

Data Sheet

TAG201N0010

R E V I S I O N S

| No. | DATE | P A G E | DESCRIPTION | DS'D | CH'D | APP'D |
|-----|------|---------|-------------|------|------|-------|
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| ED'N No. | | | | | | | | | | | | | . . | |
| DS' D A.Abe | DATE | | MODEL No. | | | | | TITLE | | | | | | |
| CH' D T.Imamura | '12.08.02 | | TAG201N0010 | | | | | Data Sheet | | | | | | |
| APP' D M.Yachi | DWG | NO. | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | SHEET | |
| | S | P | C | 0 | 0 | 4 | 9 | 5 | 5 | W | 0 | 0 | 1 / 8 | |

Data Sheet

- 1. Scope
- 2. Parts number
- 3. Mechanical characteristics
- 4. Ratings
- 5. Electrical characteristics
- 6. Measurement circuit
- 7. Assembly recommendation
- 8. Instructions

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This specification is applied to the angular rate sensor.

2-1. Tamagawa Seiki parts number
TAG201N0010

3-1. Dimension



Figure-1. Dimension

Table-1. Terminal Configurations

| No | Terminal name | Description |
|-----|---------------|--|
| (1) | Vout | Rate sensor output |
| (2) | Vcc | Power supply voltage |
| (3) | TS | Temperature sensor output (Not connected in case of nonuse) |
| (4) | GND | Ground |

| | | | | | | | | | | | | | |
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3-3. Marking

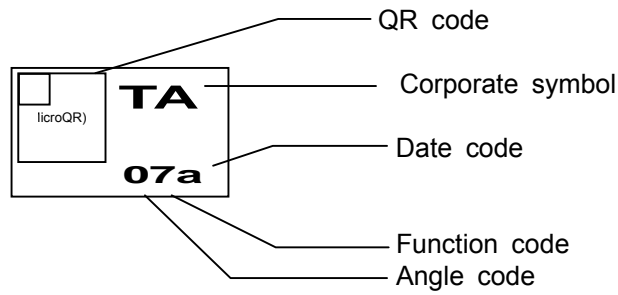


Figure-2. Marking

4. Ratings

4-1. Absolute maximum ratings

Table-2. Absolute maximum ratings

| No. | Parameter | Specification | Unit | Note. |
|-----|-----------------------------|---------------|------|---|
| 1 | Supply voltage | -0.3 to +7.0 | V | |
| 2 | Operating temperature range | -40 to +85 | °C | |
| 3 | Storage temperature range | -40 to +85 | °C | |
| 4 | Mechanical shock | 200 | G | 1 time to X-, Y-, Z-axis each, unpowered. |

4-2. Operating conditions

Table-3. Operating conditions

| No. | Parameter | Specification | | | Unit | Conditions |
|-----|----------------------|---------------|-----|------|--------|------------|
| | | MIN | TYP | MAX | | |
| 1 | Supply voltage range | 4.75 | 5 | 5.25 | V | |
| 2 | Measurement range | -60 | | 60 | ° /sec | |
| 3 | Frequency response | -7 | | -2 | dB | f=15Hz |
| 4 | Start up time | | | 0.7 | sec | 25°C ± 2°C |

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5. Electrical characteristics

5-1. Rate sensor output

The following conditions are adopted, unless otherwise specified.

- ① Temperature : $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$
- ② $V_{\text{CC}}: 5\text{V} \pm 0.01\text{V}$

Table-4. Electrical characteristics

| No. | Parameter | Specification | | | Unit | Conditions |
|-----|------------------------------------|-----------------------|------|------|---|--|
| | | MIN | TYP | MAX | | |
| 1 | Supply current | | | 6 | mA | |
| 2 | Maximum output voltage | $V_{\text{CC}} - 0.3$ | | | V | |
| 3 | Minimum output voltage | | | 0.3 | V | |
| 4 | Nominal bias | 2.35 | 2.5 | 2.65 | V | |
| | | 2.25 | 2.5 | 2.75 | V | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| 5 | Bias drift after power on | -15 | | 15 | mV | 0.7sec to 15minutes |
| 6 | Scale factor | 24.0 | 25.0 | 26.0 | $\text{mV}/^{\circ}\text{C} / \text{sec}$ | |
| | | 23.5 | 25.0 | 26.5 | $\text{mV}/^{\circ}\text{C} / \text{sec}$ | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| 7 | Scale factor symmetry | -1.0 | | 1.0 | % | |
| 8 | Linearity | -0.5 | | 0.5 | %Fs | |
| 9 | Cross axis sensitivity | -5 | | 5 | % | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| 10 | Output noise | | | 5 | mVpp/5s | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| 11 | Ratiometric error for bias | -20 | 0 | 20 | % | Start-up from 0.7s~ $V_{\text{CC}}: 4.75\text{V}$ to 5.25V |
| 12 | Ratiometric error for scale factor | -20 | 0 | 20 | % | Start-up from 0.7s~ $V_{\text{CC}}: 4.75\text{V}$ to 5.25V |

