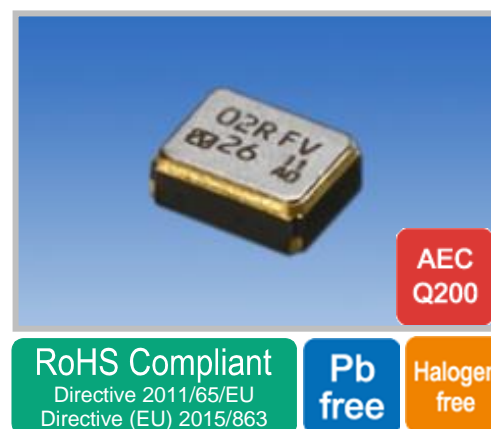![NDK logo — Crystal Bridge to the Future]

Temperature compensated crystal oscillator

■NT2016SEA Data Sheet

TCXO (CMOS / +105 °C) for Automotive

Applications
●Automotive communication
  (e.g., Automotive navigation or Telematics)
●Bluetooth, Automotive module etc.

Features
●Output specifications: CMOS

●With Stand-by function.

●Supports low power supply voltage.
  (Supports DC +1.7 V to +3.63 V. Standard specification: +1.8 V, +3.3 V)

●Ultra-compact and light with a height, cubic volume, and weight of Max. 0.8 mm,
  0.0022 cm^3, and 0.008 g, respectively.

●A surface-mount crystal oscillator. (Reflow soldering is possible.)

●Lead-free. Meets the requirements for re-flow profiling using lead-free solder.

●Conforms to AEC-Q200

NIHON DEMPA KOGYO CO., LTD.

1. Item : Temperature compensated crystal oscillator (TCXO)

2. Type : NT2016SEA

3. Nominal frequency : 12 to 52 MHz

4. NDK Spec. No.

NDK Spec. No.	NSC5370A (+1.8 V)	NSC5371A (+3.3 V)
Frequency range [MHz]	12≦ F ≦52	12≦ F ≦52

5. Maximum Rating

	Item	Rating	unit
1	Supply Voltage	-0.6 to +4.6	V
2	Stand-by terminal voltage	-0.6 to V_{cc} +0.6, Max.+4.6	V
3	Storage temp. range	-40 to +105	°C

6. Rating

	Item	Min.	Typ.	Max.	Units	Notes
1	Nominal frequency	12		52	MHz	Refer to Table1.
2	Supply voltage (V_{cc})	+1.71	+1.8	+1.89	V	(-Earth)
		+3.135	+3.3	+3.465	V	
3	Operating temp. range	-40		+105	°C	
4	Load Capacitance			15	pF	

7. Electrical specification

Unless otherwise specified, measuring condition: T=+25 ±2 °C, Vcc =+1.8 V or +3.3 V, Stand-by =+1.8 V or +3.3 V, Load = 15 pF

	Parameters	Min.	Typ.	Max.	Units	Notes
1	Current consumption (operation)			10	mA	
2	Current consumption (Standby)			10	µA	
3	Output		CMOS			
4	Frequency stability					
	1. Frequency /Temperature characteristics	-5.0		+5.0	ppm	-40 to +105 °C Based on frequency at +25 ±2 °C
	2. Frequency/Voltage coefficient	-0.3		+0.3	ppm	V_{cc} ±5 % (at +25 ±2 °C)
	3. Frequency tolerance	-2.0		+2.0	ppm	After 2 times reflow soldering, based on nominal frequency
	4. Long-term frequency stability	-1.0		+1.0	ppm	year (at +25 ±2 °C)
5	Output voltage			0.2 V_{cc}	V	V_{OL}
		0.8 V_{cc}			V	V_{OH}
6	Rise(t_r) and fall(t_f) times			5	ns	0.2 V_{cc} to 0.8 V_{cc}
7	Symmetry	45		55	%	at 1/2 V_{cc}
8	Output waveform		square wave			

	Parameters	Electrical Spec.				Notes
		Min.	Typ.	Max.	Units	
9	Stand-by function					
	1. High input voltage	80 % V_{cc}		V_{cc}	V	Operation
	2. Low input voltage	0 V		20 % V_{cc}	V	Stand-by

Table.1. Main frequency list
※Please contact us for frequencies not listed.

