BC636; BCP51; BCX51

45 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	
BC636[2]	SOT54	SC-43A	TO-92	BC635
BCP51	SOT223	SC-73	-	BCP54
BCX51	SOT89	SC-62	TO-243	BCX54

[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

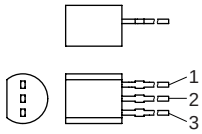
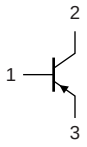
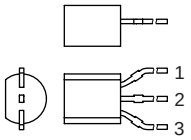
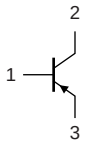
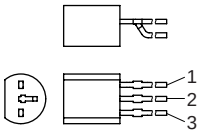
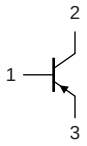
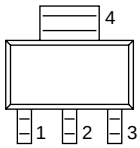
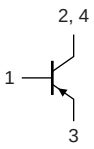
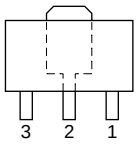
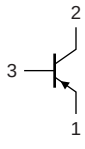
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	–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	

NXP founded by Philips

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
SOT54			
1	base	 001aab347	 sym029
2	collector		
3	emitter		
SOT54A			
1	base	 001aab348	 sym029
2	collector		
3	emitter		
SOT54 variant			
1	base	 001aab447	 sym029
2	collector		
3	emitter		
SOT223			
1	base		 sym028
2	collector		
3	emitter		
4	collector		
SOT89			
1	emitter		 006aaa231
2	collector		
3	base		

© NXP B.V. 2008. All rights reserved.

3. Ordering information

Table 4. Ordering information

Type number[1]	Package		
	Name	Description	Version
BC636[2]	SC-43A	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BCP51	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223
BCX51	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
BC636	C636
BC636-10	C63610
BCP51	BCP51
BCP51-10	BCP51/10
BCP51-16	BCP51/16
BCX51	AA
BCX51-10	AC
BCX51-16	AD

© NXP B.V. 2008. All rights reserved.

5. Limiting values

Table 6. Limiting values

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

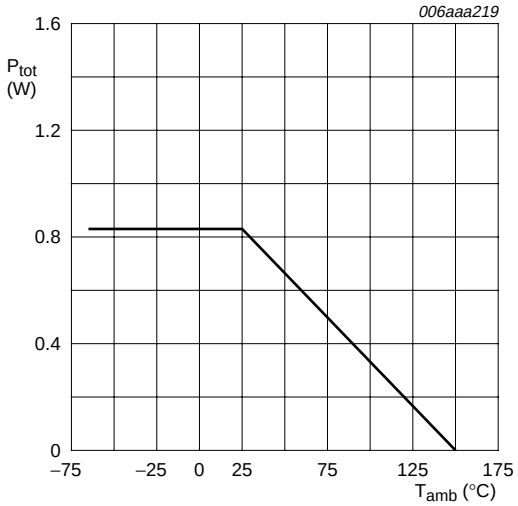
Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	–45	V
V_{CEO}	collector-emitter voltage	open base		-	–45	V
V_{EBO}	emitter-base voltage	open collector		-	–5	V
I_C	collector current			-	–1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	–1.5	A
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				
	BC636		[1]	-	0.83	W
	BCP51		[1]	-	0.65	W
			[2]	-	1	W
	BCX51		[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 cm^2.

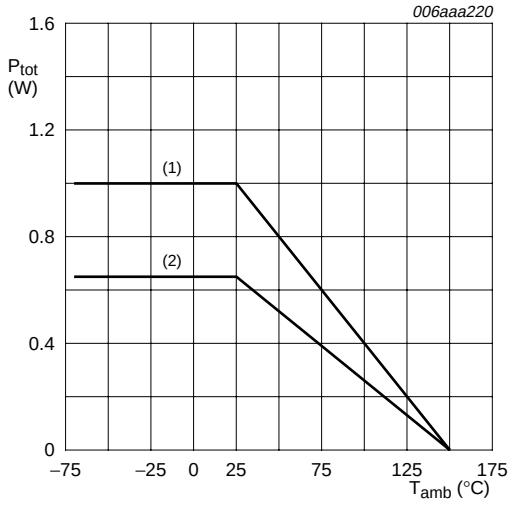
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

© NXP B.V. 2008. All rights reserved.



