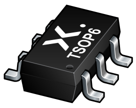

BCM56DS

80 V, 1 A NPN/NPN matched double transistors

10 April 2018 Product data sheet

1. General description

NPN/NPN matched double transistors in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

PNP/PNP complement: BCM53DS

2. Features and benefits

- High collector current capability I_C and I_{CM}
- Reduces component count
- Reduces pick and place costs
- Current gain matching 5%
- Application-optimized pinout
- AEC-Q101 qualified

3. Applications

- Current mirror
- Differential amplifier
- Linear voltage regulators
- MOSFET drivers
- High-side switches
- Power management
- Amplifiers

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
V_{CEO}	collector-emitter voltage	open base		-	-	80	V
I_C	collector current			-	-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	2	A
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 150 mA; T_{amb} = 25 °C	[1]	63	-	250	
Per device							
h_{FE1}/h_{FE2}	DC current gain matching	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		0.95	1	1.05	

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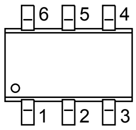
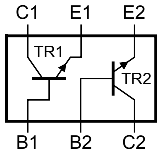
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{BE1}-V_{BE2}$	base-emitter voltage matching		[2]	-	-	2	mV

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$
[2] The smaller of the two values is subtracted from the larger value.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B1	base TR1	 TSOP6 (SOT457)	 aaa-024629
2	B2	base TR2		
3	C2	collector TR2		
4	E2	emitter TR2		
5	E1	emitter TR1		
6	C1	collector TR1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BCM56DS	TSOP6	plastic, surface-mounted package (SC-74)	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
BCM56DS	3D

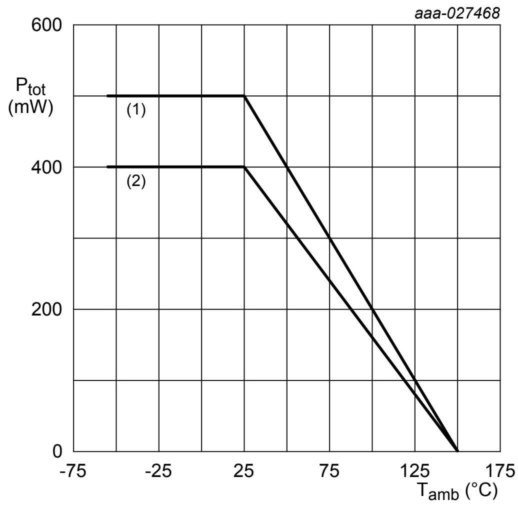
8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC60134).

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
V_{CBO}	collector-base voltage	open emitter		-	100	V
V_{CEO}	collector-emitter voltage	open base		-	80	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current			-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	2	A
I_{Blim}	limiting base current			-	0.2	A
I_{BM}	peak base current	single pulse; $t_p \leq$ 1 ms		-	0.3	A
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	270	mW
			[2]	-	320	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	400	mW
			[2]	-	500	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.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 1 cm^2.



(1) = FR4 PCB, single sided copper, 1 cm^2
(2) = FR4 PCB, single sided copper, standard footprint

