



# PLVA6xxA series

## Low-voltage avalanche regulator diodes

Rev. 4 — 1 January 2023

Product data sheet

### 1. General description

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

### 2. Features and benefits

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- 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

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

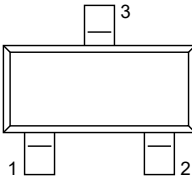
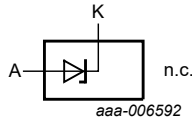
## 4. Quick reference data

**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	$\frac{\mu\text{V}}{\sqrt{\text{Hz}}}$
$\Delta V_Z$	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	$\Omega$
	PLVA653A		-	-	250	$\Omega$
	PLVA656A to PLVA668A		-	-	100	$\Omega$
$I_R$	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
<a href="#">PLVA650A</a>	TO-236AB	plastic surface-mounted package; 3 leads	<a href="#">SOT23</a>
<a href="#">PLVA653A</a>			
<a href="#">PLVA656A</a>			
<a href="#">PLVA659A</a>			
<a href="#">PLVA662A</a>			
<a href="#">PLVA665A</a>			
<a href="#">PLVA668A</a>			

## 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	$\Omega$
	PLVA653A		-	-	250	$\Omega$
	PLVA656A to PLVA668A		-	-	100	$\Omega$
$S_Z$	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	-	$\mu\text{A}$
	PLVA653A		-	3.5	-	$\mu\text{A}$
	PLVA656A		-	1.3	-	$\mu\text{A}$
	PLVA659A		-	1.0	-	$\mu\text{A}$
	PLVA662A		-	0.05	-	$\mu\text{A}$
	PLVA665A		-	0.04	-	$\mu\text{A}$
	PLVA668A		-	0.006	-	$\mu\text{A}$
$\Delta V_Z$	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

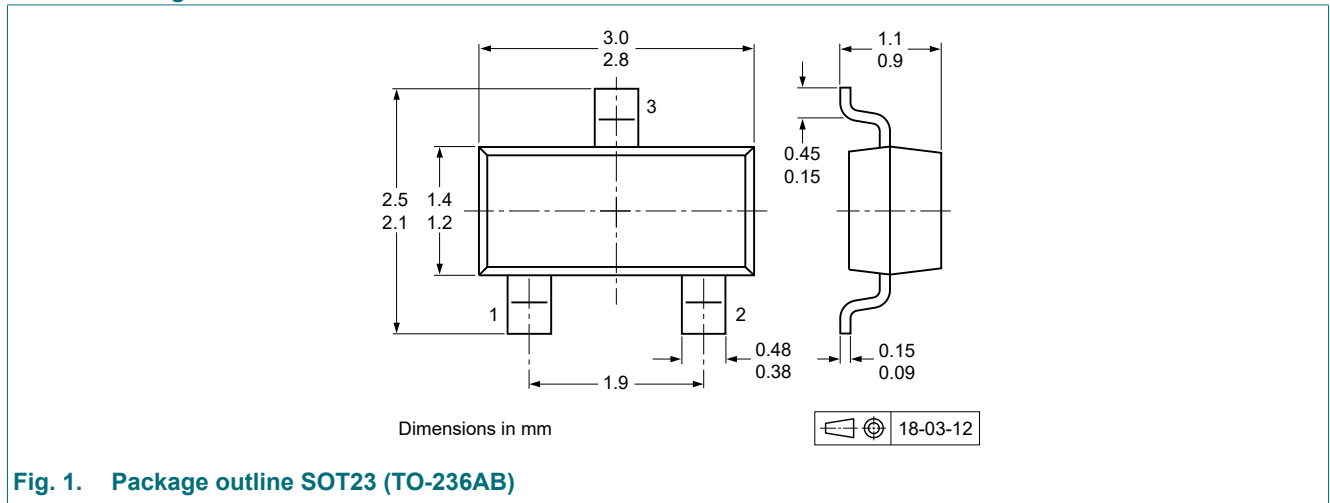


Fig. 1. Package outline SOT23 (TO-236AB)

