

# Crystal Clock Oscillator

## ■ NZ2520SHA Data Sheet For Automotive Safety

### Application

For Automotive safety

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



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

**Pb free**

**AEC  
Q100/Q200**

### Features

- High quality and high reliability design for Automotive safety
- Supports a wide frequency range. (1.5 to 125 MHz)
- Supports a wide temperature range from -40 to +125 °C.
- Compact and light. Dimensions : 2.5 x 2.0 x 0.9 mm, weight : 0.02 g.
- Low phase jitter (Typ. 90 fs (Frequency Offset : 12 kHz to 20 MHz)@125 MHz, 3.3 V)
- Output Specification : CMOS
- 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 : NZ2520SHA
3. Nominal Frequency : 1.5 to 125 MHz
4. NDK Spec. No. : See Table1
5. Maximum Ratings

	Item	Ratings			Notes
		min	max	Units	
1	Supply Voltage	-0.3	+4.0	V	
2	Input Voltage	-0.3	$V_{CC} + 0.3$	V	
3	Output Current	-20	+20	mA	
4	Storage Temperature Range	-55	+125	°C	

## 6. Electrical Specifications

	Parameters	SYM	Electrical Spec.				Notes
			min	typ	max	Units	
1	Nominal Frequency	$f_{nom}$	1.5		125	MHz	
2	Supply Voltage	$V_{CC}$	+1.8 to +3.3			V	*1
3	Current Consumption (Operating)	$I_{CC}$	See Table.2			mA	at 25 °C
4	Current Consumption (Stand-by)	$I_{ST}$			20	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	Table.1
8	Overall Frequency Tolerance	$\Delta f/f_{nom}$	± 50 to ± 100			ppm	Table.1 *1
9	Output Voltage	$V_{OL}$			$0.1 V_{CC}$	V	$1.5 \leq F \leq 80$ MHz
		$V_{OH}$	$0.9 V_{CC}$			V	
		$V_{OL}$			$0.2 V_{CC}$	V	$80 < F \leq 125$ MHz
		$V_{OH}$	$0.8 V_{CC}$			V	
10	Rise Time( $t_r$ ), Fall Time( $t_f$ )	$t_r/t_f$			5	ns	+2.5 V to +3.3 V $0.1 V_{CC}$ to $0.9 V_{CC}$
					6	ns	+1.8 V $0.1 V_{CC}$ to $0.9 V_{CC}$
					3	ns	$80 < F \leq 125$ MHz $0.2 V_{CC}$ to $0.8 V_{CC}$
11	Symmetry	SYM	45		55	%	at $1/2 V_{CC}$
12	Start-up Time	$t_{su}$			4	ms	
13	Output Wave Form	-	Square wave				
14	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 NDK Spec. No. List

●Frequency Range :  $1.5 \leq F \leq 80$  MHz

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
$\pm 100 \times 10^{-6}$	-40 to +125	NSC5072A	NSC5072B	NSC5072C	NSC5072D
$\pm 50 \times 10^{-6}$	-40 to +105	NSC5218A	NSC5218B	NSC5218C	NSC5218D
$\pm 50 \times 10^{-6}$	-40 to +85	NSC5219A	NSC5219B	NSC5219C	NSC5219D

●Frequency Range :  $80 < F \leq 125$  MHz

Overall Frequency Tolerance	Operating Temperature Range (°C)	Supply Voltage (V)			
		+1.8±0.1	+2.5±0.25	+3.0±0.3	+3.3±0.33
$\pm 100 \times 10^{-6}$	-40 to +125	NSC5166A	NSC5166B	NSC5166C	NSC5166D
$\pm 50 \times 10^{-6}$	-40 to +105	NSC5220A	NSC5220B	NSC5220C	NSC5220D
$\pm 50 \times 10^{-6}$	-40 to +85	NSC5221A	NSC5221B	NSC5221C	NSC5221D

