

FIS30XXseries Gas sensor module SPECIFICATIONS

1st edition

Model No. FIS3091-99NC-01/03
Product Name Gas sensor module
Spec. No.
Issued on March 9, 2017
Applied product for general purposes



Document	Date	By
Created	March 9, 2017	Harumi Kuribayashi
Approved	March 9, 2017	Yasushi Kuroe
Issued		



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FIS FIS Inc.

Parts Name Gas sensor module
Model FIS3091-99NC-01/03

Specification No.

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Attached documents

- 1) Product drawing
- 2) Circuit drawing

Revision history

	Date	Contents	Created by
1 st edition	March 9, 2017	1 st edition	Harumi Kuribayashi

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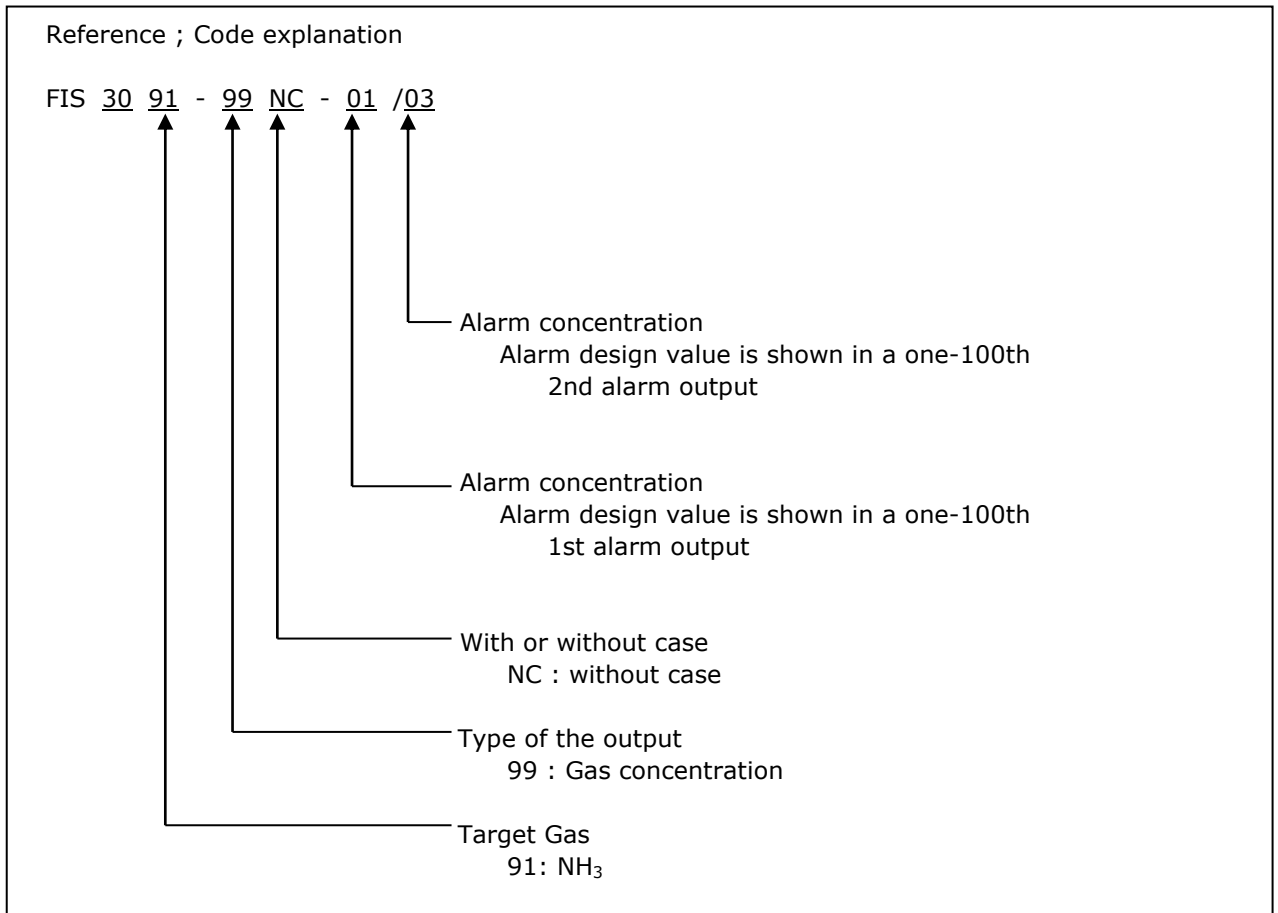
Specification No.

