

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
Per transistor						
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	

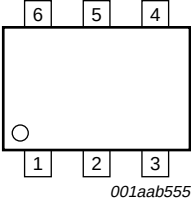
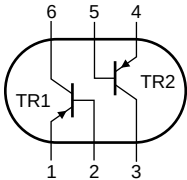
Table 2. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per device						
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	 001aab555	 sym018
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 ^[1]
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
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	-	-5	V
I _C	collector current		-	-100	mA
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms	-	-200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C			
	BCM856BS (SOT363) BCM856BS/DG (SOT363)		^[1] -	200	mW
	BCM856DS (SOT457) BCM856DS/DG (SOT457)		^[1] -	250	mW
Per device					
P _{tot}	total power dissipation	T _{amb} ≤ 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
Per transistor						
$R_{th(j-a)}$	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
Per device						
$R_{th(j-a)}$	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = -30\text{ V};$ $I_E = 0\text{ A}$	-	-	-15	nA
		$V_{CB} = -30\text{ V};$ $I_E = 0\text{ A};$ $T_j = 150\text{ }^{\circ}\text{C}$	-	-	-5	μA
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 $T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{BE}	base-emitter voltage	V _{CE} = −5 V; I _C = −2 mA	[2] −600	−650	−700	mV
		V _{CE} = −5 V; I _C = −10 mA	[2] -	-	−760	mV
C _c	collector capacitance	V _{CB} = −10 V; I _E = i _e = 0 A; f = 1 MHz	-	-	2.2	pF
C _e	emitter capacitance	V _{EB} = −0.5 V; I _C = i _c = 0 A; f = 1 MHz	-	10	-	pF
f _T	transition frequency	V _{CE} = −5 V; I _C = −10 mA; f = 100 MHz	100	175	-	MHz
NF	noise figure	V _{CE} = −5 V; I _C = −0.2 mA; R _S = 2 kΩ; f = 10 Hz to 15.7 kHz	-	1.6	-	dB
		V _{CE} = −5 V; I _C = −0.2 mA; R _S = 2 kΩ; f = 1 kHz; B = 200 Hz	-	3.1	-	dB
Per device						
h _{FE1} /h _{FE2}	h _{FE} matching	V _{CE} = −5 V; I _C = −2 mA	[3] 0.9	1	-	
V _{BE1} −V _{BE2}	V _{BE} matching	V _{CE} = −5 V; I _C = −2 mA	[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.

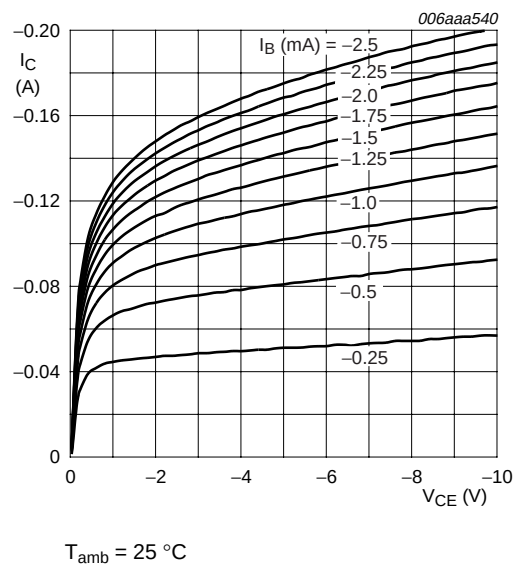


Fig 1. Collector current as a function of collector-emitter voltage; typical values

