INSTITUTE

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Japan

Offenbach, 2024-09-24

Your ref.	Your letter	Our ref. - please indicate	Contact
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Micro controller

Translation: In any case the German version shall prevail

P R Ü F B E R I C H T
zur Information des Auftraggebers

Test Report for the Information of the applicant

Produkt / *Product*:

Typ / *Type*: **RL78/G1x/G2x/F2x**

Software Class C(R2) selfdiagnostic infrastructure

Dear Sirs,

dieser Prüfbericht enthält das Ergebnis einer einmaligen Untersuchung an dem zur Prüfung vorgelegten Erzeugnis. Ein Muster dieses Erzeugnisses wurde geprüft, um die Übereinstimmung mit den nachfolgend aufgeführten Normen bzw. Abschnitten von Normen festzustellen.
Die Prüfung wurde durchgeführt vom 2024-08-13 bis 2024-08-14.

This test report contains the result of a singular investigation carried out on the product submitted. A sample of this product was tested to found the accordance with the thereafter listed standards or clauses of standards resp. The testing was carried out from 2024-08-13 to 2024-08-14.

Der Prüfbericht berechtigt Sie nicht zur Benutzung eines Zertifizierungszeichens des VDE und berücksichtigt ausschließlich die Anforderungen der unten genannten Regelwerke.

The test report does not entitle for the use of a VDE Certification Mark and considers solely the requirements of the specifications mentioned below.

Wenn gegenüber Dritten auf diesen Prüfbericht Bezug genommen wird, muss dieser Prüfbericht in voller Länge an gleicher Stelle verfügbar gemacht werden.

Whenever reference is made to this test report towards third party, this test report shall be made available on the very spot in full length.

Self-diagnostic routines according to IEC/EN 60335-1 / 60730-1

- CPU register test
- Program counter register test
- CPU instruction set test
- ROM test
- RAM test
- Clock test

Additional tests which are not covered by IEC/EN 60335-1 / 60730-1

- Watchdog test

Details of selftests

Instruction set test

8-bit Data Transfer Instructions
MOV/XCH/ONEB/CLRB/MOVS

16-bit Data Transfer Instructions
MOVW/XCHW/ONEW/CLRW

8-bit Operation Instructions
ADD/ADDC/SUB/SUBC/AND/OR/XOR/CMP/CMP0/CMPS

16-bit Operation Instructions
ADDW/SUBW/CMPW

Multiply/Divide/Multiply & Accumulate Instructions
MULU/MULHU/MULH/DIVHU/DIVWU/MACHU/MACH

Increment/Decrement Instructions
INC/DEC/INCW/DECW

Shift Instructions
SHR/SHRW/SHL/SHLW/SAR/SARW

Rotate Instructions
ROR/ROL/RORC/ROLC/ROLWC

Bit Manipulation Instructions
MOV1/AND1/OR1/XOR1/SET1/CLR1/NOT1

Call Return Instructions
CALL/CALLT/RET
※Except for BRK/RETI/RETB

Stack Manipulation Instructions
PUSH/POP/MOVW SP, src/MOVW rp, SP/ADDW SP, #byte/SUBW SP, #byte

Unconditional Branch Instruction
BR

Conditional Branch Instructions
BC/BNC/BZ/BNZ/BH/BNH/BT/BF/BTCLR

Conditional Skip Instructions
SKC/SKNC/SKZ/SKNZ/SKH/SKNH

CPU Control Instructions
SEL RBn/NOP/EI/DI
※EI/DI is tested only at power-on
※Except for HALT/STOP

Register tests
Test using ABRAHAM algorithm for 4 banks of general-purpose registers (A,X,B,C,D,E,H,L)
Test using test pattern for control registers (PSW,SP)

Control register (PC) is tested by calling a function whose return value is the inverted result of the argument
Test using test pattern for ES,CS register

ROM Test

The built-in CRC (Cyclic Redundancy Check) module in RL78 MCU is used

Test software uses a generic CRC.
Polynomial = CRC-16-CCITT (X16 + X12 + X5 + 1)
Width = 16bit
Initial Value = 0x0000

RAM test

Test uses ABRAHAM algorithm.
Since the test is destructive, the user must save the contents of the target area.

Execute the test for each block.

Clock test

Timer array unit channel 5 input
Channel 5 timer input (TI05)
Low-speed on-chip oscillator clock (fIL)

For the allowable frequency range of the target clock

MAX=(High-speed on-chip oscillator clock x (101%))/(Low-speed on-chip oscillator clock x (85%)
MIN=(High-speed on-chip oscillator clock x (99%)) / (Low-speed on-chip oscillator clock x (115%)

Watchdog timer test

MCU's built-in Watchdog Timer (WDT) module is used.

