

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_{CE0}	collector-emitter voltage	open base	-	-	45	V
I_C	collector current		-	-	100	mA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	200	290	450	

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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

$T_{amb} = 25\text{ }^{\circ}\text{C}$ 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	-
		$I_C = 100\text{ mA};$ $I_B = 5\text{ mA}$	[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.

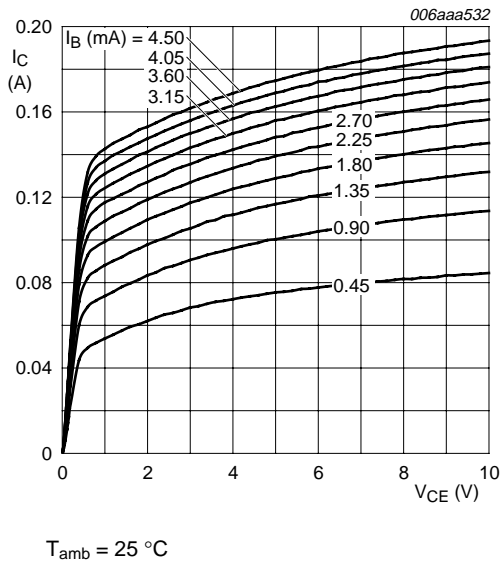


Fig 1. Collector current as a function of collector-emitter voltage; typical values

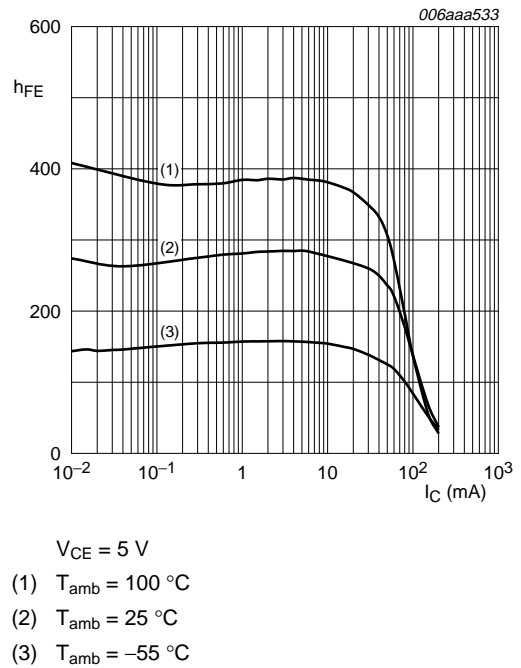


Fig 2. DC current gain as a function of collector current; typical values

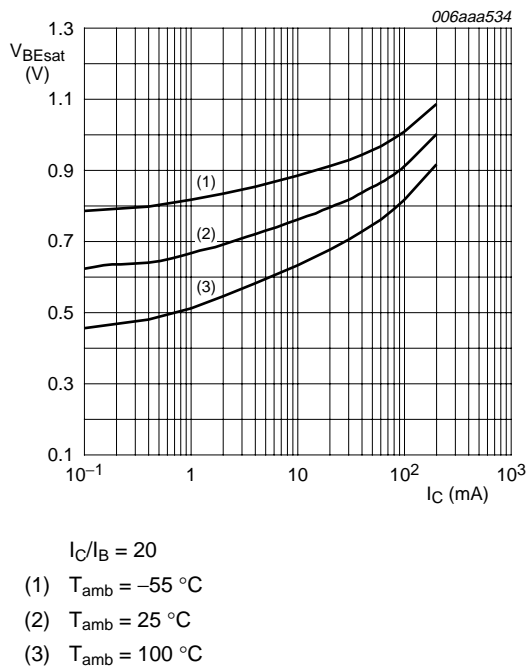


Fig 3. Base-emitter saturation voltage as a function of collector current; typical values

