PBSS4520X,135 Datasheet

https://www.DiGi-Electronics.com

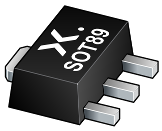
DiGi Electronics Part Number	PBSS4520X,135-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	PBSS4520X,135
Description	TRANS NPN 20V 5A SOT89
Detailed Description	Bipolar (BJT) Transistor NPN 20 V 5 A 125MHz 550 mW Surface Mount SOT-89

Purchase and inquiry

Manufacturer Product Number:	Manufacturer:
PBSS4520X,135	Nexperia USA Inc.
Series:	Product Status:
-	Active
Transistor Type:	Current - Collector (Ic) (Max):
NPN	5 A
Voltage - Collector Emitter Breakdown (Max):	Vce Saturation (Max) @ Ib, Ic:
20 V	220mV @ 500mA, 5A
Current - Collector Cutoff (Max):	DC Current Gain (hFE) (Min) @ Ic, Vce:
100nA	250 @ 2A, 2V
Power - Max:	Frequency - Transition:
550 mW	125MHz
Operating Temperature:	Grade:
150°C (TJ)	Automotive
Qualification:	Mounting Type:
AEC-Q100	Surface Mount
Package / Case:	Supplier Device Package:
TO-243AA	SOT-89
Base Product Number:	
PBSS4520	

Environmental & Export classification

RoHS Status:	Moisture Sensitivity Level (MSL):
ROHS3 Compliant	1 (Unlimited)
REACH Status:	ECCN:
REACH Unaffected	EAR99
HTSUS:	
8541.21.0075	



PBSS4520X

20 V, 5 A NPN low VCEsat transistor

19 January 2024 **Product data sheet**

1. General description

NPN low VCEsat transistor in a SOT89 (SC-62/TO-243) small and flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS5520X

2. Features and benefits

- High h_{FE} and low V_{CEsat} at high current operation
- High collector current capability: I_C maximum 5 A
- Higher efficiency leading to less heat generation
- AEC-Q101 qualified

3. Applications

- Medium power peripheral drivers, e.g. fans and motors
- Strobe flash units for DSC and mobile phones
- Inverter applications, e.g. TFT displays
- Power switch for LAN and ADSL systems
- Medium power DC-to-DC conversion
- Battery chargers

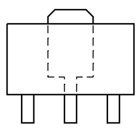
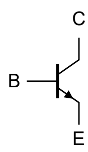
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	20	V
I_C	collector current			-	-	5	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	10	A
R_{CEsat}	collector-emitter saturation resistance	I_C = 5 A; I_B = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	32	44	mΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 SOT89	
2	C	collector		
3	B	base		

nexperia

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4520X	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	SOT89

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS4520X	%1F

[1] % = placeholder for manufacturing site code

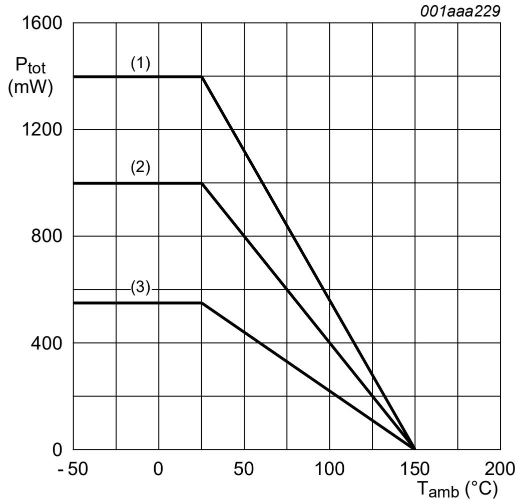
8. Limiting values

Table 5. 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		-	20	V
V_{CEO}	collector-emitter voltage	open base		-	20	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current			-	5	A
I_{CRM}	repetitive peak collector current		[1] [2]	-	7	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	10	A
I_B	base current			-	1	A
I_{BM}	peak base current	single pulse; $t_p \leq$ 1 ms		-	2	A
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[2] [3]	-	2.5	W
			[2]	-	0.55	W
			[4]	-	1	W
			[5]	-	1.4	W
			[6]	-	1.6	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	150	°C
T_{stg}	storage temperature			-65	150	°C

[1] Operated under pulsed conditions: pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[3] Operated under pulsed conditions: $t_p \leq 10$ ms; $\delta \leq 0.2$.
[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[5] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[6] Device mounted on a 7 cm^2 ceramic PCB, 1 cm^2 single-sided copper and tin-plated.



