



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

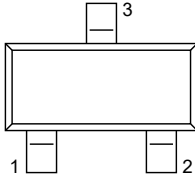
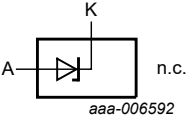
4. Quick reference data

Table 1. Quick reference data
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _n	noise voltage density	f = 1 kHz; B = 1 kHz; I _Z = 250 μA	-	-	1.0	$\frac{\mu V}{\sqrt{Hz}}$
ΔV _Z	line regulation					
	PLVA659A to PLVA668A	I _{LO} = 10 μA; I _{HI} = 1 mA	-	-	0.1	V
	PLVA656A	I _{LO} = 50 μA; I _{HI} = 1 mA	-	-	0.1	V
	PLVA650A	I _{LO} = 100 μA; I _{HI} = 1 mA	-	-	0.4	V
	PLVA653A	I _{LO} = 100 μA; I _{HI} = 1 mA	-	-	0.2	V
R _Z	dynamic resistance					
	PLVA650A	1 kHz superimposed; I _{ZAC} is 10 % of I _{ZDC} I _Z = 250 μA	-	-	700	Ω
	PLVA653A		-	-	250	Ω
	PLVA656A to PLVA668A		-	-	100	Ω
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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simlified 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 μs; δ = 10 %	-	250	mA
P _{ZSM}	non-repetitive peak reverse power dissipation	t _p = 100 μs; T _j = 150 °C	-	30	W
P _{tot}	total power dissipation	T _{amb} = 25 °C	[1] -	250	mW
T _j	junction temperature		-	150	°C
T _{stg}	storage temperature		-65	150	°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

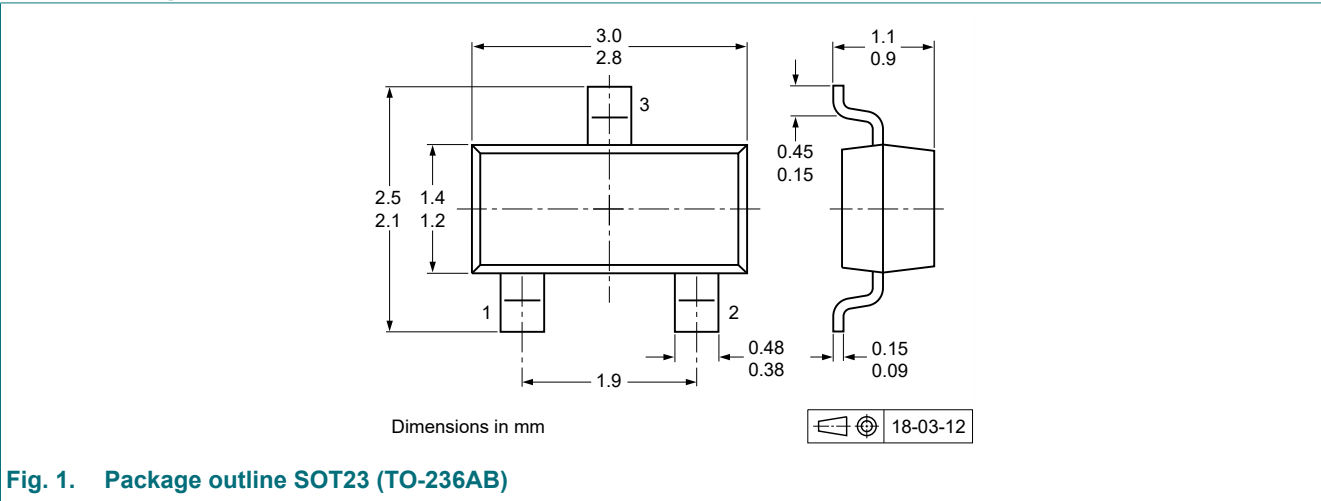
$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _F	forward voltage	I _F = 10 mA		-	-	0.9	V
V _Z	working voltage						
	PLVA650A	I _Z = 250 μA		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 μA		-	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 μA		-	-	700	Ω
	PLVA653A			-	-	250	Ω
	PLVA656A to PLVA668A			-	-	100	Ω
S _Z	temperature coefficient						
	PLVA650A	I _Z = 250 μA		-	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 μA; I _{HI} = 1 mA		-	-	0.1	V
	PLVA656A	I _{LO} = 50 μA; I _{HI} = 1 mA		-	-	0.1	V
	PLVA650A	I _{LO} = 100 μA; I _{HI} = 1 mA		-	-	0.4	V
	PLVA653A	I _{LO} = 100 μA; I _{HI} = 1 mA		-	-	0.2	V
V _n	noise voltage density	f = 1 kHz; B = 1 kHz; I _Z = 250 μA		-	-	1.0	$\frac{\mu V}{\sqrt{Hz}}$