FR4 PCB, standard footprint

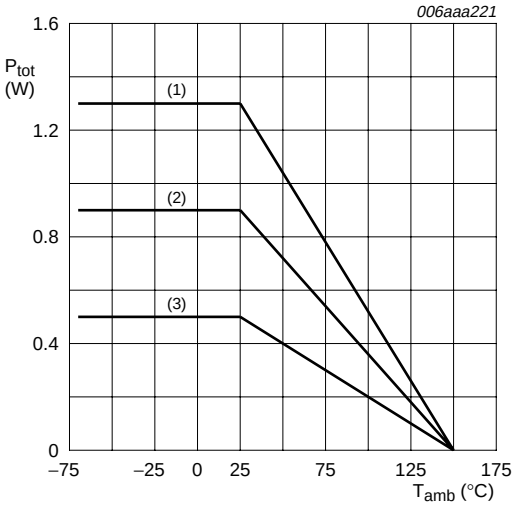
Fig 1. Power derating curve SOT54



(1) FR4 PCB, mounting pad for collector 1 cm^2

(2) FR4 PCB, standard footprint

Fig 2. Power derating curves SOT223



(1) FR4 PCB, mounting pad for collector 6 cm^2

(2) FR4 PCB, mounting pad for collector 1 cm^2

(3) FR4 PCB, standard footprint

Fig 3. Power derating curves SOT89

© NXP B.V. 2008. All rights reserved.

6. Thermal characteristics

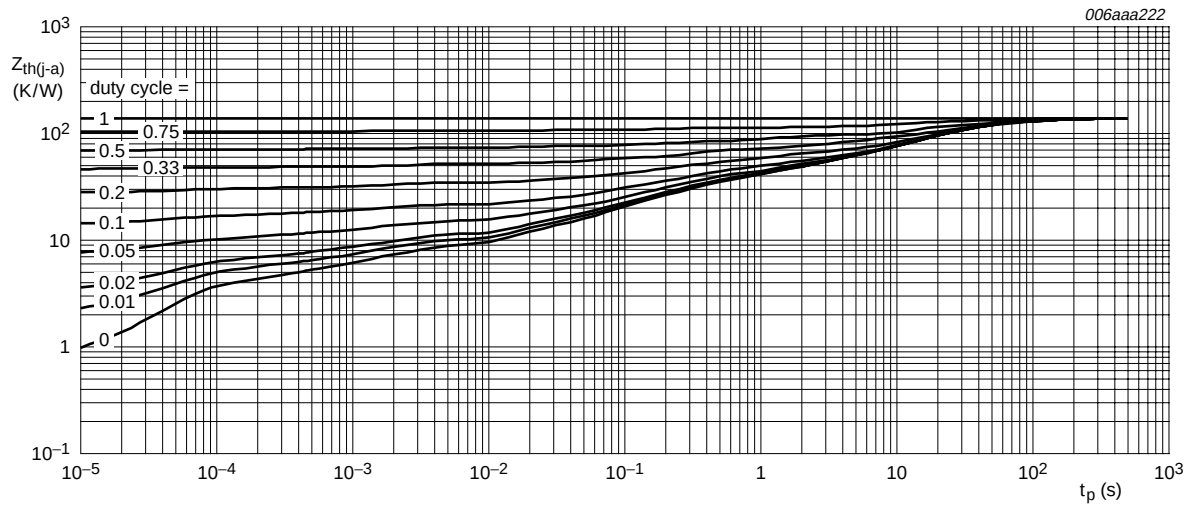
Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air					
	BC636		[1]	-	-	150	K/W
	BCP51		[1]	-	-	190	K/W
			[2]	-	-	125	K/W
	BCX51		[1]	-	-	230	K/W
			[2]	-	-	135	K/W
			[3]	-	-	95	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point						
	BC636			-	-	40	K/W
	BCP51			-	-	17	K/W
	BCX51			-	-	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 cm^2.

