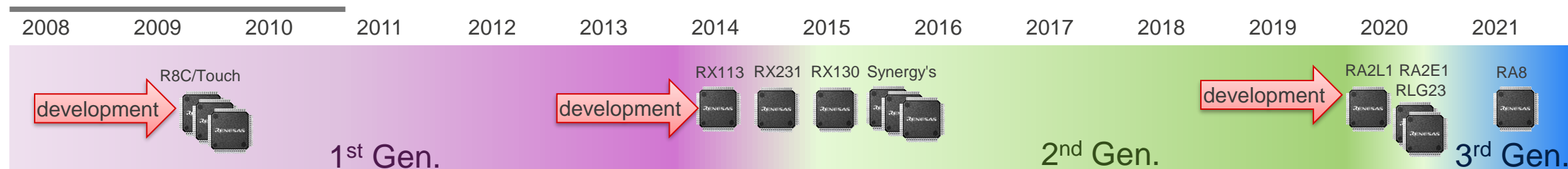


# CAPACITIVE TOUCH SOLUTIONS

RENESAS

AUG 2023  
DIEGO MORENO  
FAE  
RENESAS ELECTRONICS CORPORATION

# RENESAS TOUCH IP HIGHLIGHTS

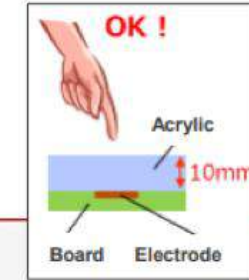


- 1st Generation Capacitance Sensor IP installed MCU (From 2008 R8C-33T...)
  - Use OMRON licensed measurement methods
  - Supports touch button application only
- 2nd Generation Capacitance Sensor IP installed MCU (From 2014 RX and onward...)
  - Renesas original measurement method
  - High noise immunity
  - Mutual capacitance method support
- 3rd Generation Capacitance Sensor IP (From 2019 RA2L1, RX140, RL78/G23 and onward... )
  - Speed up mutual capacitance measurement
  - High noise immunity
  - Active shield support for improved self-capacitance noise immunity
  - Majority selection by triple frequency measurement to avoid synchronous noise  
IEC61000-4-6 level 3 (Conducted Immunity), IEC61000-4-3 (Radiated) level 4 target goals for EMC performance
  - Accuracy improvement and self-correction function

# FEATURES OF RENESAS TOUCH KEY SOLUTION

## High sensibility

- Support acrylic panels **up to 10mm thick**(self-capacitive) and **wood materials!!**
- Enable proximity sensing ! (self-capacitive : 30cm,mutual-capacitive : 20cm)



