1.General Description

The WP111X is an integrated circuit optimized to protect low voltage system from abnormal high input voltage (up to 30V). The IC monitors the input voltage, battery voltage and the charging current to make sure three parameters are in the normal range. In case of an input overvoltage condition, the IC immediately removes power from the charging circuit by turning off an internal switch. In the case of an overcurrent condition, it limits the system current at the threshold value, and if the overcurrent persists, switches the pass element OFF after a blanking period. The input overcurrent threshold is user-programmable. Additionally, the IC also monitors its own die temperature and switches off if it becomes too hot.

The IC can be controlled by a processor and also provides status information about fault conditions to the host.

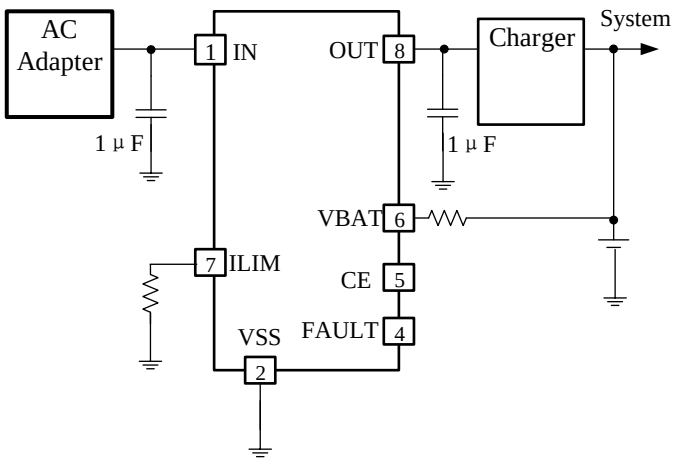
2. Features

- Input Overvoltage, With Rapid Response in <1μs
- Input Overvoltage Threshold 4.95/5.85/6.3/6.8V
- Output Voltage Clamp 4.35/5.3/5.6/6.25V
- User-Programmable Overcurrent With Current Limiting
- Battery Overvoltage
- 30V Maximum Input Voltage
- Support up to 1.5A Input Current
- Robust Against False Triggering Due to Current Transients
- Thermal Shutdown
- Enable Input
- Status Indication – Fault Condition
- Available in Space-Saving Small 8-Pin 2×2 DFN Packages
- RoHS Compliant and Halogen Free

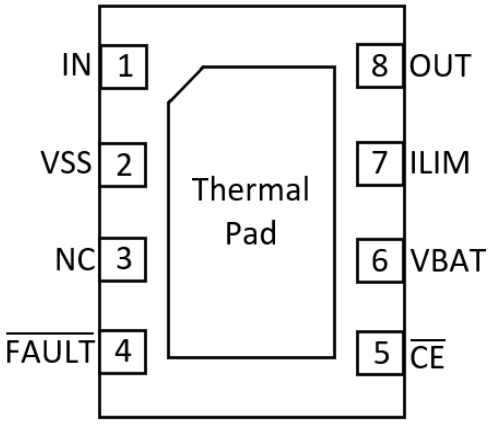
3. Applications

- Smart Phones
- Tablets
- Handheld Devices

4. Typical Application



5. Pin Configuration



DFN2*2-8

6.Pin Description

PIN NAME	PIN NUMBER	I/O	PIN FUNCTIONS
IN	1	I	Input power, connect to external DC supply. Connect external 1-μF ceramic capacitor (minimum) to VSS.
VSS	2	—	Ground terminal
NC	3	—	These pins may have internal circuits used for test purposes. Do not make any external connections at these pins for normal operation.
$\overline{\text{FAULT}}$	4	O	Open-drain output, device status. $\overline{\text{FAULT}}$ = Low indicates that the input FET Q1 has been turned off due to input overvoltage, input overcurrent, battery overvoltage, or thermal shutdown.
$\overline{\text{CE}}$	5	I	Chip enable input. Active low. When $\overline{\text{CE}}$ = High, the input FET is off. Internally pulled down.
VBAT	6	I	Battery voltage sense input. Connect to pack positive terminal through a resistor.
ILIM	7	I/O	Input overcurrent threshold programming. Connect a resistor to VSS to set the overcurrent threshold.
OUT	8	O	Output terminal to the charging system. Connect external 1-μF ceramic capacitor (minimum) to VSS.
Thermal PAD	—	—	There is an internal electrical connection between the exposed thermal pad and the VSS pin of the device. The thermal pad must be connected to the same potential as the VSS pin on the printed-circuit board. Do not use the thermal pad as the primary ground input for the device. The VSS pin must be connected to ground at all times.

7. Different product information

Model	VOVP	VOUT_CLAMP
WP1111	5.85	\
WP1112	6.8	6.25
WP1113	6.3	6.25
WP1114	4.95	\
WP1115	4.95	4.35
WP1116	6.3	5.6
WP1117	5.85	5.3

8. Absolute Maximum Ratings

PARAMETER	Rating	UNIT
IN Voltage	-0.3 to 32	V
OUT Voltage	-0.3 to 7	V
ILIM, $\overline{FAULT}$, $\overline{CE}$, VBAT	-0.3 to 7	V
IN Current	2(MAX)	A
OUT Current	2(MAX)	A
$\overline{FAULT}$ Current	15(MAX)	mA
Operating Temperature	-40 to 150	°C
Storage Temperature	-65 to 150	°C

NOTE: 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.

