

# **VDIC MAGNETORESISTIVES RANDOM ACCESS MEMORY**

## **VDMR2M16xS54xx2V35 USER MANUAL**

**Version : A3**

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# VDIC-MRAM

## HIGH-SPEED 3.3V 128K×16bit

## MAGNETORESISTIVES RANDOM ACCESS MEMORY

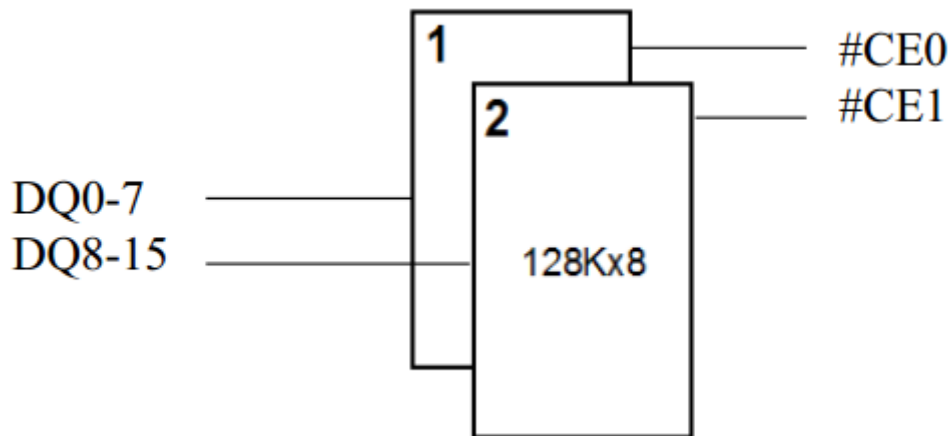
### 1. DESCRIPTION

The VDMR2M16xS54xx2V35 is a 2.097.152-bit high-speed access time, high-density Magnetoresistive Random Access Memory. Manufactured with very density SiP (VDIC) technology, it is organized with two dies of 1M bit. The VDMR2M16xS54xx2V35 offers SRAM compatible 40ns 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 VDMR2M16xS54xx2V35 is the ideal memory solution for applications that must permanently store and retrieve critical data and programs quickly. The VDMR2M16xS54xx2V35 is packaged in a 54-pin SOP.

### 2. FEATURES

- Fast 40ns Read/Write Cycle
- SRAM Compatible Timing, Uses Existing SRAM Controllers Without Redesign
- Unlimited Read & Write Endurance
- Data Always Non-volatile for >20-years
- One Memory Replaces Flash, SRAM, EEPROM and BBSRAM in a system for simpler, more efficient design
- Organized with two dies of 128k x 8 bit
- 3.3 Volt Power Supply
- Automatic Data Protection on Power Loss
- 54-pin 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
DQ9	1	54	DQ14
DQ8	2	53	DQ15
#CE1	3	52	NC
NC	4	51	NC
NC	5	50	NC
A0	6	49	NC
A1	7	48	NC
A2	8	47	NC
A3	9	46	A16
A4	10	45	A15
#CE0	11	44	#OE
DQ0	12	43	DQ7
DQ1	13	42	DQ6
VCC	14	41	VSS
VSS	15	40	VCC
DQ2	16	39	DQ5
DQ3	17	38	DQ4
#WE	18	37	NC
A5	19	36	A14
A6	20	35	A13
A7	21	34	A12
A8	22	33	A11
A9	23	32	A10
NC	24	31	NC
NC	25	30	NC
DQ11	26	29	DQ12
DQ10	27	28	DQ13

