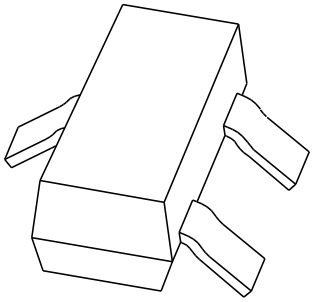
DATA SHEET



BZX84 series
Voltage regulator diodes

Product specification
Supersedes data of November 1993
File under Discrete Semiconductors, SC01

1996 Apr 26

Philips
Semiconductors

PHILIPS

Voltage regulator diodes BZX84 series

FEATURES

- Total power dissipation: max. 250 mW
- Three tolerance series: ±1%, ±2% and ±5%
- Working voltage range: nom. 2.4 to 75 V (E24 range)
- Non-repetitive peak reverse power dissipation: max. 40 W.

APPLICATIONS

- General regulation functions.

DESCRIPTION

Low-power voltage regulator diodes in small plastic SMD SOT23 packages.

The diodes are available in the normalized E24 ±1% (BZX84-A), ±2% (BZX84-B) and ±5% (BZX84-C) tolerance range. The series consists of 37 types with nominal working voltages from 2.4 to 75 V.

PINNING

PIN	DESCRIPTION
1	anode
2	not connected
3	cathode

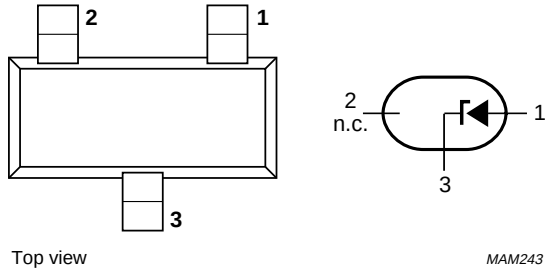


Fig.1 Simplified outline (SOT23) and symbol.

MARKING

TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE
Marking codes for BZX84-C2V4 to BZX84-C75							
BZX84-C2V4	Z11	BZX84-C6V2	Z4p	BZX84-C16	Y5p	BZX84-C43	Y15
BZX84-C2V7	Z12	BZX84-C6V8	Z5p	BZX84-C18	Y6p	BZX84-C47	Y16
BZX84-C3V0	Z13	BZX84-C7V5	Z6p	BZX84-C20	Y7p	BZX84-C51	Y17
BZX84-C3V3	Z14	BZX84-C8V2	Z7p	BZX84-C22	Y8p	BZX84-C56	Y18
BZX84-C3V6	Z15	BZX84-C9V1	Z8p	BZX84-C24	Y9p	BZX84-C62	Y19
BZX84-C3V9	Z16	BZX84-C10	Z9p	BZX84-C27	Y10	BZX84-C68	Y20
BZX84-C4V3	Z17	BZX84-C11	Y1p	BZX84-C30	Y11	BZX84-C75	Y21
BZX84-C4V7	Z1p	BZX84-C12	Y2p	BZX84-C33	Y12	–	–
BZX84-C5V1	Z2p	BZX84-C13	Y3p	BZX84-C36	Y13	–	–
BZX84-C5V6	Z3p	BZX84-C15	Y4p	BZX84-C39	Y14	–	–
Marking codes for BZX84-B2V4 to BZX84-B75							
BZX84-B2V4	Z50	BZX84-B6V2	Z60	BZX84--B16	Z70	BZX84-B43	Z80
BZX84-B2V7	Z51	BZX84-B6V8	Z61	BZX84-B18	Z71	BZX84-B47	Z81
BZX84-B3V0	Z52	BZX84-B7V5	Z62	BZX84-B20	Z72	BZX84-B51	Z82
BZX84-B3V3	Z53	BZX84-B8V2	Z63	BZX84-B22	Z73	BZX84-B56	Z83
BZX84-B3V6	Z54	BZX84-B9V1	Z64	BZX84-B24	Z74	BZX84-B62	Z84
BZX84-B3V9	Z55	BZX84-B10	Z65	BZX84-B27	Z75	BZX84-B68	Z85
BZX84-B4V3	Z56	BZX84-B11	Z66	BZX84-B30	Z76	BZX84-B75	Z86
BZX84-B4V7	Z57	BZX84-B12	Z67	BZX84-B33	Z77	–	–
BZX84-B5V1	Z58	BZX84-B13	Z68	BZX84-B36	Z78	–	–
BZX84-B5V6	Z59	BZX84-B15	Z69	BZX84-B39	Z79	–	–
Marking codes for BZX84-A2V4 to BZX84-A75							
BZX84-A2V4	Y50	BZX84-A6V2	Y60	BZX84-A16	Y70	BZX84-A43	Y80
BZX84-A2V7	Y51	BZX84-A6V8	Y61	BZX84-A18	Y71	BZX84-A47	Y81
BZX84-A3V0	Y52	BZX84-A7V5	Y62	BZX84-A20	Y72	BZX84-A51	Y82
BZX84-A3V3	Y53	BZX84-A8V2	Y63	BZX84-A22	Y73	BZX84-A56	Y83
BZX84-A3V6	Y54	BZX84-A9V1	Y64	BZX84-A24	Y74	BZX84-A62	Y84
BZX84-A3V9	Y55	BZX84-A10	Y65	BZX84-A27	Y75	BZX84-A68	Y85
BZX84-A4V3	Y56	BZX84-A11	Y66	BZX84-A30	Y76	BZX84-A75	Y86
BZX84-A4V7	Y57	BZX84-A12	Y67	BZX84-A33	Y77	–	–
BZX84-A5V1	Y58	BZX84-A13	Y68	BZX84-A36	Y78	–	–
BZX84-A5V6	Y59	BZX84-A15	Y69	BZX84-A39	Y79	–	–

