

## ■ Description

The WD9248 is an ultra-sensitive Hall-effect switch with digital latched output, mainly designed for battery operation, handheld equipments.

Special CMOS process is used for low-voltage and low-power requirement. A chopper stabilized amplifier improves stability of magnetic switch points. A sleep-awake logic controls the IC in sleep time or awake time. This function will reduce the average operating current of the IC. During the awake time, the output is changed with the magnetic flux density. During the sleep time, the output is latched in its previous state and the current consumption will reduce to some  $\mu\text{A}$ .

The IC switching behaviour is omnipolar, either north or south pole sufficient strength will turn the output on. If the magnetic flux density is larger than operating point ( $B_{OP}$ ), the output will be turned on; if it is less than releasing point ( $B_{RP}$ ), the output will be turned off.

The WD9248 is available in TO-92S-3, SOT-23-3 packages which are optimized for most applications.

## ■ Features and Benefits

- Micropower Operation
- 2.5 to 5.5V Power Supply
- Switching for Both Poles of a Magnet (Omnipolar)
- Stabilized Chopper
- Superior Temperature Stability
- Digital Output Signal
- Built-in Pull-up Resistor
- ESD (HBM) 6000V

## ■ Applications

- Cover Switch in Notebook PC/PDA
- Handheld Wireless Application Awake Switch
- Magnet Switch in Low Duty Cycle Applications

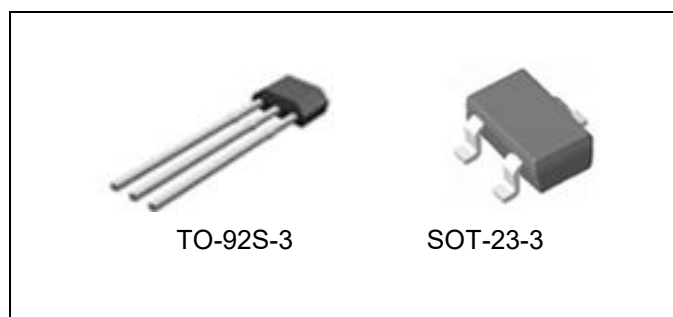
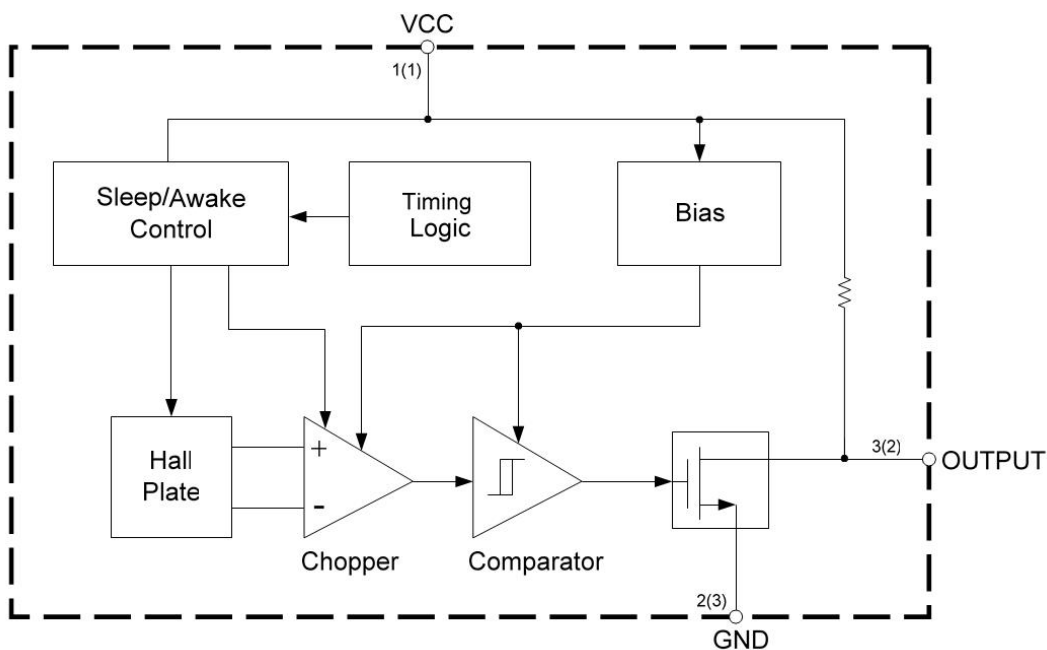


Figure 1. Package Types of WD9248

## Function Blocks



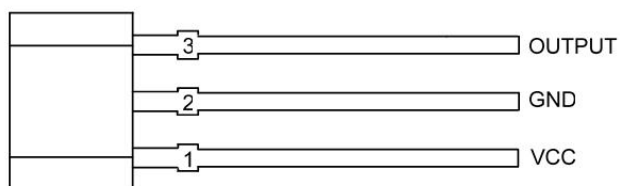
A (B):A for TO-92S-3;B for SOT-23-3.

