

## Adjustable Current Switch Device

### Features:

- Current switch, current measurement and on-site calibration
- Response time 10us
- High accuracy  $\pm 0.25A$
- Wide sensing current range 0~60A
- Output “High” when  $V_{IP} > V_{set}$
- Output “Low” when  $V_{IP} < V_{set}$
- Diameter 9.0 mm conductor through hole
- Wide operating voltage range 3.0~12V
- Almost zero hysteresis
- 23K Hz Bandwidth
- Isolation voltage 4000V



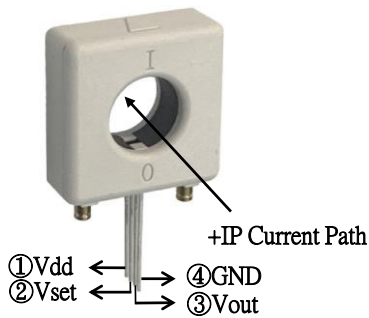
### Functional Description :

The Winson WCS2300 is designed for Current switching and Current measuring. As a switch, it can be adjusted the on/off spot by providing a reference voltage to the  $V_{set}$  pin. The output voltage ( $V_{out}$ ) turns to **high** voltage level when the internal voltage ( $V_{IP}$ ) is greater than the reference voltage ( $V_{set}$ ). In contrast, the output turns to the **low** level. As measuring, it provide a precise solution for both DC and AC current sensing in industrial. furthermore, it can be adjusted the reference voltage in measuring mode for switching mode use.

The WCS2300 consists of a precise, low-temperature drift linear hall sensor IC with temperature compensation circuit and a diameter 9.0 mm through hole. Any current flowing through this hole will generate a magnetic field which is sensed by the integrated Hall IC and converted into a proportional output voltage.

The terminals of the conductive path are electrically isolated from the sensor leads. This allows the WCS2300 current sensor to be used in applications requiring electrical isolation without the usage of opto-isolators or other costly isolation techniques.

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### Absolute Maximum Range

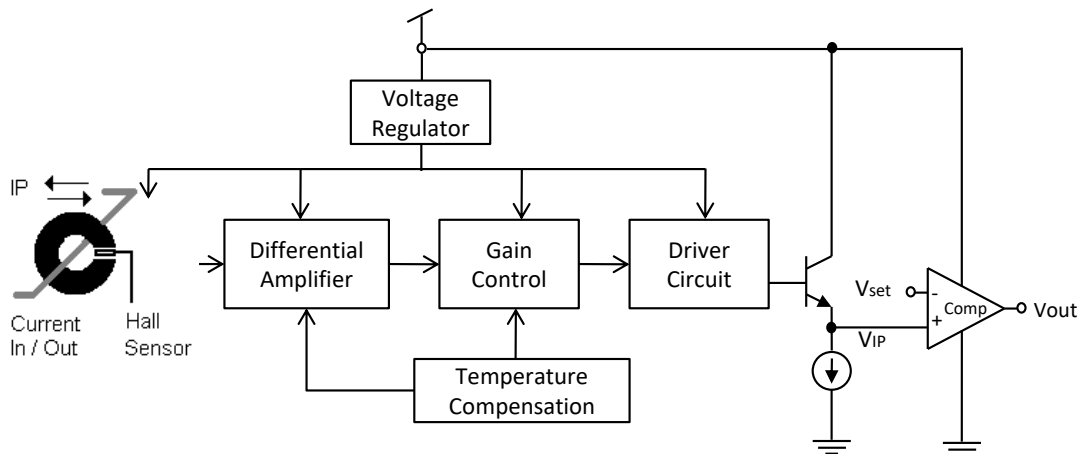
Supply Voltage, Vdd -----	14V
Pass Through Wire Diameter -----	9mm
Output Current Sink-----	50uA
Output Current Source-----	1.5mA
Basic Isolation Voltage -----	4000V
Operating Temperature Range, Ta -----	-----
-----	-20°C to +125°C
Storage Temperature Range, Ts -----	-----
-----	-65°C to +150°C
Power Dissipation, Pd -----	1W

