Fujikura

Messrs.

SPECIFICATION

Semiconductor Pressure Sensor

Model: AG3xF-115KA

Project:

Distributor:

Reference:

Yoshiyuki Uchiumi, Application Engineer

Sensor Business Unit

Electronics Business Company

Fujikura Ltd.

Table of Contents

Table shown below is revision records of this specification

1	July 2, 2018	Y. Uchiumi	Officially issued to start volume production	
Est.	October 5, 2017	Y. Uchiumi	Preliminary issued	
	Date	Name	Comment	Mark

1.   General
This document describes the specifications of Fujikura Pressure Sensors, Type of AG3xF-115KA.

2.   Principle
Fujikura Pressure Sensor is composed of a silicon piezoresistive pressure sensing chip and a signal conditioning integrated circuit. The low-level signal from the sensing chip is amplified, temperature compensated, calibrated, and finally converted to a high-level output signal that is proportional to the applied pressure.

3.   Device lineup
This device has the following lineup.

Model	Pressure Type	Supply Voltage	Accuracy	Pressure Range				
				0	15		Standard atmosphere 101.325 kPa(abs.)	115 kPa(abs.)
AG3	Absolute	5.0 Vdc	±2.0 %FS					
		3.3 Vdc 3.0 Vdc	±2.5 %FS					

Features
- ✓ Amplified and temperature compensated smooth analog output
- ✓ Low profile flat package
- ✓ Compatible with the XFAM/X3AM integrated pressure sensors
- ✓ Customization or modification available
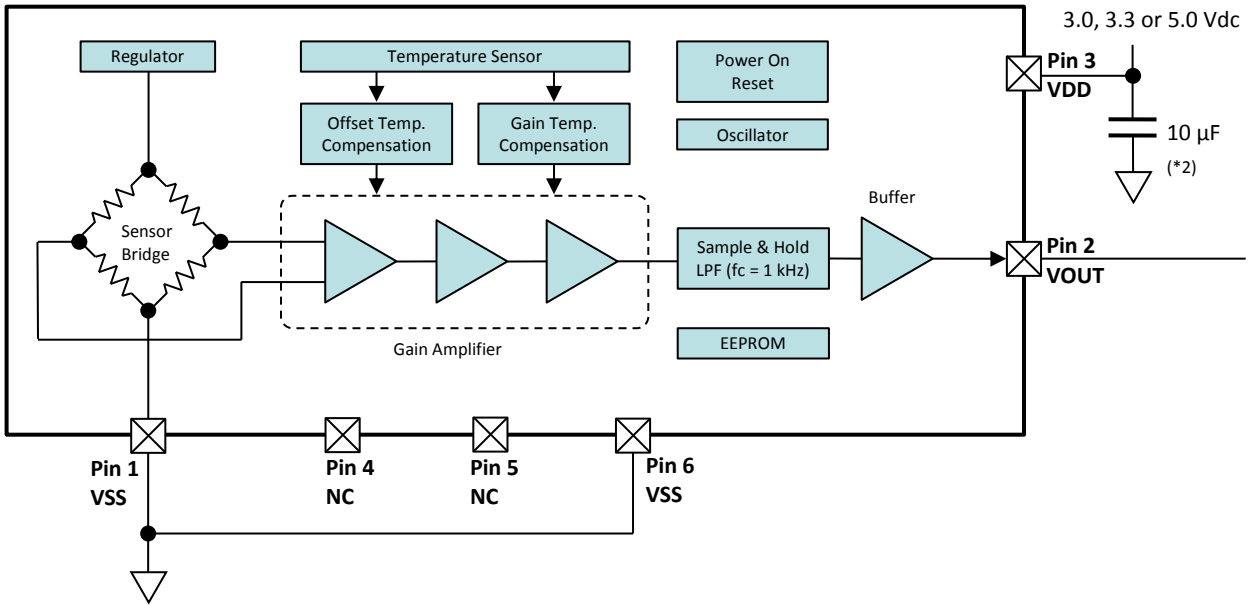
Applications
- ✓ Medical devices
- ✓ Industrial pneumatic devices
- ✓ Consumer devices