Table-5. Electrical characteristics (Variation with temperature)

| No. | Parameter | Specification | | | Unit | Conditions |
|-----|---|---------------|-----|-----|---------------------------------|--------------------------------------|
| | | MIN | TYP | MAX | | |
| 13 | Bias variation with temperature (Max-Min) | | | 8 | $^{\circ} / \text{sec}$ | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| 14 | Bias variation with temperature | -10 | | 10 | $\text{mV}/2.5^{\circ}\text{C}$ | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| | | -25 | | 25 | $\text{mV}/7.5^{\circ}\text{C}$ | $T_a = -40$ to $+85^{\circ}\text{C}$ |
| 15 | Scale factor variation with temperature | -3.0 | | 3.0 | % | $T_a = -40$ to $+85^{\circ}\text{C}$ |

Note:

- Bias variation with temperature assumes it the measurement at case of the temperature rise.
- Load impedance of $100\text{k}\Omega$ and $0.1\mu\text{F}$ to be connected between terminals Vout and GND in parallel.

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5-2. Temperature sensor output

Table-6. Temperature sensor output

| No. | Parameter | Specification | | | Unit | Conditions |
|-----|---------------------------------|---------------|------|------|-------|------------------|
| | | MIN | TYP | MAX | | |
| 1 | Temperature sensor output | 1.33 | 1.4 | 1.47 | V | Ta=25°C |
| 2 | Temperature sensor scale factor | -3.6 | -3.8 | -4.0 | mV/°C | Ta= -40 to +85°C |

Note:

- Temperature sensor output is not ratiometric on supply voltage.

<Definition of the term>

- ① Measurement range ; Angular rate measuring range for guarantee of performance
- ② Maximum output voltage ; Output voltage at input angular rate of +500 ° /sec
- ③ Minimum output voltage ; Output voltage at input angular rate of -500 ° /sec
- ④ Nominal bias ; Output voltage at input angular rate of 0 ° /sec
- ⑤ Bias drift after power on ; Maximum value of drift of bias during turned on state of applying electric power supply, where noise under 10mV is excluded.
- ⑥ Scale factor ; Ratio of the output voltage versus the rotating angular rate being applied.
- ⑦ Scale factor symmetry ; A typical value of asymmetry of sensitivity defined as a ratio of the sensitivity applying plus value of a specified input voltage to minus value of a specified input voltage.
- ⑧ Linearity ; $((Sv\omega - Sv_{max}) / (Sv_{max} \times \omega_{max})) \times \omega \times 100$ Linearity of CW direction, in the same as CCW direction.
 $Sv\omega$; Scale factor when angular rate is ω
 ω_{max} ; Maximum angular rate
 Sv_{max} ; Scale factor at ω_{max}
- ⑨ Cross axis sensitivity ; Maximum value of sensitivity of cross axis
- ⑩ Output noise ; Output noise at stable state operation.
- ⑪ Ratiometric error for bias ; Maximum value of error of bias applying voltage fluctuation caused by operating instability of applying electric power supply.
 $\{V0(V_{cc})/V0(5V)-(V_{cc}/5)\}/(V_{cc}/5-1) \times 100$ (%)
- ⑫ Ratiometric error for scale factor ; Maximum value of error of sensitivity applying voltage fluctuation caused by operating instability of applying electric power supply.
 $\{Sv(V_{cc})/Sv(5V)-(V_{cc}/5)\}/(V_{cc}/5-1) \times 100$ (%)
- ⑬ Bias variation with temperature ; Maximum value of standard bias under a specified variation in temperature.
- ⑭ Scale factor variation with temperature ; Minimum and maximum value of standard sensitivity under a specified variation in temperature

