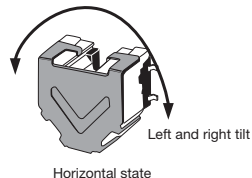


## Subminiature PCB Mounting Sensor Discriminating Left or Right Tilt



- Detects the inclination of the Sensor within an activated angle range between 45° and 75° (left and right) and a reset angle range between 50° and 20°
- A subminiature SMD PCB mounting model
- A highly reliable solid-state type by Hall IC
- A surprisingly low power consumption with a maximum of 20µA
- Lead-free



### Ordering Information

Output configuration	Model
ON/OFF	D6B-2(P)

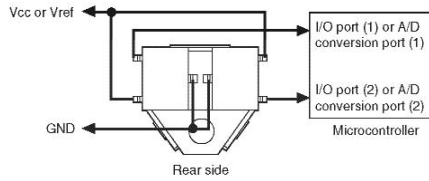
### Application

Vertical or horizontal discrimination of digital cameras, PDAs, and cellular phones.

### Performance

Operating characteristics	Activated angle	45° to 75° (left and right)
	Reset angle	50° and 20° (left and right)
		<p><b>Note:</b> Characteristic values are provided, on condition that there is no tilt back and forth while the operation speed is 10° per second.</p>
Output Config.	Horizontal state	High-voltage signal output from the terminals on both sides.
	Inclined left or right	Low-voltage signal output only from the terminals on the side of the moving direction.
Electrical characteristics	<b>Ta = 25° and Vdd = 3V DC</b>	
	Power supply voltage range (Vdd)	2.7 to 3.3 V DC
	High-voltage output	Vdd-0.5V min.
	Low-voltage output	0.5V DC max.
	Current consumption	20 µA max. (10 µA typical)
	<b>Maximum ratings</b>	
	Power supply voltage (Vdd)	-0.1 to 5.0 V
Output current (Iout)	± 1mA	
Basic specs.	Ambient temperature (operating)	-10°C to 60°C (with no condensation)
	Ambient temperature (storage)	-25°C to 70°C (with no condensation)
	Ambient humidity (operating)	25% to 85%

## Electrical Connections



## Soldering Condition

1. Recommendation reflow solder condition(infrared rays method)Please set the thermo-couple on the side of the terminal and set the reflow furnace as follows.

\*In the case of Sn-Pb eutectic solder

	Temperature °C	Time(s)
Preheat area	140	90±30
Reflow area	230±5	<= 20 seconds ->
Peak temperature	max. 240	< 5 seconds ->

\*In the case of Pb-free solder

	Temperature °C	Time(s)
Preheat area	160 – 180	90±30
Reflow area	230±5	<= 40 seconds ->
Peak temperature	max. 250	< 10 seconds ->

\*Reflow times: Less than 2 times

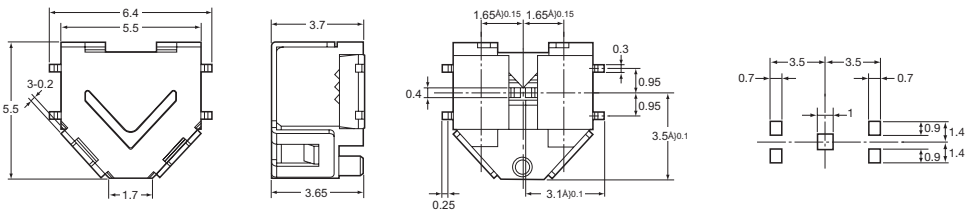
2. Detaching condition by blower

Please go within the detaching condition temperature 240°C and 5 seconds.

3. Please go for the hand solder at temperature 260°C and 10 second ahead or 350°C and 3 second or less.

4. The conventional solder containing lead can also be used.

## External Conditions



## Cautions

- The Sensor does not use any materials detrimental to the ozone layer.
- Specifications other than the electrical or mechanical characteristics, external dimensions, or mounting dimensions of the Sensor are subject to change without notice.

### ■ Handling Precautions

#### Operating Environment

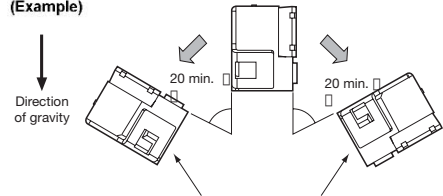
- The Sensor consists of a Hall IC and a magnet. Check that the Sensor in operation will not be influenced by any external magnetic fields.
- Do not install any magnetic materials within 2 mm of the Sensor, else the performance characteristics of the Sensor may not be guaranteeable. If there are any objects (e.g., motors and solenoids) generating magnetic fields near the Sensor, operate and test the Sensor before the Sensor comes into actual use.
- Do not apply any voltage exceeding 5V to the Sensor, else the Sensor may break.
- Do not wash the Sensor after the Sensor is soldered.
- Do not mount or dismount the Sensor while power is flowing to the Sensor.
- The Sensor may generate error signals if impacted at a minimum acceleration of  $294 \text{ m/s}^2$ .
- The Sensor may generate error signals if a vibration at a minimum frequency of 15 Hz and a minimum acceleration of  $15 \text{ m/s}^2$  is applied to the Sensor.

- Confirm that no static electricity at a maximum voltage of 5kV is applied to the pins, else the Sensor may break.

#### Operating Characteristics

The present output may be kept if the inclination of the Sensor back and forth is  $20^\circ$  or over. Under that condition, the output may not change even when the Sensor is leaned left or right.

#### (Example)



If the Sensor is kept inclined back or forth as shown in the above illustration, the level of output may not change from high to low or low to high when the Sensor inclines left or right.

□

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**

To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

- Pure mechanical tilt sensor.
- Sealed enclosure.
- Output capacity from 0.1mA at 5VDC to 100mA at 30VDC.



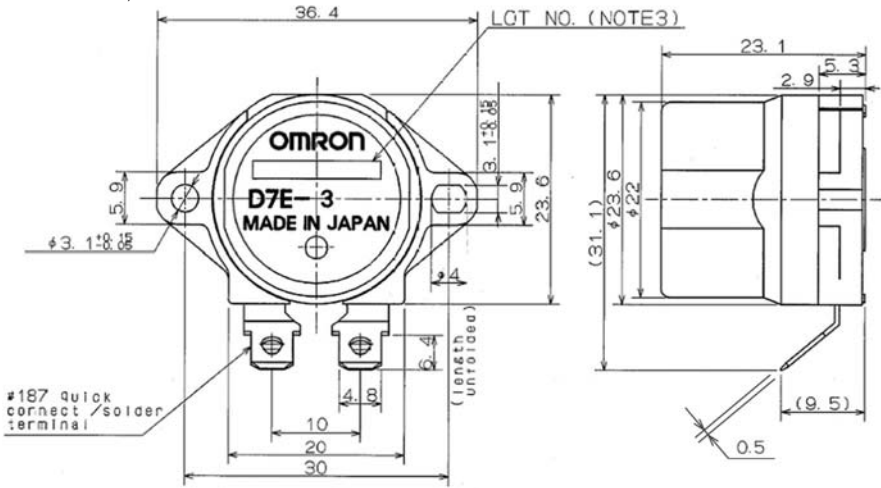
## Ordering Information

Model	Operating Angle
D7E-3	50 to 80 degrees

## Characteristics

Model	D7E-3
<b>Operating Angle</b>	Tilt of 50 to 80 degrees.
<b>Operating Characteristics</b>	The value of tilt degree is specified when the switch is tilted gradually (approx. 1 degree/s) from the horizontal.
<b>Returning Angle</b>	Tilt of more than 25 degrees. The value of tilt degree is specified when the switch is tilted gradually (approx. 1 degree/s) from the horizontal
<b>Permissible Mounting Level</b>	1 degree max. from the horizontal
<b>Contact Form</b>	Single pole single throw (NC contact / slow action)
<b>Mounting</b>	Pitch: 30mm 2 screws (M3) Height: 5.3mm
<b>Soldering</b>	Soldering iron: temperature 350±10°, 3 sec. MAX
<b>Ratings</b>	5VDC, 0.1mA to 30VDC, 100mA (Resistive load)
<b>Insulation Resistance</b>	100MΩ MIN. (250VDC, between each terminal of the same polarity To measure off condition)
<b>Contact Resistance</b>	100Ω MAX. (Initial value)
<b>Vibration During Transportation</b>	Condition: Vibration: 200 gal (1cycle: 0.5 sec.) Vibration direction: 3 axial directions Time: Total 50 hours
<b>Shock</b>	Condition: Acceleration: 980 m/s <sup>2</sup> 3 times Shock direction: 2 axial directions
<b>Operating temperature and humidity</b>	Temperature: -25°C to +60°C (with no icing and condensation) Humidity: 45 to 95 % RH
<b>Storage temperature and humidity</b>	Temperature: -25 degrees to +60 degrees (with no icing and condensation) Humidity: 45 to 95 % RH Protection
<b>Protection</b>	IP67

(All dimensions in mm)



**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**

To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

- Digital Output
- High noise immunity
- Pressure range 0 to 4.9kPa
- Current consumption 100mA ± 5% at output 3VDC
- Operating temperature range -10°C to 60°C
- Protection Structure IP40



iSensors

## Characteristics

Model	D8M-D82
Pressure Type	Gauge
Pressure range	0 to 4.9kPa (0 to 0.71 psi)
Withstand pressure	19.6 kPa for 5 minutes
Repeatability/hysteresis	± 5% FS
Non-linearity characteristics	±2% FS max
Response time	1.5 ms (pressure) 30 ms max. (switch) 45 ms (discharge)
Operating temperature	-10°C to 60°C (with no icing or condensation)
Storage temperature	-20°C to 70°C (with no icing or condensation)
Operating humidity	25 to 95%
Degree of protection	IP40
Pressure port	6mm OD
Connection method	Three AWG26 wires, 115mm long
Material	PBT (polybutylene terephthalate)

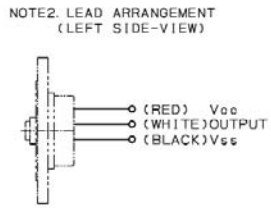
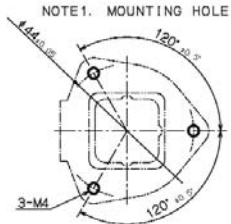
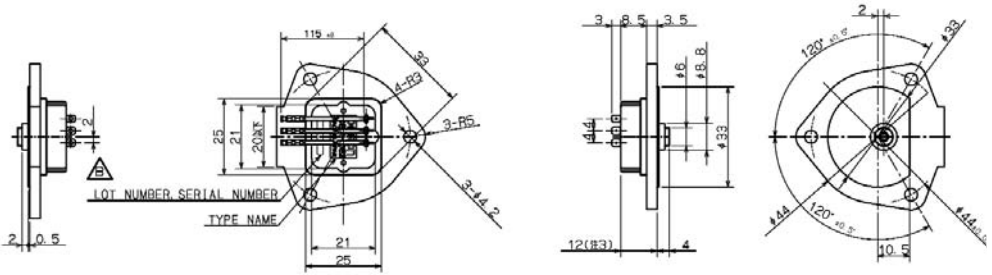
## Ratings

Power supply voltage	2.2 to 3.4 VDC with regulator
Current consumption	100mA ±5% at 3VDC
Leakage current	1 mA or less
Output resolution	1 pulse/9.81 Pa
Operating characteristics	0 kPa = 30 pulses 0.15 kPa = 45 ±30 pulses 2 kPa = 204 ±15 pulses 4 kPa = 436 ±46 pulses

## Performance

T1: Pressure measurement time	1.5ms min.
T2: Response time	30ms max.
T3: Electrical discharge time	45ms min.

