



# 64MB – 8Mx72 SDRAM UNBUFFERED

## FEATURES

- Burst Mode Operation
- Auto and Self Refresh capability
- LVTTTL compatible inputs and outputs
- Serial Presence Detect with EEPROM
- Fully synchronous: All signals are registered on the positive edge of the system clock
- Programmable Burst Lengths: 1, 2, 4, 8 or Full Page
- 3.3V ± 0.3V Power Supply
- 144 Pin SO-DIMM
  - PCB height: 27.94mm (1.10")

## DESCRIPTION

The WED3DG728V is a 8Mx72 synchronous DRAM module which consists of nine 8Mx8 SDRAM components in TSOP II package, and one 2Kb EEPROM in an 8 pin TSOP package for Serial Presence Detect which are mounted on a 144 pin SO-DIMM multilayer FR4 Substrate.

\* This product is under development, is not qualified or characterized and is subject to change or cancellation without notice.

NOTE: Consult factory for availability of:

- RoHS compliant products
- Vendor source control options
- Industrial temperature option

## PIN CONFIGURATIONS (FRONT SIDE/BACK SIDE)

### PINOUT

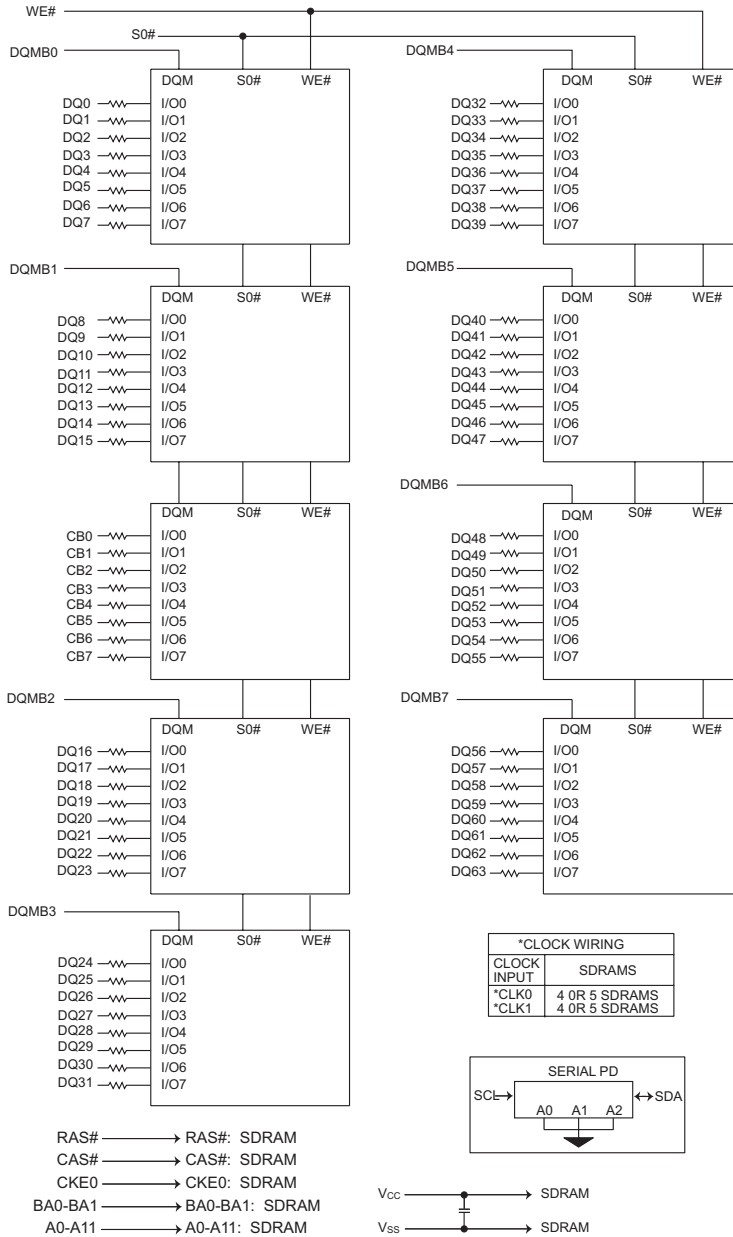
PIN	FRONT	PIN	BACK	PIN	FRONT	PIN	BACK	PIN	FRONT	PIN	BACK
1	V <sub>SS</sub>	2	V <sub>SS</sub>	49	DQ13	50	DQ45	97	DQ22	98	DQ54
3	DQ0	4	DQ32	51	DQ14	52	DQ46	99	DQ23	100	DQ55
5	DQ1	6	DQ33	53	DQ15	54	DQ47	101	V <sub>CC</sub>	102	DQ55
7	DQ2	8	DQ34	55	V <sub>SS</sub>	56	V <sub>SS</sub>	103	A6	104	A7
