

# BCM847BV; BCM847BS; BCM847DS

NPN/NPN matched double transistors

Rev. 06 — 28 August 2009

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
	NXP	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
<b>Per transistor</b>						
$V_{CE0}$	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	



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

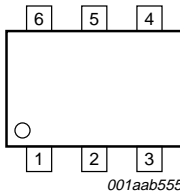
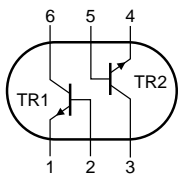
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[1] 0.9	1	-	
$V_{BE1}-V_{BE2}$	$V_{BE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[2] -	-	2	mV

[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	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 <sup>[1]</sup>
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
<b>Per transistor</b>					
V <sub>CBO</sub>	collector-base voltage	open emitter	-	50	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	45	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	6	V
I <sub>C</sub>	collector current		-	100	mA
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C			
	SOT666		[1][2]	200	mW
	SOT363		[1]	200	mW
	SOT457		[1]	250	mW
<b>Per device</b>					
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C			
	SOT666		[1][2]	300	mW
	SOT363		[1]	300	mW
	SOT457		[1]	380	mW
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	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
<b>Per transistor</b>						
R <sub>th(j-a)</sub>	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
<b>Per device</b>						
$R_{th(j-a)}$	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	
<b>Per transistor</b>							
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A}$	-	-	15	nA	
		$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A};$ $T_j = 150\text{ }^{\circ}\text{C}$	-	-	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]	910	-	mV	
$V_{BE}$	base-emitter voltage	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[2]	610	660	710	mV
		$V_{CE} = 5\text{ V};$ $I_C = 10\text{ mA}$	[2]	-	-	770	mV
$C_c$	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

