



# BCM847DS

NPN/NPN matched double transistor

27 December 2022

Product data sheet

## 1. General description

NPN/NPN matched double transistor in a SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package. The transistors are fully isolated internally.

PNP/PNP complement: BMC857DS

## 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

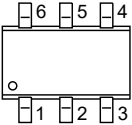
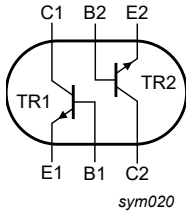
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per transistor</b>							
$V_{CE0}$	collector-emitter voltage	open base		-	-	45	V
$I_C$	collector current			-	-	100	mA
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}$ ; $I_C = 2 \text{ mA}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$		200	290	450	
<b>Per device</b>							
$h_{FE1}/h_{FE2}$	DC current gain matching	$V_{CE} = 5 \text{ V}$ ; $I_C = 2 \text{ mA}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	0.9	1	-	
$V_{BE1}-V_{BE2}$	base-emitter voltage matching		[2]	-	-	2	mV

[1] The smaller of the two values is taken as the 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	E1	emitter TR1	 SC-74; TSOP6 (SOT457)	 sym020
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
BCM847DS	SC-74; TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
BCM847DS	R6

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 <sub>CBO</sub>	collector-base voltage	open emitter	-	50	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	45	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] [2]	250	mW
Per device					
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1] [2]	380	mW
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	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.

[2] Reflow soldering is the only recommended soldering method.

## 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] [2]	-	-	500	K/W
<b>Per device</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	328	K/W

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

[2] Reflow soldering is the only recommended soldering method.

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
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> = 10 μA; T <sub>amb</sub> = 25 °C		-	250	-	
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C		200	290	450	
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; T <sub>amb</sub> = 25 °C		-	200	400	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C	[1]	-	760	-	mV
		I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA; T <sub>amb</sub> = 25 °C	[1]	-	910	-	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
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; T <sub>amb</sub> = 25 °C	[2]	-	-	770	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 = 10 Hz to 15.7 kHz; T <sub>amb</sub> = 25 °C		-	2.8	-	dB
		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
Per device							
h <sub>FE1</sub> /h <sub>FE2</sub>	DC current gain 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>	base-emitter voltage matching		[4]	-	-	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 taken as the numerator.

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

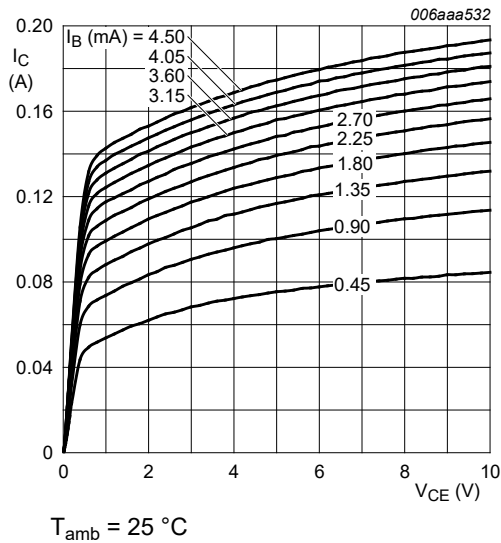


Fig. 1. Collector current as a function of collector-emitter voltage; typical values