(1) FR4 PCB; 6 cm^2 mounting pad for collector
(2) FR4 PCB; 1 cm^2 mounting pad for collector
(3) FR4; standard footprint

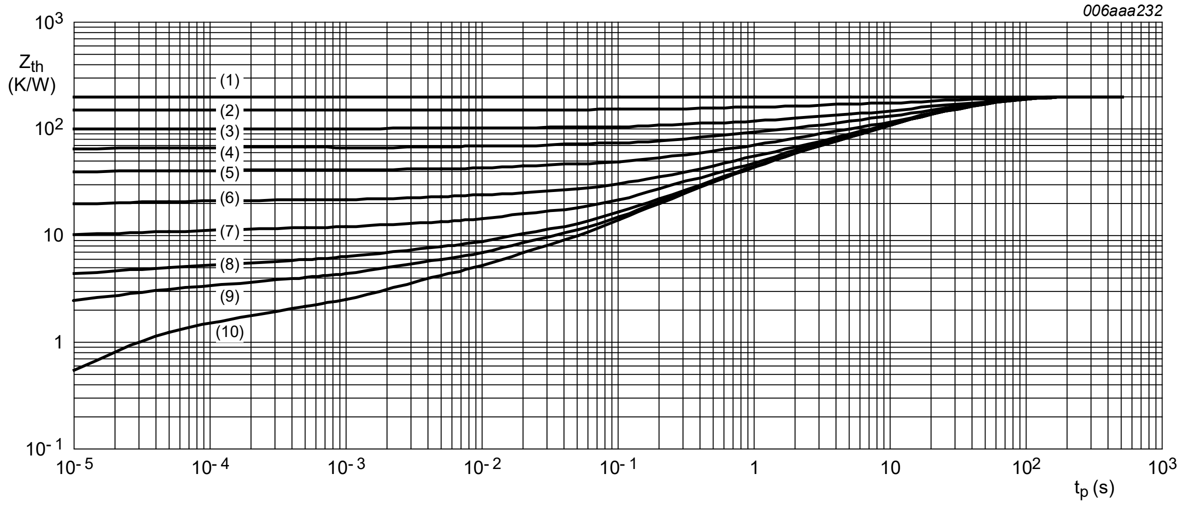
Fig. 1. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	50	K/W
			[1]	-	-	225	K/W
			[3]	-	-	125	K/W
			[4]	-	-	90	K/W
			[5]	-	-	80	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

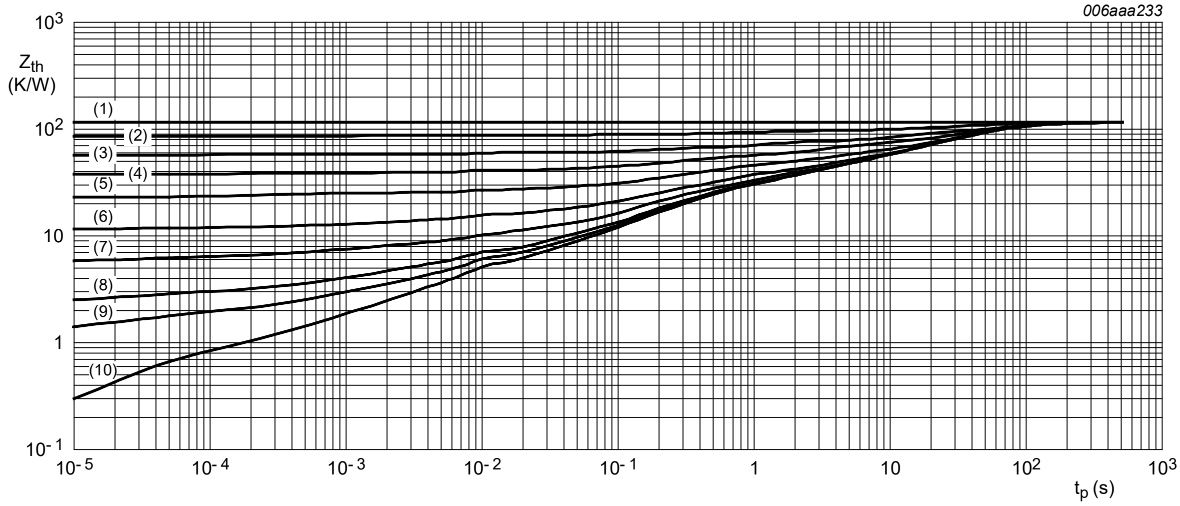
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Operated under pulsed conditions: $t_p \leq 10$ ms; $\delta \leq 0.2$.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[5] Device mounted on a 7 cm^2 ceramic PCB, 1 cm^2 single-sided copper and tin-plated.



