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-RZ*-A0110A/E	Rev.	1.00
Title	RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N specification change the accuracy of Thermal Sensor Characteristics		Information Category	Technical Notification		
Applicable Product	RZ/G Series, 2nd Generation RZ/G2H RZ/G2M V1.3, V3.0 RZ/G2N	Lot No.		RZ/G Series, 2nd Generation User's Manual: Hardware Rev.1.11 (R01UH0808EJ0111)		
		All lots	Reference Document			

This technical update describes specification change of RZ/G Series, 2nd Generation product.

[Summary]

The specification change of Thermal Sensor Characteristics.

[Priority level]

Importance: "Normal"

Urgency: "Normal"

[Products]

RZ/G2H

RZ/G2M V1.3, V3.0

RZ/G2N

[Section number and title]

Section 15. Thermal Sensor/Chip Internal Voltage Monitor (THS/CIVM)

Section 73. Electrical Characteristics, 73.38 The accuracy of Thermal Sensor Characteristics

"This is empty adjustment page to compare next Current (from) and Correction (to) on facing page. "

(By using two pages view of PDF readers this enables previously and prospectively view on odd and even pages.)

[Correction]

1. Section 15. THS/CIVM, Page 15-1, 15.1.1 Features. Thermal Sensor accuracy moved to Section.73.37 Electrical Characteristics new section.

Current (from):

15.   Thermal Sensor/Chip Internal Voltage Monitor (THS/CIVM)

15.1 Overview

This LSI provides a thermal sensor module that measures the temperature (Tj) inside the LSI. The thermal sensor module also includes a chip internal voltage monitoring module that measures the supply voltage inside the LSI.

15.1.1 Features

(1) Each of the thermal sensors measures temperature Tj with an accuracy of $\pm$ 5 °C over the range of temperatures from -40°C to 115°C.

(2) RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N provide three thermal sensor modules (THS1/CIVM1, THS2/CIVM2 and THS3/CIVM3). provide two thermal sensor modules (THS1/CIVM1 and THS2/CIVM2).

(3) This module can generate interrupts when the detected temperature Tj within the LSI rises above or falls below a specified temperature.

(4) Each of the chip internal voltage monitors in the thermal sensor module measures supply voltage inside the LSI with an accuracy of $\pm$ 60mV.

(5) RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N can monitor VDD_DVFS supply voltage. RZ/G2N can monitor VDD supply voltage.

15.1.2 Block Diagram

A block diagram of the thermal sensor modules is shown in Figure 15.1 (for RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N). The thermal sensor module consists of the thermal sensors (THS), chip internal voltage monitors (CIVM) and the thermal sensor controller (TSC). THS measures Tj temperature, and CIVM measures a voltage. TSC controls THS and CIVM.

Correction (to):

15.   Thermal Sensor/Chip Internal Voltage Monitor (THS/CIVM)

15.1 Overview

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(1) RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N provide three thermal sensor modules (THS1/CIVM1, THS2/CIVM2 and THS3/CIVM3). provide two thermal sensor modules (THS1/CIVM1 and THS2/CIVM2).

(2) This module can generate interrupts when the detected temperature Tj within the LSI rises above or falls below a specified temperature.

(3) Each of the chip internal voltage monitors in the thermal sensor module measures supply voltage inside the LSI with an accuracy of $\pm$ 60mV.

(4) RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N can monitor VDD_DVFS supply voltage. RZ/G2N can monitor VDD supply voltage.

15.1.2 Block Diagram

A block diagram of the thermal sensor modules is shown in Figure 15.1 (for RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0 and RZ/G2N). The thermal sensor module consists of the thermal sensors (THS), chip internal voltage monitors (CIVM) and the thermal sensor controller (TSC). THS measures Tj temperature, and CIVM measures a voltage. TSC controls THS and CIVM.

[Description]

Delete accuracy of THS/CIVM from RZ/G Series, 2nd Generation User's Manual: Hardware.

[Reason for Correction]

Specify the accuracy of the temperature sensor before and after application of the new temperature sensor trimming method. So, remove part of accuracy description from "Section 15 THS/CIVM", and added for as "Electrical Characteristics sub-section 73.37 The accuracy of Thermal Sensor Characteristics" as new section in RZ/G Series, 2nd Generation User's Manual: Hardware.

[Correction]

2.   Section 73. Electrical Characteristics, 73.38 The accuracy of Thermal Sensor Characteristics, new section added.

Current (from):

   (None)

Correction (to):

73.38 The accuracy of Thermal Sensor Characteristics

RZ/G2H	
RZ/G2M V1.3	RZ/G2M V3.0
RZ/G2N	RZ/G2E

The accuracy of the temperature sensors of RZ/G2H, RZ/G2M V1.3, RZ/G2M V3.0, RZ/G2N varies from part number and accuracy of the temperature sensors is as follows.

Table 73.38.1 Part number and accuracy.

