

BCM847BV; BCM847BS; BCM847DS

NPN/NPN matched double transistors

Rev. 05 — 27 June 2006

Product data sheet

1. Product profile

1.1 General description

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

Table 1. Product overview

Type number	Package		PNP/PNP complement	Matched version of
	Philips	JEITA		
BCM847BV	SOT666	-	BCM857BV	BC847BV
BCM847BS	SOT363	SC-88	BCM857BS	BC847BS
BCM847DS	SOT457	SC-74	BCM857DS	-

1.2 Features

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

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_{CEO}	collector-emitter voltage	open base	-	-	45	V
I_C	collector current		-	-	100	mA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	200	290	450	

Table 2. Quick reference data ...continued

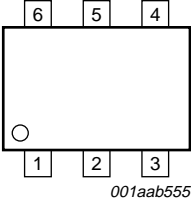
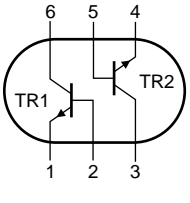
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per device						
h_{FE1}/h_{FE2}	h_{FE} matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[1] 0.9	1	-	
$V_{BE1}-V_{BE2}$	V_{BE} matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[2] -	-	2	mV

[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	Symbol
1	emitter TR1	 <p>001aab555</p>	 <p>sym020</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		Version
	Name	Description	
BCM847BV	-	plastic surface-mounted package; 6 leads	SOT666
BCM847BS	SC-88	plastic surface-mounted package; 6 leads	SOT363
BCM847DS	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
BCM847BV	3A
BCM847BS	M1*
BCM847DS	R6

[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	-	50	V	
V_{CEO}	collector-emitter voltage	open base	-	45	V	
V_{EBO}	emitter-base voltage	open collector	-	6	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				
	SOT666		[1][2]	-	200	mW
	SOT363		[1]	-	200	mW
	SOT457		[1]	-	250	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
	SOT666		[1][2]	-	300	mW
	SOT363		[1]	-	300	mW
	SOT457		[1]	-	380	mW
T_j	junction temperature		-	150	°C	
T_{amb}	ambient temperature		-65	+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.

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

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					
	SOT666		[1][2]	-	-	625	K/W
	SOT363		[1]	-	-	625	K/W
	SOT457		[1]	-	-	500	K/W

Table 7. Thermal characteristics ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT666		[1][2]	-	416	K/W
	SOT363		[1]	-	416	K/W
	SOT457		[1]	-	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.

7. Characteristics

Table 8. Characteristics

$T_{amb} = 25^\circ\text{C}$ 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
		$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A};$ $T_j = 150^\circ\text{C}$	-	-	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	-
		$I_C = 100\text{ mA};$ $I_B = 5\text{ mA}$	[1]	-	910	-
V_{BE}	base-emitter voltage	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[2]	610	660	710
		$V_{CE} = 5\text{ V};$ $I_C = 10\text{ mA}$	[2]	-	-	770
C_c	collector capacitance	$V_{CB} = 10\text{ V};$ $I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	-	1.5	pF
C_e	emitter capacitance	$V_{EB} = 0.5\text{ V};$ $I_C = i_c = 0\text{ A};$ $f = 1\text{ MHz}$	-	11	-	pF

Table 8. Characteristics ...continued $T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
f_T	transition frequency	$V_{CE} = 5\text{ V};$ $I_C = 10\text{ mA};$ $f = 100\text{ MHz}$	100	250	-	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 kHz	-	2.8	-	dB
		$V_{CE} = 5\text{ V};$ $I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega;$ $f = 1\text{ kHz};$ $B = 200\text{ Hz}$	-	3.3	-	dB
Per device						
h_{FE1}/h_{FE2}	h_{FE} matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[3] 0.9	1	-	
$V_{BE1}-V_{BE2}$	V_{BE} matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[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.