Dimensions



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 To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Air Flow detector specifically to detect clogged conditions in air filters on servers and other types of computer equipment

- Detects the clogged conditions of air filters more efficiently than a conventional time totaling meter
- Adopts a velocity of the wind monitor employing an NTC thermistor to output 0 to 5V analog voltage signals



## Ordering Information

Model
D6A-N

## Specifications

<b>Mounting method</b>	Front secured with nylon rivets (see External Dimensions for the dimensions of the Sensor)
<b>Temperature device</b>	NTC thermistor (epoxy resin coat)
<b>Detection method</b>	Velocity of wind monitor method (80 °C own heating type)
<b>Connector</b>	Japan Aviation Electronics Industry's IL-Z Series
<b>Operating temperature</b>	0°C to 45°C (with no icing)
<b>Storage temperature</b>	-25°C to + 65°C
<b>Operating humidity</b>	25 to 85%RH
<b>Storage humidity</b>	25 to 85%RH
<b>Applicable gas</b>	Air
<b>Range of velocity of wind detection</b>	0.5 to 1.5m/sec.
<b>Mounting direction</b>	Mount the Sensor so that the ventilation opening will be located vertical to the wind direction.
<b>Drive power supply</b>	12V DC asd ± 10%
<b>Operating environmental conditions</b>	The Sensor must be free of oil, moisture, and/or dust. Otherwise, the thermal diffusion characteristics of the Sensor will change.

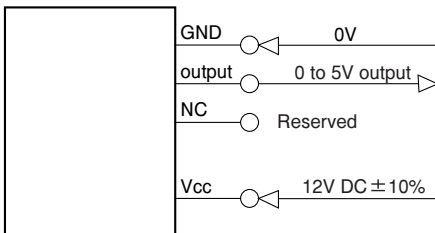
**Caution:** Judge the degree of clogging condition from a voltage differential based on the initial voltage obtained when the filter is clean. One minute will be required for the stabilization of the Sensor after the Sensor is turned on.



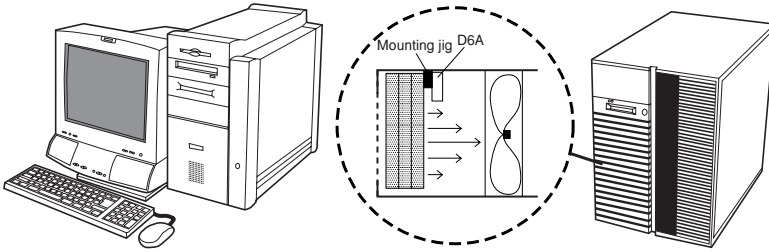
## Performance

Head	Test Method	Criteria
(1) Output voltage characteristics	<ul style="list-style-type: none"> <li>Power supply voltage: 12.0V DC</li> <li>Load resistance: 1M<math>\Omega</math></li> <li>Ambient temperature: 25 <math>\pm</math> 5 degrees, Relative humidity: 25% to 85% RH</li> </ul>	Output range: 0.2 to 5.0V (0 to 1.5m/sec.) [Relative value] Based on output at a velocity of wind of 1.5m/sec. Output at velocity of wind of 1.0m/sec.: -1.80V $\pm$ 0.45V Output at velocity of wind of 0.5m/sec.: -4.25V $\pm$ 0.75V [Absolute value] (Reference value) <ul style="list-style-type: none"> <li>Velocity of wind of 0.5m/sec.: Output of 0.25V <math>\pm</math> 1.2V</li> <li>Velocity of wind of 1.0m/sec.: Output of 2.70V <math>\pm</math> 1.35V</li> <li>Velocity of wind of 1.5m/sec.: Output of 4.50V <math>\pm</math> 1.35V</li> </ul>
(2) Temperature characteristics	<ul style="list-style-type: none"> <li>Power supply voltage: 12.0V DC</li> <li>Ambient temperature: 0°C to 45°C Relative humidity : 25% to 85% RH</li> </ul>	[Relative value] Based on output (at 25 °C ) at a velocity of wind of 1.5m/sec. Output at velocity of wind of 1.0m/sec.: -1.80V $\pm$ 0.55V Output at velocity of wind of 0.5m/sec.: -4.25V $\pm$ 0.90V
(3) Max. output voltage	<ul style="list-style-type: none"> <li>Power supply voltage: 13.2V DC</li> <li>Velocity of the wind: 1.5m/sec.</li> <li>Ambient temperature: 25 <math>\pm</math> 5°C</li> <li>Load resistance: 1M<math>\Omega</math></li> </ul>	5.2V max
(4) Current consumption	<ul style="list-style-type: none"> <li>Power supply voltage: 13.2V DC</li> <li>Measured velocity of the wind: 1.5m/sec.</li> <li>Ambient temperature: 25 <math>\pm</math> 5°C</li> <li>Load resistance: 1M<math>\Omega</math></li> </ul>	60mA max.
(5) Insulation resistance	Measure the insulation resistance between the whole terminals and the sensor frame with a 100V DC insulation resistance tester	20M $\Omega$ min.
(6) Dielectric strength	Apply 500V AC for one minute between the whole terminals and the sensor frame.	Max. leak current of 1mA

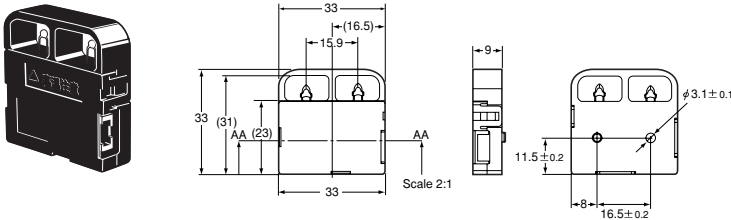
## Electrical Connections



## Application Example



## External Dimensions



## Cautions

## HANDLING PRECAUTIONS

## Storage

Pay the utmost attention as follows when storing the Sensor for long periods of time.

- (1) Select a storage venue in consideration of protecting the Sensor from dust and humidity.
- (2) Store the Sensor in the original packing materials

## Mounting to Store computer

- (1) Perform a safety check if the Sensor is dropped.
- (2) Connect the Sensor to the connector securely.
- (3) Use Kitagawa Industries' NRP-345 nylon rivets to secure the Sensor.

## Precautions for Operation

- (1) Do not apply a voltage of 13.2V DC or higher to the Sensor.
- (2) Keep clean the thermistor during maintenance. The output voltage of the thermistor will drop if there is any oil, moisture, and/or dust on the surface of the thermistor.
- (3) Do not bend the terminals of the thermistor while cleaning, otherwise the output voltage of the thermistor will drop.
- (4) Check that the PCB is free of water or moistened dust, otherwise the internal circuit will short-circuit.
- (5) A maximum of 12V DC is applied to the terminals of the thermistor.

Do not touch them, otherwise an electric shock may be received. When incorporating the Sensor into your product, describe this precaution in the maintenance manual of the product.

- (6) When the Sensor is turned on, the thermistor will heat to approximately 80°C. Touching the thermistor may result in burns.

When incorporating the Sensor into your product, describe this precaution in the maintenance manual of the product.

- (7) When disposing of the Sensor, be mindful of necessary risk prevention and environmental maintenance.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**

To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Compact, intelligent sensors featuring MEMS technology for precision mass airflow, LNG and LPG measurement

- Precision unidirectional gas mass flow up to 5 LPM
- Stable output across full scale
- Low power consumption



AIR TYPE

iSensors



LNG\LPG TYPE

## Application Examples

- Pick and place systems
- Industrial processes
- Oxygen concentrators / conservators
- Leak detection
- Spectroscopy
- Mass flow controllers
- Scientific / test equipment
- Environmental comfort controls
- Fuel cell controls

## Ordering Information

Model	Case	Applicable Gas*	Flow Range
D6F-01A1-110	PPS	Air**	0-1 LPM
D6F-02A1-110			0-2 LPM
D6F-01N2-000	Aluminum	LNG***	0-1 LPM
D6F-02L2-000		LPG****	0-2 LPM
D6F-05N2-000		LNG***	0-5 LPM

\*Could be calibrated for different gas types. Consult your Omron sales representative or similar.

\*\*Dry gas must not contain large particles, eg. dust, oil, mist.

\*\*\*Liquified Natural Gas

\*\*\*\*Liquified Propane Gas

## ■ Ratings

### Absolute Maximum Rating

Item	Symbol	Rating	Unit
Power Supply	$V_{CC}$	26.4	VDC
Output Voltage	$V_{OUT}$	6	VDC

## ■ Electrical Performance

### Recommendation Condition

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply	$V_{CC}$	–	10.8	–	26.4	VDC
Operating Temperature	$T_{OPR}$	within $\pm 4\%$ F.S. of detected characteristics of at 25°C	-10	–	60	°C
Output Voltage (Max.)	$V_{OH}$	Load resistance 10kR	–	–	5.7	VDC
Output Voltage (Min.)	$V_{OL}$	Load resistance 10kR	0	–	–	VDC

## ■ Basic Performance

0 to 1, 0 to 2 and 0 to 5L/min (Normal) volumetric flow rate at 0°C, 101.3kPa.

Measurement condition: Power-supply voltage  $12 \pm 0.1$ VDC, ambient temperature  $25 \pm 5$ °C and ambient humidity 25 to 75% RH.

### D6F-01A1-110

Flow Rate (L/min)	0	0.2	0.4	0.6	0.8	1.0
Output Voltage (VDC)	1.00 $\pm$ 0.12	2.31 $\pm$ 0.12	3.21 $\pm$ 0.12	3.93 $\pm$ 0.12	4.51 $\pm$ 0.12	5.00 $\pm$ 0.12

### D6F-02A1-110

Flow Rate (L/min)	0	0.4	0.8	1.2	1.6	2.0
Output Voltage (VDC)	1.00 $\pm$ 0.12	2.59 $\pm$ 0.12	3.53 $\pm$ 0.12	4.18 $\pm$ 0.12	4.65 $\pm$ 0.12	5.00 $\pm$ 0.12

### D6F-01N2-000

Flow Rate (L/min)	0	0.2	0.4	0.6	0.8	1.0
Output Voltage (VDC)	1.00 $\pm$ 0.12	1.90 $\pm$ 0.12	2.81 $\pm$ 0.12	3.64 $\pm$ 0.12	4.37 $\pm$ 0.12	5.00 $\pm$ 0.12

### D6F-02L2-000

Flow Rate (L/min)	0	0.4	0.8	1.2	1.6	2.0
Output Voltage (VDC)	1.00 $\pm$ 0.30	3.02 $\pm$ 0.08	3.95 $\pm$ 0.08	4.47 $\pm$ 0.08	4.79 $\pm$ 0.08	5.00 $\pm$ 0.12

### D6F-05N2-000

Flow Rate (L/min)	0	1.0	2.0	3.0	4.0	5.0
Output Voltage (VDC)	1.00 $\pm$ 0.12	2.91 $\pm$ 0.12	3.92 $\pm$ 0.12	4.47 $\pm$ 0.12	4.79 $\pm$ 0.12	5.00 $\pm$ 0.12

## ■ Characteristics

Model	D6F-01A1-110	D6F-02A1-110	D6F-01N2/05N2-000	D6F-02L2-000
Degree of Protection	IP40			
Joint type	Bamboo type (Bamboo min. external diameter: 7.4mm, Bamboo max. external diameter: 8.6mm) (passage diameter: 4mm)		Rc 1/4 Screw	
Applicable gas	Air**		LNG***	LPG****
Electrical Connection	Connector (3 wire)			
Withstand pressure	200kPa			
Accuracy	$\pm$ 3% F.S. of detected characteristics of at 25°C			
Operating temperature	-10 to 60 degrees (with no icing or condensation)			
Operating humidity	Under 85% RH (with no icing or condensation)			
Storage temperature	-40 to 80 degrees (with no icing or condensation)			
Storage humidity	Under 85% RH (with no ice or no dew)			
Temperature characteristics	+/-3%FS of detected characteristics at 25°C (within -10 to 60°C)			+/-4%FS of detected characteristics at 25°C (within -10 to 60°C)
Output signal	Analog Output 1-5 VDC (load resistance 10k $\Omega$ min.)			
Current consumption	No-load $V_{cc} = 12$ to 24VDC, $V_{ss} = 0$ V 25 deg. C, Max. 15mA			
Insulation resistance	20M $\Omega$ (500VDC, between terminal and case)			
Dielectric strength	500VAC, 50/60Hz, for 1 minute. (Leakage current typ < 1mA.) Between lead terminals and base			
Weight	12.77g		35.32g	

\*\* Dry gas must not contain large particles, eg. dust, oil, mist.