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_F	continuous forward current		–	200	mA
I_{ZSM}	non-repetitive peak reverse current	t_p = 100 μs; square wave; T_j = 25 °C prior to surge	see Tables 1 and 2		
P_{tot}	total power dissipation	T_{amb} = 25 °C; note 1	–	250	mW
P_{ZSM}	non-repetitive peak reverse power dissipation	t_p = 100 μs; square wave; T_j = 25 °C prior to surge; see Fig.2	–	40	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–65	+150	°C

Note

1. Device mounted on an FR4 printed circuit-board.

ELECTRICAL CHARACTERISTICS

Total BZX84-A and B and C series

T_j = 25 °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
V_F	forward voltage	I_F = 10 mA; see Fig.3	0.9	V
I_R	reverse current			
	BZX84-A/B/C2V4	V_R = 1 V	50	μA
	BZX84-A/B/C2V7	V_R = 1 V	20	μA
	BZX84-A/B/C3V0	V_R = 1 V	10	μA
	BZX84-A/B/C3V3	V_R = 1 V	5	μA
	BZX84-A/B/C3V6	V_R = 1 V	5	μA
	BZX84-A/B/C3V9	V_R = 1 V	3	μA
	BZX84-A/B/C4V3	V_R = 1 V	3	μA
	BZX84-A/B/C4V7	V_R = 2 V	3	μA
	BZX84-A/B/C5V1	V_R = 2 V	2	μA
	BZX84-A/B/C5V6	V_R = 2 V	1	μA
	BZX84-A/B/C6V2	V_R = 4 V	3	μA
	BZX84-A/B/C6V8	V_R = 4 V	2	μA
	BZX84-A/B/C7V5	V_R = 5 V	1	μA
	BZX84-A/B/C8V2	V_R = 5 V	700	nA
	BZX84-A/B/C9V1	V_R = 6 V	500	nA
	BZX84-A/B/C10	V_R = 7 V	200	nA
	BZX84-A/B/C11	V_R = 8 V	100	nA
	BZX84-A/B/C12	V_R = 8 V	100	nA
	BZX84-A/B/C13	V_R = 8 V	100	nA
	BZX84-A/B/C15 to 75	$V_R = 0.7V_{Znom}$	50	nA

Table 1 Per type BZX84-**A/B/C2V4** to **A/B/C24**

T_j = 25 °C; unless otherwise specified.

