WP1107

Over-Voltage Protection IC

1. General Description

The WP1107 is an Over-Voltage-Protection (OVP) load switch with fixed OVLO threshold voltage. The OVLO threshold voltage is fixed 6.0V. The device will switch off internal MOSFET to disconnect IN to OUT to protect load when any of input voltage over the threshold. The Over temperature protection (OTP) function monitors chip temperature to protect the device. The OCP function turns off OUTPUT if the load current is over the threshold and recovers when VIN re-plug or $\overline{CE}$ reactive. The OCP current limit threshold is adjustable by an external RILIM.

The WP1107 is available in SOT23-6. Standard products are Pb-free and Halogen-free.

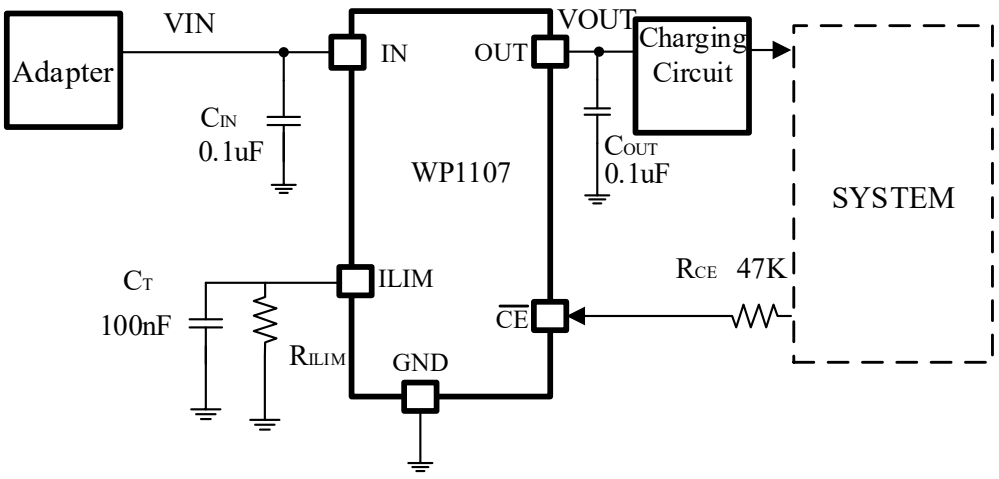
2. Features

- Maximum input voltage:32V
- Ultra-fast OVP response time:50ns (Typ.)
- Fixed OVLO threshold voltage:6.0V, ±3%
- Adjustable over-current protection: 100mA-1.5A, ±10%
- Supports up to 1.5A Load Current
- Thermal Shutdown
- Enable Function
- Fault Status indication
- Available in Green SOT23-6 Package

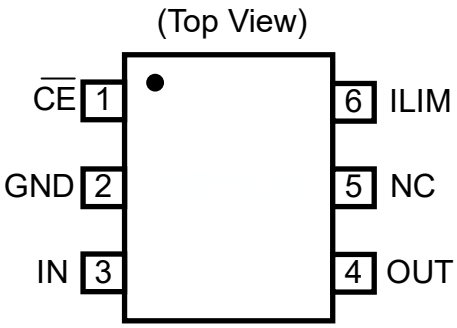
3. Applications

- Mobile Handsets and Tablets
- Portable Media Players
- Low-power Handheld Devices

4. Typical Application Circuit



5. Pin Configuration



SOT23-6

6. Pin Description

PIN NAME	PIN NUMBER	I/O	PIN FUNCTION
$\overline{CE}$	1	I	Active-Low Chip Enable Input. Connect $\overline{CE}$= "HIGH" to turn the input pass FET off. Connect $\overline{CE}$= "LOW" to turn the internal pass FET on, connecting the input to the charging circuitry. $\overline{CE}$ is internally pulled down.
GND	2	-	Ground Terminal. Connect to the thermal pad and to the ground rail of the circuit.
IN	3	I	Switch Input and Device Power Supply.
OUT	4	O	Switch output Terminal to the Charging System.
NC	5	-	No connect.
ILIM	6	I/O	Current limit adjustment. Connect a resistor to GND to set over current threshold. I_{LIM}=600/R_{ILIM}. (current in A, resistance in Ω). Short ILIM to GND will disable current limitation.

