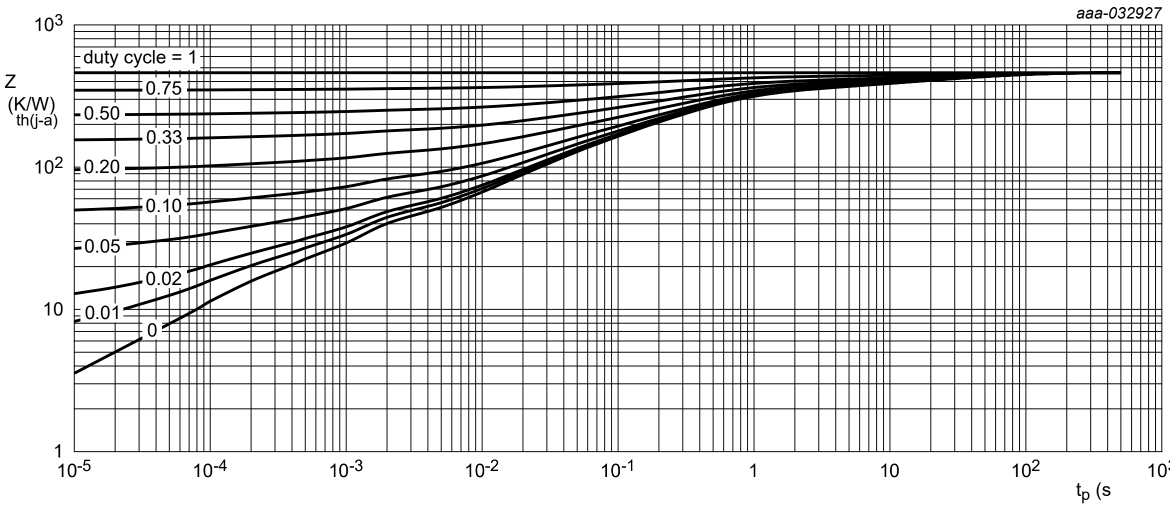
Fig. 1. Per device: Power derating curve

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	556	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	170	K/W
Per device							
$R_{th(j-a)}$	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

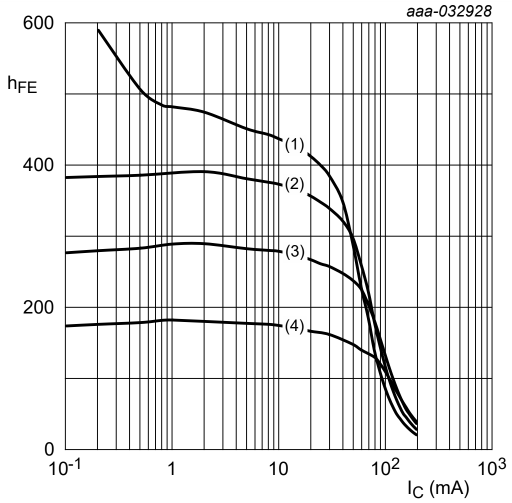
Fig. 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

