



PLVA6xxA series

Low-voltage avalanche regulator diodes

Rev. 3 — 12 May 2022

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
- AEC-Q101 qualified

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

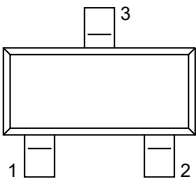
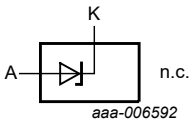
Table 1. Quick reference data

$T_{amb} = 25\text{ °C}$ 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	-	μ A
	PLVA653A		-	3.5	-	μ A
	PLVA656A		-	1.3	-	μ A
	PLVA659A		-	1.0	-	μ A
	PLVA662A		-	0.05	-	μ A
	PLVA665A		-	0.04	-	μ A
	PLVA668A		-	0.006	-	μ A
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. Test information

11.1. 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.

12. Package outline

Table 8. Package outline

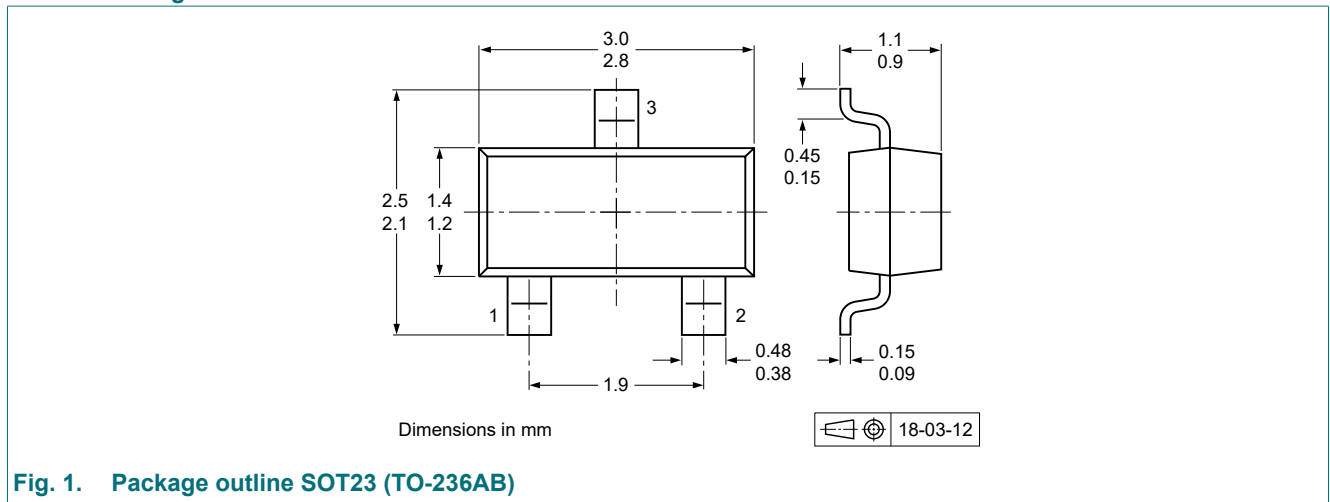


Fig. 1. Package outline SOT23 (TO-236AB)

