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BC847/BC547 series

45 V, 100 mA NPN general-purpose transistors

Rev. 07 — 10 December 2008 Product data sheet

1. Product profile

1.1 General description

NPN general-purpose transistors in small plastic packages.

Table 1. Product overview

Type number[1]	Package			PNP complement
	NXP	JEITA	JEDEC	
BC847	SOT23	-	TO-236AB	BC857
BC847A				BC857A
BC847B				BC857B
BC847B/DG				-
BC847C				BC857C
BC847W	SOT323	SC-70	-	BC857W
BC847AW				BC857AW
BC847BW				BC857BW
BC847BW/DG				-
BC847CW				BC857CW
BC847T	SOT416	SC-75	-	BC857T
BC847AT				BC857AT
BC847AT/DG				-
BC847BT				BC857BT
BC847CT				BC857CT
BC847AM	SOT883	SC-101	-	BC857AM
BC847BM				BC857BM
BC847CM				BC857CM
BC547[2]	SOT54	SC-43A	TO-92	BC557[2]
BC547B[2]				BC557B[2]
BC547C[2]				BC557C[2]

[1] /DG: halogen-free

[2] Also available in SOT54A and SOT54 variant packages (see Section 2).

NXP founded by Philips

1.2 Features

- Low current
- Low voltage
- Three different gain selections

1.3 Applications

- General-purpose switching and amplification

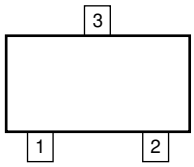
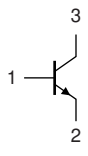
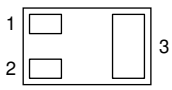
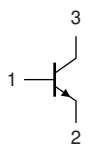
1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	45	V
I_C	collector current		-	-	100	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA	110	-	800	
	h_{FE} group A		110	180	220	
	h_{FE} group B		200	290	450	
	h_{FE} group C		420	520	800	

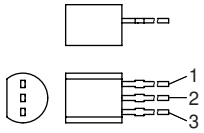
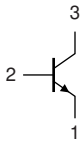
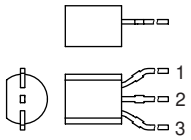
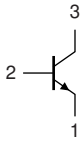
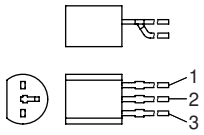
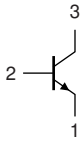
2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
SOT23, SOT323, SOT416			
1	base	 006aaa144	 sym021
2	emitter		
3	collector		
SOT883			
1	base	 Transparent top view	 sym021
2	emitter		
3	collector		

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Table 3. Pinning *...continued*

Pin	Description	Simplified outline	Graphic symbol
SOT54			
1	emitter	 *001aab347*	 *sym026*
2	base		
3	collector		
SOT54A			
1	emitter	 *001aab348*	 *sym026*
2	base		
3	collector		
SOT54 variant			
1	emitter	 *001aab447*	 *sym026*
2	base		
3	collector		

3. Ordering information

Table 4. Ordering information

Type number[1]	Package		
	Name	Description	Version
BC847	-	plastic surface-mounted package; 3 leads	SOT23
BC847A			
BC847B			
BC847B/DG			
BC847C			
BC847W	SC-70	plastic surface-mounted package; 3 leads	SOT323
BC847AW			
BC847BW			
BC847BW/DG			
BC847CW			

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Table 4. Ordering information *...continued*

Type number[1]	Package		
	Name	Description	Version
BC847T	SC-75	plastic surface-mounted package; 3 leads	SOT416
BC847AT			
BC847AT/DG			
BC847BT			
BC847CT			
BC847AM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
BC847BM			
BC847CM			
BC547[2]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BC547B[2]			
BC547C[2]			

[1] /DG: halogen-free

[2] Also available in SOT54 and SOT54 variant packages (see Section 2 and Section 9).