\*\*\* LNG - Liquefied Natural Gas

\*\*\*\* LPG - Liquefied Propane Gas

## ■ Precautions

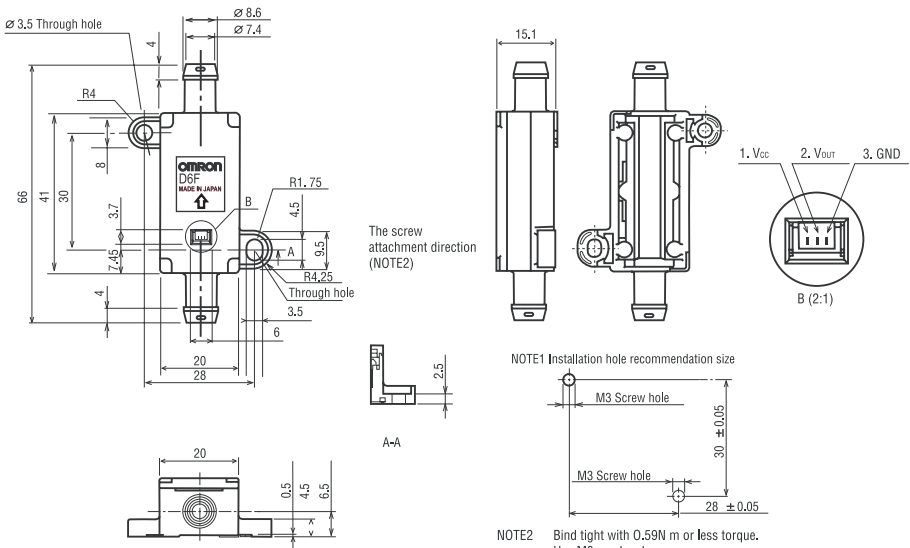
1. Avoid use in excessively dirty, wet environments
2. Do not use with corrosive gases (eg chlorine, sulphur, acids, alkalis etc). For D6F 01A1 & D6F 02A1 ONLY, do not use in the presence of flammable gases (eg. hydrogen, methane, ethane and propane). For D6F 01N2 & 05N2 ONLY use LNG (Liquified Neutral Gas). For D6F 02L2 use LPG (Liquified Petroleum Gas).
3. Install in the direction of the arrow indicated.
4. For best results (optimum accuracy), mount horizontally.
5. Use suitable M3 screws for mounting. Do not exceed a fixing torque of 0.59 Nm.
6. Do not modify D6F- in any way.
7. Do not place any object in or close to the inlet and outlet orifices.
8. Do not use the sensor in any of the following environments:
  - a location that receives radiant heat from the sun or apparatus
  - a place where intense light may radiate down
  - where fast changing temperatures occur
  - locations prone to freezing, high humidity, condensation
  - places where large magnitudes of vibration or shock could occur
9. Noise countermeasures: **VERY IMPORTANT:** Take suitable precautions to minimise the effects and potential for induced electrical noise. Install away from apparatus that generates strong high frequencies, surges and spikes. Take particular care to install away from AC power transformers, live mains power lines and high power magnetic circuits. Attach a surge suppressor and a noise filter to the peripheral equipment.
10. Ensure good grounding is achieved by grounding the GND terminal to the peripheral equipments main ground frame connection and its associated regulated power supply.
11. Do not make a direct solder connection to the integral terminals. It is recommended you use the optional cable 'D6F-CABLE1' for attachment and to ensure correct connection.
12. D6F- is a precision component. Keep in original packaging and remove only when ready for installation. Damage may occur if subjected to excessive force (e.g. dropped or kicked). Any item suspected to be damaged should be discarded.
13. Immediately following installation, a qualified person should perform checks to ensure safe, satisfactory operation.

## Dimensions

(All dimensions in mm)

**D6F-01A1-110**

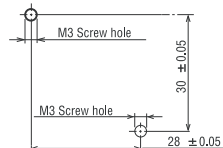
**D6F-02A1-110**



The screw attachment direction (NOTE2)

A-A

NOTE1 Installation hole recommendation size

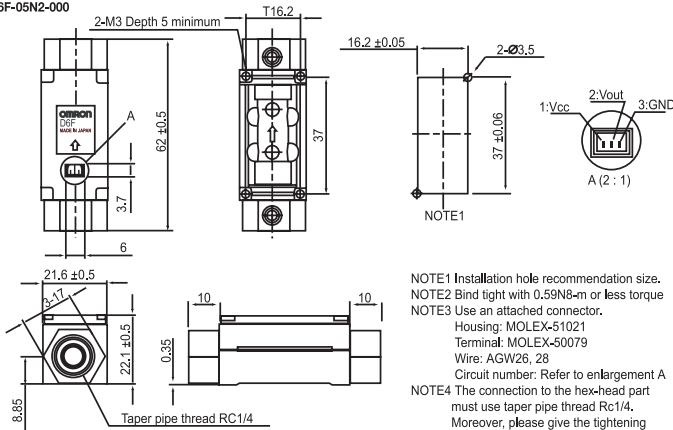


NOTE2 Bind tight with 0.59N m or less torque. Use M3 pan head screw.

NOTE3 Use an attached connector.  
 Housing: MOLEX-51021  
 Terminal: MOLEX-50079  
 Wire: AWG26, 28  
 Circuit number: Refer to enlargement B.

(All dimensions in mm)

D6F-05N2-000

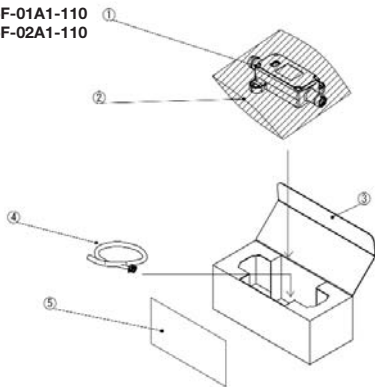


NOTE1 Installation hole recommendation size.  
 NOTE2 Bind tight with 0.59N8-m or less torque  
 NOTE3 Use an attached connector.  
 Housing: MOLEX-51021  
 Terminal: MOLEX-50079  
 Wire: AGW26, 28  
 Circuit number: Refer to enlargement A  
 NOTE4 The connection to the hex-head part must use taper pipe thread Rc1/4. Moreover, please give the tightening torque as 5N-m or less

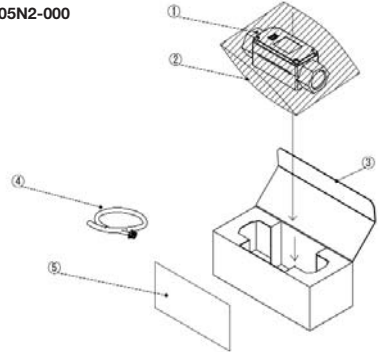
■ Packaging

No.	Name	Material
1	D6F	–
2	Polyethylene bag	Polyethylene
3	Box	Coated board paper
4	Cable	–
5	Label (Bar code)	–

D6F-01A1-110  
 D6F-02A1-110



D6F-05N2-000



■ Change in specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your Omron representative at any time to confirm actual specifications of purchased product.

■ Warranty

Omron corporation manufactures products to the highest standards and warrants that all products it manufactures are free of defects and faulty workmanship.

Please contact your local Omron representative for warranty information.

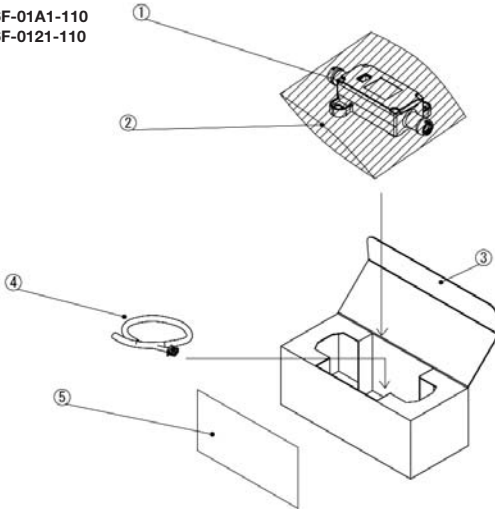
We provide application assistance personally and through our literature including our website for guidance only. It is the customers full responsibility to determine suitability of product in any intended application.

CAT NO. G900-E2-01

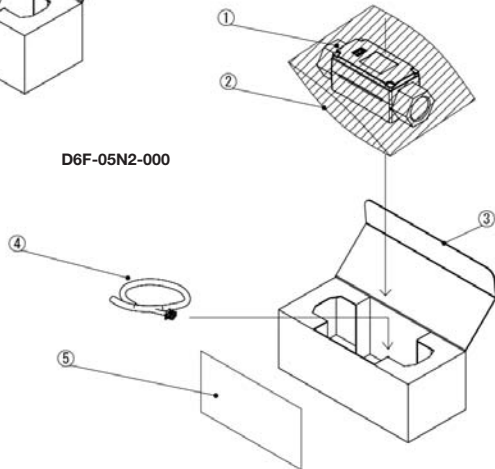
## ■ Packaging

No.	Name	Material
1	D6F	–
2	Polyethylene bag	Polyethylene
3	Box	Coated board paper
4	Cable	–
5	Label (Bar code)	–

D6F-01A1-110  
D6F-0121-110



D6F-05N2-000



## ■ Warranty

Omron corporation manufactures products to the highest standards and warrants that all products it manufactures are free of defects and faulty workmanship.

Please contact your local Omron representative for warranty information.

Specifications subject to change without notice. Any information supplied is believed to be accurate and reliable at the time of printing.

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**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**

To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Compact, intelligent sensors featuring MEMS technology for precision mass airflow measurement

- Precision unidirectional mass airflow up to 3 LPM
- Stable output across full scale
- Ultra-compact size 36.6 (L) x 8 (W) x 16.8 (H) mm
- Low power consumption



iSensors

## Application Examples

- Pick and place systems
- Industrial processes
- Oxygen concentrators / conservators
- Leak detection
- Spectroscopy
- Mass flow controllers
- Scientific / test equipment
- Environmental comfort controls
- Fuel cell controls

## Ordering Information

Model	Case	Applicable Gas	Flow Range
D6F-03A3-000	Thermoplastic resin/Aluminium Alloy	Air*	0-3LPM
D6F-CABLE 2			

\*Dry gas must not contain large particles, eg. dust, oil, mist.

