



**THE DATASHEET OF
BC846A,235**





BC846x series

65 V, 100 mA NPN general-purpose transistors

Rev. 12 — 1 July 2022

Product data sheet

1. General description

NPN general-purpose transistors in a small SOT23 (TO236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	Nexperia	JEDEC	
BC846	SOT23	TO-236AB	BC856
BC846A			BC856A
BC846B			BC856B

2. Features and benefits

- General-purpose transistors
- SMD plastic package
- Two different gain selections

3. Applications

- General-purpose switching and amplification

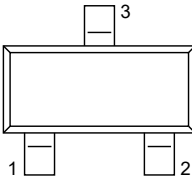
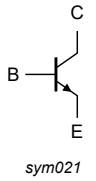
4. Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CE0}	collector-emitter voltage	open base	-	-	65	V
I_C	collector current		-	-	100	mA
	DCcurrent gain					
h_{FE}	BC846	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$	110	-	450	
	BC846A		110	180	220	
	BC846B		200	290	450	

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		 sym021
2	E	emitter		
3	C	collector		

6. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BC846	TO-236AB	Plastic surface-mounted package; 3 leads	SOT23
BC846A			
BC846B			

7. Marking

Table 5. Marking

Type number	Marking code[1]
BC846	1D%
BC846A	1A%
BC846B	1B%

[1] % = placeholder for manufacturing site code

8. 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	-	80	V
V_{CEO}	collector-emitter voltage	open base	-	65	V
V_{EBO}	emitter-base voltage	open collector	-	6	V
I_C	collector current		-	100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	200	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms	-	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C [1]	-	250	mW
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 PCB, single-sided copper, tin-plated and standard footprint.

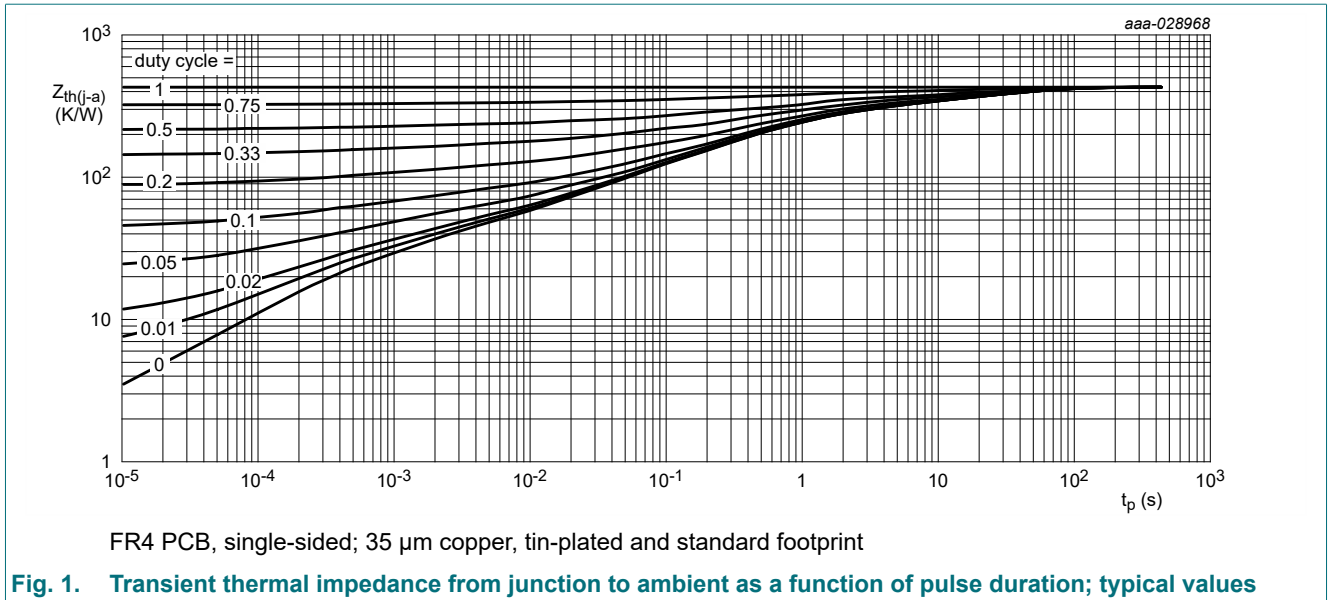
9. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air [1] [2]	-	-	500	K/W

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided; 35 µm copper; tin-plated and standard footprint.

