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RENESAS TECHNICAL UPDATE

TOYOSU FORESIA, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan
Renesas Electronics Corporation

Product Category	MPU/MCU		Document No.	TN-RX*-A0287A/E	Rev.	1.00
Title	Capacitance Reduction Characteristics of Capacitive Touch Sensing Unit (CTSU) due to Power Supply Ripple Noise		Information Category	Technical Notification		
Applicable Product	RX113 Group RX230 Group, RX231 Group RX23W Group	Lot No. All	Reference Document	RX113 Group User's Manual: Hardware Rev.1.20 (R01UH0448EJ0120) RX230 Group, RX231 Group User's Manual: Hardware Rev.1.20 (R01UH0496EJ0120) RX23W Group User's Manual: Hardware Rev.1.20 (R01UH0823EJ0120)		

1. Phenomenon

The superimposition of ripple noise on the VCC power supply might affect the CTSU circuit control current and cause a decrease of the capacitance value measured on the TSm terminal, depending on the noise frequency distribution and maximum amplitude. Please consider the provided reference characteristic data when designing the VCC power supply circuit, and adjust the CTSU operational settings as needed with referring the following application note (R30AN0453)

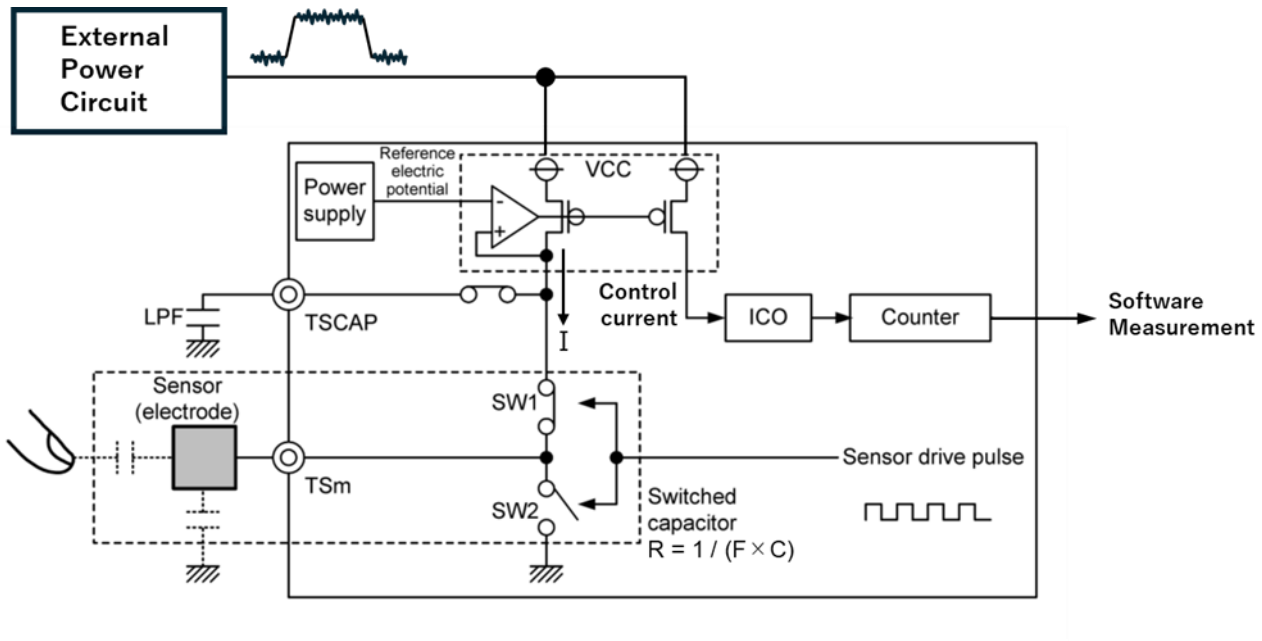

Figure 1. Measurement Circuit

For the calculation method of the measured capacitance value of the CTSU when ripple noise is superimposed, please refer to “3.4 Touch Parameter Adjustment” “(1) RX130 Capacitance Measurement Value Conversion Formula” in the application note “Capacitive Touch Ripple Countermeasures Guide (R30AN0453)”.