Number	Name	Description
1	Vdd	Power supply terminal
2	Vset	Setup input terminal
3	Vout	Output voltage terminal
4	GND	Signal ground terminal

( Vdd = 5V )

Function	Current Range	Resolution	Sensitivity
Switch	DC:±0-60A	±0.25 A	
Linear	DC:±0-60A		32 mV/A
	AC:rms 40A		

### Function Block:



Functional Block Diagram

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# WCS2300

## Electrical Characteristics:

(T=+25°C, V<sub>dd</sub>=5.0V)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V <sub>dd</sub>	—	3.0	—	12	V
Supply Current	I <sub>supply</sub>	IP =0 A	—	3.5	6.0	mA
Conductor Through Hole	—	—	—	9.0	—	mm <sup>2</sup>

## Switching Characteristics:

(T=+25°C, V<sub>dd</sub>=5.0V)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage	V <sub>H</sub>	Full Range	V <sub>dd</sub> -0.2	—	—	V
	V <sub>L</sub>		—	—	0.1	
Resolution	IP <sub>Resolution</sub>	—	—	±0.25	—	A
Adjustable Current Range	PR	DC Mode	—	±60	—	A
Response Time (low to high level)	T <sub>RP</sub>	With 7.5A overdrive C <sub>Load</sub> = 15pF <sup>(1) (2) (3)</sup>	—	3.5	—	uS
		With 7.5A overdrive C <sub>Load</sub> = 0.01uF <sup>(1) (2) (3)</sup>	—	25	—	
Response Time (high to low level)		With 7.5A overdrive C <sub>Load</sub> = 15pF <sup>(1) (2) (3)</sup>	—	11	—	
		With 7.5A overdrive C <sub>Load</sub> = 0.01uF <sup>(1) (2) (3)</sup>	—	125	—	
Rising Time	T <sub>RISE</sub>	With 7.5A overdrive C <sub>Load</sub> = 15pF <sup>(1) (2) (3)</sup>	—	0.5	—	uS
Fall Time	T <sub>FALL</sub>	With 7.5A overdrive C <sub>Load</sub> = 15pF <sup>(1) (2) (3)</sup>	—	0.7	—	uS

1. C<sub>Load</sub> includes probe and jig capacitance.

2. The response time is specified for a 15A(450mV) input step with 7.5A(225mV) overdrive.

3. Response time can refer to "characteristic Diagrams".

## Linear Characteristics:

(T=+25°C, V<sub>dd</sub>=5.0V, V<sub>set</sub> pin and V<sub>out</sub> pin short)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Zero Current V <sub>out</sub>	V <sub>IP</sub>	IP =0 A	2.35	2.5	2.65	V
Sensitivity	Sens	IP= +-10 A	27.2	32	36.8	mV/A
Bandwidth	BW	—	—	23	—	kHz
Measurable Current Range	MR	V <sub>dd</sub> =5V (DC Mode)	—	±60	—	A
		V <sub>dd</sub> =5V (AC RMS)	—	40	—	
Temperature Drift	△V <sub>out</sub>	I <sub>p</sub> =0 A	—	±0.5	—	mV/°C
Output Noise	V <sub>Np-p(0.01F)</sub>	IP =0 A, C <sub>Load</sub> = 0.01uF	—	12	—	mV
	V <sub>Np-p(0.1uF)</sub>	IP =0 A, C <sub>Load</sub> = 0.1uF	—	7	—	

