



PLVA6xxA series

Low-voltage avalanche regulator diodes

Rev. 4 — 1 January 2023

Product data sheet

1. General description

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

2. Features and benefits

- Very low dynamic impedance at low currents: approximately 5 % of conventional series
- Hard breakdown knee
- Low noise: approximately 10 % of conventional series
- Total power dissipation: max. 250 mW
- Small tolerances of V_Z
- Working voltage range: nominal 5.00 to 6.80 V
- Non-repetitive peak reverse power dissipation: maximal 30 W at 150 °C

3. Applications

- Low current, low power, low noise applications
- CMOS RAM back-up circuits
- Voltage stabilizers
- Voltage limiters
- Smoke detector relays

4. Quick reference data

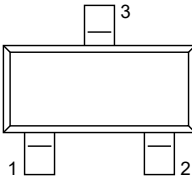
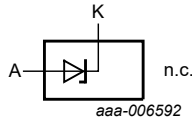
Table 1. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_n	noise voltage density	$f = 1\text{ kHz}$; $B = 1\text{ kHz}$; $I_Z = 250\text{ }\mu\text{A}$	-	-	1.0	$\frac{\mu\text{V}}{\sqrt{\text{Hz}}}$
ΔV_Z	line regulation					
	PLVA659A to PLVA668A	$I_{LO} = 10\text{ }\mu\text{A}$; $I_{HI} = 1\text{ mA}$	-	-	0.1	V
	PLVA656A	$I_{LO} = 50\text{ }\mu\text{A}$; $I_{HI} = 1\text{ mA}$	-	-	0.1	V
	PLVA650A	$I_{LO} = 100\text{ }\mu\text{A}$; $I_{HI} = 1\text{ mA}$	-	-	0.4	V
	PLVA653A	$I_{LO} = 100\text{ }\mu\text{A}$; $I_{HI} = 1\text{ mA}$	-	-	0.2	V
R_Z	dynamic resistance					
	PLVA650A	1 kHz superimposed; I_{ZAC} is 10 % of I_{ZDC} $I_Z = 250\text{ }\mu\text{A}$	-	-	700	Ω
	PLVA653A		-	-	250	Ω
	PLVA656A to PLVA668A		-	-	100	Ω
I_R	reverse current					
	PLVA650A	$V_R = 50\text{ \% } V_Z$ nominal	-	34	-	nA
	PLVA653A		-	22	-	nA
	PLVA656A		-	1.1	-	nA
	PLVA659A		-	0.9	-	nA
	PLVA662A		-	0.9	-	nA
	PLVA665A		-	0.9	-	nA
	PLVA668A		-	0.8	-	nA

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PLVA650A	TO-236AB	plastic surface-mounted package; 3 leads	SOT23
PLVA653A			
PLVA656A			
PLVA659A			
PLVA662A			
PLVA665A			
PLVA668A			

7. Marking

Table 4. Marking codes

Type number		Marking code
PLVA650A	[1]	%9A
PLVA653A	[1]	%9B
PLVA656A	[1]	%9C
PLVA659A	[1]	%9D
PLVA662A	[1]	%9E
PLVA665A	[1]	%9F
PLVA668A	[1]	%9G

[1] % = placeholder for manufacturing site code

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
I_F	continuous forward current		-	250	mA
I_{ZRM}	repetitive peak working current	$t_p = 100 \mu s$; $\delta = 10 \%$	-	250	mA
P_{ZSM}	non-repetitive peak reverse power dissipation	$t_p = 100 \mu s$; $T_j = 150 \text{ }^\circ\text{C}$	-	30	W
P_{tot}	total power dissipation	$T_{amb} = 25 \text{ }^\circ\text{C}$	[1] -	250	mW
T_j	junction temperature		-	150	$^\circ\text{C}$
T_{stg}	storage temperature		-65	150	$^\circ\text{C}$

