

VDIC MAGNETORESISTIVES RANDOM ACCESS MEMORY

VDMR4M16XS44XX1V35 USER MANUAL

Version : B1

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VDIC-MRAM

HIGH-SPEED 3.3V 256K × 16bit

MAGNETORESISTIVES RANDOM ACCESS MEMORY

1. DESCRIPTION

The VDMR4M16XS44XX1V35 is a 4 , 194 , 304-bit high-speed access time, high-density Magnetoresistives Random Access Memory device. Manufactured with VDIC Very Dense SiP technology. It is organized as one independent die of 256K x 16bit wide data interface.

The VDMR4M16XS44XX1V35 offers MRAM compatible 35ns read/write timing with unlimited endurance. Data is always non-volatile for greater than 20-years. Data is automatically protected on power loss by low-voltage inhibit circuitry to prevent writes with voltage out of specification. The VDMR4M16XS44XX4V35 is the ideal memory solution for applications that must permanently store and retrieve critical data and programs quickly.

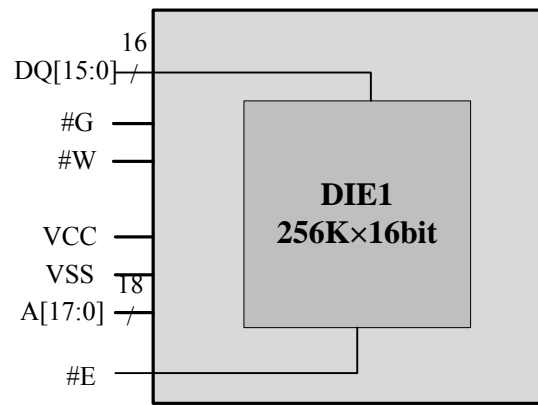
The VDMR4M16XS44XX1V35 has one die. The die can be selected separately with dedicated #CEn. Low interconnect parasitic capacitance of the stacking technology, by reducing the connection length, allows this MRAM module to be useful for a variety of high bandwidth, high performance and high density memory system applications.

The VDMR4M16XS44XX1V35 is available in a 44-pin SOP package.

2. FEATURES

- Fast 35ns Read/Write Cycle
- SRAM Compatible Timing, Uses Existing SRAM Controllers Without Redesign
- Unlimited Read & Write Endurance
- Data Always Non-volatile for >20-years at storage temperature
- One Memory Replaces Flash, SRAM, EEPROM and BBSRAM in a system for simpler, more efficient design
- Stack of one 4Mbit MRAM
- Organized as one die of 256 x 16 bit memory
- One independent Die Select
- 3.3 Volt Power Supply
- Automatic Data Protection on Power Loss
- Industrial, Automotive Temperatures
- 44-lead SOP package

3. BLOCK DIAGRAM



(All other signals are common to the memory)

Figure 1 Block diagram

4. PIN DESCRIPTIONS

| Pin Id | Pin # | | Pin Id |
|--------|-------|----|--------|
| A0 | 1 | 44 | A17 |
| A1 | 2 | 43 | A16 |
| A2 | 3 | 42 | A15 |
| A3 | 4 | 41 | #G |
| A4 | 5 | 40 | #UB |
| #E | 6 | 39 | #LB |
| DQ0 | 7 | 38 | DQU15 |
| DQ1 | 8 | 37 | DQU14 |
| DQ2 | 9 | 36 | DQU13 |
| DQ3 | 10 | 35 | DQU12 |
| VDD | 11 | 34 | VSS |
| VSS | 12 | 33 | VDD |
| DQ4 | 13 | 32 | DQ11 |
| DQ5 | 14 | 31 | DQ10 |
| DQ6 | 15 | 30 | DQ9 |
| DQ7 | 16 | 29 | DQ8 |
| #W | 17 | 28 | DC |
| A5 | 18 | 27 | A14 |
| A6 | 19 | 26 | A13 |
| A7 | 20 | 25 | A12 |
| A8 | 21 | 24 | A11 |
| A9 | 22 | 23 | A10 |