1. Scope

This specification applies to gas sensor module, FIS30XXseries.

2. Product name·model number

Product name: Gas sensor module
Model number : FIS3091-99NC-01/03
Customer model number :



3. Absolute maximum ratings

Parameter	Symbol	Maximum Rating	Remark
Power supply voltage	VDD	-0.3V ~ 6.0V	
Input voltage	VIN	-0.3V ~ VDD+0.3V	
Output voltage	VOUT	-0.3V ~ VDD+0.3V	
High temperature	Ta	120°C 10 seconds	
Operating temperature range	Top	-10 ~ 50°C	Without dew condensation
Storage temperature range	Tst	-40 ~ 60°C	Without dew condensation
Others	Should not be exposed to organic solvents such as IPA, and silicon compound.		

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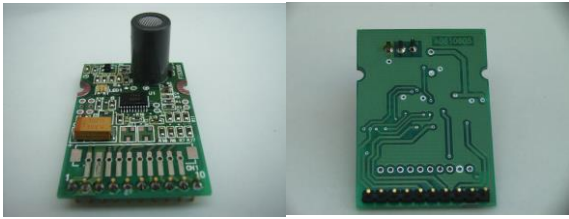
Parts Name Gas sensor module
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4. Recommended driving conditions

Parameter	Symbol	Condition	Remark
Power supply	VDD	DC5.0V±2%	
Average current consumption	Ip	35mA	Rush current 1A, during 0.17milliseconds every 5milliseconds
High-level IO voltage	VIOH	VDD×0.8~VDD	
Low-level IO voltage	VIOL	0V ~ VDD×0.2	Output current 5mA
Pre-heating time before gas alarm inspection		More than 24 hours	Pre-heating is unnecessary for easy inspection
Mounting direction		Permitted in any direction	

5. External view

Appearance	
Header Pin	Parts number : T10B-SQ, Manufacturing Corporation : JST Pin pitch : 2.54mm
Dimensions	28×41×20 (H) mm
Weight	5 g
Mounting method	Solder pins to PCB. Fill two holes with screws or hot-melt adhesive.

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6. Connector pin specifications

■The following is common to all model number and specifications

P-No.	Name	Detail	IO	Active	Remarks
1	VDD	Power supply	—	—	DC 5.0V±2%
2	VSS	GND	—	—	DC 0V
3	MAL	Malfunction output	Output of NC type without case	L	Malfunction output CMOS output
			Output of C4 type with case	OFF	Malfunction output Open collector
4	AL1	1st alarm output	Output of NC type without case	L	CMOS output
			Output of C4 type with case	OFF	Open collector
5	AL2	2nd alarm output	Output of NC type without case	L	CMOS output
			Output of C4 type with case	OFF	Open collector
6	SERIAL	For quality confirmation	Output	H	Quality data output Serial output of sensor signal, Used days and the number of alarms CMOS output
7	RST	For quality confirmation	Input	H	Quality data request Pull-down
8	CAL	Non-use	—	—	For factory setting
9	RESET	Reset	Input	L	Reset Pull-up
10	MODE	Non-use	—	—	For factory setting

7. Initial operation

1. At the start of 7 seconds period after power-on gas sensor module warms-up and malfunction check of the sensor and LED (GREEN) flashes for every 0.5 seconds.
2. After 7 seconds from power-on, the gas sensor module shifts to "Normal surveillance mode" which continues until power supply is stopped.
3. During "Normal surveillance mode" LED (GREEN) turns on.

