



# BZX84 series

## Voltage regulator diodes

Rev. 6 — 6 March 2014

Product data sheet

## 1. Product profile

### 1.1 General description

Low-power voltage regulator diodes in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

The diodes are available in the normalized E24  $\pm 1\%$  (BZX84-A),  $\pm 2\%$  (BZX84-B) and approximately  $\pm 5\%$  (BZX84-C) tolerance range. The series includes 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V.

### 1.2 Features and benefits

- Total power dissipation:  $\leq 250$  mW
- Working voltage range: nominal 2.4 V to 75 V (E24 range)
- Three tolerance series:  $\pm 1\%$ ,  $\pm 2\%$  and approximately  $\pm 5\%$
- Non-repetitive peak reverse power dissipation:  $\leq 40$  W
- AEC-Q101 qualified

### 1.3 Applications

- General regulation functions

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_F$	forward voltage	$I_F = 10$ mA	[1]	-	0.9	V
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[2]	-	250	mW

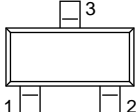
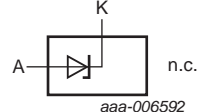
[1] Pulse test:  $t_p \leq 100$   $\mu$ s;  $\delta \leq 0.02$

[2] Device mounted on a FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



## 2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode		
2	n.c.	not connected		
3	K	cathode		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
BZX84 series <sup>[1]</sup>	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

[1] The series includes 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V and  $\pm 1\%$ ,  $\pm 2\%$  and  $\pm 5\%$  tolerances.

## 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>	Type number	Marking code <sup>[1]</sup>
BZX84-A2V4	*50	BZX84-A18	KF*
BZX84-A2V7	*51	BZX84-A20	*C2
BZX84-A3V0	*52	BZX84-A22	KG*
BZX84-A3V3	*53	BZX84-A24	KH*
BZX84-A3V6	*C1	BZX84-A27	*75
BZX84-A3V9	*55	BZX84-A30	KJ*
BZX84-A4V3	*56	BZX84-A33	KK*
BZX84-A4V7	*57	BZX84-A36	*C3
BZX84-A5V1	*58	BZX84-A39	*C4
BZX84-A5V6	*59	BZX84-A43	*C5
BZX84-A6V2	*60	BZX84-A51	*C6
BZX84-A6V8	*61	BZX84-A75	*86
BZX84-A7V5	*62	BZX84-B2V4	*Z0
BZX84-A8V2	*63	BZX84-B2V7	*Z1
BZX84-A9V1	*64	BZX84-B3V0	*S1
BZX84-A10	*65	BZX84-B3V3	*S2
BZX84-A11	*04	BZX84-B3V6	*S3
BZX84-A12	*67	BZX84-B3V9	*S4
BZX84-A13	*C0	BZX84-B4V3	*S7
BZX84-A15	*69	BZX84-B4V7	*S8
BZX84-A16	KE*	BZX84-B5V1	*R1

