128MB- 16Mx64 SDRAM, UNBUFFERED

FEATURES

- Burst Mode Operation
- Auto and Self Refresh capability
- LVTTL 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 JEDEC

DESCRIPTION

The WED3DG6416V is a 16Mx64 synchronous DRAM module which consists of eight 8Mx16 SDRAM components in TSOP II package, and one 2Kb EEPROM in an 8 pin TSSOP package for Serial Presence Detect which are mounted on a 144 pin SO-DIMM multilayer FR4 Substrate.

* This product is subject to change without notice.

PIN CONFIGURATIONS (FRONT SIDE/BACK SIDE)

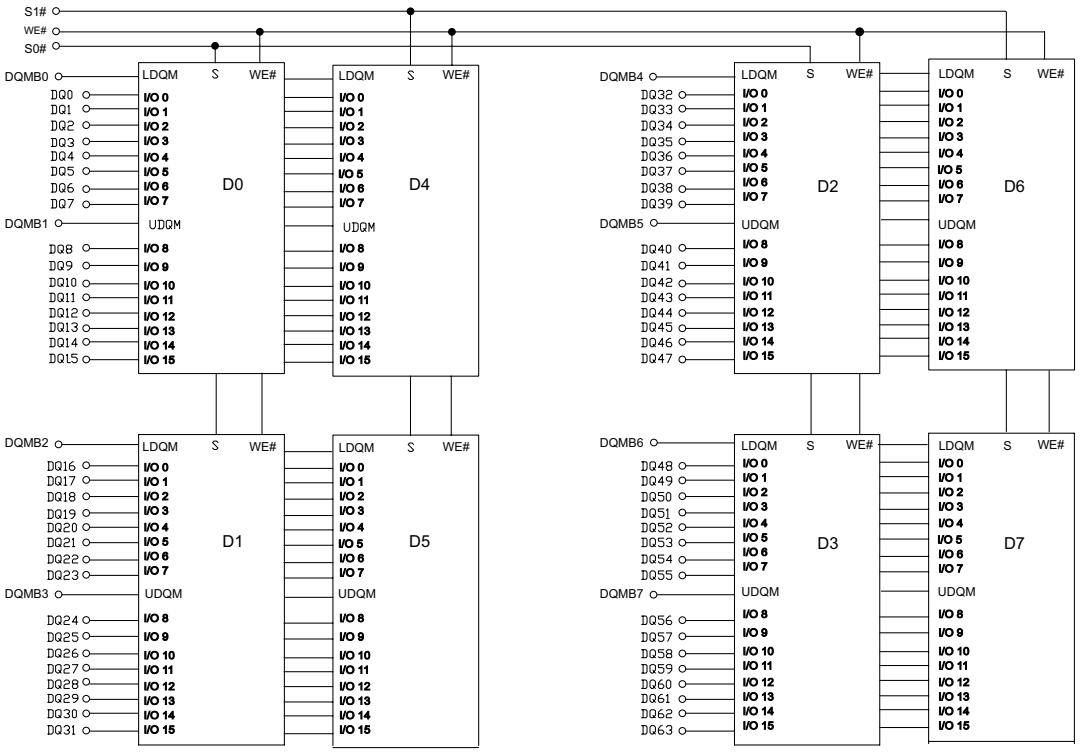
PINOUT											
PIN	FRONT	PIN	BACK	PIN	FRONT	PIN	BACK	PIN	BACK	PIN	BACK
1	V_{SS}	2	V_{SS}	51	DQ14	52	DQ46	95	DQ21	96	DQ53
3	DQ0	4	DQ32	53	DQ15	54	DQ47	97	DQ22	98	DQ54
5	DQ1	6	DQ33	55	V_{SS}	56	V_{SS}	99	DQ23	100	DQ55
7	DQ2	8	DQ34	57	NC	58	NC	101	V_{CC}	102	V_{CC}
9	DQ3	10	DQ35	59	NC	60	NC	103	A6	104	A7
11	V_{CC}	12	V_{CC}	VOLTAGE KEY				105	A8	106	BA0
13	DQ4	14	DQ36					107	V_{SS}	108	V_{SS}
15	DQ5	16	DQ37					109	A9	110	BA1
17	DQ6	18	DQ38	61	CLK0	62	CKE0	111	A10/AP	112	A11
19	DQ7	20	DQ39	63	V_{CC}	64	V_{CC}	113	V_{CC}	114	V_{CC}
21	V_{SS}	22	V_{SS}	65	RAS#	66	CAS#	115	DQM2	116	DQM6
23	DQM0	24	DQM4	67	WE#	68	CKE1	117	DQM3	118	DQM7
25	DQM1	26	DQM5	69	CS0#	70	*A12	119	V_{SS}	120	V_{SS}
27	V_{CC}	28	V_{CC}	71	CS1#	72	*A13	121	DQ24	122	DQ56
29	A0	30	A3	73	DNU	74	CK1	123	DQ25	124	DQ57
31	A1	32	A4	75	V_{SS}	76	V_{SS}	125	DQ26	126	DQ58
33	A2	34	A5	77	NC	78	NC	127	DQ27	128	DQ59
35	V_{SS}	36	V_{SS}	79	NC	80	NC	129	V_{CC}	130	V_{CC}
37	DQ8	38	DQ40	81	V_{CC}	82	V_{CC}	131	DQ28	132	DQ60
39	DQ9	40	DQ41	83	DQ16	84	DQ48	133	DQ29	134	DQ61
41	DQ10	42	DQ42	85	DQ17	86	DQ49	135	DQ30	136	DQ62
43	DQ11	44	DQ43	87	DQ18	88	DQ50	137	DQ31	138	DQ63
45	V_{CC}	46	V_{CC}	89	DQ19	90	DQ51	139	V_{SS}	140	V_{SS}
47	DQ12	48	DQ44	91	V_{SS}	92	V_{SS}	141	**SDA	142	**SCL
49	DQ13	50	DQ45	93	DQ20	94	DQ52	143	V_{CC}	144	V_{CC}

