BC846 series

65 V, 100 mA NPN general-purpose transistors

Rev. 9 — 25 September 2012

Product data sheet

1. Product profile

1.1 General description

NPN general-purpose transistors in Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number[1]	Package	Package		
	NXP	JEITA	JEDEC	
BC846	SOT23	-	TO-236AB	BC856
BC846W	SOT323	SC-70	-	BC856W
BC846T	SOT416	SC-75	-	BC856T

^[1] Valid for all available selection groups.

1.2 Features and benefits

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

1.3 Applications

■ General-purpose switching and amplification

1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	65	V
I _C	collector current		-	-	100	mA
h _{FE}	DC current gain	$V_{CE} = 5 \text{ V}; I_{C} = 2 \text{ mA}$	110	-	450	
	h _{FE} group A		110	180	220	
	h _{FE} group B		200	290	450	



2. Pinning information

Table 3. Pinning

cription	Simplified outline	Graphic symbol
OT416		
)		
ter	[3]	3
ctor		1—
		2
		sym021
	OT416 er	OT416 er 3

3. Ordering information

Table 4. Ordering information

Type number[1]	Package		
	Name	Description	Version
BC846	-	plastic surface-mounted package; 3 leads	SOT23
BC846W	SC-70	plastic surface-mounted package; 3 leads	SOT323
BC846T	SC-75	plastic surface-mounted package; 3 leads	SOT416

^[1] Valid for all available selection groups.

4. Marking

Table 5. Marking codes

•	
Type number	Marking code ^[1]
BC846	1D*
BC846A	1A*
BC846B	1B*
BC846W	1D*
BC846AW	1A*
BC846BW	1B*
BC846T	1M
BC846AT	1A
BC846BT	1B

^{[1] * =} placeholder for manufacturing site code

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	-	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; $t_p \le 1 \text{ ms}$	-	200	mA
I _{BM}	peak base current	single pulse; $t_p \le 1 \text{ ms}$	-	200	mA
P _{tot}	total power dissipation	$T_{amb} \le 25 ^{\circ}C$	<u>[1]</u>		
	SOT23		-	250	mW
	SOT323		-	200	mW
	SOT416		-	150	mW
Tj	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.

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	<u>[1]</u>			
	SOT23		-	-	500	K/W
	SOT323		-	-	625	K/W
	SOT416		-	-	833	K/W

^[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

7. Characteristics

Table 8. Characteristics

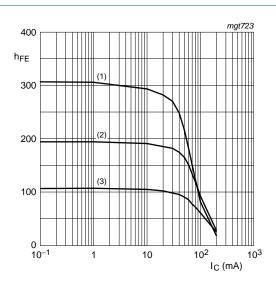
 $T_{amb} = 25$ °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
I _{CBO}	collector-base cut-off	$V_{CB} = 30 \text{ V}; I_{E} = 0 \text{ A}$	-	-	15	nΑ
	current	$V_{CB} = 30 \text{ V}; I_E = 0 \text{ A};$ $T_j = 150 ^{\circ}\text{C}$	-	-	5	μΑ
I _{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}; I_{C} = 0 \text{ A}$	-	-	100	nA
h _{FE}	DC current gain	$V_{CE} = 5 \text{ V}; I_{C} = 10 \mu\text{A}$				
	h _{FE} group A		-	180	-	
	h _{FE} group B		-	290	-	
	DC current gain	$V_{CE} = 5 \text{ V}; I_{C} = 2 \text{ mA}$	110	-	450	
<u>_</u>	h _{FE} group A		110	180	220	
	h _{FE} group B		200	290	450	
V _{CEsat} collector-emitter saturation voltage		$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}$	-	90	200	mV
	saturation voltage	$I_C = 100 \text{ mA}; I_B = 5 \text{ mA}$	[1] _	200	400	mV
V_{BEsat}	base-emitter	$I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}$	[2] _	760	-	mV
	saturation voltage	$I_C = 100 \text{ mA}; I_B = 5 \text{ mA}$	[2] _	900	-	mV
V_{BE}	base-emitter voltage	$I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}$	[<u>3</u>] 580	660	700	mV
		$I_C = 10 \text{ mA}; V_{CE} = 5 \text{ V}$	[3] _	-	770	mV
f _T	transition frequency	$V_{CE} = 5 \text{ V; } I_{C} = 10 \text{ mA;}$ f = 100 MHz	100	-	-	MHz
C _c	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = i_e = 0 \text{ A};$ f = 1 MHz	-	2	3	pF
C _e	emitter capacitance	$V_{EB} = 0.5 \text{ V}; I_C = I_c = 0 \text{ A};$ f = 1 MHz	-	11	-	pF
NF	noise figure	I_{C} = 200 μ A; V_{CE} = 5 V; R_{S} = 2 k Ω ; f = 1 kHz; B = 200 Hz	-	2	10	dB

