



# BCM846BS

NPN/NPN matched double transistor

26 June 2015

Product data sheet

## 1. General description

NPN/NPN matched double transistor in a very small SOT363 (TSSOP6) Surface-Mounted Device (SMD) plastic package. The transistors are fully isolated internally.

## 2. Features and benefits

- Current gain matching
- Base-emitter voltage matching
- Drop-in replacement for standard double transistors
- AEC-Q101 qualified

## 3. Applications

- Current mirror
- Differential amplifier

## 4. Quick reference data

Table 1. Quick reference data

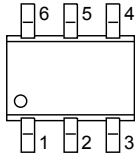
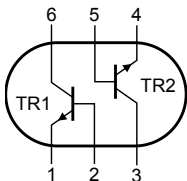
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{CE0}$	collector-emitter voltage	open base	-	-	65	V
$I_C$	collector current		-	-	100	mA
<b>Per transistor</b>						
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$	200	290	450	
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ matching	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$	[1]	0.9	1	-
$V_{BE1}-V_{BE2}$	$V_{BE}$ matching		[2]	-	-	2 mV

[1] The smaller of the two values is taken as numerator.

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

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter TR1	 <p>TSSOP6 (SOT363)</p>	 <p>sym020</p>
2	B	base TR1		
3	C	collector TR2		
4	E	emitter TR2		
5	B	base TR2		
6	C	collector TR1		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BCM846BS	TSSOP6	plastic surface-mounted package; 6 leads	SOT363

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BCM846BS	F2% [1]

[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</b>						
V <sub>CB0</sub>	collector-base voltage	open emitter		-	80	V
V <sub>CEO</sub>	collector-emitter voltage	open base		-	65	V
V <sub>EBO</sub>	emitter-base voltage	open collector		-	6	V
I <sub>C</sub>	collector current			-	100	mA
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms		-	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	200	mW
<b>Per device</b>						
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	300	mW
T <sub>j</sub>	junction temperature			-	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C

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

## 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]	-	-	625	K/W
<b>Per device</b>							
R <sub>th(j-a)</sub>	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.

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C		-	-	15	nA
		V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C		-	-	5	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C		-	-	100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C		200	290	450	
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 μA; T <sub>amb</sub> = 25 °C		-	250	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C		-	50	200	mV
		I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA; pulsed;		-	200	400	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	[1]	-	910	-	mV
		I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C	[1]	-	760	-	mV
V <sub>BE</sub>	base-emitter voltage	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; T <sub>amb</sub> = 25 °C	[2]	-	-	770	mV
V <sub>BE</sub>	base-emitter voltage	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C	[2]	610	660	710	mV
C <sub>C</sub>	collector capacitance	V <sub>CB</sub> = 10 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C		-	-	1.5	pF
C <sub>E</sub>	emitter capacitance	V <sub>EB</sub> = 0.5 V; I <sub>C</sub> = 0 A; i <sub>c</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C		-	11	-	pF
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C		100	250	-	MHz
NF	noise figure	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 0.2 mA; R <sub>S</sub> = 2 kΩ; f = 1 kHz; B = 200 Hz; T <sub>amb</sub> = 25 °C		-	3.3	-	dB
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 0.2 mA; R <sub>S</sub> = 2 kΩ; T <sub>amb</sub> = 25 °C; f = 10 Hz to 15.7 kHz		-	2.8	-	dB
<b>Per device</b>							
h <sub>FE1</sub> /h <sub>FE2</sub>	h <sub>FE</sub> matching	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C	[3]	0.9	1	-	
V <sub>BE1</sub> -V <sub>BE2</sub>	V <sub>BE</sub> matching		[4]	-	-	2	mV

[1] V<sub>BEsat</sub> decreases by about 1.7 mV/K with increasing temperature.

[2] V<sub>BE</sub> decreases by about 2 mV/K with increasing temperature.

[3] The smaller of the two values is taken as numerator.

