

BCP53-16T-QX Datasheet



DiGi Electronics Part Number	BCP53-16T-QX-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	BCP53-16T-QX
Description	BCP53-16T-Q/SOT223/SC-73
Detailed Description	Bipolar (BJT) Transistor PNP 80 V 1 A 140MHz 600 mW Surface Mount SOT-223

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Purchase and inquiry

Manufacturer Product Number:

BCP53-16T-QX

Series:

BCP53T-Q

Transistor Type:

PNP

Voltage - Collector Emitter Breakdown (Max):

80 V

Current - Collector Cutoff (Max):

100nA (ICBO)

Power - Max:

600 mW

Operating Temperature:

150°C (TJ)

Qualification:

AEC-Q101

Package / Case:

TO-261-4, TO-261AA

Manufacturer:

Nexperia USA Inc.

Product Status:

Active

Current - Collector (Ic) (Max):

1 A

Vce Saturation (Max) @ Ib, Ic:

500mV @ 50mA, 500mA

DC Current Gain (hFE) (Min) @ Ic, Vce:

100 @ 150mA, 2V

Frequency - Transition:

140MHz

Grade:

Automotive

Mounting Type:

Surface Mount

Supplier Device Package:

SOT-223

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



BCP53T-Q series

80 V, 1 A PNP medium power transistors

Rev. 1 — 14 June 2023

Product data sheet

1. General description

PNP medium power transistors in a medium power SOT223 (SC73) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		NPN complement
	Nexperia	JEDEC	
BCP53T-Q	SOT223	SC-73	BCP56T-Q
BCP53-10T-Q			BCP56-10T-Q
BCP53-16T-Q			BCP56-16T-Q

2. Features and benefits

- High collector current capability I_C and I_{CM}
- Three current gain selections
- High power dissipation capability
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Linear voltage regulators
- MOSFET drivers
- High-side switches
- Power management
- Amplifiers

4. Quick reference data

Table 2. Quick reference data

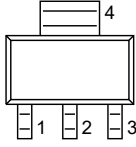
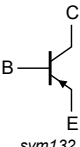
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

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; $t_p \leq 1\text{ ms}$	-	-	-2	A
h_{FE}	DC current gain					
	BCP53T-Q	$V_{CE} = -2\text{ V}; I_C = -150\text{ mA}$	[1]	63	-	250
	BCP53-10T-Q		[1]	63	-	160
	BCP53-16T-Q		[1]	100	-	250

[1] pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		
2	C	collector		
3	E	emitter		
4	C	collector		

6. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BCP53T-Q	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads	SOT223
BCP53-10T-Q			
BCP53-16T-Q			

