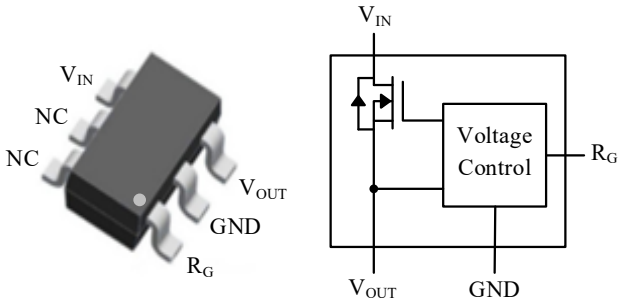
150V Programmable Over Voltage Protector

General Features

- 150V High-Voltage Input Capability
- Dual-Function Design: Programmable OVP and Voltage Regulator
- 16V Typical Output as Voltage Regulator
- Adjustable Protection Threshold
- Safe Output Clamping to < 4V During an Overvoltage Event
- RoHS Compliant
- Halogen-free Available

V_{IMP}	$R_{ON\ (Typ.)}$	$I_{ON(Min.)}$
150V	**7Ω**	**100mA**

SOT-23-6



Applications

- Overvoltage Protection
- Protection Modules and Dongles
- Smart Portable Devices
- Low Power Sub-systems
- E-cigarettes
- Portable Power Bank
- Battery Charging
- Wearable Devices
- Handheld Electronic Devices

Ordering Information

Part Number	Package	Marking	Remark
AKOVP1507	SOT-23-6	OVP1507	Halogen Free

General Description

The AKOVP1507 is an overvoltage protection device developed by ARK (ARK Microelectronics) based on a depletion-mode MOSFET. Retaining the normally-on characteristic of depletion-mode MOSFETs, it allows users to set the input overvoltage threshold flexibly. When the input voltage is below the preset threshold, the AKOVP protector operates in pass-through mode or can function as a voltage regulator. Once the input exceeds the threshold, the device responds rapidly and clamps the output voltage to within 4 V, thereby providing effective overvoltage protection.

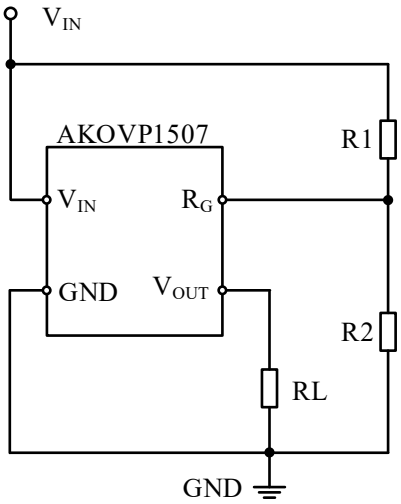


Figure 1. Application Diagram

Absolute Maximum Ratings

T_A =25℃ unless otherwise specified

Symbol	Parameter	AKOVP1507	Unit
V_{IMP}	Peak Impulse Voltage [1]	150	V
V_{RG}	R_G Pin Voltage	10	V
P_D	Power Dissipation	0.5	W
T_L	Soldering Temperature Distance of 1.6mm from case for 10 seconds	300	℃
T_J	Operating Temperature Range	-55 to 125	
T_{STG}	Storage Temperature Range	-55 to 155	

Caution: Stresses beyond those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

Thermal Characteristics

Symbol	Parameter	AKOVP1507	Unit
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	250	K/W

Electrical Characteristics

T_A =25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
V_{IMP}	Peak Impulse Voltage [1]	--	--	150	V	T_J = −40°C to +125°C
V_{OUT}	Output Voltage [2]	--	16	18	V	T_J = −40°C to +125°C
V_{OVP}	External overvoltage threshold can be configured.	4.0	--	--	V	
V_{OCL}	Output Clamping Voltage	--	--	4.0	V	$V_{IN} > V_{IN\_TRI}$
V_{RGTRI}	Drive Voltage at the R_G Port When Triggering the Output Voltage Clamping	0.4	0.7	1.0	V	$V_{OUT} = V_{OCL}$
R_{ON}	On Resistance of the Device	--	7	15	Ω	I_{OUT} = 100mA
I_{ON}	Saturation Current of the Depletion-mode MOSFET	100	--	--	mA	

NOTE：

[1] Peak impulse voltage withstand with duration less than 10 ms.
[2] The maximum output voltage (18 V) is guaranteed only under light-load conditions ($I_{OUT} \leq 10$ μA). Under higher load currents, the output voltage will be lower. Refer to typical performance curves for details.

Typical Application Circuits

The typical application circuit is shown in Figure 2.

