

BC640; BCP53; BCX53

80 V, 1 A PNP medium power transistors

Rev. 08 — 22 February 2008

Product data sheet

1. Product profile

1.1 General description

PNP medium power transistor series.

Table 1. Product overview

Type number ^[1]	Package			NPN complement
	NXP	JEITA	JEDEC	
BC640 ^[2]	SOT54	SC-43A	TO-92	BC639
BCP53	SOT223	SC-73	-	BCP56
BCX53	SOT89	SC-62	TO-243	BCX56

[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
- High-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	-	-	-80	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		
2	collector		
3	emitter		
SOT54A			
1	base		
2	collector		
3	emitter		
SOT54 variant			
1	base		
2	collector		
3	emitter		
SOT223			
1	base		
2	collector		
3	emitter		
4	collector		
SOT89			
1	emitter		
2	collector		
3	base		

3. Ordering information

Table 4. Ordering information

Type number ^[1]	Package		
	Name	Description	Version
BC640 ^[2]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BCP53	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223
BCX53	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
BC640	C640
BCP53	BCP53
BCP53-10	BCP53/10
BCP53-16	BCP53/16
BCX53	AH
BCX53-10	AK
BCX53-16	AL

5. Limiting values

Table 6. Limiting values

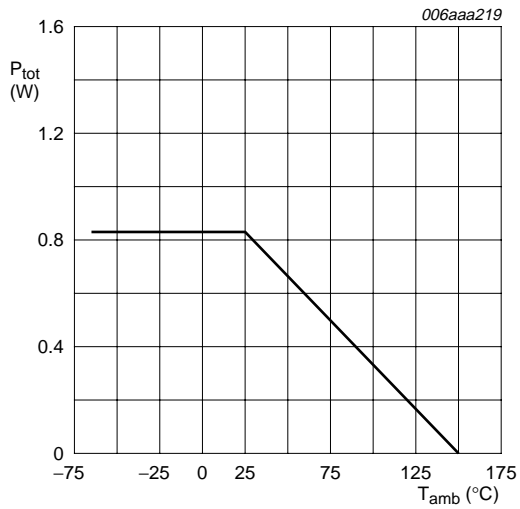
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	-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	-	-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				
			BC640	[1] -	0.83	W
			BCP53	[1] -	0.65	W
				[2] -	1	W
			BCX53	[1] -	0.5	W
				[2] -	0.9	W
[3] -	1.3	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.

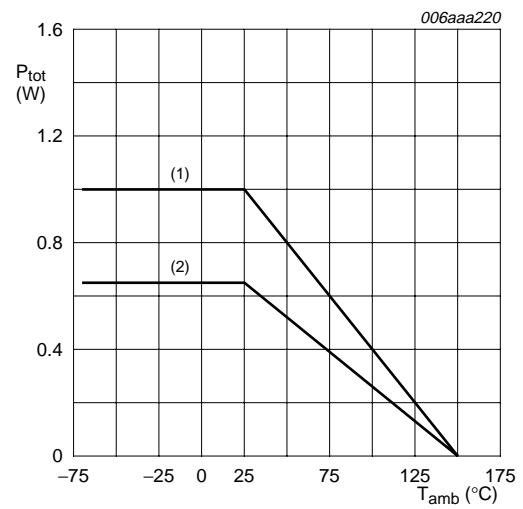
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

