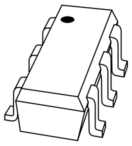


BC846BPN

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

Rev. 01 — 17 July 2009 Product data sheet

1. Product profile

1.1 General description

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

Table 1. Product overview

Type number	Package		NPN/NPN complement	PNP/PNP complement
	NXP	JEITA		
BC846BPN	SOT363	SC-88	BC846BS	BC856BS

1.2 Features

- 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
- AEC-Q101 qualified

1.3 Applications

- General-purpose switching and amplification

1.4 Quick reference data

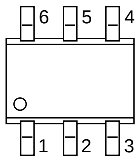
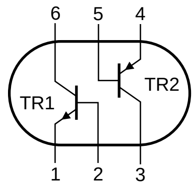
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor; for the PNP transistor with negative polarity						
V_{CEO}	collector-emitter voltage	open base	-	-	65	V
I_C	collector current		-	-	100	mA
TR1 (NPN)						
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA	200	300	450	
TR2 (PNP)						
h_{FE}	DC current gain	V_{CE} = –5 V; I_C = –2 mA	200	290	450	

founded by Philips

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	emitter TR1		 sym019
2	base TR1		
3	collector TR2		
4	emitter TR2		
5	base TR2		
6	collector TR1		

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC846BPN	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
BC846BPN	PJ*

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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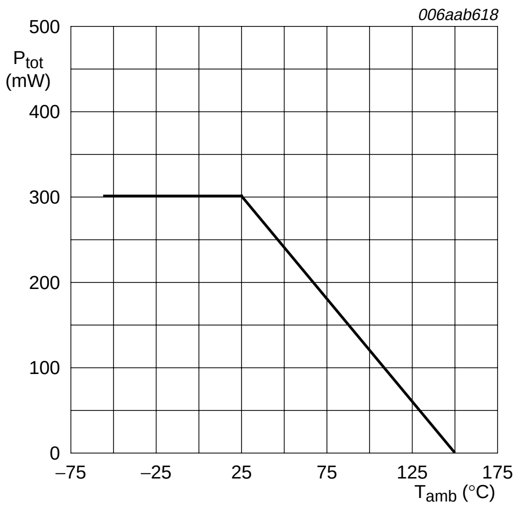
5. Limiting values

Table 6. 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		-	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	single pulse; $t_p \leq 1$ ms		-	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	200	mW
Per device						
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.



FR4 PCB, standard footprint

Fig 1. Per device: Power derating curve SOT363 (SC-88)

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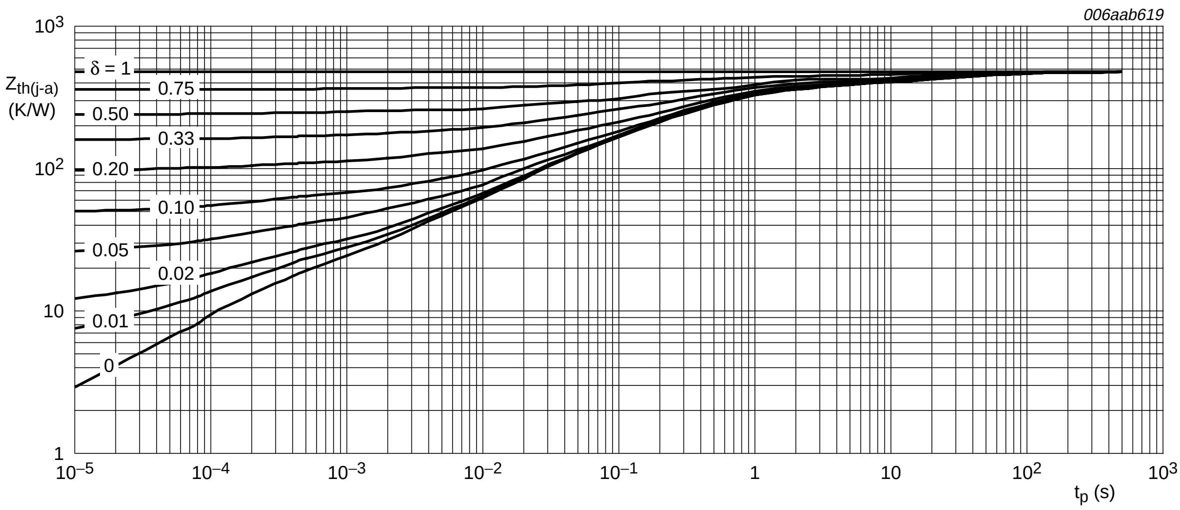
6. Thermal characteristics

Table 7. 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]	-	-	625	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	230	K/W
Per device							
$R_{th(j-a)}$	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.



