WP1108

Over-Voltage Protection IC

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1.General Description

The WP1108 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 V_{IN} re-plug or $\overline{CE}$ reactive. The OCP current limit threshold is adjustable by an external R_{ILIM}.

The WP1108 is available in DFN2x2-8L. Standard products are Pb-free and Halogen-free.

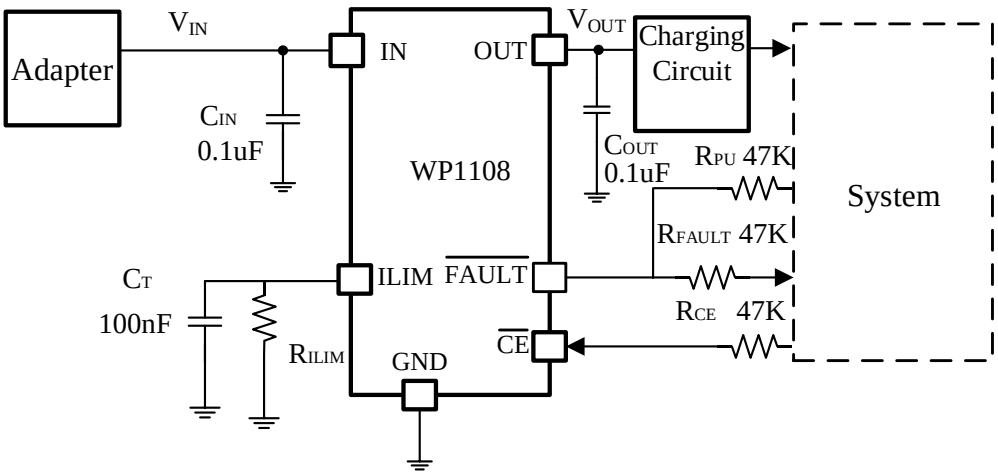
2. Features

- Maximum input voltage:32V
- OVP response time:50ns (Typ.)
- Fixed OVLO threshold voltage:6.0V, ±3%
- Adjustable over-current protection: 100mA-1.5A, ±10%
- Up to 1.5A Load Current
- Thermal Shutdown
- Fault flag output
- Available in Green DFN2x2-8L Package

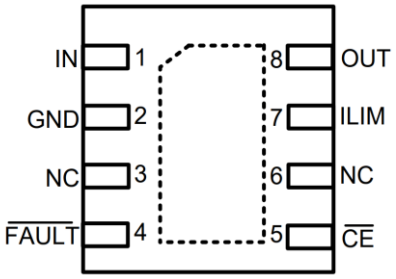
3. Applications

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

4. Typical Application



5. Pin Configuration



DFN2×2-8L

6.Pin Description

PIN NAME	PIN NUMBER	I/O	PIN FUNCTION
IN	1	I	Switch input.
GND	2	-	Ground.
NC	3,6	-	No connect.
$\overline{\text{FAULT}}$	4	O	Open-drain Device Status Output. $\overline{\text{FAULT}}$ is pulled to GND with a 3kΩ resistant internally when the input pass FET has been turned off due to OVP, OCP, OTP or UVLO. $\overline{\text{FAULT}}$ is high impedance during normal operation.
$\overline{\text{CE}}$	5	I	Enable Input, Active Low. $\overline{\text{CE}}$ is internally pulled down.
ILIM	7	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. Can't be floated.
OUT	8	O	Switch output.
Thermal PAD		-	Connect to GND

7. Absolute Maximum Ratings [1]

T_A=25℃, unless otherwise noted.