7. Absolute Maximum Ratings [1]

Operating free-air temperature range (unless otherwise noted)

PARAMETER	RATING	UNIT
IN Voltage	-0.3 to 32	V
OUT Voltage	-0.3 to 6.0	V
Storage Temperature	-55 to 150	°C
Soldering Temperature (Reflow)	260	°C
Junction Temperature	150	°C

NOTE1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

8. Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Input Voltage	3.5	32	V
I_{OUT}	Maximum Continuous Current		1.2	A
T_A	Operating Ambient Temperature	-40	85	°C

9. ESD Ratings — JEDEC Specification

PARAMETER		RATING	UNIT
Electrostatic Discharge	Human-Body Model (HBM), Per JESD22-A114(All pins)	±4000	V

10. Electrical Characteristics[2][3]

(Over operating free-air temperature range, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
I_Q	Quiescent Current	NO Load，$\overline{CE}$=GND, VIN=5V		110		μA
I_{Q_OVP}	Over voltage quiescent current	NO Load，$\overline{CE}$=GND, VIN=30V		200		μA
I_{Q_DIS}	Disable OVP quiescent current	NO Load，$\overline{CE}$=5.5V, VIN=5.5V		50		μA
V_{DROP}	Drop Voltage from IN to OUT	V_{IN}=5V, I_{OUT}=0.5A		110	140	mV
t_{OVP}	OVP response time	V_{IN} rising, C_{IN}=C_L=0pF (Note1)		50		ns
V_{OVLO}	OVP Trip Level	V_{IN} Rising	5.82	6.0	6.18	V
V_{CE_H}	CE high threshold voltage	V_{CE} Rising	1.4			V
V_{CE_L}	CE low threshold voltage	V_{CE} Falling			0.4	V
V_{UVLO}	UVLO threshold voltage	V_{IN} rising		2.7		V
V_{UVLO_HYS}	UVLO hysteresis voltage	V_{IN} falling		100		mV
I_{OCP_RANG}	OCP setting range		100		1500	mA
T_{DEB}	Debounce Time	V_{IN}>UVLO to V_{OUT}=V_{IN}*10%		17		ms
T_{ON}	Turn On Time	V_{OUT}=V_{IN}*10% to V_{OUT}=V_{IN}*90%		20		us
R_{DCHG}	Output discharge resistance	V_{IN}=5V		400		Ω
T_{SD}	Thermal Shutdown	V_{IN}=5V		150		ºC
ΔT_{SD}	Thermal Shutdown Hysteresis	V_{IN}=5V		20		ºC

NOTE2: Guaranteed by characterization testing and design.

NOTE3: Limits over full temperature are guaranteed by design, but not tested in production.

11. Typical Performance Characteristics

(V_{IN} = 5V, T_A=25℃, unless otherwise noted)

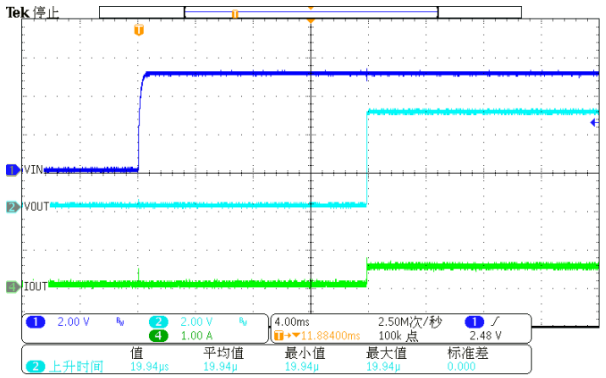


Figure 1. Power on Response
(R_{OUT}=10Ω, R_{ILIM}=1kΩ)

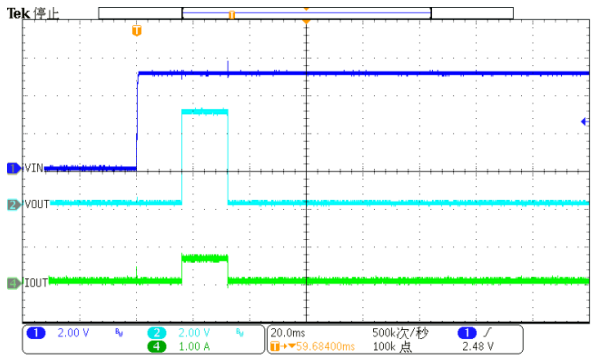


Figure 2. Power on OCP Response
(R_{OUT}=8Ω, R_{ILIM}=1kΩ)