FR4 PCB, standard footprint

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

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7. Characteristics

Table 8. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TR1 (NPN)						
I_{CBO}	collector-base cut-off current	V_{CB} = 50 V; I_E = 0 A	-	-	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} = 6 V; I_C = 0 A	-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V				
		I_C = 10 µA	-	280	-	
		I_C = 2 mA	200	300	450	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	-	55	100	mV
		I_C = 100 mA; I_B = 5 mA	-	200	300	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	-	755	850	mV
		I_C = 100 mA; I_B = 5 mA	-	1000	-	mV
V_{BE}	base-emitter voltage	V_{CE} = 5 V				
		I_C = 2 mA	580	650	700	mV
		I_C = 10 mA	-	-	770	mV
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	-	1.9	-	pF
C_e	emitter capacitance	V_{EB} = 0.5 V; I_C = i_c = 0 A; f = 1 MHz	-	11	-	pF
f_T	transition frequency	V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz	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	-	1.9	-	dB
		V_{CE} = 5 V; I_C = 0.2 mA; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz	-	3.1	-	dB
TR2 (PNP)						
I_{CBO}	collector-base cut-off current	V_{CB} = –50 V; I_E = 0 A	-	-	–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} = –6 V; I_C = 0 A	-	-	–100	nA
h_{FE}	DC current gain	V_{CE} = –5 V				
		I_C = –10 µA	-	270	-	
		I_C = –2 mA	200	290	450	
V_{CEsat}	collector-emitter saturation voltage	I_C = –10 mA; I_B = –0.5 mA	-	–55	–100	mV
		I_C = –100 mA; I_B = –5 mA	-	–200	–300	mV

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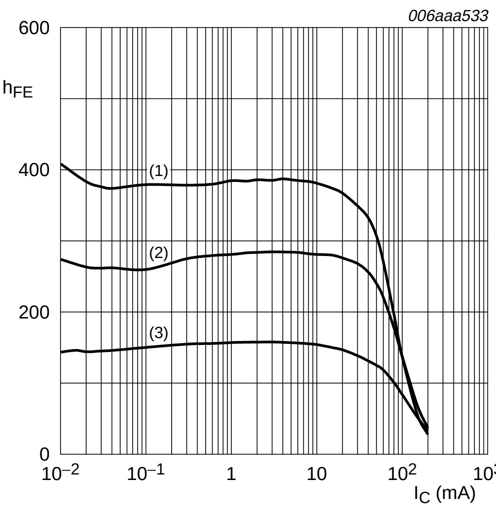
Table 8. Characteristics *...continued*

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{BEsat}	base-emitter saturation voltage	I_C = –10 mA; I_B = –0.5 mA	-	–755	–850	mV
		I_C = –100 mA; I_B = –5 mA	-	–900	-	mV
V_{BE}	base-emitter voltage	V_{CE} = –5 V				
		I_C = –2 mA	–600	–650	–750	mV
		I_C = –10 mA	-	-	–820	mV
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz	-	2.3	-	pF
C_e	emitter capacitance	V_{EB} = –0.5 V; I_C = i_c = 0 A; f = 1 MHz	-	10	-	pF
f_T	transition frequency	V_{CE} = –5 V; I_C = –10 mA; f = 100 MHz	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	-	1.6	-	dB
		V_{CE} = –5 V; I_C = –0.2 mA; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz	-	2.9	-	dB



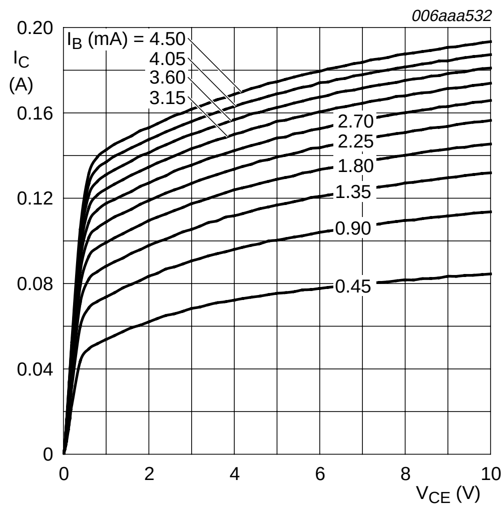
V_{CE} = 5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