9. ESD Ratings—JEDEC Specification

PARAMETER		Rating	UNIT
Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001-2017	±8000	V
	Charged device model(CDM), per ANSI/ESDA/JEDEC JS-002-2018	±2000	V
	Latch-up model, per JEDEC JESD78F-2022	±800	mA

10. Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Input voltage	3.3	26	V
I_{IN}	Input current, IN pin		1.5	A
I_{OUT}	Output current, OUT pin		1.5	A
R_{ILIM}	OCP programming resistor	15	90	kΩ
T_J	Junction temperature	-40	125	°C
T_A	Ambient temperature	-40	85	°C

11. Electrical Characteristics

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

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
IN							
V_{UVLO}	Under voltage lockout Threshold	$\overline{CE}$ = Low, V_{IN} increasing from 0V to 3V		2.6	2.7	2.8	V
		$\overline{CE}$= Low, V_{IN} decreasing from 3V to 0V		2.3	2.44	2.6	V
$V_{HYS-UVLO}$	Hysteresis on V_{UVLO}			200	260	300	mV
$T_{DGL(PGOOD)}$	Deglitch time, input power detected status	$\overline{CE}$= Low, Time measured from V_{IN} 0V→3.3V or 5V, 1-µs rise-time, to output turning ON			8		ms
I_{DD}	Operating current	$\overline{CE}$= Low, No load on OUT pin, V_{IN} = 3.3V or 5V, R_{ILIM} = 25 kΩ			400	600	µA
I_{STDBY}	Standby current	$\overline{CE}$= High, V_{IN} =3.3V or 5V			65	95	µA
INPUT TO OUTPUT CHARACTERISTICS							
V_{DO}	Drop-out voltage IN to OUT	$\overline{CE}$= Low, V_{IN} = 3.3V or 5V, I_{OUT} = 1A			170	280	mV
$R_{DS(ON)}$	Switch On-resistance	$\overline{CE}$== Low, V_{IN} = 3.3V or 5V, I_{OUT} = 1A			170	280	mΩ
INPUT OVERVOLTAGE PROTECTION							
V_{OVP}	Input overvoltage protection threshold	$\overline{CE}$= Low, V_{IN} increasing from 4.5V to 7.5V	WP1111	5.71	5.85	6	V
			WP1112	6.6	6.8	7	V
			WP1113	6.05	6.3	6.45	V
			WP1114	4.8	4.95	5.1	V
			WP1115	4.8	4.95	5.1	V
			WP1116	6.05	6.3	6.45	V
			WP1117	5.71	5.85	6	V

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
$V_{HYS-OVP}$	Hysteresis on OVP	$\overline{CE}$= Low, VIN decreasing from 7.5V to 4.5V		25	60	110	mV
OUTPUT CLAMP							
		$\overline{CE}$= Low, V_{OUT_CLAMP} <V_{IN}< V_{OVP}, measure V_{OUT}	WP1112		6.25		V
			WP1113		6.25		V
			WP1115		4.35		V
			WP1116		5.6		V
			WP1117		5.3		V
INPUT OVERCURRENT PROTECTION							
I_{OCP}	Input overcurrent protection threshold range(1)			300		1500	mA
I_{OCP}	Input overcurrent protection threshold	$\overline{CE}$= Low, R_{ILIM} = 25 kΩ		930	1000	1070	mA
BATTERY OVERVOLTAGE PROTECTION							
BV_{OVP}	Battery overvoltage protection threshold	$\overline{CE}$= Low, VIN > 4.4 V		4.3	4.35	4.4	V
$V_{HYS-BOVP}$	Hysteresis on BV_{OVP}	$\overline{CE}$= Low, VIN > 4.4 V		200	275	320	mV
I_{VBAT}	Input bias current on VBAT pin	V_{BAT} = 4.4 V, T_J = 25°C				10	nA
THERMAL PROTECTION							
$T_{J(OFF)}$	Thermal shutdown temperature				140	150	°C
$T_{J(OFF-HYS)}$	Thermal shutdown hysteresis				20		°C
LOGIC LEVELS ON $\overline{CE}$							
V_{IL}	Low-level input voltage					0.4	V
V_{IH}	High-level input voltage			1.4			V

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
I_{IL}	Low-level input current	V_{CE} = 0 V			1	μA
I_{IH}	High-level input current	V_{CE} = 1.8 V			15	μA
LOGIC LEVELS ON $\overline{\text{FAULT}}$						
V_{OL}	Output low voltage	I_{SINK} = 5 mA			0.2	V
I_{HI-Z}	Leakage current, $\overline{\text{FAULT}}$ pin HI-Z	V_{FAULT} = 5 V			10	μA

12. Timing Requirements

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
IN						
$t_{DGL(PGOOD)}$	Deglitch time, input power detected status	$\overline{CE}$= Low, Time measured from V_{IN} 0 V→5 V, 1-μs rise-time, to output turning ON		8		ms
INPUT OVERVOLTAGE PROTECTION						
$t_{PD(OVP)}$	Input OV propagation delay(2)	$\overline{CE}$= Low			1	μs
$t_{ON(OVP)}$	Recovery time from input overvoltage condition	$\overline{CE}$= Low, Time measured from V_{IN} 7.5V→4.5 V, 1-μs fall-time		8		ms
INPUT OVERCURRENT PROTECTION						
$t_{BLANK(OCP)}$	Blanking time, input overcurrent detected			176		μs
$t_{REC(OCP)}$	Recovery time from input overcurrent condition			64		ms
BATTERY OVERVOLTAGE PROTECTION						
$t_{DGL(BOVP)}$	Deglitch time, battery overvoltage detected	$\overline{CE}$= Low, V_{IN} > 4.4 V. Time measured from V_{VBAT} rising from 4.1 V to 4.4 V to $\overline{FAULT}$ going low.		176		μs

NOTE:

(1): The overcurrent threshold is programmed by a resistor R_{ILIM} connected from the ILIM pin to VSS.

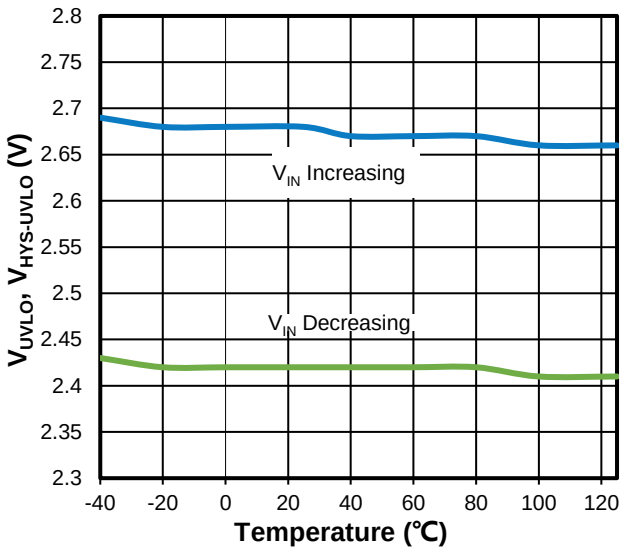
$I_{OCP}(A)=25000\div R_{ILIM}(\Omega)$

The minimum overcurrent threshold is 0.3A. Overcurrent threshold beyond 1.5A is not recommended. When R_{ILIM}=25 kΩ, the overcurrent threshold is 0.93A～1.07A.