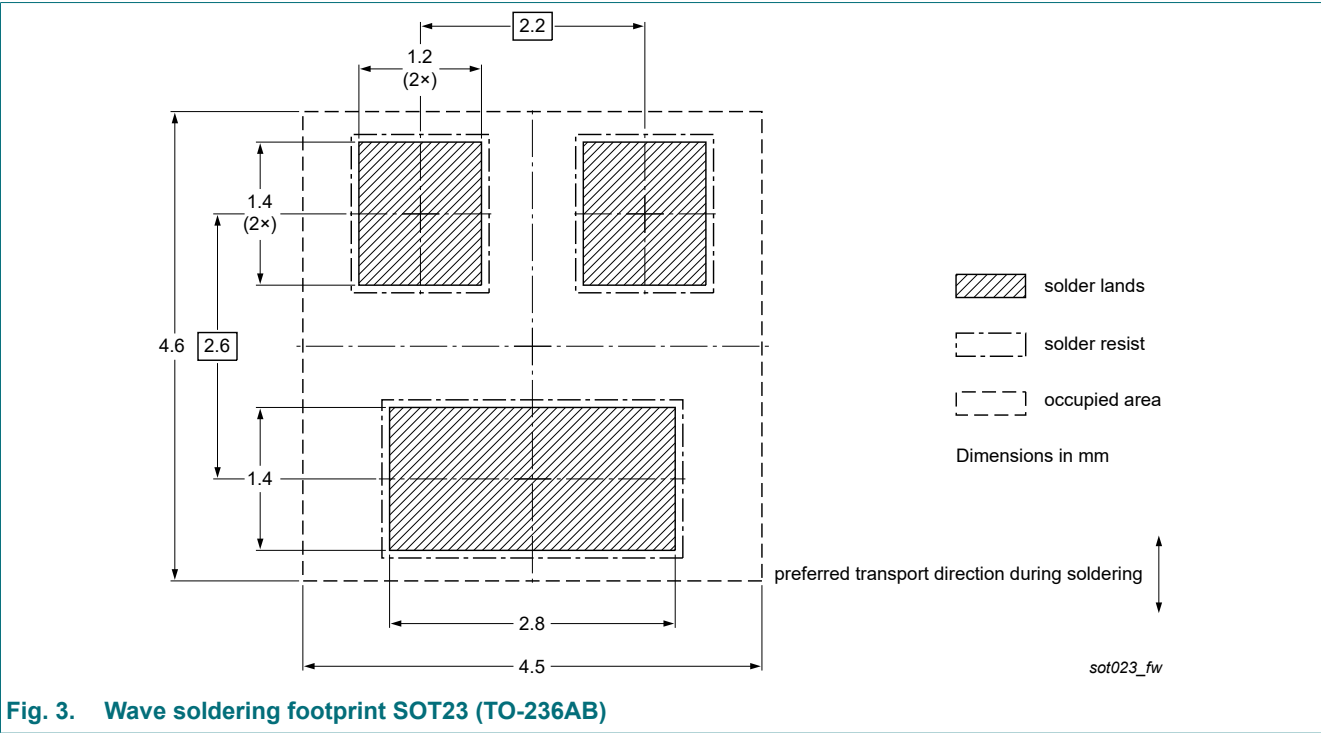
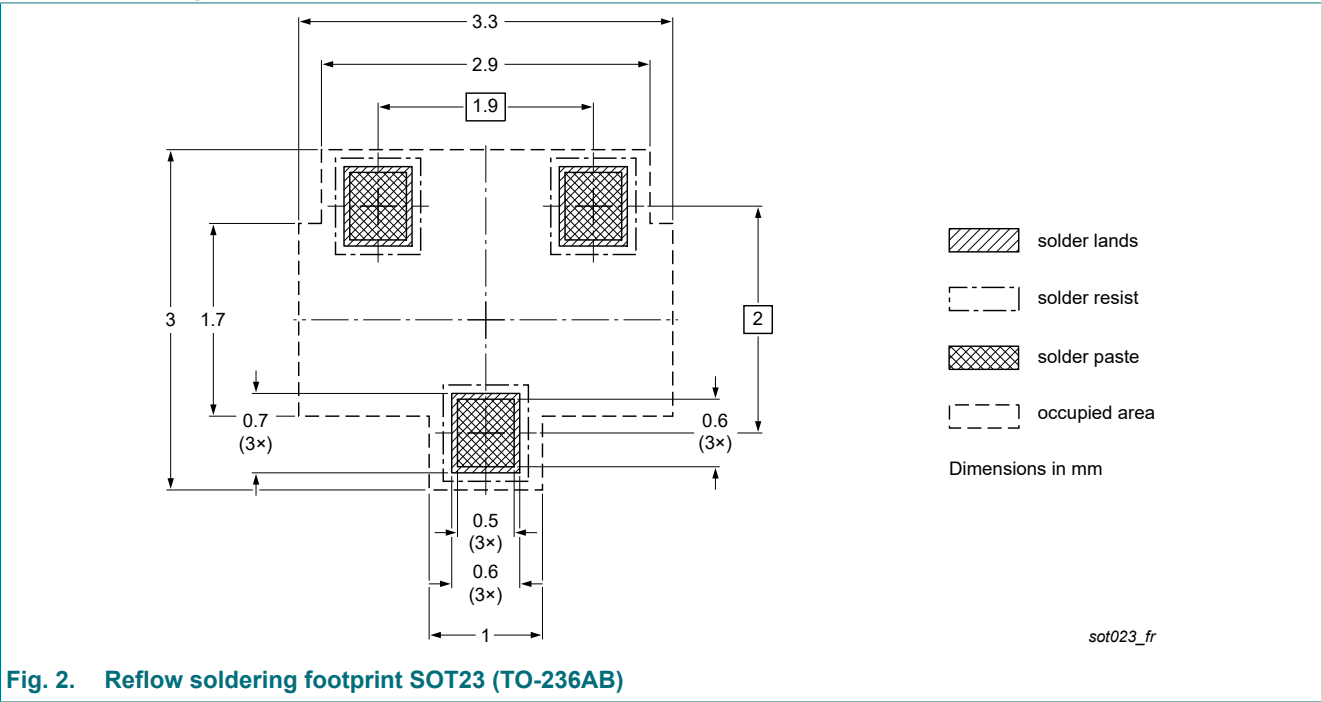
11. Package outline

Table 8. Package outline



12. Soldering

Table 9. Soldering



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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