1.General Description

WP3116 features an ultra-low $R_{DS(ON)}$ nFET switch with over voltage protection for input voltage. When input voltage exceeds the OVLO threshold, the switch is turned off immediately to prevent damage to the protected downstream devices.

The device features internal Thermal Shutdown Protection. The device features an open-drain output FLAG, when $V_{UVLO} < V_{IN} < V_{OVLO}$ FLAG is low and indicate a good input, otherwise it is high impedance

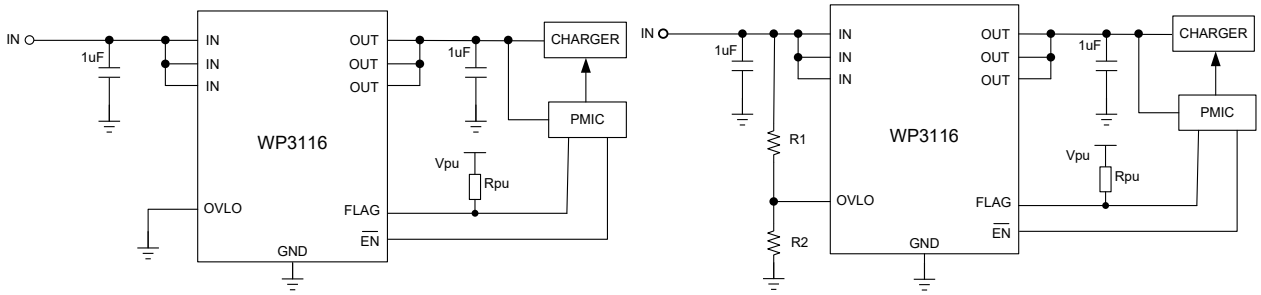
2. Features

- 4.8A Continuous Current Capability
- Ball pitch=0.4mm
- $R_{DS(ON)}$:30mΩ(Typ.)
- Surge protection to ±100V
- OVP Response Time:50ns
- Under-Voltage Lockout
- Thermal Shutdown
- ESD:4KV
- Package: WLCSP12, DFN1814-12

3. Applications

- Smart Phones
- Tablet PC
- Charging Ports

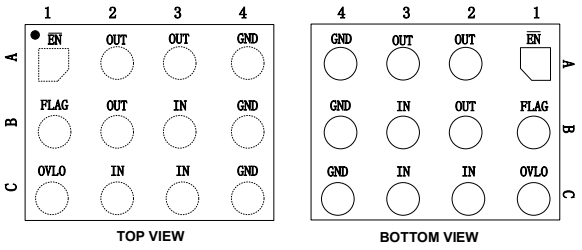
4. Typical Application



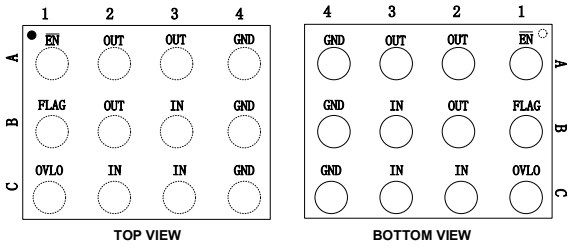
Note1：$V_{IN\_OVLO}=\frac{R_1+R_2}{R_2}V_{OVLO\_TH}$

Note2：Recommend 30 kΩ ≤ R_2 ≤ 51kΩ

5. Pin Configuration



DFN1814-12



WLCSP12

6.Pin Description

PIN NUMBER	PIN NAME	I/O	PIN FUNCTIONS		
A1	$\overline{EN}$	I	Device Enable Active low.		
A2 A3 B2	OUT	O	Output Voltage.		
A4 B4 C4	GND		Ground.		
B1	FLAG	O	Power status indicator.	0	$V_{UVLO} < V_{IN} < V_{OVLO}$, $T_J < T_{SD}$
				1	Others
B3 C2 C3	IN	I	Input Voltage.		
C1	OVLO	I	External OVLO Adjustment. Connect OVLO to GND when using the internal fix threshold. Connect a resistor-divider to OVLO to set a different OVLO threshold.		

7. Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)(1)

PARAMETER		RATING	UNIT
Input Voltage Range		-0.3 to 35	V
Output Voltage Range		-0.3 to 29	V
EN Voltage Range		-0.3 to 7	V
OVLO Voltage Range		-0.3 to 7	V
FLAG Voltage Range		-0.3 to 7	V
Maximum Continuous Current IN to OUT		4.8	A
Maximum Peak Current IN to OUT		8	A
Power Dissipation @T_A = 25°C		800	mW
Junction Temperature		150	°C
Lead Temperature Range		260	°C
Storage Temperature Range		-55 ~ 150	°C
ESD Susceptibility	HBM	±4000	V
Surge	IEC61000-4-5	-100~100	V

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.