4. Marking

Table 5. Marking codes

Type number[1]	Marking code[2]	Type number[1]	Marking code[2]
BC847	1H*	BC847AT	1E
BC847A	1E*	BC847AT/DG	B5
BC847B	1F*	BC847BT	1F
BC847B/DG	*BC	BC847CT	1G
BC847C	1G*	BC847AM	D4
BC847W	1H*	BC847BM	D5
BC847AW	1E*	BC847CM	D6
BC847BW	1F*	BC547	C547
BC847BW/DG	G9*	BC547B	C547B
BC847CW	1G*	BC547C	C547C
BC847T	1N	-	-

[1] /DG: halogen-free

[2] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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5. Limiting values

Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
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
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
	SOT23		[1]	-	250	mW
	SOT323		[1]	-	200	mW
	SOT416		[1]	-	150	mW
	SOT883		[2][3]	-	250	mW
	SOT54		[1]	-	500	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.

[3] Device mounted on an FR4 PCB with 60 µm copper strip line, standard footprint.

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air					
	SOT23		[1]	-	-	500	K/W
	SOT323		[1]	-	-	625	K/W
	SOT416		[1]	-	-	833	K/W
	SOT883		[2][3]	-	-	500	K/W
	SOT54		[1]	-	-	250	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.

[3] Device mounted on an FR4 PCB with 60 µm copper strip line, standard footprint.

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7. Characteristics

Table 8. Characteristics

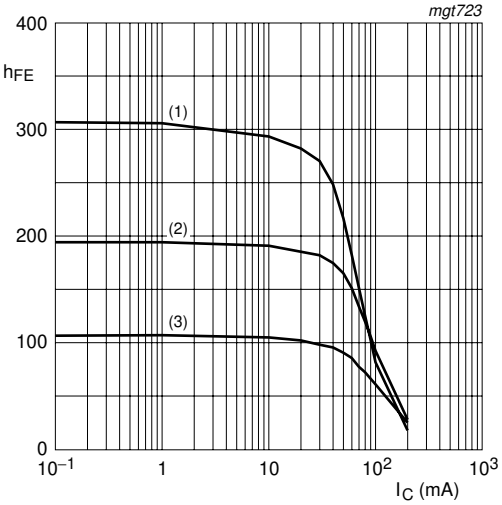
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
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						
	h_{FE} group A	V_{CE} = 5 V; I_C = 10 µA		-	90	-	
	h_{FE} group B	V_{CE} = 5 V; I_C = 10 µA		-	150	-	
	h_{FE} group C	V_{CE} = 5 V; I_C = 10 µA		-	270	-	
	DC current gain	V_{CE} = 5 V; I_C = 2 mA		110	-	800	
	h_{FE} group A	V_{CE} = 5 V; I_C = 2 mA		110	180	220	
	h_{FE} group B	V_{CE} = 5 V; I_C = 2 mA		200	290	450	
	h_{FE} group C	V_{CE} = 5 V; I_C = 2 mA		420	520	800	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA		-	90	200	mV
		I_C = 100 mA; I_B = 5 mA	[1]	-	200	400	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	[2]	-	700	-	mV
		I_C = 100 mA; I_B = 5 mA	[2]	-	900	-	mV
V_{BE}	base-emitter voltage	I_C = 2 mA; V_{CE} = 5 V	[2]	580	660	700	mV
		I_C = 10 mA; V_{CE} = 5 V		-	-	770	mV
C_c	collector capacitance	$I_E = i_e$ = 0 A; V_{CB} = 10 V; f = 1 MHz		-	-	1.5	pF
C_e	emitter capacitance	$I_C = i_c$ = 0 A; V_{EB} = 0.5 V; f = 1 MHz		-	11	-	pF
f_T	transition frequency	I_C = 10 mA; V_{CE} = 5 V; f = 100 MHz		100	-	-	MHz
NF	noise figure	I_C = 200 µA; V_{CE} = 5 V; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz		-	2	10	dB

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.

