VDIC DDR1 SYNCHRONOUS DYNAMIC RAM

VD1D2G32XS86XX2T7B USER MANUAL

Version: B0

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Contents

VDIC-DDR SDRAM

HIGH-SPEED 2.5V 64M x 32bit

SYNCHRONOUS DYNAMIC RAM

1. DESCRIPTION

The VD1D2G32XS86XX2T7B is a 2048M bits DDR1 SDRAM, organized as 64M words×32 bits. The device has two dies, each die includes 1Gbit. The device has a 32-bit interface and is selected with specific #CS,#CK and CKE. The device is useful for a variety of high bandwidth, high performance memory system applications. It is packaged in standard 86-pin SOP.

2. FEATURES

Stack of two 1Gbit DDR SDRAM.
Organized as 64Mx32-bit.
Power supply: VDD, VDDQ=2.5V±0.2V.
Double-data-rate architecture; two data transfer per clock cycle.
Internal pipelined operation; column address can be changed every clock cycle.
Bidirectional data strobe.
Differential clock inputs (CK AND #CK).
DLL aligns DQ and DQS transition with CK transition,.
Programmable Read Latency 2, 2.5(clock).
Programmable Burst length (2, 4, 8).
Programmable Burst type (sequential & interleave).
Edge aligned data output, center aligned data input.
Auto & Self refresh, 7.8us refresh interval (8192/64ms refresh).

3. BLOCK DIAGRAM

Figure 1:Block Diagram

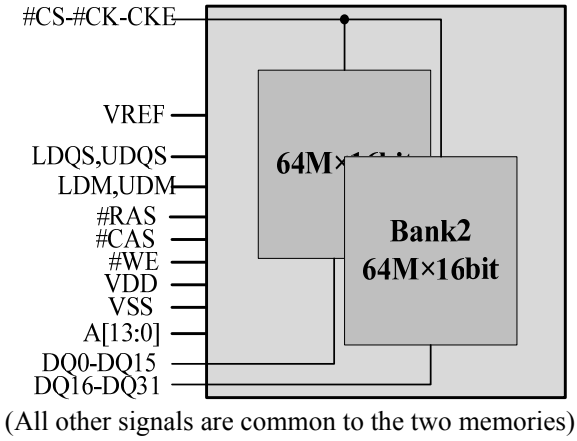


Figure 1 Block diagram

4. PIN DESCRIPTIONS

Pin Id	Pin #		Pin Id
DQ19	1	86	DQ28
DQ18	2	85	DQ29
DQ17	3	84	DQ30
DQ16	4	83	DQ31
NC	5	82	NC
VDD	6	81	VSS
DQ0	7	80	DQ15
VDDQ	8	79	VSSQ
DQ1	9	78	DQ14
DQ2	10	77	DQ13
VSSQ	11	76	VDDQ
DQ3	12	75	DQ12
DQ4	13	74	DQ11
VDDQ	14	73	VSSQ
DQ5	15	72	DQ10
DQ6	16	71	DQ9
VSSQ	17	70	VDDQ
DQ7	18	69	DQ8
NC	19	68	NC
VDDQ	20	67	VSSQ
LDQS	21	66	UDQS
A13	22	65	DNU
VDD	23	64	VREF
DNU	24	63	VSS
LDM	25	62	UDM
#WE	26	61	#CK
#CAS	27	60	CK
#RAS	28	59	CKE
#CS	29	58	NC
NC	30	57	A12
BA0	31	56	A11
BA1	32	55	A9
A10/AP	33	54	A8
A0	34	53	A7
A1	35	52	A6
A2	36	51	A5
A3	37	50	A4
VDD	38	49	VSS
NC	39	48	NC
DQ23	40	47	DQ24
DQ22	41	46	DQ25
DQ21	42	45	DQ26
DQ20	43	44	DQ27

