TN1259
Technical note

Power-on reset characterization for Serial EEPROMs

Introduction

This document describes the tests performed for the characterization of Power-on reset (POR) in Electrically Erasable Programmable Read-Only Memories with serial access (Serial EEPROMs).

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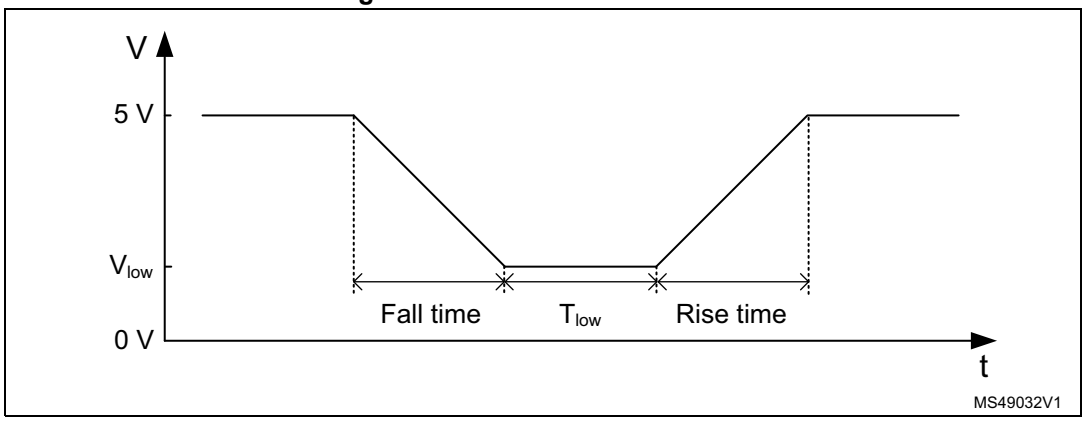
1 Parameters

The Reset characterization is carried out varying the following parameters on POR test flow:

- V_{CC}: voltage value applied to the Serial EEPROM
- V_{low}: supply voltage value when V_{CC} is not active
- T_{rise}: linear V_{CC} rise time (from V_{low} to V_{CC})
- T_{fall}: linear V_{CC} fall time (from V_{CC} to V_{low})
- T_{low}: time during which V_{CC} is equal to V_{low}

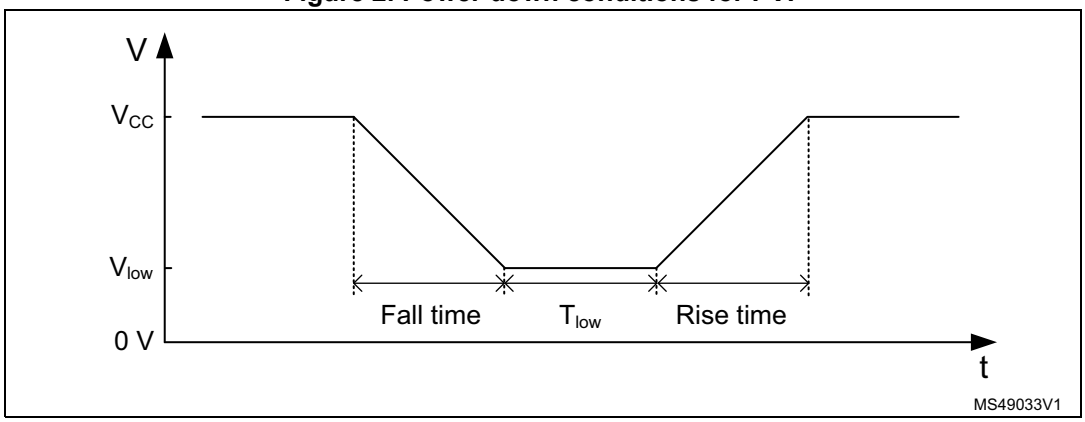
Figure 1. Power down conditions



The Reset characterization is carried out varying the following parameters on PVF (Product Validation Flow) test flow:

- V_{CC}: voltage value applied to the Serial EEPROM
- V_{low}: supply voltage value when V_{CC} is not active
- T_{rise}: 40 µs / V (from V_{low} to V_{CC})
- T_{fall}: 80 µs / V (from V_{CC} to V_{low})
- T_{low}: time during which V_{CC} is equal to V_{low} = 1 ms

Figure 2. Power down conditions for PVF



2 Internal target for the POR

The POR for any Serial EEPROM manufactured by STMicroelectronics should accept:

- $V_{low} \geq 1.0$ V
- $T_{rise} \geq 1$ µs
- $T_{fall} \geq 1$ µs
- $T_{low} \geq 1$ µs

3 Methodology

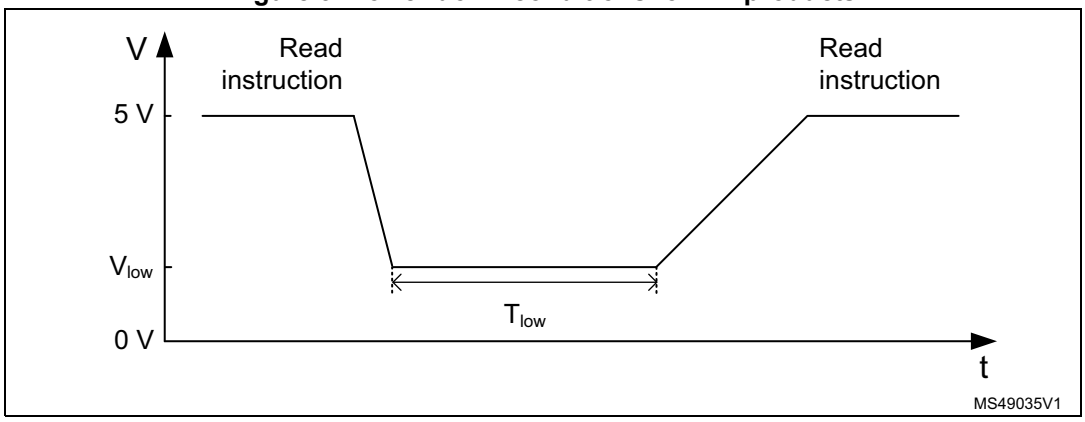
The Reset function has to be characterized when the EEPROM is in standby mode (unselected).

