

# BZB84 series

## Dual Zener diodes

Rev. 03 — 9 June 2009

Product data sheet

## 1. Product profile

### 1.1 General description

General-purpose Zener diodes in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- Non-repetitive peak reverse power dissipation:  $\leq 40$  W
- Total power dissipation:  $\leq 300$  mW
- Two tolerance series:  
B =  $\pm 2$  % and C =  $\pm 5$  %
- Wide working voltage range:  
nominal 2.4 V to 75 V (E24 range)
- Small plastic package suitable for surface-mounted design
- Dual common anode configuration
- AEC-Q101 qualified

### 1.3 Applications

- General regulation functions

### 1.4 Quick reference data

Table 1. Quick reference data

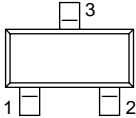
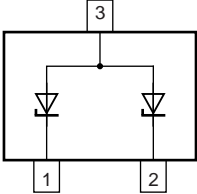
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_F$	forward voltage	$I_F = 10$ mA	[1] -	-	0.9	V
$P_{ZSM}$	non-repetitive peak reverse power dissipation		[2] -	-	40	W

[1] Pulse test:  $t_p \leq 300$   $\mu$ s;  $\delta \leq 0.02$ .

[2]  $t_p = 100$   $\mu$ s; square wave;  $T_j = 25$  °C prior to surge

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	cathode (diode 1)		
2	cathode (diode 2)		
3	common anode		

006aaa154

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BZB84-B2V4 to BZB84-C75 <sup>[1]</sup>	-	plastic surface-mounted package; 3 leads	SOT23

[1] The series consists of 74 types with nominal working voltages from 2.4 V to 75 V.

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code <sup>[1]</sup>	Type number	Marking code <sup>[1]</sup>
BZB84-B2V4	V9*	BZB84-C2V4	U9*
BZB84-B2V7	VA*	BZB84-C2V7	UA*
BZB84-B3V0	VB*	BZB84-C3V0	UB*
BZB84-B3V3	VC*	BZB84-C3V3	UC*
BZB84-B3V6	VD*	BZB84-C3V6	UD*
BZB84-B3V9	VE*	BZB84-C3V9	UE*
BZB84-B4V3	VF*	BZB84-C4V3	UF*
BZB84-B4V7	VG*	BZB84-C4V7	UG*
BZB84-B5V1	VH*	BZB84-C5V1	UH*
BZB84-B5V6	VK*	BZB84-C5V6	UK*
BZB84-B6V2	VL*	BZB84-C6V2	UL*
BZB84-B6V8	VM*	BZB84-C6V8	UM*
BZB84-B7V5	VN*	BZB84-C7V5	UN*
BZB84-B8V2	VP*	BZB84-C8V2	UP*
BZB84-B9V1	VR*	BZB84-C9V1	UR*

**Table 4. Marking codes ...continued**

Type number	Marking code <sup>[1]</sup>	Type number	Marking code <sup>[1]</sup>
BZB84-B10	VS*	BZB84-C10	US*
BZB84-B11	VT*	BZB84-C11	UT*
BZB84-B12	VU*	BZB84-C12	UU*
BZB84-B13	VV*	BZB84-C13	UV*
BZB84-B15	VW*	BZB84-C15	UW*
BZB84-B16	PT*	BZB84-C16	PB*
BZB84-B18	PU*	BZB84-C18	PC*
BZB84-B20	RP*	BZB84-C20	RQ*
BZB84-B22	PV*	BZB84-C22	PD*
BZB84-B24	PW*	BZB84-C24	PE*
BZB84-B27	PX*	BZB84-C27	PF*
BZB84-B30	PY*	BZB84-C30	PG*
BZB84-B33	PZ*	BZB84-C33	PH*
BZB84-B36	RA*	BZB84-C36	PJ*
BZB84-B39	RB*	BZB84-C39	PK*
BZB84-B43	RC*	BZB84-C43	PL*
BZB84-B47	RD*	BZB84-C47	PM*
BZB84-B51	RE*	BZB84-C51	PN*
BZB84-B56	RF*	BZB84-C56	PP*
BZB84-B62	RG*	BZB84-C62	PQ*
BZB84-B68	RH*	BZB84-C68	PR*
BZB84-B75	RJ*	BZB84-C75	PS*

