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	SOT363	SC-88	very small
BCM856BS/DG			
BCM856DS	SOT457	SC-74	small
BCM856DS/DG			

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_{CEO}	collector-emitter voltage	open base	-	-	–65	V
I_C	collector current		-	-	–100	mA
h_{FE}	DC current gain	V_{CE} = –5 V; I_C = –2 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 V; I_C = –2 mA	[1]	0.9	1	-	
$V_{BE1}–V_{BE2}$	V_{BE} matching	V_{CE} = –5 V; I_C = –2 mA	[2]	-	-	2	mV

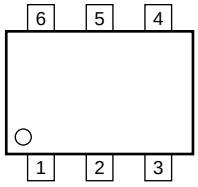
[1] The smaller of the two values is taken as the numerator.

[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		
2	base TR1		
3	collector TR2		
4	emitter TR2		
5	base TR2		
6	collector TR1		



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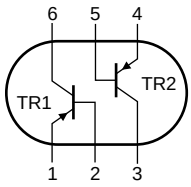

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3. Ordering information

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; $t_p \leq 1$ 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
Per device						
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
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 °C unless otherwise specified.

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

Table 8. Characteristics *...continued*

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

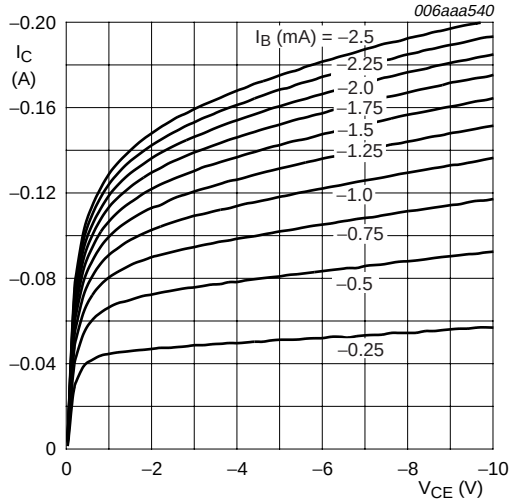
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BE}	base-emitter voltage	V_{CE} = –5 V; I_C = –2 mA	[2]	–600	–650	–700	mV
		V_{CE} = –5 V; I_C = –10 mA	[2]	-	-	–760	mV
C_c	collector capacitance	V_{CB} = –10 V; $I_E = i_e$ = 0 A; f = 1 MHz		-	-	2.2	pF
C_e	emitter capacitance	V_{EB} = –0.5 V; $I_C = i_c$ = 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.

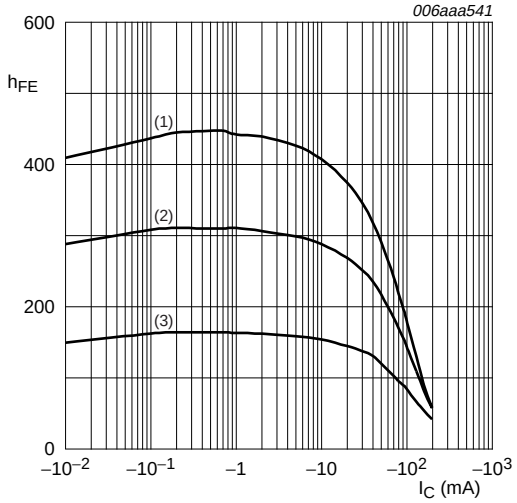
[3] The smaller of the two values is taken as the numerator.

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



T_{amb} = 25 °C

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



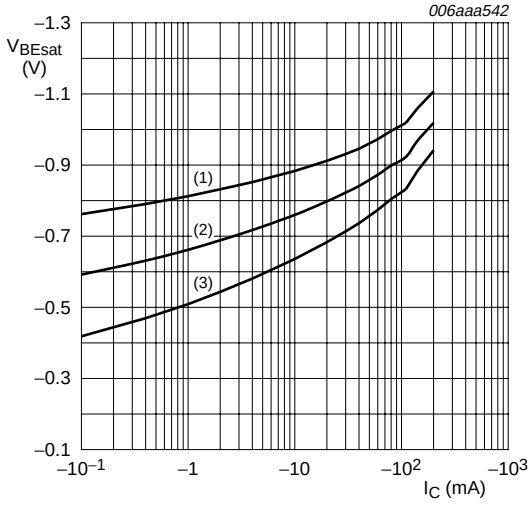
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



