

BCM846BSH

65 V, 100 mA NPN/NPN matched double transistor

6 May 2021 Product data sheet

1. General description

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

PNP/PNP complement: BCM856BSH

2. Features and benefits

- Low collector capacitance
- Low collector-emitter saturation voltage
- Current gain matching
- Base-emitter voltage matching
- Drop-in replacement for standard double transistors
- No mutual interference between the transistors
- High-temperature applications up to 175 °C

3. Applications

- Current mirror
- Differential amplifier

4. Quick reference data

Table 1. Quick reference data

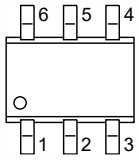
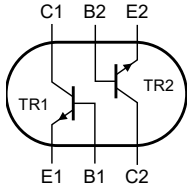
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
V_{CEO}	collector-emitter voltage	open base		-	-	65	V
I_C	collector current			-	-	100	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		200	300	450	
Per device							
h_{FE1}/h_{FE2}	DC current gain matching	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		0.95	1	1.05	
$V_{BE1}-V_{BE2}$	base-emitter voltage matching		[1]	-	-	2	mV

[1] The smaller of the two values is subtracted from the larger value.

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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 TSSOP6 (SOT363)	 sym140
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
BCM846BSH	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]
BCM846BSH	7N%

[1] % = placeholder for manufacturing site code

8. Limiting values

Table 5. Limiting values

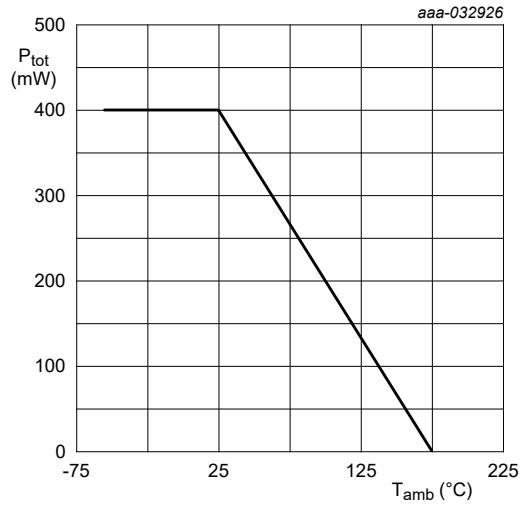
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
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
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.

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

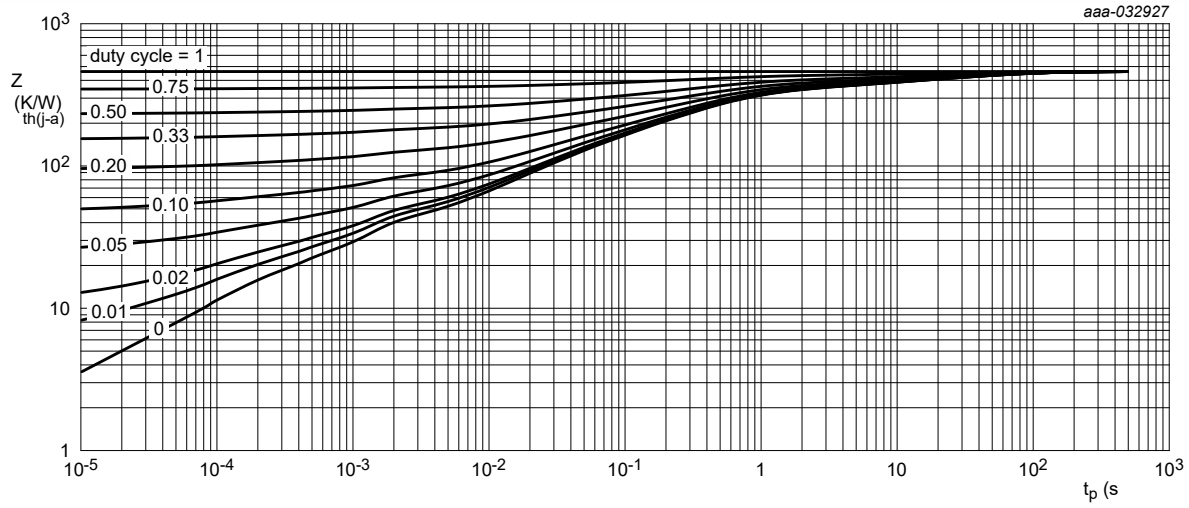
Fig. 1. Per device: Power derating curve