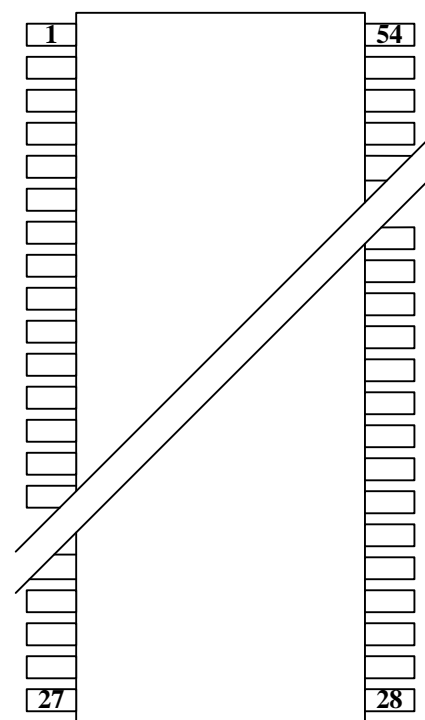


Figure 2 Pin configuration

Table 1 Pin Description

Pin	Function	Description
#CE0,#CE1	Die Enable	Enable or Disable One Die
A0 ~ A16	Address	17-bit Addresses
#WE	Write Enable	Write Enable, Active Low
#OE	Output Enable	Output Enable, Active Low
DQ0~ DQ15	Data I/O	16 Data Inputs/Outputs
V <sub>CC</sub> /V <sub>SS</sub>	Power Eupply/Ground	3.3 Volt-only Single Power Supply/ Ground
NC	No Connection	No device internal signal is connected to the package connector

## 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 <sub>DD</sub> supply relative to V <sub>SS</sub>	V <sub>CC</sub>	-0.5 ~ +4.0	V
Voltage on any pin relative to V <sub>SS</sub>	V <sub>IN</sub>	-0.5 ~ V <sub>CC</sub> +0.5	V
Operating Temperature Range	T <sub>OPR</sub>	-55 ~ +95	°C
Storage Temperature Range	T <sub>STG</sub>	-55 ~ +105	°C
Power Dissipation	P <sub>D</sub>	1	W
Maximum magnetic field during write	H <sub>max_write</sub>	2000	A/m
Maximum magnetic field during read or standby	H <sub>max_read</sub>	8000	A/m

### 5.2. RECOMMENDED DC OPERATING CONDITIONS

Table 3 Recommended DC Operating Condition

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V <sub>CC</sub>	3.0	3.3	3.6	V
Input high voltage	V <sub>IH</sub>	2.2	—	V <sub>CC</sub> +0.3	V
Input low voltage	V <sub>IL</sub>	-0.5	—	0.8	V

Parameter	Symbol	Min	Typ	Max	Unit
Write inhibit voltage	V <sub>WI</sub>	2.5	2.7	3.0	V

### 5.3. DC ELECTRICAL CHARACTERISTICS

Table 4 DC Characteristics

Parameters	Symbol	Test Conditions	Min	Max	Unit
Output voltage low level	V <sub>OL</sub>	I <sub>OL</sub> = +4mA	—	0.4	V
Output voltage high level	V <sub>OH</sub>	I <sub>OL</sub> = -4mA	2.4	—	V

