Crystal Bridge to the Future

Crystal Clock Oscillator

■NZ2016SHA Data Sheet
(For Automotive Safety)

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

Pb free

AEC
Q100/Q200

Application

●For Automotive safety
(e.g., Millimeter wave radar or Image processing for self-driving)

Features

- High quality and high reliability design for Automotive safety
- Supports a wide temperature range from -40 to +125 °C.
- Quick oscillation start up time is available compared to our Tuning Fork Crystal.
- Compact and light. Dimensions : 2.0 x 1.6 x 0.7 mm, weight : 0.01 g.
- Taped units enable automatic mounting IR Reflow (lead free) is possible.
- Lead-free.
- Conforms to AEC-Q100/Q200.

1. Item : Crystal Clock Oscillator

2. Type : NZ2016SHA

3. Nominal Frequency : 32.768 kHz

4. NDK Spec. No. : See Table.1, Table.2

5. Maximum Ratings

	Item	Ratings			Notes
		min	max	Units	
1	Supply Voltage	-0.3	+4.5	V	
2	Input Voltage	-0.3	V_{CC}+0.3	V	
3	Output Current	-5	+5	mA	
4	Storage Temperature Range	-55	+125	°C	

6. Electrical Specifications

	Parameters	SYM	Electrical Spec.				Notes
			min	typ	max	Units	
1	Nominal Frequency	f_{nom}		32.768		kHz	
2	Supply Voltage	V_{CC}	+1.8 to +3.3			V	
3	Current Consumption (Operating) **Standard type**	I_{CC}		18	32	μA	at 25 °C, No load
	Current Consumption (Operating) **Oscillation start time reduction type**			41	72	μA	at 25 °C, No load
4	Current Consumption (Stand-by)	I_{ST}			5	μA	at 25 °C
5	Output Level	-	CMOS				
6	Load Capacitance	C_L			15	pF	
7	Operating Temperature Range	T_{opr}	[-40 to +85] to [-40 to +125]			°C	See Table.1, Table.2
8	Overall Frequency Tolerance	$\Delta f/f_{nom}$	± 30 to ± 100			ppm	See Table.1, Table.2, *1
9	Long-term frequency stability	Δf_{lt}	-5		+5	ppm	at 25 °C, 1 year
10	Output Voltage	V_{OL}			0.1 V_{CC}	V	
		V_{OH}	0.9 V_{CC}			V	
11	Rise Time(t_r), Fall Time(t_f)	t_r/t_f			50	ns	0.1 V_{CC} to 0.9 V_{CC}
12	Symmetry	SYM	45		55	%	at 1/2 V_{CC}
13	Start-up Time **Standard type**	t_{su}			30	ms	+1.8 V
					20	ms	+2.5 V to +3.3 V
	Start-up Time **Oscillation start time reduction type**				4	ms	+1.8 V to +3.3 V
14	Output Wave Form	-	Square wave				
15	Stand-by Function	#1 PAD input			# 3 PAD output		
		H level (0.7 V_{CC} to V_{CC}) or open			Operating		
		L level (0.3 V_{CC} max)			High impedance		

*1 Inclusive of Freq. tolerance (at 25 °C), frequency/temperature characteristics, frequency/voltage coefficient.