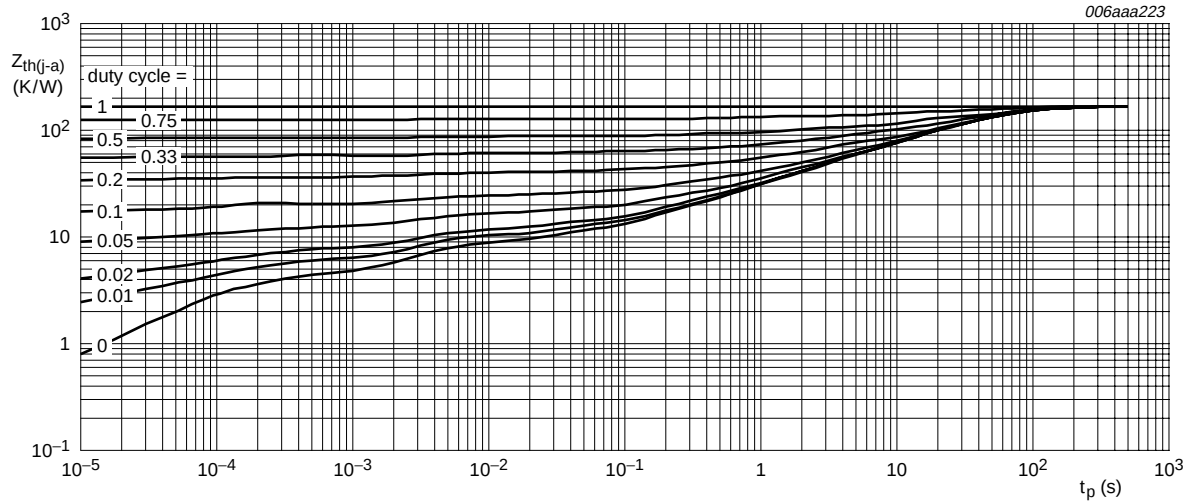
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.



FR4 PCB, standard footprint

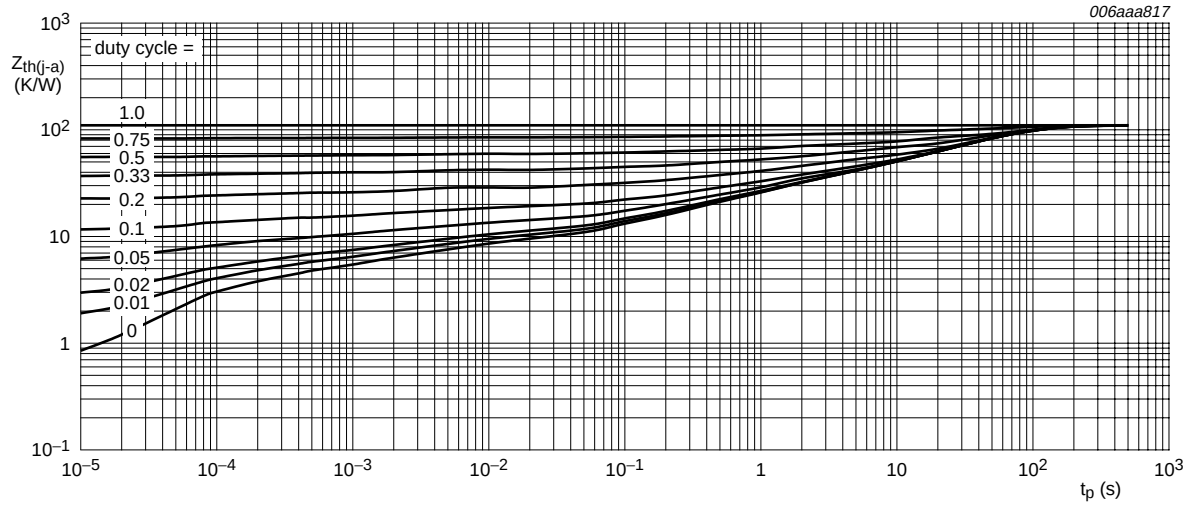
Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT54; typical values

© NXP B.V. 2008. All rights reserved.