BZX84-A or B or C XXX	WORKING VOLTAGE V_Z (V) at I_{Ztest} = 5 mA						DIFFERENTIAL RESISTANCE r_{dif} (Ω)				TEMP. COEFF. S_Z (mV/K) at I_{Ztest} = 5 mA (see Figs 4 and 5)			DIODE CAP. C_d (pF) at f = 1 MHz; V_R = 0 V	NON-REPETITIVE PEAK REVERSE CURRENT I_{ZSM} (A) at t_p = 100 μs; T_{amb} = 25 °C
	Tol. ±1% (A)		Tol. ±2% (B)		Tol. ±5% (C)		at I_{Ztest} = 1 mA		at I_{Ztest} = 5 mA						
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	MIN.	TYP.	MAX.	MAX.	MAX.
2V4	2.37	2.43	2.35	2.45	2.2	2.6	275	600	70	100	–3.5	–1.6	0	450	6.0
2V7	2.67	2.73	2.65	2.75	2.5	2.9	300	600	75	100	–3.5	–2.0	0	450	6.0
3V0	2.97	3.03	2.94	3.06	2.8	3.2	325	600	80	95	–3.5	–2.1	0	450	6.0
3V3	3.26	3.34	3.23	3.37	3.1	3.5	350	600	85	95	–3.5	–2.4	0	450	6.0
3V6	3.56	3.64	3.53	3.67	3.4	3.8	375	600	85	90	–3.5	–2.4	0	450	6.0
3V9	3.86	3.94	3.82	3.98	3.7	4.1	400	600	85	90	–3.5	–2.5	0	450	6.0
4V3	4.25	4.35	4.21	4.39	4.0	4.6	410	600	80	90	–3.5	–2.5	0	450	6.0
4V7	4.65	4.75	4.61	4.79	4.4	5.0	425	500	50	80	–3.5	–1.4	0.2	300	6.0
5V1	5.04	5.16	5.00	5.20	4.8	5.4	400	480	40	60	–2.7	–0.8	1.2	300	6.0
5V6	5.54	5.66	5.49	5.71	5.2	6.0	80	400	15	40	–2.0	1.2	2.5	300	6.0
6V2	6.13	6.27	6.08	6.32	5.8	6.6	40	150	6	10	0.4	2.3	3.7	200	6.0
6V8	6.73	6.87	6.66	6.94	6.4	7.2	30	80	6	15	1.2	3.0	4.5	200	6.0
7V5	7.42	7.58	7.35	7.65	7.0	7.9	30	80	6	15	2.5	4.0	5.3	150	4.0
8V2	8.11	8.29	8.04	8.36	7.7	8.7	40	80	6	15	3.2	4.6	6.2	150	4.0
9V1	9.00	9.20	8.92	9.28	8.5	9.6	40	100	6	15	3.8	5.5	7.0	150	3.0
10	9.90	10.10	9.80	10.20	9.4	10.6	50	150	8	20	4.5	6.4	8.0	90	3.0
11	10.80	11.11	10.80	11.20	10.4	11.6	50	150	10	20	5.4	7.4	9.0	85	2.5
12	11.88	12.12	11.80	12.20	11.4	12.7	50	150	10	25	6.0	8.4	10.0	85	2.5
13	12.87	13.13	12.70	13.30	12.4	14.1	50	170	10	30	7.0	9.4	11.0	80	2.5
15	14.85	15.15	14.70	15.30	13.8	15.6	50	200	10	30	9.2	11.4	13.0	75	2.0
16	15.84	16.16	15.70	16.30	15.3	17.1	50	200	10	40	10.4	12.4	14.0	75	1.5
18	17.82	18.18	17.60	18.40	16.8	19.1	50	225	10	45	12.4	14.4	16.0	70	1.5
20	19.80	20.20	19.60	20.40	18.8	21.2	60	225	15	55	14.4	16.4	18.0	60	1.5
22	21.78	22.22	21.60	22.40	20.8	23.3	60	250	20	55	16.4	18.4	20.0	60	1.25
24	23.76	24.24	23.50	24.50	22.8	25.6	60	250	25	70	18.4	20.4	22.0	55	1.25

Table 2 Per type BZX84-**A/B/C27** to **A/B/C75**

T_j = 25 °C; unless otherwise specified.

