

# BCM856BS; BCM856BS/DG BCM856DS; BCM856DS/DG

PNP/PNP matched double transistors

Rev. 01 — 7 August 2008

Product data sheet

## 1. Product profile

### 1.1 General description

PNP/PNP matched double transistors in small Surface-Mounted Device (SMD) plastic packages. The transistors are fully isolated internally.

Table 1. Product overview

Type number	Package		Package configuration
	NXP	JEITA	
BCM856BS BCM856BS/DG	SOT363	SC-88	very small
BCM856DS BCM856DS/DG	SOT457	SC-74	small

### 1.2 Features

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

### 1.3 Applications

- Current mirror
- Differential amplifier

### 1.4 Quick reference data

Table 2. 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
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V};$ $I_C = -2\text{ mA}$	200	290	450	

**Table 2. Quick reference data ...continued**

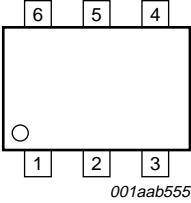
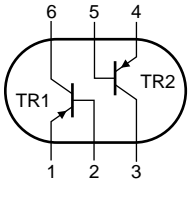
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ matching	$V_{CE} = -5\text{ V};$ $I_C = -2\text{ mA}$	[1] 0.9	1	-	
$V_{BE1}-V_{BE2}$	$V_{BE}$ matching	$V_{CE} = -5\text{ V};$ $I_C = -2\text{ mA}$	[2] -	-	2	mV

[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.

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	emitter TR1	 <p>001aab555</p>	 <p>sym018</p>
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
BCM856BS	SC-88	plastic surface-mounted package; 6 leads	SOT363
BCM856BS/DG			
BCM856DS	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457
BCM856DS/DG			

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code <sup>[1]</sup>
BCM856BS	*BS
BCM856BS/DG	PB*
BCM856DS	DS
BCM856DS/DG	R9

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

## 5. Limiting values

**Table 6. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per transistor</b>					
$V_{CBO}$	collector-base voltage	open emitter	-	-80	V
$V_{CEO}$	collector-emitter voltage	open base	-	-65	V
$V_{EBO}$	emitter-base voltage	open collector	-	-5	V
$I_C$	collector current		-	-100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C			
	BCM856BS (SOT363) BCM856BS/DG (SOT363)		[1] -	200	mW
	BCM856DS (SOT457) BCM856DS/DG (SOT457)		[1] -	250	mW
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C			
	BCM856BS (SOT363) BCM856BS/DG (SOT363)		[1] -	300	mW
	BCM856DS (SOT457) BCM856DS/DG (SOT457)		[1] -	380	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.

## 6. Thermal characteristics

**Table 7. 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				
	BCM856BS (SOT363) BCM856BS/DG (SOT363)		[1]	-	625	K/W
	BCM856DS (SOT457) BCM856DS/DG (SOT457)		[1]	-	500	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	BCM856BS (SOT363) BCM856BS/DG (SOT363)		[1]	-	416	K/W
	BCM856DS (SOT457) BCM856DS/DG (SOT457)		[1]	-	328	K/W

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

## 7. Characteristics

**Table 8. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -30\text{ V};$ $I_E = 0\text{ A}$	-	-	-15	nA
		$V_{CB} = -30\text{ V};$ $I_E = 0\text{ A};$ $T_j = 150\text{ °C}$	-	-	-5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V};$ $I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V};$ $I_C = -10\text{ }\mu\text{A}$	-	250	-	
		$V_{CE} = -5\text{ V};$ $I_C = -2\text{ mA}$	200	290	450	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -10\text{ mA};$ $I_B = -0.5\text{ mA}$	-	-50	-200	mV
		$I_C = -100\text{ mA};$ $I_B = -5\text{ mA}$	-	-200	-400	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -10\text{ mA};$ $I_B = -0.5\text{ mA}$	[1]	-	-760	mV
		$I_C = -100\text{ mA};$ $I_B = -5\text{ mA}$	[1]	-	-920	mV

