
Page Program Time for Winbond Serial NOR Flash Memory

Introduction

This application note explains how programming time may be reduced with Winbond Serial NOR Flash in the production line under certain conditions.

Skip the Chip Erase

Winbond SpiFlash has confirmed that all the parts are in the blank state before the shipment, therefore the user doesn't need to erase the chip prior to programming. If the user wants to confirm the erase state, it is recommended to use the blank check command

The Page Program Time (tPP)

- tPP typical : Most of pages take typical tPP of the spec under the nominal conditions like 1.8V/3V (by Vcc range) and room temperature.
- tPP maximum : tPP maximum values are reflected by endurance because cell degradation may happens with P/E cycling.

The Efficiency of Data Input

- tPP only represents the page programming time. It doesn't include time to input the instruction, address and data thus, faster clock frequency will reduce the overall programming time due to faster input.
- Full 1 page program time calculation by frequency.

Frequency	5MHz	10MHz	100MHz
Data Input Time	2080x0.2us=416us	2080x0.1us=208us	2080x0.01us=20.8us
tPP (typ)	0.4ms	0.4ms	0.4ms
Total Time	0.816ms	0.608ms	0.421ms

Note:

1. tPP is based on the typical spec in W25QXXEW Datasheet.
2. 2080 = 2048 bits per page + 8 of instruction + 24 of address.

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- It is strongly recommended to perform full page programming. Otherwise, the offset time like internal regulation time will increase the programming time.

Code Size	Programming Size	with 10MHz	Total Time
1MB(8Mbit)	1 Byte	48x0.1us=4.8us(data input) tBP1 = 15uS, 19.8uS per byte 19.8us x 2048 = 40.55ms per page	40.55ms x 4096 (8Mb) pages = 166sec
	256 Bytes	2080x0.1us = 208us(data input) tPP = 400us, 608us per page	608us x 4096 = 2.5sec

Note:

1. The programming time calculation is not including the offset time by RD/BY polling latency, so the polling latency has to be minimized.

Conclusion

It is recommended to skip the chip erase if the device is fresh from the factory and use the fastest frequency possible while ensuring signal integrity. Full page programming is strongly recommended to minimize the overhead.

Revision History

Version	Date	Page	Description
1.0	03/30/2017	NA	Original

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