FR4 PCB, standard footprint

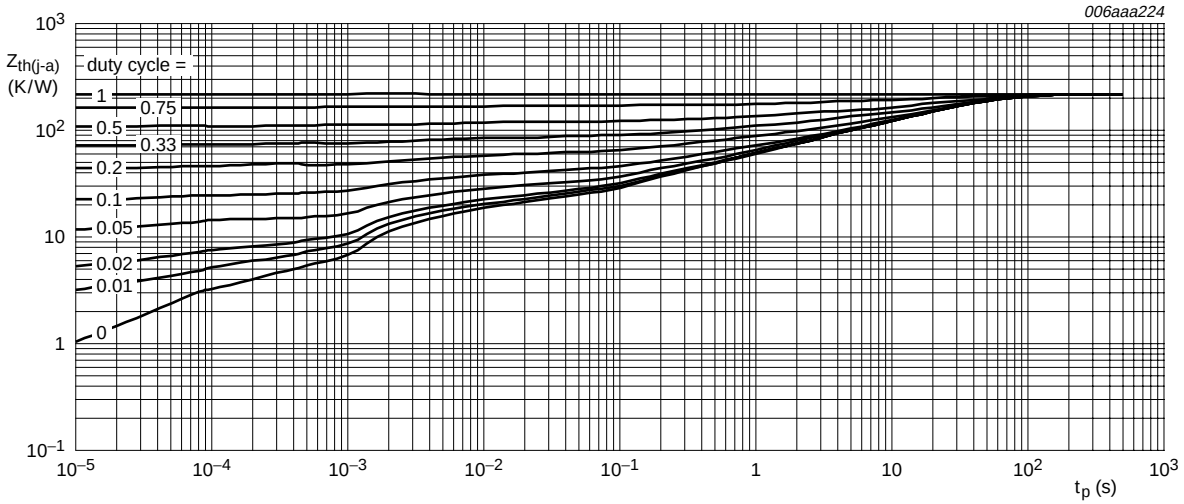
Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values



FR4 PCB, mounting pad for collector 1 cm^2

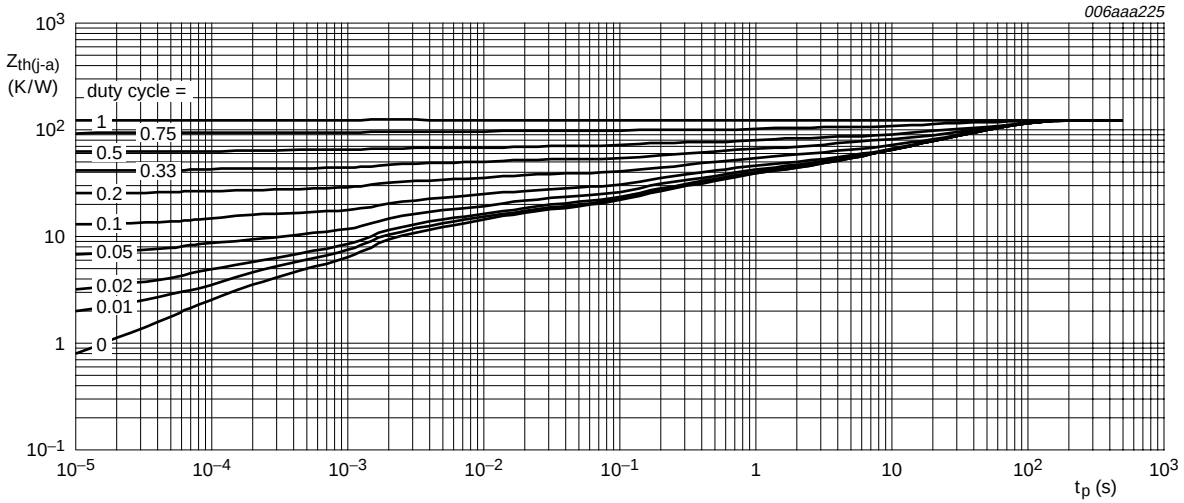
Fig 6. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values