NDK Spec. No.	Supply voltage	Nominal frequency [MHz]					
NSC5370A	+1.8 V	12	20	24	25	40	50
NSC5371A	+3.3 V	12	20	24	25	40	50

Output waveform
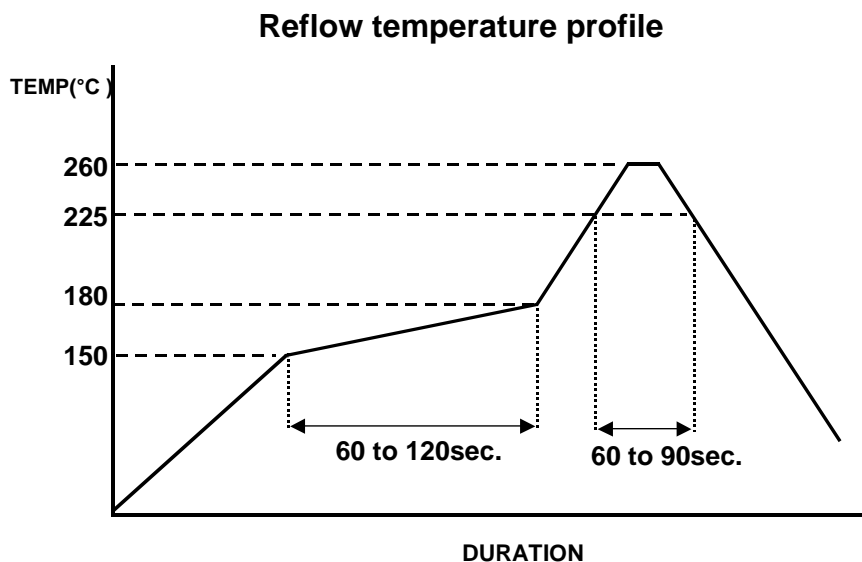

Symmetry = t / T x 100 [%]
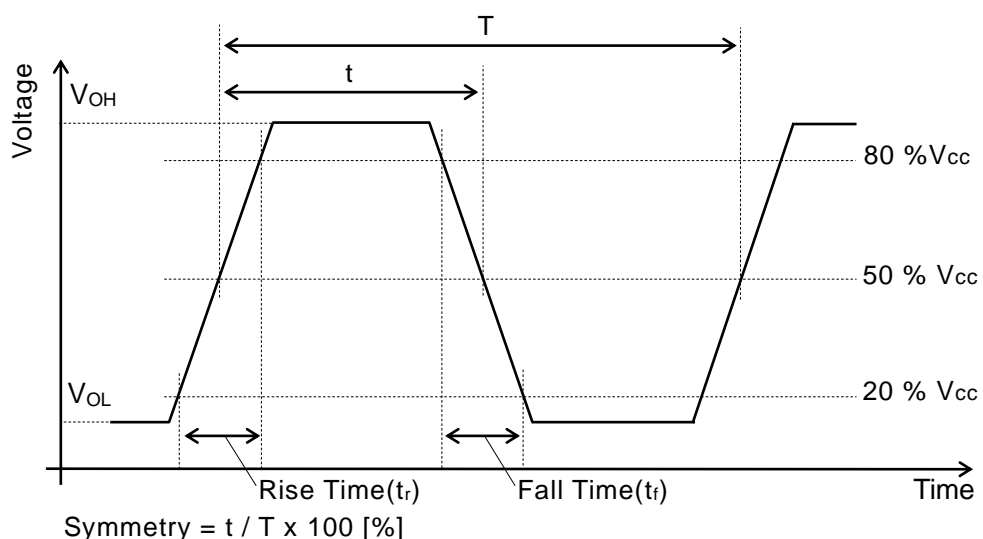
Measurement circuit
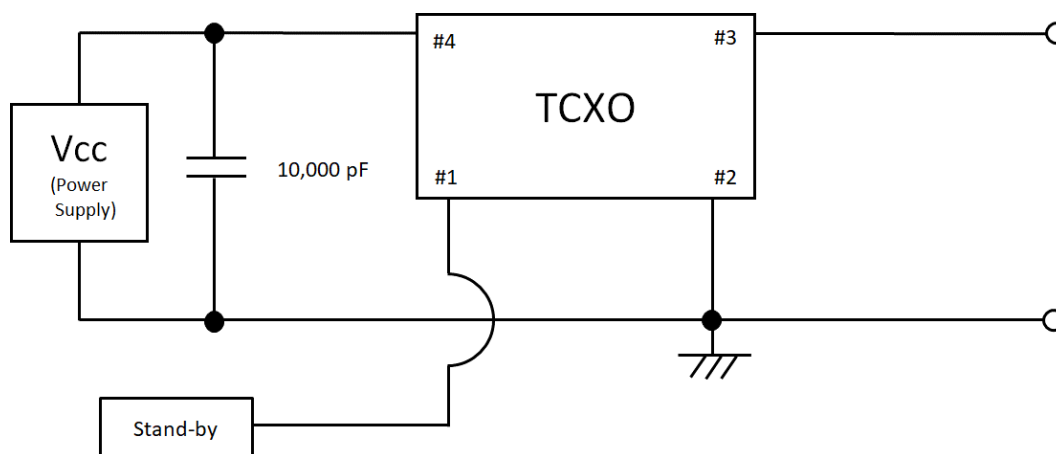
8. Mounted conditions