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6. Measurement circuit

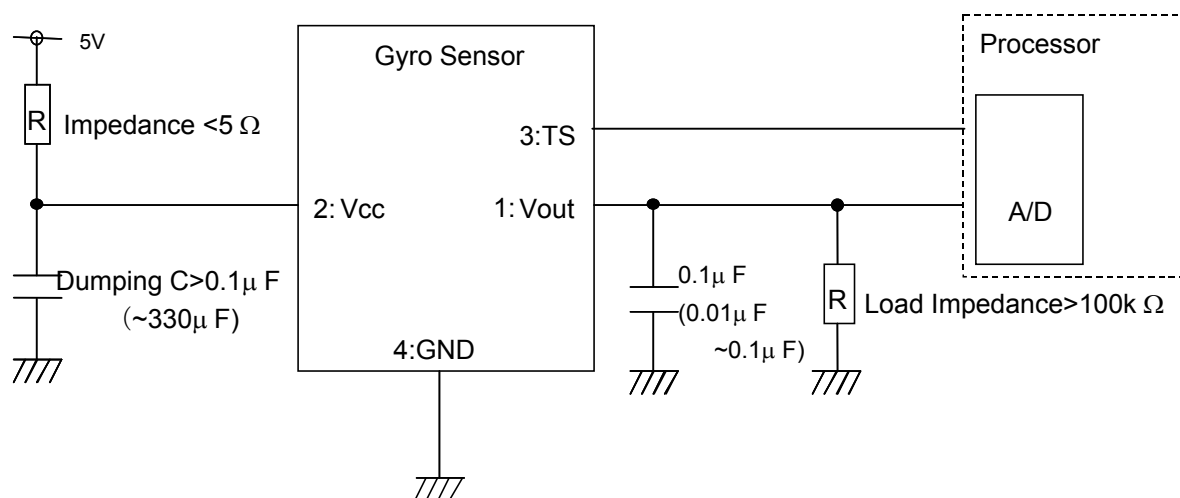


Figure-3. Measurement circuit

Note:

- To decrease the ripple voltage of the supply voltage, recommend to use the capacitor of large capacitance in order to avoid such phenomena.
- High impedance of Vout and TS terminal is needed.
(Please attach the load resistance more than 100kΩ if needed.)

7. Assembly recommendation

7-1. Assembly recommendation

7-1-1. Soldering temperature profile of reflow

- (1) 170~190°C : within 120sec
- (2) 200°C or higher : within 80sec
- (3) 220°C or higher : within 60sec
- (4) Peak temperature : 245°C, within 40sec

Where used solder is Sn-3Ag-0.5Cu

[Measurement point: Board surface]

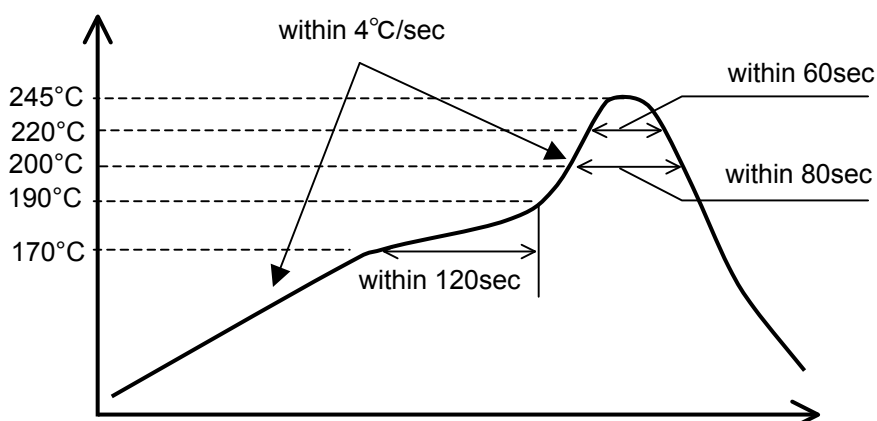


Figure-4. Reflow soldering

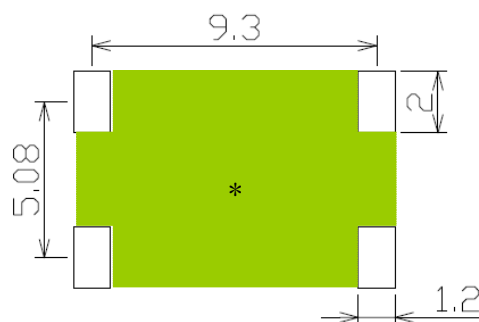
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7-1-2. Soldering temperature profile of iron

At 1 lead Temperature: Lower than 300°C Time: within 3s

7-2. Recommended footprint



*) Solder resist

Figure-5. Recommended footprint

8. Instructions

8-1. This product uses Bi-CMOS IC inside. Against static electricity discharge is needed.

8-2. Connected correctly is needed.

8-3. Reflow soldering applied only once.

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