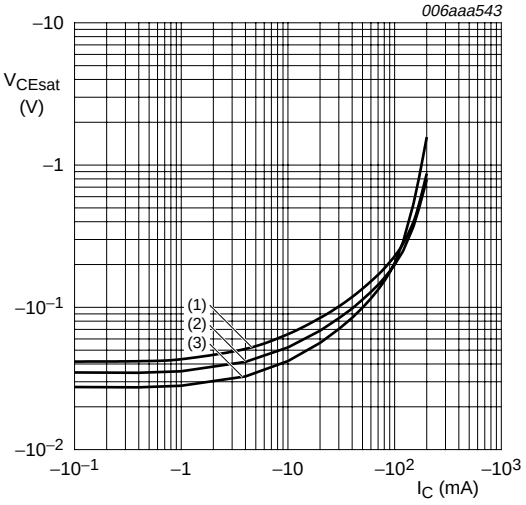
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



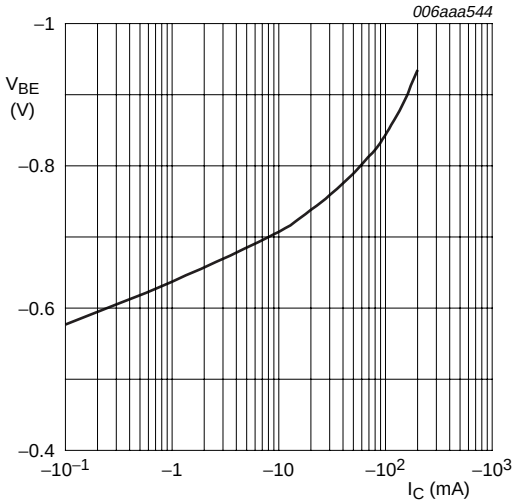
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