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

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10. Characteristics

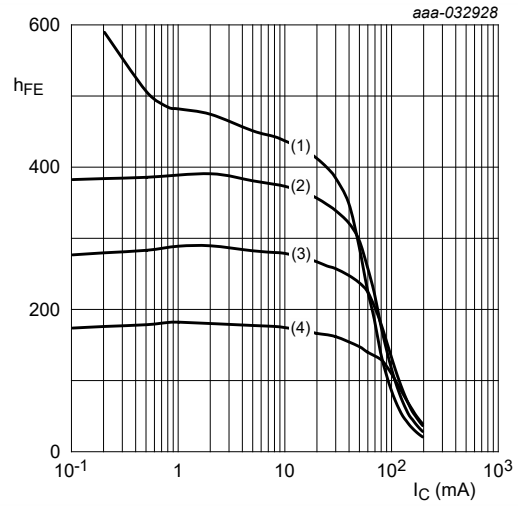
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A; T_{amb} = 25 °C		80	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 2 mA; I_B = 0 A; T_{amb} = 25 °C		65	-	-	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; $t_p \leq$ 300 µs; $\delta \leq$ 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
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
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
		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
Per device							
h_{FE1}/h_{FE2}	DC current gain matching	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		0.95	1	1.05	
$V_{BE1}-V_{BE2}$	base-emitter voltage matching		[3]	-	-	2	mV

[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.
[3] The smaller of the two values is subtracted from the larger value.

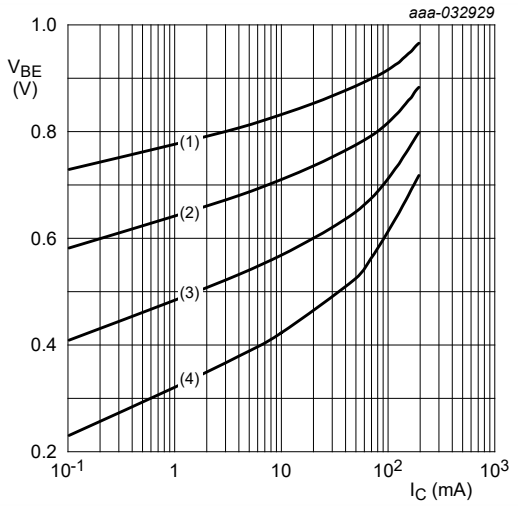
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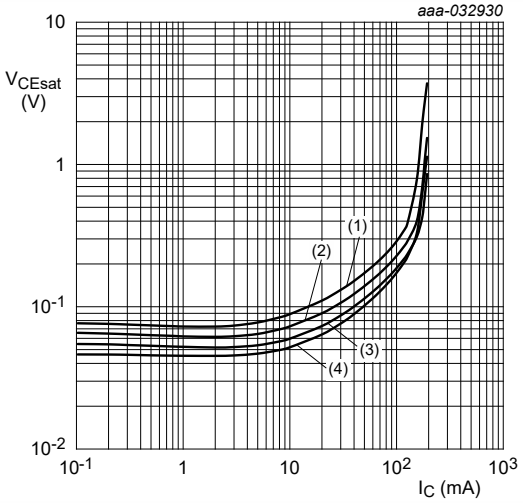
V_{CE} = 5 V
(1) T_{amb} = 175 °C
(2) T_{amb} = 150 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = -40 °C

Fig. 3. DC current gain as a function of collector current; typical values



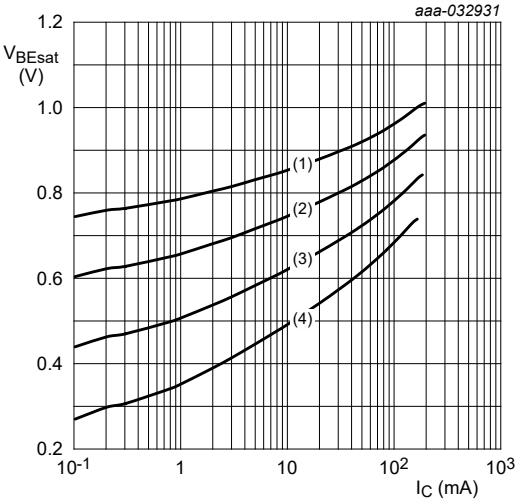
V_{CE} = 5 V
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 175°C