8. Recommended Operating Conditions

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Operating Supply voltage	2.5	28	V
	Operating Ambient Temperature	-40	85	ºC

9. Electrical Characteristics

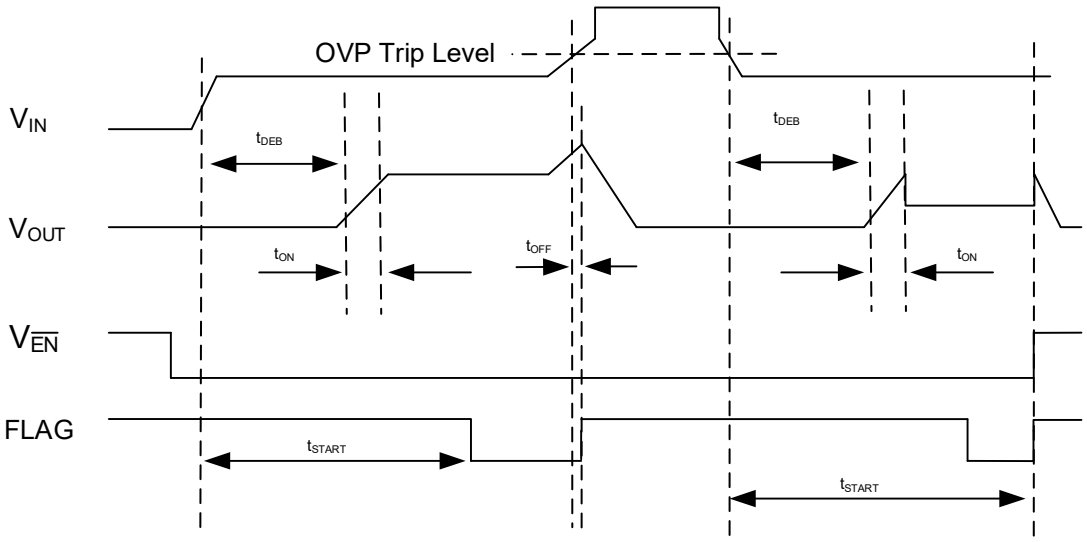
(T_A=25ºC, V_{IN}=5V, C_{IN}=1μF, unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS		MIN	TYP.	MAX	UNIT
V_{IN}	Input Voltage			2.5		28	V
I_{IN}	VIN Quiescent Current	V_{IN}=5V, OUT Floating			90		uA
I_{IN_OVLO}	OVLO Supply Current	V_{IN}=12V, OUT Floating			100		uA
$R_{DS(ON)}$	On-Resistance of Switch IN-OUT	V_{IN}=5.0V, I_{OUT}=1A, T_A=25 ºC			30		mΩ
V_{IN_OVLO}	Overvoltage Protect Of V_{IN}	A	V_{IN} Rising	5.90	5.95	5.99	V
			Hysteresis		0.13		
		B	V_{IN} Rising	6.66	6.80	6.94	
			Hysteresis		0.14		
		C	V_{IN} Rising	10.29	10.50	10.71	
			Hysteresis		0.21		
		D	V_{IN} Rising	13.7	14.0	14.3	
			Hysteresis		0.28		
	Adjustable OVLO Threshold Range	V_{IN} =2.5V to V_{IN_OVLO}		4		20	V
V_{OVLO_TH}	OVLO Set Threshold	V_{IN} =2.5V to V_{IN_OVLO}		1.18	1.2	1.22	V
V_{OVLO_SELECT}	External OVLO Select Threshold			0.2		0.3	V
V_{UVLO_R}	Under Voltage Lockout Threshold	V_{IN} Rising			2.1		V
V_{UVLO_F}		V_{IN} Falling			1.9		V
V_{FLAG_OL}	FLAG Output Logic Low Voltage	V_{PU}=1.8V, I_{SINK}=1mA			0.1	0.2	V
I_{FLAG_LEAK}	FLAG Output HIGH Leakage Current	V_{FLAG}=5V				0.5	μA
I_{OVLO}	OVLO Input Leakage Current	V_{OVLO}=V_{OVLO_TH}		-100		100	nA
V_{IH}	EN Input Logic High Voltage			1.4			V
V_{IL}	EN Input Logic Low Voltage	V_{IN}=2.5V				0.3	V
T_{SD}	Thermal Shutdown	V_{IN} = 5V			150		ºC

SYMBOL	PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
ΔT_{SD}	Thermal-shutdown Hysteresis	V_{IN} = 5V		20		ºC
t_{DEB}	Debounce Time	From V_{IN}>V_{UVLO} to 10% V_{OUT}		15		ms
t_{START}	Start-up time	From V_{IN}>V_{UVLO} to FLAG turn low		30		ms
t_{ON}	Switch turn-on time	R_L=100Ω，C_L=22μF，V_{OUT} from 10%V_{IN} to 90%V_{IN}		2		ms
t_{OFF}[1]	Switch turn-off time	V_{IN}>V_{OVLO} to V_{OUT} stop rising		50		ns