## Excellent noise tolerance

- Noise tolerance that meets the requirements of **IEC 61000 4-3/4-6 level3 !**



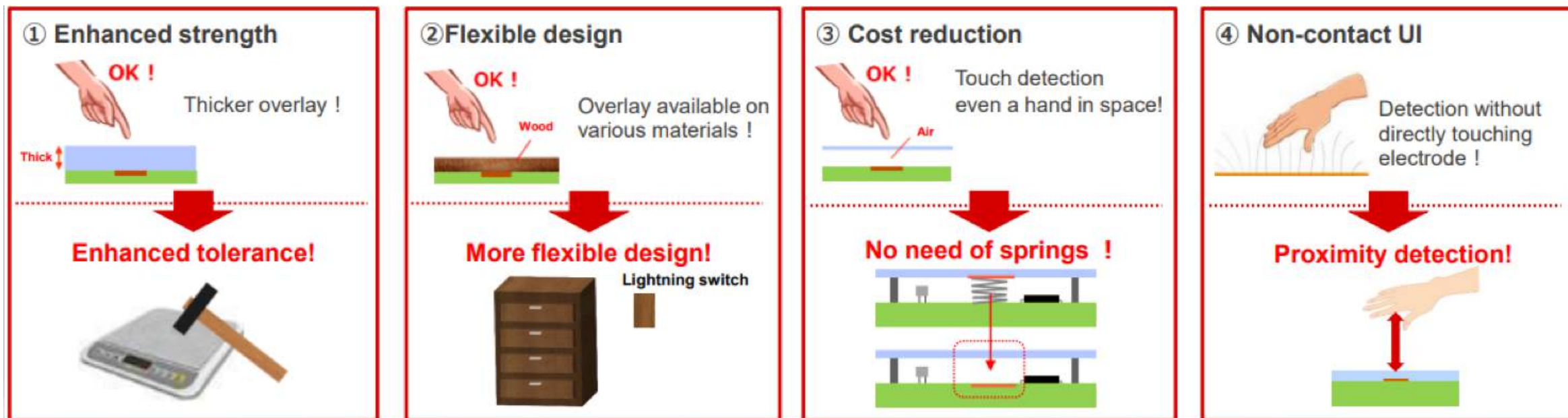
## Easy to develop

- **Automatically adjust** sensibility with the development tool!!





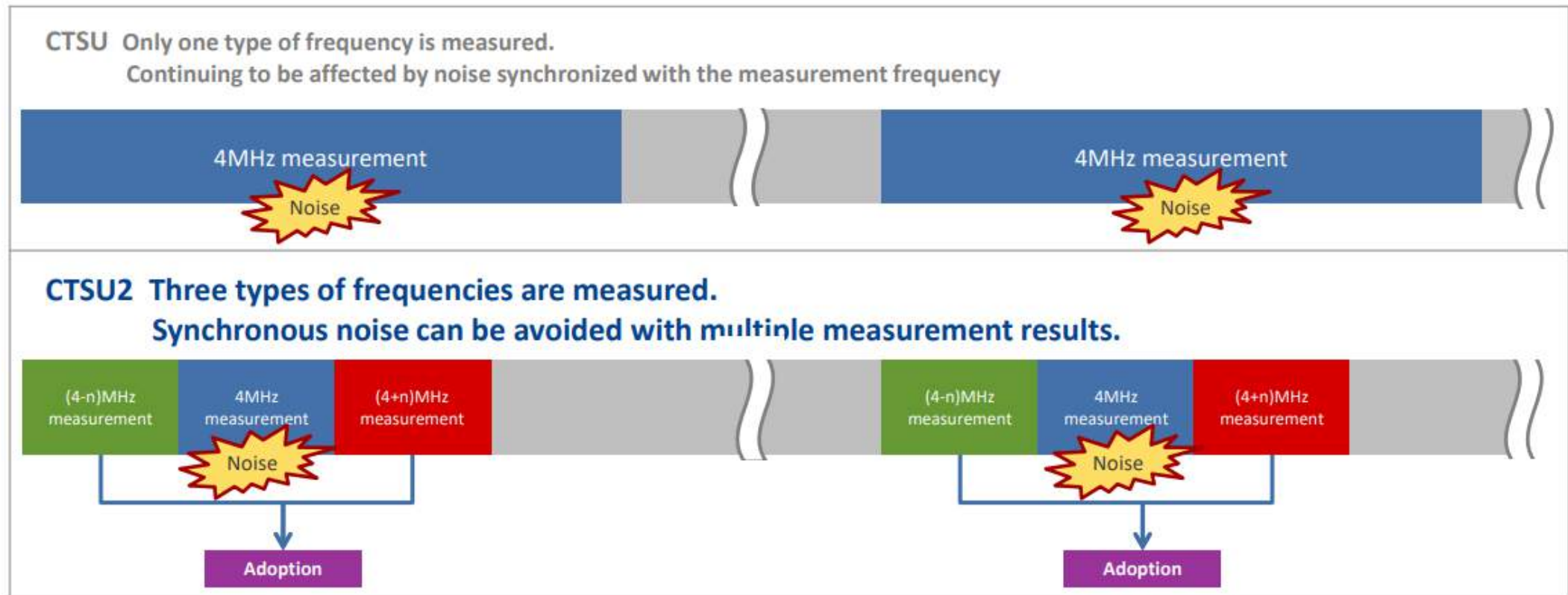
# ADVANTAGES OF HIGH SENSIBILITY



# HIGH NOISE IMMUNITY

## THREE DIFFERENT FREQUENCIES

- CTSU2 avoids synchronous noise by measuring three different frequencies
- CTSU2 achieves noise immunity that can pass noise evaluation equivalent to IEC61000 4-3 level 4.