## ■ Rating

### Absolute maximum rating

Item	Term	Ratings	Unit
Power-supply voltage	V <sub>CC</sub>	26.4	VDC
Output voltage	V <sub>OUT</sub>	6	VDC

## ■ Electrical Performance

### Recommended operation condition and DC characteristic

Item	Term	Condition	MIN	TYP	MAX	Unit
Power-supply voltage	V <sub>CC</sub>	–	10.8	–	26.4	VDC
Operating temperature	T <sub>OPR</sub>	–	0	–	50	°C
Maximum output voltage	V <sub>OH</sub>	Load resistance 10kR	–	–	5.7	VDC
Minimum output voltage	V <sub>OL</sub>	Load resistance 10kR	0	–	–	VDC



## ■ Basic Performance

0 to 3L/min (Normal) volumetric flow rate at 0°C, 101.3kPa.

Measurement condition: Power-supply voltage 12±0.1VDC, ambient temperature 25±5°C and ambient humidity 25 to 75% RH.

### D6F-03A3-000

Flow Rate L/min (normal)	0	0.6	1.2	1.8	2.4	3.0
Output Voltage (VDC)	1.00 ±0.2	2.83 ±0.2	3.77 ±0.2	4.34 ±0.2	4.72 ±0.2	5.00 ±0.2

## ■ Characteristics

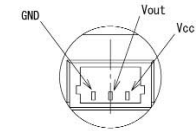
Degree of Protection	IP40
Applicable Gas	Air
Electrical Connection	Connector (3 wire)
Output Signal	Analog, 1-5VDC (load resistance 10kΩ min)
Current Consumption	Max 15mA (no load, V <sub>CC</sub> = 12 to 24VDC, V <sub>SS</sub> = GND = 0V, 25°C)
Accuracy	±5% F.S. max
Insulation Resistance	20Mohm min. (500VDC between lead terminals and case)
Dielectric Strength	500VAC, 50/60Hz for 1 minute (leakage current typ. <1mA) between lead terminals and case
Withstand Pressure	200 kPa
Operating Temperature	0 to 50°C (with no ice or dew condensation)
Operating Humidity	85%RH max. (with no ice or dew condensation)
Storage Temperature	-10 to 60°C (with no ice or dew condensation)
Storage Humidity	85%RH max. (with no ice or dew condensation)
Temperature Characteristics	+/-5% FS of detected characteristics at 25°C (within 0 to 50°C)
Weight	5.27g

## ■ Precautions

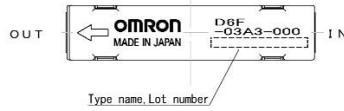
1. Avoid use in excessively dirty, wet environments
2. Do not use in the presence of flammable gases (e.g. hydrogen, methane, ethane and liquefied petroleum gas. In addition, do not use with corrosive gases (eg chlorine, sulphur, acids, alkalis etc).
3. Install in the direction of the arrow indicated.
4. For best results (optimum accuracy), mount horizontally.
5. Use suitable M3 screws for mounting. Do not exceed a fixing torque of 0.59 Nm.
6. Do not modify D6F- in any way.
7. Do not place any object in or close to the inlet and outlet orifices.
8. Do not use the sensor in any of the following environments:
  - a location that receives radiant heat from the sun or apparatus
  - a place where intense light may radiate down
  - where fast changing temperatures occur
  - locations prone to freezing, high humidity, condensation
  - places where large magnitudes of vibration or shock could occur
9. Noise countermeasures: VERY IMPORTANT: Take suitable precautions to minimise the effects and potential for induced electrical noise. Install away from apparatus that generates strong high frequencies, surges and spikes. Take particular care to install away from AC power transformers, live mains power lines and high power magnetic circuits. Attach a surge suppressor and a noise filter to the peripheral equipment.
10. Ensure good grounding is achieved by grounding the GND terminal to the peripheral equipments main ground frame connection and its associated regulated power supply.
11. Do not make a direct solder connection to the integral terminals. It is recommended you use the optional cable 'D6F-CABLE2' for attachment and to ensure correct connection.
12. D6F- is a precision component. Keep in original packaging and remove only when ready for installation. Damage may occur if subjected to excessive force (e.g. dropped or kicked). Any item suspected to be damaged should be discarded.
13. Immediately following installation, a qualified person should perform checks to ensure safe, satisfactory operation.

## Dimensions

All dimensions are shown in millimetres.



A (5 : 1)



NOTE1 Bind tight with 0.59N·m or less torque. Use M3 pan head screw.

NOTE2 Use an attached connector.

The connector linked to this product should use the following JST Mfg. Co., Ltd.

Contact and an electric wire

• Disconnectable Insulation displacement Connectors  
Receptacle : QSR-3S

Wire : AWG#30

• Disconnectable Crimp Style Connectors  
Contact : SSH-003T-P0.2

Wire : AWG#22~#28

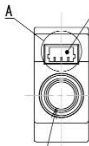
Housing : SHR-03V-S-B or SHR-03V-S

NOTE3 Installation hole recommendation size.

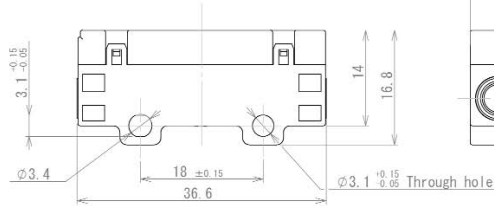
2-M3 Screw hole

18 ±0.05

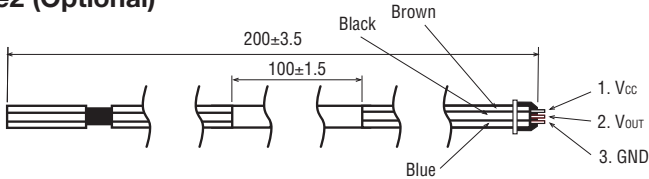
Connector  
SMO3B-SRSS-TB  
Made by JST Mfg. Co., Ltd



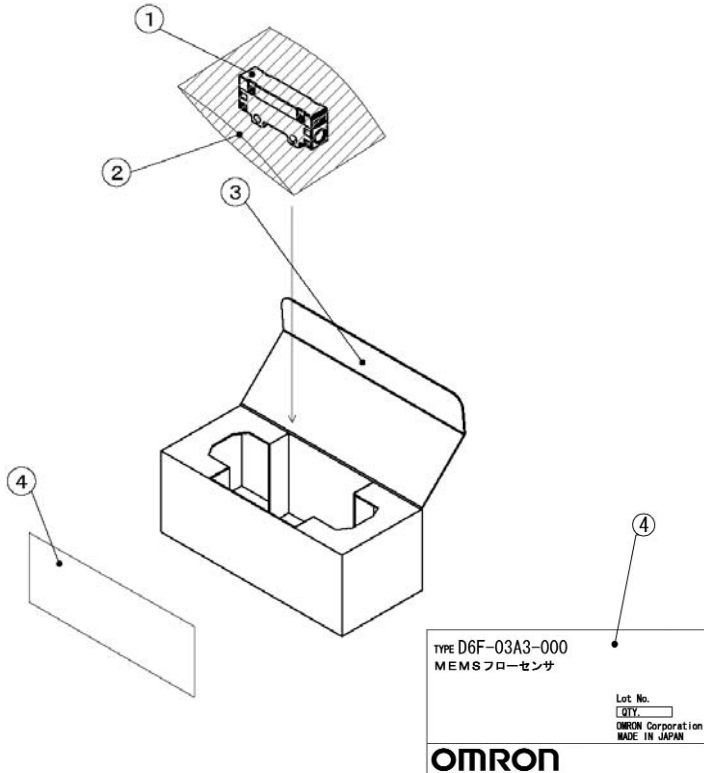
2-M5 Depth 3.1 minimum



## ■ D6F- Cable2 (Optional)



No.	Name	Material
1	D6F	–
2	Polyethylene bag	Polyethylene
3	Box	Coated board paper
4	Label (Bar code)	–



## ■ Change in specifications

Product specifications and accessories may be changed at any time based on ir Omron representative at any time to confirm actual specifications of purchased product.

## ■ Warranty

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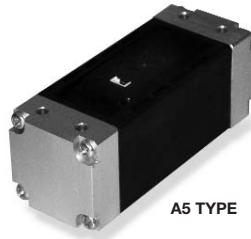
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## Compact, intelligent sensors featuring MEMS technology for precision mass airflow measurement

- Precision unidirectional mass airflow up to 50 LPM
- Stable output across full scale
- Horizontal mounting feature with \*NBR 'O' ring (A5 Type), Rc 1/4 screw (A6 Type)
- Compact size 78 (L) x 30 (W) x 30 (H) mm
- Low power consumption



A5 TYPE



A6 TYPE

iSensors

## Application Examples

- Industrial processes
- Oxygen concentrators / conservators
- Leak detection
- Spectroscopy
- Mass flow controllers
- Scientific / test equipment
- Environmental comfort controls
- Fuel cell controls

## Ordering Information

Model**	Case	Applicable Gas	Flow Range
D6F-10A5-000 D6F-10A6-000	Thermoplastic resin / Aluminium Alloy	Air*	0 – 10 LPM
D6F-20A5-000 D6F-20A6-000	Thermoplastic resin / Aluminium Alloy	Air*	0 – 20 LPM
D6F-50A5-000 D6F-50A6-000	Thermoplastic resin / Aluminium Alloy	Air*	0 – 50 LPM
D6F-CABLE1			

\*Dry gas must not contain large particles, eg. dust, oil, mist.

\*\*NBR 'O' Ring = A5 type, Rc 1/4 screw = A6 type

## ■ Rating

### Absolute maximum rating

Item	Term	Ratings	Unit
Power-supply voltage	V <sub>CC</sub>	26.4	VDC
Output voltage	V <sub>OUT</sub>	6	VDC

## ■ Electrical Performance

### Recommended operation condition and DC characteristic

Item	Term	Condition	MIN	TYP	MAX	Unit
Power-supply voltage	V <sub>CC</sub>	–	10.8	–	26.4	VDC
Operating temperature	T <sub>OPR</sub>	–	-10	–	60	°C
Maximum output voltage	V <sub>OH</sub>	Load resistance 10kR	–	–	5.7	VDC
Minimum output voltage	V <sub>OL</sub>	Load resistance 10kR	0	–	–	VDC

## ■ Basic Performance

0 to 10, 0 to 20 and 0 to 50L/min (Normal) volumetric flow rate at 0°C, 101.3kPa.

Measurement condition: Power-supply voltage 12± 0.1VDC, ambient temperature 25±2°C and ambient humidity 25 to 75% RH.