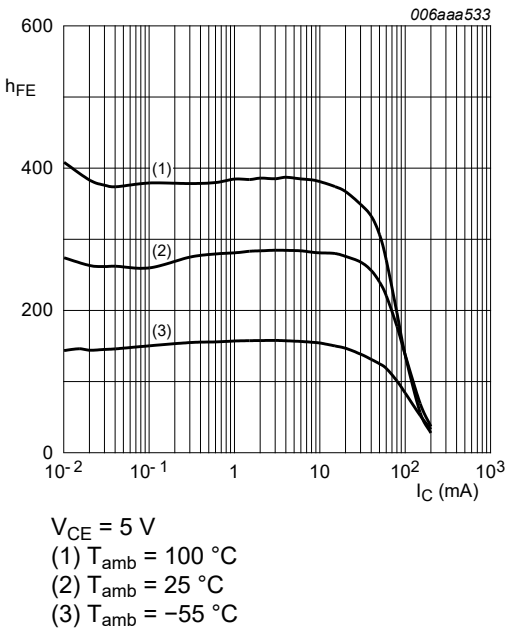


Fig. 2. DC current gain as a function of collector current; typical values

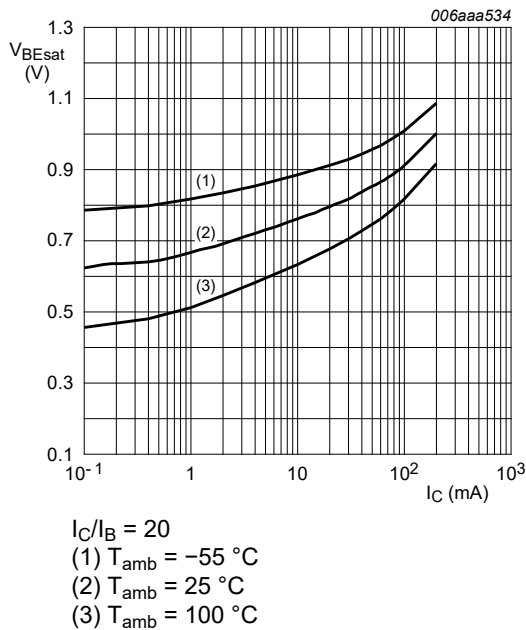


Fig. 3. Base-emitter saturation voltage as a function of collector current; typical values

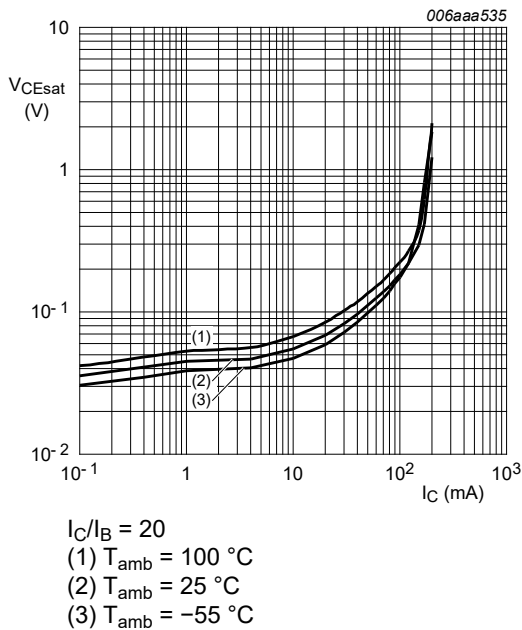


Fig. 4. Collector-emitter saturation voltage as a function of collector current; typical values

