AN1159
APPLICATION NOTE

Tips to Reduce Progam and Erase Times

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INTRODUCTION

There are several ways to minimize the time it takes to program or erase an M29 series Flash Memory from STMicroelectronics. These techniques are applicable to both in-system memories and Flash Programmers. If programming or erasing times are a concern to you then you should consider some of the options in this Application Note.

USING X8/X16 MEMORIES TO REDUCE THE PROGRAMMING TIME

Memories that support both 8-bit and 16-bit Data Bus widths (such as the M29F400BB) take the same time to program one byte as they do to program one word. When used in 16-bit mode they can therefore program words twice as quickly as they can in 8-bit mode. STMicroelectronics provides internal charge pumps for the full 16-bit program operation. During 8-bit operations only half of the charge pumps can be used.

If you are choosing a part for a new design and you want to have the fastest in-system program time then you should choose an STMicroelectronics M29 series Flash that supports 16-bit operation. This will halve the time it takes to program each word compared to 8-bit parts.

If you have a Flash Programmer that supports 16-bit mode then ensure that it is set to use the 16-bit mode.

USING THE UNLOCK BYPASS PROGRAM COMMAND TO REDUCE THE PROGRAMMING TIME

All new M29 series Flash memories from STMicroelectronics (revision 'B' and above) support the Unlock Bypass Program command. When programming large amounts of data into a Flash the Unlock Bypass Program command can reduce the number of write cycles required to issue the program commands. For in-system operation where the access time is generally much faster than the programming time the Unlock Bypass Program command does not offer very much increase in speed, typically about 1%. Some Flash Programmers, however, have long access times (as a consequence of having to support many different pin-outs) and here large savings can be made by programming using the Unlock Bypass Program command. In such cases using the Unlock Bypass Program command can reduce the programming time by 20% or more.

REDUCING ERASE TIMES

Often Erase operations precede Program operations, so it is important to ensure that these happen as quickly as possible. Reducing the Erase time is simple with M29 series Flash.

Separate charge pumps are provided for each block in M29 series Flash from STMicroelectronics, so erasing two blocks does not take twice as long as erasing one block. (Erasing two blocks still takes longer than erasing one block however). To benefit from the parallel erase it is important to issue all the blocks you want to erase with one Block Erase command. The Chip Erase command also erases the blocks in parallel and so can be used to erase the whole memory.

Erase commands perform two operations, first they individually program each word to 0000h, then they use tunnelling to set all bits to '1' at the same time. Some applications of Flash divide the Blocks into smaller Partitions. When the data in a Partition is changed the data is copied (with the changes) to an erased, spare Partition and the old Partition is marked as "dirty". Occasionally it is necessary to tidy up the Partitions and erase a Block. If the algorithm programs 0000h over the data in the dirty Partitions then, when the Block is erased, 50% of the erase time or more can be saved.

CONCLUSION

By choosing the best Program or Erase technique savings of between 20% and 50% can be made to Program and Erase Commands. Many of these involve simple changes to the software and carry no additional burden for the CPU. Be sure to incorporate them in your current and future designs!

If you have any questions or suggestion concerning the matters raised in this document please send them to the following electronic mail address:

ask.memory@st.com (for general enquiries)

Please remember to include your name, company, location, telephone number and fax number.