[2] Valid for all available selection groups.



10. Characteristics

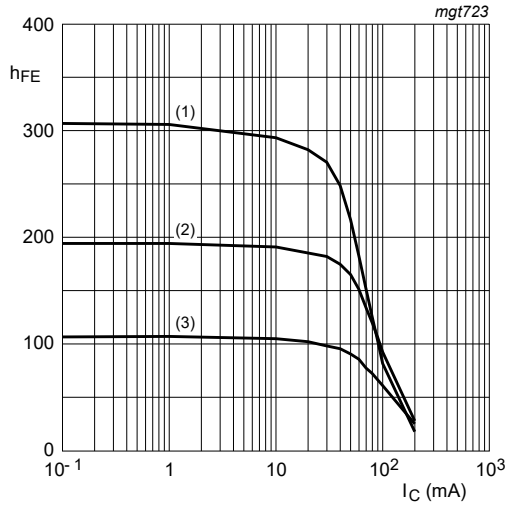
Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	80	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10 \text{ mA}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	65	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100 \mu\text{A}$; $I_C = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	6	-	-	V	
I_{CBO}	collector-base cut-off current	$V_{CB} = 30 \text{ V}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	15	nA	
		$V_{CB} = 30 \text{ V}$; $I_E = 0 \text{ A}$; $T_J = 150 \text{ }^\circ\text{C}$	-	-	5	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$; $I_C = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA	
h_{FE}	DC current gain						
	BC846A	$V_{CE} = 5 \text{ V}$; $I_C = 10 \mu\text{A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	180	-		
	BC846B		-	290	-		
	BC846	$V_{CE} = 5 \text{ V}$; $I_C = 2 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	110	-	450		
	BC846A		110	180	220		
	BC846B		200	290	450		
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	90	200	mV	
		$I_C = 100 \text{ mA}$; $I_B = 5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[1]	-	200	400	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10 \text{ mA}$; $I_B = 0.5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[2]	-	760	-	mV
		$I_C = 100 \text{ mA}$; $I_B = 5 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	900	-	mV
V_{BE}	base-emitter voltage	$I_C = 2 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[3]	580	660	700	mV
		$I_C = 10 \text{ mA}$; $V_{CE} = 5 \text{ V}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[3]	-	-	770	mV
f_T	transition frequency	$V_{CE} = 5 \text{ V}$; $I_C = 10 \text{ mA}$; $f = 100 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	MHz	
C_c	collector capacitance	$V_{CB} = 10 \text{ V}$; $I_E = i_e = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	2	3	pF	
C_e	emitter capacitance	$V_{EB} = 0.5 \text{ V}$; $I_C = i_c = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	11	-	pF	
NF	noise figure	$I_C = 200 \text{ } \mu\text{A}$; $V_{CE} = 5 \text{ V}$; $R_S = 2 \text{ k}\Omega$; $f = 1 \text{ kHz}$; $B = 200 \text{ Hz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	2	10	dB	

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

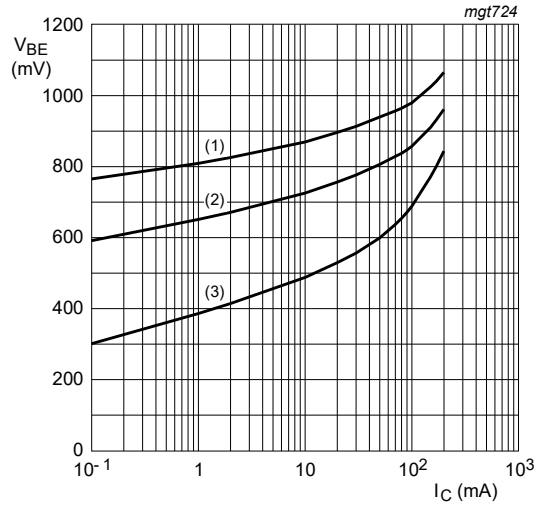
[2] V_{BEsat} decreases by approximately 1.7 mV/K with increasing temperature.