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



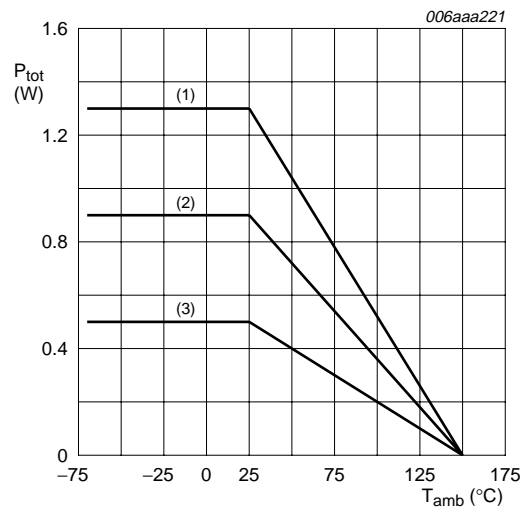
FR4 PCB, standard footprint

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

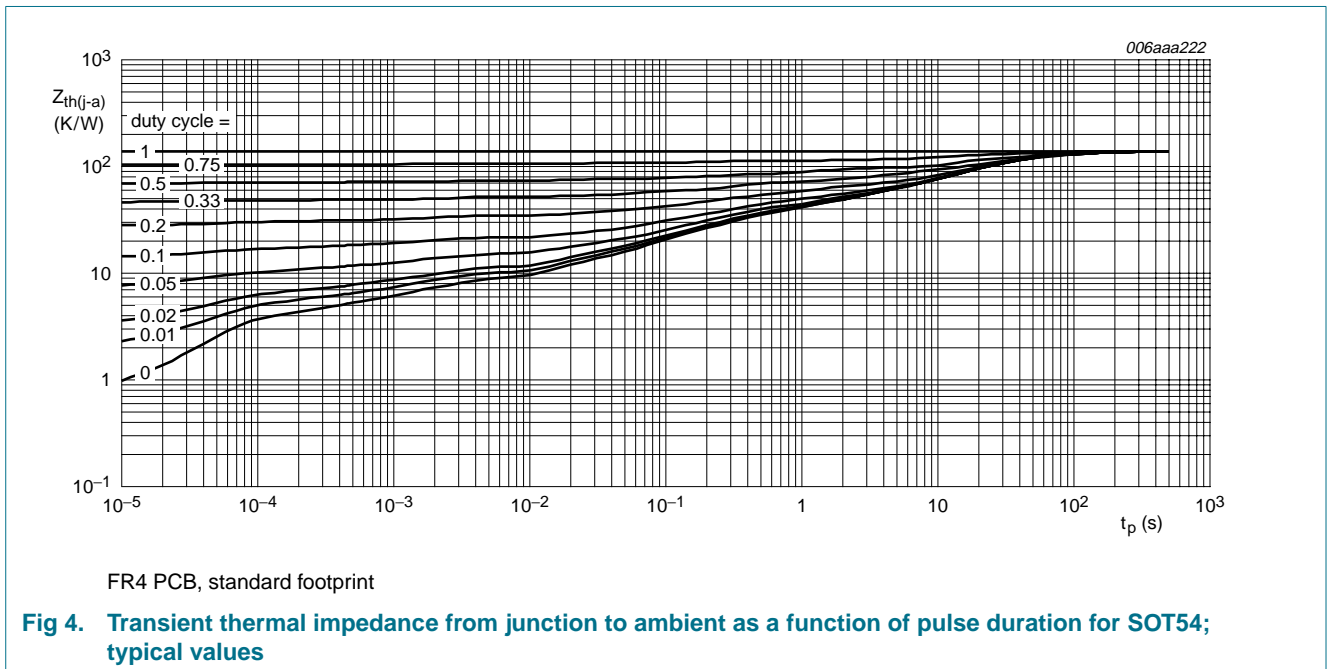
Fig 3. Power derating curves SOT89

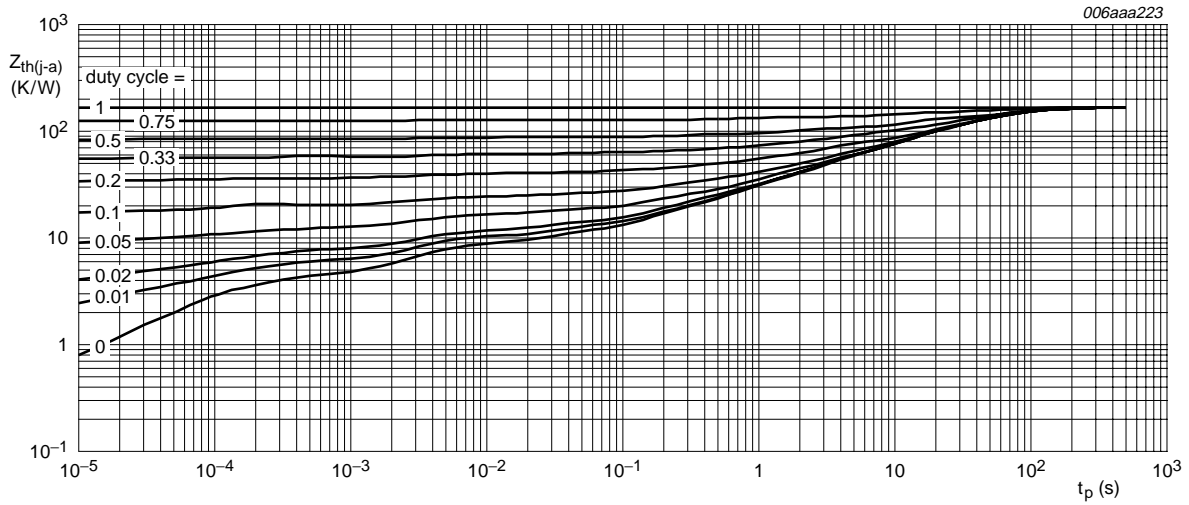
6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit		
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air						