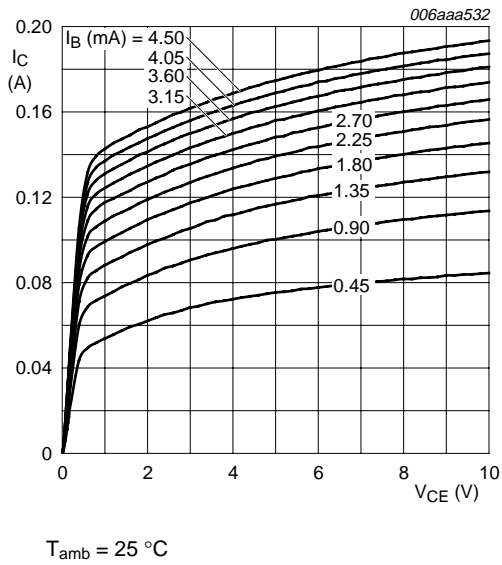


Fig 1. Collector current as a function of collector-emitter voltage; typical values

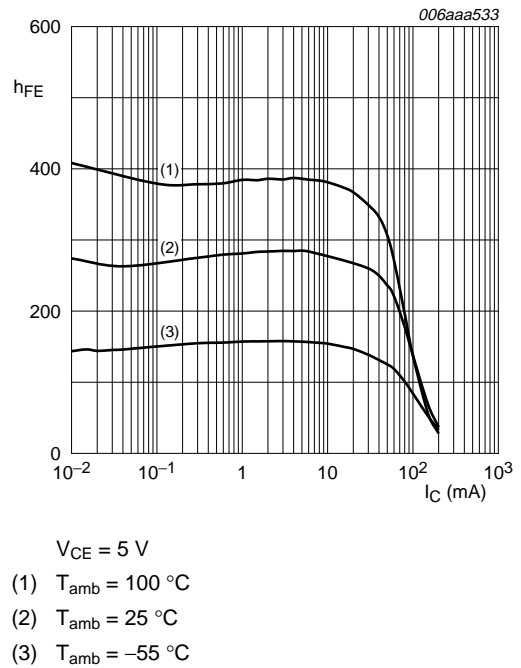


Fig 2. DC current gain as a function of collector current; typical values

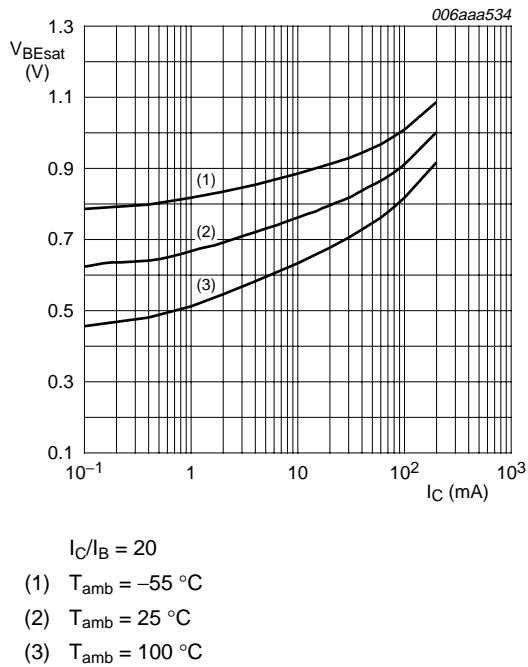


Fig 3. Base-emitter saturation voltage as a function of collector current; typical values