SYMBOL	PARAMETER	RATING	UNIT
V_{IN}	IN Voltage	-0.3 to 32	V
V_{OUT}	OUT Voltage	-0.3 to 6.0	V
$T_{J(MAX)}$	Junction Temperature	150	℃
T_{STG}	Storage Temperature	-65 to 150	℃
T_{SDR}	Soldering Temperature (Reflow)	260	℃
V_{ESD}	Human-Body Model, Per JESD22-A114(All pins)	±4000	V

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}	Output Current		1.2	A
T_A	Operating Ambient Temperature	-40	85	℃

9. Electrical Characteristics

(V_{IN}=5 V, C_{IN}=0.1μF, C_{OUT}=0.1μF, T_A=25℃, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
I_Q	Quiescent Current	V_{IN}=5V, $\overline{CE}$=GND, OUT floating		110		μA
I_{Q_OVP}	Over voltage quiescent current	V_{IN}=30V, $\overline{CE}$=GND, OUT floating		200		μA
I_{SHDN}	Shutdown Quiescent Current	V_{IN}=5.5V, V_{CE}=5.5V, OUT floating		50		μA
V_{DROP}	Drop Voltage from IN to OUT	V_{IN}=5V, I_{OUT}=0.5A		110	140	mV
t_{OVP} [1]	OVP response time	V_{IN} rising, C_{IN}=C_L=0pF		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}>V_{UVLO} to V_{OUT}=V_{IN}×10%		18		ms
t_{ON}	Turn On Time	V_{OUT}=V_{IN}×10% to V_{OUT}=V_{IN}×90%		20		μs
R_{DIS}	Output discharge resistance	V_{IN}=5V		400		Ω
T_{SD}	Thermal Shutdown	V_{IN}=5V		150		℃
ΔT_{SD}	Thermal Shutdown Hysteresis	V_{IN}=5V		20		℃

Note 2: Guaranteed by characterization testing and design.

Note 3: Limits over full temperature are guaranteed by design, but not tested in production.

10. Typical Performance Characteristics

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

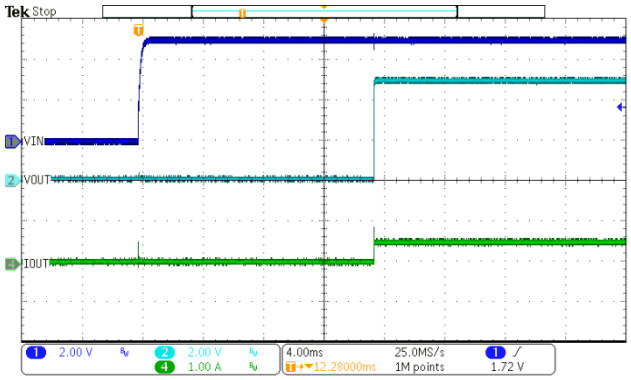


Figure 1. Power on Response
(R_{OUT}=10Ω, R_{ILIM}=1kΩ)

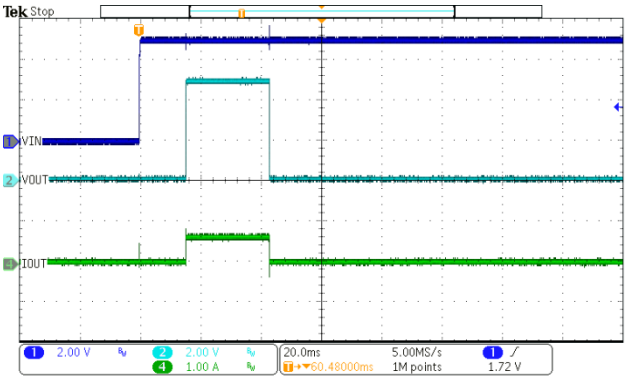


Figure 2. Power on OCP Response
(R_{OUT}=8Ω, R_{ILIM}=1kΩ)