			BC640	[1]	-	-	150	K/W
			BCP53	[1]	-	-	190	K/W
				[2]	-	-	125	K/W
			BCX53	[1]	-	-	230	K/W
				[2]	-	-	135	K/W
[3]	-	-		95	K/W			
$R_{th(j-sp)}$	thermal resistance from junction to solder point							
		BC640	-	-	40	K/W		
		BCP53	-	-	17	K/W		
		BCX53	-	-	20	K/W		

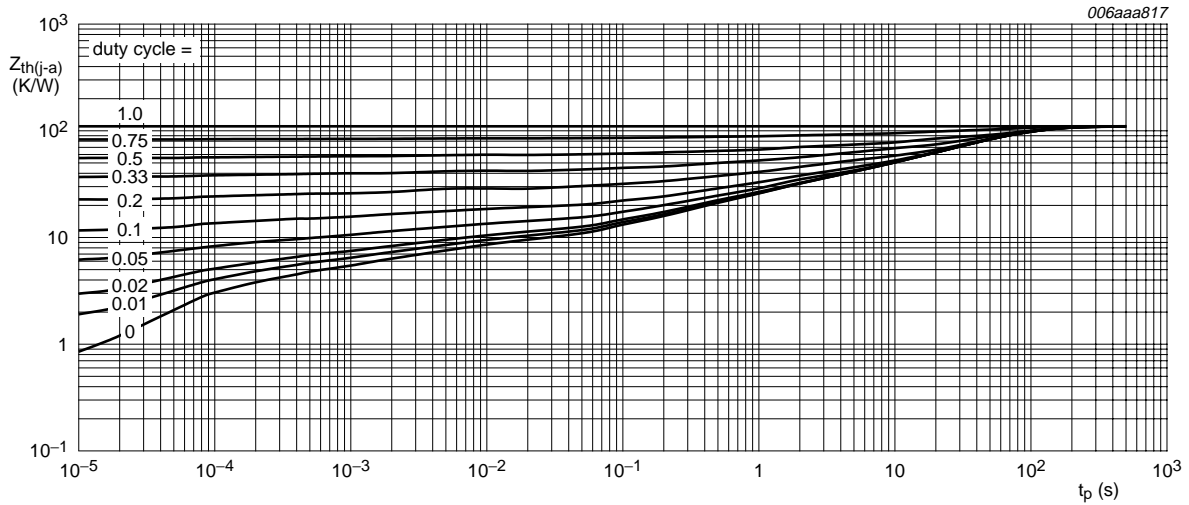
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².





