

BC635; BCP54; BCX54

45 V, 1 A NPN medium power transistors

Rev. 07 — 4 June 2007

Product data sheet

1. Product profile

1.1 General description

NPN medium power transistor series.

Table 1. Product overview

Type number ^[1]	Package			PNP complement
	NXP	JEITA	JEDEC	
BC635 ^[2]	SOT54	SC-43A	TO-92	BC636
BCP54	SOT223	SC-73	-	BCP51
BCX54	SOT89	SC-62	TO-243	BCX51

[1] Valid for all available selection groups.

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

1.2 Features

- High current
- Two current gain selections
- High power dissipation capability

1.3 Applications

- Linear voltage regulators
- Low side switches
- MOSFET drivers
- Amplifiers

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		-	-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	1.5	A
h_{FE}	DC current gain	$V_{CE} = 2$ V; $I_C = 150$ mA	63	-	250	
	h_{FE} selection -10	$V_{CE} = 2$ V; $I_C = 150$ mA	63	-	160	
	h_{FE} selection -16	$V_{CE} = 2$ V; $I_C = 150$ mA	100	-	250	

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
SOT54			
1	base	<p>001aab347</p>	<p>sym056</p>
2	collector		
3	emitter		
SOT54A			
1	base	<p>001aab348</p>	<p>sym056</p>
2	collector		
3	emitter		
SOT54 variant			
1	base	<p>001aab447</p>	<p>sym056</p>
2	collector		
3	emitter		
SOT223			
1	base	<p>sym016</p>	<p>sym016</p>
2	collector		
3	emitter		
4	collector		
SOT89			
1	emitter	<p>sym042</p>	<p>sym042</p>
2	collector		
3	base		

3. Ordering information

Table 4. Ordering information

Type number ^[1]	Package		
	Name	Description	Version
BC635 ^[2]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BCP54	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223
BCX54	SC-62	plastic surface-mounted package; collector pad for good heat transfer; 3 leads	SOT89

[1] Valid for all available selection groups.

[2] Also available in SOT54A and SOT54 variant packages (see [Section 2](#) and [Section 9](#)).

4. Marking

Table 5. Marking codes

Type number	Marking code
BC635	C635
BC635-16	C63516
BCP54	BCP54
BCP54-10	BCP54/10
BCP54-16	BCP54/16
BCX54	BA
BCX54-10	BC
BCX54-16	BD

5. Limiting values

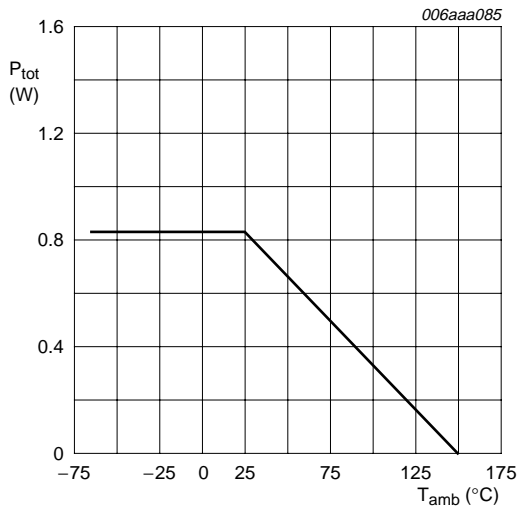
Table 6. Limiting values*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	45	V	
V_{CEO}	collector-emitter voltage	open base	-	45	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	-	1.5	A	
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms	-	0.2	A	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
			BC635	[1] -	0.83	W
			BCP54	[1] -	0.64	W
				[2] -	0.96	W
			BCX54	[1] -	0.5	W
				[2] -	0.85	W
[3] -	1.25	W				
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.