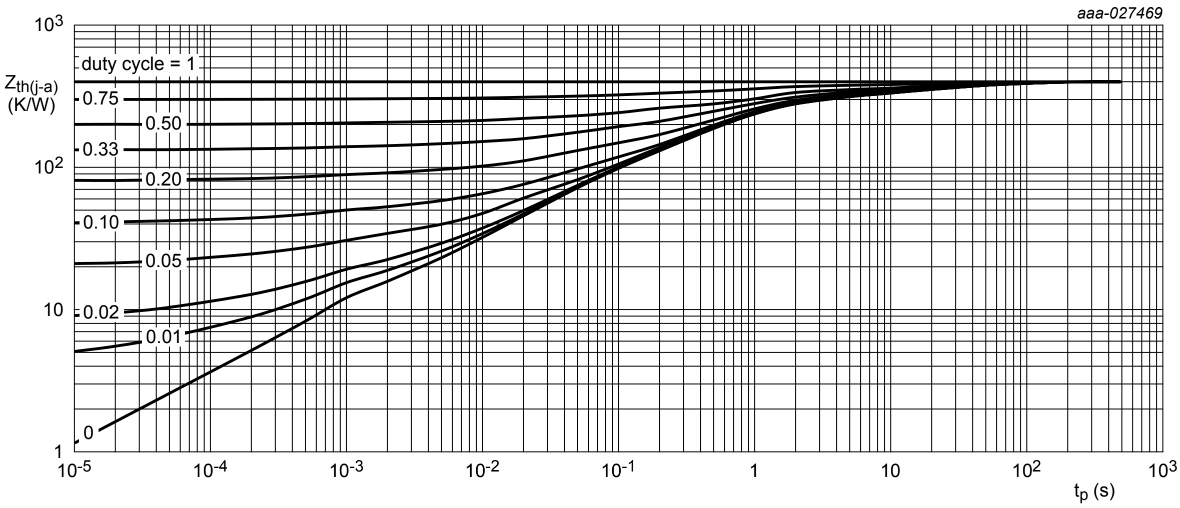
Fig. 1. Per device: Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

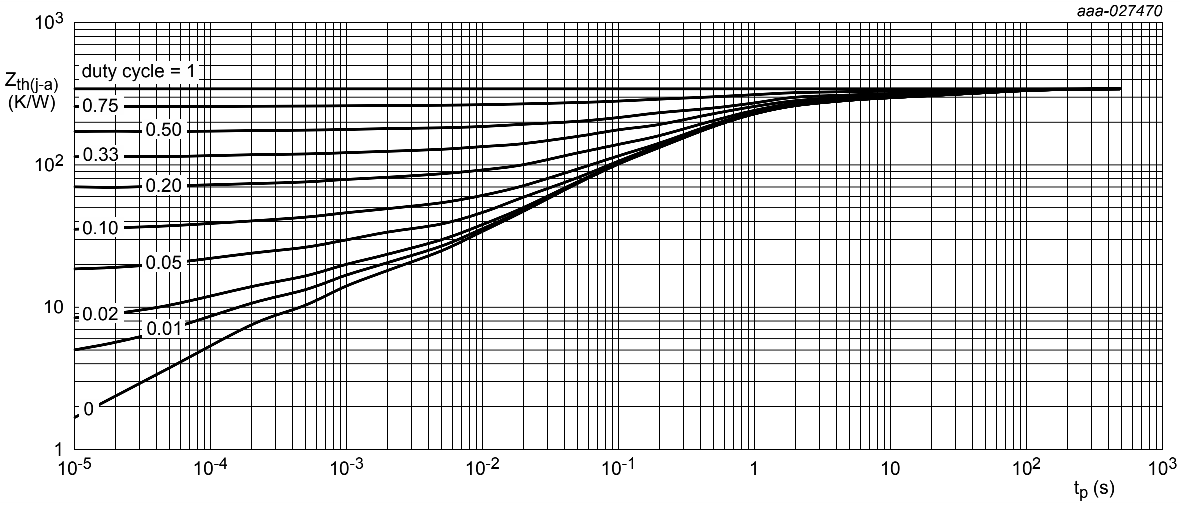
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	463	K/W
			[2]	-	-	391	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	150	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	313	K/W
			[2]	-	-	250	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm^2.