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

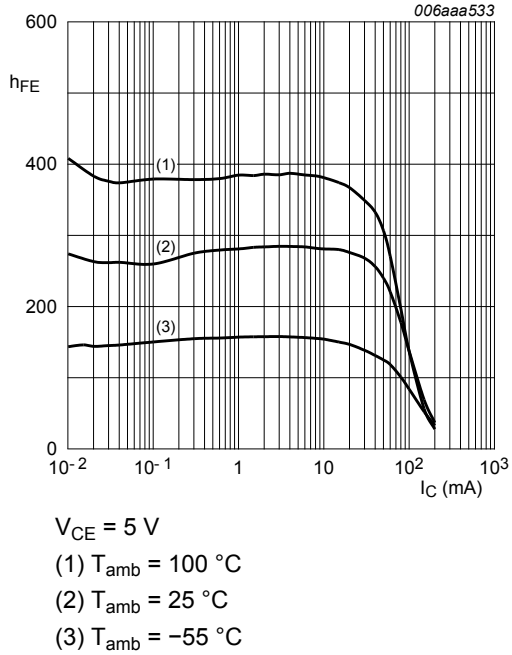


Fig. 1. DC current gain as a function of collector current; typical values

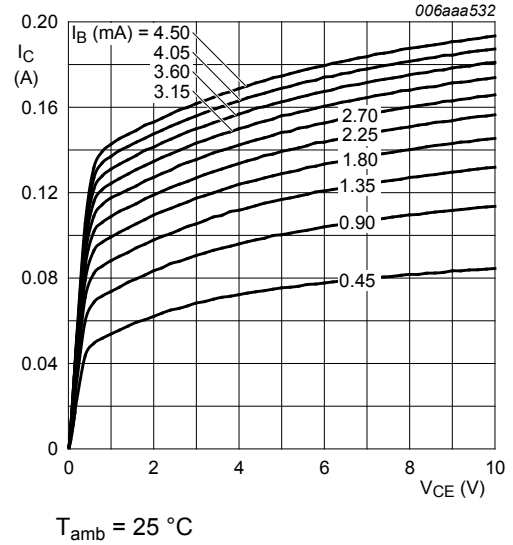


Fig. 2. Collector current as a function of collector-emitter voltage; typical values