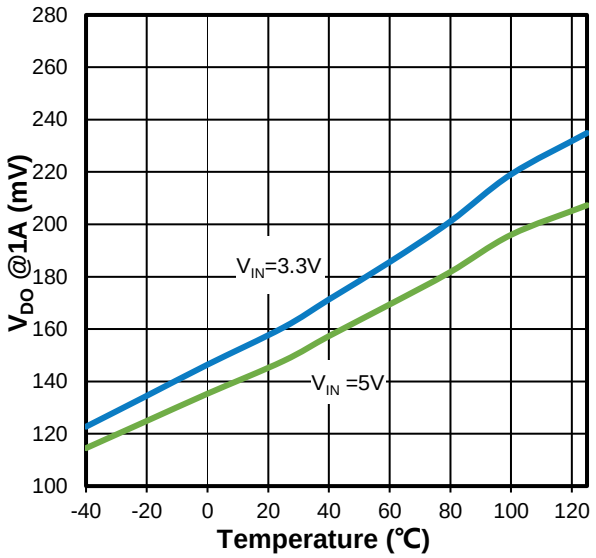
(2): Not tested in production. Specified by design.

13. Typical Performance Characteristics

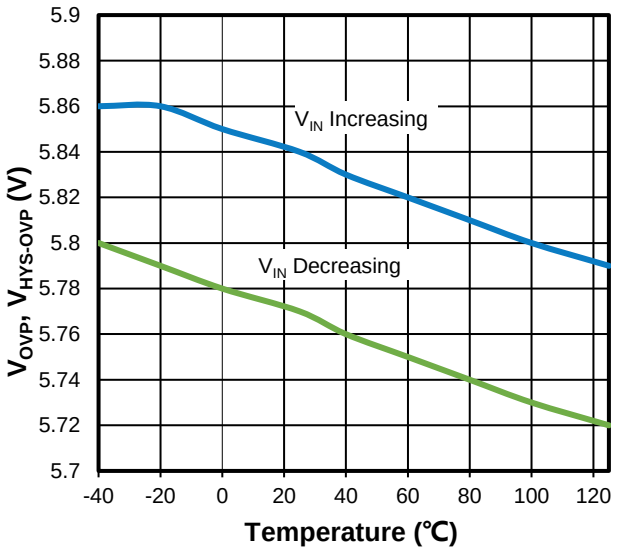
(Test conditions (unless otherwise noted) for typical operating performance: V_{IN} = 5 V, C_{IN} = 1 µF, C_{OUT} = 1 µF, R_{ILIM} = 25 kΩ, R_{BAT} = 100 kΩ, T_A = 25°C, V_{PU} = 3.3 V)



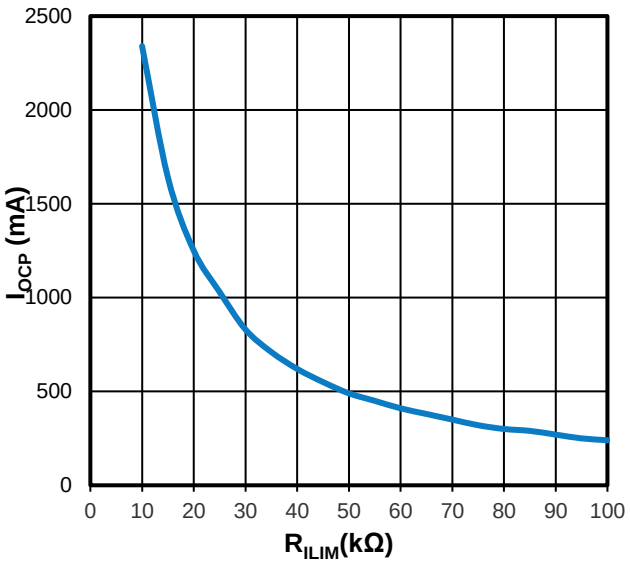
Undervoltage Lockout vs Free-Air Temperature



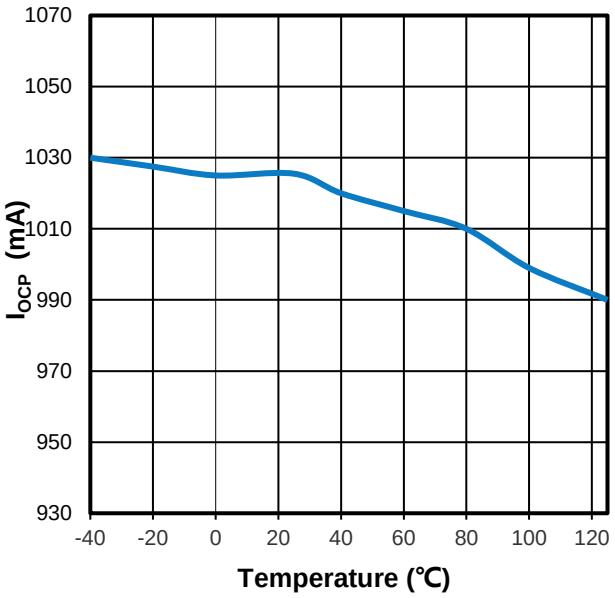
Dropout Voltage (IN to OUT) vs Free-Air Temperature