# HIGH NOISE IMMUNITY

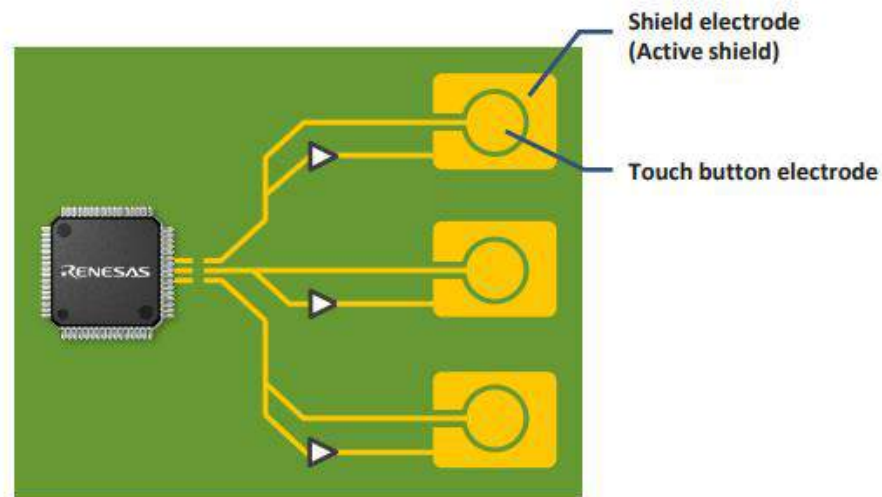
## ACTIVE SHIELD

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- CTSU2 does not require a current driver IC and can be configured with simple wiring and shield electrodes

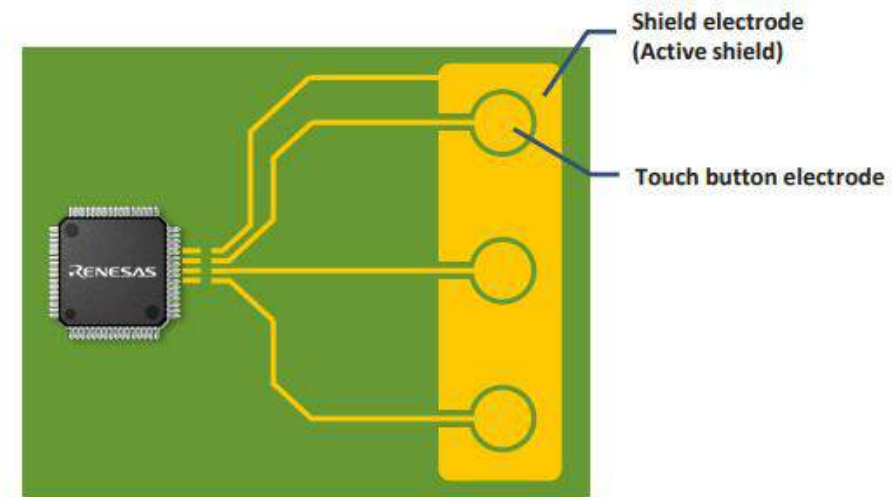
### CTSU

- CTSU can also support shield electrodes, but a current driver IC is required for each electrode



### CTSU2

- External driver IC is not required
- One shield electrode can be used for multiple electrodes (It is possible to switch the output in synchronization with the measurement electrode)
- The shield electrode can be directly driven by the microcomputer terminal



# HIGH NOISE IMMUNITY

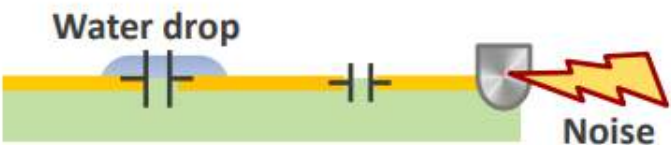
## WATERPROOF MEASURES WITH ACTIVE SHIELD

- Suppresses the increase in capacitance at the bridge due to water droplets



### ■ Shield electrode layouts beside

Shield electrode can be reduced noise affection from the side direction. And additional capacitance by the water drop bride is smaller with Shield electrode and it can be reduced the risk of malfunction.