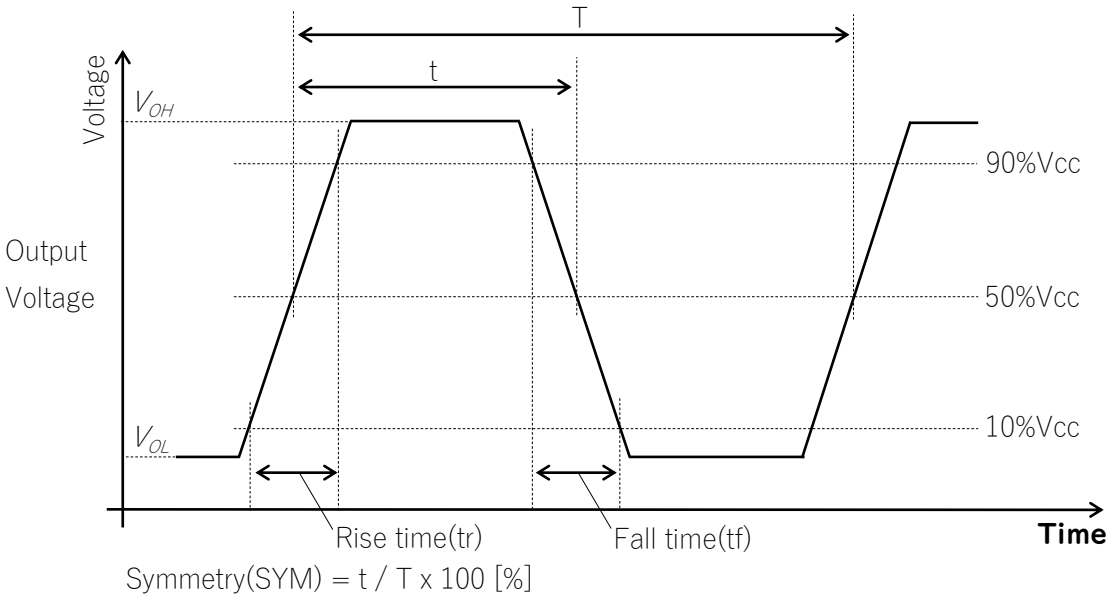
Table.1 Standard type NDK Spec. No. List

Overall Frequency Tolerance	Operating Temperature Range [°C]	Supply Voltage [V]			
		+1.8±0.18	+2.5±0.25	+3.0±0.3	+3.3±0.33
±100 × 10^{-6}	-40 to +125	NSC5297A	NSC5297B	NSC5297C	NSC5297D
±50 × 10^{-6}	-40 to +105	NSC5298A	NSC5298B	NSC5298C	NSC5298D
±30 × 10^{-6}	-40 to +85	NSC5299A	NSC5299B	NSC5299C	NSC5299D

Table.2 Oscillation start time reduction type NDK Spec. No. List

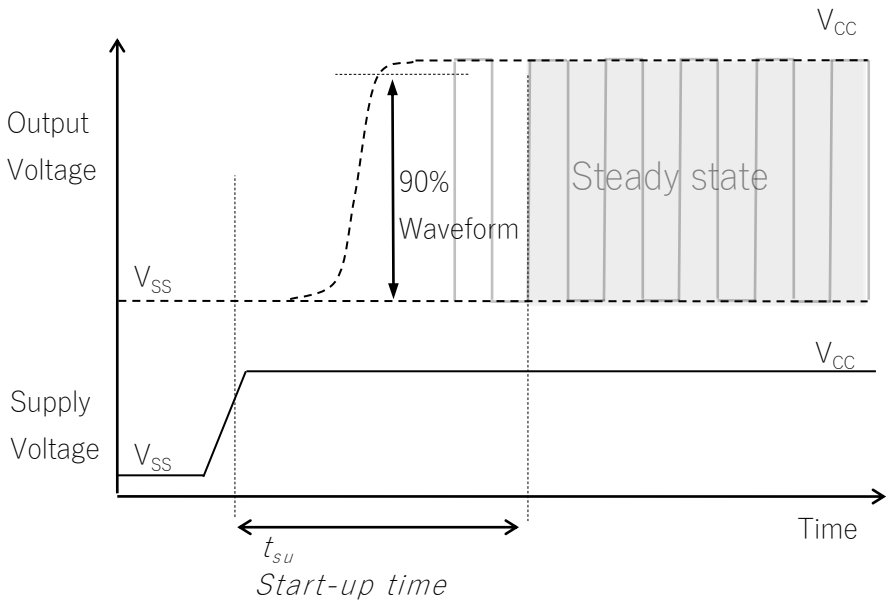
Overall Frequency Tolerance	Operating Temperature Range [°C]	Supply Voltage [V]			
		+1.8±0.18	+2.5±0.25	+3.0±0.3	+3.3±0.33
±100 × 10^{-6}	-40 to +125	NSC5385A	NSC5385B	NSC5385C	NSC5385D
±50 × 10^{-6}	-40 to +105	NSC5386A	NSC5386B	NSC5386C	NSC5386D
±30 × 10^{-6}	-40 to +85	NSC5387A	NSC5387B	NSC5387C	NSC5387D

