

# Frequency Synthesizer

## ■ S470M890MA Data Sheet UHF Band Synthesizer

### Application

- For Digital terrestrial broadcasting (DVB-T, ATSC)
- For Fixed Communication

### Features

- Low-phase noise characteristic: -95 dBc/Hz at 100 Hz
- Wide frequency range: 470 to 890 MHz
- Highly stable signal source:  $\pm 0.1 \times 10^{-6}$  max.
- Fine frequency setting resolution: 1 Hz step
- Can be synchronized with an external reference signal (10MHz)



**RoHS Compliant**  
Directive 2011/65/EU  
Directive (EU) 2015/863

**Pb free**

1. Product : Frequency Synthesizer
2. Type : S470M890MA
3. Output Frequency : 470 to 890MHz
4. Specification Number : ECY10A-00006
5. Electrical Specification

|    | Parameters                                | Symbol  | Electrical Spec. |       |               |          | Remarks         |
|----|---|---|------------------|-------|---------------|----------|-----------------|
|    |   |   | Min.             | Typ.  | Max.          | Units    |                 |
| 1  | Output frequency range                    | $f_{out}$   | 470              |       | 890           | MHz      |                 |
| 2  | Frequency setting resolution              | -   |                  | 1     |               | Hz       |                 |
| 3  | Frequency stability                       | -   | -0.1             |       | +0.1          | ppm      |                 |
| 4  | Aging characteristic                      | -   | -0.1             |       | +0.1          | ppm/year | *1              |
| 5  | Phase noise characteristic                | -   |                  | -95   |               | dBc/Hz   | at 100Hz        |
|    |   | -   |                  | -100  |               | dBc/Hz   | at 1kHz         |
| 6  | Output Level                              | $P_{out}$   | -1               | 0     | +1            | dBm      |                 |
| 7  | Spurious (Harmonics)                      | -   |                  |       | -20           | dBc      |                 |
| 8  | Spurious (Non-harmonics)                  | -   |                  |       | -70           | dBc      |                 |
| 9  | External reference signal input frequency | $f_{REF}$   | 10MHz<br>-5Hz    | 10MHz | 10MHz<br>+5Hz | -        | Sine wave       |
| 10 | External reference signal Input level     | $P_{REF}$   | -3               | 0     | +3            | dBm      |                 |
| 11 | External reference signal phase noise     | -   |                  |       | -108          | dBc/Hz   | at 10Hz         |
|    |   | -   |                  |       | -130          | dBc/Hz   | at 100Hz        |
|    |   | -   |                  |       | -145          | dBc/Hz   | at 1kHz         |
|    |   | -   |                  |       | -145          | dBc/Hz   | at 10kHz        |
| 12 | Clock output signal frequency             | $f_{CLK}$   |                  | 40    |               | MHz      | Sine wave<br>*2 |
| 13 | Clock output level                        | $P_{CLK}$   | -3               | 0     | +3            | dBm      |                 |
| 14 | Power Supply voltage                      | $V_{CC}$  | +11.4            | +12.0 | +12.6         | V        |                 |
| 15 | Current consumption                       | $I_{CC}$  |                  |       | 0.5           | A        |                 |
| 16 | Operating temperature range               | $T_{opr}$   | -20              |       | +60           | °C       |                 |
| 17 | Frequency setting                         | Serial Control Signal   |                  |       |               |          |                 |
| 18 | External interface                        | RF interface : SMA-F connector (50Ω nominal)<br>Control/power supply interface : DSUB 9-pin connector |                  |       |               |          |                 |