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



T_{amb} = 25 °C

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

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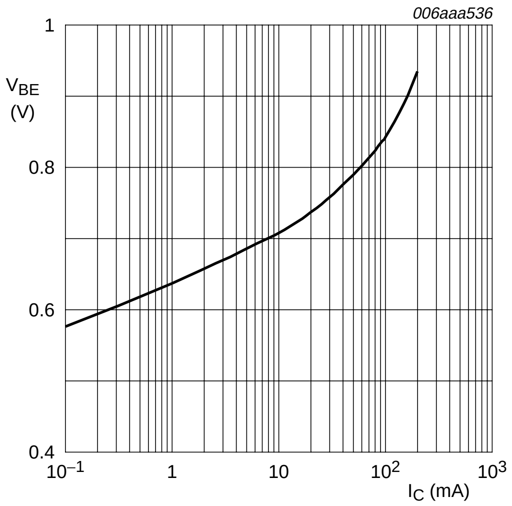
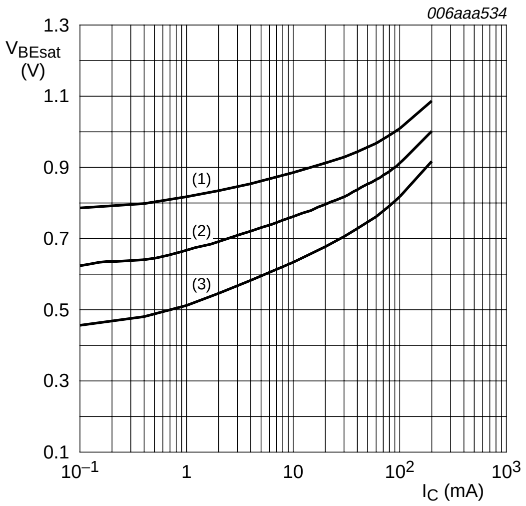


VCE = 5 V; Tamb = 25 °C

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



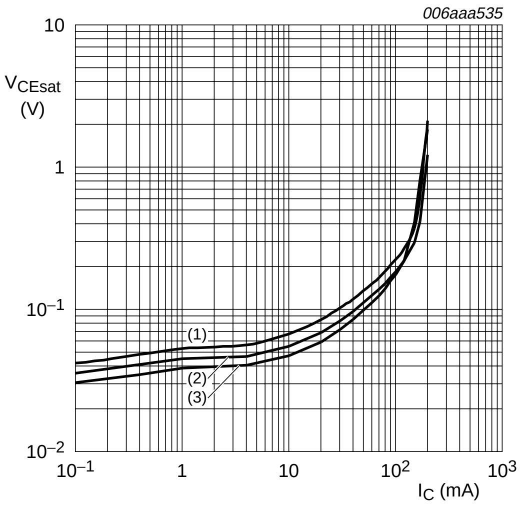
$I_C/I_B = 20$

(1) $T_{amb} = -55$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = 100$ °C

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



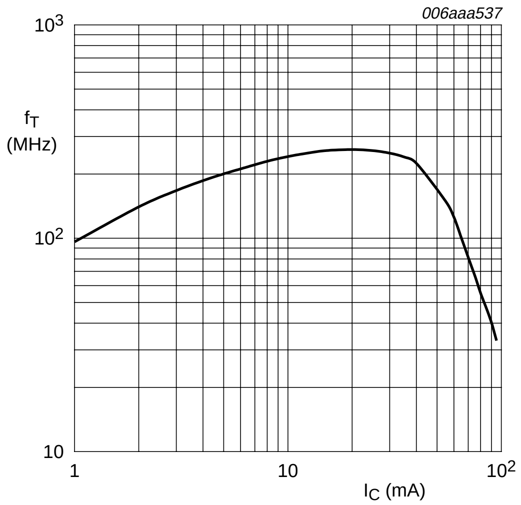
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