Table.2 Current Consumption (Operating)

Nominal Frequency [MHz]	Current Consumption (mA)							
	$1.5 \leq F < 10$	$10 \leq F < 20$	$20 \leq F < 30$	$30 \leq F < 40$	$40 \leq F < 50$	$50 \leq F < 60$	$60 \leq F < 70$	$70 \leq F \leq 80$
1.8 V	2.5 MAX	3.5 MAX	4.0 MAX	4.5 MAX	5.0 MAX	5.5 MAX	6.0 MAX	6.5 MAX
2.5 V	3.0 MAX	4.0 MAX	4.5 MAX	5.0 MAX	5.5 MAX	6.0 MAX	6.5 MAX	7.0 MAX
3.0 V	3.5 MAX	4.5 MAX	5.0 MAX	5.5 MAX	6.0 MAX	6.5 MAX	7.5 MAX	8.5 MAX
3.3 V	3.5 MAX	4.5 MAX	5.0 MAX	5.5 MAX	6.0 MAX	7.0 MAX	8.0 MAX	9.0 MAX

Nominal Frequency [MHz]	Current Consumption (mA)		
	$80 < F \leq 85$	$85 < F \leq 105$	$105 < F \leq 125$
1.8 V	9.5 MAX	10.5 MAX	12.0 MAX
2.5 V	11.5 MAX	12.5 MAX	15.5 MAX
3.0 V	13.0 MAX	15.5 MAX	19.5 MAX
3.3 V	13.5 MAX	16.0 MAX	20.0 MAX

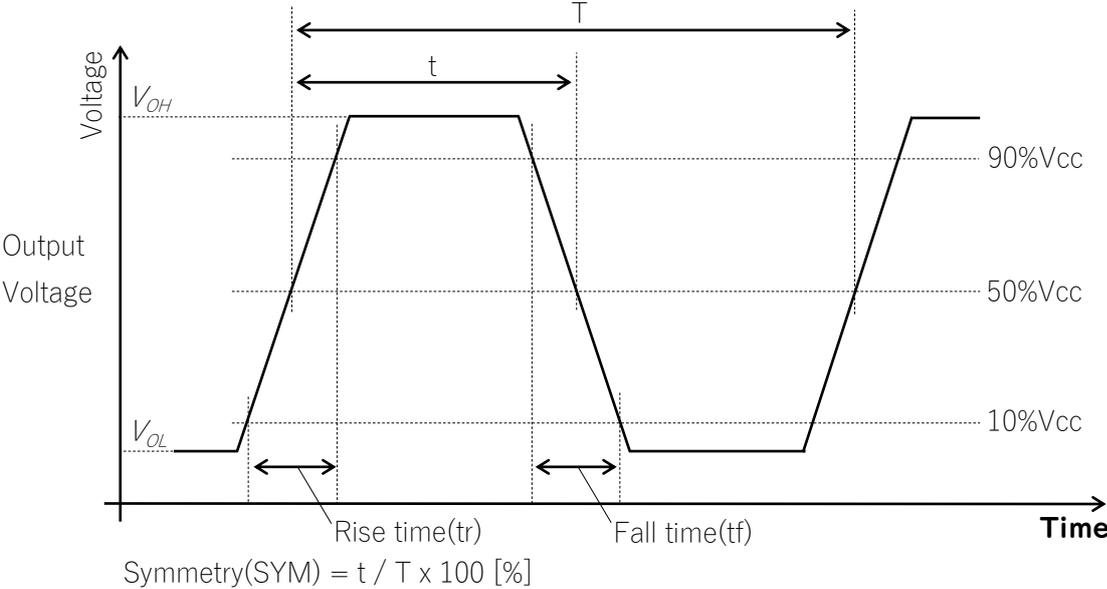
Table.3 Supported Frequency List

Nominal Frequency [MHz]					
5.6448 MHz	25 MHz	60 MHz			
8 MHz	26 MHz	63.75 MHz			
12 MHz	27 MHz	64 MHz			
12.288 MHz	30 MHz	74.25 MHz			
16 MHz	32.768 MHz	125 MHz			
19.2 MHz	33.3333 MHz				
20 MHz	40 MHz				
24 MHz	48 MHz				
24.576 MHz	50 MHz				