8. Sensor driving specifications

1. Model number, sensor number and detecting gas is listed below.
2. Sensor heater voltage is applied as listed below by PWM, and sensor circuit DC voltage is constantly applied.
3. A thermistor compensates the temperature influence on the gas sensor module.

Model number	Sensor number	Detecting gas	Heater voltage
FIS3091-99NC-01/03	SB-53	NH ₃	0.9V

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9. Alarm specifications

Model number	Inspection gas	Alarm stage	Should not alarm	Should alarm	Alarm response		Noise gas influence
FIS 3091-99	NH ₃	1st	80ppm	120ppm	-	-	-
		2nd	240ppm	360ppm	900ppm	Within 30 seconds.	Non-alarm for 100ppm of ethanol

Reference ; Alarm design value

Model number	Inspection gas	Alarm stage	Alarm start	Alarm stop
FIS3091-99	NH ₃	1st	100ppm	70ppm
		2nd	300ppm	210ppm

10. Gas concentration output specifications

Model number	Detecting gas	Gas concentration output range
FIS3091-99	NH ₃	0, 30-500ppm

11. Malfunction output (MAL)

1. Sensor is always checked for malfunction. In case of malfunction, LED(RED) and LED(GREEN) alternatively blink at intervals of 0.25 seconds.
2. When the sensor recovers, malfunction signal is automatically cancelled.
3. This terminal is connected to a pull-up resistor in the gas sensor module. If this terminal not use, it should be left.

12. RESET (RESET)

1. By inputting "Low signal" the operation is reset and then re-started from the initial operation.
2. This terminal is connected to a pull-up resistor in the gas sensor module. If this terminal not use, it should be left.

13. Non-use terminals (CAL) (MODE)

1. These terminals are prepared only for FIS factory manufacturing. Do not use them for mass production in your factory.
2. These terminals are connected to a pull-up resistor in the gas sensor module. It should be left.

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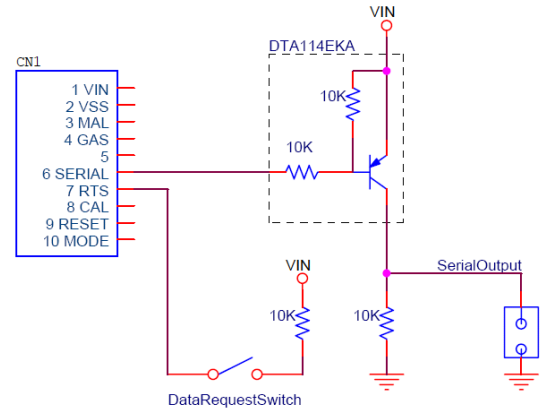
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14. Quality data (SERIAL) (RST)

1. This terminal output is for the serial data such as the gas sensor signal for quality confirmation. Do not use this for mass-production and FIS does not guarantee this. This terminal does not connect to VDD and GND.
2. There are two kinds of serial output of "Normal serial mode" and "Experiment serial mode". If this terminal is LOW(0V), it starts "Normal serial mode" at the time of power on, and input HI to RST terminal for more than 75 milliseconds this will release one set of the latest serial data. If this terminal is HI(5V), it starts "Experiment serial mode" at the time of power on, and continually flow the serial data every 0.2 seconds.
3. Transmitting protocol: 9600bps, 8bit, none parity, stop bits 1, no flow control, 0 to 5V DC, ASCII, Active Hi
4. Reverse the output of terminal (SERIAL) with a transistor to see the serial output in Hyper Terminal.



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15. Serial output specifications

15.1 Normal serial mode

※※Normal serial mode starts with terminal(RST) as LOW(0V) at the time of power on.