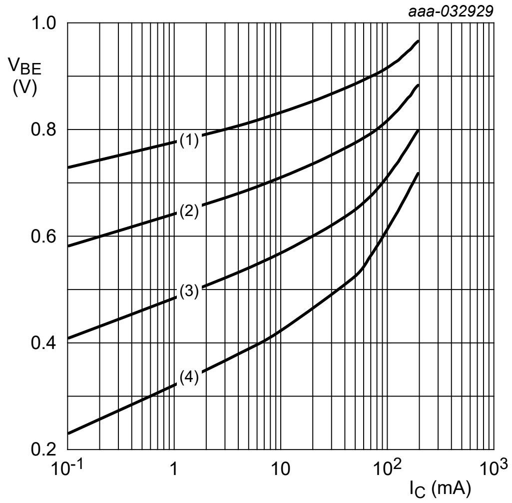
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor; for the PNP transistor with negative polarity							
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 μA; I_E = 0 A; T_{amb} = 25 °C		50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 2 mA; I_B = 0 A; T_{amb} = 25 °C		45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_C = 0 A; I_E = 100 μA; T_{amb} = 25 °C		7	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A; T_{amb} = 25 °C		-	-	15	nA
		V_{CB} = 30 V; I_E = 0 A; T_j = 150 °C		-	-	5	μA
I_{EBO}	emitter-base cut-off current	V_{EB} = 7 V; I_C = 0 A; T_{amb} = 25 °C		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		200	300	450	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA; T_{amb} = 25 °C		-	50	100	mV
		I_C = 100 mA; I_B = 5 mA; pulsed; t_p ≤ 300 μs; δ ≤ 0.02; T_{amb} = 25 °C		-	200	300	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA; T_{amb} = 25 °C	[1]	-	750	850	mV
		I_C = 100 mA; I_B = 5 mA; T_{amb} = 25 °C		-	875	-	mV
V_{BE}	base-emitter voltage	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C	[2]	600	655	700	mV
		V_{CE} = 5 V; I_C = 10 mA; T_{amb} = 25 °C	[2]	-	705	770	mV
f_T	transition frequency	V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz; T_{amb} = 25 °C		100	-	-	MHz
NF	noise figure	V_{CE} = 5 V; I_C = 0.2 mA; R_S = 2 kΩ; f = 10 Hz to 15.7 kHz; T_{amb} = 25 °C		-	1.7	-	dB
TR1 (NPN)							
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	1.2	-	pF
C_e	emitter capacitance	V_{EB} = 0.5 V; I_C = 0 A; i_c = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	11	-	pF
NF	noise figure	V_{CE} = 5 V; I_C = 0.2 mA; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz; T_{amb} = 25 °C		-	3.1	-	dB
TR2 (PNP)							
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	1.8	-	pF
C_e	emitter capacitance	V_{EB} = -0.5 V; I_C = 0 A; i_c = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	8.5	-	pF
NF	noise figure	V_{CE} = -5 V; I_C = -0.2 mA; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz; T_{amb} = 25 °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.



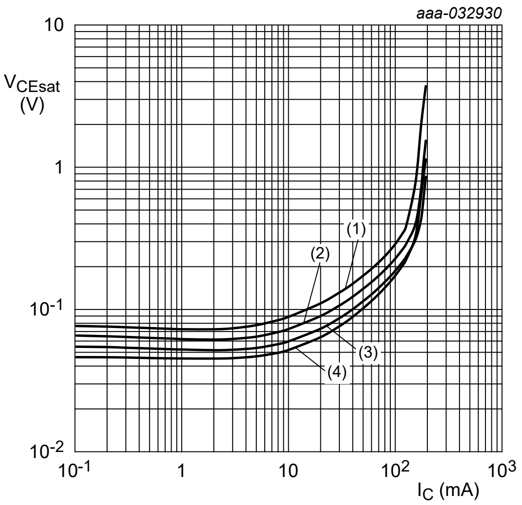
V_{CE} = 5 V
(1) T_{amb} = 175 °C
(2) T_{amb} = 150 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = -40 °C

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



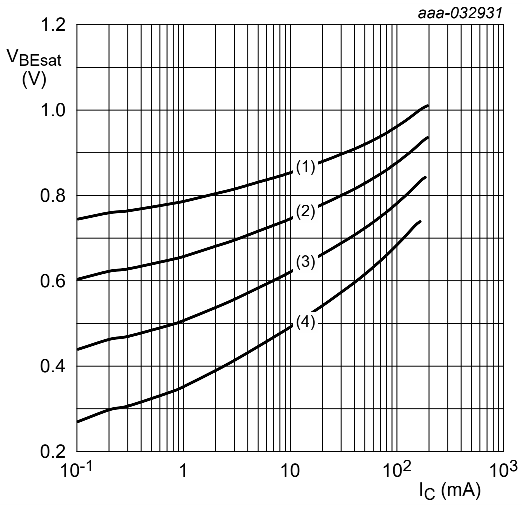
V_{CE} = 5 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 175°C