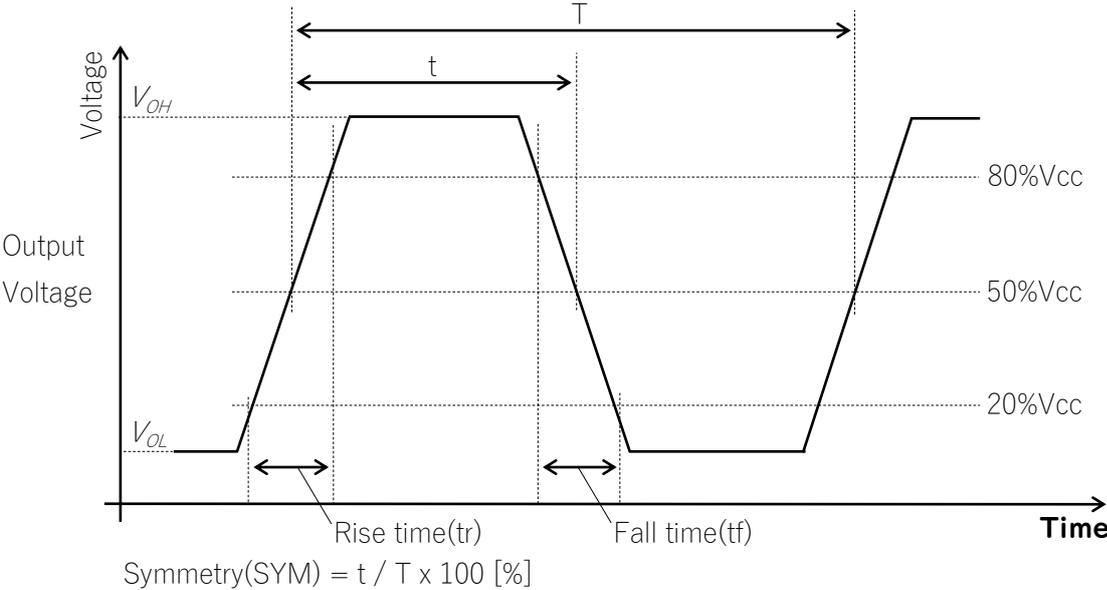
Frequencies not listed in the list are also available, so please contact us if you have any request.

### Output Voltage

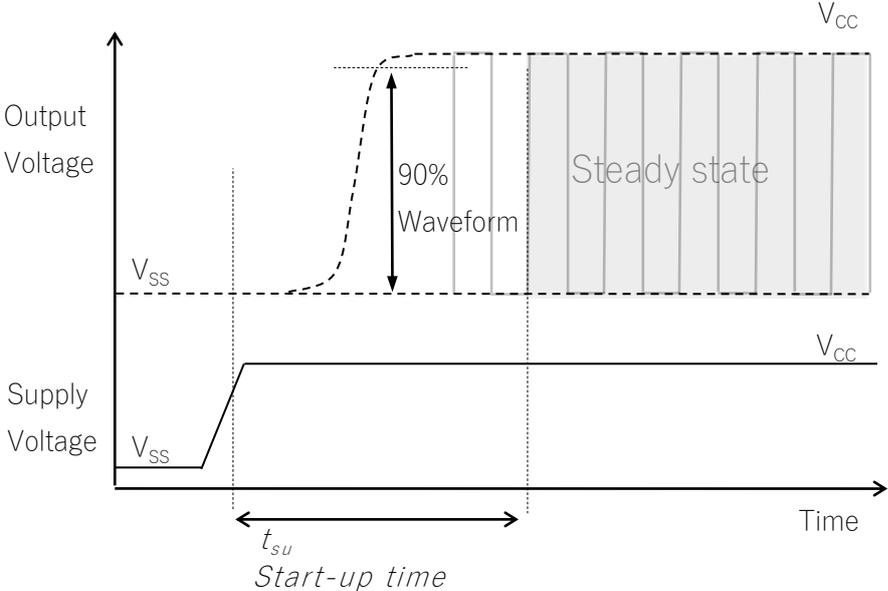
● Frequency Range :  $1.5 \leq F \leq 80$  MHz