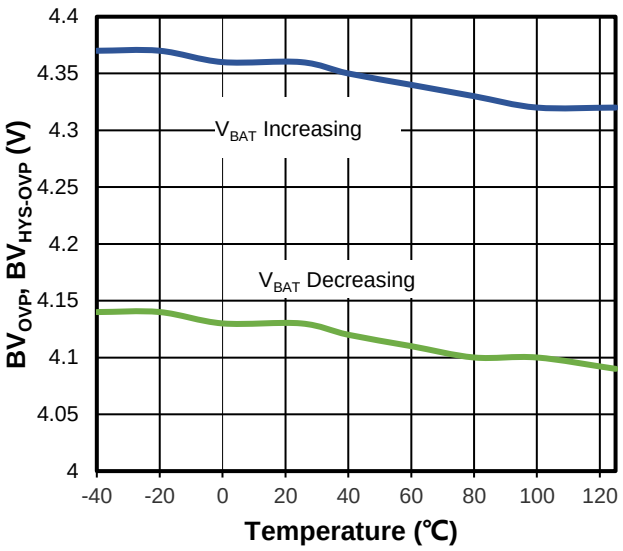
Overvoltage Threshold Protection（WP1111）vs Free-Air Temperature



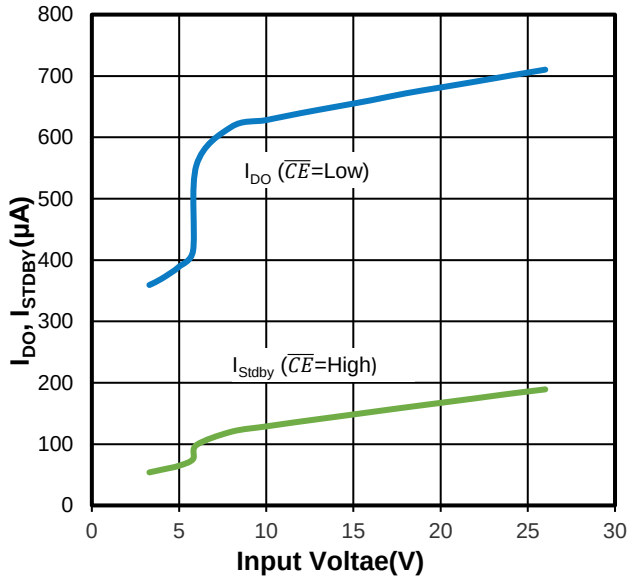
Input Overcurrent Protection vs ILIM Resistance