Fig. 4. 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. Collector-emitter saturation voltage as a function of collector current; typical values

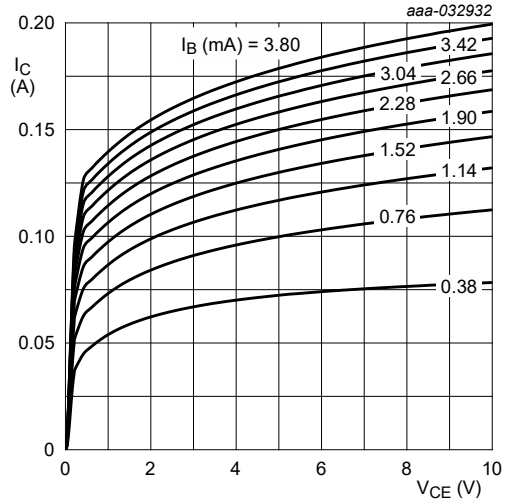


I_C/I_B = 20
(1) T_{amb} = -40 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 175 °C

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

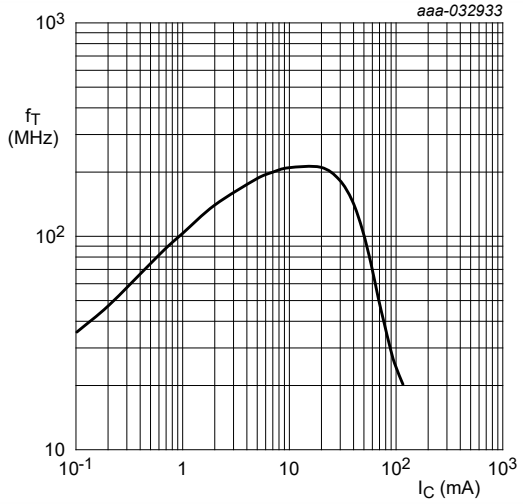
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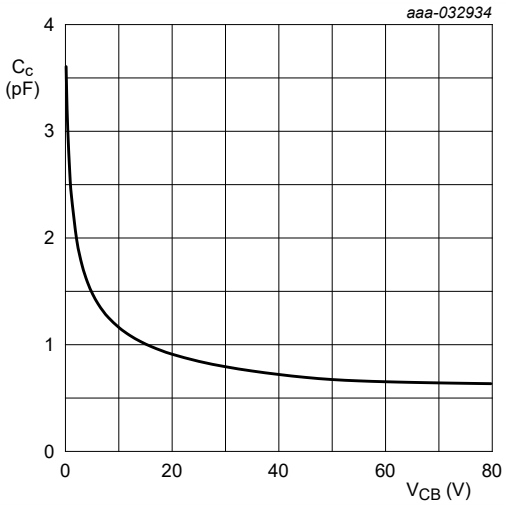
T_{amb} = 25 °C

Fig. 7. Collector current as a function of collector-emitter voltage; typical values



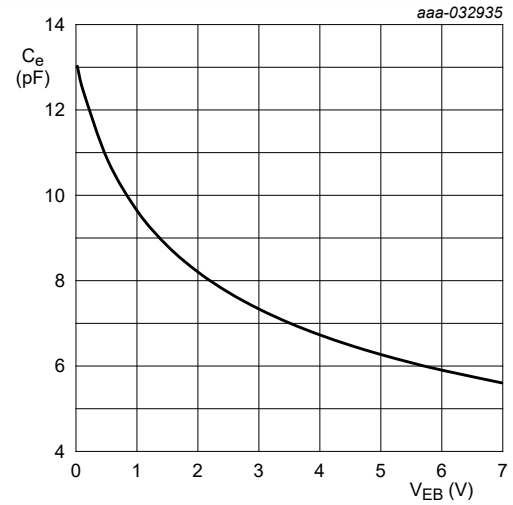
f = 100 MHz
T_{amb} = 25 °C
V_{CE} = 5 V

Fig. 8. Transition frequency as a function of collector current; typical values



f = 1 MHz
T_{amb} = 25 °C

Fig. 9. Collector capacitance as a function of collector-base voltage; typical values



f = 1 MHz
T_{amb} = 25 °C

Fig. 10. Emitter capacitance as a function of emitter-base voltage; typical values