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

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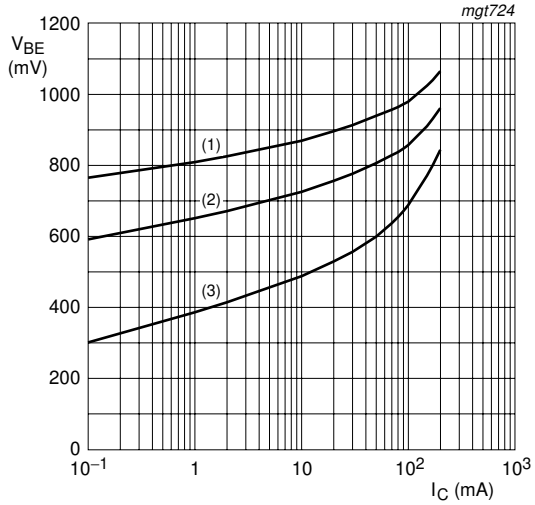
V_{CE} = 5 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 1. Selection A: DC current gain as a function of collector current; typical values



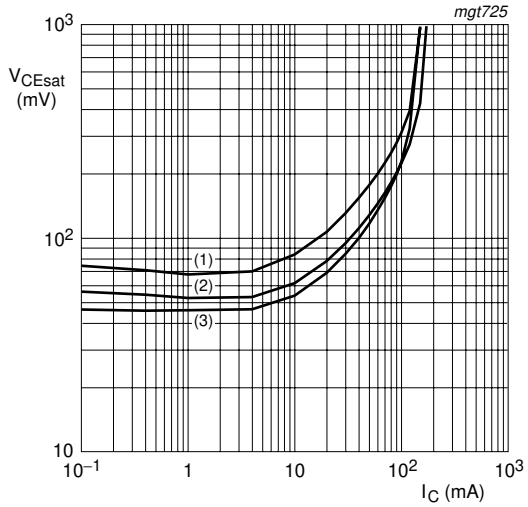
V_{CE} = 5 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig 2. Selection A: Base-emitter voltage as a function of collector current; typical values



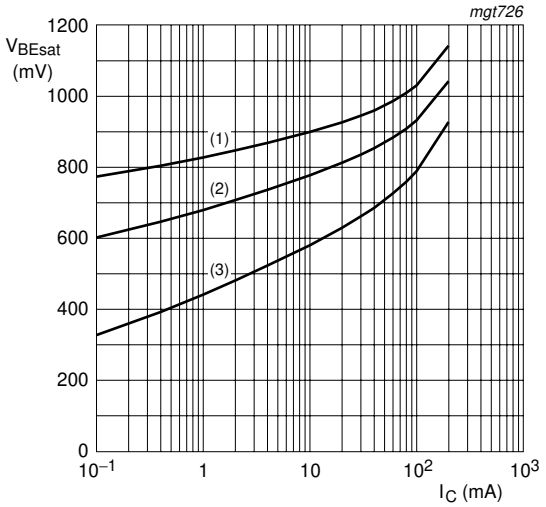
I_C/I_B = 20

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 3. Selection A: Collector-emitter saturation voltage as a function of collector current; typical values



I_C/I_B = 10

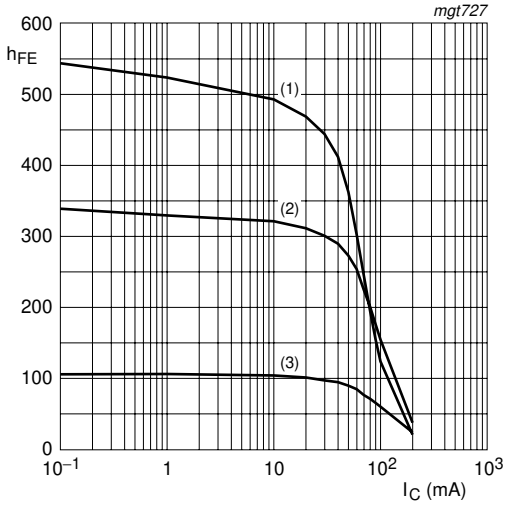
(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig 4. Selection A: Base-emitter saturation voltage as a function of collector current; typical values