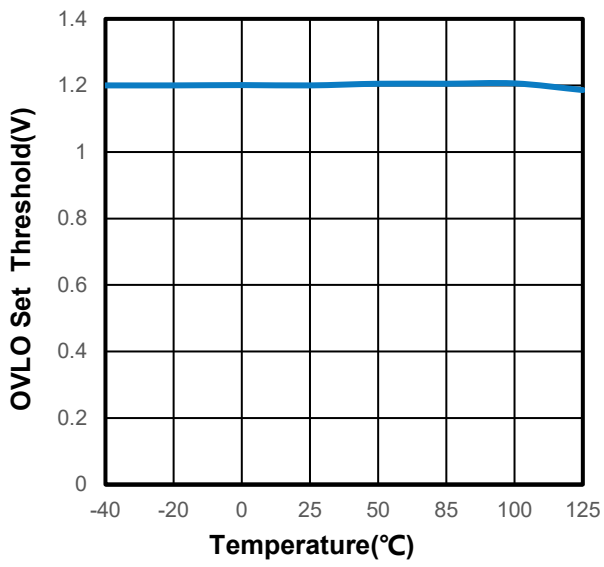
Note 1: Guaranteed by design.

10.Timing Diagram

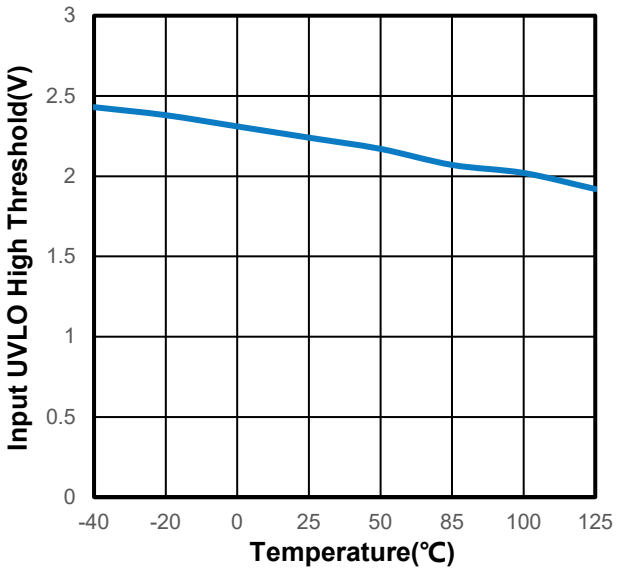


11. Typical Performance Characteristics

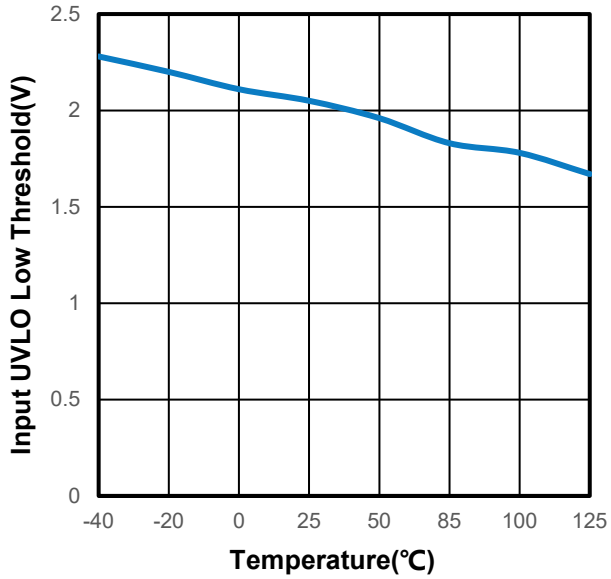
(V_{IN} = 5V, C_{IN}=1μF, C_{OUT}=1μF, T_A=25°C, unless otherwise noted)



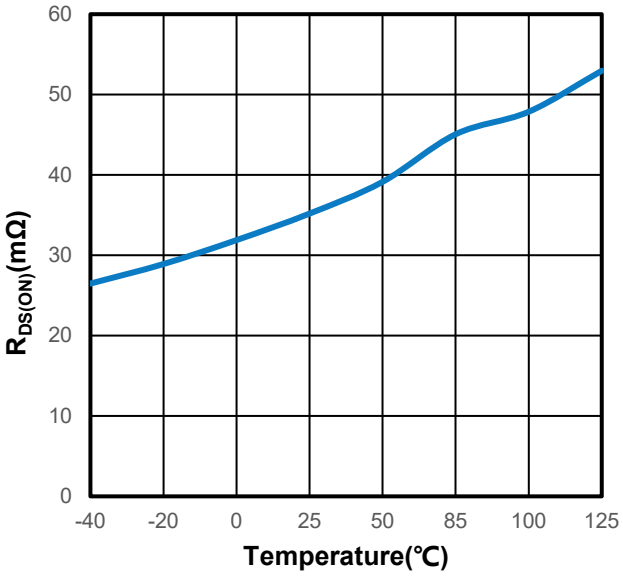
OVLO Set Threshold vs. Ambient Temperature