^[1] Pulse test: $t_p \le 300~\mu s;~\delta = 0.02.$

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

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



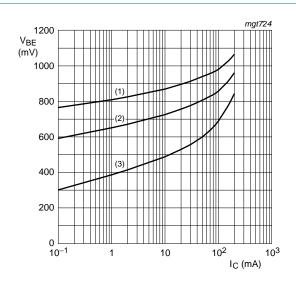
$$V_{CE} = 5 V$$

(1)
$$T_{amb} = 150 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3) $T_{amb} = -55 \, ^{\circ}C$

Fig 1. Selection A: DC current gain as a function of collector current; typical values



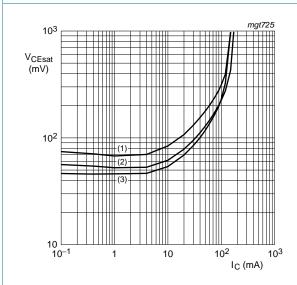
$$V_{CE} = 5 V$$

(1)
$$T_{amb} = -55 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3)
$$T_{amb} = 150 \, ^{\circ}C$$

Fig 2. Selection A: Base-emitter voltage as a function of collector current; typical values



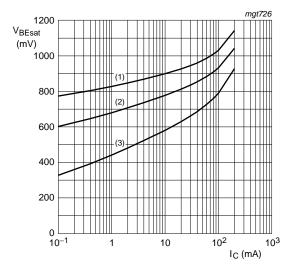
$$I_{\rm C}/I_{\rm B} = 20$$

(1)
$$T_{amb} = 150 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3)
$$T_{amb} = -55 \, ^{\circ}C$$

Fig 3. Selection A: Collector-emitter saturation voltage as a function of collector current; typical values



$$I_{\rm C}/I_{\rm B} = 10$$

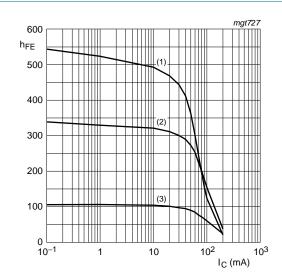
(1)
$$T_{amb} = -55 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3)
$$T_{amb} = 150 \, ^{\circ}C$$

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

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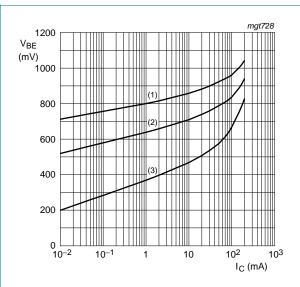
$$V_{CE} = 5 V$$

(1)
$$T_{amb} = 150 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3) $T_{amb} = -55 \, ^{\circ}C$

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



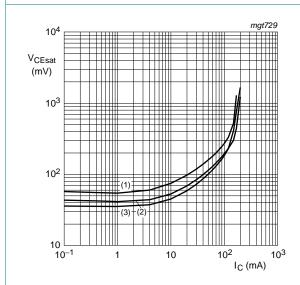
$$V_{CE} = 5 \text{ V}$$

(1)
$$T_{amb} = -55 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3) $T_{amb} = 150 \, ^{\circ}C$