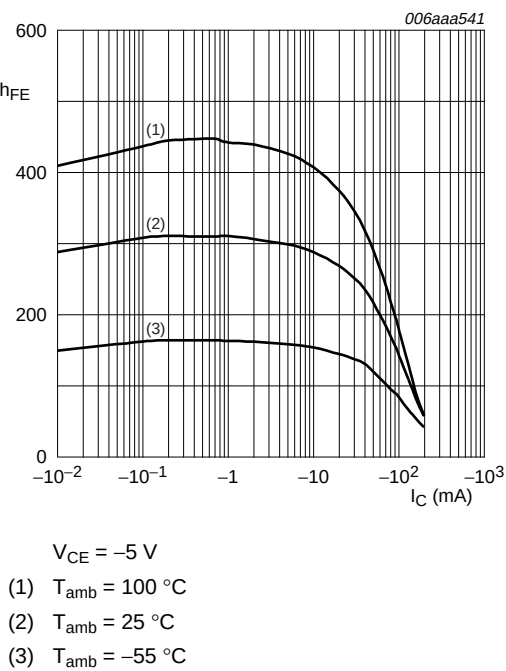


Fig 2. DC current gain as a function of collector current; typical values

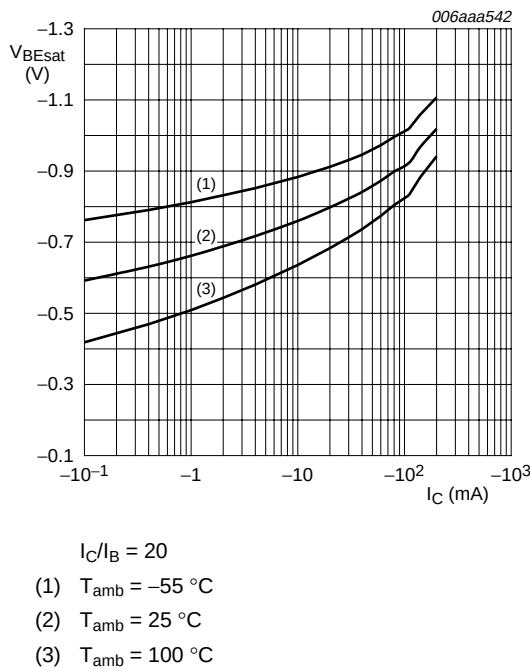


Fig 3. Base-emitter saturation voltage as a function of collector current; typical values

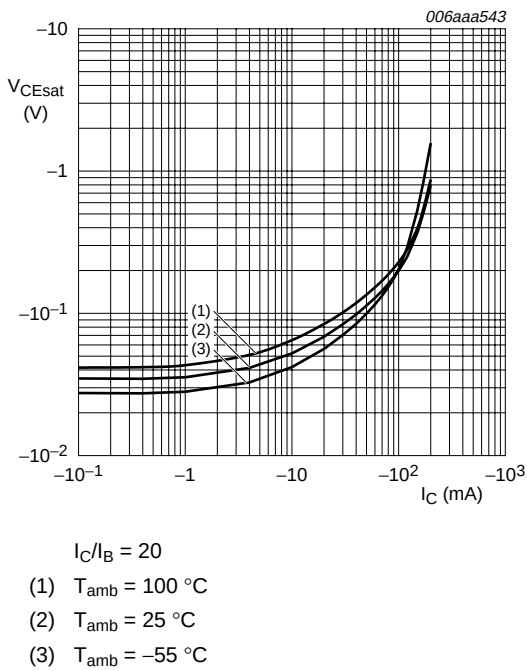
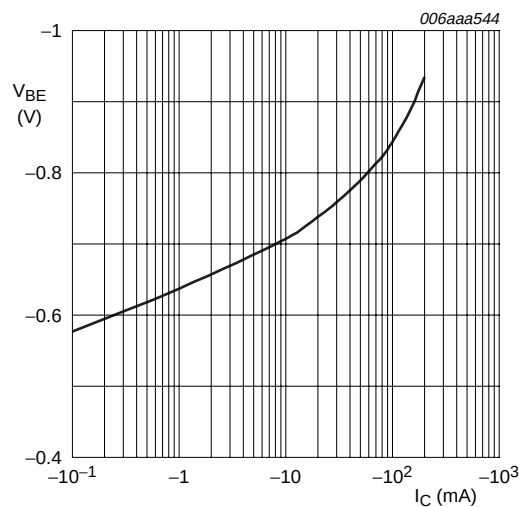
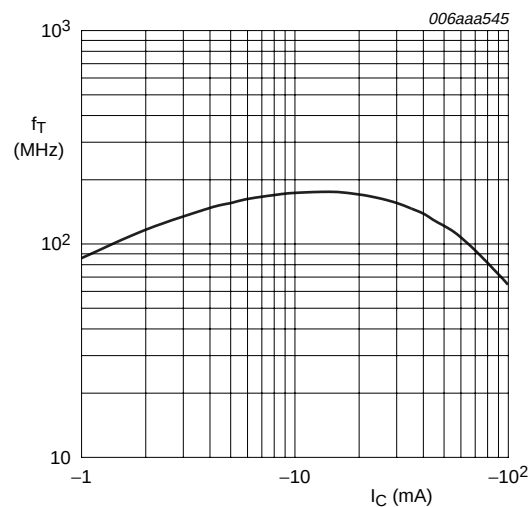


