



BCM847BSH-Q

45 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: BCM857BSH-Q

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
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Current mirror
- Differential amplifier

4. Quick reference data

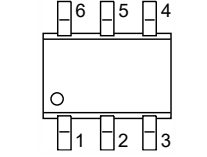
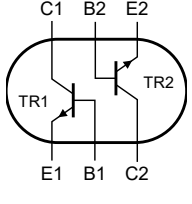
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{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	300	450	
Per device						
h_{FE1}/h_{FE2}	DC current gain matching	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	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.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E1	emitter TR1	 <p>TSSOP6 (SOT363)</p>	 <p>sym140</p>
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
BCM847BSH-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]
BCM847BSH-Q	7A%

[1] % = placeholder for manufacturing site code

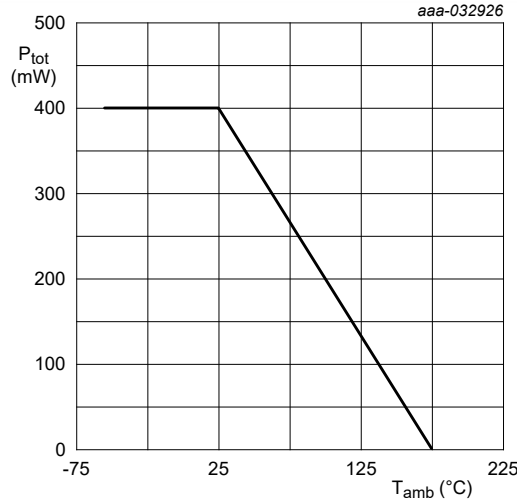
8. Limiting values

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	-	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 μ m copper, tin-plated and standard footprint.



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

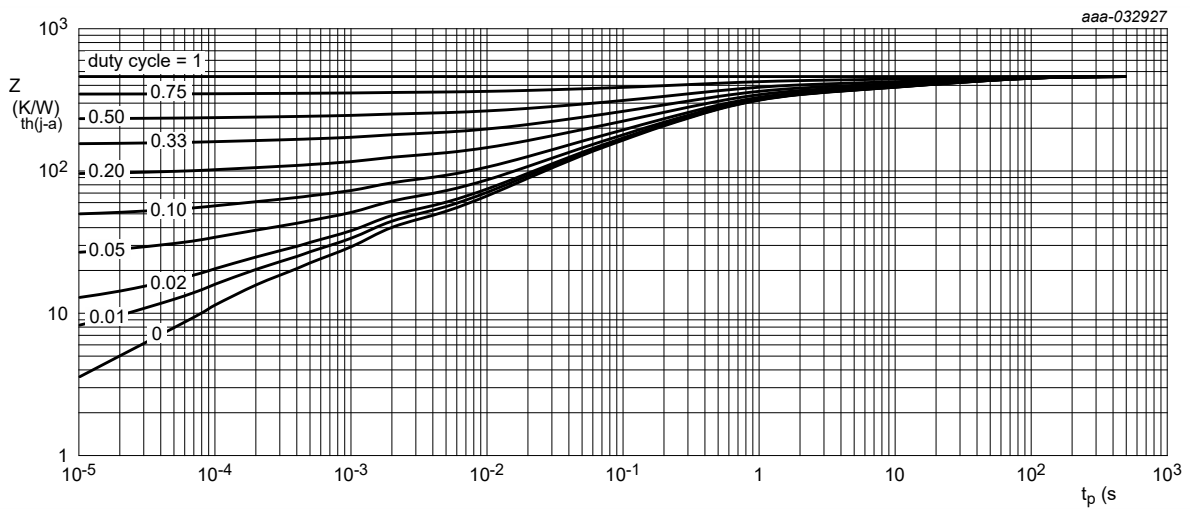
Fig. 1. Per device: Power derating curve