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

9. 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		-	-	330	K/W

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

10. Characteristics

Table 7. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_F	forward voltage	$I_F = 10\text{ mA}$	-	-	0.9	V
V_Z	working voltage					
	PLVA650A	$I_Z = 250\text{ }\mu\text{A}$	4.80	5.00	5.20	V
	PLVA653A		5.10	5.30	5.50	V
	PLVA656A		5.40	5.60	5.80	V
	PLVA659A		5.70	5.90	6.10	V
	PLVA662A		6.00	6.20	6.40	V
	PLVA665A		6.30	6.50	6.70	V
PLVA668A	6.60		6.80	7.00	V	
V_Z	working voltage					
	PLVA650A	$I_Z = 10\text{ }\mu\text{A}$	-	4.30	-	V
	PLVA653A		-	5.20	-	V
	PLVA656A		-	5.51	-	V
	PLVA659A		-	5.85	-	V
	PLVA662A		-	6.19	-	V
	PLVA665A		-	6.49	-	V
PLVA668A	-		6.80	-	V	
R_Z	dynamic resistance					
	PLVA650A	1 kHz superimposed; I_{ZAC} is 10 % of I_{ZDC} ; $I_Z = 250\text{ }\mu\text{A}$	-	-	700	Ω
	PLVA653A		-	-	250	Ω
	PLVA656A to PLVA668A		-	-	100	Ω
S_Z	temperature coefficient					
	PLVA650A	$I_Z = 250\text{ }\mu\text{A}$	-	0.20	-	mv/K
	PLVA653A		-	1.60	-	mv/K
	PLVA656A		-	1.90	-	mv/K
	PLVA659A		-	2.40	-	mv/K
	PLVA662A		-	2.65	-	mv/K
	PLVA665A		-	2.90	-	mv/K
PLVA668A	-		3.40	-	mv/K	

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_R	reverse current					
	PLVA650A	$V_R = 80 \% V_Z$ nominal	-	-	20000	nA
	PLVA653A		-	-	5000	nA
	PLVA656A		-	-	1000	nA
	PLVA659A		-	-	500	nA
	PLVA662A		-	-	100	nA
	PLVA665A		-	-	50	nA
	PLVA668A		-	-	10	nA
I_R	reverse current					
	PLVA650A	$V_R = 50 \% V_Z$ nominal	-	34	-	nA
	PLVA653A		-	22	-	nA
	PLVA656A		-	1.1	-	nA
	PLVA659A		-	0.9	-	nA
	PLVA662A		-	0.9	-	nA
	PLVA665A		-	0.9	-	nA
	PLVA668A		-	0.8	-	nA
I_R	reverse current					
	PLVA650A	$V_R = 90 \% V_Z$ nominal	-	21	-	μA
	PLVA653A		-	3.5	-	μA
	PLVA656A		-	1.3	-	μA
	PLVA659A		-	1.0	-	μA
	PLVA662A		-	0.05	-	μA
	PLVA665A		-	0.04	-	μA
	PLVA668A		-	0.006	-	μA
ΔV_Z	line regulation					
	PLVA650A to PLVA668A	$I_{LO} = 10 \mu\text{A}; I_{HI} = 1 \text{ mA}$	-	-	0.1	V
	PLVA656A	$I_{LO} = 50 \mu\text{A}; I_{HI} = 1 \text{ mA}$	-	-	0.1	V
	PLVA650A	$I_{LO} = 100 \mu\text{A}; I_{HI} = 1 \text{ mA}$	-	-	0.4	V
	PLVA653A	$I_{LO} = 100 \mu\text{A}; I_{HI} = 1 \text{ mA}$	-	-	0.2	V
V_n	noise voltage density	$f = 1 \text{ kHz}; B = 1 \text{ kHz}; I_Z = 250 \mu\text{A}$	-	-	1.0	$\frac{\mu\text{V}}{\sqrt{\text{Hz}}}$

