

RENESAS TECHNICAL UPDATE

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Product Category	MPU/MCU	Document No.	TN-RL*-A0142A/E	Rev.	1.00
Title	Capacitive Sensing Unit (CTS2L) Capacitance reduction characteristics due to power supply ripple noise		Information Category	Technical Notification	
Applicable Product	RL78/G23 Group	Lot No.	Reference Document	RL78/G23 User's Manual: Hardware Rev. 1.30 R01UH0896EJ0130 (Jan. 2024)	
		All			

1. Information regarding the capacitance reduction characteristics due to power supply ripple noise

The superimposition of ripple noise on the VDD 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 VDD power supply circuit, and adjust the CTSU operational settings as needed with referring the following application note (R30AN0453)

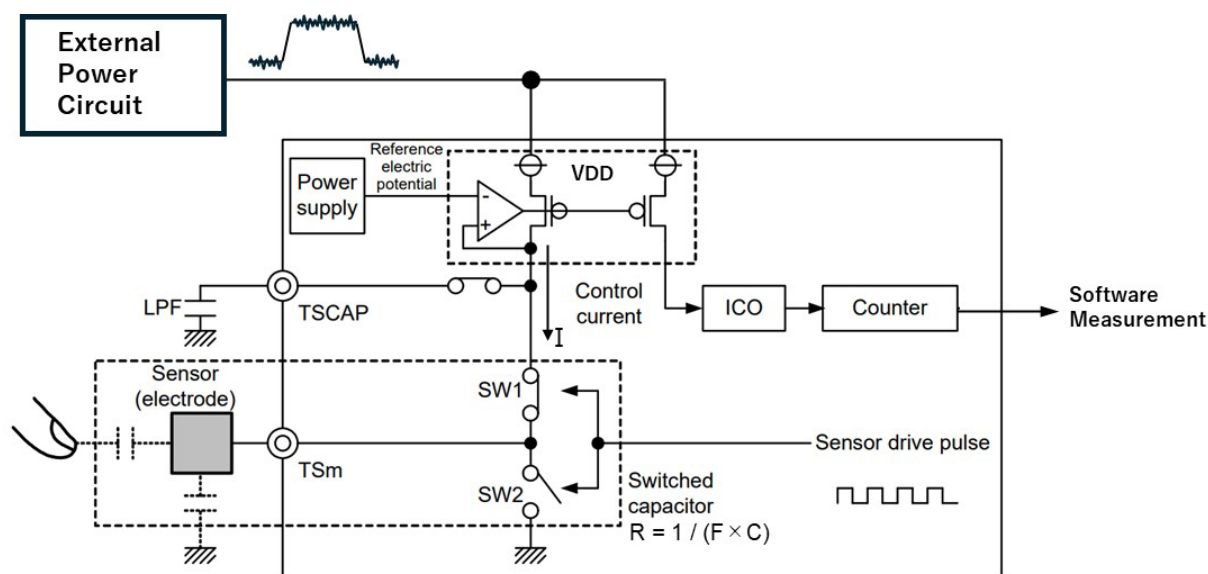


Figure 1 Measurement circuit

For the calculation method of the measured capacitance value of the CTSU2L when ripple noise is superimposed, please refer to "3.4 Touch Parameter Adjustment (2) RL78/G22 Capacitance / Measurement Value Conversion Formula" and "3.4.2 Example of Countermeasure against False Touch Judgement" in the Application Note Capacitive Touch Ripple Countermeasures Guide (R30AN0453).

Note. The capacitance / measurement value conversion formula is different for each group of capacitive sensing unit. The CTSU2L, capacitive sensing unit of the RL78/G23, belongs to the same CTSU2 group as the CTSU2La, capacitive sensor unit of the RL78/G22. Therefore, please refer to the RL78/G22 capacitance / measurement value conversion formula for the calculation method of the measured capacitance value of the RL78/G23.