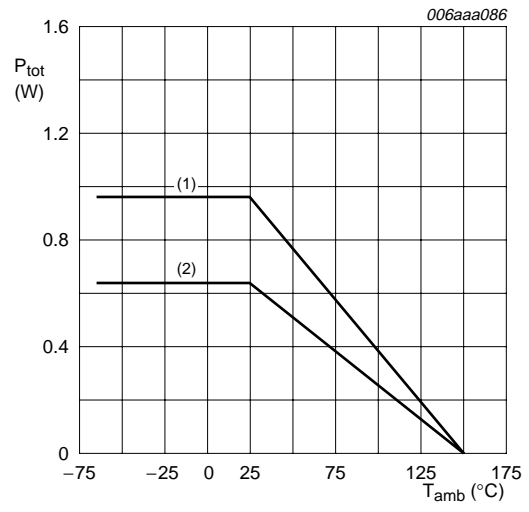
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².



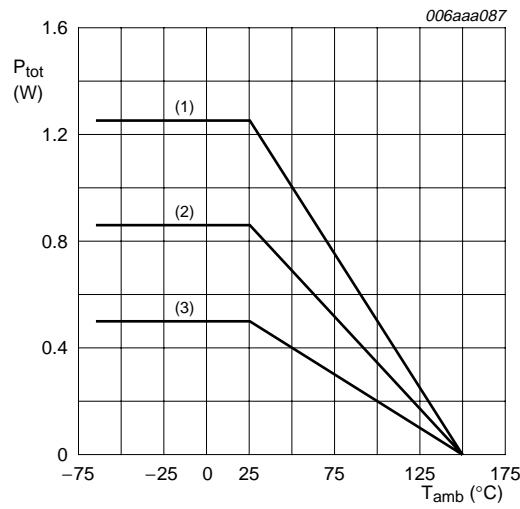
FR4 PCB, standard footprint

Fig 1. Power derating curve SOT54



- (1) FR4 PCB, mounting pad for collector 1 cm²
- (2) FR4 PCB, standard footprint

Fig 2. Power derating curves SOT223



- (1) FR4 PCB, mounting pad for collector 6 cm²
- (2) FR4 PCB, mounting pad for collector 1 cm²
- (3) FR4 PCB, standard footprint