Figure 2. Functional Block Diagram of WD9248

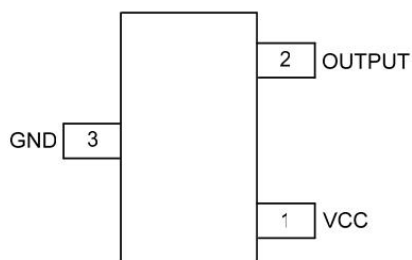
## Pin Descriptions

T3 Package (TO-92S-3)  
(SOT-23-3)

N Package



(Front View)



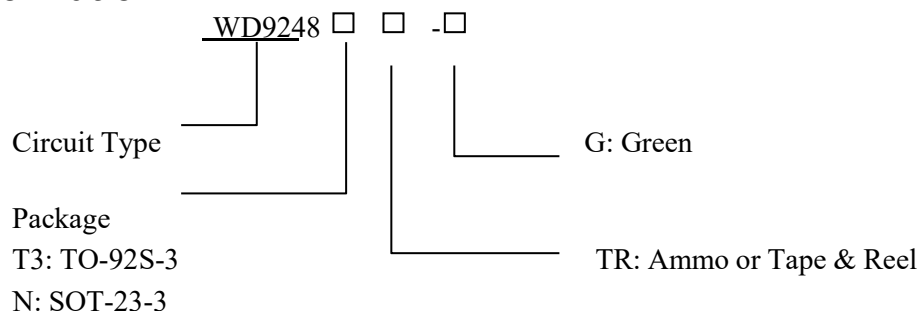
(Top View)

Figure 3. Pin Configuration of WD9248

## Pin Description

| Pin Number |          | Pin Name | Function         |
|------------|----------|----------|------------------|
| TO-92S-3   | SOT-23-3 |          |                  |
| 1          | 1        | VCC      | Power supply pin |
| 2          | 3        | GND      | Ground pin       |
| 3          | 2        | OUTPUT   | Output pin       |

## Ordering Information



| Package  | Temperature Range | Part Number | Marking ID | Packing Type |
|----------|-------------------|-------------|------------|--------------|
| TO-92S-3 | -40 to 85°C       | WD9248T3-G  | 9248       | Bulk         |
| SOT-23-3 |                   | WD9248NTR-G | GX8        | Tape & Reel  |

E-Push's Products with "G" suffix are available in green package. are RoHS compliant.

## Absolute Maximum Ratings (Ta= 25°C, Note 1)

| Parameter                       | Symbol           | Value      |     | Unit  |
|---------------------------------|------------------|------------|-----|-------|
| Supply Voltage                  | V <sub>CC</sub>  | 7          |     | V     |
| Supply Current (Fault)          | I <sub>CC</sub>  | 6          |     | mA    |
| Output Voltage                  | V <sub>OUT</sub> | 7          |     | V     |
| Output Current                  | I <sub>OUT</sub> | 2          |     | mA    |
| Magnetic Flux Density           | B                | Unlimited  |     | Gauss |
| Power Dissipation               | P <sub>D</sub>   | TO-92S-3   | 400 | mW    |
|                                 |                  | SOT-23-3   | 230 |       |
| Storage Temperature             | T <sub>STG</sub> | -55 to 150 |     | °C    |
| Junction Temperature            | T <sub>J</sub>   | 150        |     | °C    |
| ESD (Human Body Model) (Note 2) |                  | 6000       |     | V     |
| ESD (Machine Model) (Note 2)    |                  | 600        |     | V     |

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

Note 2: Electronic semiconductor products are sensitive to Electro Static Discharge (ESD). Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

