

# Crystal Bridge to the Future



Nihon Dempa Kogyo Co., Ltd.

# Company Profile

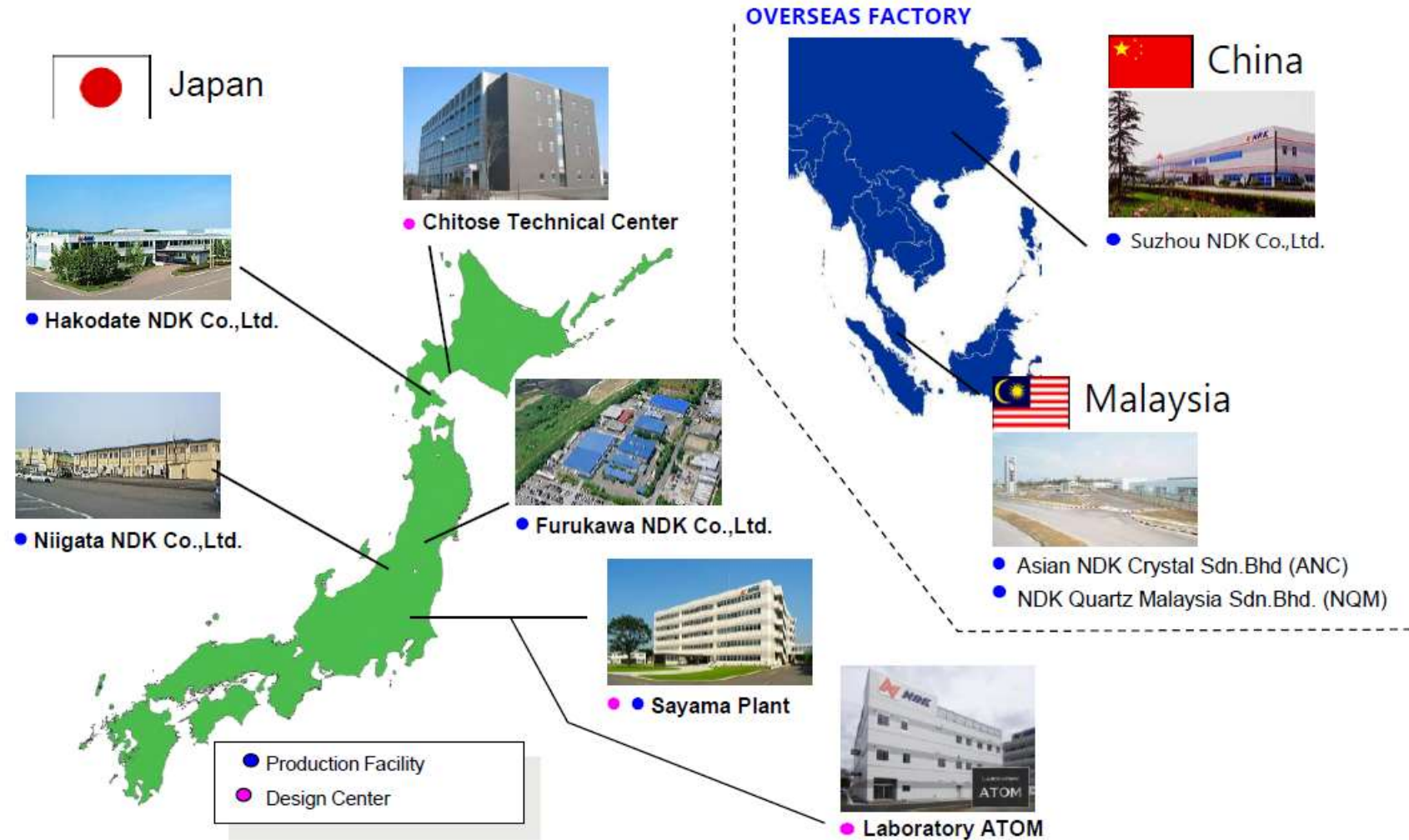
## ■ Company Profile



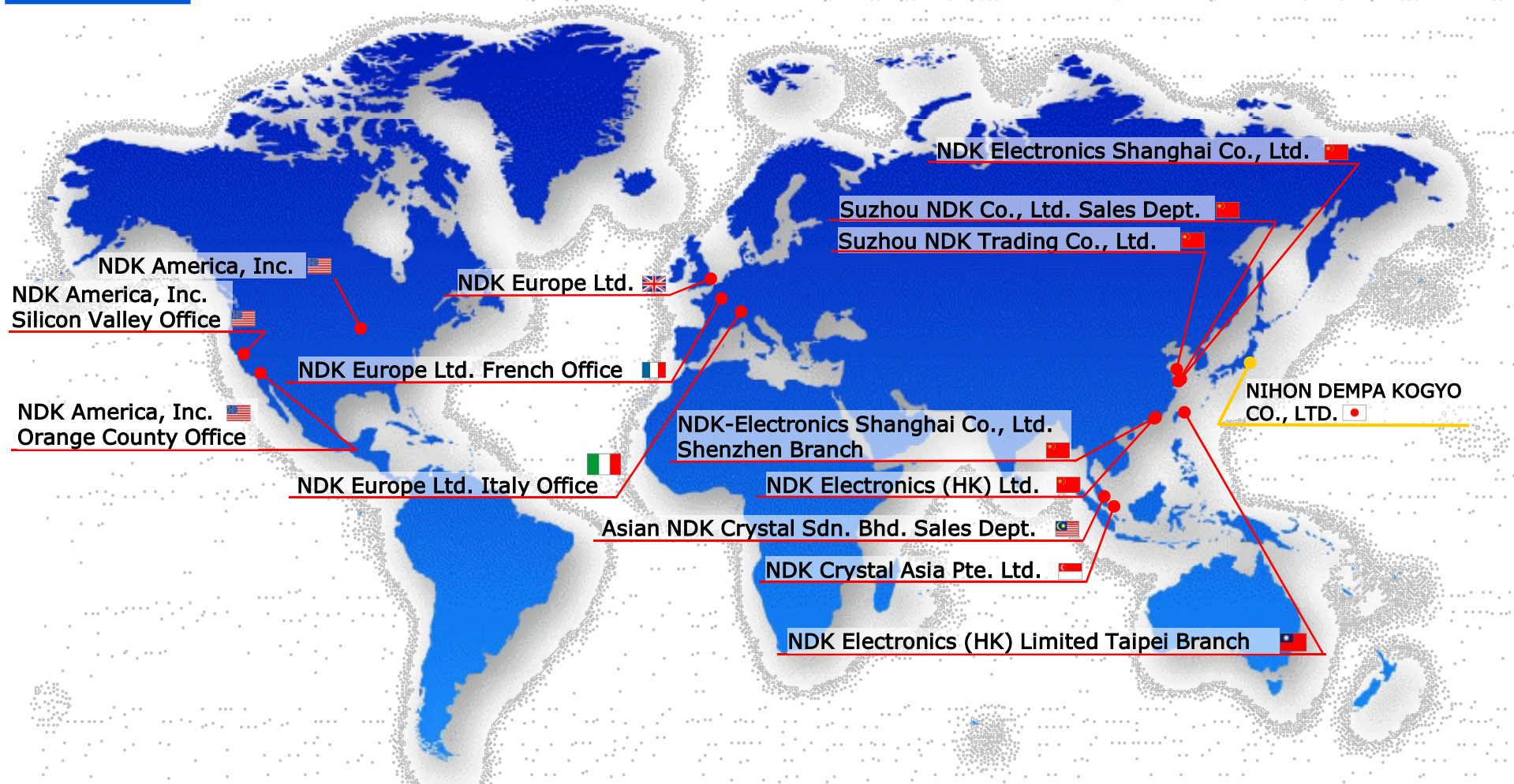
|                    |                                                                                                                       |
|--------------------|-----------------------------------------------------------------------------------------------------------------------|
| ■ Founded          | April, 1948                                                                                                           |
| ■ Capital          | 5.596Billion JPY (US\$45.7 Million)<br>(JPY122.39/US\$) (as of March 31, 2022)                                        |
| ■ Annual Sales     | 45.408Billion JPY (US\$371.0 Million)<br>(Consolidated, IFRS / March 2022)<br>(JPY122.39/US\$) (as of March 31, 2022) |
| ■ Employees        | NDK group 2,463 (as of March 31, 2022)                                                                                |
| ■ Factories        | Total 6<br>Japan(3), Malaysia(2), China(1)                                                                            |
| ■ Design Centers   | 2<br>Japan(2)                                                                                                         |
| ■ Sales SitesTotal | 17<br>Japan(3), Asia(8), Europe(3), USA(3)                                                                            |

# Production / Sales Network

## ■ NDK Production Facilities and Design Center



# NDK Sales Network in the World



NDK Headquarters are located in Japan, and also Overseas Sales Offices are located in the world to maintain business relationship with customers.

