



# 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

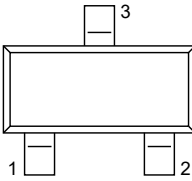
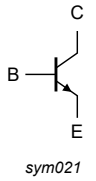
## 4. Quick reference data

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	
<a href="#">BC846</a>	TO-236AB	Plastic surface-mounted package; 3 leads	<a href="#">SOT23</a>
<a href="#">BC846A</a>			
<a href="#">BC846B</a>			

## 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.

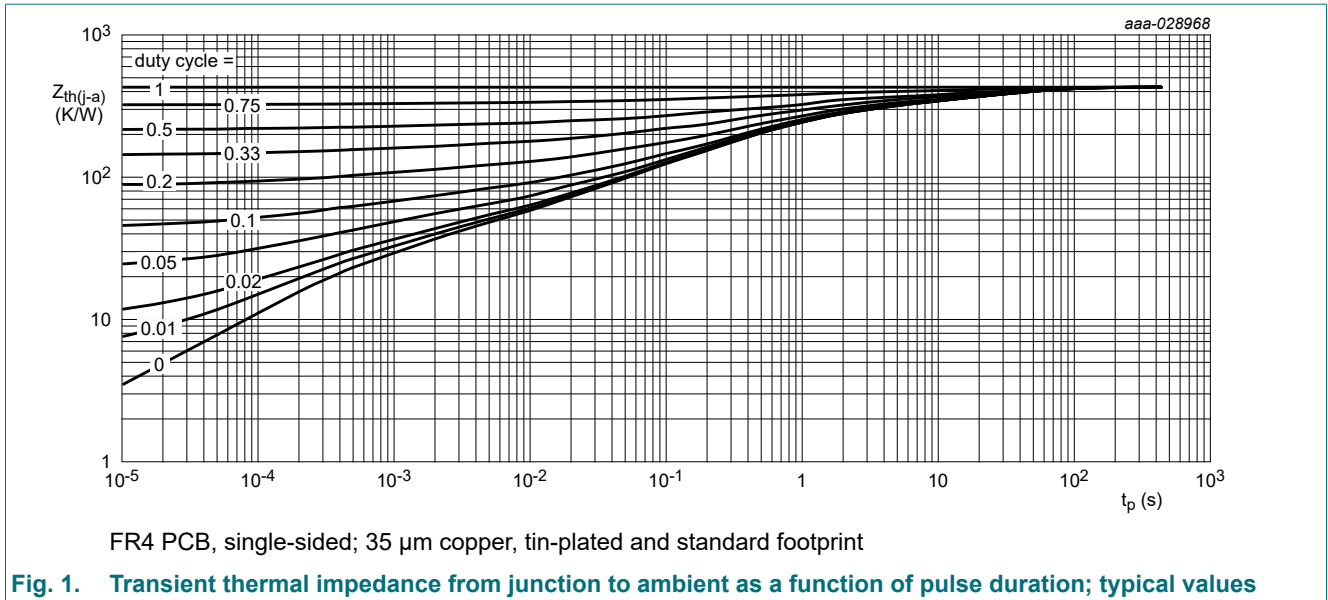
## 9. Thermal characteristics

**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

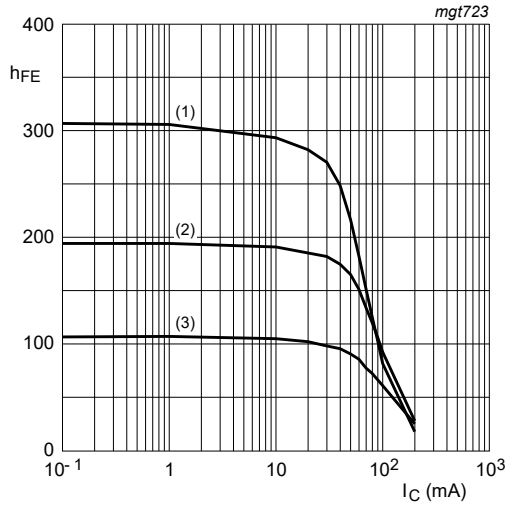
Table 8. Characteristics

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	$\mu\text{A}$	
$I_{EBO}$	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;  $t_p \leq 300 \mu\text{s}; \delta \leq 0.02$