【Contents of serial output】

Header	Byte No.	Value	Contents
GAS	0 - 3	4 byte ASCII string	Gas concentration ppm, (e.g. 0100)
	4	0x09	Tab
temp	5 - 7	3 byte ASCII string	Temperature, -40~+60 (e.g. +25)
	8	0x09	Tab
date	9 - 12	4 byte ASCII string	Used days, 0~9999
	13	0x09	Tab
AL1	14 - 15	2 byte ASCII string	The accumulation number of 1st alarms, 0~99
	16	0x09	Tab
AL2	14 - 15	2 byte ASCII string	The accumulation number of 2nd alarms, 0~99
	16	0x09	Tab
stat	17 - 18	2 byte ASCII string	Status code
	19 - 20	0x0D 0x0A	CR/LF

【An example of serial signal】

```
Rev RX.XX FIS3091-99NC-01/03
Cal[abs] 800 700 600 400 0600
0000 0000 -02 0000
GAS temp date AL1 AL2 stat
0000 +25 0000 00 00 05
0000 +25 0000 00 00 05
0000 +25 0000 00 00 05
0000 +25 0000 00 00 05
0000 +25 0000 00 00 00
0000 +25 0000 00 00 00
```

【Meaning of data】

Rev : Software number
Cal[abs] : Sensor data at calibration
GAS : Gas concentration(%)
temp : Temperature
date : Used days
AL1 : The accumulation number of 1st alarms
AL2 : The accumulation number of 2nd alarms
stat : Status code

【Meaning of status code】

Stat	Contents
00	Normal serial mode
01	Experiment serial mode.
02	No gas detecting period (Switching of load resistance)
03	No gas detecting period (Switching of load resistance)
05	Warm up
21	1st alarm
22	2nd alarm
41	Sensor malfunction
44	Poisoned by silicon compound
91	If exposed to high concentration gas, the heater will stop.

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15..2 Experiment serial mode

※※Experiment serial mode starts with terminal(RST) as HI(5V) at the time of power on.

【Contents of serial output】

header	Byte No.	Value	Contents
time	0 - 4	5 byte ASCII string	Sampling number of data (e.g. H0000)
	5	0x09	Tab
NO	6 - 9	4 byte ASCII string	Identification gas sensor module number (e.g. 0000)
	10	0x09	Tab
ABS	11 - 14	4 byte ASCII string	Sensor data, 0~1024 (e.g. 0739)
	15	0x09	Tab
TABS	16 - 19	4 byte ASCII string	Compensated sensor data, 0~1024 (e.g. 1010)
	20	0x09	Tab
GAS	21 - 24	4 byte ASCII string	Gas concentration ppm, (e.g. 0100)
	25	0x09	Tab
temp	26 - 28	3 byte ASCII string	Temperature, -40~+60 (e.g. +25)
	29	0x09	Tab
data	30 - 33	4 byte ASCII string	Used days, 0~9999
	34	0x09	Tab
AL1	35 - 36	2 byte ASCII string	The accumulation number of 1st alarms, 0~99
	37	0x09	Tab
AL2	38 - 39	2 byte ASCII string	The accumulation number of 2nd alarms, 0~99
	40	0x09	Tab
stat	41 - 42	2 byte ASCII string	Status code
	43	0x09	Tab
	44 - 46	3 byte ASCII string	FIS management data
	47	0x09	Tab
	48 - 51	4 byte ASCII string	FIS management data
	52 - 53	0x0D 0x0A	CR/LF

【An example of serial signal】

```
Rev RX.XX FIS3091-99NC-01/03
Cal[abs] 800 700 600 400 0600
0000 0000 -02 0000
time NO ABS TABS GAS temp date AL1 AL2 stat
L0000 0000 1023 0000 0000 +25 0000 00 00 05 000 0000
H0000 0000 1010 0000 0000 +25 0000 00 00 05 000 0000
H0000 0000 1010 0000 0000 +25 0000 00 00 05 000 0000
```

【Meaning of data】

Rev : Software number
Cal : Sensor data at calibration
time : Sampling number of data
NO : Identification gas sensor module number
ABS : Sensor data
TABS : Temperature compensated sensor data
GAS : Gas concentration (ppm)
temp : Temperature
date : Used days
AL1 : The accumulation number of gas 1st alarms
AL2 : The accumulation number of gas 2nd alarms
stat : Status code

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caution)

TABS and ABS of the serial data is the signal of the sensor, resulting in variation between individual sensitive sensors. FIS does not guarantee the relationship between the gas concentrations in the ABS and TABS.