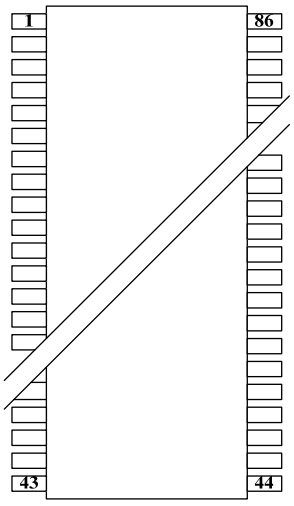


Figure 2 Pin configuration

Table 1 Pin description

Name	Function
A0~A13	Address Input. Provide the row address for ACTIVE commands, and the column address and auto precharge bit (A10) for READ/WRITE commands, to select one location out of the memory array in the respective bank. A10 sampled during a PRECHARGE command determines whether the PRECHARGE applies to one bank (A10 LOW, bank selected by BA0, BA1) or all banks (A10 HIGH). The address inputs also provide the op-code during a LOAD MODE REGISTER (LMR) command.
DQ0-DQ31	Data Input/Output Ports. 32 bi-directional ports are used to read data from, or write data into the DDR1 SDRAM.
#CS	Die Enable Input. When #CS is Low, the command input cycle becomes valid. When CSn is High, all inputs are ignored. However, internal operations (bank active, burst operations, etc.) are held.
BA0,BA1	Bank address inputs: BA0 and BA1 define the bank to which an ACTIVE, READ, WRITE, or PRECHARGE command is being applied. BA0 and BA1 also define which mode register (mode register or extended mode register) is loaded during the LOAD MODE REGISTER command.
#RAS	Row address strobe. Latches row addresses on the positive going edge of the CLK with RAS low. Enables row access & precharge.
#CAS	Column address strobe. Latches column addresses on the positive going edge of the CLK with CAS low. Enables column access.
#WE	Write Enable Input. Enables write operation and row precharge. Latches data in starting from CAS, WE active.
LDM, UDM	Input data mask: LDM and UDM are input mask signal for write data. Input data is masked when DM is sampled HIGH along with that input data during a write access. DM is sampled on both edges of DQS. Although DM pins are input-only, the DM loading is designed to match that of DQ and DQS pins.
LDQS, UDQS	Data strobe: Output with read data, input with write data. DQS is edge-aligned with read data, center-aligned with write data. It is used to capture data. LDQS is DQS for DQ[7:0] &DQ[16:23]and UDQS is DQS for DQ[15:8]&DQ[24:31].
CK,CK#	Clock: CK and #CK are differential clock inputs. All address and control input signals are sampled on the crossing of the positive edge of CK and the negative edge of #CK. Output data (DQ and DQS) is referenced to the crossings of CK and #CK.
CKE	Clock enable: CKE HIGH activates and CKE LOW deactivates the internal clock, input buffers, and output drivers. Taking CKE LOW provides PRECHARGE power-down and SELF REFRESH operations (all banks idle) or ACTIVE power-down (row active in any bank). CKE is synchronous for power-down entry and exit and for self refresh entry. CKE is asynchronous for self refresh exit and for disabling the outputs. CKE must be maintained HIGH throughout read and write accesses. Input buffers (excluding CK, CK#, and CKE) are disabled during power-down. Input buffers (excluding CKE) are disabled during SELF REFRESH. CKE is an SSTL_2 input but will detect an LVCMOS LOW level after V_{DD} is applied and until CKE is first brought HIGH, after which it becomes a SSTL_2 input only.
V_{DD},V_{DDQ}	Power supply, connect to 2.5V

Name	Function
V_{REF}	SSTL_2 reference voltage.
V_{SS},V_{SSQ}	Ground
NC,DNU	No connect

5. Electrical Specifications – DC and AC

Stresses greater than those listed may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