[1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 5. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per diode</b>					
$I_F$	forward current		-	200	mA
$I_{ZSM}$	non-repetitive peak reverse current		[1] -	see <a href="#">Table 8</a> , <a href="#">9</a> , <a href="#">10</a> and <a href="#">11</a>	
$P_{ZSM}$	non-repetitive peak reverse power dissipation		[1] -	40	W

**Table 5. Limiting values ...continued**

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per device</b>					
$P_{\text{tot}}$	total power dissipation	$T_{\text{amb}} \leq 25\text{ °C}$	[2] -	300	mW
$T_{\text{j}}$	junction temperature		-	150	°C
$T_{\text{amb}}$	ambient temperature		-55	+150	°C
$T_{\text{stg}}$	storage temperature		-65	+150	°C

[1]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_{\text{j}} = 25\text{ °C}$  prior to surge

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

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device; single diode loaded</b>						
$R_{\text{th(j-a)}}$	thermal resistance from junction to ambient	in free air	[1] -	-	417	K/W
$R_{\text{th(j-sp)}}$	thermal resistance from junction to solder point		[2] -	-	100	K/W

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

[2] Soldering points at pins 1 and 2.

## 7. Characteristics

**Table 7. Characteristics** $T_{\text{j}} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{\text{F}}$	forward voltage	$I_{\text{F}} = 10\text{ mA}$	[1] -	-	0.9	V

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

**Table 8. Characteristics per type; BZB84-B2V4 to BZB84-B24** $T_j = 25\text{ °C}$  unless otherwise specified.

BZB84-Bxxx	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	Max	Max			Min	Max	Max	Max
2V4	2.35	2.45	600	100	50	1	-3.5	0	450	6.0
2V7	2.65	2.75	600	100	20	1	-3.5	0	450	6.0
3V0	2.94	3.06	600	95	10	1	-3.5	0	450	6.0
3V3	3.23	3.37	600	95	5	1	-3.5	0	450	6.0
3V6	3.53	3.67	600	90	5	1	-3.5	0	450	6.0
3V9	3.82	3.98	600	90	3	1	-3.5	0	450	6.0
4V3	4.21	4.39	600	90	3	1	-3.5	0	450	6.0
4V7	4.61	4.79	500	80	3	2	-3.5	0.2	300	6.0
5V1	5.00	5.20	480	60	2	2	-2.7	1.2	300	6.0
5V6	5.49	5.71	400	40	1	2	-2.0	2.5	300	6.0
6V2	6.08	6.32	150	10	3	4	0.4	3.7	200	6.0
6V8	6.66	6.94	80	15	2	4	1.2	4.5	200	6.0
7V5	7.35	7.65	80	15	1	5	2.5	5.3	150	4.0
8V2	8.04	8.36	80	15	0.70	5	3.2	6.2	150	4.0
9V1	8.92	9.28	100	15	0.50	6	3.8	7.0	150	3.0
10	9.80	10.20	150	20	0.20	7	4.5	8.0	90	3.0
11	10.80	11.20	150	20	0.10	8	5.4	9.0	85	2.5
12	11.80	12.20	150	25	0.10	8	6.0	10.0	85	2.5
13	12.70	13.30	170	30	0.10	8	7.0	11.0	80	2.5
15	14.70	15.30	200	30	0.05	10.5	9.2	13.0	75	2.0
16	15.70	16.30	200	40	0.05	11.2	10.4	14.0	75	1.5
18	17.60	18.40	225	45	0.05	12.6	12.4	16.0	70	1.5
20	19.6	20.4	225	55	0.05	14.0	14.4	18.0	60	1.5
22	21.6	22.4	250	55	0.05	15.4	16.4	20.0	60	1.25
24	23.5	24.5	250	70	0.05	16.8	18.4	22.0	55	1.25