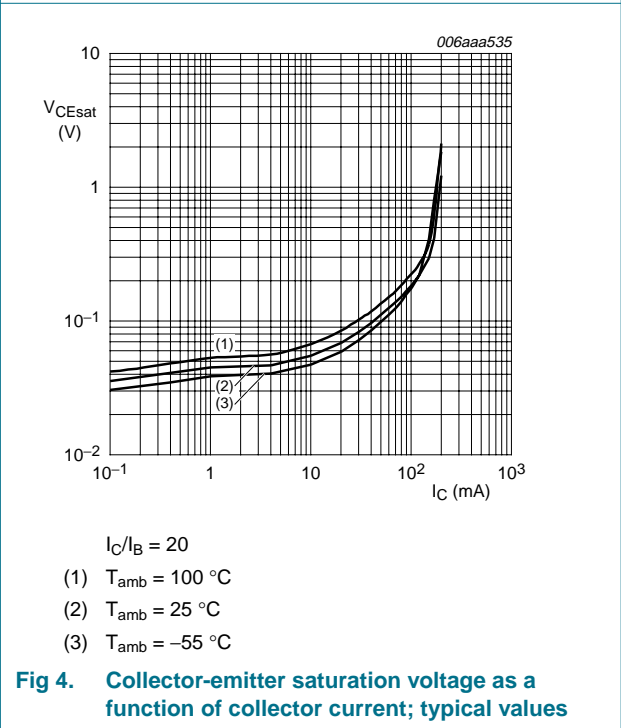
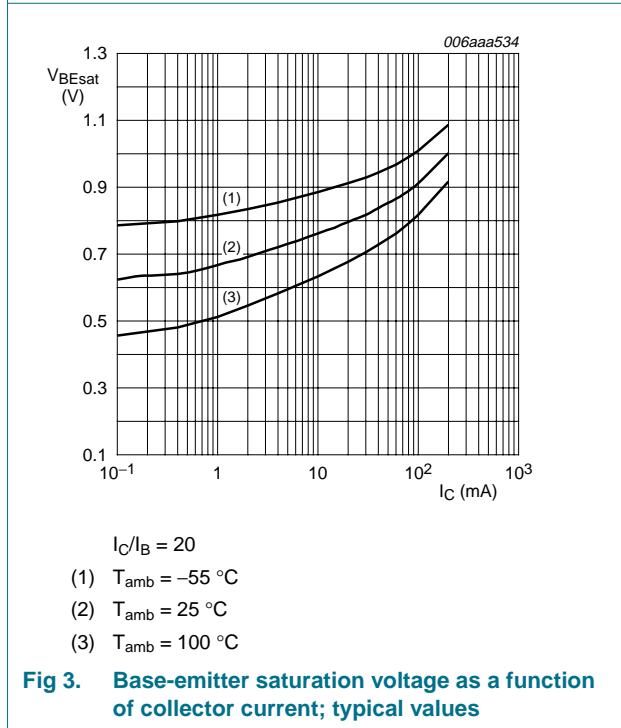
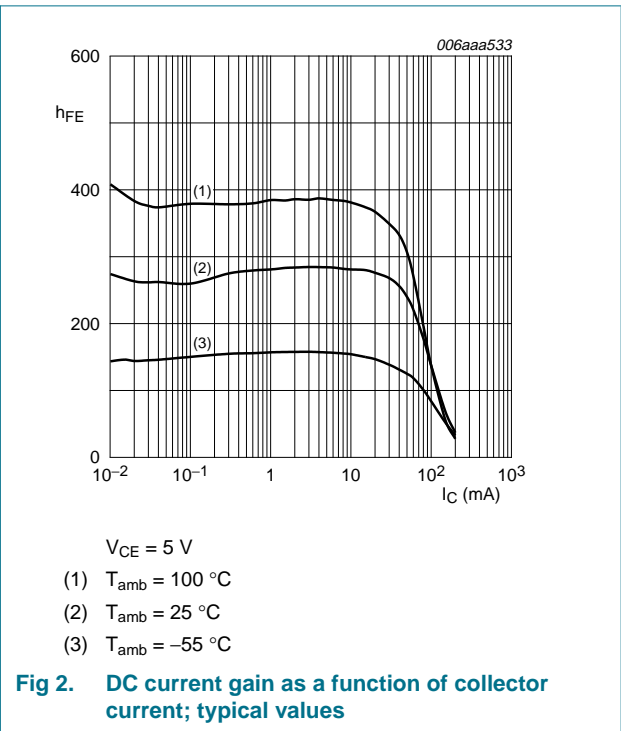
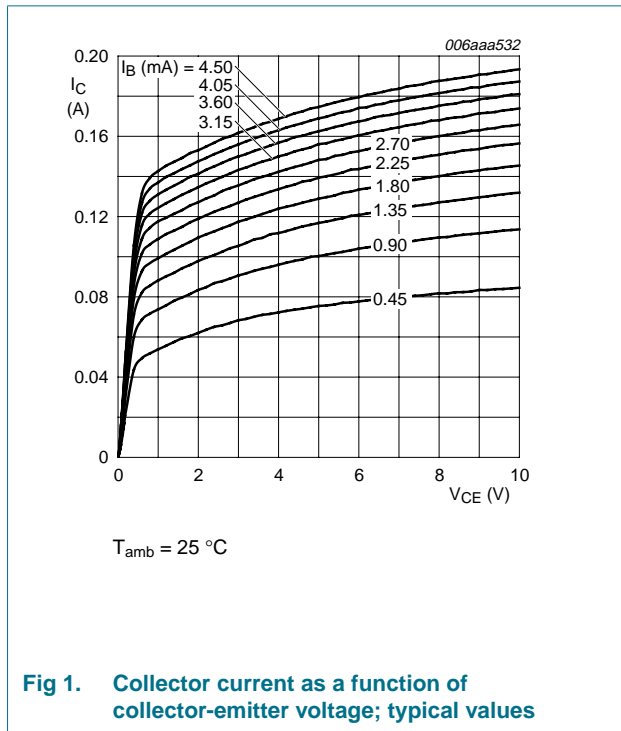
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$f_T$	transition frequency	$V_{CE} = 5\text{ V};$ $I_C = 10\text{ mA};$ $f = 100\text{ MHz}$	100	250	-	MHz
NF	noise figure	$V_{CE} = 5\text{ V};$ $I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega;$ $f = 10\text{ Hz to}$ $15.7\text{ kHz}$	-	2.8	-	dB
		$V_{CE} = 5\text{ V};$ $I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega;$ $f = 1\text{ kHz};$ $B = 200\text{ Hz}$	-	3.3	-	dB
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ 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