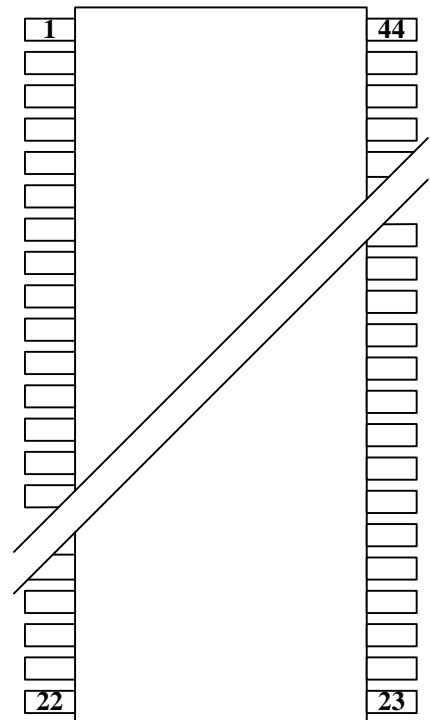


Figure 2 Pin configuration

Table 1 Pin description

| Pin | Name | Function |
|----------------------------------|---------------------|--|
| #E | Die select | Disables or enables memory die operation |
| A0 ~ A17 | Address | 18-bit addresses |
| #W | Write enable | Enables write operation common to all memory dies |
| #G | Output enable | Enables data output common to all memory dies |
| DQ0~ DQ15 | Data input/output | Data inputs/outputs 16-bit wide bus |
| V _{DD} /V _{SS} | Power supply/ground | Power and ground for the input/output buffers and core logic. |
| NC | No connection | These pins are recommended to be left No Connection on the device. |
| DC | Do not connect | These pins do not connect |

5. ELECTRICAL SPECIFICATIONS

5.1. ABSOLUTE MAXIMUM RATINGS

This device contains circuitry to protect the inputs against damage caused by high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage greater than the maximum rated voltages to these high-impedance (Hi-Z) circuits.

The device also contains protection against external magnetic fields. Precautions should be taken to avoid application of any magnetic field more intense than the maximum field intensity specified in the maximum ratings.

Table 2 Absolute maximum ratings

| Characteristics | Symbol | Maximum ratings | Unit |
|---|------------------|------------------------------|------|
| Voltage on V _{DD} supply relative to V _{SS} | V _{DD} | -0.5 to +4.0 | V |
| Voltage on any pin relative to V _{SS} | V _{IN} | -0.5 to V _{DD} +0.5 | V |
| Power Dissipation | P _D | < 0.6 | W |
| Operating Temperature Range | T _{OPR} | -55~ +95 | °C |
| Storage Temperature Range | T _{STG} | -55 to +105 | °C |

5.2. RECOMMENDED DC OPERATING CONDITIONS

Table 3 Recommended DC operating condition

| Parameter | Symbol | Min | Typ | Max | Unit |
|--------------------|-----------------|------|-----|----------------------|------|
| Supply voltage | V _{DD} | 3.0 | 3.3 | 3.6 | V |
| Input high voltage | V _{IH} | 2.2 | — | V _{DD} +0.3 | V |
| Input low voltage | V _{IL} | -0.5 | — | 0.8 | V |

5.3. DC ELECTRICAL CHARACTERISTICS

Table 4 DC electrical characteristics

| Parameters | Symbol | Test Conditions | Min | Max | Unit |
|---------------------------|-----------------|------------------------|-----|-----|------|
| Output voltage low level | V _{OL} | I _{OL} = +4mA | — | 0.4 | V |
| Output voltage high level | V _{OH} | I _{OL} = -4mA | 2.4 | — | V |

