

RENESAS TECHNICAL UPDATE

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Product Category	MPU/MCU	Document No.	TN-RA*-A0165A/E	Rev.	1.00
Title	Capacitance Reduction Characteristics of Capacitive Touch Sensing Unit (CTSUs) due to Power Supply Ripple Noise		Information Category	Technical Notification	
Applicable Product	RA4M1 Group, RA4W1 Group	Lot No.	Reference Document	Refer to reference document	
		All			

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)

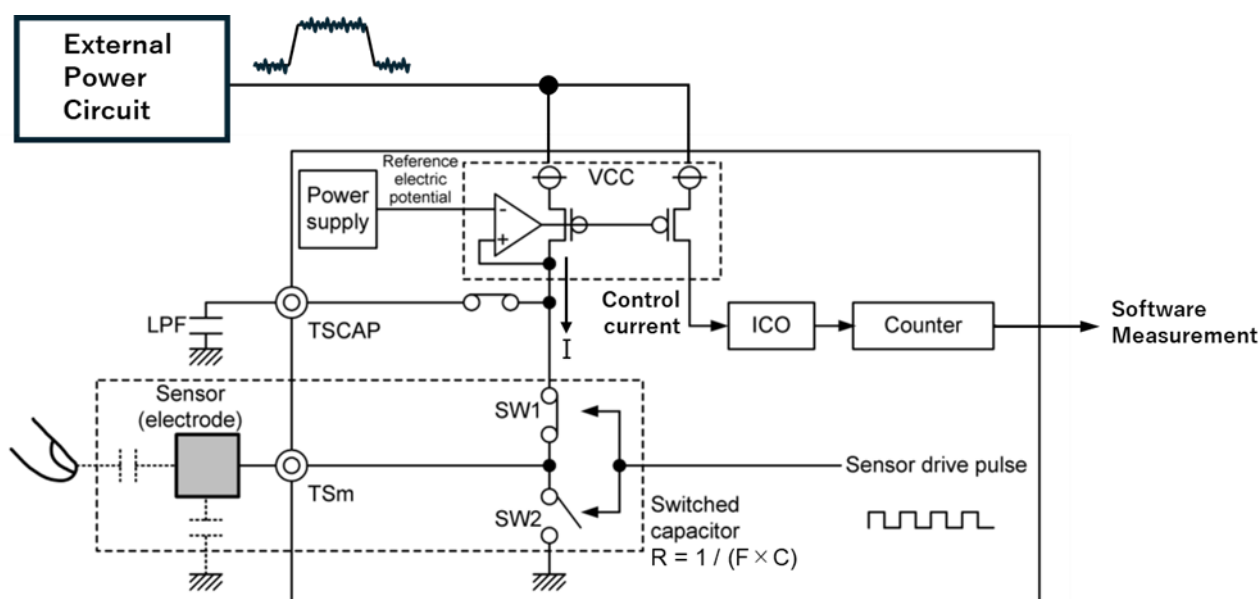


Figure 1. Measurement Circuit

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) CTSU1 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: $2.4\text{ V} \leq \text{VCC} \leq 5.5\text{ V}$, $\text{VSS} = 0\text{ V}$, $T_a = -40\text{ to }+105^\circ\text{C}$, $C_p = 20\text{ pF}$

Item		Symbol	Min	Typ	Max	Unit	Test Conditions (Ripple Noise Amplitude)
Measured capacitance reduction characteristics*1	Ripple Noise Frequency < 20kHz	C_{down}	—	—	0.01	pF	100mVpp
	$20\text{kHz} \leq \text{Ripple Noise Frequency} \leq 2\text{MHz}$		—	—	0.20		30mVpp
			—	—	0.43		50mVpp
			—	—	0.96		100mVpp
	$2\text{MHz} < \text{Ripple Noise Frequency}$		—	—	0.03		100mVpp

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 “3.2 Offset Tuning Target” in the application note “Capacitive Sensor MCU QE for Capacitive Touch Advanced Mode Parameter Guide (R30AN0428)”.

Remark. Cp: parasitic capacitance

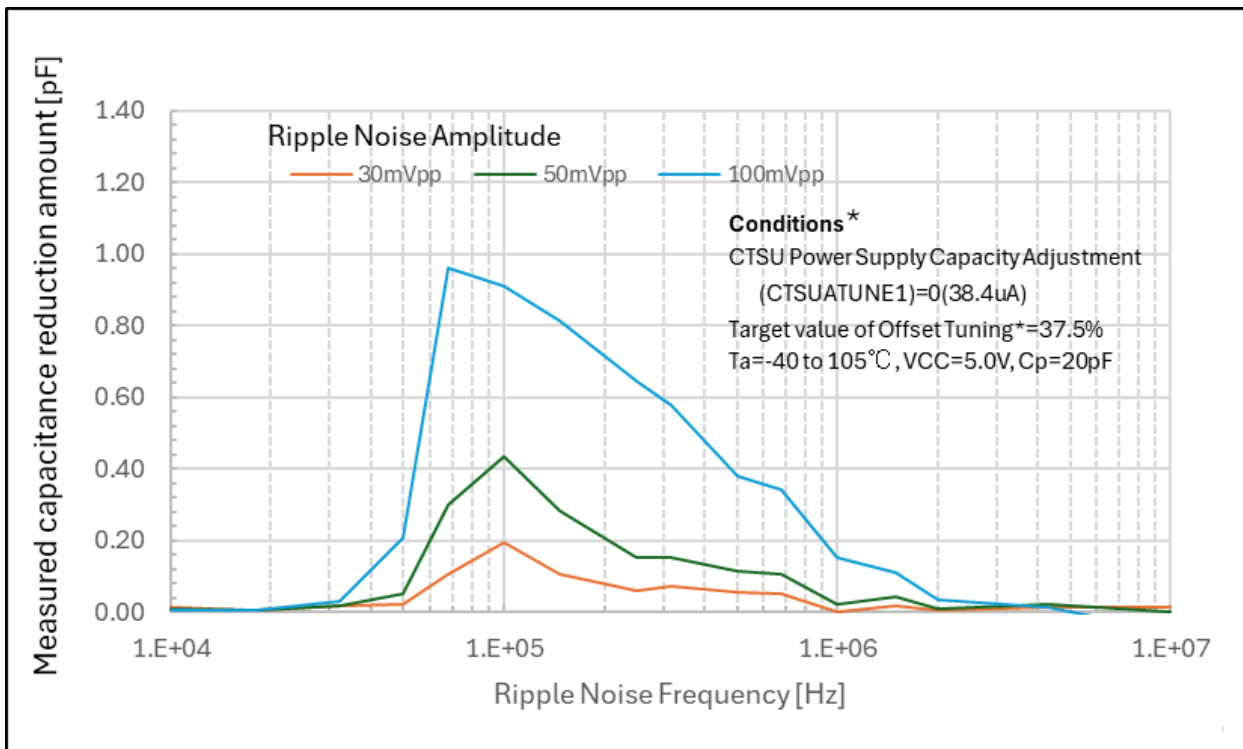


Figure 2. Measured Capacitance Reduction Amount

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

【Reference Document】

Applicable Product	Manual Title	Document Number
RA4M1	RA4M1 Group User's Manual: Hardware Rev.1.10	R01UH0887EJ0110
RA4W1	RA4W1 Group User's Manual: Hardware Rev.1.00	R01UH0883EU0100