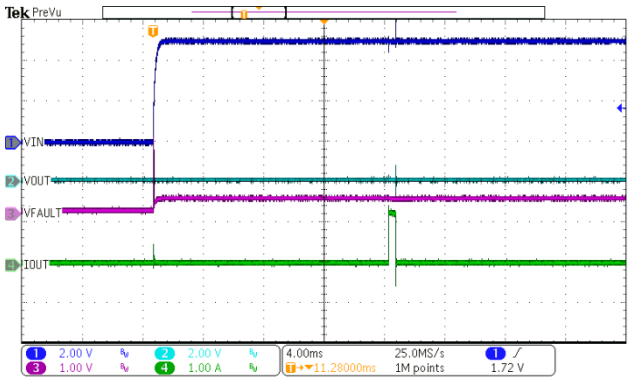


Figure 3. Power on Response with Output Short

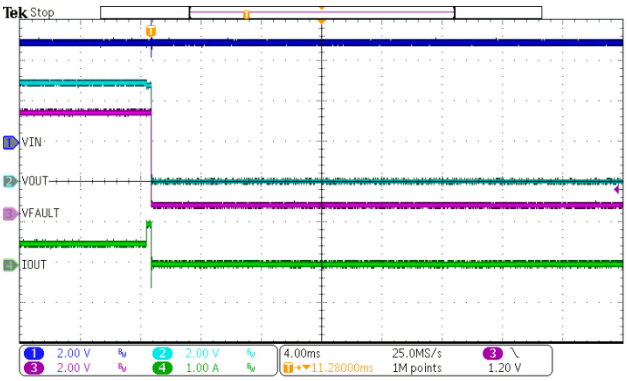


Figure 4. OCP Response

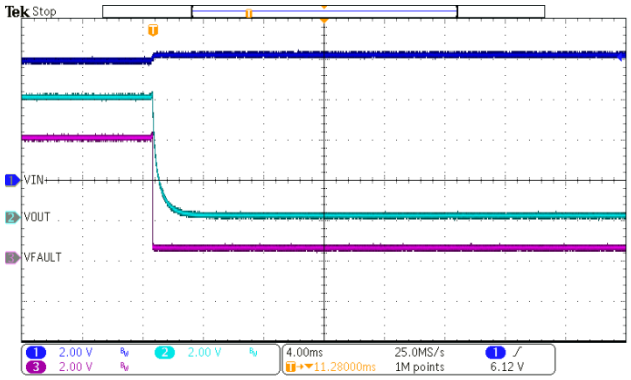


Figure 5. OVP Response

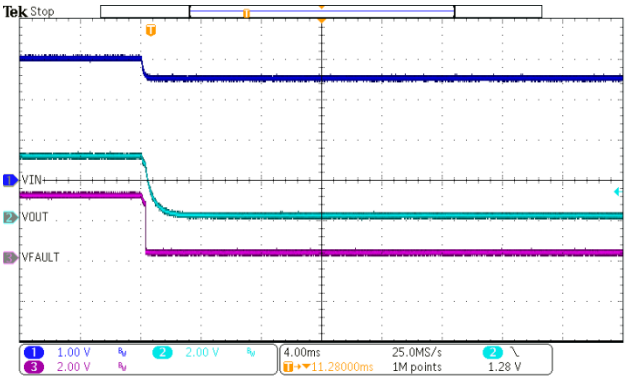


Figure 6. UVLO Response

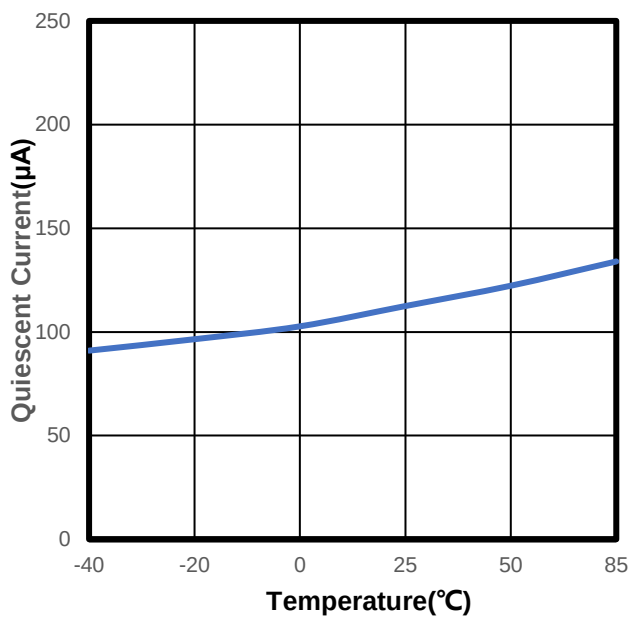


Figure 7. Quiescent Current vs. Ambient Temperature

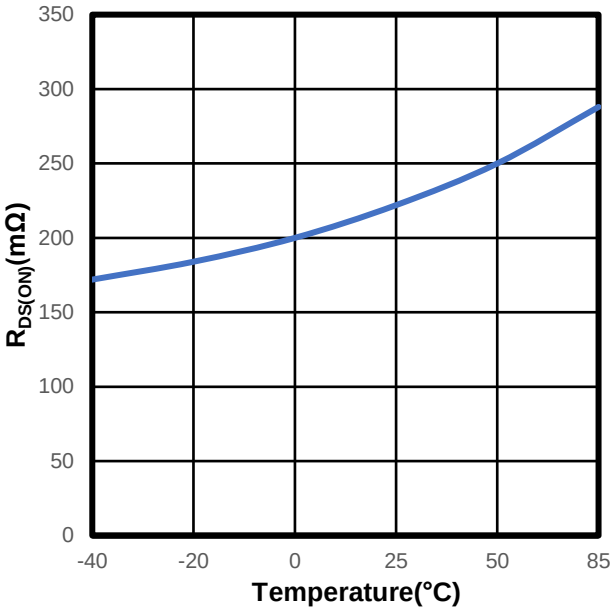


Figure 8. Switch On-Resistance vs. Ambient Temperature

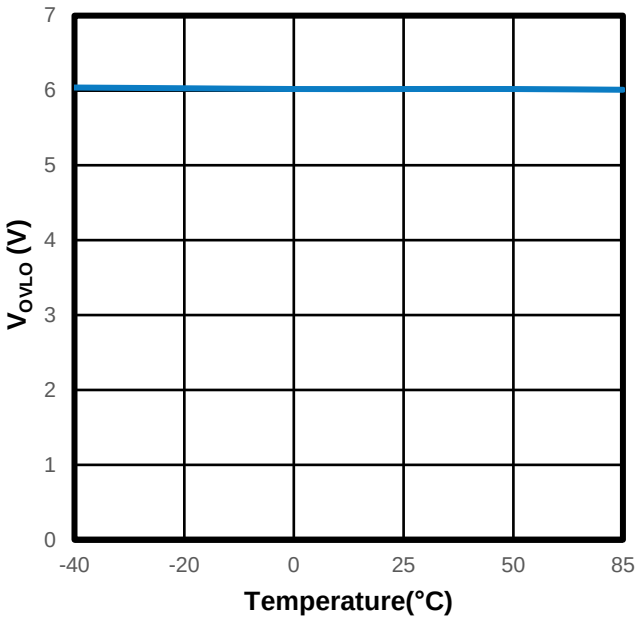


Figure 9. OVP Trip Level vs. Ambient Temperature

11. Timing Diagram

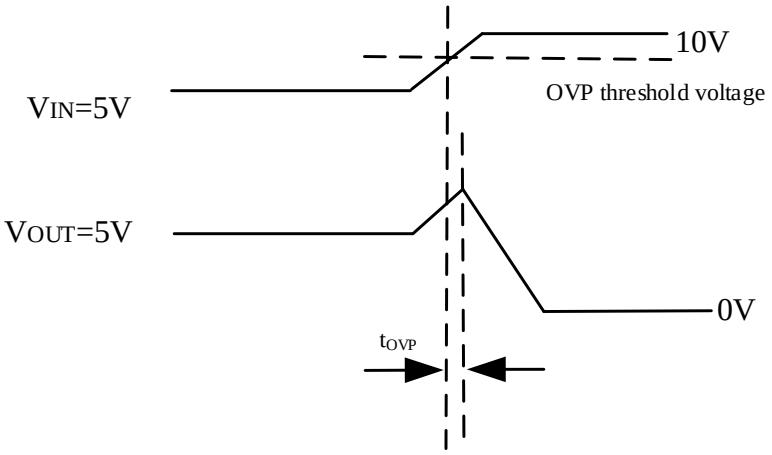


Figure 10. OVP Response Time

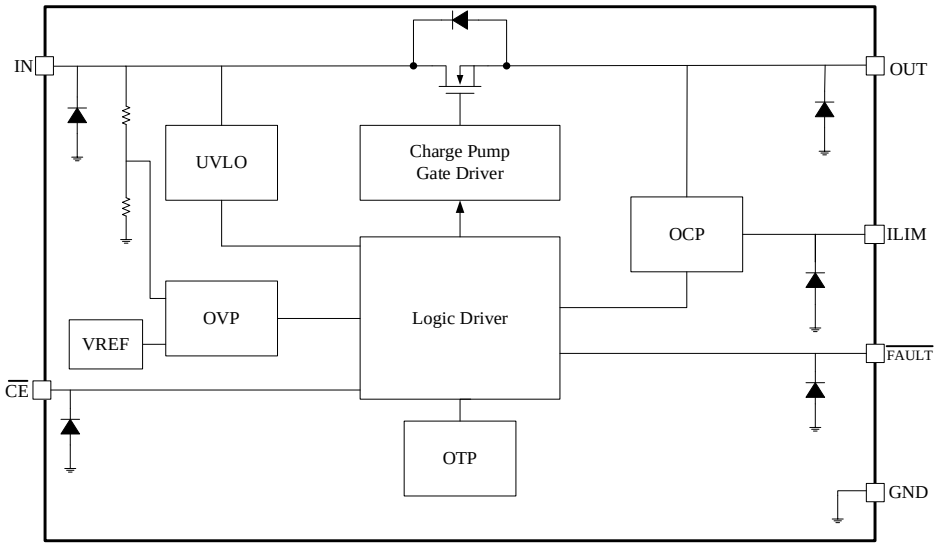
12. Function Description

12.1 Overview