Input Overcurrent Protection vs Free-Air Temperature

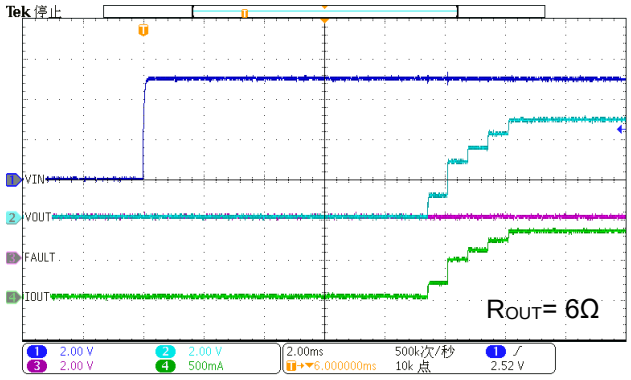


Battery Overvoltage Protection vs Free-Air Temperature

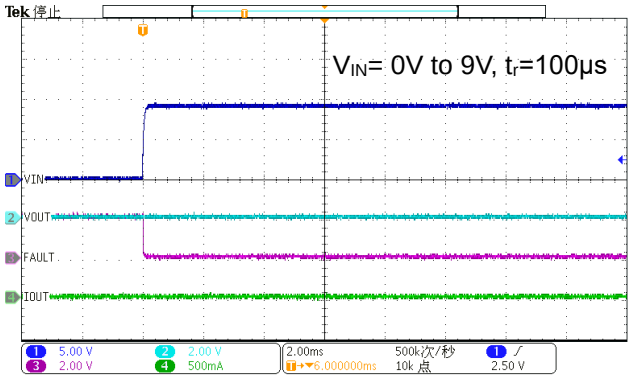


Supply Current vs Input Voltage

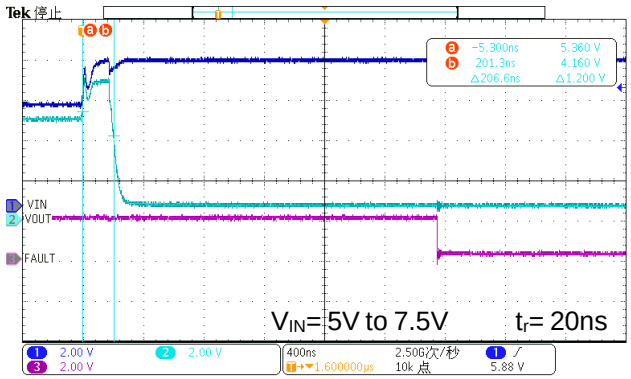
14. Application Curves



Normal Power-On Showing Soft-Start

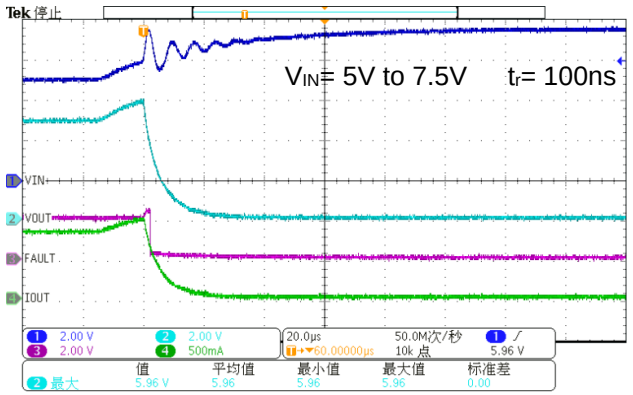


OVP at Power-On

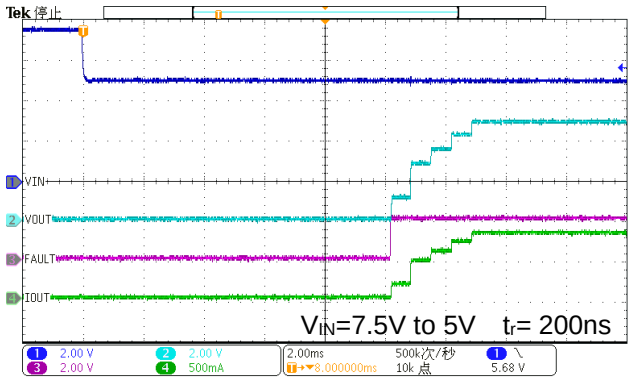


WP1111 OVP Response for Input Step

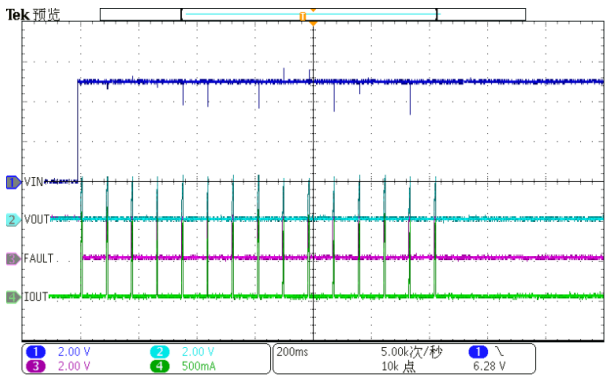
No capacitance, No load



WP1111 OVP Response for Input Step

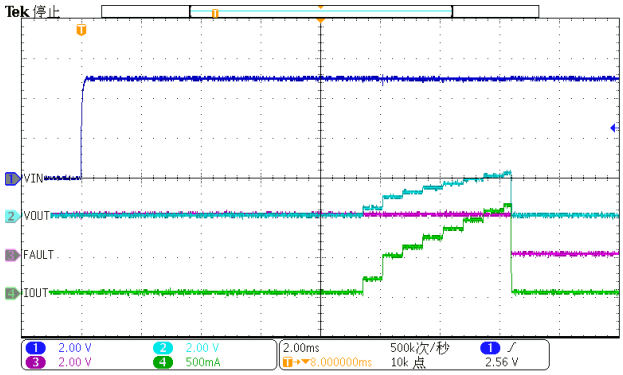


Recovery from OVP

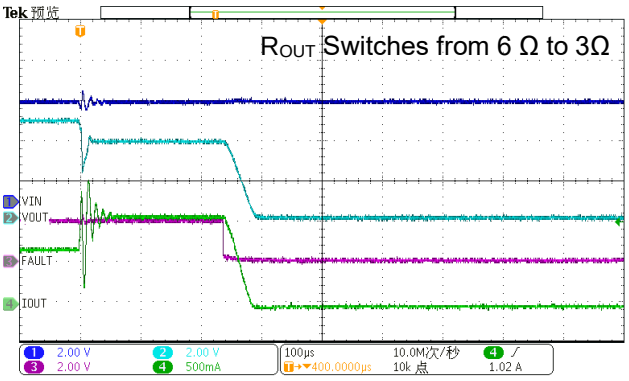


OCP, Powering Up into a Short Circuit on OUT Pin

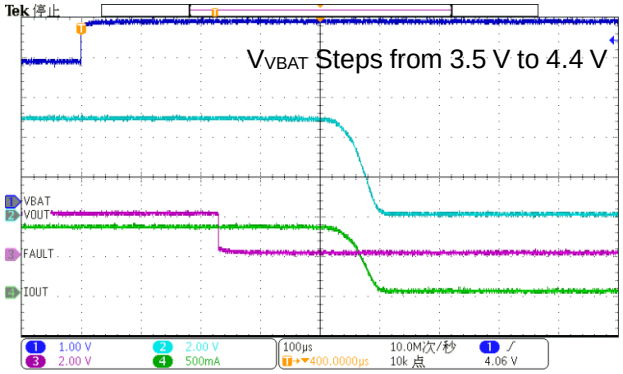
OCP, Counter Counts to 15 Before Switching



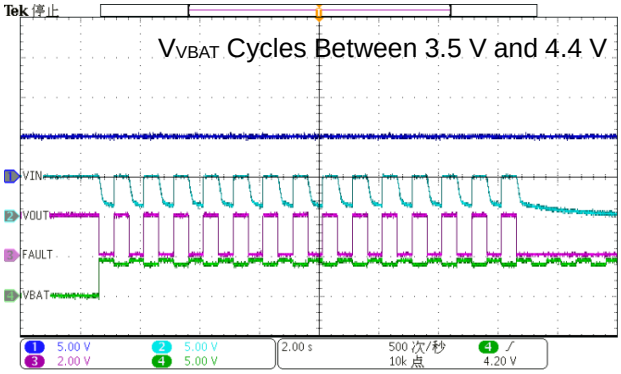
OCP, Zoom-in



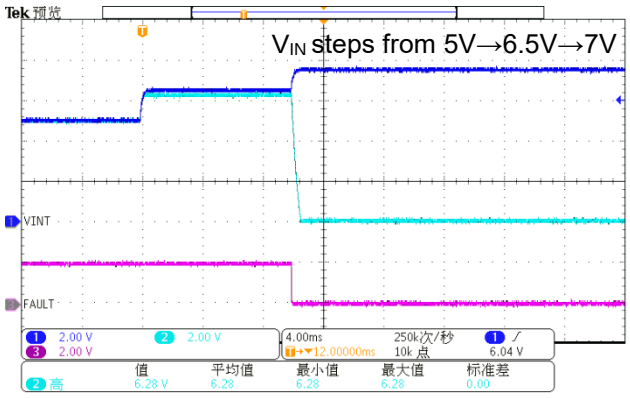
OCP, Shows Current Limiting and Soft-Stop