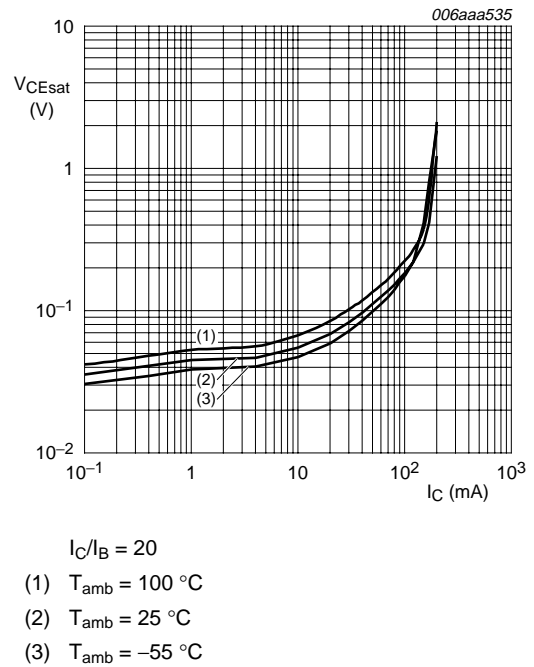
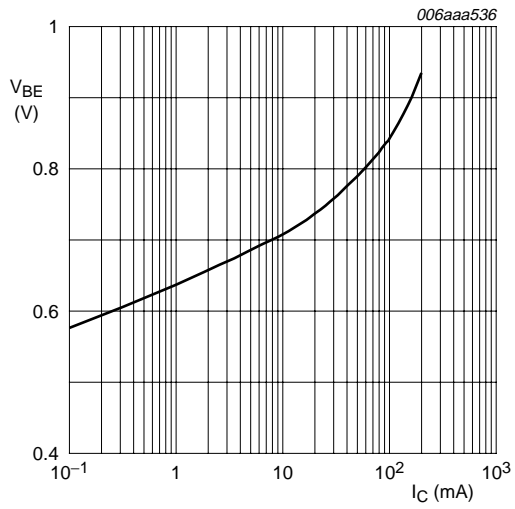
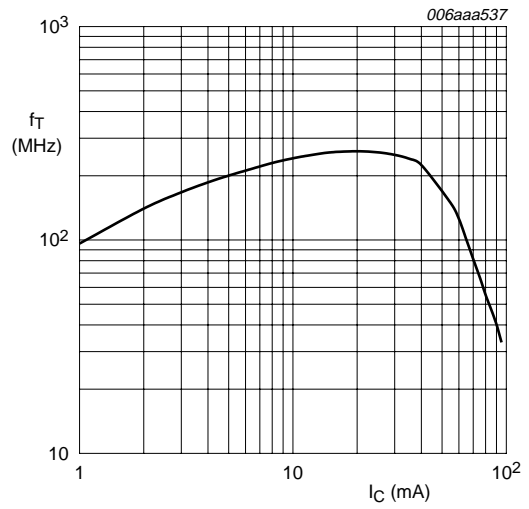


Fig 4. Collector-emitter saturation voltage as a function of collector current; typical values