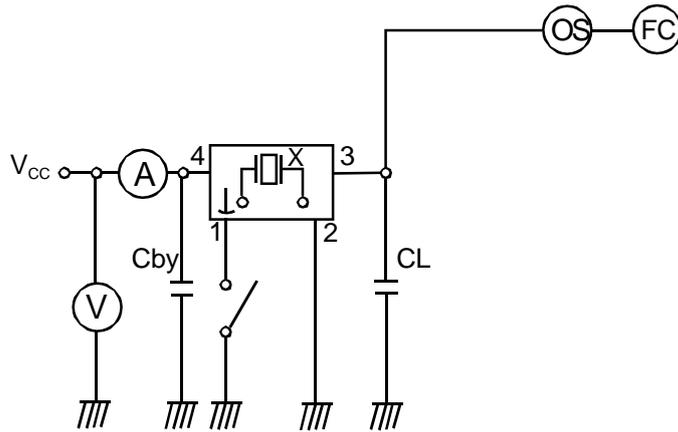
● Frequency Range :  $80 < F \leq 125$  MHz



# Start-up Time



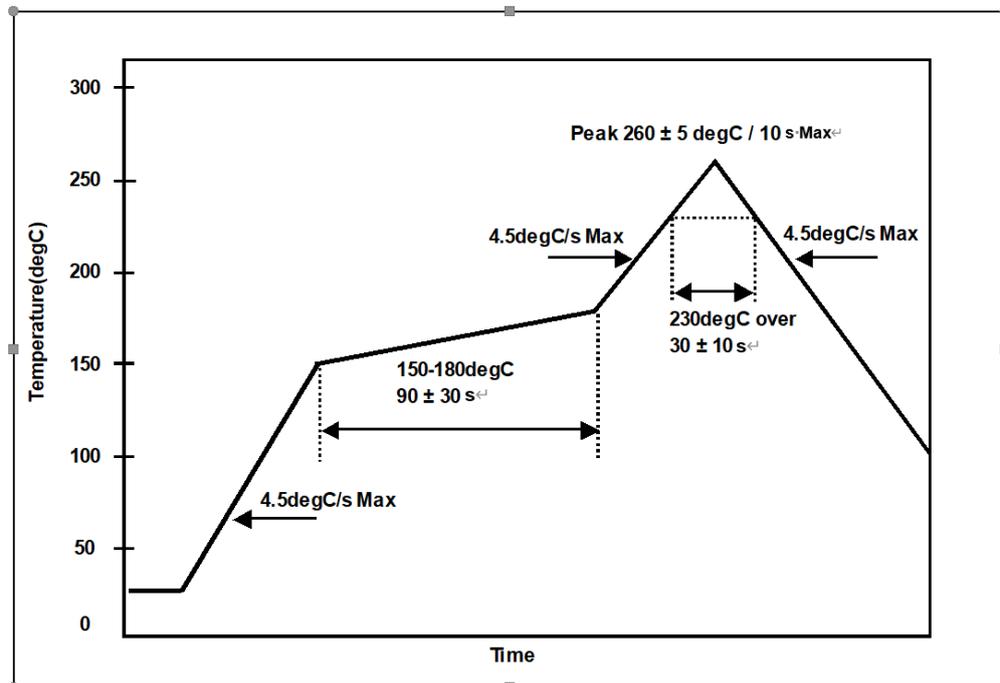
### Measuring circuits



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