Mounted on FR4 PCB; standard footprint

(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

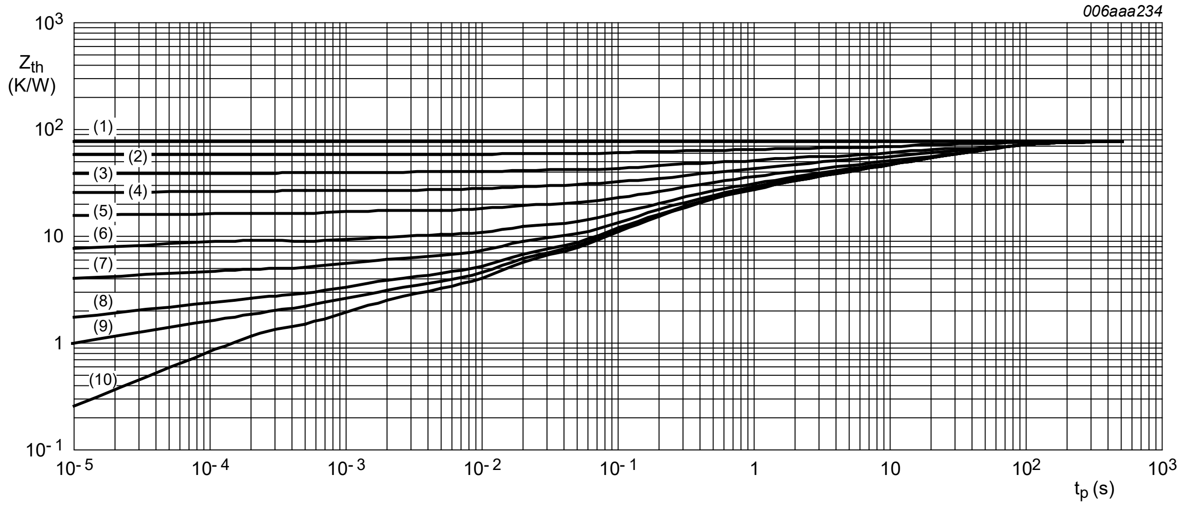
Fig. 2. Transient thermal impedance as a function of pulse duration; typical values



Mounted on FR4 PCB; mounting pad for collector 1 cm^2

(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

Fig. 3. Transient thermal impedance as a function of pulse duration; typical values



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm^2

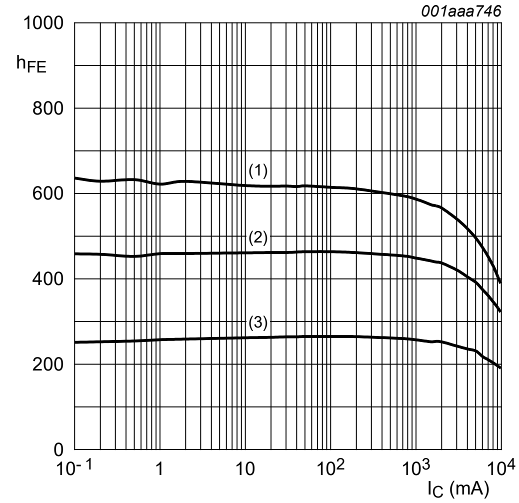
(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

Fig. 4. Transient thermal impedance as a function of pulse duration; typical values