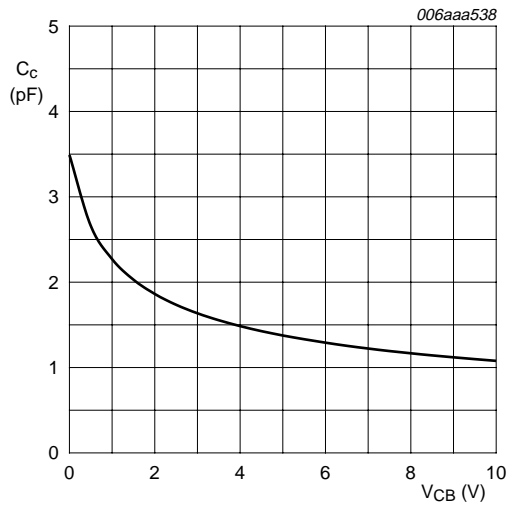
$V_{CE} = 5$ V; $T_{amb} = 25$ °C

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



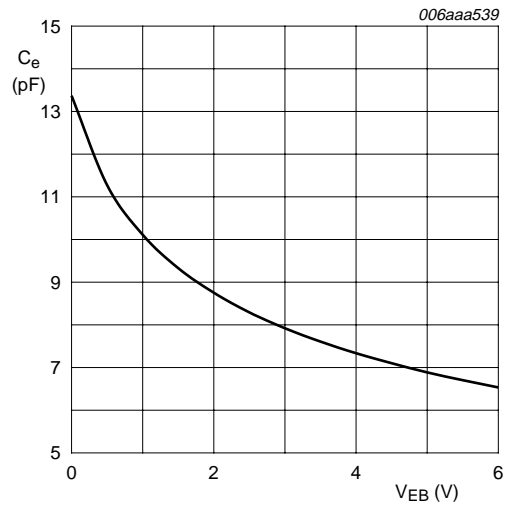
$V_{CE} = 5$ V; $T_{amb} = 25$ °C

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

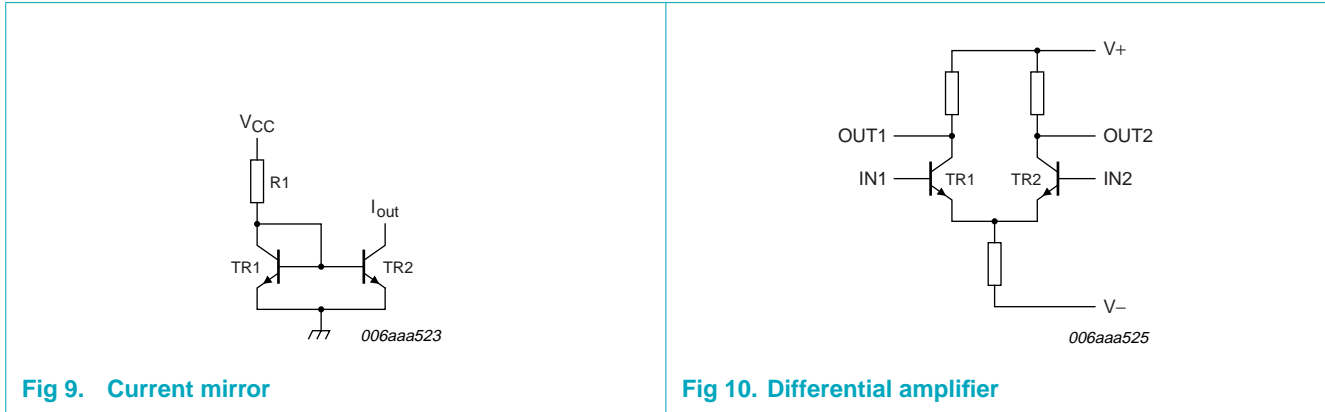