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							
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}$; $I_B = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	45	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0 \text{ A}$; $I_E = 100 \mu\text{A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	7	-	-	V	
I_{CBO}	collector-base cut-off current	$V_{CB} = 30 \text{ V}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	15	nA	
		$V_{CB} = 30 \text{ V}$; $I_E = 0 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$	-	-	5	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 7 \text{ V}$; $I_C = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA	
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}$; $I_C = 2 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	300	450		
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	50	100	mV	
		$I_C = 100 \text{ mA}$; $I_B = 5 \text{ mA}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	200	300	mV	
V_{BEsat}	base-emitter saturation voltage	$I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[1]	-	750	850	mV
		$I_C = 100 \text{ mA}$; $I_B = 5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	875	-	mV
V_{BE}	base-emitter voltage	$V_{CE} = 5 \text{ V}$; $I_C = 2 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	600	655	700	mV
		$V_{CE} = 5 \text{ V}$; $I_C = 10 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	-	705	770	mV
C_c	collector capacitance	$V_{CB} = 10 \text{ V}$; $I_E = 0 \text{ A}$; $i_e = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	1.2	-	pF	
C_e	emitter capacitance	$V_{EB} = 0.5 \text{ V}$; $I_C = 0 \text{ A}$; $i_c = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	11	-	pF	
f_T	transition frequency	$V_{CE} = 5 \text{ V}$; $I_C = 10 \text{ mA}$; $f = 100 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	MHz	
NF	noise figure	$V_{CE} = 5 \text{ V}$; $I_C = 0.2 \text{ mA}$; $R_S = 2 \text{ k}\Omega$; $f = 10 \text{ Hz to } 15.7 \text{ kHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	1.7	-	dB	
		$V_{CE} = 5 \text{ V}$; $I_C = 0.2 \text{ mA}$; $R_S = 2 \text{ k}\Omega$; $f = 1 \text{ kHz}$; $B = 200 \text{ Hz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	3.1	-	dB	
Per device							
h_{FE1}/h_{FE2}	DC current gain matching	$V_{CE} = 5 \text{ V}$; $I_C = 2 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$		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.