Refresh WDT up counter within the set time after setting and starting WDT.

If the up counter is not refreshed within the set time, an overflow is occurred.

Moreover, if the window function is enabled and WDT up counter is not refreshed within the set window, a refresh error is occurred

Items	Value	Contents
Interval interrupt of WDT	0b	Interval interrupt is not used
Window open period of WDT	01b	50%
WDT operation control	1b	Counting started after reset
Overflow time of WDT	100b	2^12/fIL（108.69 ms）
WDT stop control	1b	Counter operation enabled in HALT/STOP mode

I BESCHREIBUNG / *DESCRIPTION*

Produkt / *Product:*	Selbst-Diagnose-Routinen für Micro-Controller Familie *Self-Diagnostic Routines for Micro Controller Family*
Typ / *Type:*	RL78/G1x/G2x/F2x (Class C).
Manufacturer	Renesas Electronics Corporation / 5-20-1 Josuihon-cho / KODAIRA-SHI, TOKYO 187-8

II NORMEN / *STANDARDS*

Prüfnorm(en) / *Standard(s) used*:

DIN EN 60730-1 (VDE 0631-1):2021-06; EN 60730-1:2016+A1:2019
EN 60730-1:2016/A2:2022
IEC 60730-1:2013
IEC 60730-1:2013/AMD1:2015 IEC 60730-1:2013/AMD2:2020
Annex H for Class C

DIN EN 60335-1 (VDE 0700-1):2020-08;
EN 60335-1:2012+AC+A11+A13+A1+A2+A14:2019
EN 60335-1:2012/A15:2021 + A16:2013.
IEC 60335-1:2010
IEC 60335-1:2010/AMD1:2013 IEC 60335-1:2010/AMD2:2016
Annex R for class R2

III PRÜFUNG / *TEST*

Die unter I benannten Selbst-Diagnose-Routinen sind vorgesehen für folgende Maßnahmen nach Tabelle R.2 / H.2 der unter II benannten Normen. /

The self-diagnostic routines mentioned under I are foreseen for following measures of table R.2 / H.2 of the standards mentioned under II.

Zu Details der Prüfungen siehe VDE-Prüfbericht : 320996-TL2-1

For details of testing see VDE Test Report:

IV ERGEBNIS / *RESULT*

Die unter I benannten Selbst-Diagnose-Routinen erfüllen die Anforderungen der unter II benannten Normen. Die unter I benannten Selbst-Diagnose-Routinen können zum Aufbau einer Selbst-Test-Bibliothek gemäß der unter II benannten Normen verwendet werden. /

The self-diagnostic routines mentioned under I fulfill the requirements of the standards mentioned under II. The self-diagnostic routines mentioned under I are suitable to be used to create a self-test library according the standards mentioned under II.

V DATEILISTE / *FILE LIST*

File name	SW version	MD5 Checksum
stl_RL78_hw_clocktest.asm	1.00	3d2c654094b593fea3d21b1b8c4c3838
stl_RL78_hw_clocktest.inc	1.00	2df410fba3c069b660237e62f8b42777
stl.h	1.00	ba6519735c45ed67b2bdc239b9e7a657
stl_RL78_TestConfig.inc	1.00	834c09f1f1e05e6e82a76e585ad49909
stl_RL78_InstructionTest.asm	1.00	6b9352adfc2f7271722895dcdd82ed35
stl_RL78_InstructionTest.inc	1.00	f8be4585c00276dfa92eed9f25e1b57d
stl_RL78_RegisterTest.asm	1.00	33b338986a214c84267d90c32c1e48a3
stl_RL78_Registertest_cs.asm	1.00	52d889ed2d4fce02097dc4192e98a6b0
stl_RL78_Registertest_es.asm	1.00	8fdd19a5738a53b06d357613bfd9466b
stl_RL78_Registertest_pc.asm	1.00	86e1730fa25b5d08e6afc5b8dbf51a30
stl_RL78_Registertest_psw.asm	1.00	2278e183a03480f0f6c543eccbbba8f8
stl_RL78_Registertest_stack.asm	1.00	05c6c7fad99eaab53ce2aa62ac03e273
stl_RL78_InitialRam.asm	1.00	0b39f115c0c0ec3bc41aef04896c6a40
stl_RL78_Ram.asm	1.00	e276e8ac475422df7e5dc6f77c33cac8
stl_RL78_peripheral_crc.asm	1.00	7c62c66b5cc8f6bcd058a60f6ed2068a

Best regards

VDE Testing- and Certification Institute

Ralf Schwab ……..

Korkut Tas ……