Reflow solder mounting is recommended.
The temperature profile is as follows.

Soldering peak temp. +260 °C

Reflow temperature profile

TEMP(°C)

260
225
180
150

60 to 120sec.   **60 to 90sec.**

DURATION

9. Precaution in the storage

When storing the product in high temperature and high humidity condition for a long time,
product characteristics (solder ability etc.) and packaging condition may be deteriorated.
The product storage deadline is 1 year after delivery in unopened state. Please use within 1 year.
If you exceed 1 year please check the product characteristics etc, please use.
Please keep the oscillator under below condition.

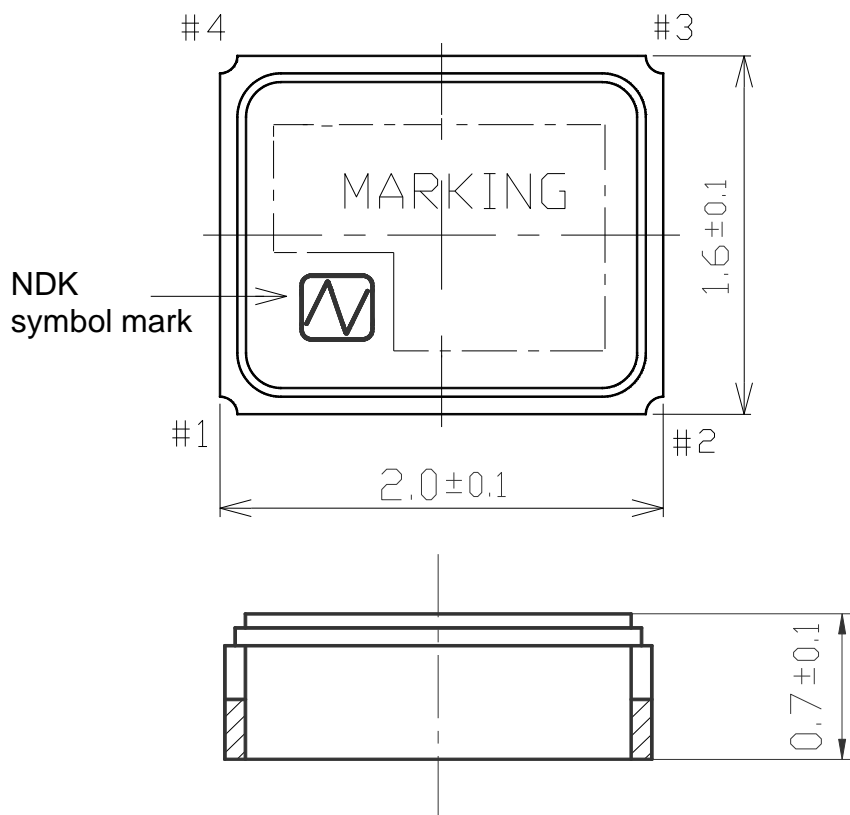| MSL		After taking out of dry bag
2	Temperature	+30 °C max.
	Humidity	60 % max.
	Period	1 year max.