[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ [2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ °C}$  prior to surge

**Table 9. Characteristics per type; BZB84-B27 to BZB84-B75**

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

BZB84-Bxxx	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>
	$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$	$I_Z = 2\text{ mA}$	Max	$V_R$ (V)	$I_Z = 2\text{ mA}$			
	Min	Max	Max	Max			Min	Max	Max	Max
27	26.5	27.5	300	80	0.05	18.9	21.4	25.3	50	1.00
30	29.4	30.6	300	80	0.05	21.0	24.4	29.4	50	1.00
33	32.3	33.7	325	80	0.05	23.1	27.4	33.4	45	0.90
36	35.3	36.7	350	90	0.05	25.2	30.4	37.4	45	0.80
39	38.2	39.8	350	130	0.05	27.3	33.4	41.2	45	0.70
43	42.1	43.9	375	150	0.05	30.1	37.6	46.6	40	0.60
47	46.1	47.9	375	170	0.05	32.9	42.0	51.8	40	0.50
51	50.0	52.0	400	180	0.05	35.7	46.6	57.2	40	0.40
56	54.9	57.1	425	200	0.05	39.2	52.2	63.8	40	0.30
62	60.8	63.2	450	215	0.05	43.4	58.8	71.6	35	0.30
68	66.6	69.4	475	240	0.05	47.6	65.6	79.8	35	0.25
75	73.5	76.5	500	255	0.05	52.5	73.4	88.6	35	0.20

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

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

Table 10. Characteristics per type; BZB84-C2V4 to BZB84-C24

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

BZB84-Cxxx	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>
	$I_Z = 5\text{ mA}$		$I_Z = 1\text{ mA}$	$I_Z = 5\text{ mA}$	$V_R$ (V)	$I_Z = 5\text{ mA}$				
	Min	Max	Max	Max		Max	Min	Max	Max	Max
2V4	2.2	2.6	600	100	50	1	-3.5	0	450	6.0
2V7	2.5	2.9	600	100	20	1	-3.5	0	450	6.0
3V0	2.8	3.2	600	95	10	1	-3.5	0	450	6.0
3V3	3.1	3.5	600	95	5	1	-3.5	0	450	6.0
3V6	3.4	3.8	600	90	5	1	-3.5	0	450	6.0
3V9	3.7	4.1	600	90	3	1	-3.5	0	450	6.0
4V3	4.0	4.6	600	90	3	1	-3.5	0	450	6.0
4V7	4.4	5.0	500	80	3	2	-3.5	0.2	300	6.0
5V1	4.8	5.4	480	60	2	2	-2.7	1.2	300	6.0
5V6	5.2	6.0	400	40	1	2	-2.0	2.5	300	6.0
6V2	5.8	6.6	150	10	3	4	0.4	3.7	200	6.0
6V8	6.4	7.2	80	15	2	4	1.2	4.5	200	6.0
7V5	7.0	7.9	80	15	1	5	2.5	5.3	150	4.0
8V2	7.7	8.7	80	15	0.70	5	3.2	6.2	150	4.0
9V1	8.5	9.6	100	15	0.50	6	3.8	7.0	150	3.0
10	9.4	10.6	150	20	0.20	7	4.5	8.0	90	3.0
11	10.4	11.6	150	20	0.10	8	5.4	9.0	85	2.5
12	11.4	12.7	150	25	0.10	8	6.0	10.0	85	2.5
13	12.4	14.1	170	30	0.10	8	7.0	11.0	80	2.5
15	13.8	15.6	200	30	0.05	10.5	9.2	13.0	75	2.0
16	15.3	17.1	200	40	0.05	11.2	10.4	14.0	75	1.5
18	16.8	19.1	225	45	0.05	12.6	12.4	16.0	70	1.5
20	18.8	21.2	225	55	0.05	14.0	14.4	18.0	60	1.5
22	20.8	23.3	250	55	0.05	15.4	16.4	20.0	60	1.25
24	22.8	25.6	250	70	0.05	16.8	18.4	22.0	55	1.25

