PLVA6xxA-Q series

Low-voltage avalanche regulator diodes

Rev. 1 — 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
- Qualified according to AEC-Q101 and recommended for use in automotive applications

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

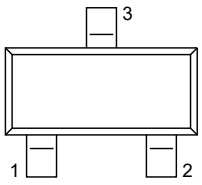
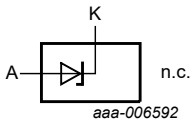
Table 1. Quick reference data

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-Q to PLVA668A-Q	I_{LO} = 10 µA; I_{HI} = 1 mA	-	-	0.1	V
	PLVA656A-Q	I_{LO} = 50 µA; I_{HI} = 1 mA	-	-	0.1	V
	PLVA650A-Q	I_{LO} = 100 µA; I_{HI} = 1 mA	-	-	0.4	V
	PLVA653A-Q	I_{LO} = 100 µA; I_{HI} = 1 mA	-	-	0.2	V
R_Z	dynamic resistance					
	PLVA650A-Q	1 kHz superimposed; I_{ZAC} is 10 % of I_{ZDC} I_Z = 250 µA	-	-	700	Ω
	PLVA653A-Q		-	-	250	Ω
	PLVA656A-Q to PLVA668A-Q		-	-	100	Ω
I_R	reverse current					
	PLVA650A-Q	V_R = 50 % V_Z nominal	-	34	-	nA
	PLVA653A-Q		-	22	-	nA
	PLVA656A-Q		-	1.1	-	nA
	PLVA659A-Q		-	0.9	-	nA
	PLVA662A-Q		-	0.9	-	nA
	PLVA665A-Q		-	0.9	-	nA
	PLVA668A-Q		-	0.8	-	nA

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Descrition	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-Q	TO-236AB	plastic surface-mounted package; 3 leads	SOT23
PLVA653A-Q			
PLVA656A-Q			
PLVA659A-Q			
PLVA662A-Q			
PLVA665A-Q			
PLVA668A-Q			

7. Marking

Table 4. Marking codes

Type number		Marking code
PLVA650A-Q	[1]	%9A
PLVA653A-Q	[1]	%9B
PLVA656A-Q	[1]	%9C
PLVA659A-Q	[1]	%9D
PLVA662A-Q	[1]	%9E
PLVA665A-Q	[1]	%9F
PLVA668A-Q	[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 °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-Q	I_Z = 250 µA		4.80	5.00	5.20	V
	PLVA653A-Q			5.10	5.30	5.50	V
	PLVA656A-Q			5.40	5.60	5.80	V
	PLVA659A-Q			5.70	5.90	6.10	V
	PLVA662A-Q			6.00	6.20	6.40	V
	PLVA665A-Q			6.30	6.50	6.70	V
	PLVA668A-Q			6.60	6.80	7.00	V
V_Z	working voltage						
	PLVA650A-Q	I_Z = 10 µA		-	4.30	-	V
	PLVA653A-Q			-	5.20	-	V
	PLVA656A-Q			-	5.51	-	V
	PLVA659A-Q			-	5.85	-	V
	PLVA662A-Q			-	6.19	-	V
	PLVA665A-Q			-	6.49	-	V
	PLVA668A-Q			-	6.80	-	V
R_Z	dynamic resistance						
	PLVA650A-Q	1 kHz superimposed; I_{ZAC} is 10 % of I_{ZDC}; I_Z = 250 µA		-	-	700	Ω
	PLVA653A-Q			-	-	250	Ω
	PLVA656A-Q to PLVA668A-Q			-	-	100	Ω
S_Z	temperature coefficient						
	PLVA650A-Q	I_Z = 250 µA		-	0.20	-	mv/K
	PLVA653A-Q			-	1.60	-	mv/K
	PLVA656A-Q			-	1.90	-	mv/K
	PLVA659A-Q			-	2.40	-	mv/K
	PLVA662A-Q			-	2.65	-	mv/K
	PLVA665A-Q			-	2.90	-	mv/K
	PLVA668A-Q			-	3.40	-	mv/K

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_R	reverse current					
	PLVA650A-Q	V_R = 80 % V_Z nominal	-	-	20000	nA
	PLVA653A-Q		-	-	5000	nA
	PLVA656A-Q		-	-	1000	nA
	PLVA659A-Q		-	-	500	nA
	PLVA662A-Q		-	-	100	nA
	PLVA665A-Q		-		50	nA
	PLVA668A-Q		-		10	nA
I_R	reverse current					
	PLVA650A-Q	V_R = 50 % V_Z nominal	-	34	-	nA
	PLVA653A-Q		-	22	-	nA
	PLVA656A-Q		-	1.1	-	nA
	PLVA659A-Q		-	0.9	-	nA
	PLVA662A-Q		-	0.9	-	nA
	PLVA665A-Q		-	0.9	-	nA
	PLVA668A-Q		-	0.8	-	nA
I_R	reverse current					
	PLVA650A-Q	V_R = 90 % V_Z nominal	-	21	-	µA
	PLVA653A-Q		-	3.5	-	µA
	PLVA656A-Q		-	1.3	-	µA
	PLVA659A-Q		-	1.0	-	µA
	PLVA662A-Q		-	0.05	-	µA
	PLVA665A-Q		-	0.04	-	µA
	PLVA668A-Q		-	0.006	-	µA
ΔV_Z	line regulation					
	PLVA650A-Q to PLVA668A-Q	I_{LO} = 10 µA; I_{HI} = 1 mA	-	-	0.1	V
	PLVA656A-Q	I_{LO} = 50 µA; I_{HI} = 1 mA	-	-	0.1	V
	PLVA650A-Q	I_{LO} = 100 µA; I_{HI} = 1 mA	-	-	0.4	V
	PLVA653A-Q	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. 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