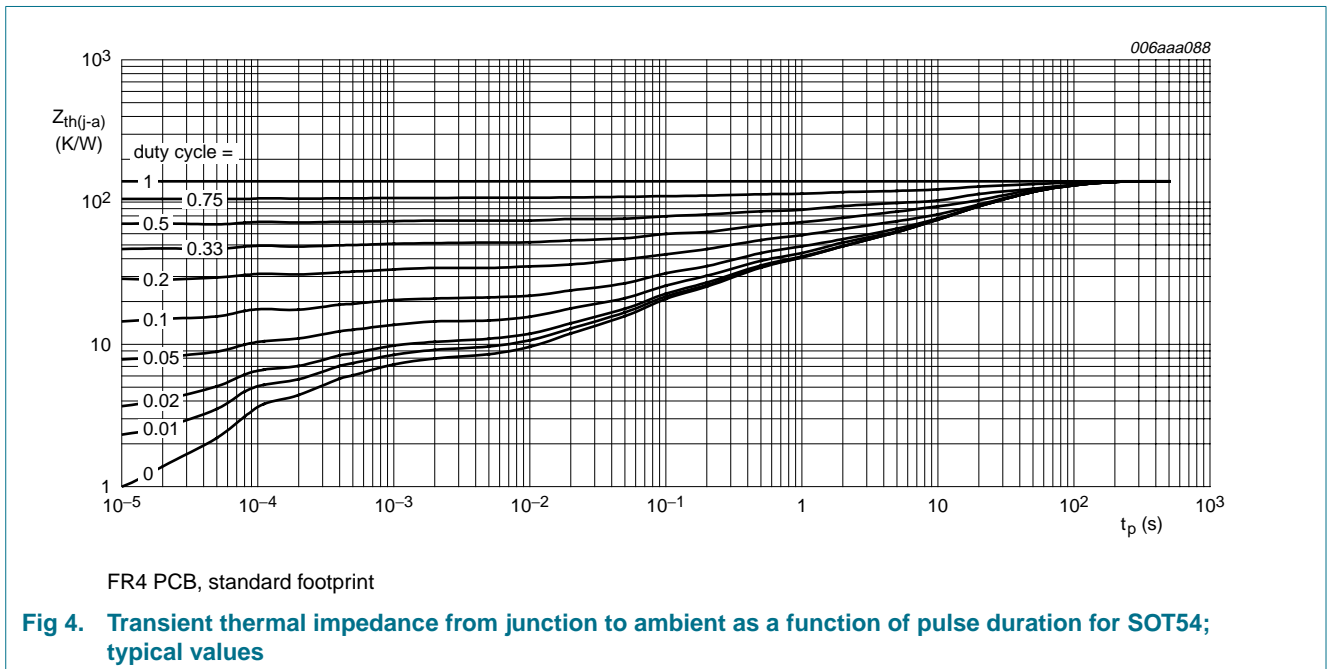
Fig 3. Power derating curves SOT89

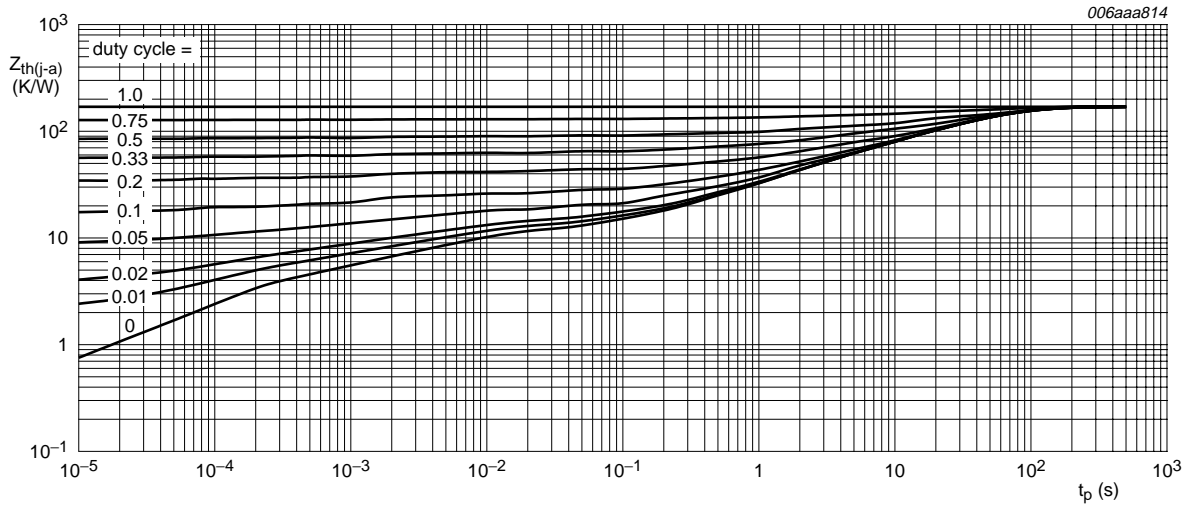
6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit		
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air						
			BC635	[1]	-	-	150	K/W
			BCP54	[1]	-	-	195	K/W
				[2]	-	-	130	K/W
			BCX54	[1]	-	-	250	K/W
				[2]	-	-	145	K/W
[3]	-	-		100	K/W			
$R_{th(j-sp)}$	thermal resistance from junction to solder point							
		BC635	-	-	40	K/W		
		BCP54	-	-	17	K/W		
		BCX54	-	-	30	K/W		