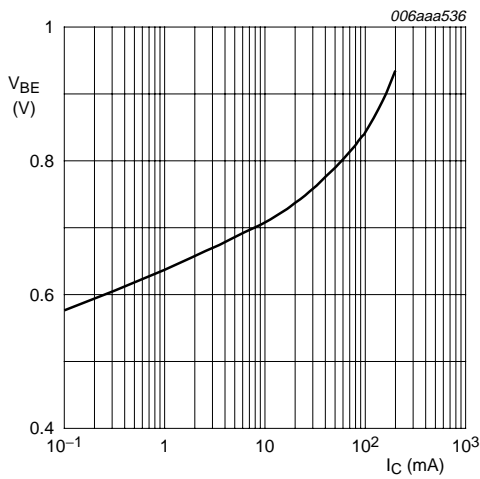
[1]  $V_{BEsat}$  decreases by about 1.7 mV/K with increasing temperature.

[2]  $V_{BE}$  decreases by about 2 mV/K with increasing temperature.

[3] The smaller of the two values is taken as the numerator.

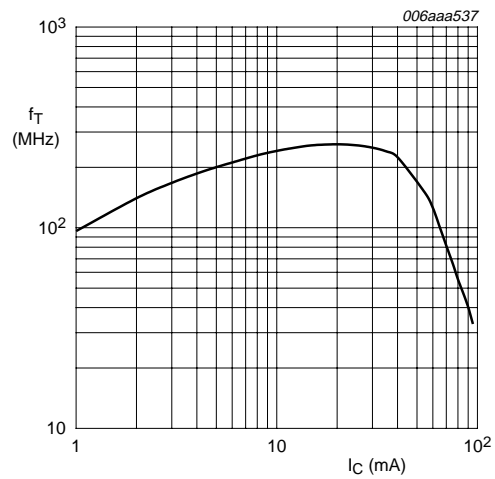
[4] The smaller of the two values is subtracted from the larger value.