## ■ Recommended Operating Conditions (Ta= 25°C)

| Parameter             | Symbol          | Min | Max | Unit |
|-----------------------|-----------------|-----|-----|------|
| Supply Voltage        | V <sub>CC</sub> | 2.5 | 5.5 | V    |
| Operating Temperature | T <sub>OP</sub> | -40 | 85  | °C   |

## ■ Electrical Characteristics

V<sub>CC</sub>=3V, T<sub>A</sub>=25°C, unless otherwise specified.

| Parameter          | Symbol           | Conditions              | Min | Typ  | Max | Units |
|--------------------|------------------|-------------------------|-----|------|-----|-------|
| Supply Voltage     | V <sub>CC</sub>  | Operating               | 2.5 | 3    | 5.5 | V     |
| Supply Current     | I <sub>AW</sub>  | Awake                   |     | 1.8  | 3   | mA    |
|                    | I <sub>SL</sub>  | Sleep                   |     | 4    |     | μA    |
|                    | I <sub>AVG</sub> | Average                 |     | 5    | 8   | μA    |
| Output Current     | I <sub>OUT</sub> |                         |     |      | 1.0 | mA    |
| Saturation Voltage | V <sub>SAT</sub> | I <sub>OUT</sub> =1.0mA |     |      | 0.4 | V     |
| Awake Mode Time    | t <sub>AW</sub>  | Operating               |     | 120  |     | μs    |
| Sleep Mode Time    | t <sub>SL</sub>  | Operating               |     | 80   | 120 | ms    |
| Duty Cycle         | D                |                         |     | 0.15 |     | %     |
| Chopper Frequency  | f <sub>C</sub>   |                         |     | 15   |     | kHz   |

## ■ Magnetic Characteristics (Ta= 25°C,Note 3)

V<sub>CC</sub>=3V, T<sub>A</sub>=25°C, unless otherwise specified. For TO-92S-3 Package

| Parameter       | Symbol           | Conditions  | Min | Typ | Max | Unit  |
|-----------------|------------------|---|-----|-----|-----|-------|
| Operating Point | B <sub>OPS</sub> | South pole to branded side<br>B>B <sub>OPS</sub> , V <sub>OUT</sub> =low(output on)   | 15  | 30  | 55  | Gauss |
|                 | B <sub>OPN</sub> | North pole to branded side<br>B>B <sub>OPN</sub> , V <sub>OUT</sub> =low(output on)   | -55 | -30 | -15 | Gauss |
| Releasing Point | B <sub>RPS</sub> | South pole to branded side<br>B<B <sub>RPS</sub> , V <sub>OUT</sub> =high(output off) | 5   | 20  | 45  | Gauss |
|                 | B <sub>RPN</sub> | North pole to branded side<br>B<B <sub>RPN</sub> , V <sub>OUT</sub> =high(output off) | -45 | -20 | -5  | Gauss |
| Hysteresis      | B <sub>HYS</sub> | B <sub>OPX</sub> - B <sub>RPX</sub>   (Note4)   |     | 10  |     | Gauss |

## ■ Magnetic Characteristics (Continued)

$V_{CC}=3V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified. For SOT-23-3 Packages

| Parameter       | Symbol    | Conditions   | Min | Typ | Max | Unit  |
|-----------------|-----------|--|-----|-----|-----|-------|
| Operating Point | $B_{OPS}$ | South pole to branded side<br>$B > B_{OPS}$ , $V_{OUT} = \text{low (output on)}$   | 20  | 30  | 40  | Gauss |
|                 | $B_{OPN}$ | North pole to branded side<br>$B > B_{OPN}$ , $V_{OUT} = \text{low (output on)}$   | -40 | -30 | -20 | Gauss |
| Releasing Point | $B_{RPS}$ | South pole to branded side<br>$B < B_{RPS}$ , $V_{OUT} = \text{high (output off)}$ | 5   | 20  | 32  | Gauss |
|                 | $B_{RPN}$ | North pole to branded side<br>$B < B_{RPN}$ , $V_{OUT} = \text{high (output off)}$ | -32 | -20 | -5  | Gauss |
| Hysteresis      | $B_{HYS}$ | $ B_{OPX} - B_{RPX} $ (Note4)  |     | 10  |     | Gauss |

Note 3: The specifications stated here are guaranteed by design. 1 Gauss=0.1mT

Note 4:  $B_{OPX}$ =operating point (output turns on);  $B_{RPX}$ =releasing point (output turns off)