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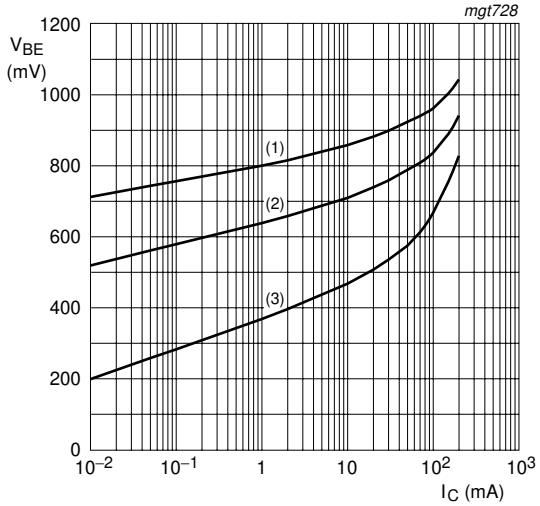
V_{CE} = 5 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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



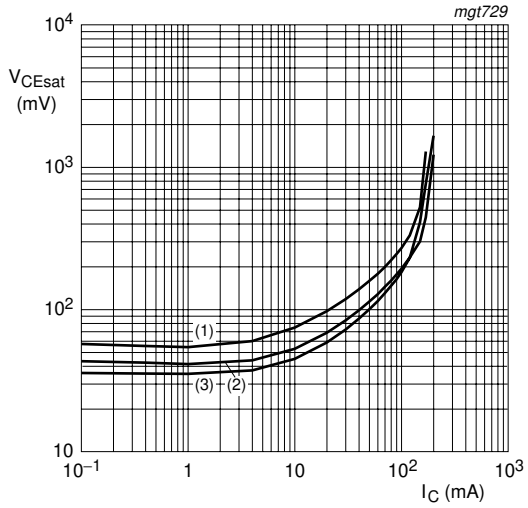
V_{CE} = 5 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig 6. Selection B: Base-emitter voltage as a function of collector current; typical values



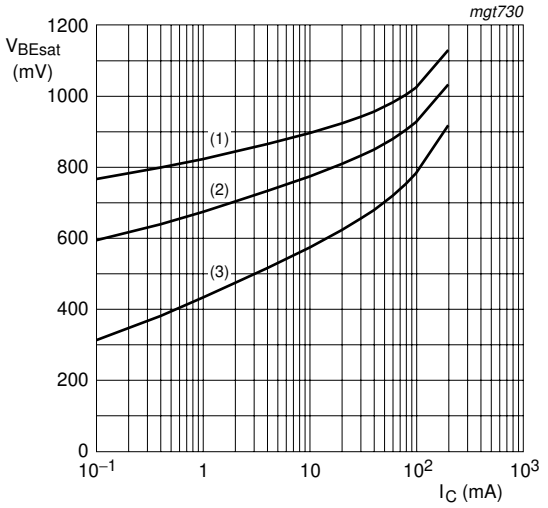
I_C/I_B = 20

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 7. Selection B: Collector-emitter saturation voltage as a function of collector current; typical values



I_C/I_B = 10

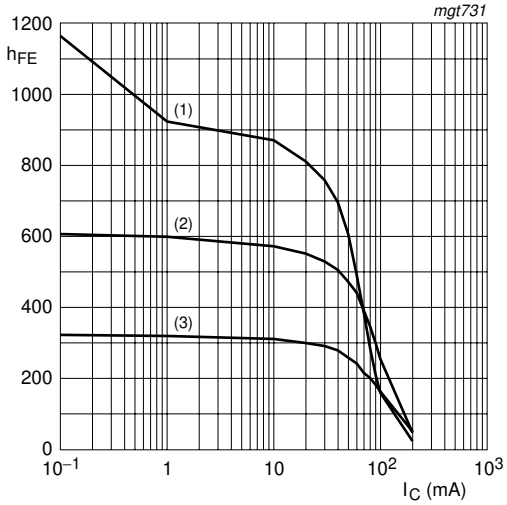
(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