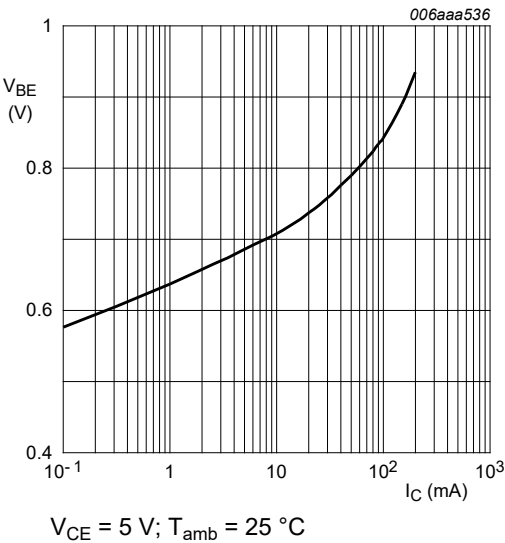


Fig. 5. Base-emitter voltage as a function of collector current; typical values

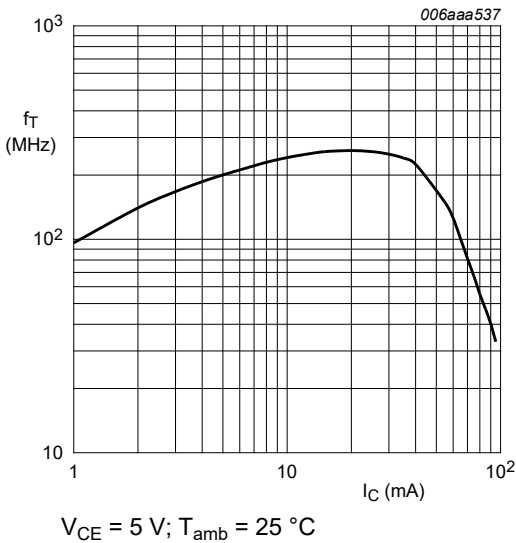


Fig. 6. Transition frequency as a function of collector current; typical values

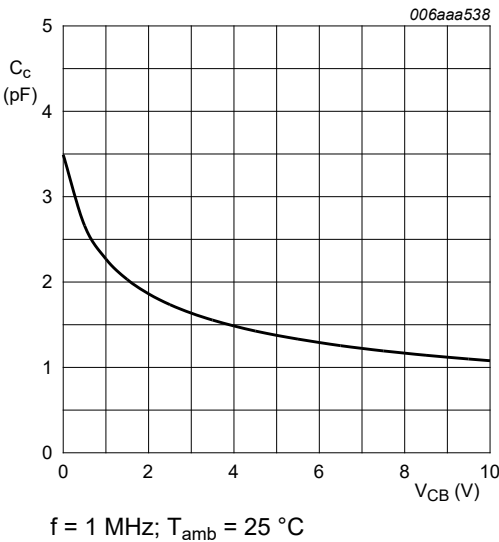


Fig. 7. Collector capacitance as a function of collector-base voltage; typical values

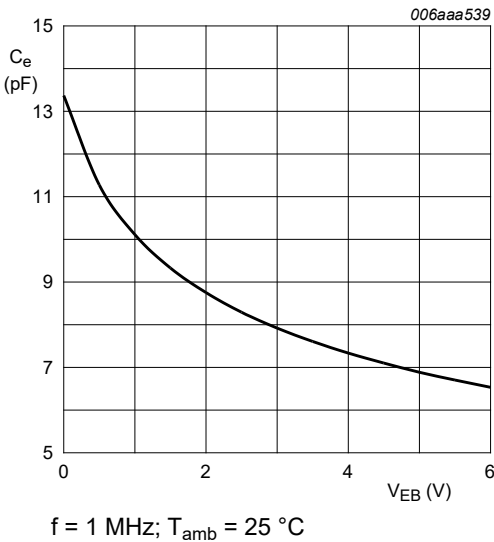


Fig. 8. Emitter capacitance as a function of emitter-base voltage; typical values