7. Marking

Table 5. Marking

Type number	Marking code
BCP53T-Q	BCP53T
BCP53-10T-Q	P5310T
BCP53-16T-Q	P5316T

8. Limiting values

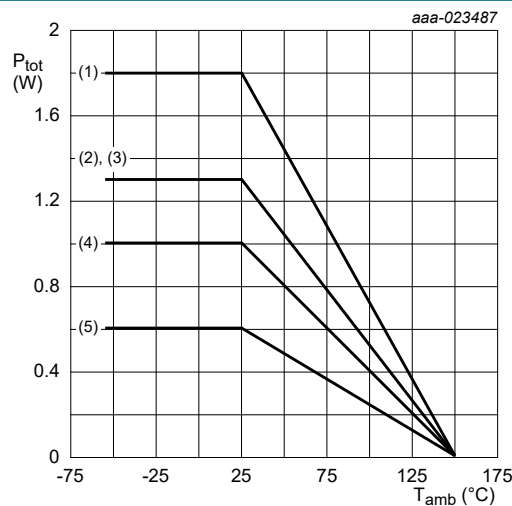
Table 6. Limiting values

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

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

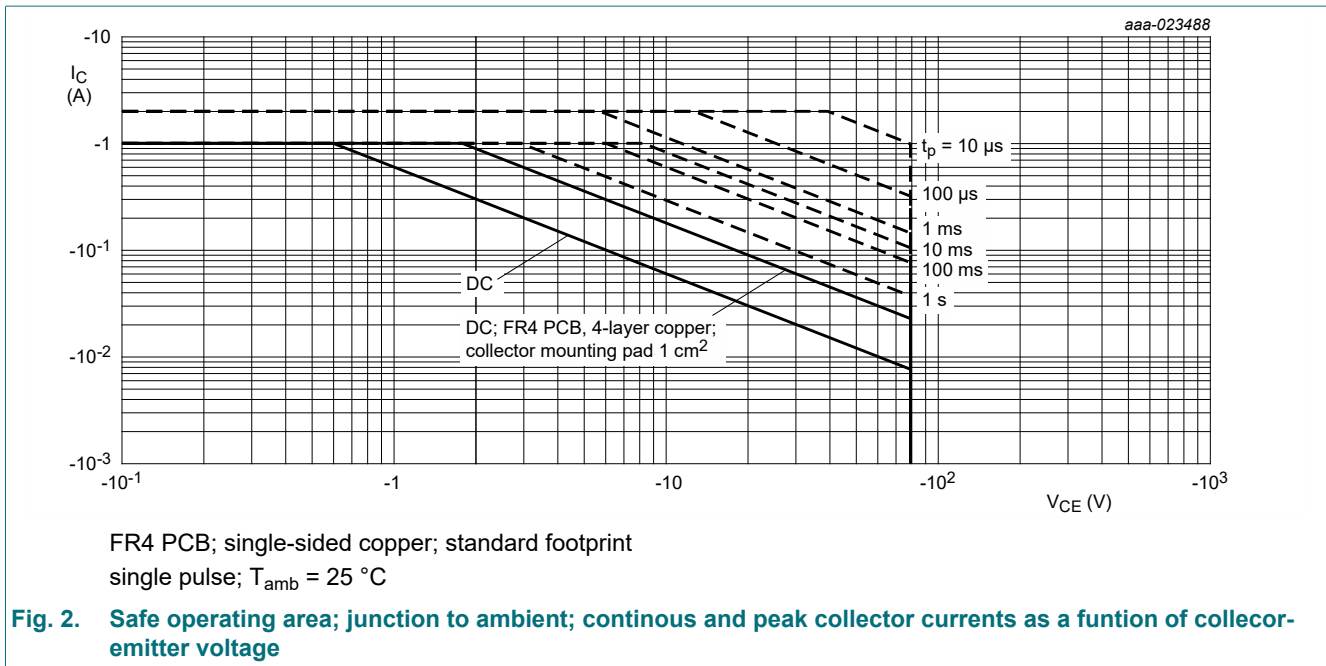
Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	-100	V	
V_{CEO}	collector-emitter voltage	open base	-	-80	V	
V_{EBO}	emitter-base voltage	open collector	-	-5	V	
I_C	collector current		-	-1	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-2	A	
I_B	base current		-	-0.2	A	
I_{BM}	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	-0.3	A	
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	0.6	W
			[2]	-	1	W
			[3]	-	1.3	W
			[4]	-	1.3	W
			[5]	-	1.8	W
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 .
 [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm^2 .
 [4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.
 [5] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm^2 .



- (1) FR4 PCB; 4-layer copper; 1 cm^2
 (2) FR4 PCB; single-sided copper; 6 cm^2
 (3) FR4 PCB; 4-layer copper; standard footprint
 (4) FR4 PCB; single-sided copper; 1 cm^2
 (5) FR4 PCB; single-sided copper; standard footprint

Fig. 1. Power derating curves



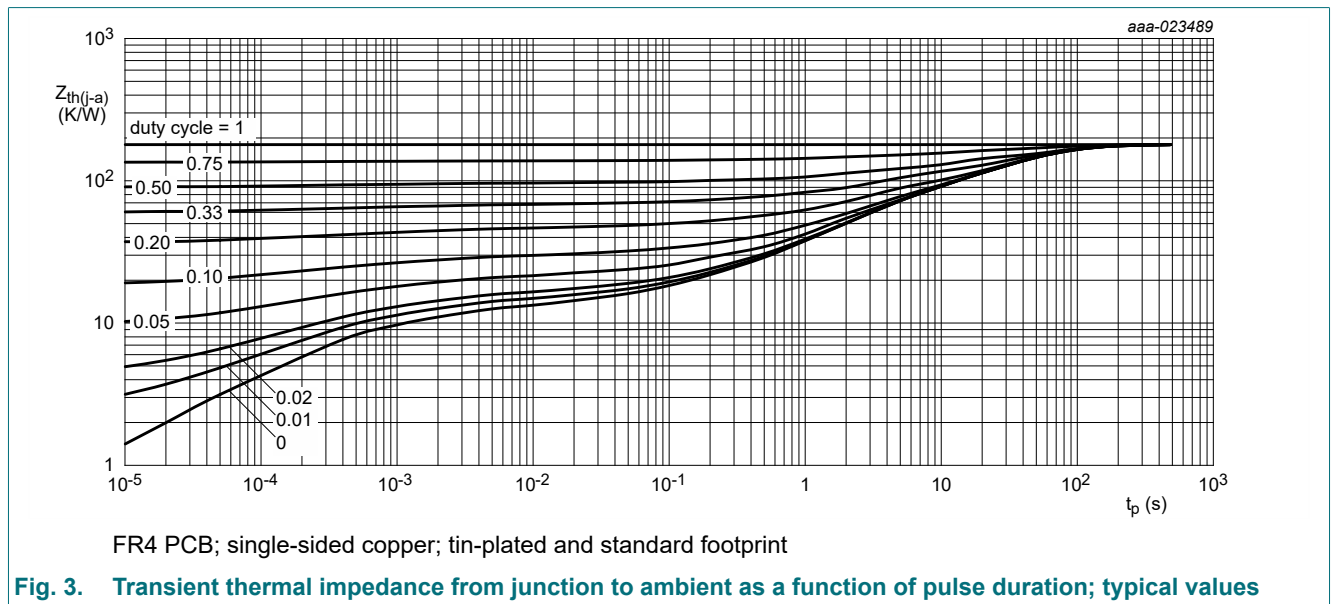
9. Thermal characteristics

Table 7. Thermal characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	209	K/W
			[2]			125	K/W
			[3]			97	K/W
			[4]	-	-	97	K/W
			[5]	-	-	70	K/W
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	18	K/W