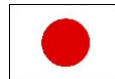
# Quality / Reliability/ Environment

# ■ High Quality, High Reliability, and Preservation of the Environment



- ISO/IEC 17025, ISO 9001, ISO 13485, IATF 16949, JIS Q 9100, and ISO 14001 Certification

(Last Updated)



## NDK

ISO 9001:2015(Dec. 2021)  
ISO 13485:2016(Mar. 2020)  
JIS Q 9100:2016(Aug. 2021)  
ISO 14001:2015(Dec. 2020)  
Quality Assurance Laboratory: ISO/IEC 17025:2018(Feb. 2020)



## Furukawa NDK Co., Ltd.

ISO 9001:2015(Feb. 2021)  
ISO 14001:2015(Dec. 2020)  
IATF 16949:2016(Feb. 2021)



## Hakodate NDK Co., Ltd.

ISO 9001:2015(Dec. 2020)  
ISO 14001:2015(Feb. 2021)  
IATF 16949:2016(Dec. 2020)

# ■ High Quality, High Reliability, and Preservation of the Environment



- ISO/IEC 17025, ISO 9001, ISO 13485, IATF 16949, JIS Q 9100, and ISO 14001 Certification

(Last Updated)



## Suzhou NDK Co., Ltd.

ISO 9001:2015(Jan. 2022)  
ISO 14001:2015(Nov. 2021)  
IATF 16949:2016(Jan. 2022)