Fig 4. Collector-emitter saturation voltage as a function of collector current; typical values



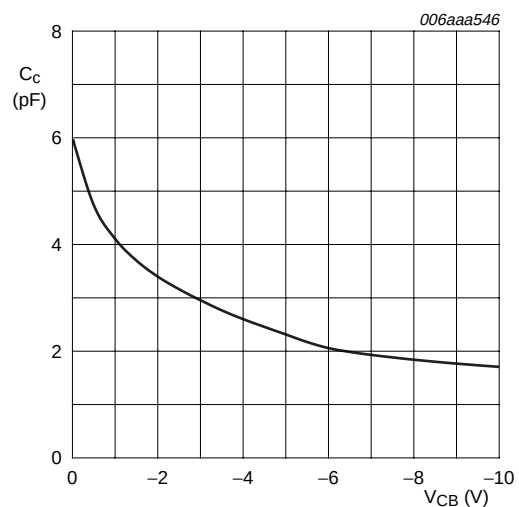
$V_{CE} = -5$ V; $T_{amb} = 25$ °C

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



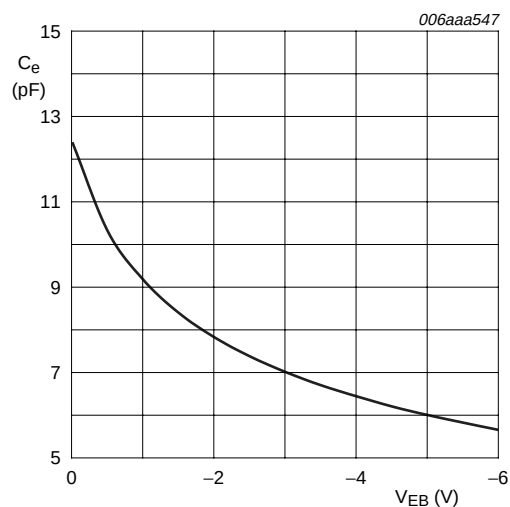
$V_{CE} = -5$ V; $T_{amb} = 25$ °C

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



$f = 1$ MHz; $T_{amb} = 25$ °C

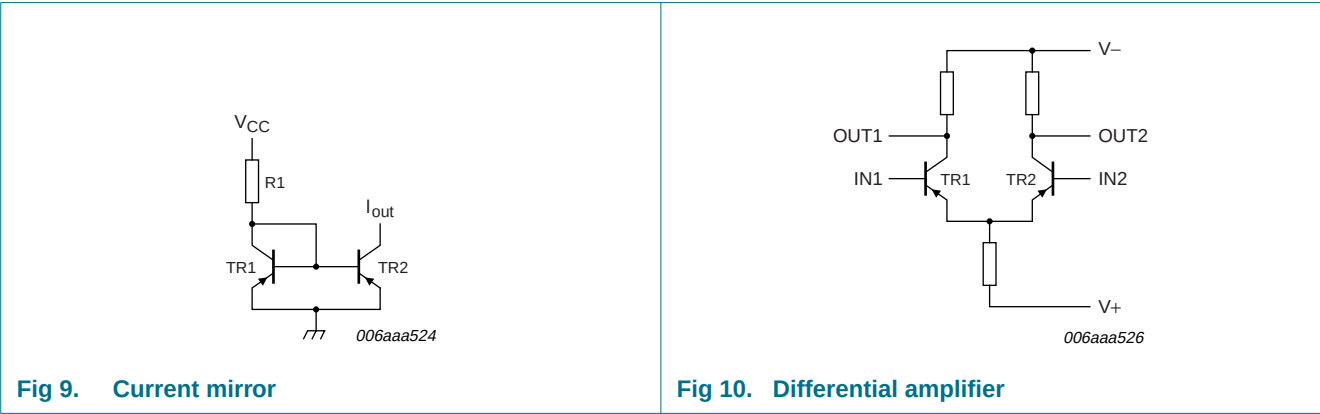
Fig 7. Collector capacitance as a function of collector-base voltage; typical values