BZX84-A or B or C XXX	WORKING VOLTAGE V_Z (V) at I_{Ztest} = 2 mA						DIFFERENTIAL RESISTANCE r_{dif} (Ω)				TEMP. COEFF. S_Z (mV/K) at I_{Ztest} = 2 mA (see Figs 4 and 5)			DIODE CAP. C_d (pF) at f = 1 MHz; V_R = 0 V	NON-REPETITIVE PEAK REVERSE CURRENT I_{ZSM} (A) at t_p = 100 μs; T_{amb} = 25 °C
	Tol. ±1% (A)		Tol. ±2% (B)		Tol. ±5% (C)		at I_{Ztest} = 0.5 mA		at I_{Ztest} = 2 mA						
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	TYP.	MAX.	TYP.	MAX.	MIN.	TYP.	MAX.	MAX.	MAX.
27	26.73	27.27	26.50	27.50	25.1	28.9	65	300	25	80	21.4	23.4	25.3	50	1.0
30	29.70	30.30	29.40	30.60	28.0	32.0	70	300	30	80	24.4	26.6	29.4	50	1.0
33	32.67	33.33	32.30	33.70	31.0	35.0	75	325	35	80	27.4	29.7	33.4	45	0.9
36	35.64	36.36	35.30	36.70	34.0	38.0	80	350	35	90	30.4	33.0	37.4	45	0.8
39	38.61	39.39	38.20	39.80	37.0	41.0	80	350	40	130	33.4	36.4	41.2	45	0.7
43	42.57	43.43	42.10	43.90	40.0	46.0	85	375	45	150	37.6	41.2	46.6	40	0.6
47	46.53	47.47	46.10	47.90	44.0	50.0	85	375	50	170	42.0	46.1	51.8	40	0.5
51	50.49	51.51	50.00	52.00	48.0	54.0	90	400	60	180	46.6	51.0	57.2	40	0.4
56	55.44	56.56	54.90	57.10	52.0	60.0	100	425	70	200	52.2	57.0	63.8	40	0.3
62	61.38	62.62	60.80	63.20	58.0	66.0	120	450	80	215	58.8	64.4	71.6	35	0.3
68	67.32	68.68	66.60	69.40	64.0	72.0	150	475	90	240	65.6	71.7	79.8	35	0.25
75	74.25	75.75	73.50	76.50	70.0	79.0	170	500	95	255	73.4	80.2	88.6	35	0.2

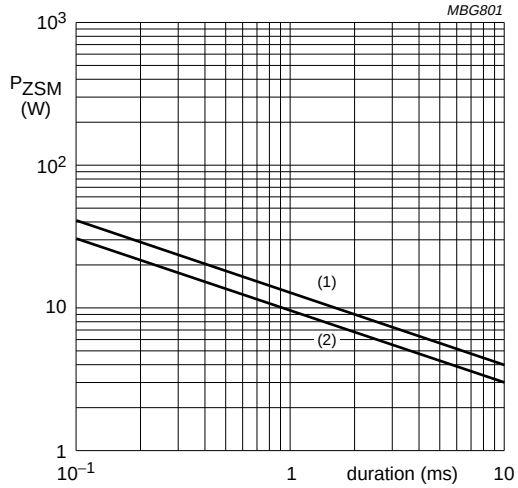
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}tp}$	thermal resistance from junction to tie-point		330	K/W
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	500	K/W

Note

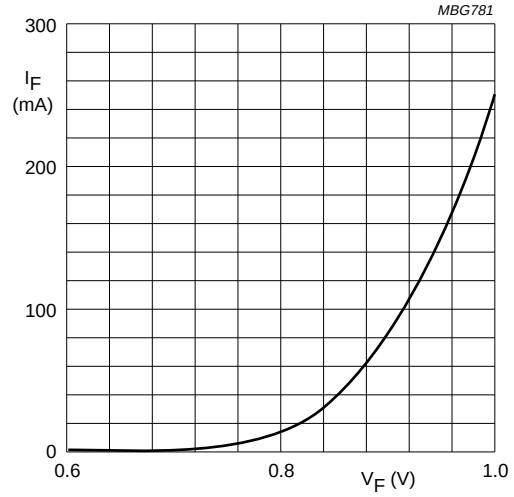
1. Device mounted on an FR4 printed circuit-board.