【Meaning of status code】

Stat	Contents
00	Normal serial mode
01	Experiment serial mode
02	No gas detecting period (Switching of load resistance)
03	No gas detecting period (Switching of load resistance)
05	Warm-up
21	1st alarm
22	2nd alarm
41	Sensor malfunction
44	Poisoned by silicon compound
91	If exposed to high concentration gas, the heater will stop.

16. LED output specifications

The following is common to all model numbers and specifications

Item	Contents
Initial operation	LED(GREEN) blinks at an interval of 0.5 seconds and LED(RED) off.
Normal operation	LED(GREEN) lights, and LED(RED) off.
Malfunction	LED(GREEN) and LED(RED) alternatively blink at an interval of 0.25 seconds.
1st alarm	LED(GREEN) and LED(RED) blinks at the same interval of 1 second (ORANGE blink)
2nd alarm	LED(GREEN) and LED(RED) blinks at the same interval of 0.5 second (ORANGE blink)

17. Mechanical characteristics

No.	Parameter	Contents, conditions	Criteria
1	Tensile strength	Tensile strength between gas sensor and PCB, and between connector and PCB	More than 9.8N (1kgf)
2	Vibration	Acceleration: 1.3G Frequency range: 5 to 500Hz Condition of changing the sweep: Logarithmic Direction of vibration: 3 dimensions (X, Y, Z) Duration of sweep: 40min Duration time : 1hr in each direction	Should satisfy the alarm specifications.
3	Drop and impact	Drop from a height of 1m Floor material: Concrete Number of drops: 3 times	Should satisfy the alarm specifications.

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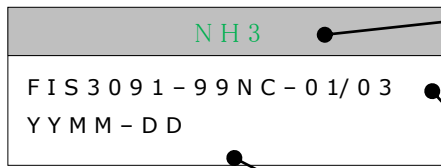
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18. Label

A label as below is attached to the gas sensor module.



Target gas symbol

Target gas symbol and label color are listed in the table below.

Model number

Production lot number

YY: Two lower digits of production calendar year

MM: Product month, 01 to 12

DD: Tracing number 01 to 99

Model number	Target gas symbol	label color
FIS3091-99NC-01/03	NH3	Gray

19. Anti-humidity material

Anti-humidity material is applied to gas sensor module where necessary.

20. Notes

1. When the gas sensor module is used for mass-production, connect an electrolytic capacitor (more than 470 uF) to power supply line (VIN). Rush current 1A flows through during 0.17milliseconds every 5milliseconds.
2. When more than two gas sensor modules are connected to a single power supply for incoming inspection or other purposes, connect an electrolytic capacitor (More than 470 uF) to all the gas sensor module power supply line (VIN), one capacitor to one line.
3. Keep any paints, solvents, and silicone bonding agents away from the gas sensor module to prevent the malfunction.