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11. Package outline

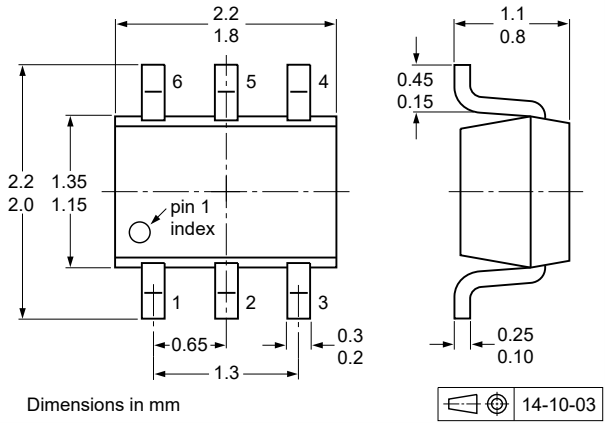


Fig. 11. Package outline TSSOP6 (SOT363)

12. Soldering

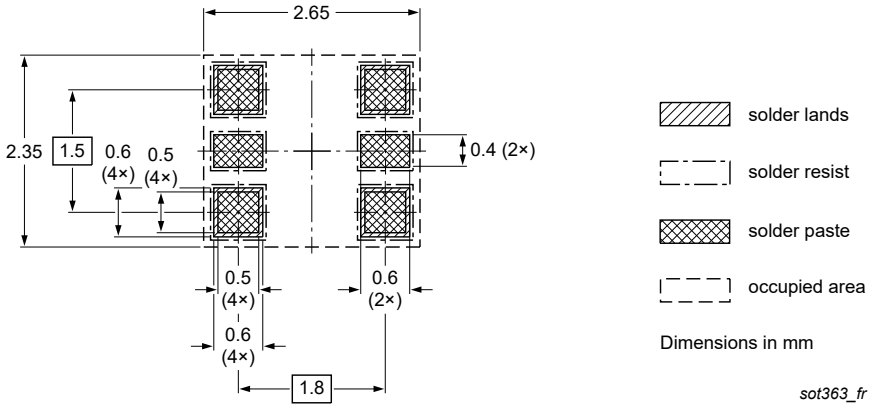


Fig. 12. Reflow soldering footprint for TSSOP6 (SOT363)

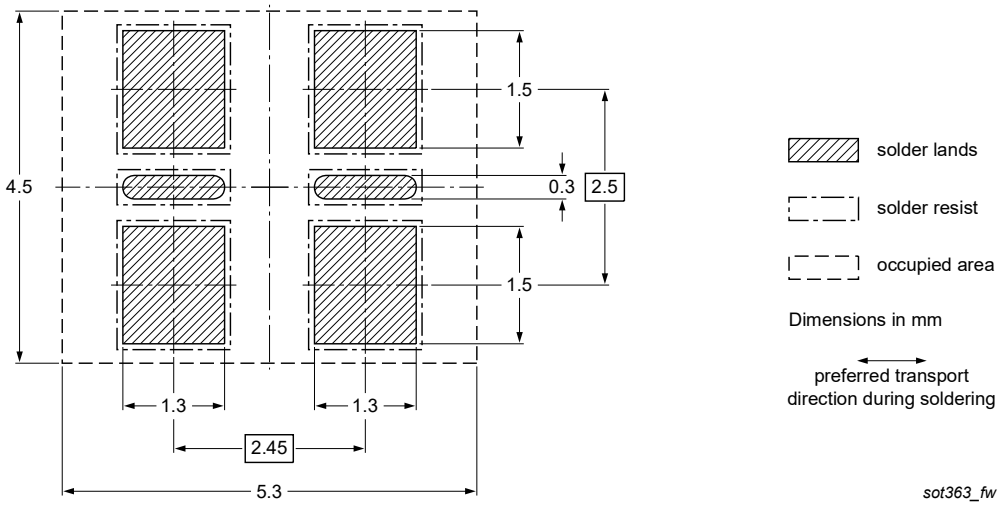


Fig. 13. Wave soldering footprint for TSSOP6 (SOT363)

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13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BCM846BSH v.1	20210506	Product data sheet	-	-

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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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