GRAPHICAL DATA



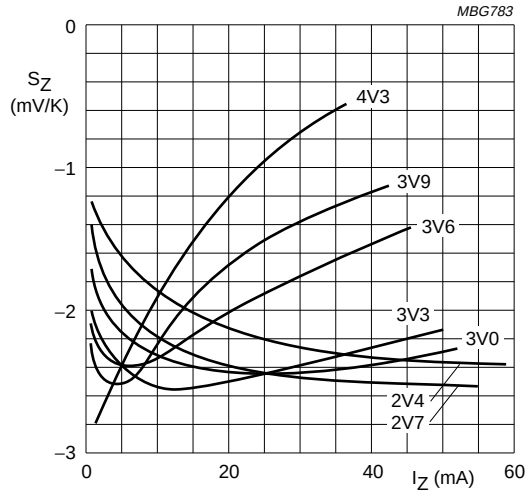
(1) T_j = 25 °C (prior to surge).
(2) T_j = 150 °C (prior to surge).

Fig.2 Maximum permissible non-repetitive peak reverse power dissipation versus duration.



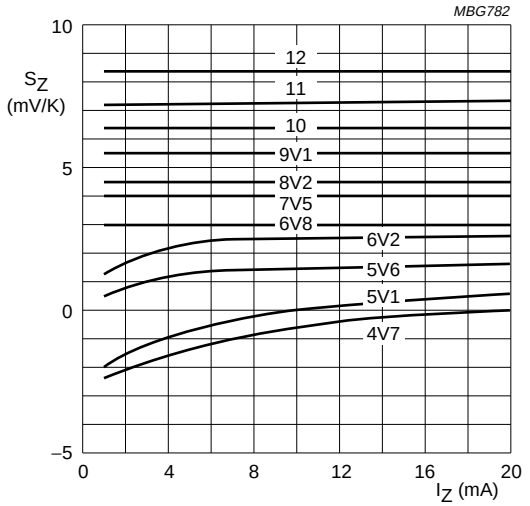
T_j = 25 °C.

Fig.3 Forward current as a function of forward voltage; typical values.



BZX84-A/B/C2V4 to A/B/C4V3.
T_j = 25 to 150 °C.

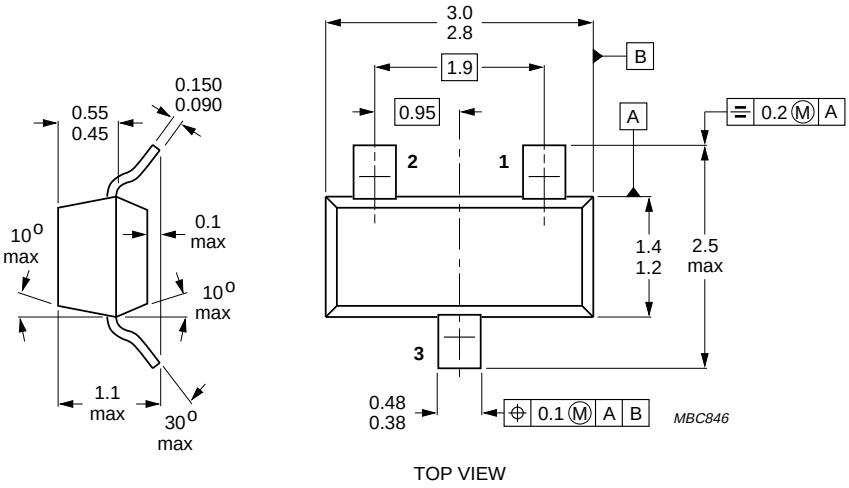
Fig.4 Temperature coefficient as a function of working current; typical values.



BZX84-A/B/C4V7 to A/B/C12.
T_j = 25 to 150 °C.

Fig.5 Temperature coefficient as a function of working current; typical values.

PACKAGE OUTLINE



Dimensions in mm.

Fig.6 SOT23.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.