9	DQ3	10	DQ35	57	CB0	58	CB4	105	A8	106	BA0
11	V <sub>CC</sub>	12	V <sub>CC</sub>	59	CB1	60	CB5	107	V <sub>SS</sub>	108	V <sub>SS</sub>
13	DQ4	14	DQ36	61	CLK0	62	CKE0	109	A9	110	BA1
15	DQ5	16	DQ37	63	V <sub>CC</sub>	64	V <sub>CC</sub>	111	A10	112	A11
17	DQ6	18	DQ38	65	RAS#	66	CAS#	113	V <sub>CC</sub>	114	V <sub>CC</sub>
19	DQ7	20	DQ39	67	WE#	68	NC	115	DQMB2	116	DQMB6
21	V <sub>SS</sub>	22	V <sub>SS</sub>	69	SO#	70	NC	117	DQMB3	118	DQMB7
23	DQMB0	24	DQMB4	71	NC	72	NC	119	V <sub>SS</sub>	120	V <sub>SS</sub>
25	DQMB1	26	DQMB5	73	NC	74	CK1	121	DQ24	122	DQ56
27	V <sub>CC</sub>	28	V <sub>CC</sub>	75	V <sub>SS</sub>	76	V <sub>SS</sub>	123	DQ25	124	DQ57
29	A0	30	A3	77	CB2	78	CB6	125	DQ26	126	DQ58
31	A1	32	A4	79	CB3	80	CB7	127	DQ27	128	DQ59
33	A2	34	A5	81	V <sub>CC</sub>	82	V <sub>CC</sub>	129	V <sub>CC</sub>	130	V <sub>CC</sub>
35	V <sub>SS</sub>	36	V <sub>SS</sub>	83	DQ16	84	DQ48	131	DQ28	132	DQ60
37	DQ8	38	DQ40	85	DQ17	86	DQ49	133	DQ29	134	DQ61
39	DQ9	40	DQ41	87	DQ18	88	DQ50	135	DQ30	136	DQ62
41	DQ10	42	DQ42	89	DQ19	90	DQ51	137	DQ31	138	DQ63
43	DQ11	44	DQ43	91	V <sub>SS</sub>	92	V <sub>SS</sub>	139	V <sub>SS</sub>	140	V <sub>SS</sub>
45	V <sub>CC</sub>	46	V <sub>CC</sub>	93	DQ20	94	DQ52	141	SDA	142	SCL
47	DQ12	48	DQ44	95	DQ21	96	DQ53	143	V <sub>CC</sub>	144	V <sub>CC</sub>