© NXP B.V. 2008. All rights reserved.



FR4 PCB, standard footprint

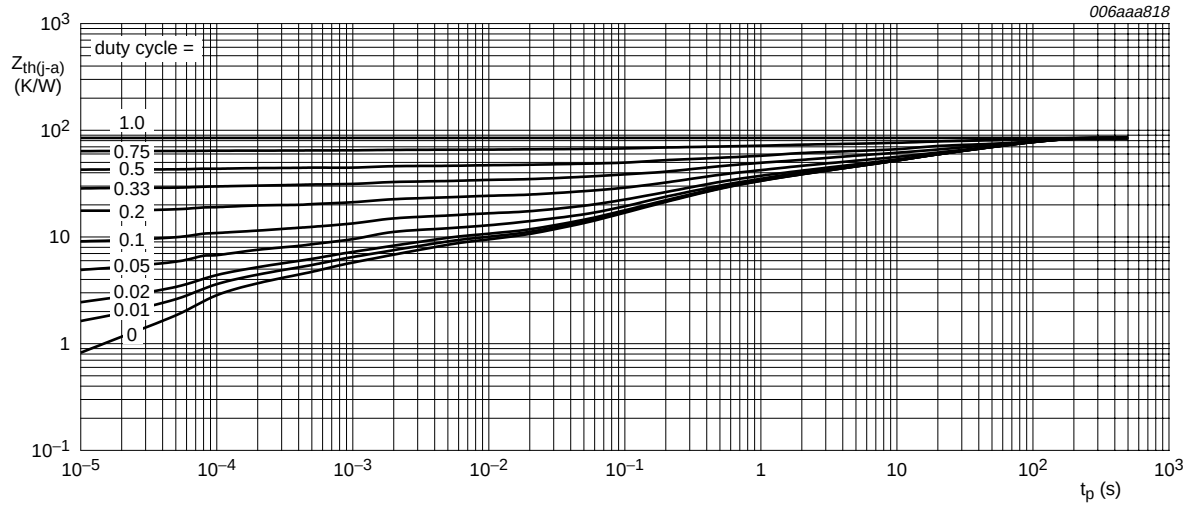
Fig 7. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values



FR4 PCB, mounting pad for collector 1 cm^2

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

© NXP B.V. 2008. All rights reserved.



FR4 PCB, mounting pad for collector 6 cm^2

Fig 9. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values

7. Characteristics

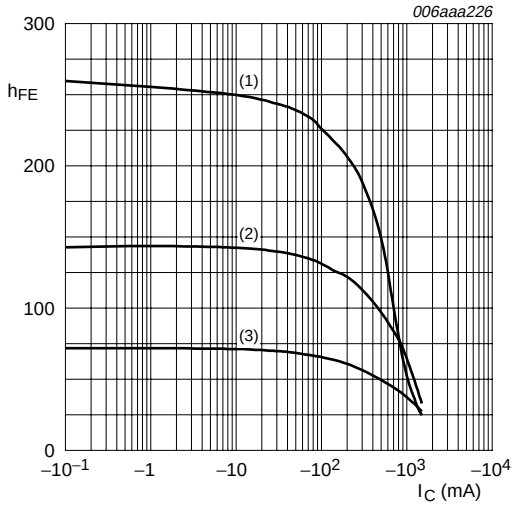
Table 8. Characteristics

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} = –10 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: $t_p \leq 300$ µs; $\delta = 0.02$.