$f = 1$ MHz; $T_{amb} = 25$ °C

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

8. Application information

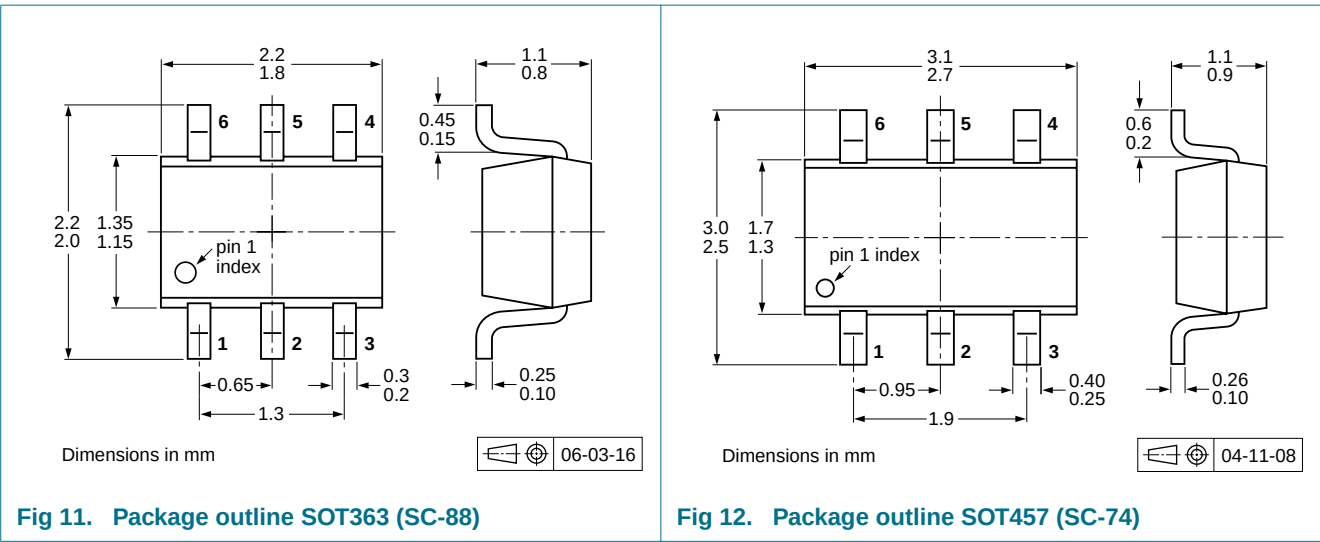


9. Test information

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



11. Packing information

Table 9. Packing methods
The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

Type number	Package	Description	Packing quantity	
			3000	10000
BCM856BS	SOT363	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-135
		4 mm pitch, 8 mm tape and reel; T2	^[3] -125	-165
BCM856BS/DG	SOT363	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-135
		4 mm pitch, 8 mm tape and reel; T2	^[3] -125	-165
BCM856DS	SOT457	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-135
		4 mm pitch, 8 mm tape and reel; T2	^[3] -125	-165
BCM856DS/DG	SOT457	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-135
		4 mm pitch, 8 mm tape and reel; T2	^[3] -125	-165

- [1] For further information and the availability of packing methods, see [Section 15](#).
[2] T1: normal taping
[3] T2: reverse taping