FR4 PCB, single sided copper, tin-plated and standard footprint

Fig. 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, single sided copper, tin-plated, mounting pad for collector 1 cm^2

Fig. 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

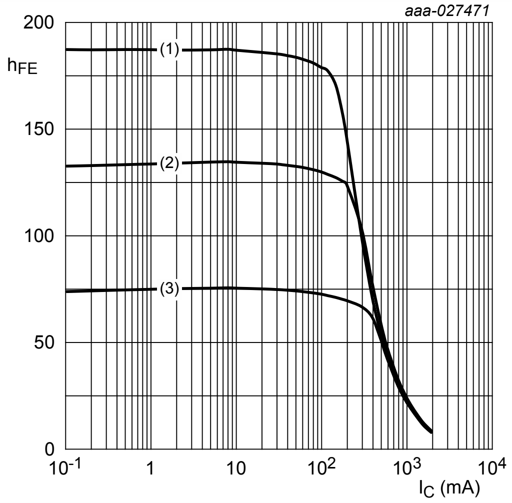
10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A		100	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 2 mA; I_B = 0 A		80	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_C = 0 A; I_E = 100 µA		5	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
		V_{CB} = 30 V; I_E = 0 A; T_j = 150 °C		-	-	10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		63	-	-	
		V_{CE} = 2 V; I_C = 150 mA; T_{amb} = 25 °C	[1]	63	-	250	
		V_{CE} = 2 V; I_C = 500 mA; T_{amb} = 25 °C	[1]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 °C	[1]	-	-	500	mV
V_{BE}	base-emitter voltage	V_{CE} = 2 V; I_C = 500 mA; T_{amb} = 25 °C	[1]	-	-	1	V
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	4.5	-	pF
f_T	transition frequency	V_{CE} = 5 V; I_C = 50 mA; f = 100 MHz; T_{amb} = 25 °C		100	155	-	MHz
Per device							
h_{FE1}/h_{FE2}	DC current gain matching	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		0.95	1	1.05	
$V_{BE1}-V_{BE2}$	base-emitter voltage matching		[2]	-	-	2	mV

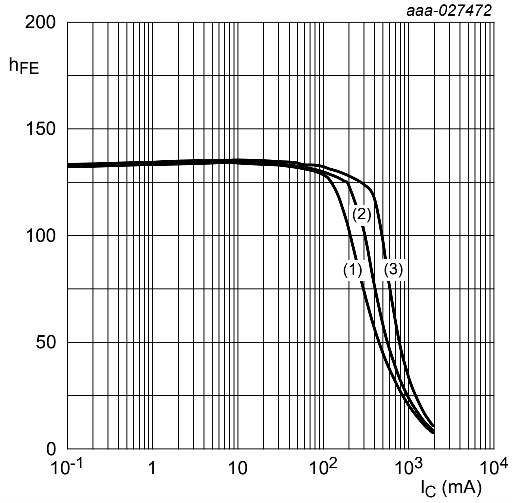
[1] Pulse test: t_p ≤ 300 µs; δ ≤ 0.02

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



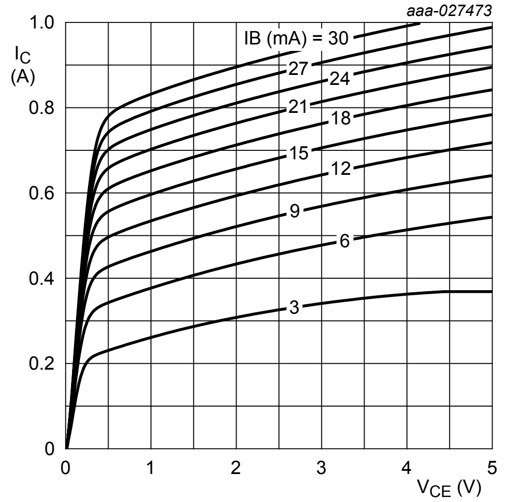
V_{CE} = 2 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 4. DC current gain as a function of collector current; typical values