10. Characteristics

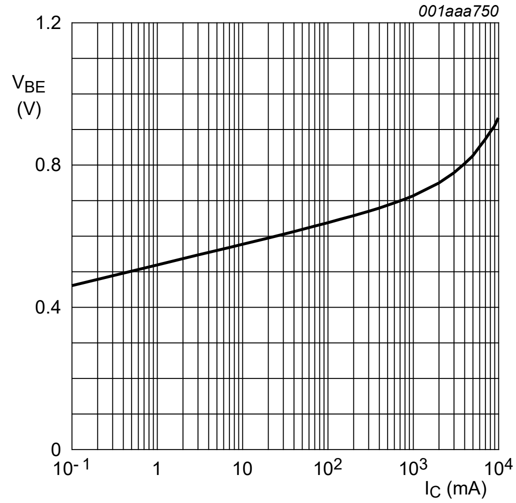
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 20 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
		V_{CB} = 20 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	100	nA
I_{CES}	collector-emitter cut-off current	V_{CE} = 20 V; V_{BE} = 0 V; T_{amb} = 25 °C		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 0.5 A; T_{amb} = 25 °C		300	450	-	
		V_{CE} = 2 V; I_C = 1 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		300	440	-	
		V_{CE} = 2 V; I_C = 2 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		250	420	-	
		V_{CE} = 2 V; I_C = 5 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		200	380	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 0.5 A; I_B = 5 mA; T_{amb} = 25 °C		-	35	50	mV
		I_C = 1 A; I_B = 10 mA; T_{amb} = 25 °C		-	50	70	mV
		I_C = 2.5 A; I_B = 125 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	85	120	mV
		I_C = 4 A; I_B = 200 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	130	180	mV
		I_C = 5 A; I_B = 500 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	160	220	mV
R_{CEsat}	collector-emitter saturation resistance			-	32	44	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 4 A; I_B = 200 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	0.9	1.05	V
		I_C = 5 A; I_B = 500 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	0.96	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 2 A; T_{amb} = 25 °C		-	0.74	0.85	V
f_T	transition frequency	V_{CE} = 10 V; I_C = 100 mA; f = 100 MHz; T_{amb} = 25 °C		100	125	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	90	110	pF



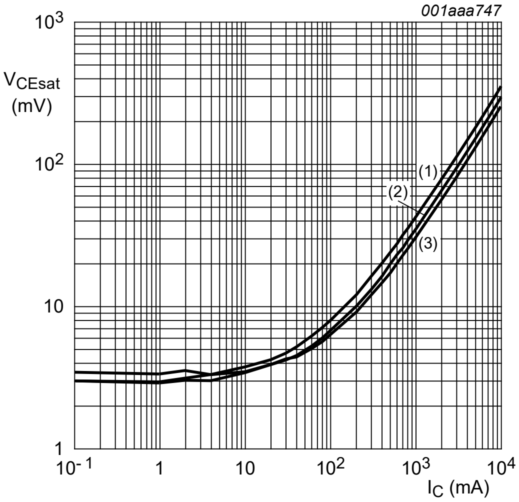
V_{CE} = 2 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



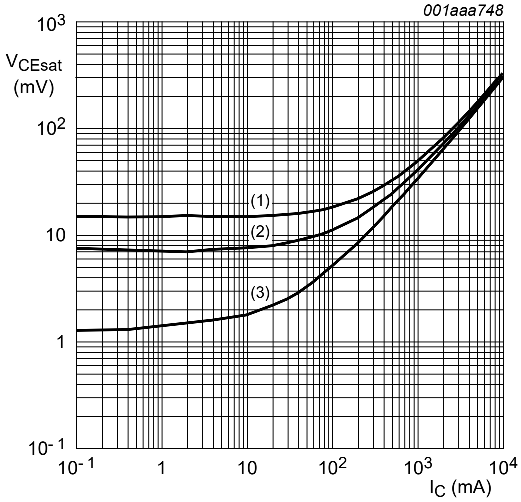
V_{CE} = 2 V
T_{amb} = 25 °C

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



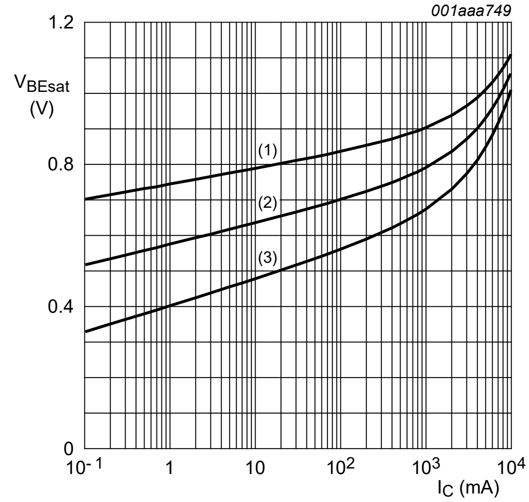
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