11. Package outline

Table 8. Package outline

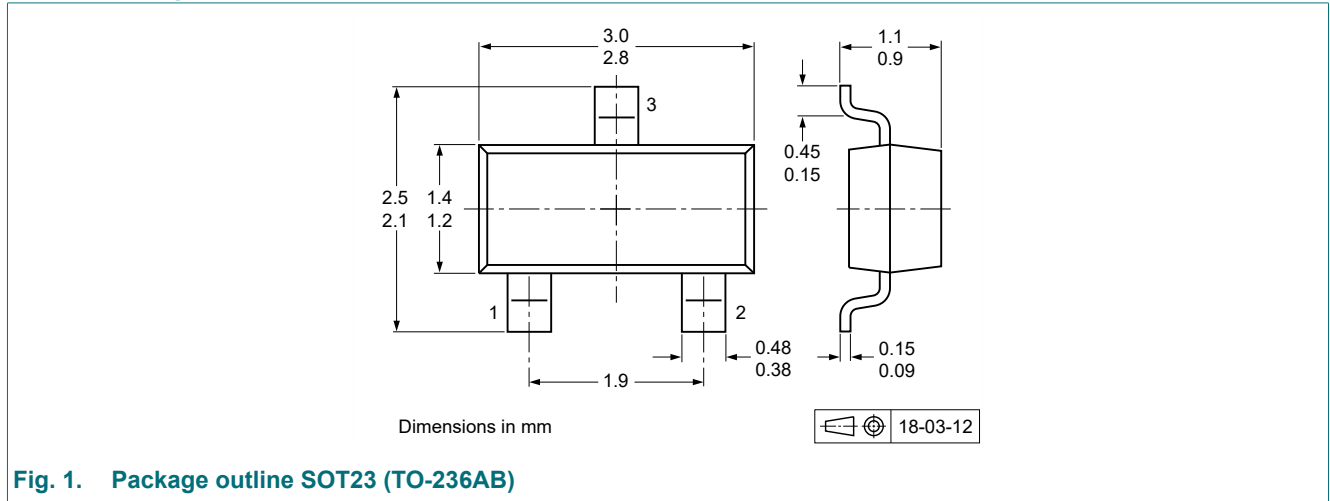


Fig. 1. Package outline SOT23 (TO-236AB)

12. Soldering

Table 9. Soldering

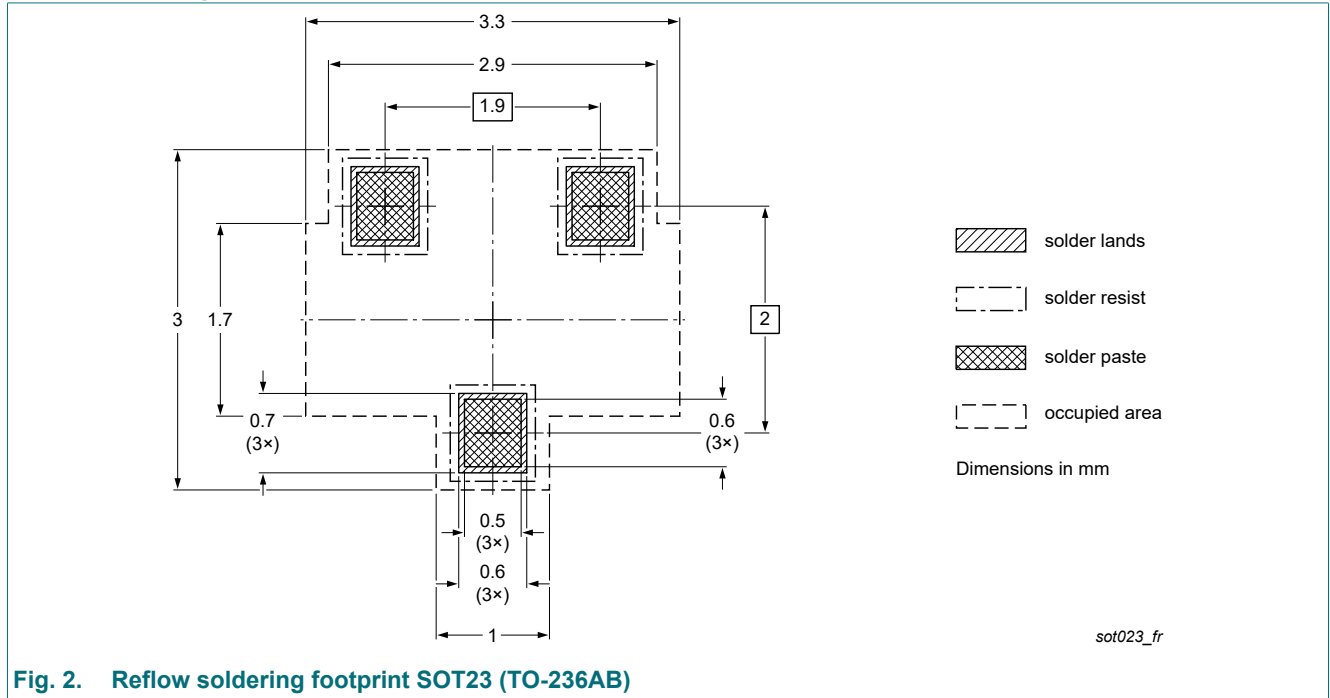


Fig. 2. Reflow soldering footprint SOT23 (TO-236AB)