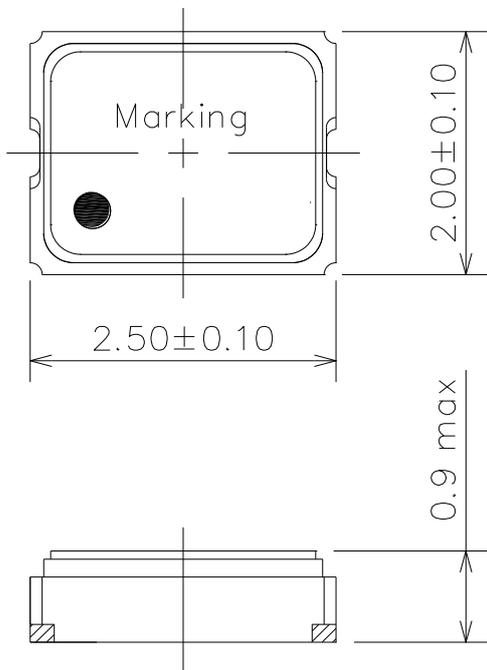
MM: 200 V

HBM: 2000 V

CDM: 500 V

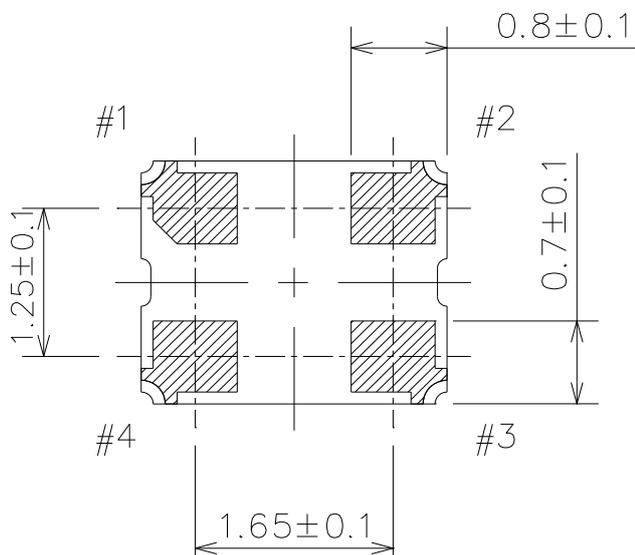
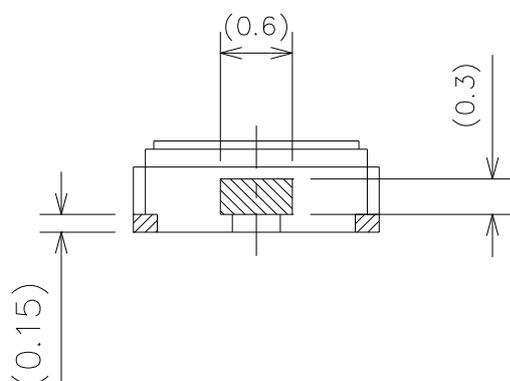
## Dimension of External