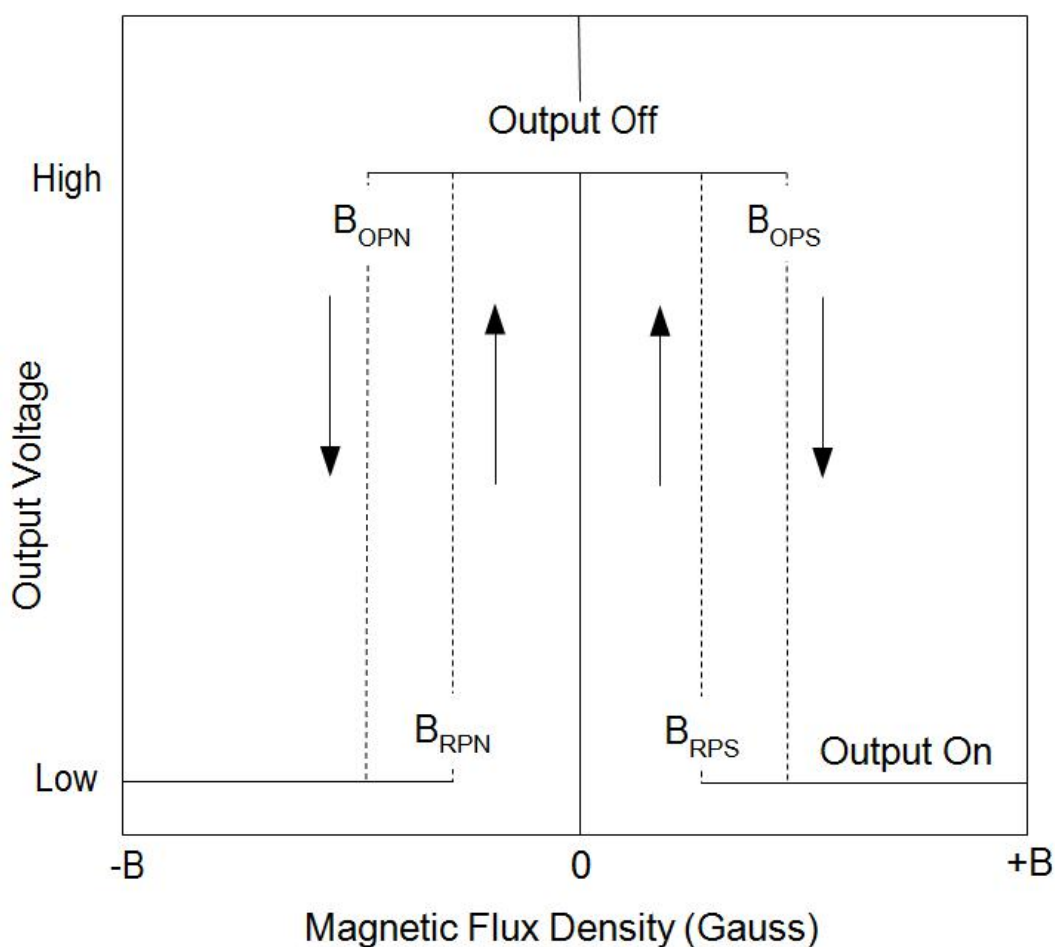


Figure 4. Output Voltage vs. Magnetic Flux Density

## ■ Test Circuit

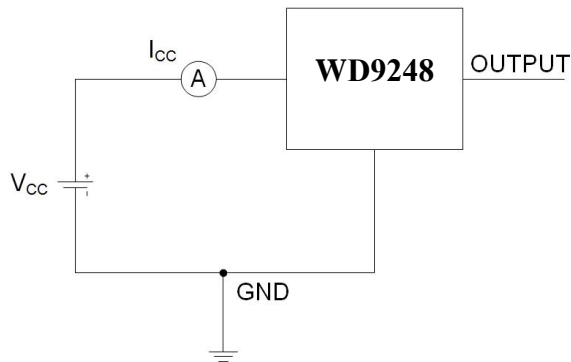


Figure 5. Average Supply Current (Note 5, Note 6)

Note 5:  $I_{CC}$  represents the average supply current. OUTPUT is open during measurement.

Note 6: The device is put under magnetic field with  $B < B_{RP}$ .