Table 4. Marking codes ...continued

Type number	Marking code <sup>[1]</sup>	Type number	Marking code <sup>[1]</sup>
BZX84-B5V6	*R2	BZX84-C3V9	*B3
BZX84-B6V2	*R5	BZX84-C4V3	*B6
BZX84-B6V8	*R6	BZX84-C4V7	Z1*
BZX84-B7V5	*R8	BZX84-C5V1	Z2*
BZX84-B8V2	*R9	BZX84-C5V6	Z3*
BZX84-B9V1	*T1	BZX84-C6V2	Z4*
BZX84-B10	*66	BZX84-C6V8	Z5*
BZX84-B11	*Z6	BZX84-C7V5	Z6*
BZX84-B12	*Z7	BZX84-C8V2	Z7*
BZX84-B13	*Z8	BZX84-C9V1	Z8*
BZX84-B15	*Z9	BZX84-C10	Z9*
BZX84-B16	*70	BZX84-C11	Y1*
BZX84-B18	*71	BZX84-C12	Y2*
BZX84-B20	*72	BZX84-C13	Y3*
BZX84-B22	*73	BZX84-C15	Y4*
BZX84-B24	*74	BZX84-C16	Y5*
BZX84-B27	*Z5	BZX84-C18	Y6*
BZX84-B30	*Z4	BZX84-C20	Y7*
BZX84-B33	*Y1	BZX84-C22	Y8*
BZX84-B36	*Y2	BZX84-C24	Y9*
BZX84-B39	*S0	BZX84-C27	*T2
BZX84-B43	*S5	BZX84-C30	*T5
BZX84-B47	*S6	BZX84-C33	*T6
BZX84-B51	*S9	BZX84-C36	*T7
BZX84-B56	*R0	BZX84-C39	*T8
BZX84-B62	*R3	BZX84-C43	*B4
BZX84-B68	*R4	BZX84-C47	*B5
BZX84-B75	*R7	BZX84-C51	*B7
BZX84-C2V4	*T3	BZX84-C56	*B8
BZX84-C2V7	*T4	BZX84-C62	*B9
BZX84-C3V0	*T9	BZX84-C68	*B0
BZX84-C3V3	*B1	BZX84-C75	*A1
BZX84-C3V6	*B2	-	-

[1] \* = placeholder for manufacturing site code

## 5. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$I_F$	forward current		-	200	mA
$P_{ZSM}$	non-repetitive peak reverse power dissipation		[1]	40	W
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[2]	250	mW
$T_{amb}$	ambient temperature		-	150	°C
$T_{stg}$	storage temperature		-55	+150	°C
$T_j$	junction temperature		-65	+150	°C

[1]  $t_p = 100\ \mu\text{s}$ ; square wave;  $T_j = 25\text{ °C}$  before surge

[2] Device mounted on a FR4 PCB, single-sided copper, tin-plated and standard footprint.

## 6. 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]	-	500	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[2]	-	330	K/W

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

[2] Soldering point of cathode tab.

## 7. Characteristics

**Table 7. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_F$	forward voltage	$I_F = 10\text{ mA}$	[1]	-	0.9	V

[1] Pulse test:  $t_p \leq 100\ \mu\text{s}$ ;  $\delta \leq 0.02$

**Table 8. Characteristics per type; BZX84-A2V4 to BZX84-C24**

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

BZX84-xxx	Sel	Working voltage $V_Z$ (V)		Differential resistance $r_{dif}$ ( $\Omega$ )				Reverse current $I_R$ ( $\mu$ A)		Temperature coefficient $S_Z$ (mV/K)			Diode capacitance $C_d$ (pF) <sup>[1]</sup>	Non-repetitive peak reverse current $I_{ZSM}$ (A) <sup>[2]</sup>
		$I_Z = 5\text{ mA}$		$I_Z = 1\text{ mA}$		$I_Z = 5\text{ mA}$		Max	$V_R$ (V)	$I_Z = 5\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max			Min	Typ	Max	Max	Max
2V4	A	2.37	2.43	275	600	70	100	50	1	-3.5	-1.6	0	450	6.0
	B	2.35	2.45											
	C	2.2	2.6											
2V7	A	2.67	2.73	300	600	75	100	20	1	-3.5	-2.0	0	450	6.0
	B	2.65	2.75											
	C	2.5	2.9											
3V0	A	2.97	3.03	325	600	80	95	10	1	-3.5	-2.1	0	450	6.0
	B	2.94	3.06											
	C	2.8	3.2											
3V3	A	3.26	3.34	350	600	85	95	5	1	-3.5	-2.4	0	450	6.0
	B	3.23	3.37											
	C	3.1	3.5											
3V6	A	3.56	3.64	375	600	85	90	5	1	-3.5	-2.4	0	450	6.0
	B	3.53	3.67											
	C	3.4	3.8											
3V9	A	3.86	3.94	400	600	85	90	3	1	-3.5	-2.5	0	450	6.0
	B	3.82	3.98											
	C	3.7	4.1											
4V3	A	4.25	4.35	410	600	80	90	3	1	-3.5	-2.5	0	450	6.0
	B	4.21	4.39											
	C	4.0	4.6											
4V7	A	4.65	4.75	425	500	50	80	3	2	-3.5	-1.4	0.2	300	6.0
	B	4.61	4.79											
	C	4.4	5.0											
5V1	A	5.04	5.16	400	480	40	60	2	2	-2.7	-0.8	1.2	300	6.0
	B	5.0	5.2											
	C	4.8	5.4											
5V6	A	5.54	5.66	80	400	15	40	1	2	-2.0	1.2	2.5	300	6.0
	B	5.49	5.71											
	C	5.2	6.0											
6V2	A	6.13	6.27	40	150	6	10	3	4	0.4	2.3	3.7	200	6.0
	B	6.08	6.32											
	C	5.8	6.6											
6V8	A	6.73	6.87	30	80	6	15	2	4	1.2	3.0	4.5	200	6.0
	B	6.66	6.94											
	C	6.4	7.2											