Fig 9. Current mirror

Fig 10. Differential amplifier

9. Package outline

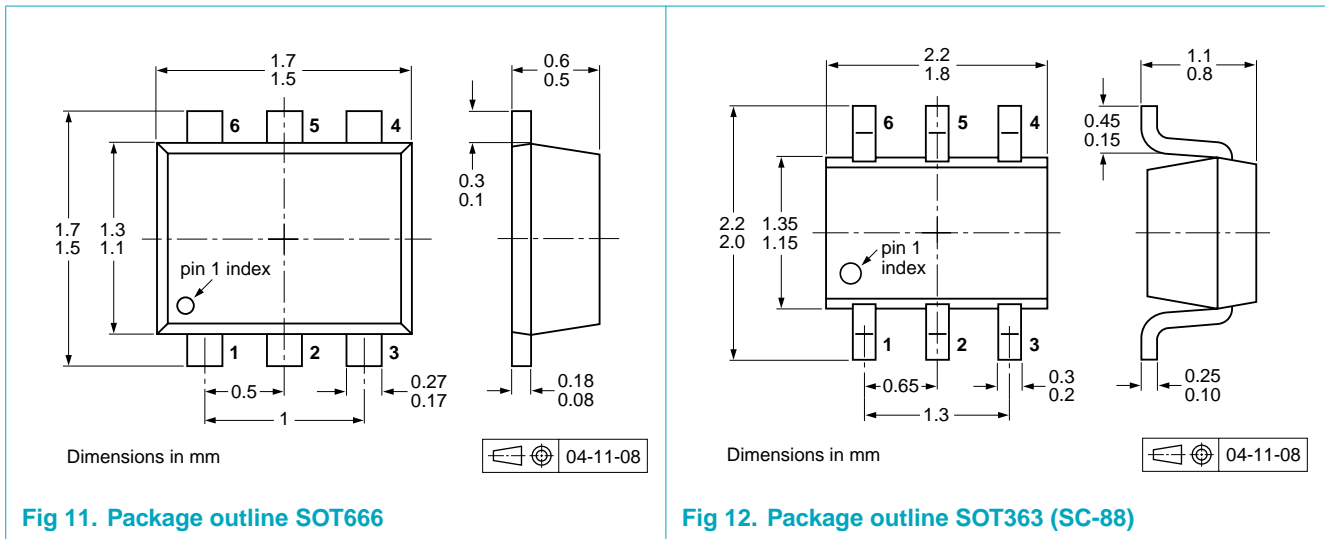


Fig 11. Package outline SOT666

Fig 12. Package outline SOT363 (SC-88)

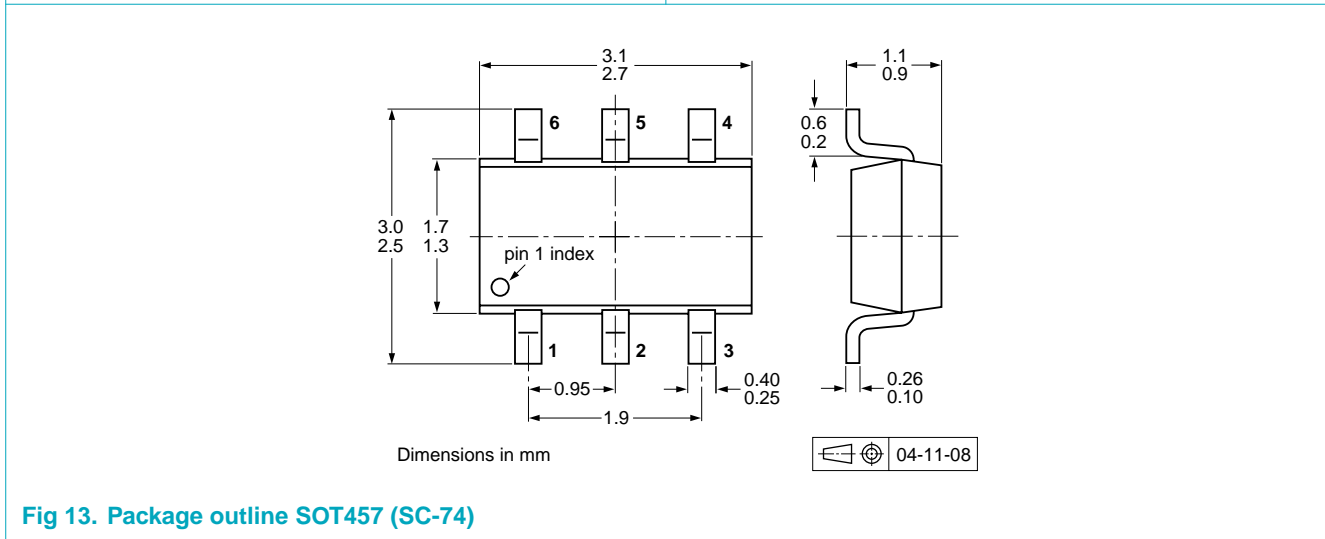


Fig 13. Package outline SOT457 (SC-74)