**Table 8. Characteristics ...continued**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>BE</sub>	base-emitter voltage	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -2 mA	[2] -600	-650	-700	mV
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -10 mA	[2] -	-	-760	mV
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = -10 V; I <sub>E</sub> = I <sub>e</sub> = 0 A; f = 1 MHz	-	-	2.2	pF
C <sub>e</sub>	emitter capacitance	V <sub>EB</sub> = -0.5 V; I <sub>C</sub> = I <sub>c</sub> = 0 A; f = 1 MHz	-	10	-	pF
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -10 mA; f = 100 MHz	100	175	-	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	-	1.6	-	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	-	3.1	-	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	[3] 0.9	1	-	
V <sub>BE1</sub> -V <sub>BE2</sub>	V <sub>BE</sub> matching	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -2 mA	[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 the numerator.

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

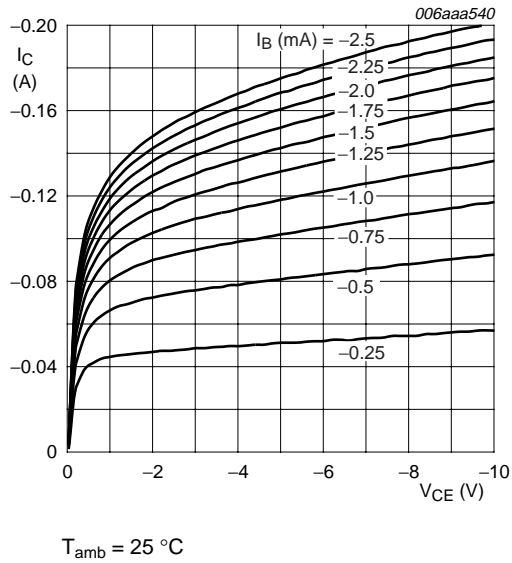


Fig 1. Collector current as a function of collector-emitter voltage; typical values

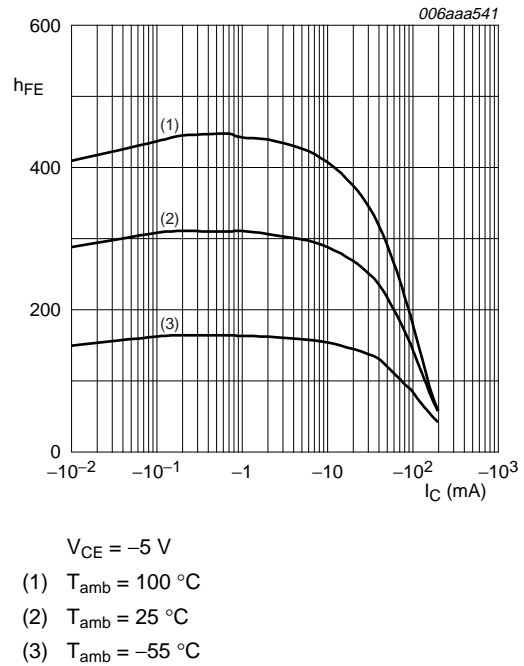


Fig 2. DC current gain as a function of collector current; typical values

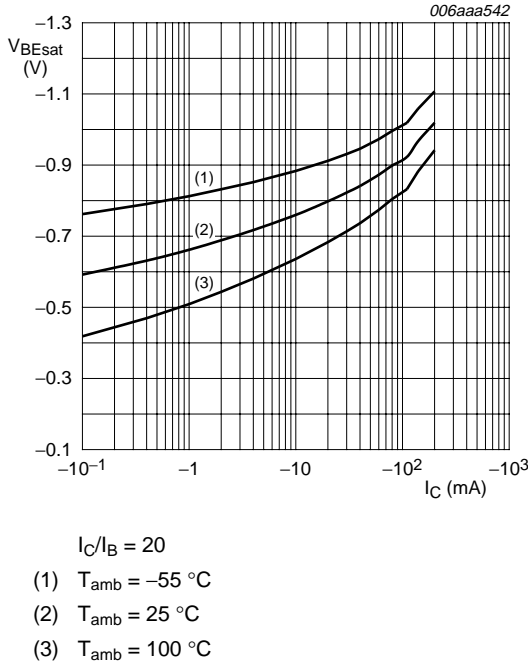


Fig 3. Base-emitter saturation voltage as a function of collector current; typical values