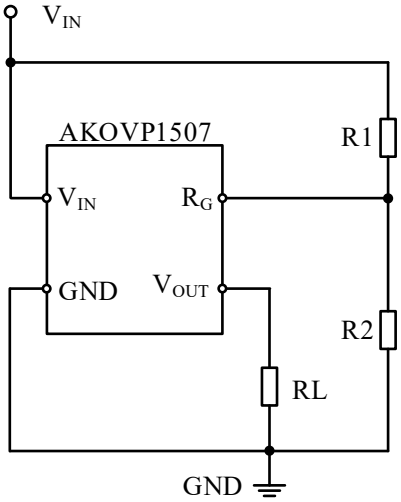


Figure 2. Typical Application Circuits

The AKOVP1507 can provide over-voltage protection in either a “pass-through” or a “regulated” application.

Pass-through mode: If the input voltage is below the device’s regulated output level, the AKOVP1507 operates as a pure pass element with a typical on-resistance of 7 Ω. When the input exceeds the over-voltage threshold, the protector clamps the output to ≤ 4 V, protecting the downstream circuitry.

Regulator mode: When used as a voltage regulator, the AKOVP1507 delivers a maximum output of 18 V. As long as the input stays below the over-voltage threshold, the output remains regulated at this fixed level. If the input rises above the threshold, the device again clamps the output to ≤ 4 V, providing over-voltage protection.

The overvoltage threshold of the AKOVP1507 is set by connecting external voltage-divider resistors to the RG pin. The typical trigger voltage at RG is 0.7 V. When the RG-pin voltage exceeds this threshold, the AKOVP1507 quickly clamps the output voltage to within 4 V. As soon as RG falls back below the threshold, the device automatically recovers.

Note: The R_G pin can withstand a maximum of 10 V. If the drive voltage exceeds this level, use a Zener diode for clamping; a 5~7 V Zener is recommended.

The overvoltage threshold is programmed with external resistors R1 and R2:

$V_{OVP}/V_{RGTRI}=(R1+R2)/R2$

Recommended resistor values for typical V_{OVP} settings are listed in the table below：

V_{OVP}（V）	V_{RGTRI}（V）	R1（MΩ）	R2（MΩ）
6	0.7	5	0.66
7	0.7	5	0.56
8	0.7	5	0.48
9	0.7	5	0.42
10	0.7	5	0.38
11	0.7	5	0.34
12	0.7	5	0.31

Note: The table assumes $V_{RGTRI\ (Typ.)}$ = 0.7 V and fixes R1 at 5 MΩ; R2 is then calculated from the equation for reference only. Customers should derive their own values based on their specific circuit application.

Example 1:

The AKOVP1507 operates in a 5 V circuit; by setting the ratio of R1 and R2, the over-voltage threshold is configured as V_{OVP} = 7 V. When a 10 V over-voltage signal is applied, the output behavior of the AKOVP1507 is as follows.

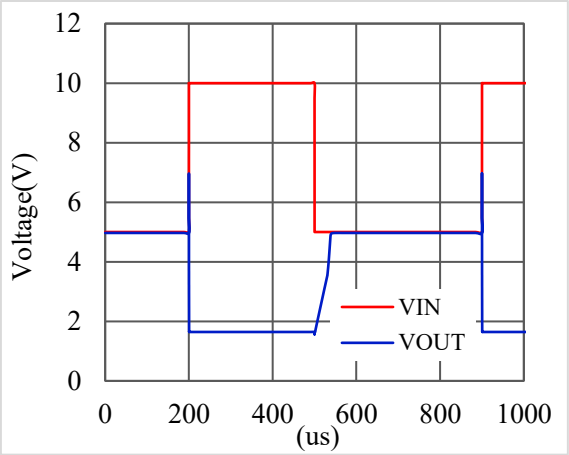


Figure 3. Output characteristics of Example 1

When V_{IN} = 5 V, AKOVP1507 is fully on and V_{OUT} ≈ 5 V.
When V_{IN} > 7 V, protection trips and V_{OUT} ≈ 1.8 V.