[3] V_{BE} decreases by about 2 mV/K with increasing temperature.



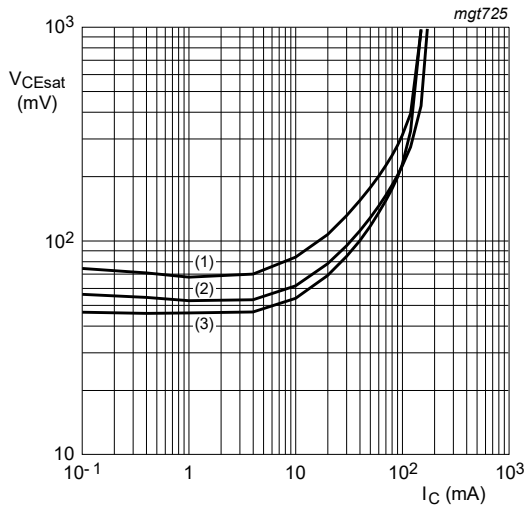
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 2. Group A: DC current gain as a function of collector current; typical values



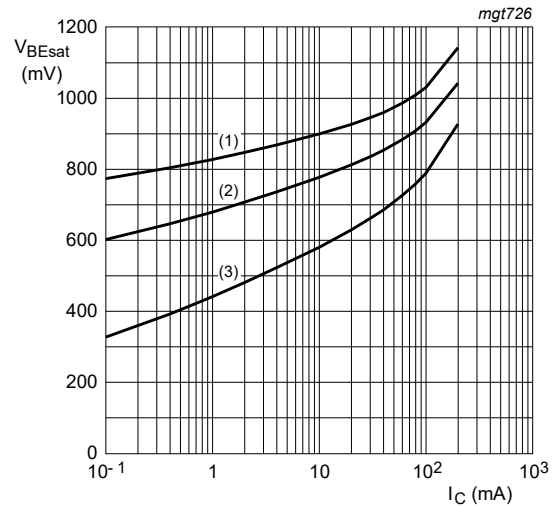
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

Fig. 3. Group A: Base-emitter voltage as a function of collector current; typical values



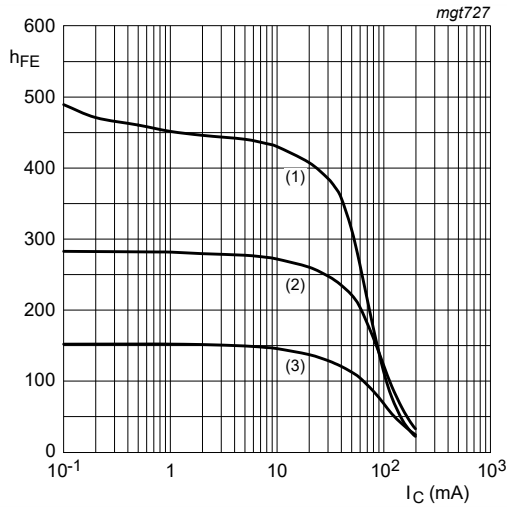
$I_C/I_B = 20$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 4. Group A: Collector-emitter saturation voltage as a function of collector current; typical values