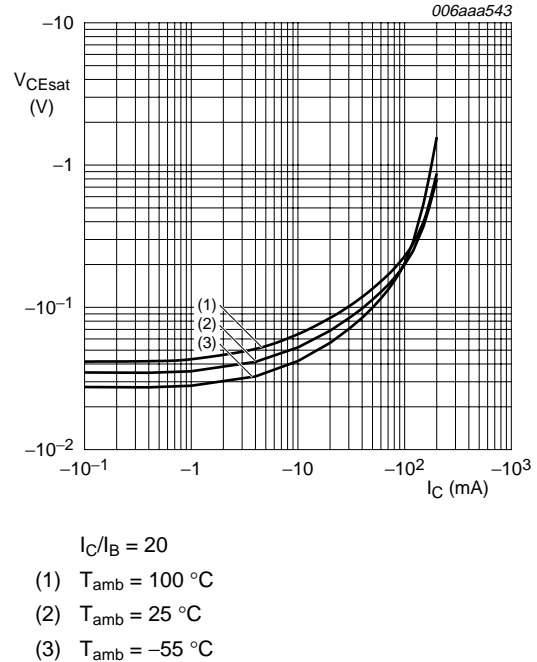
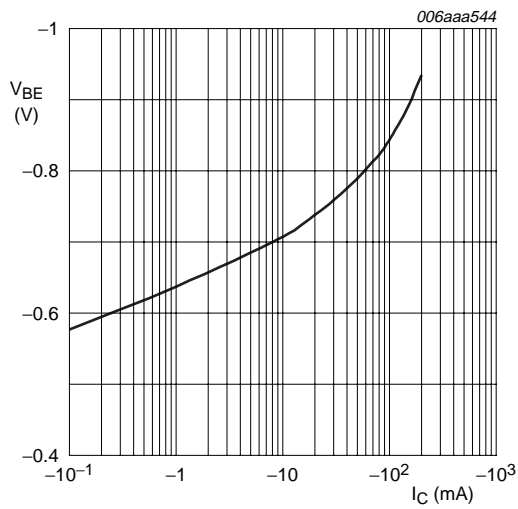
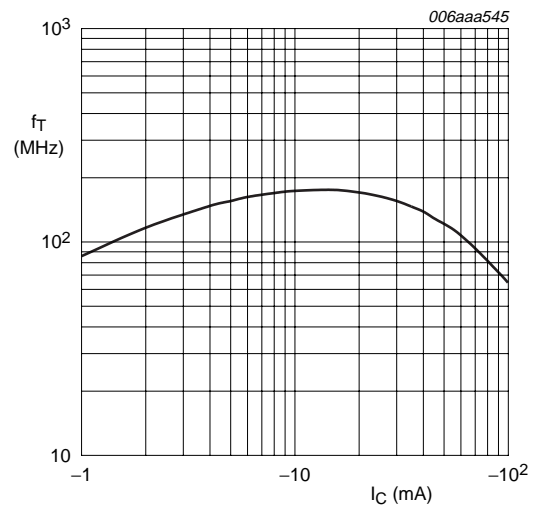


Fig 4. Collector-emitter saturation voltage as a function of collector current; typical values