(table)

10. Electrostatic withstand voltage specification

・Machine Model / MM
　Max. ±200 V (Standards / JEDEC EIA: JESD22-A115)
・Human Body Model / HBM
　Max. ±2000 V (Standards / JEDEC EIA: JESD22-A114)
・Charged Device Model / CDM
　Max. ±500 V (Standards / JEDEC EIA: JESD22-C101)
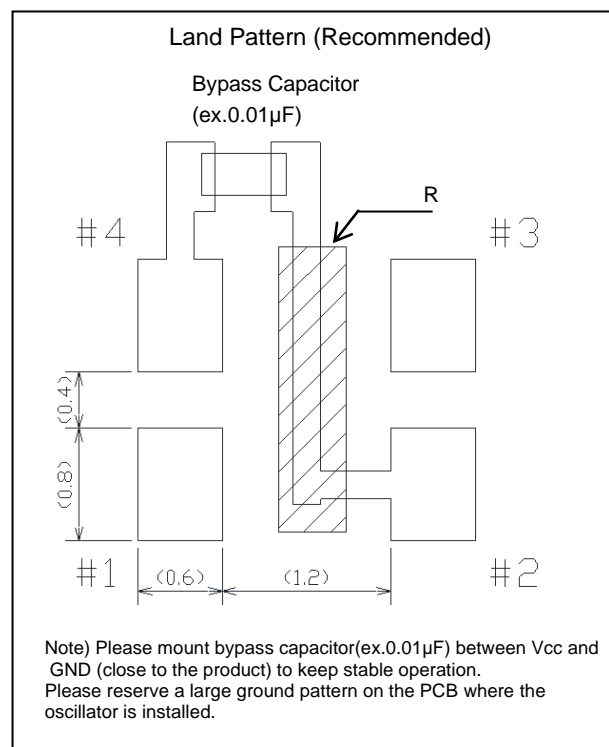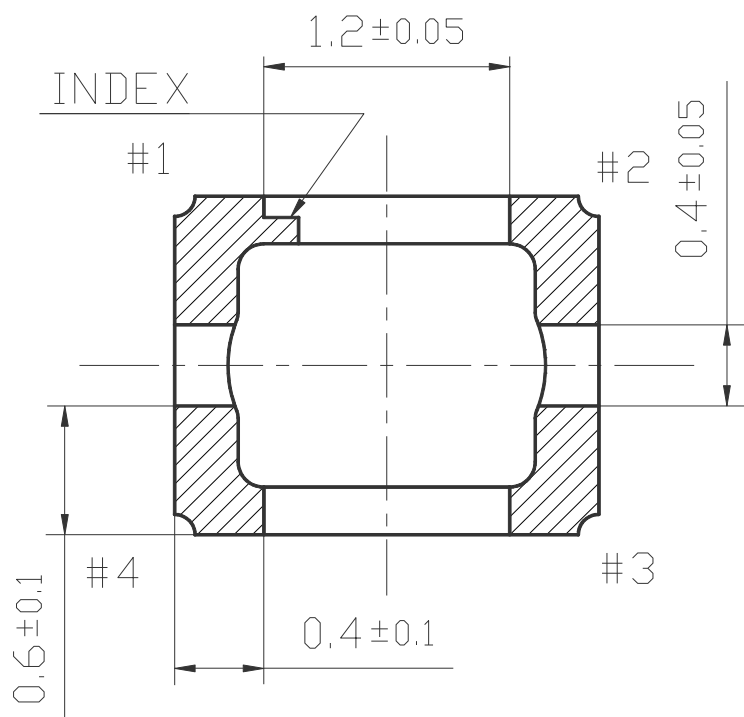
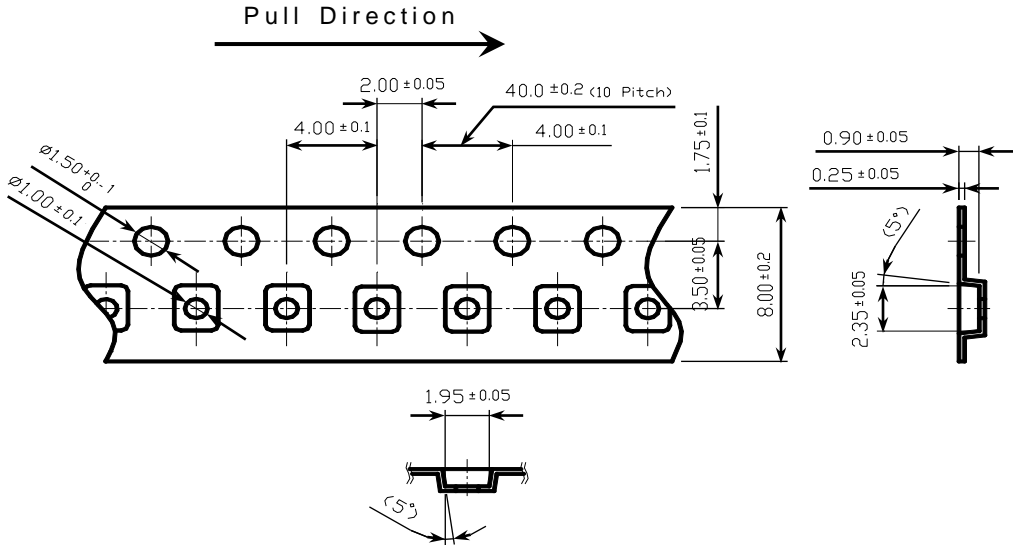# ■External dimensions