21. Related documents

1. Product drawing : (as per enclosure)
2. Circuit drawing : (as per enclosure)

22. Timing chart

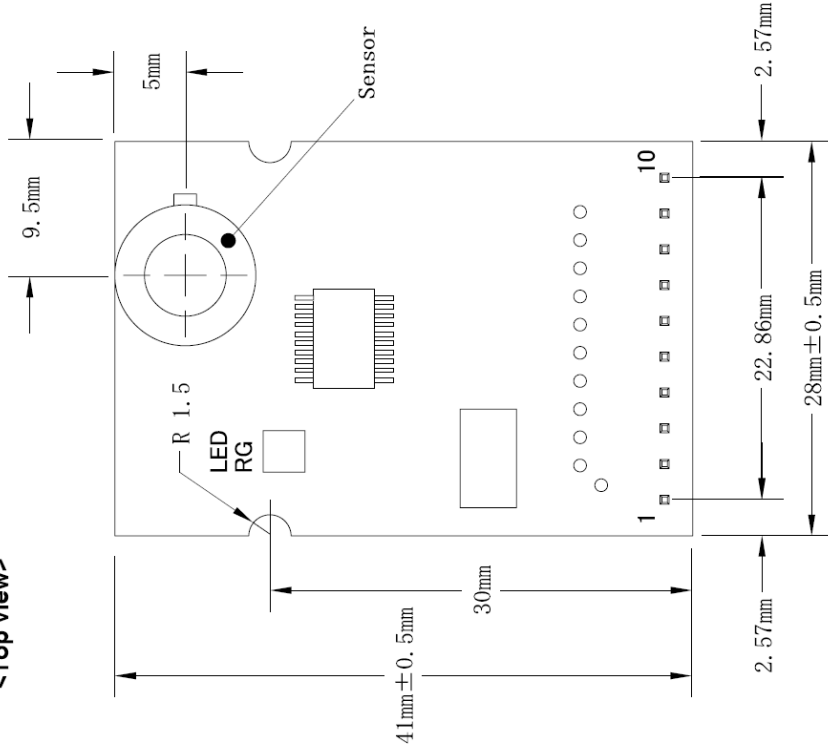
The timing chart is non-disclosure for the FIS know-how and FIS intellectual property protection.

23. Quality assurance

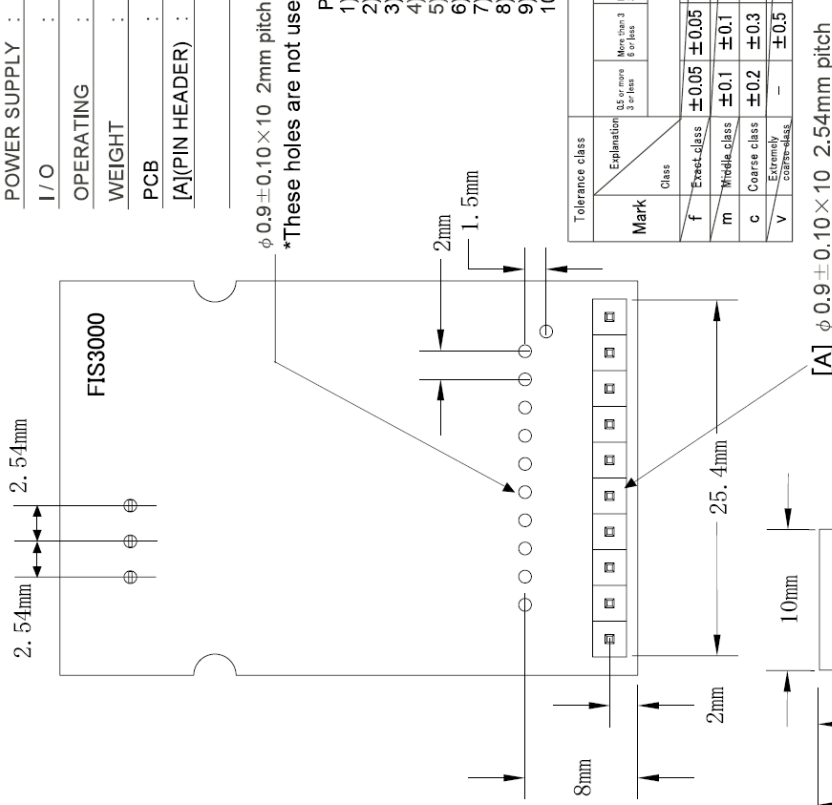
This product shall keep basic performance as a gas sensor module for a period of 7 years.