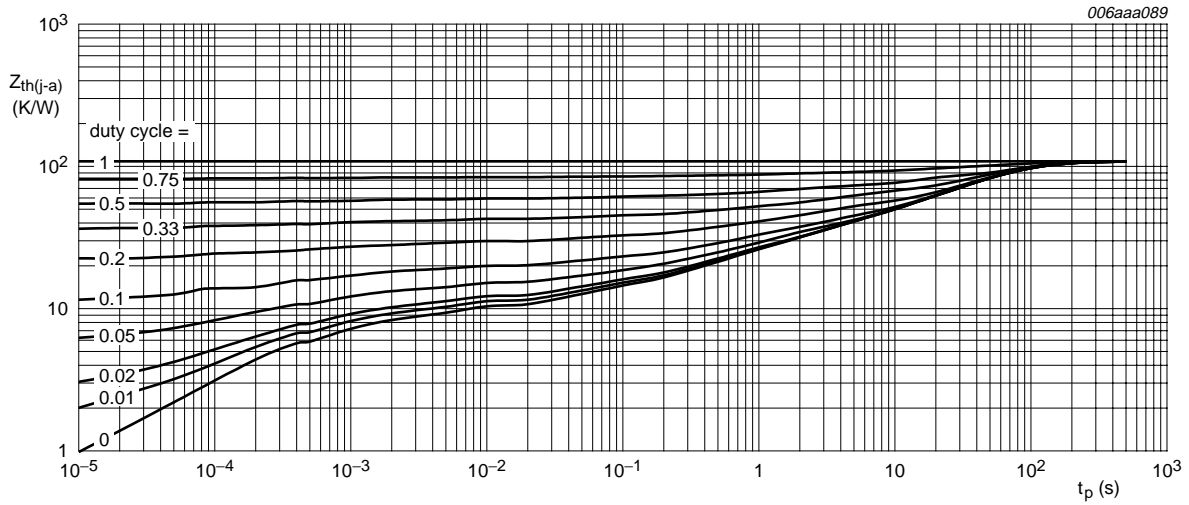
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².