**Table 8. Characteristics per type; BZX84-A2V4 to BZX84-C24 ...continued**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

BZX84-xxx	Sel	Working voltage $V_Z$ (V)		Differential resistance $r_{\text{dif}}$ ( $\Omega$ )				Reverse current $I_R$ ( $\mu\text{A}$ )		Temperature coefficient $S_Z$ (mV/K)			Diode capacitance $C_d$ (pF) <sup>[1]</sup>	Non-repetitive peak reverse current $I_{ZSM}$ (A) <sup>[2]</sup>
		$I_Z = 5\text{ mA}$		$I_Z = 1\text{ mA}$		$I_Z = 5\text{ mA}$		Max	$V_R$ (V)	$I_Z = 5\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max			Min	Typ	Max	Max	Max
7V5	A	7.42	7.58	30	80	6	15	1	5	2.5	4.0	5.3	150	4.0
	B	7.35	7.65											
	C	7.0	7.9											
8V2	A	8.11	8.29	40	80	6	15	0.7	5	3.2	4.6	6.2	150	4.0
	B	8.04	8.36											
	C	7.7	8.7											
9V1	A	9	9.2	40	100	6	15	0.5	6	3.8	5.5	7.0	150	3.0
	B	8.92	9.28											
	C	8.5	9.6											
10	A	9.9	10.1	50	150	8	20	0.2	7	4.5	6.4	8.0	90	3.0
	B	9.8	10.2											
	C	9.4	10.6											
11	A	10.8	11.11	50	150	10	20	0.1	8	5.4	7.4	9.0	85	2.5
	B	10.8	11.2											
	C	10.4	11.6											
12	A	11.88	12.12	50	150	10	25	0.1	8	6.0	8.4	10.0	85	2.5
	B	11.8	12.2											
	C	11.4	12.7											
13	A	12.87	13.13	50	170	10	30	0.1	8	7.0	9.4	11.0	80	2.5
	B	12.7	13.3											
	C	12.4	14.1											
15	A	14.85	15.15	50	200	10	30	0.05	10.5	9.2	11.4	13.0	75	2.0
	B	14.7	15.3											
	C	13.8	15.6											
16	A	15.84	16.16	50	200	10	40	0.05	11.2	10.4	12.4	14.0	75	1.5
	B	15.7	16.3											
	C	15.3	17.1											
18	A	17.82	18.18	50	225	10	45	0.05	12.6	12.4	14.4	16.0	70	1.5
	B	17.6	18.4											
	C	16.8	19.1											
20	A	19.8	20.2	60	225	15	55	0.05	14	14.4	16.4	18.0	60	1.5
	B	19.6	20.4											
	C	18.8	21.2											
22	A	21.78	22.22	60	250	20	55	0.05	15.4	16.4	18.4	20.0	60	1.25
	B	21.6	22.4											
	C	20.8	23.3											