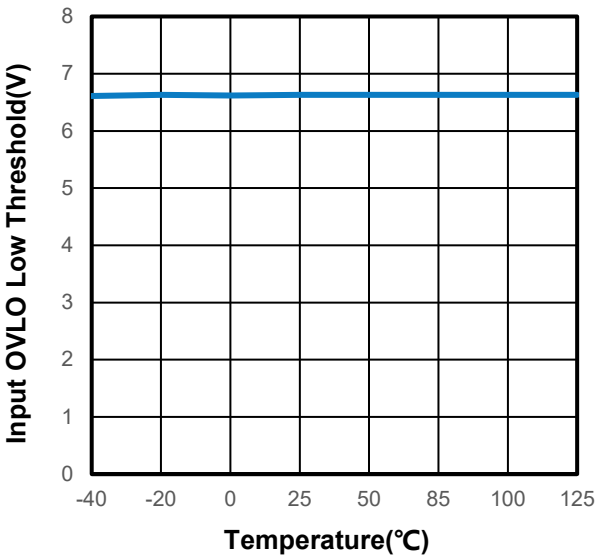
Input UVLO High Threshold vs. Ambient Temperature



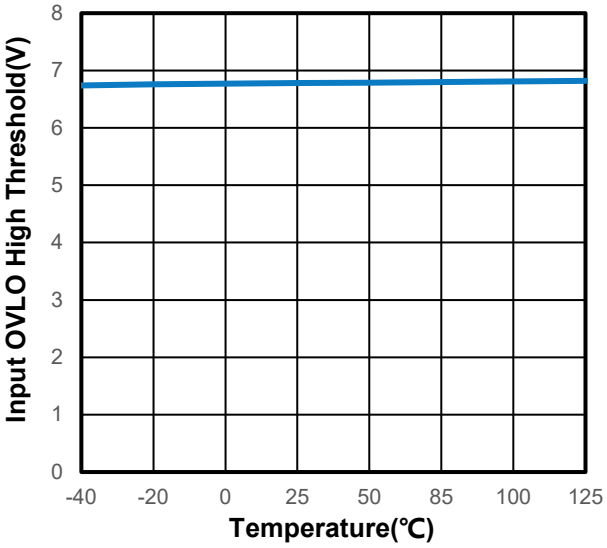
Input UVLO Low Threshold vs. Ambient Temperature



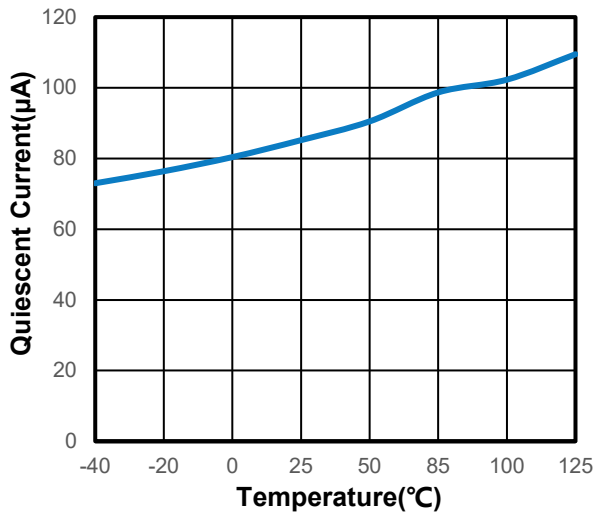
$R_{DS(ON)}$ vs. Ambient Temperature



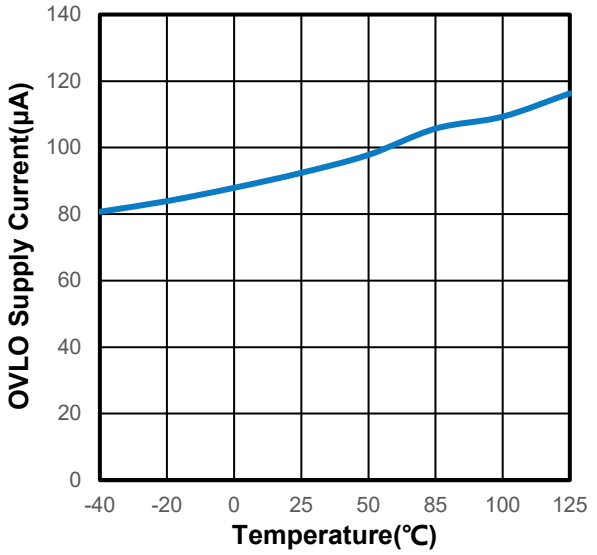
Input OVLO Low Threshold vs. Ambient Temperature



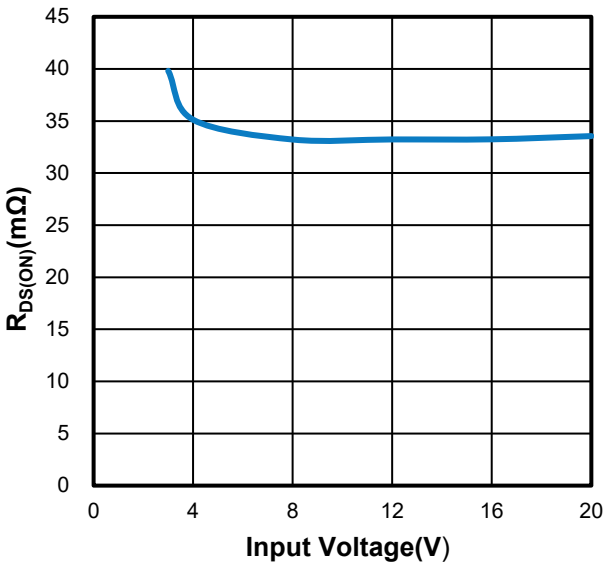
Input OVLO High Threshold vs. Ambient Temperature