2. Addition Characteristic Data

Table 1. CTSU Measured Capacitance Reduction Characteristics due to VCC Power Supply Ripple Noise (Reference Value)

Conditions: 2.4 V ≤ VCC ≤ 5.5 V, VSS = 0 V, Ta =–40 to +105°C, Cp = 20 pF

Item		Symbol	Min	Typ	Max	Unit	Test Conditions (Ripple Noise Amplitude)
Measured capacitance reduction characteristics*1	Ripple noise frequency < 20 kHz	C_{down}	—	—	0.1	pF	100 mVpp
	20 kHz ≤ Ripple noise frequency ≤ 10 MHz		—	—	2.1		30 mVpp
			—	—	2.3		50 mVpp
			—	—	2.6		100 mVpp
	10 MHz < Ripple noise frequency		—	—	0.05		100 mVpp

Note 1. These are the values under the following conditions.
- When using the Self-capacitance method (CTSUCR1.MD1= 0).
- When CTSU Power Supply Capacity Adjustment is Normal output (CTSUCR1.ATUNE1 = 0).
- When the target value for offset adjustment is 37.5%.
  For an overview of offset adjustment, refer to “2. Capacitance Detection” and “7.1 Automatic Tuning Using QE for Capacitive Touch” in the application note “Capacitive Sensor MCU Capacitive Touch Introduction Guide (R30AN0424)”.

Remark. Cp: parasitic capacitance

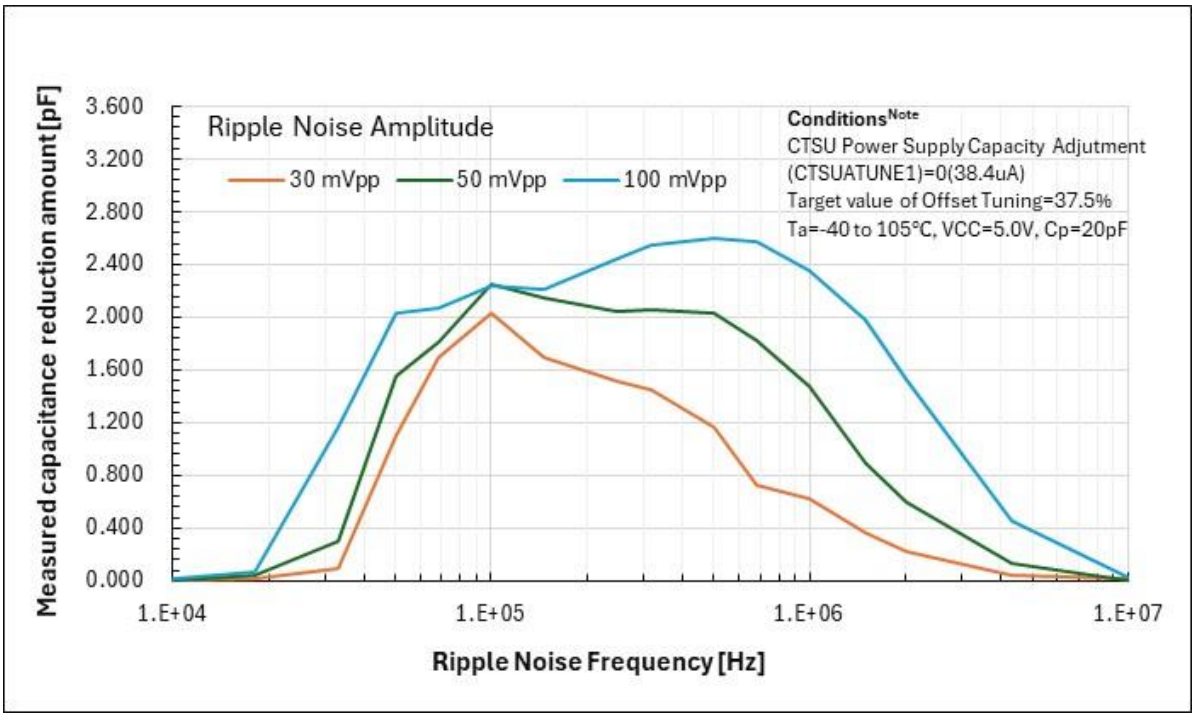

Figure 2. Measured Capacitance Reduction Amount

Note. Refer to the application note for Capacitive Sensor MCU, “Capacitive Touch QE for Capacitive Touch Advanced Mode Parameter Guide (R30AN0428)".