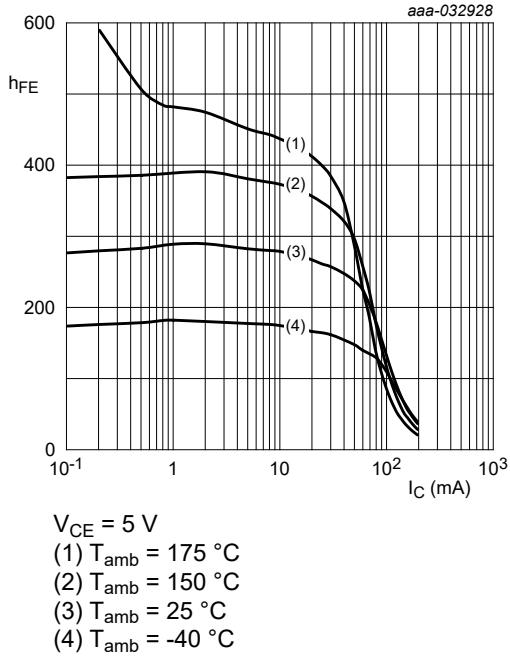


Fig. 3. DC current gain as a function of collector current; typical values

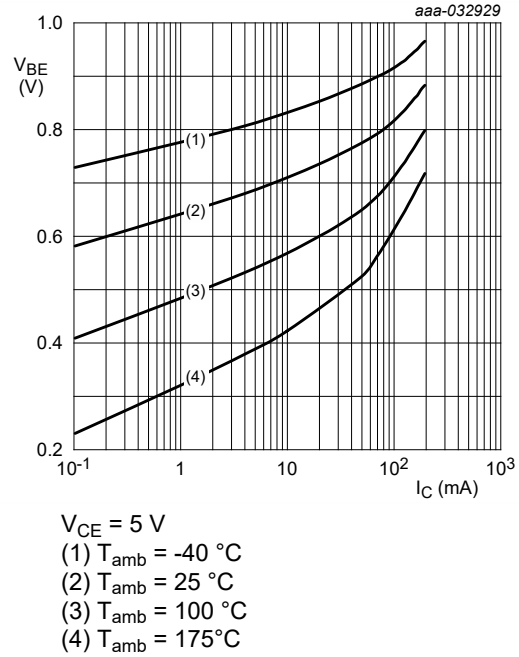


Fig. 4. Base-emitter voltage as a function of collector current; typical values

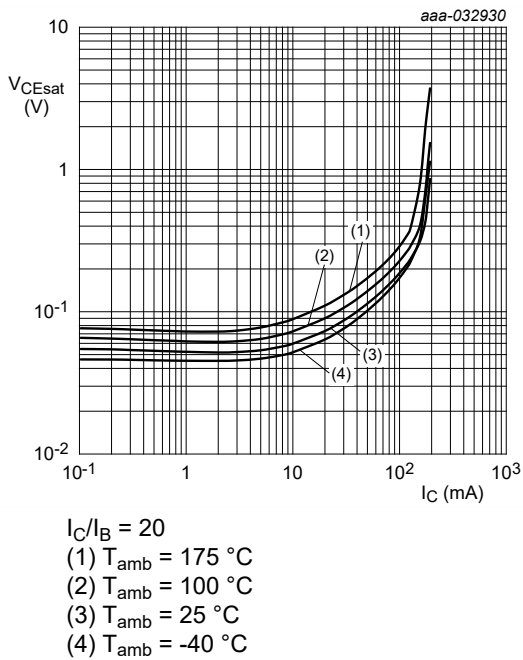


Fig. 5. Collector-emitter saturation voltage as a function of collector current; typical values

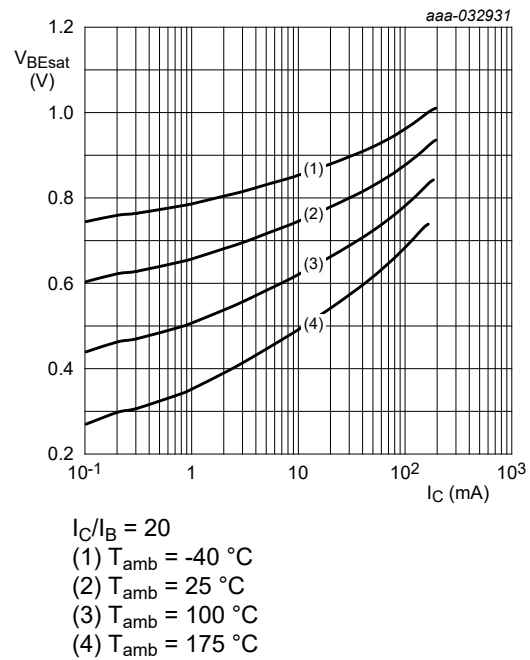


Fig. 6. Base-emitter saturation voltage as a function of collector current; typical values

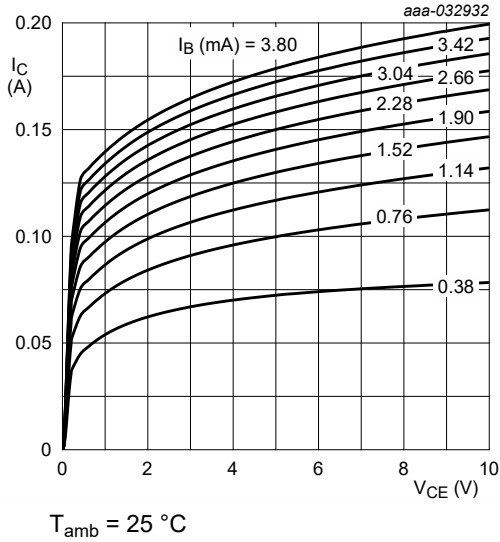


Fig. 7. Collector current as a function of collector-emitter voltage; typical values