- [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 .
 [3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 6 cm^2 .
 [4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.
 [5] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm^2 .



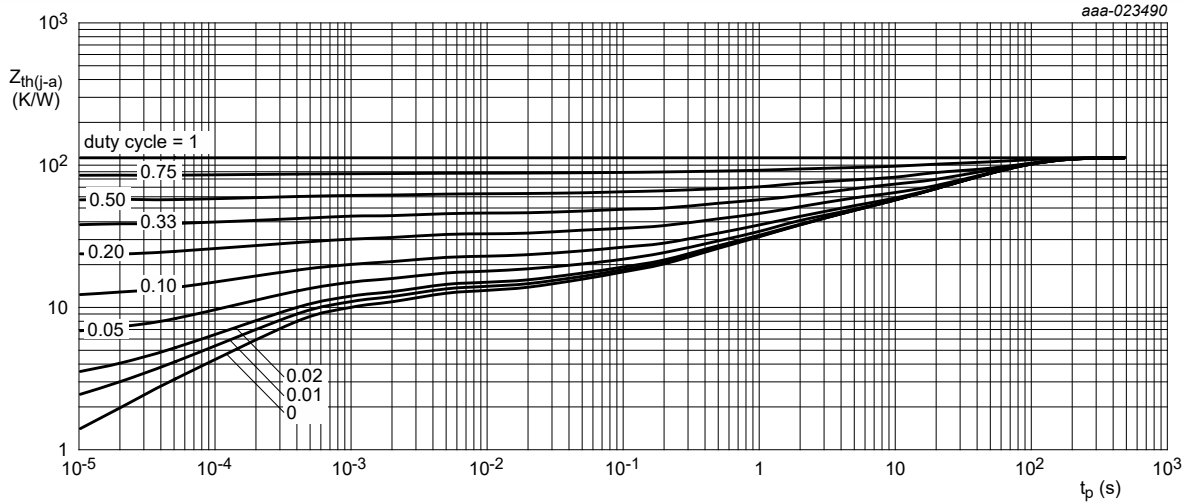


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

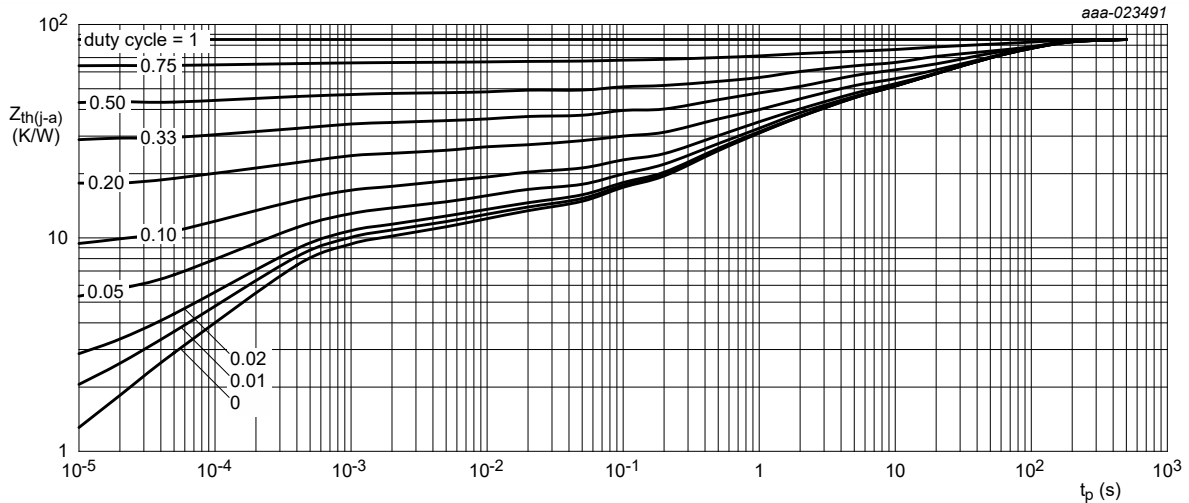


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

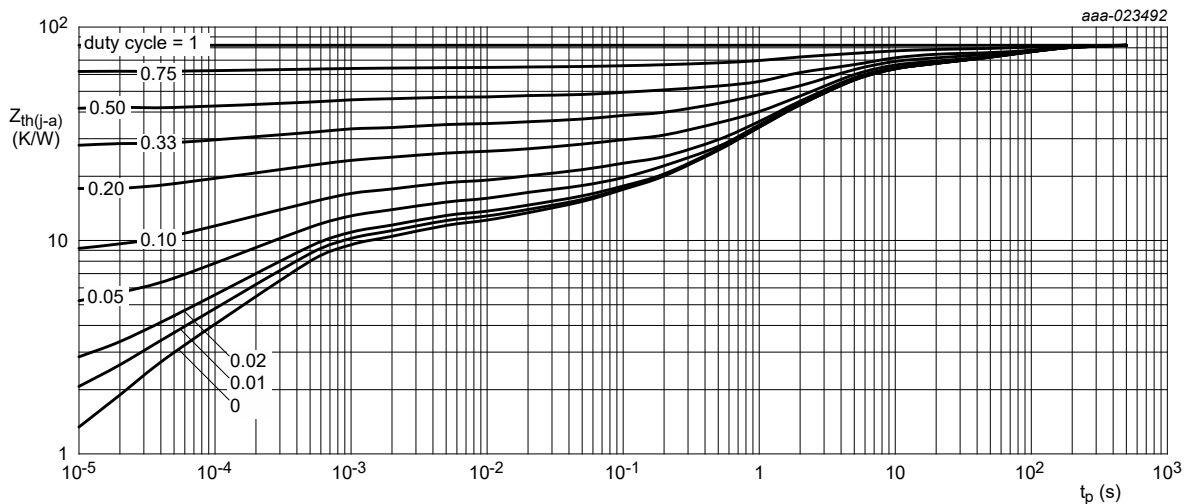
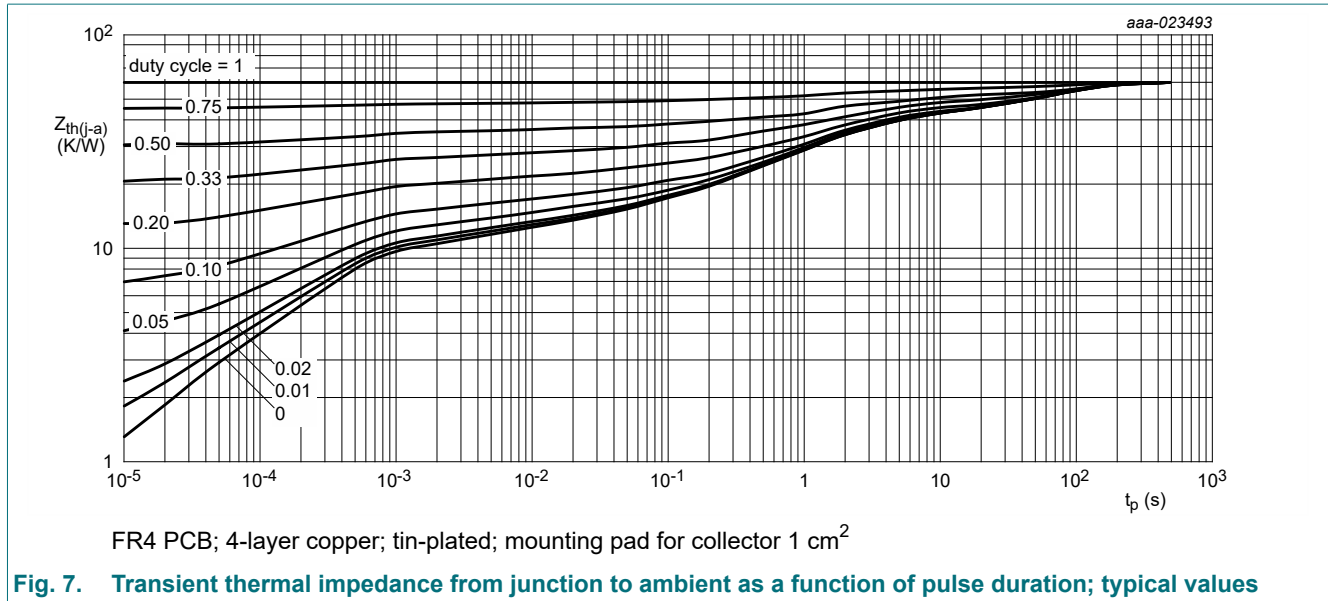