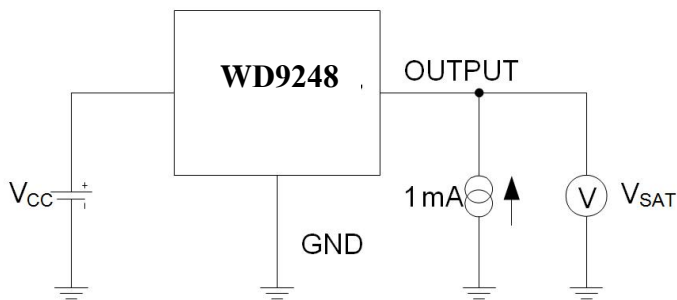


Figure 6. Output Saturation Voltage (Note 7, Note 8)

Note 7: The output saturation voltage  $V_{SAT}$  is measured at  $V_{CC}=2.5V$  and  $V_{CC}=5.5V$

Note 8: The device is put under magnetic field with  $B > B_{OP}$

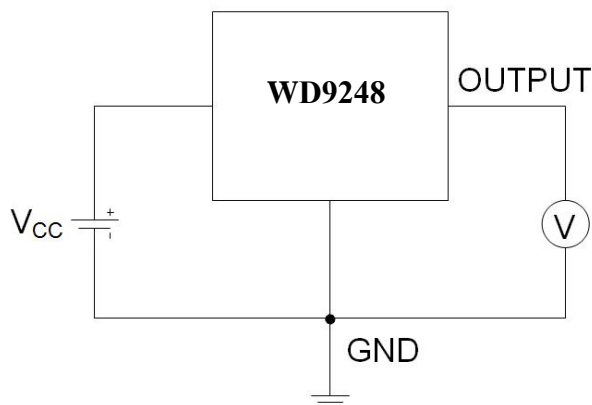


Figure 7. Magnetic Thresholds (Note 9, Note10)

Note 9:  $B_{OP}$  is determined by putting the device under magnetic field swept from  $B_{RP(min)}$  to  $B_{OP(max)}$  until the output is switched on.

Note 10:  $B_{RP}$  is determined by putting the device under magnetic field swept from  $B_{OP(max)}$  to  $B_{RP(min)}$  until the output is switched off.