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

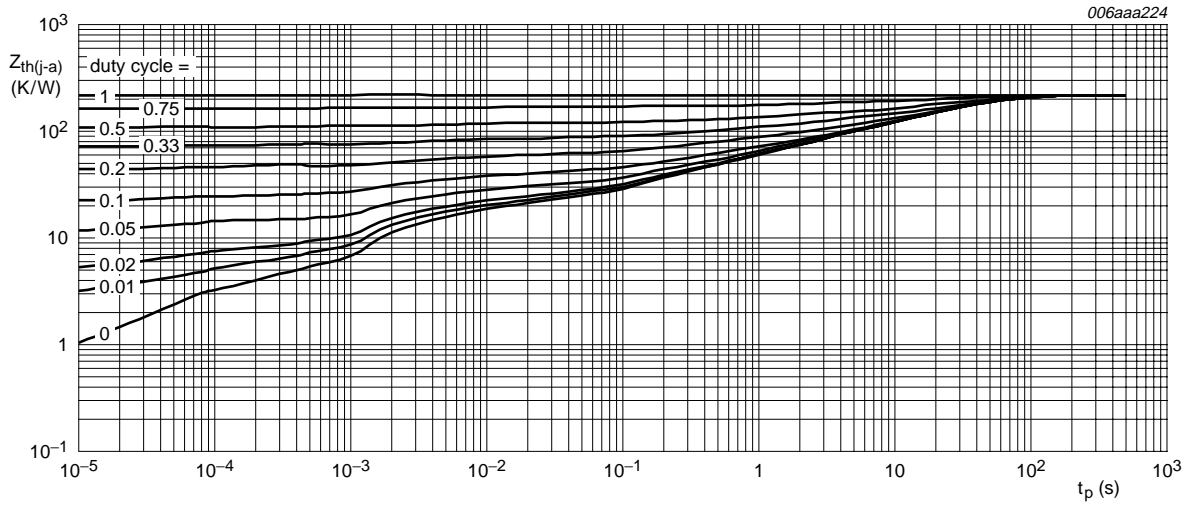


Fig 7. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values

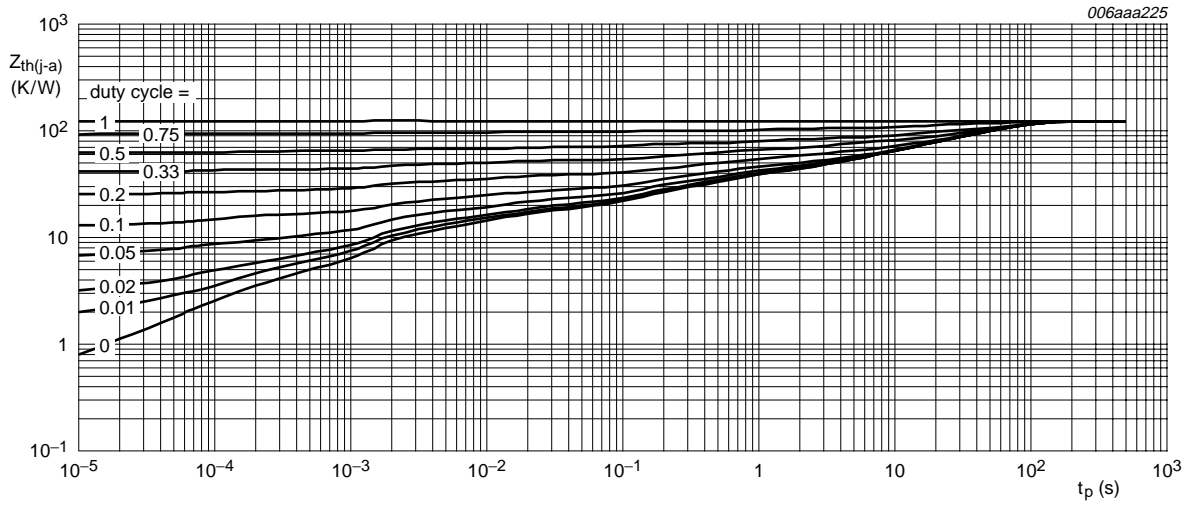
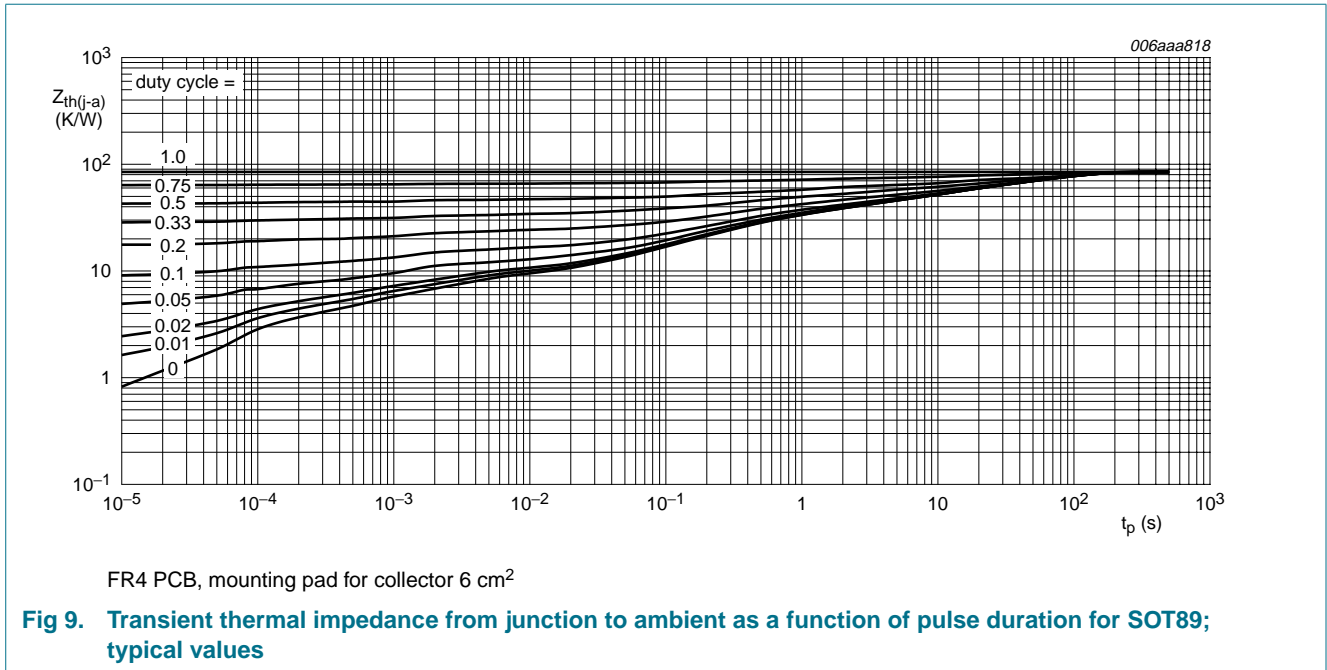