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



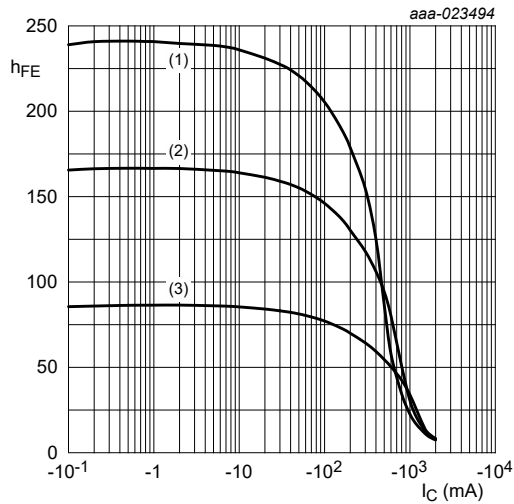
10. Characteristics

Table 8. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100\ \mu\text{A}$; $I_E = 0\ \text{A}$	-100	-		V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -2\ \text{mA}$; $I_E = 0\ \text{A}$	-80	-		V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = -100\ \mu\text{A}$; $I_C = 0\ \text{A}$	-5	-		V	
I_{CBO}	collector-base cut-off current	$V_{CB} = -30\ \text{V}$; $I_E = 0\ \text{A}$	-	-	-100	nA	
		$V_{CB} = -30\ \text{V}$; $I_E = 0\ \text{A}$; $T_j = 150\text{ °C}$	-	-	-10	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\ \text{V}$; $I_C = 0\ \text{A}$	-	-	-100	nA	
h_{FE}	DC current gain						
	BCP53T-Q, -10T-Q, -16T-Q	$V_{CE} = -2\ \text{V}$; $I_C = -5\ \text{mA}$		63	-	-	
		$V_{CE} = -2\ \text{V}$; $I_C = -500\ \text{mA}$	[1]	40	-	-	
	BCP53T-Q	$V_{CE} = -2\ \text{V}$; $I_C = -150\ \text{mA}$	[1]	63	-	250	
	BCP53-10T-Q	$V_{CE} = -2\ \text{V}$; $I_C = -150\ \text{mA}$	[1]	63	-	160	
BCP53-16T-Q	$V_{CE} = -2\ \text{V}$; $I_C = -150\ \text{mA}$	[1]	100	-	250		
V_{CEsat}	collector-emitter saturation voltage	$I_C = -500\ \text{mA}$; $I_B = -50\ \text{mA}$	[1]	-	-500	mV	
V_{BE}	base-emitter voltage	$V_{CE} = -2\ \text{V}$; $I_C = -500\ \text{mA}$	[1]	-	-1	V	
f_T	transition frequency	$V_{CE} = -5\ \text{V}$; $I_C = -50\ \text{mA}$; $f = 100\ \text{MHz}$		100	140	-	MHz
C_c	collector capacitance	$V_{CB} = -10\ \text{V}$; $I_E = I_C = 0\ \text{A}$; $f = 1\ \text{MHz}$		-	7	-	pF

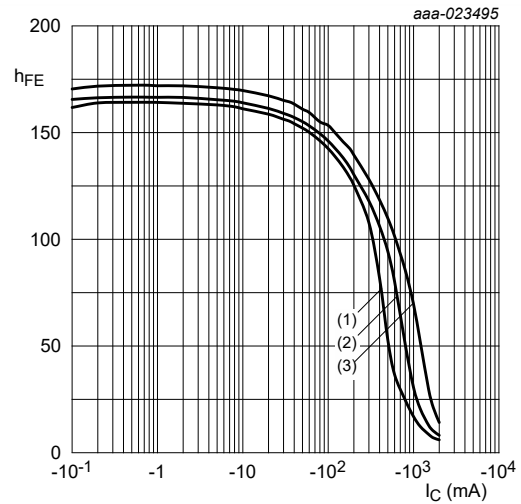
[1] pulsed; $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$



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

- (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = -55 \text{ }^\circ\text{C}$

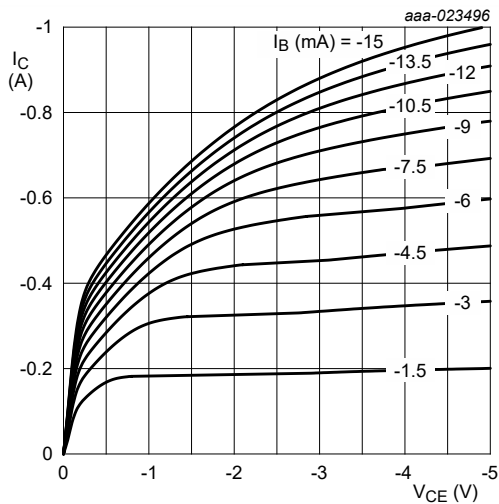
Fig. 8. DC current gain as a function of collector current; typical values



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

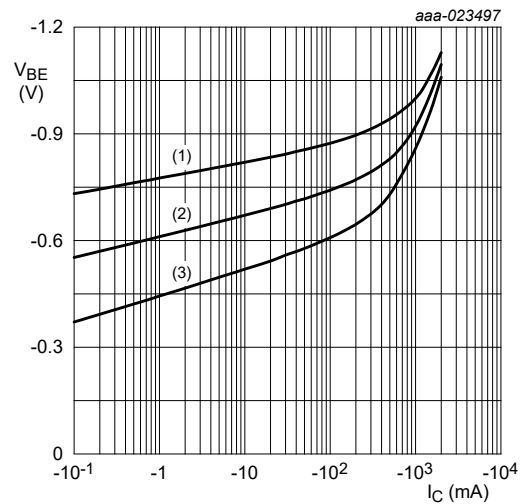
- (1) $V_{CE} = -1 \text{ V}$
- (2) $V_{CE} = -2 \text{ V}$
- (3) $V_{CE} = -5 \text{ V}$

