

# RENESAS TECHNICAL UPDATE

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Product Category	MPU/MCU		Document No.	TN-RX*-A0219A/E	Rev.	1.00
Title	Addition, Improvement, and Errata to the Electrical Characteristics for RX66T Group and RX72T Group		Information Category	Technical Notification		
Applicable Product	RX66T Group, RX72T Group	Lot No.	Reference Document	RX66T Group User's Manual: Hardware Rev.1.10 (R01UH0749EJ0110) RX72T Group User's Manual: Hardware Rev.1.00 (R01UH0803EJ0100)		
		All				

This document describes additions to the typical output characteristics, improvements to the characteristics of the programmable gain amplifier, and minor corrections to the “Electrical Characteristics” chapter of the User’s Manual: Hardware for each applicable product group.

Page and table numbers are based on those of the manual for the RX66T Group. Refer to the table on the last page for the corresponding page and table numbers for the RX72T Group.

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The following tables are added after Table 45.12, Permissible Output Currents.

**Table 45.13 Typical Output Characteristics (1)**

Conditions: VCC = AVCC0 = AVCC1 = AVCC2 = 5.0 V, VCC\_USB = 2.7 to 5.0 V,  
VSS = VSS\_USB = AVSS0 = AVSS1 = AVSS2 = 0 V, T<sub>a</sub> = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions			
High-level output voltage	Normal drive output (all output pins)	V <sub>OH</sub>	—	4.97	—	V	I <sub>OH</sub> = -0.5 mA		
			—	4.94	—		I <sub>OH</sub> = -1.0 mA		
			—	4.87	—		I <sub>OH</sub> = -2.0 mA		
			—	4.74	—		I <sub>OH</sub> = -4.0 mA		
	High-drive output (P00, P01, P10 to P17, P20 to P27, P30 to P35, P70 to P76, P80 to P82, P90 to P96, PA0 to PA7, PB0 to PB7, PC0 to PC6, PD0 to PD7, PE0, PE1, PE3 to PE6, PF0 to PF3, PG0 to PG2, PK0 to PK2)	V <sub>OH</sub>	—	4.98	—		I <sub>OH</sub> = -0.5 mA		
			—	4.97	—		I <sub>OH</sub> = -1.0 mA		
			—	4.94	—		I <sub>OH</sub> = -2.0 mA		
			—	4.87	—		I <sub>OH</sub> = -4.0 mA		
			Large current output (P71 to P76, P81, P90 to P95, PB5, PD3)	V <sub>OH</sub>	—		4.99	—	I <sub>OH</sub> = -0.5 mA
					—		4.98	—	I <sub>OH</sub> = -1.0 mA
					—		4.96	—	I <sub>OH</sub> = -2.0 mA
					—		4.92	—	I <sub>OH</sub> = -4.0 mA
	—	4.91	—	I <sub>OH</sub> = -5.0 mA					
	Low-level output voltage	Normal drive output (all output pins)	V <sub>OL</sub>	—	0.02		—	I <sub>OL</sub> = 0.5 mA	
				—	0.04		—	I <sub>OL</sub> = 1.0 mA	
				—	0.09		—	I <sub>OL</sub> = 2.0 mA	
—				0.18	—	I <sub>OL</sub> = 4.0 mA			
High-drive output (P00, P01, P10 to P17, P20 to P27, P30 to P35, P70 to P76, P80 to P82, P90 to P96, PA0 to PA7, PB0 to PB7, PC0 to PC6, PD0 to PD7, PE0, PE1, PE3 to PE6, PF0 to PF3, PG0 to PG2, PK0 to PK2)		V <sub>OL</sub>	—	0.01	—	I <sub>OL</sub> = 0.5 mA			
			—	0.03	—	I <sub>OL</sub> = 1.0 mA			
			—	0.05	—	I <sub>OL</sub> = 2.0 mA			
			—	0.10	—	I <sub>OL</sub> = 4.0 mA			
			Large current output (P71 to P76, P81, P90 to P95, PB5, PD3)	V <sub>OL</sub>	—	0.01	—	I <sub>OL</sub> = 0.5 mA	
					—	0.02	—	I <sub>OL</sub> = 1.0 mA	
					—	0.04	—	I <sub>OL</sub> = 2.0 mA	
					—	0.07	—	I <sub>OL</sub> = 4.0 mA	
—		0.09	—	I <sub>OL</sub> = 5.0 mA					
—		0.18	—	I <sub>OL</sub> = 10.0 mA					
—		0.28	—	I <sub>OL</sub> = 15.0 mA					