### D6F-10A5-000

#### D6F-10A6-000

Flow Rate L/min (normal)	0	2	4	6	8	10
Output Voltage (VDC)	1.00 ±0.12	1.75 ±0.12	2.60 ±0.12	3.45 ±0.12	4.25 ±0.12	5.00 ±0.12

### D6F-20A5-000

#### D6F-20A6-000

Flow Rate L/min (normal)	0	4	8	12	16	20
Output Voltage (VDC)	1.00 ±0.12	1.93 ±0.12	2.87 ±0.12	3.70 ±0.12	4.41 ±0.12	5.00 ±0.12

### D6F-50A5-000

#### D6F-50A6-000

Flow Rate L/min (normal)	0	10	20	30	40	50
Output Voltage (VDC)	1.00 ±0.12	2.45 ±0.12	3.51 ±0.12	4.20 ±0.12	4.66 ±0.12	5.00 ±0.12

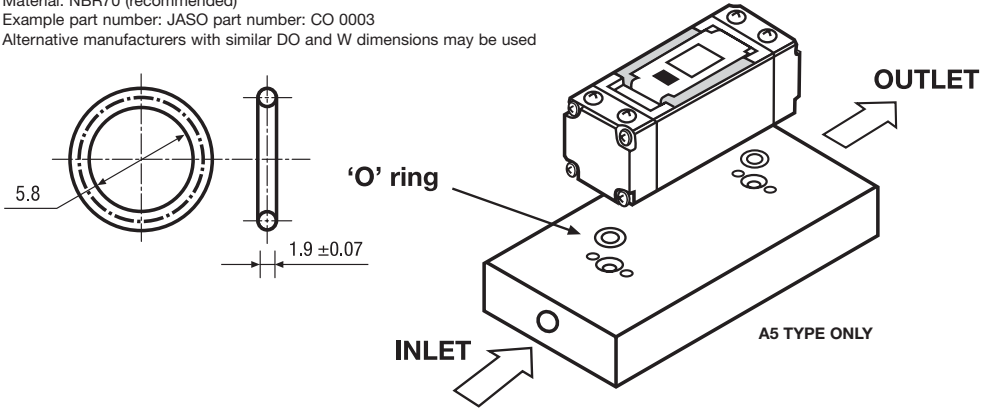
## ■ Characteristics

Degree of Protection	IP40
Applicable Gas	Air
Electrical Connection	Connector (3 wire)
Output Signal	Analog, 1-5VDC (load resistance 10kohm min)
Current Consumption	Max 15mA (no load, V <sub>CC</sub> = 12 to 24VDC, V <sub>SS</sub> = GND = 0V, 25°C)
Accuracy	± 3% FSD max, 25°C
Insulation Resistance	20Mohm min. (500VDC between lead terminals and case)
Dielectric Strength	500VAC, 50/60Hz for 1 minute (leakage current typ. <1mA) between lead terminals and case
Withstand Pressure	500 kPa
Operating Temperature	-10 to +60°C (with no ice or dew condensation)
Operating Humidity	85%RH max. (with no ice or dew condensation)
Storage Temperature	-30 to +80°C (with no ice or dew condensation)
Storage Humidity	85%RH max. (with no ice or dew condensation)
Temperature Characteristics	+/-3% FS of detected characteristics at 25°C (within -10 to 60°C)
Weight	102.56g

## Installation

Tighten screw with 0.59Nm or less torque. Use M3 pan head screw.  
Please seal to INLET and OUTLET with the 'O' ring etc.  
Please install the product as shown below.

Recommended 'O' ring for sealing inlet and outlet orifice  
Material: NBR70 (recommended)  
Example part number: JASO part number: CO 0003  
Alternative manufacturers with similar DO and W dimensions may be used



## ■ Precautions

- Avoid use in excessively dirty, wet environments
- Do not use in the presence of flammable gases (e.g. hydrogen, methane, ethane and liquefied petroleum gas). In addition, do not use with corrosive gases (eg chlorine, sulphur, acids, alkalis etc).
- Install in the direction of the arrow indicated.
- For best results (optimum accuracy), mount horizontally.
- Use suitable M3 screws for mounting. Do not exceed a fixing torque of 0.59 Nm.
- Do not modify D6F- in any way.
- Do not place any object in or close to the inlet and outlet orifices.
- Do not use the sensor in any of the following environments:
  - a location that receives radiant heat from the sun or apparatus
  - a place where intense light may radiate down
  - where fast changing temperatures occur
  - locations prone to freezing, high humidity, condensation
  - places where large magnitudes of vibration or shock could occur
- Noise countermeasures: **VERY IMPORTANT:** Take suitable precautions to minimise the effects and potential for induced electrical noise. Install away from apparatus that generates strong high frequencies, surges and spikes. Take particular care to install away from AC power transformers, live mains power lines and high power magnetic circuits. Attach a surge suppressor and a noise filter to the peripheral equipment.
- Ensure good grounding is achieved by grounding the GND terminal to the peripheral equipments main ground frame connection and its associated regulated power supply.
- Do not make a direct solder connection to the integral terminals. It is recommended you use the optional cable 'D6F-CABLE1' for attachment and to ensure correct connection.
- D6F- is a precision component. Keep in original packaging and remove only when ready for installation. Damage may occur if subjected to excessive force (e.g. dropped or kicked). Any item suspected to be damaged should be discarded.
- Immediately following installation, a qualified person should perform checks to ensure safe, satisfactory operation.

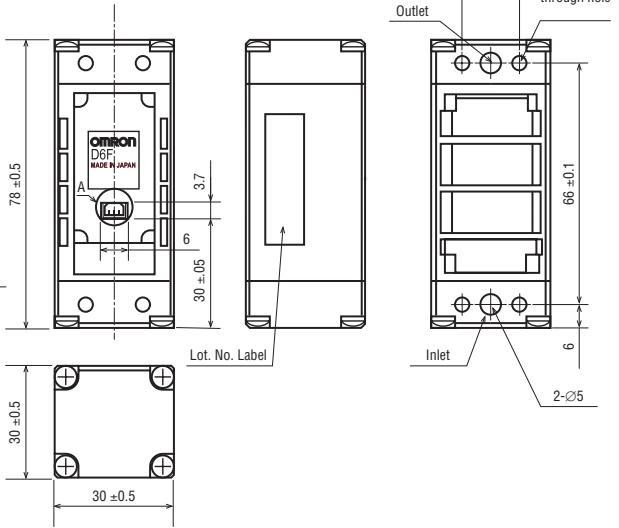
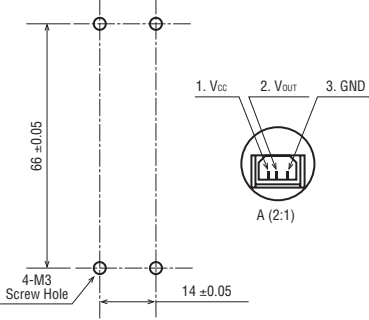
## Dimensions

All dimensions are shown in millimetres.

### D6F-10A5/20A5/50A5

NOTE 1 Use an attached connector  
Housing: MOLEX-51021  
Terminal: MOLEX-50079  
Wire: AWG26, 28  
Circuit number: Refer to enlargement A.

NOTE 2 Installation hole recommended size.

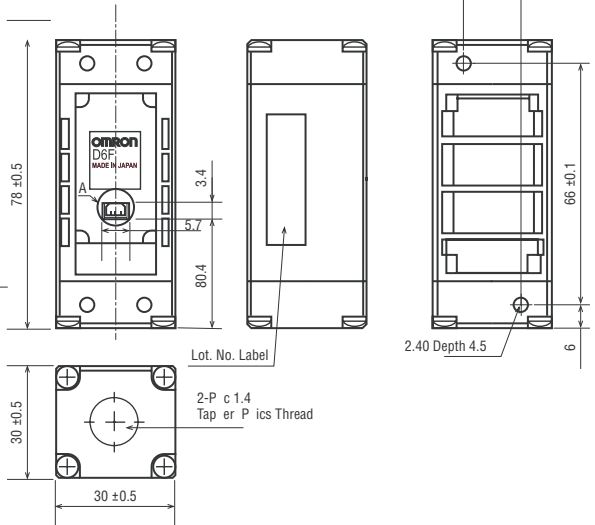
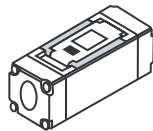
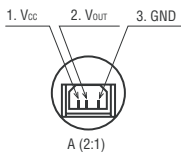


### D6F-10A6/20A6/50A6

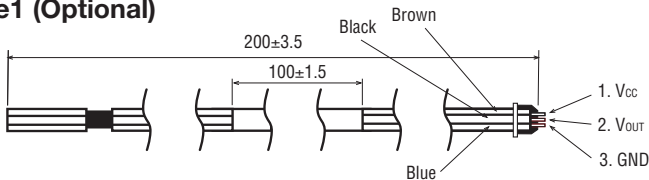
NOTE 1 Bind tight with 0.59N.m or less torque  
Use M3 pan head screw

NOTE 2 Use an attached connector  
Housing: MOLEX-51021  
Terminal: MOLEX-50079  
Wire: AWG26, 28  
Circuit number: Refer to enlargement A

NOTE 3 The connection must use taper pipe thread R1/4  
Moreover, please give the tightening torque  
as 5N.m or less

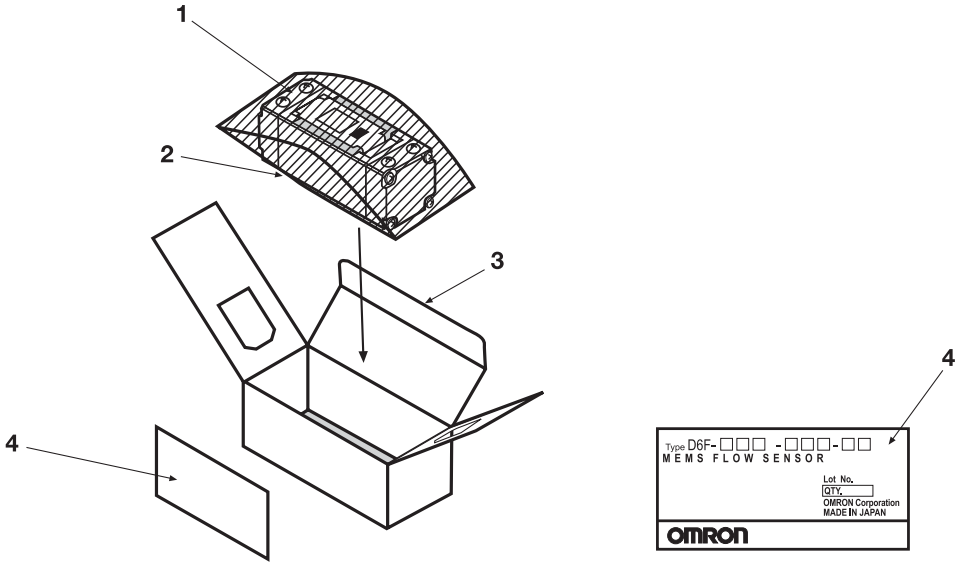


### ■ D6F- Cable1 (Optional)



**■ Packaging**

No.	Name	Material
1	D6F	–
2	Polyethylene bag	Polyethylene
3	Box	Coated board paper
4	Label (Bar code)	–



**■ Change in specifications**

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## Compact, intelligent sensors featuring MEMS precision technology for repeatable airflow detection

- RoHS / Lead-free and lead solder compatible
- Precision uni-directional air velocity detection
- Integral passive Dust Segregation System (DSS)
- Compact size: 39 (L) x 20 (W) x 9 (H) mm
- User friendly – no adjustment necessary



iSensors

## Application Examples

- Cassette (ceiling / suspended), multi-modular air conditioners
- Duct connected heating and air conditioning systems
- Alternative for single point Pitot tube
- Alternative for thermal dispersion measurement
- Air & water cooled chillers, indoor packaged AC systems
- Window / split, multi-split residential AC coolers
- Air purifiers, dehumidifiers
- Fan assisted space heaters
- Air cooled, high power indoor lighting
- Mission critical PC, Workstation ventilation
- 19" rack / tray mounted PSU watchdog ventilation systems

## Ordering Information

Model	Case	Applicable Gas	Flow Range
D6F-W01A1	PPS (Polyphenylene Sulphide)	Air*	0 – 1 m/sec
D6F-W04A1	PPS (Polyphenylene Sulphide)	Air*	0 – 4 m/sec
D6F-W CABLE			

\*Dry gas must not contain large particles, eg dust, oil, mist.

## ■ Ratings

### Absolute maximum rating

Item	Term	Ratings	Unit
Power-supply voltage	V <sub>CC</sub>	26.4	VDC
Output voltage	V <sub>OUT</sub>	6	VDC

## ■ Electrical Performance

### Recommended operation condition and DC characteristic

Item	Term	Condition	MIN	TYP	MAX	Unit
Power-supply voltage	V <sub>CC</sub>	–	10.8	–	26.4	VDC
Operating temperature	T <sub>OPR</sub>	–	-10	–	60	°C
Maximum output voltage	V <sub>OH</sub>	Load resistance 10kR	–	–	5.7	VDC
Minimum output voltage	V <sub>OL</sub>	Load resistance 10kR	0	–	–	VDC

## ■ Basic Performance

Measurement condition: Power supply voltage 12VDC, ambient temperature 25°C and dry air.