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



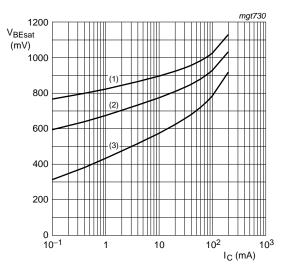
 $I_{\rm C}/I_{\rm B} = 20$

(1)
$$T_{amb} = 150 \, ^{\circ}C$$

(2)
$$T_{amb} = 25 \, ^{\circ}C$$

(3) $T_{amb} = -55 \, ^{\circ}C$

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



$$I_{\rm C}/I_{\rm B} = 10$$

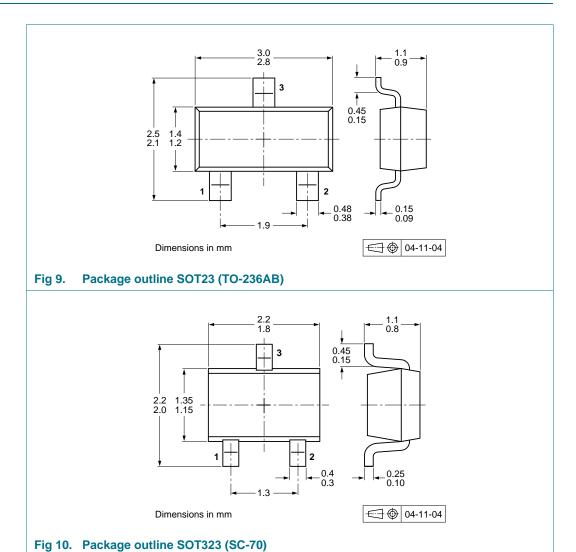
(1)
$$T_{amb} = -55 \, ^{\circ}C$$

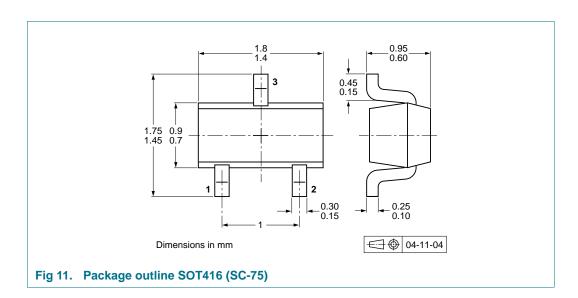
(2) $T_{amb} = 25 \, ^{\circ}C$

(3) $T_{amb} = 150 \, ^{\circ}C$

Fig 8. Selection B: Base-emitter saturation voltage as a function of collector current; typical values

8. Package outline





9. Packing information

Table 9. Packing methods

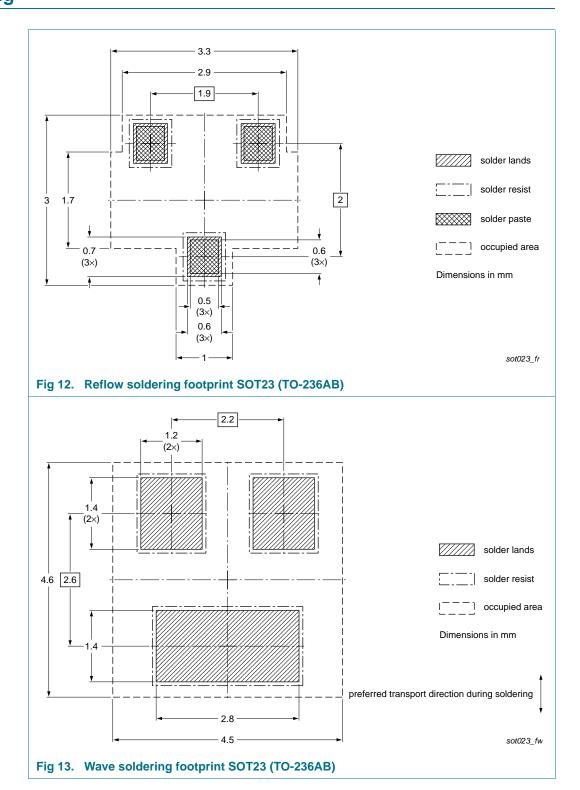
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

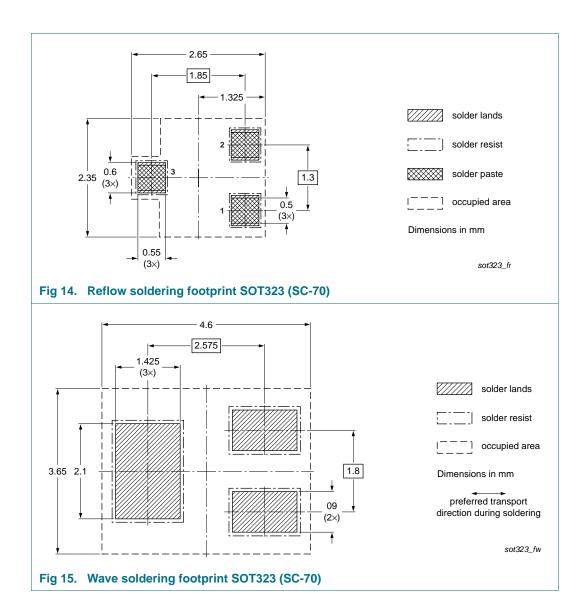
Туре	Package	Description		Packing quantity		
number[2]			1000	3000	4000	
BC846	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235	
BC846W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-135	
BC846T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135	

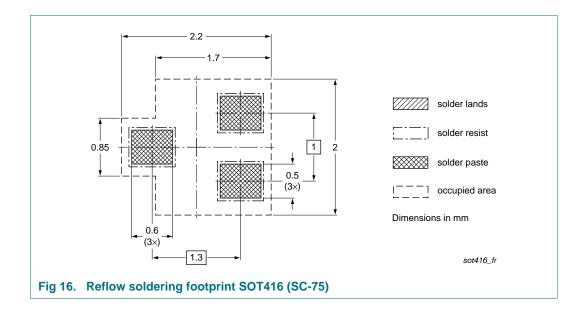
^[1] For further information and the availability of packing methods, see <u>Section 13</u>.

^[2] Valid for all available selection groups.

10. Soldering







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11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC846_SER v.9	20120925	Product data sheet	-	BC846_SER v.8
Modifications:	• Table 6 "Lir	niting values": P _{tot} values c	orrected	
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	-	-

12. Legal information

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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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BC846_SER

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BC846 series

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