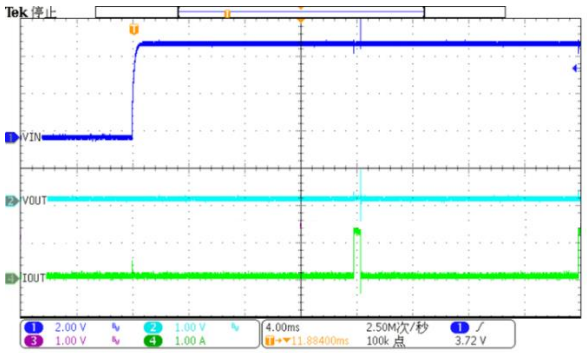


Figure 3. Power on Response with Output Short

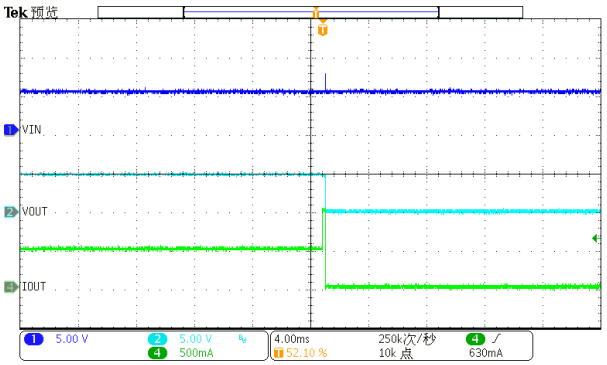


Figure 4. OCP Response

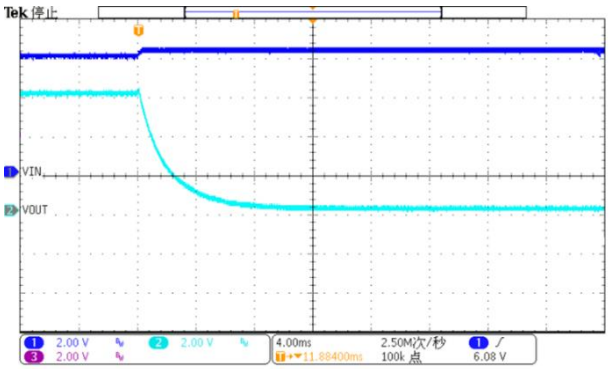
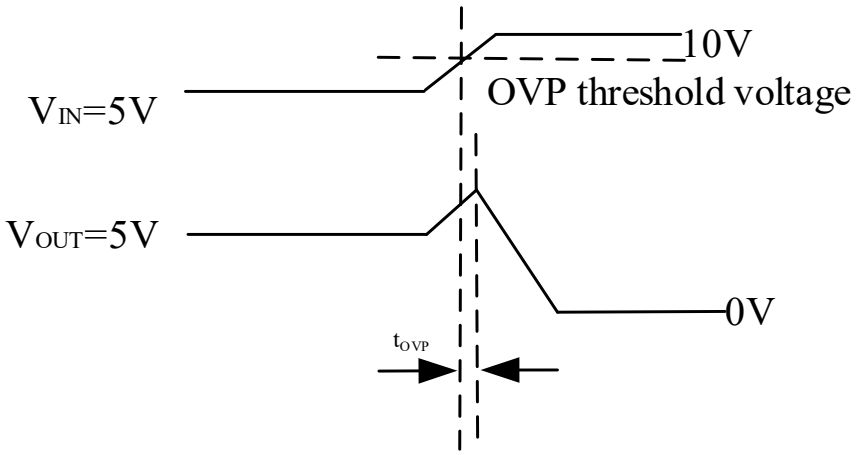


Figure 5. OVP Response

12. Timing Diagram



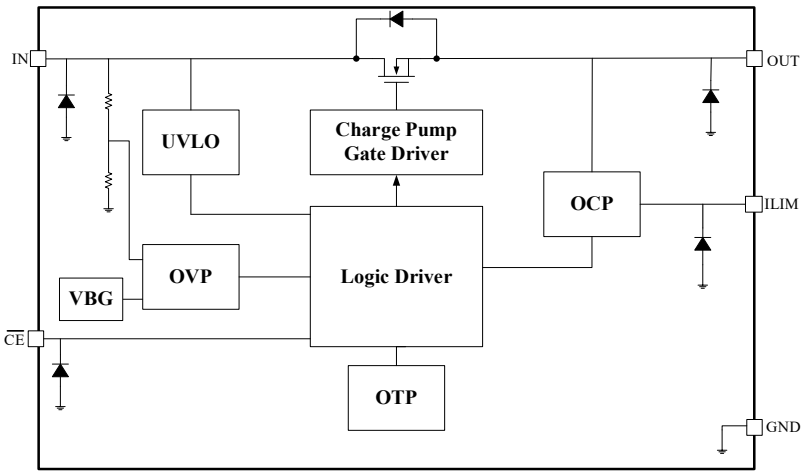
13. Function Description

13.1 Overview

The WP1107 with overvoltage protection features a low 220mΩ (Typ.) $R_{DS(ON)}$ of internal FET and protects low-voltage systems against voltage faults up to $32V_{DC}$. The OVLO threshold voltage is fixed 6.0V. The device will switch off internal MOSFET to disconnect IN to OUT to protect load when any of input voltage over the threshold. The OCP function turns off OUTPUT if the load current is over the threshold and recovers when VIN re-plug or CE reactive. The OCP current limit threshold is adjustable by an external R_{ILIM}.