5.1. Absolute Maximum Ratings

Table 2 Absolute maximum ratings

Characteristics	Symbol	Maximum ratings	Unit
Voltage on V_{DD} supply relative to Vss	V_{DD}/ V_{DDQ}	-1～ +3.6	V
Voltage on any pin relative to Vss	V_{IN}	-0.5 to V_{DDQ}+0.5	V
Power Dissipation	P_D	3.2	W
Operating Temperature Range	T_{OPR}	-55~ +105	℃
Storage Temperature Range	T_{STG}	-65 to +150	℃

5.2. Recommended DC Operating Conditions

Table 3 Recommended DC operating condition

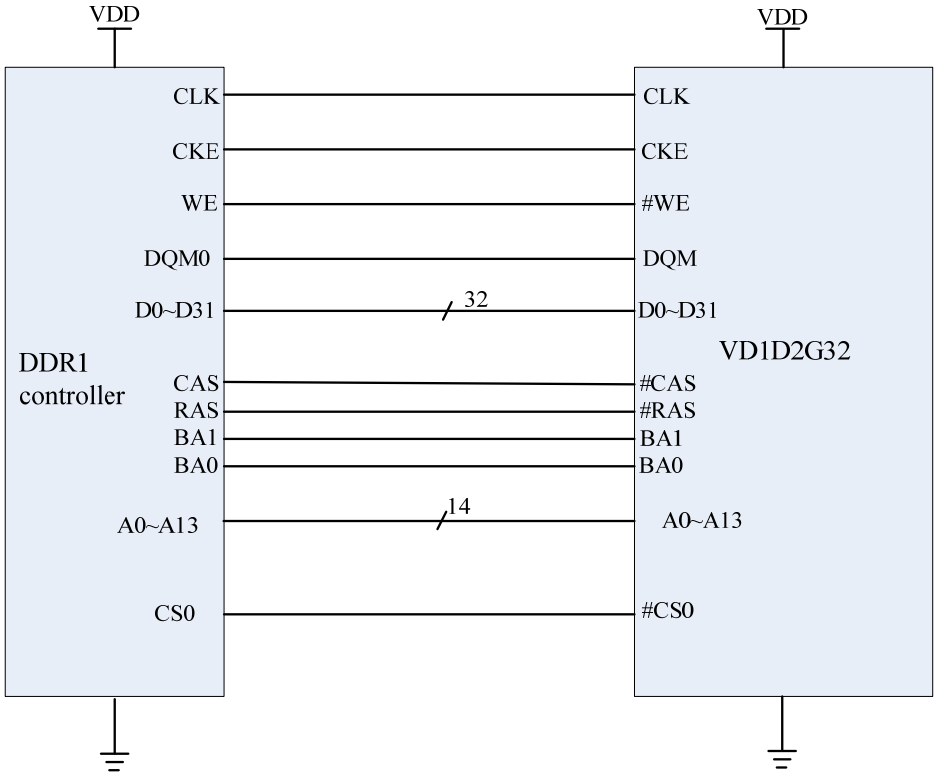
Parameter	Symbol	Min	Typical	Max	Unit
Supply Voltage	V_{DD}	2.3	2.5	2.7	V
I/O Supply Voltage	V_{DDQ}	2.3	2.5	2.7	V
I/O Reference Voltage	V_{REF}	0.49×V_{DDQ}	—	0.51×V_{DDQ}	V
I/O Termination Voltage(System)	V_{TT}	V_{REF}-0.04	V_{REF}	V_{REF}+0.04	V
Input high Voltage	V_{IH}（DC）	V_{REF}+0.15	—	V_{DD}+0.3	V
Input Low Voltage	V_{IL}（DC）	-0.3	—	V_{REF}-0.15	V