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



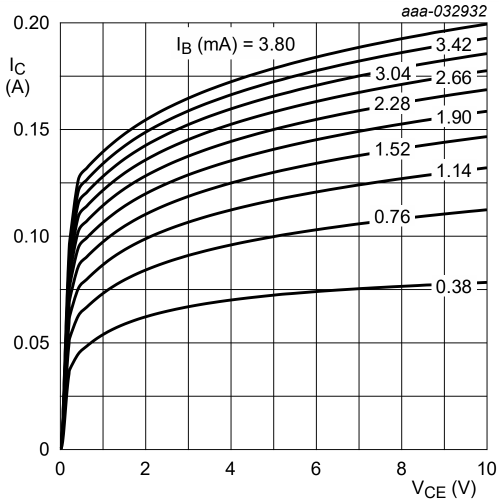
I_C/I_B = 20
(1) T_{amb} = 175 °C
(2) T_{amb} = 100 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = -40 °C

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



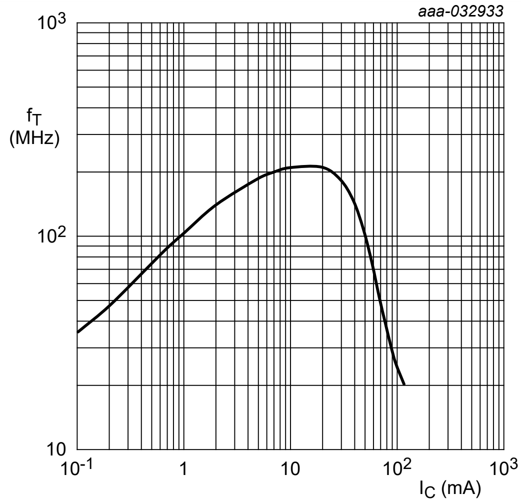
I_C/I_B = 20
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 175 °C

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



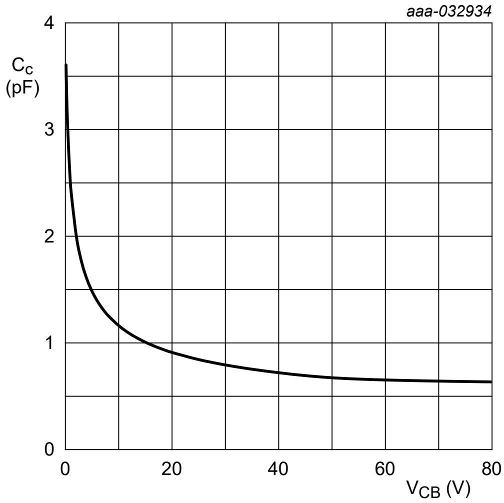
T_{amb} = 25 °C

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



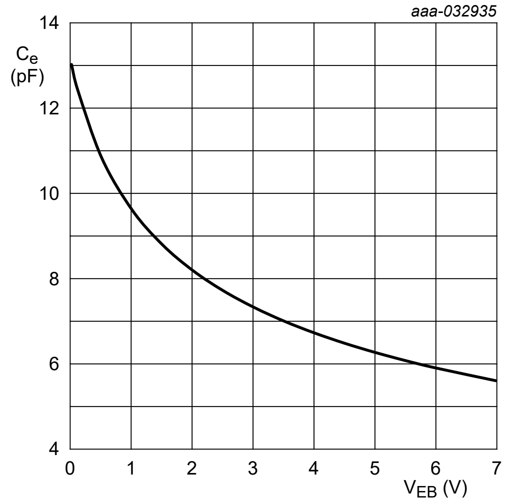
f = 100 MHz
T_{amb} = 25 °C
V_{CE} = 5 V