BAT-OVP, Shows $t_{DGL(BAT-OVP)}$ and Soft-Stop



BAT-OVP, Shows BAT-OVP Counter



WP1112 V_{OUT_CLAMP}, Shows V_{OUT_CLAMP} and OVP

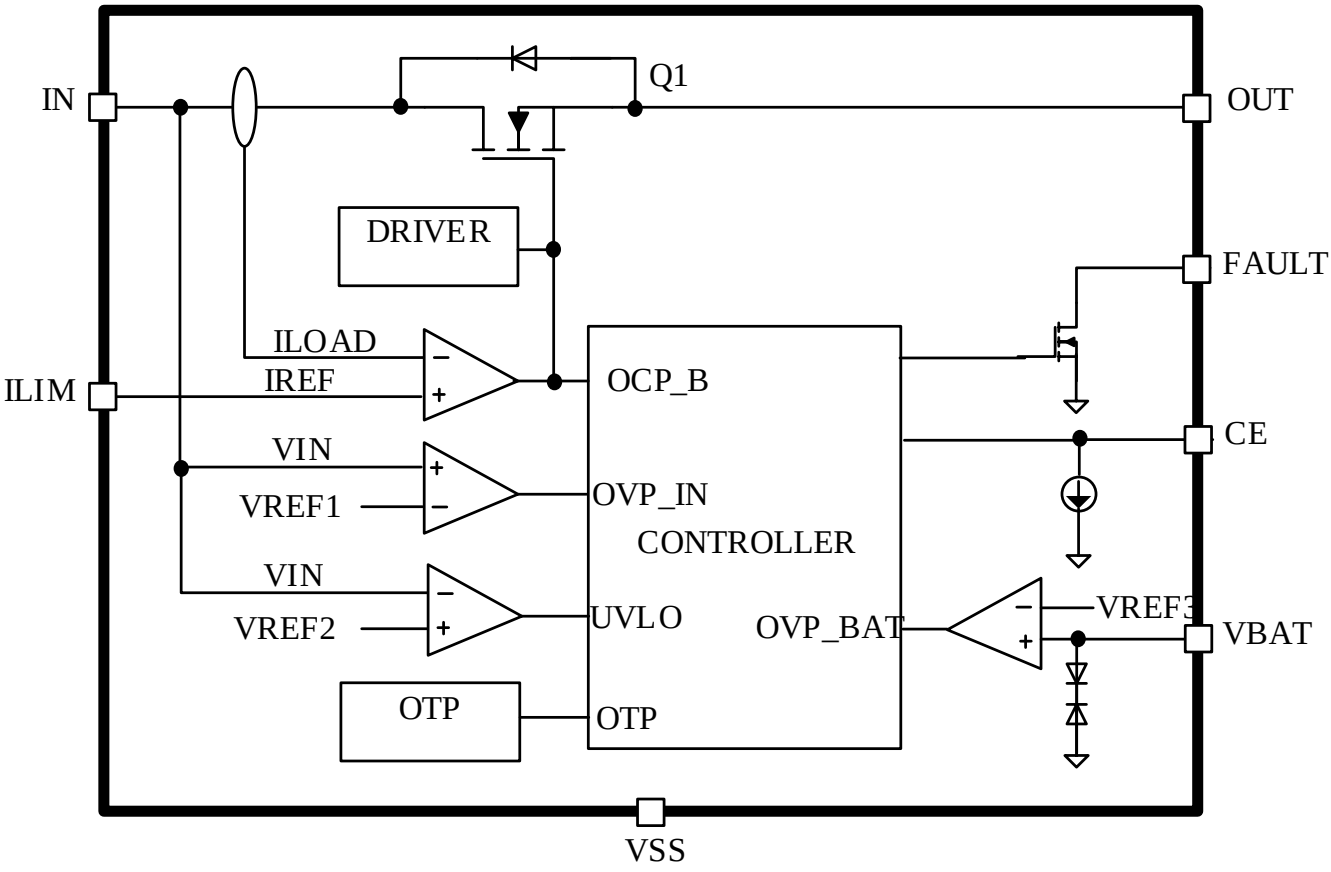
15.Function Description

15.1 Overview

The WP111X devices monitor the input voltage, input current, and the battery voltage to protect the charging system of a Li-Ion battery. The protection features can be enabled through the $\overline{CE}$ pin.

When enabled, the system is protected against input overvoltage by turning off an internal switch, immediately removing power from the charging circuit. The system is protected against an overcurrent condition by limiting the input current to a safe value for a blanking duration before disconnecting the input from the output by turning the switch off. The overcurrent threshold is user-programmable. Additionally, the device also monitors its own die temperature and switches off if it becomes too hot.

15.2 Block Diagram



15.3 Feature Description

15.3.1 Power Up Enable Control

The WP111X offers an enable ($\overline{CE}$) input. When the $\overline{CE}$ pin is pulled to logic high (>1.4V), the WP111X will be shut down. When the $\overline{CE}$ pin is pulled to logic low (<0.4V), the WP111X will be powered on. The $\overline{CE}$ pin has an internal pull-down resistor. Leaving the $\overline{CE}$ pin floating can enable the IC.

15.3.2 Warning Indication Output

The $\overline{\text{FAULT}}$ pin is an open-drain output that indicates a LOW signal when any protection event occurs (Input OVP, Output OCP and Battery OVP). When the protection events are released and then the $\overline{\text{FAULT}}$ pin indicates a HIGH signal.

15.3.3 Over Temperature Protection (OTP)

The WP111X monitors its own internal temperature to prevent thermal failures. The chip turns off the MOSFET when the internal temperature reaches 140°C. The IC will resume after the internal temperature is cooled down 20°C.

15.3.4 Input Over Voltage Protection

The WP111X monitors input voltage to prevent the input voltage lead to output system failures. The WP111X input OVP threshold is set by the internal resistor. When the input voltage exceeds the threshold, the WP111X outputs a logic signal to turn off the internal MOSFET within 1us to prevent the high input voltage from damaging the electronics in the handheld system. The hysteresis of the input OVP threshold is 60mV. When the input voltage returns to normal operation voltage rage, the WP111X re-enables the MOSFET.

15.3.5 Output Clamp Voltage

The voltage clamp for WP1111 and WP1114 is greater than the overvoltage threshold, and the clamp is not working. The voltage clamp for WP1112, WP1113,WP1115,WP1116 and WP1117 are lower than the overvoltage threshold.When the input voltage is higher than the clamp voltage and less than the overvoltage threshold, the output voltage is equal to the clamp voltage.