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Model	FIS3091-99NC-01/03	
<p>24. Handling of this specification</p> <p>This specification shall be exchanged between customer and FIS Inc. Other contents than specified in this specification shall be decided through mutual consultation between both parties. All or a part of this specification shall not be disclosed to any third parties without advance consent of the other party. The above mentioned third party excludes agent.</p>		

<Top view>



<Back view>



APPLICATION : SENSOR MODULE

GAS SENSOR : SB SERIES

POWER SUPPLY : 5.0VDC +/- 2%

I/O : 0V / 5VDC

OPERATING : -10°C to +50°C

WEIGHT : 5g

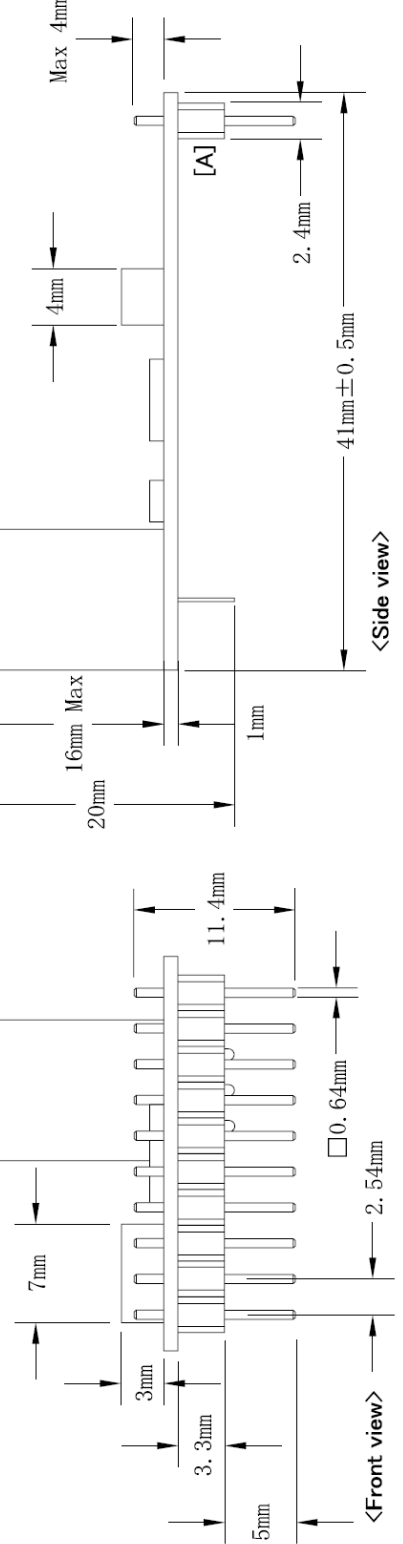
PCB : FR-4 28X41 1.0t 94V-0

[A](PIN HEADER) : T10B-SQ(JST)

RoHS Compliant

Tolerance class	Division of basic size									
	Mark	Explanation	Max. size 3 0.5 or less 3 or less	Max. size 6 1.0 or less 6 or less	Max. size 30 1.5 or less 15 or less	Max. size 100 2.0 or less 100 or less	Max. size 400 3.0 or less 400 or less	Max. size 1000 4.0 or less 1000 or less	Max. size 2000 5.0 or less 2000 or less	Max. size 4000 6.0 or less 4000 or less
f	Exact class	± 0.05	± 0.05	± 0.1	± 0.15	± 0.2	± 0.3	± 0.5	-	-
m	Medium class	± 0.1	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 4
c	Coarse class	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2	± 3	± 4	± 6
v	Extremely coarse class	-	± 0.5	± 1	± 1.5	± 2.5	± 4	± 6	± 8	± 12