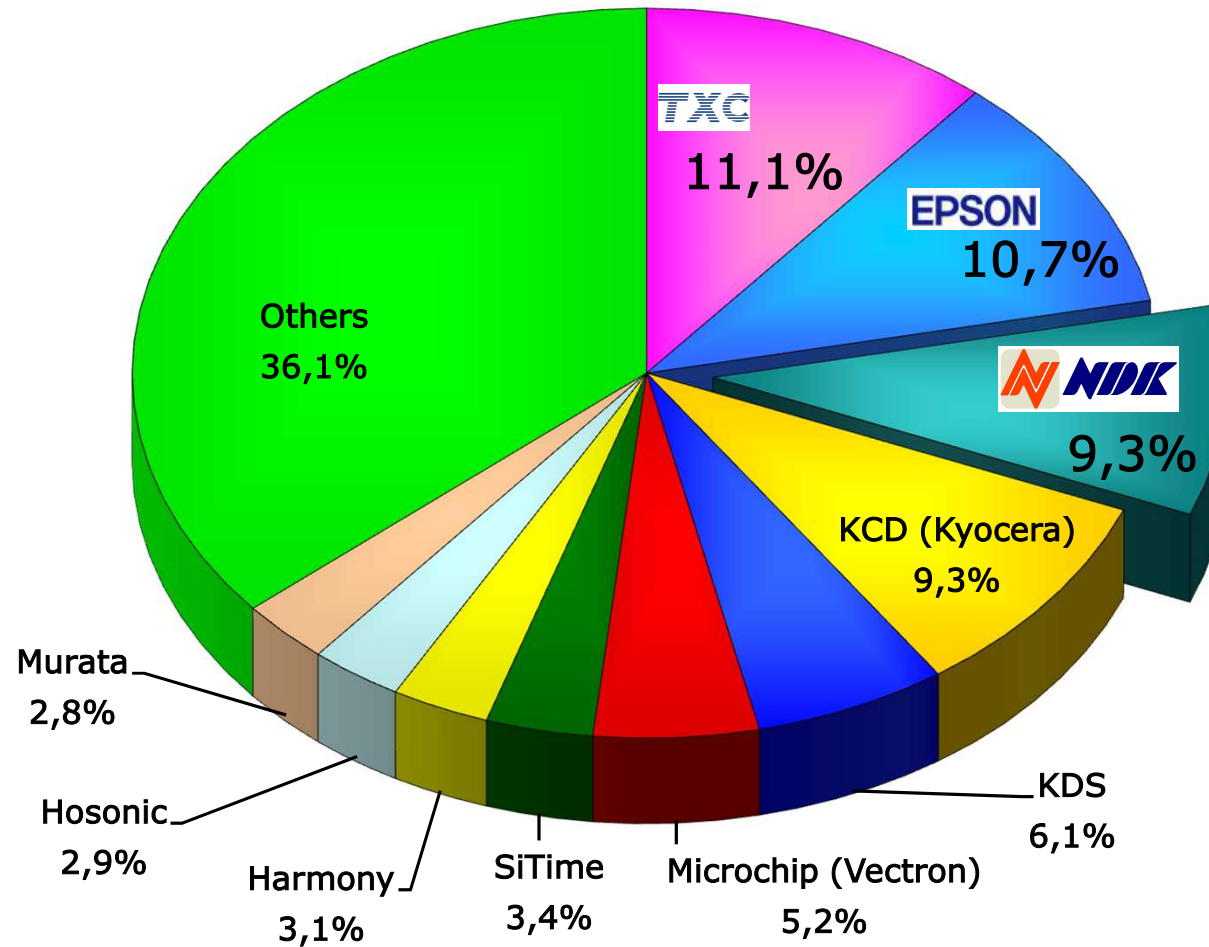
## ANC/ NQM

ISO 9001:2015(ANC: Sep. 2021)  
ISO 14001:2015(ANC: Nov. 2021)  
IATF 16949:2016(ANC: Sep. 2021, NQM: Sep. 2021)

# NDK Ranking in World's Market



CY2022



# NDK Financial results by Market

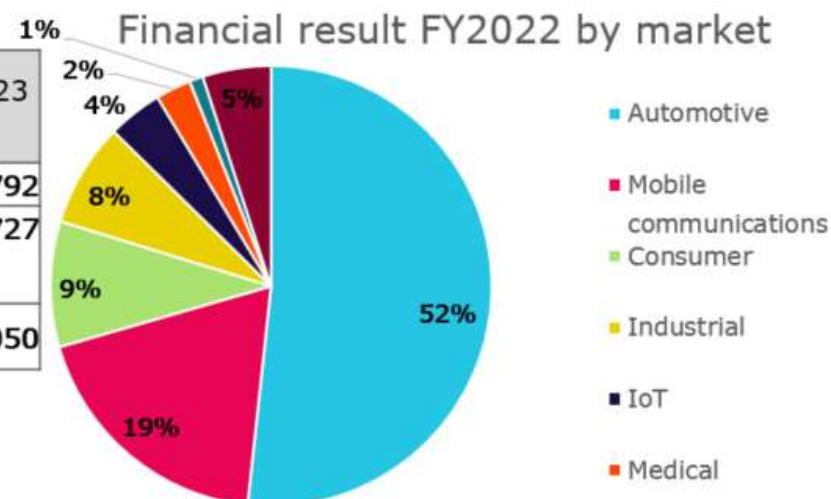


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Financial result from FY2021 to FY2022, forecast from FY2022 to FY2023

