AN1162
APPLICATION NOTE

Power Consumption Comparison between 3V M29 Series Flash Memories

Many products that use Flash memories are battery powered and, therefore, they are sensitive to the power consumption of each and every electronic part. The analysis of the power consumed by a Flash memory requires knowledge of how often the memory is read because the Read Current is significantly different to the Standby Current. Choosing the Flash memory with the lowest overall power consumption is dependent on how the application uses the memory.

Flash memories from STMicroelectronics have very low Read Currents whereas AMD and Fujitsu tend to have lower Standby Currents. Table 1 gives the maximum values for equivalent parts from each supplier.

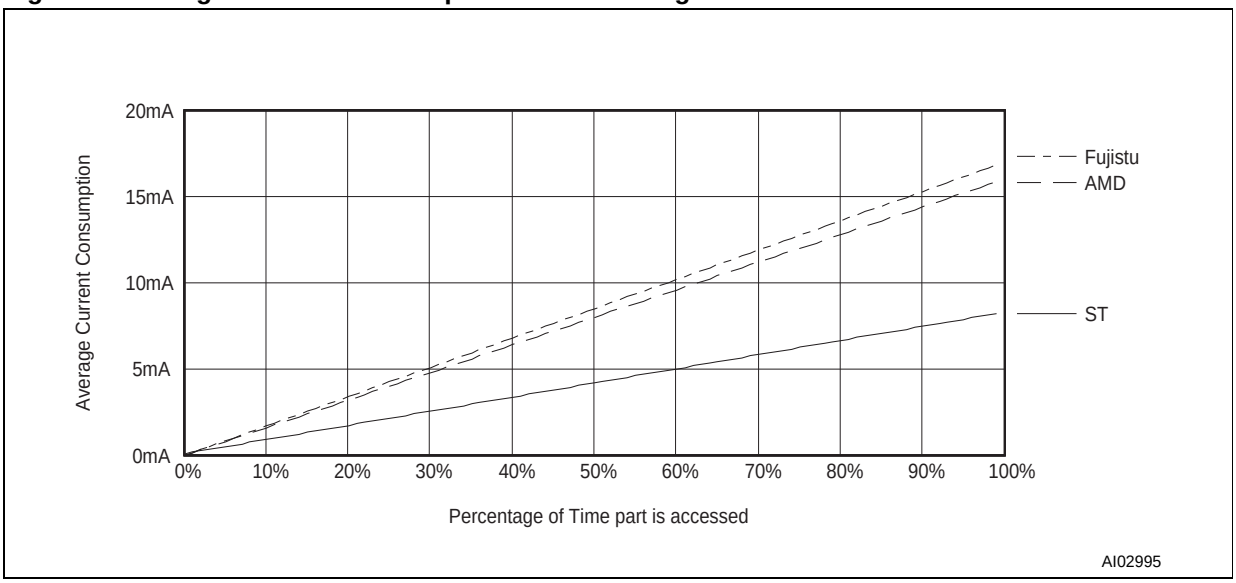
Table 1. Standby and Read Current Supply Requirements

Manufacturer	Part	Standby Current (max)	Read Current at 5MHz (max)
ST	M29W160B	100µA	8mA
AMD	Am29LV160B	5µA	16mA
Fujitsu	MBM29LV160	5µA	17mA

The figures show that the Standby Current is very much lower than the Read Current in all cases, by two or more orders of magnitude. It also appears, on first glance, that the STMicroelectronics part is going to use more power than the other two because the Standby Current is twenty times larger but the Read Current is only half. For many applications though it is the Read Current that is significant; not much of the time needs to be spent reading the memory before a considerable power saving can be made with the STMicroelectronics part.

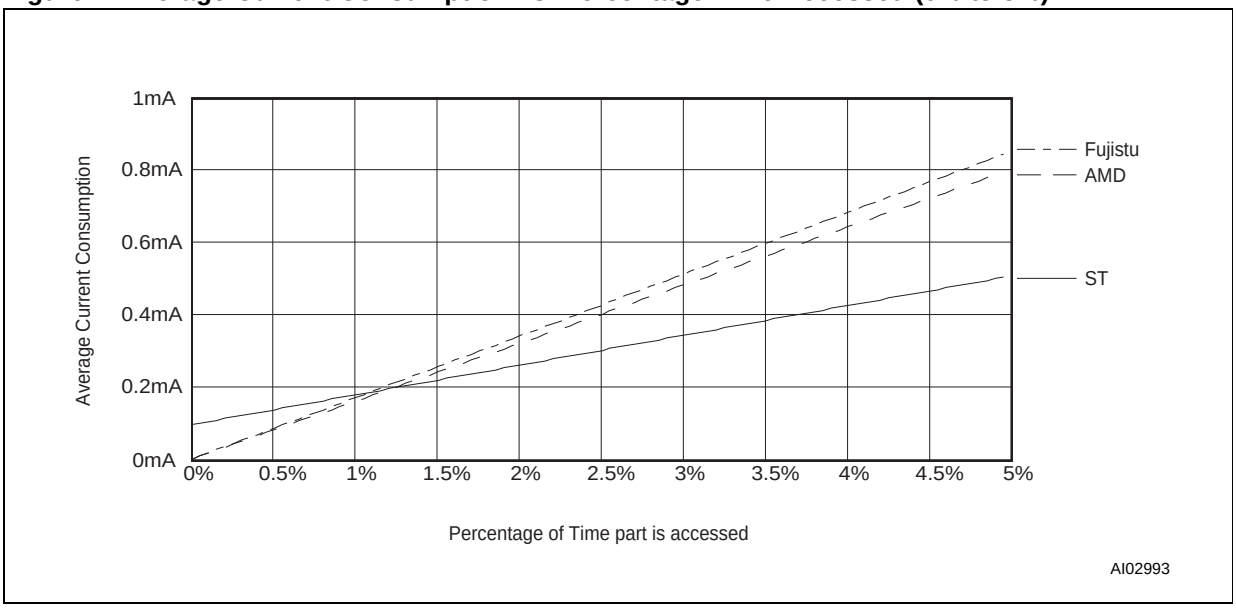
The current consumption of each memory over a period of time depends on how many times it is accessed. A memory that is accessed 0% of the time will always consume the Standby Current whereas one that is accessed 100% of the time (at 5MHz) will always consume the Read Current. Figure 1 shows a plot of the current consumption vs. the percentage of time that the part is accessed.

Figure 1. Average Current Consumption vs. Percentage Time Accessed



Because the Read Current is so much larger than the Standby Current the M29W160B clearly has a lower average current consumption than the Am29LV160B and MBM29LV160 even when the Flash is hardly used. Clearly there must be a transition point where the consumption of the M29W160B starts to use more than the other two. Figure 2 shows the region from 0% to 5%, the transition appears at just over 1%.

Figure 2. Average Current Consumption vs. Percentage Time Accessed (0% to 5%)



In conclusion, the designer who wants to minimize the power consumption of Flash memories will need to look deeper than the Standby Current. Care should be taken to consider the Read Current, particularly in applications where the microprocessor reads look-up tables from the Flash memory (e.g. µLaw and CELP encoding/decoding for voice compression, sine wave tables for DTMF tone generation etc.) or is regularly accessing the memory. Applications where the code is run directly from the microprocessor will only ever consume the Standby Current when the microprocessor is idle.

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

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