**Table 45.14 Typical Output Characteristics (2)**

Conditions: VCC = AVCC0 = AVCC1 = AVCC2 = 3.3 V, VCC\_USB = 2.7 to 3.3 V,  
VSS = VSS\_USB = AVSS0 = AVSS1 = AVSS2 = 0 V, T<sub>a</sub> = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions			
High-level output voltage	Normal drive output (all output pins)	V <sub>OH</sub>	—	3.26	—	V	I <sub>OH</sub> = -0.5 mA		
			—	3.22	—		I <sub>OH</sub> = -1.0 mA		
			—	3.13	—		I <sub>OH</sub> = -2.0 mA		
			—	2.94	—		I <sub>OH</sub> = -4.0 mA		
	High-drive output (P00, P01, P10 to P17, P20 to P27, P30 to P35, P70 to P76, P80 to P82, P90 to P96, PA0 to PA7, PB0 to PB7, PC0 to PC6, PD0 to PD7, PE0, PE1, PE3 to PE6, PF0 to PF3, PG0 to PG2, PK0 to PK2)	V <sub>OH</sub>	—	3.28	—		I <sub>OH</sub> = -0.5 mA		
			—	3.26	—		I <sub>OH</sub> = -1.0 mA		
			—	3.22	—		I <sub>OH</sub> = -2.0 mA		
			—	3.13	—		I <sub>OH</sub> = -4.0 mA		
			Large current output (P71 to P76, P81, P90 to P95, PB5, PD3)	V <sub>OH</sub>	—		3.29	—	I <sub>OH</sub> = -0.5 mA
					—		3.27	—	I <sub>OH</sub> = -1.0 mA
					—		3.25	—	I <sub>OH</sub> = -2.0 mA
					—		3.20	—	I <sub>OH</sub> = -4.0 mA
	—	3.17	—	I <sub>OH</sub> = -5.0 mA					
	Low-level output voltage	Normal drive output (all output pins)	V <sub>OL</sub>	—	0.03		—	I <sub>OL</sub> = 0.5 mA	
				—	0.06		—	I <sub>OL</sub> = 1.0 mA	
				—	0.12		—	I <sub>OL</sub> = 2.0 mA	
—				0.25	—	I <sub>OL</sub> = 4.0 mA			
High-drive output (P00, P01, P10 to P17, P20 to P27, P30 to P35, P70 to P76, P80 to P82, P90 to P96, PA0 to PA7, PB0 to PB7, PC0 to PC6, PD0 to PD7, PE0, PE1, PE3 to PE6, PF0 to PF3, PG0 to PG2, PK0 to PK2)		V <sub>OL</sub>	—	0.02	—	I <sub>OL</sub> = 0.5 mA			
			—	0.03	—	I <sub>OL</sub> = 1.0 mA			
			—	0.07	—	I <sub>OL</sub> = 2.0 mA			
			—	0.13	—	I <sub>OL</sub> = 4.0 mA			
			Large current output (P71 to P76, P81, P90 to P95, PB5, PD3)	V <sub>OL</sub>	—	0.01	—	I <sub>OL</sub> = 0.5 mA	
					—	0.02	—	I <sub>OL</sub> = 1.0 mA	
					—	0.05	—	I <sub>OL</sub> = 2.0 mA	
					—	0.09	—	I <sub>OL</sub> = 4.0 mA	
—		0.11	—	I <sub>OL</sub> = 5.0 mA					
—		0.24	—	I <sub>OL</sub> = 10.0 mA					
—		0.36	—	I <sub>OL</sub> = 15.0 mA					

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Table 45.46, Programmable Gain Amplifier Characteristics (single-ended input) is corrected as follows.