## 11. Application information

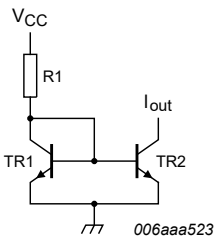


Fig. 9. Current mirror

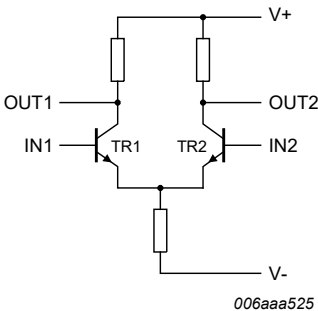


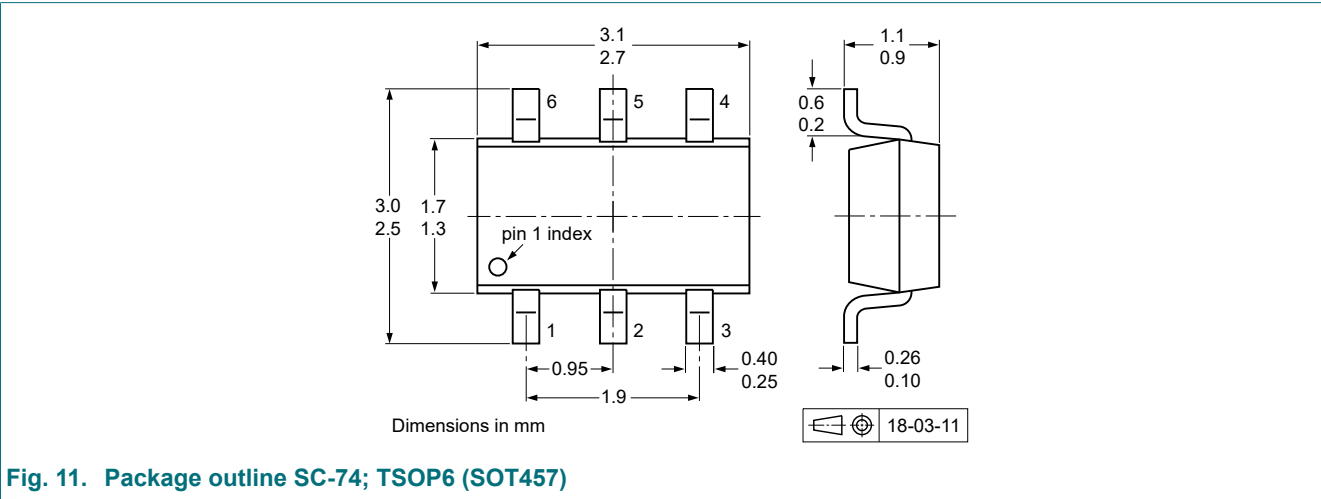
Fig. 10. Differential amplifier

12. Test information

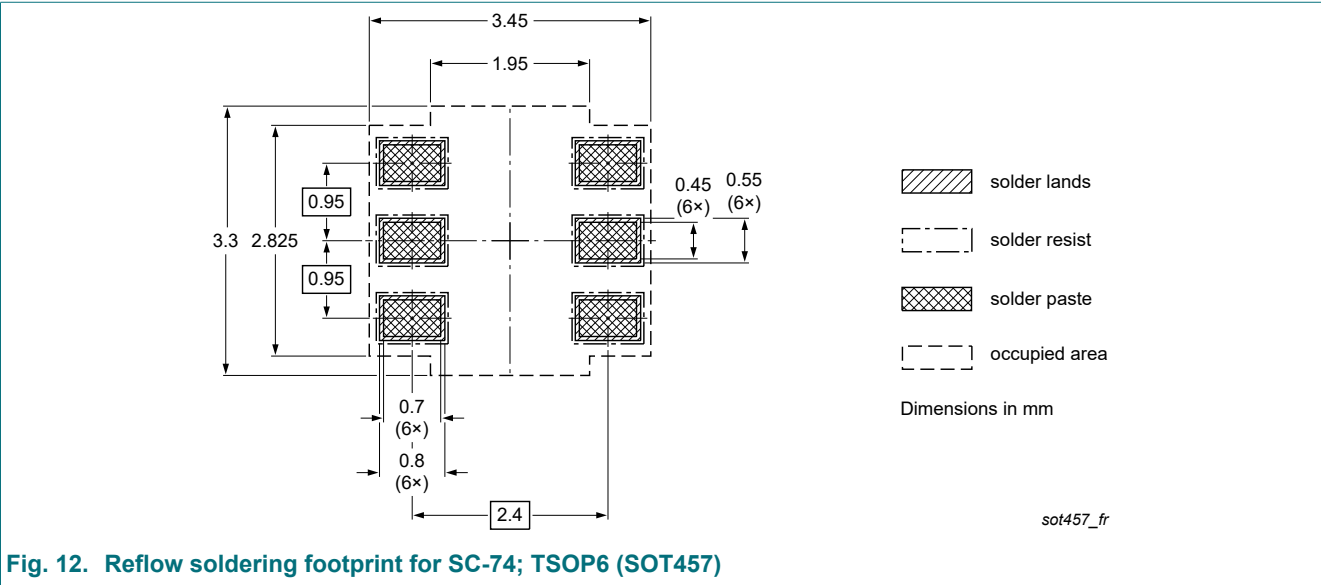
Quality information

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.