Fig 8. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values



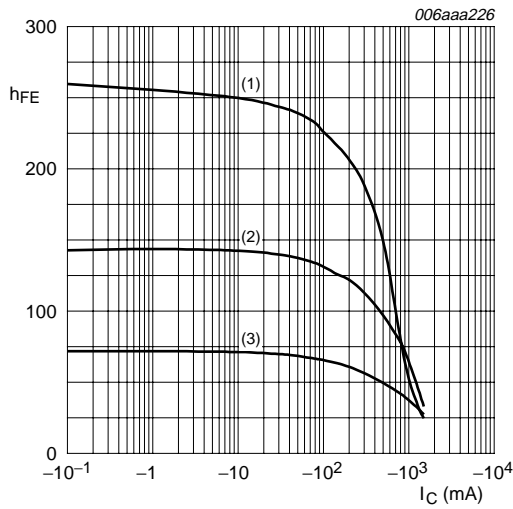
7. Characteristics

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] -	-	-0.5	V
V _{BE}	base-emitter voltage	V _{CE} = -2 V; I _C = -500 mA	[1] -	-	-1	V
C _C	collector capacitance	V _{CB} = -15 V; I _E = i _e = 0 A; f = 1 MHz	-	15	-	pF
f _T	transition frequency	V _{CE} = -5 V; I _C = -50 mA; f = 100 MHz	-	145	-	MHz

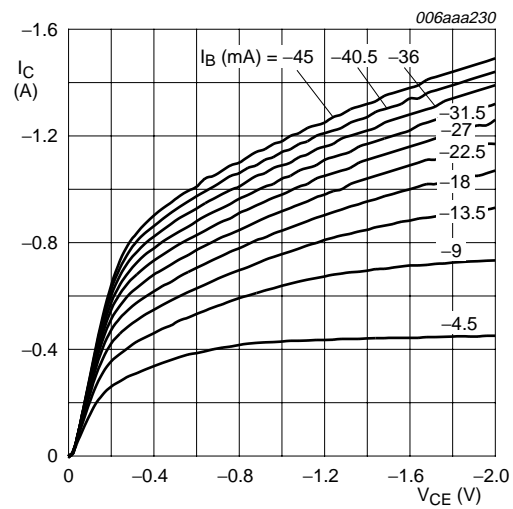
[1] Pulse test: t_p ≤ 300 μs; δ = 0.02.