\*1 Based on the frequency over 30 days

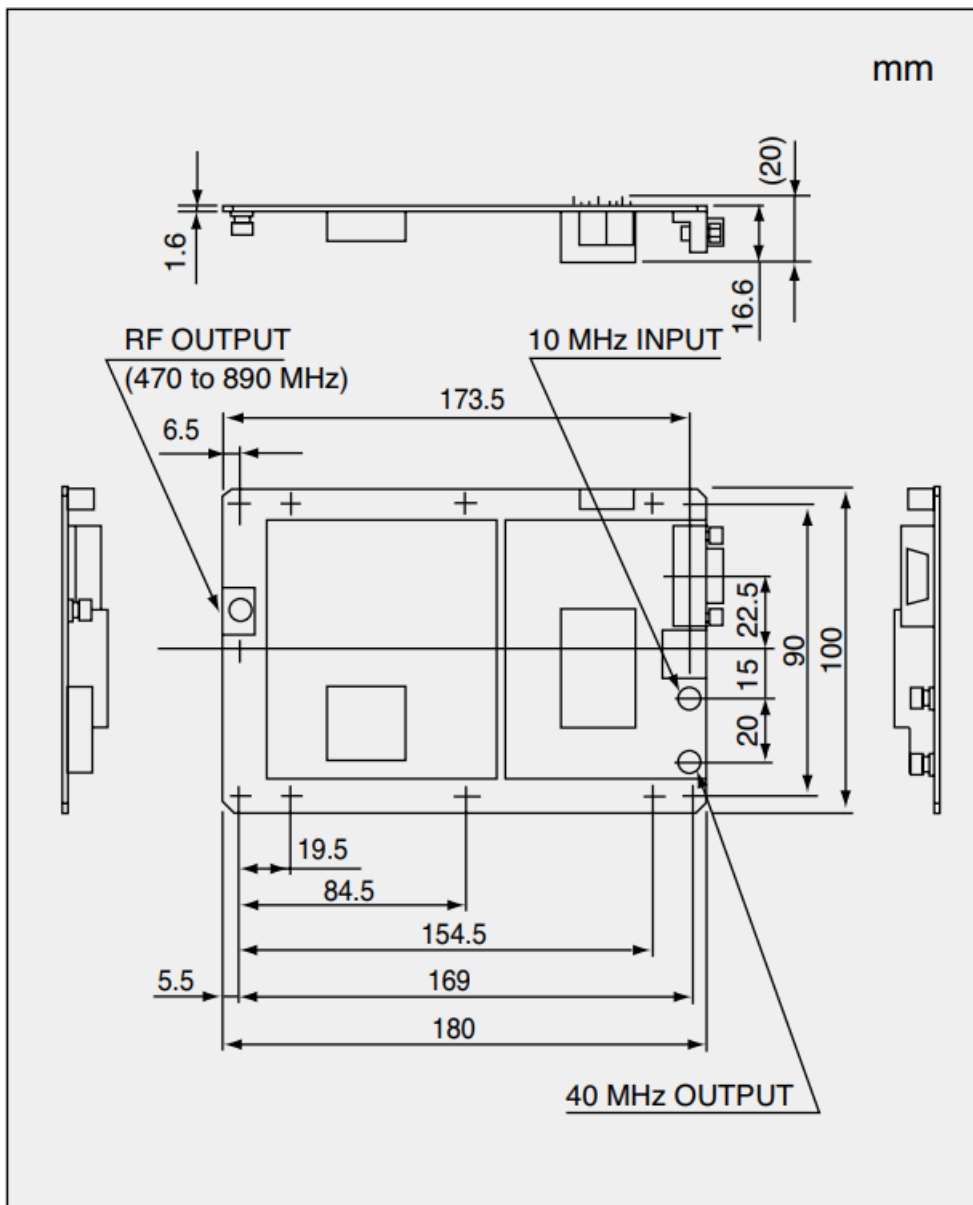
\*2 When synchronized with the external REF, the synchronized signal is output.

When asynchronous with the external REF, the internal OCXO signal is output.