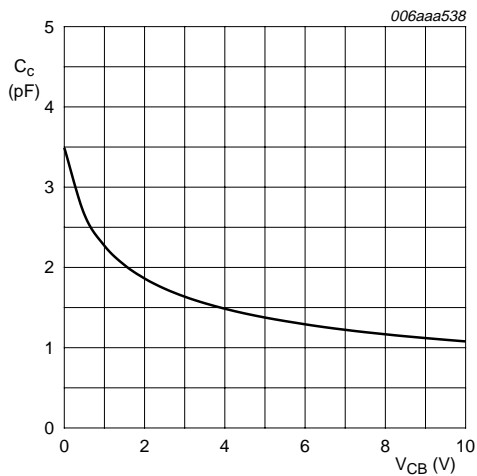
$V_{CE} = 5$  V;  $T_{amb} = 25$  °C

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



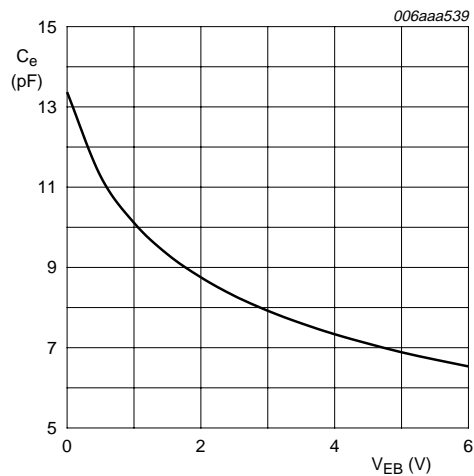
$V_{CE} = 5$  V;  $T_{amb} = 25$  °C

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



$f = 1$  MHz;  $T_{amb} = 25$  °C

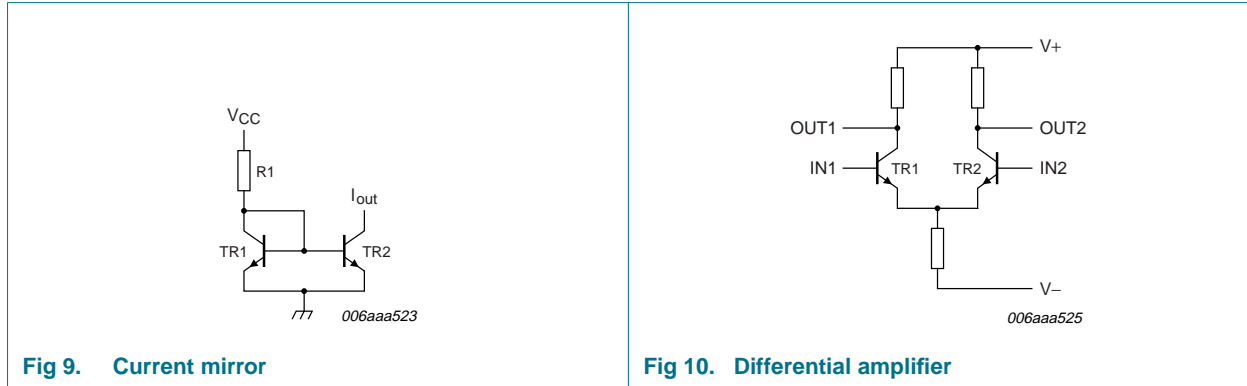
**Fig 7. Collector capacitance as a function of collector-base voltage; typical values**



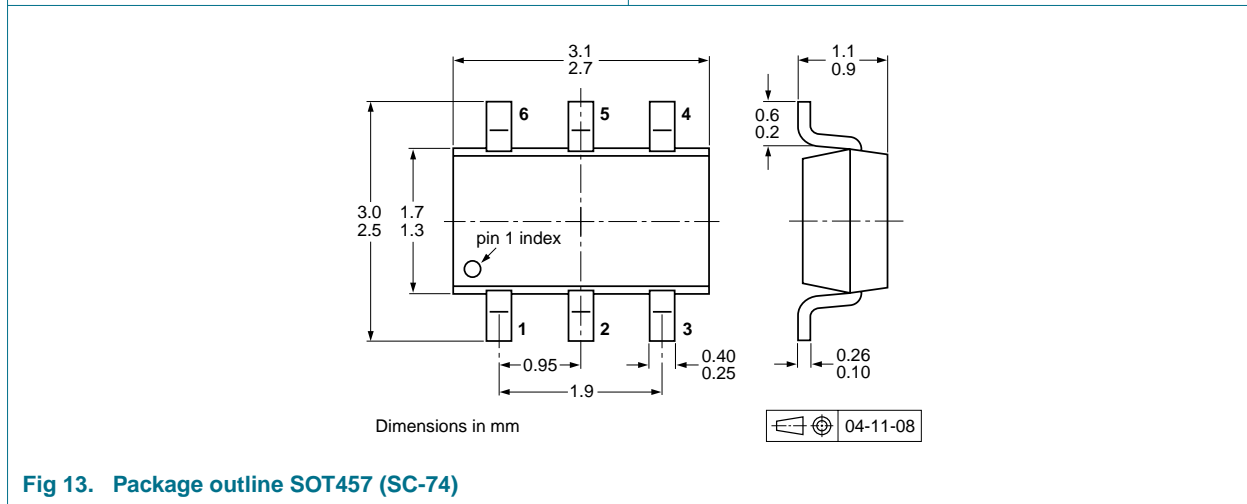
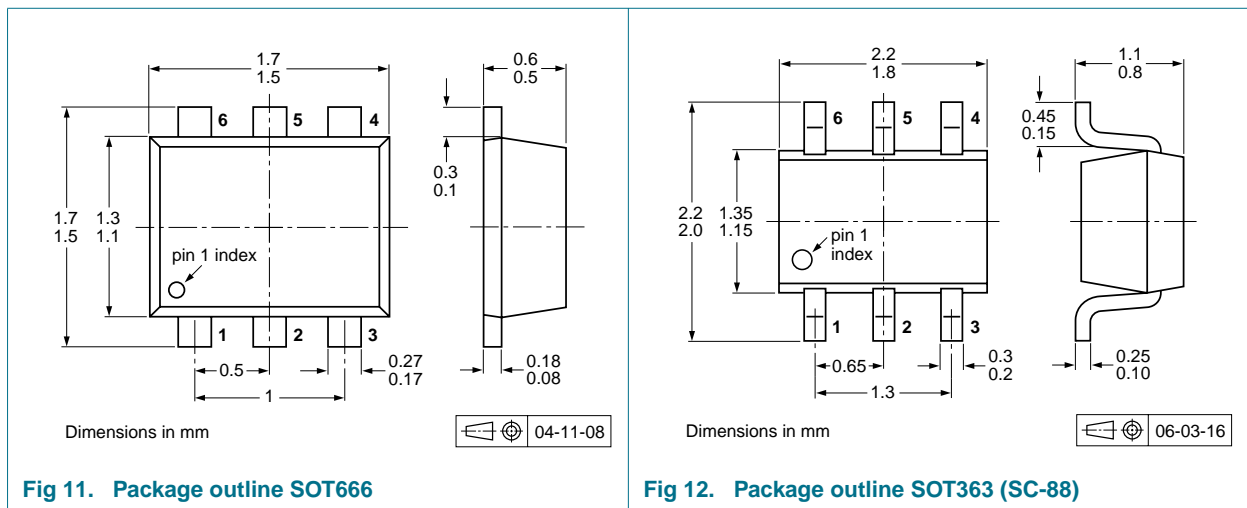
$f = 1$  MHz;  $T_{amb} = 25$  °C