**Table 8. Characteristics per type; BZX84-A2V4 to BZX84-C24 ...continued**

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

BZX84-xxx	Sel	Working voltage $V_Z$ (V)		Differential resistance $r_{\text{dif}}$ ( $\Omega$ )				Reverse current $I_R$ ( $\mu\text{A}$ )		Temperature coefficient $S_Z$ (mV/K)			Diode capacitance $C_d$ (pF) <sup>[1]</sup>	Non-repetitive peak reverse current $I_{ZSM}$ (A) <sup>[2]</sup>
		$I_Z = 5\text{ mA}$		$I_Z = 1\text{ mA}$		$I_Z = 5\text{ mA}$		$I_Z = 5\text{ mA}$						
		Min	Max	Typ	Max	Typ	Max	Max	$V_R$ (V)	Min	Typ	Max		
24	A	23.76	24.24	60	250	25	70	0.05	16.8	18.4	20.4	22.0	55	1.25
	B	23.5	24.5											
	C	22.8	25.6											

[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$

[2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ °C}$  before surge

**Table 9. Characteristics per type; BZX84-A27 to BZX84-C75**

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

BZX84-xxx	Sel	Working voltage $V_Z$ (V)		Differential resistance $r_{\text{dif}}$ ( $\Omega$ )				Reverse current $I_R$ ( $\mu\text{A}$ )		Temperature coefficient $S_Z$ (mV/K)			Diode capacitance $C_d$ (pF) <sup>[1]</sup>	Non-repetitive peak reverse current $I_{ZSM}$ (A) <sup>[2]</sup>
		$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$		$I_Z = 2\text{ mA}$		$I_Z = 2\text{ mA}$						
		Min	Max	Typ	Max	Typ	Max	Max	$V_R$ (V)	Min	Typ	Max		
27	A	26.73	27.27	65	300	25	80	0.05	18.9	21.4	23.4	25.3	50	1.0
	B	26.5	27.5											
	C	25.1	28.9											
30	A	29.7	30.30	70	300	30	80	0.05	21	24.4	26.6	29.4	50	1.0
	B	29.4	30.6											
	C	28.0	32.0											
33	A	32.67	33.33	75	325	35	80	0.05	23.1	27.4	29.7	33.4	45	0.9
	B	32.3	33.7											
	C	31.0	35.0											
36	A	35.64	36.36	80	350	35	90	0.05	25.2	30.4	33.0	37.4	45	0.8
	B	35.3	36.7											
	C	34.0	38.0											
39	A	38.61	39.39	80	350	40	130	0.05	27.3	33.4	36.4	41.2	45	0.7
	B	38.2	39.8											
	C	37.0	41.0											
43	A	42.57	43.43	85	375	45	150	0.05	30.1	37.6	41.2	46.6	40	0.6
	B	42.1	43.9											
	C	40.0	46.0											
47	B	46.1	47.9	85	375	50	170	0.05	32.9	42.0	46.1	51.8	40	0.5
	C	44.0	50.0											
51	A	50.49	51.51	90	400	60	180	0.05	35.7	46.6	51.0	57.2	40	0.4
	B	50.0	52.0											
	C	48.0	54.0											

**Table 9. Characteristics per type; BZX84-A27 to BZX84-C75 ...continued**

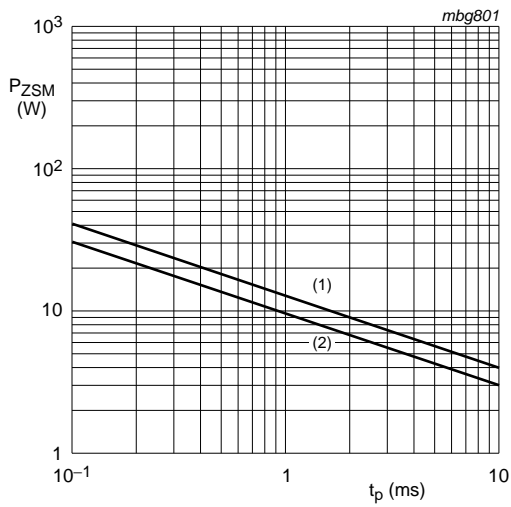
$T_j = 25\text{ °C}$  unless otherwise specified.