The WP1108 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 V_{IN} re-plug or $\overline{CE}$ reactive. The OCP current limit threshold is adjustable by an external R_{ILIM}.

The internal FET turns off when the junction temperature exceeds 150℃. The device exits thermal shutdown after the junction is cooled down by 20℃.

12.2 Block Diagram



12.3 Feature Description

12.3.1 Under Voltage Lock Out (UVLO)

The under-voltage lockout (UVLO) circuits disable the WP1108 until the input voltage reaches the UVLO turn-on threshold.

12.3.2 Over Temperature Protection (OTP)

The WP1108 monitors its own internal temperature to prevent thermal failures. The device turns off the internal FET when the junction temperature reaches 150℃. The device will resume after the junction is cooled down by 20℃.

12.3.3 Input Over Voltage Protection (OVP)

If the input voltage exceeds the WP1108 rising trip level, the switch will be turned off in about 50ns. The switch will remain off until V_{IN} falls below the WP1108 falling trip level.

12.3.4 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. OCP activation time is about tens of microseconds to hundreds of microseconds after normal power supply. 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).

13. Application

13.1 Input Capacitor

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

13.2 Output Capacitor

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

14. Evaluation Modules

Evaluation Modules (EVMs) are available to help evaluate the device performance. We have evaluation modules for different packages, you can contact us to get the evaluation module or schematic.