### Operating Characteristics

#### D6F-W01A1

Flow Velocity (m/s)	0	0.25	0.50	0.75	1.00
Output Voltage (V)	1.00 ±0.2	1.35 ±0.2	2.01 ±0.2	3.27 ±0.2	5.00 ±0.2

#### D6F-W04A1

Flow Velocity (m/s)	0	1.00	2.00	3.00	4.00
Output Voltage (V)	1.00 ±0.2	1.58 ±0.2	2.88 ±0.2	4.11 ±0.2	5.00 ±0.2

**Note:** 1. Air velocity. D6F-W is optimally adjusted for air velocity detection, derived from mass air-flow measurement according to our in-house test method using a wind tunnel phi48mm

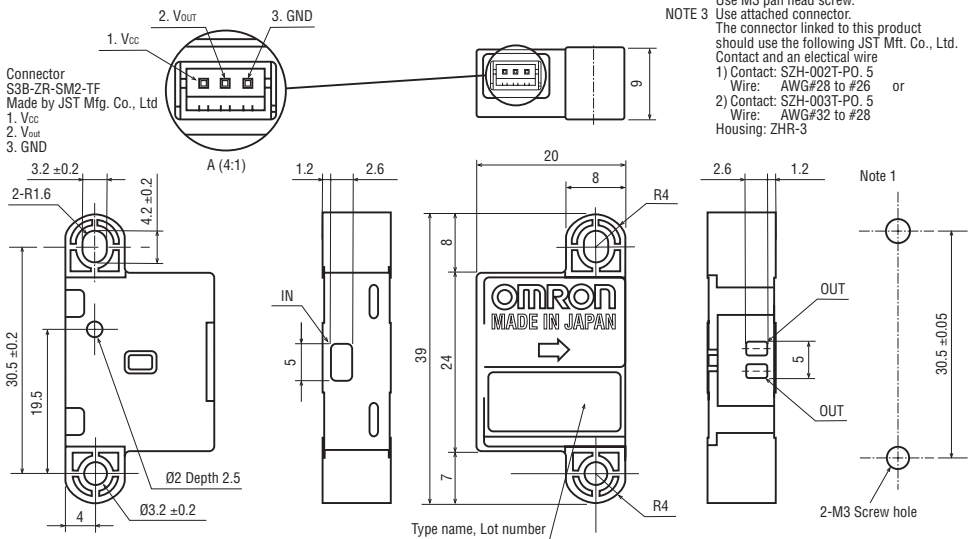
## ■ Characteristics

Degree of Protection	IP40
Applicable Gas	Air
Electrical Connection	Connector (3 wire)
Output Signal	Analog, 1-5VDC (load resistance 10kohm min)
Current Consumption	Max 15mA (no load, V <sub>CC</sub> = 12 to 24VDC, V <sub>SS</sub> = GND = 0V, 25°C)
Accuracy	± 5% F.S. max
Insulation Resistance	20Mohm min. (500VDC between lead terminals and case)
Dielectric Strength	500VAC, 50/60Hz for 1 minute (leakage current typ. <1mA) between lead terminals
Operating Temperature	-10 to +60°C (with no ice or dew condensation)
Operating Humidity	85%RH max. (with no ice or dew condensation)
Storage Temperature	-40 to +80°C (with no ice or dew condensation)
Storage Humidity	85%RH max. (with no ice or dew condensation)
Weight	6.23g

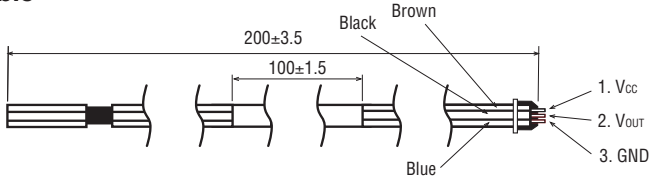
## ■ Precautions

1. Avoid use in excessively dirty, wet environments
2. Do not use in the presence of flammable gases (e.g. hydrogen, methane, ethane and liquefied petroleum gas). In addition, do not use with corrosive gases (eg chlorine, sulphur, acids, alkalis etc).
3. Install in the direction of the arrow indicated.
4. For best results (optimum accuracy), mount horizontally.
5. Use M3 screws for mounting. Do not exceed a fixing torque of 0.59Nm
6. Do not modify D6F-W in any way.
7. Do not place any object in or close to the inlet and outlet orifices
8. Do not use the sensor in any of the following environments:-
  - a location that receives radiant heat from the sun or apparatus
  - a place where intense light may radiate down
  - where fast changing temperatures occur
  - locations prone to freezing, high humidity, condensation
  - places where large magnitudes of vibration or shock could occur
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10. Ensure good grounding is achieved by grounding the GND terminal to the peripheral equipments main ground frame connection and its associated regulated power supply.
11. Do not make a direct solder connection to the integral terminals. It is recommended you use the optional cable "D6F-W Cable" for attachment and to ensure correct connection.
12. D6F-W is a precision component. Keep in original packaging and remove only when ready for installation. Damage may occur if subjected to excessive force (e.g. dropped or kicked). Any item suspected to be damaged should be discarded.
13. Immediately following installation, a qualified person should perform checks to ensure safe, satisfactory operation.

## Dimensions

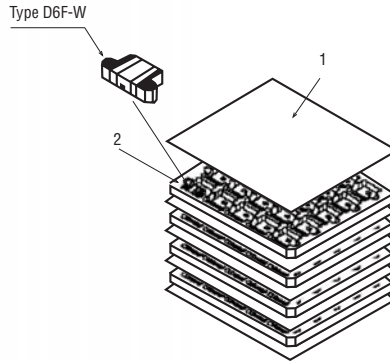


## ■ D6F-W Cable



## ■ Packaging

No.	Qty	Name	Material
1	5	Pad	Coated board paper
2	4	Tray	Polyethylene
3	1	Box	Coated board paper
4	1	Label/Bar Code	-



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## Compact, intelligent sensors featuring MEMS precision technology for repeatable airflow detection

- RoHS / Lead-free and lead solder compatible
- Precision uni-directional air velocity detection
- Integral passive Dust Segregation System (DSS)
- Ultra compact size 24 (L) x 14 (W) x 8 (H) mm



iSensors

## Application Examples

- Cassette (ceiling / suspended), multi-modular air conditioners
- Duct connected heating and air conditioning systems
- Alternative for single point Pitot tube
- Alternative for thermal dispersion measurement
- Air & water cooled chillers, indoor packaged AC systems
- Window / split, multi-split residential AC coolers
- Air purifiers, dehumidifiers
- Fan assisted space heaters
- Air cooled, high power indoor lighting
- Mission critical PC, Workstation ventilation
- 19" rack / tray mounted PSU watchdog ventilation systems

## Ordering Information

Model	Case	Applicable Gas	Flow Range
D6F-V03A1	Thermoplastic resin	Air*	0-3 m /sec
D6F-CABLE2			

\*Dry gas must not contain large particles, eg. dust, oil, mist.

## Rating

Absolute maximum rating

Item	Term	Ratings	Unit
Power-supply voltage	V <sub>CC</sub>	12	VDC
Output voltage	V <sub>OUT</sub>	3.0	VDC

## Electrical Performance

Recommended operation condition and DC characteristic

Item	Term	Condition	MIN	TYP	MAX	Unit
Power-supply voltage	V <sub>CC</sub>	–	3.15	3.3	3.45	VDC
Operating temperature	T <sub>OPR</sub>	–	-10	–	60	°C
Maximum output voltage	V <sub>OH</sub>	Load resistance 10kR	–	–	2.7	VDC
Minimum output voltage	V <sub>OL</sub>	Load resistance 10kR	0	–	–	VDC

## ■ Basic Performance

Measurement condition: Power-supply voltage 3.3VDC, ambient temperature 25°C and dry air.

### D6F-V03A1

Flow Rate (m/sec)	0	0.75	1.50	2.25	3.00
Output Voltage (VDC)	0.50 ±0.15	0.70 ±0.15	1.11 ±0.15	1.58 ±0.15	2.0 ±0.15

Note 1: Air velocity. D6F-V is optimally adjusted for air velocity detection, derived from mass air-flow measurement according to air in-house test method using a wind tunnel phi 48 mm.

## ■ Characteristics

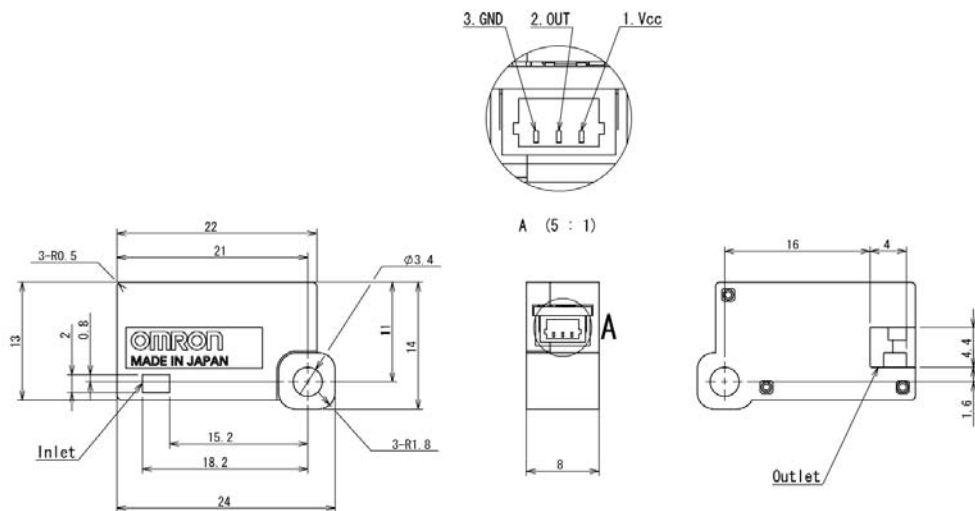
Degree of Protection	IP40
Applicable Gas	Air
Electrical Connection	Connector 3 wire
Output Signal	Analog output 0.5 to 2 VDC (non-linear output) Load resistance Min.10kΩ
Current Consumption	Max 15mA (no load, V <sub>CC</sub> =3.3VDC, V <sub>SS</sub> = GND = 0V, 25°C)
Accuracy	±10%
Insulation Resistance	20 Mohm Min. (DC500V between lead terminal and the case)
Dielectric Strength	500VAC, 50/60Hz for 1 minute (leakage current typ. <1mA) between lead terminals and case
Supply Voltage	3.15 to 3.45 VDC
Operating Temperature	-10 to 60°C (with no ice or dew condensation)
Operating Humidity	85%RH max. (with no ice or dew condensation)
Storage Temperature	-40 to 80°C (with no ice or dew condensation)
Storage Humidity	85%RH max. (with no ice or dew condensation)
Temperature Characteristics	+/-20% FS of detected characteristics at 25°C (within 10 to 60°C)
Weight	5.27g

