Application Note AN404-A1

# Dialog 1Mbit Products Overview

May 2021

# Contents

# 1 Revision History

| Version | Date | Description |
|---------|--------|-----------------|
| A1 | 5/2021 | Initial release |
| | | |
| | | |

## 2 Dialog 1Mbit Products Overview

This document describes 1Mbit products available from Dialog Serial Flash Memory family.

The AT25EU0011A is a low power low energy memory. It incorporates features geared towards energy savings such as page erase, low power read, low power erase and low power program. Finally it has a very fast erase of 8ms typical from page erase to full chip erase.

The AT25EU0011A is ideal for battery powered system, because batteries have finite energy stored in them. The fast erase times and low erase and program power enables lowest energy usage to be achieved.

This document compares the differences between the 1Mbit products in more detail.

Table 1: 1Mbit Products Overview

| Family | Part Number | Product Status | Nominal System Voltage | SPI Support |
|--------|-------------|----------------|------------------------|-------------|
| DF | AT25DF011 | Mass Production | 1.65V to 3.6V | Single/Dual |
| DN | AT25DN011 | Mass Production | 2.3V to 3.6V | Single/Dual |
| XE | AT25XE011 | Mass Production | 1.65V to 3.6V | Single/Dual |
| EU | AT25EU0011A | Sampling | 1.65V to 3.6V | Single/Dual/Quad |

# 3 Feature Comparison

Table 2 describes major feature differences between the 1Mbit products.

Table 2: 1Mbit Products Feature Comparison

| | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|
| Total Memory (Bits) | 1Mbit | 1Mbit | 1Mbit | 1Mbit |
| Total Memory (Bytes) | 128KB | 128KB | 128KB | 128KB |
| Total 64KB block # | 2 | 2 | 2 | 2 |
| Total 32KB block # | 4 | 4 | 4 | 4 |
| Total 4KB sector # | 32 | 32 | 32 | 32 |
| Page Size (Bytes) | 256 | 256 | 256 | 256 |
| Total Page # | 512 | 512 | 512 | 512 |
| Erase Block Size | 64KB / 32KB | 64KB / 32KB | 64KB / 32KB | 64KB / 32KB |
| Erase Sector Size | 4KB | 4KB | 4KB | 4KB |
| Erase Page Size | 256 byte | 256 byte | 256 byte | 256 byte |
| OTP Organization | 2 x 64 byte | 2 x 64 byte | 2 x 64 byte | 3 x 512 byte |
| UID Register Size | No | No | No | 128 bit |
| SFDP Table | No | No | No | Yes |
| Active Interrupt | Yes | Yes | Yes | Yes |
| Single SPI (1-1-1) 03/0B | Yes | Yes | Yes | Yes |
| Dual Read (1-1-2) 3B | Yes | Yes | Yes | Yes |
| Dual I/O (1-2-2) BB | No | No | No | Yes |
| Quad Read (1-1-4) 6B | No | No | No | Yes |
| Quad I/O (1-4-4, 0-4-4) EB [XiP] | No | No | No | Yes |
| JEDEC Hardware Reset | No | No | No | Yes |
| Operating Voltage Range (V) | 1.65 – 3.6 | 2.3 – 3.6 | 1.65 – 3.6 | 1.65 – 3.6 |
| Operating Temperature | -40 to 85 | -40 to 85 | -40 to 85 | -40 to 85 |
| Endurance (1) | 100K | 100K | 100K | 10K |
| Data Retention | 20yr | 20yr | 20yr | 20yr |

Tested per JEDEC47 Non-Volatile Memory Cycling Endurance Standard

# 4 Command Set (Opcode) Comparison

Table 3 shows the comparisons in Command Set or Opcode for all 1Mbit products.

Table 3: 1Mbit Products Command Set Comparison

| | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|
| **System Commands** | | | | |
| Enable Reset | | | | 66h |
| Reset Device | F0h | F0h | F0h | 99h |
| Deep Power-down | B9h | B9h | B9h | B9h |
| Release/Resume from Deep Power-down | ABh | ABh | ABh | ABh |
| Ultra-Deep Power-down | 79h | 79h | 79h | |
| Active Status Interrupt | | | | 25h |
| **Read Commands** | | | | |
| Normal Read Data | 03h | 03h | 03h | 03h |
| Fast Read | 0Bh | 0Bh | 0Bh | 0Bh |
| Dual Output Fast Read | 3Bh | 3Bh | 3Bh | 3Bh |
| Dual I/O Fast Read | | | | BBh |
| Quad Output Fast Read | | | | 6Bh |
| Quad I/O Fast Read | | | | EBh |
| Quad I/O Fast Read (Continuous Mode) | | | | EBh |
| Set Burst with Wrap | | | | 77h |
| **Write Commands** | | | | |
| Write Enable | 06h | 06h | 06h | 06h |
| Volatile Status Reg Write Enable | | | | 50h |
| Write Disable | 04h | 04h | 04h | 04h |
| **Program Commands** | | | | |
| Page Program | 02h | 02h | 02h | 02h |
| **Erase Commands** | | | | |
| Page Erase (256B) | 81h | 81h | 81h | 81h/DBh |
| Sector Erase (4KB) | 20h | 20h | 20h | 20h |
| Block Erase (32KB) | 52h | 52h | 52h | 52h |
| Block Erase (64KB) | D8h | D8h | D8h | D8h |
| Chip Erase | C7h/60h/62h | C7h/60h/62h | C7h/60h/62h | C7h/60h |
| **Security Commands** | | | | |
| Program OTP Security Register | 9Bh | 9Bh | 9Bh | 42h |
| Erase OTP Security Register | | | | 44h |
| Read OTP Security Register | 77h | 77h | 77h | 48h |
| **Suspend/Resume Commands** | | | | |
| Program/Erase Suspend | | | | 75h |
| Program/Erase Resume | | | | 7Ah |
| **Status Register Commands** | | | | |

| | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|
| Read Status Register 1 | 05h | 05h | 05h | 05h |
| Read Status Register 2 | | | | 35h |
| Read Status Register 3 | | | | 15h |
| Write Status Register 1 | 01h | 01h | 01h | 01h |
| Write Status Register 2 | 31h | 31h | 31h | 31h |
| Write Status Register 3 | | | | 11h |
| *Device ID Information* | | | | |
| Resume from DPD and read ID | | | | ABh |
| Manuf/Device ID | | | | 90h |
| Manuf/Device ID Dual I/O | | | | 92h |
| Manuf/Device ID Quad I/O | | | | 94h |
| Read JEDEC ID | 9Fh | 9Fh | 9Fh | 9Fh |
| Read Serial Flash Discoverable Parameter | | | | 5Ah |
| *OTP Commands* | | | | |
| Erase Security Registers | | | | 44h |
| Program Security Registers | | | | 42h |
| Read Security Registers/Unique ID | | | | 48h |
| Read Unique ID number | | | | 4Bh |

# 5    Device ID Comparison

All 2Mbit products have a different device ID to allow identification by the host system.

Table 4: 2Mbit Products Device ID Comparison

| | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|
| *Device ID commands* | | | | |
| Release Power-down / Read ID [ABh] | | | | 10h |
| Manufacturer and Device ID Single I/O [90h] | | | | 1Fh, 10h |
| Manufacturer and Device ID Dual I/O [92h] | | | | 1Fh, 10h |
| Manufacturer and Device ID Quad I/O [94h] | | | | 1Fh, 10h |
| Read JEDEC ID [9Fh] | 1Fh, 42h, 00h | 1Fh, 42h, 00h | 1Fh, 42h, 00h | 1Fh, 10h, 01h |
| Read SFDP [5Ah] | No | No | No | Yes |

# 6 Status Register Comparison

Table 5 shows the comparisons in Status Register definitions and access method for all 1Mbit products.

Table 5: 1Mbit Products Status Register Comparison

|  | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|
| Read Status Register 1 | 05h | 05h | 05h | 05h |
| Read Status Register 2 | 05h | 05h | 05h | 35h |
| Read Status Register 3 |  |  |  | 15h |
| Write Status Register 1 | 01h | 01h | 01h | 01h |
| Write Status Register 2 | 31h | 31h | 31h | 31h |
| Write Status Register 3 |  |  |  | 11h |

Table 6: 1Mbit Products Status Register Bit Level Comparison

|  |  | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|---|
| Status Register 1 | 0 | RDY/BSY | RDY/BSY | RDY/BSY | RDY/BSY |
|  | 1 | WEL | WEL | WEL | WEL |
|  | 2 | BP0 | BP0 | BP0 | BP0 |
|  | 3 | Reserved | Reserved | Reserved | BP1 |
|  | 4 | WPP | WPP | WPP | BP2 |
|  | 5 | EPE | EPE | EPE | BP3 |
|  | 6 | Reserved | Reserved | Reserved | BP4 |
|  | 7 | BPL | BPL | BPL | SRP0 |
| Status Register 2 | 0 | RDY/BSY | RDY/BSY | RDY/BSY | SRP1 |
|  | 1 | Reserved | Reserved | Reserved | QE |
|  | 2 | Reserved | Reserved | Reserved | Reserved |
|  | 3 | Reserved | Reserved | Reserved | LB1 |
|  | 4 | RSTE | RSTE | RSTE | LB2 |
|  | 5 | Reserved | Reserved | Reserved | LB3 |
|  | 6 | Reserved | Reserved | Reserved | CMP |
|  | 7 | Reserved | Reserved | Reserved | SUS |
| Status Register 3 | 0 |  |  |  | Reserved |
|  | 1 |  |  |  | Reserved |
|  | 2 |  |  |  | Reserved |
|  | 3 |  |  |  | Reserved |
|  | 4 |  |  |  | Reserved |
|  | 5 |  |  |  | Reserved |
|  | 6 |  |  |  | Reserved |
|  | 7 |  |  |  | HOLD/RST |

# 7 SFDP Table Comparison

The AT25EU0011A contains an SFDP (Serial Flash Discoverable Parameters) table. Contact Dialog for detailed SFDP table documents.

# 8  Packaging Options

Table 7 provides the current packaging options available for all 1Mbit products. Contact Dialog for questions regarding packaging options.

Table 7: 1Mbit Products Packaging Options

|  | AT25DF011 | AT25DN011 | AT25XE011 | AT25EU0011A |
|---|---|---|---|---|
| 8-pin SOIC (0.150" narrow body) | Yes | Yes | Yes | Yes |
| 8-pad 2 x 3 mm UDFN | Yes | Yes | Yes | Yes |
| 8-pin TSSOP | Yes | Yes | Yes |  |
| 8-ball WLCSP | Yes |  | Yes |  |

## Status Definitions

| Status | Definition |
| --- | --- |
| DRAFT | The content of this document is under review and subject to formal approval, which may result in modifications or additions. |
| APPROVED or unmarked | The content of this document has been approved for publication. |

## Disclaimer

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