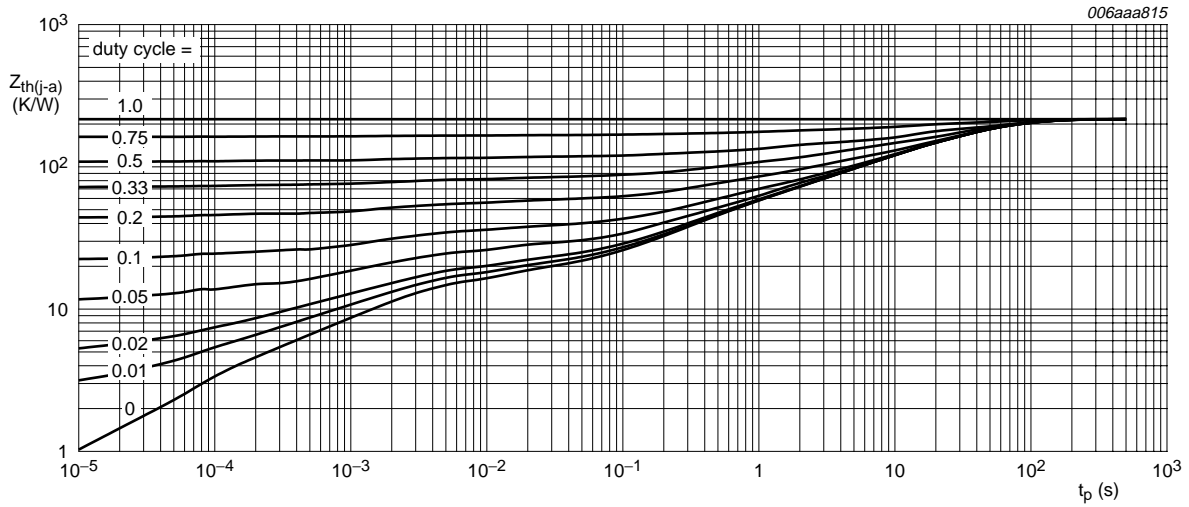
FR4 PCB, standard footprint

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values



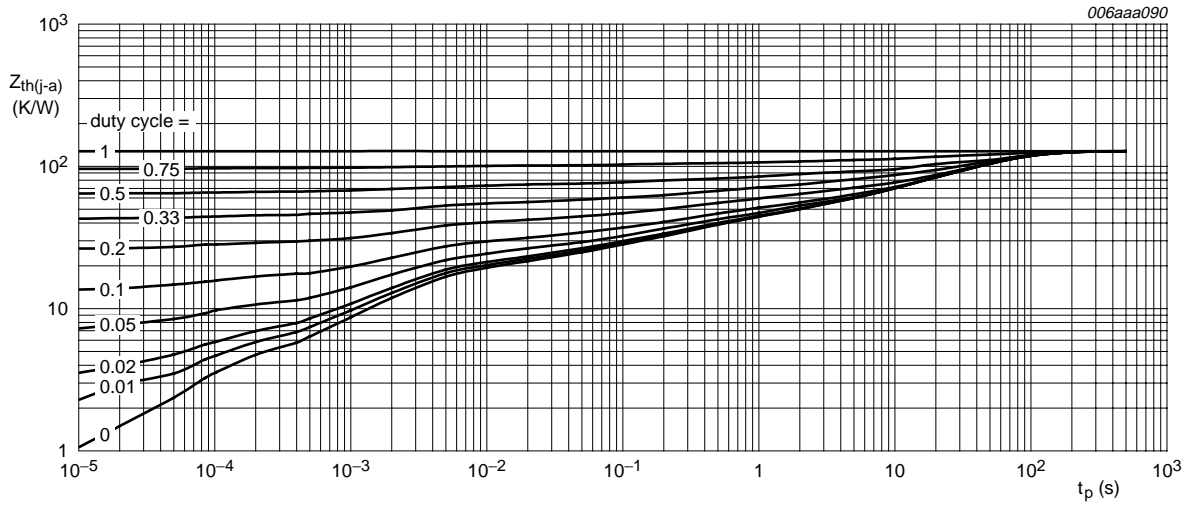
FR4 PCB, mounting pad for collector 1 cm²