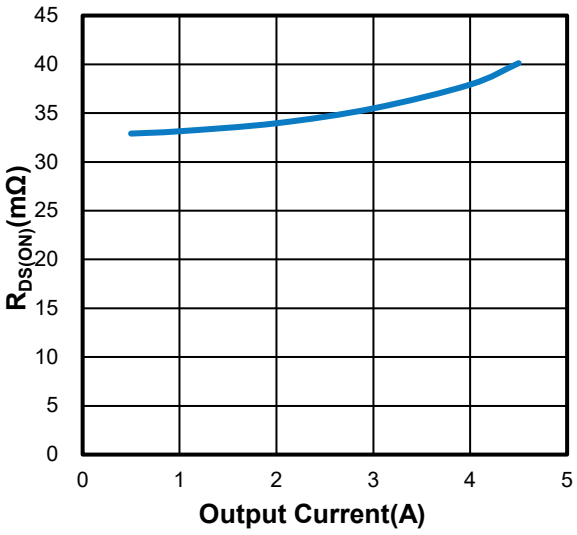
Quiescent Current vs. Ambient Temperature



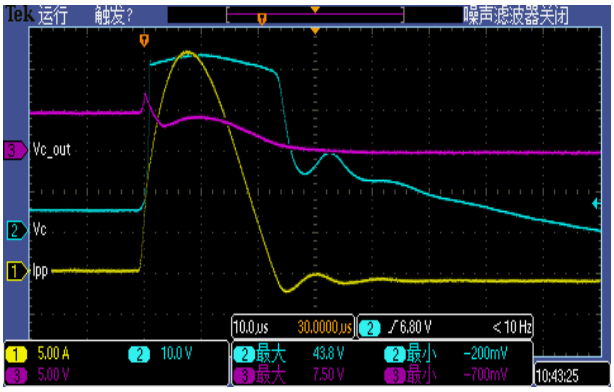
OVLO Supply Current vs. Ambient Temperature



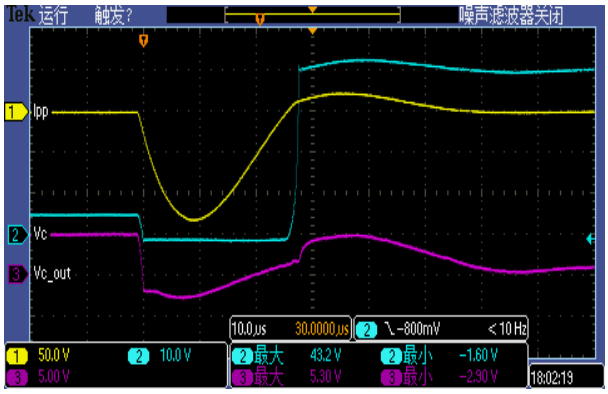
$R_{DS(ON)}$ vs. Input Voltage (I_{OUT} = 1A)