The internal FET turns off when the junction temperature exceeds +150ºC (Typ.). The device exits thermal shutdown after the junction is cooled down by 20ºC (Typ.).

13.2 Block Diagram



13.3 Feature Description

13.3.1 Under Voltage Lock Out (UVLO)

The under-voltage lockout (UVLO) circuits disable the WP1107 until the input voltage reaches the UVLO turn-on threshold.

13.3.2 Over Temperature Protection (OTP)

The WP1107 monitors its own internal temperature to prevent thermal failures. The device turns off the internal FET when the junction temperature reaches 150°C. The device will resume after the junction is cooled down by 20°C.

13.3.3 Input Over Voltage Protection (OVP)

If the input voltage exceeds the WP1107 rising trip level, the switch will be turned off in about 50ns. The switch will remain off until V_{IN} falls below the WP1107 falling trip level.

13.3.4 Over Current Protection (OCP)

If the load current rises to the OCP threshold, the device will cut off the output voltage. It takes 18ms after power on for OCP begins to detect. After Power Good, the OCP active time is dozens to hundreds microseconds. A recommended 100-220nF capacitor (C_T) connect on ILIM pin can increase the OCP active time for longer blanking time applications.

The OCP threshold is calculated by the equation: $I_{LIM}=600/R_{ILIM}$ (current in A, resistance in Ω).

14. Application and Implementation

Note: The information in the Applications section below is not part of WAY-ON's product specifications and WAY-ON does not guarantee its accuracy or completeness. The customer is responsible for determining the suitability of the component for its intended use and should verify and test its design implementation to confirm system functionality.

14.1 Selection of Input Capacitor

To limit the voltage drops on the input supply caused by transient inrush current, a capacitor 0.1μF or larger must be placed between the IN and GND pins.

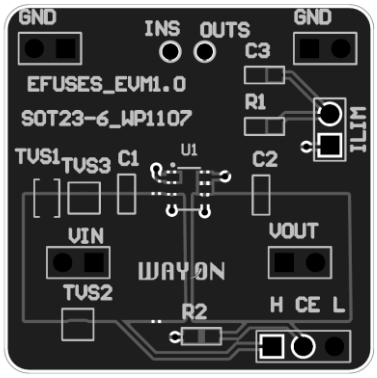
14.2 Selection of Output Capacitor

A 0.1μF or larger capacitor should be placed between the OUT and GND pins.

15. Layout

This device is a protection device, and is meant to protect down-stream circuitry from hazardous voltages. Potentially, high voltages may be applied to this IC. It has to be ensured that the edge-to-edge clearances of PCB traces satisfy the design rules for high voltages. C_{IN} and C_{OUT} must be located close to the IC. Other components like R_{ILIM} should also be located close to the IC.

15.1 Layout Example



16. Evaluation Modules

Evaluation Modules (EVMs) are available to help evaluate initial circuit performance. We have evaluation modules for different packages, you can contact us by phone or address at the end to get the evaluation module or schematic.

The module names are listed in the table below.

Name	Package	Evaluation Module
WP1107	SOT23-6	WAYON EFUSES EVM V1.0 SOT23-6_WP1107