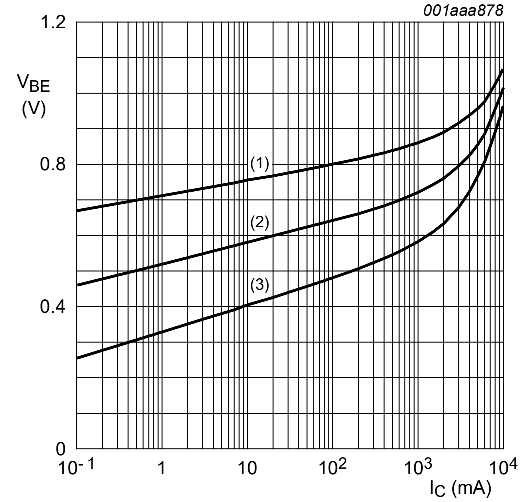
T_{amb} = 25 °C
(1) I_C/I_B = 100
(2) I_C/I_B = 50
(3) I_C/I_B = 10

Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values



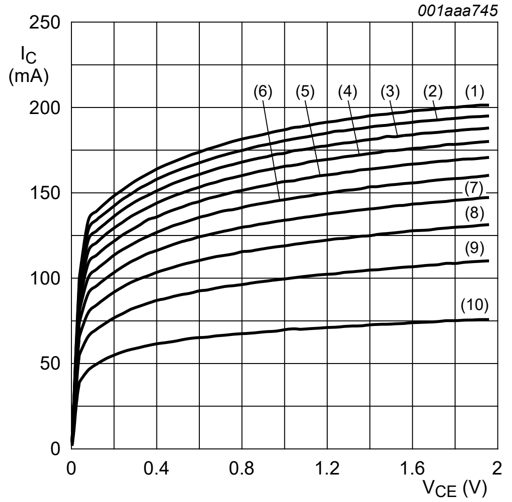
$I_C/I_B = 20$
(1) $T_{amb} = -55$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = 100$ °C

Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values



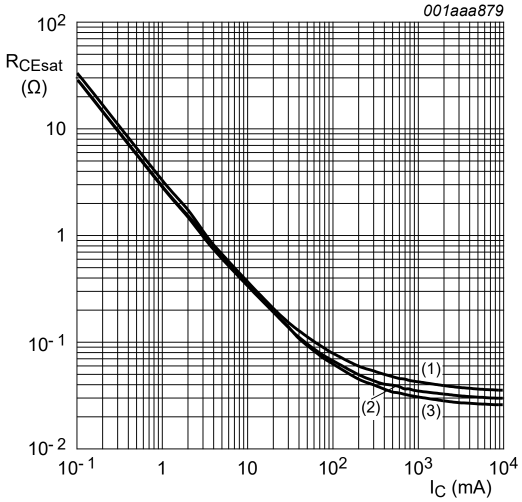
$V_{CE} = 2$ V
(1) $T_{amb} = -55$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = 100$ °C

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



$T_{amb} = 25$ °C
(1) $I_B = 5$ mA
(2) $I_B = 4.5$ mA
(3) $I_B = 4$ mA
(4) $I_B = 3.5$ mA
(5) $I_B = 3$ mA
(6) $I_B = 2.5$ mA
(7) $I_B = 2$ mA
(8) $I_B = 1.5$ mA
(9) $I_B = 1$ mA
(10) $I_B = 0.5$ mA

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



$I_C/I_B = 20$
(1) $T_{amb} = 100$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = -55$ °C

Fig. 12. Equivalent on-resistance as a function of collector current; typical values