Output Voltage

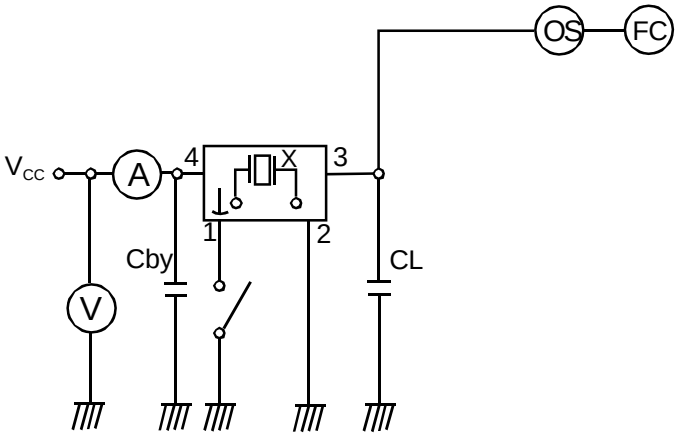


Symmetry(SYM) = t / T x 100 [%]

Start-up Time



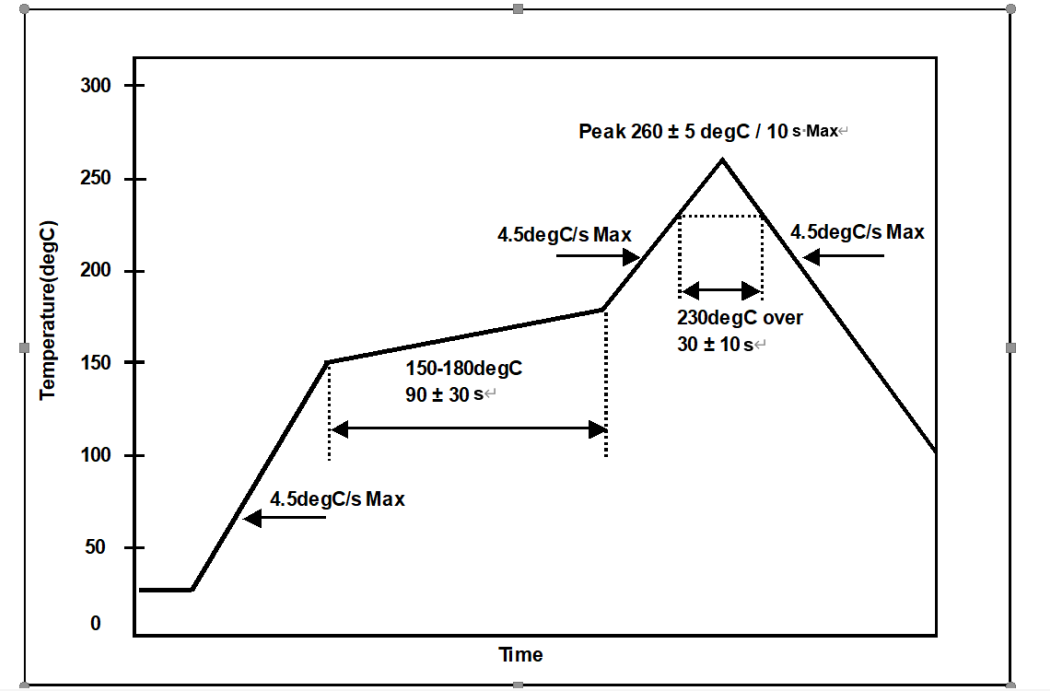
Measuring circuits



CL ; 15pF MAX including input capacity of oscilloscope
Cby ; Bypass capacitor (0.01uF)

7. Prohibited items

Example For Soldering Conditions (The below graph corresponds to Pb free solder)



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, 10 s
Heating: 230 °C or higher, 40 s
Preheating: 150 °C to 180 °C, 120 s
Reflow passage times: 3 times