© NXP B.V. 2008. All rights reserved.



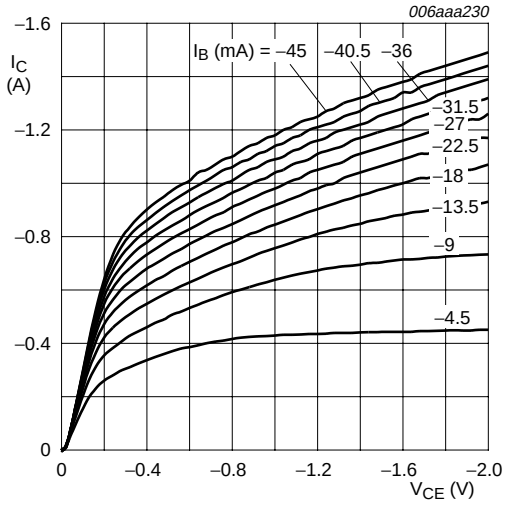
V_{CE} = −2 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

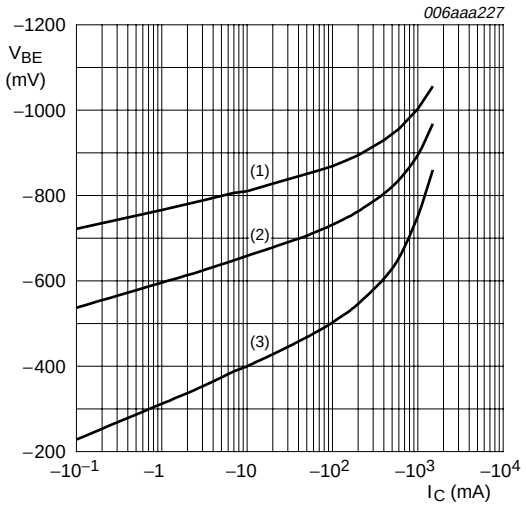
(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

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



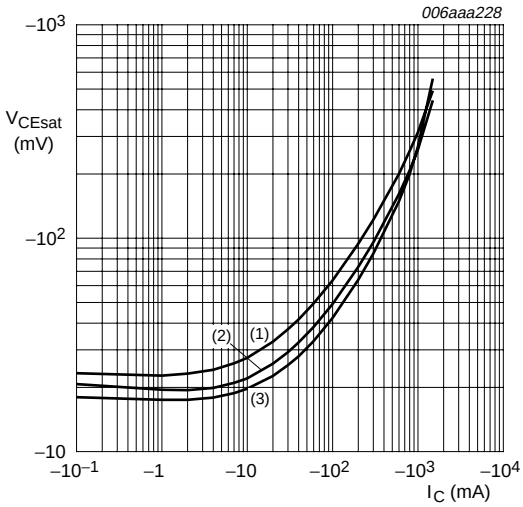
V_{CE} = −2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

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



I_C/I_B = 10

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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

© NXP B.V. 2008. All rights reserved.

8. Package outline

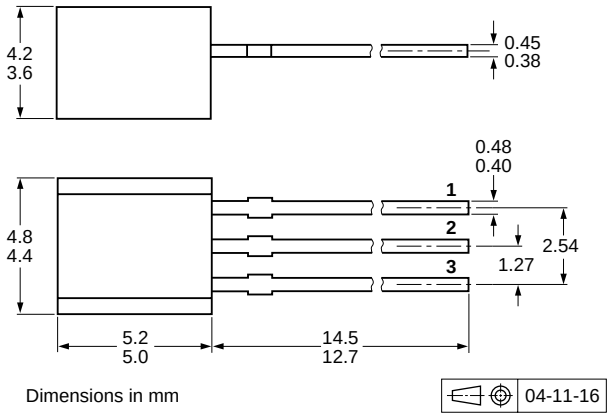


Fig 14. Package outline SOT54 (SC-43A/TO-92)