1. All output-voltage measurements are made with a voltmeter having an input impedance which is at least 100kΩ

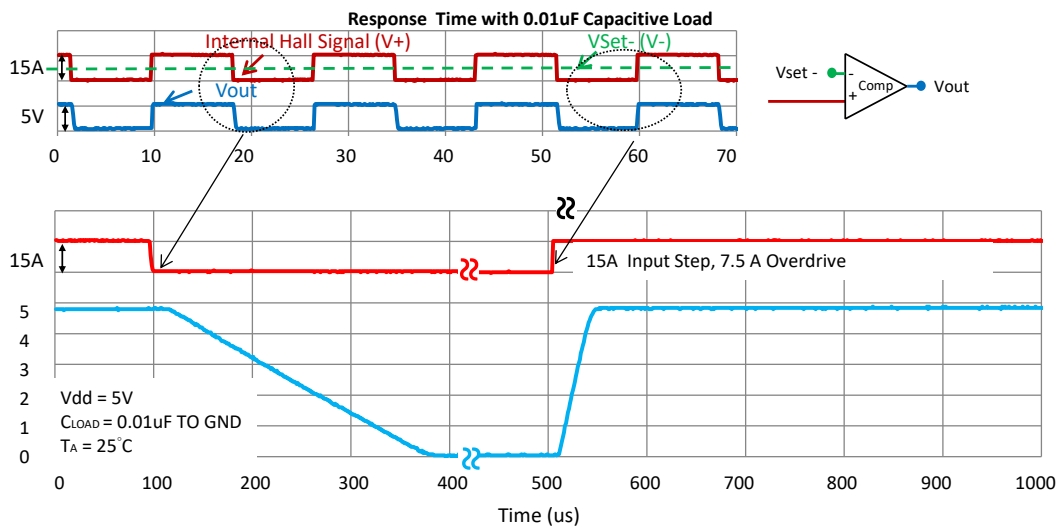
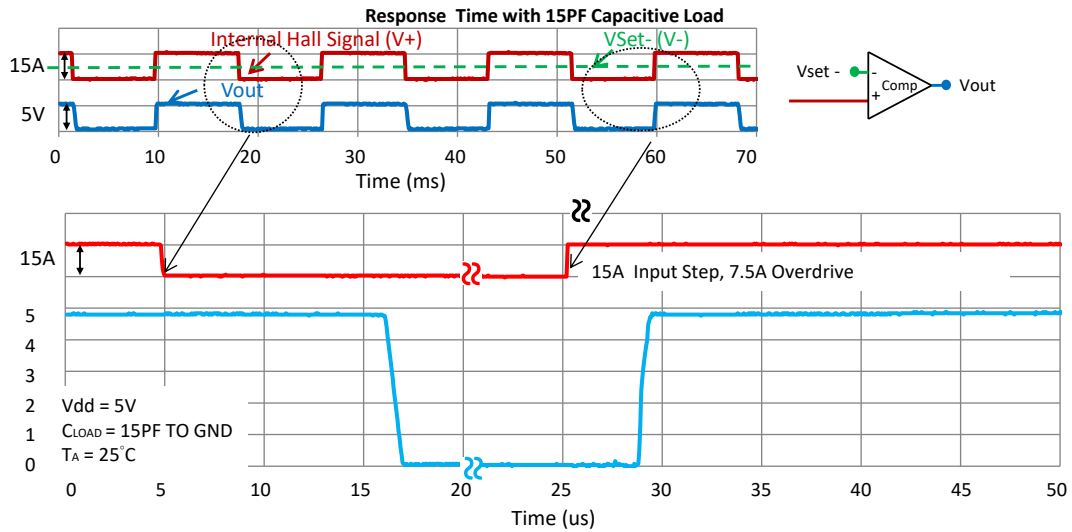
2. Connect 'capacitive load' (0.01uF) in parallel at output pin.

Do not apply any 'resistor load' on output pin, it will degrade IC's performance.