15.3.6 Battery Over Voltage Protection

The battery OVP threshold voltage is set at 4.35V in typical and the WP111X has a built-in 176us blanking time to prevent any transient voltage from triggering the battery OVP. If the OVP situation still exists after 176us, the internal MOSFET will be turned off and the $\overline{\text{FAULT}}$ pin indicates a LOW signal. The battery OVP threshold has a 275mV built-in hysteresis. The control logic contains a 4-bit binary counter. If the battery over voltage event occurs for consecutive 15 times, the MOSFET will be turned off permanently unless the input power or the enable pin is reset.

15.3.7 Over Current Protection (OCP)

The WP111X monitors the output current to prevent the output short or the charging of the battery with an excessive current. The OCP (Over Current protection) threshold can be set by the ILIM pin.

The WP111X has a built-in 176us delay time to prevent any transient noise from triggering the OCP. If the OCP situation exists for 176us, the internal MOSFET will be turned off and the $\overline{\text{FAULT}}$ pin indicates a LOW signal. When the OCP happens for consecutive 15 times, the internal MOSFET will be turned off permanently unless the input power is recycled or the enable pin is toggled.

The OCP threshold can be set by the resistor connected between the ILIM pin and GND. The OCP threshold can be calculated by the following equation :

$$I_{OCP}(A)=25000\div R_{ILIM}(\Omega)$$

15.3.8 Thermal Considerations

Thermal protection limits power dissipation in WP111X. When the operation junction temperature exceeds 140°C, the OTP circuit starts the thermal shutdown function and turns the pass element off. The pass elements turn on again after the junction temperature cools by 20°C.

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junction to ambient. The maximum power dissipation can be calculated by following formula.

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Where $T_{J(MAX)}$ is the maximum operation junction temperature, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

For recommended operating conditions specification of WP111X, the maximum operating junction temperature is 125°C. The junction to ambient thermal resistance θ_{JA} for DFN-8L 2x2 package is 165°C/W on the standard JEDEC51-3 single-layer thermal test board. The maximum power dissipation at T_A =25°C can be calculated by following formula.

$$P_{D(MAX)} = (125°C - 25°C) / (165°C/W) = 0.606W \text{ for DFN-8L 2x2 packages}$$

16. Application and Implementation

16.1 Application Information

16.1.1 Selection of RVB

The WP111X monitors the battery voltage by the VBAT pin. The WP111X will be turned off when the battery voltage exceeds the 4.35V battery OVP threshold. The VBAT pin is connected to the battery pack positive terminal via an isolation resistor (VBAT) and the resistor is an important component. The R_{BAT} determines some parameters such as battery OVP threshold error and VBAT pin leakage current. Generally, it is necessary to decrease the R_{BAT} for reducing the battery OVP threshold error. However, this will increase the VBAT pin leakage current. So, it is an important issue to get a trade-off between the battery OVP threshold error and the VBAT pin leakage current. The resistance of 200kΩ to 1MΩ is allowed for VBAT.

16.1.2 Selection of RCE, RFAULT, and RPU

The $\overline{CE}$ pin can be used to enable and disable the IC. If host control is not required, the $\overline{CE}$ pin can be tied toground or left unconnected, permanently enabling the device. In applications where external control is required, the $\overline{CE}$ pin can be controlled by a host processor. As in the case of the VBAT pin, the $\overline{CE}$ pin must be connected to the host GPIO pin through as large a resistor aspossible. The limitation on the resistor value is that the minimum V_{OH} of the host GPIO pin less the drop across the resistor must be greater than V_{IH} of the WP111X $\overline{CE}$ pin. The drop across the resistor is given by $R_{CE} \times I_{IH}$. The $\overline{FAULT}$ pin is an open-drain output that goes low during OV, OC, battery-OV, and OT events.

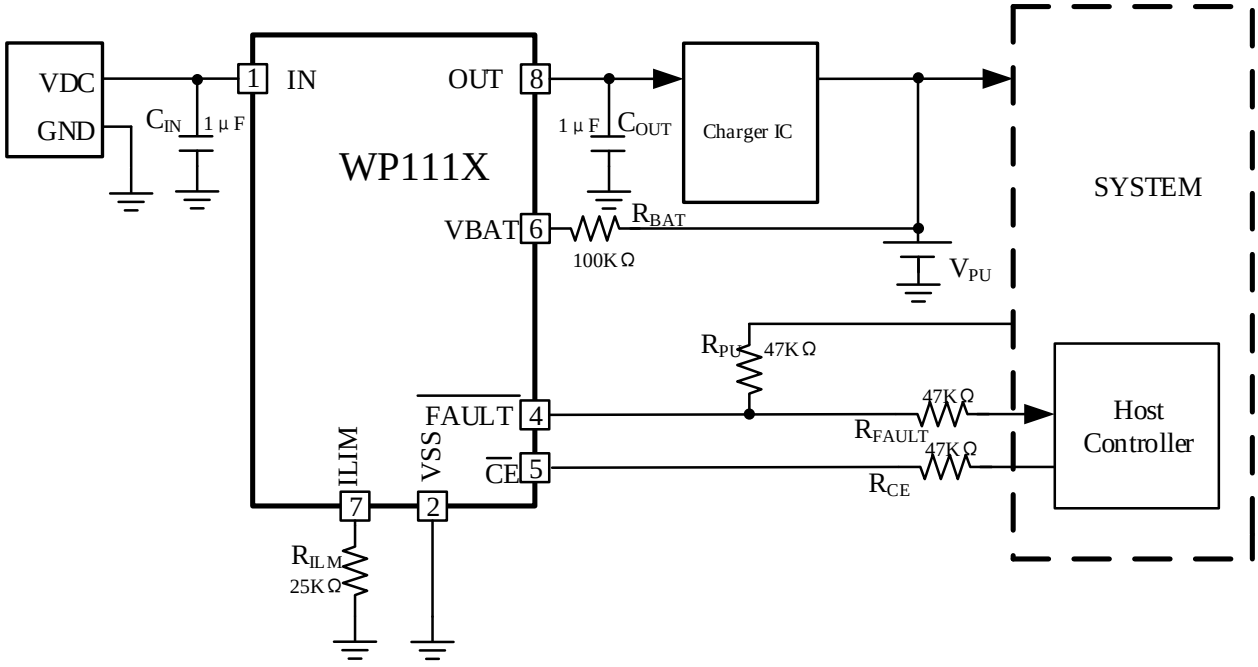
If the application does not require monitoring of the $\overline{FAULT}$ pin, it can be left unconnected. But if the $\overline{FAULT}$ pin has tobe monitored, it must be pulled high externally through R_{PU}, and connected to the host through $R_{\overline{FAULT}}$.