BZX84-xxx	Sel	Working voltage $V_Z$ (V)		Differential resistance $r_{dif}$ ( $\Omega$ )				Reverse current $I_R$ ( $\mu$ A)		Temperature coefficient $S_Z$ (mV/K)			Diode capacitance $C_d$ (pF) <sup>[1]</sup>	Non-repetitive peak reverse current $I_{ZSM}$ (A) <sup>[2]</sup>
				$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$				$I_Z = 2\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max	Max	$V_R$ (V)	Min	Typ	Max	Max	Max
56	B	54.9	57.1	100	425	70	200	0.05	39.2	52.2	57.0	63.8	40	0.3
	C	52.0	60.0											
62	B	60.8	63.2	120	450	80	215	0.05	43.4	58.8	64.4	71.6	35	0.3
	C	58.0	66.0											
68	B	66.6	69.4	150	475	90	240	0.05	47.6	65.6	71.7	79.8	35	0.25
	C	64.0	72.0											
75	A	74.25	75.75	170	500	95	255	0.05	52.5	73.4	80.2	88.6	35	0.20
	B	73.5	76.5											
	C	70.0	79.0											

[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$

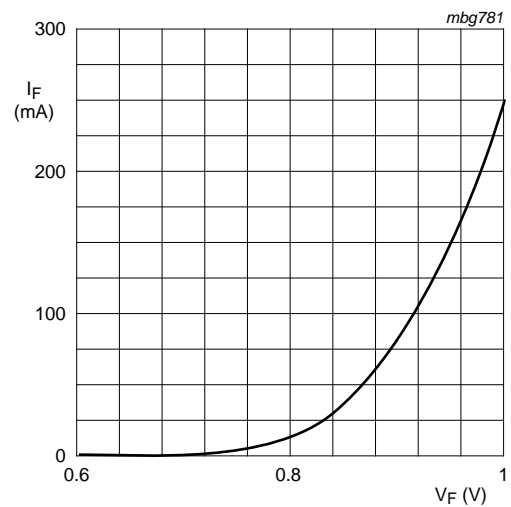
[2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ °C}$  before surge





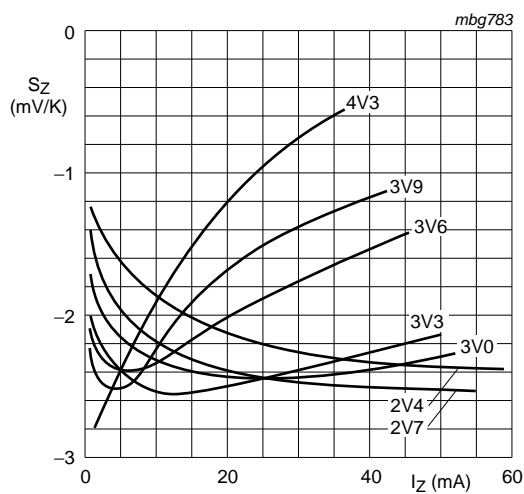
- (1)  $T_j = 25^\circ\text{C}$  (before surge)
- (2)  $T_j = 150^\circ\text{C}$  (before surge)