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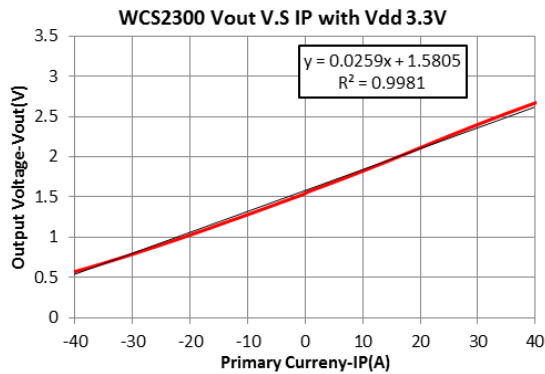
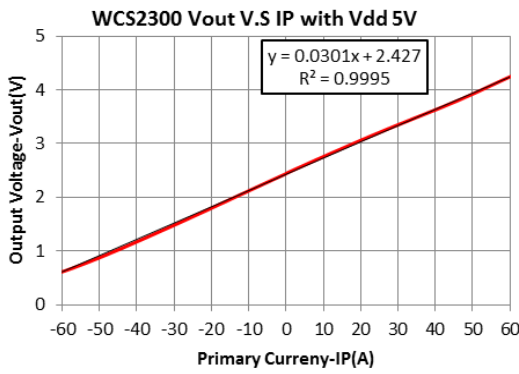
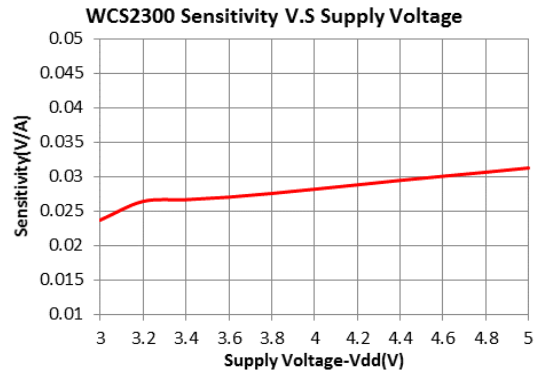
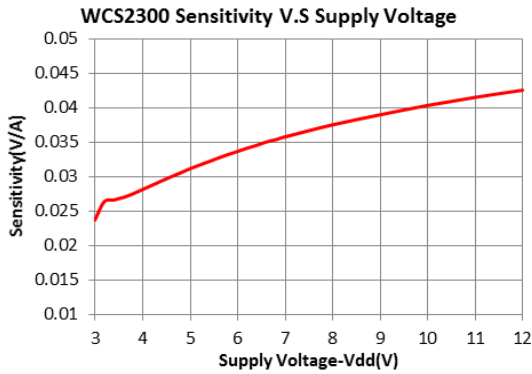
**Characteristic Diagrams:**

