1.General Description

WP3883CL can disconnect the systems from its output pin (OUT) in case wrong input operating conditions are detected.

The system is positive overvoltage protected up to 28V. The internal overvoltage threshold (OVLO) is fixed, and external OVLO setting also available. WP3883CL has internal thermal shutdown Protection and Input Voltage detection.

The device is packaged in advanced full-Green compliant Wafer Level Chip Scale Packaging (WLCSP6).

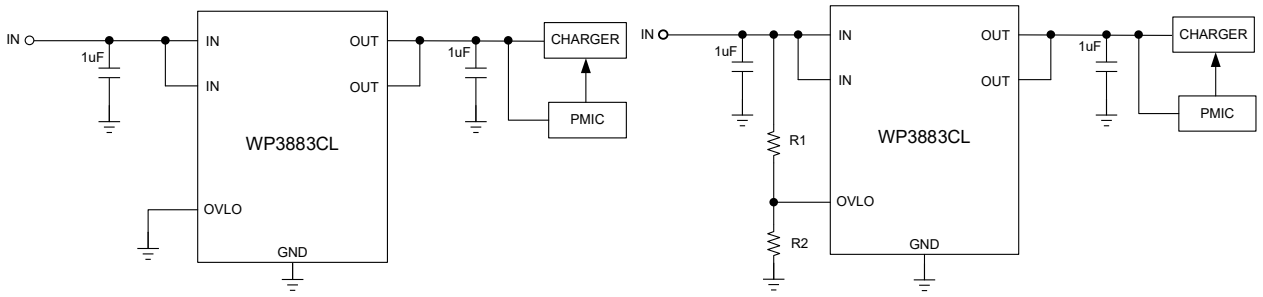
2. Features

- 4A Continuous Current Capability
- $R_{DS(ON)}$: 29mΩ (Typ.) N-Channel MOSFET
- VIN Operating Range: 2.5V to 28V
- Overvoltage Lockout: OVLO=6.8V(Typ.)
- Overvoltage-Protection Response Time: 50ns (Typ.)
- OVLO Threshold Range: +4V to +20V
- Startup Debounce Time: 15ms (Typ.)
- Internal Thermal-Shutdown Protection
- ESD Protected Human Body Model: JESD22-A114 (All pins) ±2KV
- WLCSP6 Package （ball pitch=0.4mm）

3. Applications

- Smart Phones
- Smartphones, Tablet PC
- HDD, Storage and Solid State Memory Devices
- Portable Media Devices, Laptop & MID
- SLR Digital Cameras
- GPS and Navigation Equipment
- Industrial Handheld and Enterprise Equipment

4. Typical Application

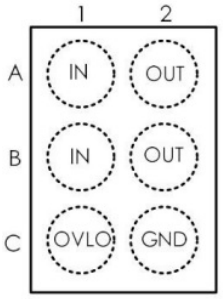


Note1：$V_{IN\_OVLO}=\frac{R_1+R_2}{R_2}V_{OVLO\_TH}$

Note2：Recommend 30 kΩ ≤ R_2 ≤ 51 kΩ

5. Pin Configuration

TOP VIEW



WLCSP6

6.Pin Description

PIN NUMBER	PIN NAME	I/O	PIN FUNCTIONS
A2, B2	OUT	O	Output Voltage. Output of internal switch. Connect OUT pins together for proper operation.
C2	GND		Ground. Connect GND pins together for proper operation.
A1, B1,	IN	I	Voltage Input. Connect IN pins together for proper operation.
C1	OVLO	I	External OVLO Adjustment. Connect OVLO to GND when using the internal threshold. Connect a resistor-divider to OVLO to set a different OVLO threshold; this external resistor-divider is completely independent of the internal threshold.

7. Absolute Maximum Ratings

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

PARAMETER		RATING	UNIT
Input Voltage Range		-0.3 to 36	V
Output Voltage Range		-0.3 to 28	V
OVLO Voltage Range		-0.3 to 7	V
Maximum Continuous Current IN to OUT		4	A
Maximum Peak Current IN to OUT		6	A
Power Dissipation @TA = 70°C		1000	mW
Junction Temperature		150	°C
Lead Temperature Range		260	°C
Storage Temperature Range		-65 ~ 150	°C
ESD Susceptibility	HBM	±2000	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	°C

