FemtoClock3 (FC3) EEPROM Programming

This document describes the connections for the EEPROM hardware, instructions on programming the EEPROM with the FC3 devices, and a list of recommended EEPROM vendors.

Contents

1. EEPROM Overview

The FC3 product line is primarily designed to utilize internal resources for initialization and operation. However, there are scenarios where integrating an external I^2C serial EEPROM is beneficial or required to access alternative configurations during device resets.

The device can load a configuration automatically from internal one-time programmable (OTP) memory. These configurations can be assigned (by a dash code number) differently for configuration(s) or tailored to specific customers. Alternatively, after reset, the I^2C master interface can automatically load a configuration from an external EEPROM.

The device will poll the I^2C bus for the EEPROM at power-up only if the OTP is configured to look for an EEPROM. The FC3 devices then become the I^2C bus master to perform this polling. This is optional (configured in OTP) as it may require the bus to be temporarily isolated to allow the FC3 to be a temporary bus master, then switch the I^2C bus over to slave mode.

The load time could vary on the size, EEPROM speed, and number of configurations loading from the EEPROM. The EEPROM load time is between 450ms–550ms to transfer a ~4KB payload.

FC3 devices have different status and event bits that enable checking of the OTP/EEPROM load status. Use "**TOP.GLOBAL.DEVICE_STS.eeprom_config_valid_sts**" to confirm if the loading is successful. However, there is no specific indicator for load failure.

For more information on saving or programming the EEPROM image using the evaluation board, refer to the RC22308A/RC32308A Evaluation Board Manual and RICBox GUI Software for FemtoClock3 User Guide.

2. Hardware Setup

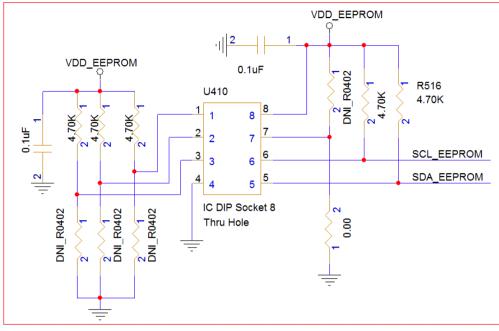Figure 1 shows an example of an EEPROM schematic.

Figure 1. EEPROM Schematic Example

The EEPROM device requires an 8-bit device address word following a start condition to enable the chip for a read or a write operation. The device address word consists of a 4-bit device code, 3-bit device address code and 1-bit read/write(R/W) code. Figure 2 illustrate the device address word decode:

	Device address word (8-bit)							
	Device code (fixed)				Device address code			R/W code*[1]
64k	1	0	1	0	A2	A1	A0	R/W
Note: 1. R/W="1" is read and R/W = "0" is write.								

Figure 2. R1EX24064ASAS0G Slave Address Word

R1EX24064ASAS0G address decode reference for Figure 2:

Device (U410) Slave Address: 1010A2A1A0 -> 1010111 -> 0x57

The symbol labeled as U410 in the Figure 1 schematic represents an EEPROM DIP socket footprint that is compatible with most 8-pin EEPROMs. Connect the SCL and SDA traces to the master I²C port of the FC3 device (SCK_SCK and SDA_SDIO).

3. Dash Code vs EEPROM Address Selection

Each EEPROM configuration in the addendum that uses EEPROM loading have a dedicated EEPROM address. To select the EEPROM address accordingly, select the configuration by selecting GPIO0 and GPIO1 and the EEPROM's pins 1-3 (A0, A1, and A2).

Table 1 details the available dash code versus EEPROM address selection. The options for pull-up or pull-down of A0, A1, and A2 facilitate the configuration of the EEPROM address.

Table 1. Dash Code vs EEPROM Address Selection

Device	Dash Code	Configuration	GPIO for Configuration Selection	EEPROM Address	EEPROM Part Number
RCx2308A001	001	Config 0	00	0x51	R1EX24064ASA/ CAT24M01/ BR24G1M-3A
		Config 1	01	0x52	
		Config 2	10	0x53	
		Config 3	11	0x57	
RC32308A001	001	Config 0	00	0x51	
		Config 1	01	0x52	
		Config 2	10	0x53	
		Config 3	11	0x57	
RC22312A002	002	Config 2	10	0x50	
		Config 3	11	0x50	
RC32312A001	001	Config 2	00	0x50	
		Config 3	11	0x50	
RC32312A002	002	Config 0	00	0x51	
		Config 1	01	0x52	
		Config 2	10	0x53	
		Config 3	11	0x57	
RC22312A003	003	Config 2	10	0x50	
		Config 3	11	0x50	
RC32312A004	004	Config 1	10	0x50	
		Config 3	11	0x50	

4. EEPROM Vendor Recommendations

Table 2 shows recommended EEPROM vendors and part numbers according to industry standards.

Note: This table highlights parts that have proven compatibility with the FC3 family of devices and is not a complete list of recommended vendors.

Table 2. Vendor Part Number Package Comments

Vendor Part Number	Vendor Name	Package Information	Comments
R1EX24064ASAS0I#S0	Renesas	SOP (8)	Datasheet
R1EX24064ATAS0I#S0	Renesas	TSSOP (8)	Datasheet
CAT24M01	On Semiconductor	-	A0 is not connected
BR24G1M-3A	Rohm	-	A0 is "don't use"

5.   Revision History

Revision	Date	Description
1.01	May 20, 2024	Updated Table 2.
1.00	May 10, 2023	Initial release.

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