5.3. DC Electrical Characteristics and Operating Conditions

Table 4 DC Electrical Characteristics and Operating Conditions

Technical Parameters	symbol	Test Conditions	Min	Max	Uint
Input leakage current low /high	I_{LIL}	V_{DD}=2.7V，V_{REF}=1.35V V_{in}=0V	-2	2	μA
	I_{LIH}	V_{DD}=2.7V，V_{REF}=1.35V VIN=V_{DD}	-2	2	μA
Output leakage current low/high	I_{LOL}	V_{DD}=2.7V，V_{REF}=1.35V，V_{out}=0V	-5	5	μA
	I_{LOH}	V_{DD}=2.7V，V_{REF}=1.35V，V_{out} =V_{DD}	-5	5	μA

6. TYPICAL APPLICATION



7. ORDERING INFORMATION

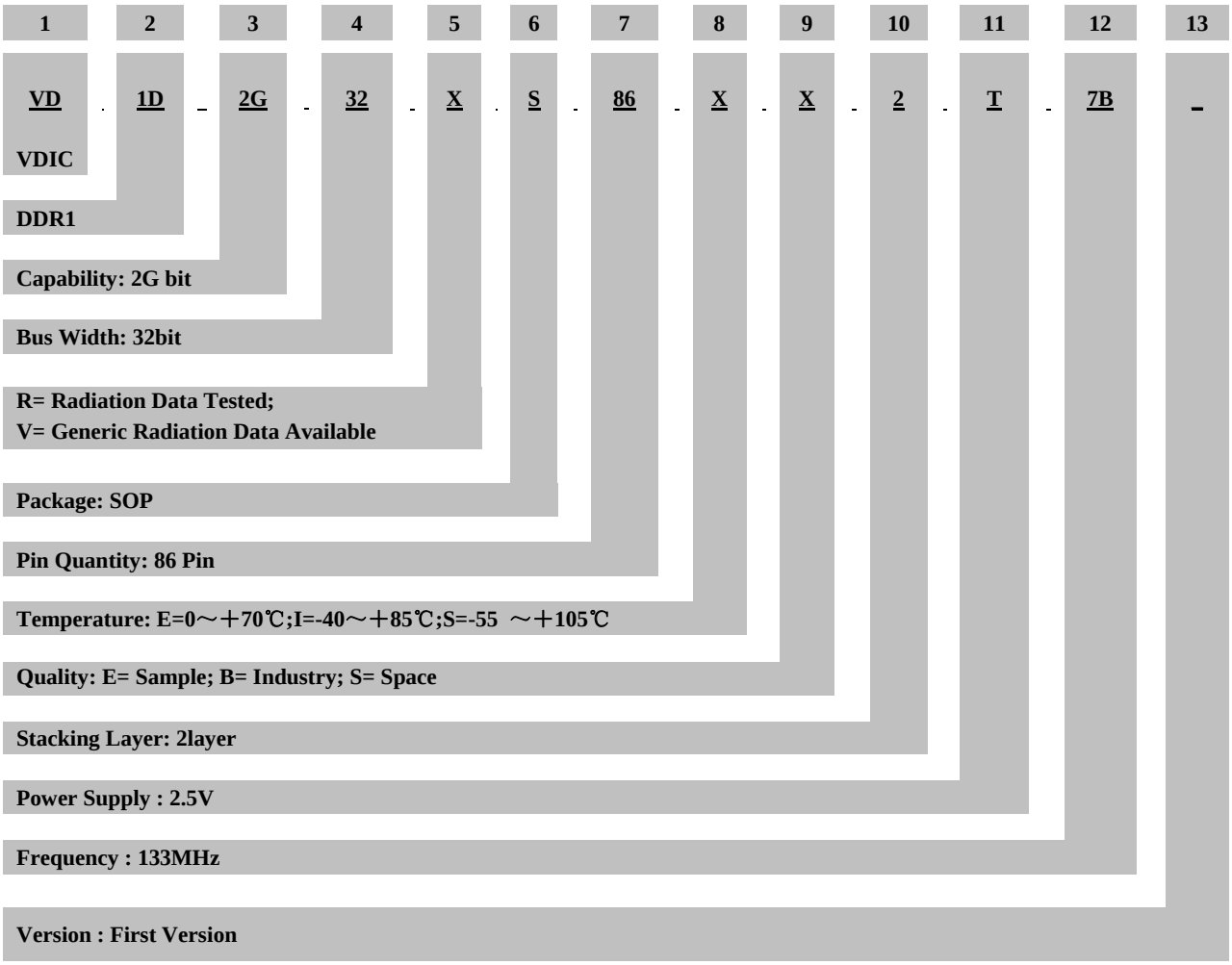


Figure 3 Typical application

Table 5 Ordering information

Part Number	Capacity (bit)	Bus Width (bit)	Radiation			Packaging	Temperature (℃)
			TID[1]	SEL[2]	SEU[3]		
VD1D2G32VS86EE2T7B	2G	32	-	-	-	SOP86	0 ~ + 70
VD1D2G32VS86IB2T7B	2G	32	-	-	-	SOP86	-40 ~ + 85
VD1D2G32RS86SS2T7B	2G	32	TBD	TBD	TBD	SOP86	-55 ~ + 105