4.   RoHS
This device is compliant with the Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS).
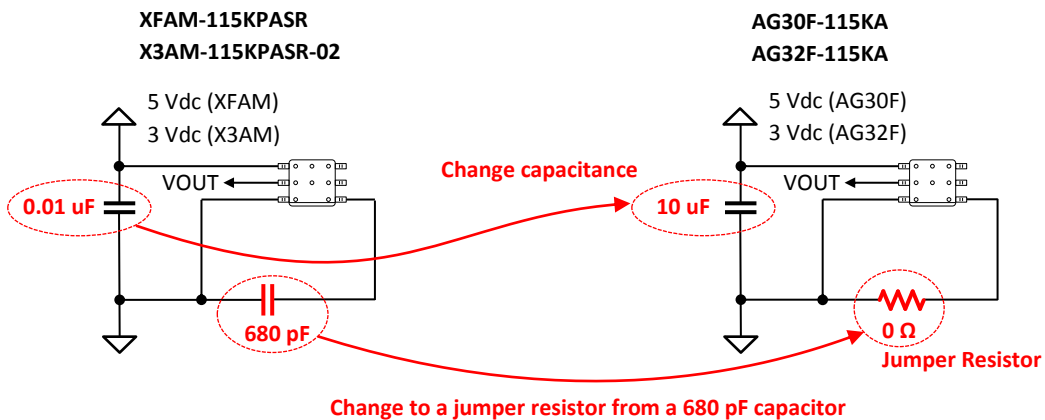
5. Block Diagram and Pin Connections

Pin Assignment	Pin No.	Pin Name	I/O	Type	Function	
	1	VSS	-	-	Common voltage connection	*1
	2	VOUT	O	Analog	Analog output	
	3	VDD	-	-	Power supply connection	*2
	4	NC	-	-	Non-connection	*3
	5	NC	-	-	Non-connection	*3
	6	VSS	-	-	Common voltage connection	*1

Notes:
*1)   Both Pin 1 and Pin 6 must be connected to VSS.
*2)   Put a 1.0 µF capacitor as minimum between Pin3 (VDD) and VSS. **If VOUT is susceptible to noise, it would be recommended to increase capacitance.**
*3)   Pin assignment of Pin 4 and 5 is NC (Non connection).

6. Drop-in Replacement

7. Device Name Code

The device name code is consisted of Sensor code, Pressure code, Custom ID and Packing style. For the exact ordering device number, please refer to Chapter 17 Ordering Information.

Sensor Code				Pressure Code				
AG3	0	F	-	115K	A	-		

	Blank:	Tray
Packing	**TP:**	Tape & Reel
Pressure type	**A:**	Absolute pressure
Pressure value	**115K:**	115 kPa
Package	**F**:	Flat package
	0:	5.0 Vdc
	1:	3.3 Vdc
Supply voltage	**2:**	3.0 Vdc
Model	**AG3:**	SMD / Smooth analog output

8. Absolute Maximum Ratings

Item	Symbol	Rating			Unit
		Min.	Typ.	Max.	
Load Pressure	Pmax+	-	-	+230	kPa(abs.)
Supply Voltage	VDDmax	-	-	6	Vdc
Operating Temperature	Topt	-40	-	+105	℃
Storage Temperature	Tstg	-40	-	+105	℃

Note:

*1) Absolute maximum ratings are the limits that the device will withstand without damage.