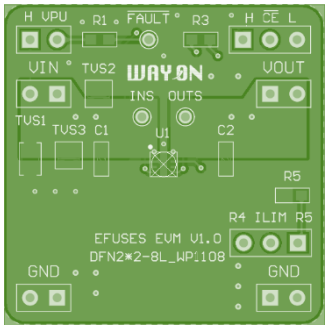
The module names are listed in the following table.

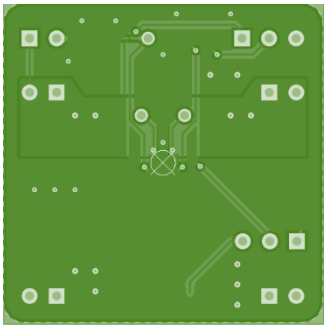
NAME	PACKAGE	EVALUATION MODULE
WP1108	DFN2×2-8L	EFUSES EVM V1.0 – DFN2×2-8L_WP1108

Layout Guidelines

For best performance, all traces should be as short as possible, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. Using wide traces for V_{IN}, V_{OUT}, and GND will help minimize parasitic electrical effects along with minimizing the case to ambient thermal impedance.

Layout Example





15. Naming Conventions

WP AB CC-DDD E

WP: WAYON Protection IC;

A: Product Category –1: E-fuse;

B: Maximum Output Current – 1:≤2A;

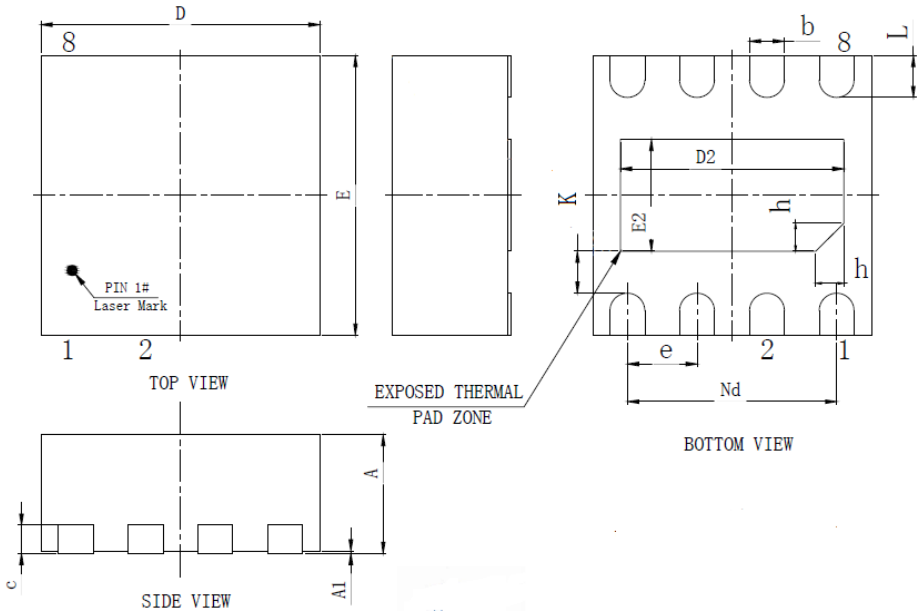
CC: Serial number;

DDD: Package – F28: DFN2×2-8L;

E: R-Reel & T-tube;

16. Package Information

DFN2×2-8L



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
b	0.20	0.25	0.30
c		0.203REF	
D	1.90	2.00	2.10
D2	1.10	1.20	1.30
e		0.50BSC	
Nd		1.50BSC	
E	1.90	2.00	2.10
E2	0.60	0.70	0.80
K	0.25	0.30	0.35
L	0.30	0.35	0.40
h		0.20REF	

17. Ordering Information

PART NUMBER	PACKAGE	PACKING QUANTITY	MARKING*
WP1108-F28R	DFN2×2-8	3k/Reel	WP1108 XXXX

* XXXX is variable.

Contact Information
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For additional information, please contact your local Sales Representative.

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.
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