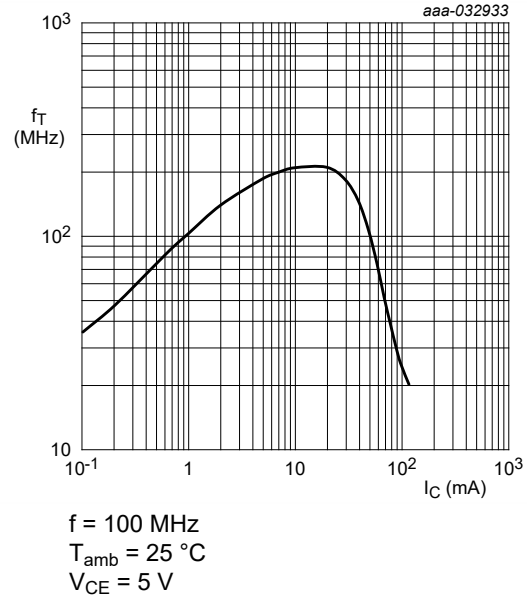


Fig. 8. Transition frequency as a function of collector current; typical values

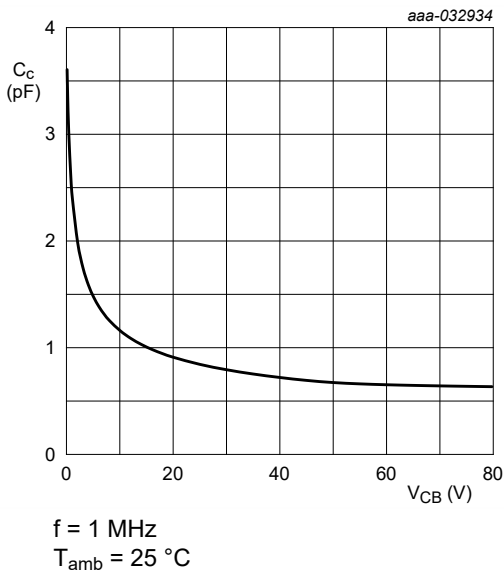


Fig. 9. Collector capacitance as a function of collector-base voltage; typical values

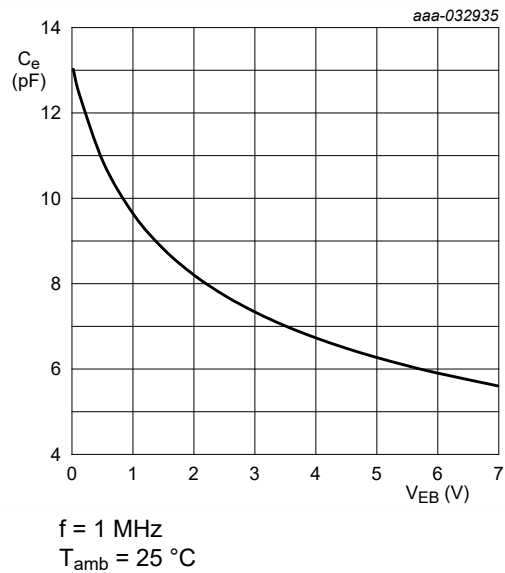


Fig. 10. Emitter capacitance as a function of emitter-base voltage; typical values

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

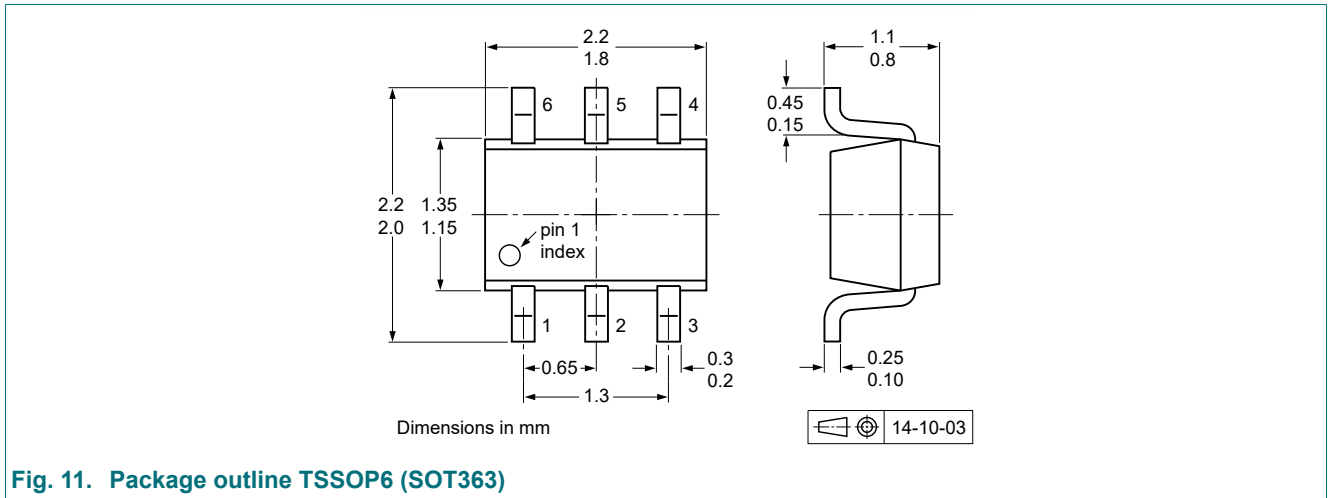


Fig. 11. Package outline TSSOP6 (SOT363)