[1] TID: Total Dose（Krads(Si)）
[2] SEL: LET Threshold（Mev.cm2/mg）
[3] SEU:SEU Threshold （Mev.cm2/mg）

8. PACKAGE DIMENSIONS

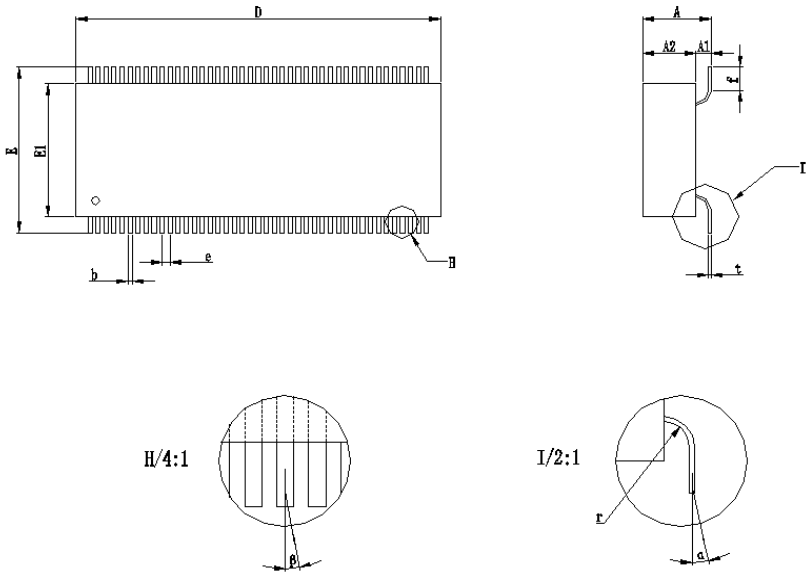


Figure 4 Package dimensions

Table 6 Dimensions information

	Min	Max
A	5.20	5.70
A2	4.00	4.40
D	29.40	29.80
E	13.40	13.80
E1	10.80	11.20
f	2.00	
b	0.35	
e	0.65	
r	1.00	
t	0.20	
α	≤3°	
β	≤3°	
NOTE: 1.Unit: mm 2. A1= A - A2		

9. REVISION HISTORY

Table 7 Revision history

Revision	Date	Description of Change
A0	Nov 5,2015	First Created
A1	Mar 21,2016	Modified the PIN DESCRIPTIONS
A2	Aug 23,2016	Modified the ORDERING INFORMATION
A3	Jan 9,2017	Modified the Package dimensions figure.
A4	Oct.25,2017	Changed company's name to Zhuhai Orbita Aerospace Science & Technology Co.，Ltd
A5	Mar 14,2018	Add or reduce the chapters.
B0	Mar 23,2020	Update TID and SEE