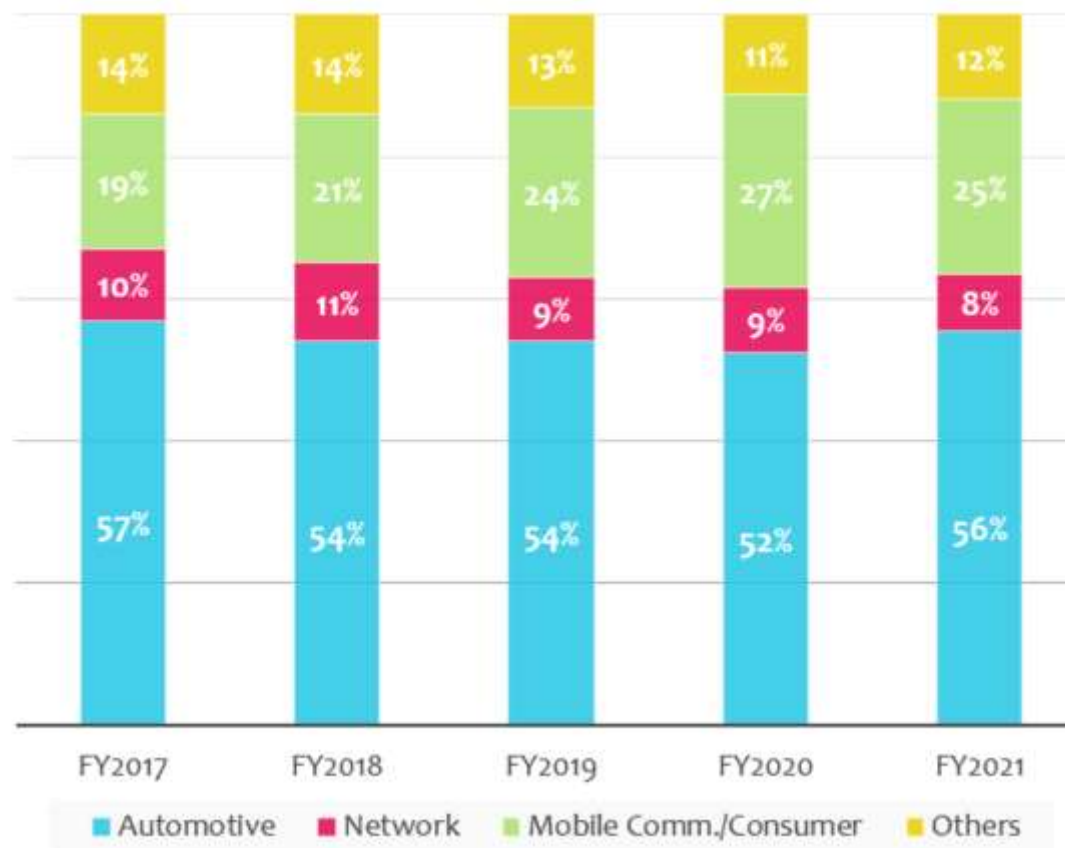
| (Million JPY)            | FY2021<br>Full Year | FY2022<br>Full Year | FY21→22<br>YoY | FY2023<br>Full Year FC | FY22→23<br>YoY |
|--------------------------|---------------------|---------------------|----------------|------------------------|----------------|
| Net sales                | 45,408              | 52,508              | +7,100         | 53,300                 | +792           |
| Operating Income         | 5,180               | 8,327               | +3,147         | 5,600                  | -2,727         |
| Operating Income Ratio   | 11.40%              | 15.80%              | 44.30%         | 10.50%                 |                |
| Income before Income Tax | 4,920               | 7,450               | +2,530         | 4,400                  | -3,050         |

\* Temporary factors for FY2022 include ¥1,136 million in grant from Suzhou government and ¥492 million in expenses associated with the termination of the Niigata NDK business. (+¥644 million in net)