[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ [2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ }^\circ\text{C}$  prior to surge

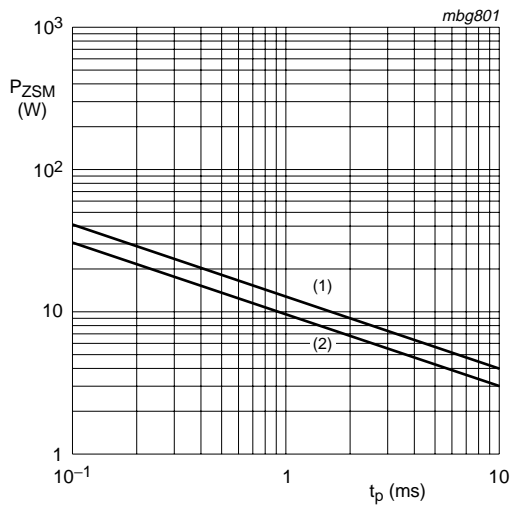
**Table 11. Characteristics per type; BZB84-C27 to BZB84-C75**

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

BZB84-Cxxx	Working voltage $V_Z$ (V)		Differential resistance $r_{dif}$ ( $\Omega$ )		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>
	$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$	$I_Z = 2\text{ mA}$	$V_R$ (V)	$I_Z = 2\text{ mA}$				
	Min	Max	Max	Max		Max	Min	Max	Max	Max
27	25.1	28.9	300	80	0.05	18.9	21.4	25.3	50	1.00
30	28.0	32.0	300	80	0.05	21.0	24.4	29.4	50	1.00
33	31.0	35.0	325	80	0.05	23.1	27.4	33.4	45	0.90
36	34.0	38.0	350	90	0.05	25.2	30.4	37.4	45	0.80
39	37.0	41.0	350	130	0.05	27.3	33.4	41.2	45	0.70
43	40.0	46.0	375	150	0.05	30.1	37.6	46.6	40	0.60
47	44.0	50.0	375	170	0.05	32.9	42.0	51.8	40	0.50
51	48.0	54.0	400	180	0.05	35.7	46.6	57.2	40	0.40
56	52.0	60.0	425	200	0.05	39.2	52.2	63.8	40	0.30
62	58.0	66.0	450	215	0.05	43.4	58.8	71.6	35	0.30
68	64.0	72.0	475	240	0.05	47.6	65.6	79.8	35	0.25
75	70.0	79.0	500	255	0.05	52.5	73.4	88.6	35	0.20

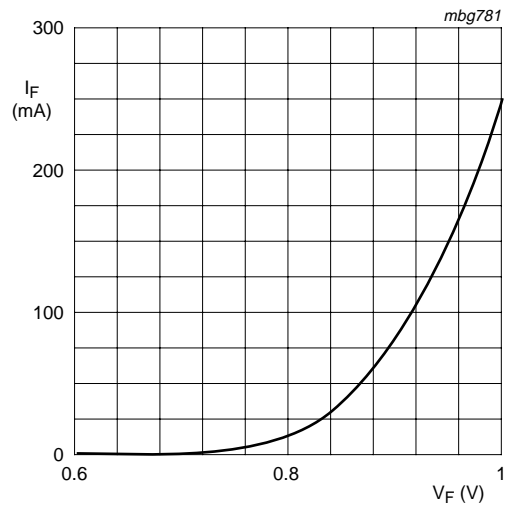
[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$

[2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ }^\circ\text{C}$  prior to surge



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

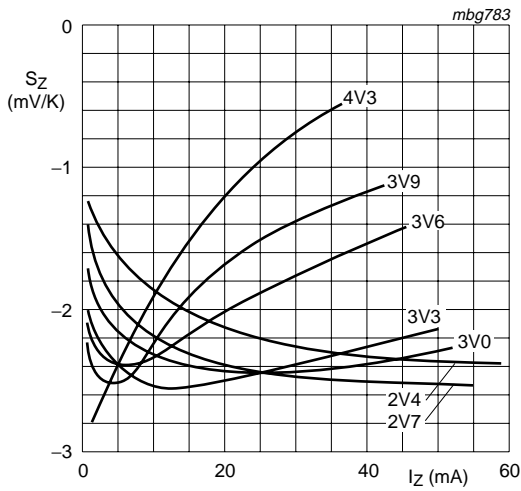
**Fig 1. Per diode: Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values**