### Dimension of External

Unit : mm

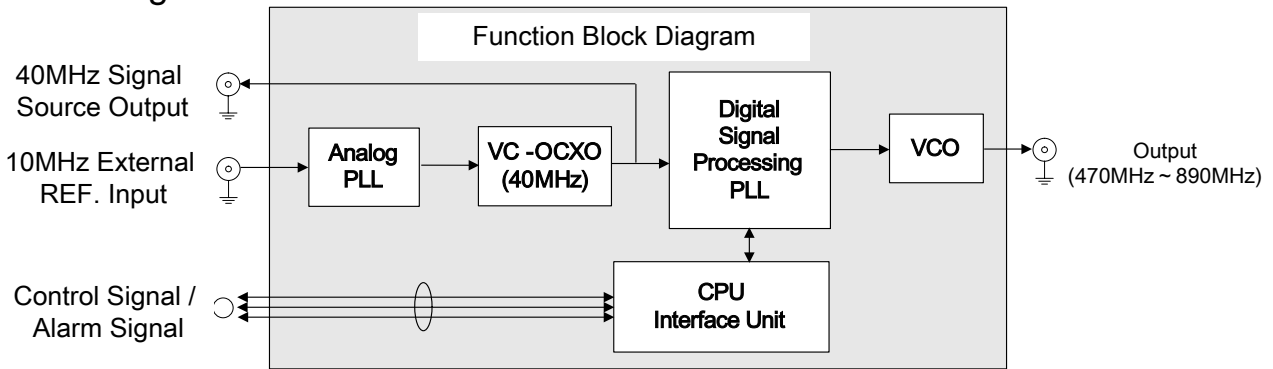
Tolerance : +/-0.4mm



Pin configuration (DELC-J9PAF)

| No. | Connection                              |        |
|-----|---|--------|
| #1  | Alarm 1 (RF unlock)                     | Output |
| #2  | SCLK (serial clock)                     | Input  |
| #3  | SDI (serial data)                       | Input  |
| #4  | SCS (serial chip select)                | Input  |
| #5  | GND                                     |        |
| #6  | Alarm 2<br>(external 10 MHz PLL unlock) | Output |
| #7  | Alarm 3 (OCXO open)                     | Output |
| #8  | GND                                     |        |
| #9  | +12V                                    | Input  |

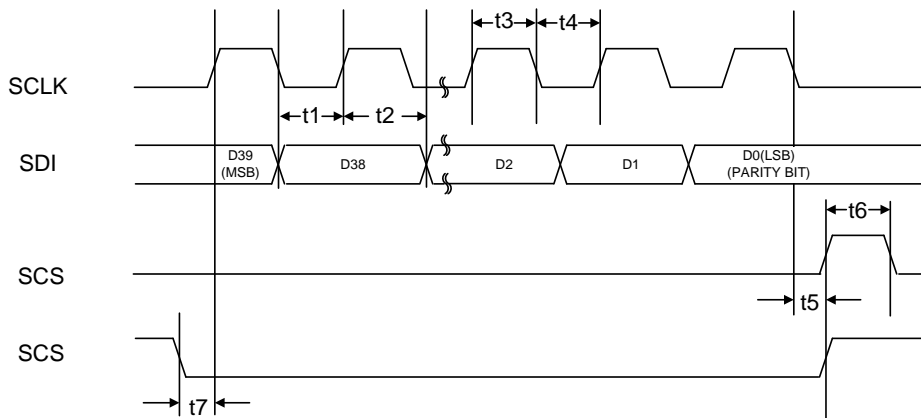
## Block Diagram



## Serial communication timing chart

| Parameter | Limit at T <sub>min</sub> to T <sub>max</sub> | Unit   | Test Conditions/Comments |
|-----------|---|--------|--------------------------|
| t1        | 200   | ns min | SDI to SCLK Setup Time   |
| t2        | 200   | ns min | SCLK to SDI Hold Time    |
| t3        | 500   | ns min | SCLK High Duration       |
| t4        | 500   | ns min | SCLK Low Duration        |
| t5        | 200   | ns min | SCLK to SCS Setup Time   |
| t6        | 100   | ms min | SCS Pulsewidth           |
| t7        | 200   | ns min | SCS to SCLK Setup Time   |

Guaranteed by design but not production tested.  
Specifications subject to change without notice.