Reduce parasitic capacitance by same phase same level driving



### ■ Nothing layouts beside

There is small additional capacitance in case of the bridge by the small water drop. However, there is no guard pattern so **easy to affect from the noise**.

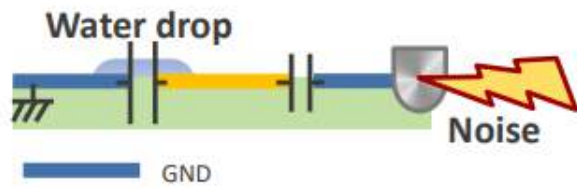


Parasitic capacitance is small since there is no shield pattern around the target electrode



### ■ GND pattern layouts decide

GND pattern can be reduced noise affection from the side direction. However, the water drop bridge may cause malfunction since capacitance with water drop bridge between electrode and GND is bigger.



Parasitic capacitance is big since level gap from GND shield





# EASY TO DEVELOP

## QE FOR CAPACITIVE TOUCH: DEVELOPMENT ASSISTANCE TOOL FOR CAPACITIVE TOUCH SENSORS

- Develop touch I/F with easy-to-operate GUI even for beginners
  - Touch sensor tuning and monitoring with easy- to-operate GUI by just following the instructions
- Automatic tuning touch sensor sensibility
  - Adjust offset/sensibility via tuning just by following the instructions



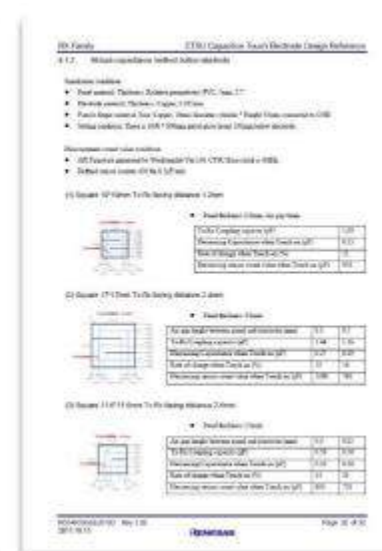
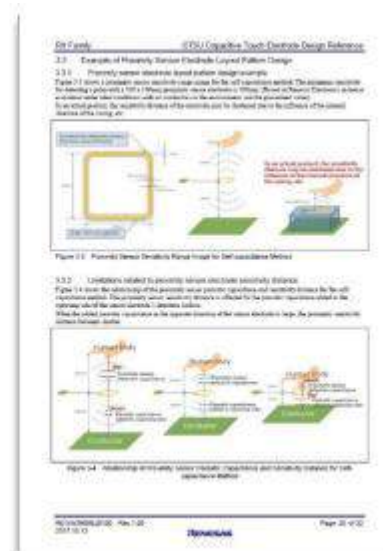
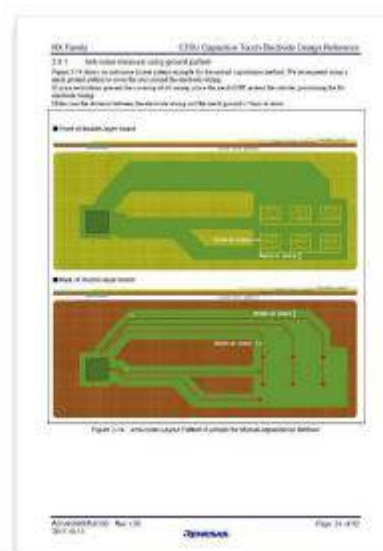
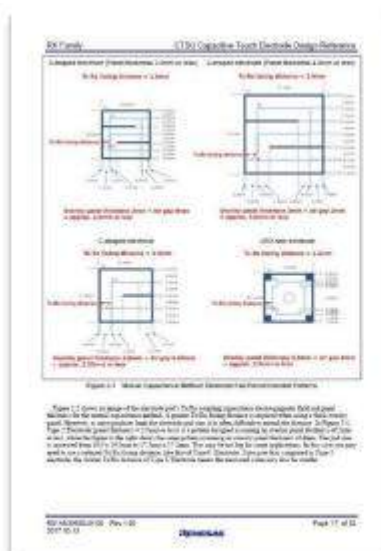
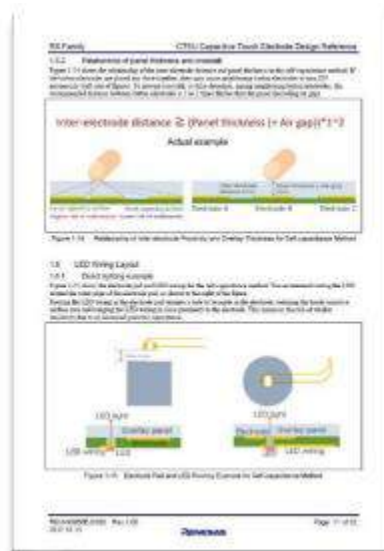