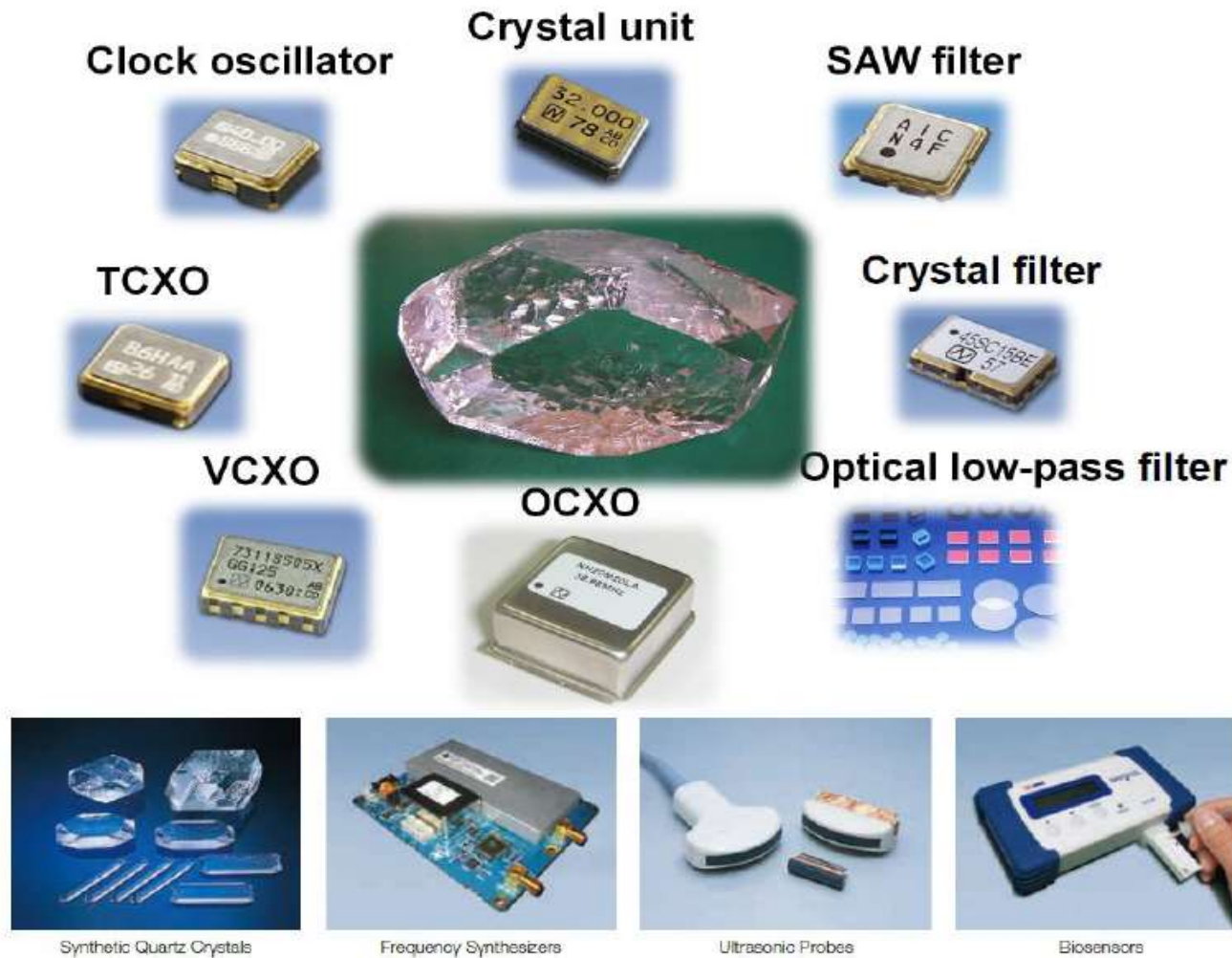


## ■ NDK Financial results by Market

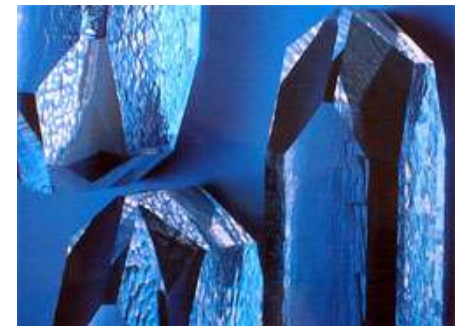
NDK Sales Breakdown by Market



# ■ NDK products Lineup



# NDK Crystal Technology Automotive market



## ■ NDK Ranking in Automotive Market



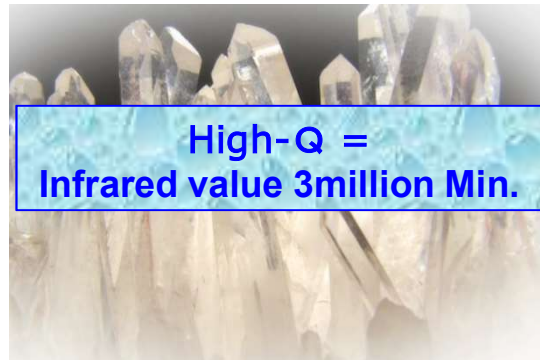
**More than 50% Share  
of the Global Automotive  
Electronics Market**

**High-quality, High-reliability  
Crystal Devices**

# NDK Quality



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High-Q =  
Infrared value 3million Min.