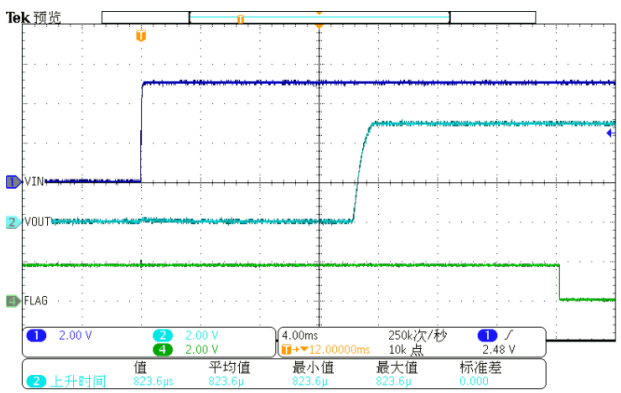
$R_{DS(ON)}$ vs. Output Current



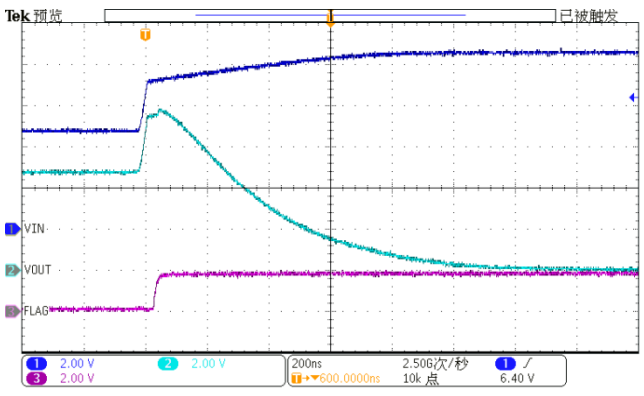
+100V Surge Response



-280V Surge Response



t_{DEB} & t_{START} & t_{ON}



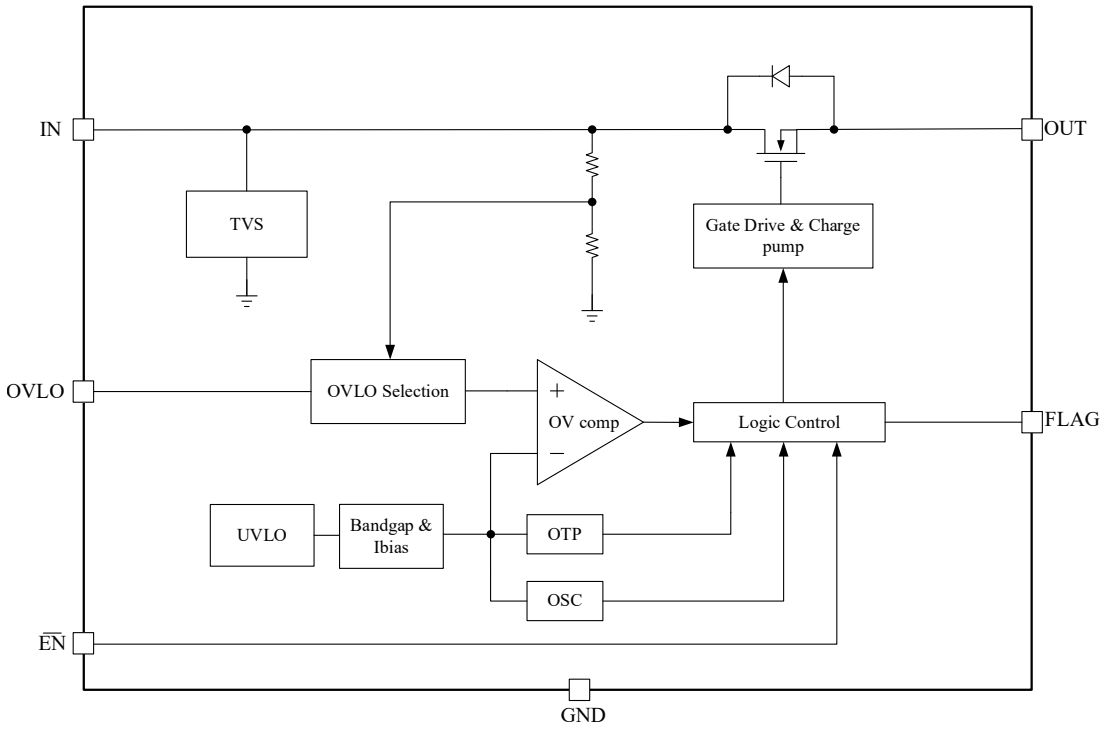
t_{OFF}

12. Function Description

12.1 Overview

If the WP3116 is enabled and the input voltage is between UVLO and OVP threshold, the internal charge pump begins to work after debounce time, the gate of the nFET switch will be slowly charged high till the switch is fully on. FLAG will be driven low about 30ms after VIN valid, indicating the switch is on with a good power input. If the input voltage exceeds the OVP trip level, the switch will be turned off in about 50ns. If $\overline{EN}$ is pulled high, or input voltage falls below UVLO threshold, or over-temperature happens, the switch will also be turned off.

12.2 Block Diagram



12.3 Feature Description

12.3.1 Warning Indication Output

The FLAG pin is an open-drain output that indicates a HIGH signal when any protection event occurs (Input OVP and Input UVLO). When the protection events are released and then the FLAG pin indicates a LOW signal(22mV).

12.3.2 Over-Voltage Protection

If the input voltage exceeds the OVP rising trip level, the switch will be turned off in about 50ns. The switch will remain off until VIN falls below the OVP falling trip level.

12.3.3 OVP Threshold Adjustment

If the default OVP threshold is used, OVLO pin must be grounded. If OVLO pin is not grounded, and by connecting external resistor divider to OVLO pin as shown in the typical application circuit, between IN and GND, the OVP threshold can be adjusted as following:

$$V_{IN\_OVLO}=\frac{R_1+R_2}{R_2}V_{OVLO\_TH}$$

The OVP threshold adjustment range is from 4V to 20V. When the OVLO pin voltage VOVLO exceeds V_{OVLO_SEL} (0.26V Typ.), VOVLO is compared with the reference voltage V_{OVLO_TH} (1.2V Typ.) to judge whether input supply is over-voltage.

12.3.4 Over Temperature Protection (OTP)

The WP3116 monitors its own internal temperature to prevent thermal failures. The chip turns off the MOSFET when the internal temperature reaches 150°C. The IC will resume after the internal temperature is cooled down 20°C.

12.3.5 Surge Protection

The WP3116 integrates a clamp circuit to suppress input surge voltage. For surge voltages between V_{IN_OVLO} and V_{IN_CLAMP}, the switch will be turned off but the clamp circuit will not work. For surge voltages greater than V_{IN_CLAMP}, the internal clamp circuit will detect surge voltage level and discharge the surge energy to ground. The device can suppress surge voltages up to 100V.

