To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

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Renesas Electronics Corporation

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RENESAS TECHNICAL UPDATE

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Product Category	MPU & MCU		Document No.	TN-16C-A172A/E	Rev.	1.00
Title	R8C/20-23 Groups (J, K versions), R8C/26-29 Groups (J, K versions) Notes on Power-on Reset Circuit and Voltage Detection Circuit		Information Category	Technical Notification		
Applicable Products	See below	Lot No. --	Reference Document			

1. Usage Notes

1) Power-on reset circuit

The power-on reset may not be deasserted when there is a steep gradient in the start-up of the power-supply.

2) Voltage detection circuit

A reset/interrupt request may not be generated when there is a steep gradient in the supply voltage drop.

2. Revisions of the Document

According to the above, electrical characteristics of the power-on reset circuit and voltage detection circuit will be partially changed.
Changes to the electrical characteristics are shown starting from the next page.
Items in RED are changes/additions as of this update.

1) Electrical characteristics of the power-on reset circuit and voltage detection circuit

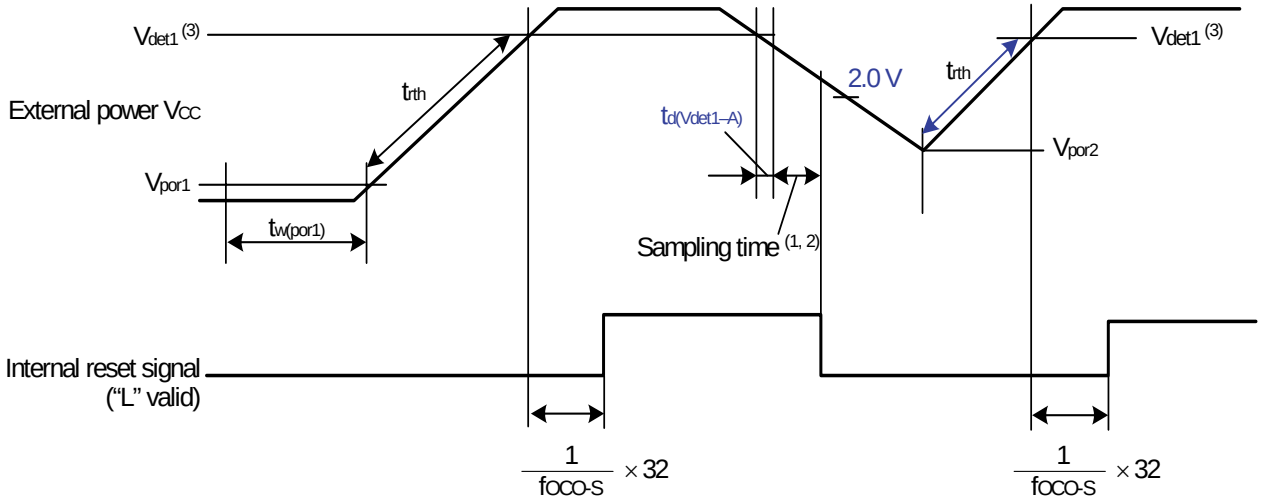
• Power-on reset circuit

When using the power-on reset circuit in the system to which external power Vcc > 3.6 V is supplied, adjust the external power supply Vcc rising gradient to 20 mV/msec ≤ trth ≤ 2,000 mV/msec.

Table 2.1 Power-on Reset Circuit, Voltage Monitor 1 Reset Electrical Characteristics (3)

Symbol	Parameter	Condition	Standard			Unit
			Min.	Typ.	Max.	
Vpor1	Power-on reset valid voltage (4)		–	–	0.1	V
Vpor2	Power-on reset or voltage monitor 1 reset valid voltage		0	–	Vdet1	V
trth	External power Vcc rise gradient	Vcc ≤ 3.6 V	20 (2)	–	–	mV/msec
		Vcc > 3.6 V	20 (2)	–	2,000	mV/msec

NOTES:
1. The measurement condition is Topr = -40 to 85°C (J version) / -40 to 125°C (K version), unless otherwise specified.
2. This condition (external power VCC rise gradient) does not apply if VCC ≥ 1.0 V.
3. To use the power-on reset function, enable voltage monitor 1 reset by setting the LVD1ON bit in the OFS register to 0, the VW1C0 and VW1C6 bits in the VW1C register to 1 respectively, and the VCA26 bit in the VCA2 register to 1.
4. tw(por1) indicates the duration the external power VCC must be held below the effective voltage (Vpor1) to enable a power on reset. When turning on the power for the first time, maintain tw(por1) for 30 s or more if -20°C ≤ Topr ≤ 125°C, maintain tw(por1) for 3,000 s or more if -40°C ≤ Topr < -20°C.