6. TYPICAL APPLICATION

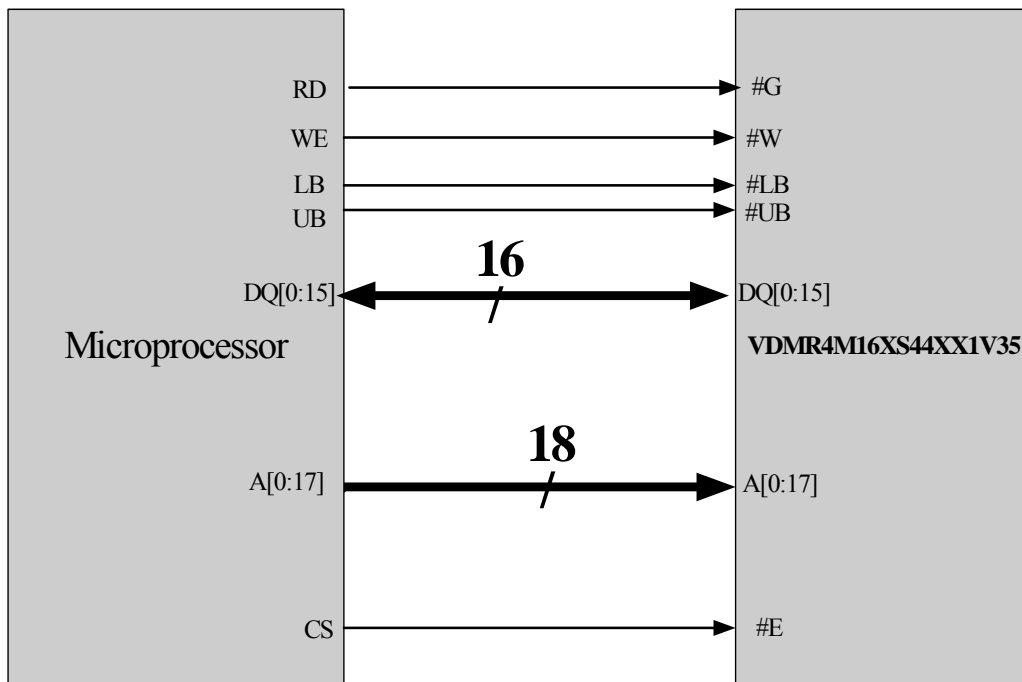


Figure 3 Typical application

7. ORDERING INFORMATION

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|--|-----------|-----------|-----------|----------|----------|-----------|----------|----------|----------|----------|-----------|----|
| <u>VD</u> | <u>MR</u> | <u>4M</u> | <u>16</u> | <u>X</u> | <u>S</u> | <u>44</u> | <u>X</u> | <u>X</u> | <u>1</u> | <u>V</u> | <u>35</u> | - |
| VDIC | | | | | | | | | | | | |
| MRAM | | | | | | | | | | | | |
| Capacity: 4M bit | | | | | | | | | | | | |
| Bus Width: 16bit | | | | | | | | | | | | |
| R= Radiation Data Tested; V= Generic Radiation Data Available | | | | | | | | | | | | |
| Package: SOP | | | | | | | | | | | | |
| Pin Quantity: 44 Pin | | | | | | | | | | | | |
| Temperature: E=0~+70℃; I=-40~+85℃; S=-55~+95℃ | | | | | | | | | | | | |
| Quality: E= Sample; B= Industry; S= Space | | | | | | | | | | | | |
| Stacking Layer: 1layer | | | | | | | | | | | | |
| Power Supply: 3.3V | | | | | | | | | | | | |
| Speed: 35ns | | | | | | | | | | | | |
| Version: First Version | | | | | | | | | | | | |