Units: mm
Tolerance : ±0.2

NDK
symbol mark

MARKING

#4   #3

#1   #2

1.6±0.1

2.0±0.1

0.7±0.1

Terminal land connections

#1	Stand-by
#2	GND
#3	OUTPUT
#4	V_{CC}

INDEX

#1

#2

#4

#3

1.2±0.05

0.4±0.05

0.6±0.1

0.4±0.1

Land Pattern (Recommended)

Bypass Capacitor
(ex.0.01µF)

#4   #3

R

#1   #2

(0.4)

(0.8)

(0.6)   (1.2)

Note) Please mount bypass capacitor(ex.0.01µF) between Vcc and
GND (close to the product) to keep stable operation.
Please reserve a large ground pattern on the PCB where the
oscillator is installed.

■Taping & reel specifications

Units: mm
Storage quantity : Max. 3,000 pcs

Pull Direction

	Embossed carrier tape	Top cover tape
Materials	PS	PET + PE + Adhesive layer
Disposition	Antistatic	Antistatic
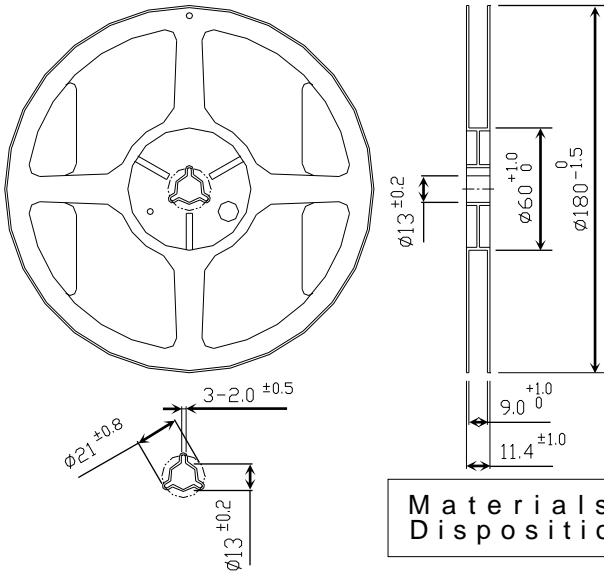
Materials : PS
Disposition: Antistatic

Pull Direction

250 MIN.	160 MIN.	*Products	150 MIN.	250 MIN.
Top tape (End)	Empty pockets	3000 PCS. MAX.	Empty pocket	Top tape (Start)

* There are no vacant pockets for this area.