13. Soldering

Table 9. Soldering

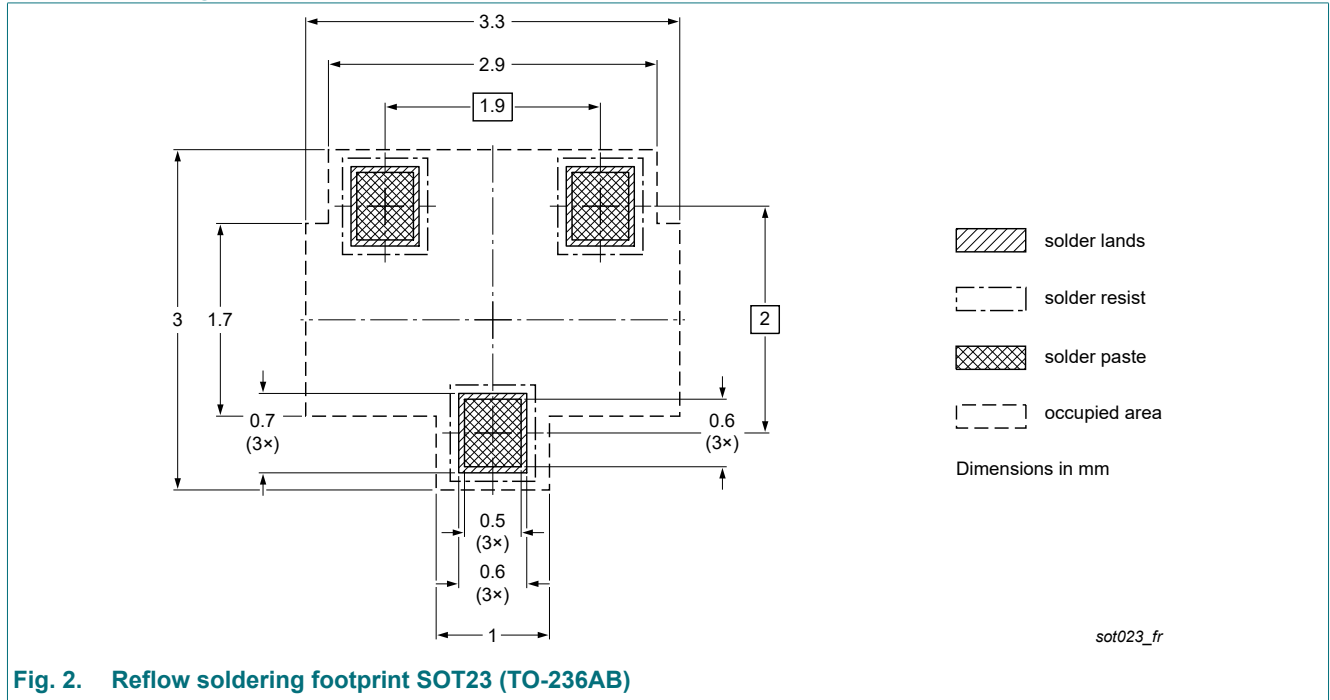


Fig. 2. Reflow soldering footprint SOT23 (TO-236AB)

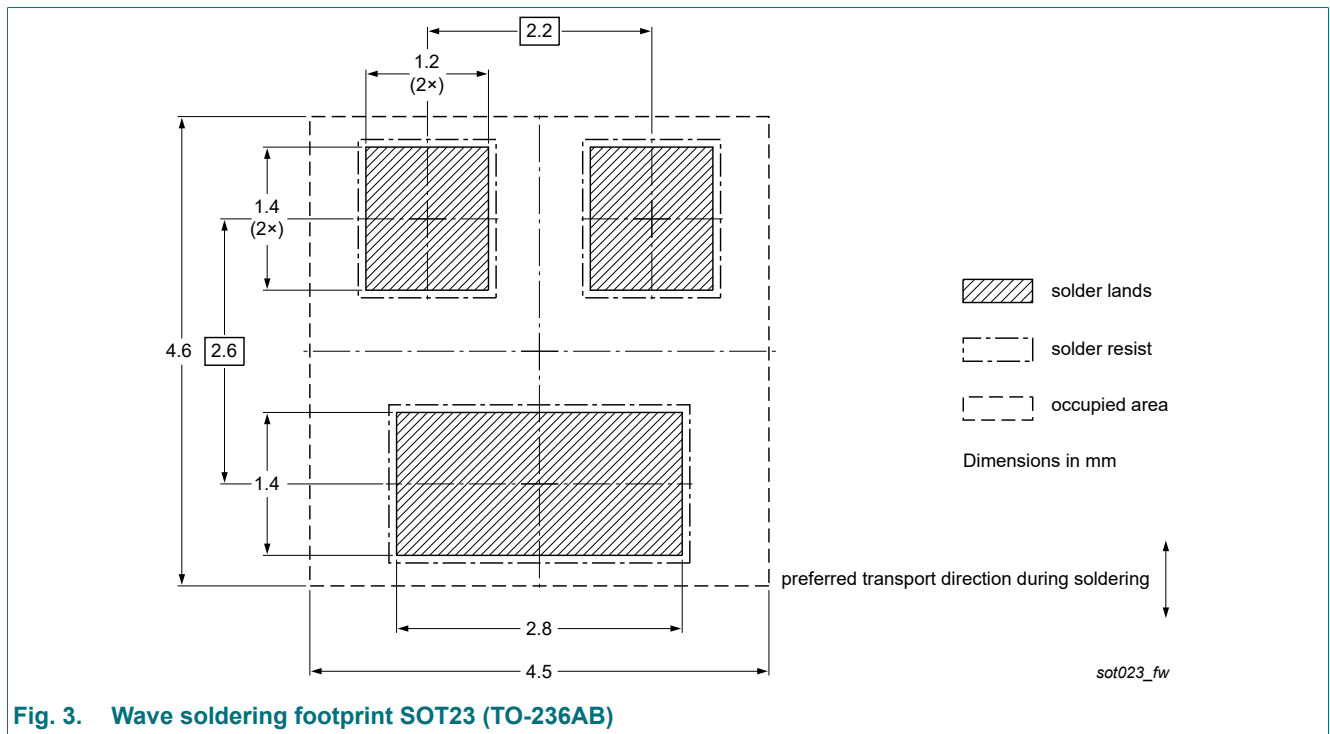


Fig. 3. Wave soldering footprint SOT23 (TO-236AB)

14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PLVA6XXA_SER v.3	20220512	Product data sheet	-	PLVA6XXA_SERIES v.2
Modifications:	<ul style="list-style-type: none">The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.Legal texts have been adapted to the new company name where appropriate.			
PLVA6XXA_SERIES v.2	20040114	Product data sheet	-	PLVA6XXA_SERIES v.1
PLVA6XXA_SERIES v.1	19990525	Product data sheet	-	-

15. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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