Fig 6. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values



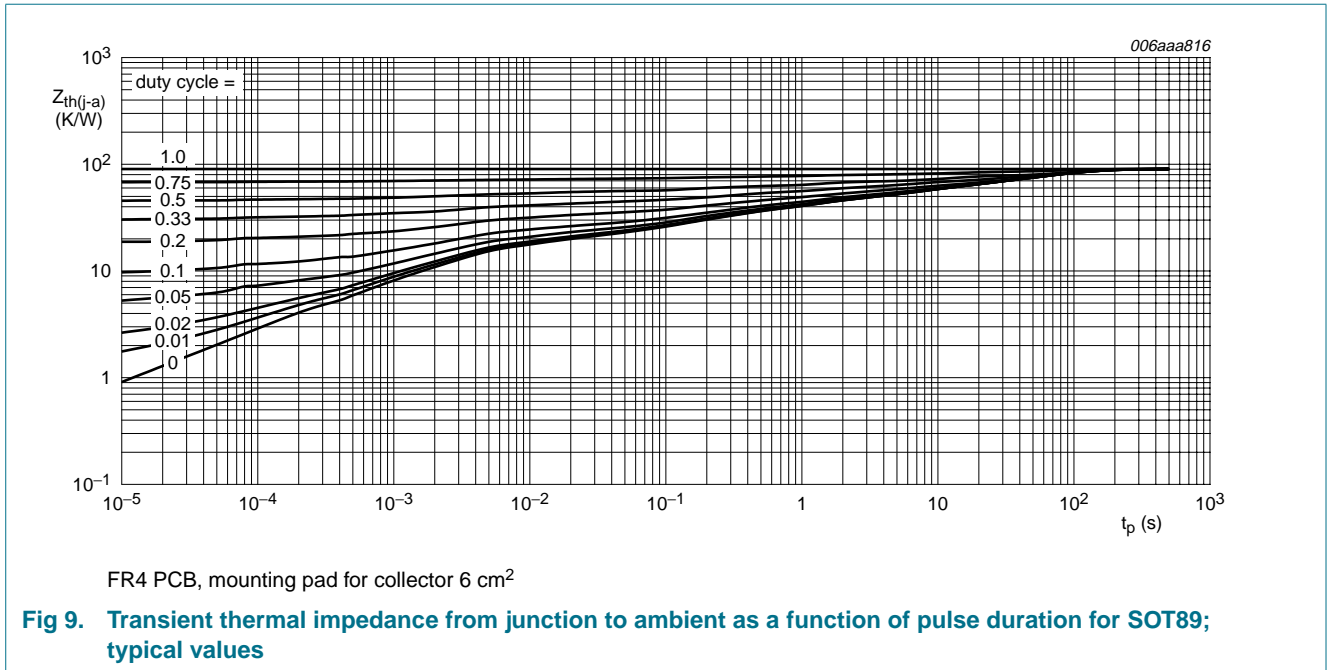
FR4 PCB, standard footprint

Fig 7. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values



FR4 PCB, mounting pad for collector 1 cm²

Fig 8. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values



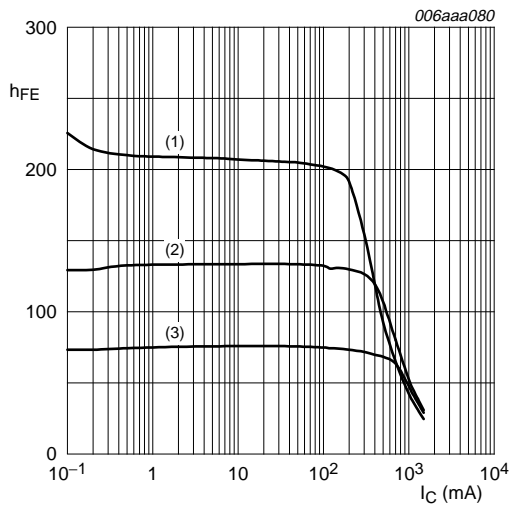
7. Characteristics

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	-	-	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	-	-	100	nA
h _{FE}	DC current gain	V _{CE} = 2 V				
		I _C = 5 mA	63	-	-	
		I _C = 150 mA	63	-	250	
		I _C = 500 mA	[1] 40	-	-	
	DC current gain	V _{CE} = 2 V				
	h _{FE} selection -10	I _C = 150 mA	63	-	160	
	h _{FE} selection -16	I _C = 150 mA	100	-	250	
V _{CEsat}	collector-emitter saturation voltage	I _C = 500 mA; I _B = 50 mA	[1] -	-	500	mV
V _{BE}	base-emitter voltage	V _{CE} = 2 V; I _C = 500 mA	[1] -	-	1	V
C _C	collector capacitance	V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz	-	6	-	pF
f _T	transition frequency	V _{CE} = 5 V; I _C = 50 mA; f = 100 MHz	100	180	-	MHz

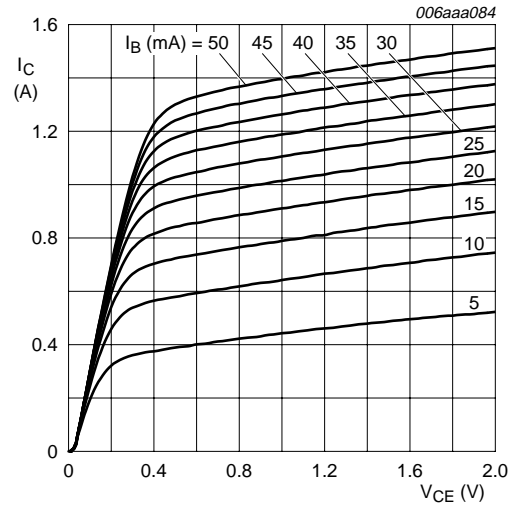
[1] Pulse test: t_p ≤ 300 μs; δ = 0.02.



$V_{CE} = 2 \text{ V}$

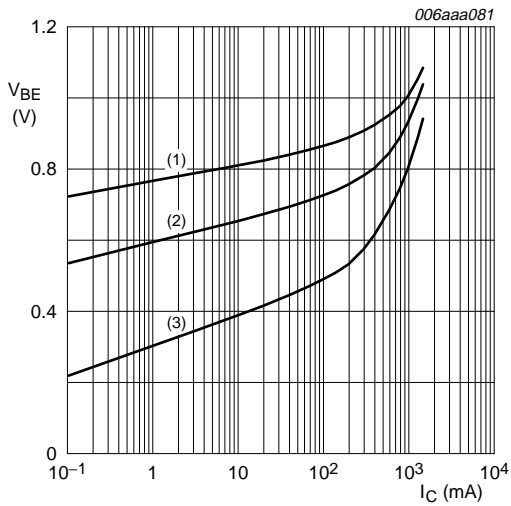
- (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = -55 \text{ }^\circ\text{C}$