12.3.6 USB On-The-Go (OTG) Operation

If V_{IN} = 0V and OUT is supplied by OTG voltage, the body diode of the load switch conducts current from OUT to IN and the voltage drop from OUT to IN is approximately 0.7V. When V_{IN} > V_{IN_UVLO}, internal charge pump begins to open the load switch after debounce time (about 15ms). After switch is fully on, current is supplied through switch channel and the voltage drop from OUT to IN is minimum.

13.Application and Implementation

13.1 Application Information

13.1.1Power Up Enable Control

The WP3116 offers an enable ($\overline{EN}$) input. When the $\overline{EN}$ pin is pulled to logic high (>1.4V), the WP3116 will be shut down. When the $\overline{EN}$ pin is pulled to logic low (<0.4V), the WP3116 will be powered on. The $\overline{EN}$ pin has an internal pull-down resistor. Leaving the $\overline{EN}$ pin floating can enable the IC.

13.1.2 Input Capacitor

To limit the voltage drop on the input supply caused by transient in-rush currents when the switch turns on into a discharged load capacitor or a short-circuit, a capacitor needs to be placed between V_{IN} and GND. A 1-μF ceramic capacitor, C_{IN}, placed close to the pins is usually sufficient. Higher values of C_{IN} can be used to further reduce the voltage drop.

13.1.3 Output Capacitor

A 1-μF capacitor, C_{OUT}, should be placed between V_{OUT} and GND. This capacitor will prevent parasitic board inductances from forcing V_{OUT} below GND when the switch turns off.

14. Layout

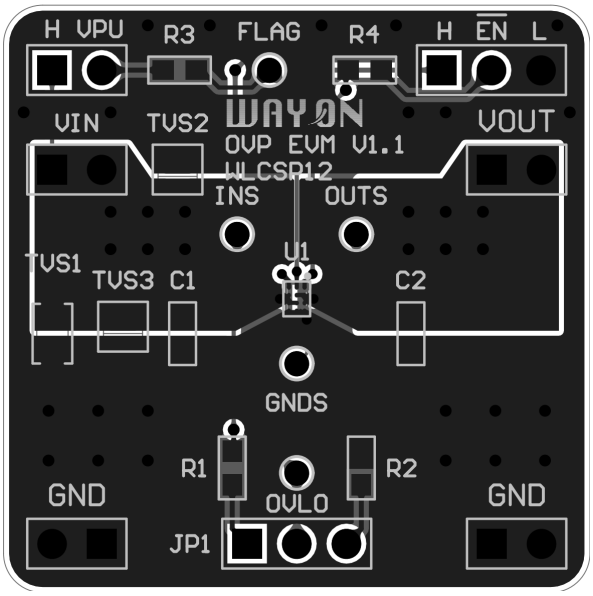
To make fully use of the performance of WP3116, the guidelines below should be followed.

1. All the peripherals should be placed as close to the device as possible. Place the input capacitor C_{IN} on the top layer (same layer as the WP3116) and close to IN pin, and place the output capacitor C_{OUT} on the top layer (same layer as the WP3116) and close to OUT pin.

2. If external TVS is used, IN pin routing passes through the external TVS firstly, and then connect WP3116.

3. If R_1 and R_2 are used, route OVLO line on PCB as short as possible to reduce parasitic capacitance.

14.1 Layout Example



15 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
WP3116	WLCSP12	WAYON OVP EVM V1.1 -WLCSP12
	DFN1814-12	WAYON OVP EVM V1.1 -WLCSP12

16 Naming Conventions

WP AB CC-D EEE F

WP: WAYON Protection IC;

A: Product Category –3: OVPn;

B: Whether TVS is integrated –1: Integrated;

CC: Serial number;