9. General Specifications

Item	Condition		Symbol	Rating			Unit	
				Min.	Typ.	Max.		
Supply Voltage	Sensor Code	AG30F	VDD	4.75	5.0	5.25	Vdc	*1
		AG31F		3.135	3.3	3.465		
		AG32F		2.85	3.0	3.15		
Type of Pressure			-	Absolute pressure				*2
Pressure Media			-	Non-corrosive gases				*3
Pressure Range			Popt	15	-	115	kPa(abs.)	*4
Compensated Temperature			-	0	-	+85	℃	*5
Operating Humidity	Non-condensing		Hopt	30	-	85	%RH	*6
Storage Humidity	Non-condensing		Hstg	30	-	85	%RH	*6
Dielectric Strength			-	-	-	1	mA	*7
Insulation Resistance			-	100	-	-	MΩ	*8

Notes:

*1) Output voltage (Vout) is not perfectly ratio-metric with the power supply voltage (VDD).

*2) Absolute pressure is defined as the difference between applied pressure to the device and absolute zero pressure.

*3) Ensure the pressure media contains no particulates. The device is not compatible with liquids.

*4) Pressure range is defined as the measurable pressure range of the device. Do not expose intentionally beyond minimum Popt and maximum Popt.

*5) Please also refer to Chapter 12 Transfer Function.

*6) Do not wet the device with dew.

*7) Dielectric strength is defined as the leakage current between all pins and the package with AC 500, 1 minute.

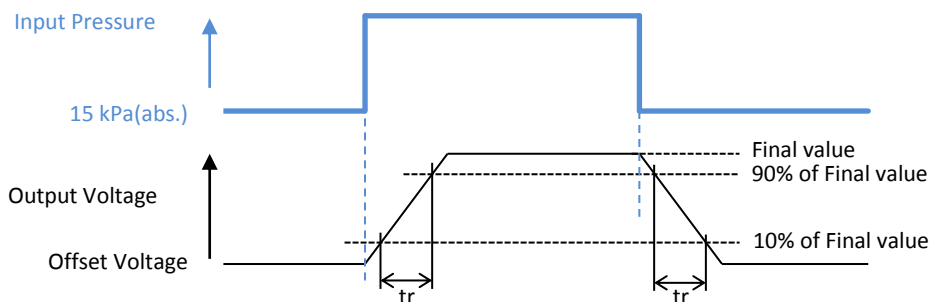*8) Insulation resistance is defined as the resistance value between all pins and the package with DC 500 V.