Fig 10. DC current gain as a function of collector current; typical values



$T_{amb} = 25 \text{ }^\circ\text{C}$

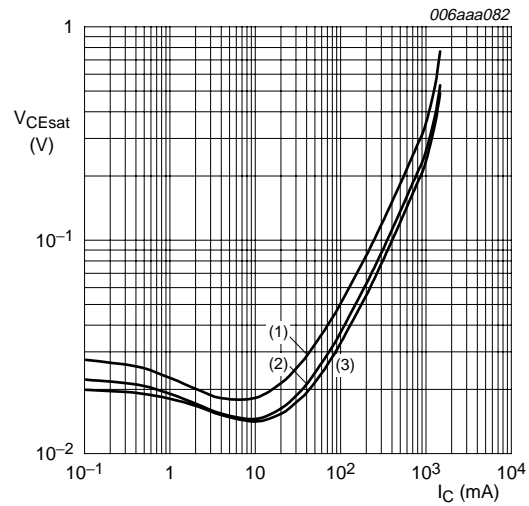
Fig 11. Collector current as a function of collector-emitter voltage; typical values



$V_{CE} = 2 \text{ V}$

- (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 150 \text{ }^\circ\text{C}$

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

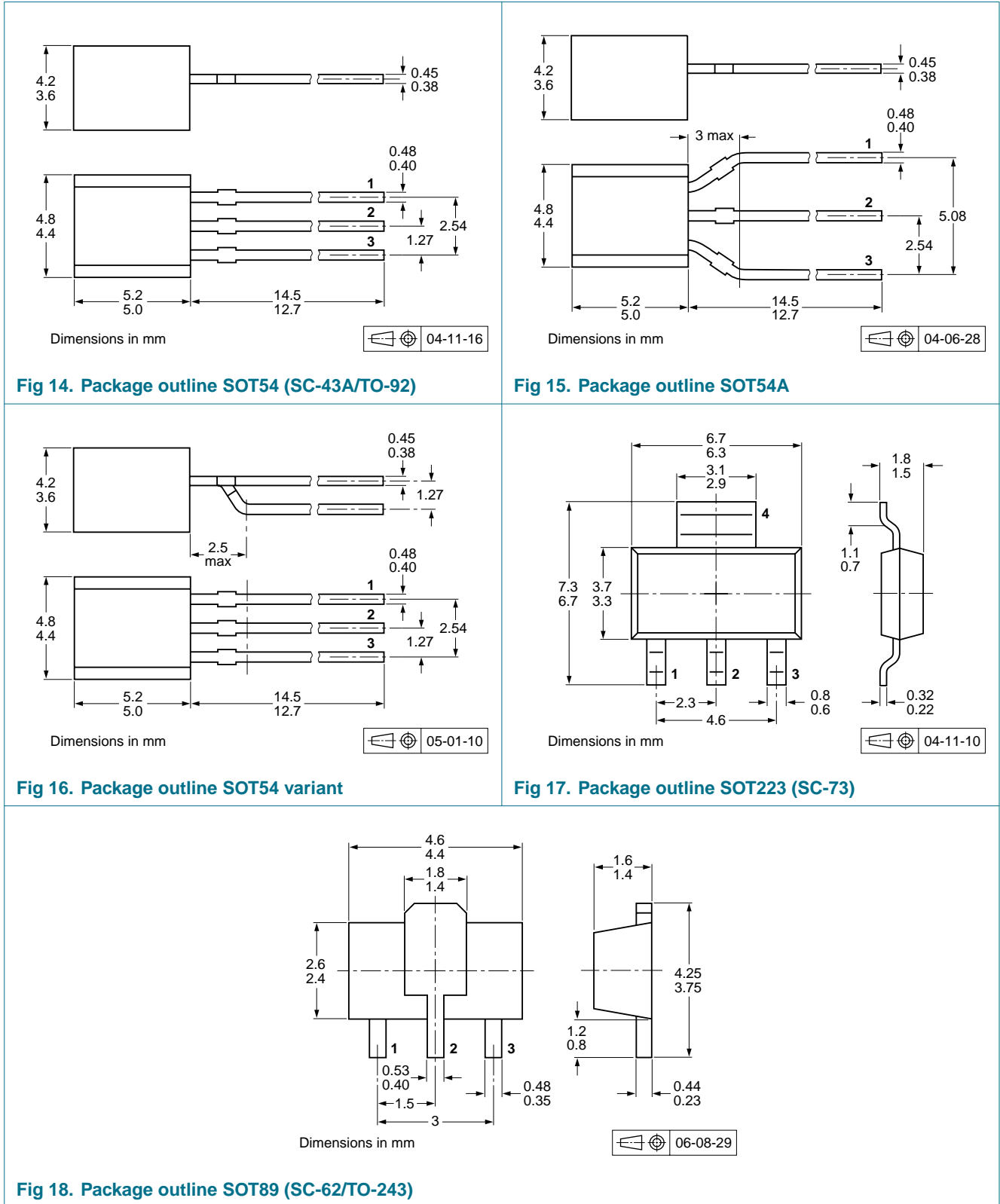


$I_C/I_B = 10$

- (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = -55 \text{ }^\circ\text{C}$

Fig 13. Collector-emitter saturation voltage as a function of collector current; typical values

8. Package outline



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			
			1000	4000	5000	10000
BC635	SOT54	bulk, straight leads	-	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-	-116
		tape ammopack, wide pitch	-	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-	-112	-
BCP54	SOT223	8 mm pitch, 12 mm tape and reel	-115	-135	-	-
BCX54	SOT89	8 mm pitch, 12 mm tape and reel; T1	^[3] -115	-135	-	-
		8 mm pitch, 12 mm tape and reel; T3	^[4] -120	-	-	-

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

[2] Valid for all available selection groups.

[3] T1: normal taping

[4] T3: 90° rotated taping

10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC635_BCP54_BCX54_7	20070604	Product data sheet	-	BC635_BCP54_BCX54_6
Modifications:				