# EASY TO DEVELOP

## APPLICATION NOTE

### ■ [CTSU Capacitive Touch Electrode Design Guide \(R01AN3958EJ0100\)](#)

- All you need to know about H/W design including electrode patterns, wiring examples, panel width, and noise measurement recommended by Renesas
- Application notes on touch IP detection theory and touch API are also available



# EASY TO DEVELOP

## EVALUATION BOARDS FOR RA, RX AND RL78

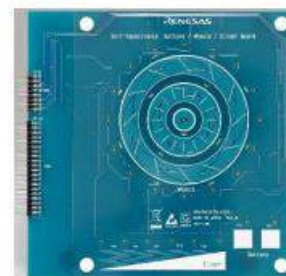
- All you need for touch evaluation in one package
- [Evaluation boards for RA, RX and RL78](#)

### Package

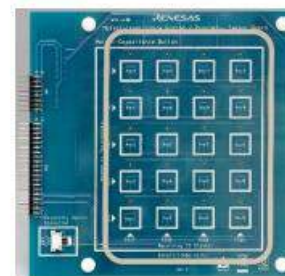
- CPU board
- Application board × 2 types
- USB cable
- Board information, development environment  
(※download from website)
  - Circuit diagram, pattern diagram
  - Capacitive touch evaluation tool Workbench6
  - Sample firmware



CPU board



① Self-capacitive



② Mix of self-capacitive/mutual-capacitive

### Application board

- ① Self-capacitive type  
Key : 3, slider × 1 pair, wheel × 2 pairs
- ② Mix of self-capacitive/mutual-capacitive  
Proximity sensing : 1 key (self-capacitive)  
Matrix key (4 x 5) : 20 keys (mutual-capacitive)