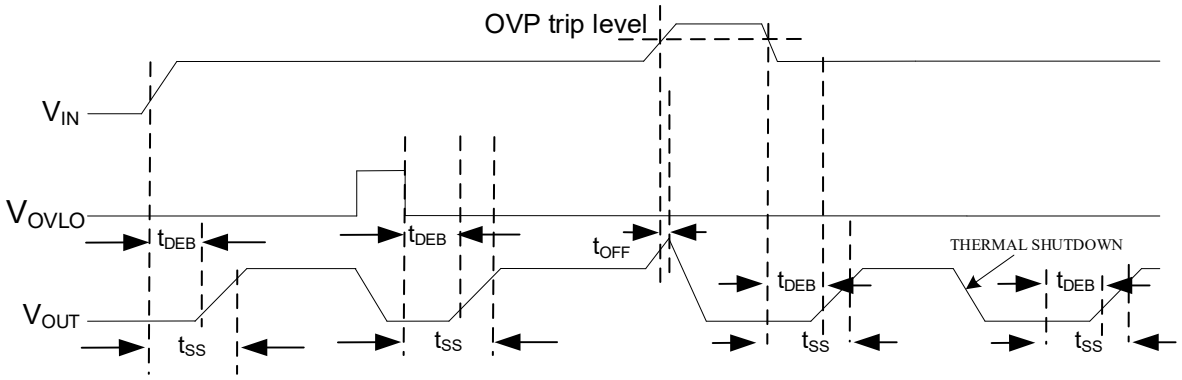
9. Electrical Characteristics

(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
R_{ON}	On-Resistance of switch IN-OUT	V_{IN}=5.0V, I_{OUT}=1A, T_A=25 ºC		29	45	mΩ
V_{OVLO}	Overvoltage Protect of V_{IN}	V_{IN} Rise up	6.6	6.8	7.0	V
	Overvoltage Protect hysteresis of V_{IN}			0.2		V
	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		2.0		V
T_{SD}	Thermal Shutdown	V_{IN} = 5V		155		ºC
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_{ON}	Switch turn-on time	RL=100Ω，CL=22μF，V_{OUT} from 10%V_{IN} to 90%V_{IN}		2		ms
t_{OFF_RES}[1]	Switch turn-off time	V_{IN}>V_{OVLO} to V_{OUT} stop rising		50		ns

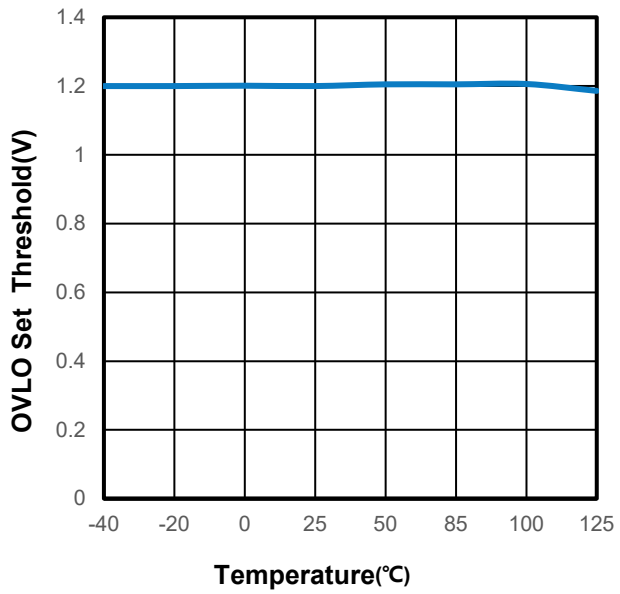
Note 1: Guaranteed by design.