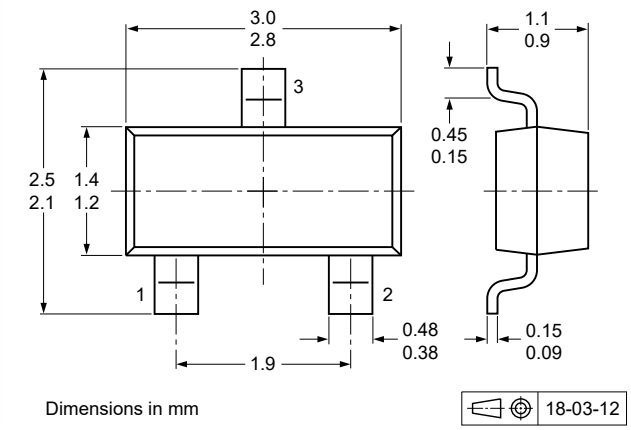


Fig. 1. Package outline SOT23 (TO-236AB)

13. Soldering

Table 9. Soldering

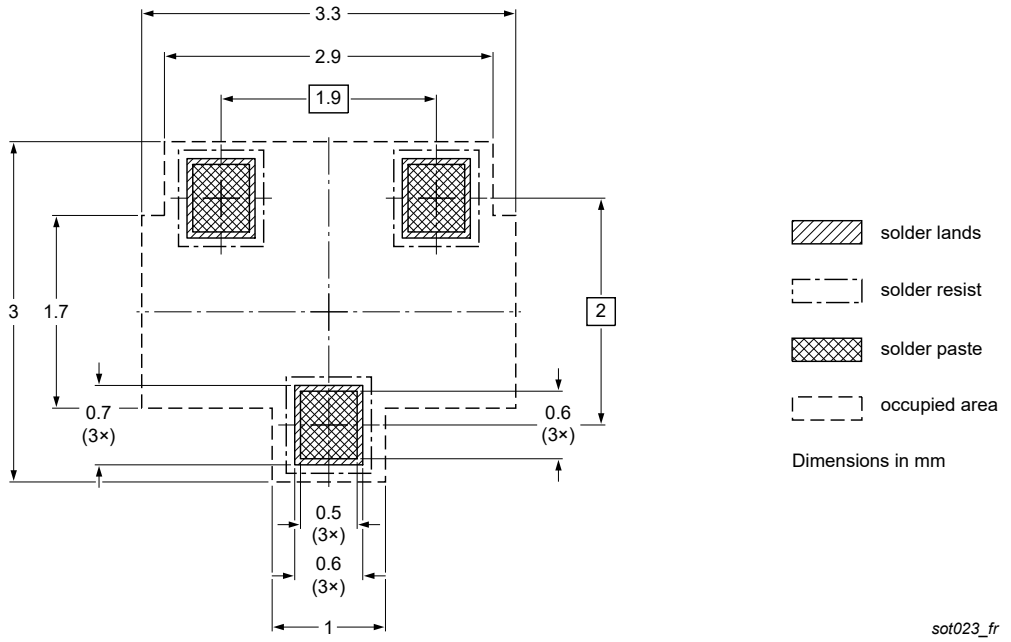


Fig. 2. Reflow soldering footprint SOT23 (TO-236AB)

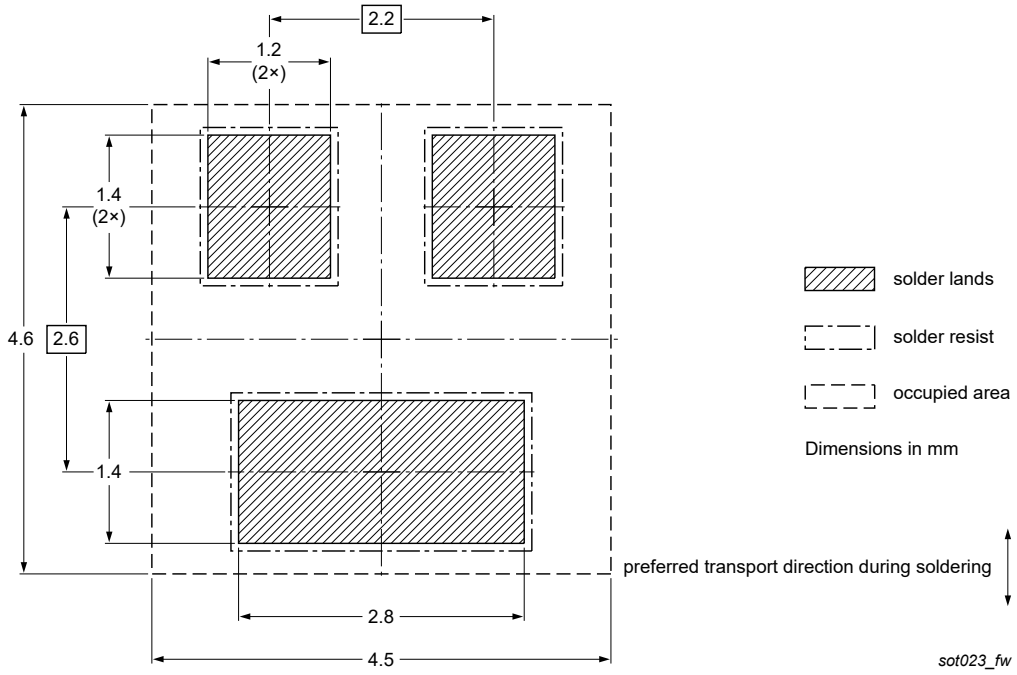


Fig. 3. Wave soldering footprint SOT23 (TO-236AB)

14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PLVA6XXA-Q v.1	20220512	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.
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