$V_{CE} = 5$ V; $T_{amb} = 25$ °C

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

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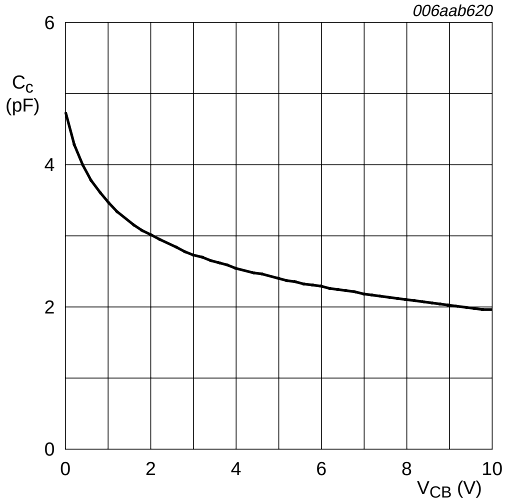
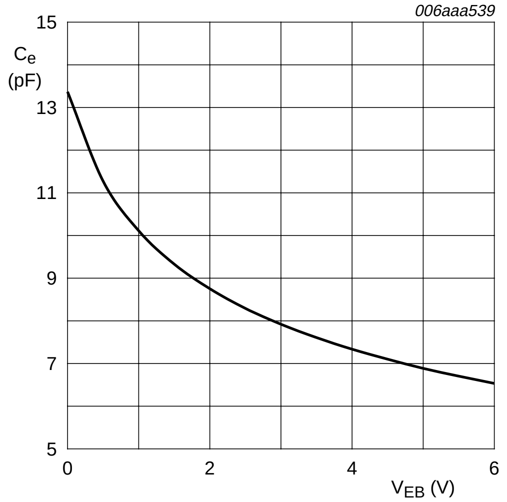


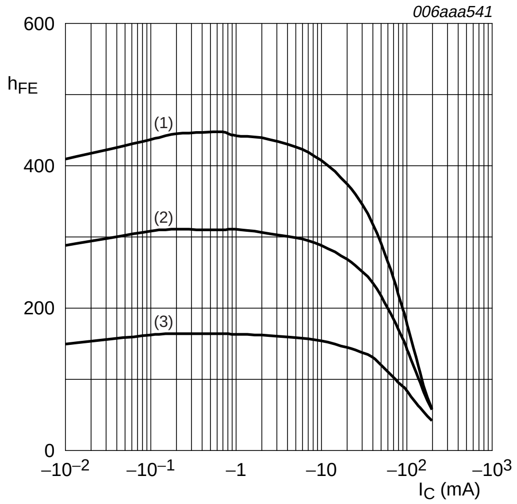
f = 1 MHz; T_{amb} = 25 °C

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



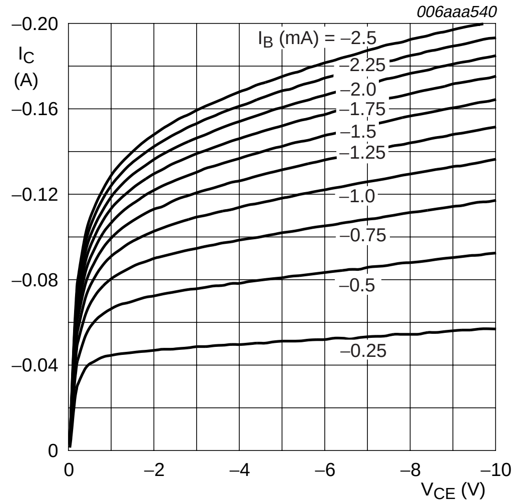
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

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

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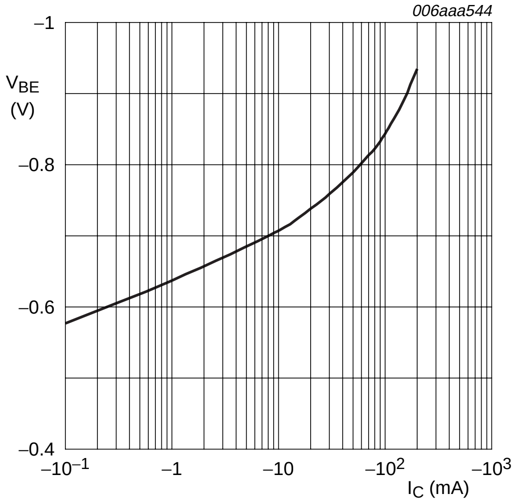
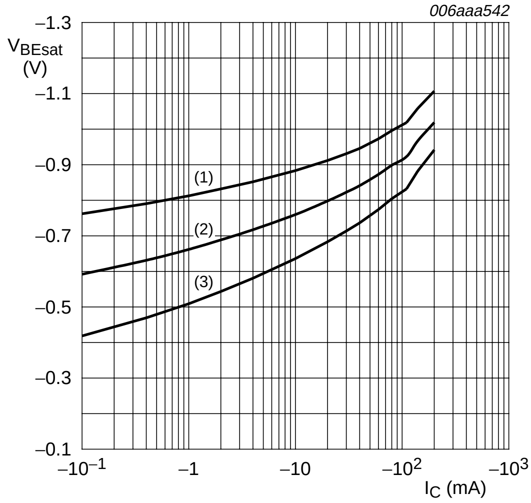