10. Electrical Characteristics

Load resistor RL = ∞, Ambient temperature Ta = 25°C

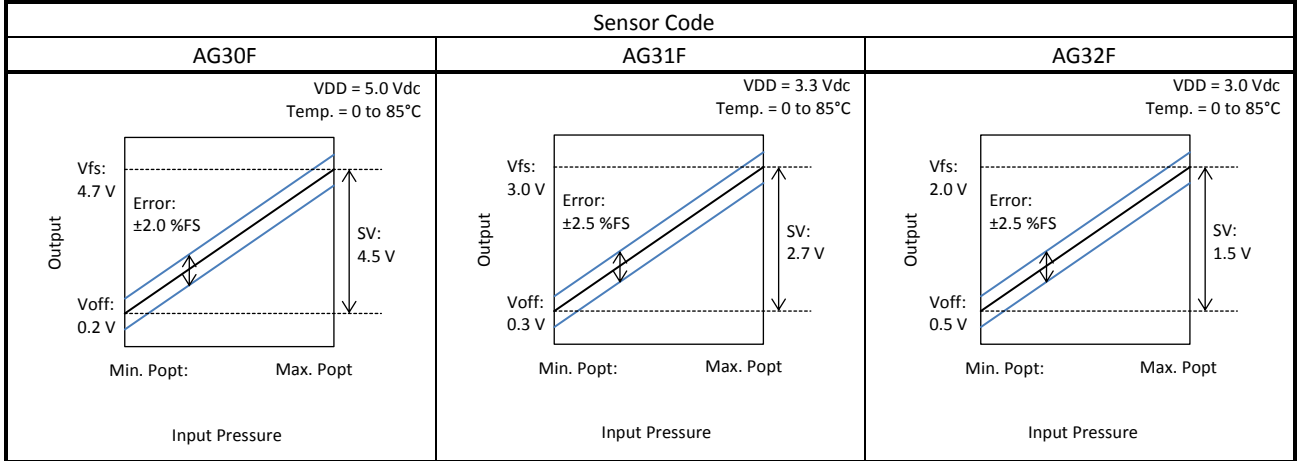| Item | Condition | Symbol | Rating | | | Unit | |
			Min.	Typ.	Max.		
Sensor Code: AG30F (VDD = 5.0 Vdc)							
Offset Voltage	Min. Popt	Voff	0.11	0.2	0.29	V	*1, 2
Full Scale Voltage	Max. Popt	Vfs	4.61	4.7	4.79	V	*3
Span Voltage	Min. to max. Popt	SV	-	4.5	-	V	*4
Accuracy	0 to 85°C	Error	-2.0	-	+2.0	%FS	*5, 6
			-0.09	-	+0.09	V	
Supply Current		Ic	-	-	6	mAdc	*7
Sensor Code: AG31F (VDD = 3.3 Vdc)							
Offset Voltage	Min. Popt	Voff	0.2325	0.3	0.3675	V	*1, 2
Full Scale Voltage	Max. Popt	Vfs	2.9325	3.0	3.0675	V	*3
Span Voltage	Min. to max. Popt	SV	-	2.7	-	V	*4
Accuracy	0 to 85°C	Error	-2.5	-	+2.5	%FS	*5, 6
			-0.0675	-	+0.0675	V	
Supply Current		Ic	-	-	5	mAdc	*7
Sensor Code: AG32F (VDD = 3.0 Vdc)							
Offset Voltage	Min. Popt	Voff	0.4625	0.5	0.5375	V	*1, 2
Full Scale Voltage	Max. Popt	Vfs	1.9625	2.0	2.0375	V	*3
Span Voltage	Min. to max. Popt	SV	-	1.5	-	V	*4
Accuracy	0 to 85°C	Error	-2.5	-	+2.5	%FS	*5, 6
			-0.0375	-	+0.0375	V	
Supply Current		Ic	-	-	5	mAdc	*7
Response Time	for reference	tr	-	1	-	msec.	*8
Load Resistor	VOUT to VSS or VDD to VOUT	RL	9.5	-	-	kΩ	*7
Load Capacitance	VOUT to VSS	CL	-	-	50	pF	*9

Notes:
*1)   Offset voltage (Voff) is defined as the output voltage at minimum Popt.
*2)   Offset error is calibration error of offset voltage at production. It does not include Long term offset drift. It would be suggested that applications have Auto-zeroing function.
*3)   Full scale voltage (Vfs) is defined as the output voltage at maximum Popt.
*4)   Output span voltage (SV) is defined as the voltage difference between Offset voltage (Voff) and Full scale voltage (Vfs).
*5)   Accuracy consists of the following:
        Non-linearity
        Temperature errors over the temperature range 0 to 85°C
        Pressure hysteresis
        Calibration errors of sensitivity and offset
*6)   The unit of Accuracy "%FS" is defined as a percent error by Span voltage (SV).
*7)   Supply Current (Ic) is increased depending on the value of Load resistor (RL).
*8)   Response time (tr) is defined as the time for the change in output voltage from 10% to 90% or from 90% to10% of its final value when the input pressure makes a step change.

*9)   Do not put Load capacitance (CL) that is over 50 pF between VOUT and VSS.