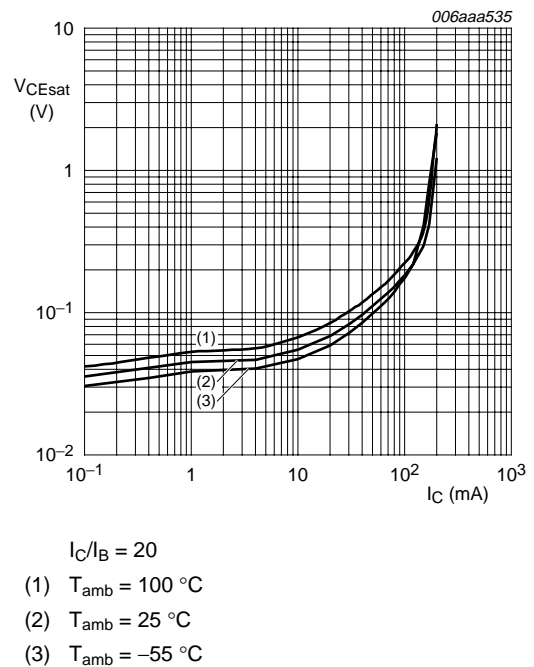
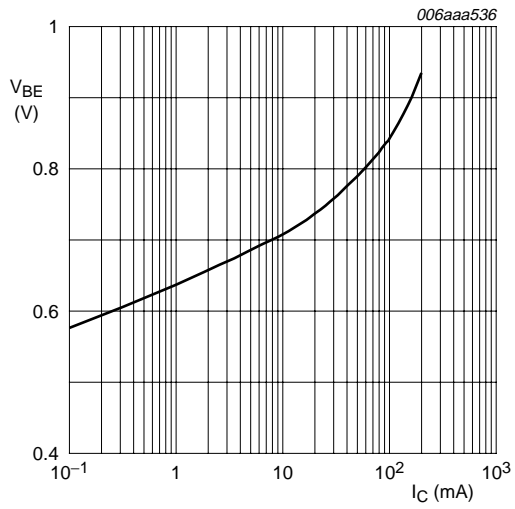
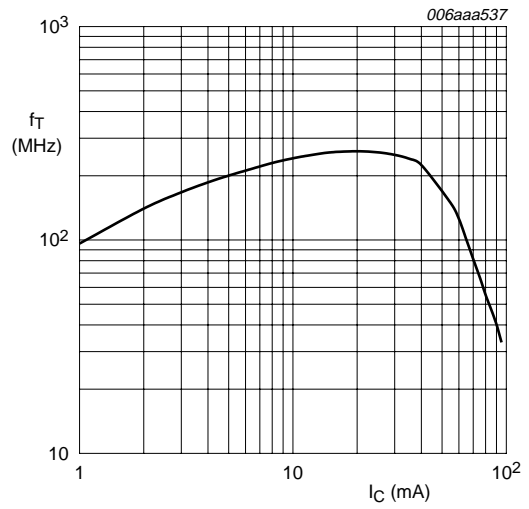


Fig 4. Collector-emitter saturation voltage as a function of collector current; typical values