10. Packing information

Table 9. Packing methods

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

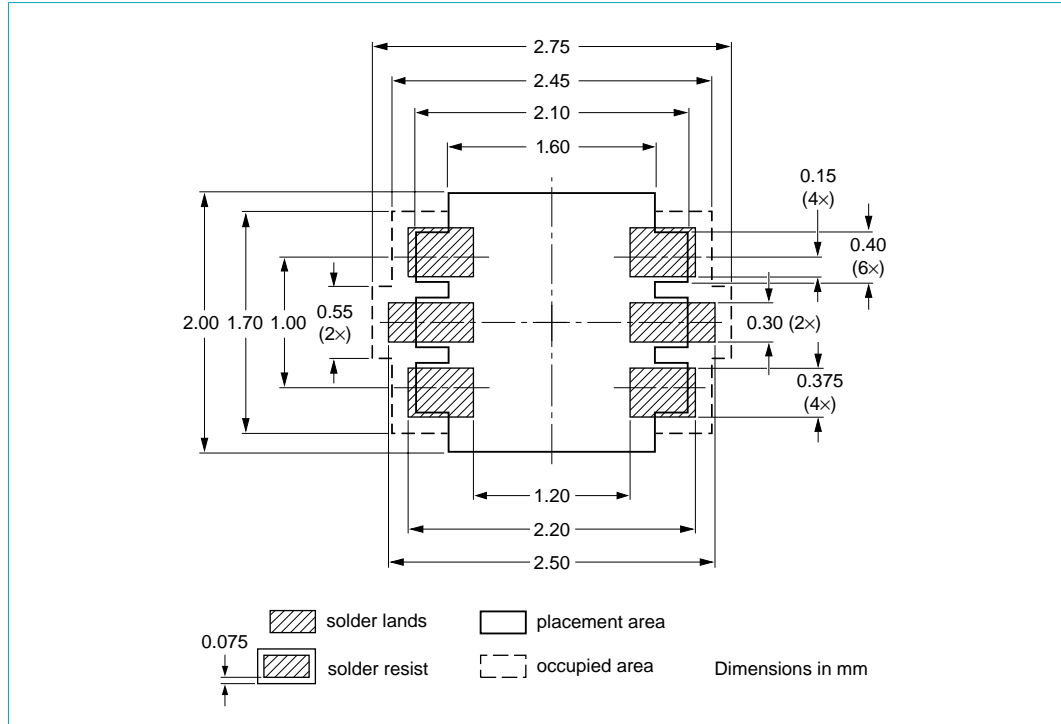
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
BCM847BV	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
BCM847BS	SOT363	4 mm pitch, 8 mm tape and reel; T1 ^[2]	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 ^[3]	-125	-	-	-165
BCM847DS	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 14](#).

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



Reflow soldering is the only recommended soldering method.

Fig 14. Reflow soldering footprint SOT666

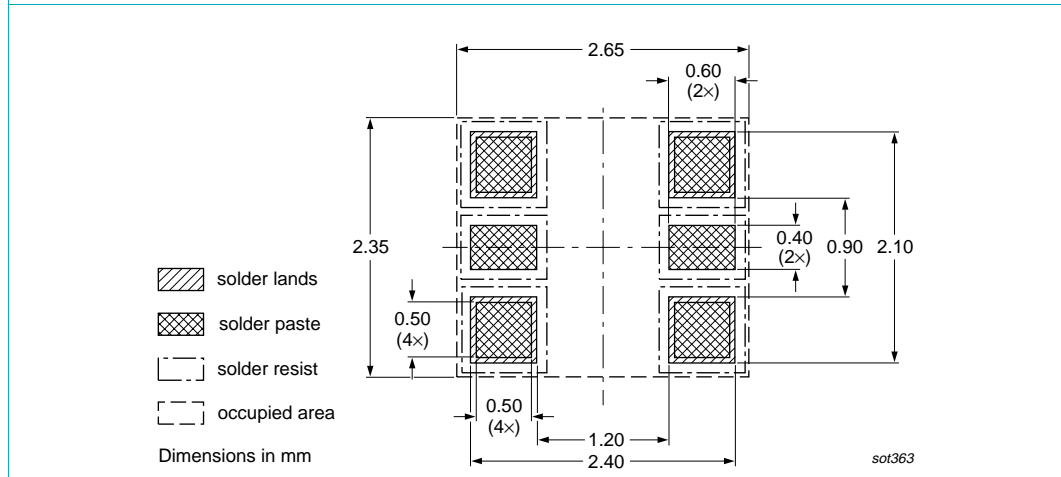


Fig 15. Reflow soldering footprint SOT363 (SC-88)