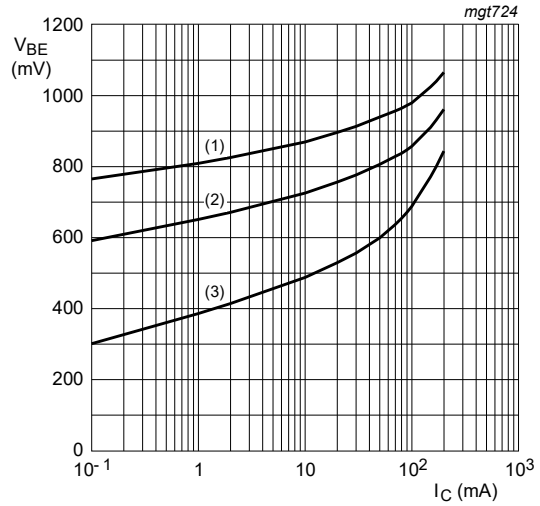
[2]  $V_{BEsat}$  decreases by approximately 1.7 mV/K with increasing temperature.

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



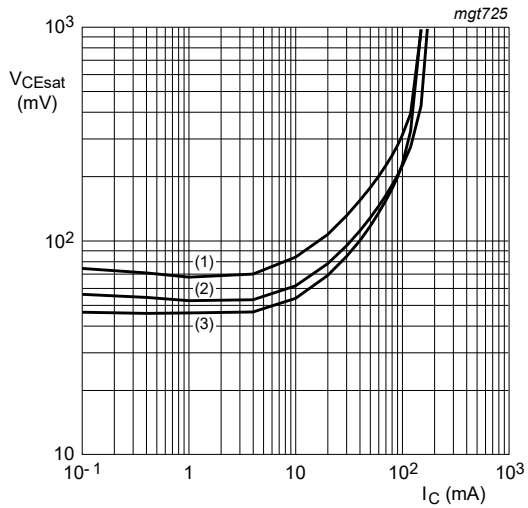
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



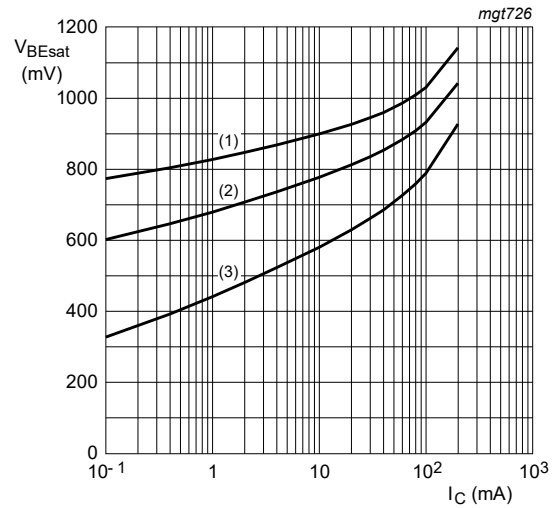
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

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



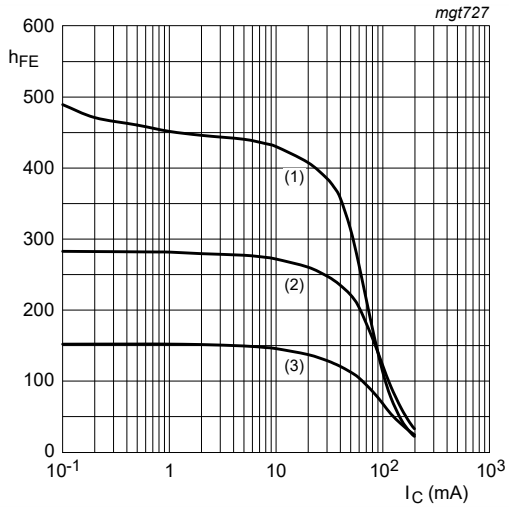
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