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



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

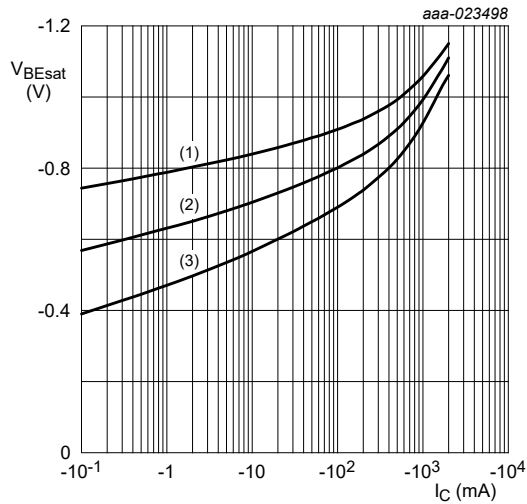
Fig. 10. Collector current as a function of collector-emitter voltage; typical values



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

- (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

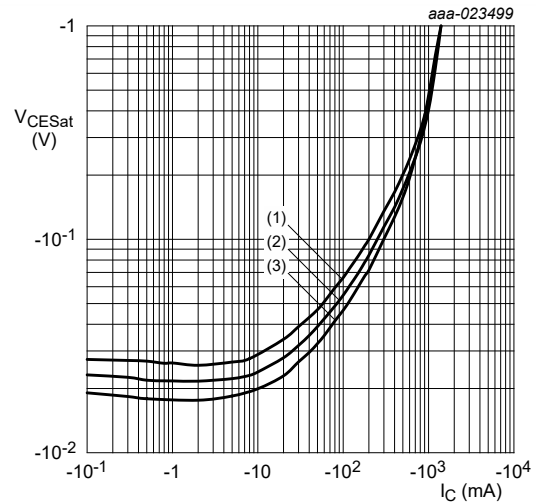
Fig. 11. Base-emitter voltage as a function of collector current; typical values



$$I_C/I_B = 10$$

- (1) $T_{amb} = -55\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = 100\text{ °C}$

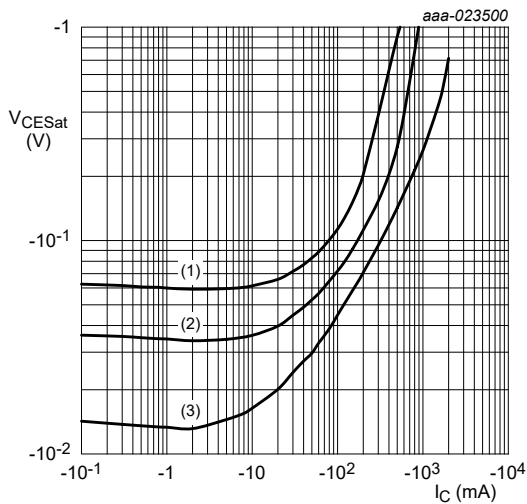
Fig. 12. Base-emitter saturation voltage as a function of collector current; typical values



$$I_C/I_B = 10$$

- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -55\text{ °C}$

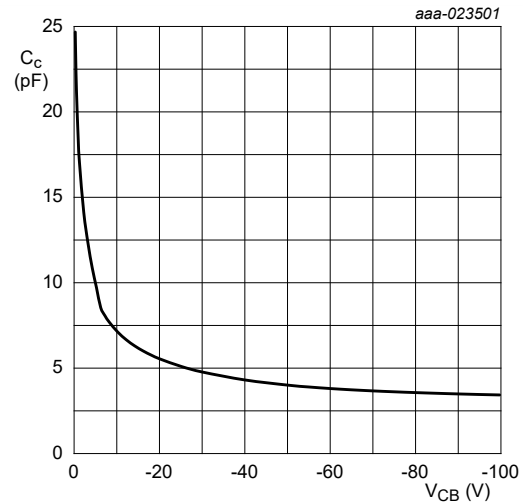
Fig. 13. Collector-emitter saturation voltage as a function of collector current; typical values



$$T_{amb} = 25\text{ °C}$$

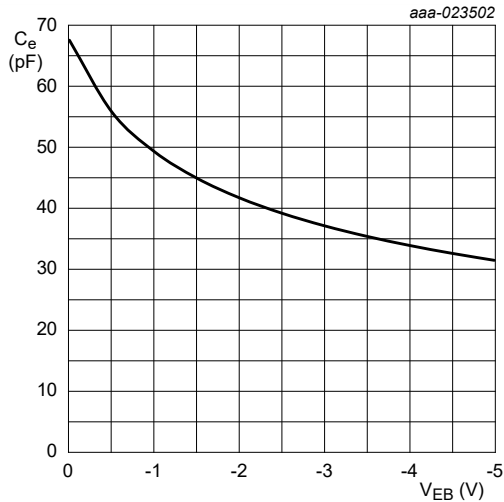
- (1) $I_C/I_B = 50$
- (2) $I_C/I_B = 20$
- (3) $I_C/I_B = 5$