## ■ Precautions

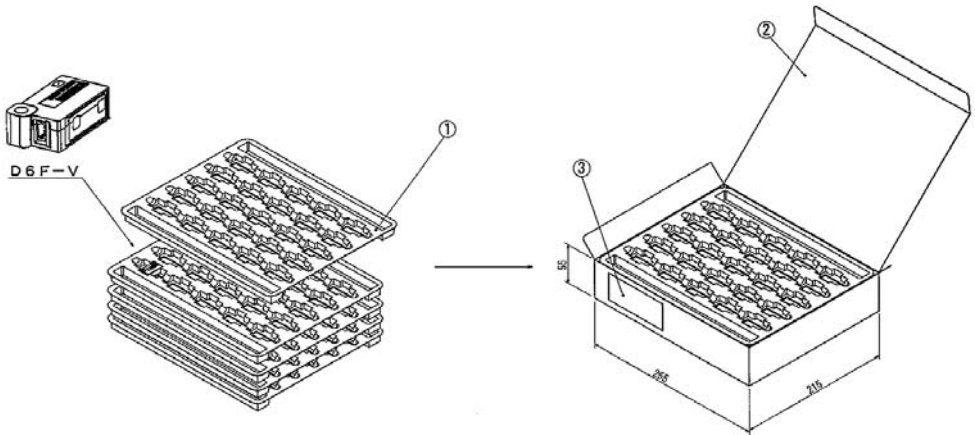
1. Avoid use in excessively dirty, wet environments
2. Do not use in the presence of flammable gases (e.g. hydrogen, methane, ethane and liquefied petroleum gas. In addition, do not use with corrosive gases (eg chlorine, sulphur, acids, alkalis etc).
3. Install in the direction of the arrow indicated.
4. For best results (optimum accuracy), mount horizontally.
5. Use suitable M3 screws for mounting. Do not exceed a fixing torque of 0.59 Nm.
6. Do not modify D6F- in any way.
7. Do not place any object in or close to the inlet and outlet orifices.
8. Do not use the sensor in any of the following environments:
  - a location that receives radiant heat from the sun or apparatus
  - a place where intense light may radiate down
  - where fast changing temperatures occur
  - locations prone to freezing, high humidity, condensation
  - places where large magnitudes of vibration or shock could occur
9. Noise countermeasures: VERY IMPORTANT: Take suitable precautions to minimise the effects and potential for induced electrical noise. Install away from apparatus that generates strong high frequencies, surges and spikes. Take particular care to install away from AC power transformers, live mains power lines and high power magnetic circuits. Attach a surge suppressor and a noise filter to the peripheral equipment.
10. Ensure good grounding is achieved by grounding the GND terminal to the peripheral equipments main ground frame connection and its associated regulated power supply.
11. Do not make a direct solder connection to the integral terminals. It is recommended you use the optional cable 'D6F-CABLE2' for attachment and to ensure correct connection.
12. D6F- is a precision component. Keep in original packaging and remove only when ready for installation. Damage may occur if subjected to excessive force (e.g. dropped or kicked). Any item suspected to be damaged should be discarded.
13. Immediately following installation, a qualified person should perform checks to ensure safe, satisfactory operation.

## Dimensions

All dimensions are shown in millimetres.



No.	Name	Material
1	D6F	–
2	Polyethylene bag	Polyethylene
3	Box	Coated board paper
4	Label (Bar code)	–



## ■ Change in specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your Omron representative at any time to confirm actual specifications of purchased product.

## ■ Warranty

Omron corporation manufactures products to the highest standards and warrants that all products it manufactures are free of defects and faulty workmanship.

Please contact your local Omron representative for warranty information.

We provide application assistance personally and through our literature including our website for guidance only. It is the customers full responsibility to determine suitability of product in any intended application.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.



**OMRON expands its switch product range by introducing the new touch sensor switch family B6TS which is based on a capacitive measurement principle:**

- B6TS-04LT – 4 channel sensor
- B6TS-08NF – 8 channel sensor
- B6TS-16LT – 16 channel sensor (available during 2007)



## Features

- B6TS is '**Application Ready**' The B6TS was developed to be highly tolerant of its working environment with adaptive features such as self teaching, auto threshold and intelligent filtering to meet the demands of most applications today. B6TS resists EMC and compensates continuously for long-term drift.
- The customer has the '**Freedom to Design**' With the exception of a few rules of thumb you are limited only by your imagination. Panel designers are free to decide electrode size, shape, spacing etc. The design is quick and easy – simulation, pcb design, cover material design, assembly – Finished Panel Solution!
- '**Freedom in Material**' You can make touch keys through any nonconducting panel material including plastic, rubber, glass, marble and wood. You can use low cost commercial PCB materials to create your designs. Most designs can be done on low cost single sided PCB like FR-2 or CEM-1.
- '**Standard or custom**' B6TS is  $\mu$ Controller based, so we can provide off the shelf solutions as well as "quick to market" customized types. Additional features may be possible at very low development cost.

## Tools

- Excellent Design Tool support enables the customer to have an easy entry in the capacitive sensing technology and customized panel solutions.

## ■ Design Tool 'B6TWorkbench' which includes

- A PC tool to program custom parameters of the B6TS like: (Sensitivity adjustment, hysteresis, timing to judge a touch event, driftcompensation, output mode selectable -> a) momentary switching b) latching switching c) serial data via SPI interface)
- RS232 to SPI interface board
- Demo panel for either (4, 8 or 16 channels) to have an application ready evaluation platform available. The demo panel can be used to immediately carry out investigations with different cover materials.
- RS232 cable

## ■ Simulation Software

- To evaluate the behavior of the custom panel design before making a PCB. (included in the Design Tool B6TWorkbench)

## ■ Application Note

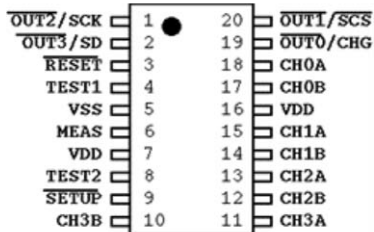
- Touch panel reference design.
- Design rule document.

## Target Applications

- Dish washer
- Washing machine
- Oven
- Fitness equipment
- Television
- Medical equipment
- HVAC controls
- Lighting controls
- Elevator
- Automatic door
- Vending machine
- Alarm clock
- In general Man Machine Interfaces
- 3 Dimensional switch solutions

## ■ B6TS-04LT - 4 Channel Sensor

### Pin arrangement diagram



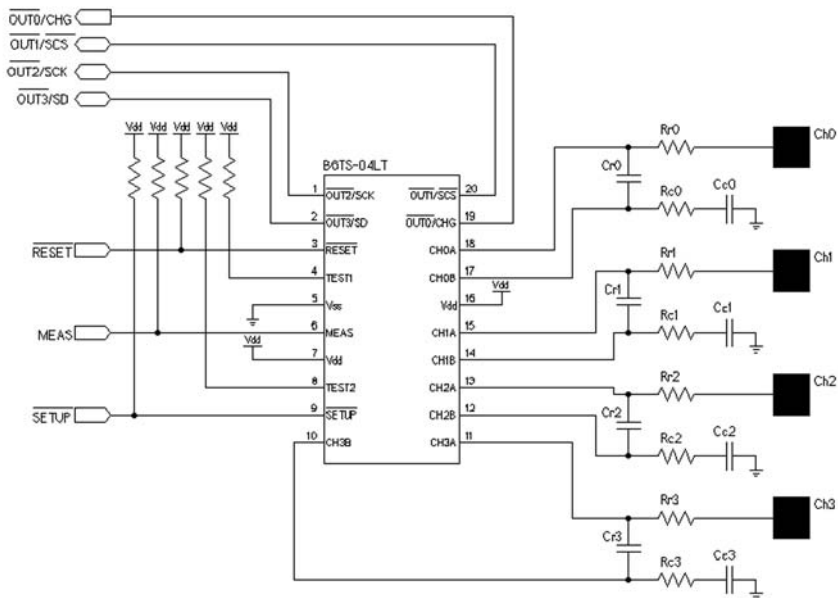
**Note 1:** Pins TEST1, and TEST2 are used for testing during manufacture of the IC. When using these pins, connect them to VDD through a pull-up resistor.

### Pin Functions

Pin No.	Designation	Input/Output	Function
1	OUT2 SCK	I/O	Output pin for measured result [On/off output mode] channel 2 output (active low) [Serial communication mode] serial communication clock input
2	OUT3 SD	I/O	Output pin for measured result [On/off output mode] channel 3 output (active low) [Serial communication mode] serial communication clock input
3	RESET	I	Reset signal input. Inputting low to this pin resets the chip. Connect this pin to VDD through a pull-up resistor of about $k\Omega$ . When VDD starts up, the power-on reset function operates and the chip is initialized. When the power-on reset function is used, no other reset signal is needed when power is turned on.
4	TEST1	I	(Connect to VDD through a pull-down resistor.)
5	V <sub>SS</sub>	I	Ground
6	MEAS	I	Initiation of measurement. Capacitance measurement is initiated by inputting high to this pin. While low is input to this pin, the chip is held in standby status.
7,16	V <sub>DD</sub>	I	Supply input (3.0 - 5.5V)
8	TEST2	I	(Connect to VDD through a pull-down resistor.)
9	SETUP	I	Setup mode. Low input to this pin moves the chip into setup mode.
10, 12, 14, 17	CH3B CH2B CH1B CH0B	I/O	Measurement pins B (channel 3 - 0) Connect these pins to the touch electrode through resistors.
11, 13, 15, 18	CH3A CH2A CH1A CH0A	I/O	Measurement pins A (channel 3 - 0) Connect these pins to the touch electrode through resistors.

Pin No.	Designation	Input/Output	Function
19	OUT0 CHG	O	Output pin to indicate operation. [Normal measurement mode] outputs measured results. [On/off output mode] channel 0 output (active low) [Serial communication mode] output of measurement finish. Two output modes are available in serial communication mode: 1. High-signal outputs every time a measurement finishes. 2. High-signal outputs when the condition changes in any one of the channels (touch→no touch, no touch→touch).  [Setup mode] When the setup mode is entered, CHG pin changes to high. However, when an EEPROM write command is received and data is being written into EEPROM, this pin is low.
20	OUT1 SCS	I/O	Output pin for measured result [On/off output mode] channel 1 output (active low) [Serial communication mode] serial communication chip select input

Example circuit - B6TS-04LT



**Note 1:** Connect R<sub>r</sub>, C<sub>r</sub>, R<sub>c</sub>, and C<sub>c</sub> to each touch electrode, as shown in the above figure.

Refer to the design tool (B6TWorkbench) for their actual values.

- R<sub>r</sub>0-7: Protective resistors
- Cr0-7: Capacitors for comparison
- R<sub>c</sub>0-3: Resistors for charge control
- C<sub>c</sub>0-3: Charge capacitors

**Note 2:** Connect a bypass capacitor of about 0.1 μF between V<sub>DD</sub> and V<sub>SS</sub> using as short wires as possible.

## Absolute maximum ratings

Designation	Item	Condition	Rated value	Unit
V <sub>DD</sub>	Supply voltage		-0.3 – 6.5	V
V <sub>I</sub>	Input voltage		-0.3 – V <sub>DD</sub> +0.3	V
V <sub>O</sub>	Output voltage		-0.3 – V <sub>DD</sub> +0.3	V
P <sub>d</sub>	Power dissipation	T <sub>OPR</sub> =25°C	300	mW
T <sub>OPR</sub>	Ambient operating temperature		-20 – 85	°C
T <sub>stg</sub>	Storage temperature		-60 – 150	°C

## Recommended operating conditions

Designation	Item	Condition	Rated value			Unit
			Minimum	Standard	Maximum	
V <sub>DD</sub>	Supply voltage		3.0		5.5	V
V <sub>IH</sub>	High input voltage		0.8V <sub>DD</sub>		V <sub>DD</sub>	V
V <sub>IL</sub>	Low input voltage		0		0.2V <sub>DD</sub>	V
I <sub>OH</sub>	High output current				-5	mA
I <sub>OL</sub>	Low output current				5	mA

Note: Unless otherwise specified, V<sub>DD</sub> = 3.0 – 5.5V, T<sub>OPR</sub> = -20 – 85° C.