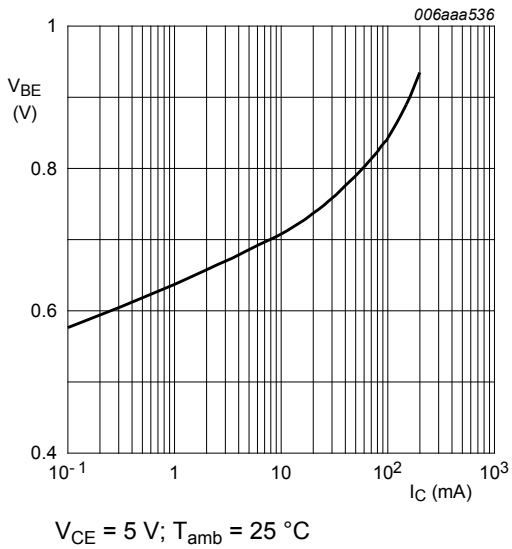


Fig. 3. Base-emitter voltage as a function of collector current; typical values

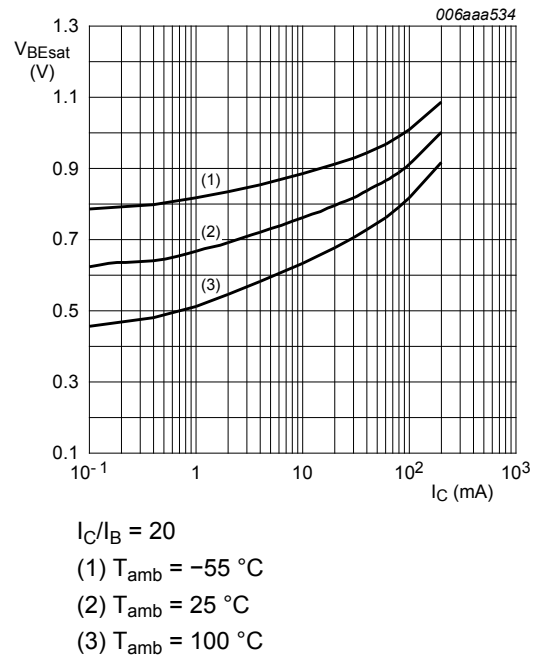
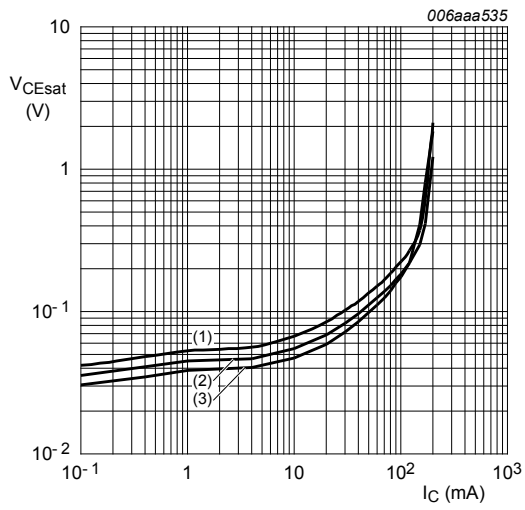
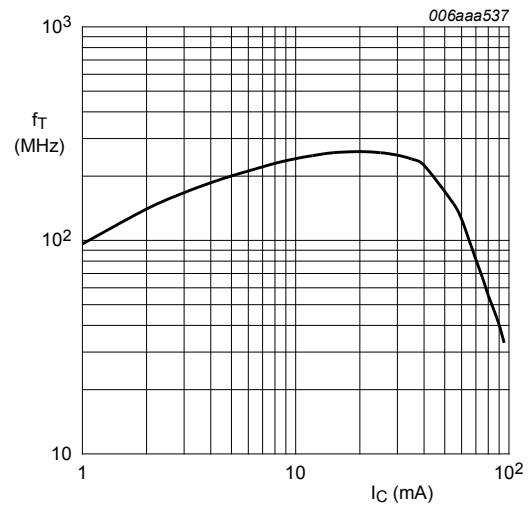


Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values



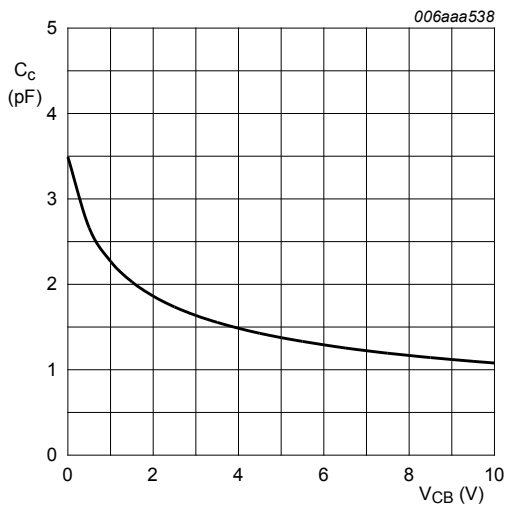
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



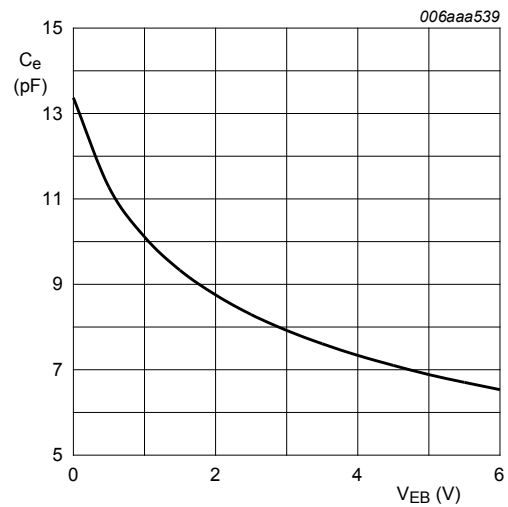
$V_{CE} = 5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