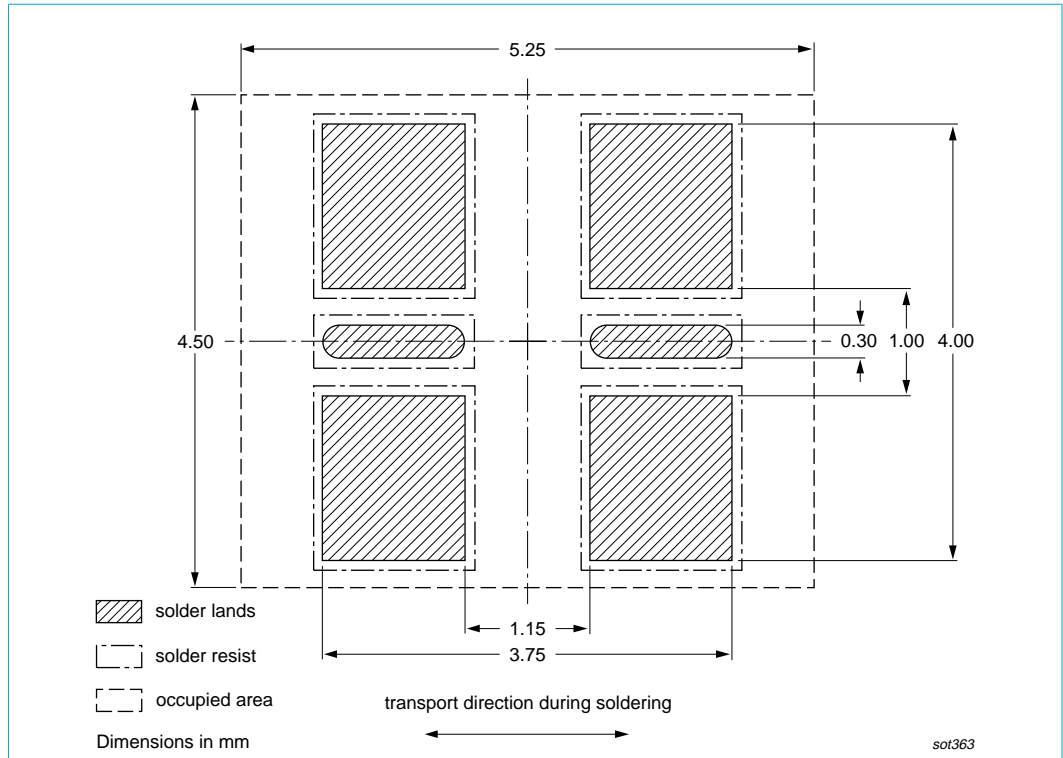


Fig 16. Wave soldering footprint SOT363 (SC-88)