Units : mm

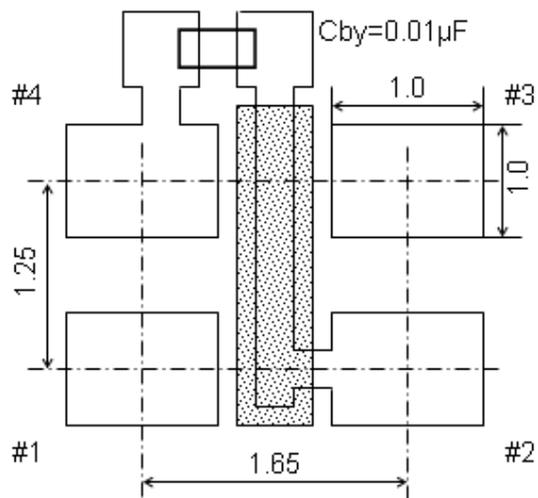


Terminal land connections

#1	STAND-BY
#2	GND
#3	OUTPUT
#4	V <sub>CC</sub>

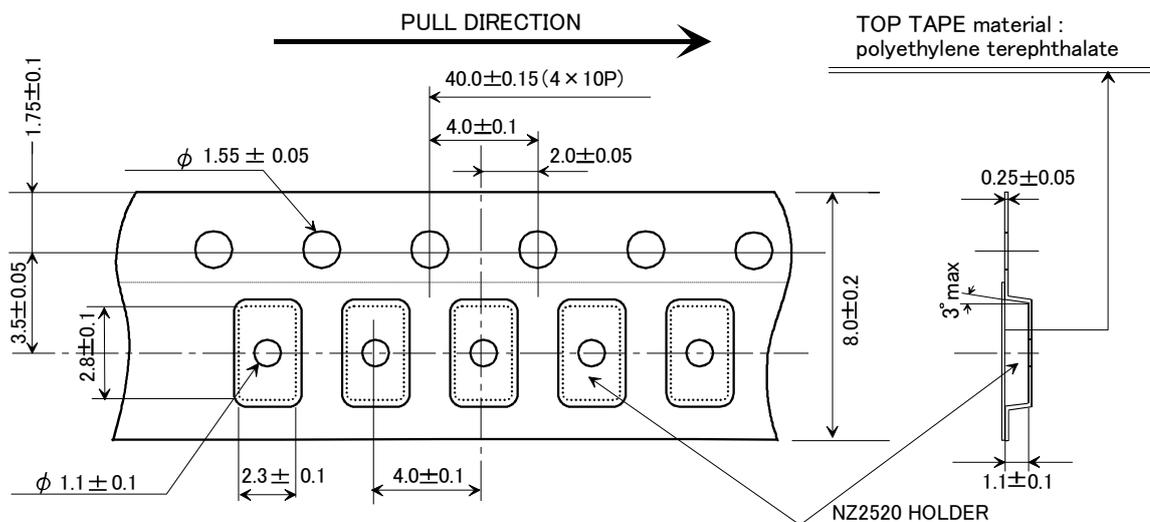


Land pattern (Recommended)



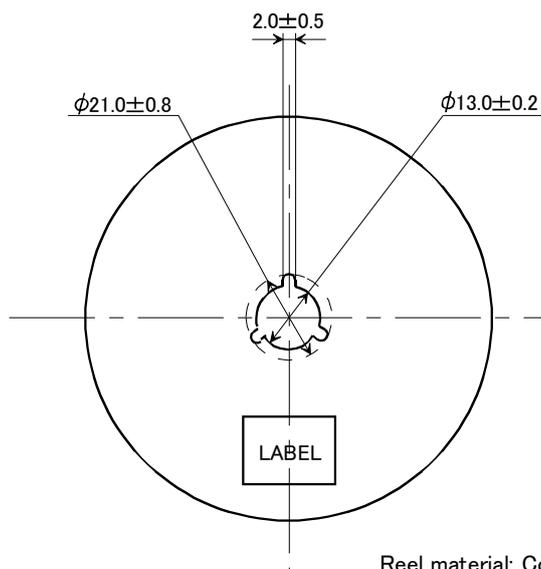
■ Taping and Reel Spec.