2. Characteristic data

Table 1 Capacitive Sensing Unit (CTS2L) Measured capacitance reduction characteristics due to VDD power supply ripple noise (reference value)

Conditions: TA = -40 to +105°C, 2.4V ≤ VDD ≤ 5.5V, VSS = 0V, Cp = 20pF

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit	
Measured capacitance reduction characteristics Notes	Cdown	Ripple Noise Frequency < 20kHz			0.02	pF	
		20kHz ≤ Ripple Noise Frequency ≤ 2MHz	Ripple Noise Amplitude = 100 mVpp	—	—		0.06
			Ripple Noise Amplitude = 40 mVpp	—	—		0.10
			Ripple Noise Amplitude = 60 mVpp	—	—		0.33
		2MHz < Ripple Noise Frequency	Ripple Noise Amplitude = 100 mVpp	—	—		0.01

Note. These are the value under the following conditions.

- When using the Self-capacitance method (CTSUCRAL.MD1 = 0) .
- When the measured current range is 40µA (CTSUCRAL.ATUNE1 = 1, CTSUCRAH.ATUNE2 = 0). For an overview of measured current range, refer to "2.2 Self-capacitance Method" and "2.2.2 Measurement Range" in the Application Note Capacitive Sensor MCU Capacitive Touch Introduction Guide (R30AN0424)
- 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

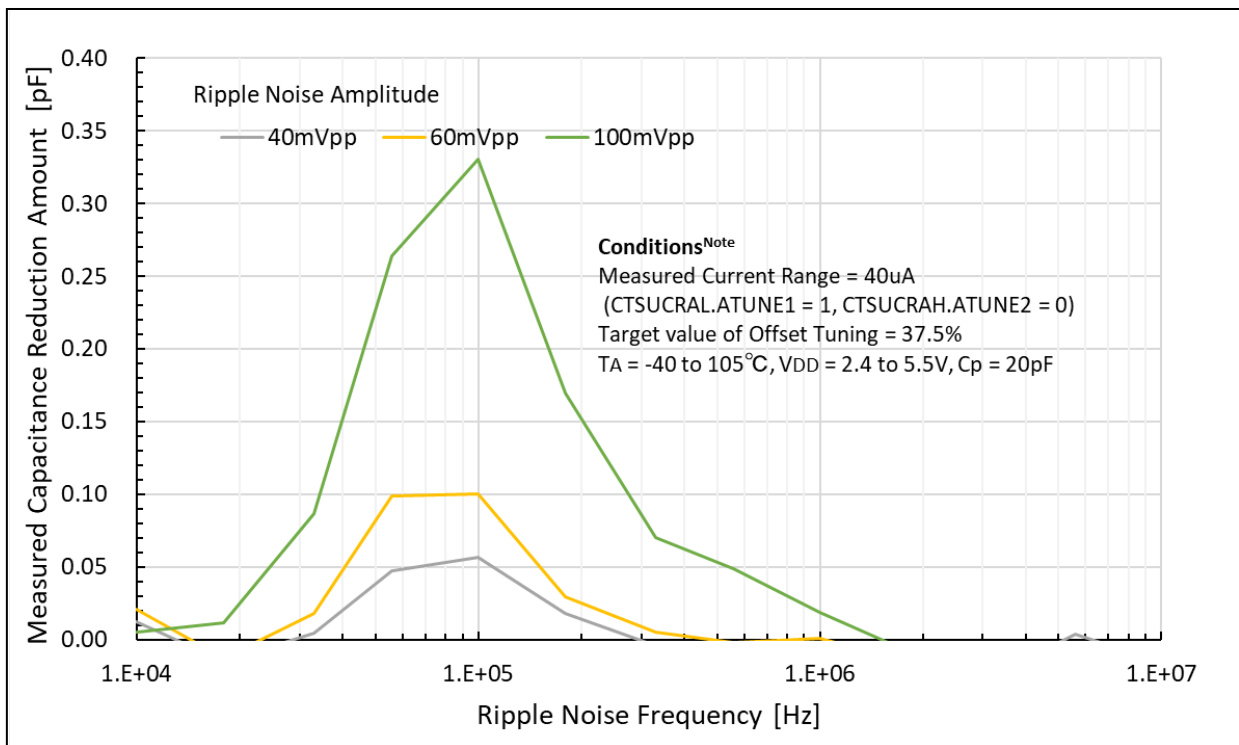


Figure 2 Measured Capacitance Reduction Amount

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

3. Document Improvement

The contents of "2. Characteristic data" will be reflected in the User's Manual: Hardware by the next revision.