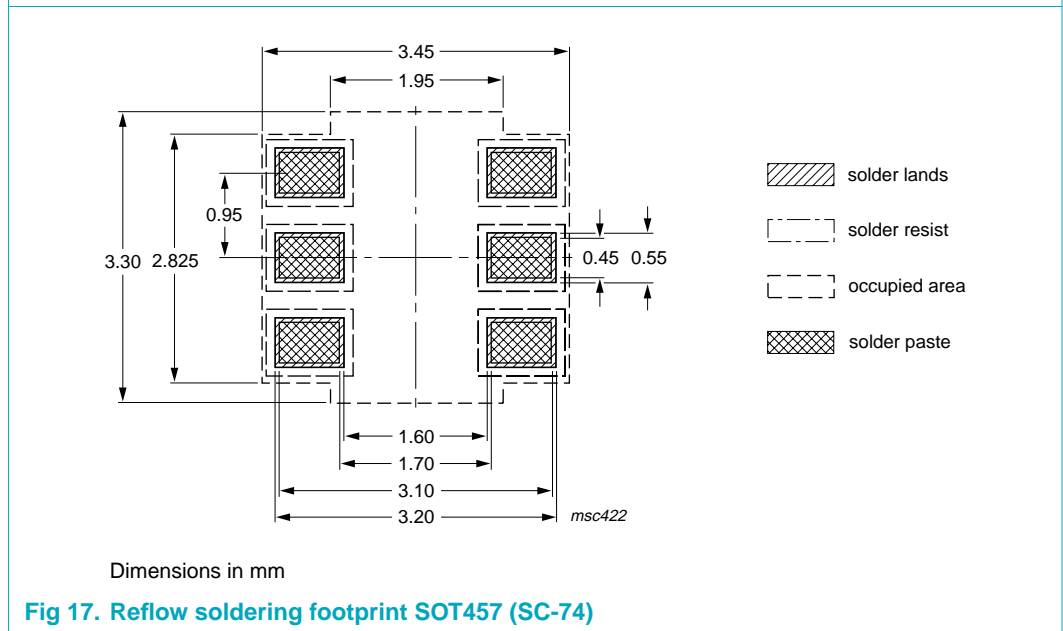
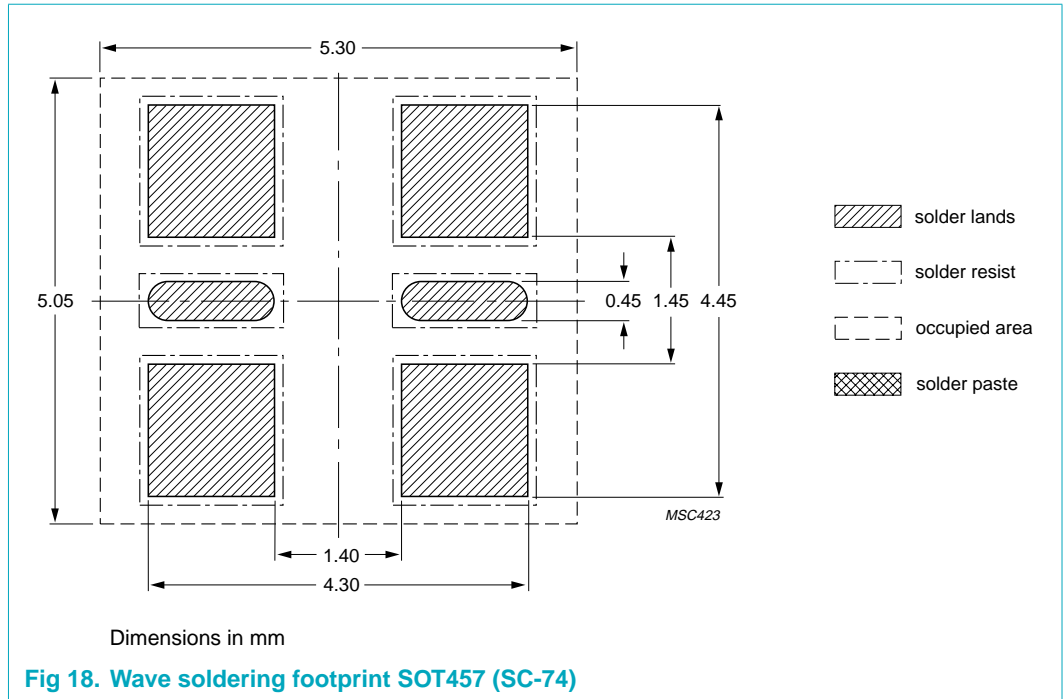


Fig 17. Reflow soldering footprint SOT457 (SC-74)



12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCM847BV_BS_DS_5	20060627	Product data sheet	-	BCM847BS_DS_4
Modifications:	<ul style="list-style-type: none">Type number BCM847BV addedSection 13 "Legal information": updated			
BCM847BS_DS_4	20060216	Product data sheet	-	BCM847BS_DS_3
BCM847BS_DS_3	20060123	Product data sheet	-	BCM847BS_2
BCM847BS_2	20050406	Product data sheet	-	BCM847BS_1
BCM847BS_1	20040914	Product data sheet	-	-

13. Legal information

13.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.semiconductors.philips.com>.

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