**(1) Switch**

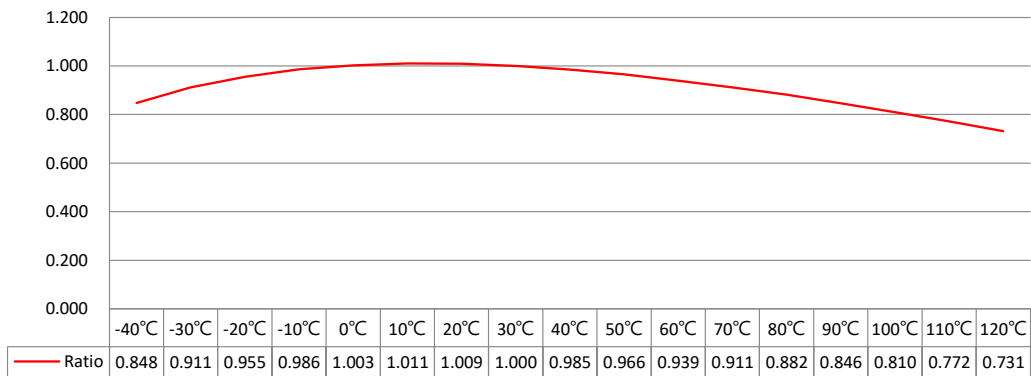


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## (2) Linear

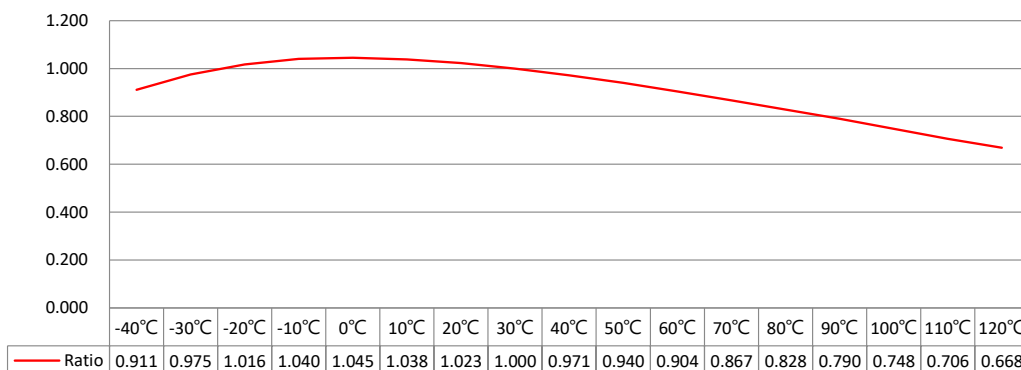


**WCS2300 Sensitivity standardization of 30°C (5V) V.S Temperature**



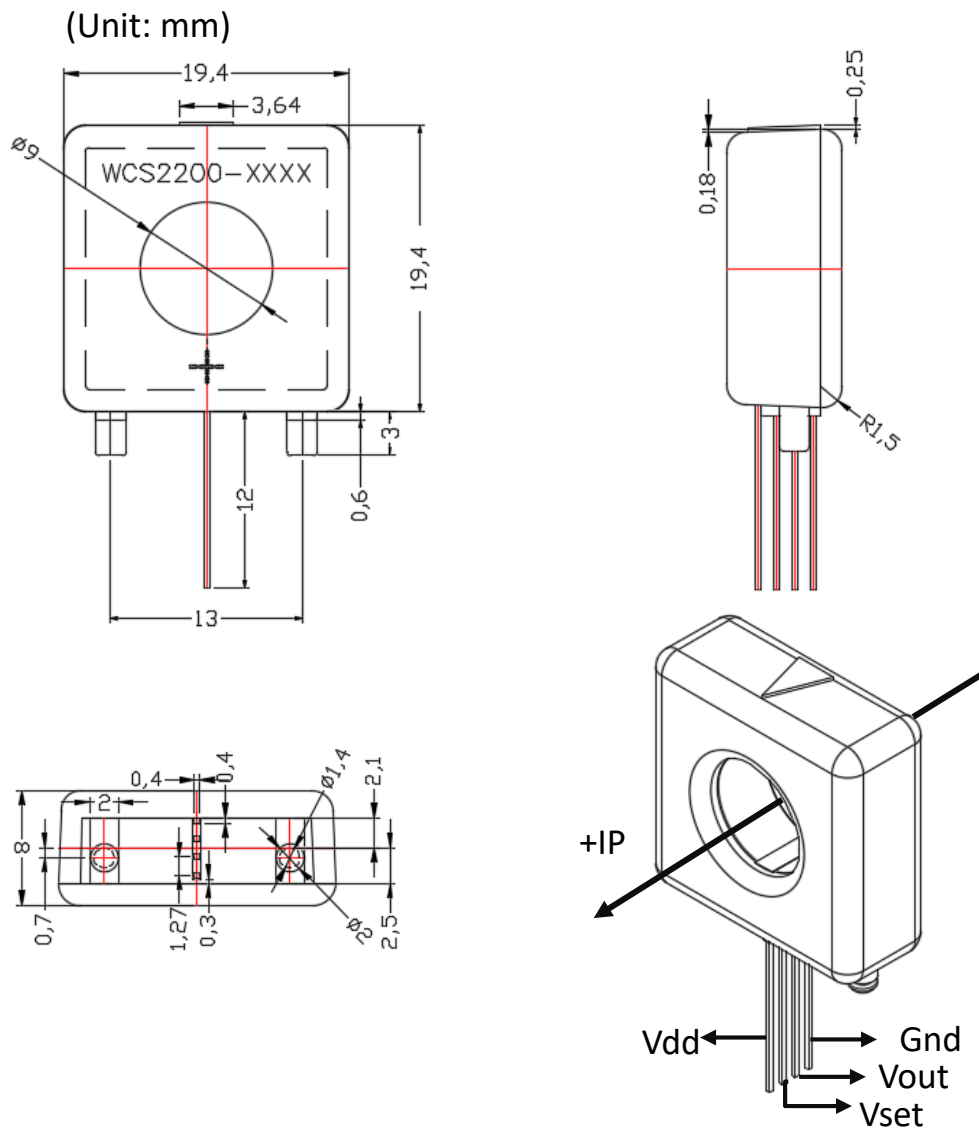
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**WCS2300 Sensitivity standardization of 30°C (3.3V) V.S Temperature**