$V_{CE} = -5$ V; $T_{amb} = 25$ °C

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



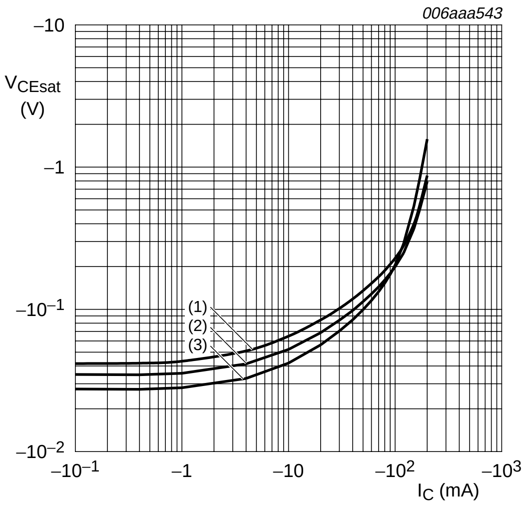
$I_C/I_B = 20$

(1) $T_{amb} = -55$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = 100$ °C

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



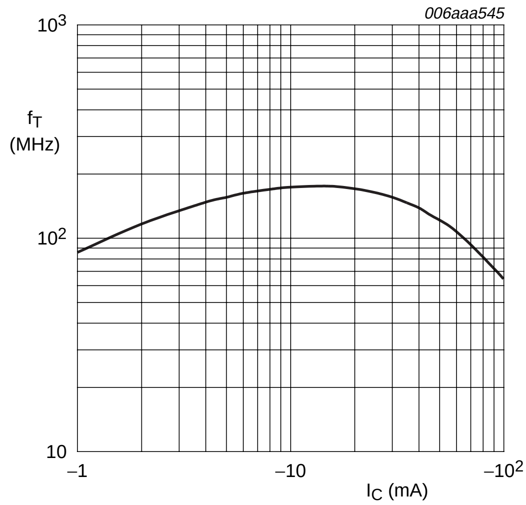
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



$V_{CE} = -5$ V; $T_{amb} = 25$ °C

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

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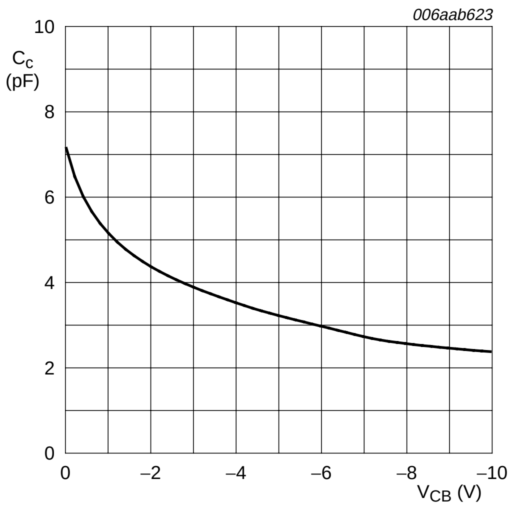
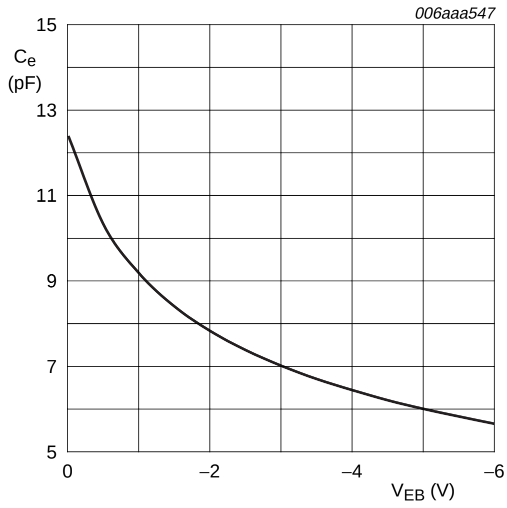


f = 1 MHz; T_{amb} = 25 °C

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

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8. Test information

8.1 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.