11. Test information

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

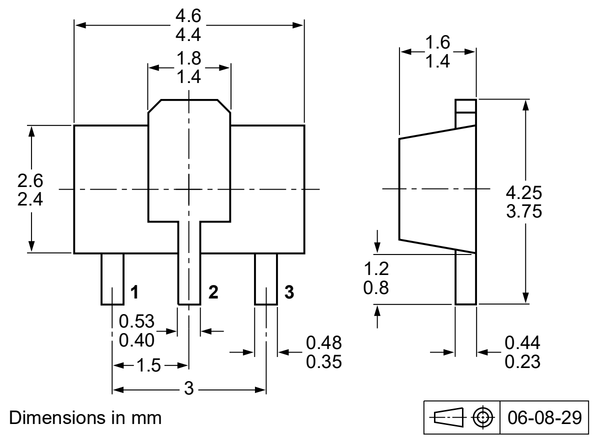


Fig. 13. Package outline SOT89

13. Soldering

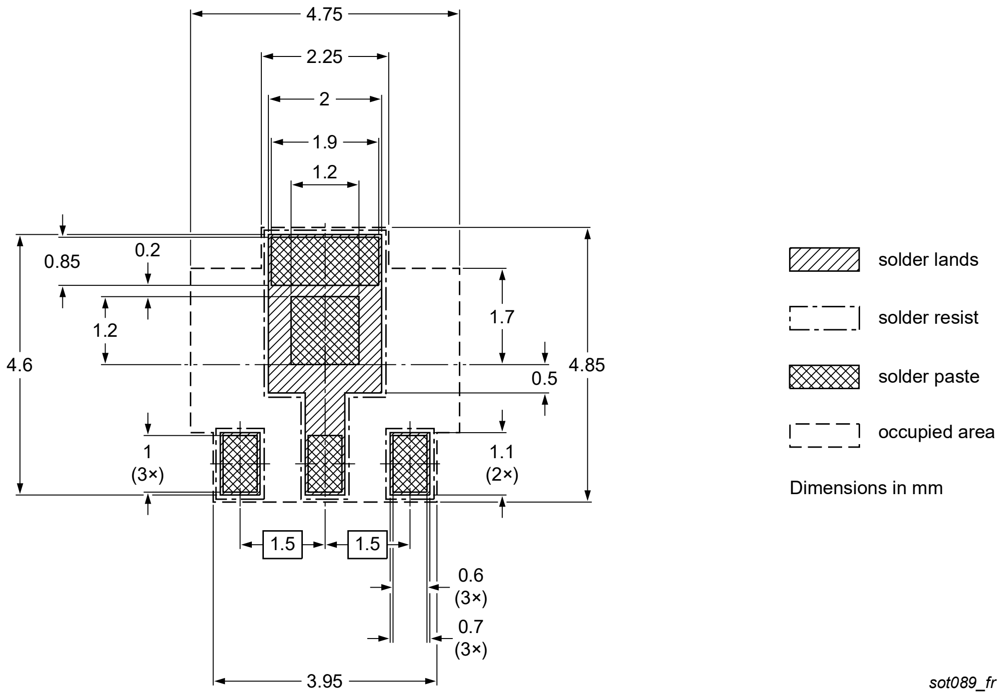


Fig. 14. Reflow soldering footprint for SOT89

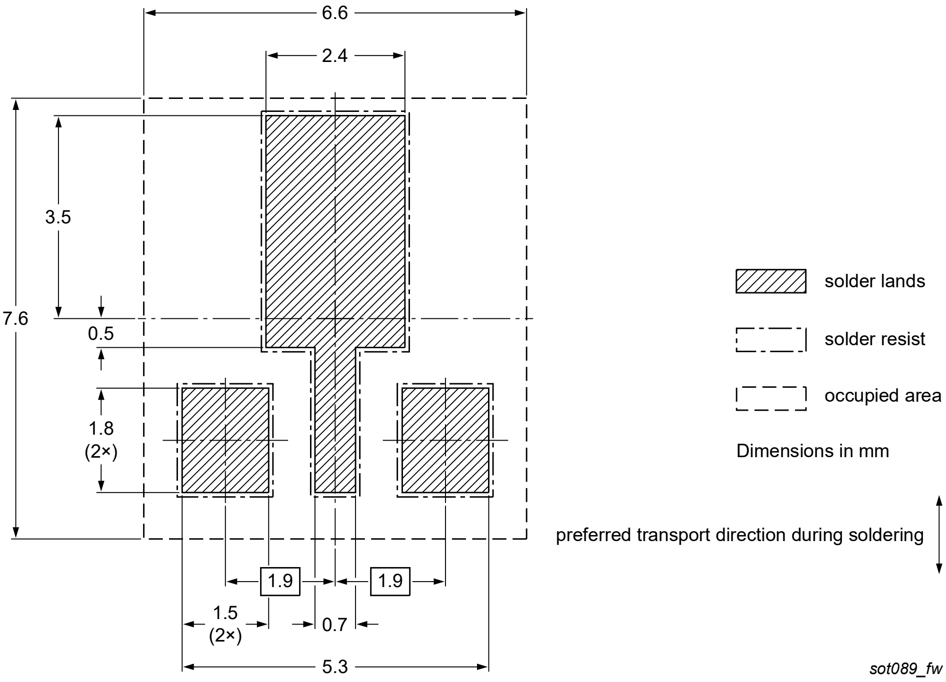


Fig. 15. Wave soldering footprint for SOT89

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4520X v.3	20240119	Product data sheet	-	PBSS4520X v.2
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
PBSS4520X v.2	20041108	Product data sheet	-	PBSS4520X v.1
PBSS4520X v.1	20040611	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.

[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 https://www.nexperia.com.

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Contents

Date of release: 19 January 2024

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