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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-RA*-A0164A/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	RA4M2 Group、RA4M3 Group RA6M1 Group、RA6M2 Group RA6M3 Group、RA6M4 Group RA6M5 Group	Lot No. All	Reference Document	Refer to reference document		

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)

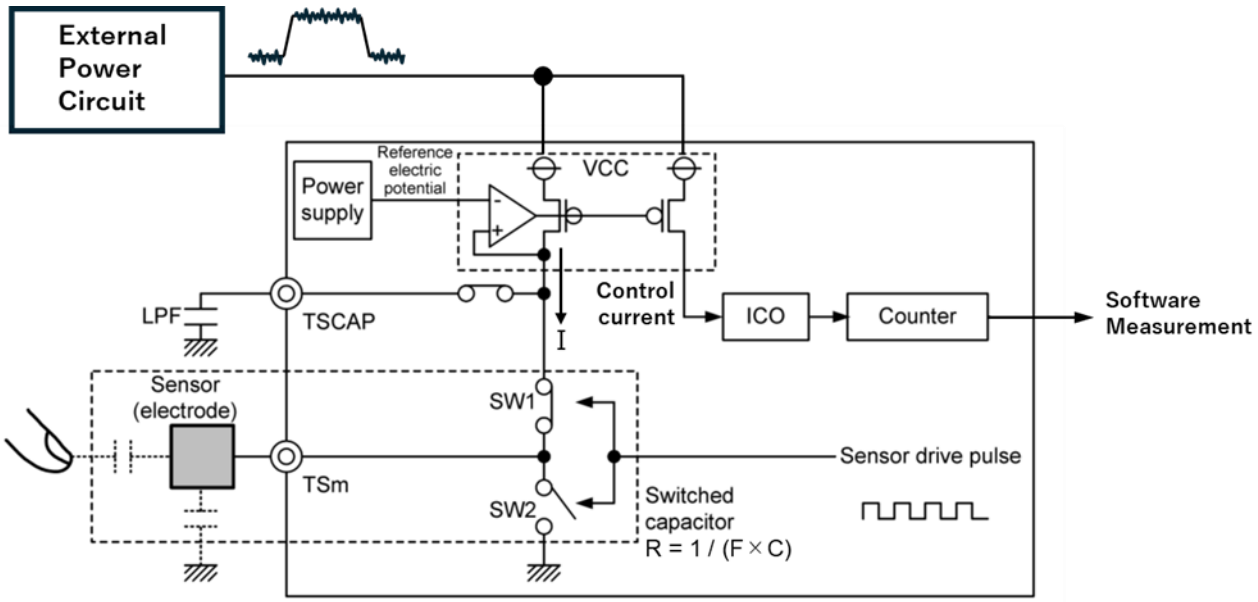

Figure 1 Measurement circuit

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)”. However, replace Vvdc (typ.) [V] with 1.18V.

2. Addition characteristic data

Table 1. CTSU Measured capacitance reduction characteristics due to VCC power supply ripple noise (reference value)

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

Item		Symbol	min	typ	max	Unit	Test Conditions (Ripple noise amplitude)
Measured capacitance reduction characteristics (Notes 1)	Ripple Noise Frequency < 20kHz	C_{down}	−	−	0.05	pF	100mVpp
	20kHz ≤ Ripple Noise Frequency ≤ 300kHz		−	−	0.26		30mVpp
			−	−	0.59		50mVpp
			−	−	0.86		100mVpp
	300kHz < Ripple Noise Frequency		−	−	0.12		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

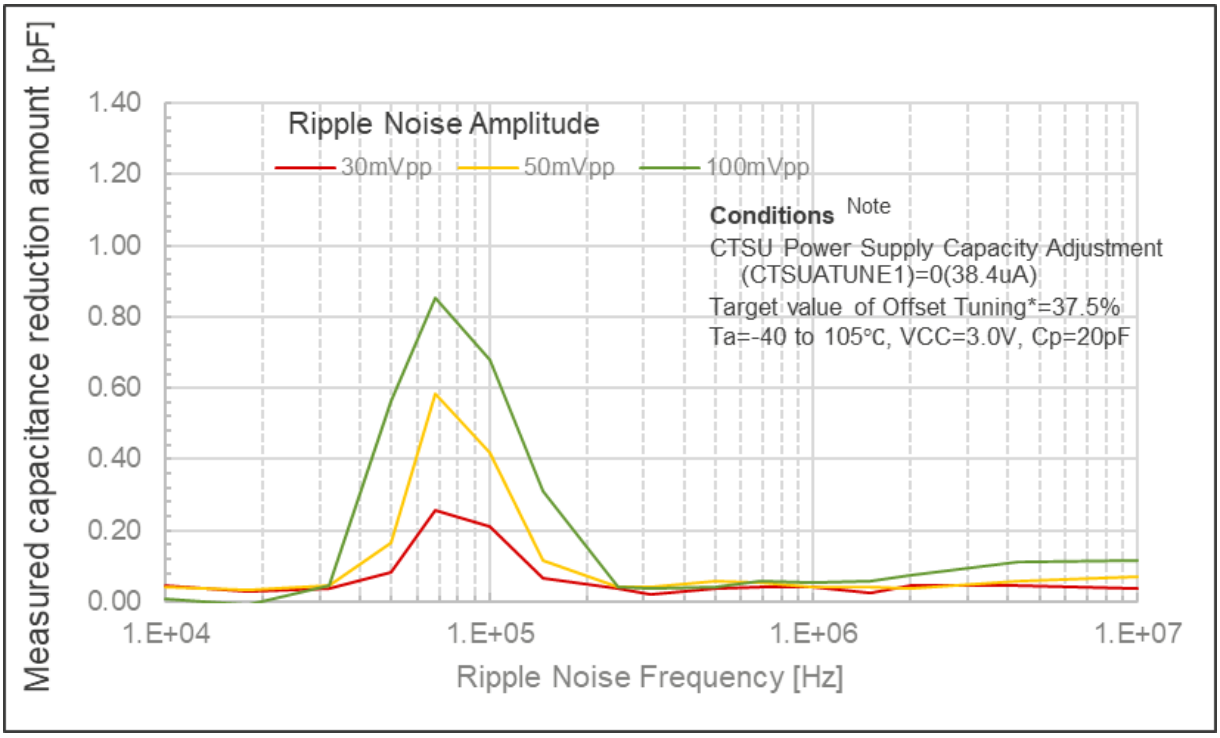

Figure 2. Measured capacitance reduction amount

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
RA4M2	RA4M2 Group User's Manual: Hardware Rev.1.40	R01UH0892EJ0140
RA4M3	RA4M3 Group User's Manual: Hardware Rev.1.50	R01UH0893EJ0150
RA6M1	RA6M1 Group User's Manual: Hardware Rev. 1.20	R01UH0884EJ0120
RA6M2	RA6M2 Group User's Manual: Hardware Rev. 1.20	R01UH0885EJ0120
RA6M3	RA6M3 Group User's Manual: Hardware Rev. 1.20	R01UH0886EJ0120
RA6M4	RA6M4 Group User's Manual: Hardware Rev.1.50	R01UH0890EJ0150
RA6M5	RA6M5 Group User's Manual: Hardware Rev.1.40	R01UH0891EJ0140