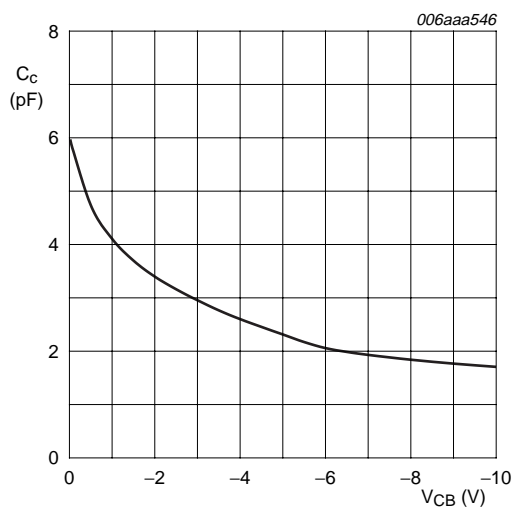
$V_{CE} = -5$  V;  $T_{amb} = 25$  °C

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



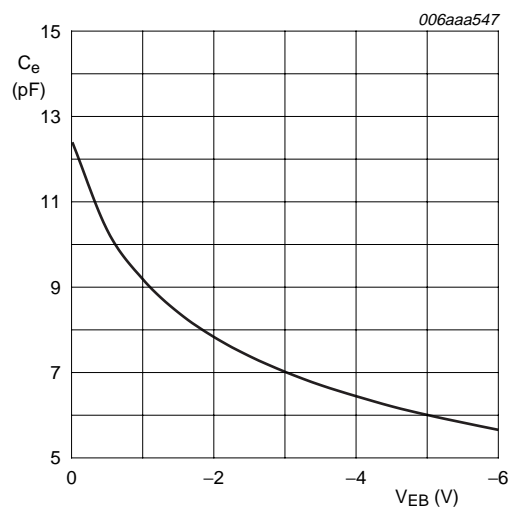
$V_{CE} = -5$  V;  $T_{amb} = 25$  °C

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



$f = 1$  MHz;  $T_{amb} = 25$  °C

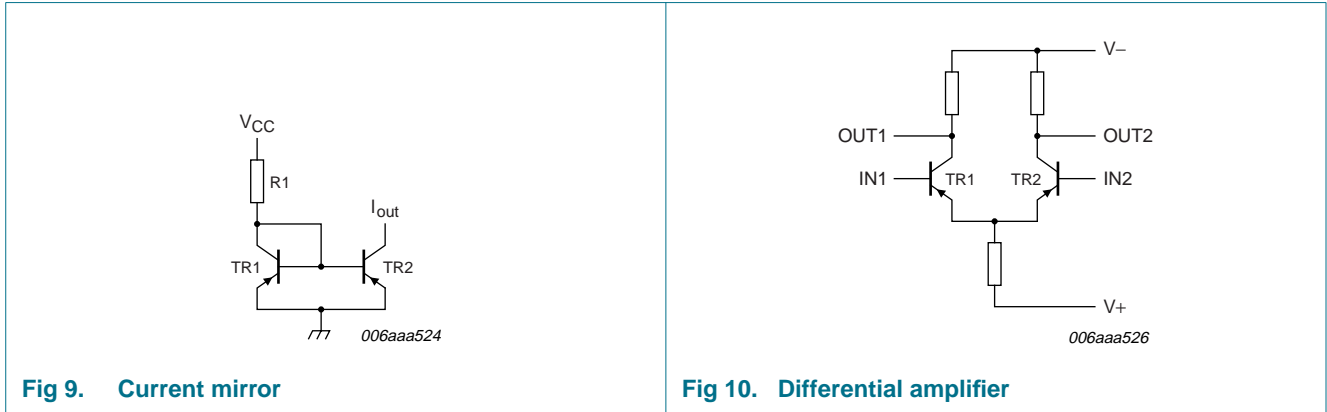
**Fig 7. Collector capacitance as a function of collector-base voltage; typical values**