Label

NIHON DEMPA KOGYO CO., LTD.
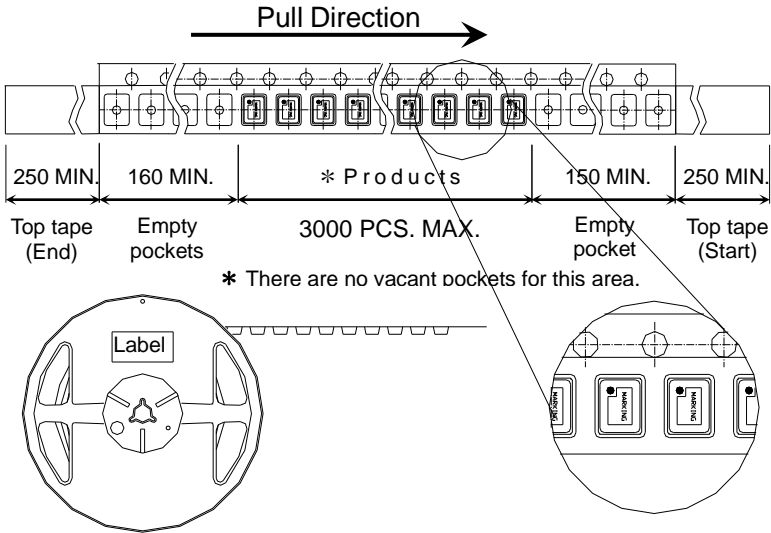
■Marking specifications

Lot No. →

Trace code ←

NDK symbol mark →

Trace code

Nominal Frequency [MHz]

【Reference】

Lot No.

113 ABC

Trace code

NDK symbol mark

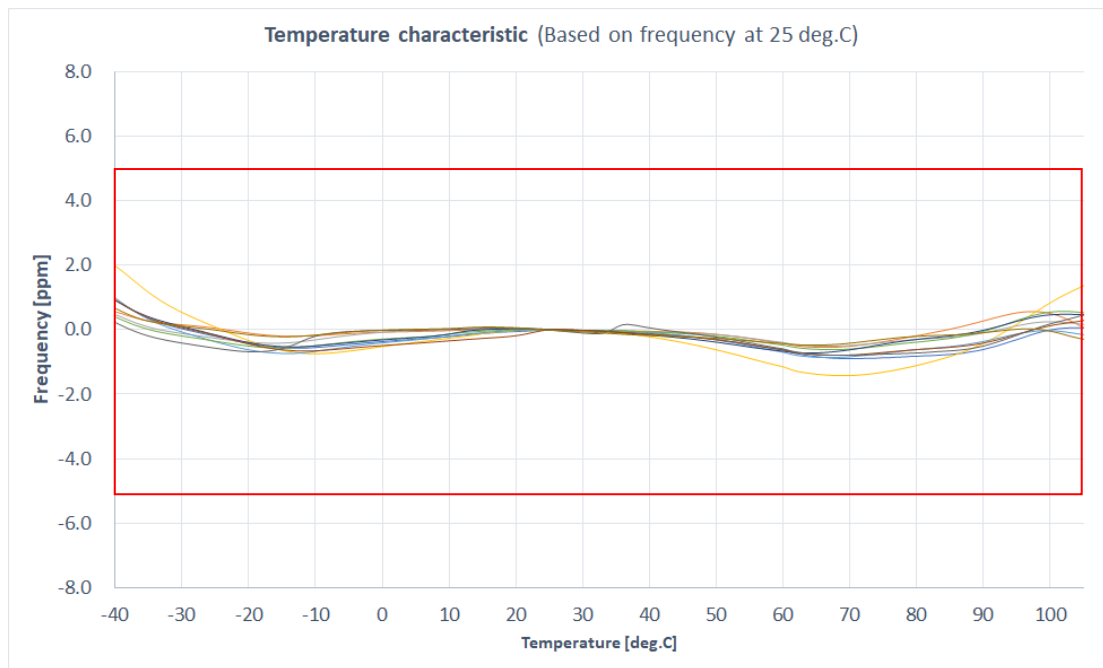26 1 2
3 4

Trace code

Nominal Frequency [MHz]