10.Timing Diagram

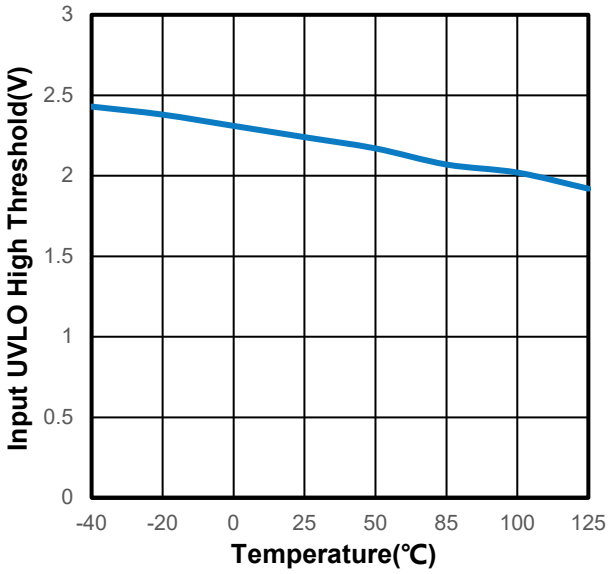


11. Typical Performance Characteristics

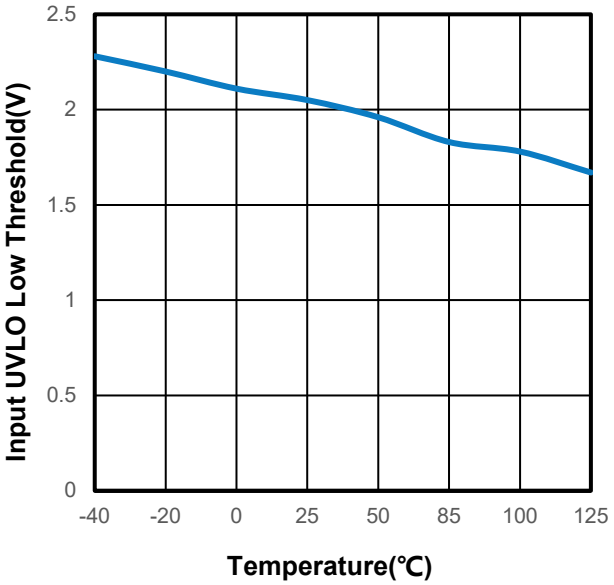
(V_{IN} = 5V, C_{IN}=1μF, C_{OUT}=1μF, T_A=25°C, unless otherwise noted)



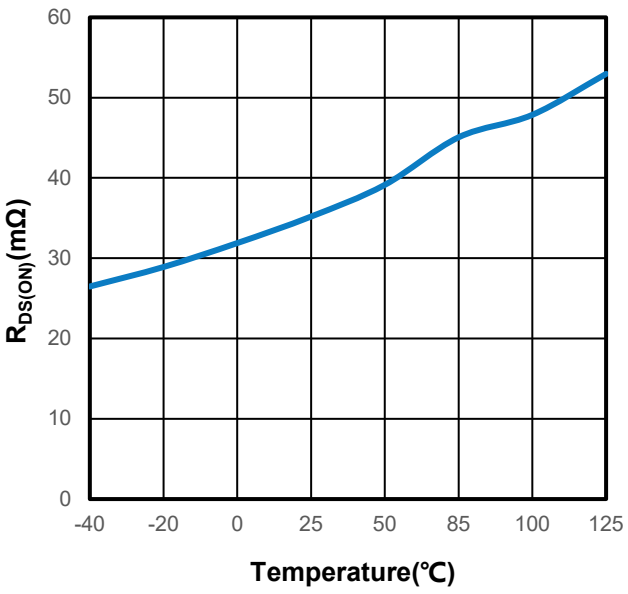
OVLO Set Threshold vs. Ambient Temperature



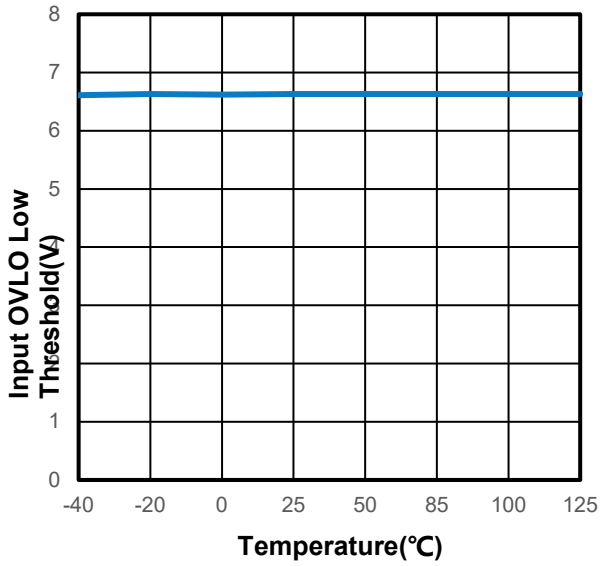
Input UVLO High Threshold vs. Ambient Temperature