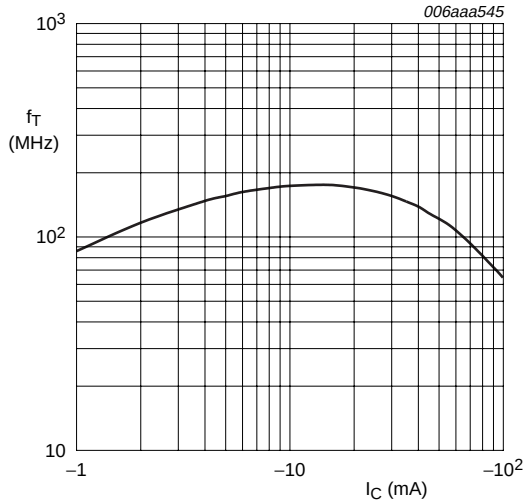
(3) T_{amb} = −55 °C

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



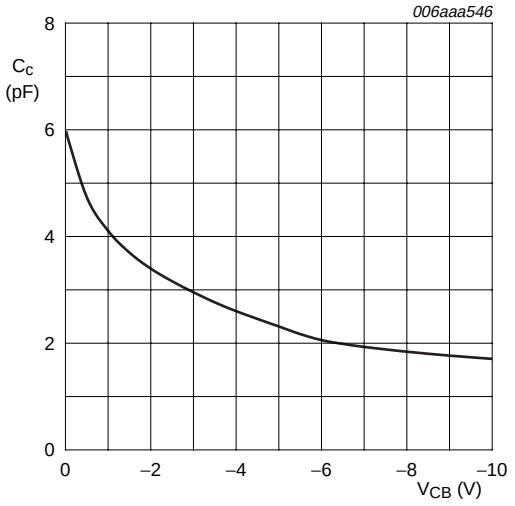
V_{CE} = –5 V; T_{amb} = 25 °C

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



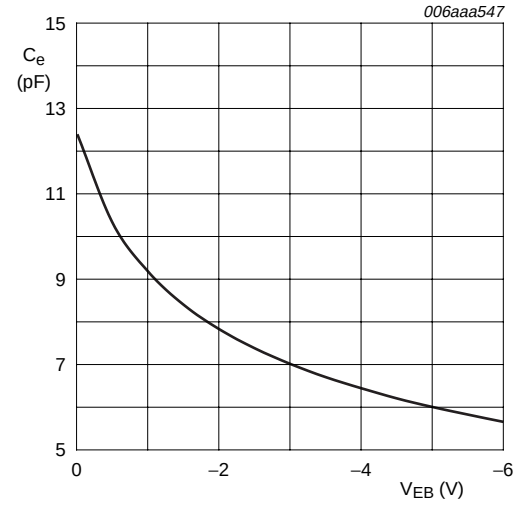
V_{CE} = –5 V; T_{amb} = 25 °C

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

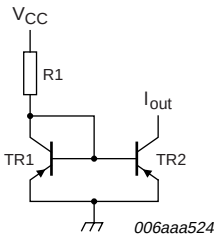


Fig 9. Current mirror

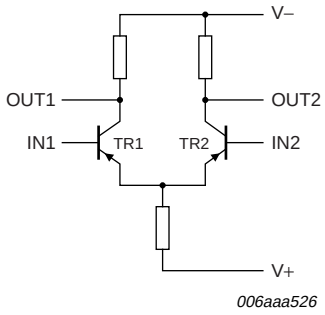


Fig 10. Differential amplifier

9. 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

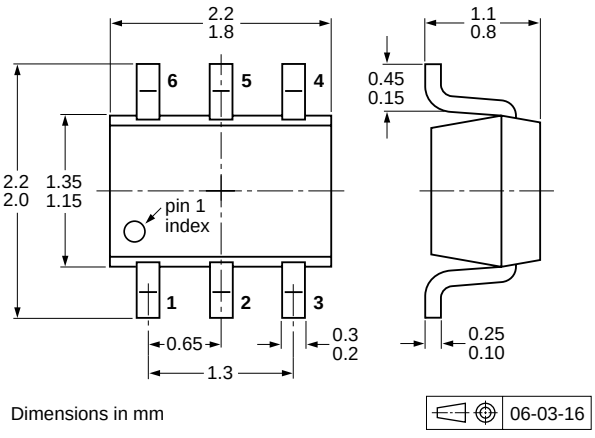


Fig 11. Package outline SOT363 (SC-88)

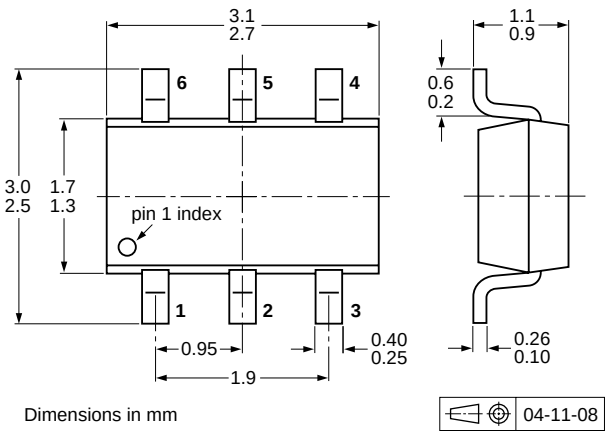


Fig 12. Package outline SOT457 (SC-74)

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

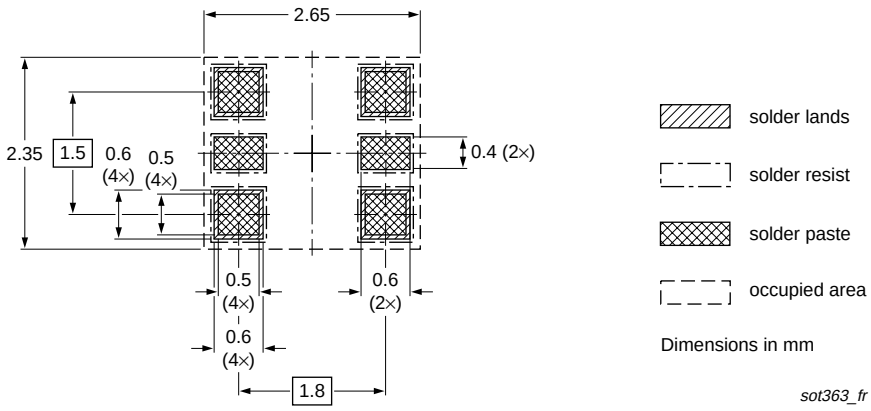


Fig 13. Reflow soldering footprint SOT363 (SC-88)