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

## 8. Application information



## 9. Package outline





## 10. Packing information

**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

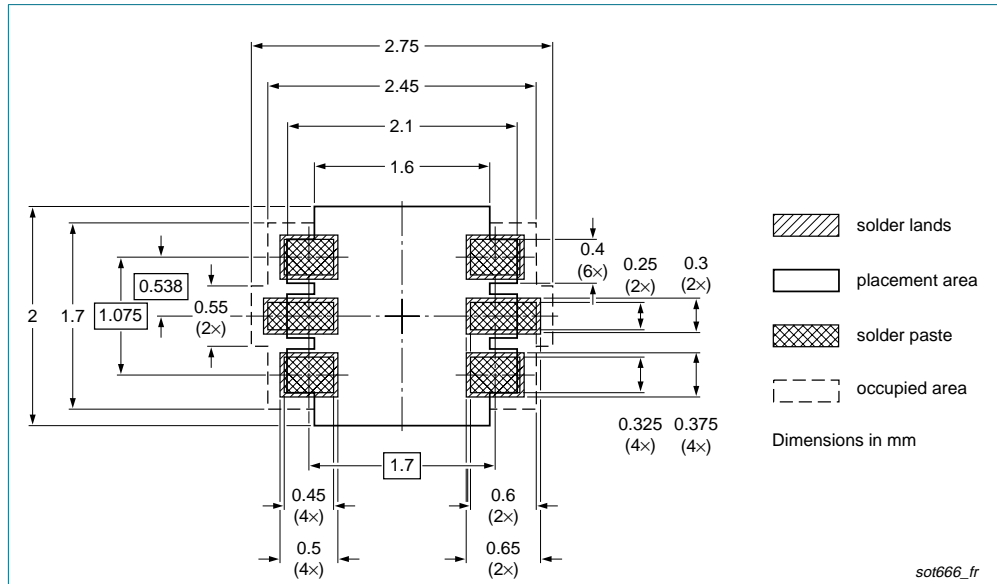
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
BCM847BV	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
BCM847BS	SOT363	4 mm pitch, 8 mm tape and reel; T1 <sup>[2]</sup>	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 <sup>[3]</sup>	-125	-	-	-165
BCM847DS	SOT457	4 mm pitch, 8 mm tape and reel; T1 <sup>[2]</sup>	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 <sup>[3]</sup>	-125	-	-	-165