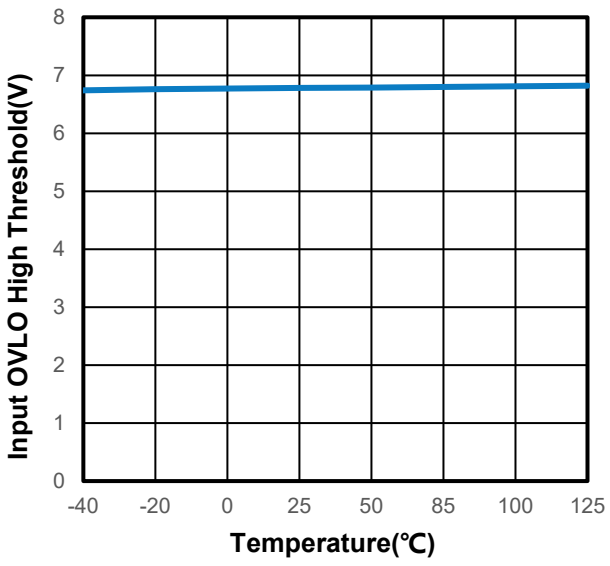
Input UVLO High Threshold vs. Ambient Temperature



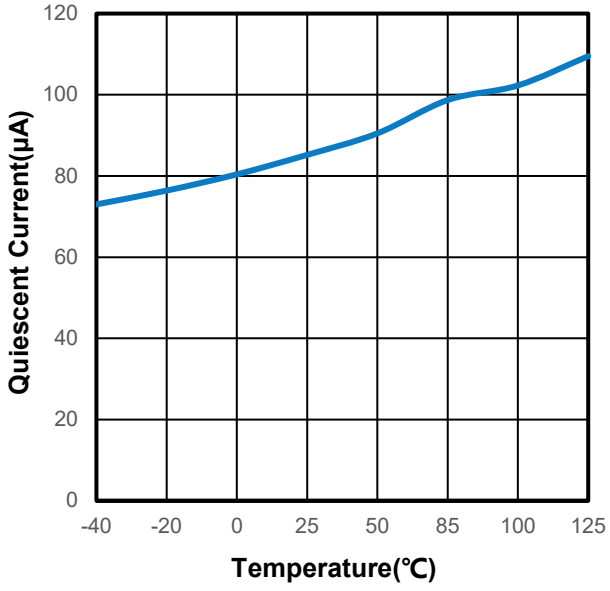
$R_{DS(ON)}$vs Free-Air Temperature



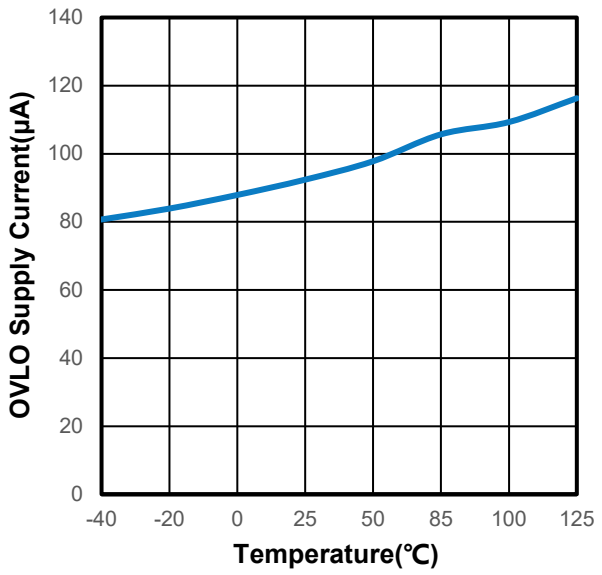
Input OVLO Low Threshold vs. Ambient Temperature



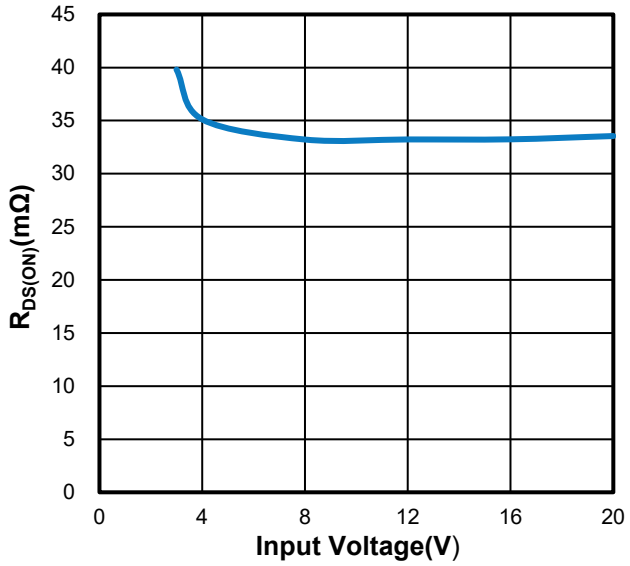
Input OVLO High Threshold vs. Ambient Temperature