Fig. 14. Collector-emitter saturation voltage as a function of collector current; typical values



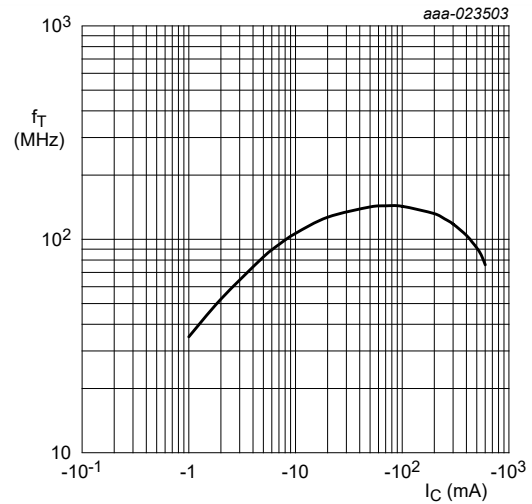
$$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$$

Fig. 15. Collector capacitance as a function of collector-base voltage; typical values



$f = 1$ MHz; $T_{amb} = 25$ °C

Fig. 16. Emitter capacitance as a function of emitter-base voltage; typical values



$V_{CE} = -5$ V

$f = 100$ MHz; $T_{amb} = 25$ °C

Fig. 17. Transition frequency as a function of collector current; typical values