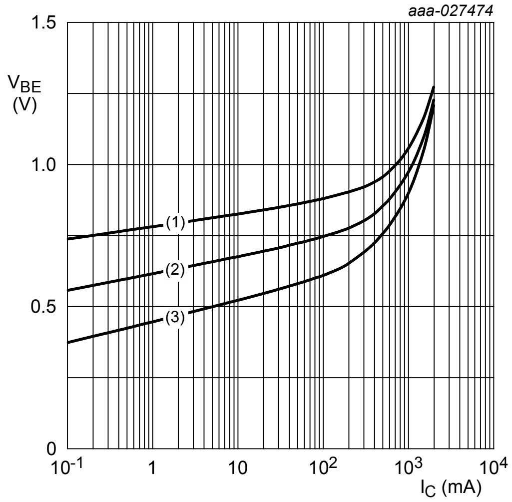
T_{amb} = 25 °C
(1) V_{CE} = 1 V
(2) V_{CE} = 2 V
(3) V_{CE} = 5 V

Fig. 5. DC current gain as a function of collector current; typical values



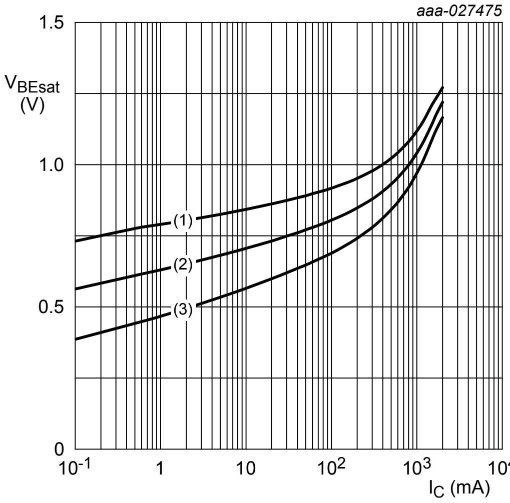
T_{amb} = 25 °C

Fig. 6. Collector current as a function of collector-emitter voltage; typical values



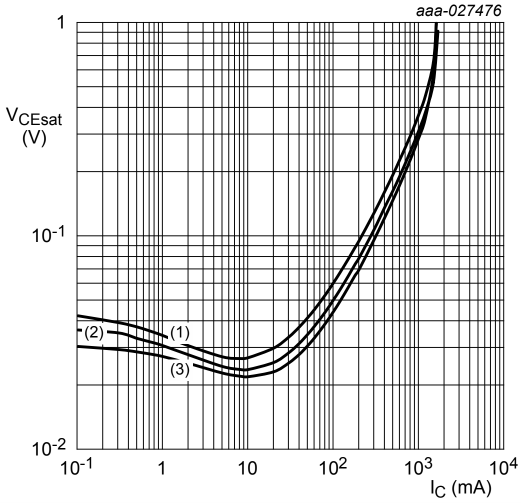
V_{CE} = 2 V
T_{amb} = -55 °C
T_{amb} = 25 °C
T_{amb} = 100 °C

Fig. 7. Base-emitter voltage as a function of collector current; typical values



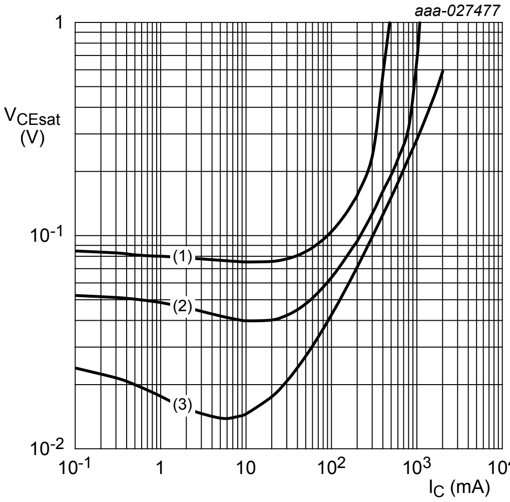
$I_C/I_B = 10$
(1) $T_{amb} = -55\ °C$
(2) $T_{amb} = 25\ °C$
(3) $T_{amb} = 100\ °C$

Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values



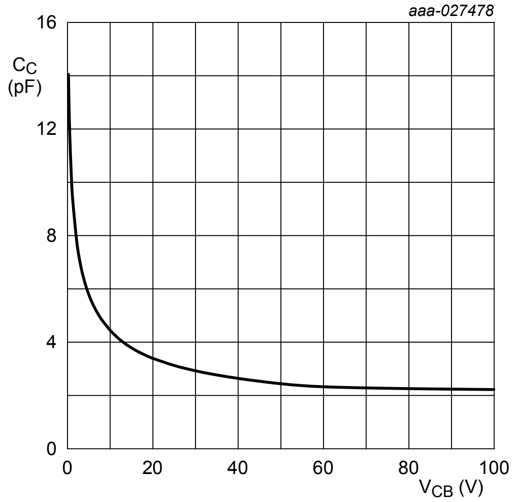
$I_C/I_B = 10$
(1) $T_{amb} = 100\ °C$
(2) $T_{amb} = 25\ °C$
(3) $T_{amb} = -55\ °C$

Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values



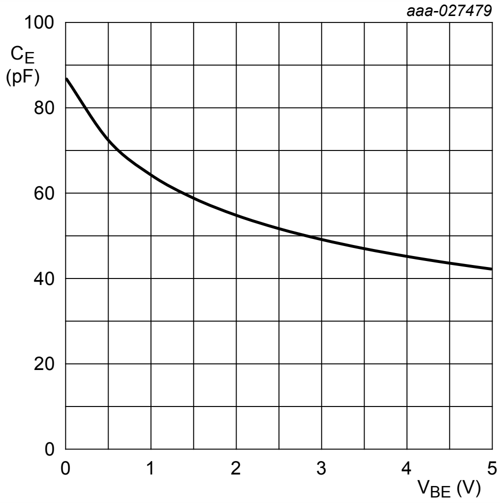
$T_{amb} = 25\ °C$
(1) $I_C/I_B = 50$
(2) $I_C/I_B = 20$
(3) $I_C/I_B = 5$

Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values



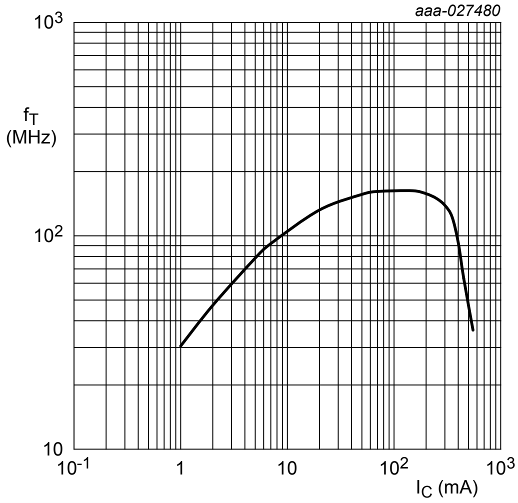
f = 1 MHz
$T_{amb} = 25\ °C$

Fig. 11. Collector capacitance as a function of collector-base voltage; typical values



f = 1 MHz
T_{amb} = 25 °C

Fig. 12. Emitter capacitance as a function of emitter-base voltage; typical values



V_{CE} = 5 V
f = 100 MHz
T_{amb} = 25 °C

Fig. 13. Transition frequency as a function of collector current; typical values

11. Test information

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.

12. Package outline

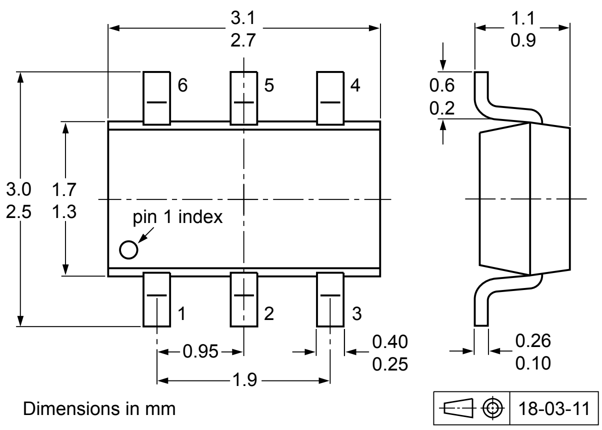


Fig. 14. Package outline TSOP6 (SOT457)