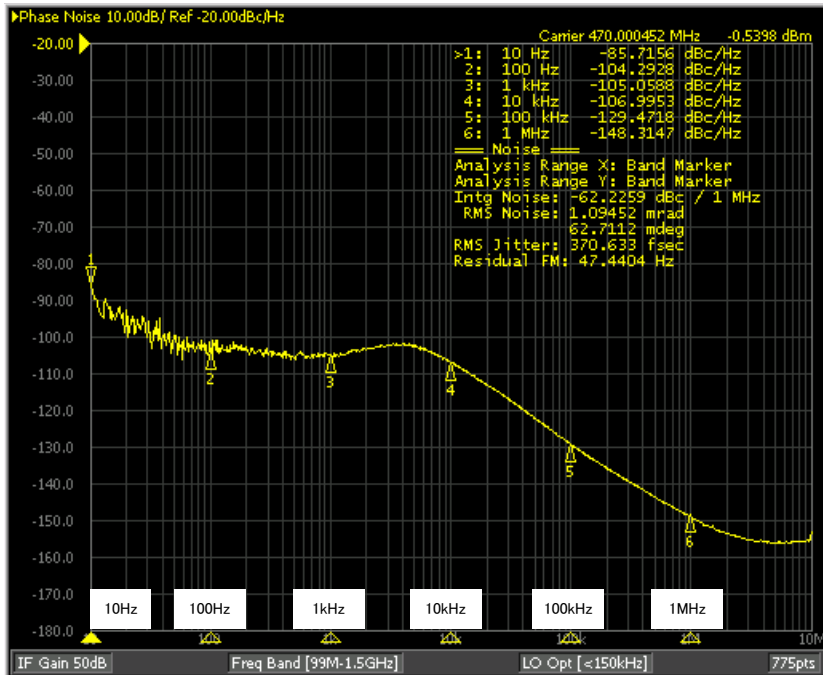
Both SCS Signals shown in the above figure are available.

## Electric Characteristic

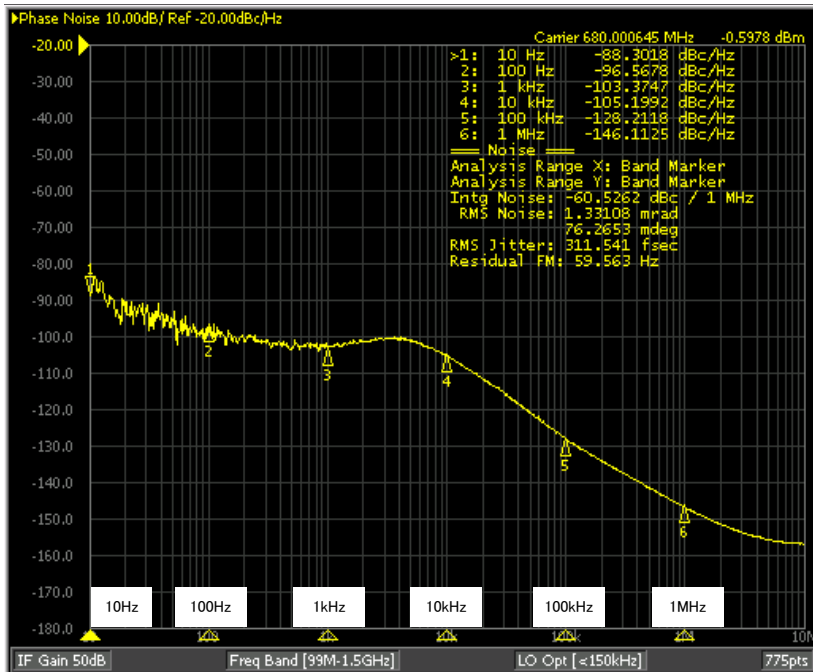
| Item  | Min. | Typ. | Max.   | Remarks                |
|---|------|------|--------|------------------------|
| ALARM1/2/3 Output High Level Voltage : V <sub>oh</sub>              | 2.0V |      | 3.3V   | I <sub>oh</sub> =800μA |
| ALARM1/2/3 Output Low Level Voltage : V <sub>OL</sub>               | 0.0V |      | 0.8V   | I <sub>ol</sub> =24mA  |
| SCLK/SDI/SCS Input High Level Voltage : V <sub>IH</sub>             | 2.0V |      | 3.3V   |                        |
| SCLK/SDI/SCS Input Low Level Voltage : V <sub>IL</sub>              | 0.0V |      | 0.8V   |                        |
| SCLK/SDI/SCS Input Input Current : I <sub>IH</sub> /I <sub>IL</sub> |      |      | ±330μA |                        |