11. Test information

11.1. 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

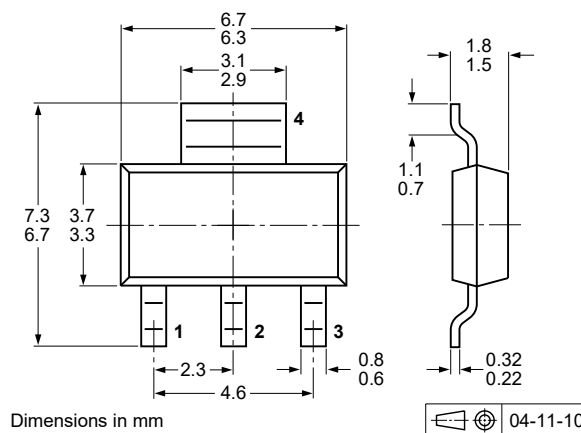
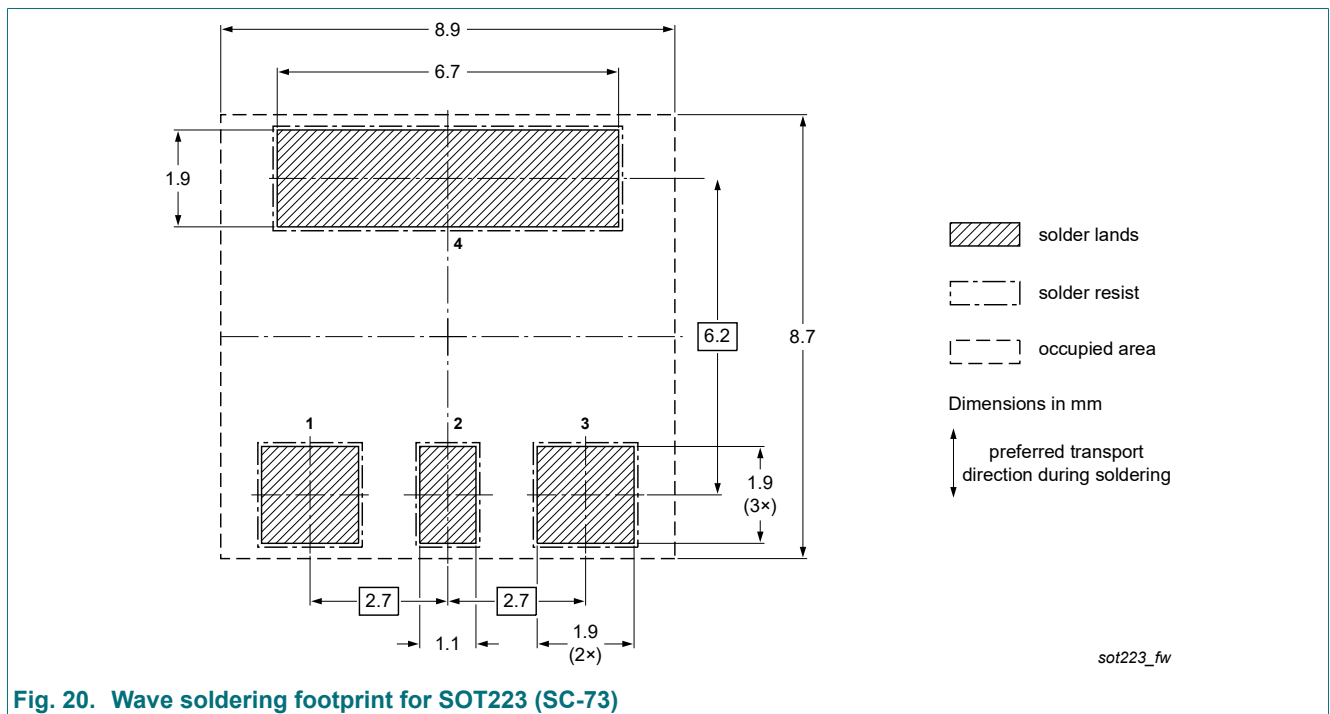
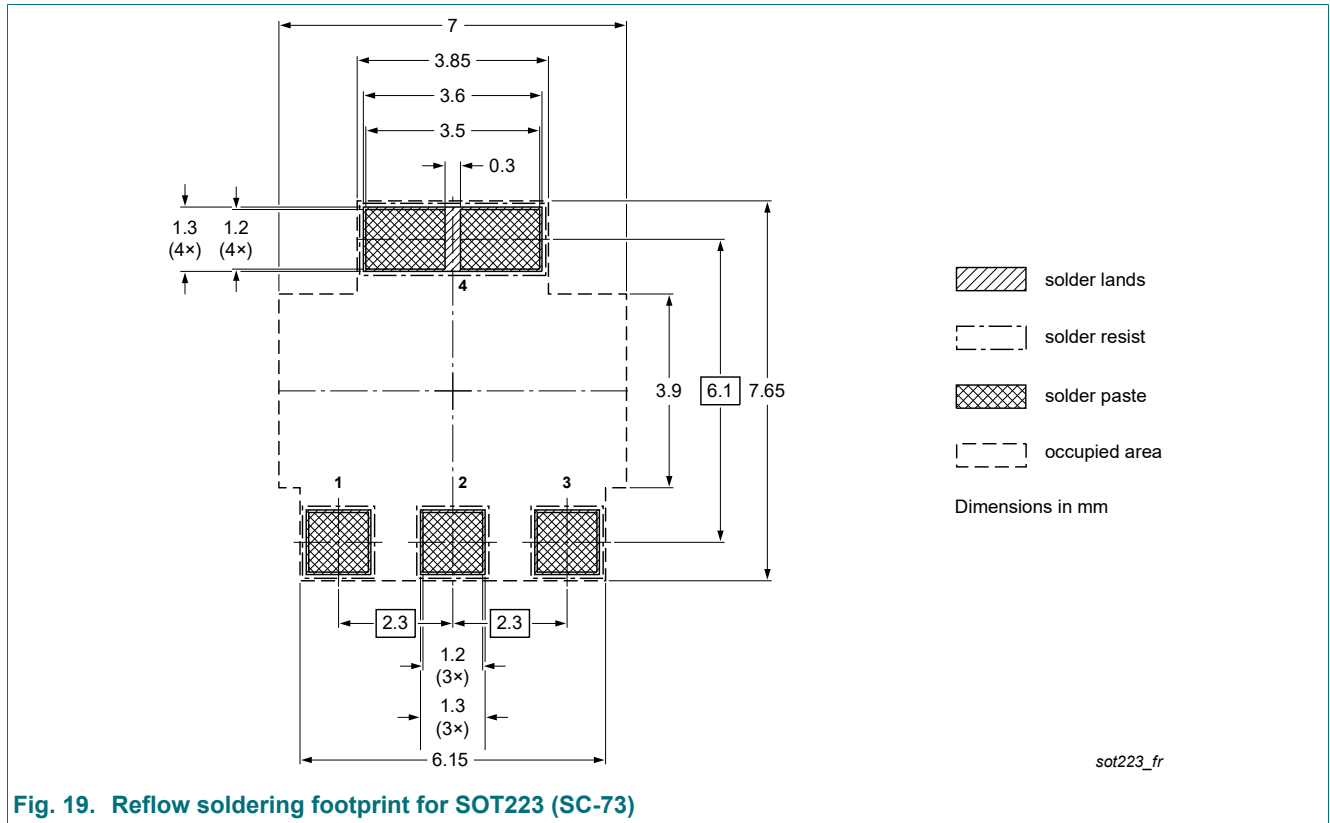


Fig. 18. Package outline SOT223 (SC-73)

13. Soldering



14. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP53T-Q_SER v.1	20230614	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.

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Date of release: 14 June 2023

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