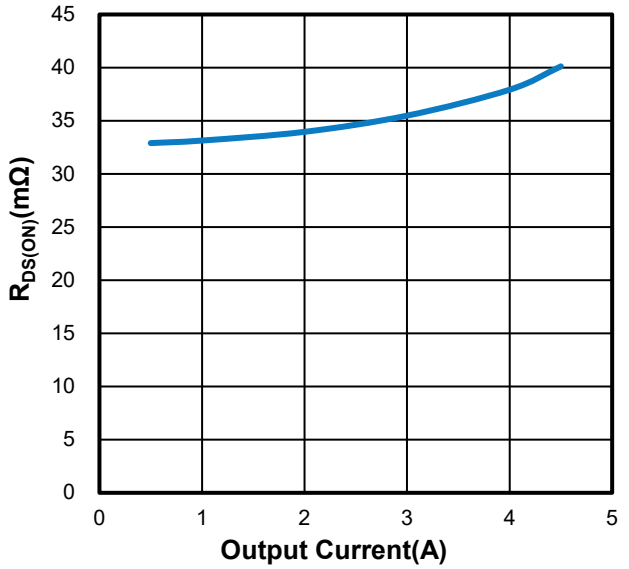
Quiescent Current vs. Ambient Temperature



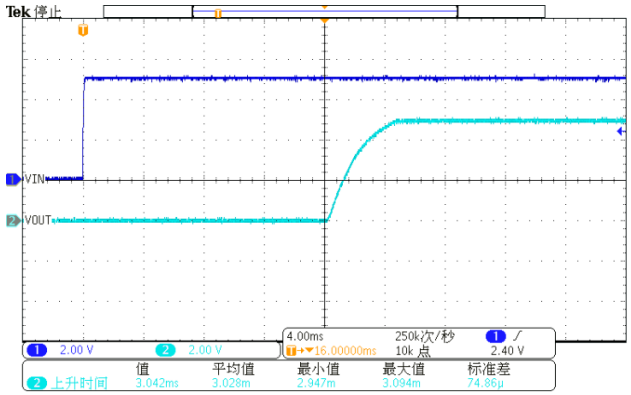
OVLO Supply Current vs. Ambient Temperature



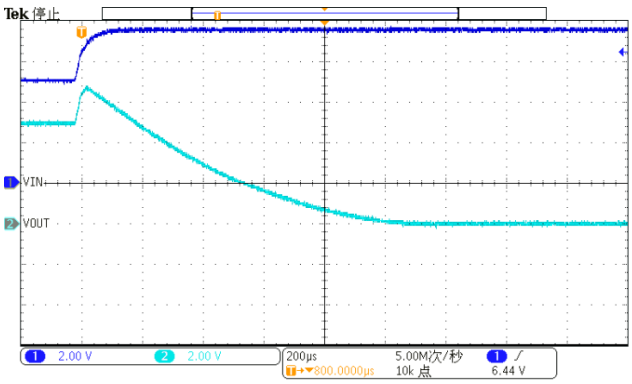
$R_{DS(ON)}$ vs. Input Voltage (I_{OUT} = 1A)