<ul style="list-style-type: none"> • Table 1 “Product overview”: amended • Section 1.2 “Features”: amended • Section 1.3 “Applications”: amended • Table 2 “Quick reference data”: I_C parameter redefined to collector current • Table 2 “Quick reference data”: I_{CM} condition added • Figure 2 and 3: amended • Table 6 “Limiting values”: I_C parameter redefined to collector current • Table 6 “Limiting values”: I_{CM} condition added • Table 6 “Limiting values”: P_{tot} values for BCP54 and BCX54 adapted • Table 7 “Thermal characteristics”: R_{th(j-a)} values for BCP54 and BCX54 rounded • Figure 4: Z_{th} redefined to Z_{th(j-a)} transient thermal impedance from junction to ambient • Figure 4: t_p parameter redefined to pulse duration • Figure 5: added • Figure 6: Z_{th} redefined to Z_{th(j-a)} transient thermal impedance from junction to ambient • Figure 6: t_p parameter redefined to pulse duration • Figure 7: added • Figure 8: Z_{th} redefined to Z_{th(j-a)} transient thermal impedance from junction to ambient • Figure 8: t_p parameter redefined to pulse duration • Figure 9: added • Figure 11: amended • Table 9 “Packing methods”: new packing method for BCX54 added • Section 11 “Legal information”: updated 				
BC635_BCP54_BCX54_6	20050225	Product data sheet	CPCN200405029	BC635_637_639_4 BCP54_55_56_5 BCX54_55_56_4
BC635_637_639_4	20011010	Product specification	-	BC635_637_639_3
BCP54_55_56_5	20030206	Product specification	-	BCP54_55_56_4
BCX54_55_56_4	20011010	Product specification	-	BCX54_55_56_3

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".

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