## Typical Performance Characteristics

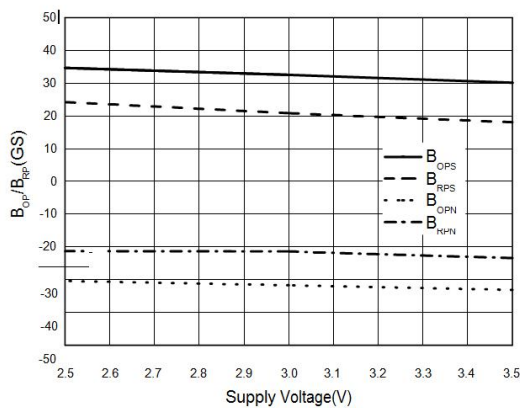


Figure 8.  $B_{OP}/B_{RP}$  vs. Supply Voltage

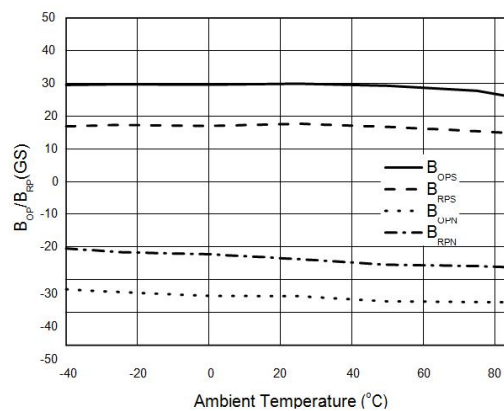


Figure 9.  $B_{OP}/B_{RP}$  vs. Ambient Temperature

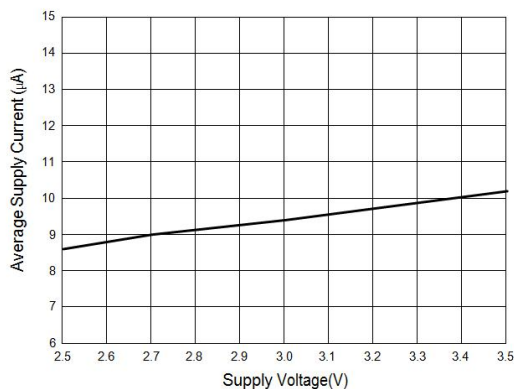


Figure 10. Average Supply Current vs. Supply Voltage

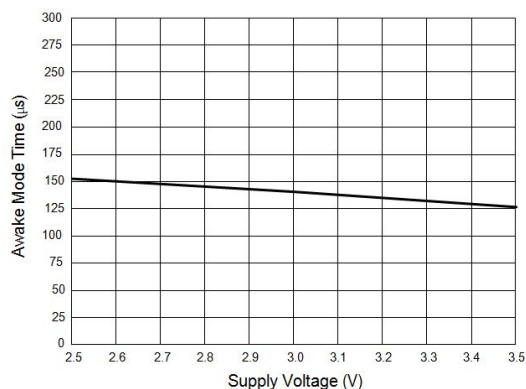


Figure 11. Awake Mode Time vs. Supply Voltage

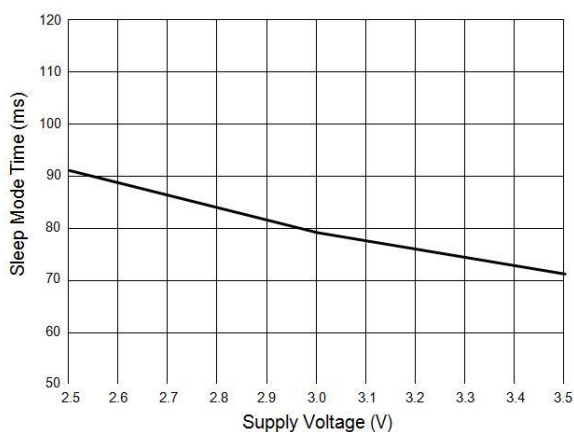


Figure 12. Sleep Mode Time vs. Supply Voltage

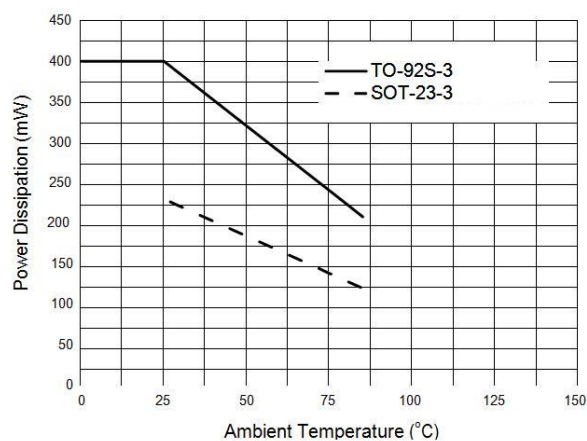