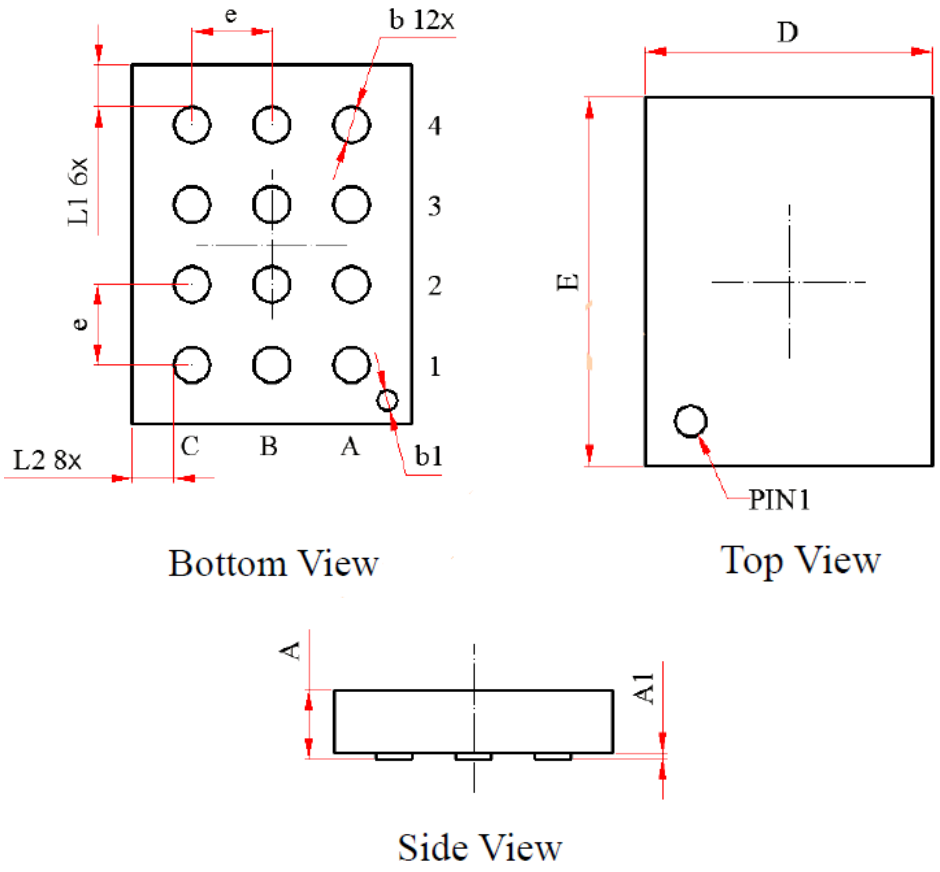
D: Overvoltage Protect of V_{IN} – A: 5.95V/ B: 6.80V / C:10.50V/ D: 14V;

EEE: Package – PB2: DFN1814-12 / C12: WLCSP12;

F: R-Reel & T-tube;

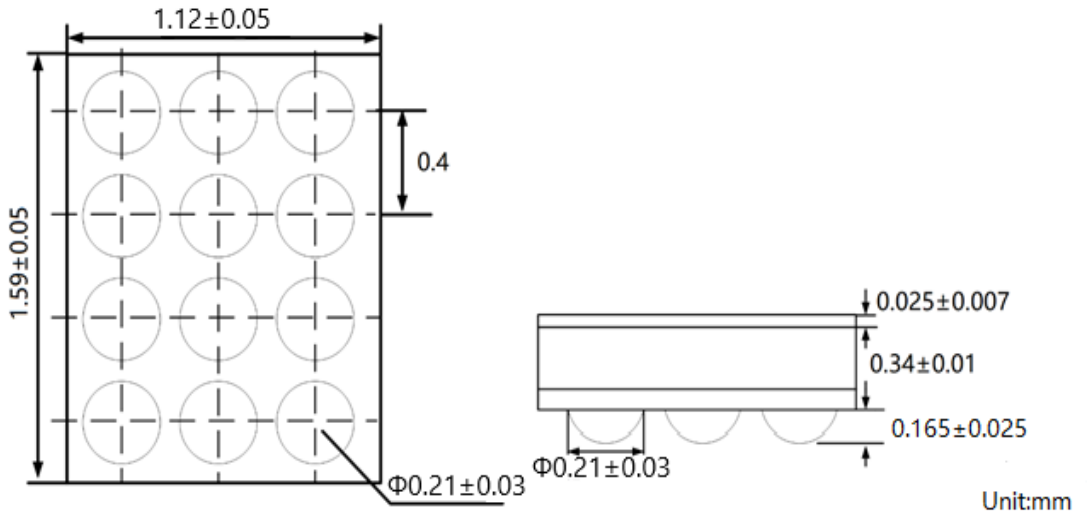
17 Package Information

DFN1814-12



SYMBOL	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.320	-	0.380
A1	-	0.030	0.075
D	1.350	1.400	1.450
E	1.750	1.800	1.850
b	0.150	0.180	0.210
b1	0.100 REF		
L1	0.210 REF		
L2	0.210 REF		
e	0.400 BSC		

WLCSP12



18 Ordering Information

PART NUMBER	V_{OVLO}	PACKAGE	PACKING QUANTITY	MARKING*
WP3116-APA2R	5.95V	DFN1814-12L	5k/Reel	316A XXXX
WP3116-BPA2R	6.8V	DFN1814-12L	5k/Reel	316B XXXX
WP3116-CPA2R	10.5V	DFN1814-12L	5k/Reel	316C XXXX
WP3116-DPA2R	14V	DFN1814-12L	5k/Reel	316D XXXX
WP3116-AC12R	5.95V	WLCSP12	3k/Reel	316A XXXX
WP3116-BC12R	6.8V	WLCSP12	3k/Reel	316B XXXX
WP3116-CC12R	10.5V	WLCSP12	3k/Reel	316C XXXX
WP3116-DC12R	14V	WLCSP12	3k/Reel	316D XXXX

Contact Information

No.1001, Shiwan(7) Road, Pudong District, Shanghai, P.R.China.201202
Tel: 86-21-68960674 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.

Specifications are subject to change without notice.
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time.
Users should verify actual device performance in their specific applications.

单击下面可查看定价，库存，交付和生命周期等信息

>>WAY-ON(维安)