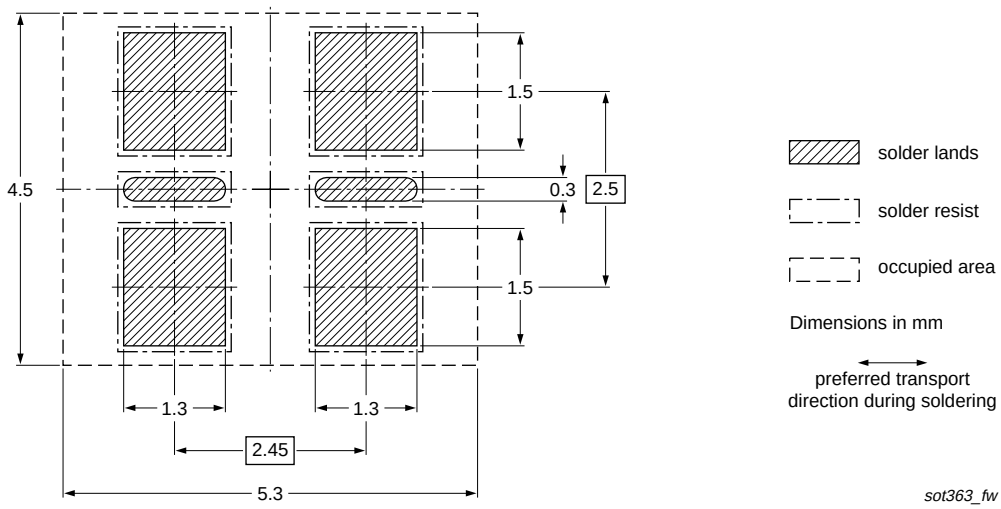


Fig 14. Wave soldering footprint SOT363 (SC-88)

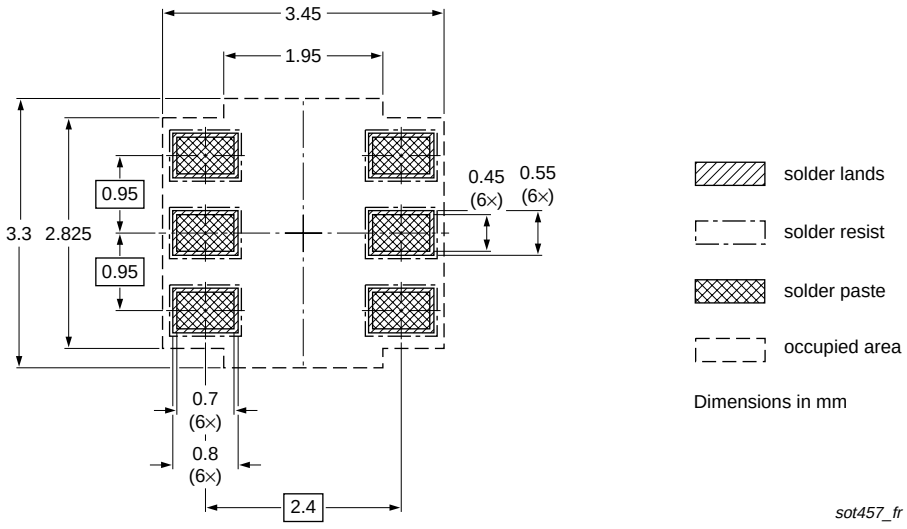


Fig 15. Reflow soldering footprint SOT457 (SC-74)

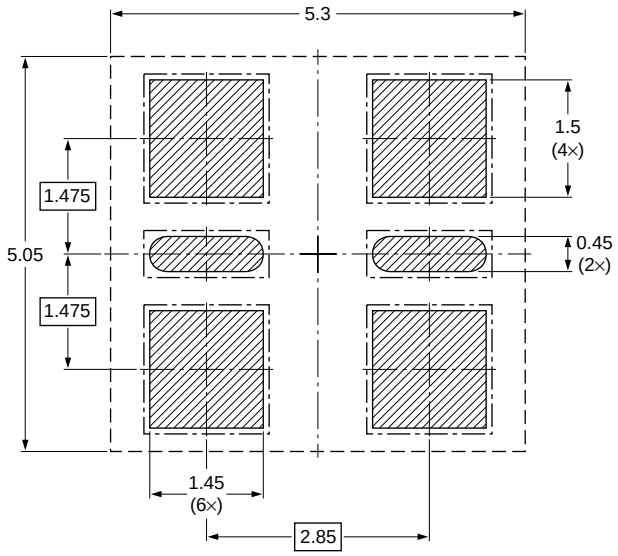


Fig 16. Wave soldering footprint SOT457 (SC-74)

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[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.nxp.com.

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15. Contact information

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For sales office addresses, please send an email to: **salesaddresses@nxp.com**

16. Contents

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