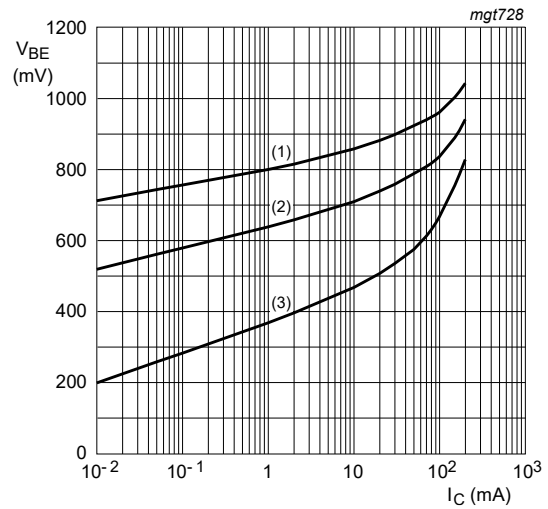
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

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



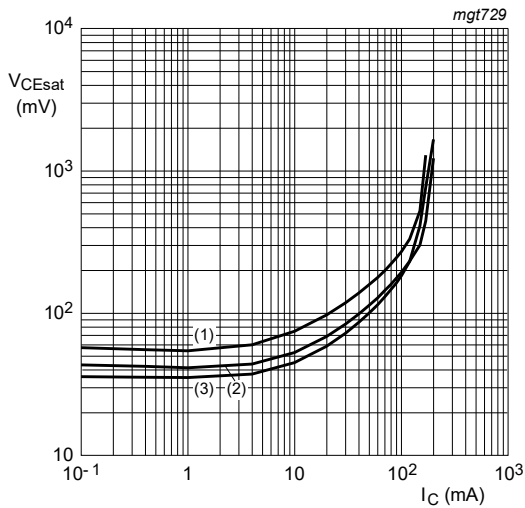
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



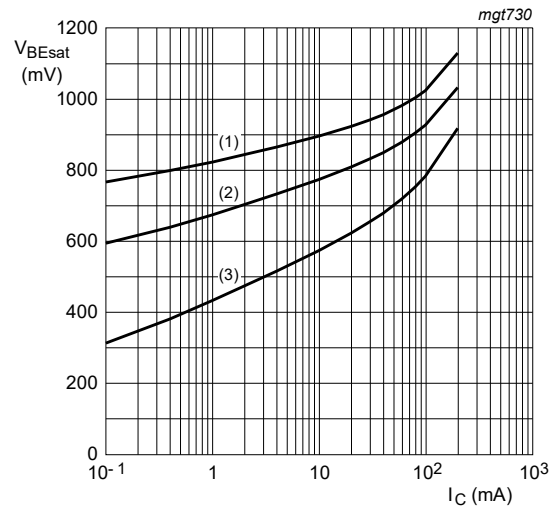
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