NIHON DEMPA KOGYO CO., LTD.
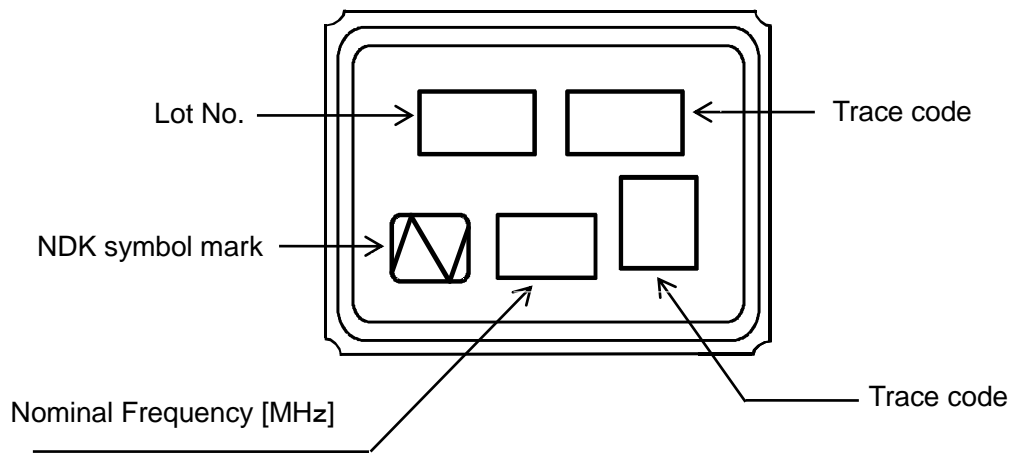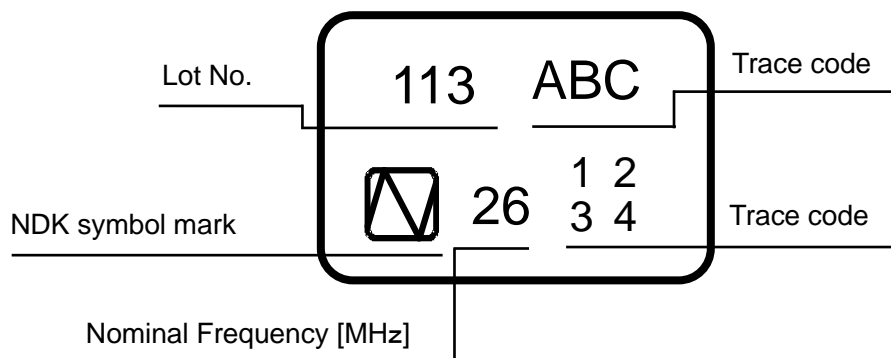
■Reference data【Frequency: : 25 MHz】

Frequency temperature characteristics

Specification : Max.±5.0 ppm/-40 to +105 °C

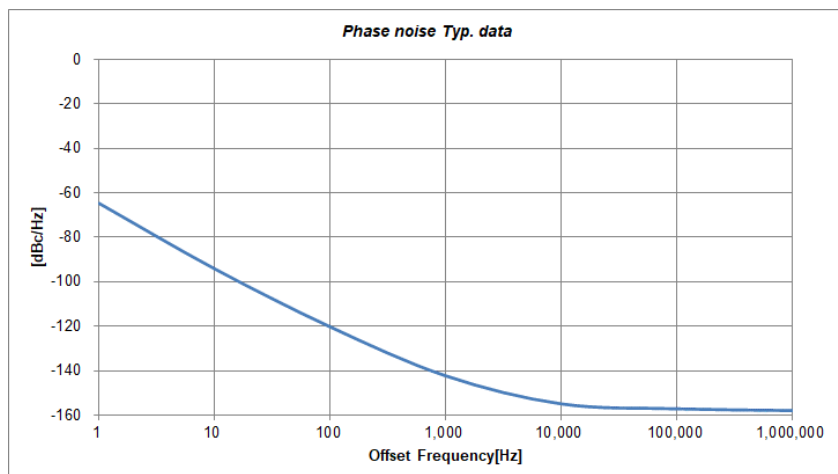**Temperature characteristic** (Based on frequency at 25 deg.C)

Phase noise

Temp = +25 ±2 °C, V_{cc} = +1.8 V

Temp = +25 ±2 °C, V_{cc} = +3.3 V

NIHON DEMPA KOGYO CO., LTD.