### Application example of self-capacitive/mutual-capacitive mixed



Proximity sensing  
by self-capacitive

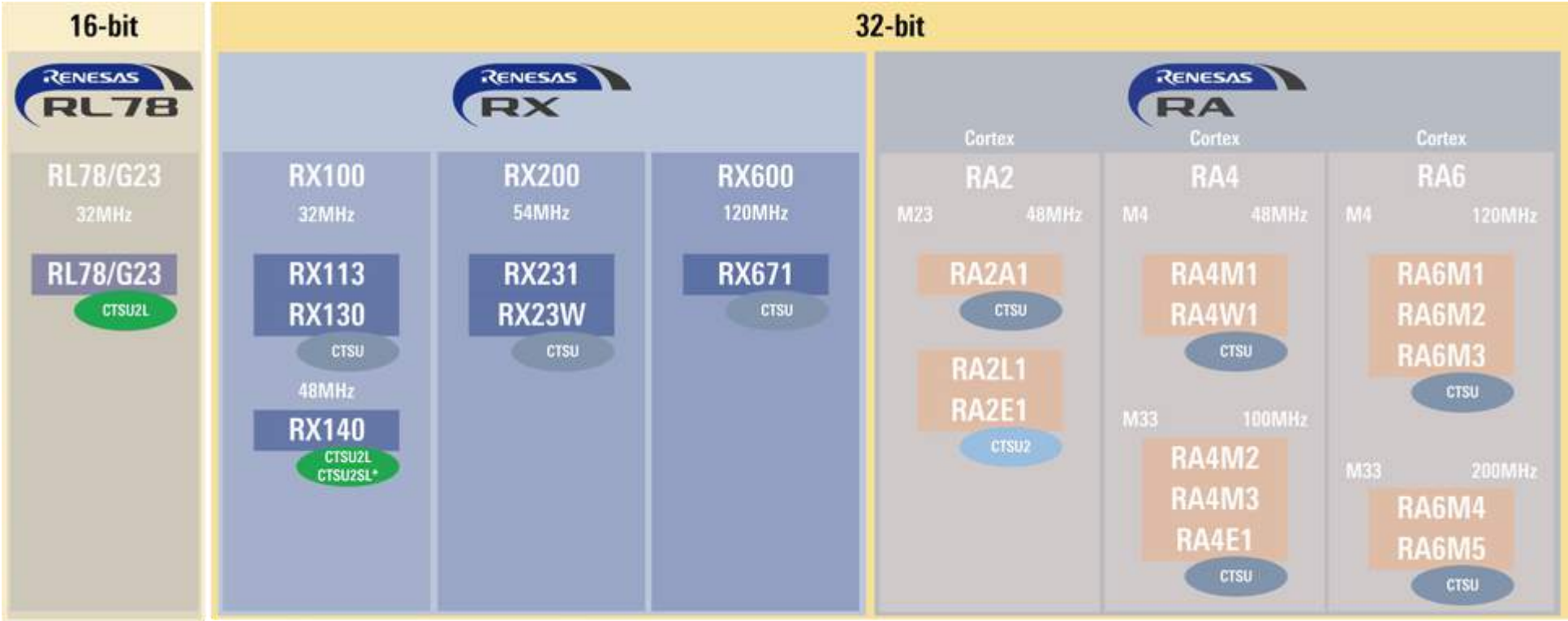


Switch to mutual-capacitive  
by starting up the application



Can operate on the running water !

# CAPACITIVE TOUCH MCU LINEUP (RA, RX AND RL78)



\* CTSU2SL: Products with 128-Kbyte or larger ROM



# SEE IT IN ACTION – DEMO VIDEOS

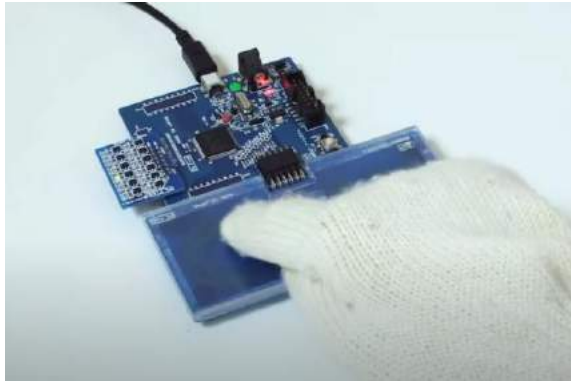
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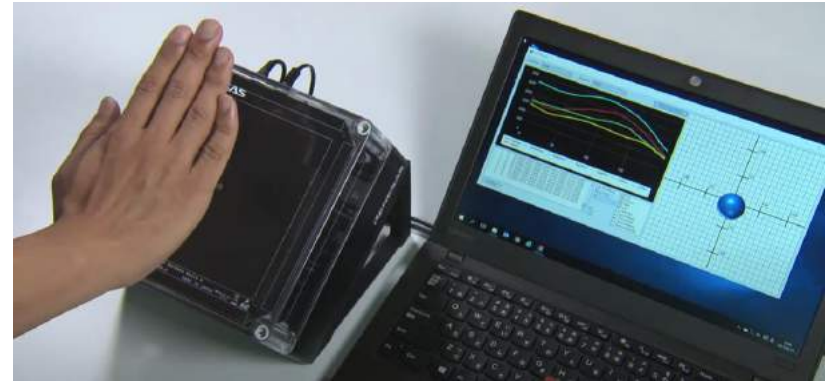
[Overlay on wood](#)



[Waterproof](#)



[With gloves](#)



[3D Gesture](#)

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[Renesas.com](https://www.renesas.com)