**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

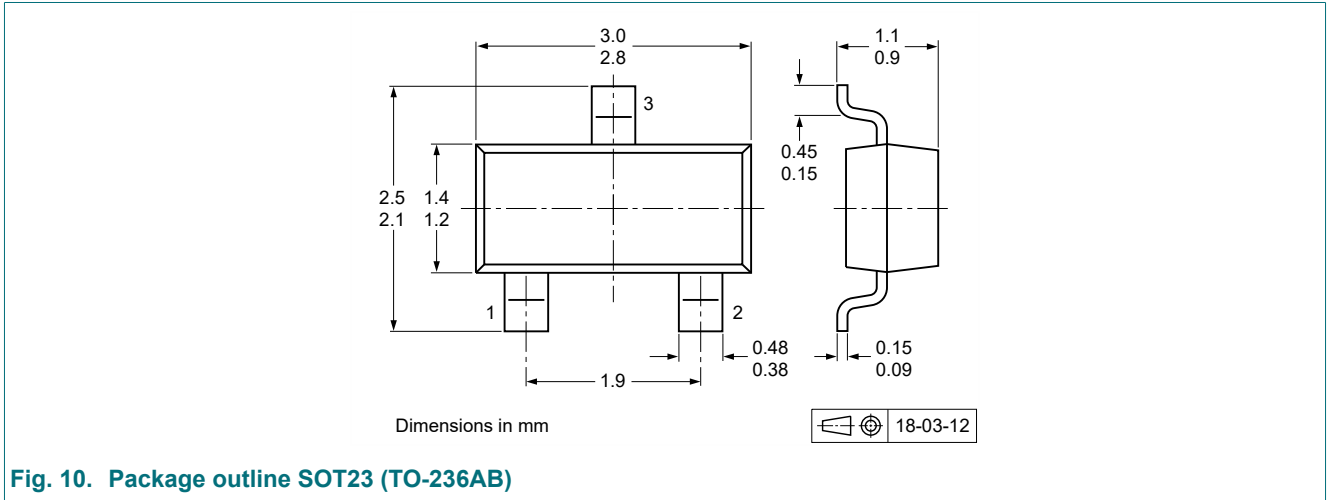


Fig. 10. Package outline SOT23 (TO-236AB)