Form P-3E
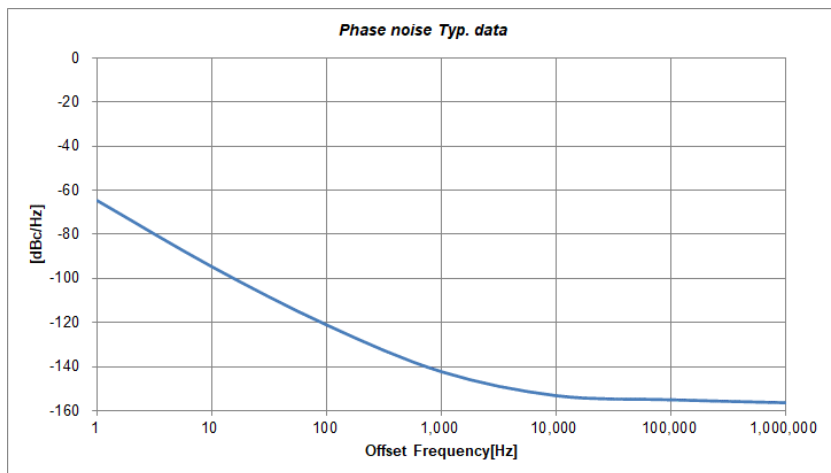
Handling Precautions

1. Frequency establishment condition
   When output frequency is set, we suppose to have the ground pattern under the oscillator.
2. Washing
   Not available for washing.

Notes on use

1 This product cannot be used for automotive applications.
   We have other products available for automotive applications so please contact us.
2 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.
3 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,
     EFFECT OF HEAT GENERATION OF PARTS USED ETC.) THAT CANNOT BE
     PREDICTED AT THE PRODUCTION STAGE.
 (3) WHEN USING ULTRASONIC WELDING MACHINE. (THERE IS A POSSIBILITY THAT THE
     CHARACTERISTIC DEGRADATION IS CAUSED BY THE RESONANCE PHENOMENON
     OF THE PIEZOELECTORIC MATERIAL.
     (EXAMPLE; CRYSTAL PIECE))
     WE WILL NOT TAKE ANY RESPONSIBILITY FOR THE INFLUENCE OF THE CUSTOMERS'
     PROCESS.
     SO, PLEASE SUFFICIENTLY EVALUATE AT A SAMPLE STEP WHEN YOU USE ULTRASONIC
     WELDING MACHINE.
 (4) USING RESIN MOLD MAY AFFECT THE PRODUCT CHARACTERISTIC.
     PLEASE MAKE SURE TO TELL OUR SALES CONTACT WHEN YOU USE RESIN MOLD.
     WE WILL PERFORM INDIVIDUAL CORRESPONDENCE ABOUT A DELIVERY SPECIFICATION
     AND A EVALUATION METHOD.
     IN ADDITION, IF YOU USE RESIN MOLD WITHOUT CONTACTING US, AND CAUSES
     DAMAGES AGAINST A CUSTOMER OR A THIRD PARTY, WE WILL NOT BE LIABLE FOR
     THE DAMAGES AND OTHER RESPONSIBILITIES BECAUSE WE CONSIDER IT IS UNDER
     SELF-RESPONSIBILITY USING RESIN MOLD.
     WE WILL NOT TAKE ANY RESPONSIBILITY FOR THE INFLUENCE OF THE CUSTOMERS'
     PROCESS.
     PLEASE EFFICIENTLY EVALUATE AT A SAMPLE STEP WHEN YOU USE RESIN MOLD.
 (5) OPERATION IN HIGH HUMIDITY OR CONDENSATION CONDITIONS WILL AFFECT THE
     CHARACTERISTICS.IF SUCH ENVIRONMENT USE, PLEASE TAKE MEASURES
     AGAINST WATERPROOF.

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(6) When using this product, please insert a bypass capacitor between the power supply and GND.
   (Closer to the product terminal is desirable.)
   The bypass capacitor values shown in our specifications and drawings are for reference only.
   (They are not guaranteed values.)
   In actual use, please select the appropriate bypass capacitor value for your circuit.
   NDK shall not be liable for any and all events resulting from or in connection with the use of
   this product in a manner that does not comply with the above instruction.
(7) WHEN PERFORMING IMPROPER HANDLING THAT EXCEEDS THE GUARANTEED RANGE.

Prohibited items

Be sure to use the product under the following conditions. Otherwise, the characteristics deterioration
or destruction of the product may result.
(1) Reflow soldering heat resistance
   Peak temperature: +265 °C
   Heating: +225 °C or higher, 90 sec
(2) Manual soldering heat resistance
   Pressing a soldering iron of +350 ±5 °C on the terminal electrode for 3 ±1 seconds.
(3) Hot air heat resistance
   Blow hot air of +350 ±5 °C on the product for 3 ±1 seconds.

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/)