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



t_{DEB} & t_{ON}



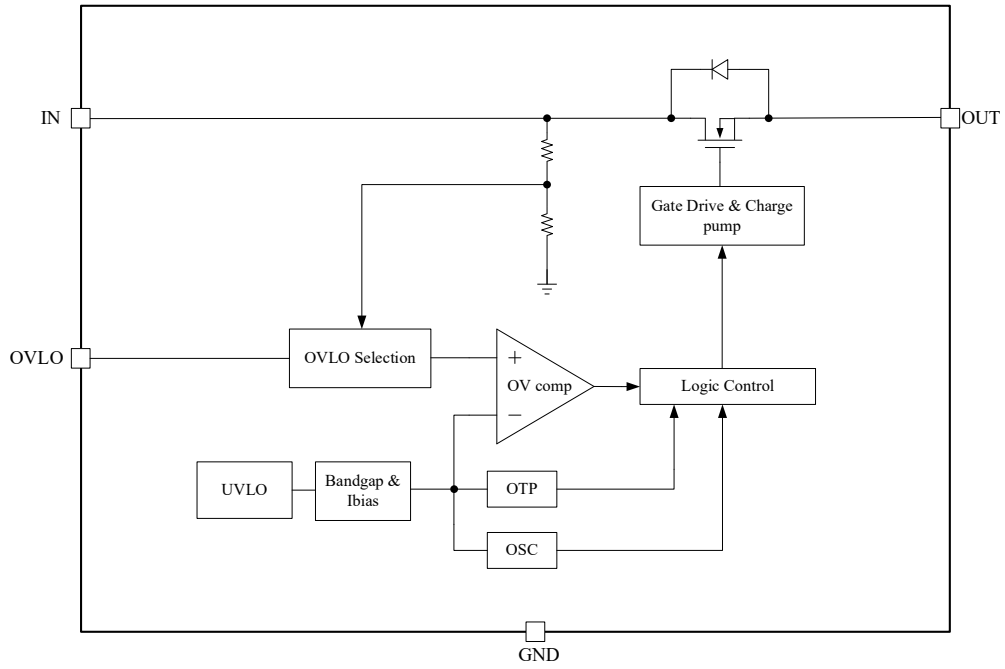
t_{OFF_RES}

12. Function Description

12.1 Overview

If the WP3883CL 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. If the input voltage exceeds the OVP trip level, the switch will be turned off in about 50ns. If 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

12.3.1Over-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.

12.3.2 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 VOVLO_SEL (0.26V Typ.), VOVLO is compared with the reference voltage VOVLO_TH (1.2V Typ.) to judge whether input supply is over-voltage.

12.3.3 Over Temperature Protection (OTP)

The WP3883CL 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.

12.3.4 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

13.1.1 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 VIN and GND. A 1-μF ceramic capacitor, C_{IN}, placed close to the pins is usually sufficient. Higher values of CIN can be used to further reduce the voltage drop.

13.1.2 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

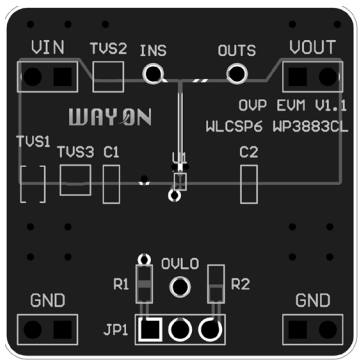
To make fully use of the performance of WP3883CL, the guidelines below should be followed.

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 WP3883CL) and close to IN pin, and place the output capacitor C_{OUT} on the top layer (same layer as the WP3883CL) and close to OUT pin.

2. If external TVS is used, IN pin routing passes through the external TVS firstly, and then connect WP3883CL.

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

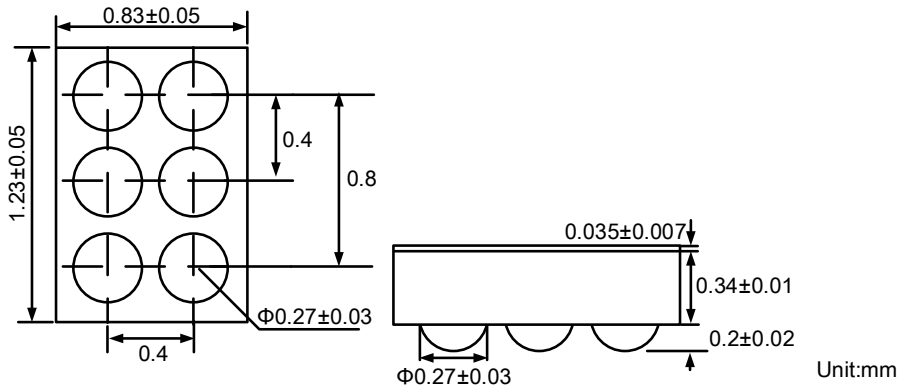
Evaluation Modules (EVMs) are available to help evaluate initial circuit performance. We have evaluation modules for different packages, you can contact us by phone or address at the end to get the evaluation module or schematic.

The module names are listed in the table below.

NAME	PACKAGE	EVALUATION MODULE
WP3883CL	WLCSP6	OVP EVM V1.1 WLCSP6 WP3883CL

16 Package Information

WLCSP6



17 Ordering Information

PART NUMBER	PACKAGE	PACKING QUANTITY	MARKING*
WP3883CL	WLCSP6	3k/Reel	WP3883CL XXXXX

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.

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)