Figure 13. Power Dissipation vs. Ambient Temperature

## ■ Typical Applications

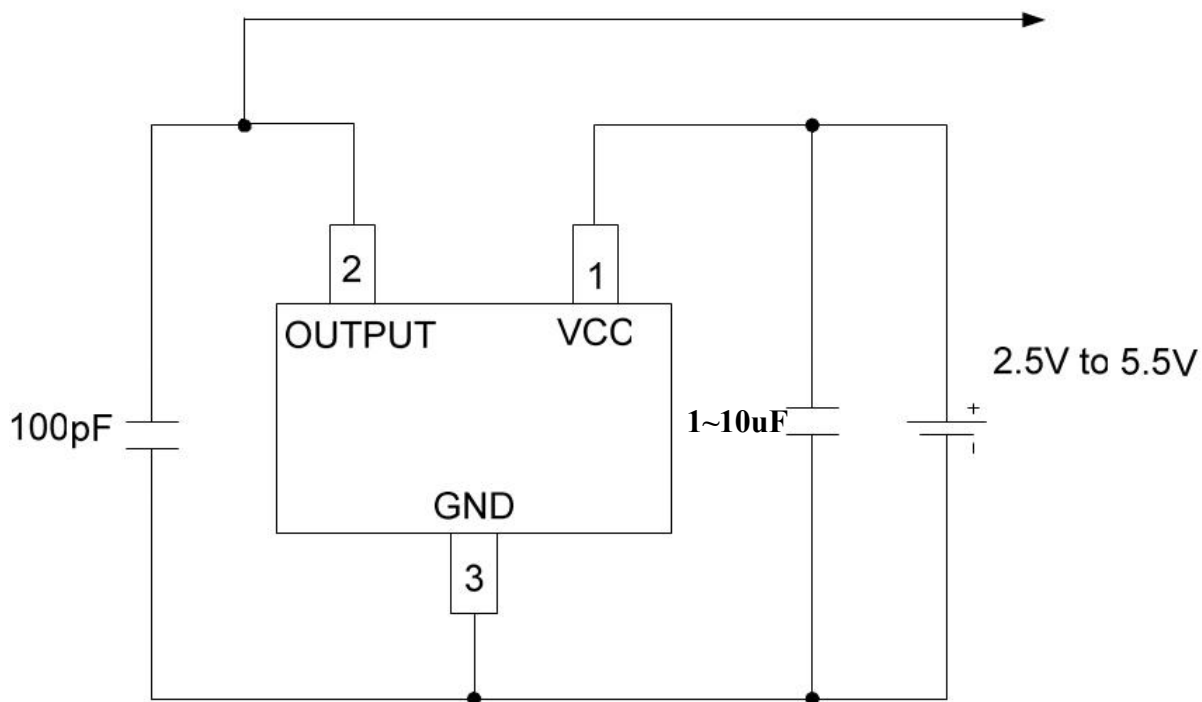


Figure 14. Typical Application Circuit of WD9248

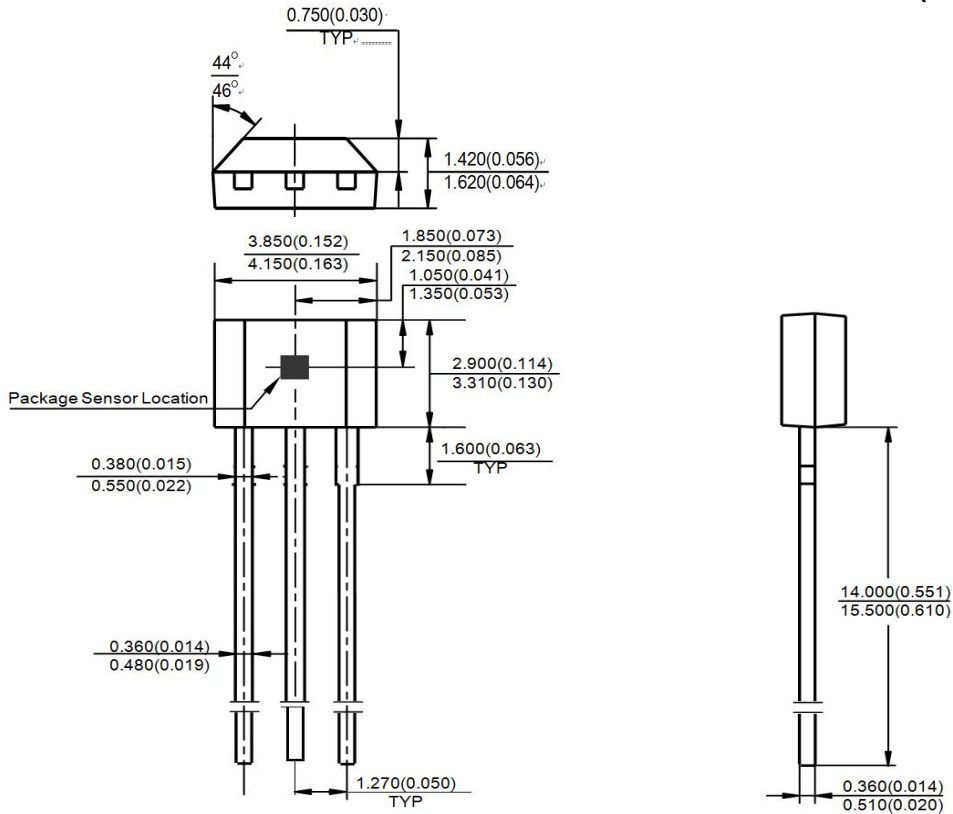
Note 11: When WD9248 is used in the typical  $V_{cc}(3V)$ , the smaller capacitors(0.1uF) can be used on  $V_{cc}$ . When WD9248 is used in the higher  $V_{cc}(5V)$ , the larger capacitors(1~10uF) need be used according the actual situation.



## Mechanical Dimensions

### TO-92S-3

Unit: mm(inch)



### SOT-23-3

Unit: mm(inch)