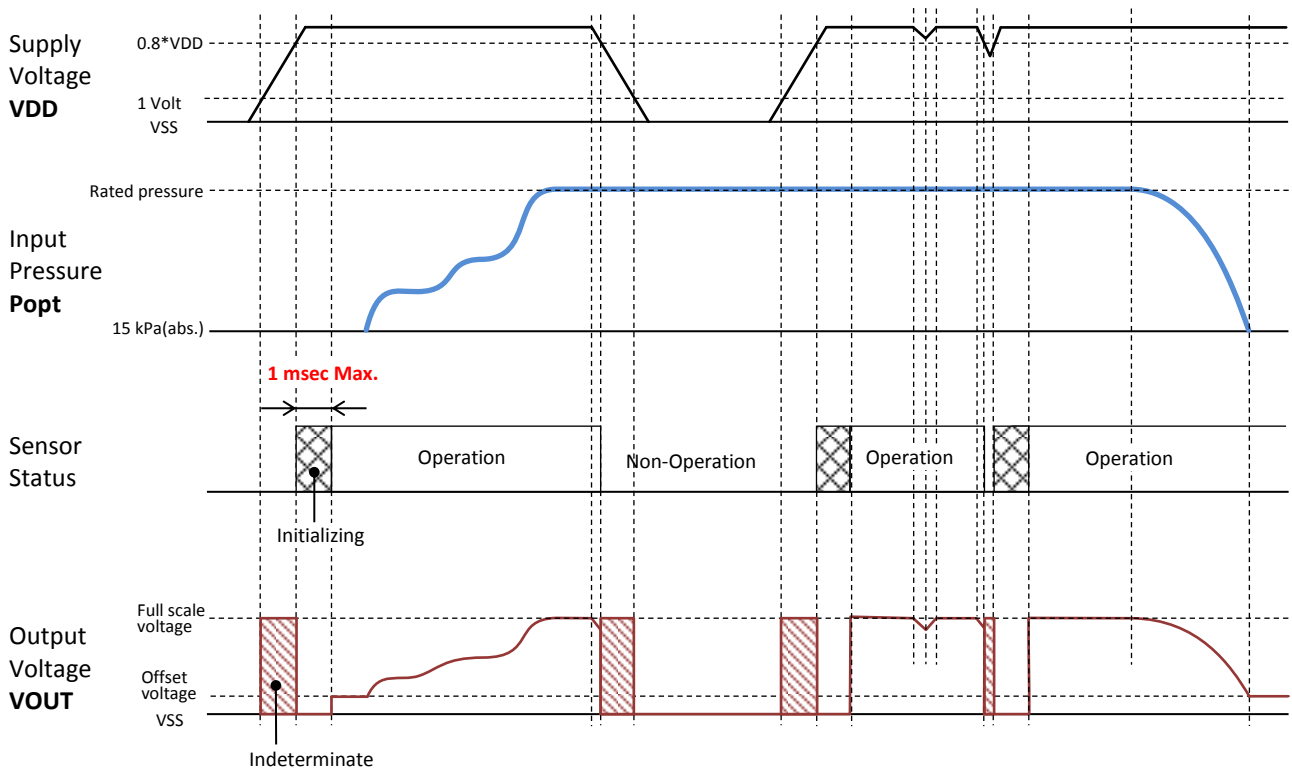## 11. Output Voltage versus Input Pressure

Sensor Code		
AG30F	AG31F	AG32F

12. Transfer Function

Item	Rating
Transfer Function	$V_{out} (V) = VDD \times ((P \times \alpha) + \beta) \pm (\text{Pressure Error} \times \text{Temperature Error Multiplier} \times \alpha \times VDD)$ $$P \text{ (kPa)} = \dfrac{\dfrac{V_{out} \pm (\text{Pressure Error} \times \text{Temperature Error Multiplier} \times \alpha \times VDD)}{Vdd} - \beta}{\alpha}$$

Parameters	Sensor Code	VDD (*1)	P	α	β	Pressure Error
	AG30F	5.0±0.25 V	15 to 115 kPa	9/1000	-19/200	2.0 kPa
	AG31F	3.3±0.165 V	15 to 115 kPa	9/1100	-7/220	2.5 kPa
	AG32F	3.0±0.15 V	15 to 115 kPa	1/200	11/120	2.5 kPa

Temperature Error Multiplier	

Note:
*1)   Output voltage (Vout) is not perfectly ratio-metric with the power supply voltage (VDD).