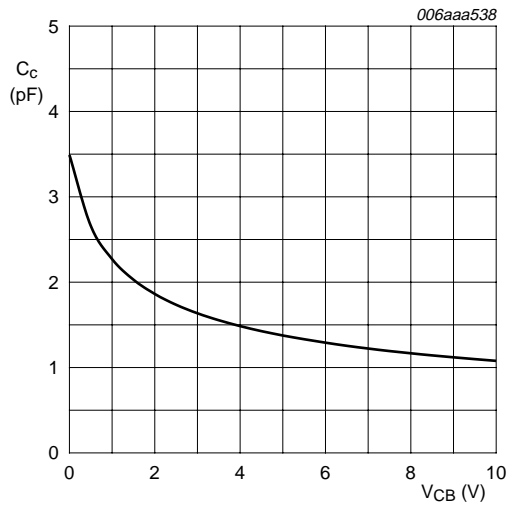
$V_{CE} = 5$ V; $T_{amb} = 25$ °C

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



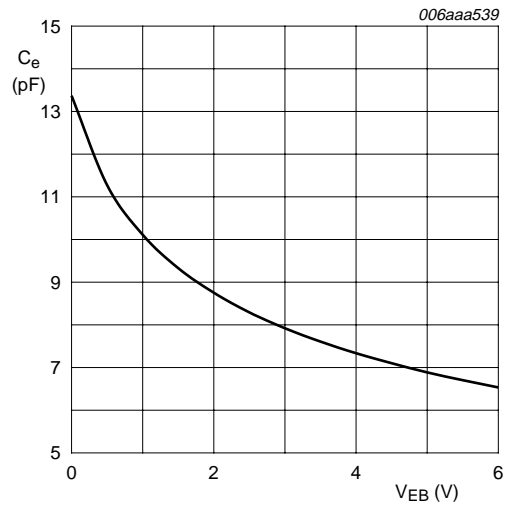
$V_{CE} = 5$ V; $T_{amb} = 25$ °C

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

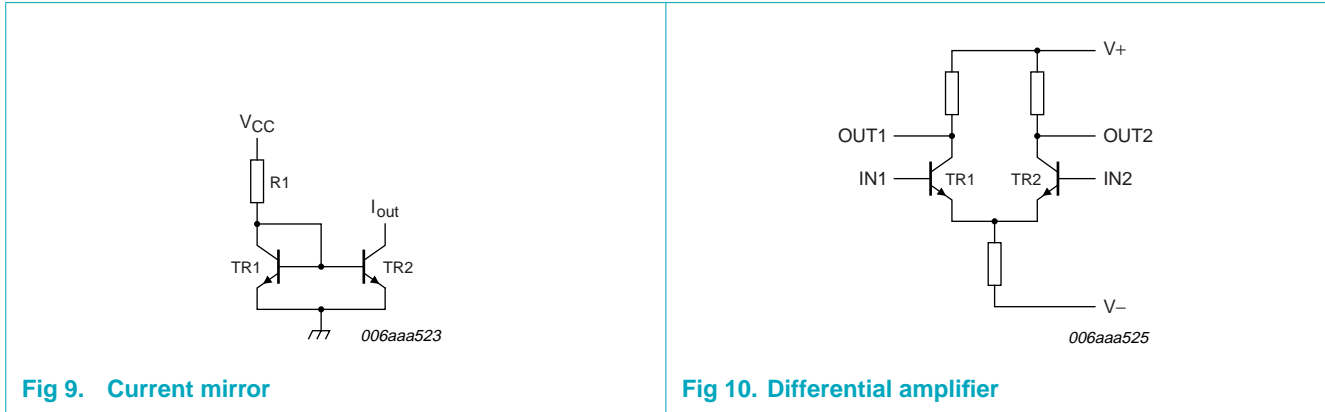


Fig 9. Current mirror

Fig 10. Differential amplifier

9. Package outline

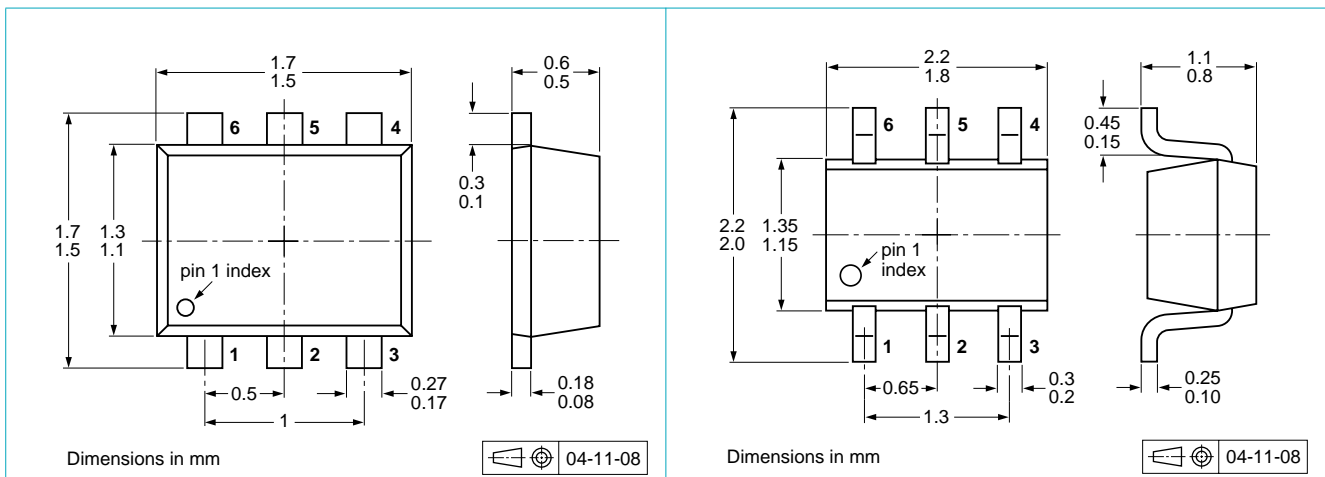


Fig 11. Package outline SOT666

Fig 12. Package outline SOT363 (SC-88)