## NDK's High-Q Synthetic Quartz Crystal makes NDK's high stability and high accuracy products.

### ➤ Temperature Range

- OSC : -40 to +125 °C

### ➤ Reliability

- OSC : AEC-Q200 and Q100

High  
Stability

High  
Reliability

High  
Quality

Automotive  
Quality  
Level

### ➤ Inspection Standard

- Special inspection for automotive products
- OSC Temperature Test of all products.
- Special inspection on all TCXO products for automotive.
  - 1) Temperature Slope
  - 2) Short term stability

### ➤ Design/Production

- Dedicated production line for automotive application
- OSC with High glade IC

Market share of automotive  
crystal products  
A result of more 50% !



# Crystal Devices for Automotive

Safety

Communication

Image

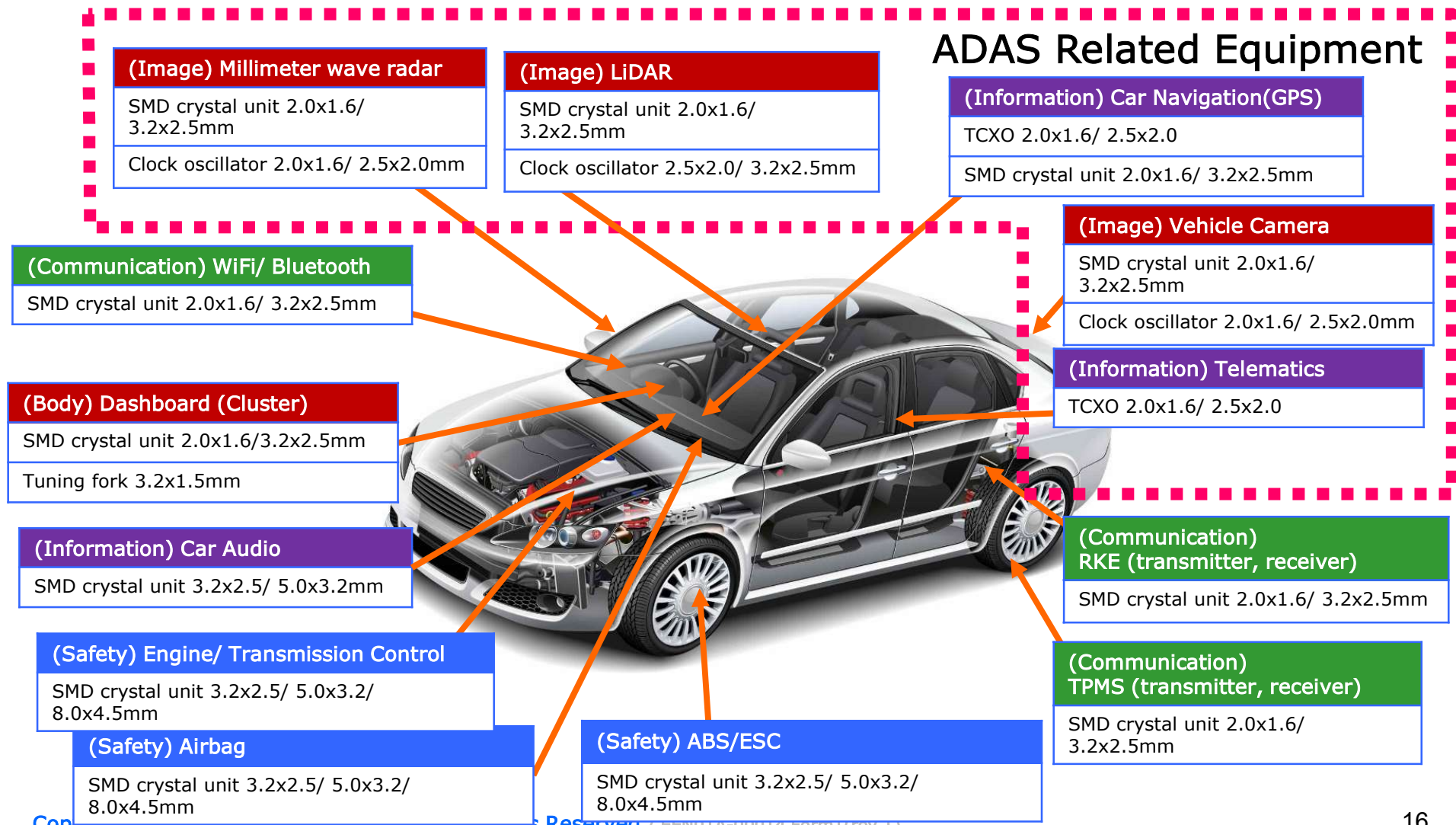
Information



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An automobile has many crystal products for a reference clock of microcomputer and for radio communication function (about 20 pcs for a compact car, 100 pcs for a luxury car).

## ADAS Related Equipment



# Collaboration with Chipset players



*NDK parts are approved on various chipset designs*



# Circuit characterization service



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***NDK provide circuit characterization service worldwide***



**EUROPE**

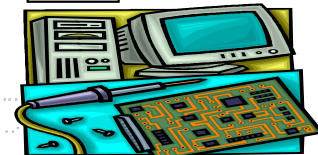


NDK Europe Ltd.

NDK have 5 locations worldwide that provides circuit analysis service.



**JAPAN**



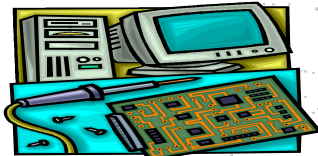
Sayama Factory

**CORE CENTER**

Circuit analysis record:  
Total 4,205 case / CY 2021



**U.S.A.**



NDK America Inc.



Testing lab in  
Illinois, USA



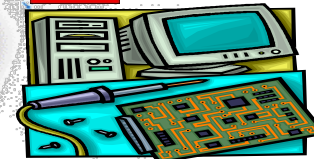
**Malaysia**



Asian NDK Crystal Sdn. Bhd



**China**



Suzhou NDK Co., Ltd.

## Circuit characterization service



***NDK provide circuit characterization service worldwide***

**Our matching is**

- 1. To confirm negative resistance,  