## 12. Soldering

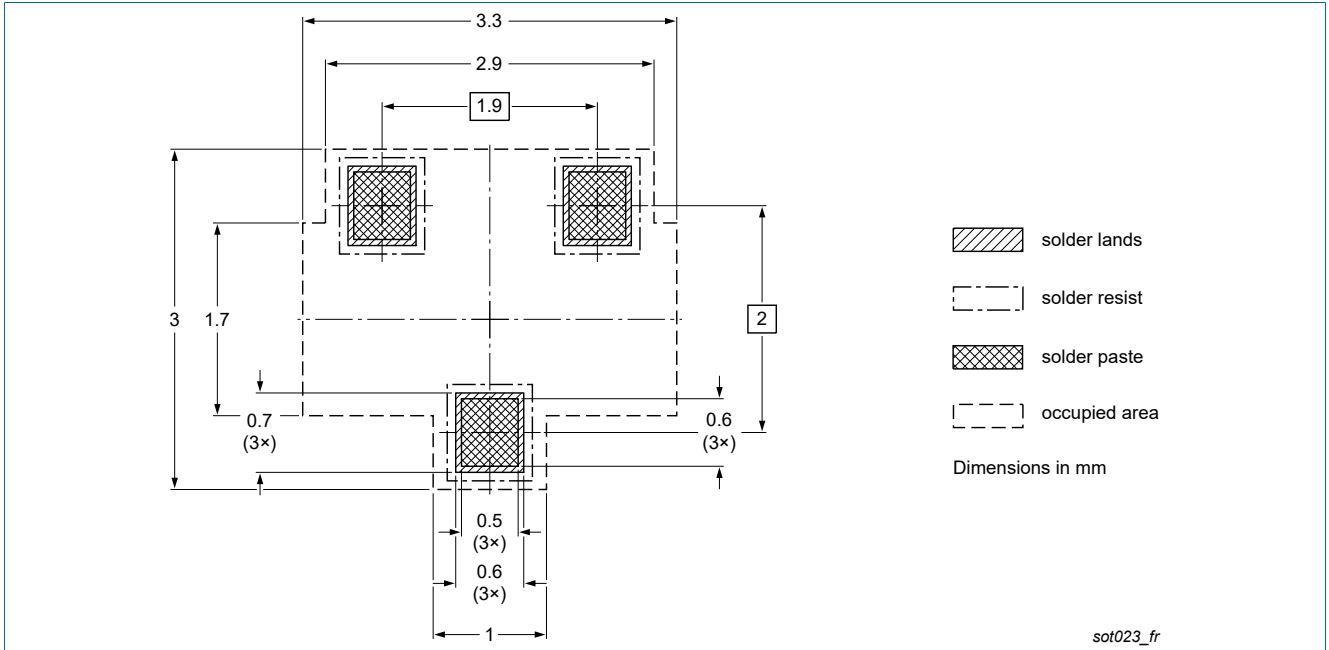


Fig. 11. Reflow soldering footprint for SOT23 (TO-236AB)

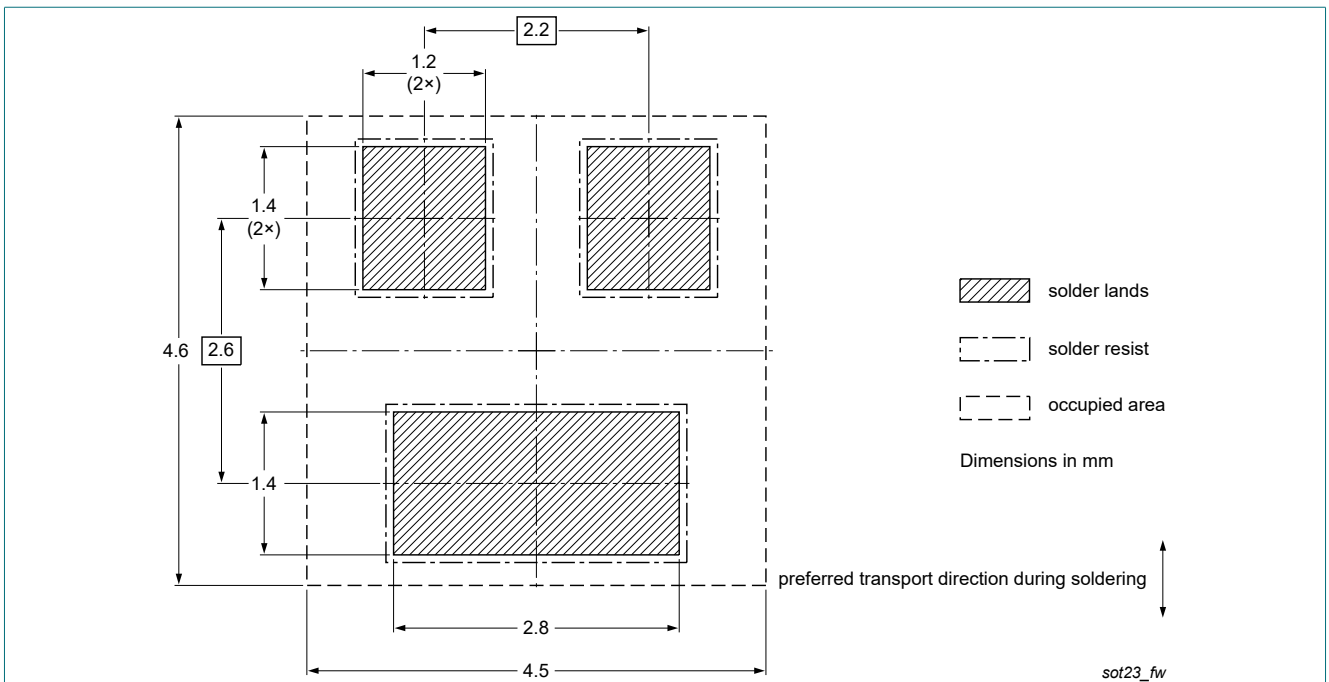


Fig. 12. Wave soldering footprint for SOT23 (TO-236AB)



## 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"> <li>Product(s) changed to non-automotive qualification. Please refer to <a href="http://nexperia.com">nexperia.com</a> for automotive (-Q) product alternative(s).</li> </ul>			
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.

- [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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