$R_{\overline{FAULT}}$ prevents damage to the host controller if the WP111X fails. The resistors should be of high value, in practice values between 22 kΩ and 100 kΩ should be sufficient.

16.1.3 Selecting Capacitors

To get the better performance of the WP111X, it is very important to select peripherally appropriate capacitors. These capacitors determine some parameters such as input inrush current and input over shoot voltage. Generally, it is necessary to increase the input capacitance C_{IN} for reducing the input over shoot voltage. However, this will increase the inrush current of input. There are two scenarios that can cause the input over shoot voltage. The first one is that when the AC adapter is hot-plugged and the second one is when the WP111X has a step-down change. The cable between the AC adapter output and the handheld system input has a parasitic inductance causing the input over shoot voltage. Generally, the input over shoot voltage range is 1.5 to 2 times of the input voltage. It is recommended to use 1μF capacitance for C_{IN} and C_{OUT} and the rated voltage should be higher than at 1.5 to 2 times of the operation voltage.

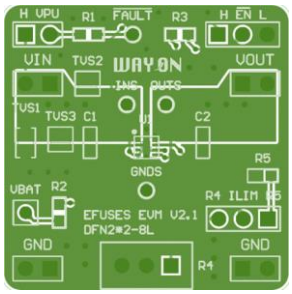
16.2 Typical Application



17. 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} and R_{BAT} should also be located close to the IC.

17.1 Layout Example



18. 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
WP111X	DFN2*2-8	WAYON EFUSES EVM V2.1 –DFN2×2-8L

19. Naming Conventions

WP AB CC-DDD E

WP: WAYON Protection IC

A: 1: E-fuse

B: Current limiting, 1: <1500mA

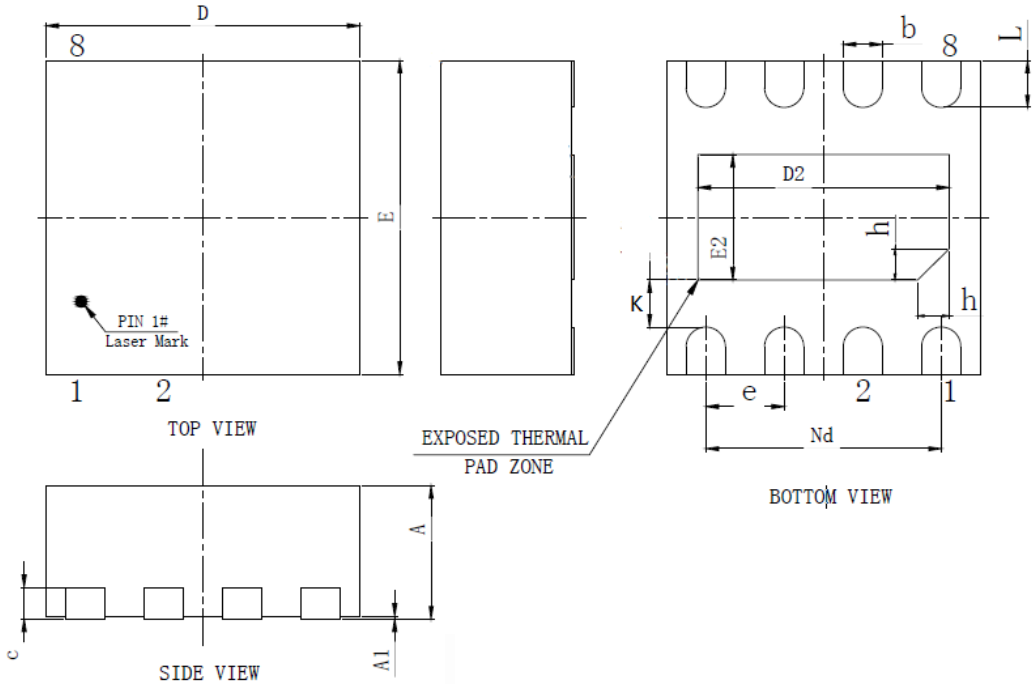
CC: Serial number

DDD: F28 – Package, DFN2*2-8

E: R-Reel & T-tube

20.Package Information

DFN2*2-8



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.20	0.25	0.30
c		0.203REF	
D	1.95	2.00	2.05
D2	1.55	1.60	1.605
e		0.50BSC	
Nd		1.50BSC	
E	1.95	2.00	2.05
E2	0.75	0.80	0.85
L	0.25	0.30	0.35
K	0.25	0.30	0.35
R		0.20 REF	

21.Ordering Information

Part Number	Package	Packing Quantity	Marking
WP1111-F28R	DFN2*2-8L	3k/Reel	WP1111 XXXX
WP1112-F28R	DFN2*2-8L	3k/Reel	WP1112 XXXX
WP1113-F28R	DFN2*2-8L	3k/Reel	WP1113 XXXX
WP1114-F28R	DFN2*2-8L	3k/Reel	WP1114 XXXX
WP1115-F28R	DFN2*2-8L	3k/Reel	WP1115 XXXX
WP1116-F28R	DFN2*2-8L	3k/Reel	WP1116 XXXX
WP1117-F28R	DFN2*2-8L	3k/Reel	WP1117 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.
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Product Specification Statement

- 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.
- 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.
- 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.
- 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.
- 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.
- 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.