■ Data

Phase Noise (Ta=25°C)

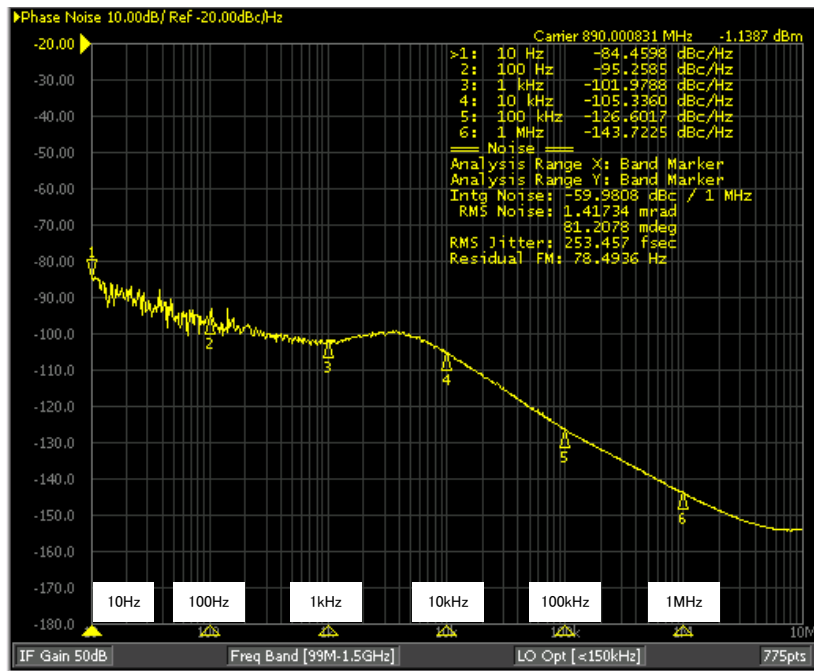


Output Frequency : 470MHz



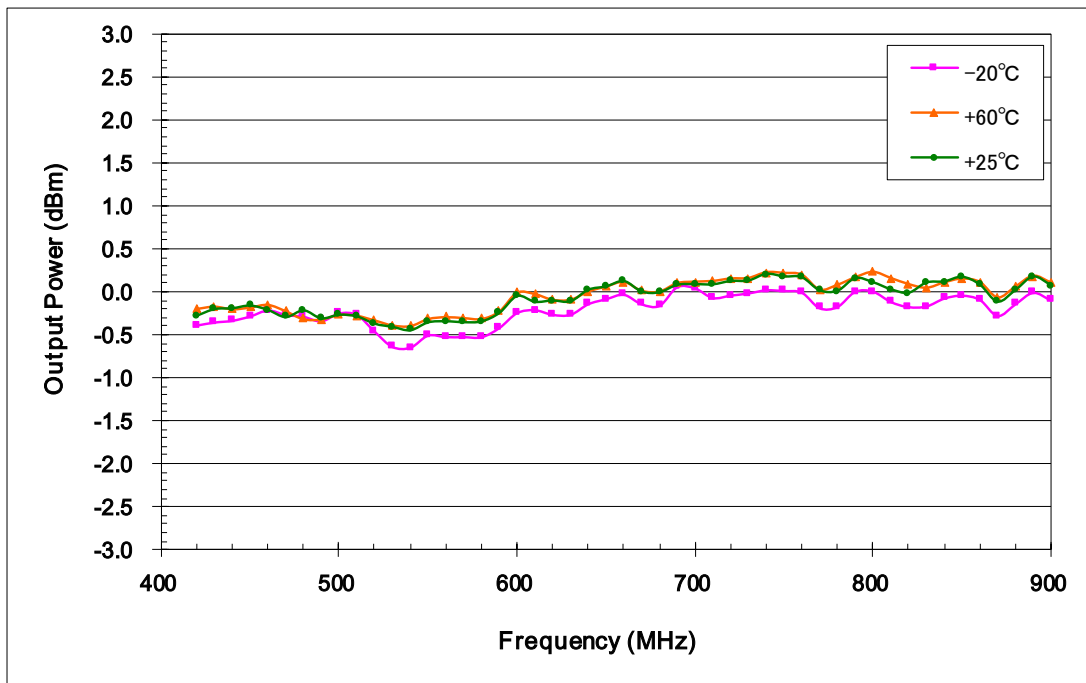
Output Frequency : 680MHz

Phase Noise (Ta=25°C)

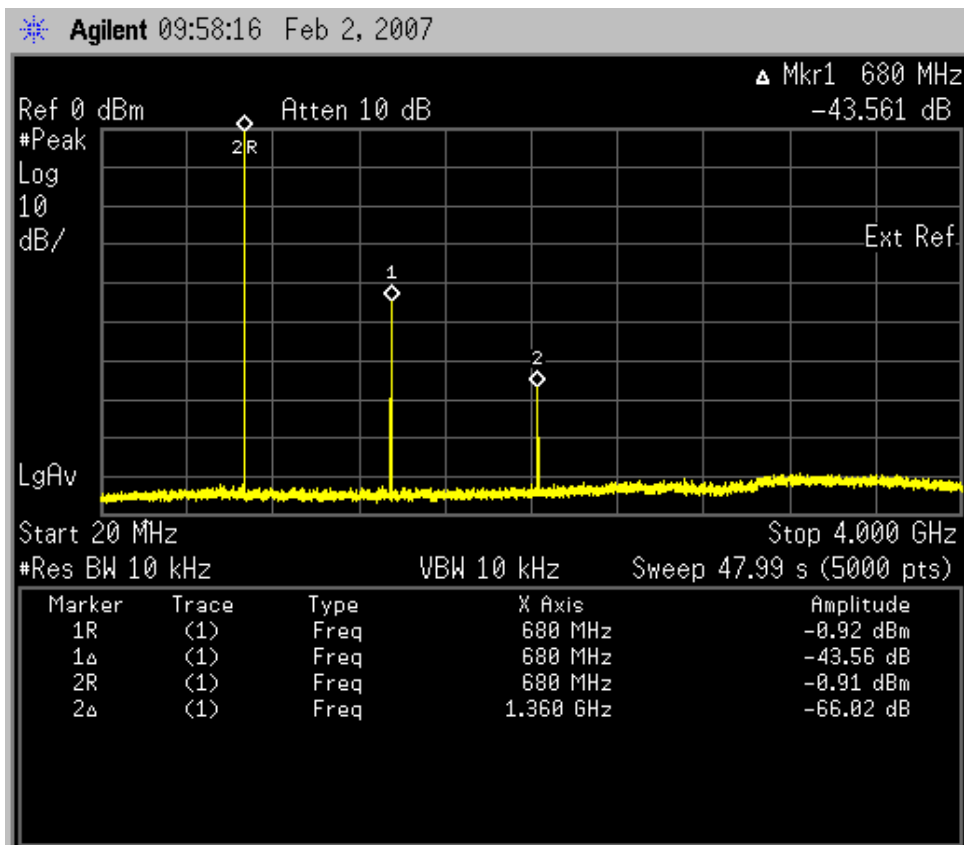


Output Frequency : 890MHz

Output Power



Spurious(Ta=25°C)



Output Frequency : 680MHz

Spurious Level(dBc)

|        |        |
|--------|--------|
| 2nd    | -43.56 |
| 3rd    | -66.02 |
| Others | < -70  |

6. Notes on use

6-1 Even if the appearance color etc. of the product differs by purchasing the component parts by more than two companies, there is no influence on the characteristics and reliability.