NOTES:
1. When using the voltage monitor 1 digital filter, ensure Vcc is 2.0 V or higher during the sampling time.
2. The sampling clock can be selected. Refer to **Voltage Detection Circuit** for details.
3. Vdet1 indicates the voltage detection level of the voltage detection 1 circuit. Refer to **Voltage Detection Circuit** for details.

Figure 2.1 Power-on Reset Circuit Electrical Characteristics

• Voltage detection circuit

A maximum response time of 200 μs is needed to generate the voltage monitor 1 reset and voltage monitor 2 reset/interrupt request ($V_{CC} \geq 2.0$ V, when not using digital filter). When using the voltage detection circuit, set $V_{CC} \geq 2.0$ V during this time.

When using the voltage detection circuit digital filter, set $V_{CC} \geq 2.0$ V during the above response time and the digital filter sampling time. To prevent a steep drop in the power supply, take measures such as adding a decoupling capacitor between VCC and VSS.

Table 2.2 Voltage Detection 1 Circuit Electrical Characteristics

Symbol	Parameter	Condition	Standard			Unit
			Min.	Typ.	Max.	
V_{det1}	Voltage detection level (2)		2.70	2.85	3.0	V
$t_{d(Vdet1-A)}$	Voltage monitor 1 reset generation time (5)		–	40	200	μs
–	Voltage detection circuit self power consumption	VCA26 = 1, V_{CC} = 5.0 V	–	0.6	–	μA
$t_{d(E-A)}$	Wait time until voltage detection circuit operation starts (3)		–	–	100	μs
V_{CCmin}	MCU operating voltage minimum value		2.70	–	–	V

NOTES:
1. The measurement condition is VCC = 2.7 to 5.5 V and Topr = -40 to 85°C (J version) / -40 to 125°C (K version).
2. Hold Vdet2 > Vdet1.
3. Necessary time until the voltage detection circuit operates when setting to 1 again after setting the VCA26 bit in the VCA2 register to 0.
4. This parameter shows the voltage detection level when the power supply drops. The voltage detection level when the power supply rises is higher than the voltage detection level when the power supply drops by approximately 0.1 V.
5. Time until the voltage monitor 1 reset is generated after the voltage passes Vdet1 when V_{CC} falls. When using the digital filter, its sampling time is added to td(Vdet1-A). When using the voltage monitor 1 reset, maintain this time until V_{CC} = 2.0 V after the voltage passes Vdet1 when the power supply falls.

Table 2.3 Voltage Detection 2 Circuit Electrical Characteristics

Symbol	Parameter	Condition	Standard			Unit
			Min.	Typ.	Max.	
V_{det2}	Voltage detection level (2)		3.3	3.6	3.9	V
$t_{d(Vdet2-A)}$	Voltage monitor 2 reset/interrupt request generation time (3, 5)		–	40	200	μs
–	Voltage detection circuit self power consumption	VCA27 = 1, V_{CC} = 5.0 V	–	0.6	–	μA
$t_{d(E-A)}$	Wait time until voltage detection circuit operation starts (4)		–	–	100	μs

NOTES:
1. The measurement condition is VCC = 2.7 to 5.5 V and Topr = -40 to 85°C (J version) / -40 to 125°C (K version).
2. Hold Vdet2 > Vdet1.
3. Time until the voltage monitor 2 reset/interrupt request is generated after the voltage passes V_{det2}.
4. Necessary time until the voltage detection circuit operates after setting to 1 again after setting the VCA27 bit in the VCA2 register to 0.
5. When using the digital filter, its sampling time is added to $t_{d(Vdet2-A)}$. When using the voltage monitor 2 reset, maintain this time until V_{CC} = 2.0 V after the voltage passes V_{det2} when the power supply falls.

3. Applicable products:
R8C/20 (J, K versions), R8C/21 (J, K versions), R8C/22 (J, K versions), R8C/23 (J, K versions), R8C/26 (J, K versions), R8C/27 (J, K versions), R8C/28 (J, K versions), and R8C/29 (J, K versions) Groups