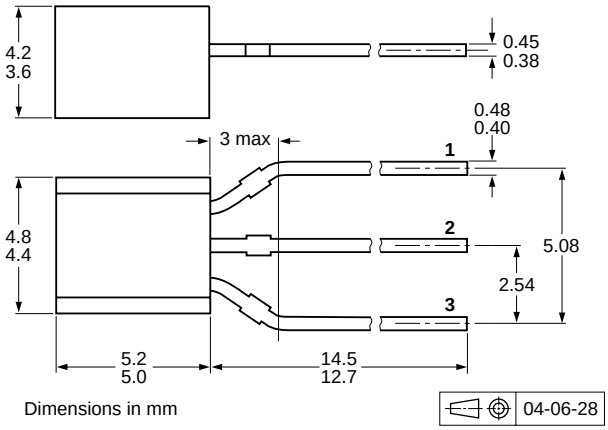


Fig 15. Package outline SOT54A

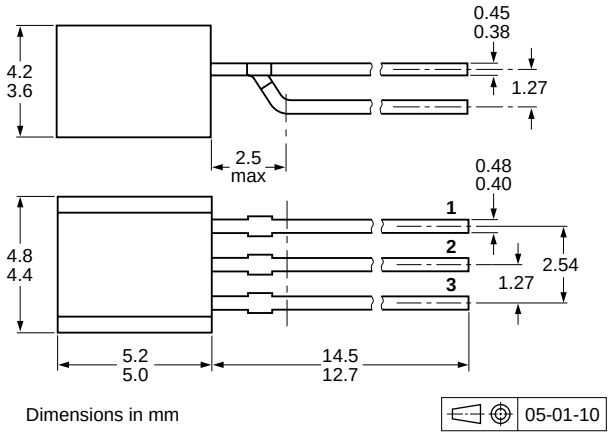


Fig 16. Package outline SOT54 variant

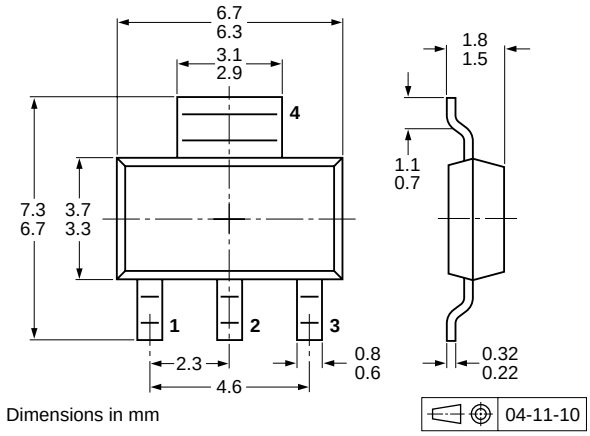


Fig 17. Package outline SOT223 (SC-73)

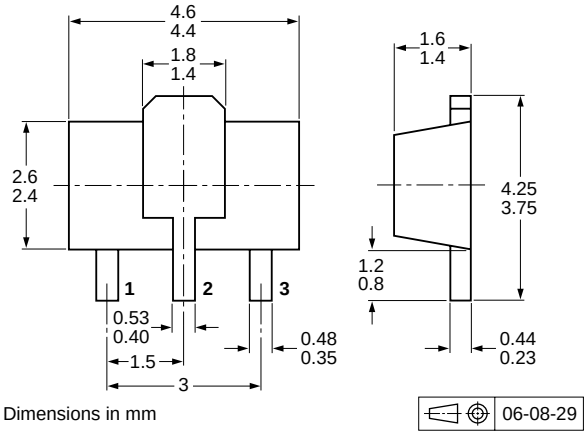


Fig 18. Package outline SOT89 (SC-62/TO-243)

© NXP B.V. 2008. All rights reserved.