13. Soldering

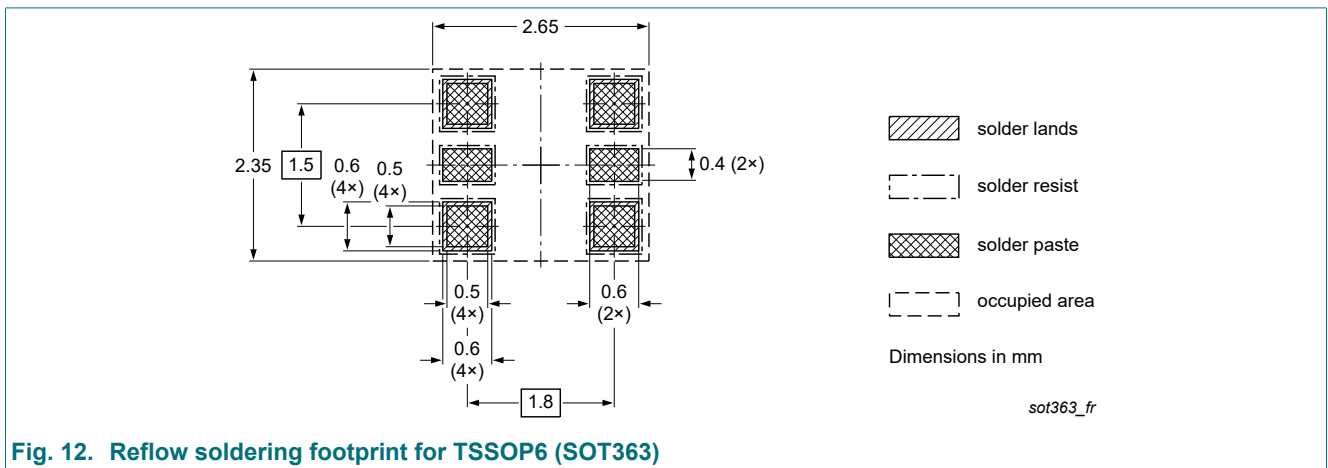


Fig. 12. Reflow soldering footprint for TSSOP6 (SOT363)

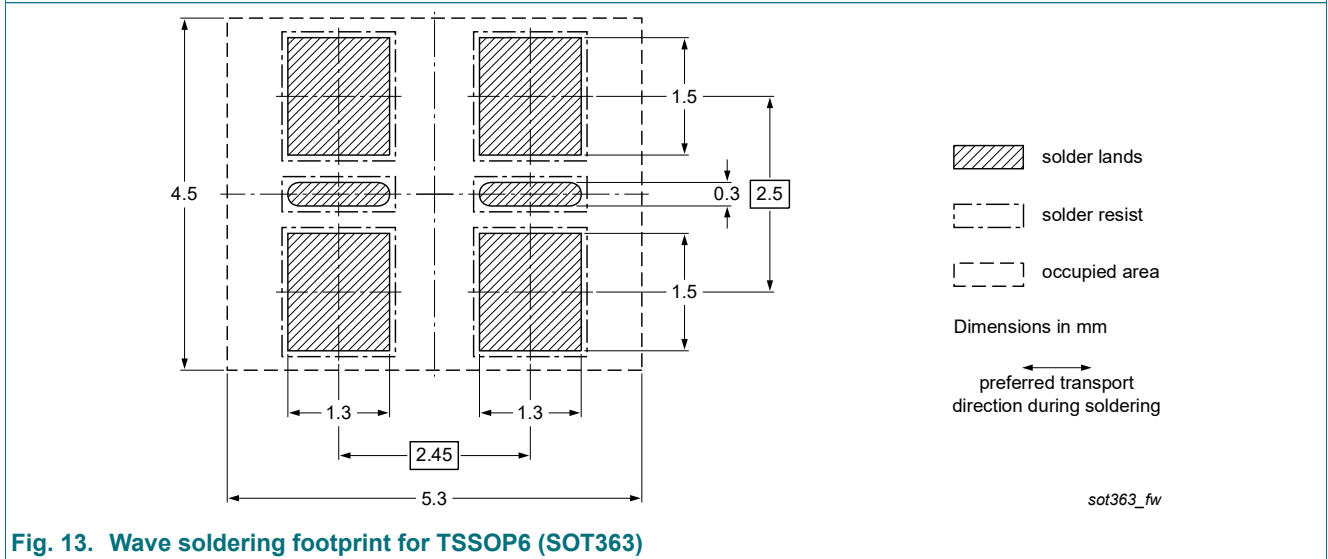


Fig. 13. Wave soldering footprint for TSSOP6 (SOT363)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BCM847BSH-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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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