PIN NAMES

A0 – A11	Address Input (Multiplexed)
BA0-1	Select Bank
DQ0-63	Data Input/Output
CLK0,CK1	Clock Input
CKE0,CKE1	Clock Enable Input
CS0#,CS1#	Chip Select Input
RAS#	Row Address Strobe
CAS#	Column Address Strobe
WE#	Write Enable
DQM0-7	DQM
V_{CC}	Power Supply (3.3V)
V_{SS}	Ground
SDA	Serial Data I/O
SCL	Serial Clock
DNU	Do Not Use
NC	No Connect

* These pins are not used in this module.
** These pins should be NC in the system which does not support SPD.

FUNCTIONAL BLOCK DIAGRAM



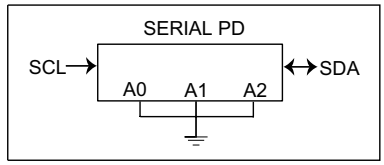
RAS# → RAS#: SDRAM D0-D7
CAS# → CAS#: SDRAM D0-D7
CKE0 → CKE: SDRAM D0-D3
CKE1 → CKE: SDRAM D4-D7

BA0-BAN → BA0-BAN: SDRAM D0-8
A0-AN → A0-AN: SDRAM D0-D8

Vcc → D0-D7
Vss → D0-D7

*CLOCK WIRING	
CLOCK INPUT	SDRAMS
*CLK0	4 SDRAMS
*CLK1	4 SDRAMS

* Wire per clock Loading Table/Wiring Diagrams



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Units
Voltage on any pin relative to V_{SS}	V_{IN}, V_{OUT}	-1.0 ~ 4.6	V
Voltage on V_{CC} supply relative to V_{SS}	V_{CC}, V_{CCQ}	-1.0 ~ 4.6	V
Storage Temperature	T_{STG}	-55 ~ +150	°C
Power Dissipation	P_D	8	W
Short Circuit Current	I_{OS}	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_{SS} = 0V, $T_A \leq$ 0°C ≤ +70°C)

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

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

CAPACITANCE

(T_A = 23°C, f = 1MHz, V_{CC} = 3.3V, V_{REF}=1.4V ± 200mV)

Parameter	Symbol	Max	Unit
Input Capacitance (A0-A12)	C_{IN1}	25	pF
Input Capacitance (RAS#,CAS#,WE#)	C_{IN2}	25	pF
Input Capacitance (CKE0, CKE1)	C_{IN3}	25	pF
Input Capacitance (CLK0, CK1)	C_{IN4}	21	pF
Input Capacitance (CS0#, CS1)	C_{IN5}	25	pF
Input Capacitance (DQM0-DQM7)	C_{IN6}	12	pF
Input Capacitance (BA0-BA1)	C_{IN7}	25	pF
Data Input/Output Capacitance (DQ0-DQ63)	C_{OUT}	12	pF