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

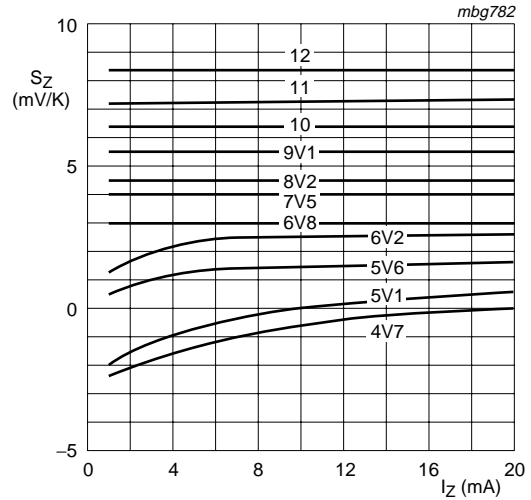
**Fig 2. Per diode: Forward current as a function of forward voltage; typical values**





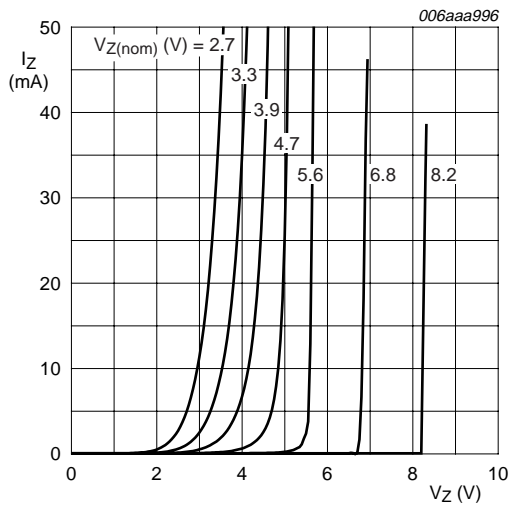
$T_j = 25\text{ }^\circ\text{C to }150\text{ }^\circ\text{C}$   
BZB84-B/C2V4 to BZB84-B/C4V3

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



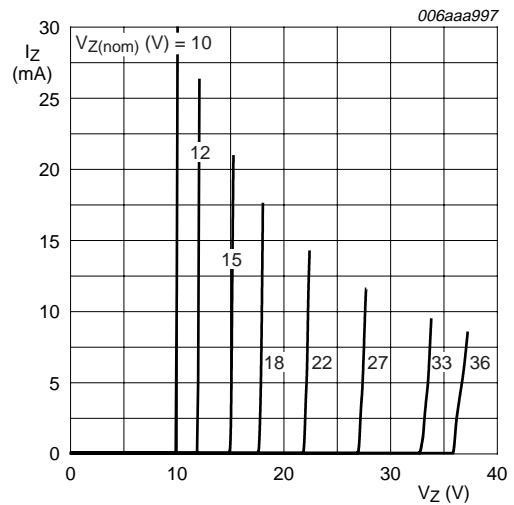
$T_j = 25\text{ }^\circ\text{C to }150\text{ }^\circ\text{C}$   
BZB84-B/C4V7 to BZB84-B/C12