6-2 IN THE CASE OF THE FOLLOWING ITEMS, WE ARE NOT RESPONSIBLE FOR WARRANTY / COMPENSATION.

(1) WHEN PRODUCTS OF THIS SPECIFICATION ARE USED FOR EQUIPMENT RELATED TO HUMAN LIFE OR PROPERTY, IT IS THE RESPONSIBILITY OF THE CUSTOMER TO CONFIRM THE INFLUENCE ON THIS PRODUCT AND EQUIPMENT TO BE USED BEFOREHAND, CONDUCT NECESSARY SAFETY DESIGN (INCLUDING REDUNDANT DESIGN, MALFUNCTION PREVENTION DESIGN, etc.), AND PLEASE USE IT AFTER SECURING SUFFICIENT SAFETY OF EQUIPMENT.

1. SAFETY-RELATED EQUIPMENT SUCH AS AUTOMOBILES, TRAINS, SHIPS, etc., OR EQUIPMENT DIRECTLY INVOLVED IN OPERATION
2. AIRCRAFT EQUIPMENT
3. SPACE EQUIPMENT
4. MEDICAL EQUIPMENT
5. MILITARY EQUIPMENT
6. DISASTER PREVENTION / CRIME PREVENTION EQUIPMENT
7. TRAFFIC LIGHT
8. OTHER EQUIPMENT REQUIRING THE SAME PERFORMANCE AS THE ABOVE-MENTIONED EQUIPMENT

(2) IN CASES WHERE IT IS NOT INDICATED IN THE REQUESTED STANDARD AND IS USED UNDER CONDITIONS OF USE (INCLUDING CIRCUIT MARGIN etc.) THAT CAN NOT BE PREDICTED AT THE PRODUCTION STAGE.

(3) WHEN PERFORMING IMPROPER HANDLING THAT EXCEEDS THE GUARANTEED RANGE.

(4) ANY MODIFICATION, ADJUSTMENT, OR REPAIR THAT WE DO NOT PERMIT.  
(INCLUDING CASES WHERE THE DISASSEMBLY PROHIBITION SEAL HAS BEEN REMOVED.)

6-3 The following items are notes when installing this product. To ensure safety and performance, please be sure to observe the following items:

- (1) Do not use in a flammable atmosphere. Do not use near flammable substances such as alcohol or thinner or in an atmosphere that may cause an explosion or fire.
- (2) Avoid places where the temperature is high or where it is exposed to direct sunlight.  
Do not set near heat generating or heating equipment or in places where the temperature changes rapidly.
- (3) Avoid places with high humidity.  
Do not set the product in a humid place such as a water heater, humidifier, or near a water supply.
- (4) The humidity range : 90%RH or less.(However, there should be no condensation.)



Condensation may occur even within the operating humidity range. In that case, please do not use the product until it is completely dry. It may cause a short circuit due to condensation, causing an overcurrent to flow or an electric shock.

(5) Do not install in a corrosive atmosphere.

Do not install in a corrosive gas atmosphere or in an environment where there is a lot of sulfuric acid mist. This may cause corrosion inside the product and poor connector contact, resulting in malfunction or failure.

(6) Do not install in a dusty or dusty place.

Dust and dust may cause electric shock and fire.

(7) Do not install the unit on a tilted or vibrating place.

Dropping or falling may cause damage or injury.

(8) Do not install it in a place with poor ventilation.

Do not block the exhaust port of the device. If the heat is trapped, the malfunction of constant temperature control will occur and accurate measurement may not be possible.

(9) Do not use in locations where there is a strong magnetic field or electric field, or where there is waveform distortion or power supply noise of the input power supply.

(10) Do not place objects on the product. Placing a heavy object may cause a malfunction.