12. Soldering

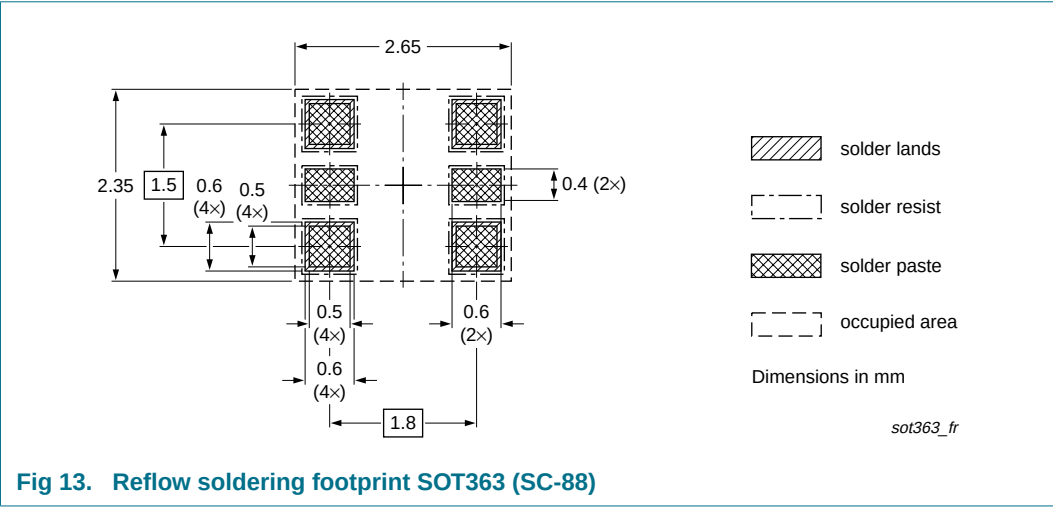
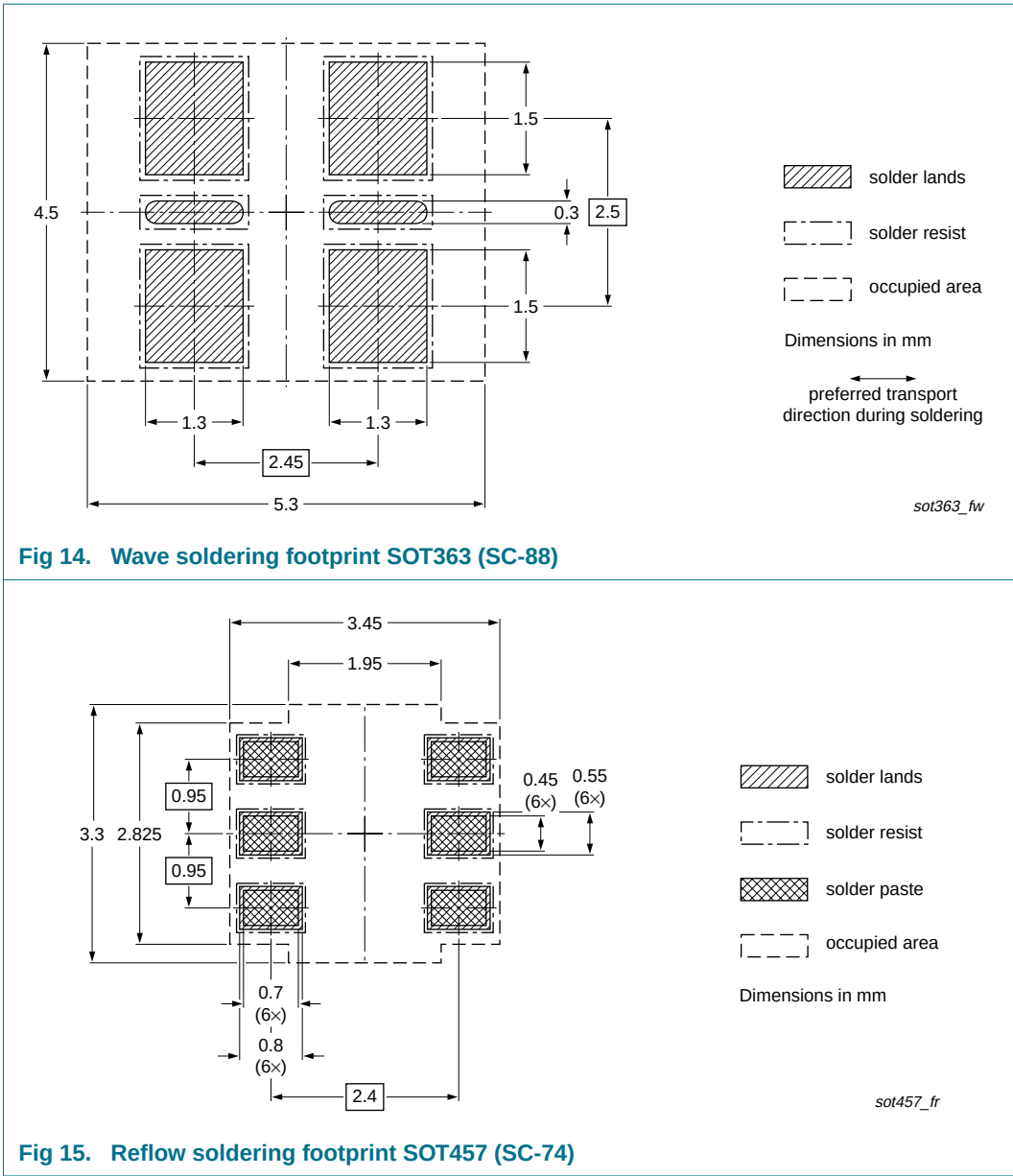
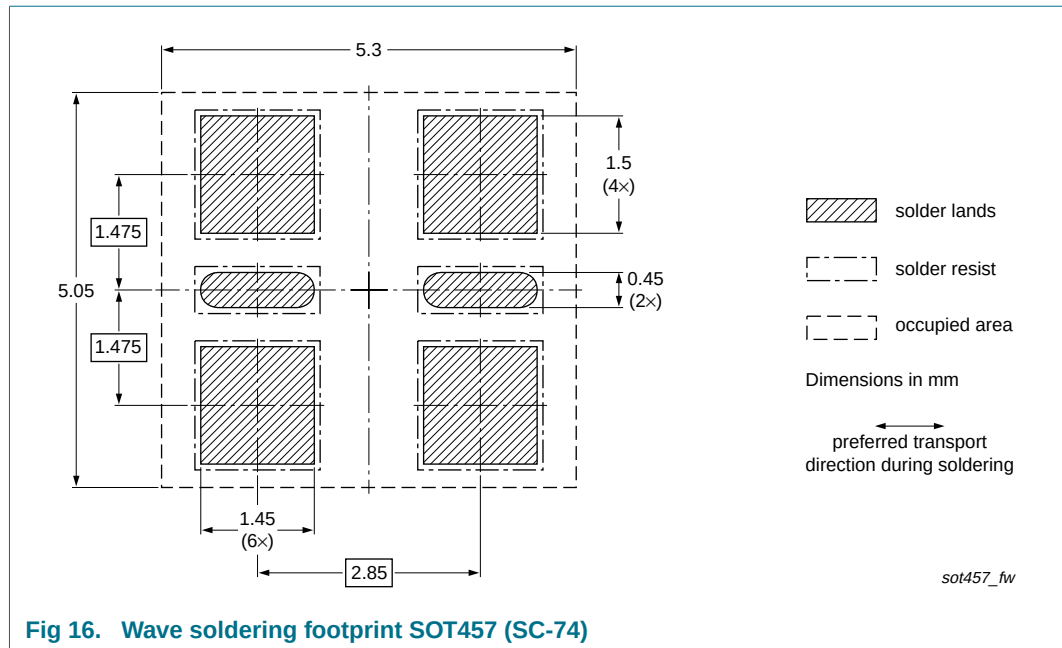


Fig 13. Reflow soldering footprint SOT363 (SC-88)





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 ^{[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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