OPERATING CURRENT CHARACTERISTICS

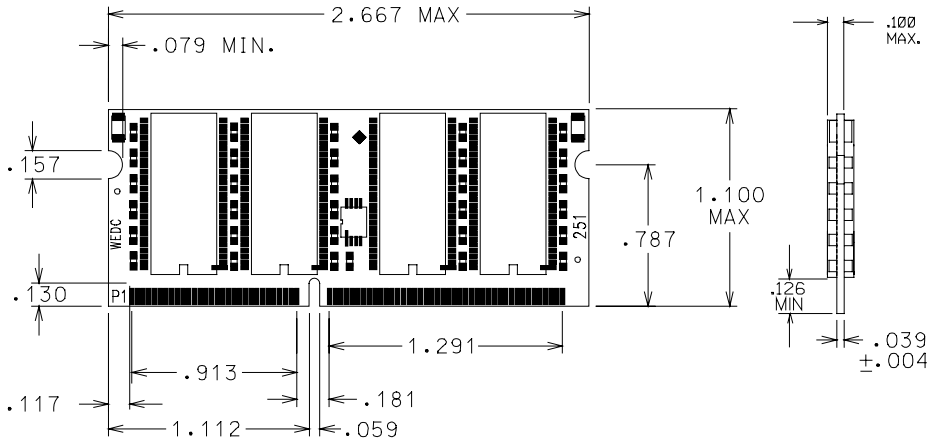
(V_{CC} = 3.3V, T_A = 0°C ≤ +70°C)

			Version			
Parameter	**Symbol**	**Conditions**	**133**	**100**	**Units**	**Note**
Operating Current (One bank active)	I_{CC1}	Burst Length = 1 $t_{RC} \geq t_{RC}$(min) I_{OL} = 0mA	520	440	mA	1
Precharge Standby Current in Power Down Mode	I_{CC2P}	CKE ≤ V_{IL}(max), t_{CC} = 10ns	10		mA	
	I_{CC2PS}	CKE & CLK ≤ V_{IL}(max), t_{CC} = ∞	10			
Precharge Standby Current in Non-Power Down Mode	I_{CC2N}	CKE ≥ V_{IH}(min), CS ≥ V_{IH}(min), tcc =10ns Input signals are charged one time during 20	80		mA	
	I_{CC2NS}	CKE ≥ V_{IH}(min), CLK ≤V_{IL}(max), t_{CC} = ∞ Input signals are stable	40			
Active Standby Current in Power-Down Mode	I_{CC3P}	CKE ≥ V_{IL}(max), t_{CC} = 10ns	25		mA	
	I_{CC3PS}	CKE & CLK ≤ V_{IL}(max), t_{CC} = ∞	25			
Active Standby Current in Non-Power Down Mode	I_{CC3N}	CKE ≥ V_{IH}(min), CS ≥ V_{IH}(min), tcc = 10ns Input signals are changed one time during 20ns	120		mA	
	I_{CC3NS}	CKE ≥ V_{IH}(min), CLK ≤ V_{IL}(max), tcc = ∞ Input signals are stable	100		mA	
Operating Current (Burst mode)	I_{CC4}	Io = mA Page burst 4 Banks activated t_{CCD} = 2CLK	600	520	mA	1
Refresh Current	I_{CC5}	$t_{RC} \geq t_{RC}$(min)	880	760	mA	2
Self Refresh Current	I_{CC6}	CKE ≤ 0.2V	15		mA	

Notes: 1. Measured with outputs open.
2. Refresh period is 64ms.
3. Unless otherwise noticed, input swing level is CMOS ($V_{IH}/V_{IL} = V_{CCQ}/V_{SSQ}$)

Ordering Information	Speed	CAS Latency
WED3DG6416V10D1	100MHz	CL=2
WED3DG6416V7D1	133MHz	CL=2
WED3DG6416V75D1	133MHz	CL=3

PACKAGE DIMENSIONS



ALL DIMENSIONS ARE IN INCHES