Electrical characteristics [V<sub>DD</sub>=5V]

Designation	Item	Condition	Rated value			Unit
			Minimum	Standard	Maximum	
V <sub>OH</sub>	High output voltage	I <sub>OH</sub> = -5mA	V <sub>DD</sub> -2.0		V <sub>DD</sub>	V
		I <sub>OH</sub> = -200μA	V <sub>DD</sub> -0.3		V <sub>DD</sub>	V
V <sub>OL</sub>	Low output voltage	I <sub>OL</sub> = 5mA			2.0	V
		I <sub>OH</sub> = 200μA			0.45	V
I <sub>IH</sub>	High input current	V <sub>IH</sub> = 5V			5	μA
I <sub>IL</sub>	Low input current	V <sub>IL</sub> = 0V			-5	μA
I <sub>DD</sub>	Supply current	Normal measurement mode		5		mA
		During sleep		0.4		mA

Note: Unless otherwise specified, V<sub>DD</sub> = 4.20 – 5.5V, T<sub>OPR</sub> = -20 – 85° C.

Electrical characteristics [V<sub>DD</sub>=3V]

Designation	Item	Condition	Rated value			Unit
			Minimum	Standard	Maximum	
V <sub>OH</sub>	High output voltage	I <sub>OH</sub> = -1mA	V <sub>DD</sub> -0.5		V <sub>DD</sub>	V
V <sub>OL</sub>	Low output voltage	I <sub>OL</sub> = 1mA			0.5	V
I <sub>IH</sub>	High input current	V <sub>IH</sub> = 3V			4	μA
I <sub>IL</sub>	Low input current	V <sub>IL</sub> = 0V			-4	μA
I <sub>DD</sub>	Supply current	Normal measurement mode		4.8		mA
		During sleep		0.4		mA

Note: Unless otherwise specified, V<sub>DD</sub> = 3.0 – 3.3V, T<sub>OPR</sub> = -20 – 85° C.

Electrical characteristics [V<sub>DD</sub>=3V]

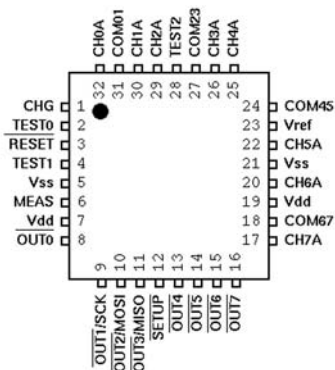
Designation	Item	Condition	Rated value			Unit
			Minimum	Standard	Maximum	
—	Number of times of EEPROM write	T <sub>OPR</sub> = 0~60°C	10000			Times
—	EEPROM write time	V <sub>DD</sub> = 5V, T <sub>OPR</sub> = 25°C (Note 2)		0.3		s
—	EEPROM data retention period	T <sub>OPR</sub> = 55°C	20			Years

**Note 1:** Unless otherwise specified, V<sub>DD</sub> = 3.0 – 5.5V, T<sub>OPR</sub> = -20 – 85° C.

**Note 2:** The period following receipt of the EEPROM write command in setup mode until the data write finishes.

■ B6TS-08NF - 8 Channel Sensor

Pin arrangement diagram



**Note 1:** Pins TEST0 - 2 are used for testing during manufacture of the IC.

When using these pins:

TEST0: Connect to Vss through a pull-down resistor.

TEST1 and TEST2: Connect to Vdd through a pull-up resistor.

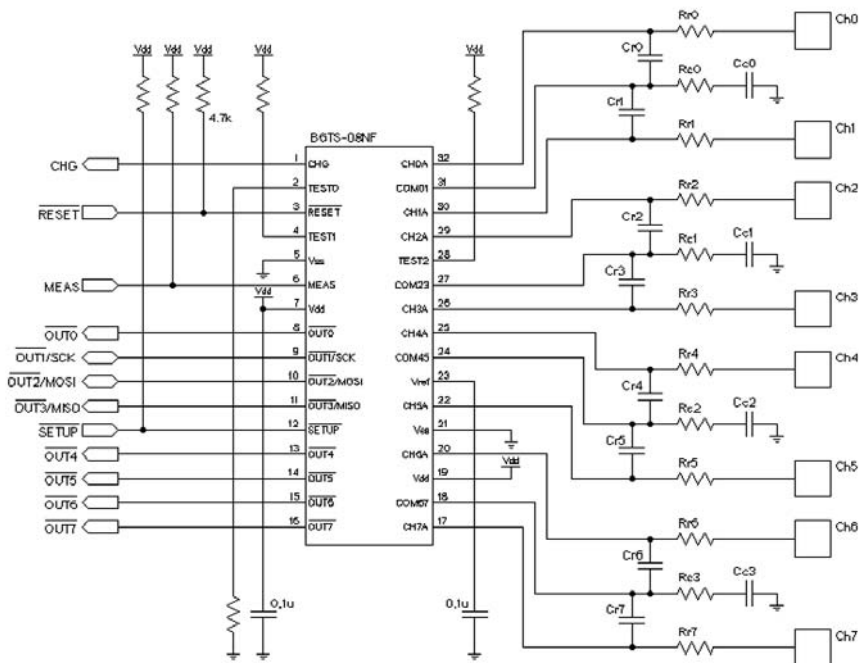
**Note 2:** Pin Vref is provided to stabilize internal power. When using this pin, connect it to Vss through a capacitor of about 0.1 μF.

Pin functions

Pin No.	Designation	Input/Output	Function
1	CHG	O	Indicates the chip's operational status. [Normal measurement mode] Outputs when measurement is complete. Two output modes are available: 1. High-signal output every time a measurement finishes. 2. High-signal output when the condition changes in any one of the channels (touch@no touch, no touch@touch). [Setup mode] When setup mode is entered, CHG pin is high. However, when EEPROM write command is received and data is being written in EEPROM, CHG pin is low.
2	TEST0	I	(Connect to Vss through a pull-down resistor.)
3	RESET	I	Reset signal input. Inputting low to this pin resets the chip. Connect this pin to VDD through a pull-up resistor of about 5 kΩ. When VDD starts up, the power-on reset function operates and the chip is initialized. When the power-on reset function is used, no other reset signal is needed when power is turned on.
4	TEST1	I	(Connect this pin to Vdd through a pull-up resistor)
5,21	Vss	I	Ground

Pin No.	Designation	Input/Output	Function
6	MEAS	I	Initiation of measurement. Capacitance measurement is initiated by inputting high to this pin. While low is input to this pin, the chip is held in standby status.
7,19	V <sub>DD</sub>	I	Supply input (4.5 - 5.5V)
8	OUT0	O	Output pin for channel 0 (active low)
9	OUT1 SCK	I/O	Output pin for measured result [On/off output mode] channel 1 output (active low) [Serial communication mode] serial communication clock input
10	OUT2 MOSI	O	Output pin for measured result [On/off output mode] channel 2 output (active low) [Serial communication mode] serial communication clock input
11	OUT3 MISO	I/O	Output pin for measured result [On/off output mode] channel 3 output (active low) [Serial communication mode] serial communication clock input
12	SETUP		I Setup mode. Low input to this pin moves the chip into setup mode.
13	OUT4	O	Output pin for channel 4 (active low)
14	OUT5	O	Output pin for channel 5 (active low)
15	OUT6	O	Output pin for channel 6 (active low)
16	OUT7	O	Output pin for channel 7 (active low)
17, 20, 22, 25, 26, 29, 30, 32	CH7A CH6A CH5A CH4A CH3A CH2A CH1A CH0A	I/O	Measurement pins (channel 7 - 0) Connect these pins to the touch electrode through resistors.
18, 24, 27, 31	COM67 COM45 COM23 COM01	I/O	Common-use measurement pins (channel 7 - 0) Common-use measurement pins for two channels each Connect these pins to charge capacitors through resistors.
23	V <sub>ref</sub>	I	Pin for stabilization of internal power Connect this pin to V <sub>SS</sub> through a capacitor of about 0.1μF.
28	TEST2	I	(Connect to V <sub>DD</sub> through a pull-up resistor)

Example circuit - B6TS-08NF



**Note 1:** Connect Rr, Cr, Rc, and Cc to each touch electrode, as shown in the above figure. Refer to the design tool (B6TWorkbench) for their actual values.

- Rr0-7: Protective resistors
- Cr0-7: Capacitors for comparison
- Rc0-3: Resistors for charge control
- Cc0-3: Charge capacitors

**Note 2:** Connect a bypass capacitor of about 0.1  $\mu$ F between V<sub>DD</sub> and V<sub>SS</sub> using as short wires as possible.

## Absolute maximum ratings

Designation	Item	Condition	Rated value	Unit
V <sub>DD</sub>	Supply voltage		-0.3 – 6.5	V
V <sub>I</sub>	Input voltage		-0.3 – V <sub>DD</sub> +0.3	V
V <sub>O</sub>	Output voltage		-0.3 – V <sub>DD</sub> +0.3	V
P <sub>d</sub>	Power dissipation	T <sub>OPR</sub> =25°C	300	mW
T <sub>OPR</sub>	Ambient operating temperature		-20 – 85	°C
T <sub>stg</sub>	Storage temperature		-65 – 150	°C

## Recommended operating conditions

Designation	Item	Condition	Rated value			Unit
			Minimum	Standard	Maximum	
V <sub>DD</sub>	Supply voltage		4.5		5.5	V
V <sub>IH</sub>	High input voltage		0.8V <sub>DD</sub>		V <sub>DD</sub>	V
V <sub>IL</sub>	Low input voltage		0		0.2V <sub>DD</sub>	V
I <sub>OH</sub>	High output current				-5	mA
I <sub>OL</sub>	Low output current				5	mA

**Note:** Unless otherwise specified, V<sub>DD</sub> = 5.5 – 5.5V, T<sub>OPR</sub> = -20 – 85° C.

## Electrical characteristics [VDD=5V]

Designation	Item	Condition	Rated value			Unit
			Minimum	Standard	Maximum	
V <sub>OH</sub>	High output voltage	I <sub>OH</sub> = -5mA	V <sub>DD</sub> -2.0		V <sub>DD</sub>	V
V <sub>OL</sub>	Low output voltage	I <sub>OL</sub> = 5mA			2.0	V
I <sub>IH</sub>	High input current	V <sub>I</sub> = 5V			5	μA
I <sub>IL</sub>	Low input current	V <sub>I</sub> = 0V			-5	μA
I <sub>DD</sub>	Supply current	Normal measurement mode		4		mA
—	Number of times of EEPROM write	T <sub>OPR</sub> = 0 – 60°C	10000			Times
—	EEPROM write time	V <sub>DD</sub> = 5V, T <sub>OPR</sub> = 25°C (Note 2)		0.3		s
—	EEPROM data retention period	T <sub>OPR</sub> = 55°C	20			Years

**Note 1:** Unless otherwise specified, V<sub>DD</sub> = 4.5 – 5.5V, T<sub>OPR</sub> = -20 – 85° C.

**Note 2:** The period following receipt of the EEPROM write command in setup mode until the data write finishes.



## Certain Precautions on Specifications and Use

1. Suitability for Use. Seller shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in Buyer's application or use of the Product. At Buyer's request, Seller will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases but the following is a nonexhaustive list of applications for which particular attention must be given:
    - (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
    - (ii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
    - (iii) Use in consumer products or any use in significant quantities.
    - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this product.
- NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
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