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

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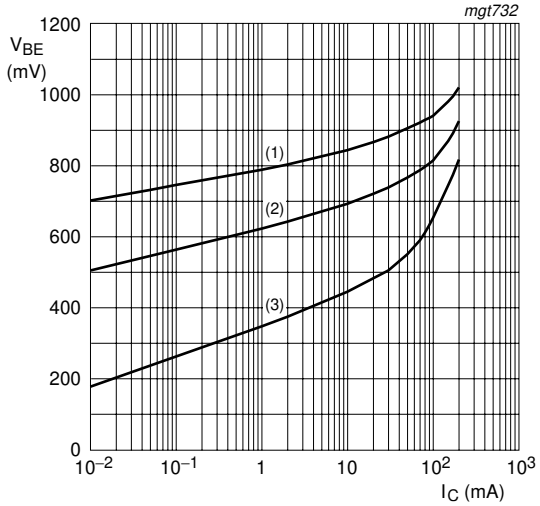
V_{CE} = 5 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 9. Selection C: DC current gain as a function of collector current; typical values



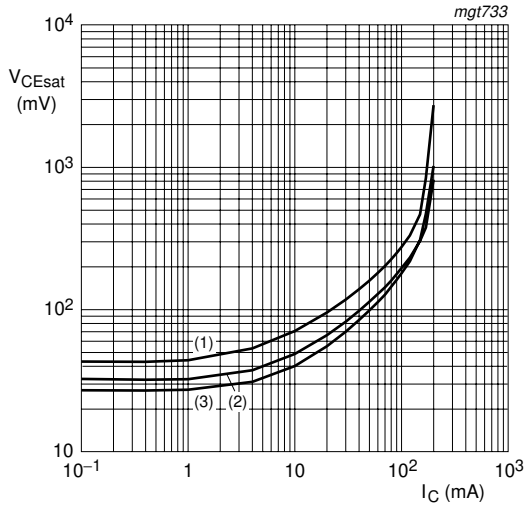
V_{CE} = 5 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig 10. Selection C: Base-emitter voltage as a function of collector current; typical values



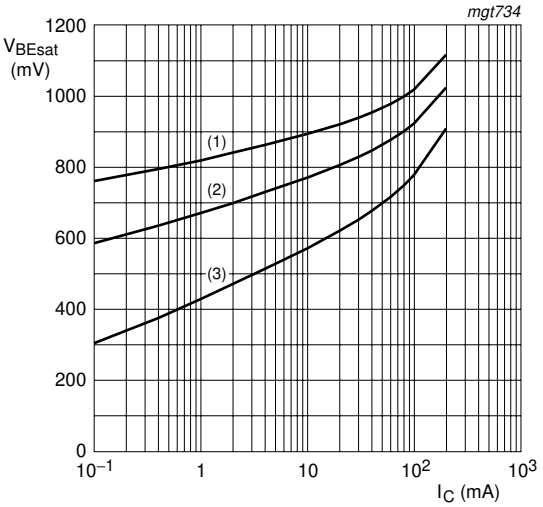
I_C/I_B = 20

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 11. Selection C: Collector-emitter saturation 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} = 150 °C

Fig 12. Selection C: Base-emitter saturation voltage as a function of collector current; typical values

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8. Package outline

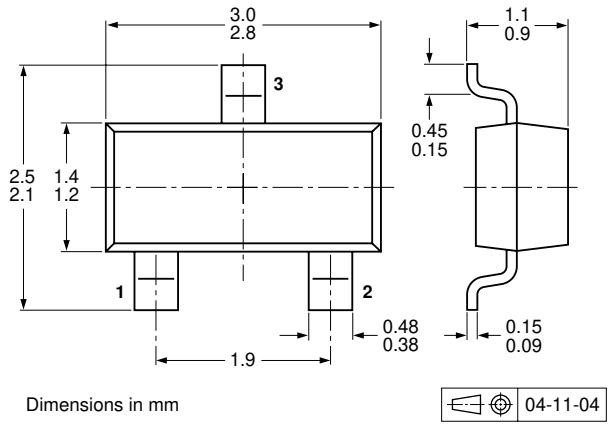


Fig 13. Package outline SOT23 (TO-236AB)