13. Package outline



14. Soldering



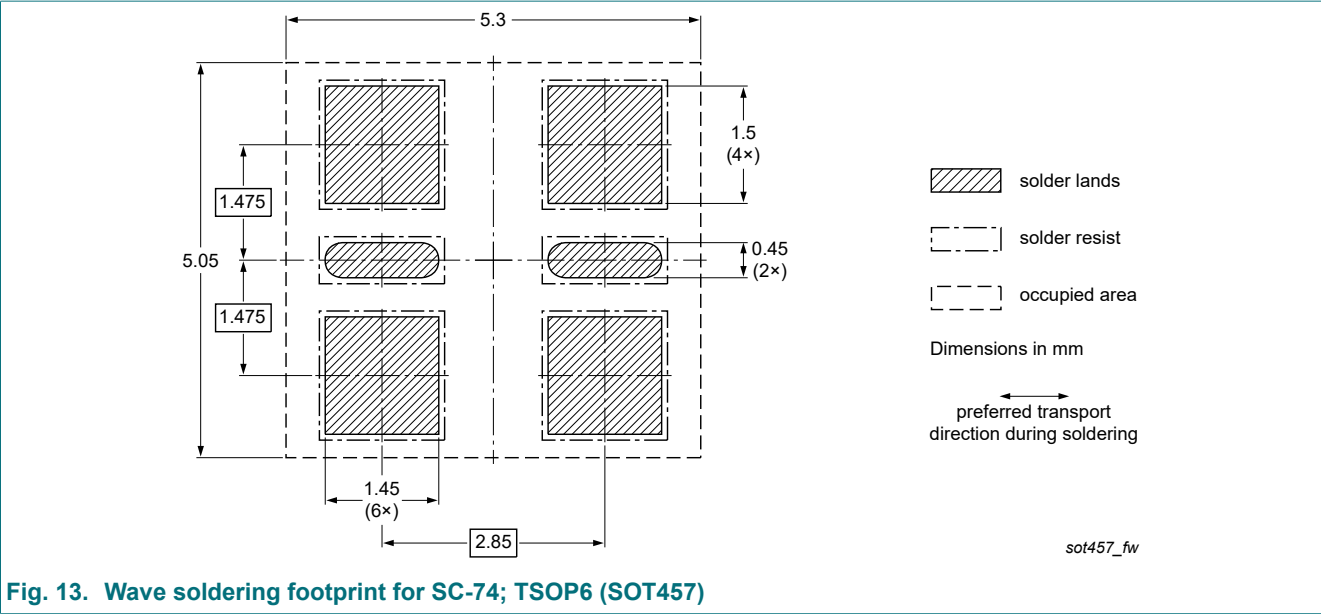


Fig. 13. Wave soldering footprint for SC-74; TSOP6 (SOT457)

## 15. Revision history

**Table 8. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BCM847DS v.7	20221227	Product data sheet	-	BCM847BV_BS_DS_6
Modifications:	<ul style="list-style-type: none"><li>Family data sheet splitted to single type data sheets.</li><li>Packing information removed.</li></ul>			
BCM847BV_BS_DS_6		Product data sheet	-	BCM847BV_BS_DS_5
BCM847BV_BS_DS_5		Product data sheet Product data sheet	-	BCM847BS_DS_4
BCM847BS_DS_4		Product data sheet	-	BCM847BS_DS_3
BCM847BS_DS_3		Product data sheet	-	BCM847BS_2
BCM847BS_2		Product data sheet	-	BCM847BS_1
BCM847BS_1		Product data sheet	-	-



## 16. 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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 27 December 2022

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