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



$T_j = 25\text{ }^\circ\text{C}$   
BZB84-B/C2V7 to BZB84-B/C8V2

**Fig 5. Per diode: Working current as a function of working voltage; typical values**



$T_j = 25\text{ }^\circ\text{C}$   
BZB84-B/C10 to BZB84-B/C36

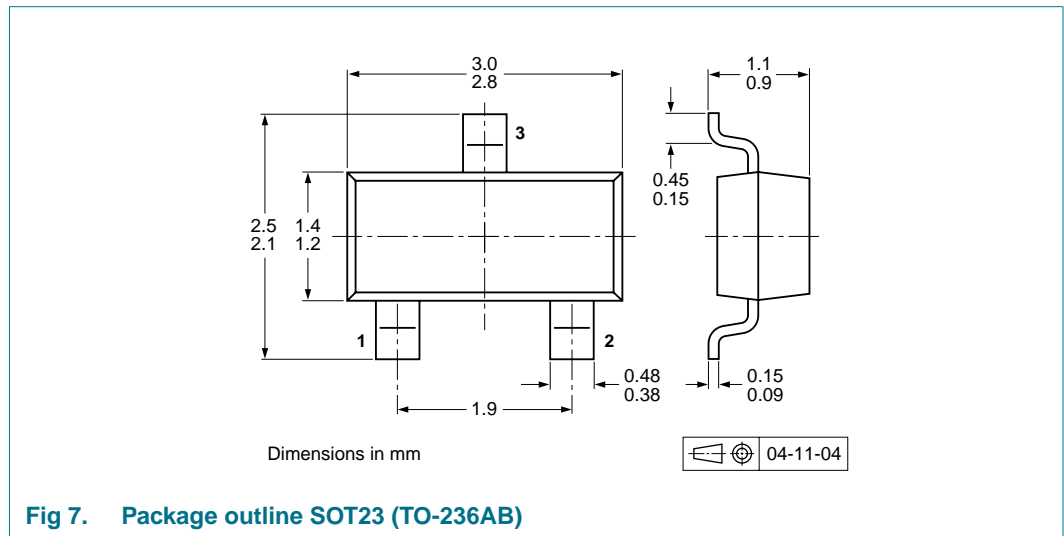
**Fig 6. Per diode: Working current as a function of working voltage; typical values**

## 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 12. Packing methods**

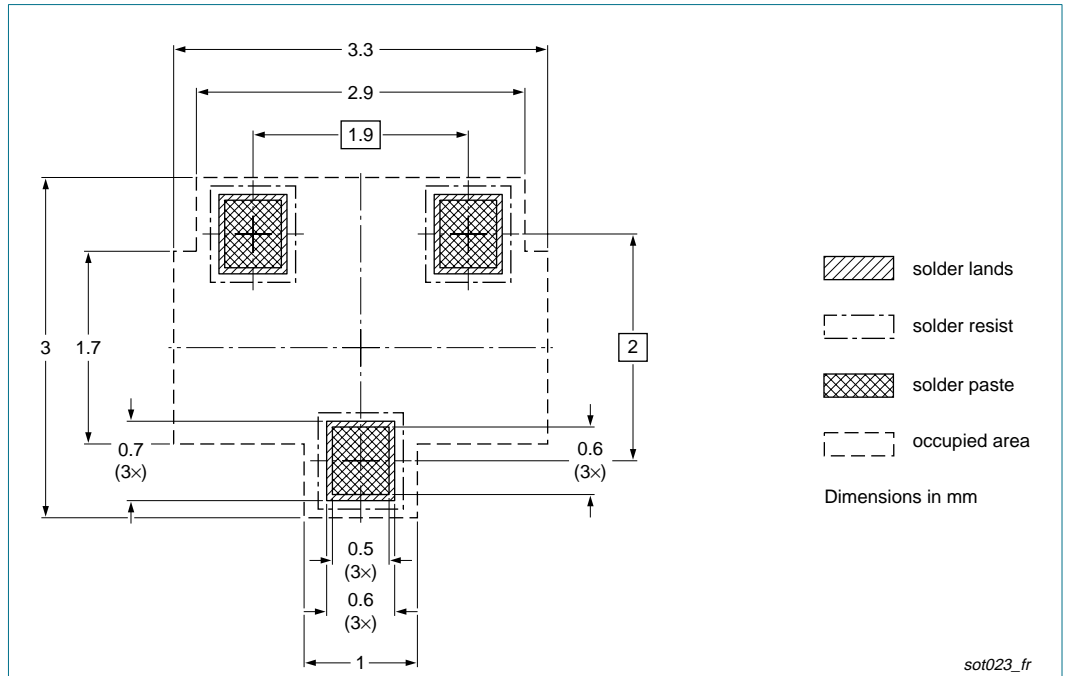
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity	
			3000	10000
BZB84-B2V4 to BZB84-C75 <sup>[2]</sup>	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