## PIN NAMES

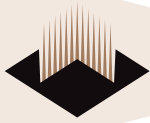
A0 – A11	Address Input (Multiplexed)
BA0-1	Select Bank
DQ0-63	Data Input/Output
CB0-7	Check Bit (Data-In/Data-Out)
CLK0,CLK1	Clock Input
CKE0	Clock Enable Input
CS0#	Chip Select Input
RAS#	Row Address Strobe
CAS#	Column Address Strobe
WE#	Write Enable
DQMB0-7	DQM
V <sub>CC</sub>	Power Supply (3.3V)
V <sub>SS</sub>	Ground
SDA	Serial Data I/O
SCL	Serial Clock
NC	No Connect



FUNCTIONAL BLOCK DIAGRAM



NOTE: DQ wiring may differ than described in this drawing, however DQ/DQMB/  
 CKE/S relationships must be maintained as shown.  
 All resistor values are 22 ohms ±5% unless otherwise specified.



## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Units
Voltage on any pin relative to V <sub>SS</sub>	V <sub>IN</sub> , V <sub>OUT</sub>	-1.0 ~ 4.6	V
Voltage on V <sub>CC</sub> supply relative to V <sub>SS</sub>	V <sub>CC</sub> , V <sub>CCQ</sub>	-1.0 ~ 4.6	V
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	°C
Power Dissipation	P <sub>D</sub>	9	W
Short Circuit Current	I <sub>OS</sub>	50	mA

Note: Permanent device damage may occur if "ABSOLUTE MAXIMUM RATINGS" are exceeded.  
 Functional operation should be restricted to recommended operating condition.  
 Exposure to higher than recommended voltage for extended periods of time could affect device reliability.

## RECOMMENDED DC OPERATING CONDITIONS

Voltage Referenced to: V<sub>SS</sub> = 0V, 0°C ≤ T<sub>A</sub> ≤ +70°C

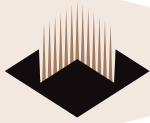
Parameter	Symbol	Min	Typ	Max	Unit	Note
Supply Voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	
Input High Voltage	V <sub>IH</sub>	2.0	3.0	V <sub>CCQ</sub> +0.3	V	1
Input Low Voltage	V <sub>IL</sub>	-0.3	—	0.8	V	2
Output High Voltage	V <sub>OH</sub>	2.4	—	—	V	I <sub>OH</sub> = -2mA
Output Low Voltage	V <sub>OL</sub>	—	—	0.4	V	I <sub>OL</sub> = -2mA
Input Leakage Current	I <sub>LI</sub>	-10	—	10	μA	3

Note:  
 1. V<sub>IH</sub> (max)= 5.6V AC. The overshoot voltage duration is ≤ 3ns.  
 2. V<sub>IL</sub> (min)= -2.0V AC. The undershoot voltage duration is ≤ 3ns.  
 3. Any input 0V ≤ V<sub>IN</sub> ≤ V<sub>CCQ</sub>  
 Input leakage currents include Hi-Z output leakage for all bi-directional buffers with Tri-State outputs.

## CAPACITANCE

T<sub>A</sub> = 25°C, f = 1MHz, V<sub>CC</sub> = 3.3V, V<sub>REF</sub> = 1.4V ± 200mV

Parameter	Symbol	Max	Unit
Input Capacitance (A0-A11)	C <sub>IN1</sub>	15	pF
Input Capacitance (RAS#,CAS#,WE#)	C <sub>IN2</sub>	15	pF
Input Capacitance (CKE0)	C <sub>IN3</sub>	15	pF
Input Capacitance (CLK0)	C <sub>IN4</sub>	20	pF
Input Capacitance (CS0#)	C <sub>IN5</sub>	15	pF
Input Capacitance (DQM0-DQM7)	C <sub>IN6</sub>	15	pF
Input Capacitance (BA0-BA1)	C <sub>IN7</sub>	15	pF
Data Input/Output Capacitance (DQ0-DQ63)	C <sub>OUT</sub>	22	pF
Data Input/Output Capacitance (CB0-7)	C <sub>OUT1</sub>	22	pF



**OPERATING CURRENT CHARACTERISTICS**

$V_{CC} = 3.3V, 0^{\circ}C \leq T_A \leq +70^{\circ}C$

Parameter	Symbol	Conditions	Version		Units	Note
			133	100		
Operating Current (One bank active)	I <sub>CC1</sub>	Burst Length = 1 t <sub>RC</sub> ≤ t <sub>RC(min)</sub> I <sub>OL</sub> = 0mA	1,080	990	mA	1
Precharge Standby Current in Power Down Mode	I <sub>CC2</sub>	CKE ≥ V <sub>IL(max)</sub> , t <sub>CC</sub> = 10ns	20		mA	
Active Standby Current in Non-Power Down Mode	I <sub>CC3</sub>	CKE ≥ V <sub>IH(min)</sub> , CS ≥ V <sub>IH(min)</sub> , t <sub>CC</sub> = 10ns Input signals are changed one time during 20ns	50		mA	
Operating Current (Burst mode)	I <sub>CC4</sub>	I <sub>O</sub> = mA Page burst 4 Banks activated t <sub>CCD</sub> = 2CK	1,350	1,170	mA	1
Refresh Current	I <sub>CC5</sub>	t <sub>RC</sub> ≥ t <sub>RC(min)</sub>	1,800	1,710	mA	2
Self Refresh Current	I <sub>CC6</sub>	CKE ≥ 0.2V	20		mA	