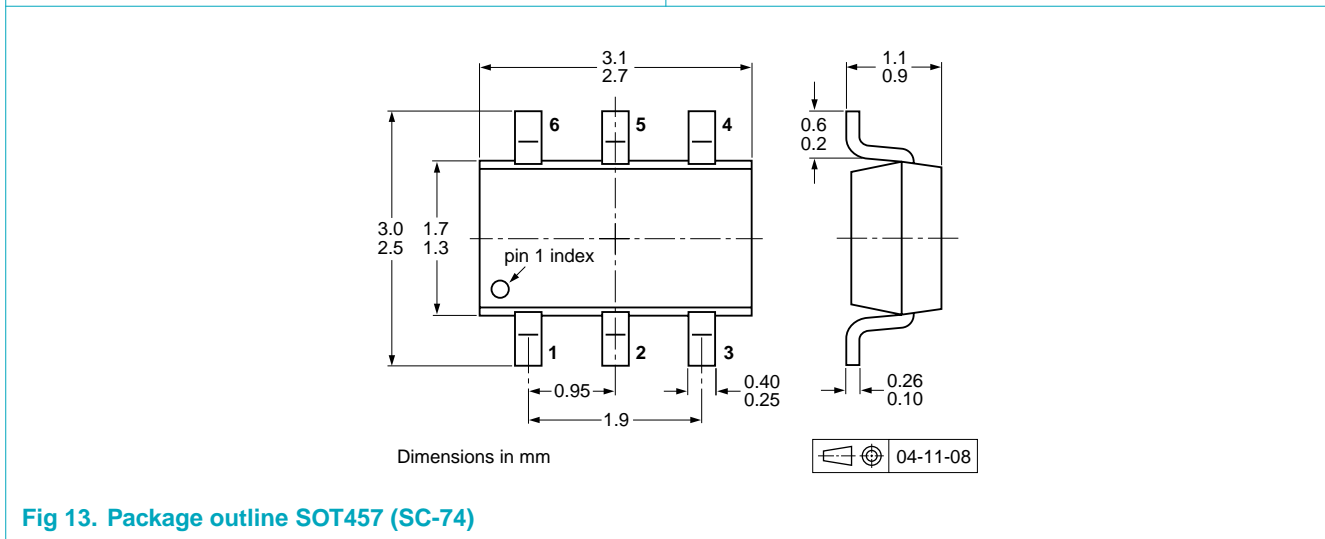


Fig 13. Package outline SOT457 (SC-74)

10. Packing information

Table 9. Packing methods

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

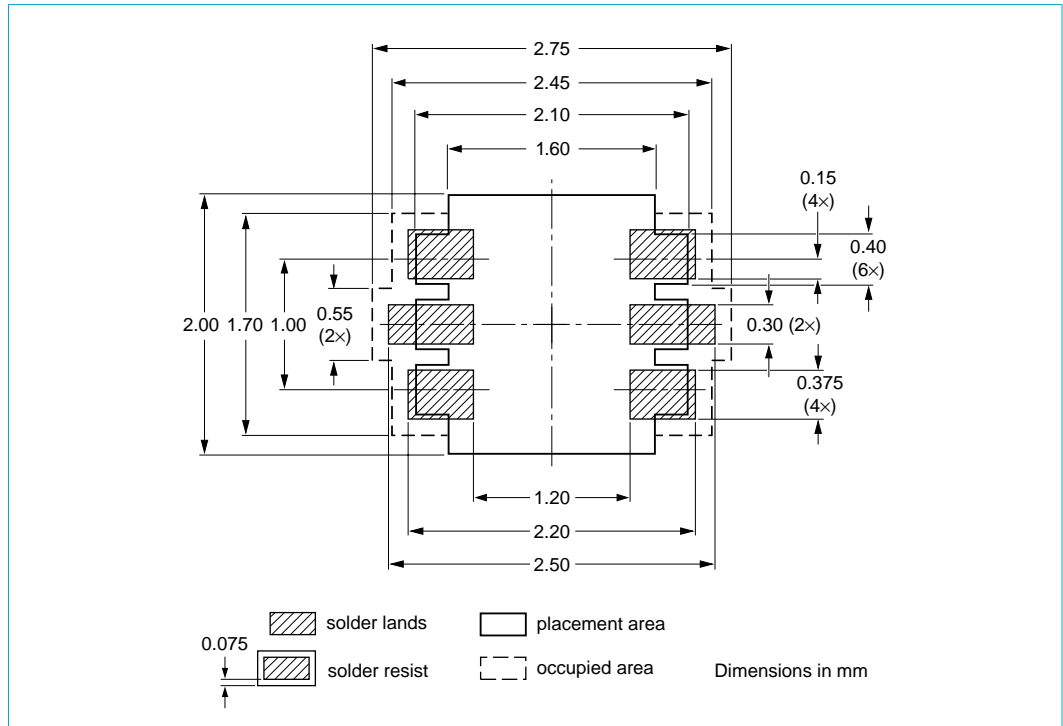
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
BCM847BV	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
BCM847BS	SOT363	4 mm pitch, 8 mm tape and reel; T1 ^[2]	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 ^[3]	-125	-	-	-165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