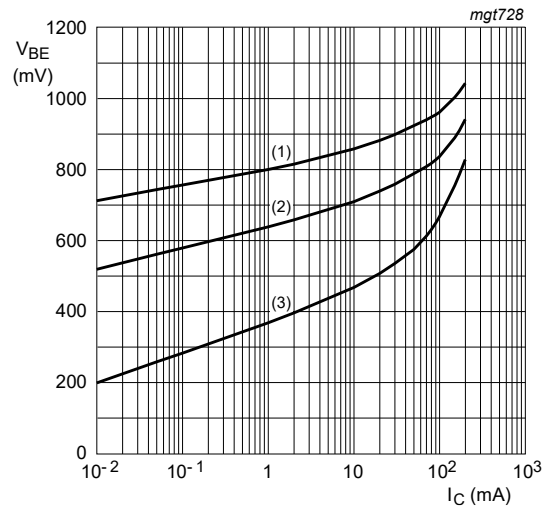
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

Fig. 5. Group A: Base-emitter saturation voltage as a function of collector current; typical values



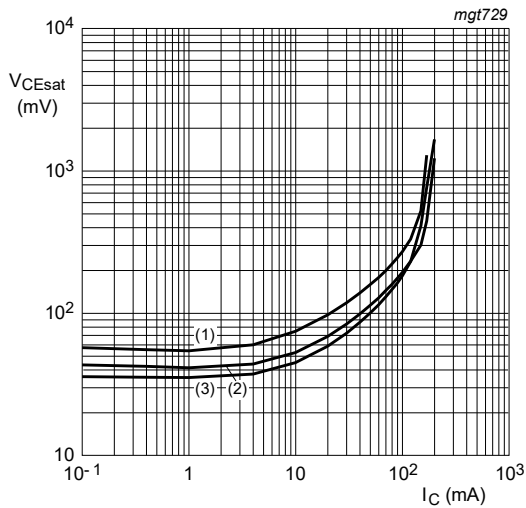
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 6. Group B: DC current gain as a function of collector current; typical values



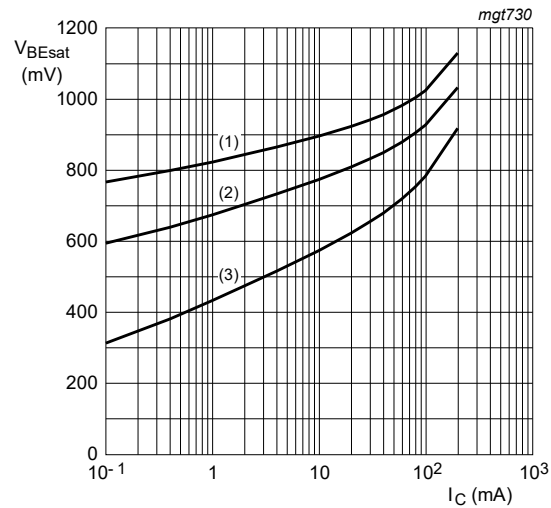
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

Fig. 7. Group B: Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 20$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 8. Group B: Collector-emitter saturation 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) $T_{amb} = 150\text{ °C}$