[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

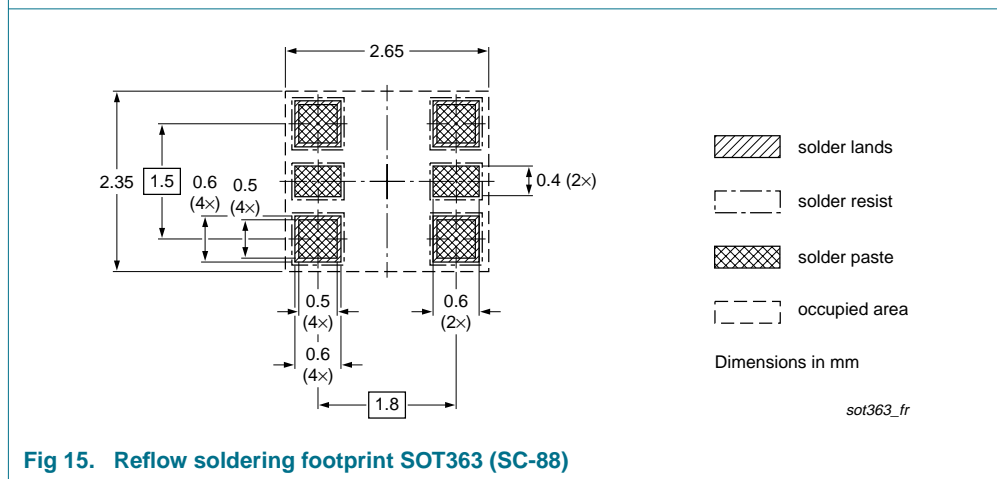
[3] T2: reverse taping

**11. Soldering**



Reflow soldering is the only recommended soldering method.

**Fig 14. Reflow soldering footprint SOT666**



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

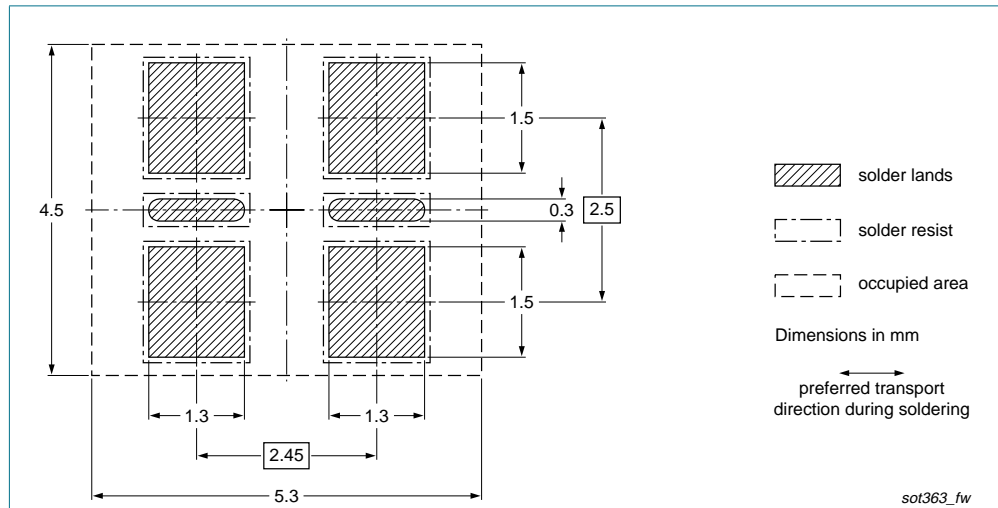


Fig 16. Wave soldering footprint SOT363 (SC-88)