## 12. Soldering

Table 9. Soldering

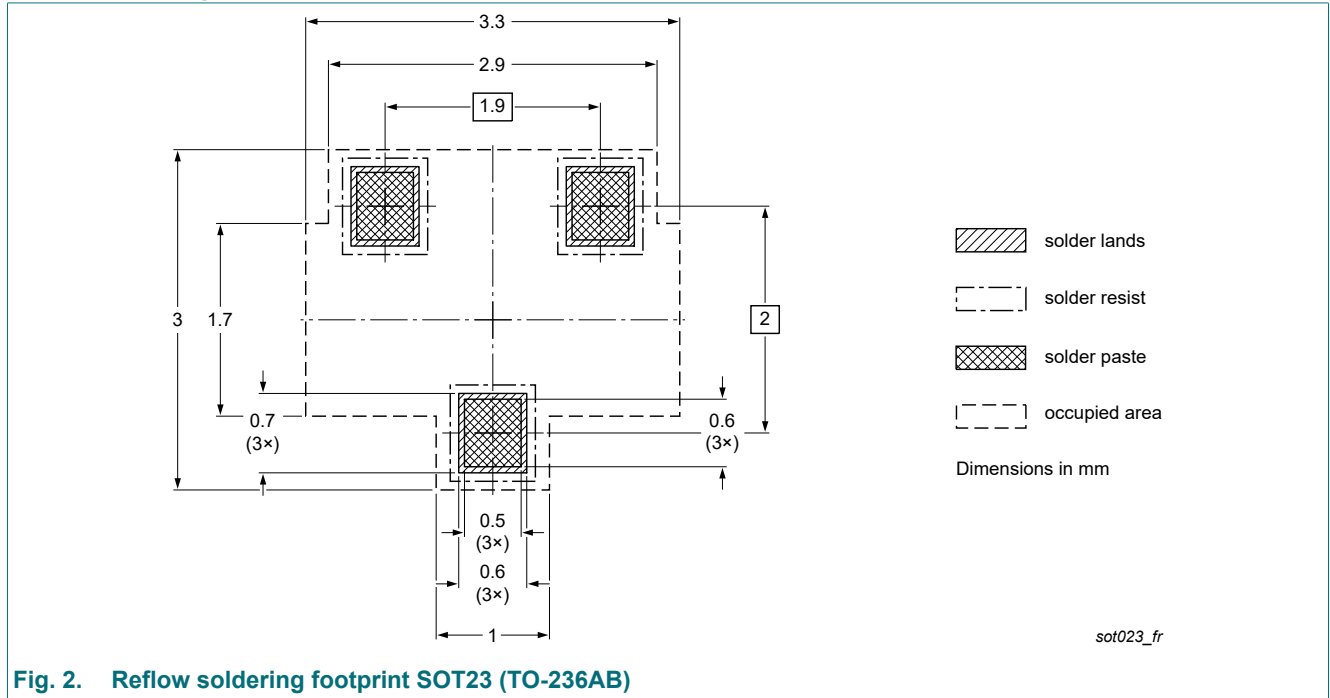


Fig. 2. Reflow soldering footprint SOT23 (TO-236AB)

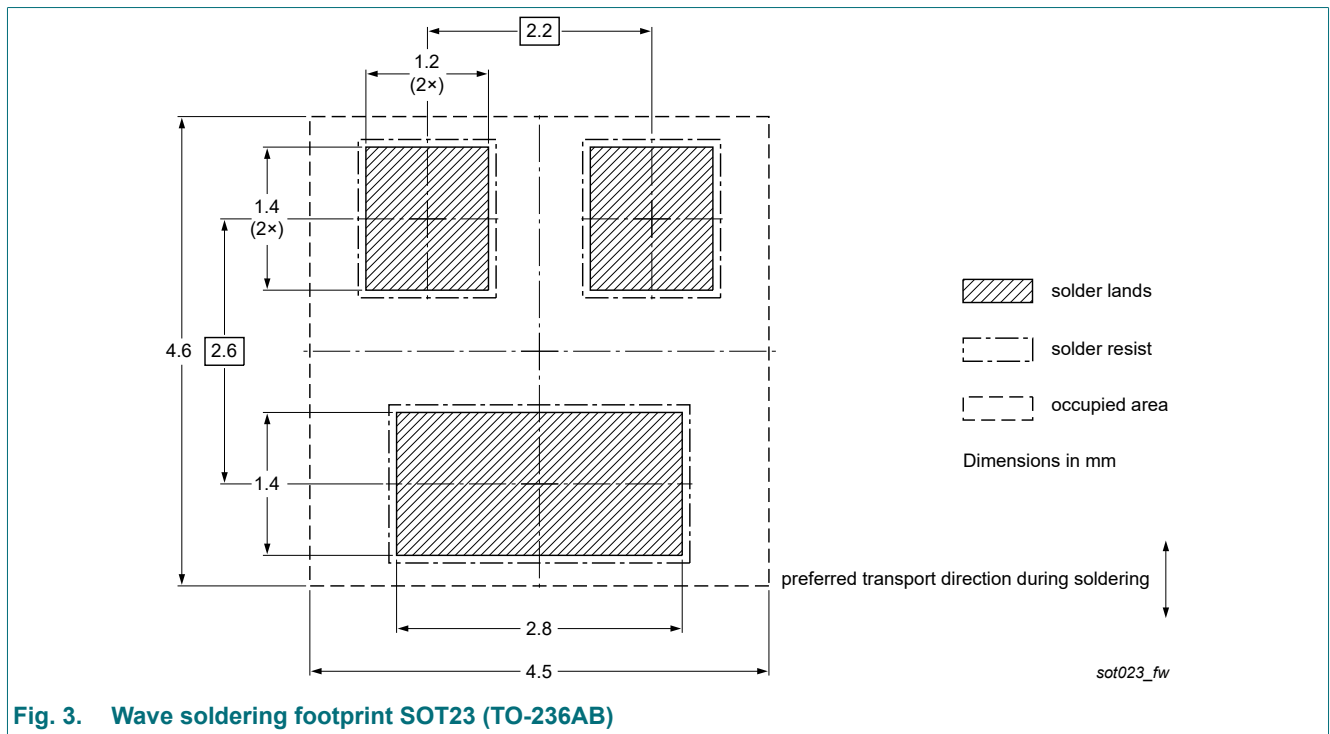


Fig. 3. Wave soldering footprint SOT23 (TO-236AB)

## 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"><li>Product changed to non-automotive qualification. Please refer to <a href="http://nexperia.com">nexperia.com</a> for automotive (-Q) product alternative(s).</li></ul>			
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.

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