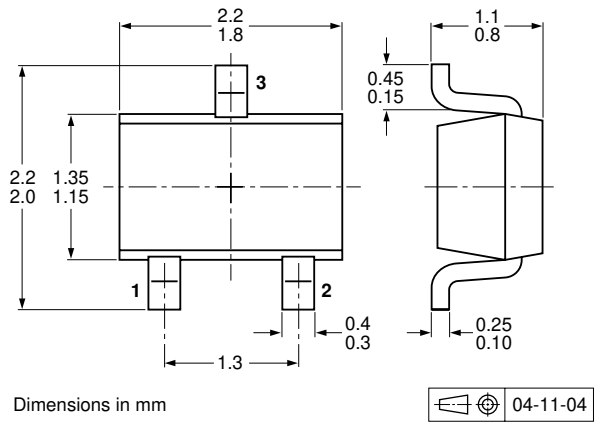


Fig 14. Package outline SOT323 (SC-70)

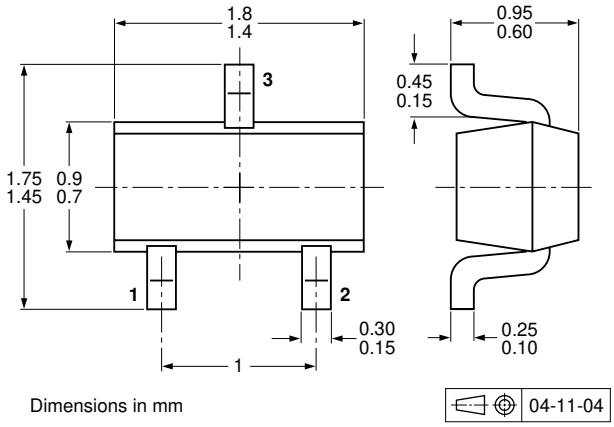


Fig 15. Package outline SOT416 (SC-75)

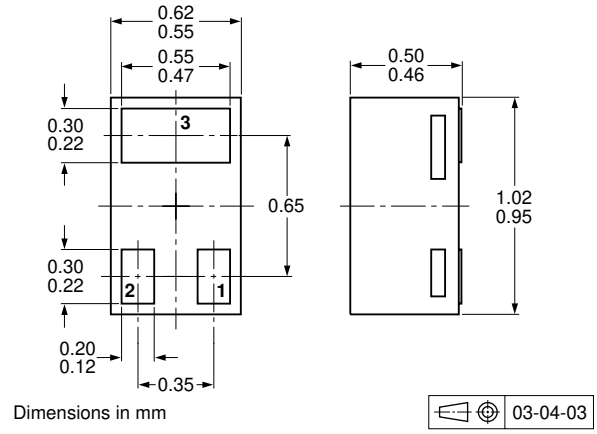


Fig 16. Package outline SOT883 (SC-101)

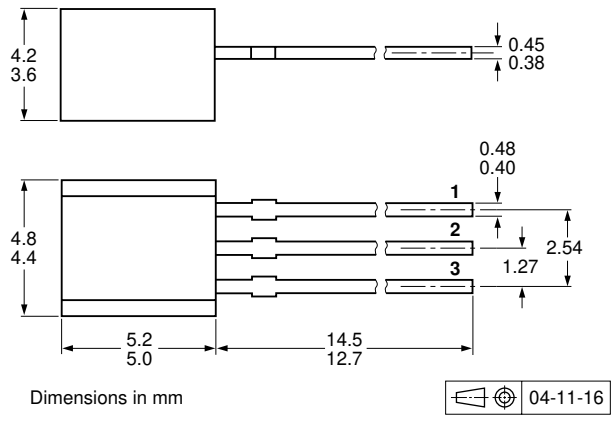


Fig 17. Package outline SOT54 (SC-43A/TO-92)