Example 2:

The AKOVP1507 operates in a 24 V circuit. By configuring the ratio of R1 and R2, the over-voltage protection (OVP) threshold is set to V_{OVP} = 30 V. When a 40 V over-voltage signal is applied, the output characteristics of the AKOVP1507 are as follows:

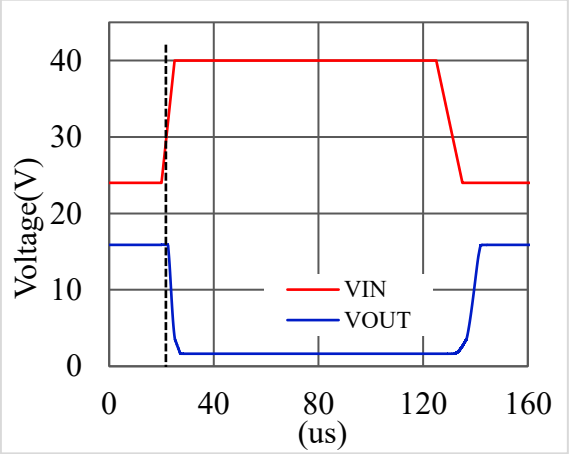


Figure 4. Output characteristics of Example 2

When V_{IN} = 24 V, AKOVP1507 works as a voltage regulator and V_{OUT} ≈ 16 V.
When V_{IN} < 30 V, the device keeps the output constant.
When V_{IN} > 30 V, protection trips and V_{OUT} ≈ 1.8 V.

Typical Characteristics

Figure 5. Output Voltage(Vout) vs. Ambient Temperature

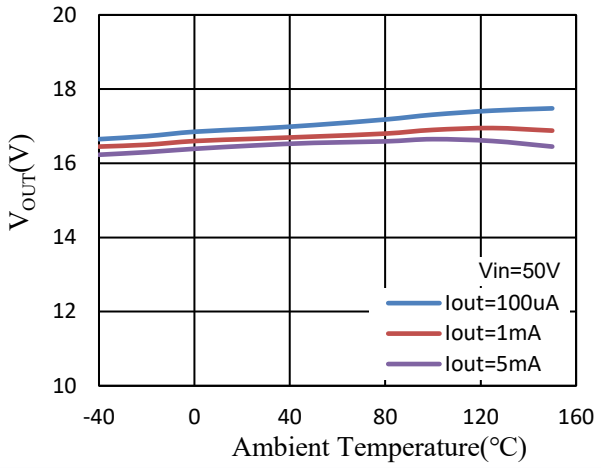


Figure 6. Output Voltage(Vout) vs. Junction Temperature

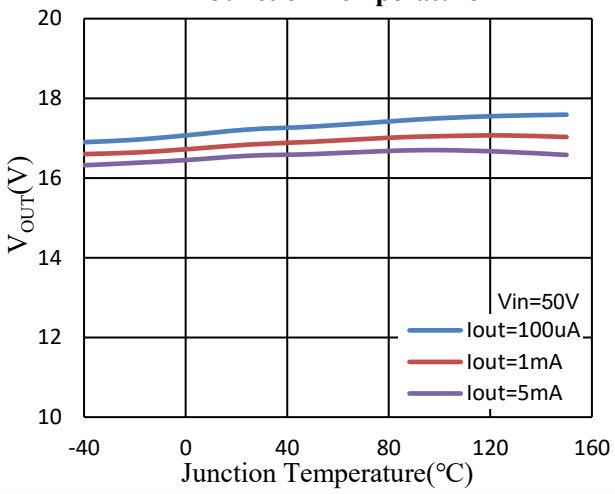


Figure 7. Output Voltage vs. Input Voltage

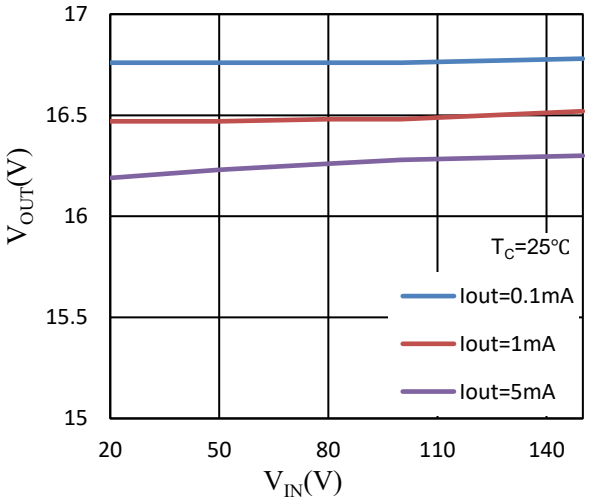
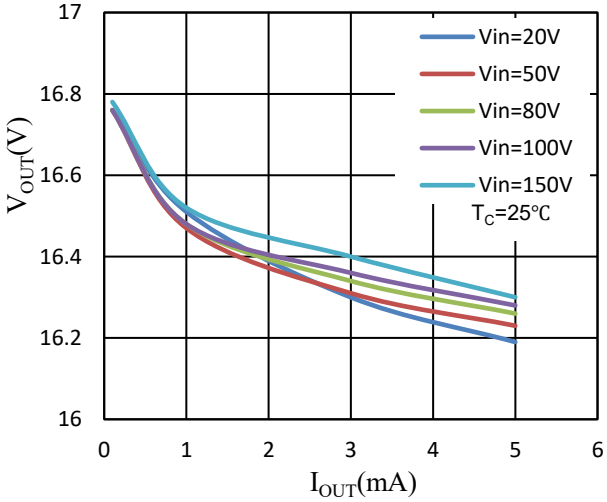