$V_{CE} = -2 V$

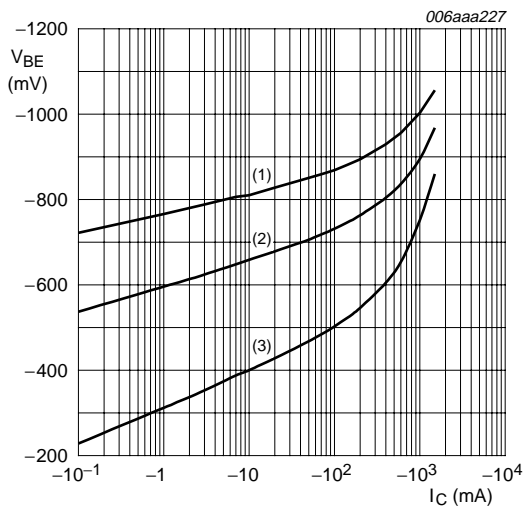
- (1) $T_{amb} = 150^\circ C$
- (2) $T_{amb} = 25^\circ C$
- (3) $T_{amb} = -55^\circ C$

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



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

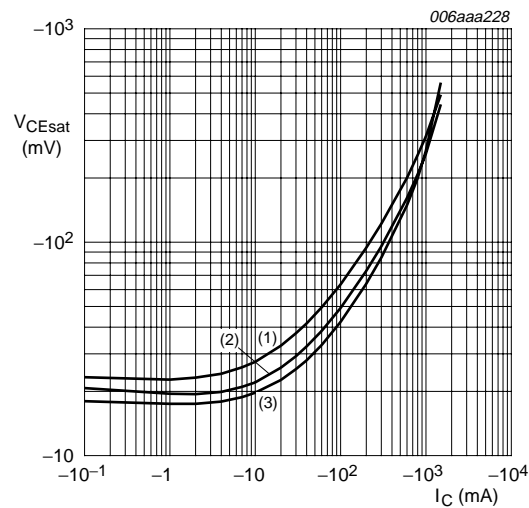
Fig 11. Collector current as a function of collector-emitter voltage; typical values



$V_{CE} = -2 V$

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

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



$I_C/I_B = 10$

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

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

8. Package outline

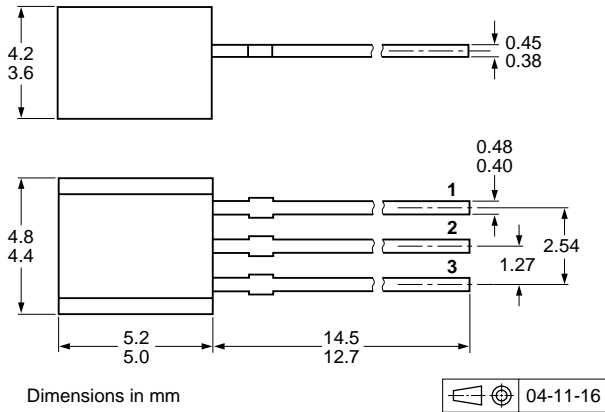


Fig 14. Package outline SOT54 (SC-43A/TO-92)