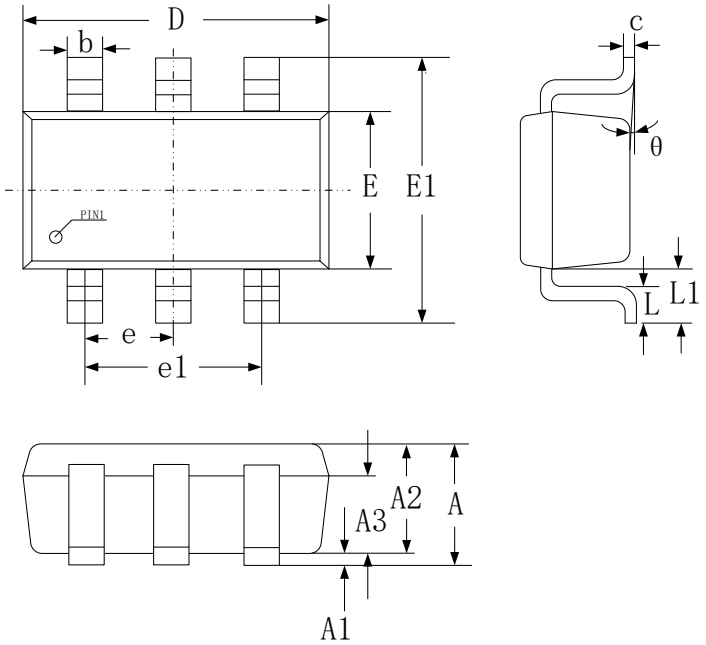
17. Naming Conventions

WP AB CC- DD EEE F

- **WP:** WAYON Protection IC;
- **A:** Product Category –1: E-fuse;
- **B:** Current limiting – 1: <2A;
- **CC:** Serial number;
- **DD:** AD-Adjustable current limit;
- **EEE:** Package – A60: SOT23-6;
- **F:** R-Reel & T-tube;

18. Package Information

SOT23-6



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	-	-	1.25
A1	0.00	-	0.15
A2	1.00	1.10	1.20
A3	0.575	0.65	0.725
b	0.325	-	0.5
c	0.1	-	0.2
D	2.82	2.92	3.02
E	1.50	1.60	1.70
E1	2.60	2.80	3.00
e	0.925	0.95	0.975
e1	1.90 BSC		
L1	0.59 REF		
L	0.35	0.45	0.60
θ	0°		8°

19. Ordering Information

PART NUMBER	PACKAGE	PACKING QUANTITY	MARKING*
WP1107-ADA60R	SOT23-6	3k/Reel	WP1107 AD XXXX

* XXXX is variable.

Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201207
Tel: 86-21-50310888 Fax: 86-21-50757680 Email: market@way-on.com
WAYON website: http://www.way-on.com
For additional information, please contact your local Sales Representative.
WAYON® is registered trademark of Wayon Corporation.

Product Specification Statement

1.The product specification aims to provide users with a reference regarding various product parameters, performance, and usage. It presents certain aspects of the product's performance in graphical form and is intended solely for users to select product and make product comparisons, enabling users to better understand and evaluate the characteristics and advantages of the product. It does not constitute any commitment, warranty, or guarantee.

2.The product parameters described in the product specification are numerical values, characteristics, and functions obtained through actual testing or theoretical calculations of the product in an independent or ideal state. Due to the complexity of product applications and variations in test conditions and equipment, there may be slight fluctuations in parameter test values. WAYON shall not guarantee that the actual performance of the product when installed in the customer's system or equipment will be entirely consistent with the product specification, especially concerning dynamic parameters. It is recommended that users consult with professionals for product selection and system design. Users should also thoroughly validate and assess whether the actual parameters and performance when installed in their respective systems or equipment meet their requirements or expectations. Additionally, users should exercise caution in verifying product compatibility issues, and WAYON assumes no responsibility for the application of the product.

3.WAYON strives to provide accurate and up-to-date information to the best of our ability. However, due to technical, human, or other reasons, WAYON cannot guarantee that the information provided in the product specification is entirely accurate and error-free. WAYON shall not be held responsible for any losses or damages resulting from the use or reliance on any information in these product specifications. WAYON reserves the right to revise or update the product specification and the products at any time without prior notice, and the user's continued use of the product specification is considered an acceptance of these revisions and updates. Prior to purchasing and using the product, users should verify the above information with WAYON to ensure that the product specification is the most current, effective, and complete. If users are particularly concerned about product parameters, please consult WAYON in detail or request relevant product test reports. Any data not explicitly mentioned in the product specification shall be subject to separate agreement.

4.Users are advised to pay attention to the parameter limit values specified in the product specification and maintain a certain margin in design or application to ensure that the product does not exceed the parameter limit values defined in the product specification. This precaution should be taken to avoid exceeding one or more of the limit values, which may result in permanent irreversible damage to the product, ultimately affecting the quality and reliability of the system or equipment.

5.The design of the product is intended to meet civilian needs and is not guaranteed for use in harsh environments or precision equipment. It is not recommended for use in systems or equipment such as medical devices, aircraft, nuclear power, and similar systems, where failures in these systems or equipment could reasonably be expected to result in personal injury. WAYON shall assume no responsibility for any consequences resulting from such usage.

6.Users should also comply with relevant laws, regulations, policies, and standards when using the product specification. Users are responsible for the risks and liabilities arising from the use of the product specification and must ensure that it is not used for illegal purposes. Additionally, users should respect the intellectual property rights related to the product specification and refrain from infringing upon any third-party legal rights. WAYON shall assume no responsibility for any disputes or controversies arising from the above-mentioned issues in any form.