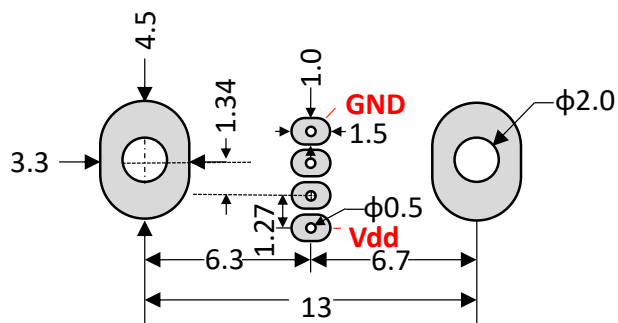


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## Package Information:



### PCB Layout Reference View( Top View)



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**Application Circuit and Note:**
**(1)Current Switching - Direct Setting Method:**

1. **Supply Voltage** : apply voltage  $V_{dd}$  °

2. **Measure the Overcurrent Value** :  $V_{set}$  pin and  $V_{out}$  pin are short-circuited, and output pin does not need to be connected to any load which is as shown in Fig.11. Users can set the IP overcurrent value by putting the target current which is flowing through this hole. Then, measure the output voltage ( $V_{out}$ ) directly by a multimeter under DC mode and records this voltage.

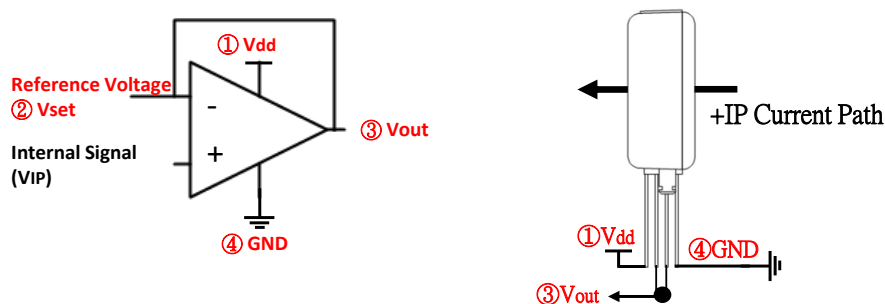


Fig. 1

3. **Set the Overcurrent Value** :  $V_{set}$  pin and  $V_{out}$  pin are open-circuited, which is shown in Fig.12. The  $V_{set}$  pin input the above-mentioned measured voltage value. The  $V_{IP}$  is an internal Hall sensing signal, which converts into a proportional voltage according to the IP current.

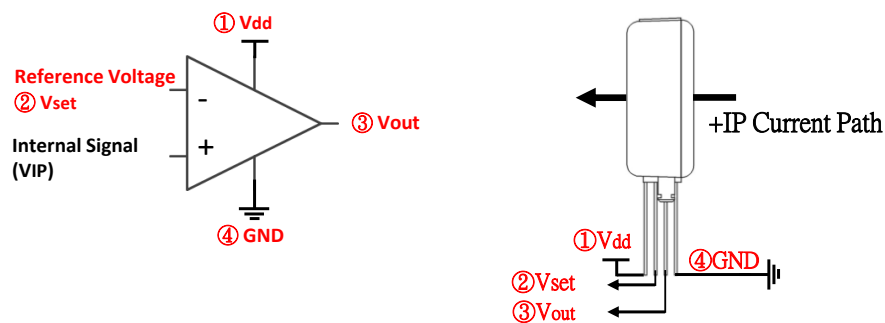


Fig. 2

4. **Output** : the output voltage levels will change according to the  $V_{set}$  voltage.