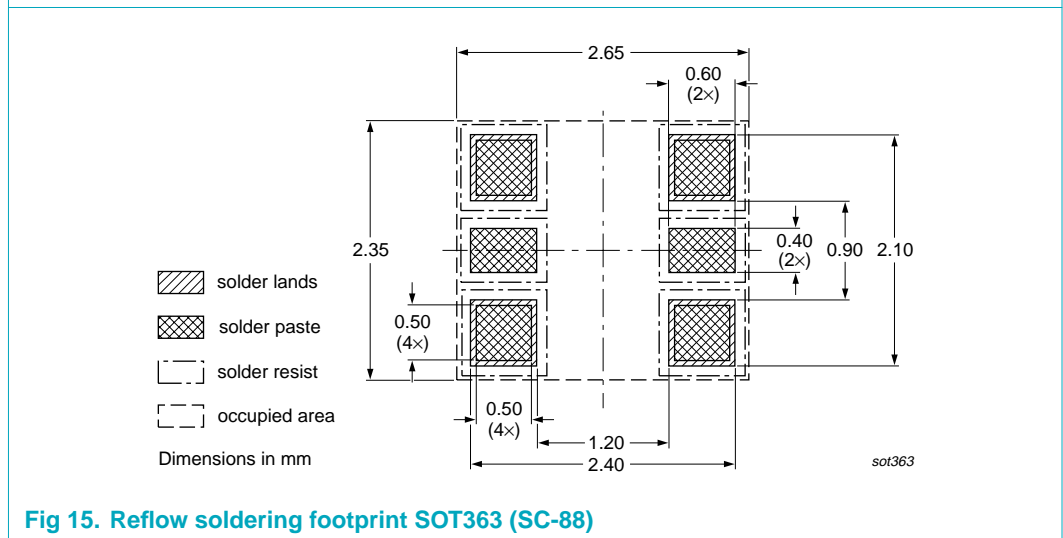
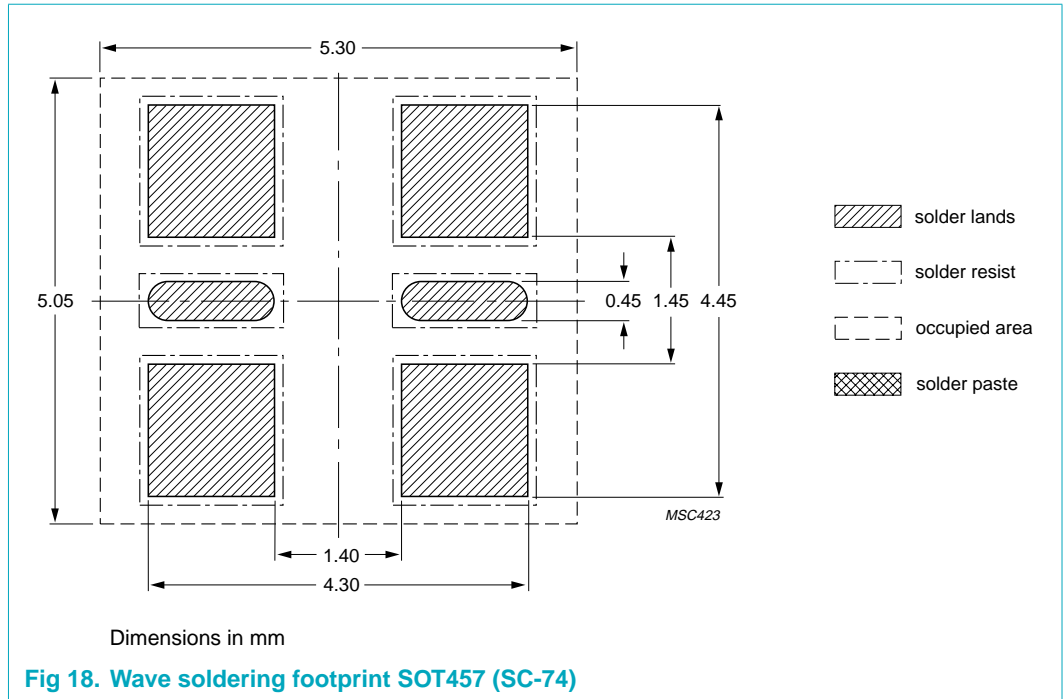


Fig 15. Reflow soldering footprint SOT363 (SC-88)



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".

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