**Fig 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values**



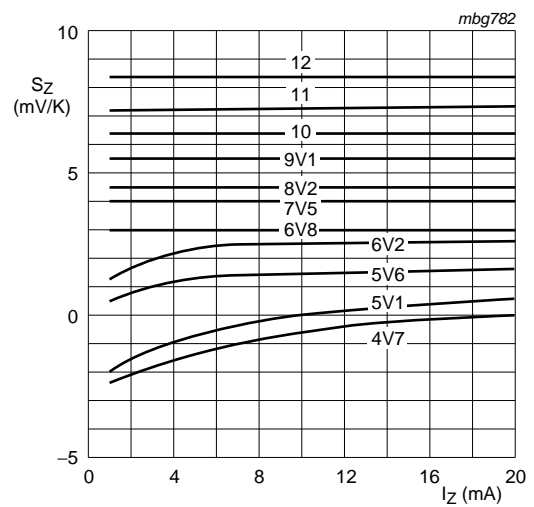
$T_j = 25^\circ\text{C}$

**Fig 2. Forward current as a function of forward voltage; typical values**



BZX84-A/B/C2V4 to BZX84-A/B/C4V3  
 $T_j = 25^\circ\text{C}$  to  $150^\circ\text{C}$

**Fig 3. Temperature coefficient as a function of working current; typical values**



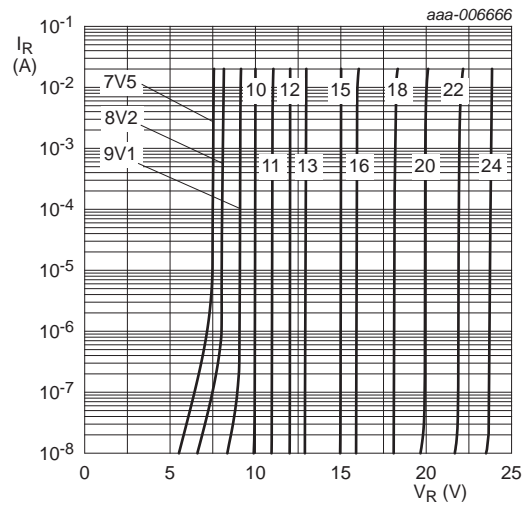
BZX84-A/B/C4V7 to BZX84-A/B/C12  
 $T_j = 25^\circ\text{C}$  to  $150^\circ\text{C}$

**Fig 4. Temperature coefficient as a function of working current; typical values**



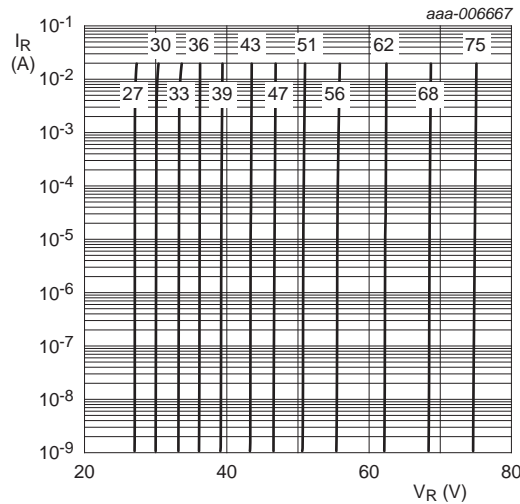
BZX84-A/B/C2V4 to BZX84-A/B/C6V8  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 5. Reverse current as a function of reverse voltage; typical values**



BZX84-A/B/C7V5 to BZX84-A/B/C24  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 6. Reverse current as a function of reverse voltage; typical values**



BZX84-A/B/C27 to BZX84-A/B/C75  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$