Products	Part number	Accuracy of the temperature sensors
RZ/G2H	R8A774E0HA01BN#U0 R8A774E0HA01BN#G0 R8A774E1HA01BN#U0 R8A774E1HA01BN#G0	5.1 to 14.9℃[*1] @Tjs = 115℃ -8.0 to -1.8℃[*1] @Tjs = -40℃
RZ/G2H	other than the above	±5℃
RZ/G2M V1.3	R8A774A0HA01BG#U2 R8A774A0HA01BG#G2 R8A774A1HA01BG#U2 R8A774A1Ha01BG#G2	4.25 to 12.35℃[*1] @Tjs = 115℃ -6.7 to -0.3℃[*1] @Tjs = -40℃
RZ/G2M V3.0	R8A774A2HA01BG#U7 R8A774A2HA01BG#G7 R8A774A3HA01BG#U7 R8A774A3HA01BG#G7	
RZ/G2M V1.3	other than the above	±5℃
RZ/G2M V3.0	other than the above	
RZ/G2N	R8A774B0HA01BG#U0 R8A774B0HA01BG#G0 R8A774B1HA01BG#U0 R8A774B1HA01BG#G0	1.8 to 9.8℃[*1] @Tjs = 115℃ -5.6 to -1.8℃[*1] @Tjs = -40℃
RZ/G2N	other than the above	±5℃

Note: Tjs means output temperature of thermal sensor.

Note.1: Accuracy ranges are reference values. Calculation examples of Tj are shown below (e.g., RZ/G2H).

When Tjs = 115℃, the temperature range of Tj is between 100.1 and 109.9℃.

(Tj = 115 -14.9 = 100.1℃, Tj = 115 - 5.1 = 109.9℃)

When Tjs = -40℃, the temperature range of Tj is between -38.2 and -32.0℃.

(Tj = -40 + 1.8 = -38.2℃ , Tj = -40 + 8.0 = -32.0℃.)

[Description]

New description 73.38 added as electrical specification.

[Reason for Correction]

Specify the accuracy of the temperature sensor before and after application of the new temperature sensor trimming method.

-    End of Document -

Specification change from Tj to Tjs due to thermal sensor(THS) issue

[Faulty behavior]

Junction temperature which shows thermal sensor(Tjs) will indicate higher temperature(Tj=115degC) than actual junction temperature(Tj) at high temperature, and lower temperature(Tj=-40degC) at low temperature.

[Root cause]

The parameter of THCODE and PTAT which are used in Tjs calculation were affected test temperature shift due to heatsink effect by probe card in mass production test. The test temperature in high temperature test is cooled than set temperature at test. And the test temperature in low temperature test is warmed up than set temperature at test.

However, Tjs calculation formular is made to be based on set temperature at test. As the result, thermal sensor shows faulty behavior.

THS （Tjs）

Actual （Tj）

Tjs

Tj

Root caseu2 :
Probe card works as the heat-sink and cools the Si wafer temperature.

To tester

Probe card

Radiation heat

Si wafer

Heat source

chuck

Root case 1 :
The heat propagate from Si wafer to probe card via probe needle.
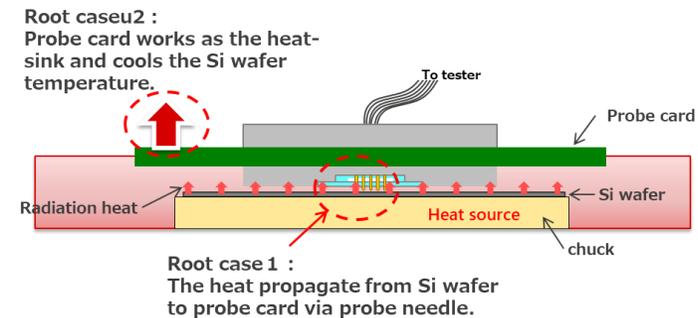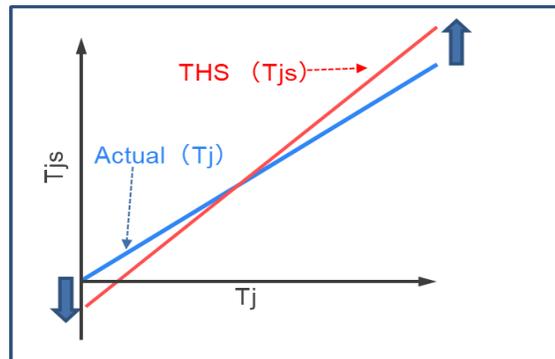
[Workaround/Limitation]

■Software Workaround
　None for software workaround.

■Limitation
　Junction temperature which shows thermal sensor(Tjs) will indicate higher temperature than actual junction temperature(Tj) at high temperature, and lower temperature at low temperature.

■Note: If you need the product that improved the accuracy of thermal sensor, contact your local sales representatives.

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