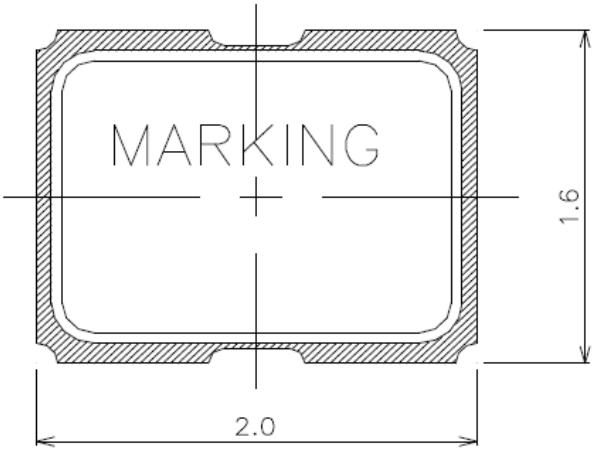
(2) Manual soldering heat resistance
Pressing a soldering iron of 350°C on the terminal electrode for 3 s.

8. Electrostatic Discharge

MM: 200 V
HBM: 2000 V
CDM: 500 V

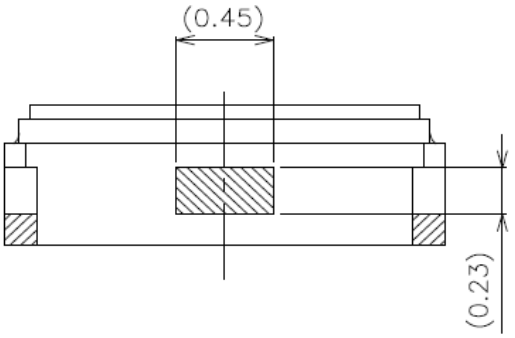
■Dimension of External

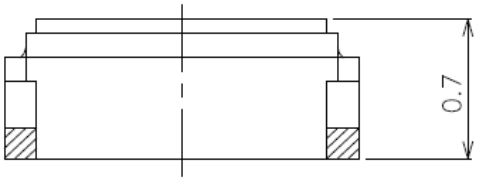
Unit：mm
Tolerance：±0.1 mm

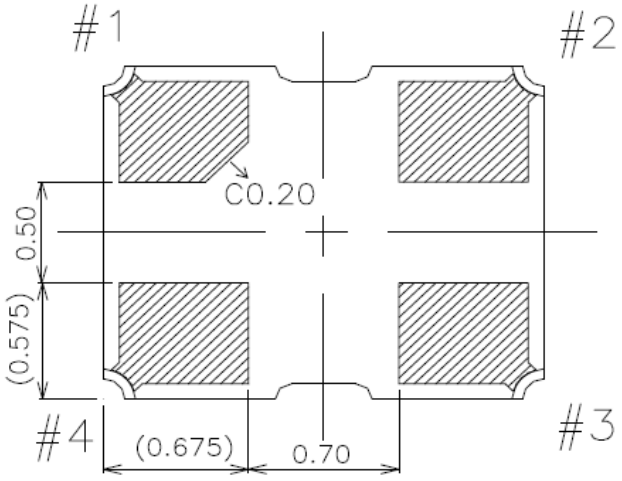


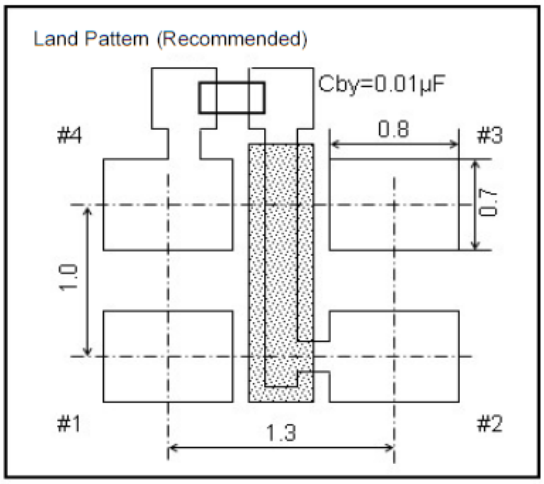
Terminal land connections

#1	STAND-BY
#2	GND
#3	OUTOUT
#4	Vcc



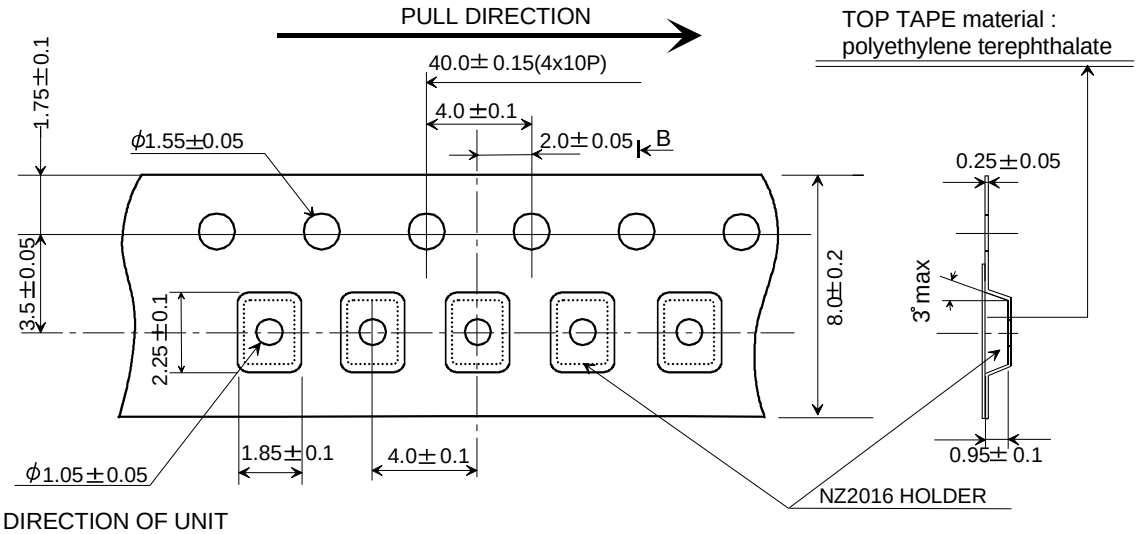


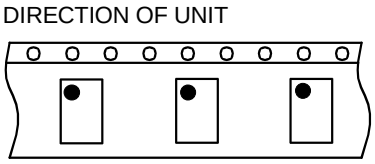


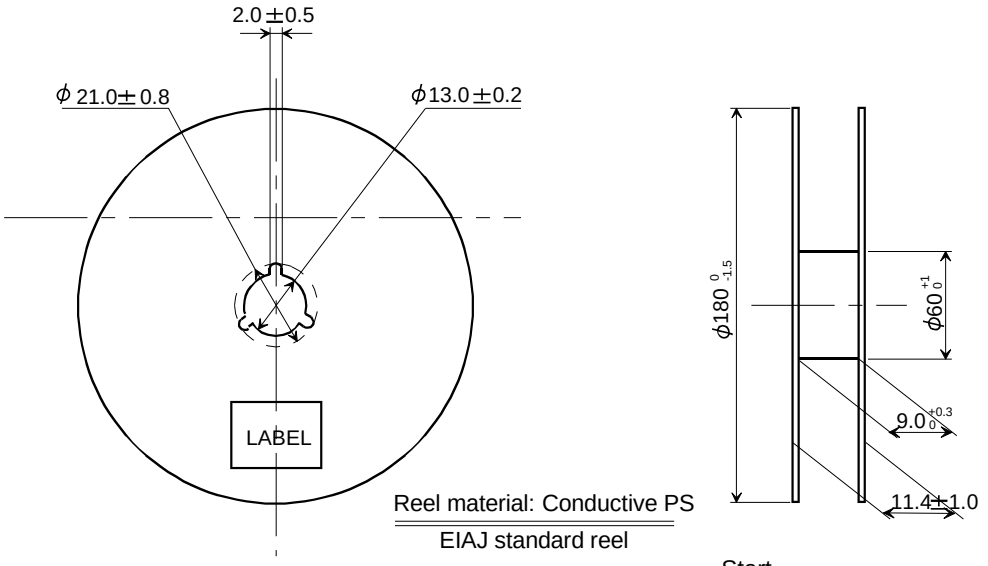


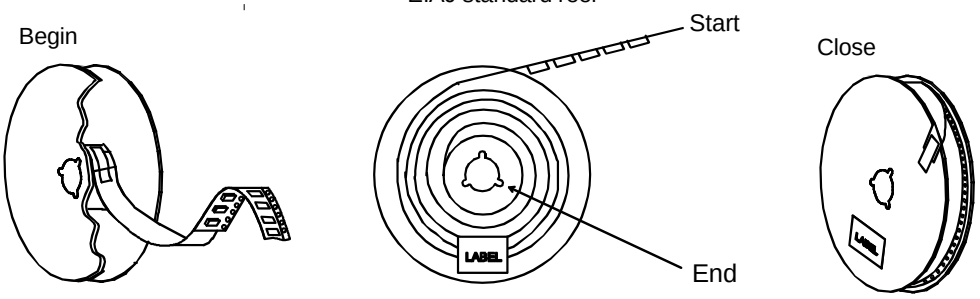
■Taping and Reel Spec.

Unit：mm



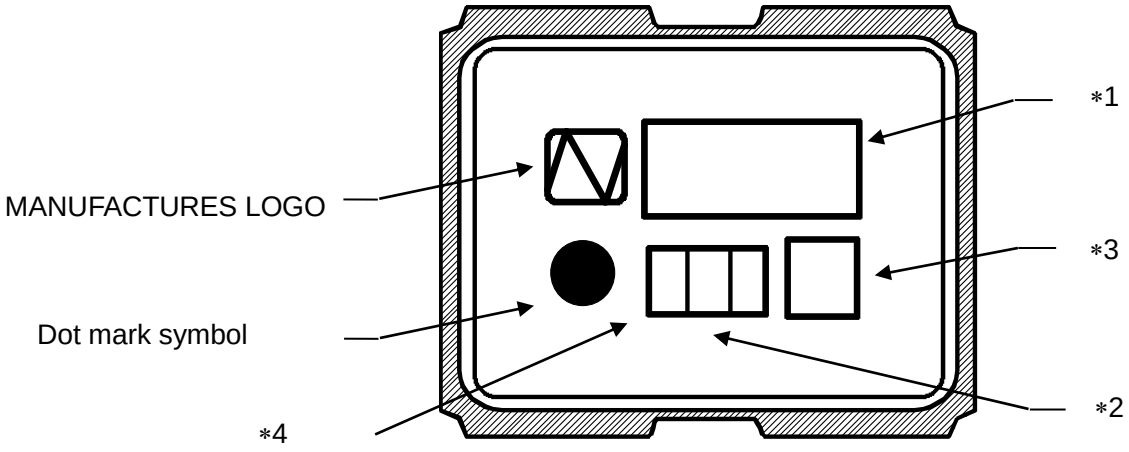






3000pcs MAX-Product Tape

■Marking



∗1 [FREQUENCY]
32.768kHz → 32K

*2 [Lot Code(Digits are Two)]

∗3 [Trace code]

∗4 [Model Symbol]
NZ2016SHA → H

Instruction Notice

1 Noise

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.

2 Resistance to dropping

The NZ2016S series is designed to be impactproof so that no damage occurs when dropped a height (75 cm) three times. However, if dropped from a desk etc., it is advisable to check their performance or contact us to check it.

3 Electrostatic protection

The NZ2016S series employ C-MOS ICs for the active element. Please use them in static-free environments.

4 Cleaning

Basically, the NZ2016S series are applicable for ultrasonic wave cleaning. However, in some case, during ultrasonic wave cleanings, internal design may get damage. Please check condition carefully beforehand.

5 Other

The NZ2016S series are C-MOS applied products. And careful handling (same as with C-MOS IC) are needed to avoid electrostatic problems.
Incorrect PAD connection is cause of trouble. Please make sure to connect correctly as below.

#2 terminal $\rightarrow$ GND
#4 terminal $\rightarrow$ V_{CC}

Notes On Use

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.

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.), 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 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 ELF-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) WHEN PERFORMING IMPROPER HANDLING THAT EXCEEDS THE GUARANTEED RANGE.

Notes on storage

1 When storing the product in high temperature and high humidity condition for a long time, product characteristics (solderability etc.) 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.

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.

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/)