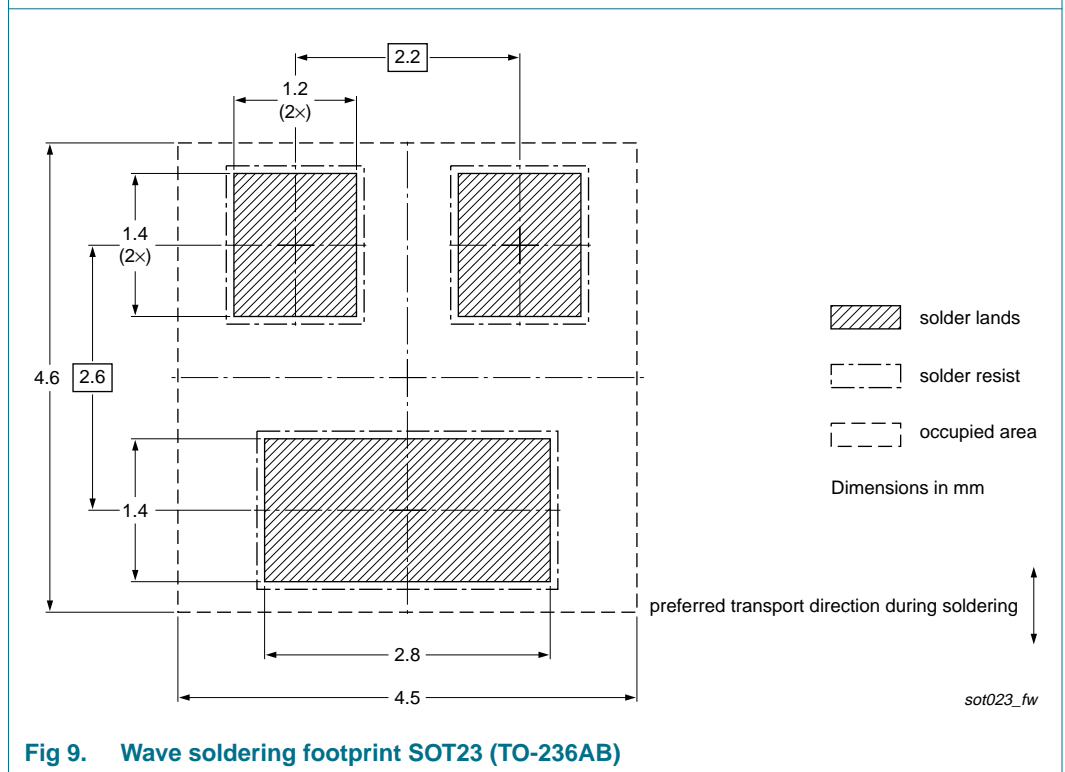
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] The series consists of 74 types with nominal working voltages from 2.4 V to 75 V.

**11. Soldering**



**Fig 8. Reflow soldering footprint SOT23 (TO-236AB)**



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

## 12. Revision history

**Table 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BZB84_SER_3	20090609	Product data sheet	-	BZB84_SER_2
Modifications:		<ul style="list-style-type: none"><li>• <a href="#">Table 5 “Limiting values”</a>: <math>P_{tot}</math> maximum value amended</li><li>• <a href="#">Table 6</a>: <math>R_{th}</math> maximum values amended</li><li>• <a href="#">Section 13 “Legal information”</a>: updated</li></ul>		
BZB84_SER_2	20090223	Product data sheet	-	BZB84_SER_1
BZB84_SER_1	20080514	Product data sheet	-	-

## 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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