6-4 The following items are notes when transporting this product. Please always observe to ensure safety and performance

(1) Turn off the power. Moving the product with the power on may cause electric shock or damage.

(2) Remove all connected cables.

Moving without removing the cables may cause injury due to deformation, disconnection, or falling.

(3) Do not apply vibration or impact while moving. It may cause equipment failure.

When transporting the equipment, move it as much as possible by using the original packaging box and packing materials.

## 7. Notes on storage

7-1 When storing the product in high temperature and high humidity condition for a long time, product characteristics and packaging condition may be deteriorated. Please store product at temperature + 5 °C to + 35 °C, humidity 85% RH or less. The product is an electronic component, so please do not storage and use, under a dewing state.

7-2 The product storage deadline is 12 months after delivery in unopened state. Please use within storage deadline. If you exceed storage deadline, please check the product characteristics etc, please use.

## 8. Other Requests

8-1 Do not disassemble or modify this product.

Never peel off the non-disassembly seal.

8-2 Please use this specification only for confirmation of the specification of this product.

8-3 If there is a change request, please contact within three weeks from issue date. If there is no communication, we will deliver the product under the contents of this specification. In addition, if the product delivery date is within 3 weeks and there is a change request, we will consult the processing separately.

8-4 NOTES THAT ARE DESCRIBED IN THIS DOCUMENT, IF YOU DID NOT COMPLY WITH THE PROHIBITIONS, AND OTHER PLEASE, INCLUDING THE FAILURE CORRESPONDENCE OR COMPENSATION OR DAMAGES, WE CAN NOT ASSUME THE RESPONSIBILITY, PLEASE UNDERSTAND.

## 9. Warranty policy

### (1) Warranty details and period

THE WARRANTY PERIOD IS ONE YEAR FROM DELIVERY.

IF A MALFUNCTION OCCURS IN ACCORDANCE WITH THIS SPECIFICATION, IT WILL BE REPAIRED FREE OF CHARGE IN ACCORDANCE WITH THE ORGANIZATION AND CONDITIONS INDICATED IN THIS DOCUMENT.

IN ADDITION, NO WARRANTY OTHER THAN THOSE DESCRIBED IN THIS SPECIFICATION WILL BE PROVIDED.

### (1) Warranty exceptions

THE FOLLOWING CASES WILL BE EXCLUDED FROM THE WARRANTY EVEN DURING THE WARRANTY PERIOD.

- FAILURE / DAMAGE DUE TO INCORRECT USE OTHER THAN SHOWN IN THE SPECIFICATIONS.
- FAILURE / DAMAGE DUE TO MODIFICATIONS, ADJUSTMENTS, AND REPAIRS NOT APPROVED

BY

THE COMPANY.

- FAILURE / DAMAGE DUE TO FORCE MAJEURE SUCH AS FIRE AND NATURAL DISASTERS.
- FAILURE / DAMAGE WHEN USED BEYOND THE OPERATING AND OPERATING CONDITIONS SPECIFIED IN THE SPECIFICATIONS.
- FAILURE / DAMAGE WHEN THE PRODUCT IS USED OUTSIDE THE NORMAL OPERATING ENVIRONMENT.  
(FOR EXAMPLE, WHEN CORROSIVE GAS, DUSTY ENVIRONMENT, HUMID ENVIRONMENT, CORROSION OF ELECTRICAL CIRCUIT, DETERIORATION OF PARTS IS ACCELERATED)
- AFTER PURCHASE, FALL, OR FAILURE / DAMAGE DURING TRANSPORTATION.
- INDIRECT DAMAGES INCLUDING LOSS OF EXPECTED PROFITS DUE TO VIOLATION OF PERFORMANCE OF DEFECTS AND PRODUCT MANUFACTURERS.

### (3) Items to be observed by customers

- Use of the equipment in the usage and maintenance methods shown in the specification.

## Handling of this document and other requests

Please refer to the " Site Guidance" on our website for the handling of information contained in this document. (<https://www.ndk.com/en/terms/>)