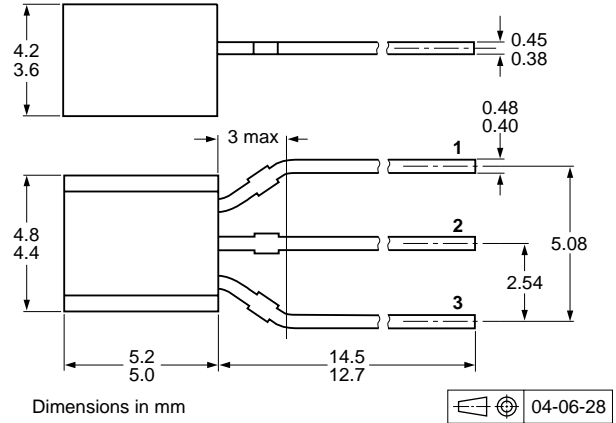


Fig 15. Package outline SOT54A

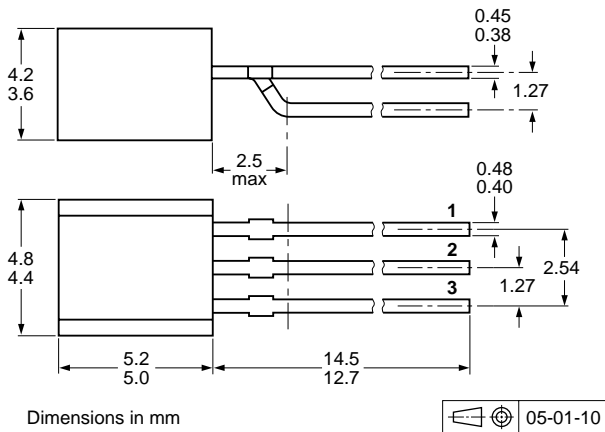


Fig 16. Package outline SOT54 variant

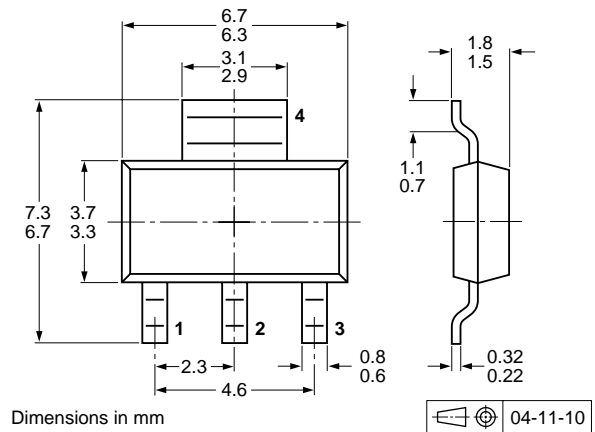


Fig 17. Package outline SOT223 (SC-73)

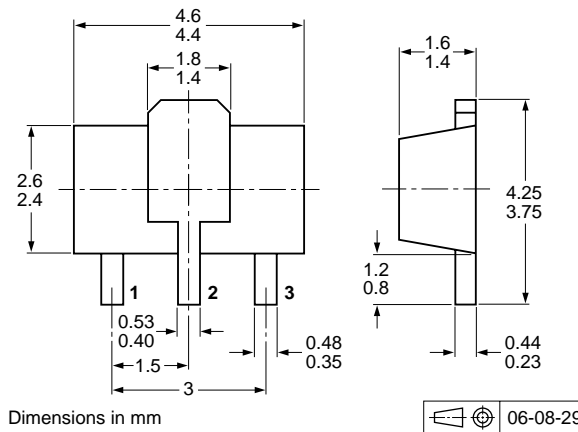


Fig 18. Package outline SOT89 (SC-62/TO-243)

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
BC640	SOT54	bulk, straight leads	-	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-	-116
		tape ammopack, wide pitch	-	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-	-112	-
BCP53	SOT223	8 mm pitch, 12 mm tape and reel	-115	-135	-	-
BCX53	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
BC640_BCP53_BCX53_8	20080222	Product data sheet	-	BC640_BCP53_BCX53_7
Modifications:	<ul style="list-style-type: none"> Type number BC640-16 has been removed Figure 11: amended 			
BC640_BCP53_BCX53_7	20070627	Product data sheet	-	BC640_BCP53_BCX53_6
BC640_BCP53_BCX53_6	20060313	Product data sheet	-	BC636_638_640_5 BCP51_52_53_5 BCX51_52_53_4
BC636_638_640_5	20041011	Product specification	-	BC636_638_640_4
BCP51_52_53_5	20030206	Product specification	-	BCP51_52_53_4
BCX51_52_53_4	20011010	Product specification	-	BCX51_52_53_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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