## 6. TYPICAL APPLICATION

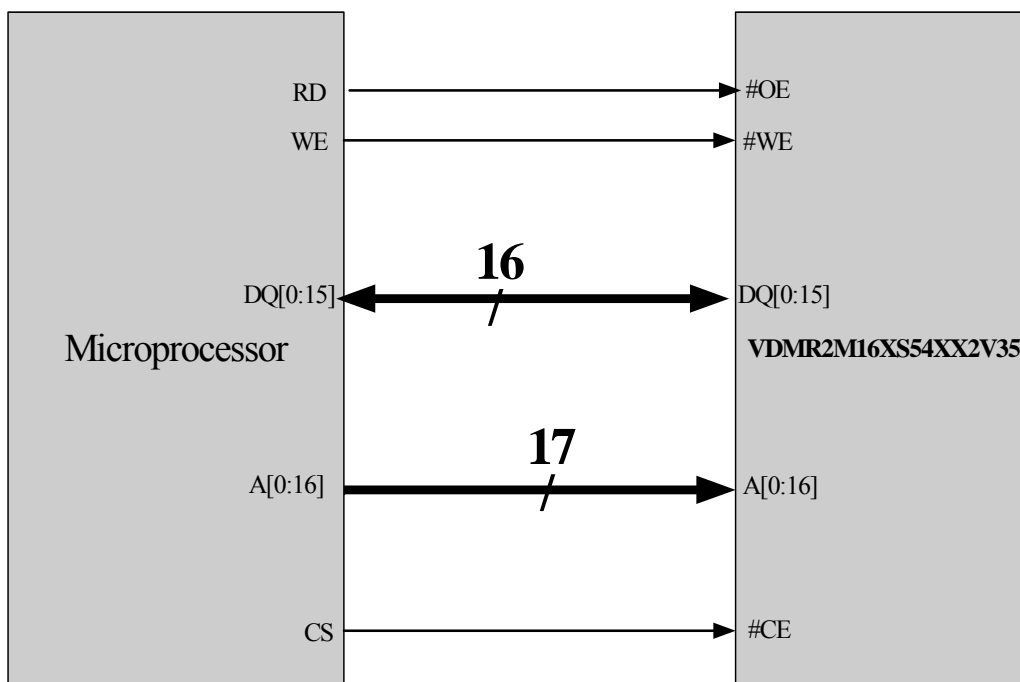


Figure 3 Typical application

## 7. ORDERING INFORMATION

1	2	3	4	5	6	7	8	9	10	11	12	13
<u>VD</u>	<u>MR</u>	<u>2M</u>	<u>16</u>	<u>X</u>	<u>S</u>	<u>54</u>	<u>X</u>	<u>X</u>	<u>2</u>	<u>V</u>	<u>35</u>	-
VDIC												
MRAM												
Capability: 2M bit												
Bus Width: 16bit												
R= Radiation Data Tested; V= Generic Radiation Data Available												
Package: SOP												
Pin Quantity: 54 Pin												
Temperature: E=0~+70℃; I=-40~+85℃; S=-55~+95℃												
Quality: E= Sample; B= Industry; S= Space												
Stacking Layer: 2 layer												
Power Supply : 3.3V												
Speed: 35ns												
Version: First Version												

Table 5 Ordering Information

Part Number	Capacity (bit)	Bus Width (bit)	Radiation			Packaging	Temperature (℃)
			TID <sup>1</sup>	SEL <sup>2</sup>	SEU <sup>3</sup>		
VDMR2M16VS54EE2V35	2M	16	-	-	-	SOP54	0 ~ +70
VDMR2M16VS54IB2V35	2M	16	-	-	-	SOP54	-40 ~ +85
VDMR2M16RS54SS2V35	2M	16	>50	>75	>75	SOP54	-55 ~ +95

<sup>1</sup> TID: Total Dose (Krad(Si))

<sup>2</sup> SEL: LET Threshold (Mev.cm<sup>2</sup>/mg)

<sup>3</sup> SEU:SEU Threshold (Mev.cm<sup>2</sup>/mg)

## 8. PACKAGE DIMENSIONS

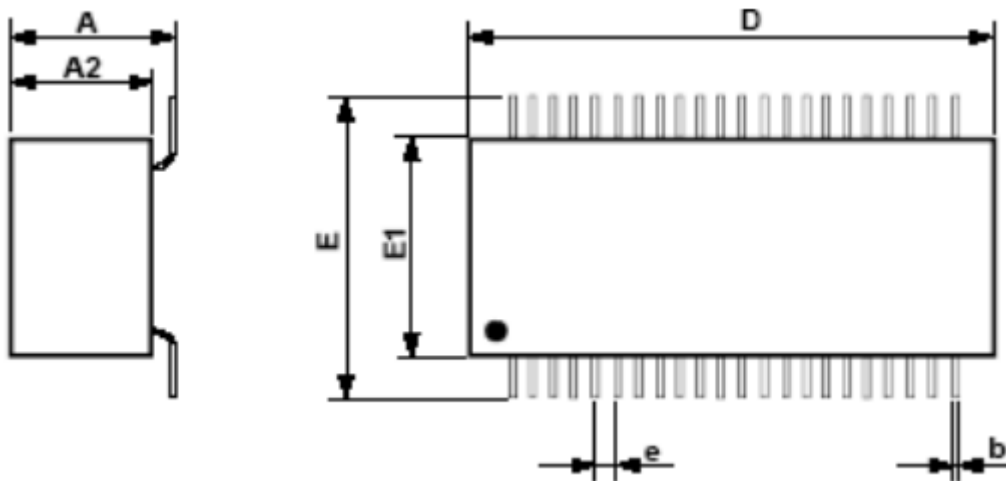


Figure 4 Package dimensions

Table 6 Dimensions Information

	Min	Max
A	4.90	5.60
A2	3.80	4.20
D	23.80	24.20
E	13.40	13.80
E1	10.85	11.05
f	2.00	
b	0.35	
e	0.80	
r	1.00	
t	0.20	
$\alpha$	$\leq 3^\circ$	
$\beta$	$\leq 3^\circ$	
NOTE: 1. Unit: mm		
2. A1= A - A2		



## 9. REVISION HISTORY

**Table 7 Revision History**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
A0	Mar 24,2018	Initial release
A1	May 22, 2018	Updata Operating Temperature Range and Storage temperature.
A2	Mar 21,2020	Update TID and SEE
A3	Mar 19, 2021	Update SEU