$f = 1$  MHz;  $T_{amb} = 25$  °C

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

## 8. Application information

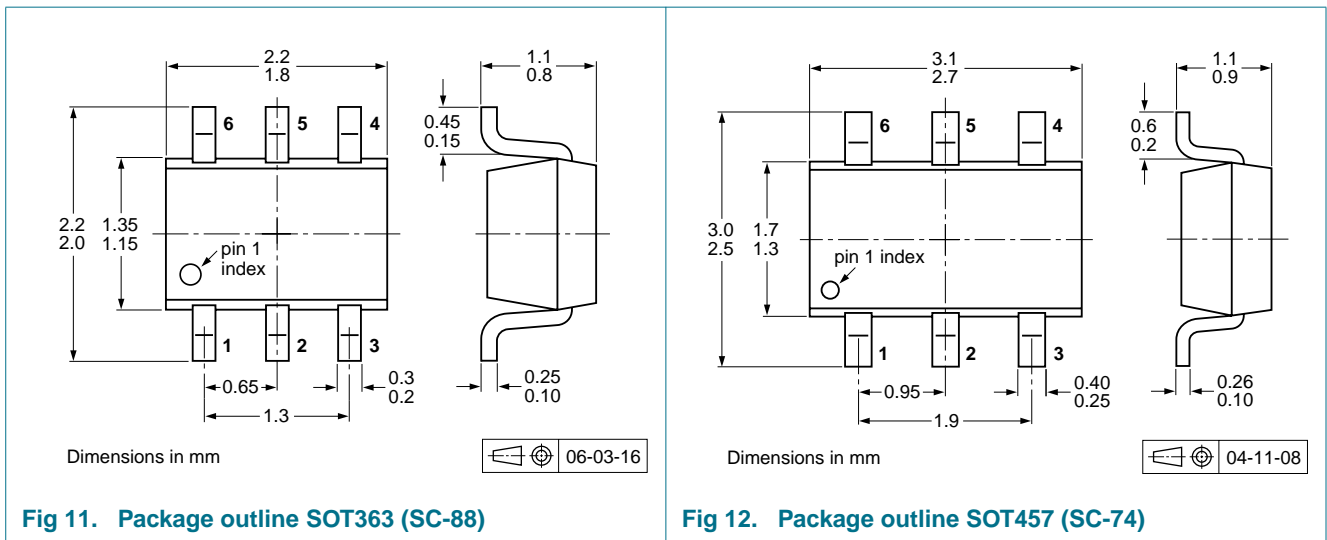


## 9. Test information

### 9.1 Quality information

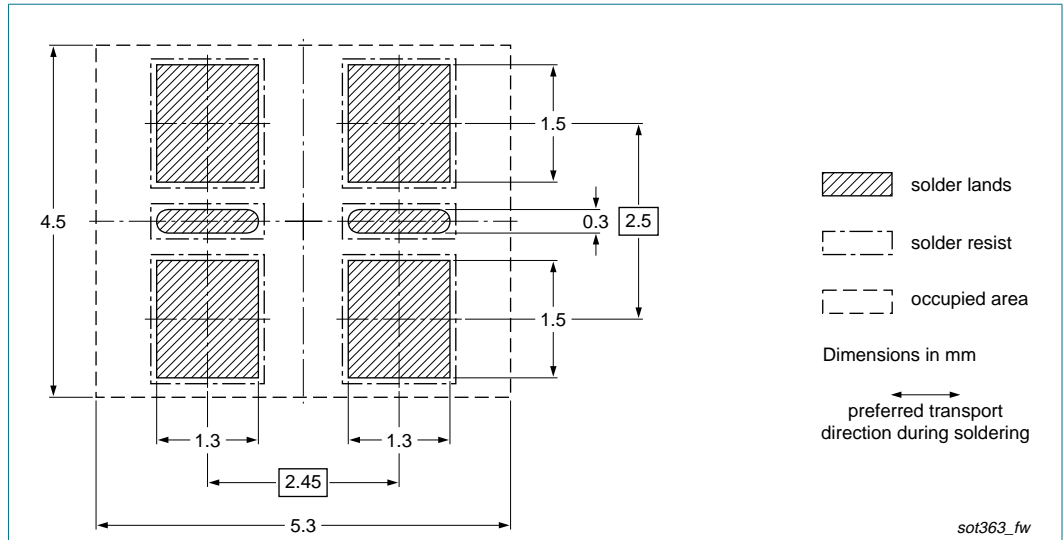
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 10. Package outline