Units : mm



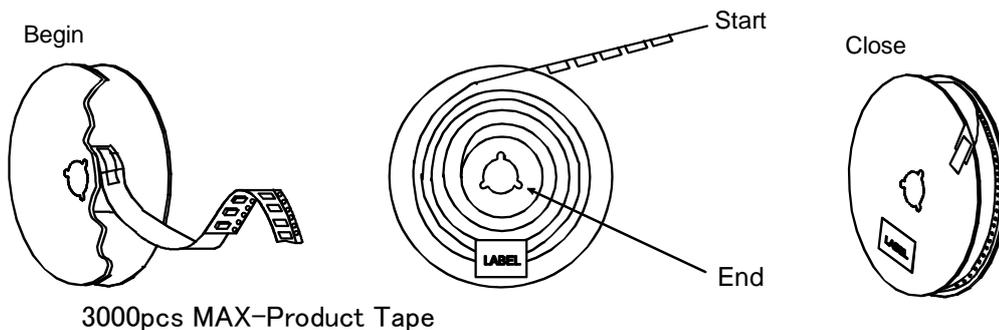
TAPING material: Conductive PS

DIRECTION OF UNIT

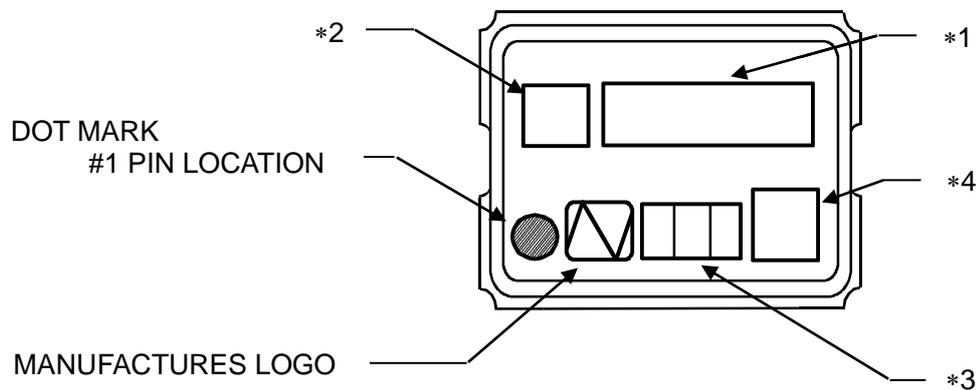


Reel material: Conductive PS

EIAJ standard reel



## ■ Marking



\*1 [FREQUENCY]

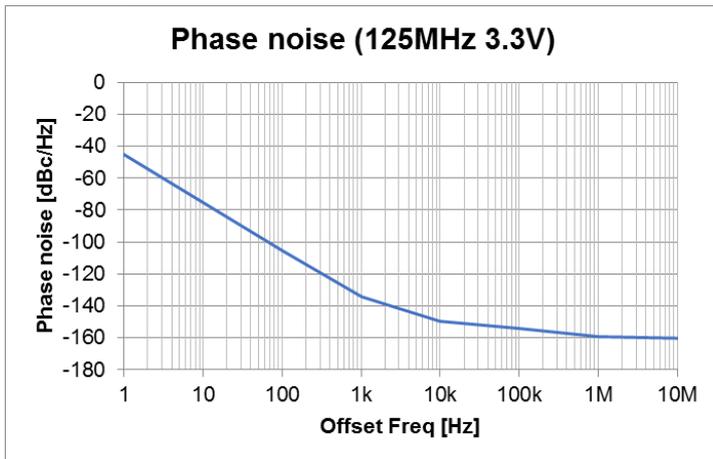
\*2 [MODEL MARK]  
NZ2520SHA → H

\*3 [WEEK CODE (Digit are three)]

\*4 [Trace code]

■ Data

• Phase jitter



- Phase jitter : Typ. 90 fs (Frequency Offset: 12 kHz to 20 MHz) @125 MHz, 3.3 V

## 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 NZ2520S 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 NZ2520S series employ C-MOS ICs for the active element. Please use them in static-free environments.

### 4 Cleaning

Basically, the NZ2520S 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 NZ2520S 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 → GND

#4 terminal → V<sub>CC</sub>

## 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 PIEZOELECTRIC 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/>)