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



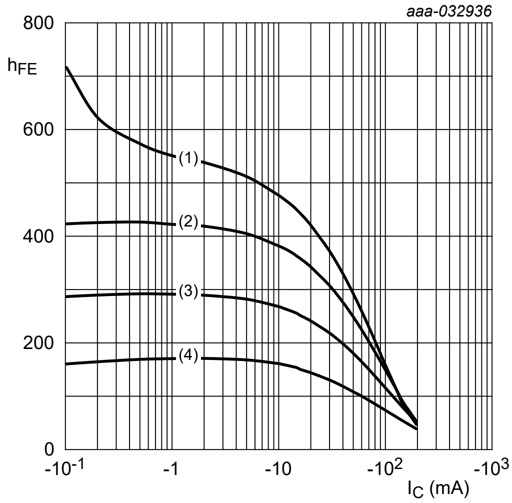
f = 1 MHz
T_{amb} = 25 °C

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



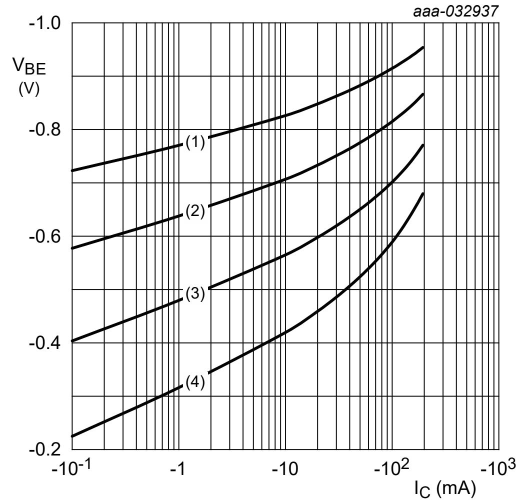
f = 1 MHz
T_{amb} = 25 °C

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



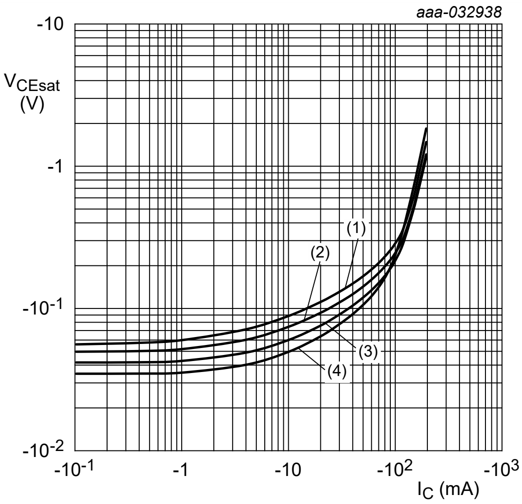
V_{CE} = -5 V
(1) T_{amb} = 175 °C
(2) T_{amb} = 100 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = -40 °C

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



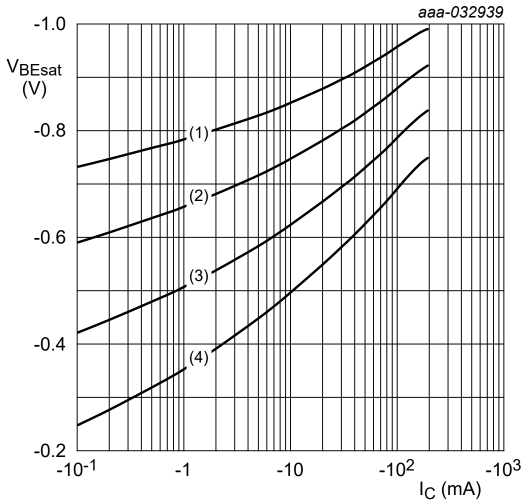
V_{CE} = -5 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 175 °C