[A] $\phi 0.9 \pm 0.10 \times 10$ 2.54mm pitch



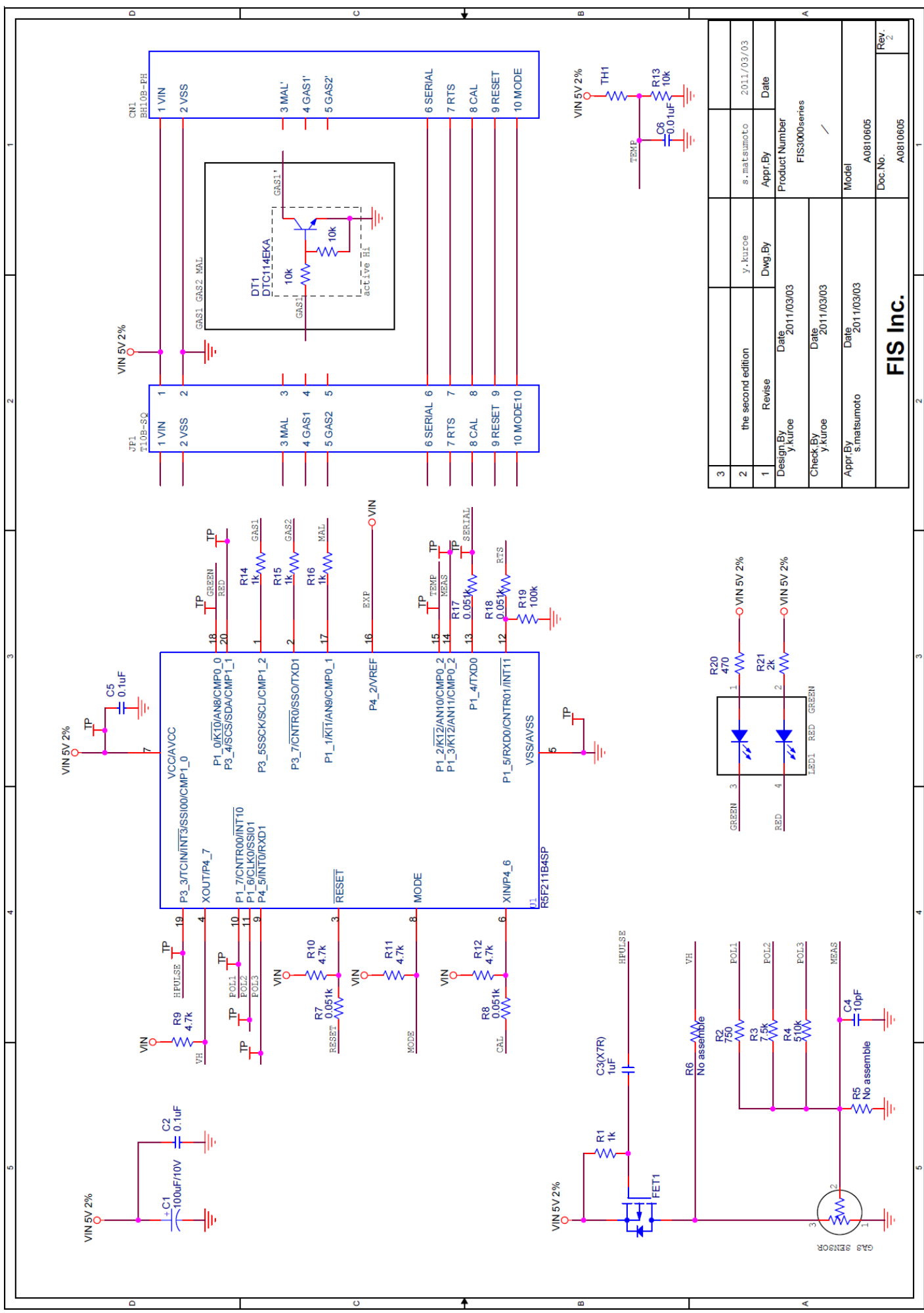
<Front view>

<Side view>

PRODUCT NAME	FIS30XX-YYNC	
SCALE	FREE	UNIT
DRAWN	Y.KUROE	CHECKED
	8/MAR/2017	S.MATSUMOTO

FIS

JAPAN



3		the second edition		y. kuroe	s. matsumoto	2011/03/03	
2		Design By	y. kuroe	Dwg. By	Appr. By	Date	
1		Check By	y. kuroe	Date	2011/03/03	Product Number	
		Appr. By	s. matsumoto	Date	2011/03/03	FIS3000series	
		<p style="text-align: center;">FIS Inc.</p>				Model	A0810605
						Doc.No.	A0810605