Output “High” when  $V_{IP} > V_{set}$

Output “Low” when  $V_{IP} < V_{set}$

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**(2)Current Switching - Formula Solution Method:****1. The Zero Current Value**

**1.1 Measure the Zero Current Value  $V_{0A}$  :**  $V_{set}$  pin and  $V_{out}$  pin are short-circuited, and output pin does not need to be connected to any load which is as shown in Fig.11. The output voltage ( $V_{out}$ ) is directly measured by a multimeter under DC mode.

**1.2 The Measuring Current  $I_{IP}$  Voltage  $V_{0A}$  :** measure the output's voltage when no current pass through under the supply voltage 5V and record this voltage.

$$V_{IP} = V_{0A} \doteq 2.5V$$

**2. The Overcurrent Value**

**2.1 Set the Reference Voltage  $V_{set}$  :**  $V_{set}$  pin and  $V_{out}$  pin are open-circuited, which is as shown in Fig.12. The  $V_{set}$  pin input voltage range is  $0 \sim V_{dd}$ .

**3.2 The Overcurrent Current Value  $I_{IP}$  Voltage  $V_{set}$  :** WCSA760 sensitivity is about **32mV/A** under the supply voltage 5V.

( $\Delta V = \text{Current} * \text{Sensitivity}$ )

Example 1: the overcurrent value is 10A

$$V_{set} = V_{10A} = (V_{0A} + \Delta V) = 2.5 + (10 * 0.032) \doteq 2.82V$$

Example 2: the overcurrent value is -10A

$$V_{set} = V_{-10A} = (V_{0A} - \Delta V) = 2.5 - (10 * 0.032) \doteq 2.18V$$

Example 3: the overcurrent value is 20A

$$V_{set} = V_{20A} = (V_{0A} + \Delta V) = 2.5 + (20 * 0.032) \doteq 3.14V$$

**3. Output :** the output voltage levels will change according to the  $V_{set}$  voltage.

**(3)Current Measuring**

**1. Supply Voltage :** apply voltage  $V_{dd}$  °

**2. Measure the Zero Current Output Voltage  $V_{0A}$  (Internal Signal,  $V_{IP}$ ):**

$V_{set}$  pin and  $V_{out}$  pin are short-circuited, and output pin needs to be connected capacitive load to GND, recommend value is 0.01uF. As shown in Fig.13. (Internal circuit configuration of this device is used a comparator, the phase compensation capacitance for oscillation prevention is not included in the comparator. So users need to connect capacitive load in parallel at output terminal if using in a negative feedback configuration.)

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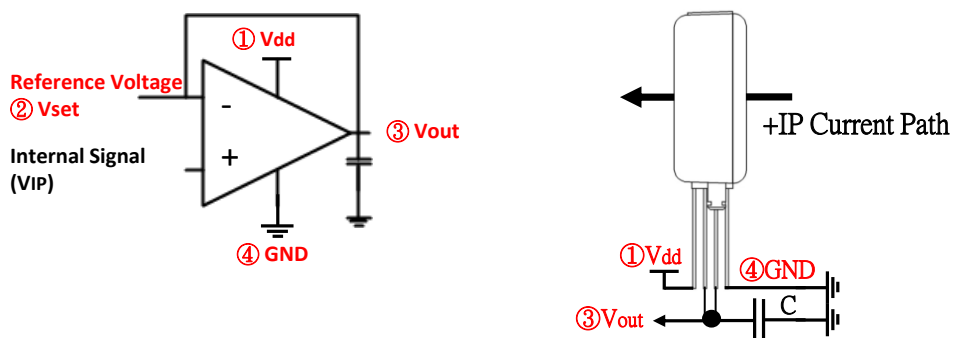


Fig. 3

3. **Calibration** : please refer to Winson Website-> Products->Application Notes-> WCS Application Note: <http://www.winson.com.tw/Product/83>