frequency deviation and drive level.**
- 2. To recommend optimized circuit  
condition for better performance.**

***Service free of charge***

# Circuit Analysis Report



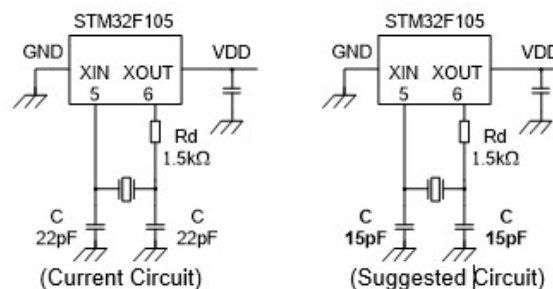
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## Circuit Analysis Report

### 1. CONDITION

|              |                  |                   |
|--------------|------------------|-------------------|
| Test IC      | STM32F105        |                   |
| Crystal      | Holder           | NX2520SA          |
|              | Frequency        | 16.000 MHz        |
|              | Load capacitance | CL= 10pF [IEC]    |
|              | Customer P/N     | ---               |
|              | NDK Spec. No.    | EXS00A-CS07310    |
| Test Circuit | IC Marking       | STM32F105 RBT6    |
|              | VDD              | VPCB=+5V, VDD=+3V |
|              | PCB              | 200-00001.B       |

### 2. CIRCUIT DIAGRAM



### 3. RESULTS

- 1) This crystal unit requires a negative resistance of  $-R=900\Omega$  minimum for stable oscillation.
- 2) The current circuit has a negative resistance of  $660\Omega$  and is not enough for stable oscillation.

| Circuit   | Rd    | C    | Frequency deviation<br>dF/F | Negative Resistance<br>-R | Drive Level<br>DL | Startup time<br>Tstr |
|-----------|-------|------|-----------------------------|---------------------------|-------------------|----------------------|
| Current   | 1.5kΩ | 22pF | -22ppm                      | 660Ω                      | 90uW              | 5ms                  |
| Suggested | 1.5kΩ | 15pF | -4ppm                       | 1260Ω                     | 80uW              | 2ms                  |

- 3) For better frequency accuracy and circuit condition we recommend using the suggested circuit.