Table 5 Ordering information

| Part Number | Capacity (bit) | Bus Width (bit) | Radiation | | | Packaging | Temperature (℃) |
|--------------------|----------------|-----------------|------------------|------------------|------------------|-----------|-----------------|
| | | | TID ¹ | SEL ² | SEU ³ | | |
| VDMR4M16VS44EE1V35 | 4M | 16 | - | - | - | SOP44 | 0 ~ +70 |
| VDMR4M16VS44IB1V35 | 4M | 16 | - | - | - | SOP44 | -40 ~ +85 |
| VDMR4M16RS44SS1V35 | 4M | 16 | TBD | TBD | TBD | SOP44 | -55 ~ +95 |

¹ TID: Total Dose (Krad(Si))

² SEL: LET Threshold (Mev.cm²/mg)

³ SEU:SEU Threshold (Mev.cm²/mg)

8. PACKAGE DIMENSIONS

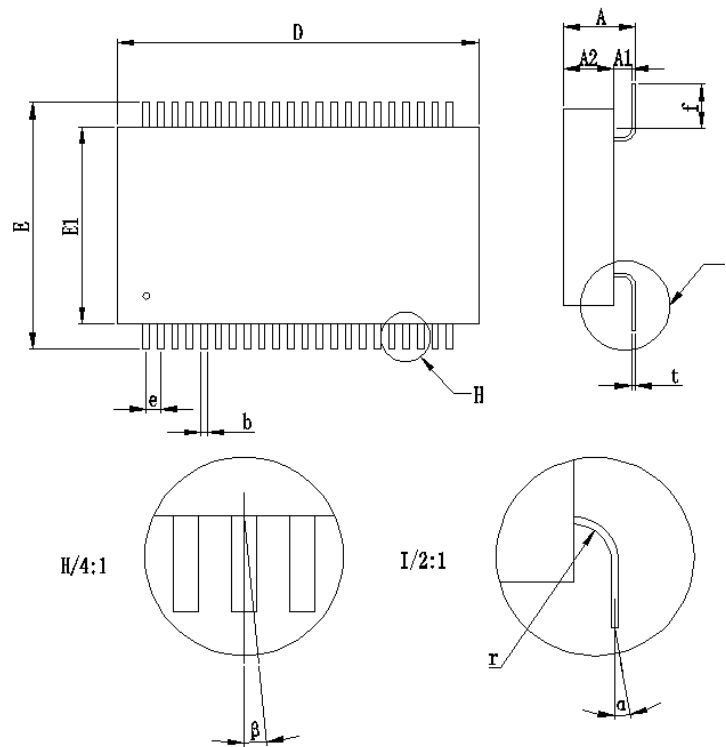


Figure 4 Package dimensions

Table 6 Dimensions information

| | Min | Max |
|------------------------------------|----------------|-------|
| A | 3.70 | 4.40 |
| A2 | 2.50 | 3.10 |
| D | 19.80 | 20.20 |
| E | 13.40 | 13.80 |
| E1 | 10.80 | 11.20 |
| f | 2.00 | |
| b | 0.35 | |
| e | 0.80 | |
| r | 1.00 | |
| t | 0.20 | |
| α | $\leq 3^\circ$ | |
| β | $\leq 3^\circ$ | |
| NOTE: 1. Unit: mm 2. A1= A - A2 | | |

9. REVISION HISTORY

Table 7 Revision history

| Revision | Date | Description of Change |
|----------|--------------|--|
| A0 | Nov 3,2015 | First Created |
| A1 | Mar 14,2016 | Modified the PIN DESCRIPTIONS |
| A2 | Aug 23,2016 | Modified the ORDERING INFORMATION |
| A3 | Jan 9,2017 | Modified the PACKAGE DIMENSIONS |
| A4 | Oct.25,2017 | Changed company's name to Zhuhai Orbita Aerospace Science & Technology Co., Ltd |
| A5 | Mar 13,2018 | Add or reduce the chapters |
| B0 | May 22, 2018 | Modified Operating Temperature Range and Storage temperature. |
| B1 | Mar 21,2020 | Update TID and SEE |