3.1 I²C products

Initial condition is all bits in the memory at the same value (e.g. all FFh), except [Address 00] = 55h and [Address 01] = AAh

1. During V_{CC}, transmit a Read at some address which does NOT use the same column and the same row than address 00h.
2. Right after the STOP ending the Read (the EEPROM is in Stby mode)
   a) drive V_{CC} line to V_{low}, wait T_{low}, then high to V_{CC} (see *Figure 3*)
3. Back to V_{CC}
   a) transmit Current Read and check that the addressed location content is 55h (this checks that the Address Pointer is reset to 0 by the POR pulse)
   b) transmit Current Read and check that the first addressed location content is AAh (this checks that the STOP of the previous instruction has not triggered an undesired Write if the Write logic was not properly reset by the POR pulse)
4. Go to *1*

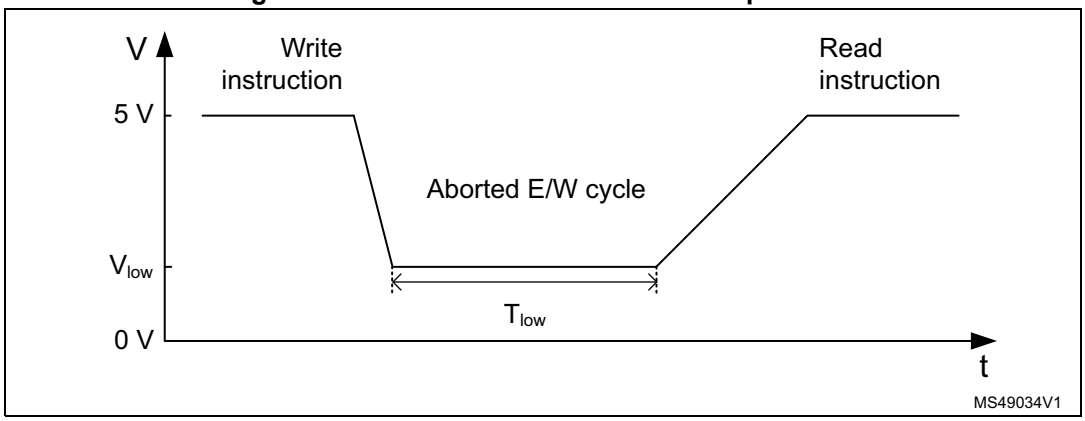
Figure 3. Power down conditions for I²C products



3.2 SPI products

1. During V_{CC}, transmit a WREN. Then, drive $\overline{S}$ high (de-select): the EEPROM is in stby mode.
2. Right after this:
   a) drive V_{CC} line to V_{low}, wait T_{low}, then high to V_{CC} (see *Figure 4*) with $\overline{S} = V_{CC}$
3. Back to V_{CC}: transmit RDSR instruction and check that WEL bit is reset to 0 (this checks that the logic is reset by the POR pulse)
4. Go to *1*

Figure 4. Power down conditions for SPI products



4 Measurement conditions

The device is not selected when T_{fall}, T_{rise}, V_{low}, and T_{low} are varying

- M95xxx: Chip Select pin $\overline{S}$ = V_{CC}
- M24xxx: STOP condition

5 Values

Table 1. POR flow conditions: 4.5 / 5.5 V, ranges “5V”3, “5V”4, “5V”8

Parameter	Conditions		Number of measurements
T	-40 °C, 25 °C, 90 °C, 110 °C or 130 °C or 150 °C for automotive		4(1)
V_{CC}	5.0 V		1
T_{fall}	20 ms / V < T_{fall} < 500 ns / V	3 measurements per decade (1, 2 and 5)	15
T_{low}	50us <T_{low} < 100ms	3 measurements per decade (1, 2 and 5)	11
V_{low}	0 to 3.5 V	50 mV steps	71
T_{rise}	100 ms / V <T_{rise} < 500 ns / V	3 measurements per decade (1, 2 and 5)	17
Total number of measurements			796620

1. Characterization should start with T = -41 °C (as this is assumed to be the worst case).

Table 2. PVF flow conditions: ranges “5V”3, “5V”4, “5V”8

Parameter	Conditions		Number of measurements
T	-50 °C, -40 °C, -20 °C, 0 °C, 25 °C, 70 °C, 90 °C, 110 °C, 130 °C and 150 °C		10
V_{CC}	0.0 to 7.0 V, with 100 mV steps		71
T_{fall}	80 µs / V	1 condition	1
T_{low}	1 ms	1 condition	1
V_{low}	0 to 4.0 V	100 mV steps	41
T_{rise}	40 µs / V	1 condition	1
Total number of measurements			29110

6 Revision history

Table 3. Document revision history

Date	Revision	Changes
11-Dec-2017	1	Initial release.

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