Before correction

**Table 45.46 Programmable Gain Amplifier Characteristics (single-ended input)**

Conditions:  $V_{CC} = 2.7$  to  $5.5$  V,  $V_{CC\_USB} = 2.7$  to  $5.5$  V,  $AVCC0 = AVCC1 = AVCC2 = 3.0$  to  $5.5$  V,  $V_{SS} = V_{SS\_USB} = AVSS0 = AVSS1 = AVSS2 = 0$  V,  $T_a = T_{opr}$

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Input offset voltage	$V_{IO}$	—	3	8	mV	
Single-ended input voltage range	$V_{ISR}$	$V_{OSR(min)}/G$	—	$V_{OSR(max)}/G$	V	
Output voltage range	$V_{OR}$	$0.10 \times AVCCn$	—	$0.90 \times AVCCn$		G = 2.000 to 3.636
		$0.15 \times AVCCn$	—	$0.85 \times AVCCn$		G = 4.000 to 6.667
		$0.20 \times AVCCn$	—	$0.80 \times AVCCn$		G = 8.000 to 20.000
Omitted						

After correction

**Table 45.46 Programmable Gain Amplifier Characteristics (Single-Ended Input)**

Conditions:  $V_{CC} = 2.7$  to  $5.5$  V,  $V_{CC\_USB} = 2.7$  to  $5.5$  V,  $AVCC0 = AVCC1 = AVCC2 = 3.0$  to  $5.5$  V,  $V_{SS} = V_{SS\_USB} = AVSS0 = AVSS1 = AVSS2 = 0$  V,  $T_a = T_{opr}$

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Input offset voltage	$V_{IO}$	—	3	8	mV	
Single-ended input voltage range	$V_{ISR}$	$V_{OR(min)}/G$	—	$V_{OR(max)}/G$	V	
Output voltage range	$V_{OR}$	$0.10 \times AVCCn$	—	$0.90 \times AVCCn$		G = 2.000 to 3.636
		$0.15 \times AVCCn$	—	$0.85 \times AVCCn$		G = 4.000 to 6.667
		$0.20 \times AVCCn$	—	$0.80 \times AVCCn$		G = 8.000 to 20.000
Omitted						

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The input voltage range of the PGAVSS0 and PGAVSS1 pins in Table 45.47, Programmable Gain Amplifier Characteristics (pseudo-differential input) is extended as follows. Pin names are also corrected as follows.

Before correction

**Table 45.47 Programmable Gain Amplifier Characteristics (pseudo-differential input)**

Conditions:  $V_{CC} = 2.7$  to  $5.5$  V,  $V_{CC\_USB} = 2.7$  to  $5.5$  V,  $AVCC0 = AVCC1 = AVCC2 = 3.0$  to  $5.5$  V,  $V_{SS} = V_{SS\_USB} = AVSS0 = AVSS1 = AVSS2 = 0$  V,  $T_a = T_{opr}$

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions*1
Input offset voltage	$V_{IO}$	—	10	20	mV	
Differential input voltage range	$V_{IDR}$	$-0.28 \times AVCCn / G$	—	$0.28 \times AVCCn / G$	V	
Output voltage range	$V_{OR}$	$0.22 \times AVCC$	—	$0.78 \times AVCC$		
Input voltage range (PGAVSS)	$V_{I(PGAVSS)}$	-0.5	—	0.3		
Omitted						

After correction

**Table 45.47 Programmable Gain Amplifier Characteristics (Pseudo-Differential Input)**

Conditions:  $V_{CC} = 2.7$  to  $5.5$  V,  $V_{CC\_USB} = 2.7$  to  $5.5$  V,  $AVCC0 = AVCC1 = AVCC2 = 3.0$  to  $5.5$  V,  $V_{SS} = V_{SS\_USB} = AVSS0 = AVSS1 = AVSS2 = 0$  V,  $T_a = T_{opr}$

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions*1
Input offset voltage	$V_{IO}$	—	10	20	mV	
Differential input voltage range	$V_{IDR}$	$-0.28 \times AVCCn / G$	—	$0.28 \times AVCCn / G$	V	
Output voltage range	$V_{OR}$	$0.22 \times AVCCn$	—	$0.78 \times AVCCn$		
Input voltage range (PGAVSSn)	$V_{I(PGAVSS)}$	-0.5	—	0.3		$AVCCn < 4.3$ V
				0.6		$AVCCn \geq 4.3$ V
Omitted						

**Page Number and Table Number**

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