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



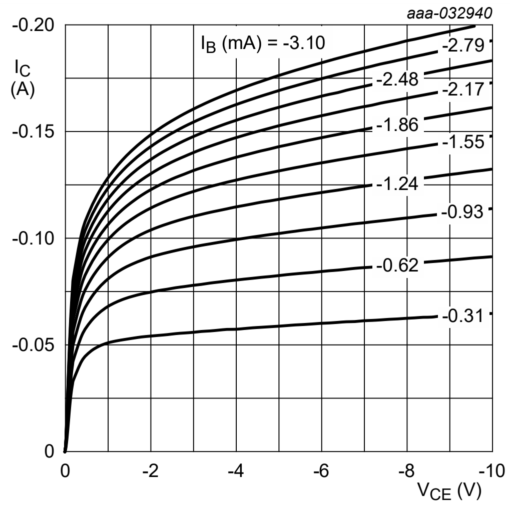
I_C/I_B = 20
(1) T_{amb} = 175 °C
(2) T_{amb} = 100 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = -40 °C

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



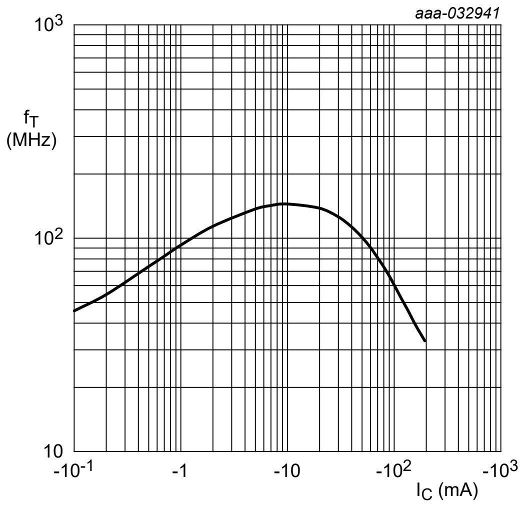
I_C/I_B = 20
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 175 °C

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



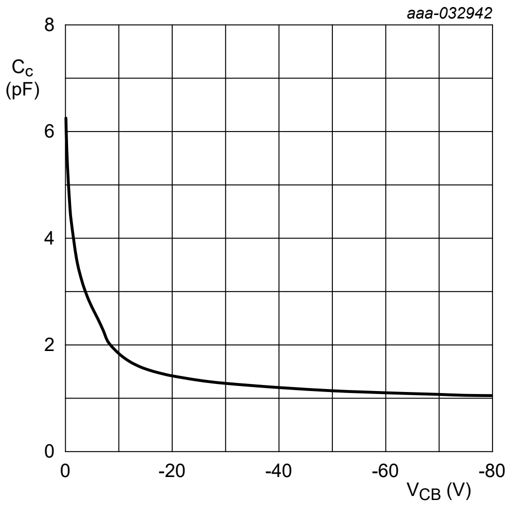
T_{amb} = 25 °C

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



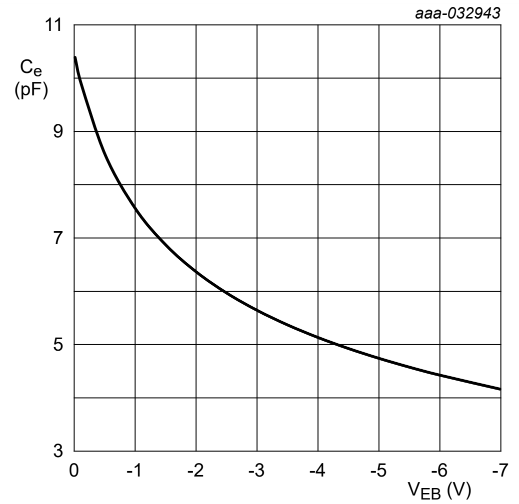
f = 100 MHz
T_{amb} = 25 °C
V_{CE} = -5 V