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

11. Package outline

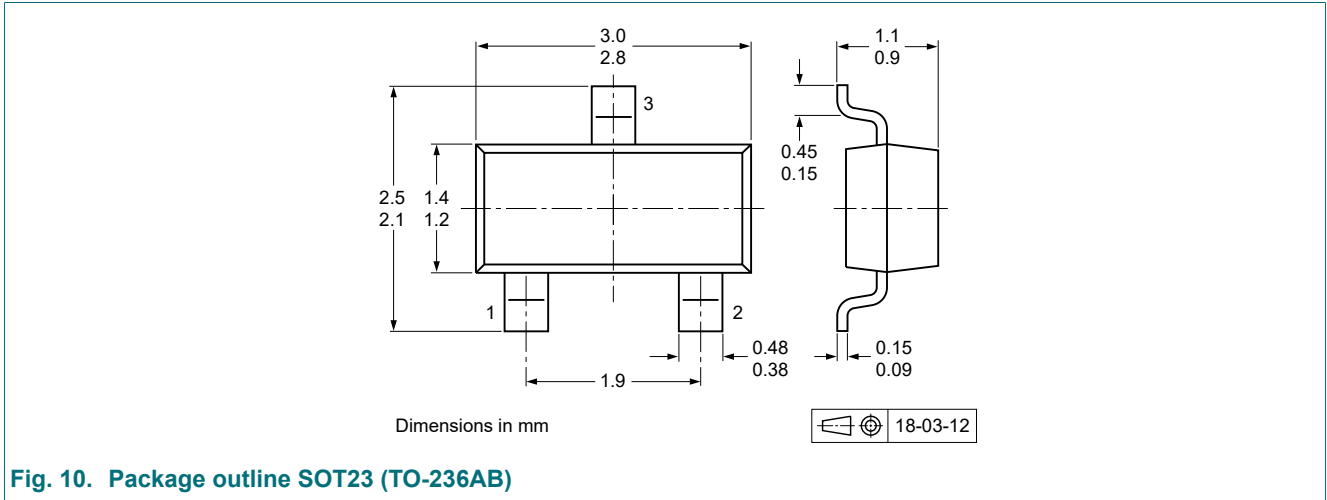
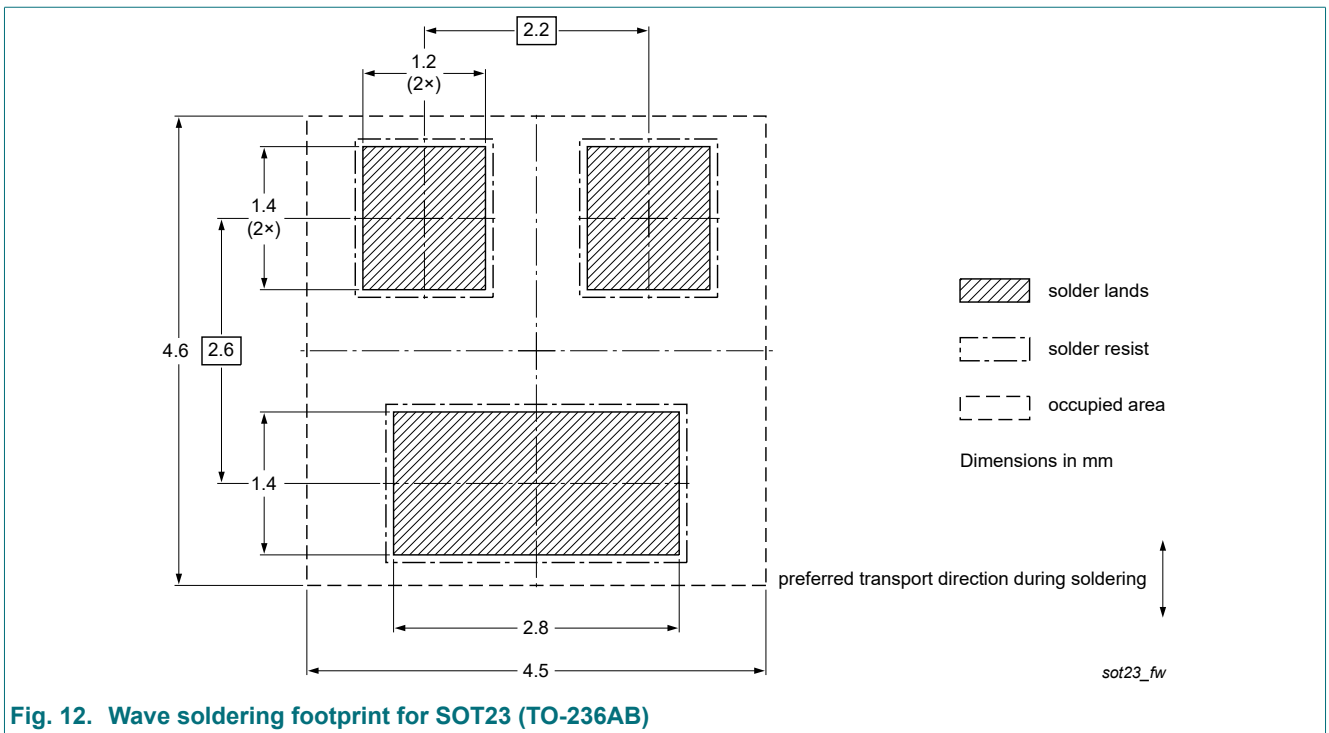
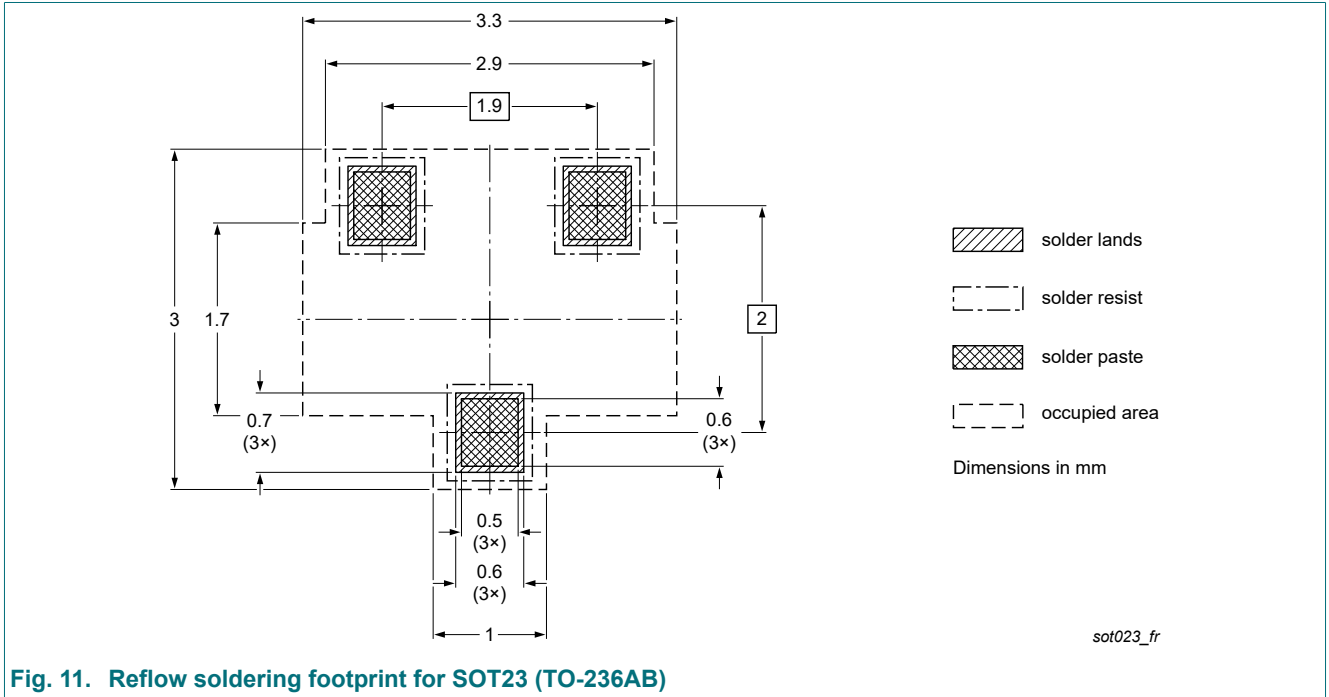


Fig. 10. Package outline SOT23 (TO-236AB)

12. Soldering



13. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC846X_SER v.12	20220701	Product data sheet	-	BC846X_SER v.11
Modifications:	<ul style="list-style-type: none"> Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s). 			
BC846X_SER v.11	20220520	Product data sheet	-	BC846X_SER v.10
BC846X_SER v.10	20220127	Product data sheet	-	BC846_SER v.9
BC846_SER v.9	20120925	Product data sheet	-	BC846_SER v.8
BC846_SER v.8	20120424	Product data sheet	-	BC846_BC546_SER v.7
BC846_BC546_SER v.7	20091117	Product data sheet	-	BC846_BC546_SER v.6
BC846_BC546_SER v.6	20060207	Product data sheet	-	-

14. 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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