

RENESAS TECHNICAL UPDATE

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Product Category	MPU/MCU		Document No.	TN-RA*-A0013A/E	Rev.	1.00
Title	RA4M2 Group, RA4M3 Group, RA6M1 Group, RA6M2 Group, RA6M3 Group, RA6M4 Group, RA6T1 Group, VBATT minimum voltage level enhancement		Information Category	Technical Notification		
Applicable Product	RA4M2 Group RA4M3 Group RA6M1 Group RA6M2 Group RA6M3 Group RA6M4 Group RA6T1 Group	Lot No.	Reference Document	RA4M2 Group User's Manual Hardware Rev.1.10 RA4M3 Group User's Manual Hardware Rev.1.20 RA6M1 Group User's Manual Hardware Rev.1.00 RA6M2 Group User's Manual Hardware Rev.1.00 RA6M3 Group User's Manual Hardware Rev.1.10 RA6M4 Group User's Manual Hardware Rev.1.10 RA6T1 Group User's Manual Hardware Rev.1.00		
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VBATT minimum voltage level is enhanced from 1.8V to 1.65V. Examples are shown below.

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Table 53.2 Recommended operating conditions

Parameter	Symbol	Value	Min	Typ	Max	Unit
Power supply voltages	VCC	When USB/USBHS is not used	2.7	—	3.6	V
		When USB/USBHS is used	3.0	—	3.6	V
	VSS	—	0	—	V	
USB power supply voltages	VCC_USB, VCC_USBHS	—	VCC	—	V	
	VSS_USB, AVSS_USBHS, PVSS_USBHS, VSS1_USBHS, VSS2_USBHS	—	0	—	V	
VBATT power supply voltage	VBATT	1.8	—	3.6	V	
Analog power supply voltages	AVCC0 ^{*1}	—	VCC	—	V	
	AVSS0	—	0	—	V	

Note 1. Connect AVCC0 to VCC. When the A/D converter and the D/A converter are not in use, do not leave the AVCC0, VREFH/VREFH0, AVSS0, and VREFL/VREFL0 pins open. Connect the AVCC0 and VREFH/VREFH0 pins to VCC, and the AVSS0 and VREFL/VREFL0 pins to VSS, respectively.

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Table 53.2 Recommended operating conditions

Parameter	Symbol	Value	Min	Typ	Max	Unit
Power supply voltages	VCC	When USB/USBHS is not used	2.7	—	3.6	V
		When USB/USBHS is used	3.0	—	3.6	V
	VSS	—	0	—	V	
USB power supply voltages	VCC_USB, VCC_USBHS	—	VCC	—	V	
	VSS_USB, AVSS_USBHS, PVSS_USBHS, VSS1_USBHS, VSS2_USBHS	—	0	—	V	
VBATT power supply voltage	VBATT	1.65 *2	—	3.6	V	
Analog power supply voltages	AVCC0*1	—	VCC	—	V	
	AVSS0	—	0	—	V	

Note 1. Connect AVCC0 to VCC. When the A/D converter and the D/A converter are not in use, do not leave the AVCC0, VREFH/REFH0, AVSS0, and VREFL/REFL0 pins open. Connect the AVCC0 and VREFH/REFH0 pins to VCC, and the AVSS0 and VREFL/REFL0 pins to VSS, respectively.

Note 2. Low CL crystal cannot be used below VBATT = 1.8V.

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Table 53.48 Battery backup function characteristics

Conditions: VCC = AVCC0 = VCC_USB = 2.7 to 3.6 V, 2.7 ≤ VREFH0/REFH ≤ AVCC0, VBATT = 1.8 to 3.6 V

Parameter	Symbol	Min	Typ	Max	Unit	Test conditions
Voltage level for switching to battery backup	V _{DETBATT}	2.50	2.60	2.70	V	Figure 53.88
Lower-limit VBATT voltage for power supply switching caused by VCC voltage drop	V _{BATTSW}	2.70	—	—	V	
VCC-off period for starting power supply switching	t _{VOFFBATT}	200	—	—	μs	
VBATT low voltage detection level	V _{battidet}	1.8	1.9	2.0	V	Figure 53.89
Minimum VBATT down time	t _{BATTOFF}	200	—	—	μs	
Response delay	t _{BATTdet}	—	—	200	μs	
VBATT monitor operation stabilization time (after VBATTMNSLR.VBATTMNSSEL is changed to 1)	t _{d(E-A)}	—	—	20	μs	
VBATT current increase (when VBATTMNSLR.VBATTMNSSEL is 1 compared to the case that VBATTMNSLR.VBATTMNSSEL is 0)	I _{VBATTSEL}	—	140	350	nA	

Note: The VCC-off period for starting power supply switching indicates the period in which VCC is below the minimum value of the voltage level for switching to battery backup (V_{DETBATT}).

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Table 53.48 Battery backup function characteristics

Conditions: VCC = AVCC0 = VCC_USB = 2.7 to 3.6 V, $2.7 \leq VREFH0/VREFH \leq AVCC0$, VBATT = 1.65 to 3.6 V *1

Parameter	Symbol	Min	Typ	Max	Unit	Test conditions
Voltage level for switching to battery backup	V _{DETBATT}	2.50	2.60	2.70	V	Figure 53.88
Lower-limit VBATT voltage for power supply switching caused by VCC voltage drop	V _{BATTsw}	2.70	—	—	V	
VCC-off period for starting power supply switching	t _{VOFFBATT}	200	—	—	μs	
VBATT low voltage detection level	V _{battidet}	1.8	1.9	2.0	V	Figure 53.89
Minimum VBATT down time	t _{BATTOFF}	200	—	—	μs	
Response delay	t _{BATTdet}	—	—	200	μs	
VBATT monitor operation stabilization time (after VBATTMNSLR.VBATTMNSLR is changed to 1)	t _{d(E-A)}	—	—	20	μs	
VBATT current increase (when VBATTMNSLR.VBATTMNSLR is 1 compared to the case that VBATTMNSLR.VBATTMNSLR is 0)	I _{VBATTSEL}	—	140	350	nA	

Note: The VCC-off period for starting power supply switching indicates the period in which VCC is below the minimum value of the voltage level for switching to battery backup (V_{DETBATT}).

Note 1. Low CL crystal cannot be used below VBATT = 1.8V.