SP 800-90B Non-Proprietary Public Use Document
RSIP_TRNGG0 V2.0 Entropy Source Version 1.0
Hardware Version R-Car U5L4
Renesas Electronics Corporation

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Revision History

Version	Date	Change
V1.0	24, Apr 2025	Official release

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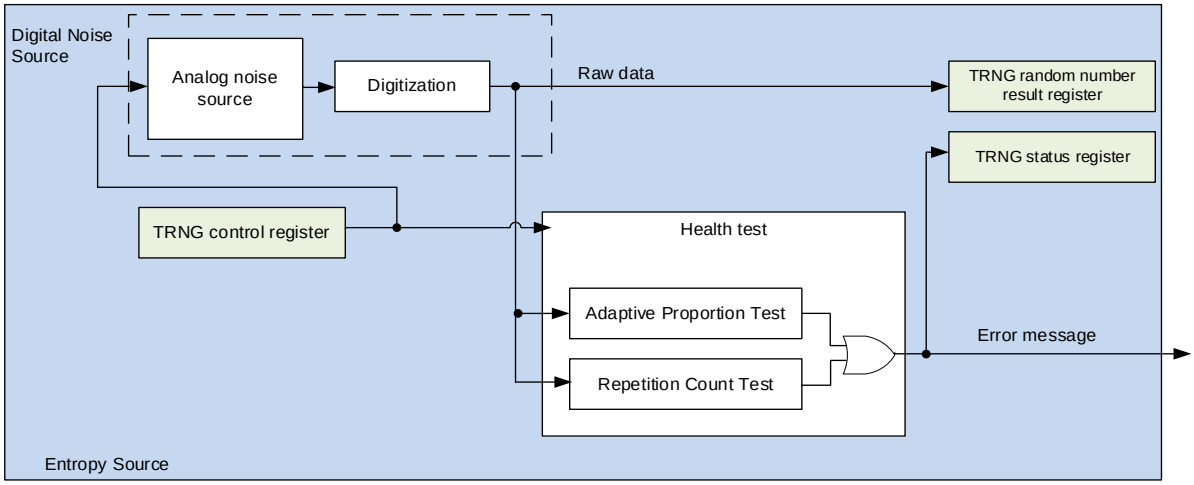
[Note: Some sections in this document may be pared down or excluded when the entropy source is validated as reuse restricted to vendor.]

1. Description

RSIP_TRNGG0 V2.0 Entropy Source Version 1.0 is a physical entropy source (entropy category: physical (P)), and the embodiment of this entropy source is a sub-chip. The operational environment is R-Car U5L4. It makes no IID claim, and thus meets all the requirements for non-IID compliance. This entropy source is certified under SP 800-90B January 2018 and FIPS 140-3 IG December 20 2024 D.J/D.K.

2. Security Boundary

TRNG structure is shown as below.



3. Operating Conditions

Operating Conditions are shown as below.

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Core supply voltage	V_{ISOVCL}		1.025	1.09	1.155	V
Junction temperature	T_j		-40		150	℃

4. Configuration Settings

Configuration Conditions are shown as below. TRNG registers should be set for TRNG to operate in SP800-90B support mode.

Item	Content
Register setting for entropy source measurement	
RSIP_TRNGG0MCR	0000_0001_H
RSIP_TRNGG0CR	2000_0003_H

5. Physical Security Mechanisms

The surface of the chip include TRNG is protected by passivation.

This chip include TRNG is sealed in package. When the chip is attacked with physical attack method, ex. probing, etc., the package should be removed to reveal the chip, and the attack trace is remained.

Therefore, this would be capable of meeting FIPS 140-3 Level 2.

6. Conceptual Interfaces

Conceptual interfaces describe in NIST SP 800-90B Section 2.3.1 is not prepared for the ESV. The I/F of R-Car U5L4 TRNG for software development is just registers which includes TRNG control register, TRNG random number result register, etc.

7. Min-Entropy Rate

H is claimed to 0.822409 bits of entropy per bit of raw noise data.

8. Health Tests

R-Car U5L4 TRNG supports Start-up health tests, Continuous health tests and On-demand health tests. Each health test includes two health tests: Adaptive Proportion test, Repetition Count test. The interruptions of TRNG health test complete and TRNG health test error detection is prepared and can be available by setting the specified bit.

If the health tests detect an error, the specified bit in the TRNG status register is set. In this case, do not read the TRNG random number result register.

9. Maintenance

TRNG does not require maintenance.

10. User Verification

Built-in Health Tests described in the Health Tests section constantly check the validity of the noise source. The test can be available by following to the operation flow described in the User's Manual.

A checklist for the module to ensure the entropy source is running properly:

1. Raw noise data through the TRNG random number result register and processed by the SP800-90B tool to obtain an entropy rate which must be near equal to or the defined min-entropy rate.
2. Obtain the restart noise data through the TRNG random number result register and processed by the SP800-90B tool.
    a. the sanity test to apply to the noise restart data must pass, and
    b. the minimum of the row-wise and column-wise entropy rate shall not be less than half of the entropy rate from 1 above.

11. Vendor Permissions and Relationship

The reuse status is "Open for reuse".

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on

   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state

   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins

   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals

   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin

   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses

   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact information

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