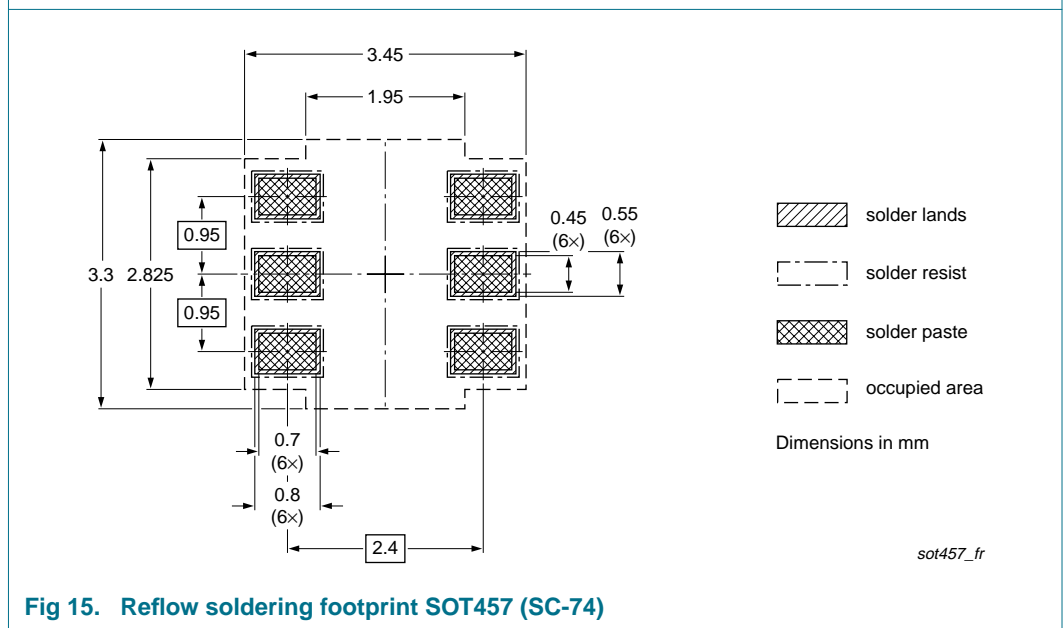




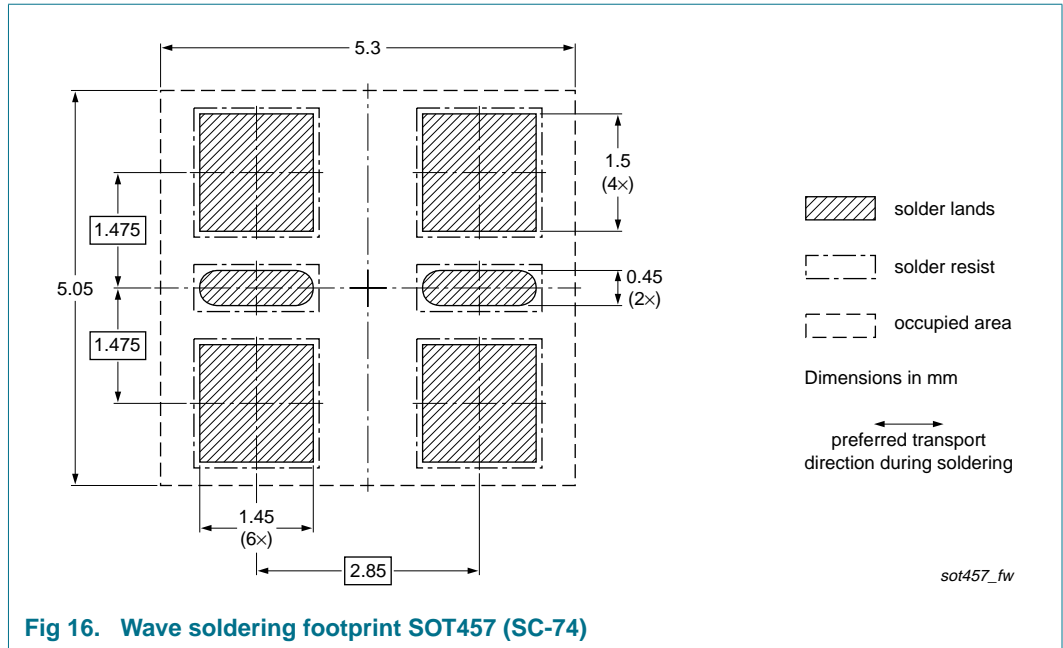




**Fig 14. Wave soldering footprint SOT363 (SC-88)**



**Fig 15. Reflow soldering footprint SOT457 (SC-74)**



## 13. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCM856BS_BCM856DS_1	20080807	Product data sheet	-	-

## 14. Legal information

### 14.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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[2] The term 'short data sheet' is explained in section "Definitions".

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