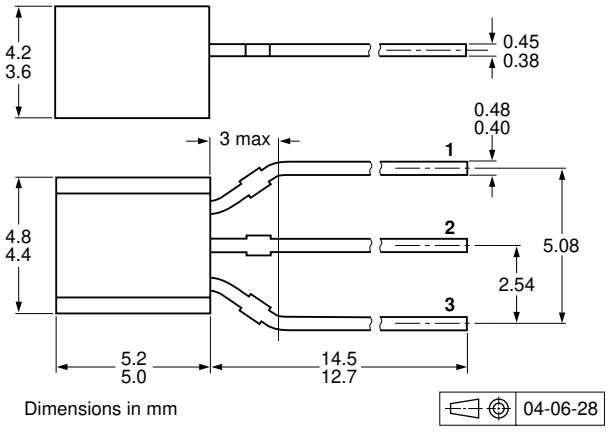


Fig 18. Package outline SOT54A

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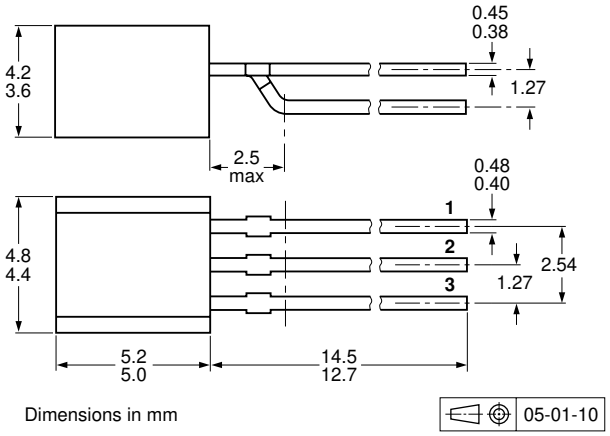


Fig 19. Package outline SOT54 variant

9. Packing information

Table 9. Packing methods

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

Type number[2]	Package	Description	Packing quantity		
			3000	5000	10000
BC847	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
BC847A					
BC847B					
BC847B/DG					
BC847C					
BC847W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-135
BC847AW					
BC847BW					
BC847BW/DG					
BC847CW					
BC847T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
BC847AT					
BC847AT/DG					
BC847BT					
BC847CT					
BC847AM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
BC847BM					
BC847CM					
BC547	SOT54	bulk, straight leads	-	-412	-
BC547B					
BC547C					

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Table 9. Packing methods *...continued*

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

Type number[2]	Package	Description	Packing quantity		
			3000	5000	10000
BC547	SOT54A	tape and reel, wide pitch	-	-	-116
BC547B					
BC547C					
BC547	SOT54A	tape ammopack, wide pitch	-	-	-126
BC547B					
BC547C					
BC547	SOT54 variant	bulk, delta pinning	-	-112	-
BC547B					
BC547C					

[1] For further information and the availability of packing methods, see Section 12.

[2] /DG: halogen-free

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10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC847_BC547_SER_7	20081210	Product data sheet	-	BC847_BC547_SER_6
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Table 1 “Product overview”: enhanced • Table 4 “Ordering information”: enhanced • Table 5 “Marking codes”: enhanced • Table 6 “Limiting values”: I_{EBO} conditions amended • Table 8 “Characteristics”: symbol N for parameter noise figure redefined to NF • Table 9 “Packing methods”: enhanced • Section 11 “Legal information”: updated			
BC847_BC547_SER_6	20050519	Product data sheet	-	BC846_BC847_ BC848_5, BC847M_SERIES_2, BC846T_847T_ SERIES_3, BC846W_BC847W_BC848W_4, BC546_547_4
BC846_BC847_BC848_5	20040206	Product specification	-	BC846_BC847_ BC848_4
BC847M_SERIES_2	20040310	Product specification	-	BC847M_SERIES_1
BC846T_847T_SERIES_3	20001115	Product specification	-	BC846T_847T_2
BC846W_BC847W_ BC848W_4	20020204	Product specification	-	BC846W_847W_3
BC546_547_4	20041125	Product specification	-	BC546_547_3

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11. Legal information

11.1 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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12. Contact information

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