13. Operating Sequence

Notes:
*1)   The status of VOUT is indeterminate when supply voltage is under 0.8*VDD.
*2)   Initializing process is started when supply voltage reaches 0.8*VDD,. At initializing process, VOUT is fixed 0.1*VDD and under.

14. Device Marking

Items			Marking					
Production Lot								
Y	Last digit of Production year		0 to 9					
M	Production month		Jan	Feb	Mar	Apr	May	Jun
			1	2	3	4	5	6
			Jul	Aug	Sep	Oct	Nov	Dec
			7	8	9	X	Y	Z
DD	Production date		01 to 31					
Sensor Code								
AG30F			AG30					
AG31F			AG31					
AG32F			AG32					
Pressure Code			115A					

The device marking figure shows:
Index
YMDD
AG30
115A

Note:
*1)   Package code is not marked on the face plate.

15. Soldering

Process	Sensor Code	Condition	
Reflow soldering	AG3xx	**Soldering Profile**	*1 *2 *3 *4

	A	Ramp up	2 to 4 °C / sec.
	B	Pre-heating	150 to 180 °C 60 to 120 sec.
	C	Ramp up	2 to 4 °C / sec.
	D	Heating	Above 230 °C, 45 sec. max. 245 °C max., 10 sec. max.
	E	Ramp down	2 to 4 °C / sec.
Moisture Sensitivity Level	AG3xx	Level 1	*5

Notes:
*1) NEVER wash the device with any washing liquid. NEVER wash the device with any ultrasonic washing machine.
*2) Do not put the solder and flux on the device's package.
*3) Temperature means the surface temperature of the device's package.
*4) Do not reflow more than twice.
*5) This device is classified as moisture sensitivity level (MSL) 1 that is defined in Jedec standard J-STD-20. Floor life time is unlimited. However, the plating of pins is silver (Ag) that could be discolored to black or brown by sulfur in the environment. Discoloration of pins could impact soldering reliability. The device should be sealed in the embossed carrier tape before soldering.
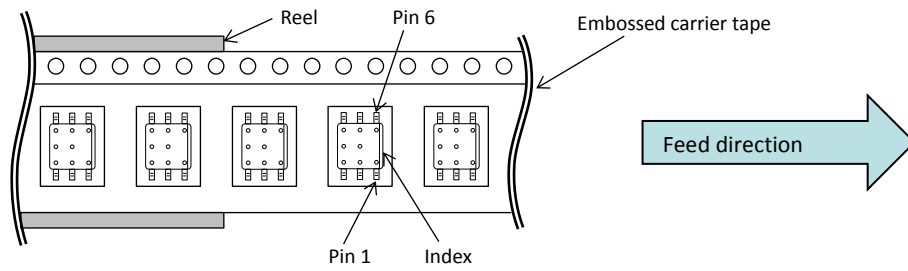
16. Dimensions and Weights

Refer to the following drawing as attached.

Sensor Code	Dimension Drawing	Weights
AG3xF	9-772-019	approx. 0.3 grams

17. Ordering Information

Supply Voltage	XFAM/X3AM	Ordering Device Number (Replacement Device Number)	Packing	Qty./Packing	
5.0 Vdc	XFAM-115KPASR	AG30F-115KA	Tray	100	Pcs/Tray
	XFAM-115KPASR-TP	AG30F-115KA-TP	Tape & Reel	1000	Pcs/Reel
3.3 Vdc	-	AG31F-115KA	Tray	100	Pcs/Tray
	-	AG31F-115KA-TP	Tape & Reel	1000	Pcs/Reel
3.0 Vdc	X3AM-115KPASR	AG32F-115KA	Tray	100	Pcs/Tray
	X3AM-115KPASR-TP	AG32F-115KA-TP	Tape & Reel	1000	Pcs/Reel