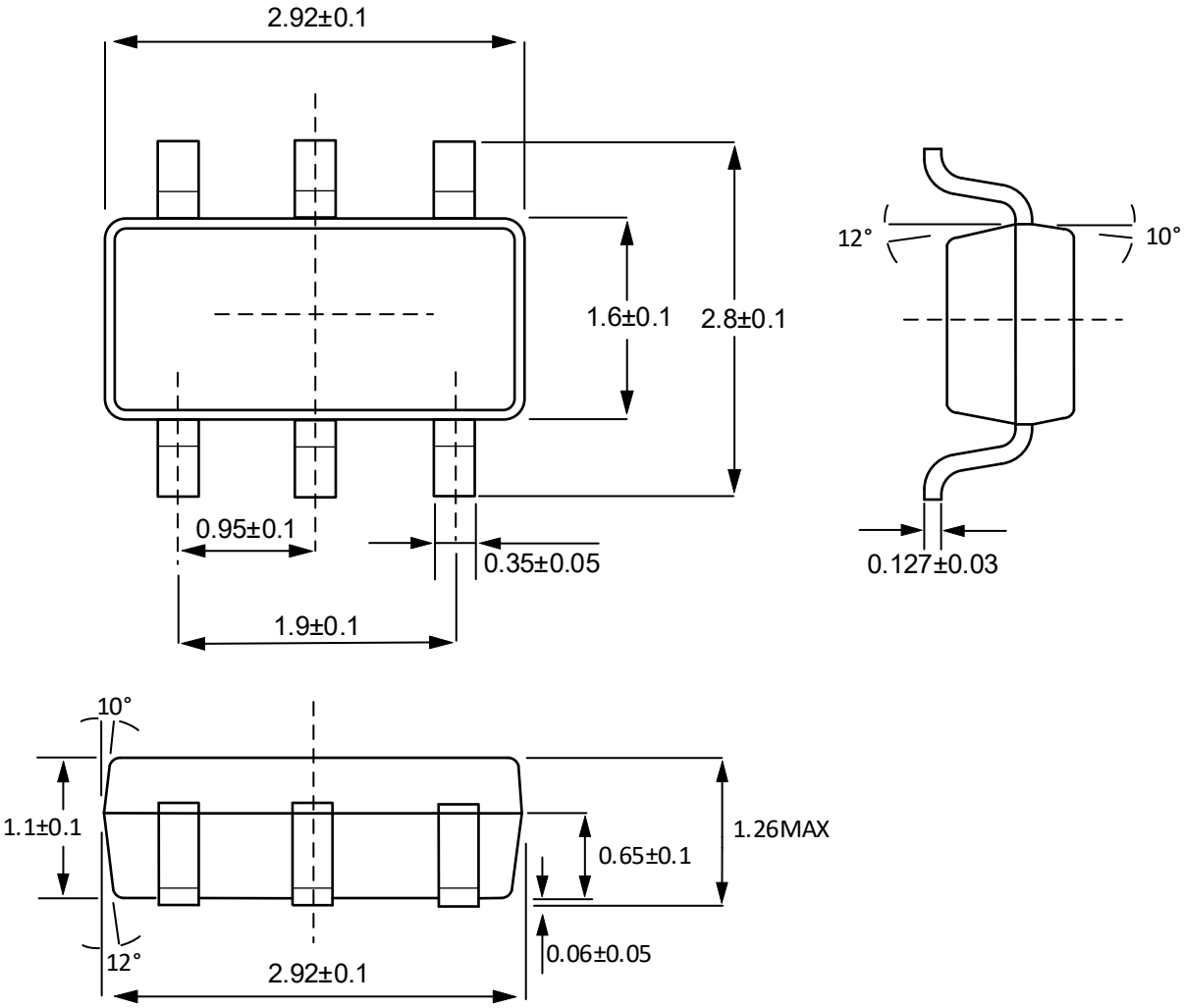
Figure 8. Output Voltage vs. Load Current



Note: This curve is measured under normal operating conditions (V_{IN} < V_{OVP}).
When overvoltage protection is triggered (V_{IN} > V_{OVP}), V_{OUT} is clamped to ≤4V.
Refer to Figure 3/Figure 4 for protection behavior.

Package Dimensions

SOT-23-6



Unit：mm

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