9. Package outline

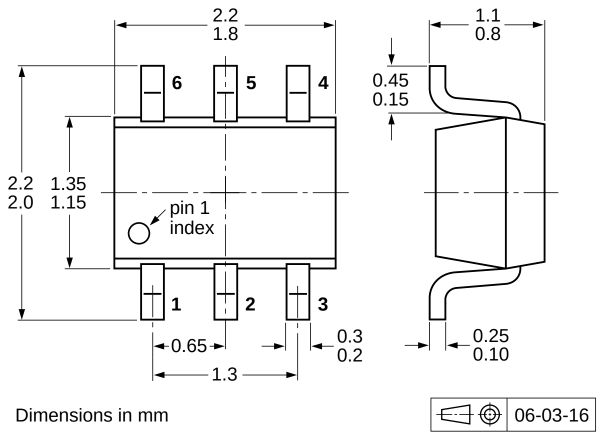

Fig 19. Package outline SOT363 (SC-88)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity	
			3000	10000
BC846BPN	SOT363	4 mm pitch, 8 mm tape and reel; T1 [2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 [3]	-125	-165

[1] For further information and the availability of packing methods, see Section 14.

[2] T1: normal taping

[3] T2: reverse taping

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11. Soldering

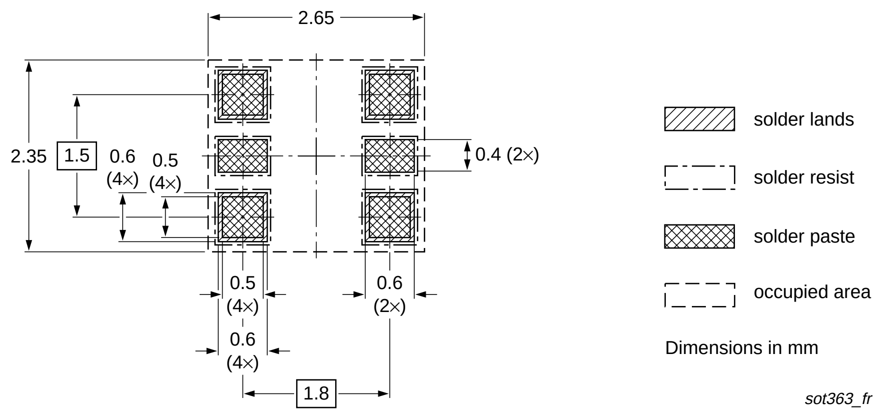

Fig 20. Reflow soldering footprint SOT363 (SC-88)

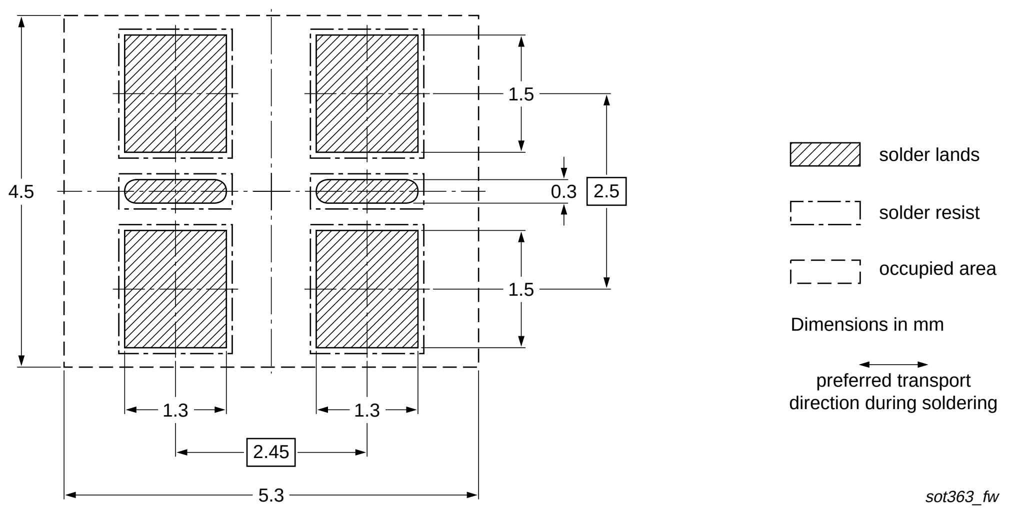

Fig 21. Wave soldering footprint SOT363 (SC-88)

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12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC846BPN_1	20090717	Product data sheet	-	-

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13. Legal information

13.1 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.

[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 URL http://www.nxp.com.

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14. Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

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15. Contents

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Document identifier: BC846BPN_1

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