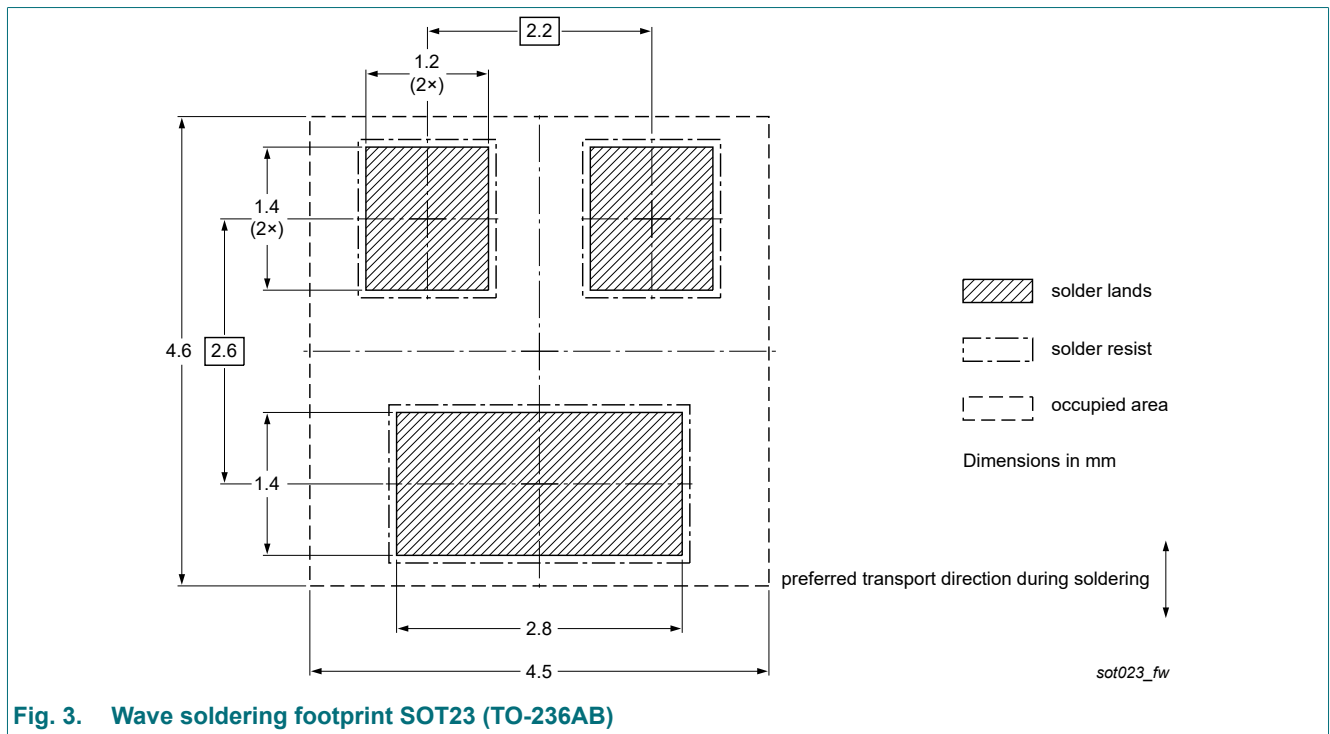


Fig. 3. Wave soldering footprint SOT23 (TO-236AB)

13. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PLVA6XXA_SER v.4	20230101	Product data sheet	-	PLVA6XXA_SER v.3
Modifications:	<ul style="list-style-type: none">Product changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PLVA6XXA_SER v.3	20220512	Product data sheet	-	PLVA6XXA_SERIES v.2
PLVA6XXA_SERIES v.2	20040114	Product data sheet	-	PLVA6XXA_SERIES v.1
PLVA6XXA_SERIES v.1	19990525	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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