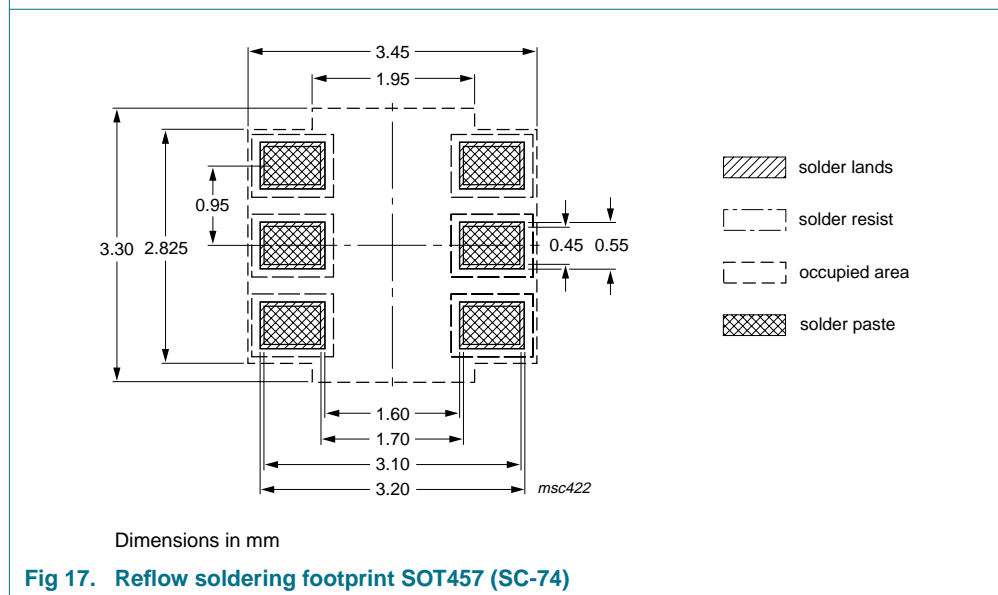
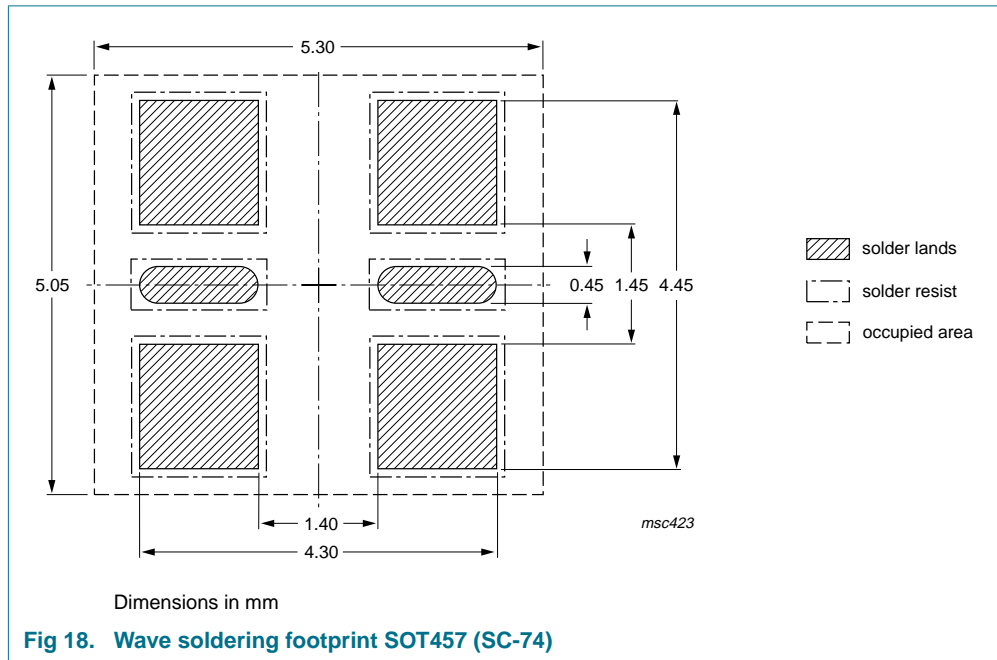


Fig 17. Reflow soldering footprint SOT457 (SC-74)



## 12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCM847BV_BS_DS_6	20090828	Product data sheet	-	BCM847BV_BS_DS_5
Modifications:	<ul style="list-style-type: none"> <li>• This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.</li> <li>• <a href="#">Figure 12 "Package outline SOT363 (SC-88)": updated</a></li> <li>• <a href="#">Figure 14 "Reflow soldering footprint SOT666": updated</a></li> <li>• <a href="#">Figure 15 "Reflow soldering footprint SOT363 (SC-88)": updated</a></li> <li>• <a href="#">Figure 16 "Wave soldering footprint SOT363 (SC-88)": updated</a></li> <li>• <a href="#">Figure 18 "Wave soldering footprint SOT457 (SC-74)": updated</a></li> </ul>			
BCM847BV_BS_DS_5	20060627	Product data sheet	-	BCM847BS_DS_4
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	-	-

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### 13.1 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.
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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 Date of release: 28 August 2009  
 Document identifier: BCM847BV\_BS\_DS\_6