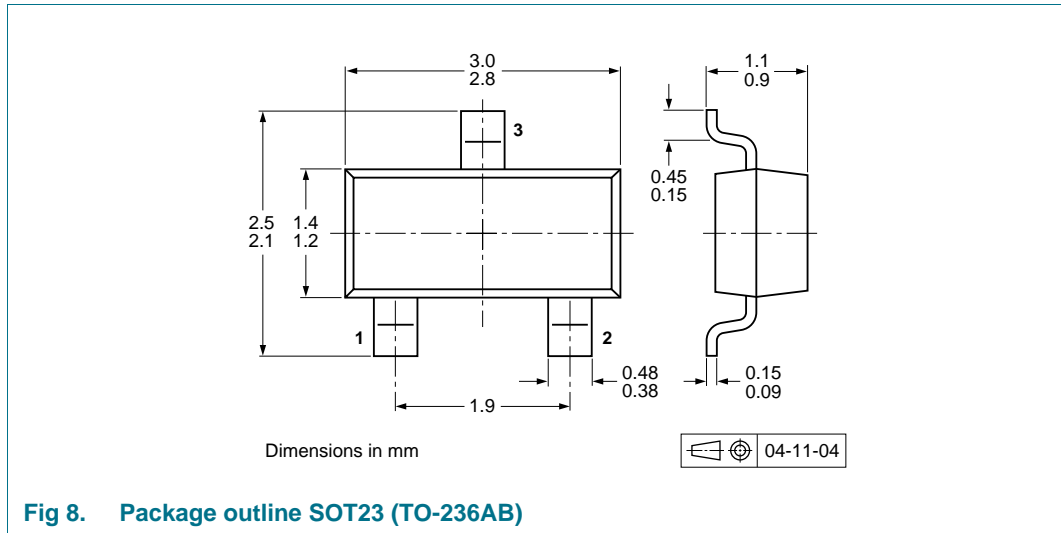
**Fig 7. Reverse current as a function of reverse voltage; typical values**

## 8. Test information

### 8.1 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.

## 9. Package outline



## 10. Packing information

**Table 10. Packing methods**

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

Type number	Package	Description	Packing quantity	
			3000	10000
BZX84 series <sup>[2]</sup>	SOT23 (TO-236AB)	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see [Section 14](#).

[2] The series includes 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V and  $\pm 1\%$ ,  $\pm 2\%$  and  $\pm 5\%$  tolerances.

# 11. Soldering

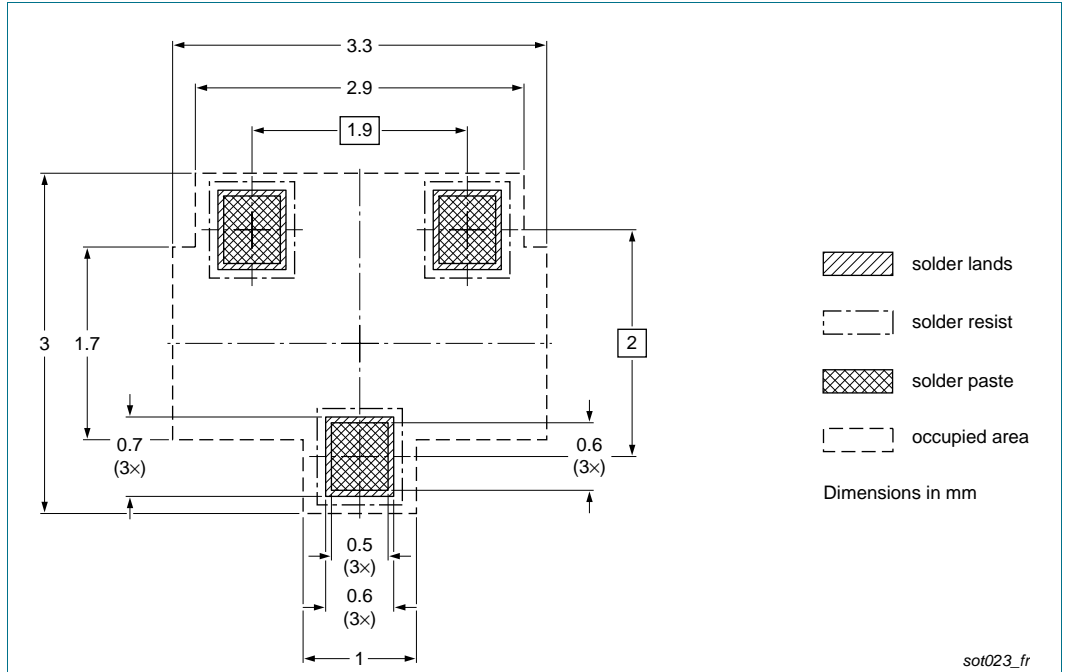


Fig 9. Reflow soldering footprint SOT23 (TO-236AB)