**Fig. 6. Transition frequency as a function of collector current; typical values**



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

**Fig. 7. Collector capacitance as a function of collector-base voltage; typical values**



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

**Fig. 8. Emitter capacitance as a function of emitter-base voltage; typical values**

## 11. Package outline

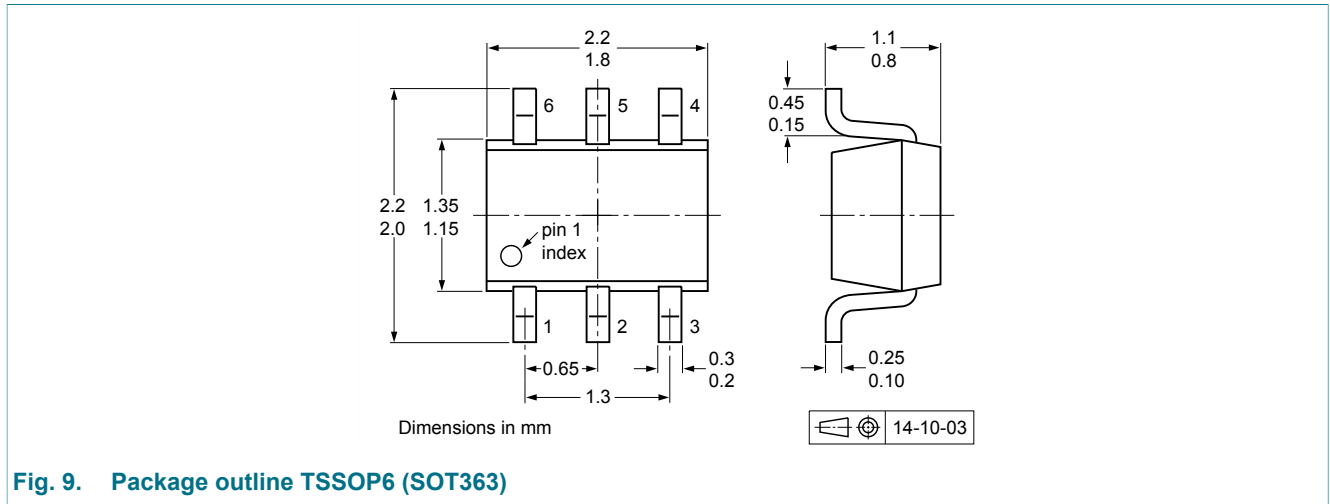


Fig. 9. Package outline TSSOP6 (SOT363)