18. Tape & Reel Information

19. Footprint for PCB (for Reference)

Sensor Code	Footprint
AG3xF	

Notes:
*1) These footprints are for reference. Please evaluate well these footprints, before your mass production.
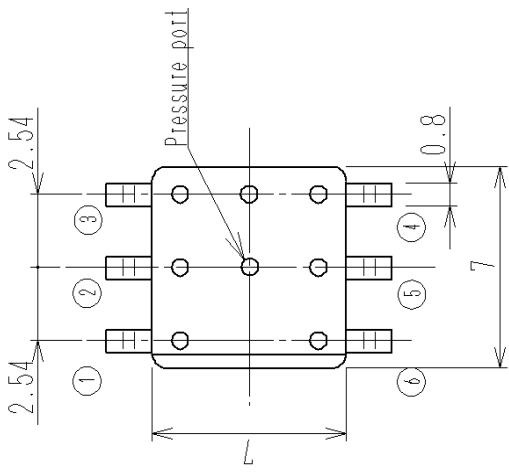*2) When designing your PCB, please also refer to the outline diagrams.

20. Handling Notes

Plating of pins is silver (Ag). Silver has physical property that is discolored to black or brown by sulfur. There are notes for handling as below:
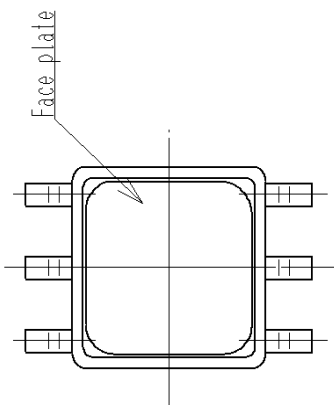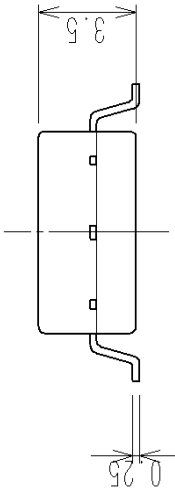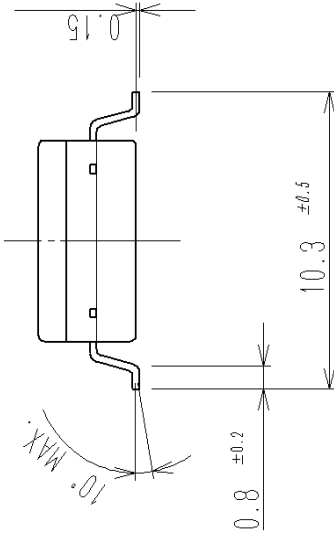
· To prevent discoloration of pins, please keep the devices sealed in static shielding bags before soldering.
· Do not solder the devices that have discolored pins.
· After soldering, pins would be discolored in black or brown in atmosphere. However it does not impact reliability of the device.

21. Notes

· Fujikura reserves all rights.
· This document is subject to change without notice.
· Limitation, usage, environment, standard warranty and so on are listed on Fujikura web site.
· Please refer to the latest specifications.

AGxxF Series
Outline Diagram

PART NO.
PROJECT NAME:
NAME OF PART 部品名

名称 TITLE

第3角法 3RD ANGLE PROJECTION
単位 UNITS mm
尺度 SCALE Free

DATE OF ISSUE
July 4, 2017
DATE OF DESIGN
July 4, 2017

図面番号 DRAWING NO.
9-772-019-0

REV. MARK

MAT'L 材質
QTY 個数
REMARKS 摘要

REVISIONS 変更

MARK 変更
DATE 年月日
BY 変更者

Pressure port
Face plate
Index

2.54
2.54
0.8
7
L

3.5
0.25

0.15
10.3 ±0.5
0.8 ±0.2
10° MAX.

① ② ③ ④ ⑤ ⑥