Notes:

1. Measured with outputs open.
2. Refresh period is 64ms.

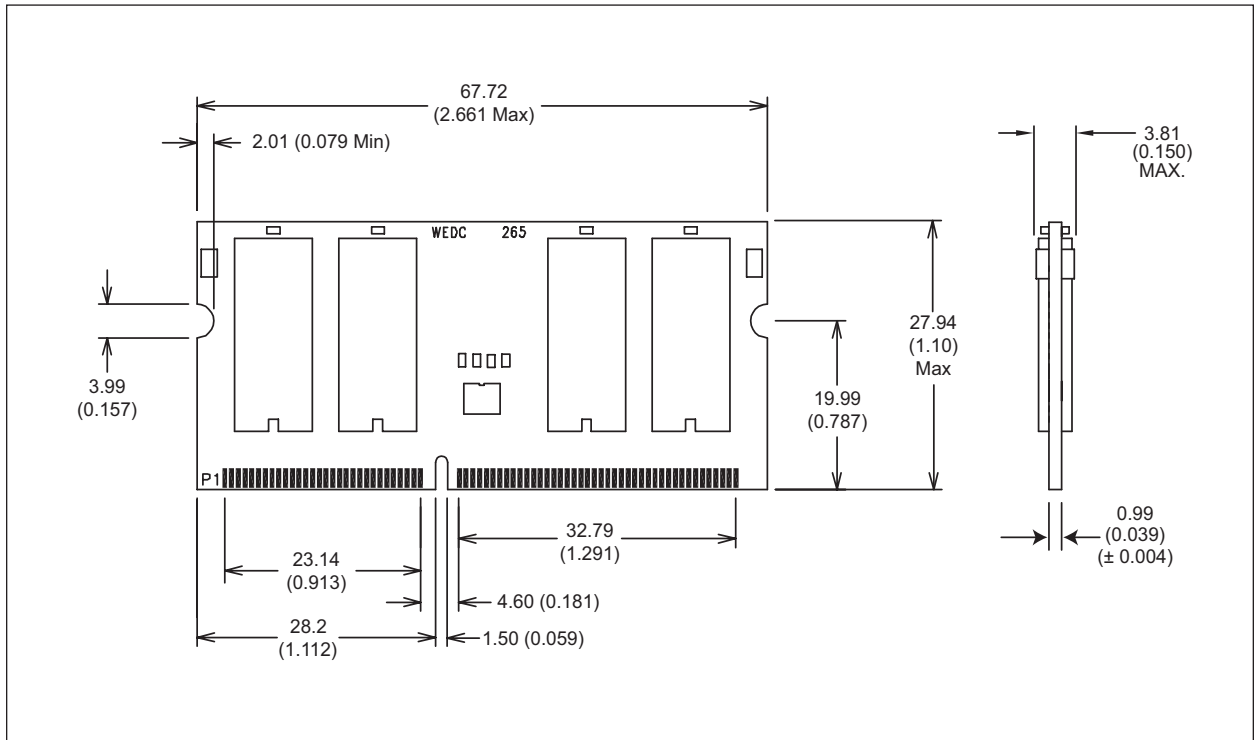


### ORDERING INFORMATION FOR D1

Part Number	Speed	CAS Latency	Height
WED3DG728V10D1	100MHz	CL=2	27.94 (1.10")
WED3DG728V7D1	133MHz	CL=2	27.94 (1.10")
WED3DG728V75D1	133MHz	CL=3	27.94 (1.10")

- NOTES:
- Consult Factory for availability of RoHS compliant products. (G = RoHS Compliant)
  - Vendor specific part numbers are used to provide memory components source control. The place holder for this is shown as lower case "x" in the part numbers above and is to be replaced with the respective vendors code. Consult factory for qualified sourcing options. (M = Micron, S = Samsung & consult factory for others)
  - Consult factory for availability of industrial temperature (-40°C to 85°C) option

### PACKAGE DIMENSIONS FOR D1



\* ALL DIMENSIONS ARE IN MILLIMETERS AND (INCHES).



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### Revision History

<b>Rev #</b>	<b>History</b>	<b>Release Date</b>	<b>Status</b>
Rev A	Created	11-9-01	Advanced
Rev 0	0.1 Updated data sheet to the new format	10-05	Advanced