13. Soldering

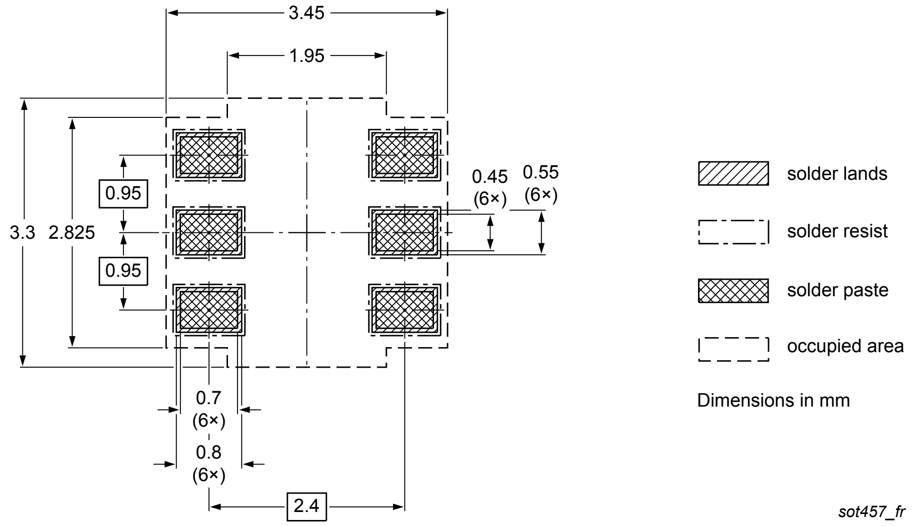


Fig. 15. Reflow soldering footprint for TSOP6 (SOT457)

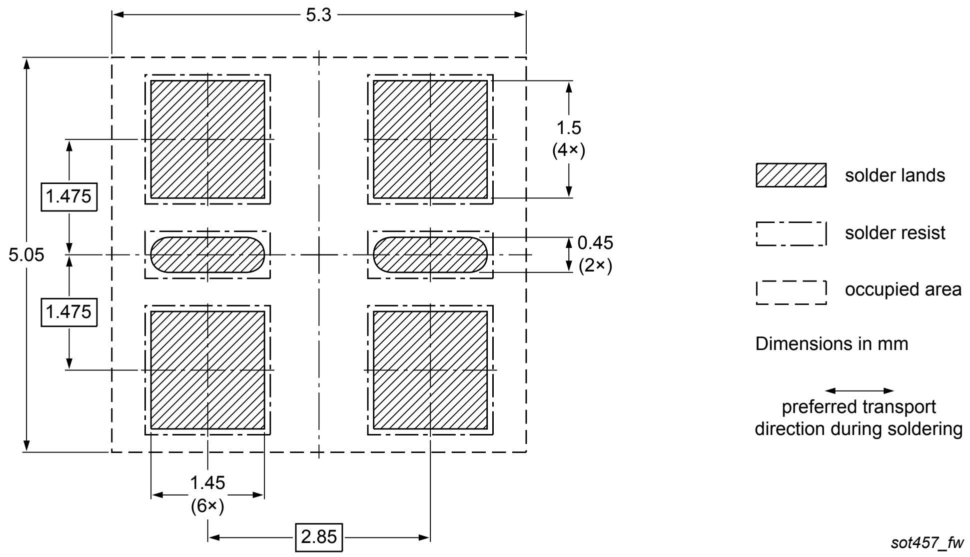


Fig. 16. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BCM56DS v.1	20180410	Product data sheet	-	-

15. Legal information

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.nexperia.com.

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16. Contents

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Date of release: 10 April 2018