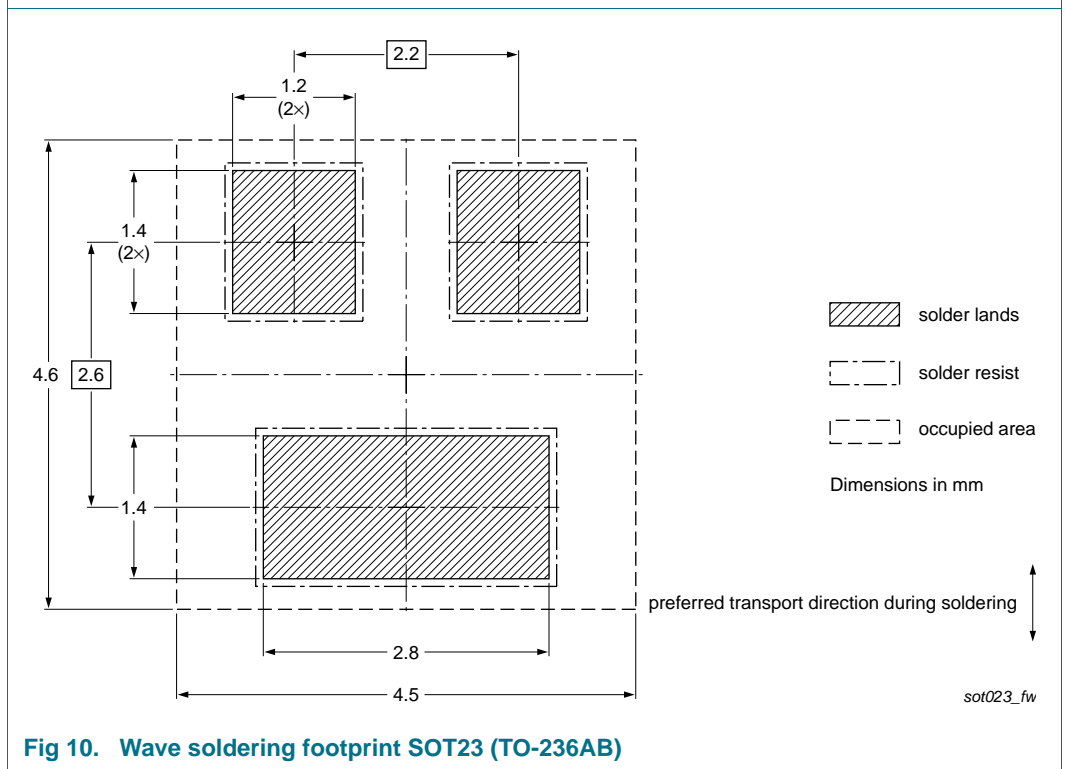


Fig 10. Wave soldering footprint SOT23 (TO-236AB)

## 12. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BZX84_SER v.6	20140306	Product data sheet	-	BZX84_SER v.5
Modifications:	• Descriptive title of the document corrected			
BZX84_SER v.5	20130918	Product data sheet	-	BZX84_SER v.4
BZX84_SER v.4	20130322	Product data sheet	-	BZX84_SERIES v.3
BZX84_SERIES v.3	20030410	Product data sheet	-	BZX84 v.2
BZX84 v.2	19990518	Product specification	-	BZX84 v.1
BZX84 v.1	19960426	Product specification	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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