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



f = 1 MHz
T_{amb} = 25 °C

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



f = 1 MHz
T_{amb} = 25 °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

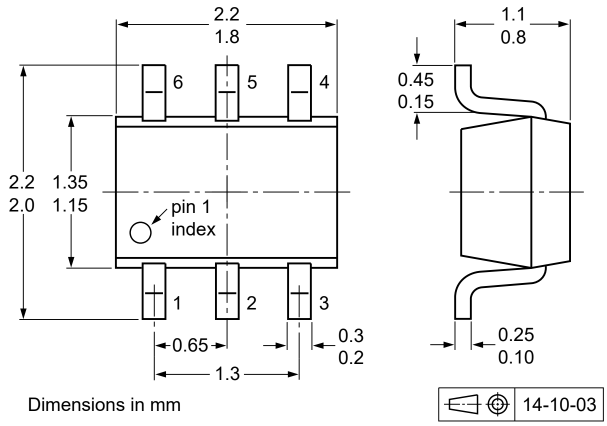


Fig. 19. Package outline TSSOP6 (SOT363)

13. Soldering

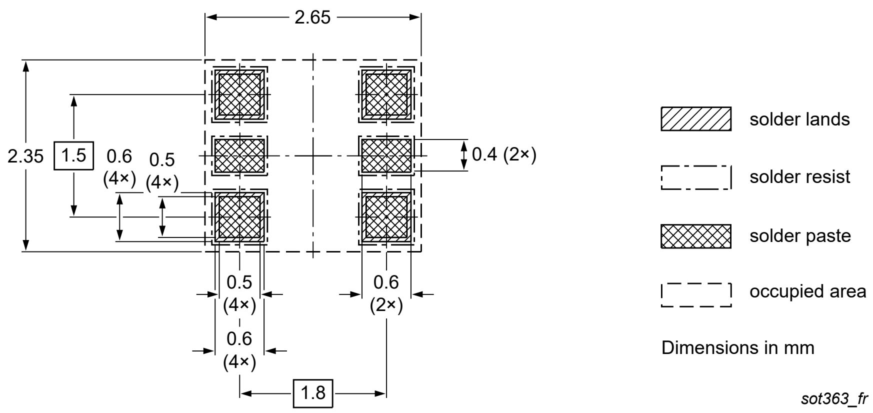


Fig. 20. Reflow soldering footprint for TSSOP6 (SOT363)

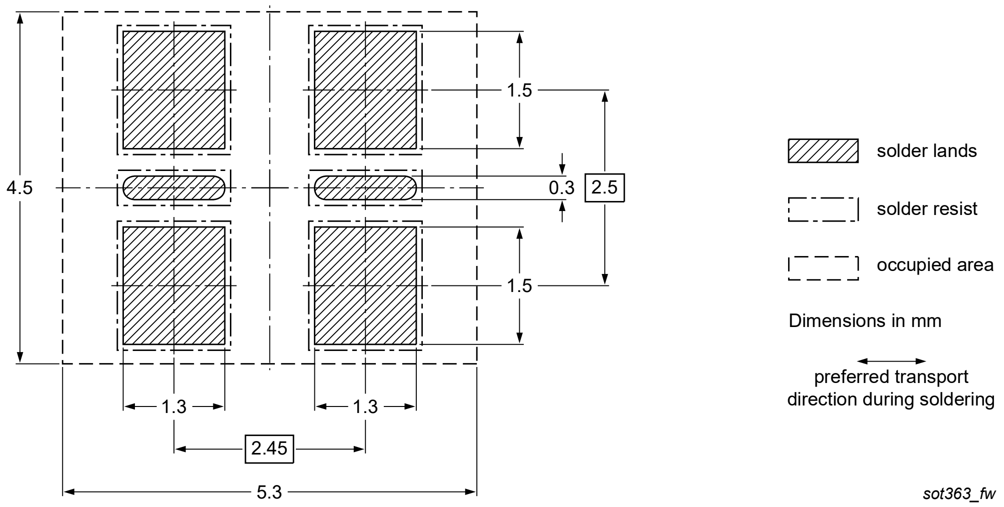


Fig. 21. Wave soldering footprint for TSSOP6 (SOT363)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC847BPNH-Q v.1	20210506	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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