## 12. Soldering

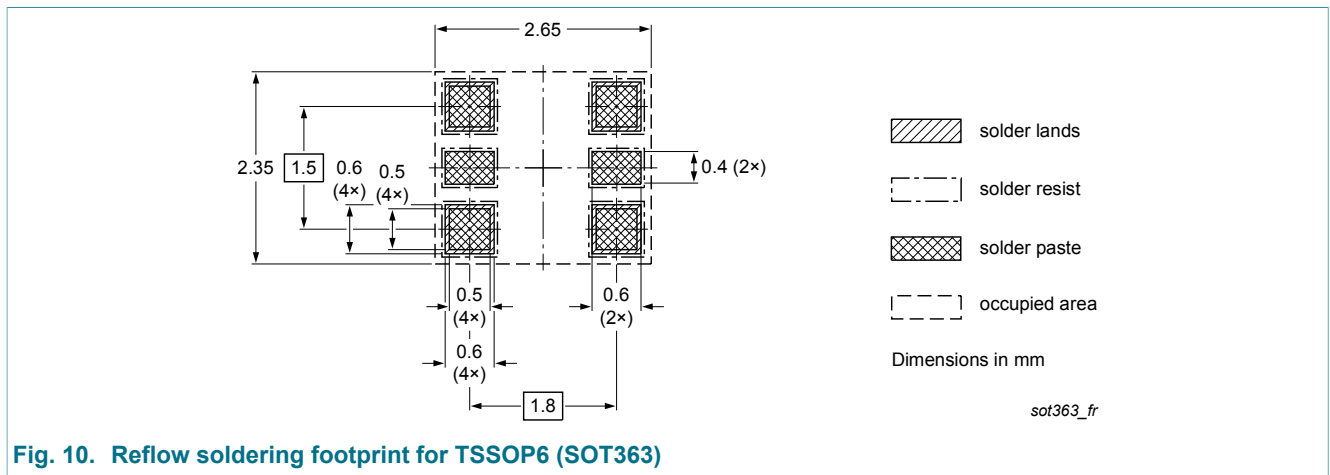


Fig. 10. Reflow soldering footprint for TSSOP6 (SOT363)

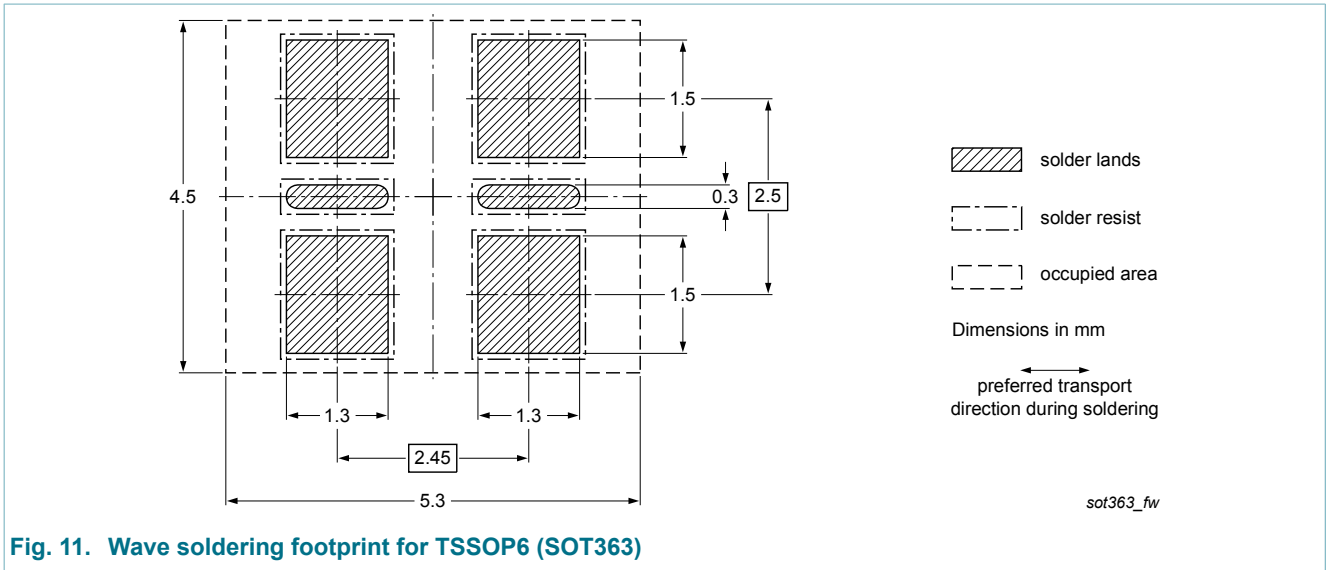


Fig. 11. Wave soldering footprint for TSSOP6 (SOT363)



## 13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BCM846BS v.2	20150626	Product data sheet	-	BCM846BS v.1
Modification:	<ul style="list-style-type: none"><li>Product status changed</li></ul>			
BCM846BS v.1	20150424	Objective data sheet	-	-

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### 14.1 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.

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